HIOKI

INSTRUCTION MANUAL

INR-9000 Series

INR-9011
INR-9021
INR-9031
INR-9041
INR-9061
INR-9081
INR-9101
INR-9121

INTELLIGENT RECORDER

HIOKI E. E. CORPORATION

CONTENTS

1. Before Using

Before using this intelligent recorder, you are advised to read well this instruction manual in order to correctly make the most of the recorder.

1.1 Notes to be taken in using this recorder

<1> For the sake of safety, never forget to ground the earthing pin of the power supply cable.
When this pin cannot be grounded, ground the earthing terminal on the back of the recorder.

<2> Installation place and position of this recorder
This recorder must be used in a level place at a temperature from 0 to 40°C with a relative humidity from 40 to 80%.
* FDD must be used at a temperature from 10 to 40°C with a relative humidity from 40 to 80%.
This recorder must not be used in a place as given below :
a. Place easily getting high in temperature or humidity due to the direct rays of the sun or a heater
b. Place exposed to sea breeze, corrosive or inflammable gas or organic solvent atmosphere
c. Humid or dusty place
d. Place exposed to strong vibration or shock
e. Place easily affected by the surge voltage or disturbing wave due to thunder or electric furnace
f. This recorder uses a discharge type cooling fan to prevent its inside from getting high in temperature. If the fan is not well ventilated, this may lead to trouble. A free space of 10 cm or more must be provided behind the fan.
Don't block the ventilating orifices provided on the side, back and bottom of the recorder.

<3> Always use voltage, current and fuses as specified.(Refer to item 1.7)
Use of a non-specified voltage, current or fuse may lead to fire or breakage.

<4> Pay full attention to the following points which may bring on danger :
a. Don't apply a voltage in excess of 200 V (when installing the standard unit FU-911A)
b. The connection of this recorder with DC power may involve danger. After having turned OFF the SW of the recorder, connect the cable with the recorder and the batteries always in this order.
c. Don't remove outer casing of this recorder.
Even after turned off the power switch, dangerous high voltage may remain in side of recorder.Consequently removing outer casing may brings danger. Please get in touch with local HIOKI distributor or us directly when repair or internal adjustment is/are required.

<5> When proceeding to the following steps, take care not to damage the apparatus :
(1) Always turn OFF the power before proceeding the following operations :
a. Mounting/dismounting the input unit
b. Mounting/dismounting the ribbon cassette
c. Mounting/dismounting an optional items(interface board, ext. control board,etc.)

(2) Never forget to turn ON the power before inserting or taking out a floppy disk,MO disk or Memory card etc. Don't bring a magnetic material such as magnet close to it.

(3) When displacing this recorder, observe the following instructions :
a. Confirm that IC card and floppy disk have been taken out from their slots.
b. Don't forget to close the front door.
c. Dismount the felt pens from this recorder and put a cap on them.

(4) Confirm that the ribbon cassette is kept taut.(Ref. Item 3.1.3)

(5) Before mounting the felt pens into this recorder, don't forget to undo their caps. Otherwise, they may strike each other.

(6) The power source of this recorder is specified for either 100V AC or 200V AC system. When connecting it with a power source, take care so that an excessive voltage may not be applied to it.

<6> Notes to be taken to assure a stable recording

(1) Don't supply the pen travelling part with oil (wipe it clean with a piece of dry cloth).

(2) When this recorder is operated at a chart speed of 120mm/h or less, a rolled recording paper and the special ink for low speed must be used for it. Using roll chart paper and low speed pen can prevent the ink from getting blurred and the paper from being caught.(Ref. Item 5.1)

(3) When you leave this recorder unused for a long time (for three days or more, depending on the relative humidity), put the cap on the pen. (This recorder is equipped with a pen rest preventing the pen tip from getting dry for the moment.)
The cap must be in the same color as the pen. Otherwise, the color of the cap may be mixed with the other color of the pen and it may lead changing color at the time of starting recording in the first. Please draw your attention.

(4) When measuring the temperature, preheat this recorder for thirty minutes or more after having connected the input cord of the sensor with it and applied the power.

<7> Backup battery

This recorder contains a nickel-cadmium battery for backing up its clock.
When the battery is completely charged, it can fulfill its backing-up function for about one month. However, attention must be paid to that this backing-up duration depends more or less on each battery and environmental temperature. We cannot estimate as a rule the life of the battery which depends greatly on its conditions of use (power supplying condition, environmental temperature). We can say at least that it will take about three to five years for a completely charged battery to descrease to half in function.
When this recorder is not supplied with power for six months or more, the life of its battery may be shortened. For this reason, it is advised to supply the recorder with power at least once a month.
If the battery is deteriorated in fuction, this may lead to an error in the date and hours of the recorder.
If you have any trouble relating to the battery of this recorder, please contact its dealer or one of our sales offices nearest to you given in the verso of this instruction manual. The battery will be replaced with new one at your own charge.

<8> Others

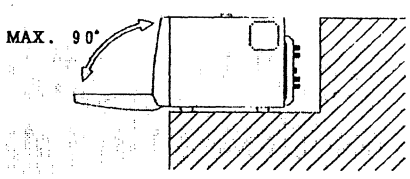
(1) When mounting input units, insert from left side slot No.1 in the rear side of recorder without leaving any space between the slots.

(2) Caution in using input unit FU-911B (Option)
The recorder mounted with FU-911B is acurately calibrated before shipment from our factory. Consequently, Please avoide changing the place of the input units or adding new input unit by end user after purchasing the recorder in order to maintain high accurate measurement.
Please get in touch with our local distributor or us directly when additional input units are required to mount or calibration is required.

(3) When you are at a loss about how to operate this recorder, either print out a list or confirm it in STATUS of EXTRA MENU. If pressing down Reset SW on its back with the tip of a pencil, the recorder can be returned to its initial status.

(4) Don't wipe the sheet keys and LCD screen on the front panel with water or alcohol.
Clean them with a piece of dry cloth.
Always operate them with your fingers. If you operate them with the tip of a pen or your nail, this may scratch or damage them.

(5) When this recorder is installed in a place as shown below, always open or close its front door with your hand put on it. The door can be opened up to at an angle of 90 degree. If you open the door at an angle in excess of this limit or put something on it, this may damage its rotating part.
When you mount the recording paper, pen or ribbon cassette into the recorder or replace them with new ones in a place as shown below, always dismount the front door beforehand.The method how to dismount front door is described in item 3.1.12.



1.2 General

1.2.1 General description

This Jurius series intelligent recorder, manufactured by HIOKI E.E.CORPORATION as a pioneer in the field of desk top recorder on the basis of its know-how accumulated for example by the development of Pegasus series recorder, is characterized by its new, multiple and high quality functions, for example, by its channel extension through the newly developped 2 channel unit (extensible up to 24 channels by a set with 4 pens or more), its real time display on large size LCD, its reproductible display (set with a storage unit), its reproductible recording (set with a storage unit) and its adoption of optical magnetic disk as an external storage unit with large capacity (option).
This recorder adopts a touch panel and a large size LCD for more ease of use. In addition to this, it is lessened in weight by 43% compared with the old models (Pegasus 12 pen) and further minituarized in outer dimension, so that it can be used with the same ease as the conventional pen recorders.

1.2.2 Features

(1) Channel extension feature
Only the input channel can be extended without increasing the number of pens.
(When the standard unit is used, the input channel can be extended to 2 channels with 1 pen, to 4 channels with 2 pens, to 6 channels with 3 pens and to 24 channels with 4 pens. For this extension, additional units must be prepared.)
The data of all the channels can be displayed.
(The data can be taken out from all the channels on condition that FD, MO, memory card and options are mounted into the recorder.)

(2) Small size and weight
Compared with the Pegasus series model of our brand with 12 pens,
lessened in weight by 10.5 kg
lessened in height by 70 mm
lessened in depth by 30 mm

(3) Easy operation
The adoption of a transparent touch panel and a large size LCD allow this recorder to be used with more ease.

(4) On-line recording
Wave form totalization software "JULILOG"
Remote-measuring
When this recorder is connected with a PC through GP-IB or RS-232C, the collected data can be recorded into the PC.

(5) Enhanced FD function
Independent sampling
Triggering function (alarm trigger, timer etc.,)
Compatible with IBM format

(6) Large capacity recording
In addition to the conventional FD, a MO (optical magnetic disk) and memory cards are offered as an option.
As a newly added function, when it is detected that the recording paper runs out, the data collected thereafter are all stored onto FD, MO and memory cards.

(7) Many optional items
The following items are offered as an option : pH/ORP unit, electric conductivity unit, AC voltage unit, AC voltage logarithmic unit, RTD unit, transient unit, 0.5mV DC voltage/thermocouple unit, FDD, interface for external magnetic disk, memory card, RS-232C board, GP-IB board, external controller/alarm board, chart reroll adaptert, DC power supply, rack mount, data collecting software.

1.3 Composition of the instruction manual

This instruction manual is composed of the following chapters which should be well understood before using this recorder :

1. Before using this recorder

   This chapter describes the instructions to be observed before using this recorder, such as cautions to be taken to operate it, the overview of its functions and the power to be supplied to it.

2. Name and function of each operation point of this recorder

   This chapter describes the name and function of each character printed on the front and back panels of this recorder and of each operation key provided on it.

3. Basic operation method

   This chapter describes the basic operation method and the contents and also setting options.

4. Option

   This chapter describes the kinds of option with their model number and also mounting and dismounting roll chart paper winding equipment and attaching rack-mount.

5. Maintenance parts

   This chapter gives the parts used to maintain this recorder.

6. Specifications and list of standard accessories

   This chapter describes the specifications of this recorder and the list of standard accessories provided for it.

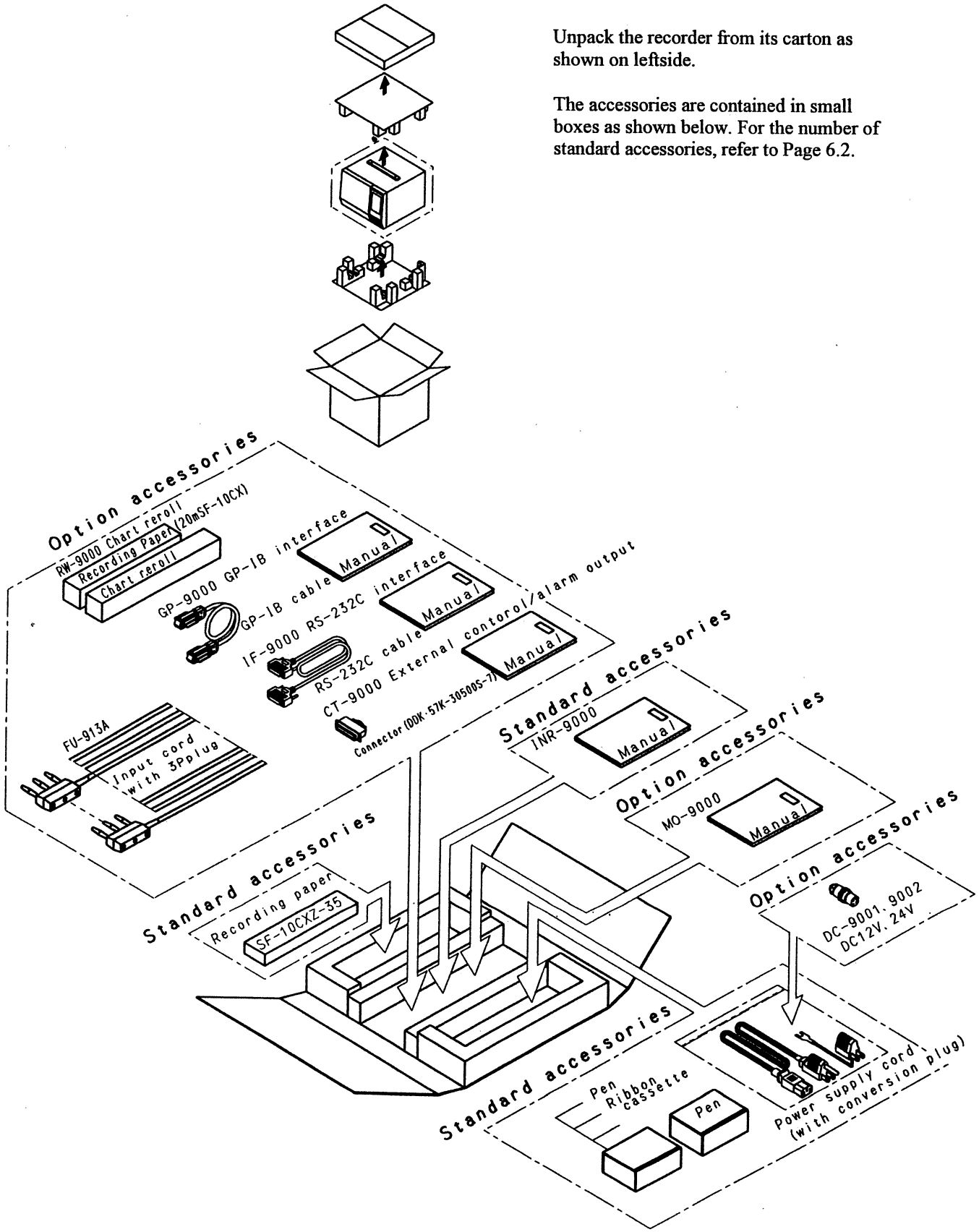
7. External view

   This chapter gives the external view of this recorder and its actual dimensions.

1.4 Preparations for using this recorder

1.4.1 Inspections before unpacking

This recorder has been minutely inspected before being shipped from factory. However, for the sake of safety, check it for error in product name, external damage and lack in the number of accessories. If you find any error, please contact your dealer.



Unpack the recorder from its carton as shown on leftside.

The accessories are contained in small boxes as shown below. For the number of standard accessories, refer to Page 6.2.

1.4.2 Power supply

AC power of thie recorder is selected from either 85 to 132VAC or 170 to 250VAC, which will be specified when ordering. 12 or 24VDC power source is provided as option.
When 85 to 132VAC is used, the attached cable or its equivalent must be used to connect it with a power supply with a power distributing capacity of 10A or more. The power supply must be easily grounded for protection.

In case of 12 or 24VDC, connect the plug (attached to option) with the following wire :

12VDC .....lead wire AWG16 or equivalent
24VDC.....lead wire AWG20 or equivalent

1.4.3 Checking the fuse

This recorder makes use of one of the time lag fuses having current capacities as given below according to the power supply used for it. Select a fuse as required by the power supply in use.

	AC85 to 132V	AC170 to 250V	DC (option)
INR-9011	1 A	0.5 A	5 A
INR-9021			
INR-9031	2 A	1 A	10 A
INR-9041			
INR-9061	3 A	2 A	10 A
INR-9081	3 A	2 A	15 A
INR-9101			
INR-9121			

Table 1.1

1.4.4 Checking the grounding

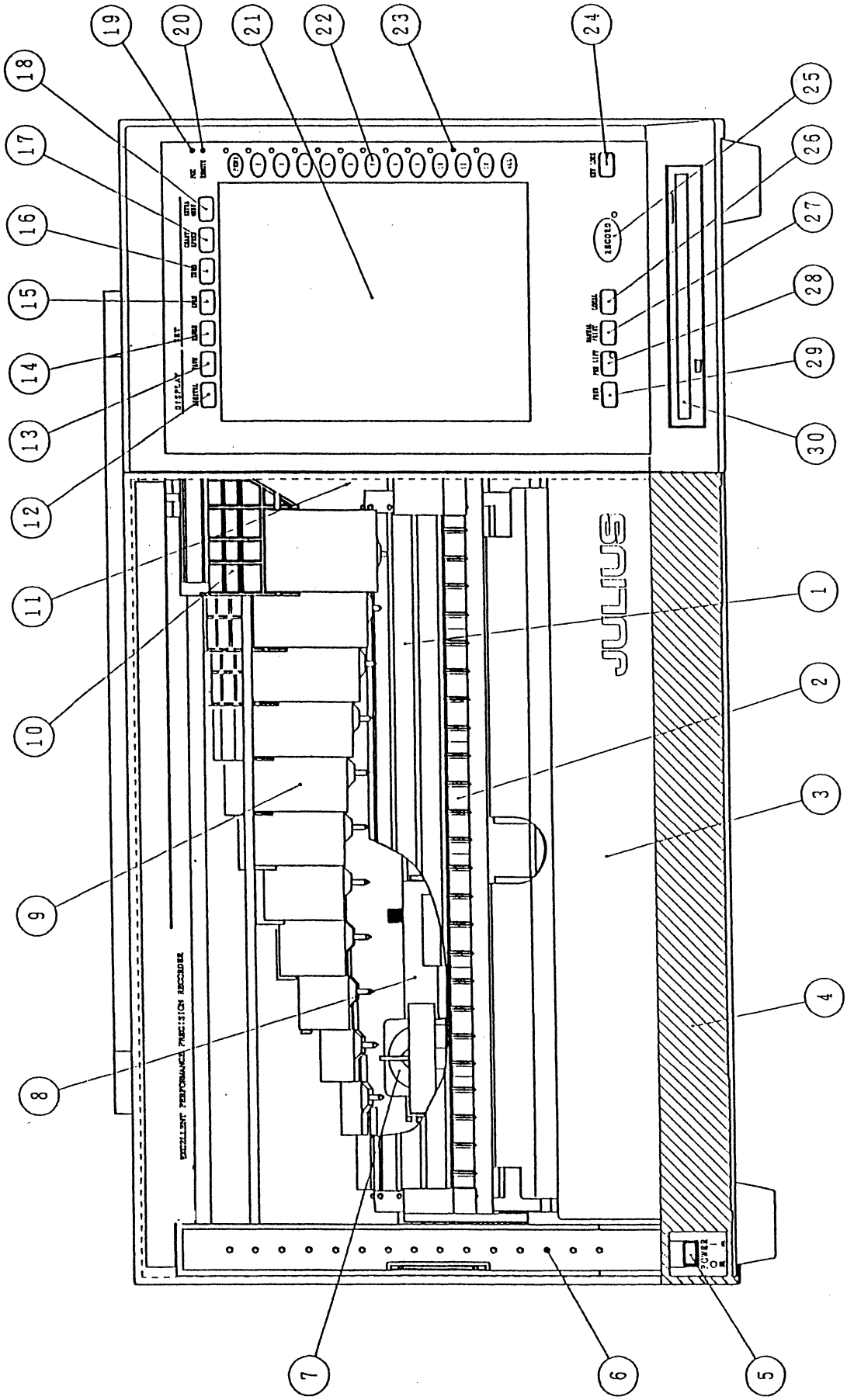
To protect you against electric shock, never forget to ground the earthing terminal on the back of the recorder or its power supply cable.
The round pin of the 3P plug of the power supply cable must be grounded through an electric outlet equipped with earthing device.
When you use a 3P-2P conversion adapter for the earthing, never forget to ground the earthing lead wire of the adapter.

Warning

For danger protection, be sure to ground the earthing pin of power cord.
When earthin pin can not be used, please ground the grouding terminal on the back panel

2. Name and Function of Each Operation Point on This Recorder

2.1 Front panel



①	Chart drum	:	This drum rotates as a whole to feed the recording paper.
②	Chart holding roller	:	This roller holds the recording paper onto the chart drum to feed the paper stably.
③	Chart receiving door	:	The recording paper is received inside this cover. Be sure to close it after loading the recording paper.
④	Front door:		This door protects the recording part against dust. Given its lower rotating axis as a fulcrum, it can be opened toward you up to 90 degree. Refer to the item 3.1.12 Mounting/dismounting the front door.
⑤	Power supply switch	:	With this switch, you can put to ON/OFF the power supply.
⑥	Pen cap receiving pin	:	This pin is used to receive a pen cap dismounted from the pen.
⑦	Printing head	:	This wire-dot printing head can print at a resolution of 5 x 7 dots.
⑧	Ribbon cassette	:	This cassette type ink ribbon must be mounted or replaced with new one by referring to 3.1.3.
⑨	Pen	:	This is a disposable cartridge ink pen.
⑩	Pen holder	:	The pen is placed into this holder.
⑪	Pen rest	:	This pen rest is used to receive temporarily a non-selected pen to prevent it from getting dry.
⑫	DIGITAL key	:	This key allows recorded data to be displayed numerically (digital).
⑬	WAVE key	:	This key allows recorded data to be displayed in the wave form.
⑭	Range key:	:	This key is used to set a range for this recorder. (Pressing down this key switches the main display into range setting screen.)
⑮	Span key	:	This key is used to set a span for this recorder. (Pressing down this key switches the main display into span setting screen.)
⑯	Zero key	:	This key is used to set a zero point for this recorder. (Pressing down this key switches the main display into zero point setting screen.)
⑰	Chart speed key	:	This key is used to set a chart speed for this recorder. (Pressing down this key switches the main display into chart speed setting screen.)

⑱ EXTRA MENU key : This key is pressed down to set each function in detail.
(Pressing down this key switches the main display into a function setting screen as given below :)

<EXTRA MENU>

Print setting (fixed hours, logging)	Comment setting
Auto-range setting	TAG No. setting
Auto-shift setting	Alarm setting
PGC mode setting	Operation setting
Display condition setting	Filter setting
Compensation setting for expanded/contracted recording paper	
Electric zero setting	Clock setting
List printing	Zone setting
Pen change	Physical setting
Media setting (FDD, IC card, MO)	LCD setting

⑲ PGC displaying LED : This LED is lit while PGC (Pen Gap Compensation) is in operation.

⑳ REMOTE displaying LED (option) : This LED is lit when a RS-232C or GP-IB interface cable is used.

㉑ Main display : This display is used to set displaying parameters and other items.

㉒ Pen selecting key : This key is used to select a pen for recording. Pressing down ALL key selects all the keys in block.

㉓ PEN displaying LED : This LED is lit when a pen is selected.

㉔ Key lock (with displaying LED) : When you press down this key, its LED is lit, indicating with a buzzer that no further key setting will not be accepted.
When you press it down again, the LED goes off, indicating that a subsequent key setting will be accepted.

㉕ RECORD key (with displaying LED) : This key is used to start or stop a recording.
When you press down this key, its LED is lit while the selected pen is displaced to the recording position. Then, the recording paper is fed to record the input signals.This key is also used to start/stop logging recording.

㉖ Remote/Local (with displaying LED) : This key is used to change Remote into Local when a RS-232C or GP-IB interface cable is connected with this recorder.

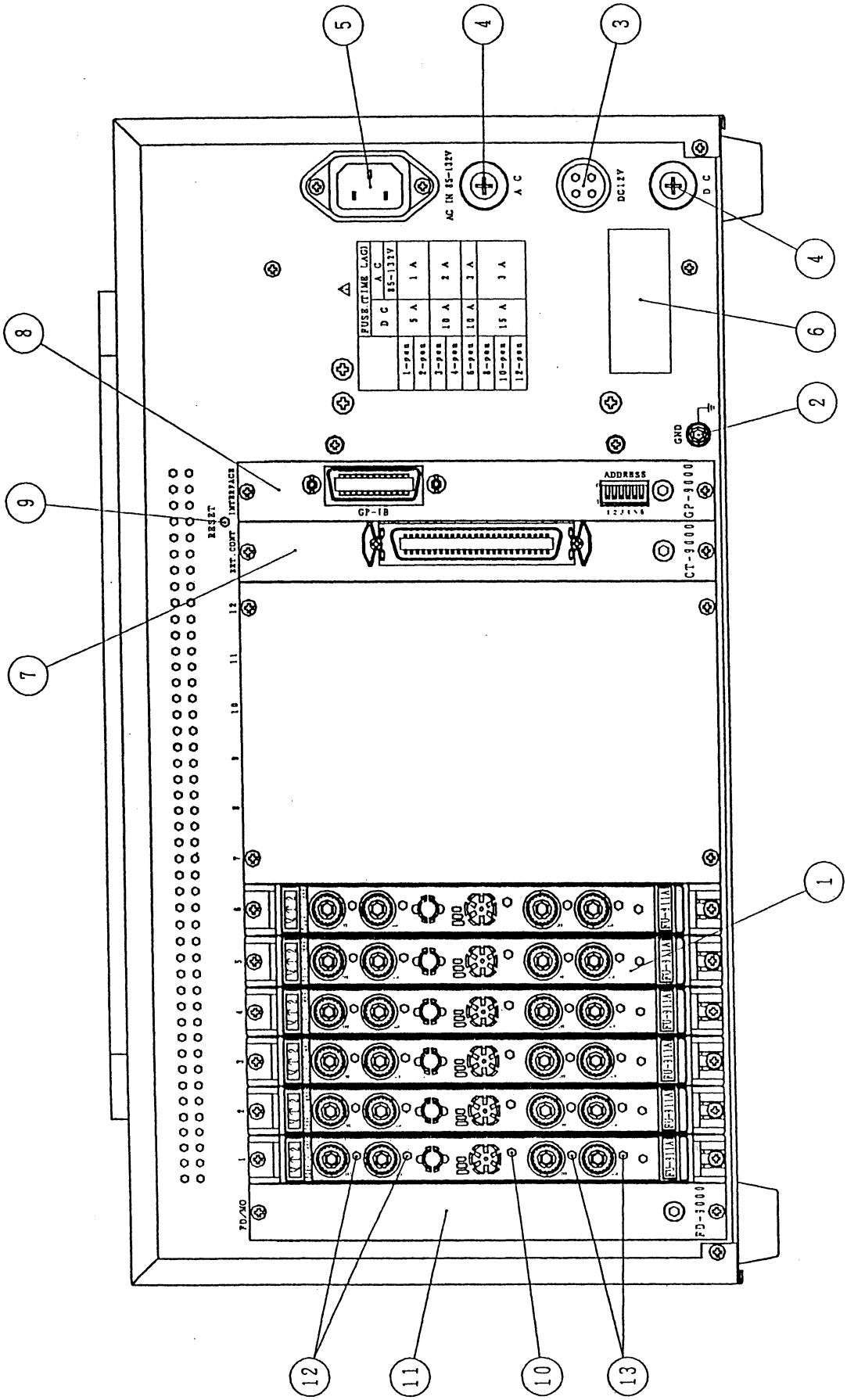
㉗ Manual print key : This key is used to print the current time and the measured value of each channel.

㉘ Pen lift key : When you press down this key, its LED is lit to lift the selected pen.
When you press it down again, the LED goes off to lower the pen.

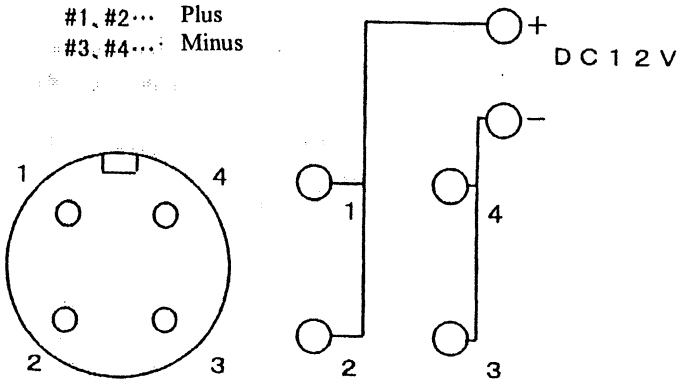
㉙ Feed key : Pressing down this key has the effect of feeding the recording paper.
When you continue to press it down, the paper is fed first slowly then more rapidly (300 mm/min. at maximum).
However, this has no effect so long as no paper is put in place.

㉚ 3.5" floppy disk/memory card inserting slot (option) : With this slot, data and setting information can be recorded on or reproduced from a floppy disk or memory card.

2.2 Back panel



①	Input unit	:	For mounting this plug-in type unit or replacing it with new one, refer to 3.1.1.
②	Ground terminal	:	This terminal is used to ground the recorder.
③	DC power supply connector (option)	:	This connector is used to connect the recorder with a 12V DC or 24V DC power supply.



④	Fuse holder	:	The fuses specified for AC and DC power supplies are mounted into this holder (fuse for DC power supply as an option. Refer to 1.7).
⑤	Power supply connector	:	This connector is used to connect this recorder with its attached power supply cord.
⑥	Name plate	:	The model name and set number of this recorder are inscribed on it.
⑦	External control unit (option)	:	This unit is used to control from outside the alarm setting output and external chart drive of this recorder.
⑧	Interface unit (option)	:	Either GP-IB or RS-232C interface board is attached. Through this unit, the recording conditions can be set by an external computer or the measured data can be output or input.
⑨	RESET button	:	This button is pressed down to reset the actually set information (except for CLOCK) to their initial values.
⑩	Reference contact temperature compensating calibrating slot	:	This is a trimmer to compensate for the temperature at reference contact when a thermocouple range is used. You have no need to turn this slot which has been calibrated as shipped from factory except for the purpose of calibration.
⑪	FDD/MO unit (option)	:	Either FDD or MO can be selected by it.
⑫	Voltage range calibrating slot (upper channels)	:	This is used to calibrate the voltage range. You have no need to turn this slot which has been calibrated as shipped from factory except for the purpose of calibration.
⑬	Voltage range calibrating slot (lower channels)	:	This is used to calibrate the voltage range. You have no need to turn this slot which has been calibrated as shipped from factory except for the purpose of calibration.

3. Basic Operation Method

3.1 Preparations for measurement

3.1.1 Mouting/replacing a unit

Although measuring input units and interface boards, etc. are set at the specified position before shipment from our factory, mount or replace other input units in the following procedure in case that you want to replace them with other units.

Caution

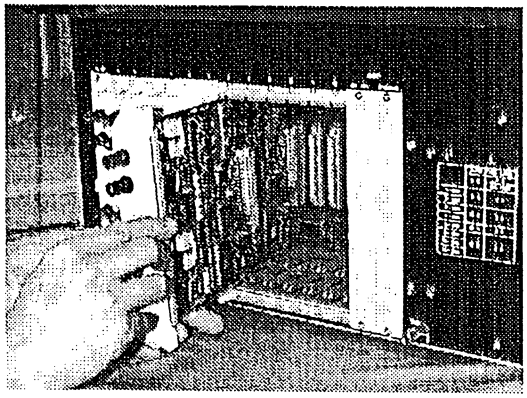
1. Always mount or replace a unit with the power supply set to OFF
2. When mount input unit(s) to rear side's slot, please mount them from left side hand, Slot No.1, without allowing space left.
   If you want to remove the input unit that is mounted in the middle, mount new input unit to the position or shift the right sides' input units to left sides so as not to allow empty slot in the middle.
   If empty slot is left in rear channel input, recorder will record and display the channel numbers skipping the empty input channel.
3. In case of using input unit FU-911B (Option)
   Recorder with FU-911B are accurately calibrated at the time of shipment.
   Consequently, it is recommended to avoid changing place of input unit FU-911B or other input unit and also to avoid increasing new input unit by end user in order to maintain high accurate measurement. In case of increasing new input units or of doing calibration, please get in touch with our local distributor or us directly.

Mounting a unit

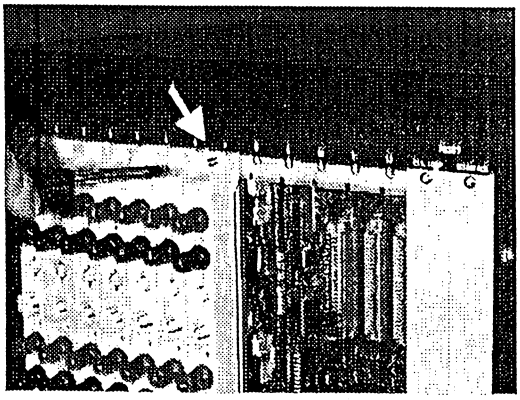
(1) Put in place the printed circuit board of a unit into the grooves of the upper and lower guide rails on the back of this recorder.
(Figure 3.1.1)

(2) Push down the unit up to the limit along the guide rails.

(3) Fix the unit with the attached two screws.
(Figure 3.1.2)

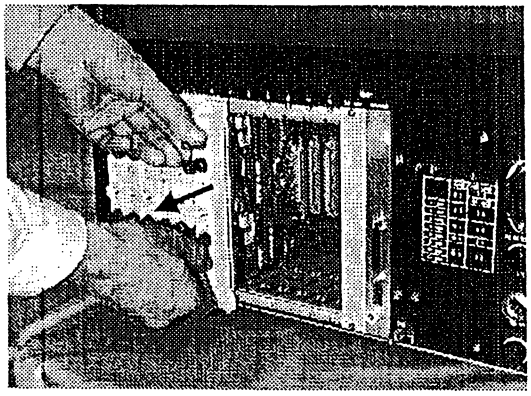


(Figure 3.1.1)



(Figure 3.1.2)

Replacing a unit with new one



(Fig 3.1.3)

(1) Undo the two screws.

(2) Pull out the unit with your hands put to its terminals.

(Figure 3.1.3)

(3) Fix in place a new unit according to the steps (1) to (3) given above.

Caution

After mounting input unit to recorder, be sure to fix input units with 2 pieces of fixture screws. If the input unit is not fixed firmly, stable measurement can not be done.

3.1.2 Mounting/replacing the ribbon cassette

Caution

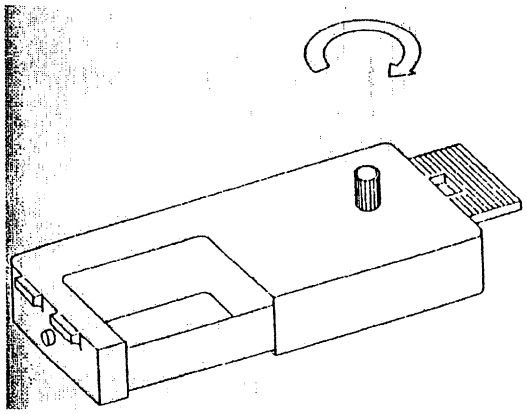
1.Replace the ribbon cassette with new one after the power supply set to OFF 2. Press down the 「Pen selecting key」 corresponding to the channel in use to put back the pen into the pen rest before turning OFF the power switch.

Mounting

(1) Open the front door and displace the print carriage to the center with your hand.

(2) Turn the knob on the right top side of the ribbon cassette in the direction shown by the arrow to make taut the ribbon.

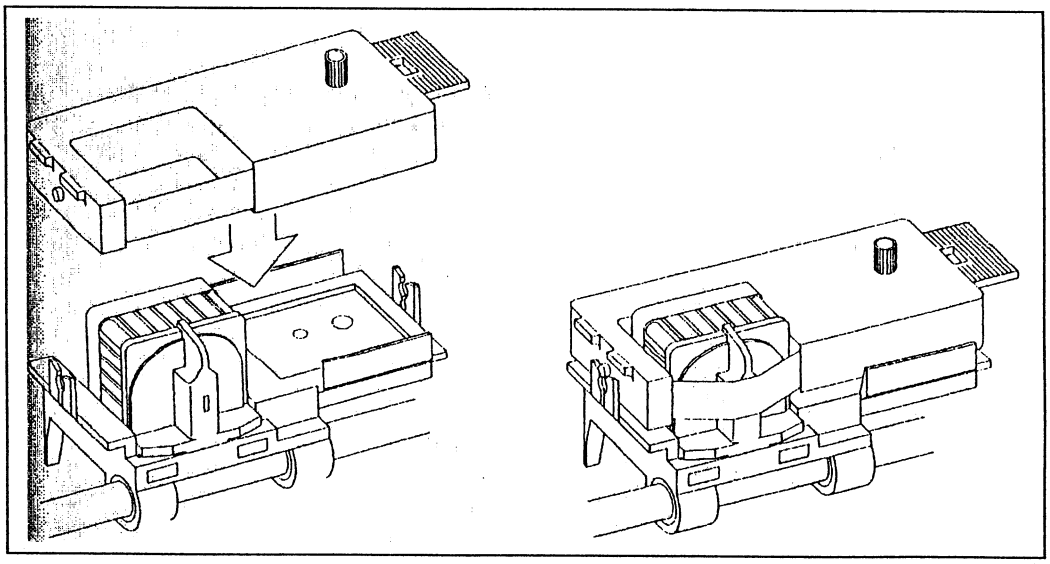
(Figure 3.1.4)



(Figure 3.1.4)

(3) Adjust ribbon cassette so that it covers printing head, then, put ribbon cassette on just above of printing carrige.

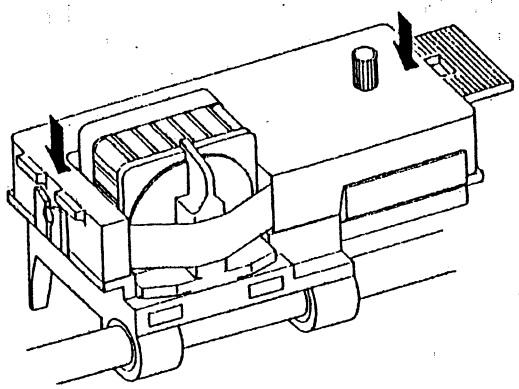
(Figure 3.1.5)

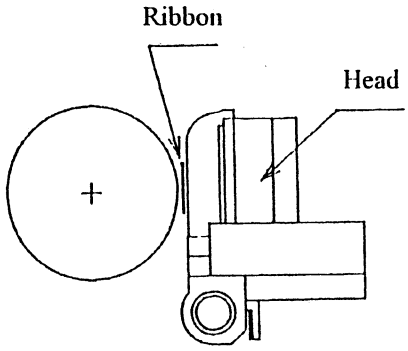


(Figure 3.1.5)

(4) After having checked that the ribbon is put in place without getting loose between the print head and the drum, push down the both ends of the ribbon cassette with your hand until the cassette clicks in place.

(Figure 3.1.6)





(Figure 3.1.6)

(5) When the ribbon cassette is correctly put in place, you have a small play on its four sides. If you have no play or that it does not click in place, push it down again while turning the knob on the right top of the ribbon cassette in the direction shown by the arrow (clockwise).

Replacement

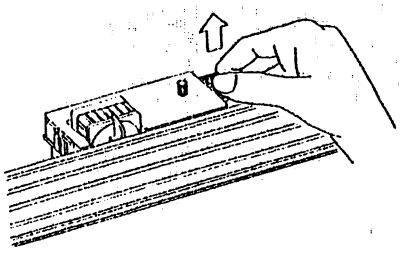
(1) When replacing the ribbon cassette with new one, lift up its right end with your finger and then release its rightside lock.

(Figure 3.1.7)

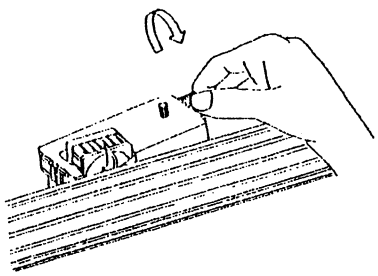
(2) You can release its leftside lock by twisting it toward you. Then, you can easily dismount the casette.

(Figure 3.1.8)

(3) Thereafter, replace it with new one by following the steps (1) to (5) given above.



(Figure 3.1.7)



(Figure 3.1.8)

3.1.3 Connecting/applying the power supply

(1) Check that the fuses satisfy the required specifications (Table 3.1.1) and then connect the attached power supply cord with this recorder.

	AC85 to 132V	AC170 to 250V	DC (option)
INR-9011	1 A	0.5 A	5 A
INR-9021			
INR-9031	2 A	1 A	10 A
INR-9041			
INR-9061	3 A	2 A	10 A
INR-9081	3 A	2 A	15 A
INR-9101			
INR-9121			

Table 3.1.1

(2) When you turn ON the power supply switch, the display changes to indicate that the recorder is now self-checking. When the self-check is finished, the screen is switched into digital display mode.
If no recording paper is mounted in place at this moment, [NO PAPER] will be given on the display screen. When you press down 「RECORD key」 after having mounted the recording paper, the indication [NO PAPER] disappears while the screen changes into digital display mode. (Ref. 3.1.6 Mounting the recording paper)
You can make disappear the indication [NO PAPER] by pressing down any of the keys on the front panel while mounting the recording paper. However, the indication [NO PAPER] will appear each time you press down 「RECORD key」 so long as the recording paper is not mounted.

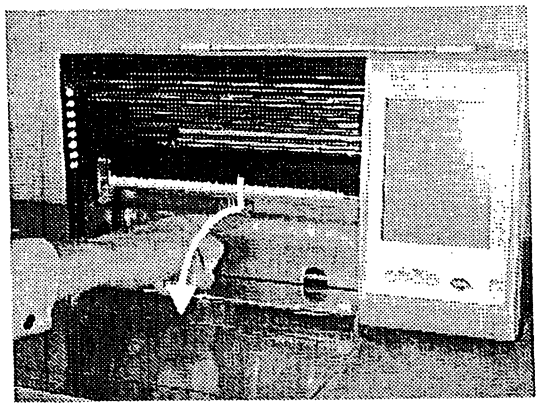
Warning

Never touch the pens and pen carriage by your hand while the recorder is self-checking with its power supply turned to ON.
Pen will move around left and right in high speed for self checking. If you close your hand, pen or pen carrige will hit your hand and it bring danger.
Also touching the pens and pen carriage with your hand on these conditions may result in error in detecting the position of the pens, making invalid the recorded data.

3.1.4 Loading the recording paper

The recording paper must be mounted into the recorder with its power supply turned to ON.
If the recording paper runs out while data are recorded on it, the indication [NO PAPER] will be given on the main display. In such a case, the pen will be automatically retracted onto the pen rest while the LED of the 「pen selecting key」 then in use will be lit.
At the same time, the recording paper on the chart drum will be discharged, so as to make free the drum.

Foled recording paper



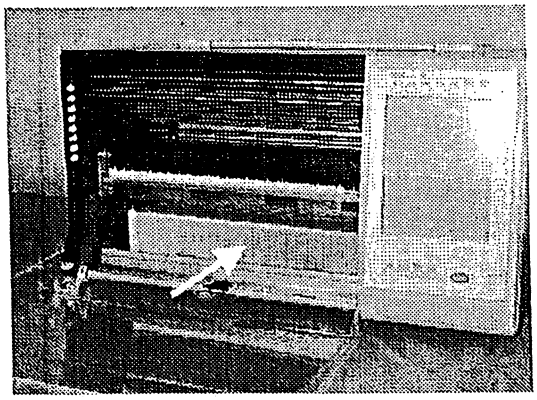
(Figure 3.1.9)

Caution

1. Don't press down 「RECORD key」 until the reocrding paper is mounted.
2. Don't turn the chart drum reversely in the direction of its running.

(1) Open the front door toward you and then open also toward you the chart receiving door by pressing down it with the tips of your finger as shown in the leftside figure.

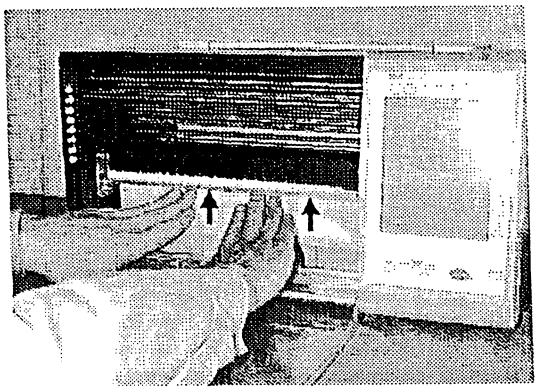
(Figure 3.1.9)



(Figure 3.1.10)

(2) Insert the recording paper into the chart receiving section. Arrange the recording paper so that its round holes may be placed on left side and its cut corners faced upward.

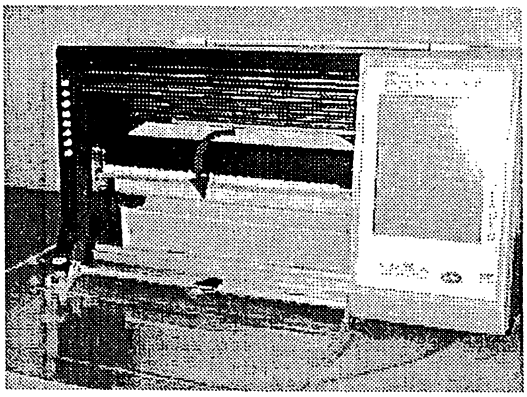
(Figure 3.1.10)



(Figure 3.1.11)

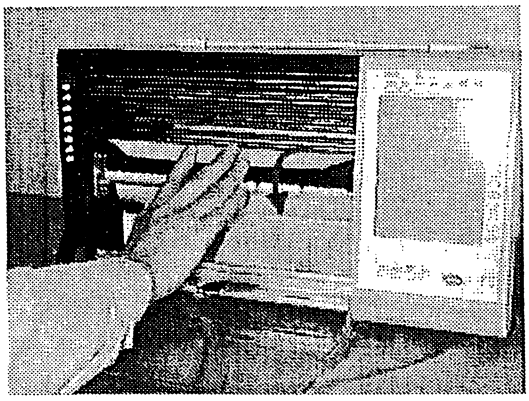
(3) Take out toward you the tip of the recording paper and insert it right upward from the underside of the chart drum along the arrow. Arrange the recording paper so that its leftside end may be aligned with the leftside face of the drum.

(Figure 3.1.11)



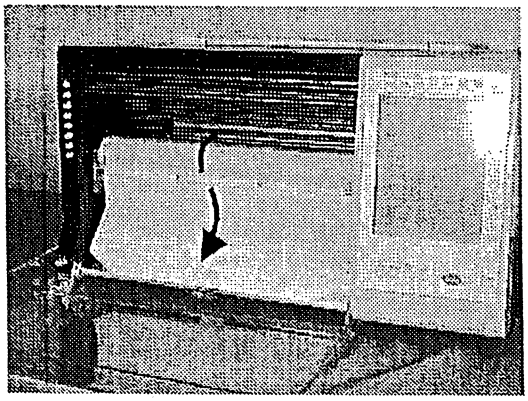
(Figure 3.1.12)

(4) While making the tip of the recording paper caught by the chart drum, turn the drum toward you. Then, check that both the left and right sprochets of the drum are correctly engaged with the right and left holes of the recording paper.
(Figure 3.1.12-13)



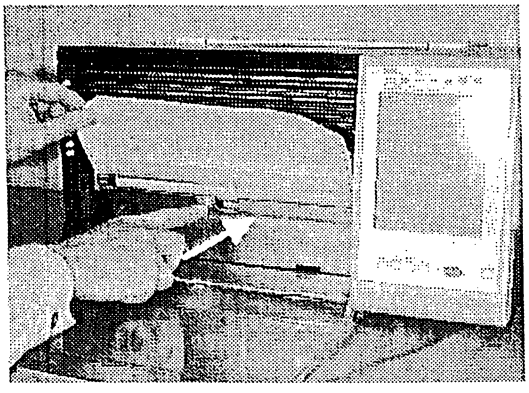
(Figure 3.1.13)

(5) Lower the chart holding roller. Then pass the recording paper aroung the drum and return the chart holding roller to its initial position.
(Figure 3.1.14)



(Figure 3.1.14)

(6) Lift up the tip of the recording paper with your fingers and push down the chart receiving door until it gets locked.
(Figure 3.1.15)



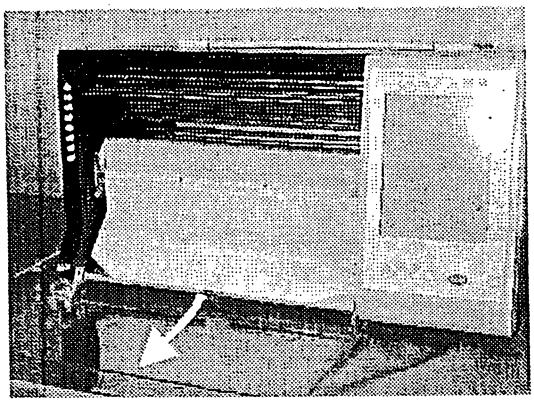
(Figure 3.1.15)

Caution

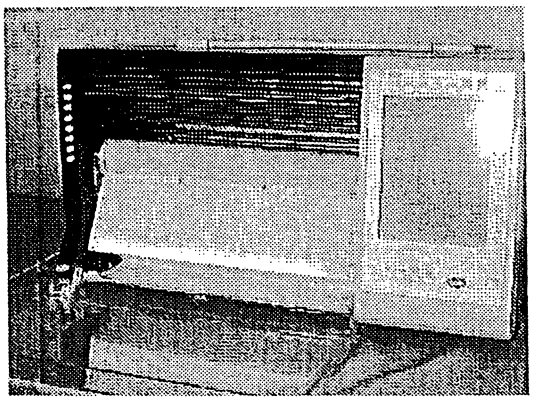
When closing chart receiving door, push the door to arrow direction until clicking it.
If you failed or forgot closing door, [NO PAPER] is indicated in the main display when pressing down RECORD key or recording measurement is unstable.

(7) Feed out the recording paper by 30 cm with your hand. Then, fold it up before setting it onto the chart receiving table.

(Figure 3.1.16, 17)



(Figure 3.1.16)



(Figure 3.1.17)

(8) At this stage, the recording paper has been mounted in place in the recorder. Pressing down again 「RECORD key」 allows the recorder to resume its recording function.

Rolled recording paper

(1) To mount in place the rolled recording paper, follow the same steps as those provided for the folded recording paper except for the step (7).

3.1.5 Replacing the recording paper

When you find that the recording paper will run out soon or that it must be replaced with new for some reason, take the steps given below.
The replacement must be done with the power supply set to ON.

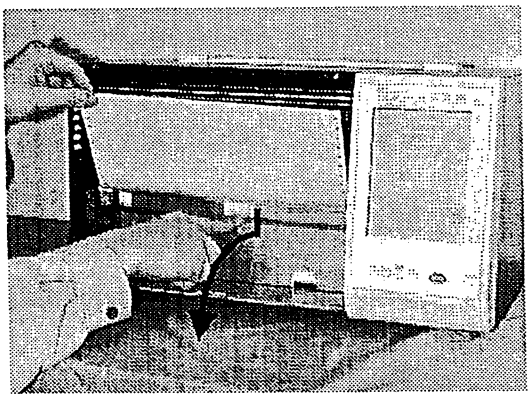
Caution

1. Before taking these steps, refer to 3.1.4, Mounting the recording paper.
2. Never press down 「RECORD key」 until the replacement has been done.
3. Don't turn the chart drum reversely in the direction of its running.

