

Zirconia Type O₂ Analyzer

Model DGO-101 Receiver

Instruction Manual



The person who operates the product must read through this instruction manual.


(E) ENERGY SUPPORT CORPORATION

1. For safe use of product


For safe use of the product, warning labels are provided on the instrument to increase caution, and cautionary messages are described in the instruction manual by the following method.



After understanding the message content, use the product safely.

1 - 1 Cautionary message

100 or 115 VAC is applied to the power terminal block.
 Since an electric shock may occur during check of wiring, turn off the external main power supply.

1 - 2 Warning

 CAUTION	*Even if the power switch at the bottom right of this equipment is turned off, the source power is supplied to the terminal block. •Be sure to turn the external power supply off when working.
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 WARNING	*Touching power supply terminal block, switches and other electric Devices may result in electric shock.
 ELECTRIC SHOCK	•Be sure to turn the power off when inspecting. Handling with wet Hands will cause danger.

●The notice terms mean the following:

WARNING It is a latent danger. Unless it is avoided, it may cause a death or serious injuries.

CAUTION It is a latent danger. Unless it is avoided, it may cause light or medium damage.

It is also used as a warning for an operation which is not safe.

2. General items

2-1 Preface

This instruction manual describes the installation, operation and inspection methods of “Model DGO-101 Receiver” for Zirconia Type O2 Analyzer. Before installation, read through this instruction manual and completely understand its content. Then, install and operate the product.

Here, keep in mind that there are different contents are partially described in the instruction manual since there are some products which are differently specified.

Therefore there are some parts which you will not use. Keeping this in mind, refer to the instruction manual.

2-2 Product Warranty

(1) Term : Described in the final document.

Unless it is provided, the warranty term will last for one year after acceptance.

(2) Conditions : In the assumption that the product is properly stored and installed till the test operation and adjustment after acceptance at the customer's site, the delivered product shall be replaced or repaired without charge if any trouble or abnormality to the poor design, manufacture or material which our company is responsible for occurs though the product is properly used during the above warranty term. Here the proper operation method is as follows:

① The operational conditions and installation conditions described in the specifications and instruction manual shall be satisfied.

② Any excessive mechanical shock or vibration shall not be applied to the probe transmitter.

③ Calibration of the analyzer and replacement of the consumable parts shall be periodically carried out.

④ The operational state of the analyzer shall be checked and maintained.

(Note) The consumable and similar parts shall be outside the warranty range.

(3)Application : The warranty range shall be limited to the parts delivered by our company.

2 - 4 Cautionary points as to operation



Use "Model DGO-101 Receiver" for Zirconia O₂ Analyzer in the following environments.

- Area not exposed to the direct sunlight as much as possible.
- Area with a surrounding temperature of -10 to 50°C with minimal variation of temperature (+/-10°C or less/day)
- Area with minimal moisture and dust
- Area with minimal mechanical vibration
- Area with minimal electromagnetic influence
- Area with minimal corrosive gases
- Any corrosive materials must not be present in the discharge gas or sampled gas.
- Keep in mind that an error may result in the measured oxygen concentration if any Combustible gas is present in the discharge gas or sampled gas.

2 - 5 Outline of product

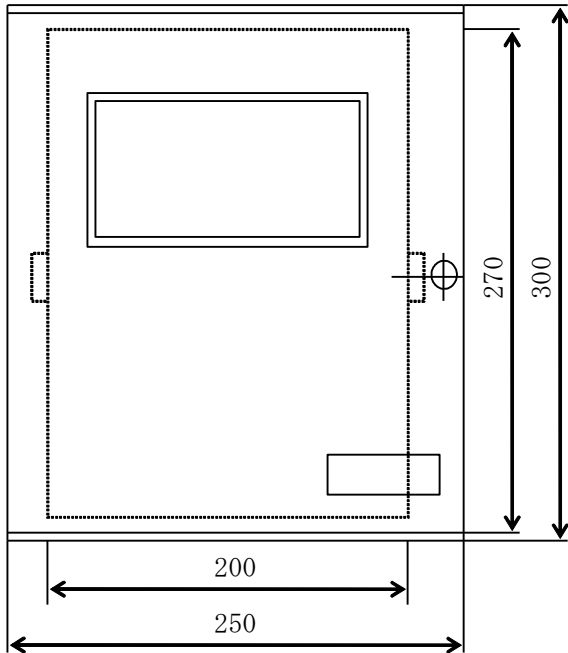
"Model DGO-101 Receiver" for Zirconia O₂ Analyzer is a gas analyzer used to monitor and control the atmosphere in an oven by measuring oxygen in the gas discharged from the boiler, hearing oven etc..

The following excellent function and performance are featured:

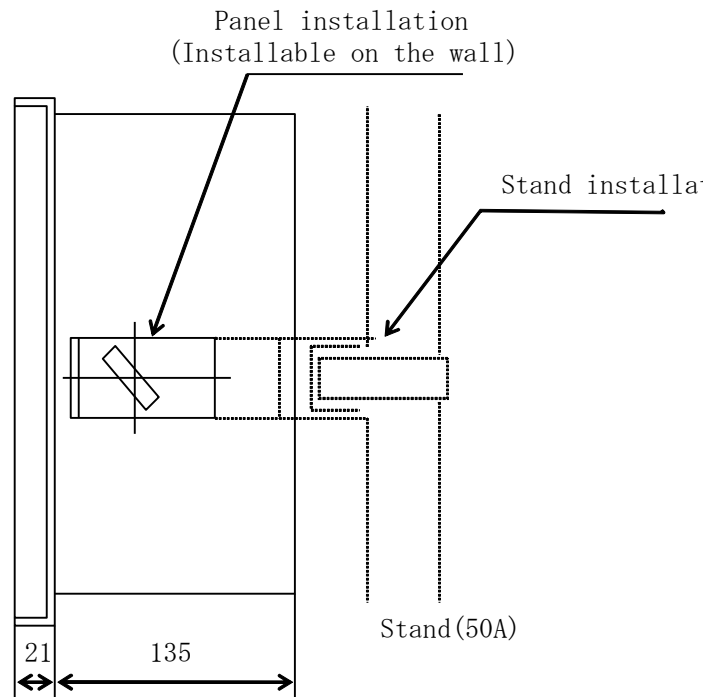
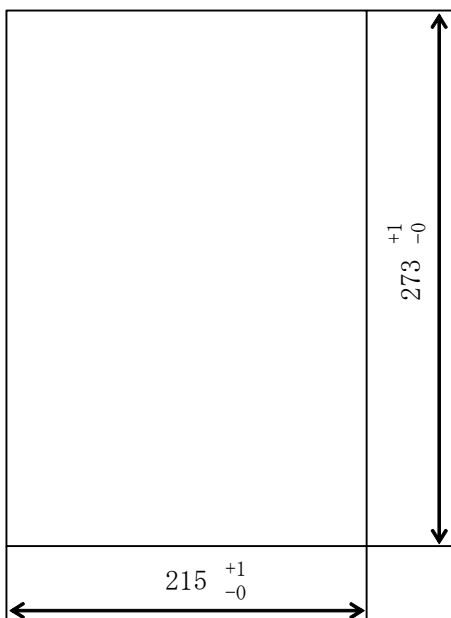
- Automatic calibration and automatic purge function setting are possible.
- Setting of the content is possible for input/output points.
- The function and abnormality content are displayed on the LCD and LED.
- The value of the sensor signal can be indicated.
- Excellent operability as an interactive unit.
- Small size and light weight with easy maintenance.

2-6 Name and functions of components

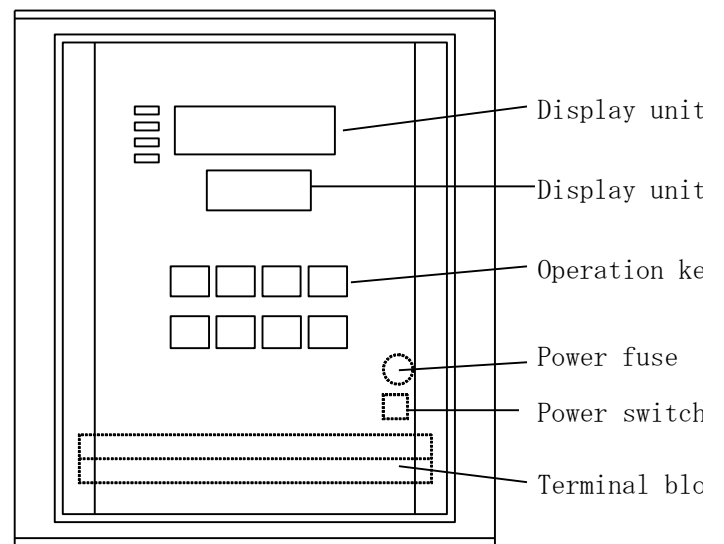
(1) Outline view



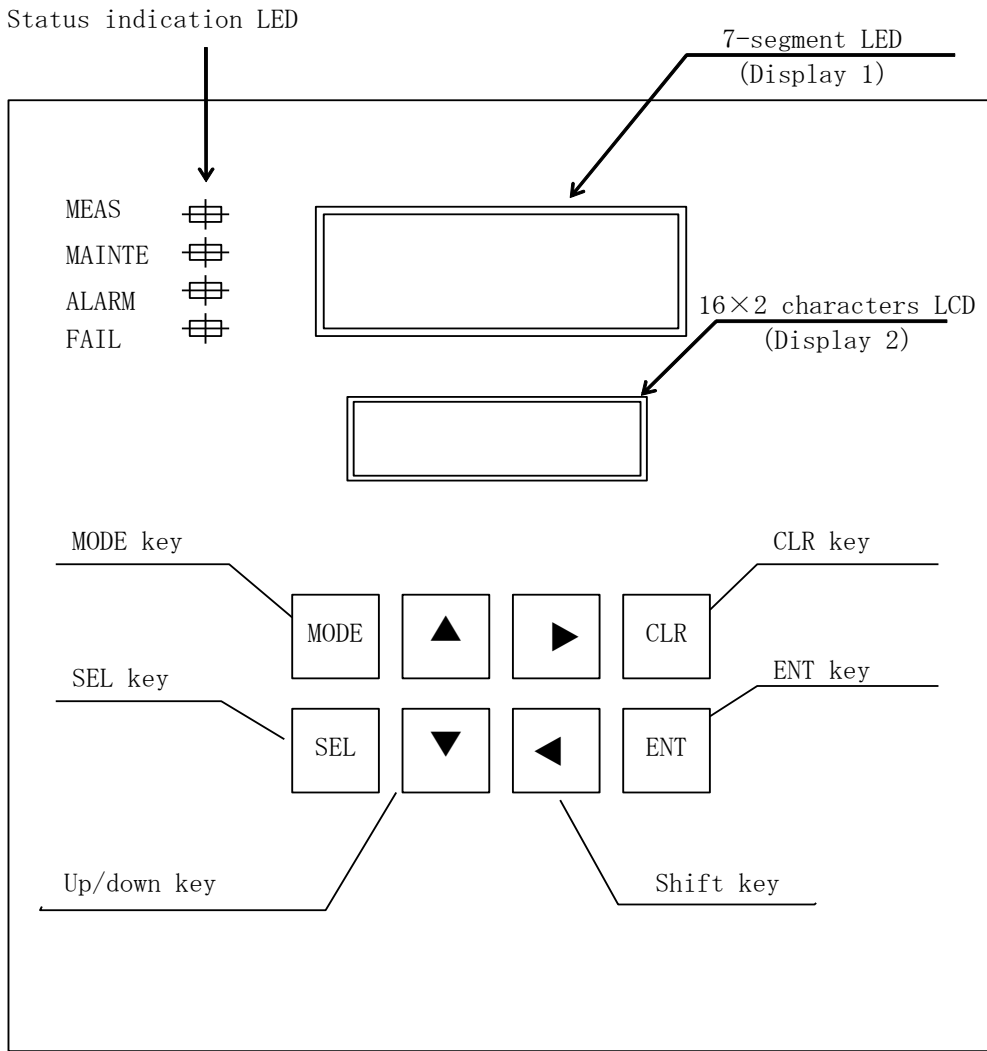
Panel cutting dimensions



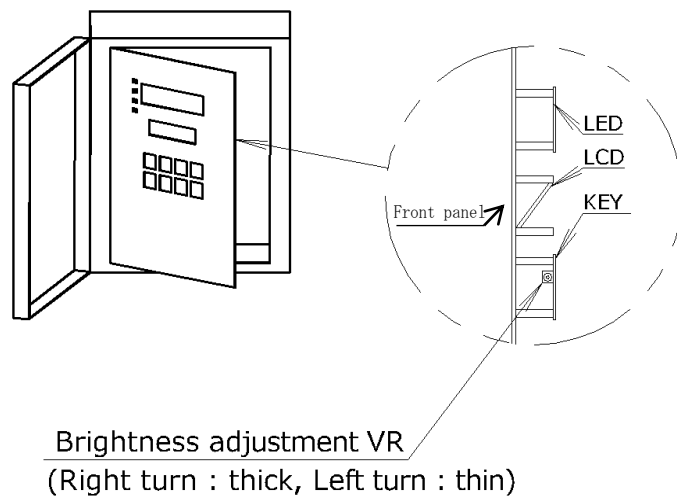
Operation panel



(3) Appearance of operation panel, and names and function of components



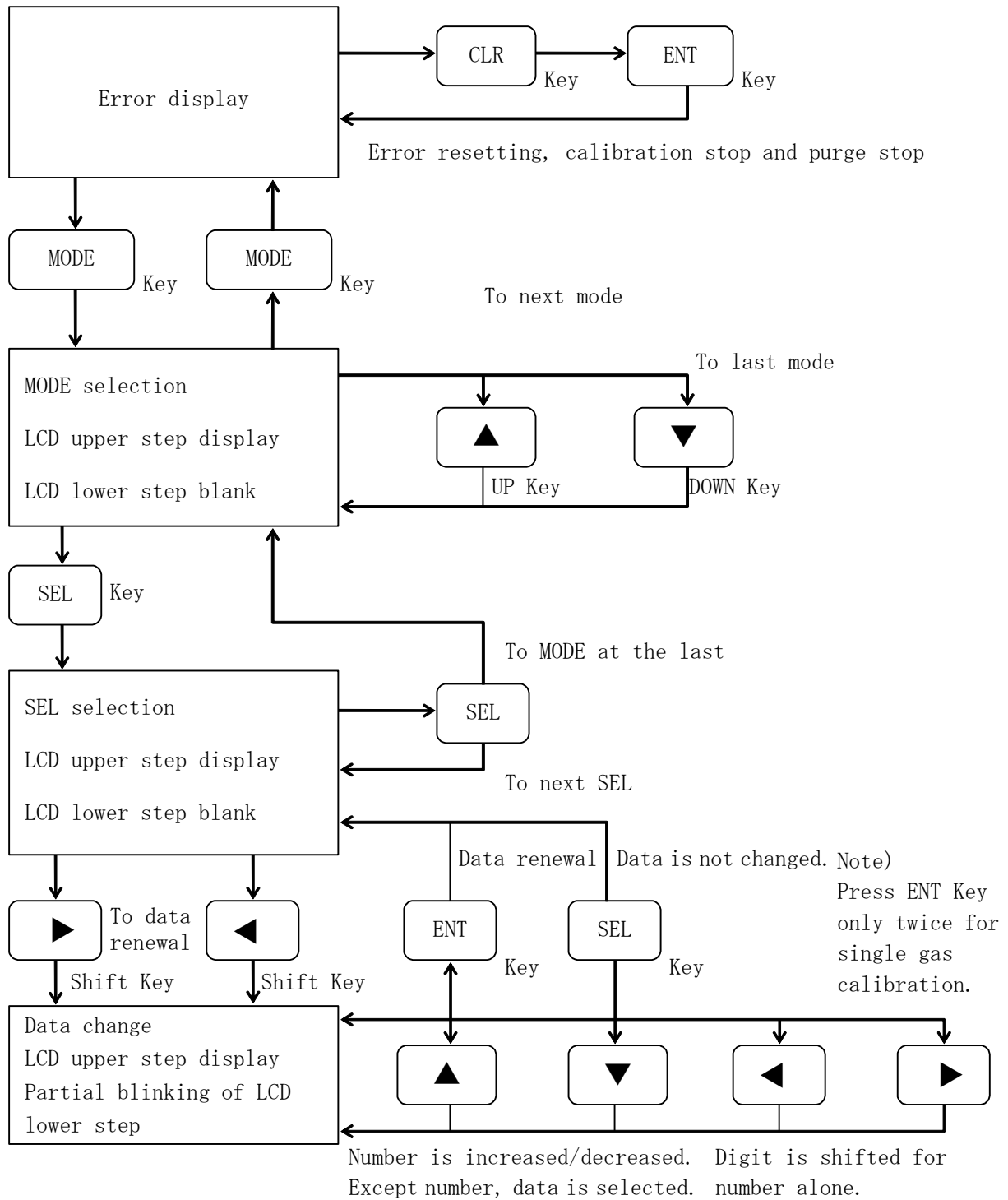
•The LCD (liquid crystal display) brightness becomes thick when the ambient temperature is high (about 50°C), or it becomes thin when the temperature is low (about 0°C). In such cases, adjust the LCD brightness with brightness adjustment VR shown below.



