Multi Point Controller

User Guide

Multi Point Controller
Version 1.3

QTECH
DATA SYSTEMS

Contents

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Revision Details

1.0	August 2012	Initial issue
1.1	June 2016	Updated Workbench section
1.2	March 2019	Updated format
1.3	April 2021	Updated to support WP2P Revision E hardware & 1W radio

Introduction

The QTech Multi Point Controller (MPC) is a central controller that communicates with up to eight Digital WP2P (wireless point to point) modules over a range of several kilometres.

It has an adaptive mapping feature that allows any of the inputs and outputs to be mapped to any module in the system.

The Multi Point Controller forms the communication hub of a star topology network, which allows WP2P modules to communicate with each other with communications being routed via the Controller.

The flexibility of the I/O mapping technique provides a "one to one", "one to many" or "many to one" relationship between the I/O.

Setup and configuration of the Multi Point Controller is via "QTech Workbench", a user-friendly PC application. Setup can be performed "offline" allowing you to pre-configure Controllers. These configurations can then be saved and printed for future use.

Overview

Figure 1: Multi Point Controller with stub antenna

Each Multi Point Controller (P/N PD8620) is supplied with the following:
  1x Multi Point Controller Module
  1x Antenna (stub type), 2dBi gain (P/N PD9230)
  1x USB (Type A-B) Programming Cable 1m (P/N CB-USB-AB)

⚠ Note - The required WP2P modules (P/N PD8810E), power supplies and alternate antennas are all ordered separately.

Getting Started

Antenna

The device is a low power device that is designed specifically for operation in New Zealand and Australia. The supplied stub antenna (P/N PD9230) should be suitable for ranges of up to 350m and where the Controller is in a non-conductive enclosure (plastic etc).

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.

Antenna Connection

Carefully connect the antenna.

For best performance mount the antenna vertically, as high as possible 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.
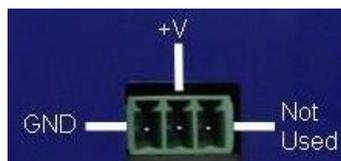
⚠ *Note – If the Controller is to be enclosed in a metal cabinet an optional external antenna will be required.*

⚠ *Note – Do not cut or join the coax cable, this will increase losses and impact reliability.*

Power Supply Connections

Multi Point Controller

The Multi Point Controller is powered from an external 12-24 V DC supply.

Connect the supply to the power connector, positive to the "+V" terminal, negative to "GND".
The third terminal on the right is not used.
We recommend the QTech plug pack P/N PD5412.

WP2P Modules

Each WP2P operates on a 6-24 Volt DC supply. Current consumption is around 6mA. The power connector is a 2.1mm DC Socket, centre pin positive. The supply voltage should be clean, continuous, and transient free. The WP2P incorporates reverse and overvoltage protection.
We recommend the QTech 12 volt plug pack P/N PD5412.

⚠ *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.*

QTech Workbench Software

The QTech Workbench configuration software is available for download at www.qtech.co.nz. QTech Workbench requires the Microsoft. NET framework version 2.5 or later, to be installed on your computer as a prerequisite.

Installation

This will install the Workbench software in your Program Files folder, create a desktop shortcut and install the required USB driver.
Power up the Controller and connect it to the PC using the supplied USB cable (type A to B). Windows should automatically detect the device and install the correct drivers. Windows will notify you when the device is ready to use.

⚠️ *Note – v2.8 or above of QTech Workbench is required for Multi Point Controller*

Workbench

This is where the configuration of the Multi Point Controller takes place. There is no configuration required for the WP2P modules.

Offline and Online Configuration

Offline - Workbench can be used to prepare and save configurations without being connected to an MPC. To configure an MPC Offline, click device type and select Multi Point Controller as below:
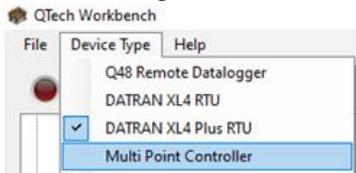
Workbench will show you are Offline by a red indicator at the top of the page

Online – This is when you connect Workbench to a powered up MPC. Workbench will automatically detect that you are connected to an MPC. You can now make changes to the module or load configurations that were prepared Offline.

