SW-OAM
Relay Module

User Manual

straightpoint®
world leaders in load monitoring technology

Introduction / Overview

The SW-OAM offers dual power relays capable of mains power switching. These relays can be configured as high, low or window alarms to one or a sum of up to 8 T24 acquisition modules per relay. Relays can be latched and a digital input or external command can be used to reset them.
An alarm/error signal relay is operated if communication is lost or other selectable errors occur and this alarm resets once the source of the alarm or error is removed.
This module is supplied in an IP65 sealed ABS case but a DIN rail option is available.
The state of the power relays during an error can be selected.

Communications Overview

The T24 range of telemetry devices each have a factory set unique **ID**.
Data is shared between devices using **Data Provider** messages. A device generates these messages which can then be used by many other devices simultaneously.
These messages (or packets) of information contain a single value of data and each is identified by a **Data Tag**.
The **Data Tag** should be unique for each message.

ID **Identifies each device**
Each device has a unique **ID** that is factory set. This is represented as a 6 character hexadecimal number consisting of the digits 0 to 9 and the letters A to F.
I.e. **`FFD3BE`**

Data Tag **Identifies each Data Provider message**
A **Data Tag** consists of a 4 character hexadecimal number consisting of the digits 0 to 9 and the letters A to F. The **Data Tag** can be changed by the user but the factory default is to match the last 4 characters of the device **ID**.
I.e. An acquisition device of **ID** **`FFC12B`** would have a default **Data Tag** of **`C12B`**.

When a device consumes data (i.e. a handheld displaying data from an acquisition device) all it is doing is listening to all of the **Data Provider** messages and selecting the one it wants to use. It then extracts the data and displays it.

Some devices that use **Data Provider** messages also need to know the **ID** of the device providing the data. This is necessary if that device needs to specifically wake the data providing device as opposed to using a broadcast wake that will wake all devices on the same channel and using the same encryption key.

Pairing offers an automated method of hooking a provider and consumer of data together. However, some devices may require you to manually enter **Data Tag** and **ID** information so it would be beneficial to the user to understand the above mechanism.

Configuration Overview

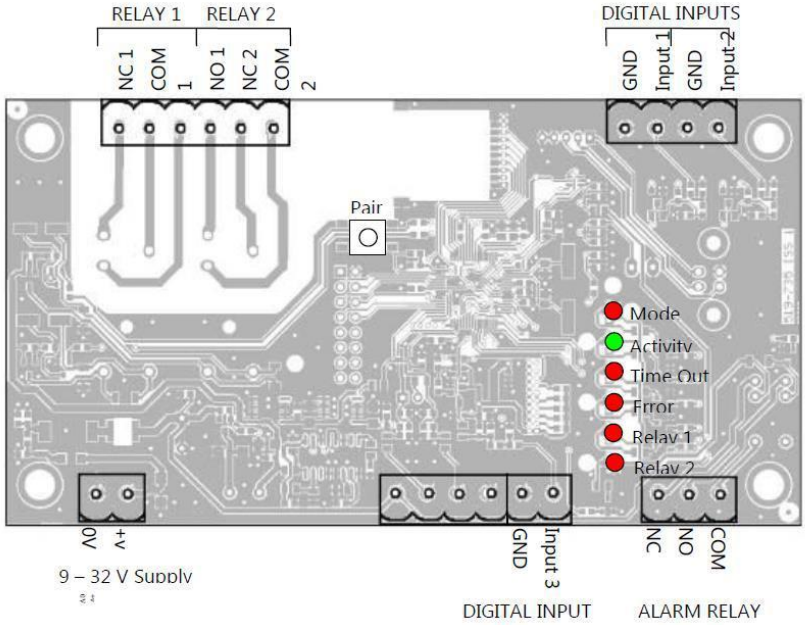
You need to determine the Data Tags of all acquisition modules that are to contribute data to this relay module.
Each relay can use the value of up to 8 inputs which are summed then checked against your setpoint.
The toolkit allows you to see the total of the selected set of Data Tags which will help in determining whether you want to apply an offset. This may be useful to effectively ‘zero’ the input total to make calculating the setpoints easier.

Getting Started

To be able to see the totals from acquisition devices supplying data to the SW-OAM and to avoid entering error mode due to timeouts, we must first ensure that the appropriate modules are transmitting their values at a suitable rate such as the default of 3 per second. Then we can configure the SW-OAM to use the data from these devices.
Configuration must be done with the T24 Toolkit software and a base station.

Connections & Indicators

You will need to connect power to the SW-OAM for it to operate. Only power is required to enable configuration using a base station and the appropriate toolkit software.



LEDs

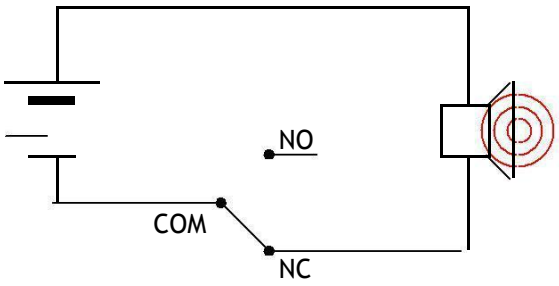
Mode	Flashes 2 x per second when operational
Activity	Flashes when T24 data packets are received
Time Out	No T24 data present for longer than user defined period
Error	Remote T24 error from any defined T24 input device
Relay 1	Relay 1 Energised (Connection between COM and NO)
Relay 2	Relay 2 Energised (Connection between COM and NO)

Inputs

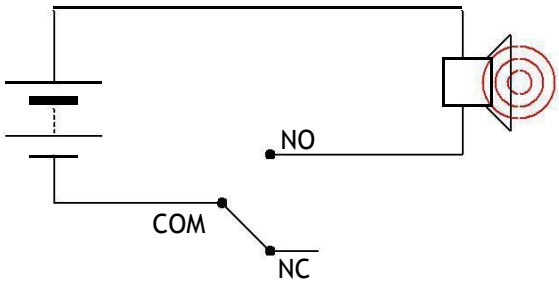
Digital Input 1	Can either reset a latched relay 1 or transmit a Data Provider Packet of a specified Data Tag
Digital Input 2	Can either reset a latched relay 2 or transmit a Data Provider Packet of a specified Data Tag
Digital Input 3	Resets both latched relays

