

BUILT-IN INPUT MODULES
PAPERLESS RECORDER
Models: 73VR2102 / 73VR2104 / 73VR2106
73VR2108 / 73VR2110 / 73VR2112

Users Manual



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INTRODUCTIONS

Thank you for choosing M-System's Paperless Recorder.

The Users Manual for models 73VR2102, 73VR2104, 73VR2106, 73VR2108, 73VR2110 and 73VR2112 (hereafter referred to as '73VR21x') will guide you through the software program views and functions, including not only its operations but also the hardware installation and wiring. Please read this manual carefully to ensure the safe use before getting started.

In addition to this document, the following are its companion documents, each providing helpful instructions and suggestions for configuring and using the 73VR21x. They are available in a CD-ROM package, 73VRPAC2, that came with your product.

Title	Document No.	Details
73VR21x Users Manual	EM-7395-B	Basic users manual explaining how to set up the 73VR21x hardware and the software, and its operations.
73VR21BLD Users Manual	EM-7395-C	Focuses on the features and operation of the PC configuration program named 73VR21x Configuration Builder.
73VRWV Users Manual	EM-7394-D	Focuses on the features and operation of the PC program named 73VR Data Viewer.
73VR21x Modbus/TCP Reference Guide	EM-7395-D	Focuses on the Modbus/TCP specifications and functions supported by the 73VR21x.

If you intend to use the 73VR21x in the following environments or conditions, redundant and/or failsafe system designs should be used to ensure the proper degree of reliability and safety.

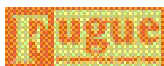
- Environments or conditions which are not defined in this manual
- Nuclear power control devices, railway control devices, aircraft control devices, transportation vehicles, fuel control equipment, medical equipment, recreational equipment, safety equipment, and other critical equipment for which safety must be secured according to relevant laws.
- Those devices which inherently require extremely high level of safety and reliability.

PACKAGE INCLUDES...

REF	ITEM	QUANTITY
1.	Paperless Recorder	(1)
2.	Mounting bracket*	(2)
3.	73VRPAC2 CD-ROM	(1)
4.	73VR21x Startup Guide	(1)

*Not included for desktop type.

The product embeds Fugue Flash File System Solution provided by Kyoto Software Research, Inc.



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1. GENERAL DESCRIPTIONS

■ DATA RECORDING FUNCTIONS

Number of input channels:	73VR2102: 2 points 73VR2104: 4 points 73VR2106: 6 points 73VR2108: 8 points 73VR2110: 10 points 73VR2112: 12 points
Input signals:	Analog: DC mV and voltage, thermocouple and RTD Discrete: Trigger input (1 point)
Storing rate:	100 millisc., 500 millisc., 1 sec., 2 sec., 5 sec., 10 sec., 1 min., or 10 min.
Data storing method:	Normal, Auto, Event recording or Remote trigger
Data form:	Binary, floating or short integer
Data storage:	CompactFlash (CF) Card

■ DATA DISPLAY FUNCTIONS

• Trend View — Shows data stored in real time on the trend graphs.

Display channels:	2, 4, 6, 8 points per view selectable
Number of display views:	4 views
Display rate:	1 sec.
Chart direction:	Perpendicular or Horizontal
Chart speed:	4, 1, 1/5, 1/32, 1/160, 1/480, 1/960
Graph line thickness:	Normal or Thick
Digital display:	Shows momentary values on the digital indicators
Alarm display:	Shows alarm status for all displayed pens
Scale:	Linear or Square root; Scales in an engineering unit is selectable.
Comment:	Shows comments inserted on the trend graph.

• Overview — Shows real-time data for all channels.

Display channels:	2, 4, 6, 8, 16 points per view selectable
Display rate:	1 sec.
Data display items:	Analog: Tag name, alarm status, momentary value (bargraph) Discrete: Tag name, alarm status, momentary value
Detailed data display:	Analog: Tag name, momentary value (bargraph + digital indicator), alarm event date/time (trigger & reset) Discrete: Tag name, momentary value, alarm event date/time

• Bargraph View — Shows data stored in real time on the bargraphs.

Display channels:	2, 4, 6, 8 points per view selectable
Number of display views:	4 views
Display rate:	1 sec.
Bar direction:	Perpendicular or Horizontal
Digital display:	Shows momentary values on the digital indicators
Alarm display:	Shows alarm status for all displayed pens
Scale:	Linear or Square root; Scales in an engineering unit is selectable.

• Retrieve View — Shows data stored in the CF Card.

Display channels:	2, 4, 6, 8 points per view selectable
Number of display views:	4 views
Retrievable data:	Those stored in the CF Card
Long span view:	Thins data out to show data for a longer time span on the chart
Data search:	By scrolling the window; by specifying the time index; or by specify a search parameter (Maximum or Minimum)
Data read out:	When a part of the screen for a specific time index is touched, digital indicators appear on the screen indicating the data at the specified time.

• **Alarm History — Shows alarm event information.**

Number of display views:	1 view
Displayed events:	16 events
Data display items:	Alarm event date/time (trigger & reset), tag name, pen No., alarm message
Search:	By scrolling the window or by specifying the time index
Acknowledge:	Individual or all events
Update:	Automatic
Jump:	Data at the time of an alarm event can be called up by specifying the event on the screen.

• **Comment History**

Number of display views:	1 view
Displayed comments:	16 comments
Data display items:	Comment and date/time
Search:	By scrolling the window or by specifying the time index
Jump:	Data at the time of the comment can be called up by specifying the comment on the screen.

■ **OPERATION FUNCTIONS**

Number of channels:	12 points
Operations:	Arithmetic: Addition/subtraction, Multiplication, Division Logical: AND, OR, NOT, XOR Mathematical: Square root, Power Accumulation: Analog accumulation Filter: Moving average, First order lag Peak hold: Peak (maximum value) hold, Peak (minimum value) hold F value calculation: F value calculation Others: Anemoscope (16 directions)
Alarm:	Alarm trip can be programmed for calculated results.

■ **ALARM**

Alarm setting:	Analog: 4 Upper (high) and Lower (low) alarm setpoints are selectable for each channel. Discrete: ON or OFF bit status alarm for each channel.
Deadband:	Analog: Deadband (hysteresis) is selectable in engineering unit value. Discrete: Delay time can be specified.
Output:	To the alarm output terminal (1 point)
Alarm history record:	Stored in the CF Card: Date/time of alarm events (trigger & reset), tag name and pen No., alarm message. Number of stored alarm events depends upon the CF Card capacity.: 250 events with 128 MB, 500 events with 256 MB, 1000 events with 512 MB or 1 GB

■ **ETHERNET CONNECTIVITY**

Real time communication:	Transmits specific data to a host PC installed with the PC Recorder Software (model: MSR128).
FTP communication:	Transmits data stored in the CF Card using the FTP protocol to a host PC by the 73VR Data Viewer (model: 73VRWV) installed in it. Data can be transmitted even during recording.
Download, Upload:	A software configuration created on the 73VR21x Configuration Builder (model: 73VR-21BLD) can be downloaded to the 73VR21x. The configuration set up on the 73VR21x can be uploaded and displayed on the 73VR21BLD.
Modbus:	Communicates with the host PC using Modbus/TCP protocol. Detailed information is provided in 73VR21x Modbus/TCP Reference Guide.

■ OTHER FEATURES

Operation Lockout:	With a password setting, unauthorized operations on the Trend View, Bargraph View and Overview can be locked out.
Data File Used Volume Information:	A bargraph with % indication is provided on the screen to show how much percent of the data file memory has been used up. 0 – 49% used: Green bargraph 50 – 79% used: Amber bargraph 80 – 100% used: Red bargraph
Hot Swapping of the CF Card:	The CF Card is hot swappable: removable during data recording. However, there may be a slight disturbance in storing rate when the card is inserted.
Screen Saver:	The backlight is automatically turned off if the screen is untouched for a certain time period.
Bus Error Alert:	An alarm is output at the alarm output terminal in case of internal bus error.
Writing/Reading Setting:	The 73VR21x's present setting can be stored in a USB flash-memory. Setting stored in the memory can be read in to the 73VR21x.
Hardware Configurations:	Burnout, Cold junction compensation, AD conversion mode, Line noise filter setting
Field Calibration:	Zero and span adjustments are available by each channel.

NOTE

Please refer to the MSR128, 73VR21BLD and the 73VRWV Users Manuals for more information about respective software features.

2. BEFORE GETTING STARTED

2.1 POINTS OF CAUTION

■ CONFORMITY WITH EC DIRECTIVES

- This equipment is suitable for use in a Pollution Degree 2 environment and in Installation Category II. Reinforced insulation (alarm output to RUN contact output to power input to FG/Ethernet/RS-485: 300V) is maintained.* Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- The equipment must be mounted on a panel surface. Once mounted on a panel, take appropriate precautions to prevent operators to be exposed to the terminal block*.
In order to enable the operator to turn off the power input immediately, install a switch or a circuit breaker according to the relevant requirements in IEC 60947-1 and IEC 60947-3 and properly indicate it*.
- Altitude up to 2000 meters*
- Insert noise filters for the ports explained below.
 - For the power source, input, and LAN cable connected to the unit, NEC Tokin ESD-SR-250 or equivalent model is recommended.
 - For the power source and input connected to the unit, COSEL NAC-06-472 or equivalent model is recommended.
 - Be sure to connect the unit's FG terminal to the ground terminal of the filter, which is inserted in the power source, and connect the ground terminal of the filter to the most stable grounding point with shortest length.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures to ensure the CE conformity.

*Except desktop type

■ SAFETY PRECAUTION

- Before you remove the module, turn off the power supply and input signal for safety.
- Do not use the 73VR21x in an environment where flammable gases are present. This may result in an explosion.
- Do not disassemble or modify the 73VR21x in any way. Doing so may result in a fire or an electrical shock.
- Do not strike the panel of the 73VR21x with a hard, heavy or pointed object, or press the panel with excessive force. Doing so may result in panel damage or injury.
- Do not block the 73VR21x's ventilation openings or use it in areas where heat accumulates. Additionally, do not store or use it under high-temperature conditions.
- Do not store or use the 73VR21x in locations subject to direct sunlight, or where excessive dust or dirt is present.
- The 73VR21x is a precision instrument. Do not store or use it where large shocks or excessive vibration can occur.
- Do not store or use the 73VR21x in environments subject to chemical evaporation (such as that of organic solvents), or where there are chemicals and/or acids present in the air.
- Do not use paint thinner or organic solvents to clean the 73VR21x.
- Observe the environmental conditions when using the 73VR21x.
- Wait at least for 5 seconds before turning on the power supply after it has been turned off. The 73VR21x may not start up if the time interval is less than 5 seconds.

■ ENVIRONMENT

- Indoor use
- The 73VR21x is designed to be mounted on a vertical panel. It is not suitable for a slanted or a horizontal panel surface.
- Environmental temperature must be within 0 to 50°C (32 to 122°F) with relative humidity within 30 to 85% RH in order to ensure adequate life span and operation.
- Desktop type cannot be mounted on a panel surface.
- The handle and rubber feet cannot be detached from desktop type unit.

■ GROUNDING

- Be sure to determine in advance the most stable grounding point in the environment and earth the 73VR21x's FG terminal and that of connected devices to it in order to protect the devices from dielectric breakdown.
- Grounding is also effective to eliminate noise that could cause errors in the 73VR21x's operation.

■ LCD PANEL

- The LCD panel's liquid contains an irritant. If the panel is damaged and the liquid contacts your skin, rinse immediately the contact area with running water for at least 15 minutes. If the liquid gets in your eyes, rinse immediately your eyes with running water for at least 15 minutes and consult a doctor.
- The following phenomena are LCD characteristics, and NOT a product defect:
 - LCD screen may show uneven brightness depending upon displayed images or contrast settings.
 - The LCD screen pixels may contain minute blank-and-white-colored spots.
 - The color displayed on the LCD screen may appear different when seen from outside the specified viewing angle.
 - When the same image is displayed on the screen for a long time period, an afterimage may appear when the image is changed. If this happens, turn off the 73VR21x and wait for a while before restarting it.
- To prevent an afterimage:
 - Set the screensaver when you plan to display the same image for a long time period.
 - Plan to change the screen image periodically so that the same image does not remain for the long time period.

■ MINIMIZING NOISE INTERFERENCE TO ANALOG SIGNAL CABLES

- Despite the 73VR21x's excellent filtering capabilities against normal mode noise interference to analog signal cables, we recommend that you would conduct wiring to the product with the following points of caution, especially for low-level signals with thermocouple, mV and RTD measurements.
- The 73VR21x is capable of notch filtering the 50/60 Hz normal mode line noise. Select the operating mode to match the line frequency.
- The A/D Conversion Mode is factory set to 'Medium' but is programmable to 'Slow.' In general, selecting the 'Slow' A/D conversion mode means the lower data conversion cycles, but the stronger noise filtering. Change this setting according to your needs.
- Do not install cables (power supply and input) close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ MINIMIZING CHANNEL-TO-CHANNEL COMMON MODE NOISE

- The CMNR ratio between channels are as described in the product's data sheet. Input types such as $\pm 12V$, $\pm 6V$, $\pm 3V$, $\pm 100mV$ are mostly safe from these interferences, however, the measuring accuracies for other input types may be compromised by large common mode noise.
- As described in the data sheet, the DC/AC voltage across the C terminals of the presently-scanned channel and the last scanned channel affects the measuring values.
- In order to obtain stable measuring results without noise interference, it is effective to minimize the common mode noise between channels and between each channel to the ground terminal.

We recommend that C terminals of each channel be cross-wired and then connected to the ground terminal to ensure the measurement of the highest accuracy.
- If such configuration is not possible, take special consideration to minimize the channel-to-channel common mode noise and the potential against the ground terminal.
- Employ a thermocouple/RTD sheath of high insulation to prevent a leak current. Do not weld a thermocouple directly to the surface of the measuring subject.
- Arranging channels so that a low-level signal channel is not located next to a high potential signal channel while multiplexing these signals is also effective.
- The potential of the open terminal C against the ground terminal equals to that of the last scanned channel. If ch 2 and ch 3 are not connected, the accuracy of ch 4 measurement is affected by potential difference between the C terminals of ch 1 and ch 4.

■ STABILIZING COLD JUNCTION COMPENSATION

- Sudden ambient temperature change could increase the cold junction compensation error by the internal terminal temperature sensor. Please take the following precautions to prevent it.
- Be sure to close the terminal cover when operating the 73VR21x.
- Stabilize the temperature around the terminal block. DO NOT expose the terminal block in the direct line of air flow from air conditioners, cooling fans, or ventilation fans. Switching on and off the fans located close to the terminal block affects the ambient temperature.
- Disposition of the terminals for odd-number channels is tend to be more favored in the CJC stability than those for even-number channels.
- Resistor modules (model: REM3-250) can be connected to the 73VR21x to convert current inputs into voltage. However, it is not recommended when TC inputs are mixed because the heat developed on and around the REM3 affects the cold junction compensation performance. We recommend that REM3 be connected on a separate terminal board.
- Do not use wires of large diameter which has large heat dissipation. We recommend using the wires of 0.5 mm² (AWG 20) or thinner diameters not only for the thermocouple channels but for all other screw terminals.

■ CONNECTING OTHER DEVICES IN PARALLEL

- Turn off the burnout function for thermocouple inputs.
- No parallel connection is permitted for RTD inputs.

■ DO NOT APPLY OVERRANGE NORMAL MODE VOLTAGE

- Do not apply voltages exceeding $\pm 20V$ to terminals B – C for $\pm 3V$, $\pm 6V$ or $\pm 12V$ ranges to prevent damage.
- For other ranges, do not apply voltages exceeding $\pm 12V$ to the same terminals to prevent damage. Applying voltages exceeding $\pm 1.5V$ may affect the measuring accuracies of other channels.

■ INTERNAL CLOCK

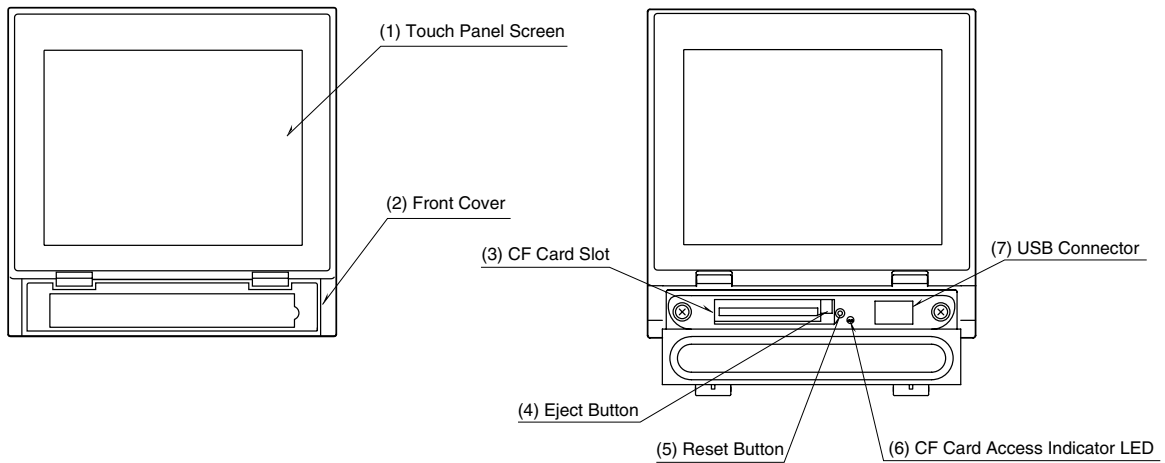
- The internal clock data is stored in memory powered by a backup battery while the 73VR21x is without external power supply.
- The data will be reset to its default status when the battery is used up while the 73VR21x is left without power supply for a long time period. The clock adjustment will be necessary once the power is restored. Please refer to the 73VR21x Users Manual for the procedure.
- Once the power is restored, the 73VR21x starts recharging the battery. It will be full in approximately in 36 to 48 hours.

■ AND....

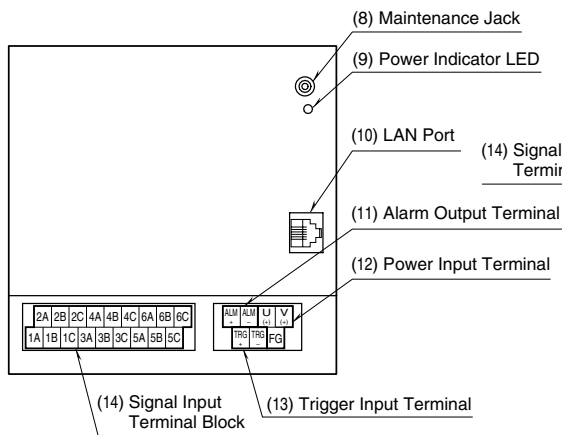
- We recommend use of an UPS (switching time: without delay, output: sine waveforms) to supply power backups.
- The module is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

2.2 73VR21x COMPONENT IDENTIFICATIONS

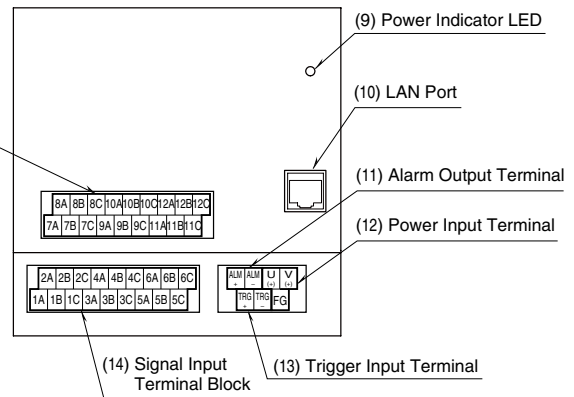
■ FRONT VIEW • 73VR21x



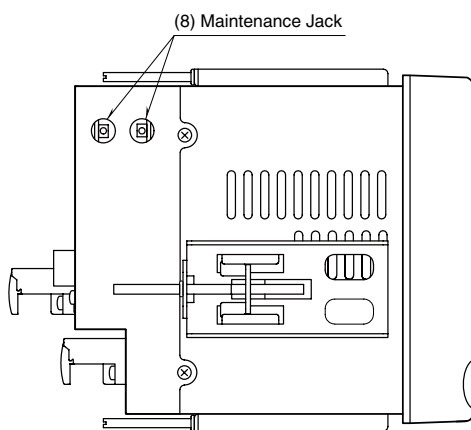
■ REAR VIEW • 73VR2102, 73VR2104, 73VR2106



• 73VR2108, 73VR2110, 73VR2112



■ SIDE VIEW • 73VR2108, 73VR2110, 73VR2112



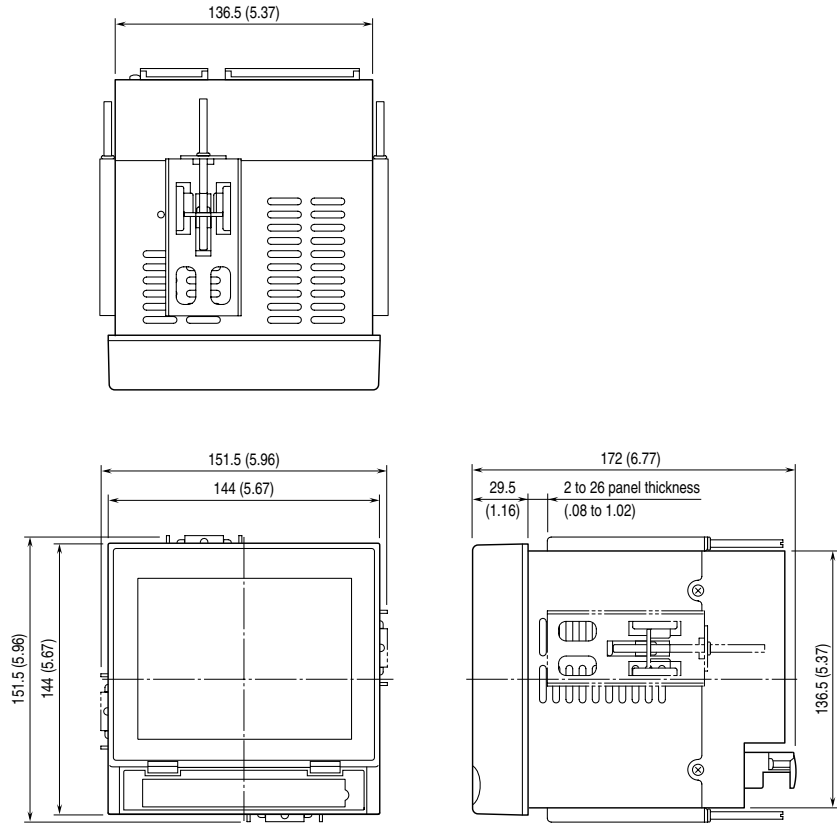
- (1) Touch Panel Screen
Trend chart and other data views and setup views are displayed.
- (2) Front Cover
Access to the CF Card Slot.
- (3) CF Card Slot
Insert a CF Card.
- (4) Eject Button
Used to retrieve the CF Card.
- (5) Reset Button
Used to restart the 73VR210x.
- (6) CF Card Access Indicator LED
Red light turns on during the CF Card is accessed.
- (7) USB Connector
Connect an USB flash-memory.
- (8) Maintenance Jack
Unused
- (9) Power Indicator LED
Light turns on while the power is supplied.
- (10) LAN Port
Connects the LAN cable (10BASE-T or 100BASE-TX)
- (11) Alarm Output Terminal
- (12) Power Input Terminal
- (13) Trigger Input Terminal
- (14) Signal Input terminal Block

2.3 INSTALLING THE 73VR21x

■ EXTERNAL DIMENSIONS unit: mm (inch)

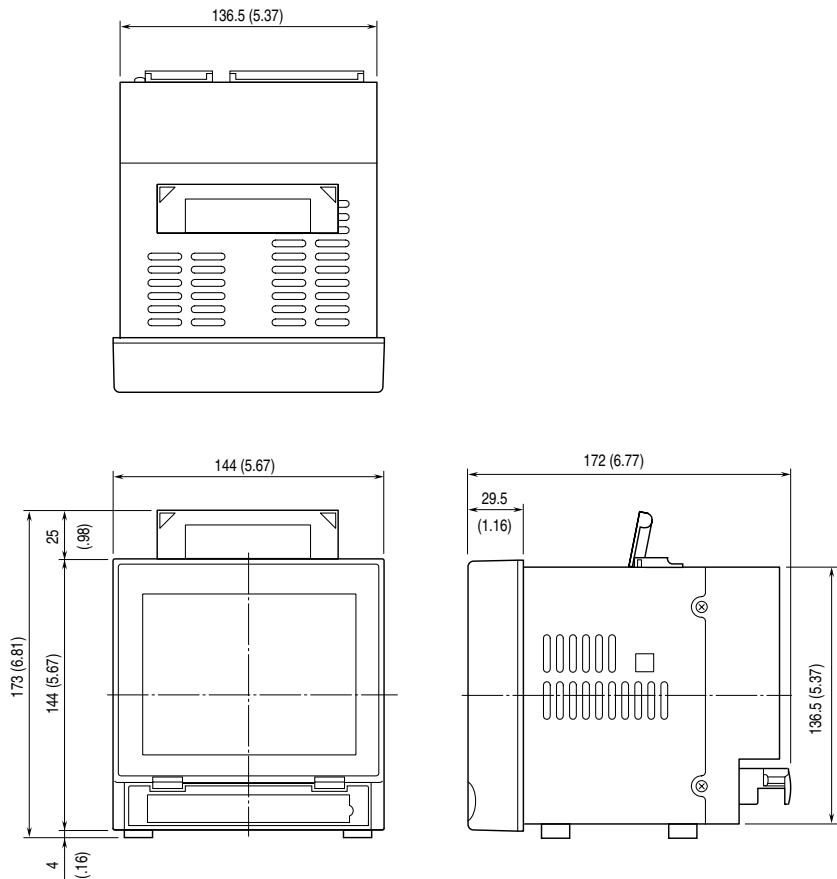
73VR2102, 73VR2104, 73VR2106

• PANEL MOUNT TYPE



• DESKTOP TYPE

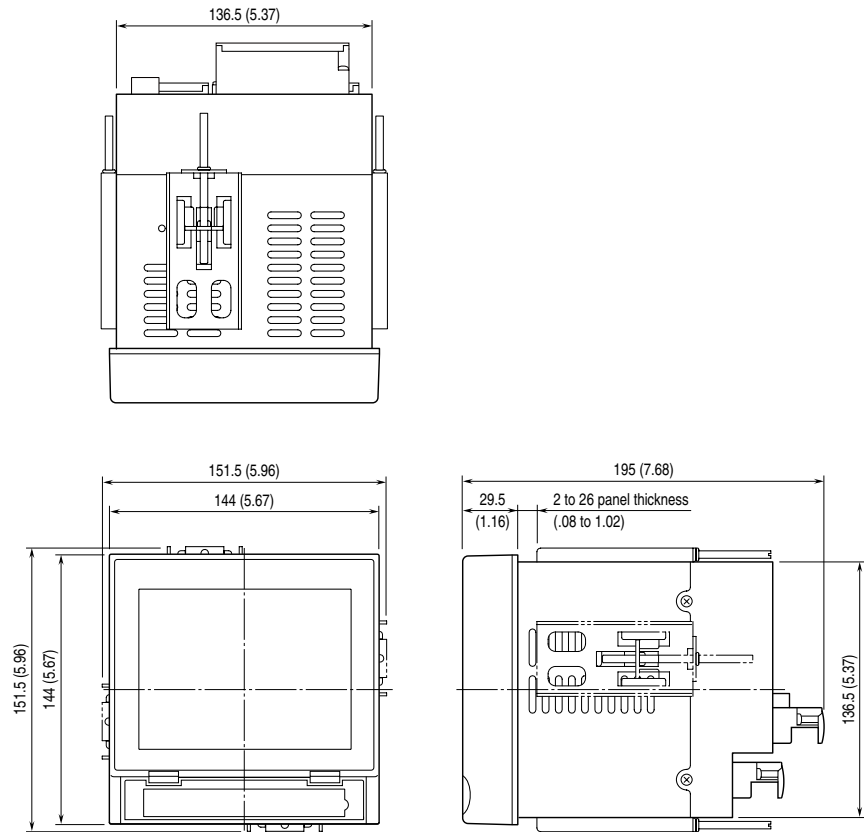
Attach the mounting bracket either on the top/bottom or on the sides.



