

Mako V2

Technical Data Sheet

Industrial WiFi, LoRa RF, Modbus PLC.

Optimised for remote locations with IoT capabilities



MV2-T

Transistor Digital Output

MV2-TG

Transistor Digital Output
GNS Navigation

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 **Point of Interest**



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Mako V2 Description

Smithtek's **Mako V2 PLC** is built around three core principles:

- **Reliability**
- **Simplicity**
- **Future proof**

Combining an ultra-fast PLC with full IoT capability, its versatile design allows it to operate as either a master or slave controller. With embedded LoRa RF, Wi-Fi, GPS, and a compact footprint, it's ideal for remote applications. Its built-in IoT connectors enable direct integration with internet-based control and monitoring services.

V-NET configuration software uses an intuitive drag-and-drop interface, making it accessible to all skill levels. Equipped with modern communications protocols, IoT connectors, and classic PLC tools, it gives users flexibility and creative control like never before.

The Mako V2 breaks traditional barriers as it steps into the future of control.

Application Use:

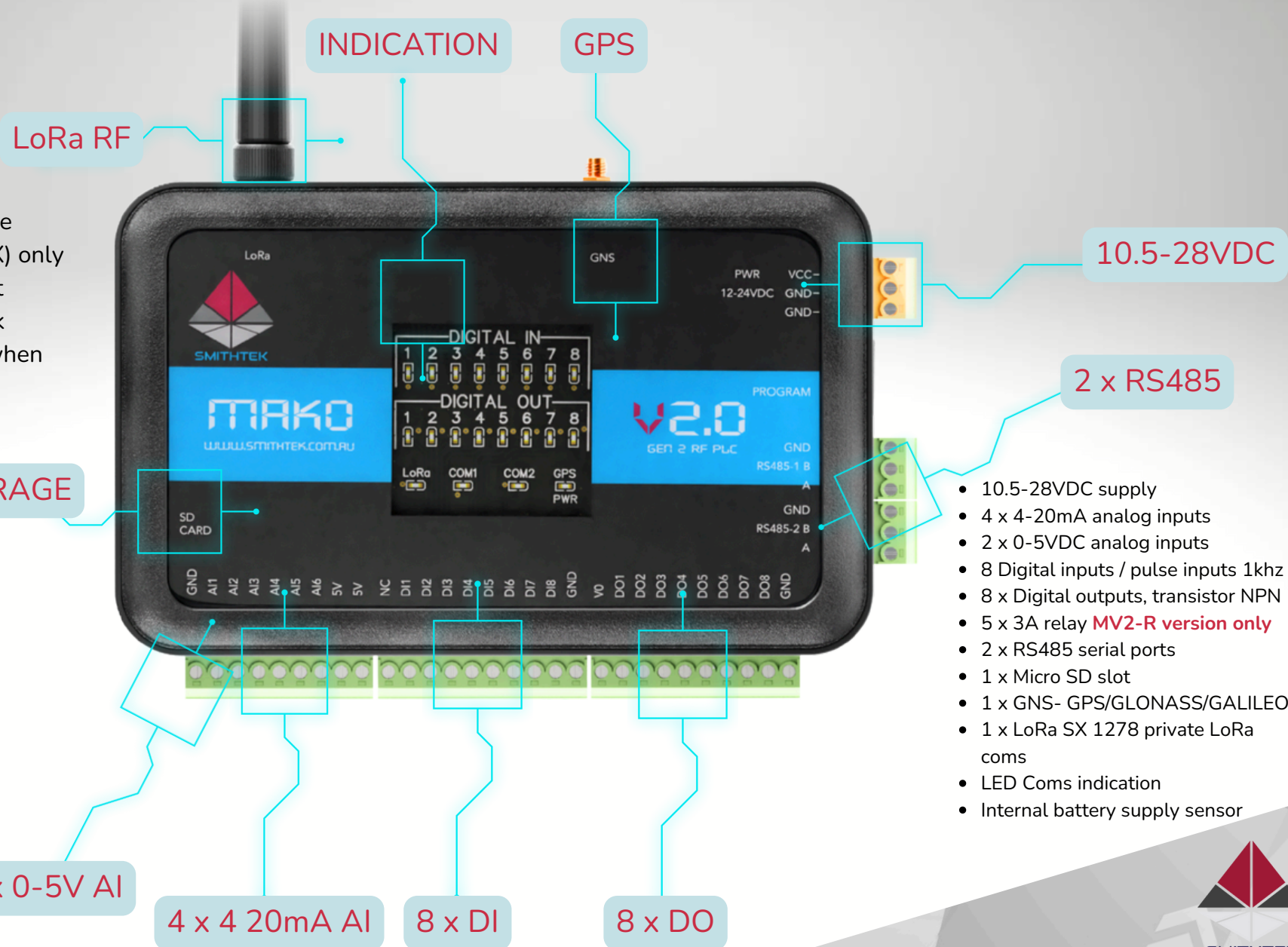
- Remote control & monitoring of assets.
- Agriculture, farming.
- Mining, resources sector.
- Pump control, irrigation control., bore control.
- Remote communities.
- Water treatment, UV disinfection, flow meters.
- Tank monitoring and control.
- Survey-data logging, environmental sensors.
- Generators, remote control and monitoring.
- Power stations, remote control and monitoring
- Parks and public areas.
- Mobile plant machines and skids.



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Device Layout



- 10.5-28VDC supply
- 4 x 4-20mA analog inputs
- 2 x 0-5VDC analog inputs
- 8 Digital inputs / pulse inputs 1khz
- 8 x Digital outputs, transistor NPN
- 5 x 3A relay **MV2-R version only**
- 2 x RS485 serial ports
- 1 x Micro SD slot
- 1 x GNS- GPS/GLONASS/GALILEO
- 1 x LoRa SX 1278 private LoRa coms
- LED Coms indication
- Internal battery supply sensor

Indicator LED's

- All indicator LED's will activate when they receive a signal (RX) only
- The GPS indicator will flash at 1hz when it has a satellite lock
- Com 1 LED will be constant when uploading a program

!
 COM1 = RS485-1
 COM2 = RS485-2

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Connection Topology



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Device Features

- 240MHz, Dual-core Xtensa® 32-bit LX6 MCU
- Multi communication ability, LoRa, WIFI, RS485
- High precision 4 20mA analog inputs.
- Low power mode
- LoRa RF, 300 to 1000Mhz range
- 15KM LOS RF communications over LoRa
- **Single** device mode, **mesh** mode, **master** slave mode
- Micro SD storage for data logging.
- GNS (GPS, GLONASS, Galileo)
- 8 Digital inputs all assignable to pulse inputs 1 to 1Khz
- 8 Digital outputs NPN transistor type
- 3A Relay version available **5 outputs**
- WiFi- IEEE 802.11, WPA2- AES
- Modbus RTU/TCP, 2 channels can act as slave or master independently
- Internal power supply sensing assignable on the V-NET software
- HTTP and HTTPS SSL security
- MQTT. 3.1 secure
- Advanced data type tools, Json, binary, packets, ASCII, base 64
- V-NET programmer IDE, simple, packed with tools to assist simplify programming functions
- Super small size, tough robust with hardened 35mm din-rail connectors



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Device Specification

Device Specs	Voltage Supply	9-28VDC
	Power Max	2.16 Watts
	Load Idle	90mA
	Load Each Relay	23mA(Relay Version)
	Operating Temperatures	40 to +85C
	Operating Humidity	0 – 95% RH (NC)
	Dimensions	160/98/34 mm
	Dimensions with Terminals Connected	178/117.5/39.5 mm
	Enclosure Material	ABS (ROHS)
	Programming Communication Method	USB Type A
	Terminals	2.54mm socket connectors WIRE SIZE 2.5MM
	Mounting Option 1	Spring load (35mm Din-rail clips)
	Mounting Option 2	Desktop
LoRa Radio	RF Type	LoRa Modulation
	RF BW	62.5-500kHz
	RF Frequency	169-915MHz
	TX Power	0-20dBm max 100mW
	Encryption	128bit AES
	Antenna Type	SMA Female
	TX Load	18.75mA at 24VDC 0.45W
	RX Load	4mA at 24VDC 0.095W
Wifi	Radio RF	2.4GHz
	Security	WPA, WPA2, WPA3 , AES
	Standards	802.11 b/g/n
	TX Power	0 - 20.5dBm
	TX Load	54mA ave at 24VDC
	Rx Load	18.75mA ave at 24VDC
IO	Digital Input	PNP open collector >10.5VDC True <6VDC False
	Digital Input	Pulse input 0.1hz to 1kHz Program debounce 0 to >99999mS
	Digital output Relay	3A max 150VDC
	Digital output Transistor	Transistor NPN Max 200mA per output
	4 20mA Analog Input	Single ended 16bit ADC
	0-5VDC Analog Input	Single ended 12bit ADC
	RS485-1	TVS protected with built in 120Ω Terminator
RS485-2	TVS protected with built in 120Ω Terminator	

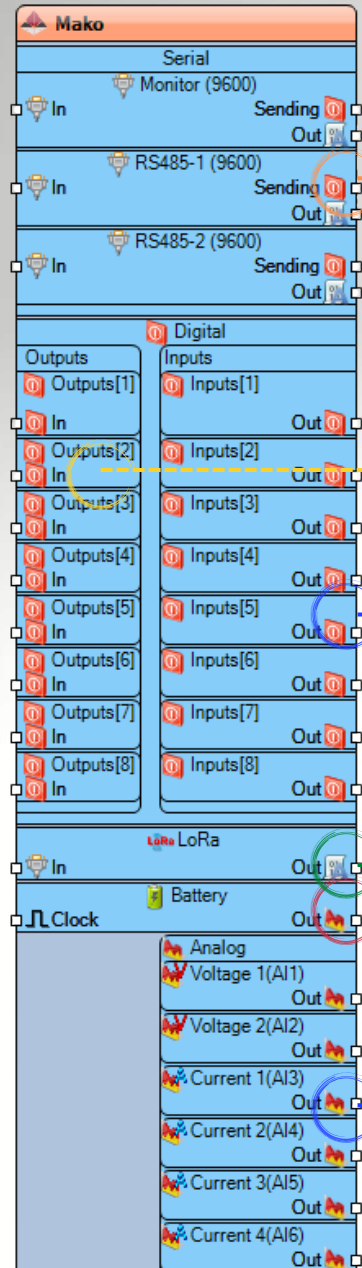
GNS	Update frequency	1Hz
	Tracking channels	32
	Positioning Precision	2.5M
	Cold start	32 seconds first fix
	Hot start	< 3 seconds from power-up
	System Features	Reads up to six satellite navigation systems and implements joint positioning, navigation.
	Navigation Satellite Systems	BeiDou ,GPS,GLONASS,Galileo
	Latitude	(DD) decimal degrees -7 decimal places
	Logtitude	(DD) decimal degrees -7 decimal places
	Course	0-360 degrees
	Speed	Feet per second
	RX load	4.8mA at 24VDC , 0.115W



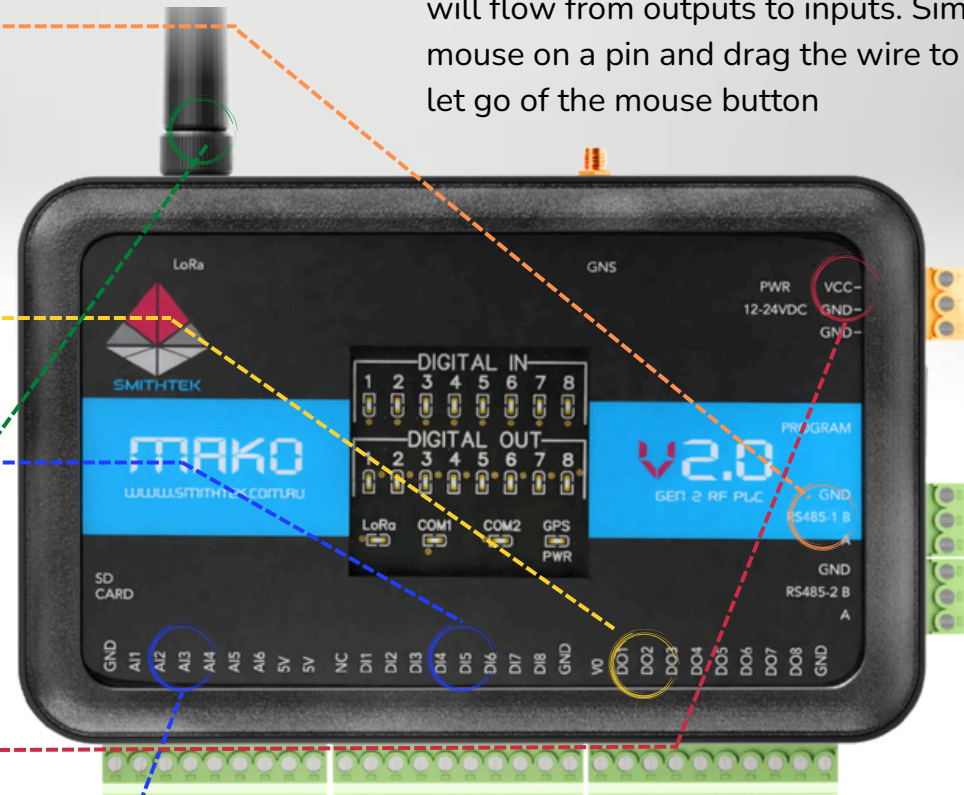
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V-NET Editor, Physical Device Terminal Mapping



On the Mako board or any component in V-net the little square dots next to an image are called "pins" to create a program you connect (wire) from pin to pin. The data will flow from outputs to inputs. Simply click your left mouse on a pin and drag the wire to the next pin and let go of the mouse button



Output pins on the Mako are on the left. Input pins on the Mako are on the right. On **components** the inputs are on the left and the outputs are on the right.

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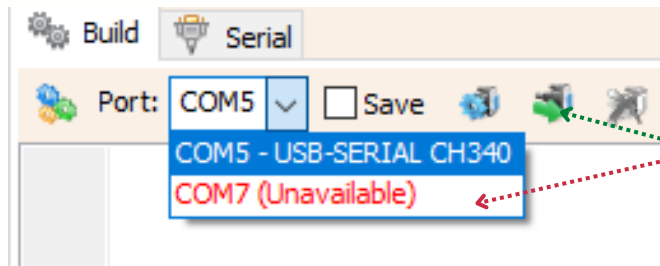
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V-NET Interface



To Program the Mako you need to use the supplied USB-A to USB-A. The Mako is a USB client device.

The Mako does not need mains DC power supply in order for it to be programmed, However, some features like the battery sense and relays on the (Relay) version may not operate correctly.



