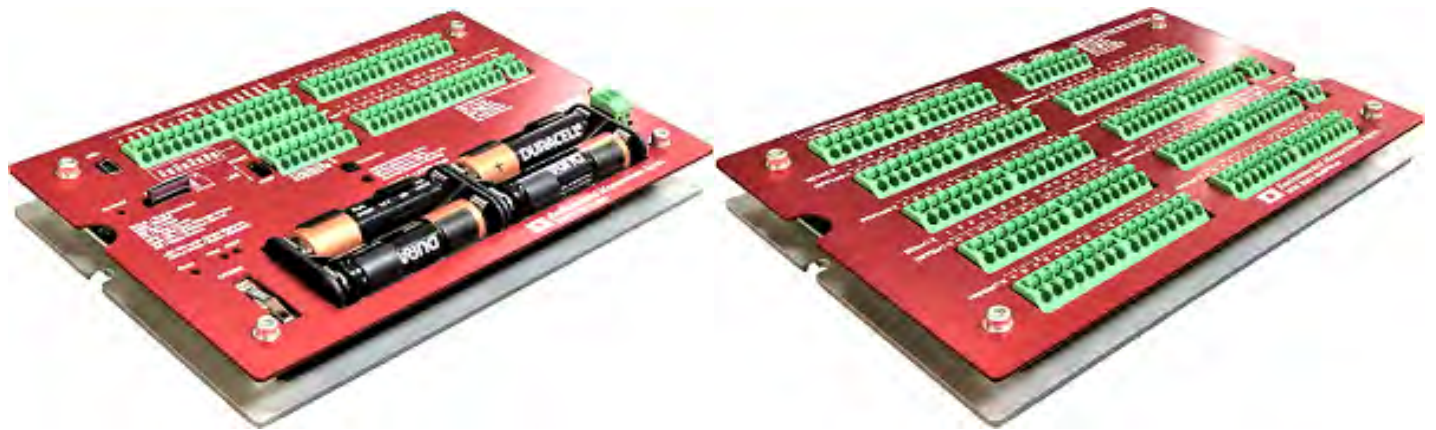


# Environmental Measurement Japan

## MIJ-01 DataLogger Manual Ver.1.0



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## 1. Overview

Thank you for using our MIJ-01 Data logger.

Traditionally, building a measurement system for outdoor use has three tedious and unavoidable factors: expensive, difficult, and power management. Our data loggers satisfied all of these three factors; cheap, easy, and low power consumption. All of the wiring according to the setting can be designed by user so it is possible to make advanced settings. It takes some getting used to it, but most of the things can be understood if you refer to this manual. The basic operation will be only 5 steps, and in the case of repeated observation without changing the setting then the operation will be only 3 to 5.

1. Preparation (page 3)
2. Sensor connection and settings using ELOG, saving the setting file to the logger and PC
3. Launching a logger at the observation site
4. Stop logger, collect data
5. Import data to PC and convert file to CSV

To measure general meteorological elements, it is sufficient to operate the terminal block in the yellow frame and the blue frame in Fig. A. The green frame is used when adding an optional multiplexer. Optional ZigBee, NPN, LGC terminals will not be explain here.

### Yellow Frame

Analog input	Analog input terminal: Equivalent to 8ch for differential connection and 16ch for single-ended connection.
Power Port×8	Setting range: according to the output of the sensor.  DIFF can be set from $\pm 15$ , $\pm 1250$ and $\pm 5000$ mV SE can be set from 0-62.5, 0-1250, 0-5000mV
Contact Pulse×4	Possible to input 4 channels of contact pulse signals of less than 20 Hz such as rain gauges.
Zero-cross×2	2ch non-contact AC signals can be input such as anemometers. Up to 1KHz. In the case of a generator typed anemometer can handle up to less than 15V.
Serial×2	2ch input and communication of sensors with serial output are possible.

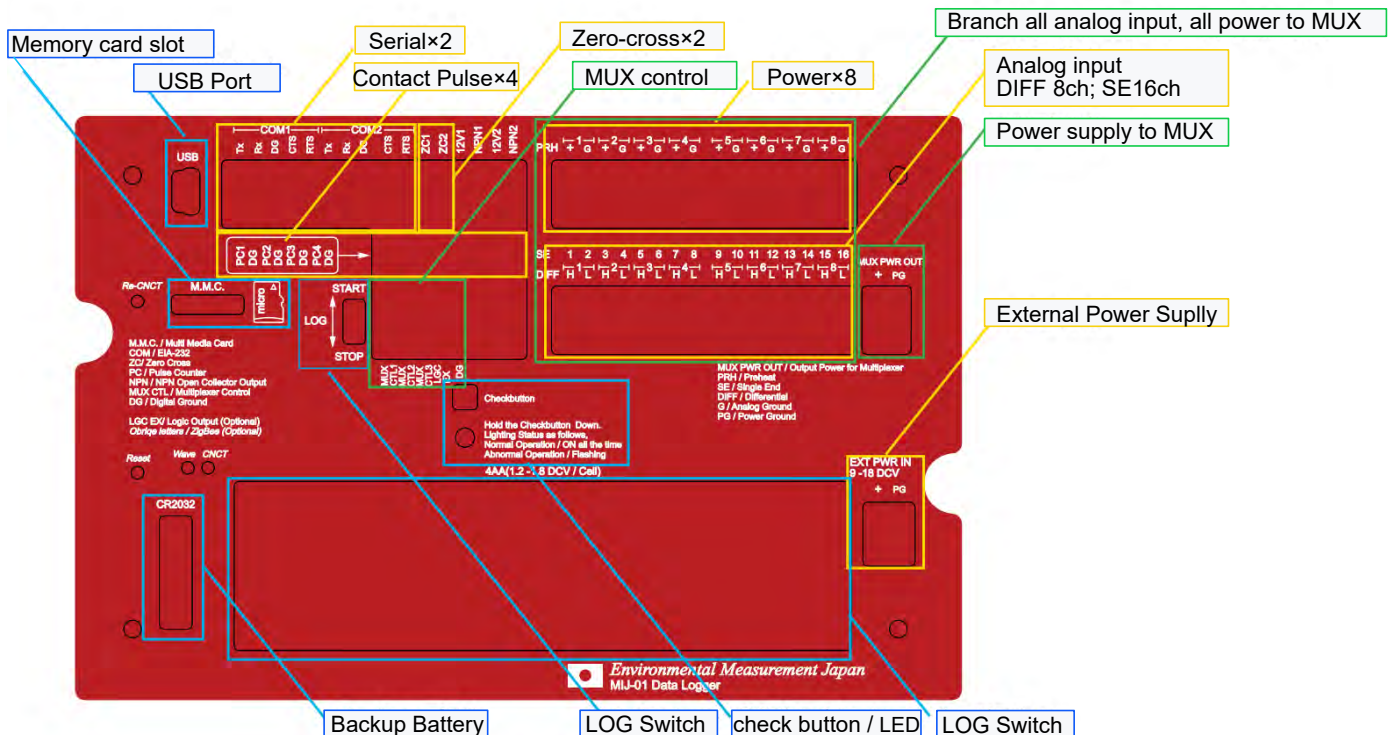
### Blue Frame

USB communication Port	Connects to a PC and sets the data logger with software. Not used for collecting data.
Memory card slot	The setting data and measurement data are recorded on the card stored here. When collecting measurement data, please do not forget to slide log switch to stop, after slide to stop, remove the card and read it on your computer by using a microSD-USB converter.
Log switch	Starts and stops the log. It also operates when the memory card is removed. It is not power ON & OFF. When setting with ELOG, communication is possible only in the STOP state.
Backup batteries	For the built-in clock is driven and It will be used in emergencies such as both the mounted AA or external power supply is cut off. Usually replaced in 2 to 3 years.
Operation check button and LED	This button will be used to check if the logger works well in measurement mode and to check that it is communicating with a computer.
4 AA Alkaline batteries	If there is no external power is supplied, the logger will be powered by this battery. When external power is supplied, it is used as a backup when external power cut off. Only AA batteries are sufficient for normal use.

### Green Frame

Analog input	This terminal controls the MUX from the logger when using the optional multiplexer MUX.
Power Port×8	MIJ-01 supplies the power to the MUX.

Steps 1 to 5 will be explain from next page.



MIJ01 terminal arrangement and role

## 2.Preparation

2.1 Insert the memory card as figure1 shown. This is the direction with the notch on the right. The format is FAT32.

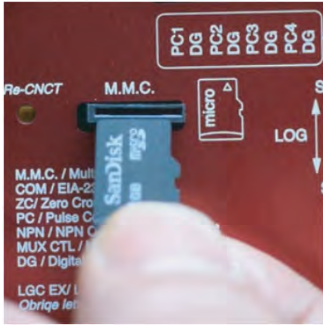


Figure1.  
Inserting a memory card

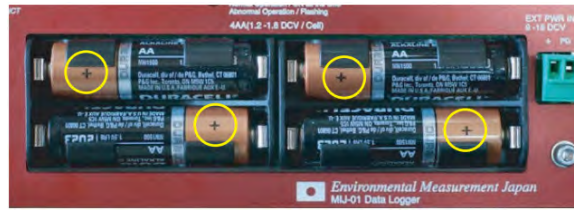


Figure2.  
Installation of AA batteries, their orientation



Figure3.  
Connecting the sensor

2.2 Insert the batteries as figure 2 shown. As long as it has an AA shape, you can use any secondary battery such as alkali, lithium, eneloop, etc., but please use the one that does not exceed 1.8V / cell. Pay attention to the orientation of the positive pole.

