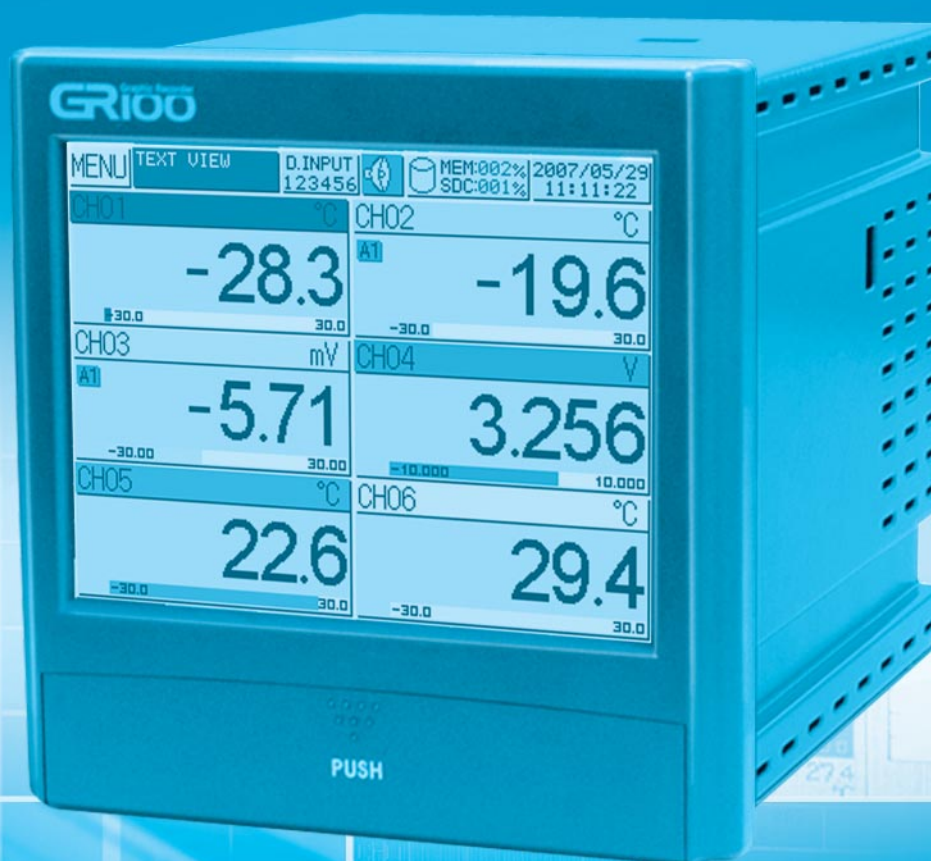


GRAPHIC RECORDER

GR100 Graphic Recorder

MANUAL



THANK YOU FOR PURCHASING **HANYOUNG** PRODUCT.
PLEASE READ THIS MANUAL CAREFULLY.

HANYOUNG nux

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1 Before starting

Thanks for purchasing HANYOUNG graphic recorder (Model: GR100).

This manual contains the function of product, installation method, caution information and the way of using this controller. So please read this manual before using it. And also please make this manual to be delivered to the final user and to be placed where can be found and seen easily

1.1 Check the contents

Please check if the product specification is the same as what you purchased. Also, please check the external damage of the product and missing parts.

If you have any other request, please contact the place where you purchased or our sales department.



① Recorder 1 Unit



② Fixing bracket 2 Unit



③ Manual 1 Volume



④ S.D Memory card 1 Unit



⑤ 3P input connector 6 Unit



⑥ 3P power connector 1 Unit



⑦ 3P RS232 connector 1 Unit



⑧ 4P RS422/485 1 Unit



⑨ D/I connector 6P×2 Unit



⑩ Relay output connector 6P×2 Unit (6P×4 Unit)

※ () for 12 channel model

1.2 Safety notice

- For safety and security of the system that is connected to the product, please read and follow this manual carefully.
- We are not responsible for any damages and safety problems due to disregards of the manual or lack of care of the product.
- Please install any extra safety circuitry or other safety materials outside the product for safety of the program that is connected to the product.
- Do not disassemble, repair or reconstruct the product. It can cause electric shock, fire, and errors.
- Do not give impact to the product. It may cause damage or malfunction.

1.3 Quality guarantee

- Unless it is included company's conditions for warranty, we are not responsible for any warranties or guarantees.
- We are not responsible for any damages and indirect loss of the use or third person due to unpredicted natural disasters.
- The warranty for the product is valid for 1 year from purchase, and we will fix any breakdowns and faults from proper uses as it is mentioned in this manual for free.
- After the warranty period, repair will be charged according to our standard policies.
- Under following conditions, repair will be charged even though it is within warranty period.
 - Breakdowns due to user's misuses
 - Breakdowns due to natural disasters
 - Breakdowns due to moving the product after installation.
 - Breakdowns due to modification of the product
 - Breakdowns due to power troubles
- Please call our customer service for A/S due to breakdowns.

2 How to install

2.1 Install place and caution notice

To avoid electric shock, please use it after installation to panel.

Please avoid installing the product for following places where

- People can touch terminal unconsciously
- Directly exposed to the mechanical vibration or impact.
- Exposed to the corrosive gas or combustible gas.
- Temperature changes too frequently
- Temperature is either too high or too low
- It is exposed to direct rays
- It is exposed to electromagnetic waves too much
- It has many combustible objects
- The case of this controller is chrome-zinc plating and front case is made by ABS/PC anti-combustion material but please do not install it to the inflammable place. Especially please do not put it on the inflammable products.
- Please keep it away from the machine or wires that causes noise. Especially, please have enough warm-up when you operate it under 10°C temperature.
- When you wire it, please cut out all electric powers.
- This controller is operating in 100V ~ 240V a.c, 50 ~ 60 Hz without additional change. If you use other voltage, it may cause fire and electric shock.
- Do not operate controller with wet hand, it may cause electric shock.
- Please follow Safety Information to prevent any fire, electric shock and any damage.
- When you put to earth, please refer to install method. (earth resistance below 100 Ω)
- Please do not turn power on until you install all parts.
- Please do not block ventilating windows. It may cause break down.
- The level of protecting over voltage is Catalogue II, and using environment is Degree II.

2.2 How to install

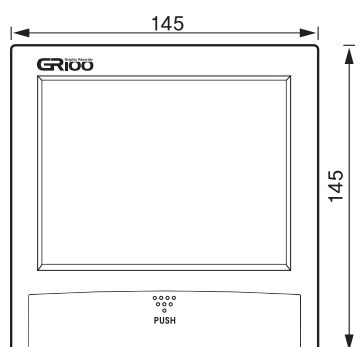
- Please use 2mm~10mm thickness of steel sheet for panel.
- In front of panel, please push it into panel
- Using fixing iron pin, please adhere it to the panel by fixing bracket.
(If you tighten it up to much by fixing bracket, it can be cause break of case or fixing bracket)

2.3 Suffix code

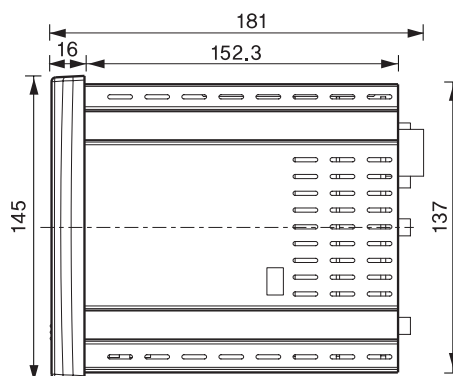
Model	Suffix code	Description
GR100-	1 0	GR100 Graphic recorder
Input channel	1	6 Channels
	2	12 Channels
Communication	0	RS232 + RS485 + USB
	1	RS232 + RS485 + USB + ETHERNET

2.4 Dimensions & Panel cutout

- Dimensions (Unit : mm)

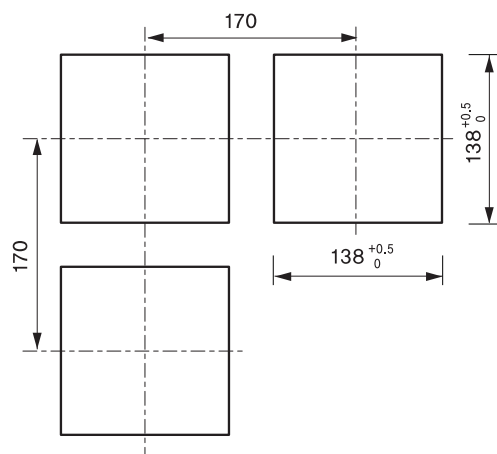


(Picture 1) Front



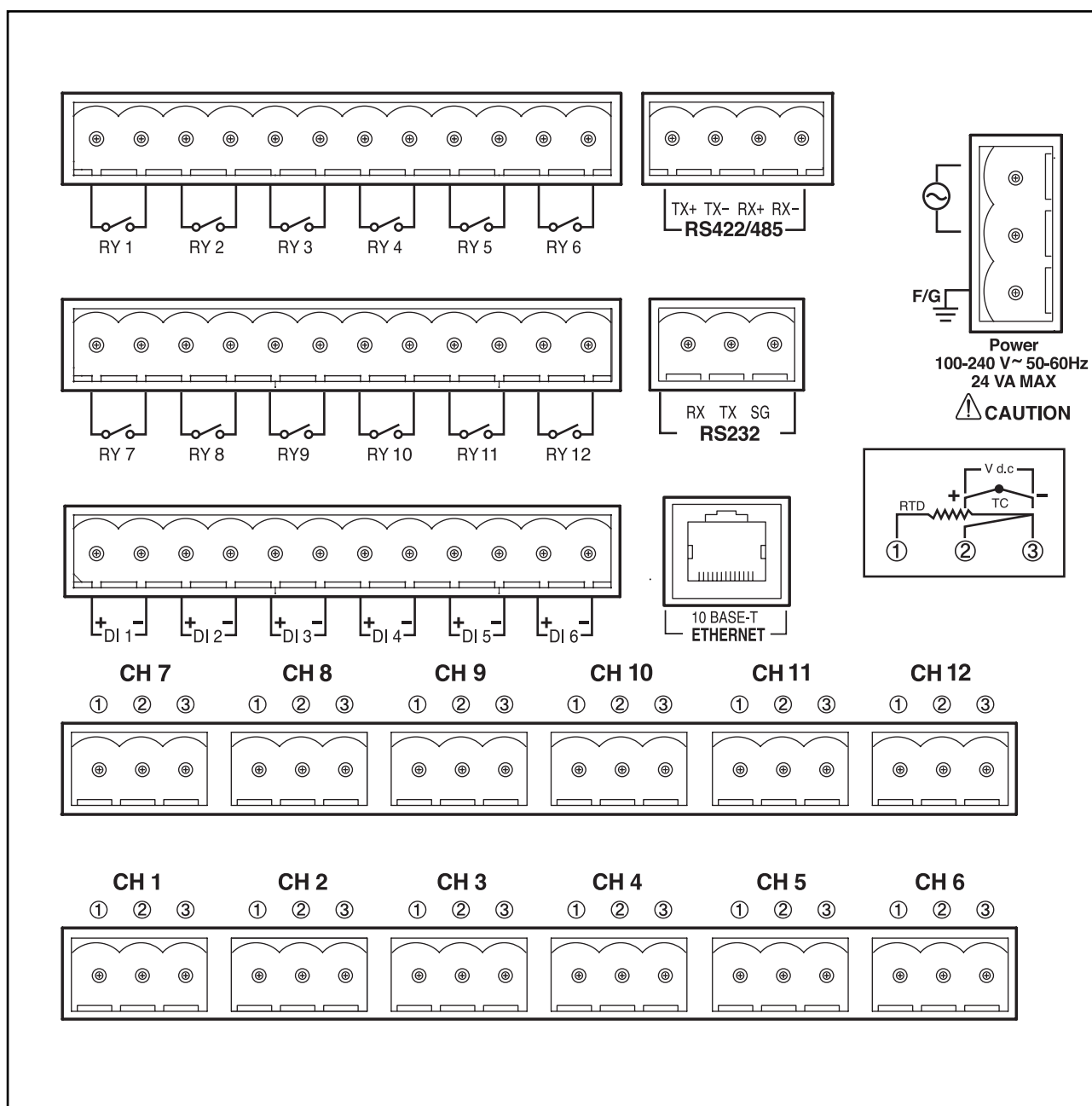
(Picture 2) Side

- Panel cutout (Unit : mm)



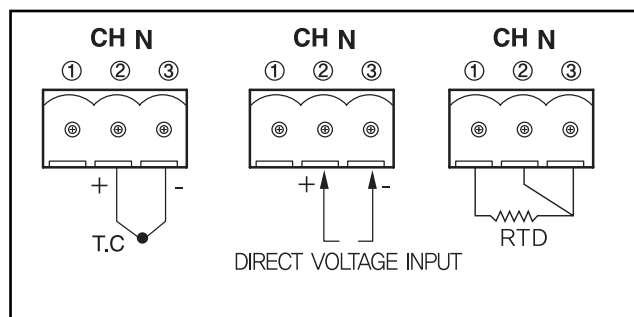
2.5 Terminal arrangement

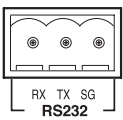
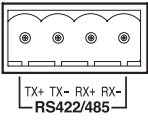
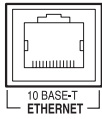
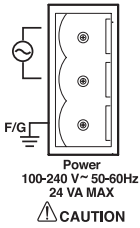
- 6 Channels and 12 Channels



(Picture 3) This is an example for GR100-21(12CH)

※ Sensor input (Connection example)



Connector Type	Name of Connector	Description
	RS232C Communication connector	Use for local area communication (Within 10m)
	RS422/485 Communication connector	Use for long distance communication (Within 1Km)
	ETHERNET connector	Use for ETHERNET communication
	Power terminal	100-240V ac 《Caution》 F/G: earth terminal



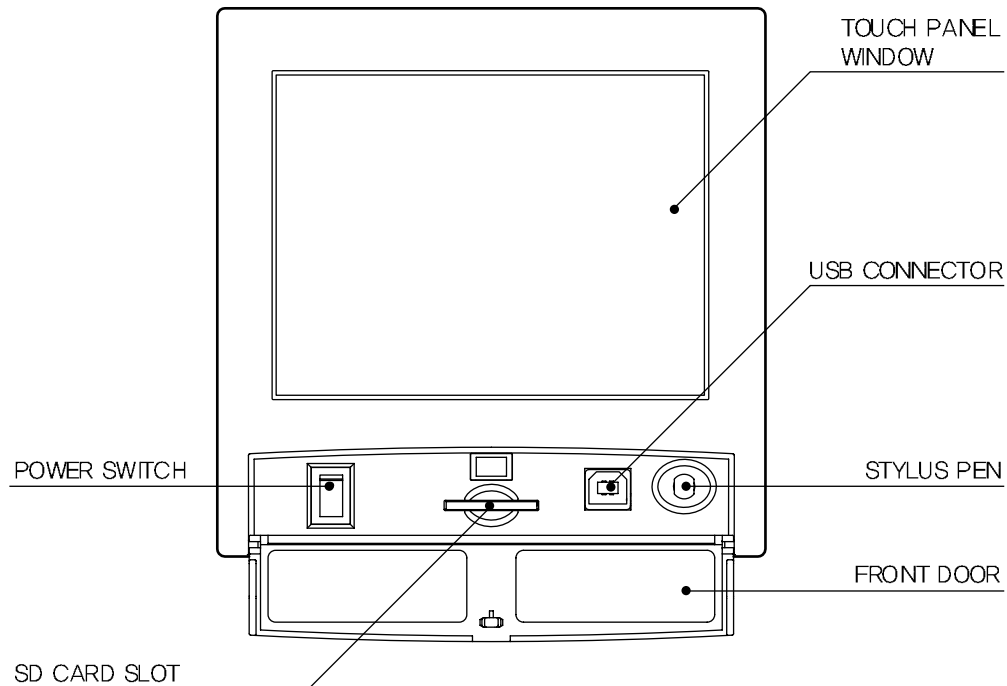
Caution for the connection of input wiring

Please pay attention to the below information when wiring input signal line.

- Please block noise for measurement circuit.
- Measurement circuit needs to be separated from power line and earth circuit.
- None-noise object is proper for measurement. But if the measurement object has noise unavoidably, please insulate measurement object and measurement circuit. Also, please earth measurement object.
- To prevent noise by Electrostatic induction, please use shield line. As necessary, the shield needs to be connected to the contact terminal of GR100 (Do not make 2 point contacts).
- To prevent noise by Electrostatic induction, twist measurement wire narrowly and then distribute wire
- Please do not use heavy wire that has heatproof effect (Please use below 0.5mm² cross section of wire)
- Please avoid a place that temperature changes too frequently. Especially near a fan can cause of frequent temperature change.
- Please do not turn ON/OFF during operation. It gives bad effect to other machines.
- RTD (resistance temperature detector) can not make parallel connect.

3 Operation and explanation of display screen

3.1 Name of each part



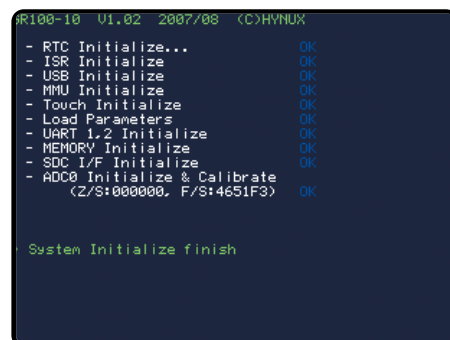
3.2 Initial screen

Our product uses touch screen and color TFT LCD so user can operate this product very easily by using push button and input box that are displayed according to each system condition.

When you turn power on, you can see HANYOUNG logo on screen (Picture 4). And then, our product checks system automatically (Picture 5). After finishing system check, it starts operation.



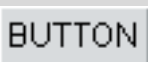


(Picture 4) HANYOUNG logo



(Picture 5) System check

3.3 How to input

(Table 1) Button and Input box

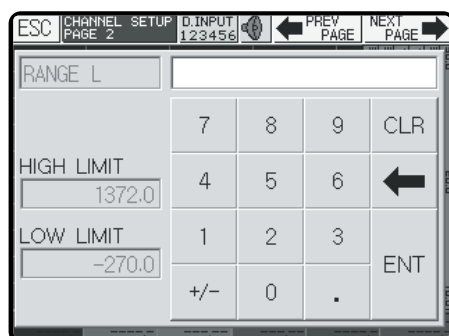
	Name	Function
	Selection button	Select button according to users need. After touching this button, operation will be selected.
	Activated input box (Input is available)	User can input various setting values. User can input numbers or letters according to each operate condition. User can input wanted setting value as like [Picture 7~10]
	Inactivated input box (Input is not available)	According to system conditions, Input box is inactivated. If condition is changed, input box will be activated again as above.

3.3.1 Number input screen

The picture 6 is a number input screen.

The integral and decimals numbers can be input. The name of value is displayed on the top of the left side, also High limit and Low limit values are displayed on the left screen.

The input numbers are displayed on the top of the box. After pushing “ENT”, displayed numbers will be input and you can cancel them by “ESC” key.



(Picture 6) Number input screen

3.3.2 Multi input screen

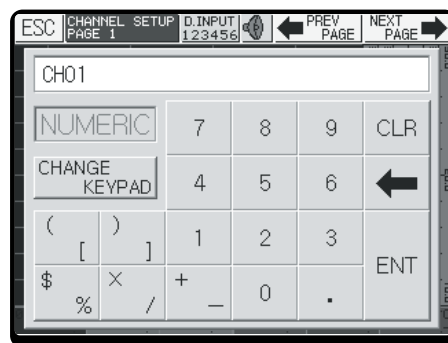
The pictures 7~10 are multi input screen for numbers, English & symbols. If you push “CHANGE KEYPAD”, you can input numbers, English & symbols individually. The sequence is “Number input mode” → “English (Capital letter) input mode” → “English (Small letter) input mode” → “Symbol input mode”. The FUNCTION keys on the right side of screen are same as each input mode and the functions are as follows.

- CLR: Delete all of input contents
- ←: Delete one letter in front of cursor.
- ENT: Save input contents to the internal memory.

If you push “ENT”, all contents will be saved to the internal memory. Also if you push “ESC”, input contents will be canceled.

(a) Number input

Picture 7 is number input screen. If you push double keys as like “([”, “)]”, “\$ %”, “X /”, “+ -”, they will be displayed one after the other. Also, if you do not push double key for 1 second, cursor will move next place automatically.



〈Picture 7 number input screen〉

Example) If you want to input “1” (Below _ is a cursor key)

Action: “1”

Result: 1_

Example) If you want to input 123.45 (below_ is a cursor key)

Action : “1” + “2” + “3” + “.” + “4” + “5”

Result : 123.45_

Example) If you want to input [

Action: “([” + “([” (Push 2 times within 1 second)

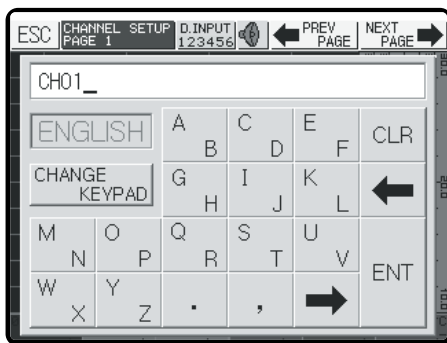
Result: [_ (below _ is a cursor key)

Action: “)]” Push 1 time and pass 1 second

Result: []_ (below _ is a cursor key)

(b) English input

Pictures 8,9 are English input screen. Except “.” , “,” all keys are double keys and basic input method is the same as number input.



