SW-SB User Manual

Introduction / Overview

The SW-SB is an active repeater which will allow the T24 range of modules to span around obstacles or increase range or coverage.
The connectivity module provides a battery holder for a pair of alkaline 'D' cells and has regulator circuitry for an external power supply. The batteries can also be used to provide power in case of external supply failure. The case is environmentally sealed to IP65.

The repeater will allow messages to be repeated once which can effectively double the radio range. Adding more repeaters will not increase range but can increase coverage.

Increase Range

With No Repeater

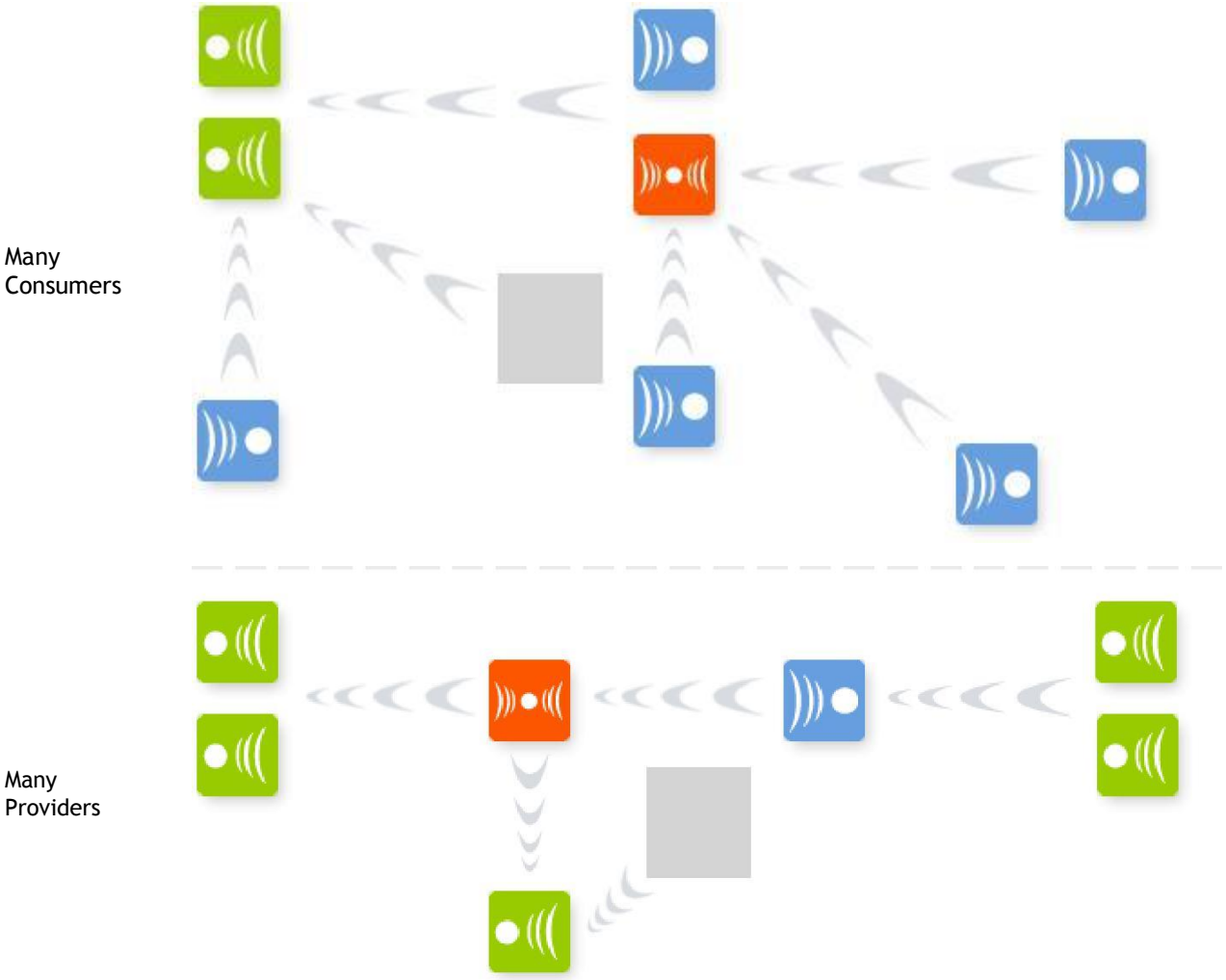
With Repeater

Span Obstacles

With No Repeater

With Repeater

Combined Solutions



Power Options

The SW-SB can operate permanently powered or can operate from on-board batteries.

Permanently Powered

This is the simplest way to operate the repeater. With a permanent supply you do not need to worry about the repeater sleeping or waking. You can optionally choose whether the repeater always wakes sleeping modules and then you could utilise the powering up of the repeater to wakeup those modules outside the normal radio range.

