

ADMAG

**AM11 - AS / DH / DE / DL / DB
Magnetic Flow Converter**

IM 1E6C1-01E

IM 1E6C1-01E
8th Edition

Contents

1. INTRODUCTION	1-1
2. HANDLING PRECAUTIONS	2-1
2.1 Checking Model and Specifications	2-1
2.2 Accessories	2-1
2.3 Storage Precautions	2-1
2.4 Installation Location Precautions	2-1
3. INSTALLATION	3-1
3.1 Installation Location	3-1
3.2 Mounting	3-1
3.3 Wiring Precautions	3-3
3.3.1 Protective Grounding	3-3
3.3.2 General Precautions	3-3
3.3.3 Cable Types	3-3
3.3.4 Connection to AM Magnetic Flow Tube	3-4
3.3.5 Wiring Ports	3-5
3.3.6 Input /Output Connections	3-6
3.3.7 DC Connections	3-8
4. BASIC OPERATING PROCEDURES	4-1
4.1 Operating Panel Configuration and Functions	4-1
4.2 Data Setting Display Configuration and Functions	4-3
4.2.1 Liquid Crystal Display	4-3
4.2.2 Data Types	4-4
4.2.3 Basic Key Operations	4-4
4.2.4 Moving the Decimal Point, and Changing Sign	4-5
5. FUNCTION AND PARAMETER SETTINGS	5-1
5.1 Nominal Size Settings	5-1
5.2 Flow Span Setting	5-2
5.3 Meter Factor Setting	5-4
5.4 Power Frequency Setting	5-5
5.5 Other Functions and Settings	5-5
5.5.1 Pulse Output	5-5
5.5.2 Totalization Function	5-6
5.5.3 Damping Time Constant	5-7
5.5.4 Current Output during Alarm Occurrence	5-8
5.5.5 Limiting Current Output	5-8
5.5.6 Alarm Outputs at High / Low Flow Limits	5-8
5.5.7 Reversing Flow-Direction	5-8
5.5.8 7-segment LED Display Contents	5-9
5.5.9 User-Defined Units	5-10
5.5.10 Pulsation Flow Application	5-11
5.5.11 Data Settings Enable/Inhibit	5-11
5.5.12 Multiple Range Selection Via External Contact Inputs (only for AM11-DH/-DE/-DL)	5-11

5.5.13	Multiple Ranges With Automatic Selection(only for AM11-DH/-DE/-DL)	5-13
5.5.14	Signal Lock at 0% Via Contact Input (Only for AM11-DH/-DE/-DL)	5-14
5.5.15	Forward Totalization Preset Via Contact Input (Only for AM11-DH/-DE/-DL) ...	5-14
5.5.16	Totalization Switch (Only for AM11-DH/-DE/-DL)	5-15
5.6	Operation Via BT200 Terminal (only available AM11-DH, -DB, and -DL)	5-16
5.6.1	Connecting the BT200 to AM11	5-16
5.6.2	BT200 Keypad Layout	5-17
5.6.3	Major BT200 Key Functions	5-18
5.6.4	Displaying Flow Rate Data	5-20
5.7	Setting Parameters Using BT200	5-21
5.7.1	Setting Nominal Size	5-21
5.7.2	Setting Flow Span	5-22
5.7.3	Setting Meter Factor	5-23
5.7.4	Power Frequency	5-24
5.7.5	Other Functions and Settings	5-24
5.7.6	Other Important Points	5-24
6.	ACTUAL OPERATION	6-1
6.1	Pre-operation Zero Adjustment	6-1
6.1.1	Zero Adjustment Using Data Setting Keys	6-1
6.1.2	Zero Adjustment Using BT200 (Only Available for AM11-DH/-DL/-DB)	6-2
6.1.3	Zero Adjustment Via Contact Input (Only Available AM11-DH/-DE/-DL)	6-2
6.1.4	Zero Adjustment using HART Communicator(Only Available for AM11-DE)	6-3
6.2	Self-diagnostics Functions	6-4
6.2.1	Display and Output status during Alarm Occurrence	6-4
6.2.2	Self-diagnostics Using HART Communicator(Only Available for AMM-DE)	6-5
6.2.3	Error Description and Countermeasures	6-6
7.	MAINTENANCE	7-1
7.1	Loop Test (Test Output)	7-1
7.1.1	Settings for Test Output Using Data Setting Keys	7-1
7.1.2	Setting for Test Output Using BT200 (Only Available for AM11-DH/-DL/-DB)	7-2
7.1.3	Setting for Test Output Using HART Communicator (Only Available for AM11-DE)	7-3
7.2	Trouble Shooting	7-5
8.	OUTLINE	8-1
■	STANDARD SPECIFICATIONS	8-1
■	FUNCTIONS	8-1
■	STANDARD PERFORMANCE	8-2
■	NORMAL OPERATING CONDITIONS	8-3
■	MODEL AND SUFFIX CODE	8-3
■	Optional Specifications	8-3
■	ACCESSORIES	8-3
■	TERMINAL CONNECTIONS	8-4
9.	PARAMETER LIST	9-1

1. INTRODUCTION

This instrument has been already adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

■ Regarding This Manual

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

■ Safety Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.

The following safety symbol marks are used in this manual and instrument;



WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.



CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.



IMPORTANT

A IMPORTANT sign denotes an attention to avoid leading to damage to instrument or system failure.



NOTE

A NOTE sign denotes a information for essential understanding of the operation and features.

- ⊕ Protective grounding terminal.
- ⊕ Function grounding terminal. This terminal should not be used as a "Protective grounding terminal".
- ~ Alternating current.
- Direct current.

1. INTRODUCTION

■ Warranty

- The guaranteed term of this instrument is described in the quotation. We repair the damages that occurred during the guaranteed term for free.
- Please contact with our sales office when this instrument is damaged.
- If the instrument has trouble, please inform us model code, serial number, and concrete substances or situations. It is preferable to be attached a outline or data.
- We decide after the examination if free repair is available or not.
- Please consent to the followings for causes of damages that are not available as free repair, even if it occurred during the guaranteed term.

A: Unsuitable or insufficient maintenance by the customer.

B: The handling, using, or storage that ignore the design and specifications of the instrument.

C: Unsuitable location that ignore the description in this manual.

D: Remaking or repair by a person except whom we entrust.

E: Unsuitable removing after delivered.

F: A natural disaster (ex. a fire, earthquake, storm and flood, thunderbolt) and external causes.

For the safety using;



WARNING

- In wiring, please confirm that the cables are not powered before connecting.

■ Combination with Flow Tube



IMPORTANT

AM11 magnetic flow converter is used with the following combination.

AM11-AS/-DH/-DE/-DB

↔ AM100D/200D/300D/400D/500D*A

AM11-DL ↔ AM500D*B



CAUTION

In case of combination with the explosion proof version flow tube (AM□□□DC/DN), please see the manual IM 1E6D0-01E. The construction of the instrument, installation, external wiring, maintenance, and repair are strictly restricted, and non-observance or negligence of these restriction would result dangerous condition.



WARNING

- The Magnetic Flow Tube is a heavy instrument. Please give attention to prevent that persons are injured by carrying or installing. It is preferable for carrying the instrument to use a cart and be done by two or more persons.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the meter.

2. HANDLING PRECAUTIONS

This instrument has been already tested thoroughly at the factory. When the instrument is delivered, please check externals and make sure that no damage occurred during transportation.

In this chapter, handling precautions are described. Please read this chapter thoroughly at first. And please refer to the relative matter about other ones.

If you have any problems or questions, please make contact with Yokogawa sales office.

2.1 Checking Model and Specifications

The model and specifications are shown on the Data Plate inside of the cover. Please confirm the specifications between the instrument that was delivered and the purchase order (refer to the chapter 8. Outline).

Please let us know Model and Serial No. when making contact with Yokogawa sales office.

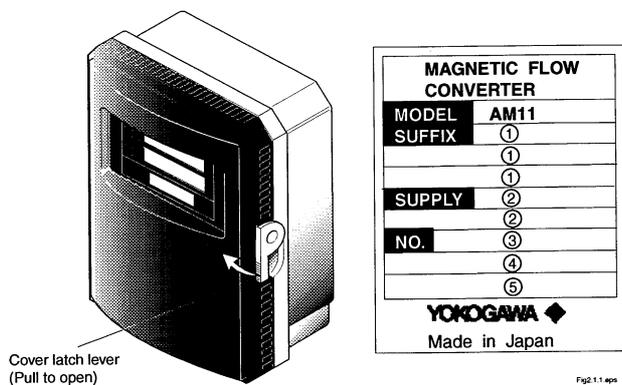


Figure 2.1 Data Plate

- ① : Suffix codes
- ② : Power supply voltage (power frequency)
- ③ : Serial number and production number
- ④ : Spare space
- ⑤ : For optional code /PRS; serial number of combined flow tube

2.2 Accessories

When the instrument is delivered, please make sure that the following accessories are in the package.

- Fuse (2A for AC, 2.5A for DC, 250V ; the spare fuse is taped to the cover inside) : 1-piece
- Mounting hardware ; 1-set
- Data sheet ; 1-sheet
- Unit labels ; 1-sheet
- Parameter table ; 1-sheet

2.3 Storage Precautions

In case the instrument is expected to be stored over a long term, please give attention to the followings;

- The instrument should be stored in its original packing condition.
- The storage location should be selected according to the following conditions:
 - 1) The location where it is not exposed to rain or water.
 - 2) The location where there is few vibration or shock.
 - 3) Temperature and humidity should be:
 - Temperature: -30 to 70°C (-22 to 158°F)
 - Humidity: 5 to 80% RH (no condensation)
 Preferable ambient temperature and humidity are 25°C (77°F) and about 65% RH.

2.4 Installation Location Precautions

Please select the installation location considering the following items to ensure long term stable operation of the flow tube.

- Ambient Temperature:
 - Please avoid to install the instrument at the location where temperature changes continuously. If the location receives radiant heat from the plant, provide heat insulation or improve ventilation.
- Atmospheric Condition:
 - Please avoid to install the instrument in an corrosive atmosphere. In case of installing in the corrosive atmosphere, please keep ventilating sufficiently and prevent rain from entering the conduit.
- Vibration or shock:
 - Please avoid to install the instrument at the location where there is heavy vibration or shock.

3. INSTALLATION



WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

3.1 Installation Location



IMPORTANT

Please install the converter to the location where it is not exposed to direct sunlight and ambient temperature is -10 to 60°C (14 to 140°F)*; relative humidity is 5 to 95%RH. (no condensation)
 *In case of the ambient temperature 50°C (122°F) or higher, please make air-purge for AM11-DL.

3.2 Mounting

This instrument can be mounted using surface mounting, 2-inch pipe mounting, or panel mounting.

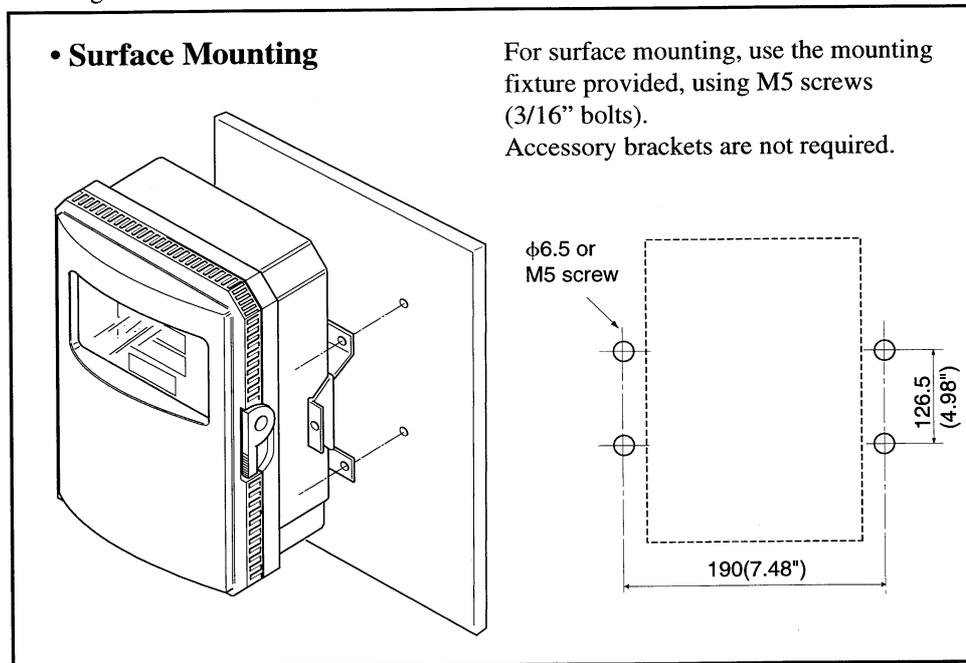


Figure 3.2.1 Surface Mounting

• 2-inch Pipe Mounting

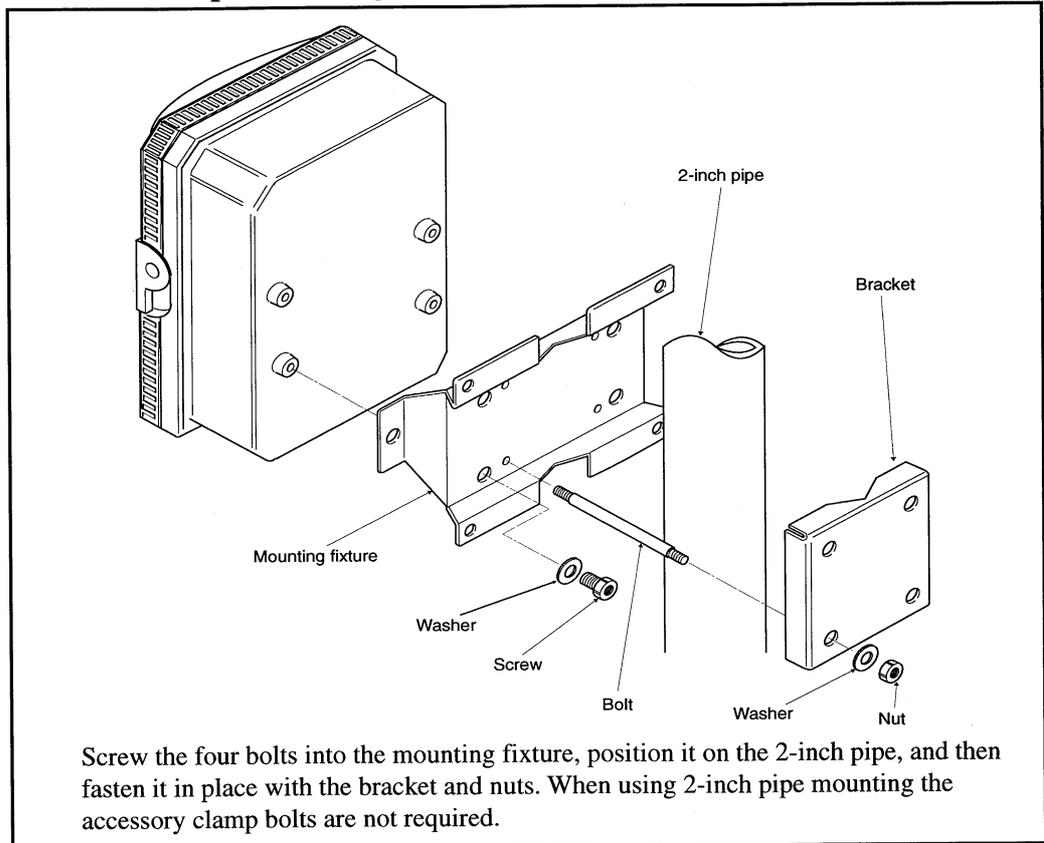


Figure 3.2.2 2-inch Pipe Mounting

• Panel Mounting

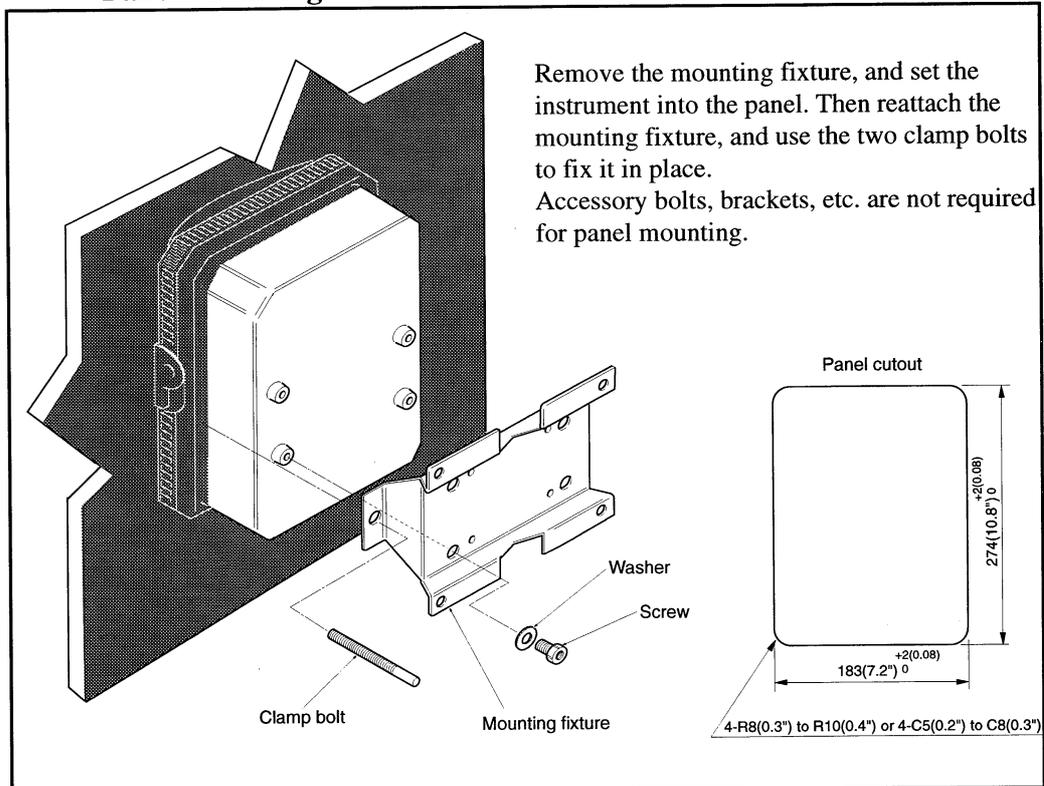


Figure 3.2.3 Panel Mounting

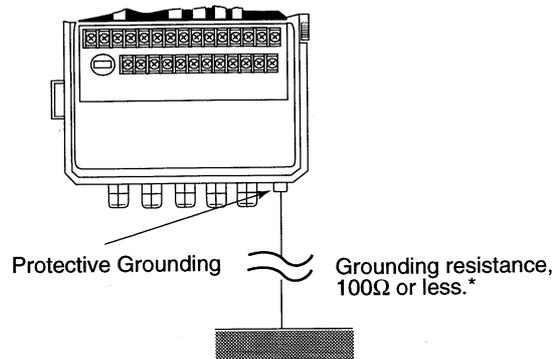
3.3 Wiring Precautions

This section is described wiring only for flow converter side. Please see "Wiring" in AM Magnetic Flow Tube Instruction Manual for flow tube side.

3.3.1 Protective Grounding

CAUTION

Please be sure to connect protective grounding of AM11 with cable of 2mm² or larger cross section in order to avoid the electrical shock to the operators and maintenance engineers and prevent the influence of external noise. And further connect the grounding wire to the  mark (100Ω or less).



*10Ω or less for optional code /A(lightning protector)

Figure 3.3.1 Protective Grounding

3.3.2 General Precautions

Please give attention to the followings in wiring.

CAUTION

- In case the ambient temperature exceeds 50°C (122°F), please use heat-resistant cable with maximum allowable temperature of 70°C (158°F) or above for using JIS flameproof type flow tube.
- Please pay attention to avoid the cable is bended excessively.
- Please do not connect cables outdoors in case of rain to prevent damages from dew formation and to keep insulation inside the terminal box of the flow tube.
- Please do not splice the cable between a flow tube and a converter if it is too short. Please replace the short cable with the cable which is appropriate length wholly.

- The all cable ends are to be provided with round crimp-on terminal.
- The signal cables must be routed in separate steel conduit tubes or flexible tubes.
- Please keep conduit or flexible tube water-tight using sealing tape.
- Please ground each of a flow tube and a converter separately.
- Please cover each shield of the signal cable with PVC tube or PVC tape to avoid contacting between two shields; shield and case.
- When waterproof glands or union equipped waterproof glands are used, the glands must be properly tightened to keep the box watertight.
- Please be sure to fully close the terminal box cover before the power is turned on.
- Please be sure to turn off the power before opening the cover.

3.3.3 Cable Types

(1) Dedicated Signal Cable(AM011)

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and used heat-resistant vinyl as the outer jacket material.

Finished diameter: 10.5 mm (0.413")
 Maximum length: 200 m (660 ft)
 Maximum temperature: 80°C (176°F)

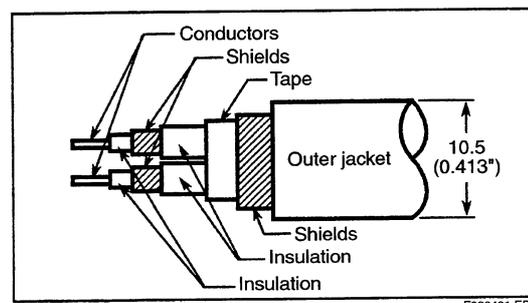


Figure 3.3.2 Dedicated Signal Cable AM011

IMPORTANT

If the cable is longer than required, cut off any extra length, rather coiling it up, and terminate the conductors as shown in Figure 3.3.3. Avoid using intermediate terminal boards to extend the cable length, or this will interrupt the shielding.

3. INSTALLATION

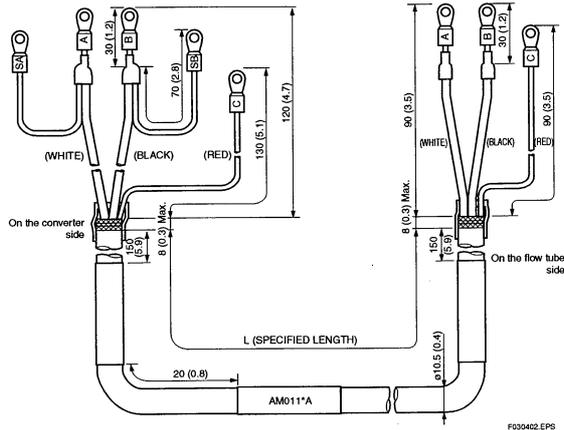


Figure 3.3.3 Treatment of Dedicated Signal Cable



CAUTION

Since A, B, SA, SB, and C all operate at different electrical potentials, securely insulate them from each other so they do not touch. The shields must not be allowed to touch each other or to touch the case. Cover each shield with vinyl tube or wrap in vinyl tape.



NOTE

Conductors A and B carry the signal from the electrodes, and C is at the potentials of the liquid it self (signal common). Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields). This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

(2) Excitation Cable

Please use Polyvinyl chloride insulated and sheathed control cables (JIS C3401) or Polyvinyl chloride insulated and sheathed portable power cables (JIS C3312) or equivalents.

Outer Diameter

- 6.5 to 12mm in diameter (7.5 to 12 mm for water-proof gland / ECG, /ECU, /ECW)

Nominal Cross Section

- Single wire; 0.5 to 2.5mm², Stranded wire; 0.5 to 2.5mm²

Unit: mm (inch)

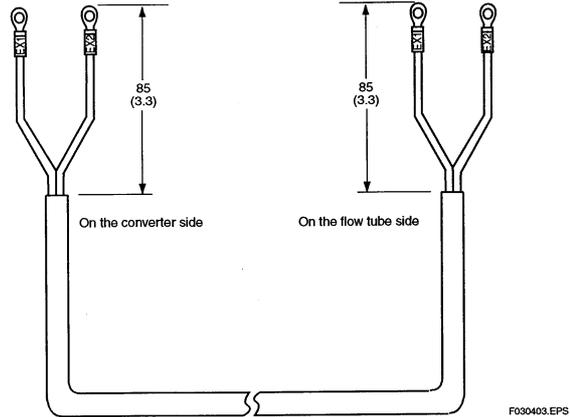


Figure 3.3.4 End Treatment of Excitation Cable

3.3.4 Connection to AM Magnetic Flow Tube

Connect the flow tube and converter in the following method.

(1) Flow Tube Model AM100D, AM200D, AM300D and AM400D

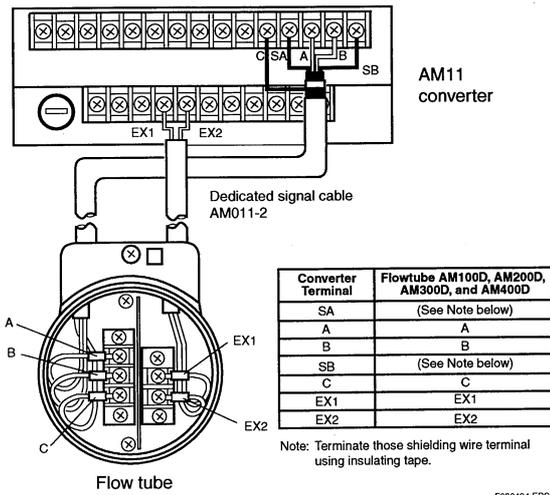


Figure 3.3.5 Connection

(2) Flow Tube Model AM500D

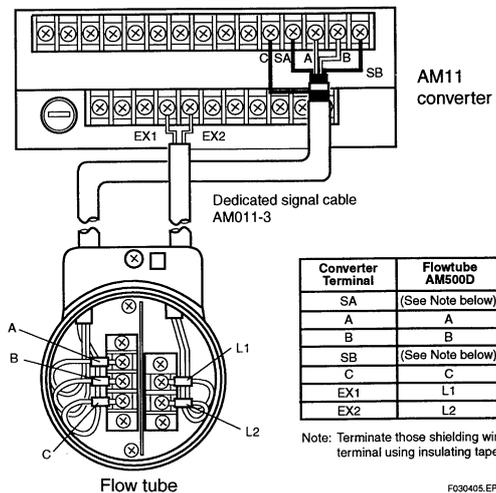


Figure 3.3.6 Connection

3.3.5 Wiring Ports

Please select the most suitable standard of wiring procedure for the wiring ports by customer's own.

A : Using the Waterproof Gland



IMPORTANT

To prevent water or condensate from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

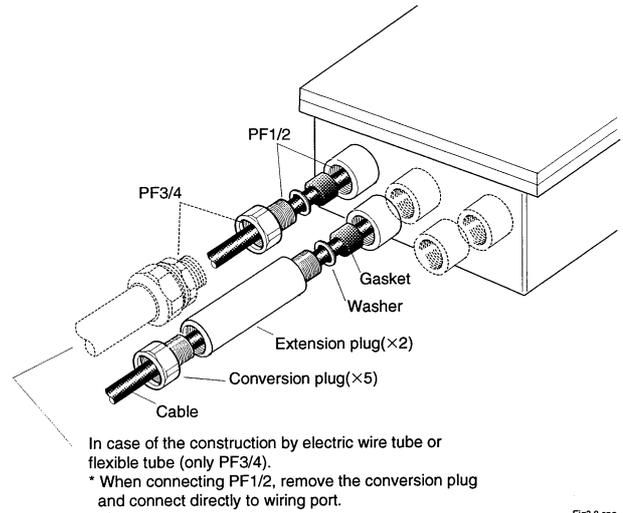


Fig3.8.eps

Figure 3.3.9 Waterproof Gland (ECW)

B : Conduit Wiring

In case of conduit wiring, please use the waterproof gland to prevent water flowing through the conduit pipe into the wiring connection.

Please slope the conduit pipe down, and install a drain valve at the low end of the vertical pipe.

Please open the drain valve regularly.

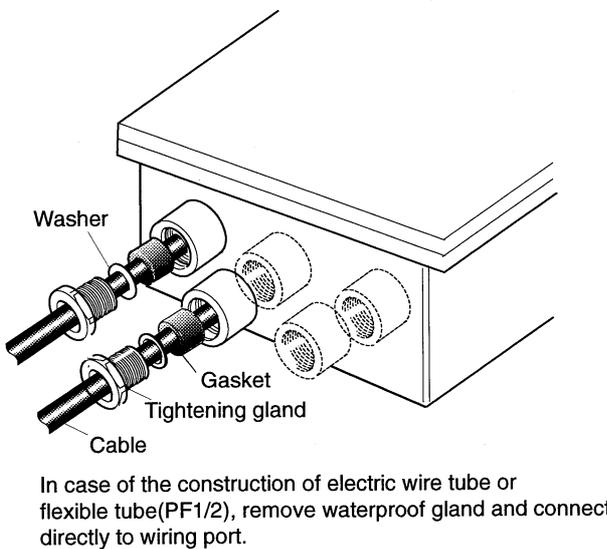


Figure 3.3.7 Waterproof Gland (ECG)

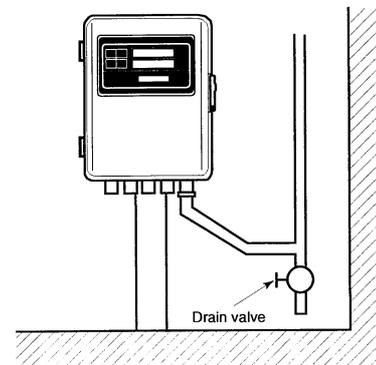


Figure 3.3.10 Conduit Wiring

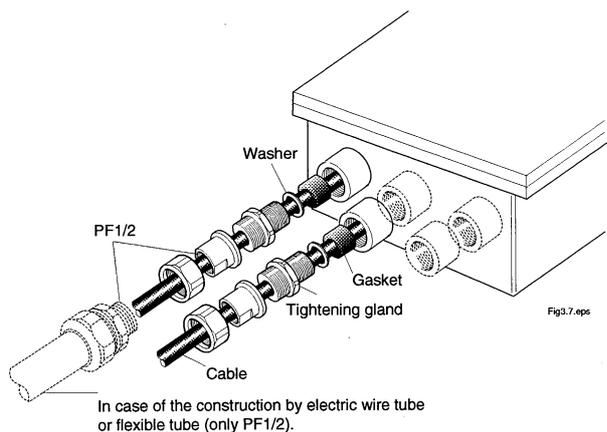


Fig3.7.eps

Figure 3.3.8 Waterproof Gland with Union Joint (ECU)

3. INSTALLATION

3.3.6 Input /Output Connections

(1) Terminal Positions

Terminal positions are shown in Figure 3.3.11, 3.3.12 and 3.3.13. The meanings are shown in Figure 3.3.14.

- AM11-AS

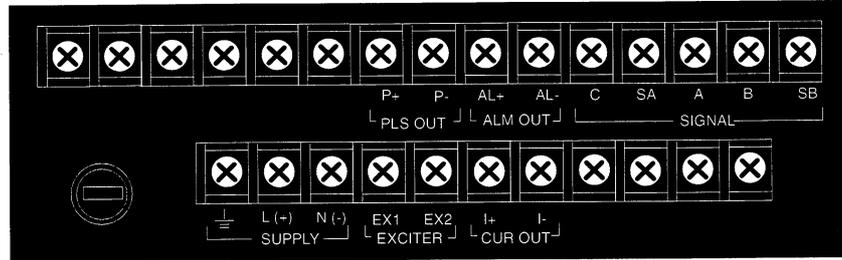


Figure 3.3.11 AM11-AS Terminal Positions

Fig3.12.eps

- AM11-DH/DE/DL

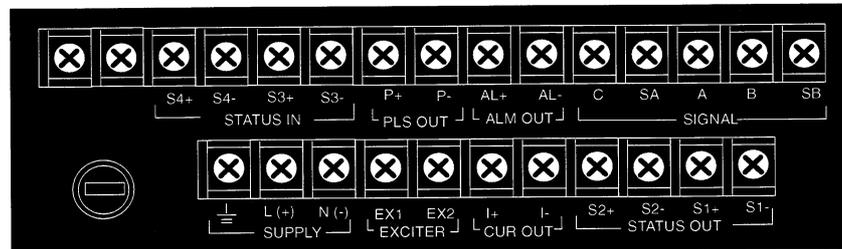


Figure 3.3.12 AM11-DH/DE/DL Terminal Positions

Fig3.13.eps

- AM11-DB

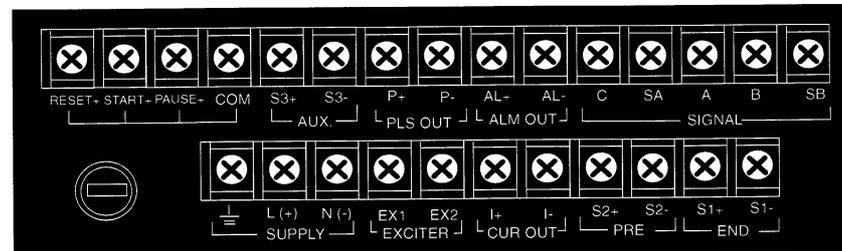


Figure 3.3.13 AM11-DB Terminal Positions

Fig3.14.eps

Terminal symbols	Description	Terminal symbols	Description		
SIGNAL	SA A B SB C	Flow signal input	STATUS OUT	S1+ S1-	Status output (only for AM11-DH/DE/DL)
CUR OUT	I+ I-	Current output 4 to 20mA DC	STATUS OUT	S2+ S2-	Status output (only for AM11-DH/DE/DL)
EXCITER	EX1 EX2	Excitation output	STATUS IN	S3+ S3-	Status input (only for AM11-DH/DE/DL)
SUPPLY	L(+) N(-) ⏏	Power supply 80 to 264V AC (Power supply 21.6 to 26.4V DC) Grounding Protective grounding (Outside and bottom of case)	STATUS IN	S4+ S4-	Status input (only for AM11-DH/DE/DL)
PLS OUT	P+ P-	Pulse output	END	S1+ S1-	Batch end status output (only for AM11-DB)
ALM OUT	AL+ AL-	Self-check or high/low limit alarm output	PRE	S2+ S2-	Prebatch status output (only for AM11-DB)
			AUX	S3+ S3-	Status input (only for AM11-DB)
			RESET START PAUSE COM		Batch reset status input(only for AM11-DB) Batch start status input(only for AM11-DB) Pause status input(only for AM11-DB)

*There are no status input/output terminals for AM11-AS.