Name	Function
7-segment LED (Display 1)	<p>Temperature rising time: The warm-up time is counted down.</p> <p>Measurement time: Oxygen concentration is displayed. Displayed content can be selected. (Refer to Page 16.)</p> <p>Abnormal time: Error code is displayed. (Refer to Page 49.)</p>
16×2characters LCD (Display 2)	<p>Upper display: Mode is displayed. (Refer to Page 18.)</p> <p>Lower display: Message is displayed. (Refer to Page 18 through 34.)</p>
Status display LED	<p>MEAS: Lit for normal measurement.</p> <p>MAINTE: Lit for temperature rise, calibration, purging, holding, MFT Input and data setting.</p> <p>ALARM: Lit when the alarm results from the upper or lower limit of the Oxygen concentration.</p> <p>FAIL: Lit for occurrence of E-10 through E-17 errors.</p>
MODE key	<p>MODE selection: LCD upper step MODE display selection/ordinary display (RANGE)</p>
SEL key	<p>SEL selection: LCD lower step display selection.</p>
UP/DOWN key	<p>MODE switch: Used to select MODE (except RANGE). MODE can be selected.</p> <p>LCD lower step: Numeral data is increased/decreased. Other data except numeral data can be selected and changed.</p>
Shift key	<p>Data change: Digits of numeral value displayed at the lower step of LCD is shifted.</p>
CLR key	<p>Error reset: Error display is reset. ENT key returns it to the measurement mode.</p> <p>Calibration stop: Calibration is stopped. ENT key returns it to the measurement mode.</p> <p>Purge stop: Purging is stopped. ENT key returns it to the measurement mode.</p>
ENT key	<p>Data renewal: Measured data is registered.</p>

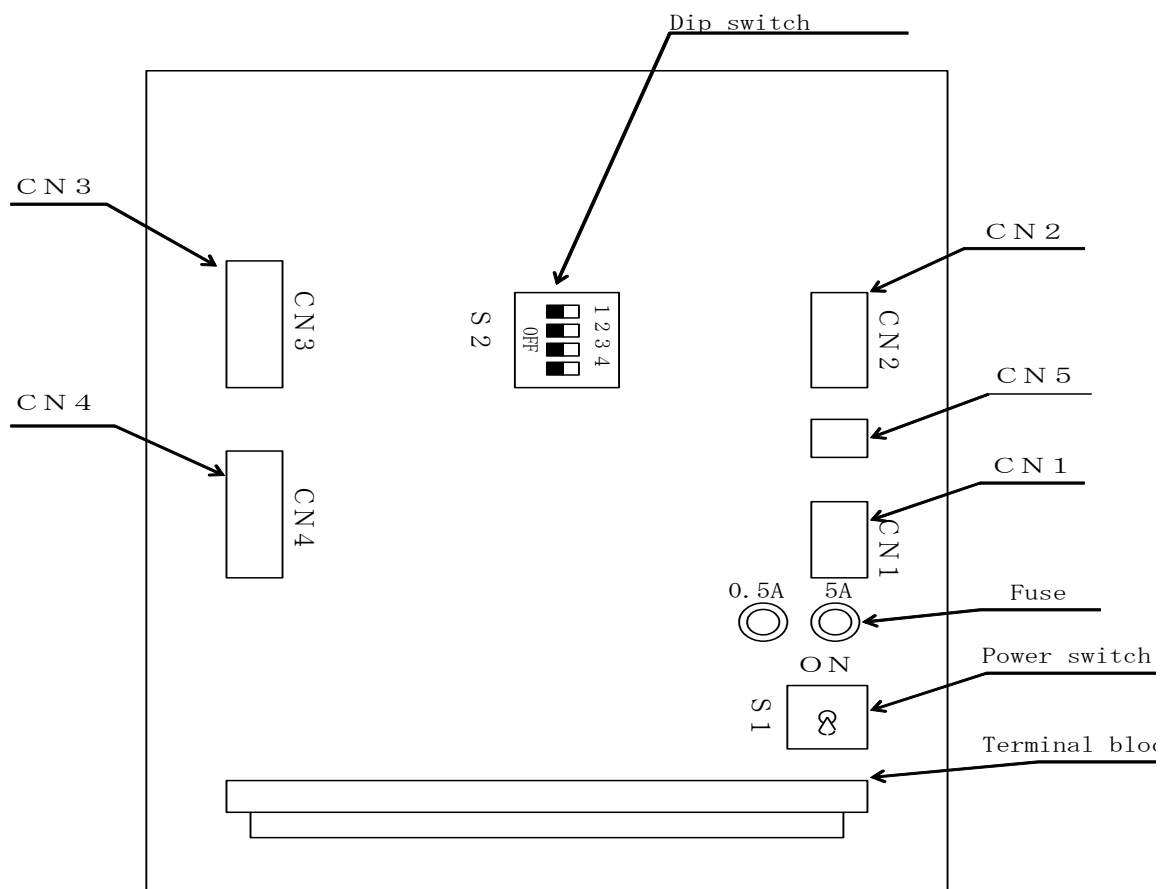
Flow chart of key operation

The concept diagram of key operation is shown. For details of operation and setting content, refer to “5-3 Key operation method”.



(4) CPU基板の外観と名称およびその機能

△1 (Normal : All OFF
System data change : 1 ON only)



Name	Function
Terminal block	External connection terminal block (Refer to p12.)
Power switch	Power switch for receiver △1 Even if the main power switch is turned off, the voltage is still supplied to the terminal block of supply.
Power fuse	Glass tube fuse (φ5.2×20mm×0.5A) JIS-MF-51NR0.5A
Heater fuse	Glass tube fuse (φ5.2×20mm×5A) JIS-MF-51NR5A
Dip switch	Only used to check the function of receiver. △1 Don't turn on the switch. (Otherwise, the ordinary function of the Receiver will turn off.)
CN1	Power connector
CN2	Transformer assembly connector
CN3	LED board connector
CN4	KEY board connector
CN5	SSR connector

2 – 7 Temporary storage of product



When temporarily storing the product, take care for the following:

- It is desirable to protect the product with styrene or similar in the box for storage.
- Store it at the place not directly exposed to sunlight.
- Store it at the surrounding temperature of -10 to 50°C with the minimal temperature variation.
- Store it at the place with minimal moisture and dust.
- Store it at the place not exposed to rain water.
- Store it at the place with minimal mechanical vibration.
- Store it at the place free of corrosive and dangerous gases.

3. Installation

3-1 Installation conditions



In order to safely and properly operate the product, take care of the following points when determining the installation place since the analyzer is a precise instrument. Select a place which satisfies the best possible conditions.

- Place with minimal vibration (0.1G or less)
- Place free of corrosive gases (SO₂, H₂S, etc.)
- Place not exposed to radiation of hot heat.
- Place with minimal influence of electromagnetic field.
- Place with minimal moisture and dust.
- Voltage minimal fluctuations.
- Fluctuations of frequency of power supply is minimal.
- Place at the surrounding temperature of -10 to 50°C (not exposed to direct sunlight).

3-2 Installation method



Cautionary points as to installation

- ① Since the analyzer is a precise instrument, take care to prevent applying excessive shock or load during installation.
- ② Since it is easily damaged, take care not to hit the instrument during installation.


3-3 Wiring method

Connect the wiring at the terminal block. Route the cables through the wiring hole at the bottom of the case.

Moreover, apply a dust-tight and drip-proof seal to the wiring during installation.

(1) Terminal block


M4 screws are all used on the terminal block.

 Since an electric shock may occur during check of wiring at the terminal block, turn off the external main power supply.

Arrangement on the terminal block

IN1	IN2	IN3	CELL +	TC +	TH +	OUT +	RY1	RY2	RY3	RY4	RY5	HEAT -ER	POW -ER	POW -ER
COM	IN4	IN5	CELL -	TC -	TH -	OUT -	RY1	RY2	RY3	RY4	RY5	HEAT -ER	E	

① POWER :POWER supply terminal 100 or 115 VAC as power supply

 If any voltage above 110 VAC (100 VAN type) or 127 VAC (115 VAC type) is applied to the power supply terminal block, it may cause or a fire.

② COM-IN1 through 5 :Contact input terminal No-voltage contact max. 5 points
(Approx. 12 VDC, 6mA is applied.)

③ CELL+ / CELL- :Detection cell input voltage (signal input from transmitter)

④ TC+ / TC- :Thermocouple input voltage (signal input from transmitter)

⑤ TH+ / TH- :Thermistor connection (for temperature compensation)

⑥ OUT+ / OUT- :Output signal of DC 4-20 mA (load Max. 600Ω)

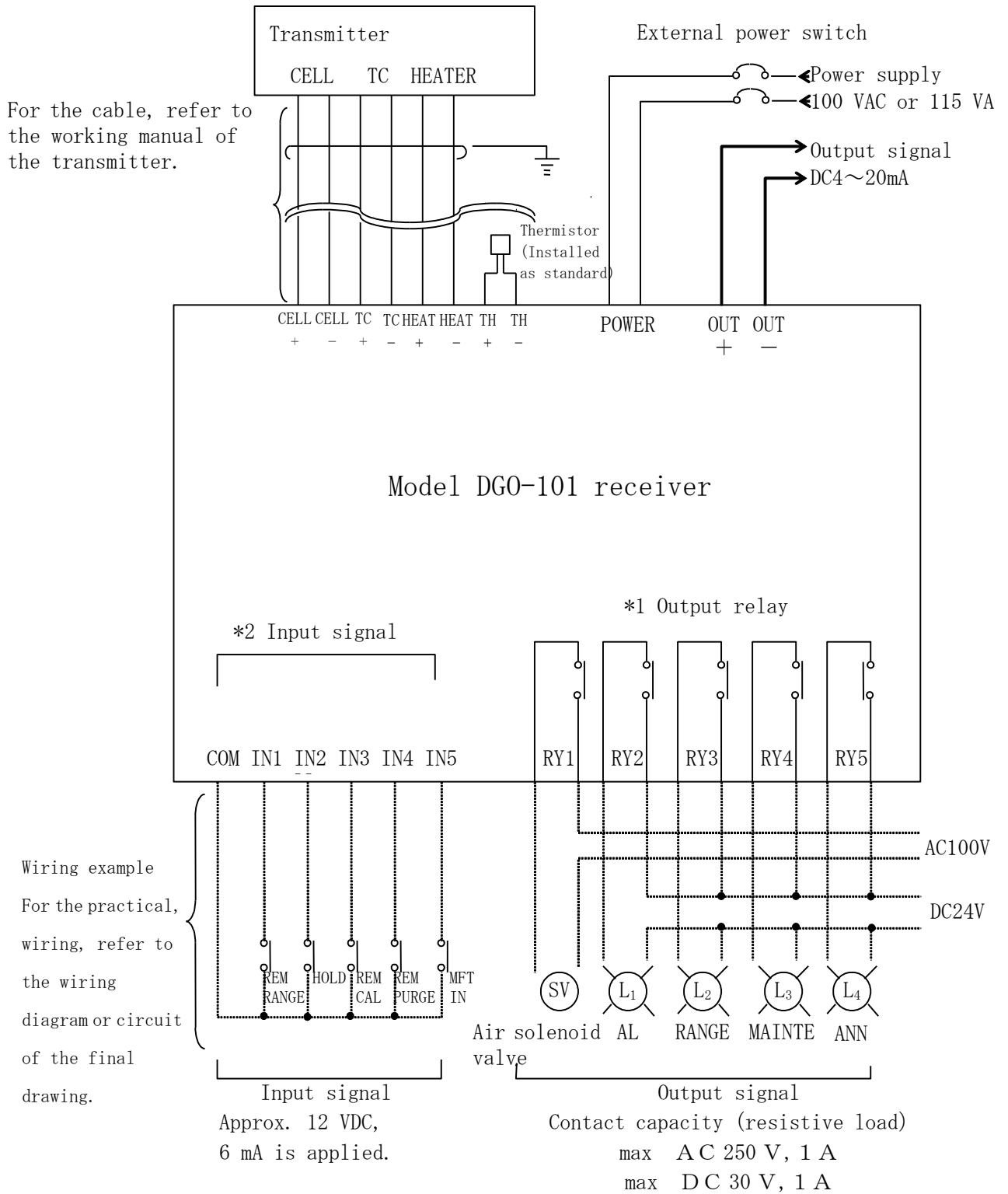
⑦ RY1 through RY4 :Contact output terminal No-voltage contact max. 4 points
(Contact capacity 250 VAC, 1A, 30 VDC, 1A resistive load)

⑧ RY5 :Power shutdown alarm and instrument trouble
(Power off and trouble: ON)

⑨ HEATER :Transmitter heater terminal

⑩ E :Ground terminal (Use a Class 3 grounding)

(2) Wiring



*1 The function of the output relay is input by ENERGY SUPPRT CORP. according to the specifications. (Refer to P37.)

*2 The function with the input signal is input by ENERGY SUPPRT CORP. according to the specifications. (Refer to P38.)

3-4 Inspection after installation



Proper wiring from the transmitter of Zirconia type O₂ analyzer to the receiver of Model DGO-101 receiver. If power is supplied to the wrong wiring, it will cause a Sensor breakage or other serious trouble.

In order to prevent trouble which results from wrong wiring, check the wiring by the following Procedure with the air selected as the measured gas when turning on the power supply for the first time for test operation and adjustment.

After verifying that the power supply of the receiver is off, check the following.

(1) Heater wiring check (HEATER)

Disconnect the lead lines of (HEATER "2 terminal") at the terminal block of the receiver, and measure the resistance between the lines.

(2) Thermocouple wiring check (TC+) (TC-)

Disconnect the lead lines of (TC+), (TC-) (HEATER) at the terminal block of the receiver, and measure the resistance between the lines.

For the reference values, refer to the instruction manual of the transmitter used.



Take sufficient care to prevent the disconnected line from being short-circuited or grounded.

(3) Cell wiring check (CELL+, CELL-)

Disconnect the lead lines of (CELL+) , (CELL-) at the terminal block of the receiver, And measure the resistance between the lines.

Room temperature : $\infty \Omega$

Note: The thermocouple lines (TC+)/(TC-) and cell lines (CELL+)/(CELL-) polarities.

During/after the temperature rise, verify that the thermocouple generates the proper electromotive force. If the +/- polarities are reversed, the error E-06 will be displayed. Moreover, it is correct if any electromotive force and value are displayed when the zero gas is flowed.

(If the polarities +/- are reversed, the E-12 error will be displayed.)

(4) After the wiring is completely checked, attach the marking bands to the cables of the transmitter and receiver as it will simplify the wiring check during maintenance, inspection and sensor replacement.

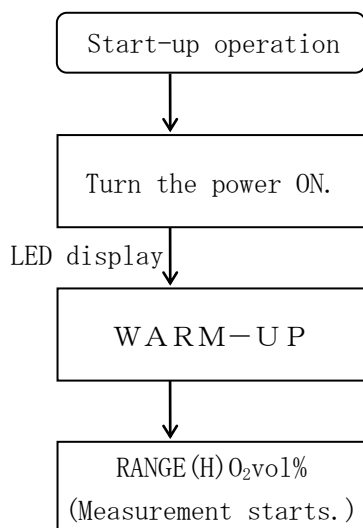
4. Function list of receiver

Item	Description
Automatic calibration function	<p>The solenoid valve is automatically opened and closed every preset time to apply the air, zero and span calibration.</p> <p>Note 1) There are two methods: automatic calibration is started Every time preset by the timer and at a desired time by key operation</p> <p>Note 2) The calibration types of one-point calibration with the Air and three-point calibration with air, zero and span Can be selected.</p>
Primary delay calculation function	<p>The primary delay calculation in the range of 0 through 60 seconds is possible. (63% response Here, 90% response conversion is multiplied 2.3 times.)</p>
O ₂ upper/lower limit alarm function	<p>The alarm contact is output by setting the upper and lower limit Values of O₂.</p> <p>Note) The alarm contact is automatically reset.</p>
Output holding function	<p>When the sensor is abnormal, the output value can be held during calibration, purging and MFT input.</p> <p>Note) Kinds of holds</p> <p>STD : The value measured 5 seconds before the phenomenon Occurs is output.</p> <p>OFF : During calibration/purging, the measured value is output. When another phenomenon occurs, the value measured 5 seconds Before the phenomenon occurs is output.</p> <p>PHM1: The set value of 0 to 100% FS is output.</p> <p>PHM2: The set value of 0 to 100% FS is output.</p>
Self-diagnosis function	<p>The abnormal places of the sensor and receiver are automatically Detected with the self-diagnosis, and the error indication and Alarm contact are output.</p>
Monitor function	<p>The O₂ value, cell electromotive force, thermocouple electromotive force and other data can be monitored.</p>
Output value check /adjustment function	<p>The output value of 4 to 20 mA can be checked and adjusted with the key operation.</p>
Programmable range function	<p>A desired value can be set for the SPAN point and ZERO point of the measured range.</p> <p>Note1) Two kinds of the Hi/Lo ranges can be set.</p> <p>Note2) The ranges of min. 5%O₂ to max. 25%O₂ is applied. The Width of the range which does not include 0% is set at 10%O₂ or more.</p>
Remote range switch function	<p>Two kinds of the ranges can be switched from the external by turning on and off no-voltage contact input of the terminal.</p>
Remote calibration start function	<p>The automatic calibration can be started by turning on the no-voltage contact input of the terminal.</p>
MFT signal input process function	<p>The heater control of the detector is turned off by the main fuel trip (MFT) signal (the error is not output), and the purge relay is turned on. After MFT is reset, it is started at the temperature rise.</p>

5. Operation

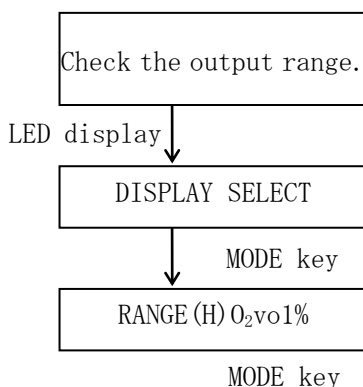
5-1 Start-up Operation

The basic operation procedure for starting the oxygen analyzer is shown below.



① Turn the power ON.

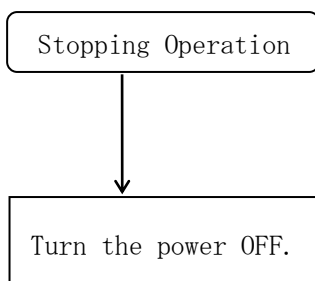
After the external power switch and the power switch inside the receiver are turned on, the receiver starts the count-down timer for warming the sensor (WARM-UP shown on LCD). After the set temperature has been reached, the measurement mode starts.



② Check the range (H/L) using the MODE key.

Operating the key on the receiver, check the output signal range. To change the range, refer to page 19.

5-2 Stopping Operation



Before turning the receiver off, check that the inside of the transmitter and the sensor are in the air environment. Otherwise sensor deterioration will result.

