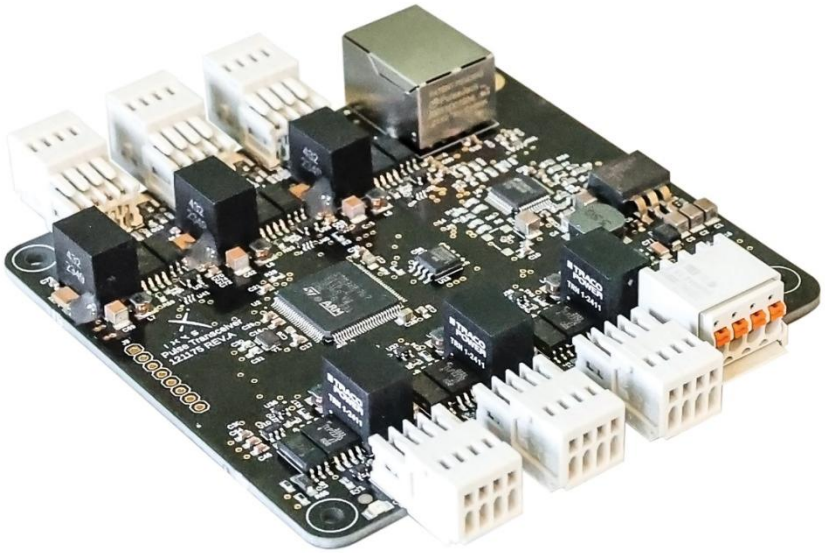
USER MANUAL



PULSE TRANSCEIVER

REVISION A

REVISIONS

PUBLISHED	REVISION	NOTES
02.06.2025	A	Initial release

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1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This document outlines and defines the installation, operation, and maintenance procedures for the Ixys Pulse Transceiver PCB. The manual will contain all relevant data and methods to be able to use and maintain the device for its intended purpose.

The manual includes technical specifications, installation information, description of the various PCB features, as well as troubleshooting suggestions.

This manual is to be used by trained and competent personnel only.

1.2 ABBREVIATIONS

ABBREVIATION	DESCRIPTION
EEPROM	Electric Erasable Programmable Read Only Memory
ESD	Electro-Static Discharge
IP	Internet Protocol
PCB	Printed Circuit Board
PPS	Pulse Per Second
PTP	Precision Time Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

1.3 SUPPLIER CONTACT INFORMATION

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Langmyra 11
4344 Bryne
Norway

+47 51 42 22 22
post@ixys.no
https://ixys.no

2 HEALTH, SAFETY AND ENVIRONMENT

2.1 GENERAL

Safety Notes and General Precautions shall be presented to all personnel concerned prior to testing, operation, maintenance, and repair. The operations shall be performed by the responsible engineer/supervisor. The personnel using this equipment must have knowledge of this type of equipment and have familiarized themselves with the applicable procedures and manuals for this product.

2.2 SAFETY MESSAGE LEVELS

Safety message level		Indication
	DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
	WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
	CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury or damage to equipment
	Electrical Hazard:	The possibility of electrical risks if instructions are not followed in a proper manner
Note:		A potential situation which, if not avoided, could result in an undesirable result or state. A practice not related to personal injury

3 TECHNICAL INFORMATION AND DATA

3.1 TECHNICAL DESCRIPTION

The Pulse Transceiver is a printed circuit board (PCB) featuring six configurable I/O channels. Its function is to transmit input signals from one PCB's input channel over Ethernet to a secondary PCB's output channel, with minimal latency.

Pulse Transceiver PCBs communicate with UDP packets, ensuring fast and lightweight communication. The board uses edge detection on incoming signals to match the output pulse width to the duration of the input signal.

Each channel is electrical isolated, with their own power supply capable of supplying up to 200 mA each.

The Pulse Transceiver supports clock synchronization via Precision Time Protocol (PTP). Synchronization messages are sent using the IPv4 Ethernet layer, compliant with the IEEE 1588-2008 standard.

A built-in web interface provides a user-friendly way to configure the board and manage each input/output channel individually.

