# Your Data Our Care

## *Option Boards Manual*




| | | | | | |
|---|---|---|---|---|---|
| Title | : | User guide ML-Option Boards Manual | Date | : | Oct 2025 |
| Version | : | 2.6 | | | |
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# WARNING

THE FOLLOWING OPERATING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID DAMAGE OR MALFUNCTION, DO NOT PERFORM ANY OPERATING OTHER THAN THAT CONTAINED IN THIS MANUAL. ANY OPERATOR SHOULD BE SKILLED WITH A TECHNCAL BACKGROUND BEFORE OPERATING THE DEVICE.

***Version History***

| | |
|---|---|
| 2.0 - 2.3 | Renewed and reviewed documentation |
| 2.4 | ML-OI-I2C added |
| 2.5 | ML-OO-LORA V1.0 added |
| 2.6 | ML-OO-LORA V1.2 change |

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# PREFACE

## Option boards to customize your data logger

Option boards can be used to add additional input /output ports, extra features or perform signal conditioning to an ML-x17 Data Logger.

- Mechanically stack up to three option boards.
- Maximum two similar boards, with a switch to choose a different CID.
- Converter (OC) or Power (OP) boards don't have CID's and you can stack as many OC /OP-boards as mechanical feasible.
- OC boards don't use the internal control bus and are wired to existing input /output ports.

This manual describes installation and configuration of Option Boards into the Data Logger
We recommend you to read this manual carefully before installation of your system.

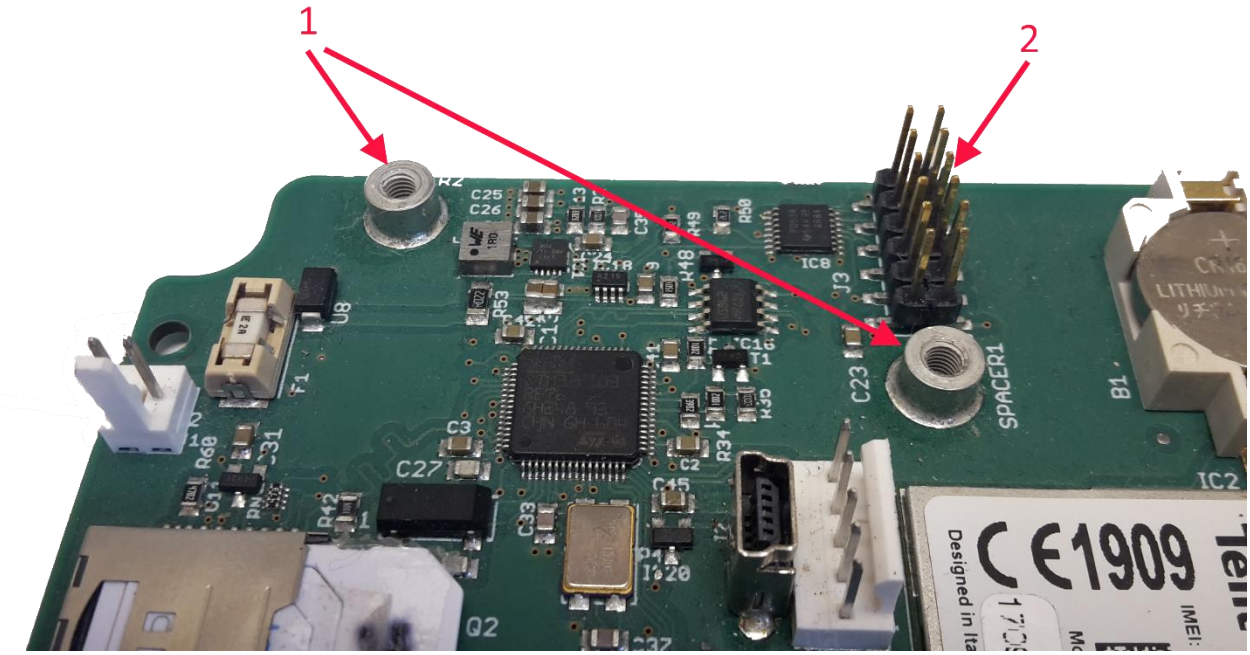
# 1 Assembly

The Option Boards have been designed to operate in conjunction with a ML-x17-xxx Data Logger. On the main PCB, there is a special “option port ” for supporting the various range of YDOC option Input /Output /Convertor boards.

**an option input board is an board that adds extra functionality to the ML-x17 Data Logger. For Instance the ML-OI-AD-10V adds two extra analogue inputs to the Data Logger. An Convertor board converts an input signal. For Instance the ML-OC-W2P converts a weak input signal to a firm rectangular waveform, which is suitable for the digital input ports of the Data Logger.*

## 1.1 Mounting the Option (or Convertor) Board

The Option Board Connector of the ML-x17 is located in the upper left corner of the Data Logger Main PCB. Option Boards are mounted with two screws, fitting in the Mounting Nuts.




1) Metal spacer.
2) Option Board Connector.

**Installation**

- Disconnect the power from your Data Logger.
- Mount the Option Board to align with the spacer, and the option connector.
- Use the attached screws to mount the Option board.
- After Mounting, restore the power and perform the Option Board configuration. (If needed).

# 2 OI-AD Type boards

Option boards for adding additional analog inputs to the data logger.

A maximum of two OI-AD boards can be installed in a data logger, and each is distinguished by the position of its CID jumper.

## 2.1 CID

Possible OI-AD category ID's are: 0x48 & 0x49

## 2.2 ML-OI-AD-2000MV

### 2.2.1 Description

Dual channel 16-bit differential input e.g. to connect Thermistors (Manual Using Thermistors) or pH-probes.

### 2.2.2 Board Overview




### 2.2.1 Connector Pinout

| Connector | Pin | Function | Description | Value | Comments |
|---|---|---|---|---|---|
| X1 | 1 | A1+ | Positive input A1 | 0 - 2000 mV | Differential input |
| X1 | 2 | A1- | Negative input A1 | 0 - 2000 mV | Differential input |
| X1 | 3 | A2+ | Positive input A2 | 0 - 2000 mV | Differential input |
| X1 | 4 | A2- | Negative input A2 | 0 - 2000 mV | Differential input |
| X1 | 5 | 5V | Sensor Power | +5.0 V Up to 200 mA | |
| X1 | 6 | GND | Sensor ground | 0V | |

### 2.2.2 Ranges

- ±2000mV
- ±1000mV
- ±500mV
- ±250mV

### 2.2.3 Specifications ML-OI-AD-2000MV

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Ranges | 2000 /1000 /500/ 250 mV |
| Input Impedance | 1 M Ohm |
| Power output | 5.0 V /200 mA (from Data Logger) |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

### 2.2.4 Configuration

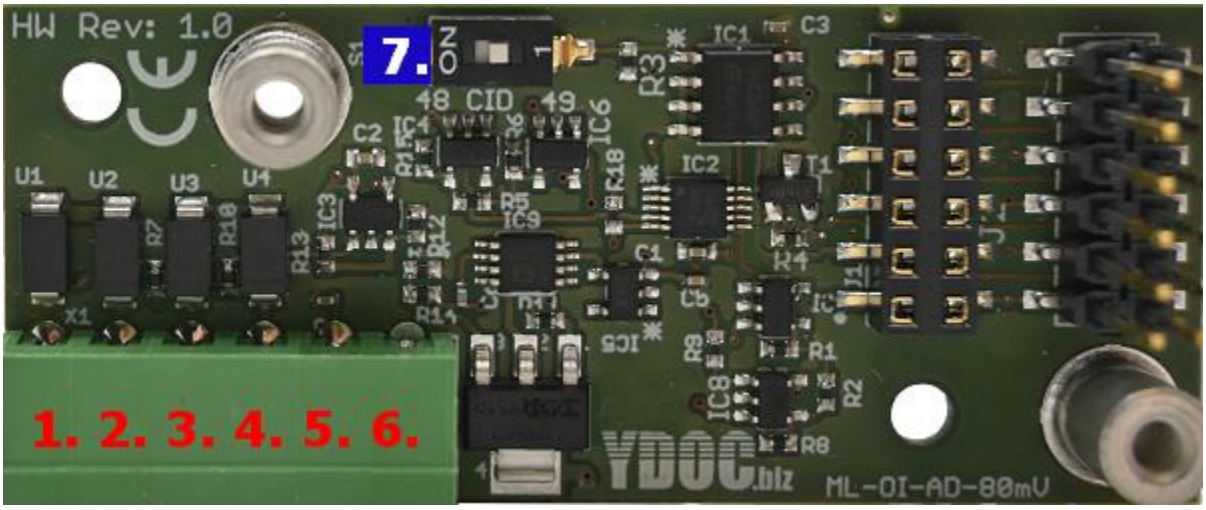
The board can operate at different ranges, defined in the configuration menu of the Data Logger.
This Chapter (section ML-OI-AD-10V/20MA/80MV/2000MV) describes the configuration process.

