GRAPHTEC

Channel Isolation and
Accurate Measurement

DC Strain Module [**GL7-DCB**]

Study Guide for GL7000

Signal conditioner for the GL7000 corresponding with the sensors using strain gauges.

- Technical guide for measuring [GL7-DCB] Amplifier.

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DATA PLATFORM GL7000

**DC Strain Module
GL7-DCB**

SIGNAL TEST™
New & Used Test Equipment

DC Strain module GL7-DCB, Study Guide

1. Outline and Basic Connection for the GL7-DCB module (1/3)

The DC strain module GL7-DCB amplifier is the signal conditioner for the GL7000 data platform. It offers isolated 4 channel input, corresponding bridge amp for the strain gauge sensor, and supports voltage and resistance measurement. Input signal type can be set individually for each channels.

- Incorporates elements (120/350 ohms) for bridge circuit, simple to measure micro distortion levels using strain gauges.
- Incorporates the excitation power source for the sensor.
- Supports TED corresponding sensors.
- Supports precision measurement using noise reduction techniques including low-pass and anti-aliasing filter.
- Supports remote-sensing and the shunt calibration to measure high accurate readings.

Types of sensors

Strain gauge

Load-cell

Acceleration sensor

Other sensors
(Based on strain gauge)

Control board

Sensors
(Voltage output type)

Thermistor

Potentiometer

Types of measurements

Measuring micro distortion (strain)

Measuring output of sensor

Measuring voltage

Measuring resistance

Input signal type can be configured individually for each channels.

GL7-DCB
DC STRAIN

**DC Strain Module
GL7-DCB** (4ch / unit)

## 1. Outline and Basic Connection for the GL7-DCB module (2/3)

The input terminal of the DC strain module GL7-DCB is a rectangle connector (D-Sub serial 9-pin). An adapter for the circular connector (NDIS type) and screw terminals are available for quick plug-and-play connection. Configuration of wiring will vary by the type of signals and sensors.

Input terminals
(for Strain, Voltage, Resistance)
Type: Rectangle connector (D-Sub
Serial 9-pin)

Switches to configure the input
channel by signal types and number
of gauges, etc.

Rectangular (D-Sub type)
connector (Plug, Male)
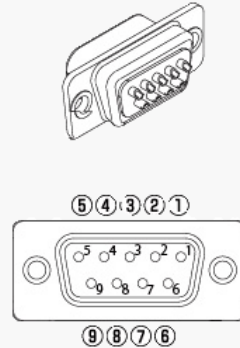
| Signal assignment of input connector				
Input connector pin number	Signal symbol	Description	Screw terminal (B-650)	NDIS connector (B-651)
1	B-	Excitation voltage (-)	1	C
2	IN-	Input signal (-)	2	B
3	S+	Sense (+)	3	N/A
4	T-	TEDS (-)	4	G
5	R+	Shunt resistance	5	N/A
6	S-	Sense (-)	6	N/A
7	IN+	Input signal (+)	7	D
8	B+	Excitation voltage (+)	8	A
9	T+	TEDS (+)	9	F
Shell	N/A	Shield	FG	E

Accessory for input terminal

Rectangular connector (D-Sub 9-pin)
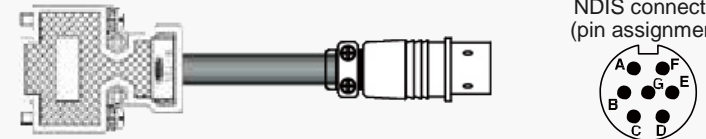(Standard accessory)
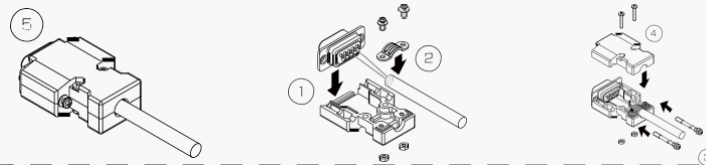
Wires from the sensor needs to be soldered to the connector. (Connection diagram varies by the type of sensor.)

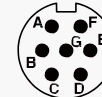Screw terminal adapter
(Option B-650)
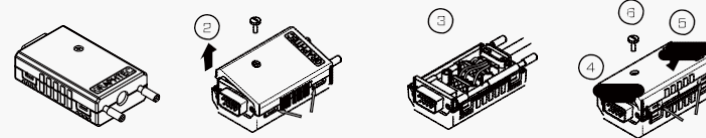
Wires from the sensor are fixed to terminal screw when this adapter is used.

NDIS connector adapter
(Option B-651)

NDIS connector
(pin assignment)

When sensor has cable with the circular connector (NDIS type), you can use the B-651 option.
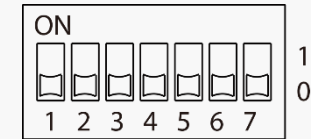
1. Outline and Basic Connection for the GL7-DCB module (3/3)

The input of each channels can be configured by the settings using the switch. This switch needs to be set according to the type of measurement and configuration of the sensors connected to the GL7-DCB module.

Switch for configuring input channel. (Located on front panel)

ON: 1
OFF: 0

| Setting of switch to set the input channel configuration															
Type of measurement	Configuration	Used the 120 ohms strain gauge							Used the 350 ohms strain gauge						
		1	2	3	4	5	6	7	1	2	3	4	5	6	7
Measuring micro distortion using strain gauge	Single gauge, 2 wires	1	1	1	1	1	1	1	1	1	1	1	1	0	0
	Single gauge, 3 wires	1	1	0	0	1	1	1	1	1	0	0	1	0	0
	Single gauge, 4 wires	1	1	0	0	1	1	1	1	1	0	0	1	0	0
	Dual gauge, 3 wires	0	1	0	1	1	1	1	0	1	0	1	1	0	0
	Dual gauge, 4 wires	0	1	0	1	0	1	1	0	1	0	1	0	0	0
	Dual gauge, 5 wires	0	1	1	1	0	1	1	0	1	1	1	0	0	0
	4 gauges, 4 wires	0	0	0	1	1	1	1	The 350 ohms strain gauge cannot be used.						
	4 gauges, 6 wires	0	0	1	1	0	1	1							
Measuring the output of a strain gauge-based sensor (ex. load cell)	4 wires	0	0	0	1	1	1	1	Use setting shown in left side.						
	6 wires	0	0	1	1	0	1	1							
Measuring direct voltage or resistance		0	0	0	1	1	1	1	Use setting shown in left side.						

Measuring micro distortion using strain gauge

When strain gauges are used, the switches are set according to the type of their sensor. The bridge circuit required to use the strain gauge is configured by the changing the settings on the switch mechanism.

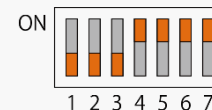### Measuring direct voltage or direct resistance

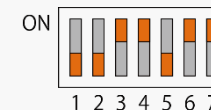When voltage or resistance is measured, switches needs to be set as shown below.
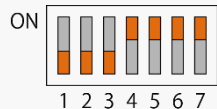
Measuring an output of a sensor based on the strain gauge
(Load-cell, Accelerometers, or other sensors)

When the output of the sensor is measured, switches are set according to the configuration of sensor you see below.
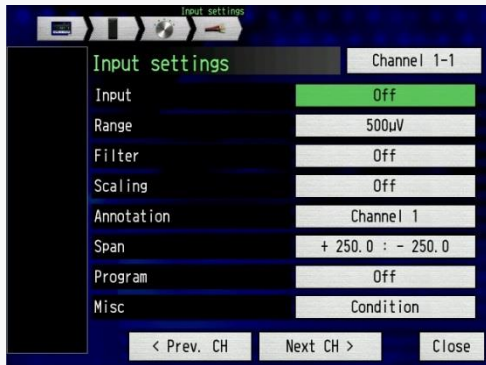
Sensor, 4 wires type

Sensor, 6 wires type

2. Setting the GL7-DCB module, Set measurement types

The GL7-DCB module can measure micro distortion levels using strain gauges, strain gauge-based sensors, voltage, and resistance. The input signal type is set on the input settings menu in each channels.
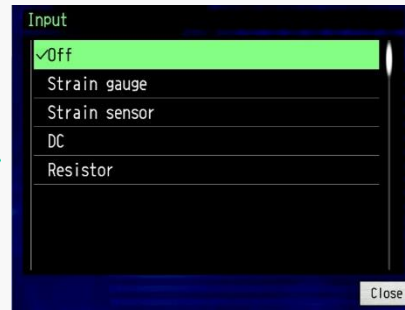
Input setting menu for GL7-DCB

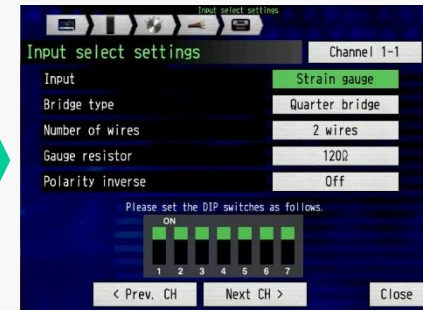Select the "Input" for setting the input signal types.

Setting of signal type (selects to the strain gauge)

Select the "Input" for setting the type of input signal.

Select the type of input signal.

Showcase the input type after selecting the sensor on the previous menu.

Note:
The description of the setting is the following.

Type	Description
Strain gauge	Micro distortion (strain) measurement using the strain gauge
Strain sensor	Sensor output measurement (using strain gauges inside sensors) (ie) Load Cell, accelerometer.
DC	Voltage measurement (DC coupling)
Resistor	Resistance measurement

Note:
When the input type is set to "Strain gauge", "Strain sensor", and "Resistor", the excitation voltage for the sensor or resistor will be outputted from the input connector. If wire connection of the sensor or equipment is not correct, the equipment or the GL7-DCB module might get damaged.

3-1. Setting the GL7-DCB module, Using Direct Strain Gauge Connection (1/2)

Bridge circuit is normally required when signal is measured using strain gauges. The element of this bridge circuit is incorporated inside the GL7-DCB module. The GL7-DCB strain gauge module supports strain gauges configured in Single gauge (Quarter bridge), Dual gauge (Half bridge), and Four gauge (Full bridge) configuration with multiple types of wiring format. The bridge circuit for each channels can be configured using the switch setting for each channels.