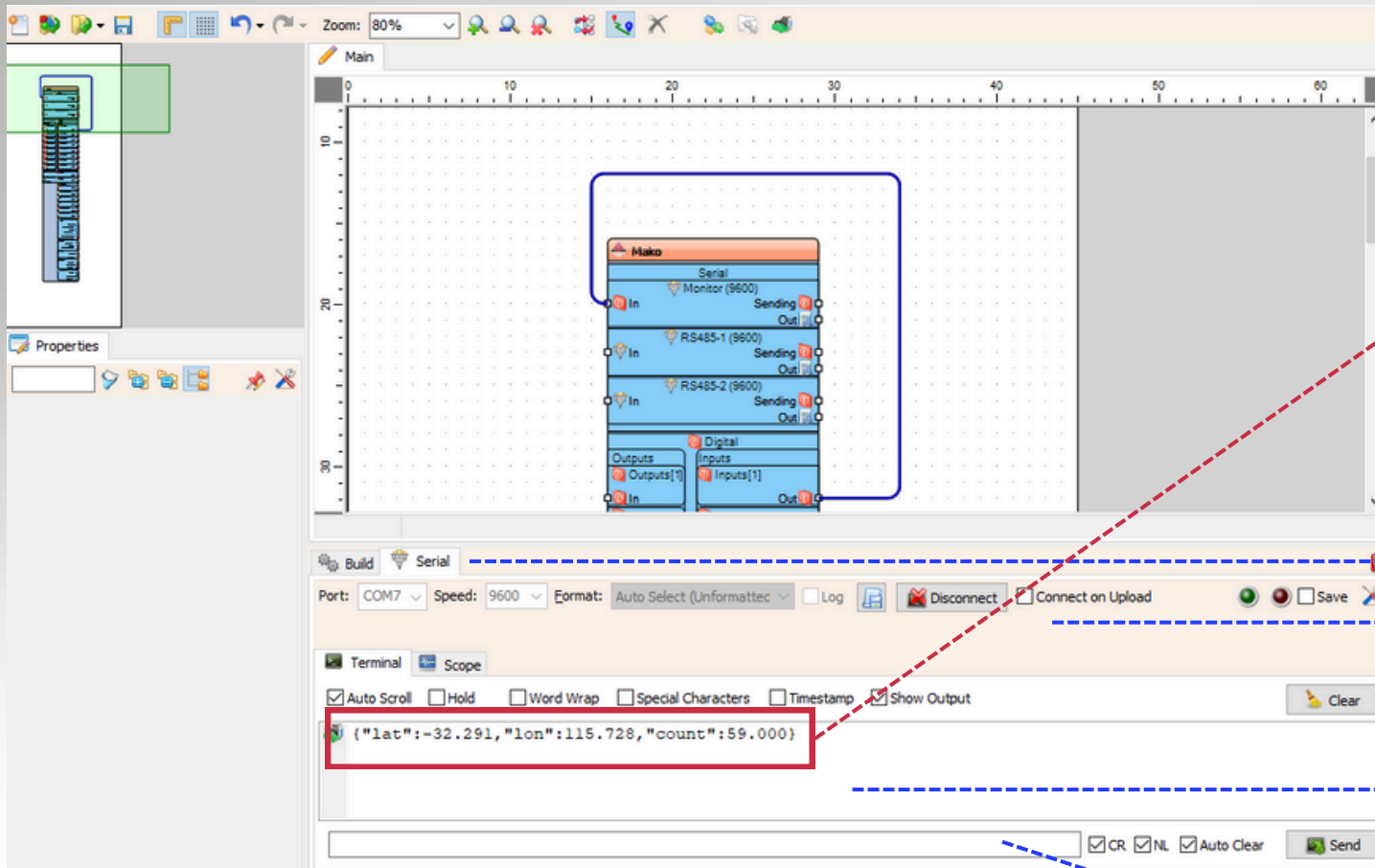
To program the Mako.

- Insert the USB to the host computer and the Mako
- **Select the correct COMS port on V-NET IDE.**
- **Press the upload button.**
- Wait for a minute for it to upload. **See page 52 of the manual.**
- Repeat as many times as you wish.

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V-NET Serial Monitor



The serial monitor window is showing GPS data that has been wired to the serial input pin.

Serial monitor

Connect / disconnect

Serial monitor display

Serial monitor Send

Serial monitor send commands

When programming the Mako using V-NET, there is a serial monitor feature that you can use.

It is a very powerful tool that will not only allow you to monitor your progress but give you an understanding on how each of the components work. To use the serial monitor you simply wire from any Mako pin or component pin to the serial input pin, respectively you can wire from the serial output pin to the Mako and/or components, and send serial data back from the keyboard, like text, numbers, bool ETC. The above example shows a digital input wired to the serial monitor input pin. When the digital input changes state the serial monitor window will display 'true' or 'false'.



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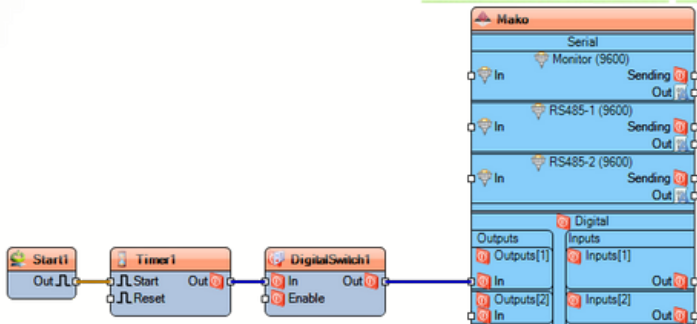
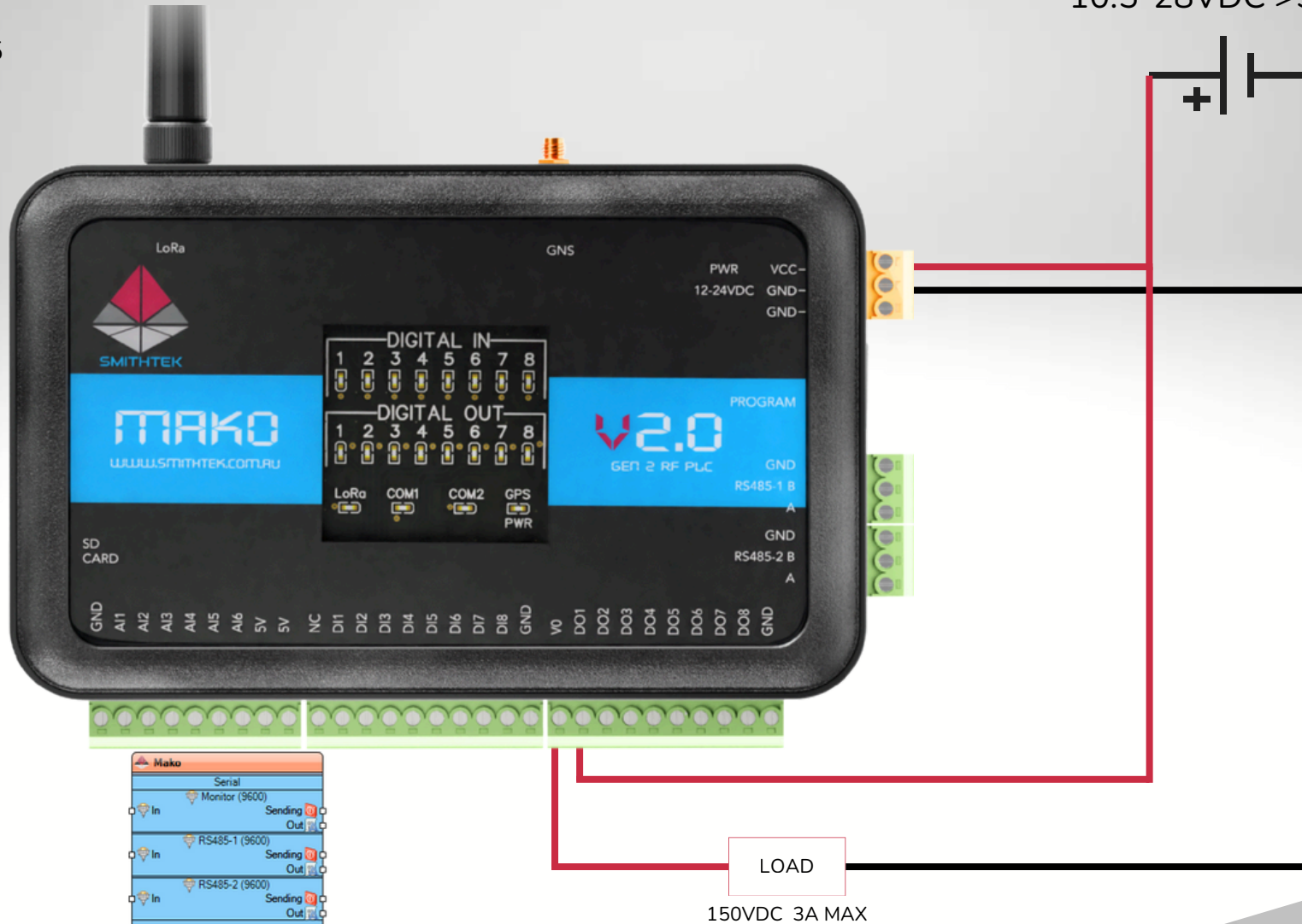
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Wiring Examples - Relay Output

Relay Output

- DO1,DO2,DO3,DO4,DO5
- DO6-Not used LED Only
- DO7-Not used LED Only
- DO8-Not used LED Only

10.5-28VDC >500mA



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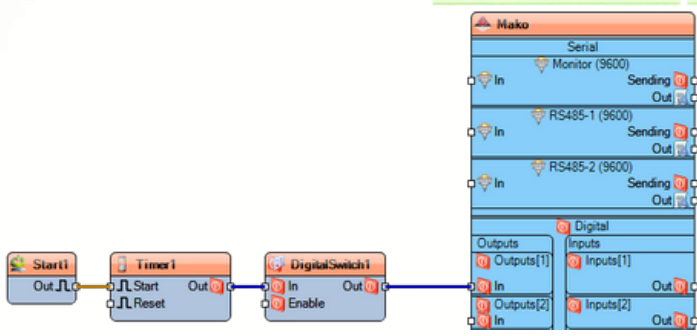
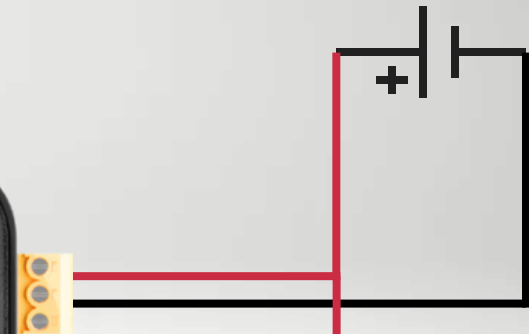
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Wiring Examples - Transistor Output

Transistor Output

DO1,DO2,DO3,DO4,DO5,DO6,
DO7,DO8

10.5-28VDC >500mA



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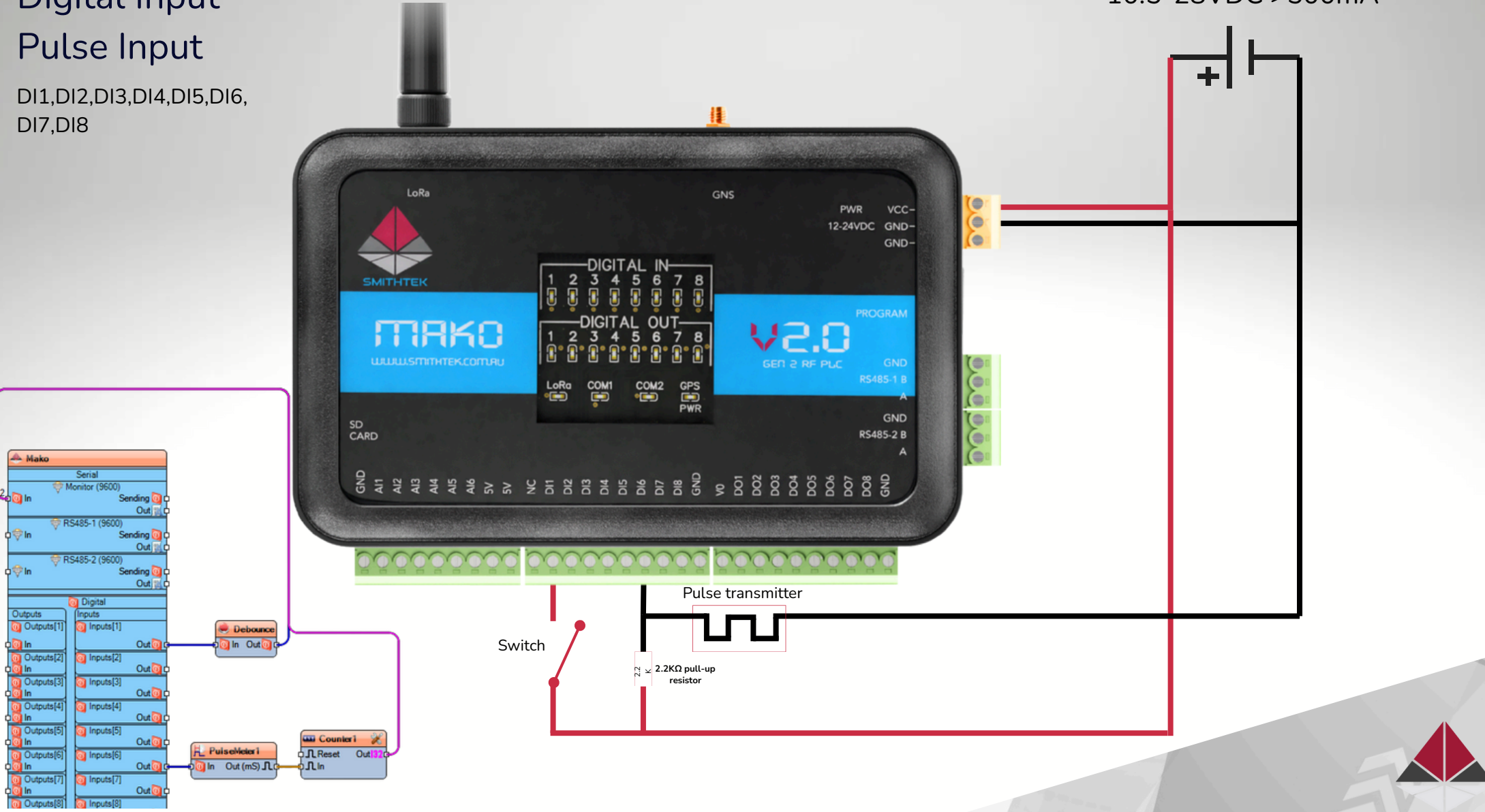
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Wiring Examples - Digital Input / Pulse Input

Digital Input Pulse Input

DI1,DI2,DI3,DI4,DI5,DI6,
DI7,DI8

10.5-28VDC >500mA



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Wiring Examples - 4 20mA Analog Input

4 20mA Input

AI3,AI4,AI5,AI6

10.5-28VDC >500mA



Optional

Active 4 20mA Loop Powered

If the power supply to the Mako is different to the sensor, make sure the ground is common on this port.

