



# 20-85-0000

## VHF/UHF TRANSMITTER



## PRODUCT MANUAL

Version 0.0.2  
March 2024

## Warranty and Disclaimer

Salcom products are warranted against defects in materials and workmanship for 12 months from the purchase date under normal use. This warranty does not cover damage resulting from misuse, accidents, negligence, unauthorized modifications or repairs, failure to follow provided instructions, or damage from acts of nature or external factors.

During the warranty period, if a defect arises and a valid claim is accepted, Salcom will repair or replace the product at its discretion. All shipping costs related to warranty service are the responsibility of the customer. To obtain warranty service, contact Salcom at [info@salcom.com](mailto:info@salcom.com), providing proof of purchase and a description of the problem.

All information provided in this document is carefully prepared and offered in good faith as a guide to the installation and use of Salcom products. Installers must ensure that the final installation operates satisfactorily within the relevant regulatory requirements. Salcom accepts no responsibility for incorrect installation.

Please refer to the product specifications for certification information.

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**Note****Configuration Software**

The programming descriptions in this manual are based on Version 1.1.7 of the configuration tool, Sacoto, which can be found on our website at [www.salcom.com](http://www.salcom.com)

If a later version of Sacoto is being used to program the device, some of the window layouts may have a different appearance, options could be shown on different tabs, or there may be new options and parameters available which are not described or shown here.

## Product Overview

The 20-85 range of VHF and UHF transmitters are a paging transmitter with an optional acknowledge function. Pressing a button on the unit will transmit a POCSAG paging message directly to a nearby pager, to a private paging network based on the Salcom 20-90 transceiver, or other POCSAG paging receivers.

The 20-85 transmitters are available on two bands (VHF or UHF) as three different button configuration options; a single button, four buttons, or eight buttons to suit a variety of requirements. The four- and eight-button versions can be programmed with different messages, data rate, and CAP codes for each button increasing the versatility beyond simple paging notification.

Typical applications include:

- Retail assistance.
- Rest home and hospital alerting.
- School and commercial alerting.
- Location reporting or call by zone.
- Remote control of lights, alarms, and machinery.
- Interrogation of the status of remote devices.
- Duress situations.
- Relay receiver control (CAP based or using Salcom Relay protocol).

The 20-85 VHF/UHF transmitter is rated to withstand dust and mildly corrosive environments although full immersion in water should be avoided.

Power is provided by two alkaline AA cells with typical battery life of up to 50,000 button presses. Battery life can be extended by using short messages, high baud rates, and Salcom POCSAG Rapid protocol for control applications. Standby battery life is typically greater than five years with occasional use, dependent on the quality of the batteries used, but heavier use will significantly reduce battery life.

The operational range is dependent upon any line-of-sight obstructions and best performance is realized with a clear line of sight of the receiver. With a partially obscured path the range can be up to 250-metres and may exceed 1000-metres in open spaces. A Salcom 20-90 transceiver can be used as a store and forward repeater to extend the range if required.

The 20-85 transmitter can receive acknowledgments from a Salcom 20-90 transceiver module (or other paging transceiver) immediately following a button press. Acknowledgments can be used to indicate that the message has been received, that remote equipment has operated correctly, or to provide an indication of a fault at the remote unit. Acknowledgements are indicated by two green LEDs which can be operated independently.

Please note that the 20-85 cannot be configured to continuously receive paging messages and we recommend using a pager if continuous reception is required.

The 20-85 can support POCSAG pagers operating at 512, 1200, or 2400 baud, in channels spacings of 25kHz, 12.5kHz or 6.25kHz.

## Layout



20-85-0151 (VHF) and 20-85-0451 (UHF)



20-85-0154(VHF) and 20-85-0454 (UHF)



20-85-0158(VHF) and 20-85-0458 (UHF)



## Indications

### Red TX LED indications

**Solid:** Transmitting or Receiving message.

**Flashing rapidly:** Low battery condition.

**Occasional flash:** Stuck button indication. One, or more, of the buttons is continuously on and draining the battery. Service may be required.

### Green Acknowledgement LED indications

A remote transceiver, such as the Salcom 20-90, can send specific acknowledgment messages to the 20-85 to operate the green LEDs for a brief period after receiving a transmission from the 20-85. The remote transceiver must be configured to send the appropriate message back to the 20-85 immediately after it has received a message. The LED shown, and the meaning of the indication, is determined by the configuration of the remote transceiver.

### Low battery indication

Indicated by the red TX LED flashing rapidly, if this indication is seen regularly then the battery may need replacing. Frequent or continuous use of the transmitter may temporally deplete the batteries giving a false indication of a low battery condition. Allow the battery to recover before using it again but if the low battery indication continues, replace the batteries as described in page 9.

