Q80 – Telemetry Radio

Owners Manual

QTECH DATA SYSTEMS

Manual Revision No. 1.04
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DISCLAIMER

The information in this document is subject to change without notice and does not represent a commitment on any part of QTech Data Systems Limited. While the information contained herein is assumed to be accurate, QTech Data Systems Limited assumes no responsibility for any errors or omissions.

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REVISION DETAILS

1.01 - April 2000	Original
1.02 - Nov 2001	Updated for Rev C Board
1.03 – Oct 2010	New logo, page layout and correction of aerial supply details
1.04 – Oct 2012	Updated address and inserted channel/DIP switch settings

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INTRODUCTION

This revision 1.02 manual is for use with the Q80 – Telemetry Radio Module up to Rev B and Rev C printed circuit boards.

Q80 – Telemetry Radio Module.

The Product

The Q80 – Telemetry Radio Module is a complete telemetry radio transceiver designed to complement the QTech range of RTU modules.

The Q80 – Telemetry Radio Module includes a state of the art Maxon 5 Watt, multi-band, synthesized transceiver together with associated RTU radio interface and power supply in a single module.

What's in this Manual

This manual contains the following sections:

- The Functionality section describes the features and functions of the various components of the Q80 – Telemetry Radio Module.
- The Configuration section explains how to configure the various
- s hardware settings on the Q80 – Telemetry Radio motherboard to suit its' specific application.
- The Connections section explains how to inter-connect the Q80 – Telemetry Radio Module to other devices.
- The Technical Notes section describes the electrical interfaces embedded in the Q80 – Telemetry Radio Module.
- At the end of this manual you will find the following sections - Specifications, Warranty details and a 'Quick Find Index' to help in finding information in this manual.

Throughout the manual ***NOTE***'s and ***TIP***'s (shown in green italic letters) are included to give related suggestions, explanations and additional information, etc.

The Q80 – Telemetry Radio Module is referred to as the Q80 Module throughout this manual.

QTech Data Systems Limited is referred to as QTech throughout this manual.

Precautions

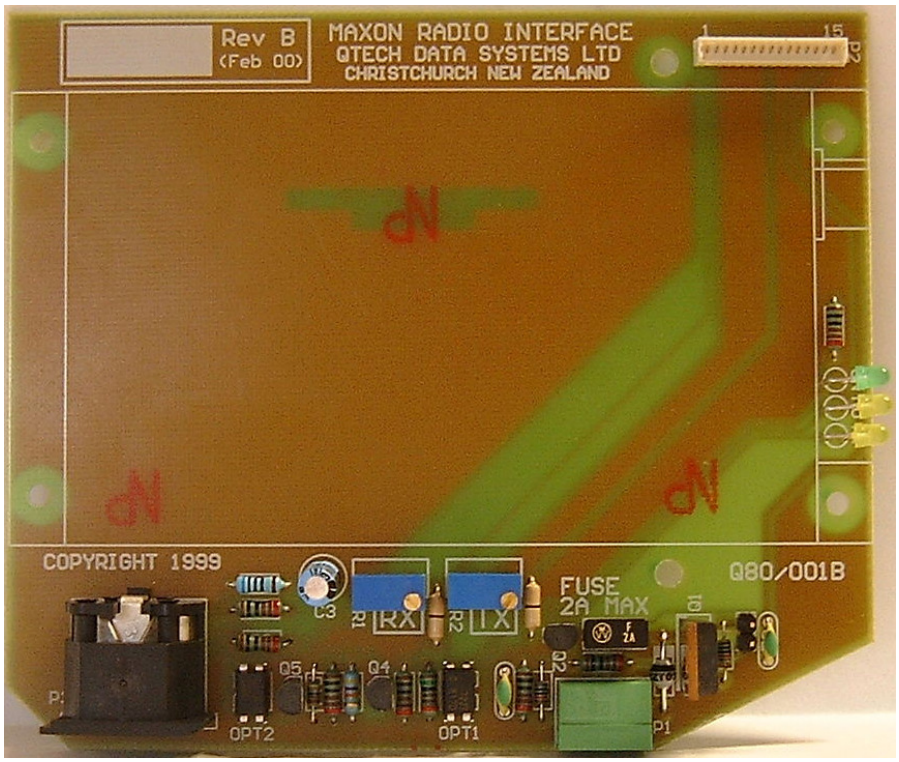
The power should be removed from the module by removing the power connector before setting up and making any adjustments to the module.