## 2.3 ML-OI-AD-80MV

### 2.3.1 Description

Dual channel 16-bit differential input e.g. to connect pyrometers or load-cells.

### 2.3.2 Board Overview




### 2.3.3 Connector Pinout

1. In 1 (+)
2. In 1 (-)
3. In 2 (+)
4. In 2 (-)
5. Excitation (5V @80mA)
6. Ground
7. CID selector

### 2.3.4 Ranges

- ±80mV
- ±40mV
- ±20mV
- ±10mV

### 2.3.5 Configuration

The board can operate at different ranges, defined in the configuration menu of the Data Logger. This Chapter (section ML-OI-AD-10V/20MA/80MV/2000MV) describes the configuration process.

### 2.3.6 Offset calibration

The ML-OI-AD-80MV has an offset of approximately 150 µV, which can be negated by performing a null-point calibration using a short circuit between the differential inputs.

### 2.3.7 Specifications

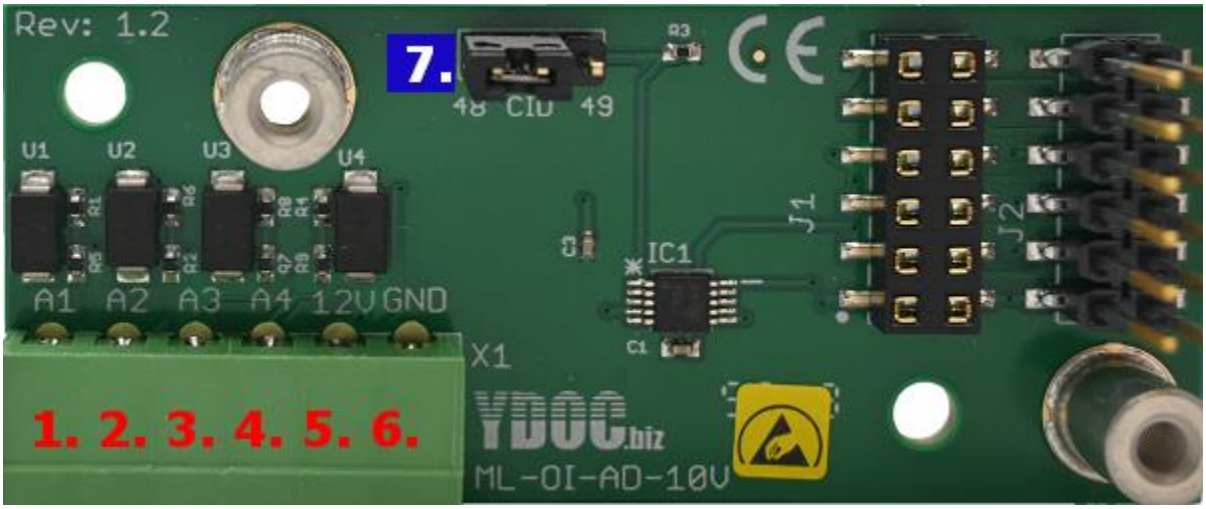
| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Ranges | 80 /40 /20 /10 mV |
| Input Impedance | 10 M Ohm |
| Power output | 5.0 V /200 mA (from Data Logger) |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |
| | |
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

## 2.4 ML-OI-AD-10V

### 2.4.1 Description

Quad channel 15-bit single ended voltage input.

### 2.4.2 Board Overview




### 2.4.3 Connector Pinout

1. Input 1
2. Input 2
3. Input 3
4. Input 4
5. Excitation (12V)
6. Ground
7. CID selector

### 2.4.4 Ranges

- ±10V

### 2.4.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Ranges | 10 /5 / 2,5 /1,25 V |
| Input impedance | 49 k Ohm |
| Power output | 12 V /100 mA (from Data Logger) |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

### 2.4.6 Configuration

The board can operate at different ranges, defined in the configuration menu of the Data Logger.
This Chapter (section ML-OI-AD-10V/20MA/80MV/2000MV) describes the configuration process.

## 2.5 ML-OI-AD-20MA

### 2.5.1 Description

Quad channel 15-bit single ended current (loop) input.

### 2.5.2 Board Overview




### 2.5.3 Connector Pinout

1. Input 1
2. Input 2
3. Input 3
4. Input 4
5. Excitation (12V)
6. Ground
7. CID selector

### 2.5.4 Ranges

- 0 – 20mA
- 4 - 20mA

### 2.5.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Ranges | 0 /4 - 20 mA |
| Input Impedance | 22 Ohm |
| Power output | 12 V /100 mA (from Data Logger) |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

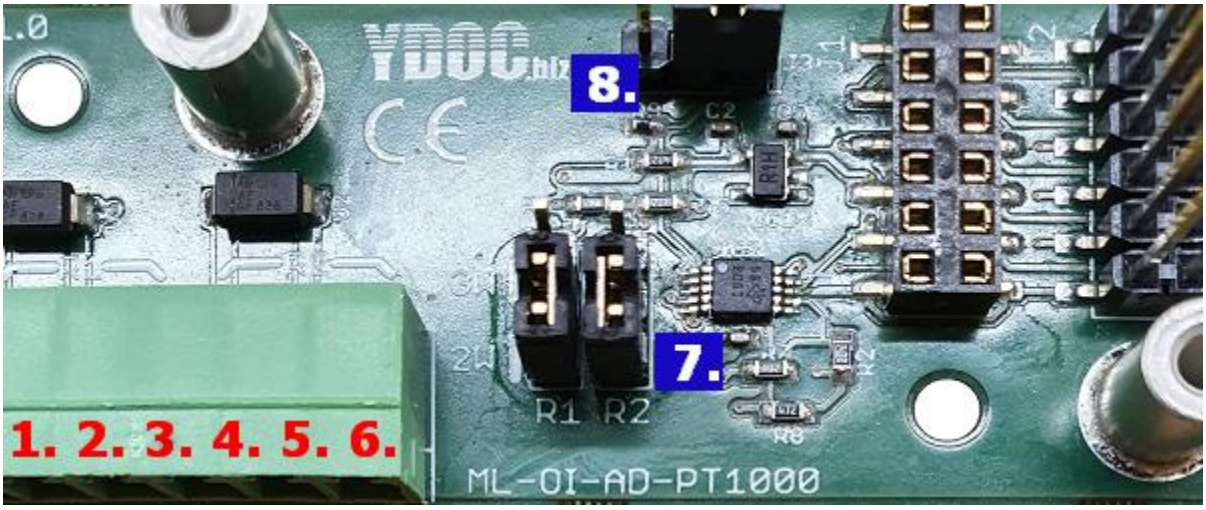
| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

## 2.6 ML-OI-AD-PT1000

### 2.6.1 Description

Dual channel 2 or 3-wire PT1000 RTD input.

