Matsushima
Matsushima Measure Tech

TGRAPHIC_COM4-003E
Rev1 : 16. Apr, 2021

INSTRUCTION MANUAL

FOR

LCD ADJUSTMENT UNIT

TYPE: GRAPHIC COM4

※The operator should read this Instruction Manual carefully and handle the device correctly.

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Safety precautions

- Be sure to thoroughly read the instruction manual before using the products.
- Keep the instruction manual in a safe, convenient location for future reference.
- All or part of the contents described in this manual may be changed without any notice.
- Due to our constant striving for further improvement of products, parts or products that differ from those described in this manual may be substituted.

WARNING (Failure to observe this WARNING may cause a fatal or serious injury.)

- Be sure to confirm that any peripheral equipment does not move before installation work. In addition, observe safety requirements for installation work where high-place work is expected.
- Be sure to turn off the power source before wiring, mounting and transportation work. (Failure to observe this WARNING may result in an electric shock/ injury or equipment damage due to short-circuit.)
- Carry out wiring work correctly with reference to a proper drawing.
- Never disassemble the equipment. (Failure to observe this WARNING may result in an electric shock.)
- Do not open the cover under an explosive environmental condition when power is entered. (Failure to observe this WARNING may result in an injury or equipment damage.)
- Do not place or store the equipment in any hostile environmental place where it will be subjected to direct sunlight, rain, water droplet, hazardous gas / water, etc..

CAUTION (Failure to observe this CAUTION may cause a moderate injury or equipment damage.)

- Do not use the equipment for any purpose other than the original purpose of use.
- Be sure to confirm the specification of equipment and use the equipment within the range of specification. (Mounting conditions such as temperature, power source, frequency, etc.)
- Make sure a correct wiring before applying power source.
- Do not have a shock or strong impact to the equipment. (Failure to observe this CAUTION may result in equipment damage.)
- Be sure to connect necessary terminals (grounding, etc.).
- Remove all wiring to the equipment before doing electrical welding work near the equipment.
- Do not forcedly bend or pull the lead wire also do not use unnecessarily long wire.
- Tighten the cover, lead outlet, etc. properly so that dust, rainwater, etc. do not enter inside the equipment.
- Do not use the equipment under a corrosive condition (NH_3, SO_2, Cl_2, etc.).
- Be sure to tighten the cable grand so that outer air does not enter inside the equipment.
- When applying piping connection such as conduit, etc. instead of cable gland, apply putty or equivalents On the cable entry so that outer air does not enter inside the equipment.

IMPORTANT (indicates notes or information to help customers.)

Limitations of Warranty:

- Warranty period shall be one year from the date of delivery (ex-factory).
- Any damage of any other products that have occurred for use of the equipment is not covered by this warranty. Also any loss induced by failure or malfunction of the equipment is not covered by this warranty.
- Failure or malfunction caused by following are not covered by this warranty:
  a. Modification or repair by a party other than MATSUSHIMA's authorized personnel, or replacement of parts not recommended by MATSUSHIMA.
  b. Inadequate storage, installation, use, inspection or maintenance that does not comply with specifications.
  c. Cause for any peripheral equipment or device.
  d. Accident beyond control and force majeure (fire, earthquake, flood, riots, etc.).

Lack of instructions to MATSUSHIMA for information or safety requirements that can be predicted only by customers' side.

This warranty conditions do not limit customers' legal right.

Price for the equipment does not include any charge for services such as commissioning, supervising, etc..

1. Overview

The LCD adjustment unit is dedicated for adjustment and diagnosis of the microwave level meter type of MWLM-PR26 (hereafter referred to as the "Level meter"). This unit is attached to top of the level meter electronics part in the housing.

Summary of functions: Waveform display, parameter settings, self test, reset and current output test.

2. Mounting/dismounting the LCD adjustment unit

Mounting: Unscrew the level meter housing cover. Attach LCD adjustment unit on the electronics part case and rotate it right to the direction "LOCK".

Dismounting: Rotate LCD adjustment unit left to the direction "OPEN" and remove.

3. Key functions

Detailed key functions of the LCD adjustment unit are described below.

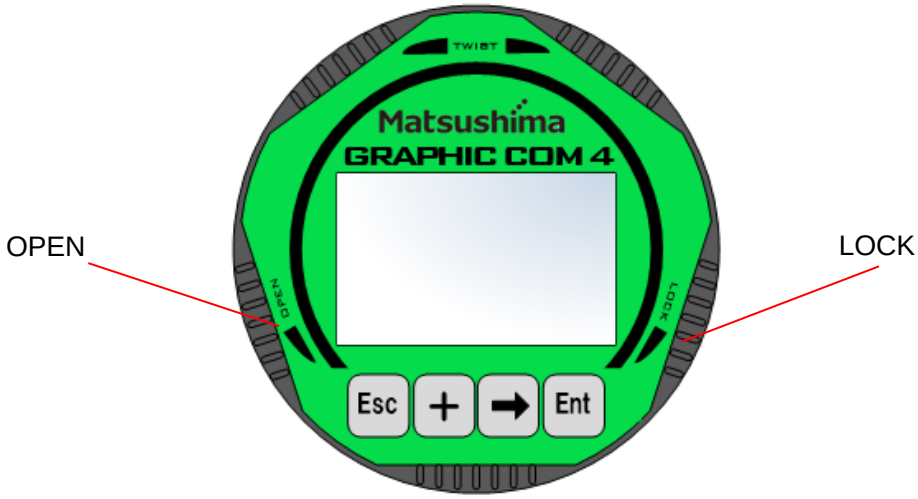


Fig. 3.1 GRAPHIC COM4 external view

Table 3.1 Key functions

Key	When menu selected	When enter/select digits or characters	When display waveform
Ent	Enter to menu Select menu item	Accept entered value	–
→	–	Move cursor right	Change X axis (distance) scale
+	Move cursor down	Select value Increment digit Move cursor when entering characters	Change Y axis (reflection) scale
Esc	Shift to parent layer	Interrupt entry (cancel)	Shift to parent layer

4. Display

4.1 Measurement display

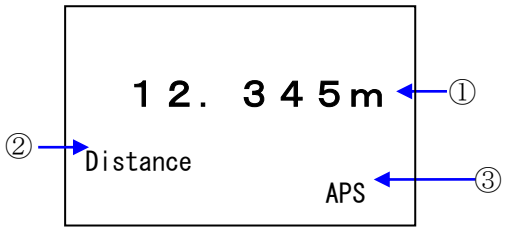


Fig. 4.1.1 Measurement view

① Measured value
Display current measured value and respective unit.
Measured value can be displayed in distance (m/ft), level (m/ft), level percent (%) or current (mA) mode.[1]

② Display mode
Indicates selected display mode.[1]

Display mode	Description
Distance	Distance from level meter
Level Distance	Distance from tank base
Level %	Level percentage
Current	Current output value

③ Auto power save (APS)
Indicates backlight usage is limited.
※There is no optional adjustment for backlight.
When there is enough power backlight will be switched on.

Note 1. Refer to chapter 12.1 Display Selection, for display mode setting.

4.2 Menu display

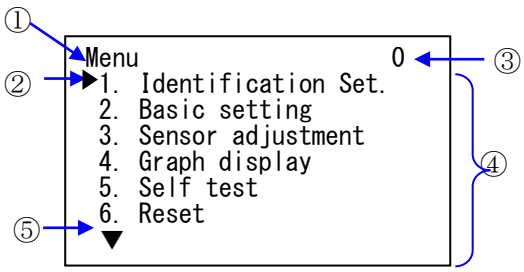


Fig. 4.2.1 Menu view

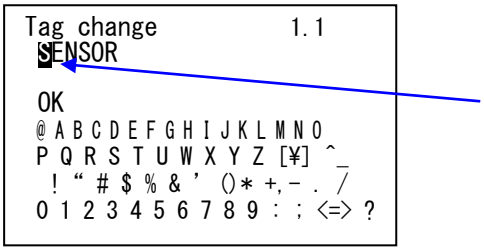
① Current menu
Current selected menu layer.

② Cursor
Indicates current menu item.

③ Layer number
Current selected menu layer number.

④ Menu list
Selectable menu item list.

⑤ Down cursor
Indicates there are more selectable menu items below.



Block cursor were used to indicate position when changing parameter values or entering characters. The block cursor was created by inverting the pixels of the characters.

4.3 Waveform display

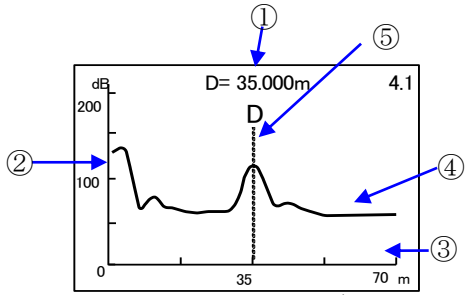


Fig. 4.3.1 Echo curve view

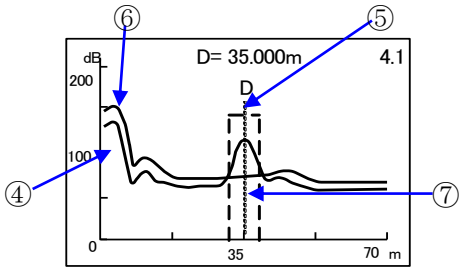


Fig 4.3.2 Echo detection curve +

+ EC + TW view

① Measured distance
Current measured distance

② Y axis
Reflection level (unit: dB)

③ X axis
Distance (unit: m or ft)

④ Echo curve (EC)
Current measured waveform.

⑤ Measurement line
Indicate current measured distance on waveform.

⑥ Echo detection curve (EDC)
Threshold curve for echo reflection detection.

⑦ Time windows (TW)
Indicates reflection echo judgement frame.

4.4 PC remote active display

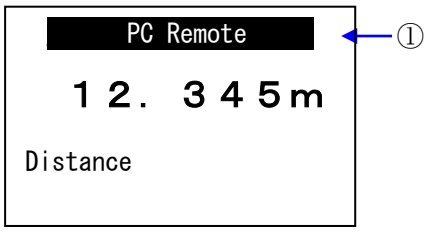


Fig. 4.4.1 PC Remote active view 1

① PC Remote
Indicates the level meter is connected to the computer.
Operation of LCD adjustment unit is not possible when the level meter is connected to the computer.

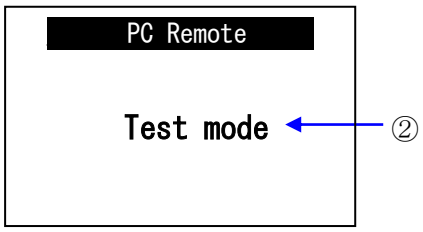


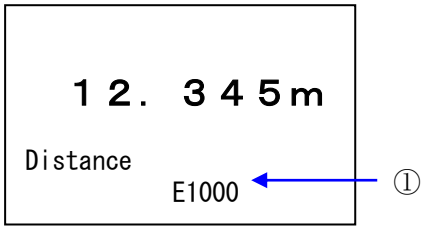
Fig. 4.4.2 PC Remote active view 2

② Level meter operating mode
Presents operating mode of the level meter.
Detailed descriptions of modes are shown below.

Table 4.1.1 Level meter modes

Mode	Description
Test mode	Current output test
Echo learning	Echo learning active
Reset	Resetting
Self test	Running diagnosis

4.5 Error display



① Error code (E****)
When there is fault in the level meter or error occurs in communication between level meter and adjustment unit, then error code will be presented.
Refer to table below for error code details.

Fig. 4.5.1 Error code presentation

Table 4.5.1 Error code details

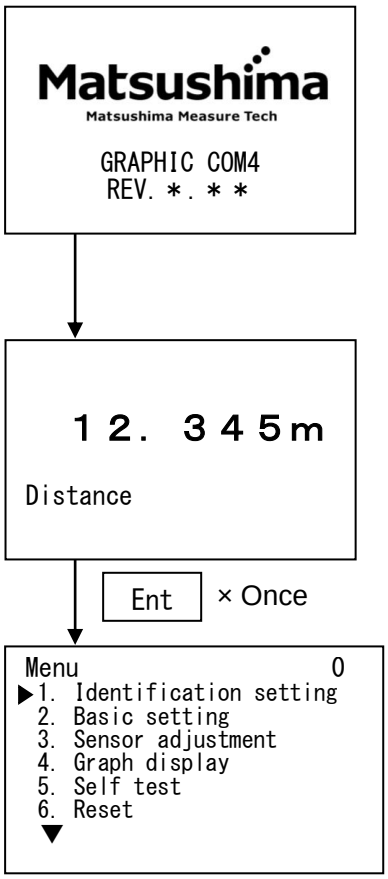
Error code	Error type	Description
E8000	SRAM Error	SRAM failure
E4000	EEPROM Error	EEPROM failure
E2000	MIC Error	MIC unit failure
E1000	Trig Error	Trigger signal lost
E0800	LCD Error	LCD adjustment unit failure
E0400	Charge Error	Charge circuit failure
E0200	I2C Checksum error	Communication between level meter and LCD adjustment unit failed
E0100	Loop Current Error	Loop Current failure
E0080	Lost echo	・Reflection echo is currently being detected ・There is no reflection echo ・There is no reflection echo in the measurement span
E0010	During Startup Processing	Startup Processing(Warning)
E0008	Min. meas. limit over	Measured distance is lower than "Min. meas. limit"
E0004	Max. meas. limit over	Measured distance is higher than "Max. meas. limit".
E0002	Upper range limit over (100% over)	Measured distance exceeds "Upper range limit over (100% over)".
E0001	Lower range limit over (0% over)	Measured distance undergoes "Lower range limit over (0% over)".
S.CPU	Level meter not responding	No response from level meter
S.I2C	I2C Checksum error	Communication between level meter and LCD adj. unit failed

※Refer to chapter 15, for troubleshooting details.

Adjustment and functions

5.1 Start up

≪Start up view≫



After power up the level meter initialize view is displayed.

≪Measured value≫

Display mode	Description
Distance	Distance from level meter
Level Distance	Distance from tank base
Level %	Level percentage
Current	Current output value

Push『Ent』to enter main menu.
Main menu summary is listed below in table.

Table 5.1 Menu summary

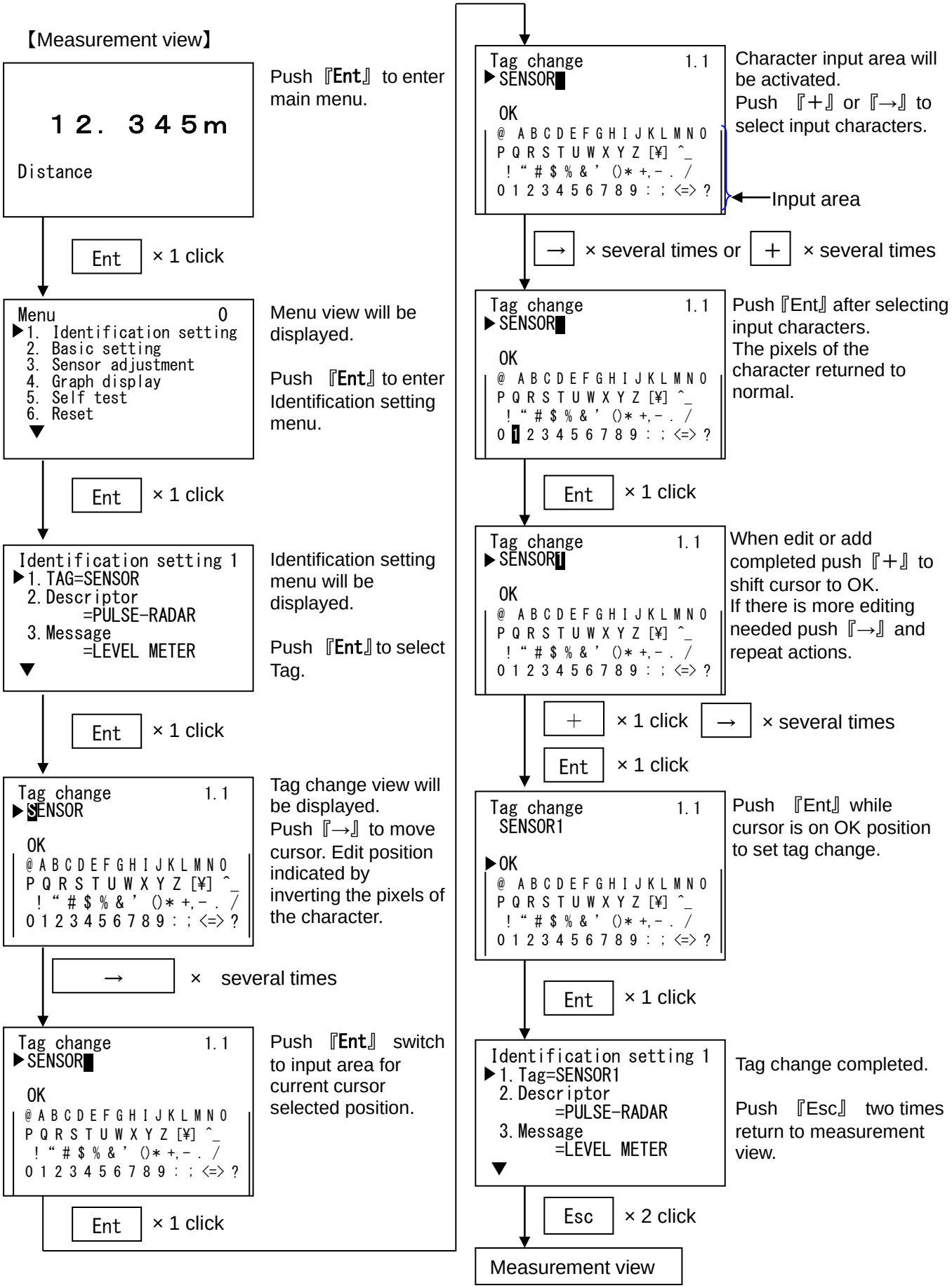
No.	Menu	Description
1	Sensor Identification setting	Tag, Descriptor, Message, Date
2	Basic setting	Application, Measurement range span, Damping
3	Sensor adjustment	Current output, Echo learning,TW adjustment
4	Graph display	Waveform display
5	Self test	Run self test
6	Reset	Reset
7	Current output test	Execute current output test
8	HART communication	HART communication setting
9	Sensor information	Level meter information
10	Display	Measured value, language setting
11	Service	Service parameter setting

5.2 Sensor identification setting

In this menu you can adjust following parameters: Tag, Descriptor, Message and Date.

