
Lo-Q plc

VQ2020
Q-cnx Installation Guide

Version 1.3

Revision History

Date	Version	Description	Author
24 th October 2008	1.0	Initial document	P. Mitchell
4 th November 2008	1.1	Wiring diagrams added Configuration section added Various tweaks	R. Merrison
15 th June 2009	1.2	Conformity Statements added	T. Underwood
23 rd July 2009	1.3	Canada Antenna statement added	T. Underwood

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1. Introduction

1.1 Purpose

This document contains guidelines for installing the layout of a radio network in a park. The purpose of this installation guide is to ensure that all installations are carried out to standard as set down by Lo-Q plc. It is important that all installs are carried out to the highest standard and is standardised throughout the organisation.

1.2 Q-cnx Hardware

A Q-cnx is a fixed radio device that is used to provide a radio network for Q-bots around a site. For information about the workings of Q-cnxes and how to plan their placement, please see the “VQ2020 RF Network Planning Guidelines” document.

All Q-cnxes are made up of two separate units – a feeder unit and a head unit. These are briefly described below.

1.2.1 Feeder Unit

The feeder unit contains:

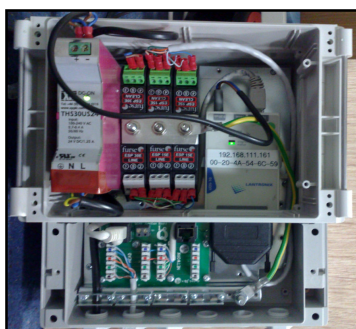
- A mains power supply unit (100-240V AC to 24V DC) and Furse protection fuse.
- (In base station Q-cnx feeders) A Lantronix UDS-10 network to RS485 device and Furse protection fuses.
- A junction board PCB, which connects the UDS-10's serial output to the header unit or allows an RJ45 terminated configuration cable to be plugged in for configuration of repeater Q-cnxes.

1.2.2 Head Unit

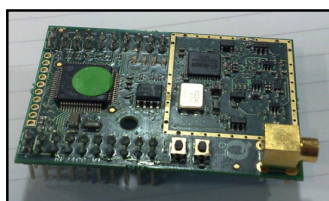
The head unit itself comprises two separate parts.

The **head unit RF board** has a microprocessor and radio transceiver and is where the main intelligence of the Q-cnx is. One of the buttons on the RF board is reset, the other is currently unused. The antenna connection on the RF board should be connected to the external antenna socket of the head unit box.

The **head unit base board** contains a TRACO power supply (10-30v DC to 5v DC) and an interface between the RF board and the RS485 connection from the UDS-10 in the feeder unit. It also has a power switch and two yellow LEDs, one of which indicates that there is power on the board and one of which indicates that the power switch is on. The four DIP switches on the base board are not currently used.



Feeder Unit



Head Unit RF Board



Head Unit Base Board

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2. General Guidelines

All installation works will be carried out in a professional manner with Lo-Q staff understanding that they are representing the company whilst working in the clients premises. The greatest of care and consideration must be shown at all times.

2.1 Cabling and Antennas

Certain rules will be adhered to when running cable lengths:

- All cable used for installation works will be of solid wire type (not stranded) and suitable for the task. (See Appendix A for full cable specification)
- Internal and outdoor direct burial cable will be shielded (S/FTP) and where necessary gel filled.
- All cables must be installed in accordance to the Lo-Q plc installation manual, Health and Safety guidelines, risk assessments and clients' own policies and procedures.
- All external Cat5e cable will meet ISO 11801 regulations - Class D, Screened Fully Shielded Twisted Pair (S/FTP).
- All cables will be installed neatly using various fixings for example staple, cable tie or cable pin to ensure a secure, neat laying of the cable (i.e. no "sagging" of cable).
- Where reasonably practicable cable will be laid in existing cable runs to avoid unnecessary sight of cable and installed through trunking/conduit if necessary.
- Cable will be laid following any natural pathways, edges, or already laid cable as to be as inconspicuous as possible.
- No run of cable will exceed 100 metres.
- All cables runs will be as straight as possible, with fixings to be no greater than 2m apart.
- All cables will be striped and punched down neatly with the cable glands tightened. Cables will be secured and any rubbish cleared.
- All cables will have a 2m-service loop cable tied in a neat circle secured to the antenna bracket.
- All cables will be labelled with Lo-Q identification and any warning labels as applicable.
- All external Cat5e cable must be joined to internal Cat5e cable if the "run" of external cable inside exceeds 6m.
- If an antenna needs to be placed using a "fly lead" these cannot be over 2 feet in length. Fly lead joins will be also wrapped in self amalgamating tape to protect against weather conditions.
- Antenna brackets need to be as inconspicuous as possible as well as being functional – spray if necessary to blend.
- Antenna brackets must not be fixed to the fascia of the building and will be 535mm (21"). 1" diameter L cranked mast fitted as standard or adapted to suit the required need.
- Any holes drilled through walls must be in a place as to not cause any unnecessary damage. Care must be taken to ensure that NO pipes or cables are in the area of the hole to be drilled.
- All holes drilled through external walls will be filled with clear silicone to prevent moisture.
- Holes drilled are to be the smallest required to do the job and where possible drilled from the outside in, to cause the least amount of damage to the fascia of the wall.
- Self-amalgamating tape will be wrapped around the antenna aerial where it joins the Q-cnx unit to seal against weather conditions.

