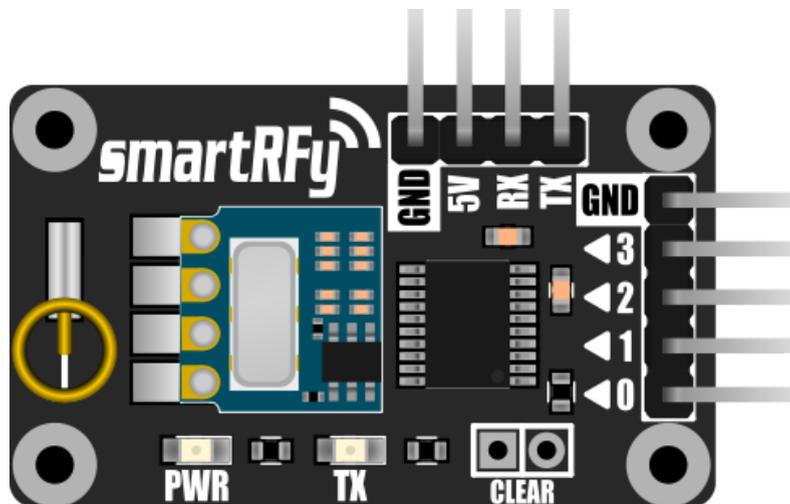


SmartRFy Digital Tx Module Manual



HCMODU0143

Revision 1.0.0

DISCLAIMER

SmartRFy modules are micro power short range devices (SRD) using the 433MHz frequency band. This frequency band is licensed exempt (within certain restrictions) in many countries including the UK, Europe, Asia, and the US. It is the end users responsibility to ensure that it is legal to operate devices in this frequency band within your own country before use.

As with all wireless devices, external factors such as range and interference may cause transmissions to be corrupted or blocked. Therefore these devices should not be used in applications where control or monitoring is a critical requirement.

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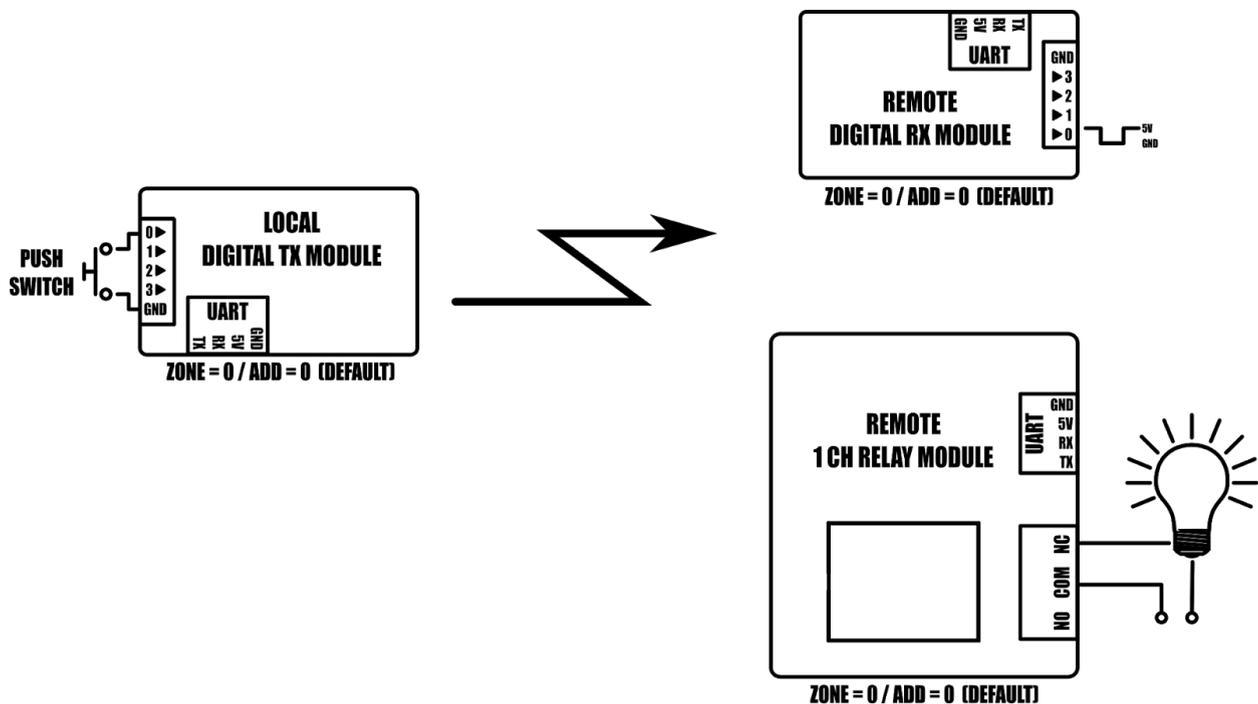
SmartRFy system overview

SmartRFy modules are a range of wireless modules that provide a simple low cost way of controlling and monitoring remote devices and sensors. They are designed to work at their basic level with no programming required. However, when reconfigured or controlled via their serial interface they can also provide more complex and even autonomous functions.

