20-62

VHF / UHF Transmitter with Ethernet

PRODUCT MANUAL

Version 1.3.4

March 2023

Warranty and Disclaimer

Salcom products are warranted for a period of 12-months from the date of purchase against faulty materials and workmanship.

If any fault should occur, the unit should be returned to the vendor, freight pre-paid. Please include a description of the fault to assist with prompt return. Any unauthorized alterations or repairs will invalidate the warranty.

We reserve the right to change products, specifications, and installation data at any time, without notice.

All information provided in this document is carefully prepared and offered in good faith as a guide in 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 specific certification information.

# Contents

Product Overview

The Salcom 20-62 is a 5-Watt, stand-alone FSK transmitter with a POCSAG encoder and external NRZ input. Models are available for the VHF or UHF bands. Each model covers its full specified frequency range without the need for any mechanical adjustments or additional calibration. The output power level can be programmed from 50mW to 5W.

Key Features:

- **POCSAG encoder:** *The 20-62 provides a built-in POCSAG encoder, supporting 512 and 1200 baud with numeric and alphanumeric messages. The 20-62 POCSAG encoder can queue up to 40 messages for transmission, with a total of up to 1000 characters combined. Individual messages can be up to 240 characters long.*

- **External NRZ input:** *Externally generated NRZ data can be transmitted using the external modulation input and PTT input.*

- **USB, Serial and Ethernet ports:** *The 20-62 may be controlled through four ports: two physical RS-232 ports, one USB serial port, and one TCP/IP or UDP Ethernet connection.*

- **Message protocols:** *The 20-62 supports a wide range of messaging protocols, including Salcom protocol, TAP (PET), TNPP, and many more. The 20-62 can support up to four different messaging protocols concurrently, one on each port. For more details, please refer to the protocol list provided in this manual.*

- **Triggered messages:** *Messages may be triggered using four input pins, the battery level, or a regular watchdog timer. Messages may be triggering on rising or falling edges with a programmable de-bounce delay. The input states and the battery state may also be transmitted at startup, or at regular intervals with the watchdog timer. These pre-programmed messages may be up to 40 character long.*

- **Sacoto configuration tool:** *The Salcom "Sacoto" configuration software allows full configuration of all functions of the 20-62 transmitter via any serial port, the USB port, or the Ethernet port. Note that the Ethernet port cannot be used to configure the Ethernet port!*

- **Store & Forward repeater:** *The 20-62 can be configured to operate as a store & forward repeater when used with a separate paging receiver such as the Salcom 12-84. Messages received by the receiver can be retransmitted by the 20-62 to extend the paging coverage area. The 20-62 provides features to prevent loops and multiple retransmissions, and can provide a delay at the originating transmitter to allow time for repeaters to forward messages without interference.*

- **Extended database tool:** *Some messaging protocols use a database of CAP codes that are stored within the 20-62. Sacoto supports up to 100 CAP codes, which is sufficient for most applications. However, if more are required an extended database tool is available to allow up to 1000 CAP codes. This is a useful feature when used with the Salcom 12-36 Paging Telephone Voice Interface.*

- **Simulcast modulation delay:** *A simulcast synchronizing delay can be applied to externally generated NRZ data. This delay can be configured to be between 10uS and 2550uS to account for a difference in propagation delay in overlapping coverage areas. Note that this feature uses a different modulation input pin to the non-delayed NRZ modulation input.*

- **Aerial mismatch detection:** *When enabled, the 20-62 can provide serial reporting of a disconnected or damaged antenna, and reduce output power to protect the transmitter. The feature must be self-calibrated for each installation before use.*

- **Over-temperature cut-out:** *The 20-62 is protected against overheating. If the transmitter operates for extended periods in a hot environment, a protective thermal cut-out may operate to reduce the output power to a safe level. It will reset when the unit temperature has fallen to below 70C.*

Connectors and Indicators
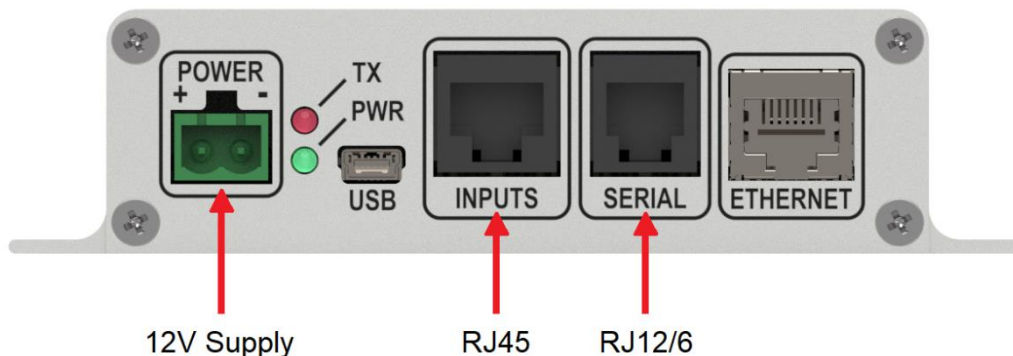
Table 1: Connectors and Indications (L-R)	
Item	**Description**
1	12V Supply
2	Transmit LED (Red)
3	Power LED (Green)
4	USB
5	Inputs (RJ45)
6	Serial ports x 2 (RJ12)
7	Ethernet

Table 2: Serial Connector (RJ12/6)	
Pin	**Connection**
1	Ground
2	Reserved
3	RS232 Port 2 TX
4	RS232 Port 2 RX
5	RS232 Port 1 TX
6	RS232 Port 1 RX

Table 3: Input connector (RJ45)	
Pin	**Connection**
1	PTT OUT, 50mA max
2	Ground
3	Trigger Input 4
4	Trigger Input 3
5	Trigger Input 2
6	Trigger Input 1
7	PTT Input for NRZ operation
8	Modulation Input for NRZ

Pin 1 on left side when viewed from front, as above.

Physical Dimensions

The 20-62 has an extruded aluminum case with a mounting flange and screw slots. A dimensioned drawing is provided below.
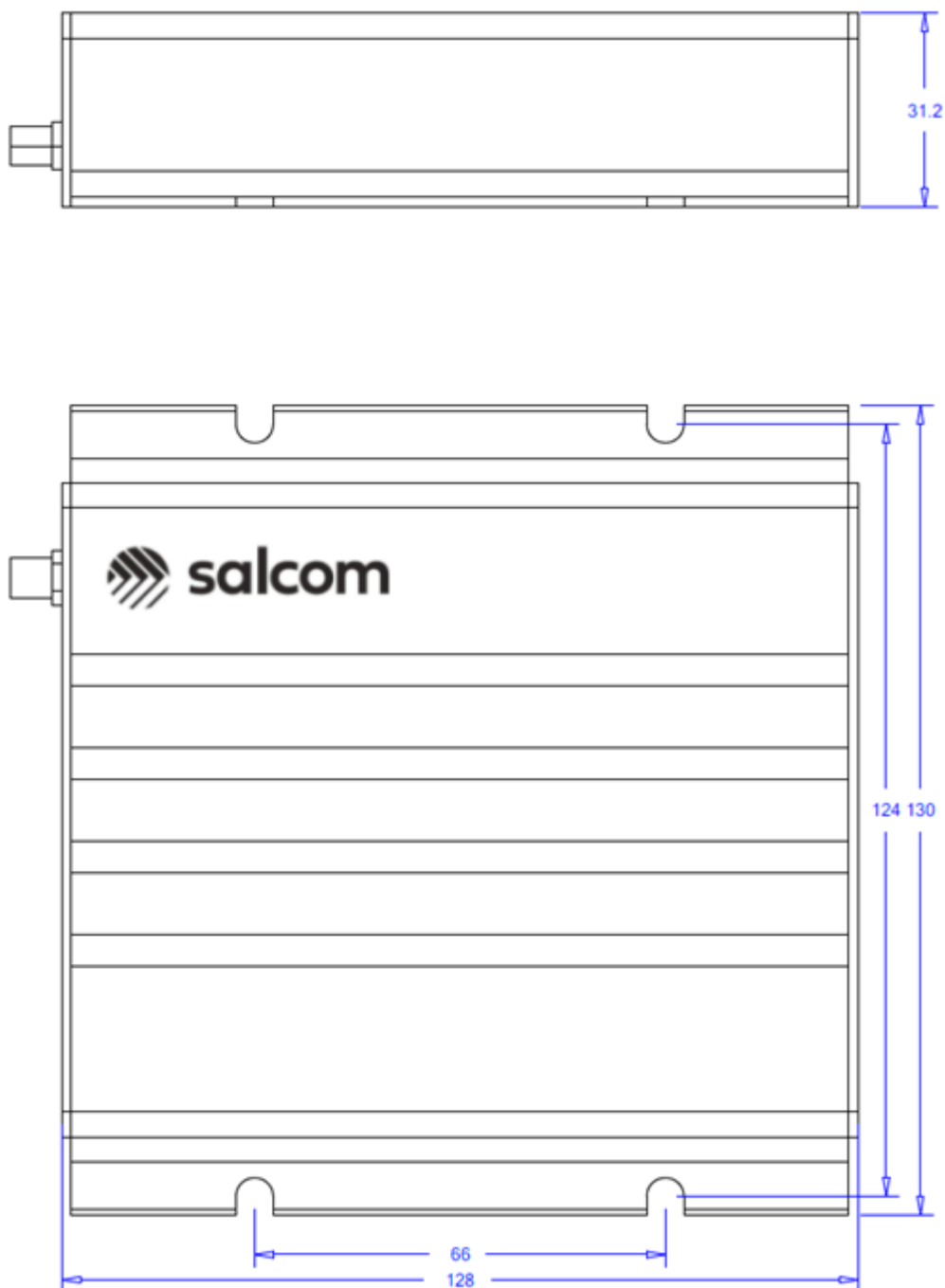
20-62 Installation and Quick Start Guide

Power Supply

Power is connected to the green "Power" connector on the front panel with the polarity as shown. Nominal supply voltage is 13.8V DC, but may vary between 10.8V and 15V. The power source must be reasonably noise free. The 20-62 is protected against reversed polarity.

Antenna Installation

The antenna is connected to the SMA connector on the rear panel. Installing the antenna outside, clear of obstacles, and high above the ground will most likely provide the best radio coverage.

The antenna should present a nominal load of 50Ω, with a VSWR of better that 1.8:1. The transmitter output power may be affected by a poorly matched antenna (i.e., if not 50Ω at the transmitter frequency).