Single gauge configuration (Quarter bridge)

Configuration	Connection	Bridge circuit	Strain Gauge Type	
			120 ohms	350 ohms
2 wires	Remote-sensing: Non (It is affected by temperature, etc.)	E: Excitation voltage, e: Output signal, R: Elements of bridge circuit		
3 wires	Remote-sensing: Yes (It is not affected by temperature, etc.)	E: Excitation voltage, e: Output signal, R: Elements of bridge circuit		
4 wires	Remote-sensing: Yes (It is not affected by temperature, etc.)	E: Excitation voltage, e: Output signal R: Elements of bridge circuit		

Dual gauge configuration (Half bridge)

Configuration	Connection	Bridge circuit	Strain Gauge Type	
			120 ohms	350 ohms
3 wires	Remote-sensing: Non (It is affected by temperature, etc.)	E: Excitation voltage, e: Output signal, R: Elements of bridge circuit		
4 wires	Remote-sensing: Yes (It is not affected by temperature, etc.)	E: Excitation voltage, e: Output signal, R: Elements of bridge circuit		
5 wires	Remote-sensing: Yes (It is not affected by temperature, etc.)	E: Excitation voltage, e: Output signal R: Elements of bridge circuit		

3-1. Setting the GL7-DCB module, Using Direct Strain Gauge Connection (2/2)

Four (4) gauge configuration (Full bridge)

Configuration	Connection	Bridge circuit	Strain Gauge Type	
			120 ohms	350 ohms
4 wires	Remote-sensing: Non (It is affected by temperature, etc.)	E: Excitation voltage e: Output signal		N/A
6 wires	Remote-sensing: Yes (It is not affected by temperature, etc.)	E: Excitation voltage e: Output signal		N/A

3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (1/7)

When micro distortion levels are measured using strain gauges, bridge circuit needs to be configured to its gauge types. The elements for the bridge circuit is incorporated in the GL7-DCB module, and will need to be configured based on your chosen strain gauges.

Input setting menu for GL7-DCB

Setting the strain gauge configuration

Select the "Input" for setting the type of input signal.

In this example, the micro distortion (strain) is measured using the strain gauge.

Set the "Input" to "Strain gauge".
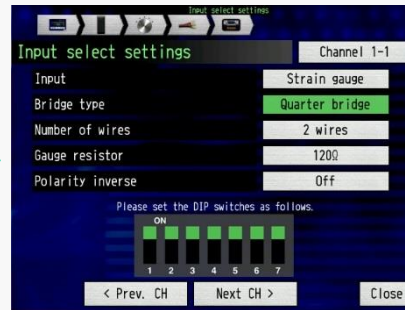
Select the "Bridge type" for setting the used number of strain gauges.

Select the type of bridge.

Note: Type of bridge - Number of gauges
Quarter bridge: using single (1) gauge
Half bridge: using dual (2) gauges
Full bridge: using four (4) gauges
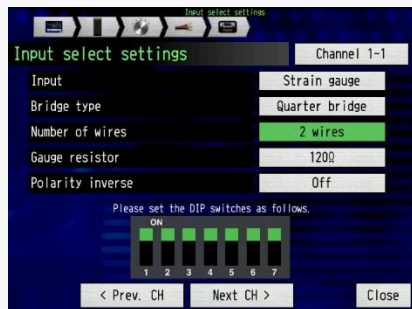
Select the "Number of wires" for setting the type of the gauge.

Select the number of wires from the gauge.

Note: Displayed number of wires are varied by the setting of the type of bridges.
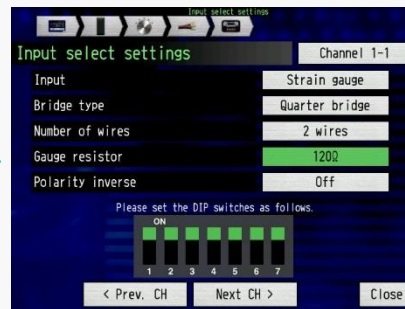
Select the "Gauge resistor" for setting the type of strain gauge.

Select the resistance of the used gauge.

3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (2/7)

The elements for the bridge circuit is incorporated in the GL7-DCB module, and they are configured by the setting on the switches for each channels. The setting pattern will be displayed on the screen after setting parameters are entered. The excitation power for the bridge circuit needs to be applied. The range of measurement will vary by the setting of the excitation source.

Setting the excitation for bridge circuit
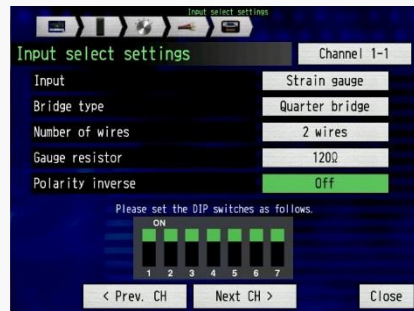
Select the "Polarity inverse" for setting polarity of the signal.

Select the ON or OFF.
Note: If polarity of the phenomena and measured signal is not the same, this setting needs to be changed.
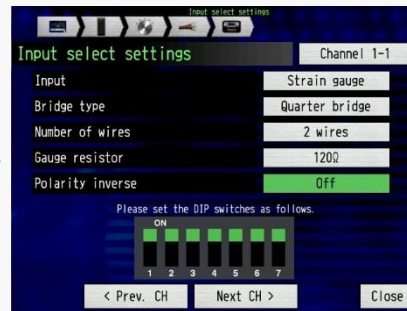
Settings of strain gauge are displayed.
Note: Setting pattern of switch for configuring channel will be shown below. You will need set the switches to the ones shown here.
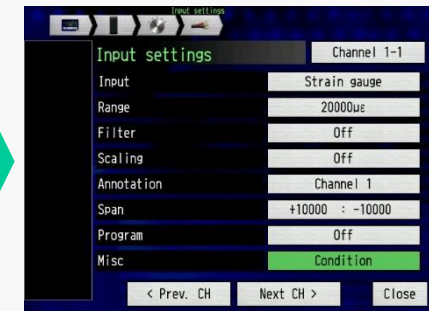
Select the "Misc" for setting the condition of the bridge circuit.

Select the "Sensor setting" for setting the condition of excitation for bridge circuit.

Select the "Bridge power" for setting the type of excitation for bridge circuit.

Select "Voltage" or "Constant current" for type of excitation.
Note: Voltage would be normally selected here. When lead wire of the gauge is long, constant current is used to avoid the noise factor from the lead wire.

Select the "Bridge voltage" for setting value of excitation.

3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (3/7)

Measurement ranges can be set after all parameters of strain gauge are complete. The range of signal to be displayed can be set here. Captured signal is limited up to the selected measuring range. The displayed signal range can be set separately from the measuring range.
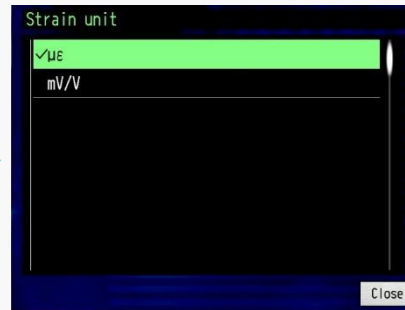
Setting the unit for strain measurement   **Setting of measuring range**

Select the voltage for excitation.

Note: 5V and 10V can be selected when the gauge with 300 ohms or higher is applied.

Select the "Strain unit" for setting the measurement unit.

Select the "με" (micro-epsilon) or "mV/V" for the unit of measurement.

Note: When micro distortion is measured, usually the "με" is used. When sensors are used, "mV/V" would normally be applied.
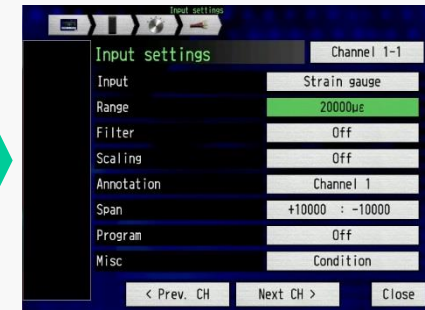
Select the "Range" for setting measuring range.

Setting the span (range of signal to be displayed)
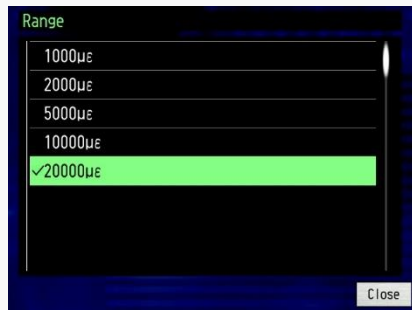
Select the range.

Note: Displayed value of ranges are varied by setting the excitation condition.
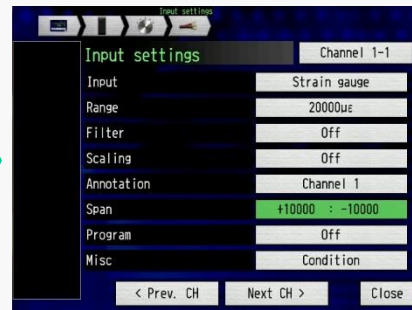
Select the "Span" for setting the displayed signal range.
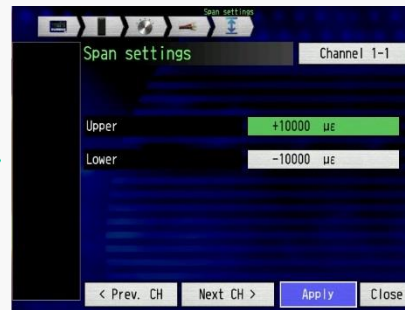
Select the "Upper" and "Lower" span for setting display signal range.
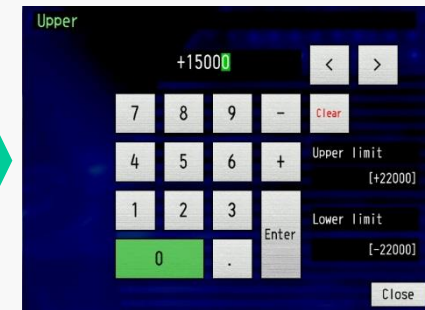
Set the value for displayed signal range.