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- After installation all clippings, cable ties etc must be removed and the area left clear and tidy.

2.2 Illustration



This photograph shows how a Q-cnx Header unit should look when installed. Note the service loop and cables neatly tied to the mounting pole.

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3. Feeder Unit Installation

3.1 Guidelines

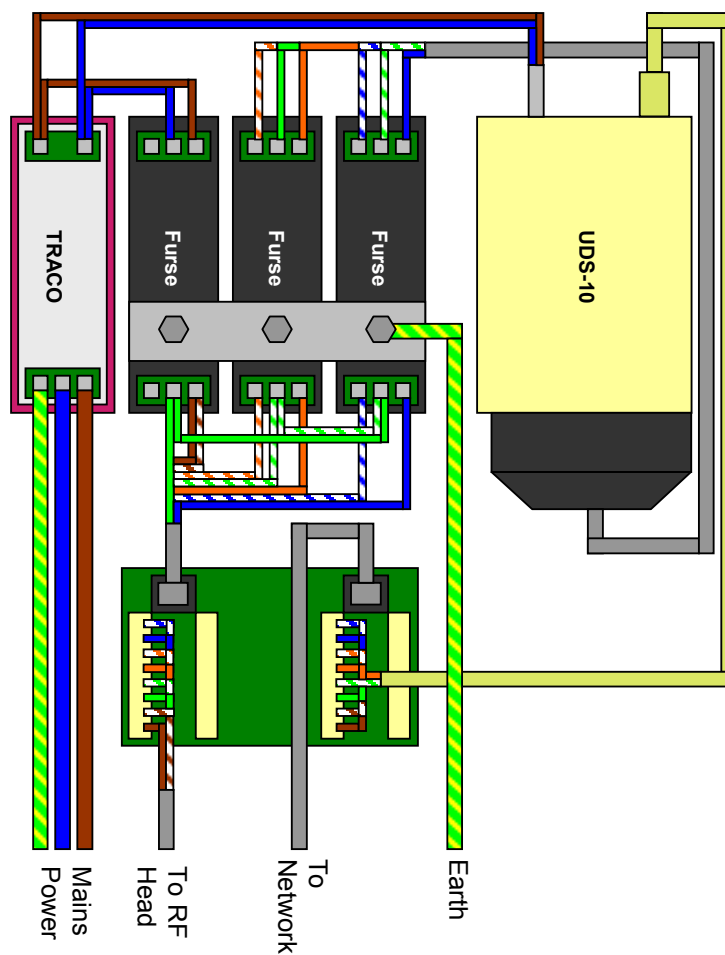
In addition to the general guidelines above, the following guidelines must be followed when installing base station or repeater feeder units.

- All base stations will be sited as per the survey and in accordance with Lo-Q's "RF Network Planning Guidelines", Health and Safety guidelines, risk assessments and the client's own policies and procedures.
- Surge protection to mains and Ethernet protection will be installed inline at a distance not exceeding 1m from Q-cnx base station/repeater unit. Surge units will be ESP 240-5A/BX (200-280V RMS) or ESP 120-5A/BX (90-150V RMS) as the country of installation's mains voltage dictates.
- All base stations, repeaters and protection devices will be mounted to a suitably sized, moisture resistant board and securely fixed to a wall using adequate fixing materials – screws, wall plugs as necessary.
- All base stations and repeaters will be mounted straight and level.
- Base stations and repeaters will be mounted in an accessible place but not obstructing any of the client's equipment.
- All mains power sockets to be used by Lo-Q must be checked for safety and must be on a dedicated spur not used by client to avoid unplugging of Lo-Q equipment. It must be able to maintain 240v or 110v, as applicable. Power supply cables must be 1mm 3 core flex rated at 74A connected to a 3amp fused plug to BS1362 and labelled.
- ESP Cat5e Transient Protectors will be fitted to base stations, with a maximum working voltage (or signalling) of 5 volts.
- Base stations and repeaters will be earthed using 16mm² cable secured to a solid earth, installing own ground rod if necessary. Unless it is totally unpractical Earth cable must not exceed 1m in length from base station or repeater. Earth cables will be labelled.
- All cabling will be secured by staples, cable ties or cable pins leaving a 1m service loop tied neatly at the end.

