

## XL4 Plus Diagnostics Using QTech Workbench

Rev 01

### Introduction

Diagnostics are used to monitor RTU activity whilst connected to QTech Workbench (Workbench), including i/o and communications activity. Diagnostics are organised into categories to enable filtering of diagnostic messages for detailed study of particular aspects of the RTU operation. This application note lists the categories and their function.

Additional Information on how to enable and monitor diagnostics is provided in:

- Q04 Plus Workbench User Guide

You can email QTech for support at [techsupport@qtech.co.nz](mailto:techsupport@qtech.co.nz)

### Diagnostics

RTUs running XL4 Plus Firmware (aka Q04 Plus) no longer supplies raw diagnostic information which has to be decoded by QTech Workbench into a meaningful message. Diagnostic data is interpreted by the RTU and transmitted as a fully formed human readable message which can be displayed in QTech Workbench and potentially in other software tools. Where pertinent, the RTU also supplies accompanying data but not always in hexadecimal format. For instance, Modem AT commands and responses are displayed in their Hayes format.

Where possible supplementary information is included in the diagnostic message to aid understanding of the RTU operation.

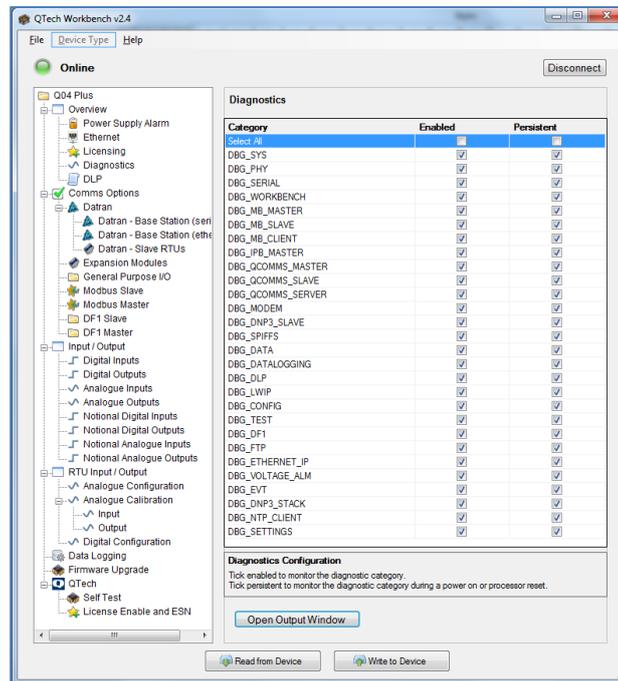


Figure 1

The RTU can output large amounts of diagnostic data, too much for a user to follow on a screen as it scrolls quickly, so it is more practicable to be able to filter the data, especially if only certain aspects of the RTU operation are being monitored. For this reason, the RTU provides a category value with each message, the categories are listed in Workbench.

Enabling a category adds any associated diagnostics into the stream that is output by the RTU, until the RTU is rebooted (or the category disabled). Categories can be enabled so that that diagnostic messages appear as soon as the RTU powers up by declaring them to be **persistent** in Workbench.

## Categories

The table below lists the supported categories in the RTU and their purpose.