2.3 Please download serial interface driver CDM21228 from WHQLCertified.exe from FTDI.

FTDI: <http://www.ftdichip.com/Drivers/D2XX.htm>

Next download the software E-LOG.exe from our website. The supported OS is Windows XP / 7/8. MIJ-01 uses FTDI's FT232RL for USB communication.

2.4 Install both CDM v2.12.00 and ELOG.

2.5 Connect MIJ-01 and PC by included USB cable.

Now ready to use MIJ-01 and ELOG

## 3. How to use ELOG software

Here explaining by looking at the actual ELOG screen. Connect the PC and logger with the included USB cable, and double-click the ELOG icon to start it. The screen begin with Analog Setting. It is also the most frequently used page. ELOG has the following three roles.

- Create a setting file (extension .esf) and save it on your PC.
- Save the configuration file to the logger's EEPROM.
- Convert the log file (extension .emj) written by the logger to the memory card to .csv and save it on the PC.

The logger only operates and measures according to the setting file saved in the built-in EEPROM, the memory card only records data, and ELOG mediates a series of operations. The ELOG screen is divided into three areas: header area, footer area, and setting area. The setting area will change by switching tabs.

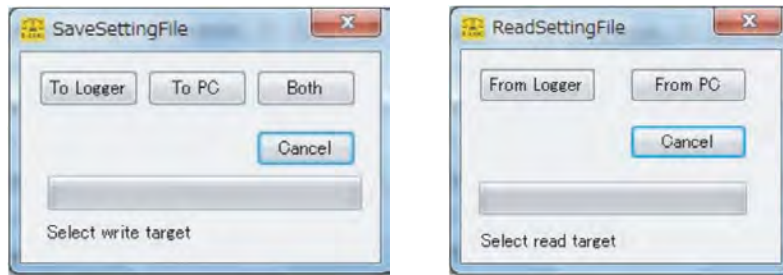
Header area

Setting area

Footer area

The screenshot shows the E-LOG Ver.1.0 software interface. At the top, the 'Header area' contains menu options (File, Convert, Other), USB COMPORT (COM13), Serial Number (E00001), OS version (0.92), and buttons for 'Read Setting File' and 'Save Setting File'. Below this, the 'Setting area' is divided into tabs: 'Analog Setting', 'Counter Setting', 'Other Setting', 'Data File Calculator Setting', and 'Initial Production Setting'. The 'Analog Setting' tab is active, showing a table of sensor configurations. The 'Footer area' at the bottom includes a 'Pulse Counter' section with four channels (Ch1-Ch4) set to 'Not Use', a 'Zero Cross Counter' section with two channels (Ch1[Hz], Ch2[Hz]) set to 'Not Use', a 'Battery Life Calculator' section with 'Battery Capacity In mAh' set to 0 and 'Battery Life' set to 0 Day, and a 'COMport Received Data' section showing COM1 and COM2. A status bar at the very bottom indicates 'COM13 is Open', 'Total Operating Time:0.60sec', 'Total Preheat Time:0sec', 'Measure Interval:600sec', and a 'Status' button.

- 3-1 Press the Connect button in the header to start communication between ELOG and the MIJ-01. ELOG displays the COM port number that can be used on the connected PC. When connected to the PC the LED continue blinking slowly (Lights for 0.6 seconds, cycle is 3 seconds)  
To connect PC and MIJ-01 the Log switch must not be at the START position. Communication only work Log switch at the STOP position.
- 3-2 To synchronize PC clock to Logger clock, press the Set Time button at right corner of header. It is accurate to set the PC clock with time.nist.gov or radio clock before this operation. If you want to change by not synchronizing with PC the please uncheck the check box of synchronize with PC clock and specify the time, and press Set Time. These operations are optional at the timing you want to set the clock. The clock error is  $\pm 30$  seconds / year, which is considerably better than a typical quartz clock, so you don't have to do it often. If you replace the AA battery and backup battery at the same time It is recommended to replace one by one as it will need to be reset.
- 3-3 At the time of shipment, all 8 channels are set to DIFF-5000mV range, interval 10 minutes, do not use counter and RS232 type sensor, and record power supply voltage and board temperature. You can changed setting as you want. After you set your own setting or unchanged factory setting click save setting file button. After click save setting file button, the following left display will appear.



Normally, specify "Both" and save the configuration file on each logger and PC. By doing so, the setting file on the PC side will also be a backup file, and the same setting will be made for multiple loggers. It is quite convenient to send it to us as an e-mail attachment if you need our support. When saving the file name the file that is easy to understand, at this time avoid Japanese and full-characters. There is also a limit of 16 alphanumeric characters. Basically, do not edit the contents of this file with other general-purpose software. In addition, the setting file saved in the PC, you can edit and save the file on your PC even if you do not have a data logger connected. In other words, you can create a configuration file and save it to the logger later.

Now the same configuration file (extension .esf) is saved in the EPROM of the logger and the PC. The next time you launch ELOG, press read setting file button at header then the above display will appear then you can load it into ELOG from logger or PC. It is also possible to save multiple different setting files on the PC and use them properly according to the purpose.

However, for loggers there is a restriction that only one setting file can be stored, and the operation is performed according to the last saved setting file. Also, ELOG has a restriction that only one configuration file can be displayed.

Strictly speaking, there is a difference between the configuration file saved on the PC and the one saved on the logger, but Data File Calculation It is a difference that is involved only in the arithmetic processing by Setting. Physical value will be described later.

- 3-4. To check operation please press Read Now at footer area. If sensors are connected, read the output and show the measured value at Measured Voltage. The display is not depend on range and display in mV unit. If nothing is connected, a random value will be displayed, this is because it is the potential at the open end.

- 3-5. After the setting is completed, by pressing calculate button at footer Battery Life calculator, you can check the approximate battery life. This calculation is the operation time according to the setting file and the integrated time of preheat(power), these detail are displayed at the bottom of the footer as total Operating Time, total Preheat Time, and measure interval.

For instance, with the above settings, If you enter 2000mAh at battery capacity, which is a typical value of AA alkali battery, the 347.32 days will be displayed. The current consumption by preheating is used as a constant assuming 15mA per location.

In addition, this battery life is only estimated battery life this is because the battery capacity itself changing with temperature or the capacity not being the nominal value in the first place. Also, when a 12V lead-acid battery is connected as an external power source, enter the capacity x 2 times the current capacity and the total of the main battery. There is a reason for this, the external power supply is usually 12V, but the logger is driven by 6V with step-down using a high-efficiency DC-DC converter.

For example, a 12V-7Ah lead-acid battery has a power of 84Wh, but since it is used at 6V, it is equivalent to  $84/6 = 14$ Ah. In other words, the input value at this time is lead 14,000 + AA alkali 2,000 = 16,000mAh, but the value is 2777.8 days. If the battery life estimated so long, the natural discharge of the battery will have a great effect. As a whole, this calculation result is a not guaranteed value but just guide.

- 3-6. Logger Status also displayed at the footer. It is a function to know the state of the logger when Read Now is pressed. The current date and time recognized by the logger, the voltage of the main battery, and the temperature of the aluminum block of the board (for compensation of the cold contact of the thermocouple) are displayed. The voltage of the main battery is a particularly important check item for practical use, and it is better to replace it if it is less than 5.5V in the case of alkali when it is newly put into the field. Please note that the Battery Voltage value is not helpful when an external power supply is connected. This is because the purpose of this function is to know the status of the AA batteries installed, so 6.1V is the upper limit of measurement. For example, even if the external battery is actually 12V, the display will be 6.1V. Check the voltage of the external battery separately with a tester or the like.

- 3-7. After setting and saving, press Disconnect in the header to disconnect and unplug the USB cable. The logger is now in a sleep state that only waits for it to run. Slide the LOG switch in the center of the main unit to the Start side to start measurement. At this time, the LED blinks for a few seconds and then turns off. To end the measurement, slide the LOG switch to the Stop side. The LED flashes for a few seconds and then turns off. If the slide switch is operated during the measurement operation, it will start blinking after the measurement is completed. Do not hurry and wait for a while before making a decision. Remove the memory card after LED flashing finished. In other words do not pull out during writing. Connect the removed memory card directly to the PC and use Convert in the ELOG menu to specify the log file .emj and convert it to CSV. The CSV file converted by ELOG is saved in the same hierarchy as the log file, so it is better to copy the log file to the PC once and specify the file to perform the Convert operation.

