salcom

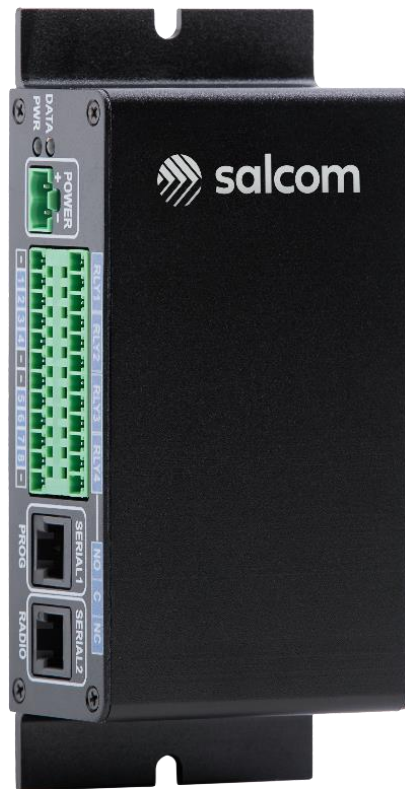# 20-03
Input-Output Expander

PRODUCT MANUAL

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 unauthorised 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

Overview

The 20-03 module is an input- output expander which consists of 4 onboard relays and 8 combined I/O pins. It is a scalable device as it can be daisy chained with other 20-03 modules to provide more relays and I/O s for a variety of applications. Outputs on any unit may be activated by inputs on any other unit in the serial chain as it is forward and backward compatible for messages.

Devices like 20-90 low power transceiver, or 20-62 transmitter, can be connected to the 20-03 I/O expander to allow an additional number of inputs and outputs without any configuration changes. In addition to a radio device, 20-03's can be connected to PC serial port to send and receive messages. Relays and I/O in the 20-03 can be controlled by sending Salcom protocol, or any configured ASCII character, messages.

Applications, when used with a suitable radio or Ethernet device, include:

- *I/O Expansion for Salcom radio products*
- *Remote alarm applications; low tank level, mains failure, door open etc*
- *Flexible output activation*
- *Control over Ethernet (RS-232 to Ethernet adaptor required)*
- *Simple telecontrol solutions; lights, barrier arms, doors, sirens etc*
- *Bi-directional, point-to-point control over serial or radio link*
- *Input and output interface for PC's, PLC's, and microcontrollers*

Key Features

- **I/O expansion:** *Any number of 20-03 modules can be daisy-chained together to expand the number of I/O and relays to meet current and future requirements. The 20-03 can be also used as I/O expander with a 20-90 transceiver or a 20-62 transmitter.*

- **Serial ports:** *The 20-03 has two serial ports for communications. Serial 1 can be specifically used for programming the module and Serial 2 is for communicating with other modules.*

- **Relays and open drain outputs:** *The 20-03 provides four clean-contact SPDT relay outputs (N.C and N.O contacts), and eight open drain outputs which can be configured as 5mA low current limit or 500mA high current limit with resettable fuses.*

- **Input triggered messages:** *The 20-03 provides up to eight inputs which can trigger message events. Messages may be triggering at power up, on the rising or falling edges with programmable de-bounce delay, or a using periodic timer (watchdog). Messages may be repeated several times with a programmable retry delay.*

- **Acknowledgement messages:** *An acknowledgement message can be triggered when an output has been activated by receipt of a valid message. Note: An acknowledgment is not sent if there is an overcurrent fault on the output.*

- **Salcom protocols and parsing:** *In addition to using Salcom message protocols, any configured pattern of ASCII command can be matched to provide output functions.*

- **Sacoto configuration tool:** *Salcom configuration tool, Sacoto, provides full configuration of 20-03 functions via a serial port.*

- **Watchdog messages:** *Used to send regular messages to confirm the unit is functional. Input states can be set to be sent with a watchdog message.*

- **Output mono-shot timing:** *An output can be programmed to remain closed for a pre-set time after it gets activated and will automatically open after that time. If the mono-shot time is set to zero, the output will remain closed until it receives a message to open it again.*

- **Serial pass through:** *The 20-03 can pass unaltered messages between connected 20-03 modules by controlling upstream and downstream pass-through directions of external, or internal, messages. The messages can be sent from Serial 1 to Serial 2, and vice-versa, if both directions of serial passthrough are enabled.*

Connectors and Indicators

The figure below shows the 20-03 connectors and indicators.
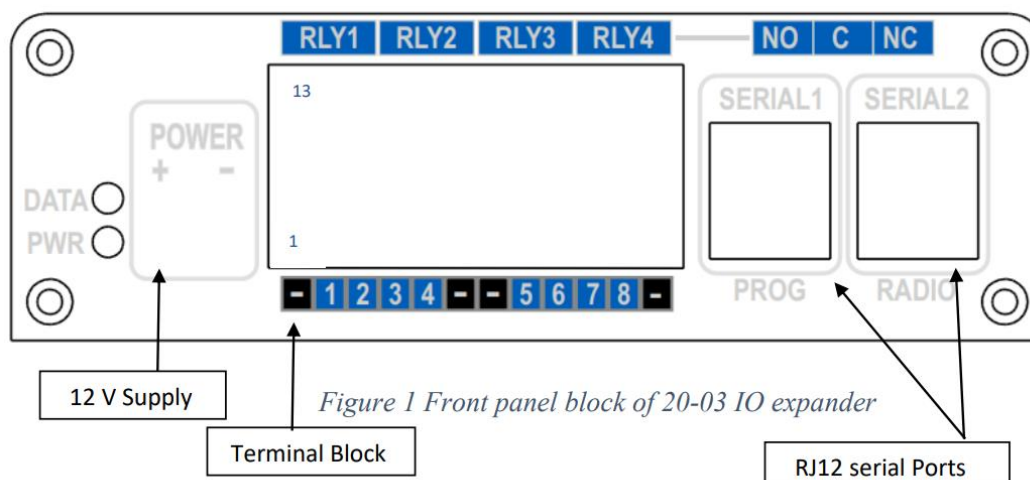
Figure 1 Front panel block of 20-03 IO expander

12 V Supply

Terminal Block

RJ12 serial Ports

Item	Description
1	12V Supply, 2-way pluggable terminal block, 5.08mm pitch
2	Data LED: Red LED, On= Active serial data, Flashing= Programming mode
3	Power LED: Green LED, Slow blink= OK, Fast= error
4	Connector terminal block R/A PCB double row, 12 x 2 way
5	Serial 1: Serial port, RJ12 (6P6C)
6	Serial 2: Serial port, RJ12 (6P6C)

Table 1 Connectors and Indicators (L-R)

The 20-03 has two serial ports and a twelve-by-two terminal block for relays and I/O connections. Pins 1to12 indicate the bottom row, and 13 to 24 are the top row, numbering from left to right. Pin 1 is on lower-left side when viewed from the front (as shown above).

Pin	Connection
1	Ground
2	Not connected
3	Not connected
4	Not connected
5	Serial 1: TX out Serial 2: RX in
6	Serial 1: RX in Serial 2: TX out

Table 2 Serial Connectors (RJ12)

Pin	Connection
1	Ground
2	I/O 1
3	I/O 2
4	I/O 3
5	I/O 4
6	Ground
7	Ground
8	I/O 5
9	I/O 6
10	I/O 7
11	I/O 8
12	Ground
13	Relay 1 - Normally open contact
14	Relay 1 - Common contact
15	Relay 1 - Normally closed
16	Relay 2 - Normally open contact
17	Relay 2 - Common contact
18	Relay 2 - Normally closed contact
19	Relay 3 - Normally open contact
20	Relay 3 - Common contact
21	Relay 3 - Normally closed
22	Relay 4 - Normally open
23	Relay 4 - Common contact
24	Relay 4 - Normally closed

Table 3 Terminal Block (12 pin, double row)

