

## 1 Installation

### 1.1 Installation of Flow Detector

#### 1.1.1 Selecting Location

Consider the following when selecting installation point for the Flow Detector:

- 1) Ambient temperature: 0 to 60°C (32 to 140°F) away from direct sunshine.
- 2) Free from electromagnetic interference. Keep away from such heavy electrical devices as motors, pumps, power-relays and solenoid valves.
- 3) The location must be with no water splashes or corrosive gases.
- 4) The location should have ease of access for maintenance.



#### 1.1.2 Mounting of Flow Detector

Consider the following when selecting installation point and installation of Flow Detector for accurate measurement.

- 1) The measuring tube of Flow Detector should always be filled with liquid. Flow Detector can be installed at any angle - vertical, horizontal or inclined pipe. However, if possible, stagnation of bubbles in the measuring tube should be avoided. If deposits or sediments are expected, Flow Detector must be mounted for ease of draining and cleaning.
- 2) To install on pipe that has open end, mounting should be in lower position of pipeline.
- 3) The arrow on side plate of Flow Detector shows flow direction. Make sure the arrow matches the direction of flow.
- 4) Flow Detector should be mounted where pressure in the pipe is above the atmospheric.
- 5) A flow control valve is recommended downstream of Flow Detector to prevent formation of bubbles in the liquid. An upstream valve may form bubbles: thus reducing the intensity of the ultrasound and interfering with measurement.
- 6) A bypass pipe run (including bypass valve and shutoff valve) is recommended for easy zero adjustment and maintenance.
- 7) Use two threaded holes for the mounting of Flow Detector on the bottom. Take great care to avoid mechanical stress on the inlet and outlet pipes.
- 8) Please refer to Maker's Instruction Manual for the connection of the inlet and outlet pipes. (Refer to "9. FITTING TOOLS COMBINATION").

### 1.2 Installation of Converter

#### 1.2.1 Selecting Location

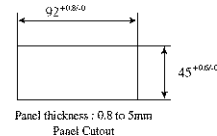
Consider the followings when selecting installation point for Signal Converter:

- 1) Ambient temperature: 0 to 50°C (32 to 122°F) away from direct sunshine.
- 2) Ambient humidity: 30 to 80%R.H. and free from condensation.
- 3) Free from electromagnetic interference. Keep away from heavy electrical devices.
- 4) Free from rain and water drops.

#### 1.2.2 Mounting of Converter

Converter is panel mount type. Refer to the cutout dimensions.

- 1) Remove the mounting brackets from the converter.
- 2) Insert converter from front side of panel.
- 3) Slide mounting brackets into guide holes of converter.
- 4) Tighten screws of mounting brackets from back of converter by a screwdriver. Tighten left and right screws alternately and fix the face flange of converter securely to fit on the panel.

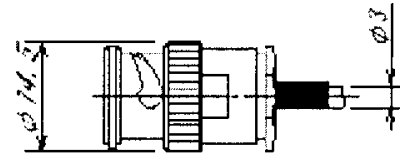


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## 1.3 Wiring

### 1.3.1 Connection of the flow detector

A pair of coaxial cables with BNC type connector is used for connection between detector and converter. Standard cable length is 5m. The cables are attached to the Flow Detector.



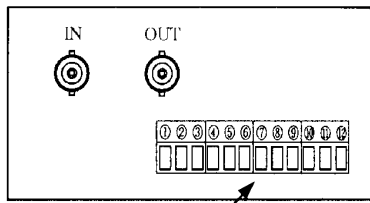
Dimension of BNC connector

### 1.3.2 Wiring of terminals

#### 1) Specifications of cable

Use cable with core size of AWG22-14. Strip the sheath approximately 7mm from cable end. Insert core into terminal to the end and tighten screw. Confirm cable is securely fixed by pulling it by hand. It is preferable to use the sleeve for secure fixing.

#### 2) Terminals and connectors



\* Terminal block is description type.

	Polarity	Functions
IN	Upstream	Flow detector signals (BNC connector)
OUT	Downstream	
①	+	Pulse output (Open collector)
②	-	
③	+	Flow rate alarm (Hi) or Preset (HH) alarm (Open collector)
④	-	Flow rate alarm (Lo) or Preset (H) alarm (Open collector)
⑤	+	
⑥	+	
⑦	-	Reset pulse input for totalizer
⑧	⊥	Frame ground
⑨	+	
⑩	-	Current output (4-20mA)
⑪	+24V	Power supply (24V DC)
⑫	0V	

#### 3) Connection of the Flow Detector

A pair of coaxial cables is provided to Flow Detector. BNC type connector is provided for each cable. Connect coaxial cable of upstream side of Flow Detector to IN receptacle and that of downstream side to OUT receptacle. Confirm cable is securely fixed.

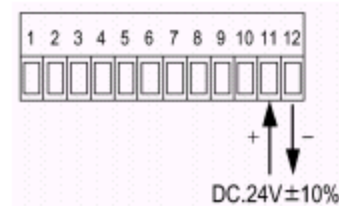
#### 4) Connection of power supply

(1) Confirm that the supply voltage shown on the tag plate and the supply voltage, which it is going to connect is the same.

(2) The power supply for instrumentation etc. should be used for a power supply, and using with the power supply for power operation should surely avoid it.

(3) Confirm supplied voltage is within tolerance of converter.

(4) At the start of the converter operation, electric current 300mA is consumed. Reserve the current for each converter.



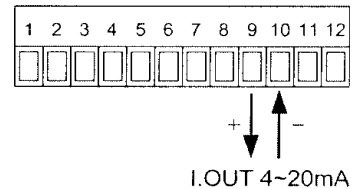
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## 5) Connection of analog output

Analog output is source type 4 to 20mA. Connect to terminals 9 (+) and 10 (-) [ I.OUT ]. Maximum load resistance is 500ohms.

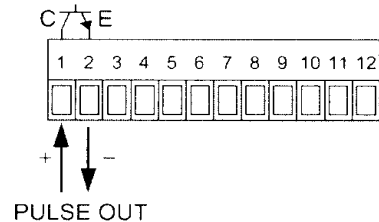
Remark :

#10 is internally connected to #12



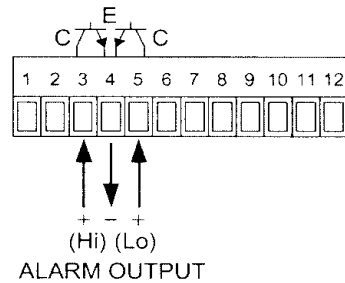
## 6) Connection of pulse output

Connect external counter or totalizer to terminals 1 (+) and 2 (-) [ PULSE OUTPUT ]. The contact rating is max. 30VDC, 50mA.



## 7) Connection of flow alarm and preset alarm

Connect annunciator or other devices to the terminals 3 (+) and 4 (-) and/or terminals 4 (-) and 5 (+). Terminals 3 and 4 are for high flow rate alarm (Hi) or high preset alarm (HH) for totalizer. Terminals 4 and 5 are low flow rate alarm (Lo) or high preset alarm (H). The contact rating is max 30VDC, 50mA.

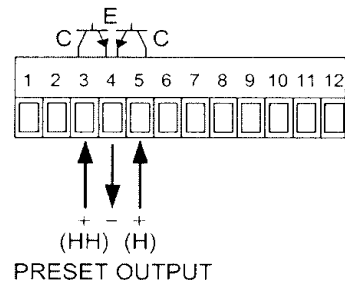


### (1) Connection of flow rate alarm

(No.7 of parameter menu, page 10)

### (2) Connection of totalized preset output

(No.9 of parameter menu, page 10)



## 8) Connection of reset pulse for totalizer

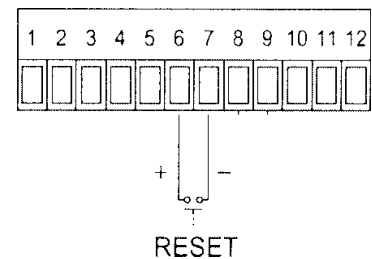
Connect reset pulse for totalizer to terminals 6 (+) and 7 (-).