Workbench will show you are Online by a green indicator at the top of the page

Workbench has several categories shown at the top left of the screen, the following is an overview of the options.

Overview Category

Number of WP2P Slave Modules

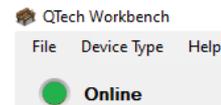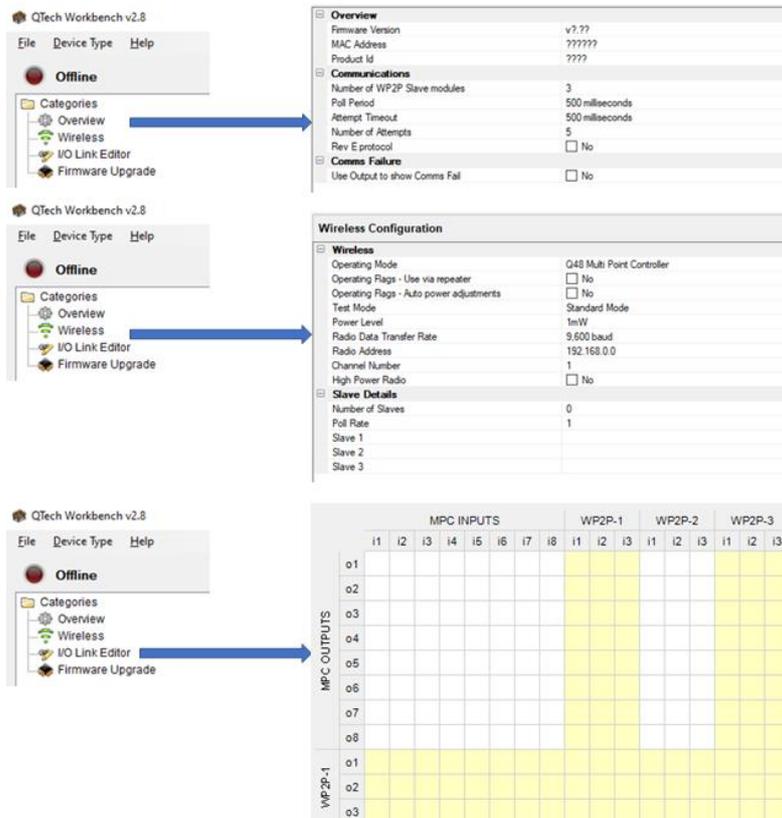This is where the number of WP2P modules in the Multi Point Controller system is defined. There can be a maximum of eight modules.

Ideally, the number of modules is defined when the system is purchased so QTech can preconfigure them. However, additional modules can be added later. Please note that all the modules in a Multi Point Controller are specifically configured at QTech, normal WP2P modules cannot be added to a Multi Point Controller system.

Each WP2P module is labelled with both a unique serial number and a radio address in the format "192.168.0.0".

All modules in a system must have the same first three numbers in their radio address. The 4th number of the radio address represents the *module ID* where the Multi Point Controller is always *module ID* "0" and the slaves are "1", "2", etc.

⚠️ *Note – All WP2P modules for a Multi Point Controller system are specifically configured at QTech. WP2P modules from a WP2P system cannot be added.*

There are twenty individual frequency bands referred to as "Channel numbers". The "Channel number" is identified by the "#" on the Multi Point Controller packaging. In the image below, 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.

Poll Period

All the configured WP2P modules are polled in sequence to synchronise their I/O. The *Poll Period* specifies the time duration between the start of each polling sequence. The poll period is specified in milliseconds. This setting is important as it defines the worst-case latency between activating a given digital input and the corresponding digital output activating. With a shorter Poll Period the I/O is scanned more frequently, but there is a downside in that there will be more radio traffic.

