

EM7162 - Evaluation Module for CDM7162

Instruction Manual

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1. Overview

The EM7162 is an evaluation module that permits easy evaluation of the characteristics of the CDM7162 carbon dioxide (CO₂) sensor module. The module is equipped with a USB connector to output CO₂ concentration measurement data, a terminal for output of the concentration signal in PWM format, and a terminal for output of a voltage signal converted from PWM output. After installing the measurement data management software in an external computer and connecting EM7162 with the included USB cable, this module can be powered through the USB cable. As measurement data output is transferred to the computer, a chart of CO₂ concentration is displayed on the computer monitor in real time.

2. Parts and Specifications

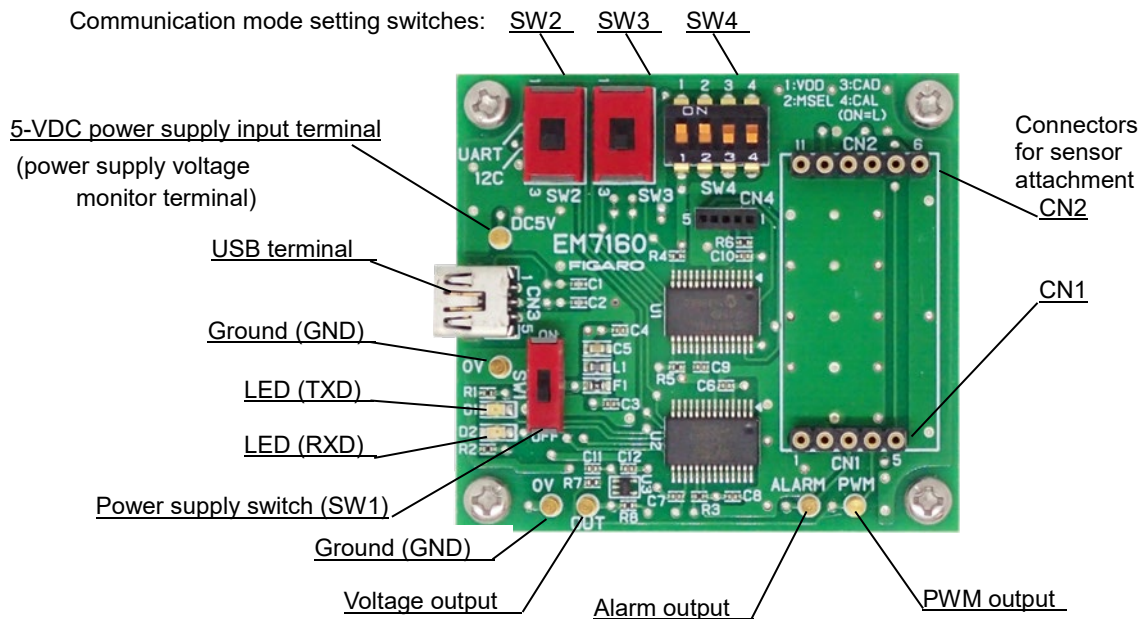


Figure 1 - Parts

Specifications

Model no.	EM7162
Name	Evaluation module for CDM7162
Target gas	Carbon dioxide
Input power supply	via USB connector or 5.0 VDC
USB output	0 to 65,535 ppm CO ₂ (Note 1)
PWM output (1 kHz)	duty ratio of 0 to 100% (corresponding to 0 to 5,000 ppm CO ₂)
Voltage output	0 to 5 V (corresponding to 0 to 5,000 ppm CO ₂)
Alarm output	CMOS output (High at 1,000 ppm or more, Low at less than 900 ppm) (Note 1)
Operating temperature/ humidity conditions	0°C to 50°C, 0 to 95% RH (without condensation)
Dimensions	Approx. 50 x 55 x 21 mm (excluding protruding portion) The height includes spacer and CDM7162 mounted.
Standard accessories	CDM7162 CO ₂ sensor module (with pin terminals) x 1 Mini-B USB cable x 1 PC Application software (available for download from the Figaro website. See section 4-1.)

Specifications of Measurement Data Management Software:

Supported OS:	Japanese version of Windows® 10 64-bit OS English version of Windows® 10 64-bit OS (Note 2 , Note 3)
Monitor screen display:	Chart display 0~5,000ppm (Max. 65,535ppm), CO2 concentrations (0~65,535ppm) (Note 1)
Data file format:	CSV file
Data recording interval:	2 seconds, 30 seconds, 60 seconds, 5 minutes, 10 minutes, 30 minutes, or 60 minutes
Data recording capacity:	Measurement data for about 24 hours max. in a single file.