SmartRFy modules work by wirelessly communicating with one another using simple text based commands - for example, to turn on a remote relay a command such as RLY=1 can be sent, and to turn it back off RLY=0. These commands can be automatically sent from one module to another or can be sent by a user via a module's serial interface to manually control modules on the SmartRF network.

They are addressable and can be grouped into one of 255 zones, with each zone capable of individually addressing 255 devices, giving a total of over 65,000 unique addresses. SmartRFy modules are designed to be both easy and flexible to use by providing three levels of control:

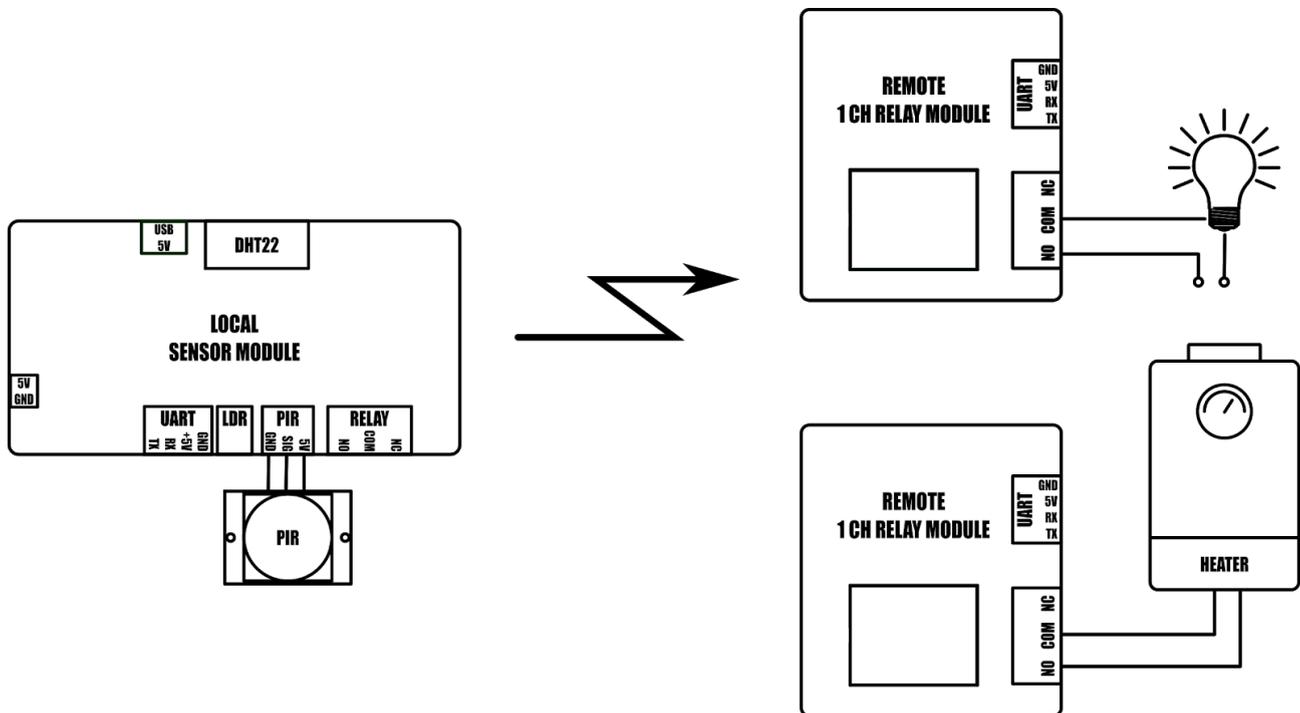
Zero configuration (out-of-the-box)



Example: Controlling a remote digital pin and light from a push switch.

With no configuration at all the SmartRFy range of modules allow basic functionality such as remotely switching relays, digital pins, or monitoring sensors, such as temperature, humidity, light, motion etc. All SmartRFy modules default to the same zone and address and so can respond to, or control, other modules without the need to modify any zone or address settings.