SW-OAM Operation

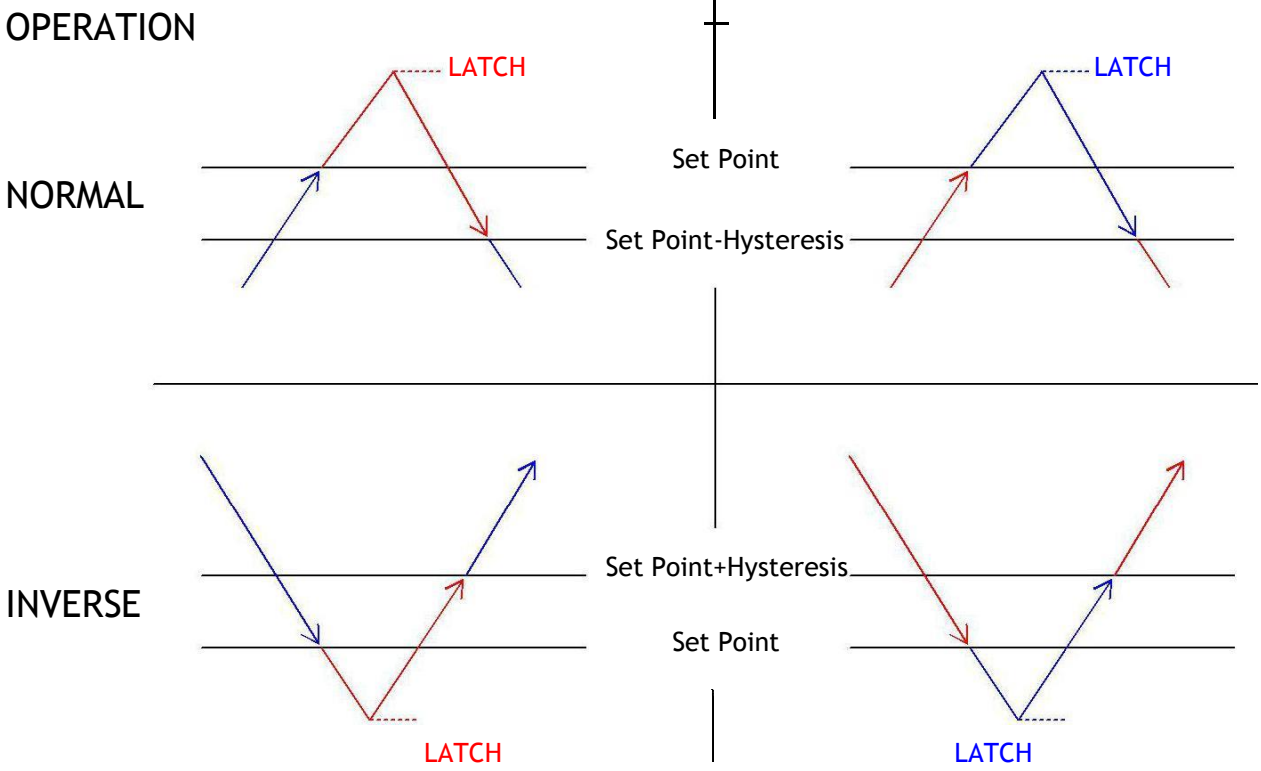
The SW-OAM can accept 8 T24 data inputs for each of the two relays, the total of the inputs compared to the set point and mode of the relay channel affects whether the relay is energised or not. In addition, when considering the use relays attention should be paid as to what state the system will be in when the power is off. The diagram below outlines how wiring and normal and inverse modes influence the state of relays.



Wired in this configuration the alarm would sound when the power is off



Wired in this configuration the alarm would not sound when the power is off



The only way to affect the operation of relays is as follows:

Arrival of a T24 data from user defined T24 device that causes the sum of a relay total to trigger the relay output state.

Triggering of digital input 1 or 2 (switch input) which if configured reset latched relays

Arrival of data from a specified data tag can reset latched relays.

A change in error state of a module specified in a relays list of inputs

The SW-OAM also features a third Alarm relay. The Alarm relay is energised from start up, (connection made between COM and NO) The relay de-energises if an error is detected, an error is classed as a time out and but can also be defined as Integrity error or low Battery. The Alarm Relay will return to normal once the source of the error is removed.

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 T24 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.

SW-USBBSE Base Station

If you have a USB version of the base station 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.

