



# 12-62-0000

## VHF / UHF Transmitter



# PRODUCT MANUAL

Version 1.03

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## Salcom Product Documentation

This document is designed to familiarise you with Salcom products and guide you through the hardware, configuration, installation and overall system management.

Salcom is an environmentally conscious company and in an effort to conserve paper no longer prints manuals with shipped products. All relevant documentation can be downloaded in PDF form from our website [www.salcom.com](http://www.salcom.com)

## Warranty and Disclaimer

Salcom products are warranted for a period of 12 months from the date of purchase against faulty materials and workmanship. Should any fault 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 unauthorised alterations or repairs will invalidate the warranty.

All information provided in this document is carefully prepared and offered in good faith as a guide in the installation, use and servicing of Salcom products. Installers must ensure that the final installation operates satisfactorily within the relevant regulatory requirements. Salcom accept no responsibility for incorrect installation. We reserve the right to change products, specifications and installation data at any time without notice

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## Product Overview

The 12-62 Series transmitters are available as VHF and UHF units, with user-programmable power outputs ranging from 50 milliwatts to 4 watts and a high VSWR tolerance. Using programming software, each model can be tuned across its full frequency range with no hardware adjustments. They are capable of operating as NRZ or POCSAG transmitters. The built-in POCSAG encoder can be enabled or disabled as required.

In addition to a direct/RS232 buffered serial port, an on-board USB port enhances the range of applications to which the transmitter can be applied. Input / Output expansion is also possible via an external RJ45 interface

The USB, RS232 ports can be used to initiate paging transmissions using the Salcom proprietary protocol, or Telocator Alphanumeric Protocol (TAP) PG1 PET (Paging Entry Protocol). These ports can be used concurrently making it possible to connect a telephone interface unit and still initiate paging transmissions via the USB port, with the RF output being through a standard BNC termination.

The unit supports 4 discrete inputs with a different pre-programmed message on high and/or low transition, plus voltage detection messages on the power input, having programmable debounce delay control. They may be used to initiate relay commands for remote control applications. Provision to transmit a message more than once and variable time between transmissions are catered for.

The 12-62 supports multiple message queuing, and will queue up to eight 240 character messages, or as many smaller messages that will fit into the available memory buffer (up to 80). Pre-defined input messages are limited to a maximum length of 40 characters which may be configured using the Salcom programming software. Control via the USB or Serial port is achieved using ASCII character commands.

A watchdog is available to initiate an action or transmit the state of selected inputs at a programmable frequency.

The 12-62 can be configured to transmit a warning message when the power supply (battery) goes below a user specified minimum level and above a user specified maximum level.

Configuration of the transmitter is performed via the USB port or the serial port using the Salcom programming application which allows for the setting of all operational parameters.

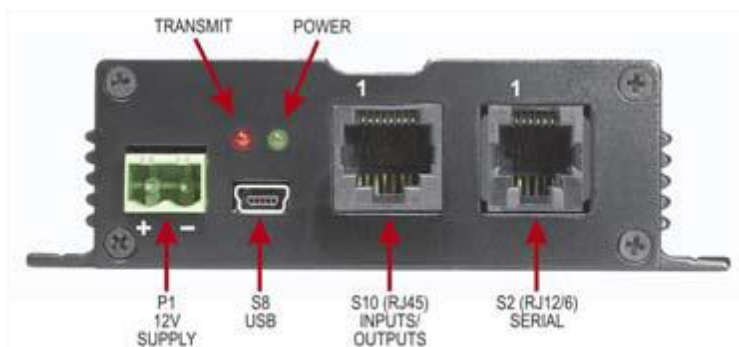
The 12-62 is housed in an attractive, durable extruded aluminium case with provision on the base plate for wall mounting.

## Product Features - Overview

The 12-62 comes with several features that make the 12-62 a versatile solution to your communication needs. Key features are overviewed below, with more details of their use provided later in this manual.

- **Messaging:** The 12-62 supports pager messaging and can transmit 3 types of POCSAG message (alphanumeric transmissions, numeric transmissions and tone only transmissions), with any one of 4 function levels.
- **Store & forward:** Can be configured to operate as a store & forward transmitter. This is when a transmitter is designated as a source, and a receiver listens to the source relaying the message to another transmitter for retransmission. Configurable as an optional feature.
- **Low Power Mode:** In Low Power Mode the 12-62 will consume approximately 17.5mA until the interrupt line INT4 goes low which will wake the 12-62 up into its normal standby state consuming 35mA.
- **Duplicate Message Reject:** when enabled a database of the last 20 messages sent is maintained. All of the entries are progressively aged out. The age out time of entries in the list can be set from 1-255 seconds. Configurable as an optional feature.
- **Simulcast Modulation Delay:** when enabled, allows the user to configure the transmission delay for modulated data. This delay can be configured to be between 10uS and 2550uS.
- **Over Temperature Cutout:** If the transmitter operates for extended periods in a hot environment, a protective thermal cutout may operate to reduce the output power to a safe level. It will reset when the unit temperature has fallen to below 70 deg.
- **Aerial Mismatch:** when enabled, 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.
- **Extended database:** The 12-62 database now supports up to 1,000 RIC/CAP codes. These can be imported via the enhanced 12-62 PSD which allows for the import of either .CSV or Text files.

## Connectors and PinOuts



**Table 1: Connectors and Indications**

Item	Description	Designation
1	12V Supply	P1
2	USB	S8
3	Inputs/Outputs (RJ45)	S10
4	Serial (RJ12/6)	S2
5	Transmit LED (Red)	L1
6	Power LED (Green)	L2

**Table 2: Pin connections for S2 (RJ12/6 Serial) connector**

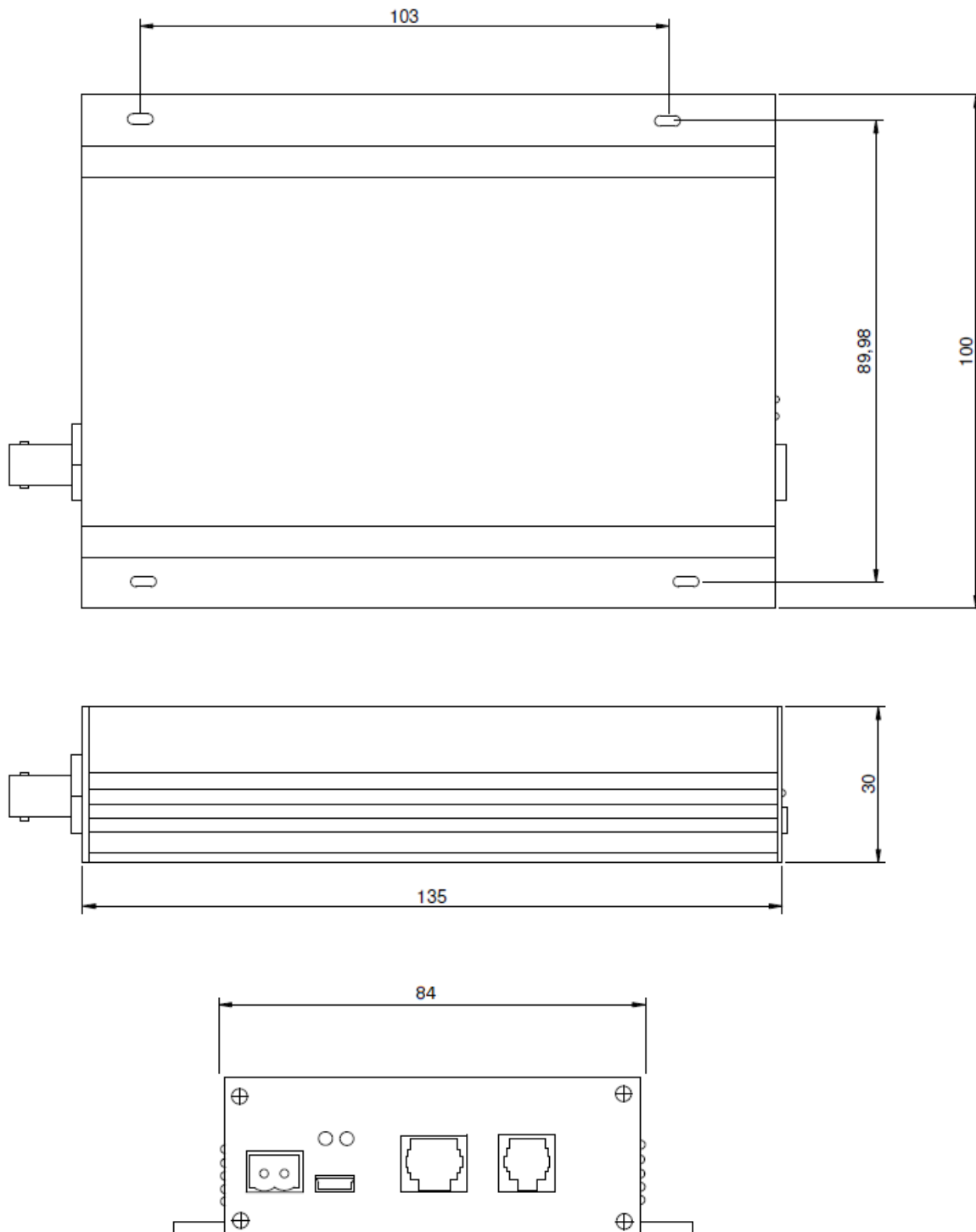
Pi	Connection
1	Ground
2	Interrupt
3	SCL
4	SDA
5	RS232 Tx
6	RS232 Rx

**Table 3: Pin connections for S10 (RJ45 Inputs/Outputs) connector**

Pin	Connection
1	PTT OUT, 50mA max
2	Ground
3	Discrete Input 4
4	Discrete Input 3
5	Discrete Input 2
6	Discrete Input 1
7	PTT Input for NRZ operation
8	Modulation Input for NRZ

## Physical Description

The 12-62 is installed in an extruded aluminum case with chassis holes for easy mounting. The following figure shows the dimensions of the 12-62 chassis and mounting holes.





## Installation

### Power Supply

The power supply is connected via PI, green power connector to +13.8 Volts DC and Ground. The unit is protected against reversed supply connections. The power source must be reasonably noise free.

Radiation Hazard: Important! To comply with FCC Controlled/Occupational Exposure Limits the aerial must be positioned or mounted to operate at least 0.26 metres away from Operational Staff and 0.57 metres away from the general public. Use only the aerial supplied.

### Antenna Installation

It is recommended to site the aerial 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 must be connected to the unit via the BNC connector on the end plate of the unit. The aerial connection should present a nominal load of  $50\Omega$ , with a VSWR of better than 1.8:1.