Note: The span setting affects the range of signal to be displayed on the screen. The range of captured signal is set by the "Range". The captured signal will be saved to specified memory media.
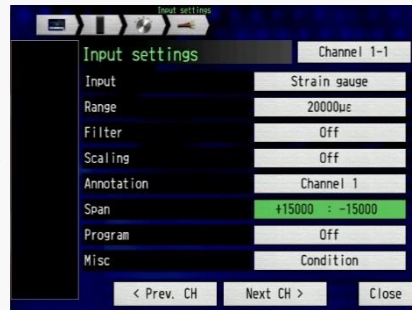
3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (4/7)

Measured signal can be converted to other physical units, and you can save and display in real time. The scaling function is used for this feature.

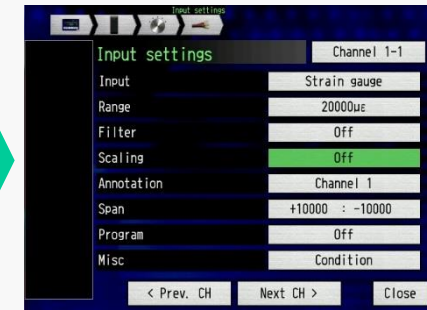**Setting of scaling conditions**
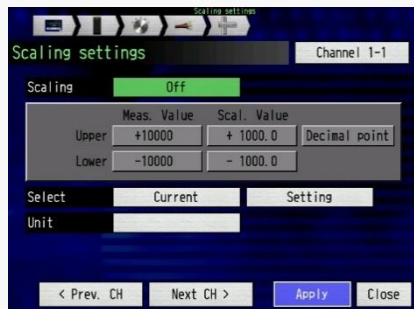

Span Setting is displayed

Sets the measurement condition for display.

The micro distortion (strain) can be measured with these settings.

If the measured signal needs to be converted to other unit, then you will need to set the Scaling function to view data in different units.

Select the "Scaling" for setting the scaling condition.

Select "Scaling" for setting the scaling condition.

Select "On" to enable the scaling function.

Select the "Upper" and "Lower" values for the "Meas. Value". (Measured Value)

Enter the value. If set value is out of the limit, measuring range will need to be changed.

Note: Signal is converted using four (4) reference points which focuses on two (2) points in measurement value and two (2) points in scaled value. The measuring value is calculated by proportional calculation based on the specified four reference points.

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3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (5/7)
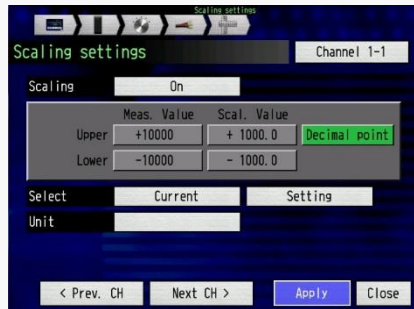
Select the "Decimal point" for setting the digits of the scaled value.
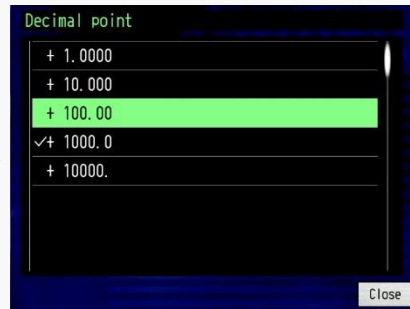
Select the number of digits above the decimal point. This will showcase the digits in the scaled value.
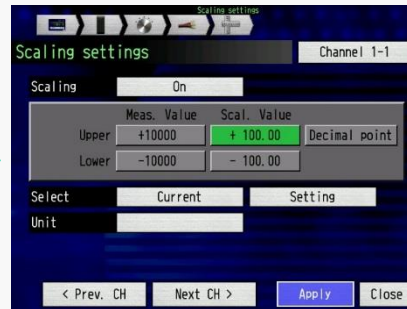
Select the "Upper" and "Lower" values for the "Scal. Value". This is the scaled value corresponding to the measurement value's "Upper" and "Lower" values.
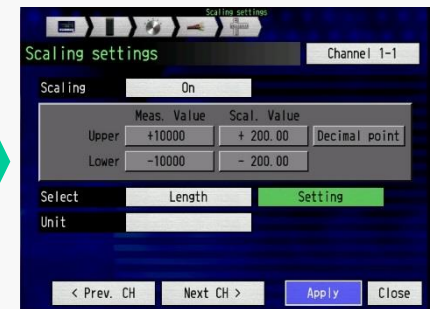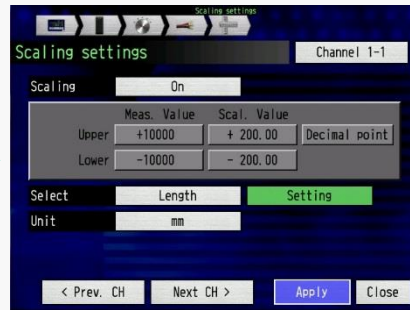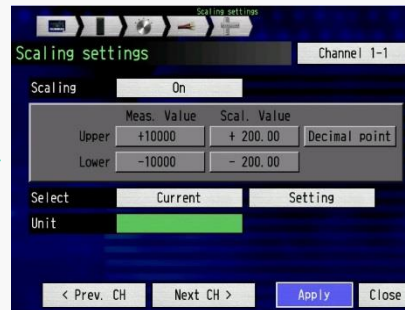
Enter the scaled values.

Setting of scaling unit (select from pre-set)

Set the scaled condition.

Press "Select" for complete setting the type of scaled signal.

Select the type of signal for displaying the unit that has been pre-set.

Select the "Setting" for setting the type of the unit.

Note: The unit of scaled value can be selected from the preset or you can enter them directly.

DC Strain module GL7-DCB, Study Guide

3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (6/7)

Setting of scaling unit (direct enter)

Select the unit from preset.
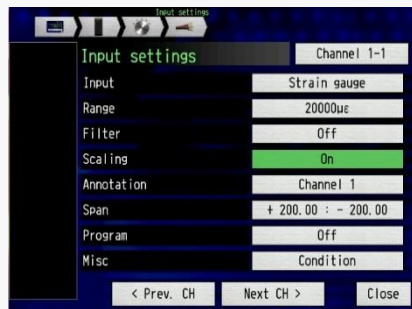

Set the units to be displayed.

or

Select the "Unit" for setting the unit of scaled value.

Note: If there is no unit available the preset list, unit can be entered directly using the keyboard.
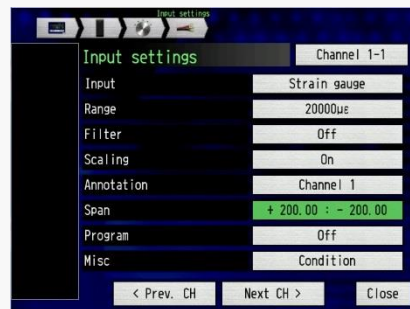
Enter the unit using displayed keyboard.

Setting the span (range of signal to be displayed in scaled value/unit)

Settings for measurement condition are displayed.

Select the "Span" for setting displayed signal range.

Select the "Upper" and "Lower" values for setting display signal range.

Set the value for display signal range.

Note: The span setting affects the range of signal to be displayed. The range of capturing signal is set by the "Range". The captured signal will be saved to specified memory media.

3-2. Setting the GL7-DCB module, Using the Strain Gauge, Menu Setting (7/7)

Displays the Span setting
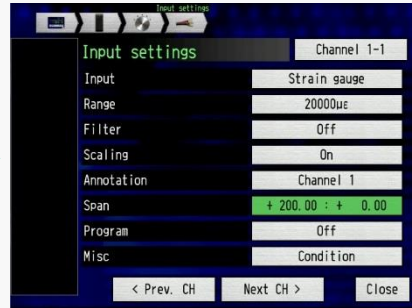
All settings for the measurement
conditions are now final.

3-3. Setting of GL7-DCB module, Using the Strain Gauge, Shunt calibration (1/1)

The GL7-DCB module has the shunt calibration and remote sensing functionality. Shunt calibration is available when the input type is selected to the "Strain gauge". This can be executed from the settings menu. The remote sensing function is automatically applied when the input type is selected to the "Strain gauge" or "Strain sensor". Those functions are available in the specific condition listed below.

Input setting menu for GL7-DCB
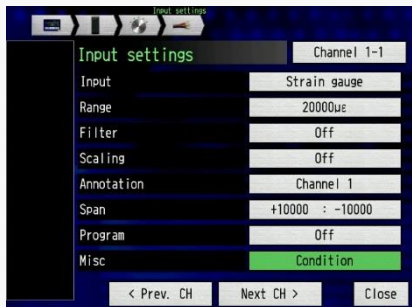
Select the "Misc" for executing the shunt calibration.

Setting of shunt calibration
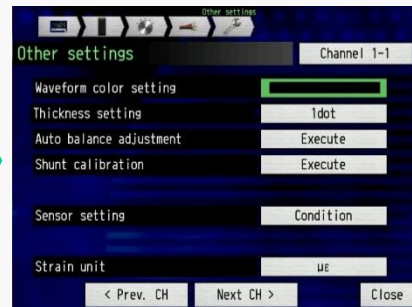
Press the "Execute" for the "Shunt calibration" for executing the shunt calibration.

Note: The shunt calibration and the remote sensing functions are available in the following configuration of the strain gauge or the strain gauge based sensor setup.

Type of input	Configuration	Number of wires	Remote sensing	Shunt calibration
Strain gauge	1 gauge (Quarter bridge)	2 wires	N/A	N/A
		3 wires	Available	Available
		4 wires	Available	Available
	2 gauges (Half bridge)	3 wires	N/A	N/A
		4 wires	Available	N/A
		5 wires	Available	Available
	4 gauges (Full bridge)	4 wires	N/A	N/A
		6 wires	Available	N/A
Strain gauge based sensor		4 wires	N/A	N/A
		6 wires	Available	N/A

Note: Shunt Calibration
The shunt calibration is executed using the shunt resistor that is incorporated within the GL7-DCB module. The shunt resistor is appended to the bridge circuit for simulating the bridge circuit. The compensation value is found by the shunt calibration. GL7-DCB module will provide accurate measurement using this compensation value.

Note: Remote Sensing
When longer lead wires of the strain gauge or strain gauge based sensor is used (ie. load cell, accelerometers), lead wire length will affect the accuracy of the measurement. The remote sensing function finds the resistance of the lead wire, and then compensates the value for the lead wire resistance levels. A further accurate measurement can be achieved using the compensation value.

The excitation voltage is required when the signal is measured using the strain gauge or strain gauge based sensor. If the lead wire is very long, the actual applied excitation voltage will be smaller then the resistance of the lead wire. This can cause an error in measurement accuracy.

