

INSTRUCTION MANUAL

IM VR204-S14E

1. GENERAL

This document describes the special specifications for the VR202, VR204, and VR206 recorders.

2. SPECIFICATIONS

Model Code: VR202-□/□□/R1/S14

VR204-□/□□/R1/S14

VR206-□/□□/R1/S14

Models with the optional /M□ calculation function, /E4 large memory and /N1 Cu10, Cu25 RTD input do not apply, however.

Special Specifications

1. Simulator Functions

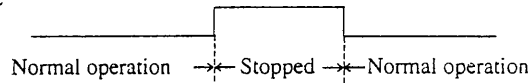
(1) Freezing the Display

Updating of the waveform (analog trend), digital and alarm displays is stopped by a remote control signal.

Terminals Remote 4-C

Close

Open



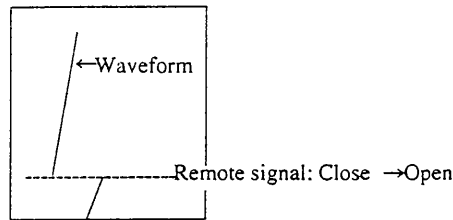
<1> Terminal used: Remote 4

<2> The recorder stops updating the waveform display in the standard mode or the magnified or reduced time-axis display mode, and stops updating the waveforms of the current data when the past data is being referenced on screen. (The waveforms of the referenced past data can be scrolled using the [←] and [→] keys.)

<3> The recorder does not stop measurement and continuously stores the measured data in the internal memory.

<4> When restarting the normal operation, the recorder starts plotting the waveforms from the point on the time axis at which updating was stopped.

Example of Vertical Waveform Display



(2) Initializing the Internal Memory and Clearing the Display

The internal memory is initialized and the display is cleared by a remote control signal.



The process is carried out when a change in the signal status from open to close is detected.

<1> Terminal used: Remote 5

<2> If past data are being referenced or the time axis is magnified or reduced, the recorder changes to the standard display mode and then initializes the internal memory and clears the display. (The display mode is left as standard.)

(3) Time Indications

The following times are not displayed:

- <1> Current time
- <2> Time indications of grids
- <3> Time indications for referenced waveforms
- <4> Time indications of messages

2. Logarithmic (LOG) range

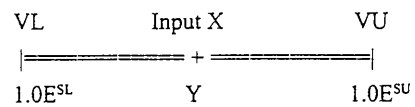
2-1. overview

Trend display (LOG scale) : In proportion to the input voltage.

Digital data display : 10^x multiply the input voltages

Relationship between input voltages and displayed values in the special LOG range.

Input voltage : X
Lower limit of displayed span : VL
Upper limit of displayed span : VU
Scaling lower limit : SL
Scaling upper limit : SU
Displayed value : Y



