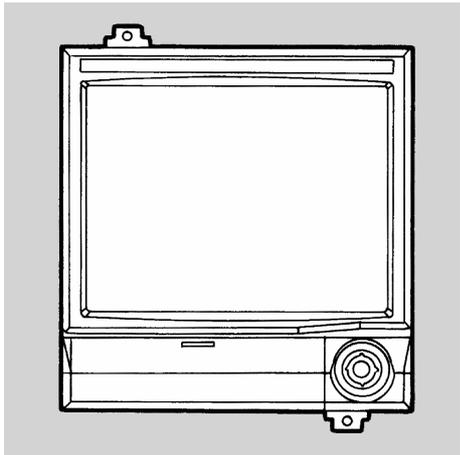


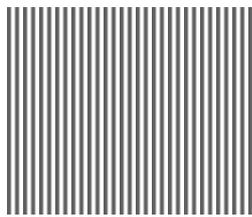
INST-No. INE-319E



BR1000 SERIES

GRAPHIC RECORDER

INSTRUCTIONS



INSTRUCTIONS

CHINO

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Cautions

- If you do not execute the storage (file open) after programming a file(s), the data can not be stored.
- If you program parameters from a floppy disk, a file(s) will be initialized.

PREFACE

Thank you for purchasing the BR1000 series graphic recorder.

Before using your new recorder please be sure to read this instruction manual which advises on how to use the instrument correctly and safely and how to prevent problems.

1. Separate Instruction Manuals

The present instruction manual describes the optional specifications of alarm output, remote contacts, mathematics, totalization, daily report file, and memory card as well as the operation of standard specifications. When the instrument is provided with the communications interface (option), the instruction manual for communications interface is attached as a separate manual. For other options for which you need to have instructions, their instruction manuals are attached respectively. Please read these instruction manuals together with this manual.

2. Request

- **Request to instrumentation engineers, constructors, and sale agents**

Make sure to deliver this instruction manual to the operator of this instrument.

- **Request to the operator of this instrument**

This instruction manual is necessary for maintenance, too. Keep this manual with care until the instrument is discarded.

1 FOR SAFE USE

This section "FOR SAFE USE" has been compiled to promote the correct use of the instrument in order to prevent human injury or damage to property before they occur. Please read the following information carefully and be sure to observe the warnings and cautions in it.

1. Preconditions for Use

This instrument is designed for indoor use by mounting it on an indoor instrumentation panel. (except for portable type)

International safety standards

- IEC standard Conforms to safety class I (with PROTECTIVE CONDUCTOR TERMINAL) and IEC1010-1 (OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2)
Conforms to the enclosure protective degree IEC529 (IP54), (Front part).
- CE-marking EMC : Conforms to EN55011 Group 1 Class A,
EN50082-2 (Industrial environment)
(EC Directive) Safety : Conforms to EN61010-1 +A2
- UL standard UL3111-1 approved (Approval pending for Model BR 17 2 type)
- CSA standard CSA C22.2 No. 1010 approved (Approval pending for Model BR 17 2 type)
(C-UL)

* The models with mechanical relay 'c' contact output (option) do not conform to the above standards.

2. Labels on This Instrument

The following labels are used for safe use.

Label	Name	Meaning
	Alert symbol mark	Caution on handling for prevention of an electric shock, injury or other accidents.
	Protective conductor terminal	A terminal is provided for connection to the protective conductor of the power supply facility for the prevention of an electric shock.

3. Symbols in This Manual

The cautions to be observed for preventing the damage of this instrument and unexpected accidents are sorted by the following symbols according to their importance degrees for enabling operators to use this instrument safely.

 Warning	The nonobservance of information under this symbol may result in hazardous, critical or serious injury to the user.
 Caution	The nonobservance of information under this symbol may result in a hazardous situation or a light injury to the user or in physical damage to the property.
 Remarks	This symbol shows a caution when the instrument does not function as specified or when such a possibility exists.
 Reference	This reference serves as a supplement for handling and operation, and it may be convenient for the user.

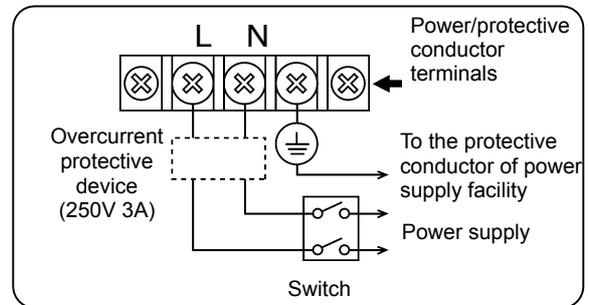
! WARNINGS

This paragraph covers important warning for safety to be observed before reading the instructions.

Fully understand the following warnings before reading this manual. These warnings are important for preventing the danger to human bodies as well as accidents.

1. Switch and overcurrent protective device

The BR1000 series graphic recorder is not provided with a power switch or a replaceable overcurrent protective device. Prepare the switch and the overcurrent protective device for the power supply (circuit breakers, circuit protectors or the like) within 3 m of this instrument in a location where the operator can reach them handily. Use a switch and an overcurrent protective device conforming to IEC947-1 and IEC947-3.



2. Be sure to ground the BR1000 series graphic recorder

Before turning the power on, connect the protective conductor terminal of the BR1000 series graphic recorder to the protective conductor of the power supply facility. In order to prevent an accident by electric shock, do not disconnect an instrument in use.

3. Before turning on the power supply

In order to ensure safety, before turning on the external power switch make sure that the power voltage is within the range indicated on the power supply label.

4. Don't repair or modify this instrument.

Make sure that any persons other than service engineers approved by CHINO CORPORATION do not repair or modify this instrument by replacing parts. Otherwise it may be damaged or will not function normally or an accident such as electric shock may occur. For ordinary operation, it is not necessary to open the internal unit.

5. Use this instrument in accordance with this instruction manual.

Use the BR1000 series graphic recorder correctly and safely by following this instruction manual. CHINO CORPORATION will not be responsible for any injury, damage, lost profit or any other claim, which may result from its wrong use.

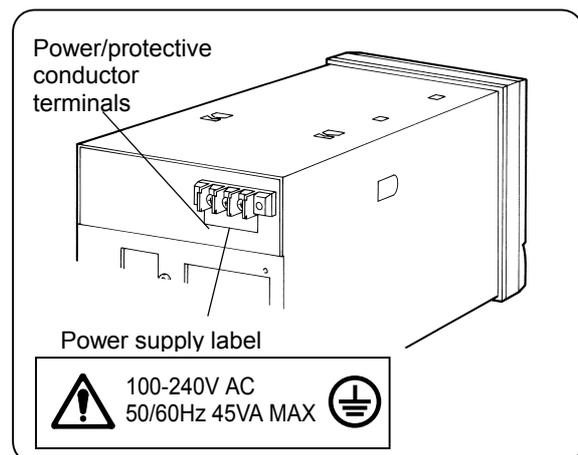
6. Turn off the power supply if an abnormal symptom occurs.

Turn off the power supply immediately and contact your local CHINO sales agent if any abnormal odor noise or any smoke occurs, or if the BR1000 series graphic recorder generates heat that is too hot to be touched.

Reference → Fuse in the power supply unit

The following fuse is mounted in the power supply unit of BR1000 series graphic recorder for safety use. However, this fuse is not replaceable.

Manufacturer	Model	Ratings
SCHURTER	SPT001.2508	250VAC 2.5A
LITTEL FUSE	21502.5	
WICKMANN	19181	
LITTEL FUSE	21500 2P	250VAC 2A



2 MAJOR FEATURES AND FUNCTIONS

The BR1000 series graphic recorder is capable of measuring temperatures and other industrial variables of multiple channels. It can also display them in various screens on a 5.5-inch TFT color LCD, storing or displaying data in or from the internal memory, exchanging electronic data with external environments and of utilizing data on spreadsheet application software such as Excel and Lotus. Additionally, a higher-order communications (MODBUS protocol) is optionally available for exchanging various programs and data. Exclusive software packages are available.

Easy measurement result management	Measurement results can be displayed in a variety of screens for ease of monitoring. Past data stored in the internal memory or a FD (memory card: optional) can be read out. Such data can also be processed by spreadsheet application software such as Excel (registered trademark of Microsoft Corporation) and Lotus (registered trademark of Lotus Development Corporation).
Compliance with international standards	CE-marking conformant. UL/C-UL standards (Approval pending for Model BR 17A2 type), IP54.
Versatile screen display	Optimum screens can be selected from the Real-time Trend, Bargraph and data (table form) screens and their composite screen (Multi-screen) according to the monitoring requirements. It is also possible to display the past and current trends in parallel as well as to display past alarm events concurrently (Alarm Summary screen). In addition, the screens can be registered for up to 5 groups and switched with a simple operation.
Versatile memory functions	Simultaneous data storage in up to 5 files can be started or ended according to arbitrary programming of conditions such as the key operations, remote contacts signals and time setting. During normal operation, data is saved in the internal memory and can be copied in a floppy disk (memory card: optional) with a one-touch operation.
Easy monitoring	The trend screens have a scale and a pointer for the easy monitoring of data trends on charts.
Messaging function	The real-time trend screen accepts the entry of messages (max. 30 alphanumeric letters). You can enter messages by keys. In addition, you can register up to 10 messages in advance. These pre-registered messages can be displayed on the chart with the key operations, remote contacts signals or communications. Message can be entered on the Historical Trend screen (display).
MODBUS communications	Programming of parameters, data logging, data communications input and operations can be performed through a personal computer. As the MODBUS is employed for the communications protocol, communications system with a instruments using the MODBUS protocol can be constructed easily without the needs to compile any communications software. (MODBUS is a registered trademark of Schneider Automation Inc.)
No need of auxiliary supplies	Auxiliary supplies such as chart paper, pens and ink as used in other recorders are not necessary, thereby making the system cleaner and labor-free.
Easy setup	As each parameter can be programmed interactively by selecting an item from the menu screen with a key operation and opening a window, the setup is easy. By storing programmed parameters in a floppy disk (memory card: optional) in advance, it is also possible to perform the setup from a PC by using an engineering port and the parameter programming software "PASS".
Packaged software	Exclusive packaged software programs are available for data management from a PC. (Data acquisition software: KIDS (Windows 95,98,Me,2000,XP and NT4.0 versions) (Parameter programming software: PASS (Windows 95,98,Me,2000,XP and NT4.0 versions)

3 CHECKING MODEL AND ATTACHMENTS

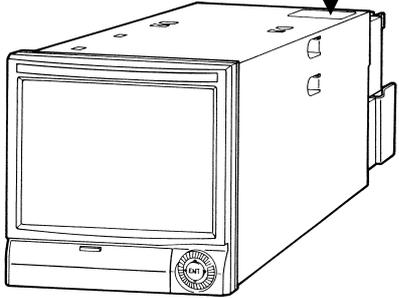
3.1 Model Check

The model No. and serial No. of the BR1000 series graphic recorder are shown on the label attached to the upper face of the case.

Please check the model of your instrument from the model code.

Model code

Model (Check with the model code) ————— BR1761-A20
 Serial No. ————— BR993A007
 MADE IN JAPAN



BR17 -

- Type (Fixed at 1): Type 1
- Input signal (Fixed at 7): Universal Input (DC voltage, thermocouple, Resistance thermometer)
- Number of input points
 - A2: 6-point input (1sec. / 6points)
 - B2: 12-point input (2 sec. / 12points)
 - 61: 6-point input (5sec. / 6points)
 - 13: 1-point continuous input (0.1 sec.)
 - 23: 2-point continuous input (0.1 sec.)
 - 33: 3-point continuous input (0.1 sec.)
 - 43: 4-point continuous input (0.1 sec.)
- Communications interface (optional)
 - N: None (2-port communications)
 - A: RS-422A (high-order) B: RS-422A + RS-422A (low-order) C: RS-422A + RS-485 (low-order)
 - S: RS-485 (high-order) T: RS-485 + RS-422A (low-order) U: RS-485 + RS-485 (low-order)
 - R: RS-232C (high-order) P: RS-232C + RS-422 A (low-order) Q: RS-232C + RS-485 (low-order)
 - E: Ethernet (high-order) G: Ethernet + RS-422 A (low-order) H: Ethernet + RS-485 (low-order)
- Alarm output and remote contacts (optional)
 - 0: None
 - 1: MOS relay alarm outputs (6-point) + Remote contacts
 - 2: Mechanical relay 'c' contact alarm outputs (6-point) + Remote contacts* (* Not conforming to international safety standards.)
 - A: Mechanical relay 'a' contact alarm outputs (6-point) + Remote contacts
- Memory
 - 1: FDD + internal memory 3MB (standard)
 - 2: Memory card+ internal memory 3MB (optional)

3.2 Attachment Check

The following attachments should be contained in the package. Please check.

Parts Name	Quantity	Remarks
Instruction Manual	1	INE-273 (for BR1000 series graphic recorder)
	(1)	INE-275 (communications interface)
		IINE-322 (ethernet communication interface)
Mounting bracket	2	For use in panel mounting.
Terminal Screw	5	M3.5, for input terminals and alarm (remote contacts) terminals. (Spare screws)



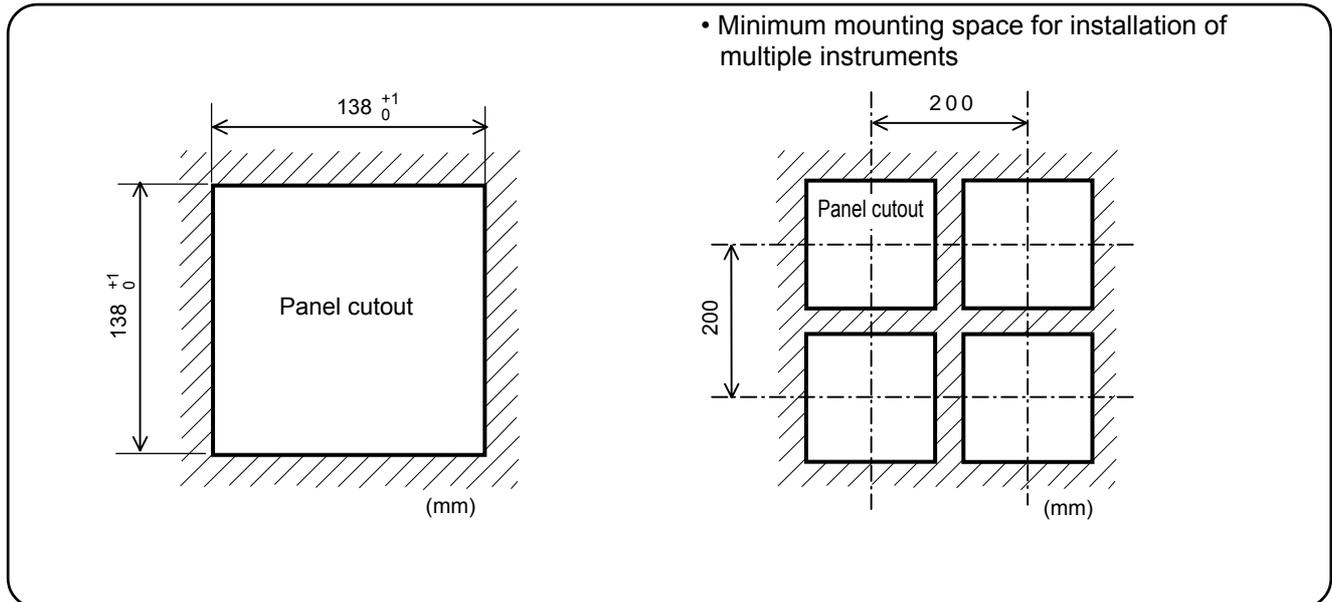
4.3 Mounting Method to a Panel

Warning

■ Mount the BR1000 series graphic recorder on a panel.

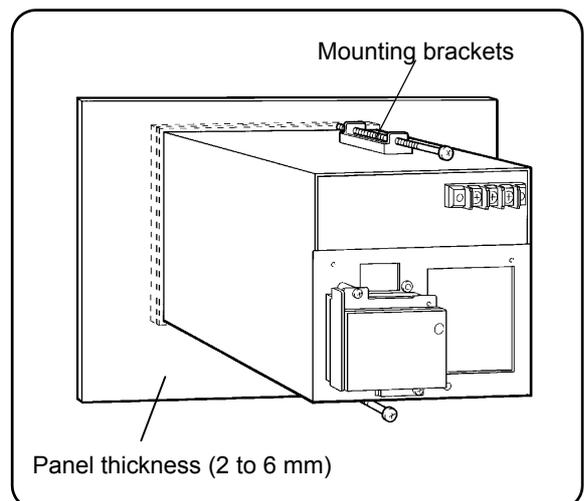
- (1) The BR1000 series graphic recorder has been designed to be mounted on an indoor instrumentation panel.
- (2) Use a panel made of a steel plate of 2mm to 6mm in thickness.

(1) Panel cutout size



(2) Mounting method

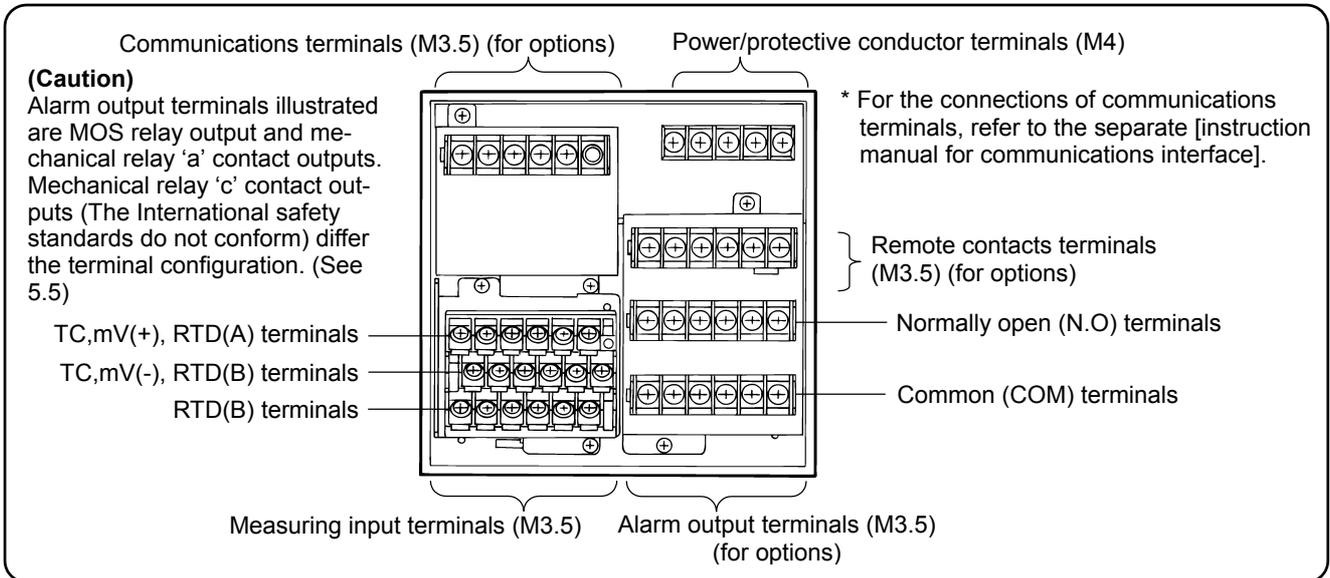
- (1) Insert the BR1000 series graphic recorder into the panel cutout from the front of the panel.
- (2) Fix the BR1000 series graphic recorder to the panel using the mounting brackets (screw tightening torque: 1.0 N•m).
Attach 2 mounting brackets to the top and bottom of this instrument.



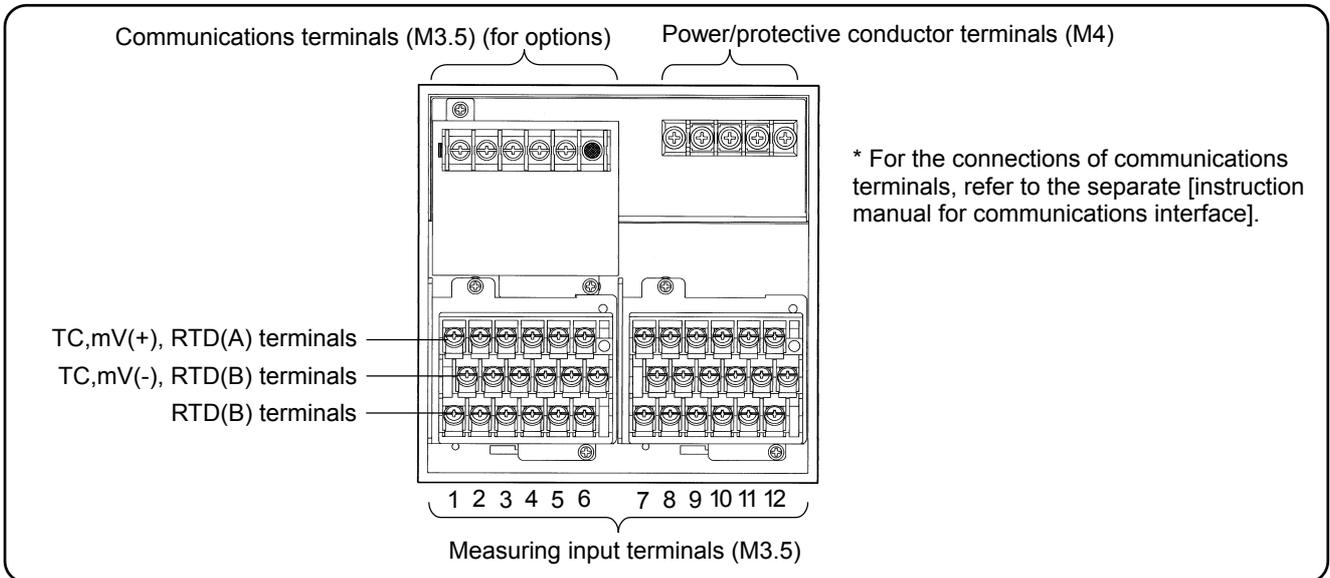
5 CONNECTIONS

5.1 Terminal Board Arrangement

The terminal board shown in the following figure is for the BR1000 series graphic recorder with options (alarm output + remote contacts and communications interface) are mounted.



The terminal board shown in the following figure is for Model BR17B2 with optional (communications interface) are mounted.



Warning

■ Alert symbol marks () and places

The alert symbol mark () is pasted at a danger place where may cause electric shock. (See the following table)

Name of terminals	Power terminals	Measuring input terminals	Mechanical alarm 'c' contact output terminals	Mechanical alarm 'a' contact output terminals
Places marked with the symbol	Lower left of power terminals	Upper left of terminal cover	Upper left of terminal cover	Beside alarm terminals

Reference Input terminal and alarm terminal blocks are removable.

The input terminal block and alarm terminal block (including the remote contacts terminal block) are removable for easy connections.

- (1) Each terminal block can be removed by removing two mounting screws.
- (2) Each terminal block is connected to the BR1000 series graphic recorder by a connector.

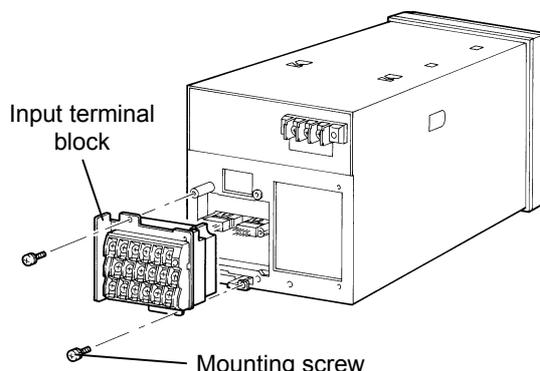
Caution

Turn off the power supply in advance.

For mounting or dismantling the terminal block, turn off the external power switch to prevent the electric circuits from being damaged.

Remarks Replacement of terminal block

The thermocouple input terminal block can not be replaced with the same kind of block being used in other instrument. If replaced, you have measuring error.



5.2 Cautions on Connections

Observe the following cautions during connections for securing safety and reliability.

(1) Power supply

Use a single-phase power supply having a stable voltage without any waveform distortion for the purpose of preventing wrong operations.

Warning

(1) A switch and an overcurrent protective device

Prepare a switch and an overcurrent protective device (3 A) to the power supply for preventing an electric shock accident during connection work. This instrument is not provided with any replaceable overcurrent protective device.

(2) Turn off the power supply before starting connections.

Be sure to turn off the power supply before connecting the power and the input/output terminals to prevent an electric shock.

(2) Keep the input/output connections away from a high voltage power circuit

Don't place the input/output cables close or in parallel with any strong power circuits including power line. Place the cables 50 cm or more away from high voltage power circuits when they are placed close or in parallel to other circuits.

(3) Keep the thermocouple input away from a heat source

For thermocouple inputs, keep the input terminals away from a heat source (a heating body) to reduce a reference junction compensation error. Don't expose the input terminals to direct sunlight, etc.

(4) Keep all connection cables away from noises

Keep all connection cables away from noise source as far as possible, otherwise a malfunction may occur. Provide a solution if the cables cannot be separated from a noise source due to unavoidable circumstances.

Major noise sources	Electromagnetic switch, etc. Power line having waveform distortion, Inverter, Thyristor regulator
Remedial measures	Insert noise filters between power terminals and input/output terminals. A CR filter is often used.

(5) Use crimp style terminals

- (1) Mount crimp style terminals as connection cables termination for preventing the looseness or disconnection of terminals and a short-circuit failure between terminals.
- (2) Use the crimp style terminals with insulation sleeve for preventing an electric shock.

(6) Unused terminals

Don't use any unused terminals for relaying, otherwise the electric circuits may be damaged.

⚠ Warning

■ Secure the connected cables properly.

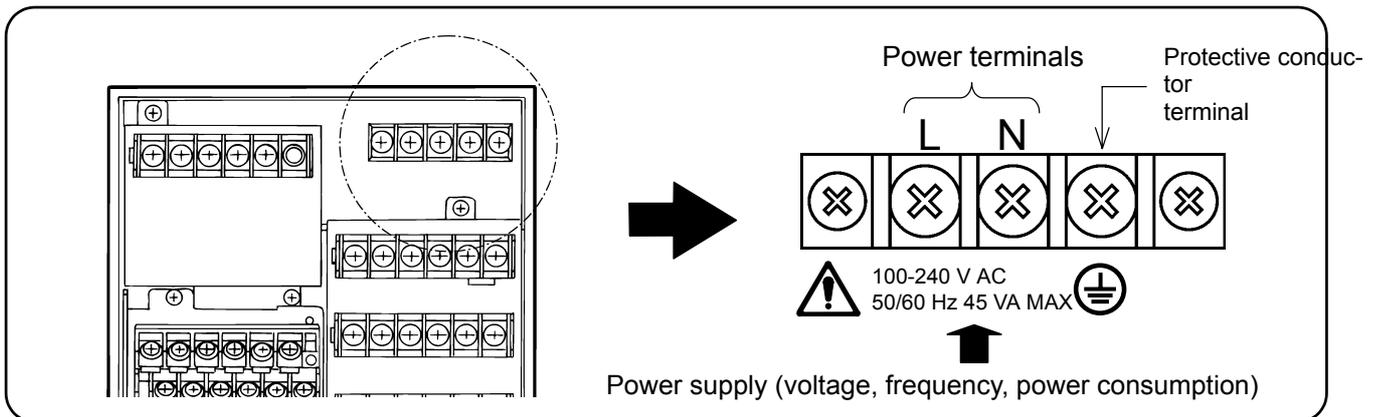
Secure the connected cables so as not to allow them to be hooked by a person or a substance, otherwise the connections may be cut and disrupted that may cause an electric shock or other accidents.

Kinds of terminals and termination

Terminal name	Screw diameter	Tightening torque	Termination (unit : mm)
Power and protective conductor terminals	M4	1.2N · m	Type O Less than 8.5 More than 4.3 (with an insulation sleeve) t : 0.8
Terminals other than described above	M3.5	0.8N · m	Type O Type Y Less than 8.5 Less than 8.5 More than 3.7 More than 3.7 (with an insulation sleeve) t : 0.8 t : 0.8 *Use Type O whenever possible.

5.3 Connection of Power and Protective Conductor Terminals

(1) Power and protective conductor terminals



⚠ Warning

■ Turn off the power supply.

Be sure to turn off the power supply before connecting the power and protective conductor terminals to prevent an electric shock.

(2) Connection of power terminals

For connection to the power terminals, use a 600 V PVC insulated cable terminated by the crimp style terminals with insulation sleeve.

Note) Use the cords approved by the following standards.

- (1) IEC 227-3
- (2) ANSI/UL817
- (3) CSA C22.2 No.21/49

⚠ Caution

■ Be careful with the power voltage and noises.

The power voltage of this instrument is indicated beside the power terminals. Don't apply any voltage other than indicated, otherwise a malfunction may result.

If noise is generated at the power supply, provide a noise reduction transformer, etc.

(3) Connection of protective conductor terminal

Be sure to connect this terminal to the protective conductor of the power supply facility. For this connection, use a cable terminated by the crimp style terminals with insulation sleeve.

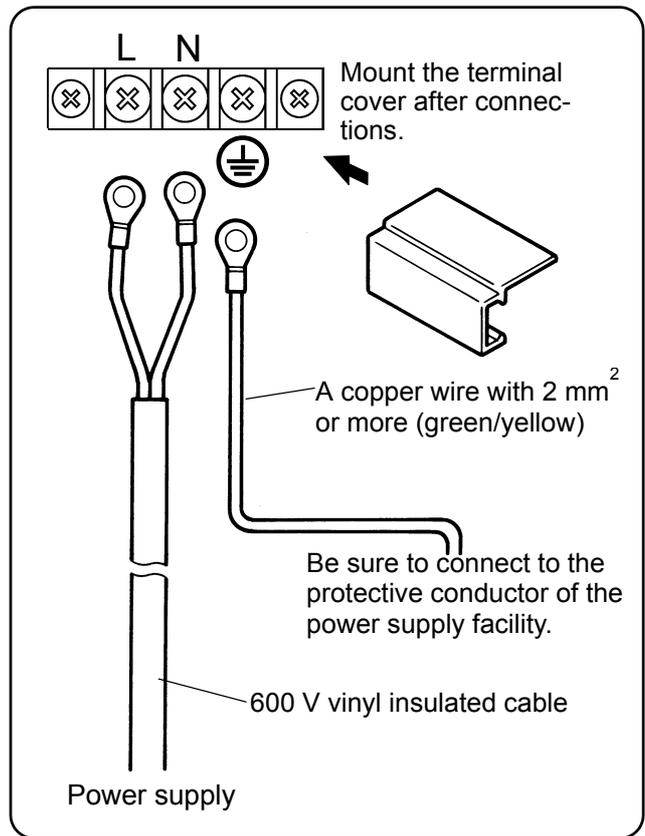
- Grounding wire :
Copper wire 2 mm² or more (green/yellow)

Warning

■  mark at power terminals
A voltage of 100 to 240 V AC is applied to the power terminals after connections. Be sure to mount the power terminal cover to prevent an electric shock.

Remarks L/N indication of power terminals

This indication conforms to the CSA standard, Canada. The live side of the single-phase AC power supply is indicated as L, and the neutral side is indicated as N. Observe the L and N connections for obtaining satisfactory performance.



5.4 Connection of Measuring Input Terminals

(1) Measuring input terminals

Be sure to turn off the power supply to prevent an electric shock.

- For the connections to the input terminals, use cables terminated by the crimp style terminals with insulation sleeve.

Caution

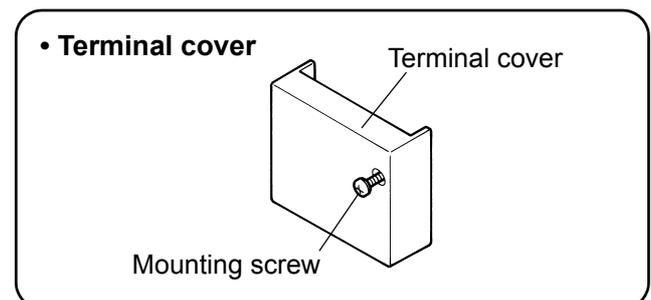
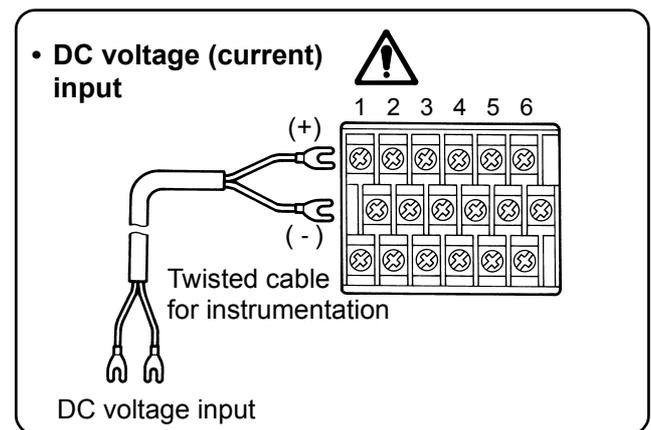
■ **Allowable input voltage**

Input type	Allowable input voltage
Voltage, thermocouple input	±10 V DC*
Resistance thermometer input	±6 V DC

* ±60 V DC with channel settings to the ±5 V or higher range.

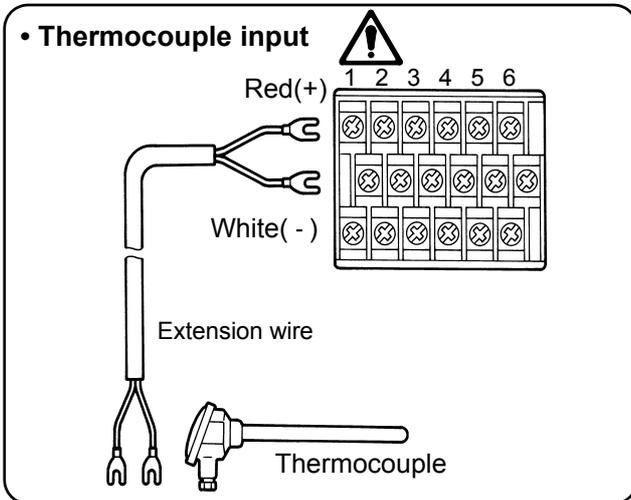
(2) Connections of DC voltage (current) input

Use twisted cables for instrumentation as the input cables for the purpose of suppressing noises. For current inputs, mount shunt resistors to the channels to be measured before connections.



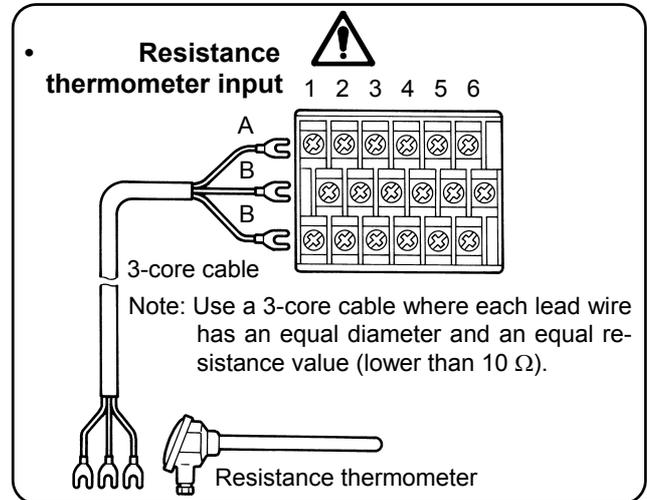
(3) Connections of thermocouple inputs

Be sure to use thermocouple wires (or extension wires) to the input terminals of this instrument. If a copper wire is used halfway, a noticeable measuring error occurs. Don't use a pair of thermocouple wires in parallel with other instruments (controller, etc.), otherwise a malfunction may occur.



(4) Connections of resistance thermometer inputs

Use a 3-core cable where each lead wire has an equal resistance value. Don't use one resistance thermometer in parallel with other instruments (controller, etc.).



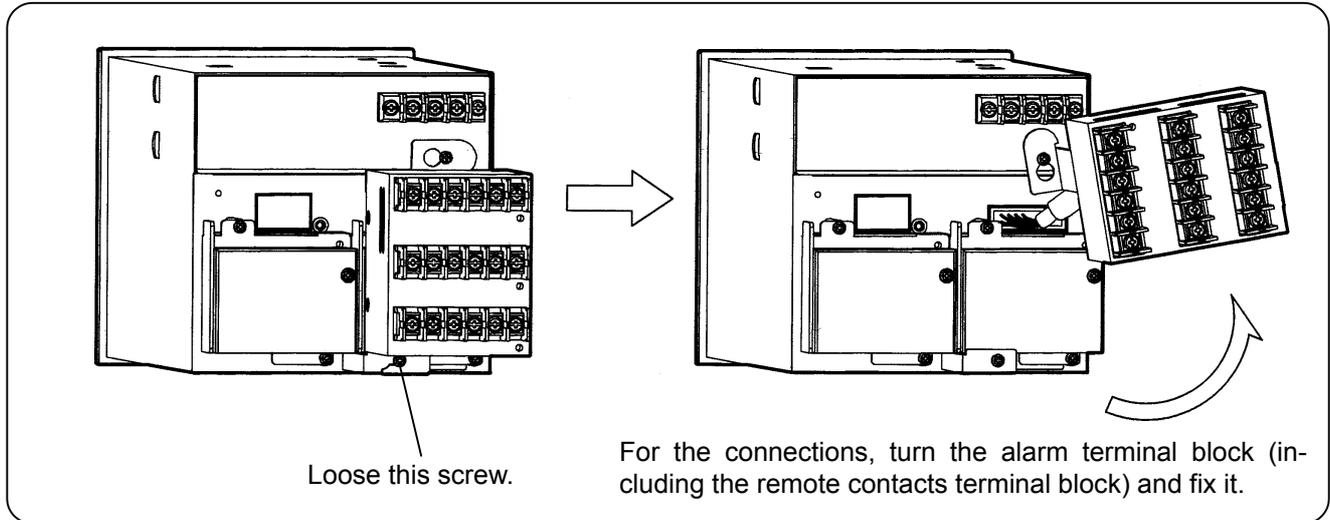
Warning

■ mark of measuring input terminals

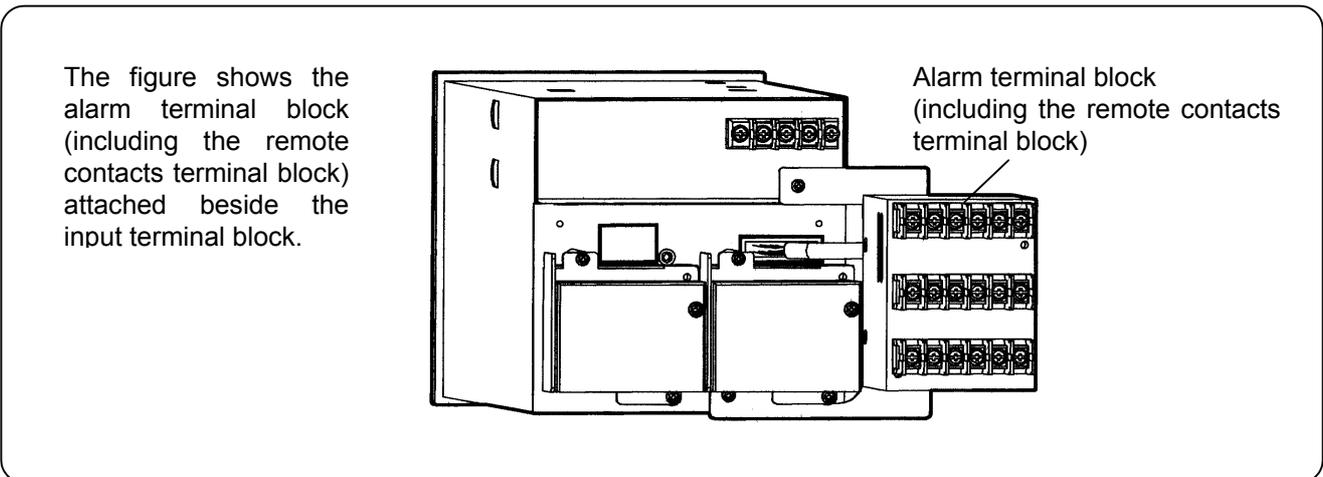
A high voltage may be applied to the measuring input terminals due to common mode noises. The allowable noise value is lower than 30 V AC or lower than 60 V DC. Make sure that the noises are lower than the allowable values. Mount the terminal cover after connections for the purpose of preventing an electric shock and to protect the input wires. In the case of thermocouple input, the mounting of the terminal cover can reduce the reference junction compensation error.

(5) For Model BR17B2 with “ alarm output + remote contacts ” (optional)

For the connections to the terminals from CH7 to CH12, turn the alarm terminal block (including the remote contacts terminal block) as shown below until you can connect to these terminals.



The alarm terminal block (including the remote contacts terminal block) can be attached beside the input terminal block. Please ask separately in that case.



⚠ Caution

■ Turn off the power supply in advance.