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4-1. Setting of GL7-DCB module, Using Proprietary Sensors, Configuration (1/1)

Variety of signals can be measured using the strain gauge based sensor such as load cells and accelerometers. These products typically carry several strain gauges inside the sensor requiring excitation power to draw power from the DAQ system to measure the resistance within the strain gauges. The GL7-DCB can supply this direct excitation power to the sensors.

For Signal measurement using Sensors (strain gauge based)

Configuration	Connection	Bridge circuit	Switch setting
4 wires	Remote-sensing: Non (it is affected by temperature.) 	N/A	
6 wires	Remote-sensing: Yes (It is not affected by temperature.) 	N/A	

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting (1/8)

When various signals are measured using the strain gauge based sensors, the input circuit needs to be configured for particular sensors for each channel of your measurement. GL7-DCB offers in-depth set up to properly match and measure your sensors.

In this example, we look at a pressure measurement that uses strain gauge based sensor with the following characteristics.

  Rated Output: 1.25mV/V
  Rated Capacity: 50kPa
  Excitation Voltage: 1 to 3V
  Output Resistance: 350 ohms

Note;
The rated output value varies by the excitation voltage value. (When excitation voltage is 2V, the rated output is 2.5mV.)

The rated output value is outputted when the rated capacity is applied to the sensor.

In this case, when the excitation voltage is 1V and the sensor receives the 50kPa pressure, the sensor outputs 1.25mV.
(sensitivity: 50kPa/1.25mV = 40kPa/mV)

Input setting menu for GL7-DCB
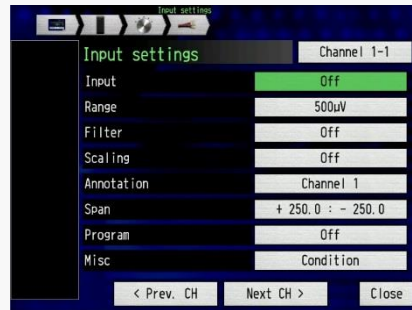
Select the "Input" for setting the type of input signal.

Setting of sensor configuration
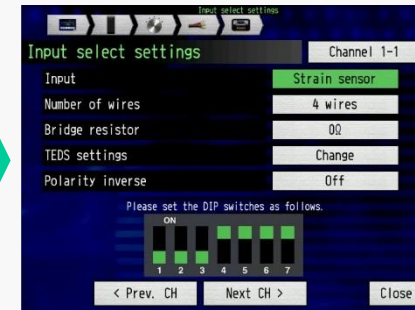
Set the Input to the "Strain sensor".
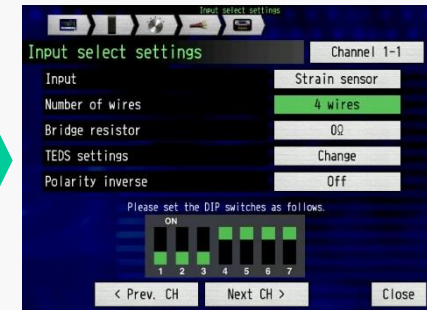
Select the "Number of wires" for setting the configuration of the sensor.

Select the number of wires from the sensor.
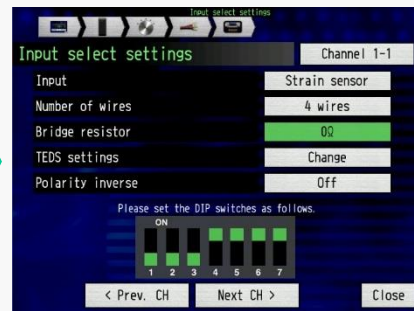
Select the "Bridge resistor" for setting the configuration of the sensor.

Set the resistance of the sensor.

Note: The resistance of the sensor is written on the specification sheet of the sensor.
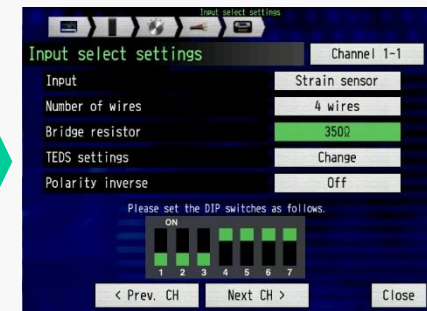
Review the displayed settings of the strain gauges.

Note: Setting pattern of switch for configuring channel is shown below. The switches will need to be set in this particular pattern based on your gauge setup.

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting(2/8)

Set the excitation voltage for sensor
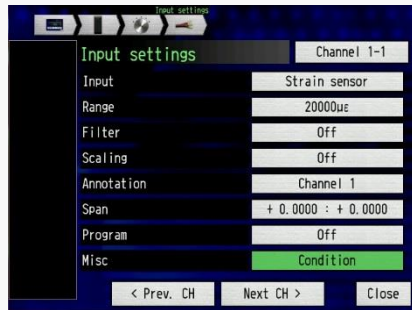
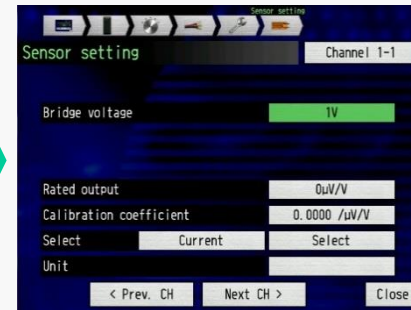Select the "Misc." for setting the sensor characteristics.

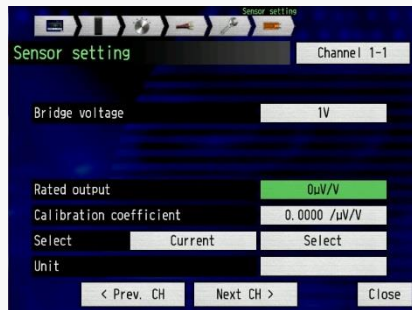Select the "Sensor setting" for setting the sensor characteristics.

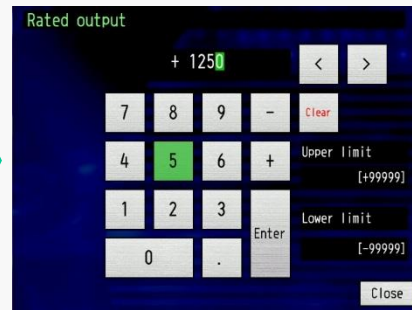Select the "Bridge voltage" for setting the excitation condition.

Select the voltage for excitation levels.

Set the sensor characteristic

Select the "Rated output" for setting the sensor characteristics.

Set the number of rated output value.

Note: The rated output is written in the specification of the sensor data sheet. The value entered in this menu is in µV.

For example, when the rated output in the specification sheet is 1.25mV/V, then the number entered in this menu would be the "1250µV/V".

Rated output;

  1.25mV/V = 1250µV/V

Rated output setting is displayed.

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting(3/8)

Set the sensor characteristics (in the measuring unit of the sensor)
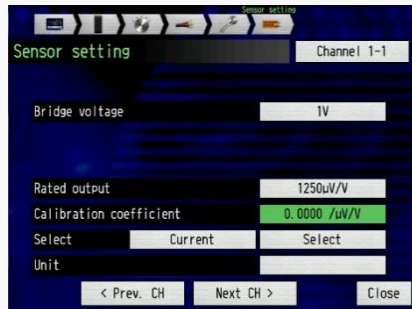
Select the "Calibration coefficient" for setting the sensor characteristics.

Note: Measurement is displayed and saved in the measuring units of the sensor. Measured voltage is converted to the measurement units in this setting.
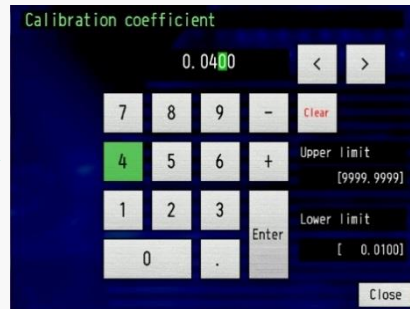
Set the value.

Note: The entered value is the sensitivity from the sensor. This sensitivity is calculated with the rated output and the rated capacity of the sensor. The unit of sensitivity in this menu is "µV".
In this sensor, the sensor outputs the 1.25mV/V (rated output) when the sensor receives the 50kPa (rated capacity). So, sensitivity is 50kPa per 1.25mV/V.

Sensitivity: 50kPa/1.25(mV/V)
= 40kPa/(mV/V)
= 0.04kPa/(µV/V)

The number (**0.04**) would be entered in this menu. The unit (kPa) is entered in the Unit section.
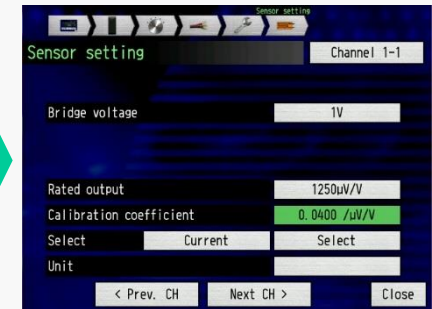
Settings of calibration coefficient (sensitivity of sensor) is displayed.

When measurement needs to be displayed in other unit, scaling would be required. Go to section 6/8 (page 21).

Set the measurement unit (select from pre-set)
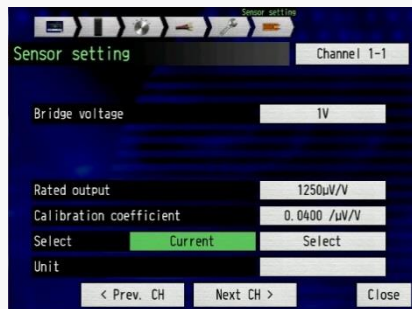
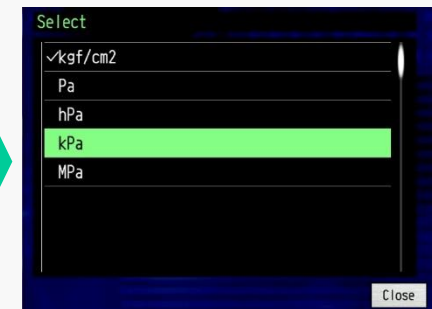Press the "Select" for setting the type of measurement signal.
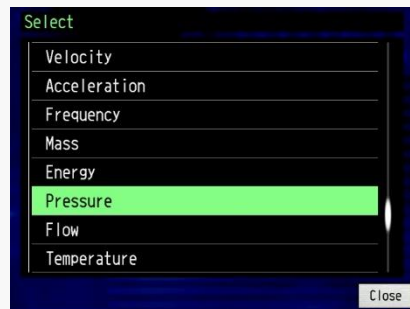
Select the type of signal for displaying the unit that has been pre-set.

