

**Ambient CO monitor
APMA-370
Maintenance Manual**

Preface

This manual describes the maintenance of the Ambient CO monitor, APMA-370, to a person with necessary knowledge and skills.

Be sure to read this manual before using the product to ensure proper and safe operation of the instrument.

Also safely store the manual so it is readily available whenever necessary.

Product specifications and appearance, as well as the contents of this manual are subject to change without notice.

■ Warranty and Responsibility

The product delivered to you is covered by HORIBA's warranty for a period of one (1) year.

If any malfunction or damage attributable to HORIBA's 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 attributable to improper operation
- Any malfunction attributable to repair or modification by any party not authorized by HORIBA
- Any malfunction attributable to the use in an improper environment
- Any malfunction attributable to violation of the instructions in this manual
- Any malfunction attributable to operations in the manner not specified in this manual
- Any malfunction attributable to natural disasters, or accidents or mishaps not involving HORIBA
- Any deterioration in appearance attributable to corrosion, rust, and so on.
- Consumables and replacement of consumables
- Products of other companies

HORIBA shall not be liable for any damages resulting from any malfunctions of this product, any erasure of data, or any other uses of this product.

■ Trademarks

Generally, company names and brand names are either registered trademarks or trademarks of the respective companies.

Conformable Directive

This equipment conforms to the following directives and standards:



Directives:

The EMC Directives	89/336/EEC, in accordance with Article 10 (1) of the Directive
The Low Voltage Directive	73/23/EEC

Standards:

[The EMC Directive]	EN61326: 1997+A1: 1998+A2: 2001 Emission: Class B Immunity Category: Industry
[The Low Voltage Directive]	EN61010-1: 2001

Installation Environment

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

FCC Rules

■ Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

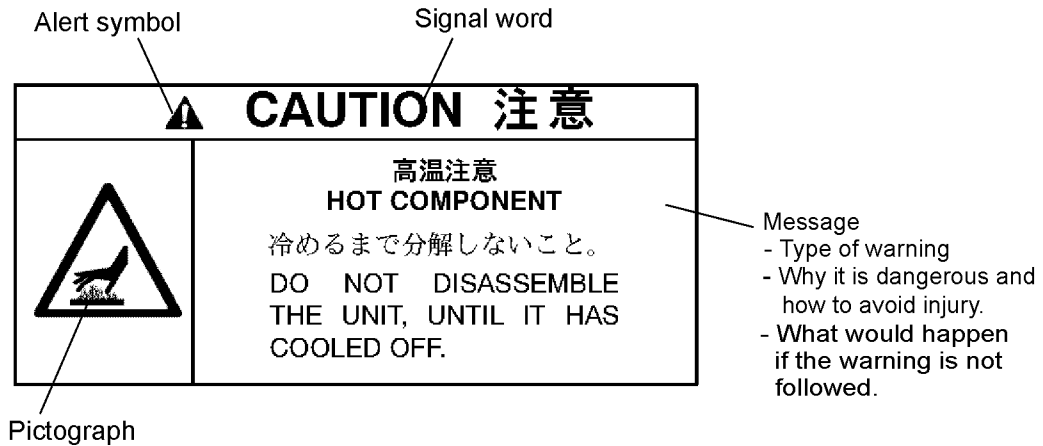
FCC label

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS : (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Safety Policy

■ Warnings and Warning Labels

We arrange warning labels on our products, and describe notes and cautions in this manual. Make sure to follow these instructions for your safety.

