
Q03 - 16 Bit Processor
Owners Manual



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REVISION DETAILS

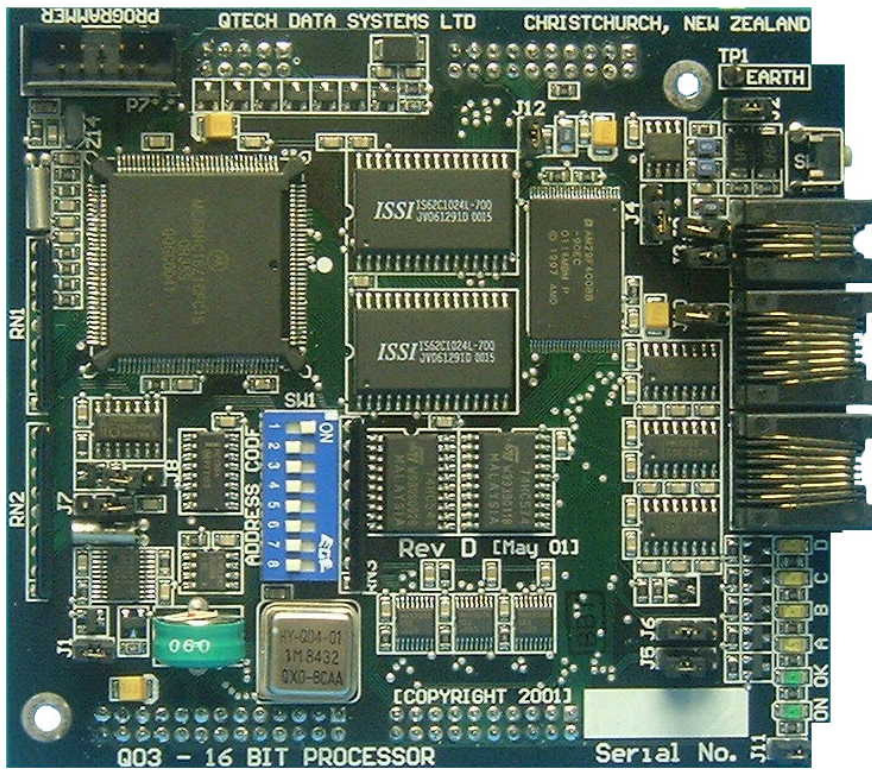
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1.02 – Nov 2000	Page 29 – Reserved Address DIP Switch codes added.
1.03 – Nov 2001	Q03 Revision D functions added.
1.04 – Oct 2003	Update Q03 dip settings table
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INTRODUCTION

This revision 1.03 manual is for use with the Q03 - 16 Bit Processor up to and including Rev D printed circuit boards.



Photograph showing the Q03D – 16 Bit Processor

Note The photograph above shows a Q03D – 16 Bit Processor revision D printed circuit board.

The Product

The Q03 - 16 Bit Processor is a central processing board (printed circuit board) based around the Motorola MC68HC16Z1 micro controller. In addition to the core CPU functions, the board includes:

- ❖ Data and program storage memory.
- ❖ EEPROM configuration data backup.
- ❖ Analog input and output functions.
- ❖ System reset functions.
- ❖ Real time clock functions.
- ❖ Serial communications functions.
- ❖ Battery backup functions.
- ❖ Control functions for associated attached motherboards.

The Q03 - 16 Bit Processor board is designed to 'piggy back' onto an associated motherboard. Examples of this are the Q20 - QRTU motherboard and the Q22 - DATRAN II eXce/ motherboard.

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 Q03 - 16 Bit Processor.

INTRODUCTION

- ❖ The Configuration section explains how to configure the various hardware settings on the Q03 - 16 Bit Processor to suit its' specific application.
- ❖ The Connections section explains how to inter-connect the Q03 - 16 Bit Processor to other devices.
- ❖ 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 Q03 - 16 Bit Processor board is referred to as the Q03 Processor throughout this manual.

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Additional Information

In conjunction with this manual the following manuals should also be read to dependent upon the application of the Q03 Processor:

- ❖ The Q20 - QRTU motherboard manual.
- ❖ The Q22 - DATRAN II *eXcel* motherboard manual.
- ❖ The Q90 - Online Configuration & Diagnostic Reference manual.

Precautions



The power should be removed from the Q03 Processor by removing the power connector before setting up and making any adjustments to the Q03 Processor.

The Q03 Processor incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the Q03 Processor.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to the terminal marked 'EARTH' on the Q03 Processor before any adjustments are made.

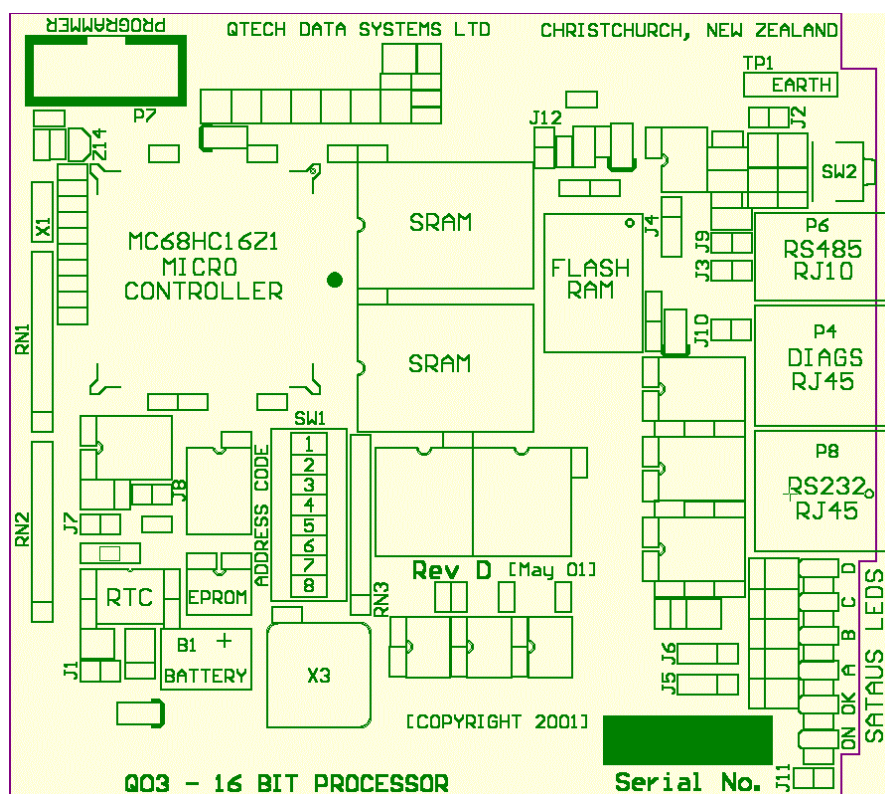
When re-installing the Q03 Processor onto the associated motherboard check to ensure that the Q03 Processor is correctly seated on the motherboard's connectors. That is, that the connectors are not misaligned.