Press the "Select" for setting the type of the unit.

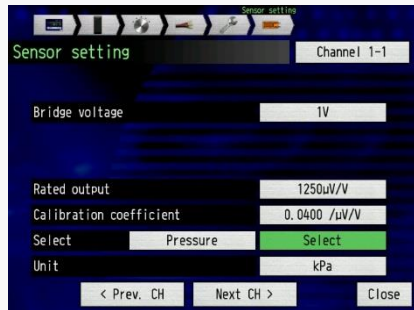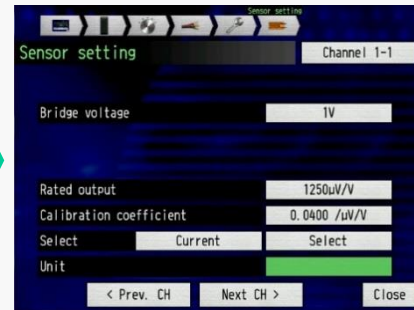Select the unit from preset.

Note: The unit of scaled value can be selected from the preset or you can enter them directly.

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting(4/8)

Setting of measurement unit (direct enter)

Settings for the units are displayed.

or

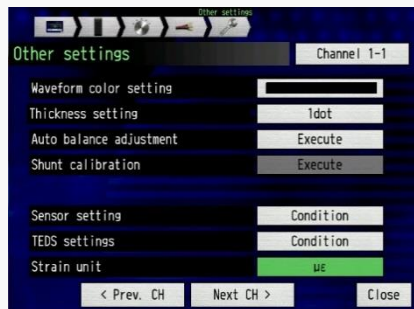Select the "Unit" for setting the unit of measurement value.

Note: If there is no unit in the preset list, unit can be entered directly using the keyboard.
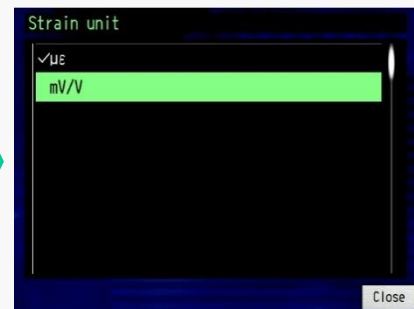

Enter the unit using displayed keyboard.

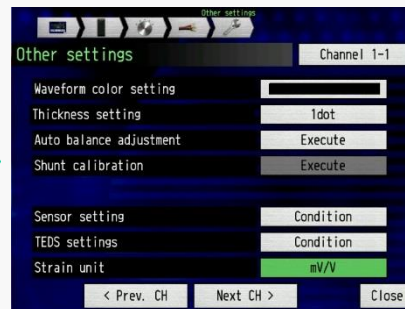Settings of the unit is displayed.

Select the "Strain unit" for setting the measurement unit for measuring range.

Select the "mV/V".

Note: When the sensor is used, usually the "mV/V" is used.
When micro distortion is measured, the "με" unit is normally is used.
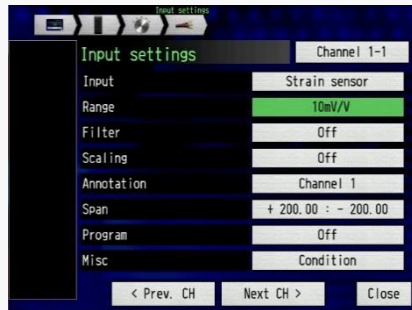

Settings of unit are displayed.

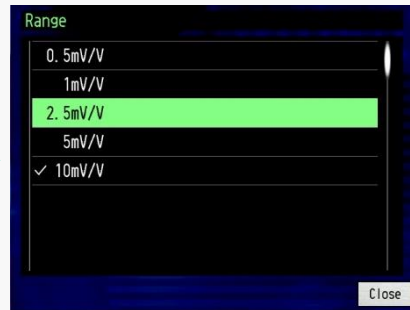Display the measurement condition after pressing Close.

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4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting(5/8)

Set the measuring range

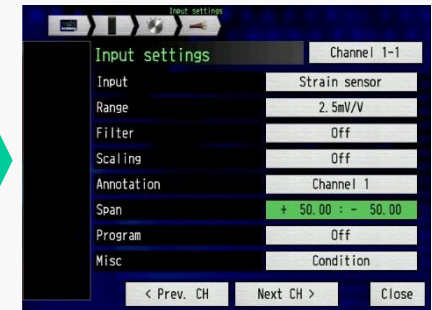
Select the "Range" for setting the measuring range.

Select the range.

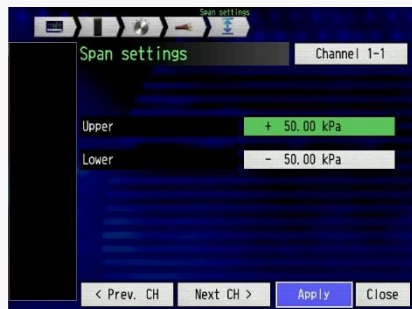Note: Displayed value of ranges are varied by settings for the excitation condition.

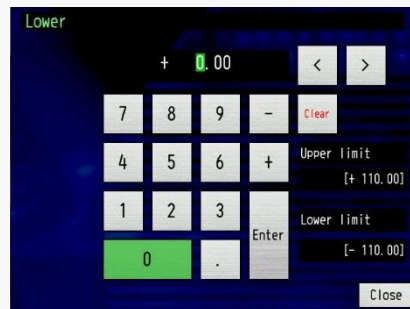Set measurement range is displayed.

Setting of span (range of signal to be displayed)
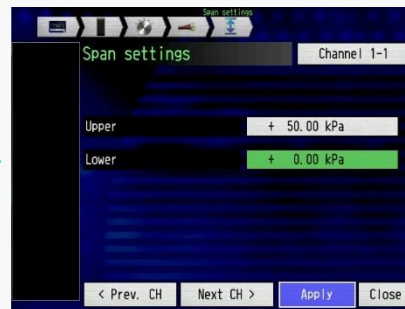

Select the "Span" for setting display signal range.
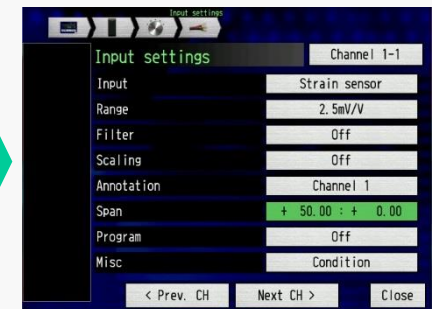

Select the "Upper" and "Lower" levels for setting display signal range.

Set the value for display signal range.

Span setting gets displayed.

Measurement Conditions are displayed after you press Apply.

Note: The span setting affects the range of signal to be displayed. The range of capturing signal is set by the "Range". The captured signal will be saved to a specified memory media.

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting (6/8)

When the measured value needs to be displayed and saved in a measurement unit other than that offered by the sensor, the number entered on the "Calibration coefficient" need to be converted to the physical units used for that measurement.

Note: "Scaling" factor on the input setting menu is not available when "Strain sensor" is selected. The scaling function needs to be set in the "Calibration coefficient" parameter.

Set the sensor characteristics (in the unit different from the sensor)
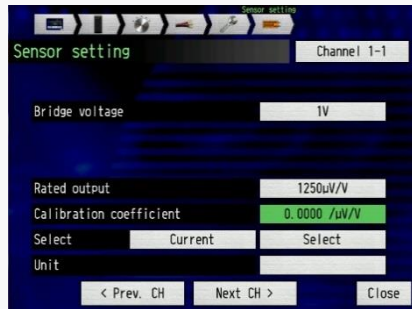
Select the "Calibration coefficient" for setting the sensor characteristics.

In this example, the pressure is measured using the sensor that is calibrated with the SI unit (kPa). The measured value is displayed in the unit as "gf/cm2" which would be the Physical unit commonly used.


Set the value of the sensitivity.

Note: The sensitivity of the sensor is calculated by the rated output and the rated capacity. It needs to be converted to the required unit.

In this particular sensor, the sensitivity of the sensor is as follow:

$$\text{Sensitivity: } 50kPa/1.25(mV/V)$$
$$= 40kPa/(mV/V)$$
$$= 0.04kPa/(\mu V/V)$$

The conversion rate between the "kPa" and "kgf/cm^2" is as follows:

$1kPa = 0.0101972kgf/cm^2 = 10.1972gf/cm^2$

So, the sensitivity in the "kgf/cm^2" is as follows

$0.04kPa/(\mu V/V) = 0.407888(gf/cm^2)/(\mu V/V)$

This number (0.4079) is entered in this menu. The unit (gf/cm^2) is entered in the Unit section.
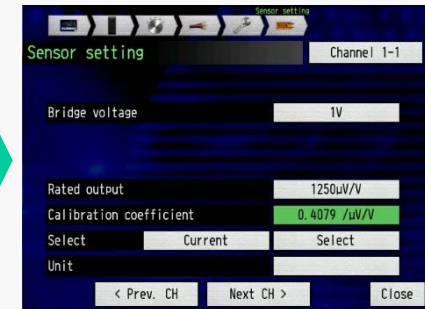
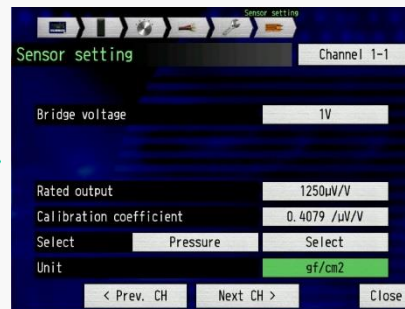Settings of calibration coefficient is displayed.
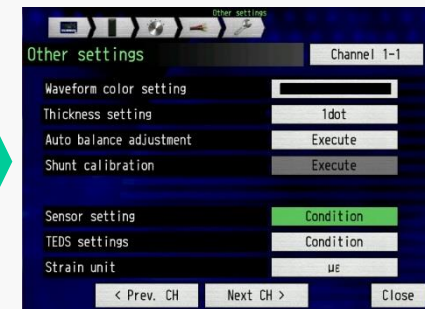
Set the scaling unit (in text)
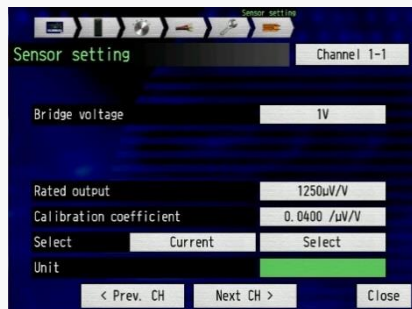
Select the "Unit" for setting the unit of measurement value.