- 3-8. It is possible to repeat the cycle of log start, measurement, and end without changing the settings. For example, start with a log switch, measure for a certain period, and stop. If you continue 3 times of this cycle in which START → Measurement → STOP then the 3 files will be recorded on the memory card. If the Logger is stop state then you can remove memory card and copy the log data to your PC.

- 3-9. The log file recorded on the card cannot be deleted from the logger or ELOG by any operation. The only erasing method is to insert the memory card into your PC and artificially erase or format it. The reason is for data protection.

### Summary of Steps: Setting, Data Save, and converting data to CSV

- Connect Logger and PC → Start up ELOG → Pressing Connect button for starting communication
- Set the setting at setting area → Press Save Setting File button (Normally choose "Both") → Write setting file .esf to Logger and PC
- Start measuring by slide Log switch to Start and to stop measurement slide the Log switch to stop
- Remove Memory card → Insert memory card to PC → Covert data file to CSV by ELOG

### NOTE

- You do not need to connect PC and Logger only if create setting file. Setting file can be create by ELOG itself
- Communication between Logger and ELOG can be done while Log switch at stop side.
- While communicating, if you press Read Now button it only display current value but not saving to memory card. This action is only for checking the sensor operation check
- Log file will be store memory card and insert memory card to PC and collect data, and then convert to CSV file. In other words, the Log file is not transfer to PC through USB cable.
- You can open setting file(.esf) with notepad but do not edit with it.

#### 4. Analog Setting: Setting and connection of sensors

4-1. Sensors are roughly divided into those that require a power supply, those that do not, analog output (voltage output), non-contact AC such as anemometer, contact pulse such as rain gauge, and serial output, etc. In addition, there is the sensor that takes time to turn on and take time to log the output so need to think about sequence. Here we will explain typical sensors.

#### 4-2. Analog output: Sensors that do not require power supply

A thermocouple, a pyranometer using a thermopile, and an optical sensor using a photodiode these sensors with a small output. Since this type of sensor has a maximum output of only a few  $\mu\text{V}$  to 10 mV, we recommend a differential connection (DIFF) with high noise immunity. As shown in below figure, there is a print of DIFF, H, L near the terminal block of the logger body, connect sensors here. H connects the higher sensor output, that is, the + side, and L connects the lower sensor output, that is, the - side. You can insert the cable end by holding down the button on the terminal block, when the cable is inserted all the way in then release the button, the cable will be always pinched by the force of the spring. Do reverse procedure for pulling out sensors. It is good to peel off the cable coating of about 7 to 10 mm. In general, solder plating is recommended because it has the effect of preventing corrosion and preventing the cables from breaking apart and crushing. In the case of thermocouples, the solder layer interferes with the reproducibility of the thermoelectromotive force and since it is a single wire, there is no point in solder plating, so better connect it as it is. For thin thermocouples of 0.2 mm or less, the terminal block connection may be weakened. To avoid weakness it is better fold it in half and then twist so that it gets thicker. For the ELOG setting, select the 15 mV range as shown in the figure. Exceptionally, when using a T-type thermocouple or K-type thermocouple, you only need to select Sensor Type Thermocp T or Thermocp K. Enter any word you like for Sensor Name. However, there is a 16-character limit.



	Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
DIFF1	Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 5000\text{mV}$	OFF	OFF
	Sensor2	<input type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 15\text{mV}$	OFF	OFF
DIFF2	Sensor3	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 5000\text{mV}$	OFF	OFF

#### 4-2. Analog output: Sensors that do require power supply

The sensors operate in a sequence called preheating is that output only after driving the electronic circuits built into the sensors, such as soil moisture sensor, temperature / humidity sensor, thermopile type with some amplifiers, and photodiode type optical sensor. These sensor normally have 4 wires. The preheat terminal shown in below Fig. is the terminal that supplies power to the sensor, and there are markings from 1 to 8, and each number corresponds to the DIFF number. For example, it is used as a set with PRH1 DIFF1. Wiring is done as follows. For the ELOG setting, select the Input range, Preheat Voltage, and Preheat Time suitable for the sensor. Especially, please chose preheat carefully you must match the Voltage to the sensor specifications. If you choose the higher voltage than sensor capacity then sensors will be damage.



	Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
DIFF1	Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 1250\text{mV}$	12V	0.1sec
	Sensor2	<input type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 15\text{mV}$	12V	0.1sec
DIFF2	Sensor3	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	Differential	$\pm 5000\text{mV}$	OFF	OFF

Many sensors that require such a power supply are characterized by the output being amplified by an amplifier. It is usually in the range of several hundred to several V. Therefore, even if it is not DIFF, it is often single-ended (hereinafter SE) with sufficient accuracy. However, if the cable length exceeds 20m, environmental noise will increase, so a DIFF connection is better.

The advantage of using SE is that you can secure many input channels. For example, MIJ-01 can allow SE16ch. The point to note when using SE and preheat together is that the PRH terminal has 8 sets of restrictions, so for example, the sensor PRH1 connected to SE1 & 2 will be shared.

For that reason, it's a good idea to connect the same sensor to SE1 & 2. In addition, if the sensor already built as SE specification, it shares the signal +, power supply +, signal ground and power supply ground, and consists of a total of three wires.

Wiring in this case is done as follows. For the shared terminal block, you will need to connect the two wires, but in order to prevent poor contact, you can either bundle the two wires externally and solder them, or connect them separately with a terminal block and then wire them to the logger.

If you select SE from the Measure Method pull-down, one line that was DIFF1 will be split into two lines, SE1and SE2. One DIFF split into two SE.

The Preheat Time at the this time of wiring is output to the PRH1 terminal for 0.1 seconds set in the line of SE1, and 2.5V is applied to both the sensors of SE1 and SE2 for 0.1 seconds. It will continue to be applied to PRH1 for the 0.1 seconds set in the SE2 line. Actually, 2.5V is continuously applied to PRH1 for  $0.1 + 0.1 = \text{total } 0.2 \text{ seconds}$ . It cannot set different voltage for two sensors that connected to SE1 and SE2.

Thus, you should connect the same sensor to SE1 and SE2.



	Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
SE1	Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-1250mV	2.5V	0.1sec
SE2	Sensor2	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-1250mV	2.5V	0.1sec

Many sensors that require such a power supply are characterized by the output being amplified by an amplifier. It is usually in the range of several hundred to several V. Therefore, even if it is not DIFF, it is often single-ended (hereinafter SE) with sufficient accuracy. However, if the cable length exceeds 20m, environmental noise will increase, so a DIFF connection is better.

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Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
SE1 Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-1250mV	2.5V	0.1sec
SE2 Sensor2	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-1250mV	2.5V	0.1sec

If the external wiring shown above is troublesome, you can use only odd SE by setting SE activation. Keep check active for SE1 and uncheck for SE2. In this case all even if it is set to part SE, only 8ch with only the logger body.

For example, as ELOG setting below shows, when connecting one sensor with preheat of 2.5V, preheat time of 0.1 seconds, and output range of 0 to 1V with SE. This is a connection method in which PRH1 is monopolized by SE1 without using the analog input of SE2 next to SE1. This connection is a usage when the number of channels can be used luxuriously by adding a multiplexer (MUX32 / 64).

Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
SE1 Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-1250mV	2.5V	0.1sec
SE2 Sensor2	<input type="checkbox"/> Active	<input type="checkbox"/> MUX	VoltageInput	SingleEnd	0-5000mV	2.5V	OFF

#### Supplement 1:

In the above explanation, you will notice that DIFF1H and SE1 and DIFF1L and SE2 are the same terminal.

The meaning of DIFF is a wiring that is insulated from G of the power supply, and it is a measurement method that cancels out the influence of noise that occurs in both H and L by detecting only the voltage difference between H and L. Since SE detects the voltage between PRH1G and SE1, it is a wiring that is relatively vulnerable to noise. However, since noise is evaluated as an absolute value, it can be said that the influence of noise is relatively small if the sensor has a large output.

As a guide line, please think that if the span is several hundred mV or more in the case of sensor, please judge that it can be used with SE. In other words, if a sensor equipped with only 3 wires then it can only be connected to SE (it does not make sense to measure with DIFF), and if a sensor equipped with 4 wires it can be wired with either DIFF or SE. Some special DIFF specification sensors cannot be used with SE. Sp it is significant to see the sensor manual.

#### Supplement 2:

Preheat Time may not be specified in the sensor manual. In that case you should repeat the settings and Read Now to find the time when the sensor output is sufficient. It is preferable to search for the shortest possible time within the range where normal operation can be performed, and the advantage of doing this is reducing the limited power consumption can be obtained.