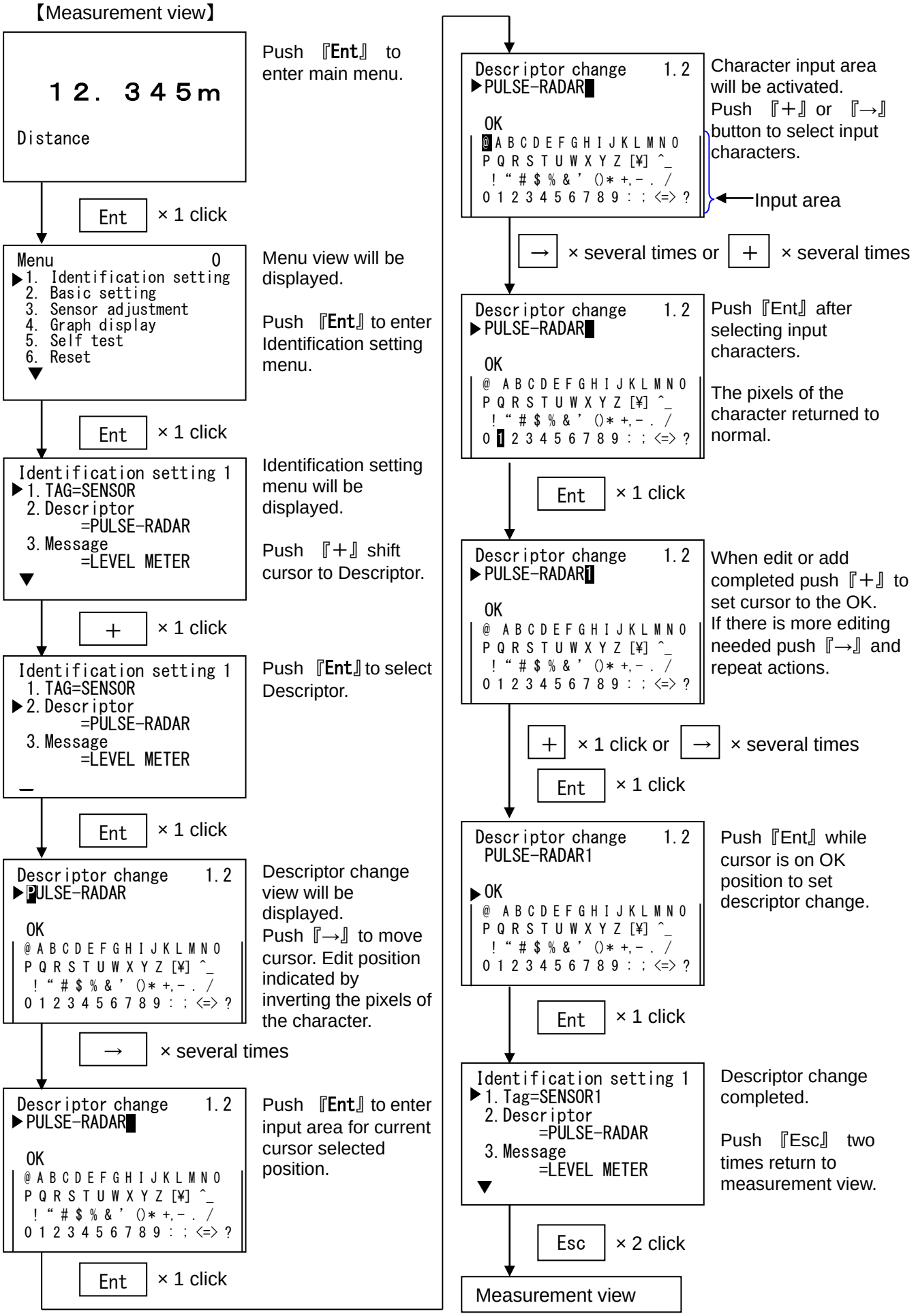
5.2.1 Tag

In the menu item "Tag" enter tag name with less than 16 characters. (Default: SENSOR)



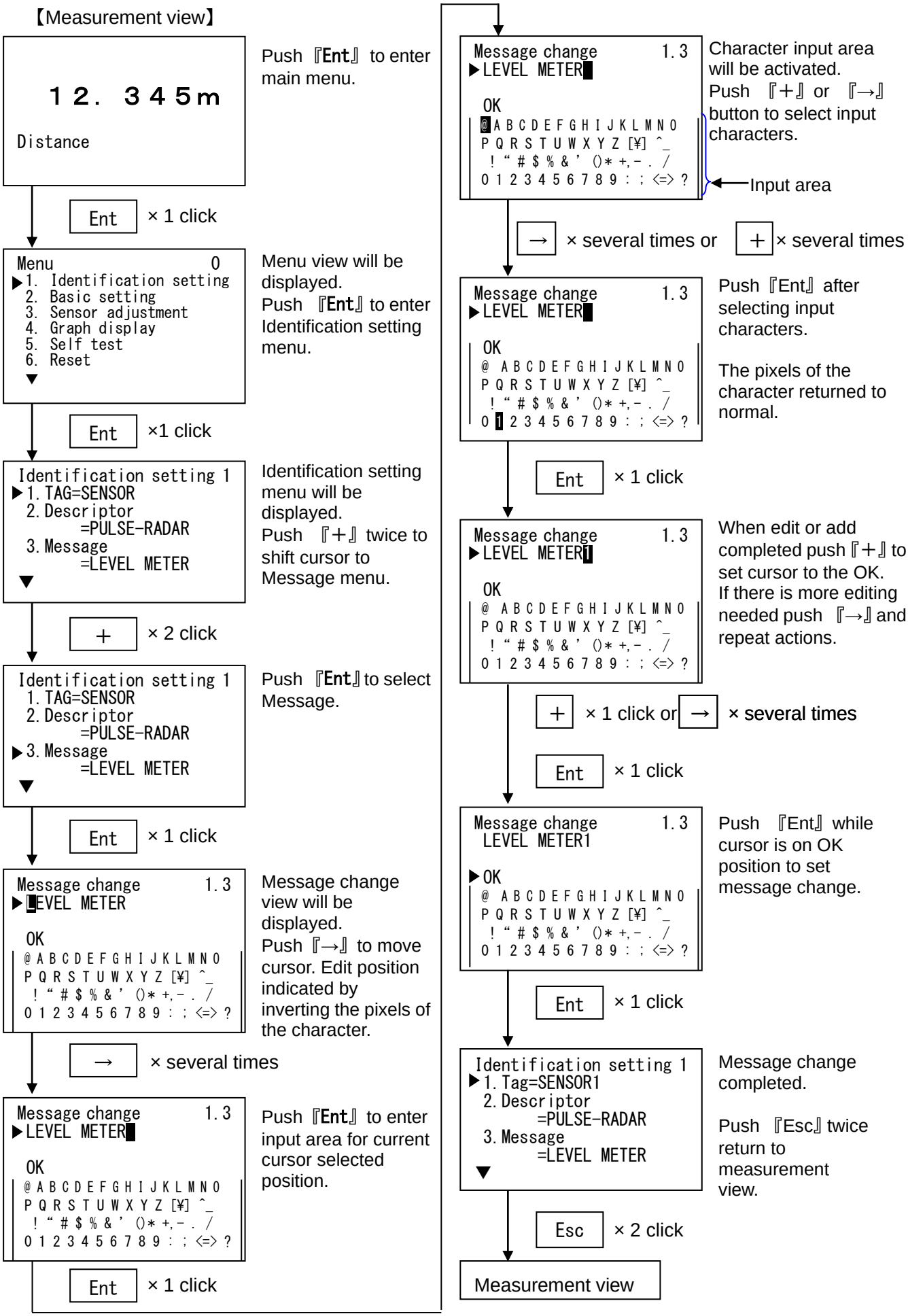
5.1.2 Descriptor

In the menu item "Descriptor", enter descriptor with less than 16 characters. (Default: PULSE-RADAR)



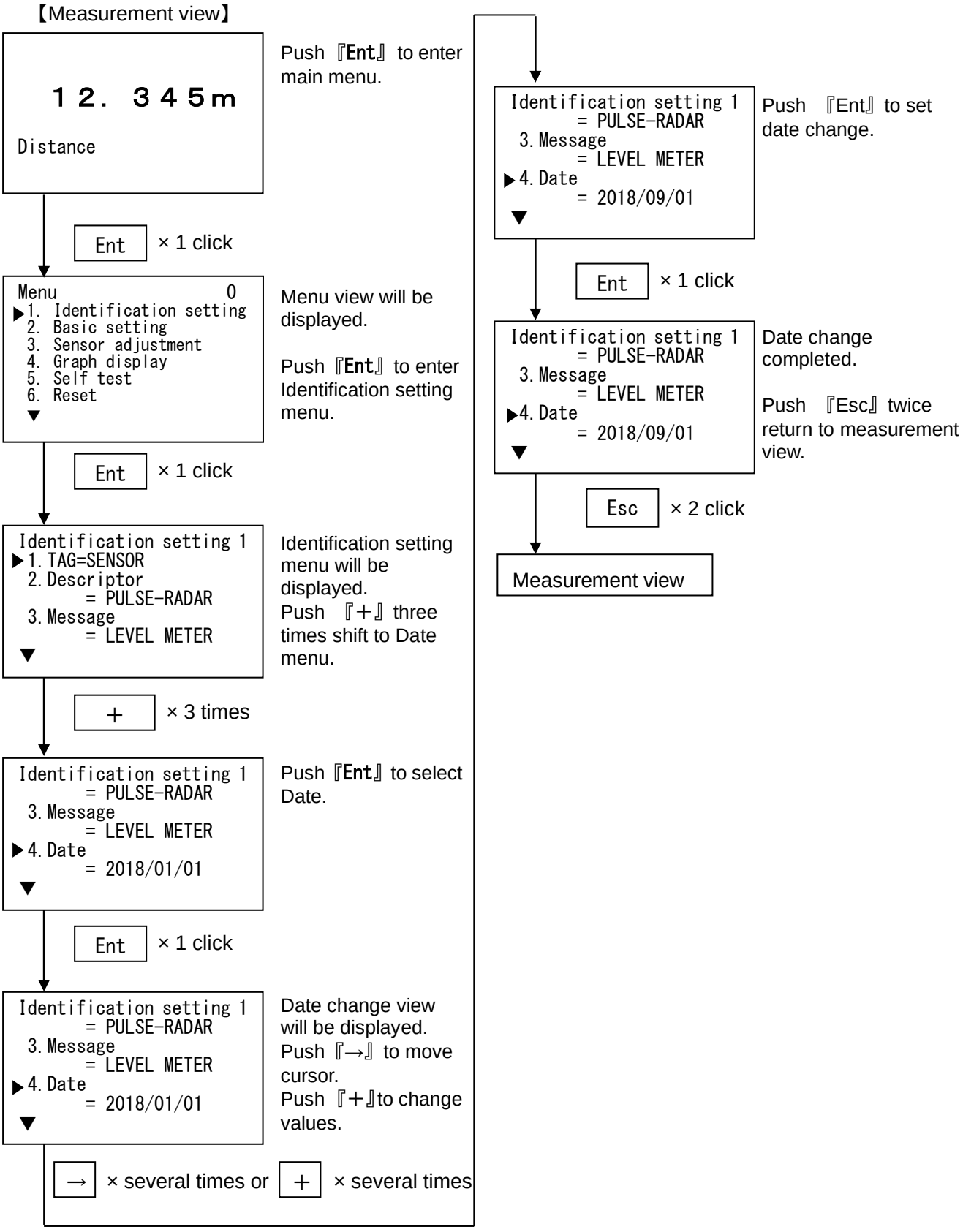
5.2.3 Message

In the menu item "Message", enter message with less than 21 characters. (Default: LEVEL METER)



5.2.4 Date

Set installation date of level meter. (Default: 2018/1/1)



5.3 Basic setting

In this menu basic setting for level meter measurement will be adjusted.

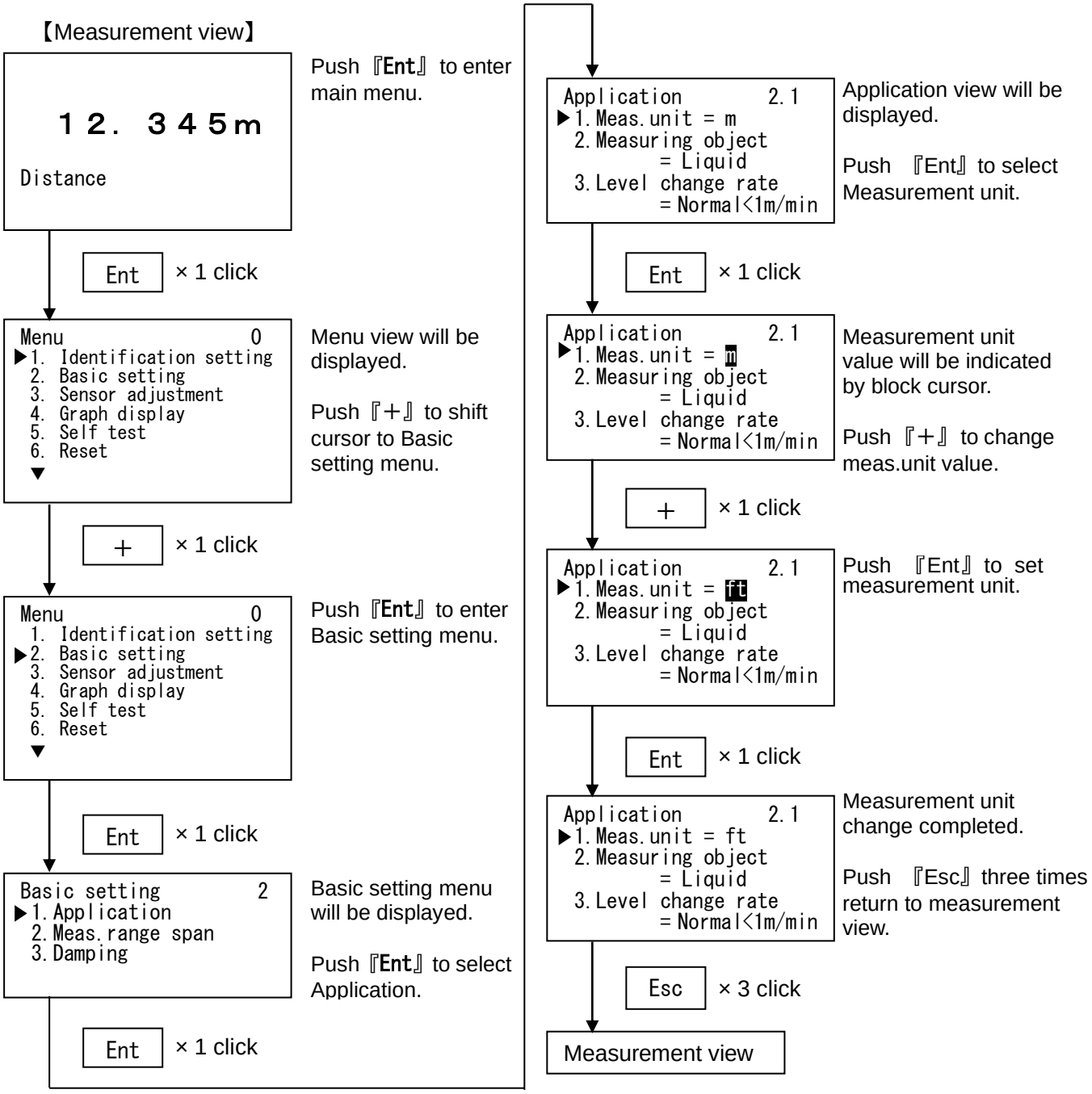
5.3.1 Application

Measurement unit, measuring object and level change rate will be set.