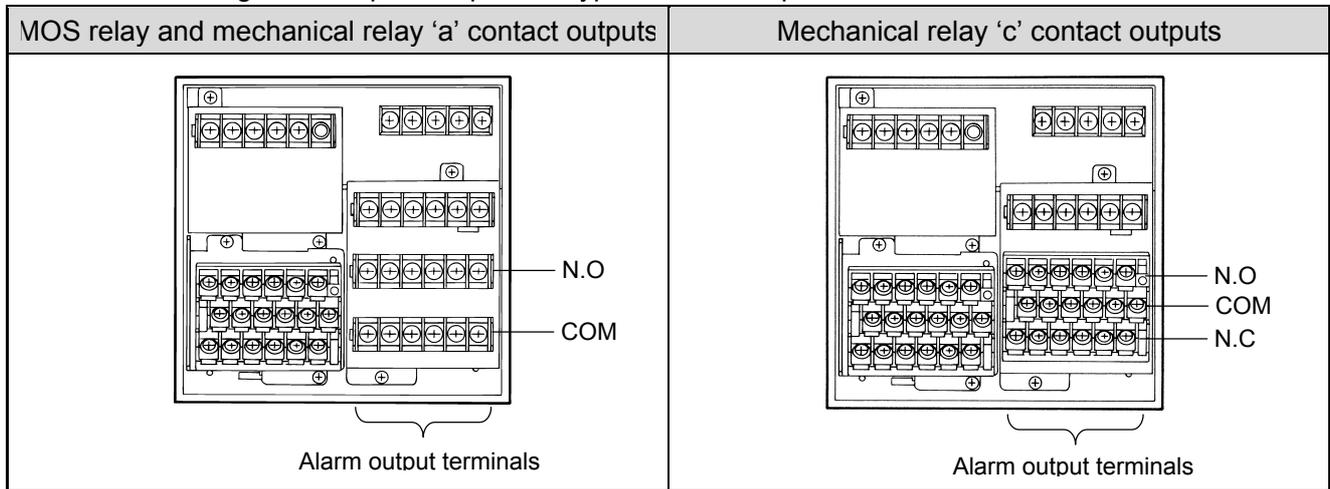
For mounting or dismounting the terminal block, turn off the external power switch to prevent the electric circuits from being damaged.

5.5 Connection of Alarm Output Terminals (optional)

The following connections apply to The BR1000 series graphic recorder with a alarm output function (optional) only. Three kinds of alarm outputs, (1) MOS relay type or (2) Mechanical relay 'a' contact alarm outputs or (3) Mechanical relay 'c' contact alarm outputs are available. The Mechanical relay 'c' contact alarm outputs does not conform to the international safety standards.

(1) Alarm output terminals

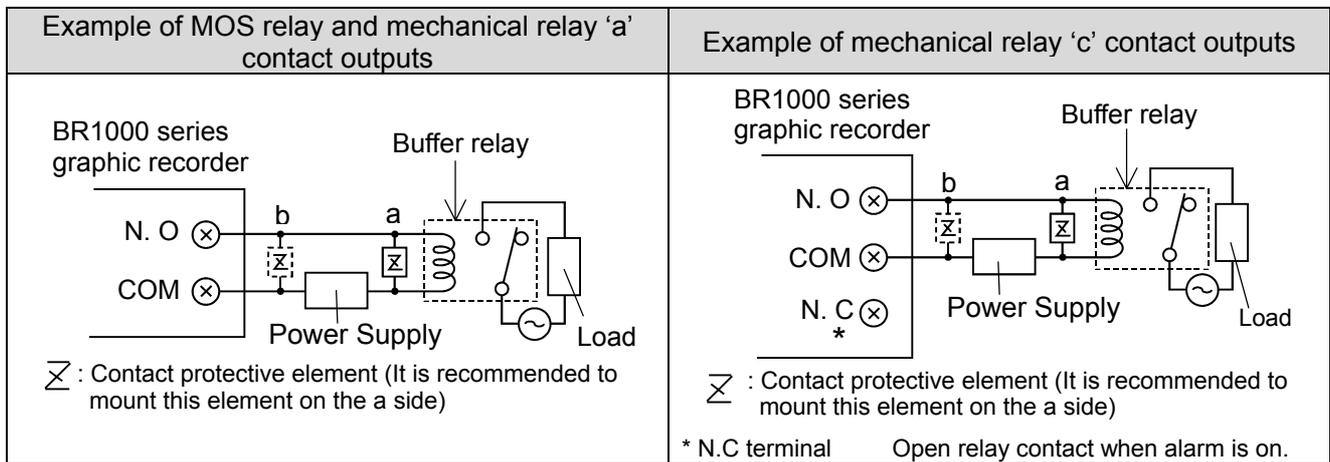
The terminal arrangement depends upon the type of alarm output.



(2) Connections

Turn off the power supply and buffer relay power supply before starting connections to prevent an electric shock.

- (1) Connect cables to the load via a buffer relay.
- (2) Use cables with the crimp style terminals with insulation sleeves for the alarm output terminals.



Warning

- 
mark of alarm output terminals
 Connect a load which does not exceed the specified contact capacity to the alarm output terminals. A buffer relay power supply is applied to the alarm output terminals after connections. Do not touch these terminal as an electric shock will occur. Be sure to mount the terminal cover after connections.

Caution

- Take a safety measure.**
 An alarm output of this instrument may become defective caused by wrong operation, failures, and other abnormal inputs. Take a safety measure against an output failure before use as occasion calls.

(3) Cautions on connections

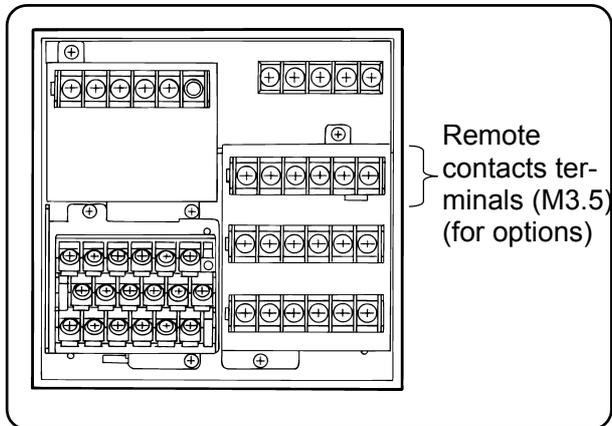
Be careful with the following cautions for connections.

Item	Description												
Contact rating of MOS relay outputs	<ul style="list-style-type: none"> • Maximum voltage240 V (AC, DC) • Maximum current 50 mA (AC, DC) * <p>*Irrespective of load types</p>												
Contact rating of Mechanical relay outputs 'a' contact and 'c' contact common	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 33%;">Power supply</th> <th style="width: 33%;">Resistive load</th> <th style="width: 33%;">Inductive load</th> </tr> </thead> <tbody> <tr> <td>100 V AC</td> <td>0.5 A</td> <td>0.2 A</td> </tr> <tr> <td>240 V AC</td> <td>0.2 A</td> <td>0.1 A</td> </tr> <tr> <td>100 V DC</td> <td>0.3 A</td> <td>0.1 A</td> </tr> </tbody> </table>	Power supply	Resistive load	Inductive load	100 V AC	0.5 A	0.2 A	240 V AC	0.2 A	0.1 A	100 V DC	0.3 A	0.1 A
Power supply	Resistive load	Inductive load											
100 V AC	0.5 A	0.2 A											
240 V AC	0.2 A	0.1 A											
100 V DC	0.3 A	0.1 A											
Mounting of contact protective element Z	<ul style="list-style-type: none"> • Mount a contact protective element conforming to the buffer relay. MOS relay is broken, if a signal exceeding the contact rating is applied even if momentarily. • To prevent a malfunction being caused by a light load, the most effective mounting position for the element is on the coil side of the buffer relay ('a' in the connection diagrams under (2) on 5.5) 												
Selection of buffer relay	<p>(1) Coil rating Less than the contact rating of output terminals</p> <p>(2) Contact rating More than twice the load current</p> <p>A coil surge absorption element built-in type relay is recommendable. Mount an additional buffer relay if a buffer relay satisfying the load rating is not available.</p>												
Selection of contact protective element	<p>Mount a contact protective element if a surge absorption element built-in buffer relay is not available. This element is generally composed of C (capacitor) and R (resistor).</p> <p><Reference values of C•R> C : 0.01 μF (Rating about 1 kV) R : 100 to 150 (Rating about 1 W)</p>												

5.6 Connection of Remote Contacts Terminals (Optional)

The following connections apply to the BR1000 series graphic recorder with a remote contacts function (optional) only. For the remote contacts, please see [16](#).

(1) Remote contacts terminals



Remarks

Remote contacts terminals characteristic

- Voltage when the contact is open. : Approx. 5 V
- Current when the contact is short. : Approx. 2 mA

(2) Connections

Turn off the power supply before connections to prevent an electric shock.

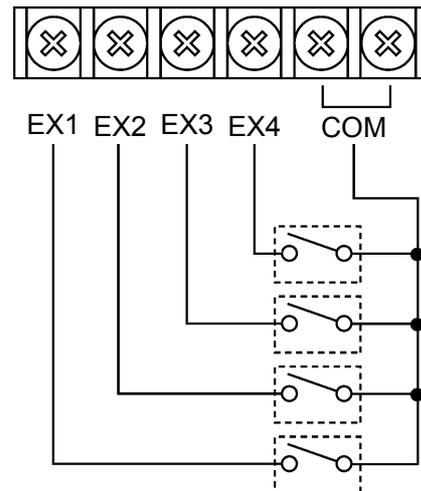
- (1) Apply a no-voltage contact signal to remote contacts terminals.
- (2) Use cables terminated by crimp style terminals with insulation sleeves for the remote contacts terminals.

Warning

■ No-voltage contacts

For the contacts to be connected to the remote contacts terminals, use a switch or relay driven at lower than 30 V AC or lower than 60 V DC, or manual contacts for very light loads.

■ Connection example



■ Terminal functions

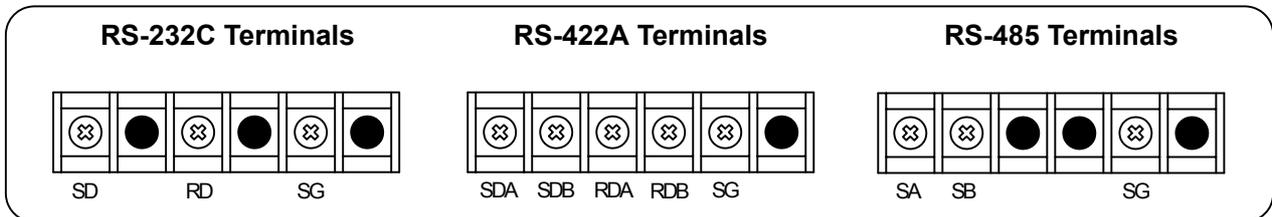
Terminal names	Functions	
EX1	(1) Integration Reset Totalising start or reset	File Drive Storing start/end into data files in the internal memory.
EX2		
EX3	(2) Message Display of message (Nos. 1 to 10)	
EX4		

- Every function requires short-circuiting of more than 1 second between the COM and the respective terminals. Functions (1) and (2) can be combined with any terminal and overlapped with storing start/end into data files.

5.7 Communications Terminals

These terminals are for the communications interface (option). For details of the connection, refer to the instruction manual for the "Communications Interfaces" provided separately.

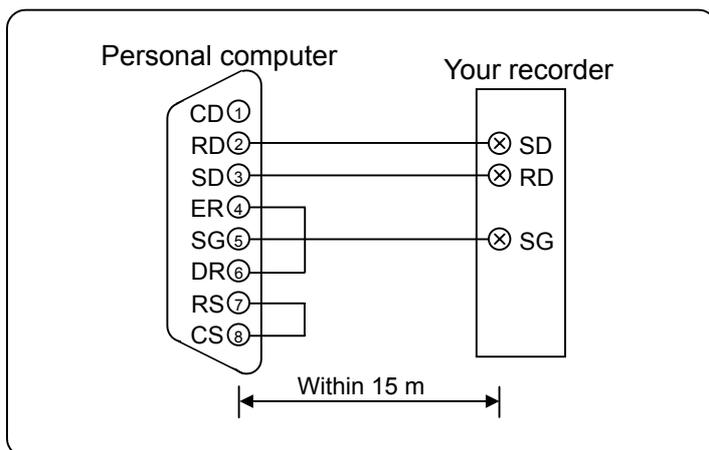
5.7.1 Communications terminals



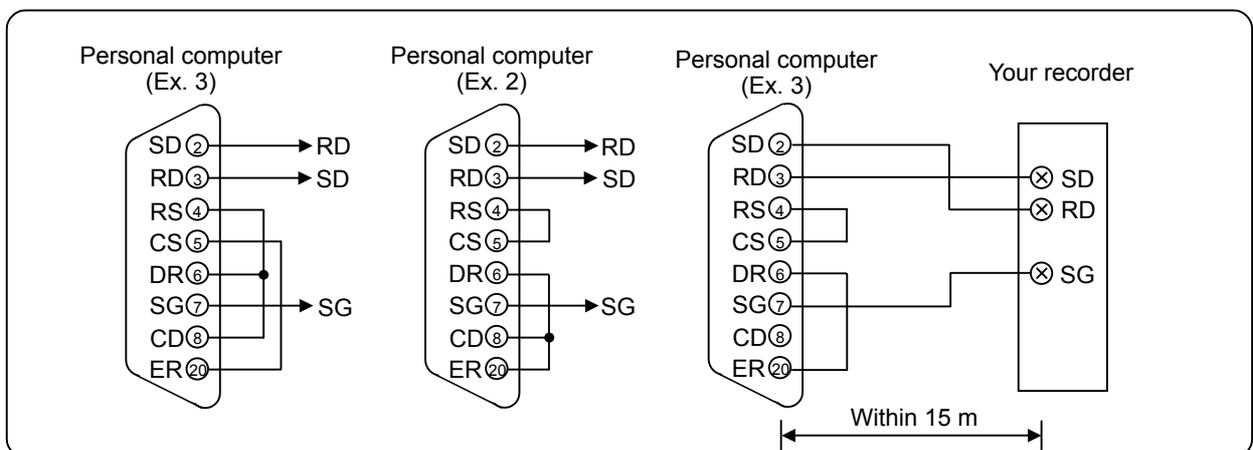
5.7.2 RS-232C Connections

When your recorder is with the communications interface of RS-232C, three terminals of SD, RD and SG are used but any control signal is not used. General personal computers are controlled by control signal. Wiring processing for control signal in a connector depends upon how the control signal is used in a personal computer. For details, refer to the instruction manual for your personal computer.

1) 9-pin connector



2) 25-pin connector



5.7.3 RS-422A, RS-485 Connections

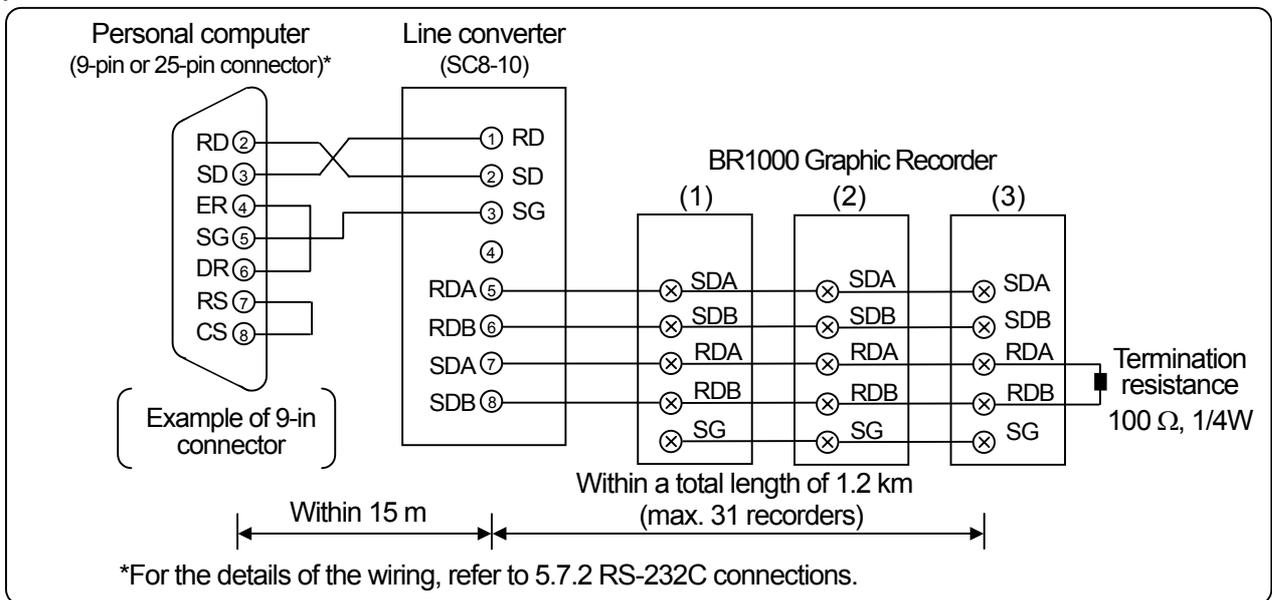
RS-422/485 communications interface is connected to a personal computer via a line converter (our Model SC8-10: sold separately). Three signals of SD, RD and SG are used between the line converter and the personal computer but any control signal is not used. Wiring processing for control signal in a connector is necessary in the same as 5.7.2 RS-232C connections.

⚠ Caution

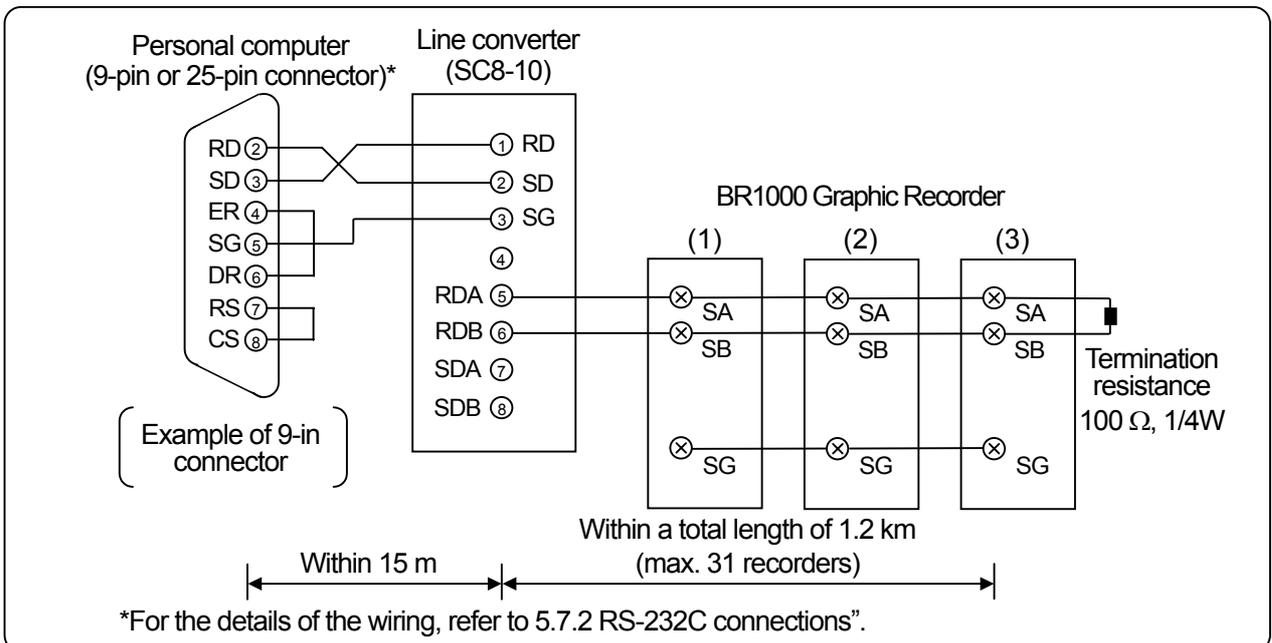
■ Termination resistance

To ensure the transmission of data by RS-422A or RS-485, a termination resistance is required at both sides of transmission line. When the line converter (SC-8) is placed between a personal computer and this unit, short the terminal ④ and ⑤ of the line converter. By short-circuiting, a termination resistance is automatically inserted.

1) RS-422A



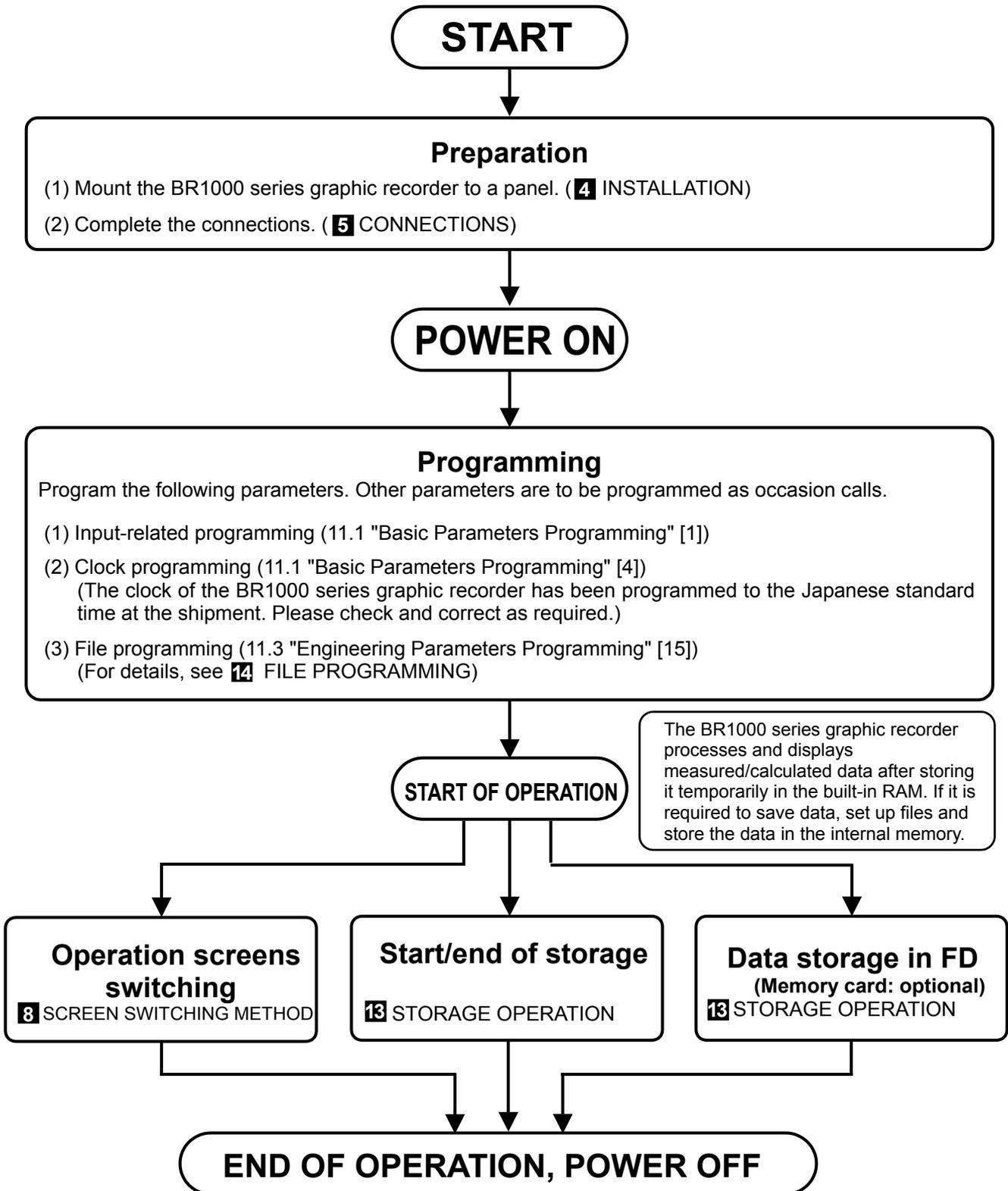
2) RS-485



6 OPERATION

(Be sure to read section 1 to ensure safety.)

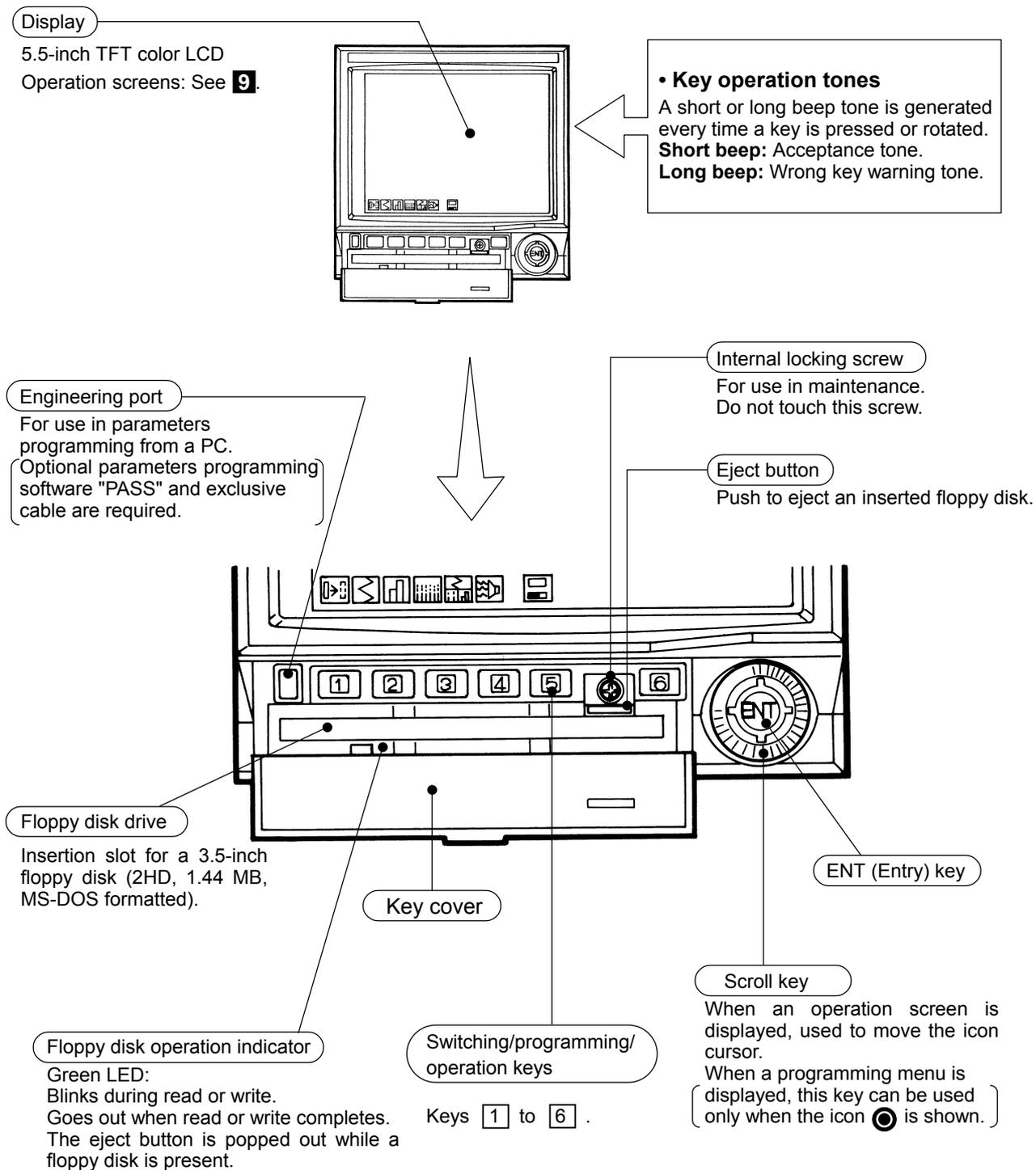
The BR1000 series graphic recorder has been preprogrammed with the default values at the factory so the test run can be started immediately as soon as turning power on. However, be sure to complete the following setup procedure before starting the actual operation.



• Some of the LCD pixels may be lit permanently while some may never be lit, and the LCD brightness may not be regular all over the screen. However, this is due to the characteristics of the LCD and not a malfunction.

7 NAMES OF COMPONENT PARTS

7.1 Front Panel Controls and Their Functions



⚠ Caution

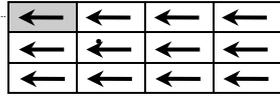
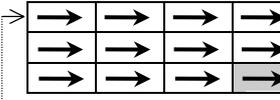
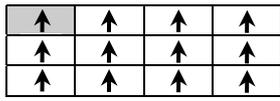
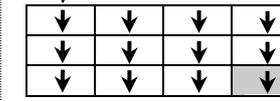
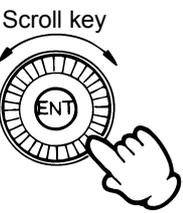
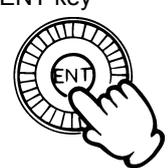
■ **Front glass**
The front of display part is made by glass. Please do not shock the glass for avoiding any injuries by its broken pieces.

7.2 Keys and Their Functions

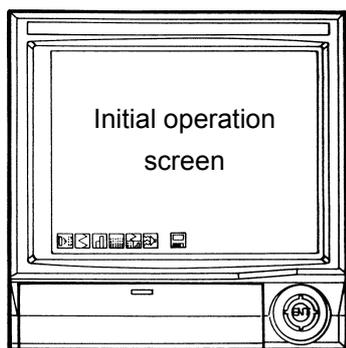
The usage and function of each key is variable depending on whether an operation screen or programming screen is being displayed.

Programming menus

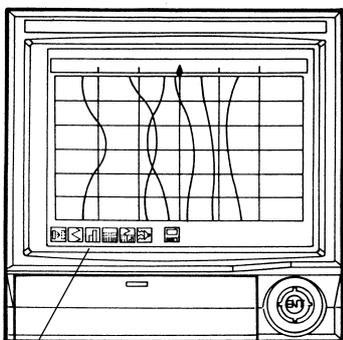
- Basic parameters programming menu
- Operation screens programming menus
- Engineering parameters programming menu

Key	Usage and function of each key																																	
	Operation Screen	Programming Menu																																
	<ul style="list-style-type: none"> Press once to open the programming menu for the current operation screen (Trend, Data or Bargraph screen). 	<p>Corresponds to the icon EXT. Each press returns to the previous screen (menu).</p> <p>The number of times the key should be pressed to return to the operation screen is displayed by the icon (1 to 5) on the bottom right of the screen.</p>																																
	<ul style="list-style-type: none"> Press once to open the basic parameters programming menu. 	<p>Correspond to the icons ← and →. Press to move the cursor (yellow) to the left or right. (Invalid with a menu in which these icons are not displayed)</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Key 2 (Left)</p>  </div> <div style="text-align: center;"> <p>Key 3 (Right)</p>  </div> </div>																																
	<ul style="list-style-type: none"> Press and hold for about 2 seconds to open the engineering parameters programming menu. 																																	
 	Not used.	<p>Correspond to the icons ↑ and ↓. Press to move the cursor (yellow) up or down or to program a value. (Invalid with a menu in which these icons are not displayed.)</p> <ul style="list-style-type: none"> Cursor movement in the character/symbol programming menu <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Key 4 (Up)</p>  </div> <div style="text-align: center;"> <p>Key 5 (Down)</p>  </div> </div> <ul style="list-style-type: none"> Cursor movement in the CH No. display menu <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Key 4 (Up)</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>CH.No.</td><td></td><td></td><td></td></tr> <tr><td>05</td><td>↑</td><td></td><td></td></tr> <tr><td>06</td><td>↑</td><td></td><td></td></tr> <tr><td>07</td><td>↑</td><td></td><td></td></tr> </table> <p>The cursor stops at the top row, but further pressing of a key decrements the CH No. to 04, 03... 01.</p> </div> <div style="text-align: center;"> <p>Key 5 (Down)</p> <table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>CH.No.</td><td></td><td></td><td></td></tr> <tr><td>01</td><td>↓</td><td></td><td></td></tr> <tr><td>02</td><td>↓</td><td></td><td></td></tr> <tr><td>03</td><td>↓</td><td></td><td></td></tr> </table> <p>The cursor stops at the bottom row, but further pressing of a key increments the CH No. to 04, 05... 30.</p> </div> </div> <p>Value programming (Key 4 to increase, Key 5 to decrease)</p> <p>0 → 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 'Space' → '-' → '.' →</p>	CH.No.				05	↑			06	↑			07	↑			CH.No.				01	↓			02	↓			03	↓		
CH.No.																																		
05	↑																																	
06	↑																																	
07	↑																																	
CH.No.																																		
01	↓																																	
02	↓																																	
03	↓																																	
	Press to stop blinking of the alarm symbol mark.	Corresponds to the icon PRG . Press to open the menu selected with the cursor. (Invalid with a menu in which this icon is not displayed)																																
	<p>Rotate to move the cursor (yellow) to the left or right for switching the operation screen or storage operation.</p> <p>Operation screen switching</p>  <p>Cursor display Storage operation</p>	Corresponds to the icon ⊙ . Press to move the cursor up/down or to the left/right or to vary the value. (Invalid with a menu in which this icon is not displayed)																																
	<p>When the above icons are not displayed, press to display the icons.</p> <ul style="list-style-type: none"> Select an icon (using the cursor) and press this key to display the corresponding screen. 	Corresponds to the icon ENT . Press to store the programmed parameter selected with the cursor. (Invalid with a menu in which this icon is not displayed)																																

8 SCREEN SWITCHING METHOD



Approx. 5 sec.



Icon display

When the power is turned on, an operation screen is displayed after the initial operation for about 5 seconds (Default screen: Real-time Trend screen). Once this operation screen has been switched, the "last selected operation screen before the power was turned off" will be displayed every time the power is turned on.

Operation tones

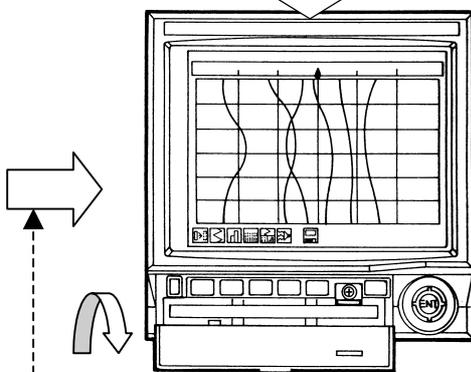
A short or long beep tone is generated every time a key is pressed or rotated.

Short beep: Acceptance tone.

Long beep: Wrong key warning tone.

Switching to a programming menu

Press one of the keys listed on the right to display the corresponding programming menu for the parameter programming.



Open the key cover.

At Trend, Bargraph or Data screen



At Trend, Bargraph, Data or Multi- screen



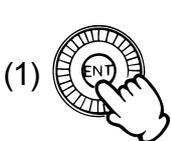
At Trend, Bargraph, Data or Multi- screen



2 sec.

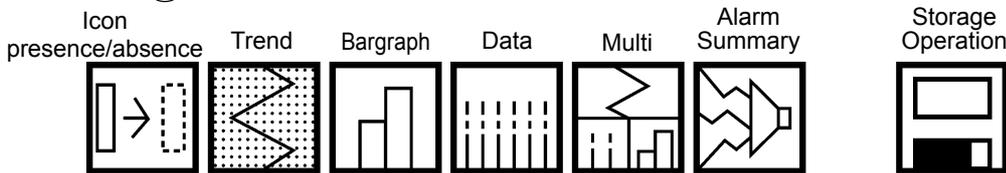
Icons on the operation screens and their switching method

Operation screens can be switched over by selecting an icon. As the initial screen does not display these icons, use the following procedure to display the desired screen.

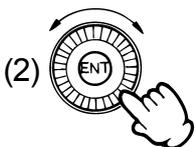


Press the ENT key to display the icons.

The icons will disappear in about 1 minute if no key has been pressed. If they disappear, press the ENT key again.



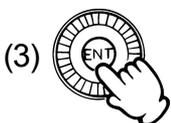
Cursor display ← Operation screens →



Move the cursor (yellow) to the desired icon by rotating the scroll key clockwise or counterclockwise.

The icon  should be selected only when it is required to remove the icons.

The icon  should be selected when it is required to perform the memory operation.

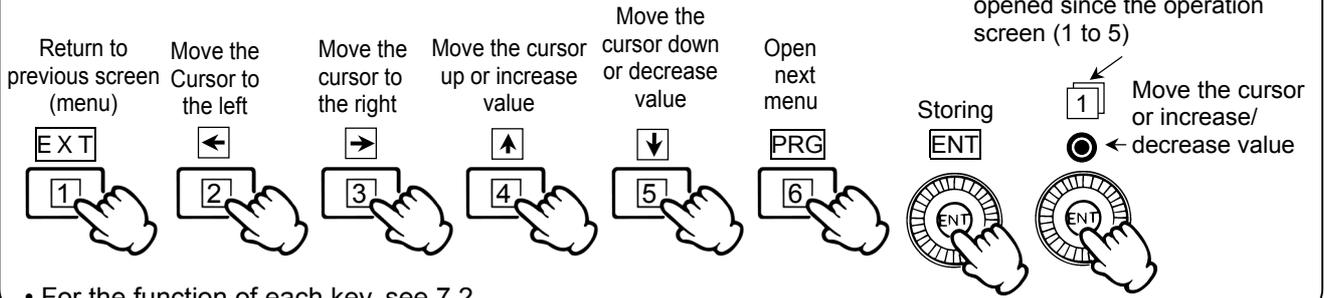


Press the ENT key to display the desired operation screen.

For switching the display groups (Groups 1 to 5), press the ENT key while the icons are displayed.

Keys and icons in the programming menus

Keys for use in the parameter programming appear as icons. Only the icons used in each parameter-programming menu appear.



• For the function of each key, see 7.2.

Operation screen programming

One of the following programming menus is displayed for the Real-time Trend, Bargraph and Data screens.

Trend Display Program
Trend Mode
Trend Scale
Trend Display
Trend Line
Time Scale
Data Display
Message

Trend screen programming menu

Bargraph Display Program
Graph Scale
Data Display

Bargraph screen programming menu

Data Display Program
Data Display
Auto Data Scan
Daily Report
Group Change

Data screen programming menu

Basic parameters programming

Parameters for input type, input range, alarm, clock, etc. can be programmed, reprogrammed or confirmed. These parameters can be programmed or reprogrammed even when the Password in Engineering Parameters has been programmed. You can restrict programming (reprogramming) of the basic parameters by the Operator Access Entry in the Engineering Parameters, but can confirm the programmed parameters under this restricted condition.

Basic Parameters
Channel Configuration 1
Mathematics
Alarm
Data/Time

- Used to program the input type, input range, scale and scale display range of channels.
- Used to program the maths-related parameters.
- Used to program the alarm parameters.
- Used to program the date, hour, minute and second.

• A programming guidance (English or Japanese, default in English) is available providing the information and contents of each menu.

Engineering parameters programming

Engineering Parameters
Password
Guidance Language
°C / °F
Channel Configuration 1
Channel Configuration 2
Mathematics
Alarm
Date/Time and Format
Message
Screen Saver
Brightness
Group Display
Screen
Trend Display Format
File
Operator Access Entry
External Input Allocation
Status Output Allocation
Communications 1
Communications 2
Maintenance Mode

Password Check						
█						
••••						
A	K	U	e	o	y	8
B	L	V	f	p	Z	9
C	M	W	g	q	0	
D	N	X	h	r	1	
E	O	Y	i	s	2	
F	P	Z	j	t	3	
G	Q	a	k	u	4	
H	R	b	l	v	5	
I	S	c	m	w	6	
J	T	d	n	x	7	

When the password has been programmed, the above keypad appears first.

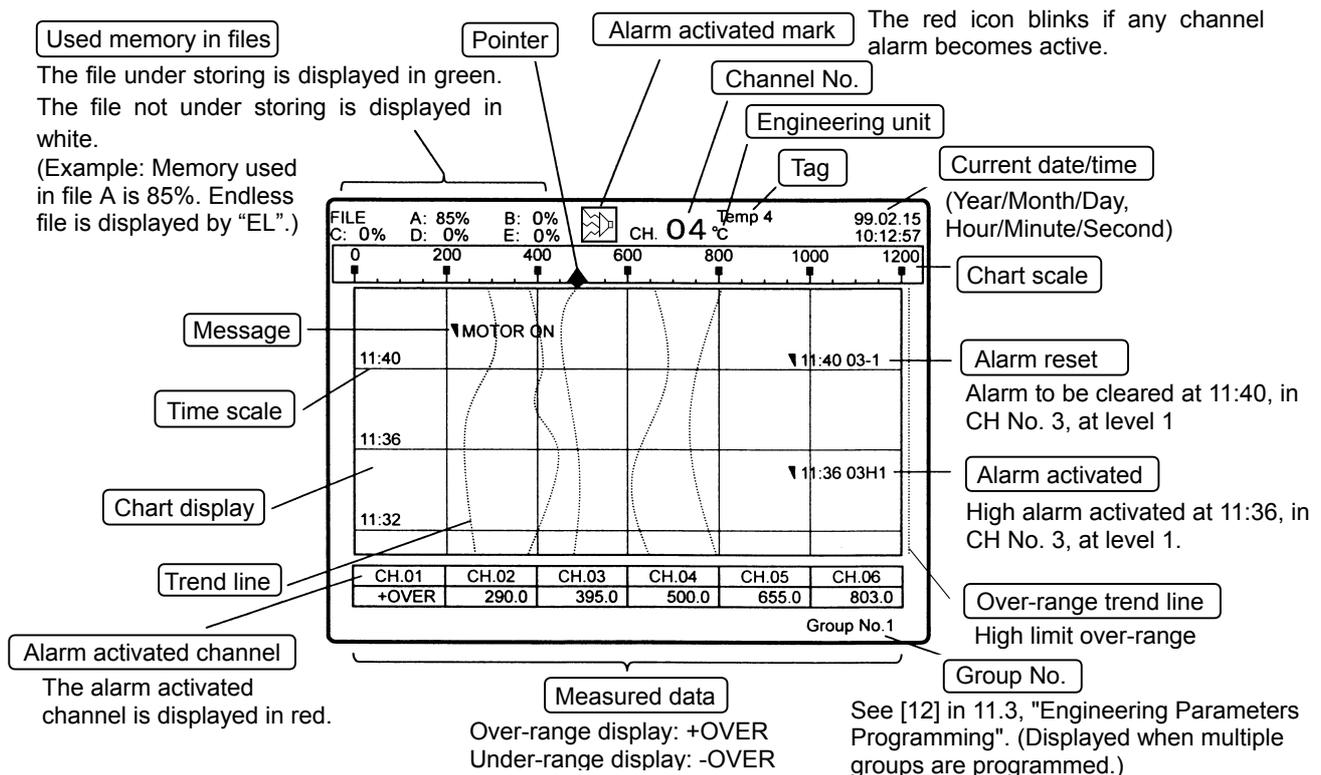
When the correct password is entered, the Engineering parameters programming menu appears.