The handle and rubber feet cannot be detached from desktop type unit.

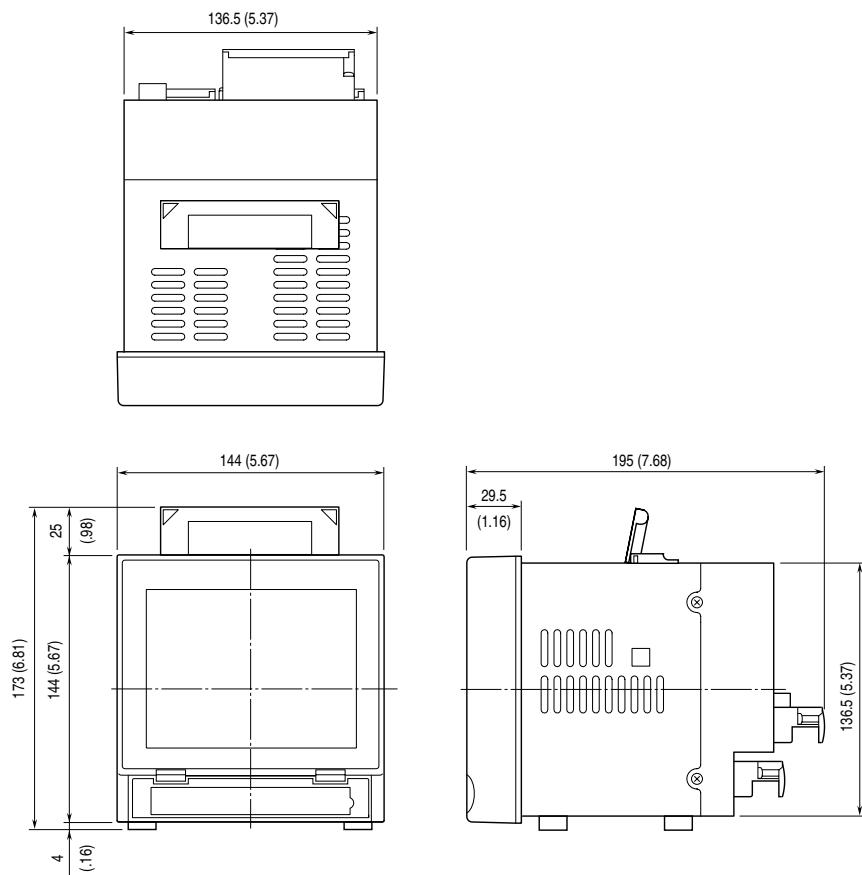
73VR2108, 73VR2110, 73VR2112

• PANEL MOUNT TYPE



Attach the mounting bracket either on the top/bottom or on the sides.

• DESKTOP TYPE

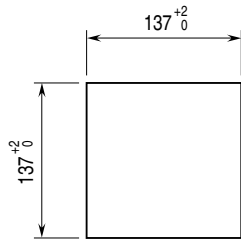


The handle and rubber feet cannot be detached from desktop type unit.

■ **PANEL CUTOUT unit: mm (inch)**

Usable panel thickness: 2 – 26 mm (0.08” – 1.02”)
 Usable panel material: Steel

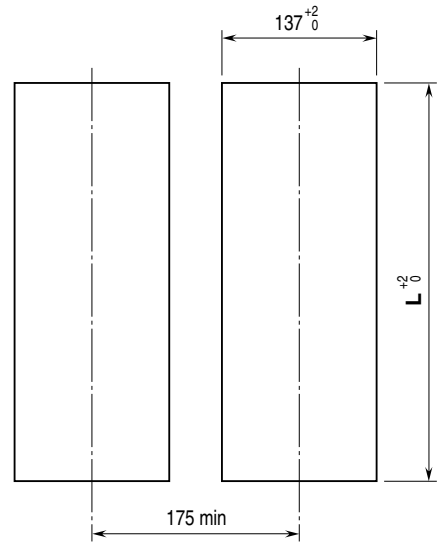
■ **SINGLE MOUNTING**



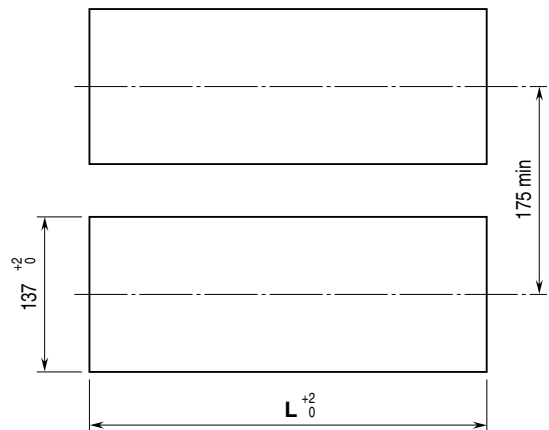
Number	L_0^{+2} (mm)
2	282
3	426
4	570
5	714
6	858
7	1002
8	1146
9	1290
10	1434
n	$(114 \times n) - 6$

- Notes
1. Dimensional tolerance $\pm 3\%$ unless otherwise specified. (± 0.3 mm for < 10 mm)
 2. Desktop type cannot be mounted on a panel surface.

■ **VERTICAL CLUSTERED MOUNTING (max. 3 units)**

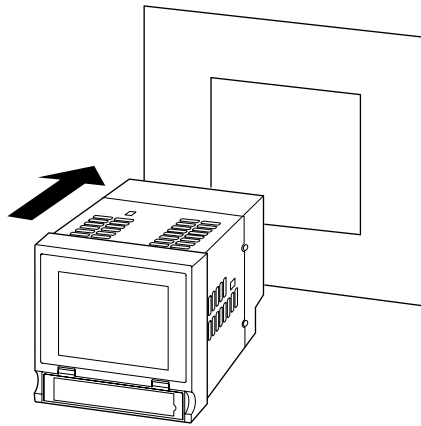


■ **HORIZONTAL CLUSTERED MOUNTING**

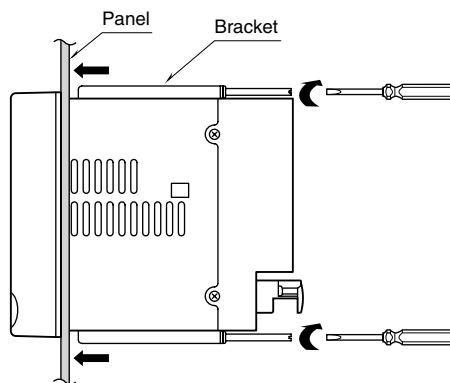


INSTALLATION PROCEDURE

1. Insert the 73VR21x from the front side of the panel.



2. Remove the sheets covering the mounting bracket holes. Fix two mounting brackets either on the sides or on the top and bottom of the unit. Tighten screws.



CAUTION !

Adequate tightening torque for the screws used to mount the unit onto the panel is between 0.8 and 1.2 N·m. If an excessive force is applied, the unit's enclosure may be destroyed, or the panel may be distorted, which would cause a compromise in the unit's protection against water or liquid ingress.

2.4 TERMINAL WIRING

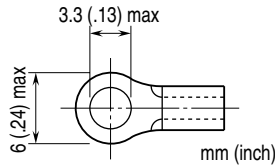
TERMINAL BLOCK

Connection: M3 screw terminal

Screw terminal material: Nickel-plated steel (torque 0.5 N·m)

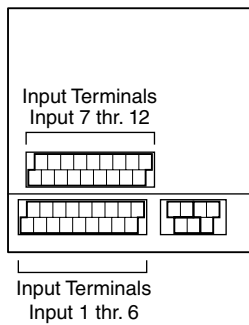
Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)

Recommended manufacturer: Japan Solderless Terminal MFG.Co.Ltd, Nichifu Co.,Ltd

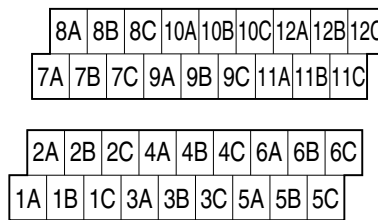


INPUT SIGNAL WIRES

1. Confirm that the power supply is turned off and open the input terminal cover.
2. Connect the wires to the terminal. Remove the CJC sensor(s) from Input 1 and Input 7 terminals when connecting an RTD to them. If you want to mix thermocouple and RTD inputs, connect a thermocouple to Input 1 and Input 7 terminals.
3. Close the cover.



INPUT TERMINAL ASSIGNMENT



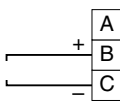
Terminals 1A, 1B, 1C :	Input 1
Terminals 2A, 2B, 2C :	Input 2
Terminals 3A, 3B, 3C :	Input 3
Terminals 4A, 4B, 4C :	Input 4
Terminals 5A, 5B, 5C :	Input 5
Terminals 6A, 6B, 6C :	Input 6
Terminals 7A, 7B, 7C :	Input 7
Terminals 8A, 8B, 8C :	Input 8
Terminals 9A, 9B, 9C :	Input 9
Terminals 10A, 10B, 10C :	Input 10
Terminals 11A, 11B, 11C :	Input 11
Terminals 12A, 12B, 12C :	Input 12

Notes

Usable number of terminals depends upon the input type designated by the model number.
Terminal blocks are separable. The top row one is for Input 7 through 12, and the bottom row is for Input 1 through 6.

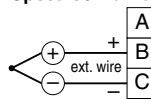
Input Connection Examples

DC INPUT



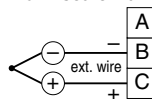
T/C INPUT

Upscale / No Burnout

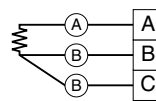


T/C INPUT

Downscale Burnout

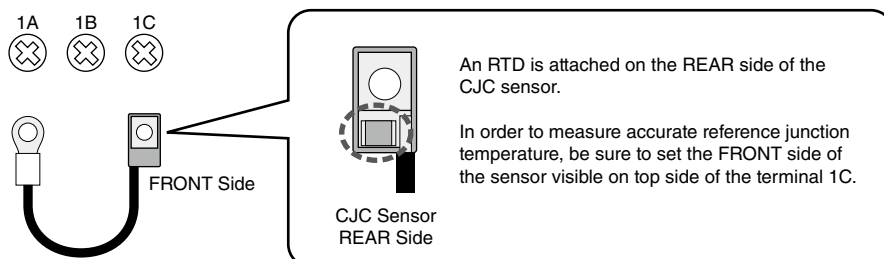


RTD INPUT



CAUTION !

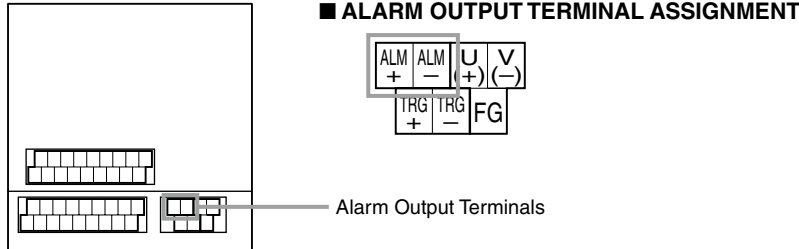
The CJC sensor must be attached to the terminals 1A and 1C as shown below. For the 73VR2108, 73VR2110 and 73VR2112, connect one also to the terminals 7A and 7C.



ALARM OUTPUT WIRES

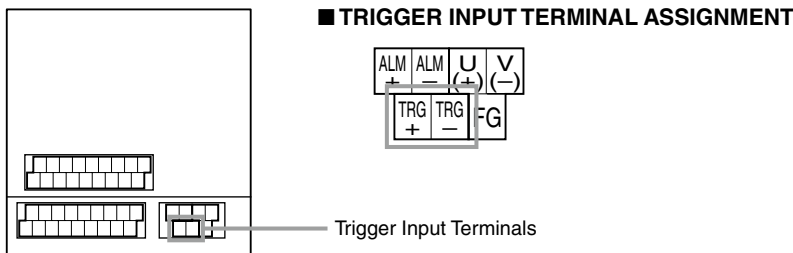
1. Confirm that the power supply is turned off and open the alarm output terminal cover.
2. Connect the wires to the terminal.
3. Close the cover.

TRIGGER INPUT WIRES



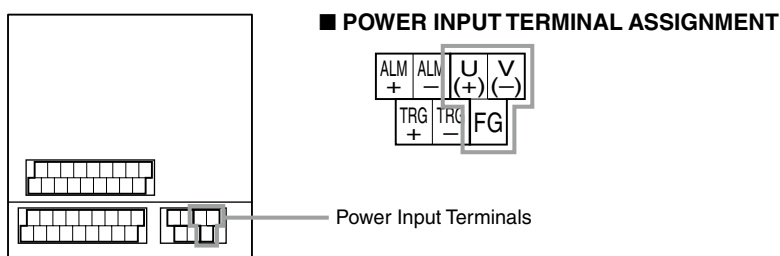
1. Confirm that the power supply is turned off and open the trigger input terminal cover.
2. Connect the wires to the terminal.
3. Close the cover.

POWER INPUT



- Power input rating & operational range: Check the power rating for the unit on the specification label.
 Rating 100 – 240V AC: 85 – 264V, 47 – 66 Hz, approx. 25VA at 100V, approx. 35VA at 240V
 Rating 24V DC: 24V ±10%, approx. 11W
- Supplying any level of power other than specified above can damage the 73VR21x or the power source.
- The power cables and the signal I/O cables for the 73VR21x must be located separately.
- The main circuit cables (high voltage and high current), the signal I/O cables, and the power cables should not be bundled together or placed near each other.

1. Confirm that the power supply is turned off and open the power input terminal cover.
2. Connect the wires to the terminal.
3. Close the cover.



2.5 CF CARD

M-System will not guarantee the product's described performance if a CF Card other than purchased from M-System, or specified below, is used.

1. Manufacturer:	Hagiwara Solutions		
Model No.:	MCF10P-xxxxS (Alternative model: CFI-xxxxDG)		
Capacity:	128 MB through 1 GB		
2. Manufacturer:	Apacer Technology		
Model name:	CFC III		
Model No.:	AP-CFxxxxE3ER-ETNDNRK	Parts No.:	256 MB ... 81.2A010.1H34C
			512 MB ... 81.2B010.1H34C
			1 GB ... 81.2E010.1H34C
Model No.:	AP-CFxxxxE3ER-ETNDNR	Parts No.:	256 MB ... 81.2A010.1H10C
			512 MB ... 81.2B010.1H10C
			1 GB ... 81.2E010.1H10C
Capacity:	256 MB through 1 GB		

The 73VR21x reads the setting file (e.g. storing condition, pen setting) in the CF Card during its startup. If you have started the 73VR21x without the CF Card inserted in the unit, it reads settings stored in the unit.

The setting in the card is not read in if you inserted it after the unit has been started.

Be sure to have the CF Card inserted before the power supply is turned on.

CAUTION !

- DO NOT turn off the power supply to the 73VR21x or reset it during data recording. The CF Card can be removed during recording, but observe a specific procedure described in Section 9 of this manual.
- Confirm the sides of the CF Card and the connector position. The side with label is the bottom side.

WARNING ! – Data in the CF Card May be Lost

Data file in the CF Card is reset by the following actions. Data in the file is deleted and overwritten when the card is reset. We recommend you to keep data backup files in an external device.

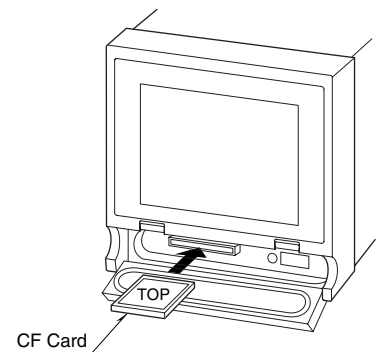
- Changing data format in System Configuration
- Changing storing interval in Store Setting
- Enabling/Disabling pens (including Function pens)
- Hot swapping the CF Card

INSERTING THE CF CARD

1. Open the front cover.
2. Insert the CF Card so that its side without label is on the top.
3. Push it in until EJECT button is popped up.
4. Close the front cover.

REMOVING THE CF CARD

1. Open the front cover.
2. If the power is supplied to the 73VR21x, confirm with the LED behind the cover that the CF Card is not accessed.
3. Push EJECT button to extract the CF Card.



2.6 SD CARD

The recommended SD/CF conversion adapter and SD card described below are available for storing on SD card. The SD/CF conversion adapter, which has SD card incorporated, can be handled as CF card.

SD/CF conversion adapter: DeLOCK adaptor CF II to SDHC,SDXC, 61796

SD card: Hagiwara Solutions NSDA-004GT, NSDA-004GL

Note: The use of recommended device prevents loose of data, however correct operating it is not always guaranteed.

WARNING ! – SD card limitations

- SD card memory is 4 GB, however, only 1 GB will be used.
- Storing interval 100 m sec. setting is not available. Use the SD card in a storing interval slower than 0.5 sec.
- Do NOT hot swap the CF card every minute on the minute (at 00 second). The data of one cycle may be lost.
- FTP data transfer setting is not available. If FTP data transfer operation starts during storing data on SD card, data on SD card may be lost.

3. HARDWARE CONFIGURATIONS

Burnout, Cold junction compensation, Line noise filter and A/D conversion mode are selectable. Analog inputs' update cycle is determined by the line noise filter and the A/D conversion mode..

Burnout for T/C and RTD input

Upscale, Downscale or No burnout selectable. Select 'No Burnout' to minimize the measuring errors caused by the sensor/wire resistance and the burnout sensing current.

>>> Refer to Section 5.5.1. Pen Setting.

Cold junction compensation (CJC) for T/C input

CJC can be enabled or disabled per each channel.

>>> Refer to Section 5.5.1. Pen Setting.

Line noise filter

NMNR ratio to the line frequency and its harmonic contents can be optimized. Select either frequency for the most effective result.

>>> Refer to Section 5.6. Hardware Configuration.

A/D conversion mode

Fast, Medium or Slow selectable for all channels.

With Slow setting, data fluctuations are minimized with limited sampling time (speed). With Fast setting, sampling time (speed) can be high through data fluctuations increase.

>>> Refer to Section 5.6. Hardware Configuration.

ANALOG INPUTS' UPDATE CYCLE

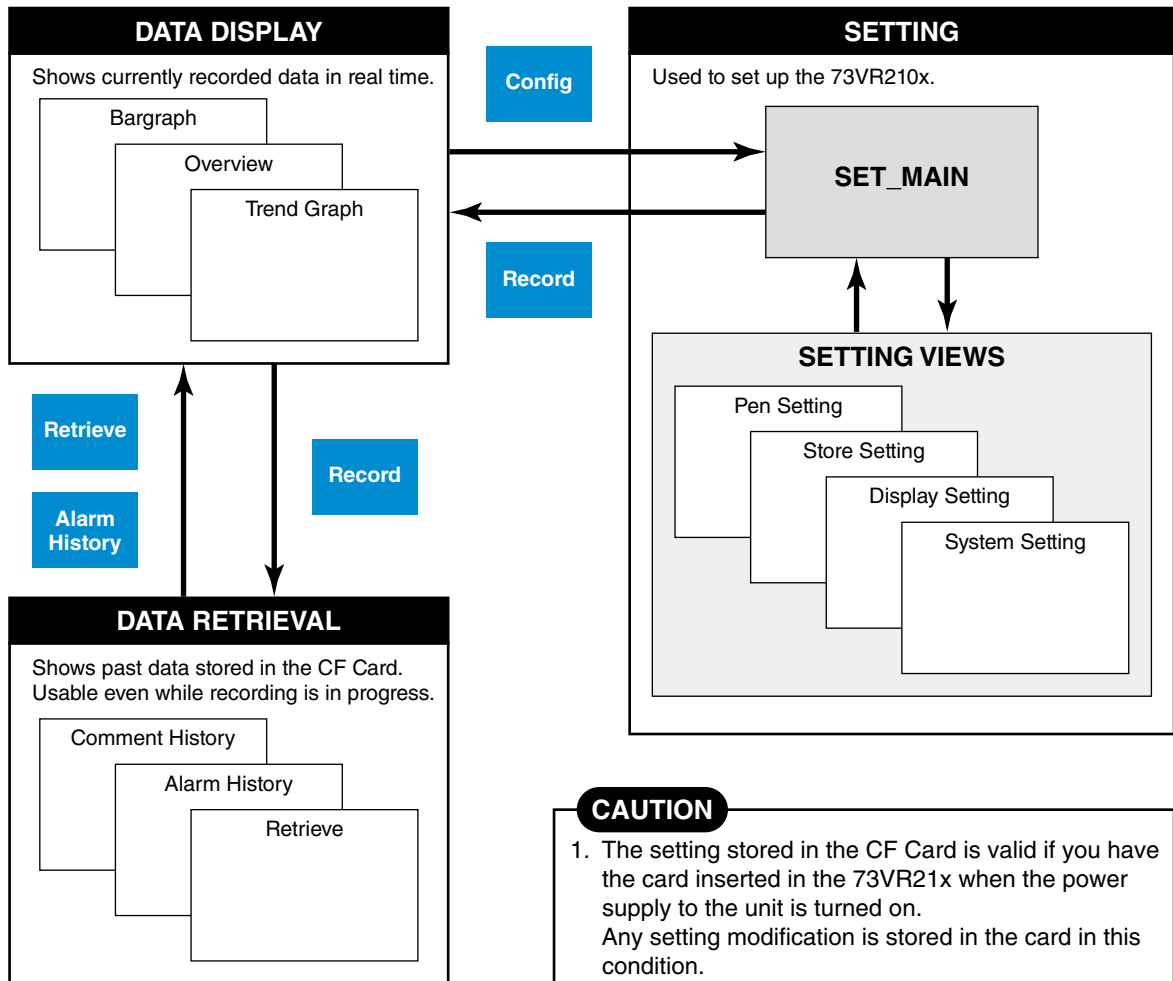
LINE NOISE FILTER FREQ.	A/D CONVERSION (sec)			
	MEDIUM*1	SLOW	FAST	100 ms RATE
50 Hz	0.39	0.54	0.27	0.095
50/60 Hz*1	0.37	0.50	0.25	
60 Hz	0.34	0.46	0.23	

Multiplied by two (2) for RTD and potentiometer input.

*1. Standard setting

4. 73VR21x VIEWS & BASIC OPERATIONS

Views used in the 73VR21x are grouped in three functions: Data display, Setting and Data retrieval. Groups and views are related to each other as shown in the figure below.



CAUTION

1. The setting stored in the CF Card is valid if you have the card inserted in the 73VR21x when the power supply to the unit is turned on. Any setting modification is stored in the card in this condition.
2. The setting stored in the 73VR21x is valid if you have no card in the 73VR21x when the power supply is turned on. Any setting modification is stored in the unit in this condition.

You can copy the setting stored in the unit to a card using the Builder Software or the reading/writing operation of the unit via USB Flash Memory.

5. SETTING UP THE 73VR21x

Touching Menu key on one of the display views (Trend, Overview and Bargraph) opens selectable menu items on the right half of the screen. Touch Config key to open Main view listing the name of detailed setting windows.

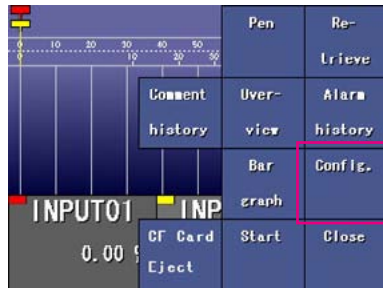
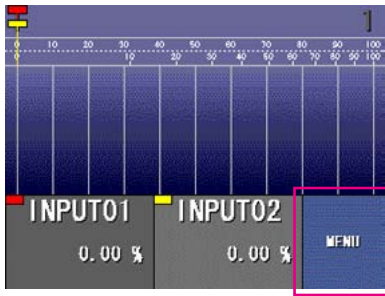


Figure: Menu key.

Main 73VR2106 Version 2.00c 1/2	
System	Data storing method
Display setting	Error output configuration
Pen setting (Input)	Pen setting (Function)
Pen setting (Alarm)	Hardware
Quick setup	Comment
Page	Back to Record

Figure: Main view 1.

Figure: Config key.

Main 73VR2106 Version 2.00c 2/2	
Write setting file	Read setting file
Page	Back to Record

Figure: Main view 2.

In order to enable new setting, touch Back to Record key and go back to the previously displayed recording view (Trend, Overview and Bargraph).

■ MAIN MENU & SUB MENU LIST

MODIFY : Y = Can be modified during recording, N = Not

MAIN MENU	SUB MENU	MODIFY
System	Operating mode	N
	Temperature unit	N
	Start mode	N
	Data storing form	N
	Data overwrite	N
	Screen saver	Y
	Touch panel beep	Y
	Date and time	N
	Password	N
	IP address	N
	Subnet mask	N
	Default gateway	N
	Data storing method	Storing interval
Storing setting		N
Display setting	Chart speed	N
	Graph direction	Y
	Digital display type	Y
	Digital display	Y
	Data file used volume	Y
	Display pen number	Y
	Display pen number (Overview)	Y
	Auto pen switching	Y
Chart color	Y	
Error output	Enable / Disable	N
	Output ch.	N

MAIN MENU	SUB MENU	MODIFY	
Pen setting (Input)	Enable / Disable	N	
	Tag	N	
	Unit	N	
	Color	Y	
	Line thickness	Y	
	Analog	Decimal place	Y
		Square root	N
		Overview color	Y
		Analog type	N
		Input range	N
		Engineering range	N
		Plot position	Y
		Scale shift	Y
		Normal / Log (Exp. scale, Log. plot position)	N
		CJC (Cold Junction Compensation) SW	N
	Discrete	Burnout type	Y
		OFF description	N
		ON description	N
Pen setting (Function)	Enable / Disable	N	
	Tag	N	
	Unit	N	
	Color	N	
	Line thickness	N	
	Function	N	
	Equation	N	
	Analog	Decimal place	Y
		Overview color	Y
		Plot position	Y
		Scale shift	Y
		Normal / Log (Exp. scale, Log. plot position)	N
	Discrete	OFF description	N
ON description		N	
Pen setting (Alarm)	Analog	Limit 1...4	Y
		Deadband 1...4	Y
		Normal zone	Y
		Zone color 0...4	Y
		Alarm output	Y
		Relay	Y
		Up message	Y
		Down message	Y
	Discrete	OFF output	Y
		ON output	Y
		Delay	Y
		Normal state	Y
		OFF color	Y
		ON color	Y
		OFF Message Output	Y
		ON Message Output	Y
		OFF Message	Y
ON Message	Y		
Hardware	AD conversion mode	N	
	Line noise filter	N	
	Zero/span adjustment	N	

MAIN MENU	SUB MENU	MODIFY
Quick setup	Group name	Y
	Group color	Y
	Comment	Y
Comment	Comment direct input	Y
	Group name	Y
	Group color	Y
	Comment (Group 7 comment can be modified during recording)	Y
Write setting file		N
Read setting file		N

■ TIPS FOR KEY OPERATIONS

Alphanumeric Keypads

When you need to enter alphabets and numbers during a setting process, the alphanumeric keypads consisting three pages are used: Small letters, Capital letters and Numbers as shown below.

Figure: Small letters.



Figure: Capital letters.



Switching keypads

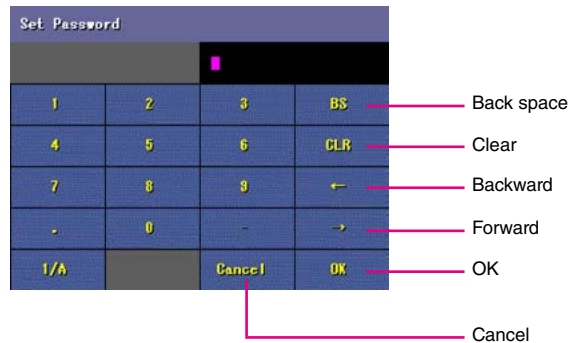


Figure: Numbers.

For example, the key showing 'abc' is used to enter characters 'a,' 'b,' or 'c.' 'a' is entered by touching the key once, 'b' for twice, and 'c' for three times. Other letters can be selected in the same manner. When you need to enter the same character or another character on the same key in series, move the cursor before choosing the second character.

OK and Cancel Keys

When you are satisfied with changes you applied, touch OK to confirm the setting and move to the next window. If you do not want to apply the changes, touch Cancel key.