Battery Powered

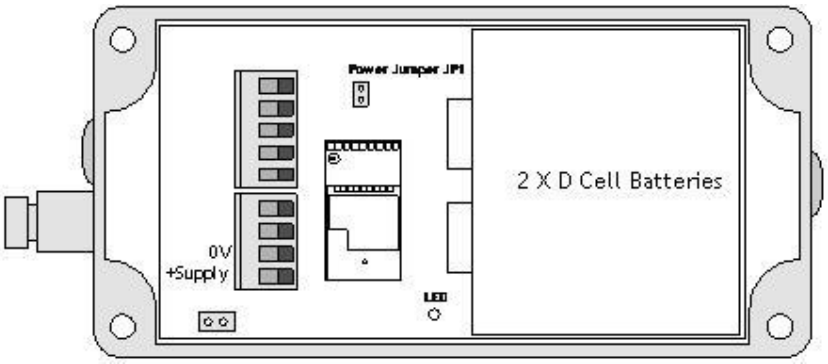
In low power battery mode the repeater wakes from sleep when other modules are woken and will remain awake until it stops receiving Stay Awake messages. This will work transparently with most SP wireless instrumentation. Please note that a SW-C handheld would require radio firmware version 2.01 or above to be able to wake a repeater when powered on.
You just need to decide on the Sleep Delay for a battery powered repeater. This causes the repeater to enter sleep mode if it does not receive stay awake messages within the Sleep Delay time.
Stay awake messages are transmitted by handhelds, analog output modules and PC software etc so that when those items are turned off or disabled all other T24 modules will sleep when their Sleep Delay time elapses.

Connecting Power

Power can be supplied by fitting 2 X ‘D’ cell alkaline 1.5 Volt batteries or the module can be supplied from an external 5V to 18V DC source.

In both cases you need to fit the JP1 power jumper to supply power to the acquisition module.
When powered from the external DC source the LED will illuminate.

If internal batteries are fitted when external power is applied the batteries will be utilized if external power is lost.



Getting Started

Use the T24 Toolkit to ensure that the repeater radio channel matches the rest of the T24 modules. You will then need to decide whether the repeater is battery powered or permanently externally powered and whether it should always wake other sleeping modules when it is powered up and awake.

Considerations

- Each repeater can effectively double the amount of traffic transmitted. Be careful not to introduce too many repeaters that are within range of each other as there may be un-necessary duplication of radio traffic. Carefully plan the layout of radio modules to minimise this.
  Using the Data Provider monitor in the T24 Toolkit can show the amount of traffic. The T24 Toolkit on a laptop or netbook is ideal for checking installations as it is mobile so traffic can be monitored at different points in the installation.

- A repeater will not repeat a packet that has already been repeated. Hence there is only one extra 'hop' introduced and a maximum range increase to 2X.

- When waking remote modules separated by a repeater and that repeater is asleep it may take twice as long to wake a module as when no repeater is involved.

- If the repeater is to be battery powered use the same Sleep Delay as is suitable for the acquisition modules in the system.

- You cannot pair to a module through a repeater. Using the T24 Toolkit it **may** be possible to configure module through a repeater by connecting **without** pairing. The results will vary depending on the number of repeaters and amount of radio traffic. In some cases it may be necessary to power down repeaters when configuring modules.

- Most data consumer modules and software issue a broadcast wake when turned on or activated and this will also wake a sleeping repeater which will then proceed to wake those modules within its range. But some modules only wake specific single target modules such as the T24-HS handheld module and the T24-AO1 analog output module. For these modules to wake the repeater they must be fitted with at least v2.1 version radio modules. This only affects repeaters with a SleepDelay set.

Configuration

This section explains how to install software and connect the required devices together. Please note that you will need the T24 Toolkit software and a SW-USBBSE base station to allow your computer to communicate with SP telemetry devices.

Installation

T24 Toolkit

To configure the devices we must use the **T24 Toolkit** software application. This can be downloaded from our web site or may be shipped with your products.
Install this on a PC or laptop.
Run **setup.exe** and follow the prompts to install the software.

Base Station

If you have a USB version of the base station (SW-USBBSE) then you just need to plug this into a USB socket on your PC. If you are using an alternative base station then please refer to the appropriate manual.

