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pH/Water Quality Meter F-7X BW
Low-spec Command Reference

Preface

This manual describes the communication command list of the pH/Water Quality Meters with serial communication function, LAQUA-PH1100/PH1200/PH1300/PC1100/EC1100.
The contents of this manual are subject to change without notice.

Caution

- Use the optional USB cable (part number: 3200373941) or serial cable (part number: 3014030151) to connect the instrument to a personal computer (referred to as PC in the rest of this document).
- Make sure that the transfer format used in the instrument and a PC are the same.
  When different transfer format is used, a communication error occurs and the online mode does not start up, and as a result RS-232C communication cannot be performed. Also, when the transfer format is changed, turn OFF the power of the instrument and PC and then reboot them.

  The transfer format of the instrument is as follows.
  - ・Baud rate: 2400 bps
  - ・Character length: 8 bits
  - ・Parity: None
  - ・Stop bit: 1 bit
- If you write the program for serial communication, at first, write the command to change the instrument to the online mode. By changing the instrument to the online mode, its operation keys except for ⏻ key are locked and it changes to serial communication mode.
  If the instrument's power is turned OFF, reset the online mode.
- If the instrument does not receive the command or occurs any errors after it requested the data, add the waiting time of a few seconds before request the data again.
  If the instrument received the data continuously, the instrument does not response.
- The instrument cannot be controlled by using the DCD, CTS, and DSR.
- It is necessary to switch RTS to ON to perform communication. Set it 2.4 V above.
- Pin assignment of the instrument and the external instrument are follows.
  Instrument side (A connector MINI DIN 8 PIN)
  - 2 TX
  - 3 RX
  - 4 CTS
  - 5 COM

  External instrument side (B connector DSUB 9 PIN)
  - 2 TX (RX at an external instrument side)
  - 3 RX (TX at an external instrument side)
  - 5 COM
  - 7 CTS (RTS at an external instrument side)

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For any questions regarding this product, please contact your local agency, or inquire from the HORIBA website.
(http://global.horiba.com/contact_e/index.htm)

・Command function list (control)

Item	Command		Function
	Header	Name	
Online/Offline	C (Control)	OL	Changes between the online mode and the offline mode.
Potential follow-up stop		BR	Releases the hold state and returns to instantaneous value display state.
pH measurement mode		PH	Waits for the pH measurement.
mV measurement mode		MV	Waits for the ORP measurement mode result.
Ion measurement mode		IO	Waits for the ion measurement.
Conductivity measurement mode		CO	Waits for the conductivity measurement.
Salinity measurement mode		SA	Waits for the salinity measurement.
Resistivity measurement mode		OH	Waits for the resistivity measurement.
TDS measurement mode		TD	Waits for the TDS measurement.
Calibration mode		CM	Waits for the calibration.
pH calibration start		CP	Starts the calibration and inspection before use in the pH measurement mode or hold state.
Ion calibration start		CI	Starts the ion calibration in the ion measurement mode or hold state.
Conductivity calibration start		CD	Starts the conductivity calibration in the conductivity measurement or hold state.
Salinity calibration start		CS	Starts the salinity calibration in the salinity measurement or hold state.
Calibration clear		CC	Clears the calibration data in the measurement mode.
Data IN		IN	Stores the measurement data.

Response from pH meter

OK [CR][LF]

or

ER, n [CR][LF]

n = 1: A non-existent command was entered.
n = 2: The command was entered when the pH meter cannot accept it.
n = 3: An unacceptable number was entered in the command.

●Online/Offline command

C, OL, x [CR][LF]

0 or 1　　0: Offline　　1: Online

Name (Online/Offline operation)

Header

When the instrument accepts the online command, it enters the online mode and the keys cannot be operated.

●Potential follow-up stop command

C, BR, x [CR][LF]

Channel (1 or 2)

Name (Potential follow-up stop)

Header

Releases the hold state and returns to instantaneous value display state.
This is invalid for auto stability mode.

