
**User's
Manual**

**Model ADMAG AE
HART Protocol**

IM 1E7H0-01E

PRELIMINARY

This manual describes the function, performance, and operating procedures of the ADMAG AE Series with HART protocol. The ADMAG AE Series with HART protocol is basically same specifications with BRAIN protocol except communication function. Therefore, this manual describes only the special functions and HART Communicator operating procedures which are not covered in the ADMAG AE with BRAIN protocol instruction manual (IM1E7B0-02E or IM1E7C1-E). For the items which are not described in this manual, please refer to ADMAG AE Instruction Manual, IM1E7B0-02E or IM1E7C1-E.

*HART is a registered trademark of the HART Communication Foundation.

- The following safety symbol marks are used in this manual



IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.



NOTE

Draws attention to information essential for understanding the operation and features.

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1. OPERATION via HART COMMUNICATOR

1.1 Conditions of Communication Line

1.1.1 Interconnection Between ADMAG AE and HART Communicator

The HART Communicator can interface with the ADMAG AE from the control room, the ADMAG AE site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 230Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the ADMAG AE, the connections are non-polarized. Figure 1.1.1 illustrates the wiring connections for direct interface at the ADMAG AE site. The HART Communicator can be used for remote access from any terminal strip as well.

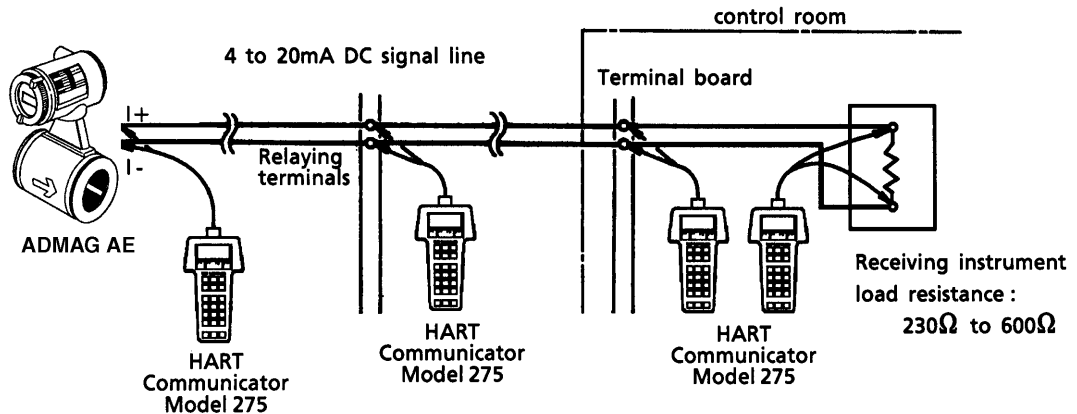


Figure 1.1.1 Interconnection Diagram

1.1.2 Communication Line Requirements

Specifications for Communication Line :

Load resistance : 230 to 600 Ω (including cable resistance)

When multidrop mode, see Figure 1.1.2.

Minimum cable size : 24 AWG, (0.51 mm diameter)

Cable type : Single pair shielded or multiple pair with overall shield

Maximum twisted-pair length : 6,500 ft (2,000 m)

Maximum multiple twisted-pair length : 3,200 ft (1,000 m)

Use the following formula to determine cable length for a specific application ;

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_r + 10,000)}{C}$$

Where : L = length in feet or meters

R = resistance in ohms, current sense resistance

C = cable capacitance in pF /ft or pF /m

$C_r = 50,000$ pF

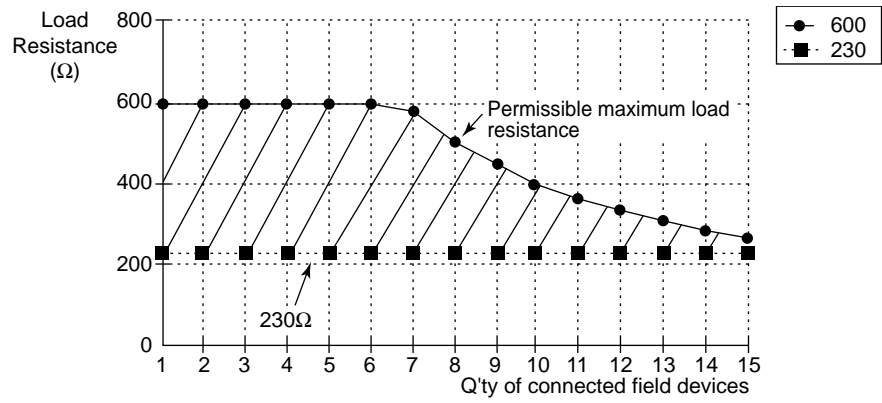


Figure 1.1.2 Load Resistance and Quantity of Devices in Multidrop Mode



NOTE

The above graph shows the load resistance in case that each current output of all connected transmitters is 4mA.

1.2 Basic Operation of the HART Communicator (Model 275)

1.2.1 Keys and Functions

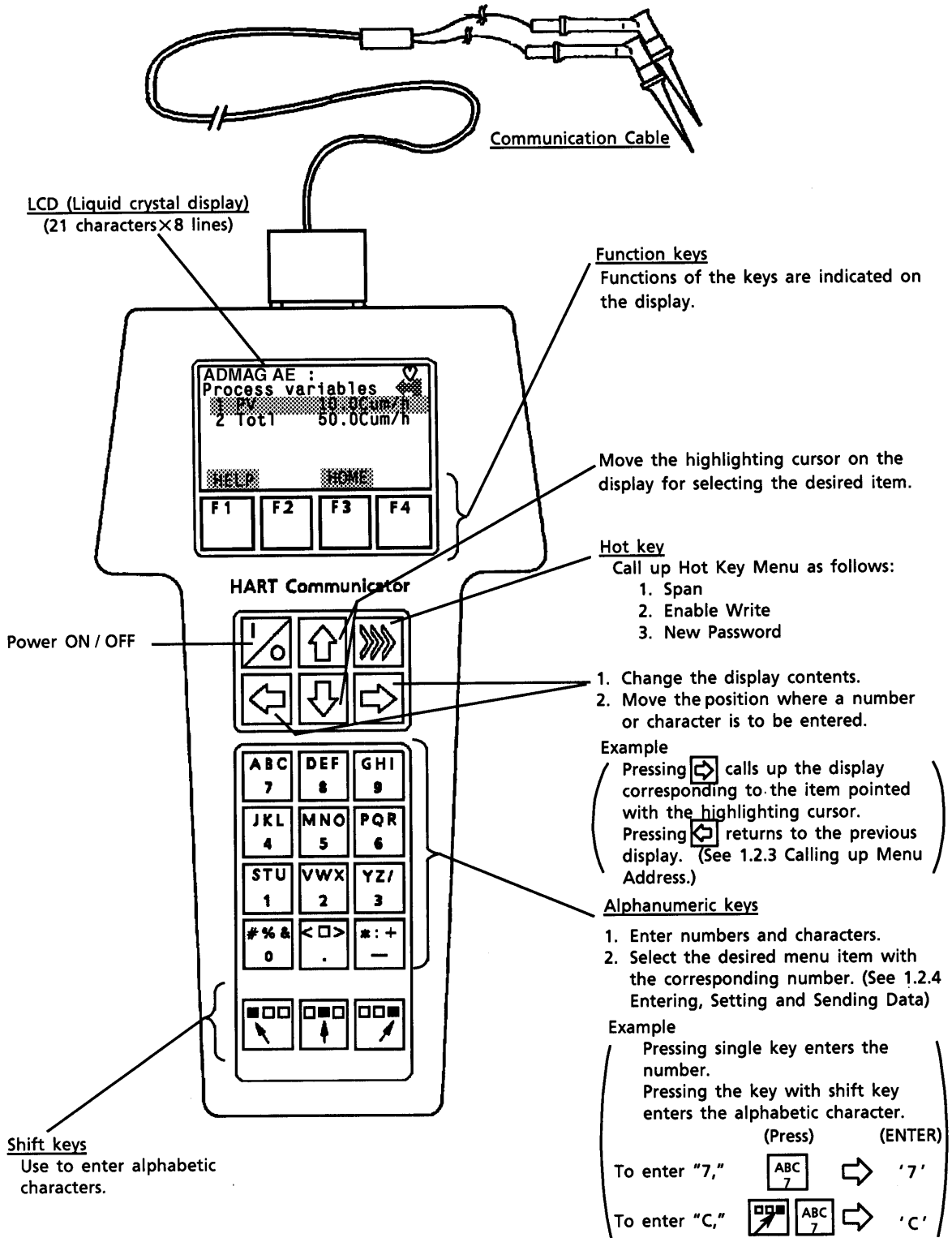


Figure 1.2.1 HART Communicator

1.2.2 Display

The HART communicator automatically searches for ADMAG AE on the 4 to 20mA loop when it is turned on. When the HART communicator is connected to the ADMAG AE, it displays “Online” menu as shown below.

