Operating and Maintenance Manual

Honeywell

FMC-1000 Plus/FMC-1000 Plus-W
Combustible Gas Alarm Controller

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Read before Use

This manual must be read carefully by all individuals who have or will have the responsibility of using, maintaining, or servicing this product. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions. The user should understand how to set the correct parameters and interpret the obtained results.

Warnings

In order to reduce the risk of electric shock, make sure the product is power off before it is dismantled or maintained and do not operate the product when it is in a dismantled state. The product can be used and maintained only in places known to be non-hazardous.

1 Scope

This manual provides detailed description of how to install and configure the controller rather than of relevant transmitters or detectors. For detailed information about these devices, please refer to corresponding user's guides.

WARNING

Do not use the controller in areas at a risk of explosive or flammable gas hazards and make use the product is used in conditions compatible with the requirements prescribed in the technical specifications. For the sake of safety and such considerations, use and maintenance of the product must only be conducted by qualified personnel who has completely read and understood this manual.

2 General Information

FMC-1000 Plus series is a smart alarm controller that features an operating mode combining independent operation and centralized control of individual channels and can work with various types of gas and flame detectors outputting 4-20mA analog signals.

FMC-1000 Plus series can be provided in two models for rack mount (RM) and wall mount (WM). The RM model features a standard 19″ 4U rack mount structure, modularized design and simple, convenient installation. The WM model can be mounted in the same manner as traditional PLCs to achieve convenient and flexible installation with resort to only one rail. The FMC-1000 Plus series controller can be assembled in a flexible way which allows the user to determine, according to the practical needs, the number of independently operating channel units to be used, as well as the external power unit and 4-20mA synchronous output modules. In addition, the controller supports RS485 ModBus communications and remote communications. All of these

characteristics enable the product to satisfy the safety and reliability requirements for applications in dangerous industrial fields to a maximum possible extent while enabling the provision of customized products for different customer needs. Other features of the controller includes visual and audible alarms, alarm history recording, query, alarm and fault on/off outputs, and flexible control of external devices, for example, external alarm and ventilation devices. Mention is particularly made of the “remote reset” and “remote mute” features specially designed for meeting the existing market demand for continuous hazardous gas monitoring and alarm control in petroleum, petrochemical, metallurgical, chemical, shipbuilding and other industries.

2.1 Applications

FMC-1000 Plus series is suitable for continuous concentration monitoring of flammable and toxic gases. It is equipped with display and alarm components, alarm relays for control of external devices, and features for remotely resetting and muting the controller.

2.2 Features

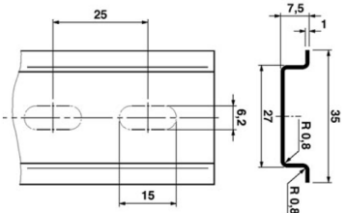
- Easy-to-install RM and WM models
- Independent channel units allowing arbitrary combinations
- A variety options of flexibly configurable, expandable modules
- RS485 and MODBUS outputs
- Highly informative common control unit dot-matrix display and highly-bright channel unit LED displays
- Readings of multiple types of gas displayed in several selectable multiple measurement units
- Operation menus selectable displayed in English or Chinese
- Outputs of two alarm thresholds and one fault threshold
- Alarm history recording and enquiry functions
- Synchronous outputs of 4-20mA signals
- Remote controller resetting and muting
- External power unit enables simple installation

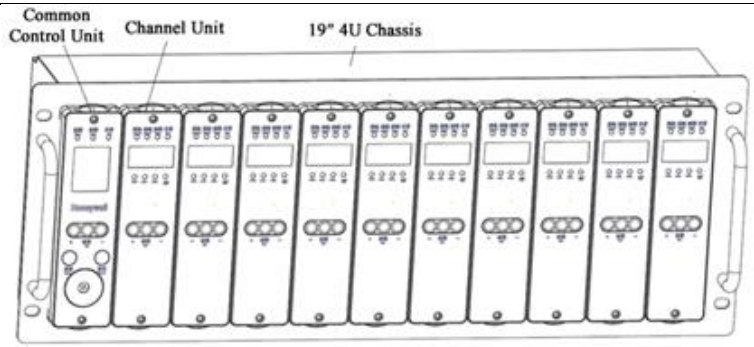
3 Parts and Configuration

3.1 Product Composition

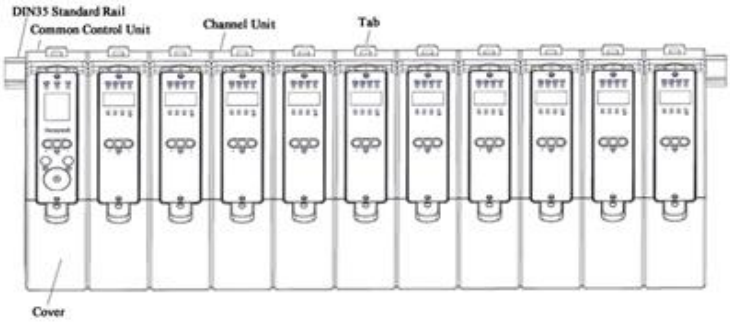
Main Parts and Functions

- 19″ 4U Rack Mount Chassis: a protection and support chassis, inluding an access panel, an enclosure and a back panel.
- Common Unit (available in RM or WM type): a general control module, for channel unit control and system status indication.
- Channel Units (RM and WM types): channel units with independent I/O terminals.
- Blank plates (for rack mount): optional components for covering unoccupied open slots.
- Installation Rack (WM): self-procured parts which is the standard DIN35 rail to fix the wall mount of controller as FMC-1000 Plus-W, figure as shown only for your reference.



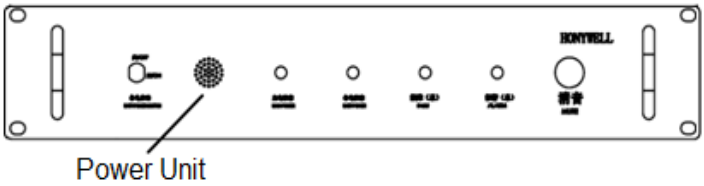


RM model (FMC-1000 Plus)



WM model (FMC-1000 Plus-W)

- Power Unit: an independent power supply unit equipped with fire alarm features.



3.2 Settings

FMC-1000 Plus series is a system comprised of independent modules for performing different tasks, including a power module, a common control unit, channel unit(s), analog output module(s), etc. According to

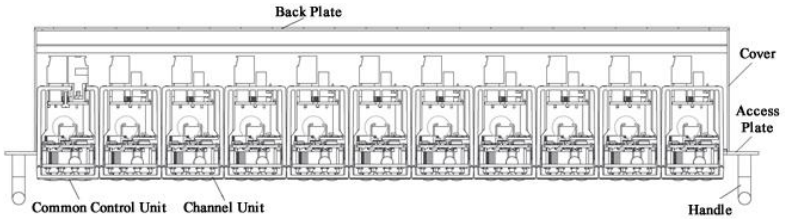
practical application needs, different numbers of channel units, power modules and output modules can be assembled in the system.

The common control unit can operate in two modes, i.e., a controller mode for centralized control of individual channel modes by communicating with them and for displaying status information of the whole system, and a detector mode for functioning as a single channel unit capable of handling input signals.

4 Installation

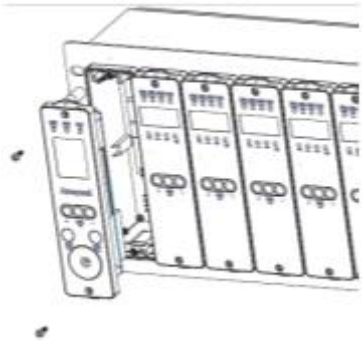
4.1 Rack Mount Model

FMC-1000 Plus mainframe, its parts and their installation positions are shown in the following drawing.



RM model

4.1.1 Common Control Unit

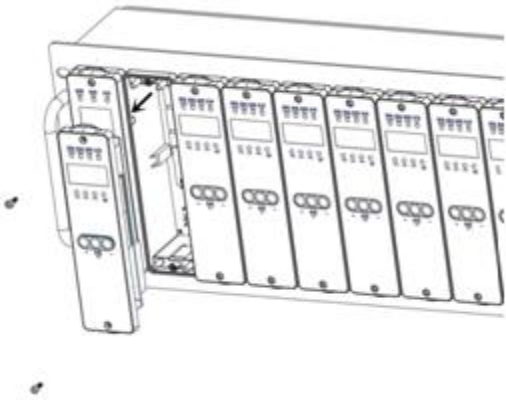


Display I/O Terminal

As shown in the figure on the left, the common control unit consists of a front-side display unit and a backside I/O terminal (fixed on the chassis). Note that the common control unit must be deployed in the leftmost slot defined in the chassis. Make sure the system is powered off prior to the insertion or removal.

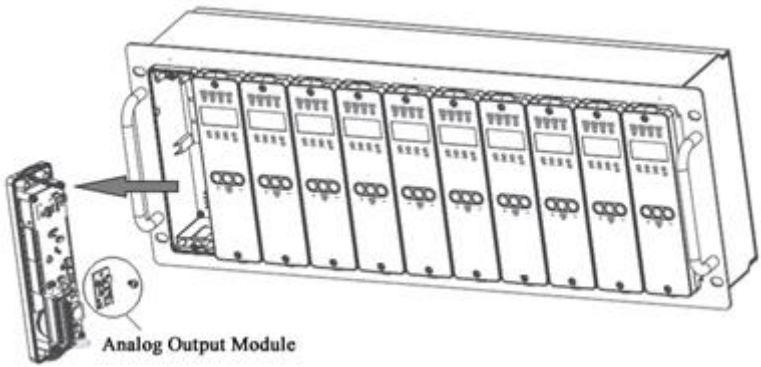
As shown in the above figure, each channel unit can be inserted or removed in the same manner as the common control unit. The user can determine the number of channel units to be incorporated in the system. Any slot left unoccupied after the installation can be closed with a blank plate. Each channel unit can be provided with a dedicated ID and equipped with a specific analog output module.

4.1.2 Channel Unit



As shown in the above figure, each channel unit can be inserted or removed in the same manner as the common control unit. The user can determine the number of channel units to be incorporated in the system. And any slot left unoccupied after the installation can be closed using a blank plate. Each channel unit can be provided with a dedicated ID and equipped with a specific analog output module.