Pulse height : 5V }10%

Pulse width : 0.2sec min

Remark :

#7 is internally connected to #12

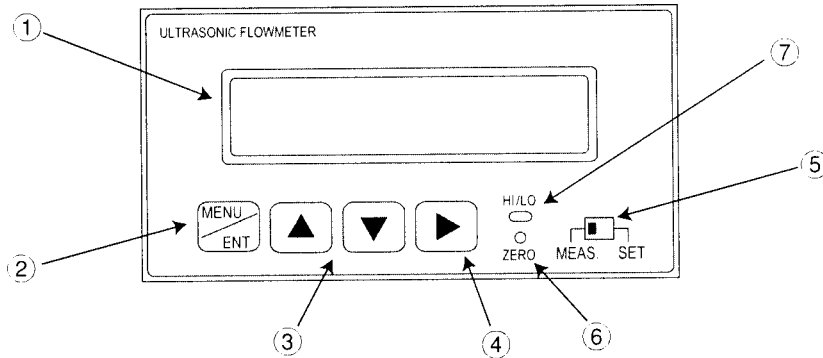


## 9) Frame Ground

The frame ground wiring may be omitted when pulse noise in AC line is low and DC power supply used has fairly high common mode rejection capability. However when any adverse noise effects are observed in the output of the flowmeter, it is better to connect #8 terminal to low impedance ground.

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## 2 Component Names Of Front Panel



No.	Name	Function
①	Display	Indication of flow rate, total flow or parameters
②	MENU / ENTER key	Selection and Fixing of menu for parameter setting
③	UP/ DOWN key	Setting of numerical values in parameter setting
④	SHIFT key	Shift of decimal position of parameter
⑤	Mode selection switch	Selection switch for measurement or parameter setting
⑥	Zero adjust switch	Zero adjustment switch
⑦	Alarm indication	Indication of alarm condition

## 3 Operation

This product is delivered after manufacturing and adjustment. Operate this product according to the procedure of this manual after installation and wiring are completed, flow rate signal by the current or pulse will be acquired. If any discrepancy happened at the time of an operation start, check the setting parameter with reference to Chapter 4.

Moreover, about the function without especially specification, it is set up with the standard value. Change the setting parameter if needed.

### 3.1 Inspection before start up

#### 3.1.1 Confirm the following before turning power on.

##### 1) Wiring

- The power supply and the output terminal have been properly wired.
- Cable has been properly connected to the terminals.
- Ensure grounding
- Detector and converter are connected in the right combination.
- Supply voltage matches the specification.

##### 2) Installation of detector

- The rock nuts of the connecting threads have been firmly fastened.
- The flow direction is in accordance with the flow indication.

#### 3.1.2 Introduction of fluid into detector

Fill the detector with measuring liquid and stop the flow by closing valves. Confirm that the fluid is perfectly stable and no leakage is found at valve. Also confirm that no bubbles are produced and no bubble exists in process.

### 3.2 Operation

#### 3.2.1 Turning on electricity

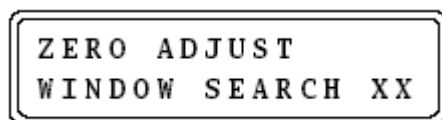
- 1) Turn on the power supply to converter.
- 2) After turning on the power supply, warm up the converter for about 15 minutes. When you change a parameter, refer to the Chapter 4.

#### 3.2.2 Zero adjustment

After introduction of liquid and before operation, push the zero point adjustment SW (hole button) of the front panel for about 1 second, and be sure to perform zero point adjustment once. It is not necessary to repeat zero adjustment every time power is turn on.

Fill the detector with measuring liquid and stop the flow.

Push zero adjustment switch SW, following display should appear 10 to 30 seconds. The flowmeter is now ready for operation.



When a received waveform is small, "EMPTY SENSOR" may be displayed on the lower line of the indicator.

#### 3.2.3 Operation

- 1) Introduce the measuring liquid and start operation.
- 2) When the indicator is indicating the flow rate, if "—" is indicated in the flow, the actual flow is in the reverse direction. Check about the following points.
  - a) Reconfirm that the actual flow is in accordance with the flow direction mark of the detector.
  - b) Confirm that connector of detector is in accordance with the connection location (IN/OUT) of a converter

## 4 Parameter Configuration

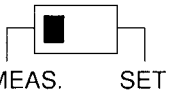




In making change of the scale range, pulse rate and the contents of a display, refer to the following chapter.

This converter has the MODE switch and four setting keys.

The MODE switch changes mode of operation to measurement mode and setting mode.

When changing parameters, set the MODE switch at the SET position and change the setting values using 4 keys. In a parameter menu, when a setting value is not right, an error message is displayed. Re-check the contents of a setting and redo the setup.

### 4.1 Function of Mode switch and setting keys

Name	Operating condition	
	Measuring mode	Parameter setting mode
Mode selection 	MEAS.	SET
MENU / ENT key 		Parameter and Numerical value are determined Shift of the parameter menu
UP key 		Increase the setting value
Down key 		Decrease the setting value
SHIFT key 		Shift of a numerical position

### 4.2 Setting of parameter

#### 4.2.1 Setting procedure

Mode switch is set into the SET side, parameter setting menu is presented.

The MENU/ENTER key is pressed, Menu No. will change to 1-12.

When changing the parameter, shift or determine by the SHIFT key after select the parameter using UP and DOWN key or change the numerical value.

(Ex. Menu No.1)



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[Style B]

Parameter menu		Contents chosen by the UP / DOWN / SHIFT key : Lower line of LCD	
No	[Indication] : Upper line of LCD		
1	[SENSOR SIZE]	4mm, 6mm, 10mm, 15mm, 20mm	
2	[FULL SCALE, UNIT]	0~9999 □□□□, □□□.□, □□.□□, □.□□□ (There is restriction for setting.)	mL/s, mL/min, L/min, L/h, m3/h
3	[KINEM VISCOSITY]	0.30~40.00mm <sup>2</sup> /s	
4	[K FACTOR]	0.800~1.200	
5	[DAMPING TIME] (63%)	0.0, 0.2, 0.5, 1, 2, 3, 5, 8, 10 s *	
6	[LOW CUT OFF]	None, 00%~30% (1%step)	
7	[FLOWRATE ALARM]	None, Yes	
	a [ALARM POINT Hi]	0.0~150.0%	
	b [ALARM POINT Lo]	-10~99%	
8	[TOTALIZATION]	None, Yes	
	a [COUNTER RESET]	None, Yes	
	b [TOTAL VOL UNIT]	mL, L, m <sup>3</sup>	
	c [MULTIPLIC FACTOR]	×0.1, ×1, ×10, ×100	
	d [PULSE WIDTH]	0.5ms (Max 1kpps), 50ms (Max 10pps), 100ms (Max 5pps)	
9	[TOTAL PRESET]	None, Yes	
	a [TOTAL PRESET H]	000000~999999 (H<HH)	
	b [TOTAL PRESET HH]	000000~999999 (H<HH)	
10	[MANUAL LIN'RIZER]	None, Yes	
	a [FOLD POINT NO]	1~15	
	b [DECIMAL POINT]	#.###, ##.##, ###.#, #### ( mL/min)	
	c [DATA **/**]	Out ##### (Actual flow rate)	In ##### (Indication flow rate of UCUF)
11	[DISPLAY]	Flow Rate, Flow Rate + Total	
12	[FLOW MODE]	Steady, Pulsating	
	a [FILTER SELECTION]	Cutoff Frq. 3, 2, 1, 0.5, 0.2, 0.1 Hz	

\* The meaning of 0.0 is no damping operation.  
There is cutput delay of the followings,  
size 04 to 06 : 0.05s, 10 to 20 : 0.1s.

## 4.2.2 Contents of each parameter

### No. 1 DETECTOR TYPE

Selection of Flow detector type (size)

UCUF-04B .....	4 mm
UCUF-06B .....	6 mm
UCUF-10B .....	10 mm
UCUF-15B .....	15 mm
UCUF-20B .....	20 mm

### No. 2 FULL SCALE

Setting of full scale flow rate and selection of flow rate unit.

### No. 3 KINEM VISCOSITY

The converter is equipped with flow rate vs current putput linearizing function. Enter the kinematic viscosity of the fluid to measure at the operating temperature (viscosity is generally temperature dependant). The kinematic viscosity is also called as dynamic viscosity. Its SI unit, mm<sup>2</sup>/s, is equivalent to cSt (centi-Stokes) and also equal to absolute viscosity ( $\mu$ ) divided by density ( $\rho$ ) in the units as shown below.

$$\text{mm}^2/\text{s} = \text{cSt} = \mu (\text{cP} \times 1000) / \rho (\text{kg/m}^3)$$

### No. 4 K FACTOR

K factor is a parameter which indicates calibration characteristics of the sensor. This factor is already set at the factory before shipping. However the combination of the sensor and converter is to be changed, new K factor, which is affixed to the sensor body, must be registered in order to adjust for the difference of calibration characteristics.