(If ADMAG AE is not found, the communicator displays the message “No Device Found. Press OK ...” Press the OK ‘F4’ function key and the main menu appears. Please retry after confirming the connection with the ADMAG AE.)

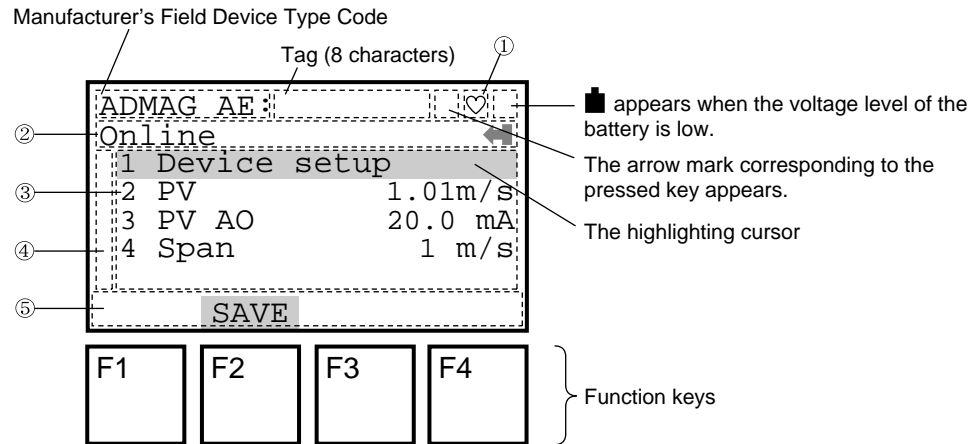


Figure 1.2.2 Display

- ① appears and flashes during communication between the HART communicator and the ADMAG AE. At Burst mode*, appears.
- ② The current display menu title appears.
- ③ Each item in menu of ② appears.
- ④ and/or appear when the items are scrolled out of the display.
- ⑤ On any given menu, the label appearing above a function key indicates the function of that key for the current menu.

*Note : Refer to “1.3.4 Setting Parameters (8) Burst Mode”.




1.2.3 Calling Up Menu Addresses


1.3.3 Menu Tree shows the configuration of Online Menu which is needed for the operation with HART communicator. The desired item can be displayed with ease by understanding the menu configuration.

When the HART communicator is connected to the ADMAG AE, “Online” menu will be displayed after the power is turned on (See figure 1.2.2). Call up the desired item as follows :

Key operation

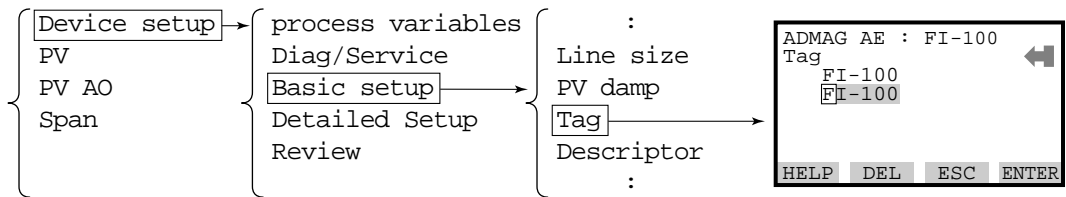
There are two choices to select the desired menu item.









1. Use the  or  key to select the desired item, and then press the  key.
2. Press the number key displayed for the desired item.

- To return to the previous display, press the  key, **EXIT (F4)** or **ESC (F3)**.

Example : Call up the “Tag” to change the tag number.

Check where “Tag” is located in the menu configuration. Then, call up “Tag” on the display according to the menu configuration.



Display	Operation
<p>①</p> <pre> ADMAG AE : FI-100 Online 1 Device setup 2 PV 3 PV AO 4 Span </pre>	<p> or </p> <p>Display ① appears when the HART Communicator is turned on. Select “Device setup”.</p>
<p>②</p> <pre> ADMAG AE : FI-100 Device setup 1 process variables 2 Diag/Service 3 Basic setup 4 Detailed Setup 5 Review SAVE HOME </pre>	<p> × 2 </p> <p>or</p> <p></p> <p>Select “Basic Setup”.</p>
<p>③</p> <pre> ADMAG AE : FI-100 Basic Setup 1 PV unit 2 Span 3 Line size 4 PV Damp 5 Tag HELP SAVE HOME </pre>	<p> × 4 </p> <p>or</p> <p></p> <p>Select “Tag”.</p>
<p>④</p> <pre> ADMAG AE : FI-100 Tag FI-100 FI-100 HELP DEL ESC ENTER </pre>	<p>The display for Tag setting appears. (The default value of “Tag” is blank)</p>

1.2.4 Entering, Setting and Sending Data

The data which are input with the keys are set in the HART communicator by pressing **ENTER (F4)**. Then, by pressing **SEND (F2)**, the data are sent to the ADMAG AE. Note that the data are not set in the ADMAG AE if **SEND (F2)** is not pressed. All the data set with the HART communicator is held in memory unless power is turned off, so every data can be sent to the ADMAG AE at one lot.

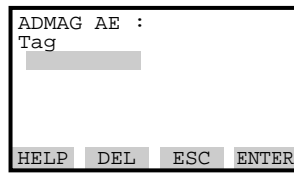
Operation

Entering data on the "Tag" setting display.

On alphabetic characters, only capital letters can be used for setting Tag No. with HART Communicator.



Call up the "Tag" setting display.



On the setting display shown above, enter the data as follows:

Character to be entered	Operation	Display
F	DEF 8	
I	GHI 9	
C	ABC 7	
-	* : + -	
1	STU 1	
A	ABC 7	

Display

①

```

ADMAG AE :
Tag
FIC-1A █
HELP DEL ESC ENTER
    
```

②

```

ADMAG AE :
Basic setup ←
1 PV unit
2 Span
3 Line size
4 PV damp
5 Tag FIC-1A
HELP SEND HOME
    
```

③

```

ADMAG AE : FIC-1A
Basic setup ←
1 PV unit
2 Span
3 Line size
4 PV damp
5 Tag FIC-1A
HELP SAVE HOME
    
```

Operation

F4
(ENTER)

Press **ENTER (F4)** to set the data in the HART communicator after entering the data.

F2
(SEND)

Press **SEND (F2)** to send the data to the ADMAG AE.

♥ flashing means during communication.

SEND label changed to **SAVE** label, and the transmission is completed.

Press **HOME (F3)**, and return "Online Menu".

1.3 Parameters



IMPORTANT

Do not turn off the ADMAG AE just after HART Communicator settings (sending) have been made. If the ADMAG AE is turned off less than 30 seconds after parameters have been set, the set data will not be stored and the data returns to previous settings.

1.3.1 Parameters Configuration

Parameters of HART communication is constructed hierarchically. The menu tree for Online menu is shown in 1.3.3 Menu Tree.

See appendix “Parameter Summary” about the usage of each parameter.

The Online menu summary is shown below.

Table 1.3.1 Online menu summary

No.	Display Item	Contents
1	Device setup	Set parameters for ADMAG AE.
2	PV	Display process value in engineering unit.
3	PV AO	Display analog output in mA.
4	SPAN	Display set span in engineering unit.

1.3.2 Data Renewing

There are two methods to load the data of ADMAG AE to HART Communicator , periodic data renewing and discretionary data renewing.

(1) Periodic Data Renewing

The following data are renewed in 0.5 to 2 seconds cycle.

PV, PV AO, PV % rng, Totl, Reverse total, Dif total, Power freq

(2) Discretionary Data Renewing

The following data can be loaded from /to ADMAG AE. Up load can be done with **SAVE (F2)** on any online menu, and down load can be done on Saved Configuration menu in Offline menu. (Refer to HART Communicator Manual.)