(Picture 8) English (Capital letter) input screen



(Picture 9) English (Small letter) input screen

Example) If you want to input “B”

Action : “A B” + “A B”

Result : B_ (below _ is s cursor key)

Example) If you want to input “OPER”

Action : “O P” + After 1 second + “O P” + “O P” + “E F” + “Q R” + “Q R”

Result : OPER_ (below _ is a cursor key)

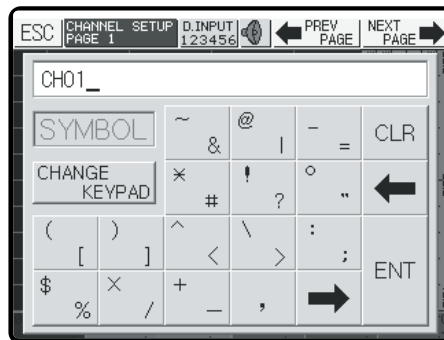
Example) If you want to input “Record”

Action : “Q R” + “Q R” + “CHANGE KEYPAD” + “e f” + “c d” + “o r” + “→” “o r” + “o r” + ‘c d’ + “c d”

Result : Record_ (below _ is a cursor key)

(c) Symbol input

Picture 10 is symbol input screen. Except “,”, all keys are double keys and basic input method is the same as English input.



(Picture 10) Multi input – symbol input mode.

Example) If you want to input “&”

Action : “~ &” + “~&”

Result : &_ (below_ is a cursor key)

Example) If you want to input “([1+2] X 3) = 9 °C”

Action: “([” + “([” + “→” + “([” + “1” + “+” + “2” + “])” + “X /” + “3” + “)” +
“CHANGE KEYPAD” + “CHANGE KEYPAD” + “CHANGE KEYPAD” + “- =” + “- =” +
“CHANGE KEYPAD” + “9” + “CHANGE KEYPAD” + “CHANGE KEYPAD” + “CHANGE KEYPAD”
+ “?” + “CHANGE KEYPAD” + “CHANGE KEYPAD” + “C D”

Result : ([1+2] X 3) = 9 °C_ (below_ is a cursor key)

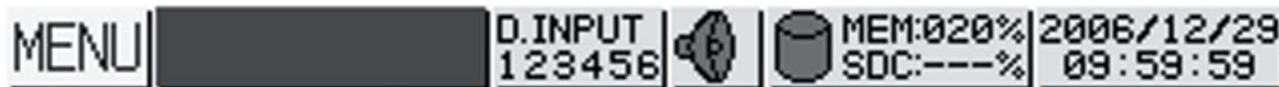
Caution

When inputting file name, symbol input screen does not appear. “X /” in the number & English input mode is not available also.




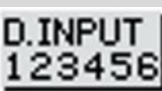
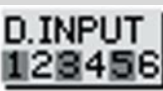






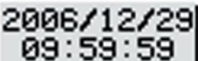
3.4 STATUS BAR

During normal operation, the status bar on the top screen has much information. The details are as follows.

- ① Menu button ② Current status screen mode ③ D/I input status ④ Alarm status ⑤ Record/Memory /SD capacity status ⑥ Date and time

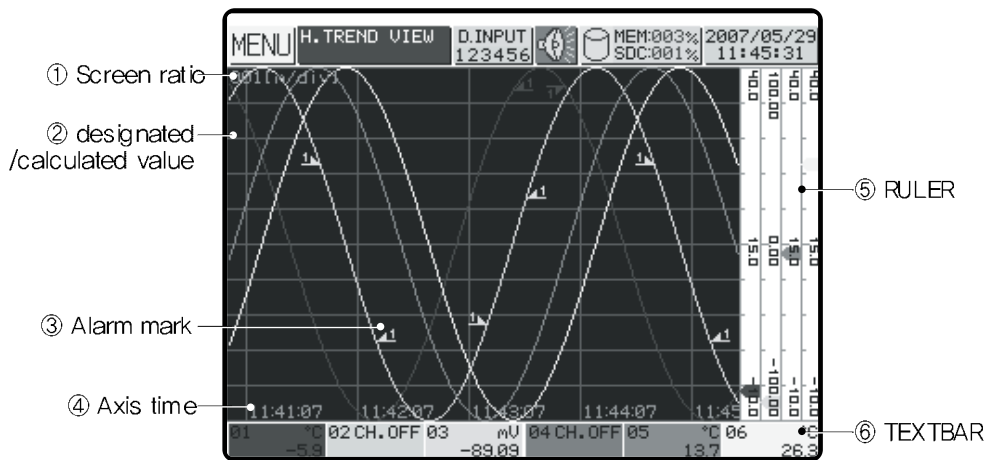


(Picture 11) STATUS BAR VIEW

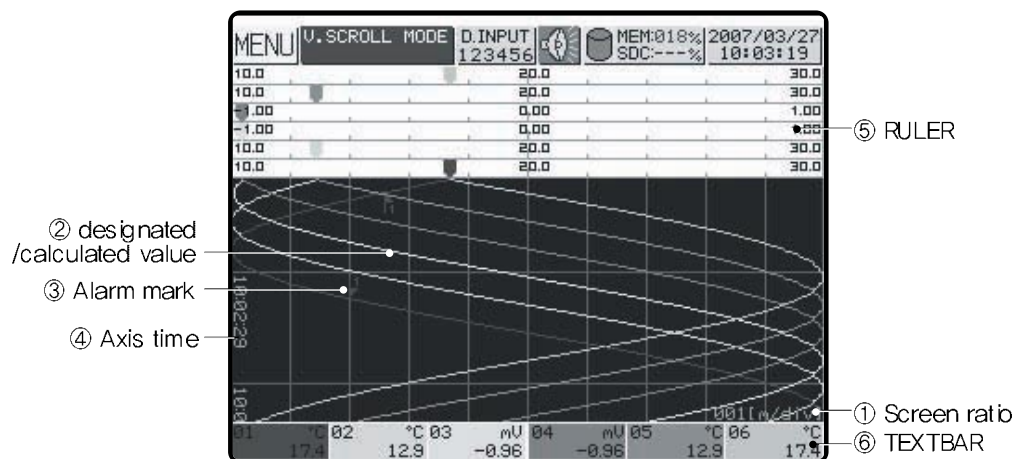
①	 	Main menu display button. When you push 'Menu' button, menu button will be displayed and then 'Menu' button will be changed to 'ESC' button.
②		Display current 'screen mode'
③	 	D.I Digital input status display button When D.I signal is working, it displays in red. If you push button, it shows alarm/D.I status
④	  	Display alarm status button When alarm is raise, back ground color is changed and show alarm action If you push button, it show alarm D.I status
⑤	 MEM:020% SDC:---%	No input SD card
	 MEM:020% SDC:009%	SD card input / No record
	 MEM:020% SDC:009%	record SD card input & Recording
⑥		Display setting date and time

3.5 Trend-view

GR100 has H.Trend view (Picture 12) and V.Trend view (Picture 13) and they show designated/calculated value by graph per each channel.







(Picture 12) H. Trend view

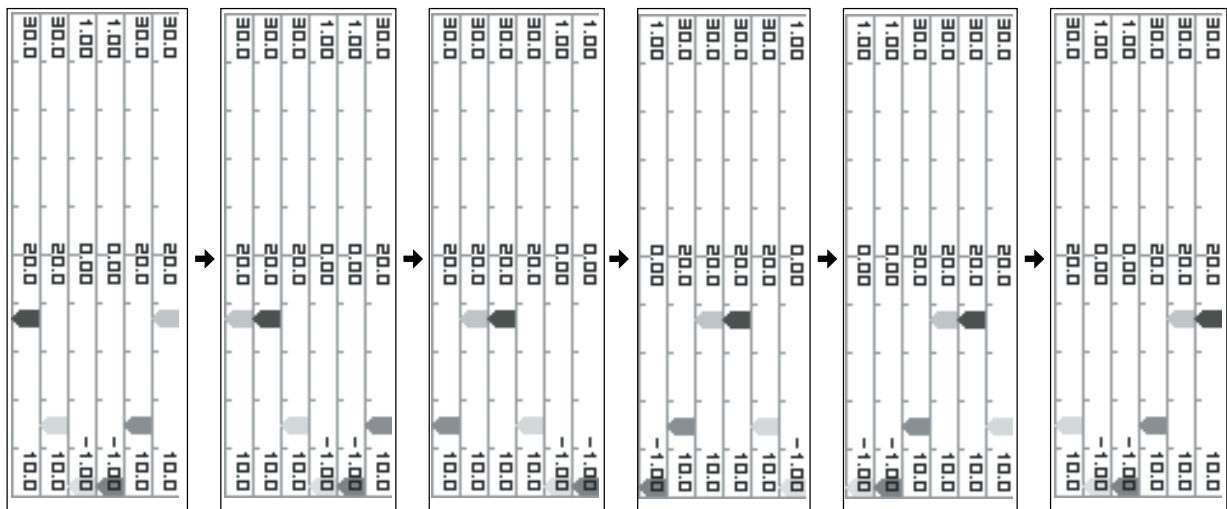


(Picture 13) V. Trend view

If you turn off a certain channel from Menu or Text-Bar, it is not displayed from graph, Ruler and Text-Bar. But turn off channel is recorded to the internal memory and SD card. So if you turn it on again, you can check process value during turn off time.

- ① [m/div] shows minute per division on X-axis. The ratio can set up from 1~120 ranges and it can change from display menu.
- ② Designated/calculated values are checked by sensor or director voltage (V d.c) and they are displayed by graph. Because changed values are displayed with time axis, user can check trend of each channel and something wrongs of old values.

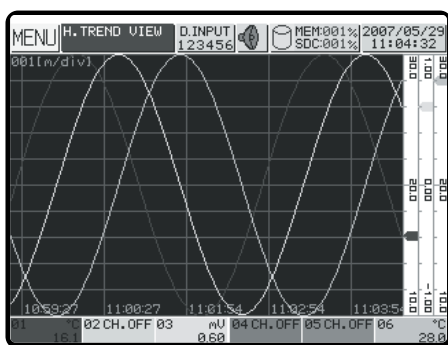
- ③ Alarm mark shows alarm start and end in graph per channel. The start mark () and end mark () are different and they are displayed in color per graph. It has 4 alarms per channel so it shows alarm number.
- ④ Axis time shows time of current axis. (Hour, minute, second).
- ⑤ Ruler indication shows maximum and minimum range value by channel according to user setting. The arrow mark ( , ) in each channel show measuring value. If you push ruler in screen, the order of ruler is changed as like picture 14. User can ON/OFF ruler in menu setting. So if user OFF channel view, the ruler is not displayed.
- ⑥ Text-Bar displays channel number, unit and process value per channel (picture 15).
Text-Bar can be ON/OFF in the menu. Direct pushing channel leads to be ON/OFF the channel.



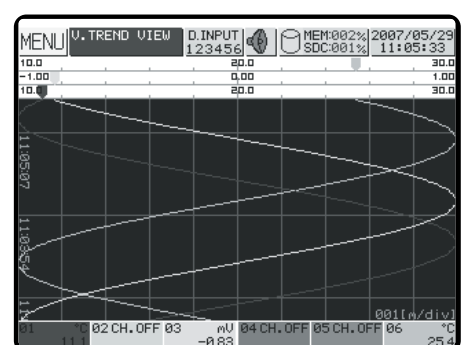
(Picture 14) Procedure of changing ruler channel display



(Picture 15) TEXTBAR



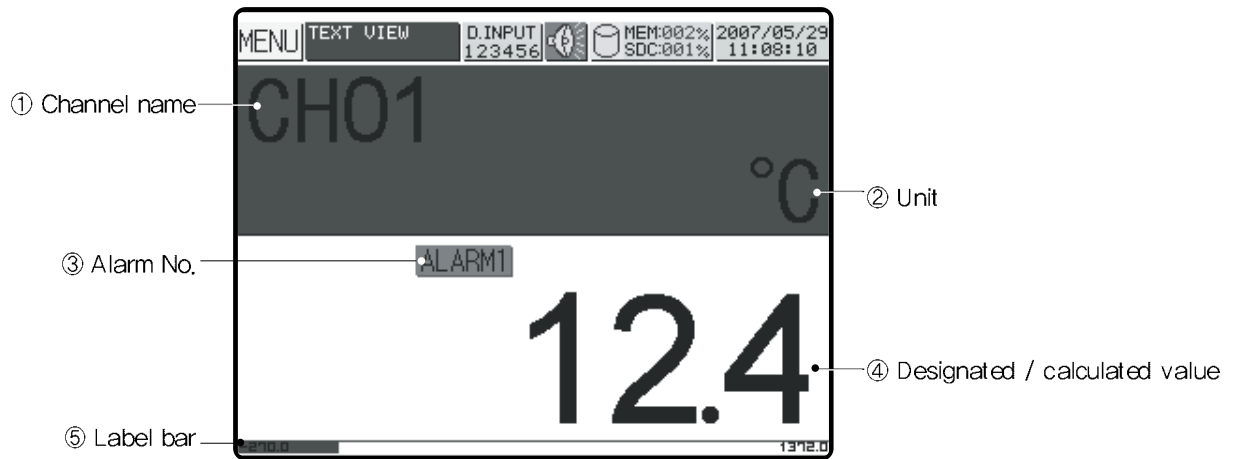
(Picture 16) V.trend 2, 4, 5 channel
OFF screen



(Picture 17) H.trend channel
OFF screen

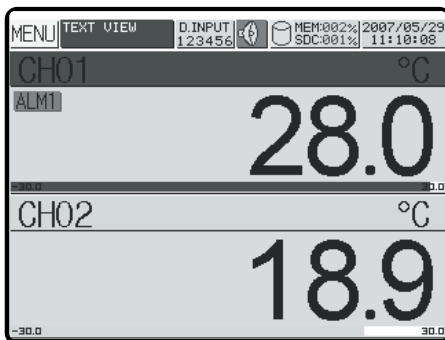
3.6 TEXT VIEW

Text view shows designated/calculated value and alarm status of each channel by number and icon. User can set up number of window in menu or display it by touch screen (1 ⇒ 2 ⇒ 3 ⇒ 4 ⇒ 6 ⇒ 1). (Picture 18 ~ 22)

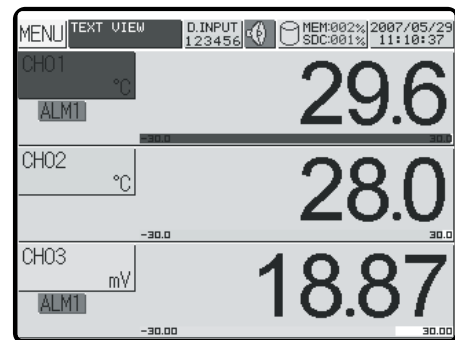


(Picture 18) Text view (1 CH)

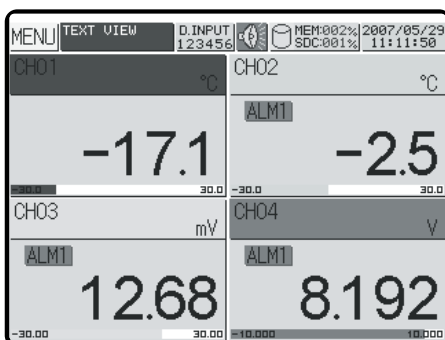
- ① The name of channel is a user setting channel name. The maximum number of letter is 10.
- ② The name of unit is a user setting unit. The maximum number of letter is 6
- ③ The number of alarm is a user setting alarm among 4 alarms of each channel.
- ④ Designated/calculated value is a number of sensor or V D.C or arithmetic value of each channel.
- ⑤ Level bar shows the level of current process value in the current display setting range



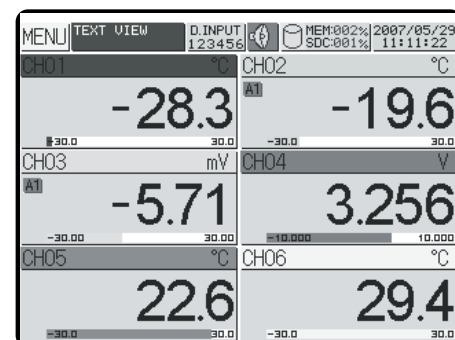
(Picture 19) Text view (2 CH)



(Picture 20) Text view (3 CH)



(Picture 21) Text view (4 CH)

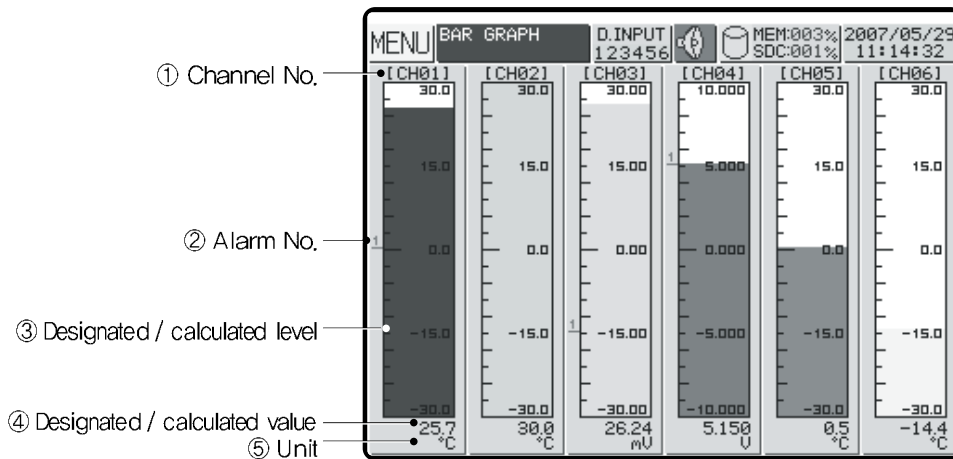


(Picture 22) Text view (6 CH)

※ Text view (5 CH) is not available.

3.7 BAR-GRAPH

Bar-graph shows designated/calculated value and alarm status by bar graph type. It shows the level of all channels in current setting range. The level bars have solid bar type and spectrum type and they are changed by touching Bar -Graph.



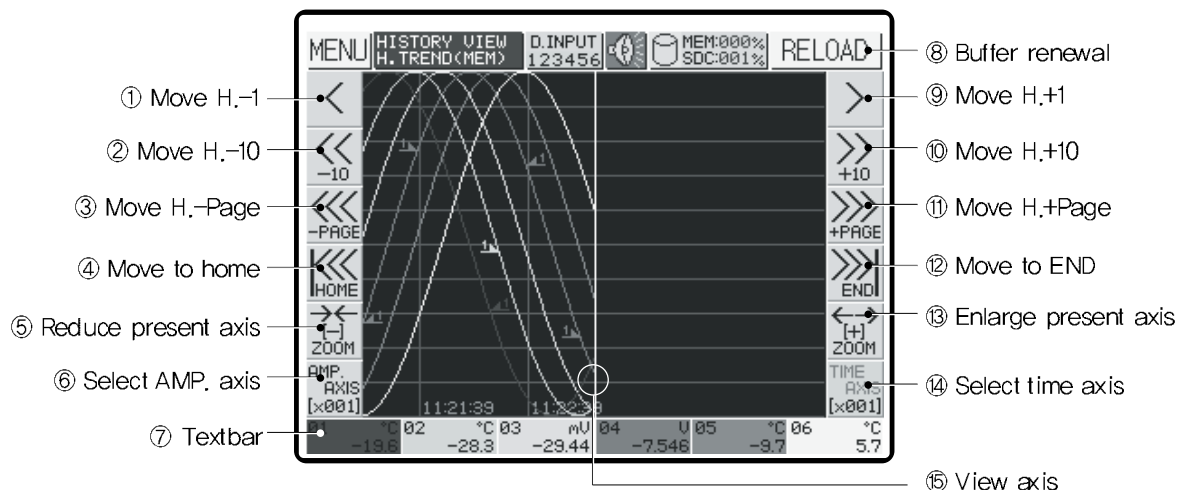
(Picture 23) Bar graph view

- ① The channel number is channel number of Bar-Graph. User can not change channel number.
- ② Alarm number shows raise an alarm status and number of each channel.
- ③ Designated/calculated level shows Bar-Graph of designated/calculated value of each channel.
- ④ Designated/calculated value shows numerical value of designation/calculation by number.
- ⑤ Unit is users setting unit.

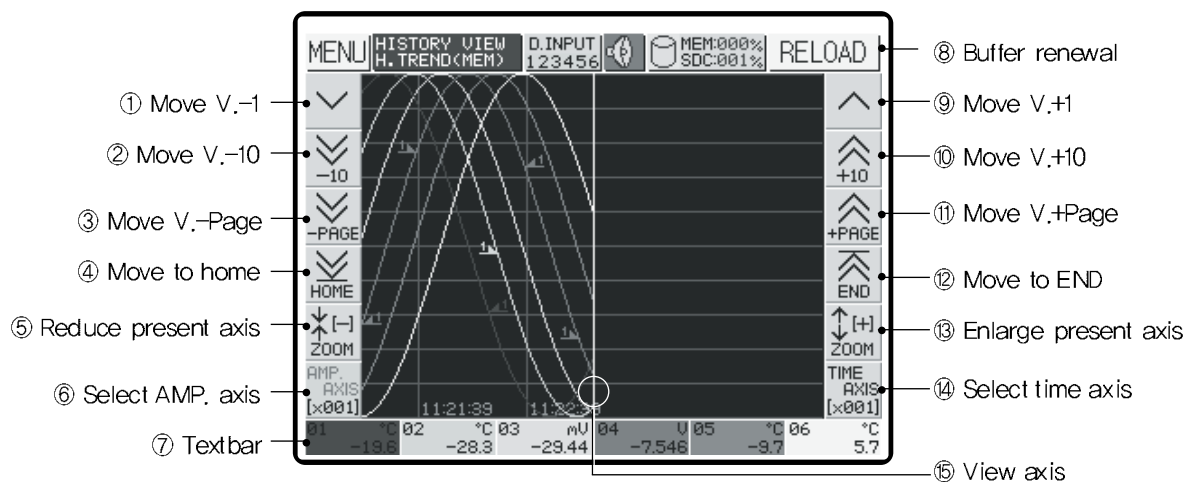
3.8 HISTORY-VIEW

History-View shows past history by graph. Users can select data from internal memory and SD card in Menu. According to setting, it is available to view H or T Trend.

