

OPERATION MANUAL
Ambient CO Monitor
APMA-360

■ Preface

The APMA-360 Operation Manual contains the information about operating APMA-360. This information is quite essential to you, in helping you to operate your APMA-360 more effectively. For maintenance or installation, refer to Maintenance Manual and Installation manual.

■ Horiba's Warranty and Responsibility

- The APMA-360 delivered to you is covered by Horiba's warranty for a period of one (1) year. If any malfunction attributable to our responsibility should occur during this period, necessary repairs or replacement of parts shall be made free of charge by Horiba. The warranty does not cover the following:
 - **Any malfunction which is attributable to improper operation of the APMA-360.**
 - **Any malfunction which is attributable to repair or modification by any other party than a Horiba-authorized dealer.**
 - **Any malfunction which is attributable to the use of the APMA-360 in an improper operating environment.**
 - **Any malfunction which is attributable to an accident or mishap not involving Horiba.**
 - **Any malfunction which is attributable to a natural disaster.**
- In preparing this Manual, every attempt has been made to include the latest equipment changes and specifications. However, please keep in mind that our equipment evolves rapidly as improvements are made, and this version of the Manual may not necessarily reflect all changes in product design. Horiba reserves the right to modify its products at any time without necessarily including these changes in the documentation.
- Horiba is not responsible for any damage that may result from any information other than that included in this document.

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■ Conformance Directive



This equipment is in conformity with the following directives and standards:

Directives

The EMC Directives	89/336/EEC as amended by 91/263/EEC, 92/31/EEC and 93/68/EEC, in accordance with the Article 10 (1) of the Directive.
The Low Voltage Directive	73/23/EEC

Standards

[The EMC Directive]	EN55011: 1991 Class B Group 1 and EN50082-2: 1995
[The Low Voltage Directive]	EN61010-1: 1993

Warning:

The equipment shall not be used in the residential, commercial and *light-industrial* environment.

■ Installation Environment:

- Installation Categories (Overvoltage Categories) II
- Pollution Degree 2

Safety Precautions

■ HORIBA's Safety Policy

We arrange warning labels on our products. Each warning message is described by the following style in this instruction manual. For your safety operation of the equipment, these instruction are to be followed strictly.

- Warning style used in this Instruction Manual are as follows:



ELECTRIC SHOCK: Maintain ground to avoid electric shock.



HOT COMPONENT: You may be burned if you touch the heating element – do not disassemble the unit until it has cooled off. Wear the safety gloves during performing this installation.

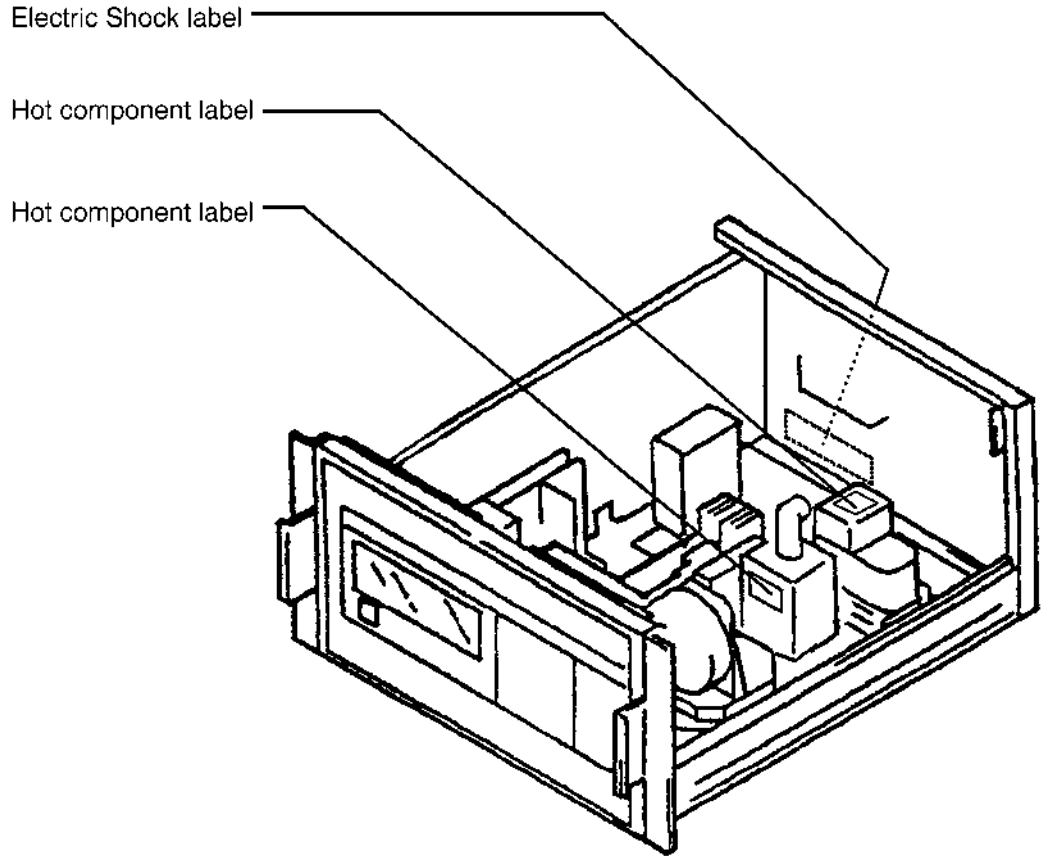
- The following two signal words are used:

WARNING: A potentially dangerous situation. If not corrected, this may result in serious injury or death.

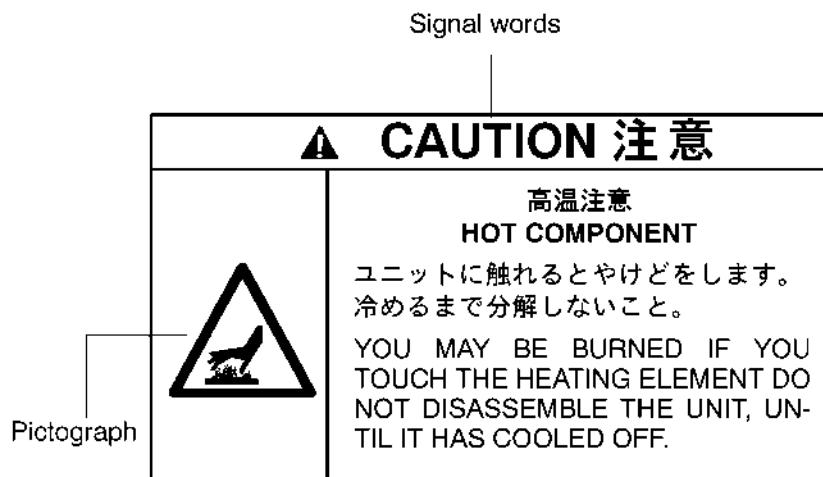
CAUTION: A potentially dangerous situation that may result in a non-fatal injury. "CAUTION" is also used throughout the manual to indicate other unsafe actions.

■ Warning Labels Description


- Sticking positions of warning labels used in the APMA-360 are as follows:




● Hot component label



●Hot component label

⚠ CAUTION 注意	
	<p>高温注意 HOT COMPONENT</p> <p>冷めるまで分解しないこと。 DO NOT DISASSEMBLE THE UNIT, UNTIL IT HAS COOLED OFF.</p>

●Electric Shock label

⚠ 警告 WARNING	
	<p>感電防止のため、 装置の接地をして ください。</p> <p>MAINTAIN GROUND TO AVOID ELECTRIC SHOCK.</p>

Organization of Manual

This manual has six chapters.

Chapter 1 Overview

Chapter 2 Operations

Chapter 3 Data Processing

Addresses the cumulative value, the average, and moving average.

Chapter 4 Features

Describes analog input/output, ranges, the internal clock, and how to set up the unit conversion coefficients.

Chapter 5 Maintenance

Describes daily maintenance procedures such as, replacing the configured gas cylinder, and replacing the sample filter.

Chapter 6 References

Covers the operation principle and the specifications.

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NOTE 

1 Overview

1.1 Introduction

The APMA-360 has been designed to measure the concentration of carbon monoxide in open air using the non-dispersive infrared analysis method as its operating principle.

For analog output of CO, you can select any two of these three: the momentary value, the cumulative value, and average value. The APMA-360's RS-232C (option) port allows data communications and remote control.

1.2 System Configuration

The APMA-360 can be operated merely by connecting it to calibration gas. The system can be upgraded by adding a computer, a controller, and a recorder.

The diagram for the system configuration of the APMA-360 is given below:

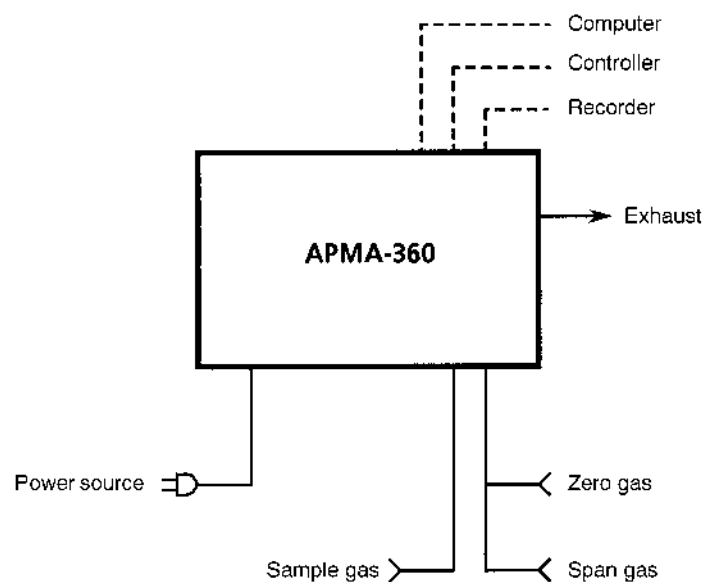


Fig. 1-1 System configuration

1.3 The Front Panel

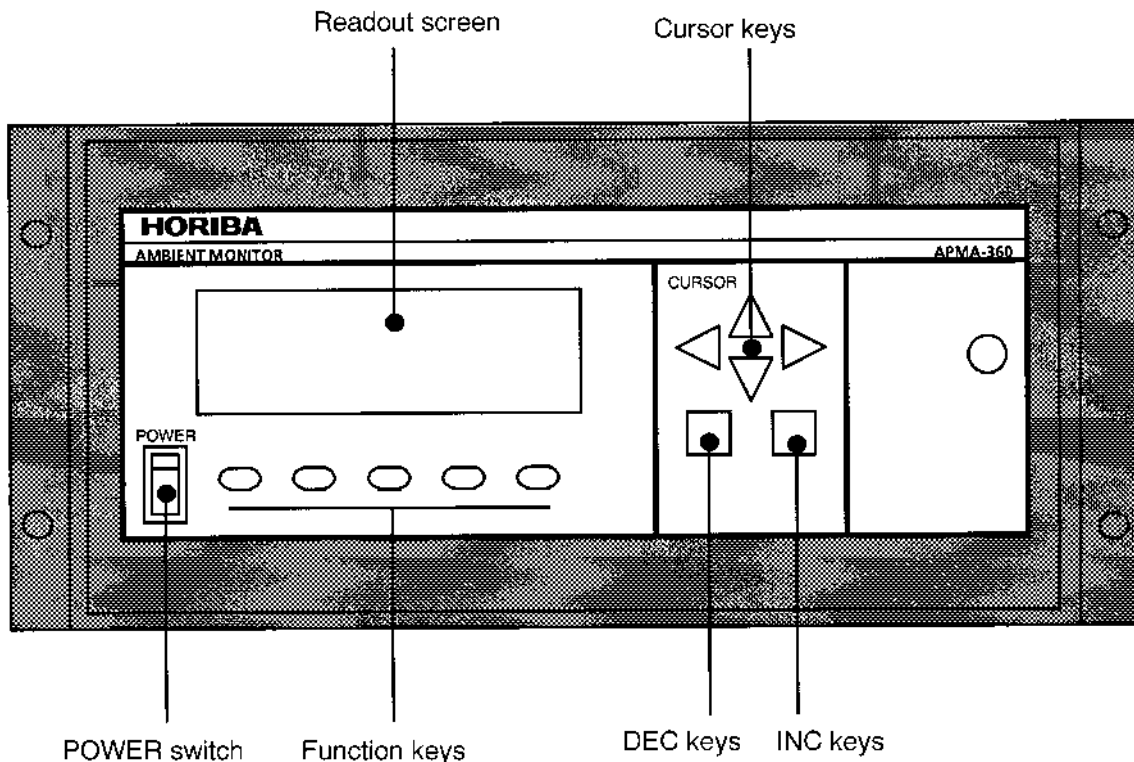


Fig. 1-2 Front panel

1.3.1 Readout Screen

This menu shows measurement error messages and information concerning various operation.

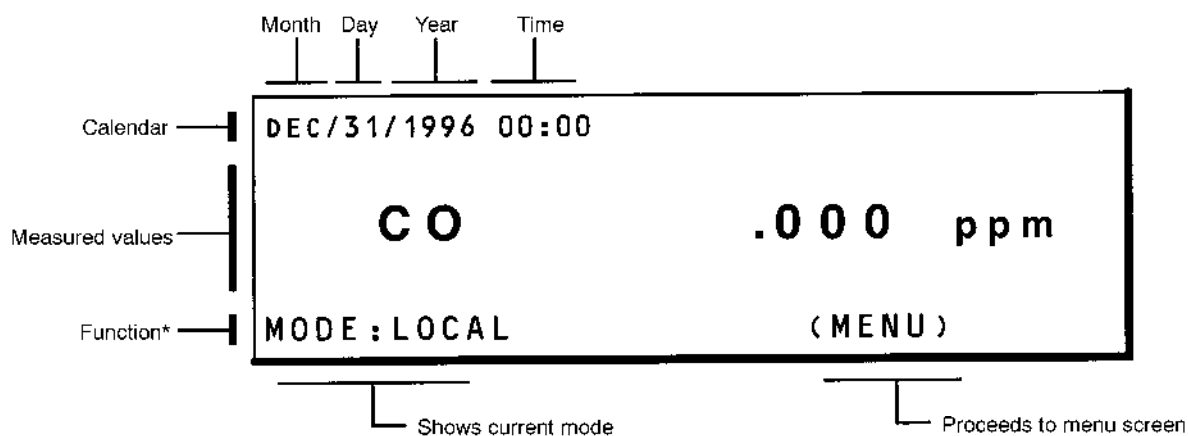
1.3.2 INC and DEC Keys

The value or information in the field on which the cursor is positioned can be toggled up and down by pressing either the INC or the DEC key. Holding the key down causes continuous toggling.

1.3.3 Function Keys

Executes the present on-screen function shown just above the key pressed. The function keys vary depending on the which menu you are in.

1.4 Description of Menu



* (): Description of function keys
Others: Current mode

Fig. 1-3 MEAS menu

There are 18 different menus in addition to the one above. The description of each menu can be found in the relevant section. Two typical examples of menus are given below:

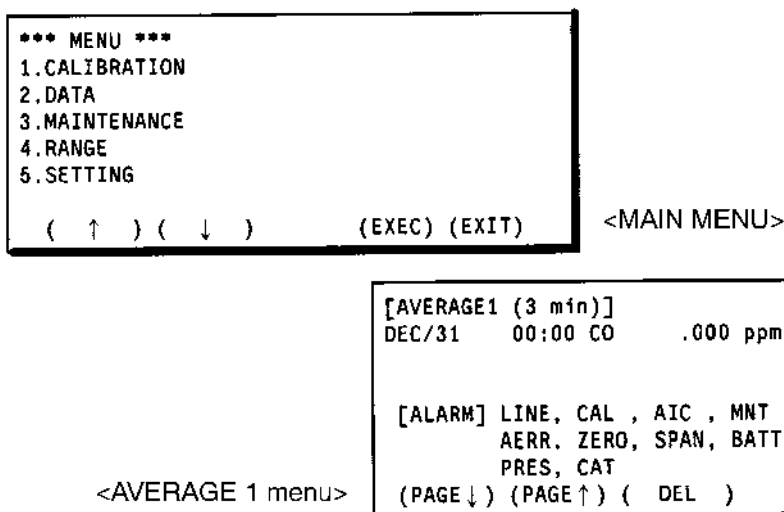


Fig. 1-4 Menu examples

1.4.1 Screen-saver Function

If no key on the front panel is pressed for 30 minutes, the screen is automatically turned off.

Pressing any key will turn on the screen. The screen saver function is disabled during AIC and during maintenance.

1.4.2 Cursor-off Function

If no key on the front panel is pressed for 10 minutes, the blinking cursor disappears. Pressing either of the cursor keys ↑ and ↓ will display the cursor.

1.5 Maintenance Switch

In operating the front panel, the PCB, AP-PNL-02 is mounted at the reverse side. The maintenance switch on this PCB, SW5: MAINTENANCE, when turned on, displays the alarm code of "MAINTENANCE" on the alarm menu and outputs the signal of "STATUS 7 (MNT)".

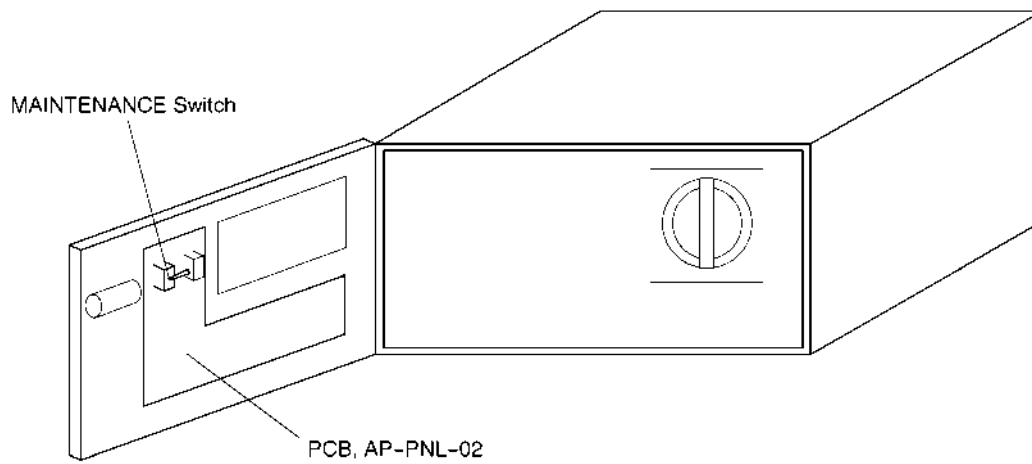


Fig. 1-5 Rear of the Front panel

2 Operations

2.1 Check Status before Turning On

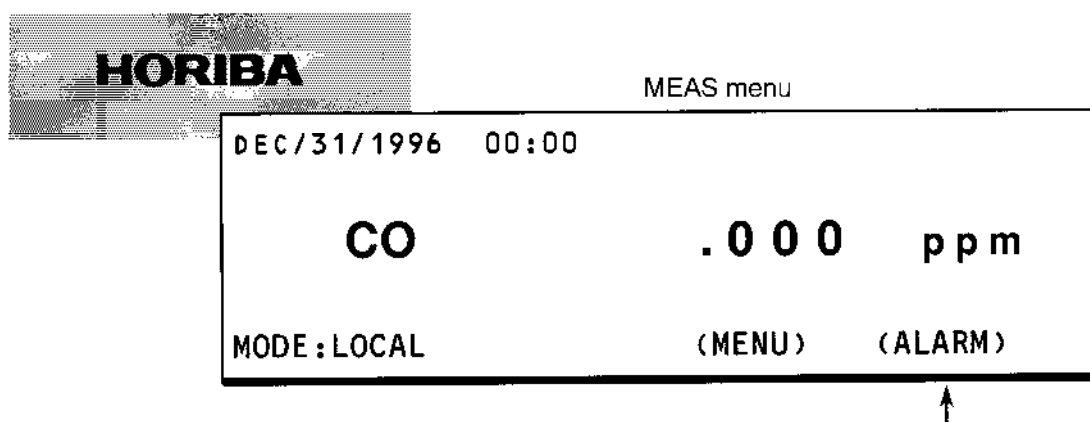
Check the ratings of your power source.
The power source requirements are shown on the plate affixed to the rear panel.

2.2 Turning the Unit On and Off

2.2.1 Turning On

1. Turning on the APMA-360

When you turn on the APMA-360, the screen will show the "HORIBA" logo, followed by the MEAS menu.



If an error has occurred in the system, the screen will start blinking at the MEAS menu. Pressing the key allows you to identify the error.

Fig. 2-1 MEAS menu

2. Warm-up

It is necessary to warm up the APMA-360 for about four hours. The ALARM ICON may (*) start blinking during this period. This will not affect the warm-up operation. If the ALARM ICON still blinks after four hours have elapsed, follow the procedures described in *Maintenance Manual*: section 6 "Alarm code:What to do". The APMA-360 does not signal when the warm-up procedure is complete. To make sure that there is enough time to get the unit thoroughly warmed up, it is recommended that the warm-up be done during off-hours, e. g. , at night.

*Blinking ALARM

The CAT ALARM is output for about one hour after the APMA-360 is turned on.

