iCE³ GT

Basic User Guide

For Software
Version: 1.00
Amendments

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<table>
<thead>
<tr>
<th>Issue</th>
<th>Version</th>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>Issue 1</td>
<td>Version 1.00</td>
<td>13th Jan 2017</td>
<td>Preliminary release of Basic User Guide.</td>
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1 Introduction

1.1 About this Manual
This manual is intended as a detailed guide for the iCE³ GT installation, configuration and operation.

This manual is also available online in PDF format at www.hyquestsolutions.co.nz

Throughout this document, small icons are used to identify additional information. These are as follows:

**NOTE:** Indicates extra detail to expand the current discussion.

**WARNING:** Describes something that may cause problems if not heeded.

1.2 Support
Additional technical support for the iCE³ GT is available by contacting:

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Tel: +64 7 857-0810
Email: support@hyquestsolutions.co.nz

For latest information and software updates, visit the HyQuest Solutions (NZ) Ltd web site at www.hyquestsolutions.co.nz.

**Access to the client area on the website requires a log-in which is can also be used to access the HyQuest Solutions forum. Self-registration is available by visiting the website home page.**
2 Overview

2.1 General Characteristics

The iCE³ GT (iQuest Circuit Extender) has been designed as a cost effective, low power, self-contained circuit extender to enable communication with equipment over a wireless (3G) network connection. Typical devices that the iCE³ GT can be used to interface with include dataloggers, PLCs etc.

The iCE³ GT unit comes standard with a d.c power lead. A host device (RS232) cable pre-wired for one of three different host device types (see Section Error! Reference source not found.) is available as an optional accessory. The SMA antenna connector allows the use of a small stubby antenna (optional accessory) or alternatively, a coaxial cable to a higher gain external antenna for use in areas where signal strength is low.

2.2 Typical Applications

The iCE³ GT can be used in a number of applications, including:

- Wireless IP telemetry and circuit extension to third party devices

The iCE³ GT provides an effective means for the migration of legacy dialup telemetry networks to more cost-effective wireless IP communications over 3G. By simply replacing existing dialup modems with an iCE³ GT, you can have virtually any logger type telemetered over the 3G network. If you are using a HydroTel telemetry system, the iCE³ GT can be configured to call-in and be downloaded using a dynamic IP address which further simplifies the deployment.
2.3 Key Features

2.3.1 Wireless Internet (IP) Connectivity

Wireless Internet connectivity is provided via the on-board modem. Through this interface, data packets can be transferred to and from the host (RS232) port. To facilitate IP connectivity, a suitably activated SIM card must be installed in the device. It is also necessary to program the unit with appropriate settings via a terminal connected to the host (RS232) serial interface.

The iCE³ GT communicates over the wireless network using TCP/IP protocol via a single data port. The device supports ASCII and binary communication to a wide range of HyQuest Solutions and third party equipment.

2.3.2 Dynamic IP addressing

The iCE³ GT supports dynamic IP address mode only.

This requires that HydroTel™ is installed at the remote (base) location. In this mode, the iCE³ GT initiates the connection, typically via the Internet and sends a special call-in packet to the base. HydroTel™ then captures the IP address that was allocated to the iCE³ GT for that session and uses it for all ongoing communication with the host device attached to the iCE³ GT.

The advantage of dynamic IP addressing is the ability to have low cost IP connectivity to any device supported by HydroTel™. This can be achieved by a simple Internet connection via a local service provider. The embedded microcontroller in the iCE³ GT manages the IP session establishment and maintenance, meaning that the host device does not need any special intelligence of its own.

3 Installation

3.1 Removing / fitting the SIM card

*Important! Ensure the iCE³ GT is depowered before attempting to fit or remove the SIM card.*

To fit the SIM card, insert the card with the gold contacts facing upwards and the edge with the chamfered corner facing the unit. Push the card fully into the slot until it clicks into place.

To remove the SIM card, press the SIM card inwards slightly. This will release the latch and allow the card to be extracted from the SIM card carrier.