9 OPERATION SCREENS AND FUNCTIONS

9.1 Real-time Trend Screen

This screen displays the trends of measured values in the same way as analog recorders. By programming to "Auto" (default), the pointer, channel No., engineering unit, tag and scale are switched on a channel-to-channel basis (Default switching interval: 5 sec.). The channels can also be switched manually by programming to "Manual". When the **ENT** key is held depressed for 2 seconds, a cursor (pink) line appears and turning the scroll key counterclockwise makes it possible to view past data. (Press and hold the **ENT** key for 2 seconds again to return to the current display.)

The trend data will be initialized by (1) power interruption more than 5 minutes, (2) reprogramming of channel parameters, (3) reprogramming of maths parameters, or (4) reprogramming of current time.



* When the time scale interval is longer than the measuring interval, the maximum value and the minimum value of data measured in the time scale interval are displayed at the interval of the time scale as trend format.

• Changing the screen setup

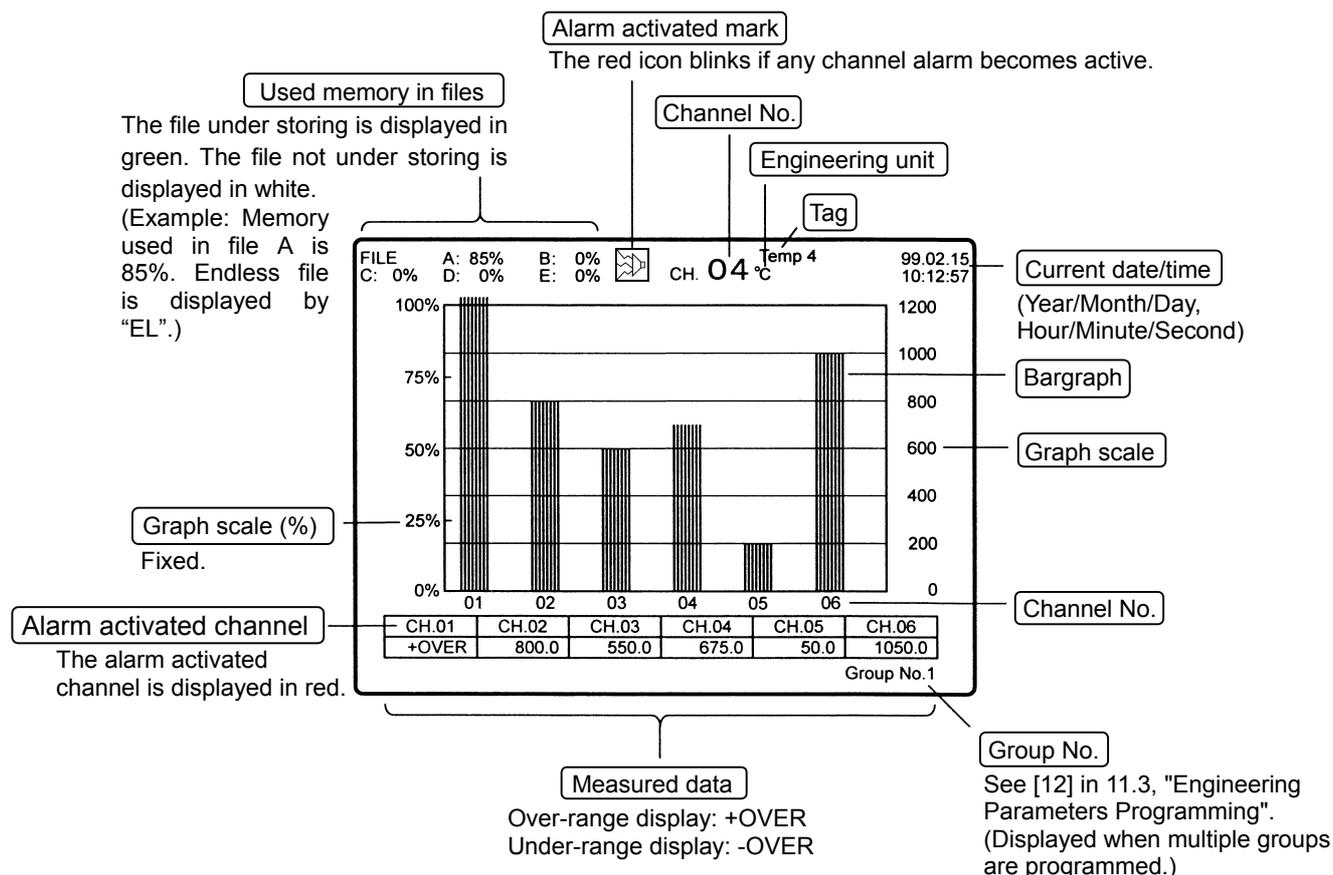
Screen Programming Item	Program Used
(1) To increase (or decrease) the channel switching interval	11.2.1 "Real-time Trend Screen Programming"
(2) To switch the channels manually	11.2.1 " Real-time Trend Screen Programming " [2] Program to "Manual" and then switch by the scroll key. (The switching can be executed with the icons not displayed.)
(3) To skip the trend line(s)	11.2.1 " Real-time Trend Screen Programming " [3]
(4) To increase the trend line width	11.2.1 " Real-time Trend Screen Programming " [4]
(5) To change the time scale interval	11.2.1 " Real-time Trend Screen Programming " [5]
(6) To not display the measured data	11.2.1 " Real-time Trend Screen Programming " [6]
(7) To execute message display	11.2.1 " Real-time Trend Screen Programming " [7]
(8) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key [6] (ACK).
(9) To turn the trend background color from black to white	11.3 "Engineering Parameters Programming" [14]
(10) To decrease the display brightness	11.3 " Engineering Parameters Programming " [11]
(11) To feed the chart (time scale) from the side	11.3 " Engineering Parameters Programming " [14]

Eight operation screens

There are a total of 8 operation screens, which are described in sections "9.1 Real-time Trend Screen", "9.2 Bargraph Screen", "9.3 Data Screen", "9.4 Multi-Screen", "9.5 Alarm Summary Screen", "9.6 Historical Trend Screen", "9.7 Dual Trend Screen" and "9.8 Magnified Data Screen".

9.2 Bargraph Screen

This screen displays measured values of channels by the bargraph format in real-time.

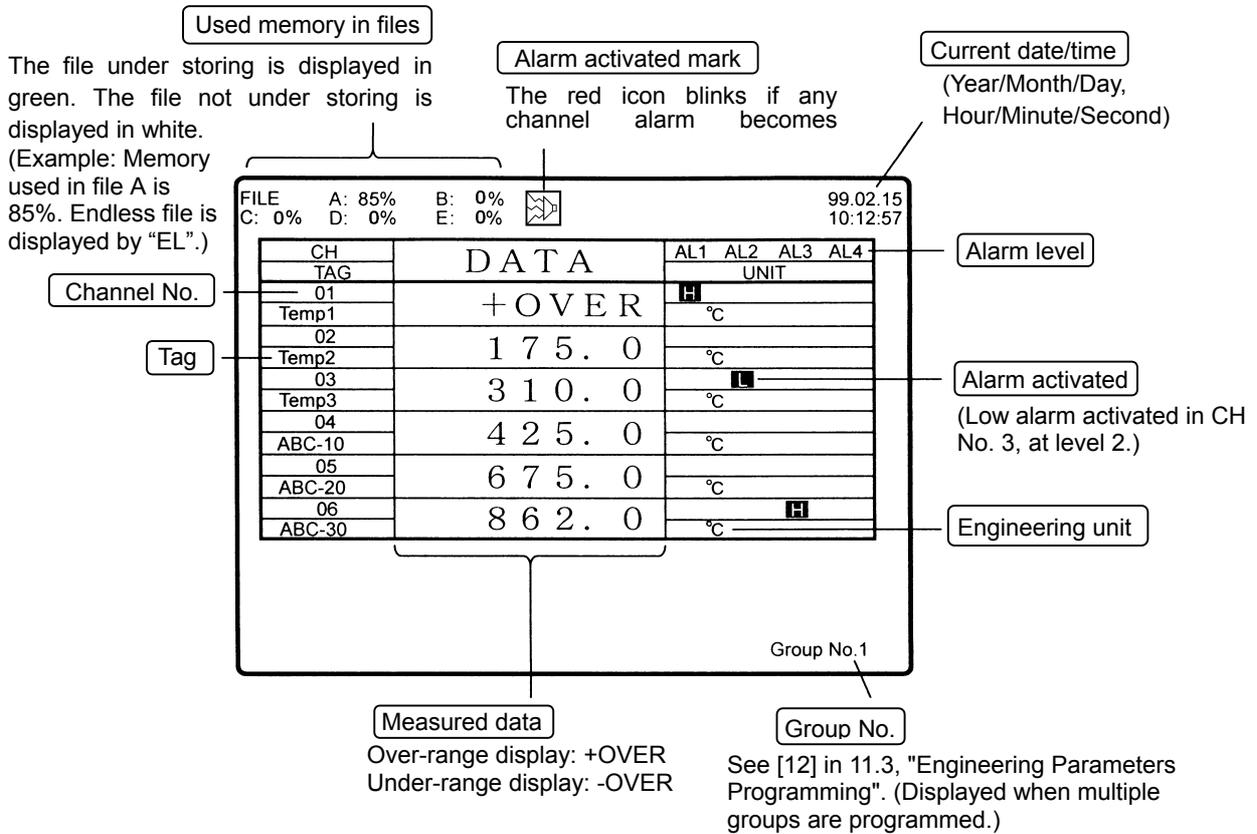


• Changing the screen setup

Screen Programming Item	Program Used
(1) To increase (or decrease) the channel switching interval	11.2.2 "Bargraph Screen Programming" [1]
(2) To switch the channels manually	11.2.2 "Bargraph Screen Programming" [1] Program to "Manual" and then switch by the scroll key. (The switching can be executed with the icons not displayed.)
(3) To not display the measured data	11.2.2 "Bargraph Screen Programming" [2]
(4) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key 6 (ACK).

9.3 Data Screen

This screen displays the "measured data of each channel" and the "alarm activation status" of all the 6 channels simultaneously.

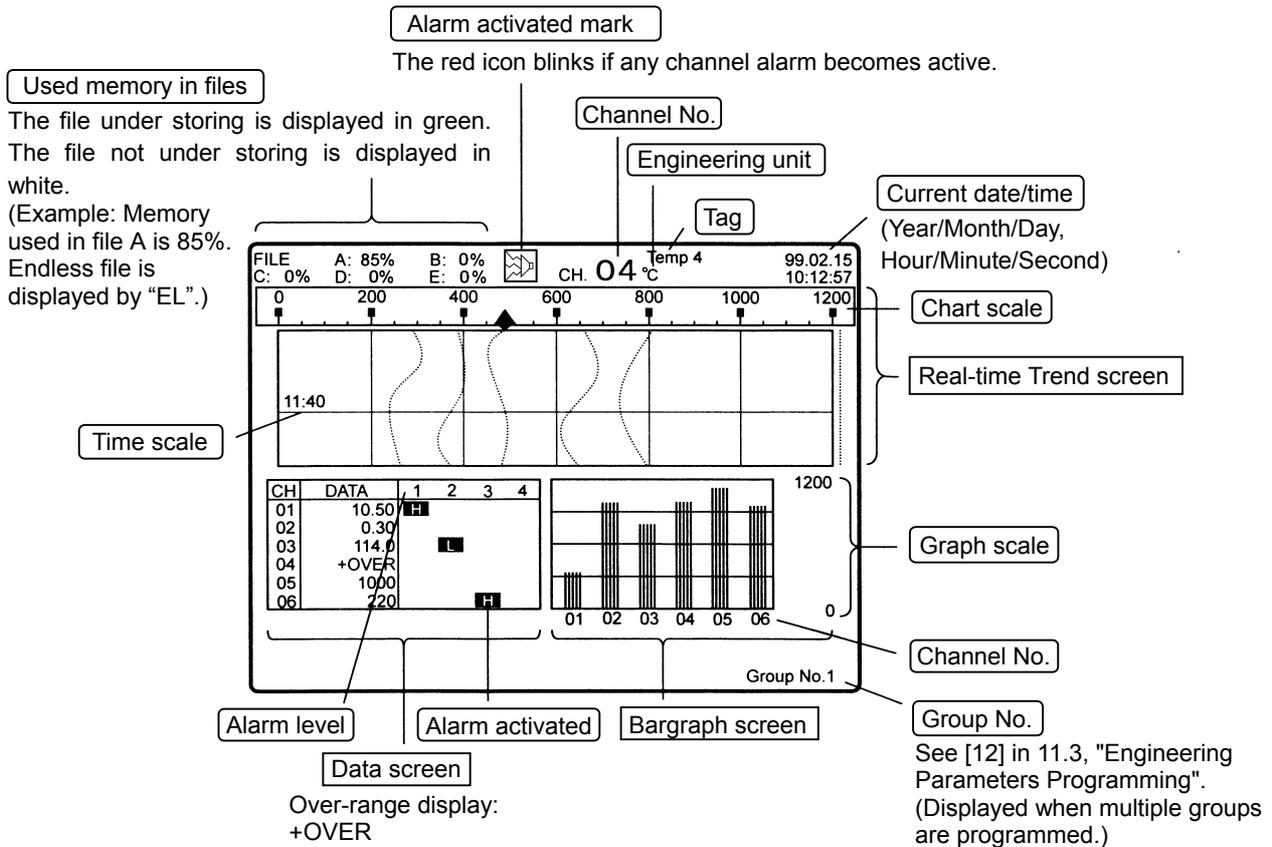


• Changing the screen setup

Screen Programming Item	Program Used
(1) To skip the data channel(s)	11.2.3 "Data Screen Programming" [1]
(2) To magnify the data (displays data on a channel-to-channel basis)	See 9.8 "Magnified Data Screen".
(3) To display a daily report	11.2.3 "Data Screen Programming" [3]
(4) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key 6 (ACK).

9.4 Multi-Screen (Composite Display)

This screen displays Real-time Trend, Data and Bargraph screens in a single screen.



- The time scale interval is commonly programmed with 9.1 "Real-time Trend Screen".
- * When the time scale interval is longer than the measuring interval, the maximum value and the minimum value of data measured in the time scale interval are displayed at the interval of the time scale in trend format.

• Changing the screen setup

Screen Programming Item	Program Used
To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key <input type="text" value="6"/> (<input type="text" value="(ACK)"/>)

* There is no other screen setup that can be programmed.

9.5 Alarm Summary Screen

This screen displays the alarm events in the bargraph format.

It also displays the output status from the alarm output terminals (Nos. 1 to 6).

Alarm output

☐ appears if the alarm became active.
 01 to 06 refer to the alarm output terminal numbers.
 (☐ appears even if the optional alarm output is not added.)

Current date/time

(Year/Month/Day,
 Hour/Minute/Second)

AL OUT		01	02	03	04	05	06	99.02.15 10:12:57
CH	TAG			99-02-15 10:12:50	99-02-15 10:12:43	99-02-15 10:12:30		
01	Temp1	AL1	L	☐				
		AL2	Non					
		AL3	Non					
		AL4	Non					
02	Temp2	AL1	Non					
		AL2	Non					
		AL3	Non					
		AL4	H	☐				
03	Temp3	AL1	Non					
		AL2	Non					
		AL3	Non					
		AL4	Non					
04	Temp4	AL1	L	☐				
		AL2	Non					
		AL3	Non					
		AL4	Non					

Alarm event time

- Can be scrolled by [2] (←) and [3] (→).
- Press [1] (|←) to display the latest alarm event time.

Alarm log

- Example: The low alarm (L) becomes active at the alarm level 1 in CH No. 1 and was reset at 10:12:50.
- Example: The alarm becomes active at 10:12:43 and is still active. (CH No. 2, alarm level 4, high alarm (H))
- Example: The alarm becomes active at 10:12:30 and is still active. (CH No. 4, alarm level 1, low alarm (L))

Alarm type

- H: High alarm
- L: Low alarm
- B: Differential high alarm
- S: Differential low alarm
- U: Rate-of-change increase high alarm
- D: Rate-of-change decrease low alarm
- Non: Not Programmed
- * The current alarm type is displayed.

Alarm event

The bar for event starts or ends at the center of each frame.

Alarm level

Tag

Channel No. (4 channels/screen)

Press the key [4] (↑) or [5] (↓) to increase or decrease the channel number.

- Programming screen set up are not necessary.
- To switch the screen, press the (ENT) key to display the icons.

9.6 Historical Trend Screen

This screen displays the data that has been stored in memory in the trend format. The data can be displayed in two ways; from "a file in the internal memory" of the BR1000 series graphic recorder or from a floppy disc (memory card : optional) (see 11.2.1).

Used memory in files
The file under storing is displayed in green. The file not under storing is displayed in white.
(Example: Memory used in file A is 85%. Endless file is displayed by "EL".)

Alarm activated mark
The red icon blinks if any channel alarm becomes active.

Channel No.
(The scale is fixed by the displayed channel No.)

Current date/time
(Year/Month/Day, Hour/Minute/Second)

Historical trend cursor
Moved by rotating the scroll key. Upward movement (clockwise rotation): Displays new historical trends. Downward movement (counterclockwise rotation): Displays previous historical trends.

Time scale
Time scale of 0.1, 0.2 or 0.5 second: displayed in Minute and Second
Time scale of 1 second or longer: displayed in Hour and Minute.

Scroll cursor position display
The current scroll cursor position is displayed in Year, Month, Day, Hour, Minute, and Second.

Data
Shows the data at the historical trend cursor position.

Scrolling amount display
The scrolling amount per scroll can be programmed by [4] key. ALL: 1 screen scroll by 1 time STD: Standard scrolling amount

Group No.
See [12] in 11.3, "Engineering Parameters Programming". (Displayed when multiple groups are programmed.)

The screenshot shows a graph with a horizontal axis from 0 to 1200 and a vertical axis with time markers at 11:32, 11:36, and 11:40. A red alarm mark is visible. Below the graph is a table of channel data:

CH.01	CH.02	CH.03	CH.04	CH.05	CH.06
250.0	480.0	500.0	607.0	765.0	1075.0

At the bottom of the screen, it shows the current date/time as 01.01.18 10:12:57, a scroll cursor position of 01.01.17 11:33:45, and a scrolling amount of ALL.

- * "Used memory in files" and "Alarm activated mark" display the condition at the current time, even though the historical data is displayed. By this reason, "Alarm activated mark" is not displayed even if the historical data had alarm activated.
- * "Channel No.": Fixed to the channel No. at when the screen turns to the historical trend screen.
- * The trends during the power failure less than 5 minutes become low limit over-range and the data become blank. For the power failure exceeds 5 minutes, the trends after the power failure can not be displayed continuously because the data after the power failure are stored into a separate file. (See 14.14)
- * When the time scale interval is longer than the storage interval, the maximum value and the minimum value of data stored in the time scale interval are displayed at the interval of the time scale as trend format. The maximum and minimum values can be switched on the data display each time (ENT) key is pressed.

• Changing the screen setup

Screen Programming Item	Program Used
(1) To return to the Real-time Trend screen	11.2.4 "Historical Trend Screen Programming" [1] After programming, press the (ENT) key.
(2) To display the desired historical trend position quickly	11.2.4 "Historical Trend Screen Programming" [4] Program the time scale to a longer interval and move the historical trend cursor to the desired position. Then reprogram the time scale to a shorter interval to view the details. (The time scale cannot be decreased lower than the programmed logging "Interval Time" in 11.3 [15] "File".)
	11.2.4 "Historical Trend Screen Programming" [2] The desired historical trend position can be searched and displayed automatically according to the time scale or condition programming.
(3) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key [6] (ACK).

9.7 Dual Trend Screen

This screen displays the real-time and historical trends in 2 rows to allow comparison of the current and past trends. It also displays the real-time and historical data in 2 rows.

Used memory in files
The file under storing is displayed in green. The file not under storing is displayed in white.
(Example: Memory used in file A is 85%. Endless file is displayed by "EL".)

Alarm activated mark The red icon blinks if any channel alarm becomes active.

CH No., tag and engineering unit of the real-time trend
CH. 04 Temp 4

Current date/time
(Year/Month/Day, Hour/Minute/Second)
01.02.15 10:12:57

Chart scale
Real-time trend only
0 200 400 600 800 1000 1200

Real-time trend
11:40

Historical trend
11:36

Historical trend cursor
Moved by rotating the scroll key.
Upward movement (clockwise rotation): Displays new historical trends.
Downward movement (counterclockwise rotation): Displays previous historical trends.

Alarm activated channel
The alarm activated channel in the real-time trend is displayed in red

Real-time data
Over-range display: +OVER
Under-range display: -OVFR

CH.01	CH.02	CH.03	CH.04	CH.05	CH.06
+OVER	290.0	395.0	500.0	640.0	803.0
310.0	425.0	670.0	860.0	970.0	1140.0

Historical data
Displays the data at the cursor position.
01.01.17 11:33:45

Scroll cursor position display
The current scroll cursor position is displayed in Year, Month, Day, Hour, Minute, and Second.

Scrolling amount display
The scrolling amount per scroll can be programmed by [4] key.
ALL: 1 screen scroll by 1 time STD: Standard scrolling amount

Group No.
See [12] in 11.3, "Engineering Parameters Programming".
(Displayed when multiple groups are programmed.)

* When the time scale interval is longer than the storage interval, the maximum value and the minimum value of data stored in the time scale interval are displayed at the interval of the time scale as trend format.

The maximum and minimum values can be switched on the data display each time (ENT) key is pressed.

• Changing the screen setup

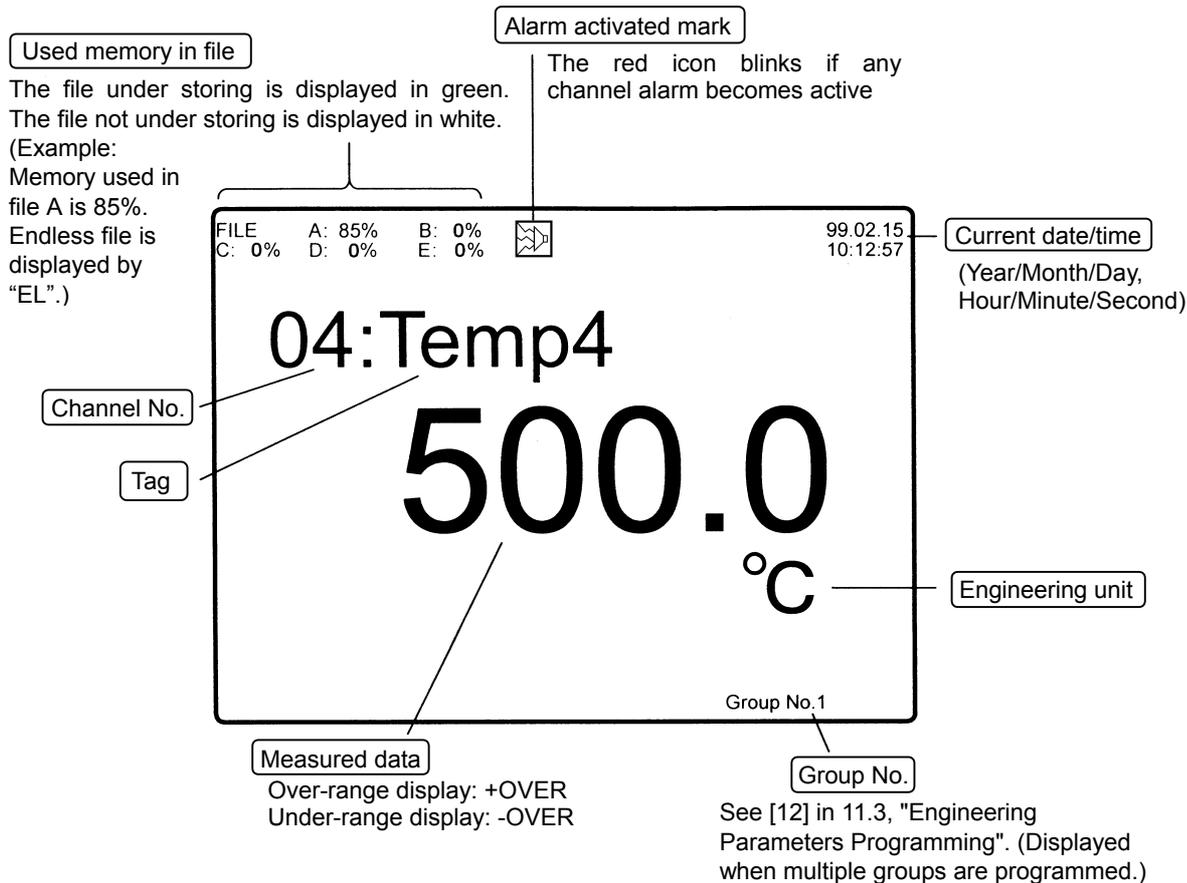
Screen Programming Item	Program Used
(1) To return to the Real-time Trend screen	11.2.5 "Dual Trend Screen Programming" [1]
(2) To display the desired historical trend position quickly	11.2.4 "Historical Trend Screen Programming" [4] Program the time scale to a longer interval and move the historical trend cursor to the desired position. Then reprogram the time scale to the shorter interval to view the details. (The time scale cannot be decreased lower than the programmed logging "Interval Time" in 11.3 [15] "File".)
	11.2.4 "Historical Trend Screen Programming" [2] The desired historical trend position can be searched and displayed automatically according to the time scale or condition programming.
(3) To increase the trend line width	11.2.5 "Dual Trend Screen Programming" [3]
(4) To change the time scale interval	11.2.5 "Dual Trend Screen Programming" [4]
(5) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key [6] (ACK).

9.8 Magnified Data Screen

This screen displays the magnified data of each channel selected.

[How to display the screen]

- (1) Select " [2] Auto Data Scan" in 11.2.3 "Data Screen Programming", and press the key [6].
- (2) Move the cursor to "Data Scan" and press the key [6].
- (3) Move the cursor to "Enable" and press the (ENT) key.
- (4) Press the key [1] twice to display the screen as shown below.

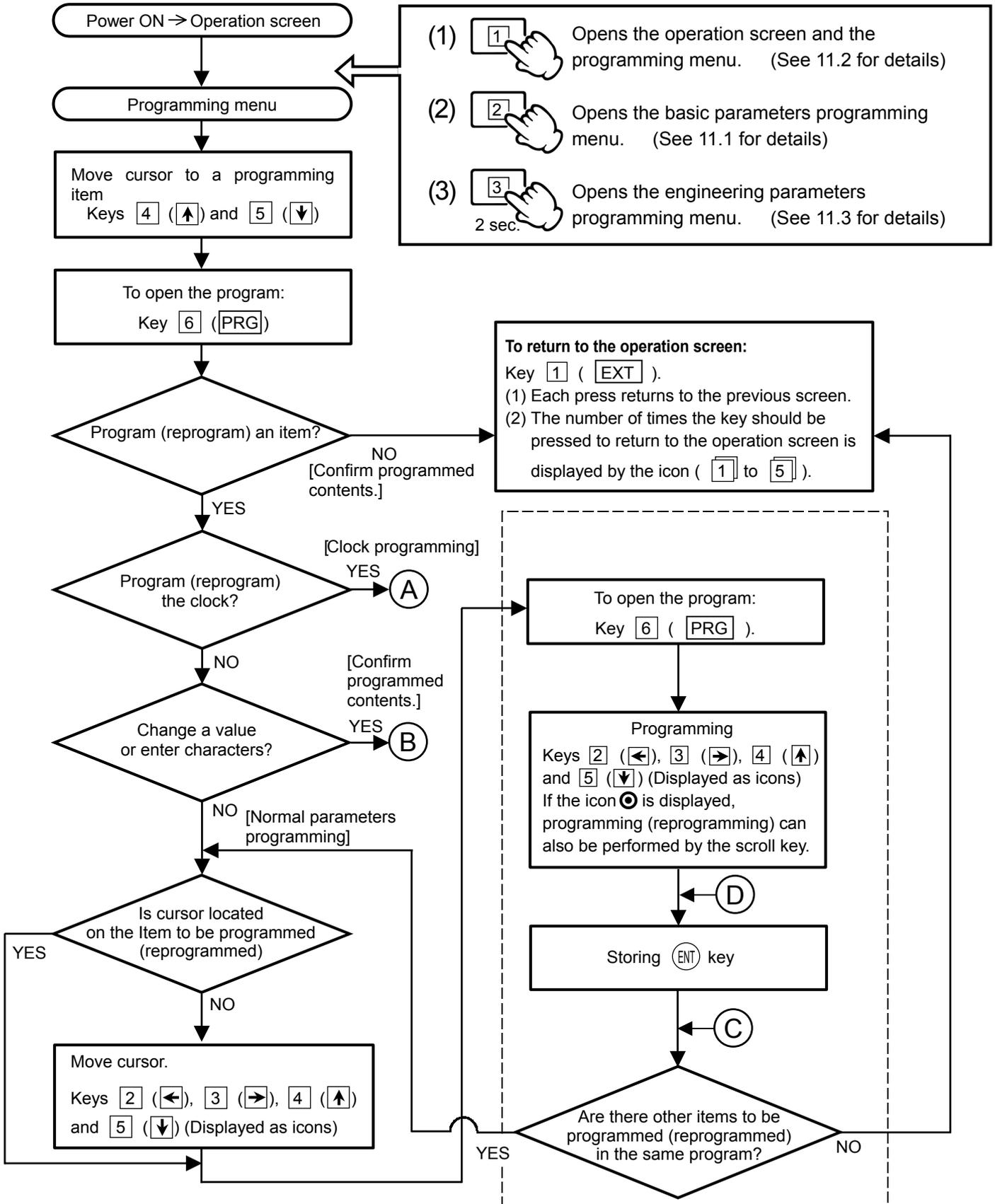


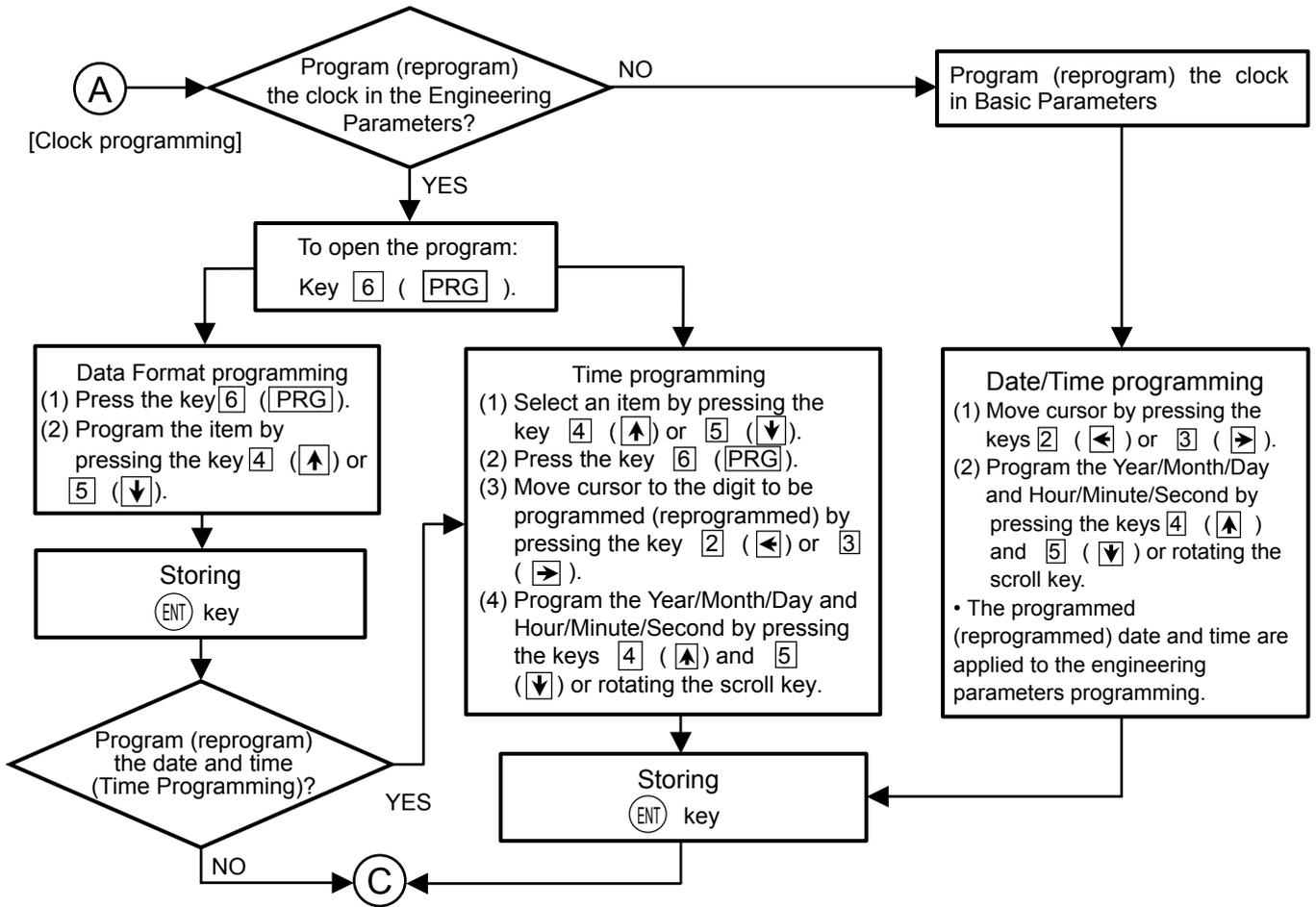
• Changing the screen setup.

Screen Programming Item	Program Used
(1) To increase (or decrease) the channel switching interval	11.2.3 "Data Screen Programming" [2]
(2) To display only the specific channel	11.2.3 "Data Screen Programming" [1] (This programming is also applied to the Data Screen.)
(3) To return the Magnified Data screen to the Data screen	In 11.2.3 "Data Screen Programming" [2], select "Disable" and then press the key [1] .
(4) To stop blinking of the alarm activated mark (red)	Check the alarm activated place(s) and press the key [6] (ACK).

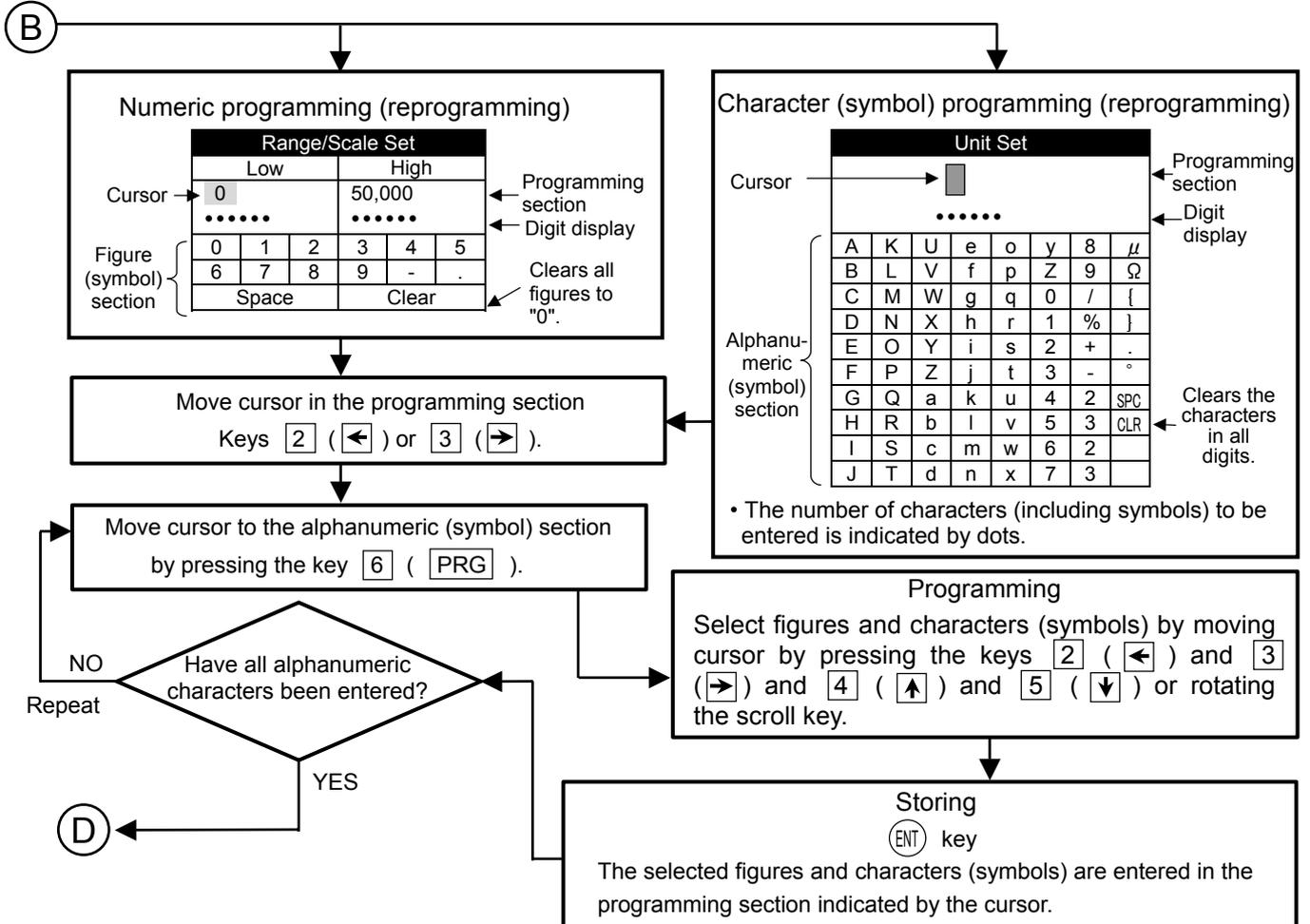
10 BASIC PROGRAMMING/OPERATION FLOWCHART

There are three kinds of programming operations including the "Basic parameters programming", "Operation screen programming" and "Engineering parameters programming". The key operations for opening the programs or programming/selecting the items are basically common to these operations.



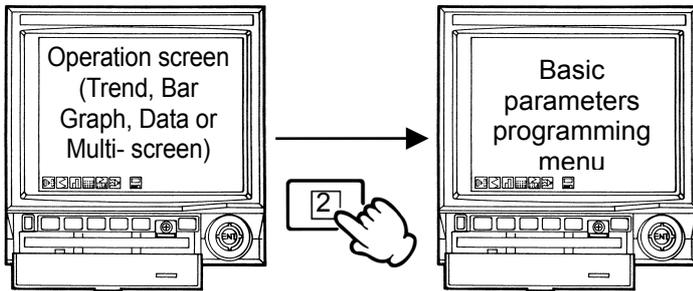


[Value/character entry]



11 PROGRAMMING

11.1 Basic Parameters Programming



Programming method
Refer **10** "BASIC PROGRAMMING/OPERATION FLOWCHART".

This programming allows you to program (reprogram) or confirm inputs, maths expression, alarms and clock without programming the engineering parameters. This programming can be executed even when a password has been programmed at the engineering parameters. (The programmed (reprogrammed) parameters are applied to the engineering parameters.)

However, the programming (reprogramming) of the basic parameters has some restriction if "[16] Operator Access Entry" in 11.3 "Engineering Parameters Programming" has been programmed.

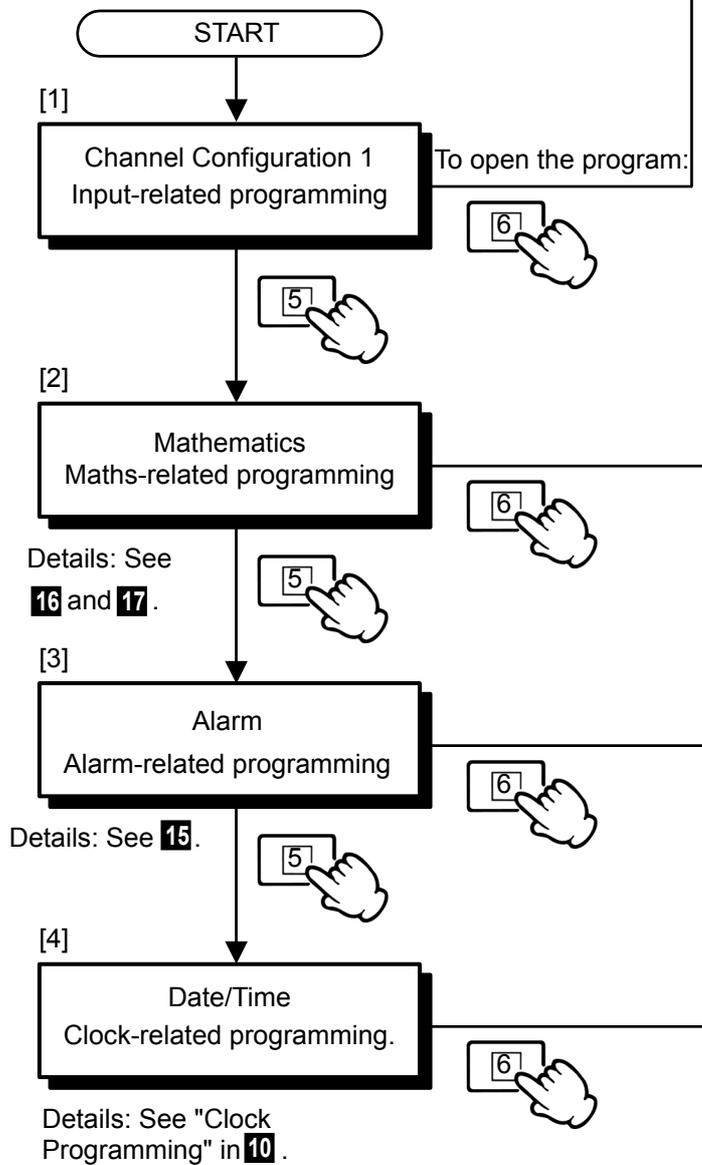
⚠ CAUTION

When the following parameters are programmed, all of the past data is erased except for the data stored in files. For restriction of these parameters programming, refer to "[16] Operator Access Entry" in 11.3, "Engineering Parameter Programming".