FUNCTIONALITY

This section describes the functions and facilities of the Q03 Processor.

Q03 Processor Layout

The diagram below shows the generalised layout of the Q03 Processor and can be used to locate and identify the various parts and functions detailed in this manual.



Generalised layout of the Q03D Processor.

Functional Description

Central Processor Core

The Q03 Processor is based around the industry standard Motorola MC68HC16Z1 high-speed 16-bit micro controller chip running at a clock frequency of 16.78MHz.

The MC68HC16Z1 application software is stored in an onboard 128K by 16 bit word Flash memory chip. The Flash memory chip has replaced the 2 EPROM program storage devices used in previous versions of the board. The flash memory is specifically designed for in-system programming via the MC68HC16Z1 micro controller BDM port. A connector is provided on the Q03 Processor to allow application software loading from a PC via a proprietary BDM programming dongle. Data is stored in two 128K by 8 bit SRAM chips configured to provide 128K by 16 bits words of data storage. The data storage SRAM is battery backed up to provided data retention during power down.

EEPROM Memory

A 4K by 8 bit serial EEPROM memory chip is used to store application specific setup and configuration data. The EEPROM memory is non-volatile and will retain data in the absence of power and back up battery failure.

Real Time Clock

The real time clock chip provides system day of the week, day of month, month, year, time in 12/24 hours format and am/pm. The real time clock is battery backed up to maintain its' operation during power down. An inbuilt software algorithm that provides accurate time keeping compensates for real time clock time drift.

Battery Backup

An inbuilt 2.4 volt 12 mA/hour nickel metal hydride battery provides system battery back up. This battery is recharged and maintained at full charge capacity whenever the Q03 Processor is powered up. A totally discharged back up battery will take approximately 40 hours to totally recharge.

When all of the battery backed up options on the Q03 Processor are enabled the total battery current is approximately 1 μ A. Therefore a fully charged back up battery will theoretically maintain these functions for 12,000 hours. Allowing for a 50% safety margin the battery will provide approximately 250 days of back up operation

Jumpers are provided on the Q03 Processor to enable/disable the various optionally battery backed up functions. Refer to the configuration section on page 14 for details.

System Reset

The system reset circuitry ensures proper and reliable operation of the Q03 Processor during power failure and power brown-outs. A system watchdog function provides protection and ensure re-starting of an out of step central processor. An externally accessible reset push button is provided for user invoked cold restarting of the central processor and associated peripherals.

The system reset functions can be disabled for diagnostic fault finding and for first time application software program loading. Refer to the configuration section on page 14 for details.

Module Address

An 8 position DIP switch is provided on the Q03 Processor to allow the setting of a unique module address. This module address is used to uniquely identify the module in all communications between the module and other modules and devices. The module address can be any number between 1 and 254. The module address 0 is a reserved address while module address 255 is used to re-load the factory default configuration settings. Refer to page 19 for details.

Status LEDs

System status is displayed on 6 LEDs. The function of these LEDs is detailed below:

- ON** This is a green LED that shows that power is applied to the Q03 Processor.
- OK** This is a green LED that shows the status of the central processing unit. The LED blinks slowly when the CPU is functioning correctly. The LED blinks 6 times quickly whenever a system reset has occurred. Any other condition of this LED indicates a malfunction of the CPU.
- A** This is a yellow LED that illuminates whenever an RS232 cable is plugged into the selected RS232 port connector. The CTS and RTS lines on the remote terminal equipment must be linked.
- B** This is a yellow LED that illuminates whenever IPB (Intelligent Peripheral Bus) communications are active.
- C** This is a yellow LED that illuminates whenever a Data Logging Event is being recorded.
- D** This is a yellow LED that flashes out the various error event codes.

Note Refer to the Online Configuration & Diagnostic Reference manual for details of the functions associated with LEDs B, C and D.

The status LEDs can be enabled and disabled. Refer to page 16 for details.

Diagnostics Port

The Diagnostics serial port is used for on-line configuration, diagnostics and data/program exchange.

The default configuration for the Diagnostics serial port is as follows:

Mode	Half Duplex
Baud	19200
Bits	8
Parity	None
Stop	1 Bit

The Diagnostics serial port can be extended up to a maximum of 15 metres. Beyond this distance communications can be unreliable.

The Diagnostics serial port can be directed to the on-board RJ45 connector or it can be redirected to another RJ45 connector on an associated motherboard. Generally the Diagnostics serial port is directed to the on-board RJ45 connector. The configuration of the Diagnostics serial port is detailed on page 17.

RS232 Port

The RS232 serial port is used for specialised serial communication devices. These devices include Telephone and Radio Modems, GSM Cellular Modems and PLC's etc.

RS485 Port

The RS485 serial port is used for inter-module long distance, high speed communications.

The RS485 serial port has inbuilt provision for line termination. In RS485 applications, especially over long lines, the RS485 transceivers at either end of the line should be terminated with a 120-ohm load. In multi-drop RS485 applications only the far end RS485 transceivers should be terminated. The RS485 serial port can operate in a multi-drop configuration allowing a maximum of 32 devices to be connected to the RS485 line.

The RS485 serial port can be extended up to a maximum distance of approximately 1000 meters with appropriate cable and installation.