Enter the unit using the displayed keyboard.
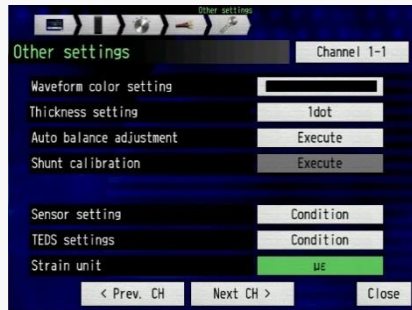

Measurement units are displayed..

Measurement conditions are displayed after pressing "Close".

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting (7/8)

Setting of measuring range

Select the "Strain unit" for setting the measurement unit.

Select the "mV/V".

Note: When the sensor is used, usually the "mV/V" is used.
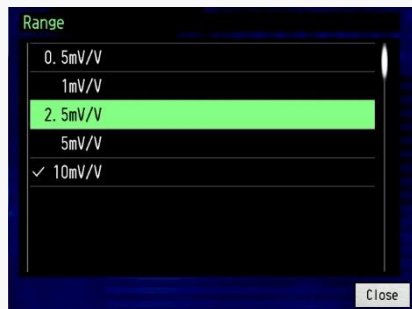When micro distortion is measured, "με" units are normally used.
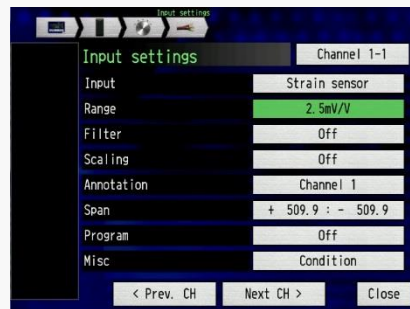
Strain unit settings are displayed.

Select the "Range" for setting the measuring range.

Setting of span (range of signal to be displayed)

Select the range.

Note: Displayed value of ranges are varied by setting of the excitation condition.

Range setting conditions are displayed.

Select the "Span" for setting display signal range.

Note: The span setting affects the range of signal to be displayed. The range of capturing signal is set by the "Range". The captured signal will be saved to a specified memory media.
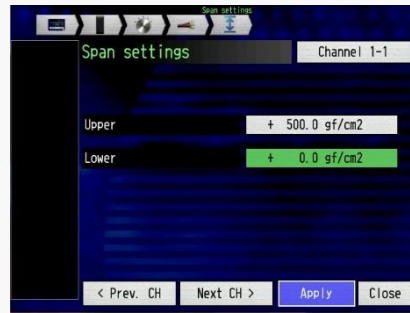
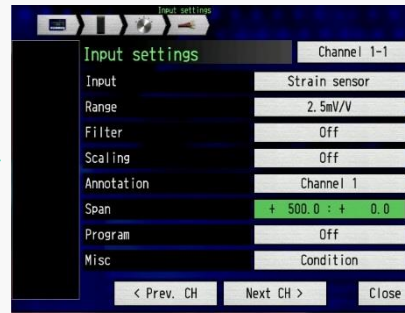Select the "Upper" and "Lower" levels for setting display signal range.

4-2. Setting the GL7-DCB module, Using Proprietary Sensors, Menu Setting (8/8)

Set the values for displayed signal range.

Span setting will be displayed

Measurement Conditions is displayed after you press "Apply".

4-3. Setting the GL7-DCB module, Using Proprietary Sensors, TEDS Compatible sensor

When TEDS (Transducer Electronic Data Sheet) compatible sensors are used, GL7-DCB module can read settings information automatically from the sensor. The information of the rated capacity, rated output and etc. are included in the TEDS, and sensor sensitivity and other informations will be set automatically. The "Range", "Filter", "Scaling" or other setting needs to be set as required after the TEDS measurements are read.

Input setting menu for GL7-DCB

Set TEDS Compatible Sensors

Select the "Input" for setting the type of input signal.

Select the "TEDS setting" for reading TEDS compatible sensors after the "Input" is set to "Strain sensor".

Note: TEDS is supported when the strain gauge based sensor is selected. If the Strain gauge is selected, then the TEDS setting menu will not be available.

Select the "Read TEDS information" for executing the reading of the information from the sensor.

Note: TEDS compliant sensors need to be compatible to the IEEEE1451.4 Template ID33 (Strain gauge based sensor) standard.
If the sensor does not support this standard, then the TEDS feature cannot be used. In such cases, the setting condition of the sensor needs to be set manually.
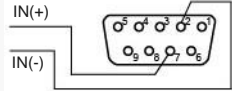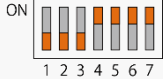
5-1. Setting the GL7-DCB module, Measuring the Voltage, Input Configuration (1/1)

Standard voltage input can be measured using this module. The input section of the channels needs to be configured for standard voltage measurement, and it is done by changing the switch setting.

For Voltage measurement

| Configuration	Connection	Bridge circuit	Switch setting
2 Wires		N/A	

5-2. Setting the GL7-DCB module, Measuring Voltage Input, Menu Setting (1/4)

Mixed signals can be measured using a strain gauge-based sensor. When these types of sensors are used, excitation power is required and GL7-DCB module can supply the excitation power to the sensor.

Input setting menu for GL7-DCB
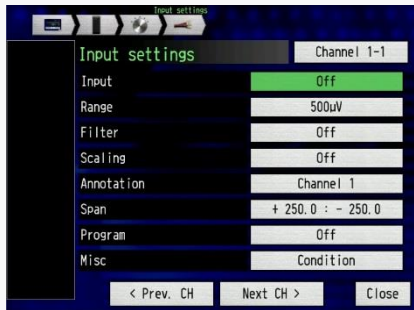
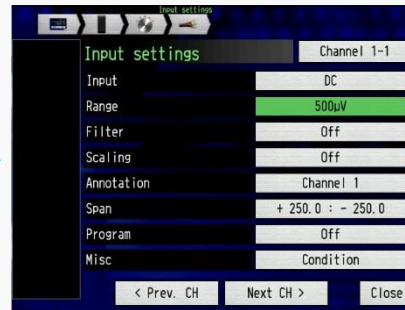Select the "Input" for setting the type of input signal.

Setting of input configuration

Set the Input to "DC" for measuring voltage.

Note: Setting pattern for DIP switch is shown below. The switch needs to be set to this pattern.

Setting of measuring range

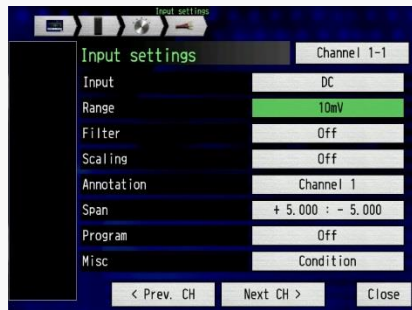
Select the "Range" for setting the measuring range.

Range

Select the range.

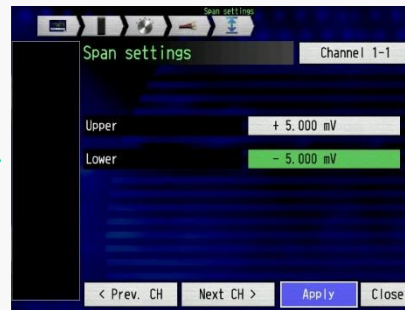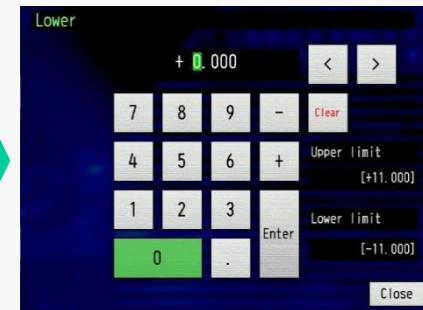**Setting of span (range of signal to be displayed)**

Setting of Range is displayed.

Select the "Span" for setting display signal range.

Select the "Upper" and "Lower" levels for setting displayed signal range.

Set the value for displayed signal range.

Note: The span setting affects the range of signal to be displayed. The range of capturing signal is set by the "Range". The captured signal will be saved to a specified memory media.

5-2. Setting the GL7-DCB module, Measuring Voltage Input, Menu Setting (2/4)

When the output voltage of the sensor is measured, the measurement value needs to be displayed and saved in its physical units. Scaling function would be used to offer this conversion.
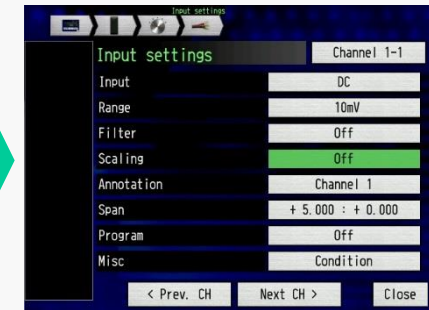

Span settings are displayed.

Measurement conditions are displayed after pressing "Apply".

Standard voltage levels can be measured in this settings.

If the measured signal needs to be converted to other unit, Scaling function will need to be used.
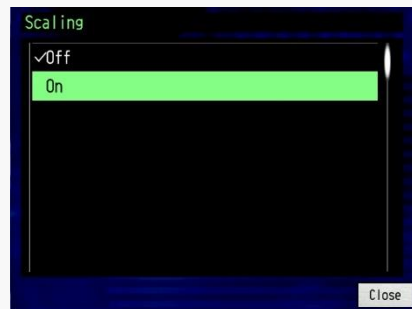
Setting of scaling condition

Select the "Scaling" for setting the scaling condition.