### 2.6.2 Board Overview




### 2.6.3 Connector Pinout

1. In 1(+)
2. In 1(-)
3. In 1(-)
4. In 2(+)
5. In 2(-)
6. In 2(-)
7. Wire selector (2 or 3 wire sensor)
8. CID selector

### 2.6.4 Ranges

- -40-+85°C (±1.5°C)
- -20-+40°C (±1°C)
- On user calibration: -40-+85°C (±0.5°C)

### 2.6.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Ranges | -40-+85°C |
| Power output | No |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

### 2.6.6 Configuration

The board can operate at different ranges, defined in the configuration menu of the Data Logger.
This Chapter (section ML-OI-AD-PT1000) describes the configuration process.

# 3 OI-AX Type Boards

Option boards for adding auxiliary inputs to the data logger.

A maximum of two OI-AX boards can be installed in a data logger, and each is distinguished by the position of its CID jumper.

## 3.1 CID

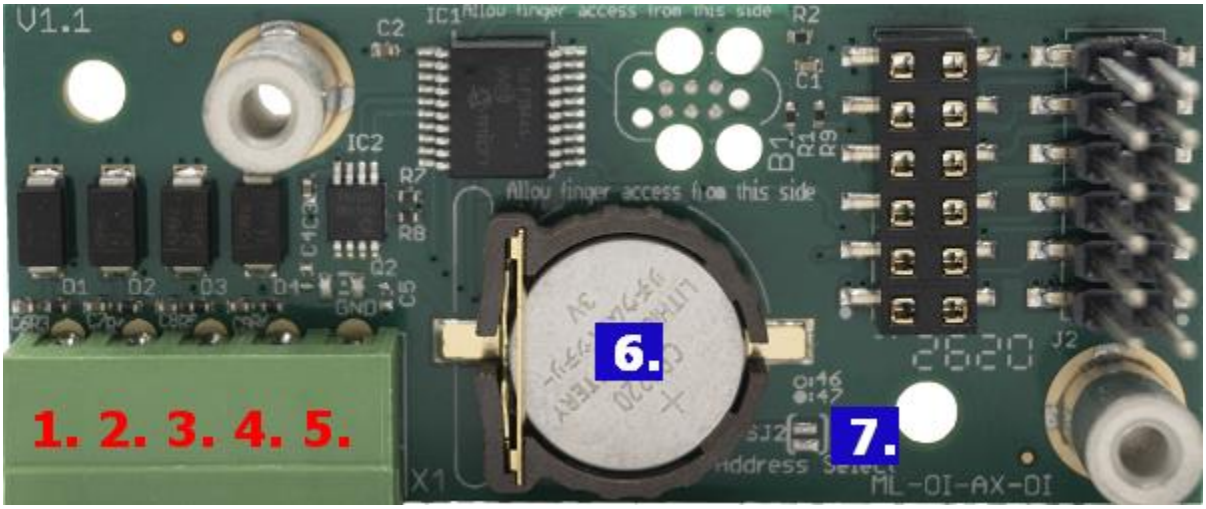
Possible OI-AD category ID's are: 0x46 & 0x47. (To use the 2nd address, close solder jumper SJ2).

## 3.2 ML-OI-AX-DI

### 3.2.1 Description

Option board to add four more digital inputs e.g. to connect cumulative pulse counters.

### 3.2.2 Board overview




### 3.2.3 Connector Pinout

1. Input 1
2. Input 2
3. Input 3
4. Input 4
5. Ground
6. Backup battery
7. CID selector

### 3.2.4 Ranges

- Input voltage: 0 - 5V
- Number of inputs: 4
- Max. frequency: 500Hz
- Each Input port has a 50k internal pull-up resistor (to 3.6V).

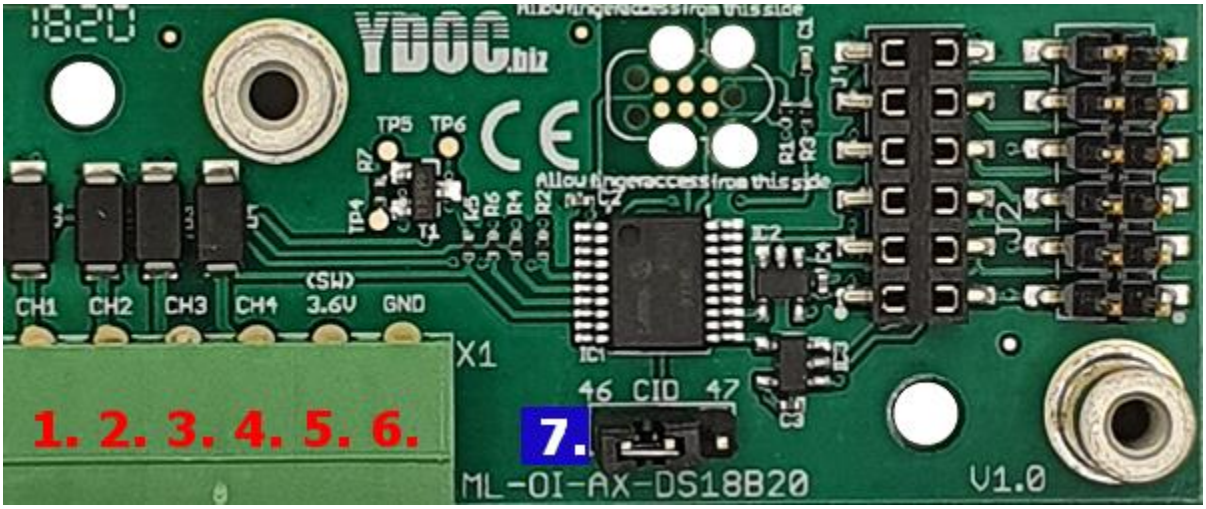
## 3.3 ML-OI-AX-DS18B20

### 3.3.1 Description

Option board to connect up to four 1-Wire digital thermometers.

**Supported Chips:** DS1820, DS18B20, DS18S20, DS1822, DS1920

### 3.3.2 Board Overview




### 3.3.1 Connector Pinout

1. Input 1
2. Input 2
3. Input 3
4. Input 4
5. Excitation (3.6V)
6. Ground
7. CID selector

## 3.4 ML-OI-AX-HART

### 3.4.1 Description

Octo channel HART inputs. Supports multi-drop topology to connect multiple sensors divided over max. 8 input channels.

### 3.4.2 Board Overview




### 3.4.3 Connector Pinout

1. Loop (+)
2. Loop (-)
3. Excitation (12V)
4. CID selector

## 3.5 ML-OI-AX-RH

### 3.5.1 Description

Option board to connect an external I2C based Relative Humidity Sensor.

**Supported chips:** AM2315 (AOSONG), ChipCap2 (Amphenol /Telaire T9602-D-3), BME280 (Bosch) and SHT3x, SHT4x (Sensirion),

### 3.5.2 Board Overview




### 3.5.1 Connector Pinout

1. SCL
2. SDA
3. Excitation (3.6V)
4. Ground
5. CID selector

## 3.6 ML-OI-AX-I2C

### 3.6.1 Description

To connect a simple external I2C sensor.
For simple sensors returning a consecutive array of bytes containing up to two raw ADC values.

### 3.6.2 Board Overview




### 3.6.3 Connector Pinout

1. SCL
2. SDA
3. Excitation (3.6V)
4. Ground
5. CID selector

### 3.6.4 Specifications

- Protocol: I2C
- Supply voltage: 3.6V DC
- Max number of sensor channels to read: 2
- Data type: Big-endian signed or unsigned integer (ADC value)
- ADC resolution: 8 .. 24bit (including sign bit, if applicable)

### 3.6.5 Configuration

The board can be configured via the internal terminal interface and is configured by default as example to connect to a Sensirion SHT4x humidity sensor.

To connect a different type of sensor, consult the sensor's datasheet and complete the following settings:

- The I2C address of the sensor.
- An optional command (up to 3 bytes) to initiate a measurement.
- The time to wait after power-on or after issuing the above command before a measurement is valid.
- An optional command (up to 3 bytes) that prepares the sensor for reading the result.
- Specify which byte in the read data contains the optional status byte (with indexing starting at 0), and define the expected masked value that indicates when a measurement is ready.
- Specify the byte offset in the read data where the ADC value for a channel begins, its resolution, any possible bit shift, and whether the value is signed or unsigned.
- Apply a factor and offset to the corresponding data logger parameter to convert the ADC value into the appropriate engineering value.