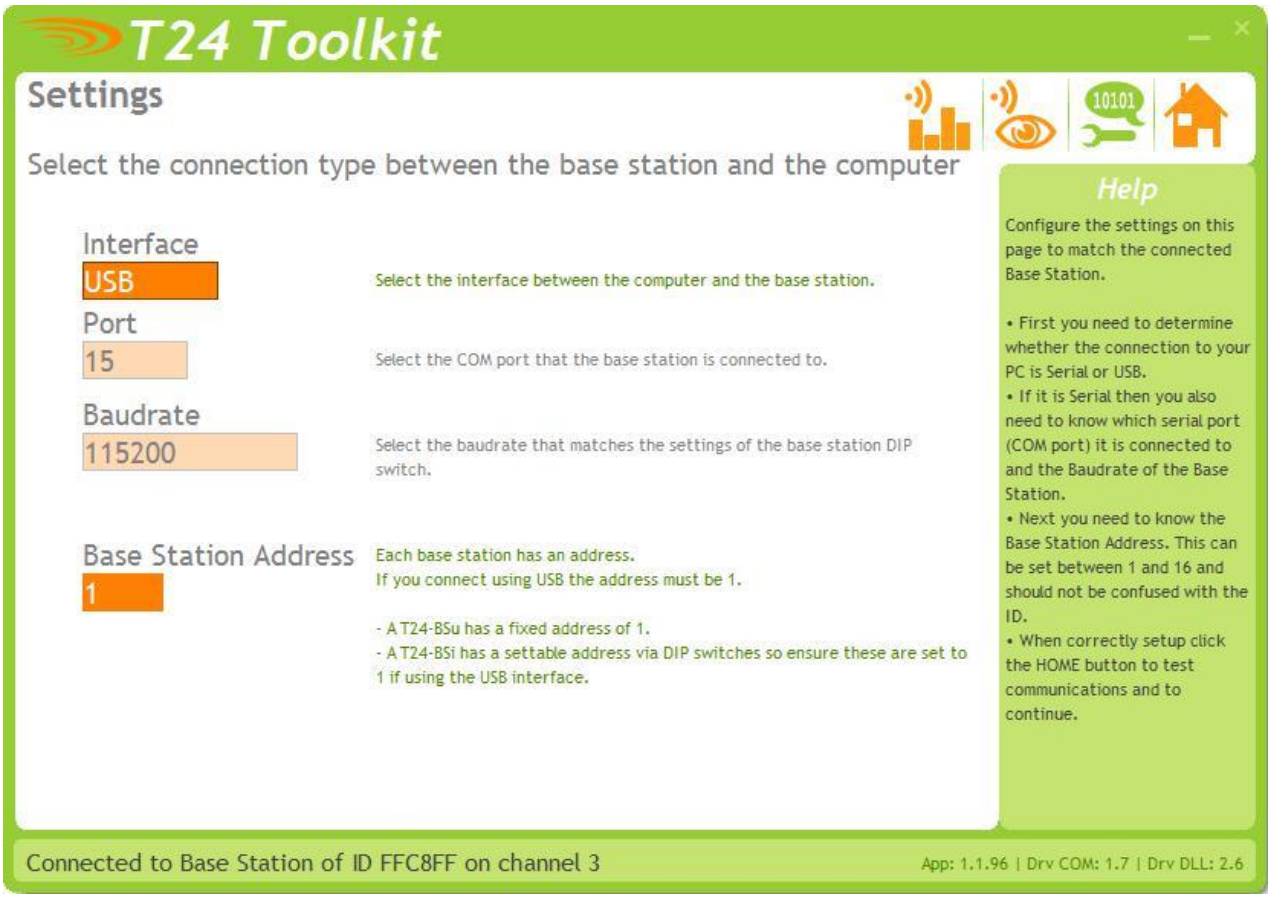
T24 Toolkit

The T24 Toolkit provides a means of simple configuration of the SW-SB along with useful tools to aid integration.

Run the T24 Toolkit software application.

General Pages

Setup Base Station Communications



Select **USB** as the interface and select 1 as the Base Station Address.
In the toolkit all items that can be changed by the user are coloured orange.
To change a value just click on the relevant orange item. You will then be presented with a new dialog window allowing you to change the value.
This may use a slider, text box or list to allow your new value to be entered.

Click the Home button to attempt communications with the base station.
If no communications can be established the toolkit will remain on this page. You will need to check that the base station is powered and that it is connected to the converter correctly.

Home

We now have successful communications with the base station so we can now pair with our device or we can select the Spectrum Analyser mode or Data Provider Monitor mode.