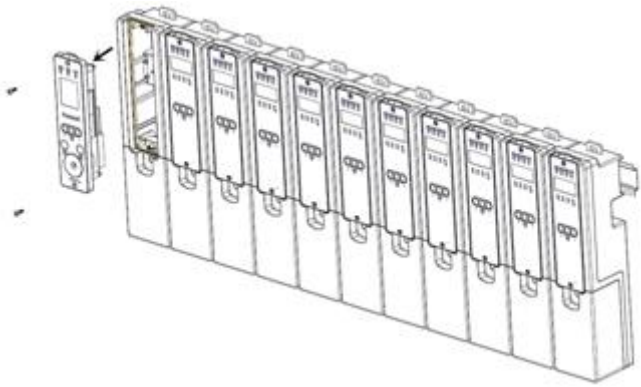
4.1.3 Analog Output Module



Each channel unit is equipped with an analog output module serving as an auxiliary I/O terminal for providing an output of a 4-20 mA synchronous analog signal. The analog output module can be plugged in sockets arranged at the backside of the control module of the corresponding common control unit or channel unit. Note that the plugging should be carried out carefully to avoid making damage to the devices.

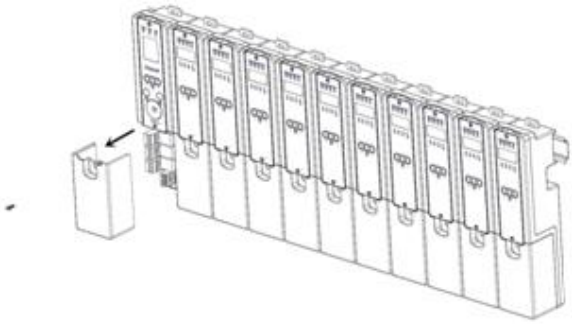
4.2 Wall Mount Model

4.2.1 Control Module



RM and WM models use the same control modules respectively for common control unit and channel unit. Make sure the control module for common control unit is installed in the leftmost slot.

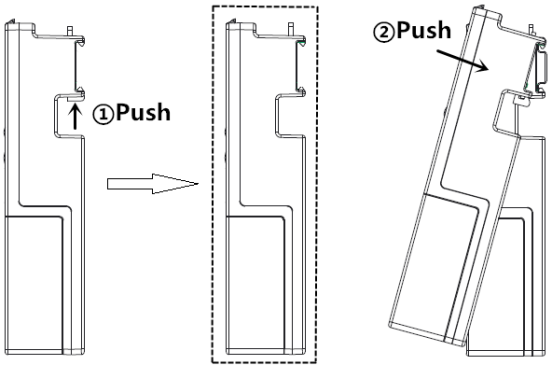
4.2.2 Terminal Block



Each terminal block can be accessed after the cover is screwed off. Refer to Section 6.2 for more information about the terminal block.

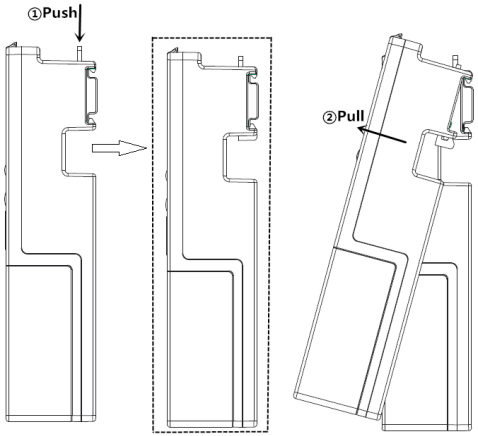
4.2.3 Base body

4.2.3.1 Lock-on



Base body of a common control or channel unit can be locked on the rail by pushing the tab upward, snapping the frame over the rail and slightly pushing the frame downward.

4.2.3.2 Removal

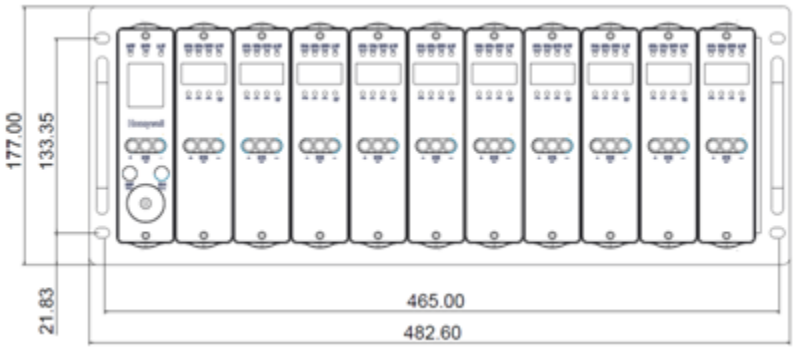


The main frame can be removed through pressing down the tab and slightly lifting the frame upward and outward.

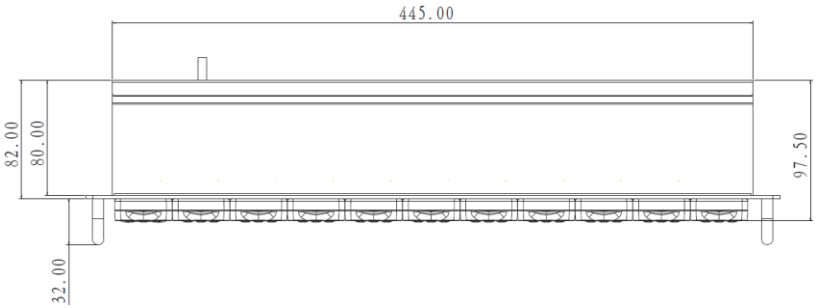
4.3 Dimensions

4.3.1 Mainframe (RM)

Dimensions of the FMC-1000 Plus model mainframe are shown below, make sure there is sufficient space for its installation.



Elevation View (Mainframe)

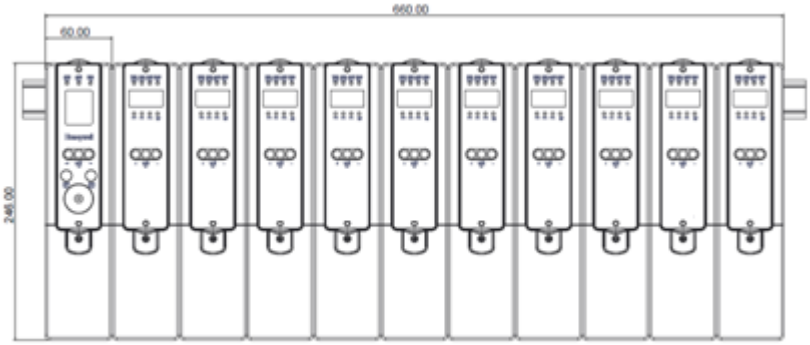


Top View (Mainframe)

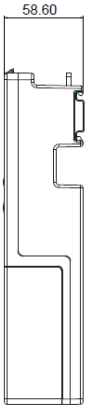
Note: All dimensions are indicated in mm.

4.3.2 Mainframe (WM)

Dimensions of the FMC-1000 Plus-W model mainframe are shown below, make sure there is sufficient space for its installation.



Elevation View

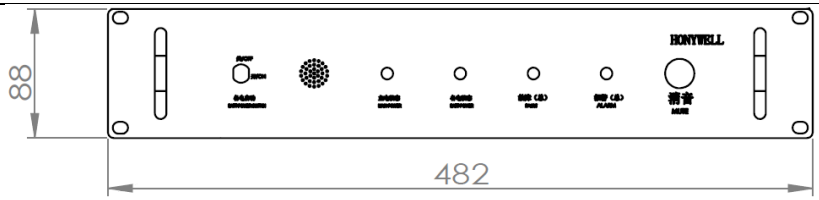


Side View

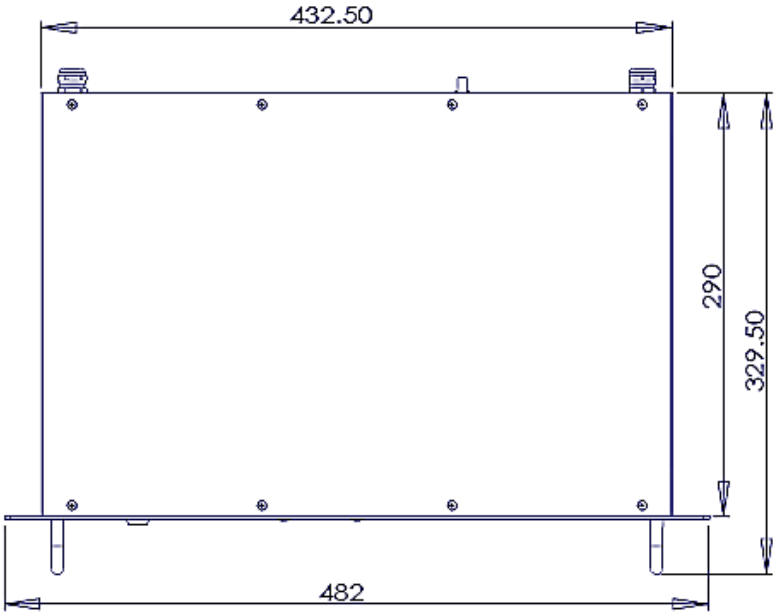
Note: All dimensions are indicated in mm.

4.3.3 Power Unit

The RM and WM models are provided with the same power unit with the dimensions shown below. Consideration should be further made for this power unit during the installation of FMC-1000 Plus controller.



Elevation View



Top View

Note: All dimensions are indicated in mm.