Folded recording paper

(1) Take out the used recording paper from the chart receiving table.
(2) Open the front door toward you. Then, open the chart receiving door toward you while pressing it right down with the tip of your finger as shown in the Figure. (Figure 3.1.18).
(3) Open the chart receiving door toward you. Then, take out toward you the recording paper remaining in the receiving section. In some case, an indication [NO PAPER] is given on the main display.

When [NO PAPER] is not displayed



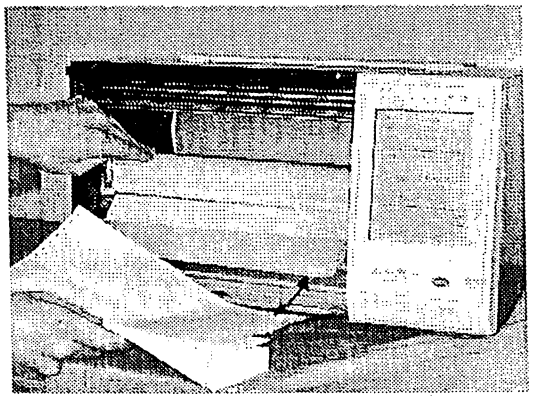
(Figure 3.1.18)

(4) The pens are automatically retracted into the pen rest. The LED of 「pen selecting key」 then in use flickers. At the same time, the chart drum makes one revolution to become free in the same way as the recording paper is mounted.

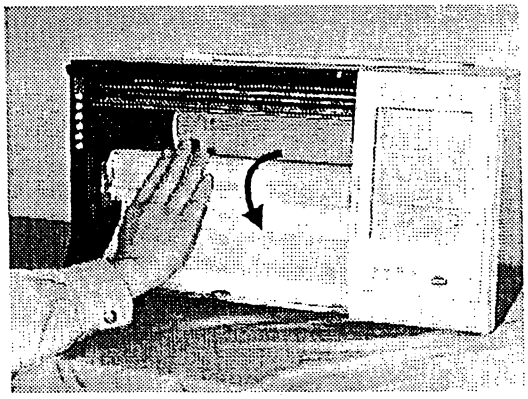
(5) Cut off the remaining recording paper taken out toward on its foled line or at an adequate point. (Figure 3.1.19)

(6) Feed toward with your hand the recording paper remaining on the chart drum and take it out. (Figure 3.1.20)

(7) At last, take the steps (2) to (8) provided in 3.1.4, Mounting the recording paper.

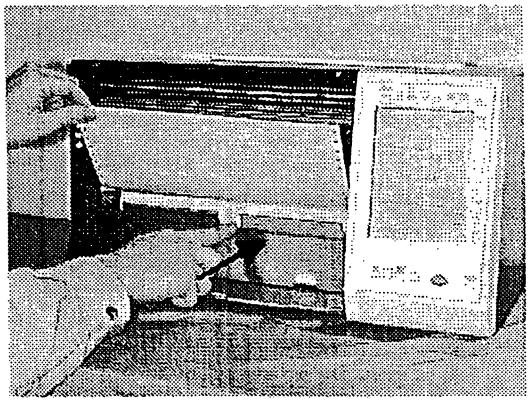


(Figure 3.1.19)



(Figure 3.1.20)

When [NO PAPER] is not displayed



(Figure 3.1.21)

(4) Pull out toward you the recording paper and tear it off along its folding line or at an adequate point.
(Figure 3.1.18)

(5) Put back the recording paper remaining in the recorder onto the chart receiving section. Then, lifting up the tip of the recording paper on the chart drum, push down the paper until the chart receiving door is locked as shown in the leftside figure.
(Figure 3.1.21)

(6) Keep pressing down 「FEED key」 until [NO PAPER] is detected.
When [NO PAPER] is detected, the pen is displaced onto the pen rest, so that the recording paper on the chart drum is discharged automatically.

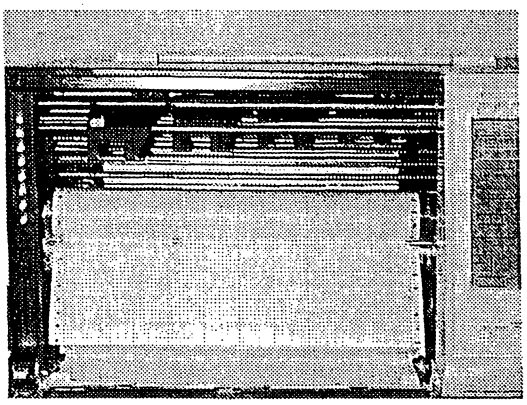
(7) Take the steps (1) to (8) in 3.1.4, Mouting the recording paper, to replace the paper with new one.

3.1.6 Mounting/replacing a pen

A pen must be mounted or replaced with new one with the power supply set to ON.

Caution

1. When mounting a pen, don't apply it an excessive force.
2. When you press down [PEN CHANGE] key, the pen is displaced at high speed. Take care so that it may not hit your hand for example.



(Figure 3.1.22)

(1) Open the front door. Press down 「EXTRA MENU」 key and then press down [PEN CHANGE] on [SET EXT PAGE1/2] screen. The first pen holder appears on the recording section so that a new pen can be easily mounted.

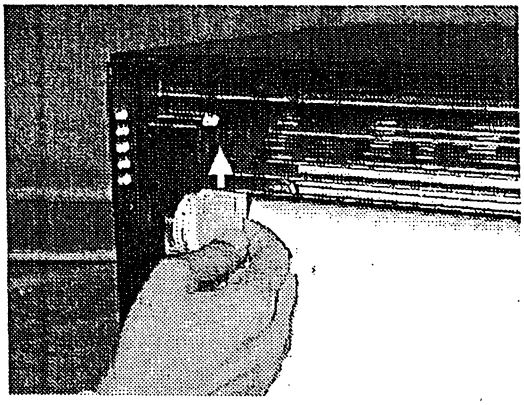
(Figure 3.1.22)

(2) Undo the cap from a new pen and push the pen in the direction indicated by the arrow while taking care so that its tip may not contact the chart or chart drum. Mount it onto the pen holder.

(Figure 3.1.23)

To dismount the pen, pull it out toward you.

(3) Press down again [PEN CHANGE] . The remaining pen holder appears onto the recording section. Then, mount other pens. At last, the pen holder returns to its initial status. The pen holder returns to its original status as the pens are replaced two times for recorder having pens 4 or less, three times for 8 pens or less, and four times for 10 pens or more respectively.



(Figure 3.1.23)

(4) The pen holders are arranged in the order of 1 channel, 2 channel and on from forefront to rear.

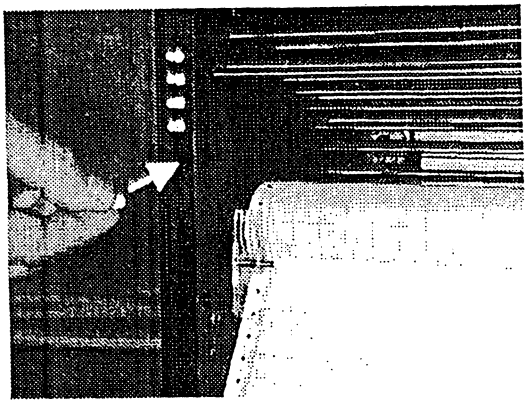
Limits

This recorder has 1 to 12 pens mounted. The frequency of pen replacement and the number of pens to be replaced depend on the number of mounted pens as follow:

1 to 4 pens type: first (1 to 4 pens)

6 pens type	: first (1 to 3 pens), second (4 to 6 pens)
8 pens type	: first (1 to 4 pens), second (5 to 8 pens)
10 pens type	: first (1 to 4 pens), second (5 to 7 pens) third (8 to 10 pens)
12 pens type	: first (1 to 4 pens), second (5 to 8 pens) third (9 to 12 pens)

3.1.7 Housing a pen cap



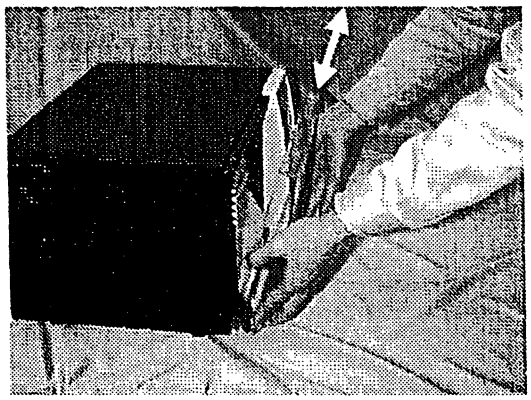
(Figure 3.1.24)

(1) A pen cap undone from its pen must be housed into the axis of the pen cap housing section provided on the front of the recorder to prevent it from getting lost. (Figure 3.1.24)

(2) When you leave the pens non used for a long time (for about three days or more, depending on humidity), put their caps on them (This recorder has an automatic pen rest which prevents them temporarily from getting dry.

Always put back the caps on their pens. Otherwise, the two different colors may be mixed with each other and affect the beginning of recording next time.

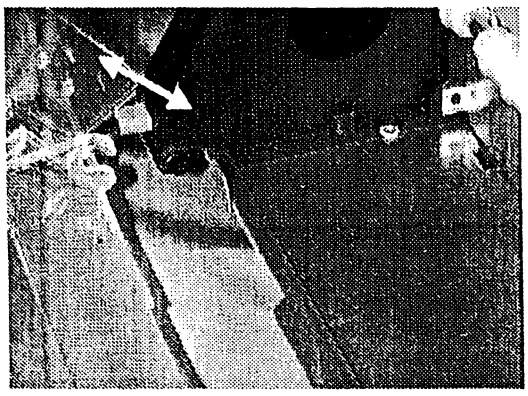
3.1.8 Mounting/dismounting the front door



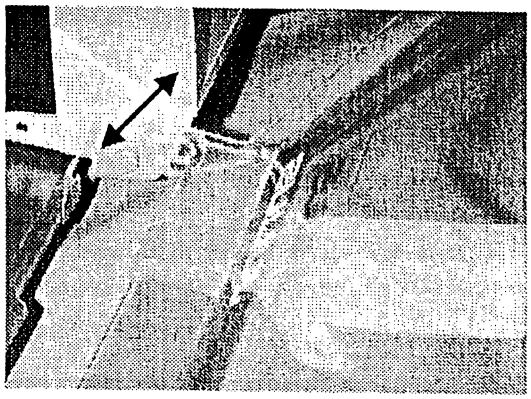
(Figure 3.1.25)

(1) Pull out the front door toward you at an angle of 20 degree. Then, lift it up as a whole and dismount it first from the rotating axis on both sides of this recorder. (Figure 3.1.25)

(2) To mount the front door, slant it toward you at an angle of 20 degree in the same way as its mounting. Insert it securely into the rotating axis while sliding the bearing of the door along the rotating axis on both side of the recorder. (Figure 3.1.26-27)



(Figure 3.1.26)



(Figure 3.1.27)

3.1.9 Mounting/replacing the memory card battery (option)

Caution

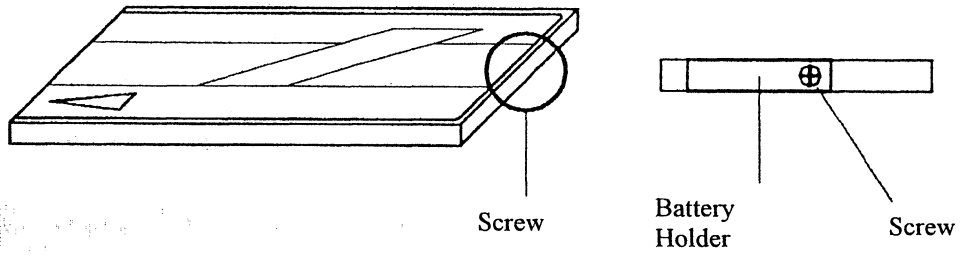
1. Before inserting the memory card into its connector, check that it is correctly directed. If it is reversely directed and inserted into the connector forcibly, this may result in damage in the connector and the memory card.
2. When mounting or replacing the battery, don't touch it with you bare hand to evade a poor contact.
3. Before using a new memory card, never forget to initialize it.
4. In replacing the battery with new one, bear in mind that the data memorized in the card are erased when the battery is taken out from the memory card. When the data must be saved, make this replacement with the memory card inserted into this recorder and the power supplied to the memory card.

(1) Pull out the battery holder of the memory card.
Turn the screws counterclock wise two or three times with the attached screw driver. You can pull out the battery holder by lightly holding it between your fingers (Figure 3.1.27).
The battery holder is locked halfway, so that you cannot pull it out completely.

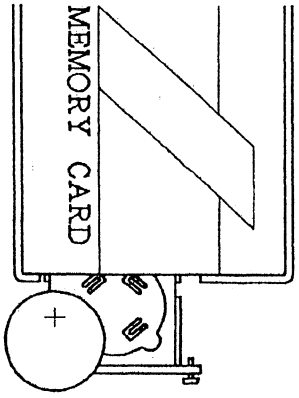
(2) Set the battery onto the battery holder with the positive face of the battery facing upward (Figure 3.1.28).

(3) Push down the battery holder and lock it by turning it two or three times with the screw driver (Figure 3.1.29).

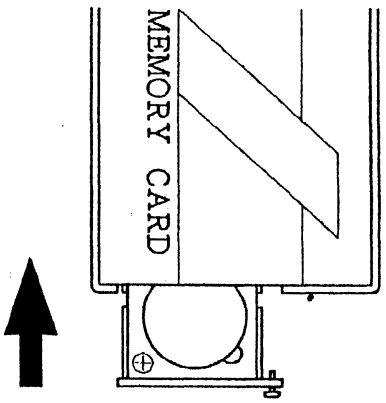
* Battery : B. Coin type lithium battery (BR2325 manufactured by Matsushita Industry Ltd.)



(Figure 3.1.27)



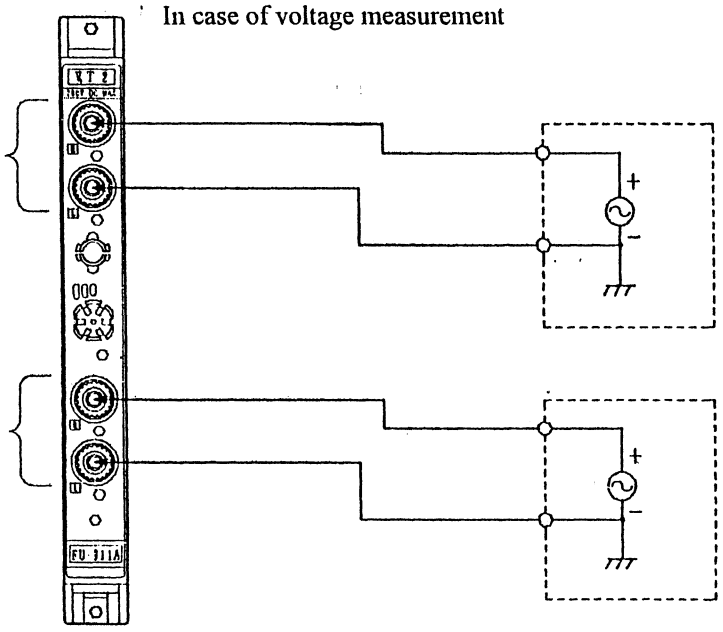
(Figure 3.1.28)



(Figure 3.1.29)

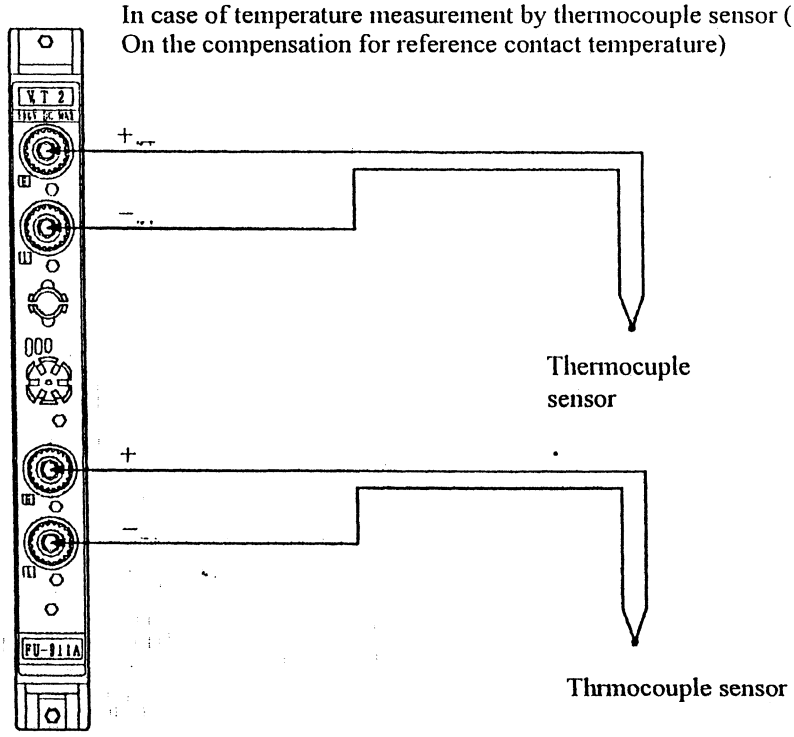
3.1.10 Connecting the input cord

Standard unit(FU-911A) have 2 input channels in one unit
To measure the voltage



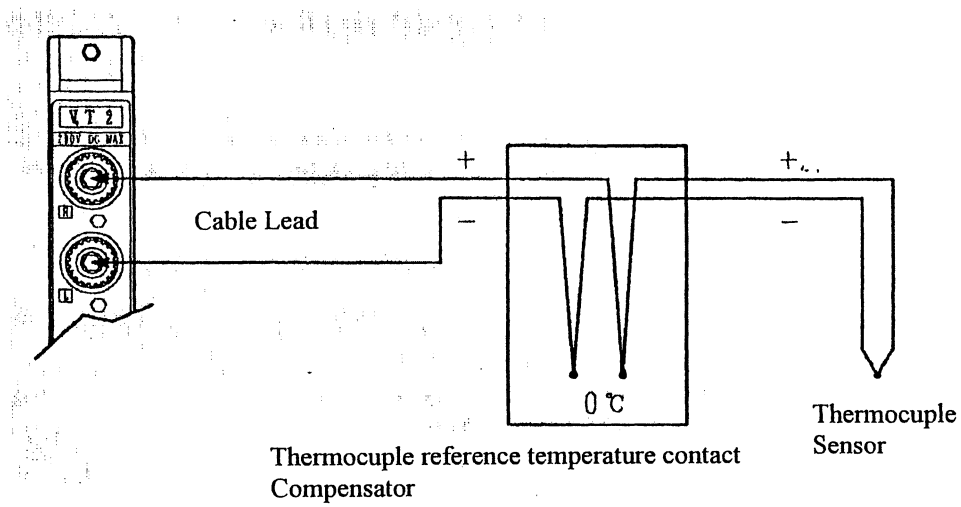
(Figure 3.1.30)

To measure the temperature by a thermocuple sensor (compensation for reference contact temperature set to ON)



(Figure 3.1.31)

To measure the temperature with the compesation for reference contact temperature set to OFF



(Figure 3.1.32)

3.2 Settings

3.2.1 Simplified setting

This section describes the simplified setting for this recorder, that is, range, zeo position, chart speed and span settings as its basic function.

For other functions, refer to the subsequent sections.

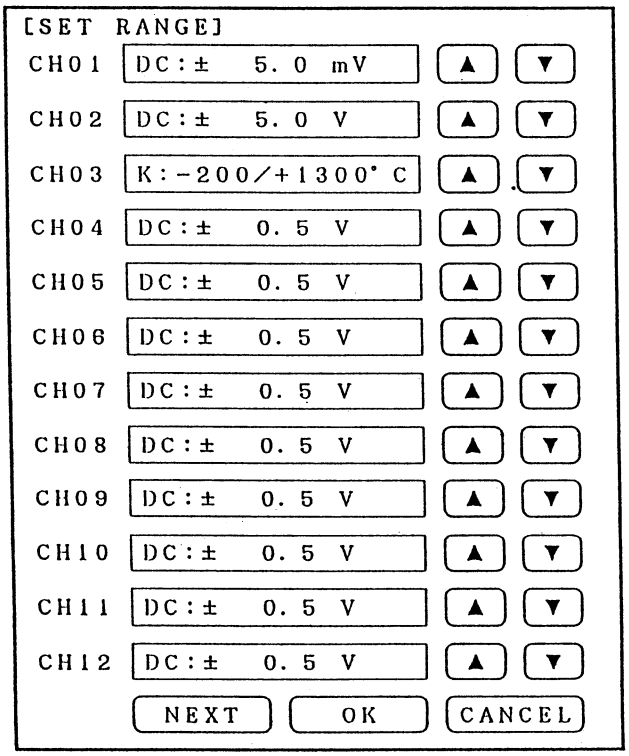
Caution

Data must be manually input into the touch panel. Don't use a hard object such as pen or your nail. If it is manipulated by the object with a pointed tip, it may be damaged and broken.

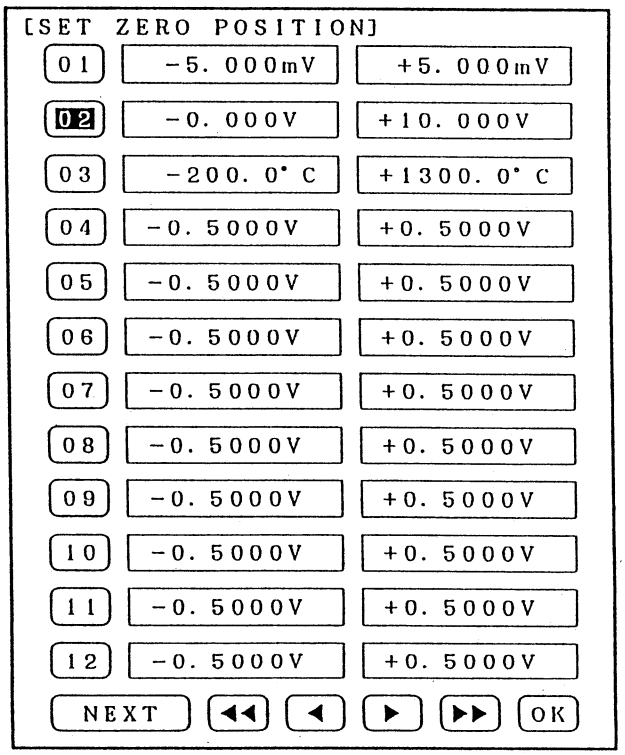
The simplified setting is decribed below on the following conditions :

CH 1	Range of ±5.0 mV, zero at center
CH 2	Range of ±5.0 V, zero at left end
CH 3	K thermocouple, span of 0 to 100°C
CHART SPEED	60 mm/h

① Press down [RANGE] key on the operation panel. The screen changes as shown in Figure 3.2.1.
② Operate [▲] [▼] keys on the rightside of CH 1 to set ±5.0 mV.
③ Operate [▲] [▼] keys on the rightside of CH 2 to set ±5.0 V.
④ Operate [▲] [▼] keys on the rightside of CH 3 to set K (-200 to 1300°C).
⑤ Press down [OK] key in the lower part of the screen.
⑥ Press down [ZERO] key on the operation panel. The screen changes as shown in Figure 3.2.2.
⑦ Press down [02] key at the left end of the screen to reservely display the channel mark.
⑧ Press down [◄◄] key in the lower part of the screen to set the zero position at the left end.
(Use [◄] key for finely adjust the position)
⑨ Press down [OK] key in the lower part of the screen.

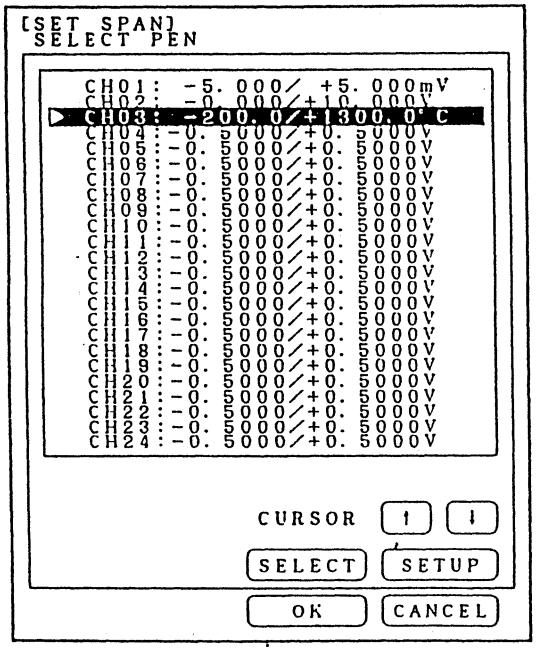


(Figure 3.2.1)

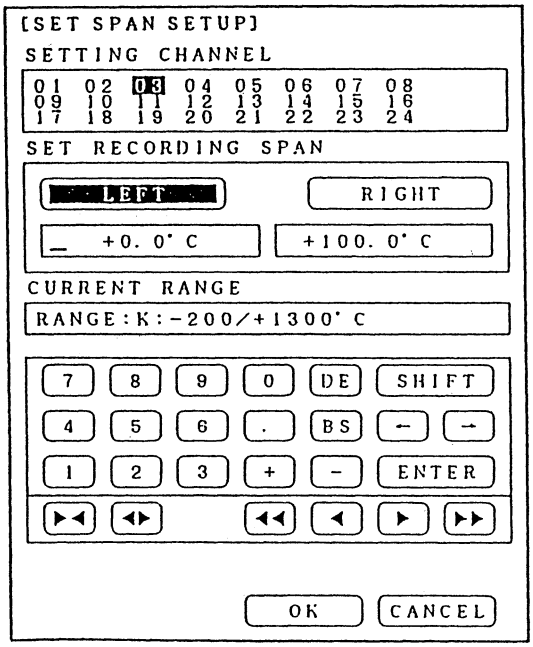


(Figure 3.2.2)

⑩ Press down [SPAN] key on the operation panel. The screen changes to SPAN as in Figure 3.2.3.
⑪ Use CURSOR key to displace the mark to 3 CH. Pressing down [SELECT] key gives the [▶] mark.
⑫ Then, pressing down [SETUP] key changes the screen into [SET SPAN SETUP] as in Figure 3.2.4.
⑬ Press down [LEFT] key, and then [0] • [ENTER] keys in this order.
⑭ Pressing down [RIGHT] key, and then [1] • [0] • [0] • [ENTER] • [OK] in this order returns the screen as shown in Figure 3.2.3.
⑮ Pressing down [OK] key returns the screen to its initial status.
⑯ Press down [CHART SPEED] key on the operation panel. The screen changes as in Figure 3.2.5.
⑰ Pressing down [60] • [mm/h] • [OK] keys in this order returns the screen to its initial status.
⑱ Press down PEN1•PEN2•PEN3 key to select a recording pen.
The PEN displaying LED on 1.2.3pen is lit while the selected pen pulls out.
⑲ Pressing down RECORD key starts the measurement.
⑳ The digital/analog display can be changed over by switching [DIGITAL] • [WAVE] key on the operation panel.



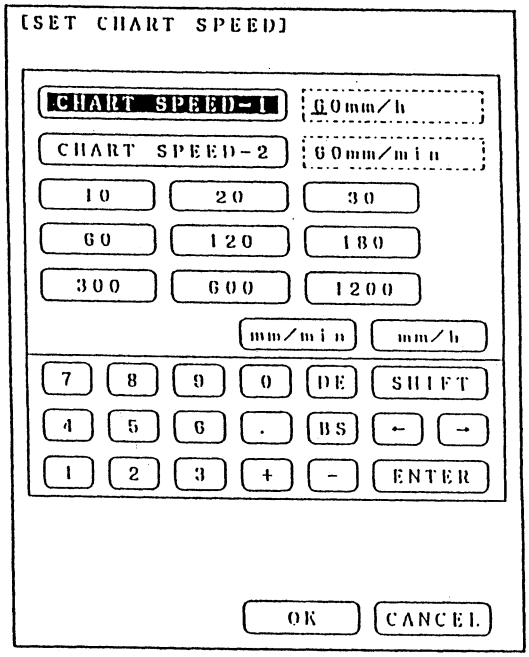
(Figure 3.2.3)



(Figure 3.2.4)

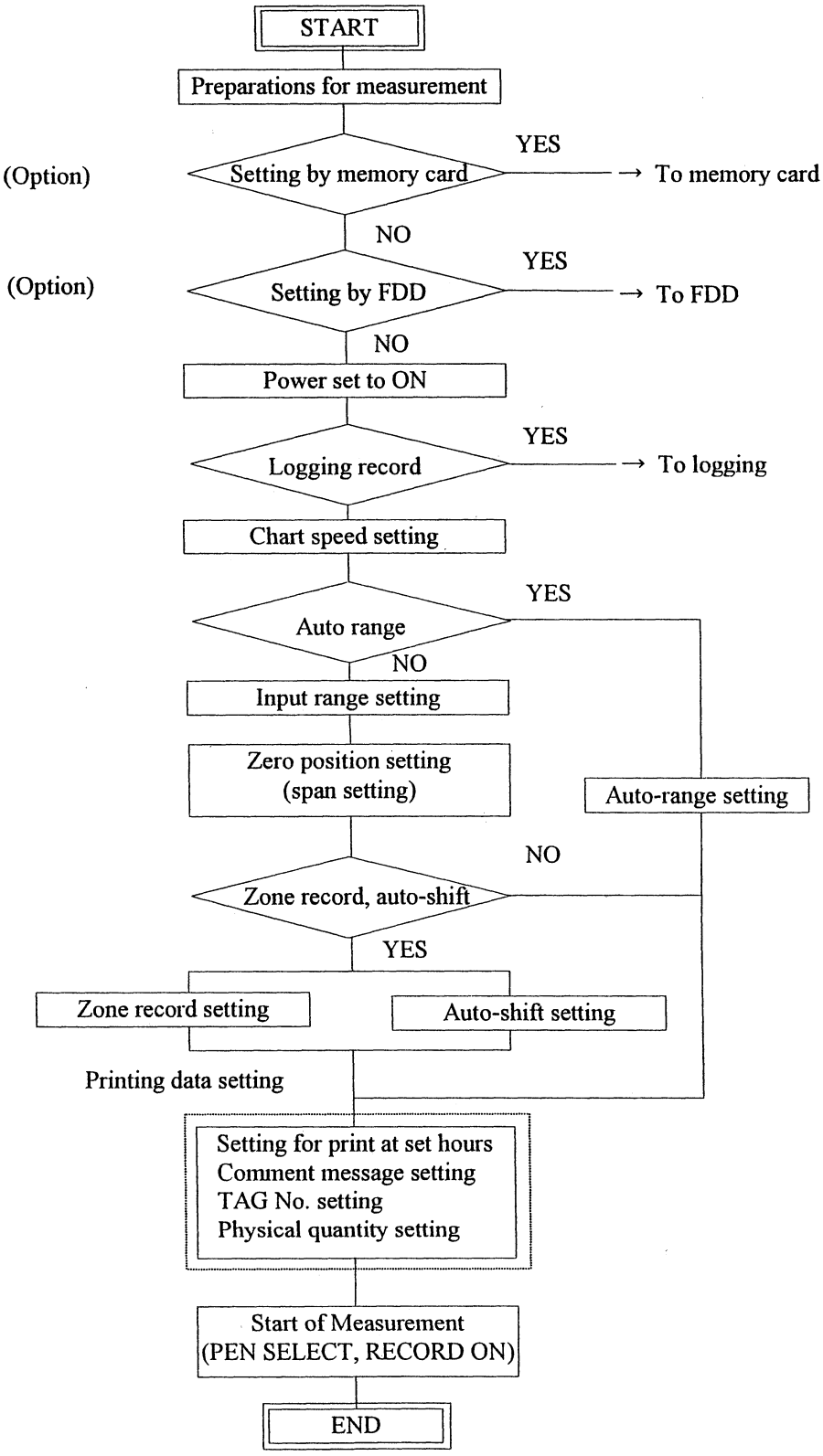
Caution

When you press down [CANCEL] key in place of [OK] key in these steps at the screen that [OK] and [CANCEL] keys are existing , the setting becomes invalid and return to its initial status.
[CANCEL] key fulfills the same function on any other screen.



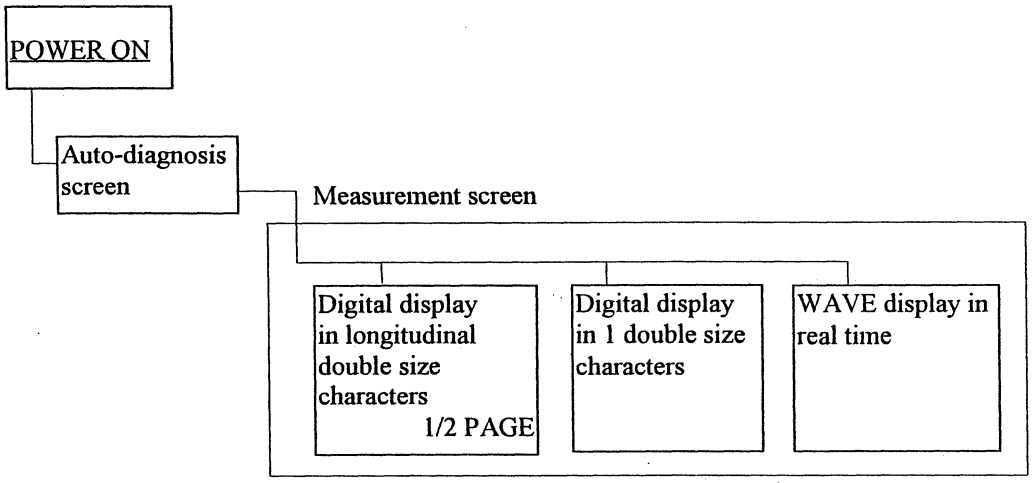
(Figure 3.2.5)

3.2.2 Flowchart of basic setting

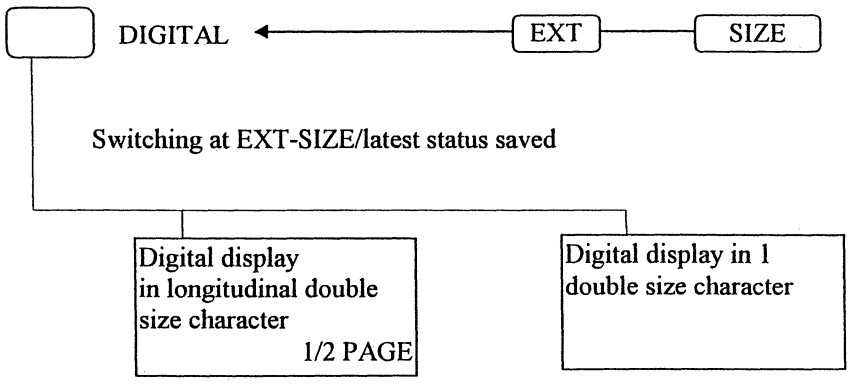


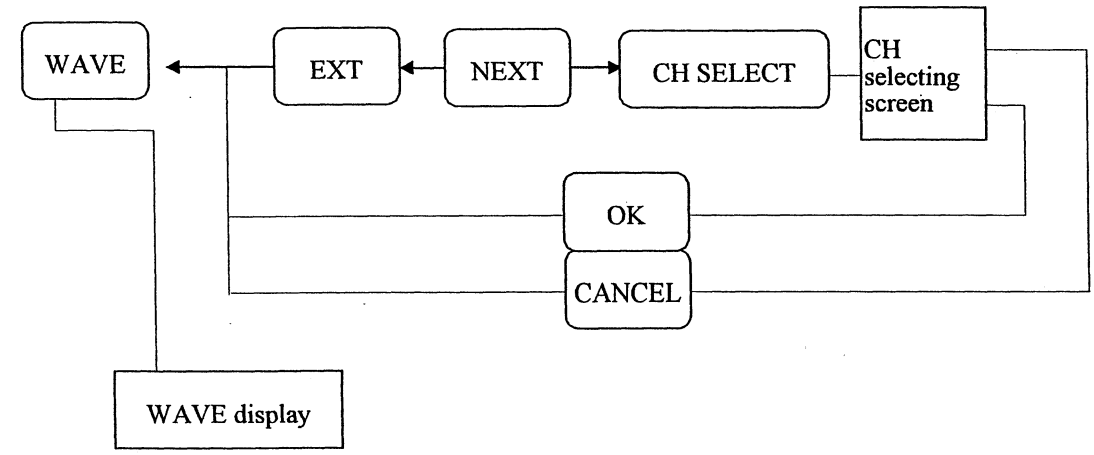
O Screen transfer

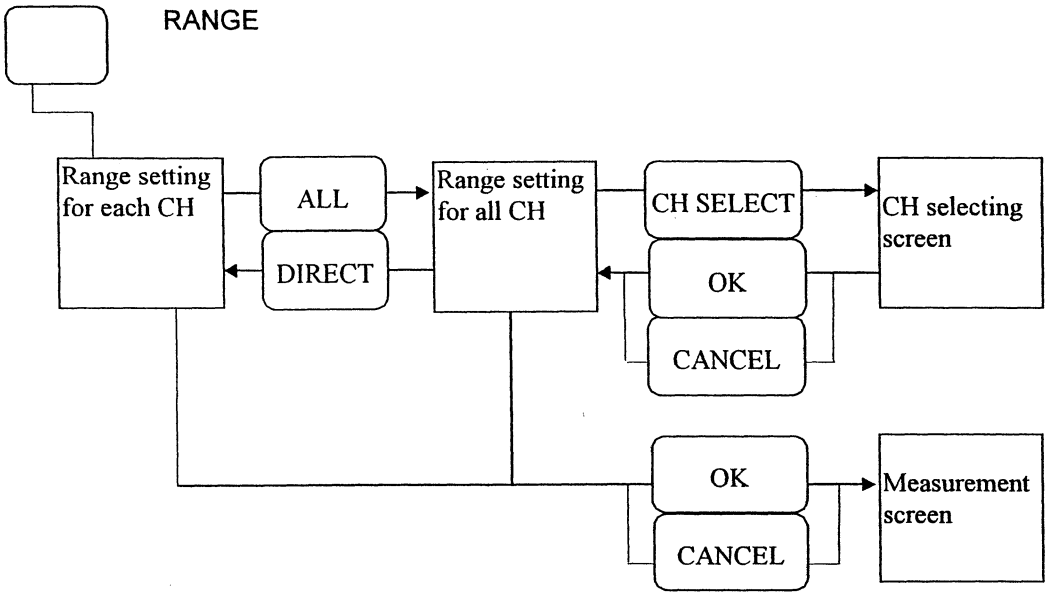
Screen with the power set to ON

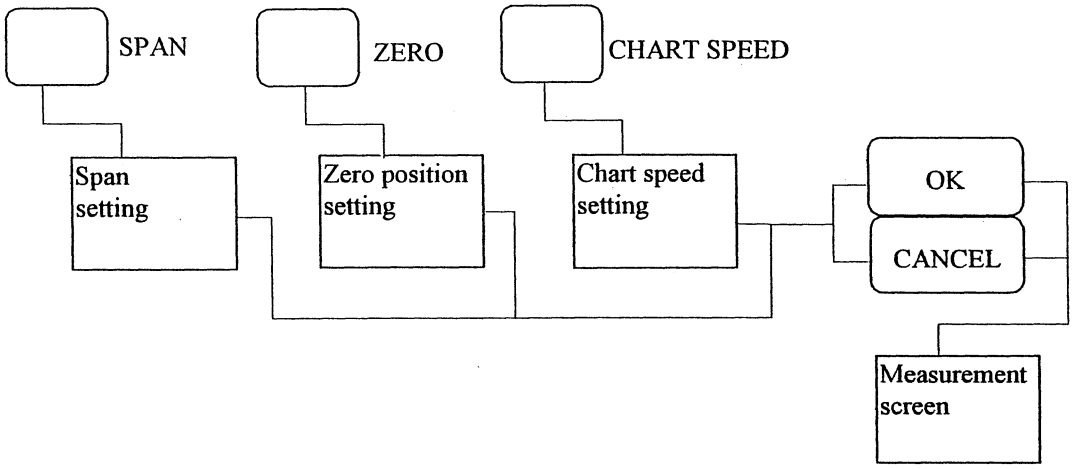


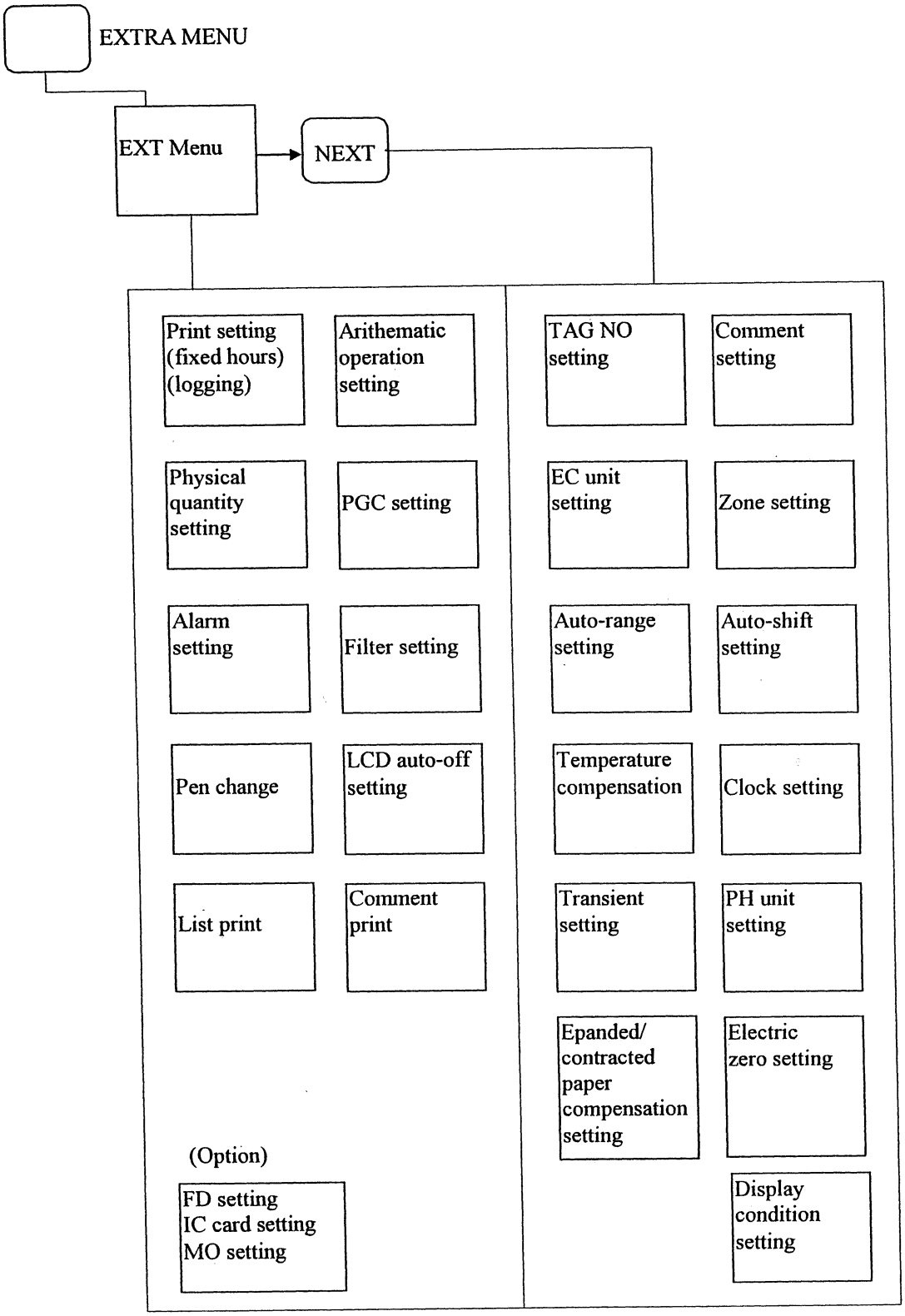
Operation of screen transfer




WAVE
EXT
NEXT
CH SELECT
CH selecting screen
OK
CANCEL
WAVE display

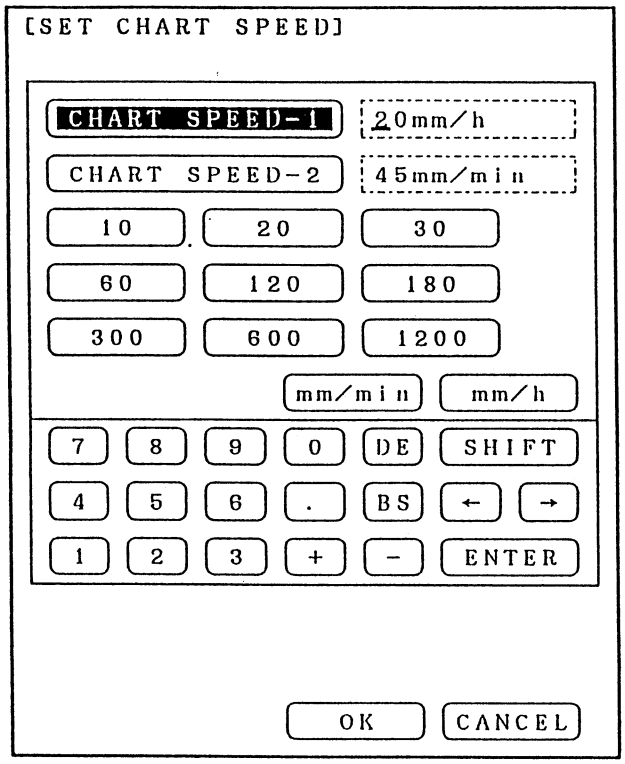

RANGE
Range setting for each CH
ALL
DIRECT
Range setting for all CH
CH SELECT
OK
CANCEL
CH selecting screen
OK
CANCEL
Measurement screen


SPAN
ZERO
CHART SPEED
Span setting
Zero position setting
Chart speed setting
OK
CANCEL
Measurement screen


EXTRA MENU
EXT Menu
NEXT
Print setting (fixed hours) (logging)
Arithematic operation setting
Physical quantity setting
PGC setting
Alarm setting
Filter setting
Pen change
LCD auto-off setting
List print
Comment print
(Option)
FD setting
IC card setting
MO setting
TAG NO setting
Comment setting
EC unit setting
Zone setting
Auto-range setting
Auto-shift setting
Temperature compensation
Clock setting
Transient setting
PH unit setting
Epanded/ contracted paper compensation setting
Electric zero setting
Display condition setting

3.2.3 Setting the chart speed

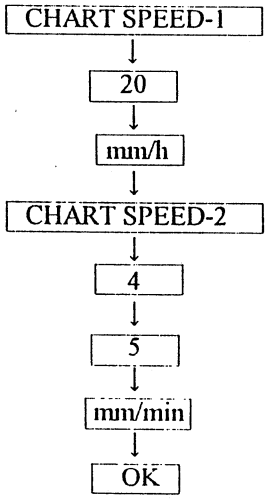
Pressing down [CHART SPEED] key changes the screen into [SET CHART SPEED] (Figure 3.2.6). On this screen, the chart speed can be set by direct keys and numerical values (10 mm/h to 1200 mm/mini in steps of 1 mm).



(Figure 3.2.6)

Example) To set the first chart speed to 20 mm/h and second chart speed to 45 mm/min,

Press down [CHART SPEED] key on the panel to change the screen (as shown in Figure 3.2.6).
Then, operate the keys on the display as follows :



Caution

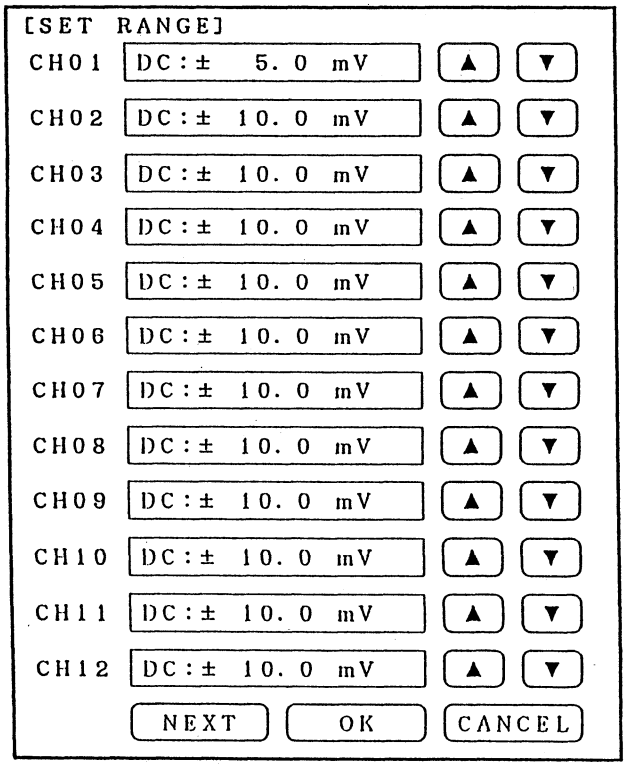
1. In normal mode of measurement, the recording paper is fed at the set first chart speed, so that you have no need to set the second chart speed.
   You must set the second chart speed when setting the alarm or changing over the first/second chart speed by an external controller (option).
2. 0 mm/min or /h cannot be set for the first chart speed so long as the alarm setting is not made to ON.

3.2.4 Setting the input range

Pressing down [RANGE] key changes the screen into [SET RANGE] (as shown in Figure 3.2.7). Use [▲] [▼] keys on the rightside of the display to set a range as desired and then press down [OK] key. When all the pens must be set at the same time, press down [NEXT] key to change the screen into simultaneous all channels setting. Then, select the channel and use [▲] [▼] keys on [SET RANGE] screen to set it to a range as desired.

