WP2P Digital & Analogue

User Guide

WP2P Digital & Analogue
Version 1.7

QTECH
DATA SYSTEMS

Contents

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Revision Details

1.1	June 2013	First issue
1.2	October 2019	Quick Start Guide updated to User Manual. First issue to support Rev E hardware and firmware.
1.3	January 2020	Clarification of specifications of power use.
1.4	March 2020	Addition of product code in Technical Specification
1.5	August 2020	Update current consumption & standby battery capacity notes
1.6	December 2020	Inserted "Adjustment & Settings" paragraph.
1.7	June 2021	Updated Rev E images

About This User Guide

This document provides assistance with the installation and operation of the QTech WP2P Digital & Analogue system. Included in this document is:

- How to install the WP2P Digital & Analogue modules
- WP2P repeater operation
- Device Configuration
- Device Specifications

Contact QTech for application notes, which can be obtained to provide guidance for specific configuration scenarios, detailing the configuration workflow steps.

Product overview

Wireless Point to Point (WP2P) modules can be used to link electrical devices together in situations where the physical separation or terrain between them would make direct wiring uneconomic or impractical.

The WP2P modules incorporate high speed digital radios which have a range of up to two kilometres. The modules use the integrated low power 900MHz digital radios to communicate their input state to the other module.

Each WP2P – DIGITAL & ANALOGUE module has two switch inputs, two relay outputs, one analogue input and one analogue output.

The products also support the use of a wireless repeater for transmission range extension. Each WP2P module can be battery powered with a solar powered charger or connected to a permanent supply. Radio modems should connect to a permanent supply.
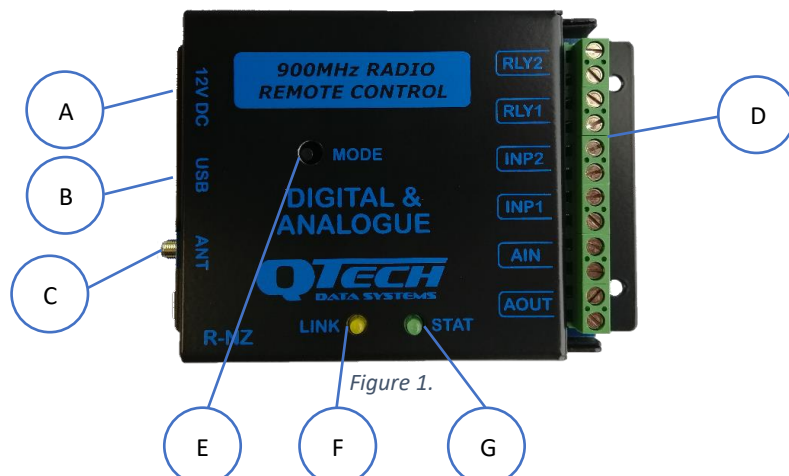
Hardware

Figure 1.

Feature	Function
A	Power Input (nominally 12 Vdc)
B	USB Type Mini B – Firmware upgrade and configuration
C	Antenna - SMA connector
D	I/O pairs (signal/ground) - RLY1, RLY2 relay contacts - INP1, INP2 digital inputs - AIN analogue input - AOUT analogue output
E	Mode pushbutton
F	LINK Indicator LED (device link communications state)
G	STAT Indicator LED (device status and power on indicator)

Features

- 2 Digital Inputs and 2 Digital (relay contact) outputs
- 1 analogue input (0-10V, or 0-20 mA loop) and 1 analogue output (0-10V, or 0-20 mA loop)
- 900MHz (FSK modulation) short range radio up to approximately 400m for local network communications. Extensible up to 4000m with high gain antenna configurations.
- Supports use of a single repeater for difficult terrain or range extension
- USB interface for diagnostics and firmware upgrades
- Solar power charging and battery operation (when supplied with QTech RSS01 Remote Solar Station enclosure)
- Firmware is field upgradeable

Digital I/O

The WP2P modules operate by copying the state of each switch input to the corresponding relay output on the other WP2P module. When a switch input is closed, the relay output on the other module will close, and when the switch is released, the relay will open again.

WP2P Module 1
Close switch contact on "INP1"

WP2P Module 2
"RLY1" closes operating light

The delay between an input activating and the corresponding output activating is normally less than 0.2 seconds (see notes). With such a fast response time, the WP2P devices can be used for flow meter pulse applications, allowing pulse rates of up to 5 pulses per second to be communicated.

Analogue I/O

The WP2P – Digital & Analogue operates by copying the analogue input value to the analogue output on the other module.