The 20-62 is designed to operate reliably over large distances, however the actual distance can vary depending on antenna height and position, obstructions, antenna cable length, local radio interference, antenna specifications, and the sensitivity of the receiver.

Important! *To comply with FCC Controlled/Occupational Exposure Limits the aerial must be positioned or mounted to operate at least 0.26 metres (0.853 ft) away from operational staff and 0.57 metres (1.87 ft) away from the general public as a safeguard against radiated emissions.*

Serial connections

The 20-62 may be configured to operate without a serial connection, transmitting regular messages, or transmitting messages in response to trigger inputs or the battery level.

For other messages, the RJ12 serial connector provides two RS-232 serial ports. Serial connection may also be made via the USB connector or the Ethernet port.

RS-232 serial ports

*Two RS-232 serial ports are provided on the RJ12 serial connector. A standard **6-way** RJ12 6P6C cable and splitter may be used to separate the two ports if required.*

*The Salcom 12-45-0000 adaptor converts **port 1** of the RJ12 to a DB-9 connector. The Salcom 12-45-2000 converts **port 2** of the RJ12 to a DB-9 connector.*

The RJ12 pin-out is provided above for custom cables.

USB serial port

The USB connector provides a standard USB serial port. In many cases drivers may already be included with your computer, however if a driver is required it can be downloaded from **Silicon Labs***:*

https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers

… or search for the **CP210x USB to UART Bridge VCP Drivers**

Download the driver for your version of Windows. The downloaded file is usually a ZIP file. Open this file and run **CP210xVCPInstaller_x64.exe** *for 64 bits systems or* **CP210xVCPInstaller_x86.exe** *for older systems (Win XP and earlier, other 32-bit systems, or if the x64 version does not work).*

Ethernet Port

To use the Ethernet port the 20-62 must first be correctly configured with the Salcom "Sacoto" configuration software. Refer to the Sacoto Quick Start Guide below for configuration procedures.

Powering-Up

When powered up the GREEN power indicator should flash once per second to indicate normal standby operation, ready to transmit. A rapid GREEN flash indicates a low battery voltage.

The RED indicator will flash for a few seconds at power up if there is a problem. Error messages are sent to RS232 serial port 1.

Configuration

The 20-62 can be entirely configured using the Salcom "Sacoto" configuration tool. Basic configuration such as frequency, power, TCP/IP configuration, and input triggered messages are covered in the **Sacoto Quick Start Guide** *later in this manual. For more detailed configuration refer to the "help" pages within Sacoto.*

Message transmission

Standard COM port Terminal software can be used to initiate messages using Salcom protocol (see below), or any of the other protocols when configured.

For example, sending the text **CA1234567 1 Hello***, terminated with a carriage return (ASCII 13), will initiate a 512 baud paging message, sent to CAP code 1234567. Sending messages is described in more detail in the "Messaging" section later in this manual.*

The RED TX indicator will light when the unit is transmitting. A flashing RED TX indicator while attempting to transmit indicates a fault. This may be due to overheating or some other fault. If overheating is suspected, please let the unit cool before trying again. Error messages are sent to RS232 serial port 1.

Salcom Protocol

Salcom protocol takes the basic form: PPXXXXXXX L MMMMMM<CR>

Where:

- *PP is either "CA", "CN", "ca" or "cn".*
- *Capital letters denote 512 baud, lower case denotes 1200 baud*
- *"A" denotes Alphanumeric, "N" denotes Numeric*
- *XXXXXXX is a 7-digit CAP code.*
- *Spaces as shown*
- *L is the function code (beep level) from 1 to 4.*
- *MMMMM is the message (up to 240 characters).*
- *<CR> is a carriage return (enter key).*

CA or ca

Usage:	*CA<pager#>[<space>]<level>[<space>]<message><CR>*
Description:	*Call alphanumeric pager*
Example:	*CA1119358 1 Please return to reception<CR>*
Response:	*CA11193581<CR><SPACE>Page Sent<CR><LF>*

CN or cn

Usage:	*CN<pager#>[<space>]<level>[<space>]<message><CR>*
Description:	*Call numeric pager*
Example:	*CN1119358 1 777<CR>*
Response:	*CN11193581<CR><SPACE>Page Sent<CR><LF>*

Other commands:

RES

Usage:	*RES<CR>*
Description:	*Restart 20-62*
Example:	*RES<CR>*
Response:	*Restart, followed by SALCOM 20-62-0000 VX.XX Rel<CR><LF>*

SN?

Usage:	*SN?<CR>*
Description:	*Retrieve unit serial number and firmware revision*
Example:	*SN?<CR>*
Response:	*SALCOM 20-62-0000 VX.XX 1234567<CR><LF>*

# Sacoto Configuration Tool - Quick Start Guide

Sa-co-to (**Sa**lcom-**co**nfiguration-**to**ol) is Salcom's configuration software. This tool replaces the serial commands used with older products for product configuration. Serial commands are available if required for systems that may need to change configuration independently of the Sacoto software.

Installation

The latest version of Sacoto can be downloaded from the Salcom website from the 20-62 product page.

Unzip the downloaded file and run **setup_Sacoto_n.n.n.exe**

Connecting Sacoto to the 20-62
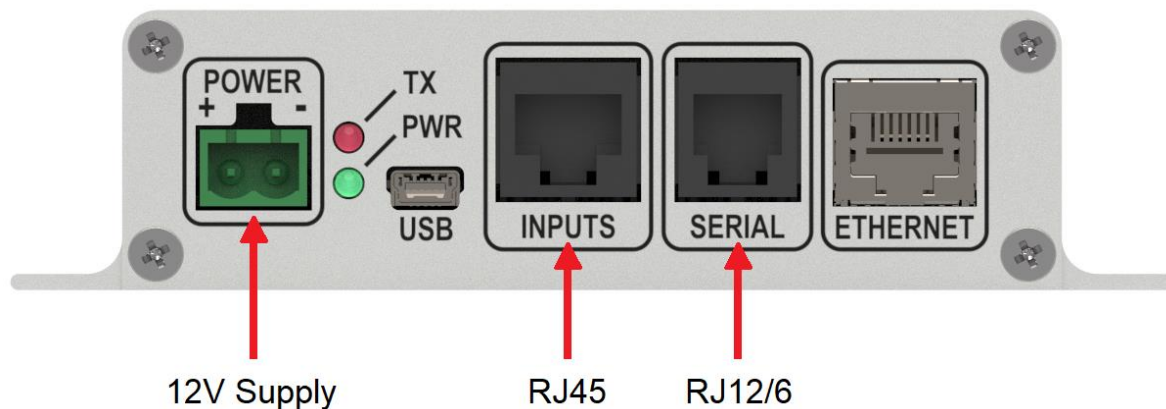
The 20-62 can be connected to a PC via either serial port on the RJ12 connector, the USB serial port, or the Ethernet port, as described in the "getting started" section above.
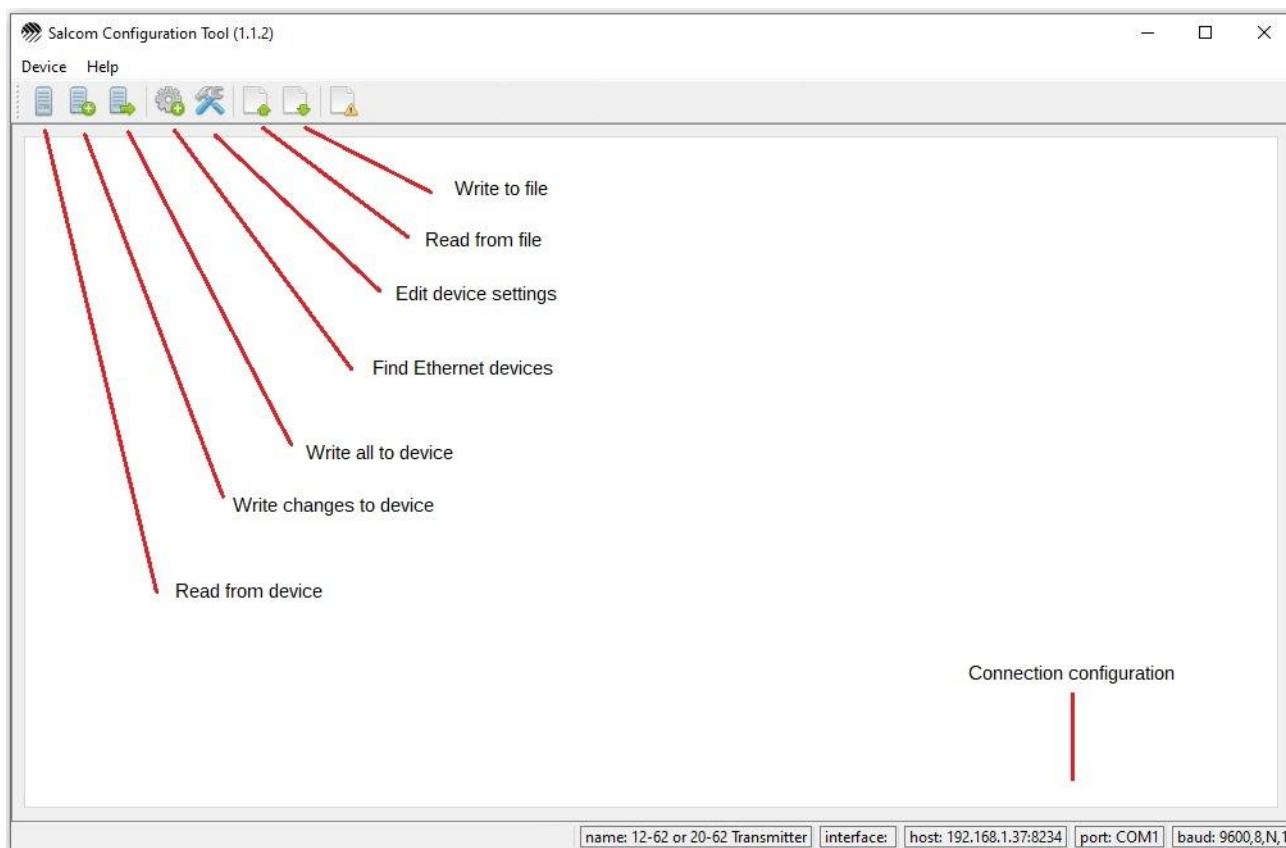
Ethernet

Ethernet can only be used once it has been configured. See below for details.

Once Ethernet is configured, and Sacoto is configured to use the Ethernet port, the Ethernet port may be used to configure all aspects of the 20-62, except the Ethernet port itself.