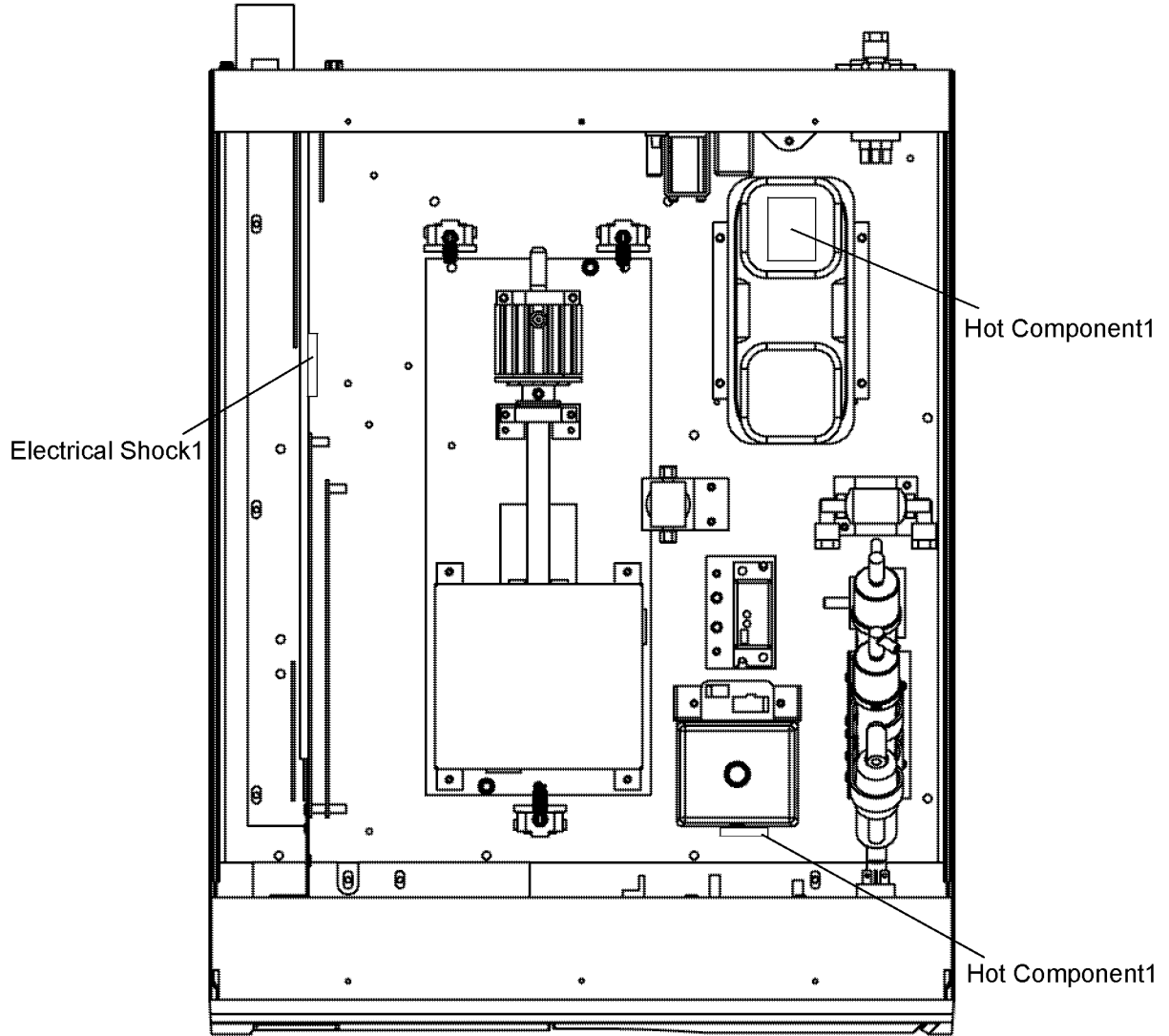


● The meanings of the signal words are as follows

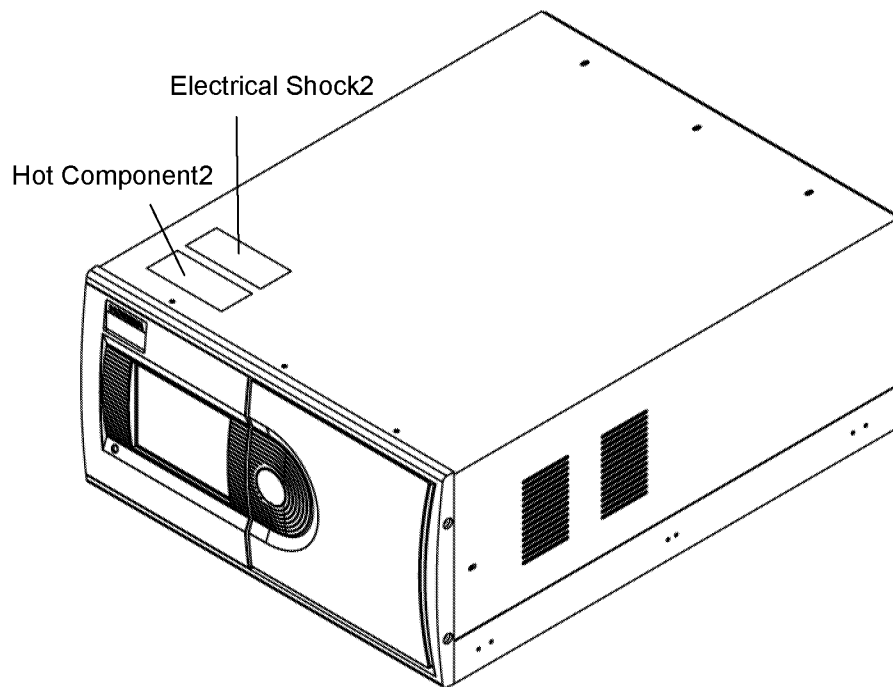
- **DANGER:**
This indicates a imminently hazardous situation which, if not avoided, could result in death or serious injury.
- **WARNING:**
This indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
- **CAUTION:**
This indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

■ Labels and Location

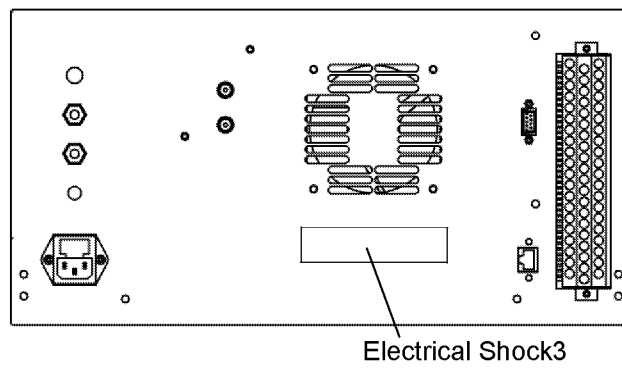
- Label location
Inside




Top




Rear




● Labels
Electrical Shock1


危険	
	<p>感電注意</p> <p>危険な電圧により、ショック、感電死をもたらします。電源をONする時は高圧コネクタをはずしていないこと。電源をOFFにして1分間待つこと</p>

DANGER	
	<p>ELECTRICAL</p> <p>DO NOT DISCONNECT HV CONNECTOR WHILE POWER IS ON. WAIT ONE MINUTE AFTER POWER IS TURNED OFF.</p>

Electrical Shock2

⚠ WARNING 警告	
	<p>感電注意 ELECTRICAL</p> <p>通電中にカバーを開けると感電することがあります。カバーを開けるときは、電源を元から切ってから行ってください。</p> <p>OPENING THE COVER WHILE POWERED ON COULD RESULT IN ELECTRIC SHOCK. BE SURE TO TURN OFF POWER PRIOR TO OPENING THE COVER.</p>

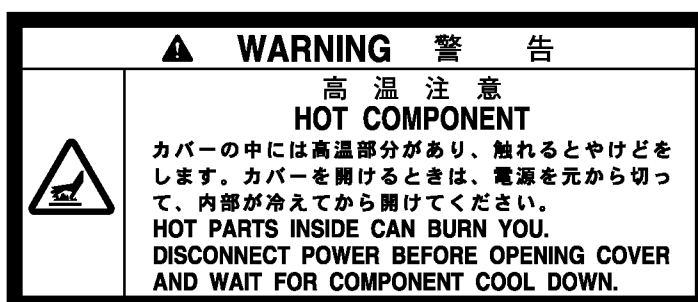
Electrical Shock3

⚠ 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>

Hot Component1



Hot Component2



■ Precautions

This instruction manual describes how to replace APMA-370 consumable parts.

The instrument inside is hot or high-voltage partly. Before opening the cover, make sure to plug off the main power cable and wait 1 hour or longer until the inside cools down.