- ① Channel Configuration 1
- ② Maths Expressions
- ③ Date/Time

Furthermore when the following parameters are programmed, storing of data in files is terminated, and the data is stored in new files. (The extension of files is updated. See **14**)

- ① Channel Configuration 1
- ② Maths Expressions
- ③ Date/Time, Daylight Saving
- ④ Unit, tag and RJ (Channel Configuration 2)
- ⑤ Group Display
- ⑥ Format of trend displays



REFERENCE

Pressing the key **1** (**EXT**) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by **1** to **5** at the bottom left of the screen.

Channel Configuration 1

Input Input type programming.
Input Range (L/H) Input range programming.
Scale (L/H) Scale programming.
Scale Disp (L/H) Scale display range programming.

Programming of mV, V, thermocouples, resistance thermometers, etc. for each channel. Sample: Dummy input. Number: Input by range number (see the range list on the next page).

Temperature input example: (K) -200 to 1370°C 0 to 1000°C
mV/V input example: (5 V) -5 to -5 V 0 to 5 V

Temperature input: No programming required. (Auto programming)
mV/V input example: 0 to 5 0 to 100

Programming range: Automatic programming based on "Scale programming". Reprogramming can be executed as desired.

Maths Parameters

Mathematics Maths expressions programming.
Scale Disp (L/H) Display range programming.
Data Dot Data decimal point programming.
Input CH Input channel programming.
Parameter Maths parameter programming

Arithmetic 1, Arithmetic 2, Square Root, Integration (Totalising), Log(e) (Natural Logarithm), Log(10) (Logarithm), Humidity (humidity/temperature calculation), e to the Power (exponential), Max., Min., Ave., Communi. in (data communications input).

Action(Analog): Operation record for input
Action(Digital): Operation record for remote contacts

Programming range: -9999 to 99999 (down to 3 digits below decimal)

Programming range: 0 to 3

Programming range: 01 to 30 (CH)

Programming range: -9999 to 99999 (down to 3 digits below decimal)

For programming "start time" and "interval time", both hour and minute should be programmed.

Alarm Parameters

Types Alarm type programming.
Relay Alarm relay count programming.
Mode Output mode programming.
Alarm Point Alarm value programming.
Ref. CH Comparison reference channel (differential alarm) programming.
Sample Sampling count (rate-of-change alarm) programming
Hys. Alarm dead band programming.

H: High alarm, L: Low alarm, B: Differential high alarm
S: Differential low alarm, U: Rate-of-change increase alarm
D: Rate-of-change decrease alarm, Non: Not programmed

Programming range: 00 to 06 (00: Alarm output terminals not specified)

Programming range: OR connection or AND connection

Programming range: -9999 to 99999 (down to 3 digits below decimal)

Programming range: 01 to the number of channels (when the alarm type is programmed to B or S).

Programming range: 01 to 20 (when the alarm type is programmed to U or D).

Programming range: 0 to 99999 (down to 3 digits below decimal)

Date/Time

Date Year/Month/Day programming.
Time Hour/Minute/Second programming.

Programming example: 99.03.05 (March 5, 1999)

Programming example: 09:25:30 (9 o'clock 25 minutes 30 sec. AM)

(Range List)

Input Type		Measuring Range			Decimal Places	Range No.	Automatic Range Programming*	
Thermocouples	K	-200.0	to	300.0	°C	1	21	A0
		-200.0	to	600.0	°C	1	22	
		-200	to	1370	°C	0	23	
	E	-200.0	to	200.0	°C	1	24	A1
		-200.0	to	350.0	°C	1	25	
		-200	to	900	°C	0	26	
	J	-200.0	to	250.0	°C	1	27	A2
		-200.0	to	500.0	°C	1	28	
		-200	to	1200	°C	0	29	
	T	-200.0	to	250.0	°C	1	30	A3
		-200.0	to	400.0	°C	1	31	
	R	0	to	1200	°C	0	32	A4
		0	to	1760	°C	0	33	
	S	0	to	1300	°C	0	34	A5
		0	to	1760	°C	0	35	
	B	0	to	1820	°C	0	36	36
	N	-200.0	to	400.0	°C	1	37	A6
		-200.0	to	750.0	°C	1	38	
		-200	to	1300	°C	0	39	
	W-WRe26	0	to	2315	°C	0	40	40
WRe5-WRe26	0	to	2315	°C	0	41	41	
PtRh20-PtRh5	0	to	1800	°C	0	42	42	
PtRh40-PtRh20	0	to	1888	°C	0	43	43	
NiMo-Ni	-50.0	to	290.0	°C	1	44	AA	
	-50.0	to	600.0	°C	1	45		
	50	to	1310	°C	0	46		
CR-AuFe	0.0	to	280.0	°C	1	47	47	
Platinel II	0.0	to	350.0	°C	1	48	A9	
	0.0	to	650.0	°C	1	49		
	0	to	1395	°C	0	50		
U	-200.0	to	250.0	°C	1	51	A7	
	-200.0	to	500.0	°C	1	52		
	-200.0	to	600.0	°C	1	53		
L	-200.0	to	250.0	°C	1	54	A8	
	-200.0	to	500.0	°C	1	55		
	-200	to	900	°C	0	56		

* Used in range programming through communications.

Remarks

On the range setting (input range) for thermocouples, when you change the default range into the range with the mark in the table above, the decimal place is automatically put.

Example: When the input of K is selected, the range of -200 to 1370 is set as default value.

When the default range is changed into the range of -200 to 300,



It is registered as the range of -200.0 to 300.0 by automatically putting the decimal place. When you want to change the decimal place of this range, change the scale range as follows. (For the details, refer to the setting example of the decimal place.)

Scale range: -200 to 300

Input Type		Measuring Range			.Decimal Places	Range No	Automatic Range Programming*	
DC Voltage		-13.80	to	13.80	mV	2	01	01
		-27.60	to	27.60	mV	2	02	02
		-69.00	to	69.00	mV	2	03	03
		-200.0	to	200.0	mV	1	04	04
		-500.0	to	500.0	mV	1	05	05
		-2.000	to	2.000	V	3	06	06
		-5.000	to	5.000	V	3	07	07
		-10.00	to	10.00	V	2	08	08
		-20.00	to	20.00	V	2	09	09
		-50.00	to	50.00	V	2	10	10
Resistance bulb thermometer	Pt100 (JIS'97)	-140.0	to	150.0	°C	1	70	AB
		-200.0	to	300.0	°C	1	71	
		-200.0	to	850.0	°C	1	72	
	Pt100 (QPt100) (JIS'89)	-140.0	to	150.0	°C	1	73	AD
		-200.0	to	300.0	°C	1	74	
		-200.0	to	649.0	°C	1	75	
	JPt100	-140.0	to	150.0	°C	1	76	AC
		-200.0	to	300.0	°C	1	77	
		-200.0	to	649.0	°C	1	78	
	Pt50	-200.0	to	649.0	°C	1	79	79
Pt-Co	4.0	to	374.0	K	1	80	80	

* Used in range programming through communications.

Remarks

Decimal places of measured values - Even if decimal places are programmed in input ranges or scales, the exact decimal places of measured values are decided by a range as shown in the left and above tables. For changing decimal point, refer to the tables.

An example of decimal places

Voltage range				Temperature Range			
① When a range is equal to a scale ;				① For increasing the decimal places ;			
Type/Range	Scale	An example of measured values	Note	Type/Range	Scale	An example of measured values	Note
5V/0.0 to 5.0	0.0 to 5.0	5.000	1	K/0 to 1200	0.0 to 1200.0	850.0	
	0 to 5	5	2	K/0.0 to 1200.0	0.0 to 1200.0	850	1
5V/0 to 5	0.0 to 5.0	5.0		Note 1 : Decimal places of measured value are fixed by range when the range is equal to the scale.			
Note 1 : Decimal places of measured value are fixed by a range when the range is equal to a scale.				② For decreasing the decimal places ;			
Note 2 : Decimal places of programmed scale become effective because different decimal places are programmed on a range and a scale. See ②.				Type/Range	Scale	An example of measured values	Note
② When a scale is programmed with the different value from a range ; The decimal places of programmed scale become effective.				E/0~200	0~200	120.0	
					0~200.0	120	1
				Note 1 : Conforms to the decimal places rule.			

Decimal places rule

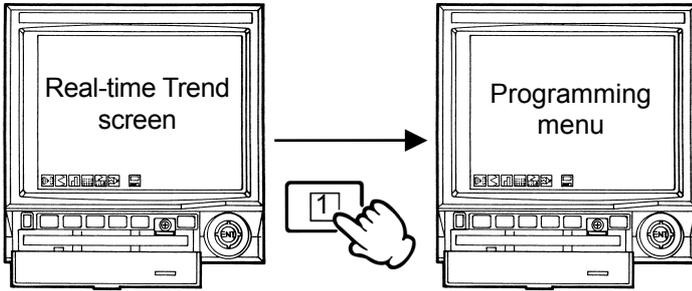
If the decimal places of lower-limit value and higher-limit value are different, the decimal places, whichever is smaller, is adopted.

(Example) 0.00 to 100.0 ⇒ 0.0 to 100.0

11.2 Operation Screen Programming

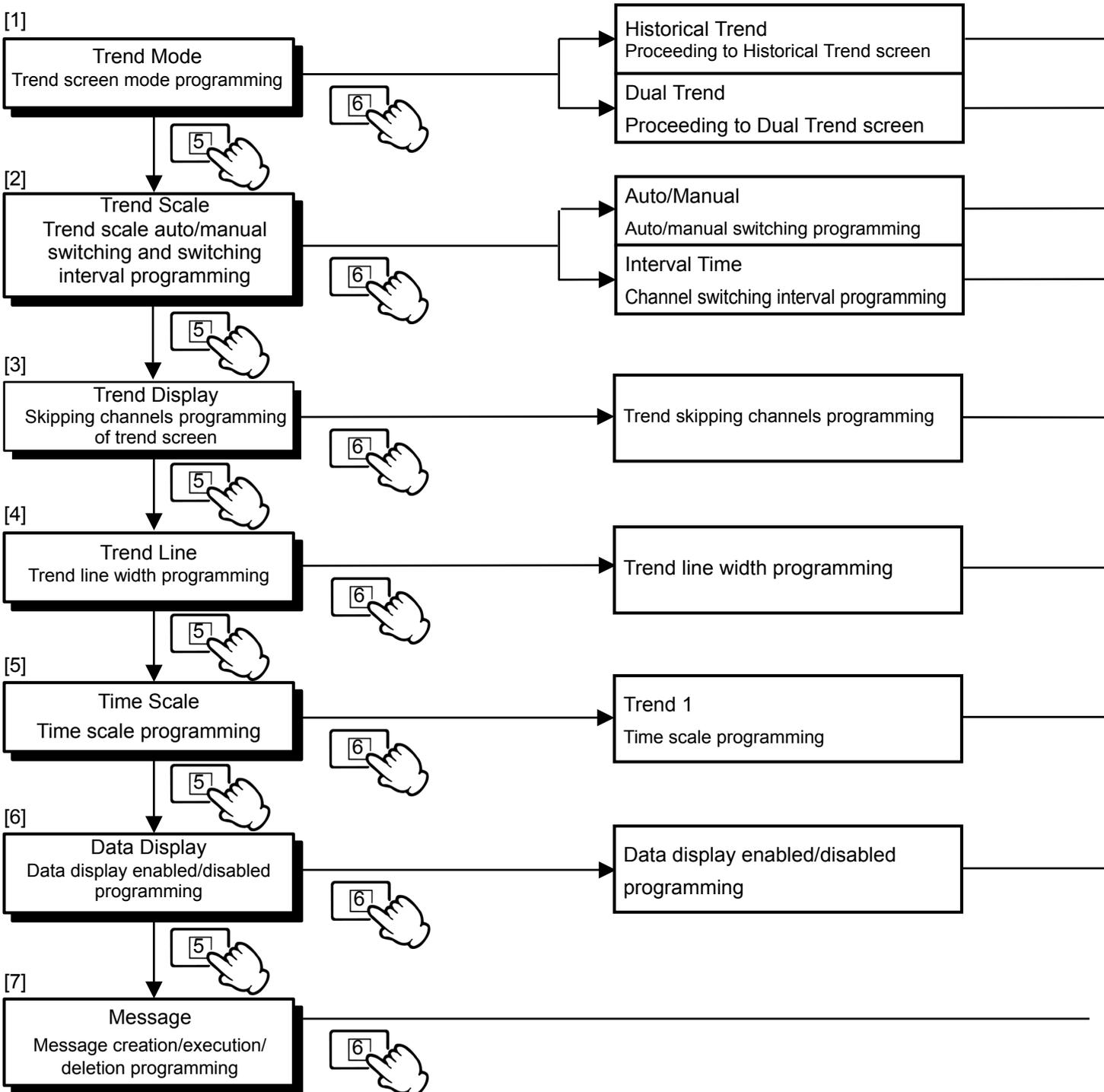
The Multi- and Alarm Summary screens do not have any programming parameters.

11.2.1 Real-time Trend Screen Programming



You can program (reprogram) the screen displaying the real-time trend of data being measured into screens displaying the trends in various modes.

The programming menu can also be used to display the measured data stored in the files in the internal memory or stored in an external memory [FD (memory card: optional)].



Remarks

Data stored in the built-in RAM can be displayed on the Real-time Trend screen. However, since the data stored in the built-in RAM is updated automatically, the data should be saved in files in the internal memory as required (see **14**).

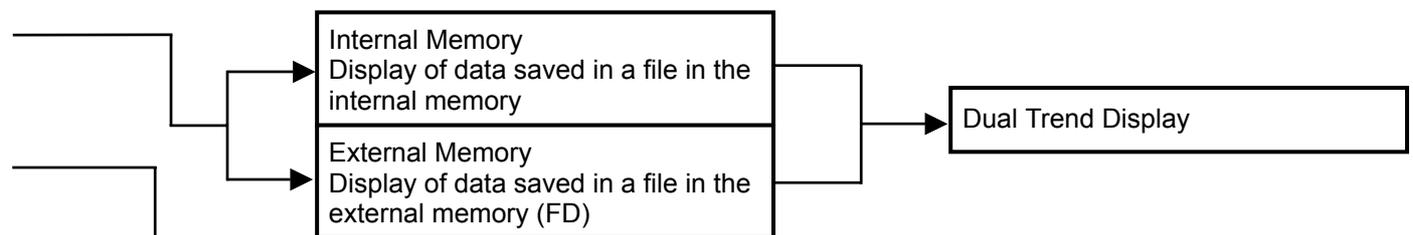
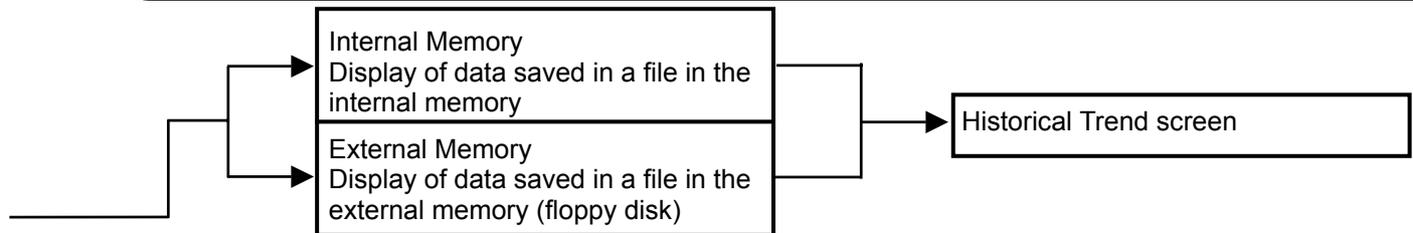
If you do not execute the storage (file open) after programming a file(s), the data can not be stored.

Note that the data stored in the built-in RAM cannot be displayed on the Dual Trend screen.

(1) Press and hold the **ENT** key for 2 seconds to display the cursor.

(2) To display the historical trends, move the cursor by rotating the scroll key.

(3) To return to the Real-time Trend screen, press and hold the **ENT** key for 2 seconds.

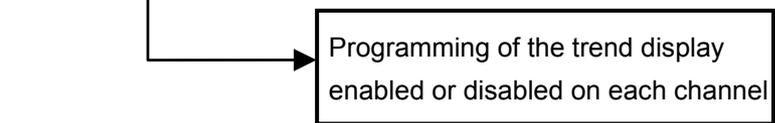


Auto: The trend scale (channel) is switched by the programmed "Interval Time.

Manual: By the scroll key.

* If the icons are displayed, operate after removing the icons.

Programming range: 3, 5, 10, 20, 30 seconds



Selection of width (1-dot or 3-dot)

When multiple display groups have been programmed, the time scale can be programmed for each group. Program the time scale while the display group to be programmed is displayed.

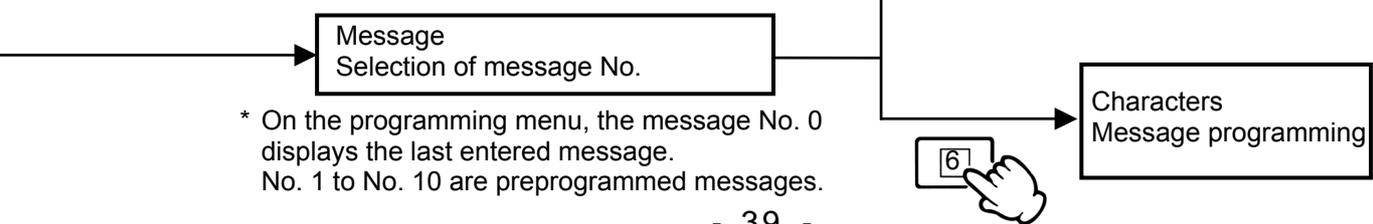
* From 1 second for Model BR17A2 , from 2 seconds for Model BR17B2 and from 5 seconds for Model BR1761

For Model BR17 3, the time scale can be set from 1 second on the real-time display but can be set from 0.1 second on the replay of data stored in built-in RAM.

(See the above **Remarks** .)

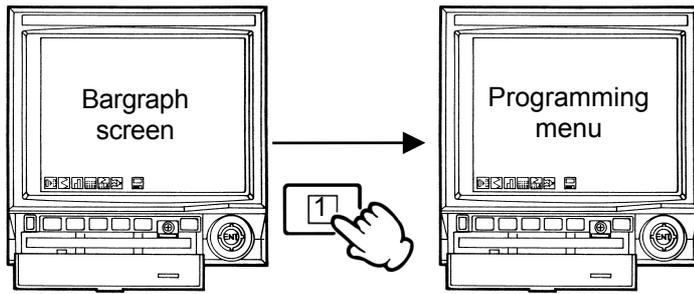
When the data display is disabled, the time scale for the trend display can be extended.

During display of data stored in the built-in RAM, a message can be entered on the past trends by moving the cursor to the time where you want to add a message and pressing the **ENT** key.

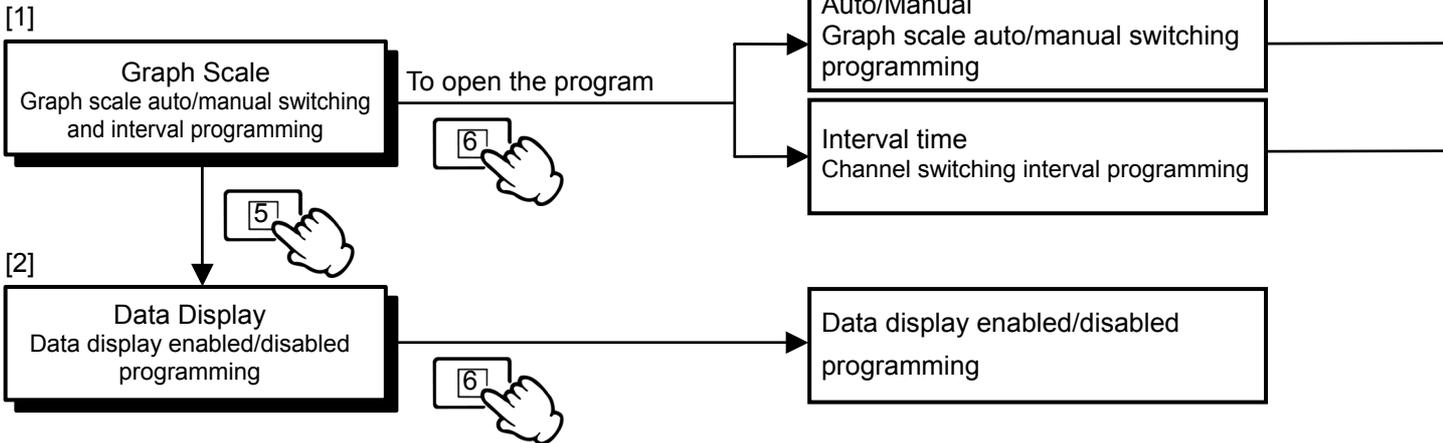


* On the programming menu, the message No. 0 displays the last entered message. No. 1 to No. 10 are preprogrammed messages.

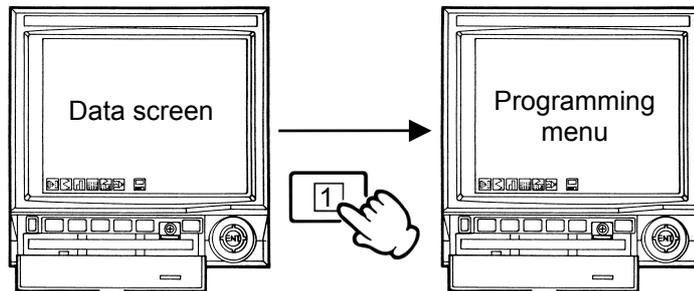
11.2.2 Bargraph Screen Programming



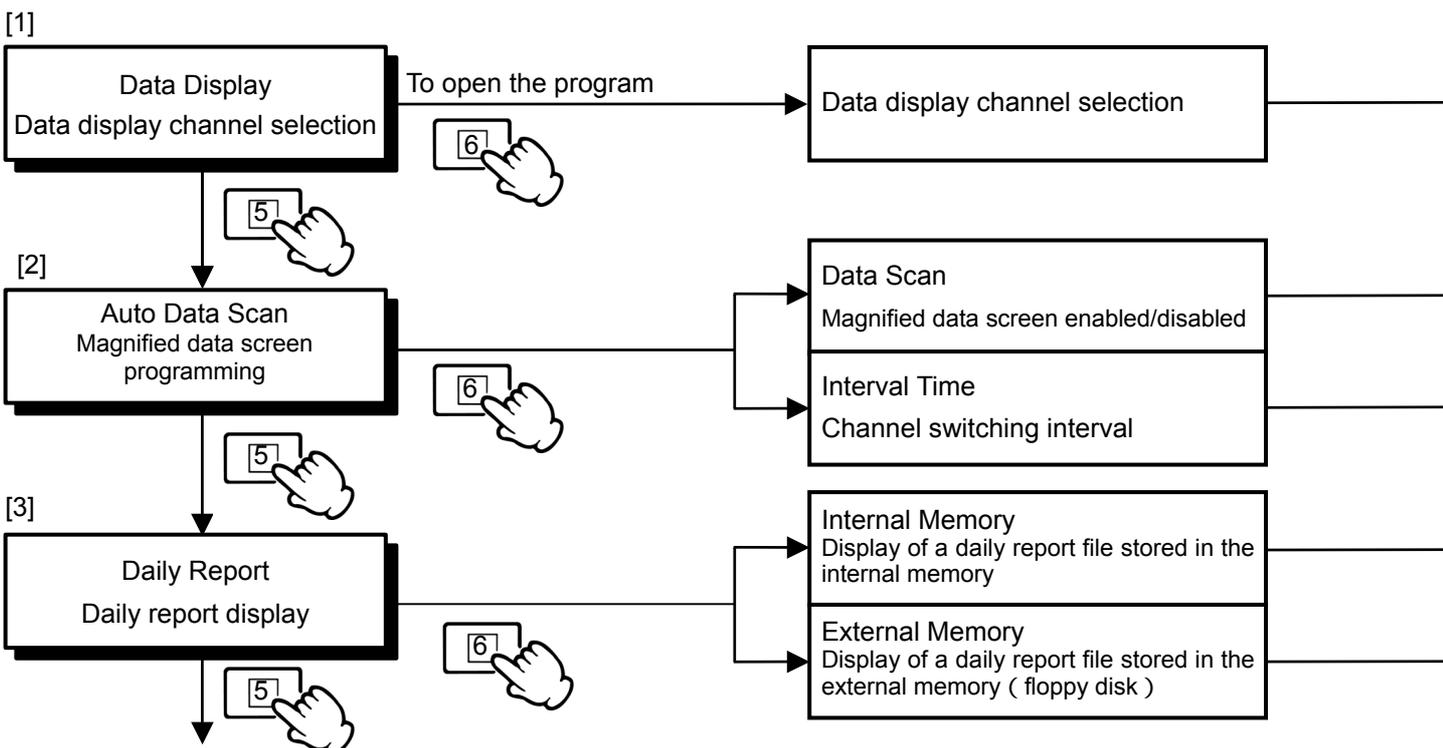
You can program (reprogram) the bargraph screen displaying the data being measured.



11.2.3 Data Screen Programming



You can program (reprogram) the data screen displaying the data being measured.



Auto: The trend scale (channel) is switched by the programmed "Interval Time.

Manual: By the scroll key.

* If the icons are displayed, operate after removing the icons.

Programming range: 3, 5, 10, 20, 30 seconds

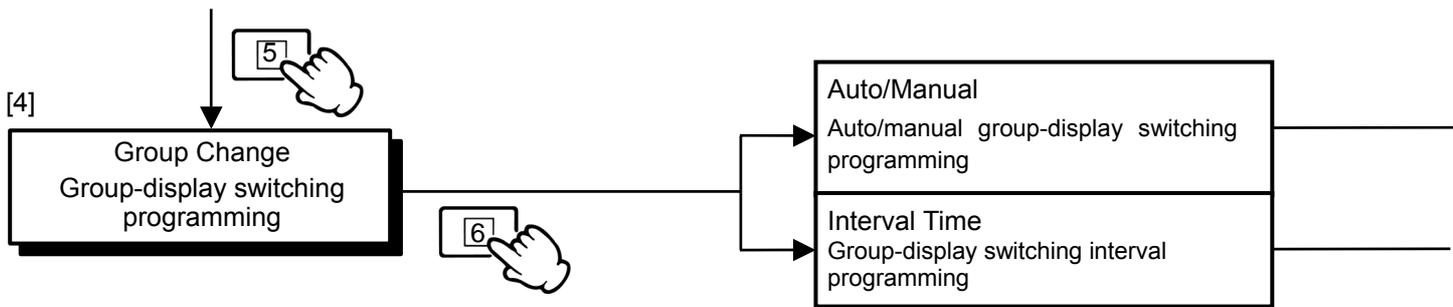
Programming of the data display enabled or disabled on each channel

Enabled: Magnified data screen (Multi-point sequential display) (see **9** 9.8).

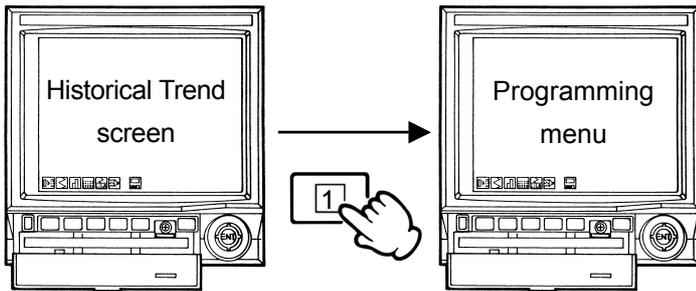
(For programming the magnified data screen only.)

Programming range: 3, 5, 10, 20 or 30 seconds.

Select the stored daily report file name.(The report can be displayed from a closed file only.)

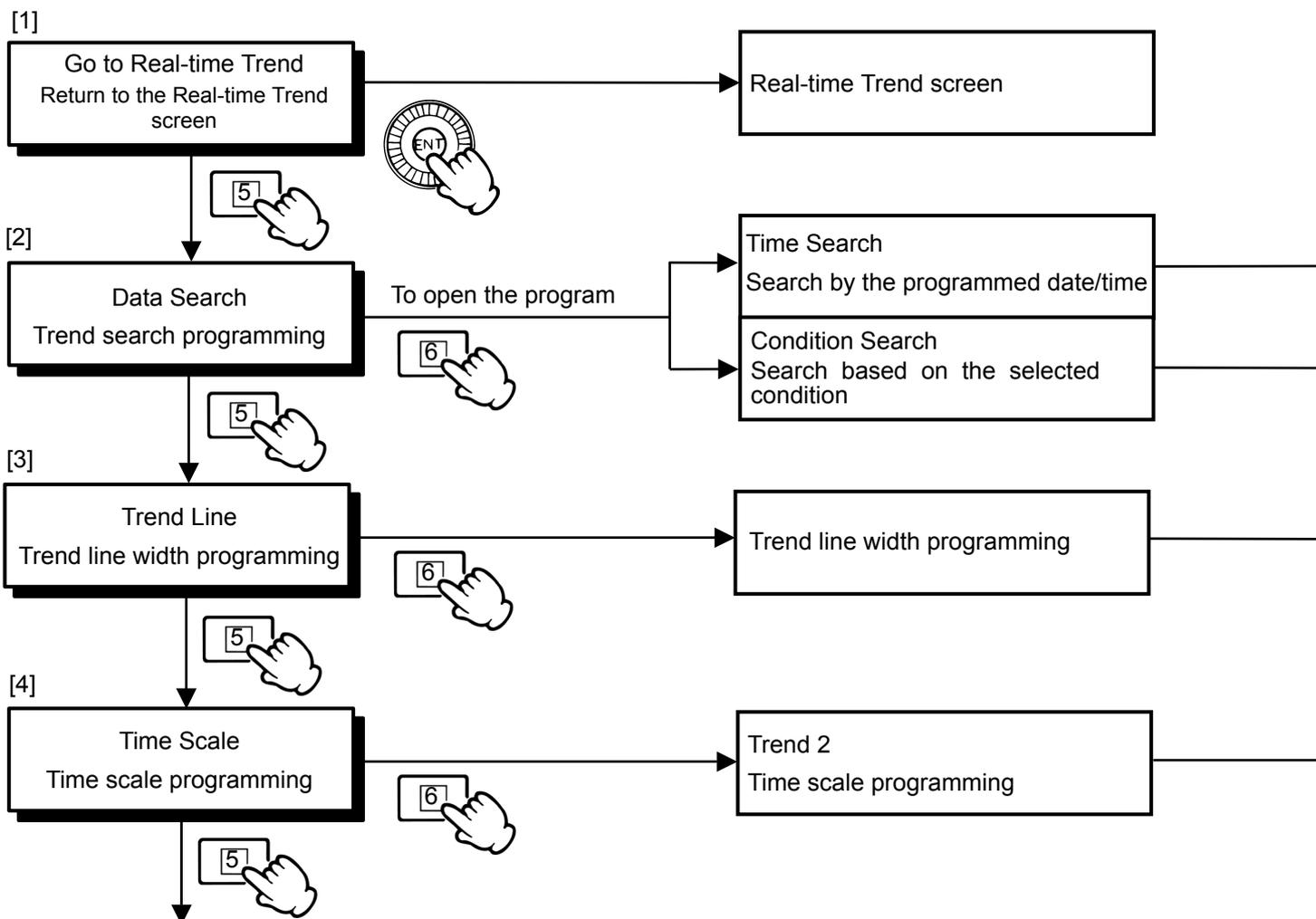


11.2.4 Historical Trend Screen Programming



Begin with the Historical Trend screen programmed in 11.2.1 "Real-time Trend Screen Programming".

This screen displays the trends of historical data stored in the internal file of the BR1000 graphic recorder or stored in a floppy disc (memory card: optional).



Auto : The group-display is switched by the programmed "Interval Time".

Manual : By (ENT) key.

Programming range: 3, 5, 10, 20, 30 seconds

Remarks

Be careful that the data may not be stored in the internal memory or a floppy disk (memory card: optional) due to a too short storing interval.

Example: If the storage start time is almost same as the storage end time, data may not be stored depending on the measuring interval.

By programming a date/time, trends at the programmed time are displayed.

Data is searched in the direction from the time at the cursor place to the current time.

*Data can not be searched in the direction to the past time.

By programming a condition, data is searched in the direction from the time at the cursor place to the latest time and the oldest trends that match the condition are displayed.

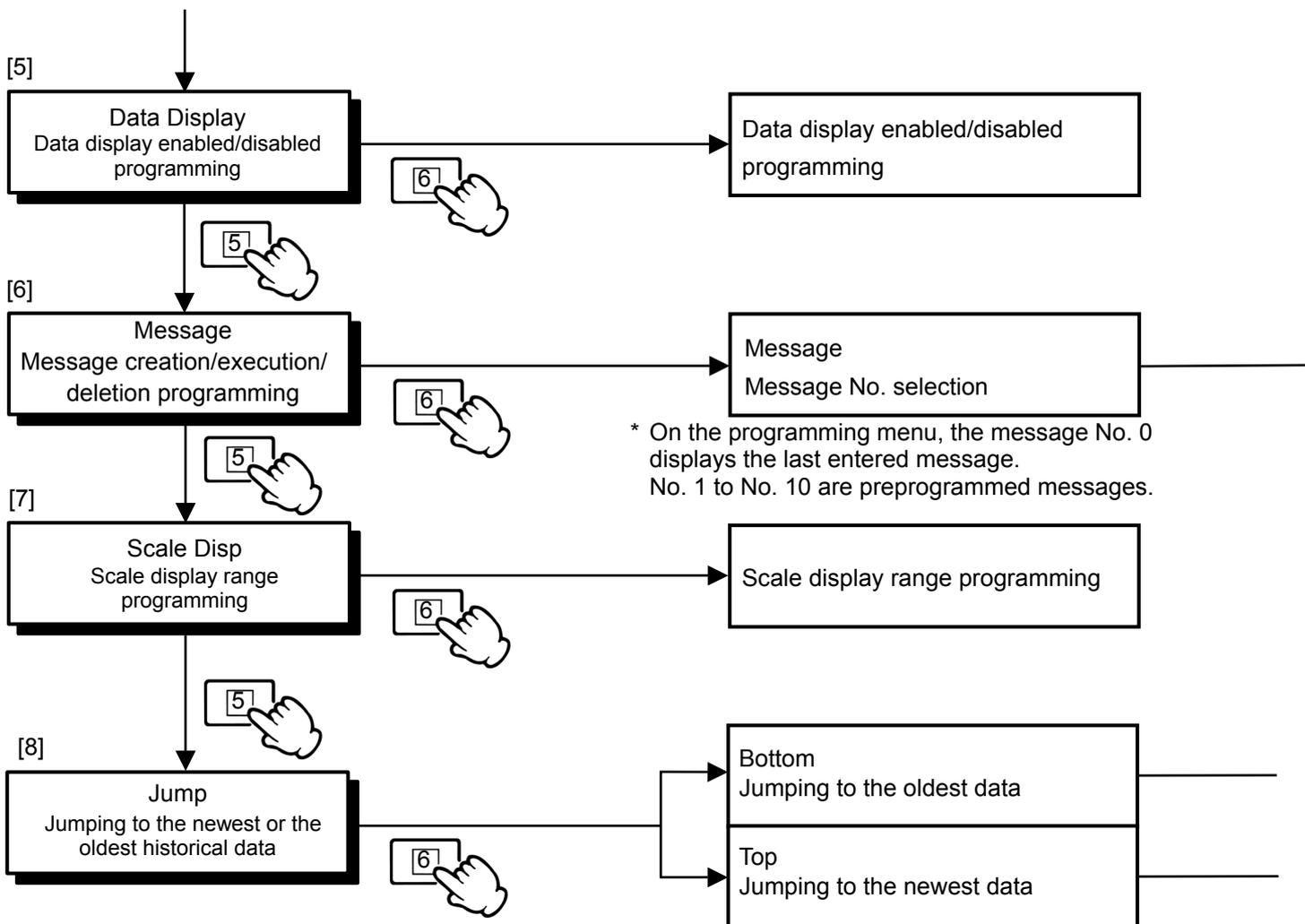
*Data can not be searched in the direction to the past time.

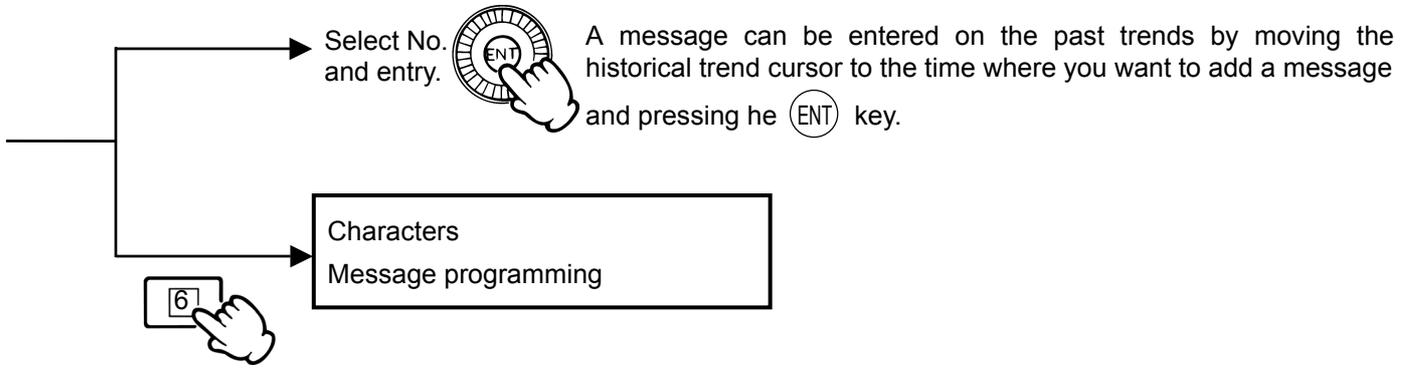
* For re-searching from the past time, it is necessary to compress the time scale for placing the cursor to the past time.

Selection of width (1-dot or 3-dot)

Programming of the historical trend time scale

The time scale shorter than the programmed storage interval time (See 14.7 Storage Interval Time) can not be programmed.





———— The historical trend with the oldest data is displayed.

———— The historical trend with the newest data is displayed.

(1) How to switch a scale display range on a historical trend screen

The historical trend screen is normally displayed with the scale display range programmed for the 1st channel on the real-time trend screen, but can be displayed with a scale display range programmed for other channels.

(1) Program the trend scale on the real-time trend screen to manual.

(See 11.2.1 Real-time trend screen programming.)

(2) On the real-time trend screen, switch to the channel with the scale display range to be displayed on the historical trend screen (See 11.2.1 Real-time trend screen programming.)

(3) The historical trend screen is displayed with the scale display range of the channel switched on the real-time trend screen.

(2) How to delete messages

The messages executed on the real-time trend screen, the historical trend screen, and the dual trend screen can be deleted.

Real-time trend screen:

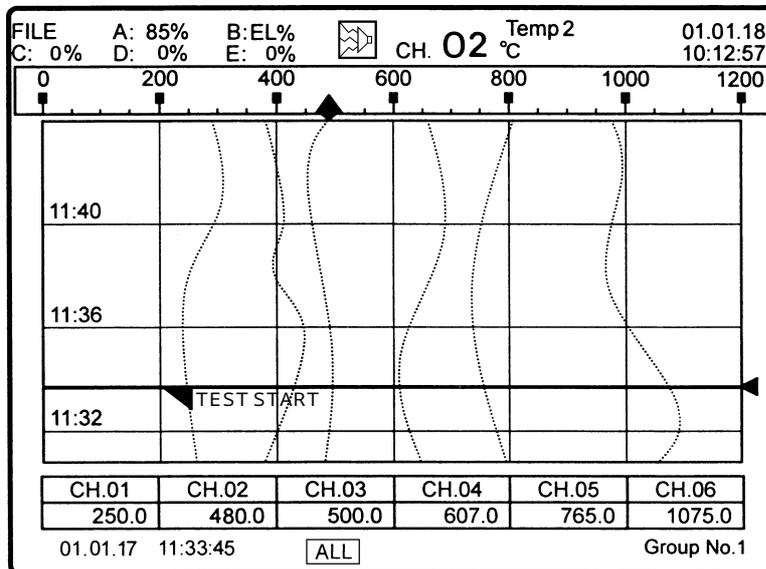
On the message programming screen, move the cursor DEL and then press **ENT** key to display a message delete execution screen. For deletion of message, press **ENT** key again.

* NOTE: The newest message is deleted on a real-time trend screen.

Historical trend screen and Dual trend screen:

(1) As shown in the following figure, move the scroll cursor to the message to be deleted.

(2) On the message programming screen, move the cursor to DEL and then press **ENT** key to display a message delete execution screen. For deletion of message, press **ENT** key again.