Serial port configuration

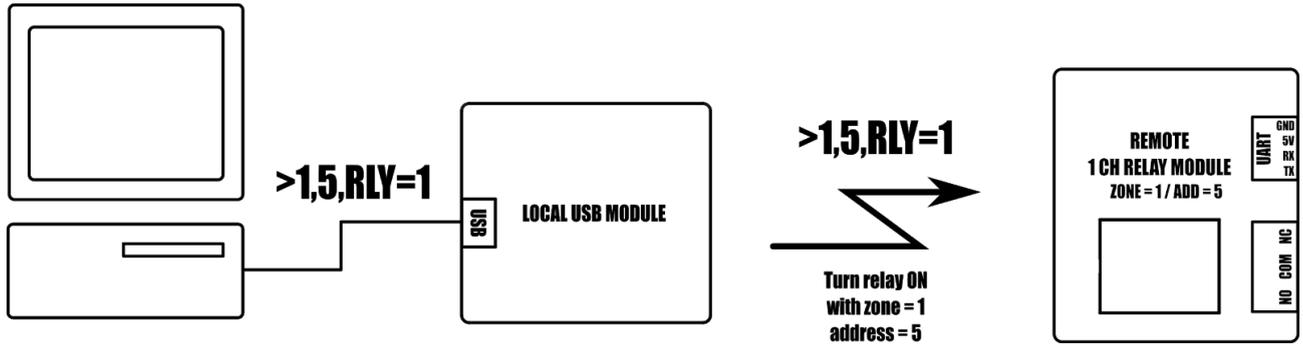


Example: Remote 1CH relay module configured to turn on light when local modules' PIR is triggered and second remote relay module is configured to control a heating device based on local modules' temperature sensor readings.

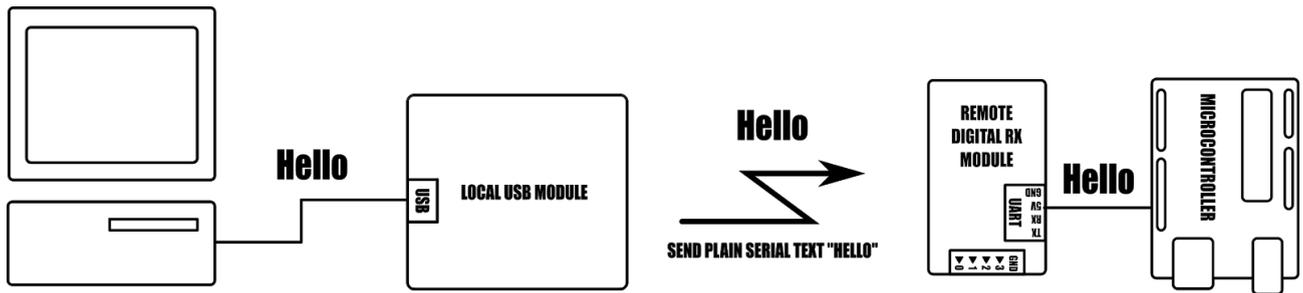
All smartRFy modules include a serial port which allows them to be re-configured using simple text based commands. These text commands allow changing of configuration settings and control of specific features of each module. Any setting changes are stored by the module's non-volatile memory and so are retained even when power is removed from the module. When reconfigured they are able to perform more complex functions and even some basic autonomous tasks. For example, a SmartRFy relay module can be reconfigured to control a heating system based on the temperature transmitted from a remote sensor or, turn on a flood light for a set amount of time when triggered by a remote PIR – all without any additional hardware. Serial port configuration also allows a module's zone and address (all SmartRFy modules default to zone and address 0) to be changed.

This provides the option for modules to be placed into groups, which will then only respond to other modules with a matching zone or address.

Slave controlled



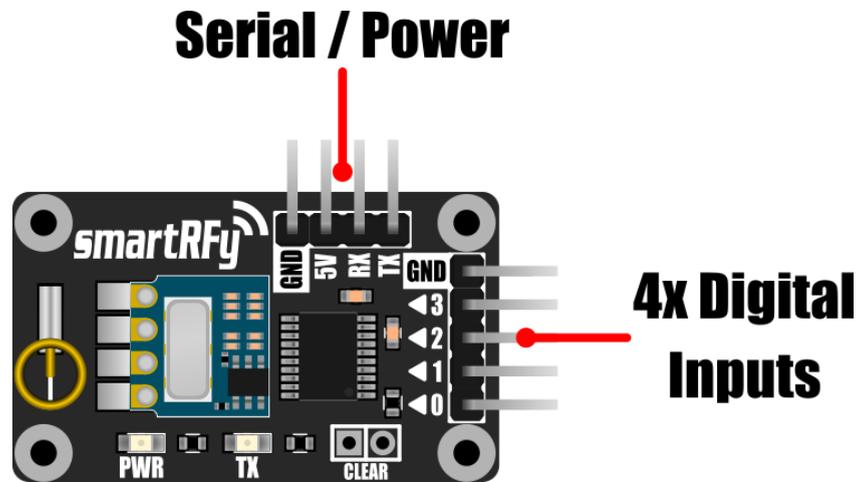
Example 1: Turning on a remote relay with zone = 1 and address = 5



Example 2: Send plain serial text "Hello" to a remote microcontroller

SmartRFy modules can also be controlled via their serial port by other devices such as microcontrollers or computer based automation software such as Node-RED. Using a SmartRFy module as a slave device (must be capable of transmitting/receiving) gives a master device the ability to monitor and control any other SmartRFy devices on the network, regardless of their zone and address. SmartRFy modules can even be used as a passive wireless serial port for passing non-SmartRFy data to other remotely connected devices.