For the safety, the works described in this book should be operated only by the service engineers who have the knowledge and skills necessary for APMA-370 maintenance.

■ Description in this manual

Notes and cautions are described in the following styles:

Note

Fix the diaphragm assembly securely, or it may cause the pump to malfunction.

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1 List of Consumables and Replacement Parts

The following table shows the consumable and replacement parts of APMA-370.

Note

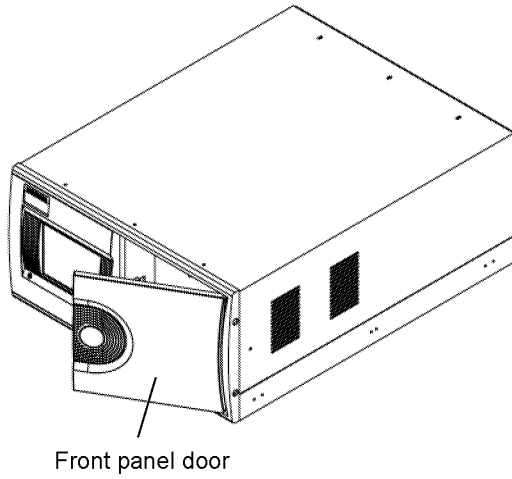
- The replacement periods shown below are given as recommended and do not assure any performance. The replacement periods of consumables may become shorter depending upon the installation environment and operating conditions.
- In order to maintain the accuracy, it is recommended that periodical maintenance and checks be performed when consumables are replaced. For information on maintenance and checks, etc., contact us.
- Consumable or replacement parts no longer required should be disposed of as industrial waste.

<i>Parts name</i>	<i>Hour-meter</i>	<i>Interval</i>
Sample filter		2 weeks
Pump diaphragm	P-1-D	2 year
Catalyzer Filling CO	CAT-1	2 year
Mist catcher BAA	MC-1	2 year
DFU filter		If necessary
Solenoid valve (Sample/Ref.-gas)	SV-2	If necessary
Pump unit (double head)	P-1-B	If necessary

You have to clean the filter sponge from the cover.

2 Preparations

1. Open the front panel door and turn OFF the power switch.



When the front panel door is open

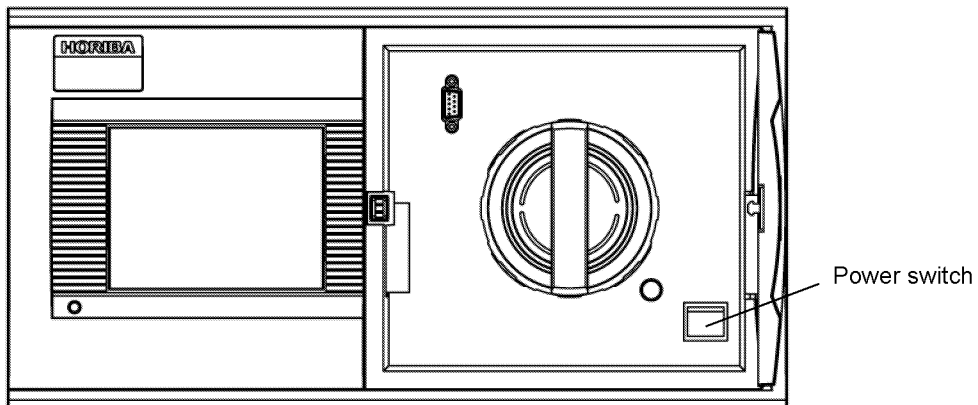


Fig. 1 Front panel

2. Unplug the power cable from the rear panel.

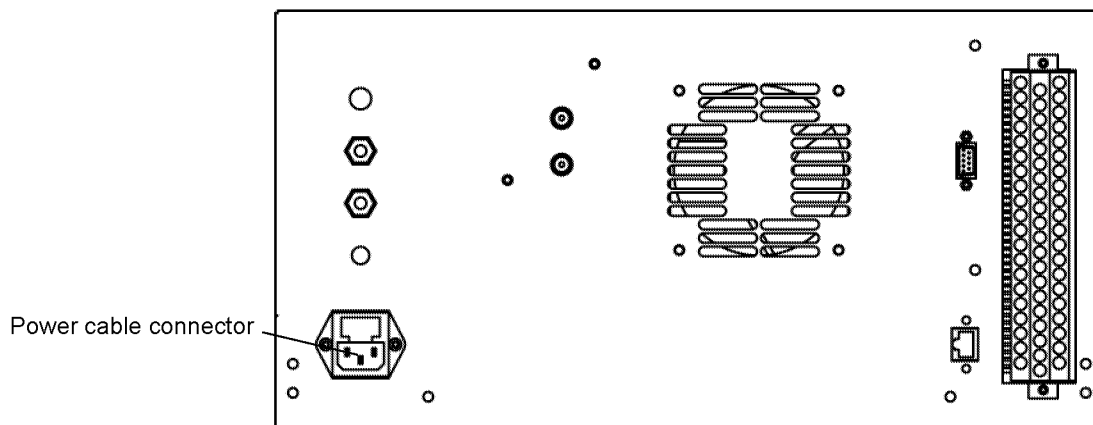


Fig. 2 Rear panel

-
3. Wait 1 hour or longer until the instrument cools down.
 4. Remove the 8 screws (M3) on the cover (shown below) and open the cover.

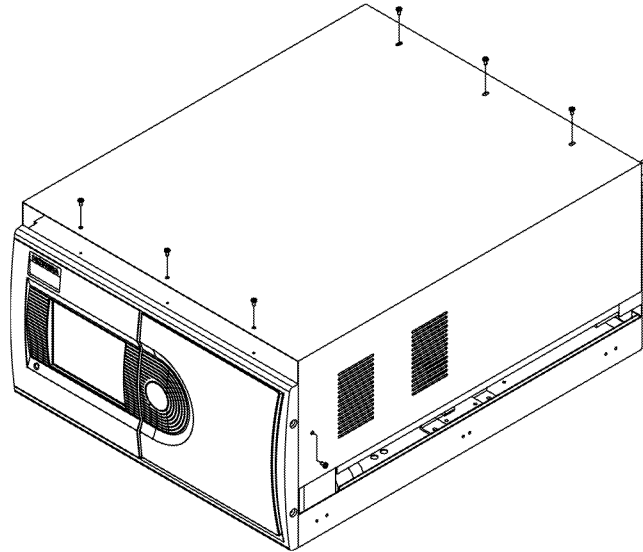


Fig. 3 Removing the cover

3 Component Arrangement

The following figure shows the component arrangement of APMA-370.