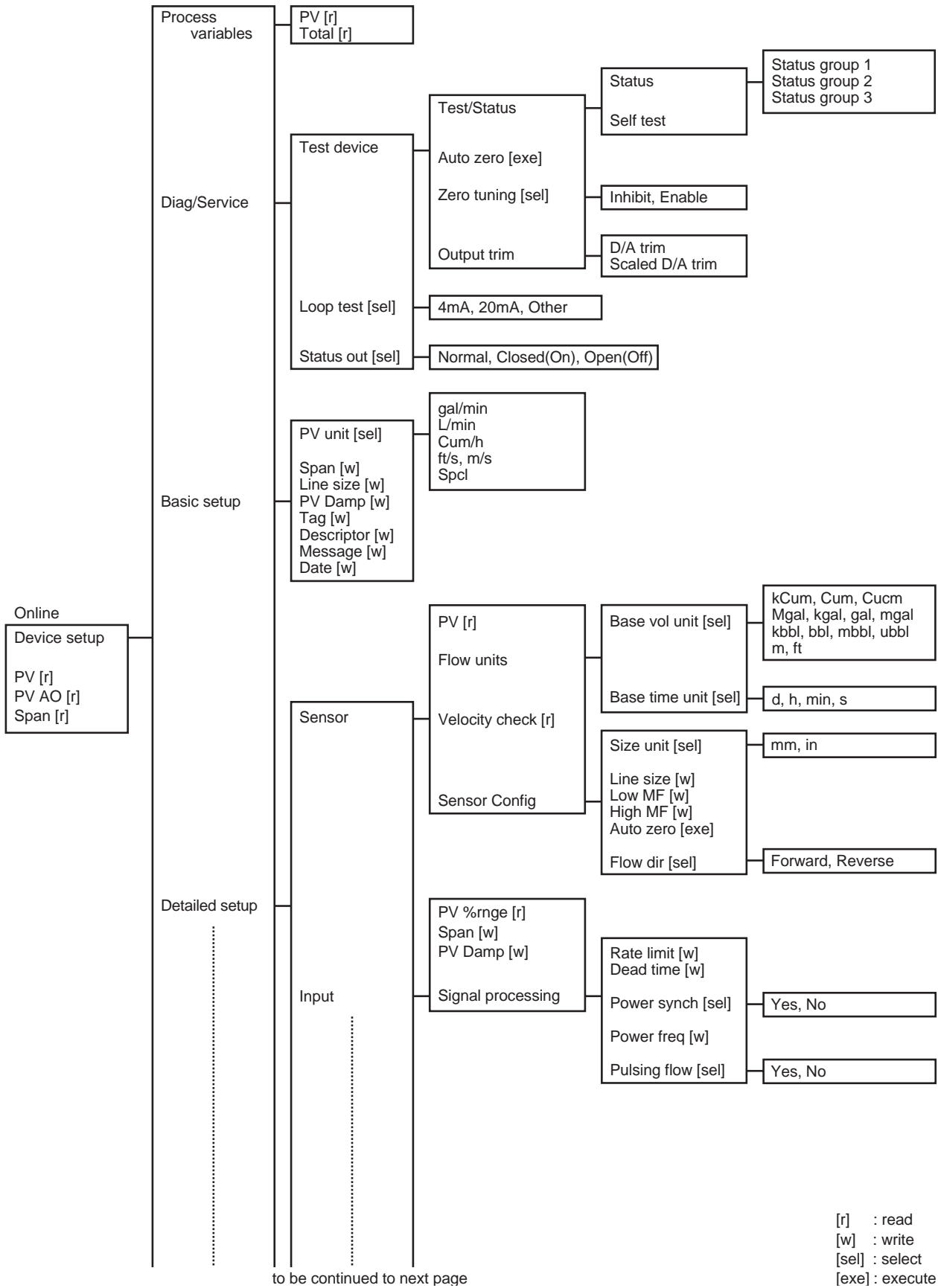
Descriptor, Message, Date, PV unit, Tag No, Span, Line size, Size unit, PV damp, Base vol unit, Base time unit, Disp select, Fl user sel, Fl user span, Total unit, Total scale, Total lowcut, Tl set value, Total set, Analog low cut, Analog low lmt, Analog hi lmt, PV AO alrm typ, Output func, Pulse unit, Pulse scale, Pulse low cut, Pulse width.