SmartRFy digital Tx module



The SmartRFy digital Tx module provides a set of 4 digital input pins which can be used to remotely control other SmartRFy modules. In particular when coupled with the digital Rx module (HCMODU0142) each pin on the Rx module will mimic the state of the 4 digital input pins on the Tx module without needing any configuration. Similarly the Digital Tx module can be used to directly control the relays on a 1, 2, or 4 channel SmartRFy relay module.

Like all SmartRFy modules it can even be used as a wireless serial port (transmit only) allowing for non SmartRFy devices to communicate with one another using a SmartRFy connection.

The module can be powered via a single 5V power supply and standard 0.1" pitch header pins provide access to power, the 4 digital input pins, and the serial interface.

Features

4 independently controlled digital input pins

Can be used to directly control a SmartRFy digital Rx module or a 1, 2, or 4 channel relay module without requiring any configuration.

Local and remote control via simple text based serial commands.

Up to 255 zones and 255 addresses (default zone 0, address 0).

Compatible with most microcontrollers featuring a serial UART interface.

Wireless serial communication with 8 different baud rates (9600 default).

Specification

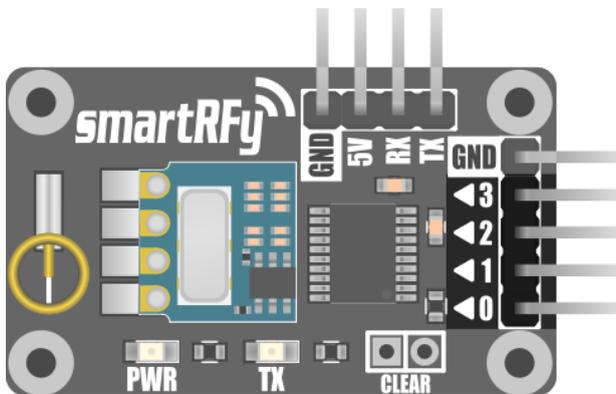
Model number:	HCMODU0142
Supply Voltage:	4.5 to 5.5V
Supply current min:	7.8mA (idle)
Supply current max:	19.3mA (transmit)
Operating frequency:	433MHz (OOK)
Operating range:	30 Meters (unobstructed)
Interfaces:	RF Tx, serial UART, and 4x 5V digital inputs
Digital input pin characteristics:	Input logic low voltage: $-0.3V$ to $V_{dd} \times 0.3V$ Input high high voltage $V_{dd} \times 0.7$ to $V_{dd} + 0.3V$
Digital Tx to Rx pin response time:	0.8 seconds (default settings) 0.6 seconds (TRS=0)
Module dimensions (WxDxH):	36.8mm x 22.1mm x 20mm

Digital Tx Module Features

Power

Power can be applied to the module via the 5V and GND pins on the serial interface header. It can be powered using an external power supply ranging from 4.5 to 5.5V with a minimum current capacity of 50mA.

Digital output pins

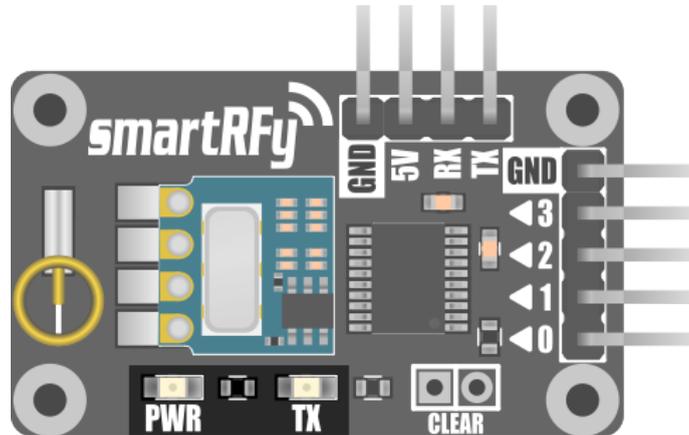


PIN	LOW	HIGH
3	SW3=0	SW3=1
2	SW2=0	SW2=1
1	SW1=0	SW1=1
0	SW0=0	SW0=1

The module includes 4 digital input pins which can be individually switched between a digital logic low (0V) and digital logic high (5V). When a pin is pulled high or low this causes the module to transmit an appropriate switch command (SWx) with the current pin state. For example pulling input pin 0 high will cause the module to transmit switch commands SW0=1, pulling pin 3 low will transmit SW3=0 etc. Therefore the digital Tx module can be used to control any remote SmartRFy module capable of responding to a SWx command including the digital Rx and relay modules.