The RS485 serial port can be directed to the on-board RJ10 connector or it can be re-directed to an alternative connector on an associated motherboard. Generally the RS485 serial port is directed to the on-board RJ10 connector. The configuration of the RS485 port is detailed on page 18.

Radio Modem Port

The Q03 Processor has a third TTL compatible serial port dedicated for use by an associated off-board radio modem for networked radio telephone and direct line communications.

CONFIGURATION

This section describes how to configure the Q03 Processor via the various on-board configuration jumpers and switches.



The power should be removed from the Q03 Processor by removing the power connector before carrying out any of the configurations detailed below.

The Q03 Processor incorporates static discharge sensitive devices. Normal Anti Static Discharge precautions should be employed when setting up and making any adjustments to the Q03 Processor.

An anti-static wristband should be worn and the earth connection of this wristband should be connected to the terminal marked 'EARTH' on the Q03 Processor before any adjustments are made.

Configuration Jumper Functions

The following list describes the function of each of the configuration jumpers on the Q03 Processor:

- J1** When closed this jumper enables the various battery backed up functions on the Q03 Processor. This jumper is normally closed.
- J2** When closed this jumper provides a 120 ohm termination to the RS485 line. This jumper is normally closed.
- J3** When closed this jumper provides an earth connection to pin 4 of the RS485 RJ10 connector. This jumper is normally open.
- J4** This two-way jumper selects whether the RS485 port is directed to the on-board or off-board RS485 port connector.
- J5** This two-way jumper selects whether the RS232 port CTS line is directed to the on-board or off-board RS232 port connector.
- J6** This two-way jumper selects whether the RS232 port RXD line is directed to the on-board or off-board RS232 port connector.
- J7** When closed this jumper provides battery back up to the MC68HC16Z1 micro controller's internal SRAM. This jumper is normally open.
- J8** When closed this jumper disables the Reset functions and is used for hardware diagnostics and first time program loading. This jumper is normally open.
- J9** When closed this jumper provides +5 volts output to pin 1 of the RS485 RJ10 connector. This jumper is normally open.
- J10** When closed this jumper provides +5 volts output to pin 1 of the Diagnostics port RJ45 connector. This jumper is normally open.
- J11** When closed this jumper enables the six on-board diagnostic LED's (lights). This jumper is normally closed.
- J12** Selects the upper or lower program block of the Flash Program memory. This jumper is normally closed.

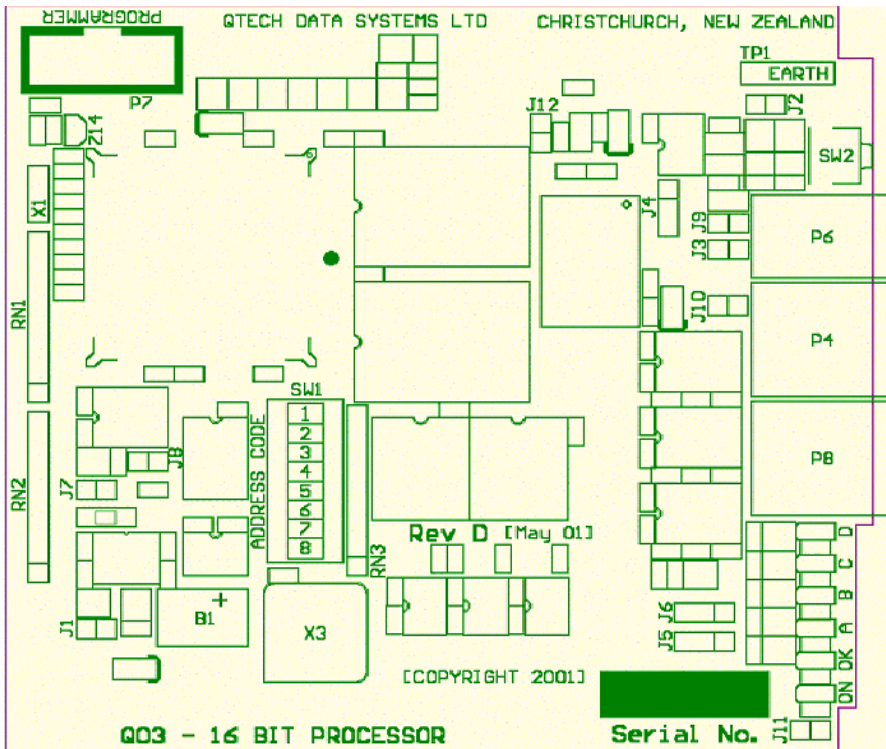
Note: A jumper is closed when a jumper shorting link is installed on the jumper. A jumper is open when a jumper shorting link is removed/not installed.

A two way jumper has three pins so that the jumper shorting link can be installed one of two ways.

Configuration Jumper Settings

The following section describes the function and settings of each of the configuration jumpers on the Q03 Processor.

The diagram below shows the general location of each of the configuration jumpers on the Q03 Processor. The precise location, orientation and identification of jumper pin numbers is best done by referring to the diagrams in this manual and referring to an actual Q03 Processor.



Location of Configuration Jumpers on Q03 Processor.

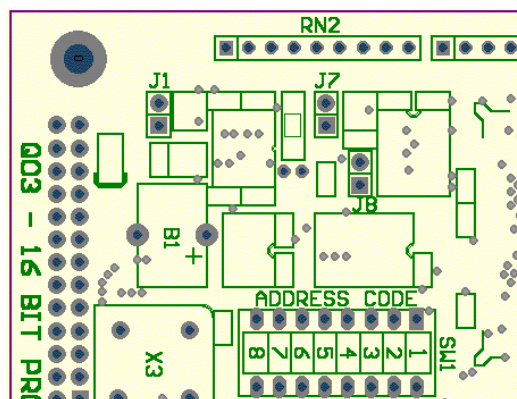
In the diagrams shown below the square pad on each jumper header is pin No 1. The pins are numbered 1, 2, and 3 away from pin No 1.

