

**EM7000 - Communication Board  
for Gas Sensor Evaluation Modules  
Instruction Manual**

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## 1. About EM7000

The **EM7000** communication board is designed to transfer output from EM series sensor evaluation modules to an external computer for facilitating evaluation of the characteristics of various Figaro gas sensors. This communication board is equipped with a USB connector to transfer output data from the EM series evaluation modules to a PC via serial communication, an output terminal for gas concentration data in PWM format from the CDM series CO<sub>2</sub> sensor, as well as a terminal for voltage output that is converted from PWM output. It facilitates an easy start to evaluating the characteristics of Figaro gas sensors.

Once the PC application software is installed on an external PC, it allows for the transfer of measurement data in serial format to the PC and the graphic display of output data on the PC monitor. Measurement data can be imported and saved in CSV format on the computer using the PC application software, then after gas measurements, it can be utilized for manual data processing and analysis using other software, such as Microsoft Excel (Note 3).

The communication board includes a Mini-B USB cable. The PC application software can be downloaded from the Figaro website. Please note that Figaro gas sensors or EM series evaluation modules are not included, but they can be purchased separately depending on evaluation needs.

## 2. Part names and Specifications

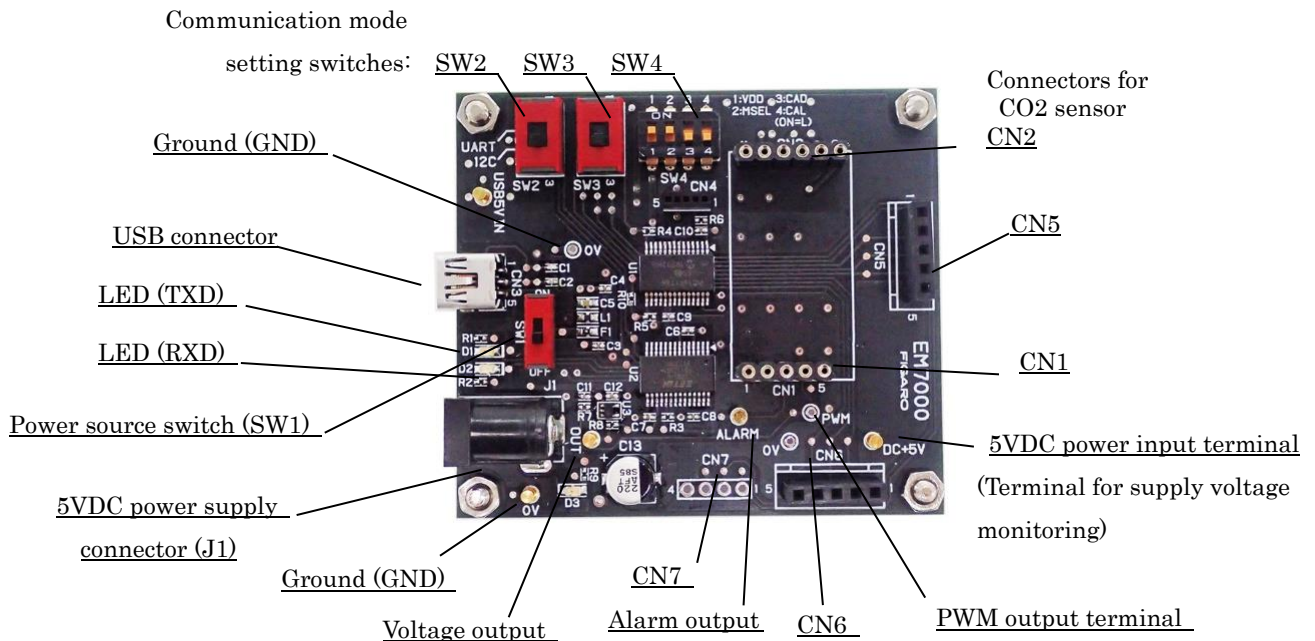


Figure 1 Part names

## Specifications

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Model no.	EM7000	
Name	Communication board for gas sensor evaluation modules	
Compatible products	EM series gas sensor evaluation modules and CDM71x CO <sub>2</sub> sensor	
Power supply	via USB connector or 5.0VDC	
USB output	0 to 65,535ppm for Carbon dioxide (CO <sub>2</sub> ) sensor (Note 1) According to the specifications of EM evaluation modules (Note 1)	
PWM output (1kHz)	duty ratio of 0 to 100% (corresponding to 0 to 5,000 ppm CO <sub>2</sub> ) for CO <sub>2</sub> sensor	
Voltage output	0 to 5V (corresponding to 0 to 5,000 ppm CO <sub>2</sub> ) for CO <sub>2</sub> sensor	
Alarm output	CMOS output (High at 1,000ppm or higher, Low at less than 900ppm) for CO <sub>2</sub> sensor	
Operating temperature/ Humidity	0°C to 50°C, 0 to 95%RH (without condensation)	