Physical dimensions

The 20-03 is housed in an extruded aluminium case with a mounting flange and screw slots. A dimensioned drawing is provided below.
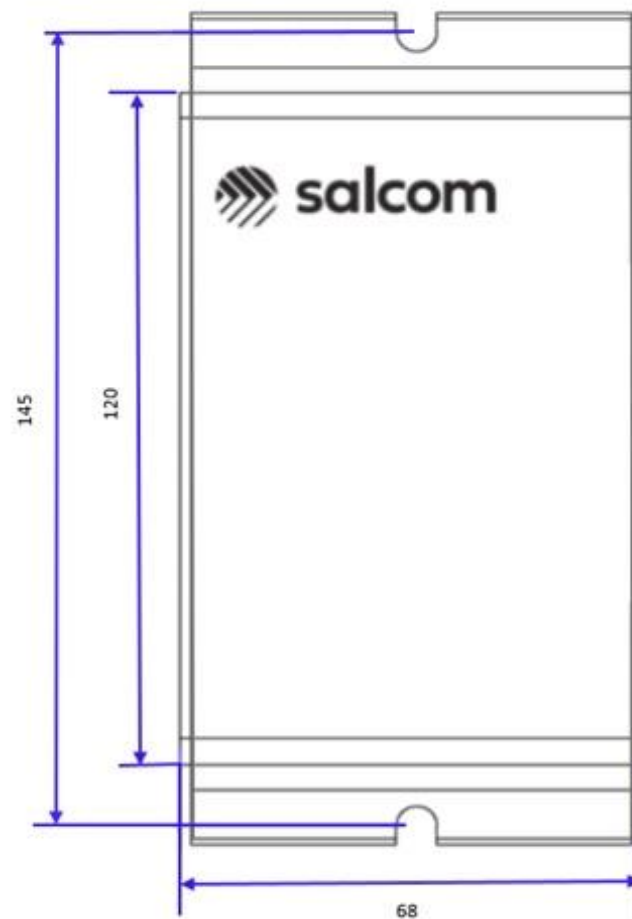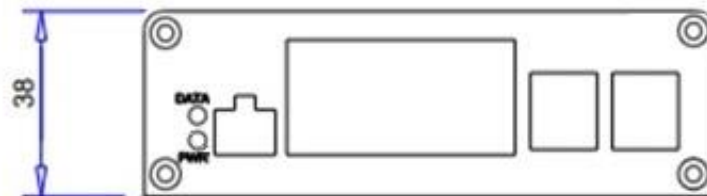
CAP codes

CAP codes in the 20-03 are used by the inputs to correctly format an outgoing message for a Salcom 20-62 Transmitter or 20-90 Transceiver. The 20-90 serial output for a received message can be formatted in Salcom protocol so will contain a CAP code.

Every paging message contains a CAP code (Channel Access Protocol) which is normally identifies the pager to which the message is addressed. The CAP code can also be known as a RIC (Radio Identity Code). CAP codes may be unique to a specific pager or shared by several pagers within a group.

A pager may respond to multiple CAP codes and may respond differently to each one. Multiple pagers may respond to the same CAP code (a broadcast to a group) in addition to having a CAP code which is unique to that pager. Ranges of CAP codes may be assigned different purposes.

CAP code ranges may be used to identify the message type; Numeric, Alphanumeric or tone messages. Ranges may also be used to filter messages by network, group, or for other purposes.

CAP code filter

The 20-03 provides up to eight CAP code ranges and will decode messages that are within one or more of these ranges (inclusive). The default CAP code range is 0000008 to 2000000.

The ranges may be programmed in any order and may overlap. Alternately, a CAP code range can be limited to just one CAP code by setting the Low and High codes identically.

You can enable or disable specific CAP code range rules as required by using the parsing option in the Sacoto configuration tool, this is explained in Parsing section.

Triggering outputs

Outputs can be actioned by the reception of CAP codes with a range even if they do not contain relay protocol commands in the message. This can be used to provide decode detection for off-air monitoring of traffic volumes.

Outputs can be triggered to send acknowledgement messages including special function messages such as watchdog messages.

When used with a mono-shot timer to monitor a remote watchdog, the opening transition may be used to trigger an alert message.

The same range of CAP code can be used repeatedly to trigger multiple output or special functions.

Salcom Protocol

Salcom Message protocol, or simply Salcom protocol, can be used to send and receive messages over serial ports or to control relays and IOs in the 20-03.
The basic format for Salcom protocol is shown below:

PPXXXXXXX[SP]**L**[SP]**MMMMMM<CR>**

- **PP** *denotes the message type and Baud rate*

  "CA" sends 512 Baud Alphanumeric messages
  "CN" sends 512 Baud Numeric messages

  "ca" sends 1200 Baud Alphanumeric messages
  "cn" sends 1200 Baud Numeric messages

  "Ca" sends 2400 Baud Alphanumeric messages
  "Cn" sends 2400 Baud Numeric messages

- **XXXXXXX** *is the 7-digit CAP code, or RIC number.*
  This must be seven-digits, use leading zeroes if required.

- **[SP]** *is a space character (ASCII character 32h)*

- **L** *is the function code (priority or "beep" level) from 1 to 4*
  Note: Salcom protocol uses 1 – 4; some other protocols use 0 – 3

- **[SP]** *is a space character (ASCII character 32h)*

- **MMMMM** *is the message (up to 240 characters)*

- **<CR>** *is a carriage return character (Enter key or ASCII character 0Dh).*

Messages may only contain readable ASCII characters from 20h to 7Eh. Do not include control characters or special characters.

Examples of Salcom message protocol

Alpha numeric messages
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>

Numeric messages
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>

Tone only paging
Usage: CN<pager#><space><level><space><CR>
Description: Call pager with beeper only (no message) using one of four alert
*   tone options <level>*
Example: CN1119358 1 <CR>
Response: CN11193581<CR><SPACE>Page Sent<CR><LF>

Salcom Relay control Protocol

Salcom Relay Control Protocol (or Relay protocol) can be used at a receiver to control relays, action other outputs, trigger acknowledgement messages or activate special functions of 20-03.

Although a relay protocol string can be sent as an alphanumeric message, numeric messages are shorter and therefore more efficient to transmit. The receiver must be configured to the correct message type to operate.

A relay protocol command is addressed to specific 20-03's using a Unit ID which can control up to eight outputs. A single unit can use multiple unit IDs enabling it to address more than eight outputs or activate special functions.

The unit ID should not be a number that regularly appears anywhere in your typical messages where it may be followed by more digits to avoid the likelihood of false commands.

Relay protocol command format is

UUC...C0N..N9S

UU   **Unit ID**
   This must be 2 digits from 00 - 99.
C   **Outputs to Close**
   Multiple outputs may be specified, from 1 to 8 in sequential order.
0   **End of Closed Outputs**
   "0" terminates the list of outputs to close. This character in mandatory.
N   **Outputs to Open**
   Multiple outputs may be specified, from 1 to 8 in sequential order.
9   **End of Open Outputs**
   "9" terminates the list of outputs to open. This terminating digit is required to consider this as a valid control string.
S   **Optional Checksum**
   If the checksum is enabled, the modulo-10 sum of relay protocol digits, including the checksum digit, must sum to 0 to be considered a valid command.

The relay control string can be embedded anywhere within the message e.g., "CLOSE RELAY ONE 16109", however the first two digits of any relay control string must match the Unit ID of the 20-03 receiving it. Multiple relay control strings can be contained in one message, each addressing a different unit ID.

Examples of Relay protocol

01109	*Turn output 1 ON in 20-03 with Unit ID 01*
01019	*Turn output 1 OFF in 20-03 with Unit ID 01*
0112309	*Turn output 1, 2 and 3 ON in 20-03 with Unit ID 01*
011029	*Turn output 1 ON and output 2 OFF in 20-03 with Unit ID 01*
14109 16209	*Turn output 1 ON in 20-03 with Unit ID 14 and turn output 2 ON in 20-03 with Unit ID 16*
251234567809	*Turn ON outputs 1, 2, 3, 4 ,5 ,6 ,7 and 8 in 20-03 with Unit ID 25*

Relay protocol can be used to control relays when it is imbedded anywhere inside a serial string.

Another form of controlling the relays is by using parsing, explained later in this document, which allows specific text messages to control relays without using Relay protocol.

Parsing rules can be configured to verify the CAP code in a received message and only action if the CAP is valid allowing the same control message to be used with different outputs by sending it with different CAP code.