The Q80 – Telemetry Radio Module incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the module.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to an earth point on the Q80 – Telemetry Radio Module before any adjustments are made.

FUNCTIONALITY

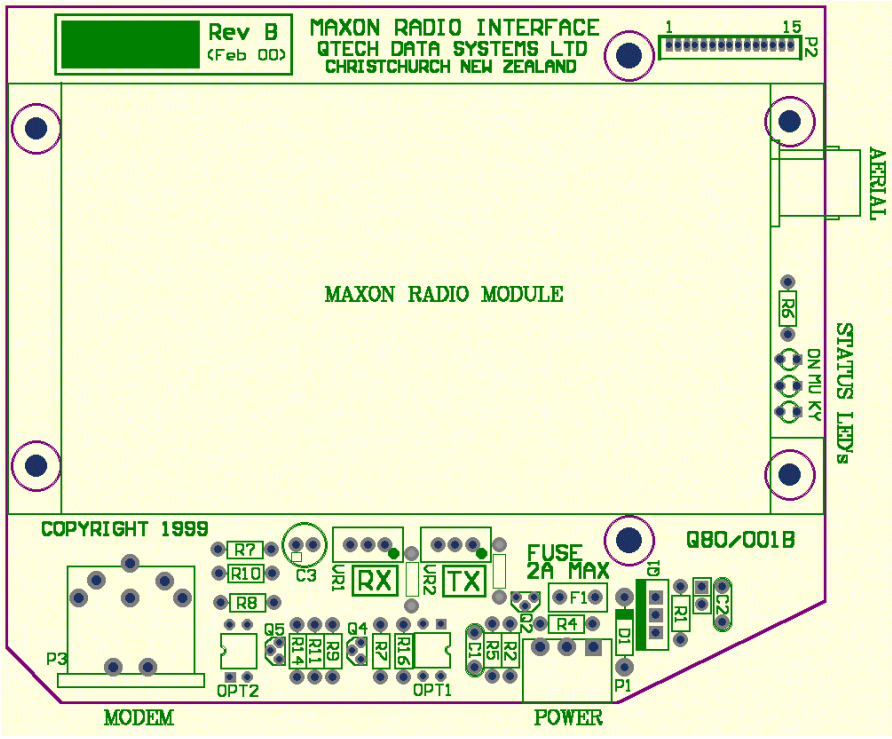
This section describes the functions and facilities of the Q80 Module up to Rev B printed circuit boards.



Q80 Telemetry Radio Motherboard.

Functional Descriptions

The diagram below shows the generalised layout of the Q80 Motherboard and can be used to locate and identify the various parts and functions detailed in this section.

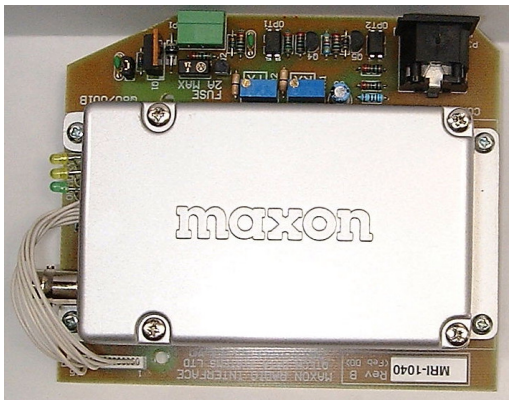


Q80 – Telemetry Radio Motherboard layout.

Maxon Radio Module.

The Maxon Radio module is a totally self contained state of the art fully synthesized radio transceiver.

The picture to the right shows the Maxon radio module installed on the Q80 Motherboard.