The Salcom unit 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.

### Powering-Up

External indicators consist of a power indicator GREEN LED, normally flashing ON once per second to indicate healthy microcontroller operation.

After a debounce delay, the green LED will flash rapidly if the low supply detector is activated. The RED LED will indicate when the unit is transmitting. A flashing RED LED indicates the unit cannot transmit as either the synthesiser is out of lock, the 12-62 is critically hot or an internal fault has been detected.

## Programming

### Preparing to Use the Programming Software

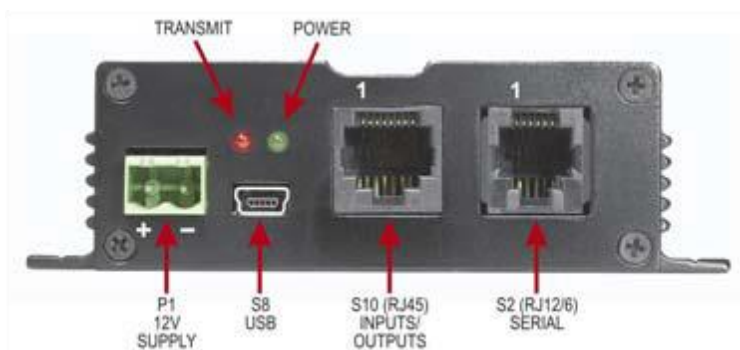
To change the field programmable options, the unit must be connected to a PC using Windows XP or later, running the 12-62 PSD programming software, downloadable from Salcom's website

<http://www.salcom.com/media/software/Salcom-1262-PSD-v2109.msi>

*Note: The 12-62 must be powered during programming with a nominal +13.8V to the power terminals.*

Connection should be via either the (preferred) USB port S8, using the supplied USB to USB mini cable, or the standard serial port S2 to a serial port on the PC i.e. DB9 connector.

When connected to your PC using the USB to USB mini cable a (virtual) com port will be created for that connection on your PC.



*Note: To use the USB connector with older computers, a virtual COM port USB driver may be required to be installed. To install the USB driver (CP210x\_VCP\_Win2K\_XP\_S2K3.exe), run the driver installer, which can be downloaded for your operating system, from Silicon Laboratories:*

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

*Note: If you do not have a serial cable you can make one with the S2 connections as shown in the section Connectors and Pin-outs in this document. Alternatively purchase a Salcom serial programming cable, part number 12-45-0000.*

*Note: Using the standard serial port S2 with a serial to USB cable will not work due to the high speed of the USB port in relation to the serial S2 connection of the 12-62.*

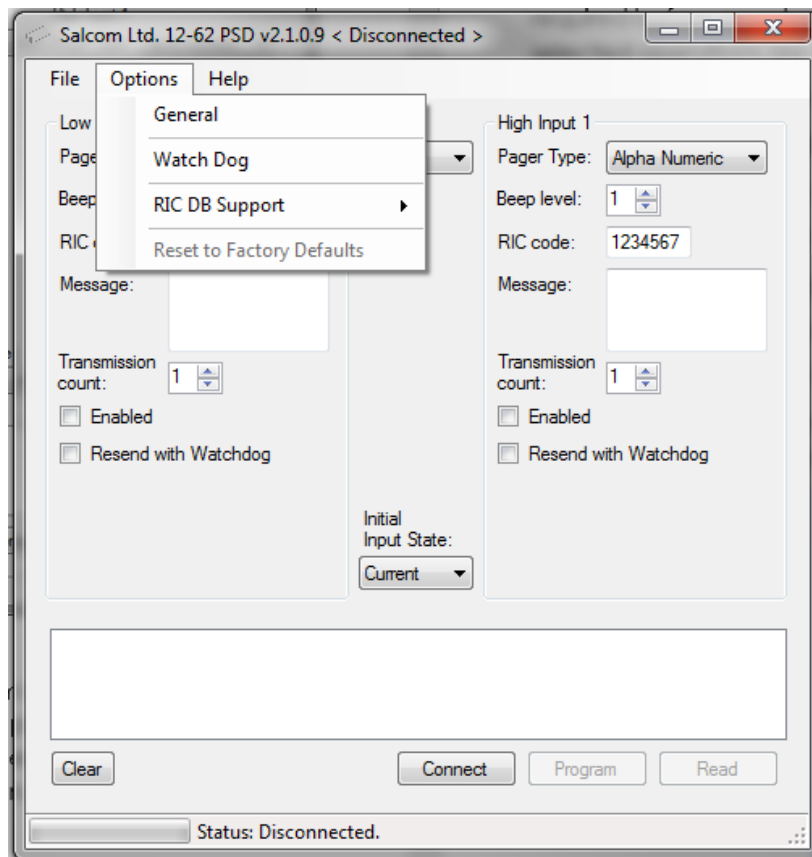
## Getting started with the Programming Software

Once correctly connected, load the 12-62 PSD programming software, this should bring up a screen as shown opposite:

This is the main screen from where you can change the settings of your 12-62, but before you can change any settings you need to connect your PC to your 12-62.

To connect your PC to your 12-62 select Options and then General this will load the General Settings screen, as below

Click on the Com Port dialog arrow to select the Com Port your 12-62 is connected to.

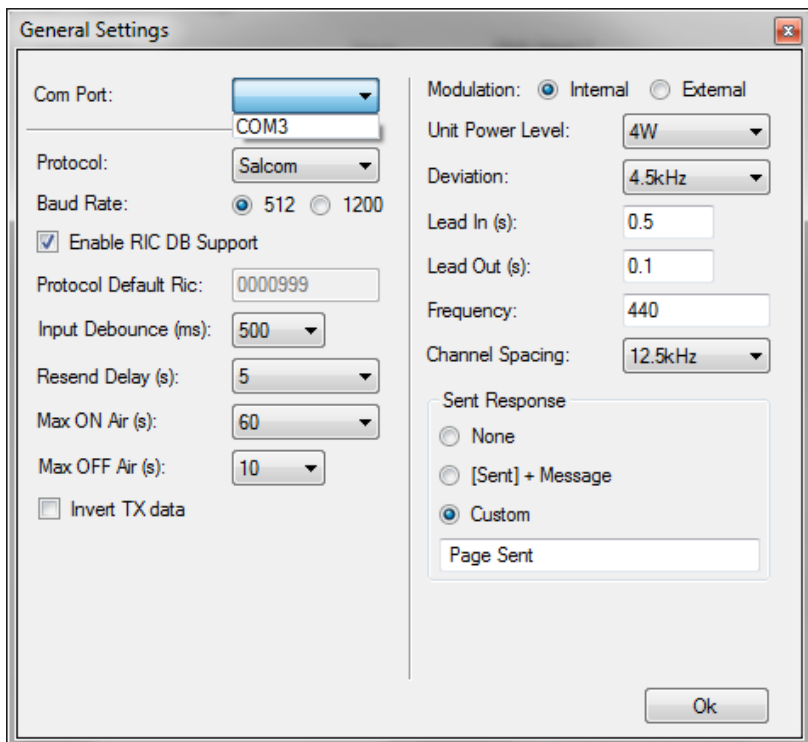


*Note: Ensure that the 12-62 PSD has the correct com port selected.*

Next select **“OK”** to return to the above screen. Press connect. The status at the bottom of the 12-62 PSD will indicate if successfully connected.

To get a valid set of parameters to start your programming configuration, either press the read button. This will load all settings of the 12-62.

Or alternatively load a PSD configuration file, by selecting the **“File->Load”** menu item and browsing and selecting a saved configuration.



Note: One of these actions is recommended before any changes can be programmed to ensure the unit is not programmed with the PSDs default values.

After programming the PSD will provide feedback if the user selected operations are successful.

## Using the Programming Software

The 12-62 PSD allows the user to configure the following characteristics:

- Input actions, watchdog, low supply detector and POCSAG transmission settings
- Pre-defined messages
- RF frequency and output power
- 1,000 pager numbers for use with the Salcom 12-36 telephone interface.

Use the mouse to select the configuration fields for each feature, which you want to change and then select 'Program' to update your 12-62's configuration.

Note: After programming the 12-62 you must select "**Disconnect**" for the changes to take affect and for the 12-62 to return to its normal operational state.

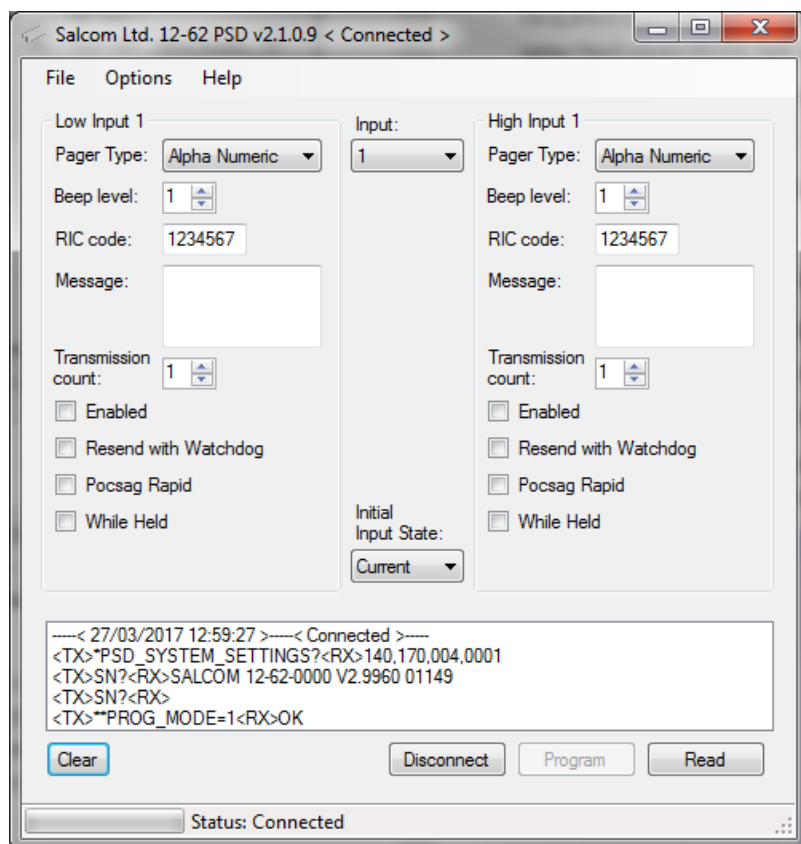
## PSD Input Configuration

**Low / High Input:** Define the action that is to occur when either a low or high input is activated.

**Input:** All inputs may be configured in a similar fashion, including supply voltage monitoring. The input drop down box provides support for the 4 inputs (Settings "1" to "4"), available on connector S10, and the "**Battery**".