⚠ *Note - The specified Poll Period value must satisfy the following relationship: poll period > number of slaves x number of attempts (retries) x attempts (retry) timeout.*

Attempt Timeout

When the Controller polls a given WP2P it waits, listening for a reply before communicating with the next WP2P module in the sequence. The Attempt (retry) Timeout specifies how long the Controller will wait for the reply. Depending on the application and quantity of modules, 500ms (0.5 seconds) should be a good starting point.

Number of Attempts

The Number of Attempts (retries) setting specifies the number of times that the Controller will transmit a poll to a given WP2P module before determining that communications with that module has failed. For each communications attempt, the Controller will wait for the Retry Timeout before re-attempting. Once the specified number of retries has been reached the Controller will determine that it cannot communicate with that WP2P module and will move on to the next WP2P module in the sequence.

Example – If we have a Multi Point system with three WP2P modules, the default settings are:
Poll Period: 5000ms, Retry Timeout: 500ms, Number of Retries: 3.

i.e., Every 5000ms (5s) the controller will poll each of the WP2P modules in sequence. The WP2P modules must provide a reply within 500ms of being polled. If a reply from a specific WP2P module is not received within 500ms, the Controller will attempt another 2 times each separated by 500ms. If the WP2P module does not reply the Controller will move on to the next WP2P module and flash the "ERR" LED to indicate which WP2P module.

The absolute minimum poll period is 4.5 seconds, but we recommend 5 seconds to cater for worst case conditions.

Rev E Protocol

This new feature has been introduced for compatibility with a new communication protocol. Revision E WP2P modules are easily identified as they have a blue text label and the MODE push button, as shown below:

Revision E WP2P Module – Blue Printing   Earlier WP2P Module – White Printing

Earlier revision WP2P modules, with white printing, can be used in the same MPC system as Revision E WP2P module but a firmware upgrade is required. This upgrade can only be performed at QTech. Please contact us for further details.

If you are using older revision WP2P modules, then do not select Rev E Protocol in Workbench.

Comms Failure Option

An output on the Multi Pont Controller can be configured to activate when any of the slave modules have a communications error. The configured output will return to the OFF state once communications are restored to all WP2P slave modules.

⚠️ **Note – The red "ERR" status LED on the Controller will flash to indicate a communications error. The number of flashes represents which WP2P module the Controller couldn't communicate with. e.g. if ERR flashes two times, the communications to WP2P module 2 has failed.**

Wireless Configuration Category

High Power Radio

This new feature is support for the latest 1W radio hardware.

This option is set to Yes during production for compatible modules – do not change this setting.

New MPC modules are factory configured to allow power output settings of 120mW to 1W.

Operating Flags – Use via a Repeater

Repeaters are not currently supported for MPC systems.

Inside each of the Revision E WP2P modules there is a configuration DIP switch labelled REPT for using a repeater. This only applies when the WP2P modules are used in a regular WP2P system. When used with an MPC the DIP switch labelled REPT must be in the OFF position.

I/O Link Editor Category

The I/O Link Editor is a versatile and powerful way of setting what I/O does what and where in the system.

Simply click in each box in the I/O grid to define the system I/O mapping.

The yellow shading is provided to help navigate between modules and has no effect on functionality.

⚠️ **Note – For ease of use please maximise this window on your PC. This will allow you to view and manage seven WP2P devices on a 1280x1024 screen without scrolling.**

I/O Link Editor – Example 1 – Simple

In this example, when the switch wired to input 1 of the Multi Point Controller is closed, the following happens:

Multi Point Controller Output 1	On
WP2P Module 1 Output 1	On
WP2P Module 2 Output 2	On
WP2P Module 3 Output 3	On

The "Summary" pane on the right-hand side shows a confirmation of the mapping.

I/O Link Editor – Example 2 - Advanced

This example is more sophisticated and shows that each WP2P module can essentially communicate with each other, with communications via the Controller.