Figure 3.3.14 AM11-AS/-DH/-DE/-DL Terminal

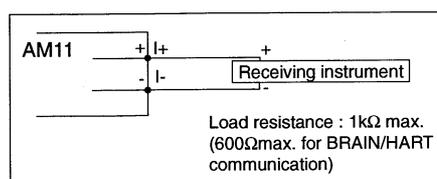
(2) Analog Signal Output(4 to 20mA DC)

Figure 3.3.15 Analog Signal Output Connection

(3) Pulse Output**IMPORTANT**

- Please give attention to voltage and polarity in wiring, because it is transistor contact (Insulation type).
- In case of the filtering constant of Electric Counter is more than the pulse width, it makes signal decreases and cannot be calculated correctly.
- In case of input impedance of Electric Counter is large, inductive noise from power supply bring bad influence to measurement. To calculate correctly, it is recommended to use sealed cable or to make input impedance small enough within the limits of pulse output of Magnetic Flowconverter.

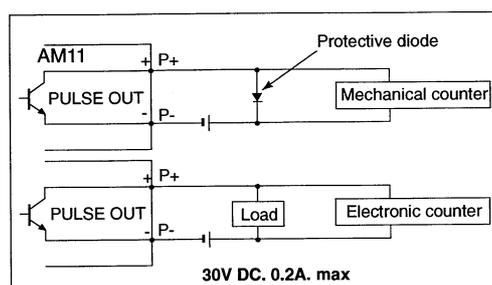


Figure 3.3.16 Pulse Output Connection

(4) Contact Input (Only Available AM11- DH /- DE/- DL/- DB)**IMPORTANT**

Contact inputs are designed for use with voltage-free ("dry") contacts (actively source current to detect the contact state). Be careful not to connect to any signal source carrying any voltage. Applying voltage may damage the input circuit.

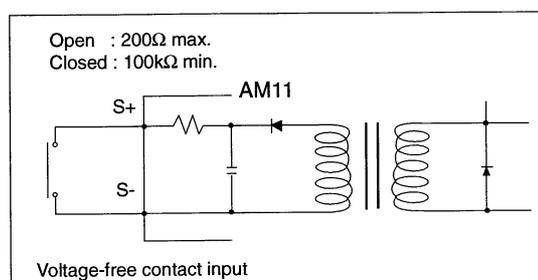


Figure 3.3.17 Contact Input Connection

(5) Contact Output (Only Alarm Output for AM11-AS)



Since this is an isolated transistor output, be careful of voltage and polarity when wiring. This output cannot switch an AC load. To switch an AC load, an intermediate relay must be inserted as shown in the figure 3.17. * The Alarm Output works "Close" (Normal) to "Open" (Alarm occurs)

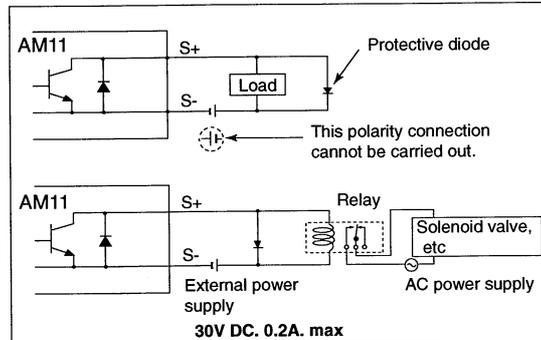


Figure 3.3.18 Contact Output Connection

3.3.7 DC Connections

(1) Setting Power Supply Frequency



In case of DC power supply version, the frequency of the power supply has to be adjusted. Please adjust for the local power frequency. Refer to "5.4 Power Frequency Setting" for the procedure.

(2) Connecting Power Supply

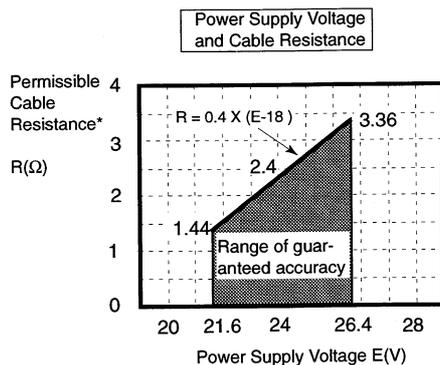


In case of 24VDC power supply, AC power supplies or reversed polarities cannot be connected. It will cause the fuse to burn out.

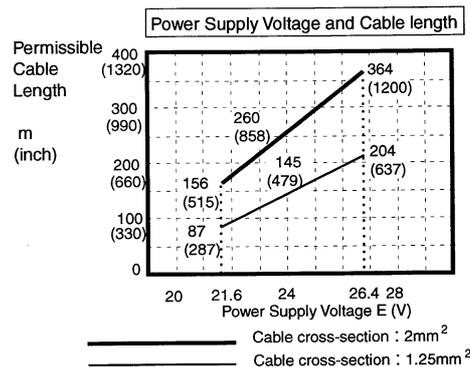
(3) Supply Power Rating for 24VDC



In case of 24VDC power supply, the specification for the supply voltage is 24VDC±10%, but input voltage of the converter drops due to cable resistance, so it should be used within the following range.



*with vinyl sheath cable at 20°C(68°F)



4. BASIC OPERATING PROCEDURES

This chapter describes the data composition and the operation procedure with the data setting keys of the operating panel of AM11. In case of AM11-DH, -DL, and -DB, see the chapter 6 for the operating procedure with BRAIN Terminal(BT). In case of AM11-DE, see the chapter 7 for the operating procedure with HART Communicator.

4.1 Operating Panel Configuration and Functions

• AM11-AS (Standard-Type)

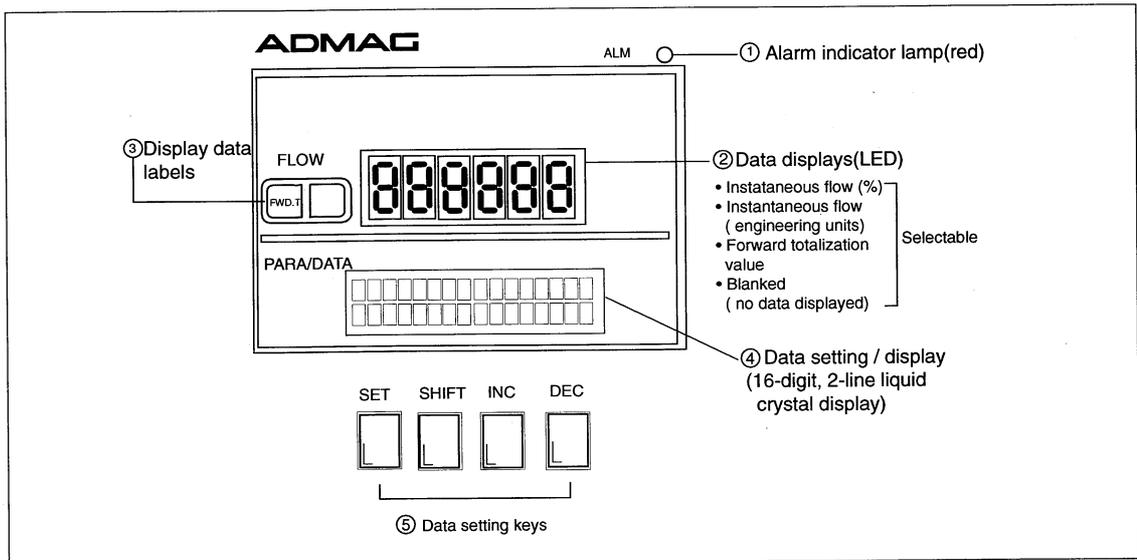


Figure 4.1.1 AM11-AS Operating Panel

• AM11-DH(High Performance, BRAIN Type), AM11-DE(High Performance, HART Type), AM11-DL(for Ultra Large Size Flow Tube)

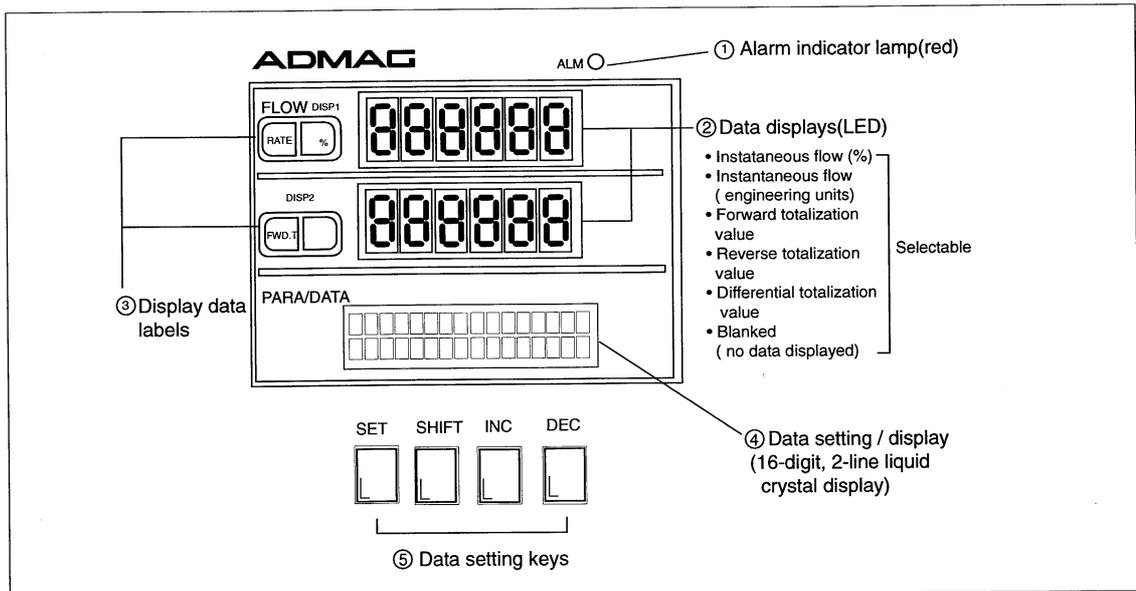


Figure 4.1.2 AM11-DH, AM11-DE, AM11-DL Operating Panel

• AM11-DB (Batch Control Type)

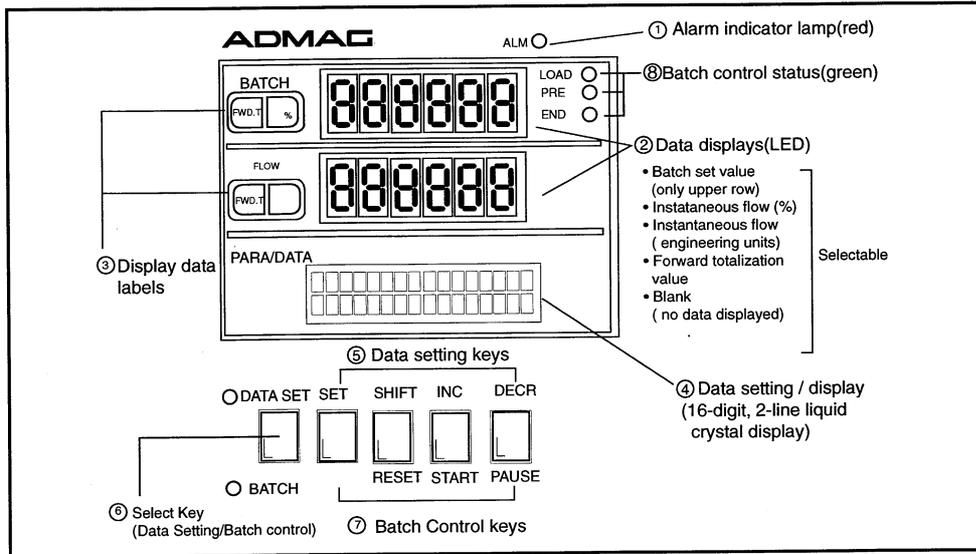


Figure 4.1.3 AM11-DB Operating Panel

Operating Panel Names and Functions

- (1) **Alarm Indicator Lamp (Red)** : Flashes when the alarm function has been activated. (instrument failure/setting error by the self-check, or a high /low flow limit alarm.)
- (2) **Data Displays (LED)** : It is available to display 4 to 6 kinds of data(including Blank) on the 6-digit, 7-segment LED.
- (3) **Display Data Labels** : The accessory kit provides adhesive labels imprinted with data types and engineering units for the data to be presented on the LED displays. The user can select and attach the appropriate labels.
- (4) **Data Setting / Display Section** : Displays all parameters.
- (5) **Data Setting Keys** : All parameter setting and changes to display items are performed using these four Keys.

*See Section 4.2," Data Setting Display Configuration and Functions", for uses of the data setting/display and data settings keys.

- (6) **Data Setting / Batch Control Selection Key(only for AM11-DB)** : Each time the select key is pressed, the data setting keys are toggled between data setting and batch control modes. The mode whose LED lamp(green) is lit is enabled. If INHIBIT has been selected using the G10 BATCH parameter, switching to batch control mode is disabled.



IMPORTANT

When changing a data setting while a batch operation is in progress, the user must first use the select key to switch to data setting mode. Be careful, since pressing the SHIFT/INC key while in batch control mode will start batch operation.

- (7) **Batch Control Keys (only for AM11-DB)** : RESET; batch totalized value reset key, START; batch control start key, PAUSE ; batch control pause key.
- (8) **Batch Control Status (only for AM11-DB)** : Batch control status is indicated with each LED lamp (green).

4.2 Data Setting Display Configuration and Functions

All data settings for individual parameters, selection of LED display items, and all other data manipulations are performed using the four keys and LCD display.

The following sections give an overview of the configuration of the LCD display and of the operations of these four keys.

4.2.1 Liquid Crystal Display

Figure 4.2.1 shows the configuration of the liquid crystal display.

The parameter name is displayed on the upper line of the display, while the data is displayed on the lower line using a combination of numerals, decimal points, unit codes, and alphanumeric character strings.

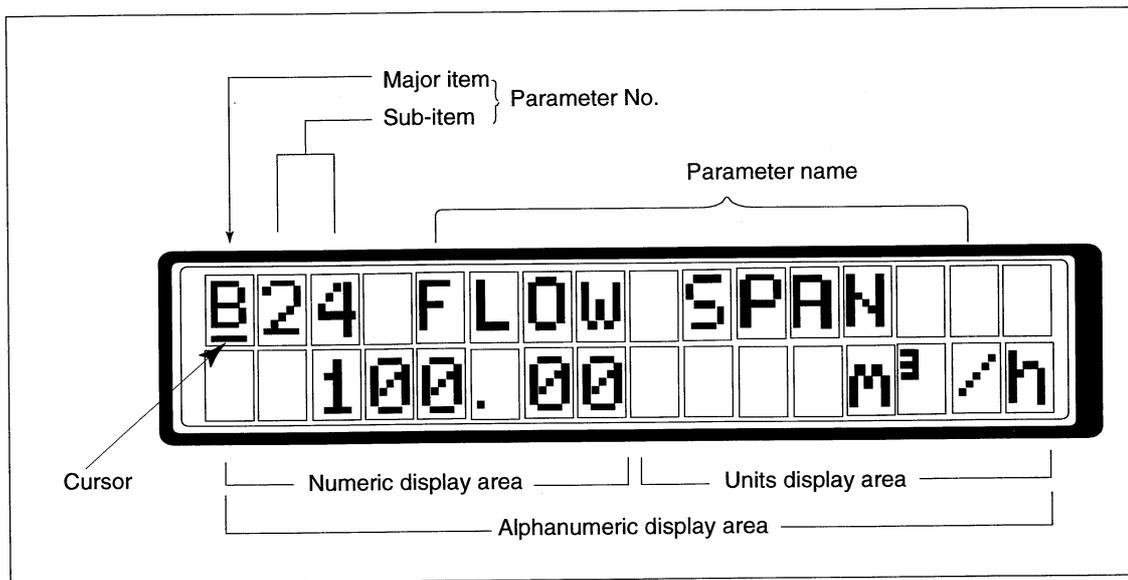


Figure 4.2.1 Liquid Crystal Display

- Major items are divided into nine broad classes of parameters, A, B, C, ...N. For example, "A" represents display-related parameters, "B" represents basic data setting related parameters, etc.
- Sub-items provide further division of functions under each major item. For example, the "B" parameters are further subdivided up to "B24", which sets the flow span, and "B25", which sets the damping (time constant).

*A full listing of the parameter types used in the AM11 are included at the end of this document. Please refer to this listing.

4.2.2 Data Types

Data types differ depending on the parameter item, and can be divided into the following three, displays example.

Format	Display Example	Description
Numeric settings	B30 LOW MF 1.0 0 0 0	Data is set one digit at a time with a combination of numerals and decimal point.
Selections	B22 FLOW UNIT m ³	Data is selected from among a predefined set of alternatives.
Alphanumeric strings	B10 TAG NO AM11 - 1	Data consisting of a combination of alphanumeric characters. This type of data is set up by selecting a series of up to eight characters from those shown in the table below (for tag numbers, user- defined units, etc.)

←DEC (Space) INC→

0	1	2	3	4	5	6	7	8	9	-	↓	A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e	f
g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	[\
]	^	_	>	{		}	!	"	#	\$	%	&	'	()	*	+	,	-	.	/
:	;	<	=	>	?																

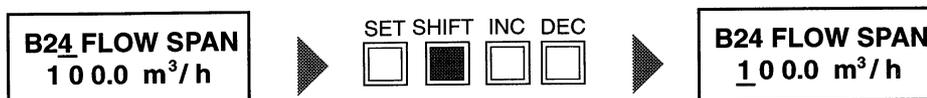
Display of the character set begins with " space ", using the"INC→" and the "← DEC" keys displays the other characters in the order that they appear in the table.

4.2.3 Basic Key Operations

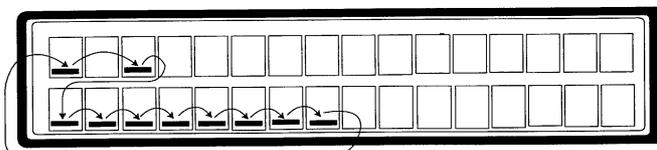
Parameters are changed using the **SET**, **SHIFT**, **INC**, and **DEC** keys.

The following illustrates the role of the individual keys. For example the key operations to change the flow span from 100.0m³/h to 200.0m³/h.

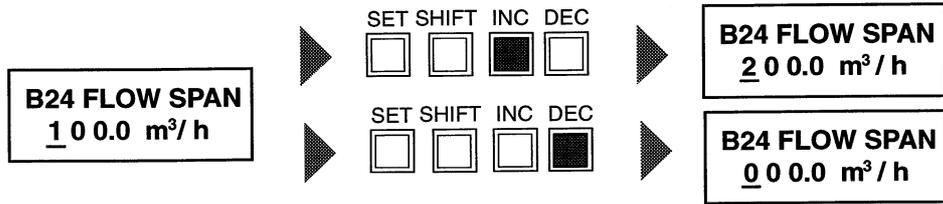
- (1) The **SHIFT** key is used to move the cursor, and select the position within the data to be changed.



- The sequence in which the cursor moves differs depending on the data type, however, the cursor always moves sequentially only along the positions that can be changed. (Cursor cannot move in the reverse direction.)

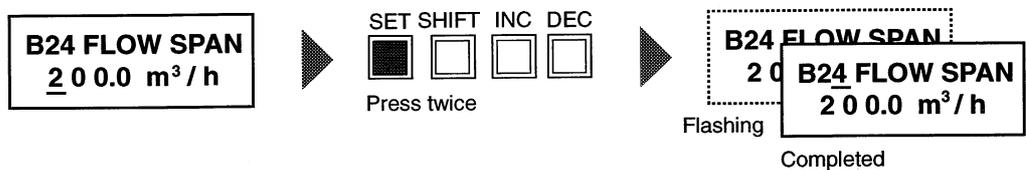


(2) **INC** is used to **INC** rease to the next data value, and **DEC** is used to **DEC** rease to the preceding data value.



The desired value can ultimately be reached using either INC or DEC.

(3) The **SET** key is used to store the modified data, and is used to "execute" a command for some functions.

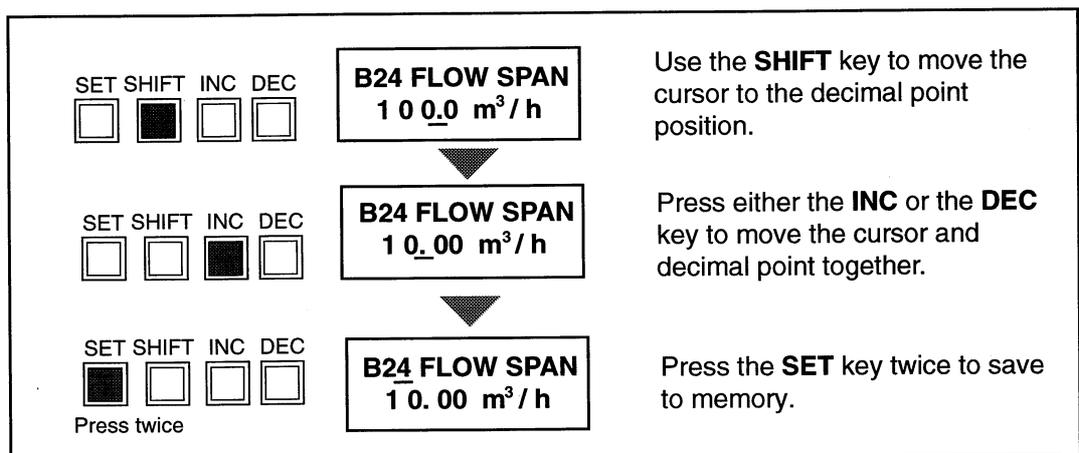


To input a parameter into memory, press the key twice, with a slight wait between key presses. Pressing the key once causes the entire display to begin flashing. After verifying the content of the area that is flashing, the user must press the key a second time to complete the setting; the cursor will move to the position shown in the diagram.

4.2.4 Moving the Decimal Point, and Changing Sign

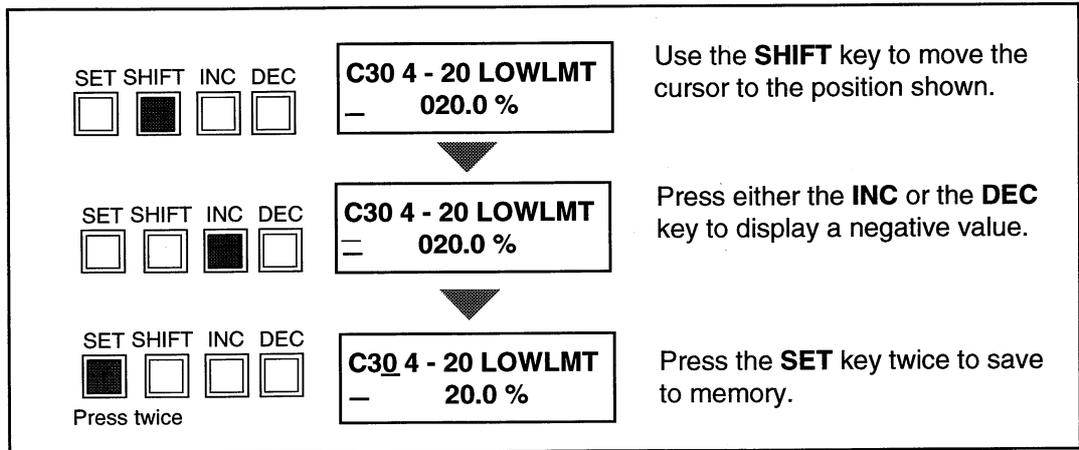
This section describes the procedures for moving the decimal point and changing the sign.

- **Moving the Decimal Point** (Except for parameters in which decimal point cannot be moved.)



4. BASIC OPERATING PROCEDURES

- **Sign Change** (Except for parameters which cannot be set to a negative value.)



5. FUNCTION AND PARAMETER SETTINGS

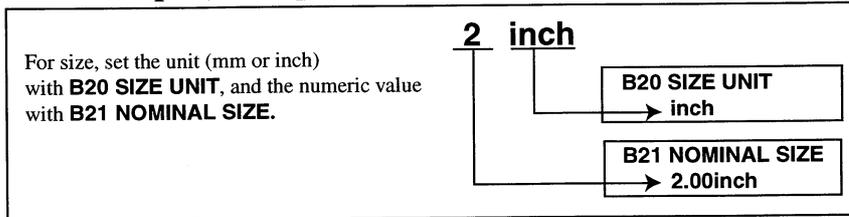
5.1 Nominal Size Settings



NOTE

Nominal size, flow span and meter factor must be set to obtain a correct signal.

• **Example ; Set up size as 2 inch**



Setting Procedure

(Note the cursor positions carefully!)

Key Operations	Display	Description
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	A00 DISPLAY	Use SHIFT to move the cursor to the major item in the display.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B00 SETTING	Press INC to set the major item to " B ".
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B00 SETTING	Press SHIFT to move the cursor to the sub - item in the display.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B20 SIZE UNIT mm	Press INC to display B20 SIZE UNIT .
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B20 SIZE UNIT _ mm	Use SHIFT to move the cursor to the unit.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B20 SIZE UNIT _ inch	Press INC or DEC to change the unit.
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B20 SIZE UNIT inch	After completing the change, press SET twice (wait slightly between presses) to input to memory.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE 10.00 inch	Press INC to display B21 NOMINAL SIZE . (The unit displayed is inch, as selected using B20.)
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE _10.00 inch	Press SHIFT to move the cursor to the first numeral to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	B21 NOMINAL SIZE 00.00 inch	Press INC or DEC to change the numeral.
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE 00.00 inch	Press SHIFT to move the cursor to the next numeral to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE 02.00 inch	Press INC or DEC to display "2".
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE 02.00 inch Flashing	After completing the changes, press SET twice (with a slight delay between the keypresses) to input to memory.
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B21 NOMINAL SIZE 02.00 inch	Pressing SET once causes the entire display to begin flashing. Wait until the flashing begins, then press the key a second time; the cursor will move, and the parameter is now set.

5.2 Flow Span Setting



NOTE

The flow rate span is the instantaneous flow rate value at which the output current is to be 20mA. Please determine the span under considering the followings.

- Please set the maximum flow rate at the most variable flow rate line. If the flow rate of the fluid exceeds the flow rate span value, the flow rate that exceeds this value (20mA or more) is not output and the meter will not display the correct flow rate (108% or more cannot be output).
- In a line where the flow rate is comparatively stable, set a value that is 1.5 to 2.0 times larger than the normal flow rate.
- Set a value that will correspond to a flow velocity of 0.1 to 10m/s. The flow velocity is checked using sizing data or parameter number "B40". (Parameter number "B40" display the set span in flow velocity valus.)
- The display of data is based on the input flow rate span value. It is recommended that the accuracy of the first digit is in a 0.05 to 0.1%. For example, 30m³/h should be set as 30.00m³/h.
- The maximum numeric value that can be set is "30000" except any relation with decimal position. Therefore, you cannot set the leftmost digit of display to numeric value greater than "4". If the leftmost digit of the span must be "4" or more, set the numeric value beginning from the digit second from the left on the display (the fourth digit). If the leftmost digit of the display is set to "3", the digits to its right can be set to "0" only, regardless of the decimal point position.

• Example : Set volume flow span to 30m³/h

30 m³ /h

To set the volumetric flow span, first select volume unit with **B22 FLOW UNIT**, and the time unit with **B23 TIME UNIT**. Those composite units are then displayed for **B24 FLOW SPAN**, where the numeric values is set as required.

B22 FLOW UNIT
→ m³

B23 TIME UNIT
→ /h

B24 FLOW SPAN
→ 30.00 m³/h

Setting Procedure -1 : Selecting volume unit

(Note the cursor positions carefully!)

Key Operations	Display	Description
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B22 FLOW UNIT m	Press INC to display B22 FLOW UNIT .
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B22 FLOW UNIT - m	Press SHIFT to move the cursor to the unit display.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B22 FLOW UNIT - m ³	Press INC or DEC to select the disired volume unit (m ³).
	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> Select <ul style="list-style-type: none"> k m³ (10³ × m³) m³ l (litre) M gal (10⁶ × gal) k gal (10³ × gal) gal m gal (10⁻³ × gal) k bbl (10³ × bbl) bbl m bbl (10⁻³ × bbl) μbbl (10⁻⁶ × bbl) m (meters)] velocity units ft (feet) </div>	
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Twice	B22 FLOW UNIT m ³	After completing the change, press SET twice. (wait slightly between presses.) to save to memory.

Setting Procedure -2 : Selecting time unit

(Note the cursor positions carefully!)

Key Operations	Display	Description								
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B23 TIME UNIT /s	Press INC to display B23 TIME UNIT .								
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B23 TIME UNIT - /s	Press SHIFT to move the cursor to the unit display.								
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B23 TIME UNIT - /h	Press INC or DEC to select the desired time unit (/h). Select <table border="1" style="margin-left: 20px;"> <tr><td>/d</td><td>(day)</td></tr> <tr><td>/h</td><td>(hour)</td></tr> <tr><td>/m</td><td>(minute)</td></tr> <tr><td>/s</td><td>(second) If "m" or "ft" was selected using B22, the selection will be forced to "/s".</td></tr> </table>	/d	(day)	/h	(hour)	/m	(minute)	/s	(second) If "m" or "ft" was selected using B22, the selection will be forced to "/s".
/d	(day)									
/h	(hour)									
/m	(minute)									
/s	(second) If "m" or "ft" was selected using B22, the selection will be forced to "/s".									
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Twice	B23 TIME UNIT /h	After completing the change, press SET twice. (wait slightly between presses.) to save to memory.								

Setting Procedure -3 : Setting the span value

(Note the cursor positions carefully!)

Key Operations	Display	Description
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN 1.0000 m ³ /h	Press INC to display B24 FLOW SPAN .
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN _1.0000 m ³ /h	Press SHIFT to move the cursor to the first numeral to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN 0_0000 m ³ /h	Press INC or DEC to change the numeral.
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN 0_0000 m ³ /h	Press SHIFT to move the cursor to the next numeral to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN 0_3000 m ³ /h	Press INC or DEC to select the desired numeral.
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B24 FLOW SPAN 0_3000 m ³ /h	Press SHIFT to move the cursor to the decimal point.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	B24 FLOW SPAN 030_00 m ³ /h	Press DEC to move the decimal point with the cursor.
SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Twice	B24 FLOW SPAN 30.00 m ³ /h	After completing the changes, press SET twice (wait slightly between presses) to save to memory.

5.3 Meter Factor Setting

The meter factors will be found inscribed on the data plate of the Flow Tube to which the converter is connected.

The meter factor is required to compute the correct electromotive force proportional to the fluid velocity, and is determined by actual flow-test, calibration at the factory. Be sure to set the L and H meter factors for size 400mm or less flow tube, and the L for size larger than 500mm.

- **Example ; Meter factor (L) : 1.2345**
Meter factor (H) : 1.1234

Meter factor L is set with **B30 LOW MF**, and meter factor H is set with **B31 HIGH MF**. (If the size is 500mm(20") or greater, meter factor H need not be set.)

Meter factor (L) 1.2345 → **B30 LOW MF**

Meter factor (L) 1.1234 → **B31 HIGH MF**

Setting procedure: Set meter factor (L) to 1.2345

(Note the cursor positions carefully!)

Key Operations	Display	Description
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B30 LOW MF 1.0000	Press INC to display B30 LOW MF .
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B30 LOW MF 1.0000	Press SHIFT to move the cursor to the first numeral to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B30 LOW MF 1.2000	Press INC to select the desired numeral.
SET SHIFT INC DEC <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	B30 LOW MF 1.2000	Press SHIFT to move the cursor to the next digit to be changed.
SET SHIFT INC DEC <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	B30 LOW MF 1.2300	Press INC to select the desired numeral.



Use the same procedure to change the subsequent digits.

SET SHIFT INC DEC <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Twice	B30 LOW MF 1.2345	After completing the changes, press SET twice (wait slightly between presses) to input to memory.
--	----------------------	---

Set meter factor (H) to **B31 HIGH MF** for Flow Tube, sizes 400mm(16") or less in the same way.

AM11-DL is not displayed the high frequency side meter factor(B31 HIGH MF) because of its single low frequency excitation.

5.4 Power Frequency Setting



IMPORTANT

In case of DC power supply version, setting frequency is required in areas where the frequency differs.