●pH measurement mode command

C, PH, x [CR][LF]

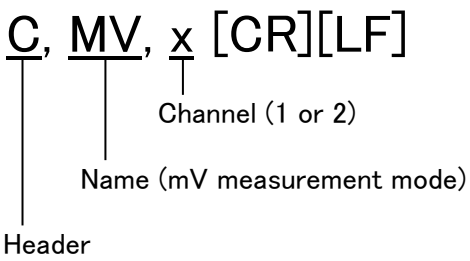
Channel (1 or 2)

Name (pH measurement mode)

Header

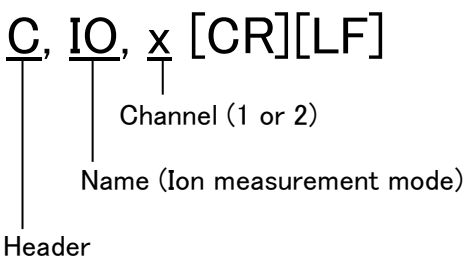
When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the pH measurement.

●mV measurement mode command



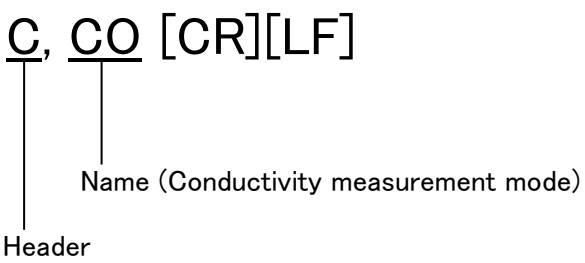
When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the ORP measurement mode result.

●Ion measurement mode command



When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the ion measurement.

●Conductivity measurement mode command



When the instrument is in the online mode, this is valid for modes other than Calibration mode.
Waits for the conductivity measurement.

●Salinity measurement mode command

C, SA [CR][LF]

Name (Salinity measurement mode)

Header

When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the salinity measurement.

●Resistivity measurement mode command

C, OH [CR][LF]

Name (Ion measurement mode)

Header

When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the resistivity measurement.

●TDS measurement mode command

C, TD [CR][LF]

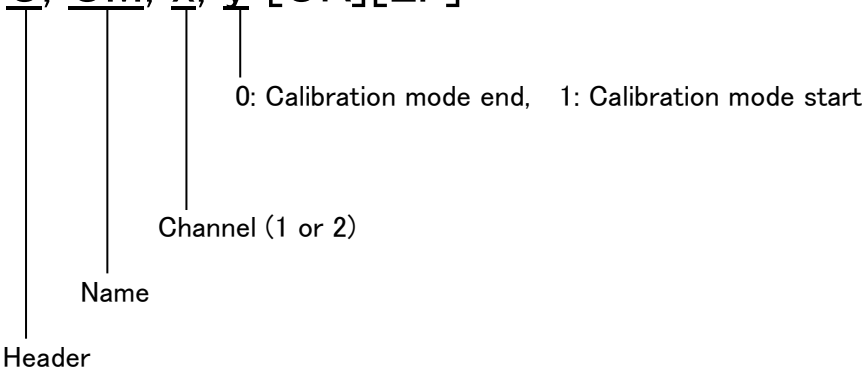
Name (TDS measurement mode)

Header

When the instrument is in the online mode, this is valid for modes other than the calibration mode.
Waits for the TDS measurement.

●Calibration mode command

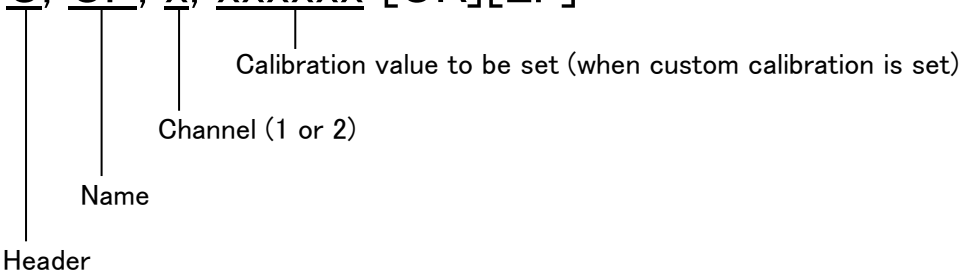
C, CM, x, y [CR][LF]



Waits for the calibration at specified mode.
※ To return to the measurement mode without calibrating after entering the calibration mode, enter "0: Calibration mode end".

