

**Recorded Data / Current Readings
(XML Format)
Specifications**

Ver 1.23

Revision History

By Date	Version	Contents
2010/3/16	1.00	First Release
2010/8/10	1.10	<ul style="list-style-type: none"> •Made compatible with RTR-574 •Made compatible with RTR-500NW and RTR-500AW •Sample attribute was added for identification of test data. •Details about significant digits in measurements were added to the description of the conversion equation. (Conversion Specifications)
2011/6/30	1.20	<ul style="list-style-type: none"> •Made compatible with RTR-505 •The element "scale_expr" was added to scale conversion in Current Readings and Recorded Data. •"Conversion of Voltage and Current Data", "Conversion of Pulse Data", and "Scale Conversion Equation" were added to the description of Conversion Equations. (Conversion Specifications) •The "model" element was added.(Current Readings / Recorded Data) •The "valid" attribute was added for identification of error in gathering current readings. (Current Readings)
2011/9/14	1.20.1	<ul style="list-style-type: none"> •The "name" attribute was added to the "file" element. (Current Readings / Recorded Data) <p>* Set the version of file format to 1.20.</p>
2012/2/16	1.21	<ul style="list-style-type: none"> •Made compatible with RTR-576 and RTR-507
2012/10/25	1.22	<ul style="list-style-type: none"> •The element "unix_time" was added to file/base/gsm/gps. (Current Readings) •The element "name" was added to file/group/remote/ch. (Current Readings) •The element "rssi" was added to file/group/remote. (Current Readings) •A description was added for the file/group/remote/ch/current/batt element. (Current Readings) •The "tag" attribute was added to the file/ch/name element. (Recorded Data) •Made compatible with TR-700W and RTR-500MBS
2013/1/29	1.22	<ul style="list-style-type: none"> •Description for file/base/gsm was corrected. (Current Readings)
2013/8/26	1.23	<ul style="list-style-type: none"> •The "author" attribute was added to the "file" element. (Current Readings / Recorded Data) •The "group" element was added. (Recorded Data) •Made compatible with TR-7wf

#	Element Name						Attribute	Description	Type	Occurs		Length	Allow empty element	Sample	Comments
										min	max				
1	file						format	Specifies Format of File Current Readings : current_readings Recorded Data : recorded_data	String	1	1			current_readings	
							version	Version of File Format	String	1	1			1.22	
							sample	For clarification of test data	String	0	1			Transmission Tests	If "sample" has been selected for the attribute , it'll be deemed as test data. This test data may be used in transmission tests or other such purposes.
							name	File Name	String	0	1			RTR-500NW.xml	This may be used to recover file names or other such purposes.
							author	Creator of this file	String	0	1			RTR-500W Ver.1.40	This info can be used to identify what created this file by such things as device model number, name of application, and so on.
2		base					Info for the Base Unit which sent for and received the current readings		0	1				If "sample" has been selected as the attribute, this may be omitted.	
3			serial				Serial Number for Base Unit	String	1	1			329E270F	Character string in hexadecimal notation (English letters in upper case)	
4			model				Model Number for Base Unit	String	1	1			RTR-500AW		
5			name				Base Unit Name	String	1	1		✓	RTR-500AW Base Unit		
6			time_diff				Offset for UTC (unit: minutes) UTC - Local Time Conversion Equation local_time = UTC + time_diff + std_bias(standard time) local_time = UTC + time_diff + dst_bias(daylight savings time) EX) Japan: 540 / Pacific Standard Time: -480	Integer	1	1			540		
7			std_bias				Offset for Standard Time (unit: minutes)	Integer	1	1			0		
8			dst_bias				Offset for Daylight Savings Time (unit: minutes)	Integer	1	1			60		
9			time_zone				Character string representing time zone	String	1	1		✓	(GMT+09:00)Osaka, Sapporo, Tokyo		
10			gsm				RTR-500 GSM, RTR-500 MBS unique info		0	1					
11				ext_ps			External Power Status (0:Broken 1:Normal)	Integer	1	1	1		0		
12				batt			Battery Level for Base Unit (5:Full - 0:Empty)	Integer	1	1	1		3		
13				input			External Contact Input Status (0:OFF 1:ON)	Integer	1	1	1		0		
14				output			External Contact Output Status (0:OFF 1:ON)	Integer	1	1	1		0		
15							Base Unit Position Information		0	2				Only when GPS sensor is connected	
16				gps			Latitude Longitude Format dmm : DMM Format (latitude longitude shown in degrees, minutes,seconds and milliseconds) deg : DEG Format (latitude longitude shown in degrees only)	String	1	1			dmm		
17					lat		Latitude Northern Latitude: ddmn.mmmm,N Southern Latitude: ddmn.mmmm,S degrees: dd, minutes: mm, decimal minutes: mmmm	String	1	1		✓	DMM Format 3614.0232,N DEG Format+36.233718	If a failure occurs in getting the location information, the element will be empty.	
18					lon		Longitude Eastern Longitude: dddmm.mmmm,E Western Longitude: dddmm.mmmm,W degrees: ddd, minutes: mm, decimal minutes: mmmm	String	1	1		✓	DMM Format 313756.7962,E DEG Format+137.946609	If a failure occurs in getting the location information, the element will be empty.	
19					unix_time		Time at which the location information is received (Number of seconds from January 1st 1970 / World Standard Time (UTC))	Integer	1	1	10	✓	566468090		
19					lan		RTR-500NW, RTR-500AW unique info		0	1					
20				input			External Contact Input Status (0:OFF 1:ON)	Integer	1	1	1		0		
21				output			External Contact Output Status (0:OFF 1:ON)	Integer	1	1	1		0		