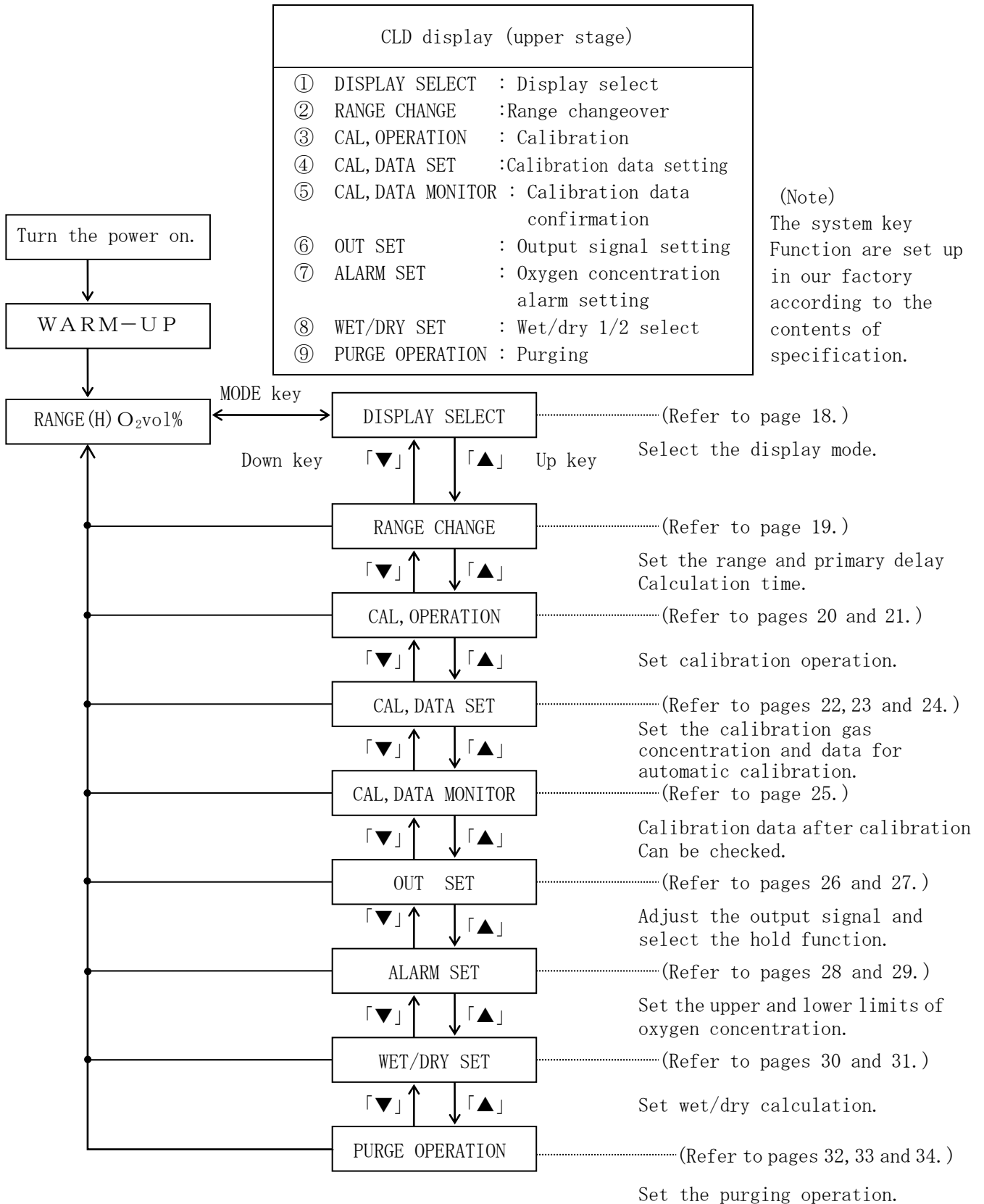
Turn the power switch of the receiver off.



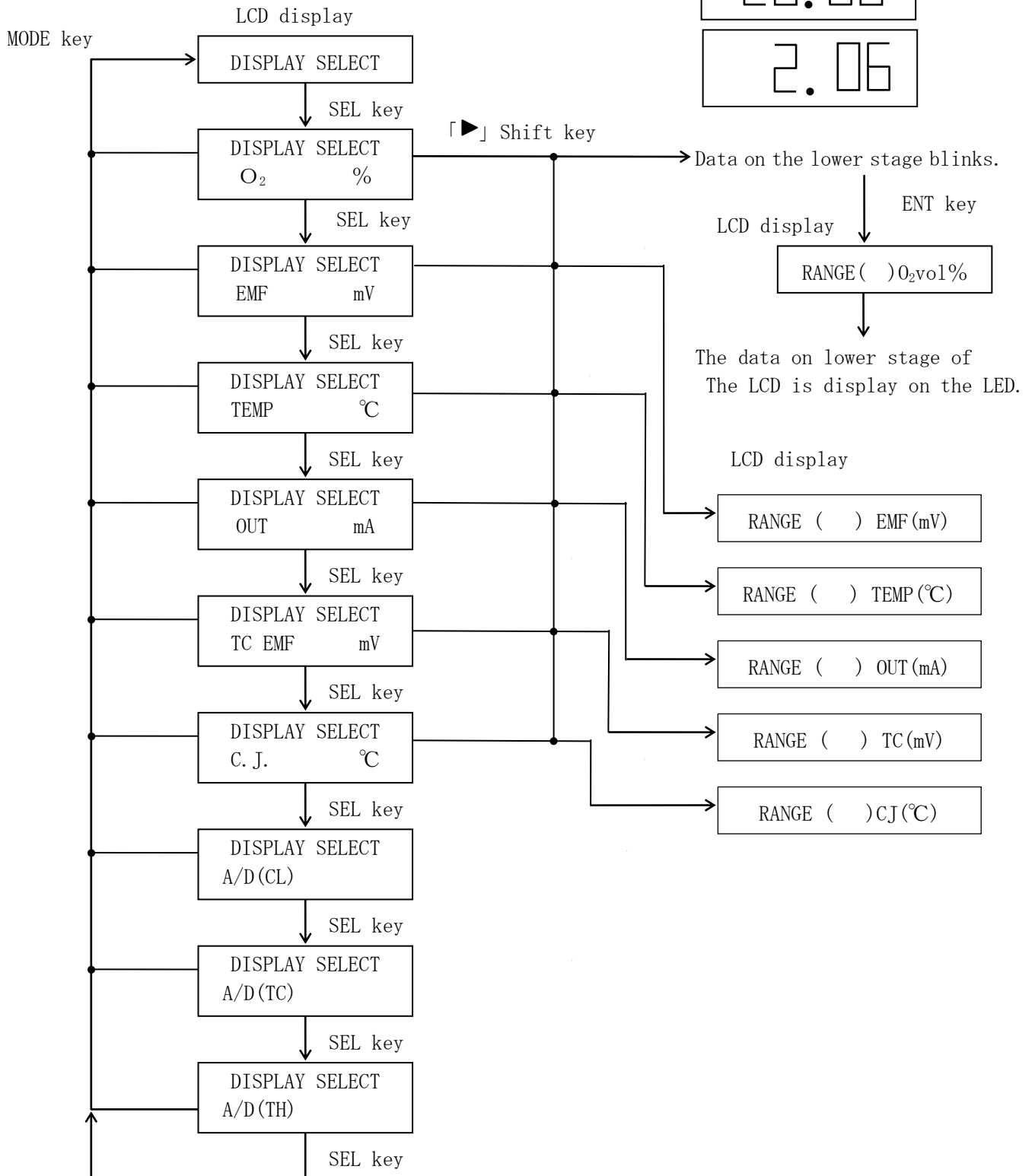
When inspecting the terminals of the analyzer or receiver or performing maintenance work accompanying disconnection of wiring, turn the external power switch (source power switch) off.

5 - 3 Key Operation Method

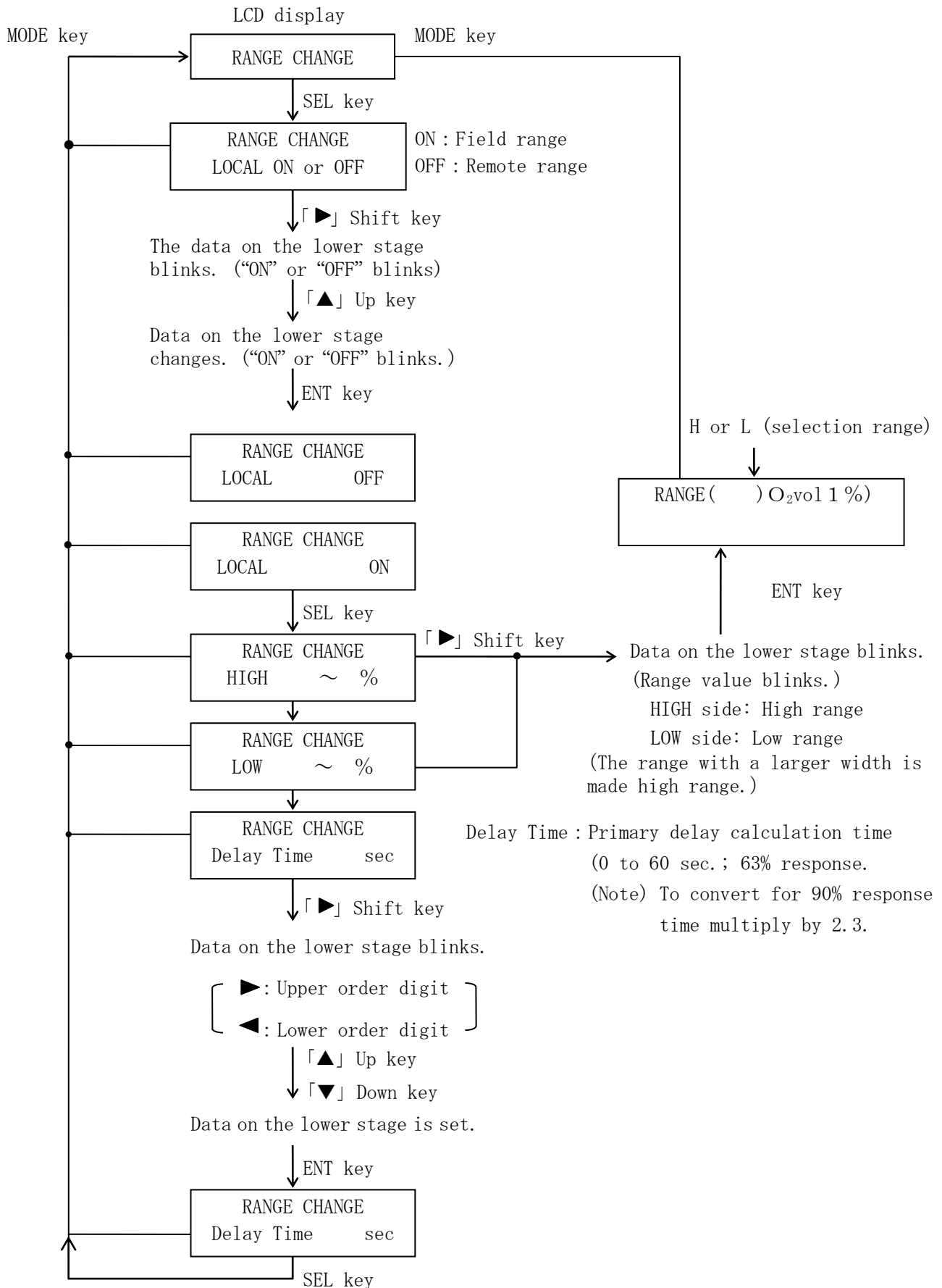
The following 10 functions are available using key operation of the (LCD) display (upper stage).



① Display select

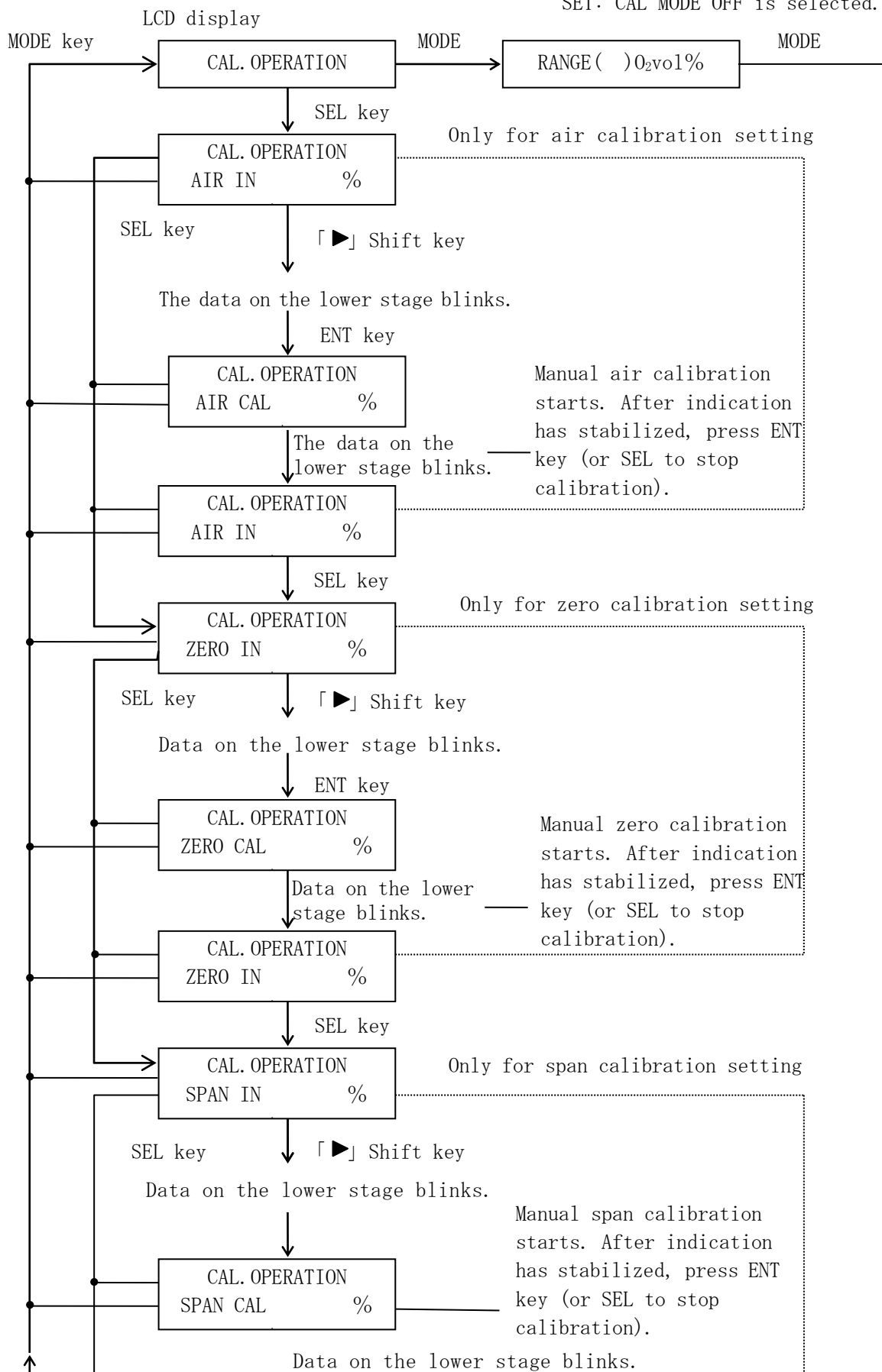


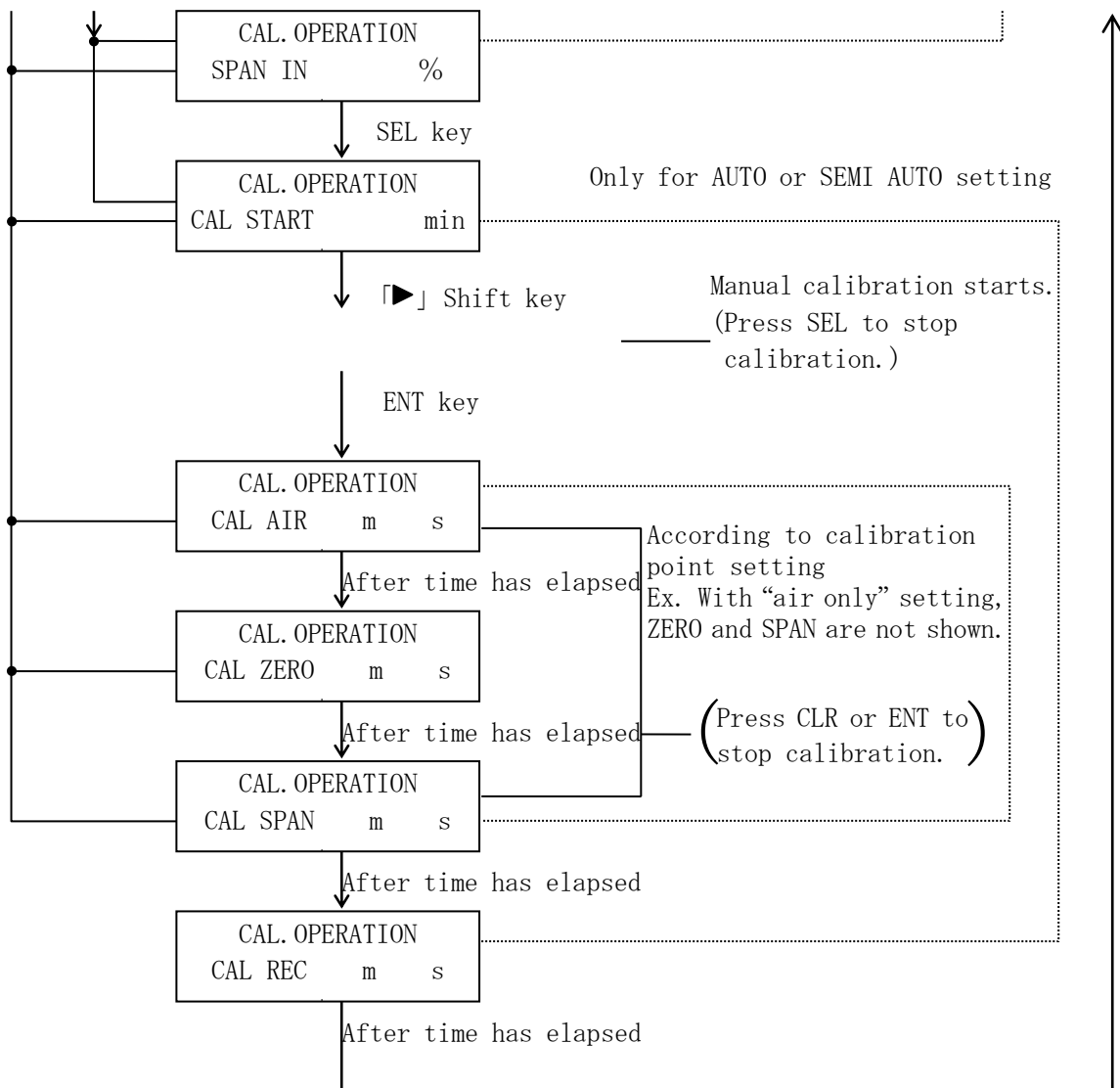
② RANGE CHANGE (Range change)



③ CAL. OPERATION (Calibration)