Computational expression : $Y = 10^{(SU-SL) * (X-VL) / (VU-VL) - SL}$

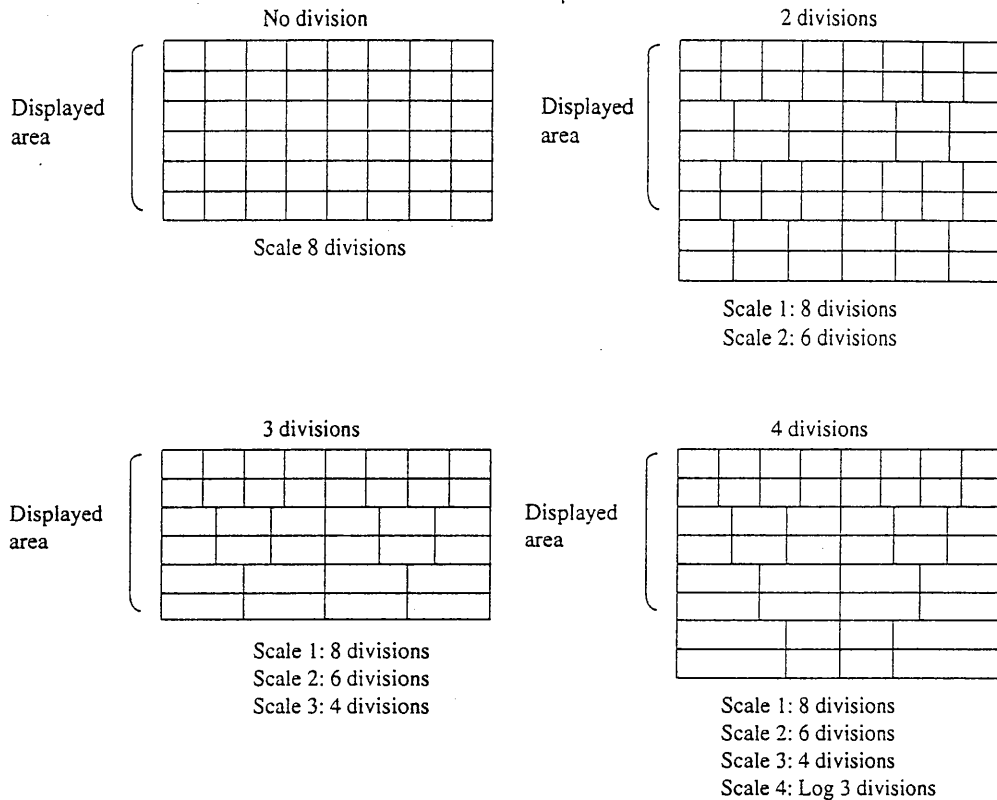
2-2. specifications

2-2-1. LOG Specification

- <1> Input range : Voltage inputs (DCV : 20mV, 60mV, 200mV, 2V, 6V, 20V)
 - Span : Within 75% of the measurement range
 - : Voltage value Lower limit of displayed span < Upper limit of displayed span
- <2> Scaling range : 1.0E+00 to 1.0E+/-15 (though a maximum of 15 decades)
 - : Scaling value Scaling lower limit < Scaling upper limit
- <3> Data display range
 - : 1.0E+00 to 1.0E+/-15 (in the same decade, 1.0E □□□ to 9.9E □□□)
 - : Number of displayable digits in the mantissa : 2 or 3 digits selectable
 - : For 3 digits 1.00E+00 to 1.00E+/-15
- <4> Unit : Specify a user unit (maximum of 6 characters)
- <5> Alarm : H or L only
 - : Set the alarm setpoints with voltage values
 - : The alarm hysteresis is fixed at 0%
- <6> Partial compression/expansion
 - : Not settable
- <7> Computation of difference between channels
 - : Not settable

2-2-2. Grid Display (Number of scale division).

- <1> Division of scale : LIN (Linear)...4 to 12 (same as standard model)
 LOG.....1 to 15 decades (added)
 These 24 kinds of divisions are selectable.
- <2> Division of time scale : No division (same as standard model)
 Divide...2 to 4 divisions (added)
 These 4 kinds of divisions are selectable.



(Note)

- "Scale 1" applies for the span and unit of channel 1.
- "Scale 2" applies for the span and unit of channel 2.
- "Scale 3" applies for the span and unit of channel 3.
- "Scale 4" applies for the span and unit of channel 4.

<3> Channel number display on the scale is ON/OFF selectable.

2-2-3. Number of bar-graph division

<1> Division of scale : LIN (Linear)...4 to 12 (same as standard model)
LOG.....1 to 15 decades (added)
These 24 kinds of divisions are selectable.

2-2-4. Limitation

<1> Only "Vertical" can be selected for waveform display direction.
"Horizontal" is not available.
<2> New setting items and error messages for this special function cannot be displayed in German or French.