3. Displaying the MAIN MENU

Pressing the MENU key at the MEAS menu will invoke the Main Menu. Every operation is started on at the Main Menu.

At this point, you have five options to select from the menu. To display the ALARM menu, press the ALARM key at the MEAS menu.

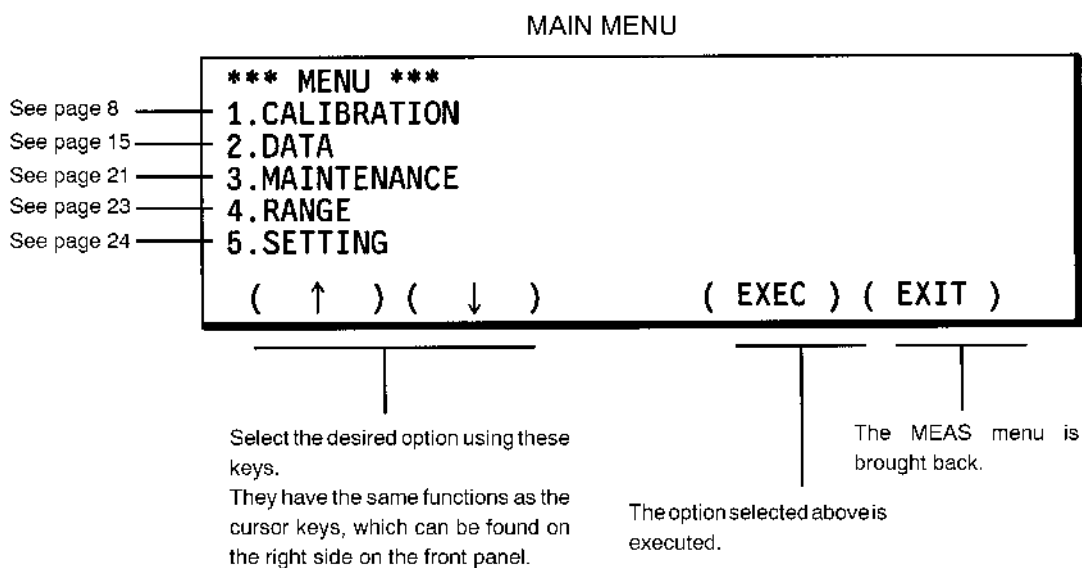


Fig. 2-2 Description of MENU

2.2.2 Turning Off

Turn off the power switch on the APMA-360.

2.3 Checking the Flow Rate

The MEAS and CAL menus are used to check the flow rate. When the flow rate is checked, no flow rate value is shown. To find the flow rate value, invoke the MONITOR (analog input) menu.

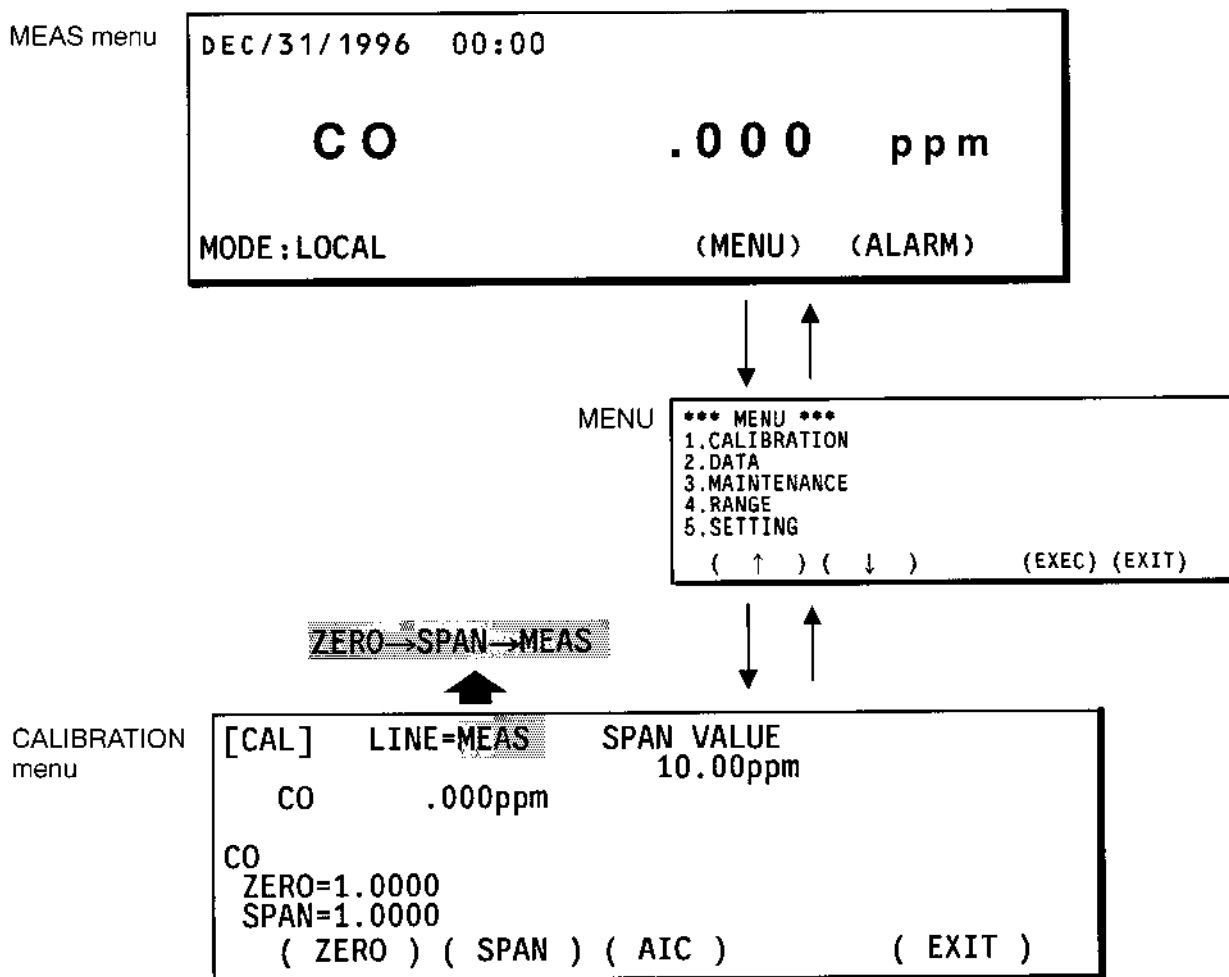


Fig. 2-3 Menu sequence for checking the flow rate

1. Go to the CAL menu via the MEAS menu.
2. Using either the INC or DEC key, change the LINE field on the CAL menu to "LINE=ZERO."
3. Bring up the MEAS menu.
Check that no FLOW ALARM is displayed on the screen. FLOW ALARM occurs when the overflow of the calibration gas is less than 1.2 ℓ /min.
When this occurs, increase the secondary pressure of the cylinder.
4. Repeat steps 1 to 3 with "LINE=ZERO" changed to "LINE=SPAN."

2.4 Calibration

In order to obtain stable and accurate data, carry out the calibration procedure both when starting a measurement and at regular intervals.

There are two types of calibration, automatic (AIC) and manual.

1. Automatic Calibration (AIC)

The AIC function executes the AIC sequence either at specified intervals – or with either an external input or command – to carry out both the zero and span calibrations automatically.

[AIC SEQUENCE]			
	[ZERO]	[SPAN]	[MEAS]
1. WAIT	3min	3min	3min
2. HOLD	1min	1min	
3. CAL	YES	YES	
(EXIT)			

2. Manual Calibration

Manual calibration refers to calibrating the APMA-360 manually at any arbitrary time.

[CAL]	LINE=MEAS	SPAN VALUE
		10.00ppm
CO	0.000ppm	
CO	ZERO=1.0000	
	SPAN=1.0000	
	(ZERO) (SPAN) (AIC)	(EXIT)

2.4.1 Automatic Calibration (AIC)

For automatic calibration (AIC), set up both the AIC sequence and the AIC function. The internal clock will automatically start the calibration. The calibration can also be started at any arbitrary time by pressing the AIC key on the CALIBRATION menu.

1. Setting up the AIC Sequence

The AIC sequence should be set up on the AIC SEQUENCE menu, as follows:

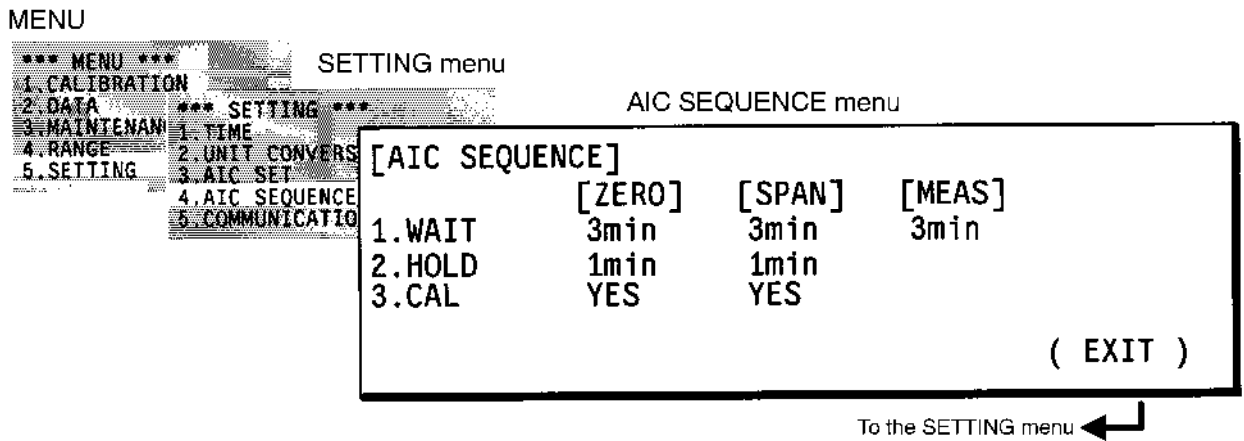


Fig. 2-4 AIC SEQUENCE menu

Selectable range

1. WAIT (ZERO, SPAN)	: 1 to 999 min	Wait time for the reading to be stabilized after gas is changed. Set the time of more than 3 minutes.
2. HOLD	: 0 to 999 min	Time for checking that the calibration has been completed.
3. CAL	: YES, NO	Determines whether or not the calibration has been performed.