TIP A pair of fine pointed nosed pliers or tweezers can be used to remove and install the jumper shorting links. The jumper shorting links will only fit onto the jumper pins one way. Always check that they are seated properly.

Unused or open jumper shorting links may be installed on only one pin of the jumper

Battery Back Up

The diagram below shows the location of the Battery Backup Enable jumper J1 at the lower left hand edge of the Q03 Processor.



Location of Configuration Jumper J1.

Jumper J1 globally enables and disables the battery back up functions. These functions include the Real Time Clock, data storage SRAM and the MC68HC16Z1 micro controller in-built SRAM.

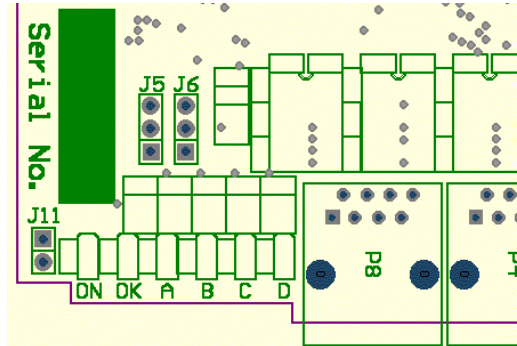
Jumper J1 should normally have a shorting link installed. It should only be open when undertaking board level servicing or when the Q03 Processor is to be stored for a very long period to prevent the battery going completely flat.

System Battery Back up	
	J1
ENABLED	INSTALL
DISABLED	OPEN

Battery Back Up Jumper Configurations.

Status LEDs Enable

The diagram below shows the location of Status LED Enable jumper J11 at the lower left hand edge of the Q03 Processor.



Location of Configuration Jumper J11.

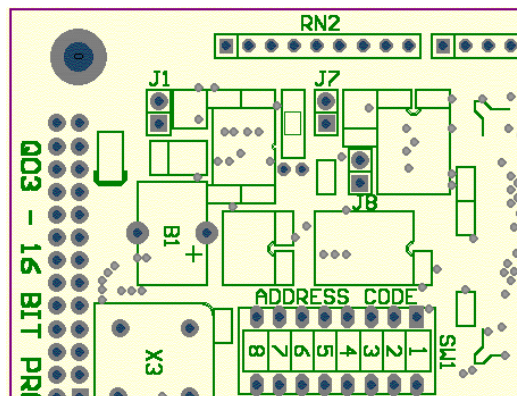
Jumper 11 enables and disables the power to the Status LEDs. Normally J11 should have a shorting link installed. However in power consumption sensitive applications the Status LEDs can be turned off to conserve power by removing this shorting link.

Status LEDs Power	
	J11
ENABLED	INSTALL
DISABLED	OPEN

Status LED's Power Jumper Configurations

System Reset Disable

The diagram below shows the location of the System Reset Disable jumper J8 at the upper left hand edge of the Q03 Processor.



Location of Configuration Jumper J8.

The system reset signals are generated by the reset button or by the on-board watch dog timer timing out. The system reset can be disabled for hardware diagnostics and for first time program loading.

Note Refer to the Online Configuration & Diagnostic Reference manual for use of this option.

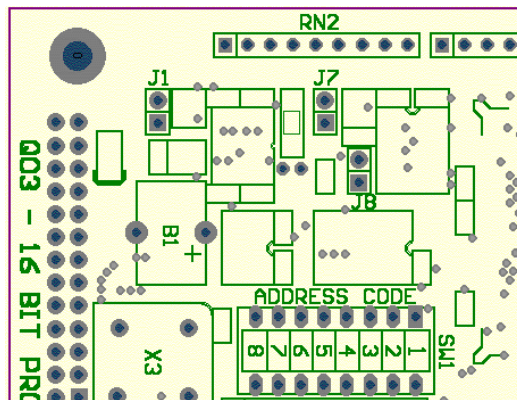
Jumper J8 enables and disables the System reset function. Normally this jumper is open.

System Reset Control	
	J8
ENABLED	OPEN
DISABLED	INSTALL

System Reset Disable Jumper Configurations

Processor SRAM Enable

The diagram below shows the location of Processor SRAM Enable jumper J7 at the upper left hand edge of the Q03 Processor.



Location of Configuration Jumper J7.

Jumper J7 is used to enable battery backup to the MC68HC16Z1 micro controller in-built SRAM. Normally this jumper is open.

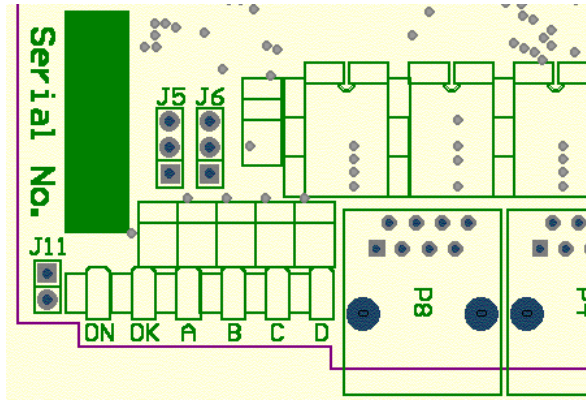
Note In software applications that require the micro controller in-built SRAM to be battery backed up, details will be given in the applicable software notes.

Processor SRAM Enable	
	J7
ENABLED	INSTALL
DISABLED	OPEN

Processor SRAM Enable Jumper Configurations

RS232 Serial Port

The diagram below shows the location of the jumpers J5 and J6 associated with the RS232 port configuration at the bottom left of the Q03 Processor.



Location of RS232 Configuration Jumpers.

The RS232 serial port is used for on-line configuration, diagnostics and data/program exchange. The RS232 serial port can be directed to the on-board RJ45 connector or it can be redirected to another RJ45 connector on an associated motherboard. Generally the RS232 serial port is directed to the on-board RJ45 connector.