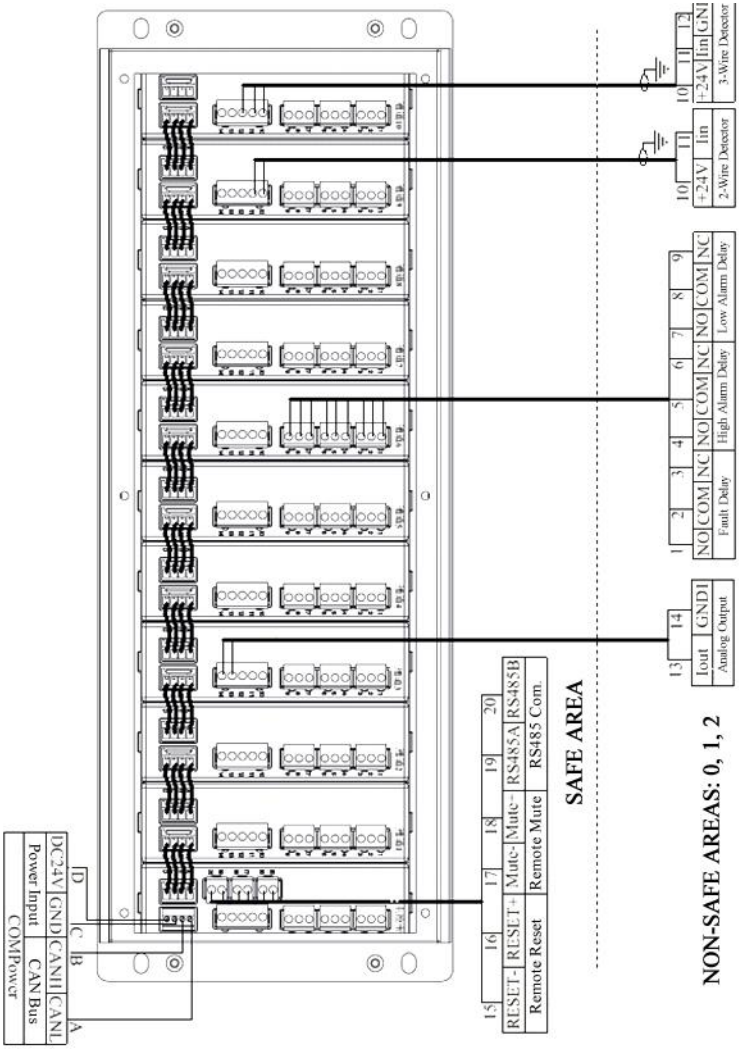
5 Specifications

FMC-1000 Plus/FMC-1000 Plus-W Specification			
Basic	Main Power Supply		24VDC, 5A
	Backup Power Supply		24VDC, 7.2Ah
	Power Output		24VDC, 500mA (each channel)
	Operating Mode		Each channel operates independently
	Power		100W (full load)
	Input Signal		4~20mA (2-wire/3-wire detector)
	Output Signal		4~20mA/channel (optional)
Output/Alarm	Alarm Record		Alarm time, concentration reading, Channel number, alarm type
	Alarm Settings		Limit Alarm (alarm when High or Low alarm limit is reached), 2 levels available; Interval Alarm (oxygen only)
	Alarm Function		Different colors of LED light and different buzz frequencies of buzzer indicate different alarm levels.
	Alarm Output		High, Low and Fault at each channel
	Contact Rating		220VAC, 5 A
	Communication Interface		RS-485 MODBUS
Environmental	Temperature		-20-+50 °C
	Humidity		0-99% R.H.(non-condensing)
	Pressure		86-106 KPa
Display	Mode	Common Control Unit	96×128 array LCD, with backlight
		Channel Unit	4 digit 8 segment LED

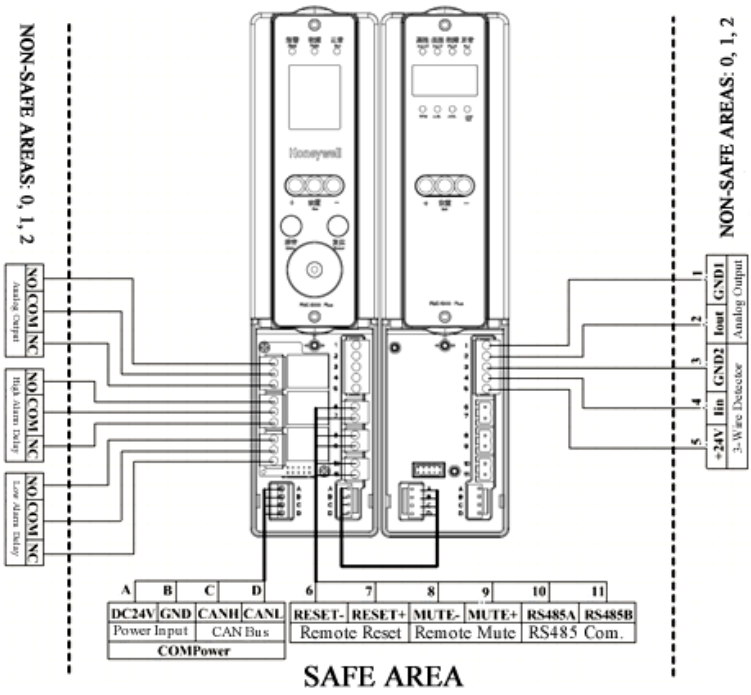
	Resolution	Adjustable
	Accuracy	Combustible: ±3%LEL Toxic gas: ±5%FS
Physical	Dimensions	RM：177×482.6×97.5mm（HWD） WM：246×660×58.6mm（HWD）
	Color	Silver
Power Unit		
Basic Parameters	Input	220VAC, +10%, -15%; 50Hz±5Hz
	Output	28VDC±0.5 V, 5A
Appearance	Dimensions	88×482×290mm (HWD)

6 Electrical Wiring

FMC-1000 Plus mainframe can be powered by the power unit or an external 24V DC power supply. FMC-1000 Plus can be used with both 2-wire and 3-wire detectors. The wiring diagram is as follows:

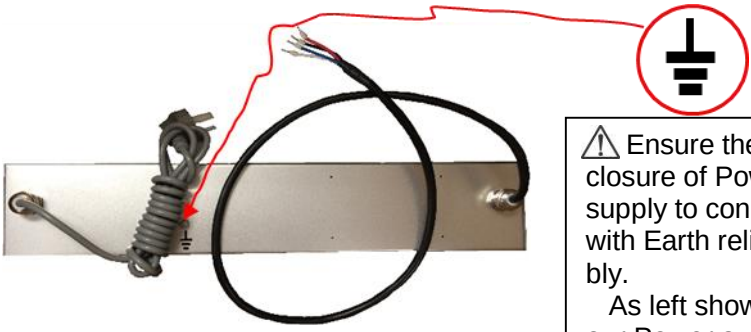


Electrical Wiring (RM)



Electrical Wiring (WM)

Connected with Earth

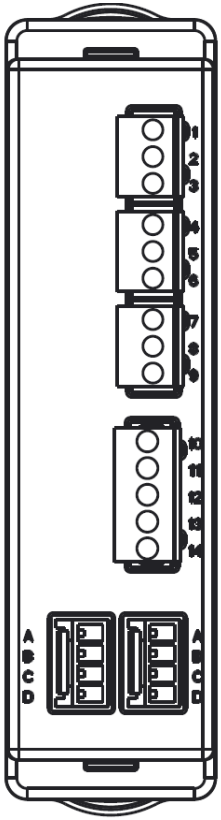


⚠ Ensure the enclosure of Power supply to connect with Earth reliably.

As left shown is our Power supply.

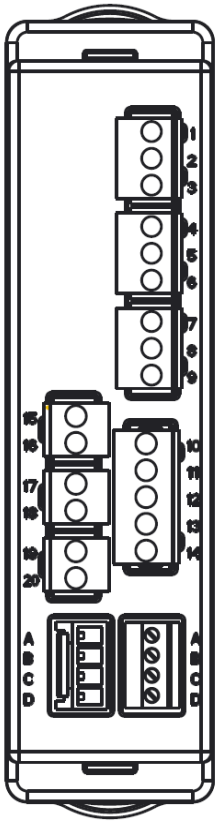
6.1 Terminal Diagram (RM)

I/O Terminals (Channel Unit):



No.	Symbol	Function	Note
1	NO	Normally Open	Fault Relay
2	COM	Common	
3	NC	Normally Closed	
4	NO	Normally Open	High Alarm Relay
5	COM	Common	
6	NC	Normally Closed	
7	NO	Normally Open	Low Alarm Relay
8	COM	Common	
9	NC	Normally Closed	
10	+24V	Voltage Output	Detector Interface
11	I_{in}	Signal Input	
12	GND2	Ground (Detec-tor)	
13	I_{out}	Current Output	Analog Output
14	GND1	Ground	
A	CANL		CAN Bus
B	CANH		
C	GND	Ground (Power)	DC. 24V Input
D	24V	Power Input	

I/O Terminals (Common Control Unit):

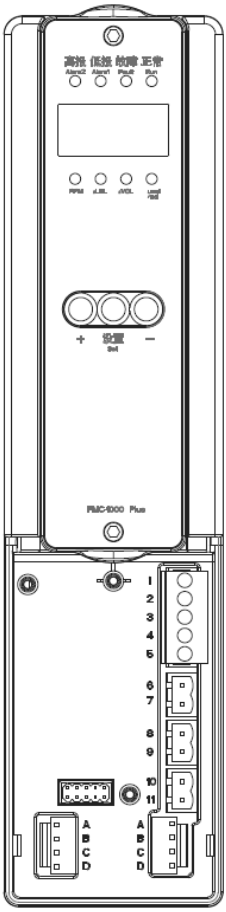


No.	Symbol	Function	Note
1	NO	Normally Open	Fault Relay
2	COM	Common	
3	NC	Normally Closed	
4	NO	Normally Open	High Alarm Relay
5	COM	Common	
6	NC	Normally Closed	
7	NO	Normally Open	Low Alarm Relay
8	COM	Common	
9	NC	Normally Closed	
10	+24V	Voltage Output	Detector Interface
11	I_{in}	Signal Input	
12	GND2	Ground (Detector)	
13	I_{out}	Current Output	Analog Output
14	GND1	Ground	
15	RESET-	Reset Input	Remote Reset
16	RESET+	24V	
17	MUTE-	Mute Input	Remote Mute
18	MUTE+	24V	
19	RS485A		RS485
20	RS485B		
A	CANL		CAN Bus
B	CANH		
C	GND	Ground (Power)	DC. 24V Input
D	24V	Power Input	

Note: Ports in shadow area are those indicated for the common control unit.