22		group					Group Info		1	N						If "sample" has been selected as the attribute, this may be omitted.
23			num				Group Number	Integer	1	1				1		
24			name				Group Name	String	1	1			✓	Group1		
25			remote				Remote Unit Info		1	N						
26				serial			Serial Number for Remote Unit	String	1	1				3FB80004		Character string in hexadecimal notation (English letters in upper case)
27				model			Model Number for Remote Unit	String	1	1				RTR-501		
28				num			Remote Unit Number	Integer	1	1				1		
29				name			Remote Unit Name	String	1	1			✓	unit01		
30				rss			Signal Strength between Base Unit (Remote Unit) and Remote Unit 5: Strong - 1: Weak, 0: Communication Impossible	Integer	1	1			✓	5		If there is no wireless communication function, the element will be empty.
31				ch			Channel Info		1	N						
32					num		Channel Number	Integer	1	1				1		
33					scale_expr		Scale Conversion Equation	String	1	1			✓	3.368Yn1.285Yn4Ynkgf/cm2Yn		(Note 3) Equation to convert measurement units
34					name		Channel Name	String	1	1			✓	Refrigerator		
35					current		Current Readings									
36					unix_time		Time of Current Reading (Number of seconds from January 1st 1970 / World Standard Time (UTC))	Integer	1	1	10			566468090		If a failure occurs in getting the current readings, the time of the error will be set.
37					time_str		Time of Current Reading as a character string (The converted local time using the clock info of the Base Unit)	String	1	1				2009/02/02 15:30(GMT-8:00)		
38					value		Current Readings If the "scale_expr" element contains some description, the value will be that of the result of scale conversion. If the "scale_expr" element is empty, the value will be that of the one shown in the "unit" element.	String	1	1				73.4		If a failure occurs in getting the current readings, the reason for the error will be set as a character string. (EX) Communication Error : Communication Error Sensor Error : Sensor Error No Data : No Data
39					valid		Results of Gathering Current Readings Success:valid=true Failure:valid=false When omitted, it means the same as "valid=true".	String	0	1				valid=true		If a failure occurs in getting the current readings, "valid=false" will be set.
40					unit		Units for Current Readings (Note 1) If the "scale_expr" element contains some description, the unit will be as specified in the scale conversion.	String	1	1			✓	F		If a failure occurs in getting the current readings, the element will be empty.
41					batt		Battery Level for Remote Unit 5: Full - 0: Empty, -1: Devices without battery level info	Integer	1	1	1		✓	3		If a failure occurs in getting the current readings, the element will be empty.
42					record		Current Readings Archive (latest current reading + several sets of past current readings)									The value in the "data" element of the last current reading data is the same as that in the "current" element.
43					type		Type of Data (Note 2)	Integer	1	1			✓	13		
44					unix_time		Time of the head Current Reading in the data element (Number of seconds from January 1st 1970 / World Standard Time (UTC))	Integer	1	1	10		✓	566468090		
45					data_id		ID number for most recent current reading (last current reading in the "data" element) in the Current Readings Archive	Integer	1	1			✓	5		Each time data is recorded into the Remote Unit, a value of 1(one) is added (and returns to 0 (zero) after reaching 65535).
46					interval		Recording Interval (unit: seconds)	Integer	1	1			✓	3600		
47					count		Number of Recorded Data	Integer	1	1				10		
48					data		Current Readings Archive (Note 3) The number of archival data readings specified in the "count" element	String	1	1			✓	HgVGBTIFeAWwBA==		