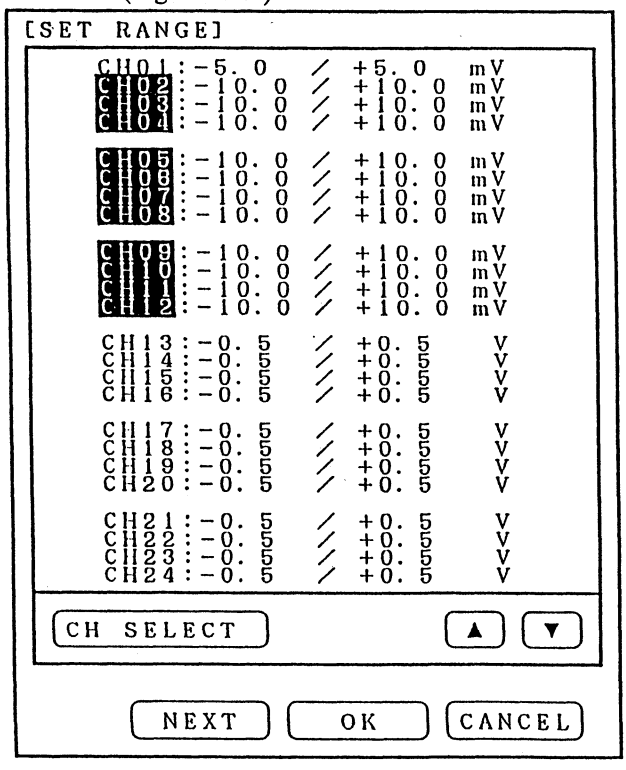
In case that range setting for 5 or 6 pens want to be done simultaneously, press down [CH SELECT] key in all channel simultaneous setting screen(figure 3.2.8), then select the channels to be set in the screen of [SELECT CHANNEL] then press [▲] [▼] key and set the required range.

Example) To set channel 1 to a range of ±5 mV and channels 2 to 12 to that of ±10 mV,

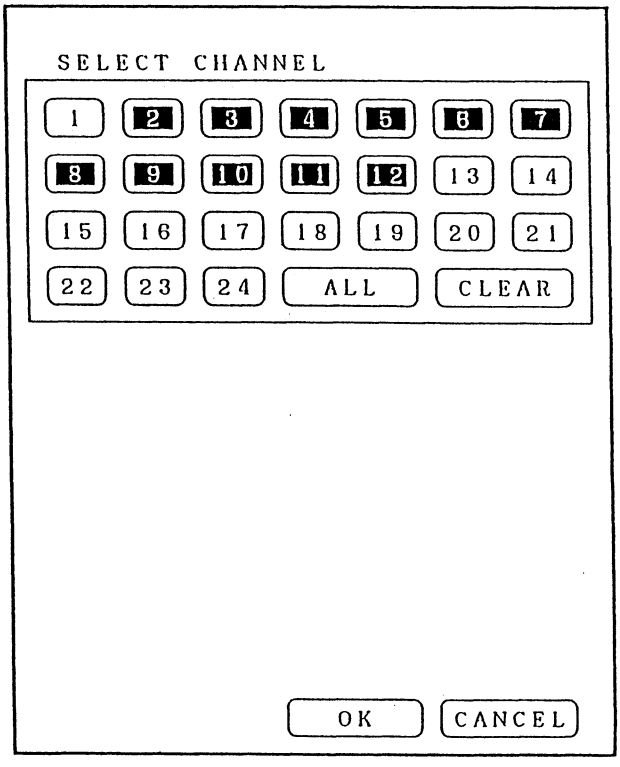


(Figure 3.2.7)

[RANGE]
↓
Use CH01 [▲] [▼] keys to set channel 1 to a range of ±5 mV. (Figure 3.2.7)
↓
Press down [NEXT] key to set all CH at the same time. (Figure 3.2.8)
↓
Press down [CH SELECT] key to change the screen into [SELECT CHANNEL](Figure 3.2.9)
↓
Select channels 2 to 12.
(With [ALL] key, all the channels can be set in block)
↓
Press down [OK] key to return to the screen (as shown in Figure 3.2.8).
↓
Use [▲] [▼] keys to set channels 2 to 12 to a range of ±10 mV.
↓
[OK]
↓
Measurement screen



(Figure 3.2.8)



(Figure 3.2.9)

Range/span reference table (standard input unit FU-911A)

Voltage

Range	Span	
	Left	Right
RANGE : ± 100V	-100.00	100.00
± 50V	-50.00	50.00
± 25V	-25.00	25.00
± 10V	-10.000	10.000
± 5V	-5.000	5.000
± 2.5V	-2.500	2.500
± 1V	-1.0000	1.0000
± 0.5V	-0.5000	0.5000
± 250mV	-250.0	250.0
± 100mV	-100.00	100.00
± 50mV	-50.00	50.00
± 25mV	-25.00	25.00
± 10mV	-10.00	10.00
± 5mV	-5.000	5.000

Table 3.2.1

Thermocouple

Range	Span	
	Left	Right
K : -200 to 1300°C	-200.0	1300.0
T : -200 to 400°C	-200.0	400.0
R : 0 to 1700°C	000.0	1700.0
E : -200 to 1000°C	-200.0	1000.0
J : -200 to 1200°C	-200.0	1200.0
S : 0 to 1700°C	000.0	1700.0
B : 0 to 1800°C	000.0	1800.0

Table 3.2.2

3.2.5 Setting the zero position

The zero position can be set for the pen.

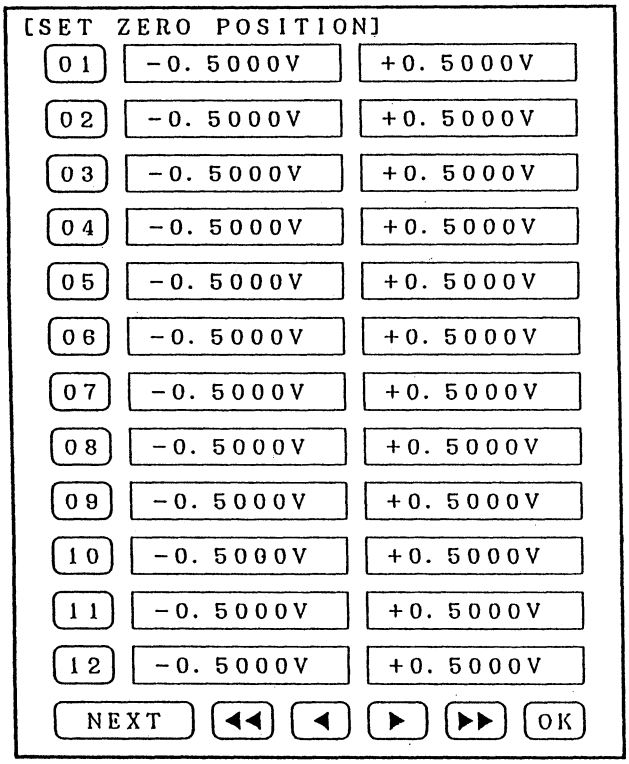
Pressing down [ZERO] key on the control panel changes the screen into [SET ZERO POSITION] (as shown in Figure 3.2.10).

Select a channel to be set by the touch switch on the leftside of the display and use [▸|| ◂] keys to set the zero position at any point on the recording paper.

Pressing down [◂◂] [▸▸] keys has the effect of displacing the position of the pen at every five scales, which is useful for largely displacing the position.

Limits

1. The zero position cannot be set when the temperature is to be measured by thermocouple and temperature measuring resistor (The zero position can be changed by setting the recording span as specified in 3.2.6.)
2. Some limits are imposed on the zero position setting for an AC unit.
   For further detials, please refer to individual instruction manual



(Figure 3.2.10)

3.2.6 Setting the recording span

The recording span can be set for this recorder at your option.

Pressing down [SPAN] key on the control panel changes the screen into [SET SPAN] (as shown in Figure 3.2.11).

Select a channel to be set by using [↑] [↓] keys to make required channel reversed and make the reversed channel left end indicated with ▸ mark by pressing down [SELECT] key.

Then, press down [SETUP] key to change the screen into [SET SPAN SETUP]. (Figure 3.2.12)

Through the keyboard on the display, input the right and left spans.

As an alternative way, you can set the recording span by arrow keys (as shown in Figure 3.2.12).

The arrow keys have the following effects :

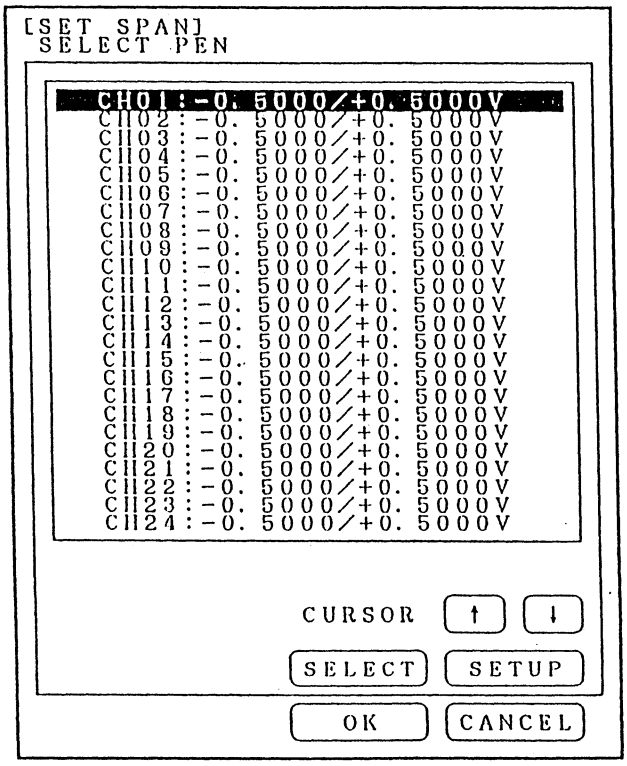
- [▸] : Fine increment
- [▸▸] : Gross increment
- [▸◂] : Values on both ends reduced
- [◂] : Fine decrement
- [◂◂] : Gross decrement
- [◂▸] : Values on both ends extended

Caution

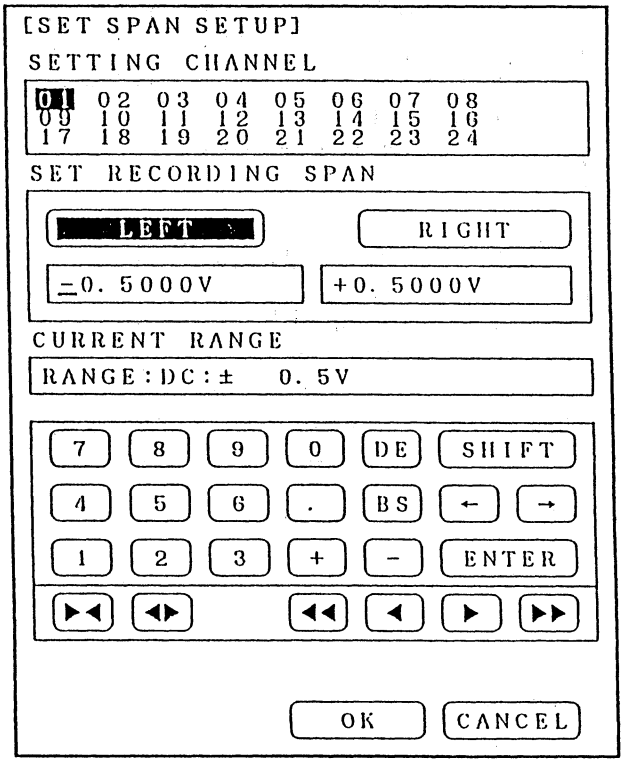
For example, when numerical values of 502.4 and 503.4 are set for leftside and rightside spans respectively, recorded wave forms may be oscillated in the form of ladder due to internal resolution and noise in the amplifier. Therefore, a partially magnified setting should not be done, as in the above case.

Limits

Rightside and leftside spans cannot be set to the same value.
If leftside span is set to 100.0 and rightside span to 100.0, the leftside span will be rewritten into 99.99.
If the leftside and rightside spans are set in the reverse order, the rightside span will be rewritten into 100.01.



(Figure 3.2.11)



(Figure 3.2.12)

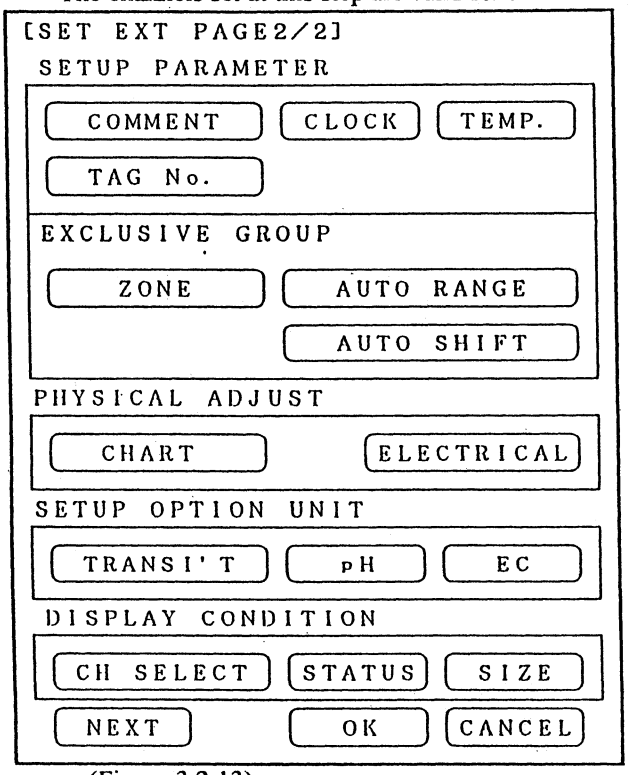
3.2.7 Setting the display conditions

The following three conditions shown on the main display must be set :

① Channels to be displayed
② Size of digitally displayed data character
③ List of settings

① Channels to be displayed.

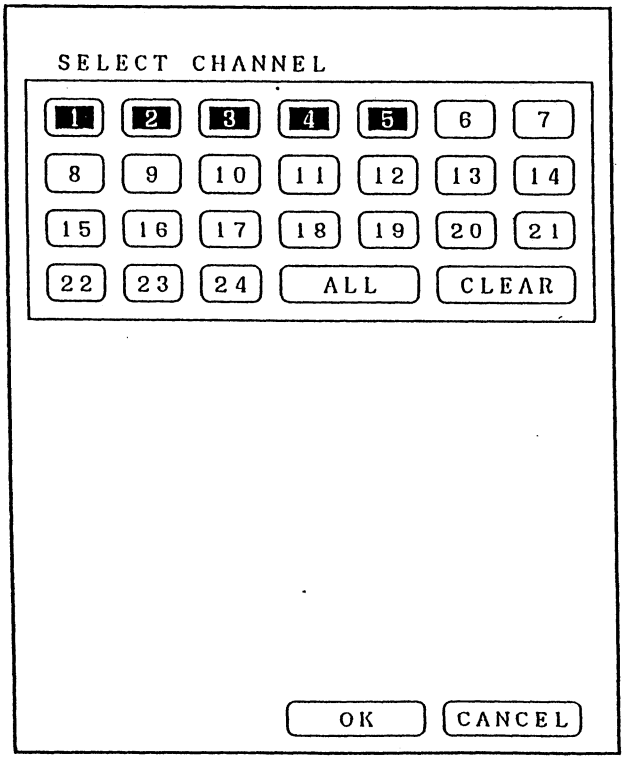
Set the channels to be displayed on the measurement screen.
The channels set at this step are valid for the wave display screen.



(Figure 3.2.13)

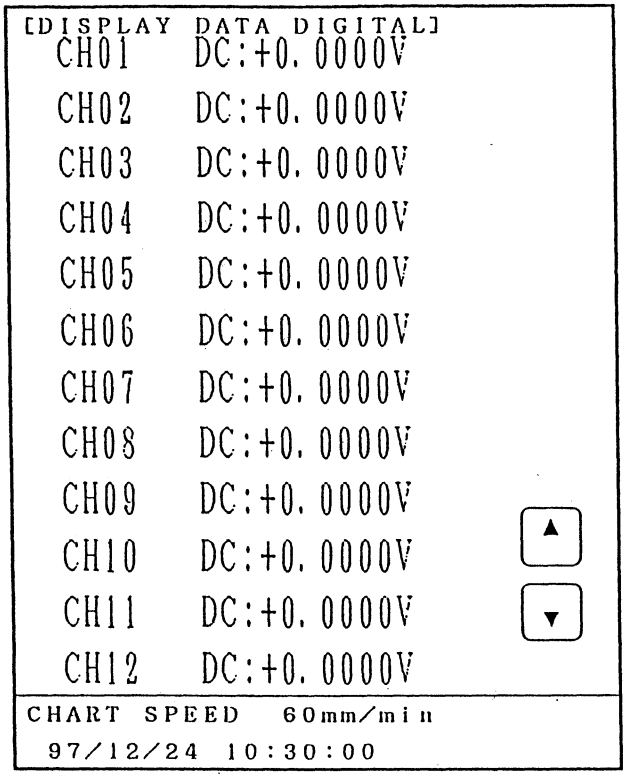
Press down [EXTRA MENU] key.
↓
[NEXT] (Figure 3.2.13)
↓
[CH SELECT] (Figure 3.2.14)
↓

Use the key switch to select the channel to be displayed and make them reversed. [OK] → [OK] allows you to return to the measurement screen.
Pressing down [ALL] key allows you to select all the channels at once.

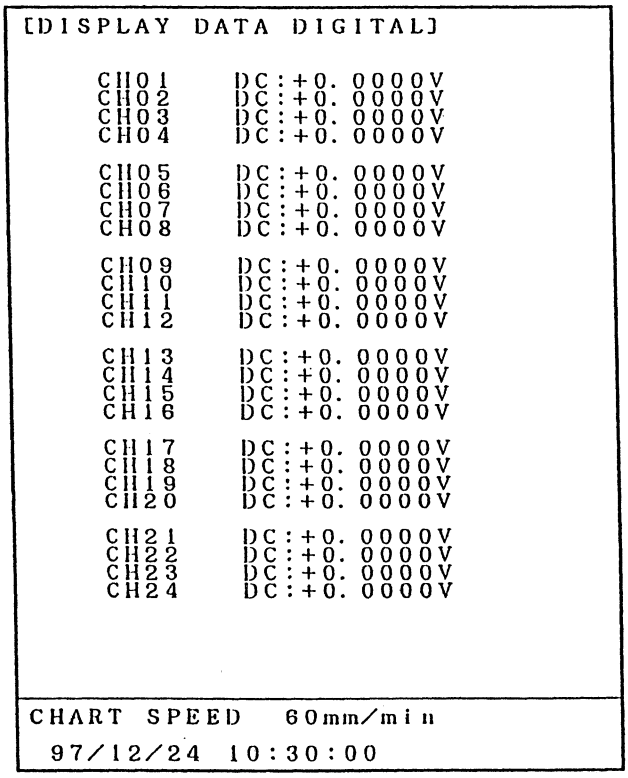


(Figure 3.2.14)

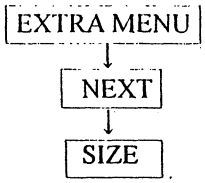
② Size of digitally displayed data character
Keying in the following order has the effect of changing the size of character on the measurement screen by turns (Figure 3.2.15) (Figure 3.2.16).



(Figure 3.2.15)



(Figure 3.2.16)

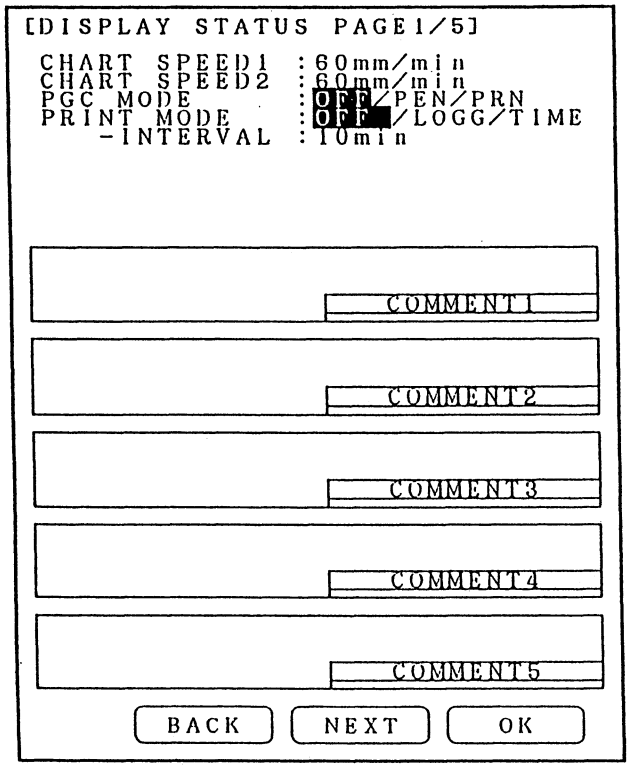


Caution

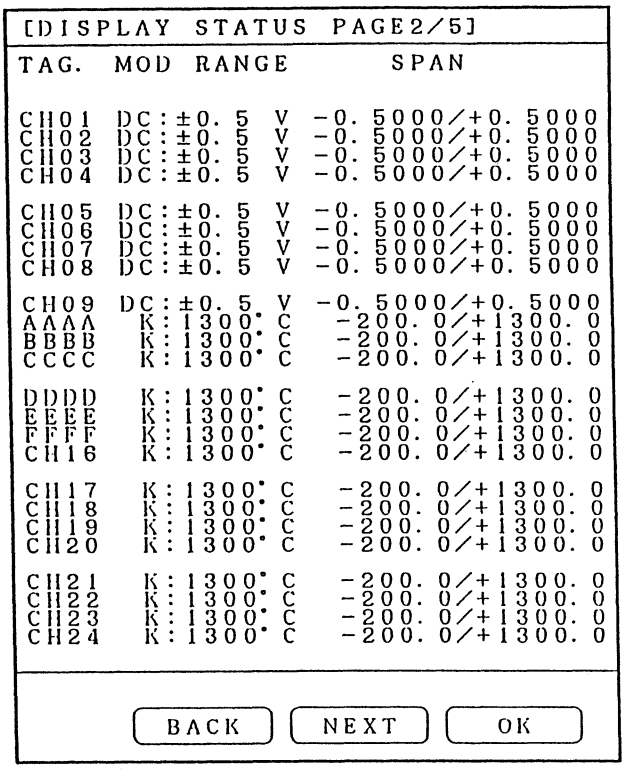
Pressing down [▼][▲] keys on the rightside changes the screen into Channels 13 and on. However, when the input unit has not been installed at No. 13 channels or more, this key opration cannot be made.

③ List of settings

Pressing down [EXTRA MENU] → [NEXT] → [STATUS] keys in this order has the effect of displaying a list of settings. This list is composed of five pages which can be switched over forwardly and backwardly every time you press down [NEXT] and [BACK] keys respectively (Figure 3.2.17). Five pages of lists are shown (as given in Figure 3.2.18).



(Figure 3.2.17)



(Figure 3.2.18)

3.2.8 Setting the auto-range down

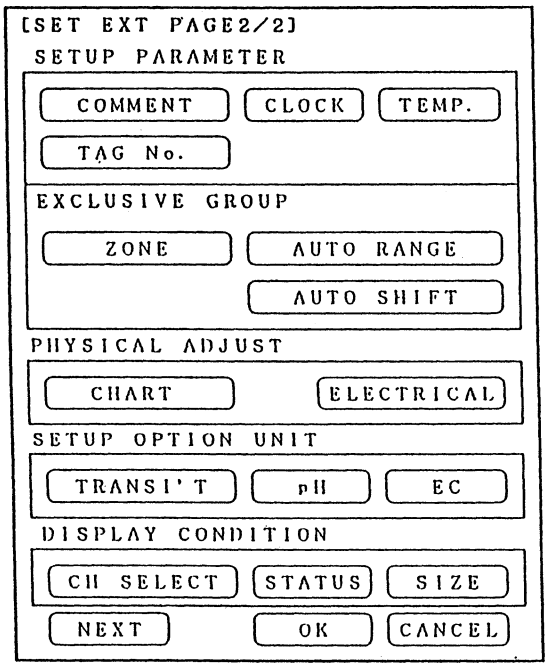
When the auto-range down is set, the optimum range is selected according to the specified input signal level by reducing the sensitivity in case that input signal level exceeds range width or at the each time when input signal level surpass the range limit.

When this auto-range down is occurred, the occurred channel number and new range value are printed out in the chart paper.

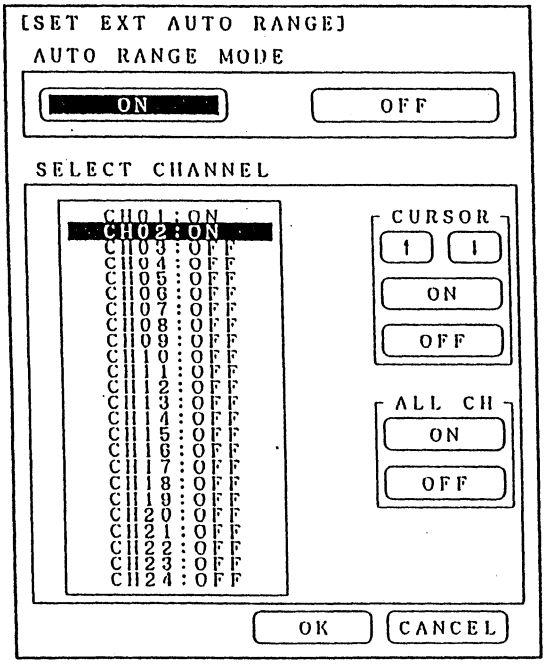
Pressing down [EXTRA MENU] on the control panel changes the screen into [SET EXT PAGE1/2]. Press down [NEXT] key in the leftside lower section to change the screen into [SET EXT PAGE2/2]. (Figure 3.2.19). Pressing down [AUTO RANGE] changes it into [SET EXT AUTO RANGE]. (Figure 3.2.20). On [SELECT CHANNEL], set the channel whose range must automatically go down.

Use [↑] [↓] keys to select the desired channel and press down [ON] key. Then, press down [ON] key on [AUTO RANGE MODE].

Press down [OK] → [OK] keys to return to the measurement screen.



(Figure 3.2.19)



(Figure 3.2.20)

Example) To set channels 1 and 2 as auto-range down,

[EXTRA MENU]
↓
[NEXT] [SET EXT PAGE1/2]
↓
[AUTO RANGE] (Figure 3.2.19)
↓ [SET EXT PAGE2/2]
Use [↑] or [↓] key to select Channel 1
↓ (Figure 3.2.20)
[ON] [SELECT CHANNEL]
↓
Use [↑] or [↓] key to select Channel 2
↓
[ON] [SELECT CHANNEL]
↓
[ON] [AUTO RANGE MODE]
↓
[OK]
↓
[OK] (Figure 3.2.19)
↓ [SET EXT PAGE2/2]
To the measurement screen

Limits

1. The auto-range is switched into auto-range down at a point where 1% of *standard range span is exceeded.
2. The span is given as the standard range span after the auto-range has been switched into auto-range down. When the auto-range is switched from OFF to ON, the initial range and span are given by those immediately before the auto-range down has been put to ON. Then, the auto-range down switching point is valid with a value given above in (1).
3. When the auto-range is put to ON, neither range switching nor span setting cannot be done. Put to OFF the auto-range to switch the range or set the span.
4. The auto-range down function cannot be set commonly with the auto-shift and/or the zone recording. When the auto-range down is set, the auto-shift and zone recording are automatically set to OFF.
5. It takes several seconds for the range to be switched. During this switching, the indicated value is held.
6. The data of six channels are printed when several auto-range down status occur simultaneously, due to print width.
7. The auto-range down can be set only for channel linking equal mark "=". In such a case, set it to operation input channel.
   The auto-range down does not function when it is set to operation results channel.

Caution

Auto range down does not function evenif auto range is set as long as range sensitivity is low and the input signal level does not exceed the set range width.

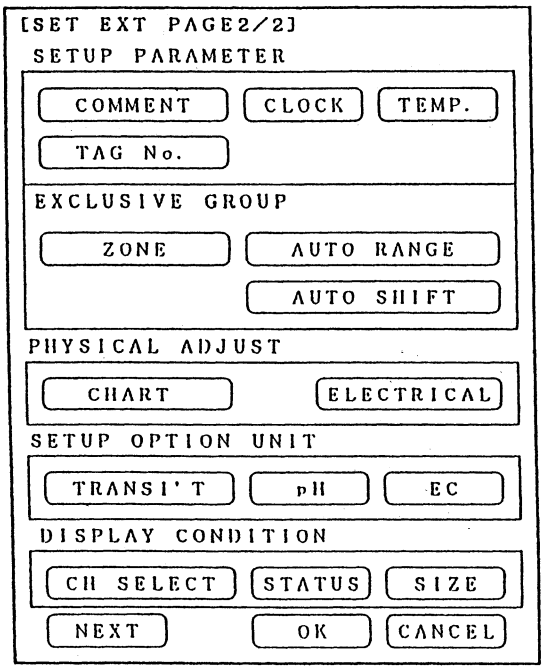
3.2.9 Setting the auto-shift

Setting the auto-shift allows the recorded data to be shifted by one span when they exceed their display limit on right or left side.

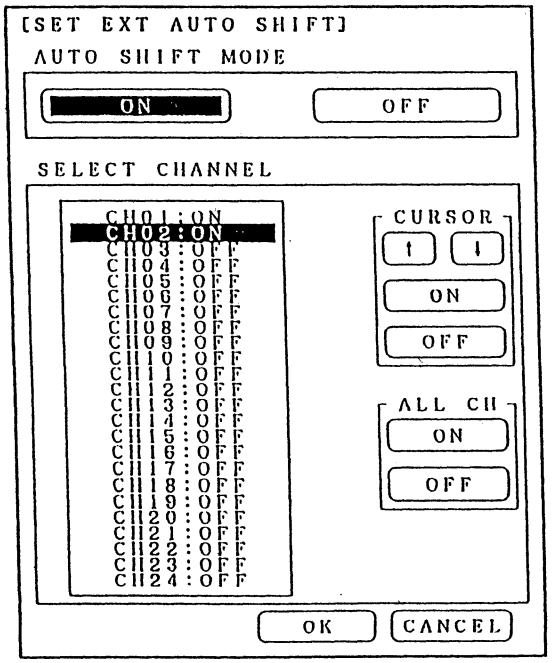
Pressing down [EXTRA MENU] on the control panel changes the screen into [SET EXT PAGE1/2]. Press down [NEXT] key in the leftside lower section to change the screen into [SET EXT PAGE2/2]. (Figure 3.2.21). Pressing down [AUTO SHIFT] changes it into [SET EXT AUTO SHIFT]. (Figure 3.2.22). On [SELECT CHANNEL], set the pen which must be automatically shifted. Use [↑][↓] keys to select the desired channel and press down [ON] key. Then, press down [ON] key on [AUTO SHIFT MODE]. Press down [OK] → [OK] keys to return to the measurement screen.

Example) To set Channel 1 and 2 as auto-shift,

[EXTRA MENU]
↓
[NEXT] [SET EXT PAGE1/2]
↓
[AUTO SHIFT] (Figure 3.2.21)
↓ [AUTO SHIFT MODE]
Use [↑] or [↓] key to select Channel 1
↓ (Figure 3.2.22)
[ON] [SELECT CHANNEL]
↓
Use [↑] or [↓] key to select Channel 2
↓
[ON] [SELECT CHANNEL]
↓
[ON] [AUTO SHIFT MODE]
↓
[OK]
↓
[OK] (Figure 3.2.21)
↓ [SET EXT PAGE2/2]
To the measurement screen



(Figure 3.2.21)



(Figure 3.2.22)

Limits

1. The auto-shift cannot be set commonly with the auto-range down and/or the zone recording.
   When the auto-shift is set, the auto-range down and zone recording are automatically put to OFF
2. It takes about 160 ms for the span to be displaced.
3. The auto-shift can be set only to the channel linking equal mark "=". In such a case, set it to operation input channel.
   The auto-range down does not function when it is set to operation results channel.

3.2.10 Setting the zone recording

Assuming that the zone area is 0% on leftside and 100% on rightside, the recording zone area can be changed at your option. (A fixed zone can be also selected by AUTO ZONE.)
Assuming for example that the recording zone is 20% on leftside and 70% on rightside, the recording area is given by 70 - 20 = 50%. Therefore, the data are recorded in a recording area reduced to half.
Example of recording (Figure 3.2.23)

When [AUTO ZONE] is set, the zone is automatically set to the area defined by the number of pens.

Limits

The zone recording cannot be set commonly with the auto-range down and/or the auto-shift. When the zone recording is set, the auto-range down and auto-shift are automatically put to OFF.

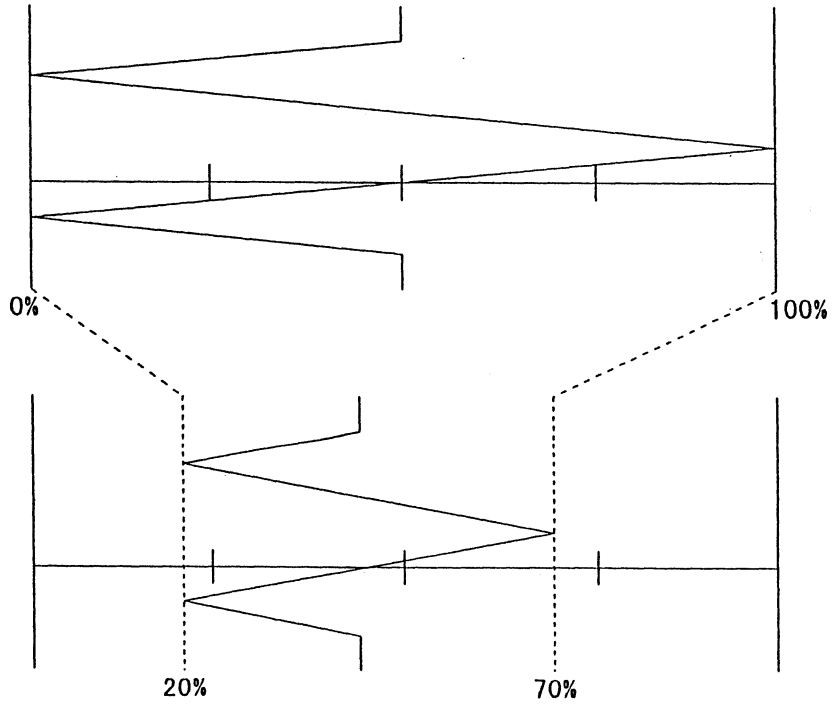
(1) AUTO ZONE Setting

Pressing down [EXTRA MENU] on the control panel changes the screen into [SET EXT PAGE1/2].
Press down [NEXT] key in the leftside lower section to change the screen into [SET EXT PAGE2/2]. (Figure 3.2.25). Pressing down [ZONE] changes it into zone setting. (Figure 3.2.26).
Use [↑] or [↓] key to select the pen for which the zone must be set and make it reversed then press down [SELECT] key to put ▸ mark in the leftend of reversed pen.
Then press down [AUTO ZONE] key and press down [ON] key in [ZONE MODE].
Recording zone are divided automatically in equal as per number of selected pens.

There are two kinds of atuo zone partition (division) as described below depending number of selected pens.

- Equal division per scale of chart paper
- Equal division per effective recording width(250mm width)

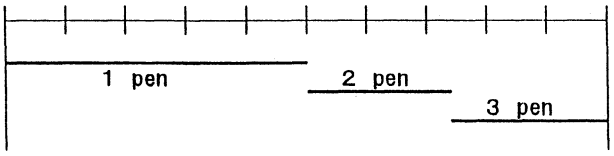
By pressing down [AUTO ZONE] key, the selection changes in turns.



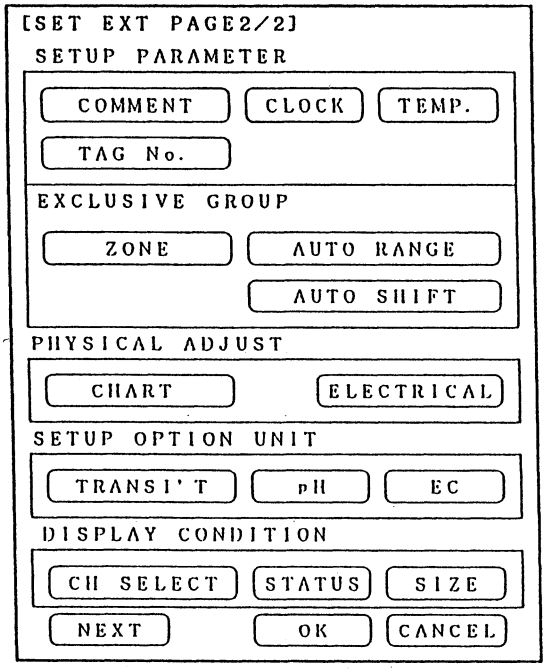
(Figure 3.2.23)

(2) Manual AUTO ZONE setting

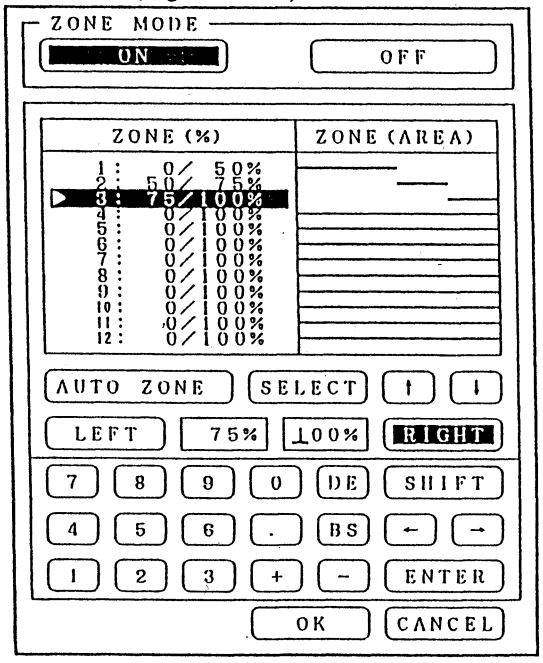
Pressing down [EXTRA MENU] on the control panel changes the screen into [SET EXT PAGE1/2]. Press down [NEXT] key in the leftside lower section to change the screen into [SET EXT PAGE2/2]. (Figure 3.2.25). Pressing down [ZONE] changes it into zone setting. (Figure 3.2.26).
Use [↑] or [↓] key to select the pen for which the zone must be set and make it reversed then press down [SELECT] key to put ▸ mark in the leftend of reversed pen. Input value for the left end and right end positions of zone recording with numeric keys and then press down [ON] key in [ZONE MODE].



(Figure 3.2.24)



(Figure 3.2.25)



(Figure 3.2.26)

Example) (As in Figure 3.2.24)
To set 1 pen to 0 to 50%
2 pen to 50 to 75%
3 pen to 75 to 100%

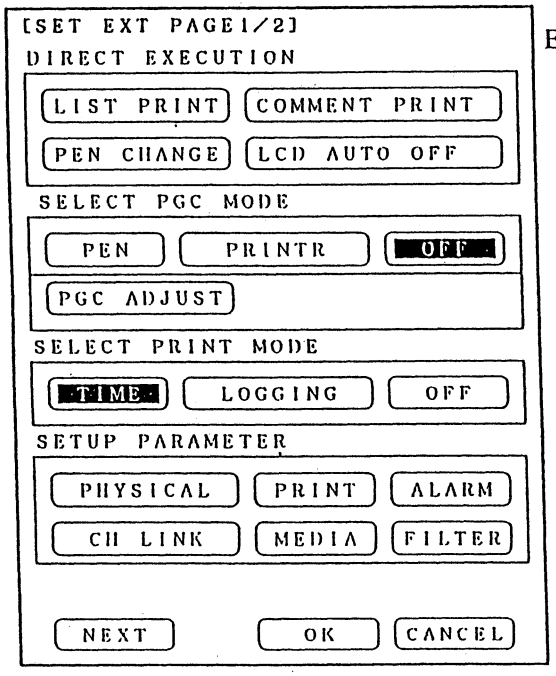
[EXTRA MENU]
↓
[NEXT] [SET EXT PAGE1/2]
↓
[ZONE] (Figure 3.2.25)
↓
Use [↑] or [↓] key to select 1pen and put ▸ mark
↓ with SELECT (Figure 3.2.26)
Press down [LEFT] → [0] → [ENTER]
↓
Press down [RIGHT] → [5] → [0] → [ENTER]
↓
Press down [SELECT] to release 1pen's ▸ mark
↓
Use [↑] or [↓] key to select 2pen and put ▸ mark
↓ with [SELECT]
Press down [LEFT] → [5] → [0] → [ENTER]
↓
Press down [RIGHT] → [7] → [5] → [ENTER]
↓
Press down [SELECT] to release 2pen's ▸ mark
↓
Use [↑] or [↓] key to select 3pen and put ▸ mark
↓ with [SELECT]
Press down [LEFT] → [7] → [5] → [ENTER]
↓
RIGHT → [1] → [0] → [0] → [ENTER]
↓
[ON] [ZONE MODE]
↓
[OK]
↓
[OK] (Figure 3.2.25)
↓
To measurement screen

3.2.11 Setting the printing at fixed time interval

This recorder can record the printing data either in analog or digital modes. Either "LINE" or "EACH" can be set for it. In "LINE" mode, it prints on one line the time data and measured data (on two lines for the data on 13 channels or more). In "EACH" mode, it prints the time data and each channel data on separate lines (on two lines for the data on 13 channels or more).

The data are printed at fixed interval when TIME is set in printer mode on EXTRA MENU while [RECORD] key on the panel is put to ON.

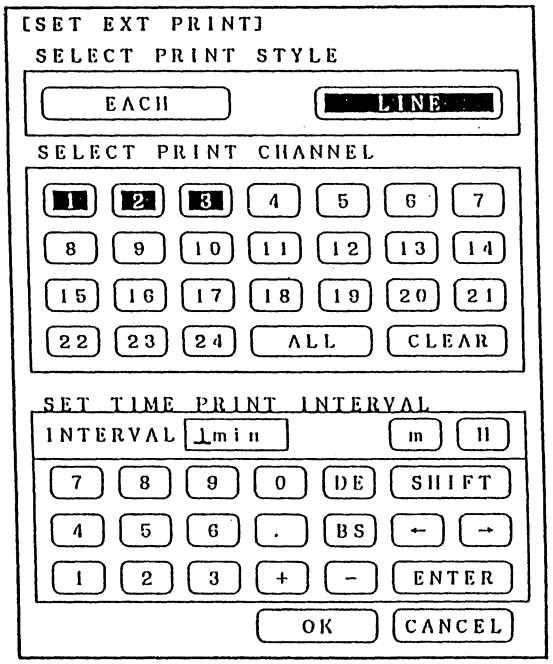
Either switching OFF of printer mode in EXTRA MENUE or switching OFF [RECORD] key in control panel screeen will stop the printing at fixed time inverval.



(Figure 3.2.27)

Example) To print the measured data on channels 1 to 3 at intervals of one minute,

[EXTRA MENU]
↓
[PRINT] (Figure 3.2.27)
SETUP PARAMETER
↓
[LINE] (Figure 3.2.28)
[SET EXT PRINT]
↓
[1] → [2] → [3]
SELECT PRINT CHANNEL
↓
[1] → [m] → [OK]
SET TIME PRINT INTERVAL
↓
[TIME] (Figure 3.2.27)
SELECT PRINT MODE
↓
[OK]
↓
To measurement screen Press down [RECORD] to start the print at fixed time interval



(Figure 3.2.28)

Caution

1. Once you press down [RECORD] key, the interval starts counting. However, when [RECORD] key is already set to ON, the interval starts counting when you press down [TIME] key.
   (When only the interval is to be changed, the data are printed at fixed intervals after they have been once printed at intervals fixed before.)
2. The data are not printed so long as [RECORD] key on the panel is not put to ON.
3. The interval can be selected from 1min. to 59 min. and 1H to 24H.
4. As shown in Tables 3.2.3 and 3.2.4, some limits are imposed on chart speed and interval. When chart speed is changed halfway, interval will be automatically changed as shown in these tables.

Limits

1. The printing at fixed time interval cannot be used commonly with the logging print. When the former is set, the latter is automatically put to OFF.
2. When the unit of measured data is physically given by three or more characters, the unit is printed only by three characters.
3. As shown in the tables below, there is some limitations between chart speed and time intervals. If chart speed is changed in the middle of recording, the setting of time intervals is automatically changed as shown in the table 3.2.3 and 3.2.4 below. Please take it into your account.

In "LINE" mode (12 channels or more), two fold for 12 channels or more

Chart speed	Interval
10 to 1200 mm/min.	1 minute
1 to 9 mm/min.	4 minutes
600 to 1200 mm/h	1 minute
120 to 599 mm/h	2 minutes
60 to 119 mm/h	4 minutes
30 to 59 mm/h	8 minutes
20 to 29 mm/h	12 minutes
10 to 19 mm/h	24 minutes

Table 3.2.3

In "EACH" mode

Chart speed	Interval
60 to 1200 mm/min.	1 minute
10 to 59 mm/min.	6 minutes
1 to 9 mm/h	60 minutes
600 to 1200 mm/h	6 minutes
300 to 599 mm/h	12 minutes
150 to 299 mm/h	24 minutes
60 to 149 mm/h	1 hour
30 to 59 mm/h	2 hours
10 to 29 mm/h	6 hours

Table 3.2.4

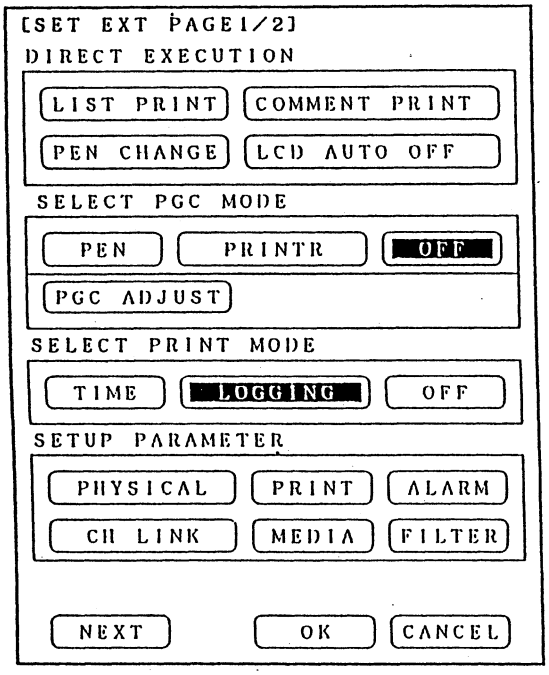
3.2.12 Setting the logging record

Only the printed data are recorded. (The data are not recorded in analog mode by cartridge pens.) The logging record is printed when LOGGING is set in printer mode on EXTRA MENU while [RECORD] on the panel is set to ON.

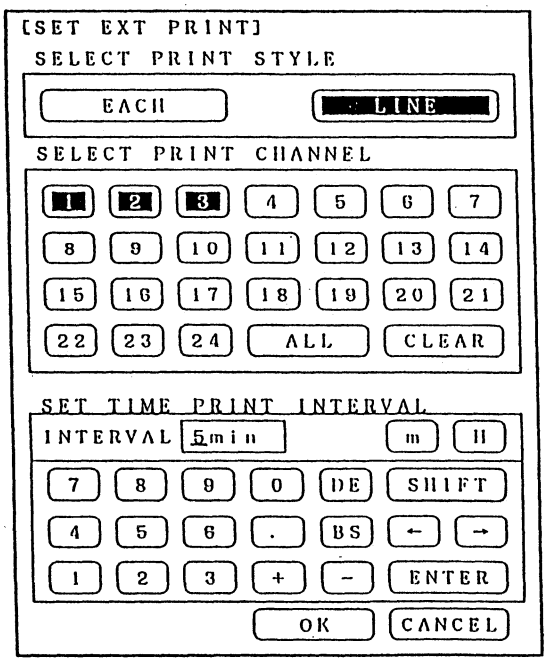
To stop this printing, set to OFF the printer mode on EXTRA MENU or put to OFF [RECORD] key on the panel. At this moment, the maximum, minimum and mean values of operation results are printed. The operation is made of 4000 items of data at maximum for each channel. When the operation is made of 4000 items of data, the maximum, minimum and mean values are automatically printed. The operation is newly made of the 4001th item and on.

Limits

1. The logging data are printed only in "LINE" mode.
2. While logging data are reocrded, the pen selecting key cannot be used.
3. When the unit of measured data is physically given by three or more characters, the unit is printed only by three characters.



(Figure 3.2.29)



(Figure 3.2.30)

Example) To make the logging record on channels 1 to 3 at intervals of 5 minutes,

[EXTRA MENU]
↓
[PRINT] (Figure 3.2.29)
[SETUP PARAMETER]
↓
[1] → [2] → [3]
SELECT PRINT CHANNEL
↓ (Figure 3.2.30)
[5] → [m] → [OK]
SET TIME PRINT INTERVAL
↓
[LOGGING] (Figure 3.2.29)
SELECT PRINT MODE
↓
[OK]
↓
To measurement screen Press down
[RECORD] to start the logging print

Caution

1. The interval can be set from 1 min to 59 min and 1H to 24H
2. Please draw your attention that analog recording using pen can not be performed if PRINT MODE of EXTRA MENU is not switched to OFF.
3. Interval will start at the monent when [RECORD] key is pressed down. However, in case that [RECORD] key has already been pressed down, iterval starting point will changed to the moment when LOGGING key is pressed down. (In case that only interval time setting is changed, interval printing per the time newly set will be printed out after the initial interval printing is printed out.
4. It will not print out as long as [RECORD] key is pressed down to ON.