Relay Protocol mapping

The 20-03 uses four Unit IDs starting at the base ID as specified in the **System > Relay Protocol Tab in** *Sacoto configuration tool. Unit ID and output mapping is shown below.*

Base ID + 0
The upper row of 12 x 2 terminal block of 20-03 corresponds to the four relays and the Unit ID for triggering these using relay protocol command is Base ID+0.

If base ID is set to 0, relays are addressed to Unit ID, which is Base ID + 0= 00.

I/O channel	Relay	Close Function	Relay protocol	Open Function	Relay protocol
0	*Relay 1*	*Close relay 1*	*00109*	*Open relay 1*	*00019*
1	*Relay 2*	*Close relay 2*	*00209*	*Open relay 2*	*00029*
2	*Relay 3*	*Close relay 3*	*00309*	*Open relay 3*	*00039*
3	*Relay 4*	*Close relay 4*	*00409*	*Open relay 4*	*00049*

Table 4 Relay protocol example for relays with Base ID 00

Base ID + 1
The bottom row of the 12 x 2 terminal block is connected to the I/O channels and the Unit ID for activating these inputs using a relay protocol command is Base ID+1.

e.g., If the base ID set to 0, the I/O channels are Base ID+1 = 01.

I/O channel	Output	Close Function	Relay protocol	Open Function	Relay protocol
8	1	Close input 1	01109	Open input 1	01019
9	2	Close input 2	01209	Open input 2	01029
10	3	Close input 3	01309	Open input 3	01039
11	4	Close input 4	01409	Open input 4	01049
12	5	Close input 5	01509	Open input 5	01059
13	6	Close input 6	01609	Open input 6	01069
14	7	Close input 7	01709	Open input 7	01079
15	8	Close input 8	01809	Open input 8	01089

Table 5 Relay protocol example for I/O with Base ID 01

Base ID + 2
This base ID increment is not used

Base ID + 3
This ID is used to trigger special functions in 20-03. Unit ID for triggering the special functions using relay protocol command is Base ID+3.

If base ID is set to 0, Unit Id for special functions will be Base ID+3 = 03.

I/O Channel	Output	Close function	Relay Protocol
29	6	Reset	03609
31	8	Watchdog	03809

Special Functions

The 20-03 supports two "special functions" which are activated by relay protocol or POCSAG messages within CAP code range (when using parsing) and uses Unit Base ID + 3. It is configured to close output channels 29 and 31 on the receipt of configured message. In the following examples, Base ID is configured as 00 (default), thus Unit ID is Base ID+3, or 03.

Reset: 03609

This function stops any current actions and resets the 20-03. Any messages configured to transmit at power up will be transmitted following the reset. A confirmation response is sent to Serial port 1 after a reset gives the firmware version.

> *Message received: CA1234567 1 Reset 20-03 03609*
> *Unit response: *SALCOM 20-03-0000 V0.02 REL Rev.D*

Trigger Watchdog: 03809

This function can be used to force a watchdog response between regular watchdog events or to trigger the watchdog when the timer is not set (watchdog repeat time = 0). Regardless of whether the watchdog timer is operating or not, any messages that are configured to be sent with the watchdog timer will be transmitted, including any inputs configured as "with watchdog" and the watchdog message (if enabled). This function may be used to check if a unit is operating (message only), or to read back the state of inputs that have been configured to be sent with the watchdog.

> *Watchdog: Enabled*
> *Watchdog message: 512A 1234567 1 Watchdog Test*
> *Received message: A1234560 1 Trigger watchdog 03809*
> *Transmitted message: CA1234567 1 Watchdog Test*

*Firmware version number and release variant subject to change.

Input and Output Operation

The 20-03 has four Relay outputs and eight combined I/O pins. These operate as follows:

- *20-03 Inputs and Outputs are typically active low.*
- *The low state is referred to as "Closed" referring to a closed switch to ground, or an active open-drain output pulling the I/O pin to ground.*
- *An energized relay is referred to as "Closed" (the normally open contact is closed).*
- *When an open-drain output is "Open" (inactive) an internal pull up resistor allows the I/O pin to be configured as an input.*
- *An external switch can pull the I/O pin to ground triggering a message. A message may also be transmitted when the switch is opened.*

Inputs
- *The 20-03 always monitors the state of each I/O pin.*
- *The 20-03 can be configured to transmit messages to a downstream unit; 20-62 transmitter, 20-90 transceiver or another 20-03 module, when an I/O pin changes state.*
- *Separate messages can be defined for open and closed states. Transmission of either, or both, messages may be enabled or disabled.*
- *The message corresponding to the input state may be transmitted at start-up (defined by the "At powerup" flag for each input), or with a regular "watch dog" timer.*
- *Since inputs and outputs are combined on the same pin, changes to an output can be monitored and acknowledged by configuring the input messages for the I/O pin. This can also detect if the output protection or current limits have been activated.*
- *Input messages can be defined for I/O channels which are not physically implemented. These can be triggered by the relay protocol or a range of CAP codes as a form of acknowledgement without changing the state of any physical I/O pins.*

Outputs

- *Each output can be activated using Salcom Relay Protocol commands embedded in received message, or by any ASCII commands received over the serial ports.*
- *Messages received must be within a programmed CAP code range of a connected receiver to activate outputs.*
- *Outputs can be programmed to trigger an associated input when they are activated for sending confirmation messages.*
- *Each output can be disabled to ensure that received messages can not affect the input.*
- *An output may be configured with a "Mono-shot" timer to automatically open after a specified time.*
- *The Relay protocol may be used activate "virtual" outputs which are not physically implemented but are used to trigger special functions within the 20-03.*

Relay operation

- *Relays are controlled by matching a character pattern within a CAP range (when using parsing) or by a correctly configured Salcom relay control protocol message received as ASCII characters.*
- *A 20-03 can detect relay protocol messages with a valid unit ID, e.g., 'Door open 00109', embedded anywhere in the received string.*
- *Outputs can also be controlled by pre-defined messages (using parsing) which do not contain Relay protocol.*
- *Any message with a non-valid Unit ID is passed serially to be processed by the next module in the system.*
- *The relays will automatically open after the mono-shot time expires if this has been set.*
- *Outputs with mono-shot times set to zero will remain closed until it receives a message to open it again.*

Getting Started

Power up

Power is connected to the 2-way pluggable terminal block 'power' connector on the front panel with the polarity as shown. Nominal supply voltage is 13.8V DC but can be between 10.8V and 15V. The power source must be reasonably noise free. The 20-03 is protected against reversed polarity.

When powered up the GREEN power indicator will flash once per second to indicate normal operation. A rapid GREEN flash indicates a low battery voltage.
The RED indicator will flash slowly for two seconds at power up if there is a problem and an error message will be sent to Serial port 1.

Serial connections

The 20-03 module has two RJ-12 serial connectors (used with the Salcom 12-45 RJ-12 to DB-9 adaptor) which provide RS-232 serial at 9600 baud, 8, N,1. They are used for message transmissions, programming, monitoring and provide a cross-over connection allowing several 20-03s to be daisy-chained together to expand the number of inputs and outputs as required. The RADIO serial port can be connected directly to a 20-90 transceiver to provide extra relays and I/O s and with 20-62 transmitter to provide additional inputs.
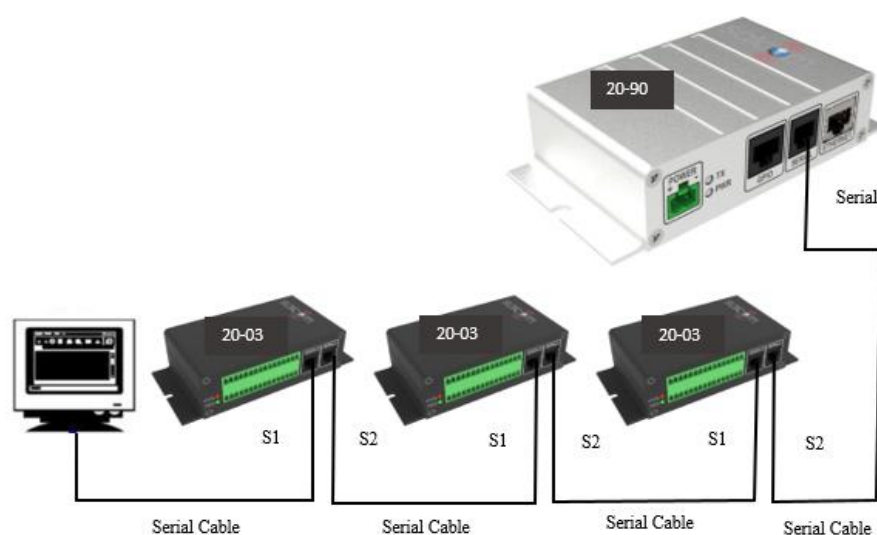
Multiple 20-03 s connected to 20-90 Transceiver

Figure 1 Serial connections of 20-03

Sacoto Configuration Tool

Sacoto (Salcom-configuration-tool) is Salcom's configuration software. A copy of the Serial command set is available on request for systems that need to change configuration independently of the Sacoto software.