●pH calibration start command

C, CP, x, xxxxxx [CR][LF]



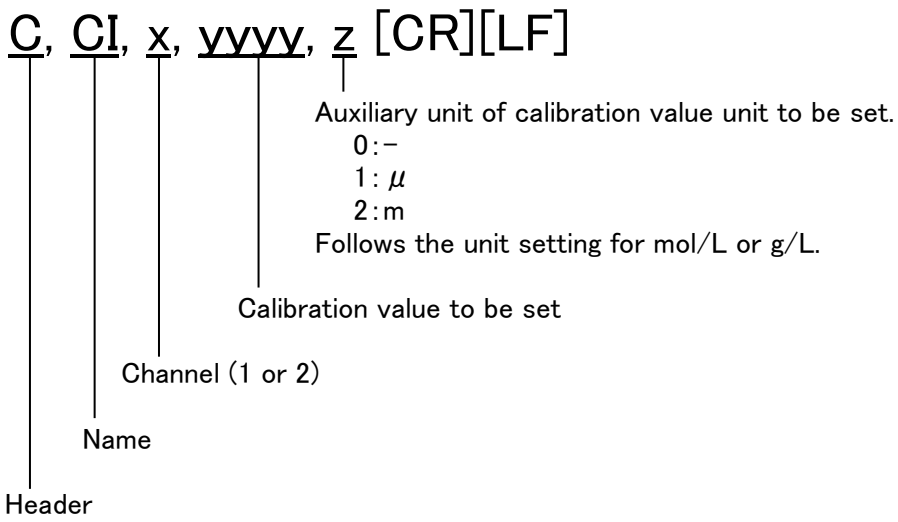
Starts the calibration when waiting for pH calibration.
Even when the setting is other than the custom calibration,
it is necessary to enter the calibration value (It will not be used.).
ER, 2 is returned when the measurement value or temperature value is Or (Ur).

Setting range of calibration value

Specified by three decimal places.
0.000 to 14.000

※ Automatically returns to the measurement mode after the calibration is finished.
※ Automatically returns to the measurement mode even if a calibration error is generated.
※ A calibration error can be checked by the alarm inquiry (R, AL).
※ Calibration errors are released by the alarm clear (R, AR).

●Ion calibration start command



Starts the ion calibration when waiting for ion calibration.
ER, 2 is returned when the temperature value is Or (Ur).
Calibration is possible when the measurement value is Or (Ur).

Setting range of calibration value

Unit: mg/L, μg/L, mmol/L, μmol/L
0.00 to 9.99
(Possible at [SP][SP]X or [SP]X.X.)
10.0 to 99.9
(Possible even at [SP]XX.)
[SP]100 to [SP]999

※ Automatically returns to the measurement mode after the calibration is finished.
※ Automatically returns to the measurement mode even if a calibration error is generated.
※ A calibration error can be checked by the alarm inquiry (R, AL).
※ Calibration errors are released by the alarm clear (R, AR).

●**Conductivity cell constant calibration start command**

C, CD, yyyyy, z [CR][LF]

Auxiliary unit of calibration value unit to be set.
0: –
1: μ
2: m
Follows the unit setting for S/m or S/cm.
No limit for input value when automatic calibration is ON.

Calibration solution concentration to be set
Even if the automatic calibration is set to ON,
it is necessary to enter the calibration value (It will not be used).
No limit for input value when automatic calibration is ON.