WP2P Module 1
Analogue 0-20mA signal input

WP2P Module 2
Analogue 0-20mA signal output

The analogue I/O can be configured for current loop or voltage operation. The factory default configuration is for current loop operation. The analogue I/O operates over a range of 0-20mA, which makes the WP2P – DIGITAL & ANALOGUE modules compatible with the industry standard 4-20mA range, which allows detection of an open circuit failure.

The Analogue I/O has 12 bit resolution, a stated accuracy of +/-1% FSD and is sampled at a rate of once per second.

Output Relays

The output relays (Labelled RLY1 and RLY2) are normally open contacts that are rated at maximum of 2 Amps. The relays are internally protected by solid state snubbers for operating with inductive loads.

⚠ Warning – Do not directly connect to 220V AC voltage. The New Zealand and Australian wiring regulations require that any wiring in excess of 32 volts must be carried out or be certified by a registered electrician. Consult your local electrical installer for further guidance.

Switched Inputs

The inputs (Labelled INP1 and INP2) are electrically isolated, normally open inputs. They are connected to suitable mechanical switches, contacts and other closure devices. An input is active or ON when the input switch is closed and inactive or OFF when the input switch is open.

⚠ Warning – Only mechanical switches or mechanical closure devices should be connected to the inputs. No external voltage or other electrical source is to be connected to the inputs.

WP2P Repeater Module

A WP2P Repeater Module is available to increase the range and coverage of a WP2P system. It is used in situations where the WP2P modules are a long way apart or there is an obstacle preventing line-of-sight between them.
The WP2P Repeater Module operates by listening for complete and valid WP2P messages and then re-transmitting them. It can be used with both WP2P Digital and WP2P Digital & Analogue type modules simultaneously.
Please refer to the WP2P Repeater User Manual for further details.

Preparing for Installation

Line of site communications is necessary for optimum operation of the WP2P Digital & Analogue System. When planning the installation consider the following and contact QTech for advice if necessary:

a) Consider using high gain antennas supplied by QTech for extended communications range and if communication is unreliable due to weak signal strength.
b) Consider undertaking a field radio survey to ascertain antenna requirements and identify potential radio channel interference by neighbouring transmitters.
c) If the device is to be mounted outdoors please use an environmentally protected enclosure.
d) Antenna elevation is important to obtain best performance. Ensure antennas are mounted in free space, unobstructed by solid objects.
e) Consider the use of a QTech WP2P Repeater if the terrain does not permit clear line of sight.
f) Ensure the device is operating the latest firmware especially if the device has been in storage for some time. If in doubt, contact QTech for advice.
g) Ensure that the power supply meets the correct specifications detailed herein.

Installation

Mounting

For indoor mounting, the device should be mounted onto a flat surface using the Qty 4x M4 fixing holes at ~102mm x 50mm centres. Where the device is to be operated outside or in other adverse site conditions, then, the device should be housed in an appropriate plastic enclosure.

For outdoor mounting, use the RSS01 solar charging environmental enclosure and follow the installation guide for that product. Alternatively use a minimum of IP65 rated enclosure to suit the device and any additional equipment to be housed, ensuring that all cables use suitable cable glands.

Avoid mounting in locations that may be subject to shock or vibration or temperature extremes.

⚠️ *Note – If the WP2P is to be enclosed in a metal cabinet then an optional external antenna will be needed. Please contact QTech for alternative antenna details and advice.*

Note – Solar Supplies and design considerations: Before using any device in a solar powered system please check our "Solar Application Note" on our website. Explicit consideration must be given to the maximum voltage and voltage regulation to prevent damage.

Antenna

The device is a low power device that is designed specifically for operation in New Zealand and Australia. Each unit is supplied with a stub antenna that will provide an operating range of up to 350 meters, dependent upon terrain and obstacles such as trees and buildings. All radio systems work most reliably when the path between the radios is clear "line of sight". This needs to be considered when planning longer range systems.

Optional higher gain, long range antennas are available. Please contact QTech for details and advice.

For best performance mount the antenna up high and away from large objects.

⚡ Warning – Do not operate the device without an antenna attached. Do not substitute antennas; use only those antennas recommended by your equipment supplier. Failing to comply with these requirements can damage the device. Never operate the devices in violation of RSM conditions. AS/NZS 4268:2008 specifies a maximum EIRP of 1 watt.