All features of the 20-03 can be configured using the Salcom "Sacoto" configuration tool including baud rate, output configuration, input triggered messages, and system settings.

Installation

The latest version of Sacoto can be downloaded from the Salcom website from the 20-90 product page. Unzip the downloaded file and run setup_Sacoto_n.n.n.exe where n.n.n denotes the version of Sacoto. Please check our website at www.salcom.com for the latest version.

Connecting Sacoto to 20-03

The 20-03 can be connected to a PC via the Serial 1 programming port using a serial cable and a Salcom 12-45 adaptor to be configured using Sacoto. The module must be powered on for configuration.
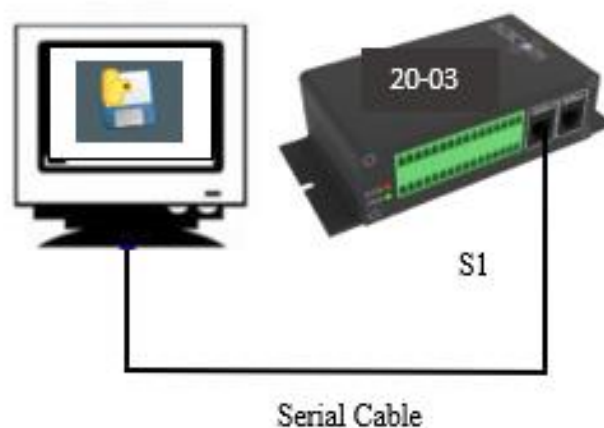

Figure 2 Connecting Sacoto to 20-03

Welcome to Sacoto!

When first run, there is an option to read a Getting Started guide if you need an introduction about how to use Sacoto.
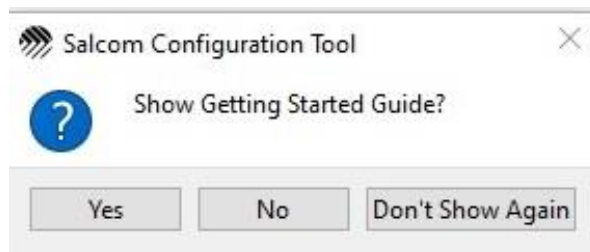

Figure 3 Sacoto getting started guide

The main screen of Sacoto shows various icons and menu. The first step is configuring Sacoto to program the 20-03.
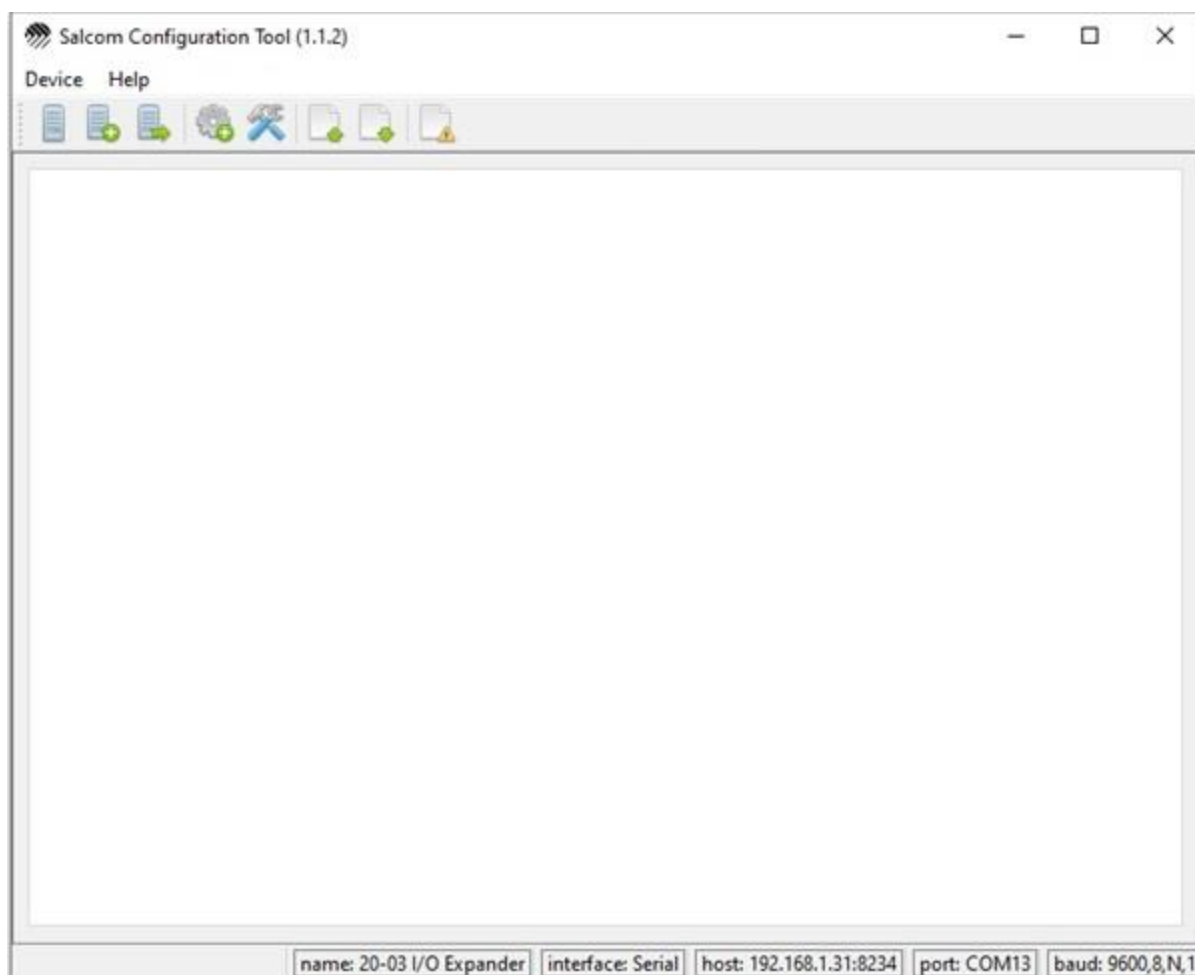

Figure 4 Sacoto opening window

Device menu

Reading, writing and setup functions can be accessed from the "Device" menu.
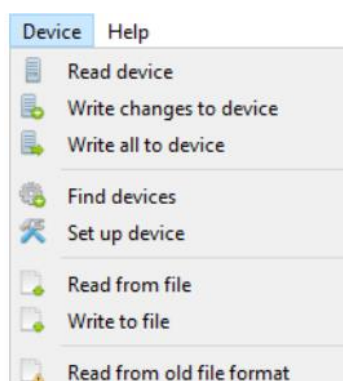

Figure 5 Sacoto device menu

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

*For setting up the device connection, choose "**Device -> Set up Device**" from the menu or click the "device settings" icon to open the setup window. The connection settings are effective immediately and you can close this window any time. **There is no OK button**.*

Serial port Settings

For a physical RS-232 port on a PC, or a third-party USB-to-Serial adaptor, set Sacoto as follows:

- *Device: 20-03 I/O Expander*
- *Unit Id: Enter the Unit id of device*
  Note: Unit id 96 to read first module
- *Interface: Serial (Ethernet connection is not available on this device)*
- *Serial port: Identify the COM port associated with your serial connection and select*
- *Other settings are unchanged*

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

Configuring 20-03 using Sacoto

Read the configuration
The initial configuration must first be read from the 20-03 or from a file saved on disk; Sacoto does not start with a default configuration. This may then be modified as required and written back to the 20-03.
*Select "**Device -> Read device**" from the menu or click the icon to read the current configuration.*

Configuration Tabs

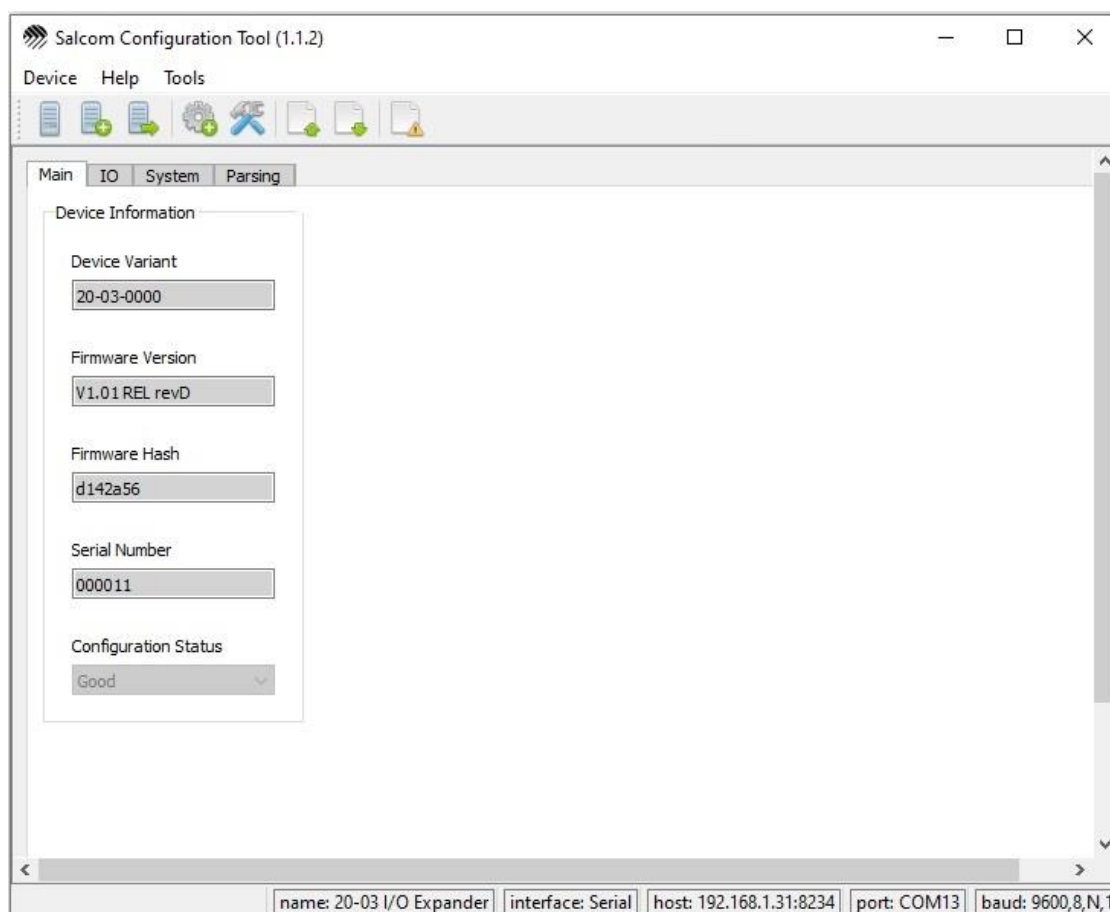*Tabs along the top provide configuration options for the various 20-03 features:*

Figure 6 Configuration Tab of Sacoto

Main:	*Information panel*
IO > inputs:	*Enable Inputs, input messages, input options*
IO > Outputs:	*Relay protocol triggered outputs, current limits, mono-shot delays*
System:	*Watchdog messages, relay protocol settings and mapping, serial passthrough*
Parsing:	*Enable or disable patten matching rule, set up patterns of messages*

Some of the tabs may change with later versions of Sacoto but the basics will remain the same. Refer to Sacoto Help for updated descriptions.

Writing the configurations

Write changes

*Select "**Device->Write Changes**" from the menu or click the icon to write only the fields which have been changed since the last read or write. This is much quicker than writing everything. If a field was changed it will be highlighted in yellow and any tabs with fields that have been changed will also be highlighted in yellow.*
If the configuration has been read from a file, or from another 20-03, any differences from the configuration in Sacoto and in the configuration of the 20-03 is unknown.

Write all

*If you want to duplicate a known configuration read from a 20-03 module, or restore a previous configuration saved on disk and then write to a new module, 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 20-03) will be highlighted.
*There may be other differences between the current 20-03 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 20-03.*

Tools Menu

This menu can be used to reset configuration of 20-03 module to default setting or find 20-03 modules by showing information such as the serial number, ID, firmware version of any module connected.

Tools
- Reset configuration
- Find 20-03 Modules
- Write calibration data
- Test Serial Command
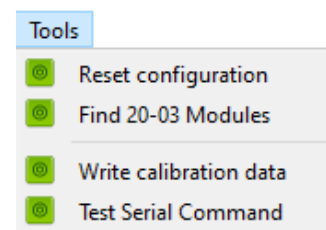
Input and output messages

Inputs tab

The Input tab is under the I/O tab. Here you can configure the input messages and select other input options and parameters.
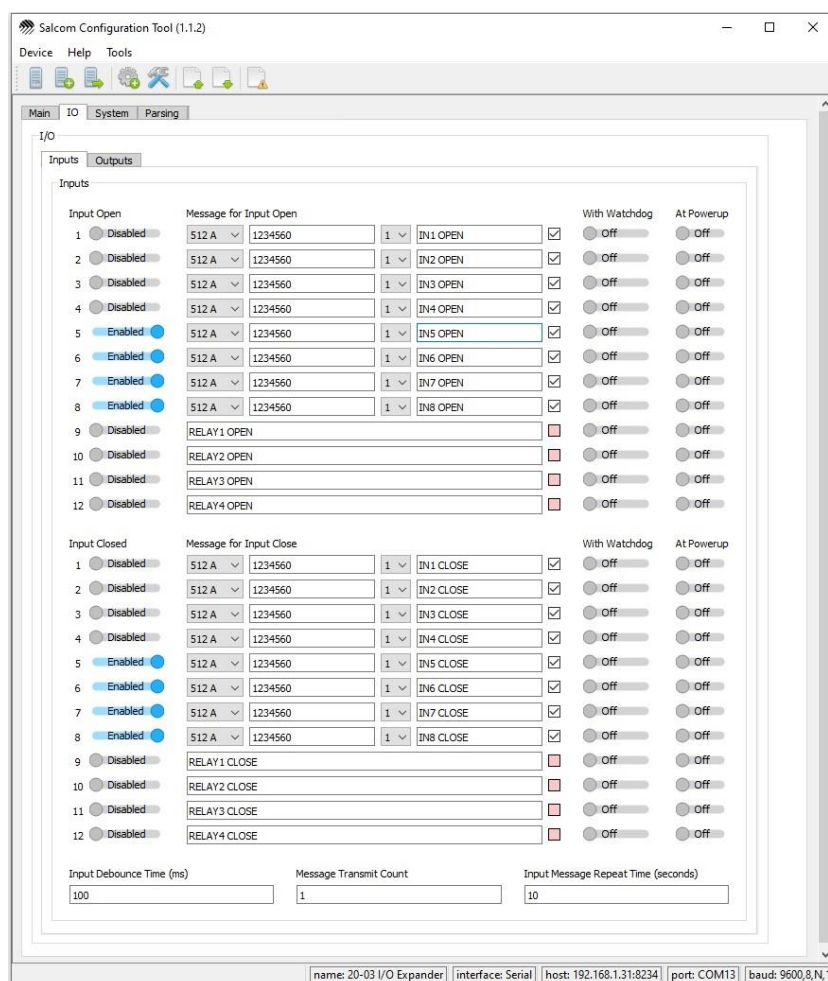

Figure 7 Example of the Inputs Tab

The 20-03 can be configured to transmit messages in response to the state of the inputs. Messages can be transmitted on a closing or opening transition. Input messages are specified with baud rate, Alpha or Numeric message type, CAP code, function level, and the message Text. A de-bounce time can be specified to prevent transmissions until the input state is stable.