Display	Description
B32 FREQUENCY 50.00 Default : 50.00Hz	Set the value in areas where the frequency differs in "B32 FREQUENCY". Setting Range : 47.00 to 53.00 Hz

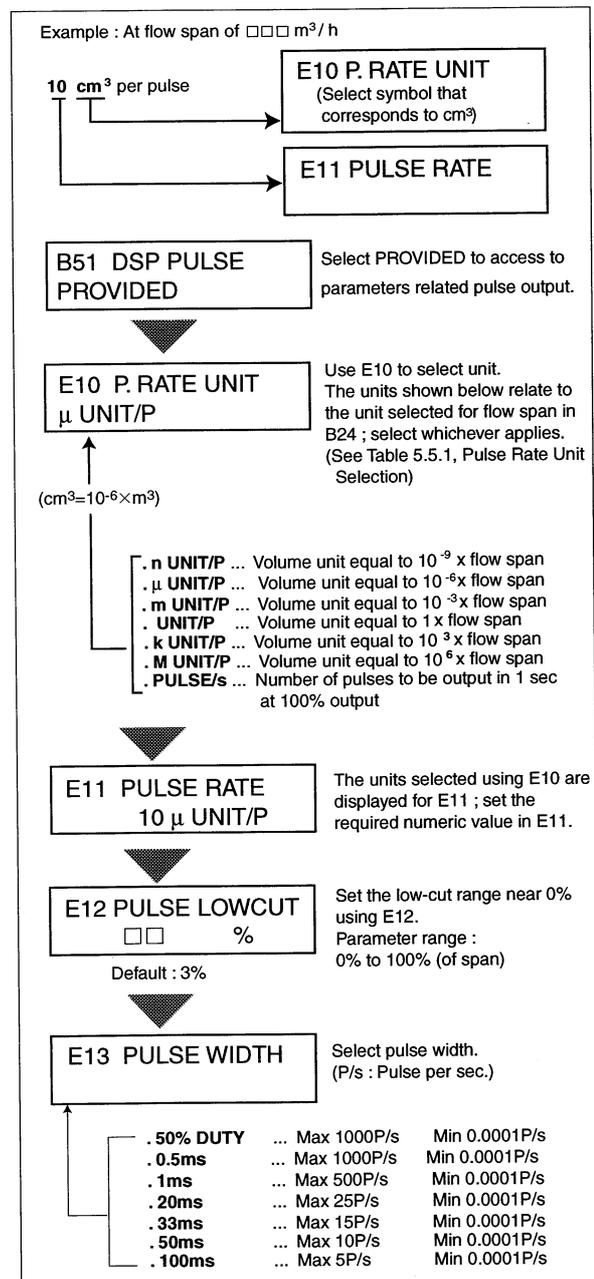
5.5 Other Functions and Settings

5.5.1 Pulse Output

- By setting a pulse weight, a scaled pulse is transmitted to external counters or measuring instruments.
 - If the multi-function is used, the span is based on the largest range.
 - If the multi-function is used, the setting value of E12 PULSE LOW CUT must be smaller than the span of the smallest range.
 - Pulse Output Overview
Output specifications;
transistor contact (30VDC, 200mA)
Connecting Terminals;
P+, P-
Pulse width;
50% DUTY, 0.5, 1, 20, 33, 50, 100ms
Output Rate;
0.0001P/s min, 1000P/s max.
- See " 3.3.6(2) Pulse Output" for information on how to connect external instruments.

Table 5.5.1 Pulse Rate Unit Selection

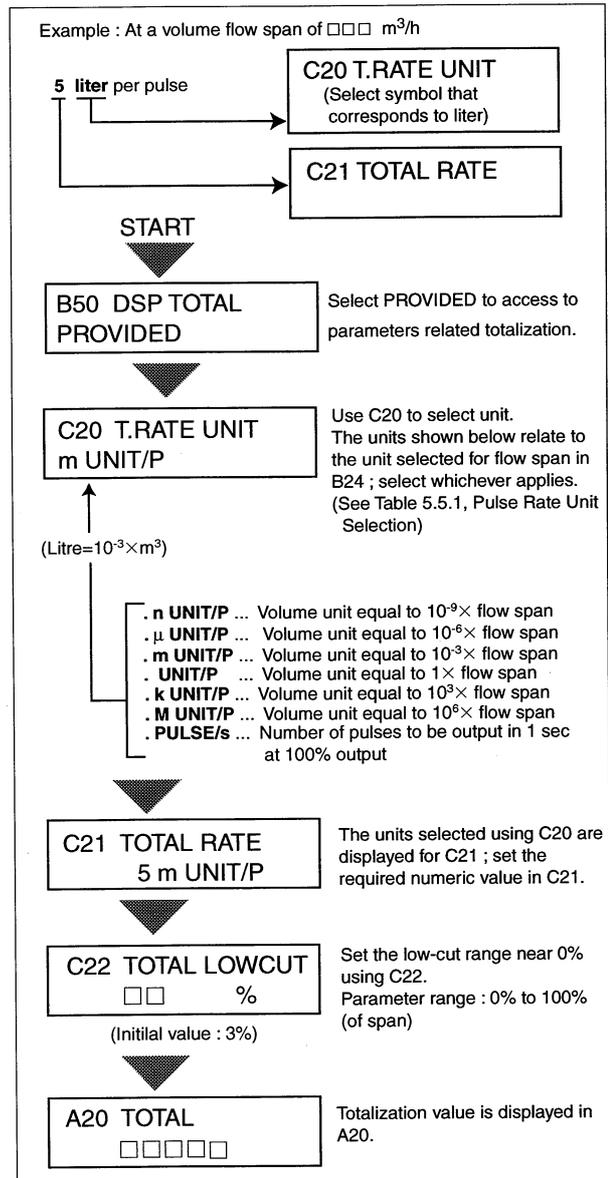
Pulse Units Span Units	km ³	m ³	l (liter)	cm ³
km ³	UNIT/P	m UNIT/P	μ UNIT/P	n UNIT/P
m ³	k UNIT/P	UNIT/P	m UNIT/P	μ UNIT/P
l (liter)	M UNIT/P	k UNIT/P	UNIT/P	m UNIT/P
cm ³		M UNIT/P	k UNIT/P	UNIT/P



5.5.2 Totalization Function

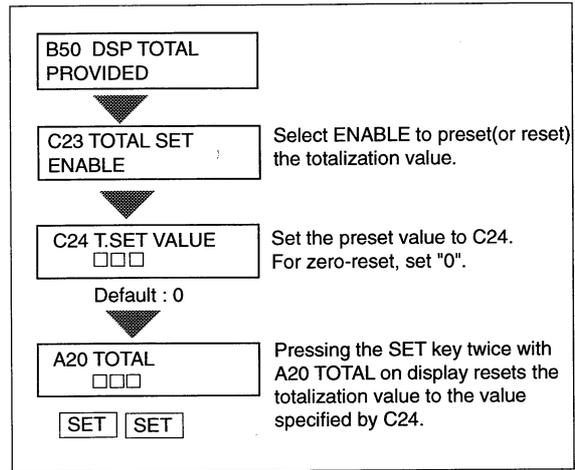
(1) Totalization Display

- The totalization function operates by assigning a weight per pulse. The minimum totalization rate is 0.0001P/s, and the maximum rate is 1000P/s.
- Maximum display is 999999; if this value is exceeded, totalization begins again from 0. However the display stops at 999999 when the totalization switch function (See Section 5.5.16) is used.
- If the multi-function is used, the span is based on the largest range.
- If the multi-function is used, the setting value of **C22 TOTAL LOWCUT** must be smaller than the span of the smallest range.
- Reverse Totalization (**F10 REV. TOTAL**) and Differential Totalization (**F11 DIF. TOTAL**) is also available for AM11-DH/-DE/-DL.

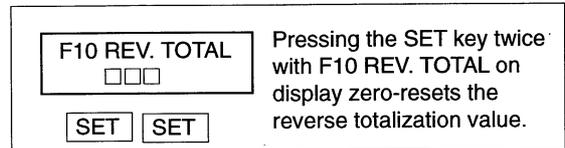


(2) Totalization Value Preset (Reset)

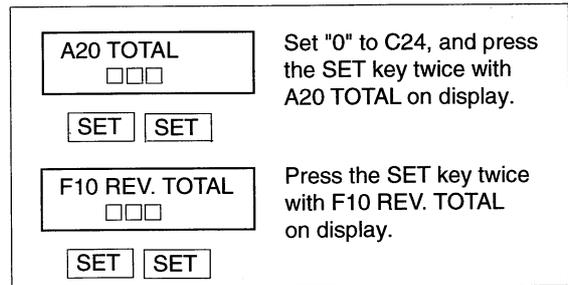
- This function is to preset (or reset) the forward totalization value.
- When INHIBIT is set in **C24 TOTAL SET**, set the required value in **A20 TOTAL** to preset the forward totalization value.



- This function is to zero-reset the reverse totalization value. (Only for AM11-DH/-DE/-DL).



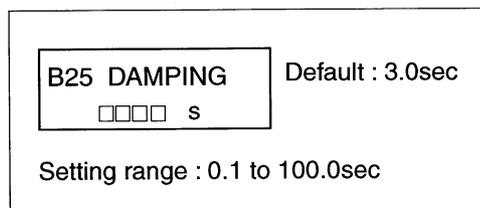
- To zero-reset the differential flow totalization, you must reset both **A20 TOTAL** and **F10 REV. TOTAL**. It is not possible to zero-reset by pressing the SET key twice with **F11. DIF. TOTAL** on display.



5.5.3 Damping Time Constant

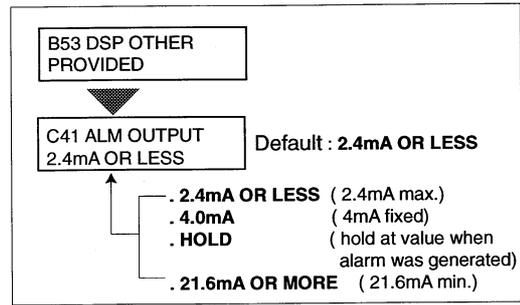
- To suppress fluctuations in the output, or to change the speed of response, you can change the time constant in **B25 DAMPING**.
- The time constant also influences the instantaneous flow value, totalization, and pulse output.

* Time constant : Time required for output to reach 63.2% from 0%.



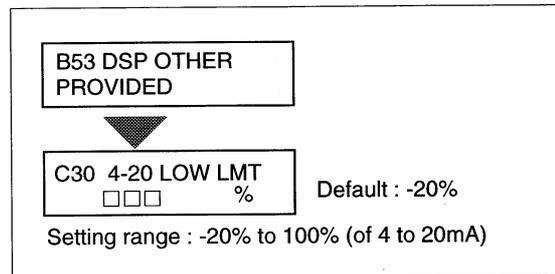
5.5.4 Current Output during Alarm Occurrence

- The user can preselect a limit value of the current output at an alarm condition.



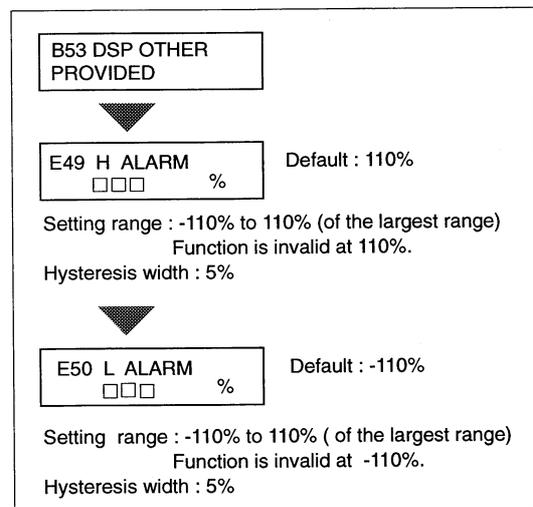
5.5.5 Limiting Current Output

- This function is to restrict the lowest of the 4 to 20 mA current output.
- There is a limit of -8%(2.72mA) as the limit for a back current.
- Use this function when you want to limit to the value more than 2.72mA.



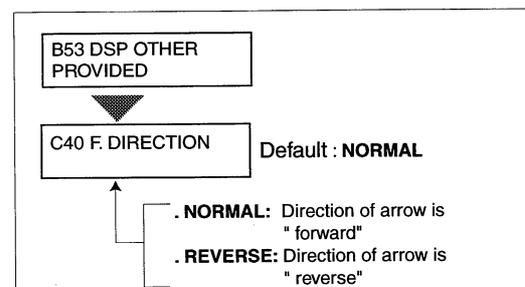
5.5.6 Alarm Outputs at High / Low Flow Limits

- If flow exceeds certain specified levels, the alarm output contact goes to OFF (normally ON). This alarm occurrence does not restrict the other outputs and functions, it is only displayed in SELF CHECK.
- At the malfunction alarm occurrence, this high/low alarm output is not output because they use the same output terminals.



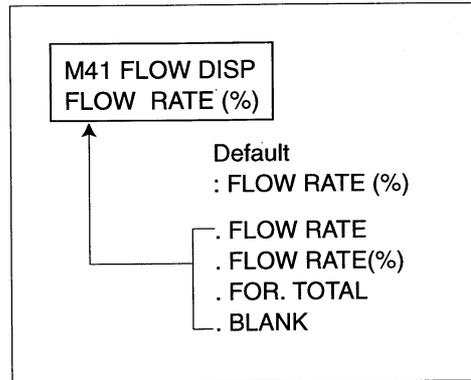
5.5.7 Reversing Flow-Direction

- When you want to use with flow direction opposite to the arrow on the Flow Tube as normal flow direction, select **REVERSE** using **C40 F. DIRECTION**.
- * This differs from the function that enables both forward and reverse flow measurement.



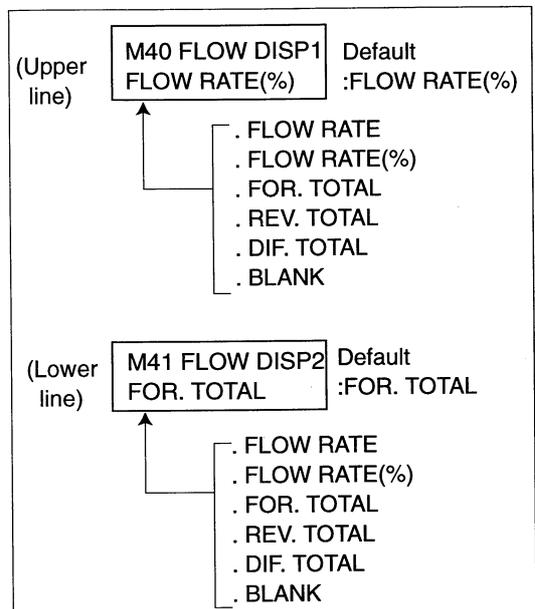
5.5.8 7-segment LED Display Contents

- AM11-AS (one line)
The following four alternatives may be selected for the LED display line. Display data is the same as the parameters whose numbers appear in () in the LCD display. The selection is made with parameter M41.



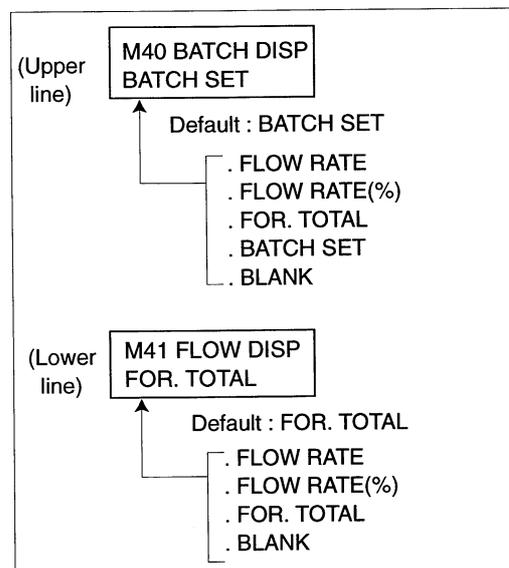
- . (A10) **FLOW RATE**
... Instantaneous flow rate
- . (A11) **FLOW RATE (%)**
... Instantaneous flow rate in %
- . (A20) **FOR. TOTAL**
... Forward flow totalization value
- . **BLANK** ... Nothing displayed

- AM11-DH/-DE/-DL (two lines)
The following six alternatives may be selected for the two LED display lines. The selection is made with parameter M40 for the upper line, and M41 for the lower line. Display data is the same as the parameters whose numbers appear in () in LCD display.



- . (A10) **FLOW RATE**
... Instantaneous flow rate
- . (A11) **FLOW RATE (%)**
... Instantaneous flow rate in %
- . (A20) **FOR. TOTAL**
... Forward flow totalization value
- . (F10) **REV. TOTAL (%)**
... Reverse flow totalization value
- . (F11) **DIF. TOTAL**
... Differential totalization value
- . **BLANK** ... Nothing displayed

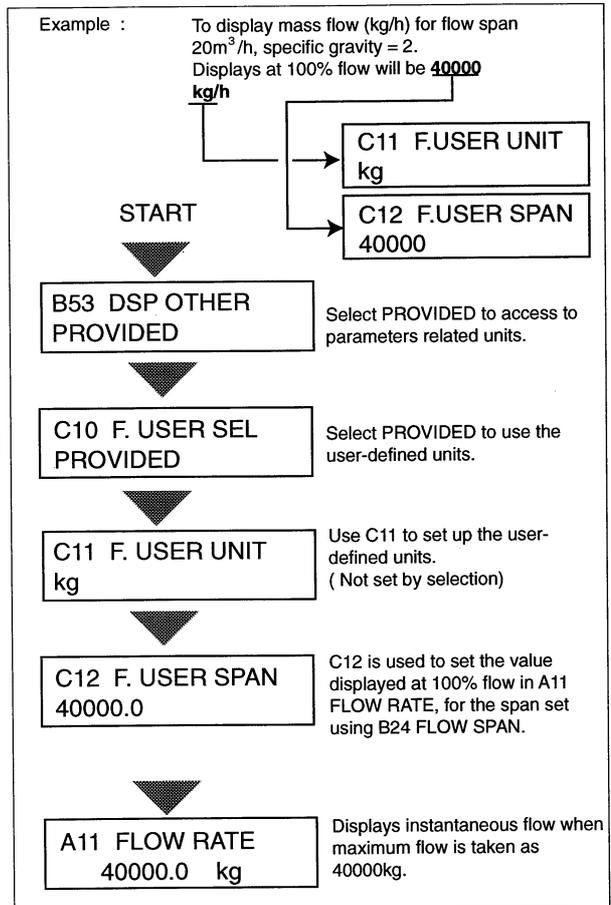
- AM11-DB (two lines)
The following five alternatives may be selected for the two LED display lines. The selection is made with parameter M40 for the upper line, and M41 for the lower line. Display data is the same as the parameters whose numbers appear in () in LCD display.
* The display range of LCD is -999999(6 digits) to 999999, but one of LCD is -999999 (5 digits) to 999999.



5.5.9 User-Defined Units

(1) User-defined Units for Instantaneous Flow Rate

- This function allows the instantaneous flow displayed by **A11 FLOW RATE** to be displayed using units other than those that can be selected using **B22**.

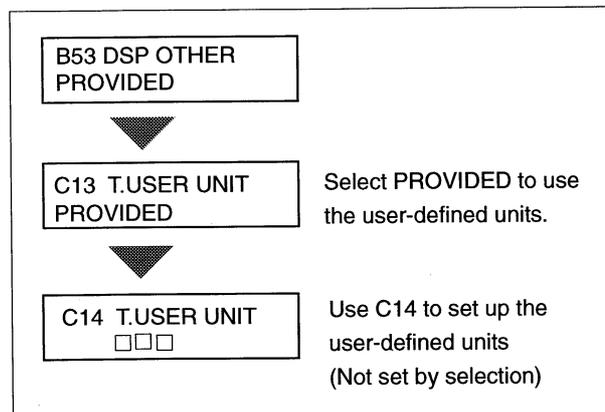


(2) User-defined Units for Totalization Value

- The unit set using **C14. T. USER UNIT** is displayed on the following parameters; A20 TOTAL, C24 T. SET VALUE, E51 TOTAL SWITCH*, F10 REV. TOTAL*, F11 DIF TOTAL*, G20 BATCH SET 1**, G21 INT.T.LMT1**, G22 PREBATCH 1**, G23 PRED LEAK 1**, G24 LEAK DETECT 1**, G30 BATCH SET 2**, G31 INT. T. LMT2**, G32 PREBATCH 2**, G33 PRED LEAK 2**, G34 LEAK DETECT 2**, G40 BATCH SET 3**, G41 INIT. T. LMT3**, G42 PREBATCH 3**, G43 PRED LEAK 3**, G44 LEAK DETECT 3**, G50 BATCH SET 4**, G51 INIT. T. LMT 4**, G52 PREBATCH 4**, G53 PRED LEAK 4**, G54 LEAK DETECT 4**

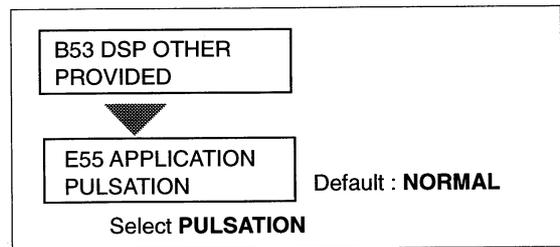
* Only for AM11-DH/-DL

** Only for AM11-DB



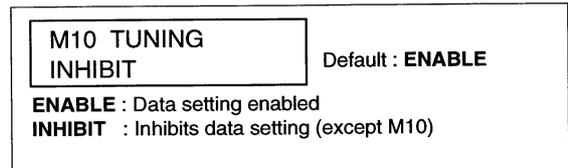
5.5.10 Pulsation Flow Application

- If errors are being generated in the average flow values due to pulsating flow, there is a function that controls the computations to better track the flow variations.



5.5.11 Data Settings Enable/Inhibit

- This function inhibits data setting (except M10).
- However, Auto-zero is available if L10 ZERO TUNING is ENABLE, and Totalization Preset is available if C23 TOTAL SET is ENABLE.



5.5.12 Multiple Range Selection Via External Contact Inputs (only for AM11-DH/-DE/-DL)

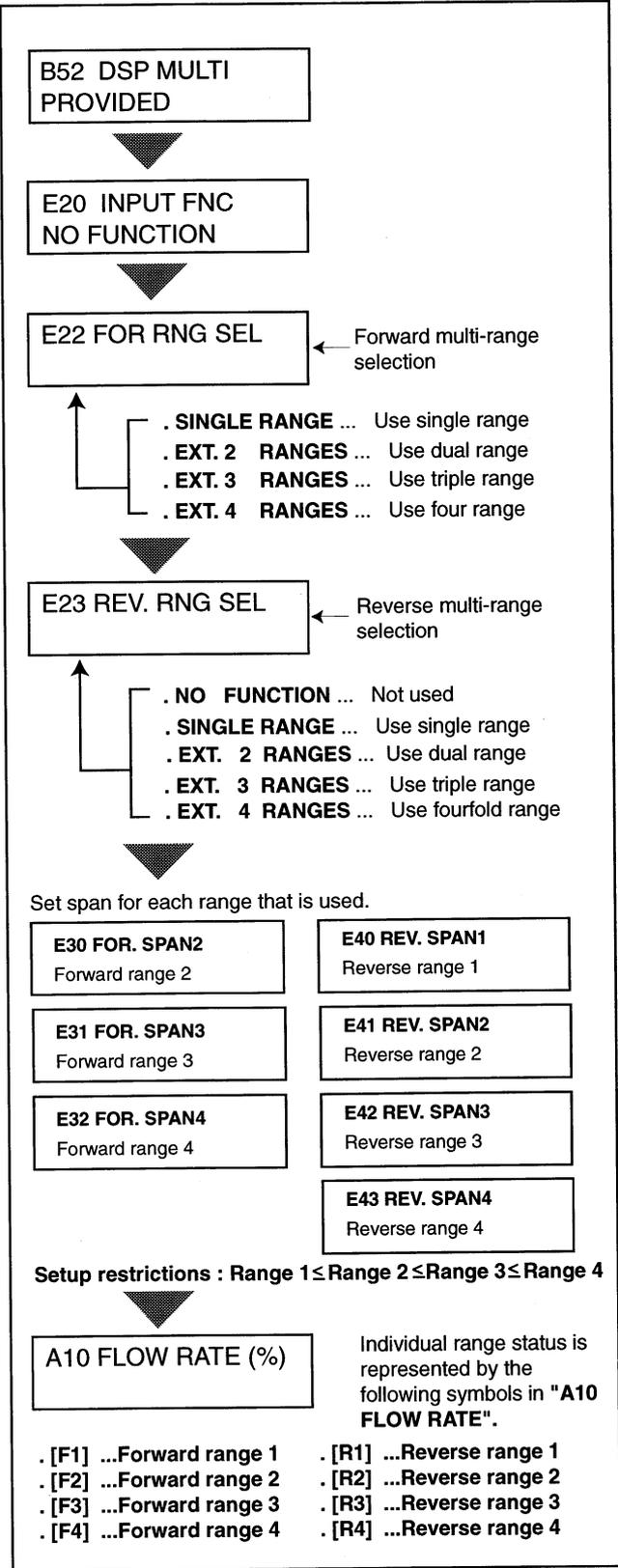
- Contact inputs can be used to select among up to four ranges, both in the forward and the reverse direction.
 The switching using external contact inputs is available only in case of the same direction.
 The switching from forward to reverse direction is automatically carried out only when the fluid flows backward.
 See Table 5.5.2 Range Selection via External Contact Input.

Table 5.5.2 Range Selection via External Contact Input

Function		Status input		Status output	
		S3	S4	S3	S4
Forward single range		—	—	—	—
Reverse single range		—	—	—	ON
Forward dual range	Range 1	—	OPEN	OFF	OFF
	Range 2	—	SHORT	ON	OFF
Reverse dual range	Range 1	—	OPEN	—	ON
	Range 2	—	SHORT	—	ON
Forward triple range	Range 1	OPEN	OPEN	—	OFF
	Range 2	OPEN	SHORT	—	OFF
	Range 3	SHORT	OPEN	—	OFF
Reverse triple range	Range 1	OPEN	OPEN	—	ON
	Range 2	OPEN	SHORT	—	ON
	Range 3	SHORT	OPEN	—	ON
Forward fourfold range	Range 1	OPEN	OPEN	—	OFF
	Range 2	OPEN	SHORT	—	OFF
	Range 3	SHORT	OPEN	—	OFF
	Range 4	SHORT	SHORT	—	OFF
Reverse fourfold range	Range 1	OPEN	OPEN	—	ON
	Range 2	OPEN	SHORT	—	ON
	Range 3	SHORT	OPEN	—	ON
	Range 4	SHORT	SHORT	—	ON

5. FUNCTIONS AND PARAMETER SETTINGS

- The terminal pairs for the connections are **S3** and **S4**.
- The status output terminal **S2** goes to ON when the forward range is switched to the reverse range.
The status output terminal **S1** goes to ON when the forward range 1, 3, or 4 is switched to the forward range 2.
When the reverse dual range is used with the forward range, and the range is switched to the reverse range 2, the status output terminal **S1** goes to ON.
- These functions cannot be combined with the other functions which use the above terminals. See Table 5.5.4 Status Input/Output Combination Compatibility.

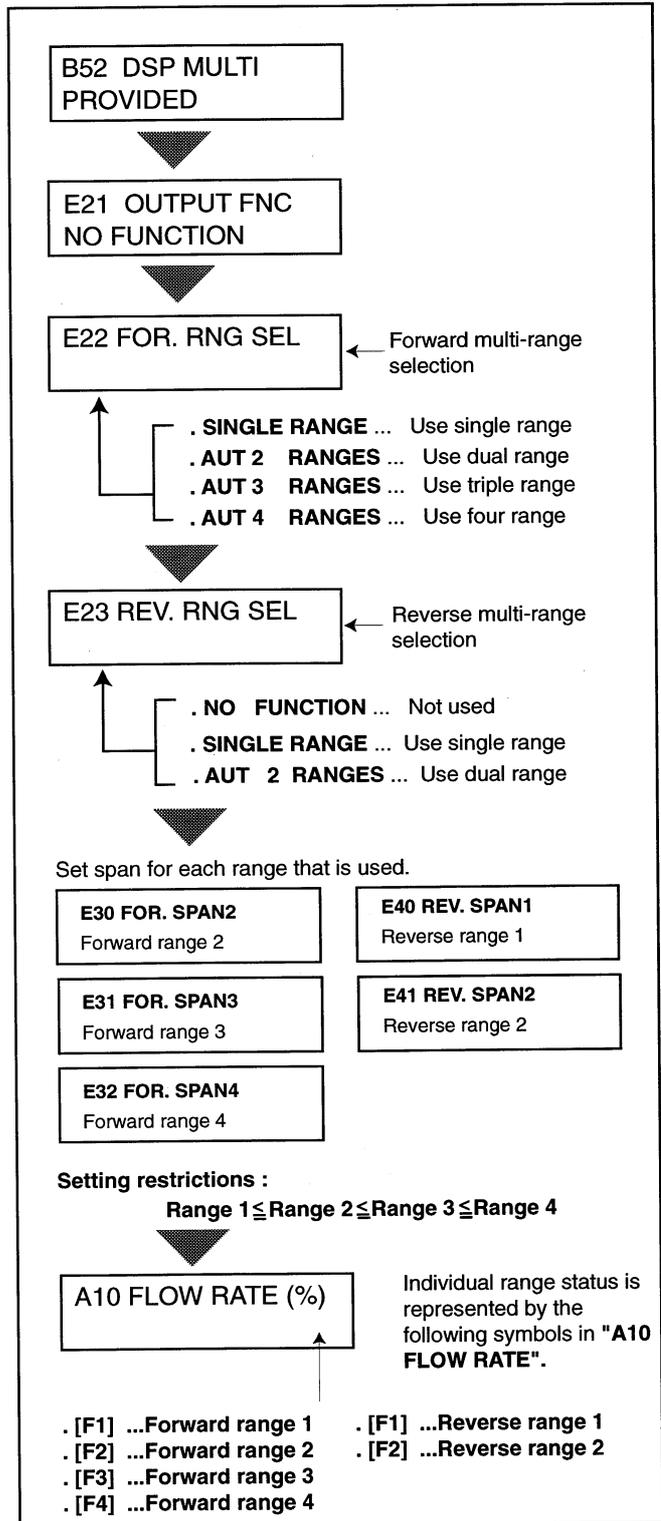
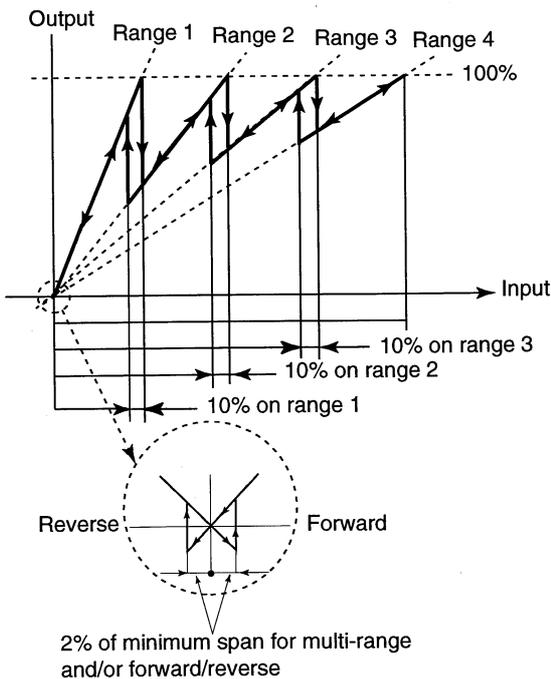


5.5.13 Multiple Ranges With Automatic Selection(only for AM11-DH/-DE/-DL)

- This function provides automatic switching to the next higher range whenever the input exceeds 100% on the present range, or to the reverse range when the fluid flows backward.
- The presently selected range is indicated by status outputs from terminal pairs S1 and S2. The output status for each range is shown in Table 5.5.3 Output Status at Automatic Range Selection.

Table 5.5.3
Output Status at Automatic Range Selection

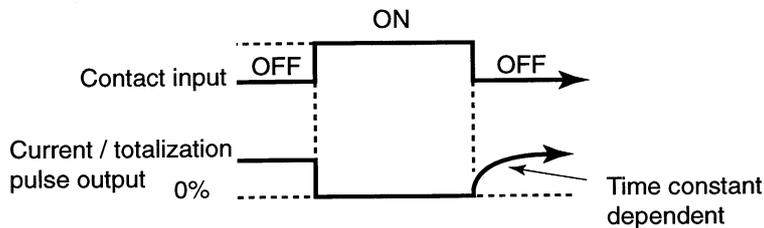
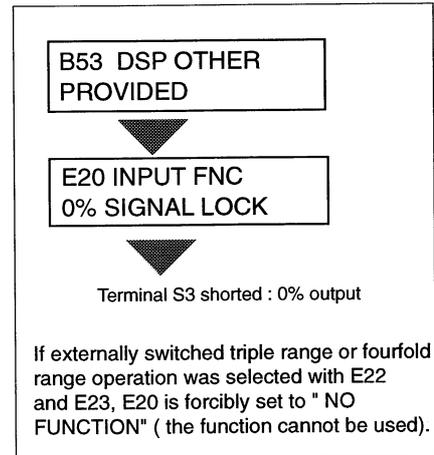
Functions		Status Output	
		S1	S2
Forward single range		—	—
Reverse single range		—	ON
Forward dual range	Range 1	OFF	—
	Range 2	ON	—
Reverse dual range	Range 1	OFF	ON
	Range 2	ON	ON
Forward triple range	Range 1	OFF	OFF
	Range 2	ON	OFF
	Range 3	OFF	ON
Forward fourfold range	Range 1	OFF	OFF
	Range 2	ON	OFF
	Range 3	OFF	ON
	Range 4	ON	ON



- These functions cannot be combined with other functions which use the above terminals. See Table 5.5.4 Status Input/Output Combination Compatibility.

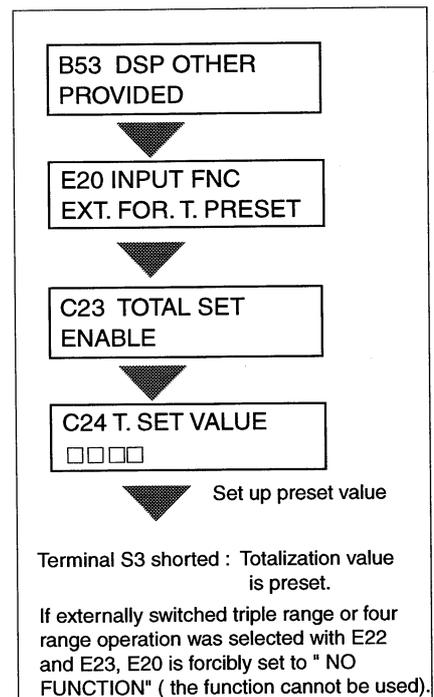
5.5.14 Signal Lock at 0% Via Contact Input (Only for AM11-DH/-DE/-DL)

- If the user wishes to be able to forcibly stop instantaneous flow indication and flow totalization, the "signal lock" functions enables the signal output and totalization pulse output to be locked at 0%(4mA) by shorting the terminal S3.
- 0% signal lock has priority over the signal level set up to be output during malfunction alarm conditions.
- See Table 5.5.4 Status Input/Output Combination Compatibility about the combination with the other functions.