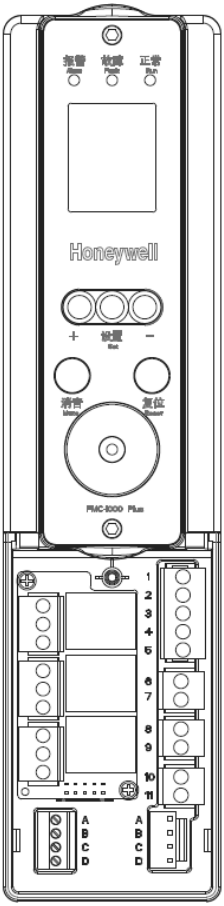
6.2 Terminal Diagram (WM)

I/O Terminals (Channel Unit):



No.	Sym-bol	Function	Note
1	GND1	Ground	Analog Out-put
2	I_{out}	Current Output	
3	GND2	Ground (Detector)	Detector Interface
4	I_{in}	Signal Input	
5	+24V	Voltage Output	
A	24V	Power Input	DC. 24V In-put
B	GND	Ground (Power)	
C	CANH		CAN Bus
D	CANL		

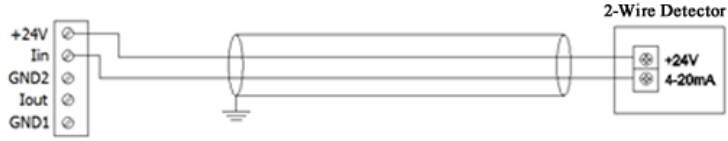
I/O Terminals (Common Control Unit):



No.	Sym-bol	Function	Note
1	GND1	Ground	Analog Output
2	I_{out}	Current Output	
3	GND2	Ground (Detec-tor)	Detector Interface
4	I_{in}	Signal Input	
5	+24V	Voltage Output	
6	RE-SET-	Reset Input	Remote Reset
7	RE-SET+	24V	
8	MUTE-	Mute Input	Remote Mute
9	MUTE+	24V	
10	RS485 A		RS485
11	RS485 B		
A	24V	Power Input	DC. 24V Input
B	GND	Ground (Power)	
C	CANH		CAN Bus
D	CANL		

Note: Ports in shadow area are those indicated for the common control unit.

6.3 Connection with 2-Wire Detector

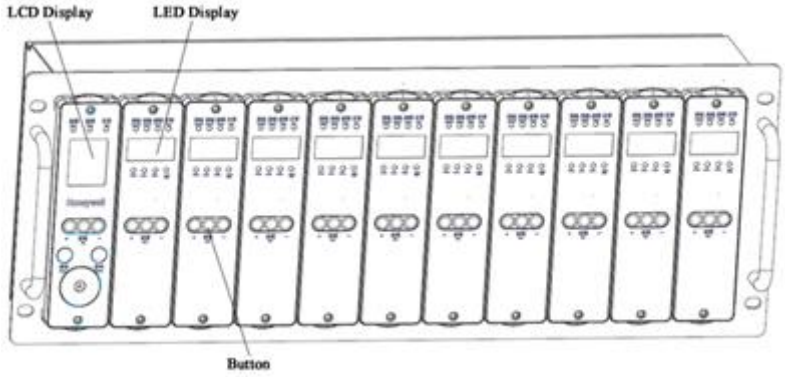


6.4 Connection with 3-Wire Detector

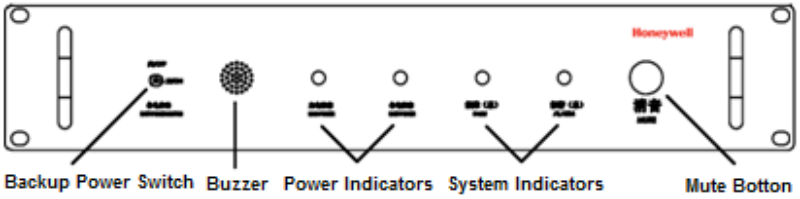


7 User Interface

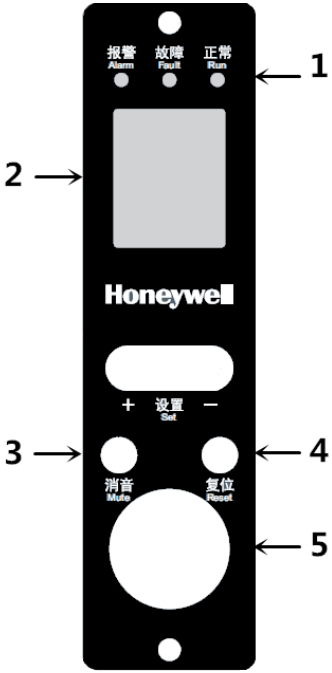
User interface of the FMC-1000 Plus controller consists essentially of displays and certain features of the common control and channel units, including LED indicators, a buzzer (inside the common control unit) and manipulative keys and buttons. Common control unit is provided with three manipulative keys, one reset button and one mute button, while each channel unit is only provided with three manipulative keys, as shown below.



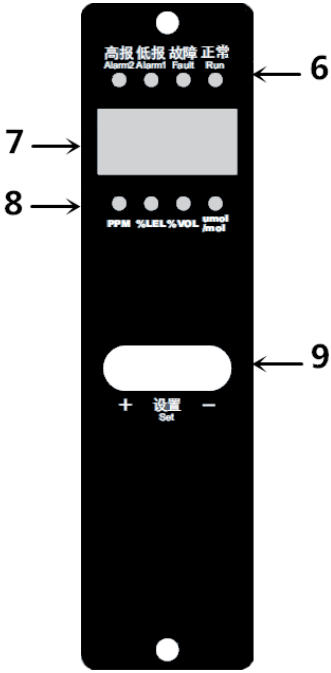
User Interface of FMC-1000Plus Controller (Mainframe)



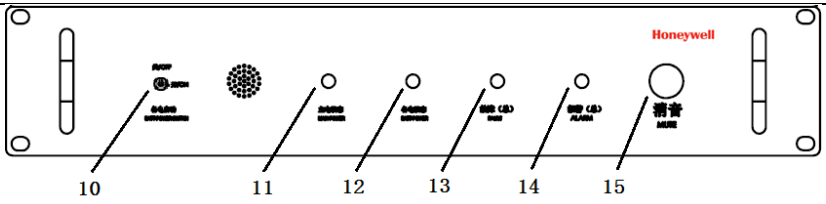
User Interface of Fire Prevention Power Supply for FMP-1000Plus Controller



Common Control Unit



Channel Unit



Power Supply

1 Status Indicator	2 LCD Display	3 Mute Button
4 Reset Button	5 Buzzer	6 Status Indicator
7 LED Display	8 Measurement Unit	9 Three Keys
10 Backup Power Switch	11 Main Power Status	12 Backup Power Status
13 Fault(System)	14 Alarm(System)	15 Mute(System)

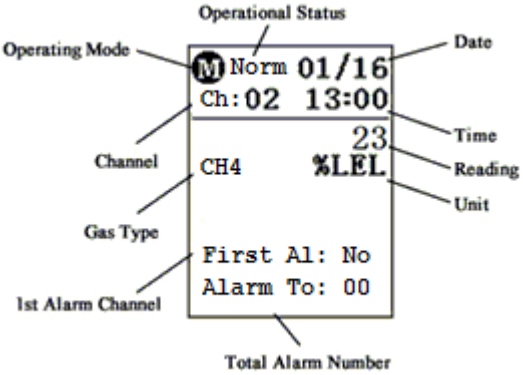
7.1 Status Indicators

Basic Visual Information of Indicators

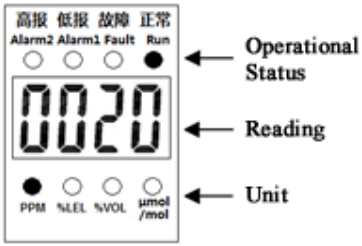
LED	Information
Common Control Unit	Normal: Green Fault: Yellow Alarm: Red
Channel Unit	Normal: Green Fault: Yellow Low Alarm: Red High Alarm: Red
Main Power	Normal: Green; Fault: Yellow
Backup Power	Power Normal: Green; Power Fault: Yellow System Fault: Yellow; System Alarm: Red
Measure-ment Unit	Four indicators are provided each for one of the four measurement units, ppm, %LEL, %VOL and µmol/mol. The indicator corresponding to the currently used unit lights in green.

7.2 Display

Common control unit is equipped with a LCD display for providing visual information including reading, time, menu options, etc. Each channel unit has a high-brightness 4-digit LED display which, together with status and measurement unit indictors, provides visual information and menu settings. The screen displays a real-time measured value when the controller operates in normal condition:



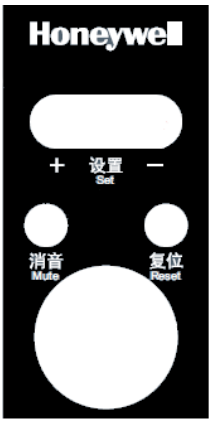
Common Control Unit



Channel Unit

7.3 Manipulative Keys

Common control unit has five, and each channel unit has three, manipulative keys for parameter configuration and menu navigation:



Common Control Unit



Channel Unit

Each of the common control and channel units has the following three keys and their functions are described in the following table.

Keys	Functions
+	Menu scroll-up, value increase
-	Menu scroll down, value decrease
Set	Menu entry, confirmation and cursor shift

The common control unit further has the following two buttons which function is detailed below.

Buttons	Functions
Reset	Upon this button being pressed, entry of the password can initiate a controller reset process
Mute	If any alarm occurs, pressing this button can turn off the audible alert, leaving only the visual alert activated.

7.4 Common Control Unit Operating Modes

Modes	Icons	Description
Controller	Ⓜ	Centralized control of 64 channel units as a maximum
Detector	Ⓢ	Serving as a channel unit (generally for one-point measurement applications)

7.5 Alarm

Three alarm types:

- Fault Alarm
- Low Alarm
- High Alarm

Fault alarm: Buzzer gives out constant buzz

Low Alarm: Buzzer gives out inconstant buzz at a frequency of 2Hz

High Alarm: Buzzer gives out inconstant buzz at a frequency of 4Hz

Sound of any alarm can be muted by pressing the “Mute” button on the common control unit.