Dimensions	Approx. 60 x 68 x 23 mm (excluding protruding portion) The height includes spacers.	
Standard accessories	Mini B USB cable	x 1

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## Specifications of PC Application Software:

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Supported OS:	Windows®10, 64bit version (Japanese and English versions) (Note 2, Note 3)	
Display on monitor:	Graph chart of 0 to 5V, 0 to 65,535ppm CO <sub>2</sub> (Note 1)	
Data file format:	CSV format	
Data saving interval:	2 sec, 4 sec, 10 sec, 20 sec, 30 sec, 60 sec, or 5 min, 10 min, 30 min, or 60 minutes	
Data capacity:	Measurement data for about 24 hours max. in a single file	

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Note 1) For specification details, please refer to the Product Information of each EM series evaluation modules and CDM716x CO<sub>2</sub> sensor.

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

Note 3) The operation of the PC application software has been tested and verified on the above operating systems. However, proper operation of this software is not guaranteed.

## 3. Setting Sensors and Serial Communication Mode

RS232-USB conversion is used for serial data transmissions between this communication board and an external computer.

**Only the I2C bus mode can be used for serial communication between the CDM71X CO<sub>2</sub> sensor and this communication board, as factory preset as follows.**

### **3-1) Switch settings for I2C bus mode**

Default settings of switches SW2, SW3, and SW4 (1 to 4) are as follows.

- SW2, SW3: Set to the position for I2C (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).

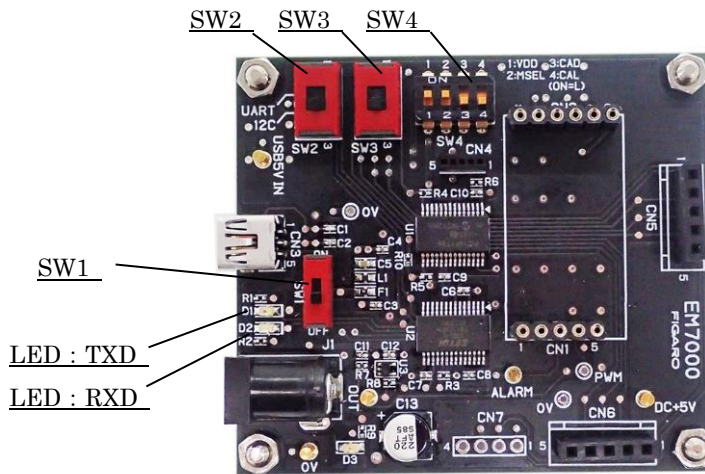


Figure 2 - I2C Communication Settings

**Caution!!** Change of the default settings of switches SW2, SW3, or SW4 may cause damage of CDM716x sensors.

### 3-2) Attaching CO2 Sensor

The CDM716x series CO2 sensor module is not included with shipment from the factory. When mounting a CDM716x, match the pin # of connectors CN1 and CN2 on EM7000 with the corresponding pin # of the CDM716x (Figure 3).

**Caution!!** Before mounting or removing CDM716x, be sure to turn off the power switch (SW1) by setting it to the lower position as shown in Fig. 3.

**Note)** The standard CDM716x CO2 sensor module is not equipped with pin terminals for connection.

If you purchase a CDM716x sensor module, solder commercially available pin terminals to the CDM716x and mount onto the communication board.