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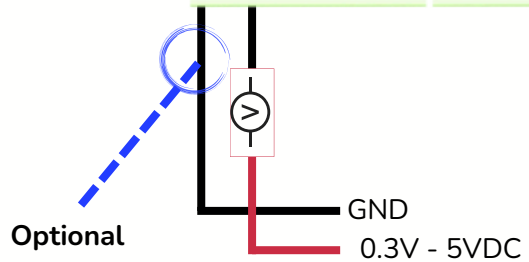
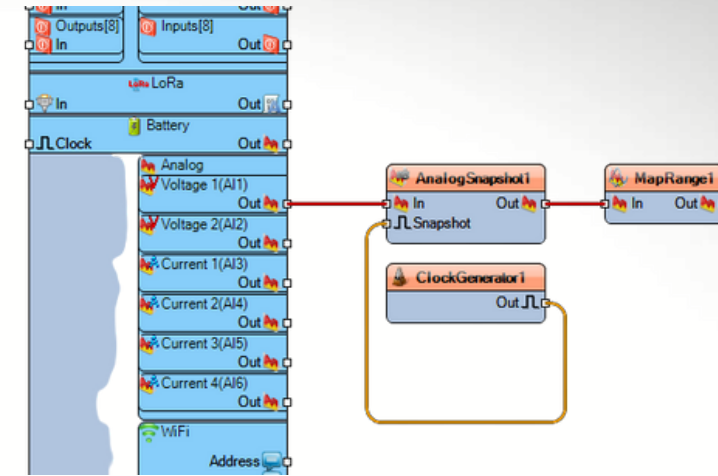
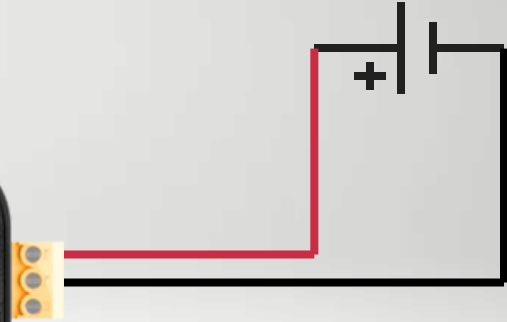
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Wiring Examples - 0-5V Analog Input

0-5VDC Input

AI1 & AI2

10.5-28VDC >500mA



If the power supply to the Mako is different to the sensor make sure the ground is common on this port

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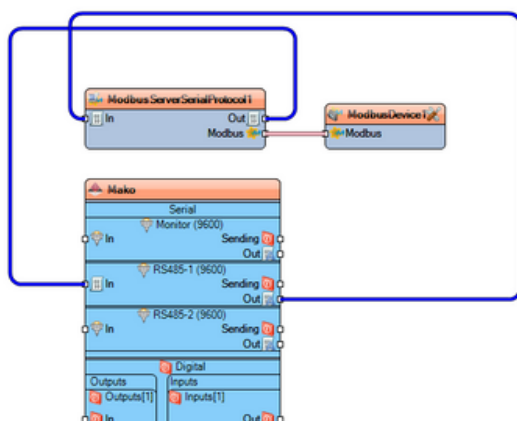
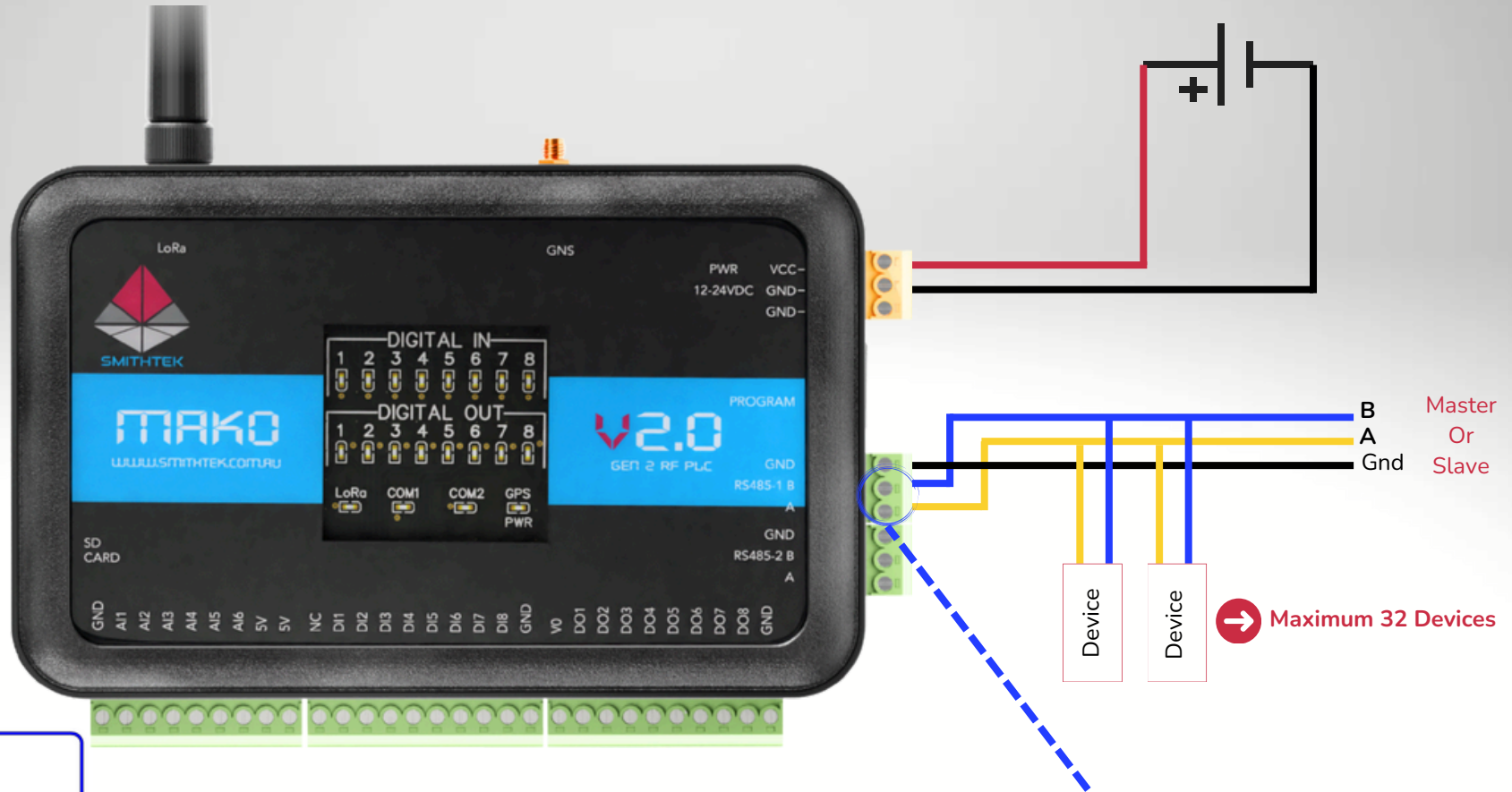
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Wiring Examples - RS485 Interface

RS485

RS485-1
RS485-2

10.5-28VDC >500mA



Both RS485 ports have built in 120Ω termination resistors. Depending on the serial protocol used both ports can act as either a **slave** or **master** device

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V-NET Configuration Software - Installation

V-NET Programmer V8 Installation Guide

Follow these steps to install the V-NET Programmer V8 on your Windows computer.

System Requirements:

Before you begin the installation process, please ensure your computer meets the following minimum system requirements:

- **Operating system:** Windows 7 with SP1 (Windows 10 recommended)
- **Processor:** Intel or AMD processor with 32-bit, 64-bit support (1.2 GHz or faster recommended)
- **GPU or video memory:** 2GB
- **System memory (RAM):** 4GB
- **Free storage space:** 4 GB
- **Installation size:** 1.3GB

Installation Process:

1. Download the installation package from the following link:
https://www.smithtek.com.au/_files/archives/6ba956_11b6010da19048098addfea6b54d73a0.zip
2. Extract the contents of the .zip file to a folder on your computer.
3. Inside the extracted folder, you will find the following files:
 - V-NET Programmer installation file (.EXE)
 - V-NET USB drivers
 - README file with installation instructions
4. Open the README file and review the installation instructions.
5. Double-click the V-NET Programmer installation file (.EXE) to start the installation process.
6. Follow the on-screen prompts to complete the installation.
7. Once the V-NET Programmer is installed, locate and install the V-NET USB drivers.
8. After installing the USB drivers, restart your computer to complete the installation process.

You have now successfully installed the V-NET Programmer V8 on your Windows computer.

Enjoy using the software!



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V-NET Configuration Software - Design Area

Program Tools

This is the basic tools
Save files, load files ,
create subflows

Design Map

The design map allows
you too see the whole
project area

Compile and Monitor

Tools for compiling your program,
Using the serial monitor debug tool
Or the serial monitor scope tool. **USB
port for uploading is chosen in this section**

Components

This is the library of instruction sets to build
your program. **They drag and drop into the
design area, or you can click once on the
component, then click again in the design area**

Mako & Components Properties

The Mako board properties can be edited in this section.
Wifi settings, LoRa settings, Analog settings, EEprom settings, SD
card setting and more. The same area also allows you to edit the
properties for every component used in the program. **just click once
and it will display the properties**

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V-NET Configuration Software - Data Types

V-net supports the following data types.

- **Digital:** (bool) Represents true or false values, typically used for decision-making or conditional operations.
- **Analog:** (Floating point) on some components there are options to change byte order from LSB to MSB
- **Integer:** 8,16,32,64 bit represents whole numbers, either positive or negative. Integers do not store decimal values.
- **Unsigned:** 8,16,32,64 bit (positive number)
- **Text:** (String) A sequence of characters, representing text or other human-readable data.
- **Binary:** Represents data in the binary format, which is a sequence of bits (0s and 1s).
Binary data types are often used for low-level operations, such as bit-wise manipulation or communication with hardware devices.
- **Quaternion**
- **Clock:** Pulse signal
- **Char:** Represents a single character or symbol, such as a letter, number, or punctuation mark.
- **Complex:**
- **Array:** A collection of elements, all of the same data type, stored in a contiguous block of memory.
Arrays can be used to store multiple values of the same type in a single variable.
- **Date/Time:** Represents date and time values, allowing for the storage and manipulation of calendar dates and times.
Date and time formats can be represented in various ways, such as Unix timestamps (the number of seconds since January 1, 1970), or more human-readable formats like "YYYY-MM-DD HH:MM:SS".

Each data type has a unique symbol next to the wiring (PIN) captured in the image below



Data types can be interchanged or converted in the program. If you can convert the data the program will allow you to wire between the pins

Most data types can trigger the clock pins.

This is useful for triggering events whilst reading sensor input data at the same time.

The screenshot shows a wiring diagram on the left and an 'Elements' panel on the right. The wiring diagram includes components like 'Outputs[6]', 'Inputs[6]', 'LoRa', 'Battery', 'Analog', 'Voltage 1(A11)', 'Voltage 2(A12)', 'Current 1(A13)', 'Current 2(A14)', 'Current 3(A15)', 'Current 4(A16)', and 'WiFi'. Red dotted lines connect specific pins to their data types: 'Digital' (pin 6), 'Serial' (pin 7), 'Clock' (pin 8), 'Analog' (pin 11), and 'Char' (pin 16). The 'Elements' panel lists various data types with unique symbols: Storage, Storage State, Analog, Complex, Quaternion, Integer, Unsigned, Integer 64bit, Unsigned 64bi, Integer 8bit, Unsigned 8bit, Char, Integer 16bit, Unsigned 16bi, Digital, Text, Binary, and Date/Time. A red dotted box highlights the list, and a red arrow points from the text above to it.

Integer
Unsigned
Binary
Text
Complex
Quaternion
Date/Time



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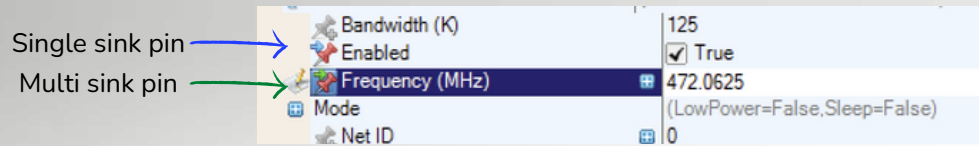
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V-NET Configuration Software - Sink Pins

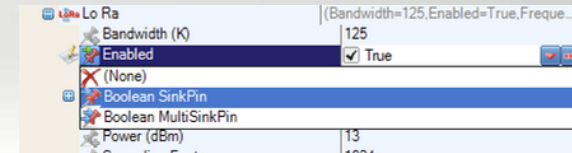
Sink Pins (Set-Points)

V-NET has a feature that allows you to dynamically change values within your code by the means of sink pins, AKA set-points. If a component supports sink pins you will identify this by the thumb tac at the side of the pin. click on this tac and you will have options. **None, Sink Pin, Multi Sink Pin.** the options will be prefixed with the data type, so the example below shows for a digital sink pin (Boolean) The **single sink pin** has a **blue arrow** associated with its symbol, the **multi sink pin** has a **green arrow**

Sink Pin Types



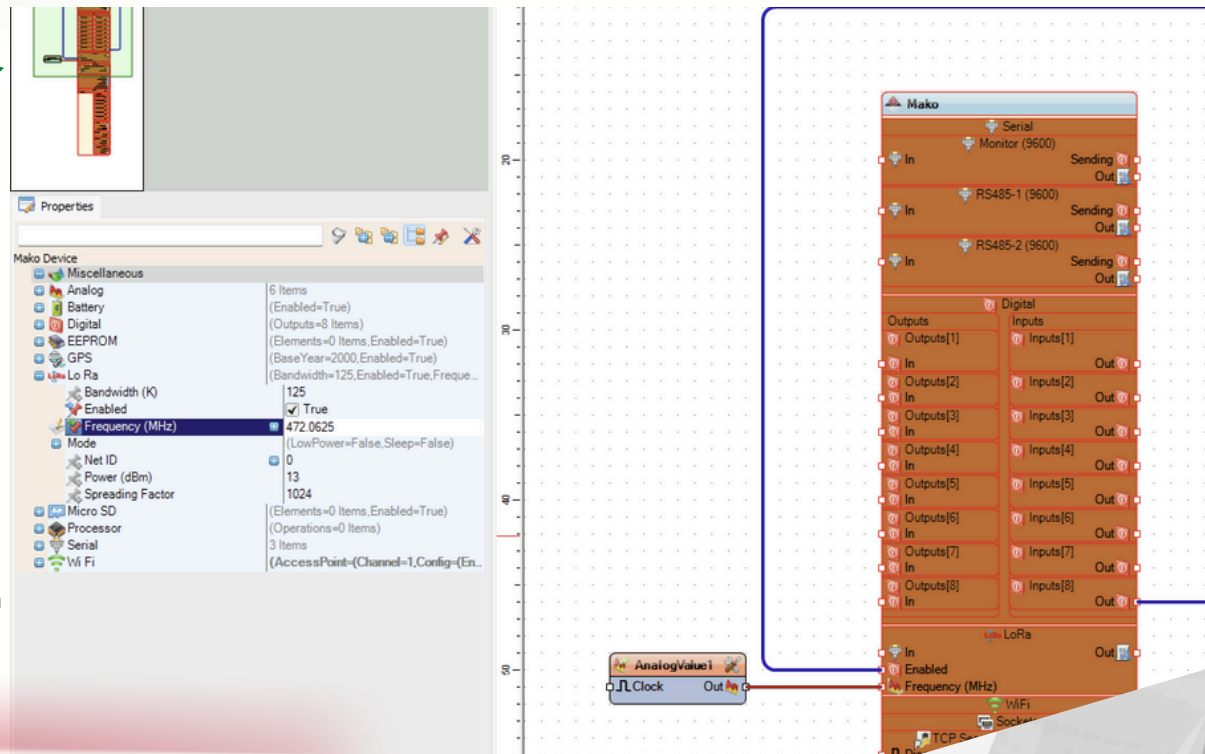
Sink Pin Options



Example

On the example to the right, we are wiring digital input 8 to turn on /off the LoRa module by means of its enable sink pin. We are also injecting a simulated analog value to the 'Frequency' band sink pin of the LoRa RF module.

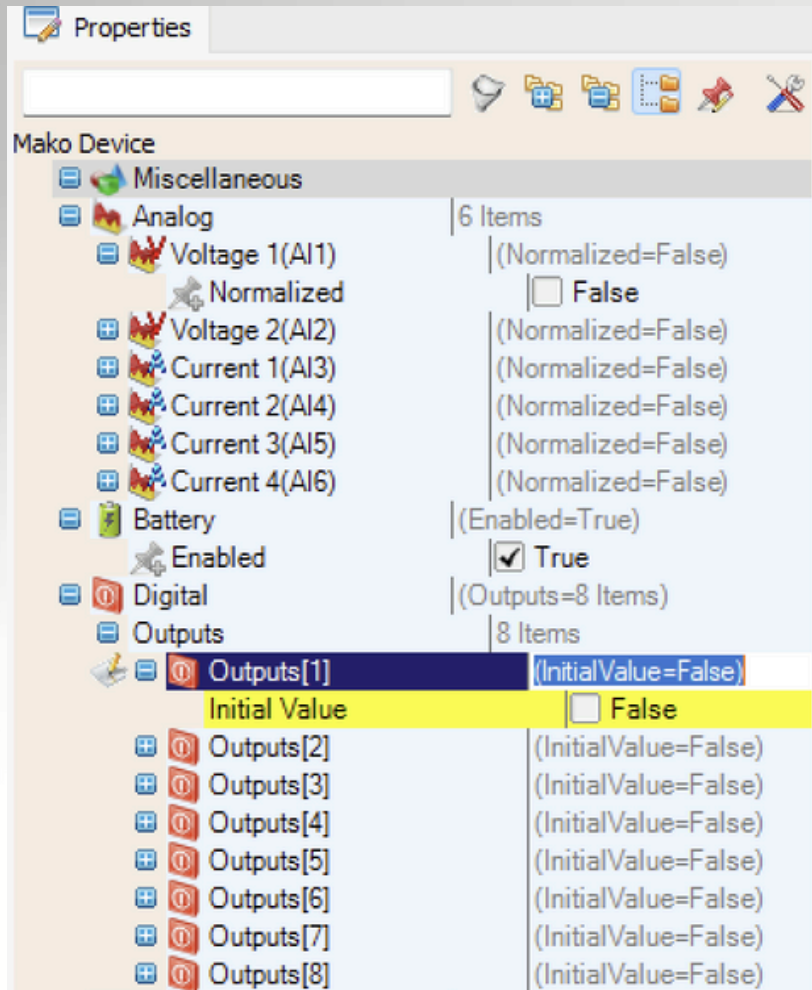
This example shows how we can dynamically change the RF frequency and turn on/off LoRa module dynamically. Sink pins are very useful for automation processes where the operators is required to update settings without having to re-program the PLC.