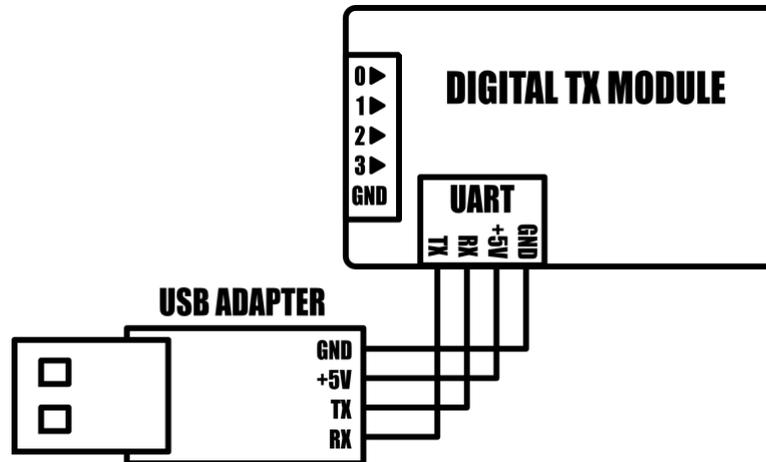
LEDs

The sensor module includes 2 LEDs which indicate the current state of the module.



PWR LED (green)	Indicates the module is currently powered.
TX LED (red)	Indicates the module is currently transmitting.

Serial UART



Command interface feature

The module includes a full duplex serial UART interface which can be used for issuing local commands and settings directly to the module (local commands).

Wireless serial port feature

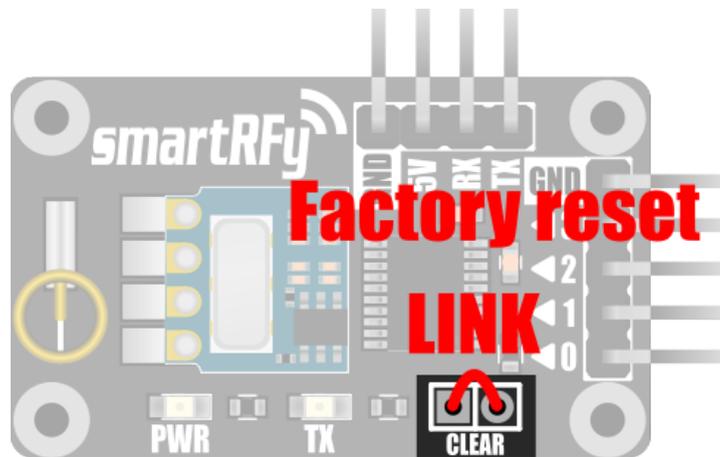
Additionally, the serial interface can also act as a passive wireless serial port for transmitting non-SmartRFy related data to other devices connected to remote SmartRFy modules.

Default configuration settings

By default the serial interface is configured to 9600 baud, 8 data bits, no parity, and 1 stop bit. See the serial interface control section for more information on setting the baud rate, verbose mode, and issuing commands.

Note: Connecting the module to a PC via its serial port will require an additional USB to serial adapter (see Hobby Components items HCARDU0011 or HCMODU0076).

Clear (Factory Reset)



The module is capable of storing a number of user configuration settings in its non-volatile memory. This allows it to retain these settings even after power is removed. The two pads marked 'CLEAR' provide a means of restoring the module back to its original factory default settings. Should you wish to reset the module, connect power to the module whilst shorting the two pads together.

Alternatively the module can be restored back to factory default settings by issuing the factory reset (FTRE) command via the serial interface – see the SmartRFy commands section for more information.

SmartRFy commands

Command formats

SmartRFy modules are capable of responding to an array of text based commands sent via the serial interface. These commands can be either module configuration settings or commands to control the locally connected module or a remote module.

Command format requirements

In all cases the command must always be terminated with a carriage return (ASCII code 13) and a line feed (ASCII code 10).

The relay modules do not have transmit capability. Therefore commands can only be processed by the module itself (local commands) and cannot be transmitted to other modules (remote commands). To tell the module that you are issuing a local command, the command must be prefixed with an asterisk (*). For example *SW0=1 will cause relay 0 to be energised. Remote commands, i.e. commands prefixed with a greater than symbol (>) will be ignored.

Commands must always be in uppercase and no part of the command should include white space characters, including spaces.

Some commands require more than one parameter. In this case parameters should be separated by commas (,) with no spaces.

Commands are always 4 characters in length. Commands that require one or more parameters will have an equals (=) as the last character (e.g. XXX=), and commands that are querying information will have a question mark (?) as the last character (e.g. XXX?).