The key features of the Maxon Radio module include:

- Fully synthesised 16 channel receiver and transmitter.
- Each of the 16 channels can be programmed for:
  - 12.5 kHz or 25 kHz channel spacing.
  - Simplex or repeater operation.
  - 0.5 to 5 watts output in 8 steps.
- Low power consumption Standby 80mA, Receive 100mA and Transmit 1.2A at 5 Watts output.
- Aerial BNC connector 50 ohms unbalanced.
- Small, compact, environmentally sealed and rugged.

Power Supply

The Q80 Module is designed to operate with a DC power supply voltage of nominally 12 volt. The Q80 Module draws approximately 80mA in Standby, 100mA on Receive and 1.2A on Transmit at 5 Watts output.

The power connector is located on the bottom panel of the Q80 Module and is labelled **'PWR'**. The connections to the power connector are:

G	Ground. The negative lead of the power supply.
+IN	The positive lead of the power supply.
CTL	The remote power ON/OFF control input.

Note *The Q80 Module has a 2 amp fuse on the Q80 Motherboard to protect the unit under fault conditions or when reversed polarity or over-voltage power supplies are connected to the module. Refer to the Technical Notes for details on how to replace this fuse.*

The DC power supply to the Q80 Module must be adequately smoothed and be free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the required electrical regulations.

Note *The maximum input voltage to the Q80 Module is 15 volts. Input voltages in excess of 15 volts will blow the internal 2 amp fuse.*

The power supply of the Q80 Module includes a remote power ON/OFF control line. This allows the Q80 Module to be switched OFF remotely by a Q22 – DATRAN *eXcel* module when the system battery voltage drops too low. This feature prevents the Q80 Module from totally discharging the system battery and eliminates the possibility of erratic operation.

Radio Interface

The embedded Maxon Radio interface on the Q80 Motherboard provides a simple and versatile half duplex interface between the Q80 Module and QTech RTU modules or customer specific equipment.

The interface provides opto-isolation of both the transmit key and the receive busy lines. A bi-directional audio interface connects the transmit and received audio to the auxiliary equipment via an external line isolation audio transformer. Potentiometers on the Q80 Motherboard are provided to independently adjust both the receive and transmit audio levels for customer specific applications.

The Q80 Module is easily interconnected to an associated QTech RTU module via a standard QTech DATRAN 6 way DIN radio patch cord.

Note *The Technical Notes section of this manual describes the radio interface in detail and allows interfacing of the Q80 Module to customer specific equipment.*

Front Panel Status LED's

There are three status LED's on the front panel of the Q80 Module. These status LED's display the following Q80 Module status:

ON The power is ON.

MU The radio receiver is busy, i.e. the receiver mute is open.

KY The radio transmitter is keyed ON.

CONFIGURATION

This section describes how to configure the Q80 Maxon Radio Motherboard.

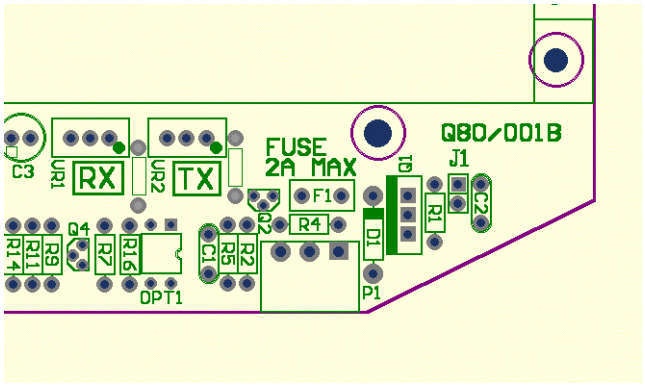
The power should be removed from the module by removing the power connector before setting up and making any adjustments to the module.

The Q80 Maxon Radio Module incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the module.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to an earth point on the Q80 Maxon Radio Module before any adjustments are made.

Remote Power Control Jumper J1

Jumper J1 is used to configure the remote power control function. Jumper J1 is located at the bottom right hand side of the Q80 Motherboard as view with the front panel BNC RF connector to the right.