Also Time Axis and Amp Axis can be enlarged or reduced by 64 times so users can check important process range precisely. (Only Time Axis is available when reducing)



(Picture 24) H. History-view (Select time axis)



(Picture 24) H. History-view (Select AMP. axis)

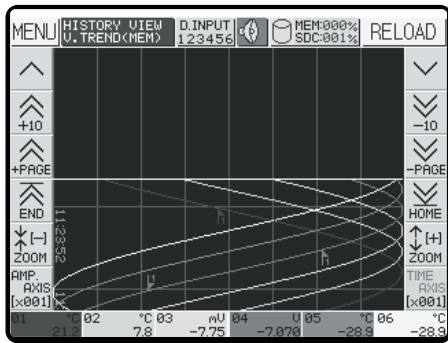
①~④/⑨~⑫ Move buttons are used when user want to move Amp Axis or Time Axis to check certain range. It moves to ± 1 , ± 10 , \pm Page, Start and End point. The unit of move is as a user's setting period in menu.

⑤ Reduce present axis / ⑬ Enlarge present axis ⑥ AMP. Axis ⑭ Time axis are magnified or reduced base on selected axis.

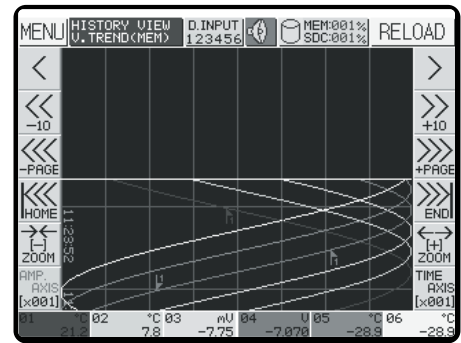
⑥ AMP. axis and ⑭ Time axis are used for movement or magnification / reduction.

⑦ Textbar shows channel data of view axis.

If you push ⑧ Buffer renewal button, (a) In case of memory view, it loads latest data from memory. (b) In case of SD card, it shows SD card file selection.

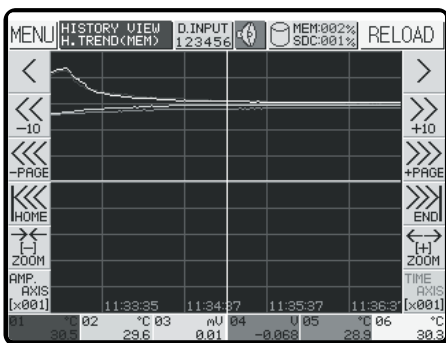


(Picture 26) V. History-view
(Select time axis)

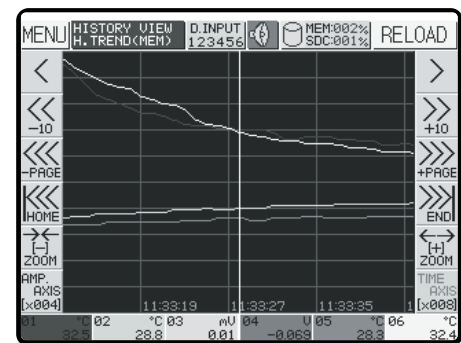


(Picture 27) V. History-view
(Select AMP. axis)

(Pictures 26, 27) are V-History view. The way of using buttons are same as H-History view. (Pictures 28, 29) are the example of the H-History view. The measuring value from channel 1,2,6 is changed but it does not show from normal view as picture 28. But user can check it from magnified graph as like picture 29.



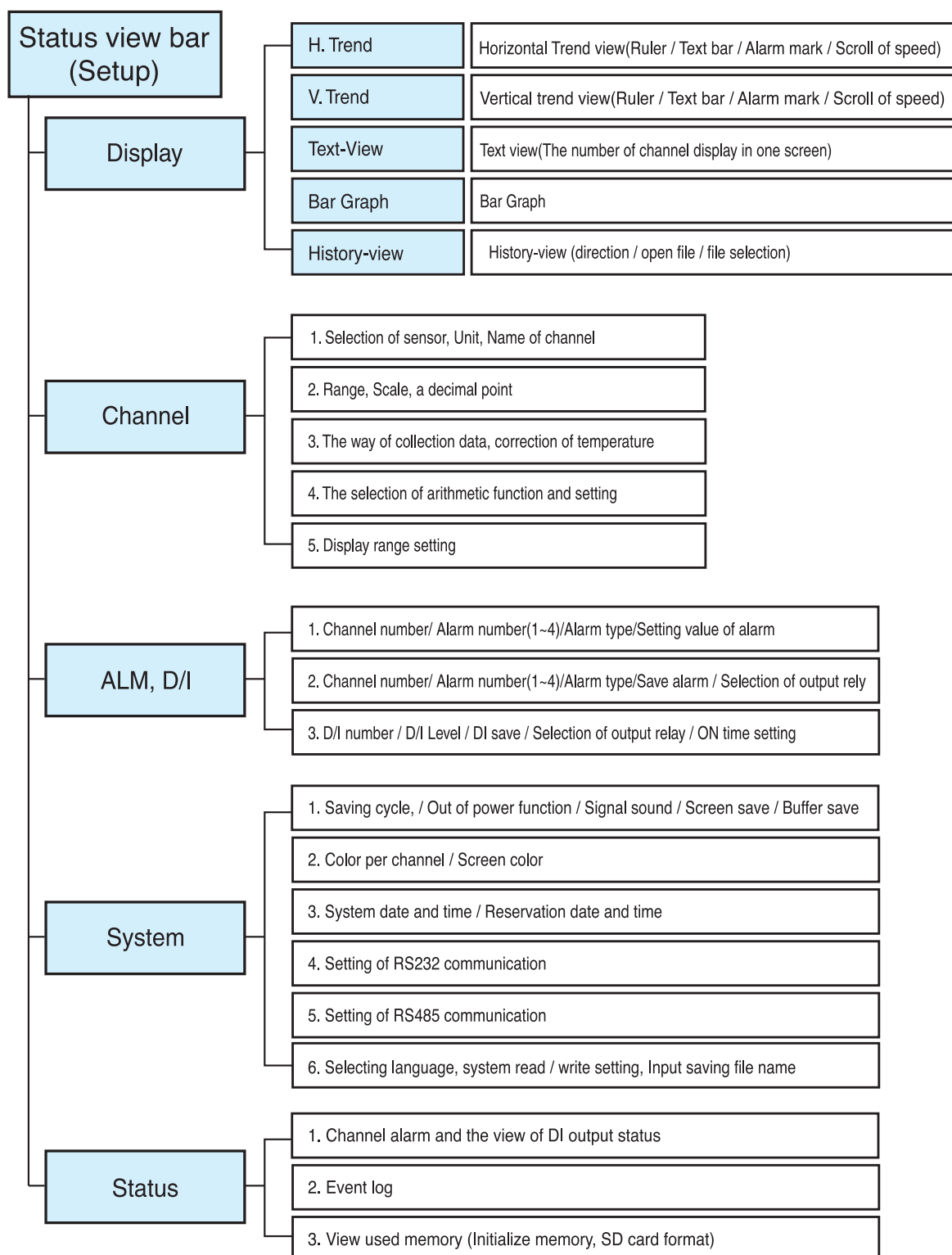
(Picture 28) H. History basic view



(Picture 29) H. History enlarged view

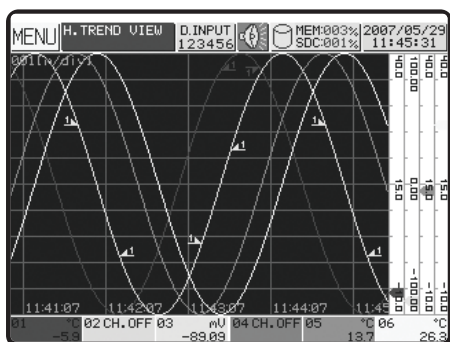
4 Basic setup

4.1 Basic setting

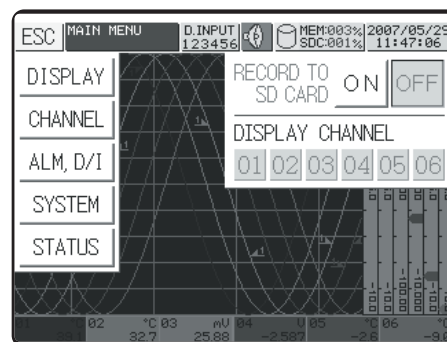


4.2 Main Menu

If you push **MENU** in the normal view screen as like picture 30, the Main menu will be displayed as like picture 31. The functions of left buttons are as follows and frequent using buttons are placed on the right side.



(Picture 30) H. Trend view



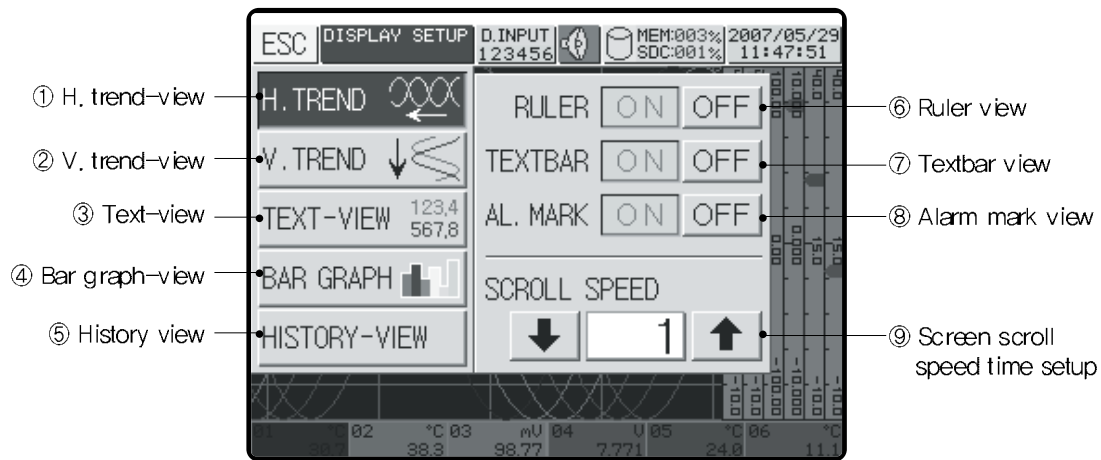
(Picture 31) Main menu view

	When you push ON button, designated &calculated values of all channels will be saved to SD card. When you push OFF button, the save will be stopped.
	ON / OFF of screen view for each channel. During OFF screen, Internal memory records continuously, although it does not show on the screen.
	It is used for display. User can set up H/V Trend view, Text view, Bar-Graph view and History view etc.
	It is used for channel. User can set up Input type, name of channel, Decimal point, revision of input and calculation function.
	It is used for alarm and digital input. User can set up selection of alarm (1~4), Type of alarm, alarm value, condition of save, number of contact output, time setup and digital input etc.
	It is used for system. User can set up save time, restart after out of power, selection of signal sound, screen save, function of buffer save color per channel, screen color, date and hour, setup of communication and system parameter etc.
	It is used for status. User can sent up status of alarm relay, D.I status and logo history and content of memory.

4.3 Display Setup

Select screen view and screen related items in display setup.

(a) Horizontal Trend View



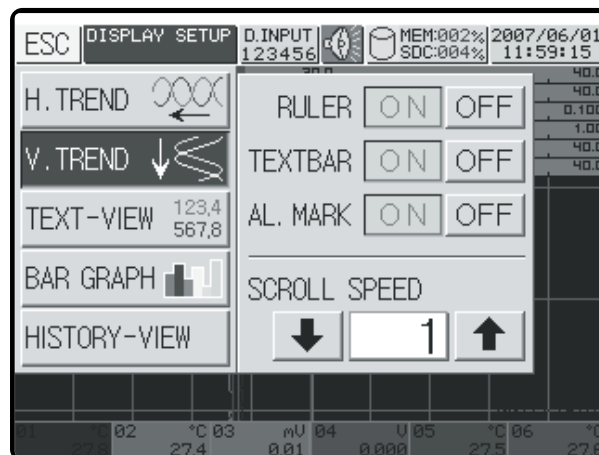
(Picture 32) Display setup view

- ① Horizontal Trend View moves into left & horizontally. It shows measured /calculated value.
- ② Vertical Trend view moves into vertically and it shows measured /calculated value.
- ③ Text View : it shows channel's measured /calculated value and alarm status through numbers and icons.
- ④ Bar Graph View : it shows channel's measured /calculated value and alarm status through Bar Graph.
- ⑤ History View : it shows past measured /calculated value by shape of horizontal/vertical trend.
- ⑥ Ruler View : Ruler indicates its range and tap and it makes RULER on/off in the horizontal/vertical trend view.
- ⑦ TEXTBAR View : it makes TEXTBAR on/off in the horizontal/vertical trend view & HISTORY View. TEXTBAR is shown as number at the bottom.
- ⑧ ALARM Mark View Setup makes alarm indication per each channel on/off.
- ⑨ Screen Scroll Speed Time Setup : it selects Scroll Speed in the Trend View.

※ Explanation of example for ①~⑤ : Please refer to 3.3 ~ 3.6

Explanation of operation for ⑥~⑧ : Please refer to 3.4 Trend View.

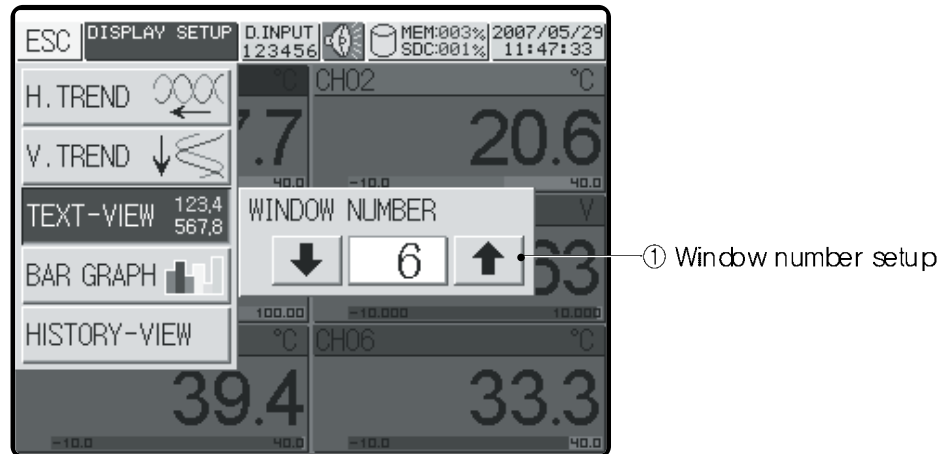
(b) Vertical Trend View



(Picture 33) Display Setup View

(c) Text View

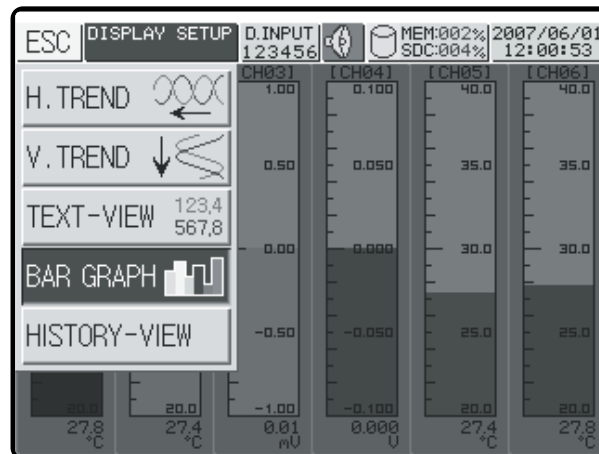
When selecting Text View (Picture 34), select your channel screen number in the ① window number (right side)



(Picture 34) Select Text View

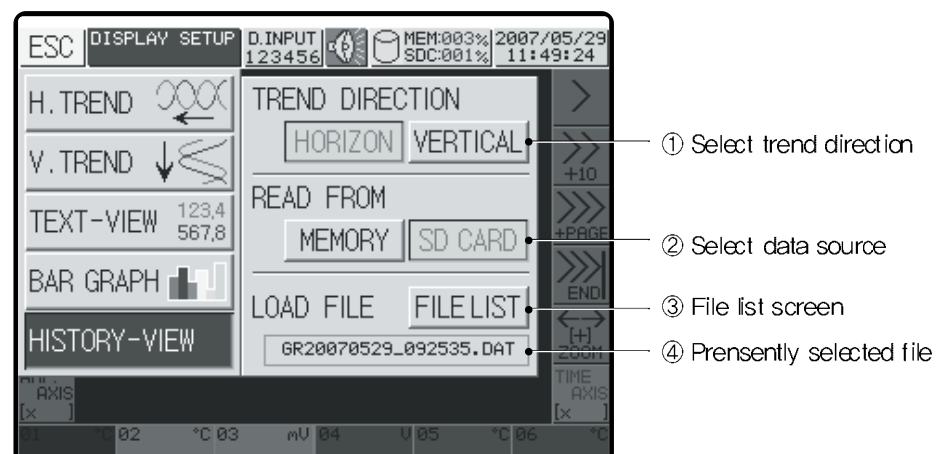
(d) Bar Graph View

When pressing Bar Graph View button, it will be set up as Bar Graph View and there is no related detailed setup.



(Picture 35) Select Bar Graph View

(e) History View



(Picture 36) Select History-view

① Select Trend Direction

The selection of Trend Direction in the HISTORY-VIEW selects horizontal/vertical trend direction of Graphic Data.

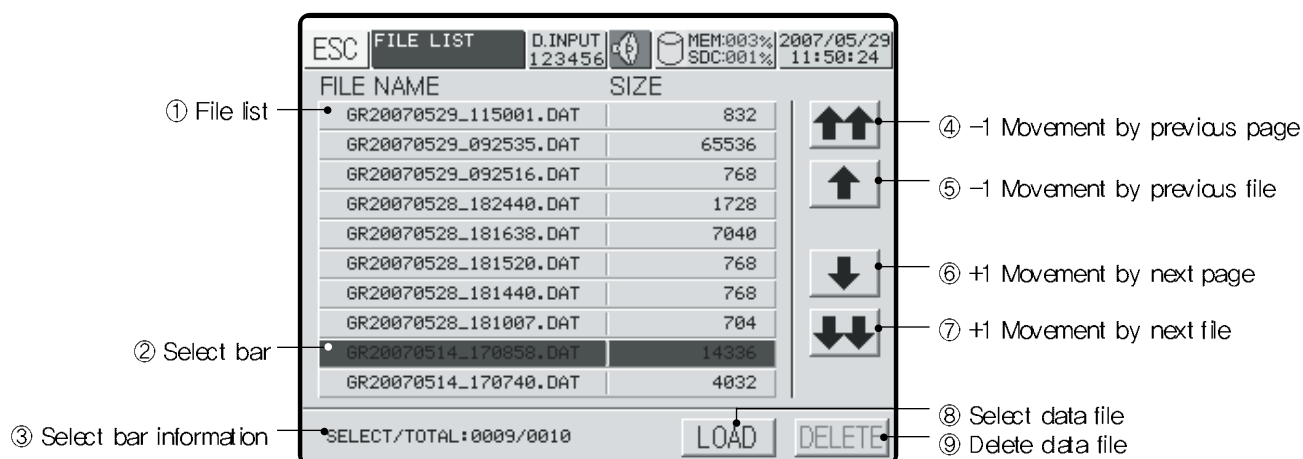
② Select Data Source

Selection of data source in the HISTORY-VIEW selects Graphic Data Source which one you want to see. If you select MEMORY and it reads from internal buffer memory. Selection of SD card makes it to select one out of SD files.

③ File List Screen When selecting File List View, Data Source will be selected as SD Card automatically and File List View will be shown up.

④ Presently selected File : The file name which was selected in ③ File List View will be shown up.

※ “SD Card” button in ② and “File List” button in ③ is not selected in case SD Card is not inserted. Also Currently Selected File name in ④ will be shown with file name deleted.



(Picture 37) File list view

① File name & size will be shown on file list. ② Select Bar: Press ④, ⑤, ⑥, ⑦ button and it moves upward/downward per each one and per page. After selecting page which you want to go, press ⑥ File Selection button can read selected file and moves from (Picture 37) to (Picture 36) automatically. ③ Select Bar Information: It shows total file quantity and displays the sequence number of presently selected bar.

When selecting History-View (Picture 36), if you press File List Button on the right-bottom side, you can see GR 100 file list which was saved in present SD card like picture 37.

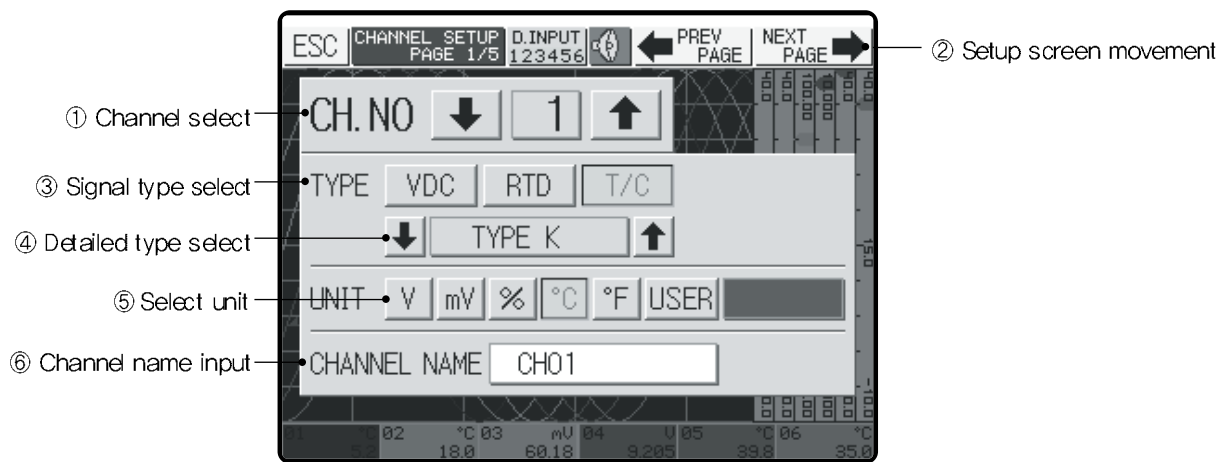
Caution

Please format SD Card which was provided together with the product before using it.