### Low battery detection

Low battery detection is done at three threshold levels: Normal, Low, and Critical.

Normal level is the voltage the battery must be over when the button is pressed for the 20-85 to begin a transmission.

Low level is the voltage the battery must fall below during a transmission to show a low battery state on the Transmit LED or send a low battery message.

The critical level is the battery voltage at which the 20-85 stops transmitting.

These voltages are factory set (see specifications for details); please contact Salcom if different levels are required.

## Physical Dimensions

The Physical dimensions of 20-85-0000 transmitter are shown in the figure below.



20-85 dimensions – mm(in)

## Battery Replacement

The 20-85 transmitter uses two AA size alkaline batteries and care must be taken when replacing them to ensure they are fitted correctly; incorrect installation will rapidly discharge the battery and may damage the transmitter.

After battery replacement, it is recommended to check the 20-85 is functional by sending a test message. If the unit fails to operate, remove batteries, confirm correct battery orientation, and reinsert if necessary.

- Replace the batteries only with the correct AA-size (LR6) alkaline type.
- Do not use any type of rechargeable (1.2 Volt) or Carbon-Zinc battery as these types will not work properly in the 20-85.

### Steps for Battery replacement

1. Remove the four screws in the rear of the case using a PH-1 screwdriver.



2. Lift the rear case off.
3. Remove both AA batteries.
4. Fit new batteries making sure the positive of the battery aligns with the plus sign on the board as shown below.



5. Refit the rear case and tighten the screws making sure not to overtighten. The screws should be tightened to a maximum of 0.3 N-m.



Ensure the rear case is correctly replaced with all four screws properly replaced and tightened to avoid accidental removal of the batteries.



Please dispose of any old battery carefully and follow any local hazardous material regulations by disposing at recycling facilities.

## Operation

The 20-85 is normally in a low-power state. When any of the buttons are pressed, it sends a pre-programmed message to a pager or to a receiver using a CAP code, data type and message programmed for that button.

While transmitting, the Red TX LED is on solidly as an indication the 20-85 is operating. After the transmission ends, the 20-85 returns to the low-power standby condition.

### Acknowledge receipts.

The 20-85 can be programmed to stay active after a transmission to receive a confirmation, or Acknowledgement, from a receiving 20-90 transceiver.

When an acknowledgement is received, either of the green LED's can be made to flash providing a visual indication that a message has been received, or actioned, by the 20-90 transceiver.

### Low battery message

The 20-85 can be configured to transmit a message when a successive number of low battery events have been detected. The number of events needed for the message to be sent is programmed in Sacoto.

The screenshot shows the Sacoto configuration interface with the following settings:

- System Messages**
  - Battery Warning Message**
    - Battery Low: 512 A (dropdown)
    - 1234560 (text input)
    - 1 (dropdown)
    - BATTERY LOW WARNING (text input)
  - Battery Warning Count**
    - Battery Low: 0 (text input)

## Programming

Before use, the operating frequency of the transmitter, along with the CAP codes, data rates and messages for each button need to be configured using the Salcom configuration tool Sacoto and a 20-51-USBTTL cable (ordered separately).

### Installation

The current version of Sacoto can be downloaded from the 20-85 Product page on the Salcom website at [www.salcom.com](http://www.salcom.com)

Unzip the downloaded file and run “setup\_Sacoto\_n.n.n.exe” to install. Note: n.n.n indicates the version of Sacoto and some features in earlier or later 20-85 firmware versions may not be supported, please contact Salcom if any problems are encountered.

### Connecting to SACOTO

After installing and starting the Sacoto configuration software, plug the 20-51-0001 programming cable into a free USB socket on the PC. Windows will usually install the driver automatically but, if it does not, the driver can be found on the download tab on the Silabs website at:

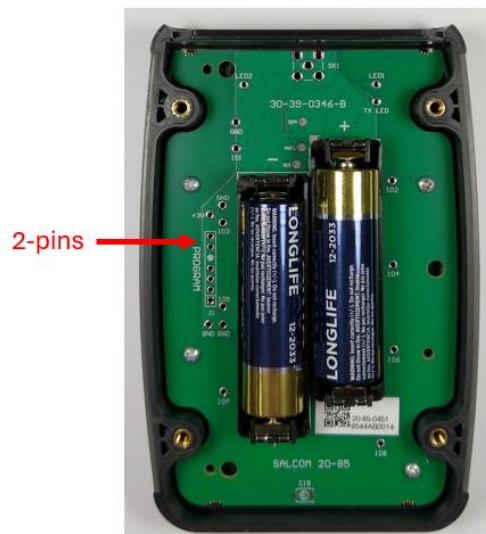
<https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers>

All 20-85 transmitters need the rear cover removed to be programmed.