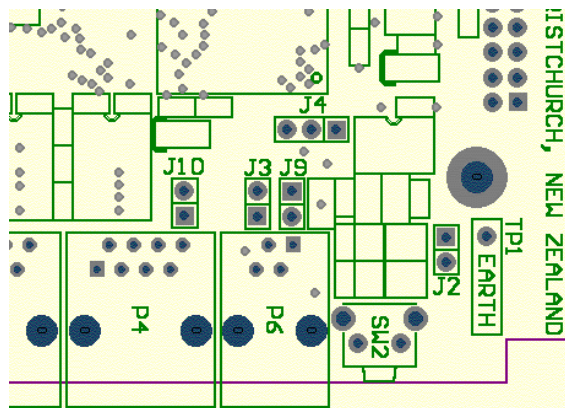
Note In a Q22 - DATRAN II eXcel application the RS232 is always directed to the on-board RJ45 connector.

RS232 Serial Port Configuration		
	J5	J6
ON-BOARD	1 - 2	1 - 2
OFF-BOARD	2 - 3	2 - 3

Optional RS232 Jumper Configurations.

RS485 Serial Port

The diagram below shows the location of the jumper J4 associated with the RS485 port configuration at the bottom left of the Q03 Processor.



Location of RS485 Configuration Jumpers.

The RS485 serial port is used for inter-module long distance, high speed communications. The RS485 serial port can be directed to the on-board RJ10 connector or it can be re-directed to another other connectors on an associated motherboard. Generally the RS485 serial port is directed to the on-board RJ10 connector.

Note In a Q22 - DATRAN II eXcel application the RS485 is always directed to the on-board RJ10 connector.

RS485 Serial Port Configuration	
	J4
ON-BOARD	1 - 2
OFF-BOARD	2 - 3

Optional RS485 Jumper Configurations.

The RS485 serial port has inbuilt provision for line termination. In RS485 applications, especially over long lines, the RS485 transceivers at either end of the line should be terminated with a 120-ohm load. In multi-drop RS485 applications only the far end RS485 transceivers should be terminated.

To enable the 120 ohm line terminating resistor install a shorting link on J2

RS485 Line Termination	
	J2
TERMINATED	INSTALL
UN-TERMINATED	OPEN

RS485 Line Termination Jumper Configurations.

The onboard RJ10 RS485 connector has provision for supplying ground and +5 volts on pins 4 and 1 respectively. This option provides power for specialised RS485 self-power devices that may be plugged into this connector.

This option when enabled also provides +5 volts on pin 1 of the RS232 serial port RJ45 connector.

RS485 Power Output		
	J3	J9
ENABLED	INSTALL	INSTALL
DISABLED	OPEN	OPEN

RS485 Power Jumper Configurations

*Note Under normal operating conditions this option **must** be disabled. If the ground and/or the +5 volt lines on this connector are routed over the RS485 and/or RS232 line/s then any induced RF, voltages, or static discharges would be coupled directly back into the Q03 Processor power supply rails causing possible hardware failure.*

Module Address Settings.

Each module in a network must have a unique module address. This address can be any number in the range 1...239. The module addresses 0 and [240 to 255] are reserved addresses and should not be used.

Note Refer to the Online Configuration & Diagnostic Reference manual for details of the functions associated with addresses 240 to 255

Module address 255 is used to restore the factory default setting.

An 8 position DIP switch is located approximately in the centre of the Q03 Processor. This DIP switch is used to set the required module address. The DIP switches are labeled 1 to 8. The ON position is also marked on the DIP switch, that is the direction that a DIP switch must be moved to for the DIP switch to be on.

TIP Use a ball pen or small screw driver blade to set the DIP switches. Ensure that the DIP switch is positioned at the end of its' travel when setting the switches.

The DIP switches are set in binary number format. That is:

	Binary
Switch 1	1
Switch 2	2
Switch 3	4
Switch 4	8
Switch 5	16
Switch 6	32
Switch 7	64
Switch 8	128

The table below shows the DIP switch settings for the individual addresses 0 to 255. Do not use dip settings for address ranges that are not clearly marked as valid address.

Address	1	2	3	4	5	6	7	8	Remarks
---------	---	---	---	---	---	---	---	---	---------

CONFIGURATION

Address	1	2	3	4	5	6	7	8	Remarks
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Not valid
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Valid address
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	"
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	"
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	"
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	"
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	"
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	"
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	"
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	"
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	"
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	"
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	"
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	"
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	"
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF	"
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	"
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	"
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	"
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	Valid address
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	"
21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	"
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF	"
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF	"
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	"
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	"
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF	"
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF	"
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	"
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF	"
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF	"
31	ON	ON	ON	ON	ON	OFF	OFF	OFF	"
32	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	"
33	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	"
34	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	"
35	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	"
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	"
37	ON	OFF	ON	OFF	OFF	ON	OFF	OFF	"
38	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	"
39	ON	ON	ON	OFF	OFF	ON	OFF	OFF	"
40	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	"
41	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	"
42	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	"
43	ON	ON	OFF	ON	OFF	ON	OFF	OFF	"
44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF	"
45	ON	OFF	ON	ON	OFF	ON	OFF	OFF	"
46	OFF	ON	ON	ON	OFF	ON	OFF	OFF	"
47	ON	ON	ON	ON	OFF	ON	OFF	OFF	"
48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	"
49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	"
50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	"
51	ON	ON	OFF	OFF	ON	ON	OFF	OFF	"
52	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	"
53	ON	OFF	ON	OFF	ON	ON	OFF	OFF	"
54	OFF	ON	ON	OFF	ON	ON	OFF	OFF	"
55	ON	ON	ON	OFF	ON	ON	OFF	OFF	"
56	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	"
57	ON	OFF	OFF	ON	ON	ON	OFF	OFF	"
58	OFF	ON	OFF	ON	ON	ON	OFF	OFF	"
59	ON	ON	OFF	ON	ON	ON	OFF	OFF	"
60	OFF	OFF	ON	ON	ON	ON	OFF	OFF	"
61	ON	OFF	ON	ON	ON	ON	OFF	OFF	"
62	OFF	ON	ON	ON	ON	ON	OFF	OFF	"
63	ON	ON	ON	ON	ON	ON	OFF	OFF	"
64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	"
65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	Valid address
66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	"
67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	"