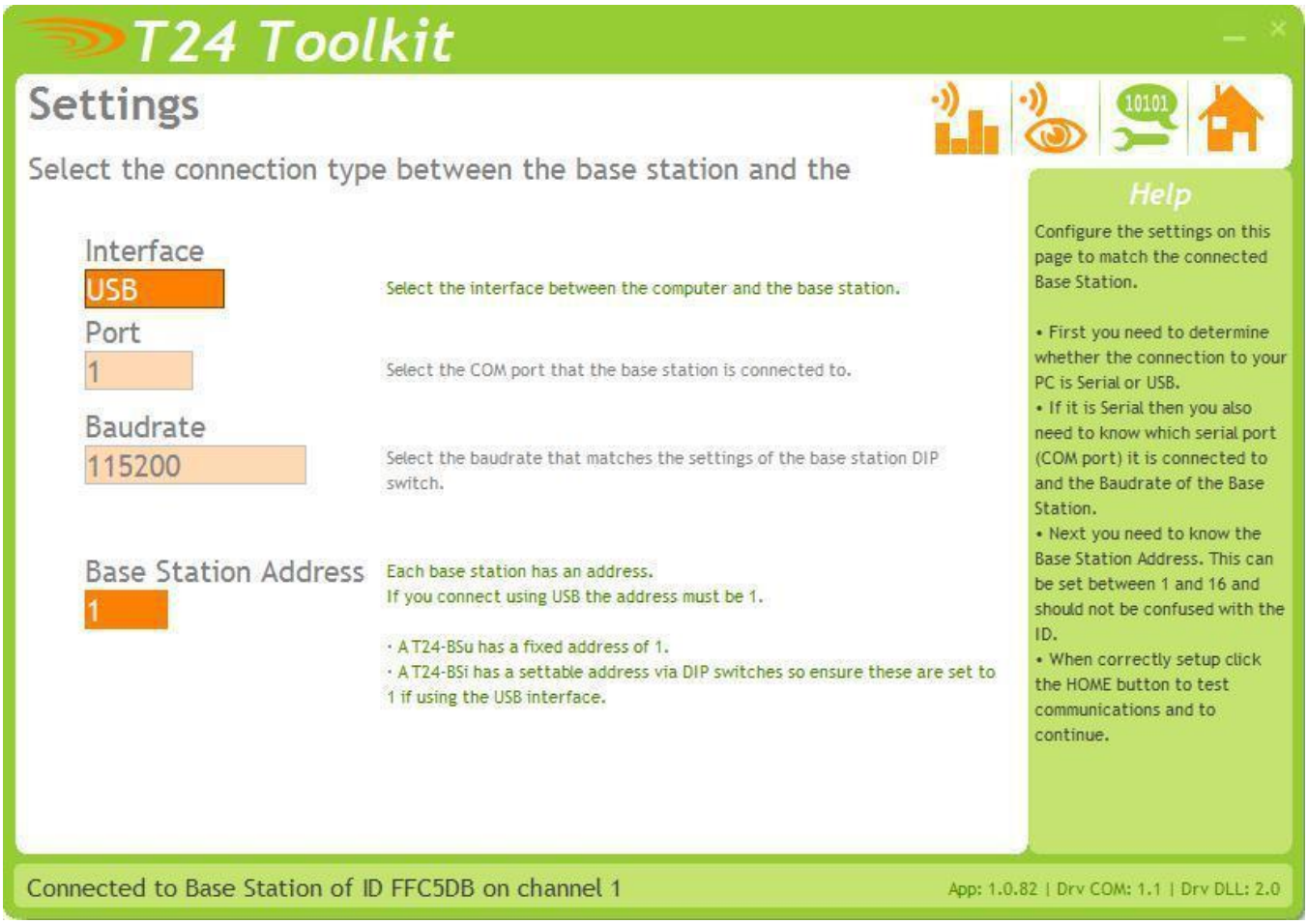
T24 Toolkit

The T24 Toolkit provides a means of simple configuration of the SW-OAM and associated acquisition module along with useful tools to aid integration. Calibration of the acquisition modules is also provided.

Run the T24 Toolkit software application.

General Pages

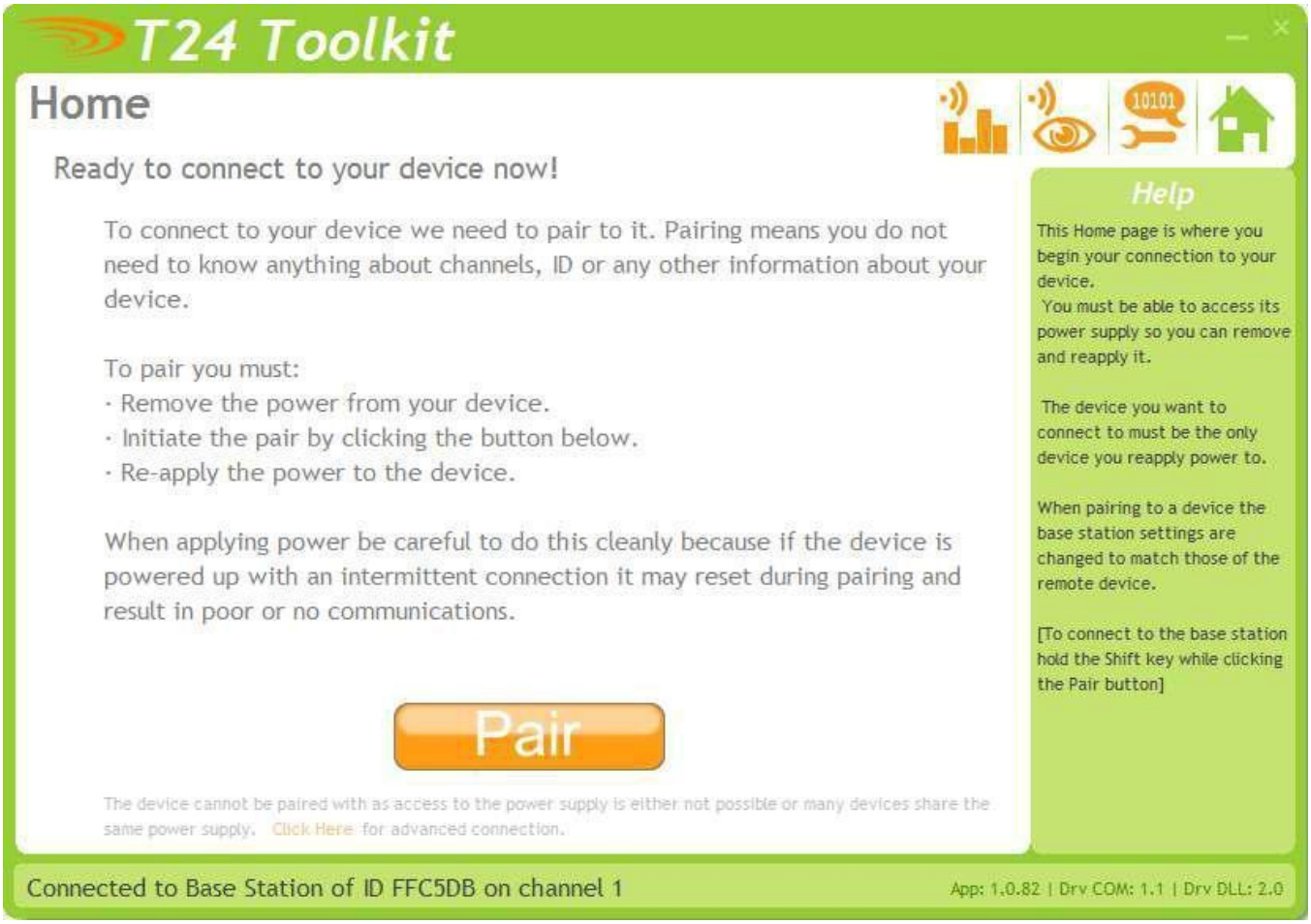
Setup Base Station Communications



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.