Using a Philips PH1 screwdriver, undo the four screws around the edge of the back cover.



The batteries do not need to be fitted for programming but have been shown fitted below to help indicate the orientation of the programming adaptor.



2-pin end of programmer  
towards top of case



Programmer fitted

Connect the configuration cable to the programming interface on the 20-85 as shown above (2-pin end towards the negative of the battery) holding the lead on an outwards angle to ensure contact with the pads.

Sacoto must now be configured to the correct device type and the USB COM port assigned for the programming lead; this is described in the next section.

## Getting Started Guide

The following configuration guide shows images from Sacoto V1.1.7; current release versions may differ slightly in appearance, layout, or features available.

### Welcome to Sacoto!

When Sacoto is run for the first time, there is an option to read the Getting started guide. If you select not to show this again, there is a configuration item in the setup device tab to enable showing this again.

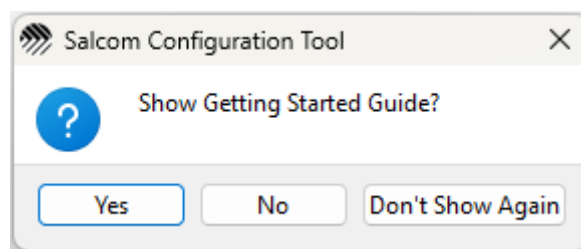
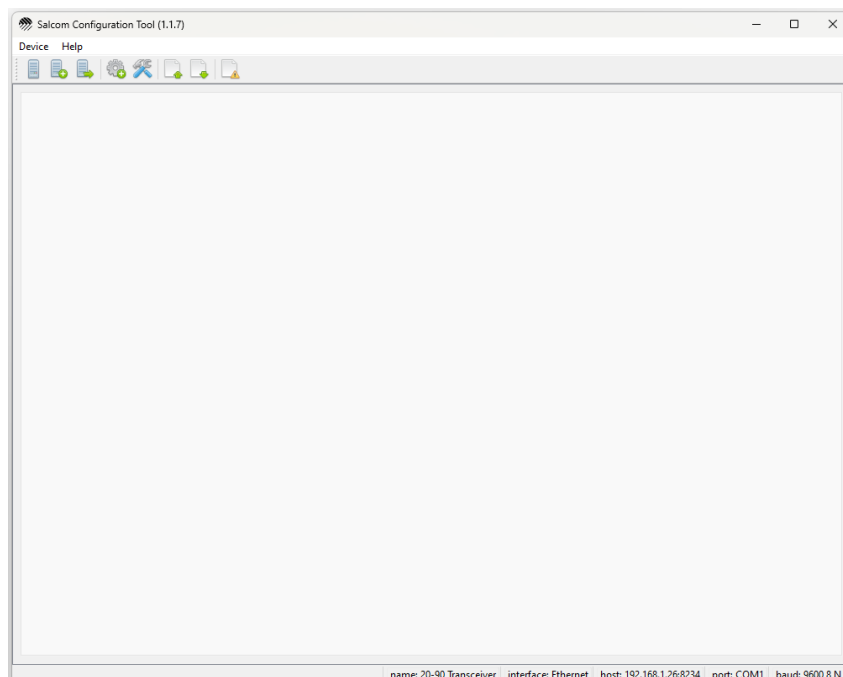


FIGURE 1 GETTING STARTED GUIDE

The Getting Started Guide can be found via a link on the HELP page; **Help menu > Help > getting started guide** link.

When you run Sacoto, the main screen will be blank until a device or file is read.





## Icons

Several of the options in the device menu are shown as icons below the tool bar. These can be used as a quick alternative to opening the Device menu.



### **Read from the selected device**

Reads the configuration from the connected device. In the case of the 20-85, the configuration will be displayed as one of three simple (Quick) or a full (Advanced) configuration layout depending upon the option selected in the Device Type menu.



### **Write changes to the selected device**

Writes any changes made to the configuration since the last device read or written to. This option is useful after making a small number of changes to one device.



### **Write all to the selected device**

Writes all configuration parameters to the device. This option must be used when programming new devices, using loaded files, or when programming multiple identical devices.



### **Find Ethernet enabled device**

Finds Salcom Ethernet enabled devices on a connected network – *not used with the 20-85 series products.*



### **Edit device settings (Click to refresh serial ports)**

Opens the Device Settings window to set the device type, serial ports, and other programming options.



### **Read data from a file**

Reads a saved configuration from disc.



### **Write data to a file**

Writes the current configuration file to disc.