3.2 External Power Supply

The iCE³ GT does not have an internal battery and therefore requires an external power supply. It will accept any external dc power source ranging from 6 to 55Vdc.
3.3 Power Supply + I/O Connector

Only Pin 1 and 3 are required. The pin designations of the power supply are shown in the diagram below.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POWER</td>
<td>Input Power supply range 6-55V</td>
</tr>
<tr>
<td>2</td>
<td>Power Enable</td>
<td>Control pin to turn ON/OFF Terminal power. When putting this pin to voltage &gt;5V the unit will be turn OFF. When putting this pin OPEN or GND the unit will be turn ON.</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Not connected</td>
</tr>
</tbody>
</table>

Pin assignment of the power plug including power supply and Power Enable

Male 4-pole plug for power supply
To use with MOLEX MICRO FIT 3mm
PART NUMBER 43025-0400

Figure 1 - Power Supply I/O Connector and Cable
3.4 RS232 Connector

The pin designations are shown in the table below.

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Signal name</th>
<th>I/O</th>
<th>Function of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DCD</td>
<td>O</td>
<td>Data Carrier Detected</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>O</td>
<td>Receive Data</td>
</tr>
<tr>
<td>3</td>
<td>TKD</td>
<td>I</td>
<td>Transmit Data</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>I</td>
<td>Data Terminal Ready</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>-</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>DSR</td>
<td>O</td>
<td>Data Set Ready</td>
</tr>
<tr>
<td>7</td>
<td>RTS</td>
<td>I</td>
<td>Request To Send</td>
</tr>
<tr>
<td>8</td>
<td>CTS</td>
<td>O</td>
<td>Clear To Send</td>
</tr>
<tr>
<td>9</td>
<td>RING</td>
<td>O</td>
<td>Ring Indication</td>
</tr>
</tbody>
</table>

Table 1 – RS232 Connector Pin Functions

3.5 Antenna Connection

The iCE³ GT has a standard SMA antenna connector. For installations with a good signal level, a small right-angle ground plane independent stubby antenna will provide good results. Such antennae are available from HyQuest Solutions or other suppliers. This attaches directly to the SMA connector on the front of the unit. In areas of marginal coverage, HyQuest Solutions recommend using an external higher gain antenna.

3.6 Setting the Real Time Clock

If the iCE³ GT will be used in scheduled connection mode (by using the communication scheduler), the internal clock will need to be checked and if necessary, set correctly after installation on site and all other configuration has been completed. This is done using iLink 2012.

This step is required because the clock is reset to a default time when the iCE³ GT has been depowered for any reason.

Note that the comms schedule will still work if the clock has not been synchronised, they will just not be synchronised to the correct time of day.
3.7 Recommended Deployment Procedure

- Obtain and install the SIM card from your preferred service provider. See Section 3.1 for details on fitting the SIM card.
- Connect an antenna and power supply to the iCE³ GT.
- Using a standard cable connect a computer with iLink 2012
- Configure the iCE³ GT completely before taking it into the field for installation. Use the typical configuration at the end of this document as a guide.
- Configure the logger and site in HydroTel™ for the installation, including the chosen communication address. This must match the address in the iCE³ GT and in the host device. Note that the iCE³ GT can be configured to automatically set its address based on its serial number with an optional offset.
- Test it on-line. If necessary use the SMS “GOL” option to force a connection if waiting for the scheduler is not an option. See Section 5.2
- Take the iCE³ GT to site and install it. Take a suitable computer (laptop) and standard cable to allow testing and further configuration on-site if needed.
- As the iCE³ GT will be used in scheduled connection mode, the final step is to check the internal clock. Use the standard cable and iLink 2012 (Overview screen) to do this.
- Finally, make sure the correct cable is securely connected to the host device.
- If possible check that the system works properly end to end, including communication with the host device.
4 Configuration

All the configuration is done by connecting the device using iLink 2012. Once the iCE³ GT is connected to your computer, open up iLink 2012 and click on the 'Quick Connect' button. Select the COM port from the drop down menu and set the baud rate as 115200. When the device is connected successfully, click on the General option under the Configuration tab to see the configuration settings for the device.

4.1 iLink 2012 Configuration Menus

4.1.1 General

Site Name
Enter a name for the site in this field. This is not used by the logger and is simply provided for user’s administrative/management purposes.

RS232 Port Speed (bps)
This option configures the RS232 port speed to use when the device is connected to the host device. The default is 115200.
4.1.2 Addressing

The Addressing configuration menu allows the configuration of the iCE³ GT communications addressing settings.

**Serial Number as Address**

Tick this option if you want the iQuest protocol communication address to be automatically obtained from the GT’s serial number.