5.5.15 Forward Totalization Preset Via Contact Input (Only for AM11-DH/-DE/-DL)

- This function is used to perform a zero reset or preset (to a value other than zero) on the totalization display value, from an external contact (shorter Terminal S3).
- See Table 5.5.4 Status Input/Output Combination Compatibility about the combination with the other functions.



5.6 Operation Via BT200 Terminal (only available AM11-DH, -DB, and -DL)

This section describes the operation procedures using BRAIN terminal. For details on the functions of the AM11, see Chapter 5, "Function and Data Settings" And also, see the "BT200 Instruction Manual" (IMIC0A11-01E) for more detailed information.

*It is not available to use RESET, START, and PAUSE functions of the batch control.

5.6.1 Connecting the BT200 to AM11

The communication signal of the BRAIN communication signal is superimposed onto the 4 to 20 mA DC analog signal to be transferred. Since the modulated wave is communication signal, superimposing it on the normal signal will, from basic principles, cause no error in the DC component of the analog signal. Thus, monitoring can be performed via communications while the AM11 is online.

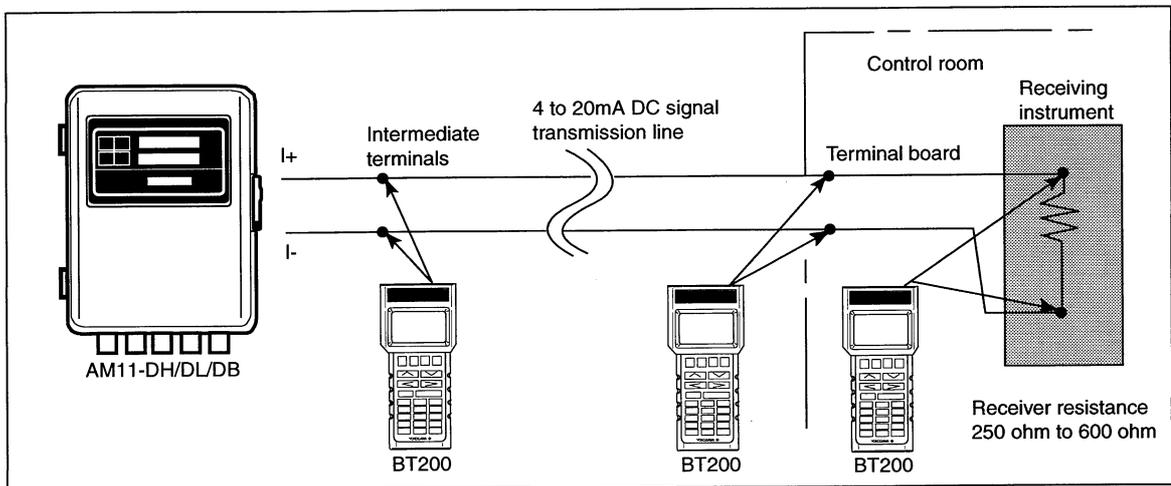


Figure 5.6.1 Interconnection Diagram

5.6.2 BT200 Keypad Layout

Figure 5.6.2 shows the key pad lay out and the displays of the BT200.

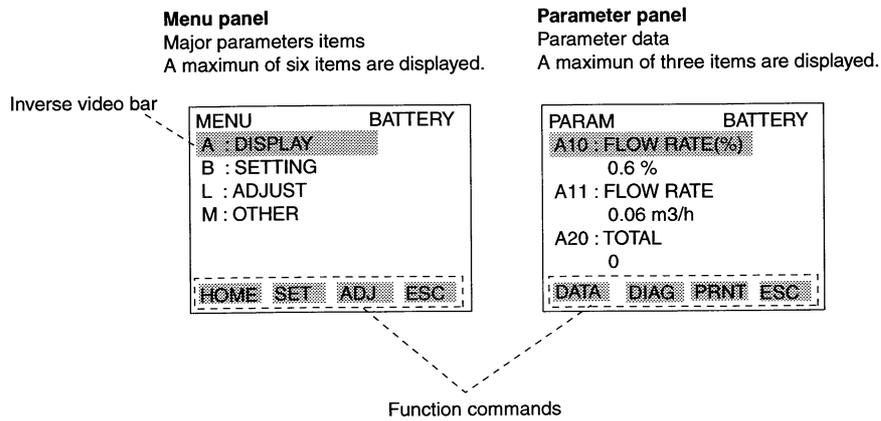
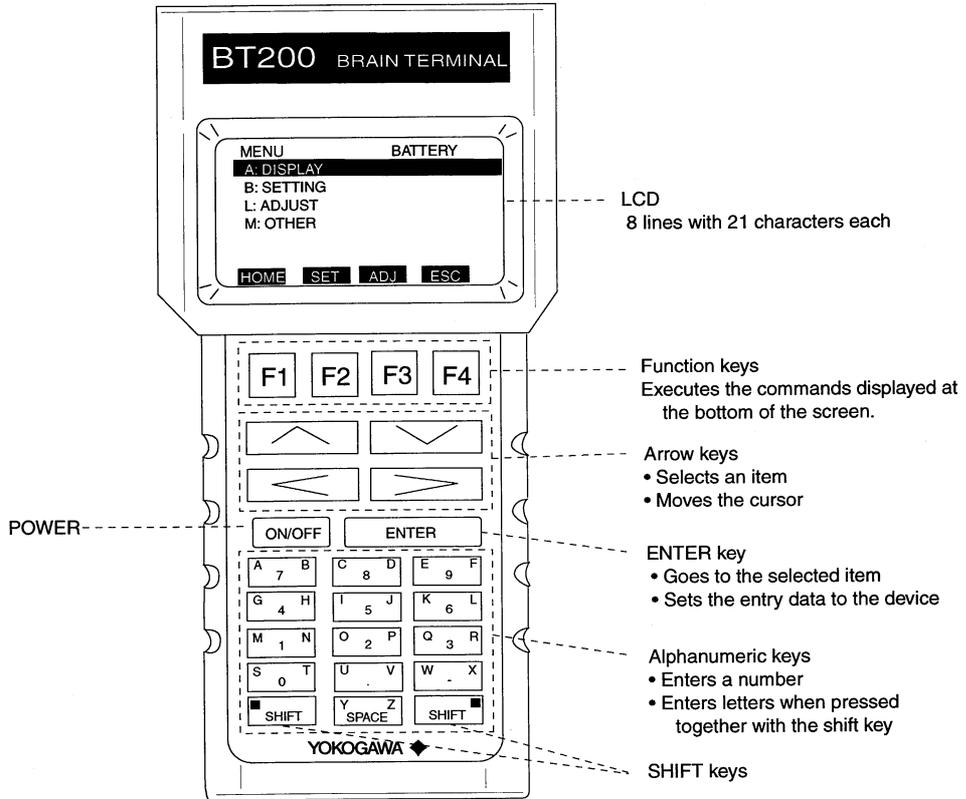


Figure 5.6.2 Key Layout and Displays

5.6.3 Major BT200 Key Functions

(1) Entry of Alphanumeric Characters

Numbers, codes and letters can be entered in combinations of the alphanumeric keys and the SHIFT key.

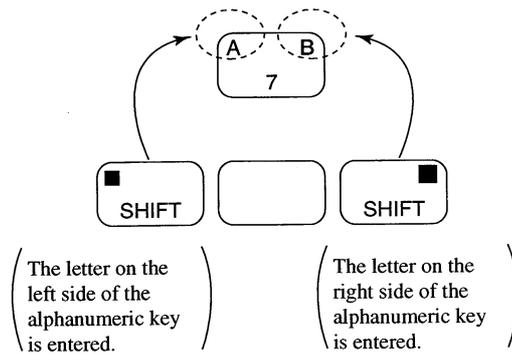
- **Entry of numbers, codes and a space (0 to 9, ., -, _)**

Entering of them is possible by using the alphanumeric keys.

Example of entry	Key Operation
-4.3	
1_ -0.3	

- **Entry of letters**

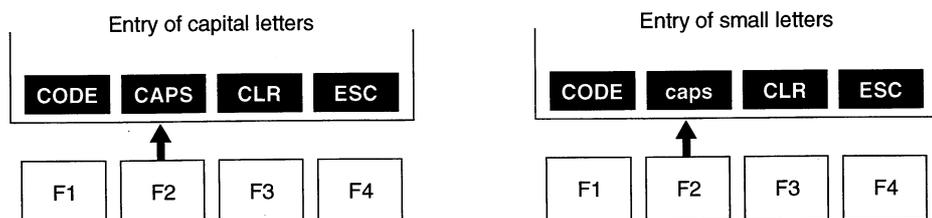
Press an alphanumeric key while one of the SHIFT keys is pressed and the letter on the same side of the key as the SHIFT key that is pressed can be entered. Press the SHIFT key each time when entering a letter.



Example of entry	Key operation
WIC	
J.B	

- **Selection of capital / small of letters**

Capital and small letters can be selected alternately by pressing the function key [F2] (CAPS).

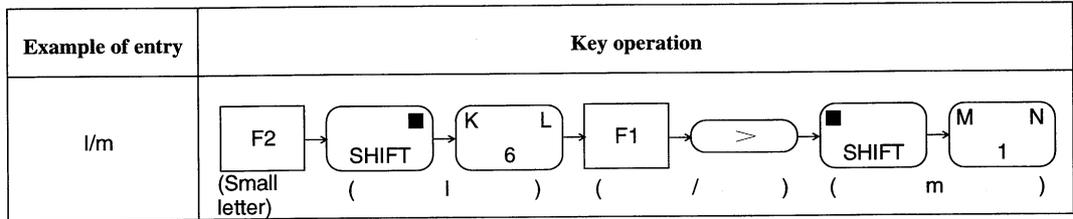


• **Entry of codes**

Codes can be entered by pressing the function key [F1] (CODE). Every time [F1] CODE is pressed, the codes are displayed at the cursor position in the order shown below.

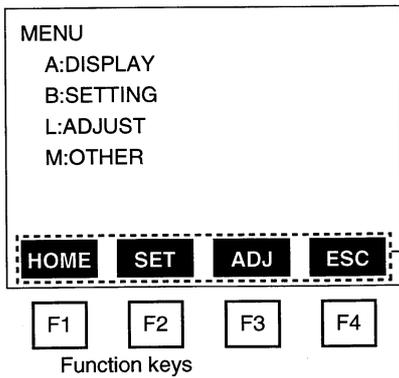
/ . - , + *) (' & % \$ # " !

To enter characters after the codes above, move the cursor using the [>] key before entry.



(2) Function Keys

The functions of the function keys vary with the commands being displayed on the display panel.

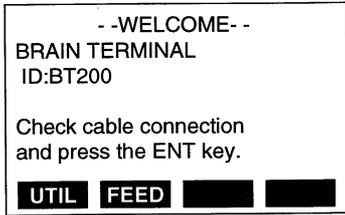


Command	Description
ADJ	Calls up the zero-adjustment menu.
CAPS/caps	Changes the uppercase / lowercase mode.
CLR	Clears entered data /deletes all data.
COPY*	Prints parameters on the screen.
DATA	Updates parameter data.
DEL	Deletes one character.
DIAG	Calls up the self-check screen.
ESC	Returns to the preceding screen.
FEED*	Paper feed.
HOME	Calls up the home menu (A : DISPLAY).
LIST*	Prints all parameters of the menus.
NO	Setting stop / re-setting. Returns to the previous screen
OK	Goes to the next screen.
PARM	Parameter number setting mode.
PON/POFF*	Printer output of data whose setting was changed Mode on / off
PRNT*	Changes to the prints mode.
SET	Calls up the setting menu. (B : SETTING)
SLOT	Returns to the slot selection screen.
GO*	Starts print out.
STOP*	Stops printing.
UTIL	Transfers to the utility screen.

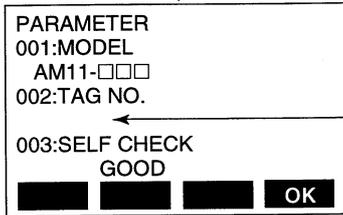
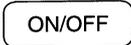
*The command is available only for BT200-P00

5.6.4 Displaying Flow Rate Data

Flow rate data can be displayed on the BT200 screen according to the following procedure.

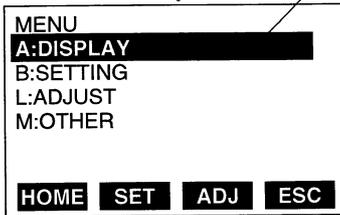


Turn the power on and the screen on the left appears after "please wait..." is displayed for a few seconds.



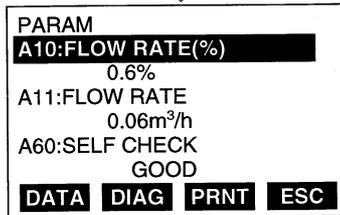
Pressing the ENTER key causes the initial data screen on the left to be displayed.

The tag number specified upon ordering is entered.

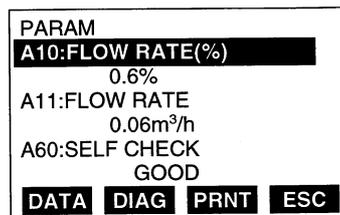


Inverse video bar

Pressing the F4 key or the ENTER key causes the menu screen on the left to be displayed.



- With "A : DISPLAY" displayed on the menu panel in the inverse video bar, press the ENTER key and the flow data screen appears.
- A maximum of three data items can be displayed on one screen.
- Data are communicated at an interval of 5 seconds. Thus, the data are updated every 5 seconds.
- The arrow keys, [^], [v] or [<], [>], are used for page feeds or item selection.



Execution of the function keys

- F1:** Updates the current data. Pressing this key causes forcible communication with the connected instruments and the data of the instruments are loaded to be read.
- F2:** Displays the self-check screen.
- F3:** Displays the parameter print screen.
- F4:** Returns to the previous panel (menu panel).

5.7 Setting Parameters Using BT200

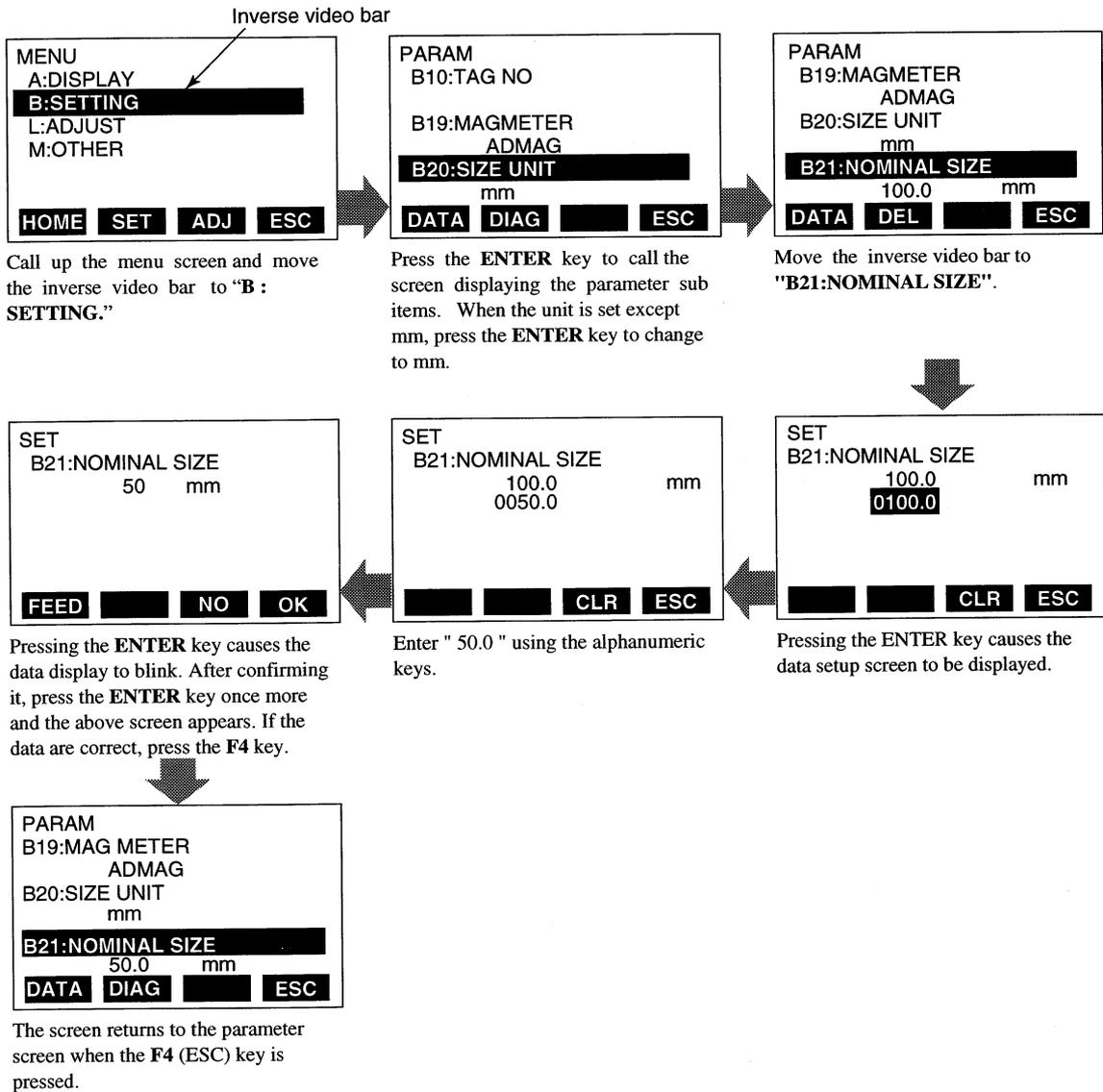


NOTE

Nominal size, flow span, and meter factor must be set to obtain a correct signal.

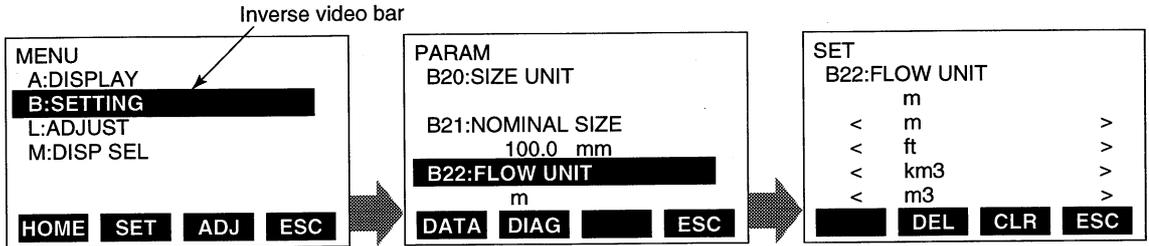
5.7.1 Setting Nominal Size

Example: Setting to size 50mm



5.7.2 Setting Flow Span

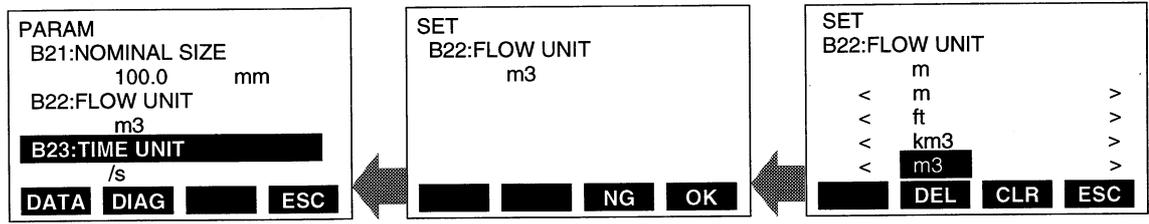
Example: Flow span 30.0 m³/h



Call up the menu screen and move the inverse video bar to "B : SETTING."

Press the ENTER key to call the screen displaying the parameter sub items. Move the inverse video bar to "B22 : FLOW UNIT".

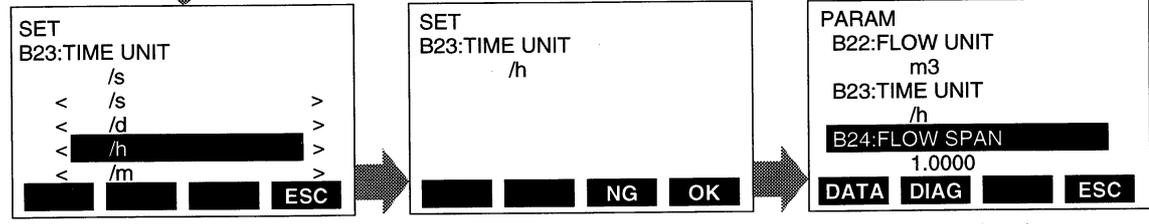
Pressing the ENTER key causes the data setup screen to be displayed. If the security screen is displayed, enter the security code.*



The screen displaying the parameter sub-items is displayed again. Using the arrow key to move the inverse video bar to the item "B23 : TIME UNIT."

Pressing the ENTER key causes the data display to blink. After confirming it, press the ENTER key once more and the above screen appears. If the data are correct, press the F4 key.

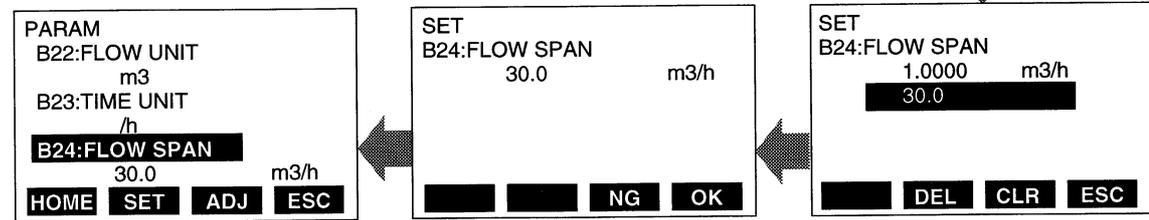
Move the inverse video bar to "m3"



Pressing the ENTER key causes the data setup screen to be displayed. Move the inverse video bar to "/h" If the security screen appears, enter the security code* to display the above screen.

Press the ENTER key twice at intervals and the above screen appears. If the data are correct, press the F4 key.

The screen displaying the parameter sub-items appears again. Using the arrow key to move the inverse video bar to "B24 : FLOW SPAN".



Setting is completed. The screen returns to the preceding screen when the F4 (ESC) key is pressed.

Press the ENTER key twice at intervals and the above screen appears. If the data are correct, press the F4 key.

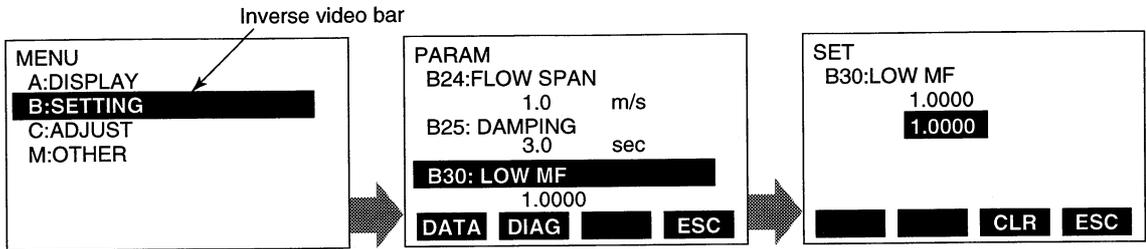
Pressing the ENTER key causes the data setup screen to be displayed. A number in the inverse video bar is "0" and enter "30.0" using the alphanumeric keys.

*For entry of the security code, see IM 1C0A11-01E.

5.7.3 Setting Meter Factor

Flow tubes having bore sizes up to 400m(16") have two meter factors (L, and H).

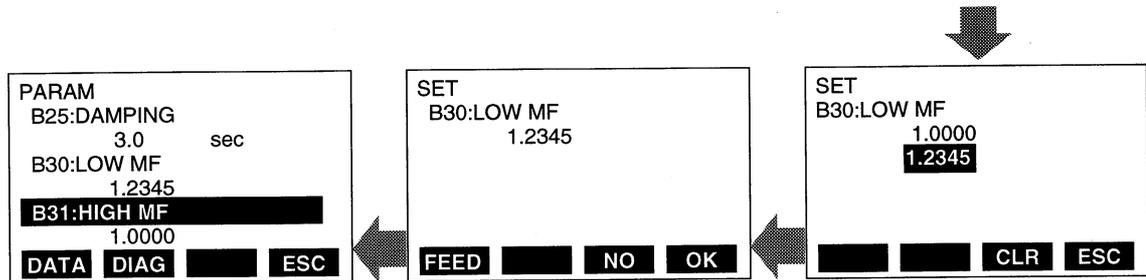
Both of these must be set.



Call up the menu screen and move the inverse video bar to "B: SETTING."

Press the **ENTER** key to call the screen displaying the parameter sub items. Move the inverse video bar to "B30 : LOW MF".

Pressing the **ENTER** key causes the data setup screen to be displayed.



The meterfactor of H side is set "B31: HIGH MF" as same as L side.

Pressing the **ENTER** key causes the data display to blink. After confirming it, press the **ENTER** key once more and the above screen appears. If the data are correct, press the **F4** key.

Read the meter factor of L side from the dataplate of the flow tube. Set by alphanumeric keys.

5.7.4 Power Frequency



IMPORTANT

In case of DC power supply version, setting power frequency is required.

PARAM
B32:FREQUENCY
50.00HZ
B40:VELOCITY CHK
2.00 m/s
B50:DSP TOTAL
PROVIDED
DATA DIAG ESC

Set the value in areas where the frequency differs in "B32: FREQUENCY"
 Default : 50.00Hz
 Setting Range : 47.00 to 63.00 (Hz)

5.7.5 Other Functions and Settings

See 5.5 Other Functions and Settings for the other functions.

5.7.6 Other Important Points

- (1) The automatic power-off function turns the BT200 off automatically if no key access for about 5 minutes or more. However, this function does not operate when the BT200 is displaying the variables in (2) below.
- (2) When **A10 FLOW RATE (%)** or **A11 FLOW RATE** is displayed, data is updated every 5 seconds.
- (3) UPLD is used when parameters of one AM11 are copied to the BT, and DNLD is used when the parameters copied to the BT are copied to another AM11. For details, see the " BT200 Instruction Manual " (IM 1C0A11-01E). Parameters that can be copied are as follows:

- | | |
|-------------------------|-------------------------|
| B19 MAGMETER | E10 P.RATE UNIT |
| B20 SIZE UNIT | E11 PULSE RATE |
| B21 NOMINAL SIZE | E12 PULSE LOWCUT |
| B22 FLOW UNIT | E13 PULSE WIDTH |
| B23 TIME UNIT | E49 H ALARM |
| B24 FLOW SPAN | E50 L ALARM |
| B25 DAMPING | |
| B50 DSP TOTAL | |
| B51 DSP PULSE | |
| B53 DSP OTHER | |
| C10 F. USER SEL | |
| C11 F.USER UNIT | |
| C12 F. USER SPAN | |
| C13 T.USER SEL | |
| C14 T. USER UNIT | |
| C20 T. RATE UNIT | |
| C21 TOTAL RATE | |
| C22 TOTAL LOWCUT | |
| C23 TOTAL SET | |
| C24 T.SET VALUE | |
| C30 4-20 LOW LMT | |
| C40 F.DIRECTION | |
| C41 ALM OUTPUT | |

5.8 OPERATION VIA HART COMMUNICATOR (Only available for AM11-DE)

5.8.1 Interconnection between AM11 and HART Communicator

The HART Communicator can interface with the AM 11-DE from the control room, the AM 11-DE 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 AM 11-DE, the connections are non-polarized. Figure 5.8.1 illustrates the wiring connections for direct interface at the AM 11-DE site. The HART Communicator can be used for remote access from any terminal strip as well.

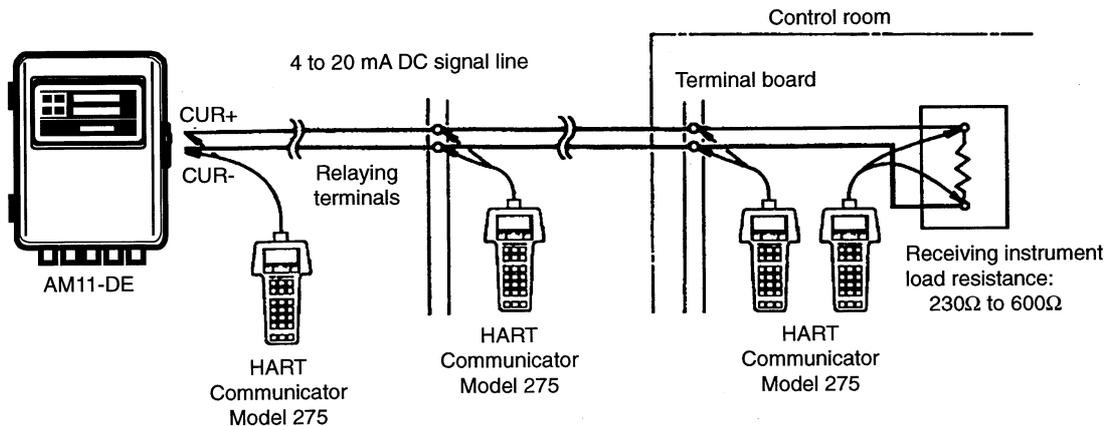


Figure 5.8.1 Interconnection Diagram

5.8.2 Communication Line Requirements

Specifications for Communication Line:

- Load resistance: 230 to 600Ω (including cable resistance)
When multidrop mode, see Figure 7.1.2.
 - 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

5. FUNCTIONS AND PARAMETER SETTINGS

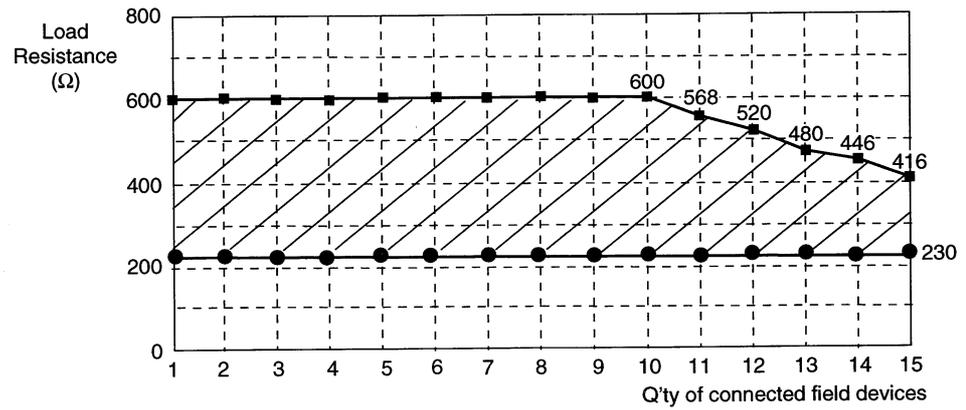


Figure 5.8.2 Load Resistance in case of Multidrop Mode



NOTE

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

5.8.3 Keys and Functions of the HART Communicator (Model 275)

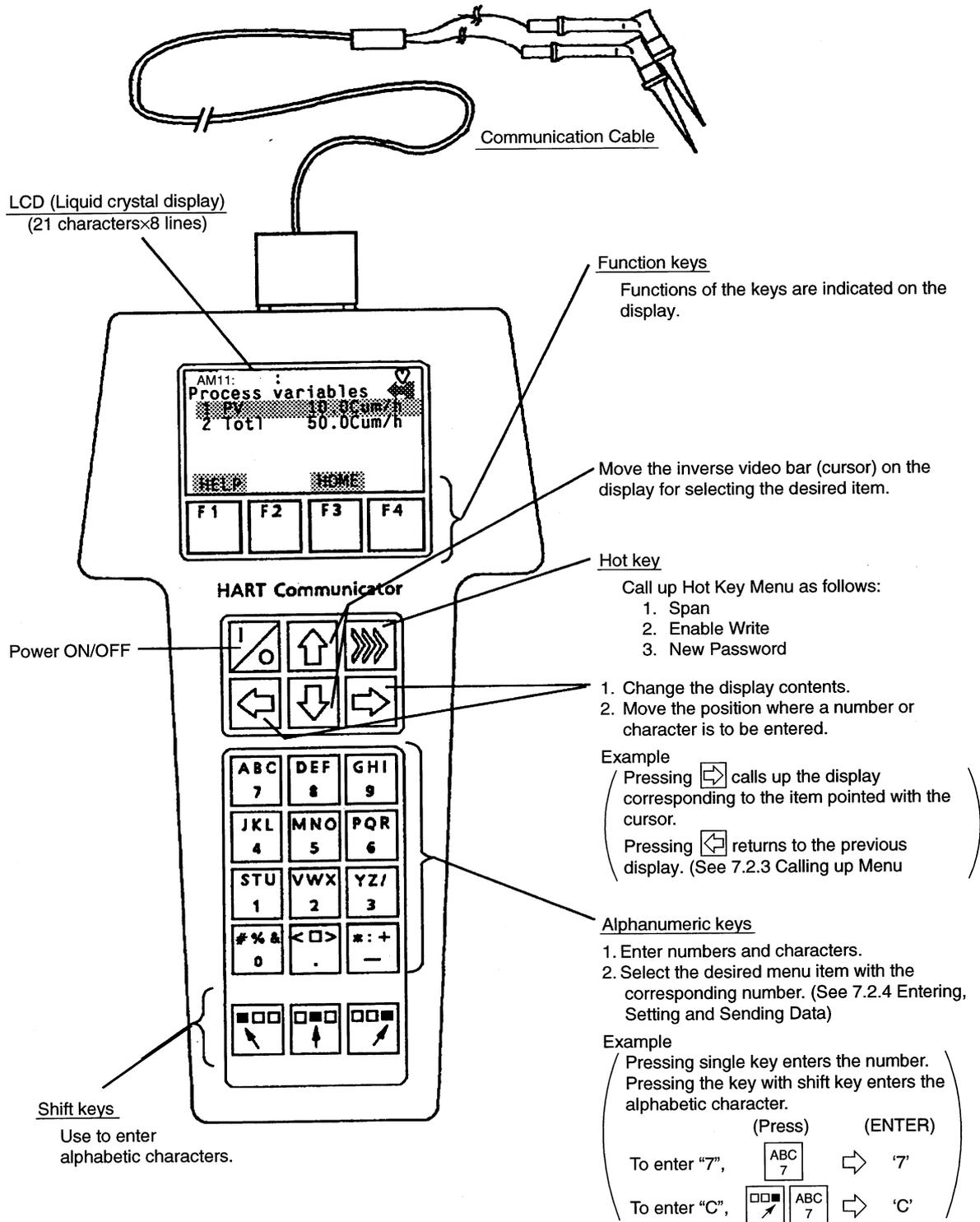


Figure 5.8.3 HART Communicator

5.8.4 Display

The HART Communicator automatically searches for AM 11-DE on the 4 to 20 mA loop when it is turned on. When the HART Communicator is connected to the AM 11-DE, it displays “Online” menu as shown below.