Some inputs are not physically implemented but may be triggered by received relay protocol messages or CAP code ranges to generate acknowledgements. The message corresponding to the initial input state can set to send at power up.
An input message can be transmitted with the watchdog timer to transmit the input state on a regular basis.

The message repeat period can be specified for multiple transmissions. The message transmit count must be set one or more to transmit messages. Inputs should only be enabled if they are being used to transmit a message. Outputs should be disabled on I/O ports that are used for inputs unless the input is being used to monitor the output; check the configuration in the Outputs tab.

Outputs Tab

Each output of the 20-03 may be opened or closed by Salcom relay protocol, by a received CAP code within a range or by configured pattern of ASCII commands. The Output tab is under the I/O tab.
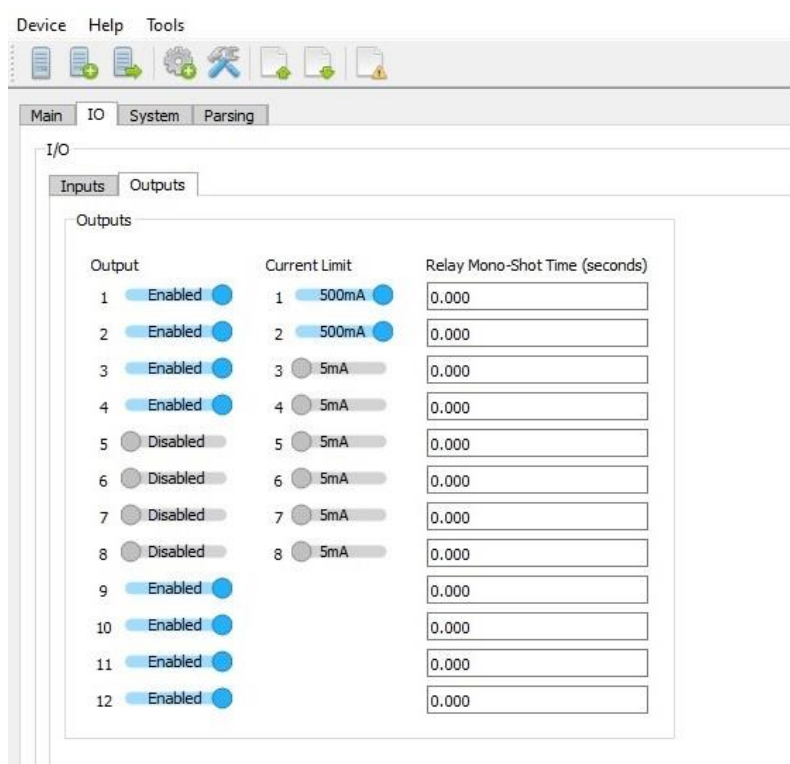

Figure 8 Example of the Outputs Tab

Outputs will respond to relay protocol messages only if enabled. Since inputs and outputs share the same physical pins, enabled inputs will respond to changes in the state of the corresponding output. This can be used to monitor outputs or send acknowledgement messages. However, in most cases the corresponding input should be disabled when an output is used.

If an output is not used it should be disabled so that the output state remains "open" and the pin can be used as an input. All outputs have selectable 5mA or 500 mA current limits with resettable fuses (PTC) so individual ports can have the current limit set as required.

Outputs can operate as a momentary output, or mono-shot, where the output opens automatically after a short delay following a "close" trigger. If the mono-shot time is set to 0, the output will remain closed until triggered to open.

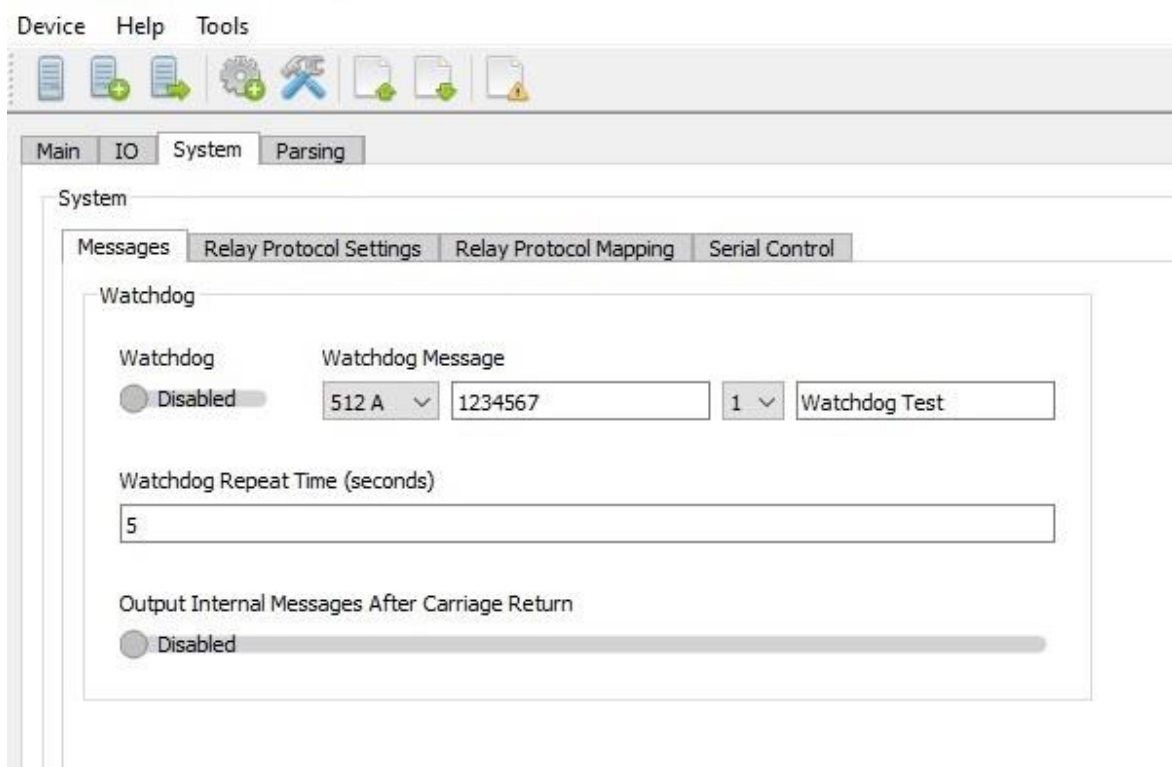*System Settings*

Watchdog message configuration

Figure 9 Example of the Watchdog message Tab

*The watchdog configuration can be found under the **System > Messages tab** and may be used to send a regular watchdog message, or to regularly send an update of any input configured to be sent "with watchdog" depending on the input state.*

The watchdog function is enabled by setting a Watchdog Repeat Time, when set to zero the watchdog function is disabled. Input messages configured to be sent "with watchdog" will be sent at regular intervals specified by the watchdog repeat time.

Enabling or disabling Watchdog in this field only affects the periodic message; inputs set to resend with watchdog will be sent at the watchdog repeat times. To only send active switches with no watchdog message, leave Watchdog set to Disabled. The maximum "watchdog repeat time" is 1,800 seconds, or thirty minutes.