Each input can have a message defined for both its high and low state. With the input parameters being configured as shown below:

The "**Battery**" input is used for setting a minimum and maximum battery voltage warning. See later under "**Min Batt v**" and "**Max Batt v**" for configuration.



**Pager type:** "Alpha Numeric" or "Numeric". Tone only pagers are supported by ensuring that the message field is left blank.

**Beep Level:** Page beep level having settings of "1" default to "4".

**RIC Code:** Pager ID. Valid Codes are:

Ranges
0000008 to 2007663
2007672 to 2045055
2045064 to 2097143

Default RIC code of "**1234567**"

*Note: 0000000 may be used as a "drop" code. This may be used for the watchdog when the watchdog is used, but a watchdog message is to be suppressed.*

**Message:** User message, up to 40 characters in length.

**Transmission Count:** How many times that message will be sent if triggered. Valid settings are "1" to "9" sends

**Enabled:** When selected, the configured message will be sent when triggered.

**Resend with Watchdog:** When "Resend with Watchdog" is selected, the input message will be sent periodically as configured.

*Note: See below, "PSD Configuring a Watchdog" below, for how to configure the Watchdog.*

**POCSAG Rapid:** When selected, "Pocsag Rapid" is used. Here the data size is minimised to significantly speed up transmission times.

*Note: "Pocsag Rapid" will not work with pagers.*

**While Held:** When the "While Held" option is selected, when the input is held in its selected trigger state (low or high), the message will be transmitted repeatedly until the input is no longer held.

Note: "Pocsag Rapid" together with "While Held" provides a means for a very responsive system when used with a receiver such as the 12-84.

Note: that in order to use "Pocsag Rapid" a compatible receiver must be used, such as the 12-84.

**Initial Input State:** Input messages are sent when transitioning to the enabled state.

If on start-up "**Current**" has been selected the current input state is read, so that the input message will not be sent on start-up.

If "**High**" is selected, the input is assumed to be high on startup, the transition to low resulting in a message being transmitted (if enabled, and the input is in the high state).

If "**Low**" is selected, the opposite will occur, the input is assumed to be low on startup, the transition to high resulting in a message being transmitted (if enabled, and the input is in the high state).

Default setting of "**Current**".

**Min Batt v:** Used to send, a user defined, a low battery warning message to a specified RIC code.

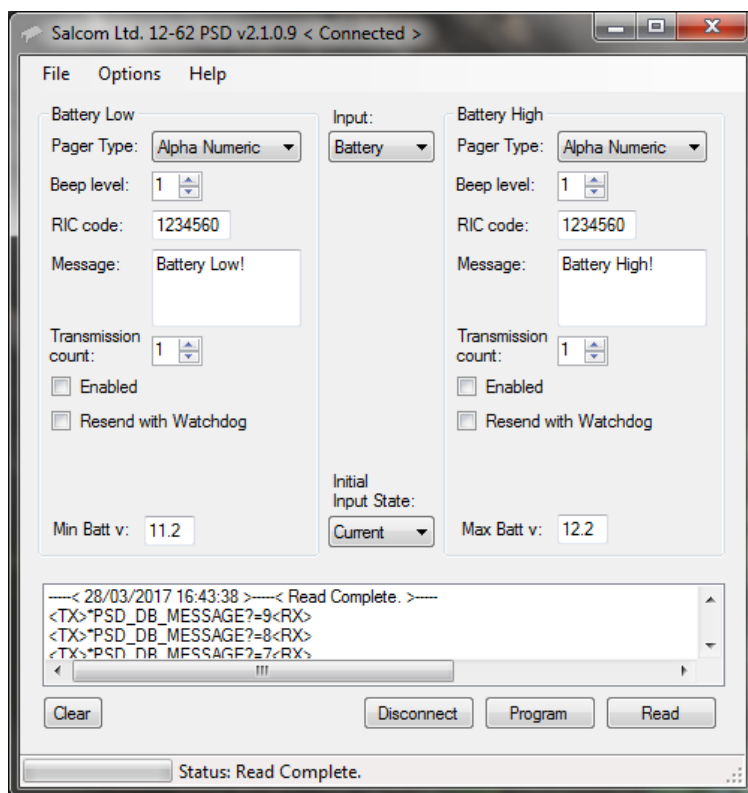
Volts	Description
10.0	Minimum Voltage
11.2	Default
13.0	Maximum Voltage
0.1	Step size

Default message of "**Battery Low!**"

**Max Batt v:** Used to send, a user defined, high battery warning message to a specified RIC code.

Volts	Description
Min Batt v + 0.2	Minimum Voltage
12.2	Default
13.0	Maximum Voltage
0.1	Step size

Default message of "**Battery High!**"



**Status Messages:** A display is provided to give status updates of connecting and programming the 12-62. This display can be cleared using the “**Clear**” button below it.

### PSD Configuring a Watchdog

To configure the Watchdog select “Options” and then “Watch Dog” for the Watch Dog screen as shown opposite to be displayed.

**Pager type:** “Alpha Numeric” or “Numeric”. Tone only pagers are supported by ensuring that the message field is left blank.

Default setting of “Alpha Numeric”.

**Beep Level:** Page beep level having settings of “1” default to “4”.

**RIC Code:** Pager ID. Valid Codes are:

Ranges
0000008 to 2007663
2007672 to 2045055
2045064 to 2097143

Default RIC code of “**1234567**”

*Note: 0000000 may be used as a “drop” code. This may be used for the watchdog when the watchdog is used, but a watchdog message is to be suppressed.*

**Message:** User message, up to 40 characters in length.

**Watch Dog Timeout:** Sets the time between Watchdog messages being sent

Setting	Description
0	No Watchdog
0.1	Minimum Frequency = 6s
1	Default
720	Maximum Frequency = 720mins (12hrs)

0.1

Step size = 6s

## PSD General Configuration

Selecting "**Options->General**" will display the general configuration screen as shown below. The items that may be set are described below.

**Com Port:** The Com Port through which the PC is connected to the 12-62, as described earlier.

**Protocol:** Allows the serial protocol to be changed, see later for available protocols.

**Baud Rate:** Changing this setting will result in all configured input messages to be transmitted at the selected baud rate. Available settings are "**512**" default or "**1200**" baud.

*Note: baud rate changes are not applied to serially generated Salcom protocol messages.*

**Enable RIC DB Support:** This enables 12-36 support, which will allow the Salcom 12-36-0000 telephone interface to be configured.

*Note: This feature only needs to be selected if you are using the Salcom 12-36-0000 Telephone Interface.*

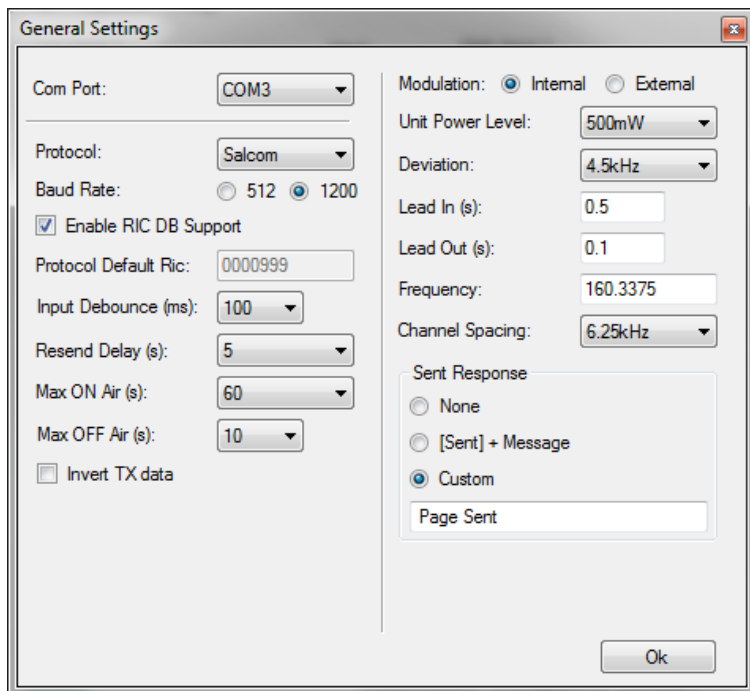
*Note: When enabled, the "**Preset Messages**" and "**RIC Database**" pages will be available under "**Options-> RIC DB support**".*

Default "**Not Selected**"

**Protocol Default RIC:** Only available with the ASCOM protocol.

*Note: This feature only needs to be selected if you are using ASCOM protocol.*

Default RIC code of "**0000999**"





**Input Debounce:** The time delay, in milliseconds (ms), between the input being triggered and the message being sent.

Setting	Description	Debounce Time
100	Minimum debounce time	100ms
500	Default	500ms
2000	Maximum debounce time	2000ms
100	Step size	100ms

**Resend Delay:** When an input has been configured with a transmission count greater than 1, the resend delay is the delay in seconds before sending the message again.

Setting	Range
0	Minimum
5	Default
30	Maximum
1	Step size

**Max ON Air:** When the 12-62 is transmitting, this setting controls how long the transmitter may be continuously on-air. When this period has been exceeded the transmitter ceases transmission and will remain off-air for the duration defined by the “**Max OFF Air**” setting. This setting has no effect when **External Modulation** has been selected.

Setting	Description
0	Disabled, no rest required.
1	Minimum duration before rest
60	Default
300	Maximum duration before a rest
1	Step size

**Max OFF Air:** When the 12-62 has exceeded the “**Max ON Air**” continuous transmission time, the “**Max OFF Air**” setting controls how long the transmitter will remain powered down before allowing transmission to continue.

Setting	Description
---------	-------------

0	Minimum duration before sending next message
10	Default
300	Maximum duration before sending next message
1	Step size

**Invert Tx data:** Internally generated data is inverted when "Invert Tx data" is selected and "Internal Modulation" is selected. The "Invert Tx data" option is unavailable when external modulation is selected.

Default "Not Selected"

**Modulation:** If external modulation has been selected then no serial or input controlled messages will be sent, data transmission is solely controlled by the PTT and Modulation inputs on connector P2. When internal modulation is selected then the PTT and modulation inputs do not serve any purpose.

Setting	Value
0	Internal (default)
1	External

**Unit Power Level:** The power level to transmit at.

Setting	Power Level
0	4W(default)
1	2W
2	1W
3	500mW
4	250mW
5	100mW
6	50mW

*Note: that the power will be reduced when the 12-62 exceeds 70 degrees Celsius.*

**Deviation:** How much the selected frequency deviates by when transmitting data.

Setting	Value
0	4.5KHz (default)
1	2.25KHz
2	<Custom>

*Note: the custom setting is not to be used unless the 12-62 has been factory set to support this option.*

**Lead In:** The lead-in defines, in seconds, how long the transmitter carrier will be present before data transmission commences.