Note 1)For specifications of the CDM7162, see the CDM7162 Product Information.

Note 2)Windows and Excel are registered trademarks of Microsoft Corporation.

Note 3)Although the operation of the measurement data management software was tested on the above operating systems, proper operation of this software is not guaranteed.

3. Setting the Method of Serial Communication

The I2C bus or UART interface can be chosen for serial communication between the CDM7162 CO2 sensor and this evaluation module.

Set the serial communication method by using the communication mode selection switches on the EM7162 module before connecting the USB cable or the power supply.

Caution!! Before changing the serial communication setting, be sure to turn off the power switch (SW1) by setting it to the lower position as shown in Fig. 2.

3-1) Switch settings for I2C bus mode

Set switches SW2, SW3, and SW4 (1 to 4) as follows:

- SW2, SW3: Set to I2C position (**lower position** as seen in Figure 2).
- SW4-1, SW4-2: Set to ON position (**upper position** as seen in Figure 2).
- SW4-3, SW4-4: Set to OFF position (**lower position** as seen in Figure 2).

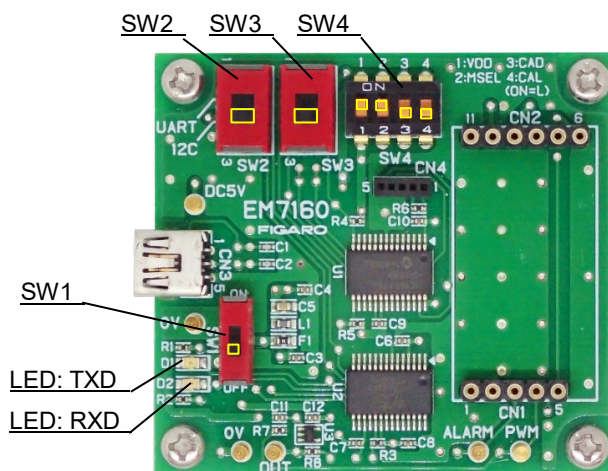


Figure 2 - I2C Communication Setting

Caution!! Do not change the preset positions of SW2, SW3, and SW4. Changing switch positions may cause damage to the CDM7162 sensor.

3-2) Switch settings for UART interface

Set switches SW2, SW3, SW4 (1 to 4) as follows:

- SW2, SW3: Set to UART position (upper position as seen in Figure 3)
- SW4-1, SW4-2, SW4-3, SW4-4: Set to OFF position (lower position as seen in Figure 3).

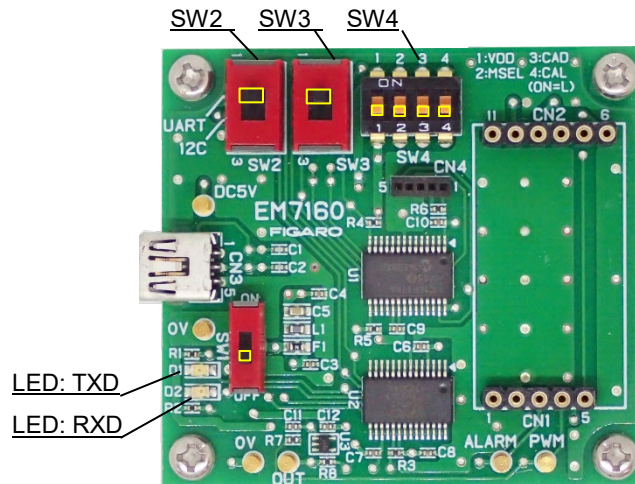


Figure 3 - UART Communication Setting

Caution!! Do not change the preset positions of SW2, SW3, and SW4. Changing switch positions may cause damage to the CDM7162 sensor.