(If AM 11-DE 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 AM 11-DE.)

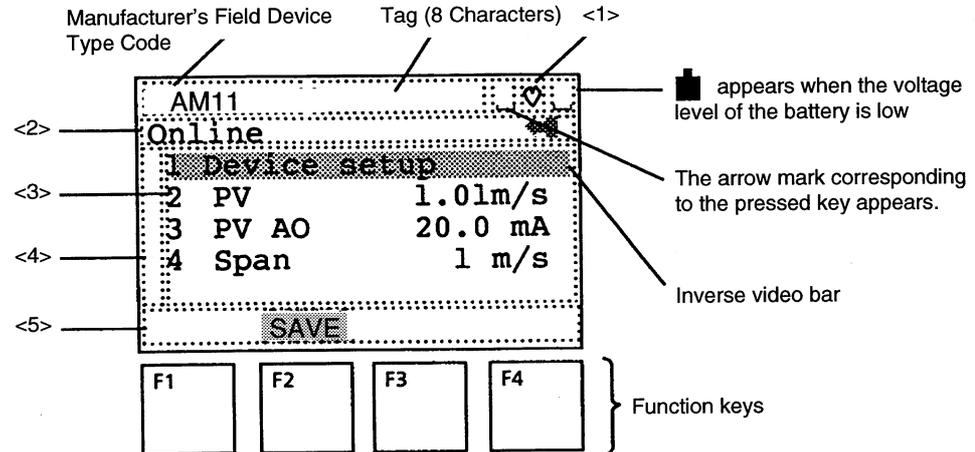


Figure 5.8.4 Display

- <1> appears and flashes during communication between the HART Communicator and the AM 11-DE. 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 “5.8.9 Setting Parameters (7) Burst Mode”.

5.8.5 Calling Up Menu Addresses

5.8.8 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 AM 11-DE, “Online” menu will be displayed after the power is turned on (See figure 5.8.4). Call up the desired item as follows:

Key operation

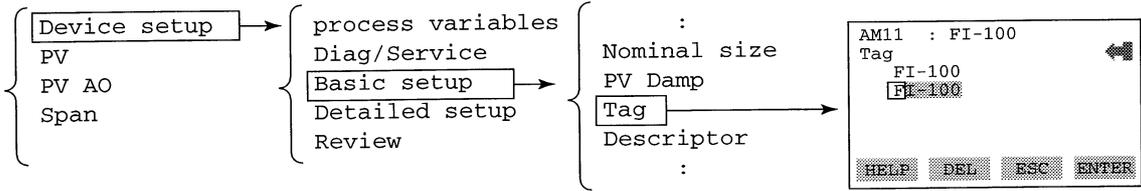
There are two choices to select the desired menu item.

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	
<div style="border: 1px solid black; padding: 5px;"> <p>1 AM11 : FI-100 Online 1 Device setup 2 PV 3 PV AO 4 Span</p> </div>	 or 	<p>Display 1 appears when the HART Communicator is turned on.</p> <p>Select “Device setup”.</p>
<div style="border: 1px solid black; padding: 5px;"> <p>2 AM11 : FI-100 Device setup 1 Process variables 2 Diag/Service 3 Basic setup 4 Detailed setup 5 Review SAVE HOME</p> </div>	 x2  OR 	<p>Select “Basic setup”.</p>
<div style="border: 1px solid black; padding: 5px;"> <p>3 AM11 : FI-100 Basic setup 1 PV Unit 2 Span 3 Nominal size 4 PV Damp 5 Tag HELP SAVE HOME</p> </div>	 x4  OR 	<p>Select “Tag”.</p>
<div style="border: 1px solid black; padding: 5px;"> <p>4 AM11 : FI-100 Tag FI-100 FI-100 HELP DEL ESC ENTER</p> </div>		<p>The display for Tag setting appears. (The default value of “Tag” is blank.)</p>

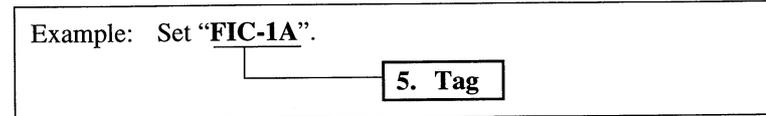
5.8.6 Entering, Setting and Sending Data

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 AM 11-DE. Note that the data are not set in the AM 11-DE 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 AM 11-DE at one lot.

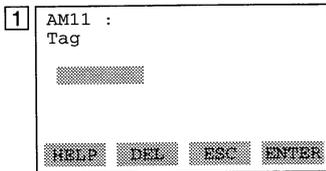
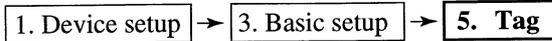
Operation

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 “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 AM11 :
Tag
FIC-1A

HELP DEL ESC ENTER

2 AM11 :
Basic setup ←
1 PV Unit
2 Span
3 Nominal size
4 PV Damp
5 Tag FIC-1A

HELP SEND HOME

3 AM11 : FIC-1A
Basic setup ←
1 PV Unit
2 Span
3 Nominal 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 AM11-DE.

* ♡ is flashing during communication.

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

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

5.8.7 Parameters

(1) Parameters Configuration

Parameters of HART Communicator is constructed hierarchically. The menu tree for Online menu is shown in 5.8.8 Menu Tree.

See "Chapter 9. Parameter List" about the usage of each parameter. Note the differences between parameters on AM 11-DE display and those on HART Communicator.

The Online menu summary is shown below.

Table 5.8.1 Online Menu Summary

No.	Display Item	Contents
1	Device setup	Set parameters for AM11-DE.
2	PV	Display process value in engineering unit.
3	PV AO	Display analog output in mA.
4	SPAN	Display set span in engineering unit.

(2) Data Renewing

There are two methods to load the data of AM 11-DE from/to HART Communicator, periodic data renewing and discretionary data renewing.

- Periodic Data Renewing

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

PV, PV AO, PV % rng, Totl, Reverse total, Diff. total, Frequency, Velocity, SI S3, SI S4

- Discretionary Data Renewing

The following data can be loaded from/to AM 11-DE. 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.)

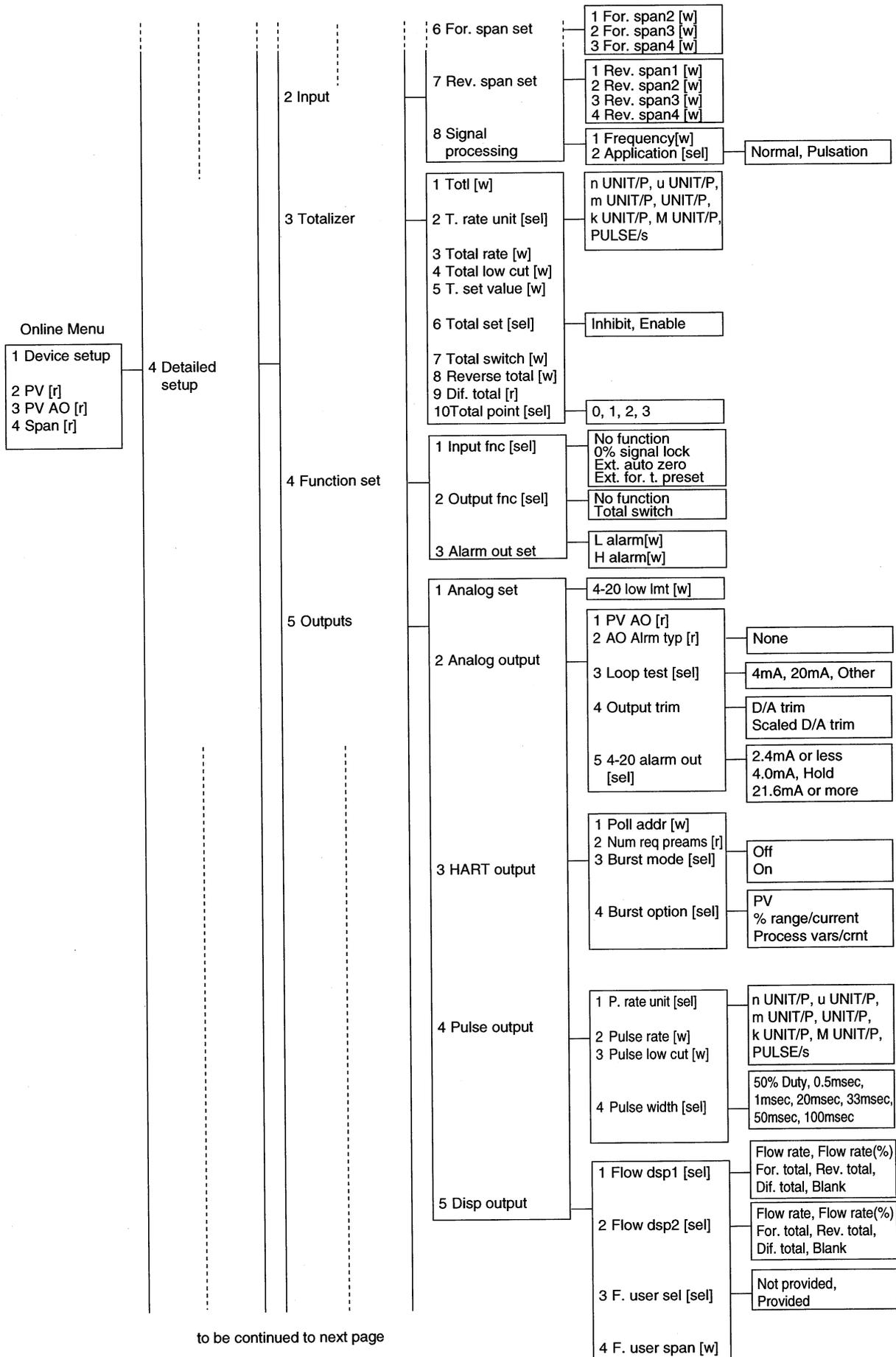
Descriptor, Message, Date, Tag, Span, Nominal size, Size unit, PV Damp, Flow unit, Time unit, F. user sel, F. user span, Total rate unit, Total rate, Total low cut, T. set value, Total set, 4-20 low lmt, 4-20 alarm out, P. rate unit, Pulse rate, Pulse low cut, Pulse width, F. direction, H alarm, L alarm.



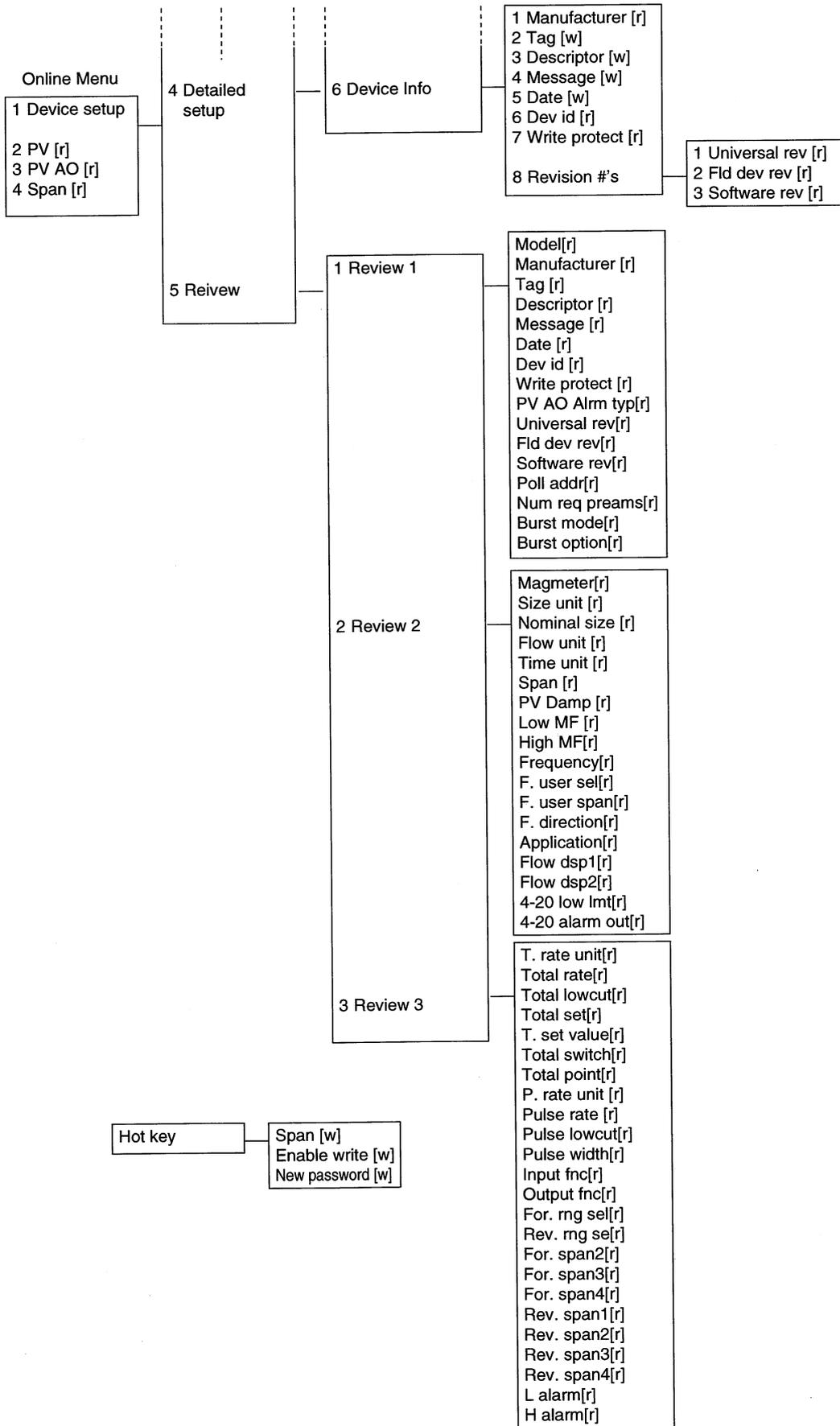
NOTE

1. "F. USER UNIT", "T. USER SEL" and "T. USER UNIT" which are parameters of AM11-DE are not available for HART communication. They can be used only on AM11-DE display.
2. The changed data with HART Communicator is sent to AM 11-DE by pressing **SEND (F2)** of HART Communicator.

5. FUNCTIONS AND PARAMETER SETTINGS



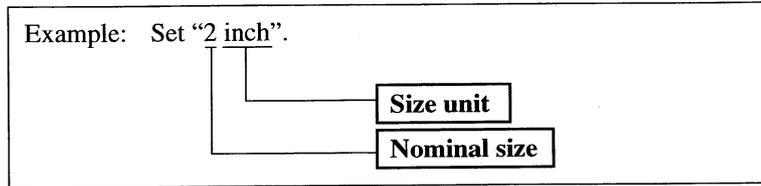
to be continued to next page



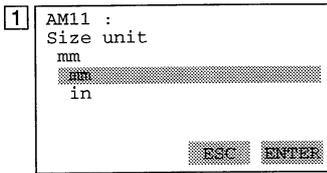
5.8.9 Setting Parameters

(1) Nominal Size

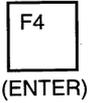
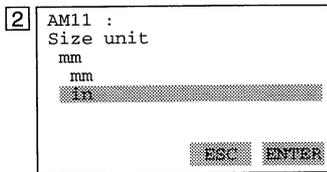
The nominal size is engraved on the data plate of the combined flow tube.



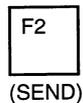
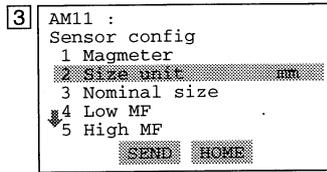
Call up "Size unit" setting display.



Select "in" (inch).

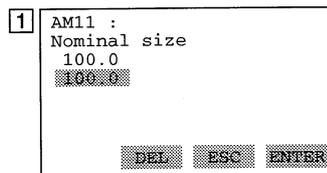
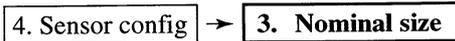


Press ENTER (F4).



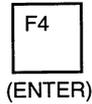
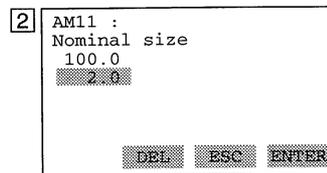
Press SEND (F2) to set data to the AM11-DE.

Call up "Nominal size" setting display.

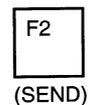
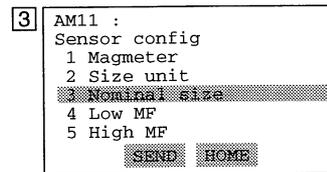


'2'

Enter "2" with alphanumeric keys.

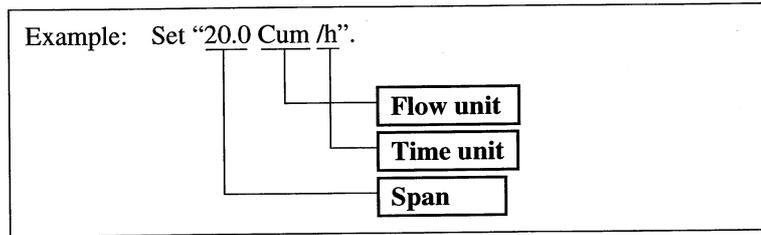


Press ENTER (F4).

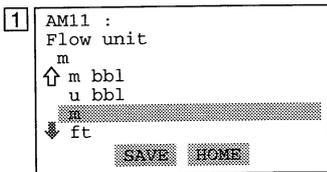
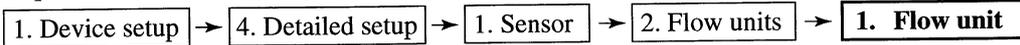


Press SEND (F2) to set data to the AM11-DE.

(2) Span

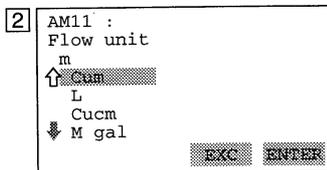


Call up "Flow unit" setting display.



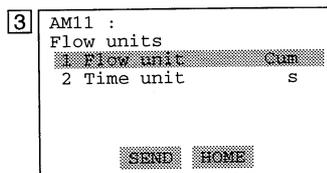
x11

Select "Cum" (m³).



(ENTER)

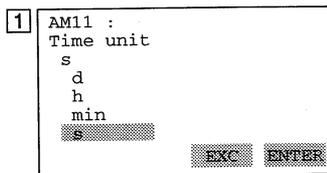
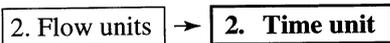
Press ENTER (F4).



(SEND)

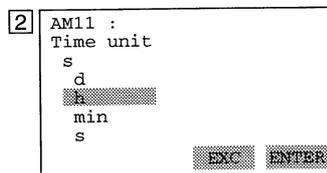
Press SEND (F2) to set data to the AM11-DE.

Call up "Time unit" setting display.



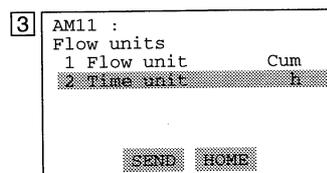
x2

Select "h".



(ENTER)

Press ENTER (F4).



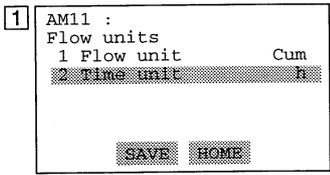
(SEND)

Press SEND (F2) to set data to the AM11-DE.

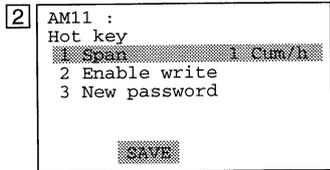
5. FUNCTIONS AND PARAMETER SETTINGS

Call up “Span” setting display.

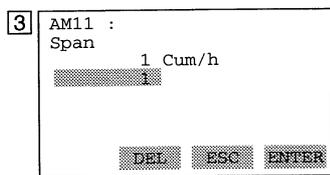
Hot key → 1. Span



Press Hot key.

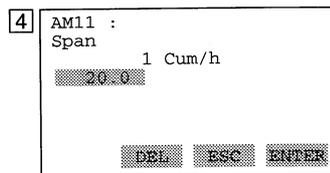


Select “Span”.

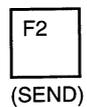
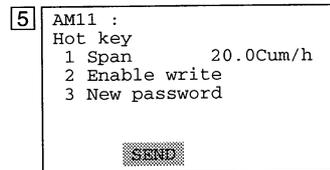


‘20.0’

Enter “20.0” with alphanumeric keys.



Press **ENTER (F4)**.



Press **SEND (F2)** to set data to the AM11-DE.

Return to the previous display by pressing  or .



NOTE

When the span is set in engineering units using the AM 11-DE 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 AM 11-DE (parameter A11 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 "Flow unit" and "Time unit"

These parameters can be set with both AM11-DE 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*

* "m" and "ft" can be combined only with /s.

"Time unit": /d, /h, /min, /s

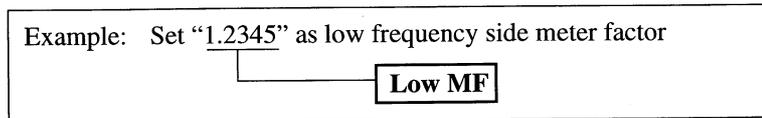
If the unit undefined in "PV Unit" is set in these parameters, the display of "PV Unit" indicates "Spcl."

<3> "F. USER UNIT" and "T. USER UNIT"

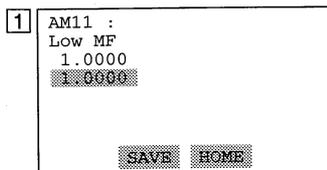
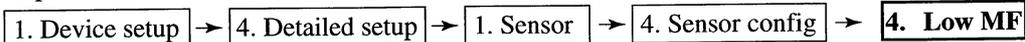
These parameters are user defined units, available only for AM11-DE display. They can be set only with AM11-DE front panel key switches, not with HART Communicator. If the user defined unit is set in these parameters (It means "F. USER SEL" is "PROVIDED"), the flow units on HART Communicator indicates "CONV"

(4) Meter Factor

The meter factor is engraved on the data plate of the combined flow tube.

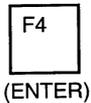
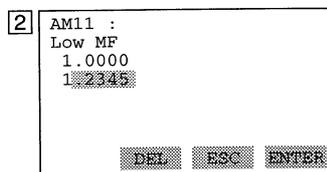


Call up "Low MF" setting display.

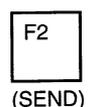
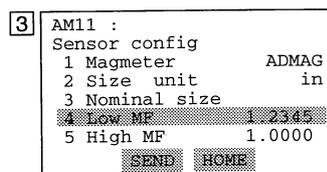


Enter "1.2345" with alphanumeric keys.

'1.2345'

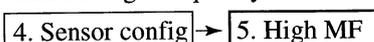


Press ENTER (F4).



Press SEND (F2) to set data to the AM11-DE.

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

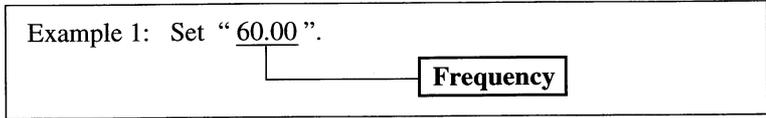


(5) Power Frequency (For DC version only)

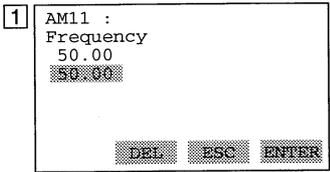
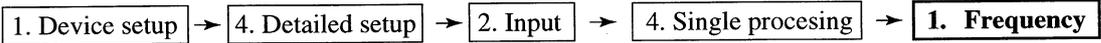


IMPORTANT

In case of DC power supply version, setting power frequency is required in area where the frequency differs. The meter is set to 50.00Hz at the factory.

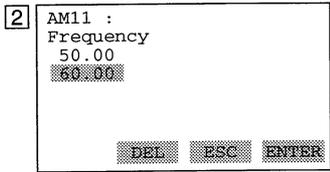


Call up "Frequency" setting display.



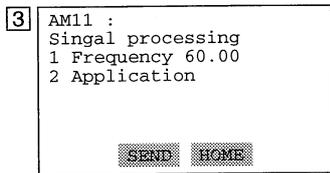
'60.00'

Enter "60.00" with alphanumeric keys.



F4
(ENTER)

Press **ENTER (F4)**.



F2
(SEND)

Press **SEND (F2)** to set data to the AM11-DE.

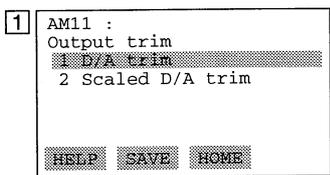
(6) Trim Analog Output

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

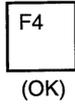
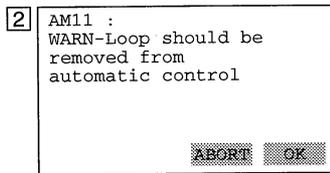
- **D/A Trim**
 “D/A trim” is to be carried out if the calibration digital ammeter does not read 4.000 mA and 20.000 mA exactly with the output signal of 0% and 100%.
- **Scaled D/A Trim**
 “Scaled D/A trim” is to be carried out if the output is adjusted using a voltmeter or other types of meters or using a meter with 0% to 100% scale.

Example 1: For the adjustment using an ammeter ($\pm 1\mu\text{A}$ is measurable.)

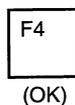
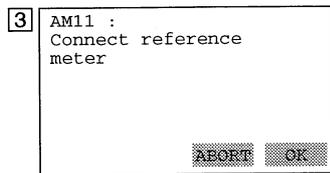
Call up “Output trim” display.



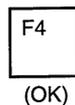
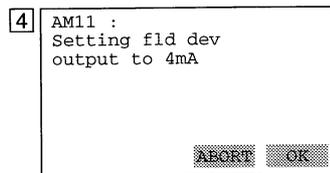
Select “D/A trim”.



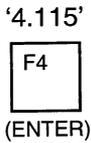
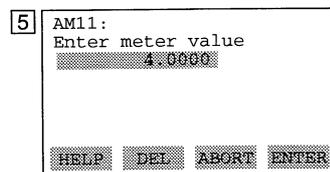
Press **OK (F4)**.



Connect the ammeter ($\pm 1\mu\text{A}$ is measurable.), and press **OK (F4)**.



Press **OK (F4)**, and the AM11-DE outputs the output signal of 0%.



Ammeter reading: 4.115

Enter the read value “**4.115**” of the ammeter, and press **ENTER (F4)**.
 (The output of the AM11-DE changes.)

5. FUNCTIONS AND PARAMETER SETTINGS

```

6 AM11 :
  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 4.000 mA, select “Yes” and press ENTER (F4).

If the reading is not 4.000 mA, select item 2. “No”. Repeat steps 5 until the ammeter reads 4.000 mA.

```

7 AM11 :
  Setting fld dev
  output of 20mA
  ABORT OK
    
```

F4
(OK)

Press OK (F4), and the AM11-DE outputs the output signal of 100%.

```

8 AM11 :
  Enter meter value
  19.050
  HELP DEL ABORT ENTER
    
```

'19.050'
F4
(ENTER)

Ammeter reading: 19.050

Carry out the same procedures as those described under 5.

```

9 AM11 :
  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 AM11 :
  NOTE-Loop may be
  returned to automatic
  control
  OK
    
```

F4
(OK)

Press OK (F4).

Example 2: Adjust using a voltmeter

```

1 AM11 :
  Trim analog output
  1 D/A trim
  2 Scaled D/A trim
  HELP SAVE HOME
    
```

VWX
2

Select the “Scaled D/A trim” item.

```

2 AM11 :
  WARN-Loop should be
  removed from
  automatic control
  ABORT OK
    
```

F4
(OK)

Press OK (F4).

3 AM11 :
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 AM11 :
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 4 mA. In this case, enter the value of the voltage across a 250Ω resistor (1 V), and press **ENTER (F4)**.

5 AM11 :
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 20 mA. Then, enter **“5”** (5 V), and press **ENTER (F4)**.

6 AM11 :
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 AM11 :
Connect reference
meter

IMPORTANT

ABORT OK

F4
(OK)

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

8 AM11 :
Setting fld dev
output to 4mA

ABORT OK

F4
(OK)

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

9 AM11 :
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 AM11-DE changes.)

10 AM11 :
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 1.000 V.

5. FUNCTIONS AND PARAMETER SETTINGS

11 AM11 :
Setting fld dev
output to 20mA

ABORT OK

F4
(OK)

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

12 AM11 :
Enter 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 AM11 :
Scaled output: 5.210
equal readout
device?
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 AM11 :
NOTE-Loop may be
returned to automatic
control

OK

F4
(OK)

Press **OK (F4)**.



IMPORTANT

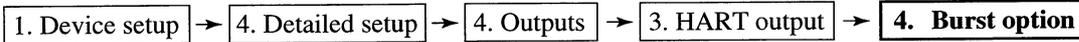
D/A trim should be executed only at single range mode. If D/A trim is executed at multirange mode, it is feared that the current output becomes 108%.

(7) Burst Mode

The AM 11-DE continuously sends the data stored in it when the burst mode is set "On". Either one of instantaneous flow rate, output in %, totalization values and current output can be selected and sent. The data is sent intermittently as a digital signal when the AM 11-DE is set in the burst mode.

Setting of Burst Mode

Call up "Burst option" display.



```

AM11 :
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 mode" display.



```

1 AM11 :
  Burst mode
  Off
  Off
  On
  ESC  ENTER
  
```

↓
F4
(ENTER)

Set "ON" and press ENTER (F4).

```

2 AM11 :
  HART output
  1 Poll addr      0
  2 Num req preams s
  Burst mode      On
  4 Burst option   PV
  HELP  SEND  HOME
  
```

F2
(SEND)

Press SEND (F2).

Releasing from Burst Mode

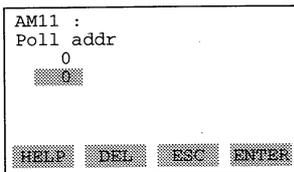
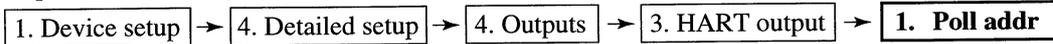
Call up "Burst mode" display, and set "Off".

(8) 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 20 mA output and turns it 4 mA. Refer to Fig. 7.1.2 for the load resistance.

Setting of Multidrop Mode

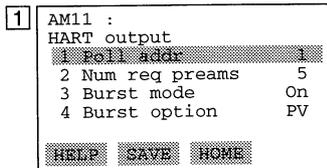
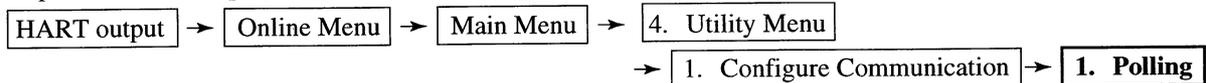
Call up “Poll addr” display.



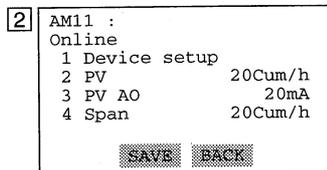
Set the polling address (a number from 1 to 15) and press **ENTER (F4)**.

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

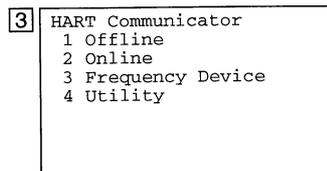
Call up “Auto Poll” display.



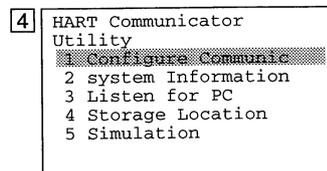
Return to “**Online Menu**” with **HOME (F3)**.



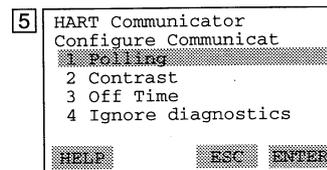
Return to “**Main Menu**” with a “previous” key.