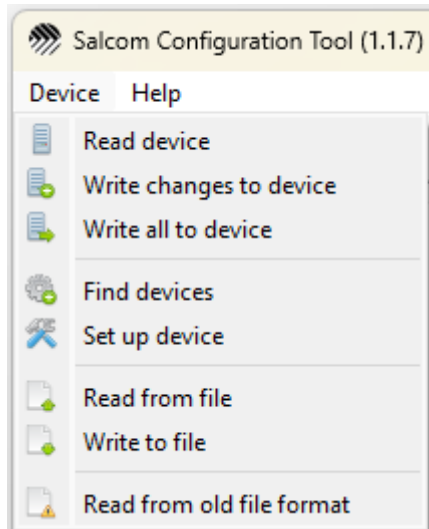


### **Read data from file version 1.0.1 or earlier**

File compatibility for older devices; *not used with 20-85 products.*

## Device menu

Functions such as reading, writing and setup functions can also be accessed from the “Device” menu, although not all options available are used when programming a 20-85.



## Sacoto connection settings

For setting up the device connection, choose “**Device → Set up Device**” from the menu or click the “device settings” option to open the setup window. The connection settings take effect immediately so you can close this window at any time; there is no OK button.

Sacoto gives three Quick setup options and one Advanced setup option for the 20-85 device types.

Quick setups only show the frequency, channel spacing, and buttons closed actions and is used for basic setup when sending messages to devices such as pagers. There are quick options for each of the button variants, one-, four- or eight.

Using the Advanced setup gives access to all configuration parameters in the 20-85. The advanced option is common between the 20-85 and 20-86 products so is shown as an option for both products.

## Settings

**Salcom Configuration Tool: Settings**

Device name:  
20-86 or 20-85 Button Remote Advanced Setup

Unit ID:  
96

Reset device before reading:  
☐ Yes ☒ No

Reset device after writing:  
☒ Yes ☐ No

Check serial number before writing:  
☐ Yes ☒ No

Interface:  
☒ Serial ☐ Ethernet

Remote Hostname or IP address, and port:  
 192.168.1.26 8234

Local Hostname or IP address, and port:  
 localhost 8235

Remote Mode:  
☐ UDP Client ☐ UDP Server ☐ TCP Client ☒ TCP Server

Serial port:  
☒ COM1  
☐ Show additional virtual serial ports

Baud settings:  
 9600 8 N 1

Show getting started guide:  
☐ Yes ☒ No

### ← Device Name:

Select the configuration method; advanced or one of the quick setups for the number of buttons on the transmitter.

### ← Reset device after writing:

Ensure this is checked as Yes.

← **Interface:** Set to serial; the 20-85 does not support Ethernet programming

### ← Serial port:

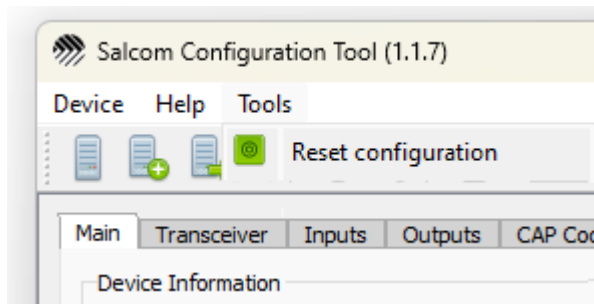
Set to the COM port assigned by the PC when the 20-51-USBTTL programming cable was plugged in.

All other settings must remain unchanged.

To help identify your COM port, you can refresh the COM ports list by clicking the “Device settings” icon or select “Device > Set up device” from the main menu; it is not necessary to close the settings window first.

The new COM port will be shown in the Serial port options along with a message indicating that a new port has been discovered.

## Reset Configuration to Factory Defaults



There is a Reset configuration option in the Tools menu which will reset configuration of 20-85 module back to the default settings in the event the module has been incorrectly configured or programmed.

This allows a “clean slate” approach to reconfiguring an incorrectly functioning module but is only available after reading the unit.

## Configuring the 20-85 Using Sacoto

### Read the Configuration

When Sacoto is run, and the 20-85 product selected, it does not initialise with a default configuration so one must be read, either from a connected 20-85 or loaded from a previously saved file. This can then then be modified as required and written to the 20-85.

To read from a connected 20-85, select "Read device" in the Device tab or click the Read device icon. If changes are made to a read file, these can be quickly written to the 20-85 using the Write Changes Icon. Once these changes have been written, selecting Write Changes is not available until further changes have been made.

When writing to a new 20-85 or writing a saved file which has been loaded, use the Write All option to ensure all parameters are being programmed. Write All will program a device even if no changes have been made to the configuration.