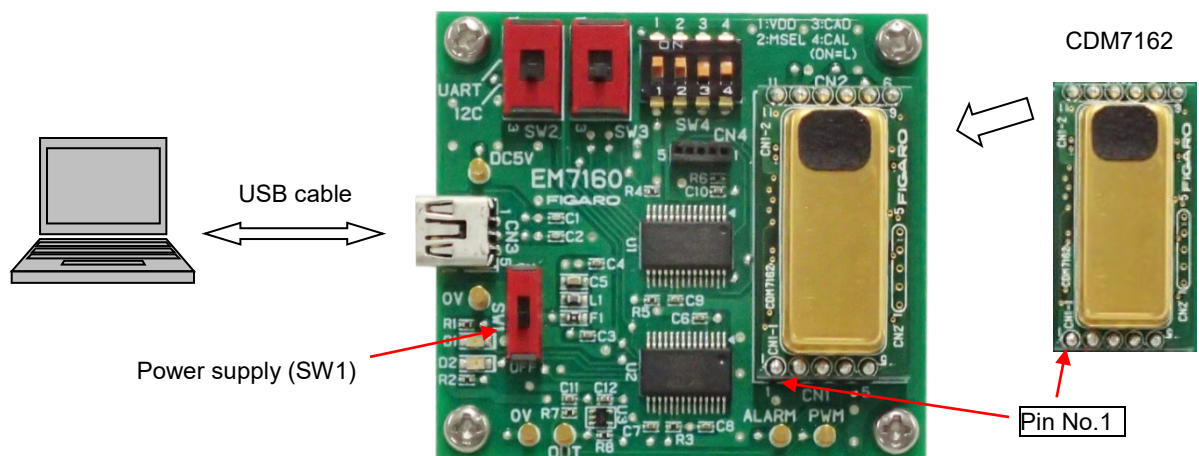
3-3) Attaching CDM7162

The included CDM7162 sensor module is attached to the EM7160 evaluation module at the factory. When replacing the CDM7162 or removing and remounting it, match the pin # of connectors CN1 and CN2 on EM7162 with the corresponding pin # of the CDM7162 (Figure 4).

Caution!! Before mounting or removing CDM7162, be sure to turn off the power switch (SW1) by setting it to the lower position as shown in Fig. 4.

Note) The standard CDM7162 CO2 sensor module is not equipped with pin terminals for connection. If you purchase additional CDM7162 sensor modules, solder commercially available pin terminals to the CDM7162 and mount onto the evaluation module.

Figure 4 - Attachment of CDM7162



4. Installing the Measurement Data Management Software and USB Driver

Before installing the USB driver, check the version of Windows OS on your computer by following the description on the Microsoft website.

Microsoft website:

(1) Check the version of Windows:

https://answers.microsoft.com/en-us/windows/wiki/windows_10-windows_install/how-to-find-out-the-version-of-windows-that-you/9cd9df62-b195-4875-8b9c-76dcc37aef65

(2) Check whether the Windows OS is a 32-bit version or a 64-bit version:

<https://support.microsoft.com/en-us/kb/827218>

Caution!! Do not connect the evaluation module to the computer before completing installation of the USB driver.

4-1) Downloading the Measurement Data Management Software

Download a set of the PC Application software for EM7162 from the following website of Figaro Engineering Inc. onto a PC.

EM7162 Evaluation module for CDM7162

(English version) <https://www.figaro.co.jp/en/product/entry/em7162.html>

(Chinese version) <https://www.figaro.co.jp/cn/product/entry/em7162.html>

(Japanese version) <https://www.figaro.co.jp/product/entry/em7162.html>

4-2) Installation of USB driver

Install the USB driver (FT232R-USB) on a PC from the folder containing the application software downloaded in step 4-1. The following procedure and figures are for Windows 10. The procedure and screen display will vary according to the version of Windows OS.

(1) Open the [USB Driver] folder contained in the downloaded folder and double-click the applicable icon:

① 32-bit version of Windows OS

Double-click "dpinst-x86.exe."

② 64-bit version of Windows OS

Double-click "dpinst-amd64.exe."

(2) When the license agreement is displayed, check the terms and conditions, select [I agree], and click the [Next] button. Installation will commence.

(3) When the USB driver is completely installed, click the [Finish] button to close the installation screen.

(4) Connect the USB terminal on the evaluation module to the USB port on the computer using a USB cable (included).

- (5) Turn on the power switch SW1 of EM7162 and confirm that the USB driver is recognized on the computer screen.
- (6) Press the Windows key + I shortcut to open "Settings".
Then click "Devices", scroll down on the right pane of the Device window, and click the "Devices and Printers" link under the "Related settings"
- (7) Right-click the "FT232R USB UART" USB driver icon and select "Properties" (Figure 5).

