# IO_TRANSMITTER

## (IO_MU_12)
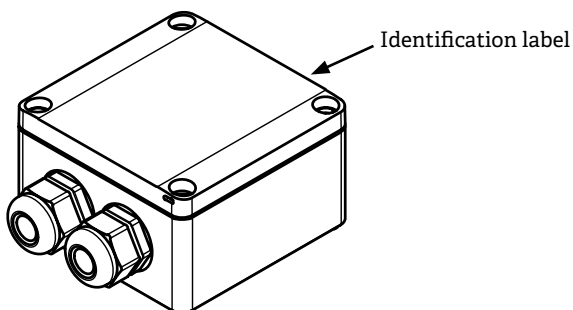
Technical Manual [ENG]

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Document ID: D1062

**This user manual refers to:**
Main board (K1002) version 2.3
Firmware version 1.6

Output board IO_OB_DO  (*Optional*)
Output board IO_OB_DAO  (*Optional*)

Identification label

> **!**   **This manual contains technical information. For operational information see the User Manual. [ENG, FIN, SWE]**

[ENG]   Find this manual and more on our website:
[FIN]   Löydä tämä käyttöohje ja muuta nettisivultamme:
[SWE]   Hitta denna manual och mera på vår website:
www.radio-remote.com/documentation

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# REVISION HISTORY

| Date | Revision | Notes |
|------|----------|-------|
| 13.11.2024 | 1.0 | **Divided into separate technical- and user manuals. New radio module (K1002 V2.3). Model no. changed.** |

**TABLE OF CONTENTS**

# 1    INTRODUCTION

The IO_Transmitter (IO_MU_12) is mainly designed to be used for transmitting signals from external sources to receivers within the IO_Series and Tele Radio Panther range.

The transmitter can be used with Digital and Analog sources. Digital, such as sensors (8-32V, High Level) and push buttons, switches or similiar (Gnd, Low Level) or Analog inputs 0.5-4.5V, 0-5V, 0-10V for Joysticks, Potentiometers and similiar.

Please read this manual and the User Manual carefully before mounting, installing, configuring or operating this product.


# 2    REQUIRED SKILLS AND SAFETY

The installer and user must have basic knowledge of machine controlling, electronical connections, and should follow general machine safety guidelines, directives
and regulation appropriate to the location where the product will be used. A
separate safety analysis is always recommended for the complete system.

The cabling should be designed and constructed according to best practice, an
external fuse must be installed for the product's power supply.
Tele Radio Finland Oy reserves the right to improve or change the product without
further notice.

## 3    TECHNICAL DATA

| | |
|---|---|
| Input Voltage | 8-32 VDC (or 5 VDC) |
| Current Consumption | ~ 25 mA + (5V max 0.75 A) |
| Inputs (IN_1-12) | 12 pcs (DIGITAL); configurable LOW (0V) or HIGH (8-32V), 2 analog, 0-5V, 0.5-4.5V, 0-10V |
| Reference Voltage Outputs | 1 pc; 5V (0.75 A) |
| Digital Outputs *(Optional output board)\** | 2 pcs; 2A each or max 3.5A both simultanously (resistive or inductive load, activated by Inputs) |
| Analog Outputs *(Optional output board)\** | 1pc; 0-20mA |
| Ingress Protection | IP66 |
| Dimensions (width x length x height) | 100 x 100 x 60 mm |
| Connectors Dimensions | GND, POT, BATT, GND : max 1.5 m2<br>IN_1-12, GND: max 0.5 m2 |
| Weight | ~ 250g |
| Certifications | CE, FFC, IC, MIC |
| Operating frequency | 2.4 GHz (2.410 - 2.475 GHz as per IEEE 802.15.4) |
| Radio Transmission Power (typical) | +10dBm |