4.4 Channel Setup

Channel Setup Page 1(Picture 38) is a basic input setup screen such as signal type per channel and detailed type, unit, channel name etc. Channel setup is consisted of total 4 pages, and each setup page is formed type by type

(a) Sensor Type and Unit, Tag Setup.

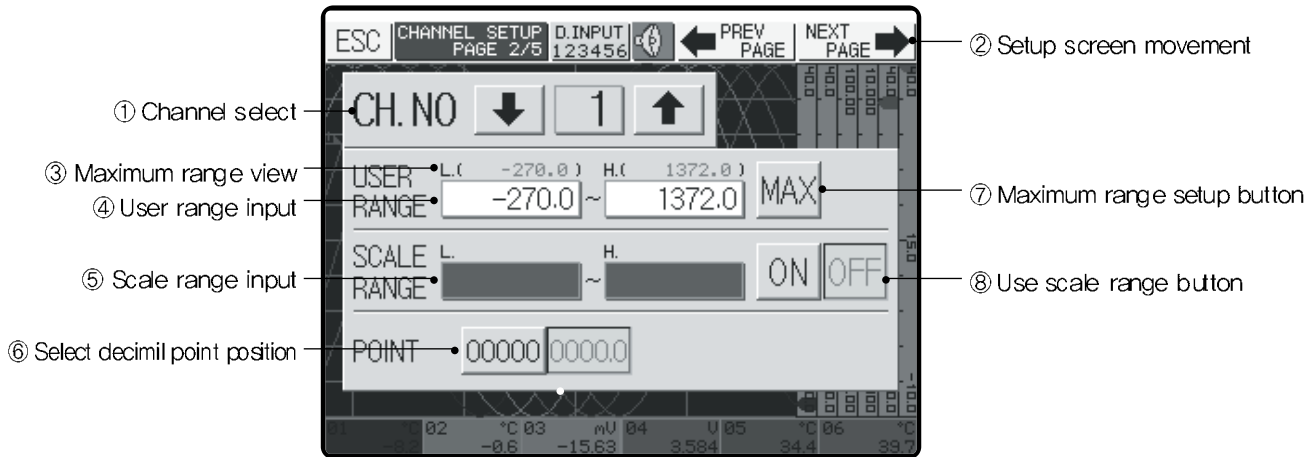


(Picture 38) Channel setup page 1

- ① Channel Select : Select Channel No. which you want to select. You can change channel by Up/Down Arrow.
- ② Setup Screen Movement : It is used when moving among channel setup screen (total 5 pages)
- ③ Signal Type Select : Select input of channel which wants to select.
- ④ Select detailed unit : Select range and sensor type in the ③ Signal Type Select.
- ⑤ Users can input wanted unit. When selecting ③ Signal Type, basic unit is changed automatically but user can select unit which user want to select. In case you want to display specific unit, press "USER" button on the right side and USER UNIT input window will be activated. Press Input Window and input your specified unit which you want.
- ⑥ Through channel name input, you can change channel name.

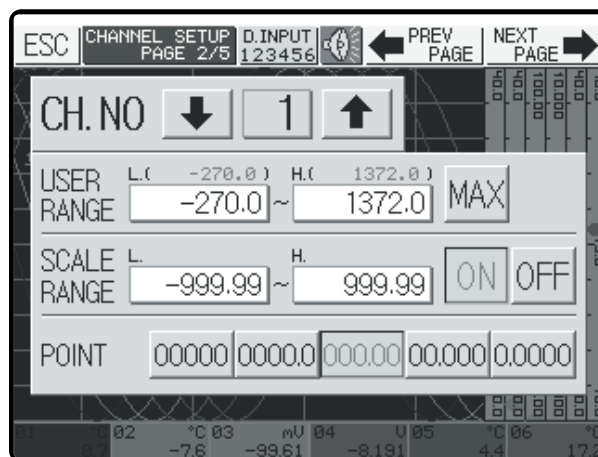
Signal Type	Detailed Type
V d.c : 3 kinds	$\pm 30.00 \text{ V}$, $\pm 10.000 \text{ V}$, $\pm 100.00 \text{ mV}$
R.T.D : 2 kinds	DIN43760, JIS C1604-1989(Old)
Thermocouple (T.C) : 12 kinds	K, J, E, T, R, S, B, N, PL-2, U, L, W

(b) SETUP of Range & Scale, Decimal Point



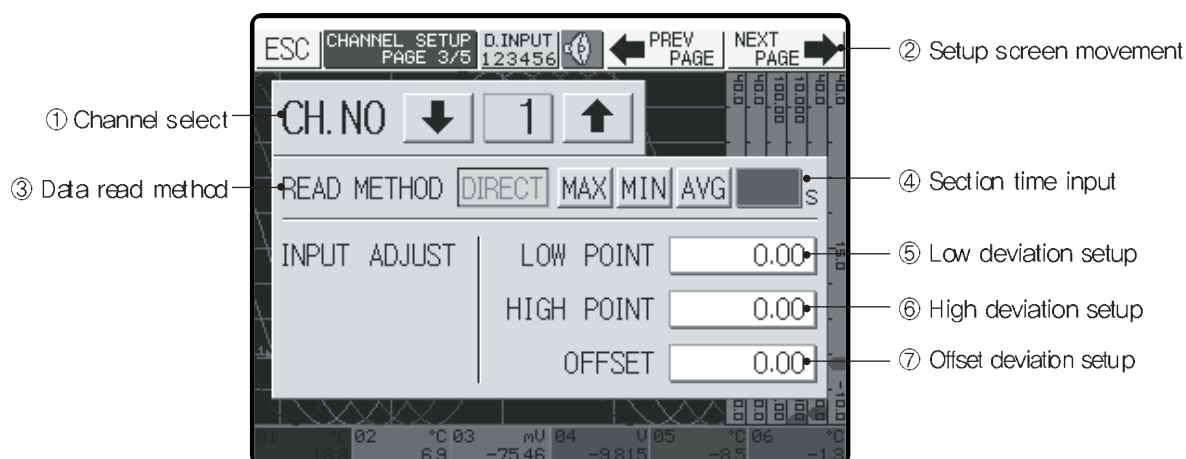
(Picture 39) Channel setup page 2 (Scale OFF)

- ① Channel Select: Select Channel No. which you want to select. You can change channel by Up/Down Arrow.
- ② Setup Screen Movement: It is used when moving among channel setup screen (total 4 pages)
- ③ Maximum Range View: It shows available low/high range of selected input type.
- ④ User Range Input: input users wanted low/high range directly.
- ⑤ In order to use Scale Range Input, ⑧ Scale Range Use Button should be ON. Scale change makes it possible to use the changed value which is converted from low/high value in the User Range Input into scale range low/high value.
- ⑥ You can select decimal point position which you want. Basically decimal point position is restricted according to input type. When using Scale function or Calculation function respectively or together, you can select until 4 digits out of total 5 digits. (Picture 37) For example, without decimal point, -99999 ~ 99999 range could be displayed. When decimal points are used, it displays until -9.9999~9.9999 range.
- ⑦ Maximum range setup button: It let Usable Range Input maximum initialize low/high value of input type.
- ⑧ If you want to use Scale Range, press ON button and make Scale Calculation function activated.



(Picture 40) Channel setup page 2 (Scale ON)

(c) Data Read Method & Input Correction setup

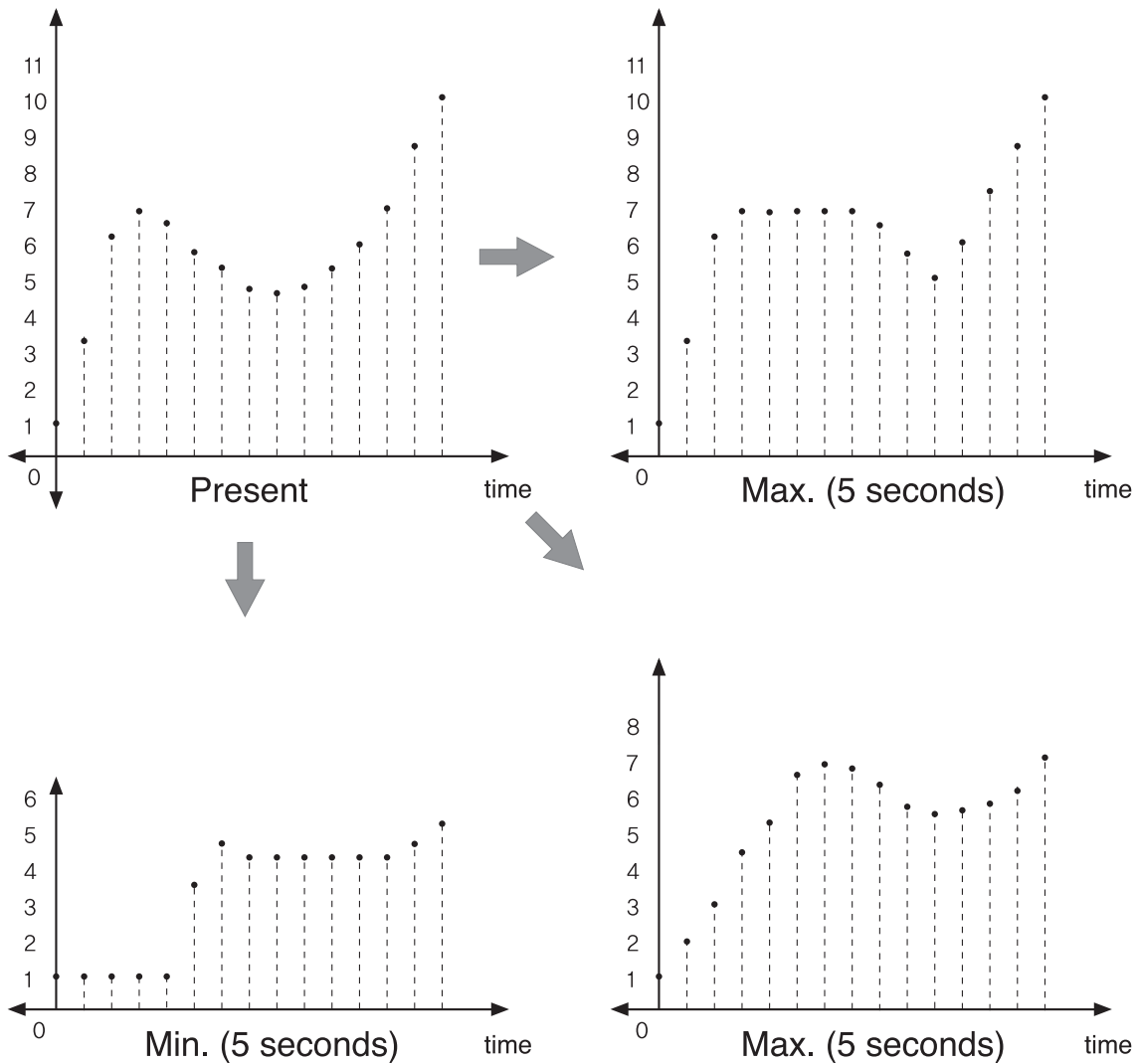


(Picture 41) Channel setup page 3

- ① Channel Select: Display the channel what you want to select and channel will be changed with Up/Down arrow.
 - ② Setup screen movement: It is used when moving among Channel Setup Screen. (Total 5 pages)
 - ③ Data read Method supports 4 kinds largely and its operations are as below table 2.
 - ④ Section Time Input is not activated when selecting direct method in the Data Collection Method. It does not affect previously input time value. However if you select one out of MAX, MIN, AVG, window is activated and it performs its functions within Input Time Section.
- (Picture 42)

(Table 2) Data read Method

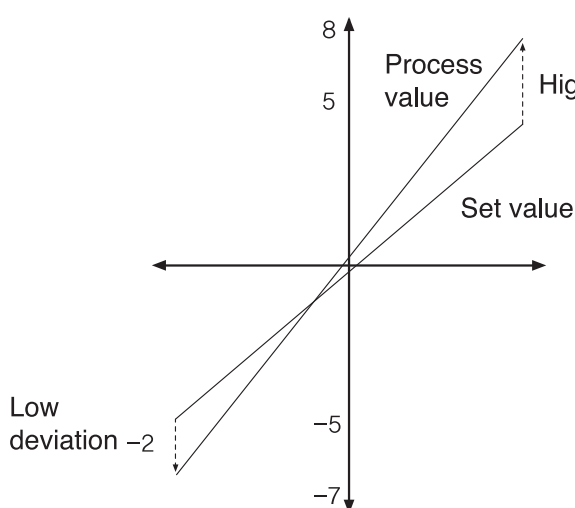
Collect Method	Function
DIRECT	Convert analog value which was connected to each channel into digital data through internal Analog to Digital Converter and use digital data. If selected, right side of time input window will not be activated.
MAX	Within selected section time, use the highest value of the past values as present process value. . If selected, right side of time input window will be activated.
MIN	Within selected section time, use the lowest value of the past values as present process value. . If selected, right side of time input window will be activated.
AVG	Within selected section time, use the average value of the past values as present process value. . If selected, right side of time input window will be activated.



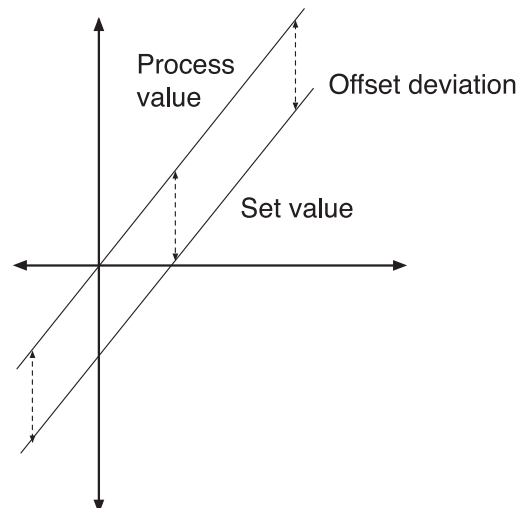
(Picture 42) Example of Data Collection Method (DIRECT, MAX, MIN, AVG)

Setup of ⑤ Low deviation & ⑥ High deviation: it is to correct the inclination of deviation between process value or processed/calculated value and desired set value. Input low deviation and high deviation value directly and correct inclination.

⑦ Offset Deviation Setup : it is to correct the Offset Deviation between process value or processed/calculated value and desired set value. Input offset value directly and correct offset.



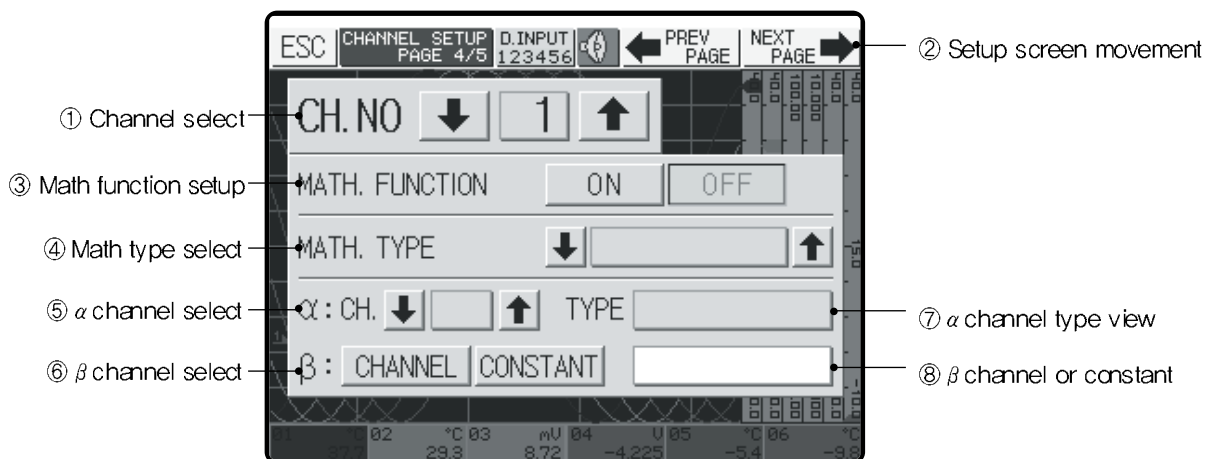
(Picture 43) High / Low deviation setup



(Picture 44) Offset deviation setup

(d) Mathematical Function

Mathematical function of GR100 is not only limited in present channel but also can take other channels mathematical value. So it can be used to consecutive and complicated mathematical function. For example, process or processed/calculated value could be displayed by mixing process value and mathematical value.



(Picture 45) Channel Setup Page 4 (MATH. Function setup)

- ① Channel Select: Display the channel what you want to select and channel will be changed with Up/Down arrow.
- ② Setup Screen Movement : It is used when moving among channel setup screens (total 5 pages)
- ③ Math.Function Setup : When selecting on, below inactive input window will be activated. When selecting off, input value is saved. However it will be inactive and do not affect its operation.

- ④ Select Mathematical Type and available mathematical kinds are as below table 3.
- ⑤ Select α channel. Selected channel types are
- ⑥ Select β channel or ⑥ β constant. Channel or Constant Value will be shown
- ⑦ in the α channel type (On the right)
- ⑧ Input in the β channel or Constant Input Window.
- Input range of constant number is $-99,999.99 \sim 99,999.99$

	Math. type	Function
①	$(CH \alpha) + (CH \beta \text{ or } \beta)$	$[\alpha \text{ channel}] \text{ value} + [\beta \text{ channel or } \beta \text{ Constant}]$. Caution: Do not let math. Result exceeds its maximum range.
②	$(CH \alpha) - (CH \beta \text{ or } \beta)$	$[\alpha \text{ channel}] \text{ value} - [\beta \text{ channel or } \beta \text{ Constant}]$. Caution: Do not let math. Result exceed its minimum range.
③	$(CH \beta \text{ or } \beta) - (CH \alpha)$	$[\beta \text{ channel}] \text{ value} - [\alpha \text{ channel or } \alpha \text{ Constant}]$. Caution: Do not let math. Result exceeds its minimum range.
④	$(CH \alpha) \times (CH \beta \text{ or } \beta)$	$[\alpha \text{ channel}] \text{ value} \times [\beta \text{ channel or } \beta \text{ Constant}]$. Caution: Do not let math. result exceeds its maximum range.
⑤	$(CH \alpha) \div (CH \beta \text{ or } \beta)$ (Caution 1)	$[\alpha \text{ channel}] \text{ value} \div [\beta \text{ channel or } \beta \text{ Constant}]$. Caution: Keep in mind that $[\beta \text{ channel or } \beta \text{ Constant}]$ is not "0".
⑥	$(CH \beta \text{ or } \beta) \div (CH \alpha)$ (Caution 1)	$[\beta \text{ channel or } \beta \text{ Constant}] \div [\alpha \text{ channel}] \text{ value}$. Caution: Keep in mind that $[\alpha \text{ channel}]$ is not "0".
⑦	$ CH \alpha $	Find absolute value for $[\alpha \text{ channel}]$
⑧	$(CH \beta \text{ or } \beta) \times \sqrt{(CH \alpha)}$	$[\beta \text{ channel or } \beta \text{ Constant}] \times [\alpha \text{ channel}]$'s square root value
⑨	$(CH \beta \text{ or } \beta) \times \sin(CH \alpha)$	$[\beta \text{ channel or } \beta \text{ Constant}] \times [\alpha \text{ channel}]$'s Sine value (Use Radian Unit)
⑩	$(CH \beta \text{ or } \beta) \times \cos(CH \alpha)$	$[\beta \text{ channel or } \beta \text{ Constant}] \times [\alpha \text{ channel}]$'s Cosine value (Use Radian Unit)
⑪	$(CH \beta \text{ or } \beta) \times \tan(CH \alpha)$ (Caution 2)	$[\beta \text{ channel or } \beta \text{ Constant}] \times [\alpha \text{ channel}]$'s Tangent value. Keep in mind that $[\alpha \text{ channel}]$ value is not $\pm(2n-1) \times (\pi/2)$. (Use Radian Unit)
⑫	$(CH \beta \text{ or } \beta) \times \log_{10}(CH \alpha)$ (Caution 3)	$[\beta \text{ channel or } \beta \text{ Constant}] \times [\alpha \text{ channel}]$'s Common Logarithms value : Keep in mind that $[\alpha \text{ channel}]$ is not "0"
⑬	$(CH \beta \text{ or } \beta) \sim (CH \alpha) \% RH$	Find Relative Humidity Value of $[\beta \text{ channel or } \beta \text{ Constant}]$ and $[\alpha \text{ channel}]$. The two values should be input as temperature unit $^{\circ}C$.
⑭	$(CH \alpha) ^{\circ}C \rightarrow (CH \alpha) ^{\circ}F$	Change of $[\alpha \text{ channel}]$'s temperature from $^{\circ}C$ to $^{\circ}F$

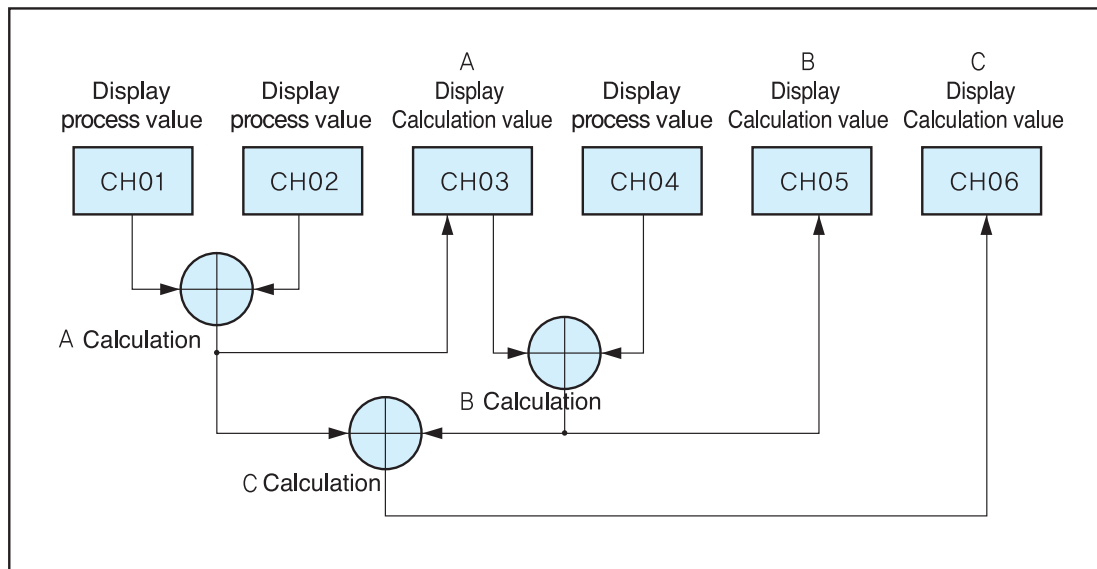
(Table 3) : Math. Type

(Caution 1) If divided by 0, it will be infinite value (∞) and it causes math. Error.