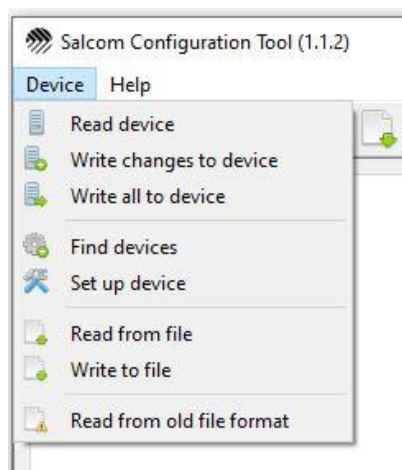The Ethernet port can only be configured using the USB or RS-232 ports.

Starting Sacoto

This is the opening screen of an early version of Sacoto. Later versions may vary but these essential elements should remain much the same.

Device Menu

These functions can also be accessed from the "Device" menu.

Help!

Advanced configuration information and general help can be found under the "Help" menu.

A brief description of each field is shown when the mouse is over each setting.

Sacoto Connection Settings

Choose "Device > Set up Device" from the menu or click the "Device settings" icon to open the setup window.

Serial Port Settings

For USB port, physical RS-232 port on PC, or third-party USB-to-Serial adaptor.

- *Device: 20-62*
- *Interface: Serial*
- *Serial port: Identify the COM port associated with your serial connection*
- *Other setting can be left as the default settings.*

*To help identify your COM port you can **refresh the list of COM ports** by clicking the "Device settings" icon from the main Sacoto window, or select "Device > Set up device" from the main menu. It is not necessary to close the settings window first. Refreshing the list after a USB port has been plugged in, or unplugged, can help identify the COM port number.*

Ethernet Settings

The 20-62 TCP/IP options must have been previously configured before Sacoto can communicate with it via Ethernet. This can be done through the RS-232 ports or the USB port.

*The 20-62 must be set up as a **TCP/IP server**. You need to note the **IP address** and the **port** number when you previously configured the TCP/IP tab via the serial port. You will need to ensure that the IP address is valid. This is described in "Ethernet Configuration" below.*

- *Device: 20-62*
- *Interface: TCP/IP*
- *IP address: Static IP address from TCP/IP tab*
- *Port: 8234 (default) from TCP/IP tab*
- *Other setting can be left as the default settings.*

*These connection setting are updated immediately - **there is no OK button***

Configuring the 20-62 using Sacoto

Reading the configuration

The initial configuration must be read from the 20-62 or from a file saved on disk. This may then be modified as required and written back to the 20-62.
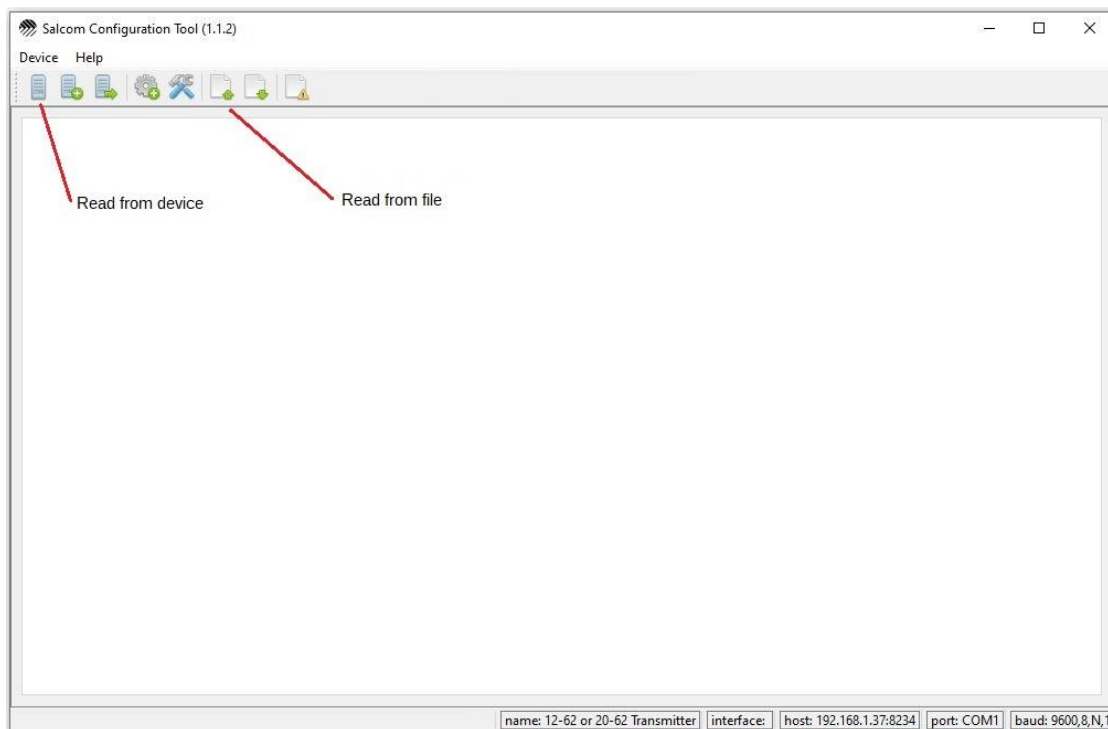
Sacoto configuration screen before reading data from the 20-62 or from a file.

The configuration is arranged into various tabs along the top. Many of these are for advanced functions or for specific protocols. These will not be described here however a full description can be found in the Sacoto Help Menu.

Of most interest for getting the basics set up and running are:

Transmitter:	*Frequency and power settings*
Inputs:	*Input triggered messages*
System > Messages:	*Watchdog and battery messages*
TCP/IP:	*Ethernet configuration*

Some of the tabs may change with later versions, but these basics will remain much the same. Refer to the Sacoto Help for up-to-date descriptions.

Writing the Configuration
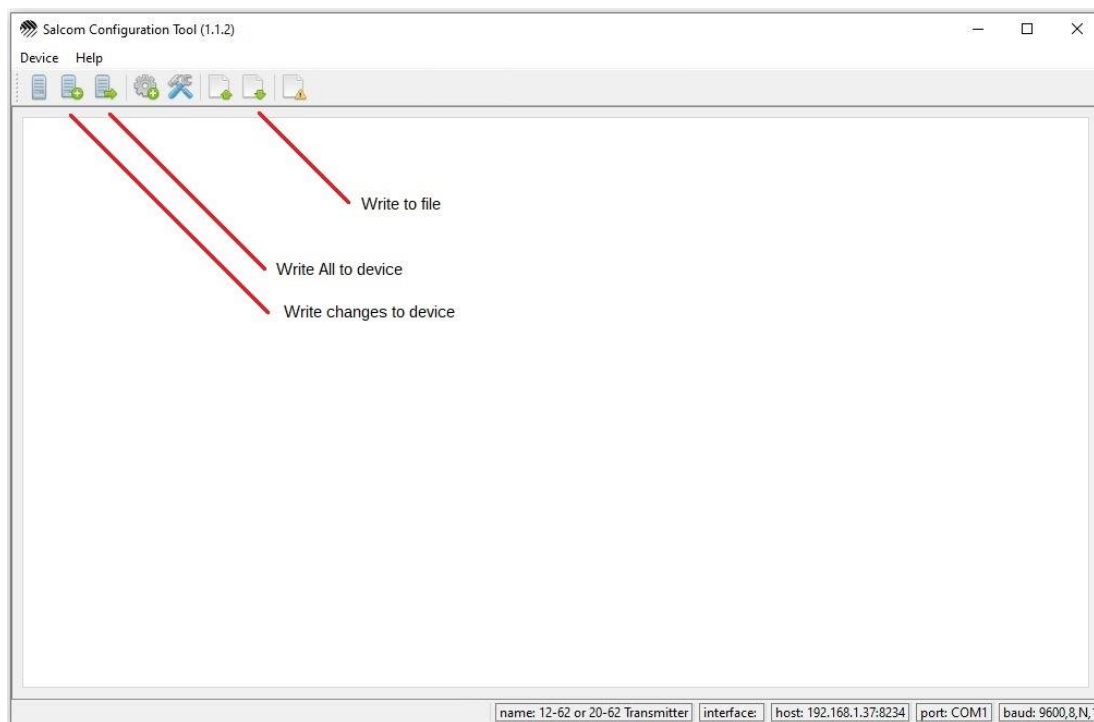
Write Changes

If a field is changed it will be highlighted in yellow.

Any tabs with fields that have changed will also be highlighted in yellow.

Select "Device->Write Changes" from the menu, or click the "Write changes" icon to write ONLY the fields highlighted in yellow. This is much quicker than writing everything.

*If the configuration has been read from a file, or from another 20-62, any differences from the configuration in Sacoto and in the configuration of the 20-62 is unknown. If you want to preserve the settings in the device and only make a few changes you should **read from the 20-62 first***.

Write All

If you want to duplicate a known configuration read from another 20-62, or restore a previous configuration saved on disk, then you should select "Device->Write All" from the menu, or click the "Write all" icon.

Changes can be made to the configuration before writing, but only the changes from the previously read configuration (from a file or another 20-62) will be highlighted. There may be other differences between the current 20-62 configuration and the configuration shown in Sacoto. Select "Write all" to ensure that all configuration items read from another source are written to the connected 20-62.

Main Screen
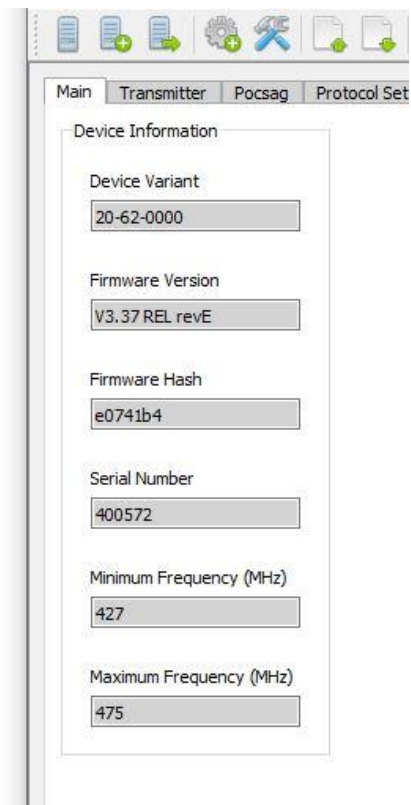
Firmware version

The version of firmware installed in the device. Ensure the version in the device is compatible with the version of Sacoto being used and any saved files which will be used.

Serial number

The serial number programmed into the device. This should match the number on the underside of the unit. The first digit identifies VHF (1) or UHF (4).