5.3.1.1 Measurement unit (Meas.unit)

Selects measuring unit of level meter from meter (m) and feet (ft). (Default: m)

<u>※This setting will affect all measuring units.</u>

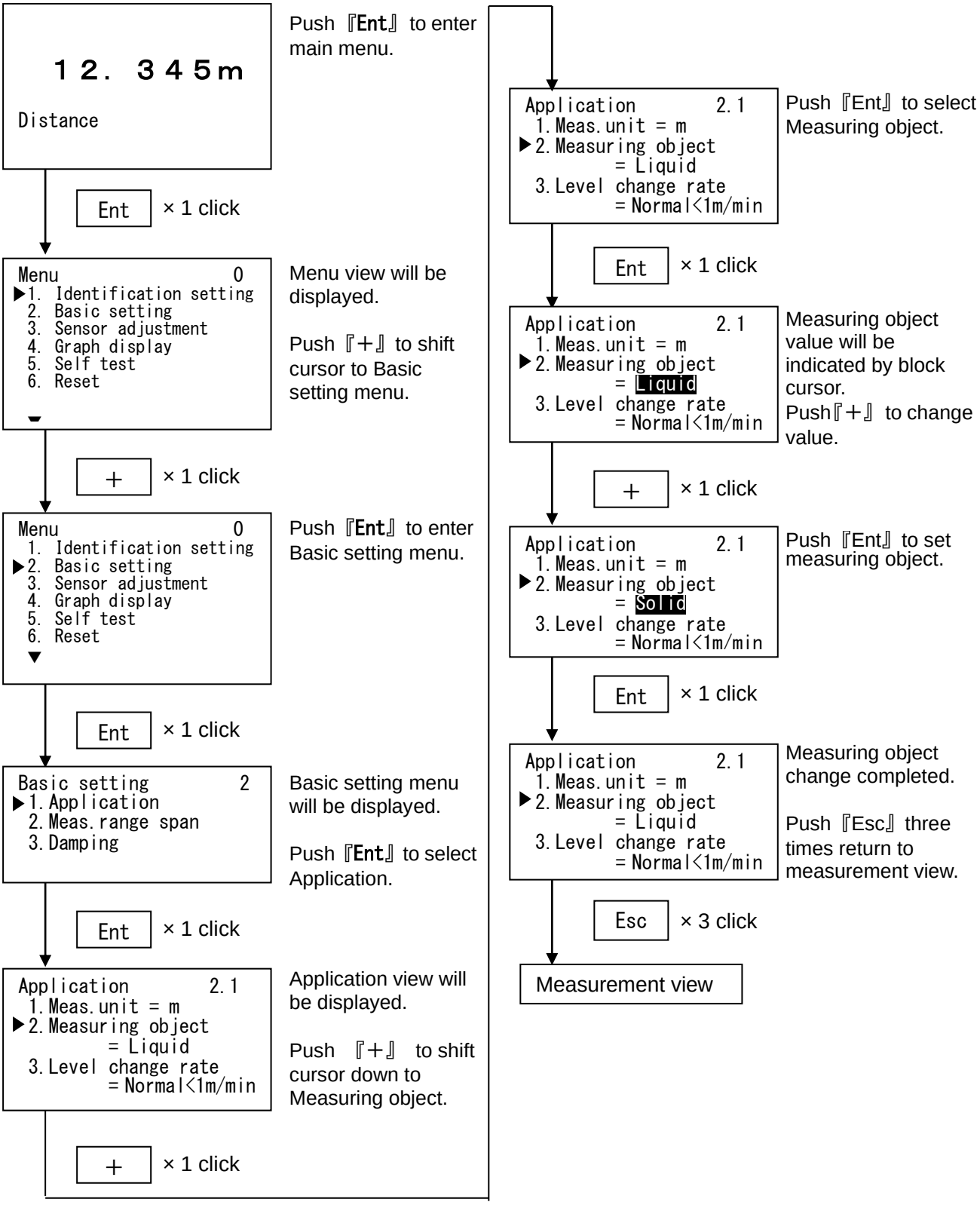


5.3.1.2 Measuring object

Measuring object can be selected form “Liquid” and “Solid”, to change parameter sets for easier measurement. (Default: Liquid)

<u>※The measuring object will change other parameters simultaneously.</u>

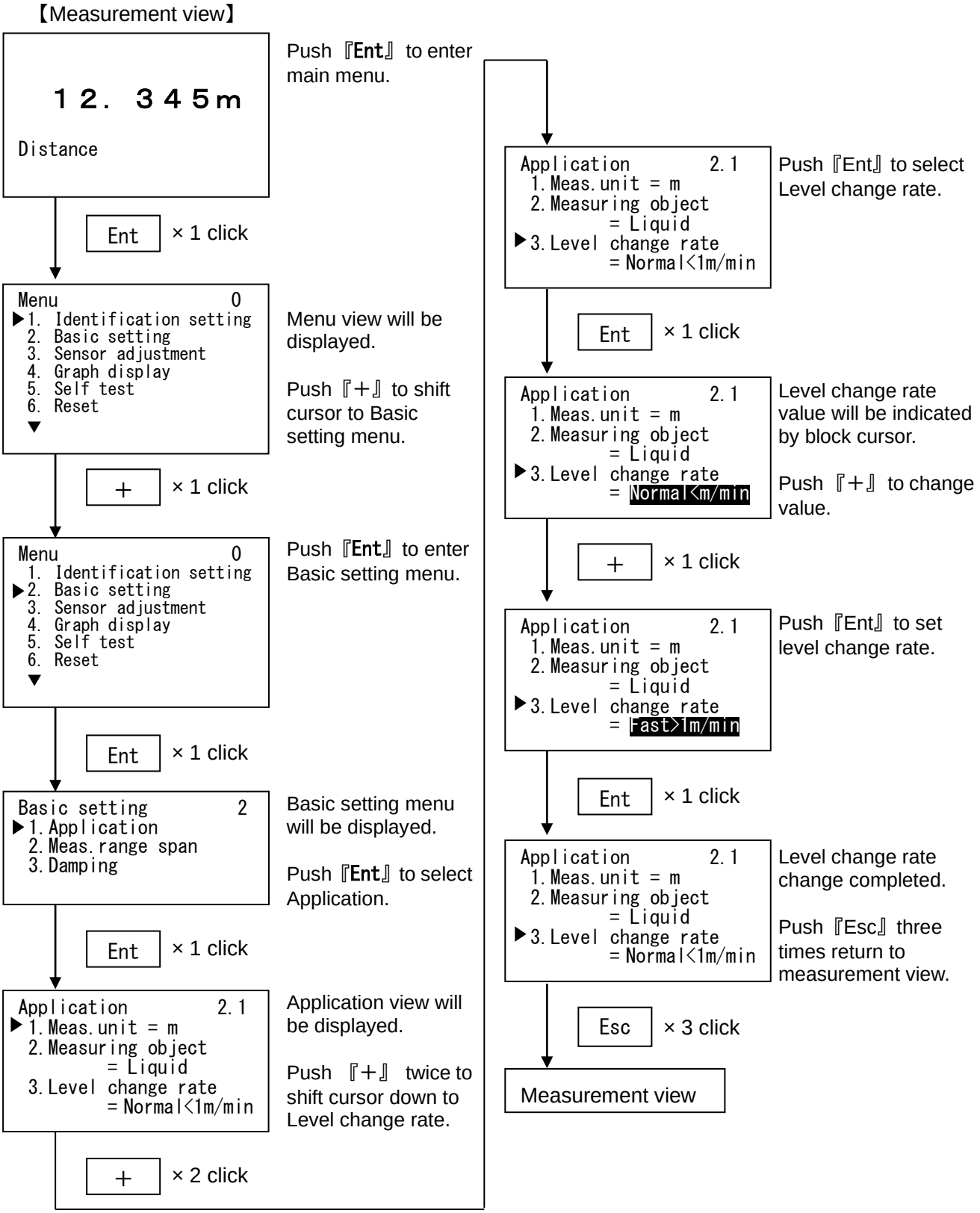
【Measurement view】



5.3.1.3 Level change rate

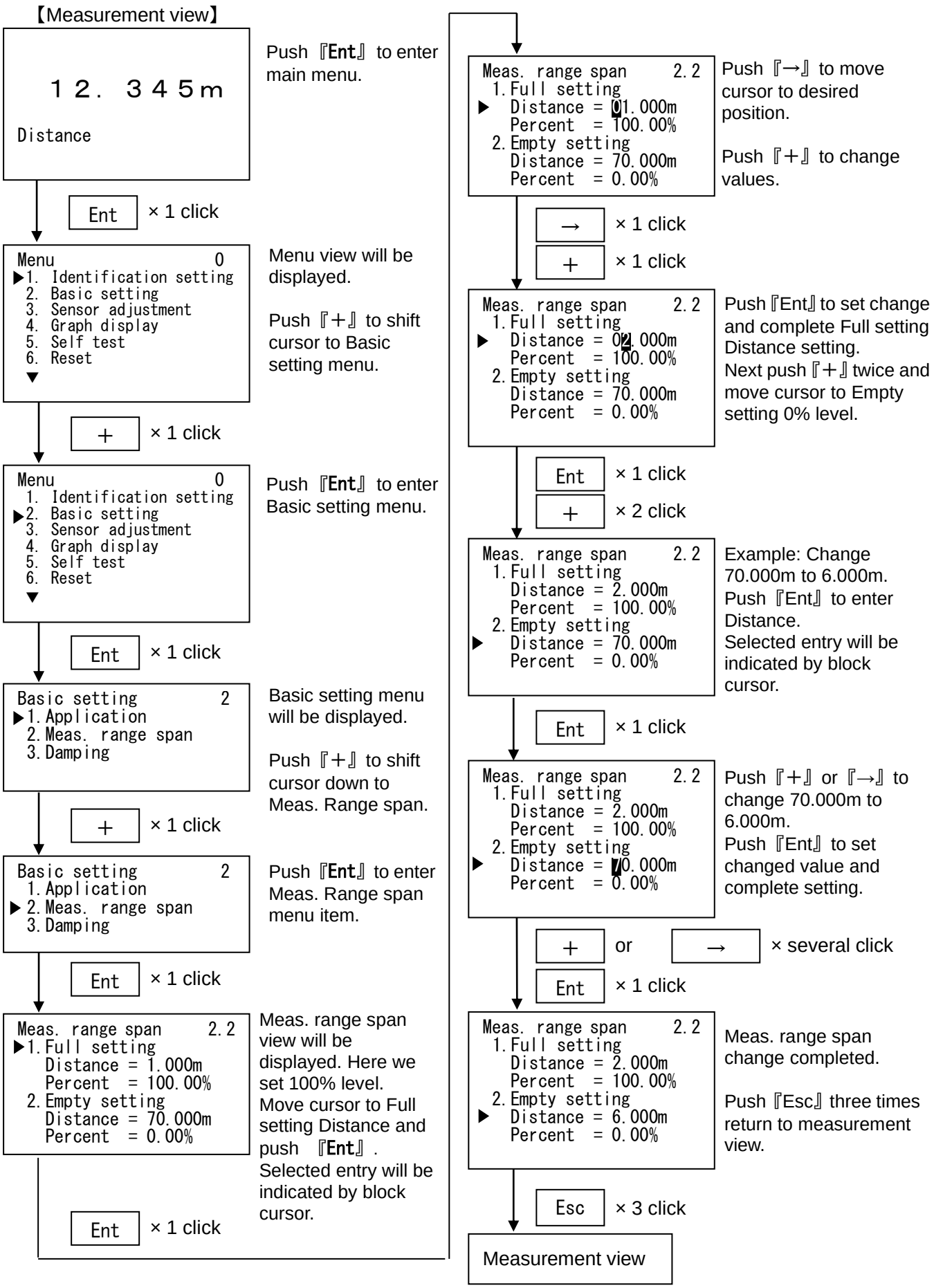
Measuring object level change rate can be selected form “Normal” and “Fast” to change parameter sets for easier measurement. (Default: Normal <1m/min)

※The level change rate will change other parameters simultaneously.



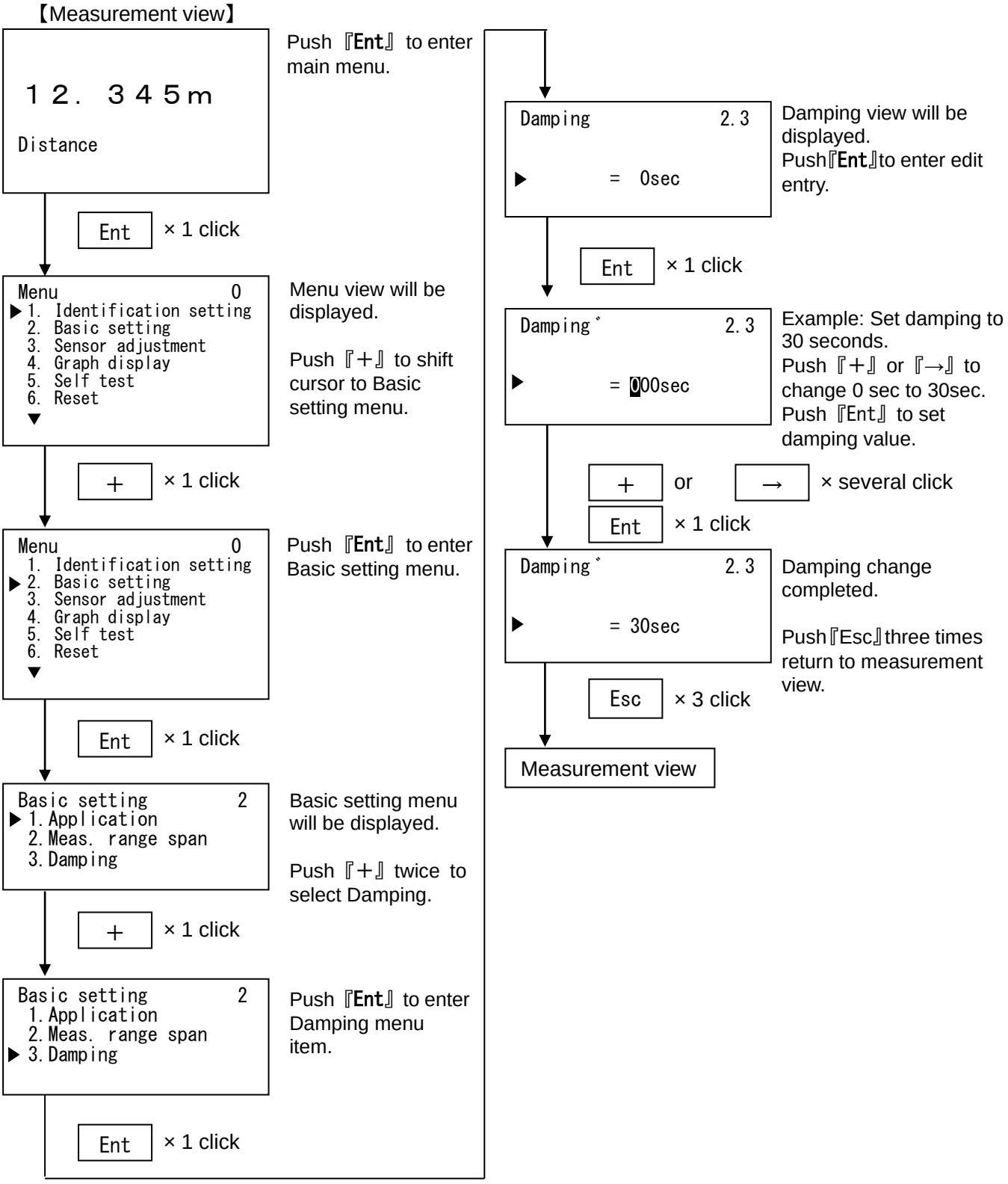
5.4 Measurement range span (Meas. range span)

Measurement range span sets full/empty distance and related percentage.
Here, measurement distance is distance from level meter.