Always read the full configuration from a unit using the Advanced device type before using "Write data to file". Also, "Read from file" or "Read" from another unit before using "Write All"

Any changes made since a read, write or file load are highlighted in yellow making it easy to identify which parameters, if any, have been changed before programming a device.

## Configuring a button or input

Programming buttons or inputs to send messages is done on the Inputs tab. Each button can use different CAP codes, data type or over-air data rate. The image below shows part of the settings on the inputs tab for button closures. The options are explained underneath going from left to right.

Input Closed	Message for Input Close			Pocsag Rapid	While Held	At Powerup
LED1 ACK <input type="radio"/> Disabled	512 A	1234560	1	LED1 ON <input checked="" type="checkbox"/>	<input type="radio"/> Off	<input type="radio"/> Off
LED2 ACK <input type="radio"/> Disabled	512 A	1234560	1	LED2 ON <input checked="" type="checkbox"/>	<input type="radio"/> Off	<input type="radio"/> Off
BUTTON 1 <input checked="" type="radio"/> Enabled	512 A	1234560	1	Button 1 <input checked="" type="checkbox"/>	<input type="radio"/> Off	<input type="radio"/> Off
BUTTON 2 <input checked="" type="radio"/> Enabled	512 A	1234560	1	Button 2 <input checked="" type="checkbox"/>	<input type="radio"/> Off	<input type="radio"/> Off

<b>BUTTON 1</b>	Button label	Identifies the button or LED the settings are for.
<input checked="" type="radio"/> Enabled	Active	Sets the Button or LED as enabled or disabled. Click the slider to change.
512 A	Data Rate and Type	The over-air data rate and message type. The digits are the Baud rate and the letter is the message type; A = Alphanumeric, N = Numeric. Select using the Pull-down menu arrow at right.
1234560	CAP Code	The seven-digit CAP code of the receiving device; pager or 20-90.
1	Alert Level	Message alert level; 1 – 4. Select using the pull-down menu arrow at right.
Button 1	Message	The message being sent; maximum of forty ASCII characters.
<input checked="" type="checkbox"/>	Display option	Sets how the Data type, CAP code, level and message displayed by Sacoto; unchecking this box displays these parameters as a Salcom protocol string.
<input type="radio"/> Off	POCSAG Rapid	When checked to On, this enables the proprietary Salcom Rapid protocol for use with Salcom relay receivers. Note: pagers will not decode POCSAG Rapid messages.
<input type="radio"/> Off	While held	When checked to On, continually sends the message while the button is held.
<input type="radio"/> Off	At Power Up	The expected button state when the battery is inserted. If the state is different, the message for the active state is sent.

### Quick options layout

Quick setup is a device option which shows the minimal options needed to configure a 20-85 as either one-, four-, or eight-buttons. It is intended for creating a configuration where only the button closure, bandwidth, and frequency need to be changed. Only two tabs are shown, Main and Quick Setup –

Salcom Configuration Tool (1.1.7)