Ions for Fault Alarm:

- Under-load (fault current < 2.5 mA)



- Over-load (fault current > 21.5 mA)



- No channel Unit

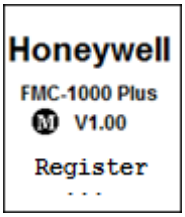


8 Operation

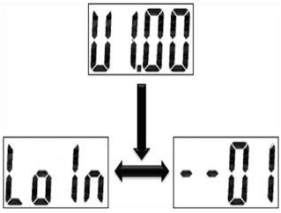
Except the powering on operation, FMC-1000 Plus controller can start up rapidly without any manual interventions.

8.1 Powering on

Once powered on, FMC-1000 Plus undergoes a process for self-diagnosis, initialization and channel unit registration. In this process, there appears first on the display screen of the common control unit the logo of Honeywell (if the logo fails to appear, please contact the distributor or our service department). Afterward, each channel unit displays the version number of the used software program, e.g., V 1.00, and then alternately “LoIn” (log-In) and the channel number, e.g., --01. Concurrently, the measurement unit indicator flashes, indicating that the channel unit is communicating with the common control unit for registration. If this succeeds, “--ON” will be displayed and subsequently a reading value of the connected detector. Otherwise, “-OFF” will be displayed and then “----”, with the measurement unit indicator continuing flashing.

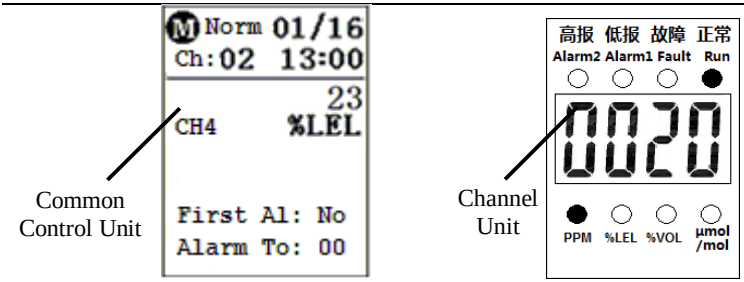


Common Control Unit



Channel Unit

After the 20-second self-diagnosis, initialization and registration process, the following monitoring screens are displayed:



Under the normal monitoring screen, press the"+" button quick access to "Alarm Check" menu to review alarm records, the detail operation is the same as "Alarm Check" please refer to.

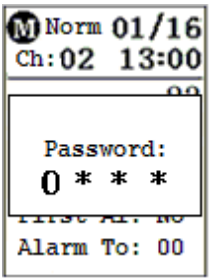
8.2 Powering off

The controller can be powered off by cutting off the main power supply and toggling the backup power switching to the OFF position.

9 Common Control Unit Settings

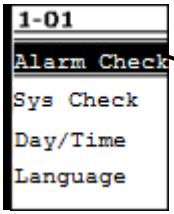
Press the “Set” button when the controller is under normal operation, to show the password entry screen. Enter the 4-digit password (Primary Password is “1111” and Secondary Password is “8888”) and thereby access the setting menu. Press the “+” or “-” keys to change the number to a desired number, and then press the “Set” button to conform the change. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds.

An example is given below to illustrate a process of inputting the password, including the steps of:



1. The digit flashes successively from the first one on the left.
2. Press “+” or “-” to change the flashing digit, press “Set” to confirm the change and advance to the next digit.
3. After all the 4 digits has been changed successively press “Set” , then the 4 digits will flash simultaneously. Press “Up” to confirm the change and press “Set” to return to a password setting menu.

If the correct password is input, a configuration menu is display, with the “Alarm Check” option being selected as default.



Selected option highlighted in black background

Press “+” or “-” to scroll from one option to another.

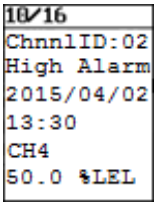
Primary Password	Secondary Password
Alarm Check	Alarm Check
Sys Check	Sys Check
Day/Time	Day/Time
Exit	Language 中文
	Run Mode
	Channel Set *
	Comm Set
	Display Set
	Password
	Factory Set
	Exit

Note: This option differs with the operating mode of the common control unit.

Press “Set” for 3 seconds, or select “Exit” and press “Set” to exit the configuration menu and return to the monitoring menu.

9.1 Alarm Check

This option allows the review of alarm records.



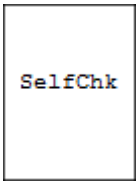
1. Press “Set” to access alarm records;
2. Press “-” to review the last alarm record;
3. Press “+” to review the next alarm record;
4. Press “set” to return to the parent configuration menu;
5. Long press “+” or “-” to rapidly scroll up/down pages.

The display will return to the monitoring screen if “Set” is pressed for 3 seconds or there is no manipulation made for a period of 60 seconds.

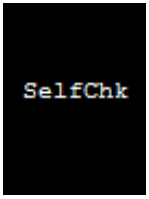
9.2 Sys Check

Selection of this option will initiate a self-diagnosis process of the system.

1. Press “Set”.



2. One second later, the following screen is displayed:



3. Indicator on the common control unit lights for a while successively in red (Alarm), yellow (Fault) and green (Normal) and buzzer buzzes for a while successively continuously, at 2 Hz and at 4Hz.

4. The screen will return to the configuration menu after the process is done.

9.3 Date/Time

Upon this option being selected, the following sub-menu is accessed:

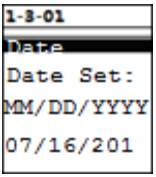


Options:

- Date
- Time
- Exit

9.3.1 Date

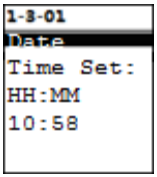
This option allows changing the system date in the form of "MM/DD/YYYY".



1. Press "Set" to access the screen where the date can be changed. The cursor flashes at the left-most digit.
2. Press "+" or "-" to change the value of an active digit.
3. Press "Set" to confirm the changed value and advance to the next digit.
4. After all the 8 digits have been changed successively, press "Set", then the 8 digits will flash simultaneously. Press again "Set" to confirm the change and return to the parent configuration menu.

9.3.2 Time

This option allows changing the system time in the form of “HH: MM”.



1. Press “Set” to access the screen where the date can be changed. The cursor flashes at the left-most digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the 4 digits have been changed successively, press “Set”, then the 4 digits will flash simultaneously. Press again “Set” to confirm the changes and return to the parent configuration menu.

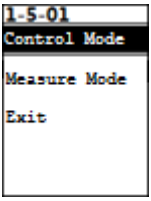
9.4 Language 中文

Common control unit of the FMC-1000 Plus controller can display menus either in English or in Chinese (default). The displaying language can be selected via this option, following the steps of:

1. Press “Set” to access the language selection screen;
2. Press “+” or “-” to select a desired language; and
3. Press “Set” to confirm the selection and return to the parent configuration menu.

9.5 Run Mode

Common control unit of the FMC-1000 Plus controller can operate in two modes: Controller and Detector. The operating mode can be selected via this option. **Note:** the Controller mode is set as default and the Detector mode is only suitable for one-point measurement applications. In the Detector mode, communications of the common control unit to another other channel unit is disabled.



1. Press “Set” to access the operating mode selection screen.
2. Press “+” or “-” to select a desired mode.
3. Press “Set” to confirm the selection and return to the parent configuration menu.

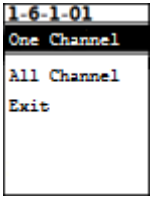
9.6 Channel Set

Selection of this option leads to the access to a sub-menu containing different items for different operating modes of the common control unit, as presented in the following table.

Controller Mode	Detector Mode
Channel Sel	Measure Type
Measure Type	Unit
Unit	Point
Point	Range
Range	High Alarm
High Alarm	Low Alarm
Low Alarm	Input Cal
Exit	Output Cal
	Exit

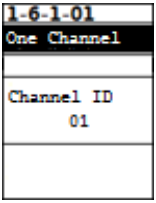
9.6.1 Channel Sel

In the controller mode of the common control unit, this item allows designating the ID number of a certain channel unit to be configured or designating to configure all channel units.



9.6.1.1 One Channel

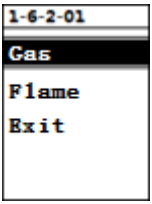
This option allows inputting the ID number (within 1-64) of a channel unit to be configured.



1. Press “Set” to access the ID number entry screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the 2 digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

9.6.2 Measure Type

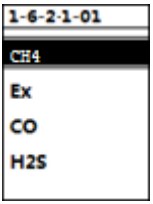
This option allows selecting the detection type measured.



1. Press “Set” to access measure type selection screen. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds
2. Press “+” or “-” to select gas or flame to be measured;
3. Press “Set” to confirm the selection and enter into the next menu.

9.6.2.1 Gas Type

This option allows selecting a gas to be measured, from CH_4 (methane), Ex, CO, H_2S, SO_2, O_2, ETO, Cl_2, NH, HCN, PH_3, NO, NO_2, HCl, ClO_2, H_2, CO_2, HF, SiH_4, AsH_3, VOC and EC.

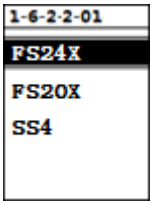


1. Press “Set” to access the gas selection screen. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds
2. Press “+” or “-” to select the gas to be measured;

3. Press “Set” to confirm the selection and return to the parent menu.

9.6.2.2 Flame Type

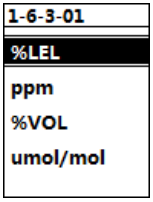
This option allows selecting a flame detector to be connected, from FS24X, FS20X and SS4.



1. Press “Set” to access the flame detector selection screen. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds
2. Press “+” or “-” to select the flame detector to be connected;
3. Press “Set” to confirm the selection and return to the parent menu.

9.6.3 Unit

This option allows selecting a measurement unit to be used, from %LEL, ppm and μmol/mol.



1. Press “Set” to access the unit selection screen. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds.
2. Press “+” or “-” to select the unit to be measured.
3. Press “Set” to confirm the selection and return to the parent menu.

9.6.4 Point

This option allows selecting a resolution of readings. Items of the menu corresponding to this option are numbers with the implications as follows.

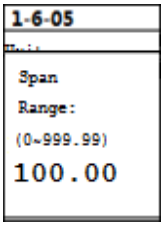
Number	Implication
0	Without fractional digit
1	Without or with one fractional digit
2	Without or with one or two fractional digits

3	Without or with one, two or three fractional digits (when the range is set <10)

1. Press “Set” to access the resolution selection screen.
2. Press “+” or “-” to select a number corresponding to the desired resolution;
3. Press “Set”, then the selected number is shaded and flashes. Press “Set” again to confirm the selection and return to the parent menu.