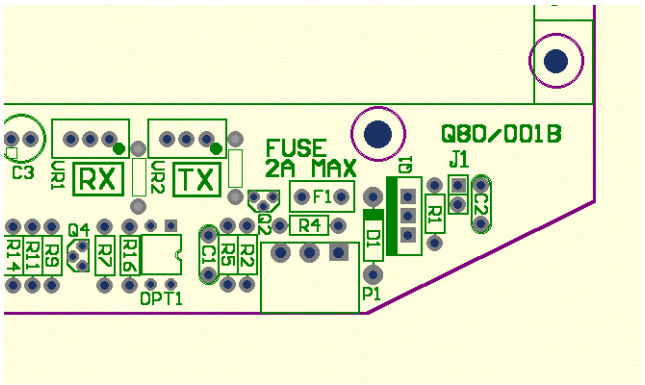
Location of Power Control Jumper J1.

When jumper J1 is installed the remote power control function is disabled.

Note *For applications with the Q22 – DATRAN eXcel module jumper J1 should be installed, for most other applications J1 should not be installed.*

Audio Level Potentiometers

The potentiometers VR1 and VR2 are used to set the Q80 Module receive and transmit levels respectively. VR1 and VR2 are located at the bottom right hand side of the Q80 Motherboard as view with the front panel BNC RF connector to the right.



Location of Power Control Jumper J1.

The receive and transmit levels are preset prior to delivery and should not normally require adjustment when the Q80 Module is to be used with a QTech RTU module. For applications with customer supplied equipment refer to the Technical Notes for adjustment details.

Note *The 600 ohm modem line terminating resistor in the QTech RTU modules should be removed, i.e. not installed.*

CONNECTIONS

This section describes the function and connections to the various connectors on the Q80 Module.

Power Supply

The Q80 Module is designed to operate with a DC power supply voltage of nominally 12 volt. The Q80 Module draws approximately 80mA in Standby, 100mA on Receive and 1.2A on Transmit at 5 Watts output.

The power connector is a 3 way connector located on the bottom panel of the Q80 Module and is labelled '**PWR**'. The connections to the power connector are:

G Ground, the negative lead of the power supply.
+IN The positive lead of the power supply.
CTL The remote power ON/OFF control input.

Note *The Q80 Module has a 2 amp fuse on the Q80 Motherboard to protect the unit under fault conditions or when reversed polarity or over-voltage power supplies are connected to the module. Refer to the Technical Notes for details on how to replace this fuse.*

The DC power supply to the Q80 Module must be adequately smoothed and be free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the required electrical regulations.

Note *The maximum input voltage to the Q80 Module is 15 volts. Input voltages in excess of 15 volts will blow the internal 2 amp fuse.*

The power supply of the Q80 Module includes a remote power ON/OFF control line. This allows the Q80 Module to be switched ON/OFF remotely by a Q22 – DATRAN *eXcel* module when the system battery voltage drops too low. This feature prevents the Q80 Module from totally discharging the system battery and eliminates the possibility of erratic operation.

The remote power ON/OFF control line should be connected to the '**+**' terminal of the Q22 DATRAN eXcel Module power connector. In most other applications the remote power ON/OFF control line is left open and jumper J1 is installed.

The remote power switching control input '**CTL**' on the power connector functions as follows:

- CTL = 12volts is Q80 powered up.
- CTL = 0 volts is Q80 powered down.

Modem Connector

The 6 way DIN socket labelled '**RTU**' on the bottom panel of the Q80 module accepts a standard QTech Radio Patch Cord for interfacing to QTech RTU modules. This radio patch cord may be installed either way around, i.e. either end of the patch cord may be plugged into the Q80 Module. The other end of the patch cord plugs into the socket labelled '**RADIO**' on the associated RTU.

For customer specific applications of the Q80 Module the connections to the 6 way DIN Modem socket are:

Radio Patch Cord Connections	
Pin No.	**Function**
1	Audio input/output
2	Audio input/output
3	+12 volts interface supply
4	Transmit key line
5	Ground & cable screen
6	Busy output

The patch cord should be constructed using good quality metal 6 way 270º DIN plugs. For short patch cords up to 200mm in length 6 way, stranded, multi-core, circular, unscreened cable may be used. For longer length patch cords screened cable should be used. The screen should be connected to the Ground Pin No 5.