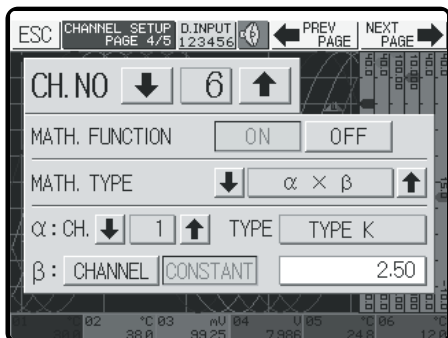
(Caution 2) If seek tangent value with $\pm(2n-1) \times (\pi/2)$, it leads to infinite value (∞).

SO it causes math. Error.

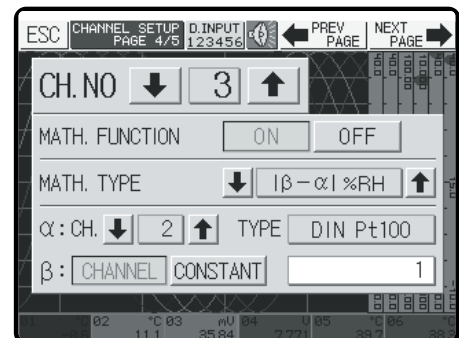
(Caution 3) Because $\log_{10}(0)$ is not exist, it leads to math. Error.



(Picture 46) Example of Math. function



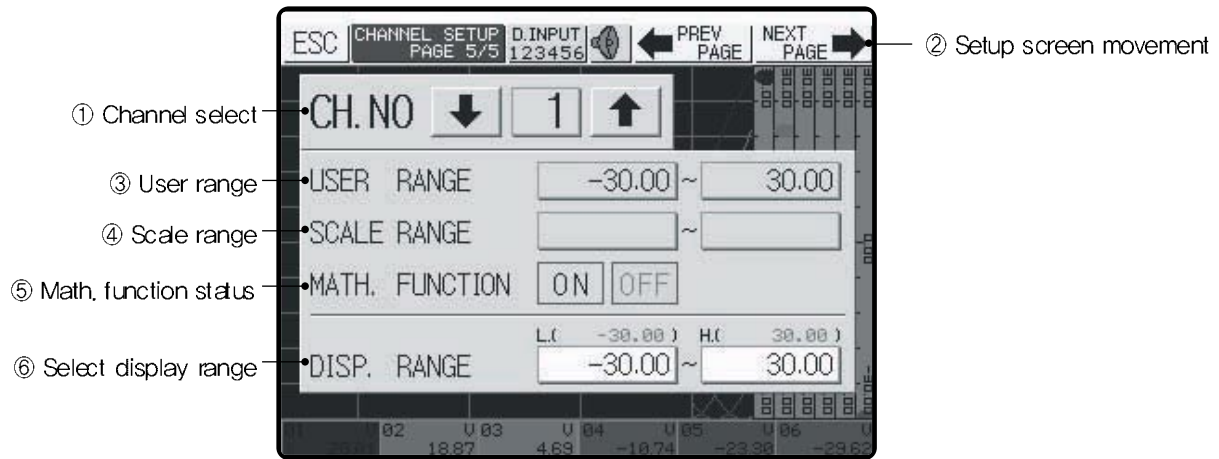
(Picture 47) Channel setup page 4.
Example 1



(Picture 48) Channel setup page 4.
Example 2

(Picture 47) is an example screen of using math function, Process Value of channel-1 (TC K-TYPE) and the value which was multiplied by 2.5 will be displayed on channel 6.
(Picture 48) : receive Channel-1 & 2 temperature through web bulb & dry bulb's temperature respectively and change it into relative humidity. Then it will be shown on Channel-3.

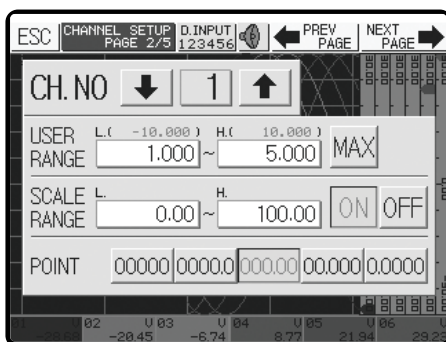
(a) Display Range Setup Per Channel



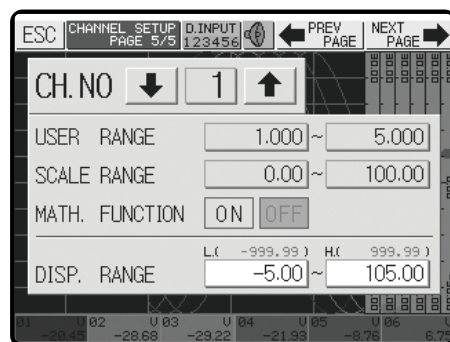
(Picture 49) Channel Setup Screen 5 (Display Range Setup)

- ① Channel Select : Display the channel what you want to select and channel will be changed with Up/Down arrow.
- ② Setup Screen Movement: It is used when moving among channel setup screens (total 5 pages)
- ③ User Range will be shown in the Channel Setup screen 2 (Picture 40)
- ④ Scale Range will be shown in the Channel Setup screen 2 (Picture 40)
- ⑤ Math. Function status which user selected will be shown in Channel Setup screen 4 (Picture 40).
- ⑥ Display range which is shown on the screen. High/Low value will be varied depend on the setup status of ③, ④, ⑤.

Below picture 50 & 51 : connects 4~20 mA input which is used in common with 250 Ω in parallel and receives 1~5 V. In channel setup screen 1(Picture 38), select input type as V d.c. \pm 10V. Select user range as 1~5 V and select Scale Range as 0 ~ 100 in the Channel Setup page 2 (Picture 50). This time decimal point will be displayed until two points. If selected like this, each channel shows at 0~100 range. If you have particular display range, particular range will be displayed by selecting display range as Picture 51.



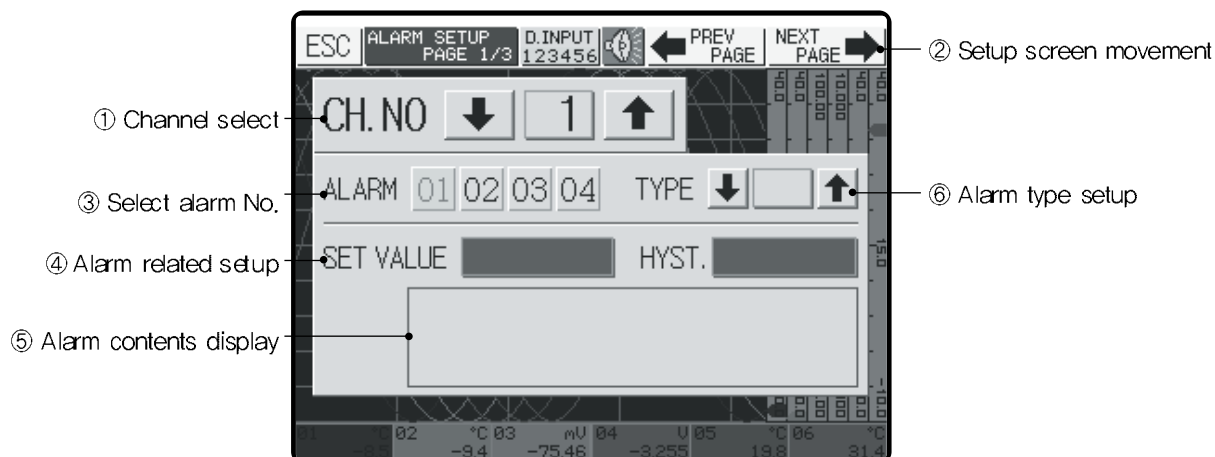
(Picture 50) Display 1~5 V as 0~100



(Picture 51) Display scale range (0~100) as -5~105

4.5 Alarm and Digital Input Setup (ALM & D.I)

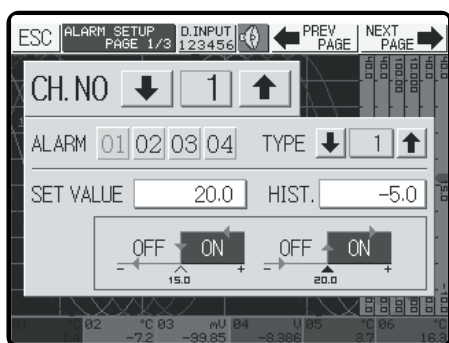
(a) Setup of Alarm No. Type and Set Value



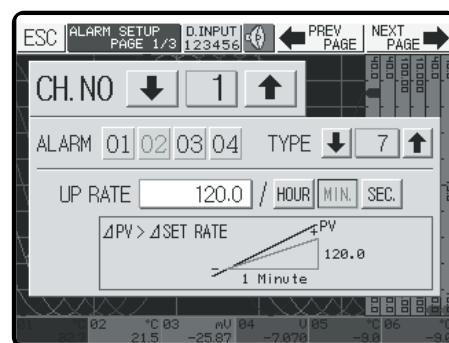
(Picture 52) Alarm setup page 1

- ① Channel Select: Display the channel what you want to select and channel will be changed with Up/Down arrow.
 - ② Setup Screen Movement : It is used when moving between alarm setup and D/I setup screen. (Total 3 pages)
 - ③ Select alarm no. Each channel supports 4 alarms.
 - ④ Alarm related setup input will be varied in accordance with ⑥ alarm type.
 - ⑤ Alarm Contents Display : It displays its operation of alarm with picture.
 - ⑥ Alarm Type Setup : it shows type of alarm operation which user wants.
- Refer to “(Table 4) or ⑤ Alarm Contents Display.

Below picture 53 is an example of high alarm operation, Alarm is on in case Set Value or calculated value is above 100 and Alarm is off below 90. Picture 54 is an example of High Alarm for Up Rate ratio. When process or processed / calculated value is rising more than the changing ratio of SET RATE 1/sec, alarm is ON.



(Picture 53) Example of alarm setup (High alarm)

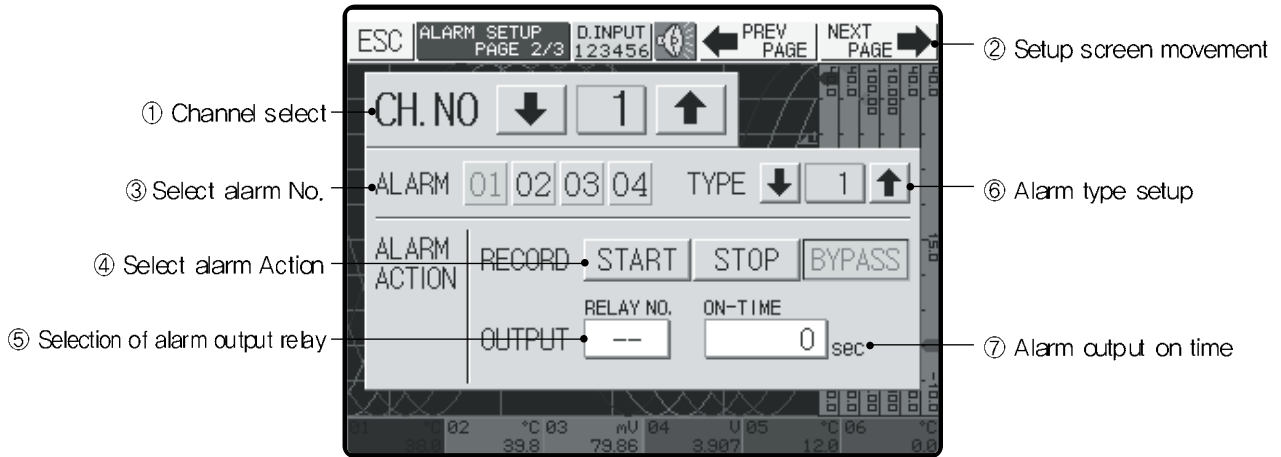


(Picture 54) Example of alarm setup (Up rate ratio)

No.	Alarm type (∧: Deviation, ▲Alarm SV)	Function
①		High Alarm : Alarm on above ▲, Alarm off below ∧
②		Low Alarm : Alarm on below ▲, Alarm off above ∧
③		Alarm within High*Low setup range Base on ▲, alarm on within $\pm \wedge$, alarm off out of $\pm \wedge$
④		Alarm out of High*Low setup range Base on ▲, alarm on out of $\pm \wedge$, alarm off within $\pm \wedge$
⑤		Alarm out of setup range between channels Alarm on out of setup bias range between two channels, Alarm off within set
⑥		Alarm within setup range between channels Alarm on within setup bias range between two channels, Alarm off out of setup bias range between two channels.
⑦		High Alarm for Up Rate Ratio Alarm on when rising rapidly more than selected rate ratio.
⑧		Low Alarm for Down Rate Ratio Alarm on when falling rapidly more than selected rate ratio.
⑨		Low Alarm for Up Rate Ratio Alarm on when rising late more than selected rate ratio
⑩		Rising Alarm for Down Rate Ratio Alarm on when falling late more than selected rate ratio.
⑪		Hold High Alarm Alarm on above ▲, Alarm off below ∧
⑫		Hold Low Alarm Alarm on below ▲, Alarm off above ∧
⑬		Alarm within Hold Low * High Base on ▲, Alarm on within $\pm \wedge$, Alarm off out of $\pm \wedge$
⑭		Alarm out of Hold Low * High Base on ▲, Alarm on out of $\pm \wedge$, Alarm off within $\pm \wedge$
⑮		Loof Brake Alarm Alarm when selected RTD,TC, ± 110 mV d,c input exceed its usable range.

(Table 4) Alarm Operation

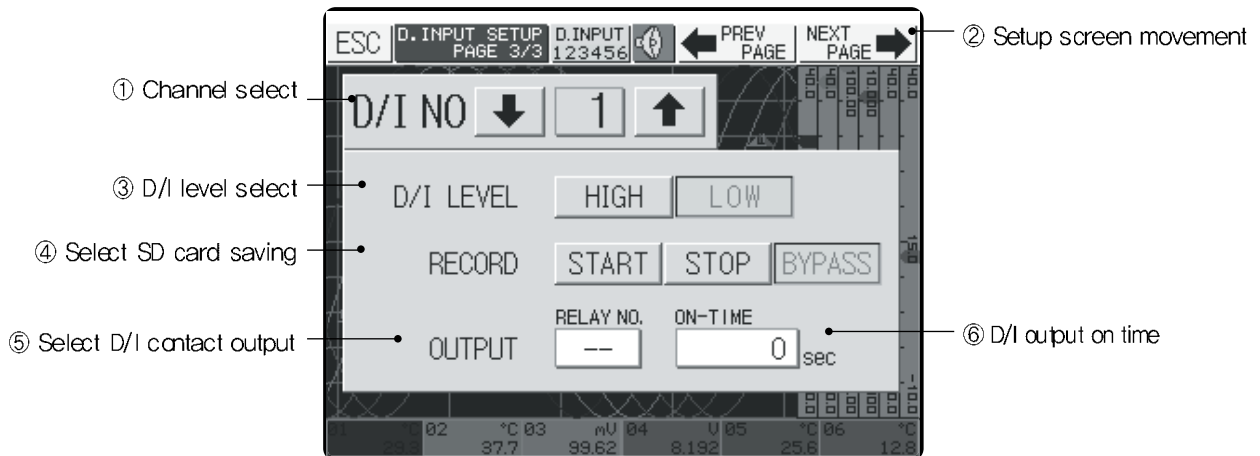
(b) Condition of Alarm Record & Relay output setup



(Picture 55) Alarm action/output setup

- ① Channel Select: Display the channel what you want to select and channel will be changed with Up/Down arrow.
- ② Setup Screen Movement: It is used when moving between alarm setup and D/I setup screen. (Total 3 pages)
- ③ Select alarm no. Each channel supports 4 alarms.
- ④ Select Alarm saving: Select it in order to do "Record" or "Stop" or "Bypass" when user selected Alarm is on.
- ⑤ Contact output under Alarm: Input Relay Contact No when user selected alarm is on.
- ⑥ Select Alarm Type: Select alarm type which you want to use.
- ⑦ Alarm Output On time: Input the time (second) which contact output is maintained in case user selected alarm is ON. You can select up to maximum 999,999 second.

(c) D.I Label and Relay Output Setup



(Picture 56) D/I label and relay output setup

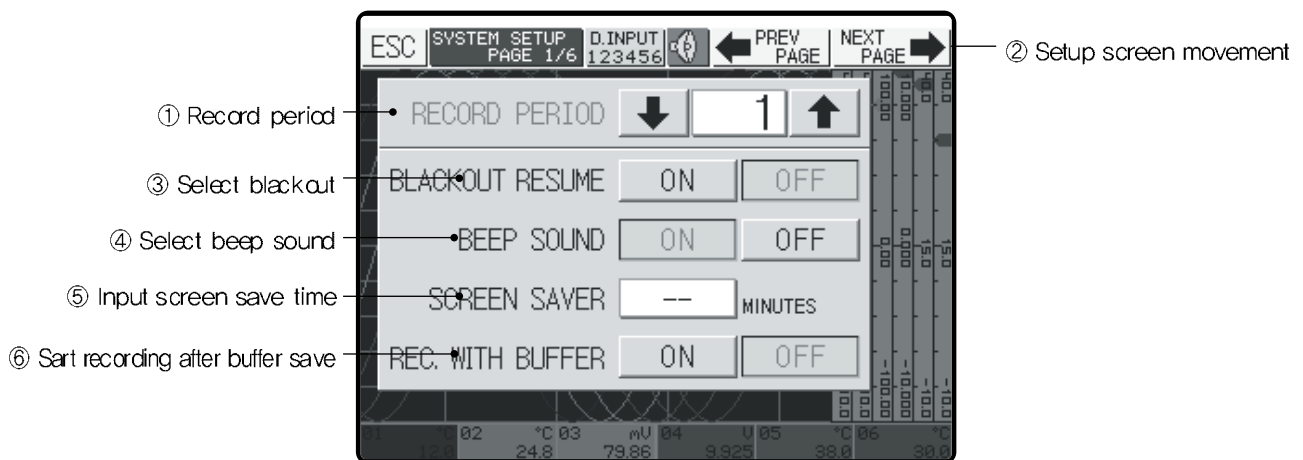
- ① Channel Select : Display the channel what you want to select and channel will be changed with Up/Down arrow.
- ② Setup Screen Movement : It is used when moving between alarm setup and D/I setup screen. (Total 3 pages)

- ③ Select D.I Label: Select D.I label of input signal between HIGH and LOW.
- ④ Select D.I saving : Select it in order to "START" or "STOP" or "Bypass" when user selected D.I comes in.
- ⑤ Select D.I contact output: Select Relay output no. when user selected D.I comes in.
- ⑥ D.I Output On time: Input the time (second) which contact output is on in case user selected D.I input comes in. You can select up to maximum 999,999 second.

4.6 System Setup

(a) Select Record conditions, Beep Sound, Screen Saver, Record with Buffer

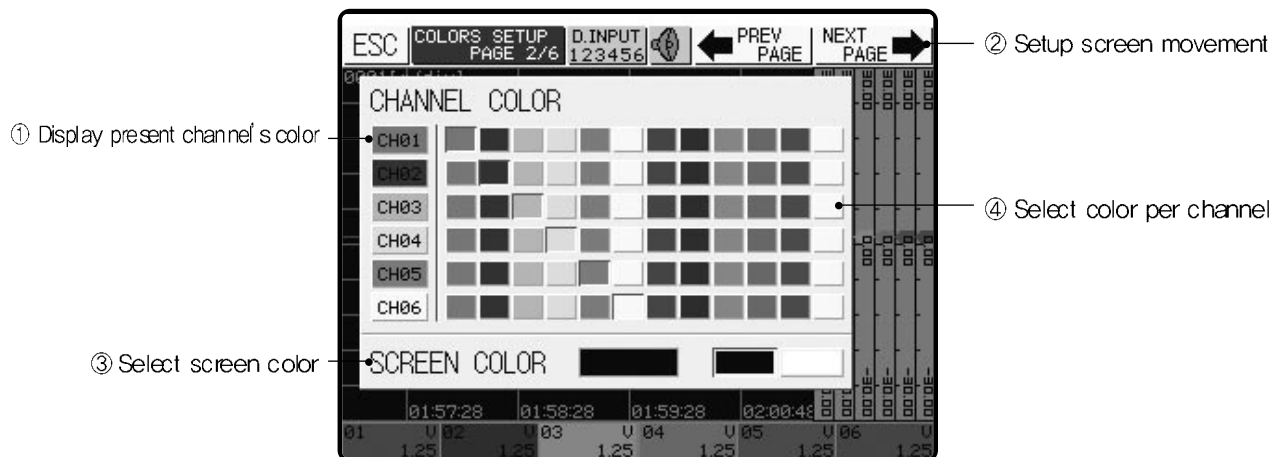
System setup screen is consisted of total 6 pages and select the following items in each screen.



