

QDR - QTech 900MHz Digital Radio

User Guide

QDR - QTech 900MHz Digital Radio

Revision 1.8



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Revision Details

Rev	Description	Date	Author
1.8	Added RS485 cable option for XL4 Plus RTU – P/N PD9119-485RTU	July 2022	AM
1.7	Quick Start Guide and Owner's Manual combined to User Guide	July 2018	JH
1.6		Feb 2018	
1.5	Amended max distance from 10km to 6km. Updated formatting.	Jan 2015	DC
1.4	Added note to 5.1 relating to non-standard installations.	Oct 2014	RH
1.3	Added note for different RS485 cable options (and pinouts) and updated wording on power supply warning.	Aug 2012	IH
1.2	Added extra cable pin outs, address change & corrected power plug to 2.1mm & added PSU warning.	Mar 2012	AM
1.1	Amend for 256 byte packets, v1.10 firmware.	April 2011	TR
1.0	Original.	Jan 2011	RH

Introduction

This document provides help specifically for the QDR - QTech 900MHz Digital Radio.

The QDR is a digital modulation radio operating in the 921.5 – 928.0MHz ISM band.

The QDR is used for connecting serial devices as a wireless link. It can be regarded as a wireless alternative to RS232 or RS485 cable connections.

Serial interface options are Full Duplex RS485, Half Duplex RS485, or RS232.

The radios can be supplied pre-configured and with a suitable cable for these modes of operation.

The radio can be configured to operate in Repeater Mode, whereby it stores and retransmits any (RF) data packets it receives.



Each QDR option is supplied with the following:

P/N PD9119-232 QDR - 900MHz DIGITAL RADIO - RS232

- Qty 1x QDR Radio
- Qty 1x Internal Stub antenna, 2dBi gain
- Qty 1x 1m DC Power Cable
- Qty 1x 1m Serial Cable P/N CB-QDR-RS232

P/N PD9119-485 QDR - 900MHz DIGITAL RADIO – RS485 (Expansion Modules)

- Qty 1x QDR Radio
- Qty 1x Internal Stub antenna, 2dBi gain
- Qty 1x 1m DC Power Cable
- Qty 1x 1m Serial Cable (RJ12 – RJ10) P/N CB-QDR-RS485

P/N PD9119-485RTU QDR - 900MHz DIGITAL RADIO – RS485 (XL4 Plus RTU)

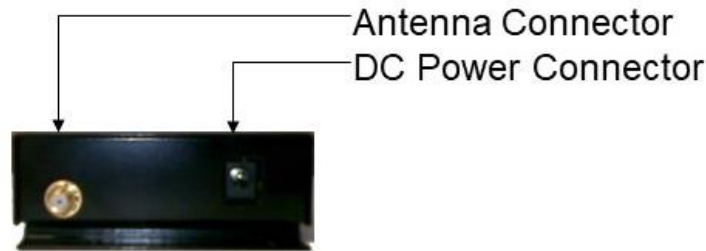
- Qty 1x QDR Radio
- Qty 1x Internal Stub antenna, 2dBi gain
- Qty 1x 1m DC Power Cable
- Qty 1x 1m Serial Cable (RJ12 – RJ12) P/N CB-QDR-RS485-XL4

A range of suitable external antennas are also available:

- PD9225 - 4 element Yagi, 9dBi gain with 5m coax and SMA connector
- PD9218 - Whip antenna, 5dBi gain with 5m coax, bracket and SMA connector

Connections

The connections of the QDR are identified below:



DC Power Connector – 2.1mm Socket

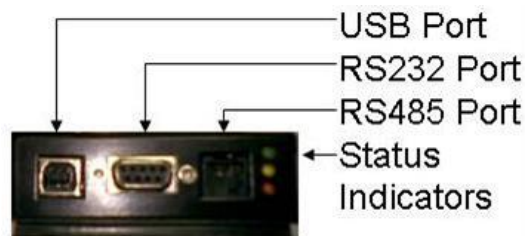
Centre pin +V.

Spare power cables are available, P/N CB-QDR-PWR.

⚠ 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.

Antenna Connector – SMA Socket

This is used to connect a suitable antenna with an SMA plug. Please also refer to the notes section this manual.



USB Port – Type B Socket

This is used for configuration via Workbench Software on a PC or upgrading the radio firmware.