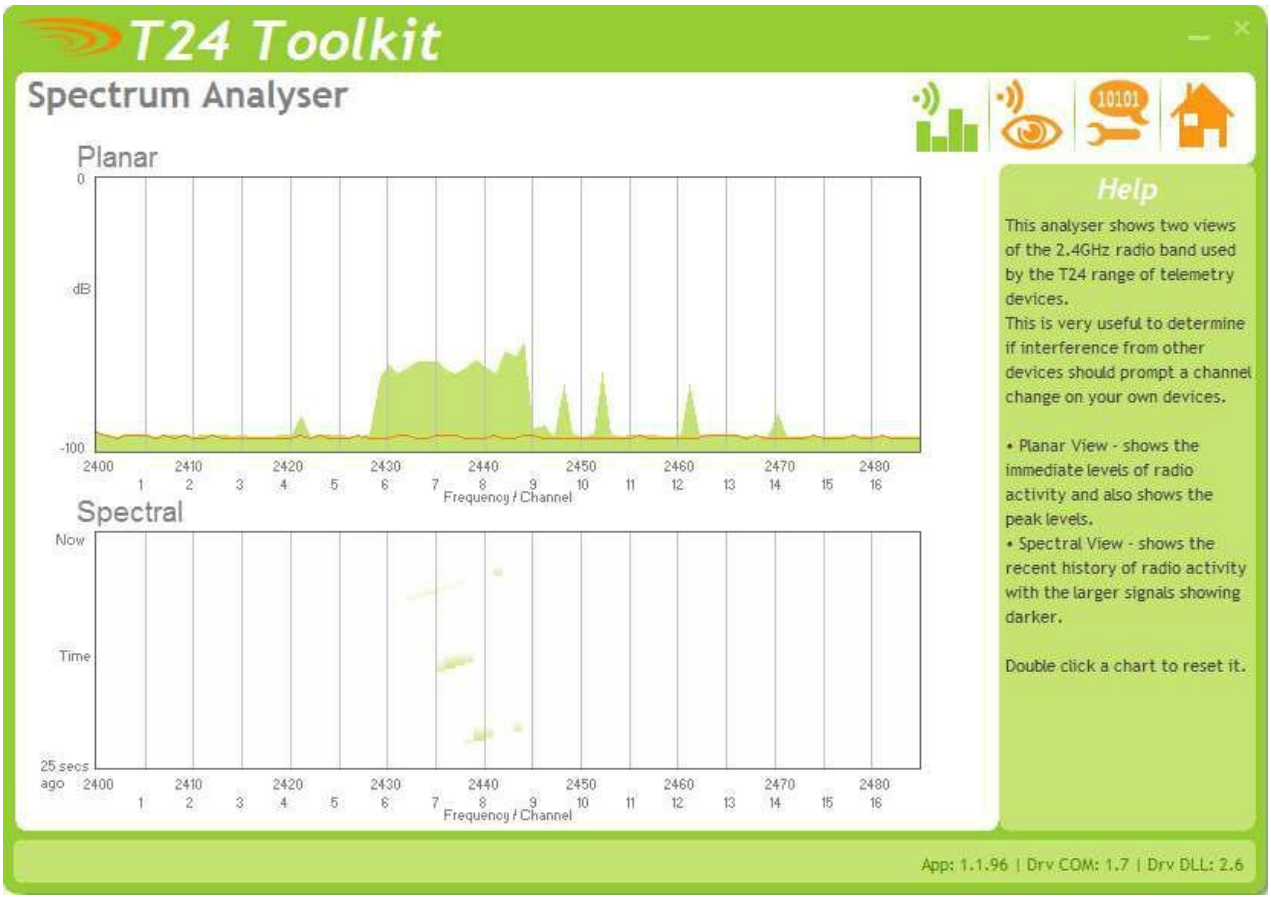
Pairing Procedure

- Remove power from the SW-SB module.
- Click the Pair button on the toolkit.
- You now have 10 seconds to re-apply power to the SW-SB module.

If you connect successfully the toolkit will change to the Information page.
If the pairing fails try again.

NOTE: The act of Pairing with the toolkit will **not** change the radio configuration settings of the connected device. The settings will only change if you change them yourself within the toolkit.

Analyser



The analyser page is provided as a tool and will not normally be needed unless you plan to change channels and want to find the best channel to select, or to diagnose poor communications issues.

This page shows the radio signal levels detected across all the channels available to the T24 series of devices. Using this tool may help in detecting noisy areas and allow you to decide on which channels you may want to use.

The above charts show the traffic from a Wi-Fi network and it can be seen to be operating over channels 6 to 9 and it would be best (though not essential) to avoid using these channels.