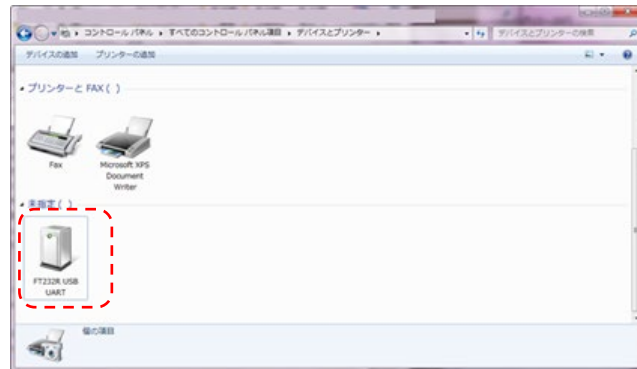


Figure 5 - USB Driver Icon on the "View devices and printers" screen

- (8) Click the "Hardware" tab on the "Properties" screen and check the displayed COM port number (Figure 6). Write down this number as this is necessary for initial setup of the data management software. (See Sec. (5-1) (5)).

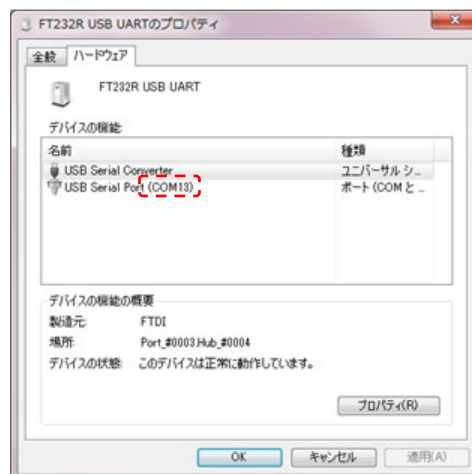


Figure 6 - COM Port No.

4-3) Installing the measurement data management software

Copy the folder named "**Conc Measure**" contained in the downloaded folder and paste it to the desired location on the computer (e.g. desktop).

Open the "**Conc Measure**" folder on the computer and confirm that "**ConcMeasure.exe**" and **ConcMeasure.exe.config** file are present.

Measurement data management software executable file icon:



ConcMeasure.exe

4-4) Installing Framework 3.5 SP1

If **.NET Framework 3.5 SP1** software is not installed on your computer, download it from the following Microsoft website:

(Japanese version)

<https://www.microsoft.com/ja-jp/download/details.aspx?id=22>

(English version)

<http://www.microsoft.com/en-us/download/details.aspx?id=22>

4-5) Uninstalling the measurement data management software

Delete the folder that contains the following two files from the computer:

- **ConcMeasure.exe**
- **ConcMeasure.exe.config**

5. Using EM7162 with the Measurement Data Management Software

After installing the measurement data management software and USB driver (FT232R-USB) on the computer, connect EM7162 to the computer using a mini B-USB cable. In this way, CO₂ concentration and measurement data can easily be collected by the CDM7162 CO₂ sensor module.

5-1) Initial setting of the measurement data management software and measurement data collection

- (1) Mount the CDM7162 sensor module onto the EM7162 (see Sec.3-3)
- (2) Connect the EM7162 to the computer with a mini B-USB cable.
The EM7162 is powered through the USB cable.
- (3) Turn on the power switch (SW1) on EM7162 (see Fig. 7).
- (4) Double-click the icon for the data management software (ConcMeasure.exe) as installed on the computer to display the startup screen shown in Figure 8.