In this example, the flow rate is measured using voltage output sensor. The sensitivity of the sensor is as follows: 5mV output at 0.5m³/min
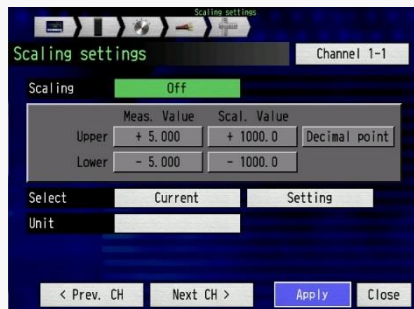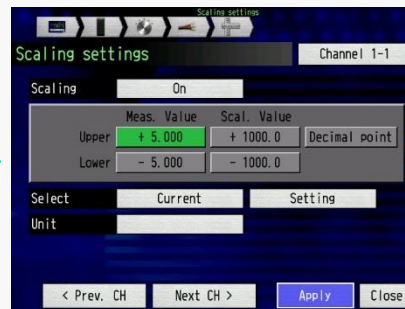

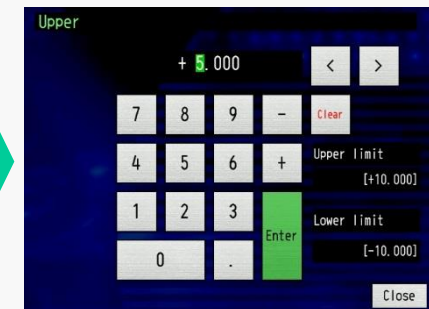Select the "Scaling" for setting the scaled condition.

Select to "On" to enable the scaling function.

Setting of span (range of signal to be displayed)

Select the "Upper" and "Lower" levels of the "Meas. Value".

Enter the value. If set value is out of limit, the setting of the measuring range needs to be changed.

Note: The signal is converted using four (4) reference points that includes two (2) points in measurement value and two (2) points in scaled value. The measuring value is calculated by proportional calculation based on the specified four reference points.
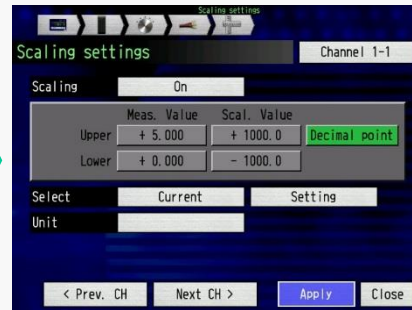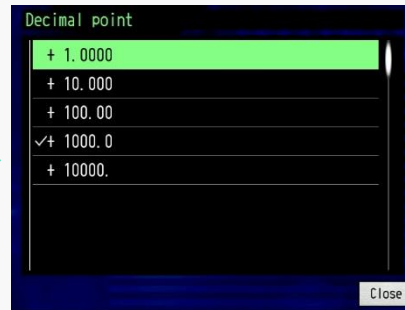
DC Strain module GL7-DCB, Study Guide

5-2. Setting the GL7-DCB module, Measuring Voltage Input, Menu Setting (3/4)

Set the reference points for scaled values.

Select the "Decimal point" for setting the digits for the scaled value.

Select the number of digits below the decimal point. This will be how the scaled values will be displayed.

Select the "Upper" and "Lower" values for the "Scal. Value". This is the scaled value corresponding to the measurement value to the "Upper" and "Lower" levels for the "Meas. Value".

Setting of scaling unit (select from pre-set)
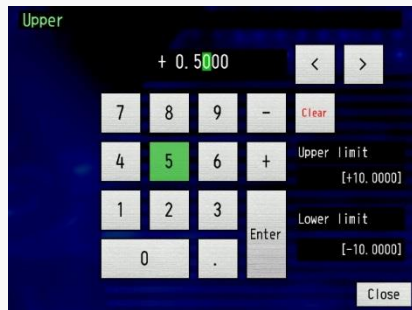
Enter the value for scaling.

Set the scaled conditions..

or
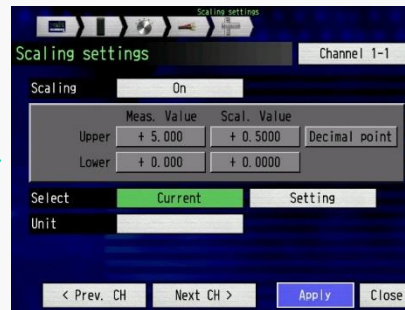
Press "Select" for setting the type of scaled signal.
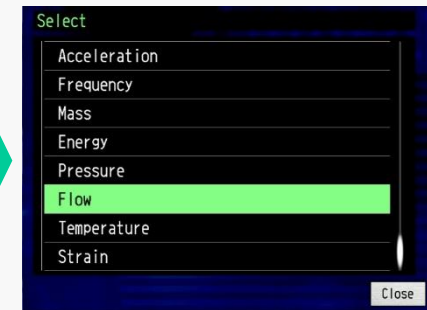
Select the pre-set type of signal for displayed unit..

Note: The unit of scaled value can be selected from the preset or can be entered manually..

5-2. Setting the GL7-DCB module, Measuring Voltage Input, Menu Setting (4/4)

Setting of scaling unit (direct enter)

Select the "Setting" for setting the type of units.
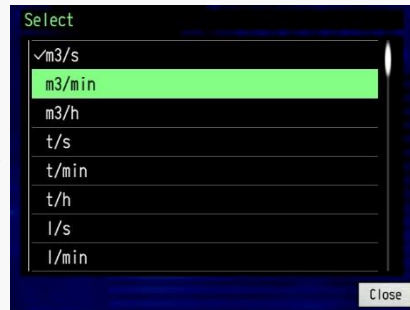
Select the unit from preset.

Select the "Unit" for setting the unit of the scaled value.

Note: If there is no unit available in the preset list, unit can be entered manually using the keyboard.

Enter the unit using displayed keyboard.

Display the set values.

Display the measurement conditions after pressing "Apply".

6-1. Setting the GL7-DCB module, Measuring Resistance, Input Configuration (1/1)

Resistance can also be measured using this module. The input section of the channel needs to be configured for measuring resistance, and this is done by setting the proper conditions on the DIP switch.
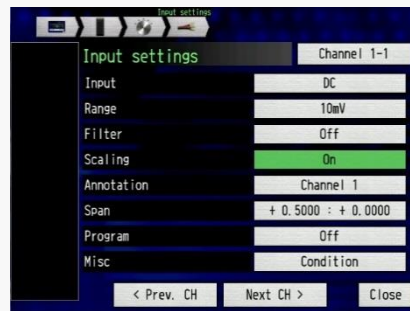
For Resistance measurement

Configuration	Connection	Bridge circuit	Switch setting
2 Wires		N/A	
4 Wires		N/A	

Note: When resistance is measured using two (2) wires, it is required to connect between the pin #1 and #2, and pin #7 and #8. It is shown in above figure.
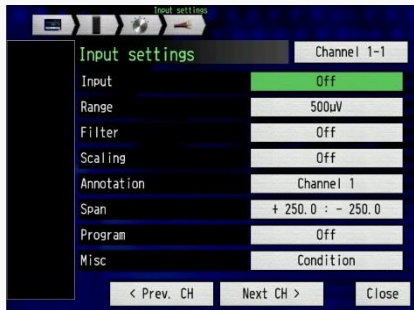
6-2. Setting the GL7-DCB module, Measuring Resistance, Menu Setting (1/4)

Various signals can be measured using the strain gauge-based sensors. Internal strain gauges require excitation power and GL7-DCB module can supply the excitation power to these sensors.

Input setting menu for GL7-DCB

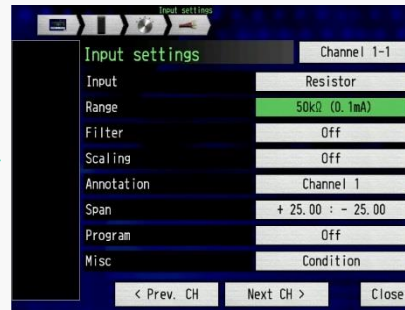Select the "Input" for setting the type of input signal.

Setting of input configuration

Set the Input to "Resistor" for measuring resistance.

Note: Setting pattern for DIP switch will be shown below. The switch needs to be set to this particular pattern.

Setting of measuring range
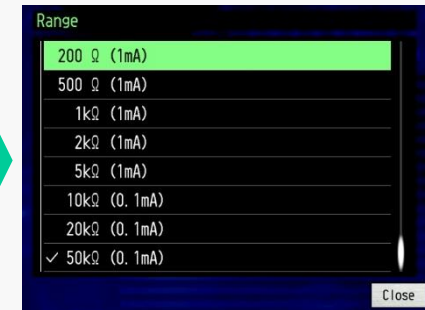
Select the "Range" for setting the measuring range.

Select the range.

Setting of span (range of signal to be displayed)

Setting is displayed.

Select the "Span" for setting display signal range.

Select the "Upper" and "Lower" levels for setting display signal range.
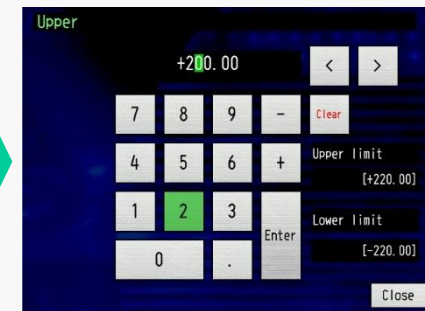
Set the value for display signal range.

Note: The span setting affects the range of signal to be displayed. The range of capturing signal is set by the "Range". The captured signal will be saved to a specified memory media.

6-2. Setting the GL7-DCB module, Measuring Resistance, Menu Setting (2/4)

When the output resistance of the sensor is measured, the measured value needs to be displayed and saved in its physical units. The scaling function can help support this conversion.

Setting of scaling condition

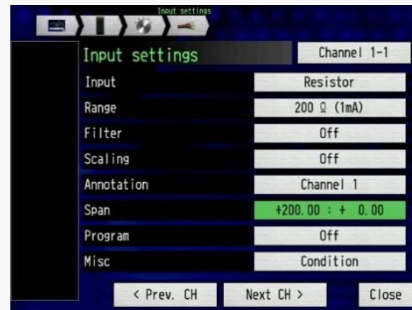Resistance can be measured in this particular settings.

If the measured signal needs to be converted to other unit, then use the scaling feature to convert original signal measurement scale

Span setting is displayed. Press "Apply" after confirming the measurement range.