3.2.13 Setting the manual printing

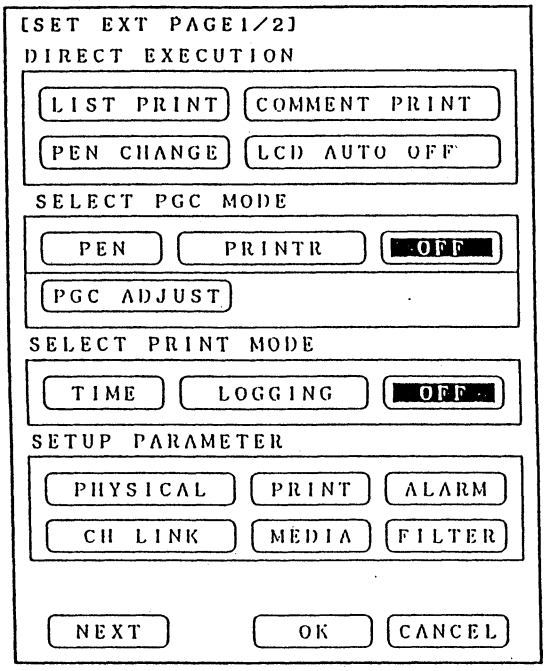
Pressing down [MANUAL PRINT] key on the operation panel allows you to print the measured data and date/hours on each channel.

In this manual print mode, only "LINE" is effective, so that the data on time and measurement are printed on one line (two lines for 13 channels or more).

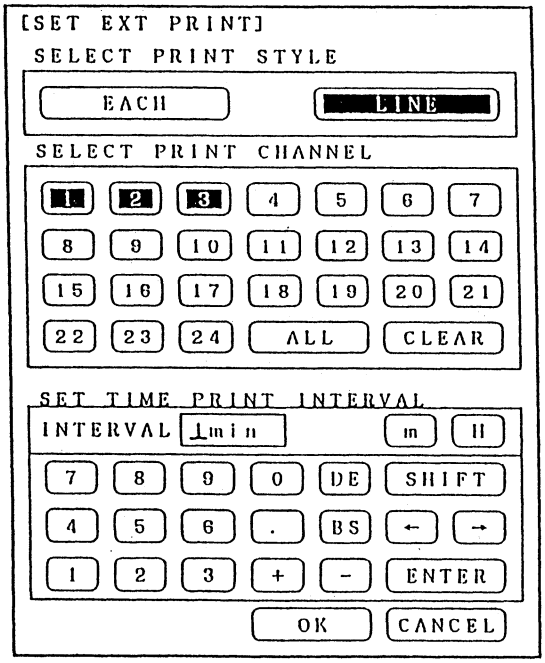
By selecting printing channel whose data are to be printed, only the data in the required channel can be printed.

Limits

1. When data are manually printed immediately after a printing at fixed time interval, these two kinds of printing characters may be overlapped on each other.
2. When MANUAL PRINT key is pressed down again before the second line is printed, data are printed again from the first line without printing the second line.
3. When the unit of measured data is physically given by three or more characters, the unit is printed only by three characters.



(Figure 3.2.31)



(Figure 3.2.32)

Example) To manually print the measured data on channels 1 to 3 on one line,

[EXTRA MENU]
↓
[PRINT] (Figure 3.2.31)
[SET PARAMETER]
↓
[1] → [2] → [3] (Figure 3.2.32)
SELECT PRINT CHANNEL
↓
[OK]
↓
[OK]
↓
To measuremene screen
↓
Press down [MANUAL PRINT] key as required.

Caution

Every time of pressing down [MANUAL PRINT] key starts printing on chart paper regardless of ON/OFF of [RECORD] key, consequently, the printed characters may be overlapped if chart paper is not feeded or the feeding speed is remarkablly slow.

3.2.14 Setting the comment

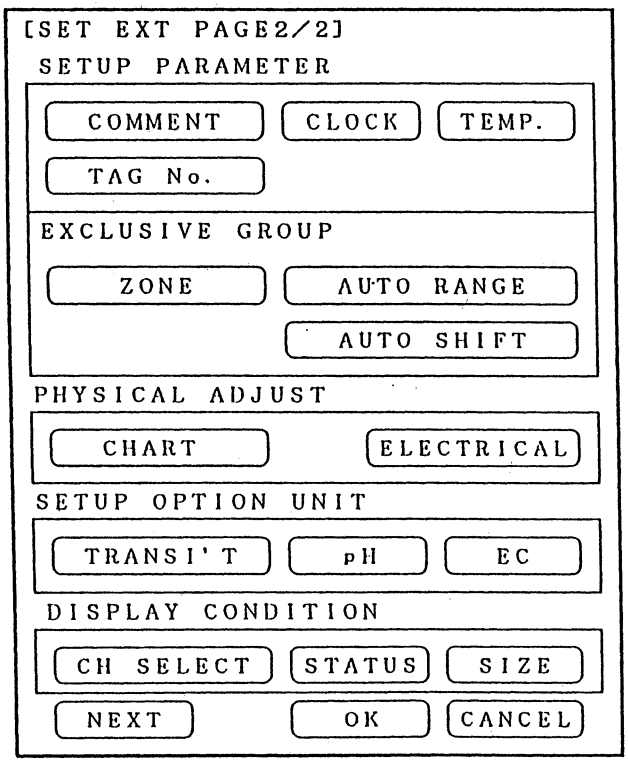
A comment message of 70 alphanumerical characters or numerical figures at maximum can be set. Five kinds of comment, COMMENT 1 to COMMENT 5, can be set. COMMENT 1 is printed by pressing down [COMMENT PRINT] key while COMMENT 2 to COMMENT 5 are printed onto the list by pressing down [LIST PRINT] key.

Example) To set ABCD for COMMETN 1 and 70 Ω for COMMENT 2,

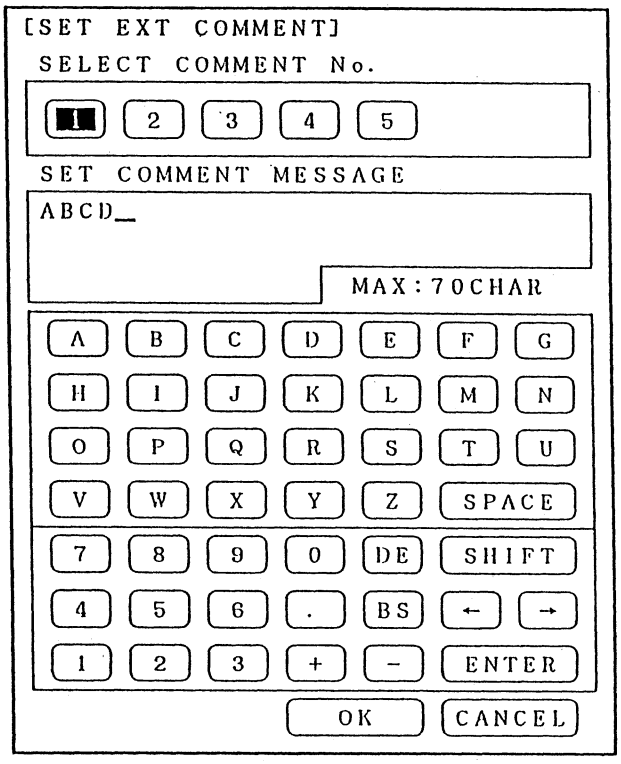
[EXTRA MENU]
↓
[NEXT] [SET EXT PAGE1/2]
↓
[COMMENT] Select this from [SETUP PARAMETER] (in Figure 3.2.33)
↓
[1] Select a comment number from [SET EXT COMMENT] (in Figure 3.2.34)
[A] → [B] → [C] → [D] Set the comment message.
↓
[2] Select a comment number.
↓
[7] → [0] → [SHIFT] → [Ω] Set the comment message.
↓
[OK]
↓
[NEXT] (Figure 3.2.33)
↓
[LIST PRINT] or [COMMENT PRINT]

(Figure 3.2.31)

- Only COMMENT 1 is printed by COMMENT PRINT.
- All the lists are printed including COMMENT 1 and COMMENT 2 by LIST PRINT.



(Figure 3.2.33)

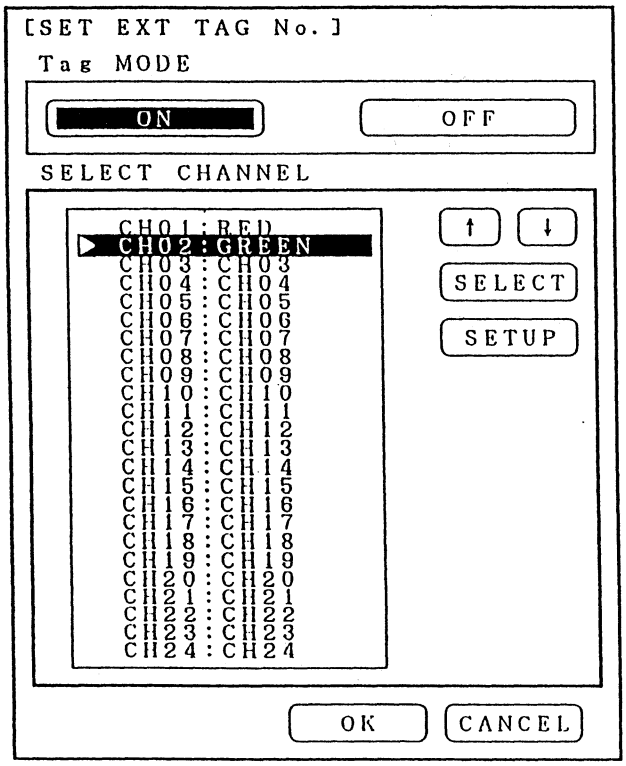


(Figure 3.2.34)

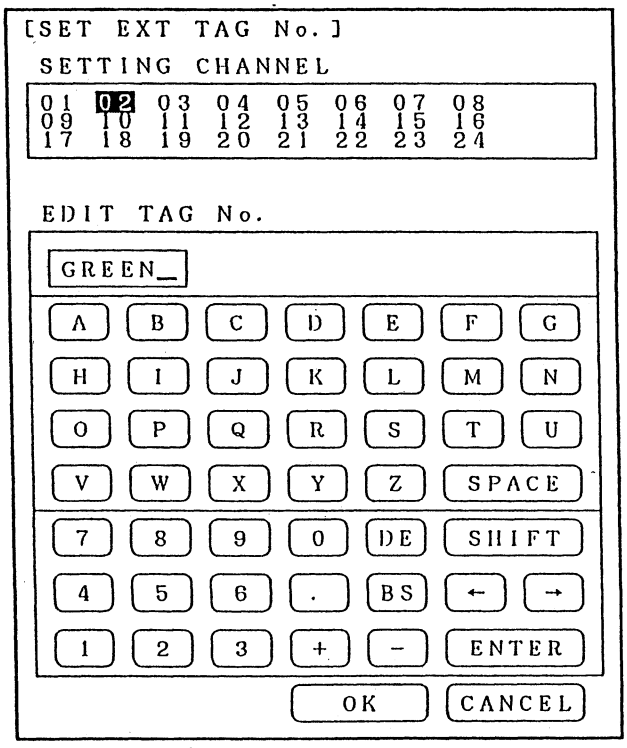
3.2.15 Setting the TAG No.

A TAG No. of six characters at maximum can be set in place of channel numbers (CH01 to CH24), for example, as the name of an object to be measured. TAG No. is displayed in digital indication measuring screen and also is printed out in the list.

Example) To set RED for channel 1 and GREEN for channel 2,



(Figure 3.2.35)



(Figure 3.2.36)

EXTRA MENU
↓
NEXT [SET EXT PAGE1/2]
↓
TAG No. Select this from [SETUP PARAMETER] on [SET EXT PAGE2/2]
↓
↑ or ↓ Select CH01 and make reversed
↓
SELECT → SELECT Press the key to put ▸ mark(Figure 3.2.35)
↓
SETUP To (figure 3.2.36)
↓
R → E → D → OK (Figure 3.2.36)
↓
SELECT → Press the key to release ▸ mark from CH 01
↓
↑ or ↓ Select CH02. (Figure 3.2.35)
↓
SELECT → SELECT Press the key to put ▸ mark(Figure 3.2.35)
↓
SETUP To (figure 3.2.36)
↓
G → R → E → E → N
↓
OK
↓
ON [Tag Mode] (Figure 3.2.35)
↓
OK
↓
OK
↓
To measurement screen

Release of TAG No.

Pressing down OFF key of [Tag MODE] release TAG No. setting from all channel. If only particular channel want to be released, it is requested to input initial channel No. to the channel in accordance with the procedure described above.

3.2.16 Setting the physical quantity

A conversion can be made of an unit such as V into Kg or of a scale such as 0 to 2V into 1 to 5 Kg.

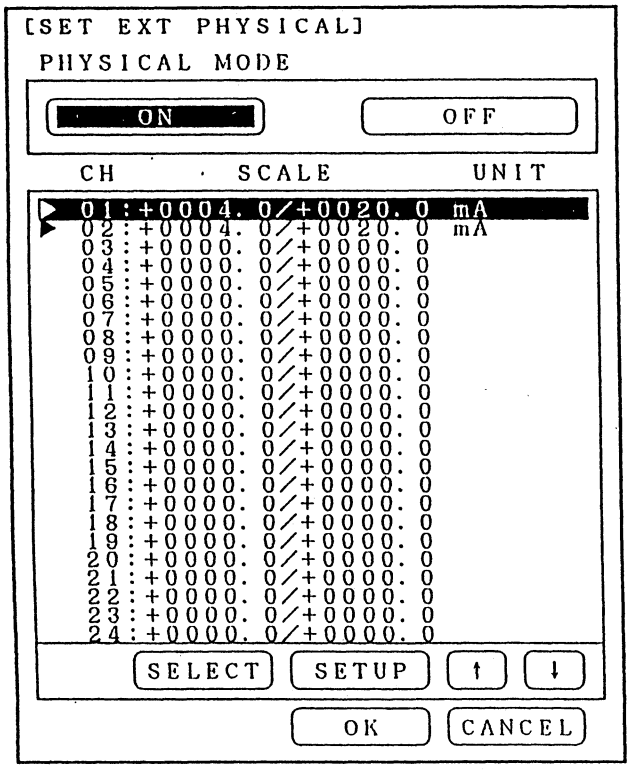
Caution

Don't switch the range after having set this quantity. Switching the range at this stage changes the span and the sensitivity in consequence.

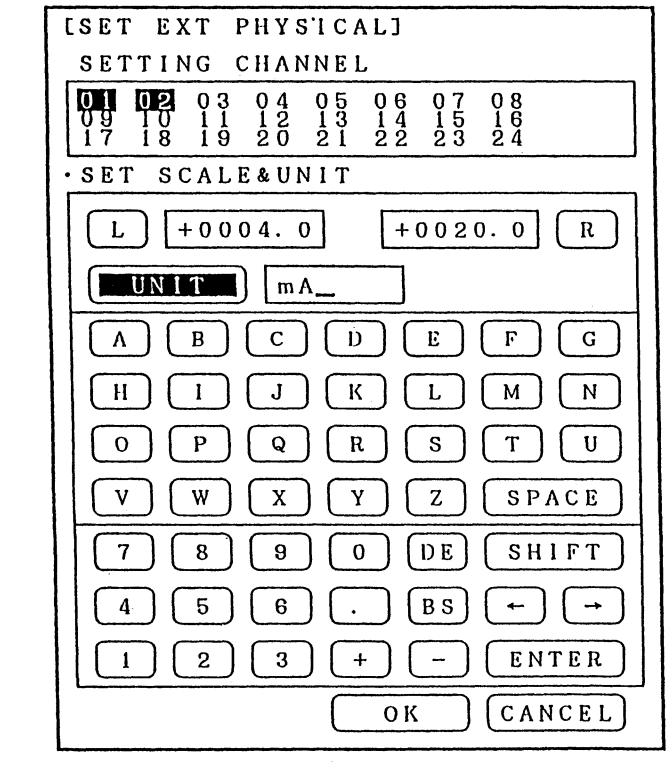
Example) To set the unit and scale of channel 1 as shown below,

1V 5V → 4mA 20mA

(on condition that 1V/5V range and span have been set beforehand)



(Figure 3.2.37)



(Figure 3.2.8)

EXTRA MENU
↓
PHYSICAL
↓
↑ ↓ Use these to reversely display CH01.
SELECT Put ▸ mark
↓ (Figure 3.2.37)
↑ ↓ Use these to reversely display CH02.
SELECT Put ▸ mark
↓
SETUP To (Figure 3.2.38)
↓
Press down L key in SET SCALE.
↓ (Figure 3.2.38)
+ → 4 → ENTER *
↓
Press down R key on SET SCALE.
↓
+ → 2 → 0 → ENTER *
↓
Press down UNIT key on SET SCALE.
↓
SHIFT → m → SHIFT → A
↓
OK
↓
ON (Figure 3.2.37)
↓ [PHYSICAL MODE]
OK
↓
OK
↓
To measurement screen

To release the set physical quantity,

Press down OFF key on [PHYSICAL MODE] to release the settings of all the channels. When a particular channel is to be released, select the channel and input zeros to L and R on SET SCALE marked by *.

3.2.17 Setting the filter (option)

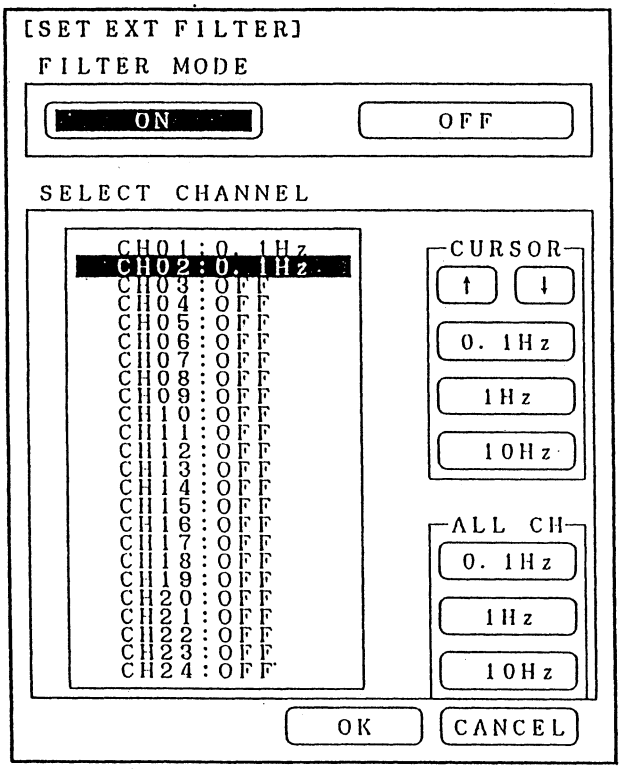
The frequency of the low-pass filter provided in 0.5mV DC voltage/thermocouple unit (FU-913A) can be set to 0.1 Hz, 1 Hz or 10Hz.

Limits

1. The frequency of the filter cannot be set when a thermocouple is used to measure the temperature.
2. The frequency of the filter can be set only for 0.5mV DC voltage/thermocouple unit (FU-913A).

Example) To set the frequency of the filter of channels 1 and 2 to 0.1 Hz,

[EXTRA MENU]
↓
[FILTER] [SET EXT MENU]
↓
[↑] [↓] Reversely display CH01.
[0.1Hz] Decide it.
↓ (Figure 3.2.39)
[↑] [↓] Reversely display CH02.
[0.1Hz] Decide it.
↓
[ON]
↓ [FILTER MODE]
[OK] (Figure 3.2.39)
↓
[OK]
↓
To measurement screen



(Figure 3.2.39)

3.2.18 Setting the alarm

The alarm levels can be set for upper limit, lower limit, lower/upper limit and intermediate value. When an alarm is given, this recorder can function as follows :

- ○ To print the alarming channel number, alarm time and alarm level
- ○ To change chart speed 1 into chart speed 2
- ○ To output the alarm contact (option)

Limits

1. The alarm setting level must be included in the recording span width.
2. The alarm is released for a channel whose range has been changed.
3. More than one channel can be set simultaneously only for the same channel and span.
4. The chart speed 1 can be set to 0 mm/min or /h by setting [ALARM MODE] to ON.

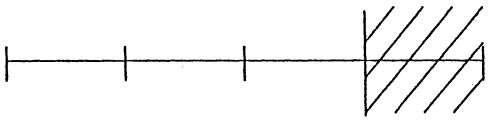
Cautions

1. The alarm level cannot be set in auto-range mode.
2. When [ALARM MODE] is set to OFF while the chart speed is set to 0 mm/min or /h, the chart speed returns to its initial value, 60 mm/min.
3. PGC must not be set with the chart speed set to 0 mm/min or /h.

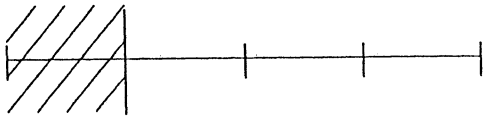
Alarm setting procedure

① Press down [EXTRA MENU] → [ALARM] to change the screen into alarm setting mode.
② Use [↑] or [↓] to reversely display the desired channel.
③ Press down [SELECT] key to put ▸ mark on it.
④ Press down [ON] key on [SET TRIGGER CHANNEL] to turn ON at the channel reversely displayed.
⑤ Press down [SETUP] key to change the screen into alarm setting up mode (Screen).
⑥ Set the start and stop levels.
(To set either of them, do not reversely display the [HI] · [IN] · [LO] keys of the unnecessay one.)
⑦ Press down [OK] key to return to the preceding screen.
⑧ Set to [ON] the [ALARM MODE] and press down [OK] key to return to measurement screen.
(Four start and stop levels can be set as follows :)

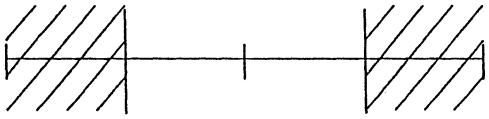
HI Higher limit



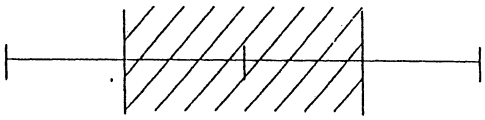
LO Lower limit



HI and LO Higher and lower limits



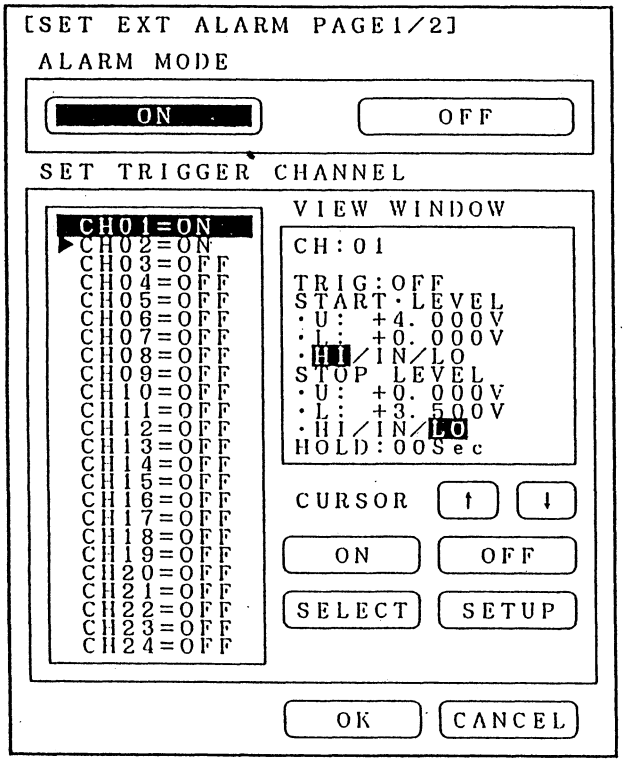
IN Intermediate level



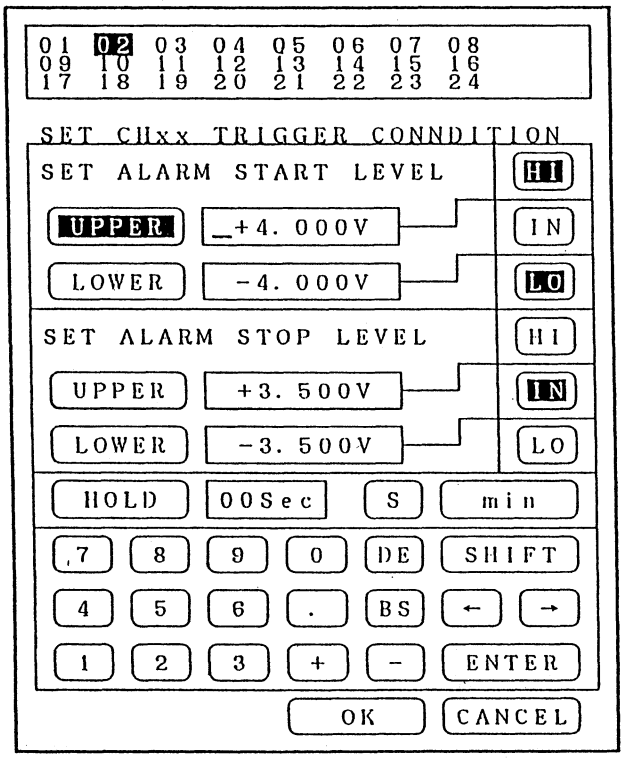
1. By setting the first chart speed to 0 mm/min or /h, data can be recorded only when an alarm is given. In such a case, the pen remains in its pen rest as long as no alarm is given.
2. The hold time is given by the time during which the alarming function is held when the alarm changes from ON to OFF. When it is set to 0 second or 0 minute, it becomes normal alarm function

Example) CH1 ..... Alarm is set to ON for an input of 4V or more and to OFF for that of 3.5V or less
CH2 ..... Alarm is set to ON for an input of 4V or more and to OFF for that of 3.5V or less and to ON for that of -4V or less and to OFF for that of -3.5V or more
Hold time : 0 second

Press down [EXTRA MENU] → [ALARM] to change the screen into alarm setting mode (Figure 3.2.40)



(Figure 3.2.40)



(Figure 3.2.41)

↓

[↑] or [↓] to reservely display CH01

Press down [SELECT] to put ▸ mark on it

↓

Press down [ON] key (SET TRIGGER CHANNEL)

↓

[SETUP] Screen change to (Figure 3.2.41)

↓

Start level

[UPPER] → [4] → [ENTER] → [HI]

↓

Stop level

[LOWER] → [3] → [.] → [5] → [ENTER] → [LO]

↓

[OK] Screen change to (Figure 3.2.40)

↓

Press down [SELECT] key to release ▸ mark from CH01

↓

[↑] or [↓] to reservely display CH02

Press down [SELECT] to put ▸ mark on it

↓

Press down [ON] key (SET TRIGGER CHANNEL)

↓

[SETUP]

↓ (Figure 3.2.41)

Start level

[UPPER] → [4] → [ENTER] → [HI]

[LOWER] → [—] → [4] → [ENTER] → [LO]

↓

Stop level

[UPPER] → [3] → [.] → [5] → [ENTER]

[LOWER] → [—] → [3] → [.] → [5] → [ENTER] → [IN]

↓

Hold time

[HOLD] → [0] → [S] → [OK]

↓

[OK]

↓

[Alarm mode] (Figure 3.2.40)

[ON]

↓

[OK]

↓

[OK]

To measurement screen

3.2.19 Setting the channel link

Channel link function means the data arithmetically operated between two channels can be recorded onto other channel and also the data on one channel can be also recorded onto another one. (By setting CH1=CH24, the data on CH24 can be recorded onto CH1.) This function is called as a equal sigin here-in-after.

Limits

* Description of each term
  1) Measurement items as classified below

①	VOLT	:	Voltage	(FU-911A, FU-913A, FU-941A, FU-961A)
②	TEMP	:	Temperature	(FU-911A, FU-913A, FU-917A)
③	ACLOG	:	AC logarithm	(FU-972A)
④	PH	:	pH	(FU-921A)
⑤	EC	:	Electric conductivity	(FU-922A)

  2) CHX Link operation results channel
  3) CHA Link operation input pre-item channel
  4) CHB Link operation input post-item channel

1. Addition/subtraction
   1) Functional limits
      ① Measurement item
         a. All the measurement items can be set.
         b. The same measurement items must be set for CHX, CHA and CHB.
      ② Input range
         a. The ranges for VOLT,TEMP., ACLOG, EC, for CHX, CHA and CHB can be set at your option.
         b. pH for CHX, CHA and CHB must be set in the same range.
      ③ Auto-shift and auto-range down cannot be set. (Refer to table 3.2.5)
      ④ The set value for physical quantity cannot be added or subtracted.(Refer to table 3.2.5)
   2) Operation results
      a. The range is set by CHX. (In case of FU-913A, arithmetical unit is converted per setting of CHX unit if arithmetical unit for TEMP : K, °C is set at arithmetical input side.
      b. The span is set by CHX.
      c. The operation value is given by the following expressions :
         Addition Operation value (CHX) = measured value CHA + measured value CHB
         Subtraction Operation value (CHX) = measured value CHA - measured value CHB

2. Multiplication/division
   1) Functional limits
      ① Measurement item
         a. Only VOLT can be set for CHA and CHB.
         b. Only VOLT (DC voltage) can be set for CHX.
      ② Input range
         a. Only the same range can be set.
      ③ Auto-shift and auto-range down cannot be set.
      ④ The set value for physical quantity cannot be multiplied or divided.
   2) Operation results (Refer to table 3.2.5)
      a. The range is set by CHX.
      b. The span is set by CHX.
      c. The operation value is given by the following expressions :
         Multiplication Operation value (CHX) = measured value CHA* measured value CHB
         Division Operation value (CHX) = measured value CHA / measured value CHB

3. Equality sign : "="
   1) Functional limits
      Auto-shift, auto-range down and physical quantity must be set on the side of operation input channel.
      When they are set on operation results channel, they do not function.
   2) Equal sign is as per following formula
      In case of eqal sign Result value (CHX) = CHA Input value

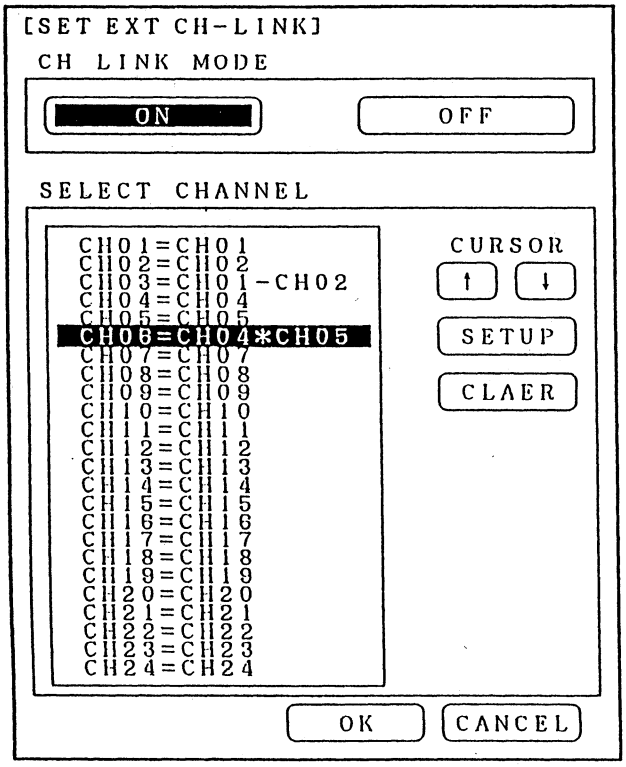
4. Others

1) In case that channel link and other function are co-used, there is some rule that other function must be set either input channel side or result channel side as shown below.
Please set at the side marked with circle.

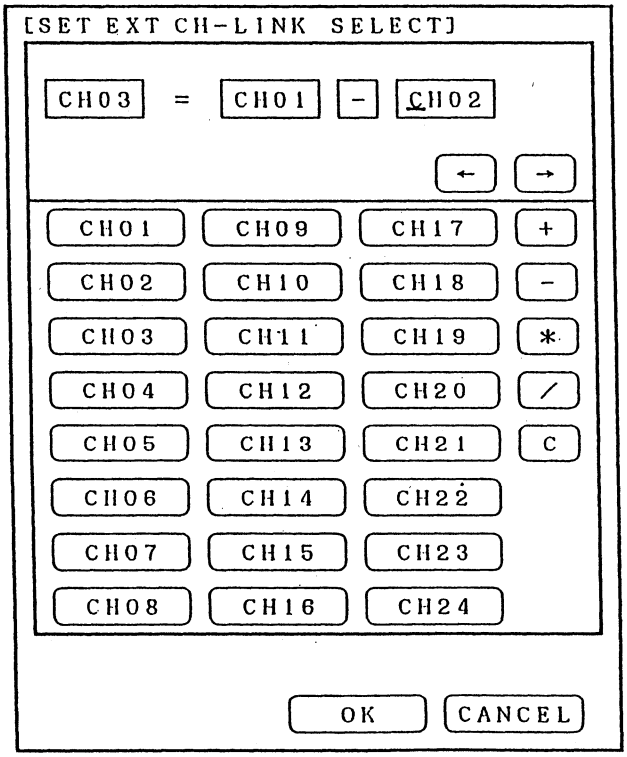
Function	Equal Sigin		Four basic operation of arithmetic			
			Addition/Subtraction Operation		Multriplication/ Division Opeation	
	Result side	Input side	Result Side	Input Side	Result Side	Input Side
Auto-Shift	—	○				
Auto Range Down	—	○				
Physical Amount	—	○	○	—	○	—
Input Range	—	○	○	—	○	—
Recording Span	—	○	○	—	○	—
Zero Position	—	○	○	—	○	—
Alarm	○	—	○	—	○	—
Zone	○	—	○	—	○	—
Electrical Zero	—	○	—	○	—	○
Filter	—	○	—	○	—	○
Compensation for Recording paper	○	—	○	—	○	—
Compensation for reference contact Temperature	—	○	—	○		

Table 3.2.5

Example) To record the temperature (A) onto CH1,
to record the temperature (B) onto CH2,
to record the temperature (A) - (B) onto CH3
to record the DC voltage (D) onto CH4
to record the DC voltage (E) onto CH5 and
to record the DC voltage (D) * DC voltage (E) onto CH6,



(Figure 3.2.42)



(Figure 3.2.43)

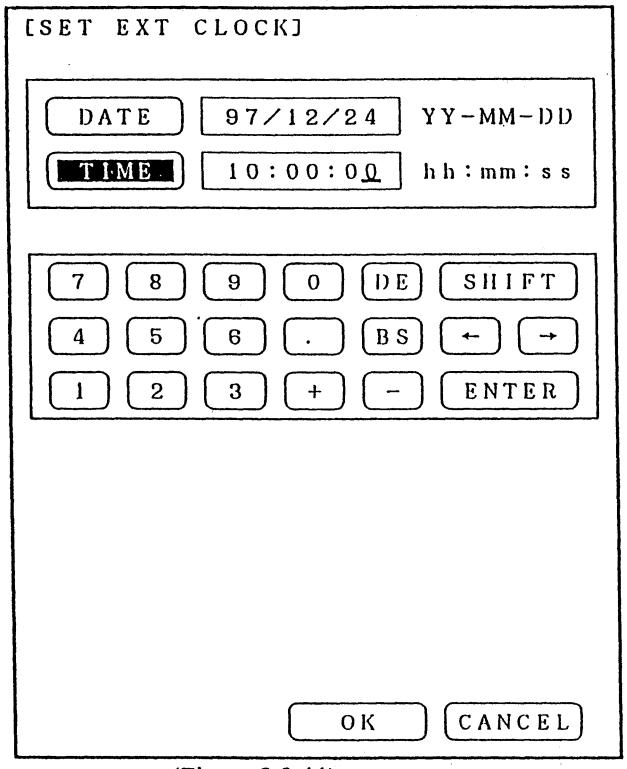
[EXTRA MENU]
↓
CH LINK [SET EXT PAGE1/2]
↓
Use [↑] or [↓] to revert CH01
↓ (Figure 3.2.42)
Press down [CLEAR] key to make CH01=CH01
↓
In the same way, revert CH02, CH04 and CH05 and press down [CLEAR] key to make as follows :
CH02 = CH02
CH04 = CH04
CH05 = CH05
↓
Use [↑] or [↓] to revert CH03
Press down [SETUP] key to change the screen into [SET EXT CH LINK SELECT]
↓ (Figure 3.2.43)
[CH01] → [→] → [—] → [→] → [CH02] → [OK]
↓
Use [↑] or [↓] to revert CH06.
Press down [SETUP] key to change the screen into [SET EXT CH LINK SELECT] (Figure 3.2.42)
↓ (Figure 3.2.43)
[CH04] → [→] → [*] → [→] → [CH05] → [OK]
↓
[ON] [CH LINK MODE]
↓ (Figure 3.2.42)
[OK]
↓
[OK]
↓
To measurement screen

Pressing down [CLEAR] key has the effect of making the input channel identical with the result channel.

3.2.20 Setting the date/hour

The current time is set by year, month, day, hours, minutes and seconds in 24 hours system.

Example) To set the current time to 24,December,1997 at 10:00:00



(Figure 3.2.44)

EXTRA MENU
↓
NEXT [SET EXT PAGE1/2]
↓
CLOCK [SET EXT PAGE2/2]
↓
DATE [SET EXT CLOCK]
↓ (Figure 3.2.44)

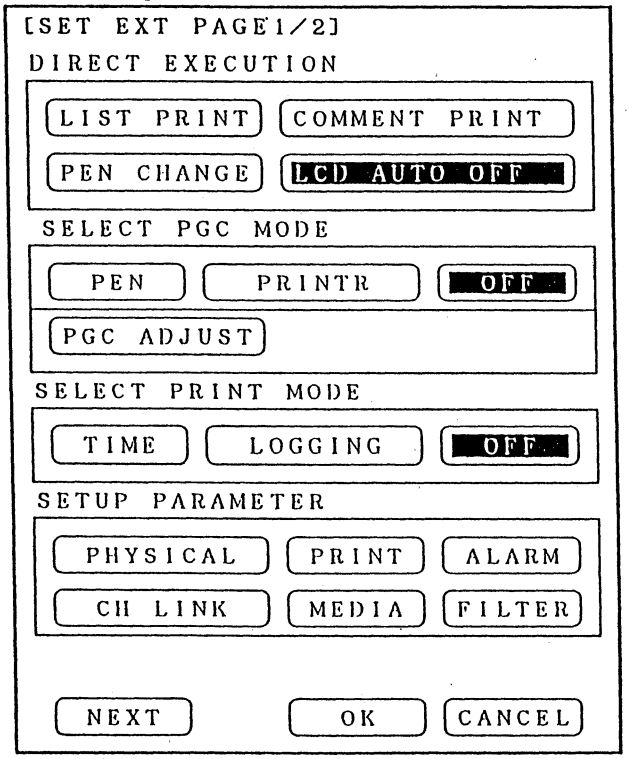
9 → 7 → 1 → 2 →
2 → 4 → TIME → 1 → 0 →
0 → 0 → 0 → 0
↓
OK The clock starts now.
↓
OK
↓
To measurement screen

Caution

1. The clock does not start by pressing down ENTER key after the current time has been entered. Press down OK key.
2. When you are in current time setting mode without need to do so, press down CANCEL key. The clock resumes its counting.

3.2.21 Setting the LCD AUTO OFF

When LCD AUTO OFF key is pressed down, the LCD backlight goes off from the screen. When pressing any other key in control panel, LCD backlight twill lit again. LCD remains always lit so long as LCD auto-off is not set.



(Figure 3.2.45)

LCD auto-off setting procedure

EXTRA MENU
↓
LCD AUTO OFF
[SET EXT PAGE1/2] (Figure 3.2.45)

Caution

1. Pressing down LCD Auto-OFF key has the effect of putting to OFF the LCD back light at the same time.
   When you touch the operation panel on above conditions, LCD back light is lit. Then, it goes off when no further keying is made for five minutes or more.
2. When all the LEDs go off on the panel, LCD remains lit.

3.2.22 Setting the electric zero

Due to an offset of the input unit or an unstable sensor, the digital display of this recorder does not always indicate the zero when nothing is input.

Setting the electric zero consists in compensating such an inconformity.

Caution

1. A calibration of ±3°C at maximum can be made for the temperature measuring range. Take note that a value exceeding this calibration limit is calibrated within this limit.
2. In case of temperature measurement range, please do electric zero setting after connecting the input corresponding to 0 ℃.
3. The calibrated value is automatically cleared when the range is changed or the power supply is turned ON/OFF.

Pressing down [EXTRA MENU] → [NEXT] → [ELECTRICAL] keys changes the display into electrical zero setting mode (Figure 3.2.46).

Select a channel to be compensated for and press down [EXECUTE CORRECT]. Once the compensation has been made, it is released by [RESET] key.

3.2.23 Setting the compensation for expanded/contracted recording paper

The recording paper is expanded or contracted due to humidity, so that the digitally displayed value does not correspond always to the indication given by the pen.

Setting the compensation for expanded/contracted recording paper consists in offsetting such an inconformity.

Press down [ZERO] key on the control panel and displace the pen to the rule line at the right end of the recording paper through zero position setting. Confirm that the digital value on the rightside of the display screen is zero.

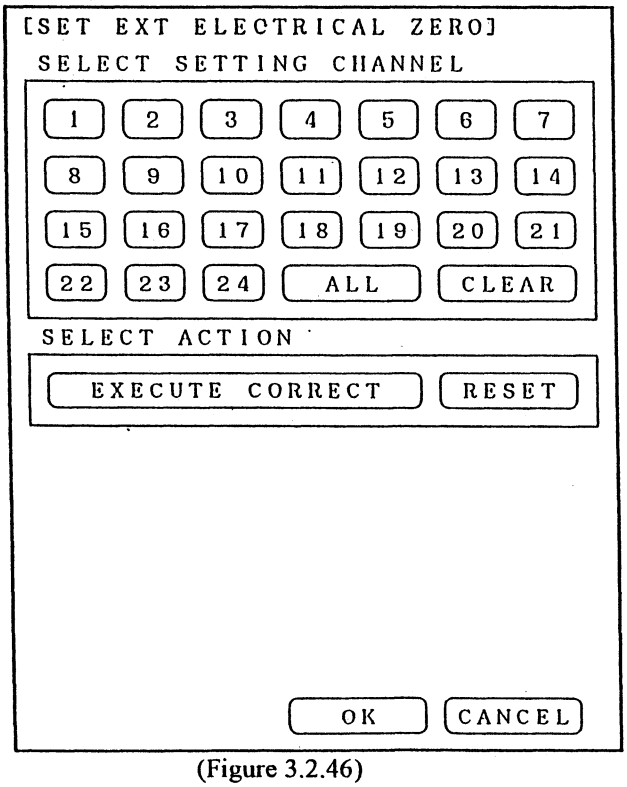
Pressing down [EXTRA MENU] → [NEXT] → [CHART] keys in this order changes the screen into expanded/contracted recording paper setting mode (as shown in Figure 3.2.47).

Manipulate [◄◄] [◄] [►] [►►] keys so that the pen is positioned at the right end of the ruled line on the recording paper.

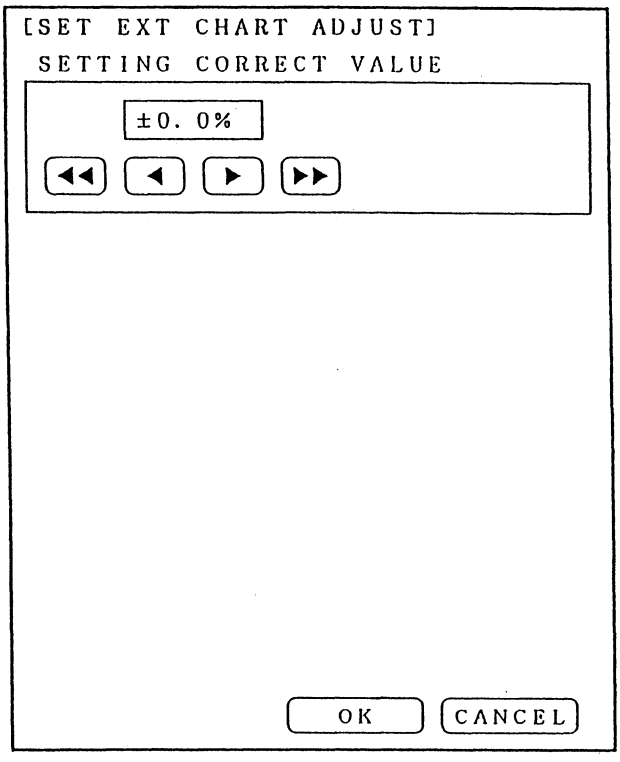
(Adjustable in a range of about ±1.2 %)

[►]: Rightward displacement(fine adjustment) [◄] : Leftward displacement (fine adjustment)

[►►]: Rightward displacemen (gross adjustment) [◄◄] : Leftward displacement (gross adjustment)



(Figure 3.2.46)



(Figure 3.2.47)

3.2.24 Setting to ON/OFF the compensation of reference contact temperature

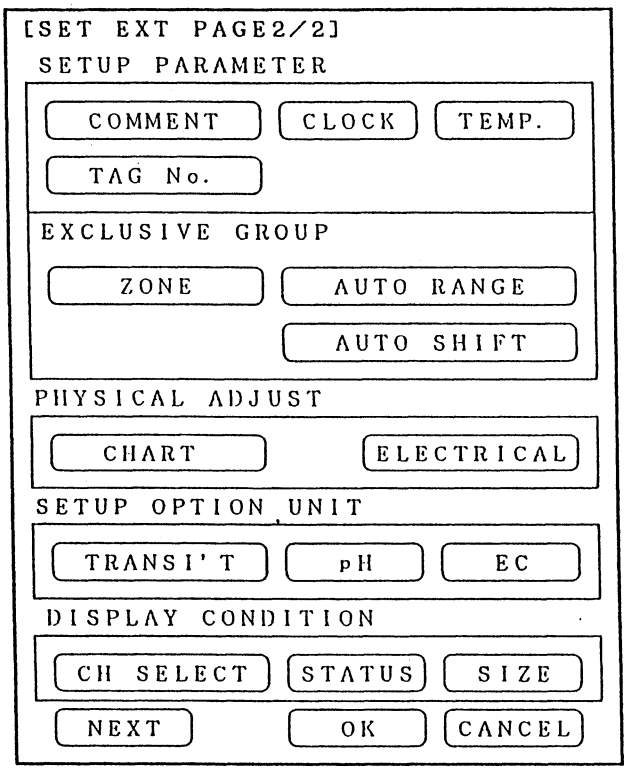
This recorder has a function to set to ON/OFF the compensation of reference contact temperature required to make measurements by means of a thermocouple.
In normal operation mode, this function must be set to ON.

Caution

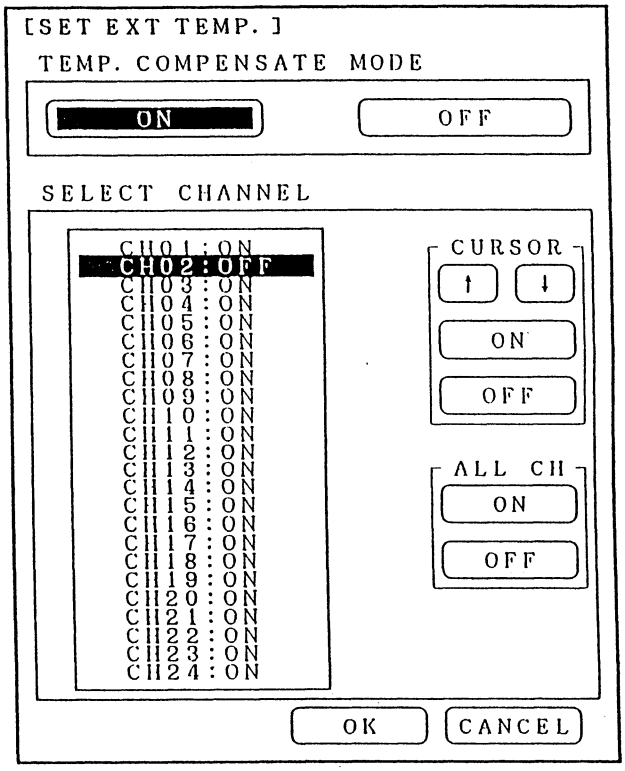
When this function is set to OFF, temperature cannot be measured by directly connecting a thermocouple with this recorder as the compensation for reference contact temperature is out of service on these conditions.

Setting procedure

Press down [EXTRA MENU] → [NEXT] keys to change the screen (as shown in Figure 3.2.48).
Press down [TEMP] key on [SETUP PARAMETER] to change the screen (as in Figure 3.2.49).
Use the cursor key [↑] or [↓] to reversely display the channel to be set and select [ON] or [OFF] key under the cursor key.
When all the channels are to be set all at once, you can use [ON] or [OFF] key on [ALL CH].
Decide this setting by [ON] or [OFF] key on [TEMP.COMPENSATE MODE].