# 4    ELECTRICAL CONNECTION
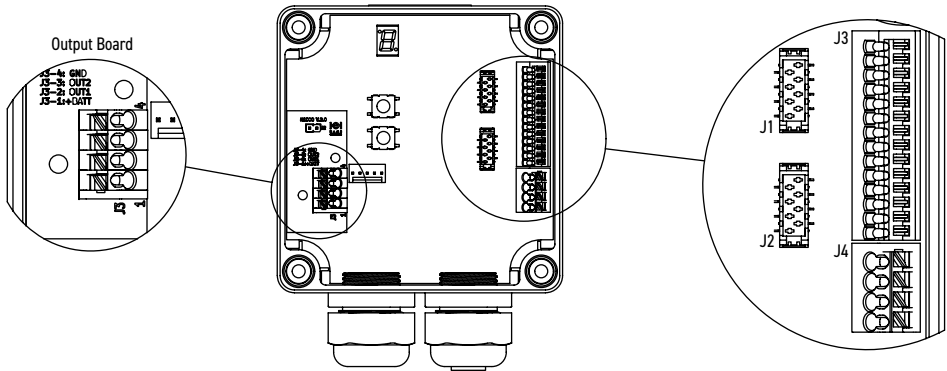


**Connector Terminal Block J4**

| J4-1 | GND | Ground |
|------|-----|--------|
| J4-2 | POT/EXT_IN | 5V out/in (0,75A) |
| J4-3 | BATT+ | Supply power (8-32VDC) |
| J4-4 | GND | Supply ground |

*Output Board Connector Terminal Block (Optional)*

**ATTENTION!** Always GROUND both Output Board (J3-4) and Main Board (J4-4).

| J3-1 | Supply power (8-32VDC) |
|------|------------------------|
| J3-2 | Output 1 (2A, activated by any input) |
| J3-3 | Output 2 (2A, activated by any input) |
| J3-4 | Ground |

**Connector Terminal Block J3**

| J3-1 | Ground |
|------|--------|
| J3-2 | Input 12* |
| J3-3 | Input 11* |
| J3-4 | Input 10 |
| J3-5 | Input 9 |
| J3-6 | Input 8 |
| J3-7 | Input 7 |
| J3-8 | Input 6 |
| J3-9 | Input 5 |
| J3-10 | Input 4 |
| J3-11 | Input 3 |
| J3-12 | Input 2 |
| J3-13 | Input 1 |
| J3-14 | Ground |

All inputs are configurable **HI** or **LO** *(see Menu Section 2).*

* Inputs 11 & 12 are also configurable as analog inputs *(see Menu Section 7)*
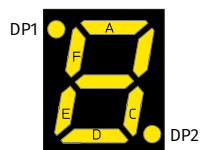
# 5    OPERATION
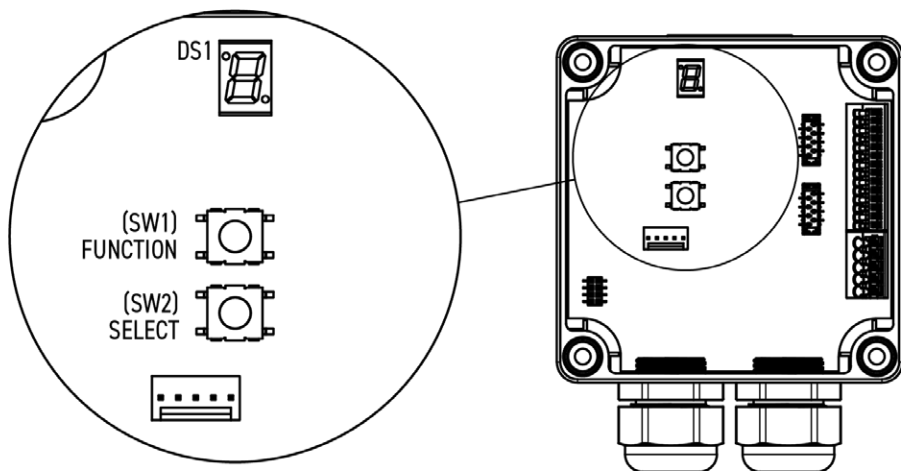


**The Display**

By default the Display shows the active input. 1...9, A=10, B=11, C=12.