3.2 TECHNICAL DATA

Manufacturer	Ixys AS
Ixys part number	121176
Description	PCB Pulse Transceiver
Weight	~100 g
Dimensions	96 x 90 x 13 mm (PC/104 format)
Supply voltage	24 V DC (21.6-26.4)
Power consumption	< 10 W
Communication	Ethernet, 10/100 Mbps
Pulse input voltage range	0 / 5-24 V DC
Pulse output voltage range	0 / 5 V DC
Channel power supply output	5 V DC, up to 200 mA per channel
Pulse transmission delay	<800 µs
PPS accuracy	<50 µs

3.3 ORDERING

Ixys Part Number	Description
121176	PCB Pulse Transceiver

3.4 ACCESSORIES

Ixys Part Number	Description
100086	Connector – 4-way cable contact Wago 733-104
112073	Connector – 4-way plug Wago 3.5 mm 2091-1124

4 HARDWARE DESCRIPTION

4.1 DRAWING

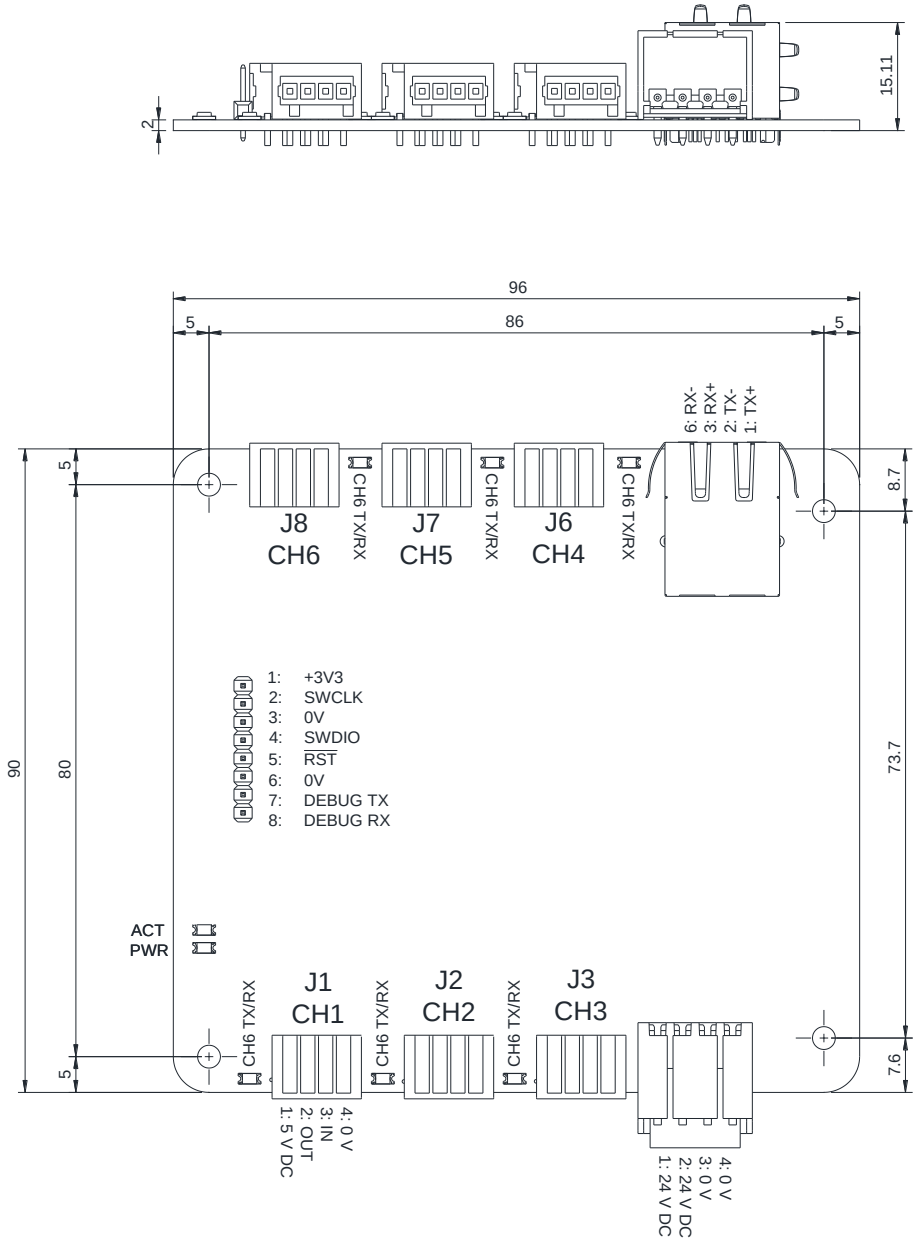

Figure 1 - Dimensions and pinout

4.2 LEDS

The POWER LED will light up as soon as the board is powered correctly. The ACTIVITY LED will blink once per second when the application is running correctly.

The RJ45 has two LEDs. The green LED indicates link, and when it's lit, a link has been established. The yellow LED blinks when there is network traffic.

Each channel has a dedicated LED. In trigger mode, the LED shows the corresponding channel's output state, and in PPS mode the LED will blink with 0.5 Hz frequency.

4.3 CONNECTIONS

The PCB is powered via the supply voltage input on connector J4. The RJ45 connector provides a standard Ethernet interface and can be connected directly to any Ethernet switch or compatible device.