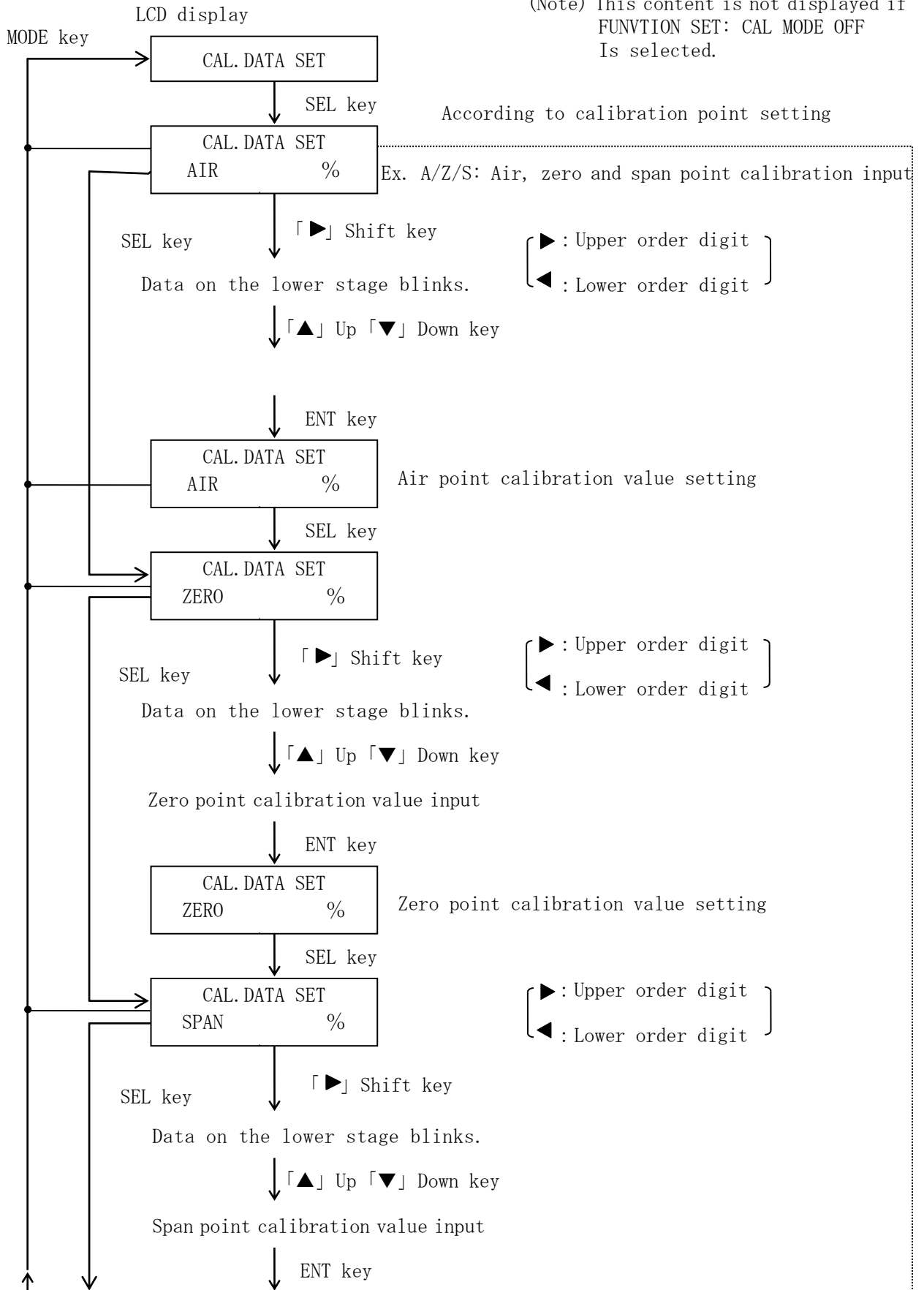
(Note) This content is not display if FUNCTION SET: CAL MODE OFF is selected.

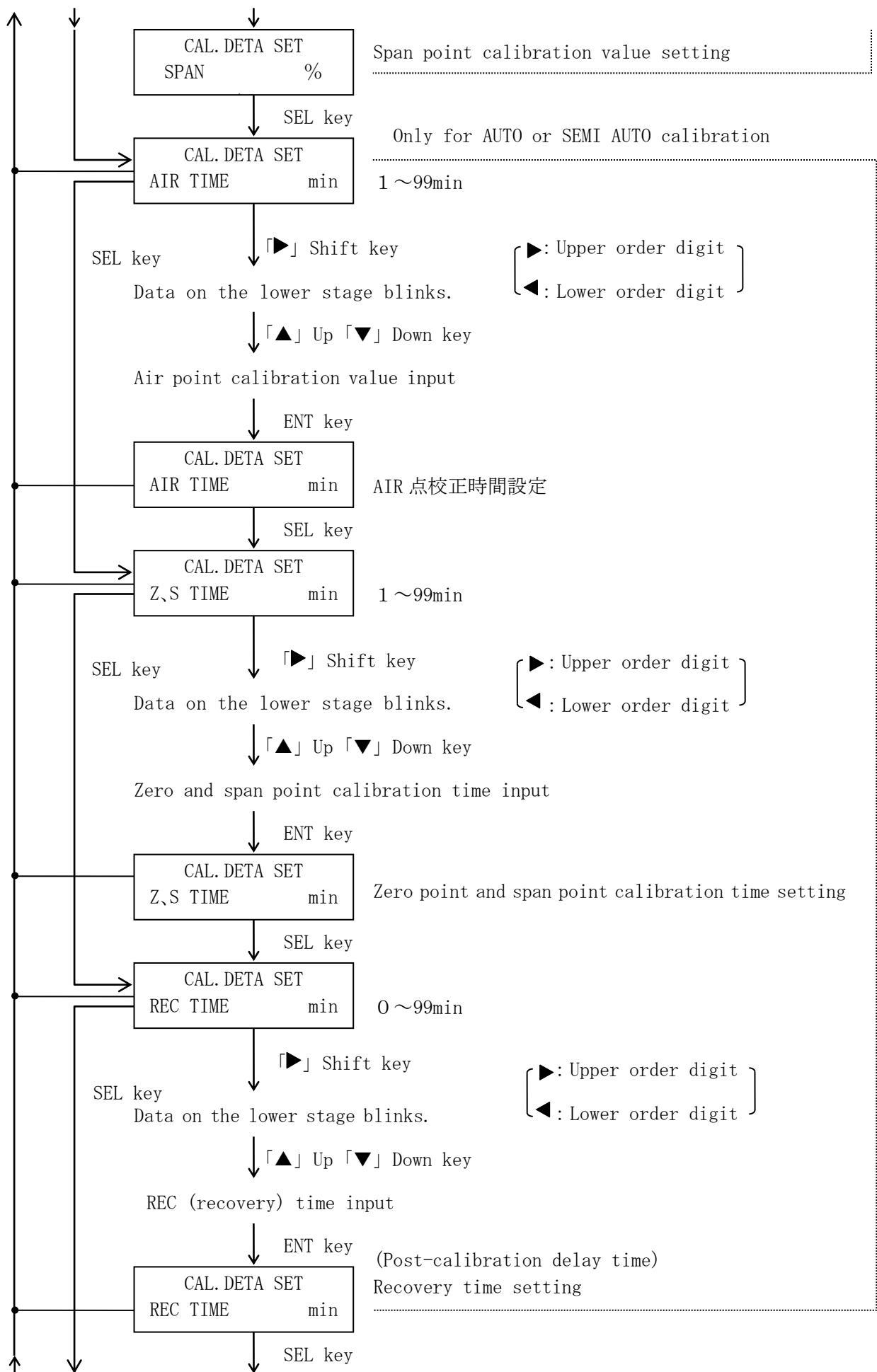


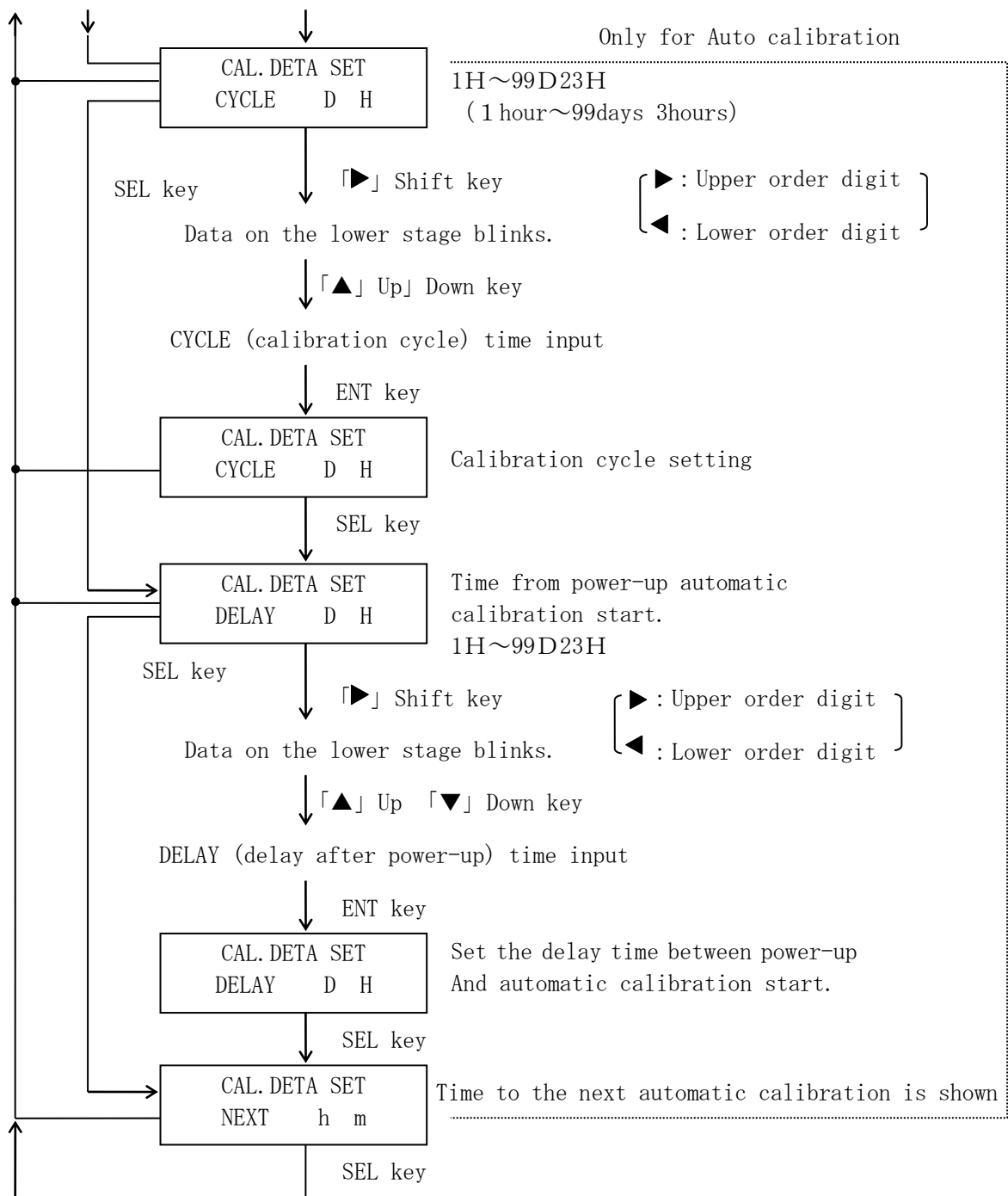


④ CAL. DATA SET (Calibration data setting)

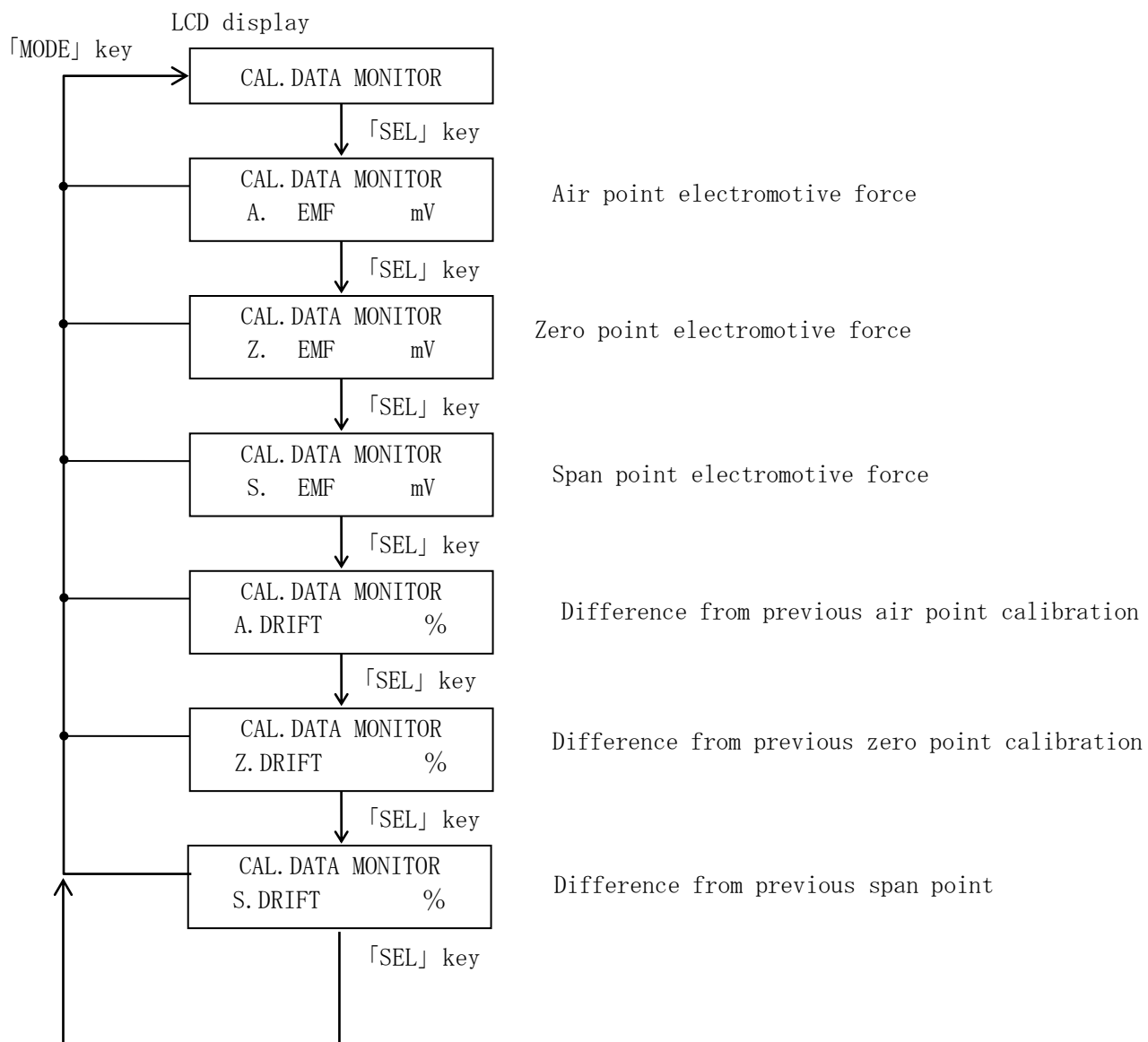
(Note) This content is not displayed if
FUNVTION SET: CAL MODE OFF
Is selected.



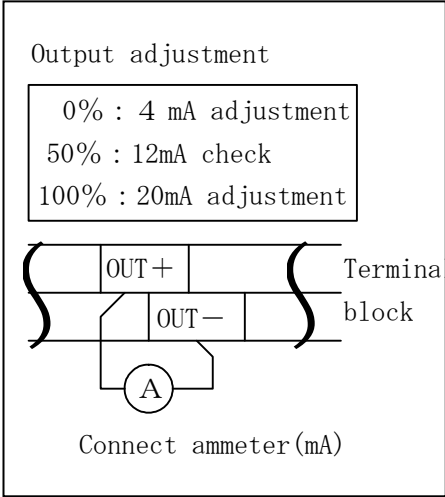
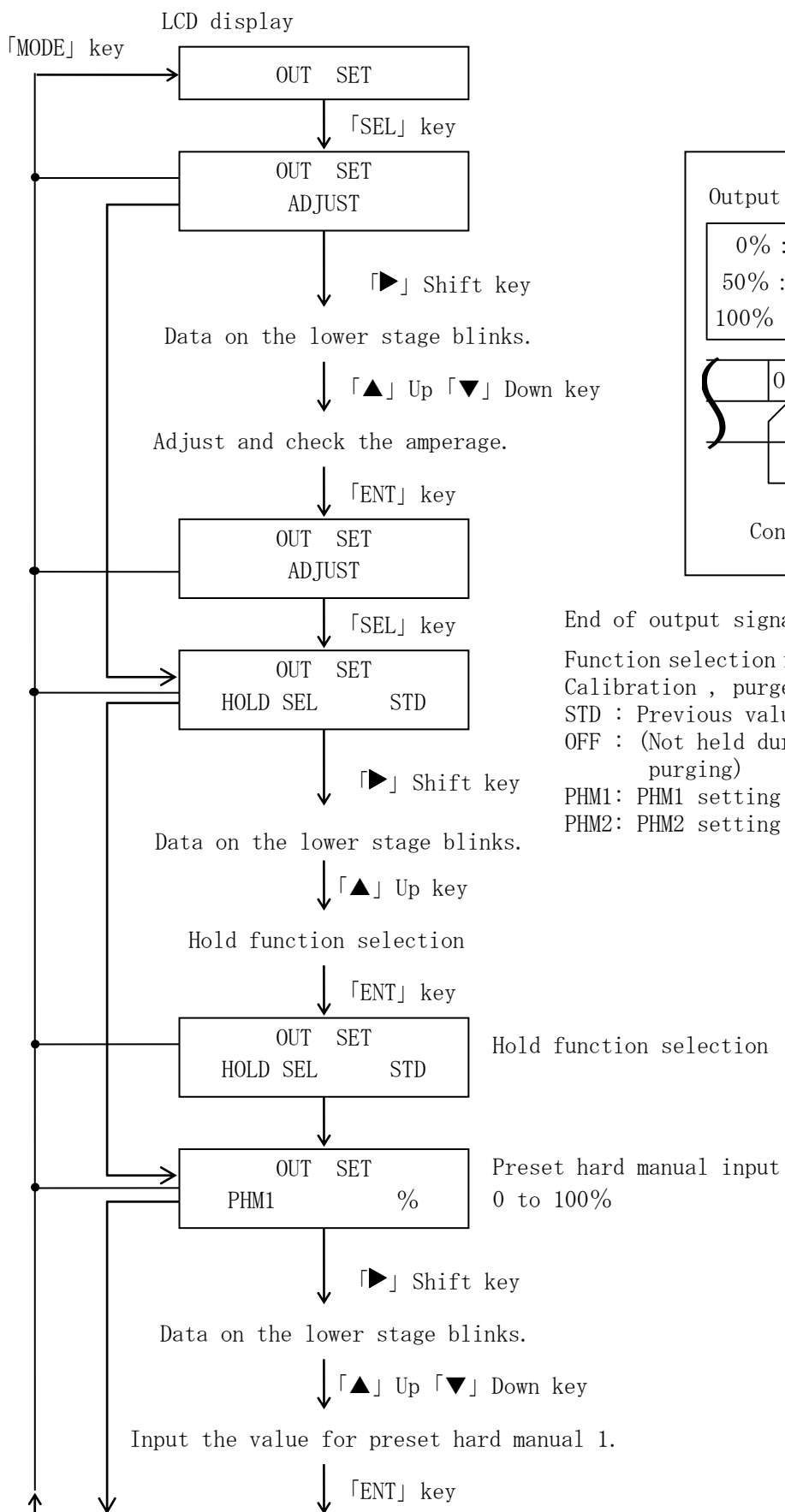