#### 4-4. Platinum resistance temperature detector measurement

There is a sensor that outputs the change in resistance value such as Thermistor thermometer, platinum thermometer, some water potential sensors, dendrometer, etc. Here explaining representative sensor connection of the platinum resistance temperature resistor Pt100. If you select SE in ELOG, you can specify Pt100 from the Sensor Type pull-down menu. At this point, the voltage range and preheat voltage for Pt100 are set automatically. The wiring at this time is as shown in the figure. Use an external shunt resistor of 10K.

The operation uses the preheat voltage, is divided by the shunt resistor, reads the Pt100 side as the voltage value, and displays and records the ELOG in units of temperature (°C).

Select a shunt resistor with the best temperature coefficient. For example, PTF5610K000AZEB is recommended from the viewpoint of balance between price and performance.

Sensor Name	Activation	Use MUX	Sensor Type	Measure Method	Input Range	Preheat Voltage	Preheat Time
SE1 Sensor1	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	pt100	SingleEnd	0-1250mV	5V	0.1sec
SE2 Sensor2	<input checked="" type="checkbox"/> Active	<input type="checkbox"/> MUX	pt100	SingleEnd	0-1250mV	5V	0.1sec

#### 4-6.General resistance measurement

The general method of measuring the resistance value and converting the value into a physical quantity is described here. Method of measuring and converting the resistance value as a voltage value by the same wiring method as above.

Assume the shunt resistance is  $R_r$ , the applied voltage is  $V_r$ , the measurement target is  $R_s$ , the applied voltage is  $V_s$ , and the set preheat voltage is  $V_p$  then the equation will be below.

$$R_s/R_r=V_s/V_r$$

$$R_s=V_s/V_r \cdot R_r=V_s/(V_p-V_s) \cdot R_r$$

$V_s$  is the voltage actually measured by SE1,  $V_p$  is the preheat voltage, so it is known,  $R_r$  is also known, and  $R_s$  can be calculated. As a specific example, calculate when the wind direction of the anemometer is a potentiometer and 0-360 ° is 0-10KΩ.

When the preheat is 5V and the shunt resistance is 10KΩ, then the formula will be  $R_s = V_s / (5V_s) \cdot 10000$ .  $R_s$  can be calculated up to this point. Later we will explain but if you use Data File Calculation for calculating resistance value you will input as below.  
 $X001/1000/(5-X001/1000) \cdot 10000$  (X001 is a variable specification./1000 is converted from mV to V).

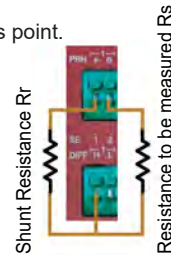
Next, calculate the wind direction  $WD$  ° is calculated as below.

$$WD=360/10000 \cdot R_s$$

$$=360/10000 \cdot V_s/(5-V_s) \cdot 10000$$

If the voltage obtained by SE1 is 1500 mV then  $WD=360/10000 \cdot 1.5/(5-1.5) \cdot 10000=154.28^\circ$ ; this is the wind direction.

When using conversion to physical quantity in the same way as above, you can enter  $360/10000 \cdot X001 / 1000 / (5-X001 / 1000) \cdot 10000$  then it will be possible to record it as an angle.



#### 4-7.Non-contact AC: eg anemometer

Although it is sometimes called an AC pulse, it is not actually a pulse, and an AC sine wave is output. The logger considers it as 1 count when the voltage 0V is crossed for the judgment, so it is called zero cross. The ZC (zero cross) port is equipped with 2 channels, and two pulse output type anemometers can be connected. It is possible to count up to 1KHz.

Depending on the specifications of the anemometer, there is also a type that is converted to FV (converted from AC sine wave to voltage) and output as voltage, so in that case it does not correspond to the explanation here, and it corresponds with voltage input and preheating. This section is for general AC output anemometers. The wiring is as follows.

- One of the signal lines of anemometer 1 ZC1
- Another one of the signal lines of anemometer 1 DG
- One of the signal lines of anemometer 2 ZC2
- Another signal line for anemometer 2 DG

DG means digital ground, and this logger shares it with the contact pulse DG. The relationship between frequency and wind speed depends on the specifications of the anemometer. For example, the conversion coefficient such as  $m/s = 0.0980 \times \text{Hz}$  is the wind.

Since it is described in the specifications of the speed meter, the value is set to ZC Multiplier. Enter with Coefficient.

The ZC specification specifies the frequency by measuring the time interval of 2 counts of zero cross. Zero cross does not occur when there is no wind. In this case, it will stop measuring in 1 second and record as 0Hz (0m / s). ZC interval will be common with an interval set by analog setting. Regarding whether zero cross detection is possible when using YOUNG's anemometer as an example, judge that the boundary below 80 rpm cannot be detected. Realistically the reason is that the number of revolutions at which the signal level and the magnitude of noise roughly match is the point. In other words, 80rpm = 1.3Hz = 0.127m / s, so in the first place it is an area that has not reached the starting wind speed so it does not matter.

#### 4-8.Contact pulse: eg rain gauge

This is a very simple signal, which can be described as a pulse. The specifications of the PC (pulse counter) input are during the set interval (including the recording operation time).

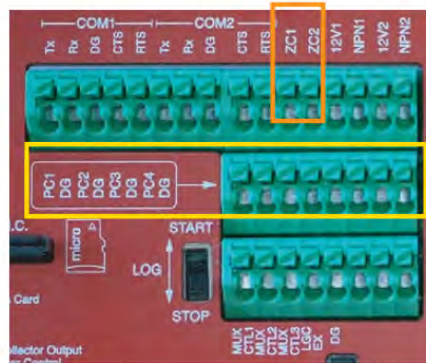
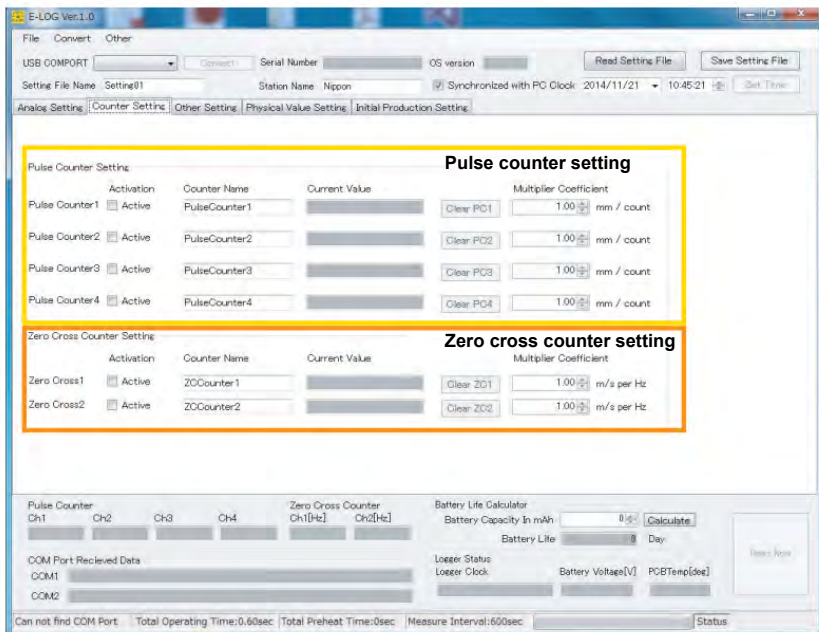
In other words, AC (Unlike pulses, there are no omissions), all generated pulses are integrated, logged, the count number is reset, and repeat this step.

For example, using a 0.5 mm / time rain gauge, and set 10 minutes interval then 10 times are counted during the 10 minutes interval, so 0.5 mm x 10 times = 5 mm will be recorded. If you need data with high time resolution, it is a good idea to set a short interval.

If you set to use a PC, power consumption will be generated for each count even during sleep condition, and assume that you use the above 0.5 mm / time rain gauge, it is equivalent to about 1.5 μAh / 10 mm rainfall. Rain gauges have different specification, but there is always a coefficient of 0.XXmm / count, so enter and set that value to Multiplier coefficient of your PC. Since the PC input is equipped with 4 channels, 4 rain gauges can be connected. The wiring is as follows.

- One of the signal lines of the rain gauge 1 PC1
- Another one of the signal lines of the rain gauge 1 DG

The same applies to PC2-4.