5.5 Damping

Sets amount of damping in number of seconds to respond fast step inputs.



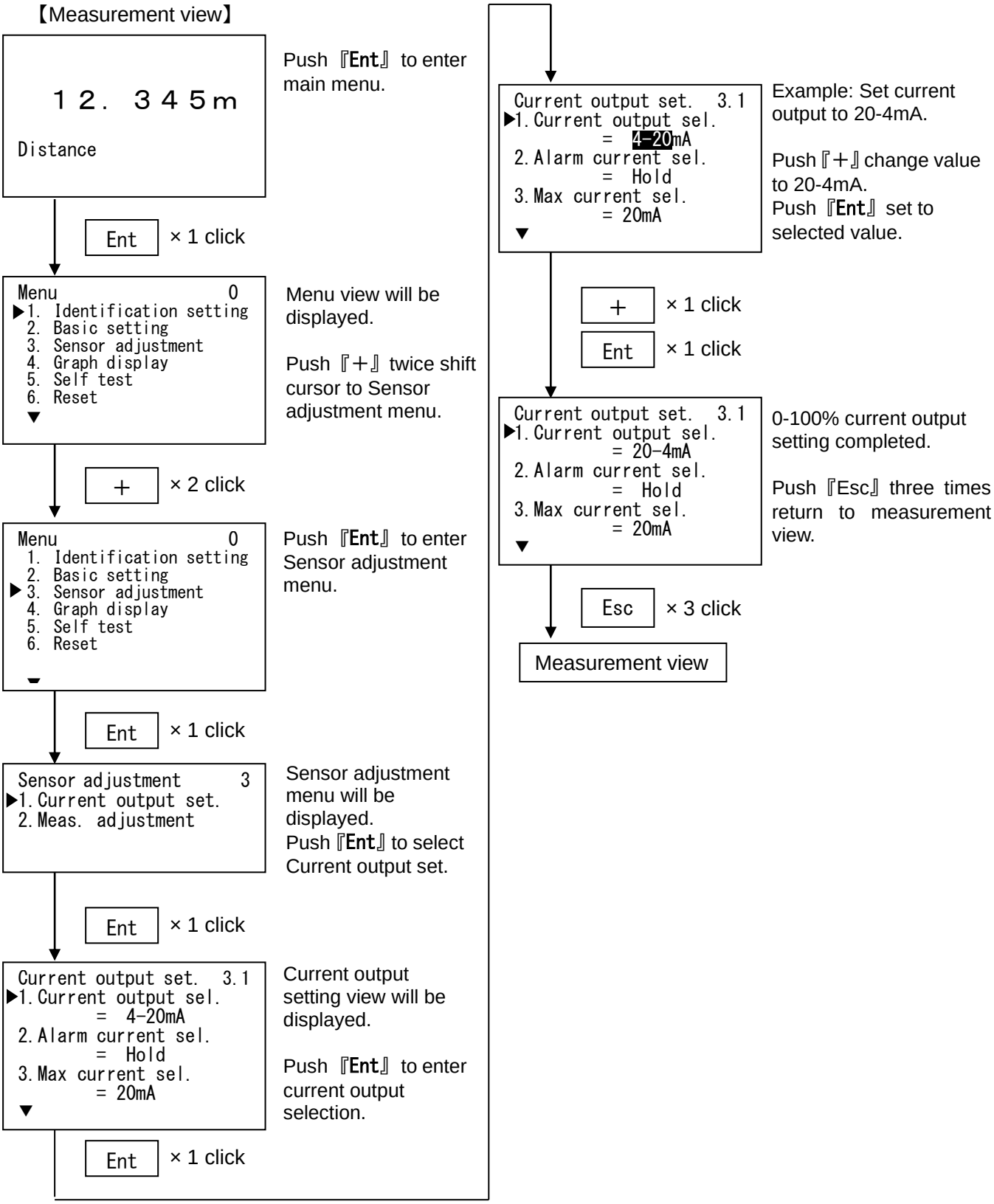
5.6 Current output setting (Current output set.)

5.6.1. 0-100% current output selection

Sets 0-100% current output values. (Default: 4-20mA)

『4-20mA』 ＝ 100% level (Upper level) is 20mA
0% level (Lower level) is 4mA

『20-4mA』 ＝ 100% level (Upper level) is 4mA
0% level (Lower level) is 20mA



5.6.2 Alarm current output

Sets output current value during fault condition.

Alarm current selection: Output current value when measurement is not valid because of no reflection echo loss or other reasons.

Selection =「Hold」「Sel.val.」「Max」「Min」

- Hold: Output remains at previous measured result during alarm.
- Selected value (Sel.val.): Alarm output current is set to value entered in “5.Sel. alarm current val.”
- Max: Alarm output current is set to value selected in “3. Max current sel.”
- Min: Alarm output current is set to value selected in “4.Min current sel.”

Max current sel.: Selects current output value when「Max」is selected in “2. Alarm output sel.”

Selection range =「20mA」「20.5mA」「22mA」

Min current sel.: Selects current output value when「Min」is selected in “2. Alarm output sel.”

Selection range =「4mA」「<3.6mA」「3.8mA」(Microwave Level Meter over Ver2.0)

Selection range =「4mA」「3.6mA」「3.8mA」(Except for the above)

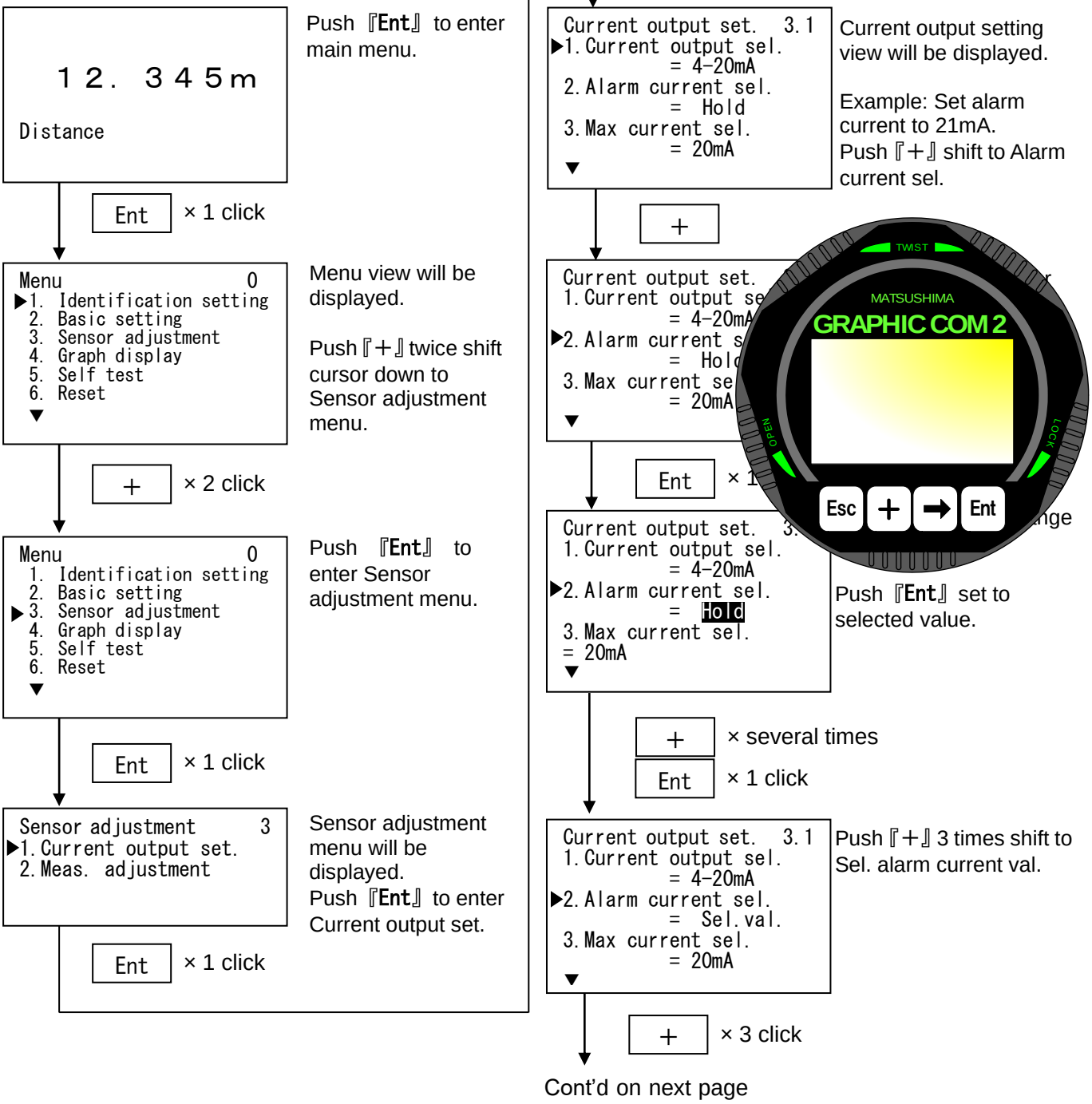
Sel. alarm current val: Sets current output value when「Sel.val.」is selected in “2.Alarm output sel”

Selection range = 3.55mA to 22.0mA (Microwave Level Meter over Ver2.0)

Selection range = 3.60mA to 22.0mA (Except for the above)

※You can not select several options for alarm current output.

【Measurement view】



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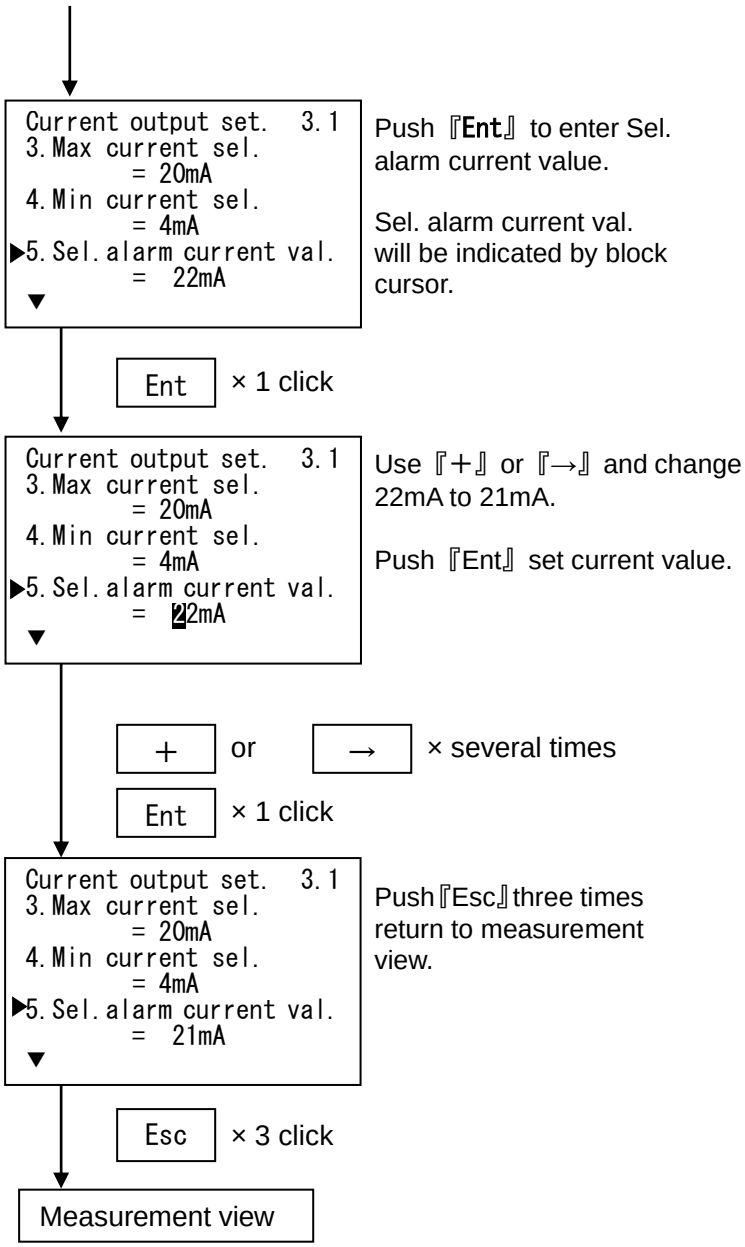
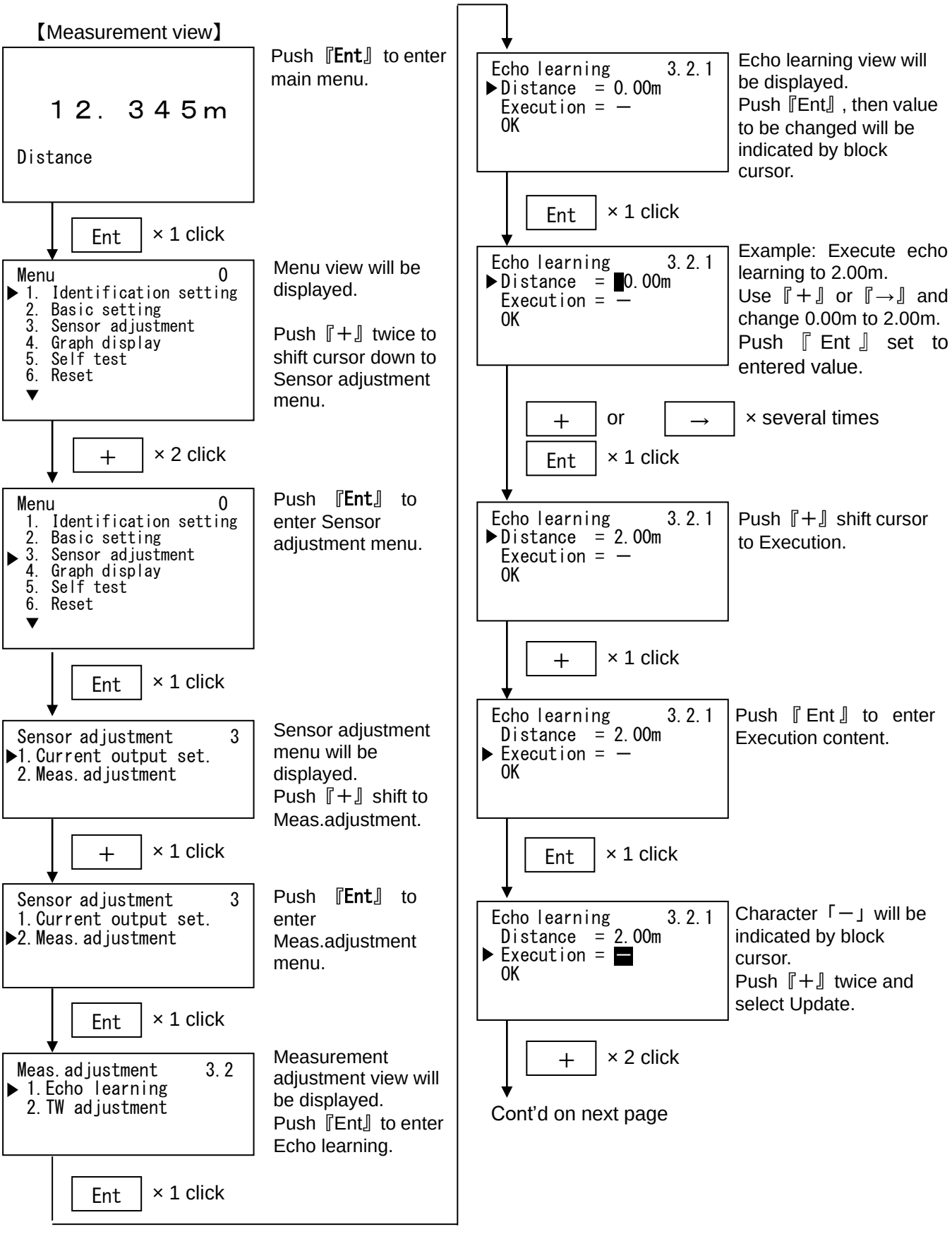


5.7 Echo learning

Sets mask to unwanted reflections (false echoes or noise echoes) reflected from obstructions in the tank.

Important : In most cases sets distance from level meter to unwanted reflections as echo learning distance. If there is true echo between the level meter and the masking distance, then echo learning distance shall be set as distance to true echo. Actual distance to mask will be around 1m less than the entered value.