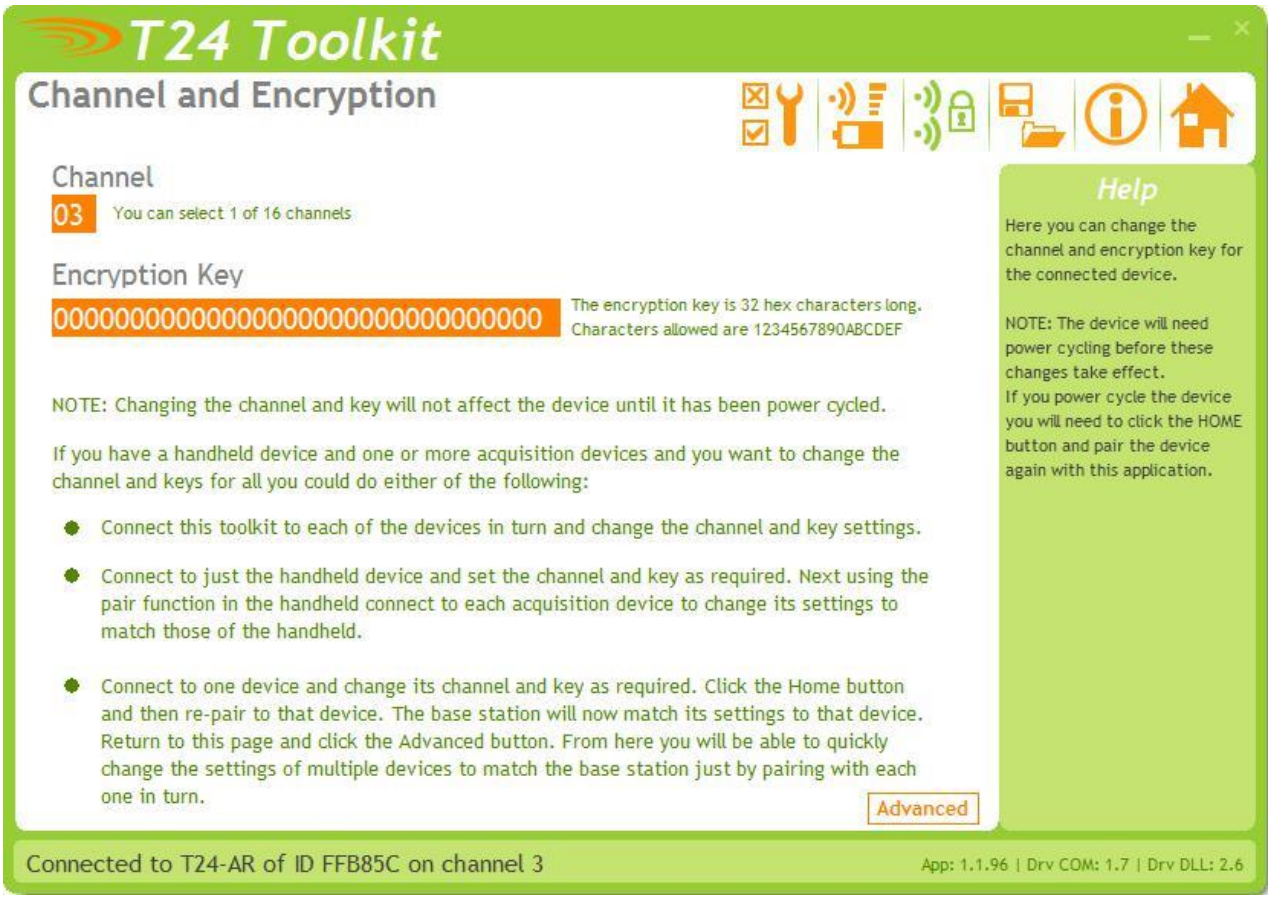
Information

This page shows you information about the connected device.

Items you can change:

Name — You can enter a short descriptive name (11 characters) which may help you recognise this device in the future.

Channel and Encryption



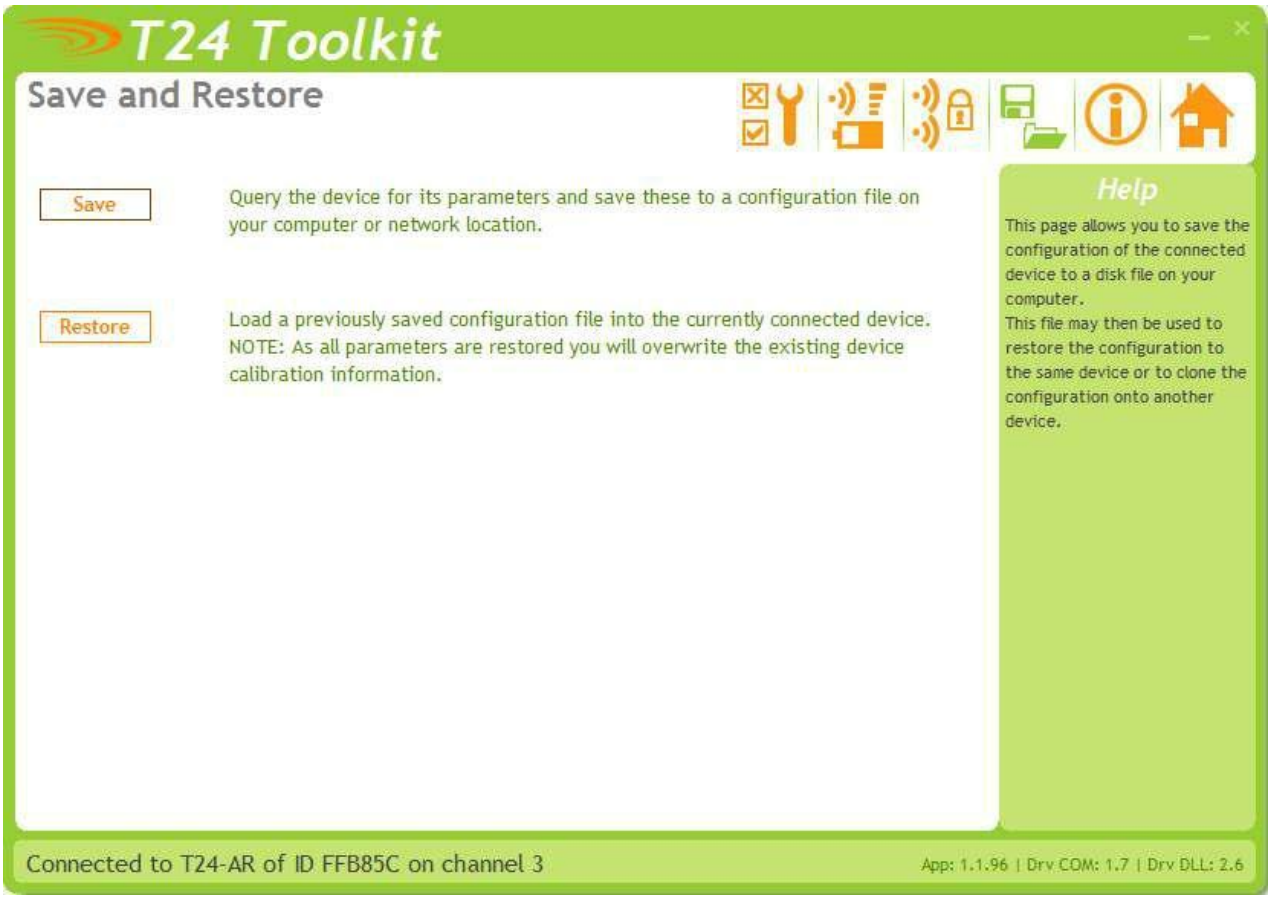
Here you can change the channel and encryption key for the module.

NOTE: Early acquisition module do not yet utilise the encryption keys so these should be left at all zeros.