Note 1) Units for Current Readings

Type of Data	Unit of Measurement
Temperature (Celsius)	C
Temperature (Fahrenheit)	F
Humidity	%
Illuminance	lx
Cumulative Illuminance	lxh
UV Intensity	mW/cm ²
Cumulative UV Light	mW/cm ² h
Current	mA
Voltage	mV or V
Pulse	pulse
CO2	ppm

* Only when scale conversion settings are not active.

Note 2) Relationship between Type of Data and Conversion Equation for Data in Current Readings Archive

Type of Data	Setting Value	Conversion Equation (Note 3)
Temperature (Celsius)	13 (0x000D)	3.1
Humidity (1% Accuracy)	208 (0x00D0)	3.1
Humidity (0.1% Accuracy)	209 (0x00D1)	3.1
Illuminance	73 (0x0049)	3.2
Cumulative Illuminance	329 (0x0149)	3.3
UV Intensity	85 (0x0055)	3.2
Cumulative UV Light	341 (0x0155)	3.3
Current (0.01mA Accuracy)	129 (0x0081)	3.4
Voltage (0.1mV Accuracy)	146 (0x0092)	3.4
Pulse (Falling)	77 (0x004D)	3.5
Pulse (Rising)	78 (0x004E)	3.5
Total Pulse Count (Falling)	333 (0x014D)	3.6
Total Pulse Count (Rising)	334 (0x014E)	3.6
Total Pulse Count with Time	589 (0x024D)	3.7
Total Pulse Count with Time	590 (0x024E)	3.7
CO2	66 (0x0042)	3.4

Note 3) See the [Conversion Specifications] sheet.