(Figure 3.2.48)

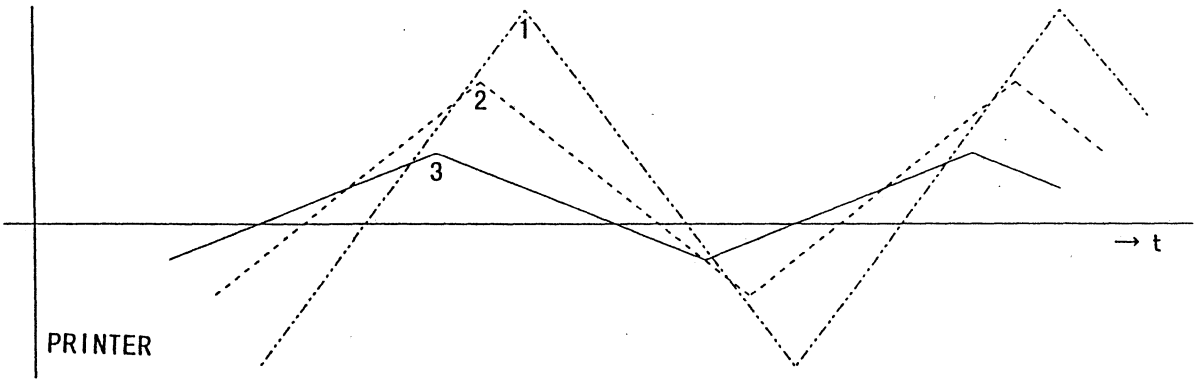


(Figure 3.2.49)

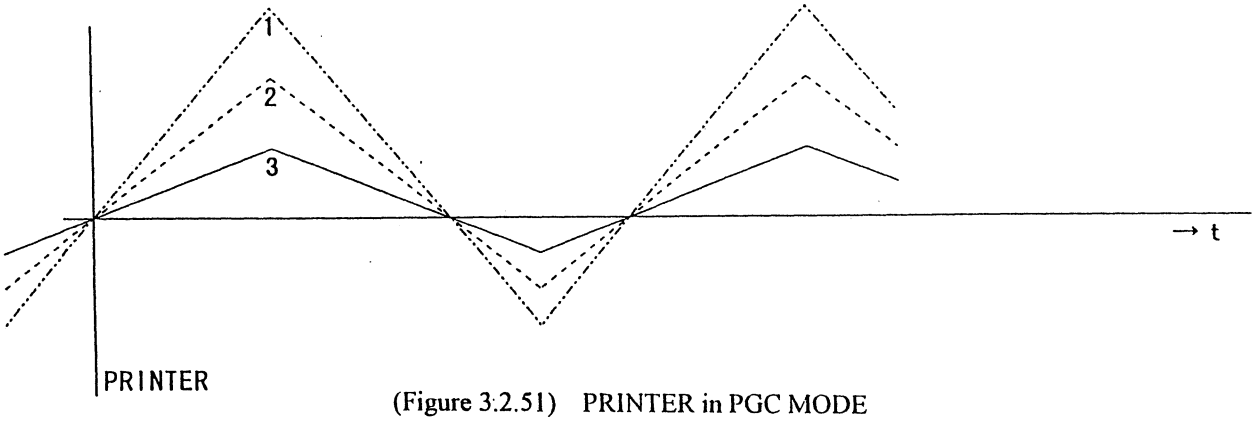
3.2.25 Setting the PGC (Pen Gap Compensator) mode

The INR-9000 series recorder has a physical gap between its pen tips and printers. Therefore, even when the same wave form is applied to each channel, the wave forms printed on recording paper look as if signals with certain time gaps were applied (as shown in Figure 3.2.50). In analyzing the phenomena from recorded results, the gaps between channels and printers must be always taken into consideration before examining the correlations between recorded wave forms.

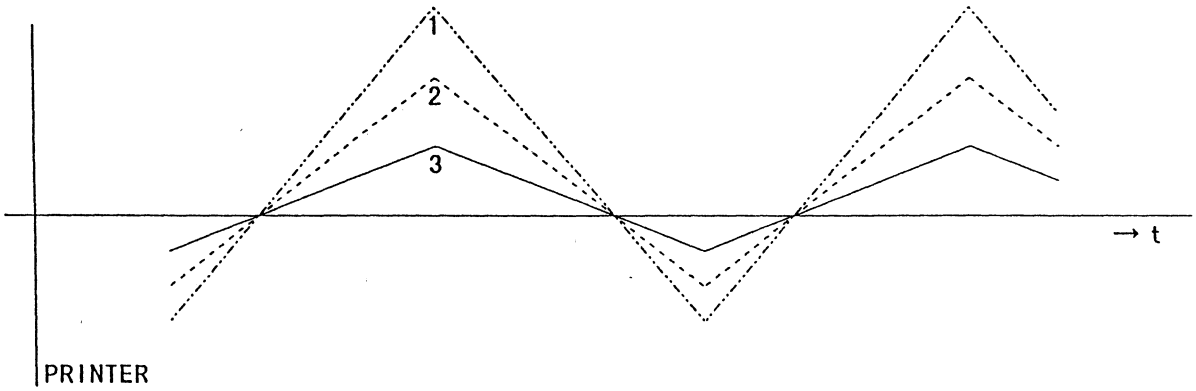
PGC (Pen Gap Compensator) dispenses you from such a complicated procedure by correcting wave forms (as shown in Figure 3.2.50) into those given in Figures 3.2.51 and 3.2.52, allowing you to easily understand the correlations between them. When you put [RECORD] key to OFF during PGC recording, the measured data on the channel then compensated in the terms of time axis are discharged at about 300 mm/min. Then, the pen is lifted up to stop the measurement. Immediately after this PGC mode has been put to OFF, the recorder resumes its normal measurement.



(Figure 3.2.50) PGC MODE set to OFF



(Figure 3.2.51) PRINTER in PGC MODE



(Figure 3.2.52) PEN in PGC MODE

Pressing down [EXTRA MENU] key on control panel changes screen to [SET EXT PAGE 1/2].
Choose PGC to be used among [PEN] or [PRINTER] or [OFF] key at [SELECT PGC MODE] (Figure 3.2.53)
At the moment of pressing [PEN] or [PRINTER] key, PGC recording starts.

Furthermore, when pressing down [RECORDER] key to set OFF during PGC recording, it immediately starts to output the measured data at the PCG channel compensated by time axis at the speed per 300mm/min then filt pens to terminate recording. Besides, pressing down [OFF] key at [SELECT PGC MODE] directly changes normal recording.

Example) To set PGC at pen as

[EXTRA MENU]
↓
[PEN] (Figure 3.3.53)
↓ SELECT PGC MODE
[OK]
↓
To measuring screen

Limits

Maximum chart speed is restricted while using PGC function as shown below depending on number of mounted input channepl.

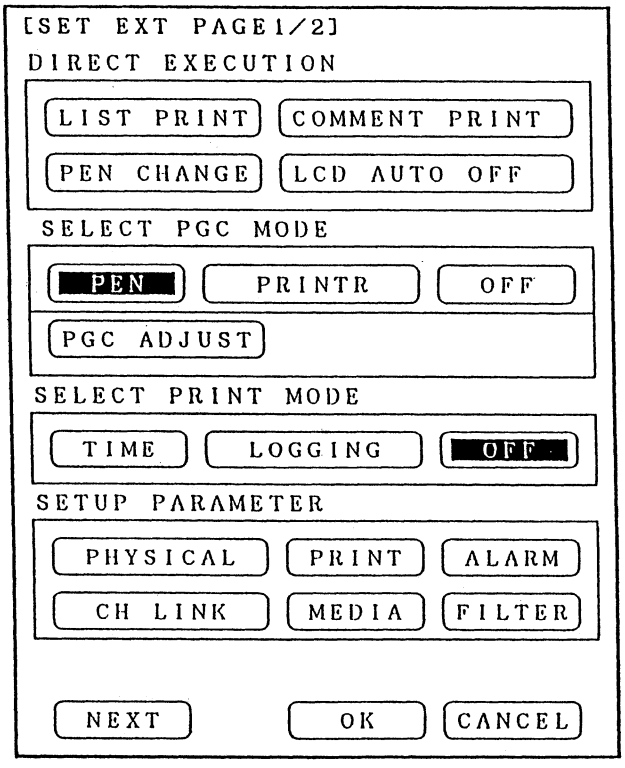
Media recording is unused

Mounted Channel No.	Maximum Chart Speed
13 ~ 24 ch	400mm/min
9 ~ 12 ch	600mm/min
5 ~ 8 ch	800mm/min
1 ~ 4 ch	1,200mm/min

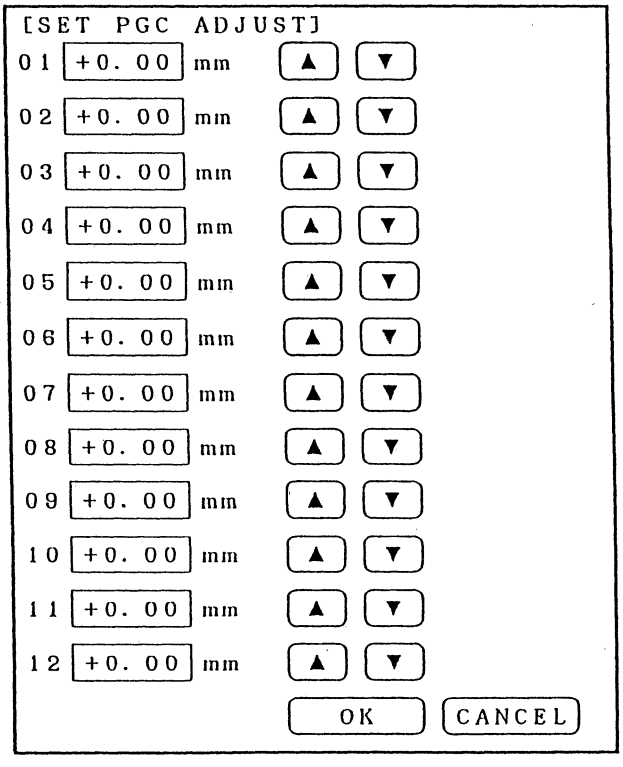
Media recording is used

Mounted Channel No.	Maximum Chart Speed
13 ~ 24 ch	100mm/min
7 ~ 12 ch	120mm/min
1 ~ 6 ch	200mm/min

In case that fine adjustment is requested, Press PGC ADJUST key at [SET EXT PAGE 1/2] screen and do fine adjustment by pressing [▲] [▼] keys at the required channel at [SET PEN ADJUSTMENT] screen (Figure 3.2.54) (It is adjustable up to approxi. ± 1mm)



(Figure 3.2.53)



(Figure 3.2.54)

3.2.26 Setting the MEDIA (option)

MEDIA can be used to save (write) and load (read, set and record) the measured data. The data can be saved onto FDD while they are recorded by pens. In addition to this, they can be saved onto FDD even when the recording by pen is set to OFF.
The data loaded from FDD are automatically compensated for pen gap (PGC) and synchronized in their phase before being recorded.

Important limits when using MEDIA are described below. Please draw your attention on these limits and obey when using MEDIA.

Common limits (FDD, Memory Card, MO)

1. Number of file
1) The number of files must not be exceeded at10 files of only setting information and at 100 files of setting information & measured data respectively.
2. Save
1) Sampling frequency
Synchronized with chart speed(CHART) : ※Refer to the table 3.2.6
Synchronized with logging(LOGGING) : 1 to 59min. 1 to 24 hours
Independent sampling (FREE) : Max. rate to 999mS, 1 to 59s, 1 to 59min., 1 to 24 hours ※Refer Max. rate to table 3.2.6
2) Save can not be done when auto-range down is set to ON
3) Alarm setting can not be shared in both recording side and Media memory side.
4) Channel link can not be set or changed during data saving.
5) Contents of Media can not be modified during data saving.
3. Load
1) Printing out is not made to the loaded record after saving the record in which many printing out such as constant time printing and alarm printing are existing.
2) When loading the saved data using channel link and auto-shift, auto-shift can not be replayed.
3) Following setting contents can not be changed during data loading
RANGE, SPAN, ZERO, PGC, MEDIA
4) The chart speed in case of the load becomes two speeds of the replay as [▸] and [▸▸]. When wanting to extract early, it is possible to do a chart speed range ※ by changing it but the amplitude of pen moving sometimes becomes small because the pen speed doesn't attain.(※ Less than chart speed of data feeding from MEDIA)
4. Others
1) FDD, Memory Card and MO can not be used simultaneously
2) Either one of Media among FDD, Memory Card and MO can be installed to recorder.

Limits (Individual)

1. FDD
1) The floppy disk formatted by 2HD 1.25MB can not be used. Please format again with this recorder and use it. (2HC 1.2MB or 2HD 1.44MB)
2. Memory Card
1) Auto-loading file for memory card can not be prepared at your option. At the every time when the setting condition of recorder is changed, it is automatically prepared.
2) There is no request of formatting type in the memory card that is different from the floppy disk. Consequently it is not necessary to set format select key in [SET EXT MEDIA FORMAT] screen.
3. MO
1) There is no request of formatting type in the MO that is different from the the floppy disk. Consequently it is not necessary to set format select key in [SET EXT MEDIA FORMAT] screen.

Important matters to call your attention for Media setting are given in followings.
Please read carefully before use and obey all cautions

Cautions

1. Common cautions

1) Never change the setting of input range and chart speed range while data is on saving. Otherwise normal measured data can not be saved.
2) In case that ADD function for file name setting (to add charaters etc. to the existing data file name for data file saving) is to be used, setting condition must be identical with the existed data file. The setting condition of the existed data file can be confirmed by list printing after loading the file once.
3) Only up to eight (8) characters/figures can be input for file names of setting information and measured data.
   Furthermore, large capital characters ,A to Z , figures 0 to 9 and hyphen are available for inputting. Small capital characters a to z can be entered, however, it will be converted to large captital when the file name is replayed.
4) When the sample rate of data saving is changed to set at LOGGING, the display screen between samples become freezed because the display indication speed synchronizes sampling speed. Please draw attention on this.
5) Pen recording action will be suspended temporary when moving to format screen, or to sample rate screen of save, changing the setting value at sample rate screen. Please draw attention on this.
6) If the interuption of power supply service is occurred while saving is doing, the data under saving can not be replayed. When there is possibility of the interruption to service, it recommends the use of the interruption-to-serviceless power supply equipment.

2. FDD

1) It takes approx. one minute to format a floppy disk. During formatting, recording by pen is suspended. In order to prevent lack of measuring date in the middle, it is recommended to do formatting in the beginning.
2) Never turn ON the power switch of recorder after inserting unformatted floppy disk nor the floppy disk which is formatted by other way than 2HD(1.44mB) or 2HC(1.2MB), to floppy disk driver.

3. Memory Card

1) It takes approx. one minute and 30 second to format a memory card. During formatting, recording by pen is suspended. In order to prevent lack of measuring data in the middle, it is recommended to do formatting in the beginning.

4. MO

1) In case of using MO, be sure to turn ON power switch of MO driver before the power switch of reocrder is turned to ON.
2) It takes approx. eleven minute to format a memory card. During formatting, recording by pen is suspended. In order to prevent lack of measuring data in the middle, it is recommended to do formatting in the beginning.
3) Following key pressings at MO setting shall be done while MO driver's BUSY lamp is put OFF :
   - Pressing down SAVE key at save of setting information [SET EXT MEDIA] screen
   - Pressing down LOAD key at load of setting information [SET EXT MEDIA] screen
   - Pressing down DELETE key at delete of setting information [SET EXT MEDIA] screen
   - Pressing down REC.FILE NAME key at save of measured data [MEAS. DATE MEDIA] screen
   - Pressing down LOAD key at load of measured data [SET EXT MEDIA] screen
   - Pressing down DELETE key at delete of measured data [SET EXT MEDIA] screen
4) In case of using auto loading file with MO, be sure to turn ON power switch of MO driver then load MO disk and turn ON the power switch of recorder after the BUSY lamp of MO driver is put OFF.

※ Sampling rate to MEDIA & Maximum chart speed printed out from MEDIA

	Mounted Channel No.	Media input sampling rate (Max.)		Max. chart speed printed Out from Media
		Synchronize chart	FREE	
Channel Link Unused	13ch or more	Less than150mm/min.	20mS	150mm/min.
	12ch or less	Less than300mm/min	10mS	300mm/min.
Channel Link Used Equal Sign Only	13ch or more	Less than 100mm/min	30mS	75mm/min
	7 to 12 ch	Less than 150mm/min	20mS	150mm/min
	1 to 6 ch	Less than 250mm/min	15mS	200mm/min
Channel Link Used Arithmetic	13ch or more	Less than 75mm/min	40mS	75mm/min
	7 to 12 ch	Less than 100mm/min	30mS	150mm/min
	1 to 6 ch	Less than 150mm/min	20mS	200mm/min
Zone, PCG Using time	13ch or more	Less than 100mm/min	30mS	100mm/min
	7 to 12 ch	Less than 120mm/min	25mS	120mm/min
	1 to 6 ch	Less than 200mm/min	15mS	200mm/min

Table 3.2.6

Calculation of recording time

The relations between recording time and sampling time are given by the following expression :

$$\text{Recording time} = \frac{\text{Remaining MEDIA Capac.(byte)}}{\text{Number of recorded channels x 2}} \times \frac{\text{Sampling time (msec)}}{1000} \text{(sec)}$$

The relations between sampling time and chart speed are given by the following expression :

$$\text{Sampling time} = \frac{3}{\text{Chart speed (mm/min)}} \times 1000 \text{ (msec)}$$

Example) Given the remaining MEDIA capacity as 1200 kbyte, the chart speed as 60 mm/H and the number of recorded channels as 3, the recording time is calculated as follows :

$$\text{Sampling time} = \frac{3}{60/60} \times 1000 = 3000 \text{ (msec)}$$

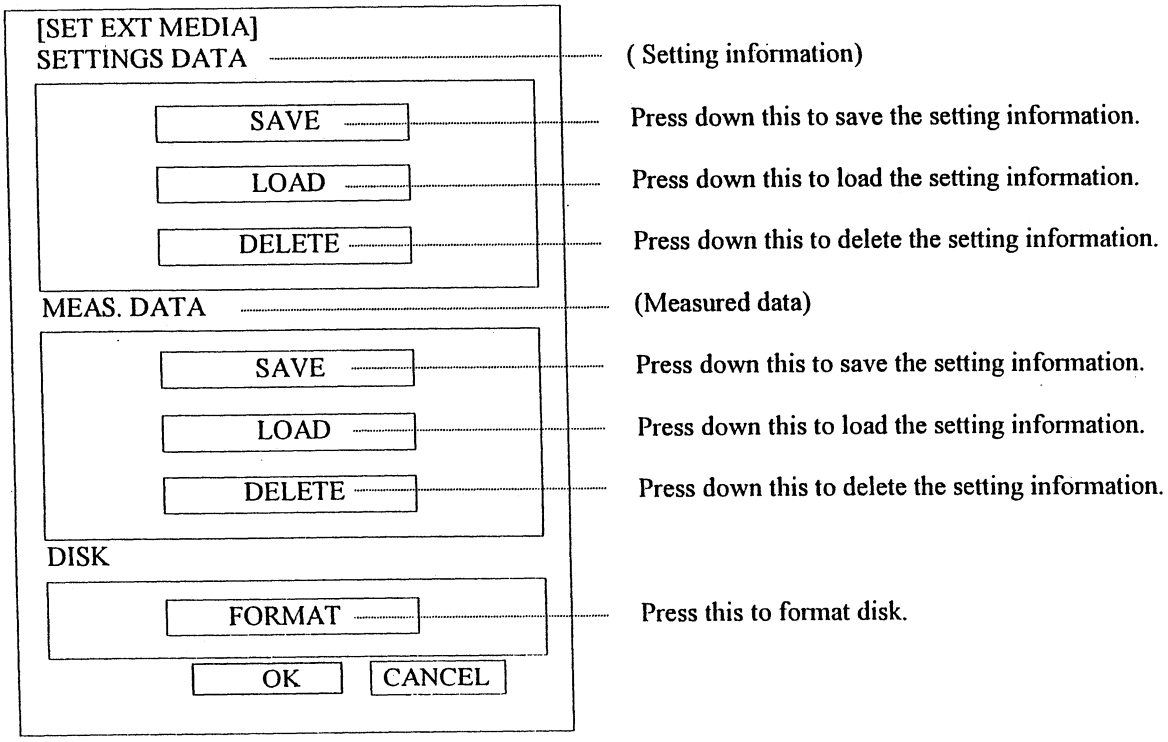
$$\text{Recording time} = \frac{1200 \times 1000}{3 \times 2} \times \frac{3000}{1000} = 600000 \text{ (sec)}$$

Recording time as 600000 seconds = 6 days 22 hours 40 minutes

The relations between chart speed and data saving time onto data FDD are given in Item 3.7.

FDD setting procedure

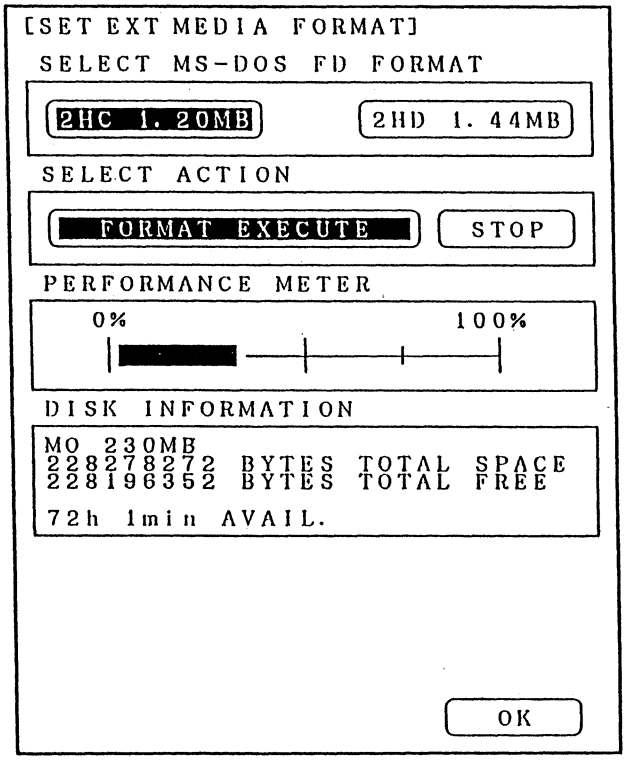
Pressing down [EXTRA MENU] → [MEDIA] changes the screen into [SET EXT MEDIA] (as shown in Figure 3.2.55).



(Figure 3.2.55)

(1) Formatting the MEDIA

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA] and then press down [FORMAT] key. Select a formatting type (2HD 1.25 MB, or 2HD 1.44 MB) on the [SET EXT FDD FORMAT] screen and press down [FORMAT EXECUTE] key. The disk is formatted while its formatting status is displayed. (Figure 3.2.56)



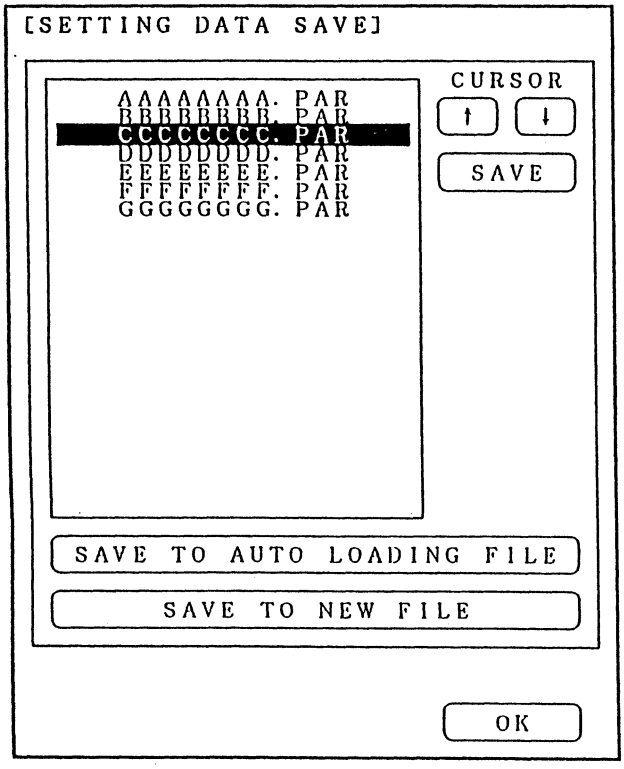
(Figure 3.2.56)

Caution

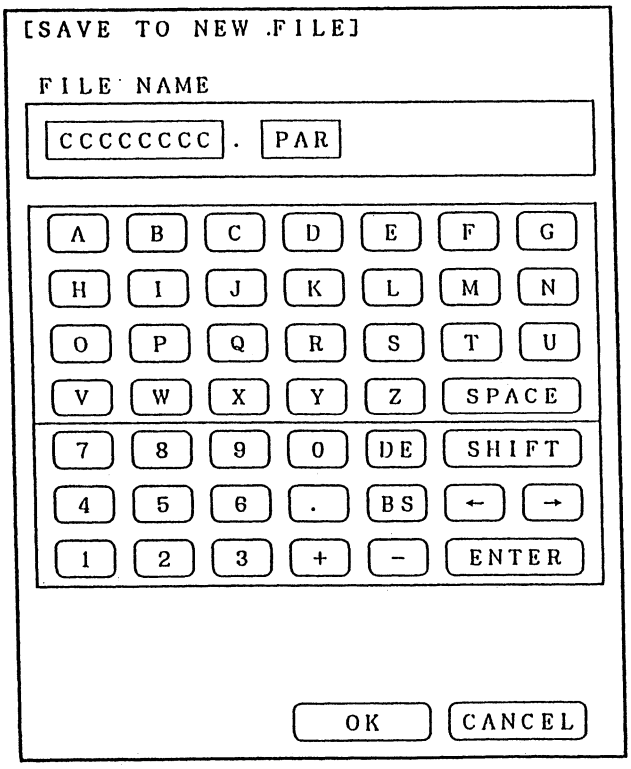
1. Recording by pen is suspended during formatting. In order to prevent lack of recording, it is recommended to do formatting before recording.
2. There is no request of formatting type for memory card and MO that is different from FDD.
   Format kind select key is indicated on [SET EXT MEDIA FORMAT] screen, but it is not necessary to select the format kinds.

(2) Saving the setting information

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on [SETTING MEDIA] to change the main display into [SETTING DATA SAVE]. (Figure 3.2.57)



(Figure 3.2.57)



(Figure 3.2.58)

① To change the already set information

Use [↑] or [↓] key to reversely display the applicable file and then press down [SAVE] key.

② To save data onto auto-loading file

Press down [SAVE TO AUTO LOADING FILE].

Auto-loading file	:	When FD is inserted at latest 3 seconds after the power is applied to this recorder, the recorder is set by the data saved in this file.

Caution

1. Auto-loading file of memory card can not be prepared optionally. At each time of changing setting of recorder, it automatically be prepared.
2. When pressing [SAVE] key of SETTING DATA for MO setting, be sure to press it while MO driver's BUSY lamp is put OFF.
3. When using auto-loading file function is used with MO, be sure to insert MO disk to driver then turn ON power switch of the recorder after MO driver's BUSY lamp is put OFF.

③ To save the setting information with a new name

Press down [SAVE TO NEW FILE] to change the main screen into [SAVE TO NEW FILE] (as shown in Figure 3.2.58). Use key switches to set a name as you like.

Caution

1. Take note that the file name must be composed of eight characters at maximum.
2. Available characters for file name are A to Z, 0 to 9 and - .
   Small capital a to z can be entered, however, these characters will be converted to large capital when loding file name again.

(3) Loading the setting information

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [LOAD] key on [SETTING MEDIA] to change the main display into [SETTING DATA LOAD]. Use the cursor keys to reversely display SETTING DATA and press down [OK] key.(Figure 3.2.59)

After loading of setting information is completed, it changes to [SET EXT MEDIA] screen.

Caution

In case of pressing LOAD key on SETTING DATA using MO, be sure to press the key under the condition that MO driver's BUSY lamp is put OFF

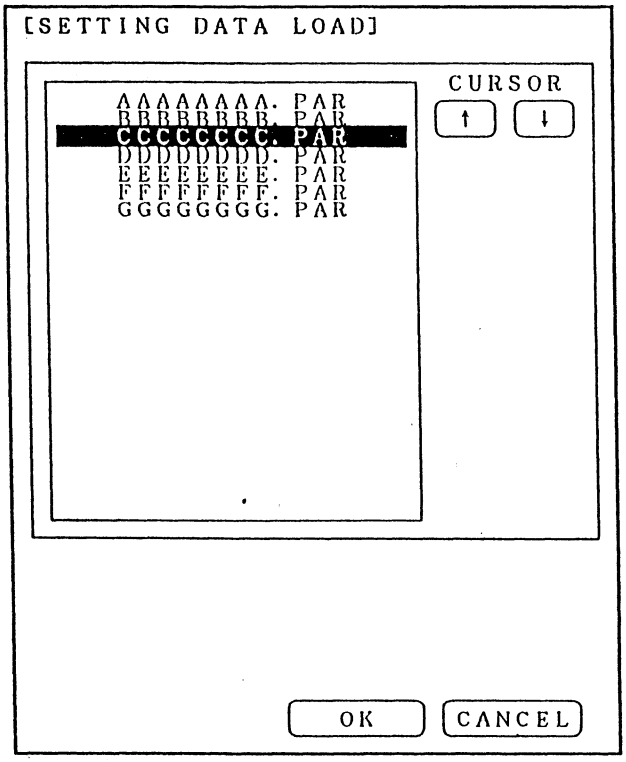
(4) Deleting the setting information

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [DELETE] key on SETTING MEDIA to change the main display into [SETTING DATA DELETE]. Use the cursor keys to reversely display SETTING DATA and press down [DELETE] key. (Figure 3.2.60)

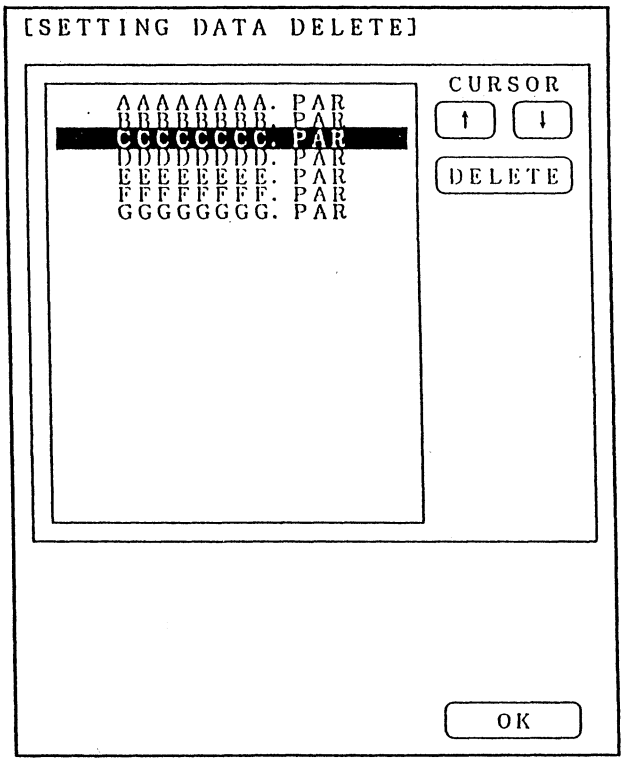
Pressing OK key changes to [SET EXT MEDIA] screen.

Caution

In case of pressing [DELETE] key on SETTING DATA using MO, be sure to press the key under the condition that MO driver's BUSY lamp is put OFF



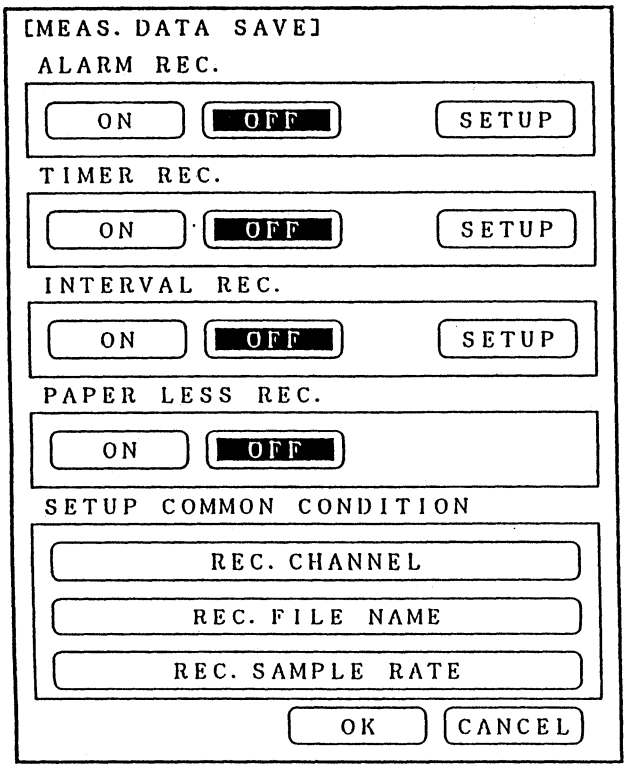
(Figure 3.2.59)



(Figure 3.2.60)

(5) Saving the measured data

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.61) Select the recording conditions on the screen and set them. The following recording conditions can be set :



(Figure 3.2.61)

①	ALARM REC.	:	Used to set to ON/OFF the data saving onto MEDIA by alarm setting conditions
②	TIMER REC.	:	Used to set to ON/OFF the data saving onto MEDIA by timer setting conditions
③	INTERVAL REC.	:	Used to save data recorded intermittently by time
④	PAPER LESS REC.	:	Used to start saving data onto MEDIA when the recording paper runs out
⑤	REC. CHANNEL	:	Used to set the channel to be saved onto MEDIA
⑥	REC. FILE NAME	:	Used to set the file name with which data are saved onto MEDIA
⑦	REC. SAMPLE RATE	:	Used to set the sampling rate at which data are saved onto MEDIA

Caution

In case of pressing [REC. FILE NAME] key on SETUP COMMON CONDITION using MO, be sure to press the key under the condition that MO driver's BUSY lamp is put OFF

Initial values for setting data

1. The set initial values are made to OFF for ① ② ③ and ④.
2. All channel are selected for ⑤ .
3. No initial value is set for ⑥ .
4. FREE (100mSec) is set for ⑦ .

Setting of simplified manual recording

Even after setting of ⑥ mentioned above, manual memory for all channel will be able to start at FREE (100mSec.)

Enter file name on ⑥ REC. FILE NAME, then changed to measurement screen by pressing down [OK] → [OK] then press down [MANUAL] key in lower position of the screen to start memory.

Setting of manual memory

When current recording data at the specific channel number with the specific sampling rate are memorized to MEDIA, follow the procedure given below :

1) Press down EXTRA NENU MEDIA to change the display screen into [SET EXT MEDIA]. Then press down SAVE key to change the main display screen into [MEAS. DATE SAVE] screen (Figure 3.2.61)

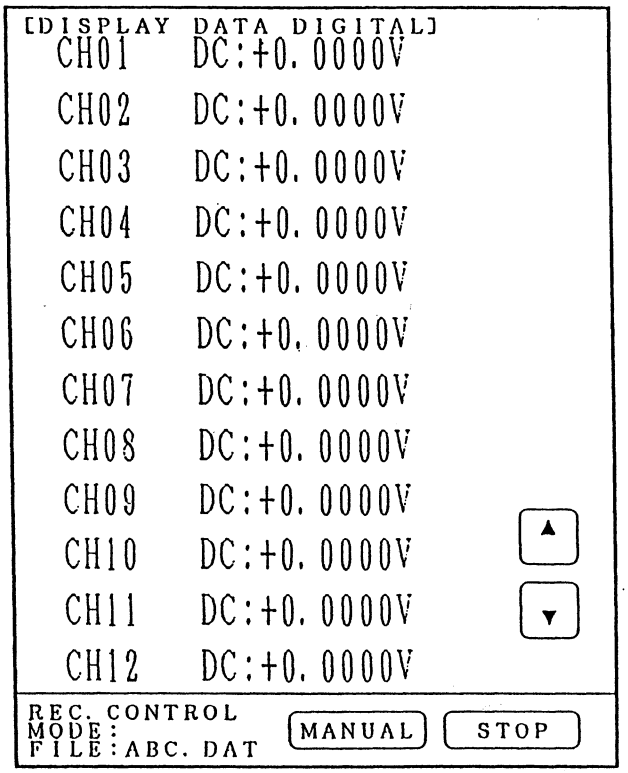
2) Secondly set recording channel, file name and sampling rate in accordance with the setting procedure ginve in the specific pages shwon below :

Recording channel	(5)- ⑤	Page 3. 2. 50
File name	(5)- ⑥	Page 3. 2. 51
Sampling rate	(5)- ⑦	Page 3. 2. 52

3) After completion of settings mentioned above, press down OK key to change into [MEAS. DATE SAVE] screen.
4) Press down OK key to change measurement screen. (Figure 3.2.62)
5) When the screen is changed into measurement screen, MANUAL / STOP key for media recording is indicated. Pressing down MANUAL key starts memory.
6) After this, pressing down MANUAL each times makes turn of suspending of memory recording / resuming memory recording.
7) When pressing down STOP key, the file become closed and the measuring data saving is finished.

Cautions

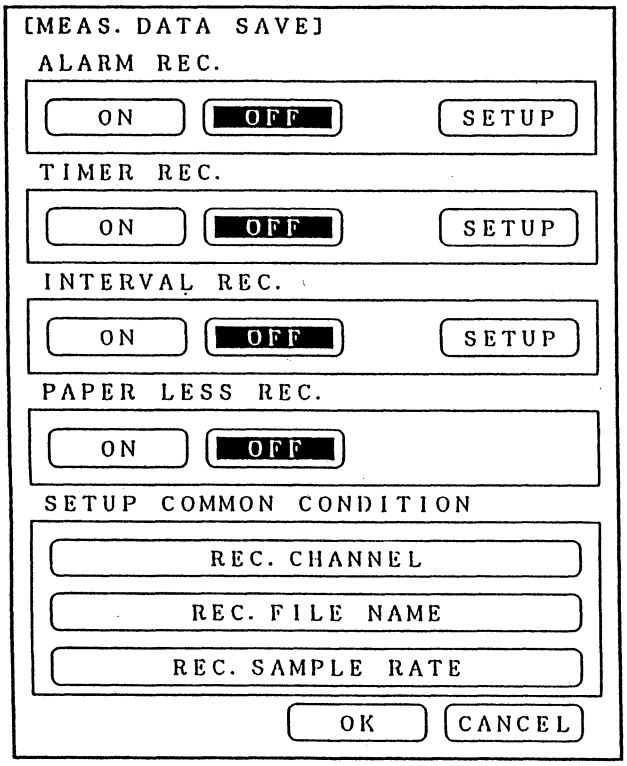
> If pressing down MANUAL key lower section of the screen under Signal waiting condition for alarm or timer etcm it is possible to start manual recording while neglecting alarm or timer memory. (Please note that STOP ONLY function of timer memory is still effective)



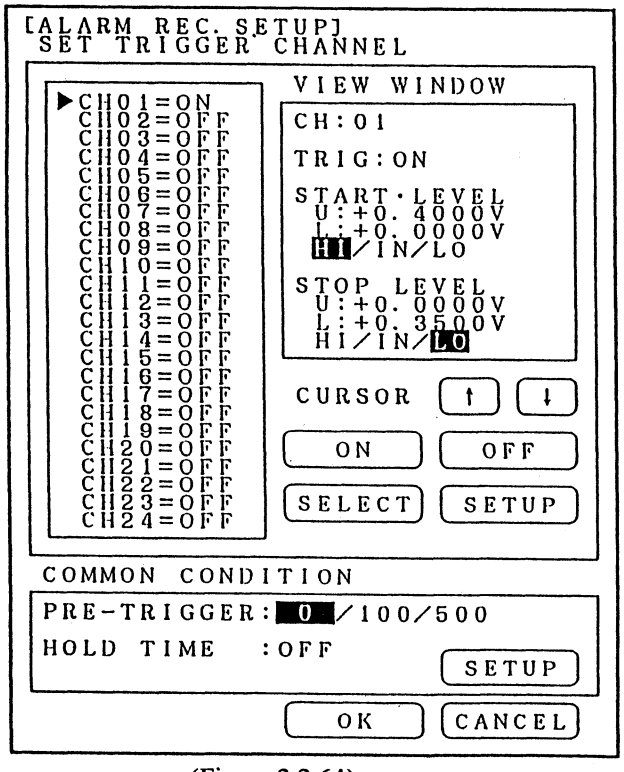
(Figure 3.2.62)

(5) - ① Setting the alarm recording condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.63). Then, press down [SETUP] on [ALARM REC.] to change the main screen into [ALARM REC. SETUP] (Figure 3.2.64).



(Figure 3.2.63)



(Figure 3.2.64)

Use [↑] or [↓] key to reservely display the desired channel.

Press down [SELECT] key to put mark at the right end of the reversely displayed channel.

Set to ON the desired channel by pressing down [ON] key.

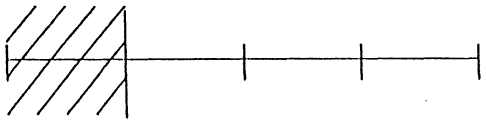
Press down [SETUP] key to change the main screen into [ALARM TRIGGER LEVEL] (as shown in Figure 3.2.65). Set the start and stop levels. (When either of them can be omitted, do not make the [HI] · [IN] · [LO] of the unnecessary level setting key reversely displayed.)

At the end of this setting, press down [OK] key to return to the preceding screen.

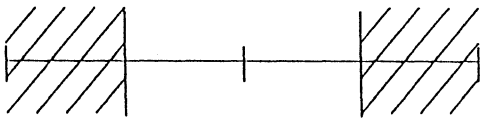
For the level setting, there are the following 4 types for each START and STOP.

[HI] Upper limit

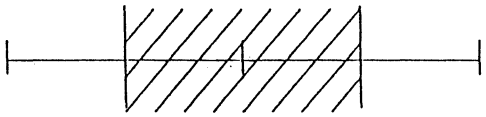
[LO] Lower limit



[HI] and [LO] Upper and lower limit



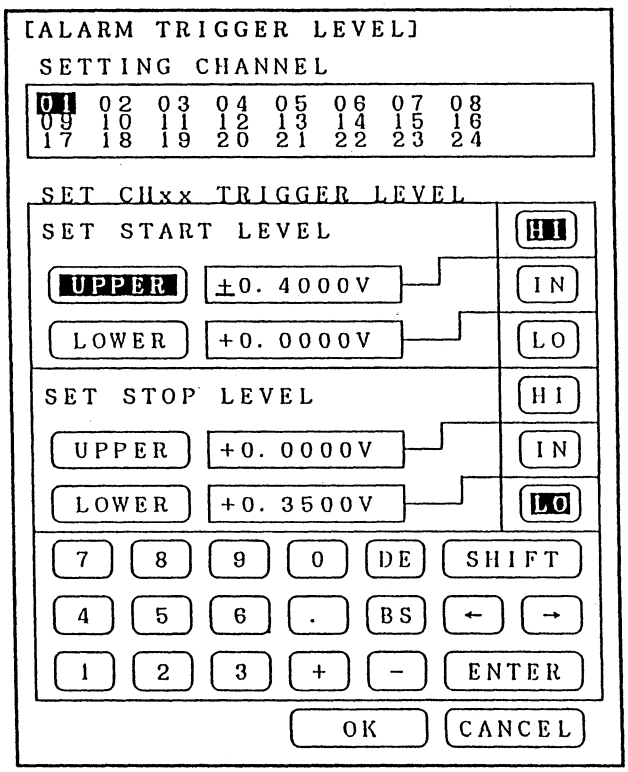
[IN] Intermediate level



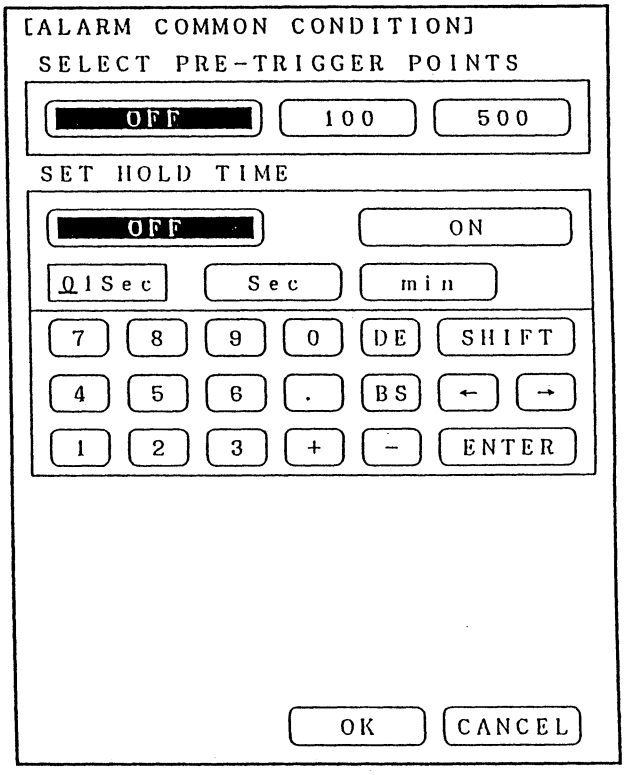
Then, proceed to set the pre-trigger and hold time.
Pressing down [SETUP] key on COMMON CONDITION (as in Figure 3.2.64) changes the screen into [ALARM COMMON CONDITION] (as shown in Figure 3.2.66).

Pre-trigger : This trigger is set when the data before alarm ON on alarm recording conditions are to be saved.
The number of data items can be set to 0/100/500.
When this pre-trigger is set to OFF, zero data item is set.

Hold time : This is to set the time for data recording after the alarm is OFF by alarm memory setting.
The hold time can be set in a range of 1 to 59 sec and 1 to 59 min.
When the hold time is set to OFF, zero minute is set.



(Figure 3.2.65)



(Figure 3.2.66)

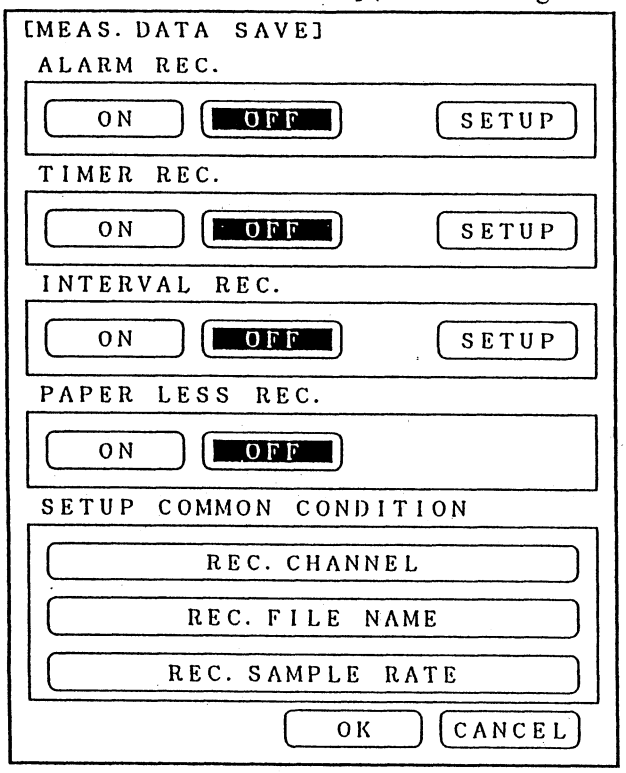
At the end of this setting, press down [OK] → [OK] keys to return to [MEAS. DATA SAVE] (as shown in Figure 3.2.63) and set [ALARM REC.] to [ON] .
Press down [OK] to return to the measurement screen and it become to alarm signal waiting condition.

Caution

If pressing down [MANUAL] key at lower section of measurement screen under alarm signal waiting condition, manual memory will starts neglecting alarm memory. Please draw your attention on this matter.

(5) - ② Setting the timer recording condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.67). Then, press down [SETUP] on [TIMER REC.] to change the main screen into [TIMER CONDITION] (as shown in Figure 3.2.68).



(Figure 3.2.67)

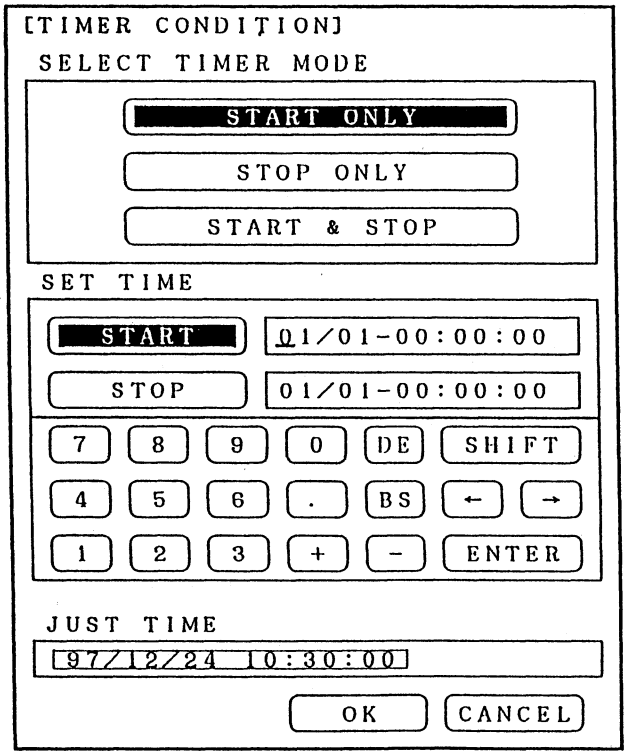
Pressing down [START ONLY] key allows MEDIA to start saving data at a time set to the timer (MEDIA does not stop operating even when a stop time is set.)

Pressing down [STOP ONLY] key allows MEDIA to stop saving data at a time set to the timer (MEDIA does not start operating even when a start time is set. Press down [MANUAL] key for start)

Pressing down [START & STOP] key allows MEDIA to start/stop saving data at a time set to the timer.

After selecting timer mode, input start time and stop time with key switch in the screen.
At the end of this setting, press down [OK] key to return the main screen into [MEAS. DATA SAVE] (as shown in Figure 3.2.67) and then set to [ON] [TIMER REC.]