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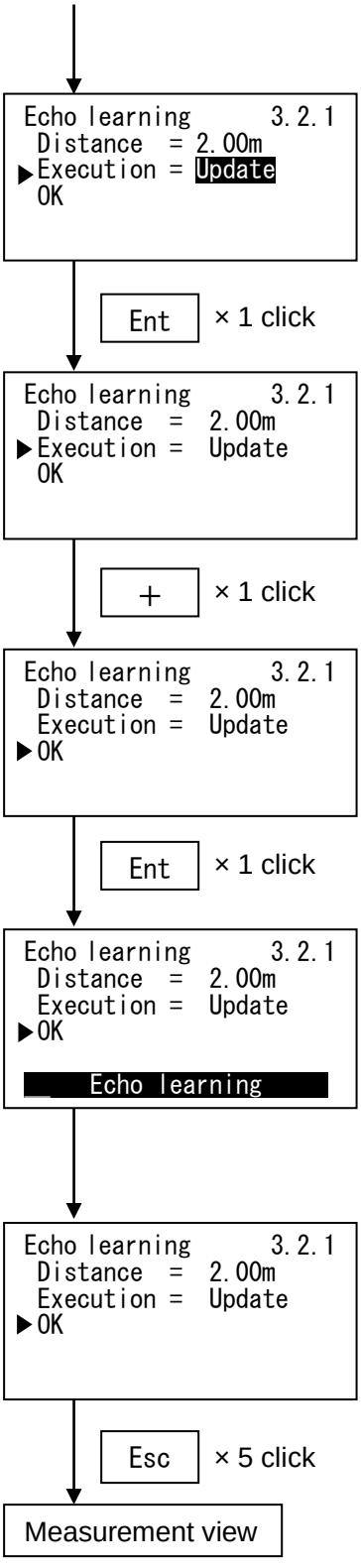


Push『Ent』set to 'Update'

To execute echo learning push 『＋』 and shift cursor to OK.

Push 『Ent』to execute echo learning.

Echo learning message will be displayed in the lower part of display.

When echo learning completed message will be cleared.

Push『Esc』four times and return to measurement view.

・"Selectable execution
【Clear／Update／Addition】

Clear : Deletes all echo learning data.

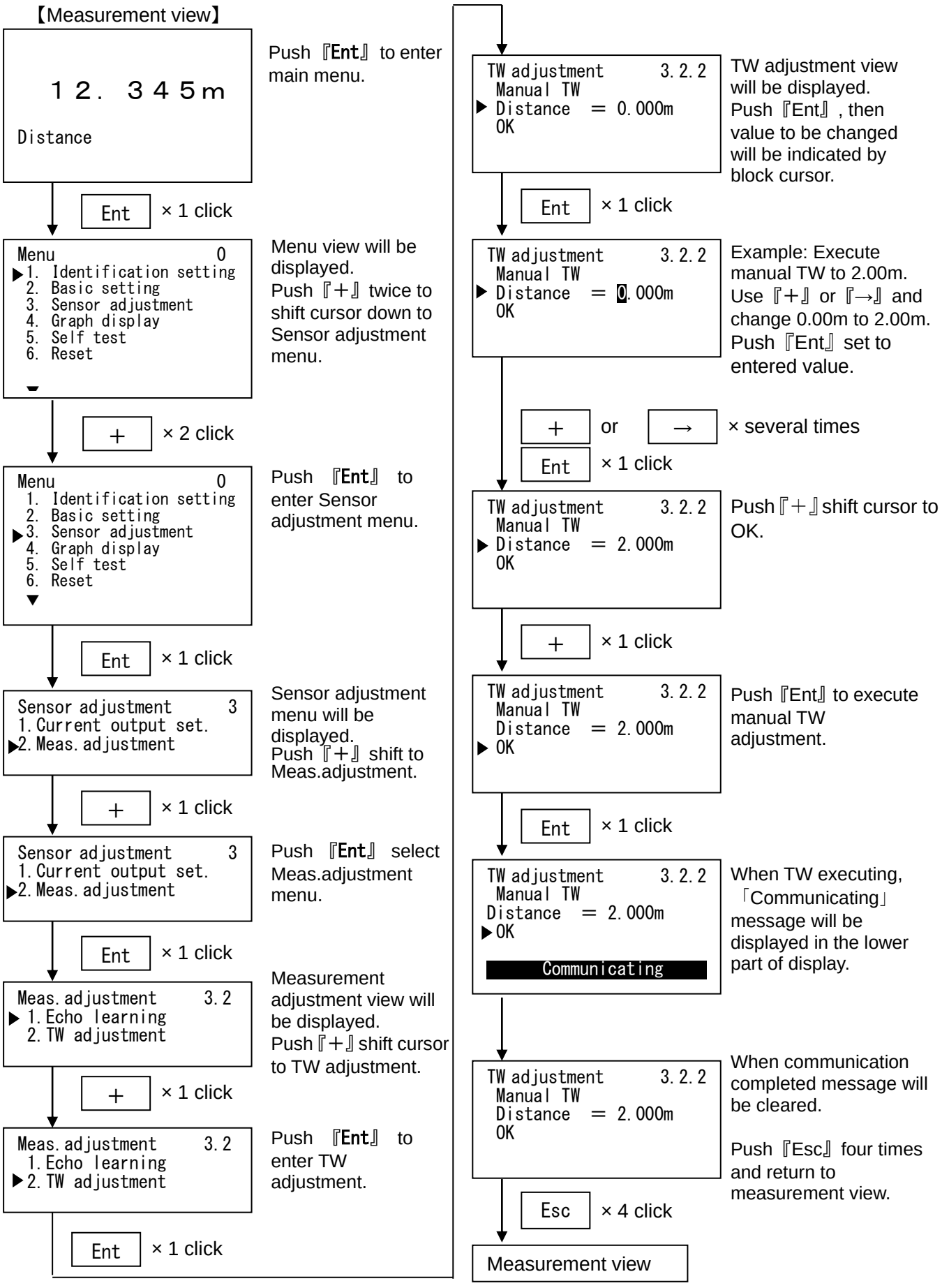
Update : Deletes current echo learning data and writes new data.

Addition : Adds echo learning data
Adds new data without deleting past data.

5.8 TW adjustment

TW (Time window) adjustment is used to keep TW peak temporary when peak moved outside of TW. (This setting used only when application->level change rate =Fast>1m/min).

If TW adjusted by this setting is not correct then must be set manually to correct value.



6. Graph display

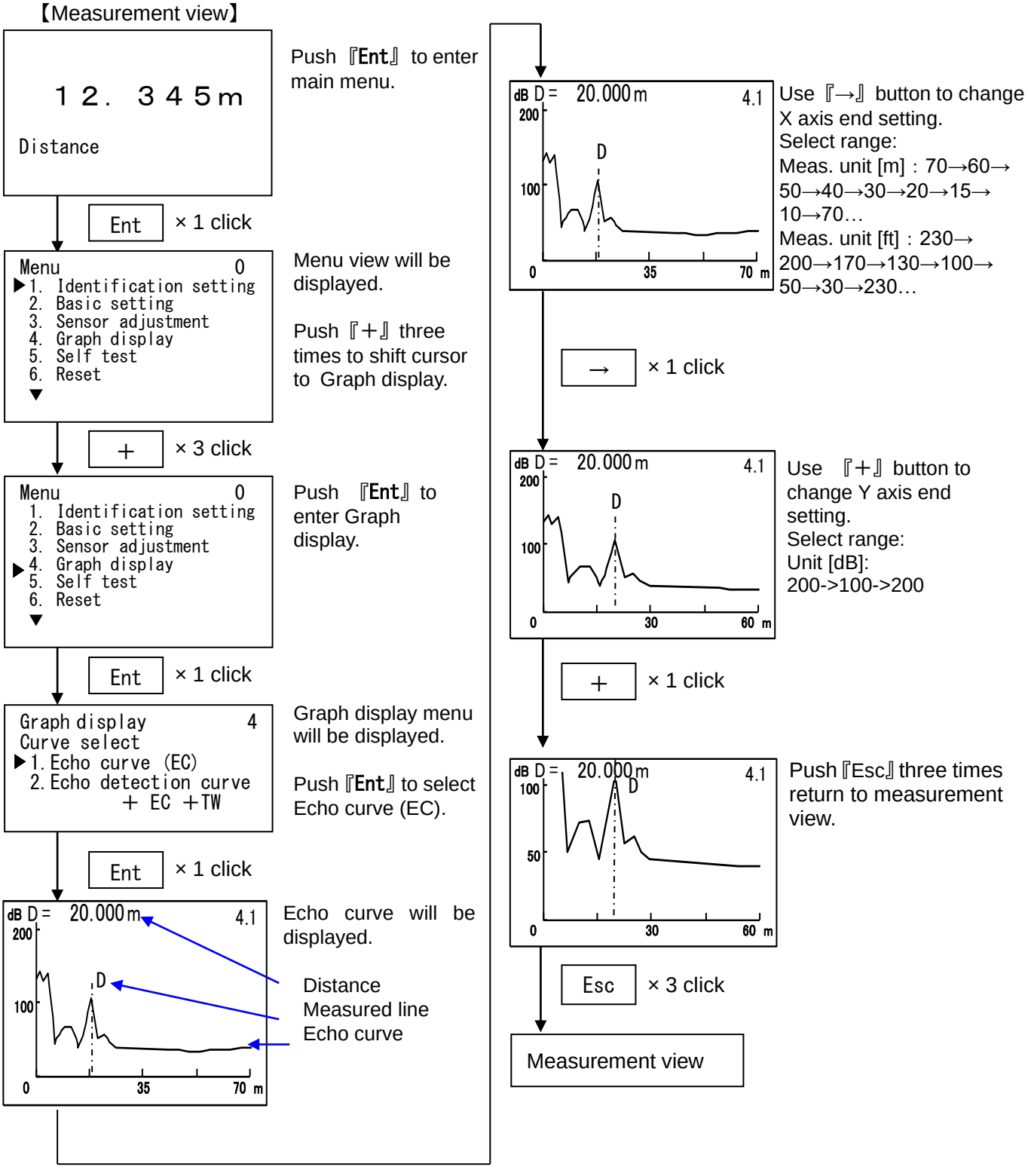
Displays either of echo curve only or echo detection curve + echo curve + time window from current active measurement. Waveforms are updated automatically.

- Echo curve: Reflection waveform (EC)
- Echo detection curve + EC + TW: Detection waveform (EDC) + Reflection waveform (EC) + Time window (TW)

6.1 Echo curve (EC)

Displays echo curve of current active measurement.

※This view will not return to measurement view automatically.

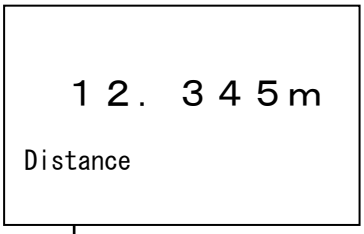


6.2 Echo detection curve + EC + TW

Displays echo curve, echo detection curve and time window of current active measurement simultaneously.

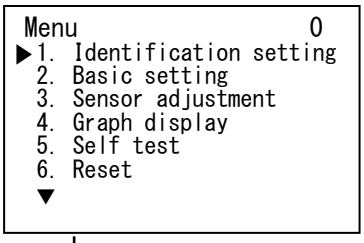
※This view will not return to measurement view automatically.

【Measurement view】



Push 『Ent』 to enter main menu.

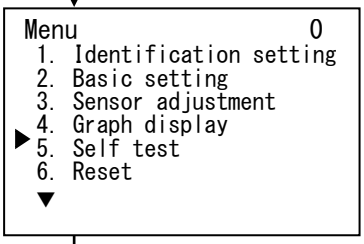
Ent × 1 click



Menu view will be displayed.

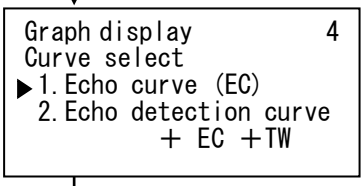
Push 『＋』 three times to shift cursor to Graph display.

＋ × 1 click



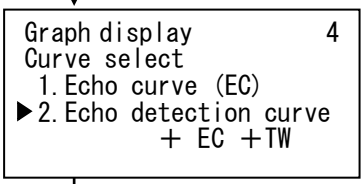
Push 『Ent』 to select Graph display.

Ent × 1 click



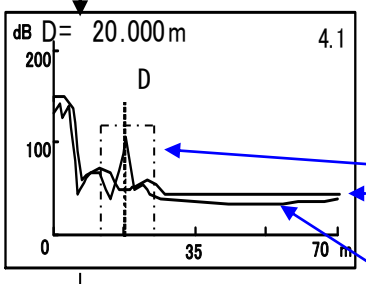
Graph display menu will be displayed. Push 『＋』 to shift cursor to Echo detection curve + EC + TW.

＋ × 1 click



Push 『Ent』 to enter Echo detection curve + EC + TW.

Ent × 1 click

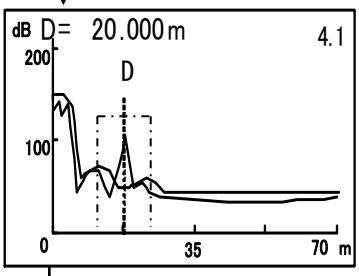


Echo detection curve + EC + TW will be displayed.

Time window (TW)

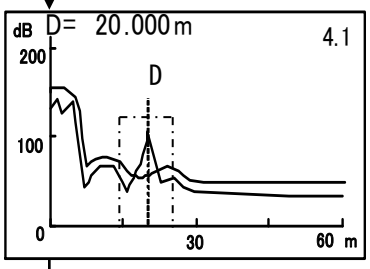
Echo detection curve

Echo curve (EC)



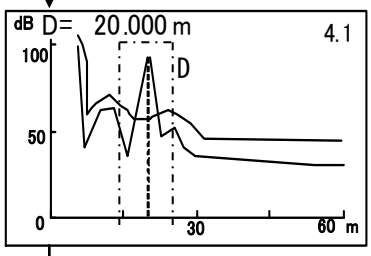
Use 『→』 button to change X axis end setting.
Select range:
Meas. unit [m] : 70→60→50→40→30→20→15→10→70…
Meas. unit [ft] : 230→200→170→130→100→50→30→230…

→ × 1 click



Use 『＋』 button to change Y axis end setting.
Select range:
Unit [dB]:
200->100->200

＋ × 1 click



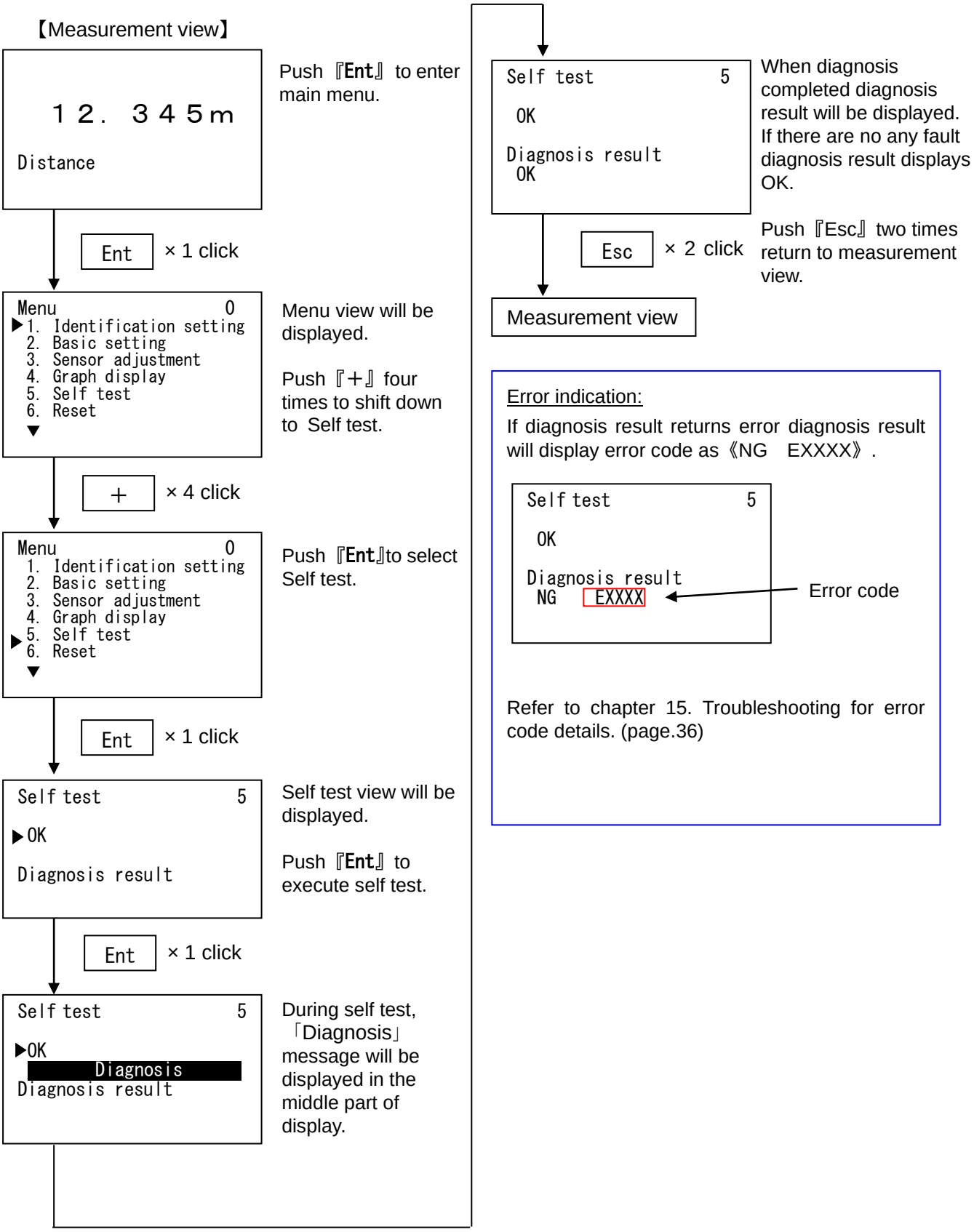
Push 『Esc』 three times return to measurement view.