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Mako Properties - Analog, Battery, Digital Outputs



Analog 4 20mA inputs

Normalised: Selecting false on this will produce a 4 20mA value on the analog pins. Selecting true on this will output a 4 20mA output scaled between 0-1 value 1 being the maximum 20mA, 0 being 4mA.

NOTE: The default value AI1,2,3,4 will output is 4.0000 to 20.0000, this is designed to mirror the actual current level of your sensors. The user can map this value using a 'Map Range Analog'

Battery

Enabled: Turn on the feature to read the Mako device VCC DC input supply. It will output a typical voltage between the range of 12VDC to 24VDC, depending on your application. The optimal voltage measuring range is 9VDC to 28VDC. If the Mako device is only powered by the USB programming lead, the battery will output a voltage 0.6VDC. This is an internal reference voltage indicating the USB only is connected.

Digital outputs

Initial Value: You can select if the digital output initialises (starts) with a **true value** or **false value**

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Mako Properties - EEprom

WARNING

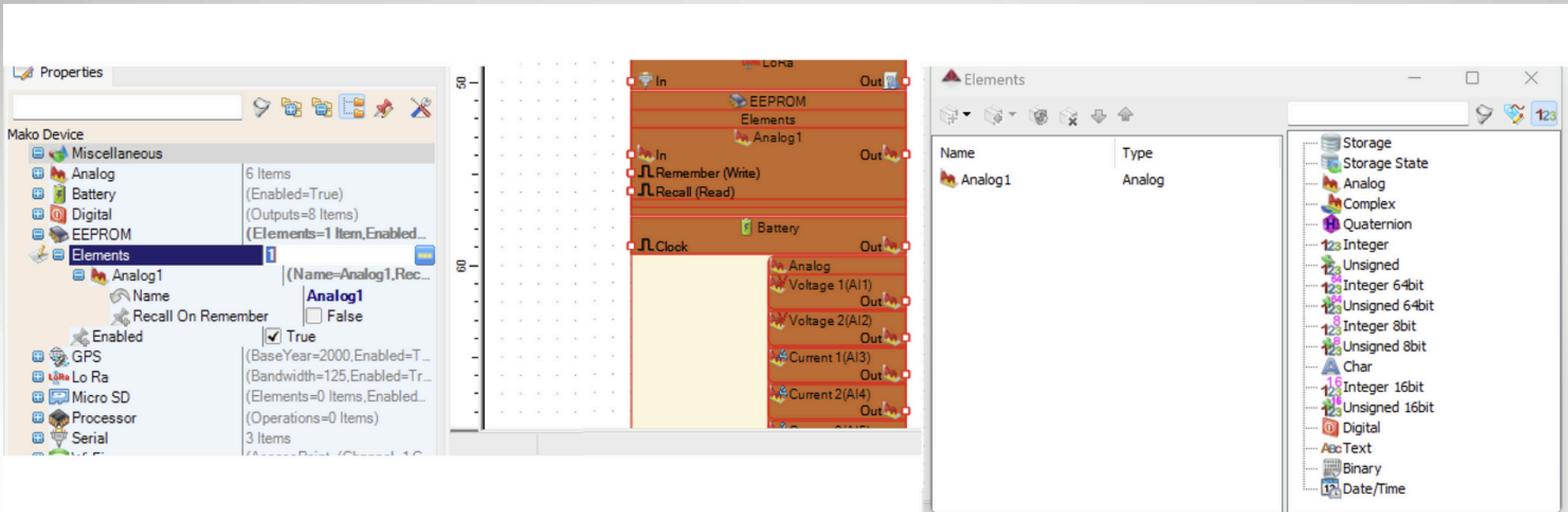
'The EEprom maximum storage capacity is 512kb.'

'The maximum write cycles is 100K per life of the product'

EEprom

Elements: Open elements and add EEprom data types. When added to the EEProm elements table (below picture) the Mako board will change its shape and new pins will show. A new input pin in the selected data type, a new output pin with the same data type. Remember pin for (writing to EEprom) recall pin for reading

Recall on remember: If you clock the remember pin it will automatically recall the stored data.



When data is connected to the **EEPROM** data pin, as shown in the example where it's an analog pin, the data continuously flows into the pin. As soon as the "**remember**" pin is triggered, the data present at that moment will be saved. For storing multiple data points, you can use a text element as storage and connect a JSON object to it. This approach allows you to store and retrieve batches of sensor data or set-point data simultaneously.



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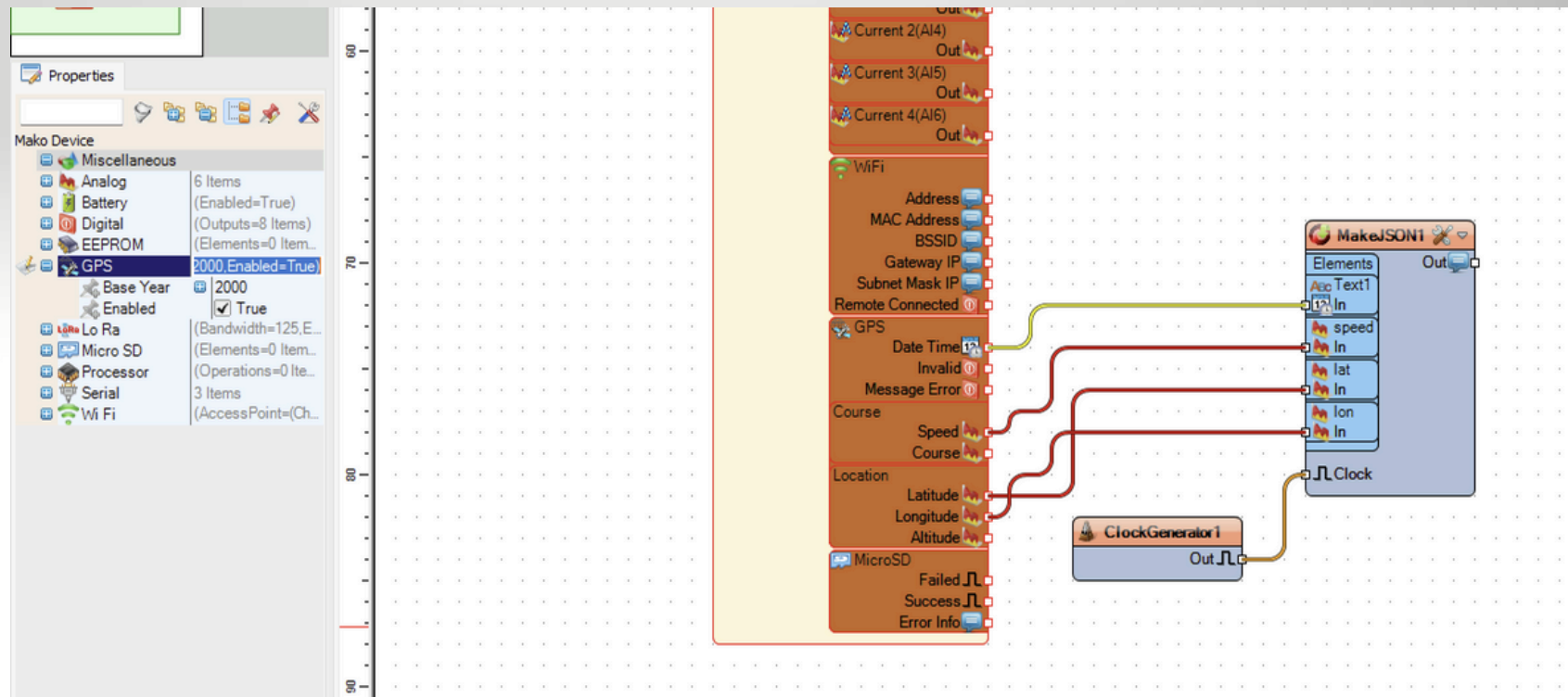
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Mako Properties - GNS

GNS

Base Year: Sets the base year of your GNS NMEA date/time output

Enabled: Turns the GNS data feed on/off



The GNS update is 1hz, (every second) the bottom right hand side of the Mako board has the GNS data pins, coordinates, speed, course, date/time. Each of these pins will output data at the 1hz at the same time. A useful way to use the GNS is to feed the data to a json object for further use in your program or you can wire each GNS pin directly to Modbus.

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Mako Properties - LoRa RF Introduction

LoRa RF

The **Mako V2**, a versatile and powerful device equipped with the cutting-edge LoRa SX1276 module. This module enables long-range, low-power wireless communication, making it perfect for a wide range of IoT applications, including smart agriculture, smart city infrastructure, and industrial monitoring. Before you begin using your Mako V2, **it is essential to familiarise yourself with the local RF rules and regulations. Ensuring that your module adheres to these guidelines will help prevent any legal issues and potential interference with other wireless devices operating in your area.**

To get started with your Mako V2 and its LoRa SX1276 module, follow these simple steps:

1. Carefully read the device's documentation, paying close attention to the technical specifications and wiring instructions.
2. Properly connect the antenna and ensure that it is compatible with the communication system's frequency. The antenna plays a crucial role in the communication system, and selecting the right one is vital for optimal performance.
3. Configure the LoRa RF module to match your desired communication settings, such as the frequency band, spreading factor, and output power.
4. Test the communication range and signal quality between your Mako V2 and other LoRa devices, making any necessary adjustments to ensure reliable and efficient data transmission.

By following these guidelines and adhering to local RF rules and regulations, you'll be well on your way to harnessing the full potential of your Mako V2 and its RF. Enjoy exploring the many possibilities this powerful combination offers for your IoT projects!

Constructing a Network (one point to multi-point):

The RF1276 is a semi-duplex module capable of supporting point-to-point or one point to multi-point communication. In the one point to multi-point mode, you need to designate one module as the master and the others as slave modules. Each module must have a unique ID. The master module controls the communication coordination by sending data or commands with ID information. All slave modules receive the data packets and compare the received ID with their own. If there's a match, the module processes the data packet, otherwise discards it. To prevent interference, only one module should transmit data when the network is in operation. The RF1276 allows you to set multiple different frequencies, enabling several networks to function simultaneously in the same area. When setting up your network, keep in mind the following considerations due to the complexities of wireless communication and inherent characteristics of airborne data transfers.

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LoRa RF

Bandwidth: The RF bandwidth

Enabled: Turns the LoRa on/off

Frequency: Sets the communication frequency

Mode:

Low Power: LP mode for power saving

Sleep: Sets the LoRa to sleep

Net ID: Sets your unique communication ID key 0 to 256.

Power: Sets the RF output power

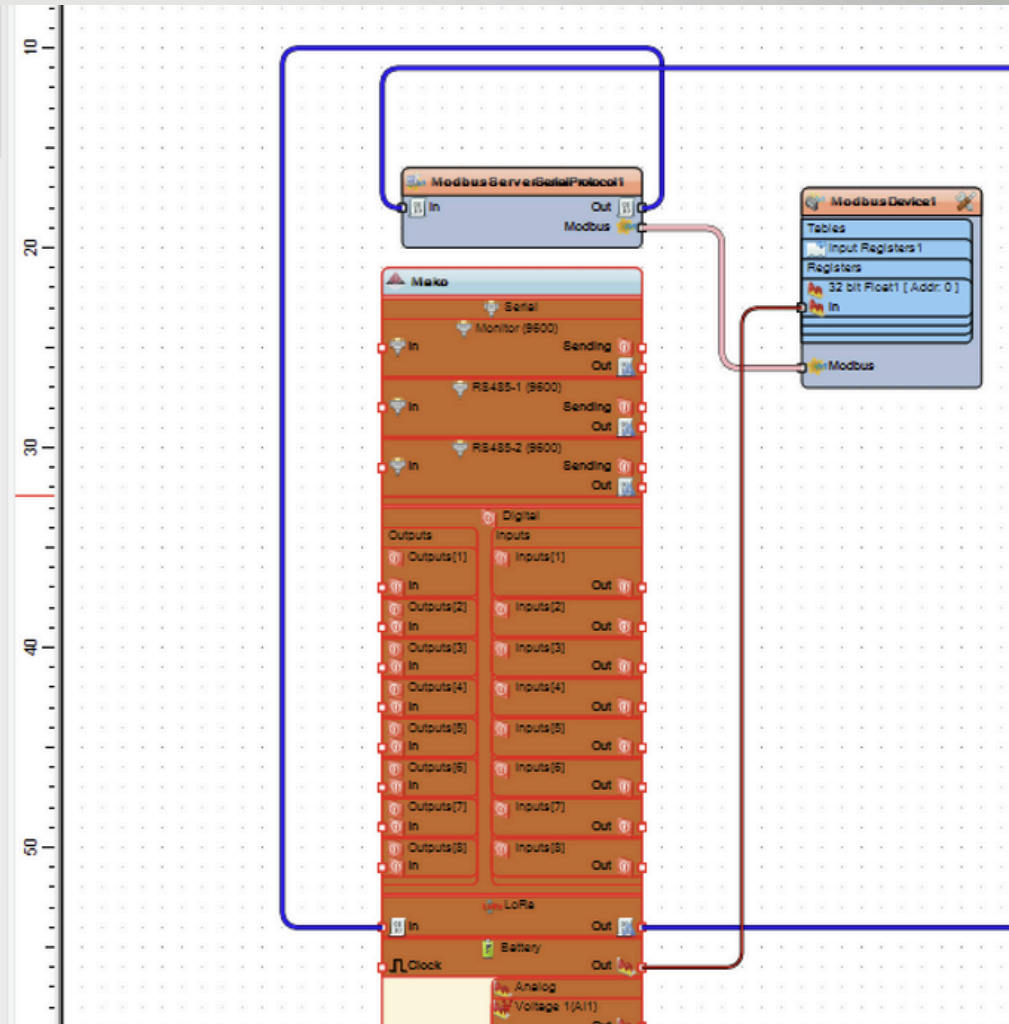
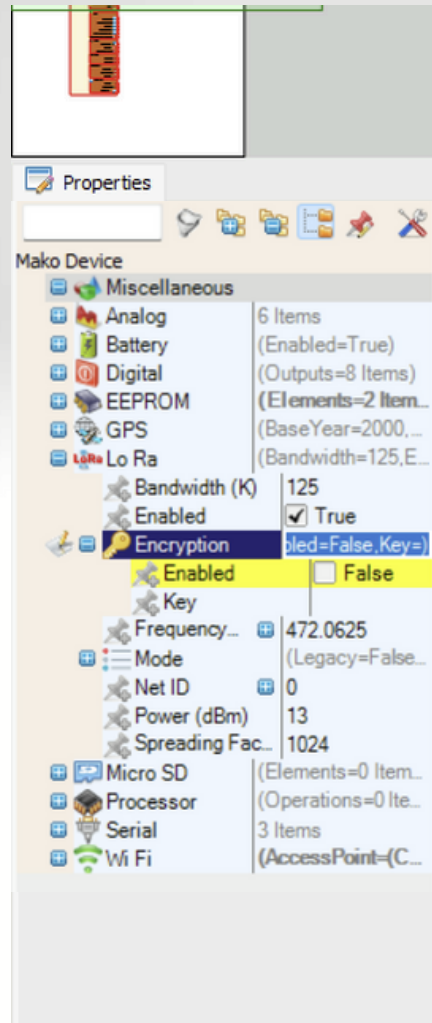
Spreading Factor: Sets the air data rate.