Setting	Description
0.1	Minimum lead in time (s)
0.5	Default (s)
10.0	Maximum lead in time (s)
0.1	Step size (s)

**Lead Out:** The lead-out time controls how long, in seconds, the transmitter will remain on air after data transmission has finished.

Setting	Description
0.1	Minimum lead out time (s)
0.5	Default (s)
30.0	Maximum lead out time (s)
0.1	Step size (s)

**Frequency:** Configures the transmission frequency.

Frequency	Minimum	Maximum
VHF	138.0000	174.0000
UHF	427.5000	475.0000

*Note: The selected frequency must be evenly divisible by the channel spacing.*

**Channel Spacing:** Defines the frequency step resolution.

Settings
5kHz
6.25kHz
10kHz
12.5kHz (default)

*Note: To obtain a channel spacing of 25kHz, select 12.5kHz as multiples of the selected frequency also applies.*

**Sent Response:** Controls the serial response when a page has been transmitted. May be used to provide a controlling application with feedback that another message may be submitted for transmission.

Setting	Description
0	For no response
1	to send [SENT]+whole message
Custom	Any user defined response up to 40 characters in length. Default setting with message "Page Sent"

*Note: Selecting "1" will allow feedback to the user which message has been transmitted, but may introduce backwards compatibility problems with applications supporting other Salcom products.*

### PSD Reset Options

Selecting "**Options->Reset to Factory Defaults**" will allow the user to restore the 12-62 to its original factory state. This option will not affect any factory calibrated settings.

### PSD Configuration files

The current 12-62 configuration can be saved using "**File->Save**". Previously saved configuration files can be loaded and edited with, or without a 12-62 being connected.

## Using Serial Commands to Program your 12-62

### Serial Commands

The 12-62 can be controlled using serial commands this allows the control of the 12-62 from another device it also means a suitable terminal program can be used to send commands and receive the results from the 12-62 unit.

Commands are issued using the 9600 N:8:1 serial format.

*Note: The majority of commands are preceded by a single '\*', with some requiring two '\*\*' and SN? not requiring any asterisks. The following descriptions include the asterisks (\*) and carriage returns (<CR>) to aid clarity.*

*Note: Similar to programming, the 12-62 will be connected to a PC through a suitable Com Port. Follow the specific program's instructions for guidance on how to connect to the Com Port.*

### PSD Commands

PSD commands, allow any of the commands that are available through the PSD program to be actioned through a serial interface using serial commands.

- PSD\_INPUT\_L= (Set input message and settings – low)

- Format: **PSD\_INPUT\_L=a,b,c,d,e,ffggggggg h <message>**

Parameter	Descriptor	Valid Values
a	Input	1, 2, 3, 4 or 17 (Battery)
b	Enabled	0 (Disabled) or 1 (Enabled)
c	Resend with Watchdog	0 (Disabled) or 1 (Enabled)
d	No. Times Message Sent	1 to 9
e	Initial Input State	0 (low), 1 (high) or 2 (current)
ff	Pager Type	CA or ca for (Alpha Numeric) CN or cn for (Numeric)
gggggggg	RIC Code	0000008 to 2000000
h	Beep Level	1, 2, 3 or 4
<message>	Message to be sent	248 characters

Note: Using upper case CA or CN transmits the message at a baud rate of 512, whereas lower case ca or cn, transmits the message at 1,200 baud rate.

- Typical Usage:     **\*PSD\_INPUT\_L=1,1,0,1,2,CA1234567 2 Horse Down <CR>**  
  
                           **\*PSD\_INPUT\_L=1,1,0,0,2, <CR>** to set options without sending a message.
- Responses:         **OK** or **ERROR**
  
- PSD\_INPUT\_L?= (Get input message and settings – low)
  - Typical Usage:     **\*PSD\_INPUT\_L?=1 <CR>** (get message for input 1)
  - Typical Response:  **"1,0,1,2,CA1234567 2 Horse Down"** or **ERROR**.
  
- PSD\_INPUT\_H= (Set input message and settings – high)
  - Format:             **PSD\_INPUT\_H=a,b,c,d,e,ffggggggg h <message>**  
  
 Parameters as for Input Low.
  - Typical Usage:     **\*PSD\_INPUT\_H=1,1,0,1,2,CA1234567 2 Horse Down <CR>**  
  
**\*PSD\_INPUT\_H=1,1,0,0,2,** to set options without sending a message.
  - Responses:         **OK** or **ERROR**
  
- PSD\_INPUT\_H?= (Get input message and settings – high)
  - Typical Usage:     **\*PSD\_INPUT\_H?=1 <CR>** (get message for input 1)
  - Typical Response:  **"1,0,1,2,CA1234567 2 Horse Down"** or **ERROR**.
  
- PSD\_RAPID= (set which inputs will use POCSAG RAPID).
  - Format:             **PSD\_Rapid=a,b**

Parameter	Descriptor	Valid Values
a	3 digit decimal bitmap for low input states	000 to 015
b	3 digit decimal bitmap for high input states	000 to 015

Below is shown the decimal bitmap settings and how they affect the Inputs in terms of being Enabled or Disabled.

Decimal Setting	Input State			
	Input 1	Input 2	Input 3	Input 4
000	Disabled	Disabled	Disabled	Disabled
001	<b>Enabled</b>	Disabled	Disabled	Disabled
002	Disabled	<b>Enabled</b>	Disabled	Disabled
003	<b>Enabled</b>	<b>Enabled</b>	Disabled	Disabled
004	Disabled	Disabled	<b>Enabled</b>	Disabled
005	<b>Enabled</b>	Disabled	<b>Enabled</b>	Disabled
006	Disabled	<b>Enabled</b>	<b>Enabled</b>	Disabled
007	<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>	Disabled
008	Disabled	Disabled	Disabled	<b>Enabled</b>
009	<b>Enabled</b>	Disabled	Disabled	<b>Enabled</b>
010	Disabled	<b>Enabled</b>	Disabled	<b>Enabled</b>
011	<b>Enabled</b>	<b>Enabled</b>	Disabled	<b>Enabled</b>
012	Disabled	Disabled	<b>Enabled</b>	<b>Enabled</b>
013	<b>Enabled</b>	Disabled	<b>Enabled</b>	<b>Enabled</b>
014	Disabled	<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>
015	<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>	<b>Enabled</b>

- Typical Usage:        **\*PSD\_RAPID=000,000 <CR>**
- Responses:            **OK** or **ERROR**
  
- PSD\_RAPID? (Gets which inputs will use POCSAG RAPID).
  - Typical Usage:        **\*PSD\_RAPID? <CR>**
  - Typical Response:     **000,000**
  
- PSD\_WHILEHELD= (set which inputs will use the “while held” feature).
  - Format:                **PSD\_WHILEHELD=a,b**

Parameter	Descriptor	Valid Values
a	3 digit decimal bitmap for low input states	000 to 015
b	3 digit decimal bitmap for high input states	000 to 015

Note: See PSD\_RAPID for decimal bitmap settings and how they affect the inputs.

- Typical Usage: **\*PSD\_WHILEHELD=000,000 <CR>**
  - Responses: **OK** or **ERROR**
- PSD\_WHILEHELD? (Gets which inputs will use the “while held” feature).
    - Typical Usage: **\*PSD\_WHILEHELD? <CR>**
    - Typical Response: **000,000**

*Note: The same inputs in both the high and low state cannot be set at the same time – this will not be allowed by the firmware.*

- PSD\_MIN\_BATT\_V= (Min battery voltage threshold, voltage at which “Low battery” message will be sent if configured to do so).

Setting	Description
10.0	Minimum Voltage
11.2	Default
13.0	Maximum Voltage
0.1	Step size

- Typical usage: **\*PSD\_MIN\_BATT\_V=11.3 <CR>**
  - Responses: **OK** or **ERROR**
- PSD\_MIN\_BATT\_V? (Get min battery voltage)
    - Typical usage: **\*PSD\_MIN\_BATT\_V? <CR>**
    - Typical response: **11.2**



- PSD\_MAX\_BATT\_V= (Max battery voltage threshold, voltage at which “battery OK” message will be sent if configured to do so).

Setting	Description
Min Batt v + 0.2	Minimum Voltage
12.2	Default
13.0	Maximum Voltage
0.1	Step size

- Typical usage: **\*PSD\_MAX\_BATT\_V=11.3 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_MAX\_BATT\_V? (Get max battery voltage)
  - Typical usage: **\*PSD\_MAX\_BATT\_V? <CR>**
  - Typical response: **12.2**

## General Settings

- PSD\_PROTOCOL= (Set protocol)

Setting	Protocol
1	Salcom (Set to support 11-36)
2	TAP (PET)
3	Flex (Not a full implementation)
4	TNPP
5	12-84
6	SMS
7	Gaming
13	GENT
14	ESPA
16	11-10
18	Ascom
19	Austco

22	Match
26	GPS & Pulse Count

- Typical Usage: **\*PSD\_PROTOCOL=1 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_PROTOCOL? (Get protocol)

- Typical Usage: **\*PSD\_PROTOCOL? <CR>**
- Responses: **0,1,2,3,4,5,6,C,P** or **ERROR**

- PSD\_INPUT\_DEBOUNCE= (Set input debounce period in 100ms steps – max 9 min 0)

Setting	Description	Debounce Time
0	Minimum debounce time	100ms
9	Maximum debounce time	1000ms
1	Step size	100ms

- Typical Usage: **\*PSD\_INPUT\_DEBOUNCE=5 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_INPUT\_DEBOUNCE? (Get input debounce period)

- Usage: **\*PSD\_INPUT\_DEBOUNCE? <CR>**
- Responses: **5** or **ERROR**

- PSD\_DELAY\_RETRY= (How long in seconds before messages are resent)

Setting	Range
0	Minimum
30	Maximum
1	Step size

- Typical Usage: **\*PSD\_DELAY\_RETRY=5 <CR>**

- Responses: **OK** or **ERROR**

- PSD\_DELAY\_RETRY? (Get Delay Retry)

- Usage: **\*PSD\_DELAY\_RETRY? <CR>**
- Typical Response: **5**

- PSD\_MAX\_ON\_AIR= (Max time in seconds allowed on air before a rest is required, either for thermal or channel usage).