Minimum Frequency (MHz)

The minimum frequency that can be programmed into the device.

Maximum Frequency (MHz)

The maximum frequency that can be programmed into the device.

Frequency and Power Settings

These are found under the Transmitter tab.
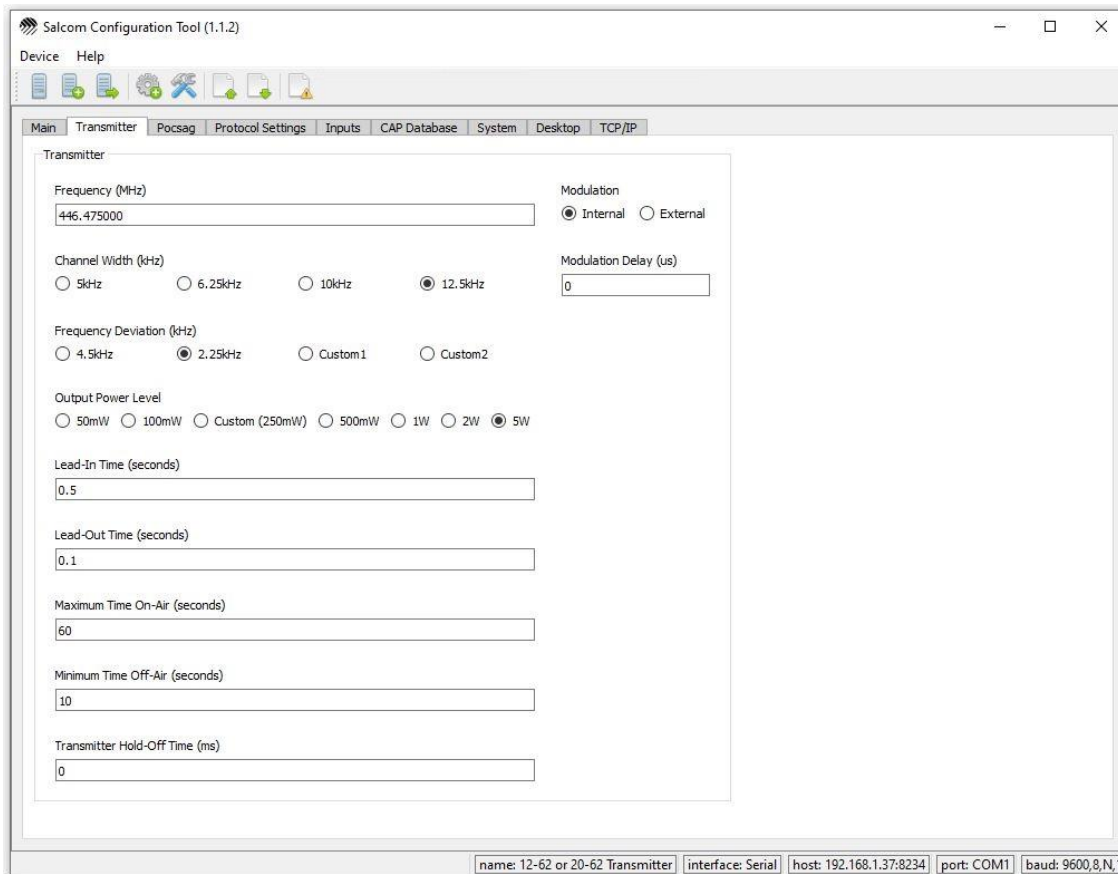
Frequency: *Entered in MHz. This is checked against the selected channel spacing. Off-channel frequencies are not possible.*

Channel Spacing: *The 20-62 can only transmit on channels which are multiples of 5 kHz, 6.25 kHz, 10 kHz or 12.5 kHz. This setting is only used for frequency selection and does not affect transmitter deviation or bandwidth.*

Deviation: *This is independent of the selected channel spacing. Channel spacing is only used for frequency selection. Typically, a 12.5 kHz wide channel will use 2.25 kHz deviation.*

Output power: *Select your power level as required. The Custom setting is usually set to 5W unless otherwise requested.*

Other settings *can be left as the default value. For a detailed explanation of these setting refer to the Sacoto Help. A brief description of each field is shown when the mouse is over each setting.*

Write changes back *to the 20-62 using "Device>Write changes" menu or the write changes Icon.*

Trigger Input Configuration

The 20-62 can be configured to transmit messages in response to the state of the trigger inputs.

Features:

- *A message can be triggered by a high-to-low or a low-to-high transition.*
- *A message may be sent multiple times from a single trigger event to ensure reliable reception.*
- *The message repeat time can be specified.*
- *The input messages can be transmitted with the watchdog timer to indicate the current state.*
- *A message can be sent at power up if the input is not in a specified state.*
- *A message may be repeated continuously while the input is held in a specified state.*
- *POCSAG rapid can be selected for faster relay control.*
- *A minimum trigger hold time (de-bounce time) may be specified to prevent false triggers.*
- *Trigger inputs are internally pulled high if they are disconnected.*
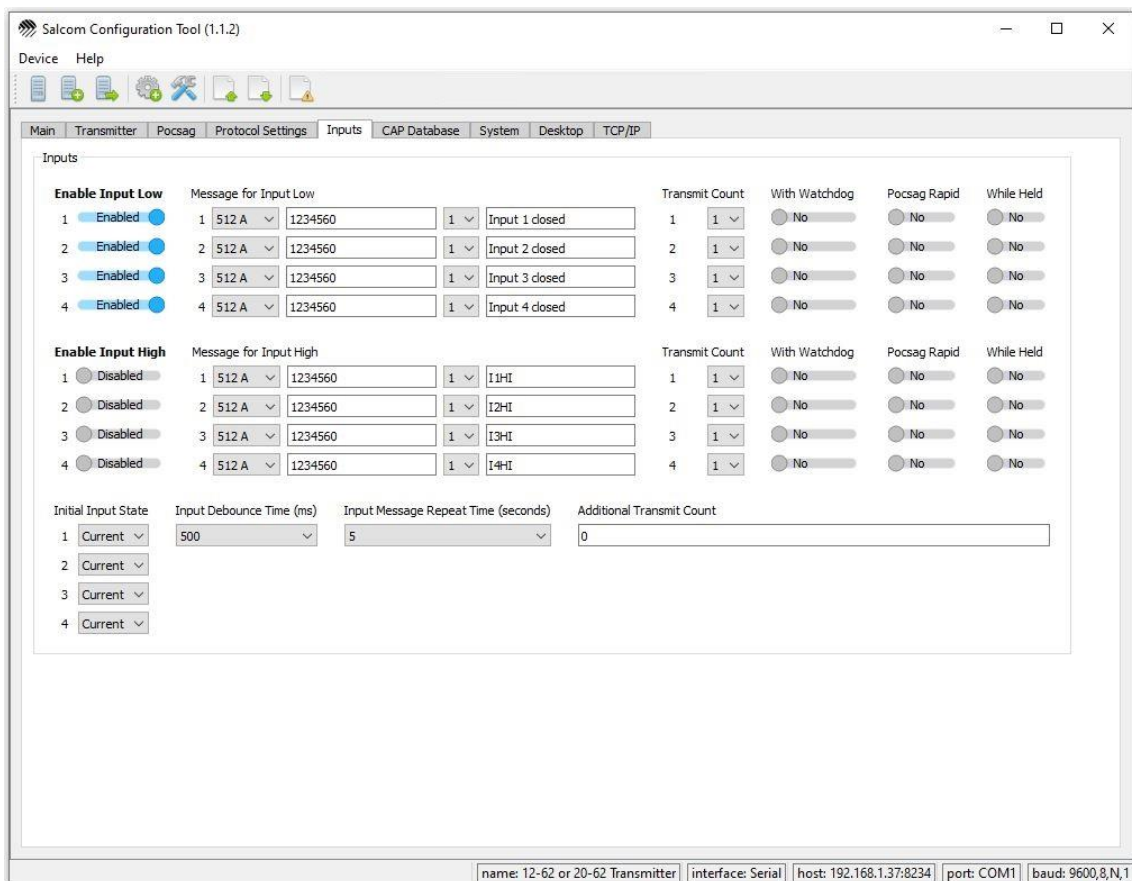
Example input configuration

Moving the mouse over any field will show a brief description of its function.

Configuring inputs:

- *Messages for high or low states can be configured independently.*
- *Each input can be configured independently.*
- *The message format is described below (Sacoto message format).*
- *The number of transmissions, the expected initial state, and other options can be selected for each input and each state.*

Input configuration examples:

The various input capabilities and settings can be demonstrated by way of these examples.

- *The state of **Input 1**, both high and low states, are transmitted with every watchdog but the input does not trigger messages when it changes. The watchdog is enabled on the system tab. (see "Watchdog configuration" below) If the input message was enabled it would also trigger messages when the input changes.*

- *When **Input 2** changes, either to a high or low state, a "tone only" message is sent. There is no text but the receiving pager can be programmed to produce different sounds for "beep level 1" and "beep level 2". The message is sent 3 times to ensure it is received. The "message repeat time" is 5 seconds.*

- *When **Input 3** is held low, the numeric message "3" is sent repeatedly ("while held") at 1200 baud. This might be used for push button control of a remote relay. No message is sent when the input returns to the high state.*

- *In this example **Input 4** is normally held low by an external circuit (initial state = low). If it is high at power-up (e.g., disconnected, or the circuit is broken) the message "I4HI" will be sent. After start-up any change triggers either an "I4LO" or "I4HI" message. Setting initial state = "Current" prevents transmission at power up.*

In all cases the input must remain in the same state for 500ms (de-bounce time) before a message is triggered.

POCSAG Rapid

POCSAG rapid allows even faster response to a push button input. POCSAG rapid uses a short 250ms preamble, and starts message transmission in the first frame, regardless of the CAP code. This ensures the fastest transmission time. For even faster response keep messages short and consider using numeric messages, reducing the de-bounce time and lead-in time, and using 1200 baud.

When POCASG rapid is used with the 'While held' option, messages are transmitted continuously until the input is released. POCSAG rapid sends short messages in all eight frames of the POCSAG data stream, rather than just the one of that corresponding to a single CAP code.

SALCOM relay receivers are able to provide quick response when configured to use POCSAG rapid, giving faster response and more precise "on-time" control. POCSAG rapid should be used with short numeric messages like the Salcom relay protocol.