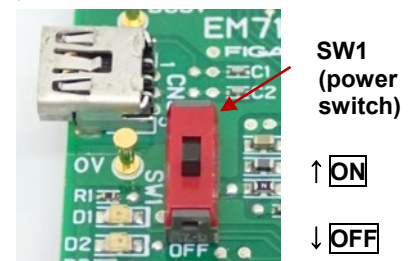


Figure 7

ConcMeasure.exe



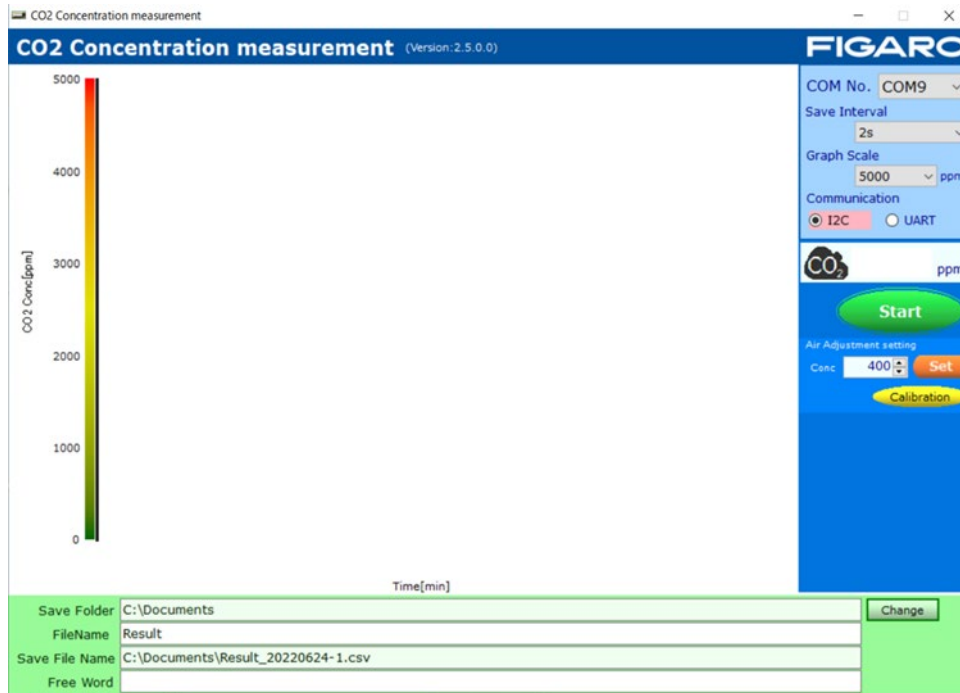


Figure 8 - Startup Screen

(5) Setting the COM port number [COM No.]

Set the number of the COM port to which the EM7162 is connected in "COM No." at the top right of the screen. (*for how to check the COM port no., see steps 6~8 in Sec. 4-1*).

(6) Setting the recording interval [Save Interval]

Select one of the following from the Save Interval pull-down menu at the top right of the screen: 2 seconds, 30 seconds, 60 seconds, 5 minutes, 10 minutes, 30 minutes, or 60 minutes. This will specify the interval for recording measurement data in CSV format.

Note) *The measurement interval and the update interval of the measurement data chart display are fixed at 2 seconds.*

(7) Selecting the serial communication method [Communication]

Select UART or I2C according to the serial communication method setting on EM7162.

(8) Setting the storage destination [Save Folder]

The directory for the default storage destination folder is displayed in the Save Folder field. The destination folder to save measurement data (CSV files) can be changed by clicking the [Change] button while CO2 concentration is not being measured.

(9) Setting the file name to save data [Save File Name]

Measurement data is automatically saved under the name consisting of the file name entered in the [File name] field (e.g. Result), date (e.g. _20220624), and serial number (e.g. -1) (example: Result_20220624-1.csv").

(10) Entering free-form text [Free Word]

You can record measurement-related information and remarks in the header section of the CSV file by entering it in the [Free Word] field.

(11) Starting measurement

- When you click the [Start] button, measurement of CO2 concentration starts and the measurement data chart is displayed.

- The screen displays data from the most recent 10 minutes of measurement data for a measurement session (see Figure 9).
- Measurement data is saved in CSV format on the computer at recording interval specified in Step 6 above.