Name (Conductivity calibration start)

Header

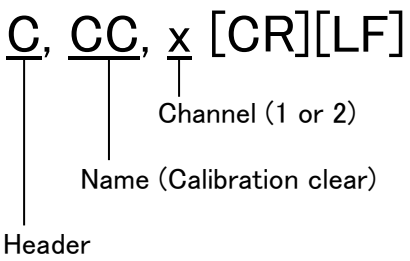
Starts the conductivity calibration when waiting for conductivity calibration.
ER, 2 is returned when the measurement value or temperature value is Or (Ur).

Setting range of calibration value

When the unit is μS/m: 0.001 to 2000.0
When the unit is mS/m or S/m: 0.001 to 200.0

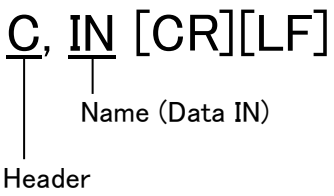
※ Automatically returns to the measurement mode after the calibration is finished.
※ Automatically returns to the measurement mode even if a calibration error is generated.
※ A calibration error can be checked by the alarm inquiry (R, AL).
※ Calibration errors are released by the alarm clear (R, AR).

●Calibration clear command



Clears the calibration data in the measurement mode.

●Data IN command



Stores the measurement data.

・Command function list (Request data)

Item	Command		Function
	Header	Name	
Request of the calibration history of pH	R (Request Data)	PC	Gets the latest calibration history of pH.
Request of the calibration history of ion		IC	Gets the latest calibration history of ion.
Request of the calibration history of conductivity		CC	Gets the latest calibration history of conductivity.
Request of the measurement value		MD	Gets the measurement value of specified channel.
Request of the clock data		OT	Gets the clock data.
Request of the number of stored memories		MC	Gets the number of data stored in the memory.
Request of memory data		MS	Gets the memory data to be specified.
Alarm inquiry		AL	Gets the alarm code in the instrument.
Clear alarm		AR	Clears the alarm code in the instrument.

Response from pH meter
When it is OK:

Describes in each command.

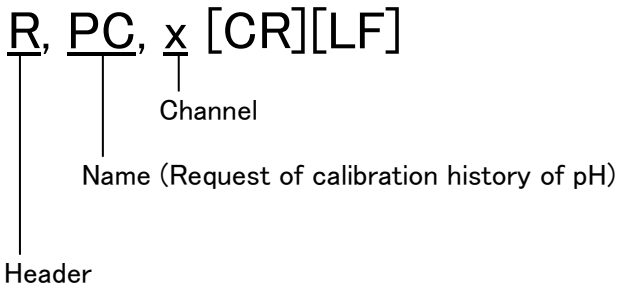
or

ER, n [CR][LF]

n = 1 : A non-existent command was entered.
n = 2 : The command was entered when the pH meter cannot accept it.
n = 3 : An unacceptable number was entered in the command.

●**Request command and response of the calibration history of pH**

Request command



Response from pH meter

RPC, x, x, x, x, Xxxxx.x, x, (⇒)

- Header
- Channel 1 digit 1: CH1 2: CH2
- Calibration points 1 digit 1 to 5
- Calibration result 0: good
- Temperature setting 1 digit 0: ATC 1: MTC
- Asymmetry potential (7 digits including symbol) ±XXXX.X
- Inspection before use 0: No 1: Yes

Slope (sensitivity) (5 digits including decimal point and symbol)
For one-point calibration⇒First-point sensitivity: [SP]
For two-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity [SP]
For three-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity [SP]
For four-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity: Potential diff. between 3rd and 4th solutions, fourth-point sensitivity [SP]
For five-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity: Potential diff. between 3rd and 4th sensitivity solutions, fourth-point sensitivity: Potential diff. between 4th and 5th solutions, fifth-point sensitivity [SP]

(⇒)

xxxx,	xx,	xx,	xx,	xx,	xx,	xx.xxx,	Xxxx.x,	Xxxxx.x,	xxx.x
						xx.xxx,	Xxxx.x,	Xxxxx.x,	xxx.x
						xx.xxx,	Xxxx.x,	Xxxxx.x,	
						xx.xxx,	Xxxx.x,	Xxxxx.x,	x.xxx