		MPC INPUTS								WP2P-1			WP2P-2			WP2P-3		
		i1	i2	i3	i4	i5	i6	i7	i8	i1	i2	i3	i1	i2	i3	i1	i2	i3
MPC OUTPUTS	o1									x								
	o2												x					
	o3															x		
	o4																	
	o5																	
	o6																	
	o7																	
	o8																	
WP2P-1	o1									x								
	o2												x					
	o3															x		
WP2P-2	o1									x								
	o2												x					
	o3															x		
WP2P-3	o1									x								
	o2												x					
	o3															x		

Summary

WP2P-1:Input 1 -> MPC:Output 1
WP2P-2:Input 1 -> MPC:Output 2
WP2P-3:Input 1 -> MPC:Output 3
WP2P-1:Input 1 -> WP2P-1:Output 1
WP2P-2:Input 1 -> WP2P-1:Output 2
WP2P-3:Input 1 -> WP2P-1:Output 3
WP2P-1:Input 1 -> WP2P-2:Output 1
WP2P-2:Input 1 -> WP2P-2:Output 2
WP2P-3:Input 1 -> WP2P-2:Output 3
WP2P-1:Input 1 -> WP2P-3:Output 1
WP2P-2:Input 1 -> WP2P-3:Output 2
WP2P-3:Input 1 -> WP2P-3:Output 3

Multiple links can be configured for any input or output anywhere in the system.

In this example the following happens:
Input 1 of WP2P module 1 is closed:

Multi Point Controller Output 1	On
WP2P Module 1 Output 1	On
WP2P Module 2 Output 1	On
WP2P Module 3 Output 1	On

Input 1 of WP2P module 2 is closed:

Multi Point Controller Output 2	On
WP2P Module 1 Output 2	On
WP2P Module 2 Output 2	On
WP2P Module 3 Output 2	On

Input 1 of WP2P module 3 is closed:

Multi Point Controller Output 3	On
WP2P Module 1 Output 3	On
WP2P Module 2 Output 3	On
WP2P Module 3 Output 3	On

The "Summary" pane on the right-hand side shows a confirmation of the mapping.

⚠️ **Note – Save the Configuration. Please remember to save the configuration and/or press "Print" to provide you with a paper copy of the I/O mapping. These should be kept for future reference.**

Inputs and Outputs – Multi Point Controller

Digital Inputs

The digital inputs are normally open inputs that can be 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. The digital input LED will light up when the input is ON.

⚠️ **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.**
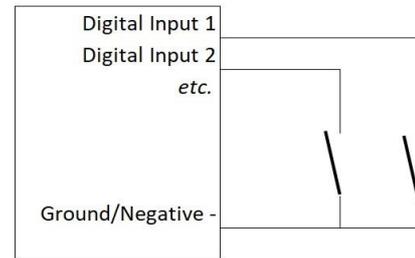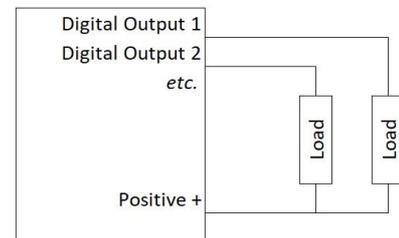
Digital Outputs

The digital outputs are solid state devices designed to interface to low power relays. The module turns a Digital Output on by switching the terminal to the power supply Ground.
The Digital Output LED will light up when the Digital Output is ON.

The Digital Output channels can switch 1 amp at up to 26.5 volts. However, the maximum current available to drive all eight interface relays is 1.5A. Output voltages are clamped to 65 volts during inductive switching. The voltage into a Digital Output channel when the channel is OFF is also clamped to 65 volts, which eliminates the need for reversed biased diodes across inductive loads.

To use a Digital Output with a relay, wire as shown in the diagram to the right. We suggest relays with a current of ~50mA.
The Digital Outputs have a Hold function if communication link to WP2P modules is lost. The outputs will retain their state. This is not configurable for the Multi Point Controller digital outputs.

Analogue Inputs and Outputs

The analogue inputs and outputs on the Controller are not used for communicating with WP2P modules. Do not connect any signals to the analogue inputs or outputs.