The device will respond to a successful local command with the response 'OK'. An unsuccessful command will respond with an 'ERROR'. There is no response by the local device when issuing remote commands. All responses are terminated with a carriage return and line feed.

No serial data sent to the local device, command or otherwise, may exceed 25 characters in length (including carriage return / linefeed termination).

Local command format

Prefix	Command	Optional parameter	Optional parameter	Optional parameter	Carriage return	Line feed
*	XXX	<parameter 1>	, <parameter 2>	, <parameter n>	0x0D (\r)	0x0A (\n)

Example: *Setting and confirming the zone of the local device*

*ZON=1<CR><LF>

Sets the zone of the connected module to 1.

Response:

OK<CR><LF>

*ZON?<CR><LF>

Requests the current zone of the local device.

Response:

1<CR><LF>

Command quick lookup table

SmartRFy generic commands – quick lookup table

Command	Description	Parameter(s)	Response
FWW?	Get firmware version	None	Vx.x (C) HobbyComponents.com
ZON?	Get zone number (default: 0)	None	Zone number (0 to 255)
ADD?	Get address (default: 0)	None	Address (0 to 255)
STO= <i>Time</i>	Sets the timeout time for the serial interface (default: 2000ms)	<i>Time</i> : Timeout time in milliseconds (0 to 65535)	OK
BUR= <i>Baud</i>	Sets the BAUD rate for the serial interface	Baud: 0 = 1200 BAUD Baud: 1 = 2400 BAUD Baud: 2 = 4800 BAUD Baud: 3 = 9600 BAUD (default) Baud: 4 = 19200 BAUD Baud: 5 = 38400 BAUD Baud: 6 = 57600 BAUD Baud: 7 = 115200 BAUD	OK
TRS= <i>Resends</i>	Sets the number of times any Tx data will be retransmitted	<i>Resends</i> : Number of resends (0 to 5)	OK
VBM= <i>Mode</i>	Sets the verbose mode which specifies what received data is output to the serial interface (default: 0)	Mode: 0 = Both passive serial & commands from all zones and addresses Mode: 1 = Only passive serial data from all zones and addresses Mode: 2 = Only control from all zones and addresses Mode: 3 = Both passive serial & commands with matching zone and address Mode: 4 = Only passive serial data with matching zone and address Mode: 5 = Only commands with matching Zone and address	OK
ZON= <i>Zone</i>	Sets the devices zone number	<i>Zone</i> : Zone number (0 to 255)	OK
ADD= <i>Address</i>	Sets the devices address	<i>Address</i> : Devices address (0 to 255)	OK
TRP= <i>State</i>	Turns on or off repeater mode (default: off)	<i>State</i> : Repeater state (0 = off, 1 = on) Note: Only available on modules with both RF Tx & Rx capability	OK
FTRE	Performs a factory reset - all settings are restored to their default values	None	OK

Digital Tx module specific commands – quick lookup table

Command	Description	Parameter(s)	Response
SxN= <i>Name</i>	Sets an alternative three letter command that will be transmitted when the input pin is toggled (default: SWx)	x: The digital output pin number (0 to 3). E.g. S0N is digital input pin 0 Name: Three letter name of the alternate command	OK
SxT= <i>Time</i>	Sets the transmit time interval for retransmitting the current input pin state (default = 0)	x: The digital output pin number (0 to 3). E.g. S0T is digital input pin 0 Time: Transmit time interval in seconds (0 to 65535). Default = 0 (disabled)	OK

Generic SmartRFy commands

Commands listed below are common to all SmartRFy modules, including the digital Rx module. Note that all commands must be preceded with a carriage return and line feed, but for clarity purposes this is omitted from the examples in this section.

Firmware version (FWV?)

Gets the firmware version of the module.

Example: *FWV?

Returns: Vx.x

(C) HobbyComponents.com

Where Vx.x is the version number

Get the modules zone (ZON?)

Gets the modules current zone number

Example: *ZON?

Returns: The current zone number as a decimal value (0 to 255)

Get the modules address (ADD?)

Gets the modules current address

Example: *ADD?

Returns: The current address as a decimal value (0 to 255)

Serial serial timeout time (STO=)

Sets the timeout time for the serial interface in milliseconds. Maximum timeout time is 65535ms (65.535 seconds). If a complete command (including CR + LF termination) is not received within this time the command will be ignored and an 'ERROR' will be returned.

Default: 2000 (2 seconds)

Example: *STO=1000

The above example will set the serial port timeout time to 1000ms (1 second).

Returns: OK

Set the baud rate (BUR=)

Sets the communication baud rate for the serial UART interface. There are 8 (0 to 7) possible settings for the baud rate:

0 = 1200 BAUD
1 = 2400 BAUD
2 = 4800 BAUD
3 = 9600 BAUD (default)
4 = 19200 BAUD
5 = 38400 BAUD
6 = 57600 BAUD
7 = 115200 BAUD

NOTE: This command sets the serial communication speed between the connected device and the SmartRFy module – it does not set the wireless RF communication speed between modules.