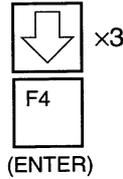
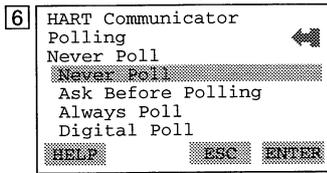
Select “**Utility**”.



Select “**Configure Communication**”.



Select “**Polling**”.



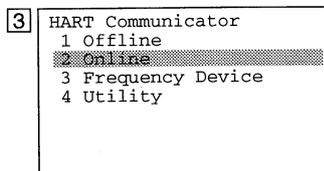
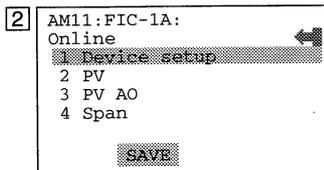
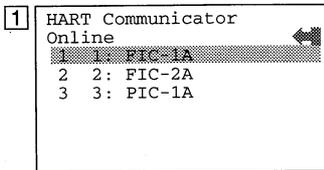
Select “**Digital Poll**” and press **ENTER (F4)**.



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) 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) Select 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) 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.

(9) Write Protection

Write protection function is provided to inhibit parameter change. Write protection function becomes active by entering a password in "New Password". Write protection status is released for 10 minutes by entering the password in "Enable Write".



NOTE

When the write protection function is active, data setting changes in all parameters of the AM 11-DE are inhibited and cannot be changed using either the HART Communicator or the AM 11-DE front panel key switches. However, even with the write protect function active, it is possible using the external status inputs to change two parameters; automatic zero adjustment and totalization preset.

Setting Password

Example: Set the password to "1 2 3 4 _ _ _ _"

Call up "New Password" in Hot key menu

Hot key → **3. New Password**

1 AM11 :
Hot key
1 Span 1 m/s
2 Enable Write
3 New Password

YZ/
3

Select "New Password".

2 AM11 :
Enter New Password

DEL ABORT ENTER

STU VWX YZ/ JKL F2
1 2 3 4 ×4
F4 (DEL)

Set "1 2 3 4 _ _ _ _" and press ENTER (F4).

3 AM11 :
Re-Enter New Password
1234
1234

DEL ABORT ENTER

F4
(ENTER)

Press ENTER (F4).

4 AM11 :
Set New Password OK

ABORT OK

F4
(OK)

Press OK (F4).

"Write protect" status changes from "No" to "Yes".

5 AM11 :
Method Aborted

ABORT OK

F4
(OK)

Press OK (F4).

Changing Password

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

Call up "Enable write" in Hot key menu

Hot key → **2. Enable write**

1 AM11 : "1 2 3 4 _ _ _ _" Enter the password and press **ENTER (F4)**.
 Input password

 DEL ABORT ENTER
 F4
 (ENTER)

2 AM11 : Write enable in 10 minutes
 Write protect status is released for 10 minutes.
 ABORT OK
 F4
 (OK)

3 AM11 : Method Aborted
 Press **OK (F4)**.
 ABORT OK
 F4
 (OK)

4 AM11 : Select the "New Password".
 Hot key 1 m/s
 1 Span
 2 Enable write
 3 New Password
 YZ/
 3

5 AM11 : "6 7 8 9 A _ _ _" Set "6 7 8 9 A _ _ _".
 Enter New Password

 DEL ABORT ENTER
 F4
 (ENTER)

6 AM11 : Press **ENTER (F4)**.
 Re-Enter New Password
 6789A
 6789A
 DEL ABORT ENTER
 F4
 (ENTER)

7 AM11 : Set New Password OK
 ABORT OK
 F4
 (OK)

8 AM11 : Press **OK (F4)**.
 Method Aborted
 ABORT OK
 F4
 (OK)



NOTE

1. **“Enable Write”** releases 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 AM 11-DE 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. In case of using AM11-DE front panel key switches, enter the password in **“M11 ENABLE WRITE”** and the write protect status is released. The write protect status is displayed in **“M10 WRITE PROTECT”**.

“Jorker password”

When you forget the password that has been registered, it is possible to release the mode for 10 minutes by using a jorker password. Enter YOKOGAWA to release **“White protect”** status for 10 minutes.

(10) Other Functions and Operation

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

Product Manual for the HART Communicator : MAN 4250

5.9 Batch Control Functions (Only for AM11-DB)

The AM11-DB is equipped with batch functions (2-stage closing batch algorithm).

- The batch sequence can be operated either via the four contact inputs; RESET, START, PAUSE, and AUX, or with the START, PAUSE, and RESET keys on the converter front panel.
- The batch sequence status can be confirmed with LED lamps indications ; LOAD, PRE, and END on the converter front panel, and two contact outputs; PRE and END.

5.9.1 Batch Control Functions Status

Figure 5.8.1 shows the status of the input/output terminals and LED lamps indications during batch control.

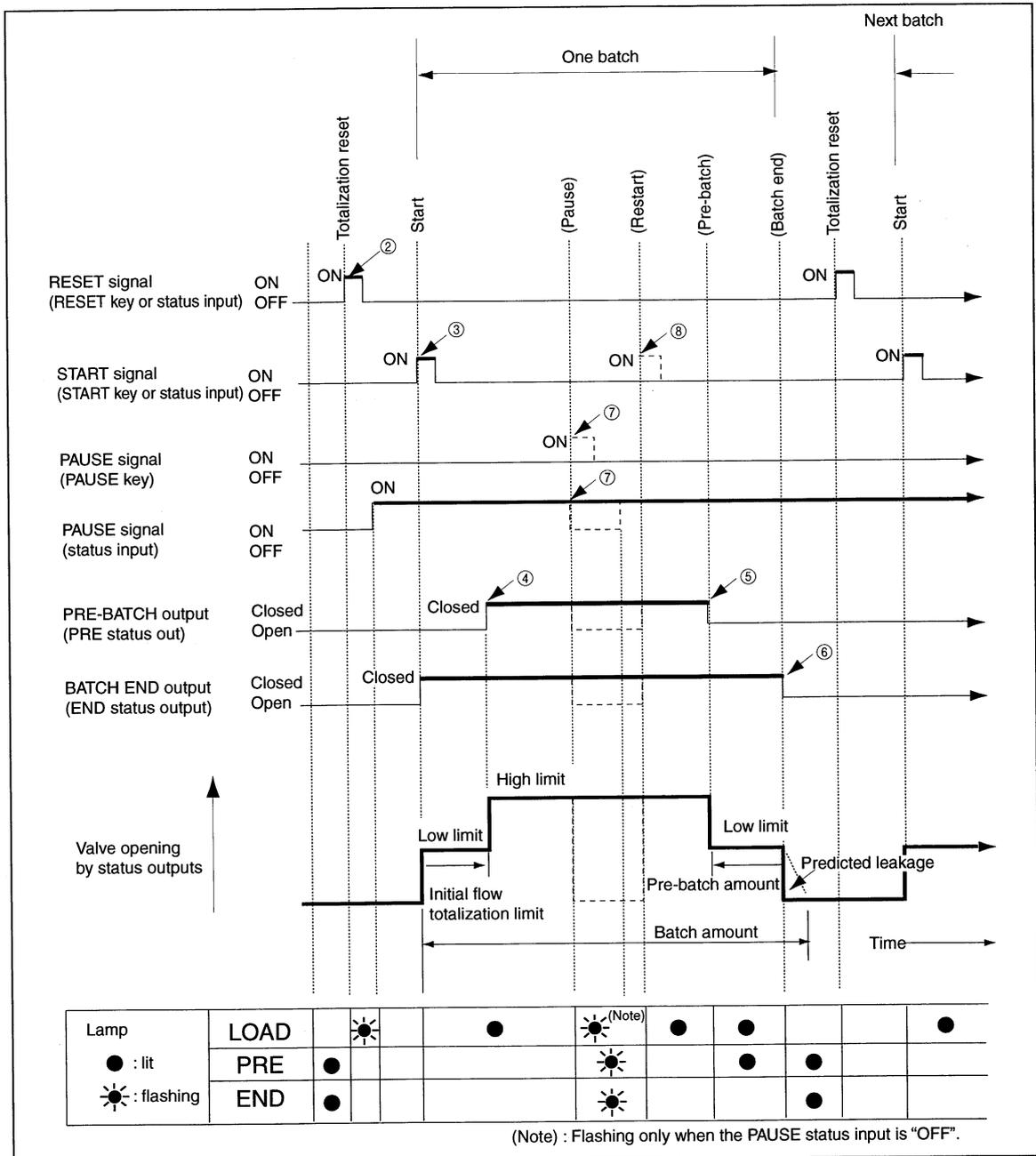


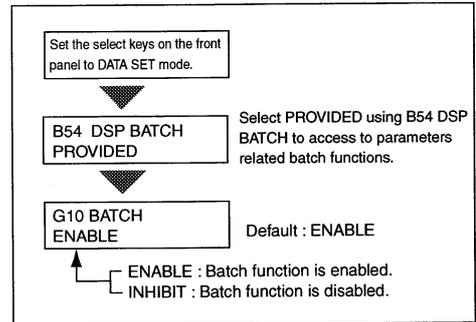
Figure 5.9.1 Batch Sequence

5.9.2 Batch Control Functions and Settings

This subsection describes the setting for the parameter data associated with batch mode.

(1) Batch Function Enable/Inhibit Selection

- This parameter enables or disables the batch functions. Setting “ENABLE” to G10 BATCH enables the batch functions. If “INHIBIT” is set, the select keys on the front panel are forcibly fixed to DATA SET mode.



(2) Normal Batch/High Speed Batch Selection

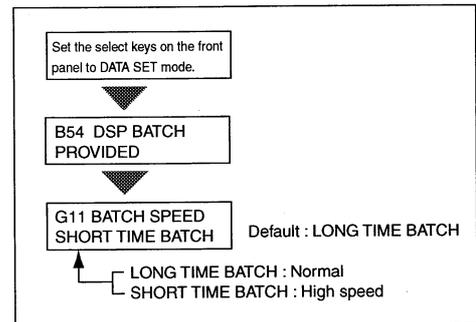
- If fast response is required, use G11 BATCH SPEED to select SHORT TIME BATCH (high-speed batch). High-speed batch should be selected in case that the batch time is short, or the batch amount is not sufficiently consistent. However high-speed batch control cannot be selected if the size exceeds 400 mm.

LONG TIME BATCH (Normal Batch):

The totalization cycle is 80 ms.

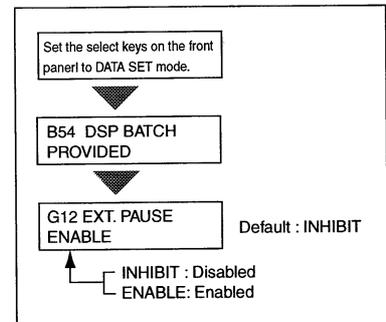
SHORT TIME BATCH (High Speed Batch) :

The totalization cycle is 13.3 ms.



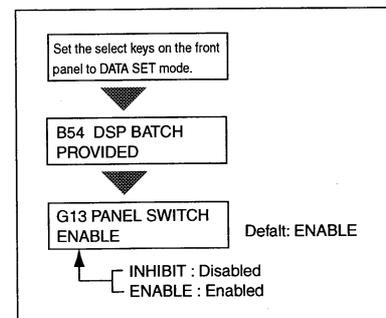
(3) PAUSE via Contact Input Enable/Inhibit Selection

- This parameter enables or disables the PAUSE via contact input. Setting “ENABLE” to G12 EXT. PAUSE enables this function. The other contact inputs (non-locked contact) like RESET, START are always enabled.



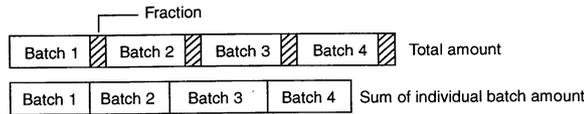
(4) Batch Control Keys Enable/Inhibit Selection

- Setting “ENABLE” to G13 PANEL SWITCH enables the batch control keys on the front panel.

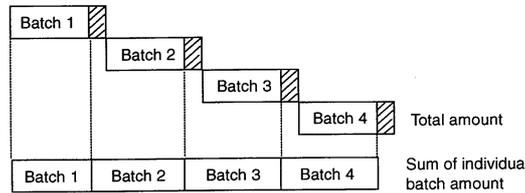


(5) Totalization Fractions Reset/Preserve Selection

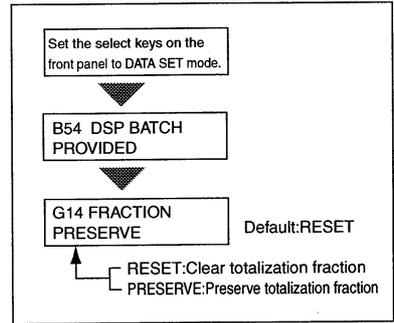
- Although the totalization value is displayed using six-digit, the converter also holds internally a fraction which is not displayed. Normally, this fraction is discarded at reset. However, in applications where batch operations are performed repeatedly, it makes a difference between the actual amount and the accumulated batch amounts without truncating fractions.



This function makes it possible to minimize this difference by preserving the fraction from the previous batch, and carrying it forward to the next batch.

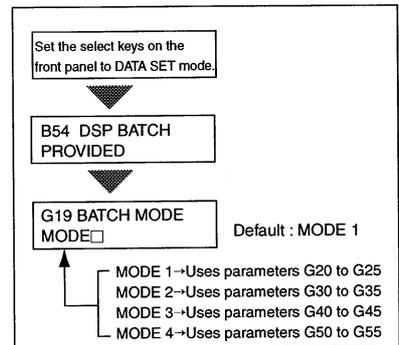


Setting "PRESERVE" to G14 FRACTION enables this function. If RESET (clear totalization fraction) is selected the pulse output fraction is also cleared.



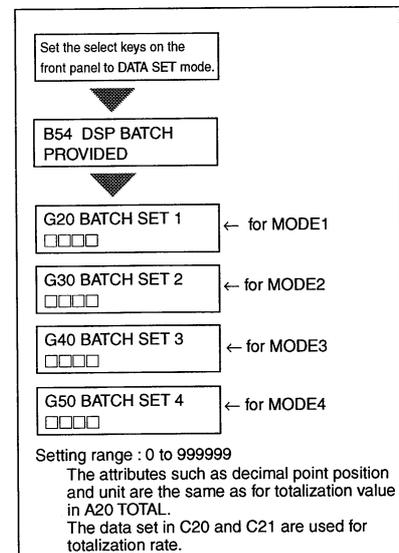
(6) Batch Mode Selection

- Selects the batch mode among four modes which have been set.



(7) Batch Amount Setting

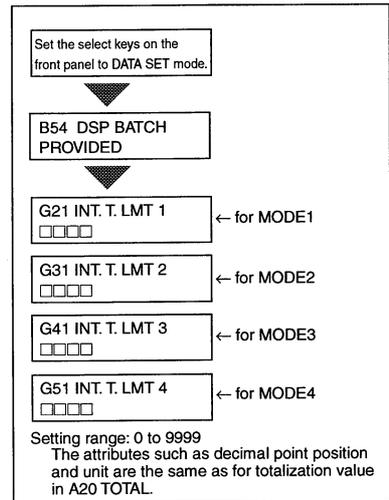
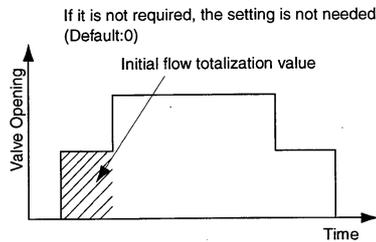
- Sets batch amounts to G20 (Mode 1), G30 (Mode 2), G40 (Mode 3), and G50 (Mode 4). Select "BATCH SET" using M40 BATCH DISP to display on an LED display (upper side only). Setting FOR. TOTAL to M41 FLOW DISP causes the totalization value to be displayed on a lower side LED display.



(8) Initial Flow Totalization Value Setting

- Sets the initial flow totalization limit value to G21 (Mode 1), G31 (Mode 2), G41 (Mode 3), and G51 (Mode 4).

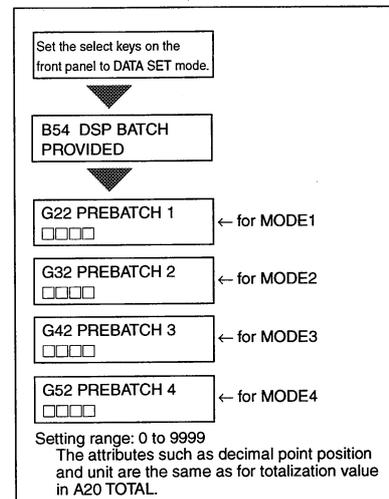
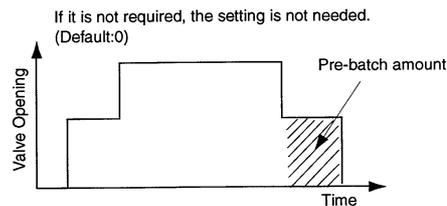
This function is used for 2-stage opening batch control.



(9) Pre-Batch Amount Setting

- Sets the pre-batch amount to G22 (Mode 1), G32 (Mode 2), G42 (Mode 3), and G52 (Mode 4).

This function is used for 2-stage closing batch control. This pre-batch amount is included a predicted leakage amount. (See (10) Predicted Leakage Setting.)

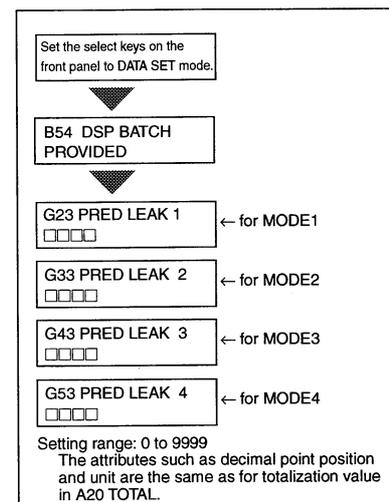
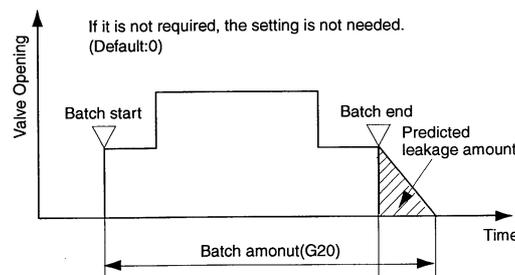


(10) Predicted Leakage Setting

- This functions is used to set the predicted leakage amount after valve closing.

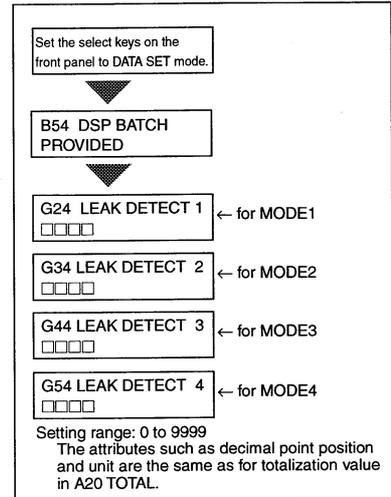
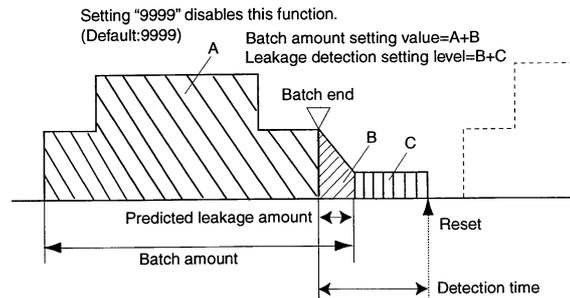
The batch end output is generated when the totalization reaches the value substracted the predicted leakage amount from the batch amount.

Sets the predicted leakage amount to G23 (Mode 1), G33 (Mode 2), G43 (Mode 3), and G53 (Mode 4).



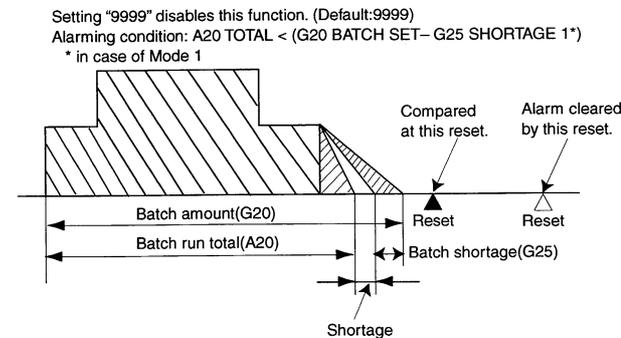
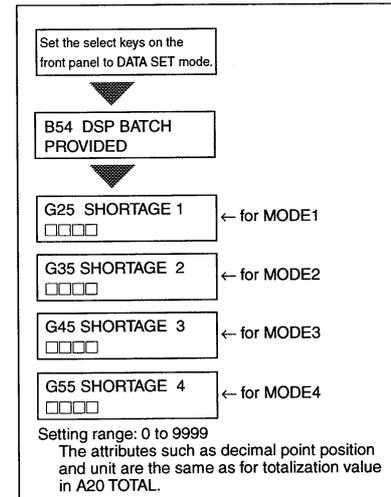
(11) Leakage Detection Level Setting

- This function sets a level against which to compare the leakage occurring between batch end and reset, and causes an alarm (LEAKAGE DETECT) to be output if leakage exceeds this comparison level.
- Sets the leakage detection level to G24 (Mode 1), G34 (Mode 2), G44 (Mode 3), and G54 (Mode 4).
- This alarm can be cleared by RESET signal. Leakage detection resumes at the time that it is cleared by RESET signal.



(12) Shortage Detection Level Setting

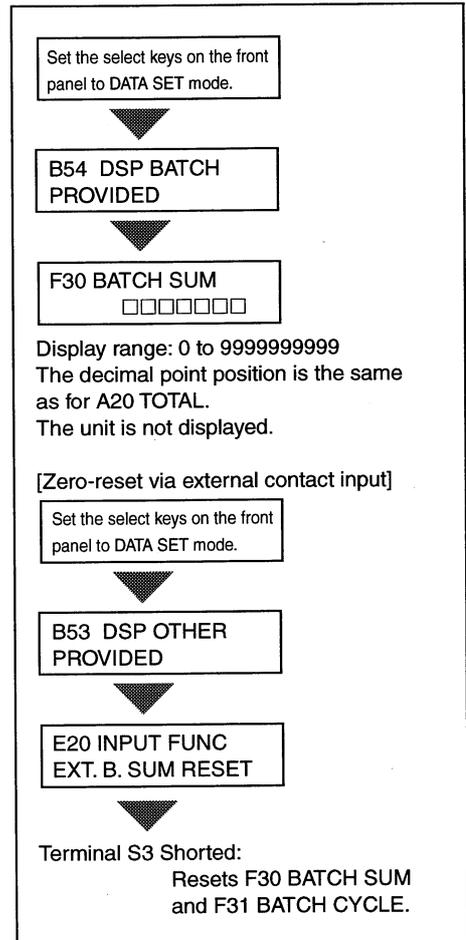
- This function sets an allowable level of shortage detection between start and reset, and causes an alarm (BATCH SHORTAGE) to be output if the shortage exceeds the allowable level.
- Sets the shortage detection level to G25 (Mode 1), G35 (Mode 2), G45 (Mode 3), and G55 (Mode 4).
- When this alarm occurs, the 4 to 20 mA output and totalization pulse continue, and A20 TOTAL is not reset. The alarm is cleared by another RESET signal. The operation returns to the original batch cycle after the alarm is cleared.



Note: The alarm, LEAKAGE DETECT or BATCH SHORTAGE will be output when " 0 " is set as the leakage detection level and the shortage detection level, and the actual batch run total and the batch amount setting are not exactly same.

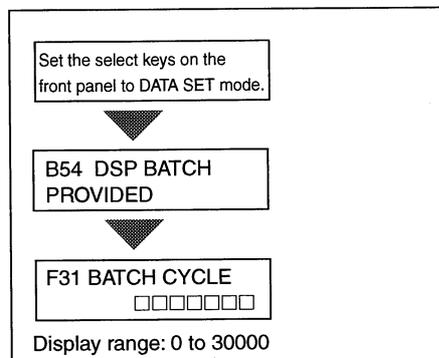
(13) Batch Totalization Sum Display and Zero Reset

- The sum of batch operation is displayed in F30 BATCH SUM.
- Although the totalization value in A20 TOTAL is cleared to “0” by each RESET signal, the totalization continues in F30 BATCH SUM.
- Display F30 BATCH SUM and press SET key twice to reset to zero. In case of using BT200, display F30 and press ENTER key twice to reset to zero. Setting “EXT. B. SUMRESET ” to E20 INPUT FUNC enables zero reset using an external contact input. In this case, the batch cycle count display (F31 BATCH CYCLE) is reset to zero at the same time. See (14) Batch Cycle Count Display and Zero Reset.



(14) Batch Cycle Count Display and Zero Reset

- The batch cycle count is displayed in F31 BATCH CYCLE.
- Display F31 BATCH CYCLE and press SET key twice to reset to zero. In case of using BT200, display F31 and press ENTER key twice to reset to zero. Zero reset is also possible using an external contact input. See (13) Batch Totalization Sum Display and Zero Reset for the procedure.



6. ACTUAL OPERATION

After you have installed the flow tube into the process piping, wired the input / output terminals, set up the required parameters and performed the pre-operation zero adjustment, the magnetic flowmeter should output an accurate flow signal from its terminals as soon as the measured fluid begins to flow.

This section describes procedures of zero adjustment and alarms countermeasure.

6.1 Pre-operation Zero Adjustment

In the magnetic flowmeter, zero adjustment is required before beginning operation in order to obtain a 4 to 20mA signal that is accurately proportional to the flow.

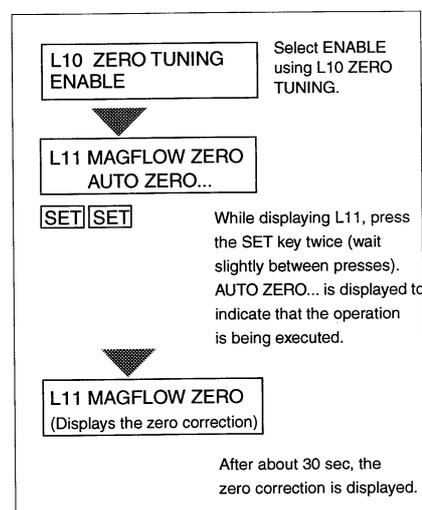
This section describes three procedures for performing zero adjustment; using the data setting keys on the converter front panel, using the BT200 using the HART communicator, or using the external contact input. Zero adjustment is made to set the instrument to 0%(4mA) when the flow rate is 0.



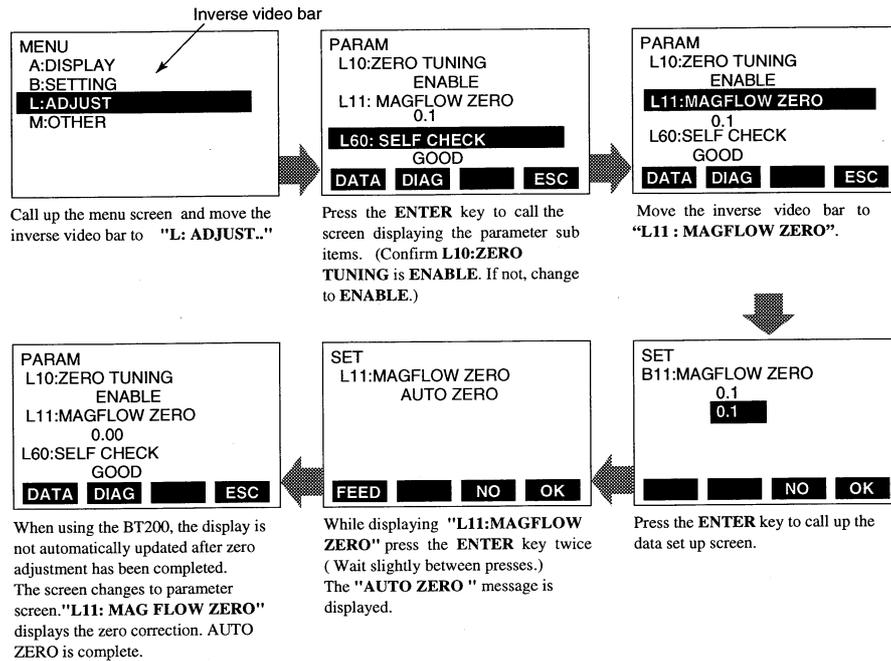
IMPORTANT

1. Zero adjustment should be done only when the fluid is filled in the flow tube and the fluid velocity is completely zero by closing the valve.
2. In case that the measured fluid is changed, zero adjustment should be done with the measured fluid each time.
3. Zero adjustment should be done prior to the other operation. For 30 seconds during the zero adjustment, any setting cannot be accepted.
4. Do not turn off the power to the AM11 immediately after zero adjustment. Powering off within 30 seconds after zero adjustment will return the adjustment to the previous setting.

6.1.1 Zero Adjustment Using Data Setting Keys

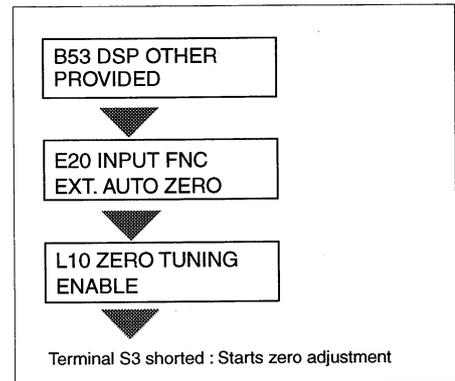


6.1.2 Zero Adjustment Using BT200 (Only Available for AM11-DH-/DL-/DB)



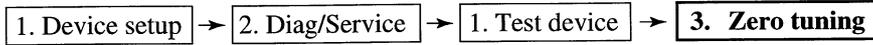
6.1.3 Zero Adjustment Via Contact Input (Only Available AM11-DH-/DE-/DL)

When performing zero adjustment via a status contact input, there is no need to call up L11 MAGFLOW ZERO. Follow the procedures shown in the figure at right.



6.1.4 Zero Adjustment using HART Communicator(Only Available for AM11-DE)

Call up “Zero tuning” display.



```

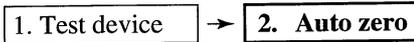
AM11 :
Zero tuning
Enable
Inhibit
Enable
    
```

~~ESC~~ ENTER

F4
(ENTER)
F2
(SEND)

Select “Enable” and press ENTER (F4) and SEND (F2).

Call up “Auto zero” display.



1 AM11 :
About to enter auto
zero

~~ABORT~~ OK

F4
(OK)

Press OK (F4).

2 AM11 :
waiting for auto zero
to complete

~~ABORT~~

Wait for about 30 seconds.

3 AM11 :
Auto zero passed

~~ABORT~~ OK

F4
(OK)

Press OK (F4).

This parameter is only for execution.

6.2 Self-diagnostics Functions

- The self-diagnostics function displays instrument internal errors, input/output signal abnormalities, setting errors, and other problems.
 - When an alarm occurs, the alarm indicator lamp (ALM) of the operating panel flashes. And alarms are displayed in “A60 to N60:SELF CHECK” parameter.
 - The current output during the alarm occurrence can be selected from among the followings.
 - 2.4mA or less
 - 4mA
 - HOLD
 - 21.6mA or more
- See “6.2.1 Display and Output Status during Alarm Occurrence.”
- When the BT200 is used, alarms are displayed in “A60 to N60:SELF CHECK” parameter.
 - When the HART Communicator is used, alarms are displayed in “Status group 1 to 3” parameters. There are two methods for self-diagnostics, every transmission and manually executing the “Self test” command. See “6.2.2 Self-diagnostics Using HART Communicator.”
 - When an error message appears, follow “6.2.3 Error Description and Countermeasure.”