Esc × 3 click

Measurement view

7. Self test

Runs self diagnosis routine and if there are any fault detected then error code will be displayed.



8. Reset

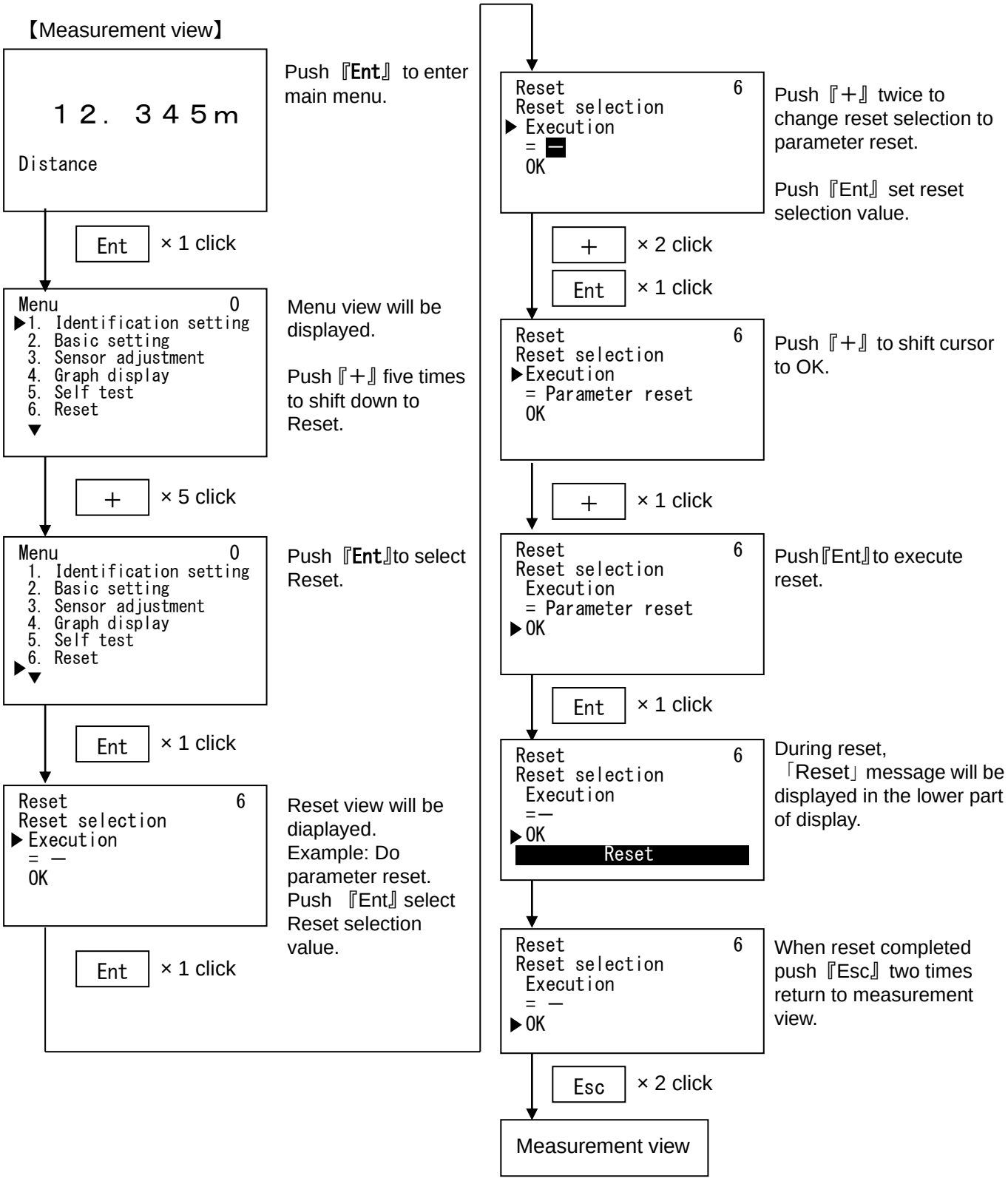
There are two reset options.

Use "Measuring reset" to restart measurement without affecting parameters.

Use "Parameter reset" to reset parameters to the default settings.

Important : "Parameter reset"

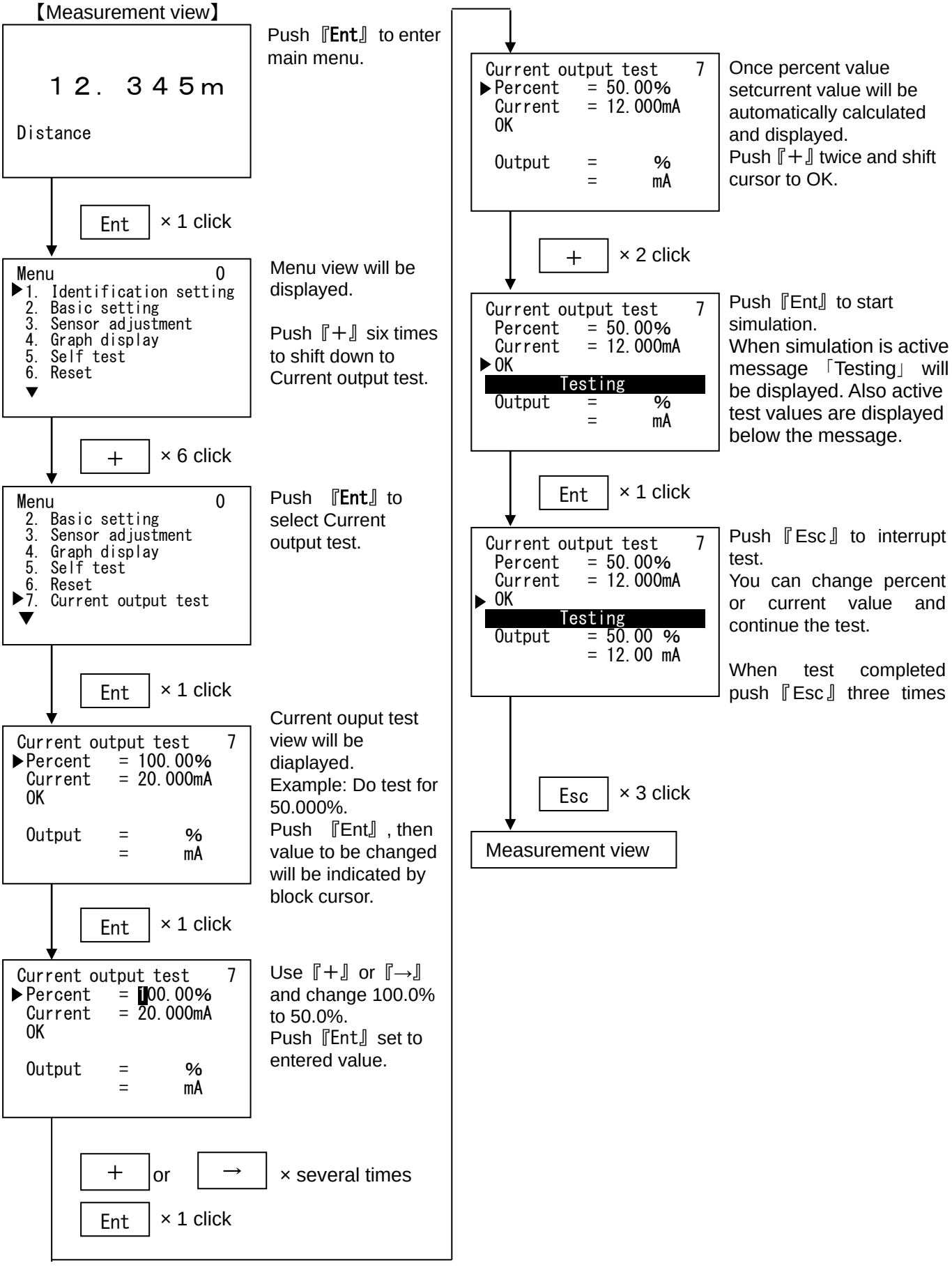
- **Parameter reset returns various parameters to instrument default. Please take note of current settings before execute parameter reset.**
- **Manual noise suppression setting value adjusted by using the optional PC software will be cleared after execution of reset, but echo learning setting will not clear even when reset is executed.**



9. Current output test

Outputs entered simulation value in order to test the functioning of the current output.
(Level input range: -10.00% to +110.00%,
current input range: 3.55mA(3.60mA：Microwave Level Meter under Ver2.0) to 22.00mA)

⚠ **Important : When you wish to end the simulation and return the instrument to actual measurement, please push 'Esc' button.**



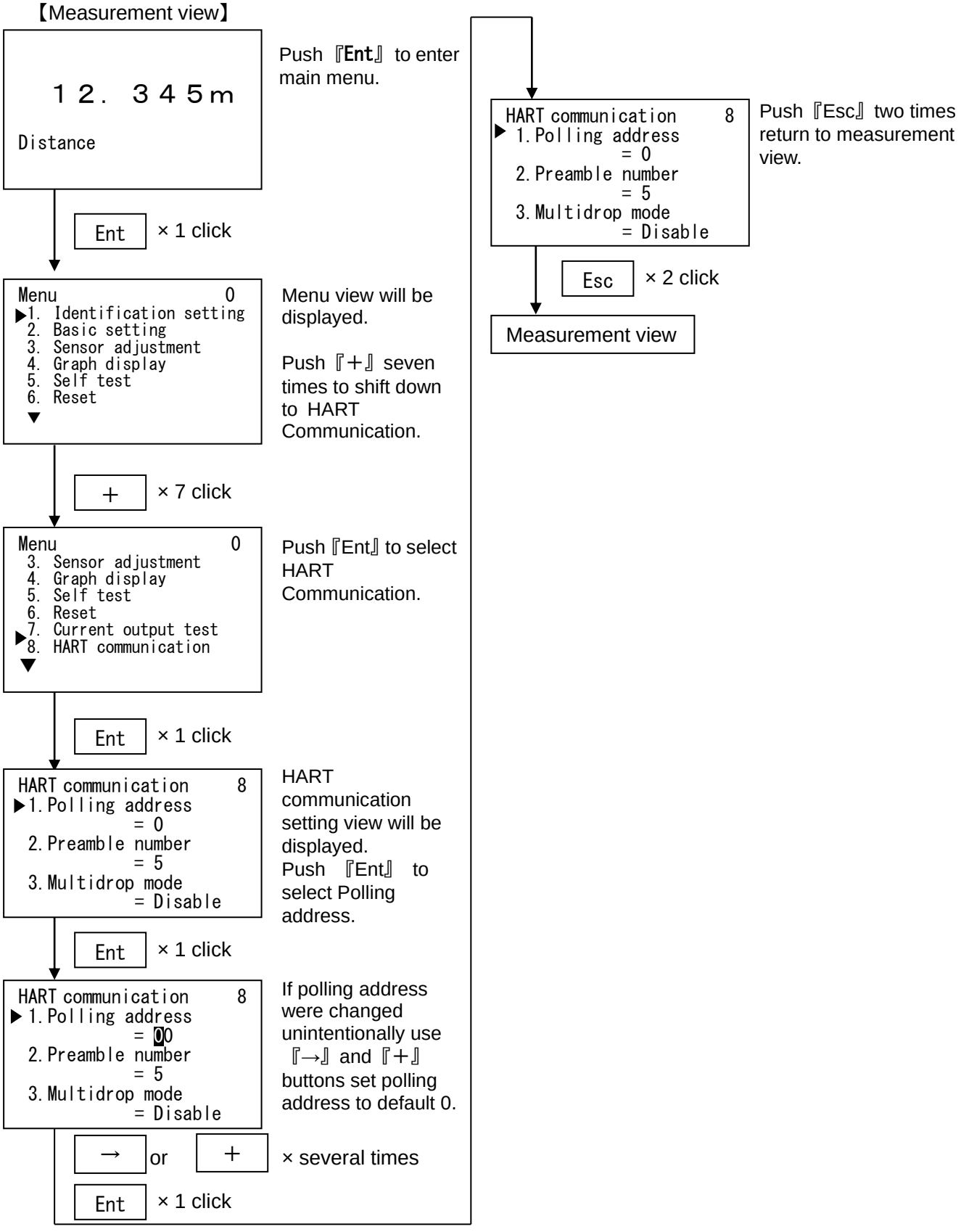
10. HART Communication setting

Sets HART polling address and request preamble number for HART communication.

10.1 Polling address

Sets polling address for HART communication. (Default: 0, input range: 0 to 63)

Important: If polling address in not multidrop mode were changed unintentionally use 『→』 and 『＋』 buttons set polling address to default 0.

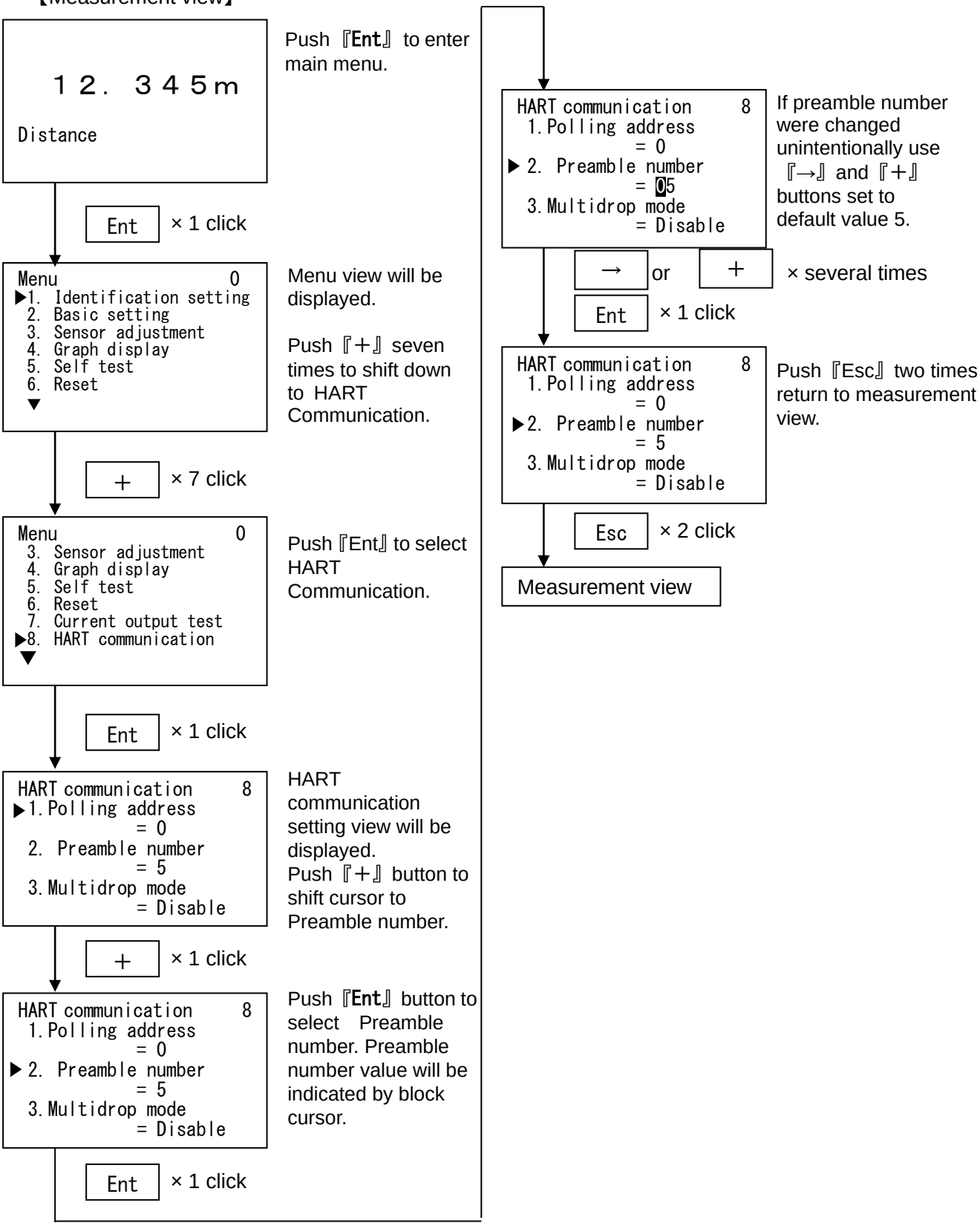


10.2 Preamble number

Set preamble number for HART communication.
（Default：5, Input range: 5 to 20）

Important: If preamble number in not multidrop mode were changed unintentionally use『→』and 『＋』 buttons set to default value 5.