Default: 3

Example: *BUR=5

The above example will set the serial port baud rate to 38400 baud.

Returns: OK

Set number of transmit resends (TRS=)

Sets the number of times the module will automatically re-transmit data. Increasing the number of times data is retransmitted will reduce the chances of the data not being received due to interference but will also increase transmission times and network traffic. The number of resends can be set from 0 (no resends) to 5.

Default: 2

Example: *TRS=3

The above example will set the number of resends to 3. Therefore any data wirelessly transmitted by the module will be transmitted a total of 4 times.

Returns: OK

Set the serial verbose mode (VBM=)

Sets what type of data received by the module is automatically output to its serial port. There are 6 possible modes (0 to 5):

- 0 = Both passive serial and commands from all zones and addresses
- 1 = Only passive serial data from all zones and addresses
- 2 = Only control from all zones and addresses
- 3 = Both passive serial and commands with matching zone and address
- 4 = Only passive serial data with matching zone and address
- 5 = Only commands with matching zone and address

Default: 0

Example: *VBM=5

The above example will set the module to only output received commands that have been transmitted from a module with the same zone and address as itself.

Returns: OK

Set the modules zone number (ZON=)

Sets the modules zone number. The zone number can be between 0 and 255.

Note that zone 255 is a special zone number. Setting the module to this zone number means that it will treat received data from any zone as if it were in the same zone as itself. Therefore this zone number can be used when you wish the module to respond to commands from modules in multiple zones. Additionally, when transmitting data with a zone of 255 all modules within range will respond to the data as if it is in the same zone as

itself. Therefore this zone number can also be used when you require the module to control multiple remote modules in different zones.

Default: 0

Example: *ZON=2

The above example will set the modules zone number to 2.

Returns: OK

Set the modules address (ADD=)

Sets the module's address. The address can be between 0 and 255.

Note that address 255 is a special address. Setting the module to this address means that it will treat received data from any address as if it were the same address as itself. Therefore, this address can be used when you wish the module to respond to commands from modules with different addresses. Additionally, when transmitting data with an address of 255 all modules within range will respond to the data as if it has the same address as itself. Therefore this address can also be used when you require the module to control multiple remote modules with different addresses.

Default: 0

Example: *ADD=5

The above example will set the modules address to 5.

Returns: OK

Turn on/off repeater mode (TRP=)

Turns repeater mode on or off. When turned on the module will retransmit any data it receives regardless of its zone and address. This mode can be used when a remote module is outside the range of a module that needs to communicate with it, but the

repeating module is within range of both modules. Setting the repeater mode to 1 will turn on repeater mode and setting it to 0 will turn it off.

Note:

This mode is only supported by SmartRFy modules with both RF receive and transmit capabilities.

Turning on the repeater mode will double network traffic for any modules within range.

Default: 0 (off)

Example: *TRP=1

The above example will turn on repeater mode.

Returns: OK

Factory reset (FTRE)

Performs a factory reset of the module. All module settings will be restored to their factory defaults.

Example: *FTRE

The above example will restore all settings to their defaults.

Returns: OK

SmartRFy Tx module commands

Commands below are specific to the SmartRFy digital Tx module and can be used to configure parameters relating to the hardware features of this module.

Set an alternative pin name (SxN=)

Sets an alternative 3 letter command name the module will use when transmitting the current state of one of the digital input pins.

To specify which input pin the commands are intended for substitute x for the pin number (0 to 3). For example S0N= for pin 0, S1N for pin 1, etc.

Default: SW0 for pin 0
 SW1 for pin 1
 SW2 for pin 2
 SW3 for pin 3

Example: *S0N=ABC

In the above example the module will transmit the state of digital input pin 0 as ABC=x where x is the current state of the pin.

Returns: OK

Set the digital pin state transmit time (SxT=)

Sets the time interval in seconds for transmitting the current input pin state. The transmit time can be set anywhere between 10 and 65535 seconds. Setting the transmit time to 0 seconds (default) will disable automatic retransmitting of the digital pin state.

To specify which input pin the commands are intended for substitute x for the pin number (0 to 3). For example S0T= for pin 0, S1T for pin 1, etc.