2-3. Accuracy and display resolution

2-3-1. Measurement and display accuracy (digital display)

(1) Calculation method of displayed value accuracy

Input voltage : X

Lower limit of displayed span : VL

Upper limit of displayed span : VU

Scaling lower limit : SL

Scaling upper limit : SU

Displayed value : Y

<1> Computational expression

$$Y = 10^{(SU-SL) * (X-VL) / (VU-VL) + SL}$$

<2> Measurement accuracy (using minus side because of characteristic of log)

$$X_{err} = X - (\text{measurement accuracy of voltage range})$$

<3> Hardware error of displayed value

$$Y' = Y - Y_{err}$$

(Y_{err} is the displayed value when the input is X_{err} . The hardware error (Y') is the deviation between true value (Y) and Y_{err})

<4> Accuracy of the exponential displayed values

$$\text{Accuracy} = Y' \times 1.1 + 1 \text{ digit}$$

(2) Calculation example

2V range voltage span : 0.000 to 1.000V

Log span : -2 to 3

<1> Obtain the computational expression for this setting

$$\begin{aligned} Y &= 10^{(SU-SL) * (X-VL) / (VU-VL) + SL} \\ &= 10^{(3-(-2)) * (X-0) / (1-0) + (-2)} \\ &= 10^{(5X-2)} \end{aligned}$$

<2> Obtain the measurement error for the input voltage

$$\begin{aligned} \text{Measurement accuracy of 2V range} &= \pm (0.1\% \text{ of rdg} + 2 \text{ digits}) \\ &= \pm (0.001 * 1000 + 2) \\ &= \pm 3 \text{ digits} \end{aligned}$$

Therefore, displayed value may be 0.997 to 1.003V for the input of 1V.

And the calculation must be done in minus side because of log characteristics,

$$X_{err} = 0.997V$$

<3> Hardware error of the displayed value

Insert the obtained value from <2> (X_{err}) into the formula of <1>.

$$Y_{\text{err}} = 10^{(5 \times 0.997 - 2)}$$

$$= 9.6 \times 10^2 \text{ (Truncate under 2 digits from decimal point)}$$

True value is, $Y = 1.0 \times 10^3$, so error is 4 digits.

Therefore, the hardware error of displayed value is, $Y' = \pm 4$ digits.

<4> Accuracy of the exponential displayed value

Software error must be added to the hardware error as the final error.

(Software error = hardware error \times 1.1 + 1 digit)

Displayed value accuracy = \pm (4 digits \times 1.1 + 1 digit)

$$= 5.4 \text{ digits}$$

therefore, ± 6 digits is the measurement accuracy.

In case that the number figure of the exponential part is 3, measurement accuracy will be 10 times of above mentioned measurement accuracy.

In case of above-mentioned example, measurement accuracy is;

$$\pm 6 \text{ digits} \times 10 = \pm 60 \text{ digits.}$$

2-3-2. Display Resolution

The target minimum voltage span values necessary for obtaining a 0.01 resolution (1.00 to 9.99) of the exponential displayed values per decade in each range are as follows:

RANGE	SPAN
20mV	2.31mV or more
60mV	6.93mV or more
200mV	23.1mV or more
2V	0.231V or more
6V	0.693V or more
20V	2.31V or more