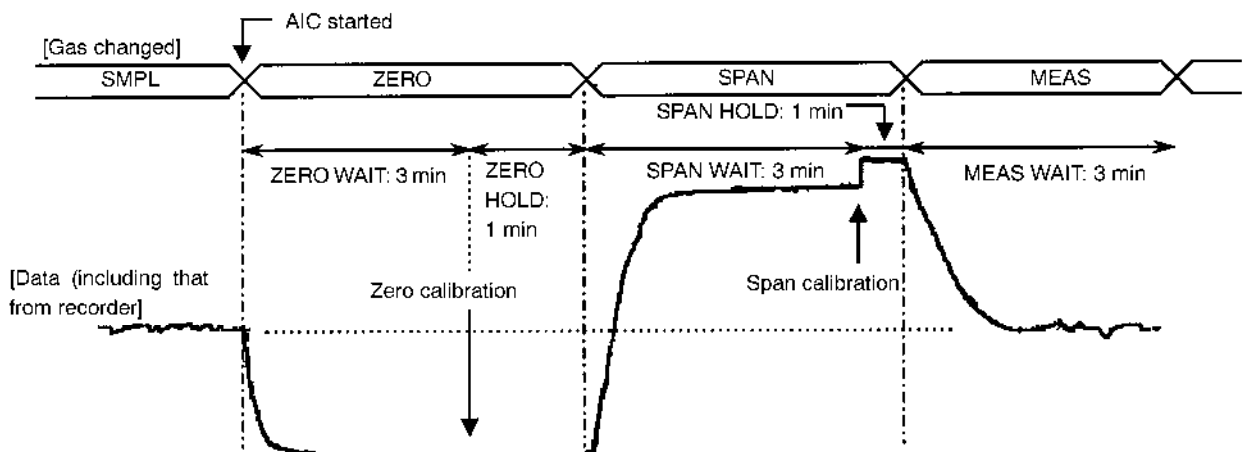


Fig. 2-5 Typical example of AIC sequence

2. Setting up the Function

The AIC function should be setup on the AIC SETUP menu, as follows:

MENU

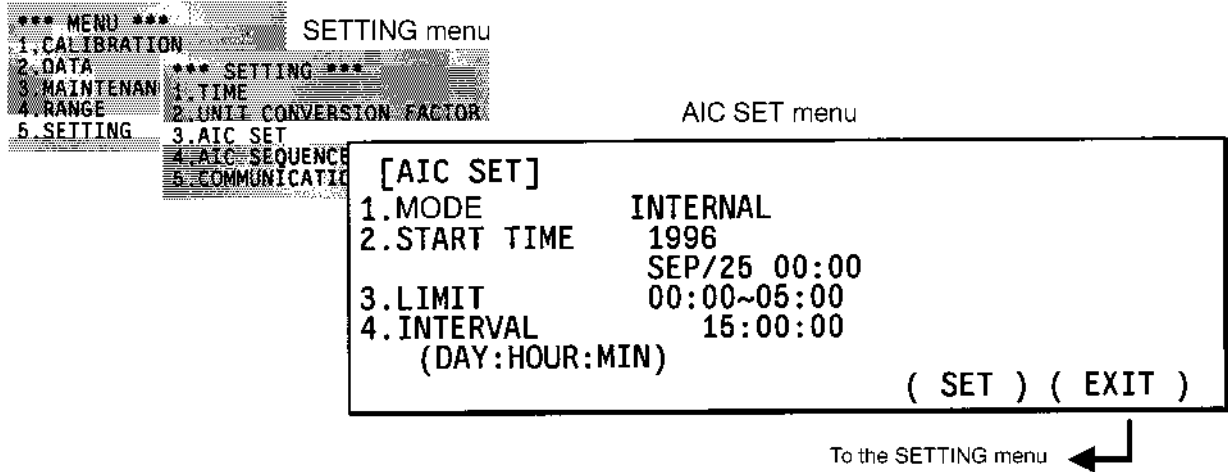


Fig. 2-6 AIC SET menu

Description of Fields

1. MODE

[Value options] **INTERNAL**, **EXTERNAL**, and **OFF**

INTERNAL: The AIC sequence is executed at time intervals specified by the internal clock. However, if the execution of the AIC sequence is already in progress, it is not restarted.

EXTERNAL: The AIC sequence is executed if: (1) the AIC input in the external input/output is turned on or (2) the AIC START command is received via serial communications. However, if the execution of the AIC sequence is already in progress, this input or command is ignored.

OFF: The AIC sequence is not executed unless the AIC key has been pressed on the CAL menu.

2. START TIME

[Value options] Year: 1992 to 2091, Month: 01 to 12, Day: 01 to 31,
Hour: 00 to 23, Minute: 00 to 59

This field sets the time to start the next AIC sequence. The AIC sequence is started if the internal clock reaches or exceeds this value.

- This field is only shown if **INTERNAL** is set in the **MODE** field.
- When the AIC sequence is started, its setup is changed to the future time advanced by the value specified the **INTERVAL** field. If this time does not fall within the range specified in the **START RANGE** field, it is adjusted so as to fall within that range.

3. START RANGE

[Value options] 00:00 to 23:59 for each limit.

This field sets the range, which allows AIC sequence to be started.

- This field is shown only if **INTERNAL** is the **MODE** field.
- If both time limits of range are the same, the range to start the AIC sequence is assumed to be unlimited.

4. INTERVAL

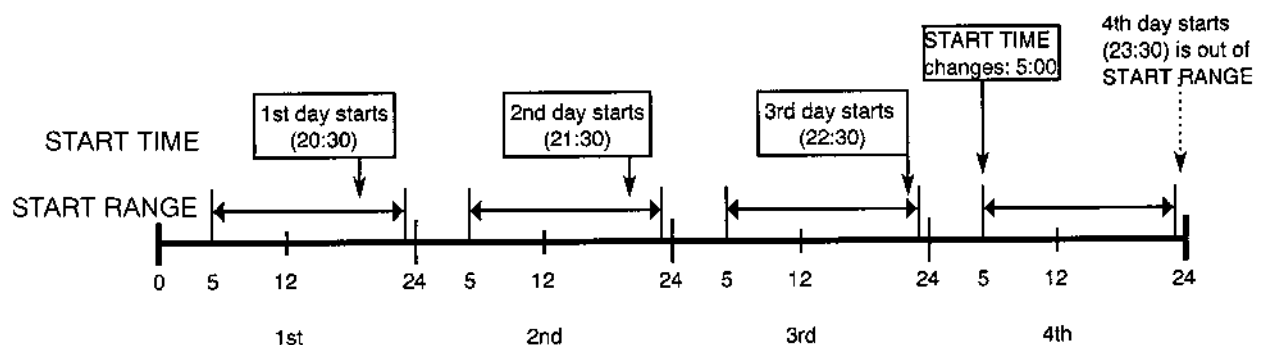
[Value options] 00 days and 00:00 to 00 days and 23:59

This field sets the time interval at which the AIC sequence is started by the internal clock.

- This field is only shown if **INTERNAL** is set in the **MODE** field.
- If the setup of the AIC sequence is changed and the time required for that sequence exceeds the value specified in the **INTERVAL** field minus 10 minutes, the value in this field is changed to the time required for AIC sequence plus 10 minutes.

Example

If AIC START INTERNAL is set to one hour; START RANGE is set to 5:00 to 23:00; and START TIME is set to 20:30;



Since START TIME deviates by one hour per day, AIC START TIME may fall out of START RANGE.

Settings

The above settings become valid when the **SET** key is pressed, and then the **SETTING** menu is brought back.

However, they do not become valid in the following cases. Enter correct values.

1. The data specified in the **START TIME** field is practically impossible.
2. The value entered in the **START TIME** field exceeds the range set in the **START RANGE** field.
3. The value in the **INTERVAL** field is less than the time required for the AIC sequence, plus 10 minutes.

Cancel

Pressing the **EXIT** key will cancel the settings and invoke the **SETTING** menu again.

2.4.2 Manual Calibration

Manual calibration is carried out via the CALIBRATION menu.

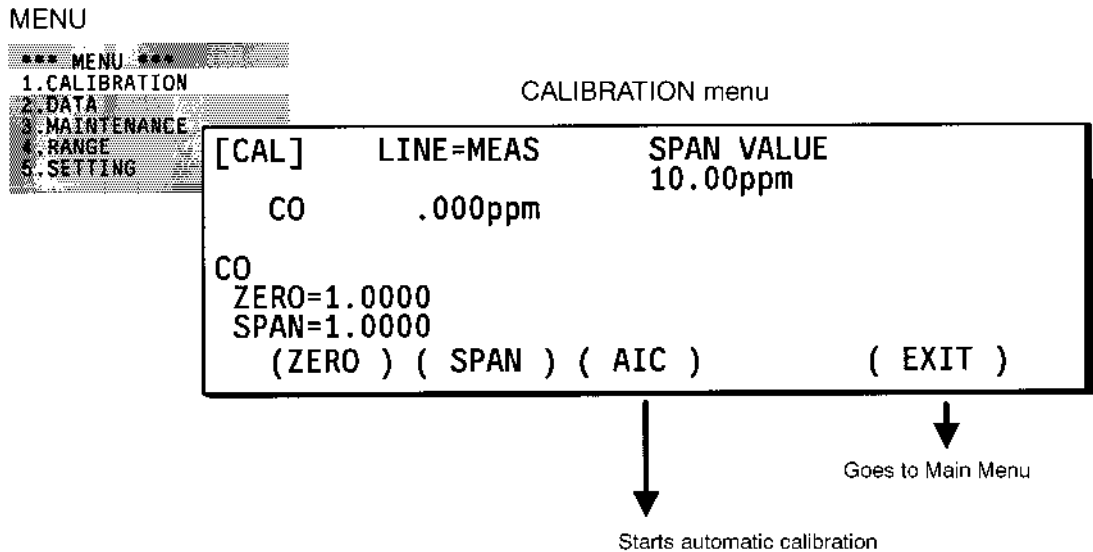


Fig. 2-7 CALIBRATION menu

Description of Fields

This menu shows both the current measured values (momentary values) and the calibration coefficients.

The following fields are available for you to enter the desired values. To enter the values, move the cursor to each field.

- LINE:** Selects the line used to introduce external gas. The line is changed five seconds after this field is set.
[Value options] **MEAS**, **ZERO**, **SPAN**, and **SPAN 2***
- CONC:** Sets the concentration of span gas. This value is required to perform the span calibration. Different values may be entered for the **MEAS**, **SPAN**, and **SPAN 2** line. For AIC use, input the span gas concentration for **SPAN**.
[Value range] .0000 to 9999
- ZERO:** Sets the zero calibration coefficient. The initial value** is 0.
[Value range] .50000 to 2.0000
- SPAN:** Sets the span calibration coefficient. The initial value is 1.0000. [Value range] .50000 to 2.0000

Calibration is performed in accordance with the procedure below:

*SPAN 2 is optional.

**The initial value means the value set at the factory and is generally called the default value.

ZERO Calibration

The **ZERO** key functions only when **MEAS** or **ZERO** is set in the **LINE** field.