Page, Next and Previous Keys

When more than one page exist for one menu item, use Page key to switch from one page to another.

Next and Previous keys are used to move between different channels for the same setting item.

Record Key

Important !

In order to apply new setting, touch Record key to save and return to one of the Display views (Trend, Overview or Bargraph).

5.1 SYSTEM SETTING

The System setting menu consists of three views as shown below.



Touch Page key to switch between pages.

5.1.1 OPERATING MODE

Touching the current selection of the Operating mode shows selectable options at the bottom of the screen. Choose among the following options.

DEMO	Demonstration mode	You can run the 73VR21x program without actual signal input for learning, evaluation and demonstration when you choose DEMO.
Normal	Running mode	Choose this option when you connect actual input signals to the 73VR21x.

5.1.2 TEMPERATURE UNIT

Touching the current selection of the Temperature Unit shows selectable options at the bottom of the screen. Choose among the following options.

When 100 msec. storing rate (interval) has been or to be selected, temperature unit setting is invalid since temperature input modules are usable only for 500 msec. or longer intervals.

Centigrade	Centigrade (Celsius)
Fahrenheit	Fahrenheit

5.1.3 START MODE

Touching the current selection of the Start Mode shows selectable options at the bottom of the screen. Choose among the following options.

Cold Start	At a restart, the 73VR21x stands by showing the initial view.
Hot Start	At a restart, the 73VR21x automatically starts recording.

5.1.4 DATA STORING FORM

Touching the current selection of the Data Storing Form shows selectable options at the bottom of the screen. Choose among the following options.

Float	Floating point	1 data size: 4 bytes Decimal fraction: max. 4 decimal places (effective number of digits: 6 or 7) Float is to be selected when you need to store data including decimal fractions. The 4-byte-long data is better in data precision but the total storable time in the CF Card becomes shorter compared from Short Int.
Short int	Short integer	Integer data multiplied by 10. The 2-byte-long data is not as precise (one decimal place) as Float type is, but the total storable time in the CF Card is longer.

WHICH FORM TO CHOOSE? -- EXAMPLE

If you have selected Short integer, and when an input range 1 – 5V is converted in an engineering unit range of 0 – 10, the actual converted values are: 0 at 1V input, 0.25 at 1.1V. In this case, the 73VR21x can store only one decimal place, and '0.25' is saved only as '0.2.' Likewise, the input 1.15V is converted into 0.275 in the engineering unit range, but is saved also as '0.2.' 1.1V and 1.15V inputs make no difference in the short integer form.

Choose Float if you want to make difference between 1.1V and 1.15V.

WARNING !

When the data storing form setting is changed, new data stored in the same data file overwrite previously stored data.

5.1.5 DATA OVERWRITE

You can specify if you want to stop recording or continue recording by overwriting the oldest data when the CF card capacity is full. Detailed explanations on the data file is given in Section 10.1.

OFF	Recording is stopped.
ON	Recording continues by overwriting the oldest data.

5.1.6 SCREEN SAVER

The LCD display's backlight can be turned off when the screen is untouched for a specific time period.

Touching the current selection of the Screen saver replaces the screen with a numeric keypad. The setting can be modified even while recording is in progress.

Enter a desired time in minutes to initiate the screen saver.

Screen saver time setting	Selectable range: 0 to 99 (minutes) The screensaver function is deactivated with the time set to zero (0).
---------------------------	---

Touching the screen cancels the screen saver mode. The screen saver is automatically cancelled when an alarm is output.

5.1.7 TOUCH PANEL BEEP

You can specify if you want a beep sound or not whenever you touch the screen.

Touching the current selection of the Touch panel beep shows selectable options at the bottom of the screen. The setting can be modified even while recording is in progress.

OFF	Beep sound is off.
ON	Beep sound is on.

5.1.8 DATE AND TIME

Date / time is indicated in the format: YY / MM / DD HH : MM : SS.

Touching the current time index replaces the screen with a numeric keypad. Enter a correct time and touch OK.

CAUTION !

If incorrect date is entered, OK button turns grey and becomes disabled.

CAUTION !

After the clock has been rewound (e.g. from 10:02:34 to 10:00:00), a part of the data in Data file, Comment history file and Alarm history file will be deleted in certain conditions as explained in the following. They are not deleted when the clock has been forwarded.

1. When you touch Start button, a warning dialog box will appear if the clock shows the time earlier than the last data's time index in the data files. When you touch OK, the data will be deleted. If you touch Cancel, no data will be deleted but recording is stopped.

With the remote trigger, event recording or time specified storing mode, data will be deleted not at the moment of Start, but at the moment of the trigger (or the specified time).

2. With Hot Start setting, data will be deleted without warning if the clock shows the time earlier than the last data's time index in the data files when the data recording has been started automatically.
3. When the recorder is started remotely by the 73VR21BLD or MSR128, data will be deleted without warning if the clock shows the time earlier than the last data's time index in the data files.

5.1.9 PASSWORD

Password setting prevents unauthorized access to data displays and changes in the setting. When you have set a password and returns to one of the Display views, the password will be requested every time you touch a control key on the screen.

Once the password lock is released, you can access control keys and move to other views including Config.

Password	Max. 6 alphanumeric characters
----------	--------------------------------

CAUTION !

The password lock function is valid only on the Display view (Trend, Overview or Bargraph). If another view is left open in unlocked state, anyone can change its setting.

If you forgot your password, please contact M-System.

The following functions are available without needing a password:

- Switching Pages within the same function view.
- Updating digital displays
- Zooming in a digital display

5.1.10 IP ADDRESS

In order to connect the 73VR21x to a PC via Ethernet when using the 73VR21BLD (Builder) or the 73VRWV (Data Viewer), set an appropriate IP address.

Touching the current selection of the IP address replaces the screen with a numeric keypad. Enter a desired IP address on the keypad and touch OK.

IP address	Factory default setting: 192.168.0.1
------------	--------------------------------------

CAUTION !

In order to apply new IP address setting, the 73VR21x must be restarted. Be sure to return to one of the Display views to save the new setting. All new setting will be lost otherwise.

Consult your network administrator for IP address.

5.1.11 SUBNET MASK

Touching the current selection of the subnet mask replaces the screen with a numeric keypad. Enter a desired value on the keypad and touch OK.

Subnet mask	Factory default setting: 255.255.255.0
-------------	--

CAUTION !

In order to apply new subnet mask setting, the 73VR21x must be restarted. Be sure to return to one of the Display views to save the new setting. All new setting will be lost otherwise.

Consult your network administrator for subnet mask.

5.1.12 DEFAULT GATEWAY

Touching the current selection of the default gateway replaces the screen with a numeric keypad. Enter a desired value on the keypad and touch OK.

Default gateway	Factory default setting: None
-----------------	-------------------------------

CAUTION !

In order to apply new default gateway setting, the 73VR21x must be restarted. Be sure to return to one of the Display views to save the new setting. All new setting will be lost otherwise.

Consult your network administrator for default gateway.

5.1.13 LINGER TIME

TCP Socket is closed after no communication is detected for a preset Linger Time. This setting is used when connecting to a host PC via Modbus/TCP.

Touching the current selection of the linger time replaces the screen with a numeric keypad. Enter a desired value on the keypad and touch OK.

Linger time	0.0 to 3000.0 seconds (100 msec. increments)
-------------	--

5.2 DATA STORING METHOD

The initial view for the Data storing method setting is as shown below.



5.2.1 STORING INTERVAL

The data is stored in time intervals preset as the Storing interval.

Touching the current selection of the Storing interval shows selectable options at the bottom of the screen. Choose among the following options. For the F value calculation, choose 500 milliseconds:

100msec	100 milliseconds
500msec	500 milliseconds
1sec	1 second
2sec	2 seconds
5sec	5 seconds
10sec	10 seconds
1min	1 minute
10min	10 minutes

Total recording time in a CF Card depends upon the storing interval selection. Selecting greater storing interval allows longer recording time, though the data are more thinned, which may jeopardize the data accuracy.

CAUTION !

When the storing interval setting is changed, previously stored data are overwritten with new data.

Consider analog inputs' update cycle when determining the storing interval.

■ ANALOG INPUTS' UPDATE CYCLE

LINE NOISE FILTER FREQ.	A/D CONVERSION (sec)			100 ms RATE
	MEDIUM*1	SLOW	FAST	
50 Hz	0.39	0.54	0.27	0.095
50/60 Hz*1	0.37	0.50	0.25	
60 Hz	0.34	0.46	0.23	

Multiplied by two (2) for RTD and potentiometer input.

*1. Standard setting

5.2.2 STORING SETTING

Five storing methods are selectable.

Touching the current selection of the Storing interval shows selectable options at the bottom of the screen. Choose among the following options:

No Storing	Normal
Remote Trigger	Event recording
Time specified	Cancel

No storing	No recording	Data is plotted on the chart or displayed on the digital meter or bargraph, but no data is stored in the CF Card.
Normal	Normal storing mode	Recording is manually initiated and stopped. Data is continuously stored while the recording is on.
Remote trigger	Remote trigger recording mode	Data is automatically recorded while the external trigger condition (analog or discrete input) is true. (See 5.2.3)
Event recording	Event recording mode	The 73VR21x detects an external event by trigger signal, and stores preset number of samples (max. 1200 respectively) before and after the moment of event. (See 5.2.4)
Time specified	Store at defined time mode	Recording is automatically initiated and stopped at predefined time. (See 5.2.5)

5.2.3 REMOTE TRIGGER RECORDING

In the remote trigger recording mode, data is automatically stored while the external trigger condition (analog or discrete input) is true.

With an analog trigger, the signal are continuously compared with a preset threshold, and the 73VR21x starts and stops recording when it is in a pre-determined condition (higher or lower than the threshold).

With a discrete trigger, the signal logic state is continuously monitored, and the 73VR21x starts and stops recording when it is turned to a pre-determined state (ON or OFF).

■ Trigger Conditions for Analog

Value > Threshold	Data is stored while the trigger input signal value is higher than the threshold setpoint.
Value < Threshold	Data is stored while the trigger input signal value is lower than the threshold setpoint.
Value ≥ Threshold	Data is stored while the trigger input signal value is equal to or higher than the threshold setpoint.
Value ≤ Threshold	Data is stored while the trigger input signal value is equal to or lower than the threshold setpoint.

■ Trigger Conditions for Discrete

ON	Data is stored while the trigger input signal logic is ON.
OFF	Data is stored while the trigger input signal logic is OFF.

CAUTION !

If you touch Record button while the trigger condition is true, no recording starts until it turns true for a next time.

HOW TO SET THE REMOTE TRIGGER RECORDING

1. Storing setting: Select Remote trigger as explained in 5.2.2. Choosing the Remote trigger on the Data storing method view changes the subsequent menu items to those suitable for the remote trigger recording mode.



2. Discrete / Analog: Choose a type of trigger signal.

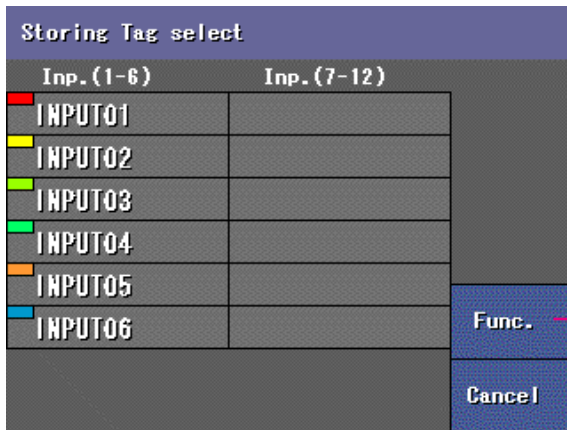
Discrete	Contact signal trigger	A discrete signal triggers recording.
Analog	Analog signal trigger	An analog signal triggers recording.

3. Threshold: For analog signals, set a threshold in an engineering unit value.

Threshold	Engineering unit value. Max. 6 digits including decimal point and minus (-) sign. 'e' is used to set an exponential value. 'e' can be used to input an exponential value such as '1e9'. Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.
-----------	---

4. Condition: Choose among the abovementioned options.

- Pen number: Choose a pen to be designated as trigger. Touching the current selection of Pen number opens the Storing pen select view which listing all available (meaning the enabled pens) tag names.



Function key
 Switches the window to pens assigned to the operation functions.
 This key is replaced with Input key while the window shows Function tag selections.

5.2.4 EVENT RECORDING

In the event recording mode, the 73VR21x detects an external event by trigger signal, and stores preset number of samples (max. 1200 respectively) before and after the moment of event.

With an analog trigger, the trigger signal is continuously compared with a preset threshold, and the 73VR21x initiates recording when it is in a pre-determined condition (higher or lower than the threshold).

With a discrete trigger, the signal logic state is continuously monitored, and the 73VR21x initiates recording when it is turned to a pre-determined state (ON or OFF).

■ Trigger Conditions for Analog

Value > Threshold	Data recording is initiated when the trigger input signal value goes above the threshold setpoint.
Value < Threshold	Data recording is initiated when the trigger input signal value goes below the threshold setpoint.
Value ≥ Threshold	Data recording is initiated when the trigger input signal values is equal to or goes above the threshold setpoint.
Value ≤ Threshold	Data recording is initiated when the trigger input signal values is equal to or goes below the threshold setpoint.

■ Trigger Conditions for Discrete

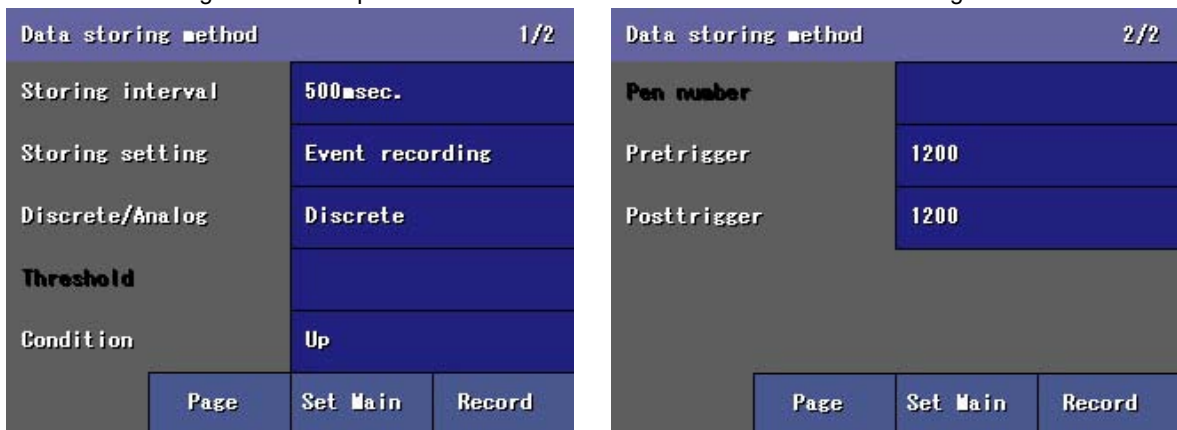
Up	Rising pulse edge	Data recording is initiated at a rising edge of the trigger input pulse.
Down	Sinking pulse edge	Data recording is initiated at a sinking edge of the trigger input pulse.

CAUTION !

If you touch Record button while the trigger condition is true, no recording starts until it turns true for a next time.

HOW TO SET THE EVENT RECORDING

1. Storing setting: Select Event recording as explained in 5.2.2. Choosing the Event recording on the Data storing method view changes the subsequent menu items to those suitable for the event recording mode.



2. Discrete / Analog: Choose a type of trigger signal.

Discrete	Contact signal trigger	A discrete signal triggers recording.
Analog	Analog signal trigger	An analog signal triggers recording.

3. Threshold: For analog signals, set a threshold in an engineering unit value.

Threshold	Engineering unit value. Max. 6 digits including decimal point and minus (-) sign. 'e' is used to set an exponential value. 'e' can be used to input an exponential value such as '1e9'. Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.
-----------	--

4. Condition: Choose among the aforementioned options.
5. Pen number: Choose a pen to be designated as trigger. Touching the current selection of Pen number opens the Storing tag select view (See 5.2.3) which listing all available (meaning the enabled pens) tag names.
6. Pretrigger / Posttrigger: Specify numbers of samples to be stored before (Pretrigger) and after (Posttrigger) the event respectively.

Pretrigger	Number of pretrigger samples	Max. 1200 samples. Pretrigger recording is NOT applicable with the storing intervals set to 2 seconds or longer.
Posttrigger	Number of posttrigger samples	Max. 1200 samples.

5.2.5 STORE AT A DEFINED TIME MODE

In the Store-at-a-Defined Time mode, recording is automatically initiated and stopped at a predefined time. Choose either 'One Time Only' or 'Every Day' under Condition option.

One Time Only	Data is stored once at a predefined time. Specify Year-Month-Day and Hour-Min-Sec. to start the recording and the time duration.
Every Day	The 73VR21x runs recording once per day at a predefined time. Specify Hour-Min-Sec. to start the recording and the time duration.

CAUTION !

If you touch Record button while in the specified time, no recording starts until a next specified time.

HOW TO SET THE STORE-AT-A-DEFINED-TIME MODE

1. Storing setting: Select Time Specified as explained in 5.2.2. Choosing the Time Specified recording on the Data storing method view changes the subsequent menu items to those suitable for the storing mode.

Data storing method		1/1
Storing interval	500msec.	
Storing setting	Time specified	
Condition	One time only	
Datetime	07/01/01 00:00:00	
Time	00:01	
	Set Main	Record

2. Touching the current selection opens a numeric keypad to enter a new setting. Specify when you want to start recording (Datetime) and the time duration (Time). With Every day setting, 'Date' is not indicated.

Datetime or time	Recording started at	Specify YY/MM/DD HH:MM:SS.
Time	For	Specify HH:MM between 00:00 and 23:59.

5.3 DISPLAY SETTING

The Display setting view is available with the following menu items:

Display setting		1/2
Chart speed	4	
Graph direction	Perpendicular	
Digital display type	Tag+Value	
Digital display	Auto hide	
Data file used volume	Not shown	
	Page	Set Main Record

Display setting		2/2
Display pen number	2 Pens	
Display pen number (OFF)	2 Pens	
Auto pen switching	Disable	
Chart color	Gradation 1	
	Page	Set Main Record

5.3.1 CHART SPEED

Touching the current selection of the Chart speed shows selectable options at the bottom of the screen.

Choose among the options in the table below. The numbers show how many pixels are used for one sample data. For example, if you choose '4,' one sample is plotted 4 pixels further than the previous one, and two sample points are connected to create a trend graph.

Plotting already on the screen disappears when the chart speed is changed, except when the new setting is 1 or 4.

The chart speed options may be limited when certain storing intervals are selected. Refer to the table below.

STORING INTERVAL	CHART SPEED	4	1	1/5	1/32	1/160	1/480	1/960
100 msec.	Yes	Yes	Yes	Yes	Yes	No	No	No
≥500 msec.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

The following tables indicates actual time spans expressed on the chart depending upon different storing intervals.

■ **Storing Interval 100 msec.**

CHART SPEED	CHART TYPE Perpendicular with digital display	Perpendicular without digital display	Horizontal
4	2.7 seconds	4.7 seconds	6.7 seconds
1	11 seconds	19 seconds	27 seconds
1/5	55 seconds	1 min., 35 sec.	2 min., 15 sec.
1/32	5 min., 52 sec.	10 min., 8 sec.	14 min., 24 sec.

■ **Storing Interval 500 msec. or longer**

CHART SPEED	CHART TYPE Perpendicular with digital display	Perpendicular without digital display	Horizontal
4	13.5 seconds	23.5 seconds	33.5 seconds
1	55 seconds	1 min., 35 sec.	2 min., 15 sec.
1/5	4 min., 35 sec.	7 min., 52 sec.	11 min., 15 sec.
1/32	29 min., 20 sec.	50 min., 40 sec.	1 hour, 12 min.
1/160	2 hours, 26 min., 40 sec.	4 hours, 13 min., 20 sec.	6 hours
1/480	7 hours, 20 min.	12 hours, 40 min.	18 hours
1/960	14 hours, 40 min.	1 day, 1 hour, 20 min.	1 day, 12 hours

5.3.2 GRAPH DIRECTION




You can specify if you want to show the chart in the perpendicular direction or the horizontal direction.

Touching the current selection of the Graph direction shows selectable options at the bottom of the screen. The setting can be modified even while recording is in progress. Choose among the following options:

Perpendicular	Perpendicular direction
Horizontal	Horizontal direction

5.3.3 DIGITAL DISPLAY TYPE

Touching the current selection of the Digital display type shows selectable options at the bottom of the screen to specify either to show only the tag name or the value, or both. Choose among the following options:

Tag + Value		The momentary value and the tag name of the data displayed on the screen.
Tag		The tag name of the data displayed on the screen.
Value		The momentary value of the data displayed on the screen.

5.3.4 DIGITAL DISPLAY

Touching the current selection of the Digital Display shows selectable options at the bottom of the screen to show or hide the digital display on the data display view. This option can be changed while recording.

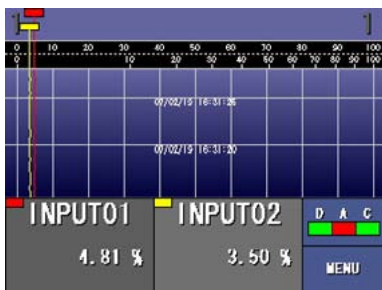
Auto hide	Digital display is automatically hidden in 30 seconds after it appears on the screen. Touch the area of the display to call it up.
Continuous	Digital display remains on the screen.

5.3.5 DATA FILE USED VOLUME SETTING

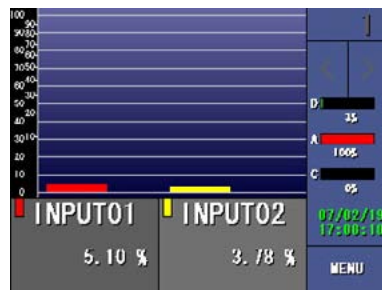
The Overview and the Bargraph view can show a bargraph how much volume of the data file has been used.

The data file is automatically created when the 73VR21x has started up. 0% is shown when there is no data in the file. Used-up rate is shown in the percentage of the total volume. This option can be changed while recording. For detailed information refer to Section 9.2.

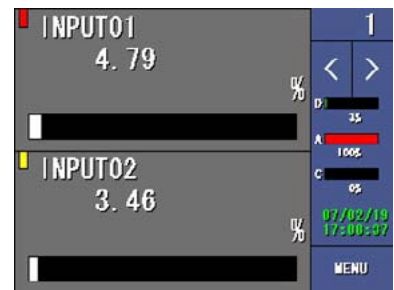
Not shown	Data file used volume bargraph is not shown.
Show	Data file used volume bargraph is shown.



Trend, perpendicular.



Trend, horizontal.

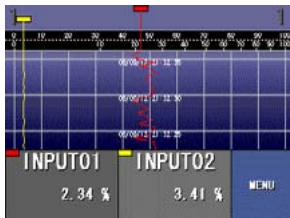


Overview.

5.3.6 DISPLAY PEN NUMBER

You can specify the number of pens to show on the screen in Trend View and Bargraph View.

Touching the current selection of the Display Pen Number shows selectable options at the bottom of the screen. The setting can be modified even while recording is in progress. Choose among the following options:



2 pens



4 pens



6 pens

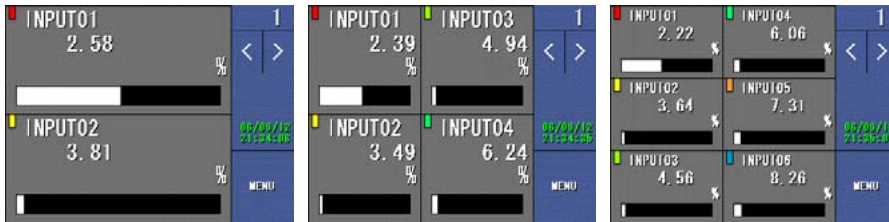


8 pens

5.3.7 DISPLAY PEN NUMBER (OV)

You can specify the number of pens to show on the screen in Overview.

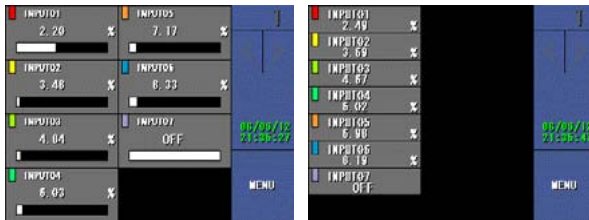
Touching the current selection of the Display Pen Number shows selectable options at the bottom of the screen. The setting can be modified even while recording is in progress. Choose among the following options:



2 pens

4 pens

6 pens



8 pens

16 pens

5.3.8 AUTO PEN SWITCHING

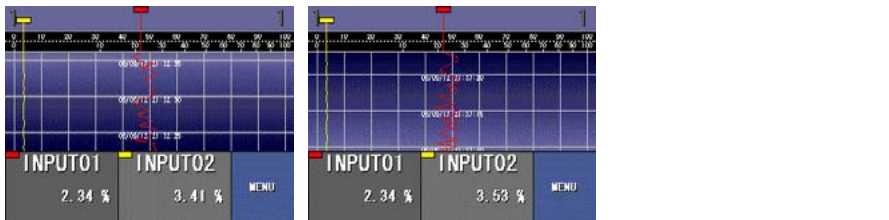
You can automatically switch the pens on the enlarged digital display on the screen.

Enable	Once the enlarged digital display is activated on the screen, pens are automatically switched from one to another.
Disable	Digital display remains on the same pen when the enlarged digital display is activated.

5.3.9 CHART COLOR

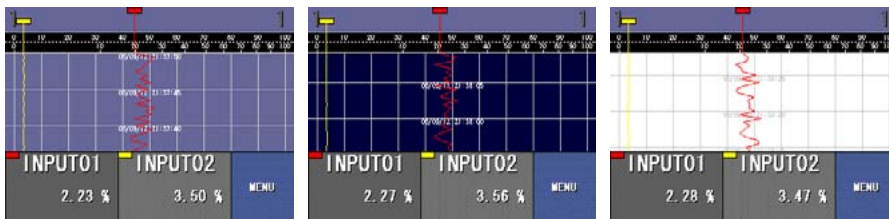
You can specify different types of chart colors.

Touching the current selection of the Chart Color shows selectable options at the bottom of the screen. The setting can be modified even while recording is in progress. Choose among the following options:



Gradation 1

Gradation 2



Plain (Light)

Plain (Dark)

Plain (White)

5.4 ERROR OUTPUT

With the error output setting is enabled, the 73VR21x outputs an alarm contact at the alarm output terminals when an internal bus error continues for longer than 1 minute.

If signal alarm outputs are enabled, the output terminals turn ON and OFF by OR logic.

1. Choose Enable or Disable. When Enable is selected, the following selection appears.
2. Contact logic: Specify whether you want to open (OFF) or close (ON) the contact at alarm.

CAUTION !

- The error output setting is enabled when Record key is pressed.
- An alarm is output while the recorder is stopped, because the internal bus communication is stopped.
- No alarm is output while the zero/span calibration is performed.

5.5 PEN SETTING

Three pen setting keys are on the main menu: Pen setting (Input), Pen setting (Function) and Pen setting (Alarm). Touching one of these three keys opens up Pen selector as shown below:

Pen select (Input)				
Inp. 1	Inp. 4	Inp. 7	Inp. 10	Inp. 13
Inp. 2	Inp. 5	Inp. 8	Inp. 11	
Inp. 3	Inp. 6	Inp. 9	Inp. 12	
				Cancel

Pen setting, example of the 73VR2112

Table. Terminal ID v.s. input number, 73VR2102.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
TRIG+, TRIG-	Input 3

Table. Terminal ID v.s. input number, 73VR2104.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
3A, 3B, 3C	Input 3
4A, 4B, 4C	Input 4
TRIG+, TRIG-	Input 5

Table. Terminal ID v.s. input number, 73VR2106.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
3A, 3B, 3C	Input 3
4A, 4B, 4C	Input 4
5A, 5B, 5C	Input 5
6A, 6B, 6C	Input 6
TRIG+, TRIG-	Input 7

Table. Terminal ID v.s. input number, 73VR2108.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
3A, 3B, 3C	Input 3
4A, 4B, 4C	Input 4
5A, 5B, 5C	Input 5
6A, 6B, 6C	Input 6
7A, 7B, 7C	Input 7
8A, 8B, 8C	Input 8
TRIG+, TRIG-	Input 9

Table. Terminal ID v.s. input number, 73VR2110.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
3A, 3B, 3C	Input 3
4A, 4B, 4C	Input 4
5A, 5B, 5C	Input 5
6A, 6B, 6C	Input 6
7A, 7B, 7C	Input 7
8A, 8B, 8C	Input 8
9A, 9B, 9C	Input 9
10A, 10B, 10C	Input 10
TRIG+, TRIG-	Input 11

Table. Terminal ID v.s. input number, 73VR2112.