Encryption Enabled : Turns on 128AES message layer encryption.

Key : This is your encryption key, make sure it is at least 8 characters long. They key must match on all devices on your network, including the PassPort and Solaris products.

When sending data over the air, attention to these settings is important to ensure communications is tuned to be reliable and efficient. The Spreading factor is important. The lower the spreading factor the longer range you can send data packets.

Mako Properties - LoRa RF Properties



Mako V2

Technical Data Sheet

Mako Properties - LoRa RF

Data Transmitting Table

The table below outlines various parameters for the RF1276 module, including the RF_Factor (Chips), RF_BW (kHz), equivalent air data rate (Kbps), and sensitivity (dBm). The default setting is highlighted for your reference:

RF_Factor (Chips)	RF_BW (kHz)	Equivalent Air Data Rate (Kbps)	Sensitivity (dBm)
128	125	5.47	-123
256	125	3.125	-126
512	125	1.758	-129
1024	125	0.977	-132
2048 (Default)	125	0.537	-135
4096	125	0.293	-138

This table provides a useful reference for understanding the trade-offs between various settings, such as higher data rates and lower sensitivity or vice versa. By selecting the appropriate configuration, you can optimise your network's performance based on your specific requirements and use case.

Mako V2

Technical Data Sheet

Mako Properties - LoRa RF

LoRa RF

Here's a brief explanation of each column:

- RF_Factor (Chips):** This is the spreading factor of the LoRa modulation, which affects the data rate and sensitivity. Higher RF_Factors result in a lower data rate but better sensitivity and range.
- RF_BW (kHz):** This is the bandwidth of the LoRa signal. In this table, all settings use a **bandwidth of 125 kHz**.
- Equivalent Air Data Rate (Kbps):** This is the effective data rate that can be achieved with the given RF_Factor and RF_BW. Higher data rates allow for faster data transmission but may have reduced range and sensitivity.
- Sensitivity (dBm):** This is the sensitivity of the receiver for the given configuration. Higher sensitivity values indicate a better ability to receive weak signals, which can increase the range.
- Best for Long Range:** This column indicates the best configuration for achieving long-range communication. In this case, an RF_Factor of 4096 is optimal.
- Best for Large Data:** This column indicates the best configuration for transmitting large amounts of data quickly. In this case, an RF_Factor of 128 is optimal.
- Time for 256-byte Packet (ms):** This column shows the approximate time it takes to send a 256-byte data packet using each configuration. The times are calculated based on the air data rate and do not account for protocol overhead or other factors that could affect the actual transmission time. These values give a rough idea of how different settings impact the time it takes to send a fixed-size packet.

Recommended settings in the 125kHz bandwidth

RF_Factor (Chips)	RF_BW (kHz)	Equivalent Air Data Rate (Kbps)	Sensitivity (dBm)	Best for Long Range	Best for Large Data	Time for 256-byte Packet (ms)
128	125	5.47	-123		✓	37.5
256	125	3.125	-126			65.5
512	125	1.758	-129			116.5
1024	125	0.977	-132			209.7
2048 (Default)	125	0.537	-135			381.0
4096	125	0.293	-138	✓		697.2

The table provides an overview of different LoRa configurations with their respective RF_Factor, RF_BW, equivalent air data rate, and sensitivity.

It also highlights the best settings for long-range communication and large data transmission.

Lastly, it shows the approximate time it takes to send a 256-byte data packet for each configuration.

Mako V2

Technical Data Sheet

Mako Properties - SD Card

WARNING

'Always power off the Mako during insert and eject of the SD card'

'Not doing so may result in corrupt data or damage to the SD card'

SD CARD

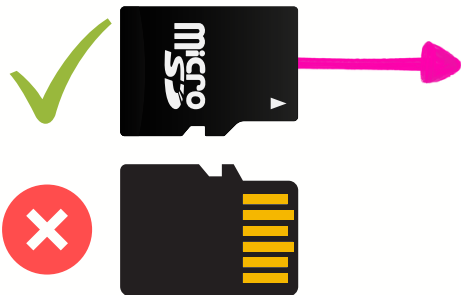
The Mako V2 is equipped with a microSD card slot on the left-hand side, which supports up to 32GB of storage. This feature allows you to expand the PLC's memory capacity for data logging, program storage, or other purposes.

To make use of this feature, follow these steps:

1. Purchase a compatible microSD card with a capacity of up to 32GB.
2. Power off the Mako V2 PLC to ensure safe handling and prevent any damage to the device or the microSD card.
3. Locate the microSD card slot on the left-hand side of the Mako V2 PLC. You will find a small slot, which may be labeled as 'microSD' or 'SD.'
4. Insert the microSD card into the slot, making sure to align it with the slot's shape and orientation. Gently push the card until it clicks into place.
5. Power on the Mako V2 PLC, and follow the manufacturer's instructions for configuring the device to use the microSD card for your desired purpose (e.g., data logging, program storage).

By using a 32GB microSD card with your Mako V2 PLC, you'll have ample storage space to handle various applications and store essential data, enabling you to take full advantage of your PLC's capabilities.

When inserting the SD card, make sure the connection pads on the SD card are facing down and the card artwork is facing up.



Mako V2

Technical Data Sheet

Mako Properties - SD Card

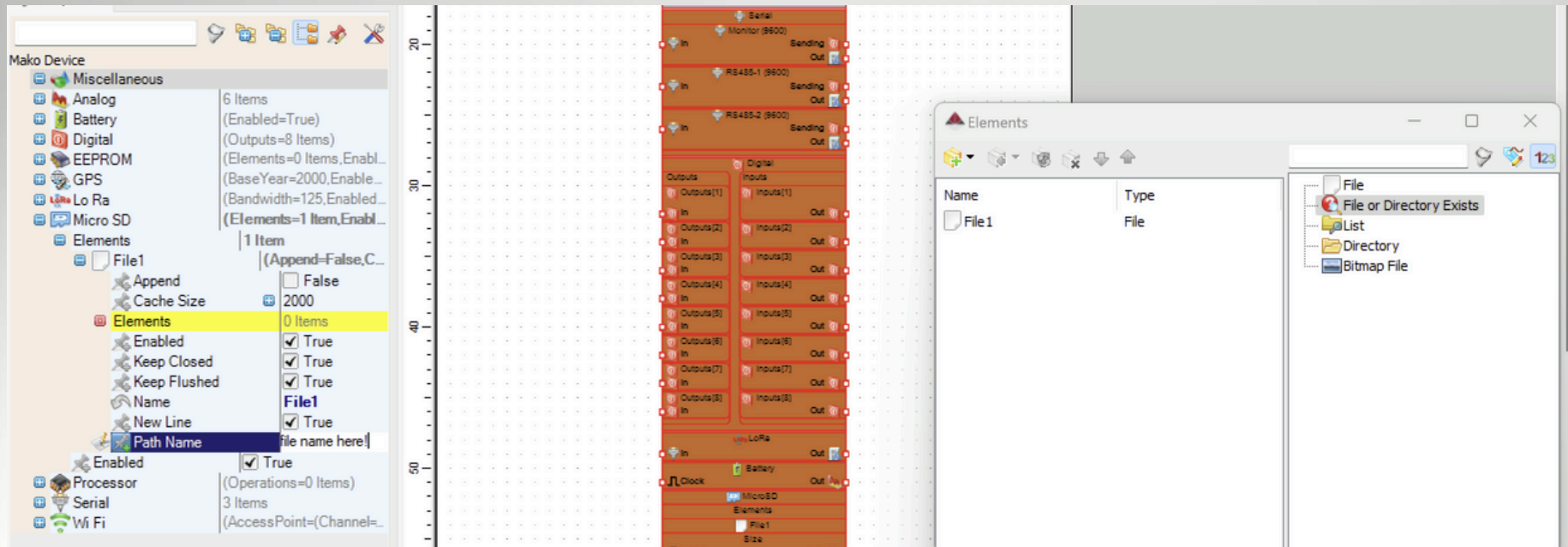
SD CARD

Elements: Add a SD card function. For a simple data logging file or storage file insert a text element.

Append: Turn on to write new lines after the last or turn off to overwrite the file every time. For data logging you would turn on 'true'.

Enabled: Turns the SD card on /off.

Cache Size: Size in bytes you can cache before writing to SD card. *The flush pin will clear the cache if clocked.*



Default Settings

Keep Closed: Keeps the write session closed, continuous operation.

keep Flushed: Automatically flushes the cache when full and after transfer to SD card.

Name: This is the name for your **element**. It is **not** the file name!

New Line: Automatically starts the new line for the next write session.

Path Name: this is the filename, pathname and file type. For example: MyNewFile.txt, or /mylocation/MyNewFile.txt, or CSV.

If you use a file extension like .CSV, you must ensure your data is stored in .CSV format, or the file will not read properly.



Mako V2

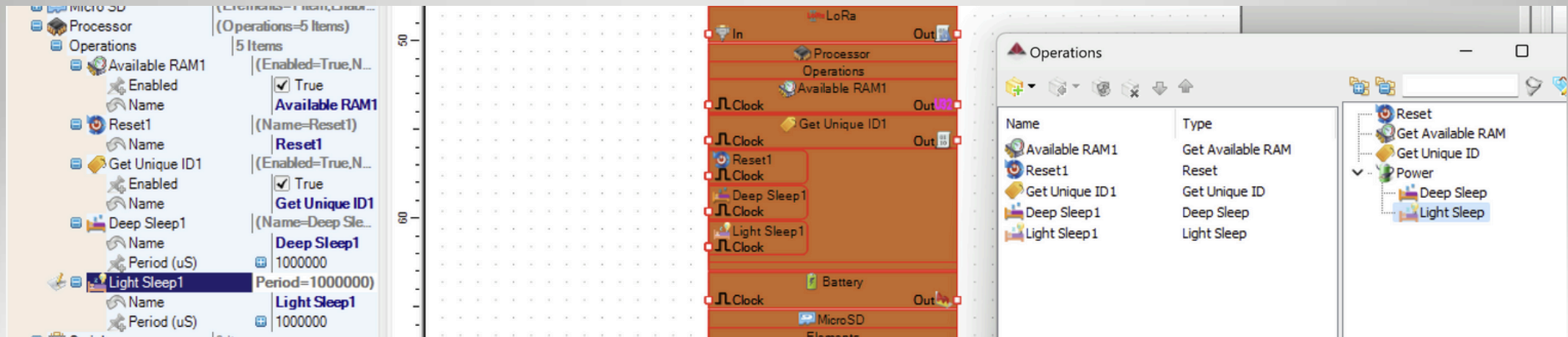
Technical Data Sheet

Mako Properties - Processor

Processor:

Operations: Select processor operations. See the image below for available operations.

Enabled: Turns the processor functions on/off



Operations:

Reset: This will add a reset pin to the Mako board. clock this pin to reset the device at any time during its operation.

This is useful for watchdog processes.

Get Available RAM: A new 32uid pin will appear on the Mako board, wire this pin to serial or other components to utilise your Mako available RAM for logic.

Get Unique ID: A new binary pin will appear on the Mako board, wire this pin to the serial or other components to utilise your ID.

Deep Sleep: Clock the deep sleep pin and the Mako processor will sleep for a period you set in microseconds uS.

Light Sleep: Clock the light sleep pin and the Mako processor will sleep for a period you set in microseconds uS.



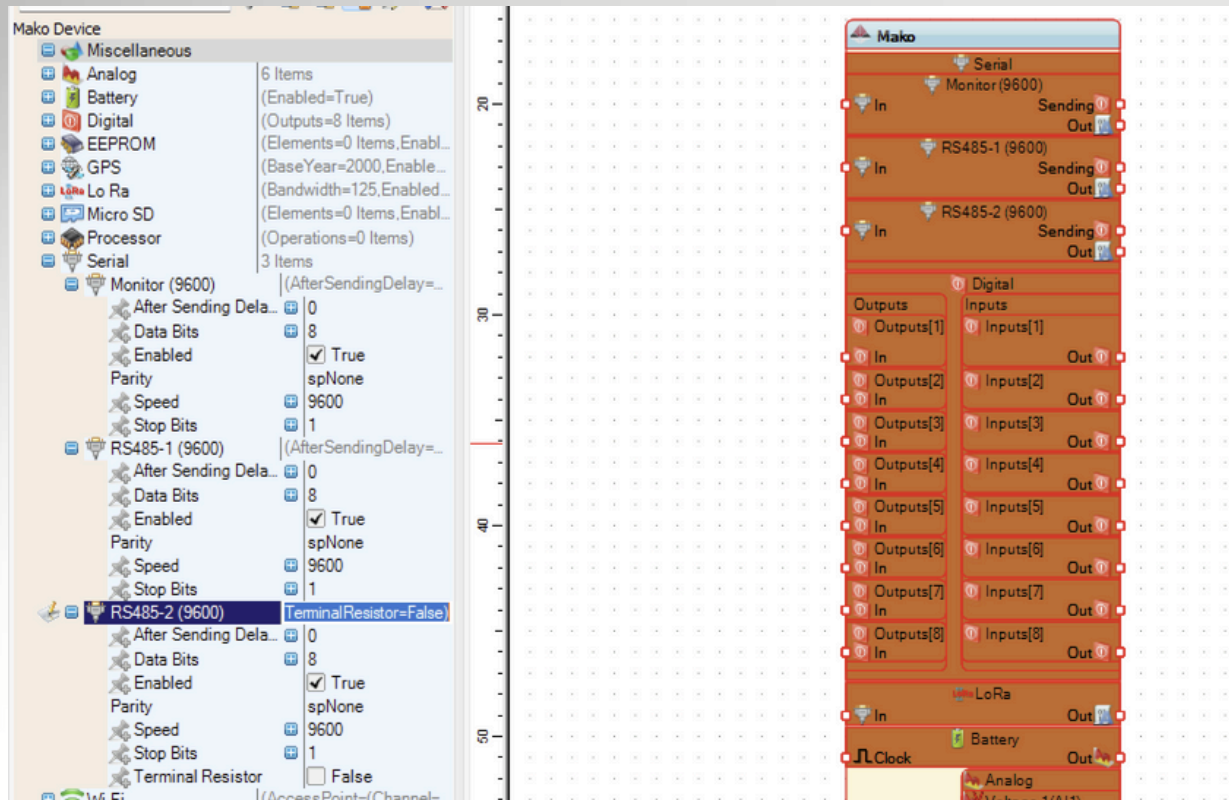
Mako V2

Technical Data Sheet

Mako Properties - Serial Port

Serial Ports:

The Mako has 3 serial ports at the top of the board in the V-NET software. The first '**Serial Monitor**' is the USB interface between your host programming device (computer) and your Mako device. It is also the serial channel you would use to directly wire components to or Mako IO for instant data viewing. The serial port is useful for debugging or testing components during program development, the 2 x RS485 sections connect to the physical RS485 on the right had side of the Mako.



Serial Properties:

After Sending Delay: Sets a delay before the Mako will send another packet. Delay time is in microseconds uS.

Data Bits: Sets the serial data bits.

Enabled: Turns the serial on/off.

Parity: Configures your serial connection parity.

Speed: Your baud rate speed, default 9600.

Stop Bits: Select your stop bit for the data end transmission.