More info

# 4 OI-BARO type Board

Option Input – Barometric type board.

## 4.1 ML-OI-BARO

### 4.1.1 Description

Atmospheric pressure & temperature sensor e.g. to compensate readings of level sensors.

### 4.1.2 CID

CID Fixed: 0x76




### 4.1.3 Ranges

- 300 - 1200hPa (±2hPa)
- -30 - +70°C (±1°C)

# 5 OI-COM Type Boards

Option board for adding an additional serial sensor port to the data logger.

A maximum of one OI-COM board can be installed in a data logger.

## 5.1 CID

OI-COM category ID is: 0x4C

## 5.2 ML-OI-COM-UART

### 5.2.1 Description

Serial sensor input (UART) UART to connect sensors with TTL UART port.

### 5.2.2 Board Overview




### 5.2.3 Connector Pinout

1. Excitation (3.3V)
2. Transmit
3. Receive
4. Ground

### 5.2.4 Ranges

- 300 - 230k4 bps
- Tx (0 - 3.3V)
- Rx (0 - 5V)

### 5.2.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Power output | 3,3 V (from Data Logger) |
| Ranges | Tx (0 - 3.3V) and Rx (0 - 5V) |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

## 5.3 ML-OI-COM-RS232

### 5.3.1 Description

Option board to add an additional RS232 port e.g. to connect an NMEA transponder.

### 5.3.2 Board Overview




### 5.3.3 Connector Pinout

1. Excitation (12V)
2. Transmit
3. Receive
4. Ground

### 5.3.4 Ranges

- 300 - 230400 bps

### 5.3.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Power output | 12 V (from Data Logger) |
| Ranges | |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

## 5.4 ML-OI-COM-RS485

### 5.4.1 Description

Option board to add an additional RS485 port e.g. to connect MODBUS sensors.

### 5.4.2 Board Overview




### 5.4.3 Connector Pinout

1. Excitation (12V)
2. RS485 A+
3. RS485 B-
4. Ground

### 5.4.4 Ranges

- 300 - 230400 bps

### 5.4.5 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Power output | 12 V (from Data Logger) |
| Ranges | |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

## 5.5 ML-OI-COM-SDI12

### 5.5.1 Description

Option board to add an additional SDI-12 port to connect SDI-12 sensors.

### 5.5.2 Board Overview




### 5.5.3 Connector Pinout

1. Excitation (12V)
2. Ground
3. Data

### 5.5.4 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Quiescent Current | 0 uA |
| Operating Current | 1.2 mA ex. load |
| Power output | 12 V /100 mA (from Data Logger) |
| Ranges | |
| ESD protection | Yes |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

# 6 OA Type Boards

Option board for adding an additional accessory to the data logger.

A maximum of one OA board can be installed in a data logger.

## 6.1 CID

OA category ID is: 0x4D

## 6.2 ML-OA-RS232

### 6.2.1 Description

The ML-OA-RS232 option board can be used to add a secondary accessory to an ML-417ADS data logger. The currently available accessories are: a TFT-display, a JPG-camera, a GPS-receiver or an Irridium satellite transceiver.

### 6.2.2 Board Overview




### 6.2.3 Connector Pinout

1. Control out
2. Transmit
3. Receive
4. Ground

### 6.2.4 Ranges

- Excitation: 3.6V
- Off/On: 0/3.6V
- 300-230400 bps

## 6.3 ML-OA-WIFI

### 6.3.1 Description

Option board to add a Wi-Fi Interface to transfer log files over Wi-Fi.

*Supported protocols:* ***MQTT(S), HTTP(S), SMTP(S), (ydoc)TCP and NTP.***

### 6.3.2 Board Overview




### 6.3.3 Ranges

- <400m
- +19dBm Transmit Power
- -96dBm Sensitivity
- IEEE 802.11b/n/g

# 7 OO Type Boards

Option boards for additional logger outputs.

Each data logger parameter can be configured to output to an OO type option board. A maximum of two option boards can be installed in a data logger, and each is distinguished by the position of its CID jumper.

If more parameters are selected for output than the board supports, only the first parameters (in the sorting order shown in the "parameter overview" menu of the data logger) will be used.

## 7.1 CID

Possible OO category ID's are: 0x50 & 0x51

## 7.2 ML-OO-MODBUS

### 7.2.1 Description

MODBUS Slave to share sensor readings with your local SCADA system.

### 7.2.2 Board Overview




### 7.2.3 Connector Pinout

1. RS485 A+
2. RS485 B-
3. Ground
4. CID selector

### 7.2.4 Specifications

- Protocol: MODBUS/RTU slave (RS-485)
- Slave address: 1…254 (default: 1)
- Maximum read size: 32 registers at once
- Data type register order: Least significant WORD first
- Baudrate: 4800…38k4bps (default: 19k2)
- Parity: None
- Stopbits: 1
- Inactivity timeout: Infinite, 1…60s (default: 4s)
- 100uA quiescent current
- 2.5mA operating current (during MODBUS interrogation)

### 7.2.5 MODBUS memory map (Input registers)

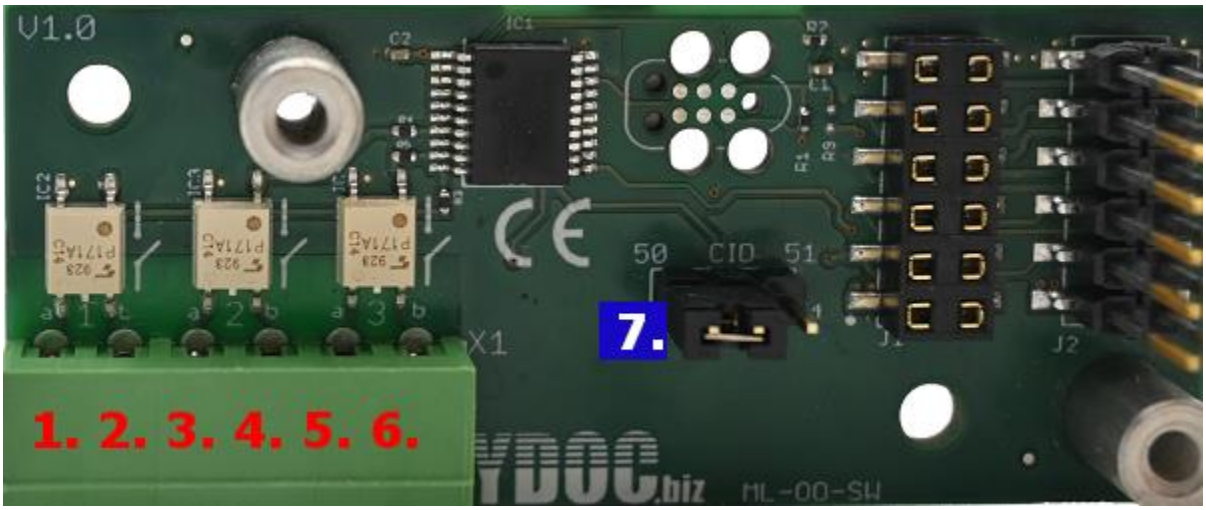
| Address | Data type | Description |
|---|---|---|
| 0(30001) | WORD | Number of published values |
| 1(30002) | WORD | Reserved |
| 2(30003) | DWORD | Value validation flags, a value is valid if its corresponding bit is set to 1 |
| 4(30005) | FLOAT (IEEE-754) | The first value |
| 6(30007) | FLOAT (IEEE-754) | The second value |
| 8(30009) | FLOAT (IEEE-754) | The third value |
| … | … | … |
| 66(30067) | FLOAT (IEEE-754) | The 32nd value |

## 7.3 ML-OO-SW

### 7.3.1 Description

Digital output board with Galvanic Isolated Switches. Three Galvanic Isolated Switches (N.O.) with potential free contacts.