9.6.5 Range

This option allows setting a maximum measurement range (the default range is determined by the selected gas).



1. Press “Set” to access the range setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the 5 digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

9.6.6 High Alarm

This option allows setting a high alarm limit (the default limit is determined by the default range of the selected gas).

1. Press “Set” to access the limit setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;

3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

9.6.7 Low Alarm

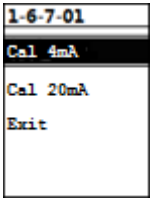
This option allows setting a low alarm limit (a range for low alarm limit is determined by the set high alarm limit).

1. Press “Set” to access the limit setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

9.6.8 Input Cal

This option allows the calibration of 4-20 mA input signals (Detector mode of the common control unit).

1. Press “Set” to access a signal selection screen.



2. Set the output of a 4-20 mA generator as 4mA or 20 mA, couple the output to the 4-20 mA analog input port of the common control unit, press “+” or “-” to select a corresponding one of the options “4 mA Calibration” or “20 mA Calibration”.

3. Press “Set” to initiate the calibration. The screen will then display the real-time value sampled by the AD converter. Press again “Set” to confirm the result of the sampling. If the calibration is successful, the screen will be navigated to the parent menu. Otherwise, the message “Parameter Errors” will be shown.
4. Press “Exit” to navigate the screen to the parent menu.

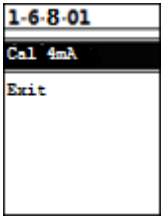
Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Notes:

4-20 MA generators that can be used in the calibration must be metrologically certified generators.

9.6.9 Output Cal

This option allows the calibration of 4-20 mA output signals (Detector mode of the common control unit).



1. Press “Set” to access a signal selection screen
2. Press “+” or “-” to set the output signal in consistence with the input 4-20 mA signal;
3. Press “Set” to return the parent menu.
4. Press “exit” to exit the menu and return to the parent menu.

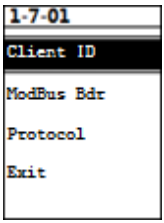
Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Notes:

1. Such functional adjustment must be made using a metrologically certified current meter or a current meter whose accuracy has been confirmed.
2. This functional operation is only for analog output modules.

9.7 Comm Set

Upon this option being selected, the following sub-menu is accessed:



Options:

- Client ID
- ModBus Bdr
- Protocol
- Exit

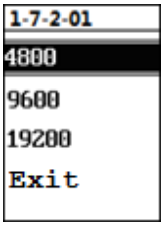
9.7.1 Client ID

This option allows setting of address for communications with an upper device in accordance with the ModBus, KLH or other protocol.

1. Press “Set” to access the address setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

9.7.2 ModBus Bdr

This option allows selecting a baud rate for ModBus communications.



1. Press “Set” to access the baud rate selection screen.
2. Press “+” or “-” to select the intended baud rate.
3. Press “Set” to confirm the selection and return to the parent menu.

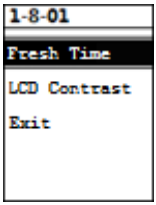
9.7.3 Protocol

This option allows selecting a communication protocol with which the FMC-1000 Plus works as a slate device to communicate with an upper device. There are presently three communication protocols available, i.e., the ModBus protocol (referring to Appendix A: ModBus Protocol), OTW6000 protocol (which supports communication with a graphic display device, referring to Appendix B: Protocol for Communications with Graphic Display Device) and KLH protocol (compatible with the precursor product FMC-1000).

1. Press “Set” to access the communication protocol selection screen.
2. Press “+” or “-” to select the intended communication protocol.
3. Press “Set” to confirm the selection and return to the parent menu.

9.8 Display Set

Upon this option being selected, the following sub-menu is accessed:



Options:

- Fresh Time
- LCD Contrast
- Exit

9.8.1 Fresh Time

This option allows configuring a time of display (1-10 seconds) of channel unit information on the common control unit.

1. Press “Set” to access the configuration selection screen.
2. Press “+” or “-” to set the time of display.
3. Press “Set” to confirm the setting and return to the parent menu.

Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

9.8.2 LCD Contrast

This option allows adjusting the contrast of LCD screens.

1. Press “Set” to access the contrast adjustment screen.
2. Press “+” or “-” until the contrast is adjusted as being visually satisfactory.
3. Press “Set” to confirm the setting and return to the parent menu.

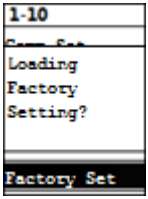
9.9 Password

This option allows changing the primary password (in the permissible range of 0-7999).

1. Press “Set” to access the password-changing screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.

9.10 Factory Set

This option allows resetting all the parameters of the common control unit to factory defaults.



1. Press “Set” to access the resetting screen.
2. Press “Set” to confirm to reset the parameters, or any other key or button to exit the screen without making any changes.

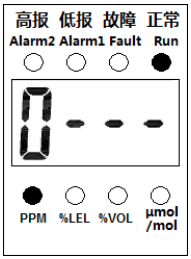
Factory Defaults

Items	Defaults
Language	Chinese
Communication Protocol	ModBus
Primary Password	1111
Secondary Password	8888
Operating Mode	Controller
Communication Address	1
Gas	Methane
Unit	%LEL
Range	100
Low Alarm Limit	25
High Alarm Limit	50
Resolution	0
4-20 mA Input Calibration	
4 mA Output Calibration	0

10 Channel Unit Settings

Press the “Set” button when the controller is under normal operation, to show the password entry screen. Enter the 4-digit password (Primary Password is “1111” and Secondary Password is “8888”) and thereby access the setting menu. Press the “+” or “-” keys to change the number to a desired number, and then press the “Set” button to conform the change. The display will return to the monitoring screen if there is no manipulation for a period of 60 seconds.

An example is given below to illustrate a process of inputting the password, including the steps of:



1. The digit flashes successively from the left-most digit.
2. Press “+” or “-” to change the flashing digit, press “Set” to confirm the change and advance to the next digit.
3. After all the 4 digits has been changed successively, press “Set” , then the 4 digits will flash simultaneously. Press “Up” to confirm the change.

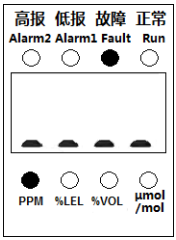
If the correct password is input, the screen will be navigated to a configuration menu. Entering the primary and secondary passwords will lead to the access to primary and secondary configuration menus, which allow the reviewing and modification of settings of channel unit parameters, respectively.

Press “Set” for 3 seconds, or select “Exit” and press “Set” to exit the configuration menu and return to the monitoring menu.

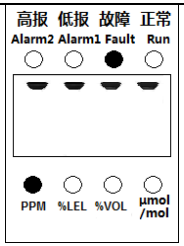
10.1 Channel Unit User Interface

10.1.1 Fault Alarm

- Under-load (fault current < 2.5 mA)

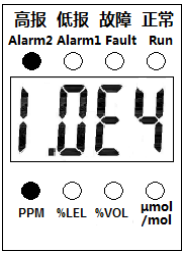


- Over-load (fault current > 21.5 mA)



10.1.2 Data Display Format

Numbers greater than 9999 are displayed in the scientific notation form. For example, the number “10000” is displayed as:



Note: During the setting of the measurement range, high alarm limit or low alarm limit, permissible range for the entered number can be altered by long pressing “+” or “-”. In case of a number displayed in the scientific notation form, long pressing the “-” can narrow the permissible range so that the number is not displayed in the scientific notation form any more.

10.1.3 Examples of Other Displayable Icons



Registration of Channel Unit



Parameter Setting Errors



Success in Channel Unit Registration

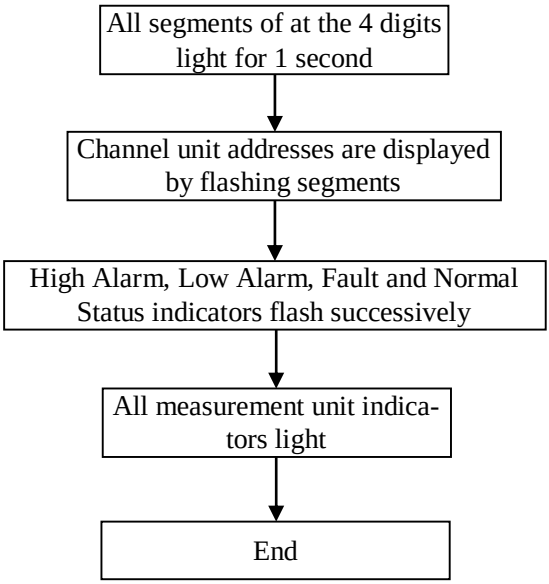


Failure in Channel Unit Registration

10.2 Channel Unit Self-Diagnosis

Upon the starting of its self-diagnosis, the common control unit will issue a command for commencing the self-diagnosis of channel units.

The channel unit self-diagnosis consisting of the following steps:



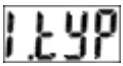
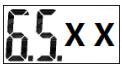
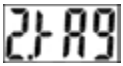
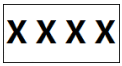
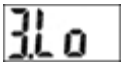
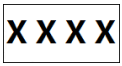
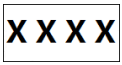
10.3 Primary Menu

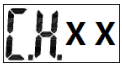
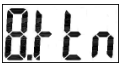
This menu can be accessed by entering the primary password and allow reviewing the parameter settings of a channel unit.

Records corresponding to each option of the menu can be reviewed by:

- pressing “+” to display the next record, or to display the first record when the final record is reached;

- pressing “-” to display the last record, or to display the final record when the first record is reached;
- pressing “Set” for 3 seconds or leaving the device not manipulated for 60 second to return to the measurement mode; or
- Selecting the following item 8 and pressing “Set” to return to the measurement mode.