Setting	Description
0	Disabled, no rest required.
1	Minimum duration before rest
300	Maximum duration before a rest
1	Step size

- Typical Usage: **\*PSD\_MAX\_ON\_AIR=0 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_MAX\_ON\_AIR? (Get max on air time)

- Usage: **\*PSD\_MAX\_ON\_AIR? <CR>**
- Typical Response: **50**

- PSD\_MIN\_OFF\_AIR= (Min time in seconds off air before sending next message – Only used after max on time has expired).

Setting	Description
0	Minimum duration before sending next message
300	Maximum duration before sending next message
1	Step size

- Typical Usage: **\*PSD\_MIN\_OFF\_AIR=0 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_MIN\_OFF\_AIR? (Get min off air time)
  - Usage: **\*PSD\_MIN\_OFF\_AIR? <CR>**
  - Typical Response: **20**
  
- PSD\_INV\_TX= (Invert TX data line)
  - Typical Usage: **\*PSD\_INV\_TX=1 <CR>**
  - Responses: **OK** or **ERROR**
  
- PSD\_INV\_TX? (Get TX invert state)
  - Usage: **\*PSD\_INV\_TX? <CR>**
  - Responses: **1** or **0**
  
- PSD\_MODULATION= (Set Modulation Mode. 0 = Internal, 1 = External)

Setting	Value
0	Internal (default)
1	External

- Typical Usage: **\*PSD\_MODULATION=1 <CR>**
- Responses: **OK** or **ERROR**
  
- PSD\_MODULATION? (Get Modulation Mode. 0 = Internal, 1 = External)
  - Typical Usage: **\*PSD\_MODULATION? <CR>**
  - Responses: **0,1** or **ERROR**
  
- PSD\_PL= (Set Unit Power Level)

Setting	Power Level
0	4W(default)
1	2W

2	1W
3	500mW
4	250mW
5	100mW
6	50mW

- Typical Usage: **\*PSD\_PL=0 <CR>**
- Responses: **OK or ERROR**

- PSD\_PL? (Get Unit Power Level)

- Typical Usage: **\*PSD\_PL? <CR>**
- Responses: **0,1,2,3,4,5 or 6**

- PSD\_DEV\_MODE= (Set Deviation Mode – max 3 min 0)

Setting	Value
0	4.5KHz (default)
1	2.25KHz
2	<Custom>

*Note: The custom setting is not to be used unless the 12-62 has been factory set to support this option.*

- Typical Usage: **\*PSD\_DEV\_MODE=0 <CR>**
- Responses: **OK or ERROR**

- PSD\_DEV\_MODE? (Get Deviation Mode)

- Typical Usage: **\*PSD\_DEV\_MODE? <CR>**
- Typical Responses: **0,1,2,3 or ERROR**

- PSD\_LEAD\_IN= (transmitter lead in time in seconds before messages).

Setting	Description
0.1	Minimum lead in time
10.0	Maximum lead in time
0.1	Step size

- Typical Usage: **\*PSD\_LEAD\_IN=0.6 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_LEAD\_IN? (Get lead in time)

- Usage: **\*PSD\_LEAD\_IN? <CR>**
- Typical Response: **0.6**

- PSD\_LEAD\_OUT= (On time in seconds after sending a message).

Setting	Description
0.1	Minimum lead out time
30.0	Maximum lead out time
0.1	Step size

- Typical Usage: **\*PSD\_LEAD\_OUT=3.0 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_LEAD\_OUT? (Get transmitter lead out time)

- Usage: **\*PSD\_LEAD\_OUT? <CR>**
- Typical Response: **3.0**

- PSD\_F= (Configured Frequency and Channel Spacing).

- Format: **PSD\_F=a,b**

Parameter	Descriptor	Valid Values
a	Frequency	VHF = 13800000 to 17400000 UHF = 42750000 to 47500000

b	Channel Spacing	500, 625, 1000, 1250 (default) & 2500
---	-----------------	---------------------------------------

Note: Frequency and Channel Spacing is in 10s of Hz e.g. a Frequency setting of 13800000 = 138MHz and a Channel Spacing of 1250 = 12.5KHz.

Note: The selected frequency must be evenly divisible by the channel spacing.

- Typical Usage: **\*PSD\_F=44000000,1250 <CR>**

Note: If the Channel Spacing is not included, e.g. **\*PSD\_F=44000000<CR>** then the default channel spacing of 12.5kHz will be used.

- Responses: **OK** or **ERROR**

- PSD\_F? (Get configured frequency and channel spacing)

- Typical Usage: **\*PSD\_F? <CR>**
- Typical Response: **44000000,1250**

- PSD\_SENT\_RESPONSE= (Set serial port reply when a page has been sent – Max 40 characters, default value “Page Sent”)

Setting	Description
0	For no response
1	to send [SENT]+whole message
<custom>	Any user defined response up to 40 characters in length. Default setting with message “Page Sent”
Not set	Results in the default “Page Sent”

- Typical Usage: **\*PSD\_SENT\_RESPONSE=Page Sent <CR>**
- Responses: **OK** or **ERROR**

- PSD\_SENT\_RESPONSE? (Get page sent reply)

- Usage: **\*PSD\_SENT\_RESPONSE? <CR>**
- Typical Responses: **Page Sent** (default when not set)

**[SENT]CA1234567 2 test message (when set to 1)**

## Watchdog Settings

- PSD\_WDOG\_FREQ=(Set periodic watchdog timeout)

Setting	Description
0	No Watchdog
0.1	Maximum Frequency = 6s
1	Default
1440	Minimum Frequency = 1,440mins (24hrs)
0.1	Step size = 6s

- Typical Usage: **\*PSD\_WDOG\_FREQ=5 <CR>**
- Responses: **OK** or **ERROR**

Note: When programming through the 12-62 Programming tool, the minimum frequency is 720minutes (12hrs)

- PSD\_WDOG\_FREQ? (Get watchdog timeout)
  - Typical Usage: **\*PSD\_WDOG\_FREQ? <CR>**
  - Typical Response: **5**

- PSD\_WDOG\_MESSAGE=(Set periodic watchdog message)

- Format: **PSD\_WDOG\_MESSAGE=ffggggggg h <message>**
- 

Parameter	Descriptor	Valid Values
ff	Pager Type	CA (Alpha Numeric) or CN (Numeric)
ggggggg	RIC Code	0000008 to 2000000
h	Beep Level	1, 2, 3 or 4
<message>	Message to be sent	248 characters

- Typical Usage: **\*PSD\_WDOG\_MESSAGE=CA1234567 4 Watchdog <CR>**
- Responses: **OK** or **ERROR**



- PSD\_WDOG\_MESSAGE? (Get watchdog message)
  - Typical Usage: **\*PSD\_WDOG\_MESSAGE? <CR>**
  - Typical Responses: **CA1234567 4 Watchdog**

## Other Settings

- PSD\_FACTORY\_DEFAULTS (Set factory default PSD Settings)
  - Typical Usage: **\*PSD\_FACTORY\_DEFAULTS <CR>**
  - Responses: **OK or ERROR**

## Feature Settings

- PSD\_LOW\_POWER= (set low power options).
  - Format: **PSD\_LOW\_POWER=a,b**

Parameter	Descriptor	Valid Values
a	Low Power Mode	0 (Disable) or 1 (Enable)
b	Time until shutting down after external interrupt wakeup.	30 to 1800 seconds

  - Typical Usage: **\*PSD\_LOW\_POWER=1,267 <CR>**
  - Responses: **OK or ERROR**

- PSD\_LOW\_POWER? (get low power options).
  - Typical Usage: **\*PSD\_LOW\_POWER? <CR>**
  - Typical Response: **1,267**

- PSD\_STORE\_FWD= (Set store forward mode. Requires optional feature enabled.)

Setting	Descriptor
0	Disabled (default)

1	Source (One message transmitted at a time, powering down after each plus delay after each message to allow forwarding transmitter to resend)
2	Simplex (No messages queued from serial port when on air, preventing transmitted messages being sent back to itself)

- Typical Usage: **\*PSD\_STORE\_FWD=1 <CR>**
- Responses: **OK** or **ERROR**

- PSD\_STORE\_FWD? (Get store forward mode. Requires optional feature enabled.)

- Typical Usage: **\*PSD\_STORE\_FWD? <CR>**
- Responses: **0, 1** or **2**

- PSD\_DUP\_REJECT= (Set Duplicate reject. Requires optional feature enabled.) This maintains a list of the last 20 entries and compares each new entry added to the queue.

Setting	Descriptor
0	Disabled (default)
1-255	Time in seconds before aging out

- Typical Usage: **\*PSD\_DUP\_REJECT=25 <CR>**
- Response: **OK** or **ERROR**

- PSD\_DUP\_REJECT? (Get Duplicate reject. Requires optional feature enabled.)

- Typical Usage: **\*PSD\_DUP\_REJECT? <CR>**
- Typical Response: **25**

## General Control

- SN? (Obtain Serial Number String)

- Usage **SN? <CR>**  
Note: With SN? it does not need to be preceded by an '\*' asterisk.
- Typical Response: **SALCOM 12-62-0000 V1.05 00000001**

- PSD\_RESET (Reset Device)
  - Typical Usage: **\*PSD\_RESET <CR>**
  - Response: **SALCOM 12-62-0000 VX.XX**
  
- PSD\_SYSTEM\_SETTINGS? (Get All system settings)
  - Typical Usage: **\*PSD\_SYSTEM\_SETTINGS? <CR>**
  - Response Format: **a,b,c,d**

Parameter	Descriptor
a	Minimum frequency
b	Maximum frequency
c	Supported Inputs
d	Protocols Supported

- Typical Response: **425,475,4,1023** (min freq = 425MHz, max freq = 475MHz, max supported inputs = 4, all 10 protocols supported (protocol bitmap))
  
- PSD\_BAUDRATE= (Set 12-62 baud rate). Sets all RS232 port serial comms to this new baud rate. Takes effect after cycling power.
  - Format: **PSD\_BAUDRATE=aaaa,b,c,d**

Parameter	Descriptor	Valid Values
aaaa	Baud rate	9600, 4800, 2400, 1200
b	Parity	N = No parity; E = Even; O = Odd
c	Data bits	7 or 8
d	Stop bits	1 or 2

- Typical Usage: **\*PSD\_BAUDRATE=9600,N,8,1 <CR>**
- Typical Response: **New Baud rate – 9600,N,8,1 – Restart to take affect or ERROR**

Note: This baud rate change only affects the RS-232 port. The USB port is fixed at 9600,N,8,1.