### 7.3.2 Board Overview




### 7.3.3 Connector Pinout

1. Contact 1A
2. Contact 1B
3. Contact 2A
4. Contact 2B
5. Contact 3A
6. Contact 3B
7. CID selector

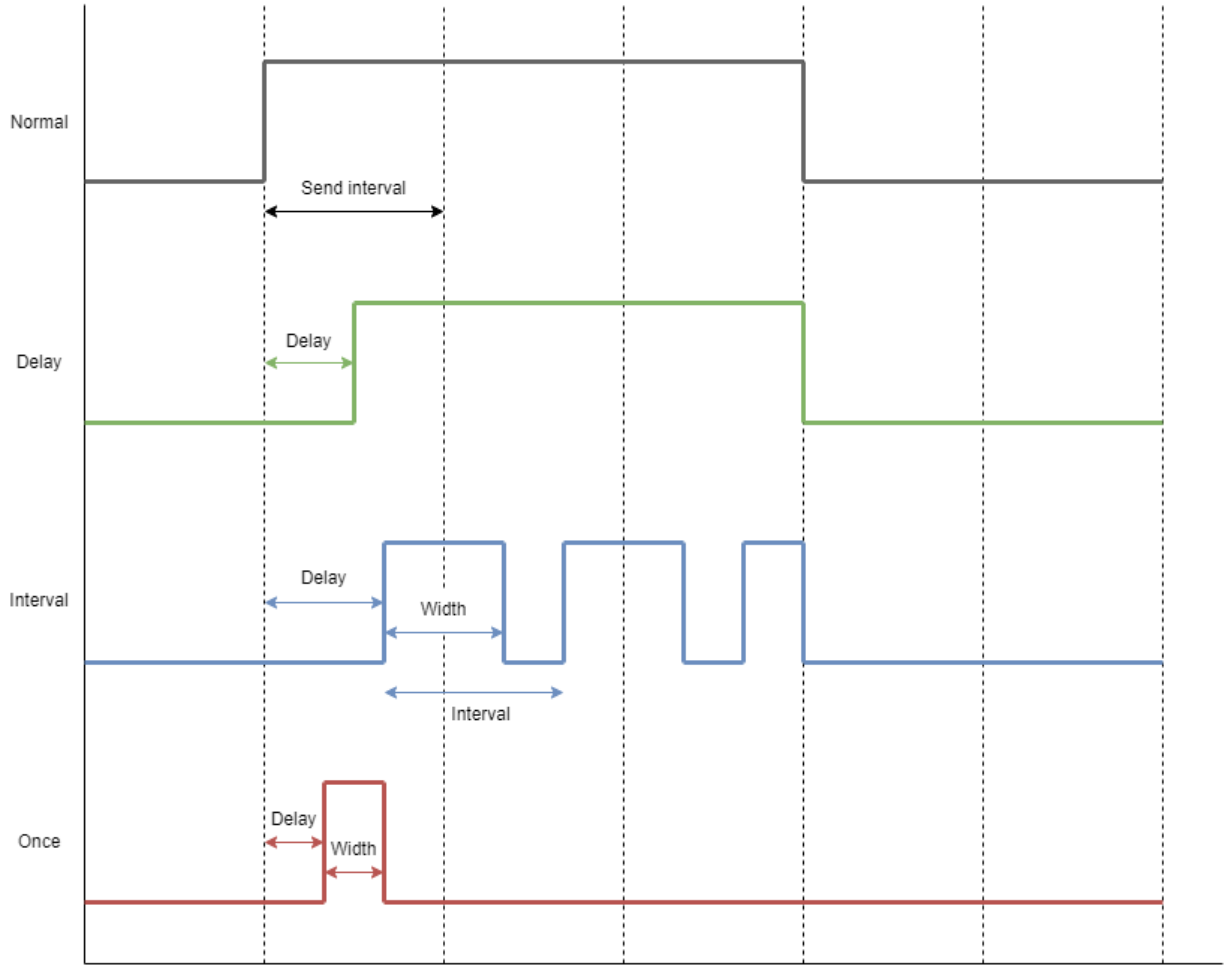
### 7.3.4 Ranges

- ±100V
- ±200mA

### 7.3.5 Specifications

- Switches: 3
- Protection: Galvanic isolated
- Contacts: Potential free
- Connected voltage: 100V maximum
- Contact current: 200mA maximum
- Power consumption: 15uA in steady state sleep, 0.5mA during active pulse and pulse-timer-active (on V1.04).
- Timing accuracy: <=20ms per second (<=2%)
- *Activation modes:* ***Steady (Pre V1.04)***

- *Activation modes:* ***Steady state or pulse mode (V1.04)***
- Activation delay: up to 4095s
- Pulse width: 1 to 4095s
- Pulse interval: Once or 2s to 4095s (max 0.5Hz)




More info

### 7.3.6 Configuration

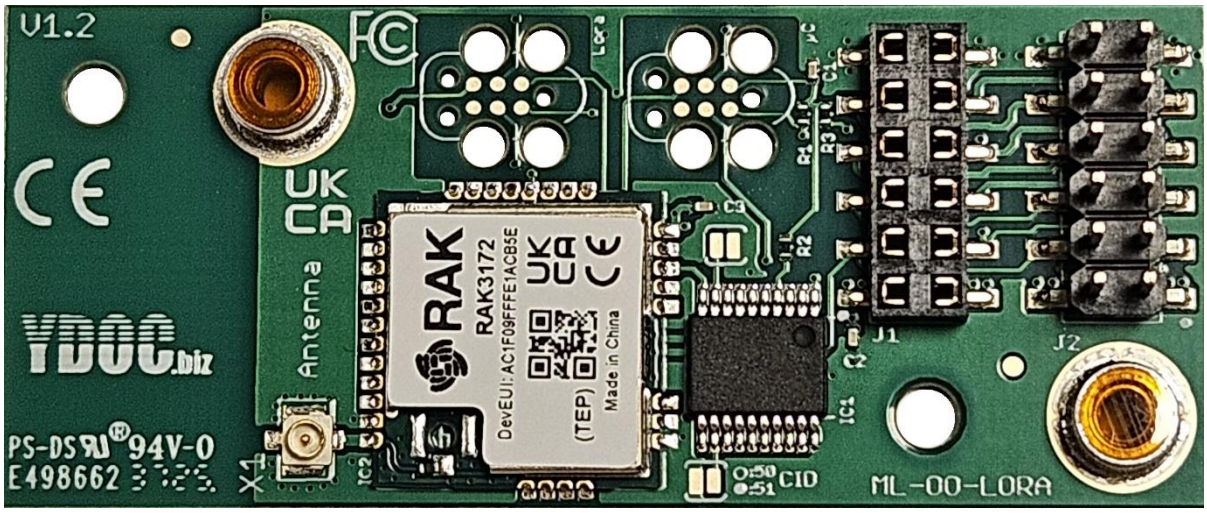
The board can operate at different ranges.
This Chapter (Option Boards) shows how to configure the activation modes using the COM port option.

## 7.4 ML-OO-LORA

### 7.4.1 Description

Installing an ML-OO-LORA board transforms your YDOC data logger into a versatile LoRaWAN end device, capable of publishing up to 12 user-selected parameters to the LoRaWAN platform of your choice as well occasionally receiving small data logger configuration snippets.

