

Quarch Technology Ltd
Torridon 4-Port Array Controller
Technical Manual

For use with:

QTL1461 - Torridon 4-Port Array Controller



Change History

1.0	19th October 2011	DRAFT manual for early preview
1.1	9th November 2011	First full manual release
1.2	29th November 2011	Added correct connection diagrams
1.3	8th July 2015	Updated to new style manual
1.4	12 th August 2016	Removed PoE, as not fitted

Contents

Quarch Technology Ltd.....	1
Torridon 4-Port Array Controller	1
Technical Manual	1
Change History.....	2
About This Manual	6
Scope and the Purpose	6
Product overview	7
Front Panel	7
Back Panel	8
Standard Accessories.....	9
Technical Specifications	10
Usage and Safety	10
Power Requirements.....	10
Mechanical Characteristics:.....	11
Introduction	12
Features.....	13
Product Versions.....	14
Basic Concepts	15

Control interfaces.....	16
Controlling the Module.....	17
Serial Control.....	17
Serial Settings	17
Ethernet Control	18
Telnet.....	18
ReST Control	18
USB Control	19
Command Set.....	20
Basic Commands	21
General Setup Commands.....	22
Addressing Commands.....	24
Ethernet Commands	26
Commands to Attached Devices	28
Addressing a single module.....	28
Addressing a range of modules	28
Addressing a list of modules	28
Chaining Array Controllers	29
Voltage Measurements	30
Default Startup State.....	31



Appendix 32

 Customer Support..... 32

 Software Updates and Drivers..... 32

 Documentation..... 32

About This Manual

Thank you for your purchase of this Quarch Module. This manual is intended as a technical reference, describing the features, operations and control API of the unit.

Additional documents available include Quick Start Guides, Datasheets and Application notes.

Scope and the Purpose

This manual provides the following:

- An overview of the QTL1461- 4 Port array controller.
- General description of the module and its features.
- Accessories and additions
- Details of its control interfaces.
- Full command spec. including example commands to the attached modules.
- Where to find additional help.

Product overview

The Controller is a simple contained unit, with an external PSU.

Front Panel



Module Ports: There are 4 ports on the front numbered 1-4, which allows control of up to four Torridon compatible modules.

Back Panel



- 12v:** 2.1mm Centre Positive Jack. For use with the supplied 12V PSU.
- PoE / LAN:** For Control via a 10BASE-T network. Also supports PoE.
- USB:** For control via a USB connection.
- RS232:** RJ45, for control via a USART Serial port (Wired as RS232D). Also used in chaining as the input from the previous module's link out port. Green LED indicates a link is made and will occur when the first data is received by the unit. Orange LED will flash to indicate that the data is being transferred.
- LINK OUT:** RJ45, Chaining port to connect to next array controller, allowing the test system to be extended.

Standard Accessories

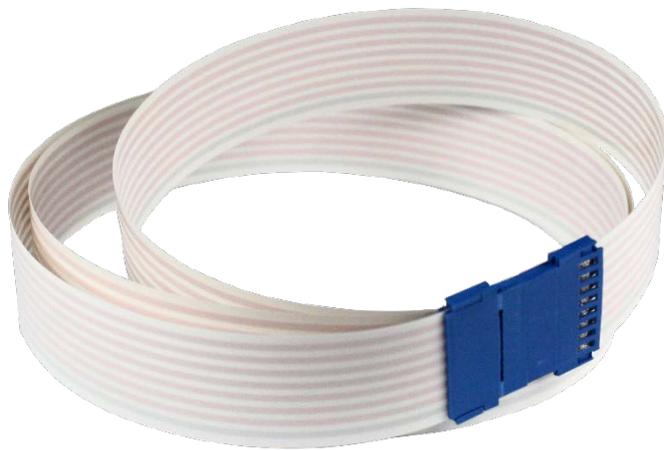
QTL1968 – 1U (Front) Rack Mount kit



QTL1855 – 1U (Rear) Rack Mount Kit



QTL1381 / QTL1382 / QTL1581



100cm / 200cm / 300cm Torridon Extension Cable

Technical Specifications

Usage and Safety

This device is part of the 'Torridon System'. The separate 'Torridon System Manual' contains important information regarding usage and safety that apply to all parts of the Torridon System. This Product is intended for use by experienced technical users in a test lab environment. You should ensure you are familiar with this information before using this device.