### No. 5 TIME CONSTANT (63%)

Setting of response of indication and output to the changing flow rate.

0.0 to 10.0s are available. (0.0 has the response delay without damping time operation. [04 to 06 of UCUF 0.05s / 10 to 20 of UCUF 0.1s])

### No. 6 LOW CUT OFF

Setting of low flow cut off.

Below the set-up value (%: percentage to flow rate) is considered compulsorily that current output and flowrate display are zero.

### No. 7 ALARM OUTPUT

Selection of alarm output. Non, Flow rate, Total flow.

### No. 8 INTEGRATION

Setting of integration function

If set up with Yes, integration functional relation can be used.

If set up with None, neither the sub menu of this item nor the selection menu of No.9 will be displayed.

### No. 9 PRESET

Setting of integrating preset function.

When alarm output function (No.7) is set up with None, the selection menu of integrating preset is displayed.

### No. 10 MANUAL LINEARIZER

Setting of linearizer by manual control. Refer to the 6.4 Linearize procedure in details.

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## No. 11 INDICATION MODE

Selection of display in LCD

When Selection of integration function (No.8) is set up with None, integration count is not displayed.

Flow Rate ..... Flow rate (%) is displayed on the upper line, and flow rate is displayed on the lower line.

Flow Rate + Total .....Flow rate is displayed on the upper line, and integration count is displayed on the lower line.

## No. 12 FLOW RATE MODE

Measuring fluid, which has pulsation by the low flow rate, set PULSATION.

## 5 Error Messages

### 5.1 Error message list

Error message	Possible cause	Measures
SETTING ERROR SENSOR VS F.S.	Sizing of detector and full-scale range are not correct.	Change the full scale according to the detector.
SETTING ERROR F.S. VS Pulse	Relation of full-scale and integration pulse width is unsuitable.	Change the pulse width according to the full scale.
ERROR MESSAGE SETTING ERR XXX	Parameter error "xxx" is error code.	Refer to the error code list and change the setting value.
PARAMETER ERR XXX		
EMPTY SENSOR XX	At the MEAS. Mode, bubbles in the measuring tube, or detector is disconnected.	Check in the measuring tube that there is no air bubbles etc. and confirm the connection of detector firmly.
ZERO PARAM ERR	The wave of a detector is not detected at zero adjustment, or the detector is out of order.	Check in the measuring tube that there is no air bubbles etc.
ERROR MESSAGE ZERO ADJ FAILED		
ZERO ADJUST FLOW?	The measuring fluid may be flowing at the time of zero adjustment.	Check the measuring status.
ZERO ADJUST LEVEL HIGH	Level is large even if it adjusts gain at zero adjustment.	Check the detector size and the setting value.
ZERO ADJUST LEVEL LOW	Level is small even if it adjusts gain at zero adjustment.	Check in the measuring tube that there is no air bubbles etc.
ZERO ADJUST U/D LEVEL RETIO	The wave of level difference at the upstream side and downstream side is large at zero adjustment.	Check in the measuring tube that there is no air bubbles etc.
SETTING ERROR In DATA OVER F.S.	The value of IN data of MANUAL LINEARIZER is larger than a full-scale value.	Check the inputted IN data.
Sleep *1	Since the supply voltage descends out of the stipulated range, the integrated value data is under evacuation.	Check if supply voltage is in the stipulated range.

\*1 "Sleep" is displayed when supply voltage descends below 20.5V (Representative value).

"Sleep" may be temporarily displayed when power supply is intercepted or switched on, but the supply voltage descends when "Sleep" is displayed continuously or intermittently. Be sure to check the voltage.

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## 5.2 Error code list

Error code	Parameter
201	Discrepancy of sensor type and full-scale value
202	Parameter range error of setting of [3. KINEM VISCOSITY]
203	Parameter range error of setting of [4. K FACTOR]
205	Parameter range error of setting of [6. LOW CUT OFF]
211	Parameter range error of setting of [ALARM POINT Hi]
212	Parameter range error of setting of [ALARM POINT Lo]
241	Parameter range error of setting of [FOLD POINT NO]
242	Parameter range error of setting of [DATA **/**] or [In DATA]
243	Error of setting of [DATA **/**] or [In DATA] (In [i]>In [i+1])

## 6 Parameter Setup Example

### 6.1 Setting of Full scale flowrate range

The following describes the procedure used when switching the full scale flowrate range from 20.00 L/min to 1000mL/min.

- 1) Shift the MODE switch to the SET side.

The setup mode is turned on and Parameter menu No.1 SENSOR SIZE appears.

```
1.SENSOR SIZE
4mm
```

- 2) Press the MENU / ENTER key.

Parameter menu No.2 FULL SCALE, UNIT appears. The column of 2 flashes.

```
2.FULL SCALE
20.00 L/min
```

- 3) Press the DOWN key.

"2" is replaced by "1".

```
2.FULL SCALE
10.00 L/min
```

- 4) Press the SHIFT key four times.

Left end letter of unit flashes.

```
2.FULL SCALE
10.00 L/min
```

- 5) Press the DOWN key.

"L/min" is replaced by "mL/min".

```
2.FULL SCALE
10.00 mL/min
```

- 6) Press the SHIFT key.

Decimal place flashes.

```
2.FULL SCALE
10.00 mL/min
```

- 7) Press UP key twice.

Decimal point is shifted.

```
2.FULL SCALE
10000 mL/min
```

- 8) Press MENU / ENTER key.

Following menu appears and specified value has been validated.

```
3.KINEM VISCOSIT
01.00mm2/s
```

- 9) Shift the MODE switch to the MEAS. side.

The measurement mode will be restored.

## 6.2 Selecting and Setting up the alarm output function

The following describes how to select and set up the High / Low alarm function.

Note 1) Be advised that the High / Low alarm function and the Integration preset output function cannot be turned on at the same time, (higher priority for Hi/Lo alarm).

Note 2) The Hi and Lo settings and corresponding contacts are independent, and alarm lamp works on OR logic basis. However, alarm display uses the same upper line, and when both alarms work, display priority is placed on Hi alarm. To avoid confusion, therefore, it is recommended to set Hi setting to be higher than Lo setting.

Refer to 6.3.3 about integrating preset output function.

The following describes the procedure for specifying, as an example, 80% for the upper limit and 20% for the lower limit in the flow rate alarm setup.

1) Shift the MODE switch to the SET side.

The setup mode is turned on and Parameter menu No.1 SENSOR SIZE appears.

1 . S E N S O R   S I Z E  
4 m m

2) Press the MENU / ENTER 6 times.

Parameter menu No.7 FLOWRATE ALARM appears.

7 . F L O W R A T E   A L A R M  
None

3) Select the menu.

Press the UP or DOWN key and select Yes.  
Note) None is selected when not using Alarm output function or using Integrating preset output function.

7 . F L O W R A T E   A L A R M  
Yes

4) Press MENU / ENTER key.

No.7-a ALARM POINT Hi appears, and Left end letter of figure flashes.

A L A R M   P O I N T   H i  
1 5 0 . 0 %

5) Press the UP / DOWN key and SHIFT key.

Set at 0.80.0%.

A L A R M   P O I N T   H i  
0 8 0 . 0 %

6) Press MENU / ENTER key.

No.7-b ALARM POINT Lo appears, and Left end letter of figure flashes.

A L A R M   P O I N T   L o  
+ 1 0 %

7) Press the UP / DOWN key and SHIFT key.

Set at +20%.

A L A R M   P O I N T   L o  
+ 2 0 %

8) Press MENU / ENTER key.

Following menu appears and specified value has been validated.

T O T A L I Z A T I O N  
None

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9) Shift the MODE switch to the MEAS. side.  
The measurement mode will be restored.

## 6.3 Setting of Integration function

### 6.3.1 Selecting of pulse width for output of integration

The following describes the procedure used for selecting an integration output pulse width. Selection of No.8-d PULTH WIDTH of integration output, it is required to select a pulse width suitable for the receiving instrument's incoming pulse width specification. Pulse width selection is also needed when selecting an another integrator from Menu No.8-b TOTAL VOL UNIT and No.8-c MULTIPLIC FACTOR.