6.2.1 Display and Output status during Alarm Occurrence

Display detail		Alarm Contact Output	Current Output	Total/Pulse Output
BRAIN Terminal/LCD	HART Communicator			
GOOD	Self test OK	ON	Normal	Normal
ERROR	Error	OFF	Fixed*	Stop
uP FAULT	uP fault	OFF	unfixed	Stop
EEPROM FAULT	EEPROM fault	OFF	unfixed	Stop
A/D (H) FAULT	A/D (H) fault	OFF	Fixed*	Stop
A/D (L) FAULT	A/D (L) fault	OFF	Fixed*	Stop
SIGNAL OVERFLOW	Signal overflow	OFF	Fixed*	Stop
COIL OPEN	Coil open	OFF	Fixed*	Stop
VEL.SPAN>10m/s	Vel. span>10m/s	OFF	Fixed*	Stop
VEL.SPAN<0.3m/s	Vel. span<0.3m/s	OFF	Fixed*	Stop
P.SPAN>1000p/s	P.span>1000p/s	OFF	Fixed*	Stop
P.SPAN>500p/s	P.span>500p/s	OFF	Fixed*	Stop
P.SPAN>25p/s	P.span>25p/s	OFF	Fixed*	Stop
P.SPAN>15p/s	P.span>15p/s	OFF	Fixed*	Stop
P.SPAN>10p/s	P.span>10p/s	OFF	Fixed*	Stop
P.SPAN>5p/s	P.span>5p/s	OFF	Fixed*	Stop
P.SPAN<.0001p/s	P.span<.0001p/s	OFF	Fixed*	Stop
T.SPAN>1000p/s	T.span>1000p/s	OFF	Fixed*	Stop
T.SPAN>.0001p/s	T.span<.0001p/s	OFF	Fixed*	Stop
4-20 LMT ERROR	Analog lmt error	OFF	Fixed*	Stop
SIGNAL ERROR	Empty pipe	OFF	Fixed*	Stop
MULTIRANGE ERROR	Multi range err	OFF	Fixed*	Stop
EEPROM DAMAGE	EEPROM damage	OFF	Unfixed	Stop
EEPROM DEFAULT	EEPROM default	OFF	Fixed*	Stop
H/L ALARM	H/L alarm	OFF	Normal	Normal
H/L ALM SET ERR	H/L alm set err	OFF	Fixed*	Stop
BATCH SET ERROR	—	OFF	Fixed*	Stop
BATCH SHORTAGE	—	OFF	Normal	Stop
LEAKAGE DETECT	—	OFF	Normal	Normal
DEV ID (displayed only on LCD)	Dev id not entered	OFF	Normal	Normal

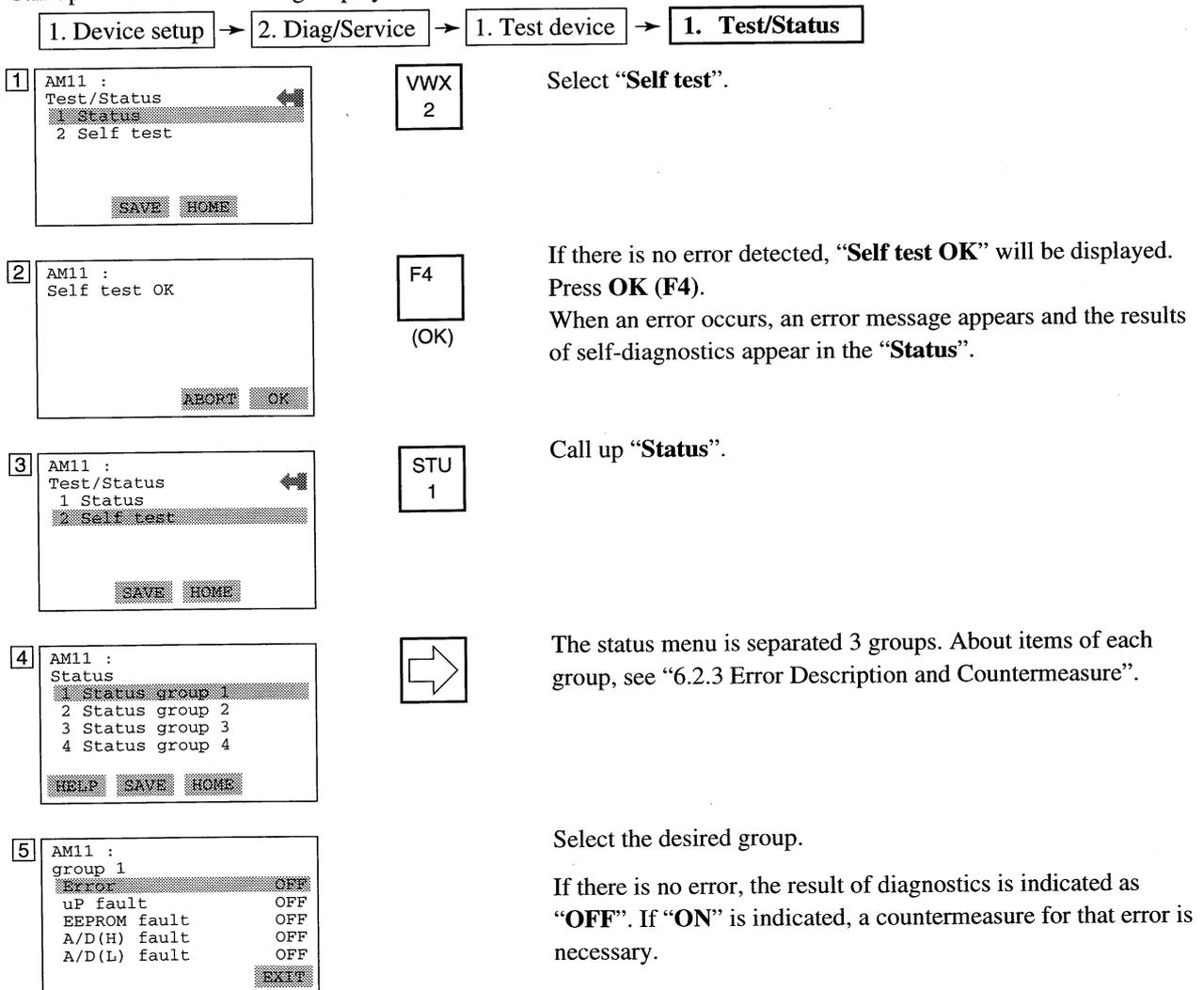
Note)

*Depending on the setting in “C41: ALM OUT (4-20 alarm out)”.

6.2.2 Self-diagnostics Using HART Communicator(Only Available for AM11-DE)

Self-diagnostics of the AM11 and check of incorrect data setting can be carried out with the HART Communicator. There are two methods for self-diagnostics of the AM11, self-diagnostics for every transmission and manually executing the “Self test” command. When an error message appears, follow “6.2.3 Error Description and Countermeasure.”

Call up “Test/Status” setting display.



6.2.3 Error Description and Countermeasures

Display detail		Description	Countermeasure
BRAIN Terminal/LCD	HART Communicator		
GOOD	—	Self test OK	Normal status
ERROR	Status group 1	Error	Alarm occurrence (At occurrence of error No.2 to 25)
uP FAULT		uP fault	Microprocessor failure
EEPROM FAULT		EEPROM fault	EEPROM failure
A/D (H) FAULT		A/D (H) fault	A/D (H) converter (high frequency) failure
A/D (L) FAULT		A/D (H) fault	A/D converter (low frequency) failure
SIGNAL OVERFLOW		Signal overflow	Excessive input signal
COIL OPEN		Coil open	Flow tube coil open-circuit
VEL. SPAN >10m/s		Vel. span>10m/s	Span velocity setting exceeds 11m/s.
VEL.SPAN <0.1m/s		Vel. span<0.1m/s	Span velocity setting is 0.05m/s or less.
P.SPAN>1000p/s	Status group 2	P.span>1000p/s	Pulse output rate exceeds 1100p/s at 50% duty. It exceeds 1000p/s at 0.5ms pulse width.
P.SPAN>500p/s		P.span>500p/s	Pulse output rate exceeds 500p/s at 1ms pulse width.
P.SPAN>25p/s		P.span>25p/s	Pulse output rate exceeds 25p/s at 20ms pulse width.
P.SPAN>15p/s		P.span>15p/s	Pulse output rate exceeds 15p/s at 33ms pulse width.
P.SPAN>10p/s		P.span>10p/s	Pulse output rate exceeds 10p/s at 50ms pulse width.
P.SPAN>5p/s		P.span>5p/s	Pulse output rate exceeds 5p/s at 100ms pulse width.
P.SPAN<.0001p/s		P.span<.0001p/s	Pulse output rate is 0.00005p/s or less.
T.SPAN>1000p/s		T.span>1000p/s	Totalization rate exceeds 1100p/s.
T.SPAN>.0001p/s		T.span<.0001p/s	Totalization rate is 0.00005p/s or less.
4-20 LMT ERROR		Status group 3	Analog lmt error
SIGNAL ERROR	Signal error		Pipe is not filled with fluid or insulating material attached to electrodes.
MULTIRANGE ERROR	Multi range err		“Span” setting exceeds “Forward span2” setting at Auto 2 ranges.
EEPROM DAMAGE	EEPROM damage		Error in EEPROM or SRAM of NOVDRAM
EEPROM DEFAULT	EEPROM default		EEPROM has been initialized.
H/L ALARM	H/L alarm		A/D converter(low frequency)failure
H/L ALM SET ERR	H/L alm set err		Difference between high and low alarm set(high limit-low limit)is less than 5%.
BATCH SET ERROR	—		Batch setting error
BATCH SHORTAGE	—		Batch amount shortage
LEAKAGE DETECT	—		Leak detector when batch control
DEV ID(displayed only on LCD)	Dev id not entered	Device ID has not been entered.	

7. MAINTENANCE

7.1 Loop Test (Test Output)

This function enables you to set up any desired value, and to output it from the converter for test. Since the function corresponds to flow rate, totalization display and pulse output, this makes it possible to check operation of individual function.

The test functions of status output are also provided.



IMPORTANT

- Test outputs take priority of the flow signal.
Do not forget to return to the normal operation mode after the loop test.
- In case of using bi-flow direction function(E23:REV RNG SEL), the setting range is available -110 to +110. Please set the loop test value in +/- percentage based on the larger flow span within forward and reverse flow span.
- In case of using multirange function(E22:FOR RNG SEL), the loop test setting value should be set in percentage based on the biggest range.

7.1.1 Settings for Test Output Using Data Setting Keys

(1) Current Output (Corresponding to flow rate, totalization display and pulse output value)

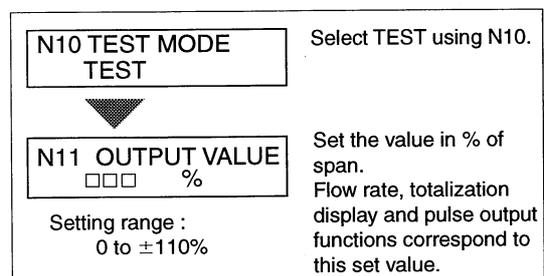


NOTE

The parameters for loop test are in N item. N item parameters are not called up without setting "55" to M50 : KEY.

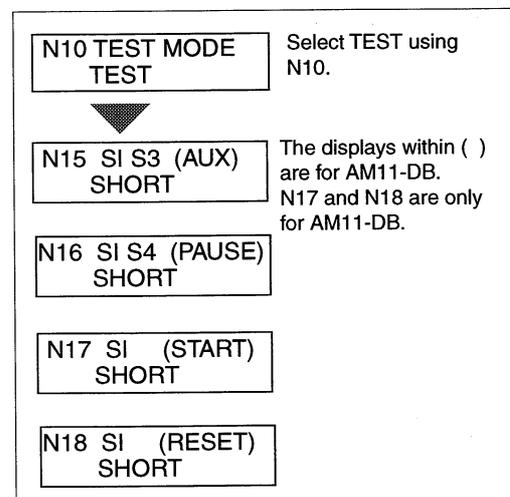
M50 KEY 55

Set M50 KEY to "55" to open N items



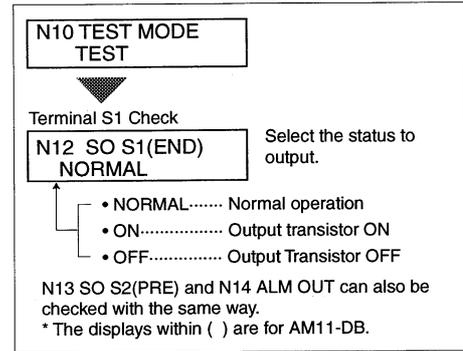
(2) Status Inputs (Only for AM11-DH/-DE/-DL/-DB)

- Check Terminal S3 and S4 for AM11 -DH/-DE /-DL, and Terminal S3(AUX) , S4 (PAUSE), START, and RESET for AM11-DB. This test does not affect the functions using the status inputs.
- When each terminal is shorted, "SHORT" is displayed in the parameter for each terminal.
- The flow signal is the value in N11 OUTPUT VALUE during this test.



(3) Status Outputs

- This test is carried out using Terminal S1 and S2.
- The flow signal is the value in N11 OUTPUT VALUE during this test.



7.1.2 Setting for Test Output Using BT200(Only Available for AM11-DH/-DL/-DB)

(1) Current Output (Corresponding to flow rate, totalization display and pulse output value)

Display	Description
<pre> PARAM N10:TEST MODE TEST N11:OUTPUT VALUE 100 % N12:SO S1 NORMAL [DATA] [DIAG] [] [ESC] </pre>	<p>Select "TEST" in "N10: TEST MODE".</p> <p>NORMAL TEST</p> <p>Set the value in % of span in "N11:OUTPUT VALUE". (The figure shows a 100% setting.)</p> <p>Flow rate, totalization display and pulse output functions correspond to this set value.</p>

(2) Status Inputs

Display	Description
<pre> PARAM N15:SI S3 (AUX) SHORT N16:SI S4 (PAUSE) SHORT N17:SI (START) SHORT [DATA] [DIAG] [] [ESC] </pre>	<p>Call up "N10: TEST MODE" and select "TEST".</p> <p>When each terminal is shorted, "SHORT" is displayed in the parameter for each terminal.</p> <p>For N18 SI(RESET)* it is displayed with the same way. *The displays within() are for AM11-DB. N17 and N18 are only for AM11-DB.</p>

(3) Status Outputs (For status outputs, alarm output or pulse output status)

Display	Description
<pre> PARAM N10:TEST MODE TEST N11:OUTPUT VALUE 100 % N12:SO S1 NORMAL [DATA] [DIAG] [] [ESC] </pre>	<p>Call up "N10: TEST MODE" and select "TEST".</p> <p>NORMAL TEST</p> <p>Select the status to be output in "N12: SO S1(END)*"</p> <p>For N13 SO S2(PRE)* and N14 ALM OUTPUT, it is possible to set with the same way. *The displays within() are for AM11-DB.</p> <p>NORMAL ON OFF</p>

7.1.3 Setting for Test Output Using HART Communicator(Only Available for AM11-DE)

(1) Loop Test

This feature can be used to output a fixed current from 2.72 mA to 21.28 mA 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**

```
AM11 :
WARN-Loop should be
removed from
automatic control

ABORT  OK
```

F4

(OK)

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

- 2**

```
AM11 :
Choose analog output
level
1 4mA
2 20mA
3 Other
4 End

ABORT  ENTER
```

↓

x2

F4

(ENTER)

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

 1. 4mA:
Outputs a 4mA current signal
 2. 20mA:
Outputs a 20mA current signal
 3. Other:
Sets a desired output with the alphanumeric keys
 4. End: Exits

- 3**

```
AM11 :
Output
4.000

HELP  DEL  ABORT  ENTER
```

'1 2'

F4

(ENTER)

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

- 4**

```
AM11 :
Fld dev output is
fixed at 12.000 mA

ABORT  OK
```

F4

(OK)

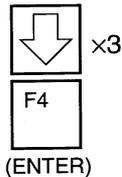
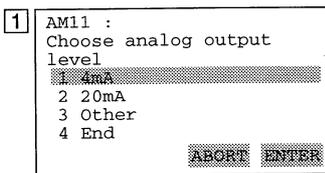
Press **OK (F4)**.
A fixed current of 12mA is output.

Releasing from Loop Test

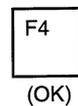
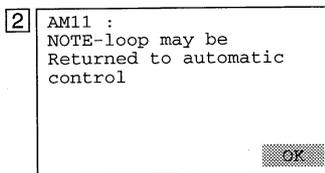
There are four methods which cause the simulated output to return to a normal flow reading.

1. Wait 10minutes to automatically release from the test mode.
2. Turn the power off to AM11-DE.
3. Execute "End". (See the following for this procedure.)
4. Set 0 mA as the test output value.

On "Loop test" display.



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

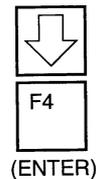
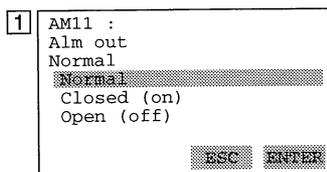


Press **OK (F4)**.

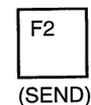
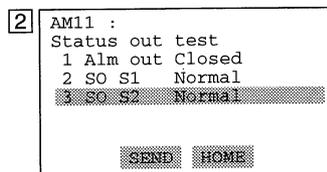
(2) Status Output Test

AM11-DE has one alarm output and two status outputs. They can be also output for test. After the status output test, return the status output parameter to "Normal".

Call up "Status out" display.



Select "Closed" (example) and press **ENTER (F4)**.



Press **SEND (F2)**.



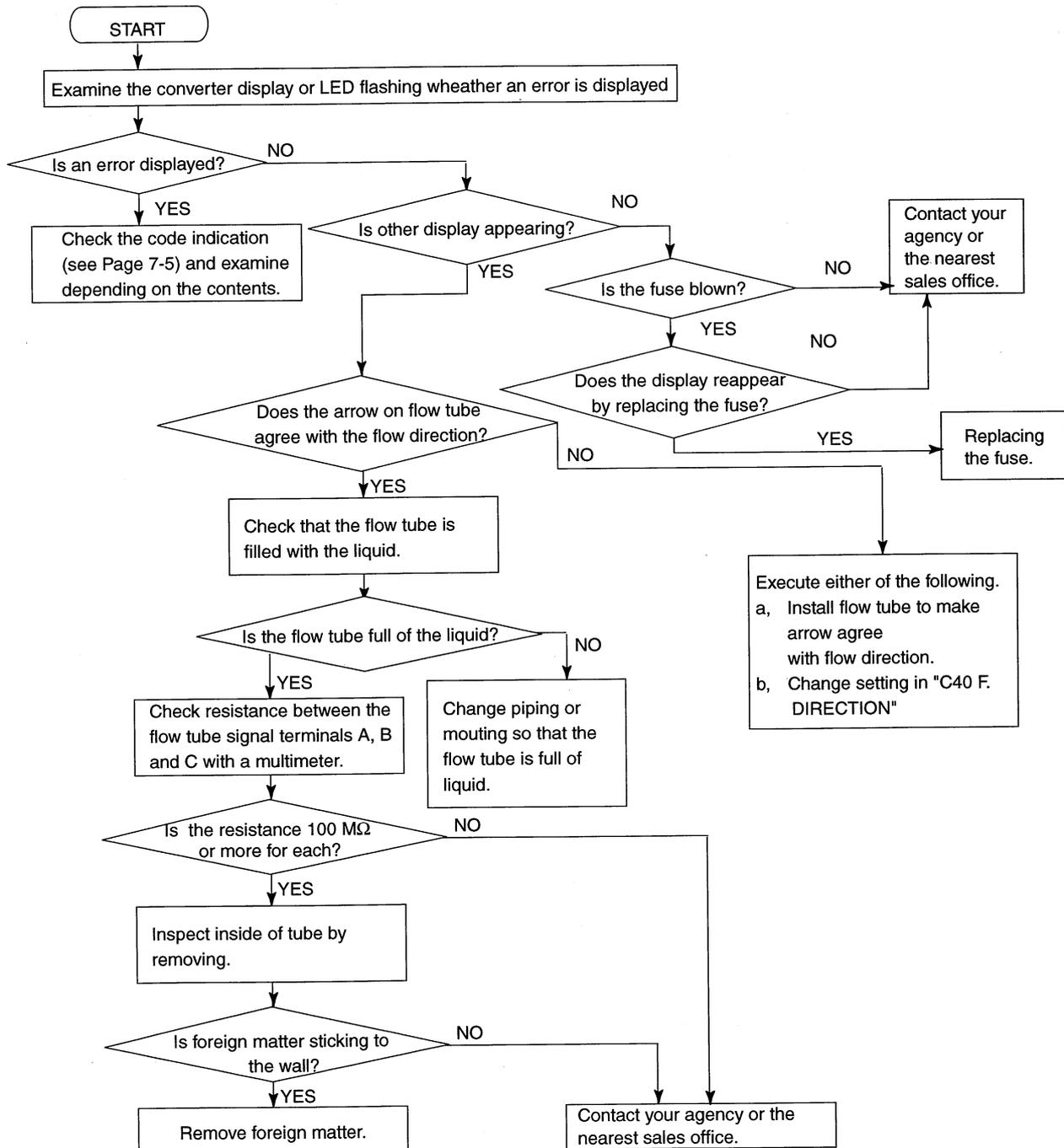
IMPORTANT

When the status output test is executed, the current output is fixed 4 mA.

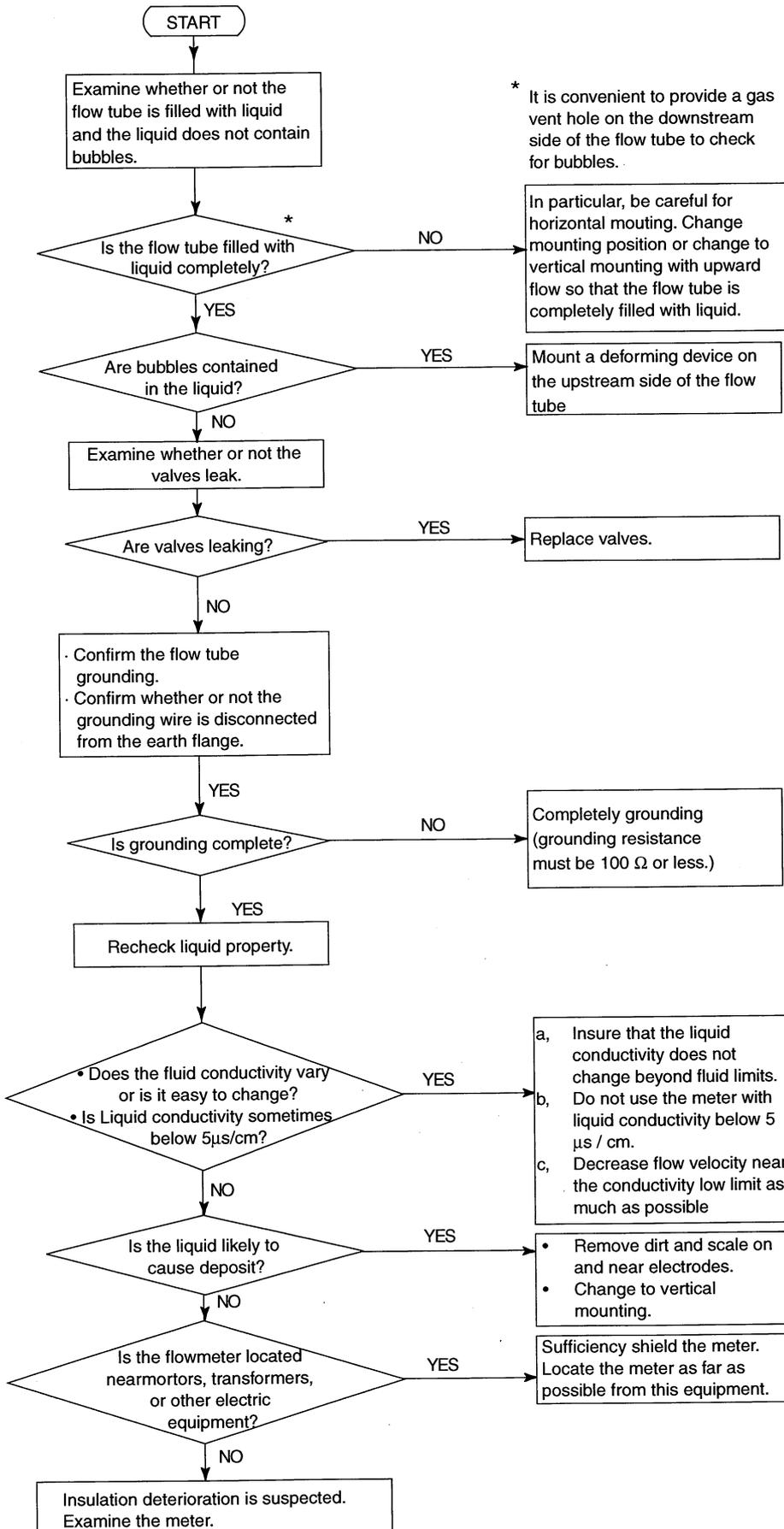
7.2 Trouble Shooting

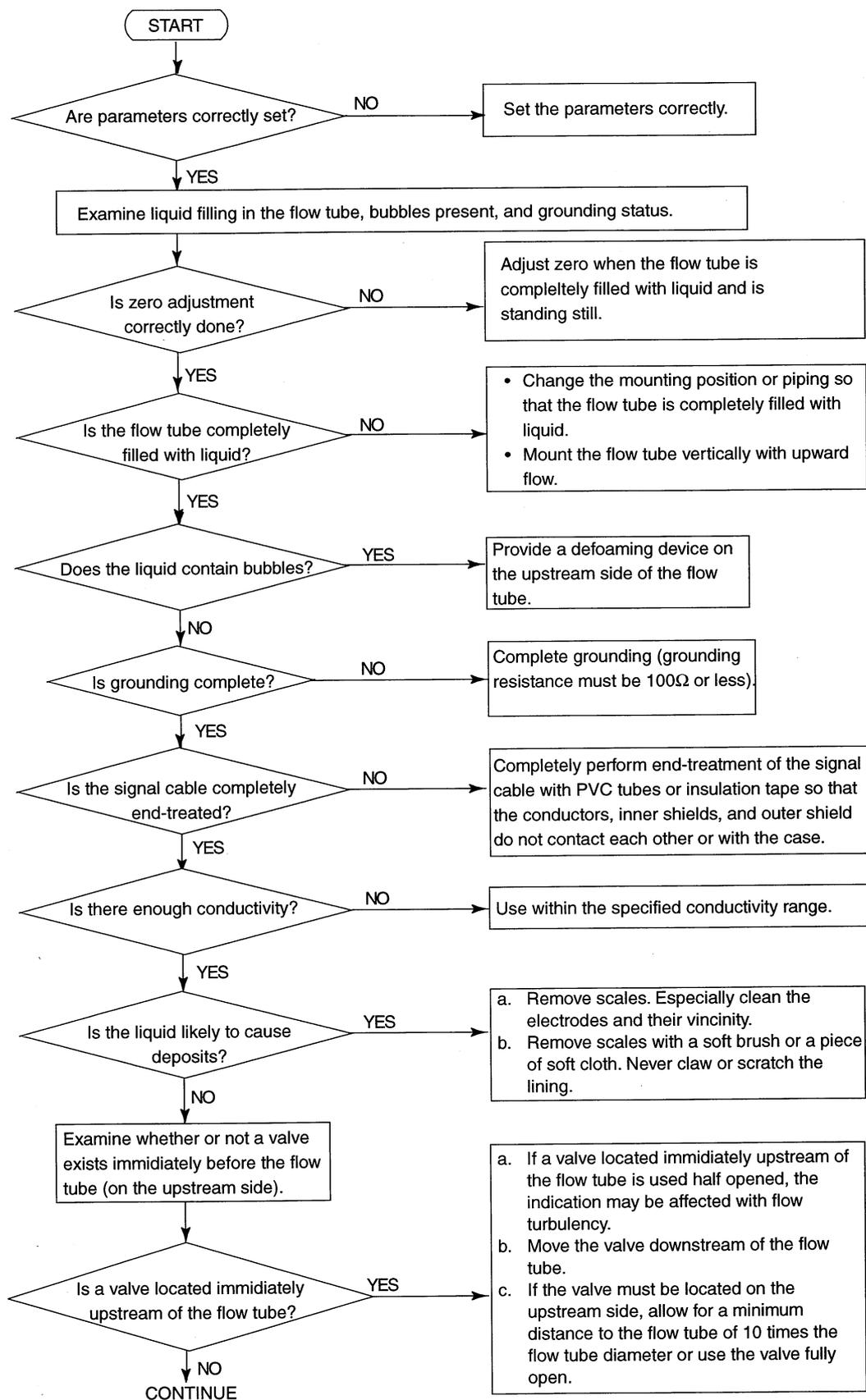
Although magnetic flowmeters rarely require maintenance, failures occur when the instrument is not operating correctly. Since a failure is located by troubleshooting the receiving instrument information. This information will be described below.

(1) No Indication



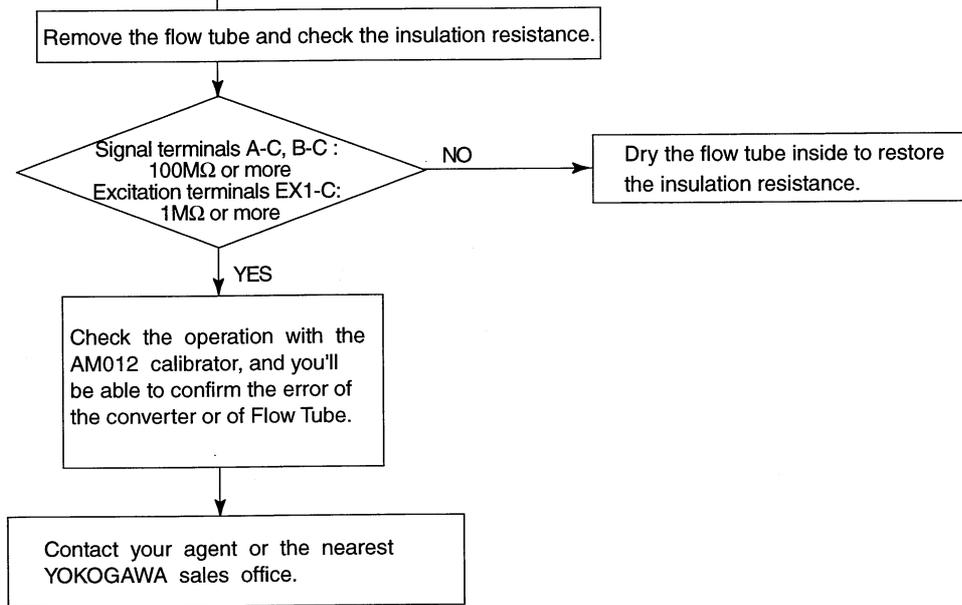
(2) Unstable Zero



(3) Disagreement of Indication with Actual Flow Result

7. MAINTENANCE

CONTINUED FROM PREVIOUS PAGE



8. OUTLINE

■ STANDARD SPECIFICATIONS

Excitation method :

Size up to 400mm (16 inch) : Dual frequency excitation
 Size 500mm (20 inch) and larger : Pulsed DC excitation

Input Signal :

Status Input : Dry contact
 Load resistance : 200Ω or less (ON)
 100kΩ or more (OFF)

Output Signal :

Current Output : 4 to 20mA DC (Load resistance : 1000Ω maximum)

Pulse Output : Transistor contact
 Rating : 30V DC(OFF), 200mA(ON)
 Output rate : 0.0001 to 1000 pps

Alarm Output : Transistor contact
 Rating : 30V DC(OFF), 200mA(ON)

Status Output : Transistor contact, 2 points
 Rating : 30V DC(OFF), 200mA(ON)

Communication (except AM11-AS) :

BRAIN or HART (Superimposed on 4 to 20mA DC signal)

Load Resistance (including cable resistance):
 BRAIN : 250 to 600Ω

HART : 230 to 600Ω, depending on q'ty of field devices connected to the loop (multidrop mode)

Load Capacitance : 0.22μF maximum

Load Inductance : 3.3 mH maximum

Distance from Power Line : 15cm (0.6ft) or more
 (Parallel wiring should be avoided.)

Input Impedance of Receiver Connected to Receiving Resistance : 10 kΩ or more (at 2.4 kHz).

Maximum Cable Length:

approx. 2km (6500ft) (when polyethylene-insulated PVC-sheathed control cables (CEV cables) are used.)

Data Security during Power Failure :

Data storage in EEPROM---back-up battery is not required.

Surge Arrestors :

Surge arrestors are built in each terminal for excitation, power supply, analog output, pulse output, status inputs and status outputs.

Mounting : 2-inch pipe, panel or surface mounting

Electrical Connection :

ANSI 1/2NPT female, DIN Pg13.5 female,
 ISO M20×1.5 female, JIS G1/2 female

Wiring Terminals : ISO M4 screw terminal

Case Material : Aluminum alloy

Coating :

Polyurethane corrosion-resistance coating
 Door : Deep sea moss green (Munsell 0.6GY3.1/2.0)
 Case : Frosty white (Munsell 2.5Y8.4/1.2)

Protection : NEMA 4

Grounding : 100Ω or less

*10Ω or less for functioning surge arrestor

■ FUNCTIONS

Instantaneous Flow Rate Display Function:

Flow rate can be displayed either in engineering units or in percent of span.

Totalization Display Function:

Totalized volume in any engineering unit can be displayed by setting a totalizing factor.

Damping Time Constant:

0.1 to 100 sec. (63% response)

Span Setting Function:

Volumetric flow setting is available by setting volume unit, time unit, flow rate and flow tube size.

- Volume Unit : gallon(US), m³, L, cm³, barrel (=158.987L)
- Velocity Unit : ft, m
- Time Unit : sec., min., hour, day
- Flow Tube Size : inch, mm
- Mass flow or user-defined volume units are programmable.

Pulse Output Function:

Scaled pulse can be output by setting a pulse factor. Pulse Width : Duty 50% or fixed pulse width (0.5, 1, 20, 33, 50 or 100ms)-user selectable

Bi-direction and Multiple Range Function:

4-range maximum for each flow direction (forward/reverse) can be switched with external status input or automatically.

Totalization Switch Function :

When the internal totalized value exceeds the set value, the switch status changes OFF to ON.

Totalization Presetting Function:

Totalized value can be preset or reset with a front panel key or an external status input.

Process Alarm Function :

High limit alarm and low limit alarm are provided. (Normal Close Fixed)

Self-diagnostics Function:

Converter failure, flow tube failure, setting error, etc. can be diagnosed and displayed.

Zero % Signal Lock Function :

Flow rate display and output can be locked on zero and the totalization can be stopped with an external status input.