RS232 Serial Port – DB9 Female Connector

This is used to connect to RS232 devices. Refer to applications.

Spare RS232 cables are available, P/N CB-QDR-RS232.

RS485 Serial Port – RJ12 Socket

This is used to connect to RS485 devices in either half or full duplex modes.

Refer to applications.

Spare RS485 cables are available, P/N CB-QDR-RS485.

⚠ Note –RS485 cable differences. To connect to a XL4 RTU (RJ12 to RJ12) use P/N CB-QDR-RS485-XL4 and for other devices (RJ12 to RJ10) use P/N CB-QDR-RS485.

Status Indicators

There are three status indicator LEDs on the QDR:

Colour	Meaning	Description
Green	Status	Indicates radio status
Yellow	RxD	Received valid (RF) data packet
Orange	TxD	Transmitted a packet

Notes

RxD LED blinks upon receiving a valid packet. A packet is valid if the Customer-ID and Site-ID in the received packet are equal to the receiving radios Customer-ID and Site-ID. The packets must also have a valid checksum.

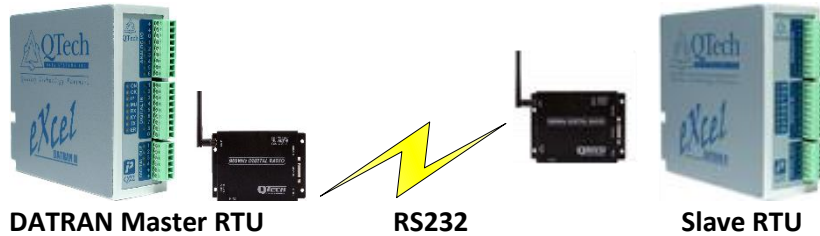
Status LED issues 6 fast flashes to indicate that the QDR has been reset/repowered. The Status LED flashes slowly to indicate the QDR processor is running correctly.

Applications

RS232 Mode

This is used for serial data communications.

A typical use of this mode would be:



The serial cable is connected from the RS232 port of the QDR to an RS232 port of the RTU.

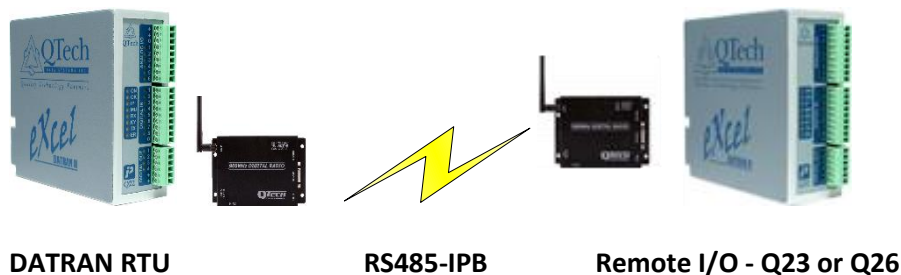
Pinout of RS232 Port and interface cable connections:

D9 Pin	Signal	Input/Output	Description	RJ45 pin
1	DCD	Output	Data Carrier Detect	
2	RxD	Output	Receive Data	2
3	TxD	Input	Transmit Data	6
4	DTR	Input	Data Terminal Ready	
5	GND	-	Ground	5
6	-	-	Not Connected	
7	RTS	Input	Request To Send	
8	CTS	Output	Clear To Send	
9	RI	Input	Ring Indication	

Note: For non-standard installations please contact QTech for advice as there can be variations in the pinout configuration.

RS485 – Half Duplex Mode

A typical use of this mode would be:



The serial cable is connected from the RS485 port of the QDR to the RS485/IPB port of the RTU at a comms speed of 9600bps.

⚠ Note –RS485 cable differences. To connect to a XL4 RTU (RJ12 to RJ12) use P/N CB-QDR-RS485-XL4 and for other devices (RJ12 to RJ10) use P/N CB-QDR-RS485.