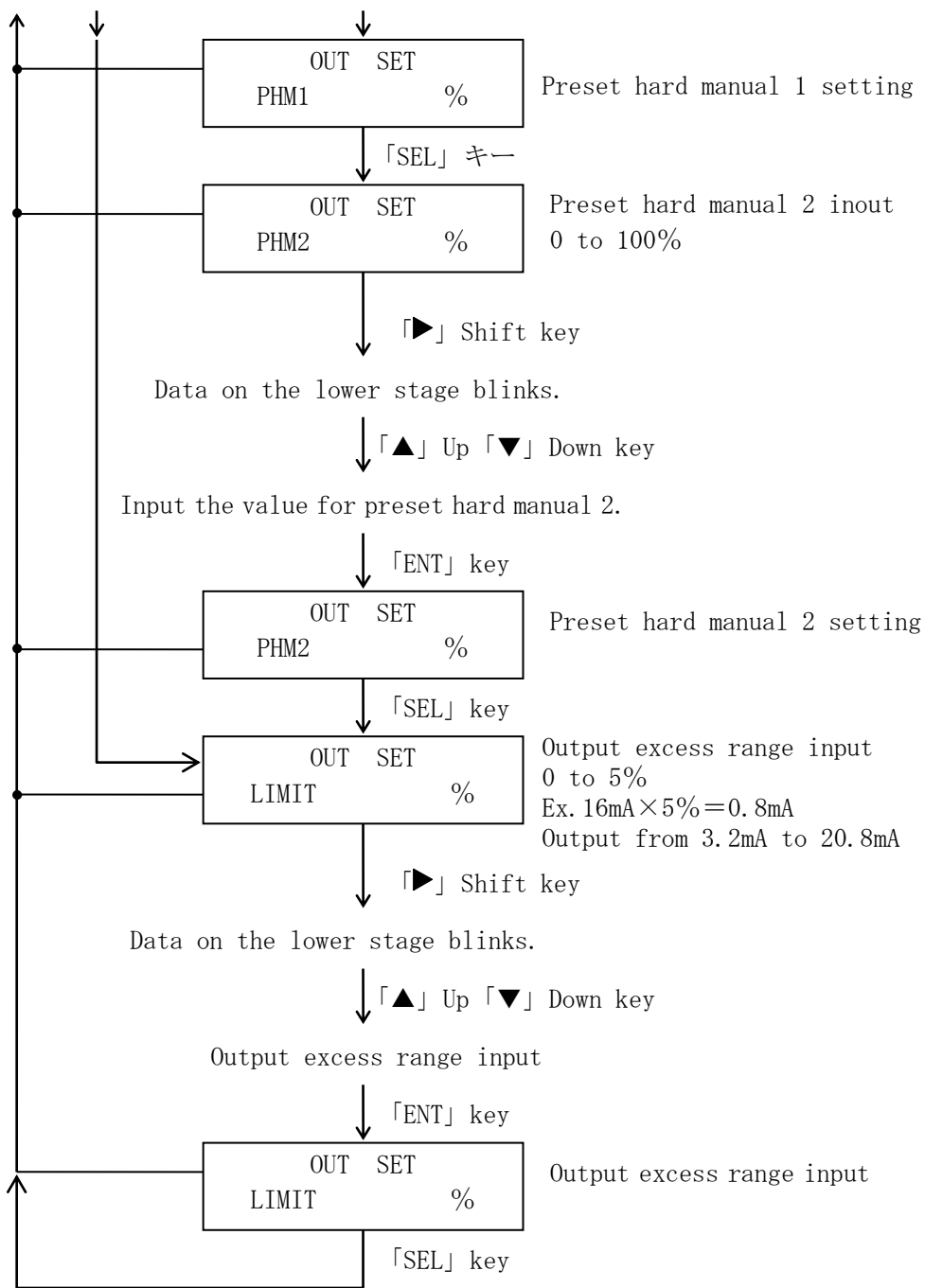
⑤ CAL DATA MONITOR (Calibration data display)



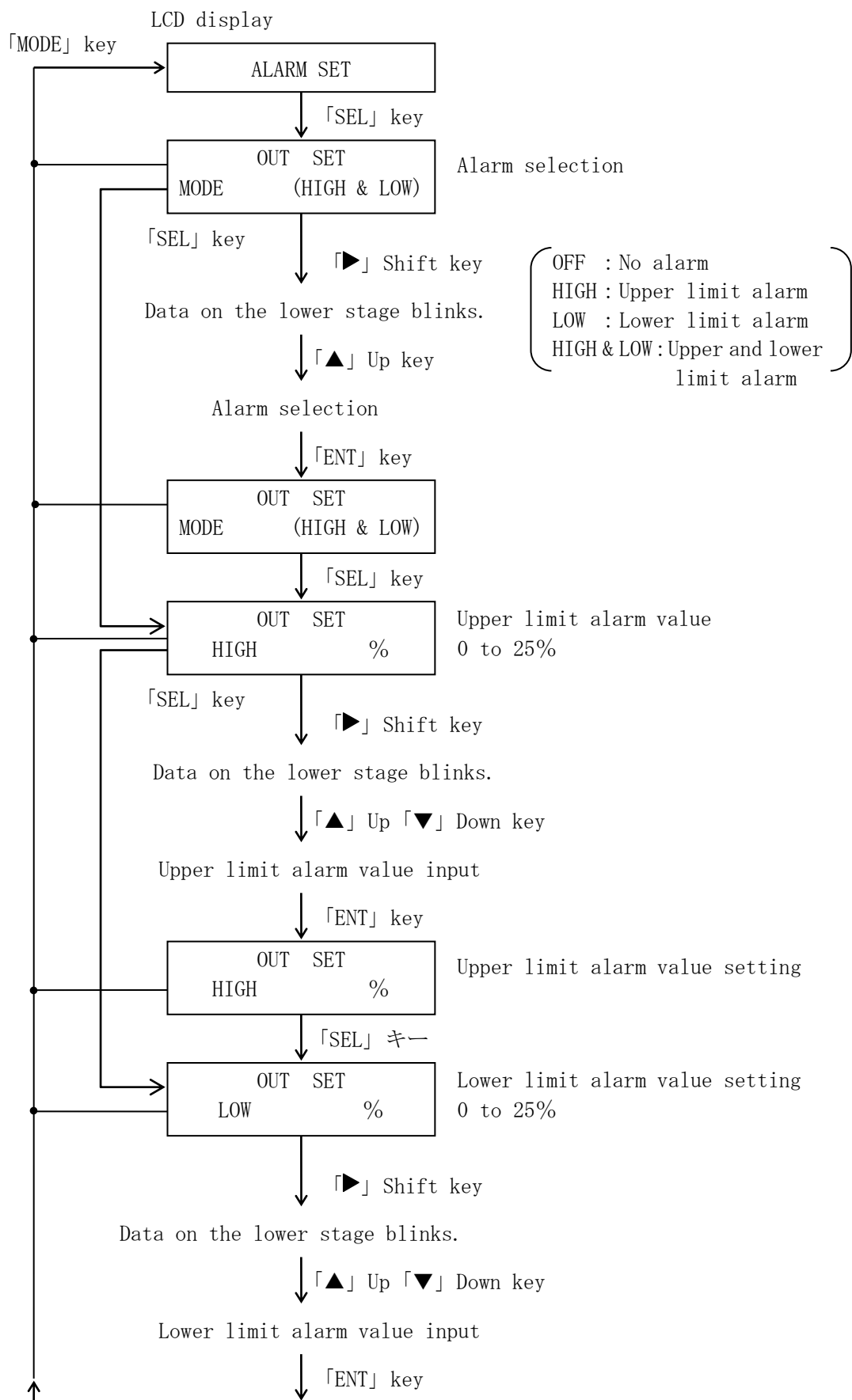
⑥ OUT SET (Output signal setting)

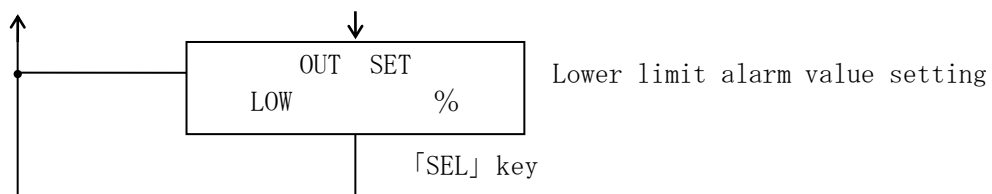


End of output signal adjustment
 Function selection for occurrence of error,
 Calibration, purge and hold.
 STD : Previous value output
 OFF : (Not held during calibration and
 purging)
 PHM1: PHM1 setting output
 PHM2: PHM2 setting output

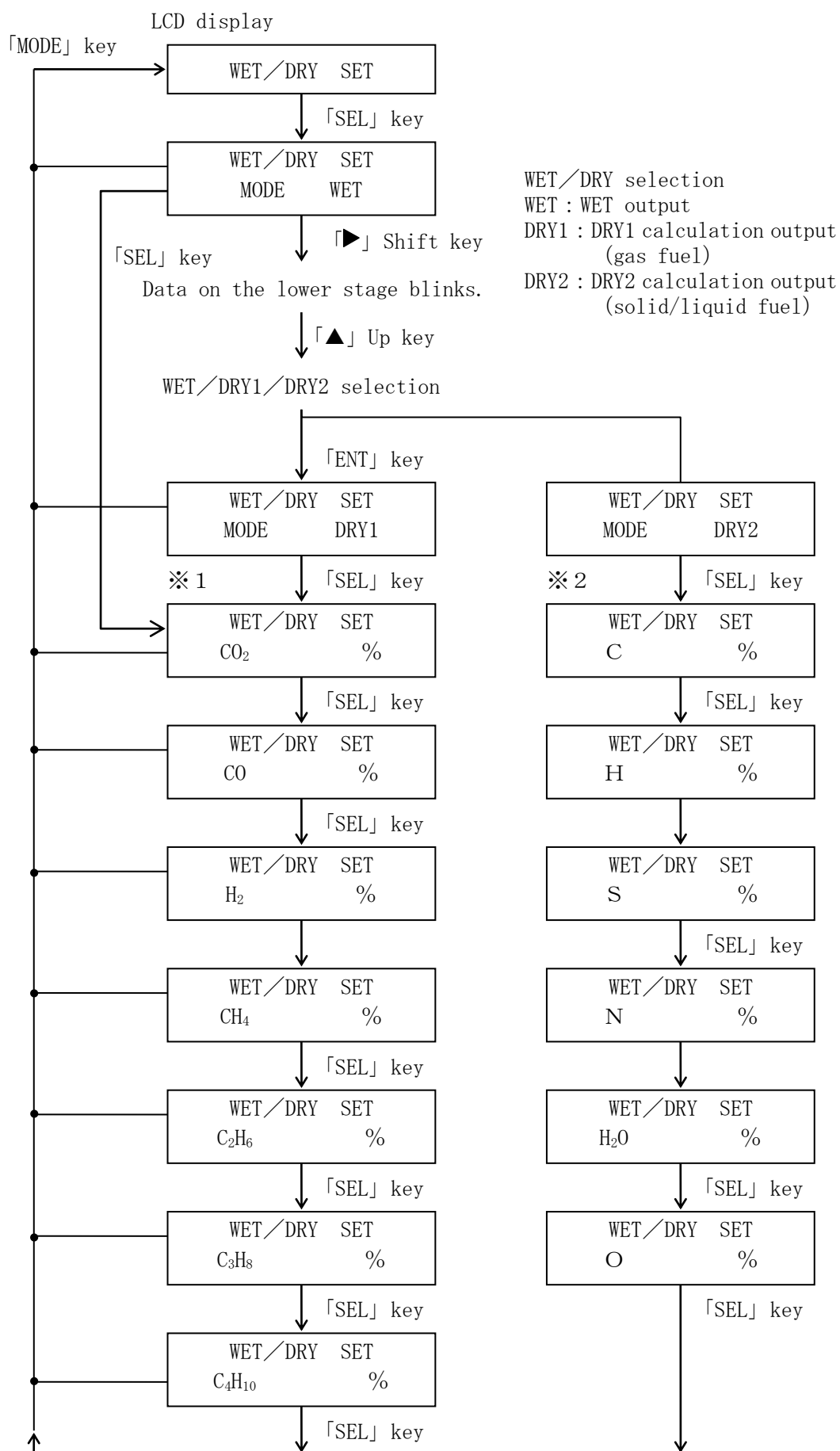


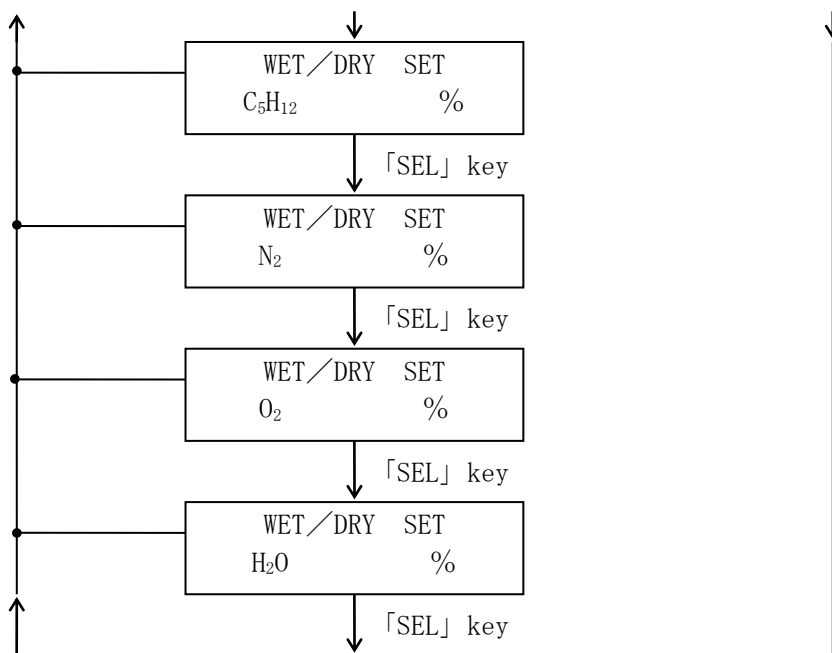
⑦ ALARM SET (Alarm setting)





⑧ WET/DRY SET (WET/DRY setting)





※1 : Input the gas fuel content.

※2 : Input the solid and liquid fuel contents

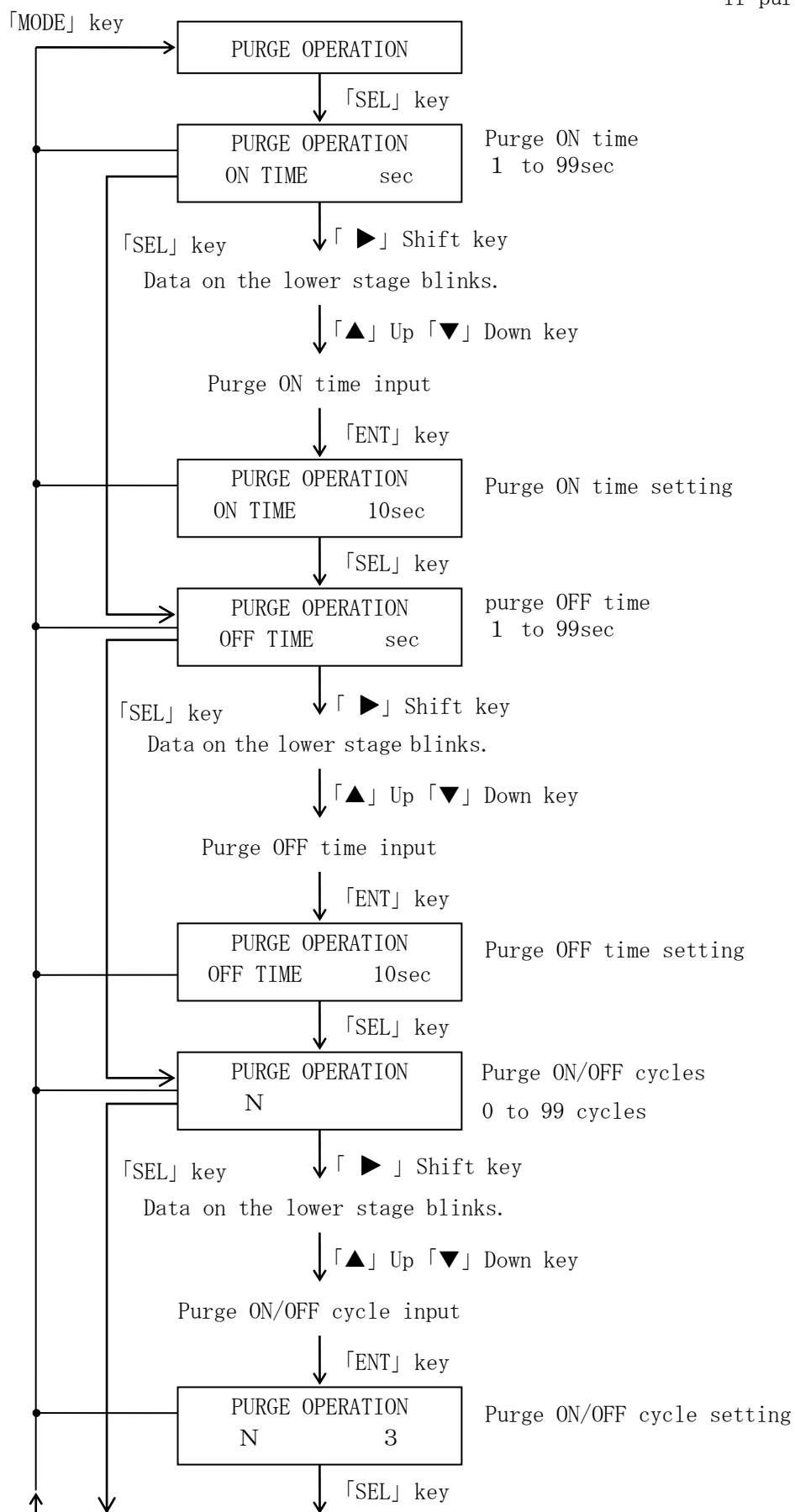
Press the 「▶」 shift key to blink the data.