#	Element Name						Attribute	Description	Type	Occurs		Length	Allow empty element	Sample	Comments
										min	max				
1	file						format	Specifies Format of File Current Readings : current_readings Recorded Data : recorded_data	String	1	1			recorded_data	
							version	Version of File Format	String	1	1			1.23	
							sample	For clarification of test data	String	0	1			Transmission Tests	If "sample" has been selected for the attribute , it'll be deemed as test data. This test data may be used in transmission tests or other such purposes.
							name	File Name	String	0	1			RTR-500NW.xml	This may be used to recover file names or other such purposes.
							author	Creator of this file	String	0	1			RTR-500W Ver.1.40	This info can be used to identify what created this file by such things as device model number, name of application, and so on.
2		base						Info for the Base Unit which downloaded recorded data.		0	1				If "sample" has been selected as the attribute, this may be omitted.
3			serial					Serial Number for Base Unit	String	1	1			329E270F	Character string in hexadecimal notation (English letters in upper case)
4			model					Model Number for Base Unit	String	1	1			RTR-500AW	
5			name					Base Unit Name	String	1	1		✓	RTR-500GSM Base Unit	
6		group						Group Info for the device which recorded the data.		0	1				If "sample" has been selected as the attribute, this may be omitted. If there are no Group Name settings, this item is omitted.
7			name					Group Name	String	1	1		✓	Group1	
8		ch								0	N				If "sample" has been selected as the attribute, this may be omitted.
9			serial					Serial Number of Remote Unit (for which recorded data is being shown)	String	1	1			3FB80004	Character string in hexadecimal notation (English letters in upper case)
10			model					Model Number for Remote Unit	String	1	1			RTR-501	
11			name				tag	Sub-Name for Recorded Data (Channel)	String	0	1			Ch.1	Channel Name, etc.
								Name for Recorded Data (Remote Unit Name)	String	1	1		✓	unit01	Remote Unit Name, etc.
12			num					Channel Number for Remote Unit (for which recorded data is being shown)	Integer	1	1			1	
13			time_diff					Offset for UTC (unit: minutes) UTC - Local Time Conversion Equation local_time = UTC + time_diff + std_bias(standard time) local_time = UTC + time_diff + dst_bias(daylight savings time) EX) Japan: 540 / Pacific Standard Time: -480	Integer	1	1			540	
14			std_bias					Offset for Standard Time (unit: minutes)	Integer	1	1			0	
15			dst_bias					Offset for Daylight Savings Time (unit: minutes)	Integer	1	1			60	
16			time_zone					Character string representing time zone	String	1	1		✓	(GMT+09:00)Osaka, Sapporo, Tokyo	
17			type					Type of Data (Note 1)	Integer	1	1		✓	13	
18			unix_time					Time of head Recorded Data for the "data" element (Number of seconds from January 1st 1970 / World Standard Time (UTC))	Integer	1	1	10	✓	566468090	
19			data_id					ID number of the last Recorded Data for the "data" element	Integer	1	1		✓	5	Each time data is recorded into the Remote Unit, a value of 1(one) is added (and returns to 0 (zero) after reaching 65535).
20			interval					Recording Interval (unit: seconds)	Integer	1	1		✓	3600	
21			count					Number of Recorded Data	Integer	1	1			16000	
22			data					Recorded Data (Note 2)	String	1	1		✓	HgVGBTIFeAWwBA==	
23			upper_limit					Upper limit for the channel (Raw Data)	Integer	1	1		✓		The actual value is calculated using the conversion equation as shown in (Note 1).
24			lower_limit					Lower limit for the channel (Raw Data)	Integer	1	1		✓		The actual value is calculated using the conversion equation as shown in (Note 1).
25			scale_expr					Scale Conversion Equation	String	1	1		✓	3.368Yn1.285Ynkgf/cm2Yn	(Note 2) Equation to convert measurement units

26			record_prop					Internal Data	String	1	1		✓		cannot be used
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Note 1) Relationship between Type of Data and Conversion Equation for Recorded Data

Type of Data	Setting Value	Conversion Equation (Note 2)
Temperature (Celsius)	13 (0x000D)	3.1
Humidity (1% Accuracy)	208 (0x00D0)	3.1
Humidity (0.1% Accuracy)	209 (0x00D1)	3.1
Illuminance	73 (0x0049)	3.2
Cumulative Illuminance	329 (0x0149)	3.3
UV Intensity	85 (0x0055)	3.2
Cumulative UV Light	341 (0x0155)	3.3
Current (0.01mA Accuracy)	129 (0x0081)	3.4
Voltage (0.1mV Accuracy)	146 (0x0092)	3.4
Pulse (Falling)	77 (0x004D)	3.5
Pulse (Rising)	78 (0x004E)	3.5
Total Pulse Count (Falling)	333 (0x014D)	3.6
Total Pulse Count (Rising)	334 (0x014E)	3.6
Total Pulse Count with Time	589 (0x024D)	3.7
Total Pulse Count with Time	590 (0x024E)	3.7
CO2	66 (0x0042)	3.4

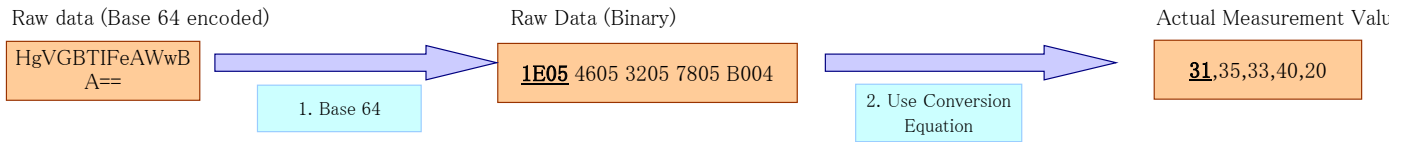
Note 2) See the [Conversion Specifications] sheet.