Note: *POCSAG rapid is not intended to work with pagers.*

Sacoto Message Format

The Sacoto message format is based on the Salcom protocol, which includes baud rate, Numeric/Alphanumeric message type, CAP code, function code and the message text.
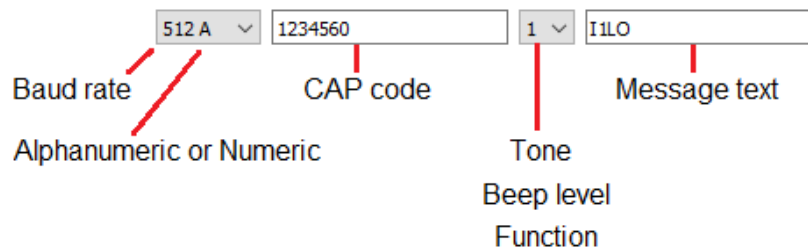
- *The 20-62 can transmit at 512 or 1200 baud.*
- *The message may be Alphanumeric (full ASCII) or Numeric (just numbers and a few symbols for faster transmission).*
- *The CAP code is the 7-digit pager address from 0000008 to 2000000 (plus special codes)*
- *The Function code can be set from 1 to 4. It may select the alert sound that the pager makes, or be a very short "message" with no text (one of four "tone only" or special function messages), or it may provide an address extension where a pager will only respond to one function code and ignore all others - allowing 4 pagers to share the same CAP code.*
- *The message text is limited to 40 characters for the 20-62's pre-programmed messages.*

Battery level monitoring and Watchdog Configuration

Battery monitoring

Messages can be triggered when the battery voltage reaches predefined limits. Both "battery low" and "battery high" conditions can be monitored to indicate a flat or charged battery.

The battery state messages (high or low) can be transmitted with the watchdog message for regular monitoring of the battery state.

Watchdog

The 20-62 can be configured to send regular periodic messages.

The watchdog may be used to regularly report:

- *The operational status of the transmitter,*
- *The state of any of the inputs,*
- *The battery state.*

*The watchdog can be **disabled** by setting the "watchdog repeat time" to 0.*

The watchdog repeat time can be set in steps of 6 seconds by entering minutes to one decimal place, e.g., 0.1 minutes = 6 seconds. The maximum time is 12 hours (720 minutes).

The watchdog message can be suppressed by using CAP code 0000000 (see below)
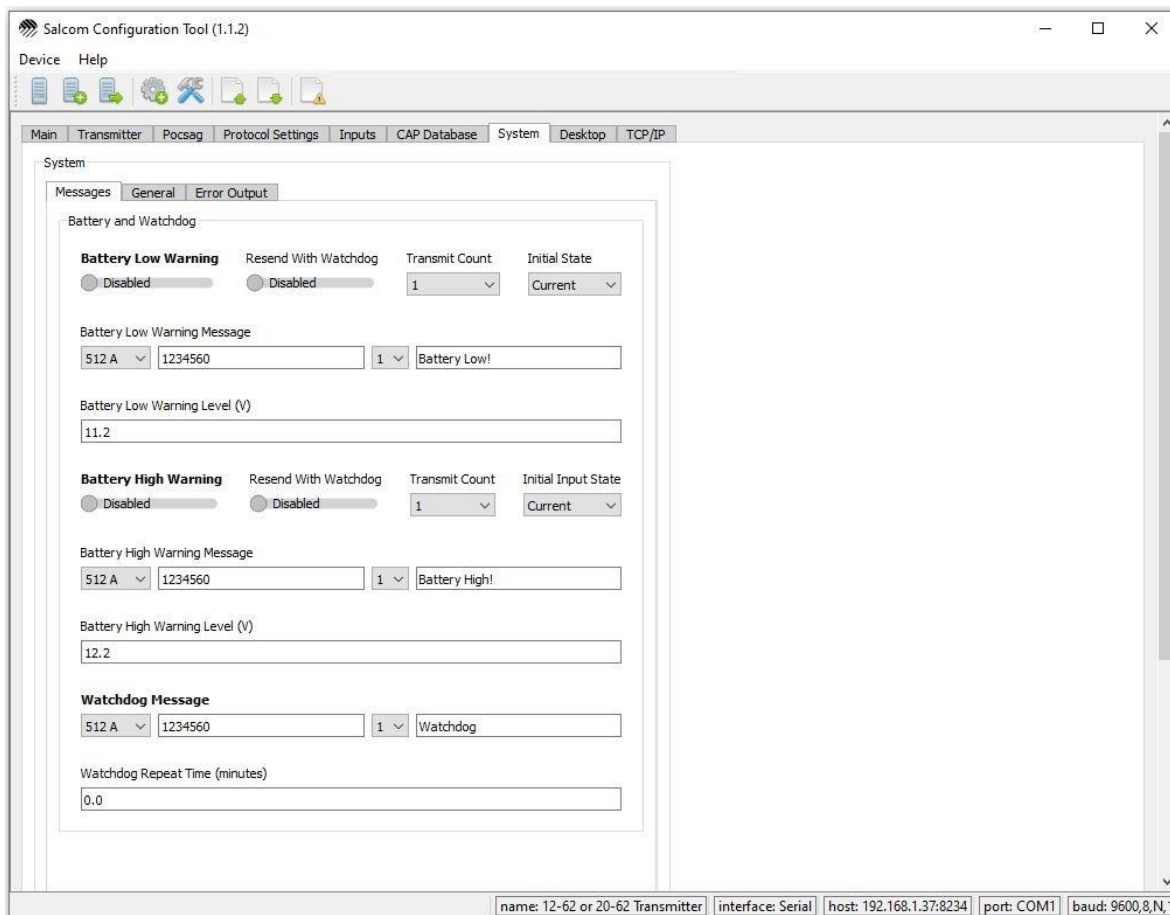
Example battery and watchdog configuration

The battery and watchdog messages are configured through the **System** tab in Sacoto, on the **Messages** sub-tab.

Move the mouse over any field to see a brief description of its function.

In this example:

- A "Battery low" message is triggered if the battery voltage drops below 11.2V
- A "Battery good" message is triggered if the battery voltage rises above 12.2V
- A "Battery low" message is transmitted if battery is low at startup (initial state=high)
- Messages are transmitted 3 times for reliable reception
- The watchdog message "Watchdog" is transmitted every 30 minutes
- If the battery voltage is below "low" or above "high" the corresponding battery message will be transmitted with the watchdog message every 30 minutes.
- Any input messages configured to transmit with the watchdog will be transmitted every 30 minutes with the watchdog message.

To use the Watchdog for battery or input monitoring without sending the watchdog message, set the watchdog CAP code to 0000000.

Ethernet Configuration

Ethernet configuration is done through the **TCP/IP** *tab.*
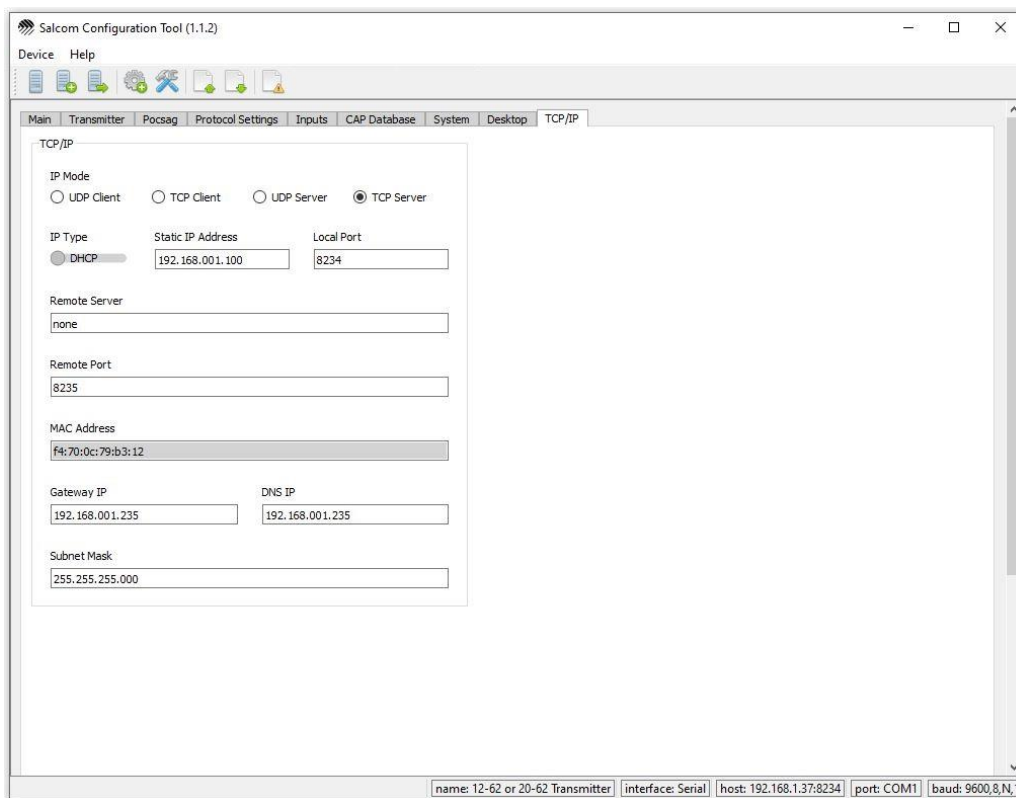
IP address, Port and Subnet

To use the Ethernet port the 20-62 must be configured with a **valid IP address** *on your network. See "Selecting an IP address" below.*

In addition to the IP address, an Ethernet connection requires a **"port"** *number, as there may be many "ports" available at an IP address, each corresponding to a different connection on the device. By default, the 20-62 uses port 8234 (in both directions), but this can be changed as required.*

The **"Subnet Mask"** *should normally be set to 255.255.255.0*

Client or Server?

The 20-62 may function as either a "client" or a "server" using either TCP/IP or UDP protocol.

When operating as a **"TCP/IP Server"** *it will respond to any device on the local network that connects to the "Current" or "Static IP address" in the TCP/IP tab. A "remote server address" is not required. Sacoto will only connect to the 20-62 if it is a TCP/IP Server.*

When operating as a **"TCP/IP client"** *it will attempt to connect to a specific server at the IP address specified in the "Remote server address" field. The "Current" or "Static IP address" is still required for the IP address of the 20-62 but the remote TCP/IP server does not need to know this. In TCP/IP client mode the 20-62 will only connect with the "remote server address".*

A **"UDP client"** *will only send data to the specified remote server address while a* **"UDP server"** *will send any response to the originating IP address. When using UDP, the 20-62 will receive all commands sent to the "Current IP address", regardless of client or server mode.*

Selecting an IP address

Selecting a valid IP address for the 20-62 to use on your network will depend on how your network is configured. If you have a network administrator, they may be able to assist with the selection and reservation of a valid IP address on their network.