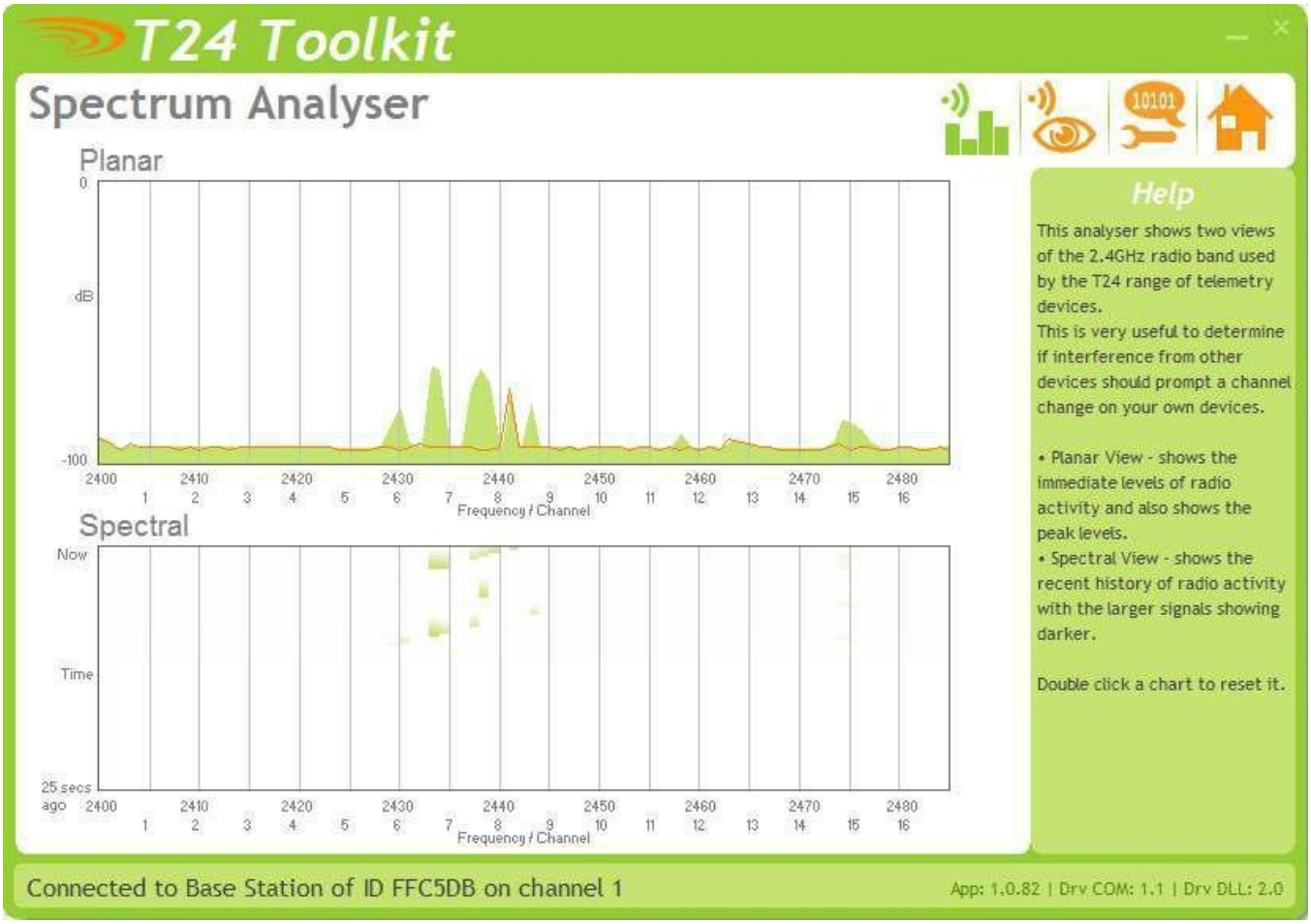
Pairing Procedure

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

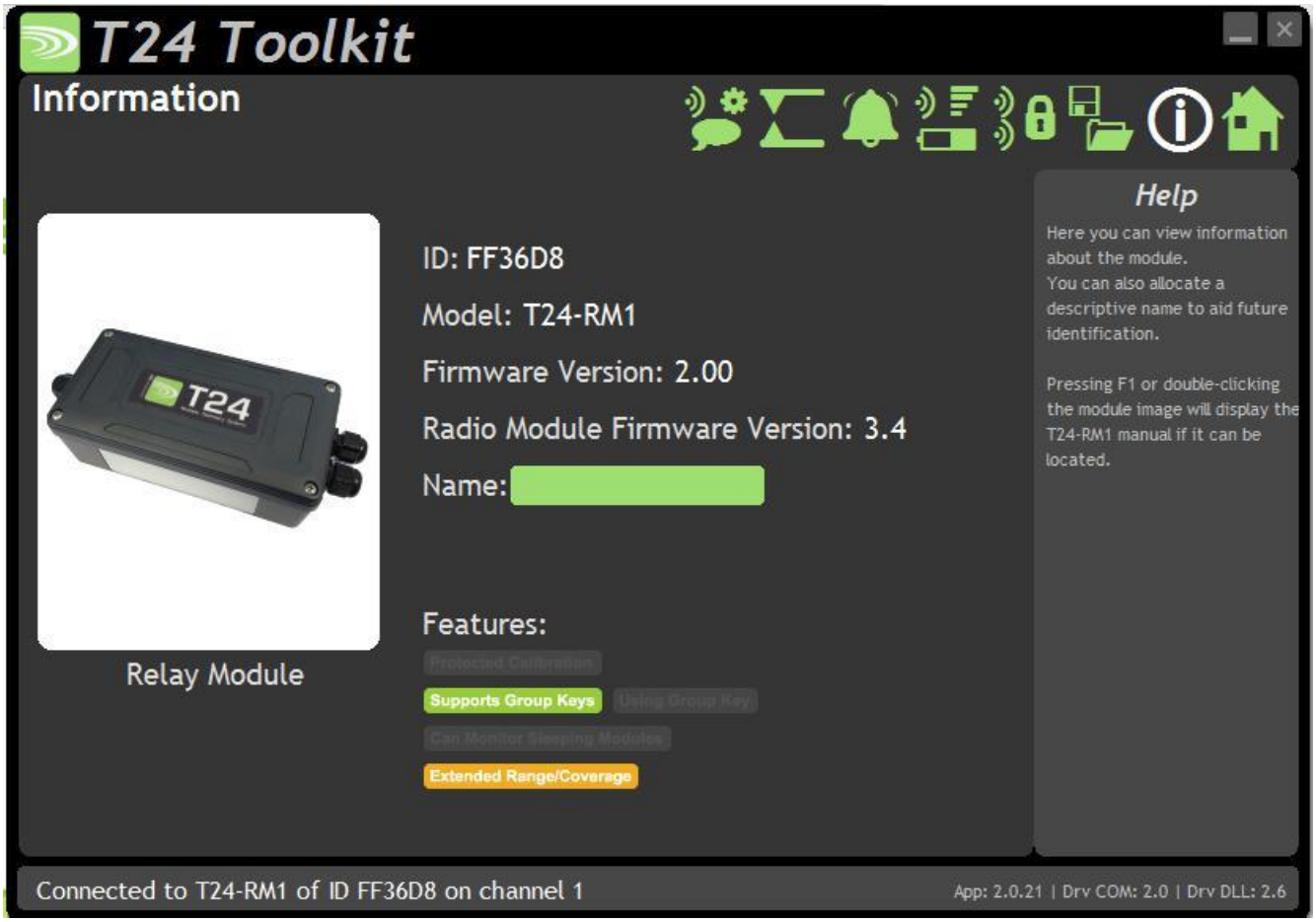


The analyser page is provided as a tool and will not normally be needed unless you plan to change channels and want to find the best channel to select, or to diagnose poor communications issues.