Jumper Settings for Half Duplex RS485 (2-Wire):

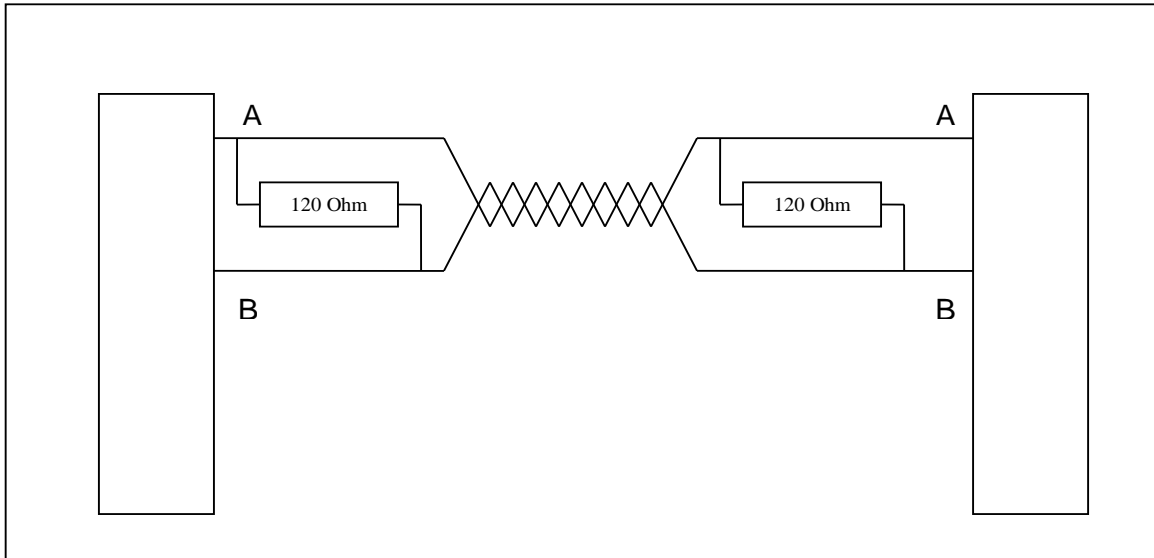
Refer to Section 6 for further details on the jumpers.

Jumper	Position
JP3	In
JP4	Out
JP5	In
JP6	In

Pinout of RS485 Port when in Half Duplex Mode:

QDR	XL4	eXcel	Signal	Input/Output	Description
Pin	Pin	Pin			
1	1	1 (NC)	GND	-	Ground
2	2	3	B	Input/Output	Inverting Input/Output
3	3	2	A	Input/Output	Non inverting Input/Output
4	4	4 (NC)	-	-	-
5	5		-	-	-
6	6		GND	-	Ground

Typical Half Duplex Connection:



Note: Line termination resistors are inside the QDR.

RS485 – Full Duplex Mode

This mode is used for serial data communications where all four signal lines are required.

Jumper Settings for Full Duplex RS485 (4-Wire):

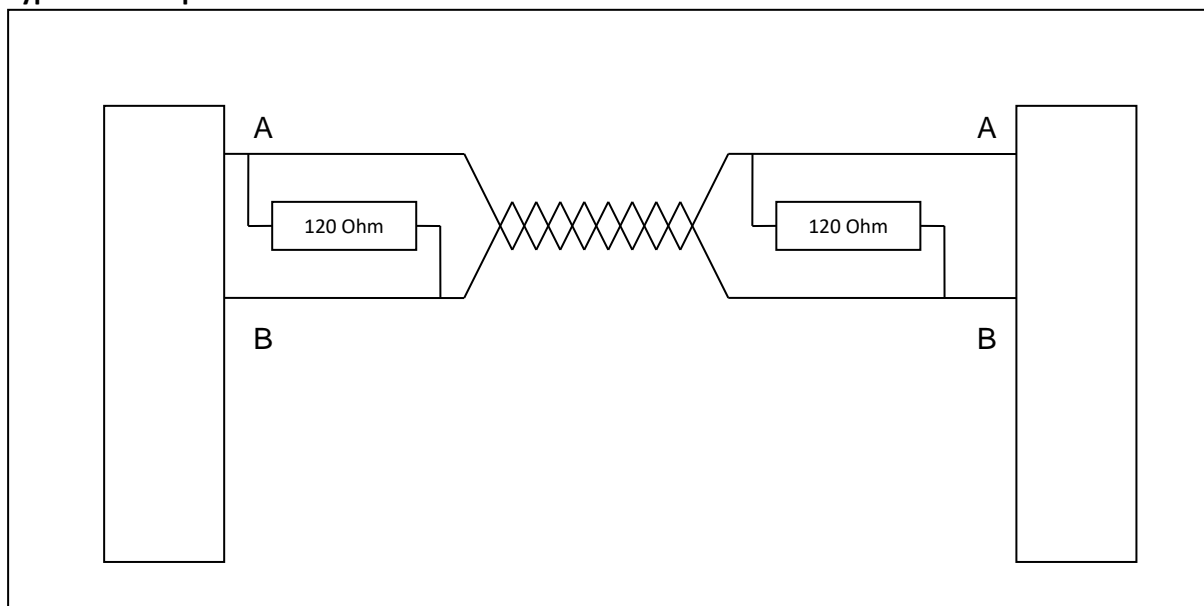
Refer to Section 6 for further details on the jumpers.