The PCB features six galvanically isolated channels, and input/output signals should remain electrically isolated from each other off the PCB as well. Each channel has a +5 V supply, which can supply up to 200 mA per channel.

Each channel's IN pin is internally pulled down to that channel's 0 V reference, and signals in the range 5-24 V DC will be cause edges to be detected.

Each channel's OUT pin is driven to the corresponding channel's +5 V DC when active, and to the channel's 0 V when inactive. Care should be taken not to draw significant current directly from the OUT pin.

Channels that are not in use may be left unconnected without issue.

5 FUNCTIONAL DESCRIPTION

5.1 GENERAL

By default, all channels are disabled, so the PCB must be configured before first use.

There are essentially two different ways to use the channels on the Pulse Transceiver, described in sections 5.2 and 5.3. Each channel is independent, and can be used in any mode.

The default IP is 10.0.37.236.

5.1.1 WEB INTERFACE

All features of the Pulse Transceiver can be configured from a user-friendly web interface. The web interface is accessible by opening the device's IP address in any modern browser.

The About page shows the PCB's firmware version, serial number and hardware revision. It's also possible to perform a Factory reset to return all settings to default, and to reboot the board.

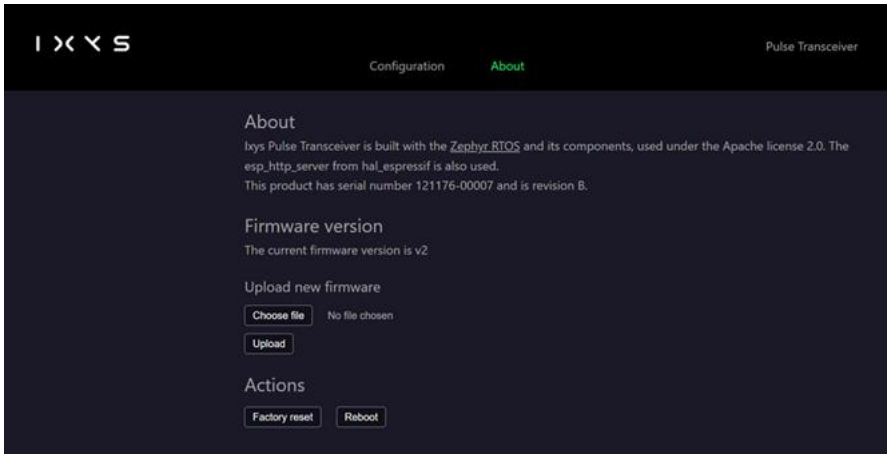

Figure 2 About page

All configuration is available on the Configuration tab, including the ability to change the board's IP address.