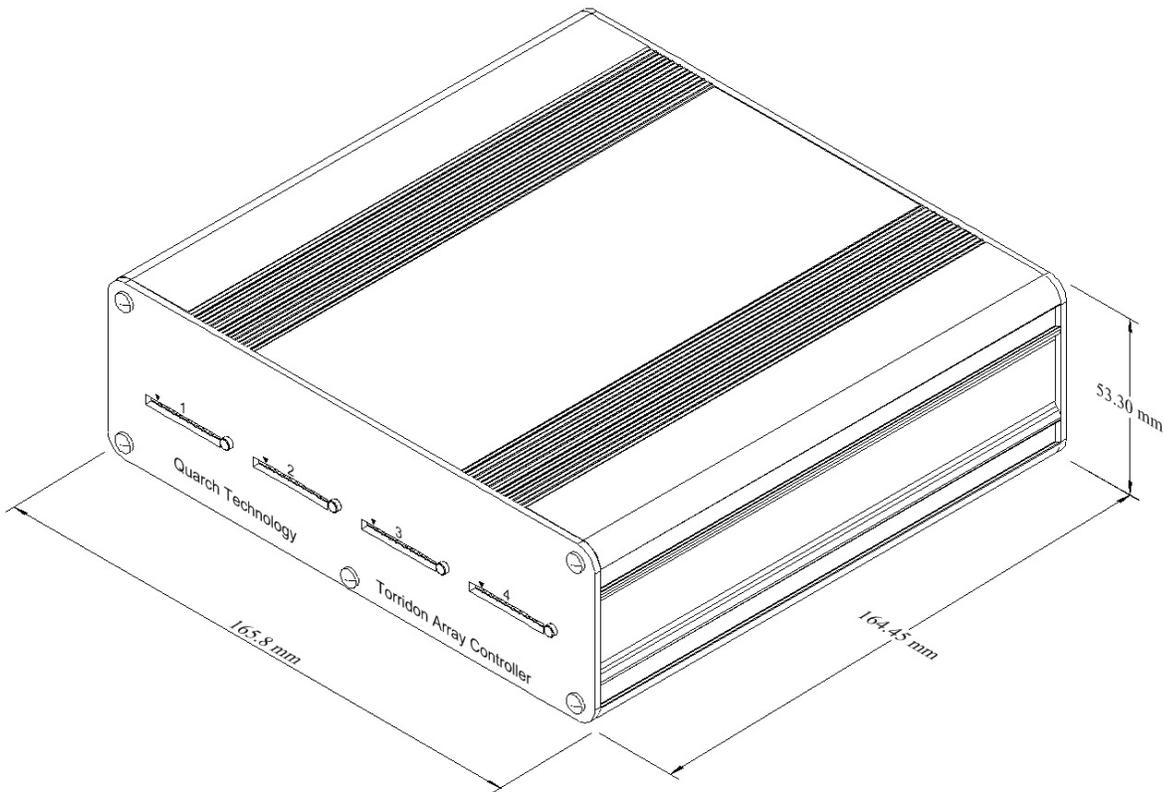
Power Requirements

A 12v DC supply is provided to power the Array Controller. The Array Controller supplies power to attached Control Modules.

The Array Controller is internally fused (auto resettable) and current limited. Only original Quarch manufactured or approved control modules should be used with the system.

Mechanical Characteristics:

The figure shows the mechanical dimensions of the QTL1461 4 Port Array Controller



Introduction

The Torridon 4 Port Array Controller - QTL1461, allows centralized control of up to 4 Torridon Modules. Any module with a Torridon interface cable may be used, these include:

- Drive Modules
- Cable Modules
- Card Modules
- SSB Canister Modules
- Power Margining Modules
- Switch Modules

The Array Controller provides a simple terminal interface to the user, single commands or entire scripts can be sent concurrently to any number of attached Control Modules.

The operation of the Array Controller is almost transparent to the user. If you are upgrading from control via Interface Kits then there are minimal changes required to the command structure. Existing control scripts can be easily modified to work with the new system.

Control of modules is via Serial, Telnet, ReST or USB. The same commands are used in each case.

Multiple Controllers can be chained to provide a larger number of control ports.

Features

- Controls multiple modules at the same time
- Cascadable: multiple Array Controllers can be linked in series¹
- Multiple control options (USB, Serial and LAN)
- Simplifies cabling requirements
- LED indicators of Control Module status
- Updatable and future proof
- Integrate easily with the existing automated test set up.
- Soft addressing allows renumbering of ports to match your system layout
- Rack mountable, with additional rack kit.