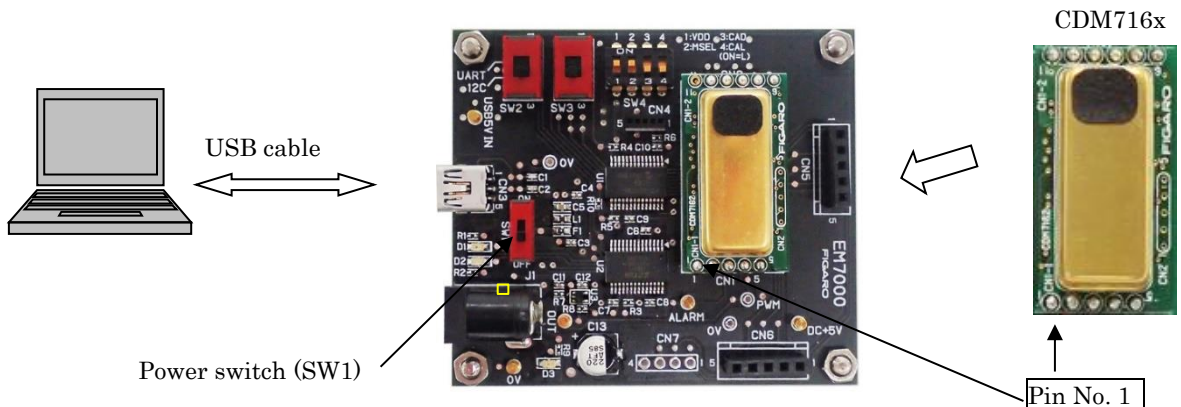


Figure 3 – Attaching CDM716x CO2 Sensor.

### **3-3) Attaching EM series Evaluation Modules**

The EM series evaluation module or TGS series gas sensor is not included with shipment from the factory. When mounting EM series evaluation modules, match the pin # of connectors CN5 or CN6 on EM7000 with the corresponding pin # of the EM evaluation module (Figure 4).



Figure 4 – Attaching EM series evaluation modules (Example)

## **4. Installing the PC Application 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 OS:

[https://www.microsoft.com/ja-jp/safety/pc-security/ver\\_win.aspx](https://www.microsoft.com/ja-jp/safety/pc-security/ver_win.aspx)

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

<https://support.microsoft.com/ja-jp/kb/827218>

**Caution!! Do not connect the communication board to the computer before completing installation of the USB driver.**

### **4-1) Downloading the PC Application Software**

Download the PC Application Software from the following Figaro website:

(Japanese version) <https://www.figaro.co.jp/product/entry/em7000.html>

(English version) <https://www.figaro.co.jp/en/product/entry/em7000.html>

(Chinese version) <https://www.figaro.co.jp/cn/product/entry/em7000.html>

When clicking the [Download PC Application Software] button on the Figaro website, a customer registration form will appear. Enter required information on the registration form and click the [Send] button. Then an email message containing a link to download the PC Application Software will be sent to the email address provided in the registration form. Click the link in the email message to download the PC Application Software to the desired location on the computer (e.g. desktop). After downloading the compressed ZIP file, decompress it and proceed with the installation of the PC Application Software and the USB driver.

#### 4-2) Installing the USB driver

Install the [USB Driver] from the decompressed folder to the computer by following the procedure below. The following procedure and figures are for Windows 7. The procedure and screen display may vary according to the version of Windows OS.

(1) Open the [USB Driver] folder and double-click the applicable icon of the executable file:

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 installation of the USB driver is completed, click the [Finish] button to close the installation screen.

(4) Connect the USB terminal on the communication board to the USB port on the computer using a mini B-USB cable included in the package.

(5) Turn on the power switch SW1 of EM7000 and confirm on the computer screen that the USB driver is recognized.

(6) Select "Start Menu", then select "Control Panel", and select "View devices and printers."

(7) Right-click the USB driver icon "FT232R USB UART" and select "Properties" (Figure 5).