Valid Settings	Baud Rate

9600	9600 no parity, 8 bits, 1 stop
9600,N,8,1	9600 no parity, 8 bits, 1 stop
9600,N,7,1	9600 no parity, 7 bits, 1 stop
9600,N,8,2	9600 no parity, 8 bits, 2 stop
9600,E,8,2	9600 even parity, 8 bits, 2 stop
9600,O,8,2	9600 odd parity, 8 bits, 2 stop

Note: If 9600 supplied on own then N,8,1 is assumed.

Note: Some invalid settings will be automatically changed to a valid setting, as below:

Invalid Setting	Changed To
BAUD,E,7,2	BAUD,N,7,2
BAUD,O,7,2	BAUD,N,7,2
BAUD,N,7,1	BAUD,O,7,1
BAUD,E,8,2	BAUD,N,8,2
BAUD,O,8,2	BAUD,N,8,2

- PSD\_BAUDRATE? (Get 12-62 baud rate)
  - Typical Usage:       \* **PSD\_BAUDRATE? <CR>**
  - Typical Responses: **9600,N,8,1**

## Product Feature - Messaging

### Overview

The 12-62 can transmit 3 types of POCSAG message, with any one of 4 function levels:

- Alphanumeric transmissions. Message can contain any alphanumeric 'ASCII' character.
- Numeric transmissions. Message contains only Numeric characters and some symbols.
- Tone Only transmissions (Alphanumeric or numeric with no message)

### Alphanumeric transmissions

Messages can contain any alphanumeric character. The 12-62 will accept the standard ASCII 7 bit character set.

### Numeric transmissions

Messages can contain numeric characters and some symbols.

These can convey a telephone number, or other numerically coded information.

The transmitted message is shorter, and therefore there is a smaller chance of errors received by the pager.

The numeric character set is as follows: **0 1 2 3 4 5 6 7 8 9 [ ] - U <space>**

### Tone Only transmissions

Any numeric or alphanumeric paging message without an actual text message is also considered 'Tone Only'. A function level will control the number of beeps on the receiver (four different function levels can be sent).

### Initiating Transmission

There are four ways of initiating a paging message transmission:

- (1) Using the external discrete inputs (action)
- (2) Supply detector threshold (action)
- (3) Watchdog (action)
- (4) RS232 Serial commands

An action is defined as a paging message, RIC (Receiver Identification Code or capcode) and flags. Flags are discussed in the PSD (product support disk) section.

### **External Discrete Inputs**

An action can be initiated from the 4 external inputs with an input transition to LOW (connection to GND) and/or HIGH (input floating or connection to >+3.5v).

### **Low supply message**

After a debounce period, the low-supply detector can initiate an action for both “supply going high” and “supply going low” conditions.

### **Watchdog**

The watchdog feature will initiate an action after a predetermined period. The watchdog also optionally allows the transmission of the current state of selected inputs (including supply level).

### **Using the RS232 Serial Commands**

Serial commands can be “manually” issued to a 12-62 using a terminal program such as PROCOMM or Hyper-terminal.

Tone only, numeric and alphanumeric pagers can be called using serial commands. These commands will be processed in parallel with other inputs actions for transmission.

## Product Feature – Store & forward

### Overview

The 12-62 can be configured to operate as a store & forward transmitter. This is when a transmitter is designated as a source, and a receiver listens to the source relaying the message to another transmitter for retransmission (usually located to allow coverage over an area that the source transmitter cannot reach).

### Enabling the Store & forward Options

- Using the command `*PSD_STORE_FWD=0` will disable any store & forward options.
- Using the command `*PSD_STORE_FWD=1` will configure the transmitter as a “Store and Forward Source”. This will ensure that only a single message is transmitted before powering the transmitter down again, then waiting a period of time to allow the forwarding transmitter sufficient time to relay the original message.
- Using the command `*PSD_STORE_FWD=2` will configure the transmitter in a store and forward “Simplex” mode of operation. When this option is set the transmitter will discard any messages received into the serial port while on air. This will prevent receiving any messages transmitted by itself. Note: The transmitter lead out delay should not be set to 0 in this configuration, a lead out delay of approximately 0.5 seconds should be sufficient.

In order for the 12-62 to operate as a store & forward working with a 12-84 the 12-62 must be configured to support the 12-84 protocol. If this is not done the PSD will not allow the 12-84 protocol to be set.

- Send the command `*SAL_SYSTEM_SETTINGS=425,475,004,0017` or `*SAL_SYSTEM_SETTINGS=140,170,004,0017` for a VHF system.
- Set the protocol to 12-84 using the PSD.

## Product Feature – Low Power Mode

### Overview

In Low Power Mode the 12-62 will consume approximately 17.5mA until the interrupt line INT4 goes low which will wake the 12-62 up into its normal standby state consuming 35mA.

Upon shutdown, the red led will briefly flash, and the message “Low Power Shutdown” is sent to the serial port.

### Serial Commands

The command PSD\_LOW\_POWER can be used to configure the enabled state of the low power mode, and how long the 12-62 will remain powered until shutting down again. During the shutdown timer period, further transitions to the INT4 line to a low state will reset the shutdown timer.

Refer to section “Using Serial Commands to Program your 12-62” for how to configure Low Power Mode.



## Product Feature – Duplicate Message Reject

### Overview

The 12-62 supports duplicate message reject if the feature has been enabled. When enabled a database of the last 20 messages sent is maintained. All of the entries are progressively aged out. The age out time of entries in the list can be set from 1-255 seconds.

If more messages are sent before the list has an available slot to add the new message to – the oldest message in the list will be removed, and the new message put in its place. If the age time is correctly set (to about 30 seconds) this is unlikely to happen.

### Enabling Duplicate Message Reject

The feature is enabled using the command

```
*PSD_DUP_REJECT=
```

Setting to 0 disables the feature. Setting to anything but 0 sets the age out time. A sensible age time for duplicate reject to work well (preventing ping ponging of messages between store & forward units) is about 30 seconds.

### Problems Arising from Duplicate Reject Usage.

Because there is a list of messages to search each time a message is added, as the list grows (as will occur in a busy system), when entries are about to age-out there is a small delay of up to 2ms while they are checked.

If messages are added in immediate succession (as in the case of stress testing the system – e.g. several messages added in the same serial command) the first character of the next message can sometimes be lost, and the message is not added to the queue.

Although there is very minor performance degradation, in a real system messages would be added separately with a delay between messages far greater than 2ms (in reality in a store & forward system this would generally be at least a second between messages).

## Product Feature – Simulcast Modulation Delay

### Overview

The 12-62, supports modulation delay and data inversion. This modulation delay, when enabled, allows the user to configure the transmission delay for modulated data. This delay can be configured to be between 10uS and 2550uS. When configuring transmitters to operate in a simulcast arrangement the delay between transmitters should be 3.3uS/km separation.

### Configuring.

1. Using the 12-62 PSD select the required Invert TX data option from the “General Settings” page.
2. Using the 12-62 PSD enable external modulation under “General Settings”.
3. Apply this configuration, then cycle power.
4. Connect to the 12-62 using a terminal program.
5. Issue the command “\*PSD\_MOD\_DELAY=N”, where N is the modulation delay in 10uS steps.

### Using Modulation Delay

- Modulation delay is only operative when modulation delay has been configured to be a non- zero value. This value must be set to be between 1 and 255.
- Modulation delay operates only when the external PTT input is driven low.
- Modulated data must be presented on the INPUT 1 pin, NOT the external modulated data pin.
- Modulated data presented on the INPUT 1 pin should be via an open collector output, or connected bypassing the input buffering.

**Warning: Applying data at 5V levels directly to INPUT 1 will result in asymmetrical modulation – do not do this!**

### 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.

### Limitations

- Min value 10uS, Max 2550uS
- Resolution is 10uS. Sampling is also only performed every 10uS. This means that when a modulation delay of 10uS is configured, the delay is no more than 10uS (but could be as

little as no delay). When 200uS is configured the delay will be no more than 200uS, but could be as little as 190uS.

## Product Feature – Over Temperature Cutout

### Overview

If the transmitter operates for extended periods in a hot environment, a protective thermal cutout 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 12-62 will not be restored until the transmitter has powered down, and the temperature has reduced below 75 degrees Celsius again.

If the 12-62 is being externally modulated and the temperature exceeds 85 degrees Celsius, the 12-62 is considered to be critically hot, and powers down.

When critically hot, no further messages queued for processing or transmission will be allowed until the 12-62 has reduced in temperature below 85 degrees Celsius. In addition, attempts to enable the 12-62 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 12-62 has become critically hot, then the 12-62 will not transmit again until the unit has dropped below 70 degrees Celsius.

### Notification When Over-Temperature

When the 12-62 is above 75 degrees, but not critically hot, there is no serial or visual indication that the 12-62 has reduced in power.

When the 12-62 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 12-62 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.

## Product Feature – Aerial Mismatch

### Overview

The aerial mismatch feature of the 12-62, 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 must be first enabled using the command:

```
PSD_MISMATCH_CONFIG=E,TTT
```

where:

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

TTT is the tolerance (decimal value between 0 and 255). The default value is 50, which should yield good results in most cases e.g. PSD\_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 12-62 responds with "OK"
4. 12-62 will auto calibrate on next transmission.
5. Test by transmitting a message (probably CA1234560 1 test depending on protocol used). The 12-62 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 the output such as

```
390-415 : 874-762
ER19 RF_LEVEL
```

will be produced. In the example above 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) and since this is above 50 an error is produced.

In very rare cases a mismatched aerial may not be detected. This is because depending upon the length of the coaxial cable the impedance presented (varying with frequency and power setting) may appear 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 PSD\_MISMATCH\_CONFIG command.

## Guidelines – Assignment of RIC Codes

### General

The following recommendations apply with greatest effect when the POCSAG transmitter is capable of batched messaging (such as the 12-62 and the 11-62).

POCSAG transmission can be optimised on RIC code allocation. If a system is struggling for air time, then consider this carefully:

POCSAG messages when batched are sent in the following manner. Note in the example below the message is deliberately started in the 4th frame (8 frames in a batch)

S-II-II-II-AD-DD-DD-DD-II-S

Where:

- Codeword is a 32 bit data stream.
- S=Sync Codeword (a 32 bit specially assigned number).
- I=IDLE Codeword (a 32 bit specially assigned number).
- A=ADDRESS codeword (holds the RIC code).
- D=DATA codeword (holds the actual message).
- Frame = 2 codewords.

Note: After the 576 bit preamble, the SYNC codeword is sent every 17 codewords, and at the end of transmission all 16 codewords between SYNCs are transmitted, regardless how small the payload is (all empty codewords are marked as IDLE).

### The Important Stuff

The position that the address and data starts in depends on the last 3 bits of the RIC code.