Relay Protocol Configuration

*Relay Protocol configuration can be found under the **System > Relay Protocol settings** tab.*
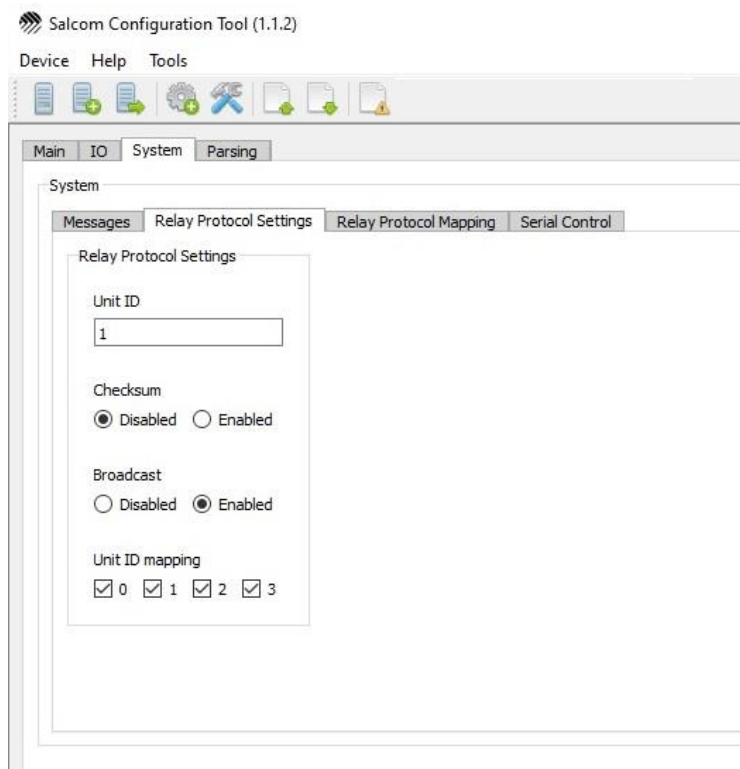

Figure 10 Relay Protocol Tab

The 20-03's Unit ID is specified here so the outputs and special functions can be addressed using this unit ID plus an offset.
The broadcast option can be enabled. If enabled, multiple 20-03 units can be addressed either by their individual ID's, or as a group using the broadcast ID, 96.

Unit ID mapping check boxes may be used to enable or disable specific IDs within the 20-03's four mapped ID's. They can provide additional protection to ensure that noise or unrelated messages cannot activate outputs or special functions.

Relay Protocol mapping

This tab shows how the Base unit ID and subsequent mapped ID's associations are configured. It is for reference only and is unable to be edited.
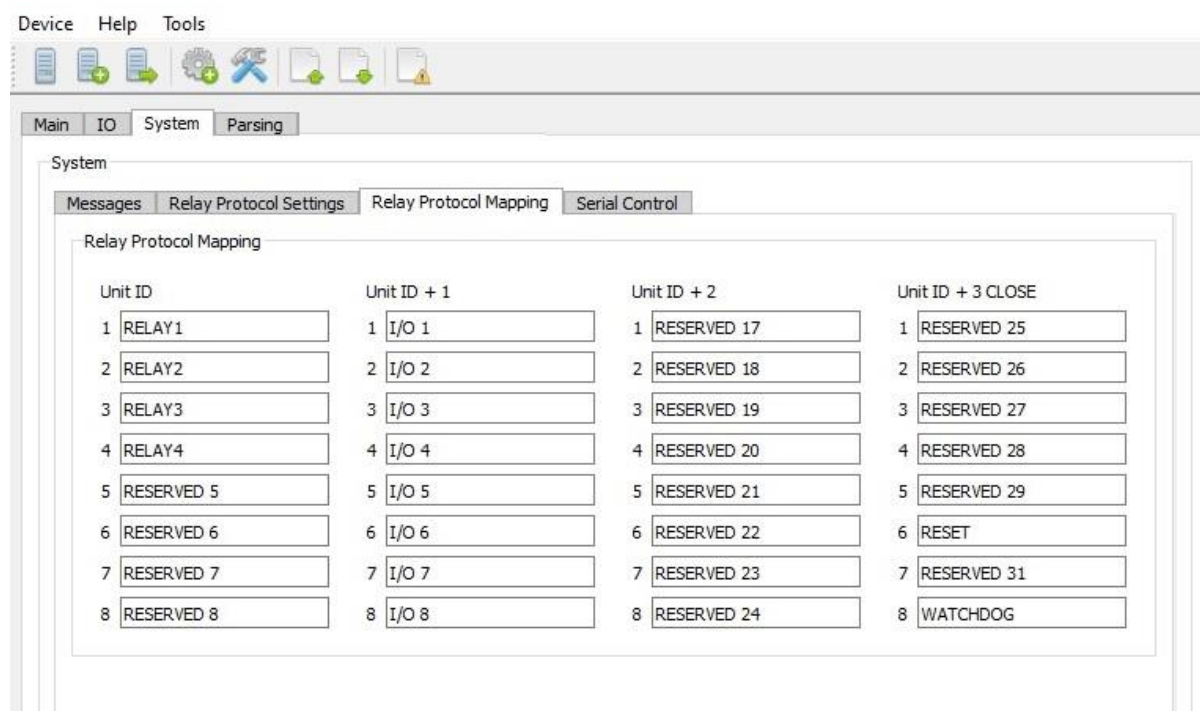
Serial Control Configuration

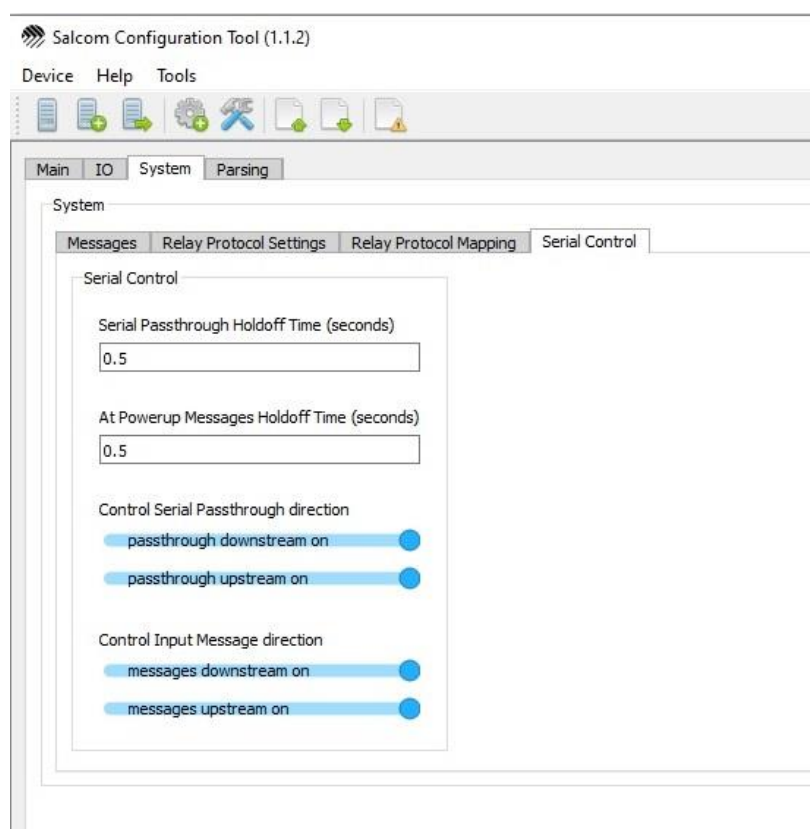*Serial control Tab can be found under* **System > Serial control.**

Figure 11 Serial control Tab

When Serial Pass through is enabled, every byte sent to the 20-03 will be transmitted, unaltered, to another 20-03 or any other module connected. Serial pass-through mode is activated after the unit is reset. Once serial pass-through mode has been activated, Sacoto will only work if the unit configuration is read immediately after the 20-03 has been powered on or reset. To restore normal operation, turn the 20-03 off and back on again then immediately read the configuration from the unit. You may then disable serial pass through mode and "write changes" to the 20-03.

Serial passthrough hold off time delays serial passthrough for specified time after power up to block power up messages from other modules. The external or internal messages can serially passthrough in both directions in 20-03 from Serial 1 to Serial 2, or Serial 2 to Serial 1, if both directions are enabled. This is required when interconnected modules must communicate each other.

Parsing

Parsing is a feature which can be used to configure specific patterns of fixed ASCII or embedded messages to operate relays, I/O and special functions. It allows eight patterns of messages, either within specific CAP code ranges and/or containing pre-set prefix/suffix, to control relays and IOs in 20-03 without using Relay protocol.