Pulse width	Outgoing pulse number per second pps (PULSE/s)	Select an appropriate pulse width after converting outgoing pulse number at full-scale flowrate into pps.
0.5ms	Max. 1kpps	
50ms	Max. 10pps	
100ms	Max. 5pps	

Flow rate unit \ Integration volume unit	mL	L	m3
	mL/s	1	10 <sup>3</sup>
mL/min	60	60 · 10 <sup>3</sup>	60 · 10 <sup>6</sup>
L/min	60 · 10 <sup>-3</sup>	60	60 · 10 <sup>3</sup>
L/h	3600 · 10 <sup>-3</sup>	3600	3600 · 10 <sup>3</sup>
m3/h	3600 · 10 <sup>-6</sup>	3600 · 10 <sup>-3</sup>	3600

<Calculating outgoing pulse numbers - Example>

How to 1mL per pulse when the full scale flow rate is 20.00 L/min.

$$\frac{\text{Volume per second in the full scale flow rate}}{\text{Volume per pulse}} = \frac{20 / 60 \times 1000^* \quad [\text{mL/s}]}{1 \quad [\text{mL/p}]}$$

$$= 333.33 \text{ pps}$$

\* : (Volume unit L is replaced by mL)

In this case, pulse width must be 0.5ms. You can select this value in the following procedures.

1) Shift the MODE switch to the SET side.  
The setup mode is turned on and Parameter menu No.1 SENSOR SIZE appears.

1 . SENSOR SIZE  
4mm

2 ) Press the MENU / ENTER key 7 times. (In case of using an alarm output function, press it 9 times.)  
Parameter menu No.8 TOTALIZATION appears.

8 . TOTALIZATION  
None

3) Select the menu.  
Press the UP or DOWN key and select Yes.

8 . TOTALIZATION  
Yes

4) Press MENU / ENTER 4 times.

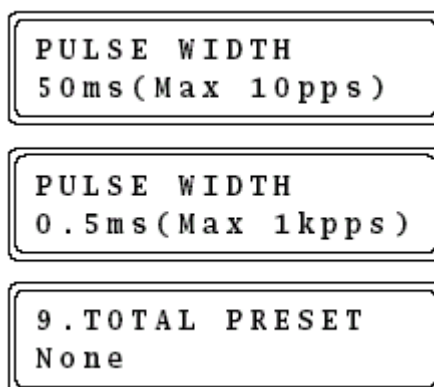
Parameter menu No.8-d PULSE WIDTH appears.

5) Press UP or DOWN key several times.

Select 0.5ms.

6) Press MENU / ENTER key.

Following menu appears and specified value has been validated.



7) Shift the MODE switch to the MEAS. side.

The measurement mode will be restored.

### 6.3.2 Changing an integrating multiplier

The following described the procedure used for switching the multiplier from x100L to x1 mL.

1) Shift the MODE switch to the SET side.

The setup mode is turned on and parameter menu No.1 SENSOR SIZE appears.



2) Press the MENU / ENTER key 9 times.  
(In case of using an alarm output function, press it 11 times.)

Parameter menu No.8-b TOTAL VOL UNIT appears.



3) Press the DOWN key.

“L” is replaced by “mL”.



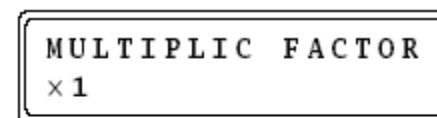
4) Press the MENU / ENTER.

Parameter menu No.8-c MULTIPLIC FACTOR appears.



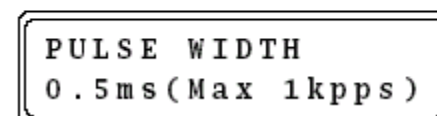
5) Press the UP key twice.

X100 is replaced by X1.



6) Press the MENU / ENTER.

Following menu appears and specified value has been validated.



7) Shift the MODE switch to the MEAS. side.

The measurement mode will be restored.

Note) Set up suitable pulse width with menu No.5. (Refer to 6.3.1)

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## 6.3.3 Selecting and Setting up the integration preset output function

The following describes the procedure for specifying, as example, 50L for (H) and 100L for (HH) in the integration preset output setup.

- 1) Shift the MODE switch to the SET side.

The setup mode is turned on and parameter menu No.1 SENSOR SIZE appears.

1 . SENSOR SIZE  
4mm

- 2) Press the MENU / ENTER key 6 times.

Parameter menu No.7 FLOWRATE ALARM appears.

7 . FLOWRATE ALARM  
Yes

- 3) Select the menu.

Press the UP / DOWN key and select None.  
Note: Integration preset output function cannot be used if Yes is selected.

7 . FLOWRATE ALARM  
None

- 4) Press the MENU / ENTER key.

Parameter menu No.8 TOTALIZATION appears.

8 . TOTALIZATION  
None

- 5) Select the menu.

Press the UP / DOWN key and select Yes.  
Note: Integration preset output function cannot be used if None is selected.

8 . TOTALIZATION  
Yes

- 6) Press the MENU / ENTER key twice.

No.8-b TOTAL VOL UNIT appears.

TOTAL VOL UNIT  
mL

- 7) Press the UP or DOWN key several times.

Select "L".

TOTAL VOL UNIT  
L

- 8) Press the MENU / ENTER key 3 times.

No.9 TOTAL PRESET appears.

9 . TOTAL PRESET  
None

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9) Select the menu.

Press the UP / DOWN key and select Yes.

```
9 . TOTAL PRESET
Yes
```

10) Press the MENU / ENTER.

No.9-a TOTAL PRESET H appears.

```
TOTAL PRESET H
999999L
```

11) Press the UP, DOWN and SHIFT key several times.

Select "50".

```
TOTAL PRESET H
000050L
```

12) Press the MENU / ENTER key.

No.9-b TOTAL PRESET HH appears.

```
TOTAL PRESET HH
999999L
```

13) Press the UP, DOWN and SHIFT key several times.

Select "100".

```
TOTAL PRESET HH
000100L
```

14) Press the MENU / ENTER.

Following menu appears and specified value has been validated.

```
10 . MAN LIN'RIZER
None
```

15) Shift the MODE switch to the MEAS. side.

The measurement mode will be restored.

## 6.4 Setting of manual linearizer

As mentioned already, this converter has automatic linearizer which ensures linearity of output with regard to flow rate by entering the kinematic viscosity of the fluid.

However, this function is effective for a Newtonian fluid, and certain nonlinear error may exist in Non-Newtonian fluid flow measurements. The Manual Linearizer is to offer an effective means to correct this error by customers themselves for individual problems.