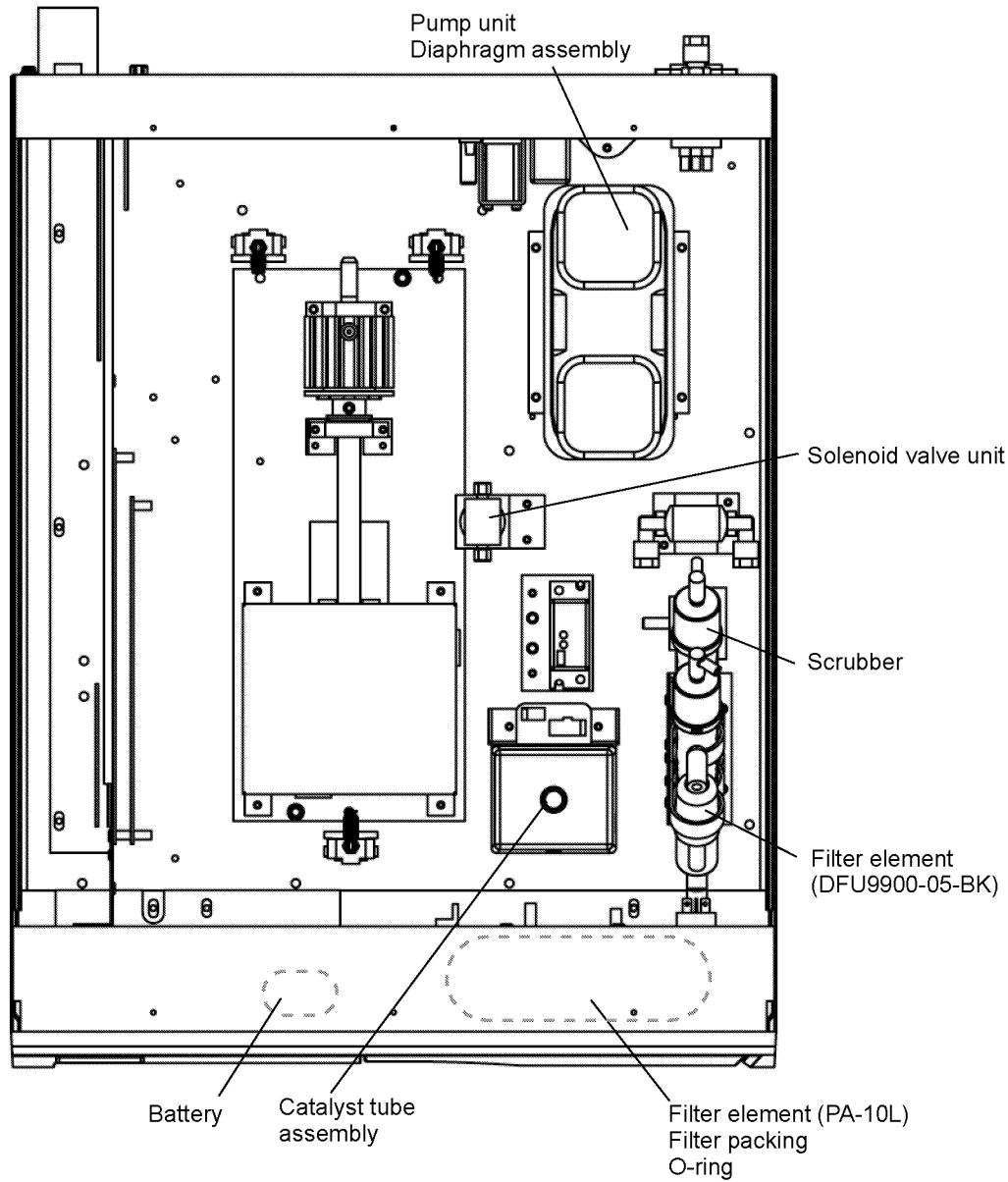


Fig. 4 Component arrangement

4 Parts Replacement

4.1 Filter element (PA-10L), filter packing, O-ring

The filter element (PA-10L) is used to purify sample gas and protect the analyzer.

If the filter element is used over a long period, the flow rate of the sample decreases.

And the filter packing or O-ring will be deteriorated with time, and it may cause troubles, such as insufficient sample flow rates.

We recommend that you replace the filter element (PA-10L), filter packing and O-ring periodically. This procedure is the same as mentioned in the APMA-370 operation manual.

Procedure

Note

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2).

1. Push the PUSH-marked area on the front panel door to open the door.

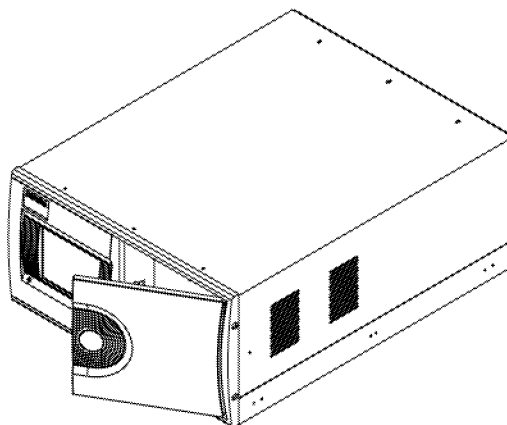


Fig. 5 Front panel door

2. Turn the filter cover leftward and then pull it out.

Front panel (with the door opened)

