Recorded Data / Current Readings
(XML Format)
Specifications

Ver 1.25

Revision History

By Date	Version	Contents
2010/3/16	1.00	First Release
2010/8/10	1.10	・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	・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	・The "name" attribute was added to the "file" element. (Current Readings / Recorded Data) ＊Set the version of file format to 1.20.
2012/2/16	1.21	・Made compatible with RTR-576 and RTR-507
2012/10/25	1.22	・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	・Description for file/base/gsm was corrected. (Current Readings)
2013/8/26	1.23	・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
2016/11/4	1.24	・Added new data types (Temperature with time and Humidity with time) for TR4 monitoring. (Current Readings / Recorded Data) ・Added [3.8 Conversion of Temperature and Humidity Data with Time Tag]. (Conversion Specifications)
2017/7/4	1.24.1	・Added the explanation to [3.1 Conversion of Temperature and Humidity Data]. (Conversion Specifications)
2017/12/7	1.25	・Added the "repeater" attribute to the file/group/remote/rssi element. (Current Readings).

#	Element Name					Attribute	Description	Type	Occurs min	Occurs max	Length	Allow empty element	Sample	Comments
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				gps			Base Unit Position Information		0	2				Only when GPS sensor is connected
16						type	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: ddmm.mmmm,N 　Southern Latitude: ddmm.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	
20			lan				RTR-500NW, RTR-500AW unique info		0	1				
21				input			External Contact Input Status (0:OFF 1:ON)	Integer	1	1	1		0	
22				output			External Contact Output Status (0:OFF 1:ON)	Integer	1	1	1		0	

No	E1	E2	E3	E4	E5	E6	Description	Type	Min	Max	Len	✔	Example	Notes
23	group						Group Info		1	N				If "sample" has been selected as the attribute, this may be omitted.
24		num					Group Number	Integer	1	1			1	
25		name					Group Name	String	1	1		✔	Group1	
26		remote					Remote Unit Info		1	N				
27			serial				Serial Number for Remote Unit	String	1	1			3FB80004	Character string in hexadecimal notation (English letters in upper case)
28			model				Model Number for Remote Unit	String	1	1			RTR-501	
29			num				Remote Unit Number	Integer	1	1			1	
30			name				Remote Unit Name	String	1	1		✔	unit01	
31			rssi				Signal Strength between Base Unit (Remote Unit) and Remote Unit 5: Strong − 1: Week, 0: Communication Impossible	Integer	1	1		✔	5	If there is no wireless communication function, the element will be empty.
32				repeater			0: Base Unit 1 or higher: Repeater Number	Integer	0	1		✔	1	If there is no wireless communication function, the attribute will be removed.
33			ch				Channel Info		1	N				
34				num			Channel Number	Integer	1	1			1	
35				scale_expr			Scale Conversion Equation	String	1	1		✔	3.368¥n1.285¥n4¥nkgf/cm2¥n	(Note 3) Equation to convert measurement units
36				name			Channel Name	String	1	1		✔	Refrigerator	
37				current			Current Readings							
38					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.
39					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)	
40					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
41						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.
42					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.
43					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.
44				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.
45					type		Type of Data （Note 2）	Integer	1	1		✔	13	
46					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	
47					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).
48					interval		Recording Interval (unit: seconds)	Integer	1	1		✔	3600	
49					count		Number of Recorded Data	Integer	1	1			10	
50					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/cm²
Cumulative UV Light	mW/cm²h
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
Temperature with Time (Celsius)	269 (0x010D)	3.8
Humidity with Time (1% Accuracy)	464 (0x01D0)	3.8
Humidity with Time (0.1% Accuracy)	465 (0x01D1)	3.8
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
with Time (Falling)	589 (0x024D)	3.7
with Time (Rising)	590 (0x024E)	3.7
CO2	66 (0x0042)	3.4

Note 3) See the [Conversion Specifications] sheet.