1. Set up the APMA-360 and the gas cylinders so that the zero calibration gas is introduced by setting either **MEAS** or **ZERO** in the **LINE** field.
2. Set either **ZERO** or **MEAS** in the **LINE** field and then introduce the zero calibration gas.
3. Wait for the measured value (momentary value) to be stabilized.
4. Press the **ZERO** key. "ZERO" will blink for about 10 seconds.
Subsequently, the zero calibration coefficient will be calculated and then updated with **ZERO** stopped from blinking.

Span Calibration

The **SPAN** key functions only when **MEAS**, **SPAN**, or **SPAN 2*** is set in the **LINE** field.

1. Set up the APMA-360 and the gas cylinders so that the span calibration gas is introduced by setting **MEAS**, **SPAN**, or **SPAN 2** in the **LINE** field.
2. Set either **SPAN** or **MEAS** in the **LINE** field and then introduce the span calibration gas.
3. Wait for the measured value (momentary value) to be stabilized.
4. Press the **SPAN** key. "SPAN" will blink for about 10 seconds.
Subsequently, the span calibration coefficient will be calculated and then updated. The "SPAN" icon will stop blinking.

Exiting the Calibration

Press the **EXIT** key to go back to the menu. However, the **EXIT** key functions only when **ZERO** or **SPAN** is blinking.

Note▶▶ If you wish to abort the calibration:

If either "ZERO" or "SPAN" starts blinking as result of either the ZERO or SPAN key having been pressed, press that key again. The calibration will be aborted.

If the calibration is accidentally aborted:

If either "ZERO" or "SPAN" starts blinking as the result of either the ZERO or SPAN key having been pressed, the AIC sequence will be started with either the internal clock signal or an external AIC start signal, and then the calibration will be aborted.

If calibration error occurs:

If the calibration coefficient exceeds range in which it may be specified, it will not be updated and will start blinking – generating a calibration error. Carry out the calibration procedure again. If this error still occurs, take actions as described in Maintenance Manual: section 6 "Alarm code:What to do".

* SPAN 2 is optional.

2.5 Measurement

After the calibration is completed, the measurement procedure will start.

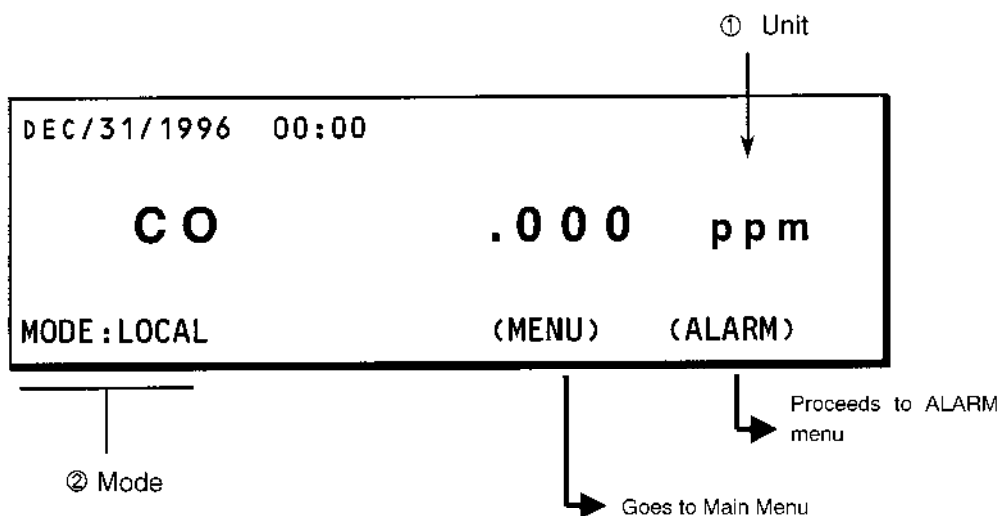


Fig. 2-8 MEAS menu

Description of Fields

This menu allows you to set the following two fields:

1. UNIT

[Value options] ppm (ppb) and mg/m^3 ($\mu\text{g}/\text{m}^3$)

2. MODE

[Value options] LOCAL and EXT

LOCAL: Various operations and setups can be via done the panel of the APMA-360. "LOCAL" blinks.

EXIT: Various operations and setups can be done via external input/output or serial communications.

You can toggle between these two modes and data can be read out in either mode.

3 Data Processing

3.1 Average

The average is calculated by accumulating the measured (momentary) value every second and then dividing the cumulative value by number of measured (momentary) values at the end averaging operation. Averages previously stored can be accessed.

MENU

```

*** MENU ***
1. CALIBRATION
2. DATA
3. MAINTENANCE
4. RANGE
5. SETTING
  
```

DATA menu

```

*** DATA ***
1. AVERAGE1 (3min)
2. AVERAGE2 (30min)
3. AVERAGE3 (3hr)
4. INTEGRATION (1hr)
5. MOVING AVERAGE (3hr)
  
```

AVERAGE1 menu

```

[AVERAGE1(3 min)]
DEC/31 00:00 CO .0000 ppm

[ALARM] LINE, CAL, AIC, MNT, POWR
AERR, ZERO SPAN, BATT, FLOW
PRES, CAT
(PAGE ↓)(PAGE ↑)( DEL ) ( EXIT )
  
```

Clears all data

Returns to DATA menu

Fig. 3-1 AVERAGE1 menu

3.1.1 Types of Averages

The average is displayed in one of the following three different time units. Since the instrument automatically determines which unit is used, you do not need to perform any further operation for this.

1. AVERAGE 1 (3 min)
2. AVERAGE 2 (30 min)
3. AVERAGE 3 (3 h)

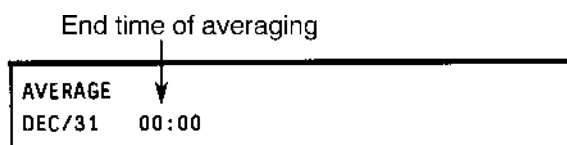
3.1.2 Maximum Number of Averages

The maximum number of averages that can be follows:

1. AVERAGE 1 (3 min) : 1000 numbers
2. AVERAGE 2 (30 min) : 1000 numbers
3. AVERAGE 3 (3 h) : 100 numbers

If the number of averages exceeds these limits, the values are deleted chronologically-starting with the oldest one. Averages previously stored can be accessed using the **PAGE ↓** and **PAGE ↑** keys.

3.1.3 Start and End of Averaging



The start and end time of averaging is entirely controlled based on the internal clock time.

If any average at the same time was already stored when an average is being stored, the existing average is overwritten by the new one.

Note▶▶▶ *If power failure occurs or the internal clock is advanced, no measurement is carried out during such a period. If no data is obtained during the averaging period-due to power failure or clock time correction-no average stored.*
If the internal clock time is delayed, the APMA-360 performs the following operation-depending on how much the time is delayed:
 (1) *If the corrected time is the start time for current averaging or later, the averaging operation continues.*
 (2) *If the correct time is earlier than the start time for current averaging, the averaging operation is canceled up to now and then newly started.*

3.1.4 Description of ALARM Codes

No.		
1	LINE:	LINE is not in the MEASURE state (including WAIT time for MEASURE in AIC sequence).
2	CAL:	Calibration has been completed.
3	AIC:	AIC has been completed.
4	MNT:	Maintenance has been completed.
5	POWR:	Power is turned on.
6	AERR:	The number of values is too small.
7	ZERO:	An error has occurred during zero calibration.
8	SPAN:	Error during span calibration.
9	BATT:	Battery for memory backup has run out.
10	FLOW:	Pump performance has deteriorated or the pump has stopped.
11	PRES:	Specified pressure has not been attained.
12	CAT:	Temperature error occurred in catalyzer unit.

3.1.5 Deleting the Averages

To delete the stored averages, press the **DEL** key.
You will be prompted to confirm your selection on the screen.



(YES) (NO)

(YES) : All the averages are cleared.

(NO) :Cancel.

3.2 Cumulative Value

The value measured every second (momentary value) divided by the average time is integrated; at the end of integration, the result is displayed as the cumulative value.

Cumulative values stored previously can be accessed.

MENU

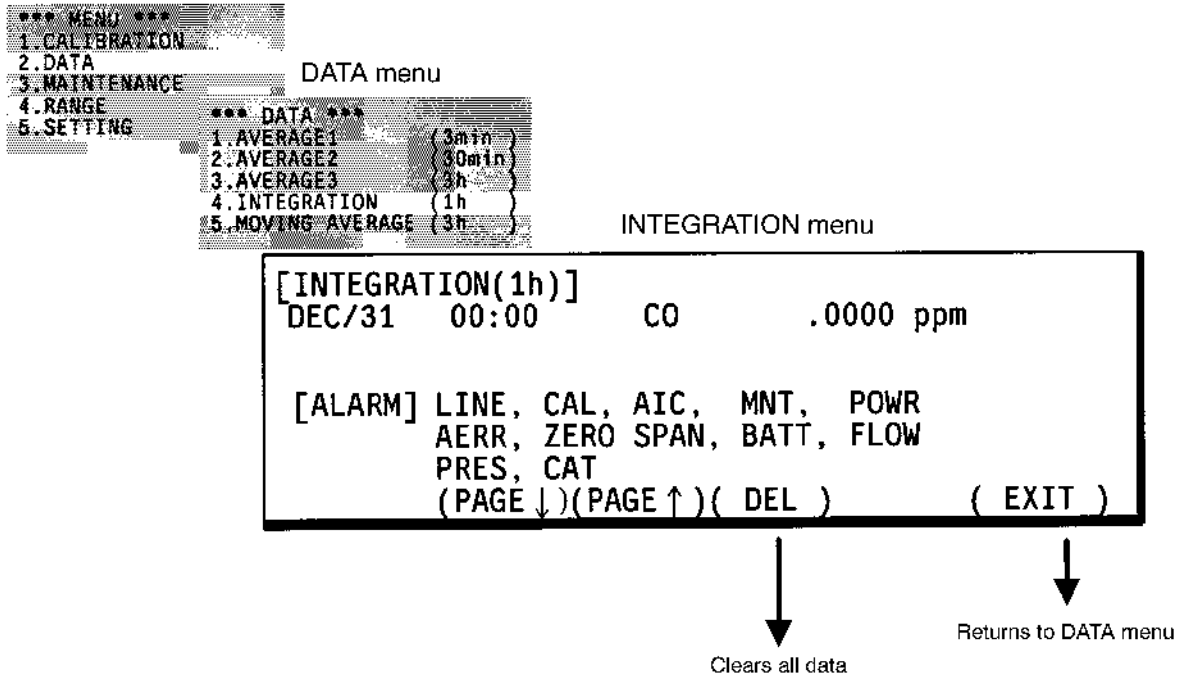


Fig. 3-2 INTEGRATION menu

3.2.1 Accumulation Time and Maximum Number of Values

Accumulation time : 1 hour

Maximum number of values : 1000

If the number of averages exceeds these limits, the values are deleted chronologically-starting with the oldest one. Past averages can be accessed using the **PAGE ↓** and **PAGE ↑** keys.