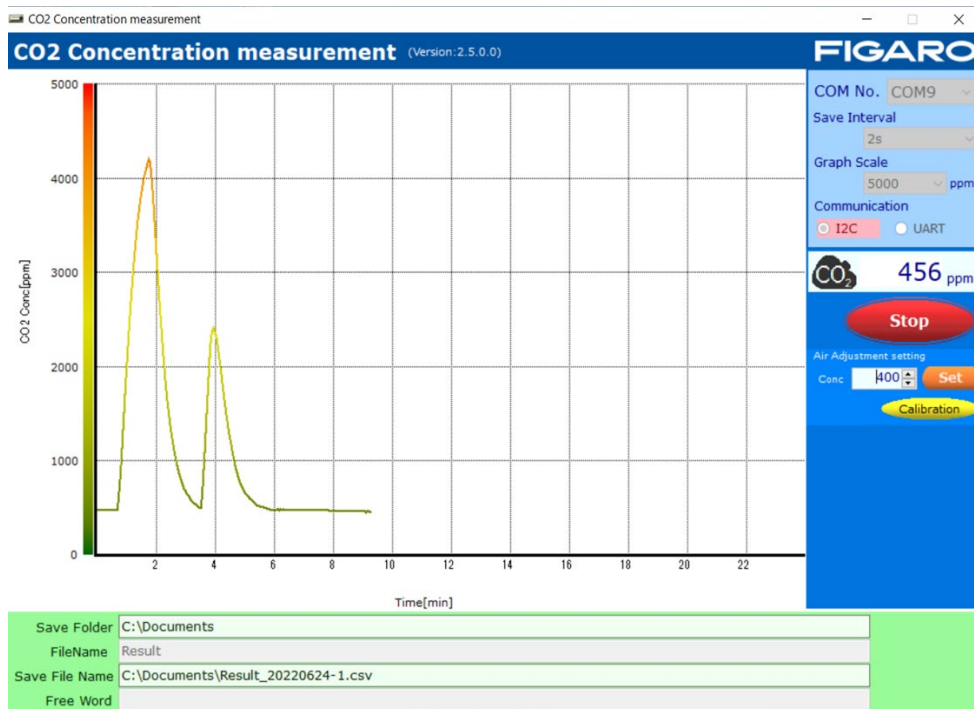


Figure 9 - Measurement Data Display Example

(To change the destination folder to save or saved file name, see Sec. 5-2.)

(12) Completion of measurement

Click the [Stop] button to terminate measurement.

When measurement is completed, measurement data is saved in the CSV format.

*** Before attaching or removing the sensor module (CDM7162), be sure to turn off the power switch (SW1).**

5-2) Saved data files

(1) Measurement data is saved in a CSV file in the folder selected as the destination to save.

Default setting of the destination folder is c:>Users>user name>Documents.

The default Document folder can be browsed as follows:

- Windows 10:

Right-click the Start button ⇒ Explorer ⇒ Select Document in the folder area

(2) The storage destination can be changed in the following way when CO₂ concentration is not being measured:

- Folder name: Click the [Change] button at the right of the Save Folder field.
- File name: Directly enter the new file name in the File Name field.
(The default file name is "Result.")

The actual saved file name and its directory are displayed in the Save File Name field.

"_YYYYMMDD-N.csv" is automatically added after the file name displayed in the File Name field.

- YYYY: The Western calendar year (four digits) on the computer clock.
- MM: Month (two digits) on the computer clock
- DD: Day (two digits) on the computer clock
- N: Serial number beginning with 1 is automatically added.

* Measurement data covering about 24 hours can be stored in one file. If the measurement time exceeds 24 hours, additional data is saved in a different file name (with serial number=N + 1).

(3) Saved CSV files can be imported to spreadsheet software such as Excel® to edit and manipulate them after measurement is completed (Figure 10).

No.	Conc[ppm]
0	535
1	535
2	534
3	533
4	531
5	531
6	532
7	532
8	533
9	534

Figure 10 - Screen example of a CSV File opened in Microsoft Excel®

As shown in Figure 10:

- Rows 1 to 3: Name of the measurement data management software
Measurement day, start time
Recording interval (Save Interval)
- Rows 4 to 5: Entered free-form text
- Rows 7 or after:

- Column A: Sampling nos. for measured data are serially recorded from 0.
- Column B: Measured CO₂ concentration (in ppm) is recorded in order.

(4) CO₂ concentration chart created in Excel

Figure 11 shows an example where the change in CO₂ concentration is displayed in chart form using the CSV file to which data is saved at a 30 second interval.

- Column D: The elapsed time (in seconds) is calculated by multiplying the sampling numbers in Column A by 30.
- Column E: The CO₂ concentration in Column B is used as is.