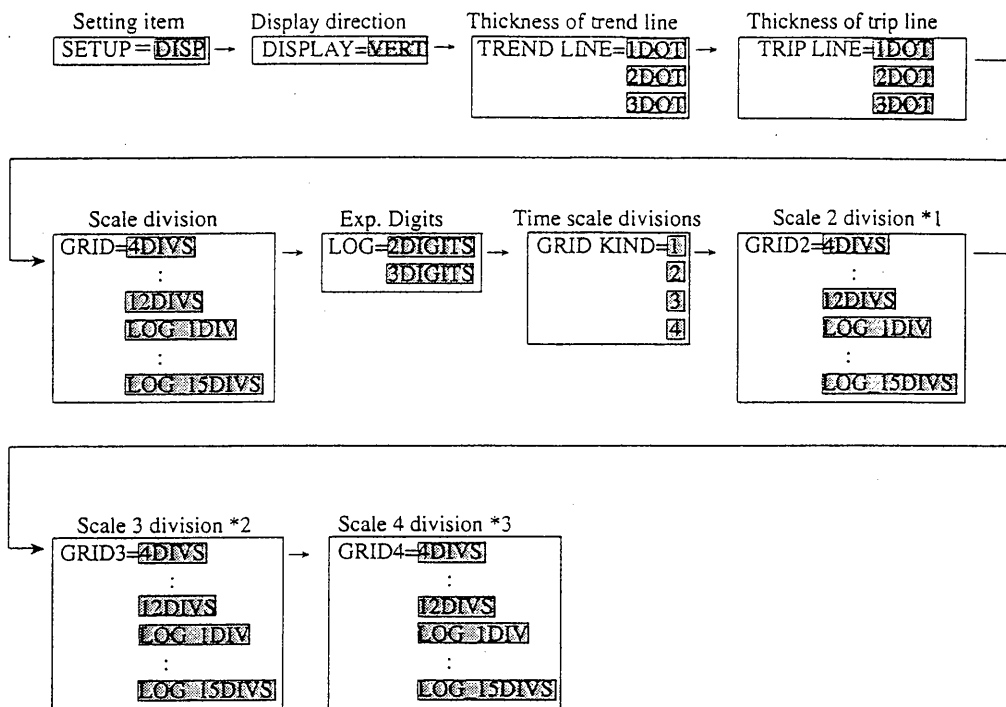
In the case of 2 decades, multiply the above values by 2 (20mV : $2.31 \times 2 = 4.62\text{mV}$)

In the case of 9 decades, multiply the above values by 9 (20mV : $2.31 \times 9 = 20.79\text{mV}$)

(Note) Since the above values are theoretical, a 0.01 resolution cannot actually be obtained in all ranges because of rounding off.

2-4. Setting of the set-up mode

2-4-1. Settings of number of figure of exponential displayed values and scale divisions



*1: This setting will be available when "GRID KIND" is set to "2" to "4".

*2: This setting will be available when "GRID KIND" is set to "3" to "4".

*3: This setting will be available when "GRID KIND" is set to "4".

Display direction : Only vertical ("VERT") can be set.

Scale division : Number of scale division can be set to "4" to "12DIVS" or "LOG_1" to "LOG_15DIVS". Default is "10DIVS".

Exp. digits : "2" or "3DIGITS" can be set. Default is "2DIGITS".

Time scale divisions : Number of time scale divisions can be set to "1", "2", "3" or "4". Default is "1".

Scale 2 division : Number of scale 2 division can be set to "4" to "12DIVS" or "LOG_1" to "LOG_15DIVS". Default is "10DIVS".

Scale 3 division : Number of scale 2 division can be set to "4" to "12DIVS" or "LOG_1" to "LOG_15DIVS". Default is "10DIVS".

Scale 4 division : Number of scale 2 division can be set to "4" to "12DIVS" or "LOG_1" to "LOG_15DIVS". Default is "10DIVS".

Operation Procedure

SETUP = ~~DISP~~

Select "DISP" by up/down key.

DISPLAY = ~~VERT~~

Select "VERT".

TREND LINE = ~~2DOT~~

Select "1", "2" or "3DOT" by up/down key.

TRIP LINE = ~~2DOT~~

Select "1", "2" or "3DOT" by up/down key.

GRID = ~~10DIVS~~

Select "4" to "12DIVS" or "LOG_1DIV" to "LOG_15DIV" by up/down key.

LOG = ~~2DIGITS~~

Select "2" or "3DIGITS" by up/down key.

GRID KIND = ~~4~~

Select "1", "2", "3" or "4" by up/down key.

GRID2 = ~~LOG_2DIVS~~

Select "4" to "12DIVS" or "LOG_1DIV" to "LOG_15DIV" by up/down key.

GRID3 = ~~LOG_4DIVS~~

Select "4" to "12DIVS" or "LOG_1DIV" to "LOG_15DIV" by up/down key.