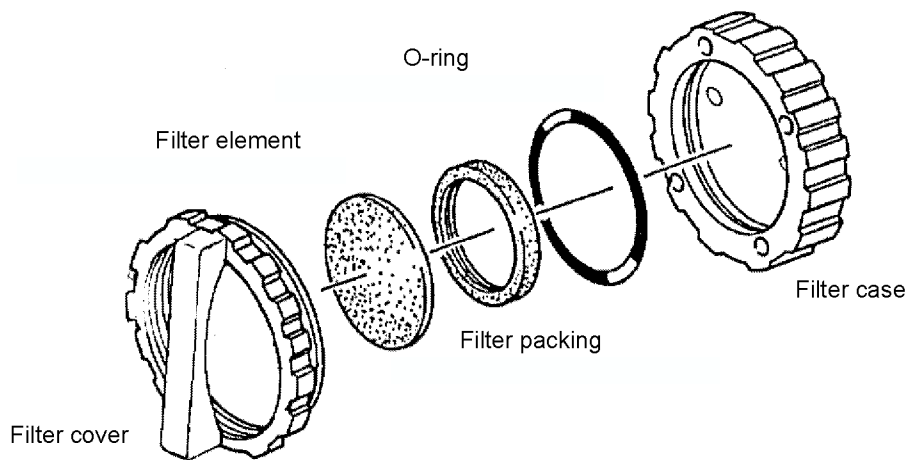
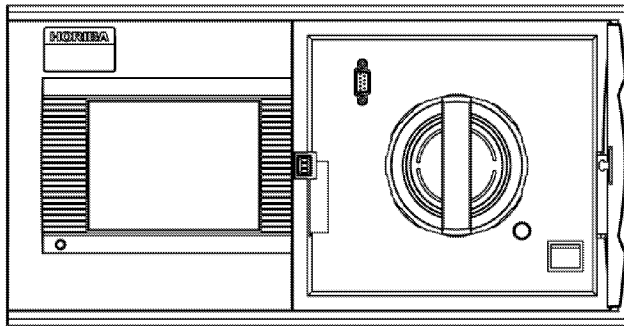


Fig. 6 Filter element, filter packing, O-ring

3. Remove the filter packing.
4. Replace the filter element, filter packing, or O-ring with new ones, and then put them back together.
5. Turn the filter cover rightward to install it.
6. Close the front panel door.

4.2 Diaphragm assembly

The diaphragm or valve will be deteriorated with time, and it may cause troubles, such as insufficient flow rates.

We recommend that you replace the diaphragm and valve periodically.

Procedure

Note

The surface of the pump is very hot.

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2) and wait until the pump cools down.

1. Remove the 4 fixing screws on the each pump head.
2. Remove the diaphragm with the special wrench provided with the diaphragm assembly.

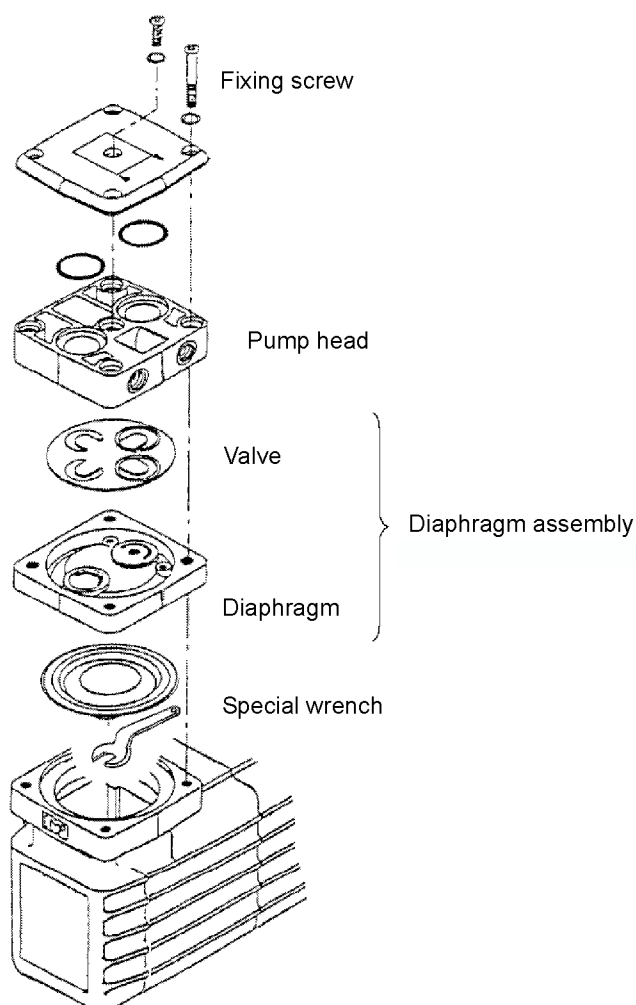


Fig. 7 Diaphragm

3. Replace the valve with new one.
4. Mount a new diaphragm and valve, and use the special wrench to fix it.

Note

Fix the diaphragm assembly securely, or it may cause the pump to malfunction.

5. Making sure that the directions of the valve and pump head are correct, put them back together.

4.3 Catalyst tube assembly

The oxidation catalyst of the catalyst unit will be deteriorated in efficiency with time, and it may cause CO readings to be low.

We recommend that you replace the catalyst periodically, as well as the filter element (DFU9900-05-BK) and scrubber.

Procedure

Note

The surface of the catalyst unit is very hot.

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2) and wait until the catalyst unit cools down.

1. Disconnect the connector from the catalyst unit.
2. Remove the fixing screws of the catalyst unit.
3. Remove the tubes from the catalyst unit.
4. Remove the joints and rubber hoses, which are attached on the top and bottom of the catalyst unit.
5. Loosen the setscrew fixing the catalyst tube assembly, and then remove the catalyst tube assembly from the unit.