Mako V2

Technical Data Sheet

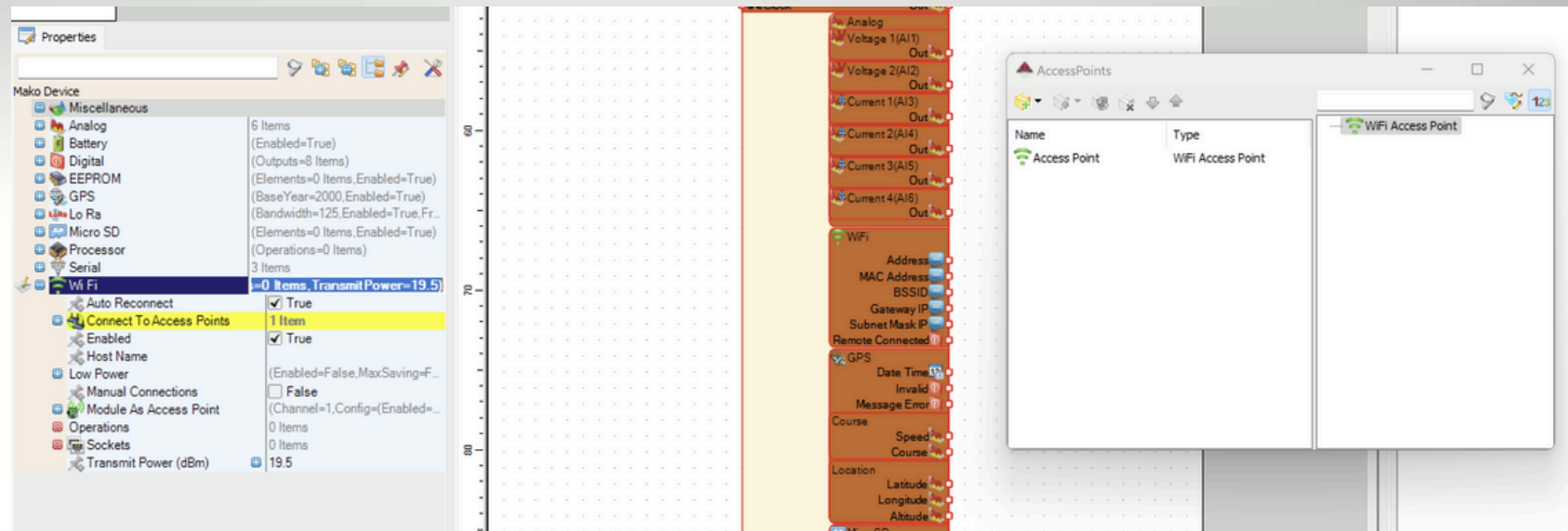
V-NET Configuration - Wifi - Introduction

Wifi - Introduction

The Mako has a powerful embedded Wifi chip that allows it to transform into an IoT device or an advanced IP PLC. It supports many features, some outlined on [page 9](#). The Mako can be a client or host device, it can connect to other Wifi hot-spots, or it can become a Wifi hot-spot. This is ideal for custom TCP, UDP protocols. The Wifi range is up to 25 meters, longer with boosted LAN networks. V-NET allows for multiple Wifi connections at the same time. When a Wifi connection is configured, it is then possible to configure sockets, TCP, UDP, these will ultimately give you access to things like Modbus TCP, Mqtt, HTTP.

It supports network features such as:

- Configuring gateway IP
- Configuring static IP
- Configuring subnet mask
- Custom MAC address
- Configuring DNS1 & DNS2
- Configuring WiFi channel



Setting Up:

Under the Wifi properties tab in the properties window, it will show the following:

Connect To Access Points: This connects your Mako to a WiFi hot-spot, **ST Mode**

Module As Access Point: The Mako then becomes a WiFi hot-spot, **AP Mode**

The Mako can operate in dual mode, allowing you to have both AP & ST at the same time.

There is a limit of 5 connections. The Mako stability cannot be guaranteed going over this limit!



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Getting Started

Wifi - Getting Started

1. Open the Mako properties, click on 'Wifi'
2. Add an access point by clicking the "Connect to Access Points". In the access point window add a new access point.
3. Fill out the access point **SSID & PASSWORD**
4. A remote connected pin will show on the Mako board in the Wifi section. ****Tip**** connect the remote connected to a digital output pin. When the Mako has a Wifi connection the digital output LED will turn on and if the connection drops, it will turn off.

The image displays the Mako V2 configuration interface, which is a grid-based environment. On the left, the 'Properties' window is open, showing the 'Mako Device' tree. The 'Wifi' section is expanded, and the 'Connect To Access Points' option is checked. A green circle with the number '1' is next to the 'Wifi' icon, and a green circle with the number '2' is next to the 'Connect To Access Points' icon. The 'Access Point' configuration is visible, with fields for 'Channel', 'Enabled', 'MAC Address (BSSID)', 'Password', and 'SSID'. A green circle with the number '3' is next to the 'Password' field.

In the center, the Mako board is shown as a grid of pins. The 'Wifi' section is highlighted in red, and a green circle with the number '4' is next to the 'Remote Connected' pin.

On the right, the 'AccessPoints' window is open, showing a table with columns for 'Name' and 'Type'. A single entry is visible: 'Access Point' with the type 'WiFi Access Point'. A green circle with the number '4' is next to the 'Remote Connected' pin in the Mako board view.

Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Connect to Access Point

Wifi - Connect to Access Point

The WiFi property settings for AP mode and ST mode are the same. Some modes may have different settings applicable to its function.

Channel: Sets the WiFi network channel

Enabled: Turns the WiFi on/off

DNS1: Sets the DNS1 IP address

DNS2: Sets the DNS2 IP address

Enabled: This second enable sets the device to static IP mode (If selected you have to fill these fields out)

Gateway: Sets the Statis gateway ID of your router,modem or network connection

IP: Sets your unique IP address in static mode

Subnet: Sets your subnet mask in static mode

Enabled: The 3rd enable allows you to customise your Mako MAC address, (this is useful for network identity schemes)

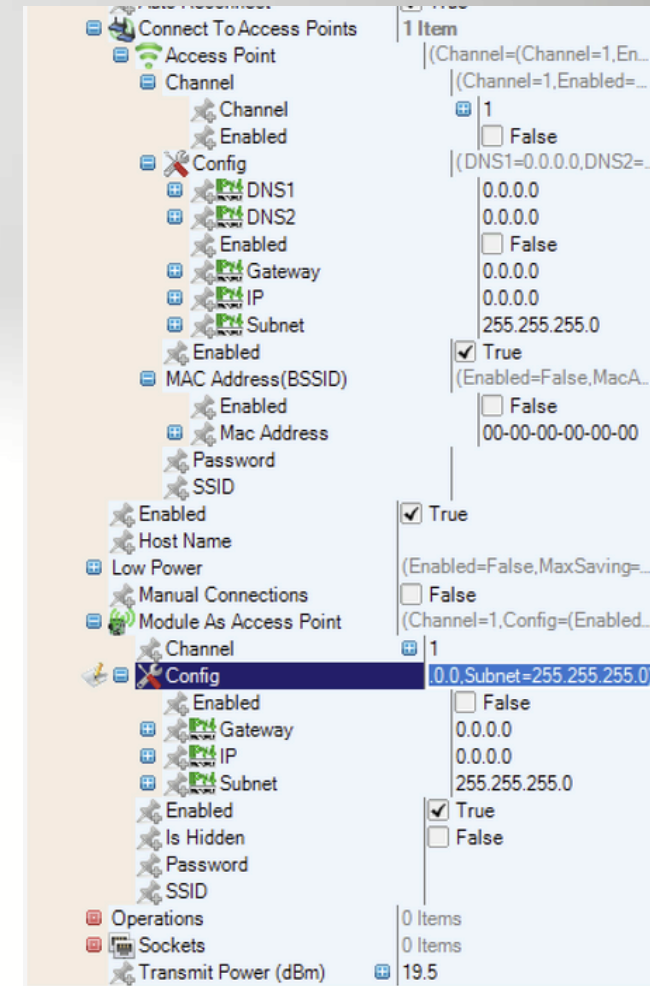
Password: Sets the Password for your hot-spot connection

SSID: Sets the WiFi hot-spot broadcast name

Host Name: Sets the personal host name of your Mako device. If your network supports host name, your Mako can be discoverable by its host name.

Low Power: Enabled turns on/off low power mode, Max saving will reduce the WiFi power draw by 40%

Manual Connections: NOT IN USE



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Module as Access Point

Wifi - Module as Access Point

The WiFi property settings for AP mode and ST mode are the same. Some modes may have different settings applicable to its function.

Channel: Sets the WiFi network channel

Enabled: This first enable sets the device to static IP mode (if selected, you must fill these fields out)

Gateway: Sets the static gateway ID of your router, modem or network connection

IP: Sets your unique IP address in static mode

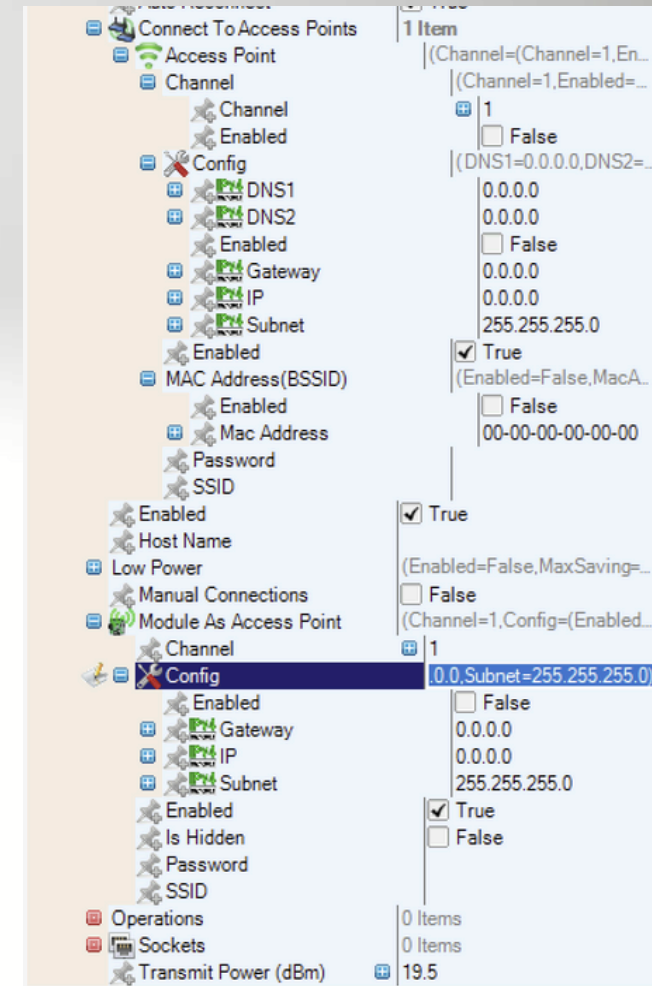
Subnet: Sets your subnet mask in static mode

Enabled: This second enable turns on /off the AP mode (Module as Access Point")

Is hidden: This will hide your AP mode from WiFi scanning. If turned on, your device will be invisible from hot-spot scans and users will be unable to connect.

Password: Sets the Password for your hot-spot connection

SSID: Sets the WiFi hot-spot broadcast name



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Operations

Wifi - Operations

The Mako has the following WiFi operations. In the properties section under WiFi, click the operations tab and in the new window add the operations on the right side you wish to use for the left side. When you add the operations, the Mako board will change shape and the new features will appear with pins to connect to.

Get Host IP: This will retrieve the gateway IP your Mako is connected to, for example if your router gateway is 192.168.1.1. This value will be available on the new pin created under 'Get Host IP'

Scan Networks: This will scan Wifi networks and output them in text from the new pin created.

Signal Strength: This will output your WiFi connection signal strength from the new created pin in 16bit Int.

Reconnect: This will create a new pin you can clock to force the Mako to reconnect.

Program Over The Air: This has multiple properties that allow you to set the MaKo to be programmed from V-NET over Wifi and not require a USB.

The screenshot displays the V-NET configuration interface for the Mako V2. On the left, the 'Operations' tab is selected, showing a list of available operations: Get Host IP, Scan Networks, SignalStrength, Reconnect, and Program Over WiFi. The 'Program Over WiFi' operation is currently selected. The right pane shows the 'Operations' window with a table of the selected operations:

Name	Type
Get Host IP	Get Host IP
Scan WiFi Networks	Scan WiFi Networks
WiFi Signal Strength	WiFi Signal Strength
WiFi Reconnect	WiFi Reconnect
Program Over WiFi	Program Over WiFi

The central workspace shows a breadboard layout with pins connected to the Mako board. The 'Program Over WiFi' operation is highlighted in red, and its pins are connected to the board's pins. The bottom status bar shows the IP address 173:808.



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Operations Explained

Wifi - Operations: Explained

Operations: Get Host IP

This operation scans for a known host name and gets the IP address

Enable: Turns the scanner on/off

Host Name: Type the name of the host you wish to scan here

Operations: Scan Networks

This operation scans for WiFi hot-spots

Enable: Turns the scanner on/off

Channel: Select the WiFi channel you want to scan, leave at default 0 for all channels

Max Time per Channel: The time allocated to scan the channels in ms

Passive: Scans passive WiFi networks

Show Hidden: Attempts to show hidden WiFi networks

Operations: Signal Strength

This operation will create a new pin on the Mako board and if clocked will output the signal strength of the connected WiFi network.

Operations: Reconnect

This operation will create a new pin on the Mako board and if clocked will force a reconnect to the configured WiFi hot-spot.

The screenshot displays the Mako V2 configuration interface, which is divided into several sections:

- Left Panel (Configuration Tree):** Lists various system settings such as Low Power, Manual Connections, Module As Access Point, and Operations. Under the Operations section, several items are listed: Get Host IP, Scan Networks, SignalStrength, Reconnect, and Program Over WiFi. Each item has a set of configuration options.
- Right Panel (Detailed Settings):** Shows the configuration for the selected 'Program Over WiFi' operation. It includes fields for 'Enabled' (checked), 'Host Name', 'Channel' (set to 1), 'Max Time per Channel (ms)' (set to 300), 'Passive' (unchecked), 'Show Hidden' (unchecked), and 'Mdns Enabled' (checked). There are also checkboxes for 'Enabled', 'Host Name', 'Password', 'Port', and 'Reboot On Success'.
- Bottom Panel (Operations List):** A table listing the available operations and their types. The table is as follows:

Name	Type
Get Host IP	Get Host IP
Scan Networks	Scan WiFi Networks
SignalStrength	WiFi Signal Strength
Reconnect	WiFi Reconnect
Program Over WiFi	Program Over WiFi



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - OTA

Wifi - Operations: Over The Air

A future feature of the Mako V2 features a program over the air (OTA) capability, which allows you to update your device's firmware remotely over WiFi networks

OTA is a future feature.



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Sockets

Wifi - Operations: Sockets

Sockets are used in internet connections to allow communication between different devices over a network. When the Mako establishes a WiFi connection, the user can add TCP and UDP sockets to enable communication with other devices or servers. These sockets act as endpoints for data transmission, allowing the Mako to send and receive data packets over the network. By utilising TCP and UDP sockets, the Mako can establish reliable and efficient communication with other devices in the network.

To add a socket, open the Mako properties, scroll down to the bottom and click 'sockets'. The sockets window will open. Add sockets to the right side of the window. The Mako board will change shape, and new pins will appear.

TCP Client: The Mako can connect to servers and share data

TCP Secure Client: The Mako can connect to secure servers using TLS and share data

TCP Server: The Mako becomes a server and other devices can connect to the Mako and share data. This mode is required for Modbus TCP Server

UDP Socket: The Mako can communicate with UDP servers and share data.

Name	Type
TCP Client1 [0.0.0.0:...	TCP/IP Client
TCP Secure Client1 [0...	TCP/IP Secure Client ...
TCP Server1 [80]	TCP/IP Server
UDP Socket1 [80/0.0...	UDP Socket

Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Client

Wifi - Operations: Sockets TCP Client

A web socket TCP client is a type of client software that establishes a web socket connection with a web socket server using the 'Transmission Control Protocol' (TCP). Web sockets are a bi-directional communication protocol that allows real-time communication between a web server and a web client over a single, long-lived connection. The web socket TCP client establishes a connection to a web socket server and can send and receive data in real-time. The web socket server can push data to the client as soon as it becomes available, without the client having to constantly poll the server for new data. Web socket TCP clients are commonly used in applications where real-time communication is critical, such as MQTT, Modbus TCP, HTTP.