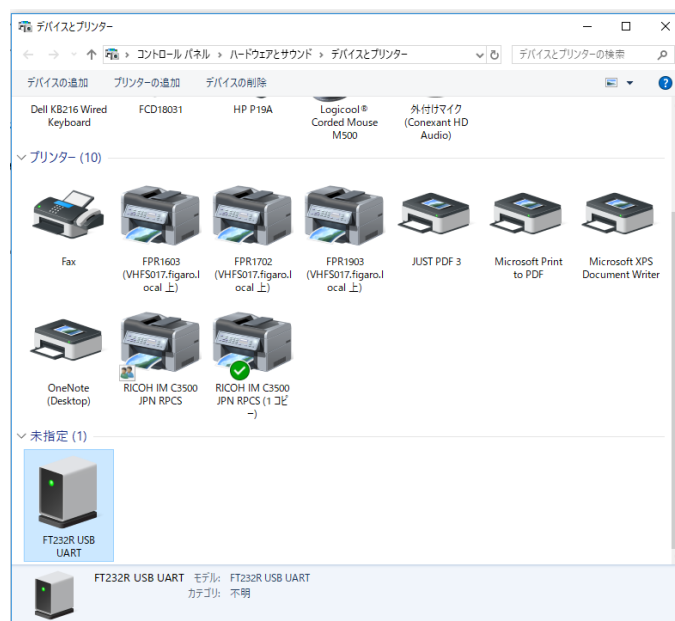


Figure 5 - USB Driver Icon on the "View devices and printers" screen

(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 PC Application software. (See Sec. 5-1) (6) ).

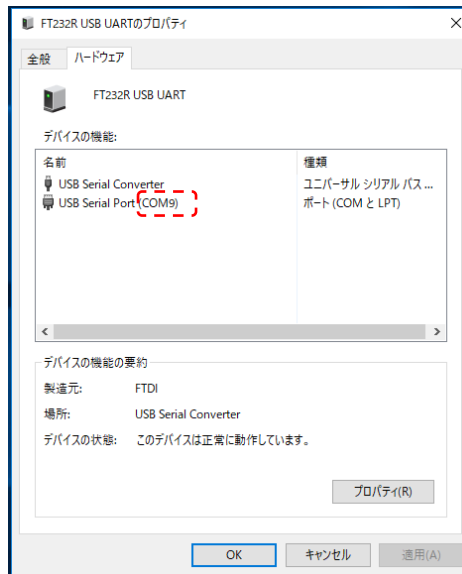
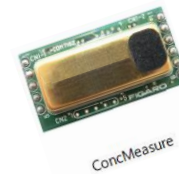


Figure 6 – COM Port No.

### 4-3) Installing the PC Application Software

Open the “**Conc Measure**” folder in the decompressed folder and confirm that the executable file of the PC Application Software, “**ConcMeasure.exe**” is properly installed.

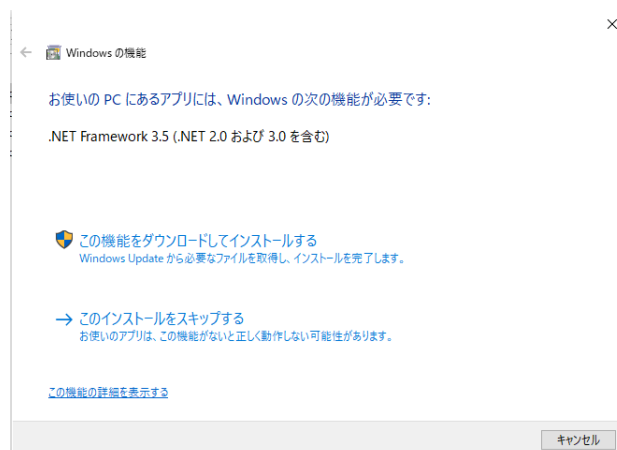
Icon of executable PC Application Software:



**ConcMeasure.exe**

### 4-4) Installing Framework 3.5 SP1

If the software .NET Framework 3.5 SP1 is not installed on your computer, the following error message will appear when you run the “ConcMeasure.exe” file. If this is the case, 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>

(Chinese version)

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

#### **4-5) Uninstalling the PC Application Software**

Delete the folder that contains the following file from the computer:

- **ConcMeasure.exe**

### **5. Using EM7000 with the PC Application Software**

After installing the PC Application software and the USB driver (FT232R USB UART) on the computer, connect EM7000 to the computer using a mini B USB cable. This set-up allows the computer to acquire CO<sub>2</sub> concentration data from the CDM716x CO<sub>2</sub> sensor module and gas measurement data from the EM series evaluation modules.