Press down [OK] to return to the measurement screen and become timer signal waiting condition.



(Figure 3.2.68)

Caution

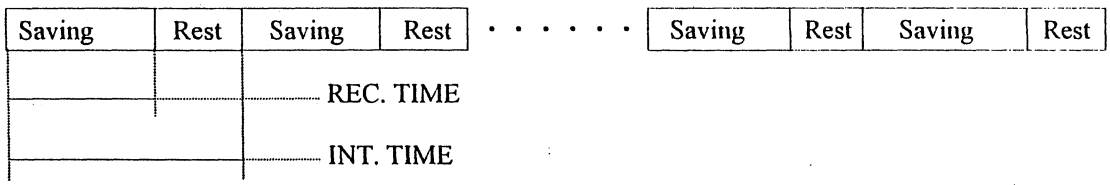
If pressing down [MANUAL] key at lower section of measurement screen under timer waiting condition, manual memory will start neglecting timer memory. Please draw your attention on this matter.
(However, STOP ONLY function is still effective.)

(5) - ③ Setting the interval recording condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.69). Then, press down [SETUP] on [INTERVAL REC.] to change the main screen into [INTERVAL CONDITION] (as shown in Figure 3.2.70).

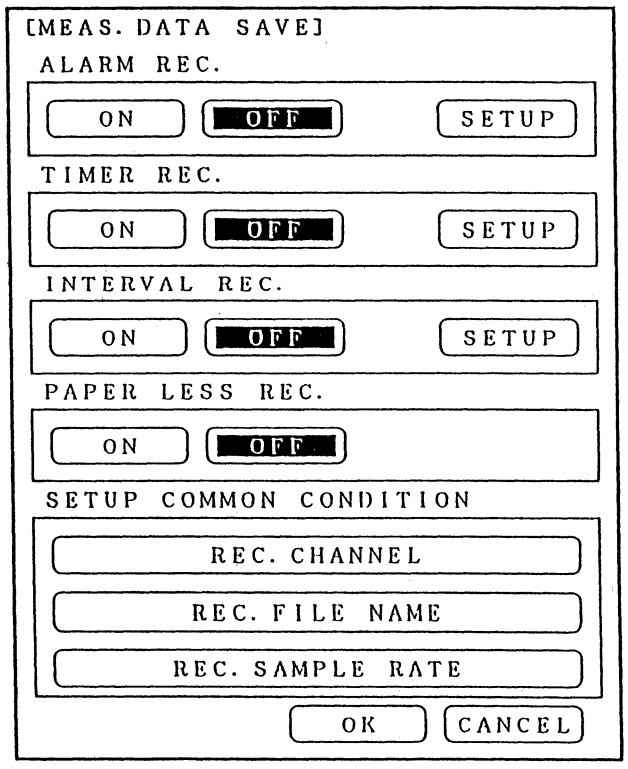
REC. TIME : (Saving time) Time at which data are saved onto MEDIA

INT. TIME : (Interval frequency) Intervals at which data are saved onto MEDIA

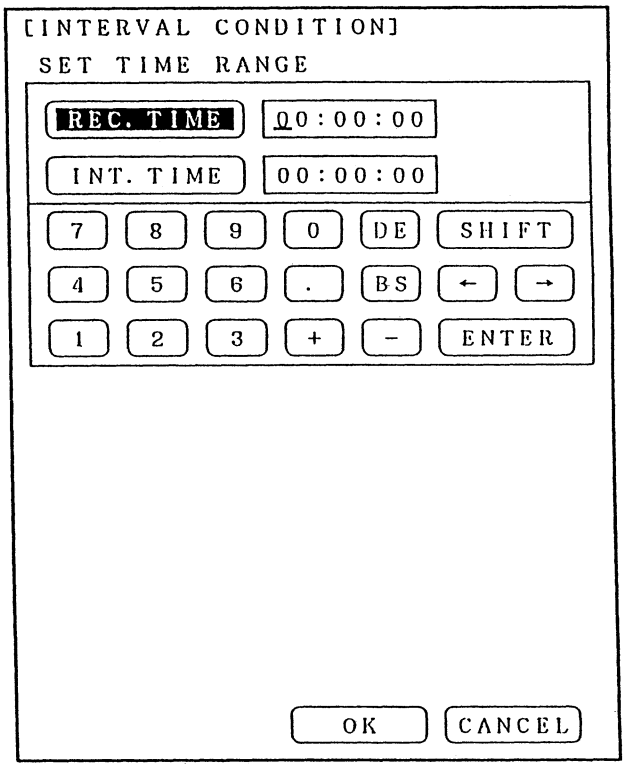


Limit

Measurement frequency > Saving time



(Figure 3.2.69)



(Figure 3.2.70)

Use the key switch on the screen to input the recording time and interval time.
At the end of this setting, press down [OK] key to return to [MEAS. DATA SAVE] screen (as shown in Figure 3.2.69) and set to [ON] the [INTERVAL REC.]
When Presssing down [OK] key on [MEAS. DATA SAVE] screen, the data saving starts and it return to the measurement screen.

Caution

If pressing down MANUAL key at lower section of screen while interval function is on operation, manual data saving will start. Please draw your attention.

(5) - ④ Setting the paper less recording condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.69). Then, set to [ON] the [PAPER LESS REC.].
Presss down [OK] to return to the measurement screen.

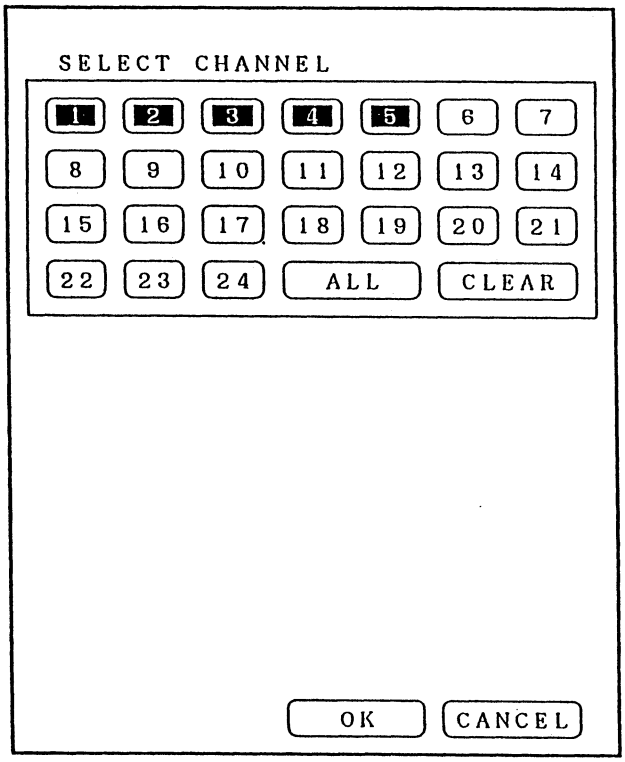
At the time when it detects the chart paper is exhausted, it starts media data saving.
After loading the chart paper then pressing down 『RECORD key』on the front panel, it stops media data saving.
When pressing down [STOP] key, file is closed and measured data saving is completed.

Caution

1. If pressing down [MANUAL] key at lower section of measrement screen under paper less recording waiting condition, it will start manual data saving neglecting paper less recording. Pleasedraw your attention.
2. If pressing down [STOP] key during paper less recording, it will close file and complete measured data saving. Please draw your attention.

(5) - ⑤ Setting the recording channel condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. MEDIA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.69). Then, press down [REC. CHANNEL] and select the channel to be saved on a channel selecting screen (as shown in Figure 3.2.71).
Pressing down [OK] key to return to [MEAS. DATA SAVE] screen.



(Figure 3.2.71)

(5) - ⑥ Setting the recording file name condition

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. DATA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.69). Then, press down [REC. FILE NAME] and set the file name on a file name setting screen (as shown in Figure 3.2.72).

[OVER] : Data are overwritten onto an existing file.
Press down [↑] or [↓] key to resersely display the desired file name and press down [OVER] key.

[ADD] : Data are added to an existing file.
Press down [↑] or [↓] key to resersely display the desired file name and press down [ADD] key.

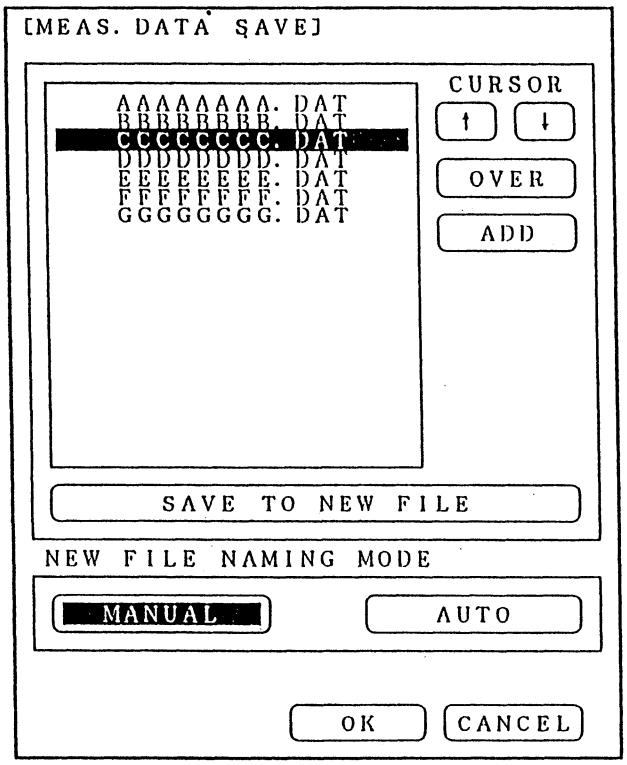
[SAVE TO NEW FILE] : Data are saved by a new file name.
This new file name can be set by manual/auto mode. Either of these modes must be selected before pressing down this key.
Selecting the mode changes the main screen into file name setting mode. Then, input a new file name.

Manual mode : This mode is used to set a file name each time data are saved.

Auto mode : Once a file name is set, serial number 00 is added after the file name. Each time same file name is entered on Auto mode, new file renewed at serial number after filen name by one up will be prepared.

Caution

1. In case that pressing down REC. FILE NAME key of SETUP COMMON CONDITION using MO driver, be sure to press down the key on the condition that BUSY lamp of MO driver is put off.
2. The characters/figures to be used for entering file name are A to Z, 0 to 9 and " - ". Small capitals from a to z also can be used for entering file name, however, the caracters will be changed to big capitals when reading the file name again.



(Figure 3.2.72)

(5) - ⑦ Setting the sampling rate

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [SAVE] key on MEAS. DATA to change the main display into [MEAS. DATA SAVE]. (Figure 3.2.69). Then, press down [REC. SAMPLE RATE] and set the sampling rate on a sampling rate setting screen (as shown in Figure 3.2.73).

Data are sampled in one of three modes : CHART/LOGGING/FREE.

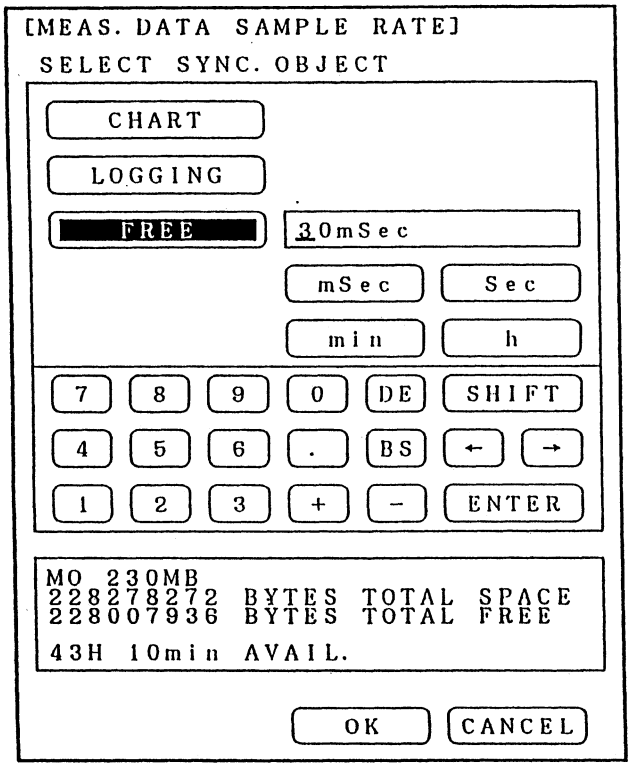
[CHART] : Data are sampled in accordance with the chart speed.

[LOGGING] : Data are sampled in accordance with the logging time.

[FREE] : The sampling rate can be freely set in the following ranges irrespective of the chart speed and logging time :
10 to 999mS, 1 to 59S, 1 to 59min and 1 to 24h
※ Maximum sampling rate is decided as per condition. So please refer to table 3.2.6 FREE (Max.)

FD Rest available capacity

After setting sampling rate, the rest available capaicy of floppy disk is displayed in time at lower information section of sampling rate setting screen.



(Figure 3.2.73)

Caution

When setting [LOGGING] at sampling rate, the speed of display indication (DIGITAL,WAVE) under saving is cynchronized with sampling rate, consequently, the display will be stationary condition Please note it.

(6) Loading the measured data

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [LOAD] key on MEAS. DATA to change the main display into [MEAS. DATA LOAD]. (Figure 3.2.74)

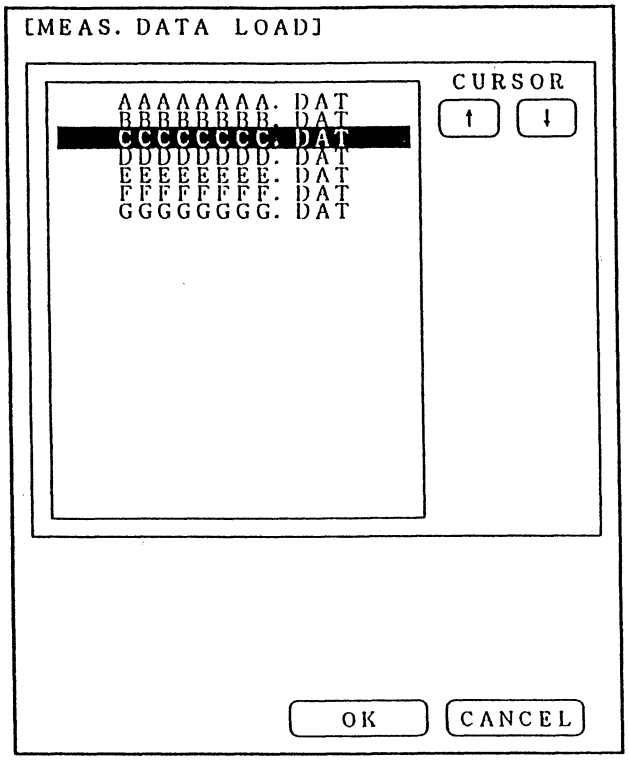
Use the cursor keys [↑] [↓] to reversely display file and press down [OK] key. The file loading condition is printed out and the screen shwon in figure 3.2.75 is displayed.

Reproduce the measured data by manipulating applicable keys.

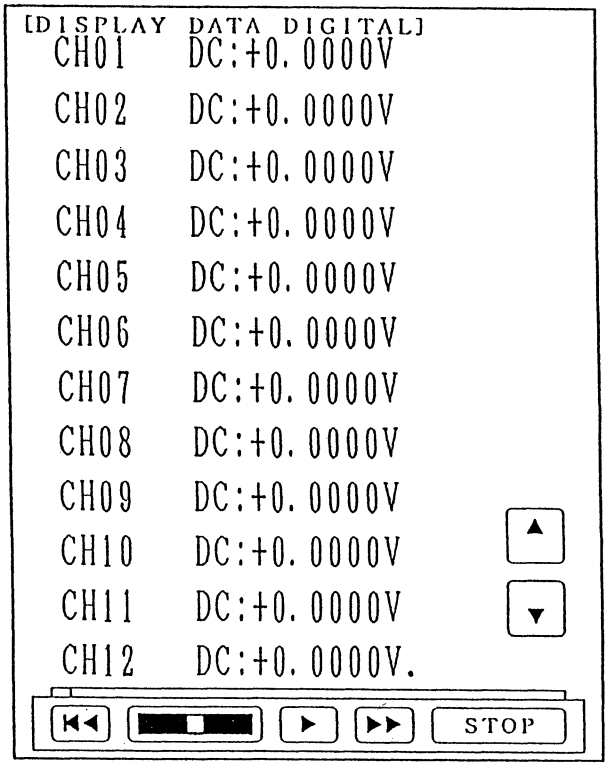
[|◀◀] : Return to leading head
[■] : Stop
[▶] : Reproduction (10mm/min.)
[▶▶] : Rapid reproduction (75 mm/mn)

Caution

1. It is required for reproducing to chart paper to set following conditions :
   - Set to ON at RECORDER key
   - Select pen selection key at saving time
2. When pressing down LOAD key of MEAS. DATA using with MO, be sure to do under the condition that BUSY lamp of MO is put off.



(Figure 3.2.74)



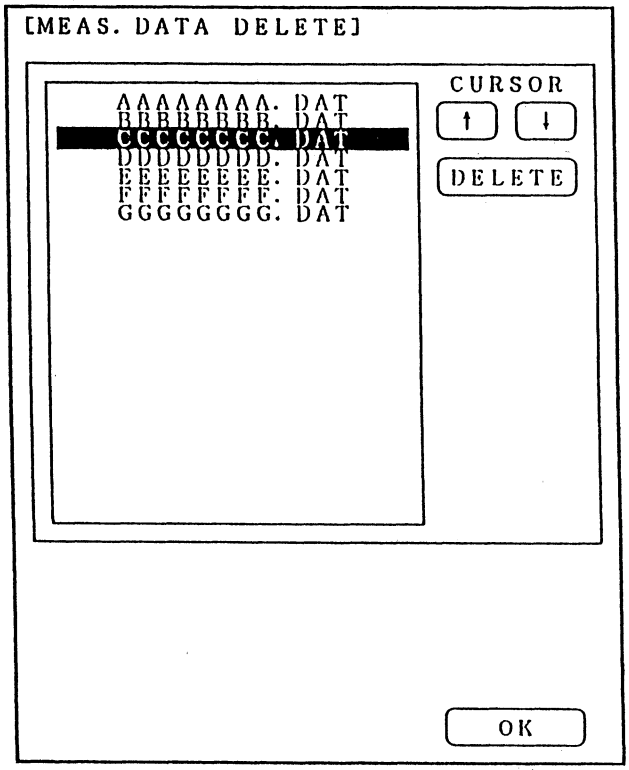
(Figure 3.2.75)

(4) Deleting the measured data

Press down [EXTRA MENU] → [MEDIA] to change the screen into [SET EXT MEDIA]. Press down [DELETE] key on [SETTING MEDIA] to change the main display into [MEAS. DATA DELETE].(Figure 3.2.76) Use the cursor keys [↑] [↓] to reversely display file and press down [DELETE] key.

Caution

> When pressing down DELETE key of MEAS. DATA using MO, be sure to press down the key under the condition that BUSY lamp of MO driver is put off.



(Figure 3.2.76)

Examples of MEDIA setting

(Example 1) File name : SAMPLE-1 (manual mode)
Measured channel : 1, 2 and 3
Sampling rate : Synchronized with chart speed
Saving mode : Manual saving (direct saving onto MEDIA on specified conditions)

① [EXTRA MENU]
↓
② [MEDIA]
↓
③ [SAVE] Press down SAVE on MEAS.DATA [Not SAVE on SETTING DATA]
↓
④ [REC. FILE NAME]
↓
⑤ [MANUAL] → [SAVE TO NEW FILE]
↓
⑥ [S] → [A] → [M] → [P] → [L] → [E] → [—] → [1]
↓
⑦ [OK]
↓
⑧ [REC. CHANNEL]
↓
⑨ [1] → [2] → [3] Select Channels 1, 2 and 3 (When other channels are set to ON, press down channel keys to set them to OFF)
↓
⑩ [OK]
↓
⑪ [REC. SAMPLE RATE]
↓
⑫ [CHART]
↓
⑬ [OK]
↓
⑭ [OK]
↓
⑮ To the measurement screen (Pressing down [MANUAL] key in the lower part of the screen to start measured data saving to MEDIA)

(Example 2) File name : SAMPLE-2 (manual mode)
Measured channel : 1, 2 and 3
Sampling rate : Synchronized with chart speed
Saving mode : Paper less recording (Data are saved onto MEDIA when the recording paper runs out on specified conditions)

Same procedures as ① to ⑬ above (Example 1)
(on condition that [2] is input in place of the last item of ⑥)
↓
⑭ Press down [ON] key on PAPER LESS REC.
↓
⑮ [OK] (At this time, it become waiting condition for paper less signal)
↓
⑯ To the measurement screen

(Example 3) File name : SAMPLE-3 (manual mode)
Measured channel : 1, 2 and 3
Sampling rate : 200 mS
Saving mode : Alarm recording (START/STOP saving data onto MEDIA on alarm conditions)

Alarm condition :

Alarm channel	1
Start level	4V or more
Stop level	1V or less
Pre-trigger	500
Hold time	1 sec.

Same procedures as ① to ⑪ above (Example 1)
(on condition that [3] is input in place of the last item of ⑥)

↓

⑫ [FREE]

↓

⑬ [2] → [0] → [0] → [mSec] (Sampling rate setting)

↓

⑭ [OK]

↓

⑮ [SETUP] Press down SETUP on ALARM REC.

↓

⑯ [↑] or [↓] Resersely display CH01.

↓

⑰ [ON] → [SELECT] → [SETUP] (Trigger channel setting)

↓

⑱ [UPPER] → [4] → [HI] SET START LEVEL (Start level setting)

↓

⑲ [LOWER] → [1] → [LO] SET STOP LEVEL (Stop level setting)

↓

⑳ [OK]

↓

㉑ [SETUP] Press down SETUP key of COMMON CONDITION

↓

㉒ [500] SELECT PRI-TRIGGER POINT (Pre-trigger setting)

↓

㉓ [ON] → [1] → [Sec] SET HOLD TIME (Hold time setting)

↓

㉔ [OK]

↓

㉕ [OK]

↓

㉖ [ON] ALARM REC. (Alarm recording set to ON)

↓

㉗ [OK] (At this time, it become alarm signal waiting condition)

↓

㉘ To mesurement screen

(Example 4) File name : SAMPLE-4 (manual mode)
Measured channel : 1, 2 and 3
Sampling rate : 500 mS
Saving mode : Timer (START/STOP saving data onto MEDIA on timer conditions)
Timer condition : Start time 1997.12.23 20 :30 :00
Stop time 1997.12.24 08 :30 :00

Same procedures as ① to ⑪ above (Example 1)
(on condition that [4] is input in place of the last item of ⑥)

↓

⑫ [FREE]

↓

⑬ [5] → [0] → [0] → [mSec] (Sampling rate setting)

↓

⑭ [OK]

↓

⑮ [SETUP] Press down SETUP on TIMER REC.

↓

⑯ [START & STOP] SELECT TIMER MODE (Timer mode setting)

↓

⑰ [START] → [1] → [2] → [2] → [3] → [2] → [0] → [3] → [0] → [0] → [0] (Start time setting)
M M D D h h m m s s

↓

⑱ [ENTER]

↓

⑲ [STOP] → [1] → [2] → [2] → [4] → [0] → [8] → [3] → [0] → [0] → [0] (Stop time setting)
M M D D h h m m s s

↓

⑳ [ENTER]

↓

㉑ [OK]

↓

㉒ [ON] TIMER REC. (Timer recording set to ON)

↓

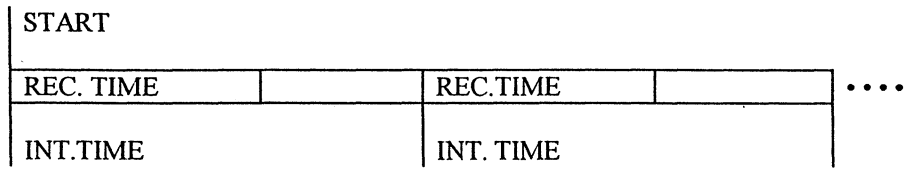
㉓ [OK] (At this time, it become to timer signal waiting condition)

↓

㉔ To mesurement screen

(Example 5) File name : SAMPLE-5 (manual mode)
Measured channel : 1, 2 and 3
Sampling rate : 500 mS
Saving mode : Interval saving

Interval condition : REC. TIME 30 minutes
: INT. TIME 60 minutes



Same procedures as ① to ⑪ above (Example 1)
(on condition that [5] is input in place of the last item of ⑥)

⑫ [FREE]

⑬ [5] → [0] → [0] → [mSec] (Sampling rate setting)

⑭ [OK]

⑮ [SETUP] Press down SETUP on INTERVAL REC.

⑯ [REC. TIME] → [0] → [0] → [3] → [0] → [0] → [0] (REC. TIME setting)
h h m m s s

⑰ [ENTER]

⑱ [INT. TIME] → [0] → [0] → [6] → [0] → [0] → [0] (INT. TIME setting)
h h m m s s

⑲ [ENTER]

⑳ [OK]

㉑ [ON] INTEVAL REC. (Interval data saving ON)

㉒ [OK] (At this time, interval data saving memory starts)

㉓ To measurement screen

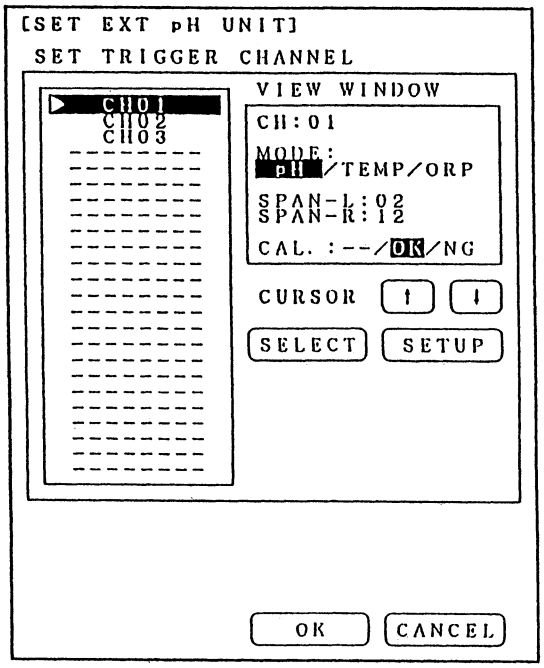
3.2.27 Setting the pH / ORP (pH) unit (option)

When a pH unit is installed into this recorder, pH 0 to 14 (electrode GST-2419C) and OPR at ±2000 mV (electrode PTS-2019C) can be measured.

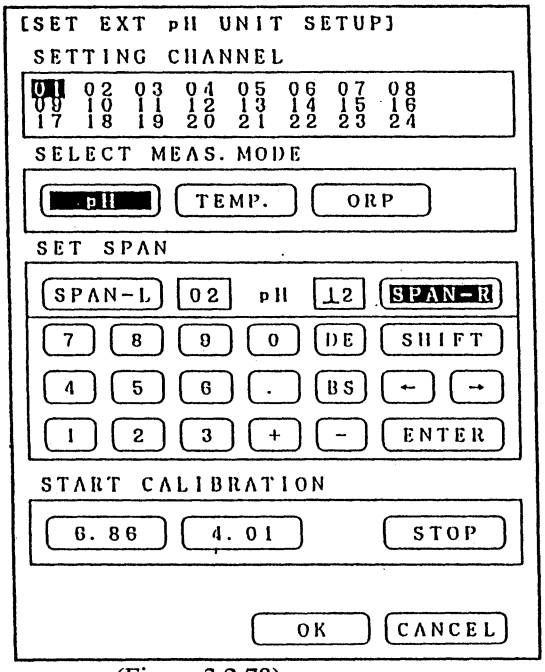
Limits

1. pH is switched into OPR by manipulating PH UNIT on EXTRA MENU.
2. The minimum span width is set to 2pH or more.
3. The span cannot be changed when setting OPR (mV)
4. The pH unit is calibrated at two points of 4.01 and 6.86.
5. Neither filter nor auto-shift/auto-range down cannot be set.
6. For other detailed specifications, refer to separate instruction manual of FU-921A.

Example) To set the pH unit for 1CH and the span to 2 to 12 PH,



(Figure 3.2.77)



(Figure 3.2.78)

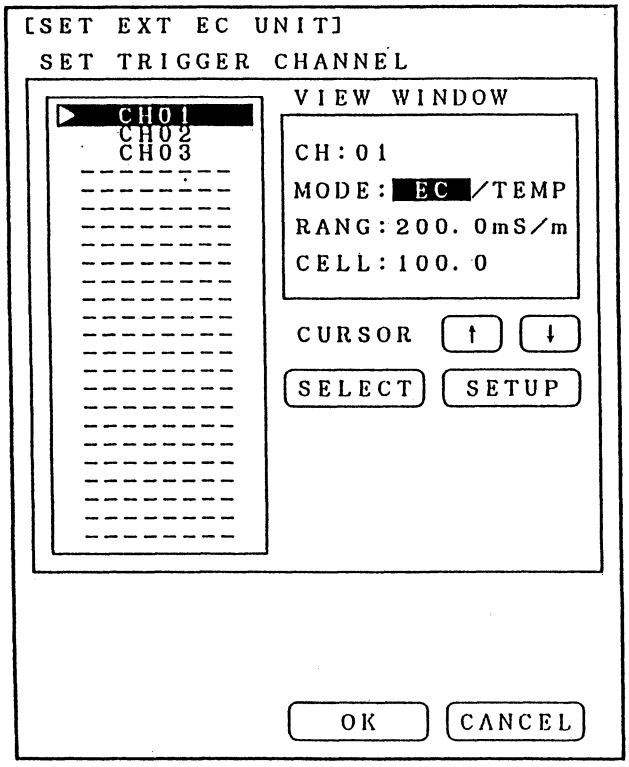
EXTRA MENU
↓
NEXT
↓
pH
↓
↑ or ↓ to set to CH1 reversely displayed
↓ (Figure 3.2.77)
SELECT to put ▸ mark on it.
↓
SETUP To Figure 3.2.78
↓
pH (SELECT MEAS.MODE)
↓
SPAN-L → 2 → ENTER
↓
SPAN-R → 1 → 2 → ENTER
↓
CAL. 6.86 (Calibration at 6.86 PH)
↓
CAL. 4.01 (Calibration at 4.01)
↓
OK
↓
OK
↓
OK
↓
To the measurement screen

3.2.28 Setting the EC unit (option)

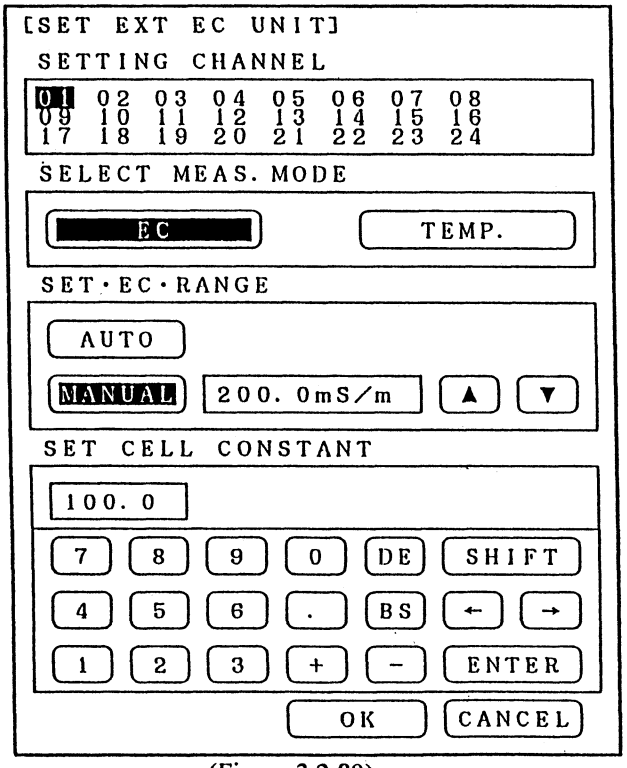
When an EC unit is mounted on this recorder, an electric conductivity of 0 to 20.00 S/m can be measured.

Limits

1. The span cannot be changed.
2. Neither filter nor auto-shift/auto-range down cannot be set.
3. For other detailed specifications, refer to separate instruction manual of FU-922A.



(Figure 3.2.79)



(Figure 3.2.80)

Example) To set the EC unit for 1CH, the range to 0 to 200 mS/m and the cell constant to 100.0, (applicable electrode : CVP-101P J=100.0)

EXTRA MENU
↓
NEXT
↓
EC
↓
↑ or ↓ to set to CH1reversely displayed
↓ (Figure 3.2.79)
SELECT to put ▸ mark on it.
↓
SETUP To Figure 3.2.80
↓
EC (SELECT MEAS.MODE)
↓
1 → 0 → 0 → ENTER
↓
MANUAL
↓
▲ or ▼ to set 200 mS/m
↓
OK
↓
OK
↓
OK
↓
To the measurement screen

3.2.29 Setting the transient unit (TRANSI'T) (option)

When a transient unit is installed in this recorder, the data on wave forms which vary at comparatively high speed can be once saved onto memory area and then recorded later on by selecting its memory trend recording mode, while data are normally recorded with DC (in a range of ±5 mV to ±100 V).

Limits

1. When turning ON the power switch, the initial value is always set at direct mode (normal DC voltage measurement)

2. In memory trend mode[SET EXT TRANSI'T], this recorder cannot make any other measurement than that by transient unit.

3. In case that memory trend recording is performed by external trigger, optional unit CT-9000 is required.

4. The manual trigger has priority over the other triggers.

5. There is following chart speed limits at the time of data saving (printed out) :
   In case of using MEMORY TREND 300mm/min. (Fixed)
   In case of using MEMORY TREND & MEDIA both 100mm/min. (Fixed)

6. Channel rink function when MEMORY TREND is used
   arithmetic operation : Operation result value (CHX) = CHA Input Value + ... /CHB Input Value
   Equal Sign : Result Value (CHX) = CHA Input value

   In case that arithmetic operation is used, transient unit must be installed to all of CHX, CHA, CHB.
   In case that equal sign is used, trnasient unit must be installed to CHA (Input value) side.

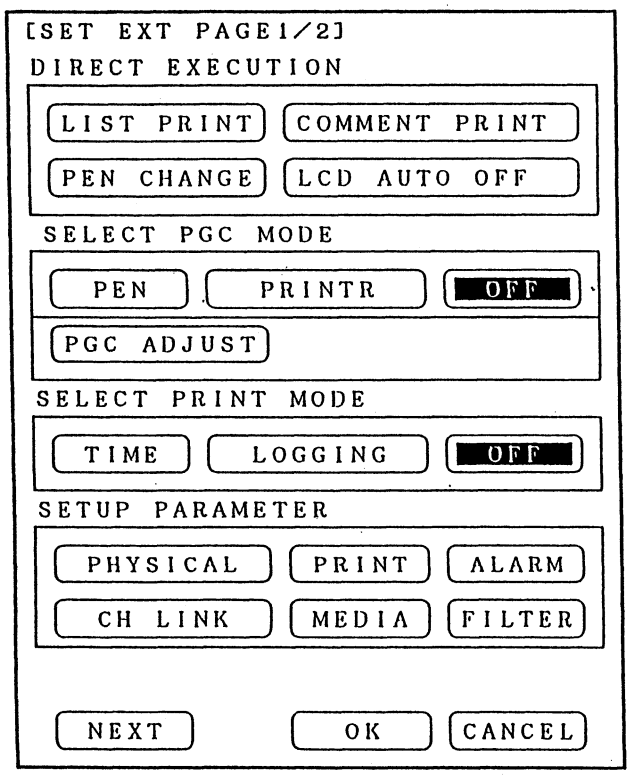
7. When memory trend is set after pressing START key, all of key operation other than STOP and MANUAL TRIG. keys must be done after once pressing STOP key. (including front panel key operation)

8. When memory trend data is output, normal measurement can not be expected for the channel (pen) other than that of installing transient unit.
   Consequently, use the recorder for memory trend data outputting after storing other pens than that installing transient unit at the pen rest except the channel using for channel rink equal sign.

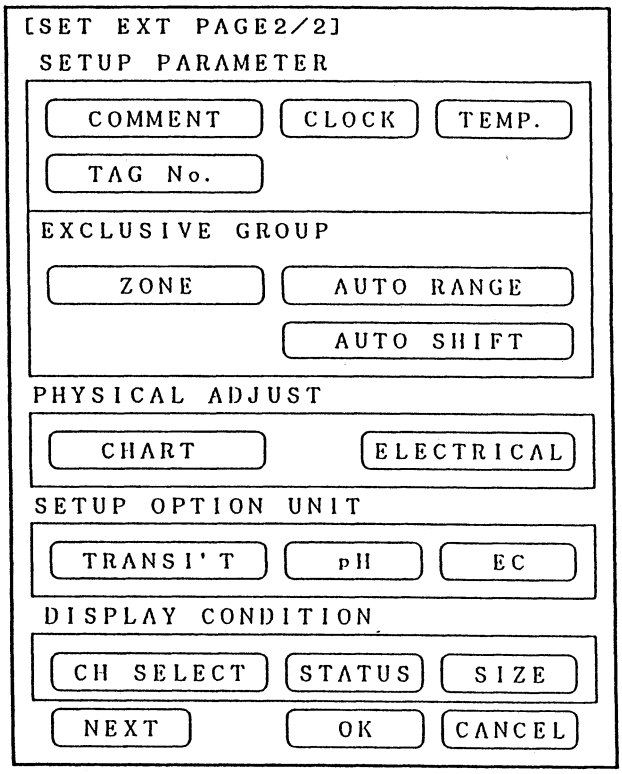
9. Interval time printing and logging function can not be co-used with memory trend function.
   Consequently, interval time printing and logging function must be set to OFF in case that memory trend function is used.

10. For other detialed specifications, please refer to separate instruction manual (FU-961A).

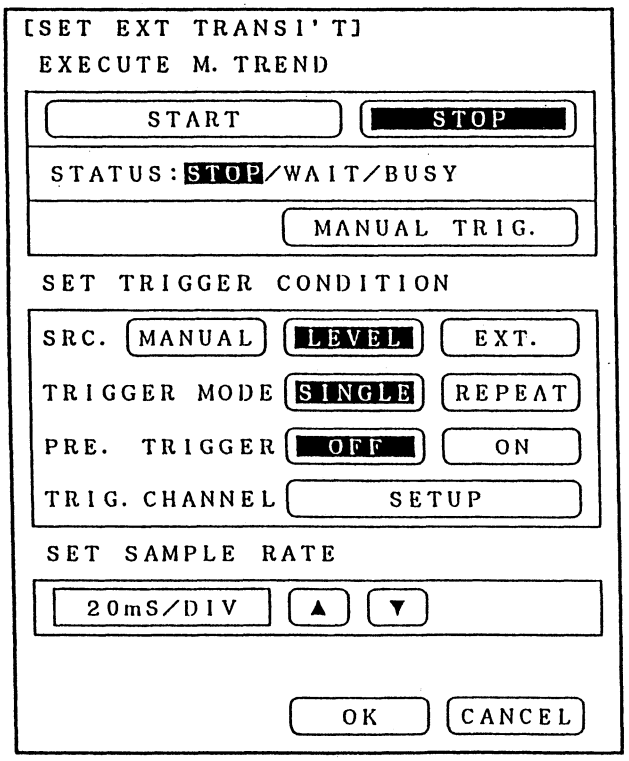
Press down [EXTRA MENU] on the panel to change the screen into [SET EXT PAGE1/2]. Press down [NEXT] key on the left lower part to change the main display into [SET EXT PAGE2/2].(Figure 3.2.82)
Then, press down [TRANSI'T] to change the main screen into [SET EXT TRANSI'T] (as shown in Figure 3.2.83) and it become memory trend mode.



(Figure 3.2.81)



(Figure 3.2.82)



(Figure 3.2.83)

(EXECUTE M.TREND)

START/STOP : START/STOP keys for memory trend function

START : Pressing down this key to make the recorder on trigger waiting situation at the trigger condition set by (SET TRIGGER CONDITION)

STOP : Pressing down this key to make the recorder on stop situation.

STATUS : The actual status of the memory trend function is displayed.

MANUAL TRIG : Press down this key to make a manual triggering.

MANUAL TRIG. : Pressing this key under WAIT situation, data saving or data printing out (memory trend) willstart (BUSY SITUATION) It automatically becomes to STOP situation after data printing out is completed.

(SET TRIGGER CONDITION)

SRC. : To select the triggering method

MANUAL : To select trigger action by pressing MANUAL TRIG. key

LEVEL : To select triger action preliminary set in trigger condition by [TRANSI'T TRIGGER CHANNEL]

EXT. : To select trigger action by signal input from external control unit CT-9000 .

TRIGGER MODE : To select the trigger recording mode

SINGLE : When trigger is occurred, it become to STOP situation after printing out the data (Once triggering)

REPEAT : When trigger is occurred, it become to WAIT situation after pringing out the data and is kept on waiting for next trigger. (Repeating Trigger)

PRE. TRIGGER : To select whether the status before triggering is recorded or not When this is set to ON, the status 10% in time before the triggering and on is recorded.

TRIGGER CHANNEL SETUP : Pressing down this key to enter setting for trigger channel and trigger level.

SETUP : Pressing down this key to change to setting screen of [TRANSI'T TRIGGER CHANNEL]

(SET SAMPLE RATE) : To set sampling rate to save to memory trend by ▲ or ▼ keys (Refer to table 3.2.7)

Available units for sampling rate are mS/DIV or S/DIV.

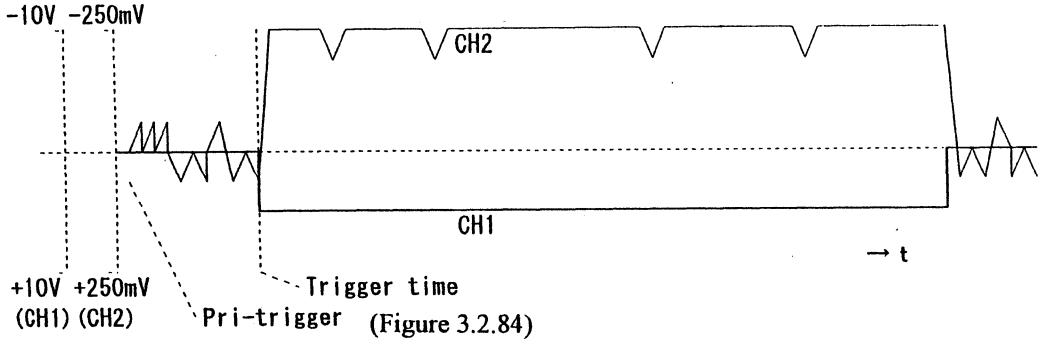
Example) 1CH : Data are triggered and saved onto memory when Lo is changed into Hi (3V) while TTL level is monitored by the transient unit (in the range of ±10 V).

2CH : The transient unit monitors at the same time the wave forms at other measuring points (trigger channel not specified in the range of ±250 mV).

Trigger mode : Only once

Pre-trigger : Set to ON to record the data on the status 10% in time before this setting

Sampling rate : 20 ms/DIV (100 μ s)



(Figure 3.2.84)

① Press down [EXTRA MENU] → [NEXT] → [TRANSI'T] to change the screen into [SET EXT TRANSI'T] (as shown in Figure 3.2.83).

② Then, press down SRC : [LEVEL]
TRIGGER MODE : [SINGLE]
PRE. TRIGGER : [ON]

③ Use [▼] or [▲] to set [SET SAMPLE RATE] to 20mS.

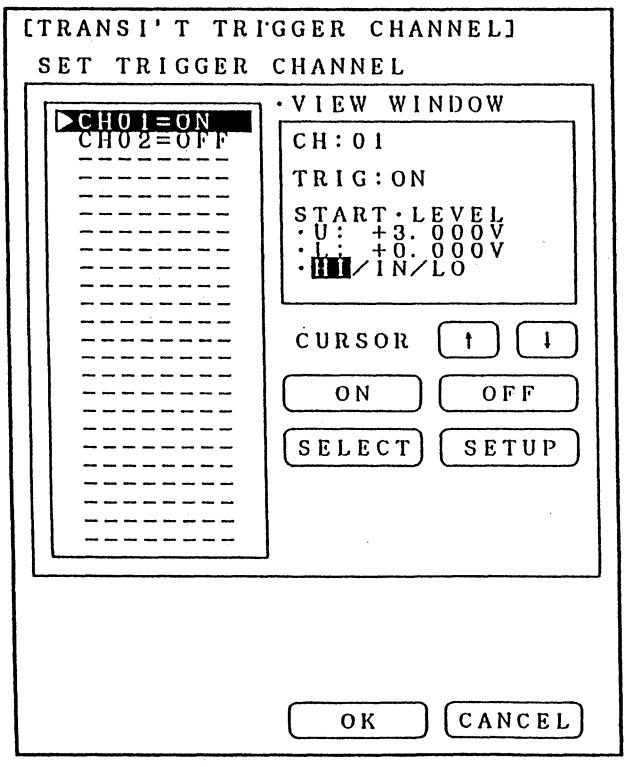
④ Then, press down [SETUP] key on TRIG CHANNEL to change the screen into [TRANSI'T TRIGGER CHANNEL] (as shown in Figure 3.2.85). Use [↑] [↓] keys to resersely display CH1. Press down [SELECT] to put ▸ mark on CH1 and [ON] key to set CH1 to ON (CH2 to OFF)

⑤ Then, press down [SETUP] key to change the screen into [TRANSI'T TRIGGER LEVEL] (as shown in Figure 3.2.86).

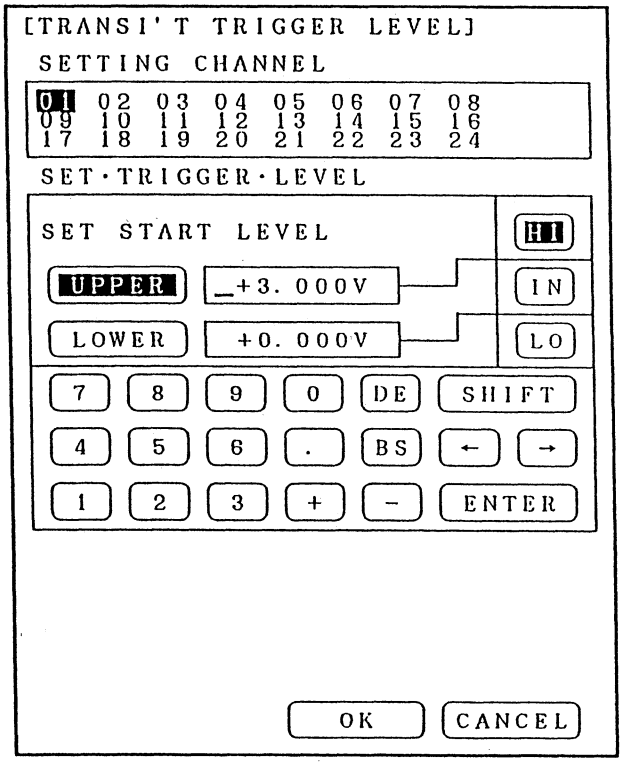
⑥ Press down [UPPER] → [3] → [ENTER] → [HI] to set the trigger level to 3V HI.

⑦ Press down [OK] → [OK] to return to [SET EXT TRANSI'T] (Figure 3.2.83).

⑧ Pressing down [START] key on (EXECUTE M.TREND) starts the recording in memory trend mode. STATUS waits for the trigger in WAIT status until it is done.



(Figure 3.2.85)



(Figure 3.2.86)

How to save data to MEDIA (FD, MB, MO) at Memory Trends Recording

① MEDIA setting shall be done before setting memory trend
(Please refer to article 3.2.26 MEDIA SETTING)
② Proceed aforesaid Transient setting
③ After trigger is occurred, it automatically start data output and start data saving to MEDIA at the same time.
④ At the same time when data output is completed, it complete data saving to MEDIA.