Jumper	Position
JP3	In
JP4	In
JP5	Out
JP6	Out

Pinout of RS485 Port when in Full Duplex Mode:

Pin	Signal	Input/Output	Description
1	GND	-	Ground
2	B	Input	Inverting Receiver Input
3	A	Input	Non inverting Receiver Input
4	Z	Output	Inverting Driver Output
5	Y	Output	Non inverting Driver Output
6	GND	-	Ground

Typical Full Duplex Connection:

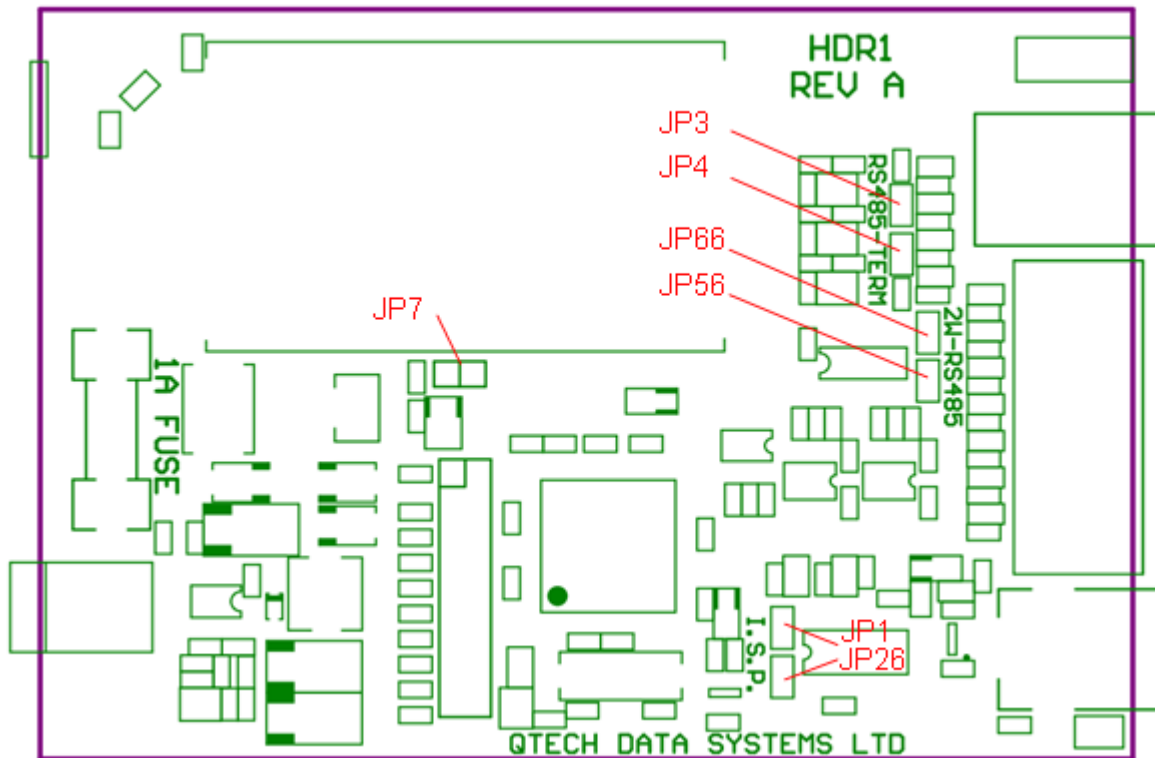


Note: Line termination resistors are inside the QDR.

Jumper Settings

A list of all jumpers and their positions on the QDR has been provided for reference.