Radio Aerial

The Maxon Radio Rx/Tx RF connector is located on the front panel of the Q80 Module. This connector is a 50 ohm BNC connector. The Q80 Module is not supplied with an aerial. QTech supply a number of suitable aerials; please contact us for further details.

Suitable aerials include whips, folded dipoles and yagis. The aerial used must present 50 ohms to the Q80 Module BNC RF connector at the operating frequency. The RF output of the Q80 Module is unbalanced referenced to ground. Therefore folded dipoles and yagis will require a suitable unbalance to balanced impedance matching balum.

Note All aerials supplied by QTech have required balums pre-installed.

QTech's aerial range are generally supplied with 6m of coaxial cable "tail" is RG58. In applications where the supplied 6 metre coaxial aerial cable is not suitable, site-specific cables can be constructed. These cable should be constructed using good quality 50 ohm BNC connectors with crimped ferrules.

Note TV 75 ohm BNC connectors have a smaller centre pin. If used, these will cause an impedance mismatch and not mate properly with the Q80 Module RF BNC connector.

The cable used to construct the aerial cable should be good quality RG58/U or RG213/U coaxial cable. For cable lengths greater than 6 metres at UHF frequencies RG213/U coaxial cable should be used.

All connections to the coaxial cable should be sealed against moisture ingress and the aerial cable routed and secured in a way so as to prevent mechanical damage and eliminate tight bends.

The completed aerial system should be checked for VSWR with a suitable VSWR meter. The VSWR should be better than 1 to 1.5.

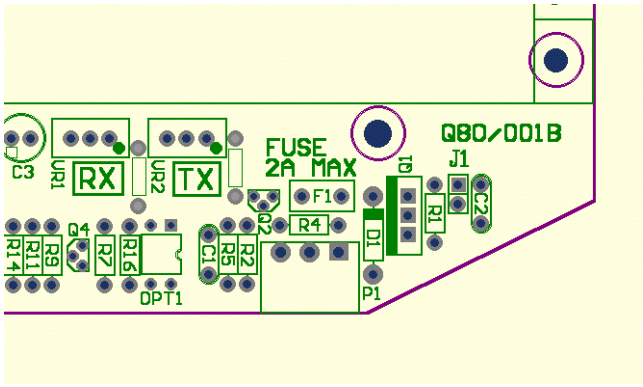
TECHNICAL NOTES

This section describes the technical aspects of Q80 Module power supply and modem interface.

Power Supply

The Q80 Module is designed to operate with a DC power supply voltage of nominally 12 volt. The Q80 Module draws approximately 80mA in Standby, 100mA on Receive and 1.2A on Transmit at 5 Watts output.

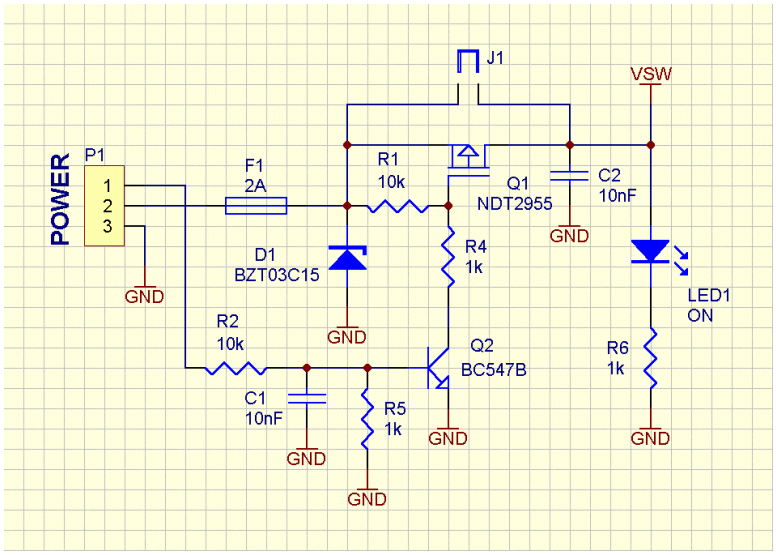
The DC power supply to the Q80 Module must be adequately smoothed and be free from noise and voltage transients. Where the DC supply is derived from the AC mains, or batteries with an associated AC mains battery charger these devices must comply with the required electrical regulations.