[CR][LF]

- Year 4 digits A.D.
- Month 2 digits 01 to 12
- Day 2 digits 01 to 31
- Hour 2 digits 00 to 23
- Minute 2 digits 00 to 59
- Second 2 digits 00 to 59
- Calibration solution value (6 digits including decimal point and symbol) 0.000 to 14.000
- Temperature (6 digits including decimal point and symbol) ±XXX.X
- Potential (7 digits including symbol) ±XXXX.X
- Repeatability (5 digits including decimal point and symbol) 0.000 to 9.999
- First point calibration
- Second point calibration
- Third point calibration
- Inspection data before use

Response from the instrument if it does not have the calibration data

RPC,**********,x,0,3

Channel 1 digit 1:CH1 2:CH2

Display format is fixed. If no data exist, [SP] is displayed.
The number of transmitted calibration data is the number of calibration points.
Displayed calibration date and time is the latest calibration date and time.
When there are two or more calibration points,
slope data is displayed and the slope data of the third point is a space.
If an inspection is carried out before use, its data will be transmitted after the calibration data is forwarded.

Slope data
For the slope data, the calibration efficiency, A X 100, between each point is output.
When it exceeds 999.9 or is a negative value, [SP][SP][SP][SP][SP] is output.

●**Request command and response of the calibration history of ion**

Request command

R, IC, x [CR][LF]

x: Channel

IC: Name (Request of the calibration history of ion)

R: Header

Collects the ion data under selection.

Response from pH meter

RIC, x, x, x, x, Xxxxx.x, X, X, (⇒)

- Unit 0: g/L 1: mol/L
- Ion type 0: −2 1: −1 2: +1 3: +2
- Asymmetry potential (7 digits including symbol) [SP][SP][SP][SP][SP][SP][SP] is output as the asymmetry potential of ion.
- Temperature setting 1 digit 0: ATC 1: MTC
- Calibration result 0: good
- Calibration points 1 digit 1 to 5
- Channel 1 digit 1: CH1 2: CH2
- Header

Slope (sensitivity) (5 digits including decimal point and symbol)
- For one-point calibration⇒First-point sensitivity: [SP]
- For two-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity [SP]
- For three-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity [SP]
- For four-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity: Potential diff. between 3rd and 4th solutions, fourth-point sensitivity [SP]
- For five-point calibration⇒First-point sensitivity: Potential diff. between 1st and 2nd solutions, second-point sensitivity: Potential diff. between 2nd and 3rd solutions, third-point sensitivity: Potential diff. between 3rd and 4th sensitivity solutions, fourth-point sensitivity: Potential diff. between 4th and 5th solutions, fifth-point sensitivity [SP]

(⇒)

xxxx,	xx,	xx,	xx,	xx,	xx,	xxxx	x,	Xxxx.x,	Xxxxx.x,	xxx.x
						xx.x	x,	Xxxx.x,	Xxxxx.x,	xxx.x
						x.xx	x,	Xxxx.x,	Xxxxx.x,	
						xxxx	x,	Xxxx.x,	Xxxxx.x,	~~x.xxx~~ [CR][LF]

First point calibration
Second point calibration
Third point calibration

- Repeatability
- Potential (7 digits including symbol) ±XXXX.X
- Temperature (6 digits including decimal point and symbol) ±XXX.X
- Auxiliary unit of calibration solution 0: − 1: μ 2: m
- Calibration solution value (4 digits including decimal point and symbol) 0.000 to 9999
- Second 2 digits 00 to 59
- Minute 2 digits 00 to 59
- Hour 2 digits 00 to 23
- Day 2 digits 01 to 31
- Month 2 digits 01 to 12
- Year 4 digits A.D.