Input and Output Wiring

Please note the polarity of the analogue I/O connections.
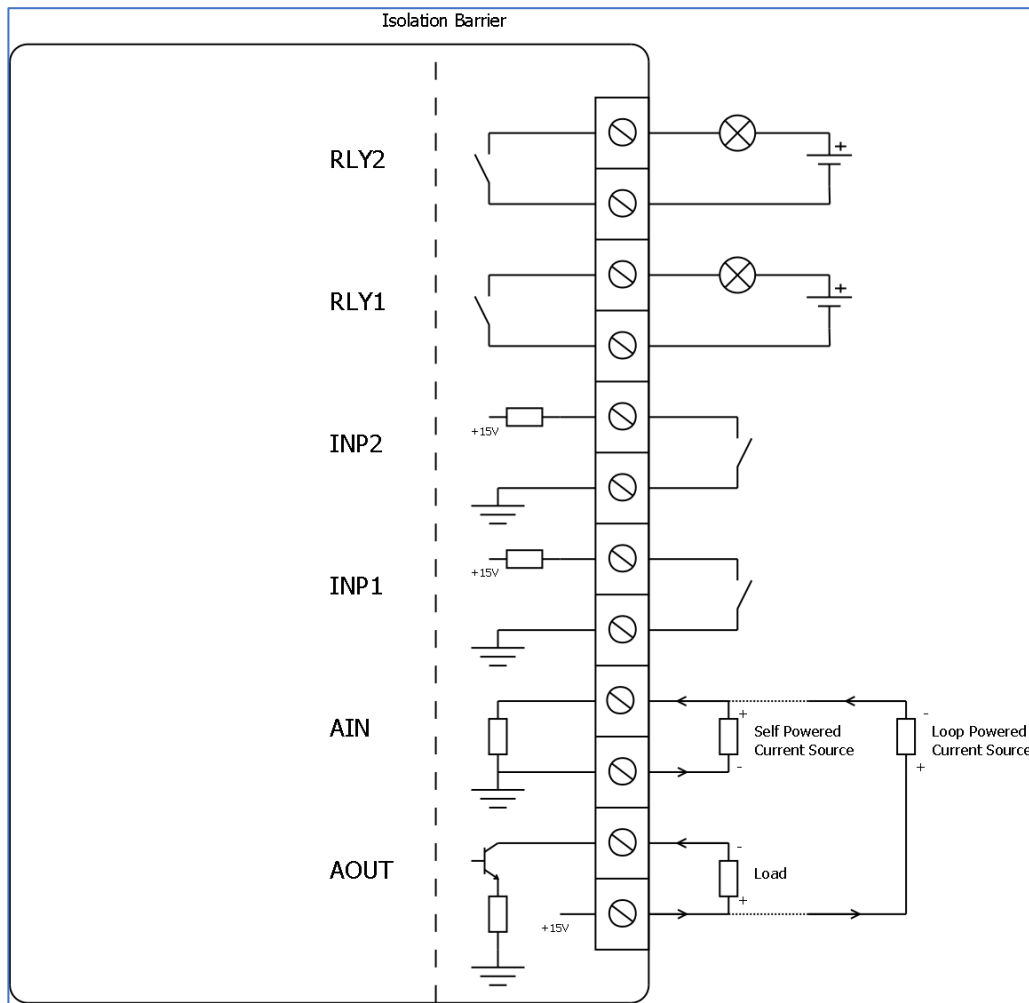
Figure 2. Wiring Diagram (WP2P MODULE-DA)

Jumper Settings

The WP2P-DA device uses internal jumpers to configure the style of analogue input or output: either voltage or current.
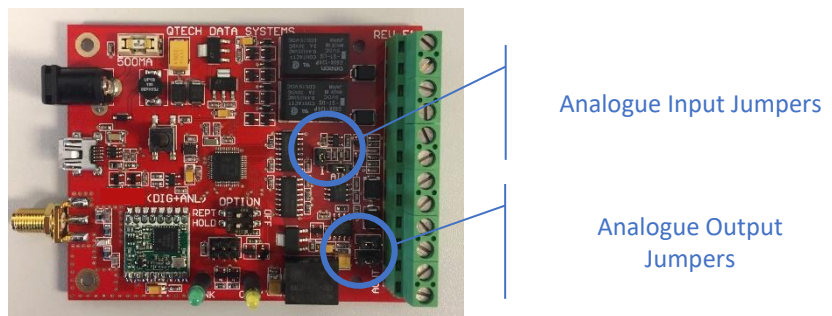

Figure 3. Analogue jumpers (WP2P-DA)

The analogue input jumpers consist of a two- pin jumper header and a three-pin jumper header designated on the board as AIN. The analogue output jumpers consist of two three-pin jumper headers designated on the board as AOUT.