3.2.2 Start and End of Integration

The start and end of integration is controlled by either (1) turning on the **RST** (integration reset) input at the external input/output or (2) by receiving the **INTEG RESET** command via serial communications. This input or command reception is called external integration reset. If the external integration reset occurs, the internal clock time is corrected to the nearest integration end/start time. If this corrected time is the expected time for ending the current integration, then the integration is finished and the next integration is started. However, if no external integration reset occurs exceeding three minutes after the end of the current integration, then the integration is finished and the next integration is started. In this case, the internal clock time is not corrected.

During the AIC or maintenance, the measured (momentary) value just before it was started is assumed to continue when the cumulative value is calculated. In addition, the relevant **ALARM** code (AIC or MNT) is marked to show this state.

If any value at the same time exists when a cumulative value is being stored, the existing value is overwritten by the new one.

Note▶▶▶ *If power failure occurs or the internal clock is advanced, no measurement is carried out during such a period. If no data is obtained during the integration period—due to power failure or clock time correction—no cumulative value is stored. If the internal clock time is delayed, the APMA-360 performs the following operation depending on how much the time is delayed:*

- *If the corrected time is the start time for current integration or later, the integration operation continues.*
- *If the correct time is earlier than start time for current integration, the integration operation is canceled up to now and then newly started.*

3.2.3 Description of ALARM Codes

No.		
1	LINE:	LINE is not in the MEASURE state (including WAIT time for MEASURE in AIC sequence).
2	CAL:	Calibration has been completed.
3	AIC:	AIC has been completed.
4	MNT:	Maintenance has been completed.
5	POWR:	Power is turned on.
6	AERR:	The number of values is too small.
7	ZERO:	An error has occurred during zero calibration.
8	SPAN:	Error during span calibration.
9	BATT:	Battery for memory backup has run out.
10	FLOW:	Pump performance has deteriorated or the pump has stopped.
11	PRES:	The specified pressure is not attained.
12	CAT:	Temperature error occurred in catalyzer unit.

3.2.4 Deleting the Cumulative Value

To delete the stored cumulative values, press the **DEL** key.

You will be prompted to confirm your selection on the screen.

.....
 (YES)(NO)

(YES): All cumulative values are cleared.

(NO): Cancel.

3.3 Moving Average

The moving average from the last one hour to the present time is sequentially displayed on the MOVING AVERAGE menu as time elapses.

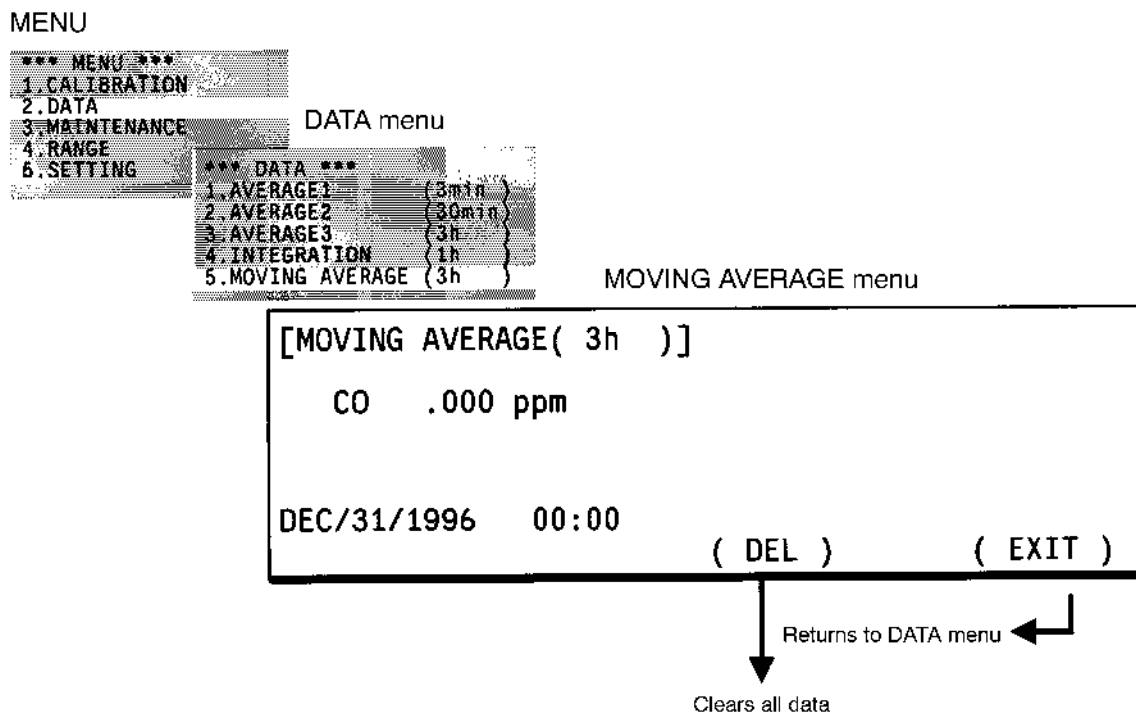


Fig. 3-3 MOVING AVERAGE menu

During the AIC or maintenance, the measured (momentary) value just before it was stored is assumed to continue when the moving average is calculated. No measurement occurs during power failure.

DEL key: Clears the data.

Pressing the **DEL** key will prompt you to confirm your selection.

```

.....
( YES )( NO )
    
```

(YES) : The data is cleared.

(NO): Cancel.

4 Features

4.1 Analog Output

The analog output is used to adjust the externally-connected units, such as a recorder. The analog output can be set either to zero or to a full-scale value via the ANALOG OUTPUT menu, as follows:

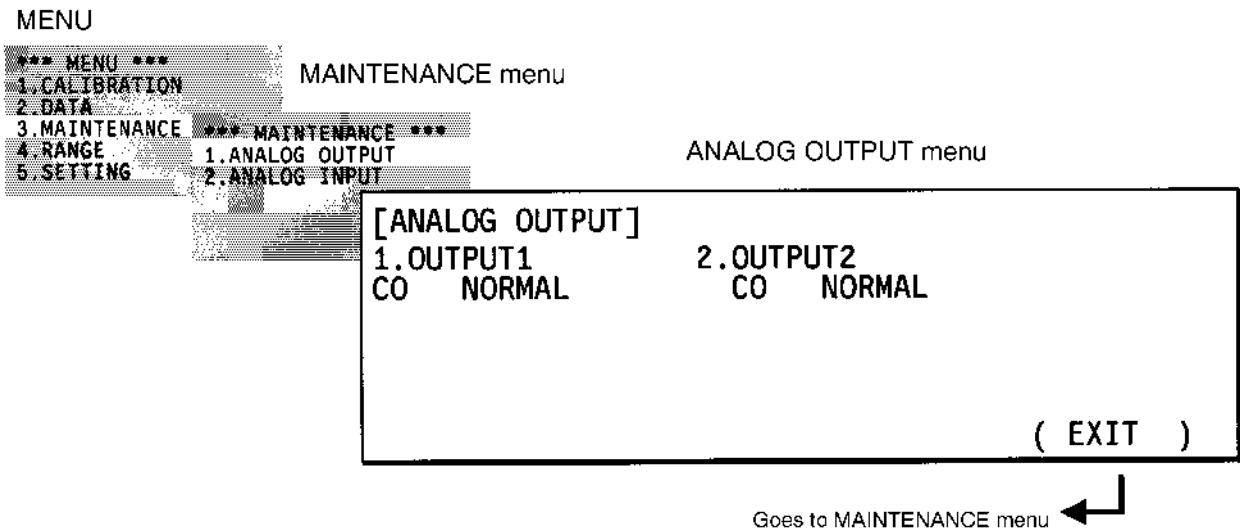


Fig. 4-1 ANALOG OUTPUT menu

This menu has the following fields to be set.

- ZERO** : Outputs zero (e.g., 4 mA).
- FULL** : Outputs a full-scale value (e.g., 20 mA).
- NORMAL** : Outputs the measured value.

If the APMA-360 is allowed to stand for more than 10 minutes after **ZERO** or **FULL** is selected, all the fields are set to **NORMAL**.

Operation Procedure

1. Move the cursor to the desired field. Using the **INC** or **DEC** key, choose **ZERO**, **FULL**, or **NORMAL**.
2. After adjusting the connected units, set all the fields to **NORMAL** and then press the **EXIT** key.

4.2 Monitor (Analog Input)

The MONITOR [ANALOG INPUT] menu allows you to see the states of analog signals. This menu is as follows:

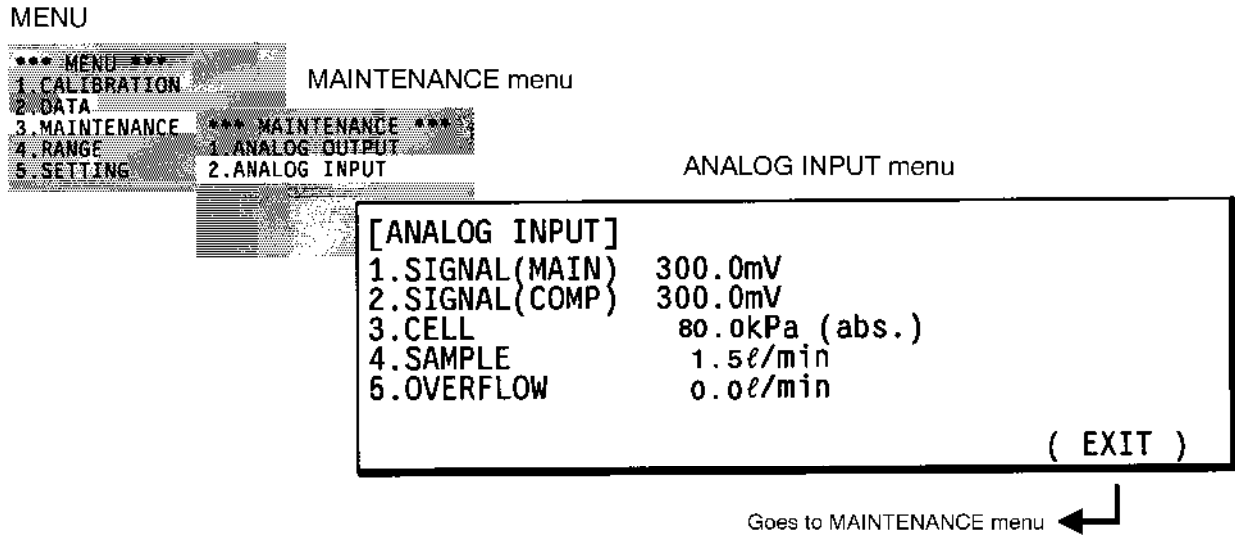


Fig. 4-2 MONITOR [ANALOG INPUT] menu

The MONITOR [ANALOG INPUT] menu is used to check the data and is not to be used for setup purposes.