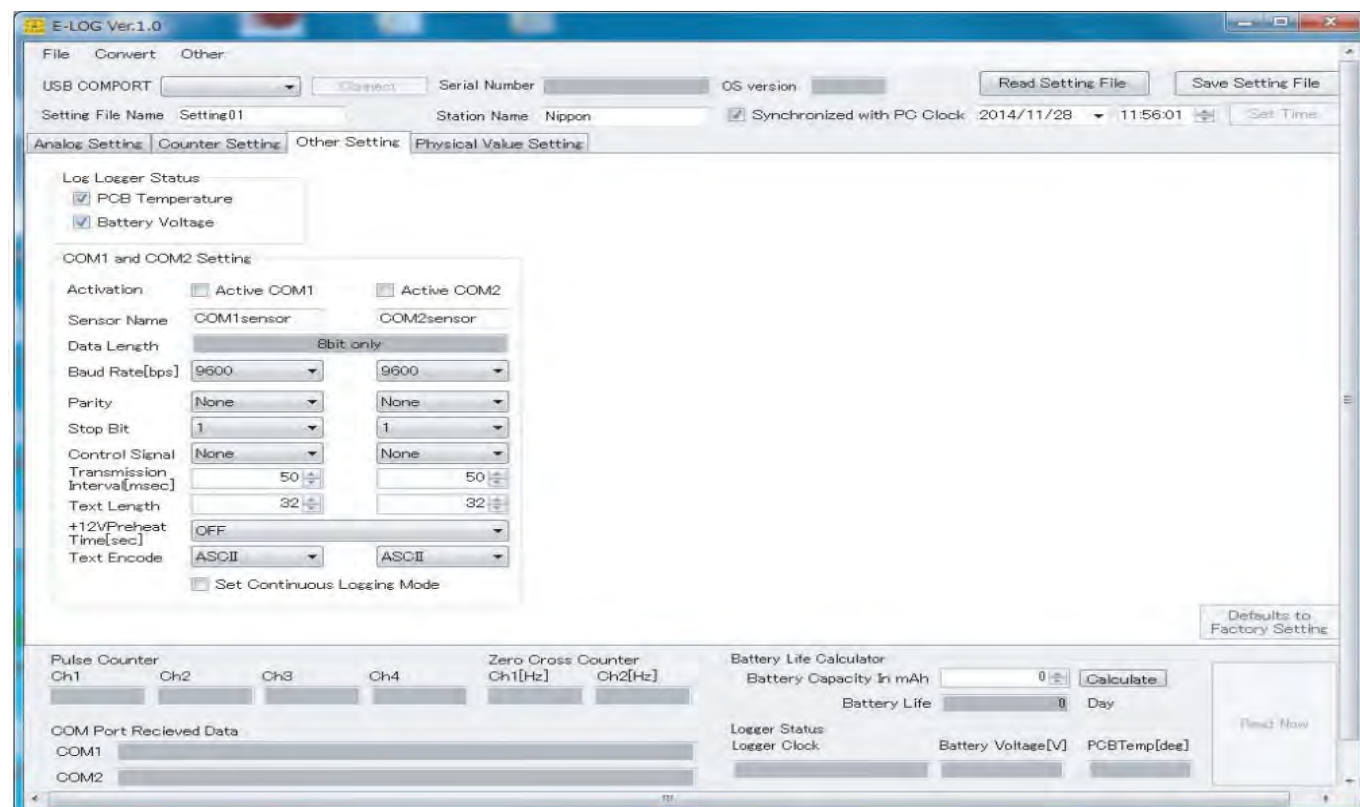


Note: Please share DG with PC and ZC. You can use any DG.

Counter setting as shown above ELOG Counter-related settings are made on the setting page, but in the initial state of ELOG, both ZC and PC is set as not use. For each activation please click the active box. After entering the sensor name and coefficient, save setting by press the save setting file button at header. To check wether sensors working or not press Read now button at the bottom right at the analog setting page. If the PC is a rain gauge, you can manually move the tipping mass and finally press Read Now button, if the ZC is an anemometer driving the propeller with a fan then press read now button and the value will be displayed on the footer. By pressing Clear ZC and Clear PC will clear the tested values. The timing of ZC measurement will be after all analog measurements are completed, and the PC will be constantly monitored and measured by the logger.

## 5. Other Setting: Cold-junction compensation temperature, battery voltage, and serial data setting

The thermistor thermometer is built in the aluminum block installed near the terminal block of the logger for the cold contact compensation of the thermocouple. This thermometer measuring the temperature near the terminal block and temperature is measured in absolute value, but this value can also be used to record the temperature of the atmosphere in which the logger is installed. You can also monitor the voltage of the four batteries installed in series and it is also possible to record. By default, both are already checked and set to record. The data memory is enough, so usually better use with initial setting.



When setting the measuring instrument that outputs data by serial communication, set according to the specifications of the measuring instrument used in COM1 and COM2 Setting. The specifications of the sensor that can be used basically correspond to the 3-wire system. Depending on the device, it may be necessary to connect control lines (CTS, RTS) to match the transmission reception timing, but this is rare case. Normally, it is received and recorded with ASCII code. By changing the encoding method during data conversion, it is possible to handle if 2-byte characters are included. Basically ASCII should be compatible with most devices. Let's look at the lists.

### Activation

Decide to use COM1 and COM2. As with analog and counters, if checked, it will be used.

### Data Length

The received data length of RS232. Only 8bit is supported.

### BaudRate[bps]

Communication speed setting. There are eight selectable speeds: 1200,2400,4800,9600,19200,38400,57600,115200bps.

### Parity

Parity bit selection. There are three types of items that can be selected: None, Odd, and Even. These stands for no parity, odd parity, and even parity.

### Stop bit

You can select 1 or 2.

### Control Signal

Determines whether to use control lines. There are two types of items that can be selected: NONE and RTS / CTS. It only supports flow control, but it may be compatible with the other party's device.

### TransmissionInterval[msec]

This is the data transmission cycle of the connected device. Match the settings of the sensor to be connected. If there is no response from the sensor even if the set value is exceeded, it will time out.

### Text Length

Specify the length of the data sent by the connected device. The number of characters from the beginning of the data to the line feed code. Since MIJ01 supports various data formats, it is designed to record all of these delimiters and data at once for the specified number of characters. For example, in LI-COR LI-6252, the measured value format is `__123.456.(" " is actually half-width space It has become. )`, the specification is such that the length of the character string itself does not change even if the number of digits changes. Or Vaisala Weather Transmitter WXT520, if the number of digits of the measured value changes, the length of the entire character string will increase or decrease accordingly. For the sensor that transmits this kind of data, please consider the length when each measured value is obtained as the maximum value. The maximum number of characters is 250.

### +12VPreheatTime[sec]

This is used when the serial equipment is operated intermittently by preheating. Use the 12V1 and 12V2 terminals of the logger. Two sensors can be controlled by independent control, but it is fixed at DC12V. Only the preheat time can be set. The preheat time setting is the time required to send the data.



### Text Encode

Specify the type of character code for data conversion. In most cases, the received data remains in ASCII code, so basically you can leave it in ASCII. If Double-byte characters are included, try changing the character code.

### Set Continuous Logging Mode

Please put check the box if you want to connect devices with a data transmission cycle of less than 1 second and acquire data continuously. If checked, the analog input including the cold contact compensation temperature and battery voltage monitor will not be used at all. This is because slow-cycle analog measurements are an obstacle to high-speed communication.

### Handling of serial data

As an example, let's take a recording of all the measurements of the WXT520 mentioned above. In the case of this sensor, a half-width space is used as a delimiter for the data itself. When you log serial data, you can often see a mixture of character strings and numbers in cells as shown below.

Comport1COM1sensor

```
0R0Dn=274DDm=274DDx=274DSn=0.0MSm=0.0MSx=0.1MTa=25.8CTp=25.8CUa=32.6PPa=1023.1H1023.1
0R0Dn=064DDm=108DDx=108DSn=0.0MSm=0.0MSx=0.1MTa=25.8CTp=25.8CUa=32.5PPa=1023.0H1023.0
0R0Dn=238DDm=238DDx=274DSn=0.0MSm=0.1MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1023.1H1023.1
0R0Dn=274DDm=290DDx=290DSn=0.0MSm=0.1MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1023.0H1023.0
0R0Dn=048DDm=048DDx=048DSn=0.0MSm=0.0MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1023.0H1023.0
0R0Dn=334DDm=334DDx=337DSn=0.0MSm=0.1MSx=0.1MTa=25.9CTp=25.9CUa=32.5PPa=1023.0H1023.0
0R0Dn=274DDm=274DDx=274DSn=0.0MSm=0.0MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1023.0H1023.0
0R0Dn=333DDm=346DDx=346DSn=0.0MSm=0.1MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1023.0H1023.0
0R0Dn=323DDm=004DDx=004DSn=0.0MSm=0.1MSx=0.1MTa=25.8CTp=25.9CUa=32.5PPa=1022.9H1022.9
```

In this case, it is better to extract only the numerical values for data analysis, but it is better to use LEFT and RIGHT as Excel functions. For example, with Pa = 1023.1H above, a column with only numbers is inserted next to the cell. In this case, H on the right is an obstacle and Pa = on the left is an obstacle, so you can use the function = LEFT (RIGHT (W170,7), 6). W170 refers to the cell Pa = 1023.1H, which means that RIGHT (W170,7) extracts only the right 7 characters, and LEFT (RIGHT (W170,7), 6) extracts the left 6 characters.

Default to Factory Setting button

This button is used assuming that the logger and ELOG are in communication. This is the role of returning the logger settings to the factory settings. When you set it to a state that you do not understand well please use it for such purposes. It does not erase important data such as logger calibration values.