Inputs and Outputs – WP2P Modules

Digital Inputs

The inputs (Labelled INP1, INP2 and INP3) 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.*

Digital Outputs - Relays

The output relays (Labelled RLY1, RLY2 and RLY3) are normally open contacts that are rated at maximum of 2Amps. The relays are internally protected by solid state snubbers for operating with inductive loads.

⚠ *Warning – 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.*

Digital Outputs – Hold Option

Inside each WP2P module, there are two DIP switches labelled "OPTION" that allow configuration options for each of the WP2P modules.
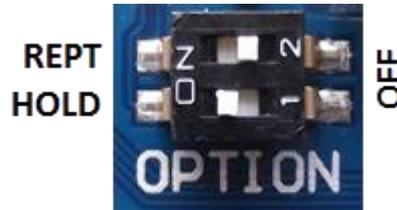
HOLD switch: Output Relay Configuration

- "ON" The outputs will retain (HOLD) their current state if the communication link to the WP2P module is lost.
- "OFF" The outputs will return to the open (OFF) state after 30seconds if the communication link to the WP2P module is lost.

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

The HOLD function applies to all outputs on a WP2P module. Each WP2P modules in a system can be configured differently to allow flexibility.

The REPT switch is not used for MPC systems and must remain in the OFF position.

Status LEDs

| PWR	(blue)	This LED is on when the device is powered on
OK	(green)	Flashes to show the device is active
ERR	(red)	This LED flashes a number of times to indicate any errors
COMS		Not Used
RXD	(orange)	Flashes when a reply has been received by the Controller
TXD	(orange)	Flashes when a poll has been sent to a WP2P module

Trouble Shooting and Tips

Symptom	Cause	Solution
Blue power status LED not blinking when power applied	Blown fuse	Replace internal fuse. Use only 2 Amp quick blow type
	Insufficient power supply voltage	Check supply and provide suitable power supply
The red ERR indicator flashes	The Controller cannot communicate with one or more of the WP2P modules	Count the number of flashes, this refers to which WP2P module, ie two flashes refers to WP2P module number 2
The I/O is not responding fast enough	Incorrect setting of the poll setting in Workbench	Decrease the Poll Period
I am having comms failures on a particular slave	Likely to be radio signal strength or line of site obstructions	Use a directional antenna at the slave pointing back to the master and check the two sites can "see" each other clearly

⚠️ *Note – Adding extra Modules to an existing system. To achieve this please order the additional modules from QTech quoting the original project/invoice details. Workbench software can then be used to change the number of modules in the system.*
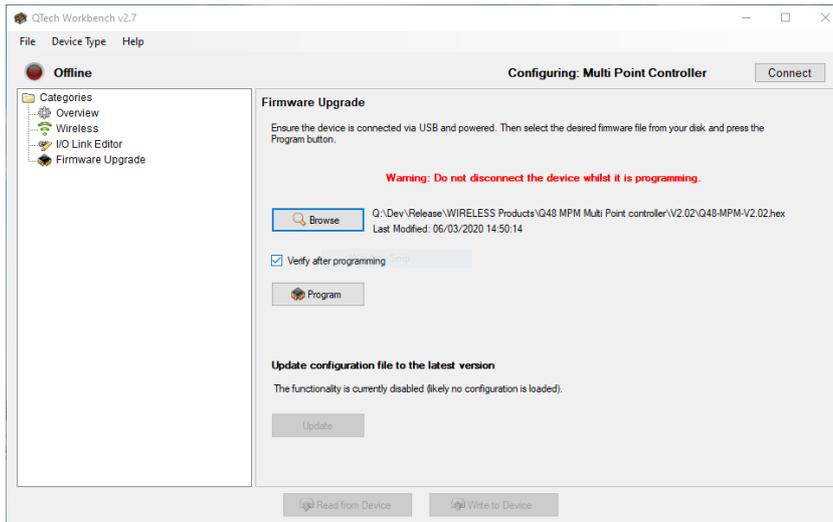
Firmware Upgrade

- Remove the top cover from the device and unplug the power connector.
- The top cover is retained by four dimples. To remove the cover, prize it upwards evenly at one end.
- Locate the two jumpers labelled I.S.P. behind the USB connector as highlighted in the photograph below.