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

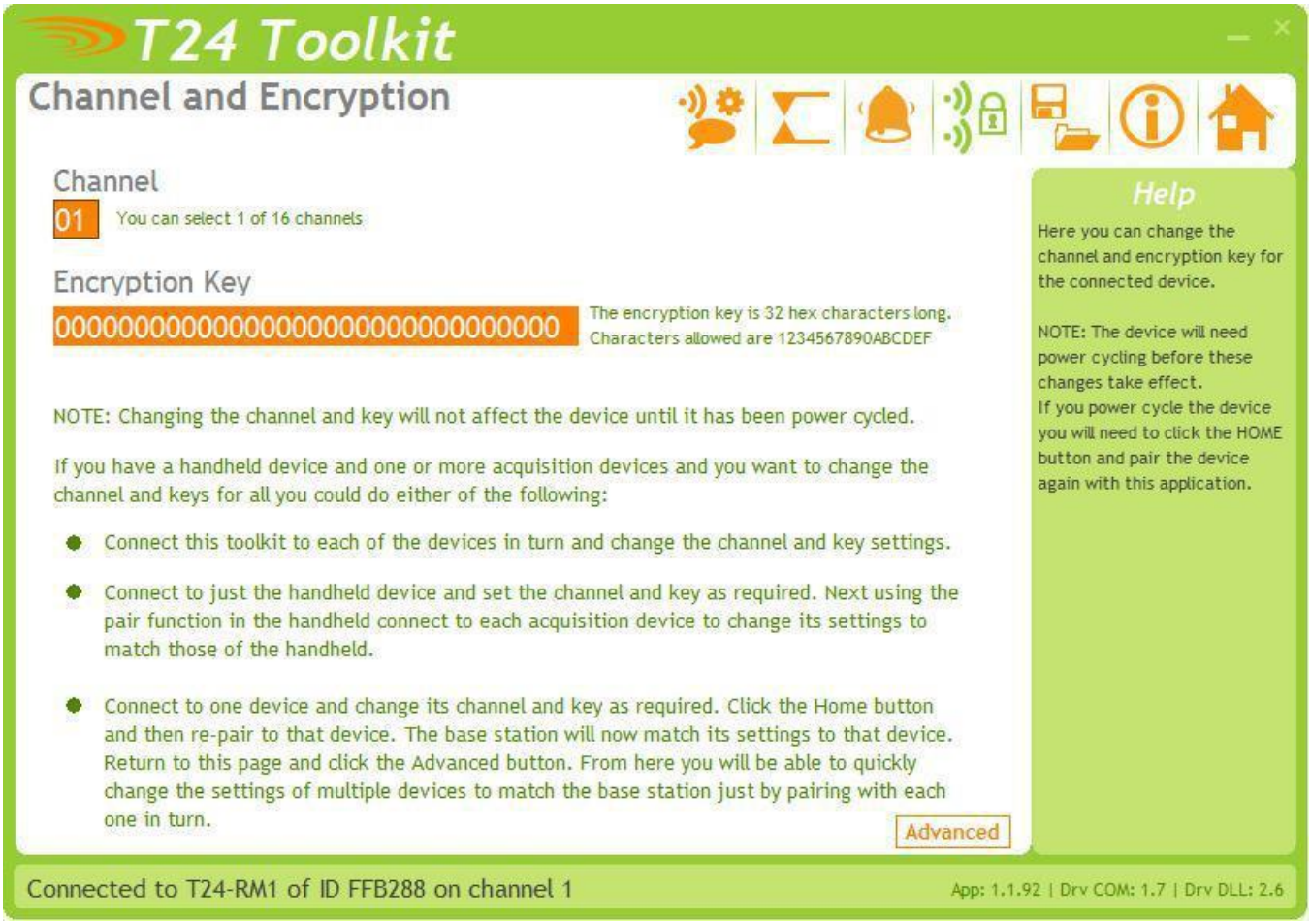


This page shows you information about the connected device.

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



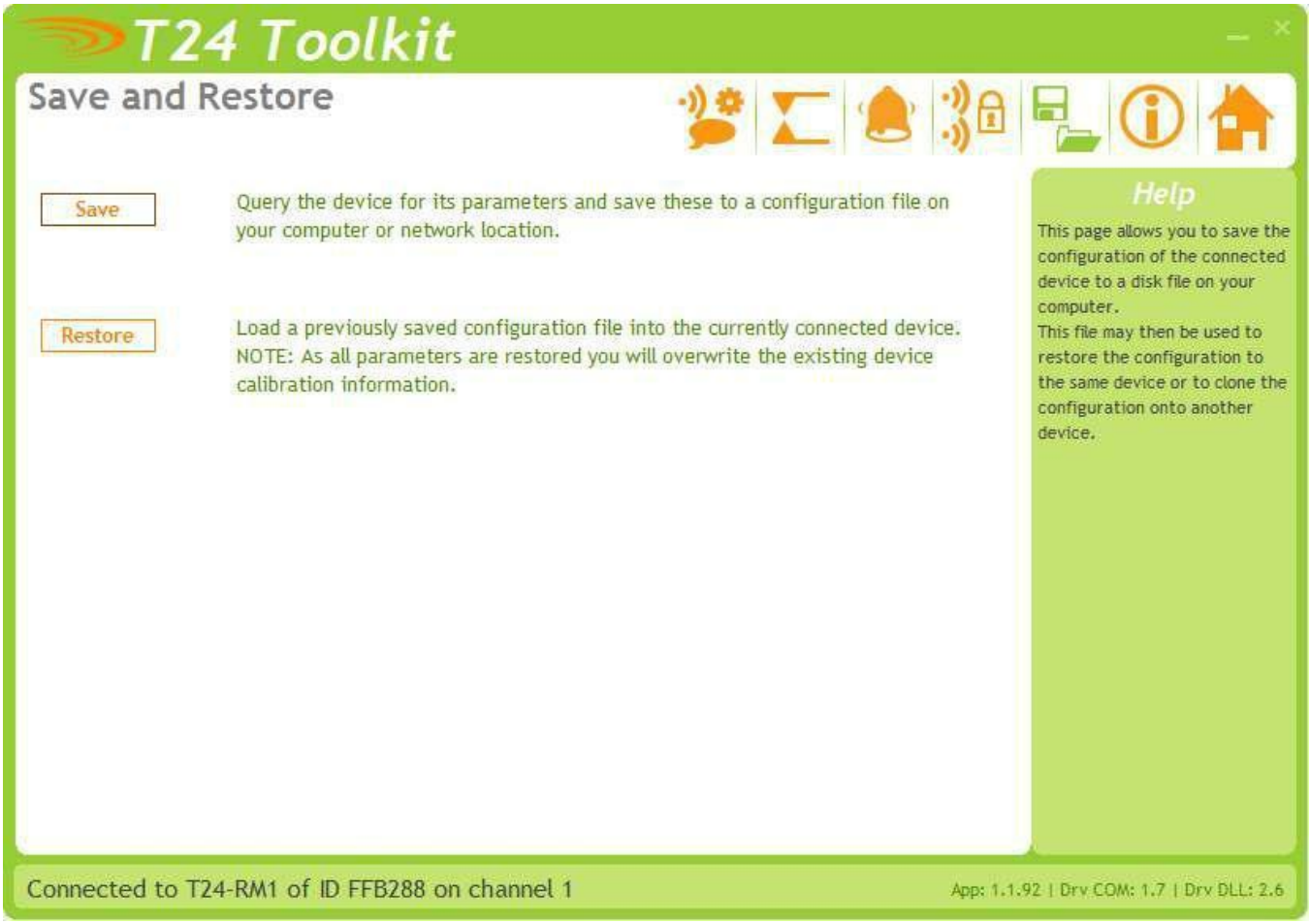
Here you can change the channel and encryption key for the module.