Device Help Tools

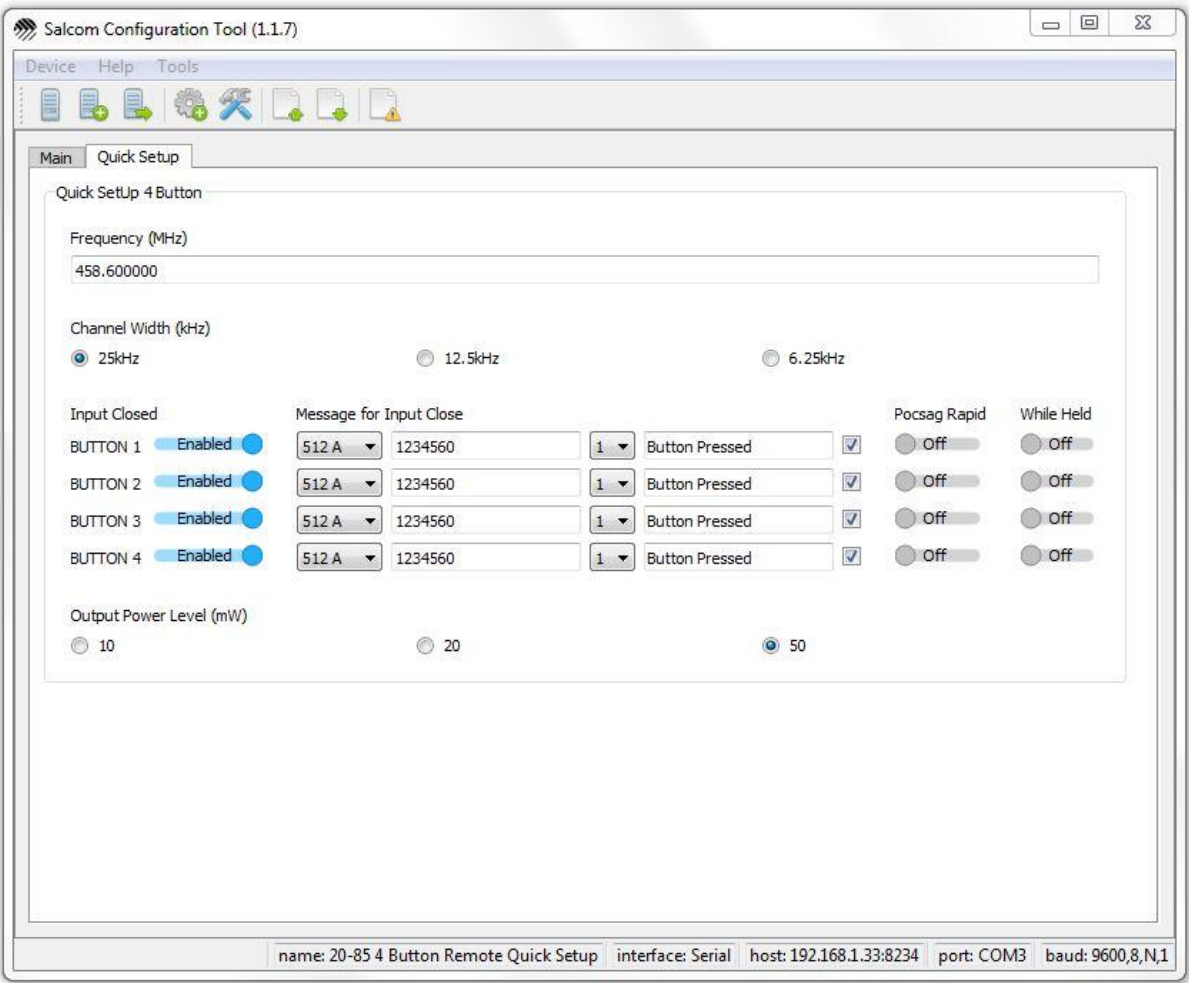
Main Quick Setup

Device Information

Device Variant	Frequency Band
20-85-0000	UHF
Firmware Version	Lowest Supported Frequency (MHz)
V2.17 REL revB	430
Firmware Hash	Highest Supported Frequency (MHz)
4889b16	470
Serial Number	
400014	
Configuration Status	
Good	

name: 20-85 1 Button Remote Quick Setup interface: Serial host: 192.168.1.33:8234 port: COM3 baud: 9600,8,N,1

Main screen for a Quick Setup



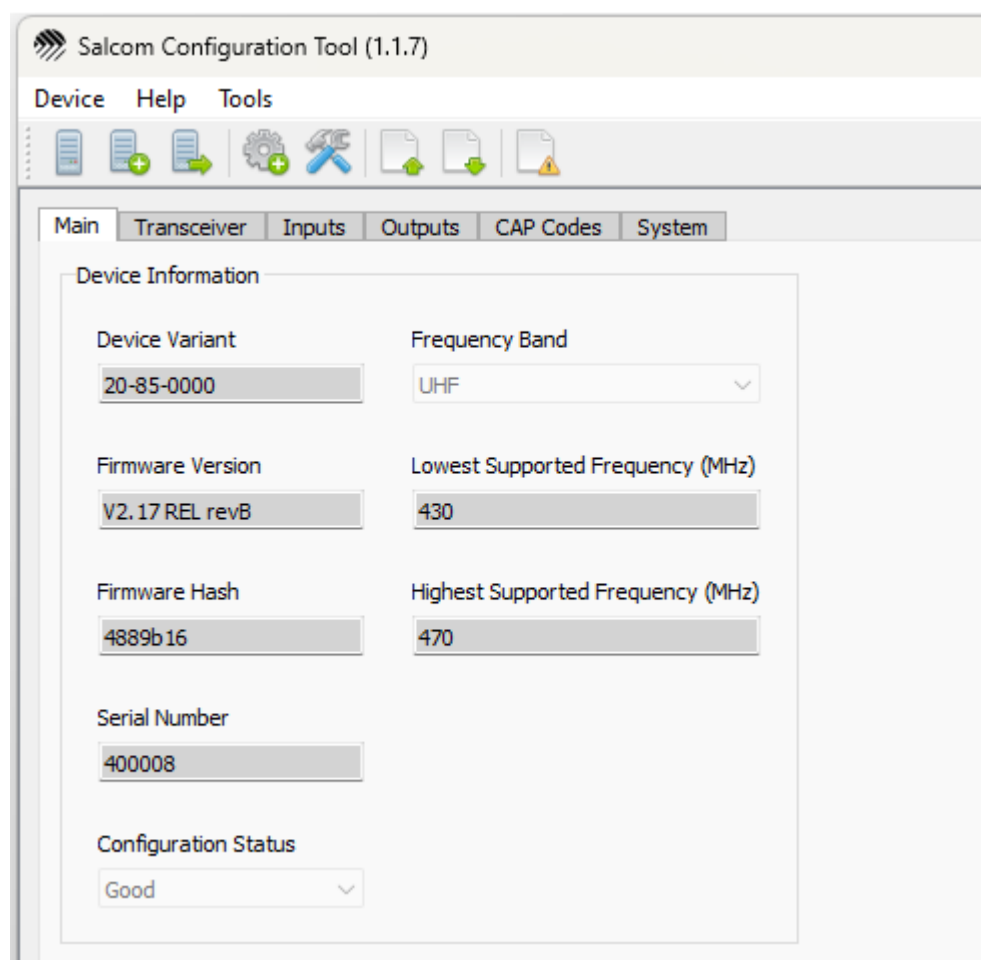
Quick Setup configuration screen (Four-button shown)