Typically, the 20-62 IP address will be valid only on your local network. IP addresses on your network will be managed according to how the network is set up. Typically, all devices on the local network will have the same 3 numbers for the first part of the address, and only the last number will change from device to device, for example 192.168.1.xxx. Typically, these first 3 numbers must be the same at both ends to establish a connection.

Manually assigning a static address

To manually assign a static IP address to the 20-62 select "STATIC" for the "IP address mode". Enter the IP address into the "Static IP address" field, and write the settings to the 20-62.

The advantage of a static address is that it will not change, so a client will always know the address of the 20-62 on the network.

To avoid conflicts, the IP address must be unique on your local network.

Typically, IP addresses are assigned automatically by a DHCP server on your network. Addresses are assigned from a range of addresses programmed into the DHCP server (the DHCP pool). When selecting an IP address manually you must make sure that the DHCP server will not automatically assign the same address to another device. The IP address must either be outside the DHCP pool or reserved for the 20-62 by the DHCP server.

Automatically assigning an IP address

You can use the DHCP server to automatically assign a unique IP address to the 20-62. Select "DHCP" as the "IP address mode". This is the easiest way to ensure that the 20-62 has a unique address, however this address could change next time the 20-62 is connected.

The DHCP server will reserve the address for a "lease" period programmed into the DHCP server. This may be a day or a week, or as short as an hour or less. The 20-62 will continue to renew this lease as long as it is active, but if it is disconnected or powered off, the address may be reassigned to another device after the lease period expires. When the 20-62 is re-connected to the network it will request the same IP address that it had last time, but if it is not available the 20-62 will receive a new address.

If the 20-62 is configured as a "TCP/IP client" the 20-62 will initiate the connection with the "remote server", so the IP address of the 20-62 does not matter, provided it is valid. In this case the DHCP server may be used to assign the IP address without concern.

Once a unique address has been assigned by the DHCP server, this address can usually be permanently reserved by configuring the DHCP server to reserve that address. This address should then be configured as the "static" IP address in the 20-62. Refer to your network administrator or router manual.

Reading the 20-62 IP address

To read the IP address assigned to the 20-62 by a DHCP server, read the configuration from the 20-62 and open the TCP/IP tab. The new address will be in the Static or Current IP address field. You can use this address as long as it remains valid on the network.

Finding your PC's IP address

If you are using the 20-62 in client mode, you will need to know the IP address of your PC so the 20-62 can connect to it.

You can find your IP address in "Windows Settings" under "Network and Internet" -> "Ethernet" (on the side bar). Click on your network name to see your Ethernet settings, or

Enter "ipconfig" from the windows command line to get the IP address of your PC.

Note that your PC will likely use a DHCP server to obtain its IP address. You may need to reserve a static address for your PC too.

Checking if an IP address is active

You can test if a device is using an IP address by using the "ping" command from the command line. e.g., "ping 192.168.1.100" If this returns a response, then a device is using that address.

Testing an Ethernet connection using Sacoto

Sacoto can be configured to connect to the 20-62 over Ethernet. This can be used to test the Ethernet connection, and to configure everything except the Ethernet connection itself.

To connect to the 20-62 using Sacoto:

- *the 20-62 must be configured as a* **TCP/IP server***,*
- *the* **Static IP address** *and* **port** *number must be entered into the Sacoto connection settings,*
- *the Sacoto connection "interface" must be set to TCP/IP.*

See the "Sacoto connection settings" section above.

Salcom UDP/TCP Test Tool

Salcom provides a simple tool for testing TCP/IP and UDP Ethernet connections. This can be downloaded from the Salcom website under the 20-62 product page.

This tool may be used to:

- *Establish and test connections,*
- *Send serial commands,*
- *Initiate paging messages.*
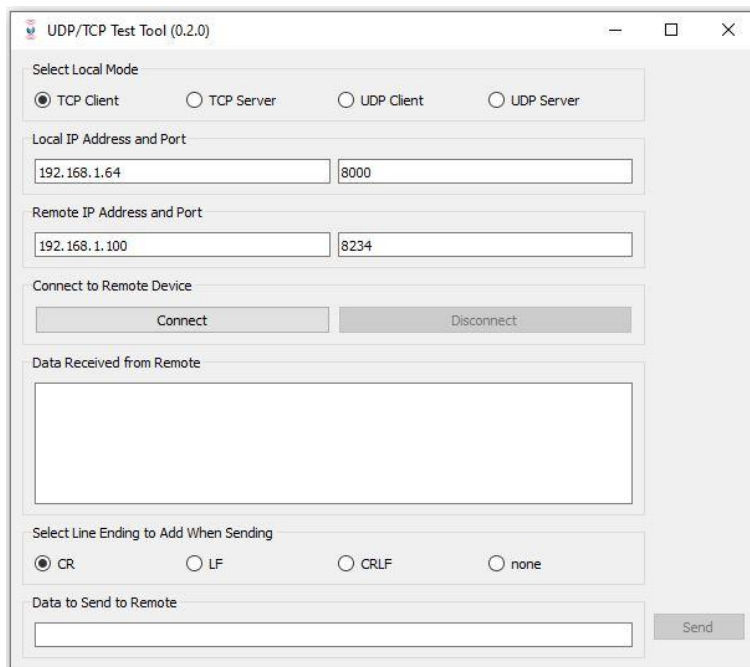
Testing a connection

➢ *If the 20-62 is configured as a server, the test tool should be a client.*

➢ *Enter both IP address and port numbers*

➢ *Click "Connect"*

➢ *Enter data to send in the bottom line and click "SEND"*

➢ *Any returned data will appear in the Data Received box.*

➢ *The serial command "SN?" will return the serial number and product information, and can be used as a handy test command.*

➢ *"CA1234560 1 Hello" can be used to initiate a paging message in Salcom protocol.*

Virtual Serial Port over Ethernet

Third party software, such as USR-VCOM, can create a virtual COM port on your computer and connect it to the 20-62 over the Ethernet. This allows you to access the 20-62 via the Ethernet in the same way you would access a physical RS-232 port or USB serial port.

This virtual COM port can be used to send paging messages and serial commands but it cannot be used with Sacoto. Sacoto can connect to the 20-62 via Ethernet directly, without the use of a virtual COM port.

Important: *USR-VCOM is proprietary software for exclusive use with USR Ethernet modules, such as the USR-TCP232-S2 used in the Salcom 20-62. USR-VCOM may not be used for any other purpose.*

Downloading and Installing USR-VCOM

USR-VCOM may be downloaded from the USR IOT website:

https://www.usriot.com/support/downloads/usr-vcom-virtual-serial-software.html

To install USR-VCOM you will need to run the installation package with administrator privileges. In some cases, accessing the Ethernet will require access to be granted through a firewall.

Configuring USR-VCOM
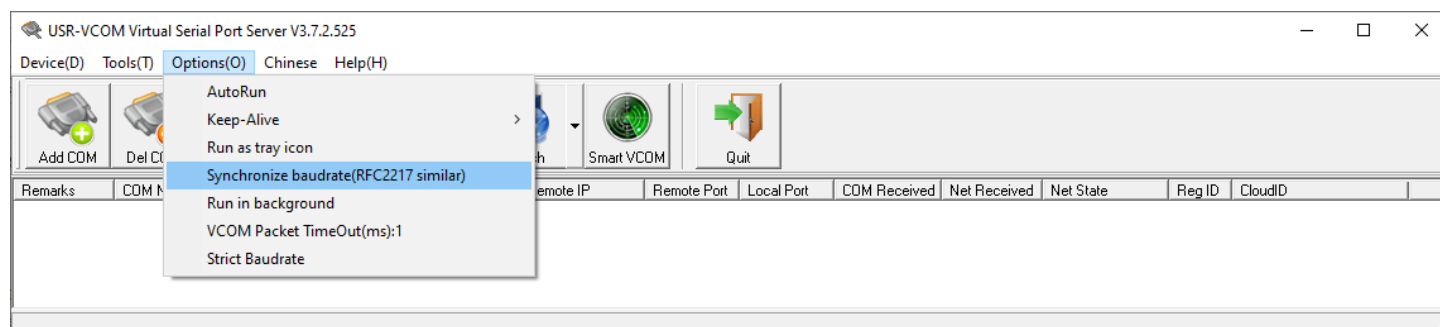
Ensure that "Synchronize baud rate" is NOT ticked under the "options" menu.

If it's ticked then you can only connect at 115200 baud.

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Configuring a Virtual serial port

➤ *Click "Add COM"*

➤ *Select the new port number to assign to the virtual COM port*

➤ *If the 20-62 is a TCP **server**, you must configure the virtual COM port as a TCP **client**.*

➤ *Enter the IP address and port number of the 20-62*

➤ *Click OK*

➤ *Turn on the 20-62 and ensure the Ethernet is connected.*

Add Virtual Serial Port

Virtual COM:	COM2
Net Protocol:	TCP Client
Remote IP/addr:	192.168.1.35
Remote Port:	8234
Local Port:	8233
Remarks:	

OK   Cancel   Advanced +

USR-VCOM Virtual Serial Port Server V3.7.2.525

Device(D) Tools(T) Options(O) Chinese Help(H)

Add COM   Del COM   Connect   Reset Count   Monitor   Search   Smart VCOM   Quit

Remarks	COM Name	Parameters	COM State	Net Protocol	Remote IP	Remote Port	Local Port	COM Received	Net Received	Net State	Reg ID	CloudID
	COM2	9600,N,8,1	Open	TCP Client	192.168.1.35	8234	--	243	9200	Connected	0	

➤ *The "Net State" should show "connected" when a connection has been established.*

➤ *Start your terminal software or other paging application and connect to the COM port you have just created.*

Store & forward systems

Overview

In a store and forward system one transmitter is the "source" (originating transmitter) while other transmitters are paired with a receiver at a distant location and are used to re-transmit the received messages on the same channel to increase the coverage area.

Several issues can arise in a store and forward system:

1. *The originating transmitter must wait for repeaters to retransmit the message to avoid transmitting at the same time as the repeater. The repeater will not receive messages from the originating transmitter when it is also transmitting on the same channel!*
2. *The message transmitted by a repeater may be received by the repeater's own receiver, then retransmitted, causing the message to be repeated in a continuous loop.*
3. *If there are multiple repeaters in a system, the first repeater might receive the message that has been repeated by the second repeater, and send it again, bouncing messages between the two repeaters in a continuous loop.*

The 20-62 has several features that can assist with store and forward systems.