1. Introduction

The data in the Current Readings Archive is shown in binary data format with 2 bytes of data for each measurement reading. The binary data is the converted value gotten by carrying out a conversion equation on the actual measurement value, which is called Raw Data. Raw data (binary) is stored in time successive order with the oldest data at the head.

In XML format, the Raw Data values encoded in Base 64 are stored into the "data" element of Recorded Data and Current Readings Archival Data.

2. Basic Process for Calculating Actual Measurement Value



- 1 The character string in the "data" element is decoded out of Base64 and converted to Raw Data (Binary).
- 2 The actual measurement value is calculated in 2-byte units using the conversion equation. In XML format in the "type" element (Type of Data) it is possible to specify the conversion equation to be used and the number of significant digits for measurement values.

3. Conversion Equations

3.1 Conversion of Temperature and Humidity Data

Conversion Equation

Raw data is stored using Little Endian. After byte inversion, the actual measurement value is calculated using the following conversion equation (Raw Temperature Data is stored in Celsius.)

$$\text{Actual Measurement Value} = (\text{Raw Data} - 1000) / 10$$

EX: When Raw Data is 0x051E and Type of Data is 13 (Temperature (Celsius)) :
 Actual Temperature = (0x051E - 1000) / 10 = (1310 - 1000) / 10 = 31.0°C

Significant Digits

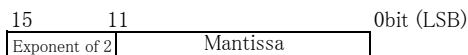
Temperature and Humidity Data (0.1% Accuracy) : Valid to one decimal point
 Humidity Data (1% Accuracy) : Valid to whole numbers only

Invalid Data

Value	Description
0xEEEE	Sensor is damaged or unconnected.

3.2 Conversion of Illuminance and UV Intensity

Structure of Raw Data



Conversion Equation

Measurement Items	Equation	Example
Illuminance	(Mantissa x 2 ^{nth}) / 100	When Raw Data is 0x6987: Actual Measurement Value = 0x987 x 2 ⁶ / 100 = 1560.96 lx
UV Intensity	(Mantissa x 2 ^{nth}) / 1000	When Raw Data is 0x3654: Actual Measurement Value = 0x654 x 2 ³ / 1000 = 12.960 mW/cm ²

Significant Digits

Measurement Items	Significant Digits	Example
Illuminance	4 digits (rounded down from fifth digit), valid to 2 decimal points	123456.78 -> 123400 123.45 -> 123.4
UV Intensity	4 digits (rounded down from fifth digit), valid to 3 decimal points	123456.789 -> 123400 12.345 -> 12.340

Invalid Data

Value	Description
0xEEEE	Sensor is damaged or unconnected.

3.3 Conversion of Cumulative Illuminance and Cumulative Amount of UV Light

Structure of Raw Data

Raw Data consists of 10 bytes : time of measurement data (8 bytes) and measurement data (2 bytes).

Time of Measurement Data 8 bytes	Measurement Data 2 bytes
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Time of Measurement Data

Time of measurement data, shown in the number of seconds from January 1st 1970 in World Standard Time (UTC), is stored using Little

Measurement Data

15	11	0bit (LSB)
Exponent of 2	Mantissa	

Conversion Equation

Measurement Items	Equation	Example
Cumulative Illuminance	Mantissa x 2 ^{nth}	When Raw Data is 0x6987: Actual Measurement Value = 0x987 x 2 ⁶ = 156096 lxh
Cumulative UV Light	(Mantissa x 2 ^{nth}) / 1000	When Raw Data is 0x2534: Actual Measurement Value = 0x534 x 2 ² / 1000 = 5.388 mW/cm ² h

Significant Digits

Measurement Items	Significant Digits	Example
Cumulative Illuminance	4 digits (rounded down from 5th digit), whole numbers only	156096 -> 156000
Cumulative UV Light	4 digits (rounded down from fifth digit), valid to 3 decimal points	123456.789 -> 123400 12.345 -> 12.340

Invalid Data

There is no invalid data.