Address	1	2	3	4	5	6	7	8	Remarks
68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	“
69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF	“
70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	“
71	ON	ON	ON	OFF	OFF	OFF	ON	OFF	“
72	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	“
73	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	“
74	OFF	ON	OFF	ON	OFF	OFF	ON	OFF	“
75	ON	ON	OFF	ON	OFF	OFF	ON	OFF	“
76	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	“
77	ON	OFF	ON	ON	OFF	OFF	ON	OFF	“
78	OFF	ON	ON	ON	OFF	OFF	ON	OFF	“
79	ON	ON	ON	ON	OFF	OFF	ON	OFF	“
80	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	“
81	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	“
82	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	“
83	ON	ON	OFF	OFF	ON	OFF	ON	OFF	“
84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	“
85	ON	OFF	ON	OFF	ON	OFF	ON	OFF	“
86	OFF	ON	ON	OFF	ON	OFF	ON	OFF	“
87	ON	ON	ON	OFF	ON	OFF	ON	OFF	“
88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	“
89	ON	OFF	OFF	ON	ON	OFF	ON	OFF	“
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF	“
91	ON	ON	OFF	ON	ON	OFF	ON	OFF	“
92	OFF	OFF	ON	ON	ON	OFF	ON	OFF	“
93	ON	OFF	ON	ON	ON	OFF	ON	OFF	“
94	OFF	ON	ON	ON	ON	OFF	ON	OFF	“
95	ON	ON	ON	ON	ON	OFF	ON	OFF	“
96	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	“
97	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	“
98	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	“
99	ON	ON	OFF	OFF	OFF	ON	ON	OFF	“
100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	“
101	ON	OFF	ON	OFF	OFF	ON	ON	OFF	“
102	OFF	ON	ON	OFF	OFF	ON	ON	OFF	“
103	ON	ON	ON	OFF	OFF	ON	ON	OFF	“
104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	“
105	ON	OFF	OFF	ON	OFF	ON	ON	OFF	“
106	OFF	ON	OFF	ON	OFF	ON	ON	OFF	“
107	ON	ON	OFF	ON	OFF	ON	ON	OFF	“
108	OFF	OFF	ON	ON	OFF	ON	ON	OFF	“
109	ON	OFF	ON	ON	OFF	ON	ON	OFF	“
110	OFF	ON	ON	ON	OFF	ON	ON	OFF	“
111	ON	ON	ON	ON	OFF	ON	ON	OFF	Valid address
112	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	“
113	ON	OFF	OFF	OFF	ON	ON	ON	OFF	“
114	OFF	ON	OFF	OFF	ON	ON	ON	OFF	“
115	ON	ON	OFF	OFF	ON	ON	ON	OFF	“
116	OFF	OFF	ON	OFF	ON	ON	ON	OFF	“
117	ON	OFF	ON	OFF	ON	ON	ON	OFF	“
118	OFF	ON	ON	OFF	ON	ON	ON	OFF	“
119	ON	ON	ON	OFF	ON	ON	ON	OFF	“
120	OFF	OFF	OFF	ON	ON	ON	ON	OFF	“
121	ON	OFF	OFF	ON	ON	ON	ON	OFF	“
122	OFF	ON	OFF	ON	ON	ON	ON	OFF	“
123	ON	ON	OFF	ON	ON	ON	ON	OFF	“
124	OFF	OFF	ON	ON	ON	ON	ON	OFF	“
125	ON	OFF	ON	ON	ON	ON	ON	OFF	“
126	OFF	ON	ON	ON	ON	ON	ON	OFF	“
127	ON	ON	ON	ON	ON	ON	ON	OFF	“
128	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	“
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	“
130	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	“
131	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	“
132	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON	“
133	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	“
134	OFF	ON	ON	OFF	OFF	OFF	OFF	ON	“
135	ON	ON	ON	OFF	OFF	OFF	OFF	ON	“

CONFIGURATION

Address	1	2	3	4	5	6	7	8	Remarks
136	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	“
137	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	“
138	OFF	ON	OFF	ON	OFF	OFF	OFF	ON	“
139	ON	ON	OFF	ON	OFF	OFF	OFF	ON	“
140	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	“
141	ON	OFF	ON	ON	OFF	OFF	OFF	ON	“
142	OFF	ON	ON	ON	OFF	OFF	OFF	ON	“
143	ON	ON	ON	ON	OFF	OFF	OFF	ON	“
144	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	“
145	ON	OFF	OFF	OFF	ON	OFF	OFF	ON	“
146	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	“
147	ON	ON	OFF	OFF	ON	OFF	OFF	ON	“
148	OFF	OFF	ON	OFF	ON	OFF	OFF	ON	“
149	ON	OFF	ON	OFF	ON	OFF	OFF	ON	“
150	OFF	ON	ON	OFF	ON	OFF	OFF	ON	“
151	ON	ON	ON	OFF	ON	OFF	OFF	ON	“
152	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	“
153	ON	OFF	OFF	ON	ON	OFF	OFF	ON	“
154	OFF	ON	OFF	ON	ON	OFF	OFF	ON	“
155	ON	ON	OFF	ON	ON	OFF	OFF	ON	“
156	OFF	OFF	ON	ON	ON	OFF	OFF	ON	“
157	ON	OFF	ON	ON	ON	OFF	OFF	ON	Valid address
158	OFF	ON	ON	ON	ON	OFF	OFF	ON	“
159	ON	ON	ON	ON	ON	OFF	OFF	ON	“
160	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	“
161	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	“
162	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	“
163	ON	ON	OFF	OFF	OFF	ON	OFF	ON	“
164	OFF	OFF	ON	OFF	OFF	ON	OFF	ON	“
165	ON	OFF	ON	OFF	OFF	ON	OFF	ON	“
166	OFF	ON	ON	OFF	OFF	ON	OFF	ON	“
167	ON	ON	ON	OFF	OFF	ON	OFF	ON	“
168	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	“
169	ON	OFF	OFF	ON	OFF	ON	OFF	ON	“
170	OFF	ON	OFF	ON	OFF	ON	OFF	ON	“
171	ON	ON	OFF	ON	OFF	ON	OFF	ON	“
172	OFF	OFF	ON	ON	OFF	ON	OFF	ON	“
173	ON	OFF	ON	ON	OFF	ON	OFF	ON	“
174	OFF	ON	ON	ON	OFF	ON	OFF	ON	“
175	ON	ON	ON	ON	OFF	ON	OFF	ON	“
176	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	“
177	ON	OFF	OFF	OFF	ON	ON	OFF	ON	“
178	OFF	ON	OFF	OFF	ON	ON	OFF	ON	“
179	ON	ON	OFF	OFF	ON	ON	OFF	ON	“
180	OFF	OFF	ON	OFF	ON	ON	OFF	ON	“
181	ON	OFF	ON	OFF	ON	ON	OFF	ON	“
182	OFF	ON	ON	OFF	ON	ON	OFF	ON	“
183	ON	ON	ON	OFF	ON	ON	OFF	ON	“
184	OFF	OFF	OFF	ON	ON	ON	OFF	ON	“
185	ON	OFF	OFF	ON	ON	ON	OFF	ON	“
186	OFF	ON	OFF	ON	ON	ON	OFF	ON	“
187	ON	ON	OFF	ON	ON	ON	OFF	ON	“
188	OFF	OFF	ON	ON	ON	ON	OFF	ON	“
189	ON	OFF	ON	ON	ON	ON	OFF	ON	“
190	OFF	ON	ON	ON	ON	ON	OFF	ON	“
191	ON	ON	ON	ON	ON	ON	OFF	ON	“
192	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	“
193	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	“
194	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	“
195	ON	ON	OFF	OFF	OFF	OFF	ON	ON	“
196	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	“
197	ON	OFF	ON	OFF	OFF	OFF	ON	ON	“
198	OFF	ON	ON	OFF	OFF	OFF	ON	ON	“
199	ON	ON	ON	OFF	OFF	OFF	ON	ON	“
200	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	“
201	ON	OFF	OFF	ON	OFF	OFF	ON	ON	“
202	OFF	ON	OFF	ON	OFF	OFF	ON	ON	“
203	ON	ON	OFF	ON	OFF	OFF	ON	ON	Valid address