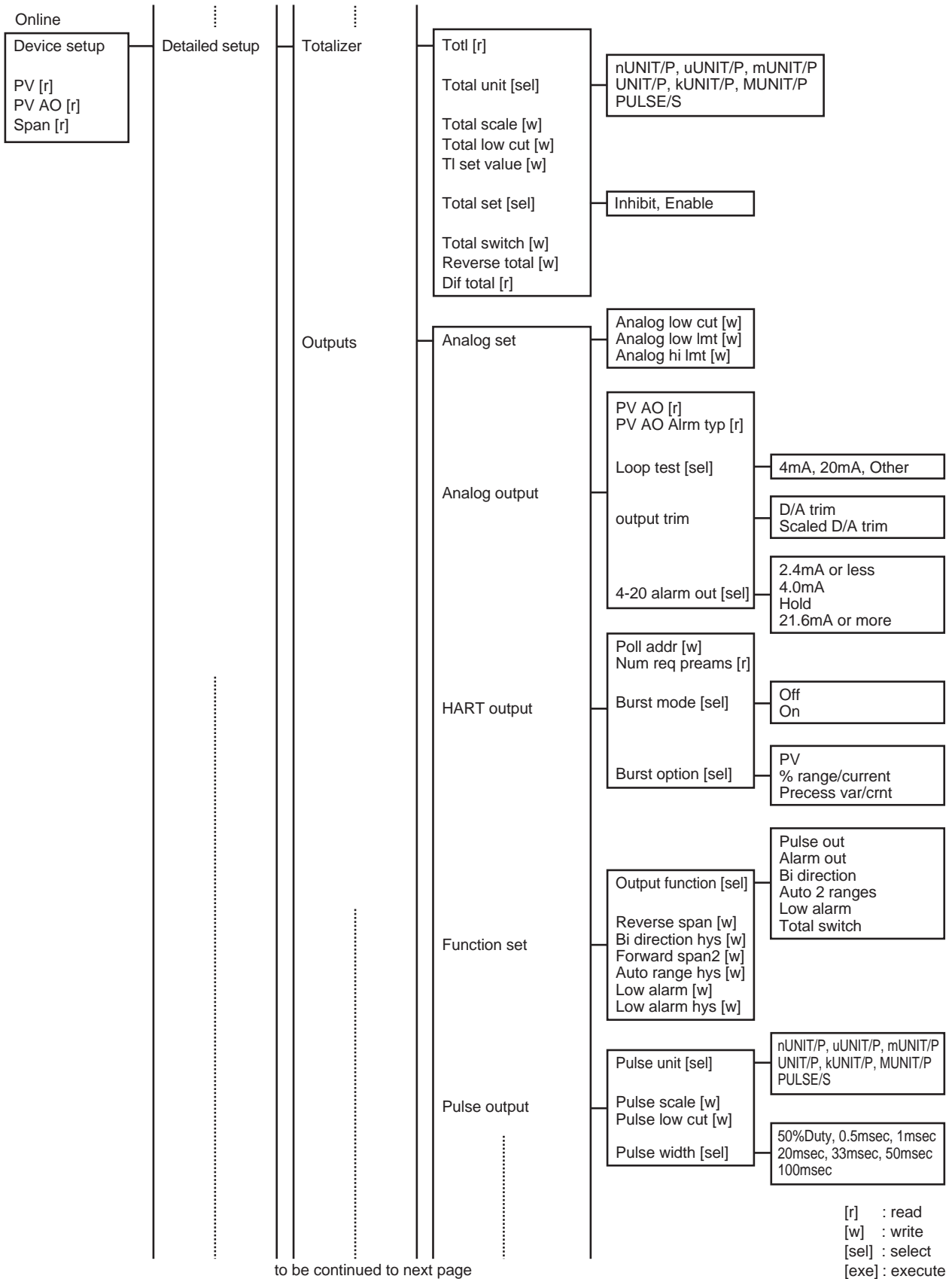
NOTE

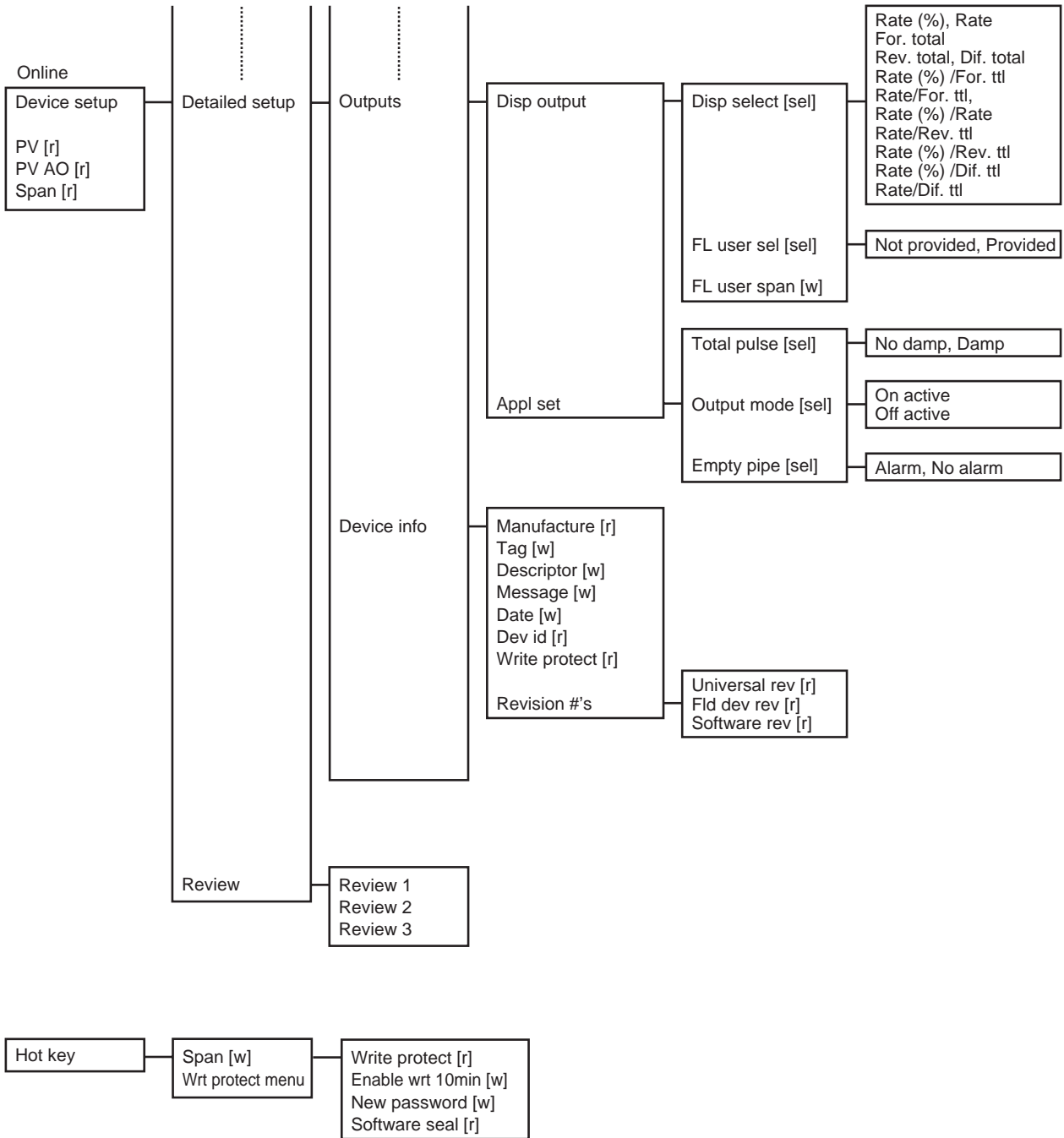
1. “Fl USER UNIT”, and “Tl USER UNIT” which are parameters of ADMAG AE are not available for HART communication.
 2. The changed data with HART Communicator is sent to ADMAG AE by pressing **SEND (F2)** of HART Communicator.
-

1.3.3 Menu Tree



to be continued to next page





[r] : read
[w] : write
[sel] : select
[exe] : execute

1.3.4 Setting Parameters

(1) Nominal Size

The nominal size is engraved on the data plate of the flow tube.

Example : Set "2 inch".

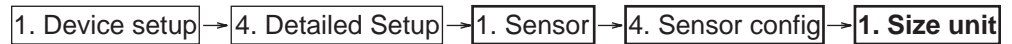
1. Size unit


2. Line size

1.

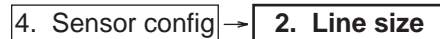
↓ This number means a turn which is numbering from the top of each parameter group in the menu tree.

Call up "Size unit" setting display.



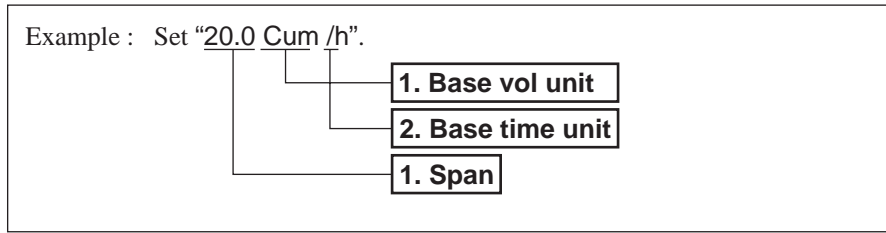
<p>①</p> <pre> ADMAG AE : Size unit mm mm in ESC ENTER </pre>		<p>Select "in" (inch).</p>
<p>②</p> <pre> ADMAG AE : Size unit mm mm in ESC ENTER </pre>	<div style="border: 1px solid black; padding: 5px; display: inline-block;">F4</div> (ENTER)	<p>Press ENTER (F4).</p>
<p>③</p> <pre> ADMAG AE : Sensor config 1 Size unit 2 Line size in 3 Low MF 4 High MF 5 Auto zero SEND HOME </pre>	<div style="border: 1px solid black; padding: 5px; display: inline-block;">F2</div> (SEND)	<p>Press SEND (F2) to set data to the ADMAG AE.</p>

Call up "Line size" setting display.



<p>①</p> <pre> ADMAG AE : Line Size 100.0 100.0 DEL ESC ENTER </pre>	<p>'2'</p>	<p>Enter "2" with alphanumeric keys.</p>
<p>②</p> <pre> ADMAG AE : Line Size 100.0 2 DEL ESC ENTER </pre>	<div style="border: 1px solid black; padding: 5px; display: inline-block;">F4</div> (ENTER)	<p>Press ENTER (F4).</p>
<p>③</p> <pre> ADMAG AE : Sensor config 1 Size unit 2 Line size 3 Low MF 4 High MF 5 Auto zero SEND HOME </pre>	<div style="border: 1px solid black; padding: 5px; display: inline-block;">F2</div> (SEND)	<p>Press SEND (F2) to set data to the ADMAG AE.</p> <p>By pressing HOME (F3), the display returns to "Online Menu."</p>

(2) Span




Call up "Base vol unit" setting display.



- 1


```

ADMAG AE :
Base vol unit
m
↑ m bbl
u bbl
m
↓ ft
ESC ENTER
            
```

 x 11 Select "Cum" (m³)
- 2


```

ADMAG AE :
Base vol unit
m
↑ Cum
L
Cucm
↓ M gal
ESC ENTER
            
```

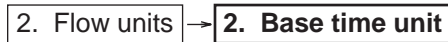
 (ENTER) Press **ENTER (F4)**.
- 3

```

ADMAG AE :
Flow units
1 Base vol unit Cum
2 Base time unit s
SEND HOME
            
```

 (SEND) Press **SEND (F2)** to set data to the ADMAG AE.


Call up "Base time unit" setting display.



- 1


```

ADMAG AE :
Base time unit
s
d
h
min
s
ESC ENTER
            
```

 x 2 Select "h".
- 2


```

ADMAG AE :
Base time unit
s
d
h
min
s
ESC ENTER
            
```

 (ENTER) Press **ENTER (F4)**.
- 3

```

ADMAG AE :
Flow units
1 Base vol unit Cum
2 Base time unit h
SEND HOME
            
```

 (SEND) Press **SEND (F2)** to set data to the ADMAG AE.

Call up "Span" setting display.

Hot key → **1. Span**

① ADMAG AE :
Flow units
1 Base vol unit Cum
2 Base time unit h

SAVE HOME



Press Hot key.

② ADMAG AE :
Hot key
1→Span 1 Cum/h
2 Enable Write
3 New Password

SAVE



Select "Span".

③ ADMAG AE :
Span
1 Cum/h
1

DEL ESC ENTER

'20.0'

Enter "20.0" with alphanumeric keys.

④ ADMAG AE :
Span
1 Cum/h
20.0

DEL ESC ENTER



Press **ENTER (F4)**.

(ENTER)

⑤ ADMAG AE :
Hot key
1→Span 20 Cum/h
2 Enable Write
3 New Password

SEND



Press **SEND (F2)** to set data to the ADMAG AE.

(SEND)

Return to the previous display by

pressing  or 



NOTE

When the span is set in engineering units using the ADMAG AE front panel key switches, consideration should be given to the least significant digit which is to be displayed for all ranges on the rate indicator of the ADMAG AE (parameter A20 FLOW RATE). For example, if the flow rate value is to be displayed to three decimal places, set the span as "20.000" as opposed to "20".

(3) Flow Units

For actual flow unit setting, the following parameters are provided.

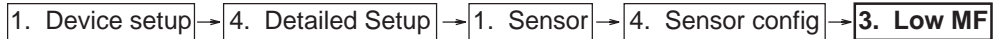
- ① “PV unit”
This parameter can be set only with HART Communicator. The selectable units are shown below.
gal/min, Cum/h, L/min, m/s , ft/s
- ② Combination of “Base vol unit” and “Base time unit”
These parameters can be set with both ADMAG AE and HART Communicator. The selectable units are shown below.
Flow unit” : k Cum, Cum, L, Cucm, M gal, k gal, gal, m gal, k bbl, bbl, m bbl, u bbl, m, ft
Time unit” : /d, /h, /min, /s
If the unit undefined in “PV unit” is set in these parameters, the display of “PV unit” indicates “Spcl”.

(4) Meter Factor

The meter factors are engraved on the data plate of the flow tube.

Example : Set “1.2345”. as low frequency side meter factor
3. Low MF

Call up “Low MF” setting display.