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

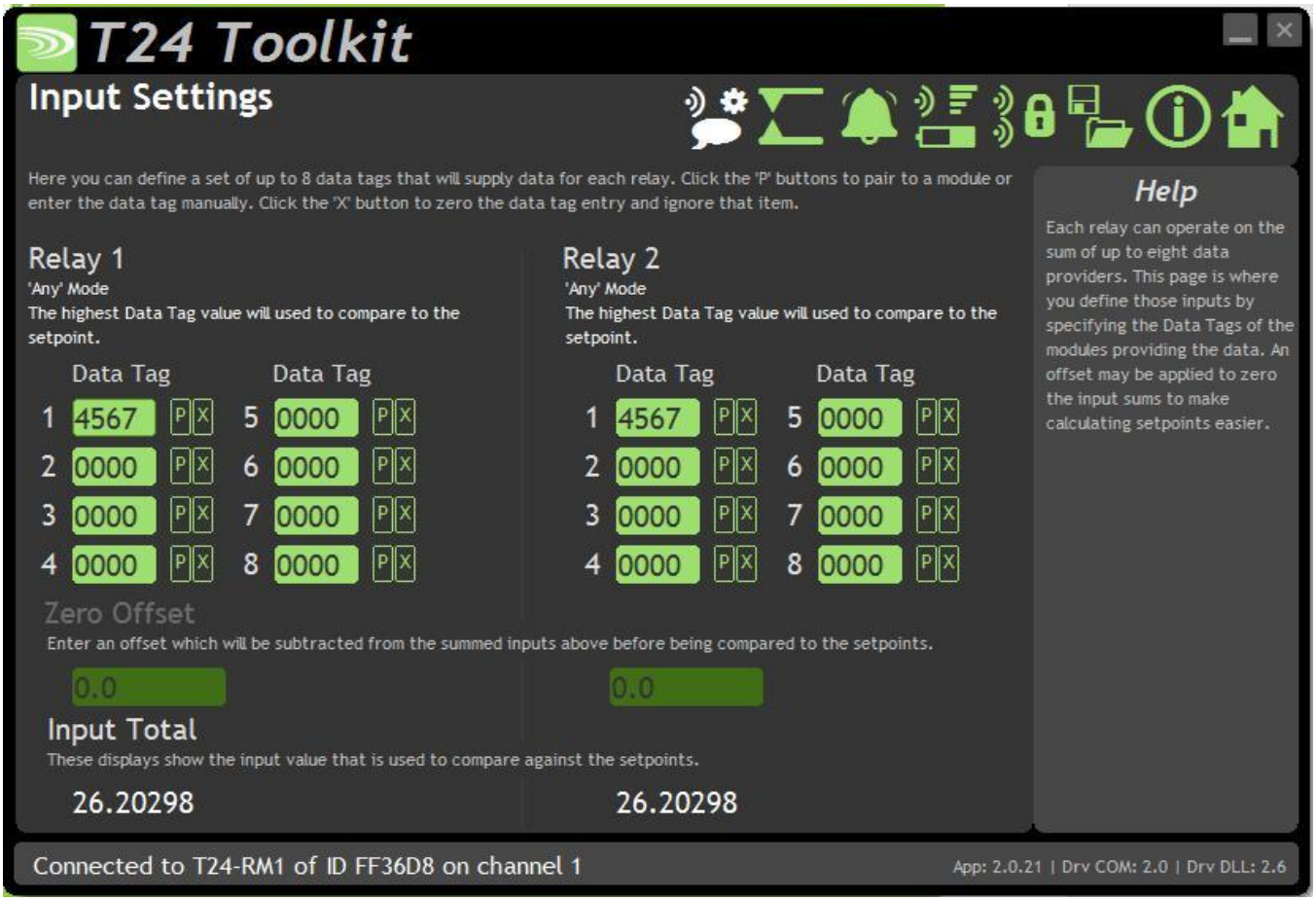


Here you can save the device settings to a file on your PC so that they can be later loaded back into the same or different device.

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.