Items	Function	Alternately Displayed Contents		Notes
1	Measure type reviewing			xx represents a number in the range of 0-22 (see Appendix C)
2	Measurement range reviewing			xxxx represents the actual range
3	Low alarm limit reviewing			xxxx represents the actual limit
4	High alarm limit reviewing			xxxx represents the actual limit
5	Measurement Unit reviewing			x represents a number in the range of 1-4 (see the section of “Measurement Unit Setting”)
6	Resolution reviewing			x represents a number in the

				range of 0-3, determined by the selected gas (see Appendix C)
7	Channel ID reviewing			xx represents an actual channel number in the range of 1-64
8	Returning to measurement mode			

10.4 Secondary Menu

This menu can be accessed by entering the secondary password and allow modifying the parameter settings of a channel unit. The menu includes the following options:

1. Measure Type
2. Range
3. Low Alarm
4. High Alarm
5. Unit
6. Point
7. Channel ID
8. Password
9. Factory Set

A. 4mA Input Cal

B. 20mA Input Cal

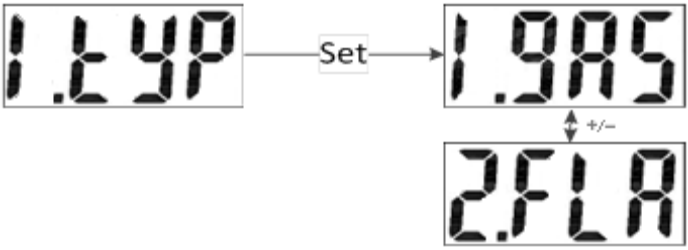
C. 4mA Output Cal

D. Return

10.4.1 Measure Type

This option allows setting a gas or flame to be connected.

1. Press “Set” to access the detector type setting screen.
2. Press “+” or “-” to set the measure type.
3. Press “Set” to confirm and then enter into the next menu.



10.4.1.1 Gas Type

This option allows selecting a gas to be measured (see Appendix C: Factory Defaults) by inputting a number corresponding to the gas.

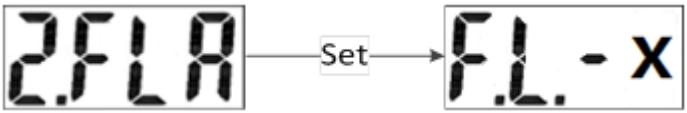
1. Press “Set” to access the gas selection screen. The cursor flashes at the second rightmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



10.4.1.2 Flame Type

This option allows selecting a flame detector to be connected (see Appendix C: Factory Defaults) by inputting a number corresponding to the model.

1. Press “Set” to access the model selection screen. The cursor flashes at the first rightmost digit;
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value;
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



10.4.2 Range

This option allows setting a maximum measurement range (the default range is determined by the selected gas).

1. Press “Set” to access the range setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the 5 digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Note:

1. Numbers greater than 9999 are displayed in the scientific notation form.
2. During the setting of the measurement range, high alarm limit or low alarm limit, permissible range for the entered number can be altered by long pressing “+” or “-”. In case of a number displayed in the scientific notation form, long pressing the “-” can narrow the permissible range so that the number is not displayed in the scientific notation form any more.

10.4.3 Low Alarm

This option allows setting a low alarm limit (a range for low alarm limit is determined by the set high alarm limit).

1. Press “Set” to access the limit setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



Note:

1. Numbers greater than 9999 are displayed in the scientific notation form.

2. During the setting of the measurement range, high alarm limit or low alarm limit, permissible range for the entered number can be altered by long pressing “+” or “-”. In case of a number displayed in the scientific notation form, long pressing the “-” can narrow the permissible range so that the number is not displayed in the scientific notation form any more.

10.4.4 High Alarm

This option allows setting a high alarm limit (the default limit is determined by the default range of the selected gas).

1. Press “Set” to access the limit setting screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



Note:

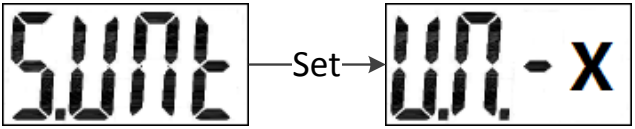
1. Numbers greater than 9999 are displayed in the scientific notation form.
2. During the setting of the measurement range, high alarm limit or low alarm limit, permissible range for the entered number can be altered by long pressing “+” or “-”. In case of a number displayed in the scientific notation form, long pressing the “-” can narrow the permissible range so that the number is not displayed in the scientific notation form any more.

10.4.5 Unit

This option allows selecting a measurement unit to be used by inputting a number corresponding to the unit.

Number	Unit
1	%LEL
2	ppm
3	%vol
4	µmol/mol

1. Press “Set” to access the unit selection screen. The cursor flashes at the rightmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



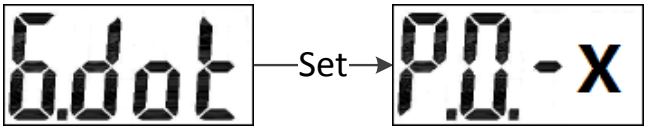
10.4.6 Point

This option allows selecting a resolution of readings. Items of the menu corresponding to this option are numbers with the implications as follows.

Number	Implication
0	Without fractional digit
1	Without or with one fractional digit
2	Without or with one or two fractional digits

3	Without or with one, two or three fractional digits (when the range is set <10)

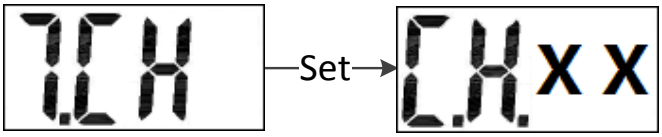
1. Press “Set” to access the resolution selection screen. The cursor flashes at the rightmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



10.4.7 Channel ID

This option allows setting the communication address of a channel unit in the system (i.e., a channel ID)

1. Press “Set” to access the channel ID setting screen. The cursor flashes.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



10.4.8 Password

This option allows changing the primary password (in the permissible range of 0-7999).

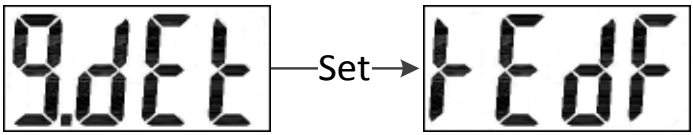
1. Press “Set” to access the password-changing screen. The cursor flashes at the leftmost digit.
2. Press “+” or “-” to change the value of an active digit;
3. Press “Set” to confirm the changed value and advance to the next digit.
4. After all the digits have been changed successively, press “Set”, then all the digits will flash simultaneously. Press again “Set” to confirm the entered values and return to the parent menu.



10.4.9 Factory Set

This option allows resetting all the parameters of a channel unit to factory defaults.

1. Press “Set” to access the resetting screen.
2. Press “Set” to confirm to reset the parameters, or any other key or button to exit the screen without making any changes.



Factory Defaults

Items	Defaults
Channel ID	1
Primary Password	1111
Secondary Password	8888
Gas	Methane
Unit	%LEL
Range	100
Low Alarm Limit	25
High Alarm Limit	50
Resolution	0
4-20 mA Input Calibration	
4 mA Output Calibration	0

10.4.10 4mA Input Cal

This option allows the calibration of 4 mA input signals.

1. Press “Set” to access a signal selection screen.
2. Set the output of a 4-20 mA generator as 4 mA, and couple the output to the 4-20 mA analog input port of the channel unit.
3. Press “Set” to initiate the calibration. The screen will then display the real-time value sampled by the AD converter. Press again “Set” to confirm the result of the sampling. If the calibration is successful, the screen will be navigated to the parent menu. Otherwise, “Err-” will be shown.

Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Notes:
4-20 MA generators that can be used in the calibration must be metrologically certified generators.



10.4.11 20 mA Input Cal

This option allows the calibration of 20 mA input signals.

1. Press “Set” to access a signal selection screen.
2. Set the output of a 4-20 mA generator as 20 mA, and couple the output to the 4-20 mA analog input port of the channel unit.
3. Press “Set” to initiate the calibration. The screen will then display the real-time value sampled by the AD converter. Press again “Set” to confirm the result of the sampling. If the calibration is successful, the screen will be navigated to the parent menu. Otherwise, “Err-” will be shown.

Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Notes:
4-20 MA generators that can be used in the calibration must be metrologically certified generators.



10.4.12 4 mA Output Cal

This option allows the calibration of 4-20 mA output signals.

1. Press “Set” to access a signal selection screen
2. Press “+” or “-” to set the output signal in consistence with the input 4-20 mA signal(in a range of from -30 to 30);
3. Press “Set” to return the parent menu.

Pressing “Set” for 3 seconds will navigate the screen back to the monitoring screen.

Notes:

1. Such functional adjustment must be made using a metrologically certified current meter or a current meter whose accuracy has been confirmed.
2. This functional operation is only for analog output modules.



10.4.13 Return

Upon “Set” is pressed when this option is selected, the screen will be navigated back to the monitoring screen.



11 Maintenance and Ordering

11.1 Maintenance

No special maintenance is required for FMC-1000 Plus, but the user is recommended to regularly check and calibrate the controller in intervals specified in a relevant document.

11.2. Ordering Information

Name	Ordering No.	Remark
Rack Kit	Front rack：F13-2011-000 Rack：F13-2012-000 Rare rack：F13-2013-000	Only for rack mount model(RM)
Common Control Unit	RM: F13-0901-100 WM: F13-0903-100	
Channel Unit	RM: F13-0902-100 WM: F13-0904-100	
Power Supply	F13-0011-000	

12 Warranty

This warranty period for this product is 1 year from the date of purchase. Products not damaged from unauthorized repair or disassembly by person other than professionals could be sent to the RAE for free maintenance service. When the warranty expires, the user continues to enjoy our long-term maintenance service, which would charge only the necessary costs and expenses incurred during the repair process.

13 Appendix A: ModBus Protocol

1. Communications:

Frame Format: RTU
Slave device: FMC-1000 Plus Common Control Unit
Slave Address: 1~247 (0x0001~0x00F7)
Baud rate: 4800, 9600, 19200 (Default: 9600bps)
Parity: None

2. Data

FMC-1000 Plus supports only 0x03 and 0x10 functional codes.