#	Element Name					Attribute	Description	Type	Occurs min	Occurs max	Length	Allow empty element	Sample	Comments
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
						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		✔	3.368¥n1.285¥nkgf/cm2¥n	(Note 2) Equation to convert measurement units
26				record_prop			Internal Data	String	1	1		✔		cannot be used

Note 1) Relationship between Type of Data and Conversion Equation for Recorded Data

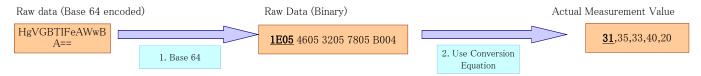| Type of Data	Setting Value	Conversion Equation (Note 2)
Temperature (Celsius)	13 (0x000D)	3.1
Humidity (1% Accuracy)	208 (0x00D0)	3.1
Humidity (0.1% Accuracy)	209 (0x00D1)	3.1
Temperature with Time (Celsius)	269 (0x010D)	3.8
Humidity with Time (1% Accuracy)	464 (0x01D0)	3.8
Humidity with Time (0.1% Accuracy)	465 (0x01D1)	3.8
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
with Time (Falling)	589 (0x024D)	3.7
with Time (Rising)	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

Raw data (Base 64 encoded)		Raw Data (Binary)		Actual Measurement Value
HgVGBTIFeAWwBA==	→ 1. Base 64	<u>1E05</u> 4605 3205 7805 B004	→ 2. Use Conversion Equation	<u>31</u>,35,33,40,20

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

<u>Conversion Equation</u>

Raw data is stored using Little Endian. After byte inversion, the actual measurement value is calculated using the following conversion equation.
Range: -32768 to 32767
(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 = (INT16(0x051E) - 1000) / 10 = (1310 - 1000) / 10 = 31.0℃

When Raw Data is 0xFFFE and Type of Data is 13 (Temperature (Celsius)) :
Actual Temperature = (INT16(0xFFFE) - 1000) / 10 = (-2 - 1000) / 10 = -100.2℃

<u>Significant Digits</u>

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

<u>Invalid Data</u>

Value	Description
0xEEEE	Sensor is damaged or unconnected.

3.2 Conversion of Illuminance and UV Intensity

Structure of Raw Data

15	11		0bit (LSB)
Exponent of 2		Mantissa	

Conversion Equation

Measurement Items	Equation	Example
Illuminance	$(\text{Mantissa} \times 2^{nth}) / 100$	When Raw Data is 0x6987: Actual Measurement Value = 0x987 x 2^6 / 100 = 1560.96 lx6 lx
UV Intensity	$(\text{Mantissa} \times 2^{nth}) / 1000$	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

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

15	11		0bit (LSB)
Exponent of 2		Mantissa	

Conversion Equation

Measurement Items	Equation	Example
Cumulative Illuminance	$\text{Mantissa} \times 2^{nth}$	When Raw Data is 0x6987: Actual Measurement Value = 0x987 x 2^6 = 156096 lxh
Cumulative UV Light	$(\text{Mantissa} \times 2^{nth}) / 1000$	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

<u>Structure of Raw Data</u>

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)	

<u>Conversion Equation</u>

Measurement Items	Equation	Example
Current (0.01mA Accuracy)	$\pm(\text{Mantissa} \times 2^{nth}) / 100$	When Raw Data is 0x6987: Actual Measurement Value = + 0x987 x 2^6 / 100 = 1560.96mA
Voltage (0.1mV Accuracy)	$\pm(\text{Mantissa} \times 2^{nth}) / 10$	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	$\pm(\text{Mantissa} \times 2^{nth})$	When Raw Data is 0x1234: Actual Measurement Value = 564 x 2^1 = 1128 ppm

<u>Significant Digits</u>
  See the specifications of the device used for the measurement.

<u>Invalid Data</u>

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

<u>Structure of Raw Data</u>

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

<u>Invalid Data</u>

Value	Description
0xF002	Out of measurement range (above)

3.6 Conversion of Total Pulse Count

<u>Structure of Raw Data</u>

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

<u>Invalid Data</u>
  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

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.

3.8 Conversion of Temperature and Humidity Data with Time Tag

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

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 3.1

Significant Digits
See 3.1

Invalid Data
See 3.1

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