GRID4 = ~~LOG_6DIVS~~

Select "4" to "12DIVS" or "LOG_1DIV" to "LOG_15DIV" by up/down key.

* DISP SET *

2-5. Setting of the set mode

2-5-1. Settings of log range

- Select "RANGE" by up/down key.
- Select "RANGE" by up/down key.

Select input range by up/down key.

Set lower span.

Set upper span.

Set scaling lower value (mantissa).

Set scaling upper values (mantissa).

2-5-2. Settings of ON/OFF for waveform display, scale display and channel number display in scale display.

- Select "AUX" by up/down key.
- Select "DISP_WAVE" by up/down key.
- Select setting channel by up/down key.
- Select ON/OFF for waveform display by up/down key.
- Select ON/OFF for scale display by up/down key.
- Select ON/OFF for channel number display in scale by up/down key.
-

2-5-3. Error messages in setting operation

Message	Description
E047 : SPAN LOWER > UPPER	Upper span value is smaller than lower span value. or Upper scaling value is smaller than lower scaling value
E048 : SPAN LIMIT ERROR	Display span is over specification (within 75% of input range). or Scaling span is over specification (within 15 decades).

2-6. RS-422-A

2-6-1. Setting commands for program

(1) Log range setting

Format : SR01, LOG, 6V, 1000, 5000, -2, 3, 0
 P1 P2 P3 P4 P5 P6 P7 P8

Description : P1...Channel numbers (CC)

P2...Set log

P3...Set input range (DC range)

P4...Lower value of span. Within 5 digits (includes minus mark).

P5...Upper value of span. Within 5 digits (includes minus mark).

P6...Lower value of scaling (mantissa). Within 3 digits (includes minus mark).

P7...Upper value of scaling (mantissa). Within 3 digits (includes minus mark).

P8...Position of decimal point (fixed to "0")

Notice : P6, P7 and P8 cannot be omitted each other. Omits all three parameters if it is needed.

(2) Setting of ON/OFF for waveform display, scale display and channel number display in scale display

Format : MD01, ON, ON, ON
 P1 P2 P3 P4

Description : P1...Channel numbers (CC)

P2...ON/OFF for waveform display

P3...ON/OFF for scale display

P4...ON/OFF for channel number display in scale display

(3) Setting of bar-graph scale divisions

Format : SH01, LOG_5
 P1 P2

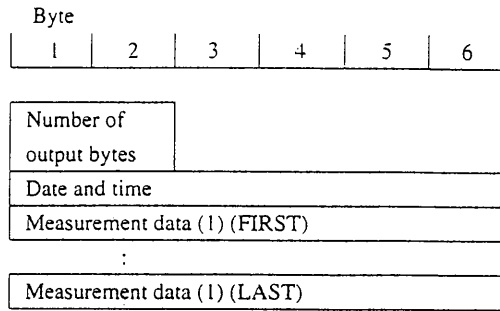
Description : P1...Channel numbers (CC)

P2...Number of divisions (4 to 12 or LOG_1 to LOG_15)

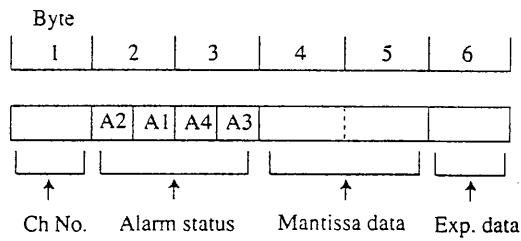
2-6-2. Output format of measurement data

(1) Binary mode

Output format



- <1> Number of output bytes : Same as standard model
- <2> Date and time : Same as standard model
- <3> Measurement data : As below



In case that measurement data is;

- Plus over : '7E7EH' for mantissa data
- '63H' for exponential data
- Munus over : '8181H' for mantissa data
- '9DH' for exponential data

Notice : Format of ASCII mode is same as the standard model.