TERMINAL ID	INPUT NUMBER
1A, 1B, 1C	Input 1
2A, 2B, 2C	Input 2
3A, 3B, 3C	Input 3
4A, 4B, 4C	Input 4
5A, 5B, 5C	Input 5
6A, 6B, 6C	Input 6
7A, 7B, 7C	Input 7
8A, 8B, 8C	Input 8
9A, 9B, 9C	Input 9
10A, 10B, 10C	Input 10
11A, 11B, 11C	Input 11
12A, 12B, 12C	Input 12
TRIG+, TRIG-	Input 13

5.5.1 PEN SETTING (INPUT)

Touching Pen setting (Input) and choosing one of the pens opens the Pen setting (Input) view for the selected. Pen setting (Input) views have five pages as shown below:

Pen setting(Input)		Inp.1		1/5
Enable/Disable		Enable		
Tag		INPUT01		
Unit		%		
Color				
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Input)		Inp.1		2/5
Line thickness		Normal		
Decimal place		2		
Square root		Normal		
Overview color				
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Input)		Inp.1		3/5
Analog type		-12 to 12 V		
Input range		0.0	12.0	
Eng. range		0.0	12.0	
Plot position		0.0	100.0	
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Input)		Inp.1		4/5
Scale shift		0		
Normal/Log		Normal		
Exp. scale		10		
Log. plot position		-1		
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Input)		Inp.1		5/5
CJC SW		ON		
Burnout type		None		
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

■ ANALOG SETTING

Enable / Disable

Enable / Disable the recording. The pen's input data is stored when this selection is set to Enable.

Tag name

Touching the current selection of the Tag name opens an alphanumeric keypad.

Tag name Max. 8 characters

Unit

Touching the current selection of the Unit opens an alphanumeric keypad.

Unit Max. 4 characters

Color

Touching the current selection of the Color opens a color palette. Choose a desired color from the palette.

Line thickness

This setting is selectable even during recording.

Normal	Normal line
Thick	Thick line

Decimal place

Decimal places for the digital indicator can be specified. This setting is selectable even during recording.

3	3 decimal places
2	2 decimal places
1	1 decimal place
0	No decimal point

Plot range with decimal place on the scale

Plot range in an engineering unit can be indicated on the scale in Trend and Bargraph views. For example, when the lower range is set to 0, and the upper range is set to 1000, the scale shows 10 divisions (0, 100, 200, ... 900, 1000). How many decimal places are to be shown depends upon the 'Decimal place' setting. For example, when '2' decimals are selected, the scale shows two decimal places.

For thermocouple and RTD input, only '0' or '1' is selectable.

Square Root

Input data is square-root-extracted when this setting is enabled.

Overview Color

This option can be changed while recording.

Specify the bargraph color for the pen in the Overview. Use the color palette.

If you have specified alarm-specific colors in Pen (Alarm) Setting, these colors are applied instead of Overview Color.

Analog type and Input range

With 100 msec. storing intervals, only voltage input ranges are selectable.

Selectable signal types and input ranges are as shown in the table in the next page. For DC input, choose the upper and lower range values (0% and 100%) within the measurable range. For temperature input, the input range is equal to the measurable range, thus fixed.

Input range	Max. 6 digits including a decimal point and minus sign
-------------	--

Table. Analog types

I/O TYPE	SELECTIONS	INPUT RANGE	USABLE RANGE		
DC input	-12 to 12 V	±12V	----		
	-6 to 6 V	±6V			
	-3 to 3 V	±3V			
	-1000 to 1000 mV	±1000mV			
	-500 to 500 mV	±500mV			
	-250 to 250 mV	±250mV			
	-125 to 125 mV	±125mV			
	-60 to 60 mV	±60mV			
T/C input			°C	°F	
	(PR)		0 – 1770	32 – 3218	
	K (CA)	Same as the usable range	-270 – 1370	-454 – 2498	
	E (CRC)		-270 – 1000	-454 – 1832	
	J (IC)		-210 – 1200	-346 – 2192	
	T (CC)		-270 – 400	-454 – 752	
	B (RH)		100 – 1820	212 – 3308	
	R		-50 – 1760	-58 – 3200	
	S		-50 – 1760	-58 – 3200	
	C (WRe 5-26)		0 – 2320	32 – 4208	
	N		-270 – 1300	-454 – 2372	
	U		-200 – 600	-328 – 1112	
	L		-200 – 900	-328 – 1652	
	P (Platinel II)		0 – 1395	32 – 2543	
RTD input	JPt 100 (JIS '89)		Same as the usable range	-200 – 510	-328 – 950
	Pt 100 (JIS '89)			-200 – 660	-328 – 1220
	Pt 100 (JIS '97/IEC)	-200 – 850		-328 – 1562	
	Pt 50Ω (JIS '81)	-200 – 649		-328 – 1200	
	Ni 508.4	-50 – 280		-58 – 536	
	Ni 100	-80 – 260		-112 – 500	
	Ni 120	-80 – 260		-112 – 500	
	Ni-Fe 604	-200 – 200		-328 – 392	
	Pt 200	-200 – 850		-328 – 1562	
	Pt 300	-200 – 850		-328 – 1562	
	Pt 400	-200 – 850		-328 – 1562	
	Pt 500	-200 – 850		-328 – 1562	
	Pt 1000	-200 – 850		-328 – 1562	
	Cu 10 @25°C	-50 – 250		-58 – 482	

Eng. Range

Set up physical representation of the upper and lower input range values. This setting determines the momentary value unit displayed on the digital displays while recording. For a temperature input, this setting is greyed out.

Eng. range	Max. 6 digits including a decimal point and minus sign
------------	--

Caution !

The maximum data range handled by the 73VR21x is from -1×10^{10} to 1×10^{10} . Engineering range must be within these limits. Any input out of this range is handled as errors.

Plot position

Determines the display range on the chart when 'Normal' is selected at 'Normal / Log.' Log's detailed setting including the display range is conducted in the Exp. scale. The plot position setting is effective on the Trend view, the Bargraph view and bargraphs on the Overview.

Set up the upper and lower display range values using the keypad. It is usually the same as the engineering unit range, but is set to a different range when you want to enlarge a part of the range to view details.

'e' can be used to input an exponential value such as '1e9'. Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.

Plot position	Max. 6 digits including a decimal and minus sign
---------------	--

For example, if you have a temperature input:

	UNIT	LOWER LIMIT	UPPER LIMIT
Scaled Range	°C	-270	1370
Plotted Range	°C	-270	1370

This is the most common setting. Eng. Range and Plot Position values are the same. Scales are -270°C at the left edge, 1370°C at the right edge of the chart.

	UNIT	LOWER LIMIT	UPPER LIMIT
Scaled Range	°C	-270	1370
Plotted Range	°C	0	1000

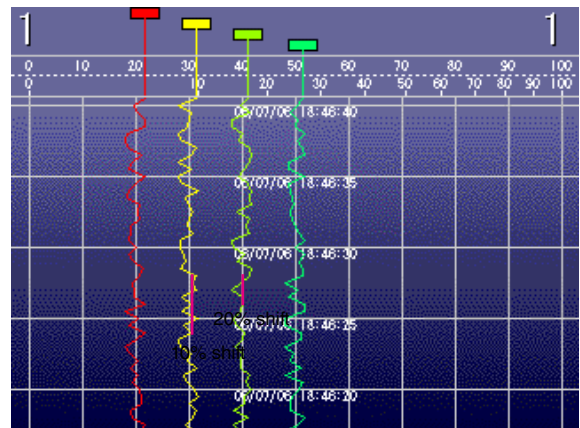
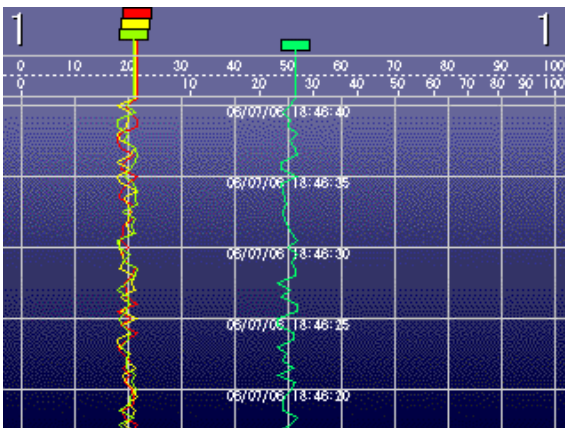
This is used when you want to enlarge a particular section of the Eng. Range. The chart is used only for a narrower range of 1000°C , between 0°C at the left edge and 1000°C at the right edge, against the 1640°C full-scale.

The plot range of a particular channel can be reflected on the scale bar (engineering unit scale). For example, if you have a plot range of 0 (lower limit) to 1000 (upper limit), the scale bar shows 0, 100, 200 900, 1000, the full-scale range (0 to 1000) divided by ten.

Scale shift

Plot positions can be shifted in parallel on the trend chart. This function is useful when multiple graphs are overlapping. You can separate the plot positions while no other data is changed.

Scale shift	Selectable within -100 to 100%
-------------	--------------------------------



Normal / Log

When Normal plotting is selected, the plot area is divided equally.

For Logarithmic plotting, specify Logarithmic Exponential Scale and Plot Position Exponent.

Logarithmic 1

Input signal is converted and plotted in direct logarithmic representation. Specify the lower limit of exponent in 'Logarithmic Plot Position Exponent' field within -9 to 8, and how many divisions you wish to have in 'Exponential Scale' among 10, 5, 4, 2, and 1.

[Example]

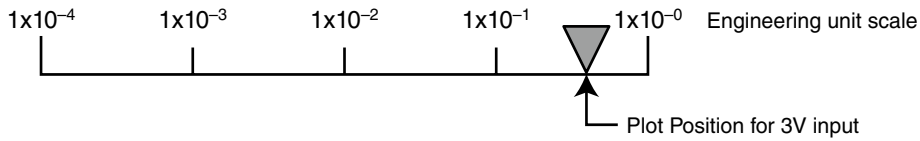
Input range: 1 to 5V

Scale: 1×10^{-4} to 1×10^0 (0.0001 to 1)

Exponential scale: 4

Logarithmic plot position exponent: -4

With 3V input, the engineering unit value equals to 5.0×10^{-1} (0.49995).



The lower plot range value equals to 1×10^{-4} , the upper value equals to 1×10^0 . 3V input, 0.5 in the engineering range equals to 5.0×10^{-1} , which is plotted as shown above.

Logarithmic 2

Input signal is converted and only the exponential scale is plotted. Specify the lower limit of exponent in 'Logarithmic Plot Position Exponent' field within -9 to 8, and how many divisions you wish to have in 'Exponential Scale' among 10, 5, 4, 2, and 1.

[Example]

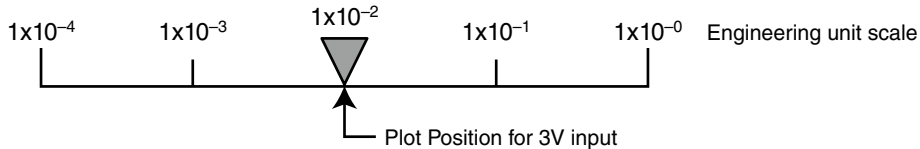
Input range: 1 to 5V

Scale: 1×10^{-4} to 1×10^0 (0.0001 to 1)

Exponential scale: 4

Logarithmic plot position exponent: -4

With 3V input, the engineering unit value equals to 1×10^{-2} .



The lower plot range value, the same as in the case of Logarithmic 1, equals to 1×10^{-4} , the upper value equals to 1×10^0 . Only the part of exponential scale (-2) of 3V input, 1×10^{-1} , is plotted as shown above.

CJC (Cold Junction Compensation) SW

Specify this setting for thermocouple input.

OFF	Disable CJC
ON	Enable CJC

Burnout type

Select 'No Burnout' to minimize the measuring errors caused by the sensor/wire resistance and the burnout sensing current.

With RTD input, the signal may go transiently to the opposite direction from the burnout setting.

With DC input, the burnout setting is ignored and the burnout sensing current is cancelled.

None	No burnout
Upscale	Upscale burnout
Downscale	Downscale burnout

■ DISCRETE SETTING

OFF Description, ON Description

Short description for ON (1) and OFF (0) status can be specified.

OFF description	Max. 5 characters
ON description	Max. 5 characters

5.5.2 PEN SETTING (ALARM)

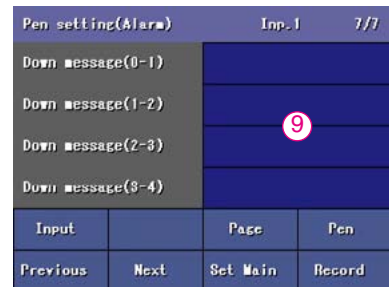
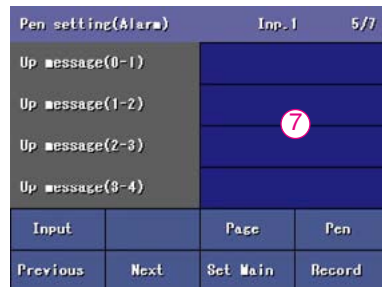
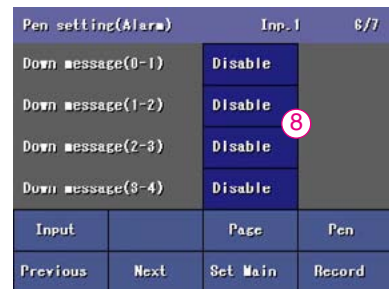
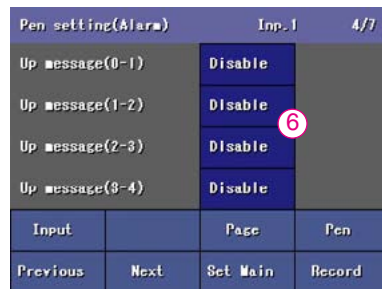
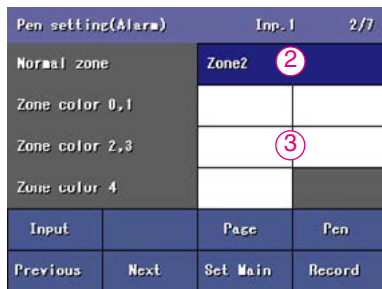
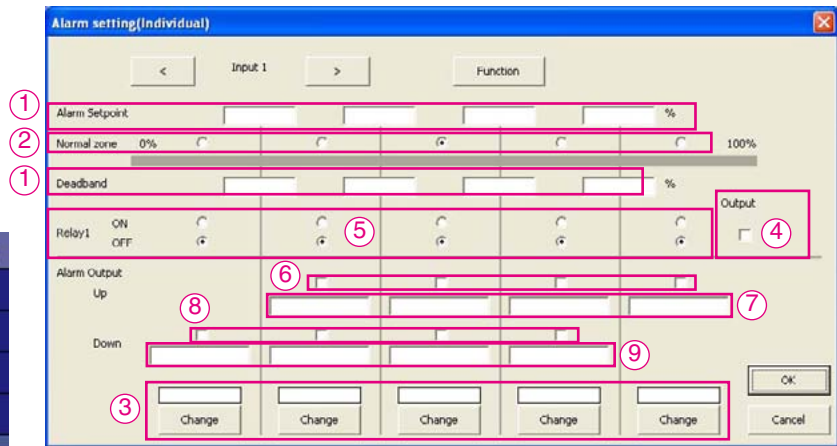
■ ANALOG ALARM

Limit alarms can be indicated on the screen. Alerting a remote device is also possible via the alarm output terminals. The alarm history is also stored as a file. Alarm functions regardless of the storing method.

Touching Pen setting (Alarm) and choosing one of the pens specified as analog channel opens the Pen setting (Input) view for the selected. It consists of seven pages as shown below. The 73VR21BLD Alarm Setting Dialog Box is also shown in order to help you understand each parameter's functions. Corresponding parameters are marked with the same numbers.

These options can be changed while recording.

73VR21BLD Alarm Setting Dialog Box



Limit (Alarm Setpoint), Deadband (1)

Specify up to 4 setpoints in engineering unit within the Input Range. Alarms are reset when the signal goes out of the alarm zone by the preset deadband values.

If you set only "High" and "Low" setpoints, they must be set immediately next to the "Normal" zone.

Deadband is used to avoid the alarm ON and OFF quickly and repeatedly around the setpoint when the input signal changes that way. The alarm, once triggered, does not reset until the signal passes the point by the preset deadband.

'e' can be used to input an exponential value such as '1e9.' Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.

Limit / Deadband	Max. 6 digits including a decimal point and minus sign
------------------	--

Normal Zone (2)

Specify the zone of normal status. When the input signal is out of this zone, the alarm indicator of the pen flashes. Choose among Zone 0, 1, 2, 3 and 4.

Zone Color (3)

You can apply specific colors to represent each zone divided by the limits for use in the Display views. Touch the current selection and use the color palette.

Alarm Output (4)

Set Enable to provide an external contact output at the alarm terminal. When multiple alarm outputs are set including error output, the alarm contact turns ON/OFF by OR logic.

Relay (5)

Specify the zone(s) in which you wish the contact to be turned on or off.

The keys are arranged from the left to right in the order of Zone numbers (Zone 0 for the leftmost key, Zone 4 for the rightmost key).

Alarm Message (6)...(9)

Set Enable to the thresholds where Messages are to be displayed on the Alarm History.

Up messages appear when the signal goes across an alarm setpoint upward. For example, Up message (0-1) is sent when the signal goes over the Limit 1. Down messages appear when the signal goes across an alarm setpoint downward. For example, Down message (0-1) is sent when the signal goes below the Limit 1. Message contents up to 10 characters respectively for Up and Down.

■ DISCRETE ALARM

Alarm status can be indicated on the screen. Alerting a remote device is also possible via the alarm output terminals. The alarm history is also stored as a file. Alarm functions regardless of the storing method.

OFF / ON Output, Delay

Alarm contact outputs can be provided at the alarm terminal.

Choose Enable to activate an relay output for respective signal status (input ON and OFF).

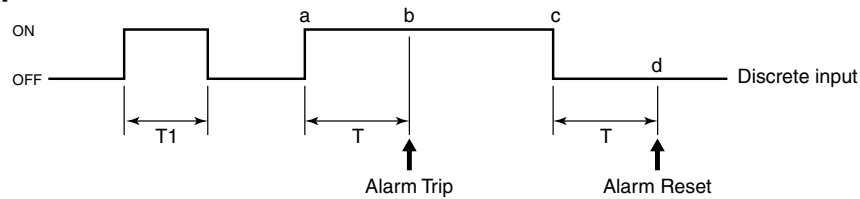
In order to eliminate noise interference, you can specify the time (seconds) to wait to apply change in signal status.

Delay	Selectable from 1 to 99 seconds
-------	---------------------------------

Caution !

Alarm is Not triggered if 'true' contact status lasts shorter than the delay time.

[Example] ON Alarm



- ON status for T1 time duration does not trigger alarm because the duration is shorter than the delay time.
- 'True' contact status starts at (a) point but an alarm is triggered only at (b) point, after the delay time T has been elapsed.
- 'False' contact status starts at (c) point but the alarm is reset only at (c) point, after the delay time T has been elapsed.

Normal State

You can specify which contact status from the trigger input terminal should be considered 'Normal.' For example, if you set 'OFF' to be normal, ON contact status triggers alarm, and it is indicated on the recorder view.

ON/OFF	Both ON and OFF are normal.
ON	ON is normal.
OFF	OFF is normal.

OFF Color, ON Color

You can apply specific colors to represent each ON and OFF status for use in the Display views. Touch the current selection and use the color palette.

OFF / ON Message Output

Set Enable to the status for which Messages are to be displayed on the Overview and Alarm History.

OFF Message, ON Message

These messages is used for Overview and Alarm History. Message contents up to 10 characters respectively for Up and Down.

5.5.3 PEN SETTING (FUNCTION)

Touching Pen setting (Function) and choosing one of the Function pens opens the Pen setting (Function) view for the selected. It consists of multiple pages as shown below.



Enable / Disable

Enable / Disable the recording. The pen's function data is stored when this selection is set to Enable.

Tag name

Touching the current selection of the Tag name opens an alphanumeric keypad.

Tag name	Max. 8 characters
----------	-------------------

Unit

Touching the current selection of the Unit opens an alphanumeric keypad.

Unit	Max. 4 characters
------	-------------------

Color

Touching the current selection of the Color opens a color palette. Choose a desired color from the palette.

Line thickness

Normal	Normal line
Thick	Thick line

Decimal place

Decimal places for the digital indicator can be specified.

3	3 decimal places
2	2 decimal places
1	1 decimal place
0	No decimal point

Overview Color

Specify the bargraph color for the pen in the Overview. Use the color palette.

Function

Choosing one of the available functions will change the rest of the parameter list to match the selected function.

Add / Subtract	Addition / Subtraction
Multiplication	Multiplication
Division	Division
Moving average	Moving average filter
First order lag	First order lag filter
Square root	Square root extraction
Peak hold (max)	Maximum value hold
Valley hold (min)	Minimum value hold
Power	Power
Analog accumulation	Analog signal accumulation
F value calculation	F value calculation
AND	Logical multiplication
OR	Logical addition (sum)
NOT	Logical negation
XOR	Exclusive disjunction
Anemoscope	Wind direction

■ ARITHMETIC FUNCTIONS

Input (X)

Touching Inp. field opens the Tag name selector view. Select input signals used for the operating function.

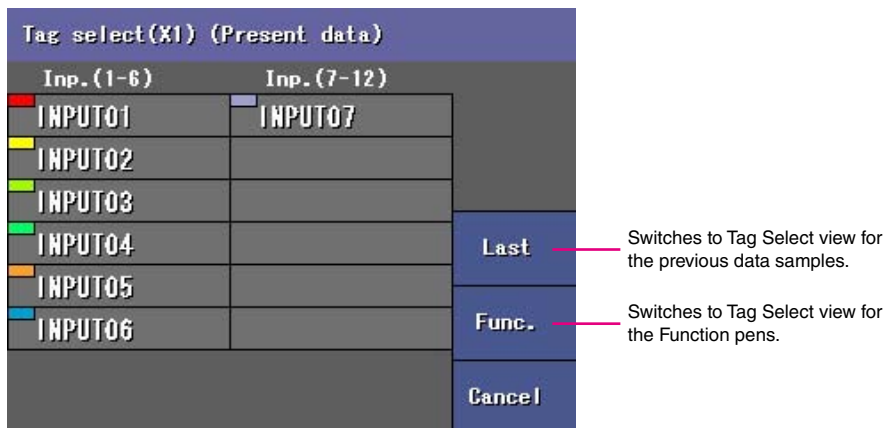
If you want to use the previous data sample (last one) or one of the function pens, switch to the respective views and choose. Tag names for previous data samples are indicated with * (asterisk).

If you want to use the previous function pen data sample (last one), first switch to the Tag select (Function) view and then touch Last key.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used as X1 or X2 in an equation for Function Pen 1.

When assigning 'last' data sample to X1 or X2, specify also the initial value. Otherwise no data is



recorded for the first operating cycle.

Coefficient (K), Constant (A)

Touching the current selection of these parameters opens a numeric keypad. Enter appropriate values.

Coefficient, Constant	Max. 6 digits including a decimal point and minus sign
-----------------------	--

Initial value

Initial value is used in the function operation cycle as default data sample when 'last' data is specified in an equation. If you do not need, leave the field blank.

Initial value	Max. 6 digits including a decimal point and minus sign
---------------	--

Note

'e' can be used to input an exponential value such as '1e9.' Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.

Scale shift

Plot positions can be shifted in parallel on the trend chart. This function is useful when multiple graphs are overlapping. You can separate the plot positions while no other data is changed. Refer to Section 5.5.1.

Normal / Log

When Normal plotting is selected, the plot area is divided equally. When Logarithmic 1 is selected, the plot area is divided in specified scale of exponents of 10.

For Logarithmic plotting, specify the lower limit of exponent in 'Logarithmic Plot Position Exponent' field within -9 to 8, and how many divisions you wish to have in 'Exponential Scale' among 10, 5, 4, 2, and 1. Refer to Section 5.5.1.

■ FILTER FUNCTIONS

Touching Pen setting (Func) and choosing one of the pens specified as analog channel opens the Pen setting (Func)

Pen setting(Function)		Func.1		3/8
Function		Moving average		
Samples		5		
Input (X1, X2)		Inp.1	Inp.1	
Coefficient (K1, K2)		1.0	1.0	
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Function)		Func.1		3/8
Function		First order lag		
Time constant		1.00		
Input (X1, X2)		Inp.1	Inp.1	
Coefficient (K1, K2)		1.0	1.0	
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

view for the selected. Filter function views are as follows:
Moving average.

First order lag filter.

Moving Average

Specify number of samples used for the moving average operation and an input channel. Touching Inp.1 opens the Tag name selector view. Select an input signal used for the operating function.

Samples	Specify between 2 and 16
---------	--------------------------

First Order Lag Filter

Specify a time constant and an input channel. Touching Inp.1 opens the Tag name selector view. Select an input signal used for the operating function.

Time constant	Specify between 0.00 and 100.00 seconds. Max. 2 decimal places.
---------------	---

■ PEAK HOLD (MAX) / PEAK HOLD (MIN)

Pen setting(Function)		Func. 1	3/6
Function		Peak hold (MAX)	
Reset	None	None	Reset after a specified time duration
Reset time	0		Reset by the trigger input signal
Input (X1, X2)	Inp. 1	Inp. 1	Reset by time of a day
	Alarm	Page	Pen
Previous	Next	Set Main	Record

Input (X1)

Touching Inp.1 opens the Tag name selector view. Select an input signal used for the operating function.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used as X1 in an equation for Function Pen 1.
When assigning 'last' data sample to X1, specify also the initial value. Otherwise no data is recorded for the first operating cycle.

Initial value

Initial value is used in the function operation cycle as default data sample when 'last' data is specified in an equation. If you do not need, leave the field blank.

Initial value	Max. 6 digits including a decimal point and minus sign
---------------	--

Reset / Reset time

In order to reset the hold function, 'Time' or 'Trigger input' can be specified. Touch the left 'None' key for 'Time,' the right key for 'Trigger input' conditions. If you leave the setting to 'None,' the data is reset only when 'Start' key is touched. When '24 hours' is specified, the reset time must be specified. Touch the current time specification and a numeric keypad appears on the screen.

• **'Reset by time' selections**

None	No resetting by time. Reset only when 'Start' key is touched.
30 min.	Reset at 0 minute and 30 minutes every hour
1 hour	Reset at 0 minute every hour
2 hours	Reset at 0 minute every even hours (0, 2, 4,...)
3 hours	Reset at 0 minute every three hours (0, 3, 6,...)
4 hours	Reset at 0 minute every four hours (0, 4, 8,...)
6 hours	Reset at 0 minute every six hours (0, 6, 12, 18)
12 hours	Reset at 0 minute every twelve hours (0, 12)
24 hours	Reset at a specified time of a day

• **'Reset by trigger input' selections**

None	No resetting by time. Reset only when 'Start' key is touched.
Up	Reset when the trigger input turns from OFF to ON.
Down	Reset when the trigger input turns from ON to OFF.
ON	Reset while the trigger input is ON.
OFF	Reset while the trigger input if OFF.

■ POWER FUNCTIONS

Input (X1)

Touching Inp.1 opens the Tag name selector view. Select input signal used for the operating function.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used as X1 in an equation for Function Pen 1. When assigning 'last' data sample to X1, specify also the initial value. Otherwise no data is recorded for the first operating cycle.

The following combinations of X1 and A1 will result in an error and the screen will show ERR: X1 = 0 and A1 < 0, or X1 is negative and A1 is not integer.

When an calculation result is overrange (equal to -1×10^{10} or lower, and 1×10^{10} or higher), the screen will be blank. Such data cells are blank when converted into CSV.

Constant (A1)

Specify the exponent.