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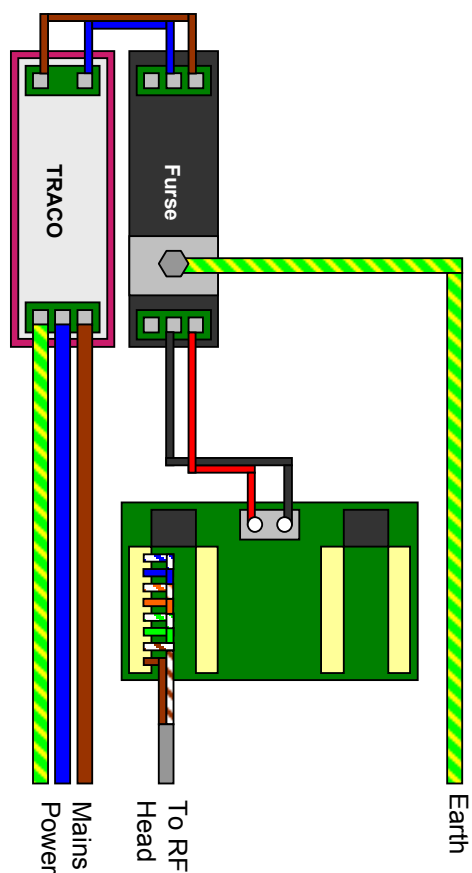
3.2 Illustrations

3.2.1 Feeder Unit Wiring Diagram (Base station)



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3.2.2 Feeder Unit Wiring Diagram (Repeater)

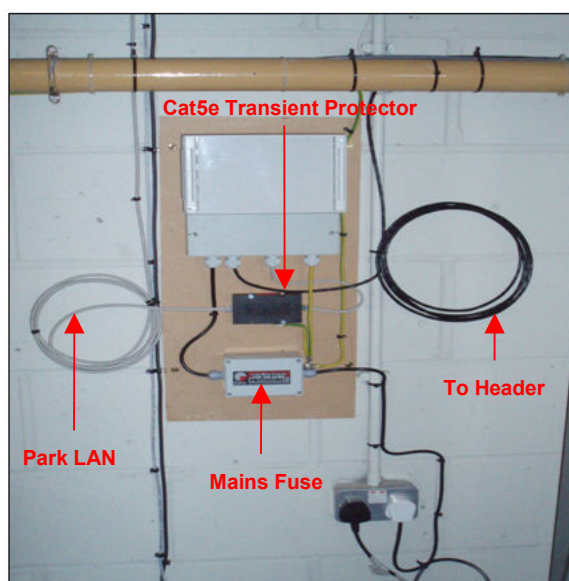


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3.2.3 Example Installed Repeater