Limits

1. Trigger is set at REPEAT, data saving to MEDIA will continue and the data will save to the same file at each time trigger is occurred until STOP key is pressed down on [EXECUTE M. TREND] screen.
2. In case that data saving to MEDIA is performed along with transient function, only manual data saving setting is effective for MEDIA data saving setting side.
ALARM, TIMER, INTERVAL and PAPER LESS setting is not available.
3. There is no need to do other setting for MEDIA than file name and channel setting.
After completion of these 2 settings above, change the screen manual memory measurement then proceed transient unit setting.
4. When doing data saving channel selection of MEDIA setting, never select the channel that transient unit is not installed.
5. Sampling rate of data saving to MEDIA is fixed at 30 mS under independent sampling (FREE)

Relation between measuring cycle and sampling rate of data saving to Memory trends

Measuring Cycle	Sampling rate of data saving to memory trends
100 μ S	20 mS / D I V
150 μ S	30 mS / D I V
200 μ S	40 mS / D I V
250 μ S	50 mS / D I V
300 μ S	60 mS / D I V
350 μ S	70 mS / D I V
400 μ S	80 mS / D I V
450 μ S	90 mS / D I V
500 μ S	100 mS / D I V
1 mS	200 mS / D I V
1.5 mS	300 mS / D I V
2 mS	400 mS / D I V
2.5 mS	500 mS / D I V
3 mS	600 mS / D I V
3.5 mS	700 mS / D I V
4 mS	800 mS / D I V
4.5 mS	900 mS / D I V
5 mS	1 S / D I V
10 mS	2 S / D I V
15 mS	3 S / D I V
20 mS	4 S / D I V
25 mS	5 S / D I V
30 mS	6 S / D I V
35 mS	7 S / D I V
40 mS	8 S / D I V
45 mS	9 S / D I V
50 mS	10 S / D I V
100 mS	20 S / D I V
150 mS	30 S / D I V
200 mS	40 S / D I V
250 mS	50 S / D I V
300 mS	60 S / D I V
350 mS	70 S / D I V
400 mS	80 S / D I V
450 mS	90 S / D I V
500 mS	100 S / D I V
1 S	200 S / D I V

Table 3.2.7

3.2.30 Order of settings list

Recording channel selection	(PEN 1) to (PEN 12) Selection by lit LED
Pen up/down	[PEN LIFT] Pen up as the display LED is lit
Range setting	[RANGE] Range setting
Zero position setting	[ZERO] Zero position setting
Chart speed setting	[CHART SPEED] Chart speed setting
Span setting	[SPAN] Span setting
Manual print execution	[MANUAL PRINT] Manual print set to ON
Pen mounting	[EXTRA MENU] → [PEN CHANGE]
Display condition setting	[EXTRA MENU] → [NEXT] → [CH SELECT] Numer of WAVE displayed channels → [STATUS] Set condition display → [SIZE] Setting the digital display size
Auto-range down setting	[EXTRA MENU] → [NEXT] → [AUTO RANGE] Auto-range setting
Auto-shift setting	[EXTRA MENU] → [NEXT] → [AUTO SHIFT] Auto-shift setting
Zone record setting	[EXTRA MENU] → [NEXT] → [ZONE] Zone setting
Interval print setting and execution	[EXTRA MENU] → [PRINT] Print condition setting → [TIME] Interval print set to ON
Logging record setting and execution	[EXTRA MENU] → [PRINT] PRINT Print condition setting → [TIME] Logging record set to ON
Comment print setting and execution	[EXTRA MENU] → [NEXT] → [COMMENT] Comment setting → [COMMENT PRINT] Comment print
List print execution	[EXTRA MENU] → [LIST PRINT] List print

TAG No. setting	EXTRA MENU → NEXT → TAG No. TAG No. setting
Physical quantity setting	EXTRA MENU → PHYSICAL Physical quantity setting
Filter setting	EXTRA MENU → FILTER Filter setting Only set for FU-913A
Alarm setting	EXTRA MENU → ALARM Alarm setting
Channel link setting	EXTRA MENU → CH LINK Channel link setting
Date/hour setting	EXTRA MENU → NEXT → CLOCK Date/hour setting
LCD auto-off setting	EXTRA MENU → LCD AUTO OFF LCD auto-off setting
Electric zero setting	EXTRA MENU → NEXT → ELECTRICAL Electrical zero setting
Expanded/contracted paper compensation setting	EXTRA MENU → NEXT → CHART Expanded/contracted paper compensation setting
ON/OFF setting for reference contact temperature compensation	EXTRA MENU → NEXT → TEMP ON/OFF setting for reference contact temperature compensation
PGC setting	EXTRA MENU → PEN or → PRINTER PGC setting → PGC ADJUST Compensation adjustment
FDD/memory card/MO setting (option)	EXTRA MENU → MEDIA Media setting
Transient unit setting (option)	EXTRA MENU → NEXT → TRANSI'T Transient unit setting
pH/ORP unit setting (Option)	EXTRA MENU → NEXT → pH PH unit setting
EC unit setting (Option)	EXTRA MENU → NEXT → EC EC unit setting

3.3 Starting the measurement

You are ready to start the measurement when you have followed the steps given in 3.1, Preparations for measurement and in 3.2, Settings.
The set functions are displayed by alphabetic abbreviations at the right upper corner of the digital display screen as follows :

Auto-range down	.....	A
Auto-shift	.....	S
Zone	.....	Z
Filter	.....	F
Electric zero	.....	E

3.3.1 Printing the list

When the set conditions are printed in a list on the recording paper, it is very useful for putting in order data as required. Print the list as follows :
Press down [EXTRA MENU] → [LIST PRINT] .
When you want to stop this printing halfway, press down again [LIST PRINT] key.
(Printed items)

- Contents of channel link
- Print mode
- Interval time printing
- TAG No.
- Input unit type
- Input unit range
- Recording span
- Input filter ON/OFF
- Alarm settings
- Auto-range down ON/OFF
- Auto-shift ON/OFF
- Zone area
- Scale value for setting the physical quantity
- Unit for setting the physical quantity
- List printing date/hour
- Chart speed 1, 2
- Comment message

3.3.2 Starting the measurement

Use the key switch at the right end of the operation panel to select the number corresponding to a pen used for recording. Then, press down the record key to start the measurement.
The pen comes down to start recording data on the paper.
At this moment, the LED corresponding to the selected pen and that beside the record key are lit.
When ALL key under the pen number is selected, all the pens can be put to ON/OFF in block.

3.3.3 Changing over the display

① The digital/analog display can be changed over to each other by switching [DIGITAL] [WAVE] key on the operation panel.

② Press down [EXTRA MENU] → [NEXT] and select [CH SELECT] on (DISPLAY CONDITION). Then, the channel to be displayed can be selected by selecting it on the channel select screen.
Refer to "Display Condition Setting" Item 3.2.7 on page (3.2.12)

③ Press down [EXTRA MENU] → [NEXT] and select [STATUS] on (DISPLAY CONDITION). Then, you can display the actual status of this recorder on the screen. (Displayed in five pages in total Press down [NEXT] key to proceed to the next page.)
Refer to "Display Condition Setting" Item 3.2.7 on page (3.2.14)

④ Press down [EXTRA MENU] → [NEXT] and select [SIZE] on (DISPLAY CONDITION). Then, the digital display screen is changed in size (12CH display/24CH display changed over each other) Refer to page (3.2.13).

3.4 Ending the measurement

Pressing down the record key makes go up the pen and stop the recording paper.
Press down the pen select key and retract the pen into its pen rest.
Unplug the input lead wire and turn OFF the power supply.

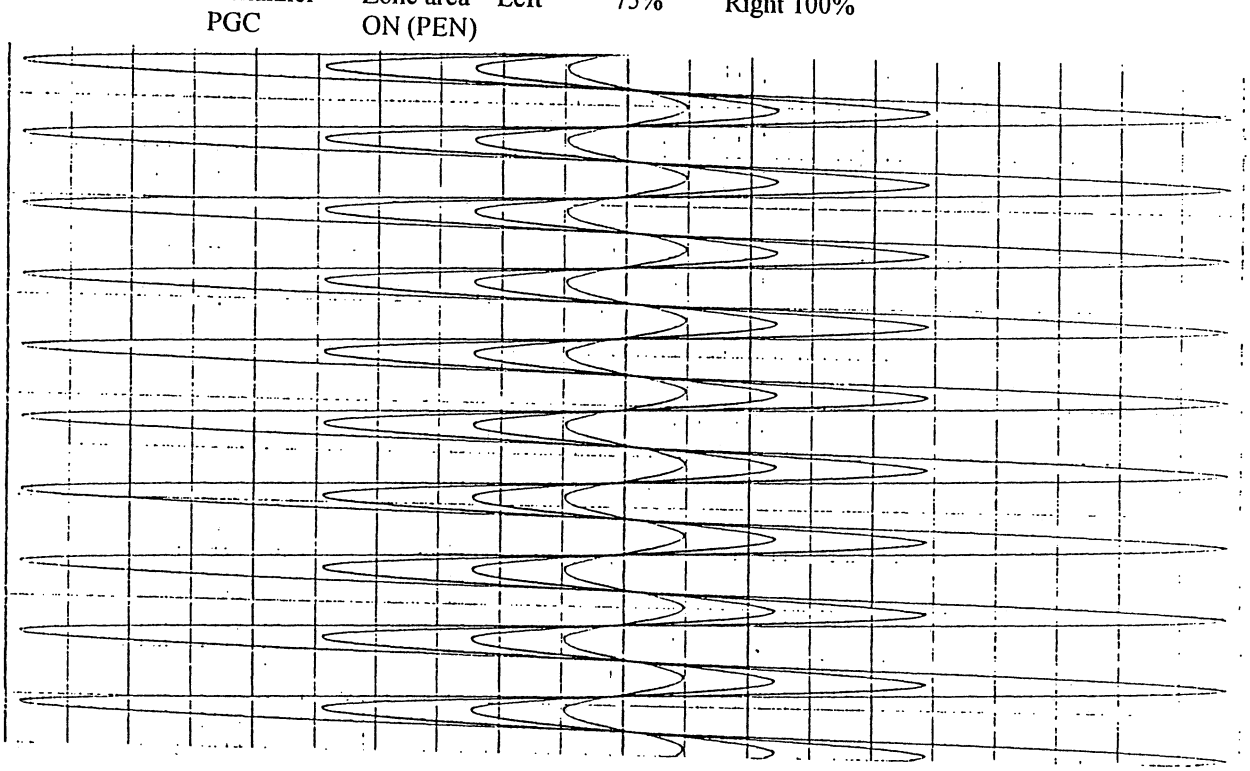
Caution

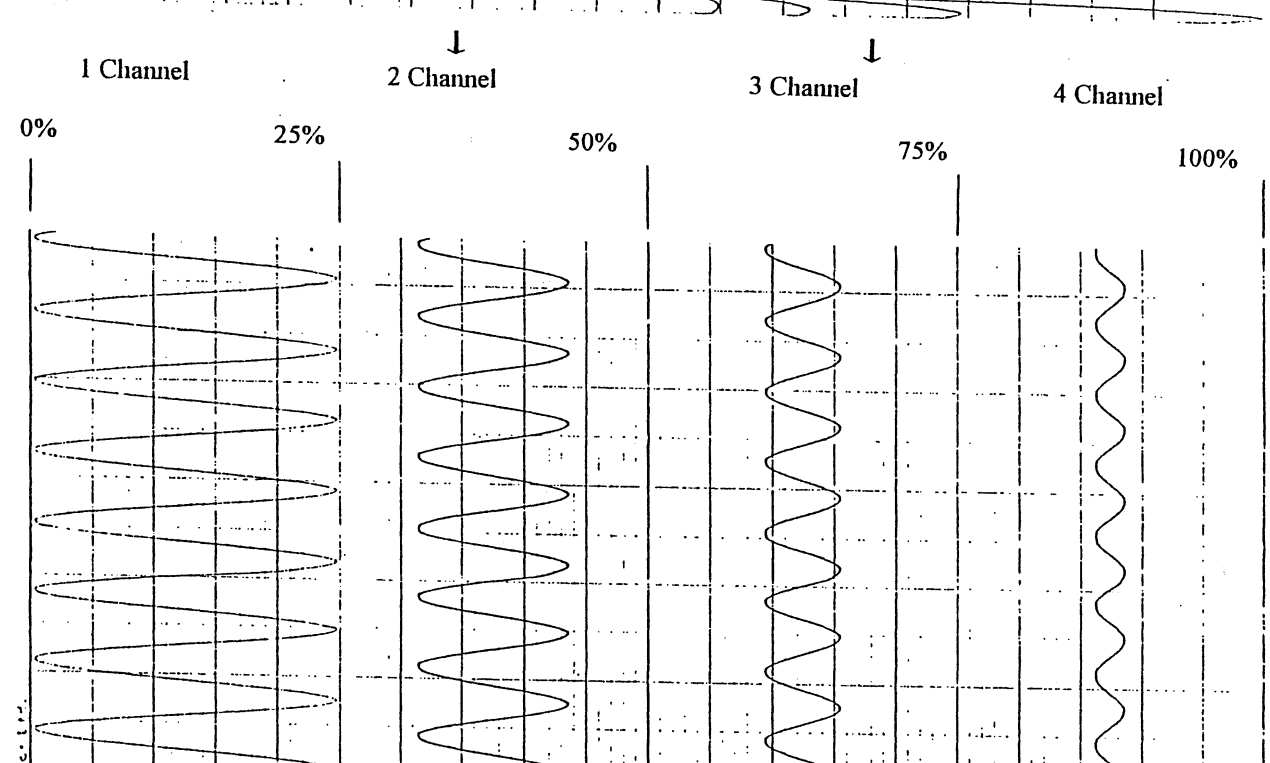
When you leave the pen non used for a long time, attach its pen cap onto its head to prevent it from getting dry.

3.5 Example of recording

3.5.1 Zone recording

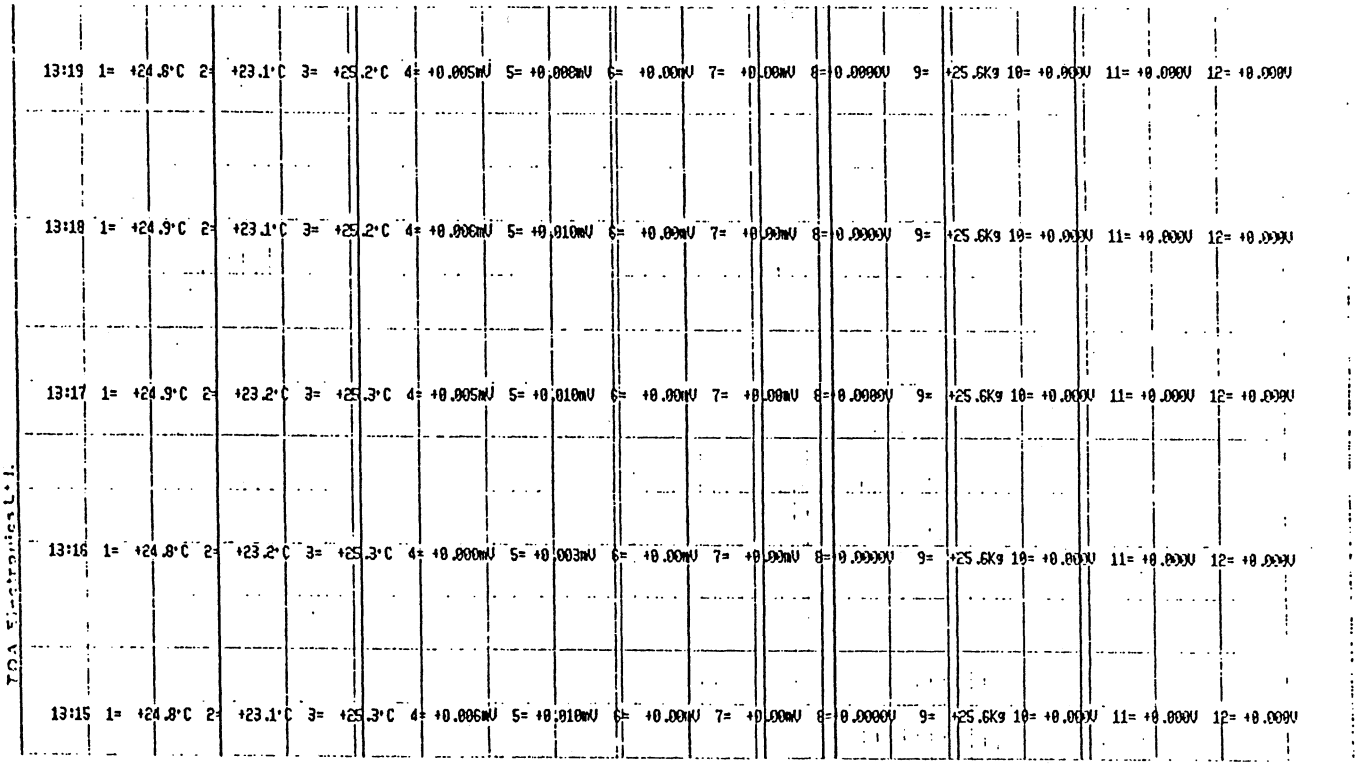
Settings :	1 channel	Zone area	Left	0%	Right 25%
	2 channel	Zone area	Left	25%	Right 50%
	3 channel	Zone area	Left	50%	Right 75%
	4 channel	Zone area	Left	75%	Right 100%
	PGC	ON (PEN)			



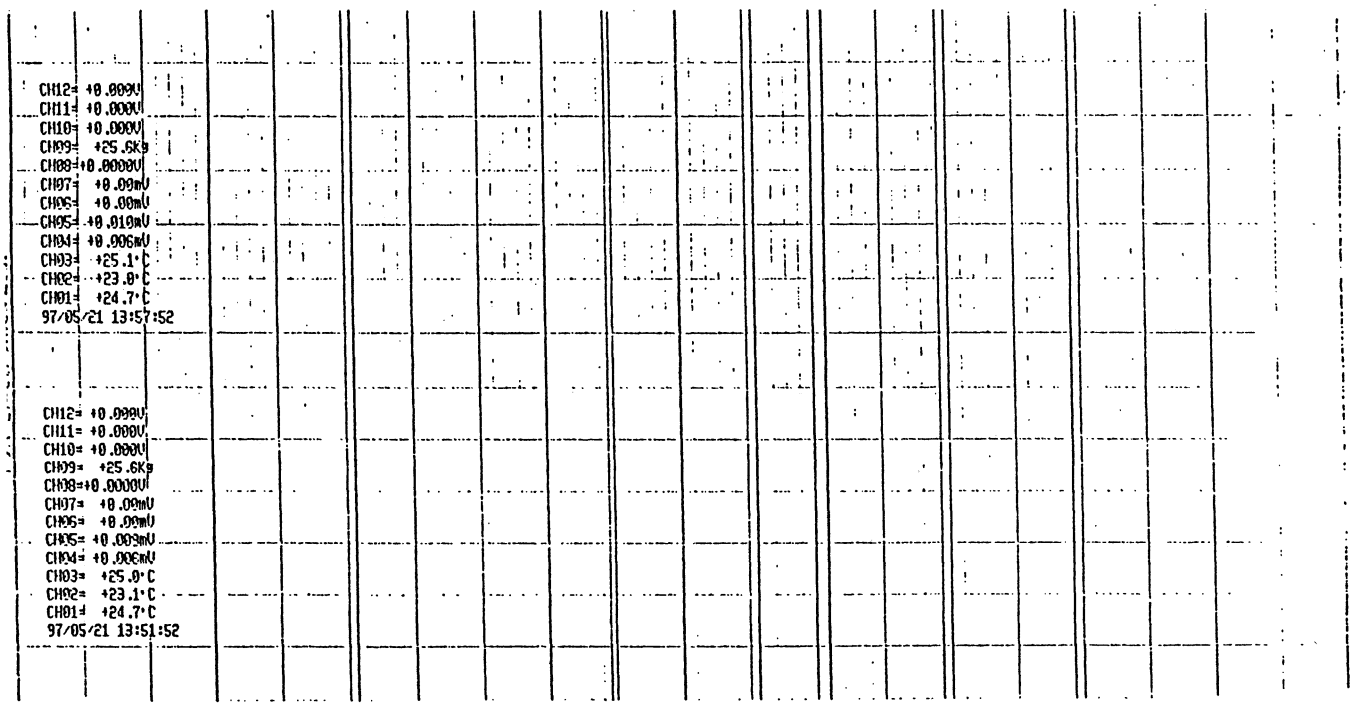


3.5.2 Interval printing

Settings : Mode LINE
Interval 1 minute

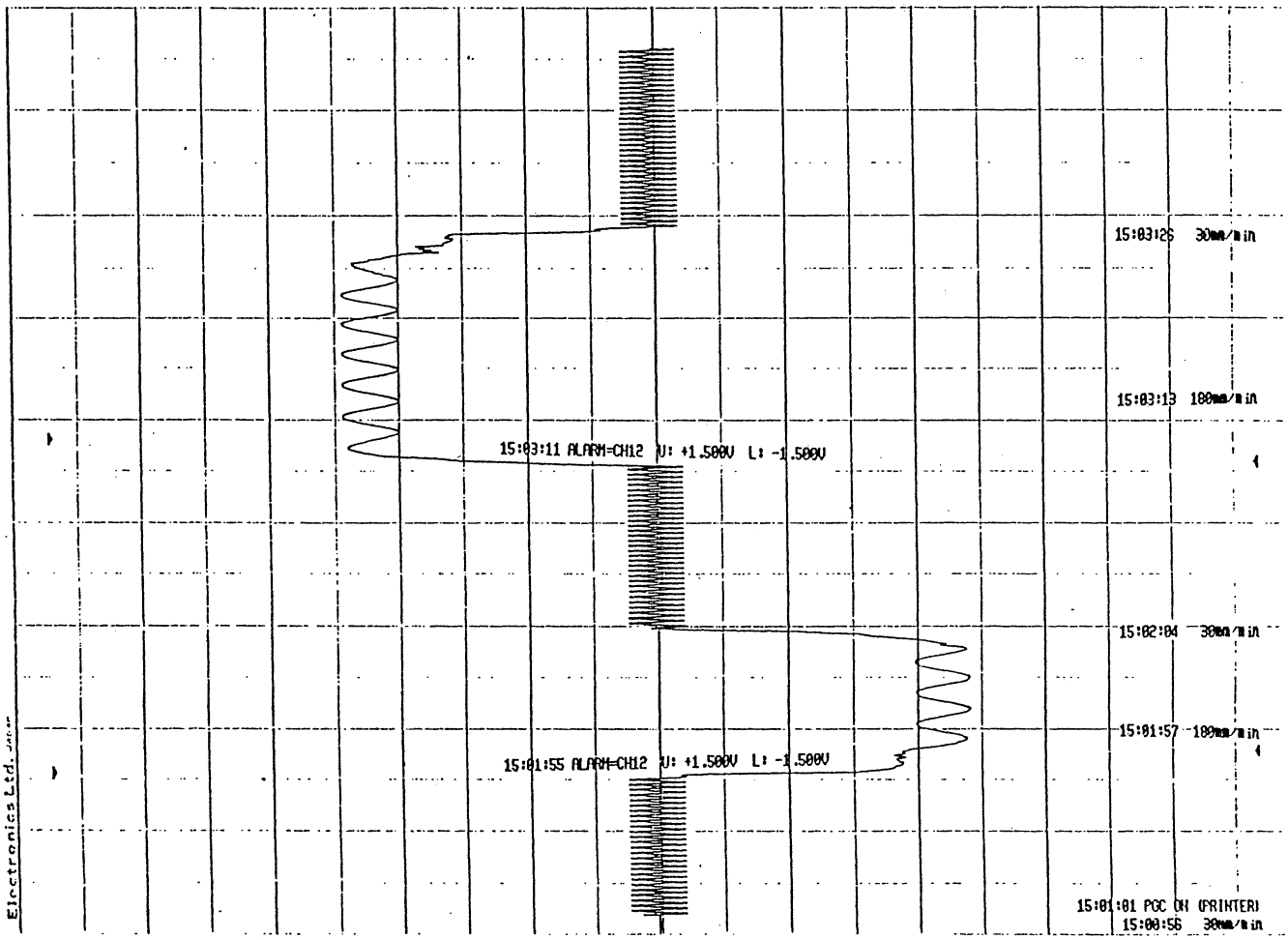


Settings : Mode EACH
Interval 1 minute

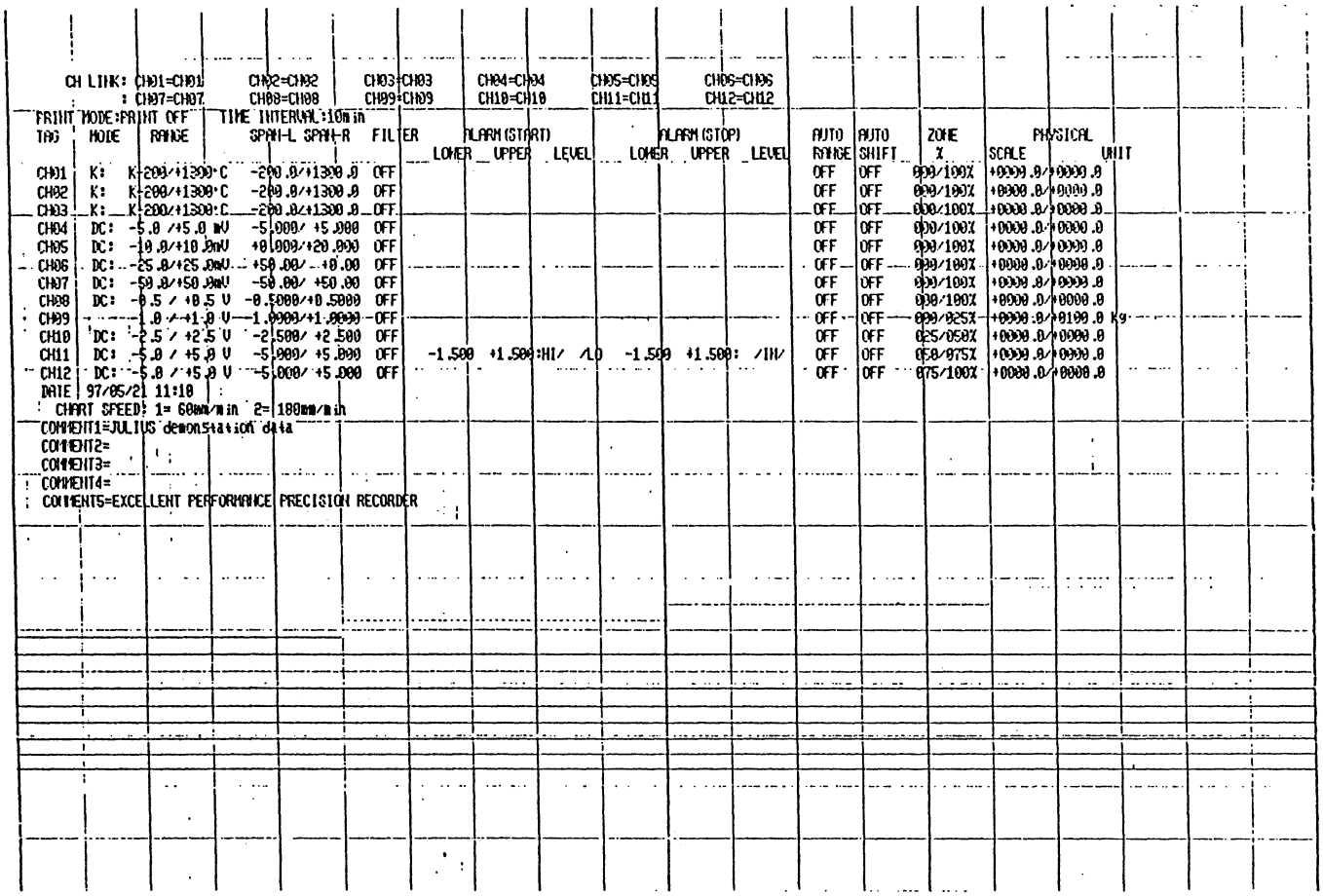


3.5.3 Switching the chart speed 1 into 2 by alarm settings

Settings :	Set channel	12 channel		
	Start level	UPPER	1.5V	HI
		LOWER	-1.5V	LO
	Stop level	UPPER	1.5V	IN
		LOWER	-1.5V	
	Chart speed 1	30 mm/min		
	Chart speed 2	180 mm/min		
	PGC	ON (PRINTER)		



3.5.4 Printing the list



CH LINK: CH01=CH01 CH02=CH02 CH03=CH03 CH04=CH04 CH05=CH05 CH06=CH06
: CH07=CH07 CH08=CH08 CH09=CH09 CH10=CH10 CH11=CH11 CH12=CH12

PRINT MODE:PRINT OFF TIME INTERVAL:10min

TAG	MODE	RANGE	SPAN-L	SPAN-R	FILTER	ALARM(START) LOWER	ALARM(START) UPPER	ALARM(START) LEVEL	ALARM(STOP) LOWER	ALARM(STOP) UPPER	ALARM(STOP) LEVEL	AUTO RANGE	AUTO SHIFT	ZONE %	PHYSICAL SCALE	PHYSICAL UNIT
CH01	K:	K:-200/+1300°C	-200.0	+1300.0	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH02	K:	K:-200/+1300°C	-200.0	+1300.0	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH03	K:	K:-200/+1300°C	-200.0	+1300.0	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH04	DC:	-5.0 /+5.0 mV	-5.000	+5.000	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH05	DC:	-10.0/+10.0mV	+0.000	+20.000	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH06	DC:	-25.0/+25.0mV	+50.00	+0.00	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH07	DC:	-50.0/+50.0mV	-50.00	+50.00	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH08	DC:	-0.5 / +0.5 V	-0.5000	+0.5000	OFF							OFF	OFF	000/100%	+0000.0/+0000.0	
CH09		-1.0 / +1.0 V	-1.0000	+1.0000	OFF							OFF	OFF	000/025%	+0000.0/+0100.0	Kg
CH10	DC:	-2.5 / +2.5 V	-2.500	+2.500	OFF							OFF	OFF	025/050%	+0000.0/+0000.0	
CH11	DC:	-5.0 / +5.0 V	-5.000	+5.000	OFF	-1.500	+1.500	:HI/ /LO	-1.500	+1.500	: /IN/	OFF	OFF	050/075%	+0000.0/+0000.0	
CH12	DC:	-5.0 / +5.0 V	-5.000	+5.000	OFF							OFF	OFF	075/100%	+0000.0/+0000.0	

DATE 97/05/21 11:10

CHART SPEED: 1= 60mm/min 2= 180mm/min

COMMENT1=JULIUS demonstration data

COMMENT2=

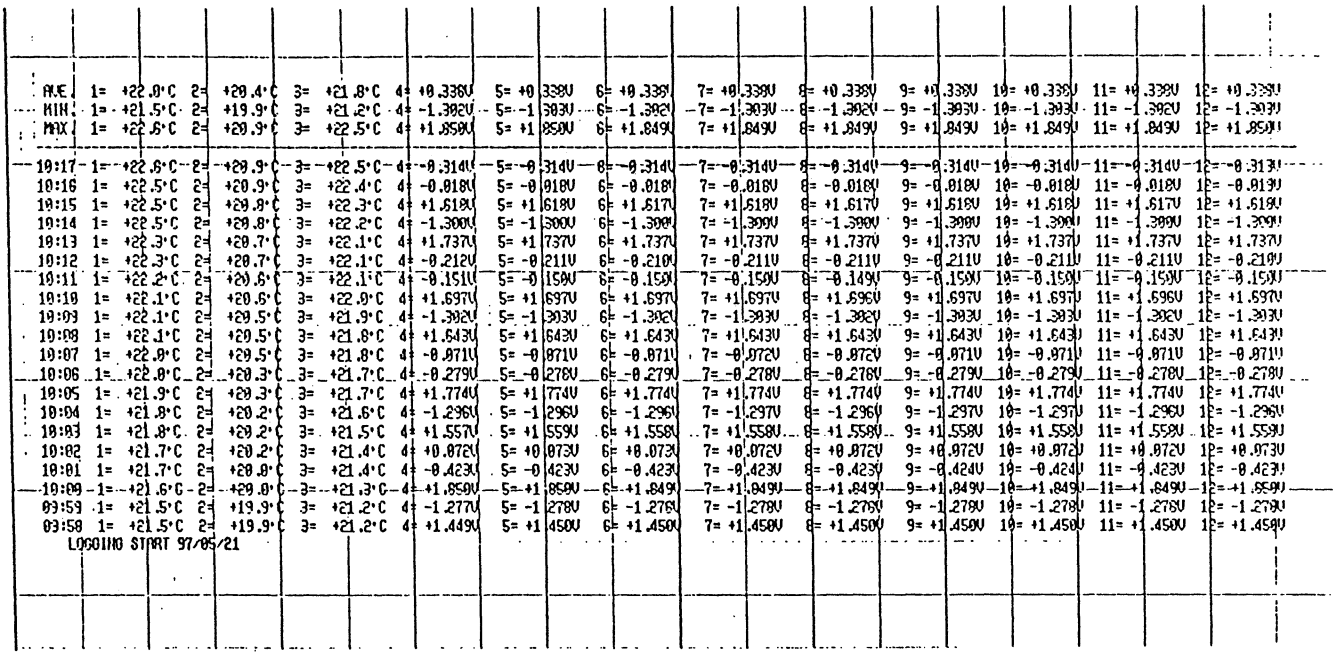
COMMENT3=

COMMENT4=

COMMENT5=EXCELLENT PERFORMANCE PRECISION RECORDER

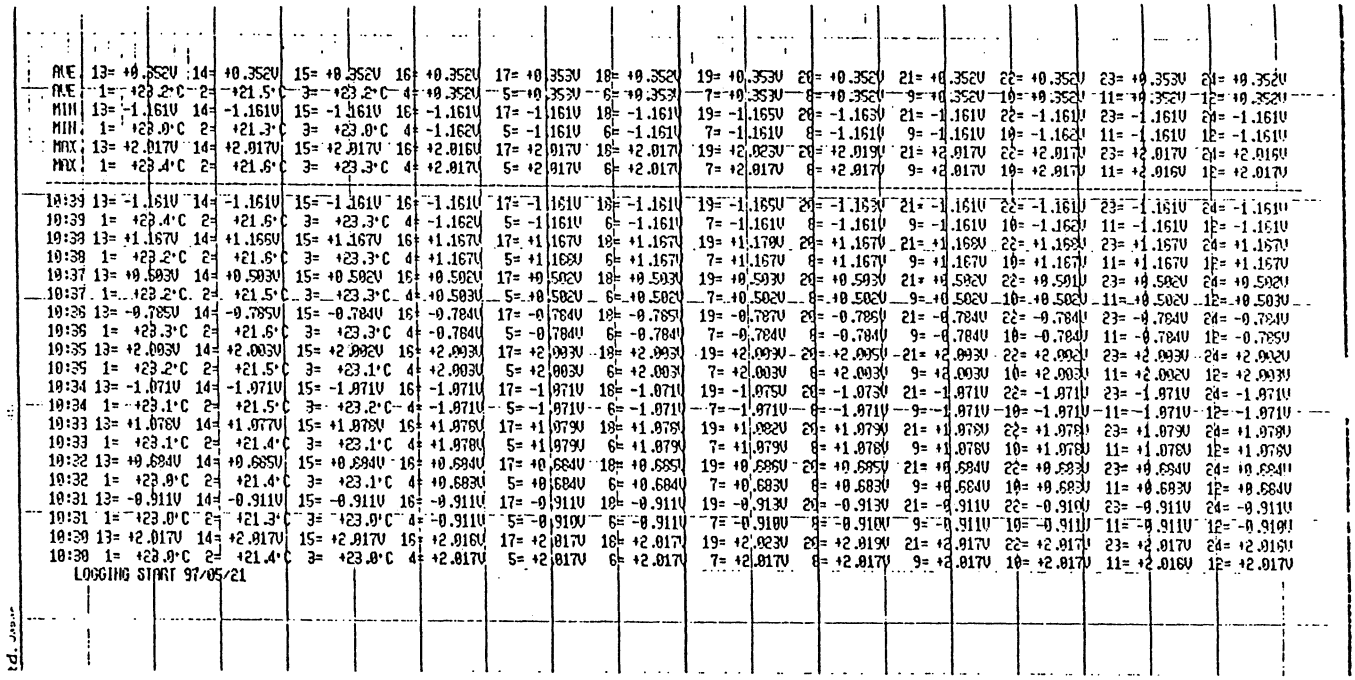
3.5.5 Logging record

Settings : 12 channels
Interval 1 minute



AVE	1= +22.0°C	2= +20.4°C	3= +21.8°C	4= +0.338V	5= +0.338V	6= +0.338V	7= +0.338V	8= +0.338V	9= +0.338V	10= +0.338V	11= +0.338V	12= +0.338V
MIN	1= +21.5°C	2= +19.9°C	3= +21.2°C	4= -1.302V	5= -1.303V	6= -1.302V	7= -1.303V	8= -1.302V	9= -1.303V	10= -1.303V	11= -1.302V	12= -1.303V
MAX	1= +22.6°C	2= +20.9°C	3= +22.5°C	4= +1.850V	5= +1.850V	6= +1.849V	7= +1.849V	8= +1.849V	9= +1.849V	10= +1.849V	11= +1.849V	12= +1.850V
10:17	1= +22.6°C	2= +20.9°C	3= +22.5°C	4= -0.314V	5= -0.314V	6= -0.314V	7= -0.314V	8= -0.314V	9= -0.314V	10= -0.314V	11= -0.314V	12= -0.313V
10:16	1= +22.5°C	2= +20.9°C	3= +22.4°C	4= -0.018V	5= -0.018V	6= -0.018V	7= -0.018V	8= -0.018V	9= -0.018V	10= -0.018V	11= -0.018V	12= -0.013V
10:15	1= +22.5°C	2= +20.8°C	3= +22.3°C	4= +1.618V	5= +1.618V	6= +1.617V	7= +1.618V	8= +1.617V	9= +1.618V	10= +1.618V	11= +1.617V	12= +1.618V
10:14	1= +22.5°C	2= +20.8°C	3= +22.2°C	4= -1.300V	5= -1.300V	6= -1.300V	7= -1.300V	8= -1.300V	9= -1.300V	10= -1.300V	11= -1.300V	12= -1.300V
10:13	1= +22.3°C	2= +20.7°C	3= +22.1°C	4= +1.737V	5= +1.737V	6= +1.737V	7= +1.737V	8= +1.737V	9= +1.737V	10= +1.737V	11= +1.737V	12= +1.737V
10:12	1= +22.3°C	2= +20.7°C	3= +22.1°C	4= -0.212V	5= -0.211V	6= -0.210V	7= -0.211V	8= -0.211V	9= -0.211V	10= -0.211V	11= -0.211V	12= -0.210V
10:11	1= +22.2°C	2= +20.6°C	3= +22.1°C	4= -0.151V	5= -0.150V	6= -0.150V	7= -0.150V	8= -0.149V	9= -0.150V	10= -0.150V	11= -0.150V	12= -0.150V
10:10	1= +22.1°C	2= +20.6°C	3= +22.0°C	4= +1.697V	5= +1.697V	6= +1.697V	7= +1.697V	8= +1.696V	9= +1.697V	10= +1.697V	11= +1.696V	12= +1.697V
10:09	1= +22.1°C	2= +20.5°C	3= +21.9°C	4= -1.302V	5= -1.303V	6= -1.302V	7= -1.303V	8= -1.302V	9= -1.303V	10= -1.303V	11= -1.302V	12= -1.303V
10:08	1= +22.1°C	2= +20.5°C	3= +21.8°C	4= +1.643V	5= +1.643V	6= +1.643V	7= +1.643V	8= +1.643V	9= +1.643V	10= +1.643V	11= +1.643V	12= +1.643V
10:07	1= +22.0°C	2= +20.5°C	3= +21.8°C	4= -0.871V	5= -0.871V	6= -0.871V	7= -0.872V	8= -0.871V	9= -0.871V	10= -0.871V	11= -0.871V	12= -0.871V
10:06	1= +22.0°C	2= +20.3°C	3= +21.7°C	4= -0.279V	5= -0.278V	6= -0.279V	7= -0.278V	8= -0.278V	9= -0.279V	10= -0.279V	11= -0.278V	12= -0.278V
10:05	1= +21.9°C	2= +20.3°C	3= +21.7°C	4= +1.774V	5= +1.774V	6= +1.774V	7= +1.774V	8= +1.774V	9= +1.774V	10= +1.774V	11= +1.774V	12= +1.774V
10:04	1= +21.9°C	2= +20.2°C	3= +21.6°C	4= -1.296V	5= -1.296V	6= -1.296V	7= -1.297V	8= -1.296V	9= -1.297V	10= -1.297V	11= -1.296V	12= -1.296V
10:03	1= +21.8°C	2= +20.2°C	3= +21.5°C	4= +1.557V	5= +1.559V	6= +1.558V	7= +1.558V	8= +1.558V	9= +1.558V	10= +1.558V	11= +1.558V	12= +1.559V
10:02	1= +21.7°C	2= +20.2°C	3= +21.4°C	4= +0.872V	5= +0.873V	6= +0.873V	7= +0.872V	8= +0.872V	9= +0.872V	10= +0.872V	11= +0.872V	12= +0.873V
10:01	1= +21.7°C	2= +20.0°C	3= +21.4°C	4= -0.423V	5= -0.423V	6= -0.423V	7= -0.423V	8= -0.423V	9= -0.424V	10= -0.424V	11= -0.423V	12= -0.423V
10:00	1= +21.6°C	2= +20.0°C	3= +21.3°C	4= +1.850V	5= +1.850V	6= +1.849V	7= +1.849V	8= +1.849V	9= +1.849V	10= +1.849V	11= +1.849V	12= +1.850V
09:59	1= +21.5°C	2= +19.9°C	3= +21.2°C	4= -1.277V	5= -1.278V	6= -1.278V	7= -1.278V	8= -1.276V	9= -1.278V	10= -1.278V	11= -1.276V	12= -1.278V
09:58	1= +21.5°C	2= +19.9°C	3= +21.2°C	4= +1.449V	5= +1.450V	6= +1.450V	7= +1.450V	8= +1.450V	9= +1.450V	10= +1.450V	11= +1.450V	12= +1.450V
LOGGING START 97/05/21												

Settings : 24 channels
Interval 1 minute



AVE	13= +0.352V	14= +0.352V	15= +0.352V	16= +0.352V	17= +0.353V	18= +0.352V	19= +0.353V	20= +0.352V	21= +0.352V	22= +0.352V	23= +0.353V	24= +0.352V
AVE	1= +23.2°C	2= +21.5°C	3= +23.2°C	4= +0.352V	5= +0.353V	6= +0.353V	7= +0.353V	8= +0.352V	9= +0.352V	10= +0.352V	11= +0.352V	12= +0.352V
MIN	13= -1.161V	14= -1.161V	15= -1.161V	16= -1.161V	17= -1.161V	18= -1.161V	19= -1.165V	20= -1.163V	21= -1.161V	22= -1.161V	23= -1.161V	24= -1.161V
MIN	1= +23.0°C	2= +21.3°C	3= +23.0°C	4= -1.162V	5= -1.161V	6= -1.161V	7= -1.161V	8= -1.161V	9= -1.161V	10= -1.162V	11= -1.161V	12= -1.161V
MAX	13= +2.017V	14= +2.017V	15= +2.017V	16= +2.016V	17= +2.017V	18= +2.017V	19= +2.023V	20= +2.019V	21= +2.017V	22= +2.017V	23= +2.017V	24= +2.016V
MAX	1= +23.4°C	2= +21.6°C	3= +23.3°C	4= +2.017V	5= +2.017V	6= +2.017V	7= +2.017V	8= +2.017V	9= +2.017V	10= +2.017V	11= +2.016V	12= +2.017V
10:39	13= -1.161V	14= -1.161V	15= -1.161V	16= -1.161V	17= -1.161V	18= -1.161V	19= -1.165V	20= -1.163V	21= -1.161V	22= -1.161V	23= -1.161V	24= -1.161V
10:39	1= +23.4°C	2= +21.6°C	3= +23.3°C	4= -1.162V	5= -1.161V	6= -1.161V	7= -1.161V	8= -1.161V	9= -1.161V	10= -1.162V	11= -1.161V	12= -1.161V
10:38	13= +1.167V	14= +1.166V	15= +1.167V	16= +1.167V	17= +1.167V	18= +1.167V	19= +1.178V	20= +1.167V	21= +1.168V	22= +1.168V	23= +1.167V	24= +1.167V
10:38	1= +23.2°C	2= +21.6°C	3= +23.3°C	4= +1.167V	5= +1.168V	6= +1.167V	7= +1.167V	8= +1.167V	9= +1.167V	10= +1.167V	11= +1.167V	12= +1.167V
10:37	13= +0.503V	14= +0.503V	15= +0.502V	16= +0.502V	17= +0.502V	18= +0.503V	19= +0.503V	20= +0.503V	21= +0.502V	22= +0.501V	23= +0.502V	24= +0.502V
10:37	1= +23.2°C	2= +21.5°C	3= +23.3°C	4= +0.503V	5= +0.502V	6= +0.502V	7= +0.502V	8= +0.502V	9= +0.502V	10= +0.502V	11= +0.502V	12= +0.503V
10:36	13= -0.785V	14= -0.785V	15= -0.784V	16= -0.784V	17= -0.784V	18= -0.785V	19= -0.787V	20= -0.785V	21= -0.784V	22= -0.784V	23= -0.784V	24= -0.784V
10:36	1= +23.3°C	2= +21.6°C	3= +23.3°C	4= -0.784V	5= -0.784V	6= -0.784V	7= -0.784V	8= -0.784V	9= -0.784V	10= -0.784V	11= -0.784V	12= -0.785V
10:35	13= +2.003V	14= +2.003V	15= +2.002V	16= +2.003V	17= +2.003V	18= +2.003V	19= +2.003V	20= +2.005V	21= +2.003V	22= +2.002V	23= +2.003V	24= +2.002V
10:35	1= +23.2°C	2= +21.5°C	3= +23.1°C	4= +2.003V	5= +2.003V	6= +2.003V	7= +2.003V	8= +2.003V	9= +2.003V	10= +2.003V	11= +2.002V	12= +2.003V
10:34	13= -1.071V	14= -1.071V	15= -1.071V	16= -1.071V	17= -1.071V	18= -1.071V	19= -1.075V	20= -1.073V	21= -1.071V	22= -1.071V	23= -1.071V	24= -1.071V
10:34	1= +23.1°C	2= +21.5°C	3= +23.2°C	4= -1.071V	5= -1.071V	6= -1.071V	7= -1.071V	8= -1.071V	9= -1.071V	10= -1.071V	11= -1.071V	12= -1.071V
10:33	13= +1.078V	14= +1.077V	15= +1.078V	16= +1.078V	17= +1.079V	18= +1.078V	19= +1.082V	20= +1.079V	21= +1.078V	22= +1.078V	23= +1.079V	24= +1.078V
10:33	1= +23.1°C	2= +21.4°C	3= +23.1°C	4= +1.078V	5= +1.079V	6= +1.079V	7= +1.079V	8= +1.079V	9= +1.078V	10= +1.078V	11= +1.078V	12= +1.078V
10:32	13= +0.684V	14= +0.685V	15= +0.684V	16= +0.684V	17= +0.684V	18= +0.685V	19= +0.686V	20= +0.685V	21= +0.684V	22= +0.683V	23= +0.684V	24= +0.684V
10:32	1= +23.0°C	2= +21.4°C	3= +23.1°C	4= +0.683V	5= +0.684V	6= +0.684V	7= +0.683V	8= +0.683V	9= +0.684V	10= +0.683V	11= +0.683V	12= +0.684V
10:31	13= -0.911V	14= -0.911V	15= -0.911V	16= -0.911V	17= -0.911V	18= -0.911V	19= -0.913V	20= -0.913V	21= -0.911V	22= -0.910V	23= -0.911V	24= -0.911V
10:31	1= +23.0°C	2= +21.3°C	3= +23.0°C	4= -0.911V	5= -0.910V	6= -0.911V	7= -0.910V	8= -0.910V	9= -0.911V	10= -0.911V	11= -0.911V	12= -0.910V
10:30	13= +2.017V	14= +2.017V	15= +2.017V	16= +2.016V	17= +2.017V	18= +2.017V	19= +2.023V	20= +2.019V	21= +2.017V	22= +2.017V	23= +2.017V	24= +2.016V
10:30	1= +23.0°C	2= +21.4°C	3= +23.0°C	4= +2.017V	5= +2.017V	6= +2.017V	7= +2.017V	8= +2.017V	9= +2.017V	10= +2.017V	11= +2.016V	12= +2.017V
LOGGING START 97/05/21												

3.6 Messages

3.6.1 General message

The general message is given mainly to indicate the operation status inside the recorder.

〈LCD Display〉

SETTING NOW !	RANGE now changing over
SETTING PARAMETER	Recorder is now under initializing as per the prameter memoried in MEDIA
LOADING NOW!	Data file is now loading from MEDIA
WAIT CORRECT NOW	Electric zero now under compensation
NO PAPER SET CHART PRESS RECORD KEY	Paper running out. Set in place new recording paper. Press down RECORD key.
EXECUTING CAL6.86 CAL 4.01 CH01 - - - - CH02 - - - - CH03 - - - -	pH unit now under calibration
COMPLETE! TOUCH ANY KEY CAL6.85 CAL4.01 CH01 OK OK CH02 NG OK CH03 OK NG	pH unit already calibrated

〈Print-out indication〉

** TIME PRINT CH NO SELECT **	This message is given when no print channel is set in interval print mode. It is printed on the recording paper. Press down EXTRA MENU → PRINT to print again after having set a print channel.
** MANUAL PRINT CH NO SELECT **	This message is given when no print channel is set in manual print mode. It is printed on the recording paper. Press down EXTRA MENU → PRINT to print again after having set a print channel.
** LOGGING PRINT CH NO SELECT **	This message is given when no print channel is set in logging print mode. It is printed on the recording paper. Press down EXTRA MENU → PRINT to print again after having set a print channel.

3.6.2 Warning messages

These messages are given mainly due to error in operation. Eliminate the cause before operating this recorder again or proceed to another step of operation.

WARNING !! TRANS'T UNIT NOT FOUND	TRANS'T key is pressed down though the transient unit is not installed.
WARNING !! pH UNIT NOT FOUND	pH key is pressed down though the pH unit is not installed.
WARNING !! EC UNIT NOT FOUND	EC key is pressed down though the EC unit is not installed.
WARNING !! SELECT CHANNEL NONE	No display CH is selected though the screen is switched into WAVE The compensation key is pressed down though no CH is selected on electric zero compensation screen.
WARNING !! MAX/MIN LIMIT	The input value from keyboard exceeds the set range.
WARNING !! CHART SPEED SLOW	The print interval time set on the PRINT setting screen is slow in chart speed, so that it is compensated.
WARNING!! AUTO RANGE ON	The key operation is prohibited while auto-range is under operating.
WARNING!! LINK CH	The key operation is prohibited for the channel link setting channel.
WARNING!! INVALID VALUE	Erroneous value is set.
WARNING!! INVALID CHARACTER	Unsuable character is set.
WARNING!! INVALID DATE	Date setting is incorrect.
WARNING!! ALARM MODE ON	The key operation is prohibited while alarm recording is under operating.
WARNING!! CHART SPEED ZERO	The key operation is prohibited when chart speed is set to zero.
WARNING!! CHART SPEED FAST	Setting chart speed is too fast to make operation relating to MEDIA.
WARNING !! ARRIVE 100 FILES	The number of file names written into media for automatic updating arrives to its upper limit of 100.
WARNING!! MEDIA LOADING	The key operation is prohibited during MEDIA loading.