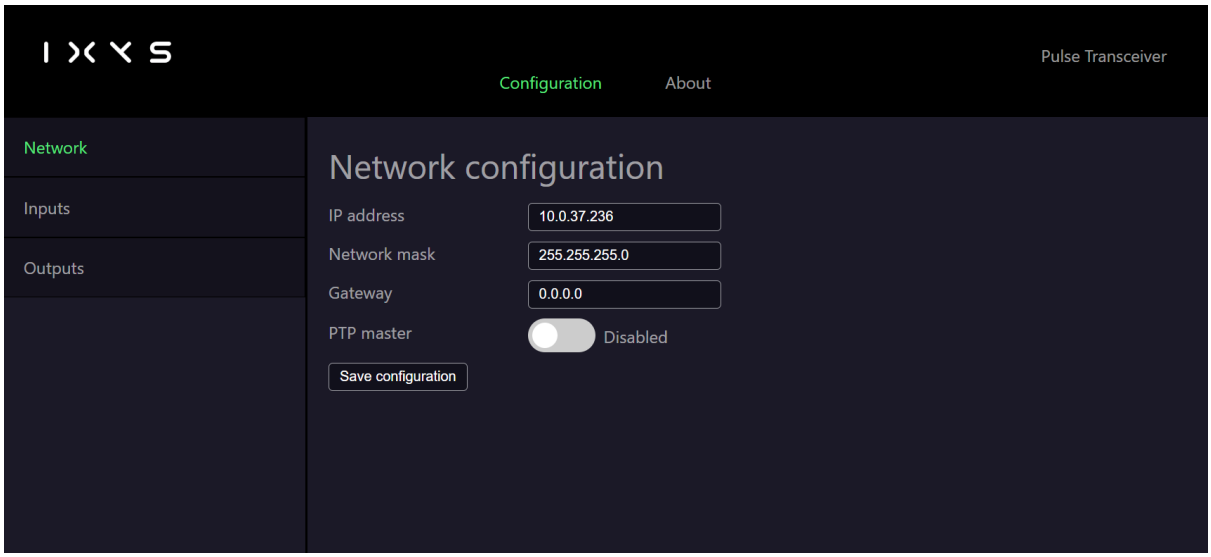

Figure 3 Basic configuration

5.1.2 HEARTBEAT BROADCAST

Every 5 seconds, the device sends a UTF-8 encoded JSON object in a UDP packet to the broadcast IP 255.255.255.255 on port 65000. This message includes the device's IP address, firmware version, serial number, and allows easy identification.

Ixys VJU Studio software will use this to automatically identify the device, but it can also be found manually for instance with Wireshark, or by other applications.

5.1.3 FIRMWARE UPGRADE

Firmware upgrades will be made available on an ongoing basis on ixys.no. Upgrades are provided as a zip archive of an updater-application. The updater application will upgrade both the actual firmware and the included web interface.

Figure 4 Updater application

After an upload has been completed, the board should be kept powered for a couple of minutes to allow the upgrade to finalize.

5.2 REMOTE TRIGGER FUNCTIONALITY

The remote trigger functionality can be used to read a digital signal on one PCB, sending a UDP packet to a secondary board on all edges, which the secondary PCB will then use to generate the same edge on its corresponding output.

UDP packets are transmitted when an edge is detected, so the output will inherently come a short time period after the input edge is detected.

This functionality can be used to send digital signals that are non-deterministic in time, e.g. that comes at non-predictable time intervals. This can for instance be sonar pings, whose interval will be dependent on depth, any kind of detection devices that measures external signals etc.

Each signal to be transmitted need to be sent through a separate channel, but it's possible to receive a signal on channel 1 on Pulse Transceiver #1 and send it out on channel 5 on Pulse Transceiver #2.

5.2.1 INPUT CONFIGURATION

On the PCB where the input signal is connected, the channel where the signal is connected need its Mode to be set to Trigger. The Remote address must be set to the IP address of the Pulse Transceiver board that should generate the output, and the Remote channel must be set to the channel on the receiving board where the output signal is desired. It's possible to set the Channel polarity to the expected input signal - *Active High* means a high input voltage is considered a high logic level.