Location of Power supply circuitry.

The above diagram shows the location of the Q80 Module power supply circuit located at the bottom right hand side of the Q80 Motherboard as view with the front panel BNC RF connector to the right. The power supply connector **P1** is a 3 way connector labelled **'PWR'** on the bottom panel of the Q80 Module. The connections to the power connector are:

CTL Pin No 1 - The remote power ON/OFF control input.
+IN Pin No 2 - The positive lead of the power supply.
G Pin No 3 - Ground, the negative lead of the power supply.



Circuit details of Power Supply Front End.

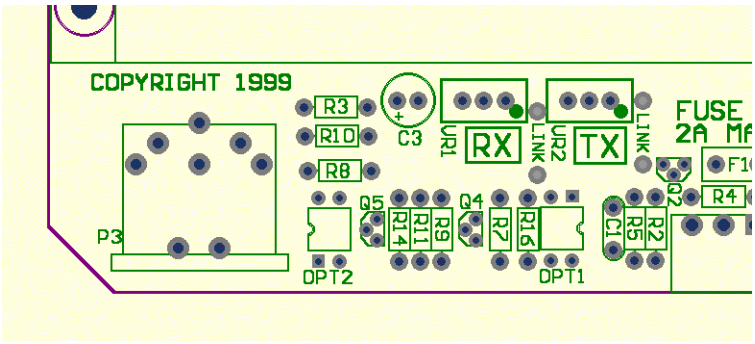
In the above circuit diagram the 15 volt zener diode **D1** and the 2 amp fuse **F1** protect the Q80 module against reverse power supply connection, over voltage and transient voltages. The fuse is a plug-in 2 amp TE5 fuse.

The remote power ON/OFF control line turns the NMOS FET transistor **Q1** on and off via transistor **Q2**. The power will be ON when 12 volts is applied to the remote power ON/OFF control line and OFF when the remote power ON/OFF control line is grounded. Jumper J1, when installed, disables the remote power ON/OFF control.

The remote power ON/OFF control line should be connected to the '**+**' terminal of the Q22 DATRAN eXcel Module power connector. In most other applications the remote power ON/OFF control line is left open and jumper J1 is installed.

Radio Interface

The embedded Maxon Radio interface on the Q80 Motherboard provides a simple and versatile half duplex interface between the Q80 Module and QTech RTU modules or customer specific equipment.



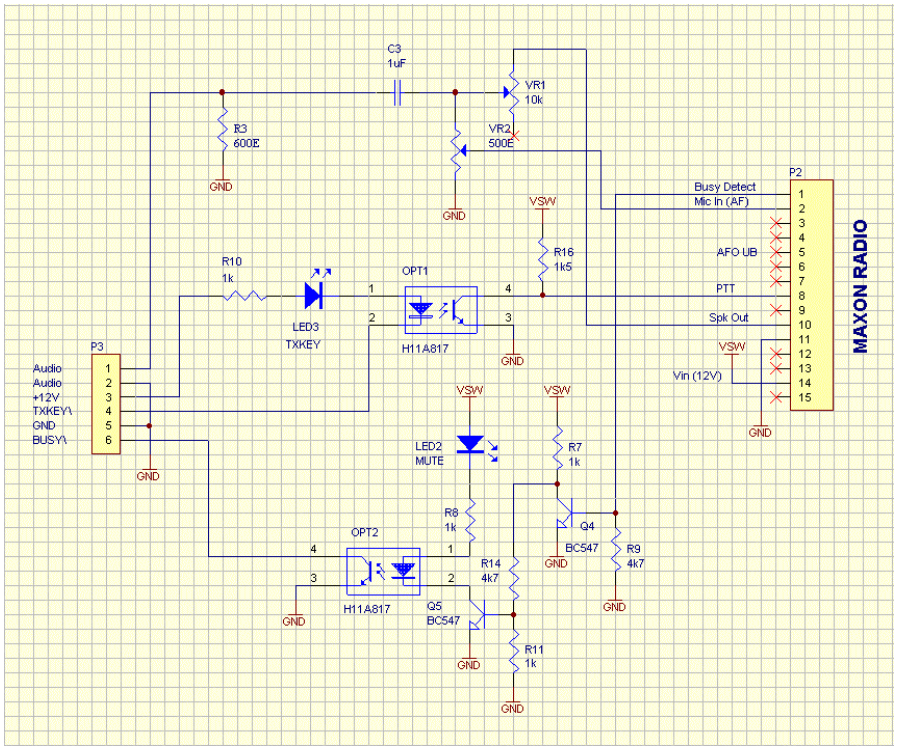
Location of Radio Interface circuitry.