¹ 4 port and 28 Port arrays (QTL1079) can be chained together in any order, but 'soft mapping' cannot be used in this case.

Product Versions

Product Version	Circuitry	Changes
QTL1461-02	-	Initial Version
QTL1461-03	-	Minor changes in components
QTL1461-04	RS232 Isolation Added	Improved protection against voltage spikes, surges, ground loops.
QTL1461-05	-	Altered front panel, reducing the possibility of the user mis-plugging a module.

Basic Concepts

The main purpose of the Array Controller is to route commands to one or more Control Modules; this is achieved through an address suffix. The Array Controller itself accepts a number of commands which are described later in this manual.

To send a command to an attached Control Module, append the port number of the device. And you will receive a response from each port.

For example, to send a 'power up' command to a module on port 1

run:power up <1>

To send the command to a range of ports:

run:power up <1-4>

A combination of lists and ports is also allowed. For example

run:power up <1,2,3-4>

For larger test systems, an RJ-45 patch cable can chain two QTL1461 controllers together to give an 8 port controller. The module can now be addressed as 1-8.

The same command/control method is used, regardless of the choice of USB/Serial/LAN control.

Control interfaces

The 4 Port Array Controller has three physical ports:

- USB
- Serial
- Ethernet

Which supports following communication:

Native USB

The USB 2 Port requires Torridon USB drivers on windows, or the LibUSB driver if you are developing your own code. You can either communicate with the QTL1461, or direct to the attached modules via the internal USB hub (required modules that support USB control).

Serial

RJ45 (RS232D), Serial control in. Allows direct Serial Control of the array controller from a PC or terminal server.

Ethernet

This 10BASE-T port can link into your network and supports NetBIOS and DHCP.

Controlling the Module

All control interfaces use the same simple, text command set. Each command is human readable ASCII text of up to 64 characters in length.

All responses to commands are 1 or more lines, of up to 64 characters each. This makes issuing commands and parsing responses very simple.

Commands can be sent from a standard terminal program, such as Putty, TerraTerm or command line Telnet clients. They can also be generated from scripts or user code (Perl, Python, C, .NET and more).

Serial Control

Any script, code or terminal program capable of opening a serial port can use this communication method.

Serial Settings

The table below shows the serial settings

Settings	Required value
Baud Rate	19,200
Data Bits	8
Stop Bits	1
Handshaking	None or Hardware

Ethernet Control

LAN control can be accessed via the units IP address (DHCP is enabled by default) or via the NetBIOS name, which defaults to the serial number of the unit (QTLxxxx-yy-zzz, as found on the label of the unit).

Telnet

This mode uses exactly the same commands as the serial ASCII terminal, but sent over a standard LAN Telnet connection. This can be done from any standard Telnet client, or most scripting languages such as Perl and Python. Only one Telnet connection can be open any time.

Settings	Required value
Port	23
SSL	No

ReST Control

ReST is a standard method of accessing a remote device over a network. It used standard http web technology, and commands can be sent from a web browser or script language. ReST command calls are formatted as:

http://192.168.1.99/RUN:POWer UP

USB Control

The USB socket provide a connection to the Array Controller which can be used to send commands to the entire system, as you can with the serial and LAN port.

The USB socket also connects to a hub which serves each of the 4 module ports. This allows direct connection to any module that supports USB control.

USB connections can be opened from the TestMonkey GUI, the Torridon.NET API or with any language supporting LibUSB drivers, such as Python or Java.

Command Set

These commands are based on the SCPI style control system that is used by many manufacturers of test instruments. The entire SCPI specification has NOT been implemented but the command structure will be very familiar to anyone who has used it before.

The commands listed here are ONLY the ones that run directly on the Controller. For commands that control the individual connected modules, see the technical manual for the relevant module.

- SCPI commands are NOT case-insensitive
- SCPI commands are in a hierarchy separated by ':'
(LEVEL1:LEVEL2:LEVEL3)
- Most words have a short form (e.g. 'register' shortens to 'reg'). This will be documented as REGister, where the short form is shown in capitals.
- Some commands take parameters. These are separated by spaces after the main part of the command (e.g. "meas:volt:self 3v3?" Obtains the 3v3 self test measurement)
- Query commands that return a value all have a '?' on the end
- Commands with a preceding '*' are basic control commands, found on all SCPI devices
- Commands that do not return a particular value will return "OK" or "FAIL". Unless disabled, the fail response will also append a text description for the failure if it can be determined.

Basic Commands

[comments]

Any line beginning with a # character is ignored as a comment. This allows commenting of scripts for use with the system.