Response from the instrument if it does not have the calibration data

RIC,**********,x,0,3

Channel 1 digit 1:CH1 2:CH2

●**Request command and response of the calibration history of conductivity**

Request command

R, CC [CR][LF]

Name (Request of the calibration history of conductivity)

Header

Response from pH meter

RCC, x, x, x, (⇒)

- Header: RCC
- Channel 1 digit 1: CH1 2: CH2
- Calibration result 0: good
- Temperature setting 1 digit 0: ATC 1: MTC

(⇒)

xxxx,	xx,	xx,	xx,	xx,	xx,	xxx.x	xxx.x,	X,	X,	Xxxx.x,	Xxxxx.x,	X.XXX	Range 5 calibration data
							xxx.x,	X,	X,	Xxxx.x,	Xxxxx.x,	X.XXX	Range 4 calibration data
							xxx.x,	X,	X,	Xxxx.x,	Xxxxx.x,	X.XXX	Range 3 calibration data
							xxx.x,	X,	X,	Xxxx.x,	Xxxxx.x,	X.XXX	Range 2 calibration data
							xxx.x,	X,	X,	Xxxx.x,	Xxxxx.x,	X.XXX	[CR][LF] Range 1 calibration data

- Year 4 digits A.D.
- Month 2 digits 01 to 12
- Day 2 digits 01 to 31
- Hour 2 digits 00 to 23
- Minute 2 digits 00 to 59
- Second 2 digits 00 to 59
- Cell constant
- Calibration solution value (5 digits including decimal point and symbol) 0.000 to 199.9
- Unit 0: S/m 1: S/cm
- Auxiliary unit 0: – 1: μ 2: m
- Temperature (6 digits including decimal point and symbol) ±XXX.X
- Potential (7 digits including symbol) ±XXXX.X
- Cell coefficiency

Display format is fixed. If no data exist, [SP] is displayed.
Displayed calibration date and time is the latest calibration date and time.
For the calibration solution concentration, unit, auxiliary unit, temperature, and potential of non-calibration range, enter [SPA].
For the cell coefficiency of non-calibration range, the reference value before or after the calibrated range is displayed.

Response from the instrument if it does not have the calibration data

RCC,**********,x,0,3

- Channel 1 digit 1: CH1 2: CH2

●**Request command and response of the measurement value**

Request command

R, MD, x [CR][LF]

Channel

Name (Request of the measurement value)

Requests the measurement value of the specified channel.

Header

Response from pH meter

RMD, xxxx, xx, x, x, x, x, xxxx, xx, xx, xx, xx, xx, (⇒)

- Second 2 digits 00 to 59
- Minute 2 digits 00 to 59
- Hour 2 digits 00 to 23
- Day 2 digits 01 to 31
- Month 2 digits 01 to 12
- Year 4 digits A.D.
- Ion type 1 digit
  - For ion measurement
    - 0: −2 1: −1 2: +1 3: +2
  - For other measurement parameter
    - [SP]
- Measurement state 1 digit
  - 0: Instantaneous value 1: Hold state
  - 2: Potential follow-up measurement
- Measurement/calibration type 1 digit
  - 0: Measurement 1: Calibration
- Channel 1 digit
  - 1: CH1 2: CH2
- Measurement mode 1 digit
  - 1: pH 2: Absolute mV 3: Relative mV 5: Ion 10: Conductivity
  - 12: Resistivity 11: Salinity 13: TDS
- Sample ID 4 digits
  - ※Enter spaces.
  - [SP][SP][SP][SP]
- Header

(⇒) Xxxxxxx, x, x, x, xxxxx, xxxxx, x [CR][LF]

- Error state
  - 2: Upper limit alarm
  - 1: Lower limit alarm
  - 0: No alarm
- Potential 7 digits
  - (Leading zero suppression)
- Temperature (6 digits including decimal point) −30.0 to 130.0
  - Right-justified
  - When the temperature value is Or (Ur), the character string Or or Ur is displayed instead of an upper or lower limit value.
- Temperature setting 1 digit
  - 0: ATC 1: MTC
- Unit 1 digit
  - (pH) 0: Non
  - (ORP) 0: mV
  - (Ion) 0: μg/L, 1: mg/L, 2: g/L, 3: mmol/L, 4: mol/L
  - (Conductivity) 0: S/m, 1: S/cm, 2: mS/cm-Fix
  - (Resistivity) 0: Ohm/m, 1: Ohm/cm
  - (Salinity) 0: PPT, 1: %
  - (TDS) 0: g/L
- Auxiliary unit 1 digit
  - 0: Non 1: μ 2: m 3: k 4: M
- Measurement value max. 7 digits