It's also possible to send a manual trigger, which sends a short pulse to the remote channel, so that the configuration can be verified during setup.

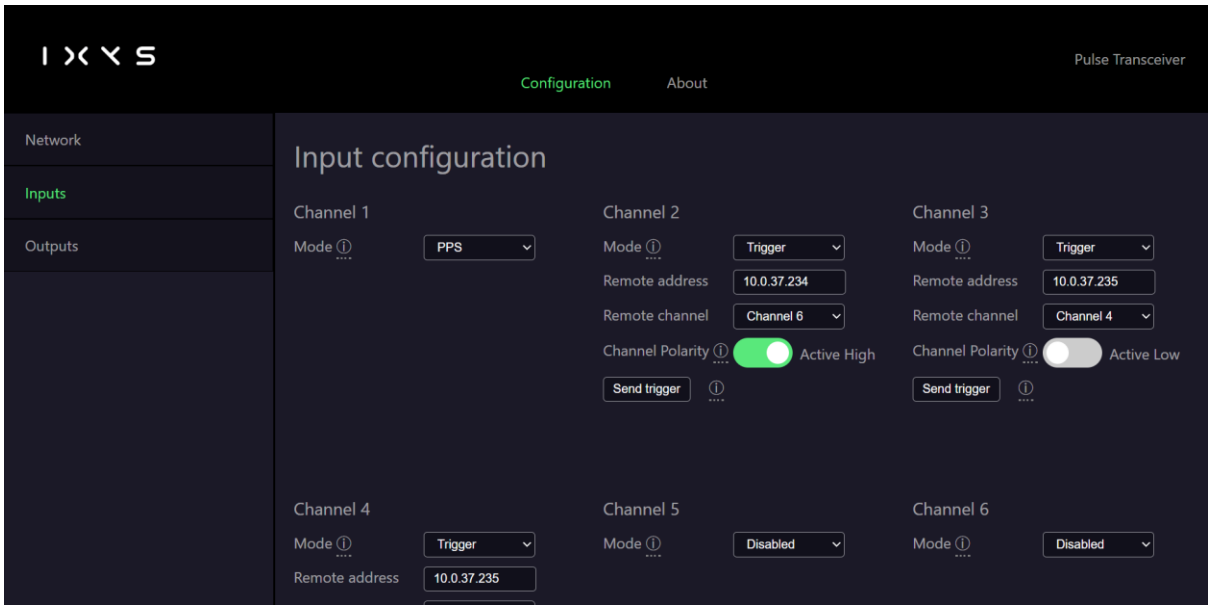

Figure 5 Input configuration

5.2.2 OUTPUT CONFIGURATION

On the remote Pulse Transceiver board, the output chosen as the Remote channel must also be set to Trigger mode. For an output it is additionally possible to select a Default output level, which determines whether the output is logically high or low before a trigger packet is received. It's also possible to set the desired output polarity - *Active High* means that a trigger packet with a logically high level sets the output voltage high. *Active Low* means the inverse, where a high-level trigger results in low voltage output.