- **0x03: Read-only register**

Frame Format of Transmitted Data:

Slave address	Functional Code	Start (High)	Start (Low)	Number of Register (High)	Number of Register (Low)	CRC Code (High)	CRC Code (Low)

Frame Format of Responded Data:

Slave address	Functional Code	Number of Bytes	Register Data	CRC Code (High)	CRC Code (Low)

- **0x10: Writable Register**

Frame Format of Transmitted Data:

Slave address	Functional Code	Start (High)	Start (Low)	Number of Register (High)	Number of Register (Low)	Number of Bytes	Register Data	CRC Code (High)	CRC Code (Low)

Frame Format of Responded Data:

Slave address	Functional Code	Start (High)	Start (Low)	Number of Register (High)	Number of Register (Low)	CRC Code (High)	CRC Code (Low)

3. Registers

(1) 0x03 (Read-only register)

a. General Information of Channel Units

Address of Channel information includes channel basic address and offset address. Channel basic address is location from 0x0000 to 0x03F0 (in Measure mode: Master channel address is 0x0000, other address are not used; in Control Mode: channel 1 address is 0x0000, channel 2 address is 0x0010 . . . , channel 64 address is 0x03F0), step value is 0x10.

Offset Address	Length	Responded Data	Description
0x0000	0x0001	byte[0] = 0 byte[1] = u8_Reg_Flag	A sign for channel unit registration 0: success; 1: failure
0x0001	0x0001	byte[0] = 0 byte[1] = u8_MeasureType	Measurement type: 0:Gas 1:Flame
0x0002	0x0001	byte[0] = 0 byte[1] = u8_GasTypeID	Channel unit gas type No. (referring to Appendix C)
0x0003	0x0001	byte[0]=DataFormat B0..B1: Data Length B2..B4: DevideFactor	Data Format **DataLength:** 00 - 1 byte 01 - 2 bytes 10 - 4 bytes 11 - 8 bytes **DivideFactor = 10^n:**

		B5..B7: Decimal-Point byte[1]=UnitCode	000 - 1 001 - 10 010 - 100 011 - 1000; 100 - 111: reserved **DecimalPoint:** 000 - 0 001 - 1 010 - 2 011 - 3 100 - 111: reserved **UnitCode:** referring to 10.1.5. Unit
0x0004	0x0001	byte[0] = Range higher byte[1] = Range high	Range high word
0x0005	0x0001	byte[0] = Range low byte[1] = Range lower	Range low word
0x0006	0x0001	byte[0] = High Alarm Value higher byte[1] = High Alarm Value high	High Alarm Value high word
0x0007	0x0001	byte[0] = High Alarm Value low byte[1] = High Alarm Value lower	High Alarm Value low word
0x0008	0x0001	byte[0] = Low Alarm Value higher byte[1] = Low Alarm Value high	Low Alarm Value high word

0x0009	0x0001	byte[0] = Low Alarm Value low byte[1] = Low Alarm Value lower	Low Alarm Value low word

b. Channel Unit Readings

Address of Channel reading includes reading basic address and offset address. reading basic address is location from 0x0700 to 0x07FC (in Measure mode: Master channel reading address is 0x0700, other address are not used; in Control Mode: channel 1 reading address is 0x0700, channel 2 reading address is 0x0704 . . . , channel 64 reading address is 0x07FC), step value is 0x04.

Offset Address	Length	Responded Data	Description
0x0000	0x0001	byte[0] = Reading higher byte[1] = Reading high	Reading high word
0x0001	0x0001	byte[0] = Reading low byte[1] = Reading lower	Reading low word
0x0002	0x0001	byte[0] = Channel status byte for Flame byte[1] = Channel status byte for Gas	Channel status byte Gas: 0: Normal; 1: Low Alarm; 2: High Alarm; 3: Fault; 4: Unregistered; 5: Reset channel unit parameter Flame: 0:Flame_fault

			1:Flame_dirty 2:Flame_normal 3:Flame_alarm 4:Flame_BC_R 5:Flame_BC_U 6:Flame_AL_F 7:Flame_AL_U 8:Flame_PR 9:Flame_OP 10:Flame_Abnormal
0x0003	0x0001	byte[0] = master configuration change counter. byte[1] = slave configuration change counter.	Master configuration counter Slave configuration counter

Note: 1) When the common control unit is operating in the detector mode, its measured data are stored in CH00 (address: 0x0700-0x0703), leaving the other address unused and returning 0 for every access;

2) As the number of bytes for readings of all the 64 channel units exceeds 256, reading in several times is recommended.

3) The common control unit parameter change counter is only applicable for the common control unit but not for any channel unit; each channel unit is equipped with parameter change counter for parameter resetting of the specific channel unit.

c. System Parameters

Start Address	Length	Responded Data	Description
0x0800	0x0001	byte[0] = Client_ID high	Client ID (range: 1~247)

		byte[1] = Client_ID low	
0x0801	0x0001	byte[0] = Baud rate high byte[1] = Baud rate low	Baud rate
0x0827	0x0003	byte[0] = year byte[1] = month byte[2] = day byte[3] = hour byte[4] = minute byte[5] = second	Get RTC
0x082c	0x0001	byte[0] = 0 byte[1] = Master card mode	Master card mode 0: Controller mode; 1: detector mode;
0x082d	0x0001	byte[0] = 0 byte[1] = language	language 0: English; 1: Chinese.

(2) 0x10 Writable Registers

a. General Information of Channel Units

Address of Channel information includes channel basic address and offset address. Channel basic address is location from 0x0000 to 0x03F0 (in Measure mode: Master channel address is 0x0000, other address are not used; in Control Mode: channel 1 address is 0x0000, channel 2 address is 0x0010 . . . , channel 64 address is 0x03F0), step value is 0x10.

Offset Address	Length	Responded Data	Description
0x0000	0x0001	byte[0] = 0 byte[1] = u8_Reg_Flag	A sign for channel unit registration Read-only, unwritable

0x0001	0x0001	byte[0] = 0 byte[1] = u8_MeasureType	Measurement type: always 0
0x0002	0x0001	byte[0] = 0 byte[1] = u8_Gas-TypeID	Channel unit gas type No. (referring to Appendix C)
0x0003	0x0001	byte[0]=Data-Format B0..B1: Data Length B2..B4: DevideFac-tor B5..B7: Decimal-Point byte[1]=UnitCode	**Data Format:** **DataLength:** 00 - 1 byte 01 - 2 bytes 10 - 4 bytes 11 - 8 bytes **DivideFactor = 10^n:** 000 - 1 001 - 10 010 - 100 011 - 1000; 100 - 111: recovered **DecimalPoint:** 000 - 0 001 - 1 010 - 2 011 - 3 100 – 111: reserved **UnitCode:** referring to 10.1.5. Unit
0x0004	0x0001	byte[0] = Range higher byte[1] = Range high	Range high word
0x0005	0x0001	byte[0] = Range low byte[1] = Range lower	Range low word

0x0006	0x0001	byte[0] = High Alarm Value higher byte[1] = High Alarm Value high	High Alarm Value high word
0x0007	0x0001	byte[0] = High Alarm Value low byte[1] = High Alarm Value lower	High Alarm Value low word
0x0008	0x0001	byte[0] = Low Alarm Value higher byte[1] = Low Alarm Value high	Low Alarm Value high word
0x0009	0x0001	byte[0] = Low Alarm Value low byte[1] = Low Alarm Value lower	Low Alarm Value low word

a. System Parameters

Start Address	Length	Responded Data	Description
0x0800	0x0001	byte[0] = Client_ID high byte[1] = Client_ID low	Client ID (1-247)
0x0801	0x0001	byte[0] = Baud rate high byte[1] = Baud rate low	Baud rate: 4800/9600/19200
0x0827	0x0003	byte[0] = year byte[1] = month byte[2] = day byte[3] = hour byte[4] = minute	RTC system clock “YMDHMS” Hex format

		byte[5] = second	
0x082c	0x0001	byte[0] = 0 byte[1] = Master card mode	Master card mode 0: controller; 1: detector.
0x082d	0x0001	byte[0] = 0 byte[1] = language	language 0: English; 1: Chinese.

14 Appendix B: Protocol for Communications with Graphic Display Device

The controller serves as a main station communicating in the 485 scheme at a baud rate of 9600 and transmitting data in the ASCII frame format.

Type	Frame Data			
	Start	Identifier	Event	Finish
Fire Alarm	@	FIR/FRI	Loop No. (3 characters) Address No. (3 characters) Year Month Day Hour Minute (2 characters) CRCH CRCL, all checked expect “#”	#
Fault	@	FAU/FAI	Loop No. Address No. Year Month Day Hour Minute CRCH CRCL	
Block	@	ISI/ISO	Loop No. Address No. Year Month Day Hour Minute CRCH CRCL	
Block Lifted	@	ISR	Loop No. Address No. Year Month Day Hour Minute CRCH CRCL	
Fault Recovery	@	FAR	Loop No. Address No. Year Month Day Hour Minute CRCH CRCL	

15 Appendix C: Factory Settings

Gas Type:

Items	Gas Name	Measure Range	Units	Dot	Low alarm	High alarm
0	甲烷	0-100	%LEL	0	25	50
1	CH_4	0-100	%LEL	0	25	50
2	Ex	0-100	%LEL	0	25	50
3	CO	0-1000	ppm	0	35	200
4	H_2S	0-200	ppm	1	10	20
5	SO_2	0-20	ppm	1	5	10
6	O_2	0-30	%vol	1	18.5	23.5
7	ETO	0-200	ppm	1	10	20
8	Cl_2	0-30	ppm	1	1	3
9	NH_3	0-100	ppm	1	25	50
10	HCN	0-50	ppm	1	5	10
11	PH_3	0-20	ppm	1	2	4
12	NO	0-250	ppm	1	25	50
13	NO_2	0-20	ppm	1	3	5
14	HCl	0-30	ppm	1	10	20
15	ClO_2	0-1	ppm	2	0.1	0.3
16	H_2	0-1000	ppm	0	200	400
17	CO_2	0-50000	ppm	0	500	2000
18	HF	0-10	ppm	1	3	6
19	SiH_4	0-50	ppm	2	0.5	1.5
20	AsH_3	0-1	ppm	3	0.05	0.15
21	VOC	0-1000	ppm	1	200	400
22	EC	0-100	ppm	1	10	20

Flame Type:

Items	Model of Flame detector	Units	Dot	Low alarm	High alarm
128	FS24X	/	/	/	/
129	FS20X	/	/	/	/
130	SS4	/	/	/	/

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