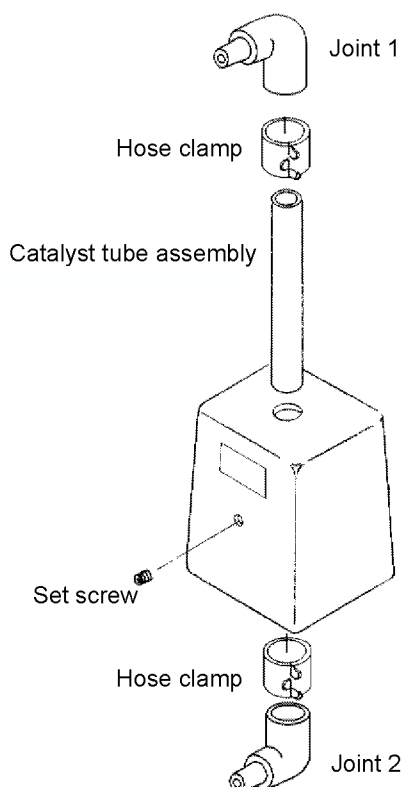


Fig. 8 Catalyst unit

6. Attach a new catalyst tube assembly, and mount the catalyst unit in the reverse procedure.

4.4 Filter element (DFU9900-05-BK)

The filter element (DFU9900-05-BK) will become clogged with time, and it may lower the flow rate to affect measured values.

We recommend that you replace the filter element (DFU9900-05-BK) periodically, as well as the catalyst and scrubber.

Procedure

Note

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2).

1. Remove the rubber joints on the top and bottom of the filter element.
2. Remove the screw fixing the filter element.
3. Remove the filter element.
4. Attach a new filter element so that the gas will flow in the downward direction, and fix it with the screw.
5. Put the rubber joints back the way they were.

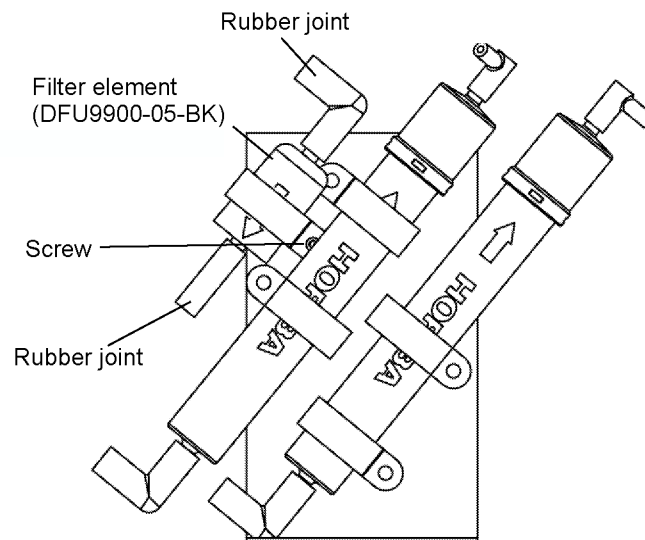


Fig. 9 Filter element (DFU9900-05-BK)

4.5 Scrubber

The scrubbers will become clogged with time, and it may lower the flow rate to affect measured values.

We recommend that you replace the scrubbers periodically, as well as the catalyst and filter element (DFU9900-05-BK).

Procedure

Note

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2).

1. Remove the rubber joints on the top and bottom of the scrubbers.
2. Remove the 2 screws fixing the scrubbers.
3. Remove the scrubber.
4. Attach new scrubbers so that the gas will flow in the upward direction, and fix them with the screws.
5. Put the rubber joints back the way they were.

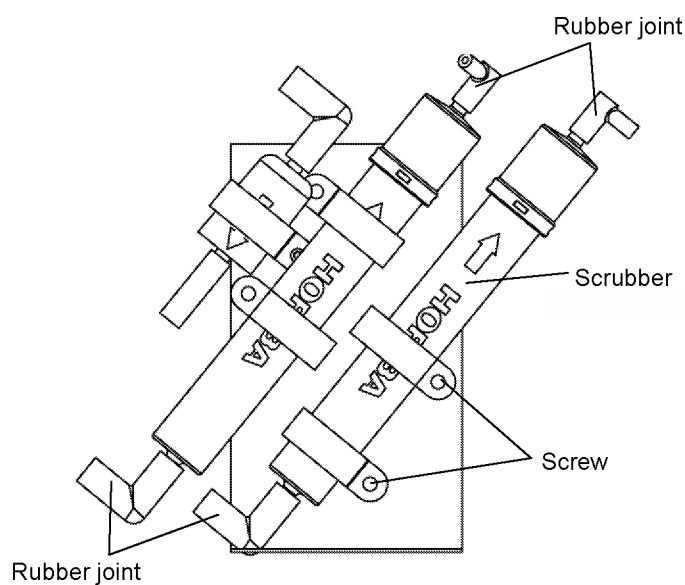


Fig. 10 Scrubber

4.6 Pump unit

The pumps will be deteriorated with time, and it may change sample flow rates. We recommend that you replace the pumps periodically.

Recommended frequency of maintenance

Approximately every 2 years (depending upon the sample conditions)

Procedure

Note

The surface of the pump is very hot.

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2) and wait until the pump cools down.

1. Disconnect the power connector of the pump.
2. Remove the joints attached to the pump.
3. Unscrew the 4 screws fixing the pump, and remove the pump.

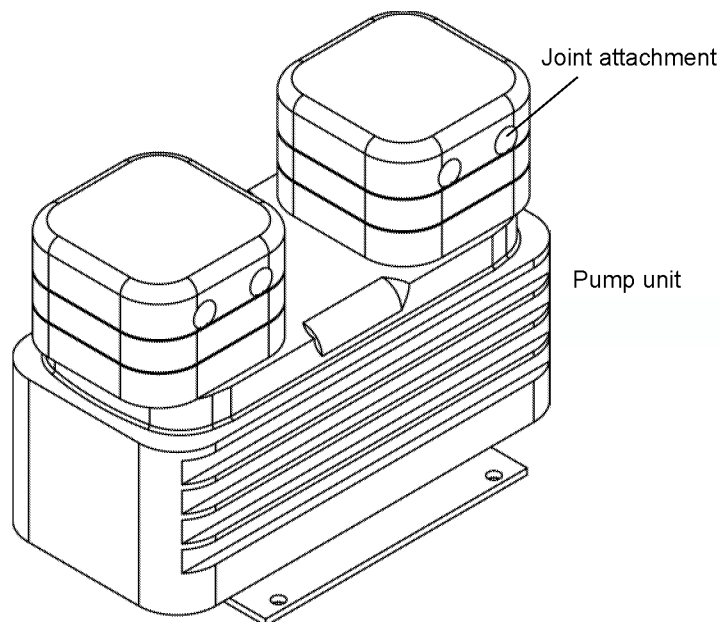


Fig. 11 Pump unit

4. Mount a new pump unit in the reverse procedure.

Note

When connecting the joints, make sure to use sealing tapes to wind them.