- Main:**
- Information panel
- Quick Setup:**
- Rapid configuration options; frequency, bandwidth, output power, and button closure messages only.



### Advanced options layout

This device selection gives access to the full range of configuration parameters including button opening actions, receive options, ACK LEDs, low battery messages, and sleep state options. Intended for more complex configurations, this device type provides access to the greater functionality of the 20-85.



**Main:** Information panel

**Transceiver:** Advanced features including the frequency, receiver message type, and channel width.

**Inputs:** Full configuration options for buttons / Inputs including closure and opening messages.

**Outputs:** Timing options for LEDs and virtual outputs.

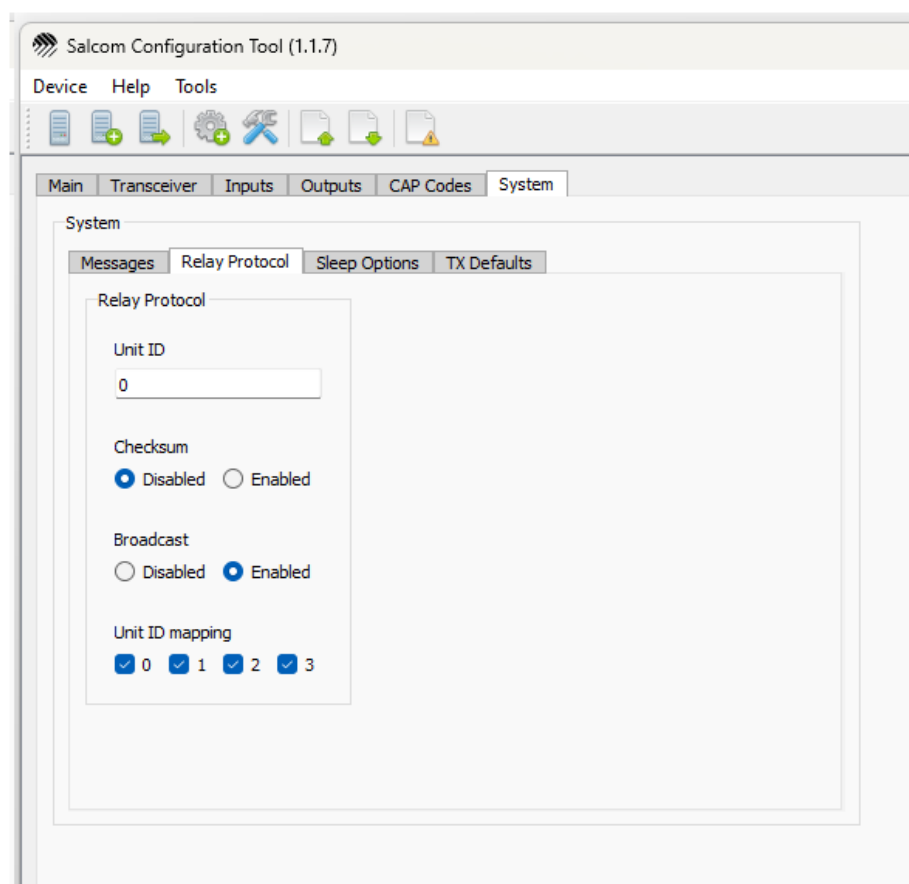
**Cap Codes:** Receiver CAP codes for LED functions and virtual inputs. Note: The CAP codes here are not used for button messages.