Input Settings

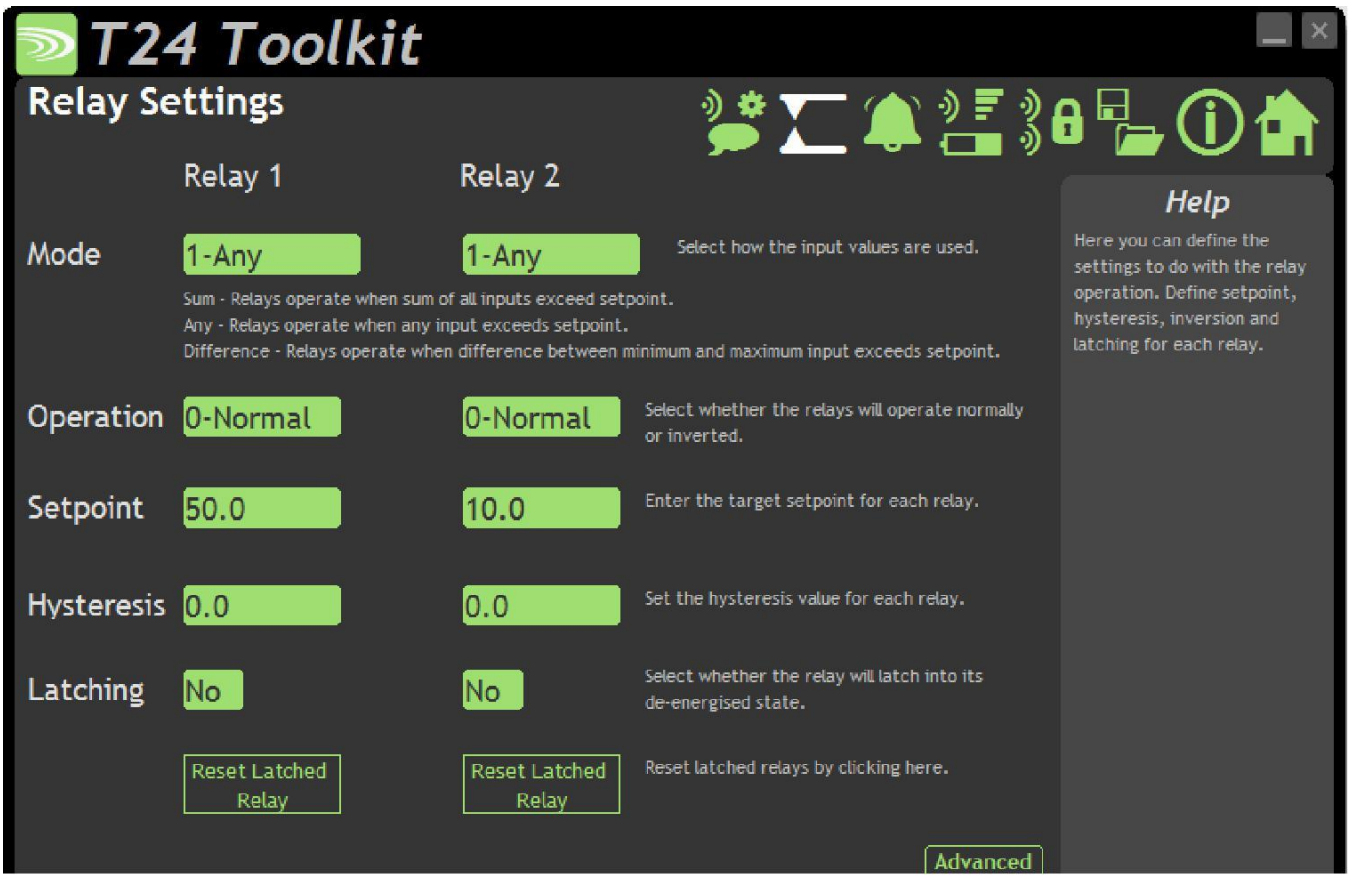


Here you can set the action to take when the switch contacts are closed, set the Data Tag that will trigger an output and also set the Data Tags of the data used as the inputs.

Items you can change:

Relay1DataTag[1-8]	Enter up to eight Data Tags the data from which will be summed and compared to the set point.
Relay2DataTag[1-8]	Enter up to eight Data Tags the data from which will be summed and compared to the set point.
Zero Offset [1-2]	This value will be subtracted from the total of the summed data from the data tags for Relay 1.

Relay Operation Settings



Here you can change various settings that influence the operation of the individual relays.

Items you can change:

Mode [1-2]

This setting determines how the Data Tag values are used to compare against the setpoint. This is only available in firmware versions 2.0 and above. Previous versions will operate only in 'Sum' mode.

- **Sum** – The values of the defined Data Tags are summed and this summed total is compared to the setpoint.
- **Any** – The Data Tag with the highest value is compared to the setpoint. i.e. If any of the individual transmitter modules exceed the setpoint.
- **Difference** - The difference between the lowest and highest values of all the Data Tags is calculated and this difference (Which is absolute i.e. always positive) compared to the setpoint.

Operation [1-2]

Whether set to normal or inverse decides how the relay state corresponds to the set point and hysteresis. (See diagram on next page)

Setpoint [1-2]

The Set Point is the level at which the relay state will change, see below.

Hysteresis [1-2]

This value sets an offset between when the relay is energised and de-energised creating a de-bounce for the relay. (See diagram on next page)

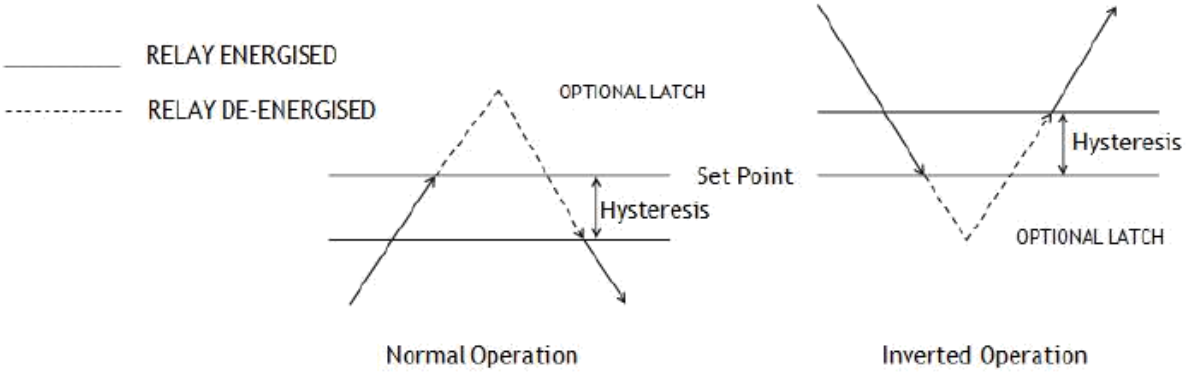
Latching [1-2]

Latching locks the state of the relay when it passes the set point.