- 1. **SIGNAL (MAIN):** Measured voltage value for CO (includes interference component valve)
Between 1500 mV and 3000 mV at full-scale gas under the maximum concentration range.
- 2. **SIGNAL (COMP):** Measured voltage value for interference component valve
- 3. **CELL:** Pressure in cell
(Present air pressure/1013 x 100 - 20) ± 4 kPa (normal value)
- 4. **SAMPLE:** Flow rate of sample
(1.5 ± 0.3 l/min) (normal value)
- 5. **OVERFLOW:** Flow rate of sample gas overflow
(1.2 l/min) (normal value)

4.3 Setting the Ranges

The ranges are set via the RANGE menu, as follows:

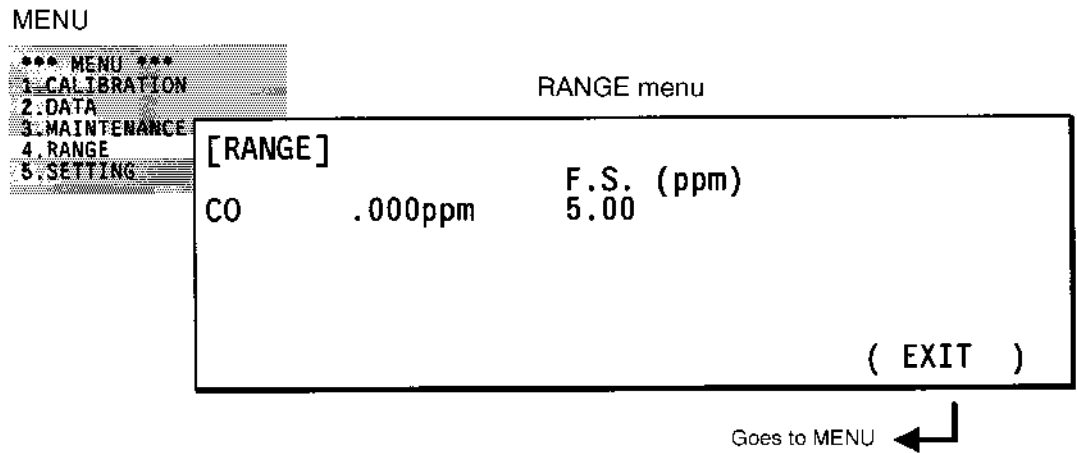


Fig. 4-3 RANGE menu

Set the ranges by changing the values in the F. S. fields. If **AUTO** is selected, the AUTO-RANGE mode becomes valid.

In the AUTO-RANGE mode, the range is automatically changed within the allowed limits so that no overflow occurs.

Operation Procedure

1. With the cursor keys, position the cursor on the desired field.
2. Use the **INC** or **DEC** key to choose the desired range.

4.4 Setting the Internal Clock

The time for the internal clock is set via the TIME menu, as follows:

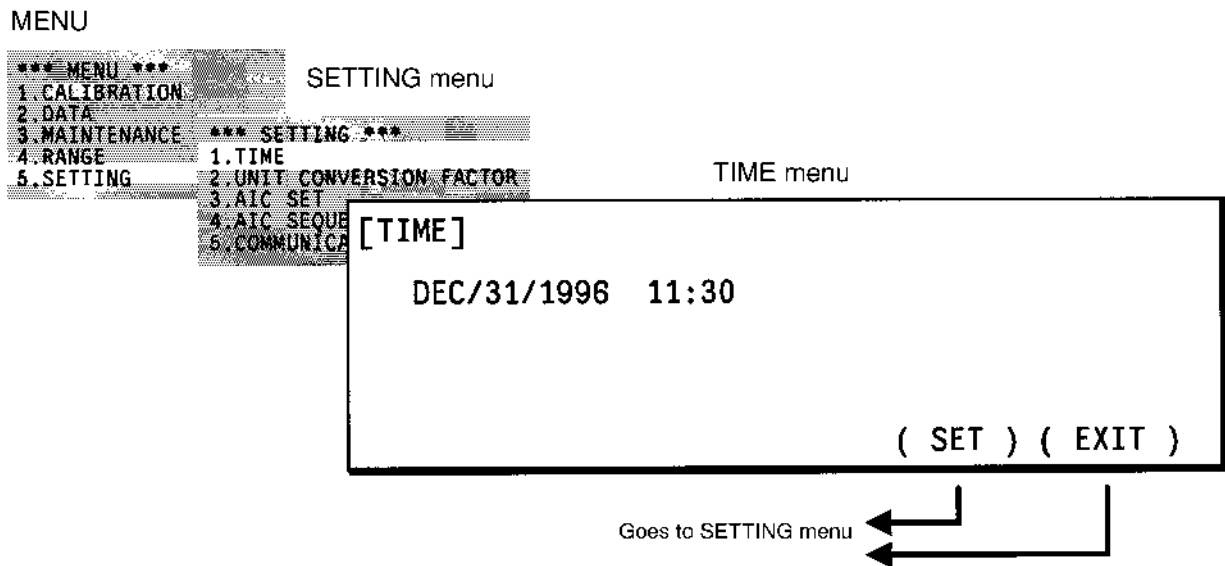


Fig. 4-4 TIME menu

Note▶▶▶ If the internal clock is set to delayed time, the averages and cumulative values for the delayed part are automatically cleared.

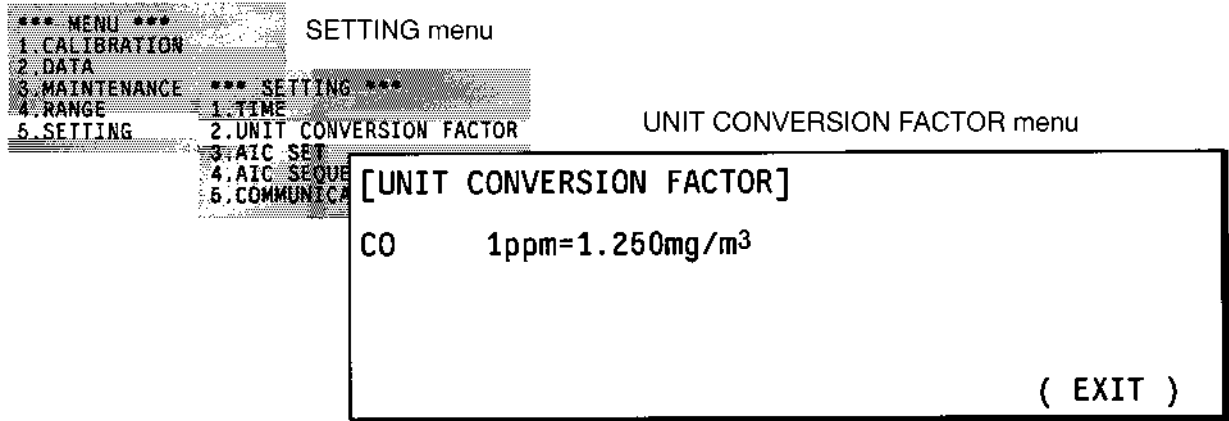
Operation Procedure

1. With the cursor key, position the cursor on the desired field.
2. Use the INC or DEC key to change the value.
3. Press the **SET** key to establish your selection.
You will be brought back to the SET menu.
If you press the **EXIT** key, the internal clock is not set to the new time. If the value is changed to any date or time that is practically impossible, the **SET** key becomes invalid.

4.5 Setting the Unit Conversion Coefficient

If the unit is changed via the MEAS menu, the concentration is converted using a unit conversion coefficient. The unit conversion coefficient is specified via the UNIT CONVERSION FACTOR menu, as follows:

MENU



The values shown on the screen are the initial values.

Goes to SETTING menu ←

Fig. 4-5 UNIT CONVERSION FACTOR menu

Operation Procedure

1. With the cursor keys, position the cursor on the desired field.
2. Use the **INC** or **DEC** key to change the value.
3. If you press the **EXIT** key, the selected unit-conversion coefficient is established and you are brought back to the SETTING menu.

NOTE 

5 Maintenance

Before maintenance works, always turn on the maintenance switch, and confirm the signal of "STATUS 7" is output.

For the maintenance switch, refer to "1.5 Maintenance Switch".

5.1 Checking the Residual Pressure of Calibration Gas (Once Every Two Weeks) and Replacing the Calibration Gas Cylinder

Replace the Calibration Gas Cylinder when:

- the primary pressure on the regulator is no higher than 980 kPa (10kgf/cm²)
- the specified service life of the cylinder has run out.

Replacement Procedure

1. Firmly close the main valve on the gas cylinder.
2. Remove the regulator.
3. Install a new cylinder. Mount the regulator on the cylinder.
4. Open the main valve and check that the regulator shows the specified primary pressure.

Primary pressure should be about 9800 kPa (100 kgf/cm²).

5.2 Replacing the Sample-filter Element

The sample filter is used to clean the sample gas and protect the analyzer. As the sample filter is used over a long period of time, the flow rate of the sample gas will decrease.

5.2.1 Replacing the Filter Element

Replacement Frequency

The replacement frequency varies depending on sample conditions, but in principle, it is recommended that you replace the sample filter every two weeks.

5.2.2 Replacing the O-ring and the Gasket

Replacement Frequency

The replacement frequency varies depending on sample conditions, but in principle, it is recommended that you replace them every one year.

Replacement Procedure

1. Pull the knob and then open the panel.
2. Turn the filter cover counterclockwise and then remove.
3. Remove the gasket and the sample filter element.
4. Fit a new sample filter element or a new O-ring and gasket.
5. Mount the filter cover.
6. Close the front panel.