3.4 Conversion of Current and Voltage Data

Structure of Raw Data

15	14	11	0bit (LSB)
Sign bit 0 = + 1 = -	3-bit exponent base = 2 unsigned integer (0 - 7)	12-bit mantissa 13-bit signed integer (2's complement)	

Conversion Equation

Measurement Items	Equation	Example
Current (0.01mA Accuracy)	±(Mantissa x 2 ^{nth}) / 100	When Raw Data is 0x0987: Actual Measurement Value = + 0x987 x 2 ⁶ / 100 = 1560.96mA
Voltage (0.1mV Accuracy)	±(Mantissa x 2 ^{nth}) / 10	When Raw Data is 0xBFFA, and complement of 2 in the mantissa is calculated, it comes to 0xFFA 0x005 + 1 = 6. Actual Measurement Value = - 6 x 2 ³ / 10 = - 4.8 mV
CO2	±(Mantissa x 2 ^{nth})	When Raw Data is 0x1234: Actual Measurement Value = 564 x 2 ¹ = 1128 ppm

Significant Digits

See the specifications of the device used for the measurement.

Invalid Data

Value	Description
0xF001	Out of measurement range (below)
0xF002	Out of measurement range (above)
0xF00F	Sensor is damaged or unconnected.

3.5 Conversion of Pulse Data

Structure of Raw Data

Raw data is stored using Little Endian. After byte inversion, the actual measurement value is calculated using the following conversion equation
Range : 0 to 61439 (0xEFFF)

Actual Measurement Value = Raw Data

(EX) When Raw Data is 0x051E and Type of Data is 77 (Falling Pulse) :
Actual Pulse Count = 0x051E = 1310 pulses

Invalid Data

Value	Description
0xF002	Out of measurement range (above)

3.6 Conversion of Total Pulse Count

Structure of Raw Data

Raw data is stored using Little Endian. After byte inversion, the actual measurement value is calculated using the following conversion equation.
 Range : 0 to 4294967294 (0xFFFFFFFF)

Actual Measurement Value = Raw Data

(EX) When Raw Data is 0x0000051E and Type of Data is 333 (Total Pulse Count (Falling)):
 Actual Pulse Count = 0x051E = 1310 pulses

Invalid Data

There is no invalid data.

3.7 Conversion of Total Pulse Count with Time Tag

Structure of Raw Data

Raw Data consists of 12 bytes : time of measurement data (8 bytes) and measurement data (4 bytes).

Time of Measurement Data 8 bytes	Measurement Data 4 bytes
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Time of Measurement Data

Time of measurement data, shown in the number of seconds from January 1st 1970 in World Standard Time (UTC), is stored using Little Endian.

Measurement Data

See 3.6

Invalid Data

There is no invalid data.

4. Scale Conversion Equation

Scale conversion uses an equation to convert measurement units.

Scale conversion equation is described based on the following rules.

1. Use a line feed (0x0A) as a delimiter. Hereafter a line feed is denoted by ¥n
2. List a slope, intercept, significant digits, and measurement unit, placing a line feed character (¥n) at the end of each.
3. Scale conversion equations should have four line feed characters (¥n).
4. Place "¥n¥n¥n¥n" when not using scale conversion.
5. When the number of significant digits is 0, place the converted value as is.

(EX)

slope = 3.368
 intercept = 1.285
 Significant Digits = 4
 Measurement Unit = kgf/cm2
 3.368¥n1.285¥n4¥nkgf/cm2¥n

(EX)

No scale conversion
 ¥n¥n¥n¥n