①	<pre> ADMAG AE : Low MF 1.0000 1.0000 </pre> <p style="text-align: right; margin-right: 5px;">SAVE HOME</p>	‘1.2345’	Enter “1.2345” with alphanumeric keys.
②	<pre> ADMAG AE : Low MF 1.0000 1.2345 </pre> <p style="text-align: right; margin-right: 5px;">DEL ESC ENTER</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> (ENTER)	Press ENTER (F4) .
③	<pre> ADMAG AE : Sensor config 1 Size unit in 2 Line size 3 Low MF 1.2345 4 High MF 1.0000 5 Auto zero </pre> <p style="text-align: right; margin-right: 5px;">SEND HOME</p>	<div style="border: 1px solid black; width: 30px; height: 30px; margin: 0 auto;"></div> (SEND)	Press SEND (F2) to set data to the ADMAG AE.

*Please set high frequency meter factor in the same way.



(5) Loop Test

This feature can be used to output a fixed current from 2.72mA to 21.28mA for loop check.

Setting of Loop Test

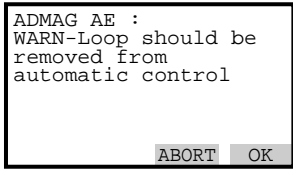
Example : Set "12mA (50%)" as test output.

2. Loop test

Call up "Loop test" display.

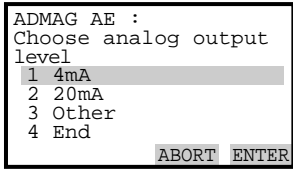
1. Device setup → 2. Diag/Service → **2. Loop test**

- ①



F4
(OK)

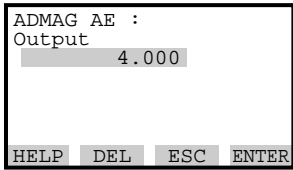
Set the control loop in manual mode, and press **OK (F4)**.
- ②



↓ x 2
F4
(ENTER)

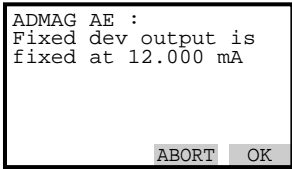
Select "Other", and press **ENTER (F4)**.

 1. 4mA :
Output a 4mA current signal
 2. 20mA :
Output a 20mA current signal
 3. Other :
Set a desired output with the alphanumeric keys
 4. End : Exit
- ③



'12'
F4
(ENTER)

Enter "12", and press **ENTER (F4)**.
- ④



F4
(OK)

Press **OK (F4)**.
A fixed current of 12mA is output.



NOTE

- In "Bi direction mode", current output can be set up to 108% of larger span either forward or reverse at Loop Test.
- In "Bi direction mode", less than 0% can not be set at Loop Test.

Releasing from Loop Test :

There are three methods to which cause the simulated output to return to a normal flow reading :

1. Wait 10 minutes for the output to automatically return to zero.
2. Turn the power off to the ADMAG AE.
3. Execute “End”. (See the following for this procedure.)


On “Loop test” display

①

```

ADMAG AE :
Choose analog output
level
1 4mA
2 20mA
3 Other
4 End
                
```

ABORT ENTER

 x 3

F4

(ENTER)

To finish the loop test, select “End”, and press **ENTER (F4)**.

②

```

ADMAG AE :
NOTE-loop may be
returned to automatic
control
                
```

OK

F4

(OK)

Press **OK (F4)**.

(6) Status Output Test

ADMAG AE has one alarm or status output. It can be output for test.

After the status output test, return the status output parameter to “Normal”.

Call up “Status out” display




①

```

ADMAG AE :
Diag/Service
1 Test Device
2 Loop Test
3 Status Out
                
```

SEND HOME




Select “Status out”.

②

```

ADMAG AE :
Status out
1 Normal
2 Close(On)
3 Open(Off)
                
```

SAVE HOME



F4

(ENTER)

Select “Close” (example) and press **ENTER (F4)**.

③

```

ADMAG AE :
Diag/Service
1 Test Device
2 Loop Test
3 Status Out
                
```

SEND HOME

F4

(SEND)

Press **SEND (F2)**.



NOTE

When the “status out” is executed, the current output is fixed 4mA.

(7) Trim Analog Output

Fine output adjustment is carried out with “D/A trim” or “Scaled D/A trim”.

- **D/A Trim**

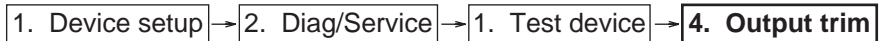
“D/A trim” is to be carried out if the calibration digital ammeter does not read 4.000mA and 20.000mA exactly with the output signal of 0% and 100%.


- **Scaled D/A Trim**

“Scaled D/A trim” is to be carried out if the output is adjusted using a voltmeter or other types of meters or using a meter with 0% to 100% scale.

Example1 : For the adjustment using an ammeter (1 μ A is measurable).

Call up “Output trim” display.



1	<pre> ADMAG AE : Output trim 1 D/A trim 2 Scaled D/A trim HELP SAVE HOME </pre>		Select “D/A trim”.
2	<pre> ADMAG AE : WARN-Loop should be removed from automatic control ABORT OK </pre>	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block;">F4</div> (OK)	Press OK (F4) .
3	<pre> ADMAG AE : Connect reference meter ABORT OK </pre>	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block;">F4</div> (OK)	Connect the ammeter ($\pm 1\mu$ A is measurable.), and press OK (F4) .
4	<pre> ADMAG AE : Setting fld dev output to 4mA ABORT OK </pre>	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block;">F4</div> (OK)	Press OK (F4) , and the ADMAG AE outputs the output signal of 0%.
5	<pre> ADMAG AE : Enter meter value 4.000 HELP DEL ABORT ENTER </pre>	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block;">4.115'</div> <div style="border: 1px solid black; padding: 2px 5px; display: inline-block;">F4</div> (ENTER)	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">Ammeter reading : 4.115</div> Enter the read value “4.115” of the ammeter, and press ENTER (F4) . (The output of the ADMAG AE changes.)

```

6 ADMAG AE :
  Fld dev output 4.000
  mA equal to reference
  meter?
  1 Yes
  2 No
  ABORT OK
    
```

F4
(ENTER)

Ammeter reading : 4.000

Because the reading on the ammeter is 4.000mA, select "Yes" and press **ENTER (F4)**.

If the reading is not 4.000mA, select item 2. "NO". Repeat steps 5 until the ammeter reads 4.000 mA.

```

7 ADMAG AE :
  Setting fld dev
  output to 20mA
  ABORT OK
    
```

F4
(OK)

Press **OK (F4)**, and the transmitter outputs the output signal of 100%.

```

8 ADMAG AE :
  Enter meter value
  20.000
  HELP DEL ABORT ENTER
    
```

'19.050'
F4
(ENTER)

Ammeter reading : 19.050

Carry out the same procedures as those described under 5.

```

9 ADMAG AE :
  Fld dev output 20.000
  mA equal to reference
  meter?
  1 Yes
  2 No
  ABORT ENTER
    
```

F4
(ENTER)

Ammeter reading : 20.000

"Returning fld dev to original output" appears.

```

10 ADMAG AE :
  NOTE-Loop may be
  returned to automatic
  control
  OK
    
```

F4
(OK)

Press **OK (F4)**.

Example 2: Adjust using a voltmeter

```

1 ADMAG AE :
  Output trim
  1 D/A trim
  2 Scaled D/A trim
  HELP SAVE HOME
    
```

VWX
2

Select the "Scaled D/A trim" item.

```

2 ADMAG AE :
  WARN-Loop should be
  removed from
  automatic control
  ABORT OK
    
```

F4
(OK)

Press **OK (F4)**.

```

3 ADMAG AE :
  Trim will be scaled
  from 4.000 to 20.000
  1 Proceed
  2 Change
  ABORT ENTER

```

VWX
2

Select "Change", and press **ENTER (F4)**.

The same operations as for "D/A trim" are required when selecting "Proceed".

```

4 ADMAG AE :
  Set scale- Lo output
  value
  4.000000
  4.000000
  HELP DEL ABORT ENTER

```

'1'
F4
(ENTER)

Enter the read value on the meter when the signal is 4mA. In this case, enter the value of the voltage across a 250Ω resistor (1V), and press **ENTER (F4)**.

```

5 ADMAG AE :
  Set scale- Hi output
  value
  20.000000
  20.000000
  DEL ABORT ENTER

```

'5'
F4
(ENTER)

Enter the read value on the meter when the signal is 20mA. Then, enter "5", and press **ENTER (F4)**.

```

6 ADMAG AE :
  Trim will be scaled
  from 1.000 to 5.000
  1 Proceed
  2 Change
  ABORT ENTER

```

F4
(ENTER)

Select "Proceed" and press **ENTER (F4)**.

```

7 ADMAG AE :
  Connect reference
  meter
  ABORT OK

```

F4
(OK)

Connect the voltmeter, and press **OK (F4)**.

```

8 ADMAG AE :
  Setting fld dev
  output to 4mA
  ABORT OK

```

F4
(OK)

Press **OK (F4)**. The output signal of 0% is output.

```

9 ADMAG AE :
  Enter meter value
  1.000000
  1.000000
  DEL ABORT ENTER

```

'1.01'
F4
(ENTER)

Voltmeter reading : 1.010

Enter the reading of the voltmeter (1.010), and press **ENTER (F4)**.