※Matches the displayed digit of each component to the display specifications.

pH	−2.000 to 16.000
ORP	−2000.0 to 2000.0
Ion	0.000 to 9999
Conductivity	0.000 to 1999
Resistivity	0.000 to 200.0
Salinity (%)	0.000 to 10.000
Salinity (PPT)	0.00 to 100.00
TDS	0.00 to 100

When the measurement value is Or (Ur),
the character string Or or Ur is displayed instead of upper and lower limit values.

●Request command and response of the clock data

Request command

R, OT [CR][LF]

Name (Request of clock data)

Requests the clock data.

Header

Response from pH meter

ROT, xxxx, xx, xx, xx, xx, xx [CR][LF

Second 2 digits 00 to 59

Minute 2 digits 00 to 59

Hour 2 digits 00 to 23

Day 2 digits 01 to 31

Month 2 digits 01 to 12

Year 4 digits A.D. (Leading zero suppression)

Header

●Request command and response of the number of stored memories

Request command

R, MC [CR][LF]

Name (Request the number of stored memories)

Requests the number of data stored in the memory.

Header

Response from pH meter

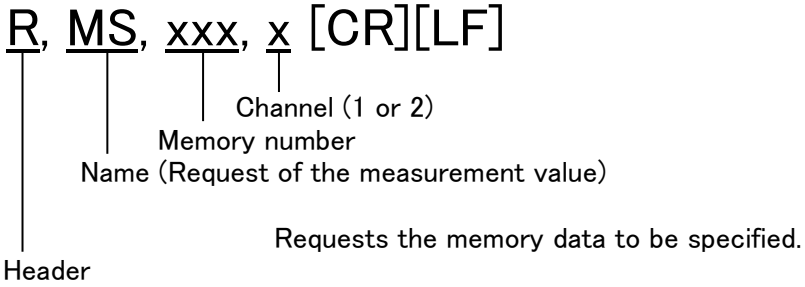
RMC, xxx [CR][LF]

Number of memories

Header

●**Request command and response of memory data**

Request command



Response from pH meter

RMS, xxxx, xxxx,(⇒)

- RMS: Header
- xxxx: Memory number
- xxxx: Sample ID

(⇒)

xx, x, x, x, x, xxxx, xx, xx, xx, xx, xx, Xxxxxxx, (⇒)

- Measurement mode 1 digit
  1: pH 2: Absolute mV 3: Relative mV 5: Ion 10: Conductivity 12: Resistivity 11: Salinity 13: TDS
- Channel 1 digit
  1: CH1 2: CH2
- Measurement/calibration type 1 digit
  0: Measurement
- Measurement state 1 digit
  0: Instantaneous value
- For ion measurement 0: −2 1: −1 2: +1 3: +2
  For other measurement parameter [SP]
- Year 4 digits A.D. (Leading zero suppression)
- Month 2 digits 01 to 31
- Day 2 digits 01 to 31
- Hour 2 digits 00 to 23
- Minute 2 digits 00 to 59
- Second 2 digits 00 to 59
- Measurement value max. 7 digits
  ※Matches the displayed digit of each component to the display specifications.

pH	−2.000 to 16.000
ORP	−2000.0 to 2000.0
Ion	0.000 to 9999
Conductivity	0.000 to 1999
Resistivity	0.000 to 200.0
Salinity (%)	0.000 to 10.000
Salinity (PPT)	0.00 to 100.00
TDS	0.00 to 100

When the temperature value is Or (Ur), the character string Or or Ur is displayed instead of an upper or lower limit value.