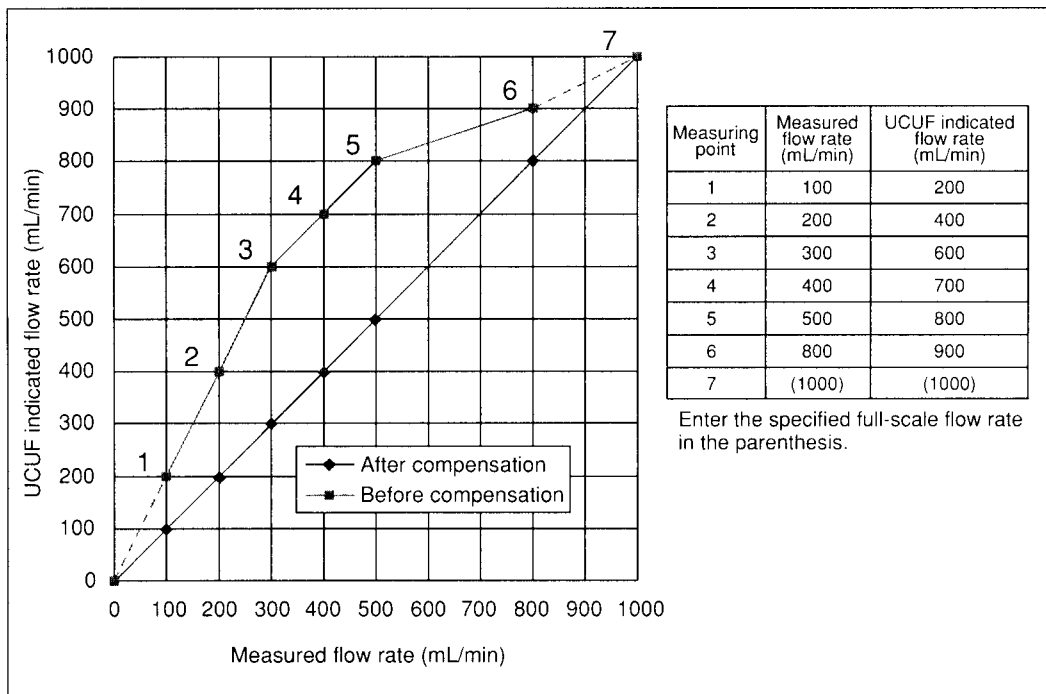
### 6.4.1 How to use the linearizer

- Polygonal line approximation is employed for the compensation. Up to 15 pieces of data can be entered for drawing the line. Measured flow rate (Out ####) and ones indicated UCUF(In ####) are alternately entered. At this time, the flow rate unit is the same as the setting value of full-scale flow rate.
- Any compensation value entered must not exceed the specified full-scale flow rate (selected from parameter No.2). In case such value is required, the specified full-scale flow rate must be previously modified.
- Data below the minimum input value up to 0 L/min are linearly approximated. You must enter the full-scale flow rate for the maximum value. Note that the guaranteed accuracy may not be obtainable below the minimum input value and near to the maximum input value.
- The data shall be expressed in engineering unit, not on % basis. If the kinematic viscosity setting is altered after the linearity data are taken, the data become void.

### 6.4.2 Linearize data input procedure

The following describes the procedure to be employed for correcting the deviation shown below using data from 7 points.

When 1000mL/min is selected for the full-scale flow rate.



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- 1) Shift the MODE switch to the SET side.

The setup mode is turned on and parameter menu No.1 SENSOR SIZE appears.

```
1 . SENSOR SIZE
4mm
```

- 2) Press the MENU / ENTER key 8 to 15 times.

It changes in the use situation of alarm or integration function.

Set the No.10 MANUAL LIN'RIZER.

```
10 . MAN LIN ' RIZER
None
```

- 3) Press the UP key or DOWN key.

Select "Yes".

```
MANUAL LIN ' RIZER
Yes
```

- 4) Press the MENU / ENTER key.

No.10-a FOLD POINT NO appears.

```
FOLD POINT NO
15
```

- 5) Input points are selected by the UP / DOWN key and SHIFT key. (Max. 15 points)

```
FOLD POINT NO
07
```

- 6) Press the MENU / ENTER.

No.10-b DECIMAL POINT appears.

```
DECIMAL POINT
X.XXX mL/min
```

- 7) Press the UP / DOWN key several times.

XXXX mL/min appears.

```
DECIMAL POINT
XXXX mL/min
```

- 8) Press the MENU / ENTER.

No.10-c DATA \*\*/\*\* appears and the 1st data setting menu appears.

```
DATA01/07 mL/min
Out1000 In1000
```

- 9) Enter the 1st point data using UP / DOWN key and SHIFT key. (01/07)

Enter the measured flow rate and UCUF indicated flow rate, in this order.

Note: Enter the data from the low flow rate.

```
DATA01/07 mL/min
Out0100 In0200
```

- 10) Press the MENU / ENTER.

2nd linearizer input menu appears. (02/07)

```
DATA02/07 mL/min
Out2000 In2000
```

- 11) Setting the data of 2 to 7 points.

Repeat 7.8.9.

Note. Enter the full-scale flow rate for the maximum value.

```
DATA07/07 mL/min
Out1000 In1000
```

- 12) Shift the MODE switch to the MEAS. side.

The measurement mode will be restored.

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## 7 Maintenance Note

Ultrasonic flow meter requires no daily maintenance since it has no moving parts that can be subject to wear and tear. However, we recommend the following checks to ensure smooth and reliable operation.

### 7.1 Connection of Flow Detector

- Check for leakage around pipe connections or liquid penetration into Flow Detector tube.
- Check for any slack of a nut.
- Tighten the connection part periodically.

### 7.2 Connecting pipe

- Check for mechanical stress to Flow Detector caused by possible warping of connecting pipes or loose connections caused by heavy pipe vibration.

### 7.3 Cable glands

- Check cable glands of Flow Detector and tighten them if loose.

### 7.4 Deposit or bubbles in the Flow Detector

- Observe the Flow Detector visually from outside and note that there are no deposits or bubbles or foreign materials in the measuring tube.

## 8 Trouble Shooting

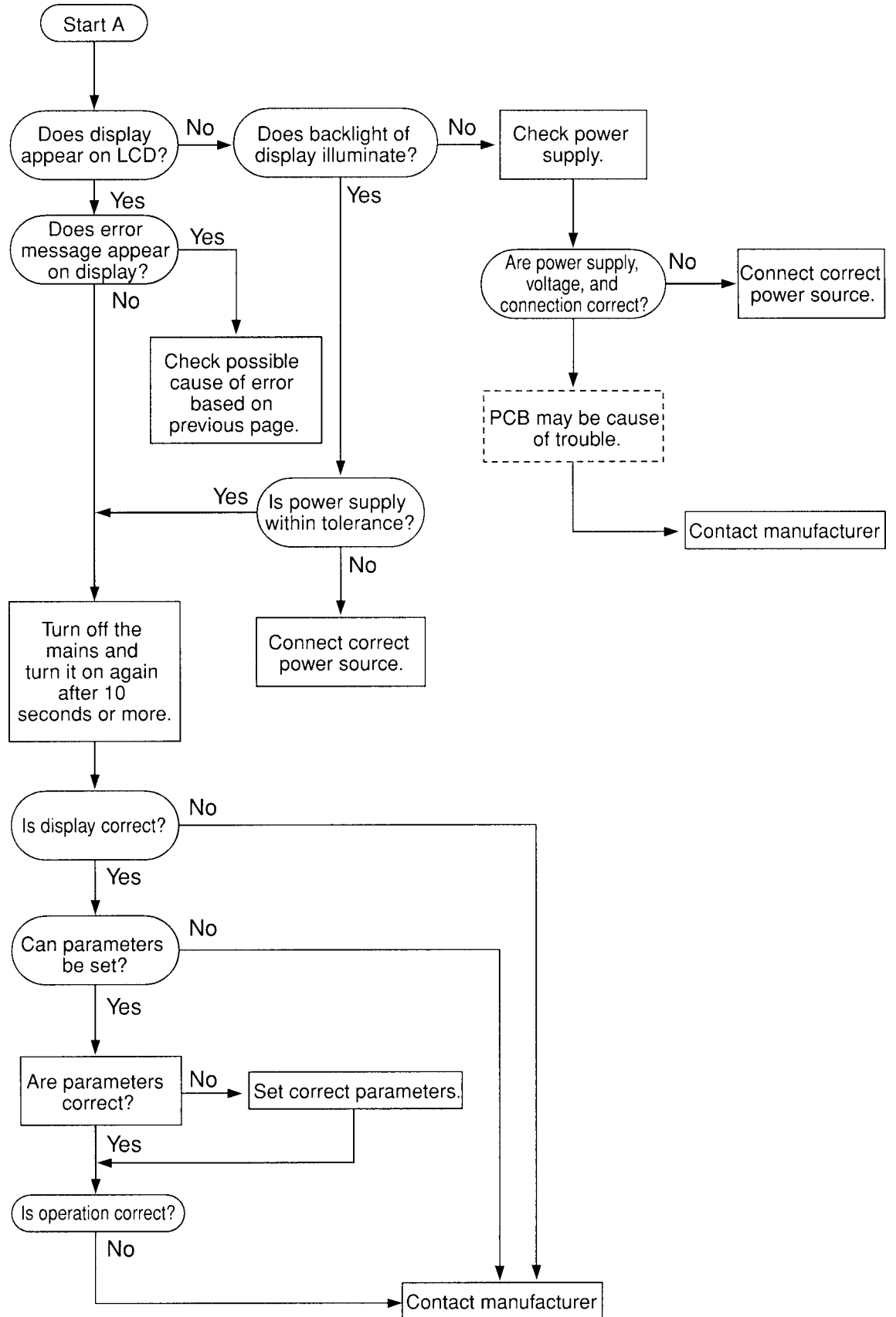
Possible troubles fall into several categories. Trouble shooting charts on the following pages identify possible causes for each category.

Please refer to the Index Table below for trouble category.