Parsing rules can be enabled or disabled as required but at least one rule must be enabled for the 20-03 to decode commands; disabling all rules will disable the decoder.
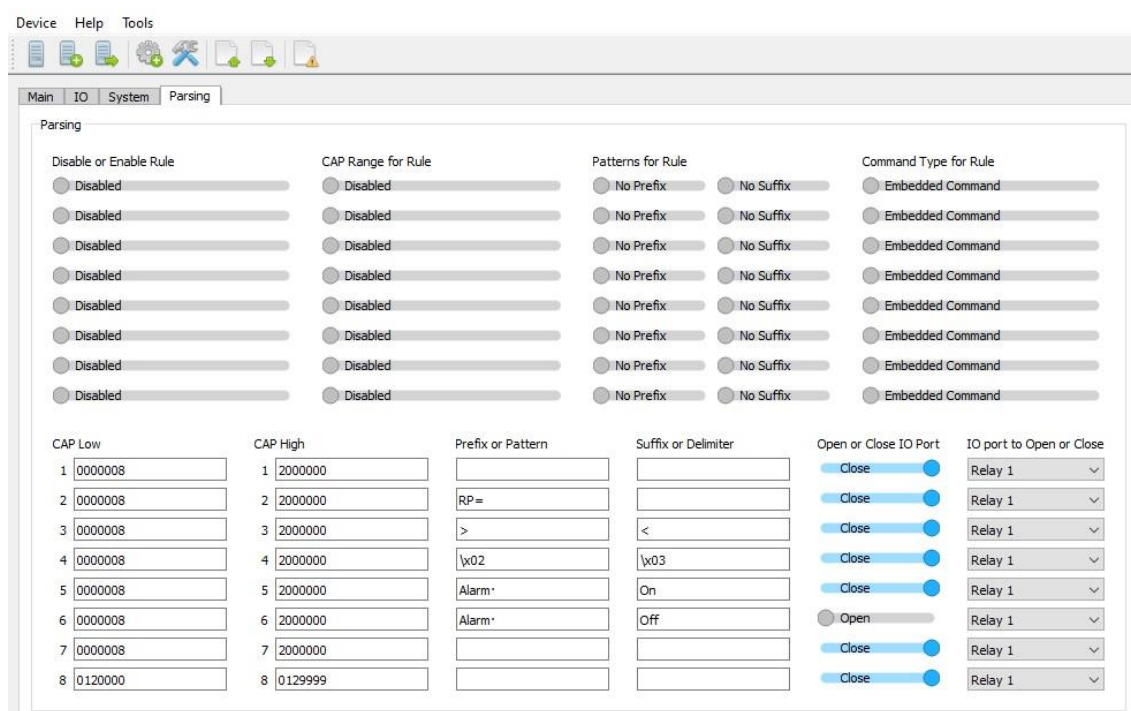

Figure 12 Parsing Tab in Sacoto

If a CAP range rule is enabled, tone only messages with configured CAP codes can be used to control the selected IO ports. Fixed ASCII patterns of messages with prefix or suffix can be configured for operating outputs using readable test messages relevant to the event triggering the output and these patterns can consist of embedded commands like relay protocol commands or any given fixed ASCII commands like "Alarm On" or "Alarm Off"

The configured patterns can operate open or close actions for any selected IO port or relay. Parsing is an advantage when needing to operate relays or outputs with any simple custom messages.

Examples of parsing

Example No	CAP Range rule	ASCII Pattern	Type	IO port	Description
1	Disabled	No prefix/suffix:	Embedded	Open input 01019	Open input receiving relay protocol message from a transceiver
2	Disabled	Has prefix: %	Fixed	Close input	Serial message with prefix '%' closes input
3	Disabled	Has prefix and suffix: > <	Fixed	Open input	Serial message with prefix '>' and suffix '<' opens input
4	Disabled	Has prefix and suffix: \x02 \x03	Fixed	Close input	Serial message with '\x02' prefix and suffix '\x03' closes input
5	Disabled	Has prefix and suffix: Alarm On	Fixed	Close Relay	Send message to turn on Alarm
6	Disabled	Has prefix and suffix: Alarm Off	Fixed	Open Relay	Send message to turn off alarm
7	Enabled	No prefix/suffix	Fixed	Open Input	Open input only for matched CAP code ranges 'CA1234560 1'
8	Enabled	No prefix/suffix	Fixed	Close input	Close input for Matched CAP code ranges 'CA0120001 1'

Troubleshooting

Fault	Problem/solution
No illumination of Green LED	• *Check power supply and connection*
No transmission, but solid red LED	• *Solid red LED indicates the channel is busy. Wait for a clear channel or check channel busy configuration in Sacoto.*
Input activated but no transmission	• *Check and write input configuration in Sacoto.*
Output not activated by received message	• *Check message is received on 20-03 serial output* • *Output disabled* • *Unit ID incorrect or disabled* • *Mono-shot timer too short* • *External circuit holding output high or low* • *Relay protocol format incorrect*
No RS232 serial communication	• *Cable not plugged in to RJ12 serial socket.* • *Incorrect COM port selected.* • *COM port configuration incorrect (baud rate, parity)* • *USB to serial adaptor not installed correctly.* • *Faulty cable or adaptors.*
Unit starts sending messages but does not complete it.	• *Poor supply voltage, or low current limit.*

Glossary

Terms	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.
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
Baud rate	The rate at which information is transferred in a serial communication, expressed in bits per second
Universal serial bus (USB)	A common interface that enables communication between devices and a host controller such as a personal computer (PC).
RS232	An electrical standard for the serial transmission of data.
RJ12 6P6C	Registered jack 12 uses a standard 6-Position, 6-Conductor connector
COM port	An I/O interface that enables the connection of a serial device to a computer.
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.

Accessories and related products

Name	Description	Part Number
RS-232 serial Port adaptor	An RJ-12 to DB9 (RS-232) adaptor	12-45-0000
Configuration Software	Salcom configuration tool (Sacoto)	Website download https://www.salcom.com/products
Power Connector	Pluggable terminal block power connector.	54-39-0012

Technical Specifications

Technical Specification 20-03-0000 - Input / Output Expansion Module	
Power Supply	+13.8V typical (11 to 15 VDC range)
Power Consumption	Normal Operation: 15mA Relays: 20mA per energized relay
Configuration Application	Salcom Configuration Tool (Sacoto)
Programming Cable	12-45-0000 (RJ12 - DB9) Can be used with a USB to RS232 DB9 Serial Adapter Cable
Serial Ports	2 ports, 9600, N, 8, 1; RS232
Protocols	Salcom Relay protocol Salcom Message protocol ASCII strings to trigger outputs ASCII messages triggered by inputs Multiple units may be daisy chained for additional inputs or outputs, or to create a bi-directional link between inputs and outputs on separate units.
Relay Outputs	4 Relays with normally open and normally closed contacts 1A @ 24 Vdc Note: Not suitable for 240VAC Connections
Open Drain Outputs	8 open drain outputs with 500mA resettable fuses (PTC). Selectable 5mA current limit. Internal protection for inductive loads. Maximum voltage = supply voltage.
Inputs	8 inputs monitoring the open drain outputs. Open drain outputs have an internal pull-up to 3.3V (4k7) and may be pulled low externally. Maximum Voltage = supply voltage.
Connectors	Two-way DC power connector Serial Port 1 (RS232) = RJ12 (6P6C) Serial Port 2 (RS232) = RJ12 (6P6C) Terminal block: 2 rows x 12 way, 3.81mm pitch. Two 12 way plugs with screw connections (supplied)
Environmental Protection	Not suitable for outdoor use and should be protected from adverse environmental conditions
Operating Temperature	-10°C to +50°C (+14°F to +122°F)
Indicators	Power LED (Green) - Slow Flashing = Normal Operation Data LED (Red) - On = Active Serial Data - Flashing = Programming Mode
Weight	250g
Enclosure Dimensions	68mm x 150mm x 38mm (W x D x H)
Enclosure Material	Extruded aluminium
Colour	Matt black

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