### 7.4.2 Board Overview




### 7.4.3 Ranges

- Publishing: Up to 12 parameters
- Payload encoding: Big-endian IEEE 754 single-precision float array
- Receiving data logger configuration snippets of up to 96 bytes
- Protocol: LoRaWAN v1.0.3
- ML-OO-LORA-8 bands: EU868 & IN865
- ML-OO LORA-9 bands: US915, AU915, KR920 & AS923-1,2,3,4
- Device activation: ABP or OTA (preferred)
- Antenna connector: U.FL / I-PEX
- Max TX power: +23 dBm
- RUI3 AT-interface (for diagnostic use and specific settings)
- Power consumption: 100uA in sleep, 90mA during transmission.
- Operating temperature: –40 °C to +85 °C

### 7.4.4 Configuration




- Register your device in your LNS (LoRaWAN Network Server).
- Choose the frequency band according to the region of operation and device activation method: ABP (Activation By Personalization) or OTAA (Over The Air Activation).
- In case of OTAA make sure the device EUI, application EUI and key in the ML-OO-LORA board are matching exactly with the ones in your LNS or the opposite.
- In case of ABP make sure to set the security keys and device address in the ML-OO-LORA board to the same values as suggested by your LNS.

### 7.4.5 Payload format

Up to 12 sensor parameters can be included in the payload. They'll be encoded as IEEE 754 single-precision float array with big endianness (one 4-byte value per parameter, MSB first). Most IoT platforms offer JavaScript for payload decoding (using the DataView.getFloat32() Method).

**Custom JavaScript formatter (TTN example)**

The JavaScript code below converts our binary payload format to The Things Network JSON payload format. A similar approach can be used for other IoT platforms.

```
function decodeUplink(input) {
  const bytes = input.bytes;
  const dataView = new DataView(new Uint8Array(bytes).buffer);
  const channelCount = bytes.length / 4;
  const channels = {};

  try {
    for (let i = 0; i < channelCount; i++) {
      const floatVal = dataView.getFloat32(i * 4, false); //false=big endian
      channels[`Channel_${i + 1}`] = floatVal;
    }

    return {
      data: channels,
      warnings: [],

      errors: []
    };
```

```
} catch (err) {
  return {
    data: {},
    warnings: [],
    errors: ['Failed to decode uplink: ' + err.message]
  };
}
```

### 7.4.6 Config snippet

Please find below an example of a small snippet to change the low alarm limit of a data logger parameter with code “BATT” to 3.15V.

```
{"ps":[{"id":"BATT","lo":3.15}]}
```

***Tip:*** *To keep payload (max 96 bytes) as small as possible avoid using spaces and line feeds.*

# 8 OC type Board

Signal converter type board.

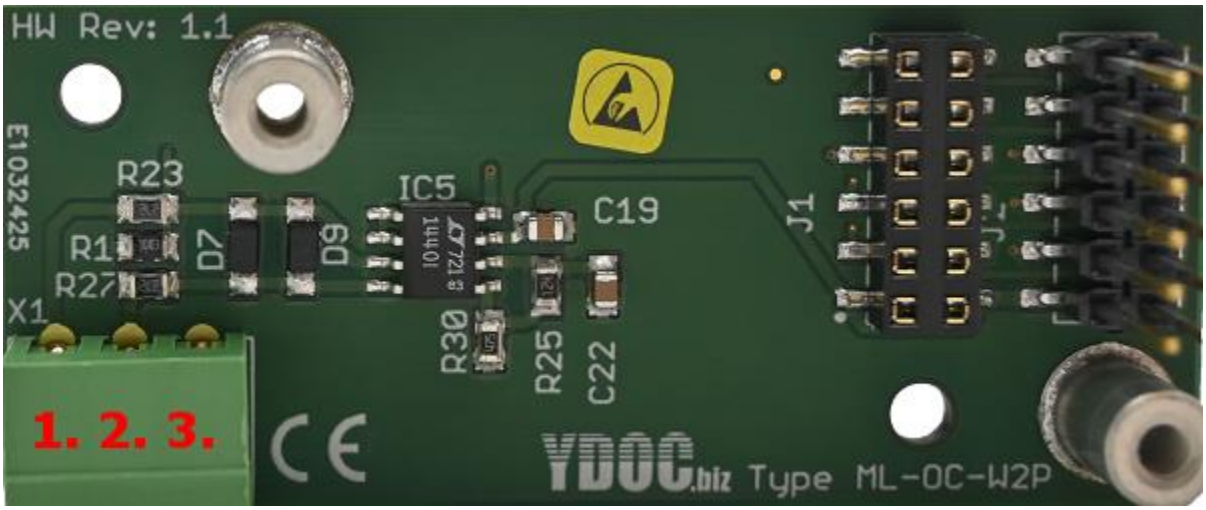
## 8.1 ML-OC-W2P

### 8.1.1 Description

Waveform to digital pulse converter. Sinus wave to square wave (digital pulse train) convertor. To connect flow meters or anemometer with a passive coil output. One sinus will give one pulse.

*This convertor board is very low power if it is connected to a digital input port with internal pull-up mode. When an external pull up resistor is used, be aware the system will draw more current.*

### 8.1.2 Board Overview




### 8.1.3 Connector Pinout

1. Coil in (+)
2. Coil in (-)
3. Pulse out

### 8.1.4 Ranges

- 0 - 50kHz
- 80mV - 24V RMS
- Output Pulse Voltage: 0.1V (Low) - 3.6V (High)
- (Differential) Input impedance 10M Ohm
- Input has connection to Gnd. (100k Ohm)

### 8.1.5 Wiring

The wiring of this board is very simple. Wire your sensor to X1.1 and X1.2. Connect a single wire between X1.3 and the digital input of your interest. A GND wire is not needed. (Ground connection is already available, between the Option Board and your Data Logger).

### 8.1.6 Specifications

| | |
|---|---|
| **Power Supply** | |
| Input | 3.6 Volts from Data Logger option Connector |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Operating Voltage | 3.6 V |
| Max Frequency | 10 kHz |
| Quiescent Current | 4 uA |
| Max. Input Voltage | 24 V RMS |
| Min. Input Voltage | 80 mV RMS |
| Input impedance | 10 M Ohm |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| | |
|---|---|
| **Dimensions** | |
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

# 9 OP type Board

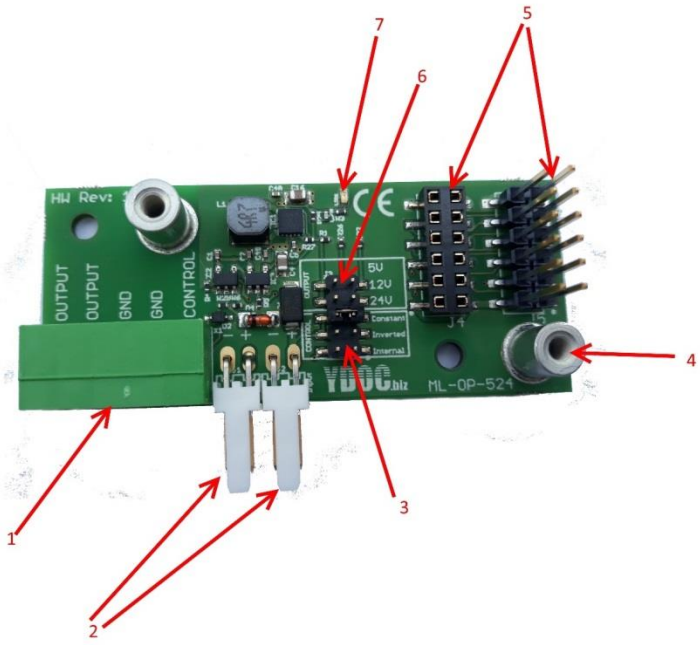
Option Power Board.

## 9.1 ML-OP-524

### 9.1.1 Description

To power external sensors or usable as standalone power supply. Power switches on in parallel with logger sensor power switch (internal control), from an external signal or continuously.

### 9.1.2 ML-OP-524 Board Layout




### 9.1.3 Connectors and Jumper Overview

1: Output Connector with Control input
2: Data Logger Power Input and through Connectors.
(Data Logger Power Daisy Chain).