(⇒) x, x, x, Xxxxxx, Xxxxxxx, x [CR][LF]

Error state
2: Upper limit alarm
1: Lower limit alarm
0: No alarm

Potential 7 digits
(Leading zero suppression)

Temperature (6 digits including decimal point) −30.0 to 130.0
Right-justified
When the temperature value is Or (Ur),
the character string Or or Ur is displayed instead of an upper or lower limit value.

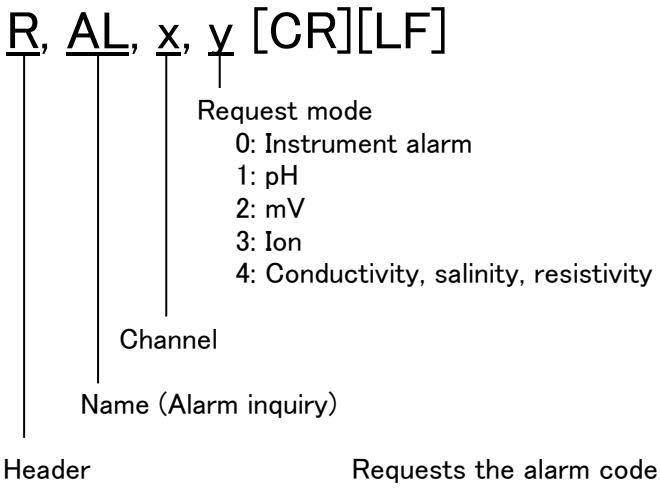
Temperature setting 1 digit
0: ATC 1: MTC

Unit 1 digit
(pH) 0: Non
(ORP) 0: mV
(Ion) 0: μg/L, 1: mg/L, 2: g/L, 3: mmol/L, 4: mol/L
(Conductivity) 0: S/m, 1: S/cm, 2: mS/cm-Fix
(Resistivity) 0: Ohm/m, 1: Ohm/cm
(Salinity) 0: PPT, 1: %
(TDS) 0: g/L

Auxiliary unit 1 digit
0: Non 1: μ 2: m 3: k 4: M

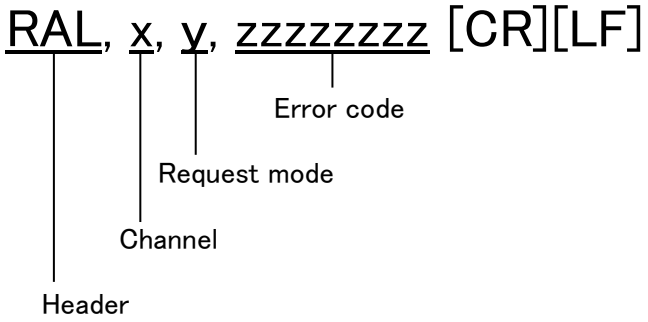
●Alarm inquiry command and response

Request command



Requests the alarm code in the instrument.

Response from pH meter



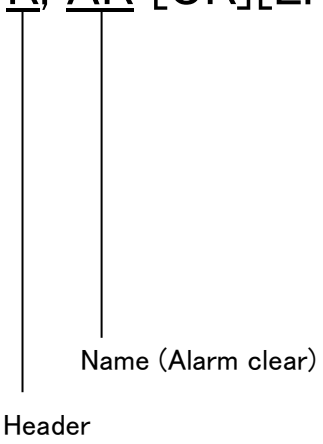
Error code

zzzzzzzz	Description
0x00000001	Internal memory error (instrument)
0x00000002	Lower battery error (instrument)
0x00000004	Electrode stability error (other than the instrument)
0x00000008	Asymmetry potential error (pH)
0x00000010	Sensitivity error (pH, ion)
0x00000020	Maximum calibration points exceeded (pH, ion)
0x00000040	Cannot identify standard solution (pH, conductivity)
0x00000080	Calibration interval error (pH)
0x00000100	Printer error (instrument)
0x00000200	Memory full (instrument)
0x00000400	Cell constant is out of range (conductivity)

●Alarm clear command and response

Request command

R, AR [CR][LF]



OK [CR][LF]