Batch Control Function :

Simple batch station is built in. It is operated with front panel keys or external status inputs. Batch function mode ; 4-mode maximum

8. OUTLINE

Functions List A : Available N : Not available

No.	Function	-AS	-DH	-DE	-DB	-DL
1	4 to 20mA DC Output	A	A	A	A	A
2	4 to 20mA DC Output Low Limit	A	A	A	A	A
3	Forward Totalization	A	A	A	A	A
4	Totalizing Presetting	A	A	A	A	A
5	Pulse Output (selectable pulse width)	A	A	A	A	A
6	User-defined Unit for Flow Rate	A	A	A	A	A
7	Automatic Zero Adjustment	A	A	A	A	A
8	Analog Output Selection when Alarming	A	A	A	A	A
9	Normal Flow Direction Setting	A	A	A	A	A
10	Test Mode (for loop test)	A	A	A	A	A
11	Self-diagnostics	A	A	A	A	A
12	High/Low Limit Alarms	A	A	A	A	A
13	Alarm Output	A	A	A	A	A
14	Damping	A	A	A	A	A
15	Tag No. Setting	A	A	A	A	A
16	Compatible with Other Flow Tubes	A	A	A	A	N
17	User-defined Unit for Totalization	A	A	A	A	A
18	Totalization, Pulse Output Low Cut	A	A	A	A	A
19	LED Display	A 1-line	A 2-line	A 2-line	A 2-line	A 2-line
20	LCD Display	A	A	A	A	A
21	Flow Span Setting	A	A	A	A	A
22	Flow Rate Display	A	A	A	A	A
23	Parameter Display Limitation	A	A	A	A	A
24	Empty Pipe Detection	A	A	A	A	N
25	Fast Response 0.1 sec. minimum	A	A	A	A	A
26	Totalization of Reverse and Difference	N	A	A	N	A
27	Totalization Switch	N	A	A	N	A
28	4-range Switching with External Input	N	A	A	N	A
29	Automatic 4-range Switching	N	A	A	N	A
30	Bi-direction Flow Measurement	N	A	A	N	A
31	Zero Adjustment with External Input	N	A	A	A	A
32	Totalization Preset with External Input	N	A	A	A	A
33	Zero % Signal Lock	N	A	A	A	A
34	BRAIN Communication	N	A	N	A	A
35	HART Communication	N	N	A	N	N
36	Batch Control	N	N	N	A	N
37	For Ultra Large Size Flow tube	N	N	N	N	A

Tab01.eps

STANDARD PERFORMANCE

Accuracy (combined with ADMAG flow tube)
PFA and Ceramics Lining

Vs: Span Setting Value (m/s)

Size in mm (inch)	Span in m/s (ft/s)	Accuracy
2.5 to 15 (0.1 to 0.5)	0.1 to 0.3 (0.3 to 1)	0.15/Vs % of span
	0.3 to 1 (1 to 3)	0.5% of span
	1 to 10 (3 to 33)	0.25% of span (at indication below 50% of span) 0.5% of rate (at indication 50% of span or more)
25 to 400 (1 to 16)	0.1 to 0.3 (0.3 to 1)	0.075/Vs % of span
	0.3 to 1 (1 to 3)	0.25% of span (at indication below 50% of span) 0.5% of rate (at indication 50% of span or more)
	1 to 10 (3 to 33)	0.1% of span (at indication below 20% of span) 0.5% of rate (at indication 20% of span or more)

Tab02.eps

Polyurethane Lining

Vs: Span Setting Value (m/s)

Size in mm (inch)	Span in m/s (ft/s)	Accuracy
25 to 400 (1 to 16)	0.1 to 0.3(0.3 to 1)	0.15/Vs % of span
	0.3 to 1(1 to 3)	0.5% of span
	1 to 10 (3 to 33)	0.25% of span (at indications below 50% of span) 0.5% of flowrate indication (at indications 50% of span or more)
500 to 1000 (20 to 40)	0.1 to 0.3(0.3 to 1)	0.225/Vs % of span
	0.3 to 1(1 to 3)	0.75 % of span
	1 to 10 (3 to 33)	0.5% of span
1100 to 2000 (44 to 80)	0.3 to 1(1 to 3)	0.75 % of span
	1 to 10(3 to 33)	0.5% of span
2200 to 2600 (88 to 104)	0.3 to 1(1 to 3)	1/Vs % of span
	1 to 10(3 to 33)	1% of span

Tab03.eps

Repeatability :

0.1% of flowrate (1mm/s minimum)

Maximum Power Consumption (for combination with flow tube) : 28W

Insulation Resistance :

- 100MΩ between power terminals and ground terminal at 500V DC*
- 100MΩ between power terminals and each output and status input terminal at 500V DC

Withstand Voltage :

1500V AC between power terminals and ground terminal for 1 minute.*

* Surge arrester ground terminal should be disconnected beforehand.



CAUTION

When performing the Voltage Breakdown Test, Insulation Resistance Test or any unpowered electrical test, wait 10 seconds after the power supply is turned off before removing the housing cover. In case of size 500 to 1000mm, be sure to remove the Short Bar at terminal "G". After testing, return the Short Bar to its correct position. Screw tightening torque should be 1.18N-m (12kg-cm)(0.88ft-lb) or more, because the G-terminal is thought as a protective grounding and should conform to the Safety requirements.

■ NORMAL OPERATING CONDITIONS

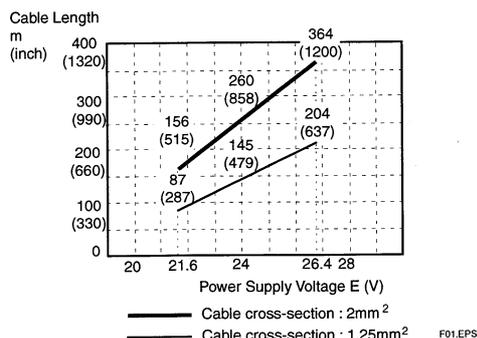
Ambient Temperature : -10 to 60°C (14 to 140°F)*
 *Air purge(Code /APC) is required only for AM11-DL at ambient temperature 50°C(122°F) or above.

Ambient Humidity :
 5 to 95%RH (Dew formation should be avoided.)

Power Supply Voltage :
 Range 80 to 264V AC/Range 100 to 130V DC,
 Range 21.6 to 26.4V DC

Power Supply Frequency : 47 to 63 Hz

Supplied Power and Max. Cable Length for 24 V DC version:



■ MODEL AND SUFFIX CODE

Magnetic Flow Converter :

Model	Suffix code	Description
AM11	Magnetic Flow Converter
Function	-AS	Standard type
	-DH	High performance type with BRAIN
	-DE	High performance type with HART
	-DB	Batch function type
	-DL	For ultra large size (1100mm or larger) flow tube
Power supply	A1	80 to 264V AC /100 to 130VDC
	D1	21.6 to 26.4 VDC(except AM11-DE)
Electrical connection	J	JIS G 1/2 female
	A	ANSI 1/2 NPT female
	D	DIN Pg13.5 female
	M	ISO M20 X 1.5 female
---	-000 ...	Always -000
Style code	*A	Style A
Optional code	/□	Refer to "Optional Specifications"

Signal Cable:

Model	Suffix code	Description
AM011	Dedicated signal cable between converter and flow tube
Termination	-0	No termination
	-2	Terminated for 1000mm(40in.) or smaller flow tube
	-3	Terminated for 1100mm(44in.) or larger flow tube
Cable length	-L□□□	Designate the length in m. (200 m maximum)
Style code	*A	Style A
Optional specification	/C□	Qty of termination parts set

Note 1: A user provided two-conductor cable is required for coil excitation.

Note 2: Submersible style flow tubes are provided with 30meters (98feet) of excitation and signal cable. No additional cable is required.

Note 3: The maximum temperature for the signal cable is 80°C(176°F).

■ Optional Specifications

Item	Specification	Code
Stainless Steel Tag Plate	Stainless Steel (SUS304) Tag Plate is fixed with screws.	/SCT
Waterproof Gland	Waterproof glands are attached to all wiring ports. For JIS G1/2 only.	/ECG
Waterproof Gland with Union Joint	Waterproof gland (union Joint) are attached to all wiring ports. For JIS G1/2 only.	/ECU
DC Noise Suppression	Eliminating DC Noise For size 15mm or larger, conductivity 50μS/cm or more, cable length within 200m. *Empty pipe detection is not available.	/ELC
Epoxy Resin Coating	Epoxy resin coating for door and case. The color is same as standard one.	/EPF
High Anti-corrosion Coating	Coating is changed to three-layer coating (Urethane coating on two-layer Epoxy coating)	/X2
Air Purge Connection	Purge pressure 0.14MPa or less, connection Rc1/4(PT1/4) female for electrical connection code J, 1/4NPT female for the code A or B, Air consumption 1.5L/min.	/APC
Parameter Setting	Flow span, totalizing pulse unit, transmission pulse unit are set at factory.	/PRS
Calibration Certificate	Level 2: Declaration and Calibration Equipment List	/L2
	Level 3: Declaration and Primary Standard List	/L3
	Level 4: Declaration and YOKOGAWA Measuring Instruments Control System	/L4
GOST Certification	Calibration Certificate for GOST (only for products produced at YFT)	/GOS
C-Tick mark	AS/NZS2064 compliance Only for Australia or New Zealand	/CTK

■ ACCESSORIES

- Fuse (2A for -A1, 2.5A for -D1) 1 pc.
- Data sheet 1 pc.
- Unit label 1 set
- Mounting bracket 1 set

9. PARAMETER LIST

List of Parameters for AM11 Indicator and BRAIN Terminal

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
A00	DISPLAY				R	SHBEL	Major outputs display functions.
A10	FLOW RATE (%)	-108.0 to 108.0%	1		R	SHBEL	Displays instantaneous flow rate in %.
A11	FLOW RATE	-32767 to 32767	0 to 4		R	SHBEL	Displays instantaneous flow rate in engineering units.
A20	TOTAL	0 to 999999	0 to 3	0	W	SHBEL	Displays and presets forward direction totalized flowrate.
A60	SELF CHECK	GOOD ERROR . . .			R	SHBEL	Displays self-check result. See "8.2 Self-diagnostics Functions".
B00	SETTING				R	SHBEL	Major parameters setting.
B10	TAG NO.	ASC II 8 characters			W	SHBEL	Sets tag no. up to 8 characters.
B19	MAGMETER	ADMAG YEW MAG CALIBRATOR		ADMAG	W	SHBEL	Selects type of magnetic flowmeter.
B20	SIZE UNIT	mm inch		mm	W	SHBEL	Selects flow tube nominal size units.
B21	NOMINAL SIZE	0.1 to 3000.0 (mm) 0.01 to 300.00 (inch)	1 2	100.0	W	SHBEL	Sets flow tube nominal size in selected unit.
B22	FLOW UNIT	km ³ (10 ³ ×m ³) m ³ l(liter) cm ³ (10 ⁻² ×m) ³ M gal k gal gal m gal k bbl bbl m bbl μ bbl m(meters) ft(feet)		m	W	SHBEL	Selects volume unit of flow span.
B23	TIME UNIT	/d, /h, /m, /s		/s	W	SHBEL	Selects time unit of flow span.
B24	FLOW SPAN	0.0001 to 30000	0 to 4	1.0000	W	SHBEL	Sets flow span in selected unit.
B25	DAMPING	0.1 to 100.0sec	1	3.0	W	SHBEL	Sets damping time constant of output.
B30	LOW MF (METER FACTOR)*	0.0100 to 3.0000	4	1.0000	W	SHBEL	Sets low frequency side meter factor. *() : for AM11-DL
B31	HIGH MF	0.0100 to 3.0000	4	1.0000	W	SHBEL	Sets high frequency side meter factor.
B32	FREQUENCY	47.00 to 63.00	2	50.00	W	SHBEL	Sets AC power frequency in case of DC power supply version.
B40	VELOCITY CHK	0 to 20.000 (m/s)	3		R	SHBEL	Displays span in m/s.
B50	DSP TOTAL	NOT PROVIDED PROVIDED		NOT PROVIDED	W	SHBEL	Restricts display of parameters associated with totalization. (A20,C00, C13 to C24, C60, E00, E21, E51, E60, F00, F10, F11, and F60)
B51	DSP PULSE	NOT PROVIDED PROVIDED		NOT PROVIDED	W	SHBEL	Restricts display of parameters associated with pulse output. (E00 to E13, and E60)

9. PARAMETER LIST

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
B52	DSP MULTI	NOT PROVIDED PROVIDED		NOT PROVIDED	W	HEL	Restricts display of parameters associated with multi-range. (E00, E22 to E43 and E60)
B53	DSP OTHER	NOT PROVIDED PROVIDED		NOT PROVIDED	W	SHBEL	Restricts display of parameters associated with extended functions. (C00 to C12, C30, to C60, E00, E20, E49, E50, E55, and E60)
B54	DSP BATCH	NOT PROVIDED PROVIDED		NOT PROVIDED	W	B	Restricts display of parameters associated with batch functions. (A20,C00, C13 to C24, C60, F00, F30 to F60, G00 to G14, G19 to G60)
B60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self-check result.
C00	STD FUNCTION				R	SHBEL	Standard Functions.
C10	F. USER SEL	NOT PROVIDED PROVIDED		NOT PROVIDED	W	SHBEL	Selects whether "A11: FLOW RATE " is displayed with user-defined units.
C11	F. USER UNIT	ASCII8 characters		(spaces)	W	SHBEL	Sets user-defined units displayed in "A11".
C12	F. USER SPAN	0 to 30000	0 to 4	100.0	W	SHBEL	Sets value to be displayed in A11 at 100% output on largest range. Units selected with C11.
C13	T. USER SEL	NOT PROVIDED PROVIDED		NOT PROVIDED	W	SHBEL	Selects wheter "A20 : TOTAL" is displayed as user-defined units.
C14	T. USER UNIT	ASCII8 characters		(spaces)	W	SHBEL	Sets user-defined unit displayed in "A20".
C20	T. RATE UNIT	n UNIT/P μ UNIT/P m UNIT/P UNIT/P k UNIT/P M UNIT/P PULSE/s		PULSE/s	W	SHBEL	Selects totalization rate unit. ("UNIT" in the selection on the left represents the "B22 : FLOW UNIT" selected.
C21	TOTAL RATE	0.0001 to 30000	0 to 4	0	W	SHBEL	Sets totalization rate.
C22	TOTAL LOWCUT	0 to 100%	0	3	W	SHBEL	Sets low cut width of totalization.
C23	TOTAL SET	INHIBIT ENABLE		INHIBIT	W	SHBEL	Selects enable/inhibit of forward direction totalization preset and reverse direction totalization reset.
C24	T. SET VALUE	0 to 999999	0 to 3	0	W	SHBEL	Sets forward direction totalization preset value.
C30	4 - 20 LOWLMT	-20 to 100 %	0	-20%	W	SHBEL	Sets low cut width of current output.
C40	F. DIRECTION	NORMAL REVERSE		NORMAL	W	SHBEL	Selects flow direction.
C41	ALM OUTPUT	2.4mA OR LESS 4.0mA HOLD 21.6mA OR MORE		2.4mA		SHBEL	Selects current output during alarm occurrence.

9. PARAMETER LIST

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
C60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self-check result.
E00	OPTIONAL FNC				R	SHBEL	Pulse output and status I/O functions.
E10	P.RATE UNIT	n UNIT/P μ UNIT/P m UNIT/P UNIT/P k UNIT/P M UNIT/P PULSE/s		PULSE/s	W	SHBEL	Selects pulse rate unit. ("UNIT" in the selection on the left represents the "B22:FLOW UNIT" selected.)
E11	PULSE RATE	0 to 30000	0 to 4	0	W	SHBEL	Sets pulse rate.
E12	PULSE LOWCUT	0 to 100%	0	3%	W	SHBEL	Sets low cut width of pulse output.
E13	PULSE WIDTH	50% DUTY 0.5msec 1msec 20msec 33msec 50msec 100msec		50% DUTY	W	SHBEL	Selects pulse width.
E20	INPUT FNC	NO FUNCTION 0% SIGNAL LOCK EXT. AUTOZERO EXT. FOR. PRESET EXT. B.SUM RESET		NO FUNCTION	W	HBEL	Selects input function (except multi-range function).
E21	OUTPUT FNC	NO FUNCTION TOTAL SWITCH		NO FUNCTION	W	HEL	Selects whether total switch is functioned.
E22	FOR. RNG SEL	SIGNAL RANGE EXT.2 RANGE EXT.3 RANGE EXT.4 RANGE AUTO 2 RANGE AUTO 3 RANGE AUTO 4 RANGE		SINGLE RANGE	W	HEL	Selects forward direction multi-range.
E23	REV. RNG SEL	NO FUNCTION SINGLE RANGE EXT.2 RANGE EXT.3 RANGE EXT.4 RANGE AUTO 2 RANGE		NO FUNCTION	W	HEL	Selects reverse direction multi-range.
E30	FOR. SPAN 2	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets the second span for forward direction multi-range.
E31	FOR. SPAN 3	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets the third span for forward direction multi-range.
E32	FOR. SPAN 4	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets the fourth span for forward direction multi-range.
E40	REV. SPAN 1	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets the first span for reverse direction multi-range.
E41	REV. SPAN 2	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets the second span for reverse direction multi-range.

9. PARAMETER LIST

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
E42	REV. SPAN 3	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets third span for reverse direction multi-range.
E43	REV. SPAN 4	0.0001 to 30000	0 to 4	1.0000	W	HEL	Sets fourth span for reverse direction multi-range.
E49	H ALARM	-110 to 110(%)	0	110	W	SHBEL	Sets high limit alarm.
E50	L ALARM	-110 to 110(%)	0	-110	W	SHBEL	Sets low limit alarm.
E51	TOTAL SWITCH	0 to 999999	0 to 3	0	W	HEL	Sets switch actuation level when using status output function as totalization switch.
E55	APPLICATION	NORMAL PULSATION		NORMAL	W	SHBE	Improves performance with pulsating flow.
E60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self-check result.
F00	OPTIONAL DSP				R	HBEL	Display functions.
F10	REV. TOTAL	0 to 999999	0 to 3	0	W	HEL	Displays or resets reverse direction totalized flow rate.
F11	DIF. TOTAL	0 to 999999	0 to 3	0	R	HEL	Displays differential totalization (F11= A20-F10).
F30	BATCH SUM	0 to 999999999	0 to 3	0	W	B	Displays or resets sum of batch amount totalizations.
F31	BATCH CYCLE	0 to 30000	0	0	W	B	Displays or resets batch cycle count.
F60	SELF CHECK	GOOD ERROR . .			R	HBEL	Displays self-check result.
G00	BATCH FNC				R	B	Batch functions.
G10	BATCH	INHIBIT ENABLE		ENABLE	W	B	Inhibits or enables batch operation functions.
G11	BATCH SPEED	LONG TIME BATCH SHORT TIME BATCH		LONG TIME BATCH	W	B	Selects normal batch or high-speed batch
G12	EXT.PAUSE	INHIBIT ENABLE		INHIBIT	W	B	Inhibits or enables PAUSE with status input.
G13	PANEL SWITCH	INHIBIT ENABLE		ENABLE	W	B	Inhibits or enables operation with panel keys.
G14	FRACTION	RESET PRESERVE		RESET	W	B	Resets or preserves totalization fractions.
G19	BATCH MODE	MODE 1 MODE 2 MODE 3 MODE 4		MODE 1	W	B	Selects batch mode.
G20	BATCH SET 1	0 to 999999	0 to 3	0	W	B	Sets MODE 1 batch set point.

9. PARAMETER LIST

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
G21	INIT.T.LMT 1	0 to 9999	0 to 3	0	W	B	Sets MODE 1 initial flow totalization value.
G22	PREBATCH 1	0 to 9999	0 to 3	0	W	B	Sets MODE 1 pre-batch set point.
G23	PRED LEAK 1	0 to 9999	0 to 3	0	W	B	Sets MODE 1 predicted leakage.
G24	LEAK DETECT 1	0 to 9999	0 to 3	9999	W	B	Sets MODE 1 leakage detection value.
G25	SHORTAGE 1	0 to 9999	0 to 3	9999	W	B	Sets MODE 1 batch shortage value.
G30	BATCH SET 2	0 to 999999	0 to 3	0	W	B	Sets MODE 2 batch set point.
G31	INIT.T.LMT 2	0 to 9999	0 to 3	0	W	B	Sets MODE 2 initial flow totalization value.
G32	PREBATCH 2	0 to 9999	0 to 3	0	W	B	Sets MODE 2 pre-batch set point.
G33	PRED LEAK 2	0 to 9999	0 to 3	0	W	B	Sets MODE 2 predicted leakage.
G34	LEAK DETECT 2	0 to 9999	0 to 3	9999	W	B	Sets MODE 2 leakage detection value.
G35	SHORTAGE 2	0 to 9999	0 to 3	9999	W	B	Sets MODE 2 batch shortage value.
G40	BATCH SET 3	0 to 999999	0 to 3	0	W	B	Sets MODE 3 batch set point.
G41	INIT.T.LMT 3	0 to 9999	0 to 3	0	W	B	Sets MODE 3 initial flow totalization value.
G42	PREBATCH 3	0 to 9999	0 to 3	0	W	B	Sets MODE 3 pre-batch set point.
G43	PRED LEAK 4	0 to 9999	0 to 3	0	W	B	Sets MODE 3 predicted leakage.
G44	LEAK DETECT 3	0 to 9999	0 to 3	9999	W	B	Sets MODE 3 leakage detection value.
G45	SHORTAGE 3	0 to 9999	0 to 3	9999	W	B	Sets MODE 3 batch shortage value.
G50	BATCH SET 4	0 to 999999	0 to 3	0	W	B	Sets MODE 4 batch set point.
G51	INIT.T. LMT 4	0 to 9999	0 to 3	0	W	B	Sets MODE 4 initial flow totalization value.
G52	PREBATCH 4	0 to 9999	0 to 3	0	W	B	Sets MODE 3 pre-batch set point.
G53	PRED LEAK 4	0 to 9999	0 to 3	0	W	B	Sets MODE 4 predicted leakage.
G54	LEAK DETECT 4	0 to 9999	0 to 3	9999	W	B	Sets MODE 4 leakage detection value.
G55	SHORTAGE 4	0 to 9999	0 to 3	9999	W	B	Sets MODE 4 batch shortage value.
G60	SELF CHECK	GOOD ERROR . .			R	B	Displays self-check result.
L00	ADJUST				R	SHBEL	Automatic zero adjustment functions.
L10	ZERO TUNING	INHIBIT ENABLE		INHIBIT	W	SHBEL	Inhibits or enables automatic zero adjustment.
L11	MAGFLOW ZERO	-100.00 to 100.00	2	0.00	W	SHBEL	Executes automatic zero adjustment and displays zero correction value.

9. PARAMETER LIST

NO.	Name	Data Range, Units	Decimal Point	Default Value	R/W	S/H/B/E/L	Description
L60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self - check result.
M00	OTHER				R	SHBEL	Write protection and display selection functions.
M10	TUNING	INHIBIT ENABLE		ENABLE	W	SHBEL	Inhibits or enables parameter data changes.
M40	FLOW DISP1 (DH/DE/DL) BATCH DISP (DB)	FLOW RATE FLOW RATE (%) FOR. TOTAL REV. TOTAL(DH/DE/DL) DIF. TOTAL (DH/DE/DL) BLANK BATCH SET (DB only)		DH : FLOW RATE(%); DB : BATCH SET	W	HBEL	Selects item to display on upper 7-seg LED line.
M41	FLOW DISP (AS) FLOW DISP2 (DH/DE/DL) FLOW DISP (DB)	FLOW RATE FLOW RATE (%) FOR. TOTAL REV. TOTAL(DH/DE/DL) DIF. TOTAL (DH/DE/DL) BLANK		AS : FLOW RATE(%); DH.DB. DE.DL : FOR. TOTAL	W	SHBEL	Selects item to display on lower 7-seg LED line.
M50	KEY	00 55 < TO "N" >	0		W	SHBEL	Enables "N" items display. Sets "55" for access to "N" items.
M60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self-check result.
N00	TEST				R	SHBEL	Input / output circuit test mode.
N10	TEST MODE	NORMAL TEST		NORMAL	W	SHBEL	Selects test mode.
N11	OUTPUT VALUE	-110 to 110	0	0	W	SHBEL	Sets test output value.
N12	SO S1 (END)	NORMAL ON OFF		NORMAL	W	HBEL	Selects test status output of S1 terminal. (END for AM11-DB)
N13	SO S2 (PRE)	NORMAL ON OFF		NORMAL	W	HBEL	Selects test status output of S2 terminal. (PRE for AM11-DB)
N14	ALM OUT	NORMAL ON OFF		NORMAL	W	HBEL	Selects test status output of ALM terminal.
N15	SI S3 (AUX)	OPEN SHORT			R	HBEL	Displays status of S3 terminal. (AUX for AM11-DB)
N16	SI S4 (PAUSE)	OPEN SHORT			R	HBEL	Displays status of S4 terminal. (PAUSE for AM11-DB)
N17	SI (START)	OPEN SHORT			R	B	Displays status of START terminal.
N18	SI (RESET)	OPEN SHORT			R	B	Displays status of RESET terminal.
N60	SELF CHECK	GOOD ERROR . .			R	SHBEL	Displays self-check result.

9. PARAMETER LIST

List of Parameters for HART Communicator

Name	Data Range, Units	Default Value	R/W	Description	Indicator of AM11
PV	-32400 to 32400		R	Displays instantaneous flow rate in engineering unit.	A11
Totl	0 to 999999	0	W	Displays and presets forward direction totalized flow rate.	A20
PV AO	2.40 to 21.6 mA		R	Displays current output.	—
Span	0.0001 to 30000	1.0000	W	Sets flow span in selected unit.	B24
Status group 1	Error µP fault EEPROM fault A/D(H) fault A/D(L) fault Signal overflow Coil open Vel. span> 10 m/s		R	Displays self-diagnostics result. “ON” shows error status. “OFF” shows normal status. See “8.2 Self-diagnostics Functions.”	—
Status group 2	Vel. span< 0.1 m/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< .0001p/s		R	Ditto	—
Status group 3	T. span> 1000p/s T. span< .0001p/s 4-20 lmt error Mult range erro EEPROM damage EEPROM default H/L alarm H/L alarm set err		R	Ditto	—
Status group 4	Dev id		R	Ditto	—
Self test	—	—	W	Executes self-diagnostics.	—
Auto zero	—	—	W	Executes automatic zero adjustment.	L11
Zero tuning	Inhibit Enable	Enable	W	Inhibits or enables automatic zero adjustment.	L10
D/A trim	ZERO: 3.2 to 5.6 mA SPAN: 18.4 to 21.6 mA		W	Performs fine adjustments of zero and span of current output.	—
Scaled D/A trim	ZERO: 3.2 to 5.6 mA SPAN: 18.4 to 21.6 mA		W	Performs fine adjustments of zero and span of scaled analog output.	—
Loop test	4 mA 20 mA Other (2.72 to 21.28 mA) End	4 mA	W	Sets test output value.	N11
Alm out	Normal Closed (on) Open (off)	Normal	W	Selects test status output of ALM terminal.	N14
SO S1	Normal Closed (on) Open (off)	Normal	W	Selects test status output of S1 terminal.	N12
SO S2	Normal Closed (on) Open (off)	Normal	W	Selects test status output of S2 terminal.	N13
SI S3	Open Short		R	Displays status of S3 terminal.	N15
SI S4	Open Short		R	Displays status of S4 terminal.	N16
PV Unit	gal/min L/min Cum/h ft/s m/s (Spcl)	m/s	W	Selects engineering unit of “PV”. Displays “Spcl” in case of setting unit except 5 units on the left.	—

9. PARAMETER LIST

Name	Data Range, Units	Default Value	R/W	Description	Indicator of AM11
Nominal size	0.00001 to 30000 mm/inch	100.0	W	Sets flow tube nominal size in selected unit.	B21
PV Damp	0.1 to 100.0 sec.	3.0	W	Sets damping time constant of output.	B25
Tag	Enter characters	—	W	Sets tag no. up to 8 characters.	B10
Descriptor	Enter characters	—	W	Sets user-defined characters up to 16.	—
Message	Enter characters	—	W	Sets user-defined characters up to 32.	—
Date	01/01/00 to 12/31/99	0	W	Sets month/day/year.	—
Flow unit	k Cum Cum L Cucm M gal k gal gal m gal k bbl bbl m bbl u bbl m(meters) ft(feet)	m	W	Selects volume unit of flow span.	B22
Time unit	d, h, min, s	s	W	Selects time unit of flow span.	B23
Velocity check	0 to 32.767 m/s		R	Displays span in m/s.	B40
Magmeter	ADMAG YEW MAG CALIBRATOR	ADMAG	W	Selects type of combined flow tube.	B19
Size unit	(00) mm (01) in	mm	W	Selects flow tube nominal size unit.	B20
Low MF	0.0100 to 3.0000	1.0000	W	Sets low frequency side meter factor. (Actual flow test data has been entered.)	B30
High MF	0.0100 to 3.0000	1.0000	W	Selects high frequency side meter factor.	B31
F. direction	Normal Reverse	Normal	W	Selects flow direction.	C40
PV % rng	-110.0 to 110.0%		R	Displays instantaneous flow rate in %.	A10
For. rng sel	Single range Ext. 2 ranges Ext. 3 ranges Ext. 4 ranges Auto 2 ranges Auto 3 ranges Auto 4 ranges	Single range	W	Selects forward direction multi-range.	E22
Rev. rng sel	No function Single range Ext. 2 ranges Ext. 3 ranges Ext. 4 ranges Auto 2 ranges	No function	W	Selects reverse direction multi-range.	E23
For. span2	0.0001 to 30000	1.0000	W	Sets 2nd span for forward direction multi-range.	E30
For. span3	0.0001 to 30000	1.0000	W	Sets 3rd span for forward direction multi-range.	E31
For. span4	0.0001 to 30000	1.0000	W	Sets 4th span for forward direction multi-range.	E32
Rev. span1	0.0001 to 30000	1.0000	W	Sets 1st span for reverse direction multi-range.	E40
Rev. span2	0.0001 to 30000	1.0000	W	Sets 2nd span for reverse direction multi-range.	E41
Rev. span3	0.0001 to 30000	1.0000	W	Sets 3rd span for reverse direction multi-range.	E42
Rev. span4	0.0001 to 30000	1.0000	W	Sets 4th span for reverse direction multi-range.	E43
Frequency	47.00 to 63.00 Hz	50.00	W	Sets AC power frequency for DC power supply.	B32
T.rate unit	n UNIT/P u UNIT/P m UNIT/P UNIT/P k UNIT/P M UNIT/P PULSE/s	PULSE/s	W	Selects totalization rate unit. ("UNIT" in the selection on the left represents the "Flow unit" selected.)	C20
Total rate	0.0000 to 30000	0	W	Sets totalization rate.	C21
Total low cut	0 to 100%	3	W	Sets low cut width of totalization.	C22

9. PARAMETER LIST

Name	Data Range, Units	Default Value	R/W	Description	Indicator of AM11
T. set value	0 to 999999	0	W	Sets forward direction totalization preset value.	C24
Total set	Inhibit Enable	Inhibit	W	Inhibits or enables forward direction totalization and reverse direction totalization from being preset and reset, respectively.	C23
Total switch	0 to 999999	0	W	Sets switching level when using status output function as totalization switch function.	E51
Rev total	0 to 999999	0	W	Displays and resets reverse direction totalized flow rate.	F10
Dif. total	-999999 to 999999	0	R	Displays differential totalized flow rate between forward and reverse. (Diff. total = Totl - Reverse total)	F11
Total point	0, 1, 2, 3	0	W	Sets decimal point position for totalization display.	—
Input func	No function 0% signal lock Ext.auto zero Ext.for.t.preset	No function	W	Selects status input functions except multi-range.	E20
Output fnc	No function Total switch	No function	W	Selects output functions for totalization switch.	E21
H alarm	-110 to 110%	110	W	Sets high limit alarm.	E49
L alarm	-110 to 110%	-110	W	Sets low limit alarm.	E50
4-20 low lmt	-20 to 100%	-20	W	Sets low limit of current output.	C30
AO Alm typ	none	None	R	Always "none".	—
4-20 alarm out	2.4 mA or less 4.0 mA Hold 21.6 mA or more	2.4 mA or less	W	Selects current output during alarm occurrence.	C41
Poll addr	0 to 15	0	W	Sets polling address when multidrop mode.	—
Num req preams	5	5	R	Displays number of request preambles.	—
Burst mode	Off On	Off	W	Selects the mode for the burst mode functionality.	—
Burst option	PV % range/current Process vars/crnt	PV	W	Selects sending items (instantaneous flow rate, output in %, totalization value and/or current output) when burst mode.	—
P. rate unit	n UNIT/P u UNIT/P m UNIT/P UNIT/P k UNIT/P M UNIT/P PULSE/s	PULSE/s	W	Selects pulse rate unit. ("UNIT" in the selection on the left represents the "Flow unit" selected.)	E10

Name	Data Range, Units	Default Value	R/W	Description	Indicator of AM11
Pulse rate	0.0000 to 30000	0	W	Sets pulse rate.	E11
Pulse low cut	0 to 100%	3	W	Sets low cut width of pulse output.	E12
Pulse width	50% Duty 0.5 msec 1 msec 20 msec 33 msec 50 msec 100 msec	50% Duty	W	Selects pulse width.	E13
Flow dsp 1	Flow rate Flow rate(%) For. total Rev. total Dif. total Blank	Flow rate(%)	W	Selects display items on flowmeter indicator (upper 7-seg LED line).	M40
Flow dsp 2	Flow rate Flow rate(%) For. total Rev. total Dif. total Blank	For. total	W	Selects display items on flowmeter indicator (lower 7-seg LED line).	M41
F. user sel	Not provided Providedprovided	Not	W	Selects whether PV is displayed with user-defined unit.	C10
F. user span	0 to 30000	100	W	Sets value displayed in "PV" at 100% output when "F. user sel" is provided.	C12
Manufacturer	YOKOGAWA	YOKOGAWA	R	Displays "YOKOGAWA".	—
Device id	—	Its own ID No.	R	Displays device ID.	—
Write protect	No Yes	No	R	Displays status of "Write Protect".	—
Universal rev	—	—	R	Displays version of universal commands.	—
Fld dev rev	—	—	R	Displays version of communication commands for field device.	—
Software rev	—	—	R	Displays version of software for field device.	—
Enable Write	Enter characters	—	W	Release write protection when the password set in "New Password" is entered.	—
New Password	Enter characters	—	W	Sets new password up to 8 characters.	—