**System:** Low battery messages, Relay protocol ID and sleep state options are set here.

### Acknowledgement LED's

The 20-85 can be configured to receive paging messages for a brief period immediately following a transmission which, when used in conjunction with a correctly configured transceiver such as a Salcom 20-90, can be used to activate the green LEDs to provide confirmation a message was received by the remote transceiver. The 20-85 cannot be configured to receive messages at other times so will not function as a pager.

The green LEDs on the 20-85 are activated by matching a CAP code, configured on the CAP CODE tab, or by using Salcom relay protocol. The relay protocol Unit ID can be configured on the SYSTEM tab.



### Extending the range using a store and forward

Where additional range is required for a 20-85, the Salcom 20-90 can be used as a store and forward repeater.

## Remote Control Applications

A 20-85 can send a Salcom relay protocol in a message, as either numeric or alphanumeric, for triggering outputs on a remote transceiver such as Salcom's 20-90. Salcom Relay Control Protocol (or Relay Protocol) is proprietary message content used to control outputs, trigger acknowledgement messages, or command special functions on a 20-90.

A relay protocol command is addressed to a Unit ID with each unit ID able to control up to 8 outputs. Some devices may have multiple unit IDs to address additional outputs, or to control special functions.

The relay control command can be embedded anywhere within the message, e.g., "CLOSE RELAY ONE 10109" where "10109" is the relay control command.

Please refer to Salcom's 20-90 manual, available from our website, for a description of relay protocol. For additional outputs, a 20-03-0000 IO expander may be connected to the 20-90.

### POCSAG Rapid

POCSAG rapid allows a faster response to a relay control command by using a shorter preamble and a more efficient over-air format. When using POCSAG rapid, the CAP code must be a multiple of eight. For the best response time keep messages short, use 1200 or 2400 Baud numeric data, and reduce the button debounce time.


Due to the shortened preamble, pagers are unable to reliably decode POCSAG rapid messages.

### While Held

The "While Held" option sends messages continuously while the input is in the specified state. Normally used with POCSAG rapid, messages are transmitted continuously until the input is released allowing a receiver programmed with a short mono-shot output timer to provide a continuous output until the button is released or the signal is lost.

For more information on Salcom Relay Protocol or POCSAG rapid, please contact Salcom for an information sheet.

## Technical Specifications

Technical Specification		
20-85-0151, 20-85-0154, 20-85-0158 (VHF) 20-85-0451, 20-85-0454, 20-85-0458 (UHF)		
Transmitters		
Options	VHF: 20-85-0151: One button 20-85-0154: Four buttons 20-85-0158: Eight buttons UHF: 20-85-0451: One button 20-85-0454: Four buttons 20-85-0458: Eight buttons	
Frequency Range	VHF: 140 – 174MHz UHF: 440 – 470MHz	
Frequency Selection	Via software	
Power Supply	Two AA Alkaline batteries (LR6)	
Battery Life	Approx. 50,000 transmissions Approx. 5 years standby	
Battery Replacement	Removal of rear case	
Power Consumption	Standby: <0.5µA Transmit: 70mA	
Transmit Power	50mW	
Channel Spacing	25kHz,12.5kHz, or 6.25kHz	
Modulation	FSK with NRZ data	
Deviation	±4.5kHz, ±2.3kHz, or ±1.0kHz	
Transmit Duty Cycle	Up to 20%; Maximum 30 seconds on time	
Baud Rate	512, 1200, or 2400	
Message Format	POCSAG, Alphanumeric or Numeric	
Configuration Application	Sacoto (Salcom Configuration Tool software)	
Programming Cable	20-51-0001 (USB)	
Serial port	9600, N, 8, 1; 3V TTL	
Antenna	Internal antenna; optional SMA	
Environmental Protection	IP65	
Operating Temperature	-10°C to +55°C	
Weight	170g with battery	
Screws	PH-1 driver	
Screw Torque	0.3 N*m	
Case Material	ABS Plastic	
Case Dimensions	118mm x 79mm x 26mm (L x W x H)	
Case Flame Rating	UL94 V-0	
Approvals	CE, FCC and AS/NZS Pending	

## How to Contact Us

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 E: [sales@salcom.com](mailto:sales@salcom.com)

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- This 'tick of approval' means we have met all the New Zealand Government's eligibility criteria, which should give you huge amounts of confidence in what you are buying.
- The Program employs a global monitoring service, Yellow Brand Protection, which trawls the web for illegitimate use of the Fern Mark. This means that when you see the Fern Mark on a product, you know it is an authentic New Zealand product.