## 6. Physical Value Setting: Calculation of physical quantity

Here, specify the conversion of the measured value to a physical quantity. Since most sensors cannot output physical quantities directly, it is a standard practice for loggers to record them as voltage values. Even in this logger, the analog value is measured in mV units regardless of the range.

On the other hand, what the user wants to get is a value called a physical quantity. For example, m (meter) is also a physical quantity. It is easy to understand that it is about this length because it is revealed.

First, let's consider a pyranometer as an explanation example. Most pyranometers are around 7 mV at It outputs about 1000W, and it has individual sensor values. This is called the calibration coefficient. When 7.123mV / KW is used as a description example, this means that when receiving 1KW of solar radiation, an output of 7.123mV is output. For analog connection, input the output of the pyranometer to DIFF 1ch, set the sensor name to RAD (W / m2), and set the range to 15 mV. Up to this point, it can be read as a voltage. Next, look at the Physical Value Setting page.

The screenshot shows the 'Physical Value Setting' page in the E-LOG software. The 'Active Physical Value Calculation' section contains the following table:

Variable	Activated Ch	Sensor Name	Enter Any Value(to Check Eq.)
X001	DIFF1	RAD(W/m2)	7.123
X003	SE3	VWC(m3/m3)	500
X004	SE4	SoilTemp	4
X005	DIFF3	Sensor5	5
X007	DIFF4	Sensor7	7
X009	DIFF5	Sensor9	9
X011	DIFF6	Sensor11	11

The 'Equation' section contains the following table:

Sensor Name	Equation	Result
RAD(W/m2)	X001/7.123*1000	1000
VWC(m3/m3)	.770*(X003/1000)-3.995*(X003/1000)^2+6.098*(X003/1000)^3-4.319*(X003/1000)^4+1.157*(X003/1000)^5	0.34371875
SoilTemp		
Sensor5		
Sensor7		
Sensor9		
Sensor11		
Sensor13		
Sensor15		

The 'Equation Hint' box lists the following functions: +, -, \*, /, ( ), ABS(x), EXP(x), INT(x), SIN(x), COS(x), TAN(x), PI, LN(x) → LOG(x), LOG10(x) → LOG(x)/LOG(10), LOG(x,A) → LOG(x)/LOG(A), SQRT(x) → SQR(x), POWER(x,y) → x^y, RADIANT(x) → x\*PI/180, DEGREE(x) → x\*180/PI.

Here, only the Ch activated by the analog setting is displayed, and Variable is automatically defined. Since the sensor name of RAD (W / m2) is entered at the time of analog setting, it is reflected and it means that X001 is a variable.

If you enter "X001 / 7.123 \* 1000" in Equation, it will be calculated in W units. Please note that you do not enter =. To check, enter 7.123 in the Enter Any Value column and press the Check button. This function allows you to check what happens to the calculation result when the input to DIFF1 is 7.123 mV.

1000 is returned in Result, which means 1000W, so it is able to confirm that the expression was entered correctly.

If the expression is not correct, an error will occur, so please check and correct. This figure also shows the SE3 with a soil moisture sensor connected.

For example, in the case of Delta-T SM300, the conversion formula is for mineral soil.

$\theta = -0.071 + 1.770V - 3.995V^2 + 6.098V^3 - 4.319V^4 + 1.157V^5$

$\theta$ : VWC (m3 / m3), V: Output voltage, but since the measurement with MIJ01 is always in mV units, the V term is / 1000. It becomes the following formula.

$-0.071 + 1.770*(X003/1000) - 3.995*(X003/1000)^2 + 6.098*(X003/1000)^3 - 4.319*(X003/1000)^4 + 1.157*(X003/1000)^5$

If you try the operation at 500 mV, it will be 0.343, so it can be judged as a normal operation.

All available functions are listed in the upper right column. Even if the entered formula is incorrect, it may hold as an formula, but MIJ01 cannot be set not to record the raw data (mV) that is the basis of the calculation, so recovery is possible if only the raw data remains.

After entering and saving the conversion formula of this physical quantity, if you press Read Now on the Analog Setting page, the column Physical on the right side of Measured Voltage (mV), the value after the operation is displayed in the Value column. After connecting the sensor, you can check the output and physical quantity of each parameter.

Note that the logger itself does not perform this operation, nor does it remember the expression itself. Save Setting When Both or PC is selected with the File button, the formula is saved in the PC, but even if it is Both, only the settings other than the formula are saved in the logger.

The setup to enable the calculation: Read the setting file including the calculation formula saved in the PC with ELOG and convert it. The calculation process of the data after logging with the logger is as follows.

1. The log data (extension emj) obtained by the logger is saved in the memory card. After stopping the logger, remove the card and connect it directly to your PC. Please copy and paste the log data to your desktop.
2. Start the ELOG and read the saved setting file by pressing the Read Setting File button.
3. From the "convert" at menu choose Convert Data File and specify the pasted file.
4. A CSV-converted log file is created in the same hierarchy as the base data. The calculation result is also saved in this CSV file.

## 7.Launching a logger at the observation field

7-1. To get started, slide the LOG switch to Start after complete the the setting and wiring then operation starts measurement. The relationship between the time of START and the time of the first log is a good time as shown in the example below. However, it depends on the set interval.

START Time	LOG Start time
13:27:22	13:30:00
11:32:16	11:40:00

Equipped with an operation check button as a means to check the operation of the logger after logging START. While holding down the check button in the center of the logger, the LED flash immediately and show the status. If you see blinking other than when operating the LOG switch, determine that something is wrong. Below shows the LED display and its meaning.

Relationship between LED display, operation, and message

Logger Condition	LED Condition	Period (sec)	Lighting time (sec)	Lighting time (sec)	Action Trigger
1.Connected to USB	Flashing slow	3	0.6	Always during USB connection	USB connection
2.Measurement Start or Stop	Falshing	1.5	0.3	5	Condition of Log switch changed
3.Error at measurment Start	Flashing fast	0.375	0.075	10	SD is not insrted etc.
4.SD writing at measurement STOP	Flasing	1.5	0.3	until SD writing complete	
5.When check button pressed	Flashing continue			While pressing	During normal operation
6.Error when pressing Check button	Flashing fast	0.375	0.075	While pressing	During abnormal operation
7.During normal operation, during sleep	No LED flash	0.375	0.075		

7-2. Sop logger, collect data, import data to PC

Collecting data will be proceed as below.

- 1.Slide the Log switch to STOP
- 2.Remove memory card (At this time please note tabel #3 and 4. Wait until the LED flash finish and remove card.)
3. Insert micro SD card to USB converter and then mount.
- 4.There is extension file (.emj), check the inside of the SD card on your PC. Please copy and paste it to PC and save at any hierarchy.
- 5.To convert data to csv please go to ELOG menu→Convert→ConvertDataFile→specify your data to convert.
- 6.To restart measurment after collected data, please return AD card to original place and slide LOG switch to START.

7-3. Measurement data and configuration file

The measured data will be remain in memory card only if you do not erase manually. The new data will be create as new file. The data name will be 20YYMMDDHHMMSS.emj so as like Year, Month, Day, hour, and sec which means the new file will be created as newest dated. The setting file can be saved after setting by pressing Save Setting File buton and chose To PC, To Logger or Both(To PC and Logger). we reccomend to save to both so that one can be used for backup file. The setting file name will be the name you entered at saved file.

Input is limited to 16 single-byte alphanumeric characters. Basically, do not edit the contents of this file with other general-purpose software. The setting file can be edited and saved on the PC even if the data logger is not connected.

## 8.External power connection

When driven by the AA battery of the main body, the capacity is about 2Ah with alkali. For many applications, it is sufficient to replace it regularly, but the capacity is sufficient to make up for the shortage, such as when the interval is short, less than 10 minutes, or when the number of channels increases with a multiplexer. You can add a large battery.

One of the restrictions of the external battery is that it is in the range of 9-18V. In other words, you can connect almost anything with 12V specifications. Lead-acid batteries are generally used, but when you want to make them smaller, you can use lithium polymer for external PCs, when you want to use them in extremely cold regions, you can use lithium primary batteries, and in remote areas, you can use a power supply consisting of a solar panel + charge controller + lead-acid batteries. Use according to the application. The power will supply from the terminal marked with EXT PWR IN. Positive pole to + , and negative pole - to PG (Power Ground). This terminal block is a removable screw terminal block so to use external power then first remove the terminal block, and complete all wiring of the external power supply, check the polarity carefully, and then insert the terminal block to logger. At this time, if the power supply cable are scattered which lead some danger so please do solder plating etc.