#### **5-1) Initial setting of the PC application software and gas measurement data acquisition**

- (1) Mount EM series evaluation modules and/or the CDM716x sensor module onto the EM7000 (see Sec. 3).
- (2) Connect an external 5.0VDC power supply to DC socket on EM7000.
- (3) Connect the EM7000 to the computer with a mini B-USB cable.
- (4) Turn on the power switch (SW1) on EM7000 (see Fig. 7).
- (5) Double-click the icon for the PC application software (ConcMeasure.exe) as installed on the computer to display the startup screen shown in Figure 8.



ConcMeasure.exe

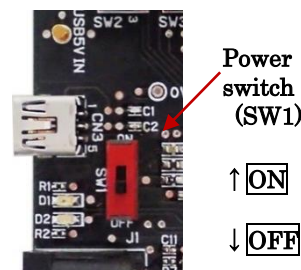


Figure 7 – Power Switch



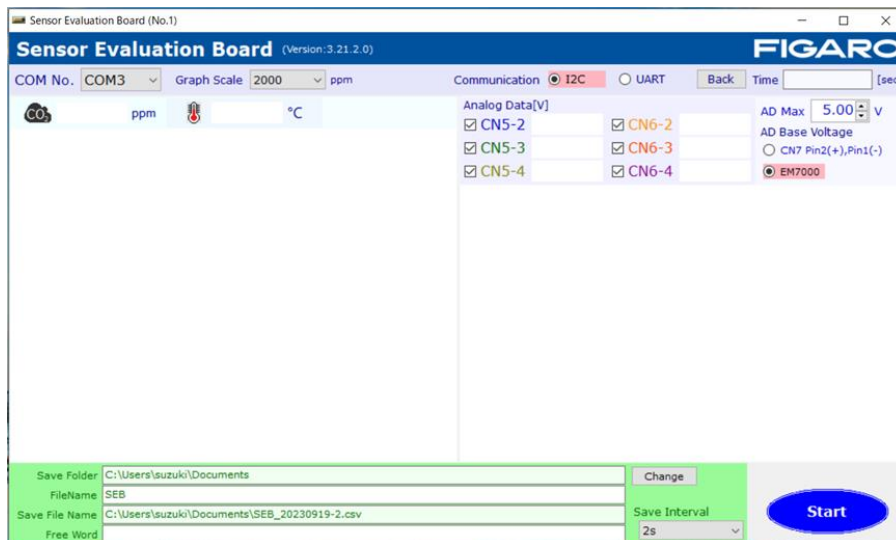


Figure 8 – Startup Screen

- (6) Setting the COM port number **[COM No.]**  
 In the "COM No." field at the top left of the screen, set the number of the COM port to which the EM7000 is connected. (See steps 6~8 in Sec. 4-2 for how to check the COM port no.).
- (7) Setting the recording interval **[Save Interval]**  
 Select one of the following intervals from the Save Interval pull-down menu at the bottom right of the screen:  
 2 sec., 4 sec., 10 sec., 20 sec., 30 sec., 60 sec., 5 min., 10 min., 30 min., 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.*
- (8) Selecting the serial communication method **[Communication]**  
 Select I2C according to the serial communication mode setting on EM7000.
- (9) Setting the storage destination **[Save Folder]**  
 The directory path 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 gas measurement is not being performed.
- (10) 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. "SEB"), date (e.g. "20230919"), and serial number (e.g. "-1") (example: "SEB\_20230919-1.csv").
- (11) Entering free-form text **[Free Word]**  
 Any information or remarks related to the measurement can be entered into the header section of the CSV file by entering it in the [Free Word] field.
- (12) Starting measurement
  - When you click the **[Start]** button, gas measurement begins, and the measurement data chart is displayed.
  - The measurement data for the most recent 16 minutes will be displayed on the screen at the measurement interval of 2 seconds (see Figure 9).

- Measurement data is saved in CSV format on the computer at the recording interval specified in Step 7 above. (for how to change the storage destination or file name of saved data, see Sec. 5-2).



Figure 9 – Measurement Data Display Example

(13) Completion of measurement

Click the **[Stop]** button to terminate measurement.

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

**Caution!! Before attaching or removing the CO2 sensor module or EM series evaluation modules, 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 Documents folder as a default setting, or in the destination folder selected in the **[Save Folder]** field. The Document folder can be browsed as follows:

- **Windows 10:**
- Right-click the Start button > Select Explorer > Select Document in the folder area.