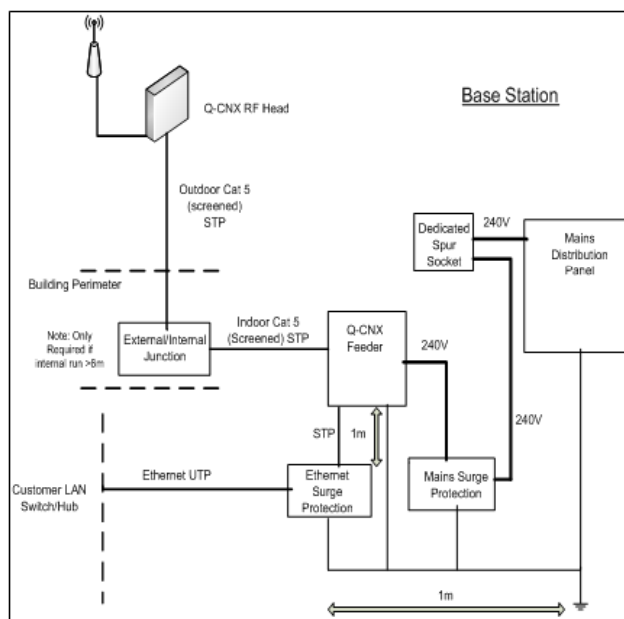


3.2.4 Example Installed Base Station



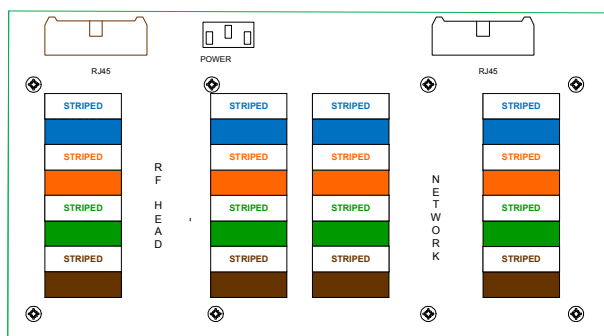
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3.2.5 Installation Diagram



From this diagram you can see that preferred system requirements are dedicated mains power, LAN point and earth within a 1 metre distance. Please note that repeaters are as per this diagram but without the Ethernet connection and associated surge protector.

3.2.6 Junction Board Layout



PCB in Base station / Repeater showing the colours of the punch down for the Cat5e cable. RF head goes to the Q-cn timer head unit. Note that the Network connectors are not used in a repeater.

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4. Configuration

Once a Q-cnx has been physically installed it must be configured correctly before it will be an operational part of the park radio network. This section describes the software configuration required when setting up Q-cnx units.

4.1 UDS-10 Configuration

For base station Q-cnxes, the UDS-10 unit must first be set up correctly before configuration of the Q-cnx itself can be performed over the network. Without properly configured UDS-10 units the server will be unable to communicate with Q-cnxes.

Refer to the Lantronix documentation for instructions on using the UDS-10 Device Installer software to assign IP addresses to UDS-10s. Once this has been done, installation can be done either through a web interface by browsing to the IP of the unit, or through a Telnet connection (which may be configured using the web interface).

The table below lists the settings that should be used. Note that the "Port" settings should be set to 50000 + the last number of the IP address; so for unit with IP 192.168.111.30, the port should be set to 50030.

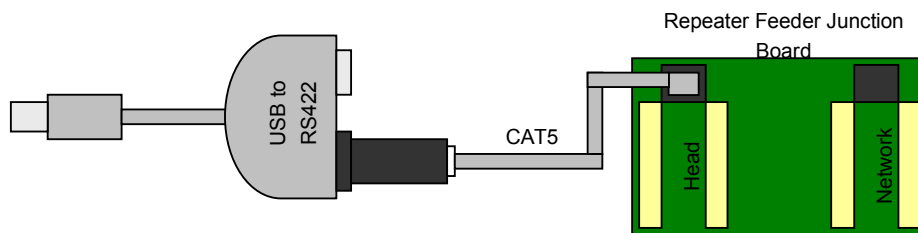
Server Properties	
Server Properties	
IP Address	IP address of this UDS-10
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0
Telnet Password	XXXX
Port Properties	
Serial Port Settings	
Serial Protocol	RS422/485- 4 wire
Speed	115200
Character Size	8
Parity	None
Stopbit	1
Flow Control	None
Connect Mode Settings	
UDP Datagram Mode	Disable
UDP Datagram Type	
Incoming Connection	Accept unconditional
Response	Nothing (quiet)
Startup	No Active Connection Startup
Dedicated Connection	
Remote IP Address	VQ2020 Server IP address xxx.xxx.xxx.nnn
Remote Port	Local port (50nnn)
Local Port	Local port (50nnn)
Flush Mode Input Buffer (Line to Network)	
On Active Connection	Enable
On Passive Connection	Enable
At Time To Disconnect	Enable
Flush Mode Input Buffer (Network to Line)	
On Active Connection	Enable
On Passive Connection	Enable
At Time To Disconnect	Enable
Packing Algorithm	

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Packing Algorithm	Enable
Idle Time	Force Transmit 12ms
Trailing Characters	None
Send Immediate After Sendchars	Enable
Sendchar Define 2-Byte Sequence	Disable
Send Character 01	7e
Send Character 02	00
Additional Settings	
Disconnect Mode	Ignore DTR
Check for CTRL-D To Disconnect	Disable
Port Password	Disable
Telnet Mode	Disable
Inactivity Timeout	Enable
Inactivity Timer	5:0
Port Password	

4.2 Configuring a Repeater via USB

As Repeater Q-cnxes are not connected to the network they must be initially configured by physically connecting to the unit via USB. This requires a USB to RS422 adapter and a specially wired 9-pin D-type to RJ45 connector. The following diagram shows this setup. This connection can then be used to configure the repeater using either the command line “Q-cnx Configuration Tool” or the “QIS Manager” tool, as described in the next two sections.