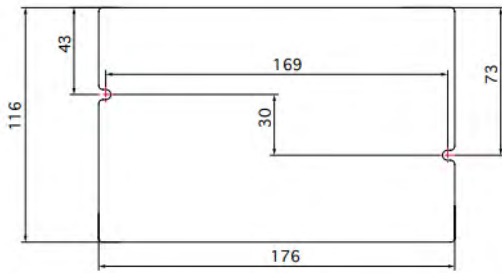


External power input terminal

## 9. Mounting to the wall

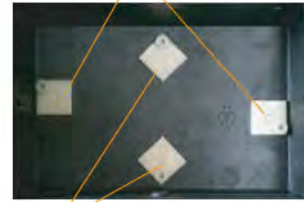
Both MIJ01 and MUX32 / 64 are not waterproof. It is strongly recommended to use it by incorporating it in a waterproof case. When installing the waterproof case at field, it will often be fixed to a vertical wall surface.

Both the logger and the multiplexer have common mounting dimensions and are shown in the below figure. The recommended screw size is M4 screw and use with washer and spring washer. If the mounting partners are able to cut the tap, and if the mounting partner is wood, it is best to fasten with a 4.2 mm tapping screw. If it is difficult to make a hole in the wall surface, it is recommended to use an adhesive spacer for the M4 receiver, or a spacer with an M4 female screw such as Petet T-700 as shown in Fig. 6-2. In this case, the left and right can be screwed, but it is fixed to the bottom plate of the logger. Since there will be gaps in the wall surface and vertical deflection will occur, it is recommended to attach a total of 4 spacers as shown in the photo to prevent surface and vertical deflection.

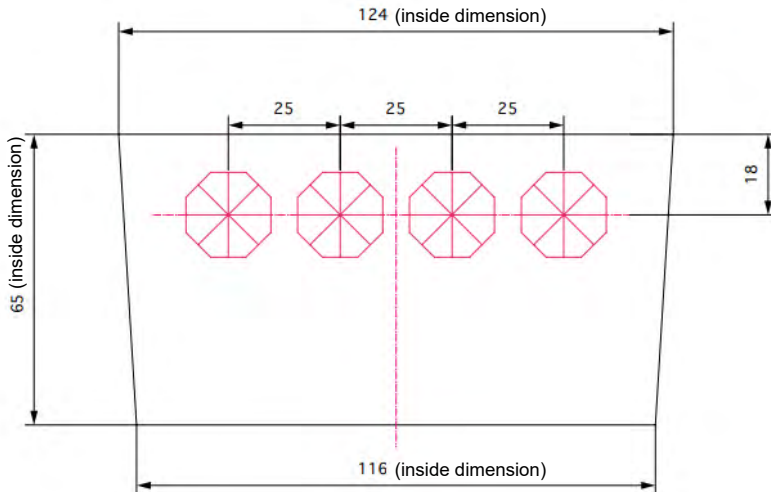


**Screw fixing position**

**Use for Screwing**



**Used to prevent deflection. No screws are used.**



**Pelican1120 Side wall inside dimensions and cable grant hole position**



**Fits Pelican 1120 and MIJ01 & MUX32 / 64**

One of the features of both MIJ01 and MUX32 / 64 is their small size and light weight. Taking advantage of this, it is also possible to build a small measurement system that is easy to carry. In this case, the recommended waterproof case for the minimum volume is the Pelican 1120.

If you use the Petet T-700 explained in Fig. 6-2, it will fit. The purge valve does not allow water to pass through, but it does allow water vapor to pass through, so fill it with silicone caulk from the inside. In addition, the cable gland is attached to the wall of the case to waterproof the sensor cable in and out. Manufacturer AVC, model FGA13-08 ( $\phi 4.5$  to 7.8mm) or FGA13-05 ( $\phi 3$  to 5.3mm) is recommended. Especially when the cable is expected to bend a lot Cable ground FGA13-P-08 or FGA13-P-05 is recommended. The figure shows the reference dimensions for mounting the cable gland on the side wall of the Pelican 1120. Screw holes are recommended for strength and water resistance rather than holes. For screw holes, use PT1 / 4 size taps. A total of 8 can be installed on both the left and right sides. In other words, when the number of sensors exceeds eight, you should resize the case. In that sense, installing MUX is none sense. In addition, it is difficult to completely seal the product no matter how waterproof it is, so add silica gel at the end. Blue gel and B-type silica gel are recommended because the main purpose is to prevent condensation. It depends on the maintenance cycle, but please add as much as possible.

## 10.Replacement of backup battery

The backup battery is a CR2032 lithium battery. We recommend that you replace it once every two years.

For replacement, remove the screws at the four corners and remove the front panel (red panel). As shown in figure slide the battery horizontally toward direction of the arrow and insert new battery as same proceed.

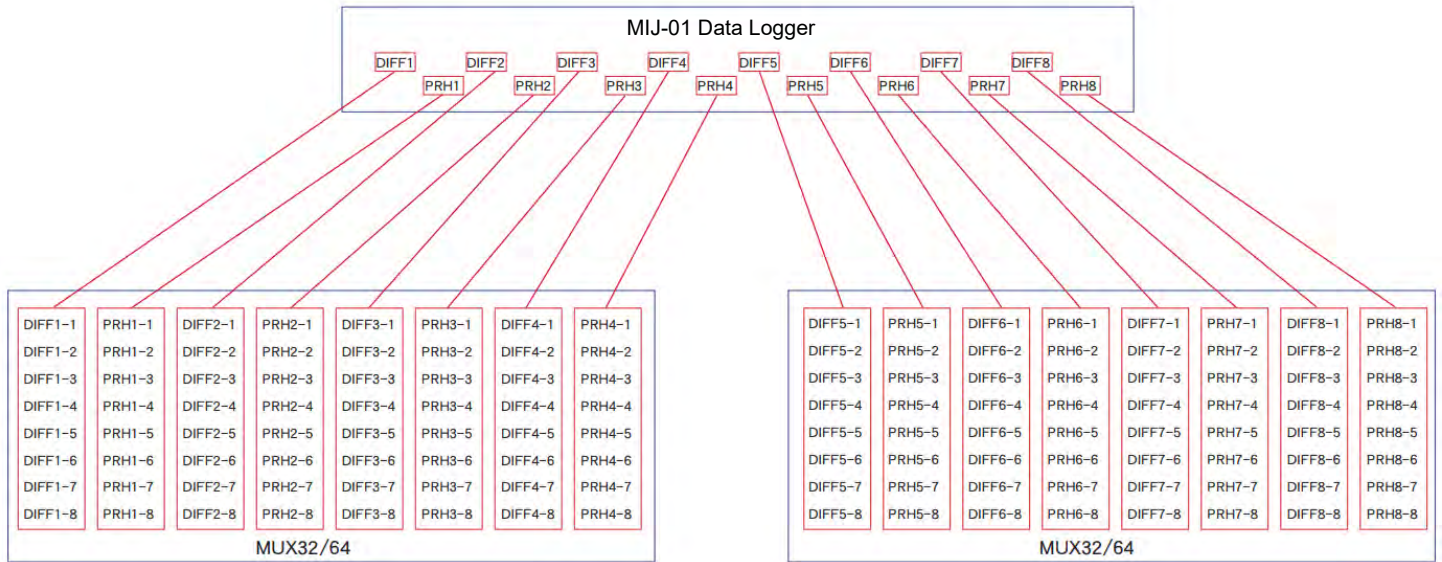
NOTE: Please do not bend strongly, if you bend + pole of holder too much, it will not be able to return to the original position.



**How to remove the backup battery**

11-1. Overview

A multiplexer (MUX) is an additional analog input terminal that tends to be in short supply when making large-scale observations. A total of two MUX can be connected to each logger. The concept of channel expansion and preheat expansion using MUX is shown in the figure.