Adding a source delay

To solve the first problem the 20-62 has a feature to add a delay between messages if it is the "source" transmitter. In this case the store and forward configuration should be set to "source".

Rejecting incoming messages during transmission

To solve the second problem the 20-62 can be configured to ignore incoming messages during a transmission. In this case the lead-out delay can be used to specify the time after the message during which incoming messages will be ignored. The store and forward configuration should be set to "repeater". This method is used where an incoming message should only be rejected if it occurs immediately after the transmission, while allowing intended duplicate transmission to be repeated.

Duplicate reject

When there are multiple repeaters in a system a repeater must reject all identical received messages coming from other repeaters. There may be a significant delay between transmission and receiving a repeat message from another repeater. The solution to this (issue 3) is to reject all duplicate message for a specified time. However, this has the effect of also rejecting intentional repeated messages. To prevent this, the delay between intentionally repeated messages should be longer than the message reject time, while the message reject time should still be long enough to reject messages repeated by another repeater.

Cross band repeaters

Where a repeater is used to repeat messages from one band to another, the transmitter is not on the same frequency as the receiver so there are no issues with message loops. The repeater does not need to ignore message while transmitting, or reject duplicate messages.

Store and Forward Port

An option is provided so the Store & Forward timing and duplicate rejection is only applied to selected serial ports. This is used when the 20-62 is being used as a Store & Forward via one port and accepting messages from another device using a different serial port.

Simulcast Modulation Delay

Overview

Simulcast systems are used to allow multiple transmitters on the same frequency to provide an extended coverage area. In such a system there may be areas covered by more than one transmitter, and these signals may interfere with each other. Normally the stronger signal would overpower the weaker one, but in overlap areas which of the two signals is strongest may change rapidly with movement and environmental changes. The interference problem is normally causes by the receiver receiving conflicting data bits, or data edges from different transmitters due to poor synchronization. To overcome this problem the transmitters can be synchronized by using the same external source data (over a data link). A delay can be applied to one of the transmitters to account for the delays in signal propagation and the data link of the other transmitter. When correctly set-up it does not matter which transmitter is the strongest at the receiver at any given moment, the data remains the same.

*The simulcast synchronizing delay can only be applied to externally generated NRZ data. This data must be connected to the "**Trigger input #1**" pin, NOT the direct external modulation pin. The same PTT input should be used.*

*The 20-62 can apply a delay of between 10us and 2550us (+/-10us) in 10us steps. It also supports **data inversion** on the "Trigger input #1" pin. (Data inversion is not available for the direct external modulation input).*

Propagation delays cannot be removed, so the transmitter with the least total delay (data link + RF) is the one that should have an additional delay added. Free space RF propagation delay is 3.3us/km, this includes RF data links, while cable-based links may have a delay of 5us/km. There may be additional delays in a linking system that must also be taken into consideration.

Sacoto can be used to configure Simulcast or delayed operation, under the "Modulation" tab.

- *Select "External modulation"*
- *Enter a "Delay time" (delay = 0 means direct external modulation)*
- *Select "Inverted data" if required*
- *Apply the modulation to "Trigger input #1"*
- *Key the transmitter by pulling the PTT input low.*

The internal pull-up on trigger input 1 is designed to balance filter delays and provide symmetric modulation when driven with an open collector output. Input filters add a delay of 250ms.

Alternatively, a version of the 20-62 is available on special request with reduced delay and the ability to accommodate a wider range for input sources. This version can also provide a modulation output when used as the transmitter of a cross-band link to remote simulcast transmitters. A special version of the 12-84 is available with a received modulation output for cross-band linking purposes

Testing Modulation Delay

- *When correctly configured, and the external PTT pin is pulled low, the green LED will light solidly. Connecting an oscilloscope to the green LED will show that the LED is in fact toggling every 10uS. If this test signal is not present, the feature will not operate.*
- *Delayed modulated data is transmitted through the same internal path as internally generated POCSAG data. The delayed data is also presently to the red LED.*
- *A dual trace oscilloscope can be connected to the red LED and the input signal to verify correct delaying of modulation.*
- *When the PTT pin is released, the green LED will flash normally again.*

Over-Temperature Cutout

Overview

If the transmitter operates for extended periods in a hot environment, a protective thermal cut-out may operate to reduce the output power to a safe level. It will reset when the unit temperature has fallen below 75 degrees Celsius.

Operation

Prior to the transmitter powering up, the NTC on-board resistor is checked. If the transmitter is above 75 degrees Celsius the maximum power level is limited to 1-Watt.

In addition to the pre-transmit power check, the temperature is checked once every second. If the transmitter is already operating and the temperature is above 75 degrees Celsius then the power will be reduced to 1-Watt (if set above 1 watt). The full power capability of the 20-62 will not be restored until the transmitter has powered down, and the temperature has reduced below 75 degrees Celsius again.

If the 20-62 is being externally modulated and the temperature exceeds 85 degrees Celsius, the 20-62 is considered critically hot, and powers down.

When critically hot, no further messages queued for processing or transmission will be allowed until the 20-62 has reduced in temperature below 85 degrees Celsius. In addition, attempts to enable the 20-62 transmitter using the external PTT line will have no effect until below 85 degrees Celsius.

If the transmitter has been controlled via the external PTT line, and for some reason the 20-62 has become critically hot, then the 20-62 will not transmit again until the unit has dropped below 70 degrees Celsius.

Notification When Over-Temperature

When the 20-62 is above 75 degrees, but not critically hot, there is no serial or visual indication that the 20-62 has reduced in power.

When the 20-62 is critically hot, the serial message "ER7 OVERTEMP" is sent out both serial ports, and the red LED flashes, but does not continue to flash.

There is no messaging when the 20-62 temperature has reduced again. However, when a message is sent for transmission, there will be a suitable response to indicate if the queued message has been transmitted.

Aerial Mismatch

Overview

The aerial mismatch feature of the 20-62, when enabled, allows changes to the aerial, changes in RF output level and changes in drive to the power amplifier to be monitored. Based on the test result performed on each transmission an error message can be returned, along with control over the error output.

This feature allows reporting when an aerial is disconnected or damaged. If a problem is encountered along with error reporting the power is reduced to a level that is not likely to damage the transmitter. The feature must be self-calibrated for each installation before use.

Operation

The feature can only be configured used serial commands.

Serial format: _MISMATCH_CONFIG=E,TTT

where:

E   '1' when the feature is enabled, '0' if the feature is disabled.

TTT   Tolerance (decimal value between 0 and 255). The default value is 50, which should yield good results in most cases

e.g., _MISMATCH_CONFIG=1,50<CR>

Calibration

The feature requires calibration before first time use. To do this:
1. Connect up the system and aerial.
2. issue the command *PSD_MISMATCH_CONFIG=1
3. Confirm the 20-62 responds with "OK"
4. 20-62 will auto calibrate on next transmission.
5. Test by transmitting a message, e.g., "CA1234560 1 test" (Salcom protocol). The 20-62 will respond with something like "RF:415:SP:762 CAL DONE".
6. Internally if the output power increases by the tolerance configured (50 by default) or the RF power module drive varies by 50, then an error is produced.
7. Test the calibrated system by:
   - Connecting a different aerial or
   - Disconnecting the aerial.

When a mismatch is detected, an output similar to that shown below will be produced:

390-415 : 874-762
ER19 RF_LEVEL

In this example "390-415" shows the recorded RF output level and the calibrated value. The difference is only 25 (415-390) and not enough to trigger a mismatch alarm. The second values shown (874-762) shows the recorded power module drive setting and the calibrated setting. In this case the difference is 112 (874-762). Since this is above 50, an error is produced.

In very rare cases a mismatched aerial may not be detected. This is because the length of the coaxial cable may be presenting an impedance (varying with frequency and power setting) which appears to be suitably matched within the limits set by the command used above. This condition is close to impossible to detect in some cases using any method of detection (other than using a remote receiver to monitor signal strength).

To overcome this if a problem is ever encountered you can either:

- *Change the length on the aerial coax slightly or*
- *Change to a different aerial or*
- *Tighten the limits of the _MISMATCH_CONFIG command.*

Antenna Selection and Installation

When installing your Salcom product solution it is recommended to site the aerial at least a few metres away from the unit to avoid the possibility of RF feedback and causing potential problems with the transmitter operation.

An external (outside) aerial is preferable and will provide better radio coverage. A suitable antenna, such as ground independent half wave, is connected to the unit via the SMA connector on the end plate of the unit. The aerial connection should present a nominal load of 50Ω, with a VSWR of better that 1.8:1. Other options such folded dipoles with 50Ω impedance, co-linear and quarter wave whips with suitable ground planes are also suitable. A high-quality aerial installation will provide additional performance and reliability.

Note: The 20-62 is designed to operate reliably over large distances, however the actual distance can vary depending on the type of location, obstructions, local radio interference and antenna system used.

Recommended aerial suppliers:

Region	Supplier
New Zealand	*Hi-Tec Aerials NZ Ltd* *http://www.hi-tec-aerials.co.nz/* *Pacific Aerials Ltd* *http://www.pacificaerials.co.nz/*
Australia	*RFI Wireless* *http://www.rfiwireless.com.au/*
UK / Europe	*Procom (antennaPRO Ltd)* *http://www.procomuk.co.uk/*

Supported Messaging Protocols

The 20-62 supports various messaging protocols, as listed below. In some cases, only a key subset of the full protocol is supported.

Supported protocols:

Salcom

TAP (PET/IXO)

TNPP v3.8

Visicad

TPP (half)

TPP (full)

Flex

ESPA 4.4.4

Match

Gent

FENZ

GPS and Pulse Count

SMS

Scope compatible

Comp1

Comp2

Multitone (half)

Multitone (full)

Ascom compatible

Austco compatible

Scope compatible

Blick compatible

Gaming compatible

Salcom product interface protocols:

12-32 Input Expansion Unit

11-36/12-36 Paging Telephone Voice Interface

12-84 Receiver

20-62 can support a different protocol on each port so up to 4 protocols can be used at the same time.