- Ensure that both "ISP" jumpers are installed as shown in the above photograph.
- Replace the top cover, ensuring that it is properly aligned and has snapped back into place on the 4 dimples.
- Reconnect the power cable and repower the device.
- Connect the USB cable between the laptop and the WP2P Multi Point Controller.
- Run the QTech Workbench software.
- From the **Device Type** menu select **Multi Point Controller**
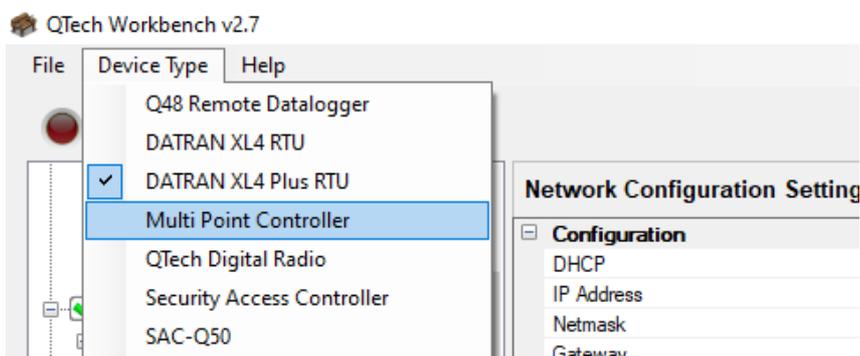
- Select the **Firmware Upgrade** task from the left-hand side window.

- Press the **Browse** button to select the firmware file provided by QTech. This will have a ".hex" extension (you may need to unzip the file if it has been provided to you in ".zip" format).
- Press the **Program** button to upgrade the firmware. The progress will be shown during the reprogramming process, and it will take several minutes.
- Once programmed, remove the top cover again and remove the ISP jumpers.
- The top cover can now be put back on, and the power and IO cables reconnected. This completes the firmware upgrade process.

Technical Specifications

Note. Specifications are subject to change without notice.

Multi Point Controller Specification

Item	Parameter	Specification
General		
	Dimensions	Approx. 186 x 120 x 40 mm 4 x M4 fixing holes at 177 x 84mm centres
	Weight	650 gms
Enclosure		
	Material	Case: 1.5 mm mild steel
	Finish	Powder coated with front panel decal
Environmental		
	Temperature	Operating: 0-65 degrees C Storage 0-65 degrees C
	Humidity	0 -90% non-condensing
	Ingress Protection	IP20, Water contact must be avoided.
Electrical		
	Power	Input voltage: 12-24V +/- 5%, 30 Vdc Max. Current: nominally 85 mA @12V, 250 mA Max (when specifying external PSU) 3 pin screw terminal Short circuit and reverse polarity protection
	Display	1 led per digital and analogue input and output to indicate status 6 device and communications status LEDs
Radio	Regulatory	ISM band, AS/NZS 4268
	Antenna	Detachable SMA
	Operating Frequency	915 – 928 MHz
	Output power	1W (30 dBm) Max.
	Modulation	GFSK
	Performance	Indoor/Urban line of sight up to ~350M (supplied stub antenna) Outdoor line of sight up to ~2km (Optional 3dB Whip antenna) Outdoor line of sight up to ~4km (Optional 9bB Yagi antenna) **Distances are indicative only (terrain dependent)**
Interfaces		
	Digital Inputs	8 signals, normally open close to activate, common ground Input voltage: 30V max. Input Current: 4 mA Gnd inputs are internally tied to power ground
	Digital Outputs	8 signals, solid state, active low output can be connected to common +V rail Max load 26.5V, 1A per individual output 1.5A Max. total for multiple switched outputs
Communications		
	USB 2.00	Device management and configuration via dedicated software by QTech

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 in this document
- Contact the support desk at support@qtech.co.nz
- Phone the support desk, contact details at beginning of this document