Use the following table to determine Analogue settings:

Function	Settings
0-10V analogue Input	- Remove the jumper from the 2-pin header - Insert the jumper in the three-pin header at the end marked "V"
0-20 mA analogue input	- Insert the jumper in the two-pin header - Insert the jumper three-pin header at the end marked "I"
0-10V analogue output	- Insert both the jumpers in the three-pin headers at the end marked "V"
0-20 mA analogue output	- Insert both the jumpers in the three-pin headers at the end marked "I"

Power Supply Notes

Power Supply

The WP2P MODULE operates from a nominal 12 Volt DC power supply.

The power connector is a 2.1mm DC Socket, centre pin positive. The supply voltage should be clean, continuous and transient free with an output of 12 Volts +/- 1.5 Volt DC. The WP2P-DA incorporates reverse and overvoltage protection.

The absolute maximum supply voltage is 13.8 V DC and any solar/battery design needs to take this into account.

⚠ Warning – Do NOT use Switch Mode Power Supplies (SMPS) with this product. The DC power supply used for this product MUST have a grounded negative or be a "linear" transformer-based plug pack. The reason is that the antenna, programming port and external connections can provide exposed earth points and the SMPS can impose an AC voltage on the DC ground, which can lead to damage. Suitable cost-effective plug packs are available from QTech P/N PD5412, PD5413 & PD5414.

Internal Fuse

The device is protected by a 20mm x 5mm 500mA fast blow fuse. This is located on the internal circuit board. To access the fuse, remove the top cover by carefully prizing it off its retaining dimples. Only replace the fuse with an identical type, do not use alternatives. This fuse will blow if the power supply maximum voltage is exceeded.

Over Voltage Protection

The device is over voltage protected by a 13 Volt Zener Diode 'crow bar' that will conduct and blow the internal fuse for voltages >14 volts. The device will tolerate 13.8 volts but will begin to draw excessive current and blow the fuse at input voltages >14.6V.

Current Consumption & Standby Battery Capacity

Solar systems utilising a solar charged battery backup facility are provided by the RSS01 or RSS02 product. For systems where a custom solution is sought then the power consumption of the device in different operating modes can be used to calculate the required standby battery capacity.

Average current consumption is ~42mA, which can be used as a guideline to assist with standby battery capacity calculations. Note Analogue outputs in current mode use 20 mA to service a 4-20 mA loop interface.

Adjustments & Settings

There are two DIP switches labelled "OPTION" that allow configuration options for each WP2P to be set.
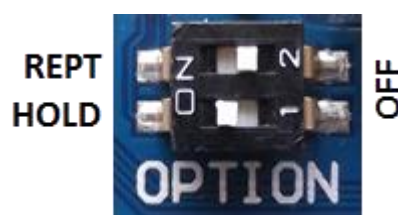
HOLD switch: Output Relay Configuration
- "ON" The outputs will retain (HOLD) their current state if the communication link between the WP2P pair is lost.
- "OFF" The outputs will return to the open (OFF) state after 30seconds if the communication link between the WP2P pair is lost.

Once the communication link is re-established the outputs will update to reflect the current input states of the other module.

REPT switch: Repeater Configuration
- "ON" The WP2P is to be used with a repeater.
- "OFF" The WP2P is to be used without a repeater.

⚠️*Note* - **Both W2P modules in a pair must have the same REPT switch setting.**

Radio Address (RA)

All WP2P systems have a unique "radio address" which is programmed into WP2P modules during manufacture. The radio code is represented and specified in the following format "192.168.0.0", it is a security measure to prevent unauthorised users.

⚠️**Note – All WP2P modules in a system must have the same first three numbers in their "radio address" and the 4th number must be a sequential pair starting from the even number e.g 0.1.1.40 & 0.1.1.41. The code is on the rear of WP2P modules. The radio code must be stated for purchasing for WP2P module replacement.**

Using Multiple WP2P Systems in the same area

There are ten individual frequency bands referred to as "Channel numbers" allowing up to ten WP2P systems to be used in the same location. The "Channel number" is identified by the "#" on the packaging label; this example is "Channel #1".

⚠️ **Warning – Do not use the same channel for adjacent systems. For example, if you currently use "#1" ensure the adjacent system is "#3" etc.**

Operation

Operational notes – How do the modules communicate?

The WP2P modules use an "event driven" approach to communications. When the state of any input changes the WP2P module will immediately communicate that change to the other WP2P module. This approach results in very fast response times.

If the communications link between a pair of WP2P modules goes down (for example if one of them loses power), then the relay output state of the on module is maintained at the value it was prior to the link going down.