Items you can change:

Channel	Select a channel between 1 and 16. The default is channel 1. You can use the Spectrum Analyser mode to determine a good clean channel to use. NOTE: Channel 16 is used to negotiate pairing so avoid this channel if possible.
Encryption Key	Only devices with identical encryption keys can communicate. You can isolate groups of devices on the same channel or just use the key to ensure the data cannot be read by somebody else.

Save and Restore

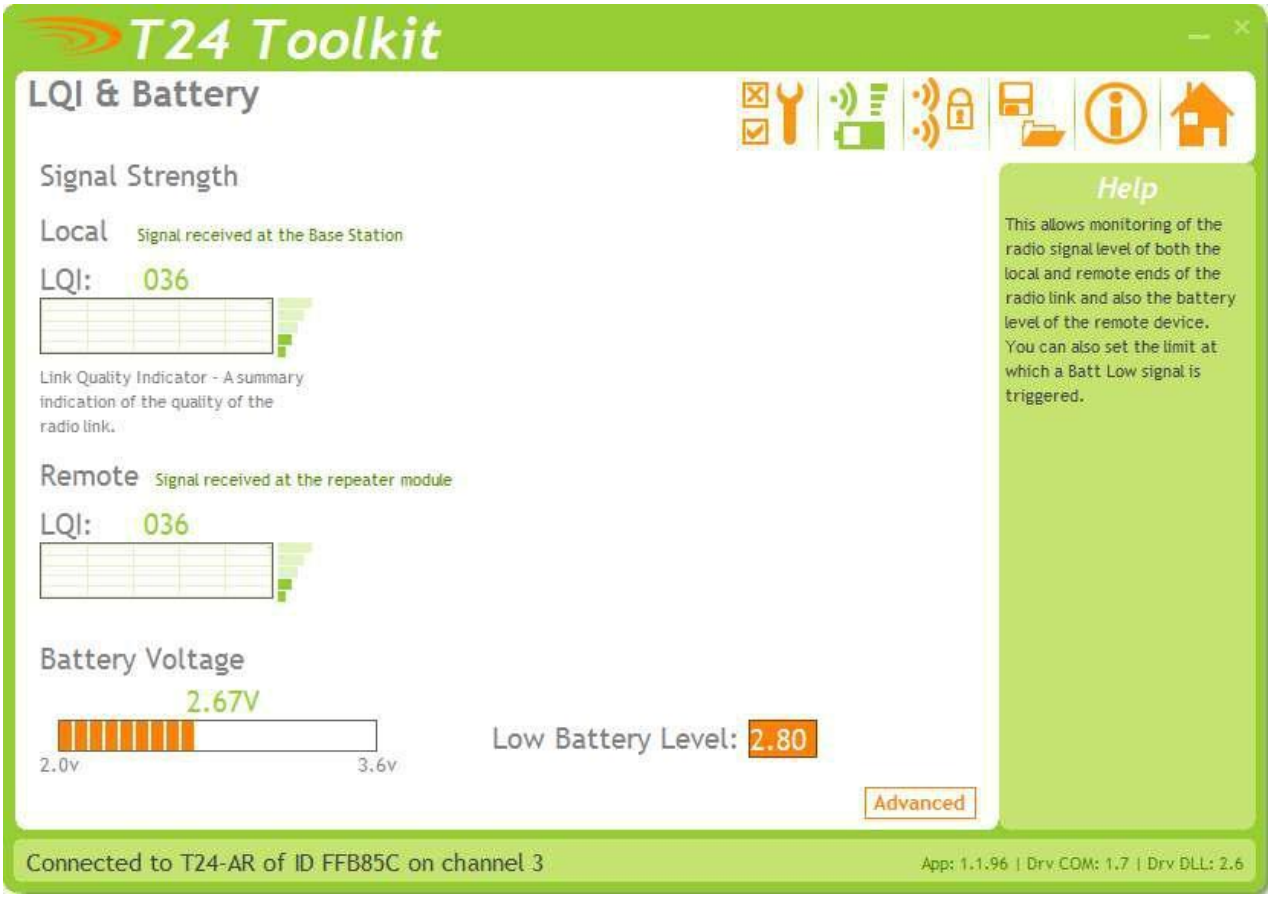


Here you can save the device settings to a file on your PC so that they can be later loaded back into the same or different device.

Items you can change:

Save	Click this button to open a file dialog window to allow you to select a filename and location to save the configuration file to. All configuration information including calibration data will be saved to the file. The file extension is tcf.
Restore	Click this button to open a file dialog window to allow you to select a filename and location of a previously saved file to load into the connected device. All configuration information **including** calibration data will be overwritten. The file extension is tcf.
Advanced Settings	Click this button to enter the Advanced Settings Page. Here are settings which do not normally require changing.

Battery and Radio Levels



Here you can see the voltage of the battery and the radio signal levels at the base station and the remote acquisition module. This simple view gives an LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable.