【Measurement view】

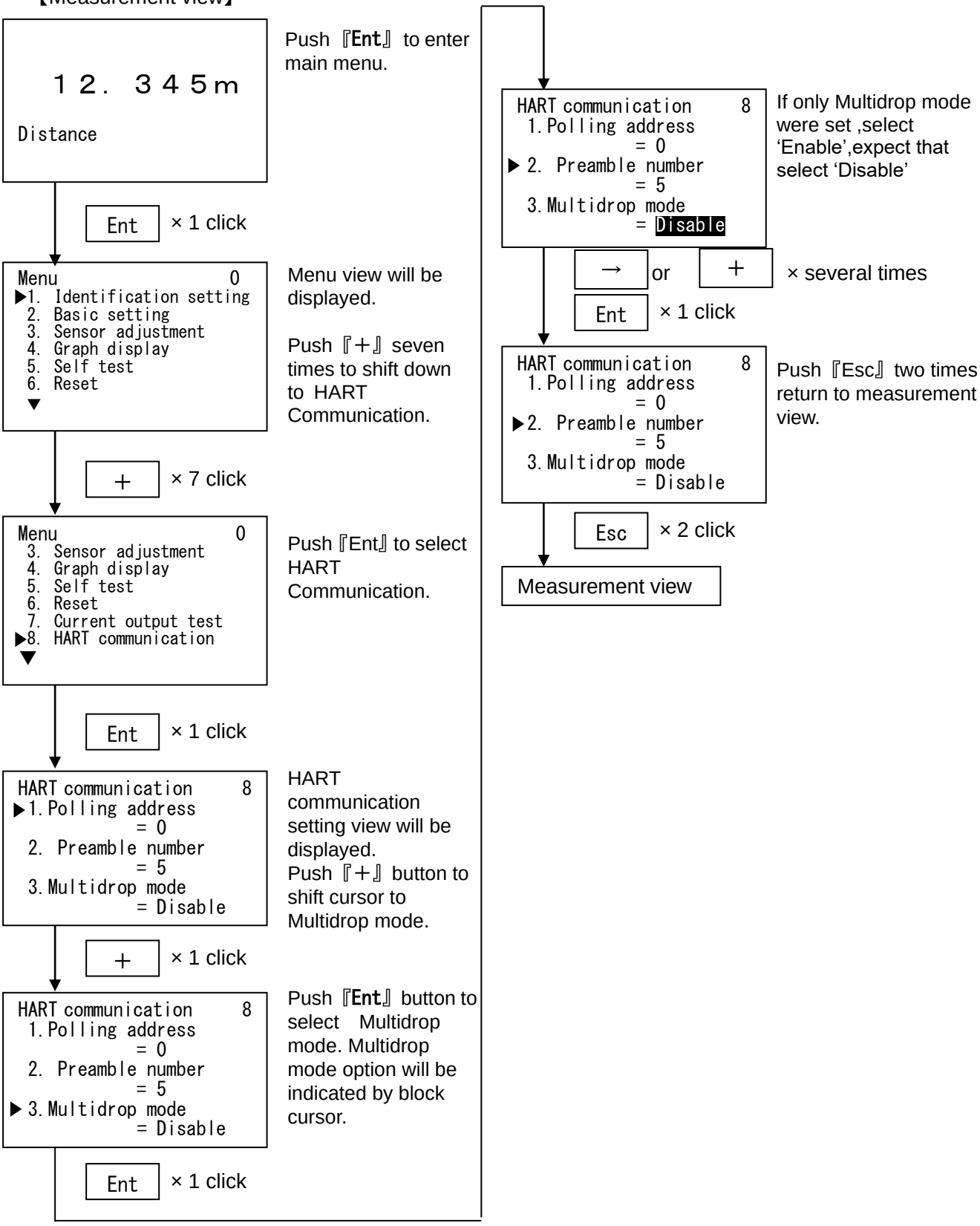


10.3 Multidrop mode　　※This mode can be set in Microwave Level Meter over Ver2.0

Set 'Disable' or 'Enable' of Multidrop mode.
（Default：Disable）

Important: When Multidrop mode **is enable ,**
9. Current output test and 5.6 Current output setting (Current output set.)can not set values.

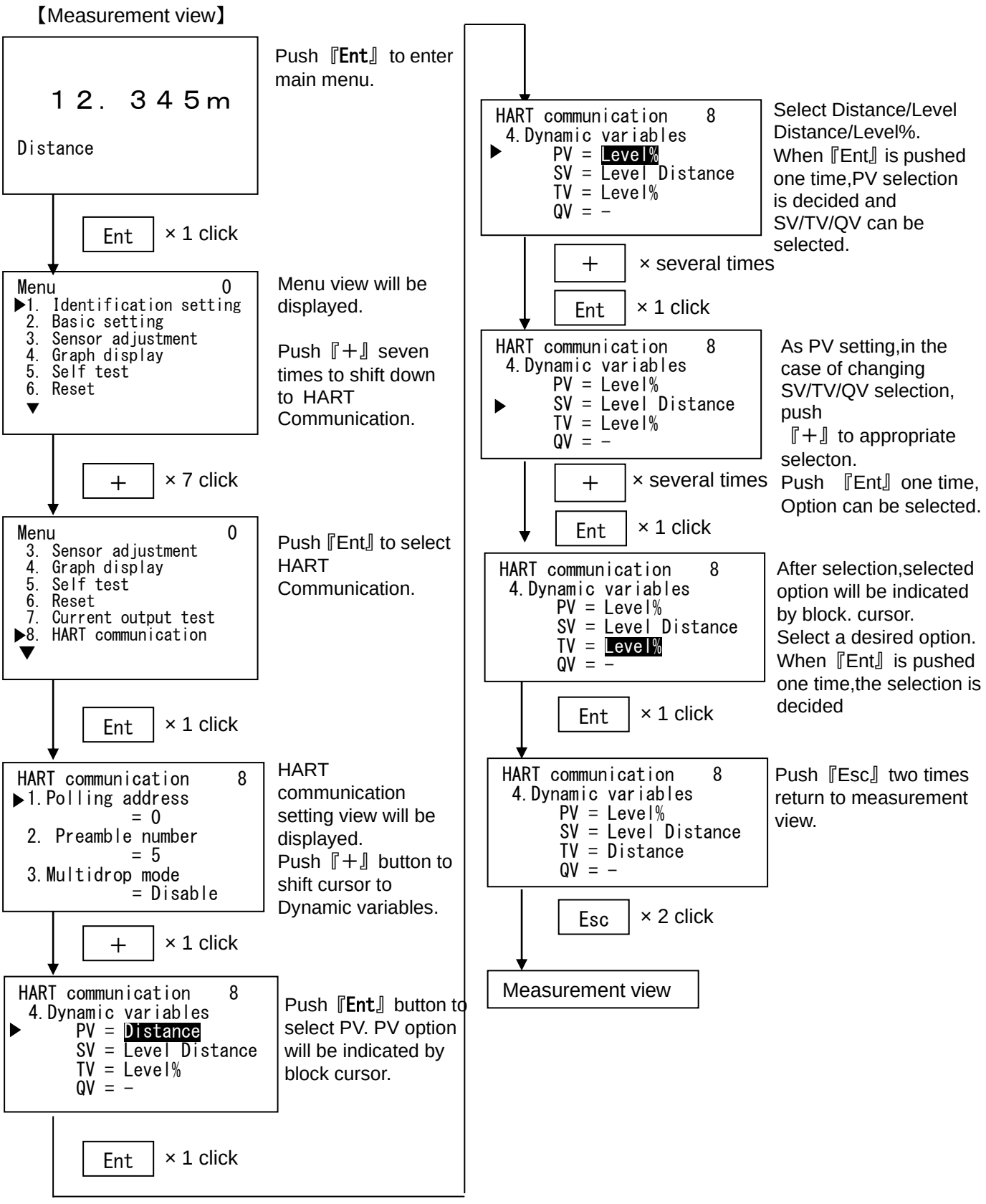
【Measurement view】



10.4 Dynamic valuables setting ※This mode can be set over in Microwave Level Meter over Ver2.0

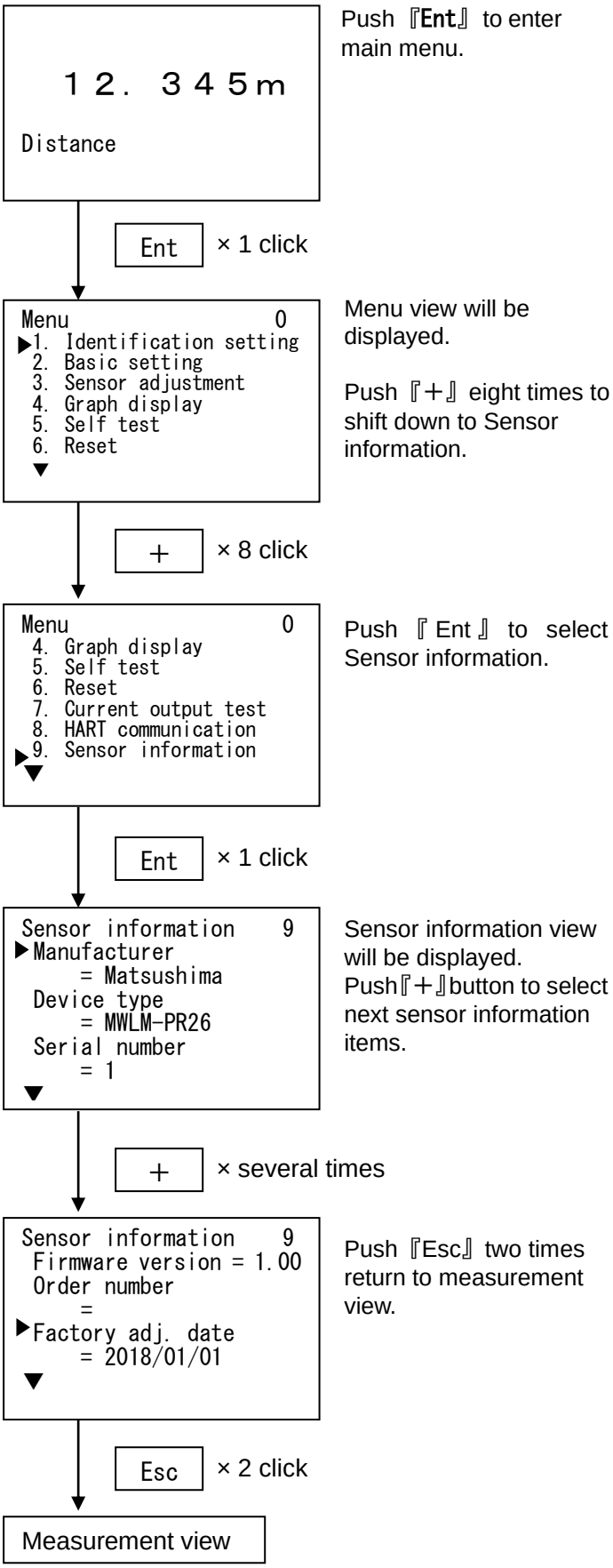
Set 'Distance' or 'Level Distance' or 'Level%' in each Dynamic valuables.

(Default : PV=Distance、SV=Level Distance、TV=Level%、 QV can not be seleted)



11. Sensor information

Checks instrument settings such as Manufacturer, Device type, Serial Number, Firmware version, Order number and Factory adjustment date.
You can only confirm current settings and can not change values.

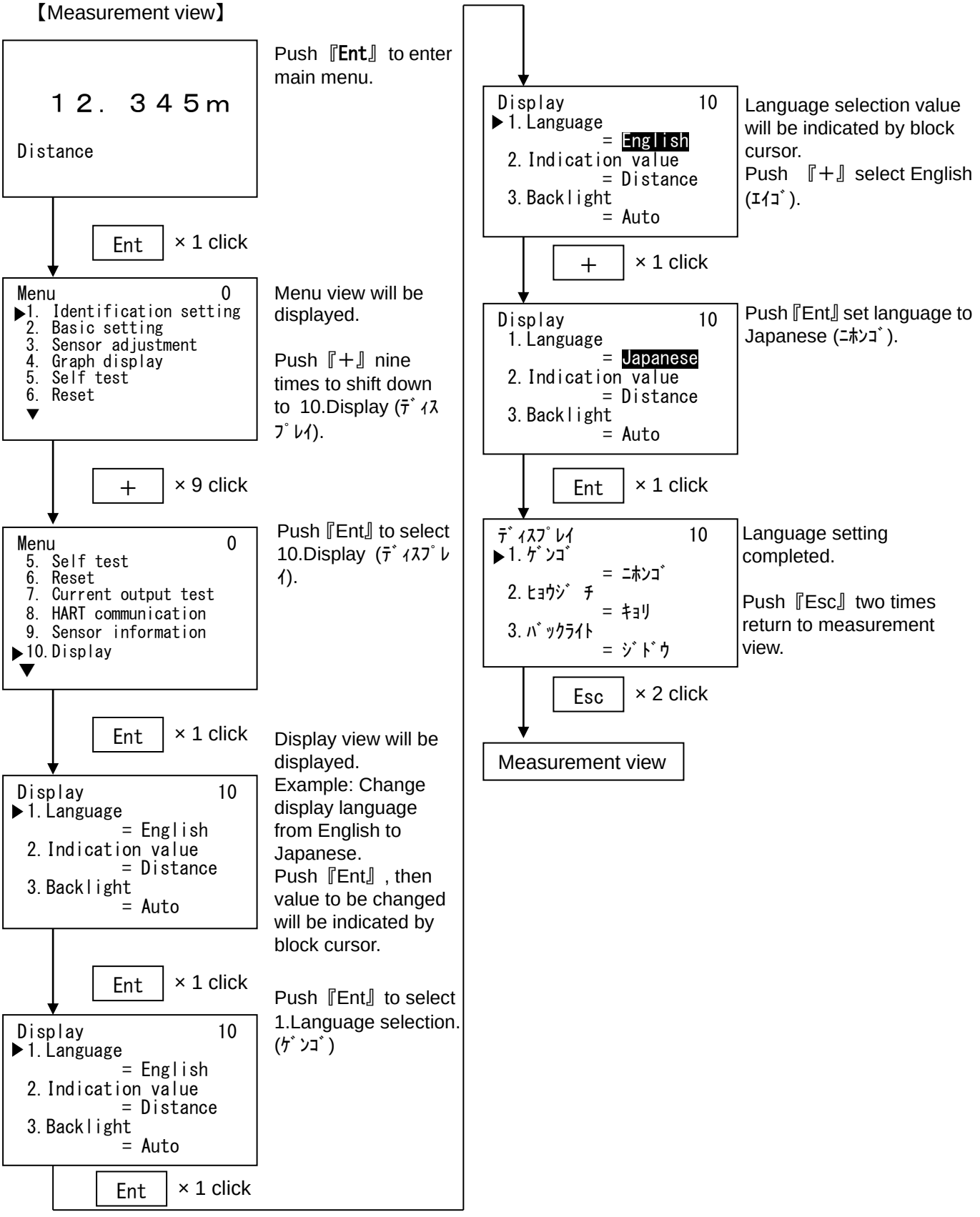


12. Display

Sets measurement view display mode and display language.