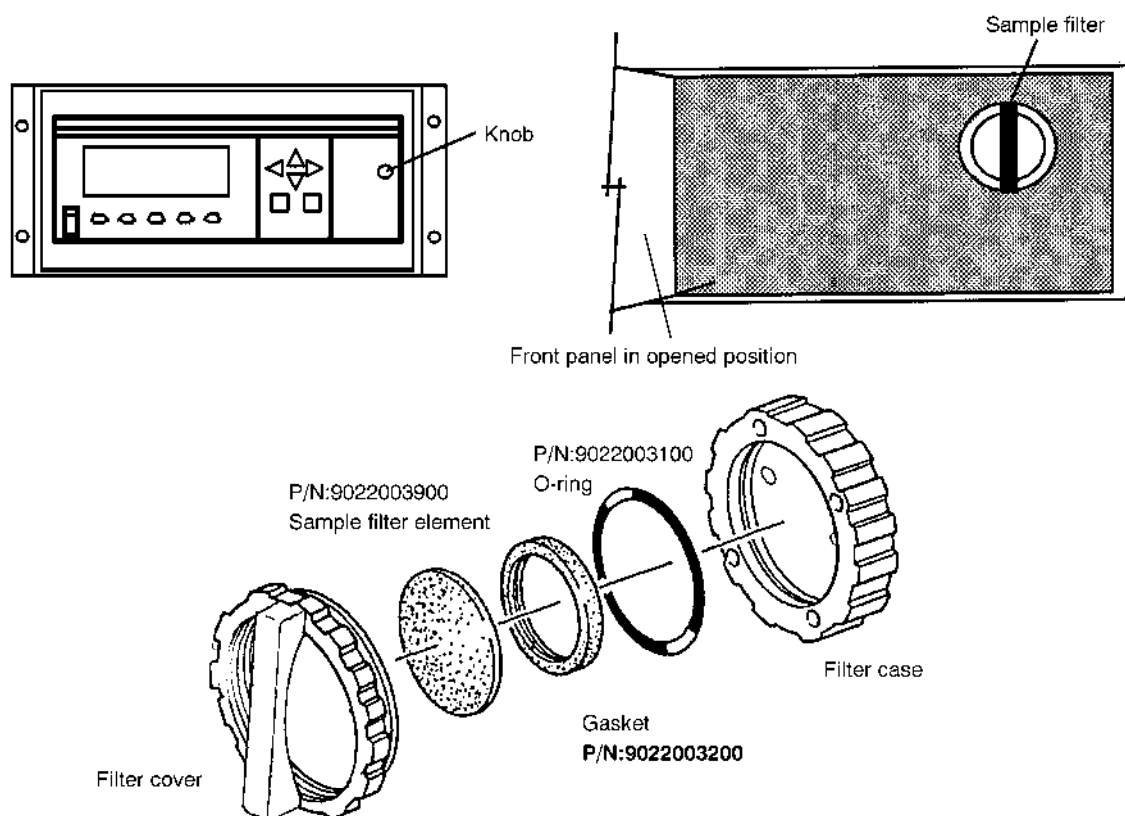


Fig. 5-1 Exploded view of sample filter

6 References

6.1 Measurement Principle

As shown in the diagram below, the APMA-360 uses the modulation effect that occurs with infrared absorption of sample gas itself when sample gas and zero gas are alternately sent to its cell at a certain flow rate using a solenoid valve which is actuated at a frequency of 1 Hz.

Unless the gas concentration of the measured component is changed in the cell, the output from the detector essentially becomes zero, therefore, the zero drift does not occur. Since the APMA-360 also uses the AS-type detector, extremely high-accuracy results are obtained without any effect of the interference component.

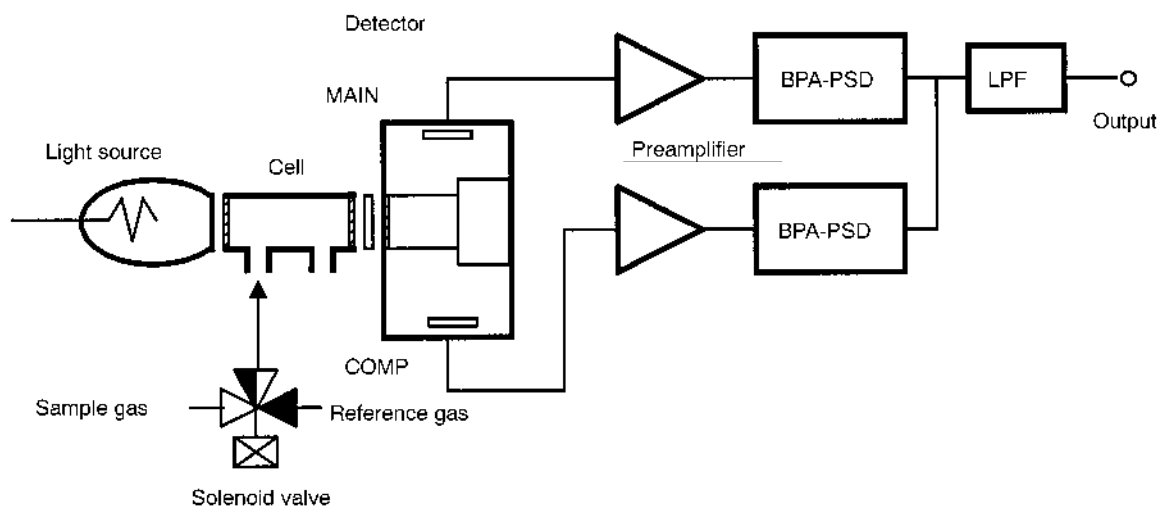
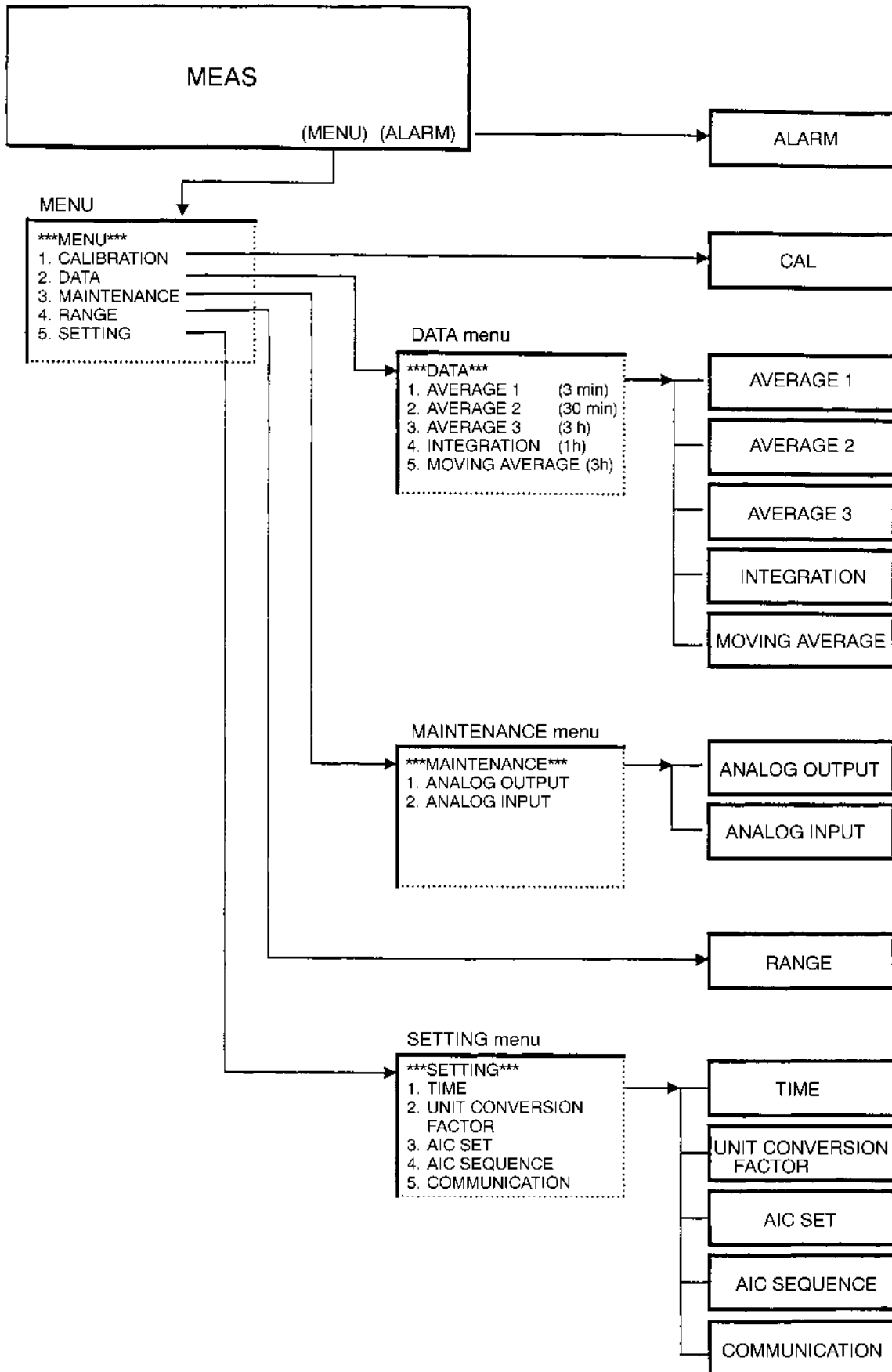


Fig. 6-1 NDIR Measurement principle

6.2 Specifications – Standard

Model:	APMA-360
Principle:	Cross-flow-modulation type non-dispersive infrared absorptiometry
Ranges:	Standard: 5, 10, 20, 50 ppm, or 10, 20, 50, 100 ppm auto-switching, remote switching possible Optional: 4 ranges between 0 and 100 ppm, maximum range expansion: 10 times minimum range: 5 ppm
Lower detection limit: (L. D. L.)	0.05 ppm (2 σ) (5 ppm range)
Repeatability:	Within $\pm 1.0\%$ full scale
Accuracy of graduation:	Within $\pm 1.0\%$ full scale
Zero drift:	Larger one of ± 0.1 ppm per day or $\pm 1.0\%$ of fullscale value per day Larger one of ± 0.2 ppm per week or $\pm 2.0\%$ of fullscale value per week
Span drift:	$\pm 2.0\%$ of full-scale value per day $\pm 3.0\%$ of full-scale value per week
Response time T_{90} :	Within 60 seconds from system inlet
Interference effect:	± 0.4 ppm for 2% H ₂ O and 1000 ppm CO ₂
Input/output:	0 to 1 V, 0 to 10 V, or 4 to 20 mA momentary value, cumulative value, or average Includes contact-point input/output, range, mode, external reset, telemeter fault, and ALARM. RS-232C (optional)
Sampling flow rate:	Approx. 1.5l/min
Working temperature range:	5 to 40 °C
Working humidity range:	Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40°C
Altitude:	Altitude up to 2000 m
Power source:	100, 110, 115, 120, 220, 230, 240 VAC (as specified) 50 Hz/60 Hz
Power consumption:	170 VA for normal operation
External dimensions:	430 (W) x 221 (H) x 550 (D) mm (excluding front and rear extrusions)
Weight:	Approx. 20 kg

Sequences of Menus During Operations



NOTE 

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