WARNING!! MEDIA SAVING	The key operation is prohibited during MEDIA saving.
WARNING!! MEDIA OPTION NOT FOUND	MEDIA option is not installed.
WARNING!! MEDIA OPERATING	The key operation is prohibited during MEDIA operating.
WARNING!! MEDIA ALARM ON	The key operation is prohibited during MEDIA alarm data saving.
WARNING!! SET REC. FILE NAME	Set the file name for data saving to MEDIA
WARNING!! SAMPLE RATE FAST	The key operation is prohibited because sampling rate for data saving is fast.
WARNING!! NO MEDIA	MEDIA such as floppy disk etc. are not installed to the driver.
WARNING!! MEDIA PROTECT	MEDIA such as floppy disk etc. are not allowed to write.
WARNING!! MEDIA UNFORMAT	MEDIA such as floppy disk etc. are not formatted.
WARNING!! MEDIA FULL	MEDIA such as floppy disk etc. do not have enough vacant capacity to write in.
WARNING!! MEDIA NO FILE	The requested file is not found
WARNING!! READ NOW!	The capacity of MEDIA and the file information are now under loading.
WARNING!! CHART SPEED FAST or ZERO	MEDIA data saving can not be performed because setting chart speed is too fast or is set at zero.
WARNING!! UNIT FAILURE IN n	The unit installed at slot n (1 ~ 12) is failure.

3.6.3 Error messages

Error messages are given when a status which cannot arise under normal conditions or may lead to malfunction is detected.

ERROR !! UNIT INTER-FACE TIME OUT	A time out is generated in communications between SUB and unit.
ERROR !! NO ANSWER PEN MOV FINISH	The finish of the PEN moving command is not detected.
ERROR !! CT [MP] BIT NO ACTIVE	The CT board manual printing is not cleared though a manual print clear signal is output.
ERROR !! CT [CP] BIT NO ACTIVE	The CT board comment printing is not cleared though a comment print clear signal is output.
ERROR !! UNIT NOT FOUND	No unit is installed.
ERROR !! PEN NOT FOUND	PEN is not detected at all.
ERROR !! RS232C FLAMING ERR	Error in RS232C I/F flaming
ERROR !! RS232C OVERRUN ERR	Error in RS232C I/F overrun
ERROR !! RS232C PARITY ERR	Error in RS232C I/F parity
ERROR !! MAIN-CPU NOT READY	MAIN-CPU cannot make communications with SUB.
ERROR !! CHART FEED	Paper is not fed at a specified point.
ERROR!! LOADING TIME OUT	MEDIA load from I/F is failed.
ERROR!! RANGE CHANGE	Range can not be changed-over.

3.7 Relation between chart speed and data saving to data floppy disk
condition : synchronized with chart speed

Chart Speed-	Number of data saving channel								
	1CH	2CH	3CH	4CH	6CH	8CH	10CH	12CH	
10 mm/h	125D00H00M00S	62D12H00M00S	41D16H00M00S	31D06H00M00S	20D20H00M00S	15D15H00M00S	12D12H00M00S	10D10H00M00S	
20	62D12H00M00S	31D06H00M00S	20D20H00M00S	15D15H00M00S	10D10H00M00S	07D19H30M00S	06D06H00M00S	05D05H00M00S	
30	41D16H00M00S	20D20H00M00S	13D21H20M00S	10D10H00M00S	06D22H40M00S	05D05H00M00S	04D04H00M00S	03D11H20M00S	
60	20D20H00M00S	10D10H00M00S	06D22H40M00S	05D05H00M00S	03D11H20M00S	02D14H30M00S	02D02H00M00S	01D17H40M00S	
120	10D10H00M00S	05D05H00M00S	03D11H20M00S	02D14H30M00S	01D17H40M00S	01D07H15M00S	01D01H00M00S	20H50M00S	
180	06D22H40M00S	03D11H20M00S	02D07H33M20S	01D17H40M00S	01D03H46M40S	20H50M00S	16H40M00S	13H53M20S	
300	04D04H00M00S	02D02H00M00S	01D09H20M00S	01D01H00M00S	16H40M00S	12H30M00S	10H00M00S	08H20M00S	
600	02D02H00M00S	01D01H00M00S	16H40M00S	12H30M00S	08H20M00S	06H15M00S	05H00M00S	04H10M00S	
1200	01D01H00M00S	12H30M00S	08H20M00S	06H15M00S	04H10M00S	03H07M30S	02H30M00S	02H05M00S	
10 mm/min	02D02H00M00S	01D01H00M00S	16H40M00S	12H30M00S	08H20M00S	06H15M00S	05H00M00S	04H10M00S	
20	01D01H00M00S	12H30M00S	08H20M00S	06H15M00S	04H10M00S	03H07M30S	02H30M00S	02H05M00S	
30	16H40M00S	08H20M00S	05H33M20S	04H10M00S	02H46M40S	02H05M00S	01H40M00S	01H23M20S	
60	08H20M00S	04H10M00S	02H46M40S	02H05M00S	01H23M20S	01H02M30S	50M00S	41M40S	
120	04H10M00S	02H05M00S	01H23M20S	01H02M30S	41M40S	31M15S	25M00S	20M50S	
180	02H46M40S	01H23M20S	55M33S	41M40S	27M46S	20M50S	16M40S	13M53S	
300	01H40M00S	50M00S	33M20S	25M00S	16M40S	12M30S	10M00S	08M20S	

D : Day H : Hour M : Minute S : Second 1200kbyte

4. Option

4.1 Measuring plug-in Units

5mV DC Voltage/Thermocouple Unit	(FU-911B)
0.5mV DC Voltage/Thermocouple Unit	(FU-913A)
RTD Temperature Unit	(FU-917A)
pH/ORP Unit	(FU-921A)
Electric Conductivity Unit	(FU-922A)
AC Voltage Unit	(FU-941A)
Transient Unit	(FU-961A)
AC Voltage Log Unit	(FU-972A)

4.2 Data Storage Media

FDD (Floppy disk driver)	(FD-9000)
Interface for external MO	(MO-9000)
Interface for Memory Card	(MB-9000)

4.3 Interface

RS-232C Interface	(IF-9000)
GP-IB Interface	(GP-9000)

4.4 DC Power Source Input , Etc.

External Control/Alarm Output Control Board	(CT-9000)
Chart Reroll adapter	(RW-9000)
DC Power Source Input	
12VDC Power Source	(DC-9001)
24VDC Power Source	(DC-9002)
Resistor Adapter	
1KΩ Resistor Adapter	(RA-9001)
1Ω Resistor Adapter	(RA-9002)
Rack Mount	(MM-9000)

4.5 Mount and dismount of chart re-roll adapter

A chart re-roll adapter is used to rewind the printed roll type chart paper to the inside of recorder and shall be handled as follows:

(1) Installing chart paper

Load chart paper to recorder (Refer to Item 3.1.4 Chart Paper Loading)

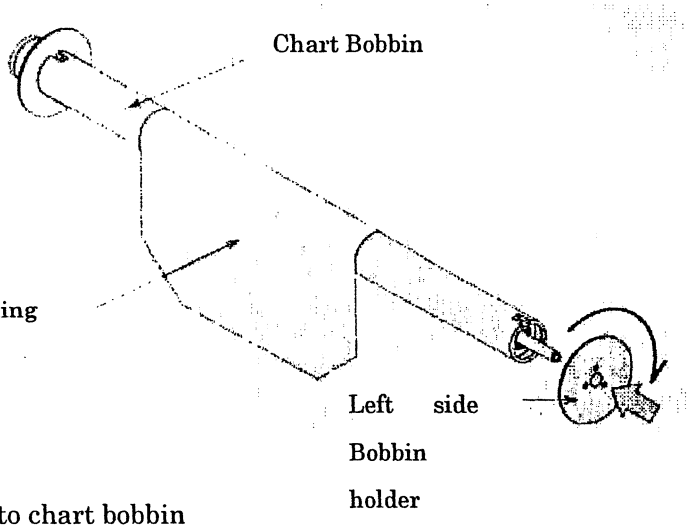
At this moment, the end of chart paper must be led around 30cm forehead so that the end of chart paper can be winded up around chart bobbin.

(2) Setting chart bobbin to re-rolling device

The right end of bobbin holder for re-rolling device is screw-in type.

It can be removed by turning to counter-clock wise direction (left-wise spinning)

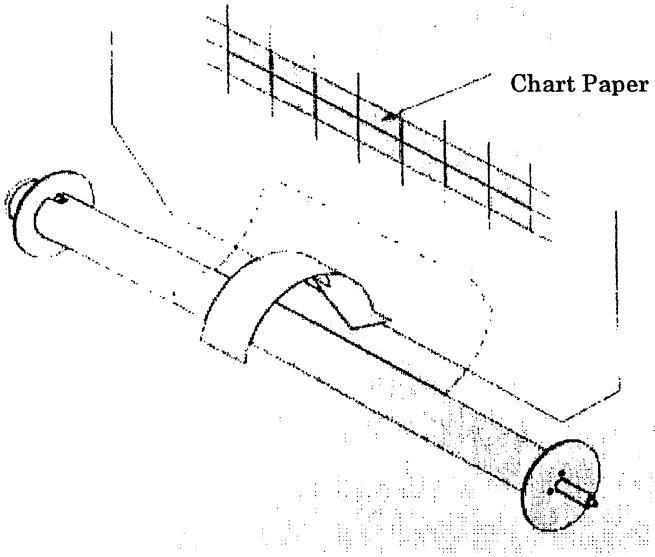
After removing the right end of bobbin holder, insert a chart paper catching paper to the chart bobbin as shown in figure 4.5.1, then screw back the right end of bobbin holder. Also at this moment, adjust and set the chart bobbin so that the cut part at left end of chart bobbin catch the pin at the left end of chart bobbin holder.



(Figure 4.5.1)

(3) Chart paper set to chart bobbin

Insert the chart paper tip between chart bobbin and chart paper catching paper so that the printed surface of the chart paper come to inward then wind up 4 to 5 times to the arrow direction shown in figure 4.5.2



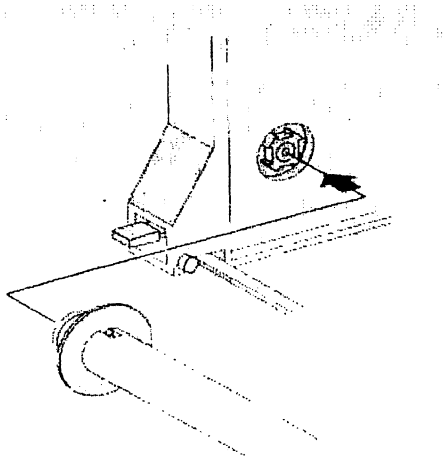
(Figure4.5.2)

(4) Mound and dismount of re-rolling device

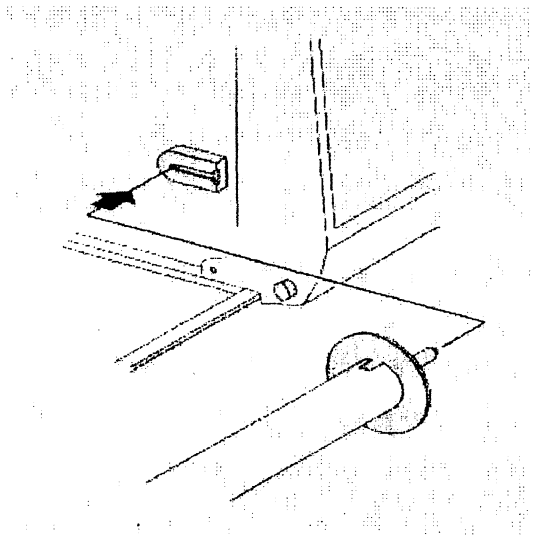
Hold the center portion of the chart bobbin being tangled with chart paper and set the left end of chart re-rolling device (Plate like shape) to the spin bearing part at the left side of the recorder then push it leftward. While pushing, set the right end of chart paper re-rolling device to the bearing parts at right side of recorder. (Figure 4.5.3, Figure 4.5.4)

After mounting, turn the chart re-rolling device to winding direction by hand and wind up the sag chart paper.

When dismounting the device, pull the right end of the device to your side while pushing the device left wise direction, then pick out the left end of the device.



(Figure 4.5.3)



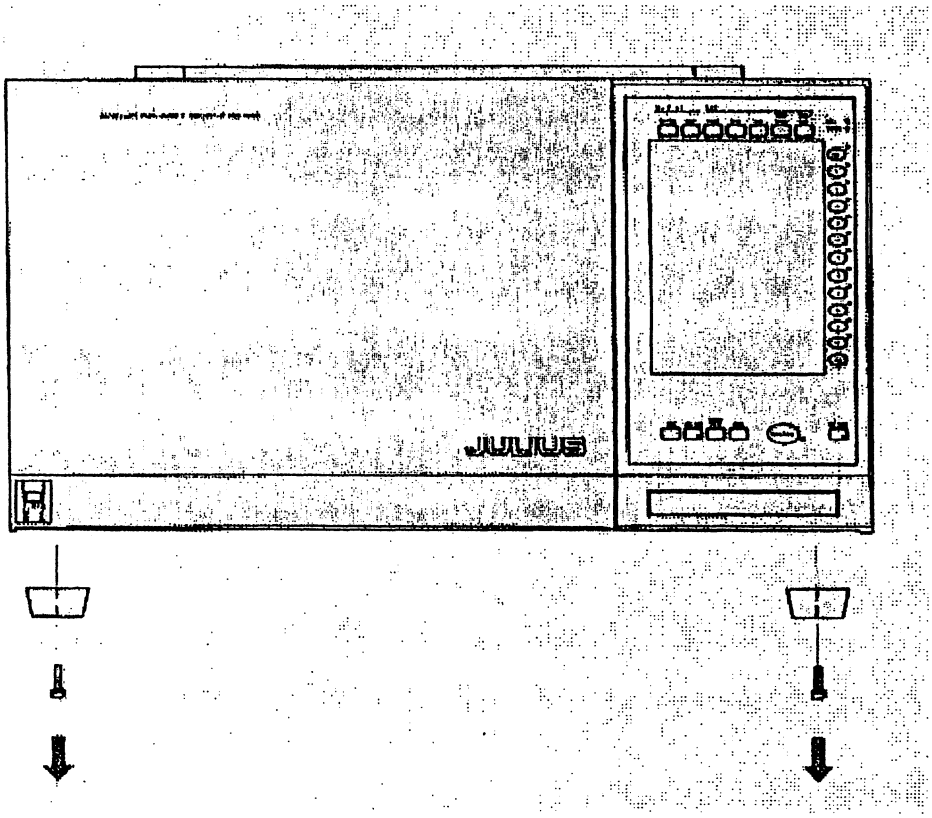
(Figure 4.5.4)

Caution

1. At the moment when mounting the chart re-rolling device to the recorder, be sure that left end of it (plate shape side) catch to the bearing parts at the left side of the recorder firmly.
2. Never give the shock to the recorder such as dropping etc., otherwise, the function of the recorder will not be fulfilled. In the event that the recorder accidentally is dropped, please get in touch with the distributor who you purchased it or us.
3. Always remove the chart re-rolling device when replacing roll type chart paper or when using fold type chart paper. The roll type chart paper can not be installed to the device in the condition that chart re-rolling adapter is mounted on the recorder. And also fold type chart paper can not be folded neatly if chart re-rolling adapter is mounted.

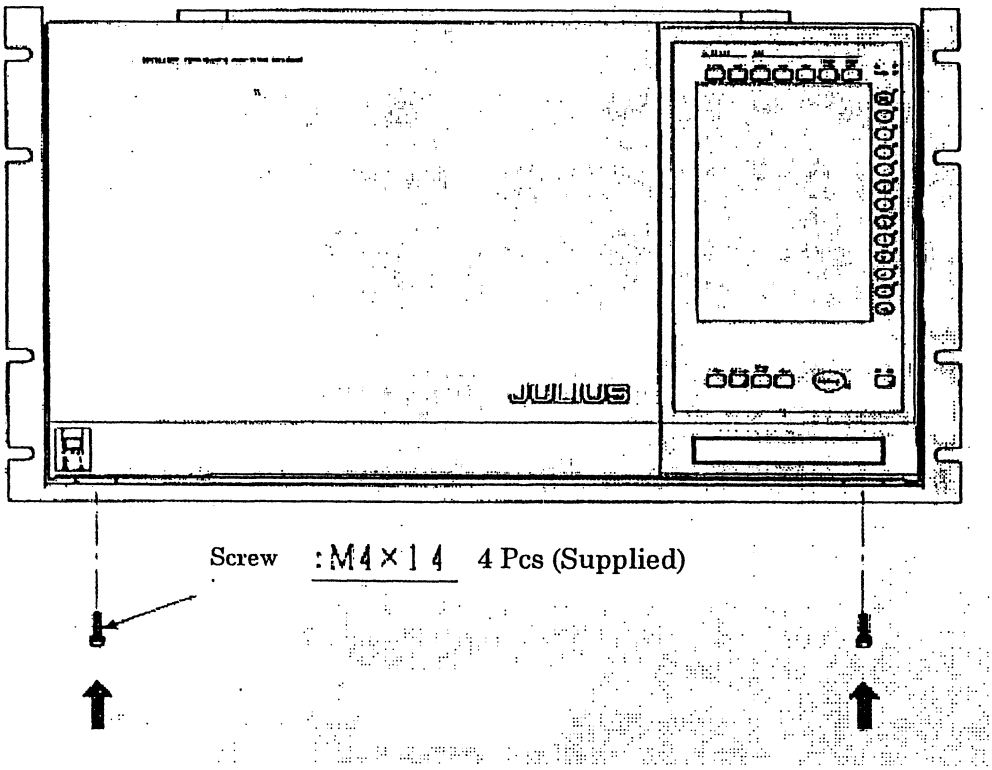
4.5 Installing rack mount

(1) Remove rubber legs from the bottom side of the recorder (Figure 4.6.1)



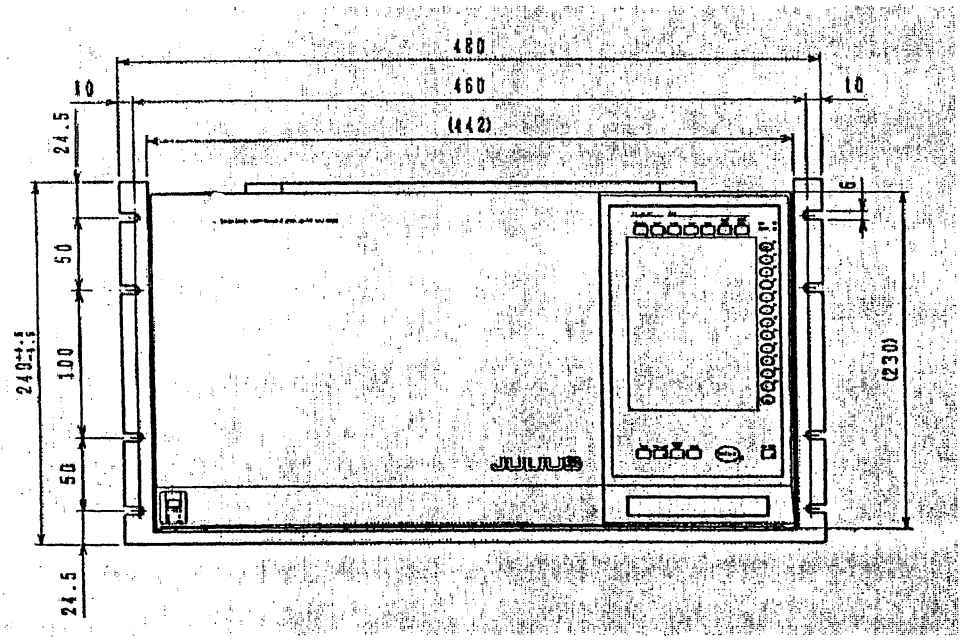
(Figure 4.6.1)

(2) Install the recorder into rack mount and fix it with specified screw (Figure 4.6.2)

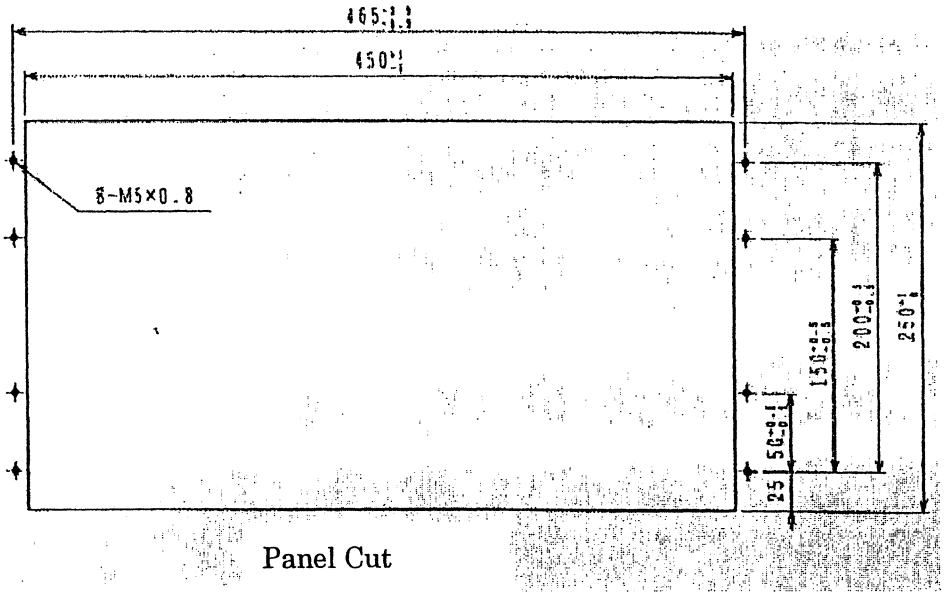


(Figure 4.6.2)

4.6 Dimension of panel cut of rack mount



(Figure 4.7.1)



Panel Cut

(Figure 4.7.2)

5. Maintenance Parts

The following parts are necessary for the maintenance of this recorder :

(1) Recording paper

	Parts number	Note
Recording paper (folded)	SF - 10CXZ – 35	35 m in length, DIN size
Recording paper (rolled)	SF - 10CX	20 m in length, DIN size

Table 5.1.1

(2) Disposable felt pen (The forms are all the same.)

Pen number	Parts number	Color
1	P1201A	Red
2	P1202A	Green
3	P1203A	Blue
4	P1204A	Brown
5	P1205A	Black
6	P1206A	Purple
7	P1207A	Orange
8	P1208A	Pink
9	P1209A	Purple-blue
10	P1210A	Light blue
11	P1211A	Yellow-green
12	P1212A	Yellow

Table 5.1.2

P 1 2 □ □ □

A : Standard
B : High speed
C : Low speed

01 to 12 colors

Standard, high speed and low speed disposable felt pens are prepared, which can be used for each purpose of use by referring to the following data :

Standard : Normal recording at a pen speed of less than 700 mm/S
High speed : High speed recording at a pen speed of 700 mm/S or more.
Low speed : Low speed recording at a pen speed of 120 mm/h or less

(3) Ribbon cassette

Parts number P1101

(4) Memory card

Model	Parts number	Capacity
MC - 512	CSCJ-512K-SM-462	512 kbyte
MC - 1000	CSCJ-001M-SM-462	1 Mbyte
MC – 2000	CSCJ-002M-SW-462	2 Mbyte

* Battery : B. coin type lithium battery (BR2325 manufactured by Matsushita Battery Industry Ltd.)

Table 5.1.3

6. Specifications and List of Standard Accessories

< Recorder >

Operation method	Automatic balancing (digital servo method)
Input	Unit method
Recording method	Disposable felt pen
Effective recording width	250 mm
Recording accuracy	±0.2 % of measurement accuracy + effective recording width (including linearity and insensitive area) * Expansion/contraction of the recording paper excluded
Paper feeding accuracy	± (0.1 % + 0.5 mm)
Pen gap	3.2 mm ± 0.5 mm
Measurement frequency	When MEDIA is not used ..... 5mS ± 1% (10mS ± 1% for the channel exceeding 13CH) When MEDIA is used ..... As per measurement cycle table 6.1
Pen gap compensation	Standard function (print reference, pen reference) (with ON, OFF)

Maximum chart speed to avail PGC as per Channel number

When MEDIA is not used

Installed Channel No.	Maximum chart speed for PGC
13 ~ 24 Ch	400mm/min
9 ~ 12 Ch	600mm/min
5 ~ 8 Ch	800mm/min
1 ~ 4 Ch	1,200mm/min

When Media is used

Installed Channel No.	Maximum chart speed for PGC
13 ~ 24 Ch	100mm/min
7 ~ 12 Ch	120mm/min
1 ~ 6 Ch	200mm/min

Maximum pen speed	1600 mm/sec. ±10 %(on AC power supply)
Chart speed	10, 20, 30, 60, 120, 180, 300, 600 and 1200 mm/h & min (adjustable at 1mm step in the above range)
Chart feed	Approx. 300mm/min. slow-up system
Recording paper	Foled paper Type : SF-10CXZ-35 (Conforming to DIN, 35 m) Rolled paper Type : SF-10CX (Conforming to DIN, 20 m)
Chart end detection	Pen housed into pen rest, remaining record paper discharged and "pen select key" LED lit during use
Zero position	Free setting
Swing-out protection	Electronic limiter
Clock	Monthly gap of ±30 seconds or less (at 25℃)
Display	
Displaying part	LCD (320x240 dots) with back light and auto-off functions
Channel extension	1P(MAX2CH), 2P(MAX4CH), 3P(MAX6CH), 4P or more(MAX24CH)
Span	Free setting
Auto-range down	Sensitivity down direction range switching * Only for DC voltage measurement
Auto-shift	±1 span shift (in a range of ±1 span of measurement range) * Only for DC voltage and temperature mesurement
Zone record	Manual/Auto (separate)
Logging record	1 to 59 min, 1 to 24 h
Alarming function	Start/stop level setting (upper limit, lower limit, upper and lowr limit, intermediate level)
Chart speed change	Switching from chart speed 1 to chart speed 2 as alarmed
Physical quantity	Free physical quantity unit input, free physical quantity scale input

Printing

Printing method	Wire-dot method
Printing speed	About 90 cps
Interval printing	LINE, EACH Adjustable frequency (1 to 59 min, 1 to 24 h) When the day advances by one, the date and month rae printed in place of hour The year, month and date are printed as the chart is stopped.
Alarm printing	Channel number alarm level printed as alarmed
Comment printing	COMMENT (1) ..... Printed as the comment print key is pressed down COMMENT (1) to (5) Printed through GP-IB, RS-232C interface
Manual printing	Time, channel number and measured value printed
TAG No. printing	Free setting of six characters at maximum
PGC printing	Printed as PGC is put to ON/OFF
Range printing	Printed as the range is changed
Chart speed printing	Printed as the chart speed is changed Printed as the chart starts
List printing	Setting conditions printed
Channel link function	Four arithmetical operations (+, -, * , /, =)
Working range	Temperature of 0 to 40°C, humidity of 40 to 80% RH Note) FDD in the range of 10 to 40°C and 40 to 80% RH
Insulating resistance	100MΩ or more at 500V DC between power cable and case, input terminal and case
Power supply	100V AC system (85V AC to 132 V)
Specified as ordered)	200V AC system (170V AC to 250 V)
DC power supply (option)	12V DC (11V DC to 15 V)
DC power supply (option)	24V DC (mountable only for 1 to 4P)
Power consumption	

Number of pens		1P	2P	3P	4P	6P	8P	10P	12P	
Maximum	AC	About 90	105	120	140	180	200	220	240	VA
	DC	About 50	60	70	80	90	110	125	135	W
Balance	AC	About 45	48	51	54	60	70	80	90	VA
	DC	About 25	27	29	31	35	40	45	50	W

* As standard specification (without option)

Outer dimensions 438 (W) x 230 (H) x 334 (D) ± 1 mm
* Protrusions (handle, leg, unit) not included

Weight

1P	2P	3P	4P	6P	8P	10P	12P	
10.2	10.5	11.0	11.4	12.2	13.0	13.7	14.5	±1 kg

* As standard specification (without option)

Standard accessories

Recording paper 35 m, folded (SF-10CXZ-35)	1 set
Disposable felt pen	1 pce./pen
Ribbon cassette (P1101)	1 pce.
Power supply cord (with conversion plug)	1 pce.
Instruction manual	1 vol.

※ Measurement cycle, data saving sampling rate and data dicharaging speed when using MEDIA

	Installed Channel No.	Measuring Cycle (Standard ±1%)	Sampling rate to MEDIA (Maximum)		Maximum printing out speed to chart paper from MEDIA
			Synchronized to chart speed	Free	
Channel Link not used	13ch or more	10mS	150mm/min or less	20mS	150mm/min
	12ch or less	10mS	300mm/min or less	10mS	300mm/min
Channel Link is used (Only equal sign)	13ch or more	30mS	100mm/min or less	30mS	75mm/min
	7 to 12 ch	20mS	150mm/min or less	20mS	150mm/min
	1 to 6 ch	15mS	200mm/min or less	15mS	200mm/min
Channel Link is used (Arithmetic Operation)	13ch or more	40mS	75mm/min or less	40mS	75mm/min
	7 to 12 ch	30mS	100mm/min or less	30mS	150mm/min
	1 to 6ch	20mS	150mm/min or less	20mS	200mm/min
ZONE/PGC Are used	13ch or more	10mS	100mm/min or less	30mS	100mm/min
	7 to 12 ch	10mS	120mm/min or less	25mS	120mm/min
	1 to 6 ch	10mS	200mm/min or less	15mS	200mm/min

Table 6. 1

<Input Unit Standard>

5 mV DC voltage/thermocouple unit (V, TC) (FU-911A)

Measuring range

Voltage ±5, 10, 25, 50, 100, 250 mV
±0.5, 1, 2.5,5, 10, 25, 50, 100 V

Thermocouple K (-200 to 1300 °C)
T (-200 to 400 °C)
R (0 to 1700 °C)
E (-200 to 1000 °C)
J (-200 to 1200 °C)
S (0 to 1700 °C)
B (0 to 1800 °C) .... (standard gurantee range : 400 to 1800 °C)

Measuring accuracy (working temperature)

Voltage ± (0.05 % of rdg + 0.1 % of range)
Thermocouple (K,E, J, T) ± (0.1 % of rdg + 0.5 °C)
(R, S, B) ± (0.1 % of rdg + 1.0 °C)

Reference contact temperature compensation accuracy ± 1.0 °C ..... K, E, J, T
± 1.5 °C ..... R, S, B

* With temperature compensation ON/OFF)

Thermal factor

Voltage Zero : 0.6 μ V/°C + 0.01% of range/°C
F S : 0.01% of range/°C

Thermocouple (K,E,J,T) Zero : 0.005 °C/°C + 0.01% of range/°C
F S : 0.01% of range/°C

(R,S,B) Zero : 0.006 °C/°C + 0.01% of range/°C
F S : 0.01% of range/°C

Maximum input voltage 200V DC

Input resistance 1 MΩ ± 1%

Allowable signal source resistance 1 kΩ or less

* The term "range" indicates the range (full span) where the record can be made.
For example, a range of ±5 mV has a measuring width of 10 mV (full span), that is, range=10 mV.

<Input unit option>

0.5mVDC voltage/thermocouple unit (FU-911B)

Reference contact temperature compensation accuracy	± 0.5 °C	K, E, J, T
	± 1.0 °C	R, S, B

* With temperature compensation ON/OFF)

Other specification than above remain same with FU-911A

0.5 mV DC voltage/thermocouple unit (FU-913A)

Measuring range		
Voltage	±0.5, 1, 2.5,5, 10, 25, 50, 100, 250 mV	
	±0.5, 1, 2.5,5, 10, 25, 50, 100, 250 V	
Thermocouple	K (-200 to 1300 °C)	
	T (-200 to 400 °C)	
	R (0 to 1700 °C)	
	E (-200 to 1000 °C)	
	J (-200 to 1200 °C)	
	S (0 to 1700 °C)	
	B (0 to 1800 °C)	(standard gurantee range : 400 to 1800 °C)
	WRe (0 to 2300 °C)	
	AFe (0 to 300K)	(standard gurantee range : 1 to 300K)
Measuring accuracy (working temperature)		
Voltage	± (0.05 % of rdg + 0.1 % of range + 1.5 μ V)	
Thermocouple (K,E, J, T)	± (0.1 % of rdg + 0.5 °C)	
(R, S, B)	± (0.1 % of rdg + 1.0 °C)	
(WRe)	± (0.2 % of rdg + 1.0 °C)	
(AFe)	± (0.1 % of rdg + 0.5 K)	
Reference contact temperature	± 0.5 °C	K, E, J, T
compensation accuracy	± 1.0 °C	R, S, B, WRe
	± 0.5 K	AFe

* With temperature compensation ON/OFF)

Thermal factor	
Voltage	Zero : 0.6 μ V/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
Thermocouple (K,E,J,T)	Zero : 0.005 °C/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
(R,S,B)	Zero : 0.006 °C/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
(WRe)	Zero : 0.12 °C/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
(AFe)	Zero : 0.1 K/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
Filter	0.1 Hz, 1 Hz, OFF
Maximum input voltage	250V DC
Input resistance	1 MΩ ± 1%
Allowable signal source resistance	1 kΩ or less
Input cord with 3P plug	Attached

* The term "range" indicates the range (full span) where the record can be made.
For example, a range of ±0.5 mV has a measuring width of 1mV (full span), that is, range=1mV.

Transient unit (FU-961A)

Measuring range	±5, 10, 25, 50, 100, 250 mV
	±0.5, 1, 2.5, 5, 10, 25, 50, 100V
Measuring accuracy (working temperature)	± (0.2 % of rdg + 0.2 % of range)
Thermal factor	Zero : 1.5 μ V/°C + 0.01% of range/°C
	F S : 0.01% of range/°C
Maximum input voltage	200V DC
Input resistance	1 MΩ ± 1%

Allowable signal source resistance	1 kΩ or less	
Frequency characteritics	DC to 1 kHz (-3 dB)	
Sampling rate	100 μ s (20ms/DIV) to 1s (200s/DIV)	(as stored onto memory)
Memory capacity	16 kbyte of data	
Trigger level	Upper limit, lower limit, upper and lower limit, intermediate level	
Pre-trigger	OFF/ON (10%)	
Trigger conditions	SINGLE/REPEAT	

* Trigger can be set for each channel (OR trigger)
* The term "range" indicates the range (full span) where the record can be made. For example, the range of ±5 mV has a measuring width of 10 mV (full span), that is, range=10 mV.

Temperature measuring resistor unit (FU-917A)

Measuring range	Pt 100 (-200 to 850 °C)	
	JPt 100 (-200 to 649 °C)	
Measuring accuracy (working temperature)	± (0.1 % of rdg + 0.2°C)	
Thermal factor	Zero : 0.01% of range/°C	
	F S : 0.01% of range/°C	

pH/ ORP unit (FU-917A)

pH

Measuring range	pH0.00 to pH14.00	
Resolution	pH0.01pH	
Temperature compensation	Automatic	
Calibration	pH4, 7 automatic calibration	
Usable electrode	GST-2419C (Plastic body)	Separately sold
	GST-2411C (Plastic body)	Separately sold
Inner solution for reference electrode	3.3mol/L KCl Solution (500mL) KCL-3.3N	Separately sold

ORP

Measuring range	-2,000mV to 2,000mV	
Resolution	1mV	
Usable electrode	PST-2019C	Separately sold
Inner solution for reference Electrode	3.3mol/L KCl Solution (500mL) KCL-3.3N	Separately sold

Electric conductivity unit

Measurable range		
Electric conductivity	0 to 20.00 S/m	
Temperature	0 to 99.9 ℃	
Measuring range	0 ~ 2.000 mS/m	J=100
	0 ~ 20.00 mS/m	
	0 ~ 200.0 mS/m	
	0 ~ 2.000 S/m	
	0 ~ 20.00 mS/m	J=1000
	0 ~ 200.0 mS/m	
	0 ~ 2.000 S/m	
	0 ~ 20.00 S/m	
Range selection	Automatic/manual	
Temperature compensation	Automatic	
Temperature coefficient	2%/℃	
Reproducibility	2% F.S.	
Usable EC cell	CVP-101P (J=100)	Separately sold
	CGP-110P (J-1000)	Separately sold
Electrode stand	S-STD-S	Separately sold
Electrode holder	EH-10PS	Separately sold
Throw-in holder	AN-10PS	Separately sold

AC voltage unit (FU-941A)

Measuring range	10, 20, 50, 100, 200 mV rms 0.5, 1, 2, 5, 10, 20, 50 V rms
Measuring accuracy (working temperature)	± 2% of range (at 1 kHz)
Thermal factor	0.05% of range/°C
Frequency characteristics (working temperature)	± 1 dB or less with reference to 1 kHz
Frequency range	10 Hz to 100 kHz
Maximum input voltage	50V AC (rms)
Input impedance	2 MΩ ± 5 %, parallel capacity of 40 pF or less (excluding the measuring lead wire)
Input mode	Unbalanced, BNC terminal
Input cord with BNC	Attached

* The term "range" indicates the range (full span) where the record can be made. For example, the range of 10 mV has a measuring width of 10 mV (full span), that is, range=10 mV.

AC voltage logarithmic unit (FU-972A)

Measuring range	0 to -40 dBm	(775 to 7.75 mVrms)
	-20 to -60 dBm	(77.5 to 0.775 mVrms)
	on condition that 0 dBm = 600 Ω, 775 mVrms sine wave	
Compression ratio	40 dB	
Compression accuracy (working temperature)	± 0.5 dB or less (at 1 kHz)	
Thermal factor	0 to -30.00 dBm	0.12 dBm//°C
	-30.01 to -60.00 dBm	0.24 dBm//°C
Frequency characteristics (working temperature)	± 0.5 dB or less with reference to 1 kHz	
Frequency range	20 Hz to 20 kHz	
Input impedance	1 MΩ ± 5 %, parallel capacity of 70 pF or less (excluding the measuring lead wire)	
Input mode	Unbalanced, BNC terminal	
Input cord with BNC	Attached	

< Memory MEDIA Option>

FDD (FD-9000)

FD in use	3.5 inch 2HD
Data capacity	MS-DOS (PC98) Data of about 510 kbyte MS-DOS (IBM) Data of about 510 kbyte
Format	MS-DOS (PC98/IBM)
Saving channel setting	Data can be saved from any channel.
Sampling frequency	Synchronized with chart speed(CHART) * As per table 6.1 Synchronized with logging (LOGGING) : 1 to 59 min, 1 to 24h Separate sampling (FREE) : Max. to 999ms, 1 to 59 sec. 1 to 59min. 1 to 24h, * Maximum rate is as per table 6.1
Number of files	Setting information files 10 files Setting information files + Measurement information files 100 files
Automatic file updating	File name automatically updated (with MANUAL/AUTO chang-over)
Remaining capacity display	Remaining capacity displayed after saving CH and sampling speed have been decided
Alarming function	FD started/stopped on alarming conditions * with holding function
Timer function	FD started/stopped on timer conditions * Storage starting and stopping time setting (year/month/hour/minute/second)
Interval storage function	FD started/stopped on interval storage conditions * Measurement frequency : 1 to 59 min, 1 to 24 h Storage time : 1 to 59 min, 1 to 24 h Measurement frequency > storage time
Paper less storage function	Storage onto FD started as paper less is detected

Memory card (MB-9000)

Memory card in use	JEIDA 4.0 or more (512k, 1M, 2M byte, SRAM) * Only the cards supplied by HIOKI (Separately sold)
Format	MS-DOS
Saving channel setting	Data can be saved from any channel.
Sampling frequency	Synchronized with chart speed(CHART) * As per table 6.1 Synchronized with logging (LOGGING) : 1 to 59 min, 1 to 24h Separate sampling (FREE) : Max. to 999ms, 1 to 59 sec. 1 to 59min. 1 to 24h, * Maximum rate is as per table 6.1
Number of files	Setting information files 10 files Setting information + Measurement information files 100 files
Automatic file updating	File name automatically updated (with MANUAL/AUTO chang-over)
Remaining capacity display	Remaining capacity displayed after saving CH and sampling speed have been decided
Alarming function	Memory card started/stopped on alarming conditions * with holding function
Timer function	Memory card started/stopped on timer conditions * Storage starting and stopping time setting (year/month/hour/minute/second)
Interval storage function	Memory card started/stopped on interval storage conditions * Measurement frequency : 1 to 59 min, 1 to 24 h Storage time : 1 to 59 min, 1 to 24 h Measurement frequency > storage time
Paper less storage function	Storage onto memory card started as paper less is detected

External optical disk interface (option)

MO in use	3.5 inch, 230 Mbyte
Format	MS-DOS
Saving channel setting	Data can be saved from any channel.
Sampling frequency	Synchronized with chart speed(CHART) * As per table 6.1 Synchronized with logging (LOGGING) : 1 to 59 min, 1 to 24h Separate sampling (FREE) : Max. to 999ms, 1 to 59 sec. 1 to 59min.

1 to 24h, * Maximum rate is as per table 6.1

Number of files	Setting information files 20 files Setting information + Measurement information files 100 files
Automatic file updating	File name automatically updated (with MANUAL/AUTO chang-over)
Remaining capacity display	Remaining capacity displayed after saving CH and sampling speed have been decided
Alarming function	MO disk started/stopped on alarming conditions * with holding function
Timer function	MO disk started/stopped on timer conditions * Storage starting and stopping time setting (year/month/hour/minute/second)
Interval storage function	MO disk started/stopped on interval storage conditions * Measurement frequency : 1 to 59 min, 1 to 24 h Storage time : 1 to 59 min, 1 to 24 h Measurement frequency > storage time
Paper less storage function	Storage onto MO disk started as paper less is detected
External MO driver in use	MO driver with SCSI-2 interface (our recommendation) – (separately sold)

<Interface Option>

GP-IB interface (GP-9000)

Standard	Conforming to IEEE 488-1978
Listener function	Setting input (ASCII) (Power ON/OFF, key lock ON/OFF expanded/contracted recording paper compensation and electric zero excluded)
Talker function	Measured value output Data output onto FD, memory card and MO
GP-IB cable in use	408JE-101 (1 m)

RS-232C interface cable (option)

Standard	Conforming to EIA RS-232C
Mode	Setting input (ASCII) (Power ON/OFF, key lock ON/OFF) Measured value input (expanded/contracted recording paper compensation and electric zero excluded) Data output onto FD, memory card and MO
Transmission rate	2400/48000/9600 bps, half-duplex, start-stop synchronization
RS-232C cable in use	MCA-13P-25P (M) - 2000K (2 m)

<Other options>

External control/alarm output unit (CT-9000)

Control items	Chart start/stop First/second chart speed switching Feed Record ON/OFF Manual print Comment print EXT trigger pulse input Simultaneous dip mark input FD, memory card or MO file close (for UPS) ☆ TTL level (Schmit trigger gate input pulled up by 10 kΩ Chart speed control by external clock Low level -10 to 0.5 V High level 4.5 to +10 V Pulse width 1 ms or more Chart END output TTL level [Low level (OUTPUT CURRENT) 8 mA or less] Paper feeding sychronized pulse output TTL level [Low level (OUTPUT CURRENT) 8 mA or less]

(Low level width : about 1 ms)

Alarm output	Relay contact output as alarmed 24V 1A or less 120V AC, 0.5 A or less
Connector in use	57K-30500S-7

Resistor adaptor (option)

1 kΩ resistor Adapter (RA-9001)	
Voltage conversion accuracy	±0.2 % (as connected with voltage unit)
Maximum input current	±250 μ A
1 Ω resistor Adapter (RA-9002)	
Voltage conversion accuracy	±0.2 % (as connected with voltage unit)
Maximum input current	±250 mA) Winding unit (option)

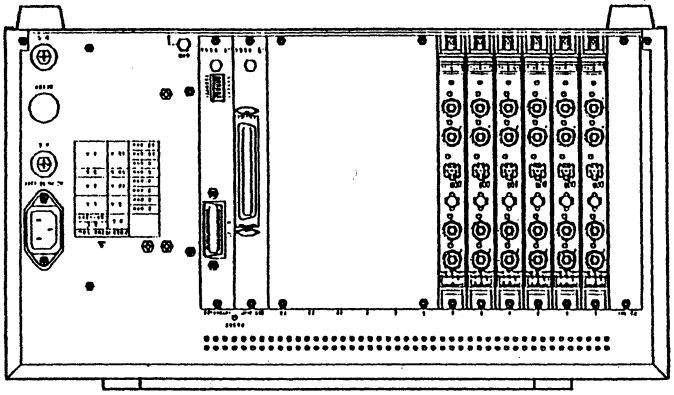
DC Power Source Input

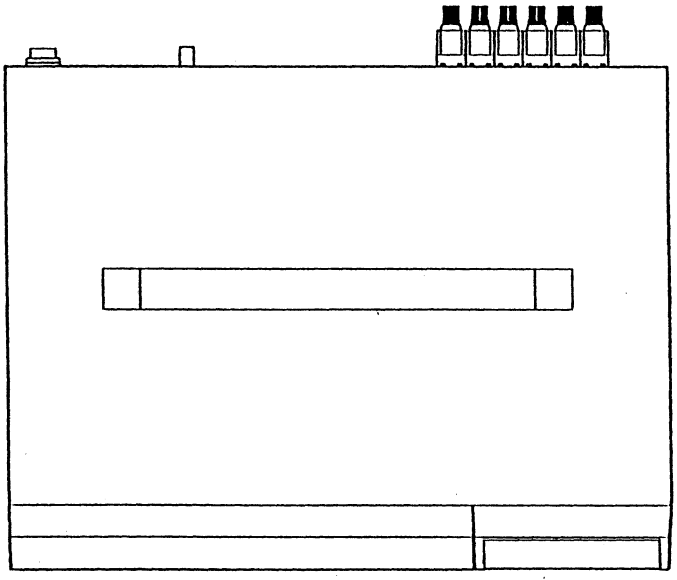
DC-12V Power Input (DC-9001)	
Input voltage range	11VDC to 15VDC
Install-able model	All Julius Recorder
DC-24V Power Input(DC-9002)	
Input voltage range	20VDC to 32VDC
Install-able model	All Julius Recorder

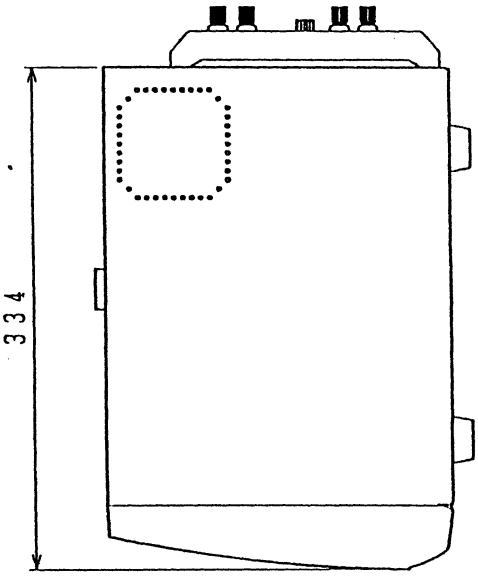
Roll Type Chart Paper Re-winding Device (RW-9000)

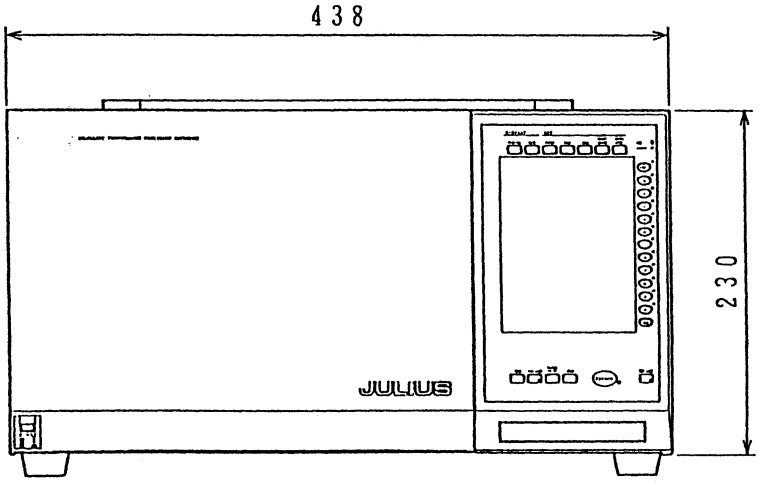
Using chart Paper	SF-10CX Comforms to DIN standard 20m length roll type chart paper.

7. External View (INR-9000 Series, 1 to 12 pens)









HIOKI INR-9000 Series
(INR-9011,9021,9031,9041,9061,9081,9101,9121)
INTELLIGENT RECORDER
Instruction Manual

Publication date: November 2006 Edition 1

Edited and published by HIOKI E.E. CORPORATION
Technical Support Section

All inquiries to International Sales and Marketing Department
81 Koizumi, Ueda, Nagano, 386-1192, Japan
TEL: +81-268-28-0562 / FAX: +81-268-28-0568
E-mail: os-com@hioki.co.jp
URL http://www.hioki.co.jp/

Printed in Japan IN9011A981-00

HIOKI

HIOKI E. E. CORPORATION

HEAD OFFICE
81 Koizumi, Ueda, Nagano 386-1192, Japan
TEL +81-268-28-0562 / FAX +81-268-28-0568
E-mail: os-com@hioki.co.jp / URL http://www.hioki.co.jp/

HIOKI USA CORPORATION
6 Corporate Drive, Cranbury, NJ 08512, USA
TEL +1-609-409-9109 / FAX +1-609-409-9108

IN9011A981-00 06-11H

Printed on recycled paper