Constant	Exponent ± 99.99
----------	----------------------

Initial value

Initial value is used in the function operation cycle as default data sample when 'last' data is specified in an equation. If you do not need, leave the field blank.

Initial value	Max. 6 digits including a decimal point and minus sign
---------------	--

Caution !

(1) The power function results in error when:

$$X1 = 0, A1 < 0 \text{ or} \\ X1 < 0, A1 \neq \text{integer}$$

'ERR' is indicated on the screen.

(2) The power function results in overrange when the results exceeds the range from -1×10^{10} to 1×10^{10} .

No data is displayed on the screen, and CSV data cells are blank.

■ ANALOG ACCUMULATION

Pen setting(Function)		Func.1		3/6
Function		Analog accumulation		
Reset		None	None	
Reset time		0		
Input (X1, X2)		Inp.1	Inp.1	
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Function)		Func.1		4/6
Sum scale		Hour		
Drop out		0.0		
Initial value				
Plot position		0.0	100.0	
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Input (X1)

Touching Inp.1 opens the Tag name selector view. Select an input signal used for the operating function.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used as X1 in an equation for Function Pen 1.

When assigning 'last' data sample to X1, specify also the initial value. Otherwise no data is recorded for the first operating cycle.

Initial value

Initial value is used in the function operation cycle as default data sample when 'last' data is specified in an equation. If you do not need, leave the field blank.

Initial value	Max. 6 digits including a decimal point and minus sign
---------------	--

Reset / Reset time

In order to reset the totalized value, 'Time' or 'Trigger input' can be specified. Touch the left 'None' key for 'Time,' the right key for 'Trigger input' conditions. If you leave the setting to 'None,' the data is reset only when 'Start' key is touched.

When '24 hours' is specified, the reset time must be specified. Touch the current time specification and a numeric keypad appears on the screen.

For details of the selections, please refer to 'Peak Hold' function.

Sum scale

Input X1, such as flow signals, could be values per time unit (/day, /hour, /min, /sec). In order to accurately totalize this type of signals, specify the time unit.

None	Simple accumulation of the input data
Sec	Per second
Min	Per minute
Hour	Per hour
Day	Per day

Drop out

Touching the number next to Drop out opens a numeric key-panel. Enter appropriate values.

Drop out	Max. 6 digits positive number including a decimal point.
----------	--

■ F VALUE CALCULATION

Pen setting(Function)		Func.1		3/7
Function	F value calculation			
Equation	$\Sigma [10^{**}\{(X1-T0)/Z\}] * ST/60$			
Reset	None			
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Function)		Func.1		4/7
Reset	None			
Limit/Deadband	0.0			
Input (X1, X2)	Inp.1	Inp.1		
Ref Temp (T0)	0.0			
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Pen setting(Function)		Func.1		5/7
Z value (Z)	0.0			
Storing interval(ST)	500msec.			
Initial value				
Plot position	0.0	100.0		
	Alarm	Page	Pen	
Previous	Next	Set Main	Record	

Reset

In order to reset the totalized value, 'Trigger input' and/or 'Analog input' can be specified. Touch the 'None' key in Page 3/7 for 'Trigger,' the one in Page 4/7 for 'Analog input' conditions. If you leave the setting to 'None,' the data is reset only when 'Start' key is touched.

For details of the trigger input selections, please refer to 'Peak Hold' function.

For the analog input resetting, choose one of the following conditions:

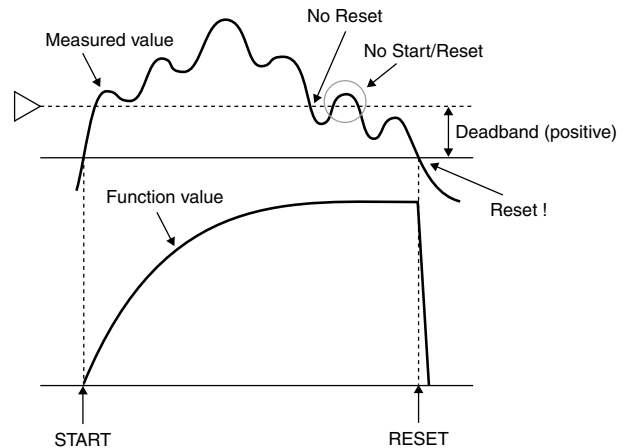
None	No resetting by analog input. Reset only when 'Start' key is touched.
Value < Limit	Reset when the measured value is lower than the limit value.
Value ≤ Limit	Reset when the measured value is equal to or lower than the limit value.

Limit / Deadband

Specify Limit value used to reset the function result. Deadband is used to prevent repeating of F value calculation execution and resetting when the measured value stays unstable close to the limit value.

A positive deadband is used to reset at 'Limit - Deadband,' while a negative deadband is used to reset at 'Limit + Deadband.'

By choosing an wide deadband, you can set different values for set and reset conditions.



Input (X1)

Touching Inp.1 opens the Tag name selector view. Select an input signal used for the operating function.

Input (X2)

Touching Inp.1 opens the Tag name selector view. Select an input signal used as resetting limit.

Ref. Temp (T0), Z value (Z)

Ref. Temp, Z value	Max. 6 digits including a decimal point and minus sign
--------------------	--

Caution !

100 msec. storing interval is not usable with F value calculation.

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the X2 in an equation for Function Pen 1.

'e' can be used to input an exponential value such as '1e9.' Entering 'e' in any other way (e.g. '1ee') will not be recognized as a numeral.

■ LOGIC FUNCTIONS

Function

Choosing one of the available functions will change the rest of the parameter list to match the selected function.

Input (X1, X2)

Touching Inp.1 or Inp.2 opens the Tag name selector view. Select input signals used for the operating function.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used in an equation for Function Pen 1.

Initial value

Initial value is used in the function operation cycle as default data sample when 'last' data is specified in an equation. If you do not need, leave the field blank.

Initial value	1 for ON, 0 for OFF
---------------	---------------------

Caution !

Any setting other than 0 and 1 will be handled as 0 as initial value.

For the XOR function, setting other than 0 and 1 to X1 or X2 will result in '0.'

OFF Description, ON Description

Short description for ON (1) and OFF (0) status for the operation result can be specified.

OFF description	Max. 5 characters
-----------------	-------------------

ON description	Max. 5 characters
----------------	-------------------

■ ANEMOSCOPE

Input (X1)

Touching Inp.1 opens the Tag name selector view. Select input signals used for the operating function.

Caution !

Be careful to choose a pen of Not Itself. For example, you cannot choose Function Pen 1 or the last data of Function Pen 1 to be used in a equation for Function Pen 1.

5.6 HARDWARE CONFIGURATION

The initial view for the Hardware Configuration setting is as shown below.

Hardware configuration		1/1	
ADC speed	Medium		
Line noise filter	50/60Hz		
Zero/Span calib.	1	2	
	3	4	
	5	6	
		Set Main	Record

5.6.1 ADC SPEED

Choose from Fast, Slow and Medium. When 100 msec. storing rate is selected, there is no need of this setting.

5.6.2 LINE NOISE FILTER

Choose from 50/60 Hz, 50 Hz or 60 Hz. When 100 msec. storing rate is selected, there is no need of this setting.

Caution !

When the line noise filter setting is changed, measured values immediately after the change may contain errors by the AD conversion cycle change. Wait for 10 seconds before resuming data recording after it has been changed.

5.6.3 ZERO/SPAN CALIBRATION

Zero/span calibration is used to compensate fine deviation in the measured signals. Field adjustments are performed by applying actual input signals.

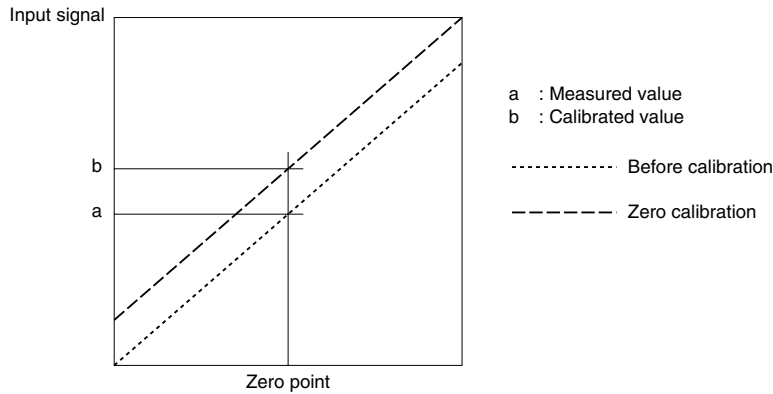
An offset is given to the signal by Zero calibration, and the signal gain is changed by Span calibration.

Calibration examples are given below.

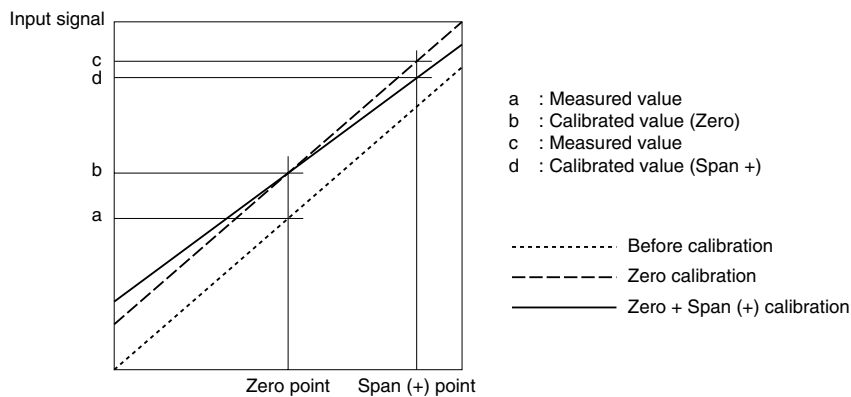
ZERO & SPAN CALIBRATION

- Span (+) and Span (-) calibrations must have another calibration point (Zero or Span).
- Calibration points must be in relation to each other as follows: Span (-) point < Zero point < Span (+) point. Otherwise the calibration will result in error.
- Switching the channel's analog input type will reset the calibrated values.

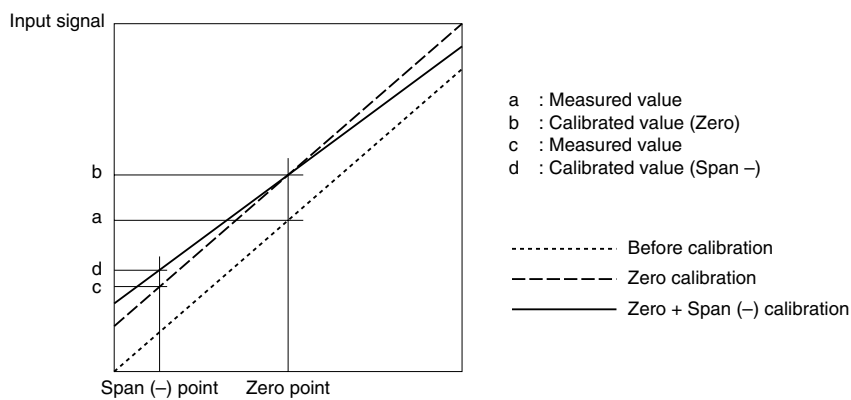
• Zero calibration (offset) only



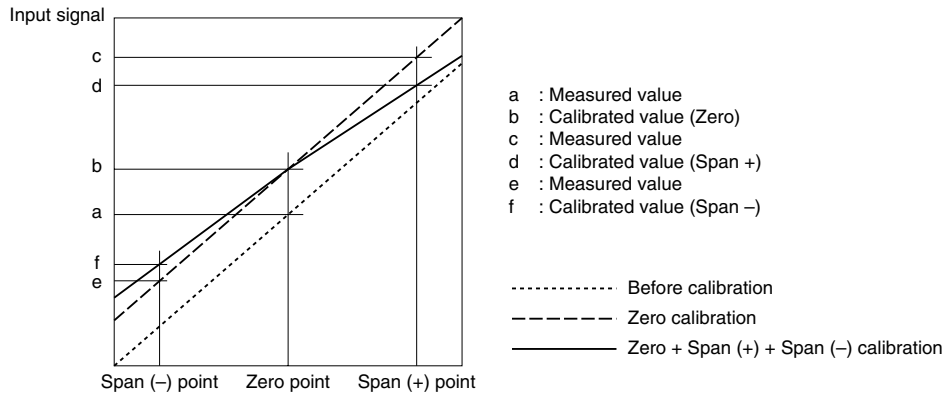
• Zero calibration (offset) + Span (+) calibration



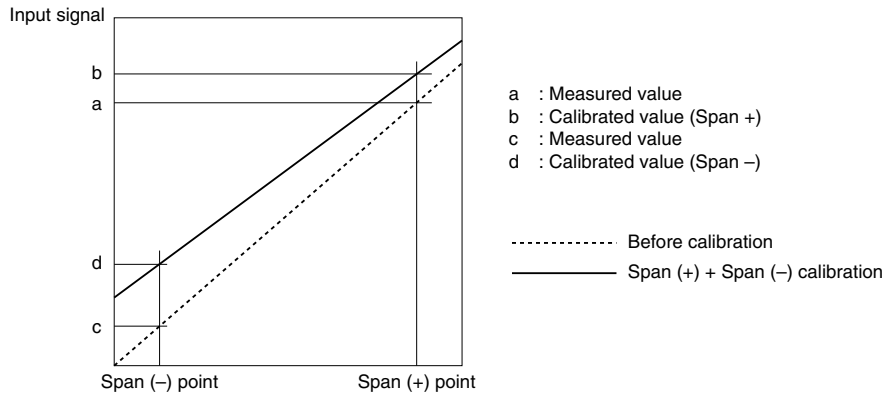
• Zero calibration (offset) + Span (-) calibration



• **Zero calibration (offset) + Span (+) calibration + Span (-) calibration**



• **Span (+) calibration + Span (-) calibration**



73VR21x measuring range and the unit used in calibration

The analog inputs (ch.1 through 12) are represented in 16-bit integer with the engineering unit as explained below:

- ±12V, ±6V, ±3V ranges: 1mV
- ±1000mV, ±500mV: 0.1mV
- ±250mV, ±125mV, ±60mV: 0.01mV
- Temperature input: 0.1°C

Before the zero/span adjustments...

1. Set the input and burnout types for the channel to be calibrated.
2. Apply a known reference input signal of adequate accuracy.
3. In order to eliminate noise interference during the calibration procedure, set the AD conversion mode to Low setting.
4. Choose the channel number indicated to the right of Zero/span calibration. For Input 7 through 12, go to next page.

Calibration procedure

Zero/Span calibration		Inp.1	1/1
Zero			
Span (+)			
Span (-)			
Before/After calib.		2	2
	Previous	Next	Return
	Cancel	Set Main	Record

1. Touch one of the right side fields next to each selection, and enter the true value (expected value) in integer.

Zero	Max. 7 digits including minus sign
Span (+)	Max. 7 digits including minus sign
Span (-)	Max. 7 digits including minus sign

2. Touch OK.

Next to 'Before/After calibration' the actual input value measured at the moment of calibration is indicated. The right side field shows the same value after this particular calibration step. The value is updated in 500 millisecond cycles.

Touch Cancel to go back to the previous view without applying the calibrated value.

3. Go to the next calibration in the same manner.
4. In order to go to another channel, touch Previous or Next key, or touch Return key to choose one directly on the view.

Once you have returned to the view to select channels, those already calibrated are indicated with CAL.

Calibrated values are stored in the memory when Record key is touched. Be sure to touch the key and return to Record view after calibration.

5.7 CONFIRMING CHANGES

New setting becomes valid when the display has gone back to one of the Display views by touching Record key. If there was any change in the storing rate, the data storing form, and/or the number of enabled pens, the message as shown below appear on the screen.

Touching OK overwrites the previous data file, and touching Cancel return the screen to Display view.



5.8 SETTING UP WITH THE 73VR21BLD

A software configuration created on the 73VR21x Configuration Builder (model: 73VR21BLD) can be downloaded to the 73VR21x. The configuration set up on the 73VR21x can be uploaded and displayed on the 73VR21BLD.

In order to apply a new setting stored in the CF Card using the 73VR21BLD, restart the 73VR21x. For detailed information about the 73VR21BLD, please refer to the users manual for the model.

6. QUICK STARTUP

The minimum setup required to start recording and showing on the screen is explained in this section, using Quick Setup.

Touch [Quick setup] to open the Basic setting view.

BASIC SETTING

Control keys

[Cancel] : Exits Quick Setup to go back to Main View without saving a new configuration setting.

[Previous] : Goes to previous view.

[?] : Shows Help view (below)

[Next] : Goes to next view

Help view (Basic setting)

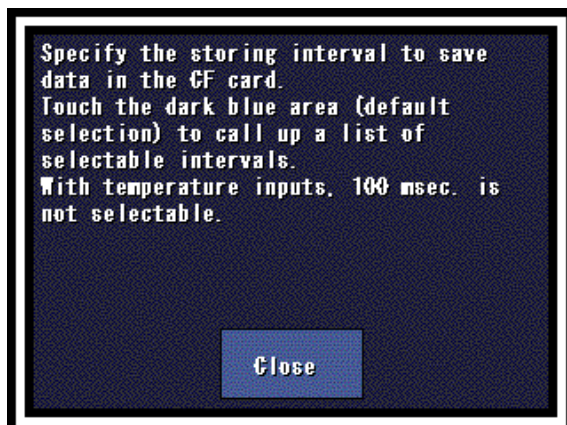


Touch [Next] to show Storing interval view.

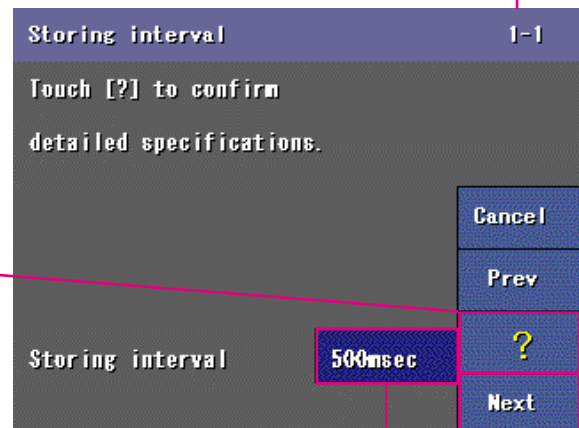
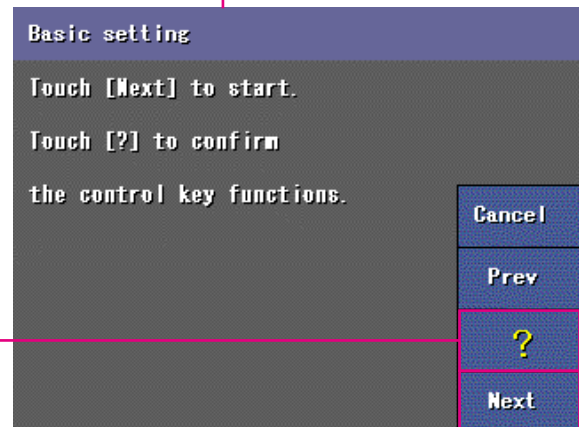
STORING INTERVAL

Touch the dark blue area (default selection) to call up a list of selectable intervals, choose one and touch [Next].

Help view (Storing interval)



Main		73VR2106 Version 2.00c 1/2	
System	Data storing method		
Display setting	Error output configuration		
Pen setting (Input)	Pen setting (Function)		
Pen setting (Alarm)	Hardware		
Quick setup	Comment		
Page	Back to Record		



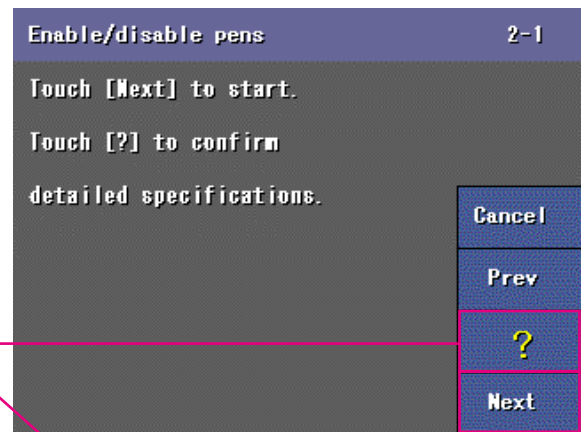
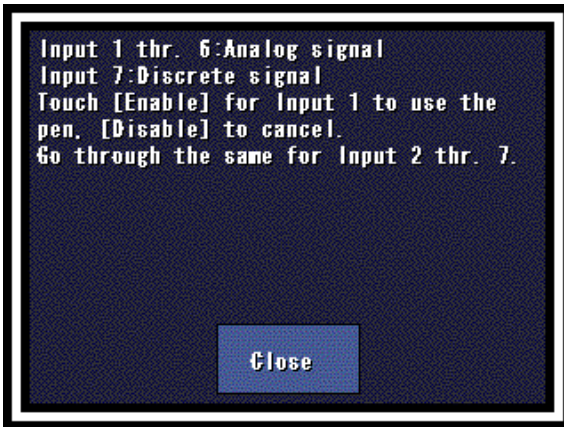
Storing interval		1-1	
Touch [Next] to start.			
100msec.	500msec		
1sec.	2sec.		
5sec.	10sec.		
1min.	10min.		
		Cancel	

ENABLE / DISABLE PENS

Touch [Next] to call up a list of pens (2-2).

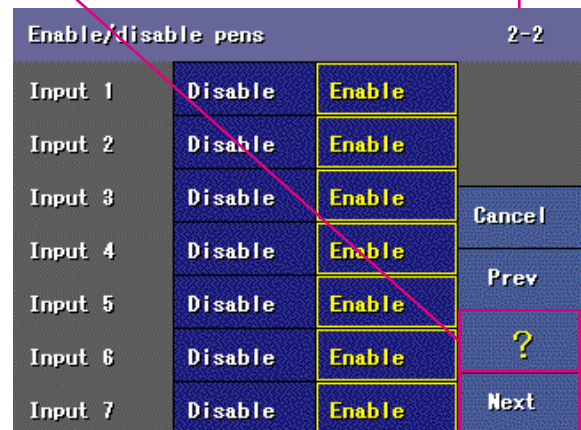
Touch [Enable] to activate pens.

Help view (Storing interval)



The screen example to the right is applied for the 73VR2106. Touch Next to show more input selections.

Touch [Next].

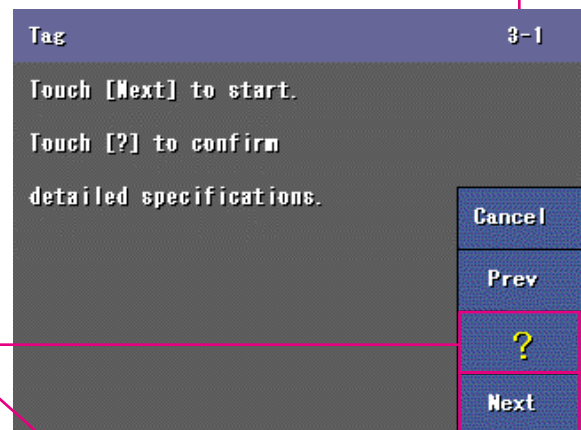


TAG

Touch [Next] to call up a list of pens (3-2).

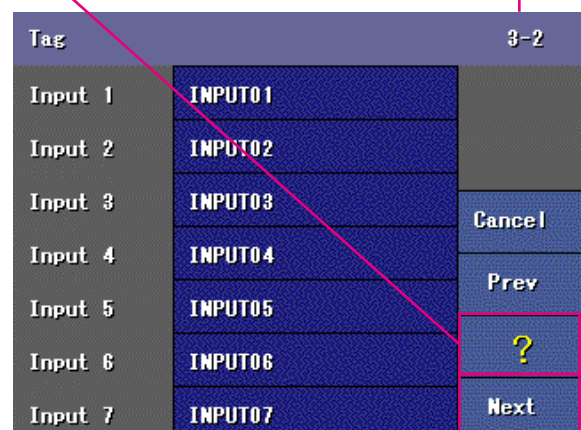
Touch the dark blue area (default name) to call up a keypad and enter a tag name. Max. 8 alphanumeric characters.

Help view (Tag)



The screen example to the right is applied for the 73VR2106. Touch Next to show more input selections.

Touch [Next].

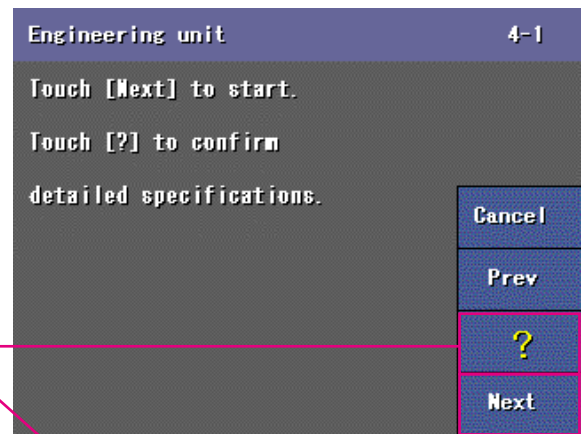
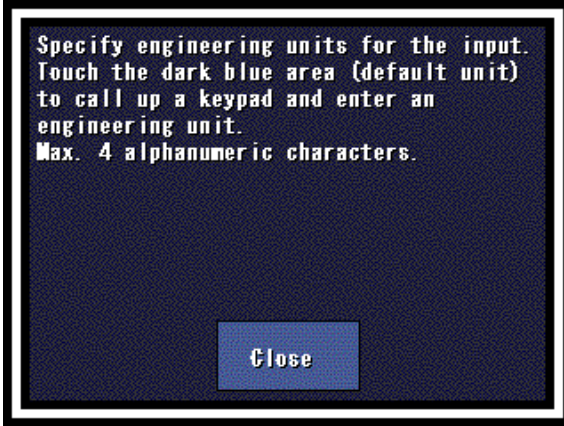


ENGINEERING UNIT

Touch [Next] to call up a list of pens (4-2).

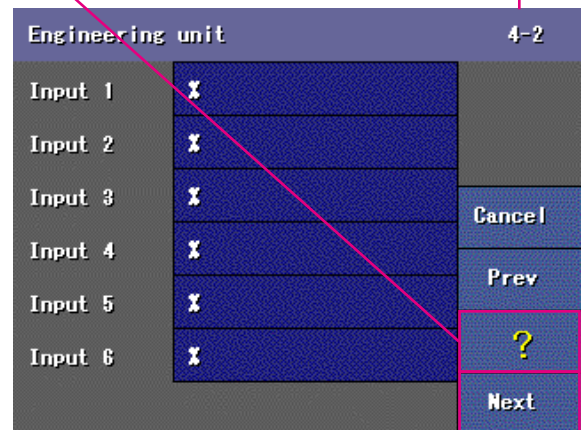
Touch the dark blue area (default unit) to call up a keypad and enter an engineering unit. Max. 4 alphanumeric characters.

Help view (Tag)



The screen example to the right is applied for the 73VR2106. Touch Next to show more input selections.

Touch [Next].

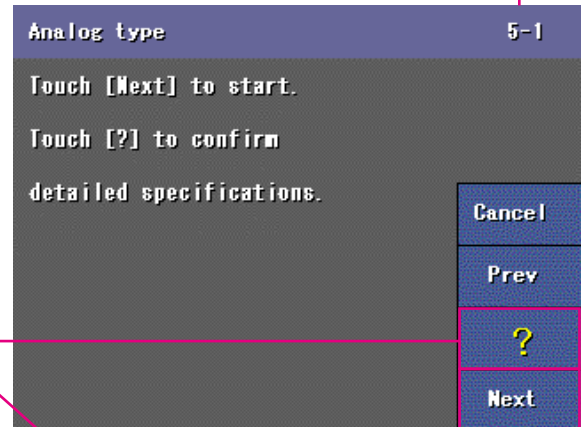
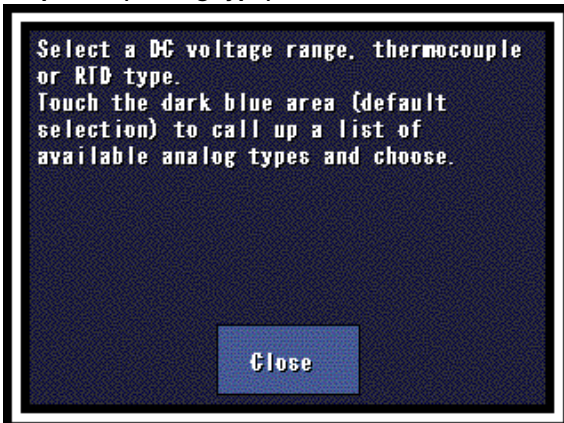


ANALOG TYPE

Touch [Next] to call up a list of pens (5-2).