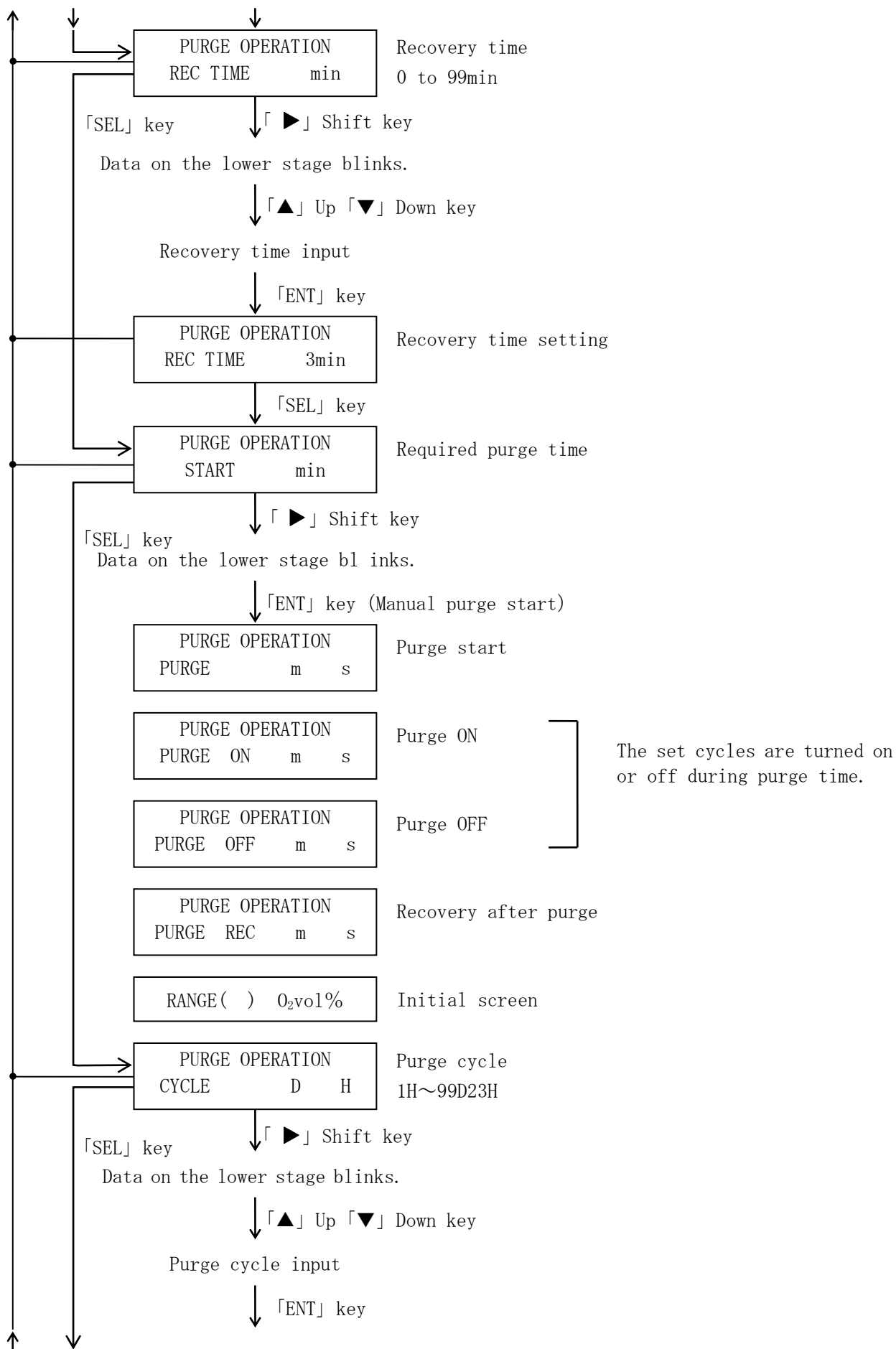
Press the 「▲」 up or 「▼」 down key input data.

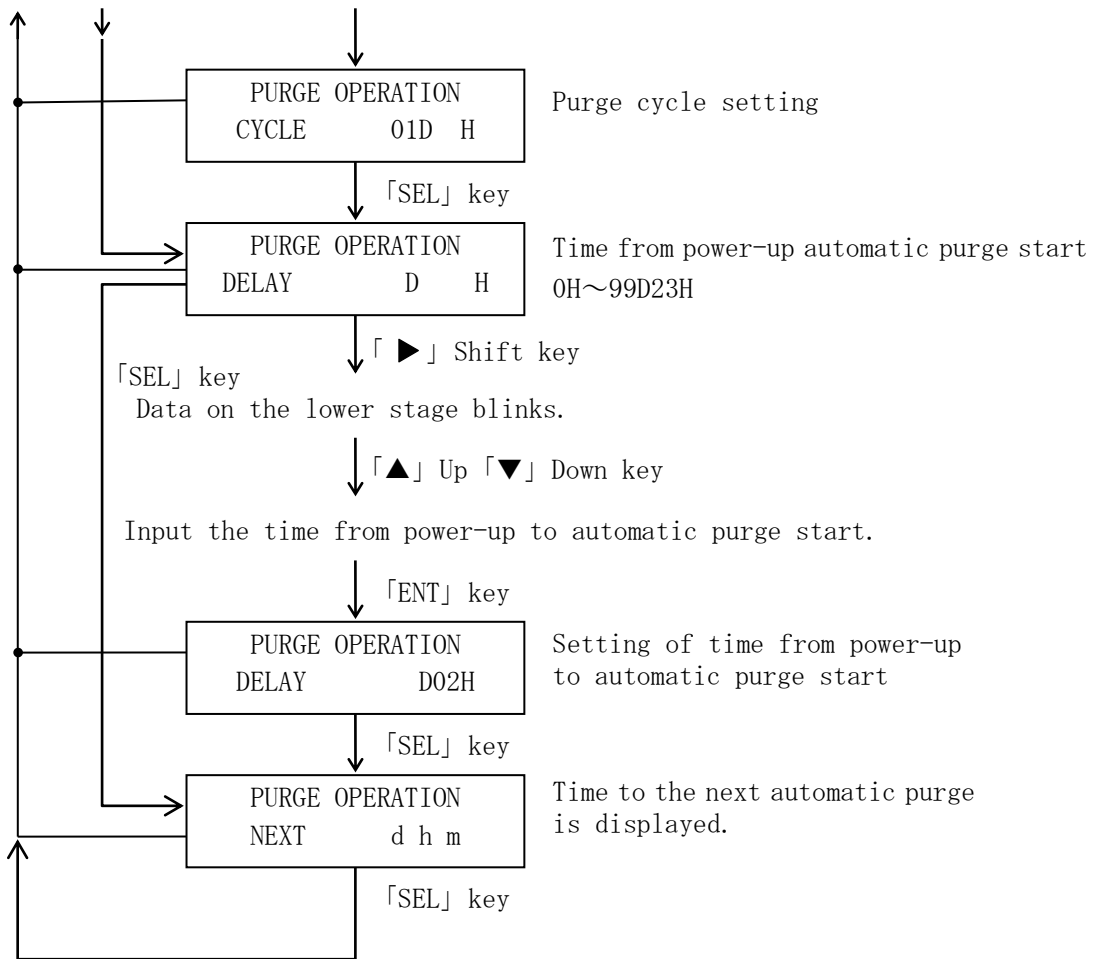
「ENT」 key

⑨ PURGE OPERATION (Purge operation)

(note) This function is not displayed if purge is not used.







5-4 User key input value (Set by ENERGY SUPPORT CORP. according to specifications in delivered product)

No.	Block name	Setting item	Set value	Content
①	DISPLAY SELECT	—	O ₂ %	LED display
②	RANGE CHANGE	LOCAL	OFF	Range select field
		HIGH	(High range)	High range selection
		LOW	(Low range)	Low range selection
		Delay Time	0 sec	Primary delay calculation time
④	CAL. DATA SET	AIR	(Air calib. value)	Air O ₂ concentration
		ZERO	(Zero gas calib. value)	Zero gas concentration
		SPAN	(Span gas calib. value)	Span gas concentration
		AIR TIME	5min	Air calibration time
		Z, S TIME	5min	Zero and span calibration time
		RECTIME	5min	Recovery time
		CYCLE	30D00H	Calibration cycle
		DELAY	00D07H	Calibration delay
⑥	OUT SET	ADJUST	0%	Output signal adjustment
		HOLD SET	OFF	Output signal hold
		PHM1	0%	Output setting 1
		PHM2	0%	Output setting 2
		LIMIT	0%	Output over range
⑦	ALARM SET	MODE	OFF	Alarm selection
		HIGH	25%	O ₂ upper limit
		LOW	0%	O ₂ lower limit
⑧	WET/DRY SET	MODE	WET	WET/DRY selection
		CO ₂ ~H ₂ O	All 0%	DRY1/DRY2 data setting
⑨	PURGE OPERATION	ON TIME	10sec	Purge ON time
		OFF TIME	10sec	Purge OFF time
		N	5	ON/OFF cycles
		RECTIME	3min	Recovery time
		START	All time display	Purge time
		CYCLE	01D00H	Purge cycle
		DELAY	00D02H	Purge delay

↑ Key operation method, item No.

↑ Description in parentheses () in the table is

input according to instruction document (Drawing, etc.)

5-5 System key input value

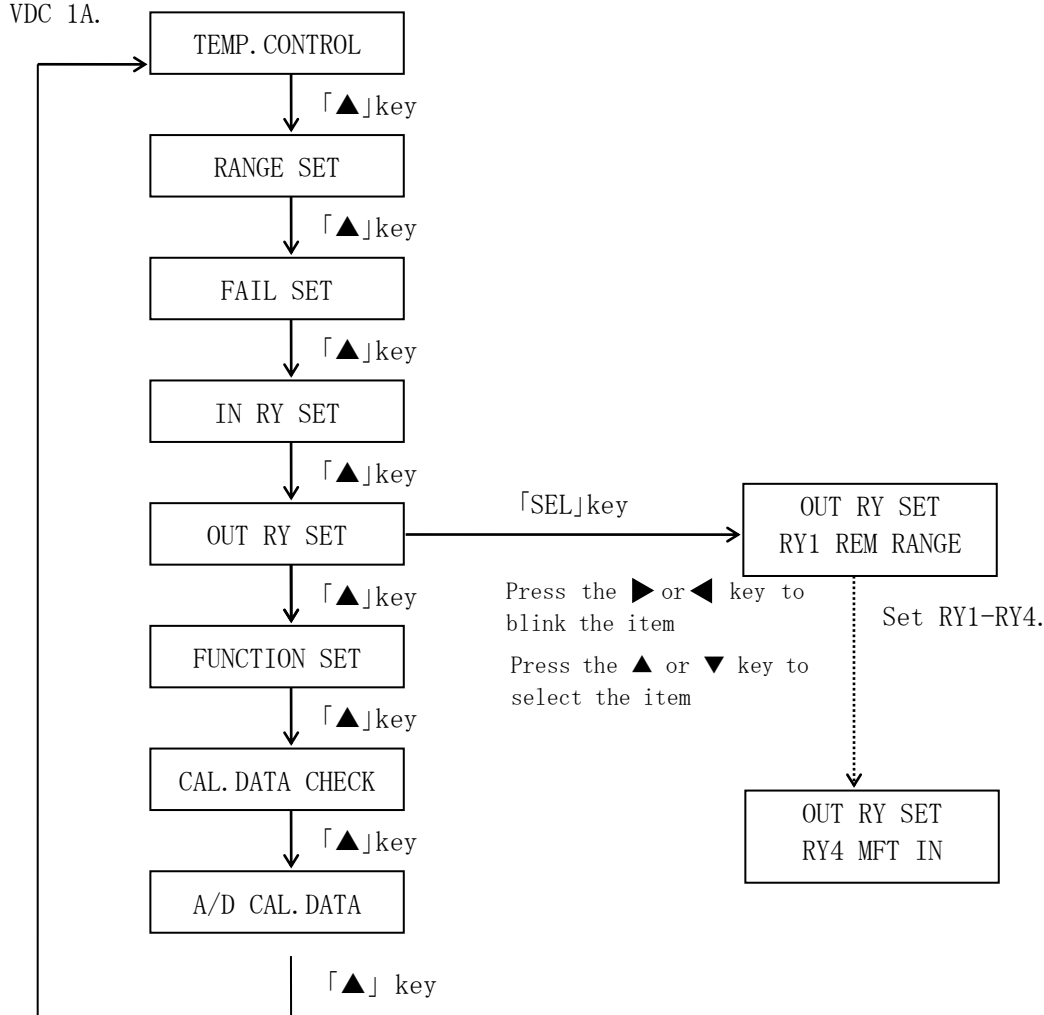
(Set by ENERGY SUPPORT CORP. according specification in delivered product)

[When confirming and changing the system data , turn ON only DIP switch (see P10.)]

Block name	Setting item	Set value	Content	
TEMP. CONTROL	CONTROL	ON, OFF	Heater control	
	Thermocouple	R, K	Thermocouple selection	
	SV	℃	Temperature setting	
	P	100%	Proportional band	
	I	100sec	Integration time	
	D	1sec	Differentiation time	
	TS	0.5Sec	Control cycle	
	AUTO TUNE	—	Automatic tuning operation	
RANGE SET	H. ZERO	Input the range from drawings, etc.	Range setting	
	H. SPAN			
	L. ZERO			
	L. SPAN			
FAIL SET	WARM UP	Min	Warm-up time error	Differs according to operating transmitter.
	TEMP L	℃	Low temperature error	
	TEMP H	℃	High temperature error	
	CAL AIR	±10.0mV	Air calibration range	
	CAL ZERO	±50.0%	Zero calibration range	
	CAL SPAN	±50.0%	Span calibration range	
	EMF L	-50.00mV	Cell electromotive force low	
	EMF H	250.00mV	Cell electromotive force high	
FUNCTION SET	CAL MODE	OFF, MANUAL, SEMIAUTO, AUTO	Calibration mode	
	CAL TYPE	A/Z, A/Z/S, Z/S	Calibration gas	
	PUG MODE	OFF, SEMIAUTO, AUTO	Purge mode	
	MONI SW	Set at OFF (A/D MONITOR)	A/D monitor	
	WARNING	Set at ON	Setting error display	

(1)Contact output (Set by ENERGY SUPPORT CORP. according to specification)

Contact outputs RY 1 through RY 5 are provided, among which RY 5 is a “b” contact only for error output (turned on upon an error) and RY1 through RY 4 are “a” contacts to which the function in the table below can be assigned. The contact capacity is 250 VAC 1A or 30 VDC 1A.



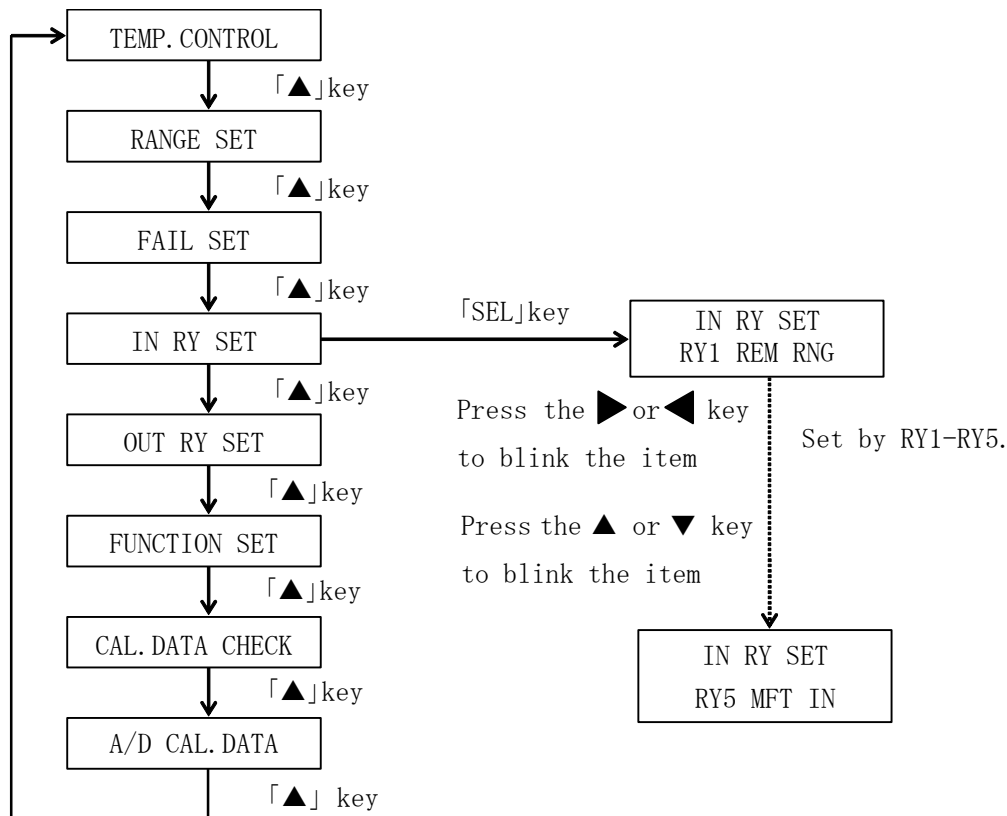
Functions assigned to contact output

Setting	Description
OFF	This contact is not used.
RANGE H	Turned on when the high range is selected.
RANGE L	Turned on when the low range is selected.
CAL AIR	Turned on when the air gas is supplied during automatic calibration.
CAL ZERO	Turned on when the zero gas is supplied during automatic calibration.
CAL SPAN	Turned on when the span gas is supplied during automatic calibration.
PURGE	Turned on during purging and MFT.
MAINTE	During temperature rise, during purging, during calibration, during hold signal input, during MFT signal input, during system data setting(when DIP switch S2-1 on the CPU board turned on)
ALARM H	The oxygen concentration is higher than the upper limit setting. (Refer to the paragraph for a alarm for details.)
ALARM L	The oxygen concentration is lower than the lower limit setting. (Refer to the paragraph for alarm for details.)
ALM H&L	ALARM H or ALARM L is turned on.