Address	1	2	3	4	5	6	7	8	Remarks
204	OFF	OFF	ON	ON	OFF	OFF	ON	ON	“
205	ON	OFF	ON	ON	OFF	OFF	ON	ON	“
206	OFF	ON	ON	ON	OFF	OFF	ON	ON	“
207	ON	ON	ON	ON	OFF	OFF	ON	ON	“
208	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	“
209	ON	OFF	OFF	OFF	ON	OFF	ON	ON	“
210	OFF	ON	OFF	OFF	ON	OFF	ON	ON	“
211	ON	ON	OFF	OFF	ON	OFF	ON	ON	“
212	OFF	OFF	ON	OFF	ON	OFF	ON	ON	“
213	ON	OFF	ON	OFF	ON	OFF	ON	ON	“
214	OFF	ON	ON	OFF	ON	OFF	ON	ON	“
215	ON	ON	ON	OFF	ON	OFF	ON	ON	“
216	OFF	OFF	OFF	ON	ON	OFF	ON	ON	“
217	ON	OFF	OFF	ON	ON	OFF	ON	ON	“
218	OFF	ON	OFF	ON	ON	OFF	ON	ON	“
219	ON	ON	OFF	ON	ON	OFF	ON	ON	“
220	OFF	OFF	ON	ON	ON	OFF	ON	ON	“
221	ON	OFF	ON	ON	ON	OFF	ON	ON	“
222	OFF	ON	ON	ON	ON	OFF	ON	ON	“
223	ON	ON	ON	ON	ON	OFF	ON	ON	“
224	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	“
225	ON	OFF	OFF	OFF	OFF	ON	ON	ON	“
226	OFF	ON	OFF	OFF	OFF	ON	ON	ON	“
227	ON	ON	OFF	OFF	OFF	ON	ON	ON	“
228	OFF	OFF	ON	OFF	OFF	ON	ON	ON	“
229	ON	OFF	ON	OFF	OFF	ON	ON	ON	“
230	OFF	ON	ON	OFF	OFF	ON	ON	ON	“
231	ON	ON	ON	OFF	OFF	ON	ON	ON	“
232	OFF	OFF	OFF	ON	OFF	ON	ON	ON	“
233	ON	OFF	OFF	ON	OFF	ON	ON	ON	“
234	OFF	ON	OFF	ON	OFF	ON	ON	ON	“
235	ON	ON	OFF	ON	OFF	ON	ON	ON	“
236	OFF	OFF	ON	ON	OFF	ON	ON	ON	“
237	ON	OFF	ON	ON	OFF	ON	ON	ON	“
238	OFF	ON	ON	ON	OFF	ON	ON	ON	“
239	ON	ON	ON	ON	OFF	ON	ON	ON	“
240	OFF	OFF	OFF	OFF	ON	ON	ON	ON	Reserved
241	ON	OFF	OFF	OFF	ON	ON	ON	ON	Reserved
242	OFF	ON	OFF	OFF	ON	ON	ON	ON	Reserved
243	ON	ON	OFF	OFF	ON	ON	ON	ON	Reserved
244	OFF	OFF	ON	OFF	ON	ON	ON	ON	Reserved
245	ON	OFF	ON	OFF	ON	ON	ON	ON	Reserved
246	OFF	ON	ON	OFF	ON	ON	ON	ON	Reserved
247	ON	ON	ON	OFF	ON	ON	ON	ON	Reserved
248	OFF	OFF	OFF	ON	ON	ON	ON	ON	Reserved
249	ON	OFF	OFF	ON	ON	ON	ON	ON	Reserved
250	OFF	ON	OFF	ON	ON	ON	ON	ON	Reserved
251	ON	ON	OFF	ON	ON	ON	ON	ON	Reserved
252	OFF	OFF	ON	ON	ON	ON	ON	ON	Reserved
253	ON	OFF	ON	ON	ON	ON	ON	ON	Clear PTP configuration at boot
254	OFF	ON	ON	ON	ON	ON	ON	ON	Clear analogue configuration at boot
255	ON	ON	ON	ON	ON	ON	ON	ON	Factory default at boot

CONNECTIONS

This section describes the function and connections to the various connectors on the Q03 Processor.