(Picture 57) System setup

- ① Input Record Period : Input record period what you want. Available selection second (Min 1 second ~ Max. 900 seconds: 15 minutes).
- ② Setup Screen Movement : It is used when moving among system setup screens. (Total 6 pages)
- ③ Blackout Resume On : While recording, it continues recording after blackout resume.
- ④ Select Beep Sound : Select ON/OFF of beep sound such as button sound.
- ⑤ Input Screen Save Time : Turn screen off after selected time in order to protect LCD. Input time should be by minutes and it can be selected up to Max. 120 minutes. If input is 0 minute, it does not work. If you press any places on LCD, screen will be ON.
- ⑥ Record with Buffer On : After saving existing maximum 12 hours' set/calculated value at present buffer, while starting recording.

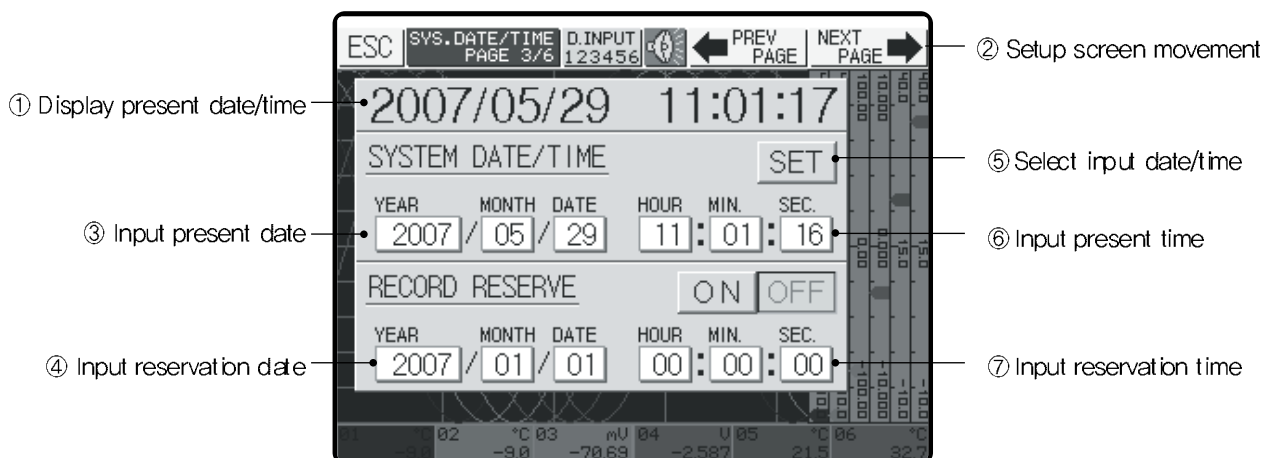
(b) Channel Color and Screen Color Setup.



(Picture 58) Channel and screen color setup

- ① Display selected color per channel.
- ② Setup Screen Movement : It is used when moving among system setup screens. (Total 6 pages)
- ③ Select Screen color. Selected color is used for graphic mode's screen color.
- ④ Select color per channel. You can change the color of each channel (12 colors.)

(c) System Date/Time & Record Reservation Date/Time Setup.

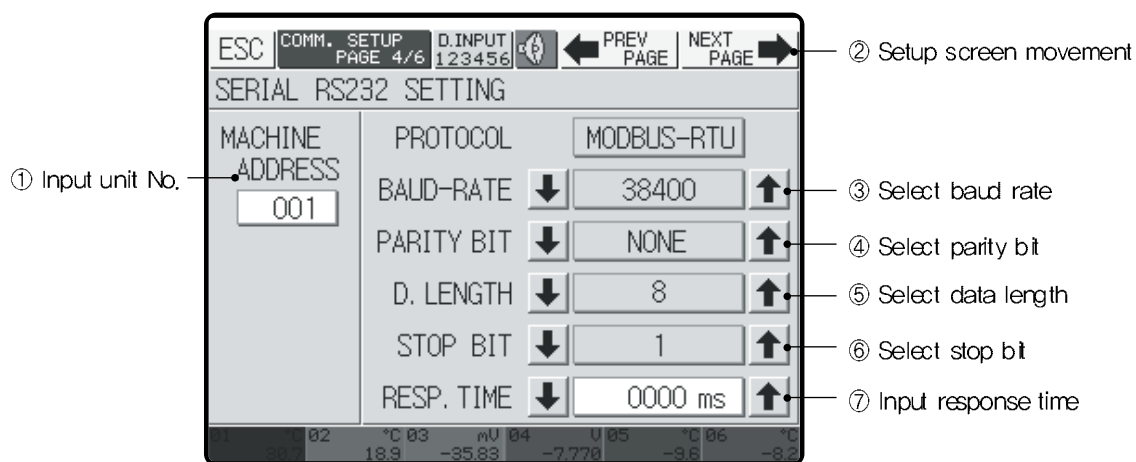


(Picture 59) System date/time & record reservation time setup.

- ① Display present date/time.
- ② Setup Screen Movement : It is used when moving among system setup screens. (Total 5 pages)
- ③, ⑥ : Input present date/time
- ④, ⑦ : Input Reservation date/time
- ⑤ Select input date/time (③, ⑥) as system date/time.

※ Selected date/time in RECORD RESERVE can be operated, if it is ON

(d) RS232C Communication Setup



(Picture 60) Communication setup (RS232)

- ① Input System's equipment number. When making several equipments, numbers are necessary.
- ② Setup Screen Movement : It is used when moving among system setup screens. (Total 6 pages)
- ③ Select Baud-Rate : Select among 9600, 19200, 38400 bps. Initial Value: 38400 bps.
- ④ Select parity bit : Select among NONE/EVEN/ODD. Initial Value: NONE.
- ⑤ Select data length : Select among 5, 6, 7, 8. Initial Value: 8.
- ⑥ Select Stop Bit : Select between 1 and 2. Initial Value: 1
- ⑦ Response Time : It is used when it occurs timing errors among equipments or it needs delay between frames. Initial Value : "0" , Time Unit : "ms"

Caution

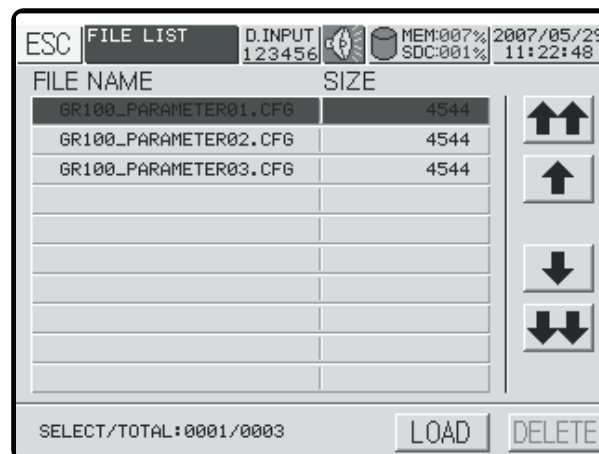
RS 422/485 setup is the same as RS 232.

(e) Select and Save System Configuration File



(Picture 61) Select languages, setup file read/write & saving file name setup.

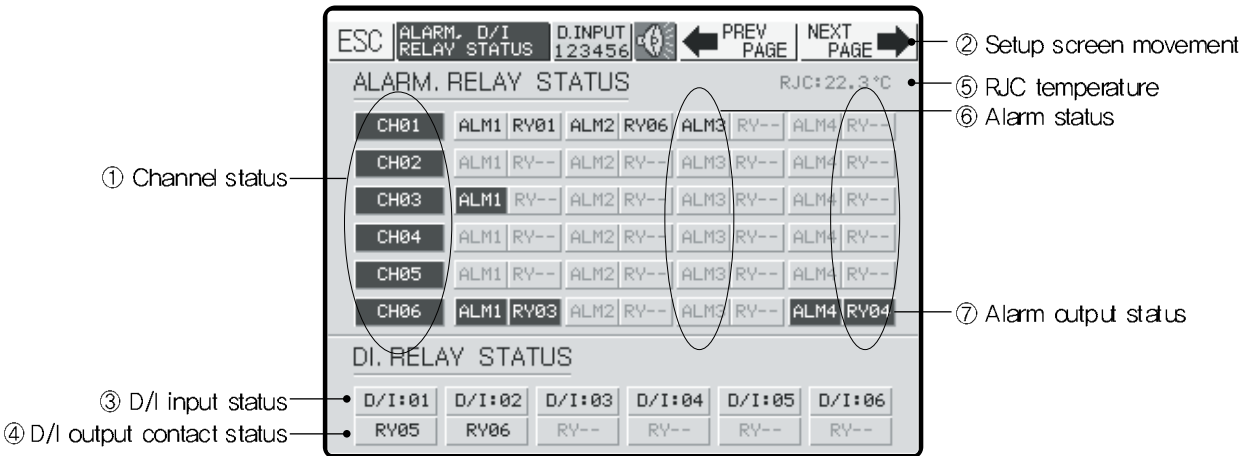
- ① Select the file which System Configuration was saved. If selected, the screen like picture 62 will be displayed.
- ② Setup Screen Movement: It is used when moving among system setup screens.
(Total 6 pages)
- ③ Select language between Korean and English.
- ④ Input setup file number which you want to read and write.
- ⑤ Save present system configuration values into the File No. Setup.
- ⑥ Setup 6 characters of file which will be saved.



(Picture 62) File List View

4.7 Status

(a) ALARM, D/I Contact STATUS VIEW



(Picture 63) Alarm, D/I and contact output status

① It shows each channel's status

CH01	Channel is working without problem (Blue Color)
CH01	Channel's input is disconnected (Red Color)

② Setup Screen Movement: It is used when moving among system setup screens. (Total 3 pages)

③ Display D.I input status (D.I 1~6 has same contents))

D/I:01	Have D.I Input
D/I:01	Do not have D.I Input

④ Display D.I output contact status (D.I 1~6 has same contents)

RV--	No Relay setup
RV01	RELAY 1 allocated + Contact OFF
RV01	RELAY 1 allocated + Contact ON

⑤ Displays temperature of systems R.J.C (Reference Junction Compensation).

This temperature is used for terminal temperature compensation when using Thermocouple.

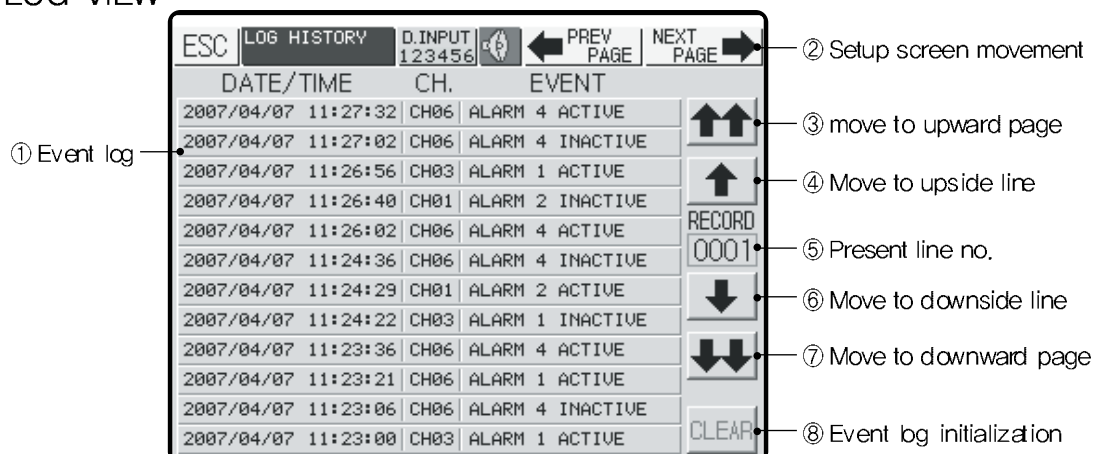
⑥ Display Alarm Status (Alarm 1~4 has same contents)

No Alarm 1 setup, Alarm 1 setup + Contact Off Alarm, Alarm 1 setup + Contact ON alarm.

⑦ Display Alarm Output Status. Display method is same as ④ Display D.I output contact

ALM1	No Alarm Setup
ALM1	Alarm 1 allocated + Contact OFF
ALM1	Alarm 1 allocated + Contact ON.

(b) EVENT LOG VIEW

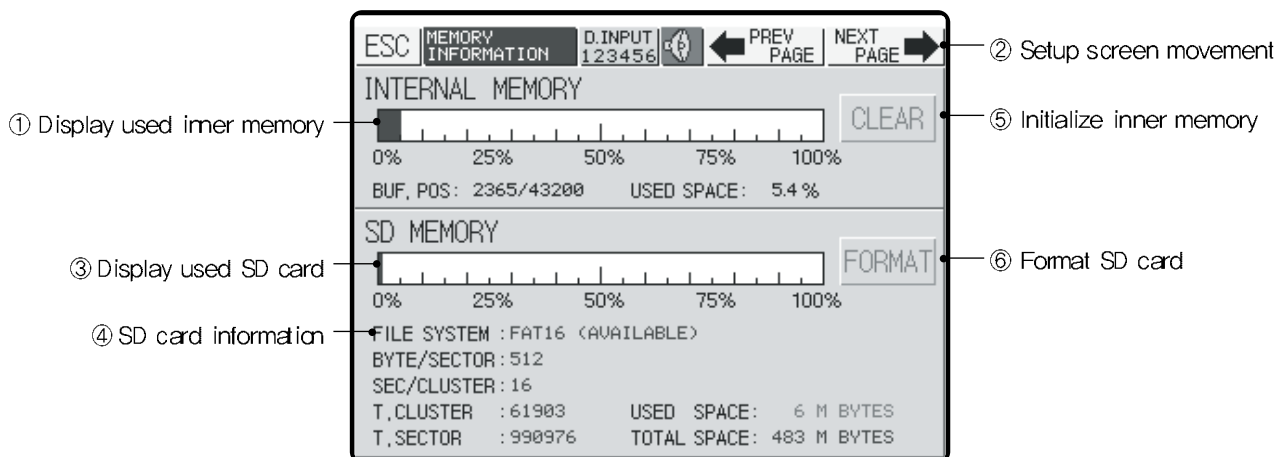


(Picture 64) Event log screen

- ① Display Event Log. It will be displayed in regular sequence: Date, Time, Channel, Contents.
- ② Setup Screen Movement: It is used when moving among system setup screens. (Total 3 pages)
- ③ It lets Event Log Screen move upward page by page.
- ④ It moves to upside of Event Log Screen line by line.
- ⑤ Display first line number of present event log screen.
- ⑥ It moves to downside of Event Log Screen line by line.
- ⑦ It lets Event Log Screen move downward page by page.
- ⑧ Initialize recorded event log contents.

※ In case of disconnected power, event log contents will be deleted.

(c) Used memory View



(Picture 65) Memory information screen

- ① Display used inner memory with bar graph and percentage (%).
- ② Setup Screen Movement: It is used when moving among system setup screens. (Total 3 pages)
- ③ Display used SD Card with Byte.
- ④ Display presently inserted SD Card information.
- ⑤ Initialize inner memory.
- ⑥ Format presently inserted SD Card.

※ If used inner memory is over 100%, it will be recorded again from the firstly recorded data.
If used inner memory is over 100%, it stops saving.

5 Specification

5.1 Input

* Input Contact Number : 6 channels, 12 channels (Refer to suffix code)

* Input Type : Multi Input (17 types)

* Range per Input Type

Input Type		Measurement Range	Accuracy
Thermocouple (T.C)	K	-270.0 ~ 1372.0 °C	± 0.1% of F.S *1
	J	-210.0 ~ 1200.0 °C	± 0.1% of F.S
	E	-270.0 ~ 1000.0 °C	± 0.1% of F.S *2
	T	-270.0 ~ 400.0 °C	± 0.1% of F.S *3
	R	-50.0 ~ 1768.0 °C	± 0.1% of F.S *4
	S	-50.0 ~ 1768.0 °C	± 0.1% of F.S *4
	B	0.0 ~ 1820.0 °C	± 0.1% of F.S *5
	N	-270.0 ~ 1300.0 °C	± 0.1% of F.S *3
	PL2	0.0 ~ 1395.0 °C	± 0.1% of F.S
	U	-200.0 ~ 600.0 °C	± 0.1% of F.S
	L	-200.0 ~ 900.0 °C	± 0.1% of F.S
	W	0.0 ~ 2315.0 °C	± 0.1% of F.S
* 1 : Below - 250 °C regulation ect. * 2 : Below - 260 °C regulation ect. * 3 : Below - 235 °C regulation ect. * 4 : Below - 25 °C ± 0.2% * 5 : 310 ~ 470 °C : ± 0.15 %, + 240 ~ 310 °C : ± 0.2 % Below +240 °C regulation etc.			
R.T.D	Pt100 Ω (DIN)	-200.0 ~ 850.0 °C	± 0.1 % of F.S
	Pt100 Ω (JIS Old)	-200.0 ~ 660.0 °C	± 0.1 % of F.S
V d.c	± 100 mV d.c	-100.00 ~ + 100.00 mV d.c	± 0.1 % of F.S
	± 10 V d.c	-10.000 ~ + 10.000 V d.c	± 0.1 % of F.S
	± 30 V d.c	-30.00 ~ + 30.00 V d.c	± 0.1 % of F.S

* Measurement cycle : 1 second

* Range setup : Select High/Low value within its maximum range according to User Range setup.

* Scale Setup : Select High/Low value according to its scale range.

* Accuracy : Refer to accuracy of input type and range.

* Applied Input Standard

Input Type	T.C	K, J, E, T, R, S, B, N	IEC 584
		PL2, W	ASTM E988
		U, L	DIN 43710, IEC 751
	R.T.D	Pt 100 Ω (DIN)	DIN 43760
		Pt 100 Ω (JIS)	JIS C1604-1989(Old)
	R.H Change	R.H Change by the difference of dry/web bulb Goff & Gratch (1946)	

- * Effect of surrounding temperature : R.T.D : Below ± 0.02 °C / °C
- * Basic Contact Compensation Error : Max ± 1.3 °C (0~50 °C)
- * Input Resolving Power : Basically below its decimal points.
- * Allowable signal source resistance : T.C: Below 250 Ω , V.d.c: Below 2 k Ω .
- * Detection of sensor disconnection : Up Scale in case of Disconnection T.C, R.T.D, V d.c. (± 100 mV d.c).
- * Effect of magnetic field : Below 400AT/m
- * Preheating Time : Above 30 minutes.
- * Input impedance : R.T.D – above 10 M Ω , T.C & V.d.c – above 1M Ω .
- * Allowable wiring resistance : R.T.D – Below 10 Ω / 1 wire
(But, conductor resistance among 3 wires should be same)
- * Type of Calculation/ Conversion
Calculation, Function Conversion : +, -, \times , \div , abs (), sqrt (), cos (), tan (), log (), % RH conversion, °F conversion.

5. 2. DISPLAY Specification

- * Display : TFT Color LCD (113.28mm x 84.71mm, Resolution 320x234, 18 bit color)
- * Color : Trend, Bar-Graph, Text, 12 colors (Background Color: Black or White selectable)
- * Lifetime of backlight : 3 years (It might be variable depend on its using environment)
- * Language : English/Korean
- * Trend View : Horizontal/Vertical Trend View, RULER, TEXTBAR, Alarm Mark View ON/OFF, Scroll Speed setup
- * Bar-Graph view : Horizontal direction – Graph display, Numerical value display, Unit display,
Level Bar – (Normal Type/Spectrum), Channel Number, Alarm status display.
- * Text View : display measured value with number, channel name, unit, alarm number, label bar –
Display screen by dividing 1~6 into equal parts.
- * Historical Trend View : Selects Memory or SD Card, and displays recorded data.
Horizontal/Vertical Trend View. Enlarged view of time axis and dimension axis (Max. 64 times), Text-Bar View.
- * STATUS VIEW : Alarm, DI, Relay status view. Log History Status View. Used Memory View.
Etc. It is consisted of 3 pages of screen.
- * File List View : If you press File List in the History View, you can see file list which was saved at SD Card.

5.3 General Specification

Rating	100 – 240 V a.c Voltage variable ratio $\pm 10 \%$
Frequency	50 – 60 Hz
Power consumption	Below Max. 24VA
Surroundings Temperature	0 ~ 50 °C
Surroundings Humidity	20 ~ 90 % R.H. (No Condensation)
Vibration	Vibration Wide: Below 1.2mm (5~14Hz)
Shock	Below 147 m/s ² 11m/s (Each 6 directions, 3 times)
Alarm Output	Contact Capacity : 30 V d.c / 5 A Max. , 250 V a.c / 5 A Max.
Insulation Resistance	Between 1st & 2nd Terminal above 500 V d.c/20 M Ω Between 1st & Earth Terminal above 500 V d.c/20 M Ω Between 2nd & Earth Terminal above 500 V d.c/20 M Ω
Dielectric Strength	Between 1st & 2nd Terminal 2500 V a.c 50/60Hz 1 minute Between 1st & Earth Terminal 2500 V a.c 50/60Hz 1 minute Between 2nd & F/G Terminal 2500 V a.c 50/60Hz 1 minute
Weight	2.5 Kg

5.4 Memory Specification

- * Type : Inner Memory(SD-RAM) : Volatile, 12 hours – In case of one second record,
FLASH : Non Volatile, Function Setup Saving, RAM : Non Volatile 3 hours – In case
of one second record, SD Card (1GB, save about one year's use in case of two
seconds record)
- * Saving Period : User Selection (1~900 seconds)
- * Memory Information : Save calculated value, Burn-out, D/I, ALARM, Relay Output Status.