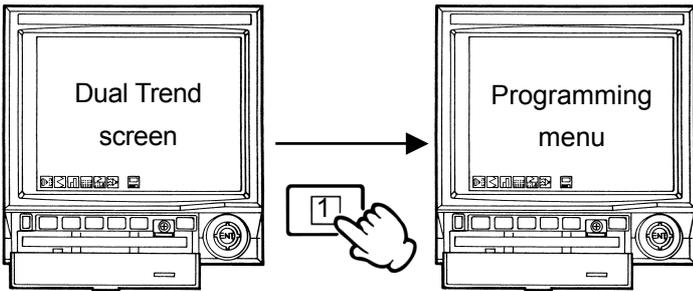


For quick searching a past data on the historical-trend screen

1. Program the time scale to a longer interval and move the historical trend cursor to the desired position. Then reprogram the time scale to a shorter interval to view the details. (See 9.6.)
2. Switch the scrolling volume display to ALL and scroll the screen (one screen up per one scroll). After scrolling to display the data targeted, switch to STD and then move the cursor to the data.
3. The desired historical trend position can be searched and displayed automatically according to the time scale or condition programming. (See 9.6.)

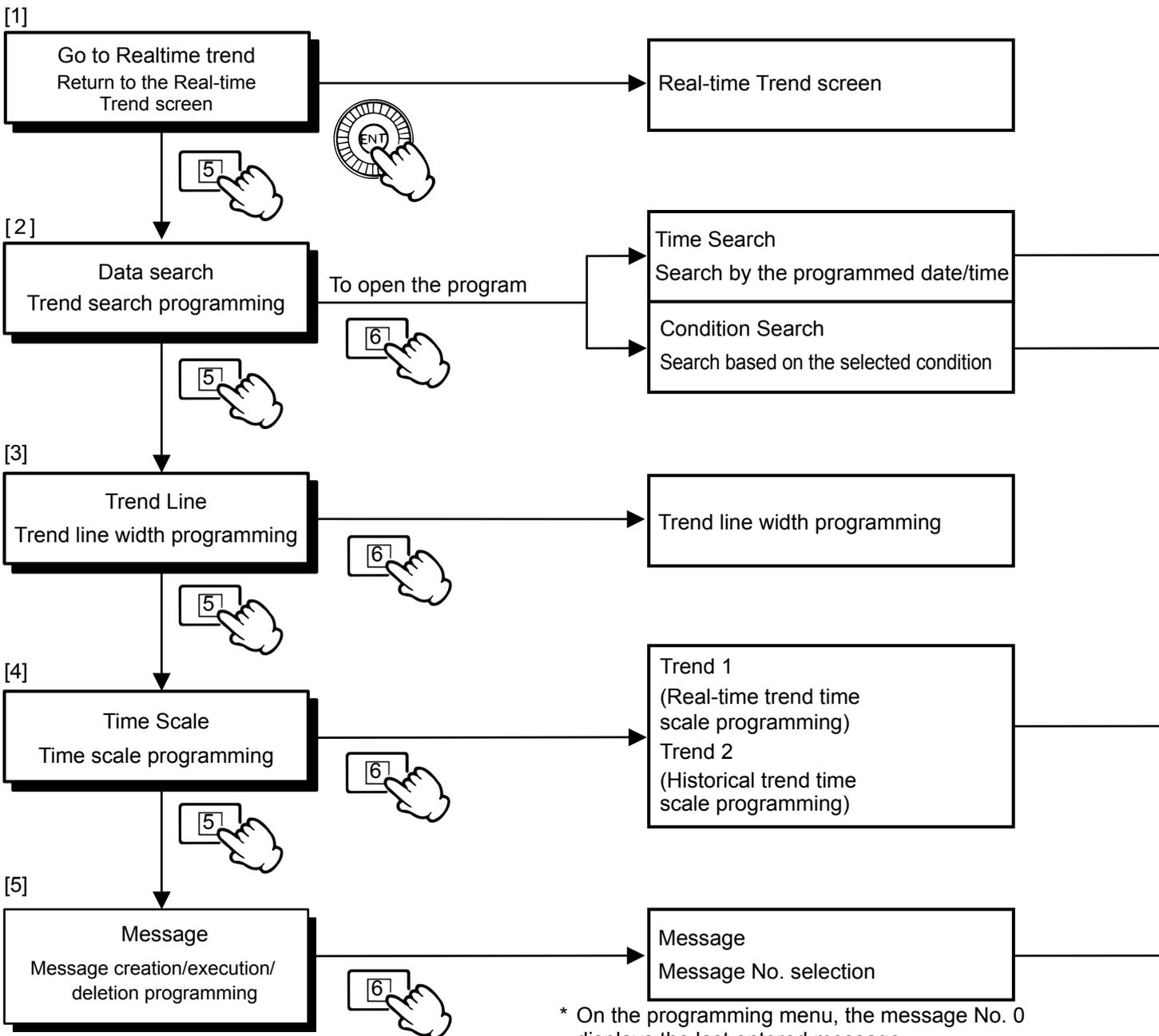
MEMO

11.2.5 Dual Trend Screen Programming



Begin with the Dual Trend screen programmed in 11.2.1 "Real-time Trend Screen Programming".

This screen divides the chart display area into two rows on the top and bottom, and displays the real-time trends in the upper row and the historical trends in the bottom row.



* On the programming menu, the message No. 0 displays the last entered message. No. 1 to No. 10 are preprogrammed messages.

Remarks

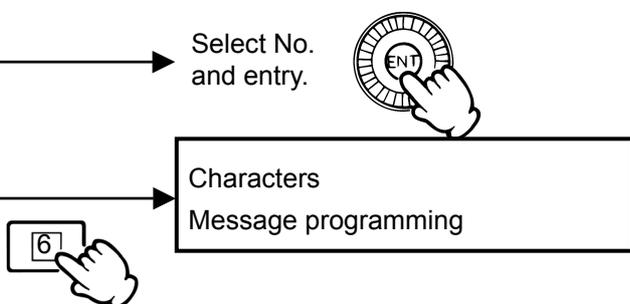
1. For the Dual Trend screen, the data stored in the built-in RAM cannot be displayed in the real-time trend display
2. A message can be entered only at the current time in the real-time trend display.

By programming a date/time, trends at the programmed time are displayed.
Data is searched in the direction from the time at the cursor place to the current time.
*Data can not be searched in the direction to the past time.

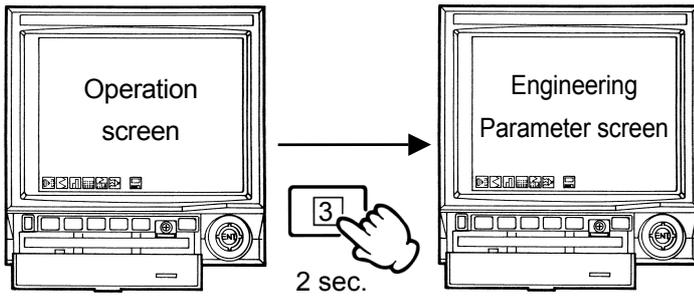
By programming a condition, data is searched in the direction from the time at the cursor place to the latest time and the oldest trends that match the condition are displayed.
*Data can not be searched in the direction to the past time.

*For re-searching from the past time, it is necessary to compress the time scale for placing the cursor to the past time.

* The time scale programming on the real-time trend is from 1 second for Model BR17A2, from 2 seconds for Model BR17B2, from 5 seconds for Model BR1761, and from 1 second for Model BR17 3. The time scale shorter than the programmed storage interval time (see 14.7 storage Interval Time) can not be programmed.

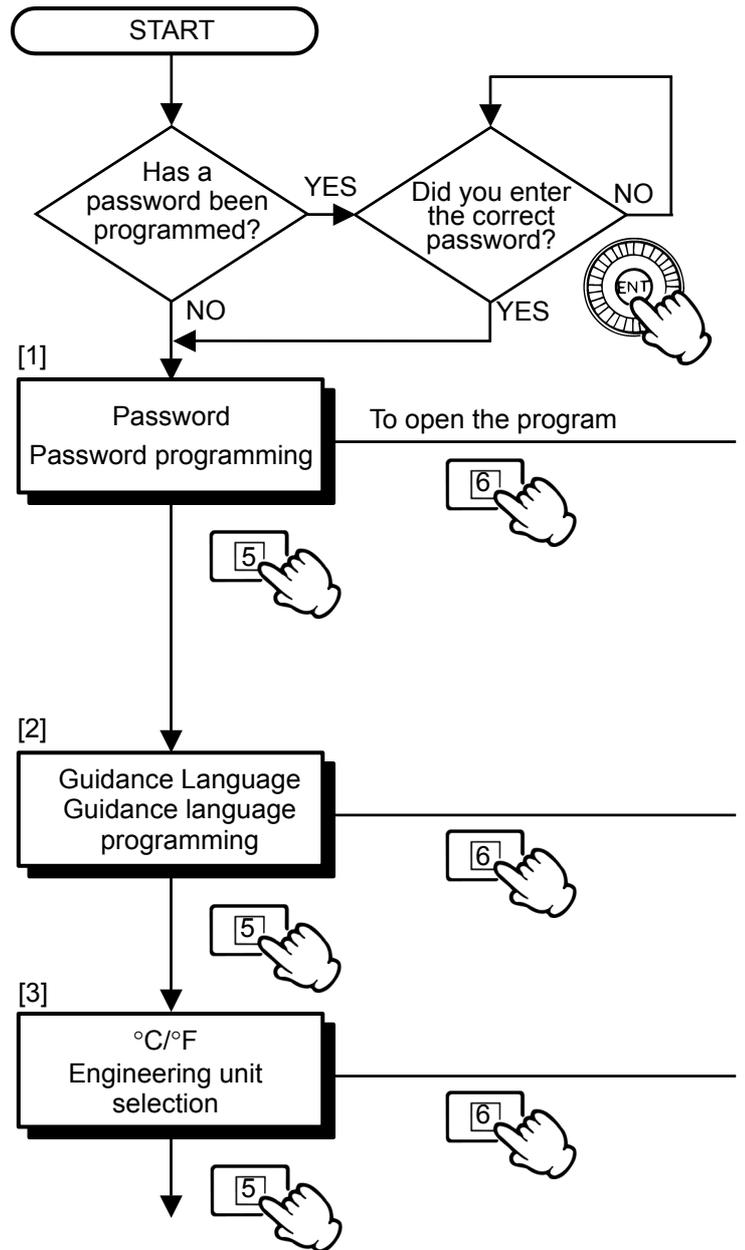
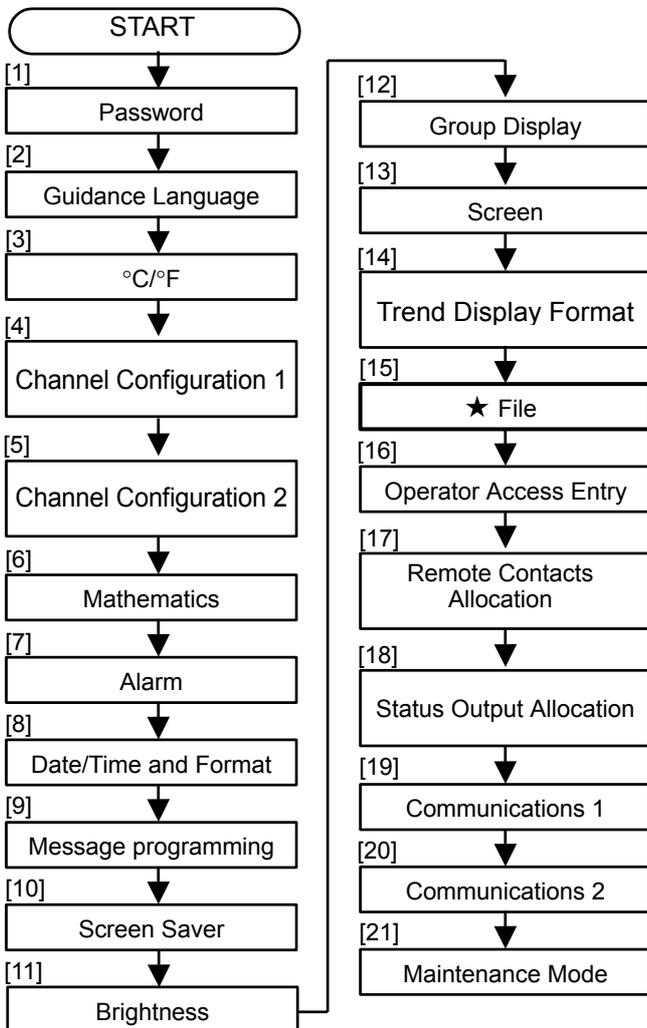


11.3 Engineering Parameters Programming



Programming method
See **10** "BASIC PROGRAMMING/OPERATION FLOWCHART".

This programming allows you to program the options and engineering-related parameters. Program only the parameters that are required for the desired operation. However, the parameters in "★ file" must be programmed before starting the operation.



REFERENCE

Pressing the key **1** (**EXT**) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by **1** to **5** at the bottom left of the screen.

Password programming

The password programming is a kind of key lock function provided to protect the programmed engineering parameters. Once a password (4 characters) has been programmed and the screen returned to the operation screen, the engineering parameters menu will not be accessible unless the correct password is entered.

For cancellation of the password, enter the correct password to access the cancellation menu.

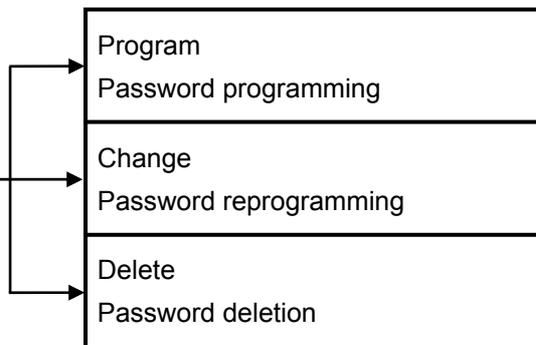
Even after the password has been programmed, the basic parameters such as Channel Configuration 1, Maths Expression, Alarm and Date/Time can be programmed (reprogrammed) or confirmed. (See 11.1, "Basic Parameters Programming"). To restrict these parameters, restrict each parameter individually. (See "[16] Operator Access Entry" in this "Engineering Parameters Programming").

[Programming method] See [Figure/character entry] in **10**.

CAUTION Be sure to note the password in a separate memo.

Menu after the password has been programmed.

Password Check							
* * * *							
. . . .							
A	K	U	e	o	y	8	
B	L	V	f	p	Z	9	
C	M	W	g	q	0		
D	N	X	h	r	1		
E	O	Y	i	s	2		
F	P	Z	j	t	3		
G	Q	a	k	u	4		
H	R	b	l	v	5		
I	S	c	m	w	6		
J	T	d	n	x	7		



Always program 4 characters.

Example: Enter 1, 2, 3 and 4 → * * * *

(The input characters are not displayed.)

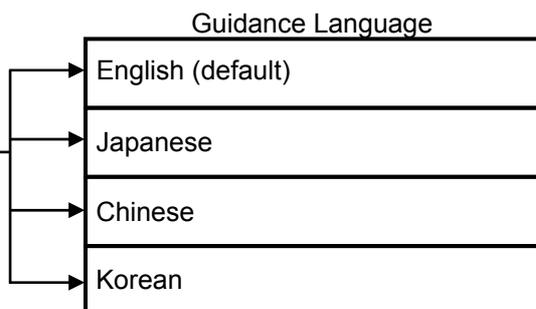
Press the **ENT** key to enter.

Always program 4 characters.

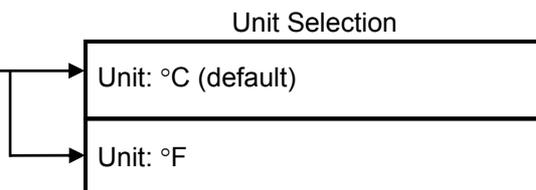
Example: 4 2 3 1

YES: Delete (default)

NO: Do not delete



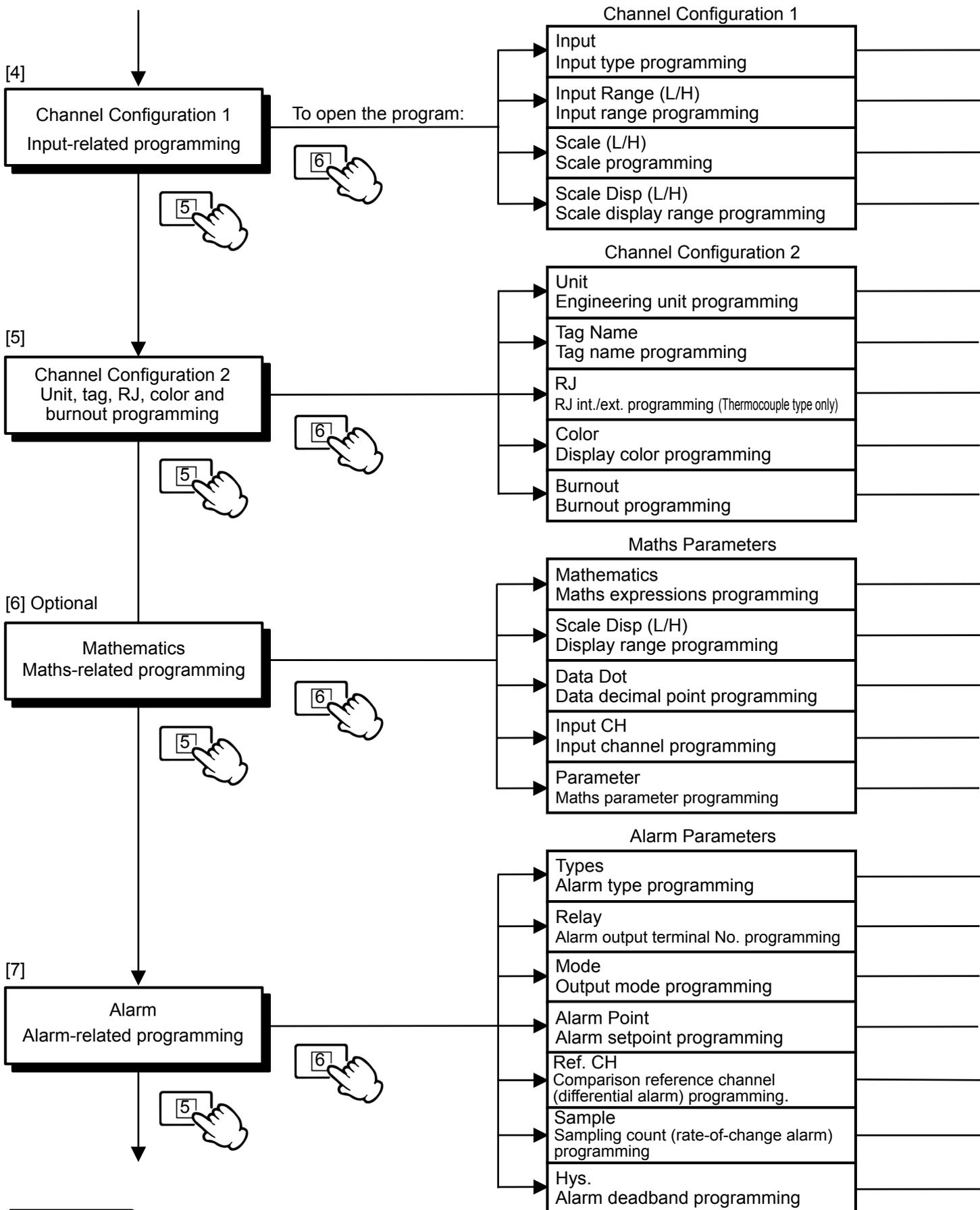
Switches the programming guidance and other information shown on the bottom of the screen between English, Japanese, Chinese, and Korean.



Switches the engineering unit for temperature between °C and °F.

(Switching between °C ↔ °F converts the temperature value automatically.)

* The unit, range and scale need to be reprogrammed.



REFERENCE

Pressing the key **1** (**EXT**) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by **1** to **5** at the bottom left of the screen.

Programming of mV, V, thermocouples, resistance thermometers, etc. for each channel.

Sample: Dummy input. Number: Input by range number (see the range list on **11**).

Temperature input example: (K) -200 to 1370°C 0 to 1000°C

mV/V input example: (5 V) -5 to +5 V 0 to 5 V

Temperature input: No programming required. (Automatic programming)

mV/V input example: 0 to 5 0 to 100

Programming range : Automatic programming by "Scale (L/H)"
Reprogramming can be expected.

Maximum 6 characters (including numerals and symbols) The temperature input is programmed to automatically.

Maximum 10 characters (including numerals and symbols)

Int: Internal. Ext: External.

Red, Blue, Green, Brown, Purple, Orange, Gray, L. Blue (Light Blue), Y. Green (Yellow Green), Yellow.

Non: Not programmed. Up: Up scale. Down: Down scale

Arithmetic 1, Arithmetic 2, Square Root, Integration (Totalising), Log(e) (Natural Logarithm),
Log(10) (Logarithm), Humidity (humidity/temperature calculation), e to the Power (exponential),
Max., Min., Ave., Communi. in (data communications input).

Action(Analog): Operation record for input

Action(Digital): Operation record for remote contacts

Programming range: -9999 to 99999 (down to 3 digits below decimal)

Programming range: 0 to 3

Programming range: 01 to 30 (CH)

Programming range: -9999 to 99999 (down to 3 digits below decimal)

For programming "start time" and "interval time", both hour and minute should be programmed.

H: High alarm. L: Low alarm. B: Differential high alarm. S: Differential low alarm

U: Rate-of-change increase alarm. D: Rate-of-change decrease alarm.

Non: Not programmed.

Programming range: 00 to 06 (00: Alarm output terminal not specified)

Programming range: OR connection or AND connection

Programming range: -9999 to 99999

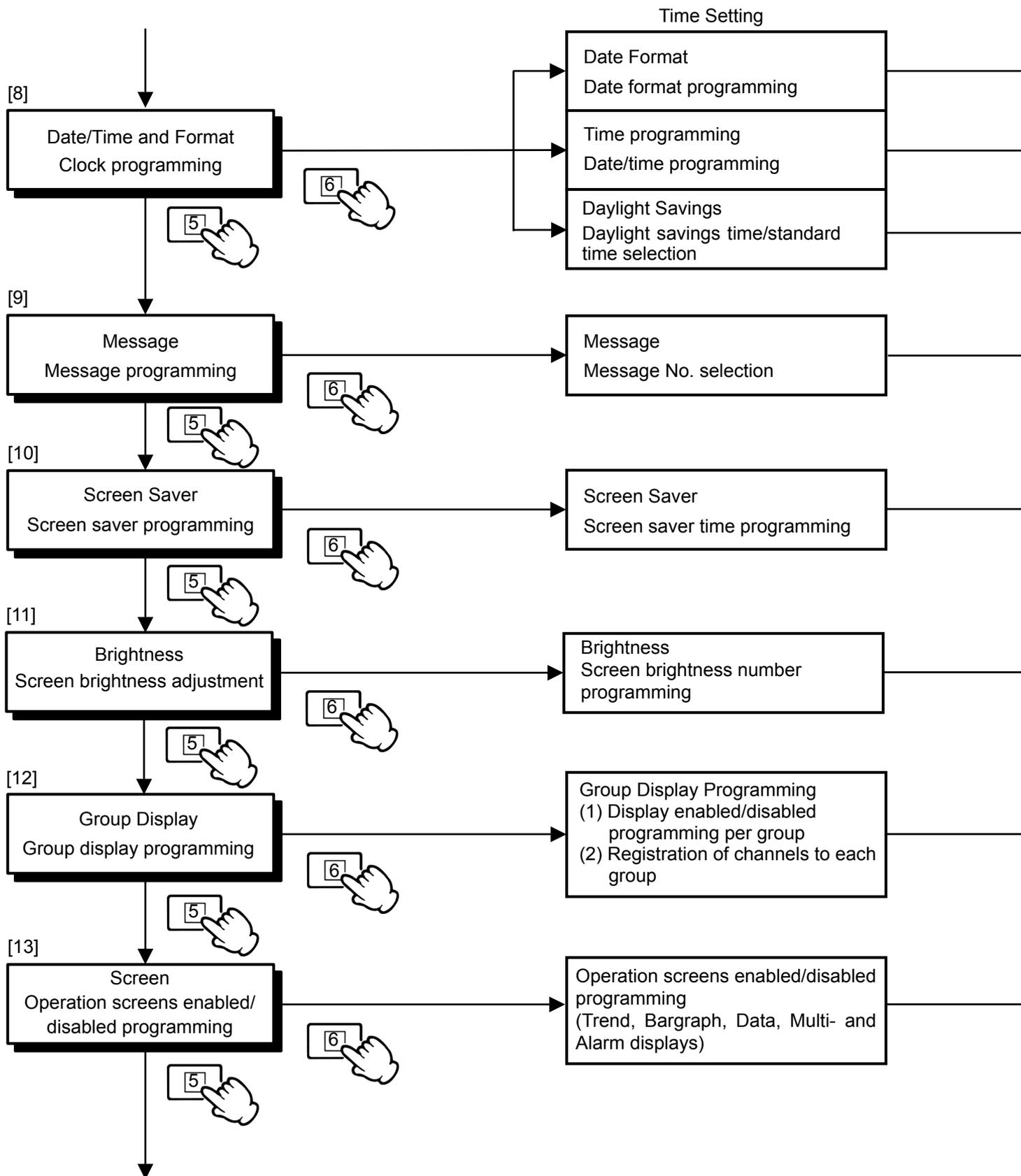
Programming range: 01 to the number of channels
(when the alarm type is programmed to B or S).

Programming range: 01 to 20 (when the alarm type is programmed to U or D).

Programming range: 0 to 99999 (down to 3 digits below decimal)

See **18** and
19 for details.

See **15** for
details.



REFERENCE

Pressing the key **1** (**[EXT]**) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by **1** to **5** at the bottom left of the screen.

YY/MM/DD, MM/DD/YY or DD/MM/YY.

Programming example: 99.03.05 (March 5, 1999)
Programming example: 09.25.30 (9 o'clock 25 min. 30 sec.)

} Can also be programmed in 11.1, "Basic Parameters Programming"

YES: Daylight savings time (1-hour advance)

NO: Standard time.

Characters
Message compilation/execution

Maximum 30 characters (including numerals and symbols).
(Examples) POWER ON, POWER OFF, etc.
(To execute the message display, see 11.2.1, 11.2.4 and 11.2.5. Operation screens)

For preventing degradation of screen (LCD).

Programming range: 0 to 60 min. (0: No screen saver)

When no key has been pressed for the programmed time period, the screen (menu) disappears and the text of "Screen Saver" scrolls.

(To return to the operation screen, press any key. If no key is pressed for the programmed time period again, the screen saver will reappear.)

Programming range: 1 to 9 (default: 8). A smaller value makes the screen darker.

(1) Program YES or NO individually for each of display groups Nos. 1 to 5.

YES: The group indicated by the cursor is enabled (displayed).

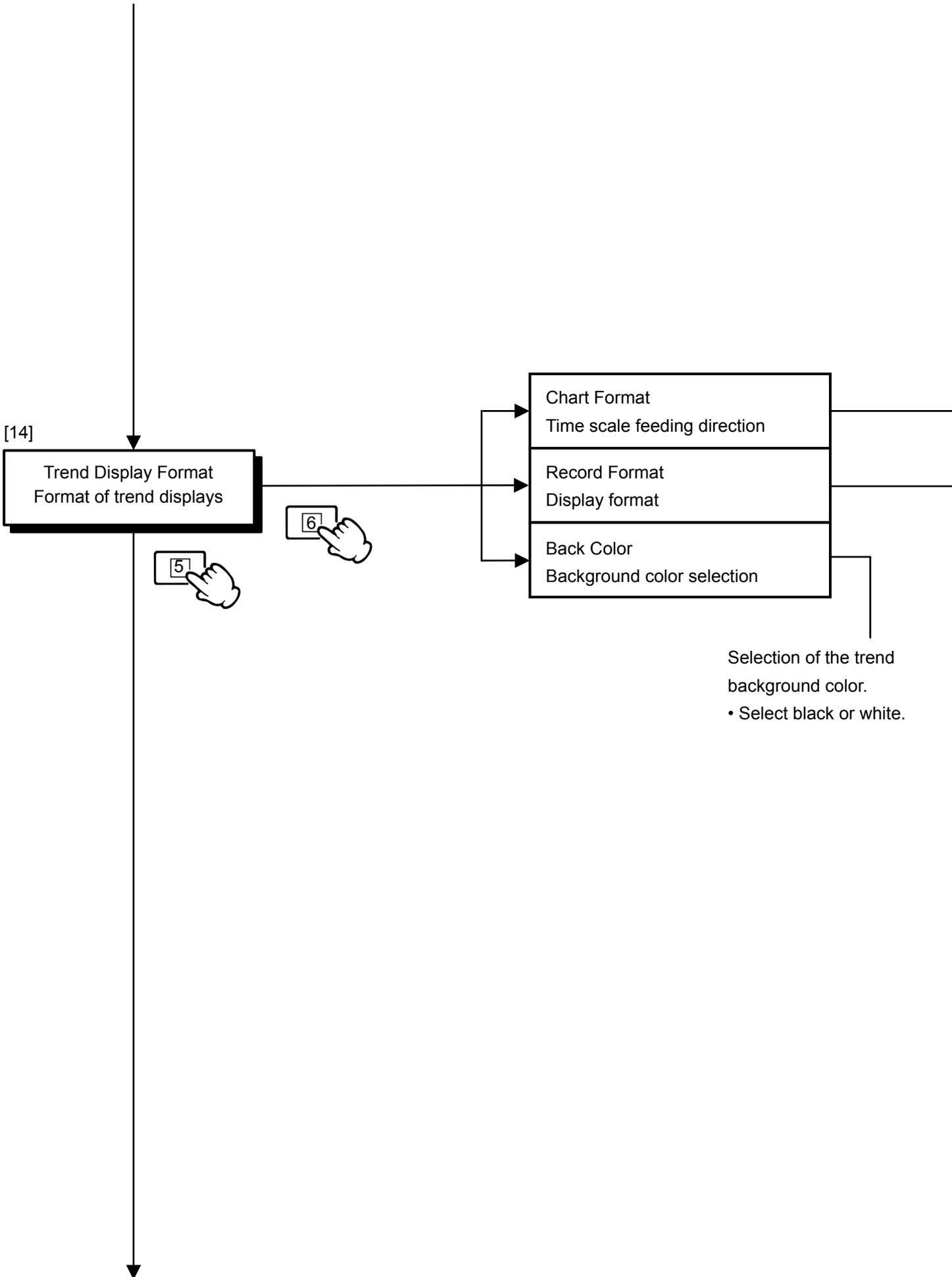
NO: The group indicated by the cursor is disabled (not displayed).

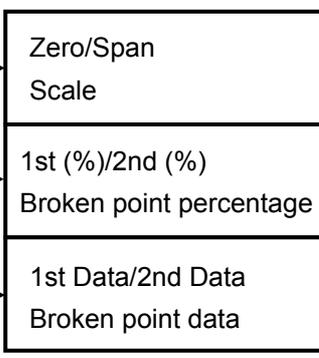
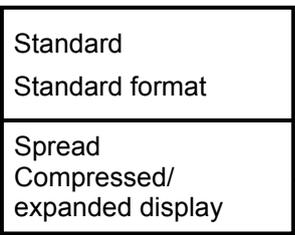
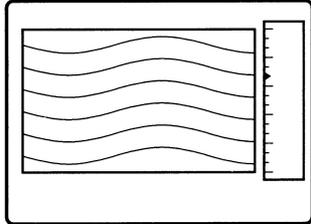
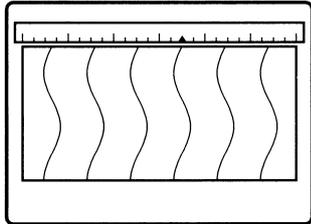
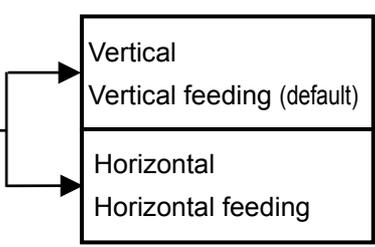
(2) Registration of channel 01 to 30 for each group (Overlapped programming of channels for each group is enabled.)

Channels of the ranges which have not been programmed or channels that are not used for calculated data are not displayed even when they have been registered.

YES: Displayed.

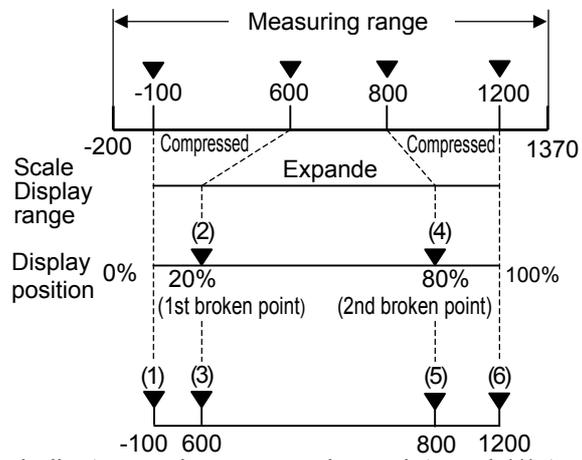
NO: Not displayed.



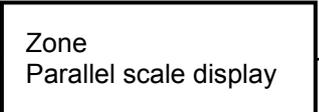


Compressed/expanded
 A specific part of trends can be compressed or expanded.

- (1) This format can be programmed for each channel.
- (2) The scale display range can be programmed arbitrarily regardless of the scale display range programmed in "[4] Channel Configuration 1"
- (3) Either a single or two broken point point(s) can be programmed.
 - A channel for which no broken point has not been programmed is displayed in the Standard format.



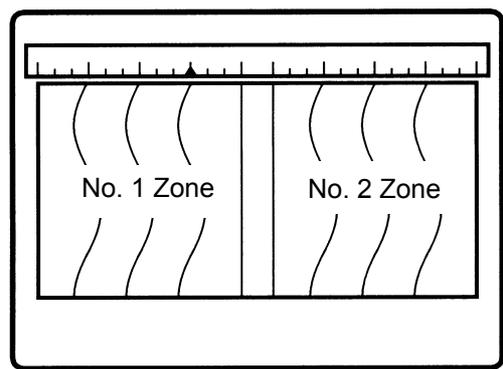
▼ indicates each programming point, and (1) to (6) indicate the programming sequence. When a single broken point is used, clear the programming of the 2nd broken point.

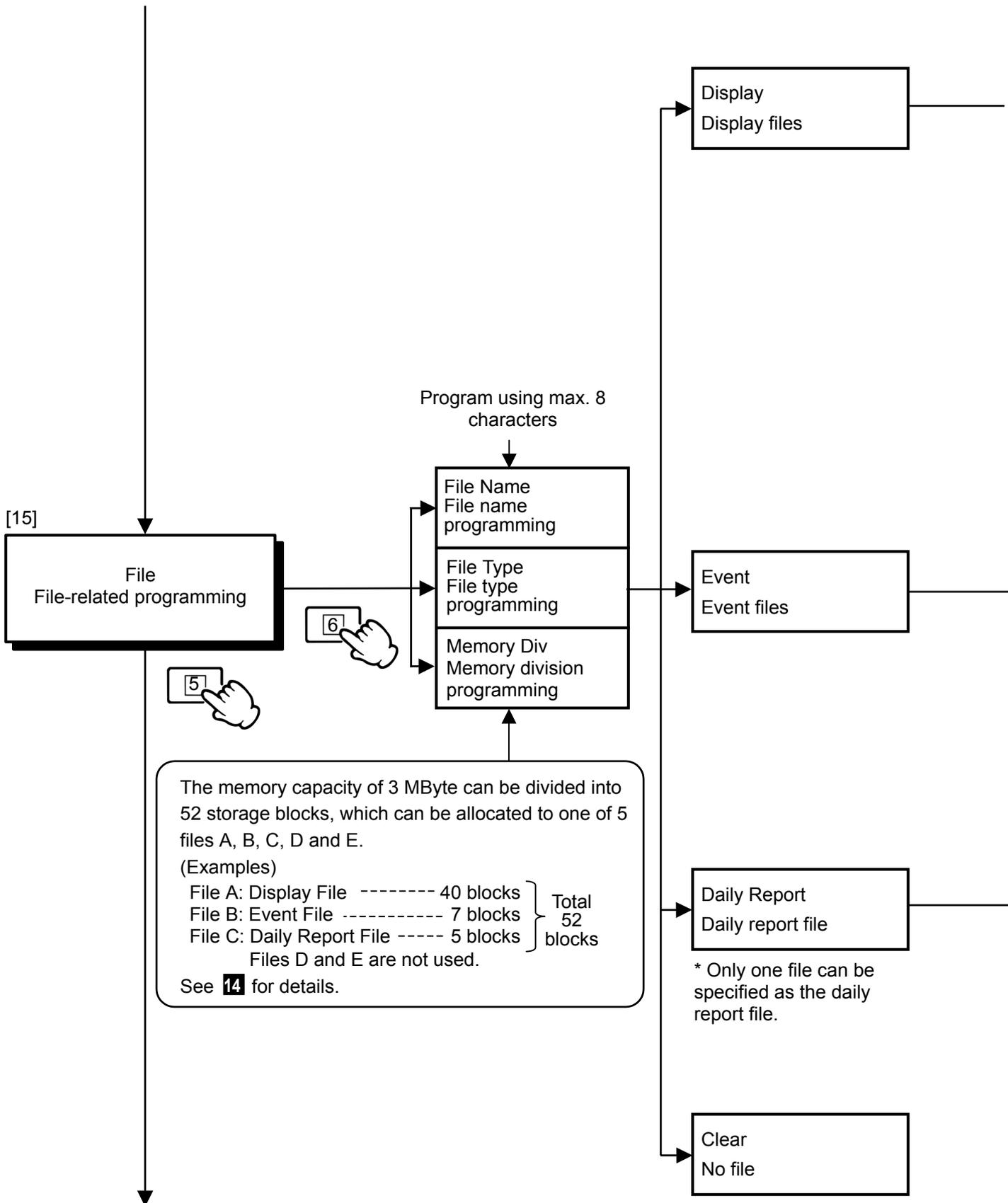


Parallel scale

The trend display can be divided into 2 zones and the zone where the data is displayed can be selected. This is effective when multiple trends overlap.

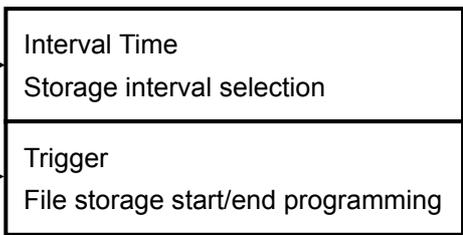
- (1) The zone can be classified for each channel.
- (2) The scale display range of each zone becomes as programmed in "[4] Channel Configuration 1".





REFERENCE

Pressing the key 1 (EXT) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by 1 to 5 at the bottom left of the screen.

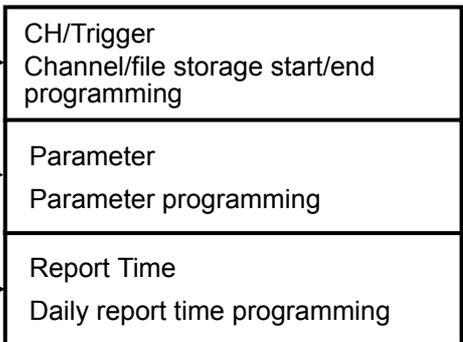
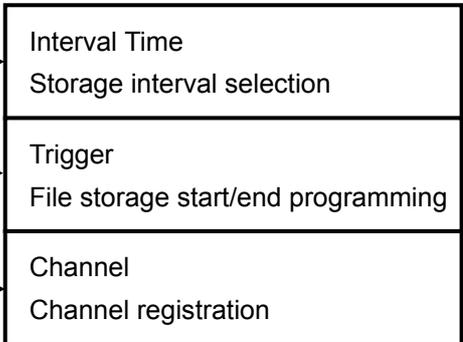


Display File		
Interval Time	Start Trigger	End Trigger
5 sec	Key	Key

File storage start/end Default

Storage interval

Model BR17A2/BR1761/BR17	3	Model BR17B2
0.1,0.2,0.5,1,2,3,5,10,15,20,30 sec		2,4,6,8,10,16,20,30 sec
1,2,3,5,10,15,20,30,60 min		1,2,3,5,10,15,20,30,60 min
*From 1 second for Model BR17A2		
From 5 second for Model BR1761		

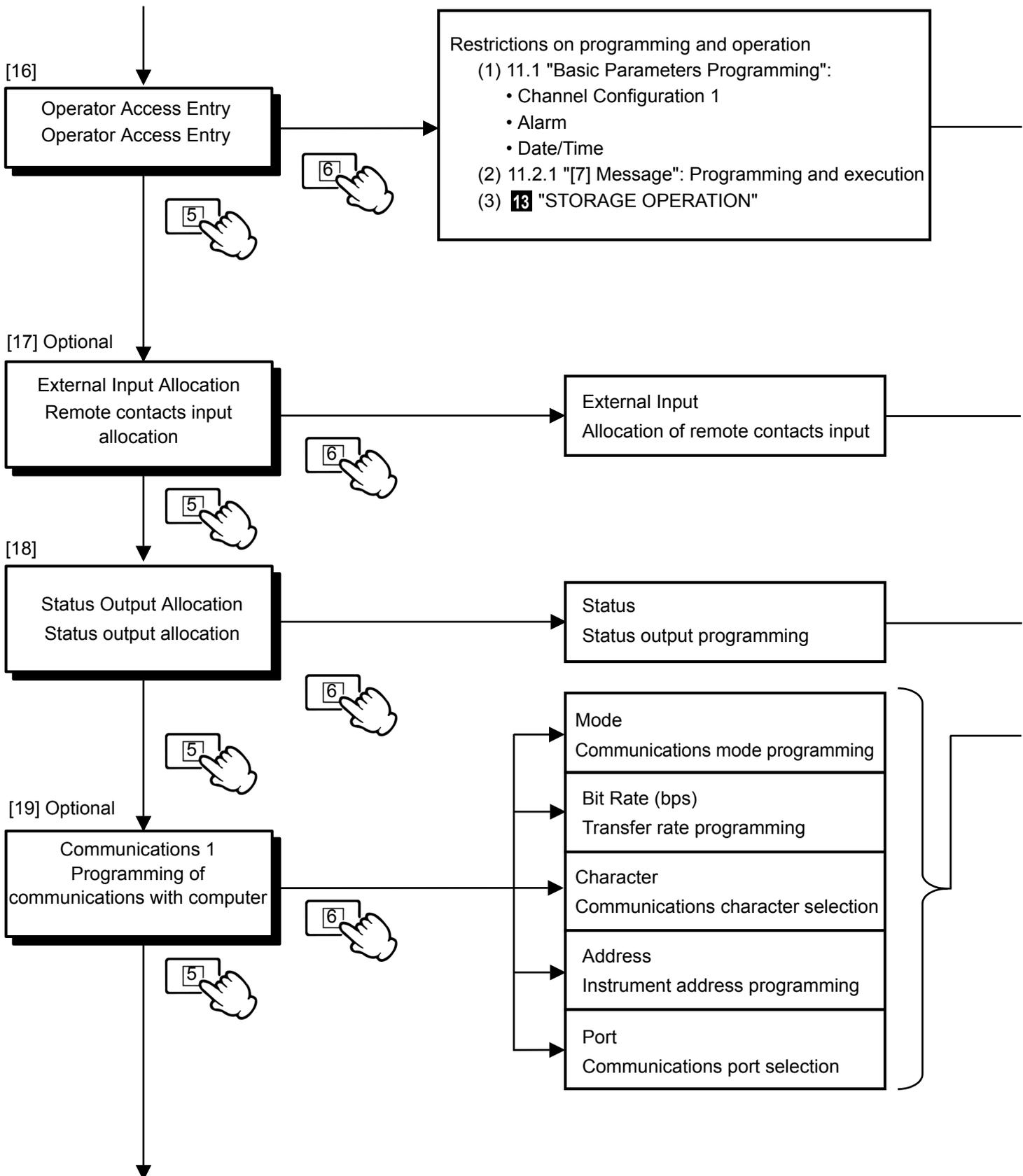


These parameters can be programmed only on the BR1000 series graphic recorder with the optional specification of a daily report file.