(The output of the transmitter changes.)

```

10 ADMAG AE :
  Scaled output: 1.000
  equal readout
  device?
  1 Yes
  2 No
  ABORT ENTER

```

F4
(ENTER)

Voltmeter reading : 1.000

Because the reading on the voltmeter is 1.000, select "YES" and press **ENTER (F4)**.

If the reading is not 1.000, select "NO". Repeat steps 9 until the voltmeter reads 1.000V.

11 ADMAG AE :
Setting fld dev
output to 20mA

ABORT OK

F4
(OK)

Press **OK (F4)**. The output signal of 100% is output.

12 ADMAG AE :
Either meter value
5.000000
5.000000

DEL ABORT ENTER

'5.21'
F4
(ENTER)

Voltmeter reading : 5.210

Enter the reading of the voltmeter (5.210), and press **ENTER (F4)**.

13 ADMAG AE :
Scaled output: 5.210
equal readout
device?
1 Yes
2 No

ABORT ENTER

F4
(ENTER)

Voltmeter reading : 5.000

Select "Yes" and press **ENTER (F4)**.

"Returning fld dev to original output" appears.

14 ADMAG AE :
NOTE-Loop may be
returned to automatic
control

OK

F4
(OK)

Press **OK (F4)**.



IMPORTANT

D/A trim should be executed only at single range mode. If D/A trim is executed at Bi direction mode, it is feared that the current output becomes 108%.

(8) Burst Mode

The ADMAG AE continuously sends the data stored in it when the burst mode is set "On". Either one of instantaneous flow rate, output in % and current output can be selected and sent. The data is sent intermittently as a digital signal at 75ms intervals when the ADMAG AE is set in the burst mode.

Setting of Burst Mode

Call up "Burst option" display.



```

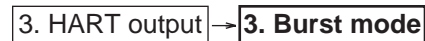
ADMAG AE :
Burst option
*****
PV
% range/current
Process vars/crnt
HELP      ESC  ENTER
    
```

F4
(ENTER)
F2
(SEND)

Set the data to be sent.

- Instantaneous flow rate (PV)
- Output in % and current output (% range / current)
- Instantaneous flow rate and current output (Process vars/crnt)

Call up "Burst option" display.



①

```

ADMAG AE :
Burst mode
Off
Off
On
ESC  ENTER
    
```

↓
F4
(ENTER)

Set "On" and press **ENTER (F4)**.

②

```

ADMAG AE :
HART output
1 Poll addr      0
2 Num req pream  s
3 Burst mode     On
4 Burst option   Pv
HELP  SEND  HOME
    
```

F2
(SEND)

Press **SEND (F2)**.

Releasing from Burst Mode :

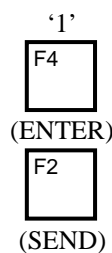
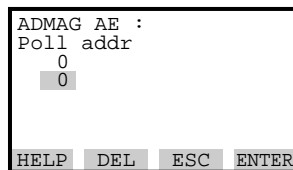
Call up "Burst mode" display, and set "OFF".

(9) Multidrop Mode

Field devices in multidrop mode refer to the connection of several field devices on a communication single line. Up to 15 field devices can be connected when set in the multidrop mode. To activate multidrop communication, the field device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20mA output and turns it 4mA. Refer to Figure 1.1.2 for the load resistance.

Setting of Multidrop Mode

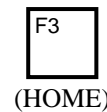
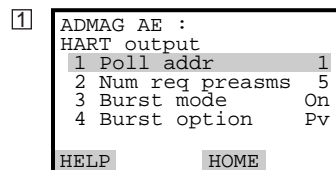
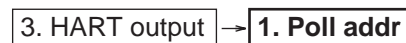
Call up "Poll addr" display.



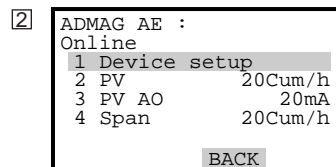
Set the polling address (a number from 1 to 15) and press **ENTER (F4)**.

Then, press **SEND (F2)** to send the data.

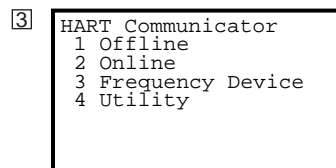
Call up "Auto Poll" display.



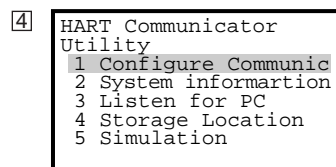
Return to "Online Menu" with **HOME (F3)**.



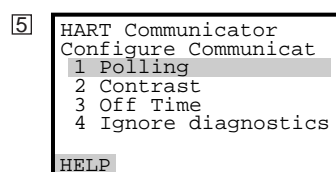
Return to "Main Menu" with a "previous" key.



Select "Utility".



Select "Configure Communication".





Select "Polling".

⑥

```

HART Communicator
Polling ←
Never Poll
Never Poll
Ask Before Polling
Always Poll
Digital Poll
HELP ESC ENTER
  
```

 x 3

 (ENTER)

Select "Digital Poll" and press **ENTER (F4)**.



NOTE

1. If "Never Poll" is set in "Polling" when the address is set, "Online Menu" cannot be called up and displayed. Be sure to set "Digital Poll" in "Polling" after setting the polling address.
2. When the same polling address is set for two or more field devices in multidrop mode, communication with these field devices is disabled.

Example : Communication when set in the multidrop mode

①

```

HART Communicator
Online ←
1 1: FIC-1A
2 2: FIC-2A
3 3: PIC-1A
  
```

- (1) The HART communicator searches for the field device is set in the multidrop mode when the HART Communicator is turned on.

When the HART Communicator is connected to the field device, the tag will be displayed (display ①).

②

```

ADMAG AE : FIC-1A
Online ←
1 Device setup
2 PV
3 PV AO
4 Span
SAVE
  
```

- (2) Select the desired field device. After that, normal communication with the selected field device is possible. However, the communication speed is slow in this case (display ②).

③

```

HART Communicator
1 Offline
2 Online ←
3 Frequency Device
4 Utility
  
```

- (3) To communicate with another field device, call up display ③, and select "Online".

- (4) Display ① will appear. Repeat the above operation.

Releasing from Multidrop Mode

First, call up the "Poll addr" display, and set the address to 0.

Second, call up the "Polling" display, and set "Never Poll".



NOTE

If the above releasing method is carried out in the reverse order, "Online Menu" can not be called up.

(10)Write Protection

Write protection function is used to prevent unauthorized data being written into the device, ADMAG AE. This function becomes active by entering a password in “New password”. Write protection status is released for 10 minutes by entering the password in “Enable wrt 10 min”.



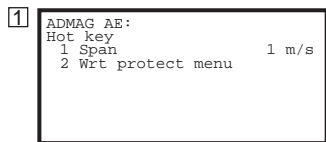
NOTE

When the write protection function is active, data setting changes in all parameters of the ADMAG AE are inhibited and cannot be changed using either the HART Communicator or the ADMAG AE front panel key switches.

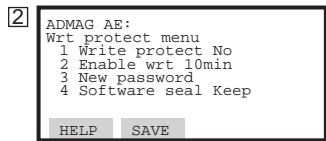
Setting Password

Example : Set the password to “1 2 3 4”.

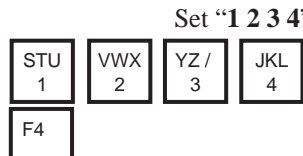
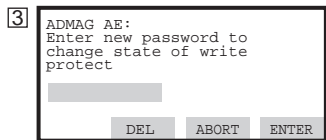
Call up “Wrt protect menu” in Hot key menu.



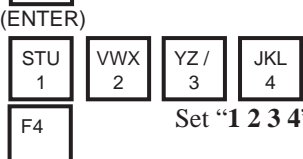
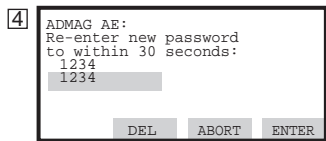
Select “Wrt Protect menu”.



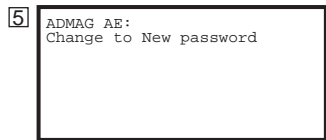
Select “New password”.



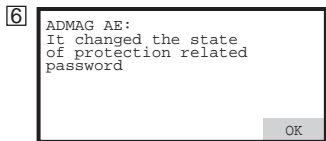
Set “1 2 3 4” and press ENTER (F4).