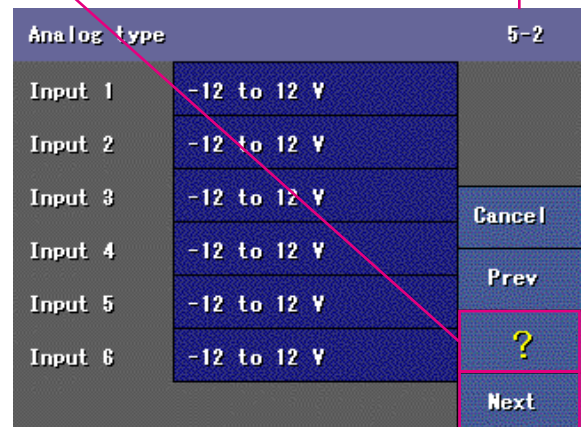
Touch the dark blue area (default unit) to call up a list of selectable types, choose one and touch [Next].

Help view (Analog type)



The screen example to the right is applied for the 73VR2106. Touch Next to show more input selections.

Touch [Next].

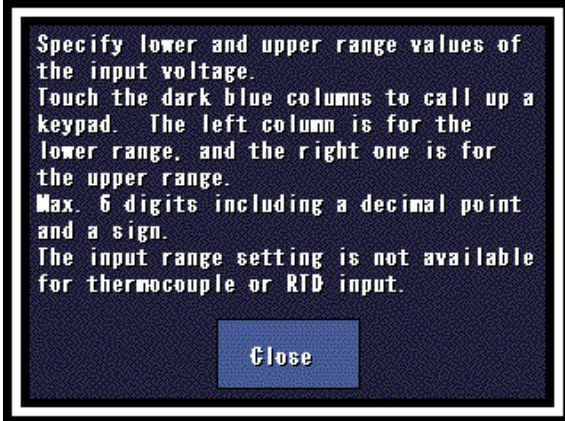


INPUT RANGE (DC input only)

Touch [Next] to call up a list of pens (6-2).

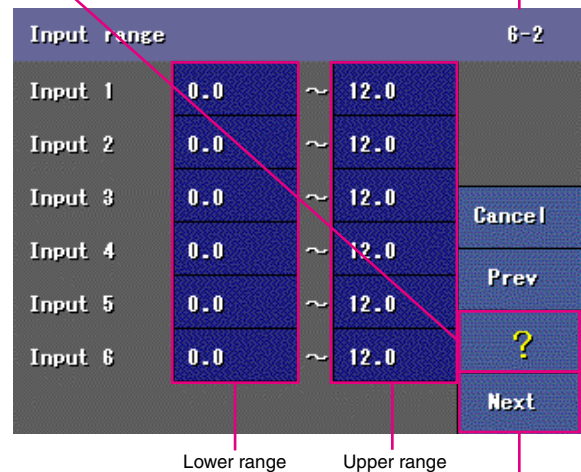
Touch the dark blue area (default unit) to call up a keypad.
Max. 6 digits including a decimal point and a sign.

Help view (Input range)



The screen example to the right is applied for the 73VR2106.
Touch Next to show more input selections.

Touch [Next].

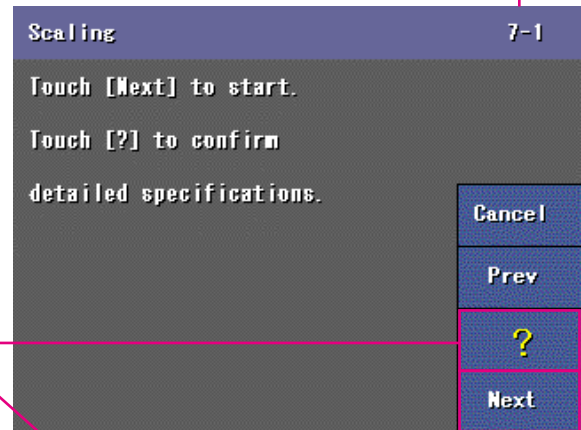
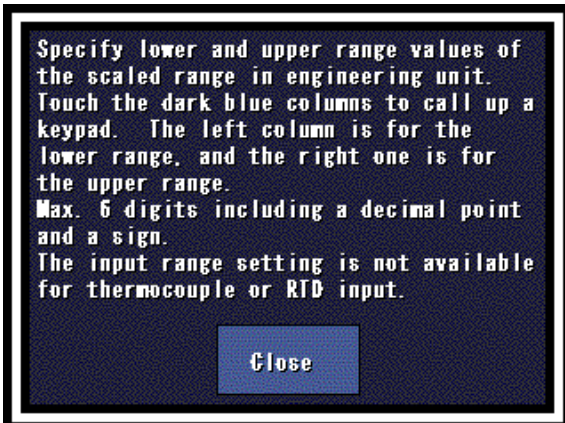


SCALING (DC input only)

Touch [Next] to call up a list of pens (6-2).

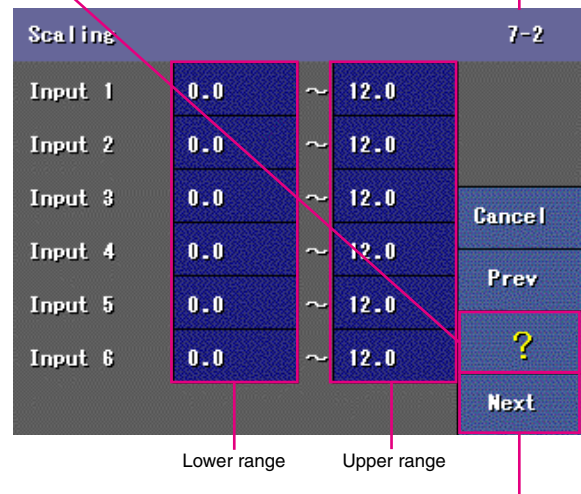
Touch the dark blue area (default unit) to call up a keypad.
Max. 6 digits including a decimal point and a sign.

Help view (Scaling)



The screen example to the right is applied for the 73VR2106.
Touch Next to show more input selections.

Touch [Next].

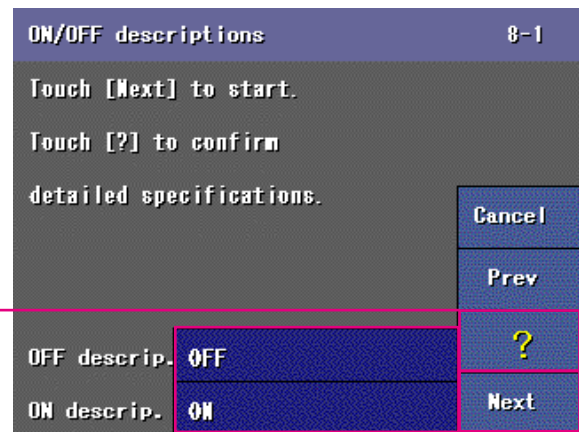
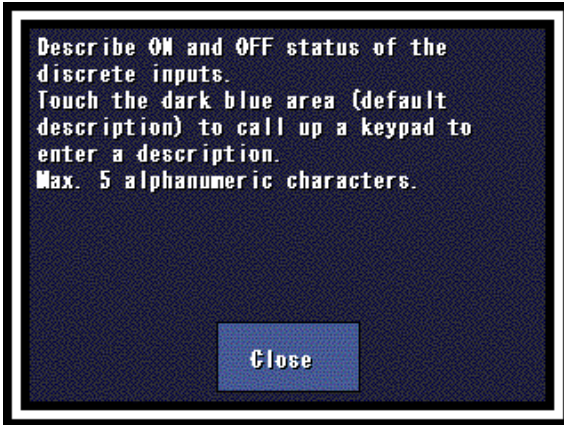


ON/OFF DESCRIPTIONS

This view appears only when you have enabled discrete input channel in 2-2.

Touch the dark blue area (default description) to call up a keypad and enter a description. Max. 5 alphanumeric characters.

Help view (Tag)



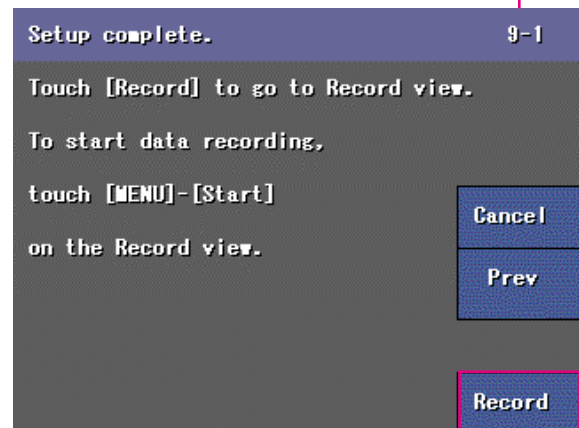
Touch [Next].

SETUP COMPLETE

Now the most basic settings are complete. Touch [Record] to go to Record view.

Caution !

When the 73VR21x is setup using the Quick Setup, the plot positions on the screen is automatically set to the same range as the scaled range (full measurable range for temperature).



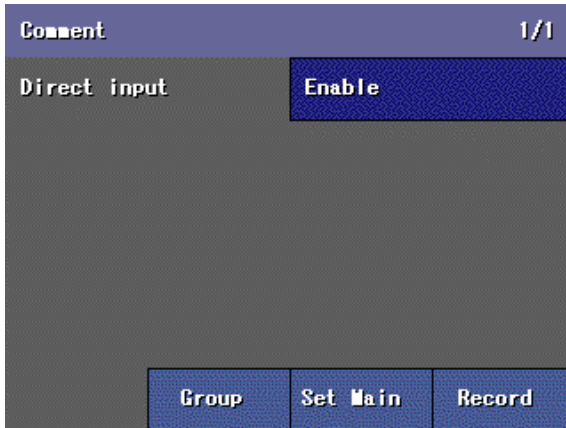
7. ENTERING COMMENTS

You can either enter comments directly on the chart while recording, or preset a library of comments to be indicated on the Trend view.

The maximum of 56 comments categorized in 7 groups (8 comments per group) can be preset. The seventh group is used also for free comment entry during recording. The comments in this group can be modified while recording.

7.1 WRITING COMMENTS DIRECTLY

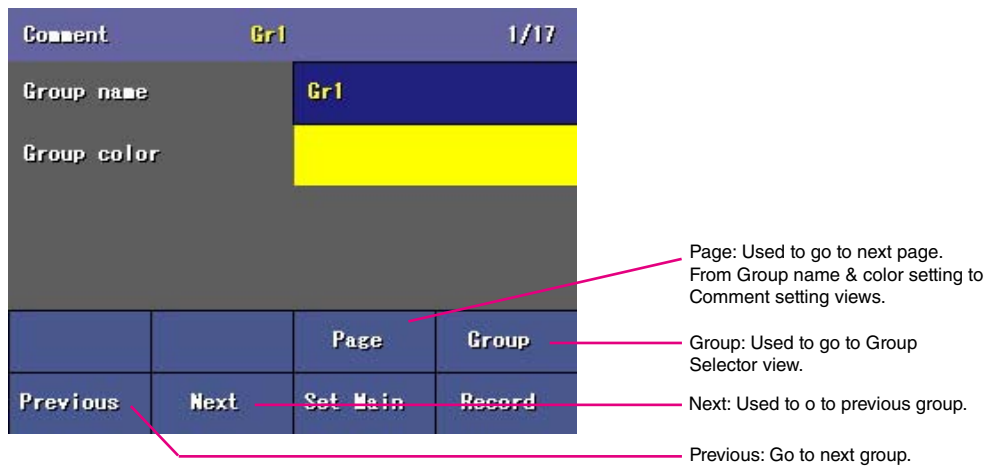
You can directly write comments on the screen while recording via an USB keyboard. These comments are stored in Group 7. When this mode is enabled, other preset comments in Groups 1 through 6 cannot be used.



1. Touch Comment Setting on the Main view.
2. Choose Enable.

7.2 SETTING COMMENT GROUPS

You can assign a specific color to each comment group which can be identified with a specific name. Comments are indicated on the Trend view in this color.



1. Touch Comment Setting on the Main view.
2. Touch Group key.
3. Choose a group.
4. Enter the group name and choose a color.

Group	Max. 10 characters
-------	--------------------

7.3 SETTING COMMENTS

1. Touch Page button at the bottom of the Group setting view. Turn pages until the screen shows the comment entry view you want to set up.
2. Touch the comment field and enter a comment. Character size is automatically adjusted according to the number of characters and character width (e.g. smaller size when 'w' or 'm' are used than when 't' or 'i' are.)
3. Enable 'Auto Write In' if needed. More explanations are give in the following.
4. Touch Page button to go to another comment entry.

Auto write in

Comments can be automatically written on the chart according to preset conditions. Choose Enable to use this function.

Discrete/Analog

Specify the signal type (analog or discrete) that you want to use to trigger the automatic comment entry.

Threshold

Specify the threshold value for analog trigger signal.

Threshold	Max. 6 digits including a decimal point and minus sign
-----------	--

Condition

For analog trigger signal, the following conditions can be used to trigger the comment entry.

Value > Threshold	The comment is written in when the subject pen signal goes above the analog trigger signal value.
Value < Threshold	The comment is written in when the subject pen signal goes below the analog trigger signal value.
Value ≥ Threshold	The comment is written in when the subject pen signal is equal to or goes above the analog trigger signal value.
Value ≤ Threshold	The comment is written in when the subject pen signal is equal to or goes below the analog trigger signal value.

For discrete trigger signal, the following conditions can be used to trigger the comment entry.

Up	The comment is written in when the subject pen signal turns from OFF to ON.
Down	The comment is written in when the subject pen signal turns from ON to OFF.

Pen number

Choose the pen number for the trigger signal.

8. OPERATING FUNCTIONS

8.1 GENERAL DESCRIPTIONS

Arithmetic and logic functions are performed and stored at the Function pens. For setting up Function pens, please refer to Section 5.5.3.

■ OPERATING FUNCTIONS

CATEGORY	FUNCTIONS
Arithmetic functions	Addition/Subtraction, Multiplication, Division
Logic functions	AND, OR, XOR, NOT
Math functions	Square root extraction, Power
Accumulation	Analog accumulation (until reset)
Filter	Moving average, First order lag
Peak hold	Peak (maximum value) hold, Peak (minimum value) hold
F value calculation	Typically used to calculate the sterilization or disinfection time in predefined conditions
Others	Anemoscope (16 directions)

■ PARAMETERS

- Measuring data: Specify input pens. With analog data, engineering unit data is used for computations. Data sampled in the last cycle can be also used.
- Function data: Specify pen numbers used to store operation function results.
- Coefficients (K1, K2)
- Constants (A1, A2, A3)
- Other parameters: Number of data sampled to be used for the moving average function, Time constant for the first order lag operation, Reference temperature and Z value for F value calculation.

Caution 1

If 'Last' data is assigned to X1 and X2, the first function data will be missed.

Measuring data and function data are used as numbers without an engineering unit. No adjustment between different scales or engineering units are performed automatically.

The function operations are consecutively performed from the smallest Function Pen No. When you take one or more function data as parameters for another function, be sure of the orders of functions.

Data range handled by these functions are from -1×10^{10} to 1×10^{10} . Function result values out of this range will be handled as errors. For F value calculation, the range is from 0 to 1×10^{10} .

The effective number of digits for the calculation result is 6 digits. Function result values exceeding the effective number of digits may have intolerable deviations.

8.2 DETAILED PARAMETER SETTING

8.2.1 ARITHMETIC FUNCTIONS

Addition / Subtractions

$$K1X1 + K2X2 + A$$

Specify measured data or function data for X1 and X2 (analog signal only), gains (K1 and K2) and bias (A1).

Multiplication

$$(K1X1+A1) (K2X2+A2) + A3$$

Specify measured data or function data for X1 and X2 (analog signal only), gains (K1 and K2) and biases (A1, A2 and A3).

Division

$$(K1X1+A1) / (K2X2+A2) + A3$$

Specify measured data or function data for X1 and X2 (analog signal only), gains (K1 and K2) and biases (A1, A2 and A3).

8.2.2 LOGIC FUNCTIONS

AND

$$X1 \wedge X2$$

Specify two measured or function data (X1, X2: only discrete signals). When both samples equal '1,'1' is output. '0' is output for all other combinations.

OR

$$X1 \vee X2$$

Specify two measured or function data (X1, X2: only discrete signals). When both samples equal '0,'0' is output. '1' is output for all other combinations.

NOT

$$\neg X1$$

Specify one measured or function data (X1, only discrete signal). An output of opposite logic to an input is provided.

XOR

$$X1 \wedge X2$$

Specify two measured or function data (X1, X2: only discrete signals). When one sample's logic matches the other, '0' is output. When it does not, '1' is output.

8.2.3 MATH FUNCTIONS

Square root

$$K1\sqrt{X1}$$

Specify measured data or function data (X1), with a coefficient (gain K1).

Power

$$X1^{A1}$$

Specify measured data or function data (X1), with a constant (exponent A1).

8.2.4 ACCUMULATION

Analog accumulation

Specify measured data or function data (X1), with Reset condition.

The measured (function) data is accumulated until it is reset when the reset condition is true or when Start key is touched. In order to reset the hold function, 'Time' or 'Trigger input' can be specified.

Reset	Time	30 min., 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 12 hours, 24 hours (selectable time of a day)
	Trigger input	Rise, Sink, ON, OFF.

Input X1, such as flow signals, could be values per time unit (/day, /hour, /min, /sec). In order to accurately totalize this type of signals, specify the time unit. For example, without the time unit setting, with 1-minute storing interval, 500 m³/h data input, 500 is added every 1 minute, up to 30000 m³/h. With the time unit setting, only one-sixtyth (1/60) of the input data is counted by every storing interval.

Sum scale	None	Σ (input or function data)
	Sec	Σ (input or function data) x (3600/GAIN)
	Min	Σ (input or function data) x (60/GAIN)
	Hour	Σ (input or function data) x (1/GAIN)
	Day	Σ (input or function data) x (0.04166/GAIN)

Values assigned to GAIN depend upon the storing interval.

Storing interval	GAIN
0.1 second	36000
0.5 second	7200
1 second	3600
2 seconds	1800
5 seconds	720
10 seconds	360
1 minute	60
10 minutes	6

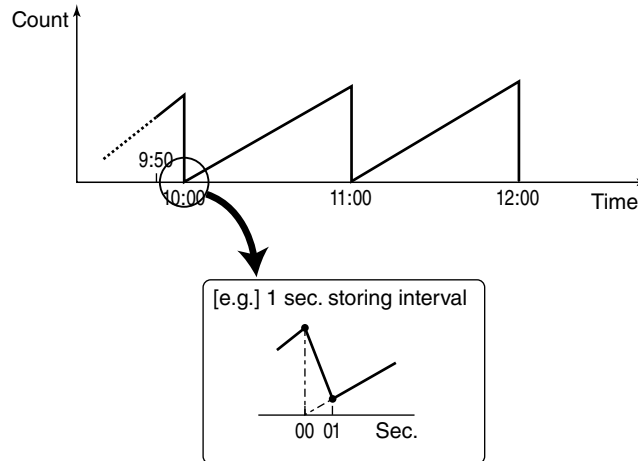
Drop out

Specify maximum 6 digits positive number including a decimal point.

The measured data or the function data is accumulated with every storing interval by drop out condition.

Drop out	Analog accumulation condition
0 or not specified	Accumulates regardless of the measured (or function) data.
More than 0	Accumulates when the measured (or function) data exceeds the drop out value.

At the timing of resetting, both the totalized count up to 00 second and '0' could exist at once. The 73VR21x stores the totalized count at 00 second and a new count at 01 second after the resetting at 00 second.



8.2.5 FILTER

First order lag

Time constant is a response time for a step input (0 to 100%) to reach 63%. By setting the first order lag filter, noises and spikes contained in the input signal could be attenuated in the output signal. Specify measured data or function data, with a time constant.

With 1 sec. or longer storing rate, function results displayed on the screen maintain the last value periodically, because the function is executed the sampling rate and displayed on the screen.

Moving average

Multiple samples of input data are averaged. When the next sample is added, the oldest sample is discarded and the new set of samples are averaged. By setting the moving average filter, noises and spikes contained in the input signal could be attenuated in the output signal.

With 1 sec. or longer storing rate, function results displayed on the screen maintain the last value periodically, because the function is executed the sampling rate and displayed on the screen.

8.2.6 PEAK HOLD

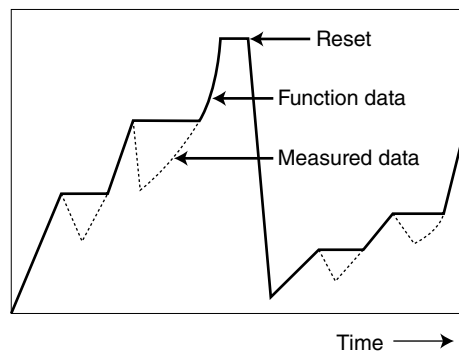
Peak hold (max)

Specify measured data or function data (X1), with Reset condition.

Maximum value hold function is operated by sampling interval (100 msec. with 100 msec. storing interval, 500 msec. with 500 msec. or longer intervals). The measured (function) data is compared with the current hold value and the former is taken when it is greater than the latter, while the latter is taken when it is smaller than the latter.

The measured data is reset when the reset condition is true or when Start key is touched. In order to reset the hold function, 'Time' or 'Trigger input' can be specified.

Reset	Time	30 min., 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 12 hours, 24 hours (selectable time of a day)
	Trigger input	Rise, Sink, ON, OFF.



Equation

When $X1_{MAX} < X1$

$Y = X1$

$X1_{MAX} = X1$

When $X1_{MAX} \geq X1$

$Y = X1_{MAX}$

When Reset condition

is true: $Y = X1$

Y : Function data

$X1$: Measured input data

$X1_{MAX}$: Hold value

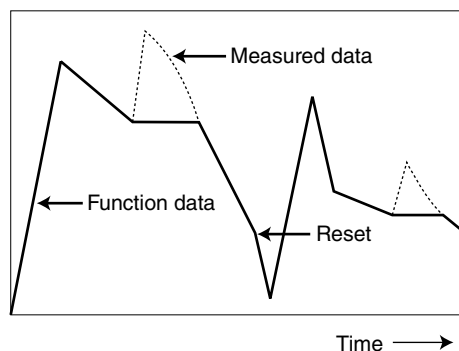
Peak hold (min)

Specify measured data or function data (X1), with Reset condition.

Minimum value hold function is operated by sampling interval (100 msec. with 100 msec. storing interval, 500 msec. with 500 msec. or longer intervals). The measured (function) data is compared with the current hold value and the former is taken when it is smaller than the latter, while the latter is taken when it is greater than the latter.

The measured data is reset when the reset condition is true or when Start key is touched. In order to reset the hold function, 'Time' or 'Trigger input' can be specified.

Reset	Time	30 min., 1 hour, 2 hours, 3 hours, 4 hours, 6 hours, 12 hours, 24 hours (selectable time of a day)
	Trigger input	Rise, Sink, ON, OFF.



Equation

When $X1_{MIN} > X1$

$Y = X1$

$X1_{MIN} = X1$

When $X1_{MIN} \leq X1$

$Y = X1_{MIN}$

When Reset condition

is true: $Y = X1$

Y : Function data

$X1$: Measured input data

$X1_{MIN}$: Hold value

8.2.7 F VALUE CALCULATION

F value calculation

Specify measured data or function data (X1), with Reset condition.

The measured (function) data is accumulated until it is reset when the reset condition is true or when Start key is touched. In order to reset the hold function, 'Time' or 'Trigger input' can be specified.

Reset	Trigger input Analog input	Up, Down, ON, OFF. Value < Threshold, Value ≤ Threshold
-------	-------------------------------	--

At the timing of resetting, both the totalized count up to 00 second and '0' could exist at once. The 73VR21x stores the totalized count at 00 second and a new count at 01 second after the resetting at 00 second.

If the reset condition remains true for more than a moment, the function data remains 0.

Equation:
$$\sum 10^{(X1 - T0) / Z \cdot ST / 60}$$

where X1: Measured temperature (°C)
T0: Reference temperature (°C)
Z: Z value
ST: Storing interval (seconds)

If the result of the equation is out of the range: 0 to 1.0×10^{10} , it is given as an error.

8.2.8 ANEMOSCOPE

Specify measured data or function data (X1).

Direction corresponding to measured data is displayed in the display view shown below.

1. Digital display of Trend view
2. Overview

Relation between input and direction

Input	Display
---	---
-3	WNW
-2	NW
-1	NNW
0	N
1	NNE
2	NE
3	ENE
4	E
5	ESE
6	SE
7	SSE
8	S
9	SSW
10	SW
11	WSW
12	W
13	WNW
14	NW
15	NNW
16	N
17	NNE
18	NE
---	---

When input is fractional value, closest direction is displayed.

Example: $1.5 \leq X1 < 2.5 \rightarrow$ NE

In the Retrieve view, input value is displayed, not direction.

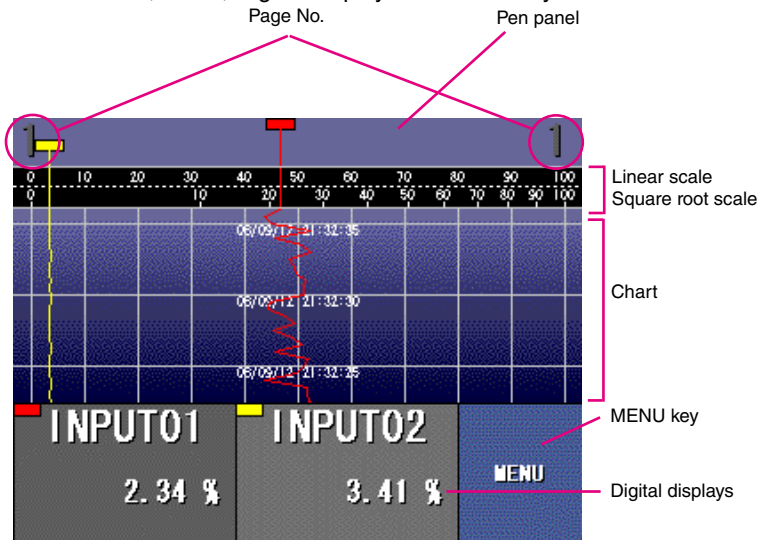
Recorded data is input value, not direction. Display in the 73VR Data Viewer (73VRWV) and converted CSV data is not direction.

9. DISPLAY VIEWS

Five data display views are available for the 73VR21x: Data display (record) views (Trend, Overview and Bargraph), Retrieve view and Alarm History. You can switch between these five views at any time.

9.1 TREND VIEW

The Trend view shows currently recorded data on a trending chart. Four pages are available, and each page consists of Pen Panel, Chart, Digital Displays and Menu key.



Trend view.

9.1.1 PEN PANEL

Pen Pointers

Pens on the chart are specified by Pen Select control. Each view can show 8 pens at the maximum. Display rate is 1 second.

Pen pointers are vertically offset to each other so that each pointer can be recognized even when multiple pointers are positioned at the same input value.

The number 1, 2, 3 and 4 indicated at the left and right ends indicates the current page. Touching the number switches the pages in turn. Ones not assigned with pens are skipped.

Scale Bar

Two scales, linear and square root from 0 to 100%, are indicated on the scale bar. The scales apply to the plot range specified in Pen Setting.

Engineering scale for a specific pen can replace the standard scale by touching the tag name for the pen. In order to return the scale to 0 to 100%, touch the scale.

The engineering unit scale is indicated to three decimal places (one decimal place with horizontal chart).

While recording, the scale bar is turned to black color.

Caution !

When more than 5 characters (including sign and decimal point) are to be shown on the scale, only those at 0%, 50% and 100% are indicated.