*RST

Triggers a reset in all connected Array Controllers and Control Modules, the system will behave as if it had just been powered on.

*CLR

Clears the terminal window and displays the normal start screen

*IDN?

Displays a standard string, identifying the Array Controller in the form:

An example return is shown below

Family: Torridon System	[The parent family of the device]
Name: 4 Port Array Controller	[The name of the device]
Part#: QTL1461-04	[The part number of the hardware]
Processor: QTL1461-01,4.009	[Part# and version of firmware]
Bootloader: QTL1541-01,1.00	[Part# and version of bootloader]
FPGA 1:QTL1467,1.3	[Part# and version of FPGA core]

*TST?

Runs a set of standard tests to confirm the Array Controller is operating correctly, these tests are also performed at start up.

General Setup Commands

CONFig:MODE BOOT

Configures the card for boot loader mode (to update the firmware), requires an update utility on the PC.

CONFig: MESSages [SHORT|USER]

CONFig: MESSages?

Gets or sets the mode for messages that are returned to the user's terminal

Short: Only a "FAIL" or "OK" will be returned

User: Full error messages are returned to the user on failure

CONFig:TERMiNal [USER|SCRIPT]

CONFig:TERMiNal?

Sets the ASCII terminal configuration mode:

USER: Standard mode for manual control via HyperTerminal etc.

SCRIPT: Does not echo characters, sends <CR> after the cursor. This is to assist scripting, especially from Linux based systems

CONFig:TERMiNal:HANDshake [ON|OFF]

CONFig:TERMiNal:HANDshake?

Sets the state of hardware handshaking on the serial terminal. When 'ON', your terminal program must support and use hardware handshaking.

CONFig:LIST MODules?

Lists the active modules in the system. This will only work fully if the attached modules are Firmware 3.50 or above. Otherwise the module response will return an error instead of its identity.

CONFig:LIST?

Lists ALL items in the system, including Array Controllers. This will only work fully if the attached modules are Firmware 3.50 or above. Otherwise the module response will return an error instead of its identity.

CONFig:DEFault:FACTory

Resets all settings on the Array Controller to its factory default. If the default settings are not compatible with your current connection method (e.g. Hardware handshaking turned on), you may lose your connection.

Some settings will not take effect until the controller is reset (Ethernet settings)

Addressing Commands

CONFig:MAPping:WRITe [HH] [SS]

Sets the mapping table for hard port [HH] to the soft address [SS]. Both address numbers are simple decimal strings (eg 17). The changes will have no effect until the new mapping is activated.

Example:

Conf:map:write 2 5

Conf:map:write 5 2 (swaps the mapping for ports 2 and 5)

CONFig:MAPping:READ [HH]

Returns the current mapping of the given hard from the mapping table

Example:

Conf:map:read 5

Returns:

5=2 (Hard address 5 is set to soft address 2)

CONFig:MAPping:DUMP [HH] [HH]

Returns the current mapping of the given range of hard addresses, from the mapping table.

Example:

Conf:map:dump 3 5

Returns:

3=3

4=4

5=2 (Hard address 5 is set to soft address 2, others as default)

CONFig:MAPping:ACTivate

Activates the current mapping pattern by setting the soft addresses of all port processors. This must be run in order to use the changes made by the **MAPping:WRITE** commands.

CONFig:MAPping:RESet

Resets the mapping table to the default mode (as it was at reset) and activates the mapping. This is used to bring the mapping back to a known state. Default state is (Hard Port = Soft Port).

CONFig:MAPping:FLAsh

Flashes the light of the port. This is used to ‘find’ the cable that a given address number is plugged into. The command is sent in the form “**CONFIG:MAPPING:FLASH <1>**”

Ethernet Commands

CONFig:ETHemet:NAME[xxxx]

CONFig:ETHemet:NAME?

Sets the NetBios name of the unit. This command will automatically store the settings in EEPROM. You will have to reset/power cycle the unit for the changes to take effect.

CONFig:ETHemet:IP [x.x.x.x]

CONFig:ETHemet:IP?

Sets the static IP address of the unit. Setting a static IP address will disable DHCP if it is currently enabled. This command will automatically store the setting in EEPROM. You will have to reset/power cycle the unit for the change to take effect.

CONFig:ETHemet:MASK [xxx.xxx.xxx.xxx]

CONFig:ETHemet:MASK?

Sets the IP mask of the unit. This command will automatically store the setting in EEPROM. You will have to reset/power cycle the unit for the change to take effect.