	Starting conditions of file storage	Ending conditions of file storage		
		No. 1	No. 2	Nos. 3/4/5
(1)	Key operation [Key]	Key operation [Key]	Memory time [Mem.Time]	Endless 1/2/4
(2)	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	-	-
(3)	Remote contacts (Status change) (Remote contacts No.1 to 4) [Ext(On)]	Remote contacts (Status change) (Remote contacts No.1 to 4) [Ext(Off)]	-	-
(4)	Time	Time	-	-
(5)	Alarm activation (Alarm output No.1 to 6) [Alarm]	Key operation [Key]	Memory time [Mem.Time]	-
(6)	Key operation with pre-triggering [Key(Pre.Trig.)]	Key operation [Key]	Memory time [Mem.Time]	-
(7)	Remote contacts (Trigger) with pre-triggering (Remote contacts No.1 to 4) [Key(Pre.Trig.)]	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	-	-
(8)	Alarm activation with pre-triggering (Alarm output No.1 to 6) [Key(Pre.Trig.)]	Key operation [Key]	Memory time [Mem.Time]	-

(CAUTION)
Regardless of the above programming, the storage can be ended also by the "Storage Operation".

For details, see 14.8 "Starting/Ending the File Storage".
* (2), (3) and (7) can be programmed only on BR1000 series graphic recorders with the optional specification of remote contacts.
* [] Inside is screen-displayed.



REFERENCE

Pressing the key **1** (**EXT**) in any menu returns to the previous screen (menu). The number of times the key should be pressed to return to the operation screen is indicated by **1** to **5** at the bottom left of the screen.

YES: Programming (reprogramming) is not restricted.

NO: Programming (reprogramming) is restricted. (Confirmation is possible.)

* When the programming of Channel Configuration 1 is restricted, the maths expression programming will also be restricted.

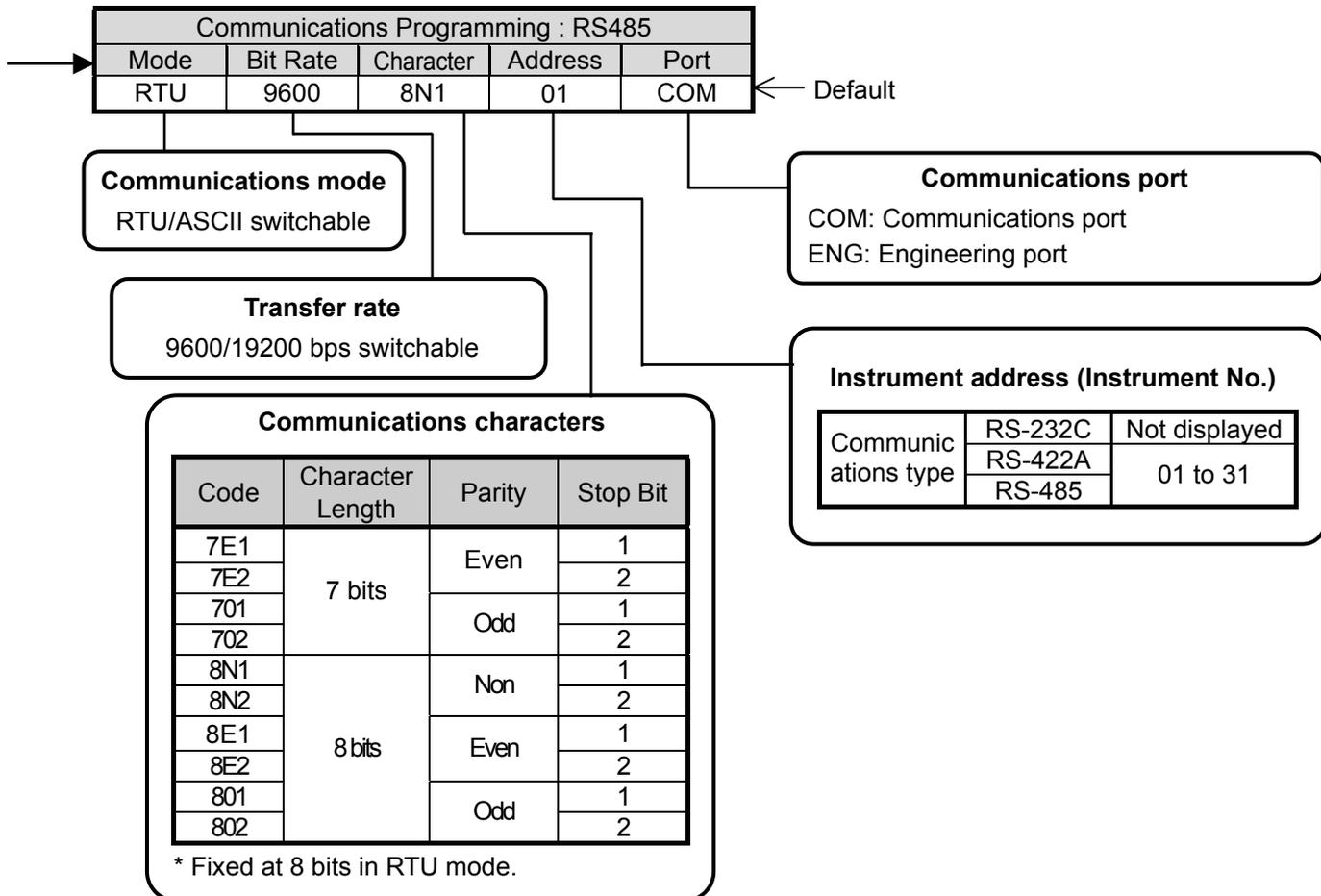
See **16**

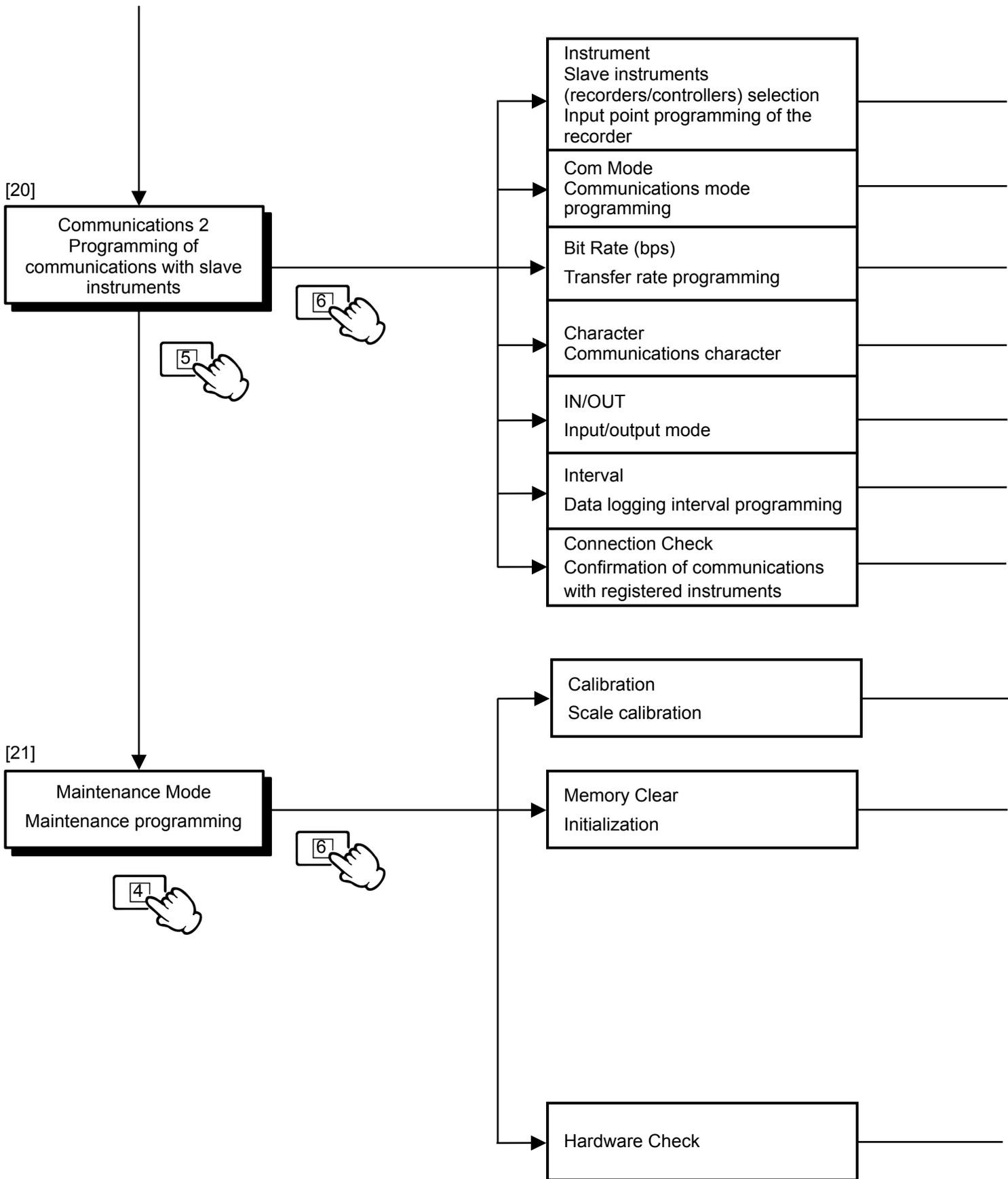
Program the alarm output terminal No. for the output of fail signal.

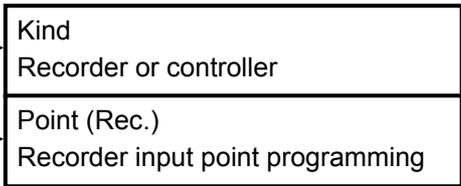
Program the alarm output terminal No. for the output of file memory status.

(The signal is output when the remaining file storage capacity drops to 10%. It can be programmed for each file.)

* Programming is possible only on BR1000 series graphic recorder with optional specifications for alarm output. The status output is output with the alarm output on OR condition.







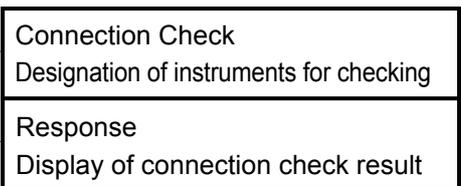
RTU or ASCII

9600 or 19200 bps switching

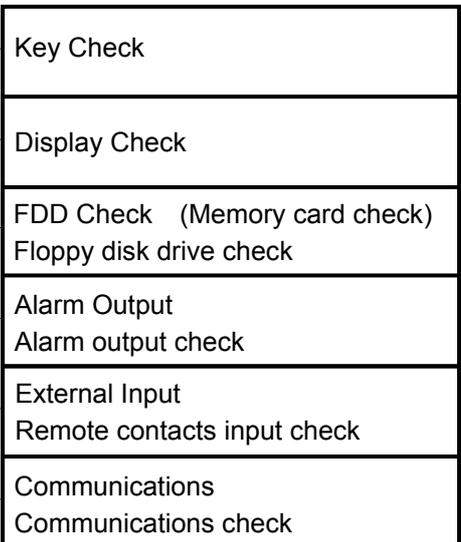
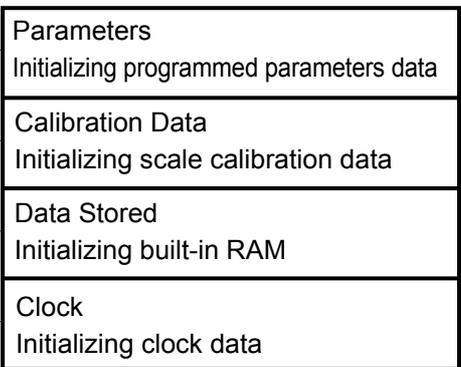
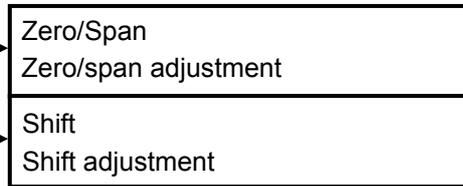
7E1, 7E2, 701, 702, 8E1, 8E2, 801, 802, 8N1 or 8N2

IN/OUT (Fixed at IN)

Programming range: 1 to 60 sec.



01 to 05, All: Communications check with registered instruments



12 PARAMETERS COPY

The parameters programmed for a channel can be copied onto other channels. This function copies parameters (values, items, messages, etc.) programmed for the copy source channel to other copy destination channels and helps in saving the programming operation and time. When copying messages, the copy source and destination are designated by the Message number instead of the CH No.

12.1 Copy Programming Examples

To copy the parameters programmed for CH.01 in Channel Configuration 1 to CH.02, CH.03 and CH.04

		Before copy						After copy					
		Channel Configuration 1						Channel Configuration 1					
	CH	Input	Input Range	(L) (H)	Scale	(L) (H)	Scale	(L) (H)	Scale	(L) (H)	Scale	(L) (H)	
Copy source	01	K	-200.0	-200.0	-200.0		-200.0	-200.0	-200.0		-200.0	-200.0	
			1370.0	1370.0	1370.0		1370.0	1370.0	1370.0		1370.0	1370.0	
Copy destinations													
	02	K	-200.0	-200.0	-200.0		-200.0	-200.0	-200.0		-200.0	-200.0	
			1370.0	1370.0	1370.0		1370.0	1370.0	1370.0		1370.0	1370.0	
	03	K	-200.0	-200.0	-200.0		-200.0	-200.0	-200.0		-200.0	-200.0	
			1370.0	1370.0	1370.0		1370.0	1370.0	1370.0		1370.0	1370.0	
	04	K	-200.0	-200.0	-200.0		-200.0	-200.0	-200.0		-200.0	-200.0	
		1370.0	1370.0	1370.0		1370.0	1370.0	1370.0		1370.0	1370.0		
	05												
	06												

*
 Cursor position 1 (Simultaneous copy) Cursor position 2 (Individual copy)

Cursor position 1: By moving the cursor to this column, all parameters can be copied simultaneously.

Cursor position 2: By moving the cursor to this column, the parameter at the cursor position can be copied.

* If copying is executed at the Input Range column, the parameters of Scale and Scale Display Range are also copied.

12.2 Programming and Executing the Copy Function

(1) Move the cursor to the parameter of copy source.

(2) Press the **ENT** key. The following display appears with the cursor positioned at "01" of copy source.

Copy [I] To [II]							
[I]	01	02	03	04	05	06	← Copy source CH No. row
[II]	01	02	03	04	05	06	← Copy destination CH No. row
Copy							← Copy execution

(3) Press the **ENT** key. "01" turns red as a confirmation of the copy source channel.

(4) Press the key **5** (**↓**) to move the cursor to the copy destination CH. No. row.

(5) Select "02" by pressing the key **2** (**←**) or **3** (**→**) and press the **ENT** key. (This turns "02" red.)

(6) Also program "03" and "04" in the same way as step (5). (Programming is complete when "03" and "04" turn red.)

(7) Move the cursor to "Copy" by pressing the key **5** (**↓**), and press the **ENT** key.

Now the copy programming is complete.

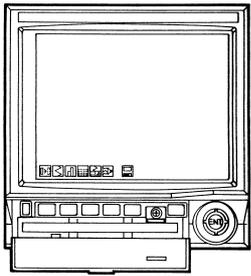
*Even after the copying to a channel has been entered, the channel selection condition can be recalled by pressing the **ENT** key again.

Parameters that can be copied

Parameters	Programs (Items)
Channel Configuration 1 Input-related programming • 11.3 "Engineering Parameters Programming" [4] • 11.1 "Basic Parameters Programming" [1]	<ul style="list-style-type: none"> • Input • Input Range • Scale • Scale Display Range *1. Copying "Input" causes other parameters to be copied simultaneously. The "Unit" and "RJ" parameters are also copied. *2. Copying "Input Range " causes "Scale" and "Scale Display Range" to be copied. *3. Other parameters can be copied individually.
Channel Configuration 2 Engineering unit, tag, RJ, other parameters programming • 11.3 "Engineering Parameters Programming" [5]	<ul style="list-style-type: none"> • Unit • Tag • RJ • Burnout * Only individual copying is available. Simultaneous copying is not possible.
Mathematics Maths-related programming • 11.3 "Engineering Parameters Programming" [6] • 11.1 "Basic Parameters Programming" [2]	<ul style="list-style-type: none"> • Maths Expression • Scale Display Range • Data Decimal Point • Input Channel • Maths Parameters * "Scale Display Range" can be copied individually but other parameters can be copied only in simultaneously.
Alarm Alarm-related programming • 11.3 "Engineering Parameters Programming" [7] • 11.2 "Basic Parameters Programming" [3]	<ul style="list-style-type: none"> • Type • Numbers of alarm • Output Mode • Alarm Setpoint • Reference Channel (Differential alarm) • Number of samples (Rate-of-change alarm) • Alarm Deadband * Copying any parameter causes other parameters to be copied in simultaneously.
Message Message programming • 11.3 "Engineering Parameters Programming" [9] • 11.2 "Operation screen programming"	<ul style="list-style-type: none"> • Message

* Figures inside [] indicate the parameter numbers in the corresponding section.

13 STORAGE OPERATION



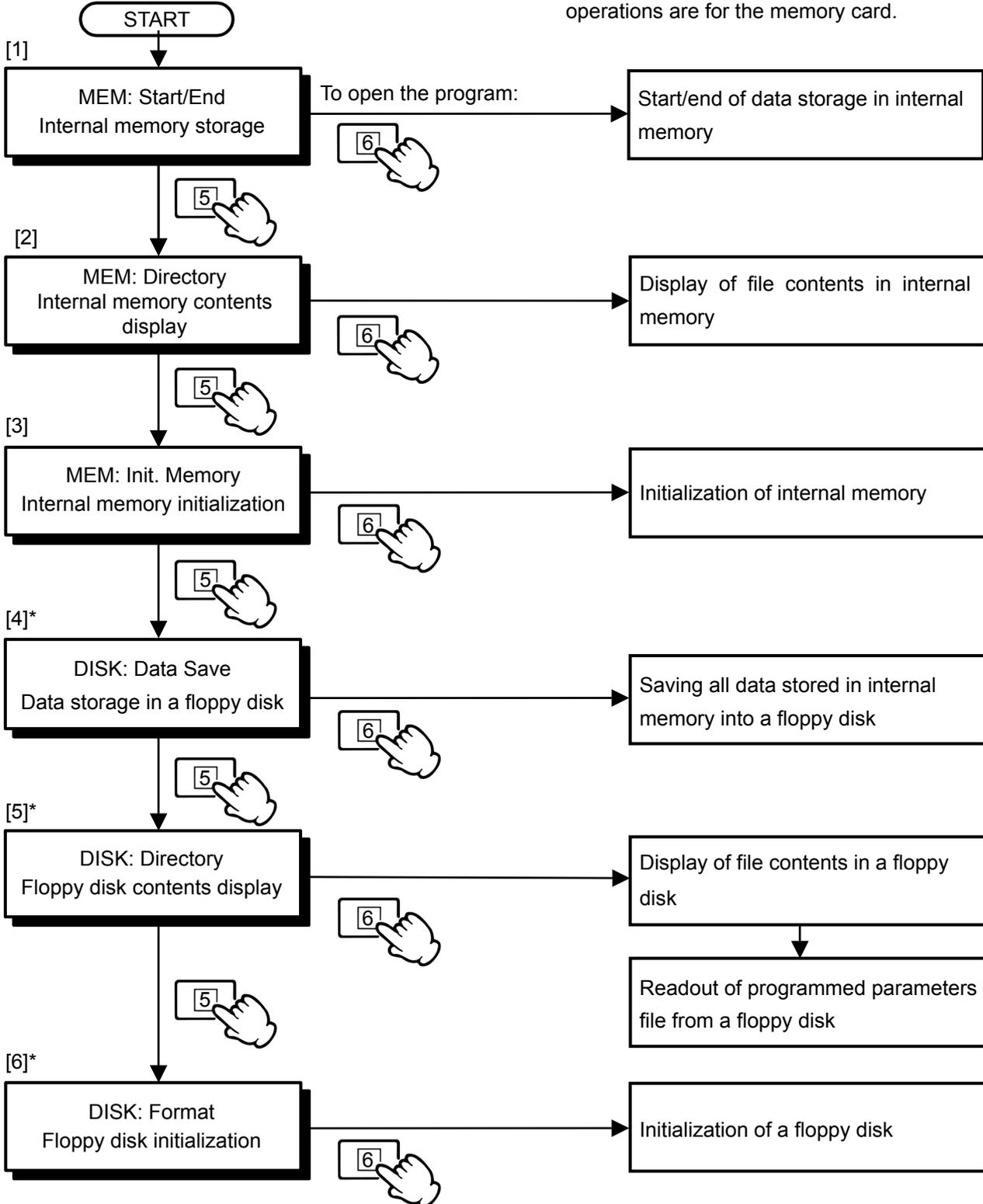
Move cursor to icon  and hold t the  key for 2 sec.

This programming menu makes it possible to store the measured data in the internal memory based on the conditions programmed in "[15] File" in 11.3 "Engineering Parameters Programming".

The measured data and programmed parameters stored in the internal memory can also be saved in a FD (memory card: optional). The measured data saved can be displayed by selecting "External Memory" in "[1] Trend Mode" in 11.2.1 "Real-time Trend Screen Programming".

13.1 Storage Operation

* When the memory card (optional) is used, the operations are for the memory card.



Program Name		Program Name & Operation
Internal memory	MEM: Start/End Internal memory storage	When [Key] is programmed as the trigger condition for storing data in files, opening/closing files operations are executed. Closing files operation can also be executed for other trigger conditions. Open: File operating (writing) status. Close: Write complete or idle status.
	MEM: Directory Internal memory contents display	By selecting a file type and pressing the key 6 (PRG), the details of each file can be displayed. Displays the memory usage situation and approximate remaining capacity available time. Note that, if you have a power failure of more than 5 minutes or a file is newly created by reprogramming, the available time varies due to the addition of programming information.
	MEM: Init. Memory Internal memory initialization	Be sure to close all files before initialization. An error message appears if you have any file opened. (1) Initialization of each file stored in the internal memory: Press the key 6 (PRG) to display the initialization screen and then press the ENT key (YES) to initialize the file selected. (2) Initialization of all files stored in the internal memory: Press the ENT key (INIT) to display the initialization screen and then press the ENT key (YES) to initialize the file selected.
External memory	DISK: Data Save Data storage in a floppy disk	The saving time differs depending on the data capacity. As the saving of data will cause existing data to be overwritten, be sure to check the existing data in the floppy disk before saving. (1) Saving of each file stored in the internal memory: Press the key 6 (FILE) to save the selected file into the floppy disk. (2) Saving all files stored in the internal memory: Press the ENT key (ALL) to save all files into the floppy disk. In addition, the file under storing into the internal memory can be saved into the floppy disk with "(1) Saving of each file stored in the internal memory". (See Remarks and Reference in the following page.)
	CARD: Data Save Data storage in a memory card (optional)	
	DISK: Directory Floppy disk contents display	Displays the file contents in a floppy disk. The programming parameters stored in the floppy disk can be copied to the internal memory when the ENT key (LOAD) is pressed.
	CARD: Directory Memory card (optional) contents display	All files stored in the internal memory are initialized if parameters are programmed from the floppy disk. For the memory card, the space capacity of the card is displayed in lower right of the screen.
	DISK: Format Floppy disk initialization	Use a 1.44 MB, MS-DOS formatted, 3.5-inch 2HD floppy disk. It takes about 2 minutes for formatting, but data logging continues even during formatting.
CARD: Format Memory card (optional) initialization	(MS-DOS is a trademark of Microsoft Corporation) The format of the memory card is FAT 16. Data logging continues even during formatting.	
⚠ CAUTION		
Do not eject the floppy disk while it is being accessed. During access to the floppy disk, the LED blinks and the message [Please Wait...] is displayed.		

Remarks

For the 3MBytes internal memory, when 21 to 52 storage blocks, which exceeds 1.44 MBytes of a floppy disk capacity, is used, two to three floppy disks are necessary to store data. When the saving of data in the 1st floppy disk is completed, the message of "Please Change New Floppy Disk" appears. Replace it with a new floppy disk and continue to save data. For the saving of endless files under storing into the internal memory, remember the following restriction.

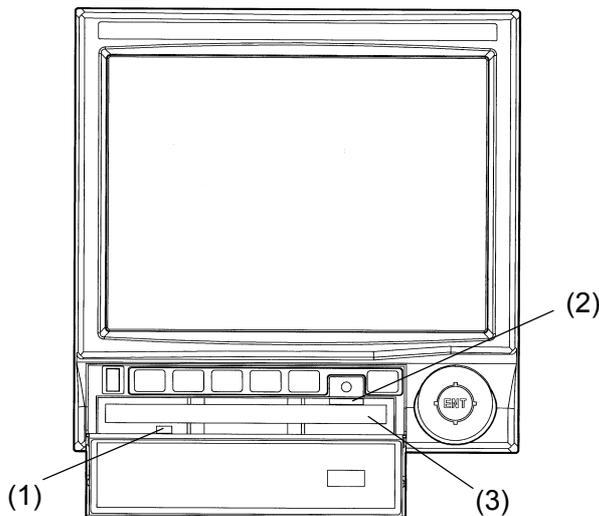
Restriction: When the saving of data in the 1st floppy disk is completed, the message of "Please Change New Floppy Disk" appears. Replace it with a new floppy disk and continue to save data. However, if the replacement of the floppy disk is not finished within the time (about 1 minute) of this message appearance, the saving action is canceled.

Reference

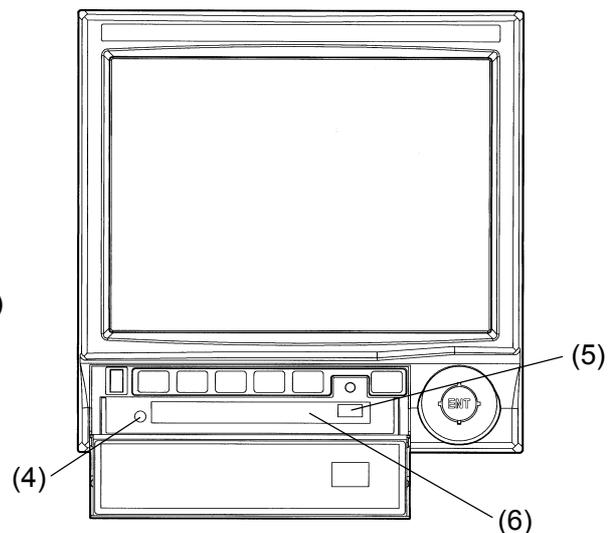
Only closed files in files under storing into the internal memory can be saved in the floppy disk.

- * When only "not-endless files" are storing into the internal memory, these files are automatically closed at saving. When only "endless files" are storing into the internal memory, there may be some files opened. If some files opened, close these file once and then save them.
- * When both of "endless files" and "not-endless files" are storing into the internal memory and the "endless files" are to be saved in the floppy disk, close the "endless files" once and then save them. (For the "not-endless files", no closed operation is required at saving.)

External memory: Floppy disk



External memory: Memory card



Name	Function	No.
Operation indicator	Green LED: Blinks during read or write. Goes out when read or write completes.	(1),(4)
Eject button	Press to eject an external memory.	(2),(5)
External drive	Insertion slot for an external memory	(3),(6)

13.2 Memory Card (optional)

A PCMCIA ATA flash memory card can be used.

For the details of memory cards, refer to the instruction manual for each card.

<Reference> Memory card and compact flash cards usable in Japan

(A compact flash adapter is required.)

PCMCIA ATA Flash memory card	Hitachi Maxell, Ltd	AT-32M-TE (H7) (Recommended) AT-96M-TE (H7) (Recommended)
	Panasonic	BN-016AB
Compact flash card	HAGIWARA SYS-COM, Ltd	CFC-032MBA CFC-064MBA
	I-O DATA DEVIC, INC	PCCF-H96MS
	MELCO INC	RFC-C96MB

● Formatting

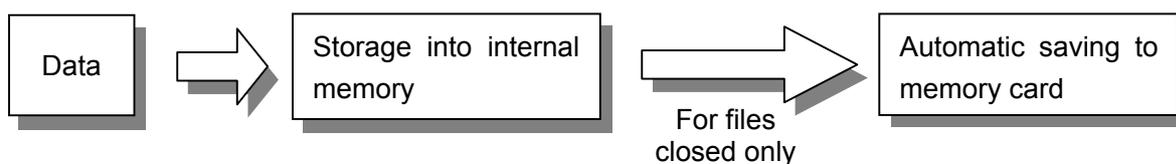
The memory card can be formatted with this unit. The format is FAT 15. For the formatting with a Windows XP personal computer, select "FAT", not "FAT32" or "NTFS".

● Automatic data saving to memory card

When the memory card is being installed, the data stored in the internal memory are automatically saved to the memory card when a file is closed. During the automatic storage, the message [Files Saving ...] is displayed.

If a closed file has been existed when the memory card is installed, the message [Closed files existed. Save them automatically? (Y/N)] is displayed. For YES, press **ENT** key. The message [Files Saving ...] is displayed and the data is automatically saved. For NO, press **1** and save the data manually in the storage operation screen.

When a file is closed by the storage operation [MEM: Start/End] (See 13.1 Storage Operation.), save the file by the storage operation [CARD: Data Save].



Remarks

The automatic data saving is executed in the operation screen (Real-time Trend screen, Bargraph screen, Data screen, Multi-screen or Alarm Summary screen) displayed or the screen saver displayed. When a file is closed in programming screens displayed, the automatic saving is not executed until the screen returns to the operation screen.

During the data saving to the memory card, no key is activated. When the data saving starts during the screen saver is working, the screen saver is stopped until the data saving is completed.

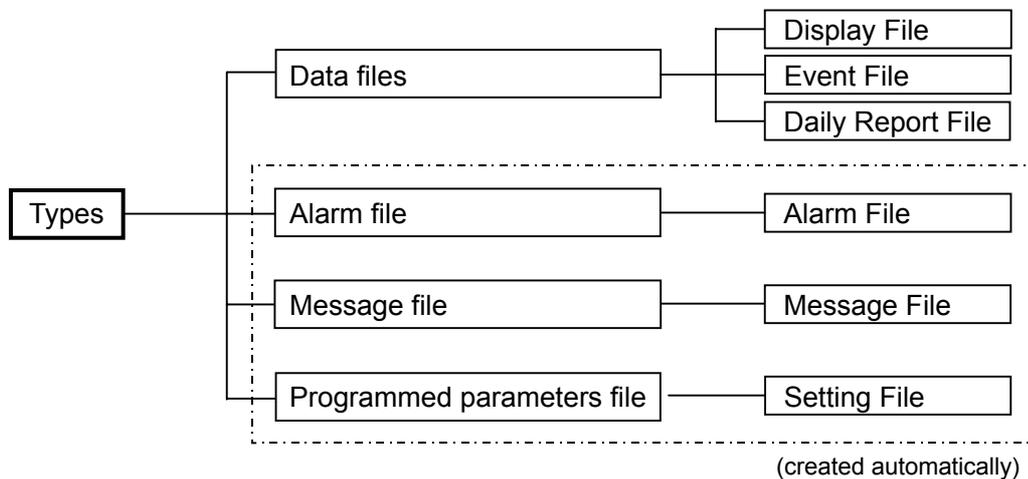
When the space capacity of the memory card is not enough for the data saving, the message [CARD OVERFLOW] is displayed at the lower right of the operation screen (Real-time Trend screen, Bargraph screen, Data screen, Multi-screen or Alarm Summary screen).

14 FILE PROGRAMMING

The data measured or calculated can be stored in files in the internal memory. The stored data can be displayed using the Historical Trend and Dual Trend screens. Up to 5 files can be programmed in the internal memory, and the data storage interval, stored input channel and storage start/end conditions can be selected for each file. The files in the internal memory can be copied onto floppy disks (memory cards: optional) and their data can be converted using the parameter programming software "PASS" (sold separately) for use with spreadsheet application software (Excel, Lotus 1-2-3, etc.). The data in the files can also be displayed on this instrument.

The "Programmed Parameters File" storing the programmed parameters, "Alarm File" storing the alarm event data and "Message File" storing the message display data are created automatically. These files are copied simultaneously with the data files when the internal memory files are copied onto an FD (memory card: optional). The "Programmed Parameters File" can also be used to set up the BR1000 series graphic recorder. The data in the "Alarm File" and "Message File" can be converted for use with the spreadsheet application software.

14.1 Types of Files



14.2 Data File Contents

Display File	Stores the data of all channels that have been registered to be displayed at the specified intervals.
Event File	Stores the data of only the selected channels at the specified intervals. When you have channels to display the measured data and/or the data with mathematical function performed but not to store them, specify "Event File". When the data stored in this file is displayed with the Historical Trend screen, the data of the channels not being selected will not be displayed.
Daily Report File (optional)	Stores the maximum, minimum and average values in the period between the specified time to time or in a day. Up to 24 time points can be specified. This means that, when every hour is specified as the time setting, the data of every hour can be stored for 24 hours and that, when every 20 minutes is specified, the data of every 20 minutes can be stored for 8 hours. The daily report of only the selected channels is created so that it can contain only the required data. The daily report can be displayed with the Data screen.

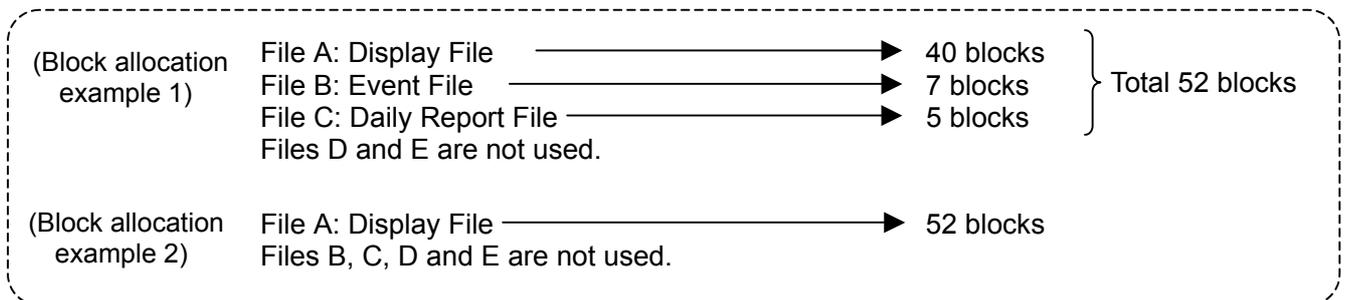
14.3 Data Stored in the Files

File Name	Stored Data
Display File	Storage start time (file write time), storage end time (file write end time), storage start/end conditions
Event File	Data storage interval, storage channels, stored data (binary, 2-byte)
Daily Report File	Storage start time (file write time), storage end time (file write end time) Storage data type Data storage time, data (binary, 2-byte)
Alarm File	Alarm event time, alarm channels, alarm types, alarm levels (up to 200 data)
Message File	Message display time, message contents (up to 200 data)*
Setting File	All programmed parameters (Update by reprogramming)

* Messages can also be written on the Historical Trend screen and can be used in analysis or in writing the operation conditions.

14.4 Data Storage (Allocation of data storage blocks)

The data file capacity of 3MByte can be divided into 52 storage blocks. The BR1000 series graphic recorders can store up to 5 files (A, B, C, D and E) at a time, and the 52 storage blocks should be allocated to the files because the total recording capacity is limited. For the allocation for the endless memory, specify it by multiplication of the number specified in the endless identification. (See 14.8.2.)



Remarks

1. The block allocation cannot be changed once files have been written. If reallocation is required, save the data temporarily in a floppy disk (memory card: optional), initialize the internal memory and perform reallocation.
2. Contact output is possible when 90% of the allocated memory capacity has been used for storage. (Status output connection: Output is possible on the optional alarm output.)
3. The memory usage amount of each file is displayed at the top left of the operation screens.
4. When the following parameters are programmed, storing of data in files is terminated, and the data is stored in new files. (The extension of files is updated.)
 - (1) Channel Configuration 1
 - (2) Maths Expressions
 - (3) Date/Time, Daylight Saving
 - (4) Unit, tag and RJ (Channel Configuration 2)
 - (5) Group Display
 - (6) Format of trend displays

14.5 Number of Files

The number of files that can be programmed is "max. 5 files", which can store the data simultaneously. The file name, file type, stored channels, storage interval time, storage start/end conditions and storage capacity can be programmed individually for each file.

However, one (1) Daily Report File only can be programmed.

Remarks

1. Additional files can be programmed any time provided that the number of files does not exceed 5.
2. Once file storage has been executed, it is not possible to change the file storage conditions or delete the files. However, the parameters of the storage channels programmed in the files can be modified as required.
3. Once file storage has been completed, It is not possible to create a new file by deleting a stored file or by modifying a file name.
4. For changing the file storage conditions or adding new files on the condition that these are not possible, the internal memory should be initialized. As initializing the internal memory causes all stored data to be lost, save necessary data in a floppy disk (memory card: optional) in advance, if required (see **13** "STORAGE OPERATION").

14.6 File Name

Any file name can be specified using "max. 8 characters". A file extension will be added according to the start/end of file storage, power failure, etc.

14.7 Storage Interval Time

The storage interval time can be selected from the periods shown in the following table.

Interval time:

Model BR17A2/BR1761/BR17 3

Second	0.1,0.2,0.5,1,2,3,5,10,15,20,30 sec (From 1 second for model BR17A2, from 5 seconds for model BR1761)
Minute	1,2,3,5,10,15,20,30,60 min

Model BR17B2

Second	2,4,6,8,10,16,20,30 sec
Minute	1,2,3,5,10,15,20,30,60 min

- When the storage interval time is longer than the measuring interval, the maximum value and the minimum value of data in the storage interval time (period) are stored. For the display of the data stored, these maximum and minimum values are displayed as trend format. The maximum and minimum values can be switched on the data display each time **ENT** key is pressed.

14.8 Starting/Ending the File Storage

14.8.1 Types of start/end conditions

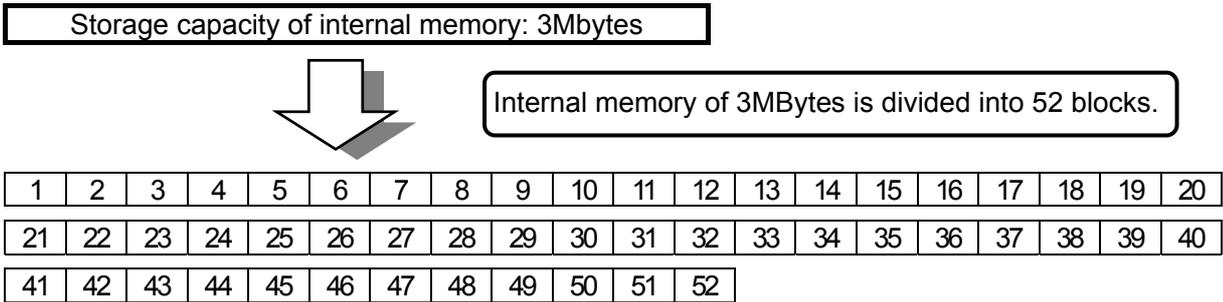
The file storage start/end conditions can be programmed for each file.