3: Control jumper selection
4: Fastener for next board
5: Option Connectors. For internal operation and stacking boards)
6: Output Voltage Jumper Selection
7: Power Active LED

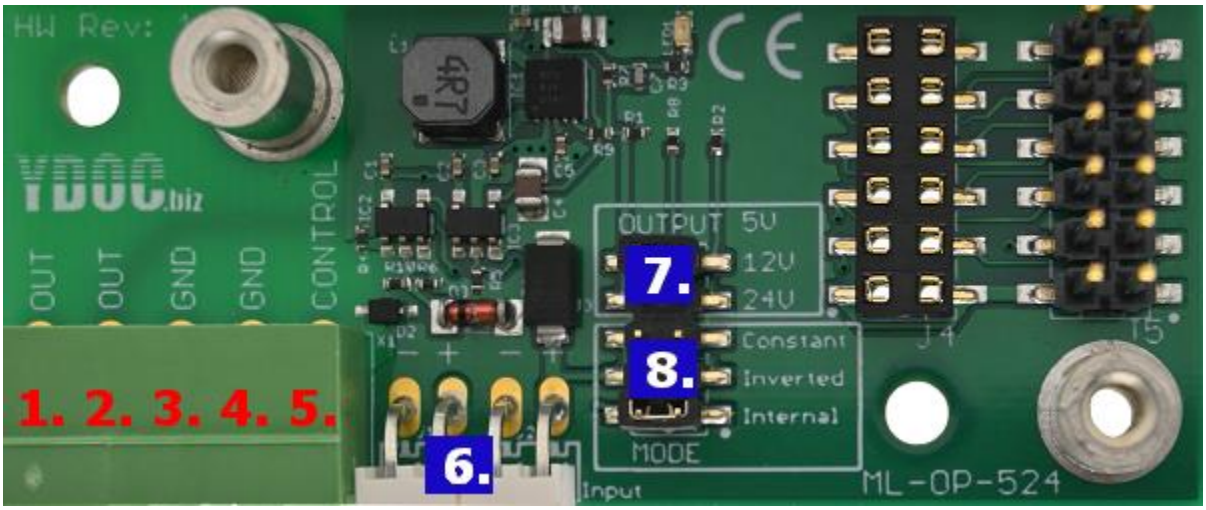
### 9.1.1 Connecting input power

The ML-OP-524 converts the input power to a selectable output voltage. The power is taken from the batteries directly, so NOT loading the Data Logger. The 2 white connectors, shown in figure 2: 2, are

connected in parallel. This is convenient, for powering also the Data Logger. So, to connect this Option Board, you need 2 power cables. Picture below shows how this is connected. Because both connectors are the same, and connected in parallel, it is not important which connector is used for the batteries and which is used for the Data Logger. It is a daisy chain.



### 9.1.1 Board Overview




### 9.1.2 Connector Pinout

1. Output (+)
2. Output (+)
3. Output (Gnd)
4. Output (Gnd)
5. Control Input
6. Power connectors. (Daisy Chain).
7. Output Voltage Selection
8: Power mode

### 9.1.3 Output Jumper Selection

**Output Voltage Selection**

5V = No jumper
12V = 12V jumper placed
24V = 24V jumper placed

**Power Mode selection**

Internal: Follows Data Logger Sensor Power available (On /Off)
Constant: Constant Power on

### 9.1.4 Ranges

- 5V@300mA
- 12V@200mA
- 24V@100mA
- Control input: 0V (Off), 3-24V (On)

*The output voltage is stabilized on 5V when a minimal current of 1.5 mA is drawn. Without a (minimal) load, the output voltage will rise above 5V.*

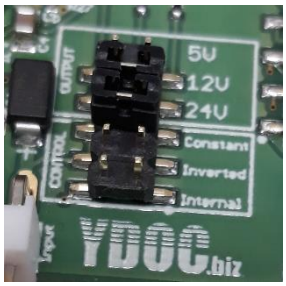
### 9.1.5 Configuration

The ML-OP-524 has no software settings, so it is NOT listed in the ML-x17 menu.
To operate the ML-OP-524, the user must set the jumper(s) to support his needs.
This board can be used in the ML-x17 Data Logger or can operate as a standalone, extra power source.

### 9.1.6 Mode of operation

There are 3 modes the board can operate with:
- Internal operation
- Standalone operation
- Constant operation

These different modes are selected by jumper(s) and explained below.




**Internal operation**
This mode is enabled when a jumper is installed on the location: “Internal”. This is the “normal” mode of operation. In this mode, the output is controlled by the sensor power of the Data Logger. This is convenient for “boosting” sensor power.

**Stand Alone operation**
When you use the board outside the Data Logger, or you like to use another source than the Data Logger’s sensor power, you must remove the jumper “Internal”. This way the board uses the signal on the “Control” input, switching the power board on /off.

**Constant operation (Always ON)**
If you like just a power booster, without controlling on /off, you can use the continuous operation for that. Install the jumper to position “Constant” And the output voltage will be indefinitely on. This mode is convenient for operation without the ML-x17 Data Logger. This mode of operation is not low power.



*When using the “constant” operation mode, be aware of the quiescent current of the device. It will draw way more energy from your batteries than with the other modes. Please check this before employment.*

**Inverted operation**
In this mode, the polarity of the Control signal is inverted. Normally, it is “Active High”. If you place a jumper on the location “Inverted” the Control signal will act on “Active low”.

This is convenient for use with the alarm output of the ML-x17, which has an open collector output. When you connect a wire from the alarm output of the Data Logger to the control input, the output is enabled when the logger is in the alarm mode. Possible usage: to drive a siren, or lamp etc. during alarm events.



*When the alarm output of the ML-x17 Data Logger is used as a control-source, make sure that you install a pull up resistor to match the open collector circuit. A resistor of 100 Ohms to 10 K can be used, depending on the external voltage supply (3 - 24 Volts). For more info on the open collector output, see Data Logger manual, Chapter: “Open Collector Output”.*

### 9.1.7 Considerations

The ML-OP-524 is a very versatile Option Board, which can be used with or without the ML-x17 Data Logger. The board is intended to be used with the YDOC Power board series (ML-PB-XX-XX). The board has NO fuse and is short circuit proof. In case of usage with the YDOC Power Boards, the fuse is already provided on the Power Board.

If the power input of the ML-OP-524 board is not connected to the Data Logger power but directly to the batteries or an external power supply, mount an external fuse. Directly connected to a external power source, the current drawn by this board is NOT registered by the Data Logger.
The internal Sensor Power of your Data Logger is not affected by the ML-OP-524 option module.
When used as continuous power convertor, please be aware of continuous (high) current draw.

### 9.1.8 Specifications ML-OP-524

| **Power Supply** | |
|---|---|
| Input | 3.6 Volts from Batteries |
| **General Enviroment** | |
| Temperature | Operating: -30 ~ + 75 °C; Storage -40 ~ +85 °C |
| Humidity | 5 ~ 100 % RH |
| **Electrical** | |
| Output Voltage | 5V* / 12V / 24V |
| MaxCurrent | 300mA @ 5V<br>200 mA @ 12V<br>100 mA @ 24 V |
| Quicsent Current | 2.9 mA @ 5V<br>6.4 mA @ 12V<br>6.7 mA @24V |
| Shutdown Current | 0.1 uA |
| Max. Input Voltage | 4.3 V |
| Min. Input Voltage | 3.0 V |
| Short circuit protected | Yes |
| Overvoltage protected | Yes, by Transorp,<br>above 5 Volts |
| Connector | Phoenix 3.81 mm |
| Galvanic Isolation | No |
| CE Compliant | Yes |
| Rohs compliant | Yes |

| **Dimensions** | |
|---|---|
| W X D x H | 64 mm X 27 mm X 12 mm |
| **Weight** | |
| Netto Weight | 20 Grams |

# 10 OU Type Board

Option User interface type Board.

## 10.1 ML-OU-BLE

### 10.1.1 Description

Bluetooth LE user interface. To enable wireless local access.