4.7 Solenoid valve unit

The solenoid valves will be deteriorated with time, and it may cause serious troubles affecting measured values, such as insufficient airtight, or malfunction. We recommend that you replace the solenoid valves periodically.

Procedure

Note

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2).

1. Disconnect the connectors of tubing and wiring from the solenoid valve unit.
2. Remove the 2 screws A on the fixing plate.
3. Unscrew the 2 fixing screws B to remove the solenoid valve unit.

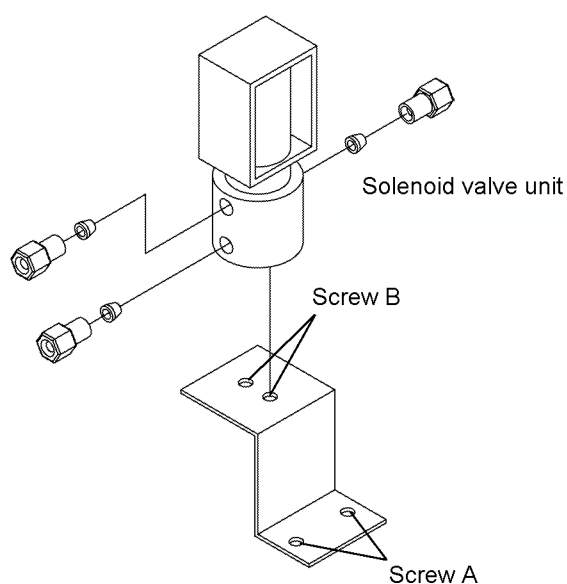


Fig. 12 Solenoid valve unit

4. Making sure that the positions of sleeve and tubing connection are correct, assemble a new solenoid valve unit in the reverse procedure, and connect the tubing and wiring.

4.8 Battery

The battery for clock/memory backup will be deteriorated with time, and the voltage will be lowered.

Procedure

Note

Before doing the procedure below, make sure to power OFF the instrument referring to " 2 Preparations " (page 2).

1. The battery is attached on the printed board that is located on the front panel inside (see below). Replace the battery with a new one.

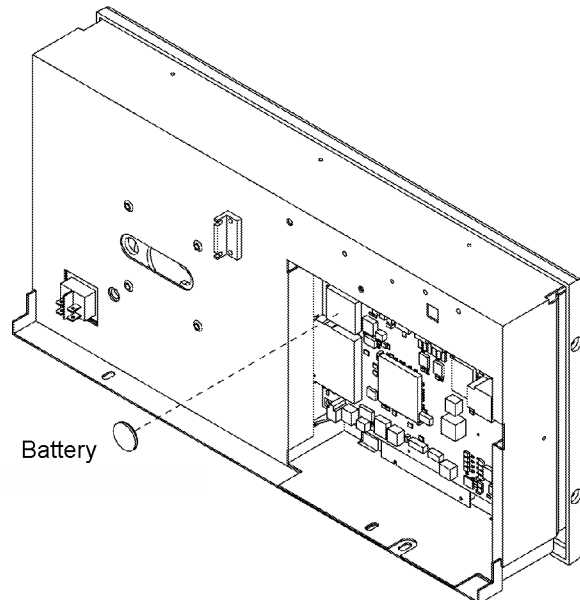


Fig. 13 Battery

2. After powering ON the instrument, adjust the internal clock (see " 5.2 Readjusting the internal clock " (page 16)).

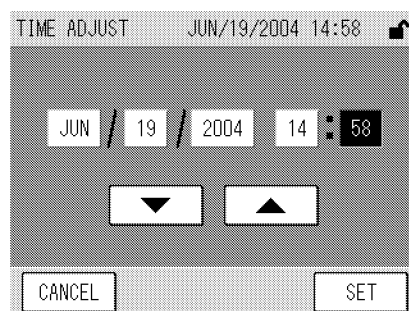


Fig. 14 TIME ADJUST screen

5 Operations after Part Replacement

5.1 Resetting the maintenance status

To use the maintenance status as an indication for the next replacement, reset the operation hours for the replaced parts on the MAINTENANCE STATUS screen.

1. After powering ON the instrument, press the [MAINTENANCE STATUS] button on the MENU/MAINTENANCE screen. The MAINTENANCE STATUS screen will be displayed.

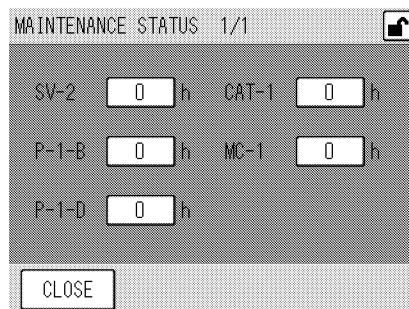


Fig. 15 MAINTENANCE STATUS screen

The operating hours of consumable parts are displayed.

For the symbols, see the flow sheet at the end of this document.

Use P-1-B for the pump itself and P-1-D for the pump diaphragm.

2. Press the button of the operating hour to be changed (reset).
The MAINTENANCE STATUS screen for setting will be displayed.

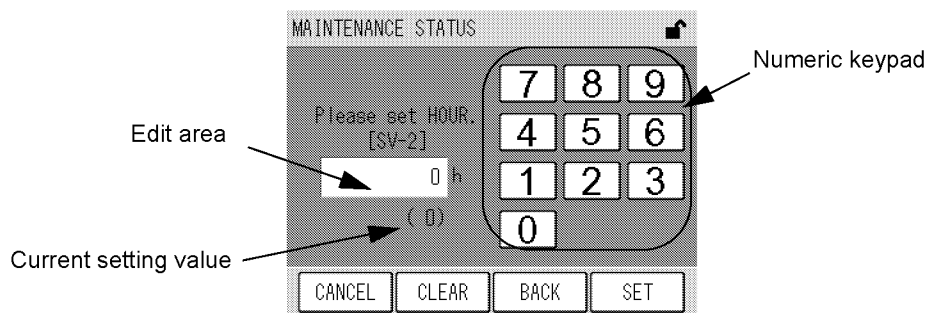


Fig. 16 MAINTENANCE STATUS screen for setting

Enter a value via the numeric keypad.