Measurement condition setting is displayed.
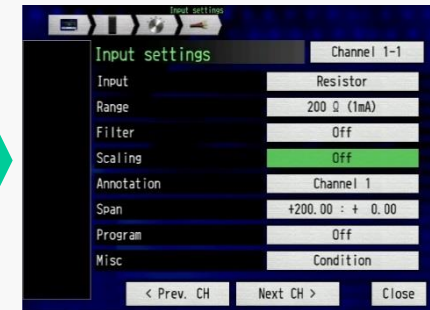
Select the "Scaling" for setting the scaling condition.

In this example, displacement is measured using a potentiometer. The sensitivity of the sensor is as follows: 200ohms at 10mm, 100ohms at 0mm, 0ohm at -10mm

Setting of span (range of signal to be displayed)
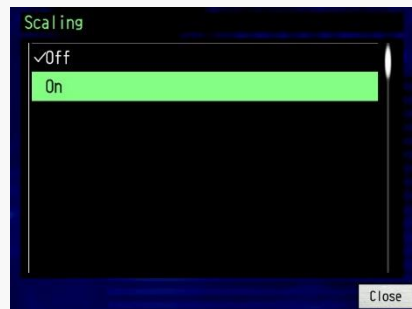
Select the "Scaling" for setting the scaling condition.

Select to "On" to enable the scaling function.
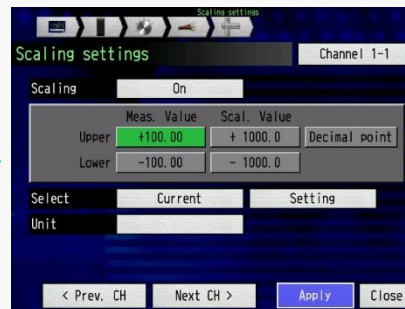
Select the "Upper" and "Lower" levels of the "Meas. Value".
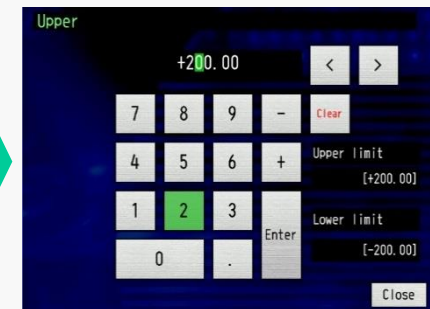
Enter the value. If set value is out of limit, the setting of the measuring range needs to be changed.

Note: The signal is converted using four (4) reference points which includes two (2) points in measurement value and two (2) points in scaled value. The measuring value is calculated by proportionaly calculating the specified four reference points.

6-2. Setting the GL7-DCB module, Measuring Resistance, Menu Setting (3/4)

Set the reference point in measured units.

Select the "Decimal point" for setting the digits to the scaled value.
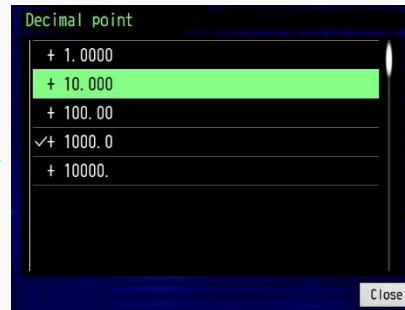
Select the number of digits above the decimal point. This will be the decimal digits that will be displayed on the scaled values.
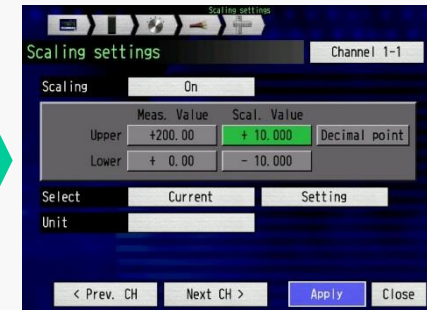
Select the "Upper" and "Lower" levels for the "Scal. Value". This is the scaled value corresponding to the measurement value to against the "Upper" and "Lower" values for the "Meas. Value".

Setting of scaling unit (select from pre-set)

Enter the value for scaling.

Scaled measurement values will be displayed..

or
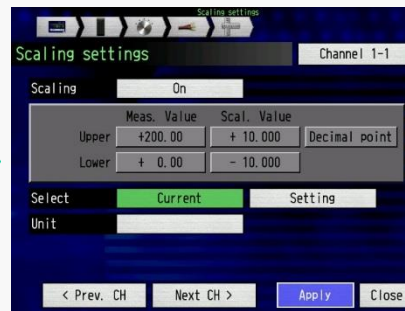
Press the "Select" for setting the type of scaled signal.

Note: The unit of scaled value can be selected from the preset menu or you can manually enter the scaled unit.
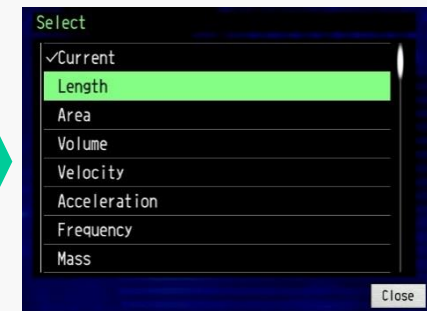
Select the type of signal for displaying the unit that has been pre-set.

6-2. Setting the GL7-DCB module, Measuring Resistance, Menu Setting (4/4)

Setting of scaling unit (direct enter)

Select the "Setting" for setting the type of the unit.

Select the unit from preset.

Select the "Unit" for setting the unit of scaled value.

Note: If there is no unit available in the preset list, you can enter the scaled unit manually using the keyboard.

Enter the unit using displayed keyboard.

Display the scaled setting. Press "Apply".
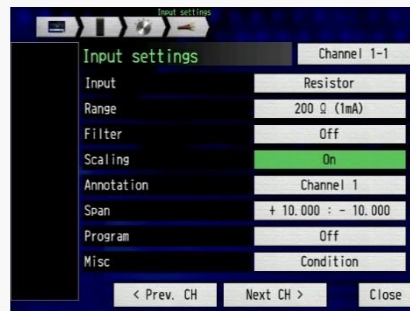
Final measurement conditions are displayed. You are set to go.

You are set to go!

GL7-DCB Measurement Specification

Modular Type Data Acquisition Unit
DATA PLATFORM GL7000

High Speed

Multi-channels

High Voltage

Large Memory Capacity

DC Strain
GL7-DCB

* Display and modules are optional.

- **Input modules can be expanded to accommodate wide variety of measurements (expand up to 10 modules)**
- **Attaching the high-definition display module with a touch panel capability allows both stand-alone operation and a system-embedded solution**
- **2 interfaces to connect the GL7000 to PC (USB and Ethernet)**
- **4 destinations to save the captured data (Built-in RAM, Built-in Flash memory, SD memory card, and SSD module)**
- **Software for high performance and easy operation (GL-Connection)**

Voltage GL7-V | Voltage/ Temperature GL7-M | High Speed Voltage GL7-HSV | High Voltage GL7-HV | DC Strain GL7-DCB | Charge GL7-CHA | Voltage Output GL7-DCO | Logic Pulse GL7-L/P

GL7-DCB (Strain Module) specifications

Item		Contents
Input ch number		4 ch/1 module
Input terminal shape		DSUB 9-pin (female)
Input system		All ch insulation, simultaneous sampling, balanced input
Sampling interval		10 µs to1 hour
Built-in RAM		2,000,000 data
Input type		Strain, voltage, resistance values (including potentiometer)
Measurement range	Strain	400, 500, 800, 1000, 2000, 4000, 5000, 8000, 10000, 20000 µε (µε : 10^{-6} Strain)
		0.2, 0.25, 0.4, 0.5, 1, 2, 2.5, 4, 5, 10 mV/V
		* The range depends on the bridge voltage.
	Voltage	1, 2, 5, 10, 20, 50, 100, 200, 500 mV, 1, 2, 5 V
	Resistance	1, 2, 5, 10, 20, 50, 100, 200, 500 Ω, 1, 2, 5, 10, 20, 50 kΩ
Measurement accuracy *1 (23°C±5°C)	Strain	±(0.2% of F.S. +10µε)
	Voltage	±(0.2% of F.S. +10µV)
	Resistance	±0.5%
		*1 After power-on, more than 30 minutes, sampling 1 sec., filter line, GND
A/D converter		System: sequential comparison system Resolution: 16-bit (Effective Resolution : Approx. ±Range 1/40,000)
Gauge factor		2.0 constant
Sensor supported	Strain	[Strain gauge transducer] 4-wire full bridge, 6-wire full bridge (Available for remote sensing) [Strain gauge] 4-wire full bridge, 6-wire full bridge (3/4-wire: available for remote sensing) 3 or 4 or 5-wire 1/2bridge (4/5-wire: available for remote sensing) 4 or 6-wire full bridge (6-wire: available for remote sensing)
	Resistance	Potentiometer, resistance
Internal gauge resistance		50 to 10kΩ (Excitation voltage 1V : 50Ω to 10kΩ, 2V : 100Ω to 10kΩ, 2.5V : 120Ω to 10kΩ, 5V/10V : 350Ω to 10kΩ)
Internal gauge resistor		1/4bridge or 1/2bridge: (available for 120Ω and 350Ω gauges) * When the internal gauge resistance is 120Ω, the Excitation voltage 1, 2, 2.5 V are available.
Excitation voltage		DC 1, 2, 2.5, 5, 10 V * When the Excitation voltage is 5 V or more, 350Ω or more gauge is available.
Constant current bridge power supply		0.1 to 20 mA (Voltage supported : Max.10V)
Balancing		Method: Auto-balancing (Range: ±10,000 µε)*Strain input only
Remote Sensing		3 or 4-wire 1/4bridge, 4 or 5-wire 1/2bridge, and 6-wire full bridge are available.
Shunt calibration		Internal approximate 60kΩ (120Ω gauge), approximate 175kΩ (350Ω gauge)
Temperature coefficient		Gain: ±0.02% of F.S./°C 0 point : ±1.2µε/°C
Input resistance		10 MΩ ±5%
Maximum input voltage		Differential input : DC10V Common-mode voltage : 10VACrms Input terminal(-) /Input terminal (-) interval : 10 Vp-p Input terminal (-)/GND interval : 60Vp-p
Withstand voltage		Input terminal (-)/GND interval : 1000Vp-p 1 minute

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Standalone Data Platform**

GL7000

Modular Data Acquisition Platform

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