The above diagram shows the location of the Q80 Module radio interface circuit located at the bottom middle left hand side of the Q80 Motherboard as viewed with the front panel BNC RF connector to the right.

The connections to **P3,** the 6 way DIN Modem socket are:

Radio Patch Cord Connections	
Pin No.	**Function**
1	Audio input/output
2	Audio input/output
3	+12 volts interface supply
4	Transmit key line
5	Ground & cable screen
6	Busy output

The diagram below shows the Radio interface circuitry.



Circuit details of Radio Interface.

The opto isolators **OPT1** and **OPT2** provide isolation of the Maxon radio transmit key and busy lines between the Q80 module and associated equipment.

Transmitter Key

The Maxon radio transmitter is keyed ON by pulling the TXKEY line to ground. The transmitter keyed **KY** LED3 will turn ON. The TXKEY line ON current is approximately 10mA.

Receive Busy

The Maxon radio busy output line switches opto isolator **OPT2** ON via transistors **Q4** and **Q5** when the radio receiver is busy. The busy/mute **MU** LED2 will turn ON. The busy output line BUSY will sink current to ground via the opto isolator output transistor. The BUSY output line can sink a maximum of 10mA.

Transmitter Audio Level

Potentiometer **VR2** is used to set the Maxon radio transmit audio level. The required level is –3dBm for +/- 3kHz (+/1.8 kHz) transmitter deviation.

Note *Set +/- 3 kHz deviation for 25 kHz channel spacing and +/- 1.8 kHz for 12.5 kHz channel spacing i.e. narrow band channel. These are the required levels when the Q80 Module is to be used with QTech RTU modules.*

Receiver Audio level

Potentiometer VR1 is used to set the received audio level. The required audio level is +/- 3kHz (1800Hz) deviation of Maxon radio received signal produces –15dBm audio output.

Note *Set +/- 3 kHz deviation for 25 kHz channel spacing and +/- 1.8 kHz for 12.5 kHz channel spacing i.e. narrow band channel. These are the required levels when the Q80 Module is to be used with QTech RTU modules.*

Audio Level Adjustment

The transmit and receive audio levels are preset by QTech prior to delivery and should not normally require adjustment.

Note *The 600 ohm modem line terminating resistor in the QTech RTU modules should be removed, i.e. not installed.*

To set the transmit and receive audio levels proceed as follows:

First set the transmit audio level. Feed a –3dBm 1800Hz audio signal into the audio terminals of the 6 way DIN Modem connector. Pin No1 and Pin No 2. Connect a deviation meter to the BNC RF connector terminated at 50 ohms. Key the transmitter on by pulling Pin No 4 of the 6 way DIN Modem connector to ground. Adjust VR2 for +/- 3kHz (+/- 1.8 kHz) transmitter deviation.

Now set the receive audio level. Connect a dBV meter to the audio terminals of the 6 way DIN Modem connector. Pin No1 and Pin No 2. Connect a calibrated RF signal generator to the BNC RF connector set to the required frequency and +/- 3kHz deviation at 1800Hz. Adjust VR1 for a received audio level of –15dBm.

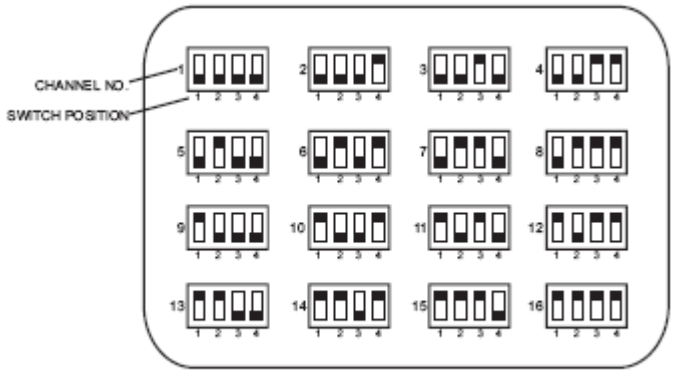
Recheck the transmit audio level as described above and re-adjust as necessary.