Jumper	Description
JP1	ISP Programming Enable
JP2	ISP Programming Enable
JP3	RS485 120 Ohm Line termination on A-B
JP4	RS485 120 Ohm Line termination on Y-Z
JP5	RS485 A-Y Link
JP6	RS485 B-Z Link
JP7	RF Power Amplifier Bias Disconnect



Configuration Parameters

The QDR is configured by QTech via the USB Port using a desktop application. The available parameters are defined below:

Parameter	Options	Notes
Radio Type	2-wire RS485	
	4-wire RS485	
	RS232	
	Standalone Repeater	
	Repeater with 2-wire RS485	
	Repeater with 4-wire RS485	
	Repeater with RS232	
Channel Sequence	1-6	
Power Level	0 - 7	1 = 20mW
6 = 960 mW for Yagi		
7 = 1W		
Customer Number	1-255	
Site Number	1-255	
Radio Address	1-255	
RSSI Mute Threshold	-128 – 0 dBm	
Background RSSI	-128 – 0 dBm	Read only
Packet RSSI	-128 – 0 dBm	Read only
Firmware Version		Read only
MAC Address		Read only

Important Notes and Warnings



Antenna Connection

The QDR should never be operated without an antenna connected. If the radio transmits without an antenna, the RF power has nowhere to go but back into the radio, which can damage it.



Transmitted RF Power Levels

The QDR must never be operated in violation of RSM license conditions. Ensure that the Transmit Power Level and antenna system design do not exceed the limitation.

Please be considerate of other users of the ISM Band.

AS/NZS 4268:2008 specifies a maximum EIRP of 1 watt.



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.

SMA Antenna Connectors

Standard Polarity

The QDR antenna connector uses the standard/conventional polarity SMA socket. QTech supplies suitable antennas for the QDR with a standard SMA plug, as shown to the right.



QDR Type SMA Cable

Reverse Polarity

If using QDRs to upgrade existing systems, such as Digi XTend radios, please check the antenna connector.

Some radios use a nonstandard, reverse polarity SMA connector, referred to as RP-SMA.

A replacement antenna, re-termination or adaptor will be required.



Reverse Type RP-SMA Cable

Troubleshooting

Symptom	Cause	Solution
Green Status LED not blinking when power applied	Blown fuse	Replace fuse. Use 1 Amp quick blow type.
	Insufficient power supply voltage	Check supply and provide suitable power supply
No Communication	RS485 jumpers not matching setup mode	Check settings and change to suit
	RS485 line termination	Check settings and change to suit
	Incorrect serial data rate	Check settings, ensure it is 9600 Baud, No Parity
	Insufficient Rx signal power	Use a directional antenna* Use Workbench to measure the RSSI. A value below -95dbm is unlikely to be reliable.
	Incorrect configuration for intended use	Options are point to point, point to multipoint, repeater

* Ensure the transmitted power from the antenna system (EIRP) does not exceed the licensed level.

Technical Specifications

Note. Specifications are subject to change without notice.

Performance	
Indoor/Urban line of sight:	up to 500m (2.1dB dipole antenna)
Outdoor line of sight:	up to 3km (3.1dB antenna)
Outdoor line of sight:	up to 6km (9dB Yagi antenna)
Data Rate:	9600bps for interface and RF
	Note: Distances are indicative only and terrain dependent
Power Requirements	
Power supply voltage:	7 – 28V DC (30V DC absolute max)
Standby supply current:	85mA @ 12V DC
Transmit supply current:	150mA @ 12V DC
Specification	
Frequency:	921.5 – 928.0MHz
RF Output:	120mW to 1W (30dBm)
Technology:	Digital Modulation
Modulation:	GFSK (Gaussian Frequency Shift Keying)
Radio Channels:	6
Modes:	point-to-point, point-to-multipoint, repeater
Maximum packet size:	256 bytes
Environmental	
Temperature:	Operating: 0-70 degrees C
Humidity:	0-90% non-condensing
Ingress Protection:	IP20 - Water contact must be avoided
Certification	
	AS/NZS 4268:2008
Network Configuration	
Customer ID:	1 to 255
Site No.:	1 to 255
Radio Address:	1 to 255
Channel No:	1 to 6
RF Power Level:	1 to 8
Repeater Mode:	ON/OFF
Serial Mode:	None/RS232/RS485-2W/RS485-4W

User Notes

Warranty

The QDR hardware and software is covered by 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



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