Take the RIC code eg. 1234567, use a tool like the windows calculator to convert to binary. Only look at the last 3 digits in the answer. 1234567 = 111. 111 binary = 7 decimal, add one to this and this will give you the frame position.

If a RIC code is placed in frame 8, then only a single character can be sent before the message overflows into the next batch.

Message "Hi" to RIC code 1234567  
S-II-II-II-II-II-II-AD-S-DD-II-II-II-II-II-II-S

Message "1" to RIC code 1234567  
S-II-II-II-II-II-II-AD-S

As you can see the available throughput on the channel is immediately halved.

If the RIC code of 1234566 is used:

12-62-0000 VHF & UHF TRANSMITTER

Product Manual

Message "Hi" to RIC code 1234566  
S-II-II-II-II-II-AD-DD-S

Message "1" to RIC code 1234566  
S-II-II-II-II-II-AD-II-S

Approximately 6 character of message can fit into a frame (without the ADDRESS), with the ADDRESS only a single character.

### **Assigning Multiple RIC codes to a Pager**

If you have the need to assign an additional RIC code to a pager, try to make additional RIC codes fit into the same frame as the other RIC codes assigned to that pager. The pager wakes up only during its allotted frame period to check if there is a message for it, so RIC codes in different frames will result in the pager waking up more often depleting the battery much faster.

### **Using Pagers on a Busy Network**

A pager will wake up when a preamble is detected, so regardless of RIC code, if there are lots of preambles being heard (like on the Telecom network), the battery life of the pager will be reduced. You can extend battery life by using a quieter channel.

### **Summary**

If you wish to have good system performance (twice as good) and you are sending lots of batched messages, then select a RIC code that preferably falls within the first 3 frames. In Frame 3 there is room for about a 40-character message before overflowing into the next batch.

If you are using a tone only pager, then the RIC code has negligible effect, they are all just as good.

If you are using a numeric pager, use a RIC code that does not fall into frame 8, all others will be fine.

If transmitter is under-utilised, or does not support batching, then the RIC code doesn't really matter.



## Guidelines - 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 0.5 wave, is connected to the unit via the BNC connector on the end plate of the unit. The aerial connection should present a nominal load of 50Ω, with a VSWR of better than 1.8:1. Other options such as folded dipoles, collinear and 0.25 with suitable ground plane are also suitable. A high quality aerial installation will provide the user with performance and reliability.

*Note: The Salcom unit 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.*

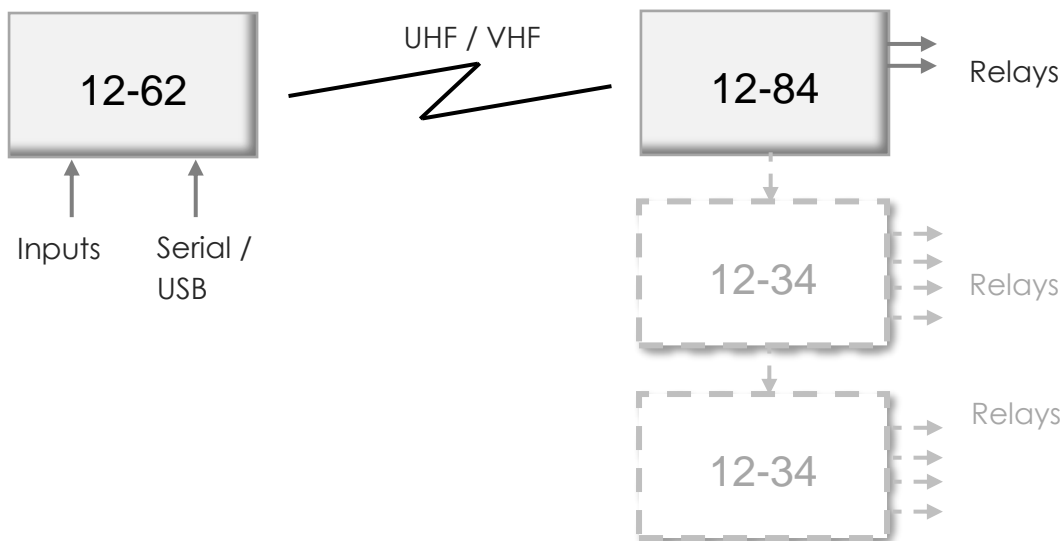
### Recommended aerial suppliers:

Region	Supplier
New Zealand	Hi-Tec Aerials NZ Ltd <a href="http://www.hi-tec-aerials.co.nz/">http://www.hi-tec-aerials.co.nz/</a>  Pacific Aerials Ltd <a href="http://www.pacificaerials.co.nz/">http://www.pacificaerials.co.nz/</a>
Australia	RFI Wireless <a href="http://www.rfiwireless.com.au/">http://www.rfiwireless.com.au/</a>
UK / Europe	Procom (antennaPRO Ltd) <a href="http://www.procomuk.co.uk/">http://www.procomuk.co.uk/</a>
North America	??

## System Solutions

### System Overview

The 12-62 / 12-84 / (12-34) combination can send signals for remote machinery control with additional outputs by adding 12-34(s).



### Typical Uses

Using the 12-84 Relay Receiver, devices can be controlled remotely by sending commands from a 12-62 transmitter to switch relays on or off. It has two built-in relays and two open collector outputs.

Where a greater number of relays are required to control additional devices, this can be achieved using the Salcom 12-34 Relay Output Module, which provides another four relays. This module can be "daisy-chained" to allow any number of relays to be controlled.

### System Components



#### 12-62-0000 VHF / UHF Transmitter

12-62 transmitters are available as VHF or UHF, with user-programmable power outputs from 50mW to 4W. The 12-62 is capable of operating as NRZ or POCSAG and has 4 discrete inputs.



#### 12-84-7000 VHF/UHF Relay Output Receiver

The 12-84-7000 is a scalable, high sensitivity paging receiver with serial connectivity and 4 controllable outputs.

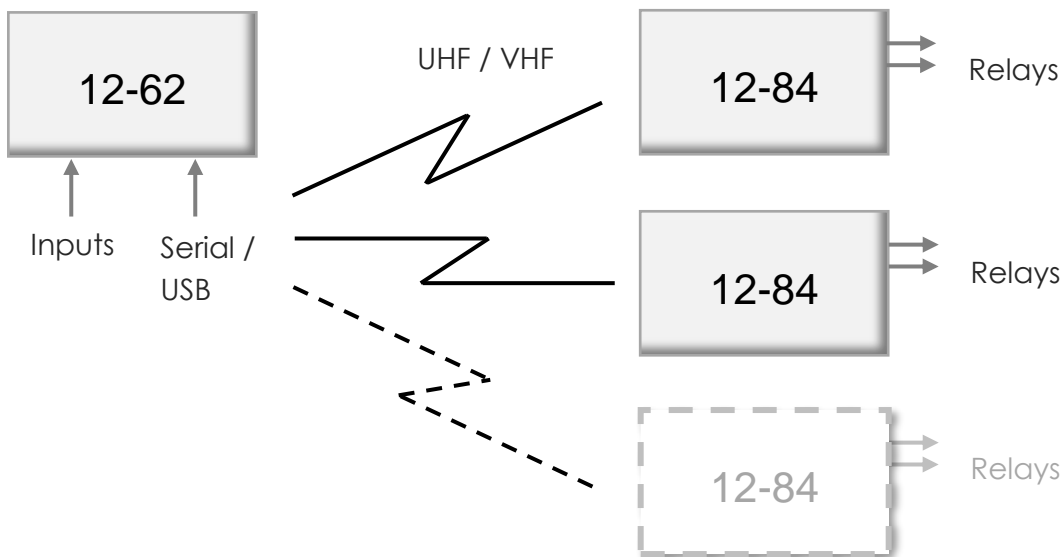


#### 12-34-0000 Relay Output Expansion Module

The 12-34 is a low-cost relay output module which enables four relays to be remotely controlled using the Salcom relay control protocol.

### System Overview

The 12-62 / 12-84(s) combination can send signals to multiple sites to control remote machinery. Sites can receive a unique or common command signal.



### Typical Uses

Using the 12-84 Relay Receiver, devices can be controlled remotely by sending commands from a 12-62 transmitter to switch relays on or off. It has two built-in relays two open collector outputs.

Where multiple sites need to be controlled, more than one 12-84 can be used on the network. The 12-84 sites can be programmed to follow a specific signal from the 12-62. The signal can be programmed to be unique to a site or common with one or more other sites.

### System Components



#### 12-62-0000 VHF / UHF Transmitter

12-62 transmitters are available as VHF or UHF, with user-programmable power outputs from 50mW to 4W. The 12-62 is capable of operating as NRZ or POCSAG and has 4 discrete inputs.

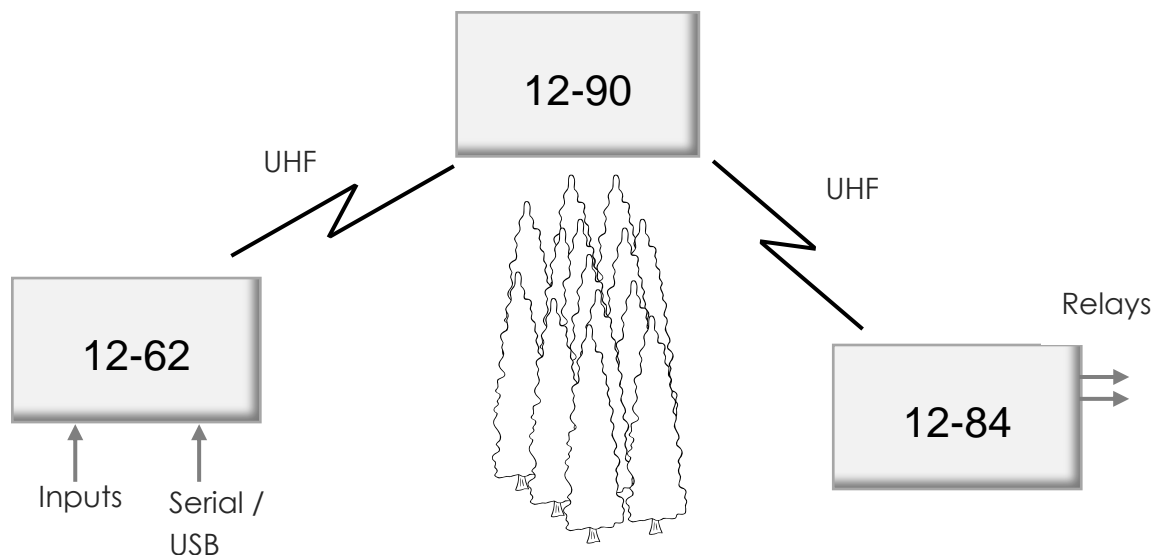


#### 12-84-7000 VHF/UHF Relay Output Receiver

The 12-84-7000 is a scalable, high sensitivity paging receiver with serial connectivity and 4 controllable outputs.