Advanced Button

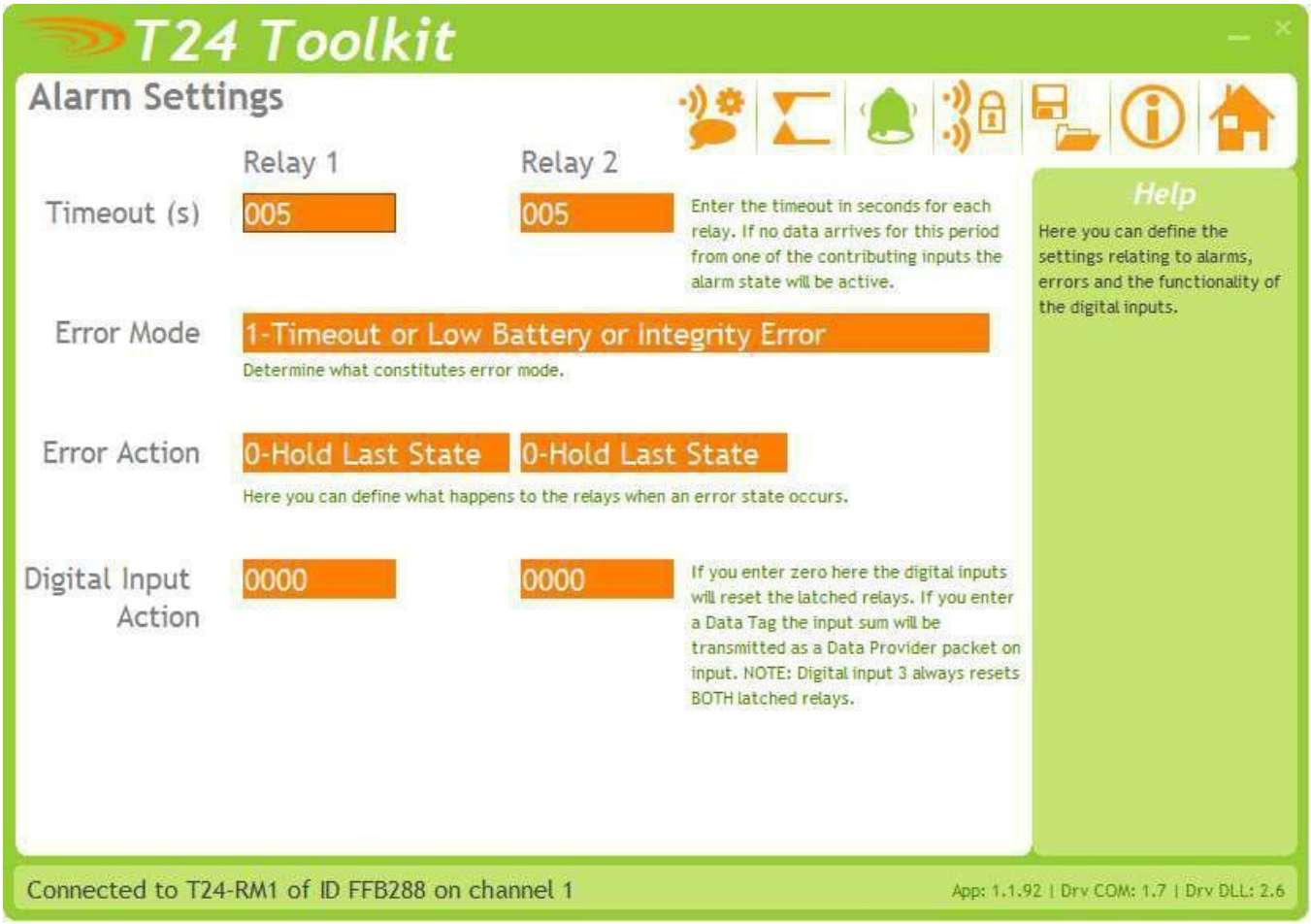
Displays the Relay Settings Advanced page.

Operation and Hysteresis Settings



Relay de-energises when reaching the set point.

Alarm Settings



This page defines how the individual relays will react to time outs and errors present from any defined T24 device, as well as how Digital inputs 1 and 2 are used.

Items you can change:

Timeout
: Enter a time in seconds that if exceeded the SW-OAM will affect the relay state according to the error action, as well as set the alarm relay and light the time out LED

Error Action
: For each relay the action upon error detection can be defined as ;
  - Hold Last State
  - De-Energise Relay
  - Energise Relay

Error Mode
: The error mode defines what is causes the alarm relay and individual error action to be triggered. Errors can be defined as
  - Time out
  - Time out or Low Battery
  - Time out or Low Battery or Integrity Error

Digital Input 1
: Digital input 1 can be used to either
  - Reset Relay 1 from its latched state
  - Transmit a data provider with user defined data tag containing the total of the inputs of Relay 1

Digital Input 2
: Digital input 2 can be used to either
  - Reset Relay 2 from its latched state
  - Transmit a data provider with user defined data tag containing the total of the inputs of Relay 2

Installation

Overview

Radio performance at microwave wavelengths is very dependent upon the operating environment; any structure within the operating region of the radios will give rise to three effects:

Obscuration. Obscuration will result in reduced range and occurs when an obstruction masks the line-of-sight between radios.

Aberrations to the horizontal and vertical space patterns. Distortion of these patterns may occur if structures or objects are placed in the near or intermediate field of the antenna. The effect will be to distort the coverage patterns, adversely affecting range and link quality.

Reflection. Any object placed in line-of-sight of the transmit antenna will result in signals arriving at the receiver by an indirect path. Degradation of performance due to reflection (multipath effects) appears as reduced range or poor link quality.

Any of the above will cause poor RSSI figures, an increase in the packet loss rate and in extreme cases complete loss of signal. Fortunately, if consideration is given to these effects at the integration stage then a good quality link will be obtained.

Guidelines for product design:
When selecting materials for product enclosures, preference should be given to fibreglass, light coloured ABS or Polypropylene; at the wavelength of 2.4GHz radio other materials will adversely affect the signal by attenuation, refraction or change in polarisation.

If the application demands that the radio is fitted inside a metal enclosure then ensure that the specified clearances are maintained around the antenna and design in a fibreglass RF window at least as large as the clearance dimensions but ideally as large as possible.

RAD24i radios fitted inside a product should be oriented so that the chip antenna will be vertical when the product is in its normal operating position.

Guidelines for installation:
When planning installations ensure that line-of –sight between nodes is maintained and that objects or structures are kept at least one metre away from antennae wherever possible.

To avoid poor link quality between a RAD24i radio and a handheld device ensure that the RAD24i is mounted so that the chip antenna is vertical. Improvement may also be obtained by altering the height above ground of the RAD24i; a small increase or reduction in antenna elevation will often improve reception.

Range underwater is only a decimetre or so depending on packet rate. Best performance underwater is obtained by using low packet rates and immersing water-proofed antennae rather than water-tight enclosures containing the antennae.

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 RAD24i (Integrated antenna)			120 (400)	Metres (feet) *
Range RAD24e (External antenna)			200 (650)	Metres (feet) *
Channels (DSSS)		16		

SW-OAM

	Min	Typical	Max	Units
PSU	9	-	32	Volts
Operational Current No Relays Active		100*		mA
Operational Current All Relays Active		155*		mA
Operational Temperature Range	-10		60	Deg C
Storage Temperature Range	-20		65	Deg C
Power Relays		240V 5A		
Alarm Relay				
Range			200 (400)**	Metres (feet)
Channels (DSSS)		16		

* At 12 Volt nominal Supply