**Address Offset**

If the “Serial Number as Address” option is enabled, then an additional offset can be entered. Using offsets can be used to categorise units into regions for example.

The serial number plus the offset must still result in an address within the allowable range of 1-32767.

**Comms Address**

When using a manual address, enter a value between 1 and 32767 (the factory default is 1). This address is used to identify the unit in all iQuest protocol communication and must be unique on a HydroTel™ communications interface.

An address of 0 is reserved for the base station (e.g. HydroTel™) and must not be programmed into the iCE³. The iCE³ will always respond to an address of -3 (which is a special universal address) no matter what its own address is.
4.1.3 Comms Configuration

**APN**
Enter the Access Point Name allocated by your network provider (eg. telstra.internet).

**Username**
Enter the user name required by your wireless network provider.

**Password**
Enter the password required by your wireless network provider.

Note: Many providers do not require any login credentials, in which case the username and password should be set to empty.

**Use DNS for IP Address**
Enable this option to use the DNS Server address for the IP address.

**Primary Base IP Address**
Enter the primary IP address that you will connect to. This is the primary destination IP address used for unsolicited binary calls and also host data traffic once the link is established.

**Primary Base Port**
Enter the port number to use for the primary connection.

**Secondary Base IP Address**
Enter an optional IP address to use for secondary communication if dual-base mode is enabled. If this is not required, you can set the IP address to 0.0.0.0.

**Secondary Base Port**
Enter the port number to use for the secondary communication. If this mode is not to be used, set the port number to zero.

**SIM PIN**
When the SIM card used has a PIN code enabled for security purposes, use this option to set it. If a PIN code is not required, enter zero (0) for this setting.

If a SIM PIN is required and an incorrect PIN is entered, the unit will not operate correctly. Also, if a SIM PIN is not required and a PIN is configured, it may lock the SIM card out due to multiple attempts to use an invalid PIN number.

**Allow changes to unsafe values**
The APN, Username and Password are marked as unsafe values, which may cause loss of comms if set incorrectly remotely. If you want to edit these columns, the option "Allow changes to unsafe values" should be enabled.

### 4.1.4 Schedule Configuration

**Start Time**
Enter the time at which the iCE³ is allowed to start establishing client IP sessions.

**End Time**
Enter the time at which the iCE³ must stop establishing wireless IP sessions.

In the example shown, the wireless IP link is established once per hour (frequency = 60 minutes), for a time of 5 minutes (duration = 300 seconds) starting at 6:00am and ceasing after 6pm. Set the start time to 00:00 (0000) and end time to 23:59 (2359) for the on/off cycle to apply regularly throughout the complete day.

**NOTE:** In this example, the “on” time is from 6am to 6pm. The “off” time is from midnight to 6am and from 6pm to midnight. These two times may be configured differently using the on interval and off interval settings described below.
Duration
Enter the length of time in seconds that you want the iCE³ to keep each wireless IP session active. The minimum value for this setting is 60 seconds.

On Interval
Enter the length of time in minutes between each successive IP session being established when the time is in the “on” period. i.e. between the start and end times.

Off Interval
Enter the length of time in minutes between each successive wireless IP session being established when the time is in the “off” period. i.e. before the start time or after the end time. This setting will normally be 0 (no activity), but this option allows a different connection rate to be configured if required.

5 SMS (Text) Commands

The iCE³ GT is capable of responding to text commands received as SMS messages. This feature allows, for example the unit to be sent a text message to ascertain its Serial Number or to be put in on-line mode. The commands are not case sensitive. If an invalid command is sent to the iCE³ GT it will not reply.

If the iCE³ GT is already on-line with an IP session, the SMS message will not be processed.

The two SMS commands supported are:

5.1 Request iCE³ Serial Number (RQ)
If the message “RQ” is received, the iCE³ GT will reply to the sender with a message containing the iCE³ GT serial number.

An example SMS response message to this command is:

12:13:26 > AE2-0001

5.2 Go On-Line (GOL)
If the SMS command “GOL” is received the iCE³ GT will immediately initiate a client IP connection sequence as if it was triggered by the scheduler or a manual command through the RS232 port terminal. It will remain on-line for the duration configured in the scheduler.

The iCE³ GT will not send a reply to this SMS command. This allows an automated connection request to be sent by SMS and the initiation of the client IP connection is deemed to be an acknowledgement of the command.
6 Troubleshooting

This section offers some possible answers to common installation and/or configuration issues.