Set “1 2 3 4” again and press ENTER (F4).



“Write protect” status changes from “No” to “Yes”



Press OK (F4).

Changing Password

Example : Change the password from "1 2 3 4" to "6 7 8 9 A "

Call up "Wrt protect menu" in Hot key menu.

Hot key → 2. Wrt protect menu → 3. Enable wrt 10min

- 1

```

ADMAG AE:
Enter current
password to enable to
write for 10
minutes:

```

DEL ABORT ENTER

"1 2 3 4"

F4

(ENTER)

Enter the password and press **ENTER (F4)**.

- 2

```

ADMAG AE:
Release the write
protection for 10
minutes.

```

ABORT OK

F4

(OK)

Press **OK (F4)**.
Write protection status is released for 10 minutes.

- 3

```

ADMAG AE:
If you wish to
release completely,
you have to change
password to all of
spaces.

```

ABORT OK

F4

(OK)

Press **OK (F4)**.

- 4

```

ADMAG AE:
Wrt protect menu
1 Write protect No
2 Enable wrt 10min
3 New password
4 Software seal Keep

```

HELP SAVE

YZ /
3

Select "New password".

- 5

```

ADMAG AE:
Enter new password to
change state of write
protect

```

DEL ABORT ENTER

"6 7 8 9 A"

F4

(ENTER)

Set "6 7 8 9 A" and press **ENTER (F4)**.

- 6

```

ADMAG AE:
Re-enter new password
write 30 seconds:
6789A
6789A

```

DEL ABORT ENTER

"6 7 8 9 A"

F4

(ENTER)

Set "6 7 8 9 A" again and press **ENTER (F4)**.

- 7

```

ADMAG AE:
Change to New password

```

- 8

```

ADMAG AE:
It changed the state
of protection related
password

```

OK

F4

(OK)

Press **OK (F4)**.

**NOTE**

1. “**Enable wrt 10min**” release write protection status for 10 minutes. While write protection status is released, it is possible to enter a new password in the “**New password**”. It will not be possible when 10 minutes have elapsed.
 2. To release write protection status completely, enter 8 spaces in the “New password”. This causes “**Write protect**” status to change from “**Yes**” to “**No**”.
 3. If both ADMAG AE and HART Communicator power off and on again within 10 minutes after releasing of write protection status, the enabled write protection status becomes unavailable.
 4. “L1:TUNING” which is the write protection for ADMAG AE front panel key switches can be set “00:INHIBIT” or “01:ENABLE” only when “Write Protect” on HART Communicator shows “No”.
-

(11) Other Functions and Operation

Please set the other needed parameters with the same way. The following document is useful for your operation.

Parameter Summary: Appendix of this text

Menu Tree: 1.3.3 Menu Tree of this text

ADMAG AE Instruction Manual: IM1E7B0-02E or IM1E7C1-E

Product Manual for the HART Communicator: MAN 4250E

2. ZERO ADJUSTMENT USING HART COMMUNICATOR

After installation, wiring and parameter setting, zero point adjustment is needed.

Zero point can be adjusted by simple key operation of the HART communicator. The operating procedure is as follows :

Call up "Zero tuning" display.

1. Device setup → 2. Diag/Service → 1. Test device → 3. Zero tuning

①

```

ADMAG AE :
Zero tuning
Inhibit
Enable
  
```

ESC ENTER



Select "Enable" and press **ENTER (F4)** and **SEND (F2)**.

F4

(ENTER)

F2

(SEND)

Call up "Auto zero" display.

1. Test device → 2. AutoZero

①

```

ADMAG AE :
Abort to enter auto
zero
  
```

ABORT OK

F4

Press **OK (F4)**.

(OK)

②

```

ADMAG AE :
Waiting for auto zero
to complete
  
```

ABORT

Wait for about 30 seconds.

③

```

ADMAG AE :
Auto zero passed
  
```

ABORT OK

F4

Press **OK (F4)**.

(OK)

This parameter is only for execution.



IMPORTANT

1. Zero adjustment should be done only when the fluid velocity is completely zero by closing the valve.
2. Do not turn off the power to the ADMAG AE immediately after zero adjustment. Powering off within 30 seconds after zero adjustment will return the adjustment to the previous setting.

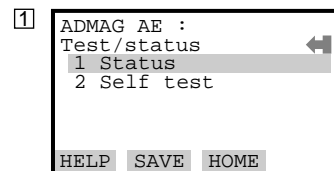
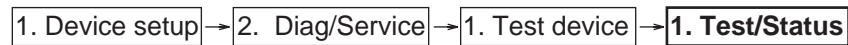
3. SELF-DIAGNOSTICS USING HART COMMUNICATOR

3.1 Checking for Problems

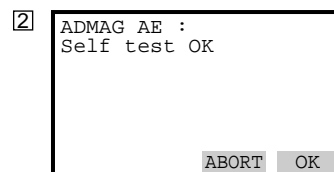
3.1.1 Identify Problems with HART Communicator

Self-diagnostics of the ADMAG AE and check of incorrect data setting can be carried out with the HART communicator. There are two methods for self-diagnostics of the ADMAG AE, self-diagnostics for every transmission and manually executing the SELF TEST command. When an error message appears, follow “Table 3.1.1 Error Description and Countermeasure.”

Call up “Test/Status” display.

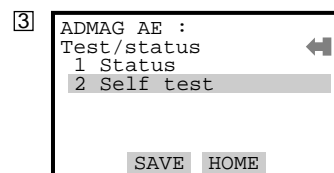


Select “Self test”

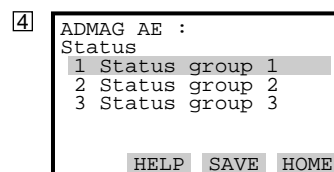


If there is no error detected, “Self test OK” will be displayed. Press **OK (F4)**.

When an error occurs, an error message appears and the results of self-diagnostics appear in the “Status”.

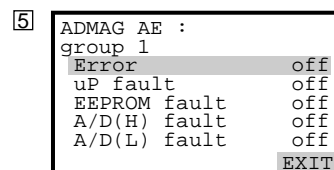


Call up “Status”.



The status menu is separated into 3 groups. About items of each group, see Table 3.1.1.

Select the desired group.



If there is no error, the result of diagnostics is indicated as “Off”.

If “On” is indicated, a countermeasure for that error is necessary.

Table 3.1.1 Error Description and Countermeasure

Parameters	No.	Error Code	Description	Countermeasures
Status group 1	1	Error	Alarm occurrence of (2) to (22)	—
	2	μP fault	Microprocessor error	Contact the nearest Yokogawa office or service center.
	3	EEPROM fault	EEPROM error	
	4	A/D(H) fault	A/D converter (high frequency) error	
	5	A/D(L) fault	A/D converter (low frequency) error	
	6	Signal overflow	Excessive input signal	Check the following : <ul style="list-style-type: none"> • Breaking of the signal line from terminals A, B and C to the flow tube • Mix of the signal, power supply, excitation and other cables • Stray currents in the measured fluid • Incorrect grounding
	7	Coil open	Flow tube coil open-circuit	Check the breaking of the flow tube exciter section with EX1 and EX2 terminals.
	8	Span vel. > 10 m/s	Flow velocity span setting exceeds 11 m/s.	Change settings.
Status group 2	9	Span vel.< 0.3 m/s	Flow velocity span setting is 0.2 m/s or less.	
	10	P.span > 1000 p/s	Pulse output rate exceeds 1100 p/s at 50% duty. It exceeds 1000 p/s at 0.5 ms pulse width.	
	11	P.span > 500 p/s	It exceeds 500 p/s at 1 ms pulse width.	
	12	P.span > 25 p/s	It exceeds 25 p/s at 20 ms pulse width.	
	13	P.span > 15 p/s	It exceeds 15 p/s at 33 ms pulse width.	
	14	P.span > 10 p/s	It exceeds 10 p/s at 50 ms pulse width.	
	15	P.span > 5 p/s	It exceeds 5 p/s at 100 ms pulse width.	
	16	P.span < 0.0001 p/s	It is 0.00005 p/s or less.	
Status group 3	17	T.span > 1000 p/s	Internal totalization exceeds 1100 p/s.	Contact the nearest Yokogawa office or service center.
	18	T.span < 0.0001 p/s	Internal totalization is 0.00005 p/s or less.	
	19	4-20 lmt error	Low limit set exceeds high limit set.	
	20	EMPTY PIPE	Pipe is not filled with fluid or insulating material attached to measuring electrode.	
	21	Multirange error	Multirange is not set as follows: first < second range	
	22	Dev id	Device ID has not entered yet.	

PARAMETER SUMMARY

This appendix describes all parameters used by ADMAG AE. Note the differences between parameters on ADMAG AE indicator and those on HART Communicator. Parameters for HART Communicator are shown in Appendix-2 to 5.