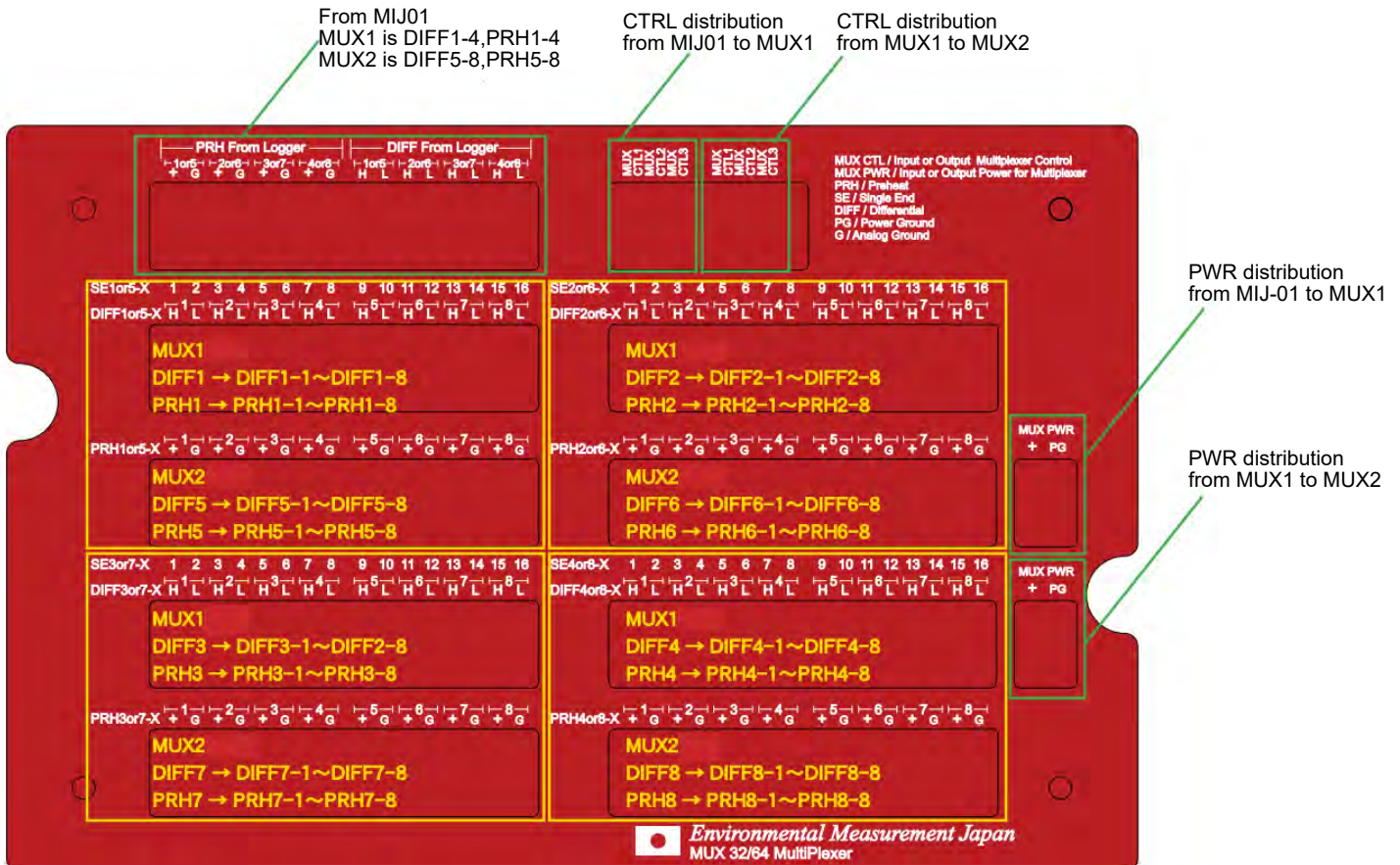


Concept of multiplexer expansion

Taking DIFF1 of the logger as an example, the number of channels has increased from DIFF1-1 to DIFF1-8, that is, 8 times and same for DIFF and PRH. The advantage of this distribution method is that wiring troubles, especially troubles due to poor contact, can be dispersed. For example, if DIFF1 is divided into 32 at once, 32ch will be wiped out at once when a trouble such as poor contact occurs in the DIFF1 system. The same can be said for the PRH side, so if preheat type sensors are connected to all, the possibility is doubled. For the purpose of minimizing damage, it is designed to limit the number of amplifications to 8 channels per DIFF 1ch. Wiring is the above DIFF and PRH branch, 3 MUX CTRLs (MUX controls) and 2 MUX PWRs. Above 1st MUX32 / 64 unit and 2nd MUX32 / 64 unit is the exact same multiplexer. In actual operation, make a mark so that you can distinguish the appearance of the first and second units. The relationship between the number of MUX expansions and the number of channels is shown below. The number of preheats is the same as DIFF.

Combination	# of DIFF
MIJ-01 Only	8ch
MIJ-01 + MUX	36(=MIJ01/4ch+MUX/32ch)
MIJ-01 + MUX +MUX	64(=MIJ01/0ch+MUX/32ch+MUX/32ch)

The details of the MUX terminal block are shown in the figure. The green frame indicates the terminal block used to connect to MIJ01 or the second MUX, and the yellow frame indicates the added DIFF and PRH.



Detailed MUX terminal blocks

## 11-2. Connection

Below Table shows the actual wiring using the cable that came with the MUX when connecting two MUX to the MIJ-01.

The attached cable is a 16-core communication cable and a 5-core power supply & control cable. After wiring is complete, fix the control system as far away as possible from the analog system. This is a consideration to prevent the digital noise of the control from entering the analog system as much as possible. It is depending on the number of channels you want to expand, you do not have to wire all of them. For example, if you want to expand only DIFF1 by 8 times, serial number wire 1,2,3,4, A, B, C, D, and E need to be connected. In other words, the MUX will not work unless the power and control cables with serial numbers A, B, C, D, and E are connected, and the analog branch cable need to be connected as required. This wiring is just a pin assignment when using the attached cable, and you can also use your own cable. In that case, we recommend AWG24 to 23 for the communication cable and the power supply & control cable. Please make sure that there are no wiring mistakes.

### Communication Cable (For connection between MIJ01 and MUX-No.1)

Serial number	Cable Color	Marking	MIJ01 Terminal Block	MUX- No.1.Therminal Block	MUX- No.2.Therminal Block
1	Red	White line	DIFF1 H	DIFF From Logger 1 or 5 H	
2	Red		DIFF1 L	DIFF From Logger 1 or 5 L	
3	Orange	White line	PRH 1 +	PRH From Logger 1 or 5 +	
4	Orange		PRH 1 G	PRH From Logger 1 or 5 G	
5	Blue	White line	DIFF2 H	DIFF From Logger 2 or 6 H	
6	Blue		DIFF2 L	DIFF From Logger 2 or 6 L	
7	Green	White line	PRH 2 +	PRH From Logger 2 or 6 +	
8	Green		PRH 2 G	PRH From Logger 2 or 6 G	
9	Yellow	White line	DIFF3 H	DIFF From Logger 3 or 7 H	
10	Yellow		DIFF3 L	DIFF From Logger 3 or 7 L	
11	Brown	White line	PRH 3 +	PRH From Logger 3 or 7 +	
12	Brown		PRH 3 G	PRH From Logger 3 or 7 G	
13	Black	White line	DIFF4 H	DIFF From Logger 4 or 8 H	
14	Black		DIFF4 L	DIFF From Logger 4 or 8 L	
15	Gray	White line	PRH 4 +	PRH From Logger 4 or 8 +	
16	Gray		PRH 4 G	PRH From Logger 4 or 8 G	

### Power & control1 (For connection between MIJ01 and MUX-No.1)

A	Green		MUX CTL1	MUX CTL1 (Left)	
B	Yellow		MUX CTL2	MUX CTL2 (Left)	
C	White		MUX CTL3	MUX CTL3 (Left)	
D	Red		MUX PWR OUT +	MUX PWR + (Up)	
E	Black		MUX PWR OUT PG	MUX PWR PG (Up)	

### Communication Cable (For connection between MIJ01 and MUX-No.2)

Serial number	Cable Color	Marking	MIJ01 Terminal Block	MUX- No.1.Therminal Block	MUX- No.2.Therminal Block
1	Red	White line	DIFF1 H		DIFF From Logger 1 or 5 H
2	Red		DIFF1 L		DIFF From Logger 1 or 5 L
3	Orange	White line	PRH 1 +		PRH From Logger 1 or 5 +
4	Orange		PRH 1 G		PRH From Logger 1 or 5 G
5	Blue	White line	DIFF2 H		DIFF From Logger 2 or 6 H
6	Blue		DIFF2 L		DIFF From Logger 2 or 6 L
7	Green	White line	PRH 2 +		PRH From Logger 2 or 6 +
8	Green		PRH 2 G		PRH From Logger 2 or 6 G
9	Yellow	White line	DIFF3 H		DIFF From Logger 3 or 7 H
10	Yellow		DIFF3 L		DIFF From Logger 3 or 7 L
11	Brown	White line	PRH 3 +		PRH From Logger 3 or 7 +
12	Brown		PRH 3 G		PRH From Logger 3 or 7 G
13	Black	White line	DIFF4 H		DIFF From Logger 4 or 8 H
14	Black		DIFF4 L		DIFF From Logger 4 or 8 L
15	Gray	White line	PRH 4 +		PRH From Logger 4 or 8 +
16	Gray		PRH 4 G		PRH From Logger 4 or 8 G

### Power & control1 (For connection between MIJ01 and MUX-No.1)

A	Green				MUX CTL1 (Left)
B	Yellow				MUX CTL2 (Left)
C	White				MUX CTL3 (Left)
D	Red				MUX PWR + (Up)
E	Black				MUX PWR PG (Up)

## 12. Repair and recalibration

Everything breaks. Sometimes it will break. Once purchased, we will repair it as much as possible. If you think it is out of order, please let us know first. Sometimes it is not a malfunction, but it can be recovered with a few operations. After checking the symptom, if you certainly conclude that it is a malfunction, please send MIJ-01 to the following address.



Environmental Measurement Japan, CO., LTD.  
2-52-42 Takamidai, Fukuoka-city Higashiku, Fukuoka 811-0215, Japan

TEL 092-608-6412  
FAX 092-985-7844

Contact us from website