6.1 Unable to connect to the remote TCP server

**SIM Card:** Check the SIM card is active and the account is in credit (if prepay).

**SIM PIN:** Check the PIN code for the SIM card is correctly configured in the Modem section in Comms configuration menu.

**APN:** The unit must be configured for a valid APN that must also match the SIM account APN.

**Signal:** Use a higher gain antenna if the signal strength is marginal.

**IP Settings:** The iCE³ will not attempt to connect unless the primary IP and port are defined. i.e. the IP address is valid and the port is non-zero.

**TCP Server:** The remote server is not available. Check that the TCP server is operational and configured correctly and also that the necessary firewall access is enabled for the TCP port and the complete dynamic IP address range that the iCE³ could be allocated by the network.

6.2 iCE³ will not respond to SMS requests

**SIM Card:** Check the SIM card is active and the account is in credit (if prepay).

**SIM PIN:** Check the PIN code for the SIM card is correctly configured in the Modem section in the Comms configuration menu.

**Connection:** If the iCE³ is connected on an IP (3G) session, the SMS feature is unavailable at that time. Configure the scheduled IP connection to minimise the time that SMS is unavailable.

**Signal:** The iCE³ may not respond if the signal strength (RSSI) is very low. Use a higher gain antenna if the signal strength is marginal.

6.3 iCE³ GT will not connect in iLink 2012

**Port:** Check the COM Port is correct

**Baud Rate:** Check the Port Speed is correct (default is 115200)

**Program:** The software may not be running in the device. Power the device off and on and wait for 10 seconds before trying again
7 Software Upgrade Procedure

7.1 Overview
This section describes the procedure to use when upgrading the software components in an iCE³ GT.

The upgrade procedure has been carried out many times without issue. However, because the process does involve erasing and reprogramming of flash memory, it is important that a good, securely connected power supply is provided to the iCE³ throughout the upgrade process.

7.2 File Naming Conventions

7.2.1 iCE³ GT Application Software.
The “Application Software” in the iCE³ GT is analogous to an application such as Word® on a PC. It is the software that contains the general functionality of the iCE³ GT.

The software upgrade files for Banks 1, 2 and 3 are in the format:

iCE3GT_xxx.pyc where:

xxx is the software version

e.g. iCE3GT_130.pyc iCE³ GT Software, Version 1.30
7.3 iCE³ GT Automated Upgrade Procedure

iLink 2012 has an automated firmware/software upgrade tool. This tool includes several checks to confirm the validity of the components being installed.

For clarity, the example given in the following pages shows a full automatic software upgrade.

- Make sure the required upgrade files are available on the computer. Ideally these should be located in C:\Program Data\iQuest\iLink2\Programs.
- Connect to the iCE³ GT using iLink 2012.
- Go to the Program screen via the [Configuration][Program] menu option on the toolbar.
- Click the Auto Upgrade button on the toolbar. Then iLink 2012 will automatically populate the Variant and Type fields with Standard and Cellular as these are the only options for the iCE³ GT. Click Yes to the warning messages in order to confirm the software upgrade.

- Once the process is completed, you can see a message saying "Upgrade completed successfully" on the status bar and the iLink 2012 window will show the current software status of the device.

If the process is cancelled or fails for any reason, the following dialog will appear. The whole process should be repeated to ensure that the iCE³ GT is completely upgraded before deployment.
7.4 iCE³ GT Manual Upgrade Procedure

iLink 2012 also allows you to upgrade the software manually. Please go through the below steps to do a manual upgrade of software for the iCE³ GT.

- Make sure the required upgrade files are available on the computer. Ideally these should be located in the default deployment folders listed above in Section 7.3.

- Connect to the iCE³ GT using iLink 2012.

- Click on the Manual Upgrade button under the Configuration tab.

- Select the appropriate software file for Bank1 using the browse button.

- Click OK to load the selected program to the device.

- Once the process is completed, you can see a message saying "Upgrade completed successfully" on the status bar and the iLink 2012 window will show the current software status of the device.
7.5 iCE³ GT Software Status Screen

After an automatic or a manual software upgrade this screen will be shown. To commit the new software to the device, the Activate button must be clicked. This will move the new software from the Pending block into the Active block as shown below. The Activate button is now greyed out.
8 User Notes