5.5 SAFETY and EMC Standard

- * CE : EN61010 (scheduled to be approved)
- * EMC : EN61000 (scheduled to be approved)

5.6 Communication Specification

5.7 Condition of Transport and Storage

Applied Standard	EIA-RS232, EIA-RS485, USB V1.1, ETHERNET (Option)	
Max. Connection Number	EIA-RS232	1 : 1
	EIA-RS422/485	1 : 32(Available setup: Address 1~999)
Communication Method	EIA-RS232	Full Duplex
	EIA-RS422/485	Half Duplex
Communication Distance	USB V1.1	Within about 1m
	EIA-RS232	Within about 10m
	EIA-RS422/485	Within about 1.2 Km
Communication Speed	USB V1.1	About 10 M bps
	EIA-RS232	9600/19200/38400 bps
	EIA-RS422/485	9600/19200/38400 bps
Length of Data	ETHERNET(Option)	10 BASE-T
	EIA-RS232	7 / 8 bit
	EIA-RS422/485	7 / 8 bit
Parity Bit	EIA-RS232	NONE / EVEN / ODD
	EIA-RS422/485	NONE / EVEN / ODD
Stop Bit	EIA-RS232	1 / 2 bit
	EIA-RS422/485	1 / 2 bit
Communication Protocol	USB V1.1	BULK MODE
	EIA-RS232	MODBUS-RTU
	EIA-RS422/485	MODBUS-RTU
	ETHERNET(Option)	MODBUS ON TCP
Communication Response Time	EIA-RS232	0 ~ 9999 ms
	EIA-RS422/485	0 ~ 9999 ms

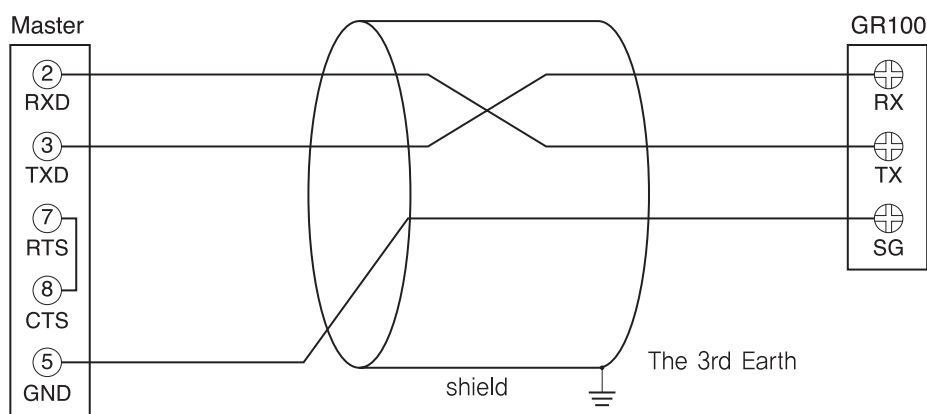
Temperature	-25 ~ 70 °C
Humidity	5 ~ 95 % RH (No Condensation)
Shock	Dropping the packed product below 1m would be endurable.

6 Communication manual

GR100 basically provides you with 2 serial channels (RS232, RS422/485). Two serials communication can be used individually and simultaneously. MODBUS-RTU is being used as its protocol.

6.1 Communication Wiring

- Communication Wiring
 - RS232C Wiring (Connector 9 pins)

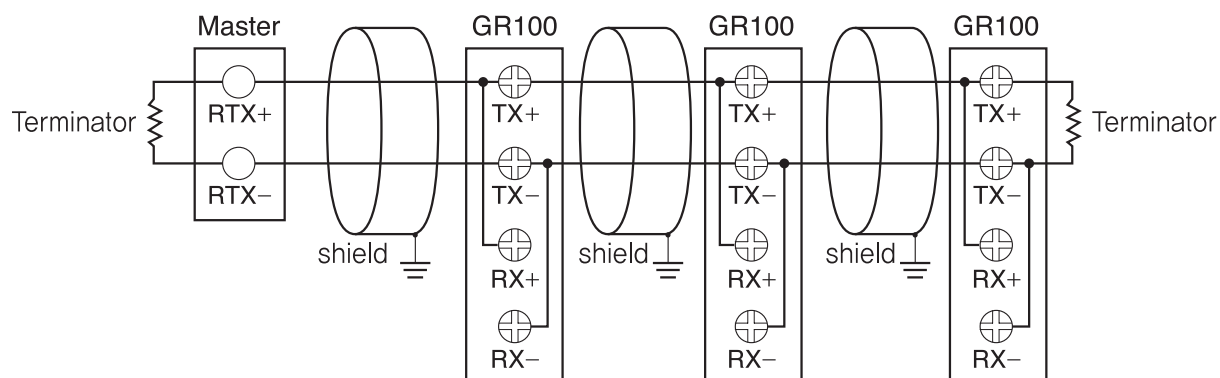


- RS422/RS485 Wiring

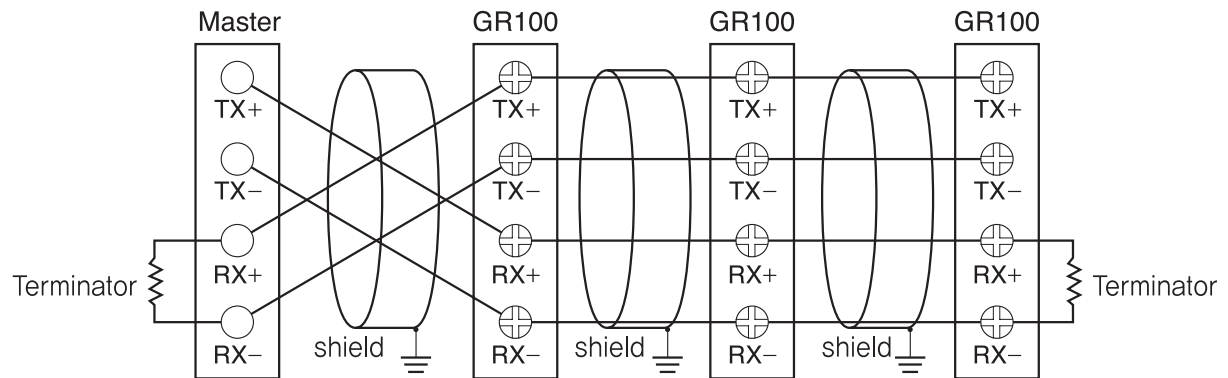
GR100 could be connected up to Maximum 32 units.

At the both ends of communication line, please connect terminator (100–200Ω 1/4W) for sure.

(Two Wire System Connection)



(Four Wire System Connection)



6.2 MODBUS–RTU Protocol

6.2.1. Frame Structure

First Character of Frame	Unit Number	Function Code	Data	Frame Confirmation CRC	Last Character of Frame
None	8 bit	8 bit	$n \times 8$ bit	16 bit	None

CRC : Cyclic Redundancy Check

6.2.2. Function Code

Function Code	Explanation of Code
03	Read Multiple Registers (n units)
06	Read Single Register (one unit)
08	Loop-Back Test
16	Write Multiple Registers (n units)

6.2.3. FUNCTION CODE 03 (READ MULTIPLE REGISTERS)

By using Function Code 03, contents of consecutive registers could be read by one time. The data number which could be read by one time varies depend on line situation and communication speed within maximum transmission frame. One transmission frame should be below 255 bytes.

► Transmission Frame

Serial No.	Contents	Size	Example(30001~300005)
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (03)	8 bit	03 h
3	Start reading register(High position)	8 bit	75 h
4	Start reading register(Low position)	8 bit	36 h
5	Read Data numbers (High position)	8 bit	00 h
6	Read Data numbers (low position)	8 bit	05 h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

► Reception Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (03)	8 bit	03 h
3	Read Transmitted Data Number	8 bit	dd h
4	Data 1 which was read (High position)	8 bit	dd h
5	Data 1 which was read (Low position)	8 bit	dd h
...
n – 4	Data n which was read (High position)	8 bit	dd h
n – 3	Data n which was read (Low position)	8 bit	dd h
n – 2	Frame Confirmation CRC(Low position)	8 bit	XX h
n – 1	Frame Confirmation CRC(High position)	8 bit	XX h
n	Last Character of Frame	None	–

6.2.4. FUNCTION CODE 06 (WRITE SINGLE REGISTER)

By using Function Code 06, one contents of specific register could be recorded.

► Transmission Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (06)	8 bit	03 h
3	Start recording register(High position)	8 bit	75 h
4	Start recording register(Low position)	8 bit	36 h
5	Recorded Data (High position)	8 bit	00 h
6	Recorded Data (low position)	8 bit	05 h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

► Reception Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (06)	8 bit	06 h
3	Start recording register(High position)	8 bit	dd h
4	Start recording register(Low position)	8 bit	dd h
5	Recorded Data (High position)	8 bit	dd h
6	Recorded Data (low position)	8 bit	dd h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

6.2.5. FUNCTION CODE 08 (LOOP-BACK TEST)

Loop-Back Test is available by using Function Code 08.

► Transmission Frame

Serial No.	Contents	Size	Example (30001 ~ 30005)
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (08)	8 bit	08 h
3	Loop-Back Code(High position)	8 bit	00 h
4	Loop-Back Code(Low position)	8 bit	01 h
5	Transmission Data (High position)	8 bit	12 h
6	Transmission Data (Low position)	8 bit	34 h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

► Reception Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (08)	8 bit	08 h
3	Loop-Back Code(High position)	8 bit	00 h
4	Loop-Back Code(Low position)	8 bit	01 h
5	Transmission Data (High position)	8 bit	12 h
6	Transmission Data (Low position)	8 bit	34 h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

6.2.6. FUNCTION CODE 16 (WRITE MULTIPLE REGISTERS)

By using Function Code 03, contents of consecutive registers could be read by one time. The data number which could be read by one time varies depend on line situation and communication speed within maximum transmission frame. One transmission frame should be below 255 bytes.

► Transmission Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (16)	8 bit	10 h
3	Start recording register(high position)	8 bit	75 h
4	Start recording register(low position)	8 bit	36 h
5	Data Numbers which should be recorded (high position)	8 bit	00 h
6	Data Numbers which should be recorded (low position)	8 bit	05 h
7	Numbers of transmission data	8 bit	05 h
8	Data 1 which should be recorded (high position)	8 bit	dd h
9	Data 1 which should be recorded (low position)	8 bit	dd h
...
n – 4	Data n which should be recorded (high position)	8 bit	dd h
n – 3	Data n which should be recorded (low position)	8 bit	dd h
n – 2	Frame Confirmation CRC(Low position)	8 bit	XX h
n – 1	Frame Confirmation CRC(High position)	8 bit	XX h
n	Last Character of Frame	None	–

► Reception Frame

Serial No.	Contents	Size	Example
0	First Character of Frame	None	–
1	Unit Number	8 bit	01 h
2	Function Code (16)	8 bit	10 h
3	Start recording register(high position)	8 bit	75 h
4	Start recording register(low position)	8 bit	36 h
5	Recorded Data Numbers (high position)	8 bit	00 h
6	Recorded Data Numbers (low position)	8 bit	05 h
7	Frame Confirmation CRC(Low position)	8 bit	XX h
8	Frame Confirmation CRC(High position)	8 bit	XX h
9	Last Character of Frame	None	–

6.2.7. Structure of Register

By using Function Code 03, contents of consecutive registers could be read by one time. The data number which could be read by one time varies depend on line situation and communication speed within maximum transmission frame. One transmission frame should be below 255 bytes.

Range of Address	Contents of Register	Attribute	Remark
30001 ~ 30047	Status of measured data for each channel and alarm, D/I, broken wires etc.	Read only	
40001 ~ 40077	All kinds of system related settings	Read/Write	
40101 ~ 40193	Channel 1 related setup.	Read/Write	
40201 ~ 40293	Channel 2 related setup.	Read/Write	
...	
40601 ~ 40693	Channel 6 related setup	Read/Write	
40701 ~ 40793	Channel 7 related setup	Read/Write	GR100-2x
...	GR100-2x
41101 ~ 41193	Channel 11 related setup	Read/Write	GR100-2x
41201 ~ 41293	Channel 12 related setup	Read/Write	GR100-2x
Etc	Reserved Areas	—	

6.2.8. Structure of Register (30001~30047)

Register group of 30000 is read only and it can read measured data for each channel and alarm, D/I, broken wires etc.

Address	Contents of Register	Attribute			Explanation
		Size	Unit	R/W	
30001	SYSTEM_MODEL_CODE	2	U 16	R	
30002	SYSTEM_VERSION	2	U 16	R	H:(255) + L:(255) → VERSION 255.255
30003	SYSTEM_DATE_YEAR	2	U 16	R	System Operating Year
30004	SYSTEM_DATE_MONTH	2	U 16	R	System Operating Month
30005	SYSTEM_DATE_DAY	2	U 16	R	System Operating Day
30006	SYSTEM_DATE_HOUR	2	U 16	R	System Operating Hour
30007	SYSTEM_DATE_MINUTE	2	U 16	R	System Operating Minute
30008	SYSTEM_DATE_SECOND	2	U 16	R	System Operating Second
30009	RECORD_STATUS	2	U 16	R	Status of SD Card Record (0: No Record, 1: Record)
30010	BO_STATUS_2	2	U 16	R	CH07 ~ 12 Status of broken wires. (※1)
30011	BO_STATUS_1	2	U 16	R	CH01 ~ 06 Status of broken wires. (※1)
30012	ALARM_STATUS_3	2	U 16	R	CH09 ~ 12 Status of Alarm (※2)
30013	ALARM_STATUS_2	2	U 16	R	CH05 ~ 08 Status of Alarm (※2)
30014	ALARM_STATUS_1	2	U 16	R	CH01 ~ 04 Status of Alarm (※2)
30015	SD_DI STATUS	2	U 16	R	Status of SD Card Inserted, Status of D/I Contact Input (※3)
30016	RELAY_STATUS	2	U 16	R	Status of Relay Contact Output. (※4)
30017	PV_CH01_H	2	Float_H	R	CH 01 Measured or Calculated Value (High Position)
30018	PV_CH01_L	2	Float_L	R	CH 01 Measured or Calculated Value (Low Position)
30019	PV_CH02_H	2	Float_H	R	CH 02 Measured or Calculated Value (High Position)
30020	PV_CH02_L	2	Float_L	R	CH 02 Measured or Calculated Value (Low Position)
30021	PV_CH03_H	2	Float_H	R	CH 03 Measured or Calculated Value (High Position)
30022	PV_CH03_L	2	Float_L	R	CH 03 Measured or Calculated Value (Low Position)
30023	PV_CH04_H	2	Float_H	R	CH 04 Measured or Calculated Value (High Position)
30024	PV_CH04_L	2	Float_L	R	CH 04 Measured or Calculated Value (Low Position)
30025	PV_CH05_H	2	Float_H	R	CH 05 Measured or Calculated Value (High Position)
30026	PV_CH05_L	2	Float_L	R	CH 05 Measured or Calculated Value (Low Position)
30027	PV_CH06_H	2	Float_H	R	CH 06 Measured or Calculated Value (High Position)
30028	PV_CH06_L	2	Float_L	R	CH 06 Measured or Calculated Value (Low Position)
30029	PV_CH07_H	2	Float_H	R	CH 07 Measured or Calculated Value (High Position)
30030	PV_CH07_L	2	Float_L	R	CH 07 Measured or Calculated Value (Low Position)
30031	PV_CH08_H	2	Float_H	R	CH 08 Measured or Calculated Value (High Position)
30032	PV_CH08_L	2	Float_L	R	CH 08 Measured or Calculated Value (Low Position)

※ Table continued on the next page

Address	Contents of Register	Attribute			Explanation
		Size	Unit	R/W	
30033	PV_CH09_H	2	Float_H	R	CH 09 Measured or Calculated Value (High Position)
30034	PV_CH09_L	2	Float_L	R	CH 09 Measured or Calculated Value (Low Position)
30035	PV_CH10_H	2	Float_H	R	CH 10 Measured or Calculated Value (High Position)
30036	PV_CH10_L	2	Float_L	R	CH 10 Measured or Calculated Value (Low Position)
30037	PV_CH11_H	2	Float_H	R	CH 11 Measured or Calculated Value (High Position)
30038	PV_CH11_L	2	Float_L	R	CH 11 Measured or Calculated Value (Low Position)
30039	PV_CH12_H	2	Float_H	R	CH 12 Measured or Calculated Value (High Position)
30040	PV_CH12_L	2	Float_L	R	CH 12 Measured or Calculated Value (Low Position)
30041	PV_RJC_H	2	Float_H	R	Value for measured system RJC (High Position)
30042	PV_RJC_L	2	Float_L	R	Value for measured system RJC (Low Position)
30043	SDC_TOTAL_SPACE_H	2	U 16	R	Total Capacity of SD Card (High Position)
30044	SDC_TOTAL_SPACE_L	2	U 16	R	Total Capacity of SD Card (Low Position)
30045	SDC_USED_SPACE_H	2	U 16	R	Used capacity of SD Card (High Position)
30046	SDC_USED_SPACE_L	2	U 16	R	Used capacity of SD Card (Low Position)
30047	INT_MEMORY_USED	2	U 16	R	Used inner memory capacity (0~100%)

※ Register Data or Bit Data in 30010, 30012, 30013, 30016, 30029~30040: In case of GR100-1x, Data equivalent to 7~12 channels could be read but there are no meanings in the contents of data.

(※1) Register bit map under the status of broken wires

Relevant Bit	Contents(BO_STATUS_1/2)	Remark
12 ~ 15		0 : No malfunction 1: Out of users range 2 : Out of calculation range or in uncertainty 3 : Out of system range
10 ~ 11	broken wirings of channel (06/12)	
08 ~ 09	broken wirings of channel (05/11)	
06 ~ 07	broken wirings of channel (04/10)	
04 ~ 05	broken wirings of channel (03/09)	
02 ~ 03	broken wirings of channel (02/08)	
00 ~ 01	broken wirings of channel (01/07)	

(※2) Register Bit Map for Alarm Status

Relevant Bit	Contents(ALARM_STATUS_1/2/3)		Remark
15	Channel (04/06/12)	Alarm 4 Status	0 : No Alarm 1 : It has Alarm
14		Alarm 3 Status	
13		Alarm 2 Status	
12		Alarm 1 Status	
11	Channel (03/07/11)	Alarm 4 Status	
10		Alarm 3 Status	
09		Alarm 2 Status	
08		Alarm 1 Status	
07	Channel (02/06/10)	Alarm 4 Status	
06		Alarm 3 Status	
05		Alarm 2 Status	
04		Alarm 1 Status	
03	Channel (01/05/09)	Alarm 4 Status	
02		Alarm 3 Status	
01		Alarm 2 Status	
00		Alarm 1 Status	

(※3) Register Bit Map for SD Card, D/I Contact Input Status

Relevant Bit	Contents (SD_DI_STATUS)	Remark
15	SD Card Status	0: Not inserted, 1: Inserted
12 ~ 14	—	No use
11	D/I 12 Contact Input Status	0 : No Contact Input 1 : It has Contact Input
10	D/I 11 Contact Input Status	
...	...	
01	RELAY 02 Contact Output Status	
00	RELAY 01 Contact Output Status	

(※4) Register Bit Map for Relay Contact Output Status

Relevant Bit	Contents (RELAY_STATUS)	Remark
12 ~ 15	—	No Use
11	RELAY 12 Contact Output Status	0 : No Contact Input 1 : It has Contact Input
10	RELAY 12 Contact Output Status	
...	...	
01	RELAY 02 Contact Output Status	
00	RELAY 01 Contact Output Status	

6.2.9. STRUCTURE OF REGISTER (40001~40074)

Register group of 40000 can read and write and it can read and write all kinds of system related setup values.