Default: 0 (disabled)

Examples:

Via modules serial port:

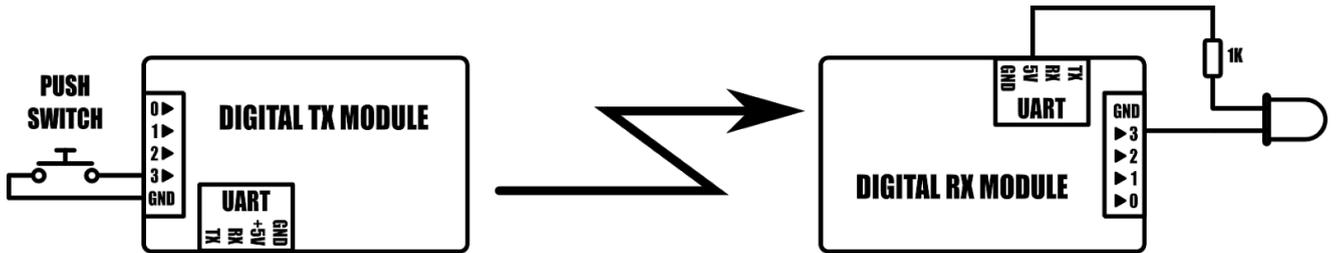
*S0T=60

The above example will set the module to automatically transmit the current state of digital pin 0 every 60 seconds.

Returns: OK

Appendix A: Examples

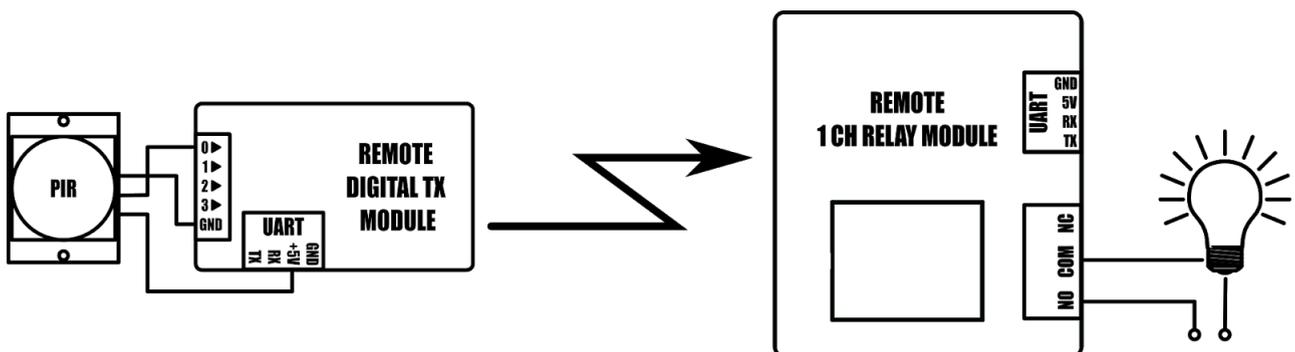
Digital Tx to Digital Rx module example



By default all SmartRFy modules are set to the same zone and address (zone = 0 & address = 0) and so without requiring any configuration a digital Rx module will automatically mimic the state of the Tx modules input pins.

In the above example a LED connected to pin 3 of the digital Rx module will turn on whenever the push button on the Tx module is pressed.

PIR Example



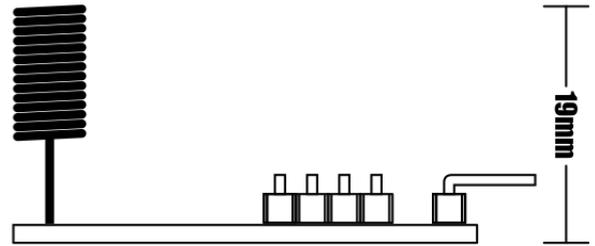
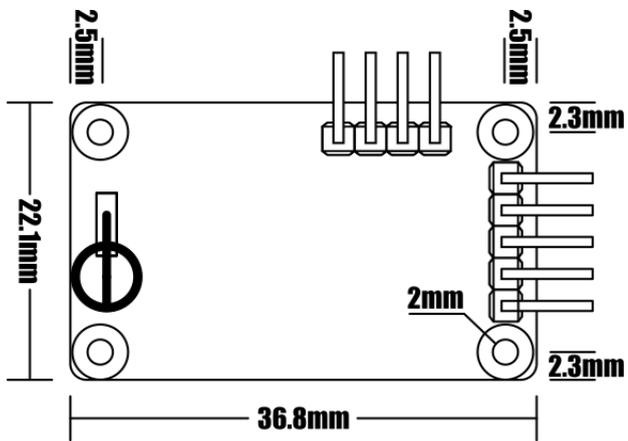
In the above example a PIR is used to turn on a remote light connected to a SmartRFy 1ch relay module. By default the SmartRFy relay module mimics the state of the Tx module's input pin 0, energising its relay when the pin is pulled high and de-energising it when pulled low, causing the light connected to the relay to turn on whenever the PIR is triggered.

To make the relay stay energised for a longer period of time the relay modules timer mode can be enabled. For example to make the relay energised for 60 seconds after the PIR is triggered send the following command to the relay module via its serial interface:

```
*S0T=60
```

See the SmartRFy relay module manual for more information.

Dimensions



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