Phenomenon		Trouble shooting chart by category
1.	Display does not show anything.	A : No display or abnormal display
2.	Display shows abnormal character(s).	
3.	Display is frozen.	
4.	Error message appears on the display.	
5.	Keys are not operable. Parameters cannot be set.	
6.	Error message appears at zero point adjustment.	B : Not available for zero point adjustment
7.	Display shows zero in liquid flow condition.	C : No indication with flow
8.	Display shows flow rate but output is not available.	
9.	Zero point is not stable (Zero point drift).	D : Unstable zero point
10.	Display shows flow rate or above Full scale when the flow stops.	
11.	Display is unstable in liquid flow condition.	E : Unstable flow rate
12.	Displayed flow rate differs from actual flow rate.	F : Inaccurate measurement
13.	Output does not match actual flow rate.	
14.	Displayed value is over Full scale.	

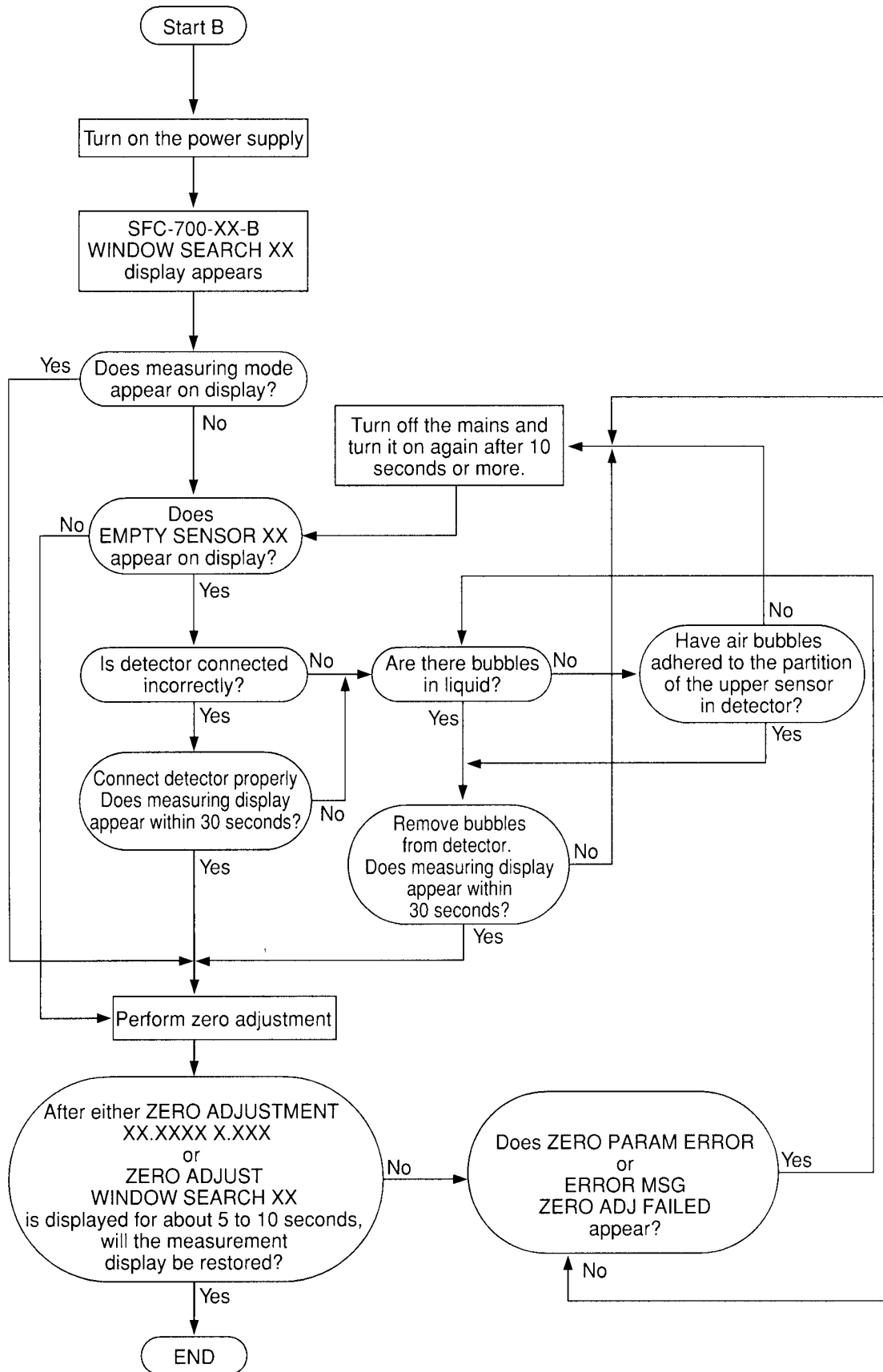
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## A. No display or abnormal display



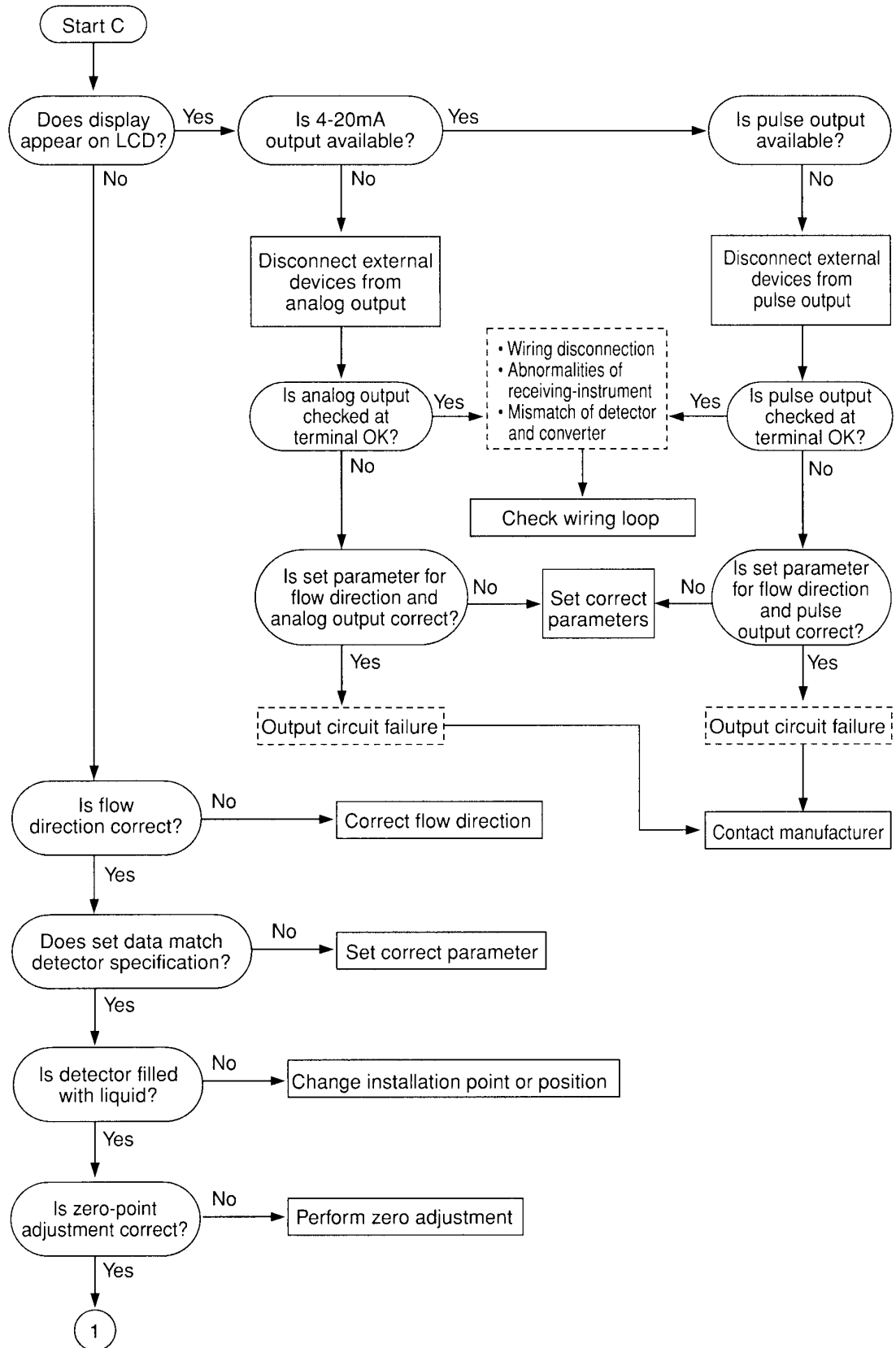
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## B. Not available for zero point adjustment