Communications Connectors

There are three connectors located on the lower edge of the Q03D Processor for the Diagnostics, RS232 and RS485 communications ports. The following paragraphs describe the connections to these ports.

Diagnostics Serial Port

The Diagnostics serial port is used for on-line configuration, diagnostics and data exchange. The Diagnostics serial port connector is an 8 way RJ45 connector located on the bottom edge of the Q03 Processor.

Note This RJ45 connector must be configured as the Diagnostics serial port before it can be used. Refer to page 17 for details.

In a standard application of the Q03 Processor the Diagnostics serial port operates at 19200 baud, the maximum allowable cable length is typically 15 metres.

Standard 8 way RJ45 crimp plugs are used in making up Diagnostics serial port interconnection cables. These plugs are designed for use with stranded (24/26 AWG) 8 core flat data cable. An RJ45 crimping tool must be used to crimp the RJ45 plugs onto the data cable to ensure proper and reliable crimping. Improperly crimped connectors can damage the RJ45 socket and cause unreliability.

Note In electrically noisy environments it may be necessary to use screened data cable for longer lengths of cable.

The Diagnostics port Clear to Send (CTS) and Request to Send (RTS) signal lines must be bridged at the Data Terminal Equipment for the Diagnostics port to be enabled.

Note RXD is serial data into and TXD is serial data out of the Q03 Processor.

The connections to the Diagnostics serial port RJ45 are shown in the following table:

	Function
Pin 1	+5 Volts
Pin 2	RTS
Pin 3	CTS
Pin 4	Ground
Pin 5	RXD
Pin 6	TXD
Pin 7	Unconnected
Pin 8	Ground

RS232 – RJ45 Connections

Note Pin 1 is an optional +5 volt output. Refer to page 19 for details.

RS232 Serial Port

The RS232 serial port is used for specialized communication devices and peripherals. These can include Telephone and Cellular modems, Radio modems, etc. The specific application and required settings are done using the Online Diagnostics and Configuration program. The RS232 serial port connector is an 8 way RJ45 connector located on the bottom edge of the Q03 Processor.

Standard 8 way RJ45 crimp plugs are used in making up serial port interconnection cables. These plugs are designed for use with stranded (24/26 AWG) 8 core flat data cable. An RJ45 crimping tool must be used to crimp the RJ45 plugs onto the data cable to ensure proper and reliable crimping. Improperly crimped connectors can damage the RJ45 socket and cause unreliability.

Note In electrically noisy environments it may be necessary to use screened data cable for longer lengths of cable.

The connections to the RS232 serial port RJ45 are shown in the following table:

	Function
Pin 1	DTR
Pin 2	RTS
Pin 3	CTS
Pin 4	Ground
Pin 5	RXD
Pin 6	TXD
Pin 7	DCD
Pin 8	RI

RS232 – RJ45 Connections

RS485 Serial Port

The RS485 serial port is used for inter-module communications over long distances of cables at high speed. The RS485 serial port connector is a 4 way RJ10 connector located on the bottom edge of the Q03 Processor.

Note This RJ10 connector must be configured as the RS485 serial port before it can be used. Refer to page 18 for details.

In a standard application of the Q03 Processor the RS485 serial port operates at 9600/19200 baud, the maximum allowable cable length is typically 1000 metres.

Standard 4 way RJ10 crimp plugs are used in making up RS485 serial port interconnection cables. These plugs are designed for use with stranded (24/26 AWG) 2/4 core twisted pair data cable. The cable used should have a characteristic impedance of approximately 120 ohms. An RJ10 crimping tool must be used to crimp the RJ10 plugs onto the data cable to ensure proper and reliable crimping. Improperly crimped connectors can damage the RJ10 socket and cause unreliability.

The connections to the RS485 serial port RJ10 are shown in the following table:

	Function
Pin 1	+5 Volts
Pin 2	485+
Pin 3	485-
Pin 4	Ground

RS485 – RJ10 Connections

Note Pin 1 is an optional +5 volt output and pin 4 is an optional ground. Refer to page 19 for details.

Programmer Connector

The 10 pin IDC header connector located at the top right hand side of the Q03 Processor is used for 'In System Programming'. A special programming dongle is used to download application software into the flash program memory chip on the Q03 Processor.

SPECIFICATIONS

Processor	Motorola MC68HC16Z1 high-speed 16-bit micro controller chip running at a clock frequency of 16.78MHz.
Program Memory	128K by 16 Bit Words, Flash memory, minimum 1000 erase/write cycles
Programmer	In system programming via BDM interface with proprietary programming dongle.
Data Memory	128K by 16 Bit Words, Static battery backed up SRAM.
EEPROM	4K by 8 Bit Word serial interfaced EEPROM. Minimum 100,000 erase/write cycles, used for system configuration storage.
RTC	Day, date, month, year, 24/12 hour time of day and am/pm, with standby battery operation. The RTC time drift calibration is done by software algorithm.
System Reset	Comprehensive system reset management including; power on, power off, power brown out, push button reset switch. Also includes data memory battery backup power management.
Battery	2.4 volt 12mA/hour Nickel Metal Hydride rechargeable battery. Average current draw is 1uA therefore expected battery backup period at 50% efficiency is approx 250 days.
ADC	8 Channels 10 Bit resolution high speed averaging Analog to digital converter channels.
ADC Reference	5 Volts Temperature coefficient 54 ppm/°C.
UARTS	3 onboard fully programmable UARTs.
RS232 Port	On board/off board half duplex RS 232 port used for diagnostic and configuration terminal equipment.
RS485 Port	On board/off board half duplex RS485 port used for inter module and peripheral equipment communications.
Modem Port	Off board half duplex TTL serial port used for modem communications.
Status LEDs	6 onboard system status LEDs. Power ON, CPU OK, and four system programmable LEDs.

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) Damage resulting from lightning 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 its 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 its 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.

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