12.1 Language setting

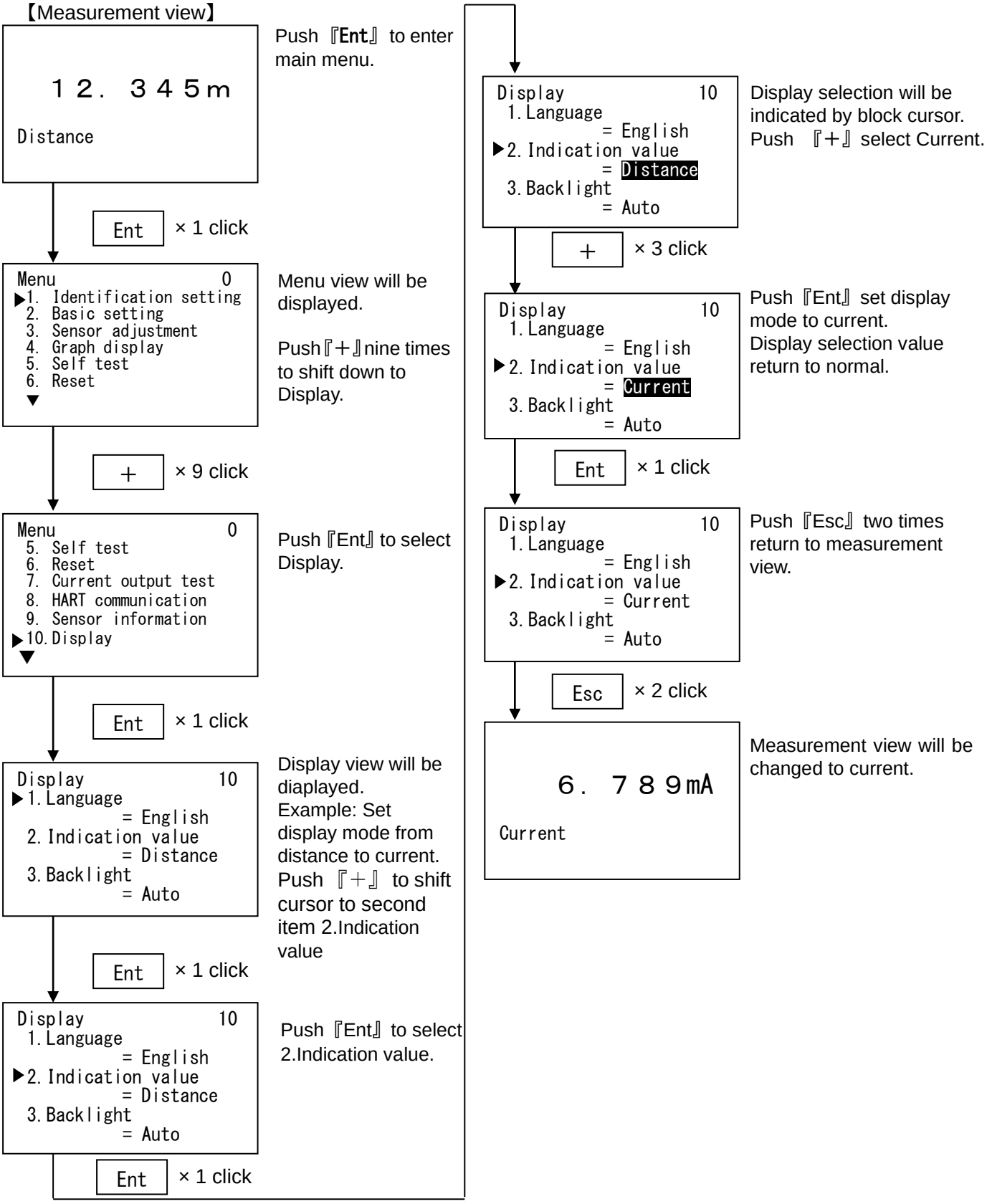
Sets display language for Graphic COM4 to English or to Japanese (Kana).
(Default: English)



12.2 Measurement view display mode

Select measurement view display mode from distance, level Distance, level percent and current output.

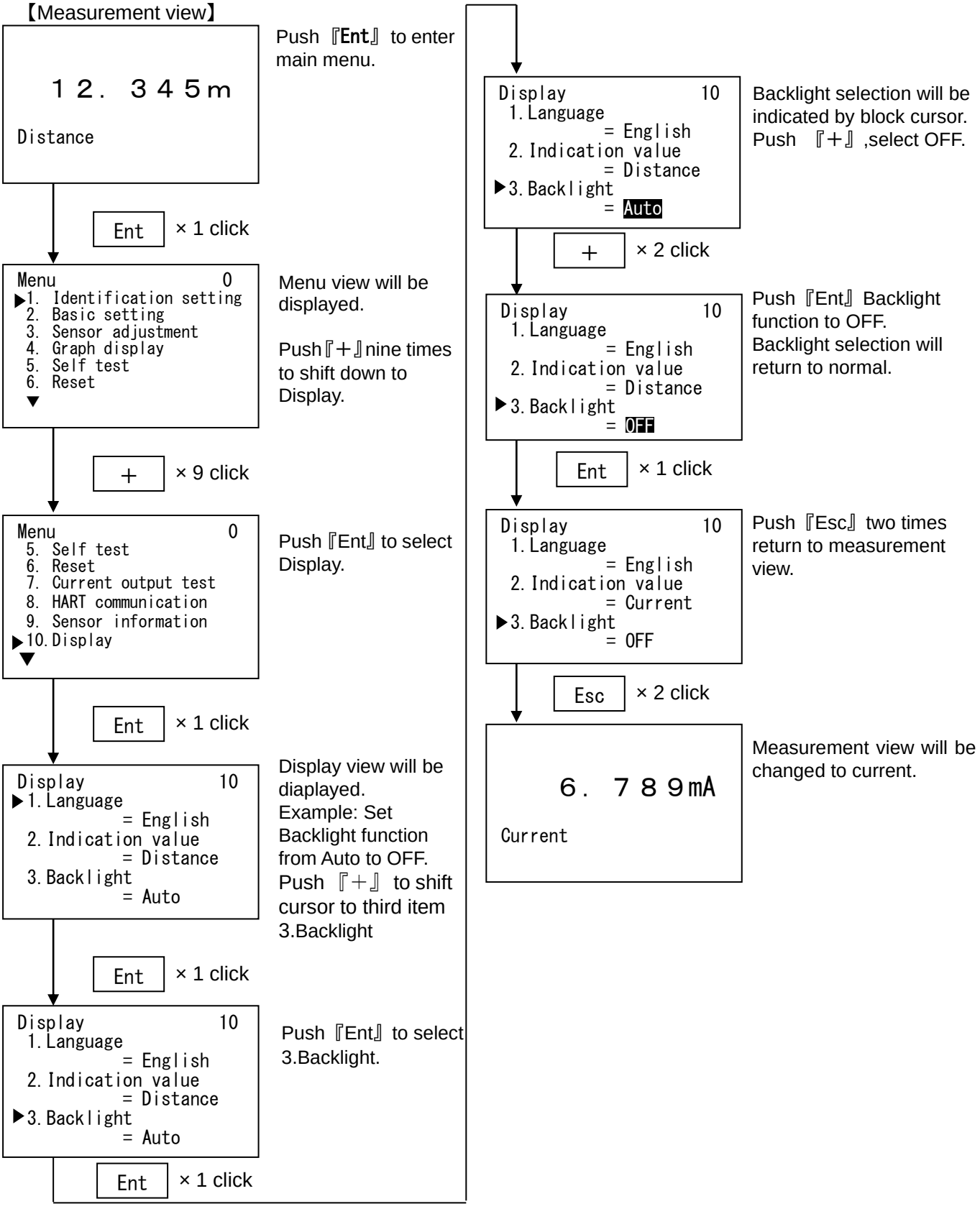
(Default: Distance)



12.3 Backlight setting

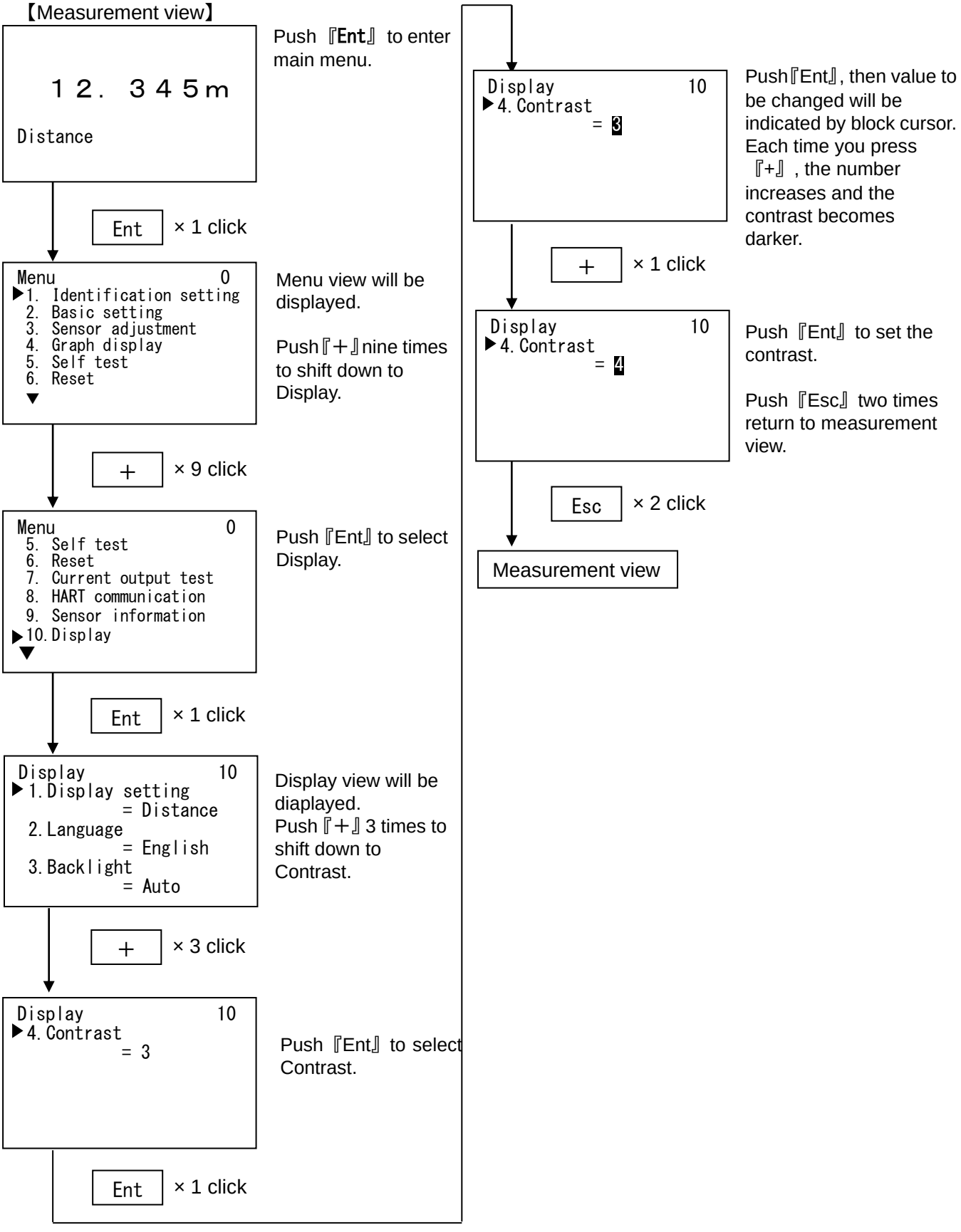
Select Auto or ON or OFF in Backlight function.(Default: Auto)

Important：In case of connecting Graphic com4 to Microwave Level Meter under Ver2.0, Backlight function can not be selected except for [Auto].



12.4 Contrast

Sets the contrast of the screen. (Default: 3)



13. Parameter list

No.	Parameter	Display abbreviation	Range	Default
	Menu	Menu		
1	Identification setting	Identification setting		
1.1	Tag	Tag	Less than 16 ASCII characters	SENSOR
1.2	Descriptor	Description	Less than 16 ASCII characters	PULSE-RADAR
1.3	Message	Message	Less than 32 ASCII characters	LEVEL METER
1.4	Installation date	Installation day	2010/1/1 to 2155/12/31	2018/1/1
2	Basic setting	Basic setting	—	—
2.1	Application	Application	—	—
	Measurement unit	Meas.unit	m / ft	m
	Measuring object	Measuring object	Liquid/Solid	Liquid
	Level change rate	Level change rate	Normal/Fast	Normal
2.2	Measurement range span	Meas. range span	—	—
	Full setting	Full setting	—	—
	Distance	Distance	0.000～70.000 (m) 0.00～229.659 (ft)	0 (m)
	Percent	Percent	-10.00～110.00 (%)	100 (%)
	Empty setting	Empty setting		
	Distance	Distance	0.000～70.000 (m) 0.000～229.659 (ft)	70 (m)
	Percent	Percent	-10.00～110.00 (%)	0 (%)
2.3	Damping	Damping	0～999(s)	0 (s)
3	Sensor adjustment	Sensor adjustment	—	—
3.1	Current output setting	Current output Set.	—	—
	Current output selelection	Current output Sel.	4-20mA/20-4mA	4-20mA
	Alarm current selection	Alarm current Sel.	Max/Min/Hold/Sel.Val.	Hold
	Maximum alarm current	Max alarm Current	20mA/20.5mA/22mA	22mA
	Minimum alarm current	Min alarm Current	・Level Meter over Ver2.0 <3.6mA/3.8mA/4mA ・Except for above 3.6mA/3.8mA/4mA	<3.6mA 3.6mA
	Selected alarm current	Sel. alarm Current	・Level Meter over Ver2.0 3.550～22.000 (mA) ・Except for above 3.600～22.000 (mA)	22.000 (mA)
3.2	Measurement adjustment	Meas. adjustment	—	—
3.2.1	Echo learning	Echo learning	Clear/Addition/Update	—
	Echo learning distance	Echo learning dist.	・Level Meter over Ver2.0 0.000～71.000 (m) 0.000～232.940 (ft) ・Except for above 0.000～70.000 (m) 0.000～229.659 (ft)	0 (m)
3.2.2	Time Window adjustment	TW adjustment	—	—
	Manual TW distance	Manual TW distance	・Level Meter over Ver2.0 0.000～71.000 (m) 0.000～232.940 (ft) ・Except for above 0.000～70.000 (m) 0.000～229.659 (ft)	—
4	Graph display	Graph display	—	—
4.1	Echo curve	Echo curve	—	—
4.2	Echo detection curve + EC + TW	Echo detection curve + EC + TW	—	—
5	Self test	Self test	—	—
6	Reset	Reset	Measuring reset Parameter reset	
7	Current output test	Current output test	—	—
	Test percent value	Percent	-10.00～100.00 (%)	—
	Test current value	Current	・Level Meter over Ver2.0 3.550～22.000 (mA) ・Except for above 3.600～22.000 (mA)	—

No.	Parameter	Display abbreviation	Range	Default
8	HART communication setting	HART communication	－	－
	Polling address	Polling address	0～15	0
	Preamble number	Preamble number	5～20	5
	Multidrop mode ※Level Meter over Ver2.0	Multidrop mode	Enable/Disable	Disable
	Dynamic Variables ※Level Meter over Ver2.0	Dynamic Variables	PV/SV/TV= Distance/Level Distace/Level% ※QV can not be selected	PV=Distance SV=Level Distace TV=Level%
9	Sensor information	Sensor information	－	－
10	Display	Display	－	－
	Display setting	Display setting	Distance/Level/ Level%/Current	Distance
	Language	Language	English/Japanese	English
	Backlight	Backlight	Auto/ON/OFF	Auto
	Contrast	Contrast	0～9	2

※All defaults values are values after parameter reset.

14. Troubleshooting

If you encounter any problems, first check if they are described in this section, then execute suggested corrective actions.

Error code and corrective actions

Error code	Type	Error type	Corrective actions
E8000	Device failure	SRAM Error	There is problem in the level meter. Turn off device power and turn on again
E4000		EEPROM Error	
E2000		MIC Error	
E1000		Trig Error	
E0400		Charge Error	
E0100		Loop Current Error	Loop current value is failure. Turn off device power and turn on again
E0080	Measurement failure	Lost echo	Reflection echo is too small Check whether there are adhesives in the horn antenna
E0008		Min. meas. limit over	Measured distance is lower than "Min. meas. limit"
E0004		Max. meas. limit over	Measured distance is higher than "Max. meas. limit".
E0002		Upper range limit over (100% over)	Measured distance exceeds "Upper range limit over (100% over)".
E0001		Lower range limit over (0% over)	Measured distance undergoes "Lower range limit over (0% over)".
E0800	Warning	LCD Error	There is problem in the level meter. Turn off device power and turn on again
E0200		I2C Checksum error	Communication between level meter and LCD adj. unit failed Ensure LCD adj. unit attached properly
E0010		During Startup processing	The status is during startup processing. Please wait until the first echo is detected.
S.CPU	Device failure	No response from level meter	No response from level meter
S.I2C		Communication between level meter and LCD adj. unit failed	Communication between level meter and LCD adj. unit failed Ensure LCD adj. unit attached properly

※When the device failure or measurement failure occur, measurement distance will not change even waveform being changed.

※If above mentioned problems persist, please contact your local Matsushima sales office concerning device failure.