9.1.2 CHART

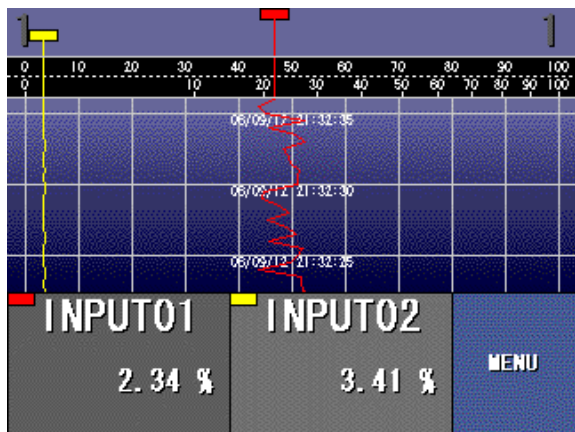
Perpendicular and horizontal charts are selectable. On the perpendicular chart, data stream from top to bottom. On the horizontal chart, data stream from left to right. In order to switch the direction, select Display setting – Graph direction (Section 5.3.2).

Perpendicular rules are lined by 10% of the linear scale.

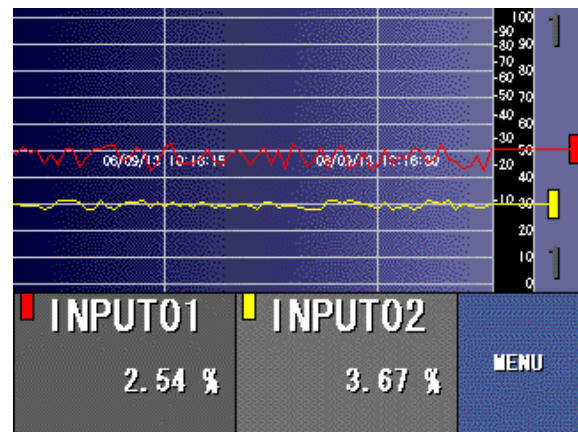
Horizontal rules are lined by time. One (1) division time depends upon the chart speed setting and the storing interval as shown in the table below. For the entire chart time spans, refer to Section 5.3.1.

Chart Speed	One Division Time	
	100 msec. storing interval	500 msec. storing interval
4	1 second	5 seconds
1	5 seconds	20 seconds
1/5	1 minute	1 minute
1/32	5 minutes	5 minutes
1/160	----	30 minutes
1/480	----	2 hours
1/960	----	4 hours

Time index is shown at the center of the chart, in 'YY/MM/DD HH:MM:SS' format.



Perpendicular chart.



Horizontal chart.

Error indication

When an input (or function result) is lower than the data range limit -1×10^{10} , its pen pointer remains at the extreme left of the chart. When it is higher than the data range limit 1×10^{10} , the pen pointer remains at the extreme right of the chart.

9.1.3 DIGITAL DISPLAY

Digital displays include the tag name and/or instantaneous value or status as specified (Tag + Value, Tag, or Value) in Digital Display Type (See Section 5.3.3).

Engineering Unit Value or Discrete Status

Analog instantaneous values indicated in engineering unit are renewed by the specified display rate.

Discrete status is indicated with the display description specified in the Pen setting.

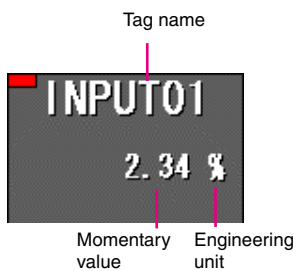
The alarm status is also indicated. Display rate is 1 second.

If Auto Hide function is enabled (See 5.3.4), the digital display is automatically hidden when the screen is untouched for 30 seconds. The chart time span is longer without the digital display. In order to show the digital display, touch the bottom half area of the screen.

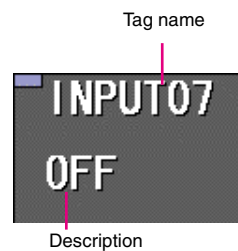
Alarm Status

Zone colors specified in Pen setting (alarm) (Section 5.5.2) are applied to the tag name and momentary value to indicate it is within respective zones. Indicator's background color turns to black color when the pen is in alarm status. Normal color is grey.

For discrete signals, ON and OFF status colors are applied to the tag name and description for respective states. Indicator's background color turns to black color in alarm, to grey in normal state.



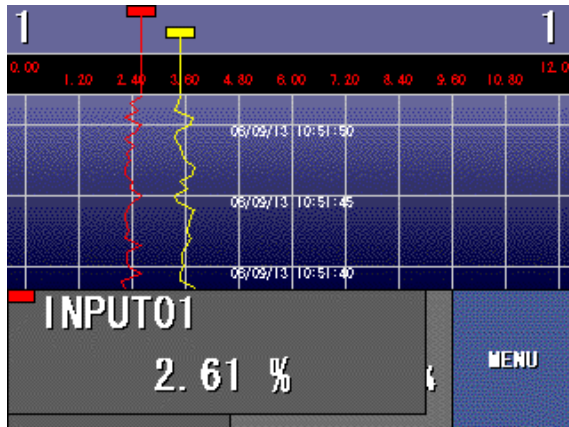
Digital display, analog signal.



Digital display, discrete signal.

Large digital display

Only one (1) digital display can be specified to appear in large size.



Large digital display.

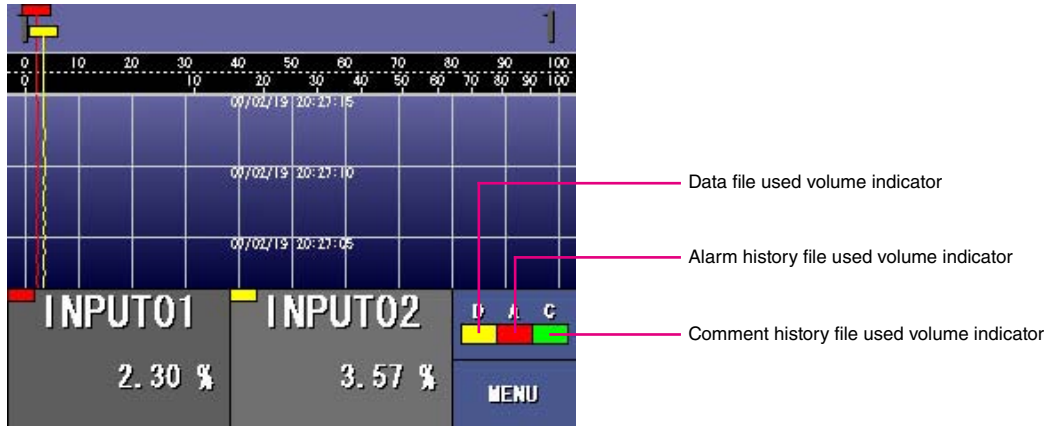
Touch twice the digital display of the pen you want to enlarge. The scale changes to the engineering unit of the pen at the first touch, and then the large display appears at the second touch. In order to reduce the display size to the original state, touch the large display once again.

Data File Used Volume

Data File Used Volume indicators are displayed above the MENU key when Data File Used Volume is set to 'Show' in the basic setting.

The 73VR21x creates a data file at the startup using all unused space and shows while recording how much space has been used in percentage (1 percent increments) about Data (D), Alarm History (A) and C (Comment History). The indicator colors change according to the used volume: green below 50%, yellow up to 79% and red over 80%. Once the used space reaches 100%, the 73VR21x overwrites the oldest data with a new one. There will be no update on this indicator after 100%.

While the CF card is hot-swapped or during the FTP while in recording, the indicators show the used volume of the backup file in the internal memory. Percentage indication turns to green color.



Data file used volume indicators

9.1.4 WRITING COMMENTS

Comments can be indicated on the screen in the Trend view. These comments are also saved in Comment History file to view on the Comment History view.

In order to write comments, three (3) methods are available:

1. Selecting from a preset list of comments
2. Writing a comment directly
3. Writing a selected comment automatically by preset conditions

When 'direct comment input' is enabled, other methods are not available.

The maximum of 56 comments categorized in 7 groups (8 comments per group) can be preset. The seventh group is used also for free comment entry during recording. The comments in this group can be modified while recording.

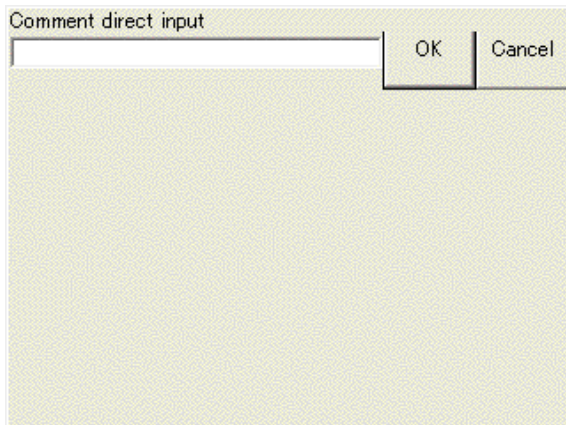
NOTE

Comment function can be used only (1) when the trend graph is showing a perpendicular chart, and (2) when the 73VR21x is recording in the CF Card. No comment can be written in while you are hot-swapping the CF Card.

While the automatic comment entry is on, DO NOT execute a FTP data transfer.

When the direct comment input is enabled:

1. Touch MENU button on the Trend view and then choose Comment write in.
2. Comment direct input view replaces it on the screen. Enter a comment using an USB keyboard and touch OK.



Comment direct input

3. The comment appears in the center of the chart, at 50% position.

When the direct comment input is disabled:

1. Touch MENU button on the Trend view and then choose Comment write in.
2. In order to choose a comment from the list, choose a group and then a comment from the list, and touch OK. The comment is written in the chart at the time index indicated on the list (the moment when the Comment write in key is touched).

In order to enter a free comment, choose Gr7 (Group 7). Choose one of the comment fields and enter a new comment, and touch OK. You can also choose an existing comment, touch Change key and modify it to use.

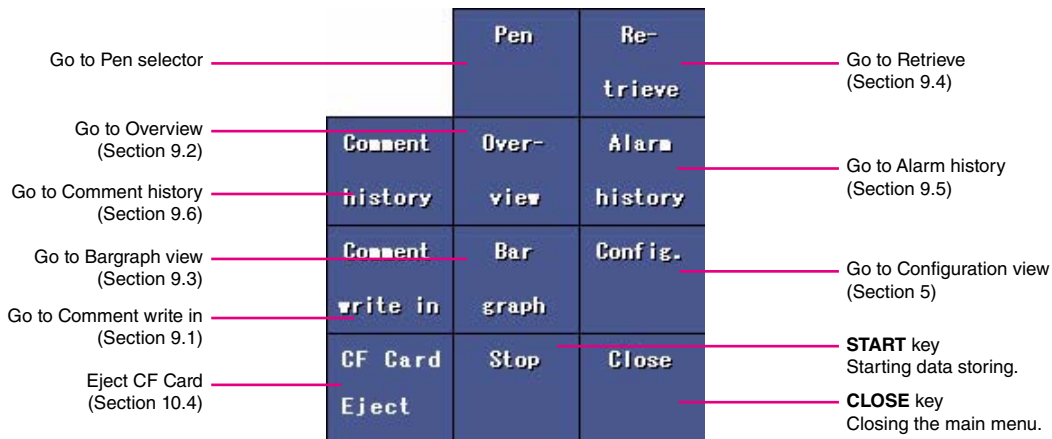
3. The comment appears in the center of the chart, at 50% position.

NOTE

1. A comment is written in according to the storing interval. For example, with 10-minute interval, even when you touch the Comment write in key at 20:27:00, the comment is written in only at 20:30:00.
 2. If multiple comments are specified during the same storing interval, only the last comment is valid.
 3. If the data recording is cancelled or terminated while you are operating to write in a comment, the comment is invalid.
 4. Only 'Hour:Minute:Second' is valid in comment writing even when 100-msec. or 500-msec. storing interval is specified.
 5. Up to 20 comments can be added on the screen. After the 21st comment, the oldest comment will be automatically deleted while it will be stored in the comment history data.
 6. Automatic comment writing is also executed according to the storing intervals. The trigger condition must be true at the moment of data storing. If the condition comes to be true and then untrue between data storing cycles, no comment writing is executed.
-

9.1.5 MENU CONTROL KEYS

Touching Menu key opens selectable menu items on the right half of the screen as shown below.

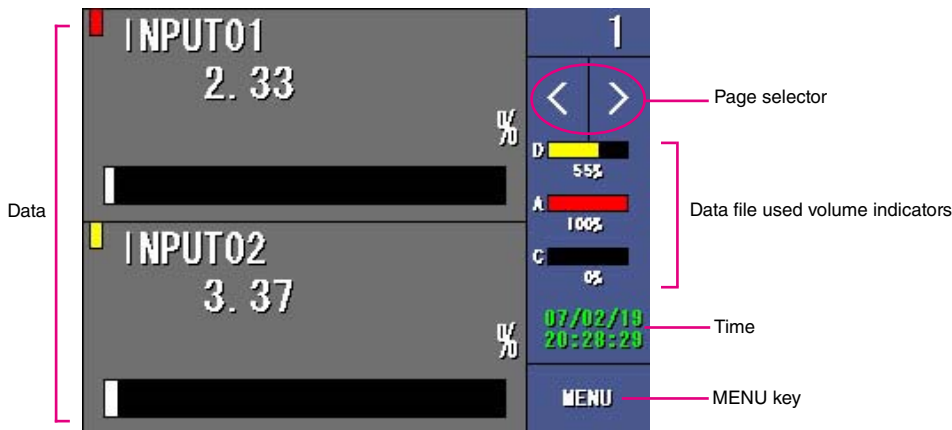


Caution !

When the line noise filter setting (Hardware Configuration) is changed, measured values immediately after the change may contain errors by the AD conversion cycle change. Wait for 10 seconds before resuming data recording after it has been changed.

9.2 OVERVIEW

The Overview is used to monitor up to 16 channels at once. Four groups (pages) are available, and each page consists of Page & Time Indicator, Data Indicators and Menu key.



Overview.

9.2.1 PAGE & TIME INDICATOR

Page Number

The number 1, 2, 3 or 4 indicated at the left and end indicates the current group (page). The number 1, 2, 3 and 4 indicated at the right top indicates the current page.

Page Selector

[<] and [>] buttons are used to switch between pages for the different groups. Touch [>] to go to the next page and [<] to the previous page.

Pages not assigned with pens are skipped.

Data File Used Volume

Data File Used Volume indicators are displayed above the MENU key when Data File Used Volume is set to 'Show' in the basic setting.

The 73VR21x creates a data file at the startup using all unused space and shows while recording how much space has been used in percentage (1 percent increments) about Data (D), Alarm History (A) and C (Comment History). The indicator colors change according to the used volume: green below 50%, yellow up to 79% and red over 80%. Once the used space reaches 100%, the 73VR21x overwrites the oldest data with a new one. There will be no update on this indicator after 100%.

While the CF card is hot-swapped or during the FTP while in recording, the indicators show the used volume of the backup file in the internal memory. Percentage indication turns to green color.

Date / Time

Date and time is shown in black characters when the recorder is stopped, in green while recording.

9.2.2 DATA INDICATORS

Pen Assignment

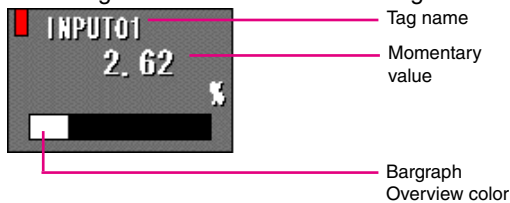
Up to 16 pens are indicated in the Overview. Numbers of pens as specified in Display pen number (Section 5.3.6).

Analog Data

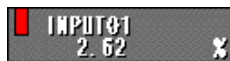
Analog data is indicated in bargraph with its tag name (no bargraph with 16-pen view). The bargraph color is set in Analog Pen Setting (Overview color). When the signal is in alarm status, the tag name, momentary value and bargraph color changes to the one specified in Analog Alarm Setting (Alarm color).

Discrete Data

Tag name and discrete data status is indicated. The status indicator tile at the bottom turns to the designated colors according to each status. When the signal is in alarm status, the background turns to black color.

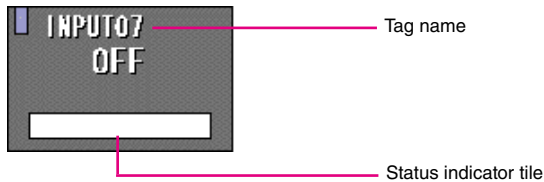


Analog data.



Analog data in alarm.

Analog data (16-pen view).

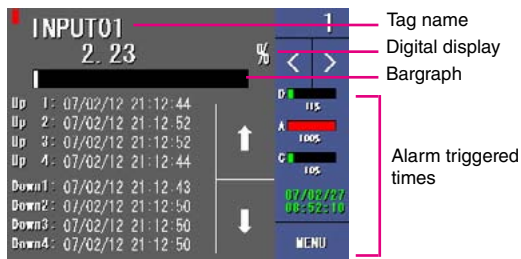


Discrete data.

Detail Monitor

More information can be displayed for a specific pen. Touch the data indicator you want to enlarge. Touch arrow keys to show other pens.

Touching the enlarged area closes the detailed information.



Detail monitor (analog and discrete).

Analog data is added with a momentary value in engineering unit. Alarm history is also indicated if the alarm setting has been enabled. When the alarm is disabled, time index shows --/-- --:--:--.

Discrete data is also added with ON/OFF history data.

Analog alarm history

- Up 1 Time when the measured value goes up from Zone 0 to Zone 1.
- Up 2 Time when the measured value goes up from Zone 1 to Zone 2.
- Up 3 Time when the measured value goes up from Zone 2 to Zone 3.
- Up 4 Time when the measured value goes up from Zone 3 to Zone 4.
- Down 1 Time when the measured value goes down from Zone 1 to Zone 0.
- Down 2 Time when the measured value goes down from Zone 2 to Zone 1.
- Down 3 Time when the measured value goes down from Zone 3 to Zone 2.
- Down 4 Time when the measured value goes down from Zone 4 to Zone 3.

Error Data Indication

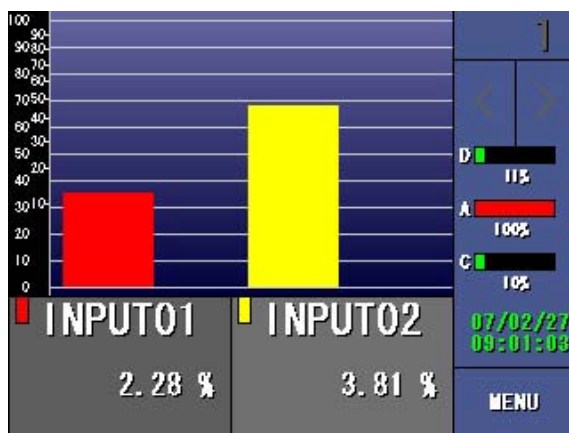
Bargraphs are blank when the input or function data is in error. For a discrete value, 'ERR' is indicated.

9.2.3 MENU CONTROL KEYS

Touching Menu key opens selectable menu items on the right half of the screen. Refer to Section 8.1.4.

9.3 BARGRAPH

The Bargraph view shows bargraphs with digital displays showing momentary values.



Bargraph view.

9.3.1 PAGE & TIME INDICATOR

Page Number

The number 1, 2, 3 and 4 indicated at the left and right ends indicates the current page. Touching the number switches the pages in turn. Ones not assigned with pens are skipped.

Data File Used Volume

A bargraph is indicated when Data File Used Volume is set to 'Show' in the basic setting.

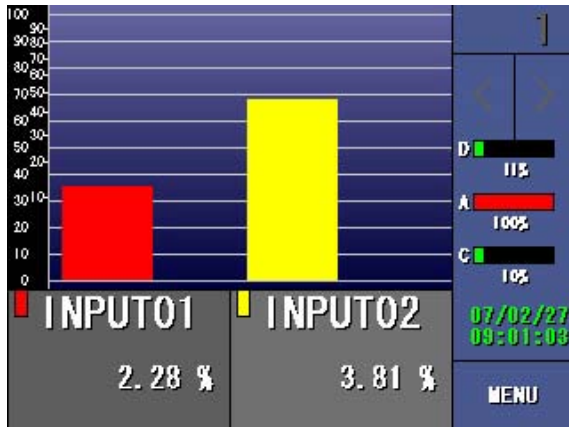
Refer to Section 9.2.1 for detailed explanations.

Date / Time

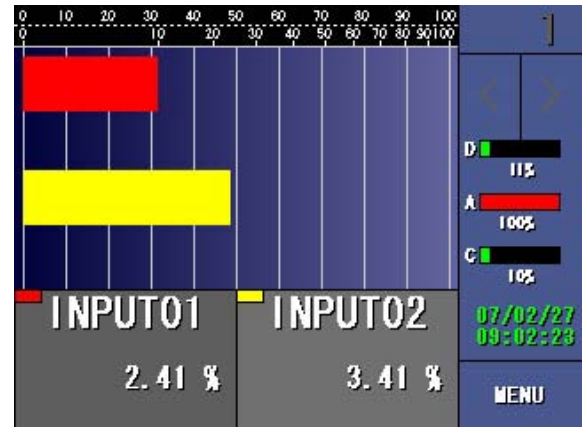
Date and time is shown in black characters when the recorder is stopped, in green while recording.

9.3.2 BARGRAPH

Perpendicular and horizontal bars are selectable.



Perpendicular bargraph.



Horizontal bargraph.

Analog Data

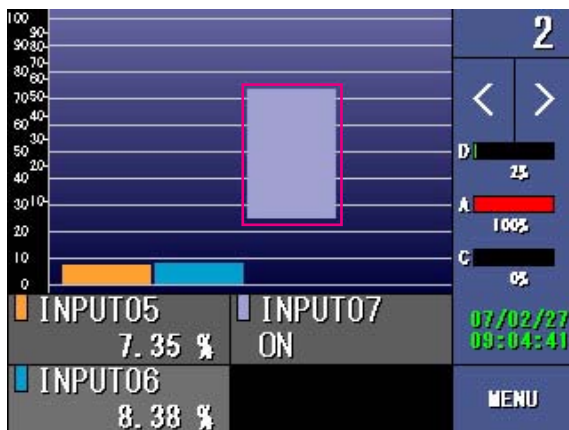
Analog data is indicated in bargraph within the range of 0 to 100%. 0% at the bottom (perpendicular bar) or at the left end (horizontal). The bargraph color is set in Pen Setting (input).

Bargraphs are blank when the input or function data is in error.

Discrete Data

Discrete data is indicated in boxes located between 25% and 75%. The box is filled in with the color specified in Common Pen Setting in ON (Logic 1) status. It is blank in OFF (Logic 0) status.

'ERR' is indicated on the digital indicator when the input or function data is in error.



Discrete data in bargraph, ON.



Discrete data in bargraph, OFF.

Scale Bar

Two scales, linear and square root from 0 to 100%, are indicated on the scale bar. The scales apply to the plot range specified in Pen Setting.

Engineering scale for a specific pen can replace the standard scale by touching the tag name for the pen. In order to return the scale to 0 to 100%, touch the scale.

The engineering unit scale is indicated to three decimal places (one decimal place with horizontal chart).

While recording, the scale bar is turned to black color.

Caution !

When more than 5 characters (including sign and decimal point) are to be shown on the scale, only those at 0%, 50% and 100% are indicated.

9.3.3 DIGITAL DISPLAY

Digital displays include the tag name and/or instantaneous value or status as specified (Tag + Value, Tag, or Value) in Digital Display Type (See Section 5.3.3).

Engineering Unit Value or Discrete Status

Analog instantaneous values indicated in engineering unit are renewed by the specified display rate.

Discrete status is indicated with the display description specified in the Pen setting.

Display rate is 1 second.

Alarm Status

Zone colors specified in Pen setting (alarm) (Section 5.5.2) are applied to the tag name and momentary value to indicate it is within respective zones. Indicator's background color turns to black color when the pen is in alarm status. Normal color is grey.

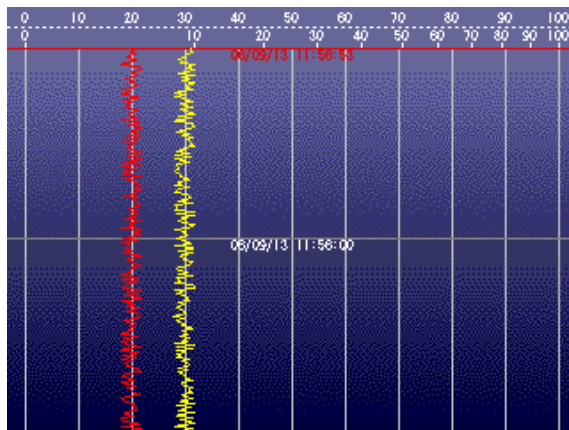
For discrete signals, ON and OFF status colors are applied to the tag name and description for respective states. Indicator's background color turns to black color in alarm, to grey in normal state.

9.3.4 MENU CONTROL KEYS

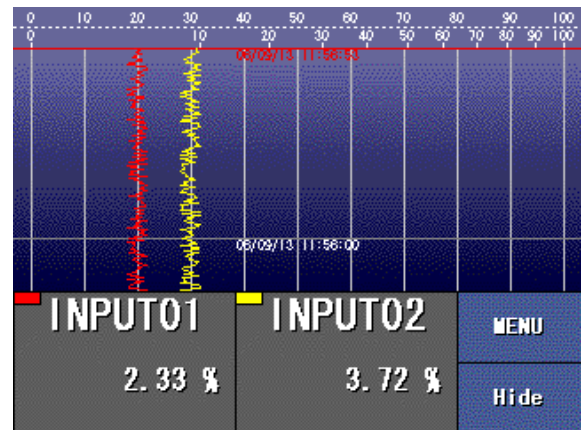
Touching Menu key opens selectable menu items on the right half of the screen. Refer to Section 9.1.4.

9.4 RETRIEVE

Data stored in the CF Card are searched and displayed on the Retrieve view. Retrieval is available even while recording. In order to show Menu key in the Retrieve view, touch on the screen. The digital display with Menu and Hide keys appear on the lower part of the screen.



Basic Retrieve view.



Retrieve view with digital display (Menu and Hide keys).

9.4.1 DATA DISPLAY

The Retrieve view can show 8 pens at the maximum. Four (4) pages (display groups) are available.

Last part of the stored data is indicated first. If you are using the 73VR21x only for plotting on the screen without recording, naturally no retrieval is available.

The screen time frame in the Retrieve chart depends upon the storing rate. Table below shows the screen time frame by display types at various storing rate settings.

CHART TYPE	Perpendicular with digital display	Perpendicular without digital display	Horizontal
100 msec.	13.7 seconds	21.7 seconds	29.7 seconds
500 msec.	1 min., 8.5 seconds	1 min., 48.5 seconds	2 min., 28.5 seconds
1 second	2 min., 17 seconds	3 min., 37 seconds	4 min., 57 seconds
2 seconds	4 min., 34 seconds	7 min., 14 seconds	9 min., 54 seconds
5 seconds	11 min., 25 seconds	18 min., 5 seconds	24 min., 45 seconds
10 seconds	22 min., 50 seconds	36 min., 10 seconds	49 min., 30 seconds
1 minute	2 hours, 17 min.	3 hours, 37 min.	4 hours, 57 min.
10 minutes	22 hours, 50 min.	1 day, 12 hours, 10 min.	2 days, 1 hour, 30 min.

The chart can be scrolled using your finger. Touch the screen with your finger and move up and down. The chart area shifts accordingly.

The digital meters shows values at the time point indicated with the red line on the screen. The red line moves to where your finger touches. Touch Hide button to remove the digital display.

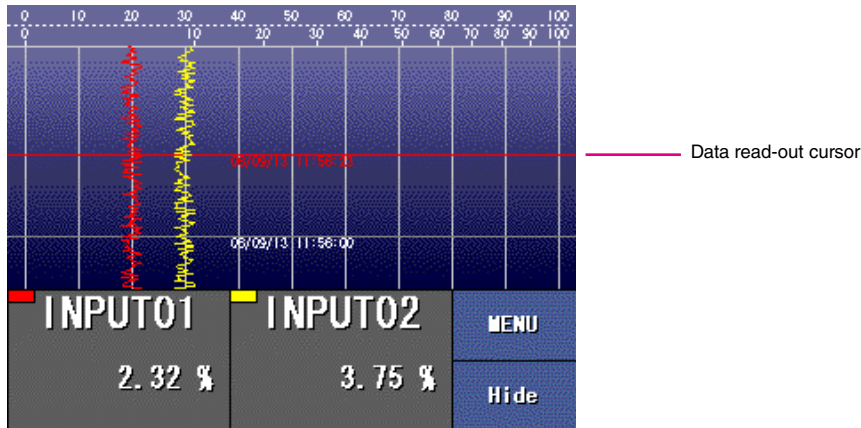


Figure: Data read-out.