The Dot (DP1) flashes when the transmitter is powered and also to indicate every new digit.

During restart, the firmware version is displayed.

## 5.1 REGISTERING

Registering means linking or joining a transmitter and a receiver. Make sure both are powered up before proceeding.

... **rEG** ...

*The IO_Transmitter does not have an on/off switch, and always is powered when connected to a power supply. The display indicates when powered.*

**In the transmitter**

- Press the FUNCTION button - *the display dot (DP2) lits*
- Press the SELECT button (within 10 seconds) - *the transmitter is now in register mode.*

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**In the receiver (Panther, Relay receiver)**
*(*Depending on receiver-model, the registering procedure may differ *slightly.)*

- Press the FUNCTION (F) button. - *The red Function LED lights up.*
- Press the SELECT (S) button. - *All relay LEDs lights up.*

*When the registration is successful, all LEDs in the receiver flashes and the receiver goes back to normal function mode.*

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To exit the transmitter's register mode, press any button, activate any input, or power-cycle the transmitter.

*Technical Note: The transmitter is sending btn1 & btn2 when in Register Mode.*

## 5.2 MENU

To enter Menu Mode press and hold the FUNCTION button for 6 seconds.

*ATTENTION! Changes in Menu structure since FW Version 1.3. (UM V_1.5). If earlier FW version, use UM V_1.4 or older.*

In the Menu, press the FUNCTION button to navigate to next Menu Section.

To save and Exit Menu Mode, navigate to Menu Section 8 (5.10) and press SELECT button or leave the transmitter without pressing anything for 60 seconds - *the transimtter saves all changes and restarts.*

**Menu Sections:**
1   CHANNEL
2   INPUT MODE
3   OFF DELAY I
4   OFF DELAY II
5   ON MASK I
6   ON MASK II
7   ANALOG/DIGITAL
8   END

## 5.3    CHANNEL (Menu Section 1)
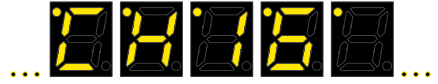
The transmitter can send on 14 different channels (12-25).

To change channel press the SELECT button.

If used in a dense wi-fi environments it's recommended to use channels 15, 20, 25. Heavy traffic on wi-fi (802.11) channels 1, 6 and 11 may otherwise cause some interference.

## 5.4    INPUT MODE (Menu Section 2)

*(Factory default: LO)*

To change Input Mode press the SELECT button.

**HI** = Activated when pulled HIGH (8-32V)

**LO** = Activated when pulled LOW (Ground)
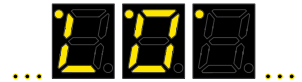
## 5.5    OFF DELAY I (Menu Section 3)

*(Factory default: 0.0)*

The time **Output 1** remains active after deactivating an input can be set from 0-1,5 seconds in steps of 0,1 seconds.

To change Delay time press the SELECT button.

## 5.6    OFF DELAY II (Menu Section 4)

*(Factory default: 0.0)*

The time **Output 2** remains active after deactivating an input. Procedure as in Menu Section 3.

## 5.7   ON MASK I (Menu Section 5)

*(Factory default: None)*

... `0` `1` `1.` ... `C.` ...

Choose which Input(s) will activate **Output 1**. The menu will loop thru every Input (1...9, A=10, B=11, C=12) with a 2 sec intervall. Active Input is indicated with lower display Dot (DP2).

To activate or deactivate Input press the SELECT button when respective Input number is shown in the display.

## 5.8   ON MASK II (Menu Section 6)

*(Factory default: None)*

... `0` `n` `1.` ... `C.` ...

Choose which Input(s) will activate **Output 2.** Procedure as in Menu Section 5.

--------------------------------------------------------------------
| *Technical Note: OUT1 and OUT2 are available at the receiver as buttons 15 and 16.* |
--------------------------------------------------------------------

## 5.9   ANALOG/DIGITAL (Menu Section 7)

*(Factory default: DI)*

... `A` `n` ...