The programmable conditions are as shown below.

	Starting conditions of file storage	Ending conditions of file storage				
		No. 1	No. 2	No. 3	No. 4	No. 5
(1)	Key operation [Key]	Key operation [Key]	Memory time [Mem.Time]	Endless1 [Endless 1]	Endless2 [Endless 2]	Endless4 [Endless 4]
(2)	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	-	-	-	-
(3)	Remote contacts (Status change) (Remote contacts No.1 to 4) [Ext(On)]	Remote contacts (Status change) (Remote contacts No.1 to 4) [Ext(Off)]	-	-	-	-
(4)	Time	Time	-	-	-	-
(5)	Alarm activation (Alarm output No.1 to 6) [Alarm]	Key operation [Key]	Memory time [Mem.Time]	-	-	-
(6)	Key operation with pre-triggering [Key(Pre-Trig.)]	Key operation [Key]	Memory time [Mem.Time]	-	-	-
(7)	Remote contacts (Trigger) with pre-triggering (Remote contacts No.1 to 4) [Ext(Pre-Trig.)]	Remote contacts (Trigger) (Remote contacts No.1 to 4) [Ext(Trig.)]	-	-	-	-
(8)	Alarm activation with pre-triggering (Alarm output No.1 to 6) [Alm(Pre-Trig.)]	Key operation [Key]	Memory time [Mem.Time]	-	-	-

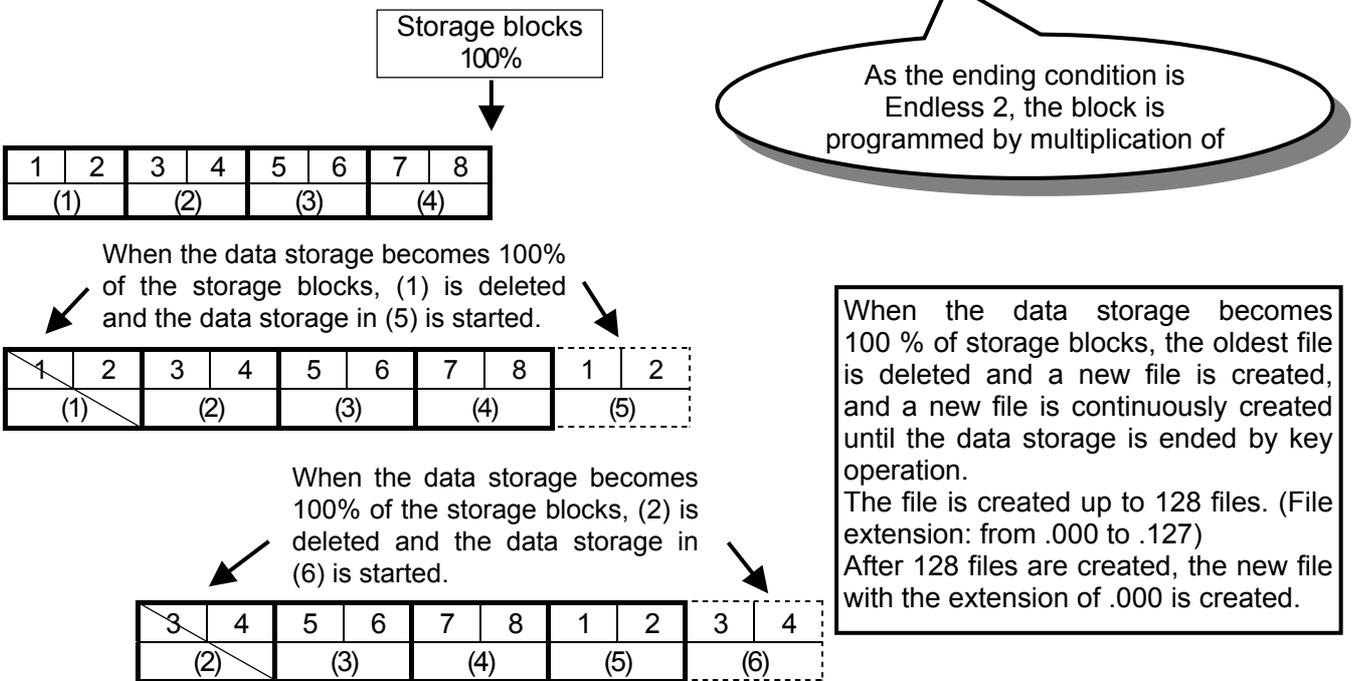
14.9 Outline of Endless Memory

The endless memory is the file storage into every storage block.

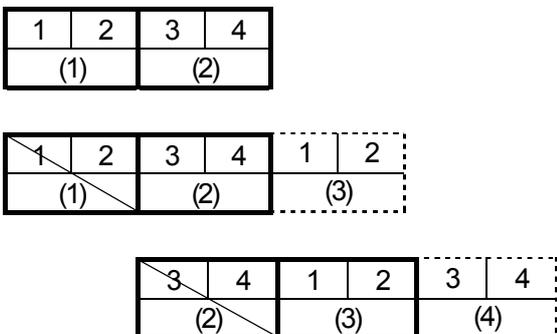


Example of endless memory

Example 1 Ending condition of file storage: Endless 2 • Storage blocks: 8



Example 2 Ending condition of file storage : Endless 2 • Storage blocks : 4



• In Endless [1, 2 and 4], the storage interval of one (1) file in Endless 2 is longer than in Endless 1, and the interval in Endless 4 is longer than in Endless 2.

14.10 Checking the Files

The files stored in the internal memory can be confirmed by the "Storage Operation" (see **13** "STORAGE OPERATION").

The information that can be confirmed includes the file names, storage start date/time and storage end date/time. The data stored in the files can be displayed with the Historical Trend and Dual Trend screens.

14.11 Saving Files to an External Memory

The files stored in the internal memory can be saved to a floppy disk (memory card: optional) by the "Storage Operation" (see **13** "STORAGE OPERATION").

14.12 Setup Using an External Memory

The BR1000 series graphic recorder can be set up by reading programmed parameters from a floppy disk (memory card: optional).

It automatically creates a "Setting File" which stores all programmed parameters. The "Setting File" is automatically stored with other files in a floppy disk (memory card: optional) when data is saved in the floppy disk (memory card: optional). This instrument can be set up by the **13** "STORAGE OPERATION" using this floppy disk (memory card: optional).

Remarks

1. With the BR1000 series graphic recorder, it is not permitted to save only the "Setting File" in a floppy disk (memory card: optional).
2. The name of the setting file becomes the name when it saves by the file unit and when saving all files, it becomes the name of file A.

14.13 Internal Memory Storable Time

As the data which can be stored in data storage block 1 block (64K) is 2 byte/data, 32768 data (= 64 x 1024 / 2) can be stored. The storable time period can be calculated with the following formula.

Storable time(second)=32768 × Allocation of data storage blocks × storage interval ÷ channel

(Ex)Model BR1743•••Storage interval : 0.1 second

Allocation of data storage blocks : 52

Channel : 4

$$32768 \times 52 \times 0.1 \div 4 = 42598 \text{ secs.} = 11.8 \text{ hours}$$

The followings show the storable time.

When the using channels are increased for mathematics (optional) or others, the storable time is shorter than the listed ones.

For 4 channels of Model BR1743

Storage interval	Approx. storable time
0.1 sec	11.8 hours
0.2 sec	11.8 hours
0.5 sec	1.2 days
1 sec	2.5 days
2 sec	4.9 days
3 sec	7.4 days
5 sec	12.3 days
10 sec	24.7 days
15 sec	37 days
20 sec	49.3 days
30 sec	74 days
1 min	147.9 days
2 min	295.6 days
3 min	1.2 years
5 min	2 years

For 6 channels of Model BR17A2

Storage interval	Approx. storable time
1 sec	3.3 days
2 sec	3.3 days
3 sec	4.9 days
5 sec	8.2 days
10 sec	16.4 days
15 sec	24.7 days
20 sec	32.9 days
30 sec	49.3 days
1 min	98.6 days
2 min	197.2 days
3 min	295.8 days
5 min	1.4 years

14.14 Memory Card Storable Time

Usually, the saving of the data stored in the internal memory to the memory card is executed by the storage operation [Data Save] (see 13.1 Storage Operation). Therefore the data the data stored in the internal memory can be saved to the memory card if the memory card has the space capacity more than 3Mbyte.

Check existed data in the memory card before the data saving as the data are overwritten when the same file name is used.

In addition, the automatic data saving (see 13.2 Memory Card) is enabled for the memory card. For the automatic data saving, the data saved in the endless memory (see 14.9 Outline of Endless Memory) are saved to the memory card when a file is closed. The followings are the storable time of the memory card in this case.

For 4 channels of Model BR1743
Condition: Endless 4

Storage interval	Approx. storable time
0.1 sec	4.8 days
0.2 sec	4.8 days
0.5 sec	12.3 days
1 sec	24.5 days
2 sec	48.5 days
3 sec	70.4 days
5 sec	121.6 days
10 sec	243.2 days
15 sec	1.0 year
20 sec	1.4 years
30 sec	2.0 years

For 6 channels of Model BR17A2
Condition: Endless 4

Storage interval	Approx. storable time
1 sec	32.0 days
2 sec	32.0 days
3 sec	48.5 days
5 sec	83.2 days
10 sec	166.4 days
15 sec	243.2 days
20 sec	332.8 days
30 sec	1.4 years

14.15 Built-in RAM Capacity

Data stored in the built-in RAM can be displayed on the Real-time Trend screen (see 11.2.1 Real-time Trend Screen Programming). Therefore, when the data are not stored in files, the data only in the following time can be referred.

Since the built-in RAM has a capacity of 256KBytes and the stored data uses 2 bytes/data, the built-in RAM can store a total of 131,072 (= 1024 x 256 ÷ 2) data. Data is stored at every interval time, and the storable time period can be calculated with the following formula:

Storable time = 131,072 x Interval time ÷ (Number of channels + 2)

(Examples)

- Model BR17A2 (Interval time 1 second) with 6 channels:
 $131072 \times 1 \text{ second} \div 8 = 16384 \text{ seconds}$ (Approx. 273 minutes = 4 hours 33 minutes)
- Model BR17B2 (Interval time 2 seconds) with 12 channels:
 $131072 \times 2 \text{ second} \div 14 = 18724 \text{ seconds}$ (Approx. 312 minutes = 5 hours 12 minutes)
- Model BR1761 (Interval time 5 seconds) with 6 channels:
 $131072 \times 5 \text{ seconds} \div 8 = 81920 \text{ seconds}$ (Approx. 1365 minutes = 22 hours 45 minutes)
- Model BR17□3 (Interval time approx. 0.1 second) with 4 channels:
 $131072 \times 0.1 \text{ second} \div 6 = 2184 \text{ seconds}$ (Approx. 36 minutes)

When the number of channels used is increased for the mathematical function (optional), etc., the storage time will decrease.

The Real-time Trend screen displays data using the data in the built-in RAM. Therefore, if the data is not saved in the form of files, only the data in the above time period can be displayed.

When the pre-triggering function is used, the data in 128 KBytes, half of built-in RAM, is used. Therefore, data up to the following time can be stored as the data before the triggering input.

- Model BR17A2 (Interval time 1 second) with 6 channels:
 $65536 \times 1 \text{ second} \div 8 = 8192 \text{ seconds}$ (Approx. 136 minutes = 2 hours 16 minutes)
- Model BR17B2 (Interval time 2 second) with 12 channels:
 $65536 \times 2 \text{ seconds} \div 14 = 9362 \text{ seconds}$ (Approx. 156 minutes = 2 hours 36 minutes)
- Model BR1761 (Interval time 5 seconds) with 6 channels:
 $65536 \times 5 \text{ seconds} \div 8 = 40960 \text{ seconds}$ (Approx. 682 minutes = 11 hours 22 minutes)
- Model BR17□3 (Interval time approx. 0.1 second) with 4 channels:
 $65536 \times 0.1 \text{ second} \div 6 = 1092 \text{ seconds}$ (Approx. 18 minutes)

When the number of channels used is increased for the mathematical function (optional), etc., the storage time will decrease.

14.16 Processing During Power ON/OFF

In case a power failure occurs while files are open and the time until the power recovery is less than 5 minutes, the "power failure" is indicated as the data (blank on Data screen and low limit over-range on Trend screens) corresponding to the power failure period. This means that the files continue without closing for power failure period of less than 5 minutes. If the power failure period exceeds 5 minutes, the file executed before the power failure is terminated and a new file starts to store data.

If the power failure exceeds 5 minutes, the built-in RAM will be initialized.

15 ALARM PROGRAMMING (ALARM OUTPUT: OPTIONAL)

Alarm parameters (alarm type, alarm set point, etc.) can be programmed for each alarm point (channel and level). By programming alarm parameters, alarm activated mark and alarm events can be displayed. The alarm output is available only with an instrument with the optional specification of the alarm output.

15.1 Programming Parameters for Alarms

Up to 4 alarm levels can be programmed per channel.

(1) Type: Alarm types

Absolute value	H : High alarm	L : Low alarm
Rate-of-change	U : Increase alarm	D : Decrease alarm
Differential	B : Differential high alarm	S : Differential low alarm

The alarm types can be selected every channel or level from the six kinds shown above.
Non: Not programmed.

(2) Relay: Alarm output terminal No. (optional)

The programming is possible whether the alarm output (optional) is added or not.
Alarm output terminal Nos. 00 to 06 can be programmed.

Note :If 00 is programmed on the recorder with the optional specification of alarm output, no alarm output is executed.(Alarm judgement is executed.)

(3) Mode: Alarm output mode

OR: Multiple alarm relays are connected to single alarm output terminals, and an alarm is output when one of the relays enter the alarm status.

AND: An alarm is output when all of the alarm relays connected to single alarm output terminals enter the alarm status.

(4) Alarm Point: Alarm setpoint

Absolute value: Program of less than 6 digits (including decimal point).

Rate-of-change: Program of less than 6 digits (including decimal point).

Differential: Program of less than 6 digits (including decimal point).

Program the differential alarm setpoint between the Ref.CH (reference channel) value and the measured value.

(5) Ref.CH: Reference channel number
(For differential alarm only)

(6) Sample Count: Sampling count
(For rate-of-change alarm only)
Programming range: 01 to 20 (Default 01)

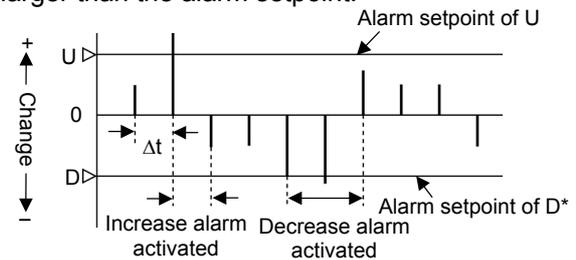
(7) Hys.:Alarm deadband
To be programmed with any alarm type.
Programming range: 0 to 99999
(6 digits including decimal point)
(Engineering unit: measuring unit)

15.2 Rate-of-Change Alarm

Rate-of-change alarm

Rate-of-change increase alarm (U): When the positive change (PV2 - PV1) per unit time (Δt) is larger than the alarm setpoint.

Rate-of-change decrease alarm (D): When the negative change (PV2 - PV1) per unit time (Δt) is larger than the alarm setpoint.

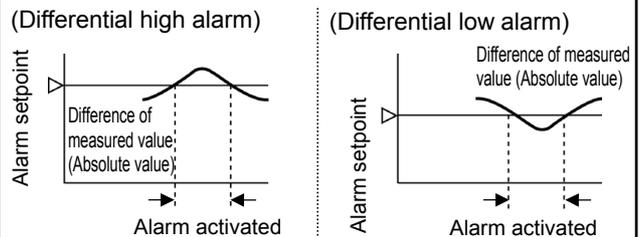


Unit time (Δt) = Measuring interval time
x Measuring count (1 to 20)

* Do not attach the minus (-) sign to the alarm setpoint for decrease alarm (D).

15.3 Differential Alarm

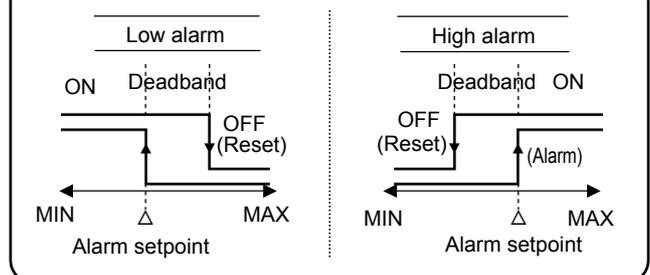
Differential alarm



Differential high alarm:
Difference of measured value \geq Alarm setpoint
Differential low alarm:
Difference of measured value \leq Alarm setpoint

15.4 Alarm Deadband

Alarm deadband



16 REMOTE CONTACTS PROGRAMMING (OPTIONAL)

The instrument with the optional specification of the remote contacts can perform the following operations according to the remote contacts input signals.

16.1 Types of Remote Contacts Operations

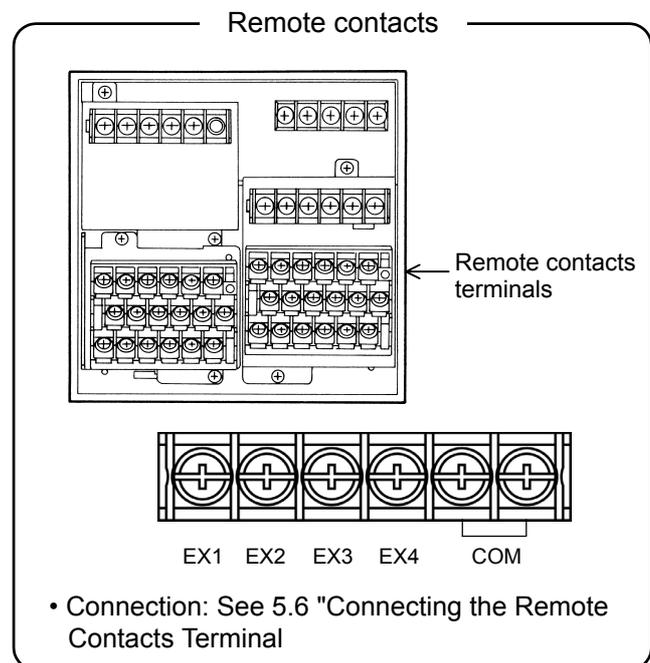
Remote Contact Name	Operations
File Drive	[File storage start/end] Start/end of file storage in internal memory data
Integration Reset	[Totaliser resetting] Totalising start/reset (optional)
Message	[Message display specified by No.] Display of programmed message Message programming: 11.3 "Engineering Parameters Programming" [9]

16.2 Programming the Remote Contacts Input Allocation

A total of 4 sets of remote contacts signals are available by combining the 4 remote contacts terminals EX1, EX2, EX3 and EX4 and the COM terminals. The 3 programs including "File Drive", "Integration Reset" and "Message" can be allocated freely to each of the contact signals.

(Programming method: See 11.3 "Engineering Parameters Programming" [17].)

For the allocation of file storage start/end, see the description on the file programming in 11.3 "Engineering Parameters Programming" [15].



CAUTION

- Remote contacts signals to be applied
- The contact signal to be applied to the remote contacts terminal should be output from switches and/or relays which are driven by voltage level not exceeding 30 V AC or 60 V DC or from contacts for small loads which can be driven manually.
- The period of ON and OFF should be more than 1 second.

When totalising start/reset by the remote contacts is programmed, the triggering of the remote contacts resets the existing totalising result and starts a new totalising operation. The "totalising start" and the "totalising reset" are executed simultaneously by triggering the remote contacts. When the totalising is allocated to multiple terminals, it is executed whenever one of the terminals is triggered.

Remarks

- It is permitted to program both "Totalising Reset or Message Display specified by No." and "File Storage Start/End" to a single remote contacts terminal. For instance, when "Display of Message No. 1" and "Storage Start/End in Data File A" are programmed for EX1, the message No. 1 is displayed and the data storage in data file A is started simultaneously.
- File storage can be started or ended either by "triggering" or by an "ON/OFF status change".
 - Triggering: File storage is started or ended alternately every time the remote contacts changes from OFF (open) to ON (shorted).
 - ON/OFF status change: File storage is started with the ON (shorted) status and ended with the OFF (open) status.
- When the start time by the remote contacts on the totalising (optional) is programmed, the totalising can be started by the triggering of the remote contacts.
- 10 kinds of message registrations are prepared and the desired message number (maximum 4 kinds) can be allocated for each terminal.

17 DAILY REPORT FILE (OPTIONAL)

By specifying desired time (maximum 24 points per day), a daily report file can be created which stores the instant, maximum, minimum and average values of data in each channel.

17.1 Contents of File

17.1.1 Specifying the time

The "start time" for starting the daily report data logging and "24 desired times" for storing data can be specified. As a result, when the daily operation hours are less than 24 hours, up to 24 data items can be logged at the desired times within the operation hours.

As the daily report data is logged from the start time to the 24th specified time, this feature is particularly convenient when there is a time zone in which the daily report data storage is not necessary every day.

17.1.2 Types of storing data

The following storing data can be selected.

- (1) Instant value (Real) :Data at the specified time
- (2) Maximum value in certain time period (T.Max) :Maximum data in the period between the specified time and the last specified time.
- (3) Minimum value in certain time period (T.Min) :Minimum data in the period between the specified time and the last specified time.
- (4) Average value in certain time period (T.Ave) :Average data in the period between the specified time and the last specified time.
- (5) Maximum value of day (D.Max) : Maximum data in the period between the start time and 24th specified time.
- (6) Minimum value of day (D.Min) : Minimum data in the period between the start time and 24th specified time.
- (7) Average value of day (D.Ave) : Average data in the period between the start time and 24th specified time.

17.1.3 Storing channels

The storing channels can be selected.

17.1.4 Start time

Any time of the day can be programmed between 00:00 and 23:59.

17.1.5 Storing time

Up to 24 desired times can be programmed between 00:00 and 23:59. When the number of specified time is below 24, the next time programming to the last specified time is to be "CLR (clear)". This also clears any other time programming after the time programmed to "clear".

* The time should be programmed beginning with the start time in order to avoid abnormal storage of the data.

17.1.6 Start/end of file creation

The "start/end conditions" of file creation is "fixed at Key".

17.1.7 Storage blocks

The file storage blocks can be programmed in the same way as other files.

17.2 Programming Method

17.2.1 Programming menu

With the operation screen displayed, press and hold the key 3 for 2 seconds to display the programming menu for "[15] File" in 11.3 "Engineering Parameters Programming".

17.2.2 Programming procedure

- (1) Program the file name.... File Name
- (2) Select the daily report file (Daily Report).... File Type * Only one Daily Report File can be created.
- (3) Program the "storing channels (Channel: YES or NO)" for file creation. CH/Trigger
- (4) Select (YES or NO) the storing data type. Parameter
- (5) Program the time (24 data) and start time (Start Time). Report Time

18 MATHS EXPRESSIONS (OPTIONAL)

The maths expressions can perform mathematical functions on the measured data. The result of the calculation performed can be displayed and stored. The alarms and the communications outputs of the calculated data are also possible.

The data with mathematical functions performed can be displayed or stored by specifying the channel No. The data with mathematical function performed can be specified to maximum 30 points (channels). However, as this instrument can treat maximum 30 points, the measured data cannot be displayed or stored if the measuring channel number is specified for the data with mathematical function performed. When displaying the data, it is also required to program the scale and decimal point position of data.

18.1 Maths Expressions

The following 11 types of maths expressions are available.

• Arithmetic. • Square root • Logarithm • Natural logarithm • Exponential • Temperature/humidity calculation • Maximum, minimum and average value in a specified period • Operation Record (input, remote contacts)

18.1.1 Arithmetic 1

The BR1000 series graphic recorder divides the arithmetical operation into 2 groups, and the addition, subtraction and multiplication are grouped in "Arithmetic 1".

Mathematical formula	$A \times (X) + B \times (Y) + C \times (X) \times (Y) + D$	<ul style="list-style-type: none"> • X, Y: (Measured) data. • A, B, C, D: Constants
Programming parameters	<ul style="list-style-type: none"> • CH Nos. *1 of data (X, Y) • Constants (A, B, C, D) 	

*1: When the CH No. is programmed as "00", the data in the channel is assumed to be "0" in calculation.

18.1.2 Arithmetic 2

The BR1000 series graphic recorder divides the arithmetical operation into 2 groups, and the division is grouped in "Arithmetic 2".

Mathematical formula	$A \times (X / Y) + B$	<ul style="list-style-type: none"> • X, Y: (Measured) data. • A, B: Constants
Programming parameters	<ul style="list-style-type: none"> • CH Nos. *1 of data (X, Y) • Constants (A, B) 	

*1: When the CH No. is programmed as "00", the data in the channel is assumed to be "1" in calculation.

*2: When data (Y) is "0", the calculated result is specified as follows by the value of $A \times (X)$.

- When $A \times (X) > 0$: Calculated result = +OVER range
- When $A \times (X) = 0$: Calculated result = 0
- When $A \times (X) < 0$: Calculated result = -OVER range

18.1.3 Square Root

Square Root operations are performed when the measured data is 1% or more of the programmed range. If the measured data is below 1%, the calculated result becomes the minimum value of the programmed scale range.

Mathematical formula	$(S_s - S_z) \times \sqrt{\frac{R_x - R_z}{R_s - R_z}} + S_z$	<ul style="list-style-type: none"> Rz: Minimum value of programmed range Rs: Maximum value of programmed range Sz: Minimum value of programmed scale range Ss: Maximum value of programmed scale range
Programming parameters	<ul style="list-style-type: none"> • CH No. of data (R_x) 	

18.1.4 Natural logarithm (Log(e))

Mathematical formula	$\text{Log}_e(X)$	<ul style="list-style-type: none"> • X: (Measured) data.
Programming parameters	<ul style="list-style-type: none"> • CH No. of data (X) 	

18.1.5 Logarithm (Log(10))

Mathematical formula	$\text{Log}_{10}(X)$	• X: (Measured) data.
Programming parameters	• CH No. of data (X)	

18.1.6 Temperature/humidity calculation (Humidity)

Mathematical formula	Calculation of relative humidity from the temperatures of the dry/wet bulbs and using the relative humidity table.	
Programming parameters	• CH Nos. of data (X : dry bulb) and (Y : wet bulb)	

18.1.7 Exponential (e to the Power)

Mathematical formula	e^X	• X: (Measured) data.
Programming parameters	• CH No. of data (X)	

18.1.8 Maximum value (Max)

Mathematical formula	Calculation of the maximum value at the programmed "interval period" from the programmed "start time".	
Programming parameters	• CH No. of data (X). • Interval: A hr. B min. (00 hr. 01 min. to 24 hr. 00 min.). • Start time: C hr. D min. (00:00 to 23:59). A: 00 to 24. B: 00 to 59. C: 00 to 23. D: 00 to 59.	

18.1.9 Minimum value operations (Min)

Mathematical formula	Calculation of the minimum value at the programmed "interval period" from the programmed "start time"	
Programming parameters	• CH No. of data (X). • Interval: A hr. B min. (00 hr. 01 min. to 24 hr. 00 min.). • Start time: C hr. D min. (00:00 to 23:59). A: 00 to 24. B: 00 to 59. C: 00 to 23. D: 00 to 59.	

18.1.10 Average value operations (Ave)

Mathematical formula	Calculation of the average value at the programmed "interval period" from the programmed "start time.	
Programming parameters	• CH Nos. of data (X)=. • Interval: A hr. B min. (00 hr. 01 min. to 24 hr. 00 min.). • Start time: C hr. D min. (00:00 to 23:59). A: 00 to 24. B: 00 to 59. C: 00 to 23. D: 00 to 59.	

18.1.11 Operation record for input [Action (Analog)]

Operation record for input Action (Analog)	The real-time trend is displayed at the programmed position. When the contact is short-circuited, the real-time trend is displayed at 5% higher position than the programmed one.	
Programming parameters	• X: CH No. of input • Y: Trend display position	

18.1.12 Operation record for remote contacts [Action (Digital)]

Operation record for remote contacts Action (Digital)	The real-time trend is displayed at the programmed position. When the contact is short-circuited, the real-time trend is displayed at 5% higher position than the programmed one	
Programming parameters	• X: Remote contacts terminal number • Y: Trend display position	

18.2 Programming Method

18.2.1 Programming menu

With the operation screen displayed, press the key **2** to display the Mathematics programming menu.

18.2.2 Programming procedure

- (1) Select the channel where the calculated data is to be displayed and stored. ... CH
- (2) Select the maths expressions. ... (Input) Mathematics.
- (3) Program the minimum value of the scale display. ... Scale Disp (L)
 - Some kinds of the maths expressions selected in (2) above do not require the programming of the minimum value of the scale display.
- (4) Program the maximum value of the scale display. ... Scale Disp (H)
 - Some kinds of the maths expressions selected in (2) above do not require the programming of the maximum value of the scale display.
- (5) Program the number of digits below the decimal point of the calculated data. ... Data Dot: 0 to 3
 - Some kinds of the maths expressions selected in (2) above do not require the programming of the number of digits below the decimal point.
- (6) Specify the channels for the data performing mathematical functions. ... Input CH: X, Y
 - It is also possible to specify the channel number for calculated data. In this case, however, the channel numbers of data X and Y should be smaller than the channel number selected in (1) above.
 - No need to specify the channel number for the data Y depending on the maths expressions selected in (2) above.
- (7) Program the constants (A, B, C, D) according to the maths expressions. ... Parameter.
 - When the maths expression is selected in (2) above, the default parameters are displayed.
- (8) Program the channels to the displaying groups.

Note : (1)For the operation record for input "Action (Analog)", the programming of the burnout (up scale or down scale) is required before the programming of the operation record.

(2)The operation record for input "Action (Analog)" is effective for thermocouple inputs or resistance thermometer inputs.

18.3 Operation Record for Input and Remote Contacts

The data "ON/OFF" of the operation record for input and remote contacts is internally recognized as a numerical value.

The parameter Y for the operation record is for a trend display position when the contact is opened. When the contact is short-circuited, the trend is displayed at the position of "Parameter Y + 5%".

Example: When the parameter Y is programmed at 50%, the trend is displayed at the position of 50% when the contact is opened and is displayed at the position of 55% when the contact is short-circuited.

Contact status	Operation record data	Operation record parameter Y (Example)	Trend display position (0 to 100%)	Internal data	Operation record data after data conversion*
Short	ON	50%	55%	55	55
Open	OFF		50%	50	50

When the operation record data "ON/OFF" is converted with the parameter programming software package "PASS", the data is expressed by a numeric value. Therefore, in a data file and a daily report file after data conversion with "PASS", "ON" or "OFF" is not displayed and is expressed by the numeric value. In addition, in a daily report file replayed on the BR recorder, only the instant value (Real) is displayed by "ON" or "OFF".

- (1) Instant value (Real), (2) Maximum value in certain time period (T.Max), (3) Minimum value in certain time period (T.Min), (4) Average value in certain time period (T.Ave), (5) Maximum value of day (D.Max), (6) Minimum value of day (D.Min), (7) Average value of day (D.Ave)

Note : The average value is computed by the total numerical values of ON, and the total numerical values of OFF.

19 TOTALIZATION (OPTIONAL)

The totalising can be performed on the measured data. The result of the totalising performed can be displayed and stored. The alarms and the communications outputs of the totalised data are also possible. The totalised data can be displayed or stored by specifying the channel No. The totalised data can be specified to maximum 30 points (channels). However, as this instrument can treat maximum 30 points, the measured data cannot be displayed or stored if the measuring channel number is specified for the totalised data. When displaying the data, it is also required to program the scale and decimal point position of data.

19.1 Contents of Totalising

19.1.1 Formula

$$D_n = D_{n-1} + \{(PV_n + PV_{n-1}) / CINT \times (T_n - T_{n-1})\} \div 2$$

D_n : Totalised results. D_{n-1} : Last totalised result.
 PV_n : Measured data. PV_{n-1} : Last measured data.
 T_n : Time of measurement. T_{n-1} : Last time of measurement.
 $CINT$: Constant for converting the measured data into seconds 1, 60, 3600.

19.1.2 Totalising reset (Totalising interval)

The totalising can be reset either by "programming the interval time" or by "the remote contacts". When the interval time (00 hr. 01 min. to 24 hr. 00 min.) is programmed, the totalised data is reset at every interval time after the start of totalising. When the totalising is to be reset by the remote contacts, the totalised data is reset when the remote contacts changes from OFF (open) to ON (shorted). The ON (shorted) time of the remote contacts should be more than 1 second to make this possible.

19.1.3 Start of totalising

The totalising can be started either by "programming the start time" or by "the remote contacts". When the start time (00:00 to 23:59) is programmed, the totalising starts from the start time after the programming of totalising. When the totalising is to be started by the remote contacts, the totalising starts when the remote contacts changes from OFF (open) to ON (shorted) after the programming of totalising. The ON (shorted) time of the remote contacts should be more than 1 second to make this possible.

19.1.4 Overflow

Overflow of totalised data is dependent on the position of the decimal point in the data. When an totalised data overflows, the totalised data is reset automatically and the totalising restarts. The occurrence of overflow can be identified only by checking the history of the totalised data.

Number of digits below decimal point of totalised data	Overflow threshold
0	99999
1	9999.9
2	999.99
3	99.999

19.1.5 Power failure processing

- (1) For the totalising reset by the remote contacts, the totalising continues, when the power supply recovers, from the last totalised data before power failure.
- (2) For the totalising reset by the interval time, the totalising continues from the last totalised data before power failure, provided that the time period until the power recovery is shorter than the interval time.
- (3) If the time period until the power recovery reaches or exceeds the interval time, the totalising restarts after resetting the totalised data.

19.2 Programming Method

19.2.1 Programming menu

With the operation screen displayed, press the key **2** to display the mathematics programming menu in 11.1 " Basic Parameters Programming".

19.2.2 Programming procedure

- (1) Select the channel where the totalised data is to be displayed and stored. ... CH
- (2) Select the maths expression for totalising (Integration). ... (Input) Mathematics
- (3) Program the minimum value of the scale display. ... Scale Disp (L)
- (4) Program the maximum value of the scale display. ... Scale Disp (H)
- (5) Program the number of digits below the decimal point of the calculated data. ... Data Dot: 0 to 3
- (6) Specify the channel for the data performing totalising. ... Input CH: X
 - It is also possible to specify the channel number for calculated data. In this case, however, the channel numbers of data X and Y should be smaller than the channel number selected in (1) above.
- (7) Program C_{INT} (constant for converting measured data into sec.).... Input CH: Y.

Measured Data	Constant	C_{INT}
Second (Ex. L/sec., m ³ /sec.)	00	1
Minute (Ex. L/min., m ³ /min.)	01	60
Hour (Ex. L/hr., m ³ /hr.)	02	3600

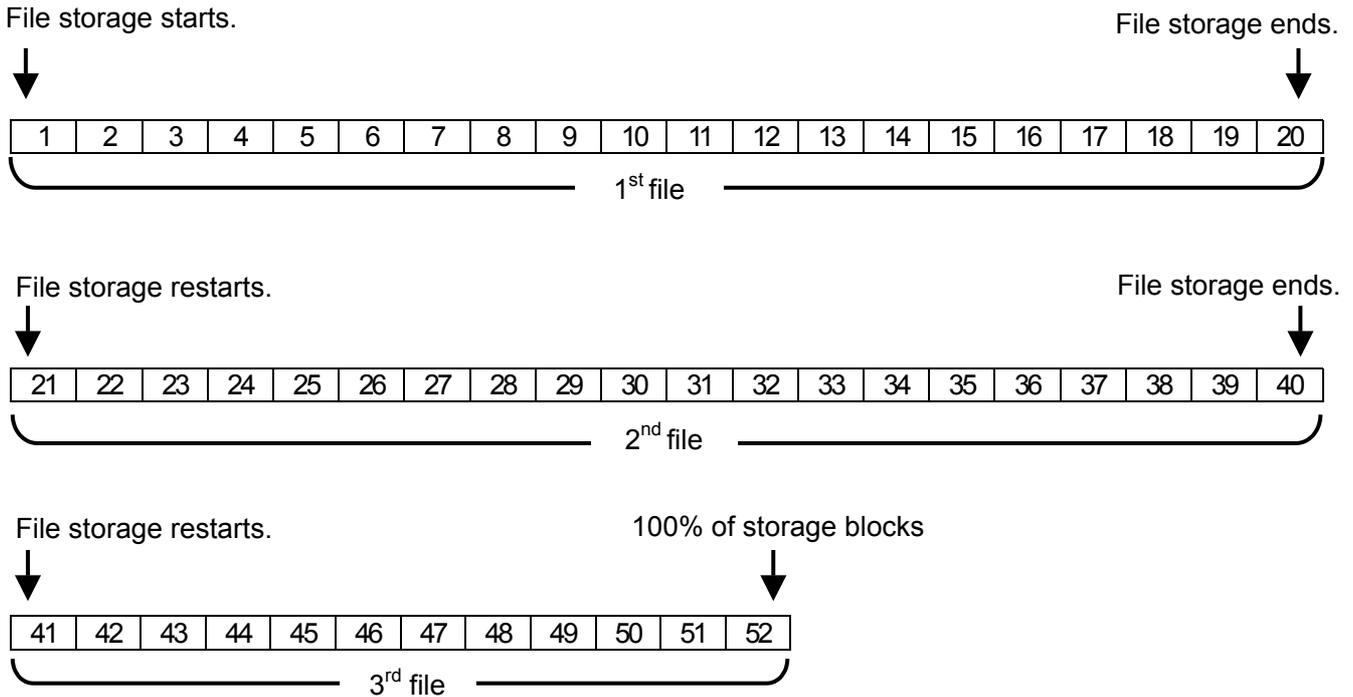
- (8) Program the totalising interval (A hr. B min.). ... Parameters A, B
 - Programming range: 00 hr. 01 min. to 24 hr. 00 min.
 - With remote contacts resetting: Program A = 99, B = 00.
- (9) Program the totalising start time (C:D). ... Parameters C, D
 - Programming range: 00:00 to 23:59.
 - With remote contacts resetting: Program C = 99, D = 00.
 - * For the remote contacts programming, see **16**.
- (10) Program the channels to the displaying groups.

20 INTERNAL MEMORY 3MBYTES

On the internal memory 3Mbytes, data is stored every 20 storage blocks when 21 to 52 storage blocks are used.

When data is stored up to 20 storage blocks, file storage is automatically ended once, and then it restarts from the 21st storage block. Furthermore, when data is stored up to 40 storage blocks, the file storage is ended again and restarts from the 41st storage block.

Example: Storage blocks: 52



21 LOW-ORDER COMMUNICATIONS PROGRAMMING

By the low-order communications function, BR1000 (master instrument) can connect the following instruments (up to 5 sets) as slave instruments. The master instrument can collect data from the slave instruments and can program "input kind", "RJ", and "burnout" of the slave instruments.

— Instruments connectable as slave instruments —

1. BR
2. AL3000
3. AH3000
4. SE3000

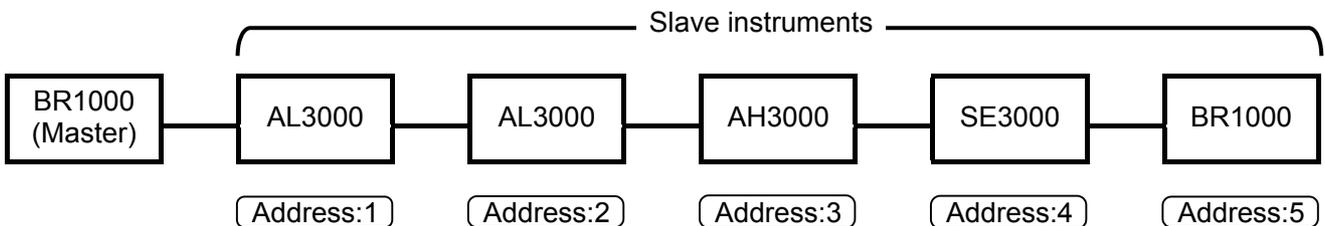
* The master instrument can manage up to 30 points of the master instrument and slave instruments mixed.

21.1 Connection Programming Procedure of Master Instrument and Slave Instrument

Connect communications lines between BR1000 (master instrument) and slave instruments, and program BR1000 (master unit) with the following procedure.

1. Supply power to the master unit and slave instruments.
2. Program the address (1 to 5) of slave instruments.

(Example of connections)



3. On the operation screen of the master instrument, press the key 3 for 2 seconds to display the engineering parameters programming menu.
4. Display the programming menu of "Communications 2" and program the slave instruments connected.

Communications 2
Instrument
Communication Mode
Bit Rate
Character
In/Out
Interval
Connection Check

- 1) For the programming of the slave instruments with the address 1 to 5 , select “Recorder” in the column of “Kind”, and then program the number of point to be managed by the master instrument.

Instrument		
Address	Kind	Point (Rec.)
1	Recorder	6
2	Recorder	12
3		
4		
5		

Programming example

Slave instrument (1): AL3000 (6 input points)

Slave instrument (2): SE3000 (12 input points)

When the number of point to be managed by the master unit is 6 points for the slave instrument (1) and 12 points for the slave instrument (2), program as shown in the left table.

- 2) Program the following communications parameters.

- Communication Mode
- Bit Rate
- Character

* Program it according to the measuring interval of slave instruments.

- 3) Program “Interval”.

Program the collection interval of data from slave instruments.

5. Program “Mathematics” and “Group Display”.

- 1) On the operation screen of the master instrument, press the key 3 for 2 seconds to display the programming menu of “Mathmatics”.
- 2) Select a channels to display and store data from a slave instrument. ... CH
- 3) Select the maths expression. ... Communi.in
- 4) Specify an address of a slave instrument. ... Input CH: X
- 5) Specify a channel of the slave instrument. ... Input CH: Y
- 6) Program channels to a group to be displayed. (See 11.3 [12].)