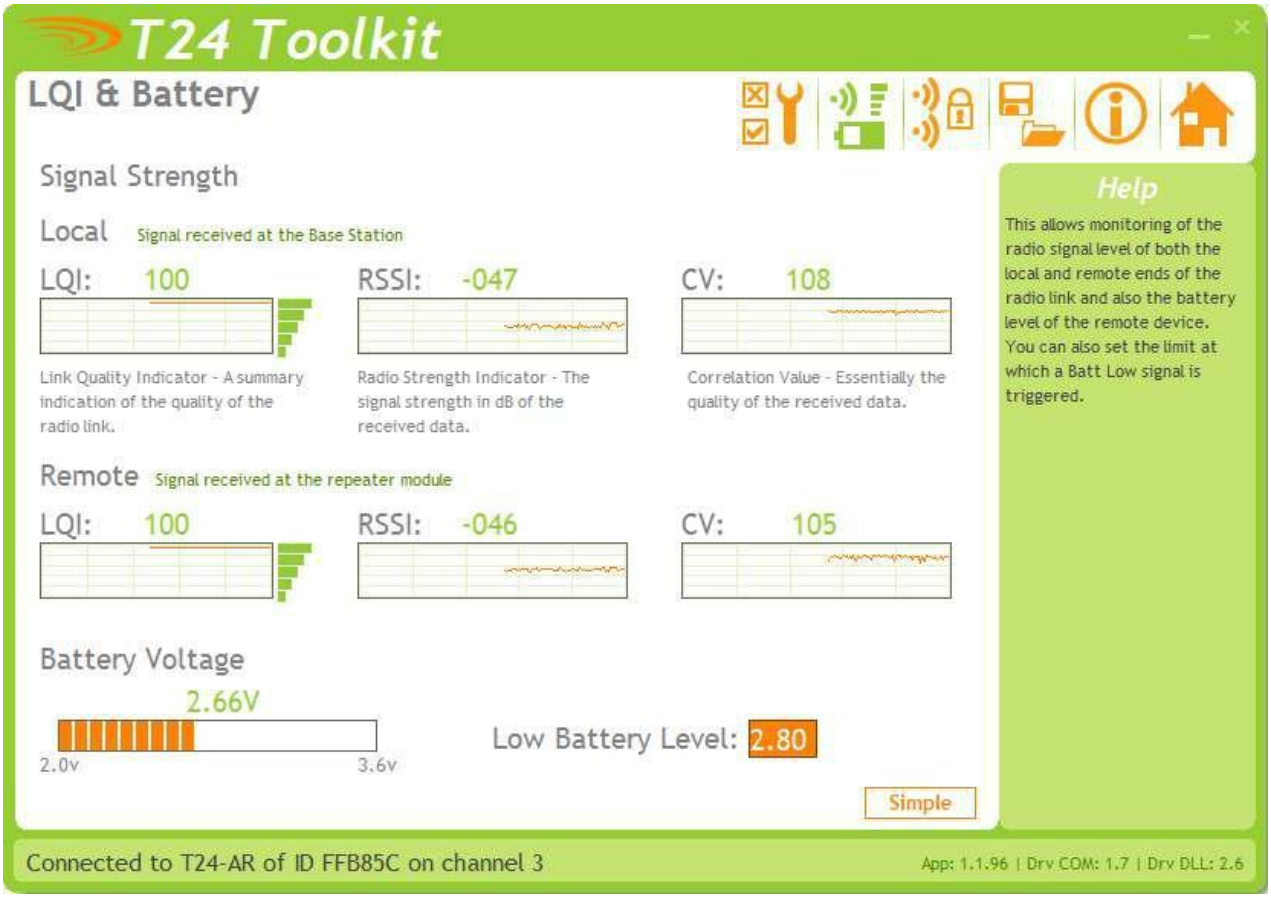
You can set the level at which the acquisition module reports a low battery.
If the battery voltage is below the Low Battery Level the bar will be coloured orange.

Items you can change:

Low Battery Level	Click this item to set the battery low level.

Clicking the Advanced button will give more detailed information on the RSSI and CV levels of the received radio packets.