Address	Contents of Register	Attribute			Explanation
		Size	Unit	R/W	
40001	RECORD_ONOFF	2	U 16	R/W	Record in SD Card (0:Stop, 1:Record)
40002	SCREEN_DISPLAY_MODE	2	U 16	R/W	Screen Display Mode 1:Vertical Trend 3:Horizontal Trend 5:Text View 6:Bar Graph
40003	RULER_ONOFF	2	U 16	R/W	Ruler View (0:Hide, 1:View)
40004	TEXTBAR_ONOFF	2	U 16	R/W	Textbar View (0:Hide, 1:View)
40005	ALARM_MARK_ONOFF	2	U 16	R/W	Alarm Mark View (0:Hide, 1:View)
40006	SCROLL_SPEED_TIME	2	U 16	R/W	Scroll Speed Time (1~120 sec)
40007	TEXTVIEW_WINDOW_NUMBE	2	U 16	R/W	Window number in Textview mode(1/2/3/4/6)
40008	HISTVIEW_SCROLL_DIRECTI	2	U 16	R/W	Scroll Direction of History View(0:H.Trend, 1:V.Trend)
40009	HISTVIEW_READFROM	2	U 16	R/W	Read History View from (0:Inner Memory, 1:SD Card)
40010	SAVE_PERIOD_TIME	2	U 16	R/W	Storing Period of SD Card (1~900 sec)
40011	BLACKOUT_RESUME_ONOFF	2	U 16	R/W	Resume blackout (0:Off, 1:On)
40012	BEEP_ONOFF	2	U 16	R/W	Beep Sound (0:Off, 1: On)
40013	SCREEN_SAVER_TIME	2	U 16	R/W	LCD Screen Saver Time (0 ~ 120 minutes)
40014	RECORD_WITH_BUFFER	2	U 16	R/W	Start Recording after storing Buffer(0:Off, 1:On)
40015	BACKGROUND_COLOR	2	U 16	R/W	Select Background Color (0:Black, 1:White)
40016	DISPLAY_LANGUAGE	2	U 16	R/W	Displayed Language (0:Korean, 1:English)
40017	RESERVED	2			No Use
40018	RESERVE_RUN_ONOFF	2	U 16	R/W	Store Reserved Function (0:Off, 1:On)
40019	RESERVE_RUN_YEAR	2	U 16	R/W	Store Reserved Year (2000~2032)
40020	RESERVE_RUN_MONTH		U 16	R/W	Store Reserved Month (1~12)
40021	RESERVE_RUN_DAY		U 16	R/W	Store Reserved Day (1~31)
40022	RESERVE_RUN_HOUR	2	U 16	R/W	System Reserved Hour (1~23)
40023	RESERVE_RUN_MINUTE	2	U 16	R/W	Store Reserved Minute (0~59)
40024	RESERVE_RUN_SECOND			R/W	Store Reserved Second (0~59)
40025	SYSTEM_DATE_YEAR			R/W	System Year (2000~2032)
40026	SYSTEM_DATE_MONTH	2	U 16	R/W	System Month (1~12)
40027	SYSTEM_DATE_DAY	2	U 16	R/W	System Day (1~31)
40028	SYSTEM_DATE_HOUR	2	U 16	R/W	System Hour (0~23)
40029	SYSTEM_DATE_MINUTE	2	U 16	R/W	System Minute (0~59)
40030	SYSTEM_DATE_SECOND	2	U 16	R/W	System Second (0~59)

※ Table continued on the next page

Address	Contents of Register	Attribute			Explanation
		Size	Unit	R/W	
40031	RS232_MAC_NUMBER	2	U 16	R/W	Serial RS232 Terminal Unit No. (1~255)
40032	RS232_PROTOCOL_CODE	2	U 16	R	Serial RS232 Terminal Protocol (Fixed)
40033	RS232_BAUDRATE_CODE	2	U 16	R/W	Serial RS232 Terminal Communication Speed (0:9600, 1:19200, 2:38400, 3:54200 BPS)
40034	RS232_PARITY_BIT	2	U 16	R/W	Serial RS232 Terminal Parity Bit (0:NONE, 1:ODD, 2:EVEN)
40035	RS232_DATA_LENGTH	2	U 16	R/W	Serial RS232 Terminal Data Length (5,6,7,8)
40036	RS232_STOP_BIT	2	U 16	R/W	Serial RS232 Terminal Stop Bit. (1, 2)
40037	RS232_DELAY_TIME	2	U 16	R/W	Serial RS232 Terminal Response Delay. (0 ~ 9,999 ms)
40038	RS485_MAC_NUMBER	2	U 16	R/W	Serial RS422/485 Terminal Machine Number. (1 ~ 255)
40039	RS485_PROTOCOL_CODE	2	U 16	R	Serial RS422/485 Terminal Protocol (Fixed)
40040	RS485_BAUDRATE_CODE	2	U 16	R/W	Serial RS422/485 Terminal Communication Speed (0:9600, 1:19200, 2:38400, 3:54200 BPS)
40041	RS485_PARITY_BIT	2	U 16	R/W	Serial RS422/485 Terminal Parity Bit. (0:NONE, 1:ODD, 2:EVEN)
40042	RS485_DATA_BIT	2	U 16	R/W	Serial RS422/485 Terminal Data Length (5,6,7,8)
40043	RS485_STOP_BIT	2	U 16	R/W	Serial RS422/485 Terminal Stop Bit (1, 2)
40044	RS485_DELAY_TIME	2	U 16	R/W	Serial RS422/485 Terminal Response Delay. (0 ~ 9,999 ms)
40045	DI01_LEVEL	2	U 16	R/W	Activated Level of D/I 1 Input (0:LOW, 1:HIGH)
40046	DI01_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40047	DI01_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40048	DI01_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40049	DI01_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)
40050	DI02_LEVEL	2	U 16	R/W	Activated Level of D/I 2 Input (0:LOW, 1:HIGH)
40051	DI02_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40052	DI02_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40053	DI02_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40054	DI02_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)

※ Table continued on the next page

Address	Contents of Register	Attribute			Explanation
		Size	Unit	R/W	
40055	DI03_LEVEL	2	U 16	R/W	Activated Level of D/I 3 Input (0:LOW, 1:HIGH)
40056	DI03_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40057	DI03_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40058	DI03_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40059	DI03_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)
40060	DI04_LEVEL	2	U 16	R/W	Activated Level of D/I 4 Input (0:LOW, 1:HIGH)
40061	DI04_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40062	DI04_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40063	DI04_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40064	DI04_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)
40065	DI05_LEVEL	2	U 16	R/W	Activated Level of D/I 5 Input
40066	DI05_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40067	DI05_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40068	DI05_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40069	DI05_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)
40070	DI06_LEVEL	2	U 16	R/W	Activated Level of D/I 6 Input
40071	DI06_RCD	2	U 16	R/W	SD Card Record operation (0:Stop, 1:Start, 2: Disregard)
40072	DI06_RYO	2	U 16	R/W	Relay Number (GR100-1x:1 ~ 06, GR100-2x:1 ~ 12)
40073	DI06_RYT_H	2	U 16	R/W	preservation time of contact output (High position) (Range of preservation time: 0~999,999 sec.)
40074	DI06_RYT_L	2	U 16	R/W	preservation time of contact output (Low position) (Range of preservation time: 0~999,999 sec.)
40075	FILE_PREFIX 1	2	Chart 2	R/W	The first strings of saving file (6 Bytes) [PREFIX 1] + [PREFIX 2] + [PREFIX 3] MSB LSB
40076	FILE_PREFIX 2	2			
40077	FILE_PREFIX 3	2			

6.2.10. Structure of Register (40101 ~ 40193)

Register group of 40100 can read and write and setup values of CH 01 could be read and written.

Channel	Address	Contents of Register	Attribute			Explanation
			Size	Unit	R/W	
Channel 01	40101	CH01_NAME1	2	Char*2	R/W	Channel Name Strings (10 Bytes) [NAME1]+[NAME2]+[NAME3]+[NAME4]+[NAME5] MSB LSB
	40102	CH01_NAME2	2	Char*2	R/W	
	40103	CH01_NAME3	2	Char*2	R/W	
	40104	CH01_NAME4	2	Char*2	R/W	
	40105	CH01_NAME5	2	Char*2	R/W	
	40106	CH01_UNIT_NAME1	2	Char*2	R/W	Channel Unit Strings (6 Bytes) [NAME1]+[NAME2]+[NAME3] MSB LSB
	40107	CH01_UNIT_NAME2	2	Char*2	R/W	
	40108	CH01_UNIT_NAME3	2	Char*2	R/W	
	40109	CH01_DISP_ONOFF	2	U 16	R/W	Channel Screen Display (0:Display, 1:Hide)
	40110	CH01_RANGE_CODE	2	U 16	R/W	Input range code of Channel 01 (1 ~ 19) (*1)
	40111	CH01_SCALE_ONOFF	2	U 16	R/W	Channel Scale Function (0:Off, 1:On)
	40112	CH01_FP_LOCATE	2	U 16	R/W	Decimal point location of Channel measured/calculated channel value (0 ~ 4)
	40113	CH01_UNIT_MODE	2	U 16	R/W	Channel Unit Display Code. (0 ~ 5) 0 : V, 1 : mV, 2 : %, 3 : °C, 4 : °F, 5 : Users can input wanted unit.
	40114	CH01_READ_MODE	2	U 16	R/W	Method of reading channel (Read Time) 0 : DIRECT, 1 : MAX, 2 : MIN, 3 : AVG
	40115	CH01_READ_TIME	2	U 16	R/W	Channel Read Time (2~3,600 sec.)
	40116	CH01_COLOR	2	U 16	R/W	Channel Color Code (0 ~ 11) (*2)
	40117	CH01_MATH_ONOFF	2	U 16	R/W	Channel Math/Function (0:Off, 1:On)
	40118	CH01_MATH_FTYPE	2	U 16	R/W	Channel Math/Function Type Code (1 ~ 14) (*3)
	40119	CH01_MATH_A_CH	2	U 16	R/W	Channel Math/Function α Channel (1 ~ 6/12)
	40120	CH01_MATH_B_SELECT	2	U 16	R/W	Channel Math/Function β Type (0:Channel Input selection, 1: Constant Input selection)
	40121	CH01_MATH_B_CH	2	U 16	R/W	Channel Math/Function β Channel (1 ~ 6/12)
	40122	CH01_MATH_B_CONST_H	2	Float_H	R/W	Channel Math/Function β Constant (High Position)
	40123	CH01_MATH_B_CONST_L	2	Float_L	R/W	Channel Math/Function β Constant (Low Position)
	40124	CH01_USER_RANGE_MAX_H	2	Float_H	R/W	Max usable channel range (High Position)
	40125	CH01_USER_RANGE_MAX_L	2	Float_L	R/W	Max usable channel range (Low Position)
	40126	CH01_USER_RANGE_MIN_H	2	Float_H	R/W	Min. usable channel range (High Position)
	40127	CH01_USER_RANGE_MIN_L	2	Float_L	R/W	Min. Usable channel range (Low Position)
	40128	CH01_SCALE_RANGE_MAX_H	2	Float_H	R/W	Max Channel Scale Range (High Position)
	40129	CH01_SCALE_RANGE_MAX_L	2	Float_L	R/W	Max Channel Scale Range (Low Position)
	40130	CH01_SCALE_RANGE_MIN_H	2	Float_H	R/W	Min Channel Scale Range (High Position)
	40131	CH01_SCALE_RANGE_MIN_L	2	Float_L	R/W	Min Channel Scale Range (Low Position)

* Table continued on the next page

Channel	Address	Contents of Register	Attribute			Explanation
			Size	Unit	R/W	
01	40132	CH01_DISP_RANGE_MAX_H	2	Float_H	R/W	Max. Channel Display Range (High Position)
	40133	CH01_DISP_RANGE_MAX_L	2	Float_L	R/W	Max. Channel Display Range (Low Position)
	40134	CH01_DISP_RANGE_MIN_H	2	Float_H	R/W	Min. Channel Display Range (High Position)
	40135	CH01_DISP_RANGE_MIN_L	2	Float_L	R/W	Min. Channel Display Range (Low Position)
	40136	CH01_OFFSET_ERROR_H	2	Float_H	R/W	Channel Offset Deviation(High Position)
	40137	CH01_OFFSET_ERROR_L	2	Float_L	R/W	Channel Offset Deviation(Low Position)
	40138	CH01_HIGHPOINT_ERROR_H	2	Float_H	R/W	Channel Highpoint Deviation(High Position)
	40139	CH01_HIGHPOINT_ERROR_L	2	Float_L	R/W	Channel High Point Deviation(Low Position)
	40140	CH01_LOWPOINT_ERROR_H	2	Float_H	R/W	Channel Low Point Deviation(High Position)
	40141	CH01_LOWPOINT_ERROR_L	2	Float_L	R/W	Channel Low Point Deviation(Low Position)
	40142	CH01_ALARM01_SV_H	2	Float_H	R/W	Channel Alarm 1 SV(High Position)
	40143	CH01_ALARM01_SV_L	2	Float_L	R/W	Channel Alarm 1 SV(Low Position)
	40144	CH01_ALARM01_HYS_H	2	Float_H	R/W	Channel Alarm 1 Hysterisis(High Position)
	40145	CH01_ALARM01_HYS_L	2	Float_L	R/W	Channel Alarm 1 Hysterisis(Low Position)
	40146	CH01_ALARM01_RATE_H	2	Float_H	R/W	Channel Alarm 1 Rate(High Position)
	40147	CH01_ALARM01_RATE_L	2	Float_L	R/W	Channel Alarm 1 Rate(Low Position)
	40148	CH01_ALARM01_TYPE	2	U 16	R/W	Channel Alarm 1 Type(0~15)
	40149	CH01_ALARM01_CCH	2	U 16	R/W	Channel Alarm 1 Comparison Channel (1~6/12)
	40150	CH01_ALARM01_TUNIT	2	U 16	R/W	Channel Alarm 1 Time Unit(0:Hour, 1:Minute, 2:sec.)
	40151	CH01_ALARM01_RCD	2	U 16	R/W	SD card storage in case Channel Alarm 1 is activated(0:Stop, 1:Start, 2:Disregard)
	40152	CH01_ALARM01_RYO	2	U 16	R/W	RELAY No. of Contact Output
	40153	CH01_ALARM01_RYT_H	2	U 16	R/W	Time to keep Contact Output (High Position), Range of keeping time: 0~999,999 sec.)
	40154	CH01_ALARM01_RYT_L	2	U 16	R/W	Time to keep Contact Output (Low Position), Range of keeping time: 0~999,999 sec.)
	40155	CH01_ALARM02_SV_H	2	Float_H	R/W	Channel Alarm 2 SV (High Position)
	40156	CH01_ALARM02_SV_L	2	Float_L	R/W	Channel Alarm 2 SV (Low Position)
	40157	CH01_ALARM02_HYS_H	2	Float_H	R/W	Channel Alarm 2 Hysterisis (High Position)
	40158	CH01_ALARM02_HYS_L	2	Float_L	R/W	Channel Alarm 2 Hysterisis (Low Position)
	40159	CH01_ALARM02_RATE_H	2	Float_H	R/W	Channel Alarm 2 Rate (High Position)
	40160	CH01_ALARM02_RATE_L	2	Float_L	R/W	Channel Alarm 2 Rate (Low Position)
	40161	CH01_ALARM02_TYPE	2	U 16	R/W	Channel Alarm 2 Type (0~15) (*4)
	40162	CH01_ALARM02_CCH	2	U 16	R/W	Channel Alarm 2 Comparison Channel (1~6/12)
	40163	CH01_ALARM02_TUNIT	2	U 16	R/W	Channel Alarm 2 Time Unit(0:Hour,1:Minute,2:sec.)
	40164	CH01_ALARM02_RCD	2	U 16	R/W	SD card storage in case Channel Alarm 2 is activated(0:Stop, 1:Start, 2:Disregard)
	40165	CH01_ALARM02_RYO	2	U 16	R/W	RELAY No. of Contact Output.

※ Table continued on the next page

Channel	Address	Contents of Register	Attribute			Explanation
			Size	Unit	R/W	
Channel 01	40166	CH01_ALARM02_RYT_H	2	U 16	R/W	Time to keep Contact Output (High Position), Range of keeping time : 0~999,999 sec.)
	40167	CH01_ALARM02_RYT_L	2	U 16	R/W	Time to keep Contact Output (Low Position), Range of keeping time : 0~999,999 sec.)
	40168	CH01_ALARM03_SV_H	2	Float_H	R/W	Channel Alarm 3 SV (High Position)
	40169	CH01_ALARM03_SV_L	2	Float_L	R/W	Channel Alarm 3 SV (Low Position)
	40170	CH01_ALARM03_HYS_H	2	Float_H	R/W	Channel Alarm 3 Hysterisis (High Position)
	40171	CH01_ALARM03_HYS_L	2	Float_L	R/W	Channel Alarm 3 Hysterisis (Low Position)
	40172	CH01_ALARM03_RATE_H	2	Float_H	R/W	Channel Alarm 3 Rate (High Position)
	40173	CH01_ALARM03_RATE_L	2	Float_L	R/W	Channel Alarm 3 Rate (Low Position)
	40174	CH01_ALARM03_TYPE	2	U 16	R/W	Channel Alarm 3 Type (0~15) (※4)
	40175	CH01_ALARM03_CCH	2	U 16	R/W	Channel Alarm 3 Comparison Channel (1~6/12)
	40176	CH01_ALARM03_TUNIT	2	U 16	R/W	Channel Alarm 3 Time Unit (0:Hour,1:Minute,2:sec.)
	40177	CH01_ALARM03_RCD	2	U 16	R/W	SD card storage in case Channel Alarm 3 is activated (0:Stop, 1:Start, 2:Disregard)
	40178	CH01_ALARM03_RYO	2	U 16	R/W	RELAY No. of Contact Output
	40179	CH01_ALARM03_RYT_H	2	U 16	R/W	Time to keep Contact Output (High Position), Range of keeping time : 0~999,999 sec.)
	40180	CH01_ALARM03_RYT_L	2	U 16	R/W	Time to keep Contact Output (Low Position), Range of keeping time : 0~999,999 sec.)
	40181	CH01_ALARM04_SV_H	2	Float_H	R/W	Channel Alarm 4 SV (High Position)
	40182	CH01_ALARM04_SV_L	2	Float_L	R/W	Channel Alarm 4 SV (Low Position)
	40183	CH01_ALARM04_HYS_H	2	Float_H	R/W	Channel Alarm 4 Hysterisis (High Position)
	40184	CH01_ALARM04_HYS_L	2	Float_L	R/W	Channel Alarm 4 Hysterisis (Low Position)
	40185	CH01_ALARM04_RATE_H	2	Float_H	R/W	Channel Alarm 4 Rate (High Position)
	40186	CH01_ALARM04_RATE_L	2	Float_L	R/W	Channel Alarm 4 Rate (Low Position)
	40187	CH01_ALARM04_TYPE	2	U 16	R/W	Channel Alarm 4 Type (0~15) (※4)
	40188	CH01_ALARM04_CCH	2	U 16	R/W	Channel Alarm 4 Comparison Channel (1 ~ 6/12)
	40189	CH01_ALARM04_TUNIT	2	U 16	R/W	Channel Alarm 4 Time Unit(0:Hour,1:Minute,2:sec.)
	40190	CH01_ALARM04_RCD	2	U 16	R/W	SD card storage in case Channel Alarm 4 is activated(0:Stop, 1:Start, 2:Disregard)
	40191	CH01_ALARM04_RYO	2	U 16	R/W	RELAY No. of Contact Output
	40192	CH01_ALARM04_RYT_H	2	U 16	R/W	Time to keep Contact Output (High Position), (Range of keeping time : 0~999,999 sec.)
	40193	CH01_ALARM04_RYT_L	2	U 16	R/W	Time to keep Contact Output (Low Position), (Range of keeping time : 0~999,999 sec.)

Caution

※ Setup of CH02~CH12 is same method as 4nn01~4nn93 in Channel 01 and Setup value can be read and write written (Example : CH05:40501~40593, CH11:41101~41193)

(※1) The Input Type Code is as follows.

Code	Sensor Type	Range			Remark
1	K	-270.0	~	1372.0 °C	
2	J	-210.0	~	1200.0 °C	
3	E	-270.0	~	1000.0 °C	
4	T	-270.0	~	400.0 °C	
5	R	-50.0	~	1768.0 °C	
6	S	-50.0	~	1768.0 °C	
7	B	0.0	~	1820.0 °C	
8	N	-270.0	~	1300.0 °C	
9	—	—			No Use
10	PL2	0.0	~	1395.0 °C	
11	U	-200.0	~	600.0 °C	
12	L	-200.0	~	900.0 °C	
13	W	0.0	~	2315.0 °C	
14	Pt100 (DIN43760)	-200.0	~	850.0 °C	
15	—	—			No Use
16	Pt100 (JIS)	-200.0	~	660.0 °C	
17	V d.c ± 100.00 mV	-100.00	~	+100.00 mV d.c	
18	V d.c ± 10.000 V	-10.000	~	+10.000 V d.c	
19	V d.c ± 30.00 V	-30.00	~	+30.00 V d.c	

(※2) The Channel Color Code is as follows.

16bit value is the value of Hexadecimal R:5,G:6,B:5 in the GR100.

Code	Color	RGB	Code	Color	RGB
0	RED	F800h	6	DARKRED	7800h
1	BLUE	001Fh	7	DARKBLUE	000Fh
2	GREEN	07E0h	8	DARKGREEN	03E0h
3	MAGENTA	07FFh	9	DARKMAGENTA	03EFh
4	PINK	F81Fh	10	PURPLE	E01Ch
5	ORANGE	FDA0h	11	DARKYELLOW	7BE0h

(※3) The contents of code number for Calculation/Function type, please refer to table 3 of chapter 4.

(※4) The contents of code number for Alarm type, please refer to table 4 of chapter 3.

6.2.11. Example of reading Float Register (VISUAL BASIC)

It is an example to let Float_H, Float_L in the Register read and write. By using Function making "BYTE → Real Number" when receiving (BytesToSingle) and Function making "Real number → BYTE" when transmitting (Single To Bytes), it could be changeable as the value what you want.

The below example was made in Microsoft Visual BASIC.

```
'=====
'=== mdlCpyMem.BAS ===
'=====

Public Declare Sub CopyMemory Lib "kernel32" Alias "RtlMoveMemory" (Destination As Any,
Source As Any, ByVal Length As Long)

Public Function SingleToBytes(ByRef lngNum As Single) As Variant
    Dim byteArray(0 To 3) As Byte

    Call CopyMemory(byteArray(0), lngNum, 4)

    SingleToBytes = byteArray
End Function

Public Function BytesToSingle(byteArray() As Byte) As Single
    Dim lngTemp As Single

    Call CopyMemory(lngTemp, byteArray(LBound(byteArray)), 4)
    BytesToSingle = lngTemp
End Function

'=====
'=== Form1.frm ===
'=====

Dim my4Byte(0 To 3) As Byte

Private Sub Command1_Click()
    Dim myVariant As Variant
    Dim mySingle as Single

    mySingle = Val(Text1.Text)
    myVariant = SingleToBytes(mySingle)

    my4Byte(3) = myVariant(3)
    my4Byte(2) = myVariant(2)
    my4Byte(1) = myVariant(1)
    my4Byte(0) = myVariant(0)

    Label1.Caption = CStr(my4Byte(0)) & ", " & _
        CStr(my4Byte(1)) & ", " & _
        CStr(my4Byte(2)) & ", " & _
        CStr(my4Byte(3))
End Sub

Private Sub Command2_Click()
    Label2.Caption = CStr(BytesToSingle(my4Byte))
End Sub
```

6-2-12. Example of reading Float Register (C Language)

It is an example to let Float_H, Float_L in the Register read and write. It is an example : the method to change “Integral number → Real number” when receiving and the method to change “Real number → Integral number”.

```
signed int    Float2Convert;           // 4 Bytes Integral number which has code.  
float         FloatValue;             // 4 Bytes Real Number  
  
FloatValue    = 123.45f;              // Substitute Real number variable for Real number.  
  
Float2Convert = *(signed int *)&FloatValue; // Substitute Real number value for Integral  
                                         number variable.  
  
FloatValue    = *(float *)&Float2Convert; // Substitute Integral number variable value for Real  
                                         number variable.
```



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