To change between Digital or Analog inputs press the SELECT button.
In DIGITAL Mode, all inputs are digital.
In any ANALOG mode, **inputs 11 & 12 are analog,** inputs 1-10 are digital and the transmitter sends in continous mode.

    **Digital** Mode, discontinous mode.

... `d` `I` ...

    **Analog 0,5-4,5V** (Joystick), continous mode.

... `U` `o` ...

    **Analog 0-5V** (Potentiometer), continous mode.

... `P` `o` ...

    **Analog 0-10V**, continous mode.

... `1` `0` ...

--------------------------------------------------------------------
| *Technical Note:* |
| *The analog value will be transmitted in place of Btn 17-24 and 25-32.* |
| *Btn 11 or 12 are active when the analog value is not zero.* |
--------------------------------------------------------------------

## 5.10  END (Menu Section 8)



To Save and Exit press the SELECT button.

# 6    APPROVALS AND SAFETY

## 6.1    EMC TESTS

Emission tests according to the test specification EN 61000-6-3: residential, commersial and light industry:

| Emission test | Test method | Conclusion |
|---|---|---|
| Radiated disturbance | CISPR 16-2-3 (2016+AMD1:2019) | Pass |
| Conducted disturbance at mains ports | CISPR 16-2-1 (2017-06 ed. 3.1) | Pass |

Immunity tests according to the test specification EN 61000-6-2: industrial environment:

| Immunity test | Test method | Performance Criterion | Conclusion |
|---|---|---|---|
| Electrostatic Discharge (ESD) | EN 61000-4-2 (2008-12) | B | Pass |
| Radiated RF Electromagnetic Field | EN 61000-4-3 (2020-09) | A | Pass |
| Fast Transient (EFT/B) | EN 61000-4-4 (2012-04) | B | Pass |
| Conducted RF Common Mode | EN 61000-4-6 (2013-03) | A | Pass |

Emission tests according to the E/ECE Regulation No. 10, Revision 6 (2019):

| Emission test | Test method | Conclusion |
|---|---|---|
| Measurement of radiated interference field strength in the frequency range 30 – 1000 MHz | E/ECE Reg. No. 10, Annexes 7 and 8 | Pass |
| Measurement of conducted disturbances | E/ECE Reg. No. 10, Annex 10 | Pass |

Immunity tests according to the E/ECE Regulation No. 10, Revision 6 (2019), (immunity related functions):

Immunity test procedures and acceptance criteria to comply with:
Agricultural and forestry machinery, ISO 14982:1998 and
Earth-moving and building construction machinery — (EMC), ISO 13766-1:2018

| Immunity test | Test method | Conclusion |
|---|---|---|
| Radiated radio-frequency electromagnetic field | E/ECE Reg. No. 10, Annex 9 | Pass |
| Immunity to transient disturbances conducted along supply lines | E/ECE Reg. No. 10, Annex 10, ISO 7637-2: 2004 | Pass |

| | Pulse 24 V, Test Method | Pulse 12 V, Test Method | Perf. Criterion |
|---|---|---|---|
| 1 | -450V, 500 pulses | -112V, 500 pulses | C |
| 2a | +55V, 500 pulses | +55V, 500 pulses | B |
| 2b | +20V, 10 pulses | +10V, 10 pulses | C |
| 3a | -220V, 1 h | -165V, 1 h | A |
| 3b | 220V, 1 h | 112V, 1 h | A |
| Starting Profile | -16V, 8V, 10 pulses | -9V, -6V, 10 pulses | B |
| Load Dump, unclamped | 123V, 10 pulses | 56V, 5 pulses | C |

ISO 10605 Electrostatic Discharge (ESD) 330pF:

| Air Discharge | Contact Discharge | Indirect Discharge |
|---|---|---|
| ±8.0kV | ±6.0kV | ±6.0kV |

*(For more detailed reports, please contact Tele Radio Finland)*

## 7.1    ENVIRONMENTAL TESTS

The enclosure is certified according to EN 62208:2011:2011

| Degree of protection (EN 60529) | IP66 / IP67 |
|---|---|
| Mechanical strength (EN 62262) | IK08 +35 oC / -40 oC |
| Material | Polycarbonate |