Protocol Descriptions

Salcom *protocol is designed to optimize control, provide access to the full functionality of Salcom products, and to provide a simple way to integrate Salcom products.*

Telocator Alphanumeric Protocol (TAP) *is an industry-standard protocol for sending short messages via a land-line modem to a provider of pager and/or SMS services, for onward transmission to pagers and mobile phones. TAP defines an industry standard for sending alphanumeric messages to pagers.*

The Telocator Network Paging Protocol (TNPP) *is an industry standard networking protocol. Many paging providers exchange pages to earn more revenue and to provide for a greater coverage area. Pages are delivered between their paging systems via satellite, radio link or leased telephone lines. Most systems in current use are networked using the Telocator Network Paging Protocol (TNPP). A group of connected paging terminals, running TNPP, will send, route and receive pages among the group. The 20-62 supports link establishment under v3.8 of the protocol.*

ESPA 4.4.4 *is a standard protocol to exchange short messages between a PABX, nurse call system, fire alarm system, building control system, SCADA/PLC system or other device, and an onsite paging system. It was developed in Europe in the 80's and despite its age it is still widely used in hospitals.*

Ascom compatible *protocol allows your Salcom product to be integrated with the Ascom range of products and other third-party devices that use an Ascom compatible protocol. Ascom's broadcast paging solution provides a set of products targeted at healthcare, aged care, corrective and government facilities, where there is the need to send mission and life critical alerts to large groups of people who may be anywhere in a facility.*

Gaming compatible *protocol provides a method to monitor gaming machines and allow gaming machines, or their users, to be serviced with cash or drinks, or to action alarms. The 20-62 can concurrently manage repeating messages from up to 40 gaming machines.*

Austco compatible *protocol allows your Salcom product to be integrated with the Austco range of products and other third-party devices that use an Austco compatible protocol. Austco is a leading global provider of communication technology and software solutions for environments where communication is critical, such as healthcare and secure facilities.*

Match *protocol can be used to initiate a paging message when any pre-defined "start" text string is received on a serial port. The paging message text can be taken from part of the received string, by specifying the start point, length, and "end" text as required. The start text must start on a new line or start after a pre-defined period of inactivity. If the "end" text is specified, the message includes all text from the start text to the end text, concatenating multiple lines if required. If no end text is specified the message will end at the first carriage return, or after the specified number of characters. If no start text is specified, all serial text will be sent. Messages are sent to all CAP codes in the database. There must be at least one CAP code specified in the database.*

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Gent is Honeywell's open protocol that allows their fire system components to communicate with each other. Their open protocol allows flexibility in the choice of products that can be integrated into their solutions, including the Salcom 20-62.

***GPS and Pulse Count** protocol is used for irrigation equipment transmitters. The protocol allows the 20-62 to be connected to a GPS receiver. $GPGGA GPS messages are stored by the 20-62, so when required the position can be transmitted as a paging message.*

***SMS** protocol is different from other industry protocols like TAP or TNPP. SMS is a scripted protocol, which allows total control over all aspects of code and communication.*

***Scope compatible** protocol allows a Salcom transmitter to be interfaced to Scope compatible paging encoders and panels. The serial command contains the CAP code, message type, level, message information and the baud rate. The maximum message length is 30 characters.*

***COMP1** allows unformatted ACSII strings to be sent as paging messages to contacts in the Cap database. As an example, this allows connection of the paging transmitter to a device with a serial printer output. Due to the message being sent to all contacts successively, it is recommended that the database be kept to a minimum.*

> *Format is Message<CR>*

***COMP2** defines the database contact in the serial string and messages are only sent to that contact. Strings are delimited with either tilde or carriage return character and can be synchronized by prefixing the command with three <DEL> control characters.*

> *Format is Pager ID<CR>Message<CR> or Pager ID<Tilde>Message<Tilde>*

Note: Both COMP1 and COMP2 do not send acknowledgements. Serial commands can be terminated in a carriage return for immediate transmission but any unterminated string is sent after a 10 second delay. Full protocol details available on request.

***12-32 Input Expansion Unit** protocol is a variation of Salcom and PET protocols. It allows a Salcom 20-62 transmitter to directly replace the 11-10, 11-62 and 12-62 transmitters. It allows backwards compatibility for 1200 Baud messaging in the 12-32 input modules.*

***12-36 Paging Telephone Voice Interface** protocol is generated by the SALCOM 11-36 or 12-36 Telephone Interface. This allows the user to connect via a phone and initiate numeric calls or pre-programmed alphanumeric calls. This is now supported by the standard "**Salcom**" protocol.*

***12-84 Protocol** is used by the Salcom 12-84 POCSAG receiver to generate a serial message string including the CAP code which can be decoded directly by the 20-62. Typically used for store and forward.*

Trouble Shooting

The following table may help in problem solving where necessary.

Fault	Solution
No illumination of Green LED	*Check power supply and connection*
Input activated but no transmission	*Check and write input configuration in Sacoto.*
Unit transmits (mostly solid red LED) but nothing received	*Poor aerial* *Wrong frequency* *Incorrect CAP code* *Incorrect baud-rate* *Power too low* *Unit too hot (the unit will also send out an error via the serial port)* *Too much vibration*
No RS232 serial communication	*Incorrect COM port connection selected.* *COM port configuration incorrect (baud rate, parity etc).* *Cable not plugged in to RJ12 serial socket.* *Faulty cable or adaptors.*
Unit starts, but does not complete transmission	*Poor supply voltage, or low current limit.*

Glossary

Definition
ASCII: *Acronym for "American standard code for information interchange," a 7-bit code representing upper- and lower-case letters, numbers, punctuation, control codes, and other special symbols. The term "ASCII" typically refers to the character set and control codes this code represents.*
SMA connector: *A standard miniature RF connector. Not to be confused with "Reverse SMA" often used with WIFI.*
De-bounce: *When a contact is switched it may make and break contact several times before settling in its final state. To avoid repeated false triggers during the switching transition, a "de-bounce" delay is added so that the no action is taken until the input has settled.*
Duty cycle: *The fraction of time that the transmitter is transmitting. Duty cycle is commonly expressed as a percentage or a ratio.*
POCSAG: *A radio transmission standard for the on-air coding and signalling used for paging.*
NRZ (Non-return-to-zero): *Digital data that may remain in either a high or low state indefinitely.*
FSK: *Frequency Shift Keying. A form of RF modulation where binary states are represented by shifting the carrier frequency high or low.*
RS-232: *An electrical standard for the serial transmission of data.*
Universal Serial Bus (USB): *A common interface that enables communication between devices and a host controller such as a personal computer (PC).*
VSWR (Voltage Standing Wave Ratio): *is a measure of how well the impedance of an antenna or other RF load is matched to the nominal load impedance expected by a transmitter. For correct performance a good match is required. A VSWR of 1:1 represents a perfect match.*
Watchdog (timer): *A regular event intended to monitor the performance of a system. Typically, an independent system would respond to the loss of a watchdog event to provide an alert, activate a failsafe system, or attempt to recover from the fault.*

Accessories and Related Products

Name	Description	Part Number
RS-232 Port 1 adaptor	*An RJ-12 to DB9 (RS-232) adaptor and cable for connection to the 20-62 RS-232 port 1*	*12-45-0000*
RS-232 Port 2 adaptor	*An RJ-12 to DB9 (RS-232) adaptor and cable for connection to the 20-62 RS-232 port 2*	*12-45-2000*
RJ12 serial cable splitter	*Standard 6P6C RJ-12 splitter and cable to allow connection to serial port 1 and serial port 2 at the same time.*	*12-45-7000 or third-party suppliers*
USB Programming Lead	*USB Mini-B*	*12-48-0000*
Ethernet Cable	*Standard Ethernet cable.*	*Standard Ethernet Cable*
Configuration Software	*Salcom 20-62 configuration tool (Sacoto). Can be downloaded from our website at www.salcom.com*	*Website download*
Power Connector	*Screw terminal power connector.*	*Supplied with product.*
RJ45 Cable	*RJ45 cable to allow the connection of trigger inputs and other functions.*	*Supplied with product.*

Technical Specifications

Frequency Range	*140 - 174MHz - VHF 427.5 - 475MHz - UHF*
Frequency Selection	*User configurable*
Power Supply	*+13.8V typical (11 to 15 VDC range)*
Power Consumption	*Standby: 60mA (90mA when connected to Ethernet)* *Transmit: 1.0A @ 5W (typical)*
Transmit Power	*5W, 2W, 1W, 500mW, 100mW, 50mW* *(Custom values on request)*
Channel Spacing	*5kHz, 6.25kHz, 10kHz, 12.5kHz, 20KHz, 25kHz*
Modulation	*FSK with NRZ data*
Deviation	*±2.25kHz or ±4.5kHz*
Transmit Duty Cycle	*100% (with adequate ventilation)*
Baud Rates	*512, 1200*
Message Format	*POCSAG*
Configuration Application	*Salcom Configuration Tool (Sacoto)*
Programming Cable	*Standard USB mini-B, RS232 (with adaptor) or Ethernet*
Serial Ports	*RS232 / USB - 9600, N, 8, 1*
Ethernet	*TCP Client, TCP Server, UPD Client, UDP Server. Static or DHCP addressing*
Serial Protocols	*Salcom; TAP (PET/IXO); TNPP v3.8; TPP (half), TPP (full); ESPA 4.4.4; Match; Gent; GPS & Pulse Count; SMS; Comp1; Comp2; VisiCAD; Morley; FENZ; Flex; Mul-tone (half). Mul-tone (Full), also protocols compatible with: Ascom, Austco, Scope, Blick and Gaming*
Trigger Inputs	*Four switch inputs on RJ45 connector*
Other I/O	*External Modulation (0 - 5V), PTT In, PTT Out (50mA max)*

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Connectors	SMA: RF Output; RJ-12 (6P6C): Two RS-232 serial ports; USB-mini: USB-2 serial; RJ-45 (8P8C): Inputs and Outputs; Network RJ-45: Ethernet; Pluggable Terminal Block: DC Power in
Power Connector	2-way pluggable terminal block, 5.08mm (0.2") pitch (provided)
Environmental Protection	Not suitable for unprotected outdoor use. Should be protected from adverse environmental conditions
Operating Temperature	-20°C to +50°C (-4°F to +122°F)
Indicators	Power LED (Green) - Slow Flashing = Normal Operation Status LED (Red) - Rapid flashing = Transmitting - Slow flashing (3 -times/sec for 7 secs) = Error Condition
Weight	320g
Enclosure Dimensions	130mm x 31mm x 125mm (W x H x D) (5.12 x 1.23 x 5.04 in)
Enclosure Material	Extruded aluminium
Colour	Bright Silver Anodised Aluminium
Type Approvals	AS/NZS 4769.1:2000 + Amendment 1:2002 (RF) EN 300-224 V2.1.0. (RF), EN301 489-2 V2.1.0 (EMC) FCC CFR47 (Part 90 (RF). Part 2 (RF), Part 15 (EMC))
NB: All specifications and applications are indicative only and subject to change without prior notification.	

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