## System Overview

The 12-62 / 12-90 / 12-84 solution using a 12-90 to get around obstructions such as trees, buildings etc.



## Typical Uses

Where there are obstructions, the 12-90 can be used to get around these obstructions with its transceiver/repeater capabilities. It can receive a 12-62 message and forward this to a 12-84.

Using the 12-84 Relay Receiver, devices can be controlled remotely by sending commands from a 12-62 transmitter to switch relays on or off. It has two built-in relays and two open collector outputs.

## System Components



### 12-62-0000 VHF / UHF Transmitter

12-62 transmitters are available as VHF or UHF, with user-programmable power outputs from 50 mW to 4W. The 12-62 is capable of operating as NRZ or POCSAG and has 4 discrete inputs.



### 12-90-0000 UHF Transceiver and Repeater

The 12-90 is a UHF transceiver, with a power output of up to 80mW. It can decode and encode 512 or 1200 baud, alphanumeric or numeric messages.



### 12-84-7000 VHF/UHF Relay Output Receiver

The 12-84-7000 is a scalable, high sensitivity paging receiver with serial connectivity and 4 controllable outputs.

## Protocols – Overview

The 12-62 supports several protocols including the primary protocols listed below.

### Protocols Supported

- Salcom
- TAP (PET)
- TNPP
- ESPA 4.4.4
- Ascom
- Gaming
- Austco
- Match
- Gent
- GPS and Pulse Count
- SMS
- Scope
- Comp1
- Comp2
- 11-10
- 11-36/12-36 Messaging
- 12-84 Receiver

These protocols can be selected either through the programming tool (PSD) or through the use of serial commands.

*Note: Apart from the Salcom Protocol it is currently necessary to get your protocol unlocked prior to shipping from Salcom. Please talk to us regarding your protocol needs and we will be happy to assist.*

### Protocol Descriptions

**Salcom** protocol is designed to optimise the control of Salcom products. The protocol is designed to provide a simple way to integrate Salcom product together in order to quickly achieve a solution implementation

**Telelocator 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 Telelocator 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 Telelocator Network Paging Protocol (TNPP). A group of connected paging terminals, running TNPP, will send, route and receive pages among the group.

**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** protocol allows your Salcom product to communicate and be integrated with the Ascom range of products and other third party devices that use the Ascom 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** protocol provides a method to monitor gaming machines and allow gaming machines, or their users, to be serviced with cash, drinks or action alarms. The 12-62 can concurrently manage repeating messages from 40 gaming machines.

**Austco** protocol allows your Salcom product to communicate and be integrated with the Austco range of products and other third party devices that use the Austco 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 when enabled replies when a defined message is seen. If there is an application to send a paging message when the serial string "TEST MESSAGE" is seen, then the "Match" protocol can be used. The matching "TEST MESSAGE" should be at the beginning of a received message. An incoming message is considered to be at the "start" if the previous message has been carriage return terminated, or there is a period of serial inactivity of at least 50mS. The protocol can also be configured so that a "Match Any" mode can be used allowing any arriving serial string to be paged out. A match on the end of the message can also be set, or configured so that the end of the message is not checked.

**Gent** is Honeywell's protocol that allows their fire system components to communicate with each other. The protocol is designed to be open to allow flexibility in the choice of products, such as the 12-62, that can be integrated in to their solutions.

**GPS and Pulse Count** protocol is used for irrigation equipment transmitters. The protocol allows the 12-62 to be connected to a GPS receiver. \$GPGGA GPS messages are stored by the 12-62, so when required the position can be transmitted as a paging message.

**SMS** protocol is different from an industry standard protocol, like PET/TAP or TNPP, because it is a scripted protocol which allows total control over all aspects of code and communication. The scripted protocol is GEN 1.0.4

**Scope Protocol** allows the SALCOM transmitter to be interfaced to Scope Communications paging encoders and panels. The serial command contains the RIC/CAP code, message type, level and message information and, when using a 12-62's with v2.9938 or higher, the baud rate. The maximum message length is 30 characters.

Format is [Message Type][Baud Rate][RIC Code][Level]Message<CR>

**COMP1** allows non-paging protocol formatted ASCII strings to be sent as paging messages to contacts in the RIC 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 synchronised 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 are non-verbose so don't 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.*

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

**11-36/12-36 Messaging** protocol allows the 12-62 can be connected to the SALCOM 11-36, or 12-36, Telephone Interface to allow the user to connect via a phone and initiate numeric calls or pre-programmed alphanumeric calls.

*Note: The 11-36/12-36 messaging protocol is selected by choosing the "Salcom" protocol, which supports this protocol.*

**12-84 Protocol** is used by the POCESAG Receiver which outputs a serial string which can be decoded directly by the 12-62, usually for use as a Paging Store and Forward. The 12-84 protocol can also support a similar formatted string from the Daviscomm POCESAG or Flex receivers.

*Note: The Daviscomm format is not added as a separate protocol as the 2 protocols need to be support concurrently, each being fed in a different serial port.*





## Trouble Shooting

The following table may help in problem solving where necessary.

Fault	Check
No illumination of Green LED	Bad power supply connection
Input activated but no transmission	Software configuration incorrect
Unit transmits but nothing received	Poor aerial Wrong frequency Incorrect RIC Incorrect baud-rate Power too low Unit too hot ( <i>the unit will also send out an error via the serial port</i> ) Too much vibration
No RS232 serial communication	Incorrect COM port connection selected Software configuration incorrect Cable faulty
Unit starts, but does not complete transmission	Poor supply voltage RF interference ( <i>the unit will also report an error on the terminal port</i> )

## Glossary

Definition
<b>ASCII:</b> Acronym for "American standard code for information interchange," a method of representing upper and lower letters in addition to numbers and special symbols.
<b>BNC connector:</b> A miniature quick connect/disconnect radio frequency connector used for coaxial cable.
<b>Debounce:</b> A time delay between an input being triggered and an action taking place. A programmable debounce delay can be added to allow an input signal to settle before it is used.
<b>Duty cycle:</b> A measure of the fraction of one transmission period the transmitter is transmitting a signal. Duty cycle is commonly expressed as a percentage or a ratio.
<b>NRZ (Non-return-to-zero):</b> Refers to a form of digital data transmission in which the binary low and high states, represented by numerals 0 and 1, are transmitted by specific and constant DC (direct-current) voltages.
<b>POCSAG:</b> A standard set of code and signaling formats for radio paging. The POCSAG standard, provides for transmission speed of up to 2,400 bps, using channels of 25 kHz in the 150.
<b>RS-232:</b> A standard for serial communication transmission of data.
<b>Universal Serial Bus (USB):</b> A common interface that enables communication between devices and a host controller such as a personal computer (PC).
<b>Telelocator Alphanumeric Protocol (TAP):</b> 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 was initially known as Motorola Page Entry (PET).
<b>VSWR (Voltage Standing Wave Ratio):</b> is a measure of how efficiently radio-frequency power is transmitted from a power source, through a transmission line, into a load (for example, from a power amplifier through a transmission line, to an antenna).
<b>Watchdog (timer):</b> An electronic timer that is used to detect and recover from embedded system malfunctions.

## Accessories and Related Products

Name	Description	Part Number
Serial Programming Lead	An RJ-12 (12-62 connection) to DB9 (computer connection) RS232 (serial) Programming Lead for use with the 12-62, 12-84 and 12-32.	12-45-0000
USB Programming Lead	USB Mini (12-62 connection) to USB (computer connection) programming lead for use with 12-62.	Supplied with product.
Programming Tool	Salcom 1262 PSD configuration tool, downloadable from <a href="http://www.salcom.com/products/tele/12-62-0000-vhf-uhf-transmitter">http://www.salcom.com/products/tele/12-62-0000-vhf-uhf-transmitter</a>	Website download
Terminal Screw Block	Terminal screw block for the external power supply source.	Supplied with product.
RJ45 Single Ended Cable	An RJ45 cable to allow the connection of the external serial source.	Supplied with product.

## Technical Specification

<b>Technical Specification</b>	
<b>12-62-0000 – VHF / UHF Transmitter</b>	
Frequency Range	148 - 164MHz - VHF (Model No. 12-62-0150) 427.5 - 475MHz - UHF (Model No. 12-62-0450)
Frequency Selection	User configurable
Power Supply	+13.8V typical (11 to 15 VDC range)
Power Consumption	Low Power Mode: 17.5mA Standby: 40mA Transmit: 1.2A @ 4W
Transmit Power	4W, 2W, 1W, 500mW, 250mW, 100mW, 50mW (5W on request)
Channel Spacing	5kHz, 6.25kHz, 10kHz, 12.5kHz, 25kHz
Modulation	FSK with NRZ data
Deviation	±2.25kHz or ±4.5kHz
Transmit Duty Cycle	50%; Maximum 5 minutes on time
Baud Rates	512, 1200
Message Format	POCSAG
Configuration Application	12-62 PSD
Programming Cable	Mini USB 12-45-0000 (RJ12 to DB9) Can be used with a USB to RS232 DB9 Serial Adapter Cable
Serial Port	9600 , N, 8, 1; RS232 / USB Other serial protocols available on request
Serial Protocols	Salcom; TAP (PET); TNPP; ESPA 4.4.4; Ascom; Gaming; Austco; Match; Gent; GPS & Pulse Count; SMS; Scope; Comp1; Comp2; 11-10; 12-36; 12-84
Discrete Inputs	4 (Ground activated)
Other I/O	PTT In; PTT Out (50mA max); External Modulation (0 - 5V ±1V)
Connectors	Serial Port (RS232) = RJ12 (6P6C) Input / Outputs = RJ45 (8C) Programming = mini USB
Power Connector	2-way plug & socket, screw connections (supplied)
Environmental Protection	Not suitable for outdoor use and 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 - Rapid Flashing = Low Supply Voltage Status LED (Red) - On = Transmitting - Flashing = Error Condition
Weight	316g
Enclosure Dimensions	100mm x 130mm x 30mm (WxDxH)



Enclosure Material	Extruded aluminium
Colour	Matt black
Type Approvals	AS/NZS 4769.1:2000 + Amendment 1:2002 (RF) EN 300-224-2 (RF) FCC CFR47 Part 90 (RF) - UHF only (Model No. 12-62-0450) EN 301 489-2 V2.1.0 (EMC) EN 60950-1:2006 (Safety)

## How to Contact Us

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