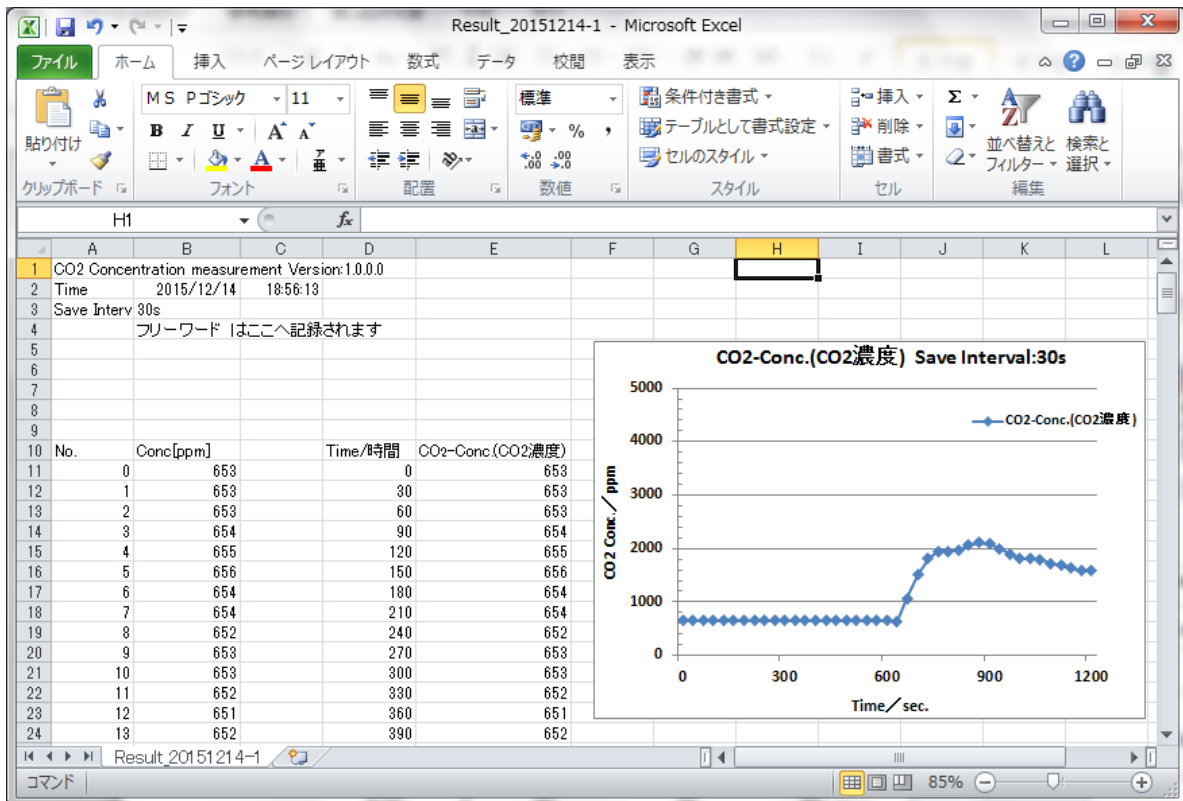


Figure 11 - Example of CO₂ Concentration Chart

5-3) Air Adjustment

Air Adjustment can be executed by placing the sensor in a clean air environment and clicking [Calibration] button on the PC Application software.

After performing Air Adjustment, the display concentration will change to 400 ppm, which is same as the default value. The default Air Adjustment setting value can be changed in 10ppm increments.

Figure 12 shows example display concentrations when Air Adjustment is performed assuming that CO₂ concentration in ambient air is 420ppm.

When Air Adjustment is performed using CO₂ gas of known concentration, set Air Adjustment setting value to the known concentration.