4.3 Pre-SAP Q-cnx Configuration

For Q-cnx units that are running firmware versions earlier than 1.0.2.1 (pre-SAP), the command-line “Q-cnx Configuration Tool” must be used to update the firmware to the latest version before the newer “QIS Manager” tool can be used for main configuration. Please see the documentation for this tool for details of how to accomplish this.

4.4 Q-cnx Configuration

Main configuration of Q-cnxes is done using the QIS Manager tool. For full details of how to use this tool see its associated documentation. This section will describe only the settings that need to be configured when installing a new Q-cnx or updating an existing Q-cnx to 1.0.2.x.

The first step of configuration is connecting directly to the Q-cnx using the QIS Manager tool. For a base station Q-cnx use the “Add New Direct Connection” button and enter the IP of the Q-cnx. For a repeater select the COM port from the list on the left-hand side that corresponds to the port being used on the USB to RS422 converter.

Set the configuration values as per the table below.

Setting	Value	Notes
Address	Automatically assigned	The Q-cnx’s radio address is allocated automatically and should not be modified by users.
Channel	Park radio channel	The standard channel that is used in parks is 25.

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		However this is subject to change based on a radio survey of each individual park.
Id	Name assigned to Q-cnx	This is a string of up to 16 characters (letters, numbers and underscores) that uniquely identifies each Q-cnx in a park. The Id assigned to each unit will be required when configuring the VQ2020 server.
LogMask	0	The level of diagnostic logging done by the unit. For live park Q-cnxs this should be set to 0.
Mode	Basestation, Repeater or Master	The mode that the unit should operate in. There must be one and only one base station in Master Mode per park.
RxAmpEnabled	True	Whether or not the Q-cnx's receive amplifier is used to boost received signal strengths.
RxMask	255	A packet type filter applied to incoming packets. Packets that do not match the filter are dropped. This should always be 255 for a live park Q-cnx.
Ttl	255	Default time-to-live value for control layer packets sent by the Q-cnx. This should always be 255 for a live park Q-cnx.
TxMask	255	A packet type filter applied to outgoing packets before transmission. This should always be 255 for a live park Q-cnx.

Press the "Configure" button to save the settings to the Q-cnx and then "Reboot Q-cnx" to apply them. The Q-cnx should now be fully functioning on the RF network.

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Warranty Statement

Lo-Q plc warrants for a period of 1 year from the date for shipment that each product supplied shall be free from defects in material and workmanship. During this period, if the customer experiences any difficulties with the product and is unable to resolve by phone or e-mail with Lo-Q Technical Support, a Return Material Authorization (RMA) number will be issued. Following receipt of a RMA the customer is responsible for returning the product to Lo-Q plc, freight pre-paid. Lo-Q plc upon verification of a valid warranty will, at its option, repair or replace the product in question, and return it to the customer freight pre-paid. No services are provided at the customer's site under this warranty.

Lo-Q plc warrants the Firmware within the product for a period of ninety (90) days from the date of shipment, that each Firmware package shall be free from defects and operate according to Lo-Q's specifications. Any Firmware revisions required hereunder cover supply of distribution media only and do not cover, or include any installation or upgrade of the product.

Lo-Q shall have no obligation to make repairs or to effect replacement required through normal wear and tear arising in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the product, or use of the product in such a manner for which it was not designed, or causes external to the product.

There are no understandings agreements, representations or warranties, express or implied, including warranties or merchantability or fitness for a particular purpose, other than those specifically set out above, or by an existing contract between the parties. Any such contract states the entire obligation of Lo-Q plc. The contents of this document shall not become part or modify any prior or existing agreement, commitment or relationship between the parties.

The information, recommendations, descriptions and safety information in this or any other documents supplied by Lo-Q plc are based on general industry experience and judgment with respect to such hardware and firmware.