Note)Either RANGE H or RANGE L is always turned on

(2) Contact input (Set by ENERGY SUPPORT CORP. according to specifications.)

Contact inputs IN 1 through IN 5 are provided, and each of them can be set. The terminal Voltage when the contact is open is about 10 to 12V, and the current when the contact is shorted is about 5 to 6mA



Functions assigned to contact input

Setting	Description
OFF	This contact is not used.
REM RNG	Opening this terminal selects the high range and shorting selects the low range in the RANGE CHANGE/LOCAL OFF mode.
OUT HOLD	When this terminal is shorted, the current outputs is held at the previous value. The 7-segment LED display is not held.
REM CAL	Shorting this terminal in the measurement mode with the CAL MODE set at SEMIAUTO or AUTO starts automatic calibration.
REM PUG	Shorting this terminal with the PUG MODE set at SEMIAUTO or AUTO starts purging.
MFT IN	Shorting this terminal holds the current output and shows “—” at the 7-segment LED. Heater control is disabled and the cell error or low temperature error is not detected. Setting the purge relay turns on the input. After the input is reset, the process starts at temperature rise.
RESET	Shorting this terminal restarts the timer for timer calibration and timer purge. The next timer calibration is after the set calibration cycle(CAL, DATA, SET, CYCLE), and the next purge is after the set purge cycle(PURGE, OPERATION, CYCLE).

If the same function is set for two or more terminals, an input to any of the terminals activates the function.

5-6 Gas calibration method



Be sure to perform gas calibration to maintain the measurement accuracy.

(About once every month)

• Calibration method

Type	Calibration	内 容
MANUAL	Manual calibration	Supply calibration gas and perform calibration key operation manually.
SEMI AUTO	Manual calibration start	Supply calibration gas and calibration operation are performed automatically by solenoid valves and other components. To start calibration, perform key operation manually or remotely
AUTO	Automatic calibration	Supply of calibration gas and calibration operation are automatically performed by solenoid valves and other components. Calibration is started by the internal timer or remote operation.

(System key input: set by ENERGY SUPPORT CORP.)

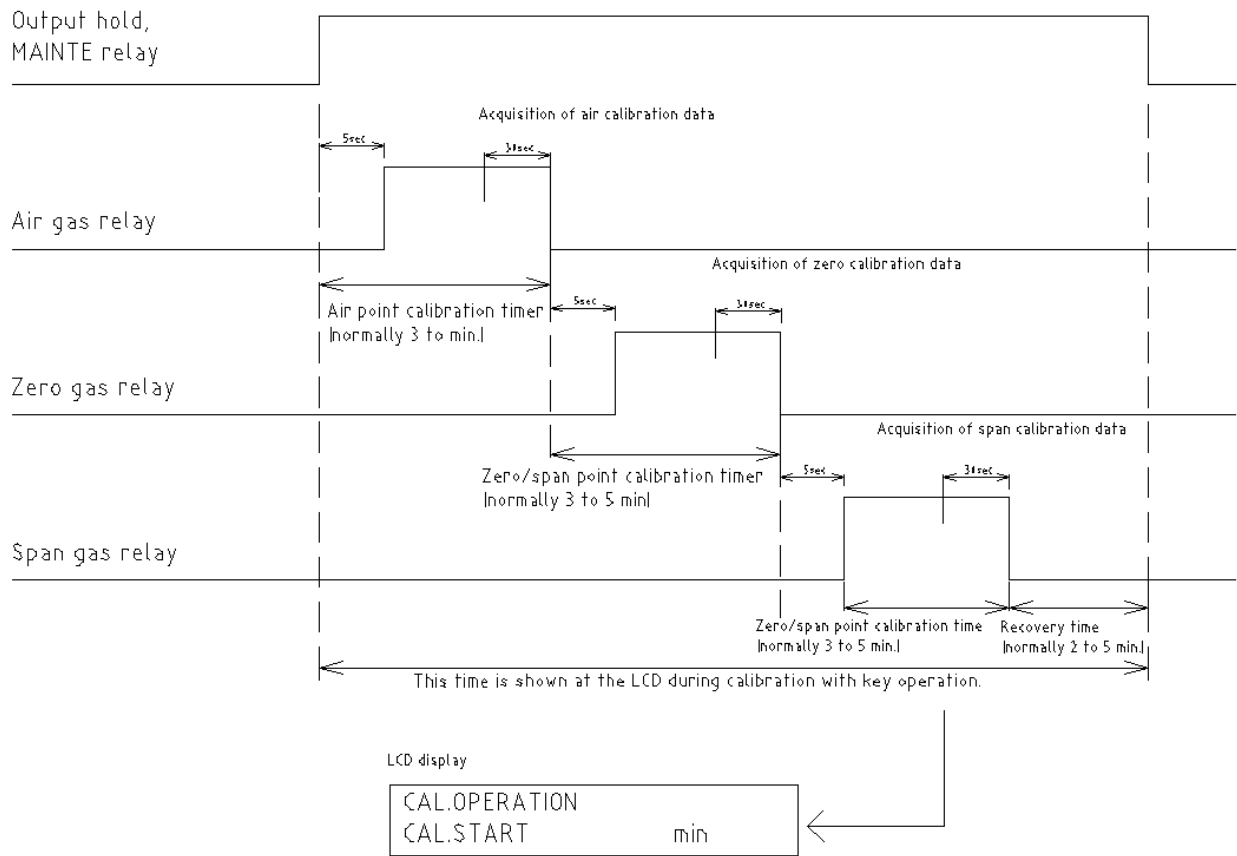
Preliminary contact input assignment

• Calibration types

Type	Calibration	内 容
A/Z	AIR、ZERO	High range two-point calibration
A/Z/S	AIR、ZERO、SPAN	High range three-point calibration
Z/S	ZERO、SPAN	Low range two-point calibration

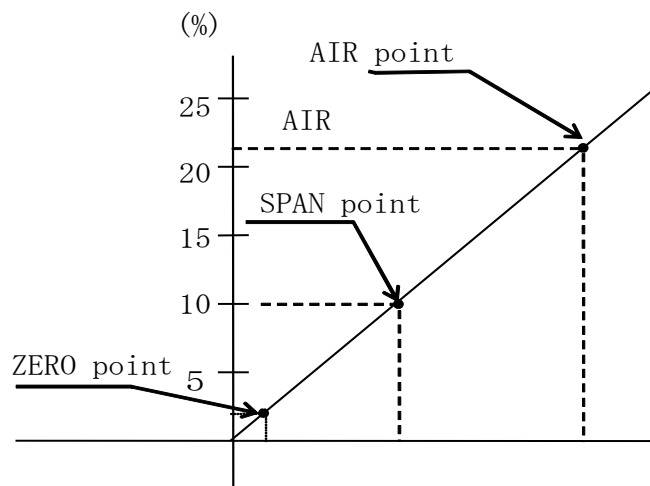
(System key inputs: set by ENERGY SUPPORT CORP.)

• Calibration timing

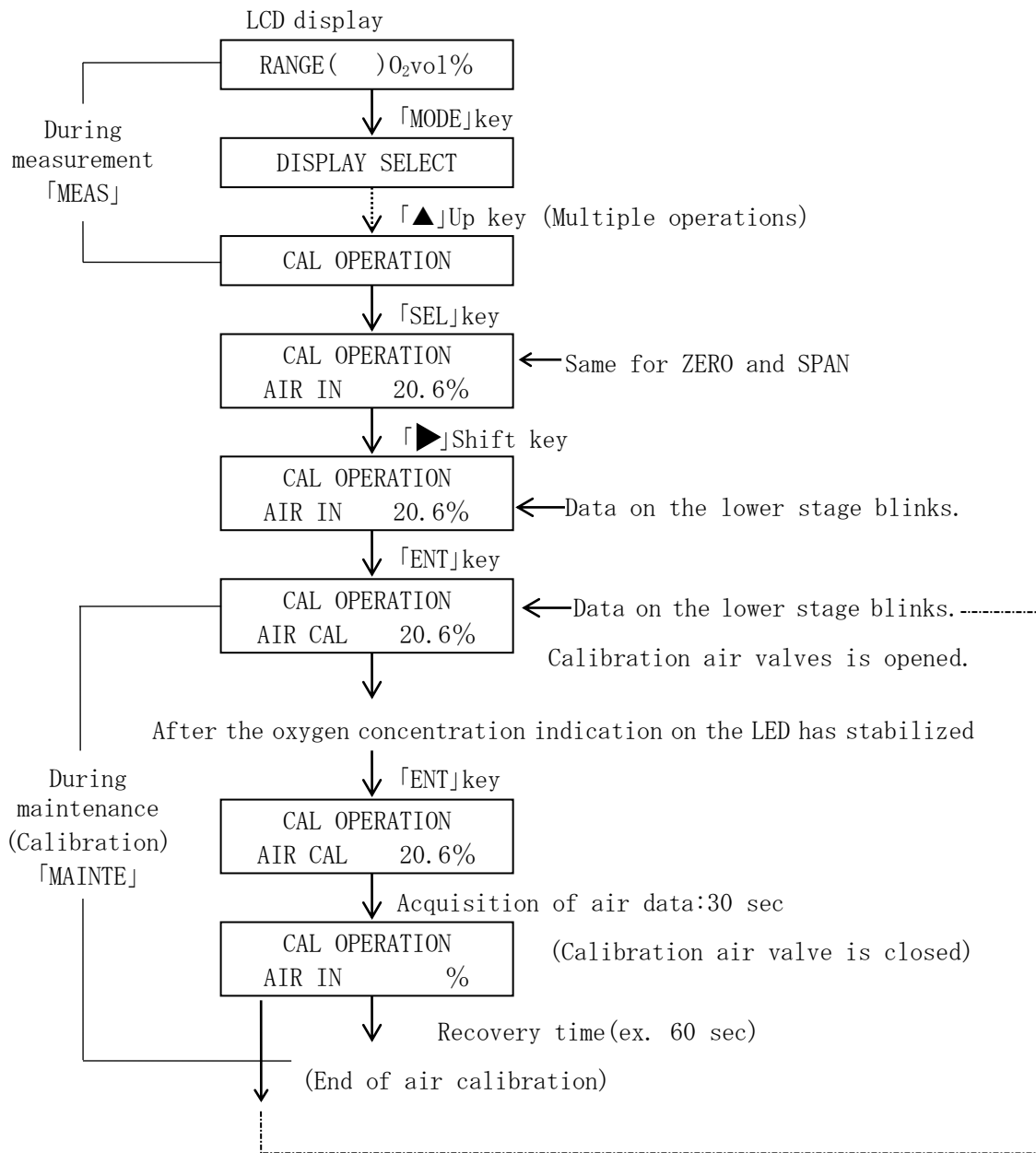


• Calibration curve

Two point calibration with air and zero gas is regular choice but you can select three point calibration with air, zero gas and span gas for more accurate measurement.

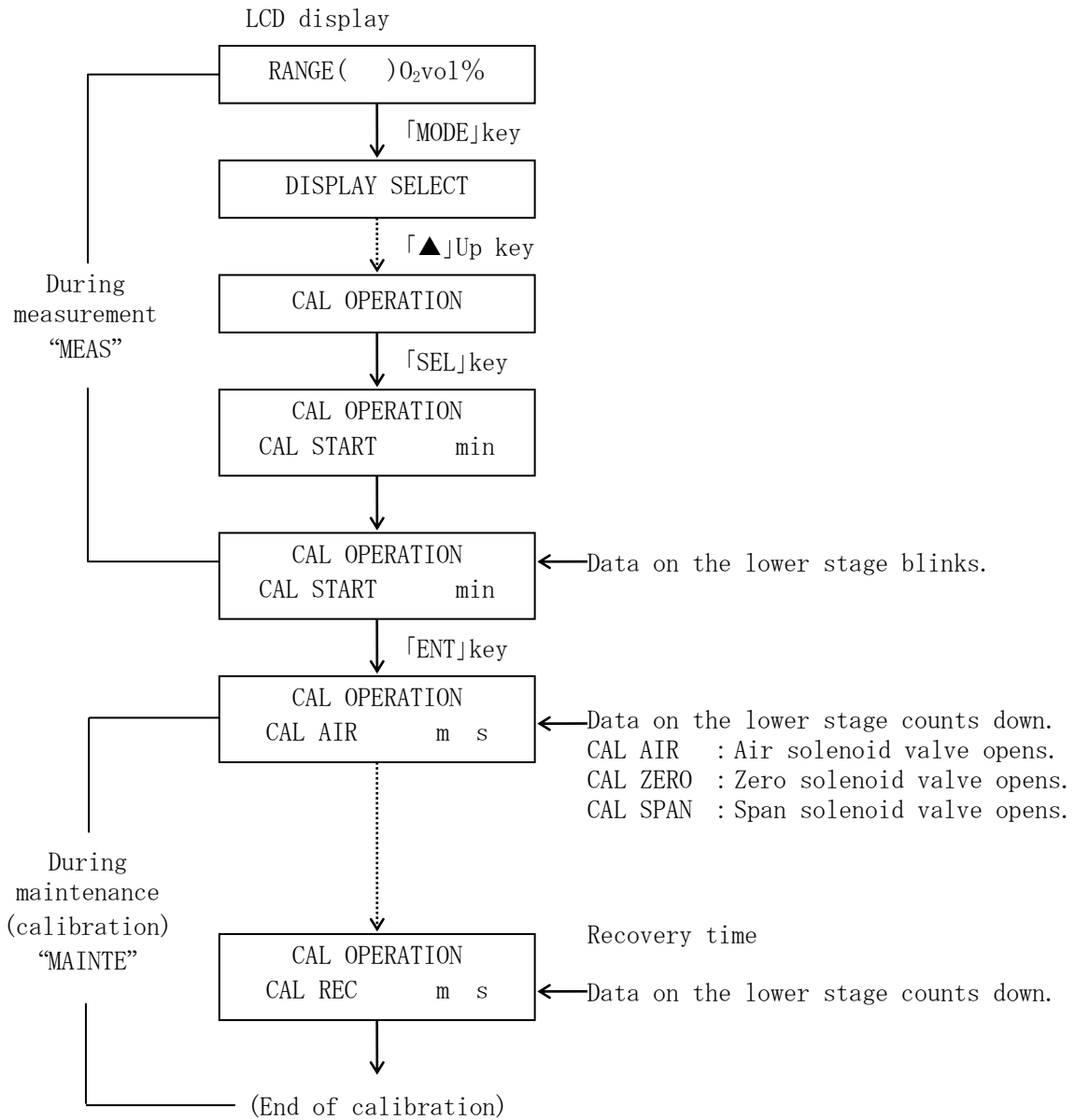


• Manual calibration method



• Semi auto(manual start)calibration method

Start automatic calibration manually



5 - 7 Purging method

In a purging process, compressed air is blown to inside the probe transmitter. Periodically Perform according to necessity.

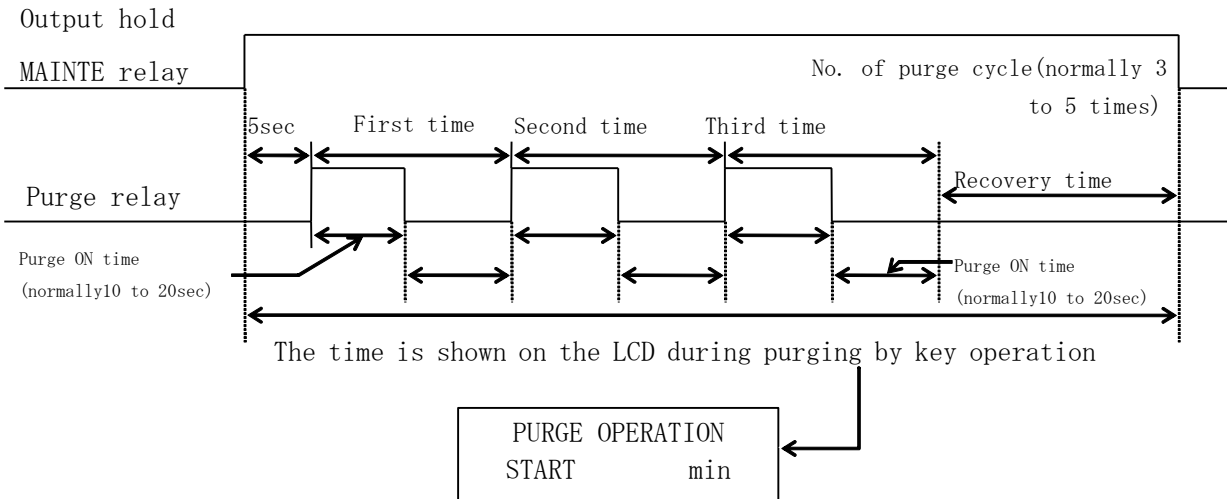
Purging method

Type	Purging method	内 容
OFF	No purging function	
SEMI AUTO	Manual purge start	Perform key operation manually or perform remote operation to output the purge contact.
AUTO	Automatic purge	The purge contact is output by the internal timer or remote operation.