The keys allow you to perform the following operations.

- [CANCEL]: Returns to the MAINTENANCE STATUS screen without changing the time.
- [CLEAR]: Deletes the value entered in the edit area.
- [BACK]: Deletes the just entered figure (1-digit).
- [SET]: Returns to the MAINTENANCE STATUS screen with the time changed.

3. Enter a desired value (0 for resetting) via the numeric keypad.
4. Press the [SET] key. The operating hours will be changed (reset) and the MAINTENANCE STATUS screen is displayed again.
5. Press the [CLOSE] key on the MAINTENANCE STATUS screen. The MENU/MAINTENANCE screen will be displayed again.

5.2 Readjusting the internal clock

Readjust the internal clock after battery replacement.

1. After powerinf ON the instrument, press the [TIME ADJUST] button on the MENU/SETTING screen. The TIME ADJUST screen will be displayed.

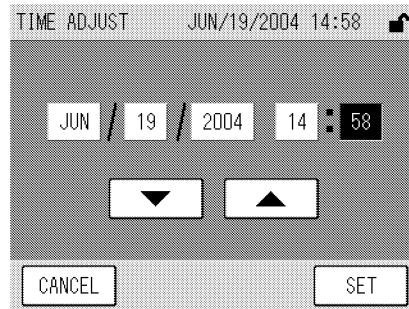


Fig. 17 TIME ADJUST screen

The current time setting is always displayed first, in a format of year, month, day, hour, and minute as respective buttons.

To change a value, press the corresponding button, and then press either of the following buttons to increase or decrease the value.

- [▲]: Increases the value.
- [▼]: Decreases the value.

The keys allow you to perform the following operations.

- [CANCEL]: Returns to the MENU/SETTING screen without changing the settings.
- [SET]: Returns to the MENU/SETTING screen with the settings changed.

2. Press a value button to be changed to select the item, and adjust the current time with the [▲] and [▼] buttons.
3. Press the [SET] key. The current time setting will be changed and the MENU/SETTING screen will be displayed again.

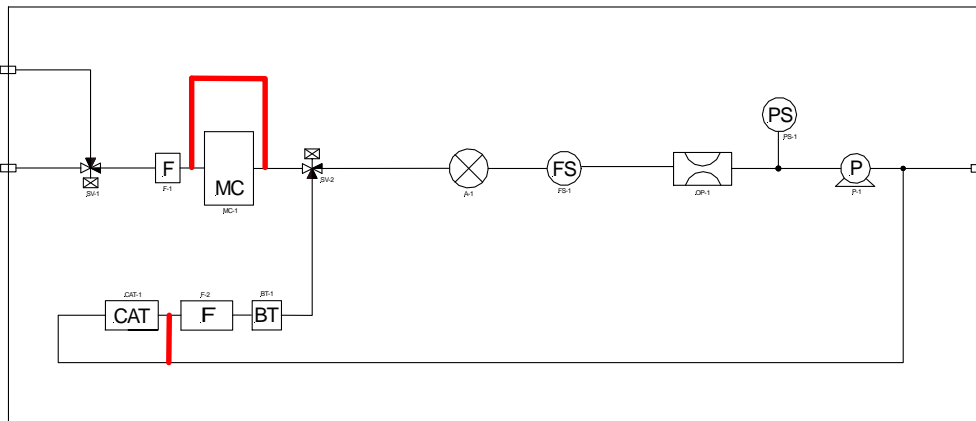
Note

- If you press the [CANCEL] button before completing the setting, the time prior to the change will apply.
- The time cannot be set on a second basis. Pressing the [SET] key will automatically set the time to 00 second.
- If you change the time to any unrealistic date or time and press the [SET] key, the realistic date or time nearest to the set value will apply automatically.
- Pressing the [SET] key will delete the internal data (e.g., average) having the creation time later than the set time.

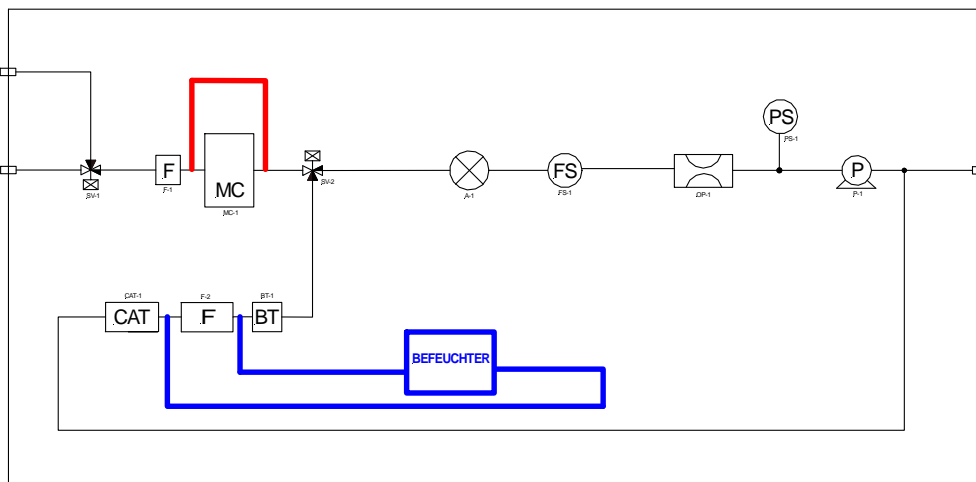
Watersteam adjustment

After maintenance of APMA you have to check and adjust compensation for water steam:

1. Change to Supervisor Modus 8/9 FACTORY CALIBRATION
2. Bypass mist catcher MC and catalyser CAT



3. Introduce zero gas and calibrate zero point
4. Bypass mist catcher MC, reinstall catalyser and insert bubbler at the outlet of catalyser



5. If the measured value is stable, press AS key and the adjustment for water steam will be done automatic
6. Exit Supervisor Modus and restore the original piping
7. Calibrate analyzer (zero and span)