Category	Description
<b>DBG_SYS</b>	RTU System: <ul style="list-style-type: none"> <li>- System capability e.g. memory size and allocation etc.</li> <li>- License validation</li> <li>- Process task execution state (starting stopping)</li> <li>- Catch all for messages that don't fit into a simple category</li> </ul>
<b>DBG_PHY</b>	Ethernet Port: <ul style="list-style-type: none"> <li>- TCP/IP configuration</li> <li>- Cable connection state</li> </ul>
<b>DBG_SERIAL</b>	Serial Comms: <ul style="list-style-type: none"> <li>- Port name and configuration parameters, e.g. baud rate</li> <li>- Raw data</li> </ul>
<b>DBG_WORKBENCH</b>	QTech Workbench: <ul style="list-style-type: none"> <li>- procedure calls and commands from workbench to the RTU</li> <li>- transaction history bulk transfer of data</li> <li>- (used primarily by QTech development)</li> </ul>
<b>DBG_MB_MASTER</b>	Modbus Master: <ul style="list-style-type: none"> <li>- Commands sent/received</li> <li>- exceptions</li> <li>- process/task status</li> </ul>
<b>DBG_MB_SLAVE</b>	Modbus Slave: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- Commands sent/received</li> <li>- exceptions</li> </ul>
<b>DBG_MB_CLIENT</b>	Modbus Client: (Ethernet) <ul style="list-style-type: none"> <li>- process/task status</li> <li>- Commands sent/received</li> <li>- Exceptions</li> <li>- Tcp connection status and events</li> </ul>
<b>DBG_IPB_MASTER</b>	IPB Master: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- comms exceptions, status</li> </ul>
<b>DBG_QCOMMS_MASTER</b>	DATRAN Master: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- commands set/recvd</li> <li>- comms state events (e.g. slave failed)</li> <li>- store and forward events</li> </ul>
<b>DBG_QCOMMS_SLAVE</b>	DATRAN Slave: <ul style="list-style-type: none"> <li>- process/task status and driver mode</li> <li>- link level connection status</li> <li>- communication timer retries and timeouts</li> <li>- store and forward events</li> </ul>
<b>DBG_QCOMMS_SERVER</b>	DATRAN Server: (Ethernet) <ul style="list-style-type: none"> <li>- process/task status and driver mode</li> <li>- link level connection status</li> <li>- communication timer retries and timeouts</li> <li>- store and forward events</li> <li>- Tcp connection status and events</li> </ul>
<b>DBG_MODEM</b>	Modem Communications: <ul style="list-style-type: none"> <li>- link level data and command/response messages over the serial ports</li> <li>- (Hayes commands)</li> <li>- Connection state</li> </ul>
<b>DBG_DNP3_SLAVE</b>	DNP3 Slave: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- (DNP3 has its own inbuilt diagnostic capability)</li> </ul>
<b>DBG_SPIFFS</b>	File System: <ul style="list-style-type: none"> <li>- File allocation</li> <li>- Exceptions</li> <li>- Debugging info for QTech</li> </ul>

Category	Description
<b>DBG_DATA</b>	Data Table: <ul style="list-style-type: none"> <li>- summary information of allocated inputs and outputs</li> </ul>
<b>DBG_DATALOGGING</b>	Data Logging: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- database integrity</li> <li>- datalogging events</li> </ul>
<b>DBG_DLP</b>	DLP Runtime: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- DLP loaded/running/error state</li> <li>- Some events show up in qcomms</li> </ul>
<b>DBG_LWIP</b>	TCP/IP Stack: <ul style="list-style-type: none"> <li>- Debugging info for QTech relating to TCP/IP protocol</li> <li>- (not recommended for customer use)</li> </ul>
<b>DBG_CONFIG</b>	Configuration File: <ul style="list-style-type: none"> <li>- processing and parsing of config file</li> <li>- errors e.g. invalid syntax</li> <li>- data validation</li> <li>- schema version exceptions</li> </ul>
<b>DBG_TEST</b>	Test: <ul style="list-style-type: none"> <li>- factory automated test results</li> <li>- self test results</li> </ul>
<b>DBG_DF1</b>	DF1: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- commands sent/received</li> <li>- exceptions (e.g. out of range)</li> </ul>
<b>DBG_FTP</b>	FTP: <ul style="list-style-type: none"> <li>- file transfer protocol task state</li> <li>- link level events</li> </ul>
<b>DBG_ETHERNET_IP</b>	Ethernet IP PLC protocol: <ul style="list-style-type: none"> <li>- under development, not for customer use</li> </ul>
<b>DBG_VOLTAGE_ALM</b>	Voltage Alarms: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- alarms and exceptions</li> </ul>
<b>DBG_EVT</b>	Internal event notification system: <ul style="list-style-type: none"> <li>- internal task communications</li> <li>- not recommended for customer use</li> </ul>
<b>DBG_DNP3_STACK</b>	DNP3 System: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- exposes DNP3 diagnostics (part of the DNP3 protocol)</li> </ul>
<b>DBG_NTP_CLIENT</b>	NTP Client: <ul style="list-style-type: none"> <li>- process/task status</li> <li>- time updates</li> </ul>
<b>DBG_SETTINGS</b>	RTU Internal Settings: <ul style="list-style-type: none"> <li>- hardware settings</li> <li>- e.g. serial number, clock calibration, FRAM allocation</li> <li>- (not recommended for customer use)</li> </ul>

## Format

Each diagnostic message is output in the form:

```
<Timestamp RTU Time><Category><message>
```

Message contents are content sensitive. For example, modbus messages contain commands (e.g. read coils from address)

The raw frame can be viewed by additionally selecting the dbg\_serial category.

*For more information contact QTech Data Systems Limited.*