CONFig:ETHemet:DNS[1|2] [x.x.x.x]

CONFig:ETHemet DNS[1|2]?

Sets the DNS of the unit. This command will automatically store the setting in EEPROM. You will have to reset/power cycle the unit for the change to take effect.

CONFig:ETHemet:GATE[x.x.x.x]

CONFig:ETHemet GATE?

Sets the Gateway of the unit. This command will automatically store the setting in EEPROM. You will have to reset/power cycle the unit for the change to take effect.

CONFig:ETHemet:DHCP [ON|OFF]**CONFig:ETHemet:DHCP?**

Enables/disables the DHCP client. When enabled, the controller will try to obtain an IP address from the local DHCP server. You will have to reset/power cycle the unit for the change to take effect.

Commands to Attached Devices

For a list of commands that each module supports, please see its Technical Manual. For full details on addressing modules, see the Torridon System User Manual.

Addressing a single module

To send a command to a single module, add the part address in angle brackets as an extra parameter at the end of the command:

“RUN:POWer UP <1>”

1:OK (Response from module 1)

“RUN:POWer UP <35>”

35:OK (Response from module 35)

Addressing a range of modules

To send the same command to a range of modules, use a “-“ between the port numbers. The lowest number must come first:

“RUN:POWer UP <1-3>”

1:OK (Response from all 3 modules in turn)

2:OK

3:OK

Addressing a list of modules

To send the same command to a list of modules, use a “,” between each port number:

“RUN:POWer UP <1,2,3>”

1:OK (Response from all 3 modules in turn)

2:OK

3:OK

Chaining Array Controllers

Multiple Array Controllers can be connected together to provide a single point of control for many modules.

To connect 2 Array Controllers, plug a standard RJ-45 patch cable (straight through) between the LINK OUT port of the first controller and the RS-232 IN port of the second. Repeat until all Array Controllers are linked. The green 'link' light should appear on each port to show that the connection has been made.

4 Port and 28 Port controllers (QTL1079) can be used together in the same chain, however the Soft Mapping feature cannot be used.

You can now send commands to the first Array Controller as normal. See below for the list of default addresses for the ports. Note that that by default,

4 Port controllers have contiguous addressing:

Array 1: Ports 1-4

Array 2: Ports 5-8

Array 3: Ports 9-12

...

28 port controllers (QTL1079) are NOT contiguous. If you have one in your chain, there will be a 1 port 'gap' in the address list:

Array 1: Ports 1-4

Array 2: Ports 6-33 (Note that address 5 does not exist)

Array 3: Ports 34-38

The 'Addressing Commands' section describes how to renumber the addresses using 'soft mapping' if this is required.

Voltage Measurements

The Array Controller is capable of measuring various voltages for self test. The following measurement points are available:

Measurement Command	Description	Resolution / Accuracy
MEASure:VOLTage:SELF 12v?	Returns the voltage of the Array Controllers internal 12v power rail	64mV / 3%
MEASure:VOLTage:SELF 5v?	Returns the voltage of the Array Controllers internal 5v power rail	16mV / 3%
MEASure:VOLTage:SELF 3v3?	Returns the voltage of the Array Controllers internal 3.3v power rail	12mV / 3%

Default Startup State

On power up or reset, the Array Controller enters a default state. The factory default settings are shown in the table below. Any other settings you changed will automatically be stored in EEPROM and will be persistent.

[NOTE: All settings can be returned to factory default state, use the command “**CONFig:SETtings RESET**”.]

Setting	State	Persists through reset
Addressing Mode	Hard mapped addressing	Y
Soft Address Map	Ports numbered sequentially from 1	Y
Soft Mapping Mode	OFF by Default	Y
Terminal Mode	“User” mode, default for use with HyperTerminal	Y
Message Returns	USER detailed error responses	Y
Default IP Address	192.168.1.99	Y
Default Mask	255.255.255.0	Y
Default Gateway	192.168.1.1	Y
Default DHCP	Enabled	Y
RS-232 Handshaking	None	Y
DNS 1 & 2	0.0.0.0	Y

Appendix

Customer Support

For further help and support, email us on

support@quarch.com

Software Updates and Drivers

For up to date software and drivers, visit our website

www.quarch.com

Documentation

You can also download the technical manuals from our website. To help you start quickly we can provide you the additional documents, such as examples in Perl, Python and C#, Telnet and Serial instructions and more, please contact us if you require access to these examples.

You can also check out our application notes and forum section, where you will find many useful examples.