In addition to the switch input state change message and the keep-alive message, the WP2P – DIGITAL & ANALOGUE modules will send a message when their analogue input value has changed by greater than 2.5%FSD since the last time it sent any message. (2.5%FSD is 0.5mA for a current loop configured module). This means that for a very fast changing analogue input value, the corresponding output will be always within 2.5% of the input value. Then, when the module sends a keep-alive message or a switch change message, the current analogue input value is also sent, so the output value will be equal to the input value.

When the WP2P modules detect a change of their input state, they will immediately transmit a message to the other module. There is a very small chance that another WP2P module on that channel also wanted to send a message at exactly the same time. This will result in a "collision", but the WP2P modules can detect that a collision has occurred and will then use a collision avoidance scheme to retransmit their messages.

STAT Indicator

The STAT indicator (marked as "OKAY" on the PCB internally) indicates the current operational status of the device. It provides a heartbeat indication that the device is operating ok, or it displays a coded error indication for faults.

Faults may be latched so that the device remains indicating an error condition even if the fault has been removed. In this way the device can be reviewed later to show that a problem had occurred.

Pressing the mode switch briefly will clear the error condition indication on the STAT led. If the fault is still present, then the STAT LED will redisplay the error condition.

Code	Meaning
1 short flash, 2s interval	Normal operating mode, Processor running, no active errors
2 short flashes, 2s interval	Unspecified intermittent communications fault. A communications failure as occurred recently.
~4 Short flashes on power up	Indicates the device booting after power up or watchdog reset. LED should usually then display normal operating mode indication.

LINK Status Indicator

WP2P modules have a Link status LED which is located next to the power connector.
This is to assist with site diagnostics and checking by indicating the state of the communications link between pairs of WP2P modules.
The Link light functions as follows:
- OFF – Module failure, no power, fuse blown, circuit failure, etc.
- SLOW FLASH – Module functioning but no communication with its partner module.
- ON – Healthy wireless communications. The LED will briefly flicker each time it receives messages from the other WP2P module.

Link Status indicator is based on the "keep-alive" message the WP2P modules send if it has been longer than 30 seconds since they last sent a message. Therefore, if one of the modules is turned off, then it will take no longer than 30 seconds for the other module to detect that the link is down and begin flashing the Link Status LED. If the connected I/O is changing more frequently than once every 30 seconds, then they don't need to send keep-alive messages.

MODE Pushbutton Switch

Pressing the mode switch briefly will clear the error condition indication on the STAT led. If the fault is still present then the STAT LED will redisplay the error condition.

Technical Specifications

Note. Specifications are subject to change without notice.

Item	Parameter	Specification
General		
	Product Code	PD8812E-WP2P-A (pair of WP2P Digital & Analogue modules)
	Dimensions	Approx. 112 x 76 x 26 mm Mounting holes 4 x M4
	Weight	250 gm
	Temperature	Operating: 0-65 degrees C Storage 0-65 degrees C
	Humidity	0-90% non-condensing
	Ingress Protection	IP20 Water contact must be avoided
	Power	Input voltage: 12V (13.8V max) Current: 42mA average Internal 500mA fast blow fuse
	I/O	2 x digital inputs, electrically isolated with internal pull-up resistor 2 x relay outputs, normally open, 2A max 1 x Analogue input, 0-10V or 4-20 mA jumper configurable, (ADC 12 bit +/- 1% FSD) 1 x Analogue output, 0-10V or 4-20 mA, jumper configurable
	Indicators	STAT – operational status and power LINK – communications link activity
	Pushbutton	Operating Mode switch
Radio	Regulatory	ISM band, AS/NZS 4268
	Antenna	Detachable SMA
	Operating Frequency	917 – 927 MHz
	Output power	20 dBm max. →100mW
	Modulation	GFSK
Communications		
	USB	USB 2.00, Type Mini-B connector Interface (configuration and firmware upgrades)

Warranty

The hardware and software for this product is covered by the QTech Limited Warranty Agreement and software End User License Agreement, respectively.

Please refer to the QTech Limited Product Warranty Agreement, which may be downloaded from the QTech website: www.qtech.co.nz

QTech Data Systems Limited does not warrant the suitability of this product for any particular application as the conditions in which it is used are beyond our control. This is not withstanding warranty of merchantability.

Additional Information and Support

If you have problems, try the following:

- Visit the QTech web site for application notes and guides
- Refer to the troubleshooting section if one is present in this document
- Contact the support desk at support@qtech.co.nz
- Phone the support desk, contact details at beginning of this document