Battery and Radio Levels Advanced Settings



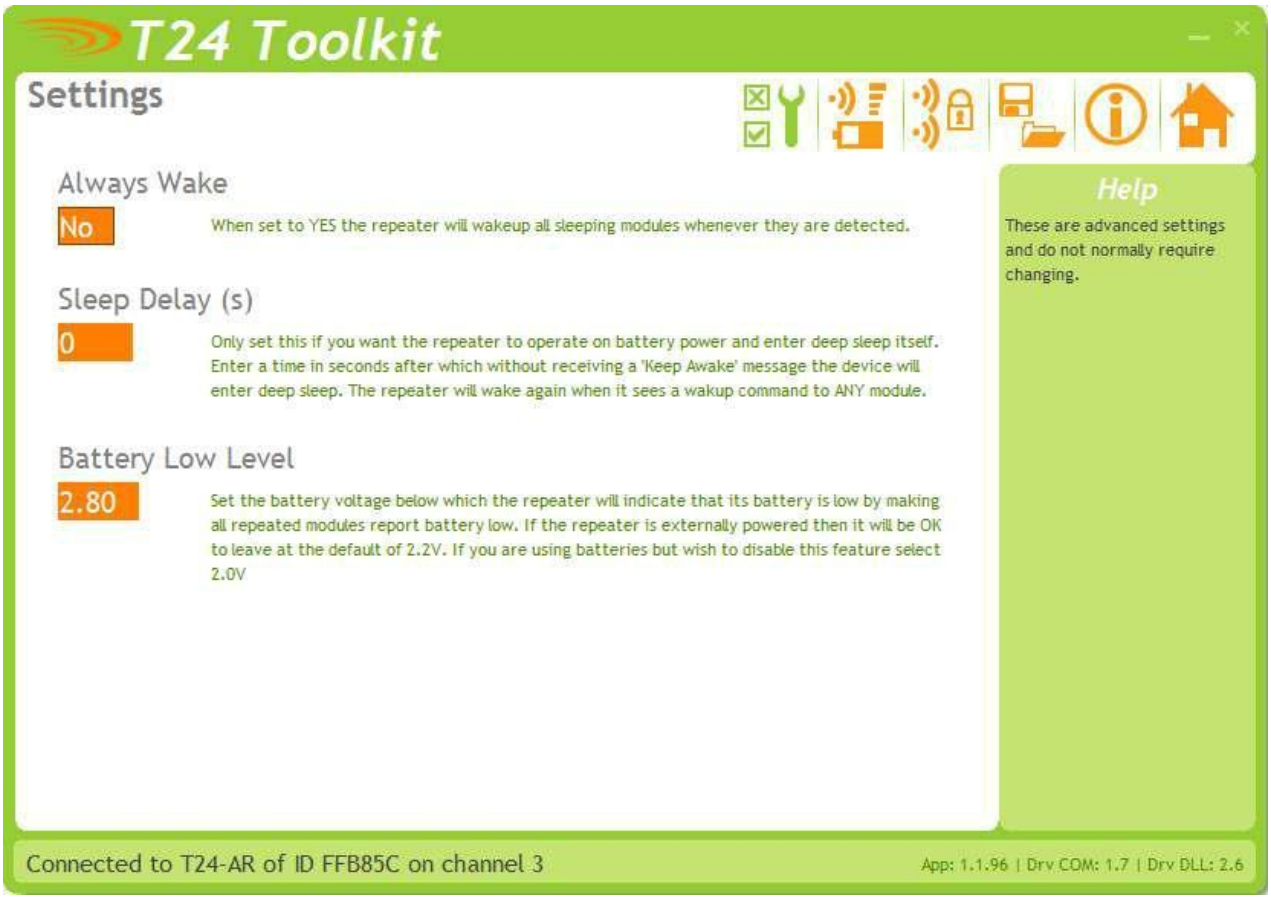
LQI value which stands for Link Quality Indicator. This value will range from 0 to 100 and within this band you should still achieve communications. As the level drops towards zero communications may become intermittent but still achievable.

RSSI is effectively the received dB level which will range from about -30 which is a good signal to -90 which is a weak signal.

CV is the correlation value and indicates how well the signal can be decoded. This ranges from 55 which is a poor quality signal and 110 which is an excellent signal.

This page could be used when performing a site survey to determine the signal levels at both the repeater and other T24 modules. Just use the toolkit on a laptop to enable the signal to be tested at different locations.

Settings



Here you can change the settings for the repeater.

Items you can change:

Always Wake	In some cases where the repeater is manually powered on and off you may want it to wake all sleeping modules within its range. Set this option to Yes to enable this. The modules you wake should have their own Sleep Delay settings set so they go back to sleep after stopping receiving Stay Awake messages from the data consumer (PC or handheld).
Sleep Delay	If the repeater is to be battery powered and you want to operate in low power mode you can employ this delay. Once the repeater stops hearing Stay Awake messages from the data consumer (PC or handheld etc) it will go to sleep after this amount of time. The repeater will wake when any other module is woken.
Battery Low Level	Select the battery voltage below which the repeater will report a low battery. It does this by making all repeated devices report a low battery so the data consumer (a handheld or PC software etc) will be able to detect a problem. The battery level applies to the voltage seen after 3V regulation. The default is 2.2V and can be left at this when the repeater is powered externally. If the repeater is battery powered and you wish to disable this feature select 2.0V

Specifications

General Radio

	Min	Typical	Max	Units
License		License Exempt		
Modulation method		MS (QPSK)		
Radio type		Transceiver (2 way)		
Data rate		250		K bits/sec
Radio Frequency	2.4000		2.4835	GHz
Power		1		mw
Range RAD24e (External antenna)			200 (650)	Metres (feet) *
Channels (DSSS)		16		

* Maximum range achieved in open field site at a height of 3 metres above ground.

SW-SB

Parameter	Minimum	Typical	Maximum	Units
Battery Supply Voltage	2.1	3	3.6	V DC
External DC Supply	5		18	V DC
Operating Temperature Range	-40	-	85**	°C
Storage Temperature Range	-40	-	85	°C
Reverse polarity Protection		-	-32	V DC
Environmental protection with suitable cables exiting through cable glands.		IP65		
Battery life using Duracell LR20 'D' cells with the SW-SB permanently activated. **		285 12		Hours Days

**Batteries used may have reduced operating temperature range.
Usually using batteries, the SW-SB would be utilising the SleepDelay to return to sleep. Therefore the actual daily usage would allow for far greater than the stated battery life. For example: If the SW-SB was used for 1 hour per day then the battery life would be 6840 hours or 288 days or nearly 10 months.

The specifications for the actual fitted acquisition module are listed in the acquisition module manual.