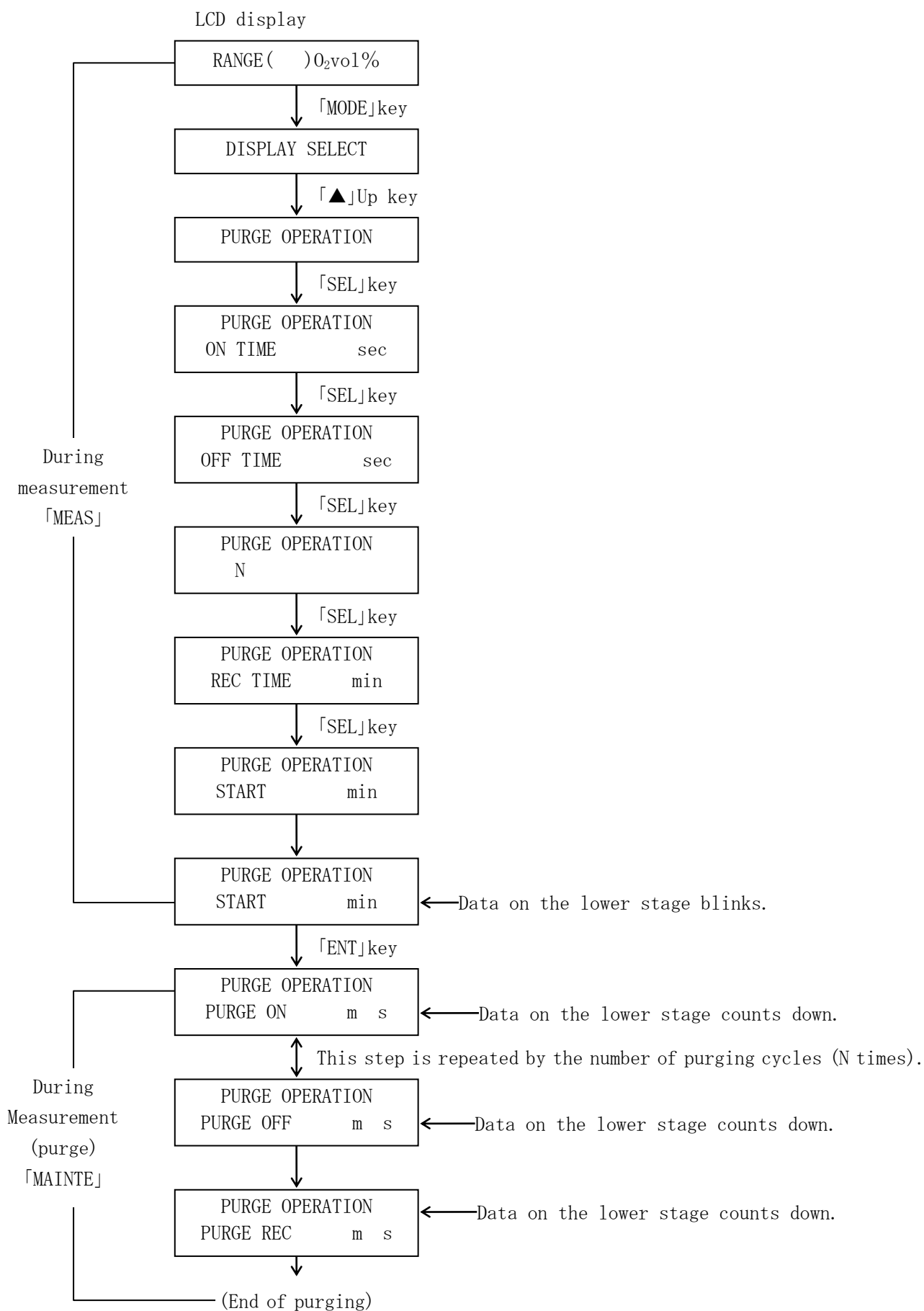
Preliminary contact output assignment is necessary for purging.

Preliminary contact input assignment is necessary for remote operation (REM PURGE)

The purging timing is shown in the figure below.



• Semi auto(manual start)purging method

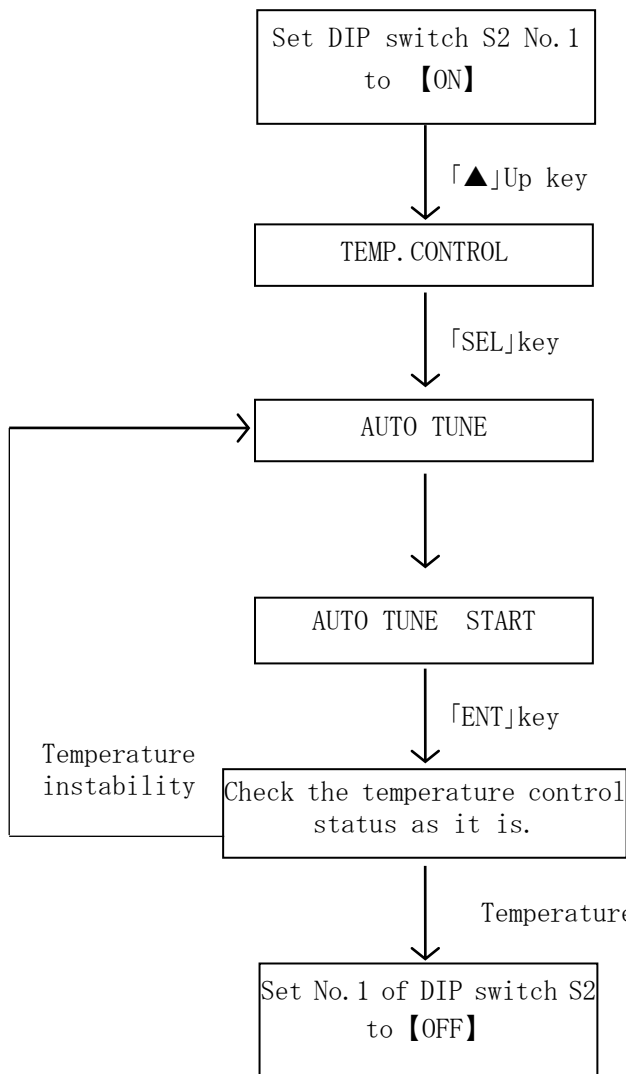


5-8 Automatic tuning operation method

Transmitter sensor temperature is controlled by PID control.

This receiver is compatible with various transmitter, so the PID value differs.

Therefore, depending on the transmitter, the temperature may not be stable. In that case, perform the auto tuning by the following.



Since this operation is the setting of the system key, perform the operation shown on the left.

Open the control panel and remove the Insulation sheet.
There is a S2 on the CPU board.

Press the [SEL] key until the [AUTO TUNE] appears.

The [START] button flashes.

The [ENT] key is pressed after about 5 seconds. Auto-tuning complete.

Attach the insulation sheet and close the control panel.

Note) ① if the heating time is too slow or too fast, or if the temperature overshoots, auto-tuning should be done during the heating process.

③ If the temperature is unstable after heating, perform an automatic tube tuning after heating.

6. Maintenance

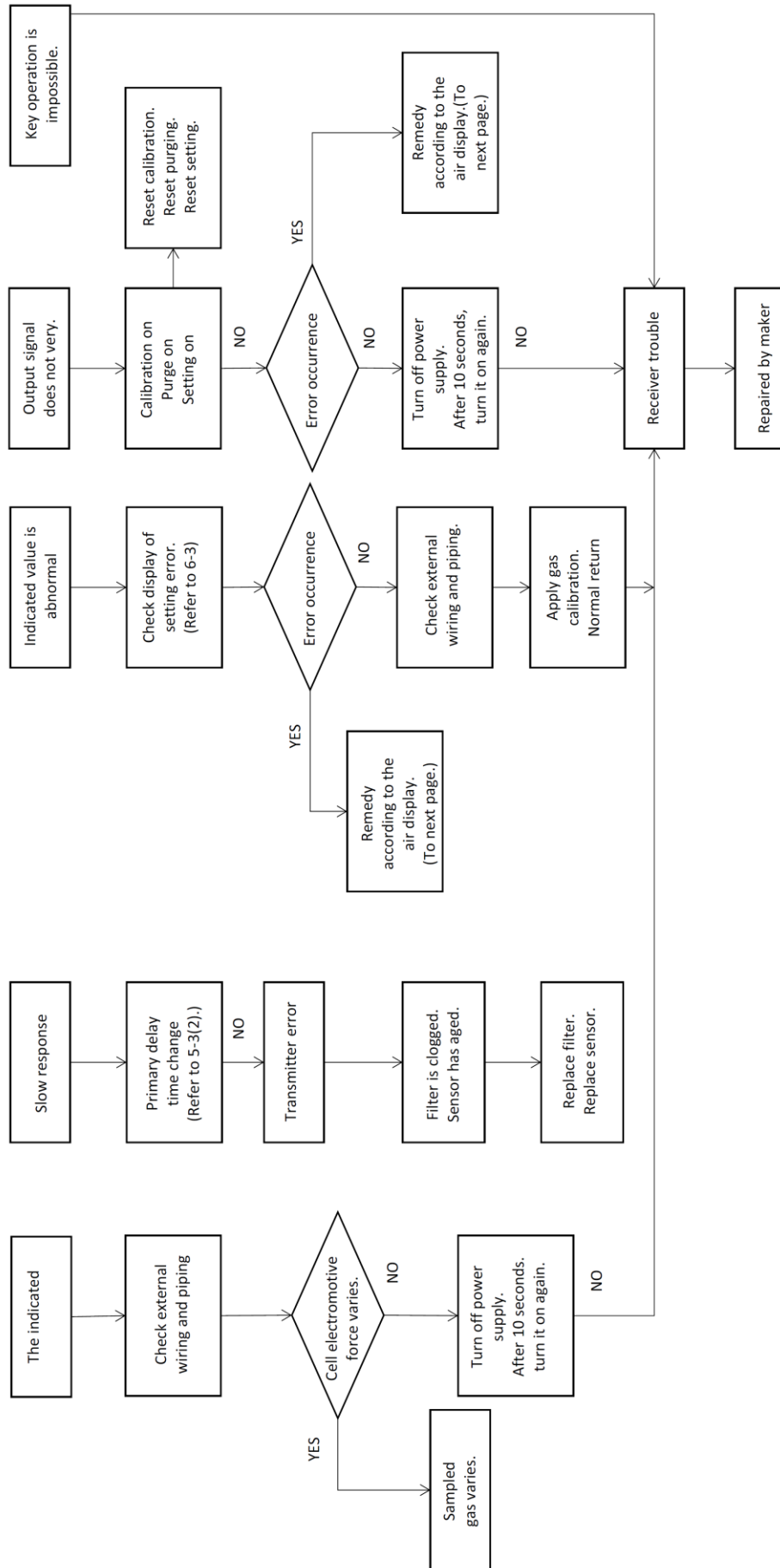
The daily /periodic inspections are important to maintain the proper function for accurate measurement. After understanding the contents of the item and method, be sure to apply the inspection.

6 - 1 Daily/periodic inspection

Gas calibration	Interval	One month
	Method	According to item 5-6, apply the gas calibration. (According to item 5-3(4), set the calibration method and so on.)
Sensor inspection	Interval	One month
	Method	After the gas calibration is completed check the drift value against the previously calibrated value. (CAL, DATAMONITOR) though it is normally +/-2% F.S./month or less, the sensor may be liable to age if the value is exceeded.
	Interval	1 to 6 months (Check if any abnormality is found during gas calibration.)
	Method	Check EMF electromotive force at the AIR, ZERO and SPAN points (DISPLAY SELECT) Check the response time which results from the calibration gas switch

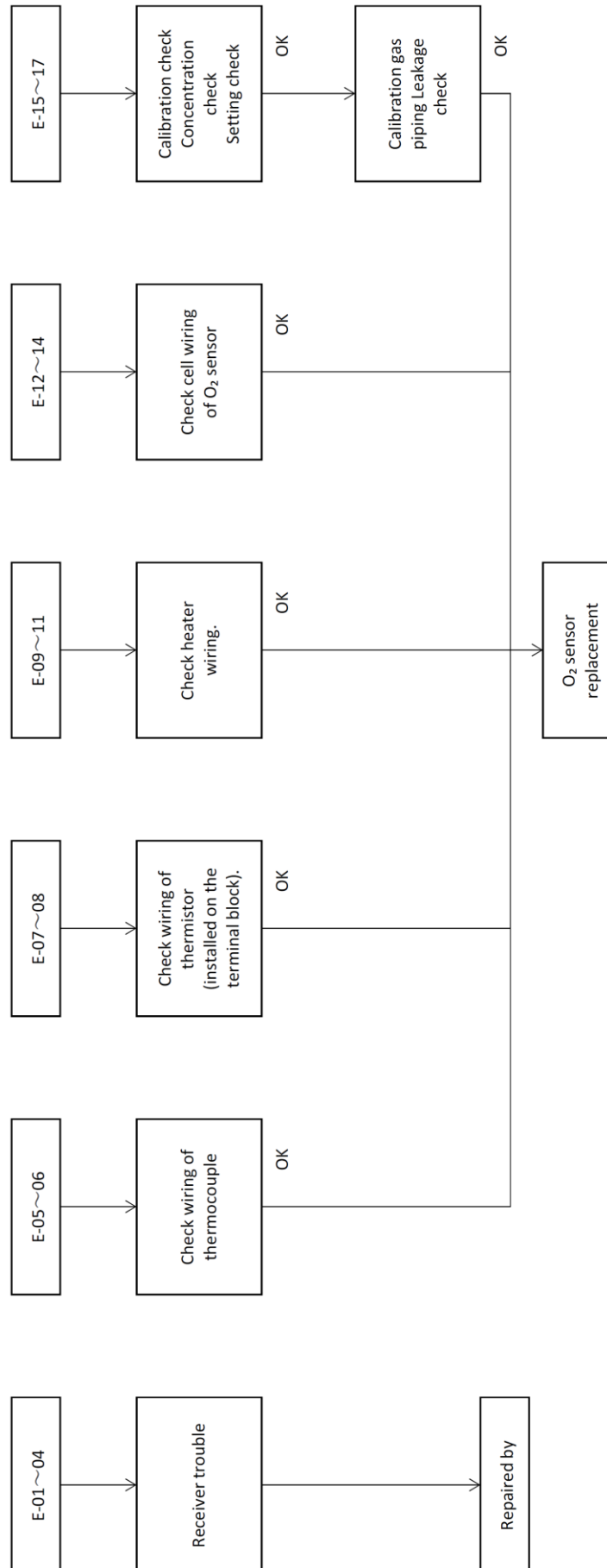
• For inspection of the sensor, refer to the instruction manual of the transmitter.

6 - 2 Trouble shooting



Trouble shooting

(Refer to the error display in P49.)



6 - 3 Display of setting error

LCD (lower step) display	Description
(01)AIR ZERO?	Air calibration gas is excessively near zero calibration gas.
(02)AIR SPAN?	Air calibration gas is excessively span calibration gas.
(03)ZERO SPAN?	Zero calibration gas is excessively near span calibration gas.
(04)CAL CYCLE?	The frequency of automatic calibration is shorter than calibration time.
(05)ALARM H&L?	At the alarm, the which is excessively narrow or H is smaller than L.
(06)DRY1>100%?	Total of gas fuel components exceeds 100%.
(07)DRY2>100%?	Total of liquid and solid fuel components exceeds 100%.
(08)PURGE CYCLE?	The frequency of automatic purging is shooter than the purging time.
(09)RANG H ZERO?	Zero of H range is larger than 80% of span.
(10)RANG L ZERO?	Zero of L range is larger than 80% of span
(11)RANGE L>H?	L range is larger than H range.
(12)TEMP L<SV?	Low abnormality of temperature is higher than set temperature -10°C
(13)TEMP L<960?	Low abnormality of temperature of K thermocouple is higher than 960°C.
(14)TEMP H<SV?	High abnormality of temperature is lower than set temperature +10°C.
(15)TEMP H<960?	High abnormality of temperature of K thermocouple is higher than 960°C.
(16)No AIR RY?	Air relay is not set during automatic calibration.
(17)No ZERO RY?	Zero relay is not set during automatic calibration.
(18)No SPAN RY?	Span relay is not set during automatic calibration.
(19)No PURGE RY?	Purge relay is not set during automatic purging.

6-4 Error display

If any error occurs, the error number will be displayed on the 7-segment LED to display the cause of the error. At this time, the function to calculate the concentration is stopped for interruption. During heater control, it is automatically continued or stopped depending on the content of the error.

LED	LCD	内 容	解 除	動 作
E-01	———	Sum error does not match.	Turn on the power again.	Measurement stop
E-02	———	RAM operation error.	Turn on the power again.	Measurement stop
E-03	EEROM ERROR(xx)	EEROM operation error.	CLR-ENT	Measurement stop
E-04	LCD ERROR	LCD operation error.	CLR-ENT	Measurement stop
E-05	Thermo C. (OPEN)	Wire breakage of thermocouple.	CLR-ENT	Measurement stop
E-06	Thermo C. (REV)	Reversed connection of thermocouple.	CLR-ENT	Measurement stop
E-07	COLD J. (OPEN)	Wire breakage of thermistor.	CLR-ENT	Measurement stop
E-08	COLD J. (SHORT)	Short circuit of thermistor.	CLR-ENT	Measurement stop
E-09	HEATER (OPEN)	Excessively long rising time of temperature.	CLR-ENT	Measurement stop
E-10	TEMP. (HIGH)	Excessively high temperature.	CLR-ENT	Measurement stop
E-11	TEMP. (LOW)	Excessively low temperature.	CLR-ENT	Measurement stop
E-12	CELL (OPEN)	Wire breakage of cell.	CLR-ENT	Temperature control continuation
E-13	EMF (HIGH)	Excessively high voltage of cell.	CLR-ENT	Temperature control continuation
E-14	EMF (LOW)	Excessively low voltage of cell.	CLR-ENT	Temperature control continuation
E-15	CAL AIR FAILED	Failure of air calibration.	CLR-ENT	Temperature control continuation
E-16	CAL ZERO FAILED	Failure of zero calibration.	CLR-ENT	Temperature control continuation
E-17	CAL SPAN FAILED	Failure of span calibration.	CLR-ENT	Temperature control continuation

*E-01 and E-02 do not blink in the LED display. Others blink in the 7-segment LED displays.

*For EEROM error, the error channel No. is displayed on LCD. (Position of xx in the list)

*Temperature control continuation : Oxygen concentration calculation is stopped but heater control is continued.

*Measurement stop : Oxygen concentration calculation and heater control are stopped.

*If any calibration error occurs when the calibration method "MANUAL" or "SEMIAUTO" is selected, FAIL lamp will come on but LED lamp will not come on. For resetting, press the key "MODE", and press [CLR] and [ENT] when "CAL DATE MONITOR" is displayed.

LED	Reference
E-05	40mV or more for K, and 20mV or more for R
E-06	-50°C or lower when converted into the temperature
E-07	Partial pressure ratio of 0.9 or more
E-08	Partial pressure ratio of 0.1 or more
E-09	After start of temperature rise, the set pressure is not reached even though time set for warm-up has passed.
E-10	Heater temperature is higher than value set for TEMP H.
E-11	Heater temperature is lower than value set for TEMP L.
E-12	Electromotive force of cell is lower than -50mV.
E-13	Electromotive force of cell is higher than value set for EMF H.
E-14	Electromotive force of cell is lower than value set for EMF L.
E-15	During air calibration, electromotive force of air is outside the set for CAL AIR.
E-16	During zero calibration, electromotive force of zero is outside the set for CAL ZERO.
E-17	During span calibration, electromotive force of span is outside the value set for CAL SPAN.

E-05 through E-08 and E-10 through E-14 are not recognized as an error unless it continues for 1 second (4 times).

The contents of this manual are subject to change without notice for improvement.



For inquiries regarding product handling, please contact us or our distributors.
Inquiry form URL : <https://www.energyys.co.jp/english/inq/all.php>
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