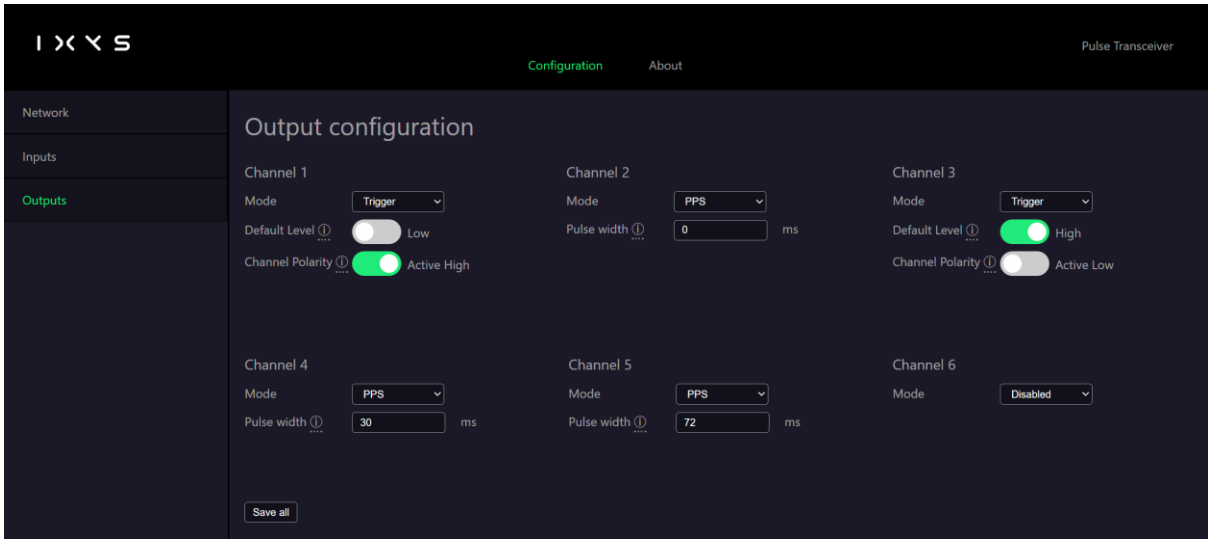

Figure 6 Output configuration

5.3 PPS FUNCTIONALITY

The Pulse Transceiver board can be used to distribute or create a synchronized PPS signal. This is useful for instance in systems where multiple sensor should sample at the same time, or to synchronize time between devices that only supports Pulse-per-second inputs instead of having full PTP support.

The Pulse transceiver PCB will by default synchronize its time with any existing PTP devices on the network.

By default, the Pulse Transceiver board will participate in the network negotiation to determine which device should be the PTP master clock. It's possible to enable the PTP master mode on the Configuration page to force a given Pulse Transceiver to be the PTP master, and this should typically be enabled when having a PPS input. See next section for details.

5.3.1 PPS INPUT CONFIGURATION

In cases where there is an external time system available that provides a 1 Hz PPS signal, it's possible to use a Pulse Transceiver PCB to read this signal. This Pulse Transceiver board will then synchronize its internal PTP clock to the incoming 1 Hz PPS signal. The stability of the incoming signal will be automatically validated, to avoid unstable correction.

The input channel where the PPS signal is connected should be configured as a PPS input. If possible, it's recommended to use Input 1 as PPS input.

Note: Only one channel can be configured as PPS input, as synchronizing between multiple sources creates instability.

A Pulse Transceiver PCB that has a PPS input signal should be set to PTP master, to ensure that other Pulse Transceiver PCBs synchronize their clocks to it.

Note: There must be only a single PTP master in a network.

5.3.2 PPS OUTPUT CONFIGURATION

Any number of output channels can be set up to generate a PPS signal with configurable pulse width. The default pulse width is 100 ms, meaning the signal is high for 100 ms every 1 s.

In a system with a PPS input on one Pulse Transceiver, PPS outputs on any other Pulse Transceiver PCB will be accurately synchronized with the PPS input. See section 5.3.1 for details.

6 TROUBLESHOOTING / FAULTFINDING

Symptom	Possible cause	Remedy
Power LED not lit, or Activity LED not blinking	Not powered	• Verify power connections are according to specifications in section 3.2 and connected as in section 4.3
	Faulty PCB	• Contact Ixys support
No RJ45 link LED	Faulty cabling	• Try different network cable • Verify cable used with other equipment
Not able to access web interface	Wrong IP address being used	• Use VJU Device Discovery or read broadcast messages to identify IP. See section 5.1.2 for details.
	Client device in wrong subnet	• Verify the client is in the same subnet as the PCB
LED on target PCB does not blink	No input signal edge detected	• Use Send trigger in web interface to manually send trigger • Verify that input signal is present and within valid range
	Remote IP set to wrong value	• Verify input channel configuration on the transmitting PCB
	Channel output configured incorrectly	• Verify output channel configuration on the receiving PCB