Maxon Radio

The Maxon radio is fully programmable through specialised programming equipment. Qtech offers complete Maxon radio after sales service and reprogramming facilities.

The radio module has 16 available channels which are set by DIP switches, similar to the module address of an RTU.

To access the channel select switches, undo the four posi drive screws of the Maxon radio module and remove the top cover.



DATRAN Q80 Radio - Channel Select Switches

SPECIFICATIONS

Power Supply DC 12 volts. Standby 80mA, Receive 100mA and Transmit 1.2A at 5 Watts output.

Remote ON/OFF Module power can be remotely controlled by Q22 – DATRAN *eXcel* Module.

Programmable The frequency synthesizer, channel spacing and power output are fully programmable.

Frequencies VHF 148 – 174MHz
UHF 400 – 440MHz (Proposed).
UHF 450 – 480MHz
UHF 480 – 520MHz (Proposed)

Channel Spacing 12.5KHz or 25KHz.

RF Output Programmable 0.5 to 5 watts in 8 steps per channel.

Aerial 50 ohms unbalance at front panel BNC connector.

Data Interface Standard DATRAN 6 pin DIN socket.

WARRANTY & LIABILITY

Subject to the under mentioned exemptions QTech Data Systems Limited undertakes to repair any manufacturing defects and replace or repair any faulty materials within (12) twelve months from the date of sale to the original purchaser.

The exemptions referred to are:

1) Fair wear and tear

2 Faulty installation, misuse, neglect, accident and similar causes.

3) Equipment that does not bear the original Serial Number label or the label has been defaced or altered.

4) Unsuitable operating conditions, including improper installation and other influences beyond QTech control.

5) Alterations carried out by the Purchaser or any unauthorised third party.

7) Power supply protection parts, including fuses and other circuitry provided to protect the unit from electrical damage.

8) Output drivers, transistors, relays and other parts of the circuitry that are directly connected to third party equipment.

9) Damage resulting from lightening strikes and other static discharges.

Liability for replacements supplied or repairs carried out is limited to the original (12) twelve month warranty period.

QTech will not accept responsibility for warranty work carried out by the purchaser or any unauthorised third party.

QTech does not assume or authorise any person to assume for QTech any other liability regarding its products.

QTech's liability is limited to the extent set out above and does not extend to any consequential damages or losses.

DISCLAIMER

In no event shall QTech nor it respective agents be liable for special, direct, indirect, or consequential damages losses, costs, charges, claims, demands, claims for loss of profit, fees, or expenses of any nature or kind.

While QTech warrants it's products it does not imply a warranty for its use for a particular purpose.

QTech shall not be liable for any infringement or violation of copyright with respect to the material reproduced or displayed on its products. .

WARRANTY SERVICE

Where the conditions of liability as set out above are met QTech will carry out warranty service as detailed below:

1) Goods returned for servicing shall be adequately packaged to prevent damage in transit and shall be forwarded freight pre-paid.

2) A description of the fault/s together with any other relevant information relating to the fault, together with the return address to which the equipment is to be returned, must be included with any equipment returned to QTech for repair.

3) QTech may elect at its sole discretion to repair or replace equipment returned for repair.

4) Where repairs to the equipment are undertaken, the repairs will be undertaken during normal business hours.

5) Once repairs or replacements are complete, the equipment will be returned by a suitable carrier to the Purchaser unless otherwise instructed by the Purchaser.

OUT OF WARRANTY SERVICE

Where the equipment is outside the (12) twelve month warranty period or is not otherwise covered by the warranty, then the service work will be carried out as detailed above with the exception that all labour, materials and freight will be charged at QTech's rates applicable at the time of service.

QUICK FIND INDEX

USER'S NOTES