## 7    DIMENSIONS AND MOUNTING

When mounting the transmitter in moist or otherwise harch environments, make sure that the cable glands are pointing downwards.
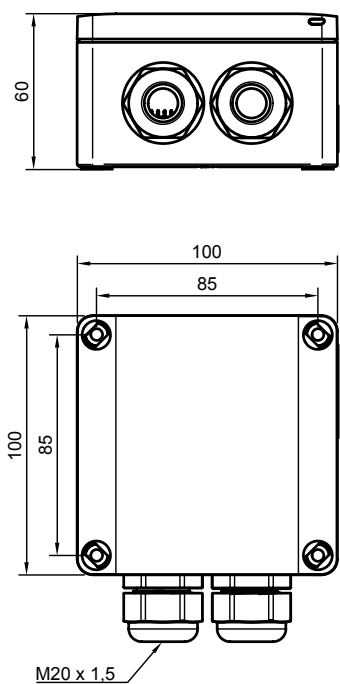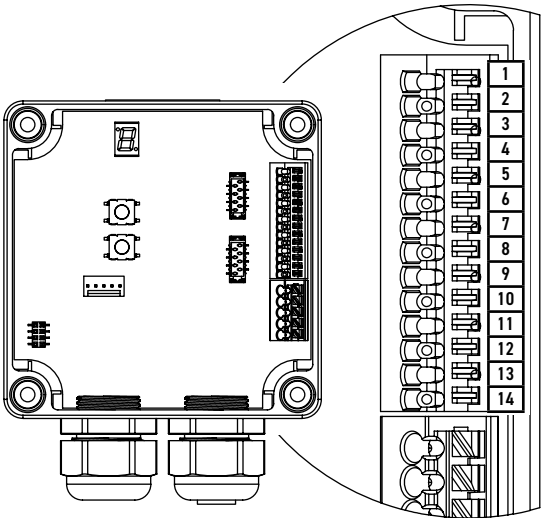
# APPENDIX A:  REPLACING THE T2182 (WALL TRANSMITTER)

IO_TX; J3 connector corresponding to T2182 connector:

| IO_TX | T2182 | Function |
|-------|-------|----------|
| J3-1 | 7 | Ground |
| J3-2 | | Input 12 |
| J3-3 | | Input 11 |
| J3-4 | 12 | Input 10 |
| J3-5 | 11 | Input 9 |
| J3-6 | 10 | Input 8 |
| J3-7 | 9 | Input 7 |
| J3-8 | 8 | Input 6 |
| J3-9 | 6 | Input 5 |
| J3-10 | 5 | Input 4 |
| J3-11 | 4 | Input 3 |
| J3-12 | 3 | Input 2 |
| J3-13 | 2 | Input 1 |
| J3-14 | 1 | Ground |

T2182 connector terminal block:
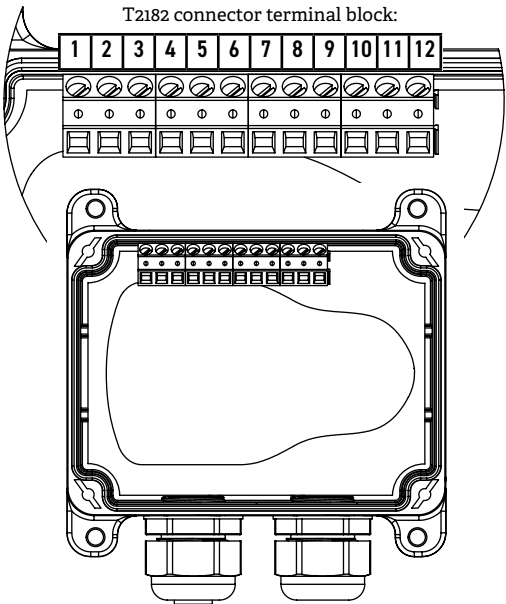


IO_TX; J3 connector terminal block:

## APPENDIX B: WIRING- AND APPLICATIONS EXAMPLES



**Connector J3**

GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**

GND 5V BAT+ GND

+24V DC    GND

### Example 1

Transmitting LOW side input to Panther receiver.