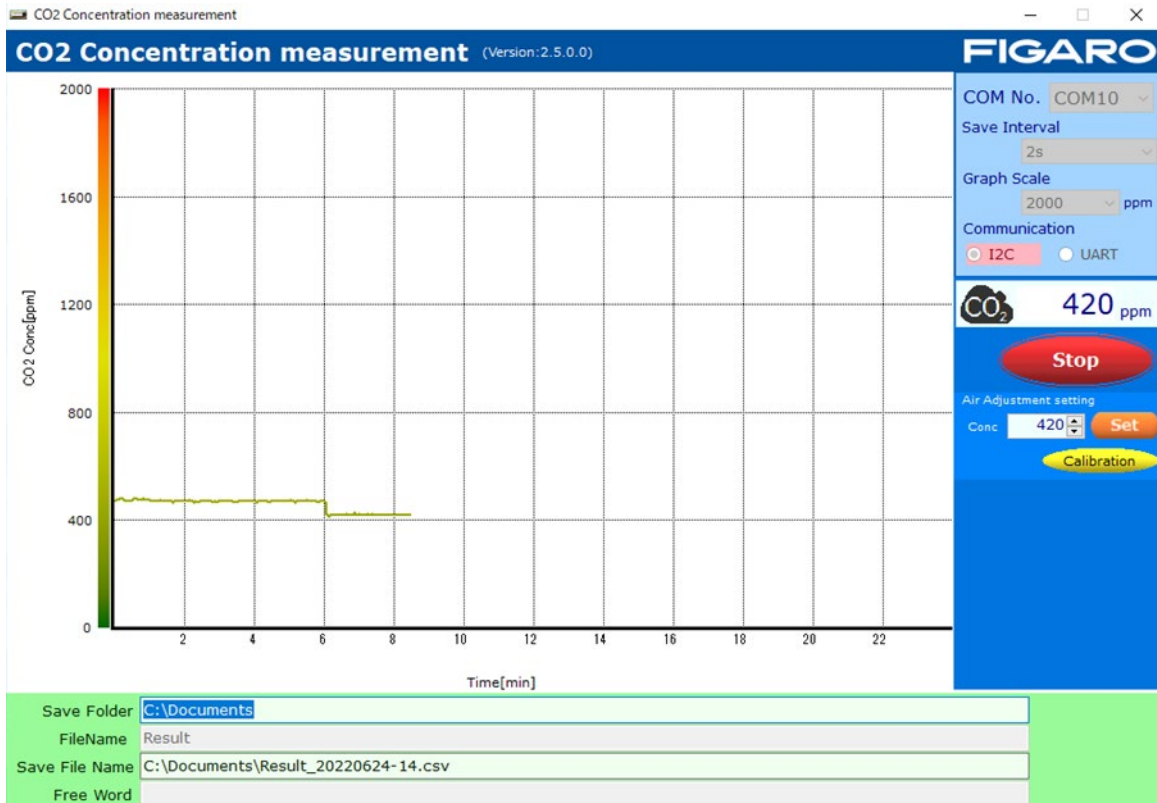


Figure 12 - Display example during Air Adjustment

Procedures for Air Adjustment:

- (1) Change the Air Adjustment setting value to assumed CO₂ concentration in ambient air (420ppm in the example shown in Figure 12) on the PC display. Then click [Set] button.
- (2) Confirm that the CDM7162 CO₂ sensor output has been sufficiently stable under this ambient conditions, and click [Calibration] button. And the concentration display will show the same concentration as the Air Adjustment setting value.
(Figure 12 shows an example of CO₂ measurements when clicking [Calibration] button after 6 minutes in ambient air for confirming stable sensor output.)
- (3) After measurements and evaluation tests have completed, change the Air Adjustment setting conc. Value to 400, and click [Set] button again for each sensor in order to reset its internal settings to the default value.

*If the Air Adjustment setting conc. value is not reset to the default value (400) after measurements, the Air Adjustment setting value recorded in the sensor remains the value changed last.

Therefore, if Air Adjustment is performed, i.e. [Calibration] button is clicked, in a different CO₂ concentration environment without resetting the Air Adjustment setting value, the display concentration output from the CDM7162 will be adjusted to the Air Adjustment setting value which is last set.

6. How to Use EM7162 without Connecting to a Computer

When using the EM7162 without connecting to a computer, connect the 5-VDC power supply between the power supply input terminal and the ground terminal (see *Figure 1*).

- The PWM output terminal outputs the PWM output signal from CDM7162 with a cycle of 1 kHz. The PWM duty ratio of 0 ~ 100% corresponds to the CO₂ concentration of 0 ~ 5,000 ppm.
- The voltage output terminal outputs the concentration signal obtained by converting the PWM output into voltage. The output voltage of 0 ~ 5 V corresponds to the CO₂ concentration of 0 ~ 5,000 ppm.
- A CMOS signal corresponding to the CO₂ concentration is output from the alarm output terminal. With the default settings of the CDM7162, the CMOS output is High when the CO₂ concentration is higher than 1,000 ppm, and the output is Low when the CO₂ concentration is below 900 ppm.

7. Notes

7-1) Connection between EM7162 and a computer

- Be sure to mount the CDM7162 onto EM7162 before connecting EM7162 to a computer.
- Do not remove CDM7162 from EM7162 while EM7162 is connected to a computer.
- Do not remove the cable connecting EM7162 and a computer while CO₂ concentration is being measured by the measurement data management software.

7-2) Error messages of the measurement data management software

If an error message is displayed, check the following items:

(Note that the details of the error message may vary depending on the location and cause of error)

(1) Error message: **[It failed on COM Port Open.]**



- Check that the COM port setting is correct on the data management software. "FT232R USB UART" should be displayed in Device Manager.
- Confirm that CDM7162 is properly mounted on EM7162.

(2) Error message: **[It failed when Lamp Interval couldn't get in I2C Communication.]** **[Failed on Lamp Interval Data!]**

- The serial communication method specified on the evaluation board does not match the communication method selected on the data management software screen.

***The EM7162 evaluation module is an evaluation tool for the CDM7162.
This module is not designed to be embedded in other devices.
These specifications are subject to change without notice for functional improvement.**

Figaro Engineering Inc.

1-5-11 Senba-nishi, Minoh, Osaka 562-8505 JAPAN

Tel: (81) 72-728-2561

URL: www.figaro.co.jp