Comments written in during recording is also indicated on the screen.

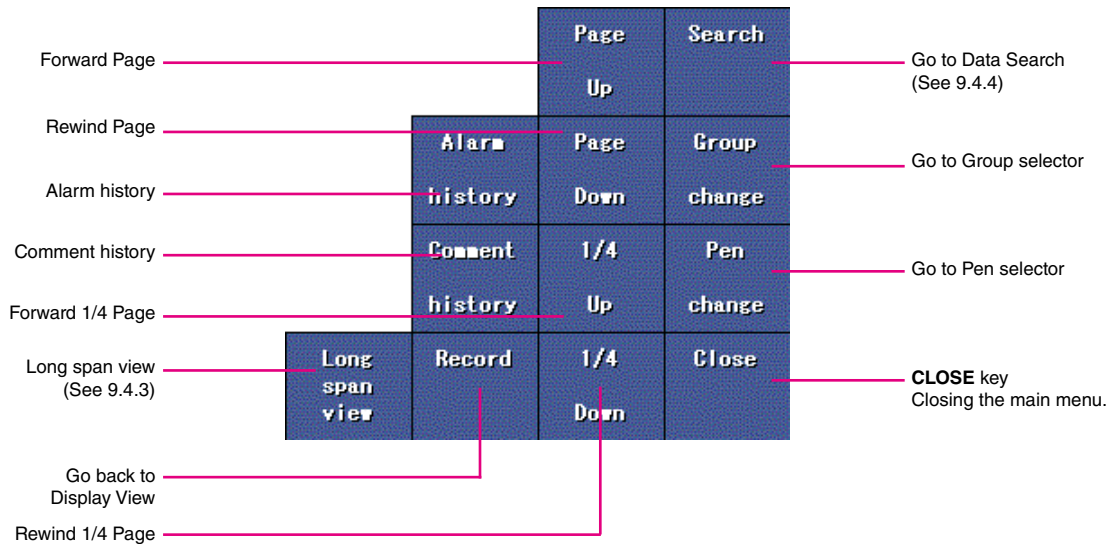


Figure: Comment written in the record.

Error Data Indication

When an input (or function data) is in error, it waveform is no plotted on the screen. 'ERR' is indicated on the digital display. For a 2-byte integer function data, '0' is indicated on the digital display.

9.4.2 MENU CONTROL KEYS



Page Up / Page Down

These keys are used to scroll the chart in forward (Up) and reverse (Down) time directions.

1/4 Up / 1/4 Down

These keys are used to scroll the chart by quarter page in forward (Up) and reverse (Down) time directions.

Group Change

Group change key is used to move between the four display groups. Groups are switched every time the key is pressed.

Pen Change

Pen Change is used to assign signal channels to be displayed on the screen.

Alarm history

Touching Alarm history key switches the screen to the Alarm history view.

Comment history

Touching Comment history key switches the screen to the Comment history view.

Record

Touching Record key switches the screen back to the Display view.

9.4.3 LONG SPAN VIEW

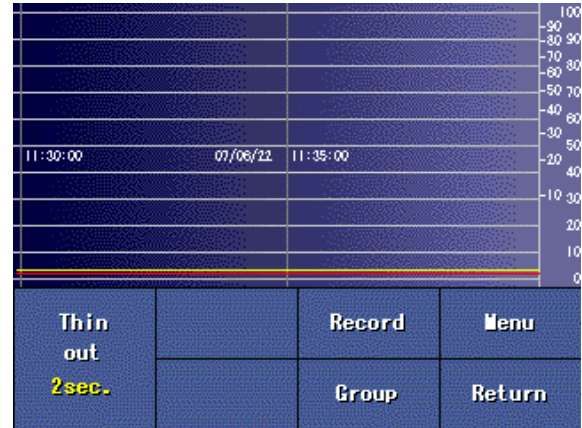
When you want to show a longer time span on the chart, choose Long span view on the main menu on the retrieve view. The 73VR21x thins out the data stored in the CF card. Thin-out time options depend upon the storing interval.

The following functions are not available while the long span view is active.

- Data read out on the chart
- Switching between the standard scale and the engineering unit scale
- Switching pens to be on the view
- Calling up Alarm History or Comment History
- Data search

CHANGING THIN OUT TIME

1. Touch on the chart to call up the control menu keys.
2. Touch Thin out key.



Perpendicular chart.

Horizontal chart.

3. Choose an appropriate thin-out time. Thin-out time options depend upon the storing interval as shown in the table below. Selected time will be shown on the control key (yellow characters).

Storing Interval	Thin-out Time	Time Span / Perpendicular Chart	Time Span / Horizontal Chart
100 millisecc.	500 msec.	1 min., 48 sec., 500 msec.	2 min., 28 sec., 500 msec.
	2 sec.	7 min., 14 sec.	9 min., 54 sec.
	10 sec.	36 min., 10 sec.	49 min., 30 sec.
500 millisecc.	2 sec.	7 min., 14 sec.	9 min., 54 sec.
	10 sec.	36 min., 10 sec.	49 min., 30 sec.
	1 min.	3 hours, 37 min.	4 hours, 57 sec.
1 sec.	5 sec.	18 min., 5 sec.	24 min., 45 sec.
	20 sec.	1 hour, 12 min., 20 sec.	1 hour, 39 sec.
	2 min.	7 hours, 14 min.	9 hours, 54 min.
2 sec.	20 sec.	1 hour, 12 min., 20 sec.	1 hour, 39 sec.
	1 min.	3 hours, 37 min.	4 hours, 57 sec.
	4 min.	14 hours, 28 min.	19 hours, 48 min.
5 sec.	30 sec.	1 hours, 48 min., 30 sec.	2 hours, 28 min., 30 sec.
	2 min.	7 hours, 14 min.	9 hours, 54 min.
	10 min.	1 day, 12 hours, 10 min.	2 days, 1 hour, 30 min.
10 sec.	1 min.	3 hours, 37 min.	4 hours, 57 sec.
	5 min.	18 hours, 5 min.	1 day, 45 min.
	20 min.	3 days, 20 min.	4 days, 3 hours
1 min.	5 min.	18 hours, 5 min.	1 day, 45 min.
	20 min.	3 days, 20 min.	4 days, 3 hours
	2 hours	18 days, 2 hours	24 days, 18 hours
10 min.	1 hour	9 days, 1 hour	12 days, 9 hours
	4 hours	36 days, 4 hours	49 days, 12 hours
	1 day	217 days	297 days

Caution

It may need time to refresh the display to show the data with the new time setting when the data volume is very large or the time span is very long.

DELETING COMMENTS FROM THE CHART

Comments are not thinned out on the chart. All comments are displayed on the perpendicular chart. With a horizontal chart, no comment is displayed.

Multiple comments may be on top of each other if too many exist within a short time span. If you do not want to show the comments, choose 'Do not display comment' among the menu controls.

In order to go back to the Retrieve view, touch Return key.

CONTROL KEYS ON THE HORIZONTAL CHART

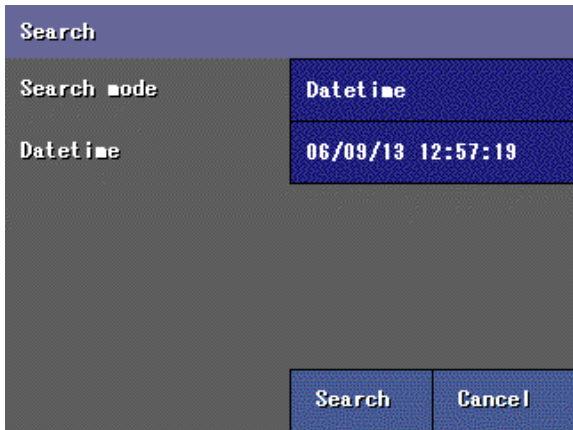
The control keys on a horizontal chart are always present. Keys other than shown above are available when you touch Menu key.

Page Up	Page Down		Menu
1/4 Up	1/4 Down		

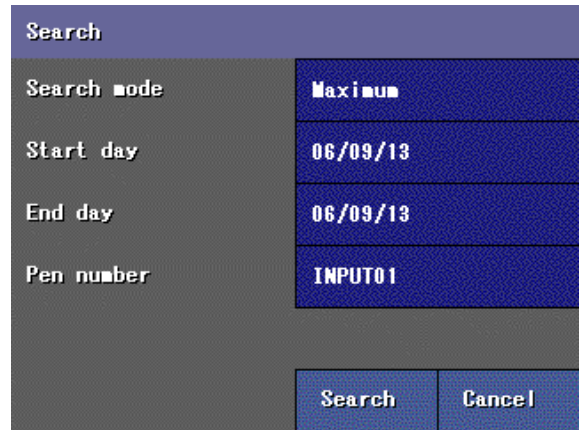
Horizontal chart, 2nd control panel.

9.4.4 DATA SEARCH

Data search is available using three parameters: Date & time, Maximum value, and Minimum value. Touching Search key in the main menu opens Search view as shown below.



Search view, Date & Time search mode.



Search view, Max. or Min. value search mode.

Datetime	Date & time search	Data at a specific time index is searched. Specify a date and time using the numeric input keypad. The searched data at the specified time is located at the top of the chart, and the previous data is shown below that.
Maximum	Maximum value search	Maximum data within a specified time span is searched. The searched data at the specified time is located at the top of the chart, and the previous data is shown below that. When you press Menu key at this moment, Next key is added to the menu, so that you can continue searching the second greatest value.
Minimum	Minimum value search	Minimum data within a specified time span is searched. The searched data at the specified time is located at the top of the chart, and the previous data is shown below that. When you press Menu key at this moment, Next key is added to the menu, so that you can continue searching the second smallest value.

NOTE

Data search may take time depending upon the data volume.

9.5 ALARM HISTORY

Analog alarm events and discrete signal status changes are stored in the CF Card. This data can be searched and displayed on the Alarm History view. When you touch the top part of the screen (enclosed in the frame), control keys appears.

Datetime	No.	Tag name	Message	60/60
07/01/24 10:40:32	102	INPUT02	Alarm3	
07/01/24 10:40:32	102	INPUT02	Alarm2	
07/01/24 10:40:32	102	INPUT02	Alarm1	
07/01/24 10:40:31	102	INPUT02	Alarm3	
07/01/24 10:40:31	102	INPUT02	Alarm2	
07/01/24 10:40:30	101	INPUT01	Alarm1	
07/01/24 10:40:30	101	INPUT01	Alarm3	
07/01/24 10:40:30	101	INPUT01	Alarm2	
07/01/24 10:40:29	102	INPUT02	Alarm1	
07/01/24 10:40:29	102	INPUT02	Alarm3	
07/01/24 10:40:29	102	INPUT02	Alarm2	
07/01/24 10:40:29	101	INPUT01	Alarm1	
07/01/24 10:40:29	101	INPUT01	Alarm3	
07/01/24 10:40:29	101	INPUT01	Alarm2	
07/01/24 10:40:29	101	INPUT01	Alarm1	
07/01/24 10:40:29	102	INPUT02	Alarm3	

Alarm history.

Datetime	No.	ACK	Page	Search
07/01/24 10:40:32	102	all	Up	Oldest
07/01/24 10:40:32	102			
07/01/24 10:40:32	102			
07/01/24 10:40:31	102	Auto update	Page	Newest
07/01/24 10:40:31	102			
07/01/24 10:40:31	102			
07/01/24 10:40:30	101	Jump	1/4	Close
07/01/24 10:40:30	102			
07/01/24 10:40:30	102			
07/01/24 10:40:29	101	Record	Up	Down
07/01/24 10:40:29	101			
07/01/24 10:40:29	101			
07/01/24 10:40:29	101			
07/01/24 10:40:29	102			

Alarm history control keys.

9.5.1 DATA DISPLAY

The Alarm History view shows the date and time of the events, pen No. and its tag name, and the alarm message (comment) pre-described for the particular status.

Sixteen (16) events are listed on the view, and the maximum of 1000 events can be searched and displayed with the 512 MB and 1GB CF card. The capacity depends upon the CF card capacity (See Section 10).

To the right top of the screen, the position of the presently selected alarm event among the total number of events is indicated.

Blinking message line means that the event is not acknowledged yet. Touch it twice to acknowledge (once to move the cursor to the line, twice to acknowledge), and it stops blinking. In order to acknowledge all events on the screen, use ACK All button.

While Auto Update is enabled, other control buttons are unavailable.

Input pens are identified as Ixx (xx = pen number), and Function pens are identified as Fxx (xx = function pen number).

9.5.2 DATA SEARCH BY ALARM EVENT

Touching Jump key when a specific alarm event is selected switches the screen to the Retrieve view where the data at the moment of alarm event is indicated.

Alarm events are stored according to the sampling rate (100 msec. or 500 msec.), while pen data are recorded according to the storing rate. When the storing rate is 1 second or longer, the time index of an alarm event does not match the storing rate. However, the 73VR21x searches data at the time index by the storing rate. For example, with 1-minute storing rate, searching the event at 16:03:40 means searching data at 16:04:00.

9.5.3 MENU CONTROL KEYS

Touching the top part of the screen on the Alarm History shows Menu on the right part.

Page Up / Page Down

These keys are used to scroll the list in forward (Up) and reverse (Down) time directions.

1/4 Up / 1/4 Down

These keys are used to scroll the list by quarter page in forward (Up) and reverse (Down) time directions.

Search

Data at a specific time index can be called up. Touching the Search button shows a numeric keypad. Specify a date and time.

ACK (acknowledge) All

Touch ACK All key when you want to acknowledge all events of the alarm history. Unacknowledged events' message lines blink. Once acknowledged, they stop blinking.

Auto Update

Touch Auto Update key to enable automatic update of the alarm history. While it is enabled, other control buttons are unavailable. Touch the key again to disable to use other controls.

Jump

Touching Jump key when a specific alarm event is selected switches the screen to the Retrieve view where the data at the moment of alarm event is indicated.

Oldest

Touching Oldest key moves the screen to the oldest alarm event.

Newest

Touching Newest key moves the screen to the newest alarm event.

9.6 COMMENT HISTORY

Comments entered on the Record view are stored in the CF Card. This data can be searched and displayed on the Comment History view. When you touch the top part of the screen (enclosed in the frame), control keys appears.

Datetime	Comment	4/4
07/02/19 21:18:38	STOP	
07/02/19 21:18:22	FUNCTION	
07/02/19 21:17:37	START	
07/02/19 21:17:25	STORING	

Comment history.

9.6.1 DATA DISPLAY

The Comment History view shows the date/time and the comments in the group specific color.

Sixteen (16) events are listed on the view, and the maximum of 1000 events can be searched and displayed.

To the right top of the screen, the position of the presently selected comment among the total number of comments is indicated.

Max. 18 characters are displayed on the list. When you want to read all characters of a comment longer than that, move the cursor to the comment row and touch the comment part.

Datetime	Comment	7/7
07/02/19 21:24:00	2007/02/19STORINGS	
07/02/19 21:21:42	2007/02/19STORINGS	
07/02/19 21:19:47	2007/02/19START	
07/02/19 21:18:38	STOP	
07/02/19 21:18:22	FUNCTION	
07/02/19 21:17:37	START	
07/02/19 21:17:25	STORING	

Datetime	Comment	7/7
2007/02/19STORINGSTART		
07/02/19 21:21:42	2007/02/19STORINGS	
07/02/19 21:19:47	2007/02/19START	
07/02/19 21:18:38	STOP	
07/02/19 21:18:22	FUNCTION	
07/02/19 21:17:37	START	
07/02/19 21:17:25	STORING	

9.6.2 DATA SEARCH BY COMMENT

Touching Jump key when a specific comment is selected switches the screen to the Retrieve view where the data at the moment of comment entry is indicated.

9.6.3 MENU CONTROL KEYS

Touching the top part of the screen on the Comment History shows Menu on the right part.

Page Up / Page Down

These keys are used to scroll the list in forward (Up) and reverse (Down) time directions.

1/4 Up / 1/4 Down

These keys are used to scroll the list by quarter page in forward (Up) and reverse (Down) time directions.

Search

Data at a specific time index can be called up. Touching the Search button shows a numeric keypad. Specify a date and time.

Auto Update

Touch Auto Update key to enable automatic update of the comment history. While it is enabled, other control buttons are unavailable. Touch the key again to disable to use other controls.

Jump

Touching Jump key when a specific comment row is selected switches the screen to the Retrieve view where the data at the moment of comment entry is indicated.

Oldest

Touching Oldest key moves the screen to the oldest comment row.

Newest

Touching Newest key moves the screen to the newest comment row.

10. DATA & FILES

10.1 73VR21x FILES

Files required to store the 73VR21x data are created automatically when the 73VR21x gets started. Table below shows the types of files.

Type	Description	File Name	Extension
73VR21x Data File	Data sampled by the 73VR21x	Fixed (73VR)	VRD21
73VR21x Alarm History File	Alarm history data	Fixed (73VR)	VRA21
73VR21x Comment History File	Comment history data	Fixed (73VR)	VRM21
73VR21x Control File	Record pointer for 73VR.VRD21	Fixed (73VR)	VRC21
73VR21x Parameter File	Parameter settings such operation mode, pen setting	Fixed (73VR)	VRP21

CAUTION !

When you delete the data file in a CF Card, delete also the control file. In any event do not modify the control file. A modified control file may destroy the data file.

WARNING !

Be sure to restart the 73VR21x before using a data file created by the 73VR21BLD configurator software. If not, the data file will be destroyed.

DATA FILE

All 73VR21x data are stored in binary in single data file named '73VR.VRD21.'

An empty data file is already created at the startup of the 73VR21x using all available space. Once data recording starts, sampled data are stored in this file. It means that the data file size is fixed regardless of the data volume in it. In order to confirm data recording, open the file in Retrieve view.

All data are stored in a single file even if multiple sets of data are recorded within a day, or if single or multiple data are recorded over multiple days. Trigger data are stored also in the same principle. Therefore the user must be aware that some data may be overwritten by another of different configuration settings if you keep recording after setting new configuration.

ALARM HISTORY FILE

Alarm history is stored in binary in single data file named '73VR.VRA21.' Analog alarm events and discrete signal status changes (regardless of alarm setting) are recorded in this file. Alarm events are recorded regardless of the storing method.

Like the data file, an empty alarm history file is already created at the startup of the 73VR21x. The file size is fixed regardless of the data volume in it.

Number of events stored in this file depends upon the CF card capacity. Refer to Table below.

CF CARD CAPACITY	ALARM EVENT NUMBERS
128 MB	250
256 MB	500
512 MB, 1 GB	1000

The alarm history file is cyclic: data in the CF Card will be overwritten when the file is full.

COMMENT HISTORY FILE

Comment history is stored in binary in single data file named '73VR.VRM21.'

Like the data file, an empty comment history file is already created at the startup of the 73VR21x. The file size is fixed regardless of the data volume in it.

The comment history file is cyclic: data in the CF Card will be overwritten when the file is full.

CONTROL FILE

The control file contains the information to manage the data file. It is used to convert the file into compatible format for use on the 73VR Data Viewer program or into .CSV format.

If this file is deleted, the data file is initialized. When storing the data file in the PC's hard disk, store also the control file.

PARAMETER FILE

The parameter file contains information about the 73VR21x's system and pen configurations. The 73VR21x reads this file at the startup to apply the parameters.

10.2 DATA STORAGE TIME

Data storage time for one CF Card depends upon the following:

1. Storing rate
2. Data storing form
3. Number of channels

There are also CF Cards of different capacities.

Data storage time of a CF Card is calculated as follows:

Record Size

[Date Information] (bytes) + [One Sample Data] (bytes) x [No. of Channels] (points) = [Record Size] (bytes)

Number of Records

[CF Card Memory Size]* (bytes) / [Record Size] (bytes) = [Number of Records]

Data Storable Time

[Number of Records] x [Storing Rate] (seconds) = [Data Storage Time] (seconds)

Date information takes 8 bytes and one bit of sampled data takes 4 bytes with the floating point form, 2 bytes with short integer form. No. of channels must include all channels set to 'Enable.'

*[CF Card Memory Size] means the volume of data file (73VR.VRD21) created in the CF Card.

[Example]

Storing rate: 5 sec.

Data storing form: Short integer

Number of channels: 6

CF Card memory size: 118 MB (for 128 MB CF Card)

A record size is calculated as:

$$8 \text{ (bytes)} + 2 \text{ (bytes)} \times 6 \text{ (points)} = 20 \text{ (bytes)}$$

The number of records which can be stored in this CF card is calculated as:

$$(118 \times 1024 \times 1024^{**}) \text{ (bytes)} / 20 \text{ (bytes)} = \text{approx. } 6186598 \text{ (records)}$$

Time duration usable for the number of records is:

$$6186598 \times 5 \text{ (sec.)} = 30932990 \text{ (sec.)} = \text{approx. } 8592 \text{ Hours.} = \text{approx. } 358 \text{ days}$$

**1KB-CF card's memory size is calculated as 1024 bytes.

This calculated result is only for approximate estimation since the data file must be smaller than the full capacity of a CF Card.

10.3 WRITING/READING SETTING FILE IN AN USB FLASH-MEMORY

The 73VR21x's setting file can be read from or written in an USB flash-memory.

Connect the USB flash-memory at the USB connector at the front behind the front cover or at the rear side. See Section 2.2 for these connectors' locations.

The USB flash-memories listed below have been tested and confirmed adequate operations with the 73VR21x. Other memory sticks are not guaranteed.

Manufacturer: Buffalo Technology
Models: RUF2-S Series (256 MB through 1 GB)
RUF-CL/U2 Series (256 MB)

Manufacturer: I-O Data Devices, Inc.
Models: TB-M2 Series (256 MB), TB-B Series (256 MB), EasyDisk Platinum2 (256 MB)

CAUTION !

USB memory sticks may need certain time before it is detected by the PC. DO NO try to read or write setting files until it is detected and confirmed.

Buffalo RUF-CL/U2, 64 MB, is Not compatible with the 73VR21x.

10.3.1 HOW TO WRITE A CONFIGURATION FILE IN

- (1) Call up the Main Menu and touch Write Setting File key.
- (2) Enter a file name you desire on the alphanumeric keypad (max. 8 characters).
- (3) Touch OK. If you do not want to save a file, touch Cancel.

CAUTION !

A file extension is automatically added when the file is stored.

10.3.2 HOW TO READ A CONFIGURATION FILE OUT

- (1) Call up the Main Menu and touch Read Setting File key.
- (2) Touch the green panel to the right of File Name to show a list of setting files in the USB flash-memory. The list consists of two (2) pages, ten (10) files in each page.
- (3) Choose a file and touch OK. If you do not want to save a file, touch Cancel.



Figure: File read view.

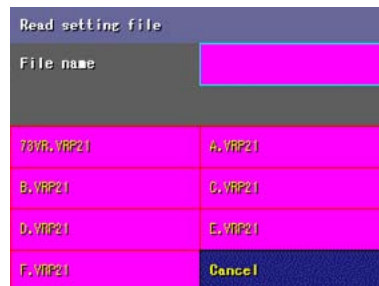


Figure: File list.

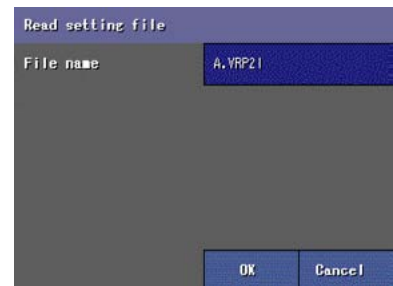


Figure: File selected.

CAUTION !

Touch Back to Record key to apply the new setting.

10.4 HOT SWAPPING THE CF CARD

The CF Card can be replaced while the 73VR21x is running.

The data sampled while the card is not placed is stored in the 73VR21x's internal memory. Its capacity is enough approximately for 5 minutes without a card. Be sure to get ready with a CF Card for replacement. If the CF Card does not contain the files 73VR.VRD21, 73VR.VRP21, 73VR.VRC21, 73VR.VRM21 and 73VR.VRA21, they must be created beforehand using the 73VR21BLD Configurator software. If the CF Card already has these files with stored data, they will be overwritten.

Be sure to observe the following procedure. If not, CF Card and its data may be damaged or lost.

HOW TO REPLACE THE CF CARD

- (1) Call up the Menu on the Display view and touch CF Card Eject key.
- (2) Confirm that you want to remove the CF Card. If not touch Cancel.
- (3) Confirm that the Menu now shows CF Card Insert key, and extract the card.

NOTE

No data retrieval or alarm history display is available while the card is removed.

- (4) Insert a new CF Card, and touch CF Card Insert key.
- (5) The 73VR21x will ask you if you want to reset the data file if one exist. Confirm that and touch OK.

CAUTION !

The CF Card cannot be removed while data in the internal memory is transferred to the card, during the card replacement or after the recording is complete. It may take certain time.

CAUTION !

The 73VRWV can perform FTP transfer while the 73VR21x is recording. The 73VR21x stores data in its internal memory while the FTP is in progress. When the internal memory is full, the file transfer is stopped, and the 73VR21x starts transferring data from the memory to the CF Card. Then with the transfer to the CF Card completed, the file transfer to the 73VRWV is resumed. Due to this operating procedure, it usually takes longer time in a file transfer when the 73VR21x is recording.

NOTE

Time elapsed (used file volume) since a card is removed can be confirmed on the Bargraph or the Overview. The Data File Used Volume bargraph will indicated 100% after 5 minutes has been passed. To use this function, choose Enable in the Display Setting.

NOTE

While the automatic comment entry is on, DO NOT execute a FTP data transfer.

APPENDIX – 1. BACKLIGHT FAILURE

If the backlight is failed, the screen becomes dark in the following circumstances:

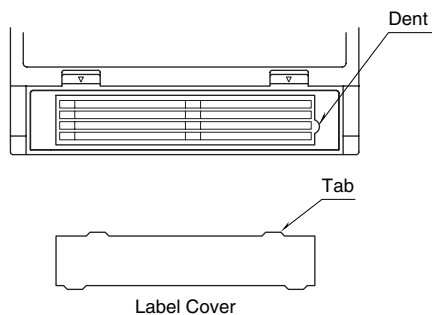
- The screen becomes dark even when no screen saver is activated.
- The screen becomes dark after the screen saver is activated, and then it does not recover even when the screen is touched.

The backlight can be replaced at M-System Factory. Stop recording, turn off the power supply and consult M-System.

The 73VR21x operation can be remotely stopped using the 73VR21BLD software. Refer to the 73VR21BLD users manual for detail.

APPENDIX – 2. REPLACING TAG LABEL

- (1) Insert a small screwdriver or a similar device under the label cover from the dent on the right side of the label, and pull up until the right tabs on the label cover is lifted out of the slots.
- (2) Lift also the left tabs.
- (3) Replace the label on the front and put the label cover back.



APPENDIX – 3. HOW TO SHOW TEMPERATURE UNIT ON THE 73VR21x SCREEN

In order to enter ‘°C’ or ‘°F’ on the 73VR21x, please use the keypad as follows:

- (1) Touch the current selection of Unit under Pen Setting (Common) to open the alphanumeric keypad.
- (2) Touch three times [/%°] key to enter [°].

Unit			
/°	abc	def	BS
ghi	jkl	mno	CLR
pqr	stu	vwx	←
.	yz	-	→
l/a	A/a	Cancel	OK

- (3) Touch [A/a] key to switch to the capital letters mode.
- (4) Touch [→] key to move to [ABC] key, and enter [C] by touching the key three times. To enter [F], move to [DEF] key.
- (5) Touch OK.

NOTE

Max. 4 characters can be used for an engineering unit. ‘°C’ or ‘°F’ takes two characters.

NOTE

Max. 4 characters can be used for an engineering unit. ‘°C’ or ‘°F’ takes two characters.

APPENDIX – 4. FIRMWARE UPDATE HISTORY

Major firmware update history (version 5 or later) is following.

Ver. 5.00F	“Drop out” function to “Analog accumulation” function added.
Ver. 5.02.xx	“Anemoscope” function added.
Ver. 5.03.xx	SD card availability added.