Description of Items

For HART Communicator (Appendix-2 to 5)

Name	Data Range, Units	Default Value	R/W	Description	Ref. No.
①	②	③	④	⑤	⑥

Description of Items

	Item	Description
①	Name	Parameter name
②	Data Range, Units	For numeric values, settable ranges are shown. For selection items, selectable items are shown. For character strings, up to 8 characters are available.
③	Default Value	Default Value is shown. For /PRS spec. (option code), the specified data has already been entered.
④	R/W	R : Read only W : Write permitted
⑤	Description	Summary of the parameter is described.
⑥	Ref. No.	Equivalent ADMAG AE indicator parameter number

Parameters for HART Communicator

Name	Data Range , Units	Default Value	R/W	Description	Ref. No.
PV	-32400 to 32400		R	Display instantaneous flow rate in engineering unit.	-
Total	0 to 999999	0	W	Display and reset forward direction totalization value.	-
PV AO	2.40 to 21.60		R	Display current output.	-
Span	0.0001 to 30000	1.0000	W	Set flow span in selected unit.	03
Status group 1	Error μ P Fault EEPROM Fault A/D(H) Fault A/D(L) Fault Signal Overflow Coil Open Span Vel.>10m/s		R	Display self-diagnostics result. "ON" shows error status. "OFF" shows normal status. (The output is off - active.) See Table 3.1.1.	-
Status group 2	Span Vel.>0.3m/s P.Span>1000p/s P.Span>500p/s P.Span>25p/s P.Span>15p/s P.Span>10p/s P.Span>5p/s P.Span>0.0001p/s		R	Ditto	-
Status group 3	T.Span>1000p/s T.Span>0.0001p/s 4-20 LMT Error Empty Pipe Multi Range Error Dev Id		R	Ditto	-
Self test	-	-	-	Execute self-diagnostics.	-
Auto zero	-	-	W	Execute automatic zero adjustment.	C2
Zero tuning	Inhibit Enable	Enable	W	Restrict automatic zero adjustment.	C1
D/A trim	ZERO: 3.2 to 5.6mA SPAN: 18.4 to 21.6mA		W	Adjust 0, 100% points of D/A converter.	-
Scaled D/A trim	ZERO: 3.2 to 5.6mA SPAN: 18.4 to 21.6mA		W	Adjust zero point and span of D/A converter.	-
Loop test	4mA 20mA Other	Other		Set test output value.	H2
Status out	Normal Close Open	Normal	W	Set test of status output.	H3
PV unit	gal/min l/min Cum/h ft/s m/s Spcl	m/s	W	Select engineering unit of flow rate. Display "spcl" in case of setting unit except item 1 to 5.	-
Line Size	0.0000 to 30000 mm/inch	100.0	W	Set flow tube nominal size in selected unit.	07
PV Damp	0.1 to 200.0	3.0	W	Set time constant of output.	02
Tag	-	-	W	Set tag no. up to 8 characters.	-
Descriptor	-	-	W	Set user-defined characters up to 16.	-
Message	-	-	W	Set user-defined characters up to 32.	-
Date	0 to 99'99'99	0	W	Set month/day/year.	-

Name	Data Range , Units	Default Value	R/W	Description	Ref. No.
Base vol unit	k Cum Cum l Cucm M gal k gal gal m gal k bbl bbl m bbl μ bbl m ft	m	W	Select volume unit of flow span.	04
Base time unit	d h min s	s	W	Select time unit of flow span.	05
Velocity check	0 to 32.767 m/s		R	Display span in m/s.	13
Size unit	mm in	mm	W	Select flow tube nominal size unit.	06
Low MF	0.2500 to 3.0000	1.0000	W	Set low frequency side meter factor.	08
High MF	0.2500 to 3.0000	1.0000	W	Set high frequency side meter factor.	09
Flow dir	Forward Reverse	Forward	W	Select flow direction.	14
PV %rnge	-10.0 to 110.0		R	Display instantaneous flow rate in %.	-
Rate limit	o to 10	5	W	Set limitation in the output change rate per second.	n3
Dead time	0 to 15	10	W	Set dead time in the rate limit.	n4
Power synch	Yes No	Yes	W	Select synchronization between excitation frequency and power frequency.	n5
Power freq	47.00 to 63.00 Hz	50.00	W	Display power frequency.	12
Pulsing flow	Yes No	No	W	In case of flow rate is pulsating flow.	n7
Total unit	n UNIT/P μ UNIT/P m UNIT/P UNIT/P k UNIT/P M UNIT/P PULSE/S	PULSE/S	W	Select totalization rate unit..	E1
Total scale	0.0000 to 30000	0	W	Set totalization rate.	E2
Total low cut	0 to 100 %	3	W	Set low input signal limit for totalizaion.	E3
TI set value	0 to 999999	0	W	Set forward direction totalization preset value.	E5
Total set	Inhibit Enable	Inhibit	W	Restrict forward direction totalization preset and reverse direction totalization reset.	E4
Total switch	o to 999999	0	W	Set switch actuation level when using status output totalization switch function.	E6
Reverse total	0 to 999999	0	W	Display and reset reverse direction flow totalization value.	-
Dif total	-999999 to 999999	0	R	Display differential totalization between forward and reverse.	-
Analog low cut	0 to 10	0	W	Set low cut width of analog output.	G1
Analog low lmt	-20 to 100	-20	W	Set low limit of analog output.	G2
Analog hi lmt	0 to 120	120	W	Set high limit of analog output.	G3
PV AO Alrm typ	-	lo	R	Display direction of current output after burn out.	-
4-20 alarm out	2.4mA or less 4.0mA Hold 21.6mA or more	2.4mA or less	W	Select current output during alarm occurrence.	11

Name	Data Range , Units	Default Value	R/W	Description	Ref. No.
Poll addr	0 to 15	0	W	Set polling address when multidrop mode.	-
Num req preams	5	5	R	Display number of request preambles.	-
Burst mode	Off On	Off	W	Select "ON" when burst mode.	-
Burst Option	PV % range/current Process var/crnt	PV	W	Select sending items (instantaneous flow rate,output" in % and/or current output) when burst mode.	-
Output function	Pulse out Alarm out Bi direction Auto 2 ranges Low alarm Total switch	Pulse out		Select output functions except multi-range.	10
Reverse span	0.0001 to 30000	1.0000	W	Set span for reverse direction multi-range.	30
Bi direction hys	0 to 10	2	W	Set hysteresis upon change in forward flow rate to reverse flow rate, and vice versa.	31
Forward span2	0.0001 to 30000	1.0000	W	Set second span for forward direction multi-range.	33
Auto range hys	0 to 15	10	W	Two range transfer hysteresis	34
Low alarm	-10 to 110	-10	W	Set low limit alarm.	36
Low alarm hys	0 to 10	5	W	Hysteresis for alarm output at low flow limits	37
Pulse unit	nUNIT/P μ UNIT/P mUNIT/P UNIT/P kUNIT/P mUNIT/P PULSE/S	PULSE/S	W	Select pulse rate unit.	F1
Pulse scale	0.0001 to 30000	0	W	Set pulse rate.	F2
Pulse low cut	0 to 100	3	W	Set low input signal limit for totalizaion when pulse output.	F3
Pulse width	50% DUTY 0.5msec 1msec 20msec 33msec 50msec 100msec	50% DUTY	W	Select pulse width.	F4
Disp select	Rate(%) Rate For.total Rev.total Dif.total Rate(%) /For.ttl Rate/For.ttl Rate(%) /Rate Rate(%) /Rev.ttl Rate/Rev.ttl Rate(%) /Dif.ttl Rate/Dif.ttl	Rate(%)	W	Select display items on upper 7-seg LED line.	d1
FL user sel	Not provided Provided	Not provided	W	Select whether PV is displayed with user-difined unit.	d2
FL user span	0 to 3.0000	100	W	Set value displayed in PV at 100% of range in selected unit.	d3
Total/Pulse	No damp Damp	Damp	W	Select whether instantaneous flow rate values or damping derived flow rate values are to be used in totalization/pulse.	n1
Output mode	On active Off active	On active	W	Select active level of status output when an item other than alarm output is selected for parameter N02.	n2
Empty pipe	Alarm No alarm	Alarm	W	Select alarm effectiveness when flow tube is not filled with fluid.	-
Manufacture	YOKOGAWA	YOKOG- AWA	R	Always "YOKOGAWA"	-

Name	Data Range , Units	Default Value	R/W	Description	Ref. No.
Dev id	-	It's own ID No.	R	Display Device ID.	-
Write protect	Yes No	No	R	Display whether "Write Protect" or not.	-
Universal rev	-	-	R	Display DDL revision number.	-
Fld dev rev	-	-	R	Display field device revision number.	-
Software rev	-	-	R	Display software revision number.	-
Review1			R	Display the parameters which has already set.	
Review2			R	Display the parameters which has already set.	
Review3			R	Display the parameters which has already set.	