(2) The storage destination can be changed while gas measurement is not being made through the following steps:

- 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 "SEB".)

The actual saved file name and the directory path are displayed in the Save File Name field. "\_YYYYMMDD-N.csv" is automatically added after the file name displayed in the File Name field.

Where,

- 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 for about 24 hours will be stored in a single file. The data for the subsequent measurements for 24 hours is saved in a file with the same name and a new serial number N, that is incremented by one.

(3) Saved CSV files can be imported into a spreadsheet software such as Excel® for manual data processing and analysis after completion of measurements (Figure 10).

No.	CO2[ppm]	CN5-2[V]	CN5-3[V]	CN5-4[V]	CN6-2[V]	CN6-3[V]	CN6-4[V]
0	630	1.747	1.019	0.944	2.018		
1	629	1.747	1.019	0.944	2.018		
2	629	1.747	1.02	0.945	2.017		
3	629	1.747	1.02	0.945	2.017		
4	630	1.747	1.02	0.945	2.017		
5	630	1.747	1.02	0.945	2.016		
6	630	1.746	1.019	0.945	2.016		
7	631	1.746	1.02	0.945	2.015		
8	631	1.745	1.02	0.945	2.015		

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

The following information and measurement data are saved in a CSV file as shown in Figure 10:

- Rows 1 to 7 : Name of the PC Application Software and its version number  
Date and start time of measurement (“Time”)  
Recording interval (“Save Interval”)  
COM number  
Maximum value (V) for AD conversion
- Rows 8 to 9 : Free-form text entered
- Rows 11 and after:
  - Column A : Sequential number of measurement data beginning from zero
  - Column B : Measured CO2 concentration in ppm is recorded if CDM716x is attached.
  - Columns C to H: Output voltages from EM evaluation modules are recorded.

## 6. Using EM700 without Connecting to a Computer (for evaluation of CO<sub>2</sub> sensors only)

If the EM7000 is used without connecting to a computer, connect the 5VDC power supply between the power input terminal and the ground terminal (see *Figure 1*).

- The PWM output terminal provides the PWM output signal with a 1 kHz cycle from CDM716x. At the default setting of the CDM716x, a PWM duty ratio of 0 ~ 100% corresponds to 0 ~ 5,000 ppm CO<sub>2</sub>.
- The voltage output terminal provides the concentration signal in a voltage that is converted from the PWM output. At the default setting of the CDM716x, the output voltage of 0 ~ 5 V corresponds to 0 ~ 5,000 ppm CO<sub>2</sub>.
- The alarm output terminal provides the CMOS signal output according to the CO<sub>2</sub> concentration. At the default settings of CDM716x, CMOS output is High when the CO<sub>2</sub> concentration is 1,000 ppm or higher, and CMOS output is Low when the CO<sub>2</sub> concentration is less than 900 ppm.

## 7. Notes

### 7-1) Cautions in connection between EM7000 and a computer

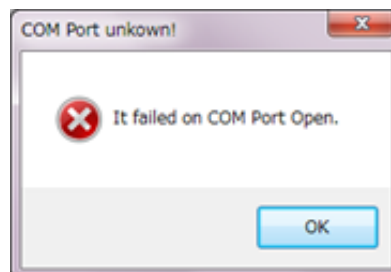
- Be sure to mount the CDM716x and the EM evaluation modules onto EM7000 before connecting EM7000 to a computer.
- Do not remove CDM716x from EM7000 while EM7000 is connected to a computer.
- Do not remove the cable connecting EM7000 and a computer while CO<sub>2</sub> concentration is being measured by the PC application software.

### 7-2) Error messages of the PC application software

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

*(Note that the details of the error message may vary depending on a faulty point or cause of error.)*

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



- Check that the COM port setting is correct on the PC application software. "FT232R USB UART" should be displayed in Device Manager on the computer.
- Confirm that CDM716x is properly mounted on EM7000.

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

- The serial communication mode set on the communication board is not consistent with the communication mode selected on the PC application software screen.

**Note: The EM7000 communication board is a tool for evaluation of the CDM716x and other Figaro gas sensors using the EM series evaluation modules. This board is not designed to be embedded in other devices. The specifications contained in this document are subject to change for functional improvement without notice.**

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