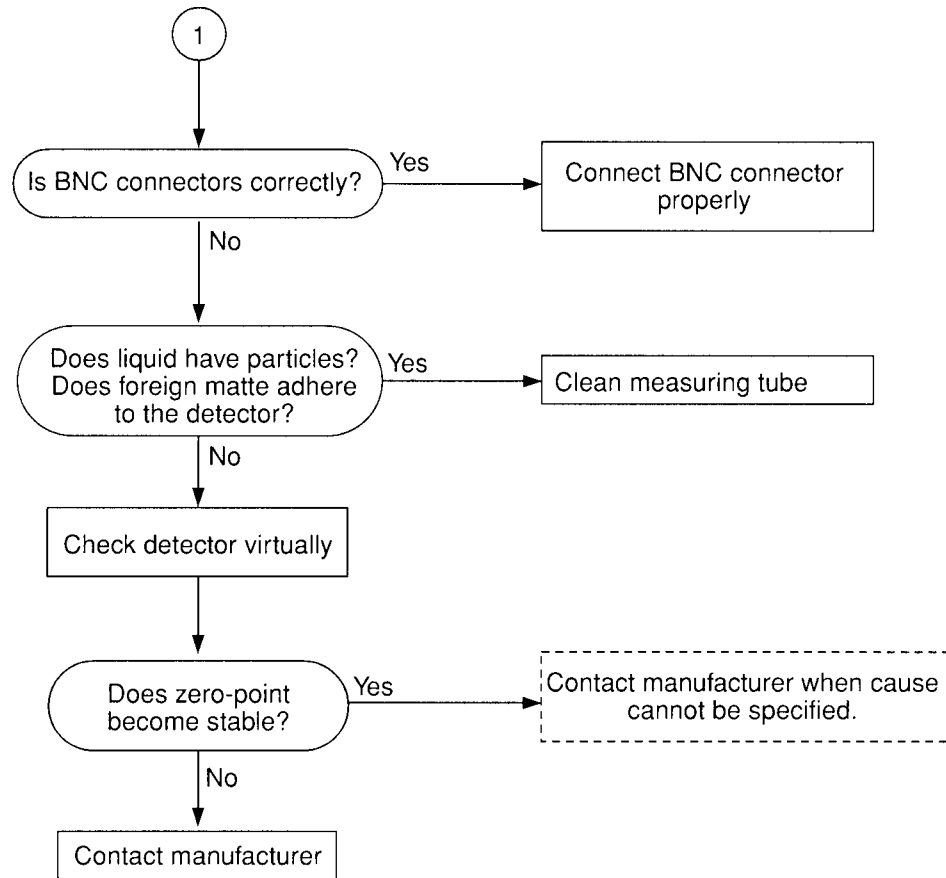


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## C. No indication with flow