Programming example: For registering slave instruments next to the master instrument (6 input points).

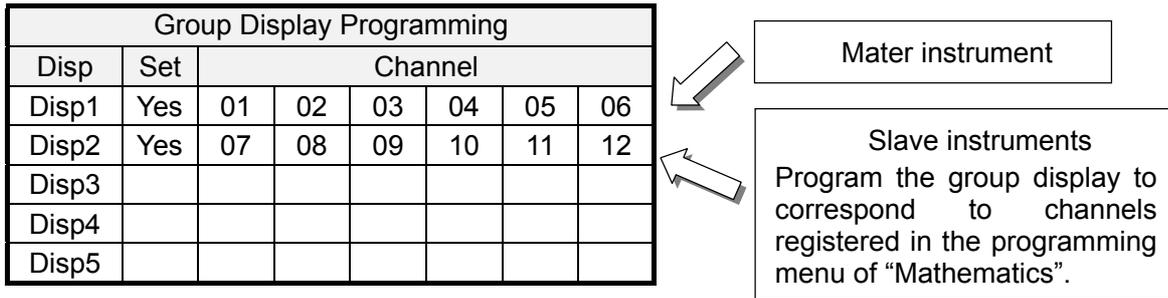
Mathematics Parameters						
CH	(Input) Mathematics	Scale Disp	(L)	Input CH	X	Parameter
			(H)		Y	
			Data Dot			
06						
07	Communi . In			01		
				01		
08	Communi . In			01		
				02		

- 1)Select “Communi.In” in CH7.
- 2)Specify the address of the slave instrument to be displayed in “Input CH X”.
- 3)Specify the channel of the slave instrument to be displayed in “Input CH Y”.

This example shows that Channel No. 1 of the slave instrument with the address No. 1 has been registered to CH7.

With the above procedure, register the connected slave instruments with the programming menu of “Mathematics”.

Program the group display for displaying the slave instruments registered in the programming menu of "Mathematics".



The programming of the connection programming of master instrument and slave instrument is completed.

21.2 Input Programming of Slave Instrument

The programming of input of slave instruments can be executed with the programming menu of "Channel Configuration 1" of the master instrument.

Programming example

Channel Configuration 1							
CH	Input	Input Range	(L)	Scale	(L)	Scale Disp	(L)
			(H)		(H)		(H)
06	T	0	0	0	0	0	
		300	300	300	300		
07	5V	1	1.0	1.0	1.0	1.0	
		5	100.0	100.0	100.0	100.0	
08	5V	1	1.0	1.0	1.0	1.0	
		5	100.0	100.0	100.0	100.0	
09	T	0	0	0	0	0	
		300	300	300	300	300	
10	T	0	0	0	0	0	
		300	300	300	300	300	

Slave instruments

When you program, with the above menu, a range or scale of Model AL3000 or Model AH3000 connected as a slave instrument, be careful of the places of programming values.

- Places of input range

Program the input range with the maximum 10 places including a mark and a decimal point.

Example: Input range (1) -200 to -150 Places: 8 Normal
 (2) -200.0 to -150.0 Places: 12 Over places

- Places of scale

Program the scale with the maximum 11 places including a mark and a decimal point.

Example: Scale (1) -200.0 to 150.0 Places: 11 Normal
 (2) -200.00 to 150.00 Places: 13 Over places

21.3 Turning On Power Supply after Finishing of Initial Programming

Turn on the power supply of the master instrument and slave instruments at almost same time.

When only the power supply of the master instrument is on, the master instrument displays the message "Please Wait ..." for about 5 minutes, and then displays the data collected from slave instruments last time.

21.4 Low-order Communications using 1-Port (high-order) Communications Unit

The BR1000 with a 1-port (high-order) communications unit can be used as a master instrument having the low-order communications function.

21.4.1 Connections

Change the connections of the 1-port (high-order) communications unit by the following procedure.

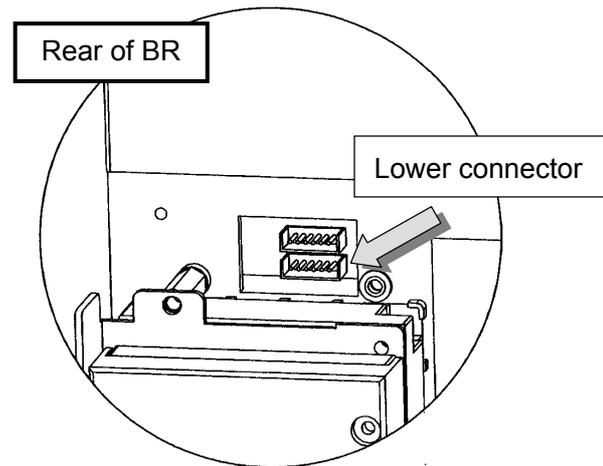
1. Remove the communications unit from the rear of BR1000 by removing its fixing screws.



2. Two (2) connectors are arranged on the rear of BR1000 as shown in the right figure. Reinsert the communication cable to the lower connector.



3. Fix the communications unit with screws.



21.4.2 “Option” programming

Program “Option” by the following procedure.

1. Turn on the power supply of BR1000 (master instrument), and then press two keys [4] and [6] simultaneously to display the menu of “Maker’s Programming”.



2. Display the menu of “Option”. Change the parameter of “Communications” into “No”, and program the parameter of “Communications 2” to the mode of the communications being connected.



3. Program the parameter of “Comset” to “Yes”.

Option	
Pop Noise Filter	No
Moving Average	No
Mathematics1	No
Mathematics2	No
User Pass Erase	CLR
Daily Report	No
Communications	RS232C
Alarm Output	No
Communications2	No
3MB Memory	No
Memory Card	No
Floppy Disk	Yes
Comset	No

Caution

Select RS422A when the mode of the communications being connected is RS232C.

22 SCALE CALIBRATION

22.1 Types of Scale Calibration

Two kinds of scale calibration are available. To maintain the measuring accuracy, it is recommended to calibrate this instrument every year.

Calibration Name	Description
(1) Zero-span adjustment	Adjustment by entering the minimum and maximum values of measuring range for each channel.
(2) Shift adjustment	Adjustment for shifting the measured value of each channel.

22.2 Calibration Environment

Scale calibration should be performed under the reference operation condition.

Reference Conditions

Items	Reference conditions
Ambient temperature	23 ±2 °C
Ambient humidity	55 ±10%RH
Power voltage	100 V AC ±1%
Power frequency	50 or 60 Hz ± 0.5%

22.3 Preparation

22.3.1 Preparation of tools

Tools	Input types			Remarks
	DC voltage	Thermocouple	Resistance	
DC standard voltage/current generator	○	○		Accuracy: Shall be better than ±0.05%
Reference junction compensator		○		0°C ±0.2°C
Thermocouple for test		○		Same type of thermocouple as input type
Standard variable resistor			○	Accuracy: Shall be better than ±0.05%
3-core copper wire			○	Three copper wires shall have the same resistance value

22.3.2 Before calibration

- (1) Attach the terminal board cover and turn power on.
- (2) Keep the BR1000 series graphic recorder's power on for more than 30 minutes until it is stabilized before starting the scale calibration. (The ideal warm-up period is more than 1 hour.)

Remarks Adjustment

Checking and adjustment of measured values require careful work with a standard tool and other tools.

When checking and adjustment of measured values are required, please contact our sales agent.

22.4 Connections

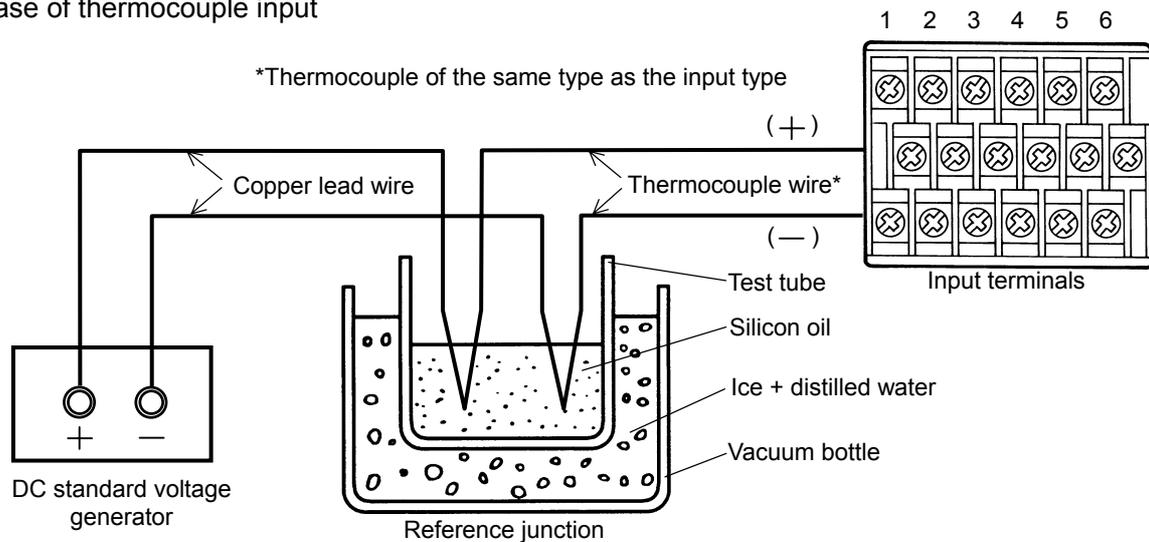
Connections depend upon the input types.

Connect a standard tool and other tools to the measuring input terminals to be adjusted.

Caution

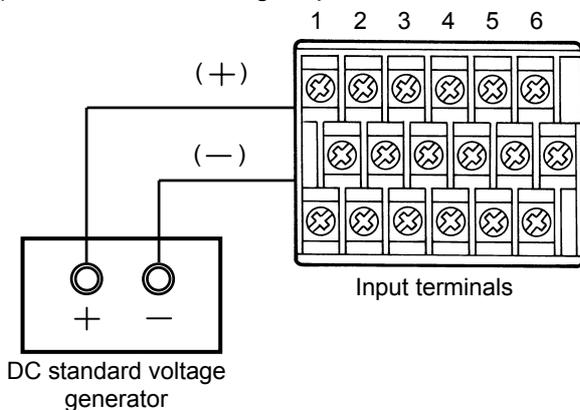
Turn off the power supply before starting connections for the purpose of preventing an electric shock accident.

(1) In case of thermocouple input

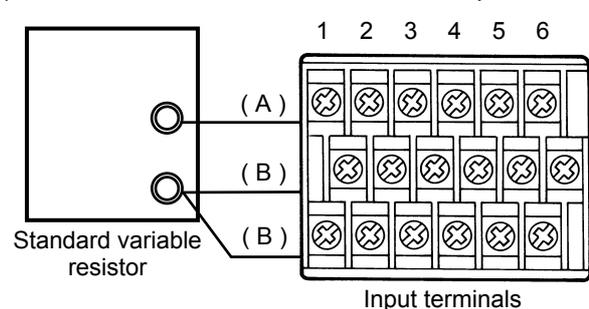


The electromotive force of the thermocouple input becomes small by the electromotive force equivalent to the temperature at terminals. This instrument itself compensates for the electromotive force equivalent to the temperature at terminals. This is called reference junction compensation. Accordingly, the reference junction compensator is necessary for reducing the electromotive force compensated.

(2) In case of DC voltage input



(3) In case of resistance thermometer input



22.5 Zero/Span Adjustment

The zero and span adjustments are to be performed by entering the minimum and maximum values of input range to each channel.

Remarks

File storage is terminated when the scale calibration mode is initiated. To resume file storage, execute the Storage Operation (see **13**).

22.5.1 Calibration menu

- (1) With the operation screen displayed, press and hold the key **3** for more than 2 seconds to display the Engineering Parameters programming menu, then select "Maintenance Mode".
 - * Maintenance Mode: When the key **5** (**↓**) is held depressed, this item appears after "Communications 2".
- (2) Then select "Calibration".
- (3) Select "Zero/Span". The input type (Input), minimum/maximum values of input range (Input Range (L)/(H)) and calibration data (Correction Data Zero/Span) of the measuring channel are displayed.
 - * The channels without range programming are also displayed, but the channels for calculated data are not displayed.

22.5.2 Adjustment procedure

- (1) Select one of the channels to be scale-calibrated by pressing the key **6** (**PRG**).
 - * Pressing the **ENT** key displays the correction data copying menu.
- (2) As the minimum value of the input range appears, apply the input corresponding to the minimum value from a voltage generator or a variable resistor to the BR1000 series graphic recorder, and press the **ENT** key.
- (3) As the maximum value of the input range appears, apply the input corresponding to the maximum value from the voltage generator or the variable resistor to the BR1000 series graphic recorder, and press the **ENT** key.
- (4) The menu in step (1) above reappears. The correction data displayed on this menu is updated.
- (5) Select another channel requiring scale calibration and perform the same adjustment procedure as above.

Remarks

In case of mistake in applying an input to this instrument or other problems, perform the following.

- Perform scale calibration again.
- With the menu in (1) above displayed, move the cursor to a channel and press the key **2** (**CLR**). This resets the correction data to the default values.

22.5.3 Copying the correction data

- (1) Press the **ENT** key.
- (2) Move the cursor to the copy source channel (I) and press the **ENT** key.
(The channel No. turns red.)
- (3) Move the cursor down to each copy destination channel (II) by pressing the key **5** (**↓**), then press the **ENT** key. Select all of the channels to which the correction data is to be copied onto.
- (4) Move the cursor down to "Copy" by pressing the key **5** (**↓**), and press the **ENT** key.

Remarks

In case of any trouble, perform the following.

- Perform the copy operation again.
- With the menu in (1) above displayed, move the cursor to a channel and press the key **2** (**CLR**). This resets the correction data to the default values.

22.6 Shift Adjustment

The shift adjustment can be performed on each channel.

Remarks

File storage is terminated when the scale calibration mode is initiated. To resume file storage, execute the Storage Operation (see page 58).

22.6.1 Calibration menu

- (1) With the operation screen displayed, press and hold the key **[3]** for more than 2 seconds to display the Engineering Parameters programming menu, then select "Maintenance Mode".
 - * Maintenance Mode: When the key **[5]** (**[↓]**) is held depressed, this item appears after "Communications 2".
- (2) Then select "Calibration".
- (3) Select "Shift". The current data (Data) and shift-corrected data (Correction) of the input channel are displayed.
 - The channels without range programming are also displayed, but the channels for calculated data are not displayed.

22.6.2 Adjustment procedure

- (1) Select one of the channels to be shift-adjusted by pressing the key **[6]** (**[PRG]**).
 - * Pressing the **(ENT)** key displays the correction data copying menu.
- (2) The current measured data appears.
- (3) Enter the desired value (data after shift-adjustment) and press the **(ENT)** key.
- (4) The menu in step (1) above reappears. The correction data displayed in this menu is updated.
- (5) Select any other channel requiring scale calibration and perform the same adjustment procedure as above.

Remarks

In case of any trouble, perform the following.

- Perform shift adjustment again.
- With the menu in (1) above displayed, move the cursor to a channel and press the key **[2]** (**[CLR]**). This resets the correction data to the default values.

22.6.3 Copying the correction data

Use the same procedure as for the zero/span adjustment (see 22.5.3).

23 INITIALIZATION PROGRAMMING

The programmed parameters, scale calibration correction data and other data can be initialized to the defaults.

Remarks

File storage is terminated when the programmed parameter of the memory clear mode is executed. To resume file storage, execute the File Programming (see 14) and Storage Operation (see 13).

23.1 Types of Initialization Programming

Item	Menu Item	Description
Programming parameters	Parameters	Initializes all parameters and the internal memory except for the programmed clock.
Scale calibration	Calibration Data	Initializes correction data (zero/span adjustment, shift adjustment) of all the measuring channels.
Built-in RAM	Data Stored	Initializes built-in RAM. *
Clock	Clock	Initializes the date/time (Default: January 01, 1999, 00:00).

* This clears data in the data, alarm and message files.

23.2 Initialization Procedure

- (1) With the operation screen displayed, press and hold the key **3** for more than 2 seconds to display the Engineering Parameters programming menu, then select "Maintenance Mode".
 - * Maintenance Mode: When the key **5** (**↓**) is held depressed, this item appears after "Communications 2".
- (2) Then select "Memory Clear".
- (3) When the items are displayed, select and execute an item.
- (4) The menu in (2) above reappears.

24 HARDWARE CHECK

Remarks

File storage is terminated when the hardware check mode is initiated. To resume file storage, execute the memory operation (see 13).

24.1 Types of Hardware Check

Item	Display	Description
Key	Key Check	Checks keys 1 to 6 , the scroll key and ENT key.
Display	Display Check	Checks the display unit.
External memory	FDD	FDD Check
	Memory card	Memory Card Check
Alarm output	Alarm Output	Can turn the alarm output ON as desired.
		 CAUTION As this check alters the alarm output status, pay attention to the status of the system connected to the alarm output terminal.
Remote contacts	External Input	Checks the shorted/open status of remote contacts terminals.
Communications	Communication	Checks communications. Refer to the communications instruction manual for details.

REFERENCE

The software version of the BR1000 series graphic recorder is displayed on the top right of the Maintenance Mode selection menu.

24.2 Hardware Check Procedure

- (1) With the operation screen displayed, press and hold the key **3** for more than 2 seconds to display the Engineering Parameters programming menu, then select "Maintenance Mode".
 - * Maintenance Mode: When the key **5** (**↓**) is held depressed, this item appears after "Communications 2".
- (2) Then select "Hardware Check".
- (3) When the items are displayed, select and execute an item.
 - * A display check can be started by pressing the **ENT** key.

25 RECOMMENDED PARTS REPLACEMENT INTERVALS

It is recommended to replace parts periodically as preventive maintenance for using this instrument under good conditions for a long time.

WARNING

For replacement of parts, always have CHINO-approved service personnel perform the operation. Otherwise this instrument may not recover properly and also accident may occur. Ask CHINO sales agent to perform parts replacement.

25.1 Operating Conditions

The reference parts exchange intervals are under the following standard conditions. The intervals become shorter if the ambient conditions are worse than the standard conditions.

Items	Conditions
Temperature	20 to 25°C
Humidity	20 to 80%RH
Operation time	8 hours/day
Corrosive gas	Shall be free of corrosive gases

Items	Conditions
Others	(1) A place free of dust, moisture, and soot
	(2) A place free of vibrations and shocks
	(3) A place where operation is not affected unfavorably

25.2 Reference of Parts Replacement Intervals

Part name	Exchange reference	Remarks
Power supply unit	5 years	Ambient temperature 25°C
Display board	5 years	*
Key	5 years	
FDD	5 years	
Relay (for input selection)	5 years	Narrow span of resistance thermometer input: 2 years
Relay (For mechanical alarm output)	70,000 times	Resistive load (Less than rated contact rating)
	20,000 times	Inductive load (Less than rated contact rating)
EEPROM	7 years	Rewrite count About 100,000 times or less
Lithium battery	6 years	

* The replacement interval extends by using the screen saver function (1 to 60 minutes) and by reducing the brightness.

26 SPECIFICATIONS

■ General Specifications

Rated power voltage:

100 to 240 V AC, 50/60 Hz
(Universal power supply)

Power consumption:

Maximum 45 VA

Environmental conditions:

- Reference operating condition
Ambient temperature/humidity range
21 to 25°C, 45 to 65%RH
Power voltage 100 V AC $\pm 1\%$
Power frequency 50/60 Hz $\pm 0.5\%$
Attitude Left/right 0°, forward tilting 0°,
backward tilting 0°
Warm-up time Minimum 1 hour
- Normal operation condition
Ambient temperature/humidity range
0 to 50°C, 20 to 80%RH
* 5 to 40°C for FDD operation
Power voltage 90 to 264 V AC
Power frequency 50/60 Hz $\pm 2\%$
Attitude Left/right 0°, forward tilting 0°,
backward tilting 0° to 20°
- Transportation condition (in the packed
condition on shipment from the factory)
Ambient temperature/humidity range
-20 to +60°C, 5 to 90%RH (no dew
condensation)
Vibrations 10 to 60 Hz, less than 0.5 G
Impact Less than 40 G
- Storage condition
Ambient temperature/humidity range
-20 to +60°C, 5 to 90%RH (no dew
condensation)

Power failure protection:

An EEPROM stores the programmed parameters. A flash memory stores data. A lithium battery backs up the clock and data RAM for more than 6 years (provided that the daily operating hours is longer than 8 hours).

Insulation resistance:

Between secondary and protective conductor terminals

More than 20 M Ω at 500 V DC

Between primary and protective conductor terminals

More than 20 M Ω at 500 V DC

Between primary and secondary terminals

More than 20 M Ω at 500 V DC

Between alarm output (mechanical relay) and other secondary terminal

More than 20 M Ω at 500 V DC

Primary terminals: Power terminals (L, N), alarm output terminals (MOS relay, mechanical relay 'a' contact).

Secondary terminals: Input terminals, alarm output terminals (mechanical relay 'c' contact), remote contacts terminals, communications terminals.

Dielectric strength:

Between secondary and protective conductor terminals

1 minute at 500 V AC

Between primary and protective conductor terminals

1 minute at 1500 V AC

Between primary and secondary terminals

1 minute at 2300 V AC

Between alarm output (mechanical relay) and other secondary terminal

1 minute at 1000 V AC

Primary terminals: Power terminals (L, N), alarm output terminals (MOS relay, mechanical relay 'a' contact).

Secondary terminals: Input terminals, alarm output terminals (mechanical relay 'c' contact), remote contacts terminals, communications terminals

Exterior material:

Front ABS resin (frame)

Enclosure and power supply material: Steel

Color:

Front Black (door, equivalent to Munsell N3.0)

Enclosure: Gray (equivalent to Munsell N7.0)

Weight:

Approx. 3.2 kg

Mounting:

Panel mounting

Clock accuracy:

± 2 minutes per 30 days (excluding errors due to power ON/OFF under the reference operation conditions)

Terminal screws:

Power terminal M4.0

Protective conductor terminal M4.0

Input terminals M3.5

Alarm output terminals M3.5

Remote contacts terminals M3.5

Communications terminals M3.5

■ International Standards

CE marking:

EN55011 Group 1 Class A.

EN50082-2, EN61010-1 + A2

UL: UL3111-1 (approval pending for Model BR17 □2)

C-UL (CSA):

C22.2, No. 1010 (approval pending for Model BR17 □2)

IP: IEC529 IP54 (front part)

Input Specifications

Number of measuring points:

BR17A2, BR1761	6 points
BR17B2	12 points
BR17□3	1, 2, 3 or 4 points

Input signals:

Universal input	
DC voltage	±13.8 mV, ±27.6 mV, ±69.0 mV, ±200 mV, ±500 mV, ±2 V, ±5 V*, ±10 V*, ±20 V*, ±50 V*. (*: With built-in shunt resistors)
DC current	Available by adding external shunt resistors
T/C	B, R, S, K, E, J, T, N, NiMo-Ni, CR-AuFe, PtRh20-PtRh5, PtRh40-PtRh20, WRe5-WRe26, W-WRe26, Platinel II, U, L
RTD	Pt ('97), Pt ('89), JPt100, Pt50, Pt-Co.

Range setup:

Programming of input types and ranges by key operation
The measuring range is selected automatically according to the programmed range.

Scale setup:

Programming of minimum values, maximum values and engineering units by key operation

Accuracy rating:

See table of inputs

Temperature drift:

±0.01% of full scale/°C [Other input types than the resistance thermometer inputs are converted into the reference range (see the Accuracy Rating table)]

Measuring interval /cycle:

BR17A2...	1 second / 6 points
BR17B2...	2 seconds / 12 points
BR1761...	5 seconds / 6 points
BR17	3...0.1 second / 4 points

Reference junction (RJ) compensation accuracy:

K, E, J, T, N, Platinel II Maximum ±0.5°C
R, S, NiMo-Ni, CR-AuFe, WRe5-WRe26, W-WRe26, U, L Maximum ±1.0°C

(The above errors are added to the accuracy ratings for the internal reference junction compensation.)

Input resolution:

Approx. 1/56,000 (converted into reference range)

Burnout:

Signal disconnection detection for thermocouple and resistance thermometer inputs
Up-scale burnout, down-scale burnout or burnout disabled can be selected for each input.

Allowable signal source resistance:

Thermocouple inputs (burnout disabled), DC voltage inputs (max. ±2 V) Maximum 1 kΩ
DC voltage inputs (±5 to 50 V) Maximum 100 Ω

Resistance thermometer inputs
[Pt('97), Pt('89), JPt100]

Maximum 10 Ω per wire -- same for 3 wires

Input resistance:

Thermocouple inputs Approx. 8 MΩ
DC voltage inputs
Approx. 8 MΩ at less than ±2 V
Approx. 1 MΩ at ±5 to 50 V

Maximum input voltage:

Thermocouple inputs (burnout disabled), DC voltage inputs (max. ±2 V)
Maximum ±10 V DC
DC voltage inputs (±5 to 50 V)
Maximum ±60 V DC
Thermocouple inputs (burnout enabled), resistance thermometer inputs
Maximum ±6 V DC

Scale calibration:

Zero/span and shift adjustments for each channel

Maximum common mode voltage:

30 V AC

Common mode rejection ratio:

Minimum 130 dB (50 or 60 Hz)
However minimum 120dB (50 or 60 Hz) for model BR17 2.

Series mode rejection ratio:

Minimum 50 dB (50 or 60 Hz)
However Model BR17 2 limits when it contains a thing for the signal and the peak value of the noise is equal to or less than 1.5 times the standard range.

Storage Function

Internal memory: 3 MBytes

Storing interval:

Model BR17A2/BR1761/BR17□3

Second	0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 15, 20, 30 sec (From 1 second for model BR17A2, from 5 seconds for model BR1761)
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

Model BR17B2

Second	2, 4, 6, 8, 10, 16, 20, 30 sec
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

Storing data:

Measured data (simultaneous storage of max. 5 files),
Messages (1 file),
Alarm event (1 file),
Programmed parameters (1 file)

- Measured data
 - File number, storage start date/time, storage interval, scale data, measured data
- Messages
 - Time, message text (max. 200 messages)
- Alarm event
 - Alarm event time, channel, level, alarm type (max. 200 information)
- Programmed parameters
 - Storage date/time, all parameters (updated on reprogramming)

Storing measured data:

2-byte binary/1 data

* When the storing interval is longer than the measuring interval, both the minimum and maximum values are stored.

(for Model BR17A2 with storing interval other than 1 second, for Model 17B2 with storing interval other than 2 seconds, for Model BR1761 with storing interval other than 5 seconds or for Model BR17 3 storing interval other than 0.1 second)

Storage into internal memory:

* The following conditions can be selected.

- Key operations
- Trigger signals (remote contacts, alarm activation)
- Storage when conductive signal is ON
- Start/end by time

* Pre-triggering storage available with the key operations and trigger signals.

Pre-triggering measuring count
= $65536 \div (\text{Number of data channels} + 2)$

- * The storage channel and storage interval can be programmed for each file.
- * Memory division enables simultaneous writing to multiple files (up to 5 files). [The memory is divided into 52 blocks and these storage blocks are allocated to files.]
- * A file closes when it has been fully written. (The storage to the specified file ends.)

Status output:

When 90% of the storage space in a file has been written, the status can be output at alarm output terminals.

Memory usage display:

The amount (%) of memory used in each file is displayed on the operation screens.

External memory medium:

3.5-inch FDD (2HD, 1.44 MB, MS-DOS formatted)

PCMCIA ATA flash memory card (optional)

Data in the internal memory can be copied to a floppy disk by the key operation.

■ Display Specifications

Display device:

5.5-inch TFT color LCD
(320 x 240 dots: 111.36 mm x 83.52 mm)

Trend display colors:

10 colors (selectable)

Operation screens:

Screens are switched with the scroll key and entry key operations.

Screens of 5 groups can be switched except for the Alarm Summary screen (max. 6 channels/group).

- Trend screens
One of the Real-time Trend, Historical Trend or Dual Trend displays can be selected.
Vertical or horizontal time scale (scale plate and pointer displays) orientation selectable/
Data display enabled or disabled selectable/Scrolling available.

- Bargraph screen

Data display enabled or disabled selectable

- Data screen
(Data + Tag + Engineering unit + Alarm activated status)
- Multi-screen
Real-time Trend screen + Bargraph screen + Data screen
- Alarm Summary screen
Current alarm output status + alarm log (Channel, level, alarm event time)

Skipping:

On the Trend and Data screens, the channels to be skipped in display can be programmed for each group.

Scrolling:

On the Trend screens, historical data can be referred with the cursor operation.

- Real-time Trend
Scrolling measuring count
= $131072 \times \text{Interval Time} \div (\text{Number of data channels} + 2)$ [Approx. 4 hours 33minutes for Model BR17A2 (6 points), approx. 5 hours 12 minutes for Model BR17B2 (12 points), approx. 22 hours 45 minutes for Model BR1761 (6 points), approx. 36 minutes for Model BR17 3 (4 points)]
- Historical Trend
Entire memory file area
- Dual Trend
Enables on the historical trend screen only.

Display (Historical Trend):

Historical data is displayed by specifying a file. Data logging is continued.

- * Display by scrolling or by time specified
- * Enables to display from a floppy disk (memory card: optional).

Data search (Historical Trend):

The trend display position matching the following conditions is searched automatically from the data in the displayed file and the cursor is moved to the position.

- CH A data = CH B data
- CH A data < CH B data
- CH A data < Specific data (optional programming)
- CH A data > Specific data (optional programming)
- Specific data 1 (optional programming) CH A data Specific data 2 (optional programming)

Message display:

Messages can be displayed on the real-trend screen by the key operation or by remote contacts input and stored in a message data file (max. 200 messages). Messages can also be displayed on the historical trend screen and stored in.

- * Pre-registration of messages (max. 10 messages, max. 30 characters/message).

Display updating interval:

Trend screens

Depended on time scale programming

Min. 1 second. However Min. 2 seconds for Model BR17B2.

Data screen

Model BR17□3: Approx. 1 second

Model BR17A2: Approx. 1 second

Model BR17B2: Approx. 2 seconds

Model BR1761: Approx. 5 seconds

Time scale programming:

Display dot interval on the time scale can be programmed. (Data replay-storing interval or longer)

Model BR17A2/BR1761/BR17□3

Second	0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 15, 20, 30 sec Model BR17A2 : From 1 second Model BR1761 : From 5 seconds Model BR17□3 : Real-time trend – From 1 second
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

Model BR17B2

Second	2, 4, 6, 8, 10, 16, 20, 30 sec
Minute	1, 2, 3, 5, 10, 15, 20, 30, 60 min

LCD saver:

When no key is operated for the specified period of time, the back-light is dimmed and the screen saver display appears. The period can be programmed between 1 and 60 minutes.

■ Programming and Operation Specifications

Key types:

[1], [2], [3], [4], [5], [6], scroll key, entry key

Operator programming:

- Message programming (Programming on trend screens: Registration and execution of 10 messages)
- Channel parameters (Input range, others)
- Maths-related parameters
- Alarm-related parameters
- Date/time programming

Engineering parameters programming:

- Channel parameters (Input range, others)
- Maths-related parameters
- Alarm-related parameters
- Date/time programming, date format selection (Date format: YY/MM/DD, MM/DD/YY or DD/MM/YY)
- Password registration/cancellation
- Programming guidance language selection (English/Japanese/Chinese/Korean)
- Screen saver-related programming
- Screen brightness adjustment
- Display group registration (page switching, max. 6 channels/screen)
- Operation screen enable/disable registration
- Trend display registration (Time scale vertical/horizontal orientation
Display format: Compressed/expanded, zone)

- File registration (Registration of data logging conditions)
- Message programming (Max. 10 messages)
- Operator access programming
- Allocation programming of remote contacts input
- Communications parameters
- Scale calibration (Zero/span adjustment, shift adjustment)
- Memory initialization
- Hardware check

Floppy disk (memory card: optional) operation:

- Formatting
- Data file copy from internal memory
- Read/write of programmed parameters

■ Alarm Specifications

Number of programmable alarms:

Maximum 4 levels/channel

Alarm types:

High alarm, low alarm, differential high alarm, differential low alarm, rate-of-change increase alarm, rate-of-change decrease alarm

Alarm storage:

Alarm event time and alarm types

* Storage of latest 200 data common to channels

Alarm output (optional): 6 outputs.

* The memory status output and fail output can be programmed to alarm output terminals.

○ Measuring Range, Accuracy Rating and Display Resolution

Note) Accuracy under the reference operation condition. For thermocouple inputs (internal RJ), the reference junction compensation accuracy is not included.

Input type	Measuring range	Reference range	Accuracy rating	Display Resolution
Thermocouple	K	-200.0 to 300.0 °C	±13.8 mV	0.1 °C
		-200.0 to 600.0 °C	±27.6 mV	0.1 °C
		-200 to 1370 °C	±69.0 mV	1 °C
	E	-200.0 to 200.0 °C	±13.8 mV	0.1 °C
		-200.0 to 350.0 °C	±27.6 mV	0.1 °C
		-200 to 900 °C	±69.0 mV	1 °C
	J	-200.0 to 250.0 °C	±13.8 mV	0.1 °C
		-200.0 to 500.0 °C	±27.6 mV	0.1 °C
		-200 to 1200 °C	±69.0 mV	1 °C
	T	-200.0 to 250.0 °C	±13.8 mV	0.1 °C
		-200.0 to 400.0 °C	±27.6 mV	0.1 °C
	R	0 to 1200 °C	±13.8 mV	1 °C
		0 to 1760 °C	±27.6 mV	1 °C
	S	0 to 1300 °C	±13.8 mV	1 °C
		0 to 1760 °C	±27.6 mV	1 °C
	B	0 to 1820 °C	±13.8 mV	1 °C
	N	-200.0 to 400.0 °C	±13.8 mV	0.1 °C
		-200.0 to 750.0 °C	±27.6 mV	0.1 °C
		-200 to 1300 °C	±69.0 mV	1 °C
	W-WRe26	0 to 2315 °C	±69.0 mV	±0.15% ±1 digit
WRe5-WRe26	0 to 2315 °C	±69.0 mV		1 °C
PtRh20-PtRh5	0 to 1800 °C	±13.8 mV		1 °C
PtRh40-PtRh20	0 to 1888 °C	±13.8 mV	±0.2% ±1 digit	1 °C
NiMo-Ni	-50.0 to 290.0 °C	±13.8 mV		0.1 °C
	-50.0 to 600.0 °C	±27.6 mV		0.1 °C
	-50 to 1310 °C	±69.0 mV		1 °C
CR-AuFe	0.0 to 280.0 K	±13.8 mV		0.1 K
Platinel II	0.0 to 350.0 °C	±13.8 mV		0.1 °C
	0.0 to 650.0 °C	±27.6 mV		0.1 °C
	0 to 1395 °C	±69.0 mV	±0.15% ±1 digit	1 °C
U	-200.0 to 250.0 °C	±13.8 mV		0.1 °C
	-200.0 to 500.0 °C	±27.6 mV		0.1 °C
	-200.0 to 600.0 °C	±69.0 mV		0.1 °C
L	-200.0 to 250.0 °C	±13.8 mV	±0.1% ±1 digit	0.1 °C
	-200.0 to 500.0 °C	±27.6 mV		0.1 °C
	-200 to 900 °C	±69.0 mV		1 °C

* Under the test environment requested by EMC Directive, indications equivalent to max. 5 °C or 200 μV (Model BR17□2-max 25°C or 2mV) may fluctuate.

K, E, J, T, R, S, B, N: IEC584, JIS C 1602-1995.

U (Cu-CuNi), L (Fe-CuNi): DIN43710.

W-WRe26, WRe5-WRe26, PtRh20-PtRh5, PtRh40-PtRh20, NiMo-Ni, CR-AuFe, Platinel II :ASTM

Input type	Measuring range	Reference range	Accuracy rating	Display Resolution	
DC voltage	-13.80 to 13.80 mV	±13.8 mV	±0.1% ±1 digit	10 μV	
	-27.60 to 27.60 mV	±27.6 mV		10 μV	
	-69.00 to 69.00 mV	±69.0 mV		10 μV	
	-200.0 to 200.0 mV	±200.0 mV		100 μV	
	-500.0 to 500.0 mV	±500.0 mV		100 μV	
	-2.000 to 2.000 V	±2 V		1 mV	
	-5.000 to 5.000 V	±5 V		1 mV	
	-10.00 to 10.00 V	±10 V		10 mV	
	-20.00 to 20.00 V	±20 V		10 mV	
	-50.00 to 50.00 V	±50 V		10 mV	
Resistance thermometer	Pt100 (JIS'97)	-140.0 to 150.0 °C	160 Ω	±0.15% ±1 digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1%	0.1 °C
		-200.0 to 850.0 °C	400 Ω	±1 digit	0.1 °C
	Pt100 (QPt100) (JIS'89)	-140.0 to 150.0 °C	160Ω	±0.15% ±1 digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1%	0.1 °C
		-200.0 to 649.0 °C	400 Ω	±1 digit	0.1 °C
	JPt 100	-140.0 to 150.0 °C	160Ω	±0.15% ±1 digit	0.1 °C
		-200.0 to 300.0 °C	220 Ω	±0.1%	0.1 °C
		-200.0 to 649.0 °C	400 Ω	±1 digit	0.1 °C
	Pt50	-200.0 to 649.0 °C	220 Ω	±0.1% ±1 digit	0.1 °C
Pt-Co	4.0 to 374.0 K	220 Ω	±0.15% ±1 digit	0.1 K	

Pt100(JIS '97):IEC751(1995),JIS C1604-1997

Pt100(JIS '89):IEC751(1983),JIS C1604-1989

JIS C1606-1989

JPt100:JIS C1604-1981,JIS C1606-1989

Pt50:JIS C1604-1981

○ Exception of accuracy rating

Input type	Measuring range	Accuracy rating
K, E, J, T, L	-200 to 0 °C	±0.2% ±1 digit
R, S	0 to 400 °C	±0.2 % ±1 digit
B	0 to 400 °C	Not specified
	400 to 800 °C	±0.15 % ±1 digit
N, U	-200 to 0 °C	±0.3 % ±1 digit
W-WRe26	0 to 100 °C	±4% ±1 digit
	100 to 400 °C	±0.5 % ±1 digit
PtRh20-PtRh5	0 to 100 °C	±4 % ±1 digit
	100 to 400 °C	±0.5 % ±1 digit
PtRh40-PtRh20	0 to 300 °C	±1.5 % ±1 digit
	300 to 800 °C	±0.8 % ±1 digit
CR-AuFe	0 to 20 K	±0.5 % ±1 digit
	20 to 50 K	±0.3 % ±1 digit
Pt100('97)	700 to 850 °C	±0.15 % ±1 digit
Pt-Co	4 to 50 K	±0.3 % ±1 digit

■ Option specifications

Options		Explanation
1	Remote Contacts	<p>Following operations are available by using 4 contact inputs and 2 common signals. (Parameter wiring)</p> <p>(1) Data memory triggering Data storage in the internal memory starts when the conductive signal turns from OFF to ON.</p> <p>(2) Data memory signaling Data storage in the internal memory continues while the conductive signal is ON.</p> <p>(3) Message display Pre-registered messages can be displayed when the conductive signal turns from OFF to ON.</p> <p>(4) Totalising reset Resets the totalising data (all channels simultaneously).</p>
	Alarm Output	<p>Alarm outputs points: 6 points (OR output possible) Contact rating :</p> <ul style="list-style-type: none"> ● Mos relay alarm output 240V (AC, DC) 50mA ... irrespective of load types ● Mechanical relay alarm output 100VAC 0.5A ... resistive load (common to "a" and "c" contacts) 240VAC 0.2A ... resistive load 100VDC 0.3A ... resistive load <p>*Mechanical relay "c" contact output: Not conforming to the international safety standards</p>
2	Communications	<p>Selection from 3 types of RS-232C, RS-422A and RS-485 MODBUS protocol (RTU/ASCII) Function: Data transmission, parameter programming, operations, data communications input, low-order communications programming *By using 1-port communications unit, low-order communications is available. (See 21.4)</p>
3	2-port communications	<p>Higher-order communications: Same as above "Communications" Lower-order communications: By connecting with CHINO's instruments(as slave instruments - up to 5 sets), BR (master instrument) can collect data from slave instruments and program "input kind", "RJ", and "burnout". (Low-order communications programming function) When controllers are connected as slave instruments, collection of "PV, SV, and MV values" data is possible. Lower-order communications: RS-422A or RS-485 (to be specified) MODBUS protocol (RTU / ASCII) Applicable instruments: Recorder BR, AL3000, AH3000 Controller DZ1000, DZ2000</p>
4	Daily report file	<p>Daily report file A daily report file can be created by specifying channels, time (max. 24 desired time) and the following items.</p> <p>(1) Instant value (2) Maximum value in a certain time period (3) Minimum value in a certain time period (4) Average value in a certain time period (5) Maximum value in day (6) Minimum value in day (7) Average value in day</p>
5	Mathematics	<p>The following maths expressions can be applied to measured data. The maths expressions can be also applied to the calculated data.</p> <p>(1) Arithmetic (2) Square root (3) Logarithm, Natural Logarithm (4) Exponential (5) Maximum, minimum and average values (6) Temperature/humidity calculation</p>
6	Integration	<p>Totalising measured data or calculated data Interval: 1 minute to 24 hours, or none (by remote contacts) Start time: 00:00 to 23:59</p>
7	Memory Card	<p>External memory medium: PCMIA ATA FLASH MEMORY CARD The file stored in the internal memory is automatically stored in memory card.</p>
8	Shunt Resistor	<p>For current input, 250 Ω or 20 Ω (mounted externally).</p>

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