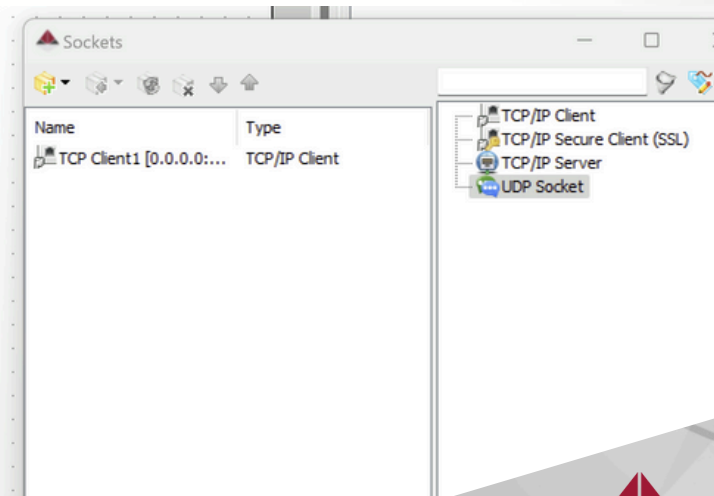
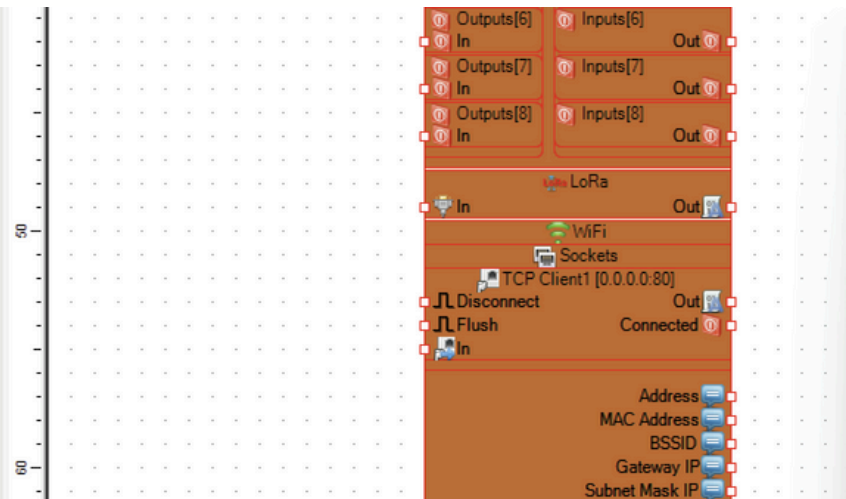
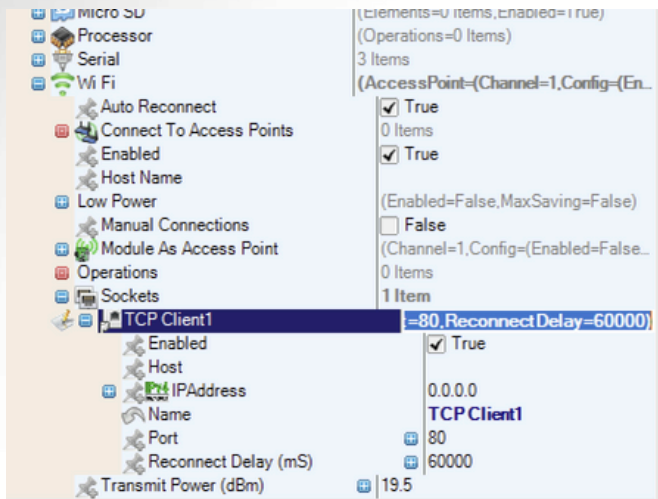
Enabled: Turns the TCP socket off/on

Host: Configure the host name of the server, example www.google.com

IP Address: Configure the IP address of your host example 8.8.8.8

Port: Configure the port of your host address example port 80

Reconnect Delay: Configure the time the Mako reconnects after it is disconnected in ms, default is 6000ms 6 seconds.



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Secure Client

Wifi - Operations: Sockets TCP Secure Client

A TLS (SSL) client socket securely connects to a WebSocket server using TCP and the TLS protocol, ensuring encrypted, tamper-proof communication. WebSockets enable real-time, two-way data exchange over a single persistent connection, allowing the server to push updates instantly without polling.

TLS WebSocket clients are used in security-sensitive, real-time applications like IoT systems, home automation, and industrial monitoring.

CA CERT: This is your CA certificate. Open the window and copy & paste your CA cert

Certificate: This is your client certificate.

Enabled: Turns the TCP socket off/on

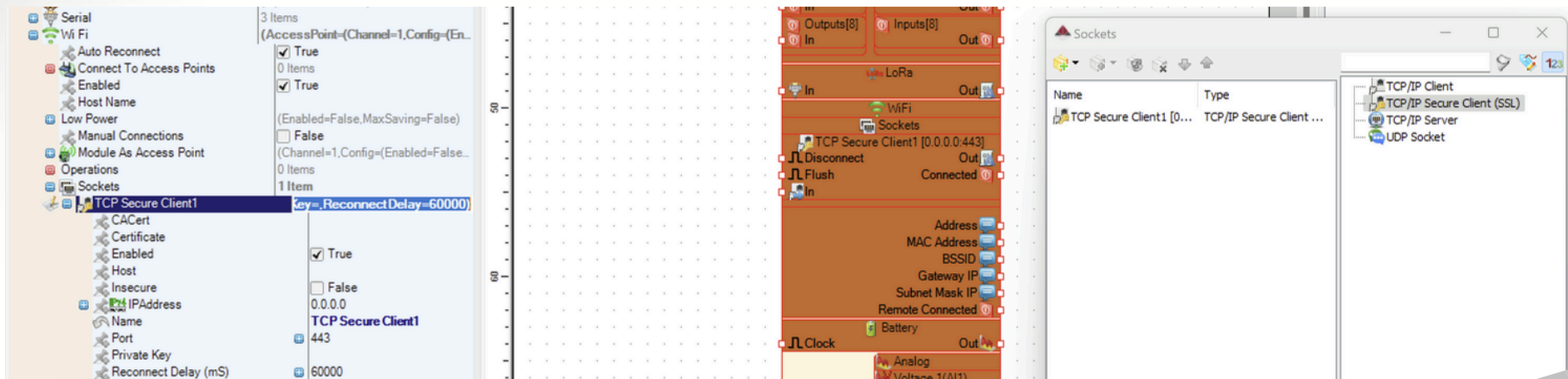
Host: Configure the host name of the server, example www.google.com

IP Address: Configure the IP address of your host example 8.8.8.8

Port: Configure the port of your host address example port 80

Private Key: This is your TLS/SSL private key, a secret cryptographic key used to decrypt TLS encrypted data. Open the window and copy & paste your private key.

Reconnect Delay: Configure the time the Mako reconnects after it is disconnected in ms, default is 6000ms 6 seconds.



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Secure CA Certificate

Wifi - Operations: TCP Secure CA Certificate

To properly use the TLS SSL TCP sockets, you must first create or retrieve the appropriate valid certificates and keys. The keys need to be copied into V-NET. In the Mako properties, open the sockets section, go to your secure client socket and click on the 'add certificate' tab next to each certificate property. Copy the PEM formatted certificate into the certificate window and press OK. The certificates and keys will be uploaded with the rest of the program when finished

Certificate format

CA: x.509 PEM encoded

The screenshot displays the Mako V2 configuration interface. On the left, the 'Properties' window shows the 'Mako Device' tree with 'Wi Fi' expanded to 'TCP Secure Client1'. The 'CACert' property is selected, showing a 'Certificate' field with a 'True' checkbox. A pink arrow points from this field to the right, where a 'CACert' dialog box is open. The dialog box contains a text area with a PEM-formatted certificate, starting with '-----BEGIN CERTIFICATE-----' and ending with '-----END CERTIFICATE-----'. The certificate text is as follows:

```

1 -----BEGIN CERTIFICATE-----
2 MIIIEczCCAlugAwIBAgIBADANBgkqhkiG9w0BAQQFAD..AkGAlUEBhMCR0Ix
3 EzARBgNVBAgTC1NvbWUuU3RhdGUxLWVBAoTC0..0EgTHRkMTcwNQYD
4 VQQLZy5DbGFzcyAxIFB1Ym9yYyBQcm1tYXJ5IEN1cn..XRpb24gQXV0aG9y
5 aXR5MRQwEgYDVQQDEwTCZXN0IENBIEIxO2DAeFw0wMD..TUwMTZaFw0wMTAy
6 MDQxOTUwMTZaMIGHMQswCQYDVQGEwJHJQJETMBEGA1..29tZS1tdGF0ZTEU
7 MBIGAlUEChMLQmVzdCBDQSBMdGQxNzA1BgNVBAeTLk..DEgUHVibG1jIFBy
8 aW1hcnkgQ2VydG1maWNhdG1vbiBBdXR0b3JpdHkxZD..AMTC0Jlc3QgQ0Eg
9 THRkMTIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCg..Tz2mr7SZiAMfQyu
10 vBjM90iJjRazXBZ1BjP5CE/Wm/Rr500PRK+Lh9x5eJ..ANBE0sTK0ZsDGM
11 ak2mlg7oruI3dY3VHqIxFTz0Tald+NAjwnLe4nOb7/..k05ShhBrJGBKkxb
12 8n104o/Sp8HAsZPdzbFMIYnJzBM2o5y5A13wiLitE..fyYkQzaxCw0Awz1
13 kVHIyCuaF4wj57lpSzkv6sv+4IDMBT/XpCo8L6wTa..sh+etLD6FtTjYbb
14 rvZ8RQM1t1KdoMHg2qxrAAV++HNBYmNws0duEdjUbJ..XI9TtnS4o1Ck7fP
15 Of1jiQIDAQABo4HnMIHkMB0GAlUdDgQWBBQ8urMCRL..5AkIp9NJHJw5TCB
16 tAYDVR0jBIGSMIGpgBQ8urMCRLYYMHUKU5AkIp9NJH..aSBijCBhzELMAkG
17 AlUEBhMCR0IxZzARBgNVBAgTC1NvbWUuU3RhdGUxLWVBAoTC0..AoTC0Jlc3QgQ0Eg
18 THRkMTcwNQYDVQQLZy5DbGFzcyAxIFB1Ym9yYyBQcm..EN1cnRpZmljYXRp
19 b24gQXV0aG9yYXR5MRQwEgYDVQQDEwTCZXN0IENBIE..DAMBgNVHRMEBTAD
20 AQH/MA0GCsGSIb3DQEBAUAA4IBAQC1uYBcsSncwA..DCsQer772C2ucpX
21 xQUE/C0pWm6gDkwd5D0SDMDJRqV/weo24wC6B73f5..bLhGYHaXJeSD6Kr
22 Xco0wLdSaGmJYs1LKZB3ZIDEp0wYTGHgteb6JfIttn..sf2xdrYfPCiIB7g
23 BMAV7Gzdc4VspS61jrAhbiiawdBiQ1QmsBeFz9JkF4..b318BoGN+qMa56Y
24 It8una2gY4120//on8r8r5IWIJm1L0oA8e4fr2yrBHX..adsGeFKkyNrwGi/
25 7vQMfXdGsRrXNGRGnX+vWD23/zWIOjoDtCkNnqEpVn..HoX
26 -----END CERTIFICATE-----

```

At the bottom of the dialog box, there is a status bar showing 'Ln: 26, Col: 26' and a 'Special Characters' checkbox. There are 'OK' and 'Cancel' buttons at the bottom right.



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Secure Certificate

Wifi - Operations: TCP Secure Certificate

To properly use the TLS SSL TCP sockets, you must first create or retrieve the appropriate valid certificates and keys. The keys need to be copied into V-NET. In the Mako properties, open the sockets section, go to your secure client socket and click on the add certificate tab next to each certificate property. Copy the PEM formatted certificate into the certificate window and press OK. The certificates and keys will be uploaded with the rest of the program when finished

Certificate format

Client Certificate: X.509 PEM encoded

The image shows a screenshot of the Mako V2 software interface. On the left, the 'Properties' window is open, displaying the configuration for a 'TCP Secure Client1'. The 'Operations' section is expanded, showing a 'Certificate' property with a value of '(CACert=(26 Lines), Certificate=(26 Lines))'. A pink arrow points from this property to a 'Certificate' dialog box on the right. The dialog box contains a text area with the following PEM-formatted certificate and private key:

```

1  "-----BEGIN ENCRYPTED PRIVATE KEY-----" & _
2  "MIICoJAcBgoqhkiG9w0BDAEDMA4ECHPQz6NdAmoFagIHOASCAoBK9KXr+dm" &
3  "Vtc0ZnEog7t3Prs4rJazwUsXEXU78ePLMquxLi/cPmqtyjb472r6XUOa9J/v" &
4  "g2gYH1J7D7FfAdTdVbHmXWf2zdIqI+AKZmrMoIfSVSSrI8mLDXLDgJvM2Gxa" &
5  "r/YJ154L4fwqWjj0b06v8nTrXTp7G3ZSxjmXc3auf8tS1RatpDuSn027jBGt" &
6  "Pg2CGPjeSomOU7Efd89R+gryW3RfXaMEv1TtGmdS+szxN4TAzgFTzjzE7qJ2" &
7  "+WL09hBRxSyi5Jybbxblr05zDbGJD8rq4kGawWUj4PYDpOkxQYQyK/cALEvv" &
8  "EipLeWvk03CadKER3EcpL7wQT3N5wJGNx7GR3efk0710/VfGf6kYFsJ8Qt94" &
9  "vBlq84abgSD+r1RX03re/NLJQ00Qx13bDrkSiRoXsfBiOeVzBVIsh03Sj4B" &
10 "V0v2KLEnEMXr40rMqTGFkd3V+FyYUehWEkE13NrIVpBSJir+g4H3t176SdNe" &
11 "mq/cTtQP+EY8fpC3I46dyDXFat3wQfubw+E5nGfv7xp6vRVRRolpZx7DpuB/" &
12 "z1zt03uP0vJ0ppjATriO/ZAVs6UrXx+DJ6XsfrAVt0jpw5Ngr8rm2EiD3/1T9" &
13 "7qlDELJ7GzCY1dG99XVjt92Xb7cI8zsPpI/gzQJLfeLe3U5Mdw0hKZLPCex" &
14 "0urs3ytK0XNu+jZAYeSaysG8/rHJaH74WogJ8gnSPY4QtWsu6+3qBErS2jBq" &
15 "7E2jRvBKWICVd1yiQCdq/c6s9LeYhNh2smcWxuX9b41G9f1LHZy0djhIYi4x" &
16 "IpcEjfjKtH+7zU0kMQ+fxZ2HtSEVft9L2Ci49jB8YReqbOuDFzzwsk3xxfL2h" &
17 "ZoRK" & _
18  "-----END ENCRYPTED PRIVATE KEY-----"

```

The dialog box also has a 'Special Characters' checkbox (unchecked), 'OK' and 'Cancel' buttons, and a status bar showing 'Ln: 18, Col: 40'.

Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Secure Private Key

Wifi - Operations: TCP Secure Private Key

To properly use the TLS SSL TCP sockets you must first create or retrieve the appropriate valid certificates and keys. The keys need to be copied into V-NET. In the Mako properties, open the sockets section, go to your secure client socket and click on the add certificate tab next to each certificate property. Copy the PEM formatted certificate into the certificate window and press OK. The certificates and keys will be uploaded with the rest of the program when finished

Certificate format

Private Key: X.509 PEM encoded RSA

The screenshot displays the Mako V2 configuration interface. On the left, the 'Properties' window shows the 'Sockets' section expanded to 'TCP Secure Client1'. The 'Private Key' field is selected, and a dialog box titled 'PrivateKey' is open, showing the PEM formatted private key text. A pink arrow points to the 'Private Key' field in the configuration window.

```

1 -----BEGIN RSA PRIVATE KEY-----
2 MIIEpQIBAAKCAQEAsTz2mr7SZiAMfQyuvBjM90i..Z1BjP5CE/Wm/Rr500P
3 RK+Lh9x5eJpO5CAZ3/ANBE0sTK0ZsDGMak2mlg7..3VHqIXFTz0Tald+NAj
4 wnLe4nOb7/eEJbDPkk05ShhBrJGBKkx8n104o/.PdzbFMIyNjJzBM2o5y
5 5A13wiLitEO7nco2WfyYkQzaxCw0Awz1kVHiLyC..7lpSzkv6sv+4IDMbT/
6 XpCoL6wTazrzrywnQsh+etLD6FtTjYbbrvZ8RQM..Hg2qxraAV++HNBmNW
7 s0duEdjUbJK+ZarypXI9TtnS4o1Ckj7POf1jiQI..IBAFyidxtqRQyv5KrD
8 kbJ+q+rsJxQlaipn2M4lGuQJefIxELFDyd3XpxP..Un/82NZNX1PmRIopXs
9 2T91jiLZEUKQw+n73j26adTbteuEaPGSrT2xBLR..yss00wWomUyILqVeti
10 6AkLONJAUkKucHGqWVgUIa4glhaE0ilcm6dWUDo..fd+PpzdCJfls4NdUWK
11 YV2GJcutGQb+jqT5DTUqAgST7N8M28rwjK6nVMI..BUpP0xpPnuYdyPow6x
12 4hBt8DZQYyduzIXBXRBNkNdv8fum68/5klHxp6..4HRkMUL958UVeljUsT
13 BFQ109UCgYEA/VqzXVz1z8K36VSTMPeH5zBATV..PRiXtYK1YpYV4/jSUj
14 vvT4hP8uoYNC+B1EMi98LtnxZiH0V4rqHDsScAq..VyeSLH01oKMZgpwFem
15 bEIDnEOD0nKrft/9K9sPYgvB43wsLEtUujayw3W..Liy0WkmB8CgYEA34xn
16 lQ10ohHbn928qYjoDYhvcj+a89tD9eMPhesfQFw..rsfGcXIonFmWdVygbe
17 6Doihc+GIYIq/QP4jgMksE1ADvoczJSke922fE2i..fitBpQERNJ00BlabfP
18 ALs5NsKnmLkWS2U2BHCbv4DzDXwiQB37KPOLLc..kBHfF2/htIs20d1UUVL
19 +PK+aXKwguI6bxLG23ofoUH+mGsS10mkp7kYZCm..OTQteRqP8rDSC7DgA
20 kHc5ajYqh04AzNFaxjRo+M3IGICUaOdKnXd0Fda..QwfoaX4Q1RTgLqb7AN
21 ZTzM9WbmnYoXrx17k21T31sCgYEAm757XI3WJVj..WoLj1+v48WyoXZpcai
22 uv9bT4Cj+LXRS+gdKHK+SH7J3z2CRHVS+WH/SVC..DxuybvebDoTOTkKicj
23 BWQaGzCaJqZa+POHK0klvS+91n0/6k539p95tfx..X4TCzbVG6+gJ1X0ysz
24 Yfeh5MCGYEAkMiKuWHcsVycab3RUF6XA9gd3qY..fctIGtS1tR5PgfFIV+G
25 eng1VoWc/hkj8SBHZz1nLxLN7KDF8ySU06MDggB..hJ+gXJKy+gf3mF5Kmj
26 DtkpjGHQzPF6v0e907y5NQLvVFGXUq/FIJZxB8k..fJdHEm2M4=
27 -----END RSA PRIVATE KEY-----

```

Ln: 27, Col: 30
 Special Characters

Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - TCP Server

Wifi - Operations: Sockets - TCP Server

The Mako can generate a TCP Server. A TCP server is a type of server software that establishes a connection with a client using the 'Transmission Control Protocol' (TCP), allowing bidirectional communication between the server and the client. The TCP server IP address is taken from the IP settings you configure during the WiFi setup or the settings your network assigns through DHCP protocol.

Enable: Turns the server on/off

No Delay: This turns on/off the no delay feature. Turned on it will prevent the Mako responding quicker than a web browser can process the data. This is only useful for programs that utilise web browser visualisation

Port: Sets the port your server is hosted on, for example port 80. If a remote client wants to connect, they should know the IP address of the device + the port of the device to make a successful connection.

Name	Type
TCP Server 1 [80]	TCP/IP Server



Mako V2

Technical Data Sheet

V-NET Configuration - Wifi - Sockets UDP

Wifi - Operations: Sockets UDP

A UDP socket is a type of endpoint for sending and receiving data over a network using the 'User Datagram Protocol' (UDP), a connectionless transport protocol that does not guarantee packet delivery, order, or integrity.

Enable: Turns the server on/off

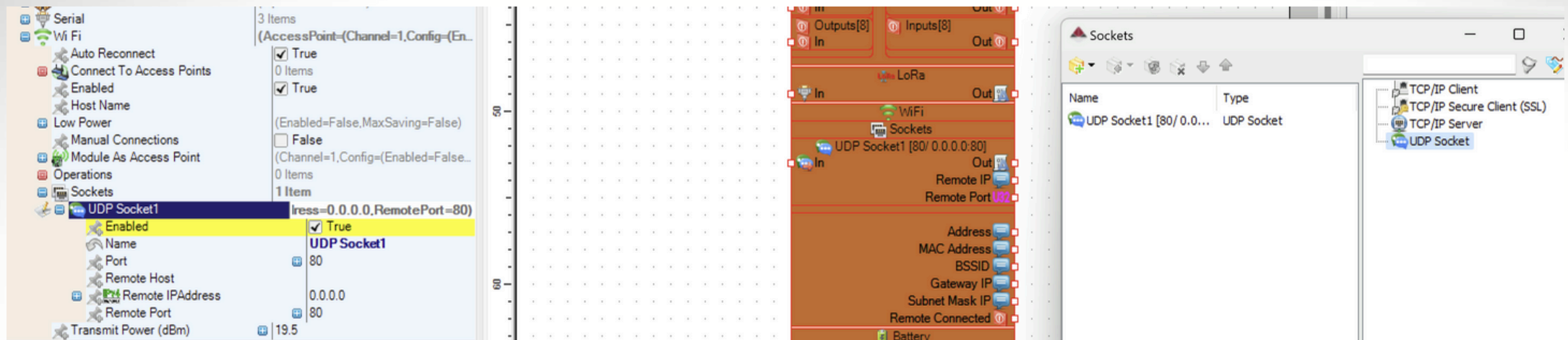
Port: Sets the local UDP port, this is required for a remote device to send data back to the Mako

Remote Host: Configure here the name of your remote host device.

Remote IP: Configure here the IP address of your remote device

Remote Port: Configure here the port number of your remote device

If the remote device was called Mako3 and it turned on a UDP socket on port 53 you would enter 'Mako3' in the 'Remote Host' and '80' in 'Remote Port'



Mako V2

Technical Data Sheet

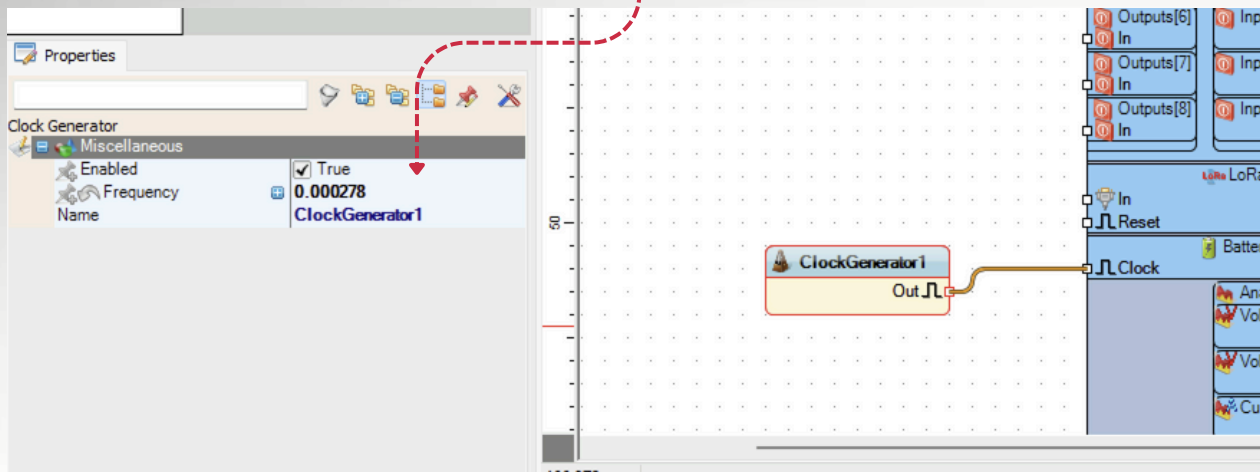
V-NET Configuration - Clock (HZ) Frequency Property

Clock (HZ) frequency property

Components within V-NET require setting the frequency property in Hertz (Hz). To configure a component to operate 5 times per second, simply enter '5' into the property. However, for operations that occur less frequently, such as every 5 seconds, a simple formula is used: **1 divided by the time in seconds**. Thus, for a 5-second interval, you would calculate $1/5$, resulting in 0.2, which is the value to enter into the property.

For longer intervals, like 1 hour, first determine the number of seconds in an hour (1 hour = 3600 seconds). To set a component to operate once every hour, calculate $1/3600$, yielding 0.000278 as the input for the frequency property.

Frequency (Hz) = 1 / Time Interval (Seconds)



Examples:

Time Interval (Seconds)	Frequency (Hz)	Frequency (Events per Hour)
5	0.2	720
10	0.1	360
15	$1/15 \approx 0.0667$	240
20	0.05	180
25	$1/25 = 0.04$	144
30	$1/30 \approx 0.0333$	120
40	$1/40 = 0.025$	90
50	$1/50 = 0.02$	72
60	$1/60 \approx 0.0167$	60



Mako V2

Technical Data Sheet

V-NET Configuration - Uploading First Sketch

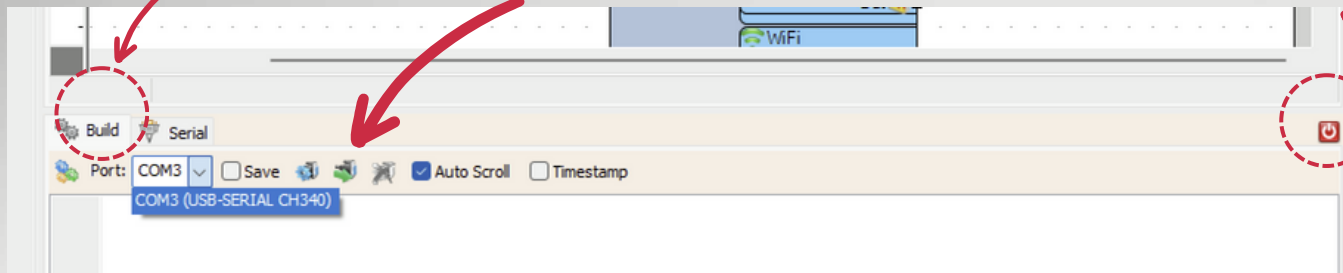
First Sketch

To upload your first sketch you must ensure your USB is plugged into the computer and Mako PLC. Its worth noting you don't need a DC supply to program your Mako, the USB cable provides enough power to power the Mako, this allows you to program on the fly without having industrial power supply's connected.

To upload the sketch press this symbol >>>



Opens the builder



Opens the (Builder) Uploader and serial debug

There are 2 stages to the upload. The first stage is the compilation of your sketch. The second is the actual uploading. You must allow sufficient time and not stop or remove the USB during this period to avoid corrupting your program.

Stage one looks like this:

```
Building...
Sketch uses 269913 bytes (20%) of program storage space. Maximum is 1310720 bytes.
Global variables use 21880 bytes (6%) of dynamic memory, leaving 305800 bytes for local variables. Max.
Build completed - Time: 00:00:30
Uploading...
Serial port COM3
Connecting...
```

Stage two looks like this: 'SUCCESS - TIME: ***'**

When it says this, it is safe to upload another program or remove the USB.

```
Leaving...
Hard resetting via RTS pin...
New upload port: COM3 (serial)
SUCCESS - Time: 00:00:17
```

TIP

To cancel the upload at anytime hit this button



before or during the upload stages



Mako V2

Technical Data Sheet

Industrial WiFi, LoRa RF, Modbus PLC.

Optimised for remote locations with IoT capabilities

Warranty

Smithtek PTY LTD warrants to the original purchaser that this product will be free from defects in workmanship and materials, under normal use and conditions, for a period of one (1) year from the original invoice date. This warranty is non-transferable. During the warranty period, Smithtek PTY LTD will, at its sole discretion, repair, replace, or refund the purchase price of any defective product that is returned to us in accordance with our return policy. Smithtek PTY LTD may use new or refurbished parts or products to fulfill its warranty obligations. The customer is responsible for all shipping and handling fees associated with returning the defective product.

This warranty does not cover:

- Damage resulting from misuse, abuse, negligence, accidents, or improper use or installation
- Aesthetic damage such as scratches, dents, or stains
- Normal wear and tear
- Damage resulting from unauthorised repair or modification
- Dissatisfaction due to buyer's remorse
- Damage resulting from natural disasters, fire, theft, or acts of God
- Any condition resulting from incorrect or inadequate maintenance or care.

This warranty is in lieu of all other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular purpose. In no event shall Smithtek PTY LTD be liable for any indirect, special, incidental, or consequential damages arising from the use of this product.

To make a warranty claim, please contact our customer support team at www.smithtek.com.au/support. You may be asked to provide proof of purchase, including the model number and original dated sales receipt. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state or province to province.



Mako V2

Technical Data Sheet

Industrial WiFi, LoRa RF, Modbus PLC.

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At Smithtek PTY LTD, we want you to be completely satisfied with your purchase. If for any reason you are not satisfied, you may return your product within 30 days of delivery for a full refund of the purchase price (less shipping and handling charges).

To initiate a return, please contact our customer service department at info@smithtek.com.au.

Please have your order number and the reason for the return ready when you call. Our customer service representative will provide you with a Return Merchandise Authorisation (RMA) number, which must be included with your return. To qualify for a refund, the product must be in its original packaging and in resalable condition. Smithtek PTY LTD reserves the right to refuse a return or charge a restocking fee if the product is not returned in its original condition.

Smithtek PTY LTD will not be responsible for return shipping charges unless the product is being returned due to an error on our part. We recommend that you use a trackable shipping method and insure the package for the full value of the product. Smithtek PTY LTD will not be responsible for any lost or damaged packages.

Once we receive your return, we will process your refund within 5 business days. Refunds will be issued to the original payment method.

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Mako V2

Technical Data Sheet

Industrial **WiFi**, **LoRa RF**, **Modbus PLC**.

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Our Mission

At Smithtek, we are a proud family-run business dedicated to empowering industries, communities, and remote operators across Australia. Our mission is to deliver reliable, locally built telemetry and automation solutions that simplify how people monitor, control, and manage their assets, from water and energy to environmental systems.

Built on the values of trust, integrity, and innovation, we believe technology should be practical, transparent, and designed to last. Every product we create represents our family's commitment to quality, honesty, and hands-on support. By combining robust Australian hardware with intuitive cloud platforms, we help our clients gain real-time visibility, improve efficiency, and make confident decisions, wherever they are.

CONTACT US

Based in Western Australia

Perth 6000

T : (08) 61189176

E: Info@smithtek.com.au

W: www.smithtek.com.au

C: www.smithtek.cloud

[in https://www.linkedin.com/company/smithtek-pty-ltd/](https://www.linkedin.com/company/smithtek-pty-ltd/)



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