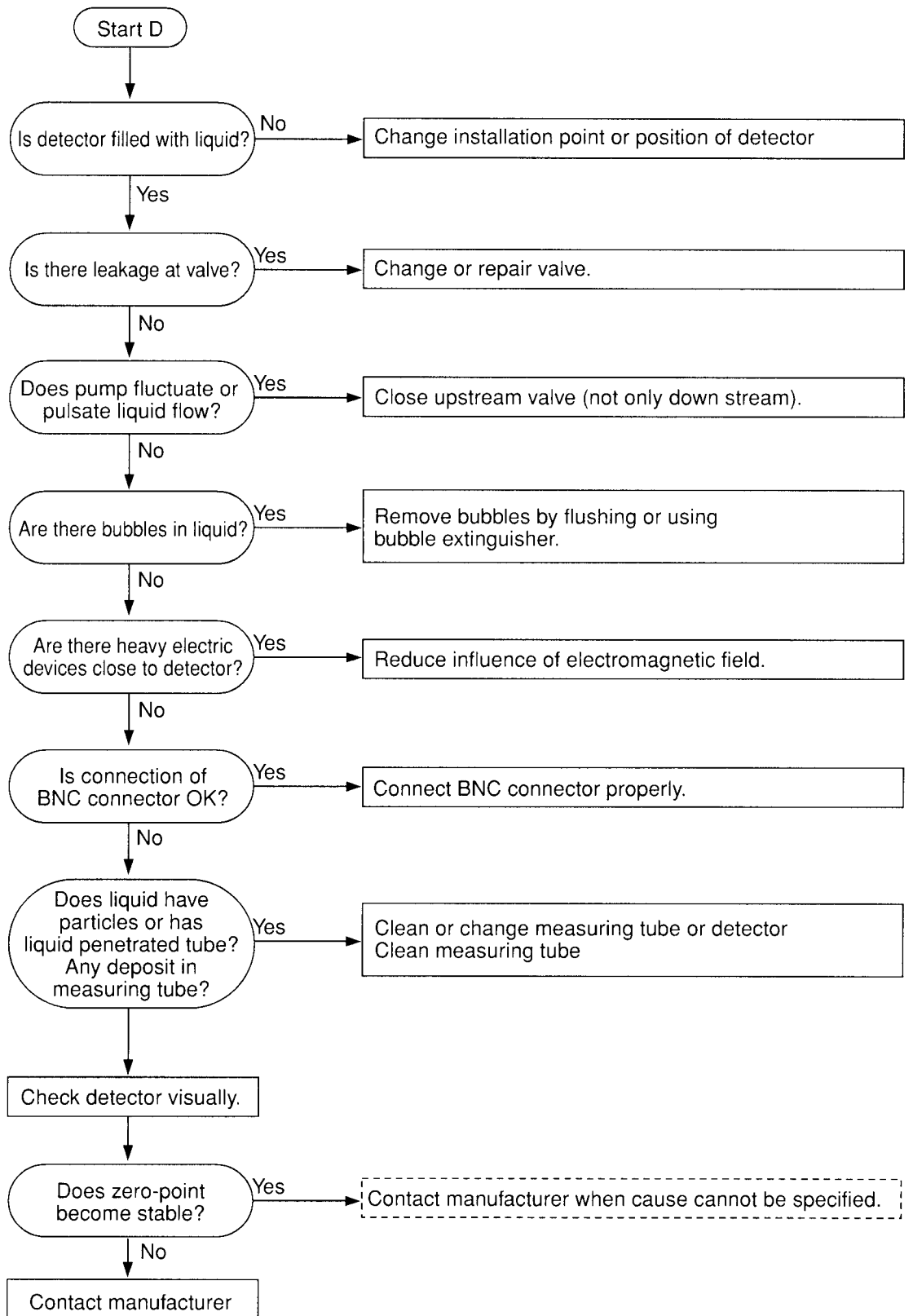


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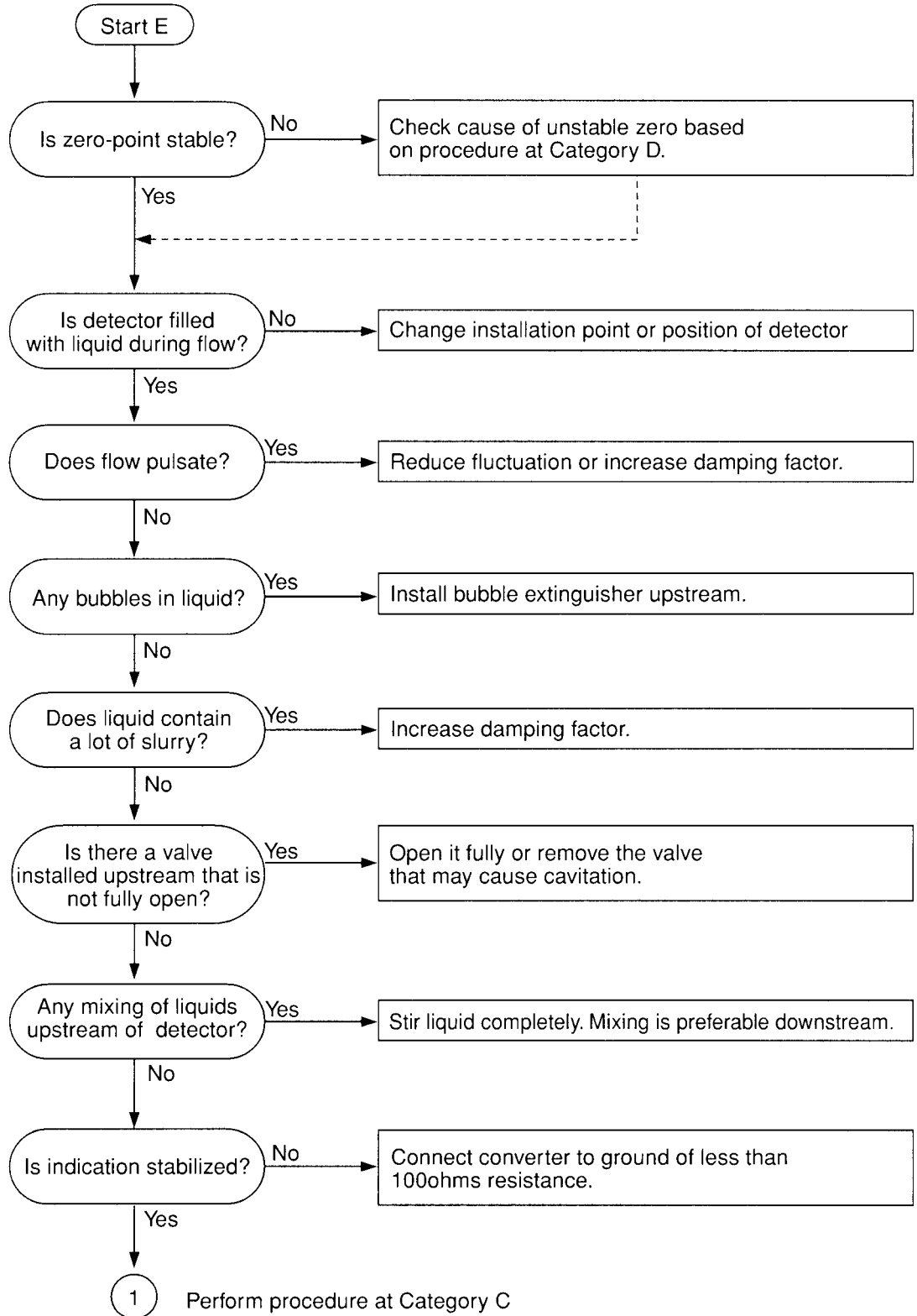


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## D. Unstable zero point

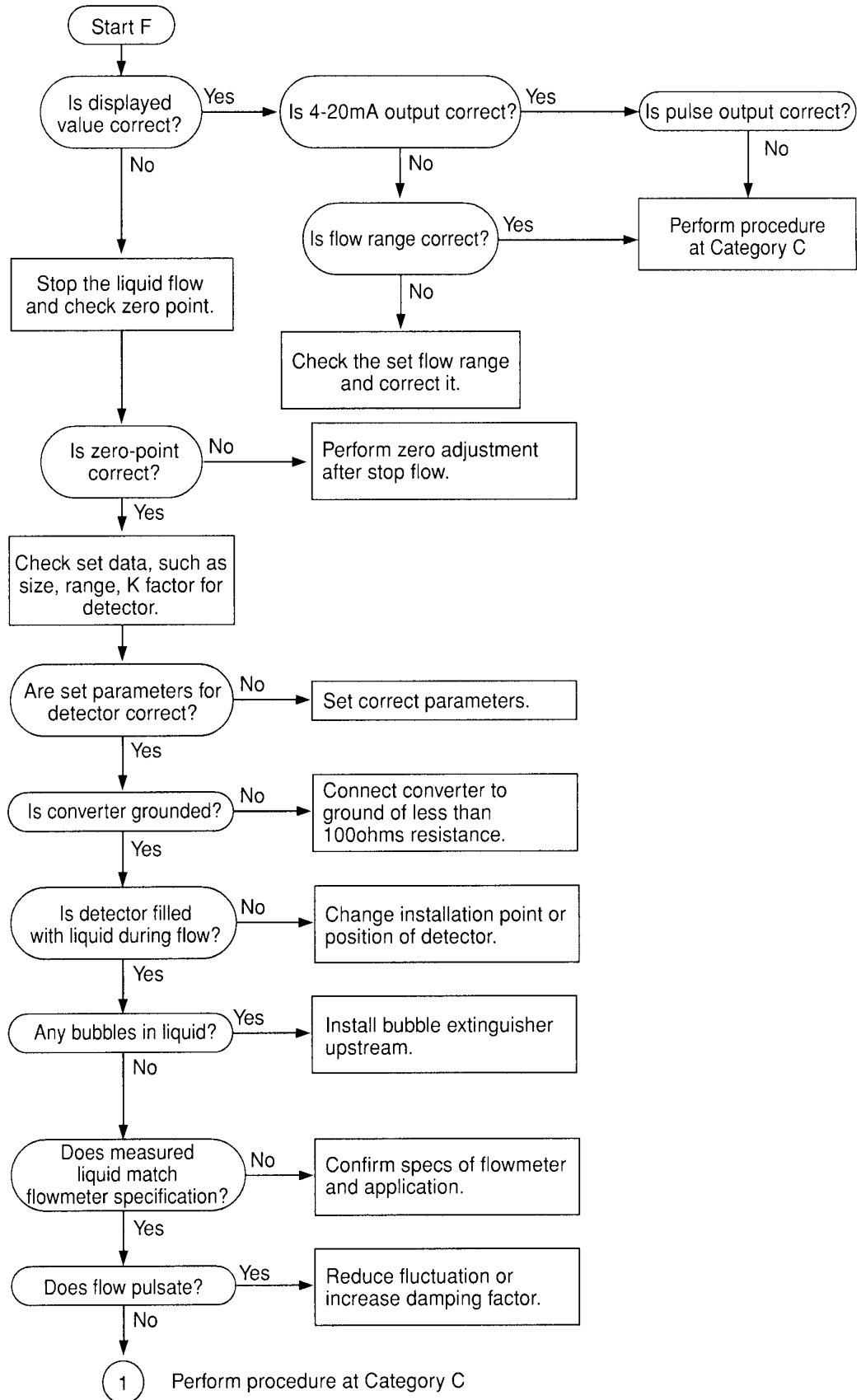


## E. Unstable indication



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## F. Inaccurate measurement



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## 9 Reference

### 9.1 Sound Velocity of Water ( m/s )

Temp [°C]	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
0	1402.39	1407.37	1412.23	1416.99	1421.63	1426.16	1430.59	1434.91	1439.13	1443.25
10	1447.27	1451.19	1455.02	1458.75	1462.38	1465.93	1469.39	1472.76	1476.04	1479.23
20	1482.34	1485.37	1488.32	1491.19	1493.98	1496.69	1499.32	1501.88	1504.37	1506.78
30	1509.13	1511.40	1513.60	1515.74	1517.81	1519.81	1521.75	1523.62	1525.43	1527.18
40	1528.86	1530.49	1532.06	1533.56	1535.02	1536.41	1537.75	1539.03	1540.26	1541.43
50	1542.55	1543.62	1544.64	1545.60	1546.52	1547.38	1548.20	1548.97	1549.69	1550.36
60	1550.99	1551.57	1552.10	1552.59	1553.04	1553.44	1553.79	1554.11	1554.38	1554.61
70	1554.80	1554.95	1555.05	1555.12	1555.15	1555.13	1555.08	1554.99	1554.86	1554.70
80	1554.49	1554.25	1553.97	1553.66	1553.31	1552.92	1552.50	1552.05	1551.56	1551.03
90	1550.48	1549.88	1549.26	1548.60	1547.91	1547.19	1546.44	1545.65	1544.83	1543.99

V. A. Del Grosso and C. W. Mader, J. Acoust. Soc. Am., 52, 1442 (1972)

### 9.2 Kinematic Viscosity of Water ( mm<sup>2</sup>/s )

Temp [°C]	Kimematic Viscosity [mm <sup>2</sup> /s]	Temp [°C]	Kimematic Viscosity [mm <sup>2</sup> /s]
0	1.792	55	0.5117
5	1.519	60	0.4750
10	1.307	65	0.4425
15	1.139	70	0.4138
20	1.004	75	0.3883
25	0.8928	80	0.3654
30	0.8008	85	0.3449
35	0.7234	90	0.3263
40	0.6578	95	0.3096
45	0.6020	100	0.2944
50	0.5537		

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