This information should not be considered to be all-inclusive or covering all contingences. No other warranties, express or implied, including warranties for fitness for a particular purpose or merchantability, or warranties from the course of dealing or usage of trade, are made regarding the information, recommendations, descriptions and safety information contained herein and in Hardware and Firmware Specification documentation, or instructions supplied by Lo-Q plc.

In no event will Lo-Q plc be responsible to the user in contract, tort (including negligence), strict liability or otherwise for any special, indirect, incidental or consequential damage or loss of equipment, plant or power system, cost of capital, loss or profits from revenues, cost of replacement power, additional expenses in the use of existing hardware or firmware, equipment or facilities, or claims against the user by its employees or customers resulting from the use of the information, recommendations, descriptions and safety information supplied by Lo-Q plc. Lo-Q plc liability is limited (at its election) to (1) refund the buyers purchase price for such affected products (without interest) (2) repair such products, or (3) replacement of such products, provided however, that the buyer follows the returns procedures outlined herein.

Warranty claims must be received by Lo-Q plc within the applicable warranty period. A replaced product, or part thereof, shall become the property of Lo-Q plc and shall be returned to Lo-Q plc at the purchaser's expense. A Return Material Authorization number assigned by Lo-Q plc must accompany all returned product.

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European Approval

A.1 Declaration of Conformity

We the undersigned,

Manufacturer	Lo-Q plc
Address	The Smith Centre
	Fairmile
	Henley-On-Thames
	Oxon
	RG9 6AB
	United Kingdom
Phone Number	+44(0) 1491 577210
Fax Number	+44(0) 1491 577270
Email	information@lo-q.com

Certify and declare under our sole responsibility that the following apparatus:

Product	Lo-Q Q-cnx
Model	QCX-Q2400-100
Description	Radio Basestation
Type	Class 1
Any Limitations	None

Conforms with the relevant standards as listed below:

EMC Immunity Testing for radio Devices	EN 301 489-1 V1.6.1
EMC Immunity Testing for radio Devices	EN 301 489-17 V1.2.1
Low Voltage Directive Safety Testing	EN 60950-1:2006
Electromagnetic compatibility	EN 300 328 V1.7.1

Therefore complies with the essential requirements of the R&TTE directive:

R&TTE Directive	R&TTE Directive 1999/05/EC
-----------------	----------------------------

The following notified body has issued a Positive Statement of Opinion.

Notified Body Reference	0889
ID of Notified Body Statement of Opinion	
Name	RFI Global Services Ltd
Address	Pavilion A
	Ashwood Park
	Ashwood Way
	Basingstoke
	Hampshire
	RG23 8BG
	UK
Telephone	+44(0) 1256 312000

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US Approval

A.2 Declaration of Conformity

We the undersigned,

Manufacturer	Lo-Q plc
Address	The Smith Centre
	Fairmile
	Henley-On-Thames
	Oxon
	RG9 6AB
	United Kingdom
Phone Number	+44(0) 1491 577210
Fax Number	+44(0) 1491 577270
Email	information@lo-q.com

Certify and declare under our sole responsibility that the following apparatus:

Product	Lo-Q Q-cnx
Model	QCX-Q2400-100
Description	Radio Basestation
Equipment Class	Part 15 Spread Spectrum Transmitter
Type	Fixed Communications Device

Conforms with the relevant standards as listed below:

FCC Part 15 Spread Spectrum Transmitter	FCC Part 15.249
---	-----------------

A.3 Conformity Statement

FCC ID: QCX-Q2400-100

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference,

And

(2) This device must accept any interference received, including interference that may cause undesired operation.

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Canadian Approval

A.4 Declaration of Conformity

We the undersigned,

Manufacturer	Lo-Q plc
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	Fairmile
	Henley-On-Thames
	Oxon
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	United Kingdom
Phone Number	+44(0) 1491 577210
Fax Number	+44(0) 1491 577270
Email	information@lo-q.com

Certify and declare under our sole responsibility that the following apparatus:

Product	Lo-Q Q-cnx
Model	QCX-Q2400-100
Description	Radio Basestation
Equipment Class	Low Power License Exempt Device
Type	Fixed Communications Device

Conforms with the relevant standards as listed below:

Industry Canada	RSS-210
-----------------	---------

A.5 Conformity Statement

FCC ID: QCX-Q2400-100

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference,

And

(2) This device must accept any interference received, including interference that may cause undesired operation.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 3dB. Antennas not included in this list or having a gain greater than 3dB are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

1. Omnidirectional antenna, gain of 3dB

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

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Contact Information

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