8-32V Supply. Digital In 1 and 2.

**Connector J3**

GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**

GND 5V BAT+ GND

+24V DC    GND

### Example 2

Transmitting HIGH side input to Panther receiver.

8-32V Supply. Digital In 1.

*Input Mode set to HIGH in Menu Section 2.*

**Connector J3**

GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

EXTERNAL 0-10V

**Connector J4**

GND 5V BAT+ GND

+24V DC    GND

### Example 3

Transmitting 0-10V input + LOW side input to Panther receiver.

8-32V Supply. Analog In + Digital In 1.

*Analog/Digital Mode set to Analog 0-10V in Menu Section 7.*

NOTE! To get the analog value out from a R8-1 receiver, use expansion board D12-4 or or use the CAN receiver R18

**Connector J3**
GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**
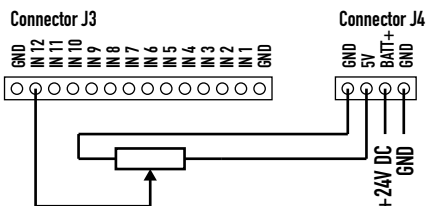GND 5V BAT+ GND

X-AXIS Y-AXIS GND +24V DC GND +5V
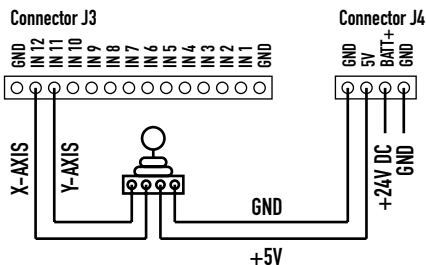
**Example 4**

Transmitting input from joystick (Analog In) to Panther receiver.

8-32V Supply. Analog In 11 & 12 .

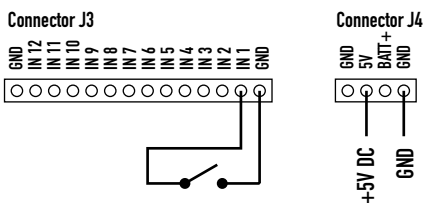*Analog/Digital Mode set to 0,5-4,5V in Menu Section 7.*



**Connector J3**
GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**
GND 5V BAT+ GND

+24V DC GND

**Example 5**

Transmitting input from potentiometer (Analog In) to Panther receiver.

8-32V Supply. Analog In.

*Analog/Digital Mode set to 0,5-4,5V in Menu Section 7.*



**Connector J3**
GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**
GND 5V BAT+ GND

+5V DC GND

**Example 6**

Using only 5V supply. Transmitting LOW side input (Digital In) to Panther receiver.



**Connector J3**
GND IN 12 IN 11 IN 10 IN 9 IN 8 IN 7 IN 6 IN 5 IN 4 IN 3 IN 2 IN 1 GND

**Connector J4**
GND 5V BAT+ GND

+24V DC
GND

**Output Board Connector J3**
GND OUT 2 OUT 1 BAT+

Solenoid
(or similar)
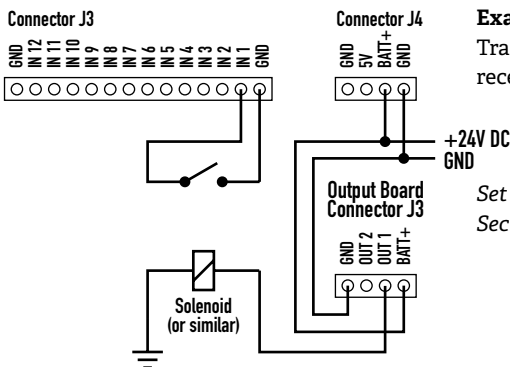
**Example 7**

Transmitting LOW side input to Panther receiver using the Output Board.

*Set Off Delays and On Masks in Menu Sections 3-6.*

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