Fixed CID: 0x4A

### 10.1.2 Board Overview




### 10.1.3 Ranges

- <160m
- +4dBm transmit power
- -92dBm sensitivity

### 10.1.4 Specifications

More info

# 11 Appendix

## 11.1 Configuring the ML-OI-AD-XXX board

First, mount your board into the Data Logger (Assembly).
Use YdocTerminal to connect to the Data Logger and enter the Configuration Setup [3].

Select “Option Boards” [5].

```
Configuration setup

[0] Exit
[1] General settings       >>
[2] Modem settings
[3] NTP time update        >> Not used
[4] Alarm messages         >> Not used
[5] Option Boards          >> None
[6] Internal sensors       >> Internal
[7] Analog inputs          >> AI1
[8] Digital inputs         >> Not used
[9] Network signal sensor  >> Not used
[A] Serial port            >> Not used
[B] Accessory port         >> Not used
[C] Derived channels       >> Not used
[D] DTU connection         >> Not used
[E] Email output           >> Not used
[F] FTP output             >> Not used
[G] TCP output             >> TCP
[-] HTTP output            >> N/A
[I] MQTT output            >> Not used
[J] SMS output             >> Not used
>
```

When you enter this menu option, you can select which type of board you like to add, select Analog Inputs, [1]

```
Option Boards

[0] Exit
[1] Analog inputs (OB1)     >> None
[2] Analog inputs (OB2)     >> None
[3] Barometric              >> None
[4] Serial port             >> None
[5] Accessory port          >> None
[6] Auxiliary inputs (OB1)  >> None
[7] Auxiliary inputs (OB2)  >> None
[8] Auxiliary output (OB1)  >> None
[9] Auxiliary output (OB2)  >> None
>
```

Choose [1] “Add a Board”

```
Serial port Option Board

[0] Exit
[1] Add board
>
```

The following menu shows a list of possible boards. Select the type, corresponding with the hardware.

```
Board type

[0] Exit
[1] ML-OI-AD-80MV
[2] ML-OI-AD-2000MV
[3] ML-OI-AD-10V
[4] ML-OI-AD-20MA
>
```

After this it the Data Logger will detect the installed hardware.
It is important to check if this is successful!



*Please confirm if the logger has successfully detected the board.*
*Also, the Configuration Menu -> Option boards will show if the just added board is available.*

There are seven port types available, choose the port type you like to use.

```
Analog inputs

[0] Exit
[1] Port 1 (mA)        >> Not used
[2] Port 2 (mA)        >> Not used
[3] Port 3 (V)         >> Not used
[4] Port 4 (V)         >> Not used
[5] Potmeter           >> Not used
[6] OB1 Port 1 (mV)    >> Not used
[7] OB1 Port 2 (mV)    >> Not used
[T] Analog input test >> Passed
>
```

Now, you can setup the properties of the port.

```
Analog input

[0] Exit
[1] Name                          >> OB1-AI1
[2] Sensor power                  >> Enabled; Warm up 00:00:01
[3] Sample interval               >> Data log interval
[4] Port mode                     >> OB1 Port 1; 0-2000 mV
[5] Parameter settings            >> Analog
[6] Parameter value at 0 mV       >> 0 units
[7] Parameter value at 2000 mV >> 100 units
[8] Determine linear offset only (1 calibration point)
[9] Determine linear conversion function (2 calibration points)
[R] Remove
[T] Test measurement
>
```

This is equal configuring the internal input ports of the Data Logger, with the addition of a selectable range. (Port Mode). Further information can be found here, (Data Logger Manual).

## 11.2 Calibrating a ML-OI-AD-XXX board

Although precision resistors are used on this Option Board, and calibration is not mandatory, a deviation of about 0.5 °C is to be expected. When you are working with a class A thermistor, or when your application demands a high precision, calibration is recommended.
To calibrate your board, follow the next section.

### Calibration Process

To Calibrate your board, use two external resistors (or order them with YDOC, using Resistor 1k and Resistor 1k3). Open the Analog Inputs menu and choose your sensor's port. Then choose "[8] Determine linear conversion function (2 calibration points)". For the first point connect the 1k resistor, and for the 2nd point connect the 1k3 resistor.
For the 1st calibration point enter "0 mV" and for the 2nd point enter "206,11 mV"

```
Determine linear conversion function for Analog port OB1-AI1

[0] Exit
[1] Measure calibration point 1 >>
[2] Measure calibration point 2 >>
>Number of mV to measure for point 1: 0


When ready to measure 0 mV
Press any key! >
```

Calibration Values with 2 resistors:

| | | |
|---|---|---|
| First Calibration point | 0 mV | R = 1000Ω |
| Second Calibration point | 206.11 mV | R = 1300Ω |

```
Determine linear conversion function for Analog port OB1-AI1

[0] Exit
[1] Measure calibration point 1 >> -0.632813 mV = 0 mV
[2] Measure calibration point 2 >> 208.0625 mV = 206.110001 mV
>
```

Now, the board is calibrated and the “nice numbers” in the analog input driver are adjusted.

```
Analog input

[0] Exit
[1] Name                    >> OB1-AI1
[2] Sensor power            >> Enabled; Warm up 00:00:01
[3] Sample interval         >> Data log interval
[4] Port mode               >> OB1 Port 1; 0-250 mV
[5] Parameter settings      >> Analog
[6] Parameter value at 0 mV   >> 0.624973 mV
[7] Parameter value at 250 mV >> 247.527969 mV
[8] Determine linear conversion function (2 calibration points)
[9] Determine linear offset only (1 calibration point)
[R] Remove
[T] Test measurement
>
```

After this, the board is very accurate in measuring in both resistance and temperature. (<0.1%)



*Calibration of your board does NOT calibrate your sensor. Only the measured resistance is calibrated, but any deviation of R0 in your sensor in not eliminated.*

## 11.3 Configuring the ML-OA-XXX board

First, mount your board into the Data Logger (See also the Data Logger Manual).
Connect to the Data Logger and enter the Configuration menu.

```
Configuration setup

[0] Exit
[1] General settings      >>
[2] Modem settings
[3] NTP time update       >> Not used
[4] Alarm messages        >> Not used
[5] Option Boards         >> None
[6] Internal sensors      >> Internal
[7] Analog inputs         >> AI1
[8] Digital inputs        >> Not used
[9] Network signal sensor >> Not used
[A] Serial port           >> Not used
[B] Accessory port        >> Not used
[C] Derived channels      >> Not used
[D] DTU connection        >> Not used
[E] Email output          >> Not used
[F] FTP output            >> Not used
[G] TCP output            >> TCP
[-] HTTP output           >> N/A
[I] MQTT output           >> Not used
[J] SMS output            >> Not used
>
```

Select “Option Boards”.

```
Option Boards

[0] Exit
[1] Analog (OB1) >> None
[2] Analog (OB2) >> None
[3] Barometric   >> None
[4] Humidity     >> None
[5] Serial       >> None
>>
```

Choose “Serial” and “Add a Board”

```
Serial port Option Board

[0] Exit
[1] Add board
>
```

The following menu shows a list of possible boards.
Select the type, corresponding with the hardware.

```
Board type

[0] Exit
[1] ML-OI-COM-RS232
[2] ML-OI-COM-UART
[3] ML-OI-COM-SDI12
[4] ML-OI-COM-RS485
>
```

Choose the just installed board type.

```
Board type

[0] Exit
[1] ML-OI-COM-RS232
[2] ML-OI-COM-UART
[3] ML-OI-COM-SDI12
[4] ML-OI-COM-RS485
>Detected

Press any key! >
```

If the Data Logger has detected the new installed hardware, it will show “Detected” in the menu.
It is important to check if this is successful.



*Please confirm if the logger has successfully detected the board.*
*Also, the Configuration Menu -> Option boards will show if the just added board is available.*

Now, chose the type of communication protocol you want to use with this board.

```
RS485 sensors

[0] Exit
[1] Generic MODBUS
[2] Generic ASCII
[3] Generic NMEA
>
```

Now, you can setup the properties of your sensor. This is equal configuring the internal serial ports of the Data Logger. Further information on this is found in the Data Logger Manual.