

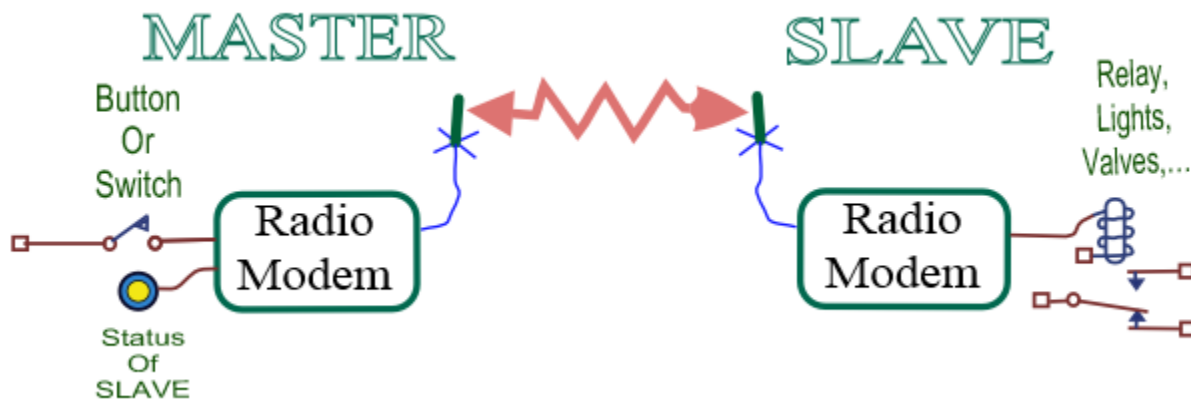


MIMIC Mode for Tech Series Modems (M21 M22) and OEM modules (M8 M6)

Raveon Technologies Corporation

Overview

Many of Raveon's radio modems include "MIMIC" mode operation for wireless I/O extension. MIMIC mode lets a smart master radio modem send data status to a SLAVE radio modem, and the SLAVE outputs the same status bits so the slave's outputs: mimic the master's inputs.



Products with MIMIC modes

Most all Raveon RF modem products have this MIMIC mode feature option incorporated into them. There are many different product version have have MIMIC modes. Here is the list.

The RV-M7 Data Radio Modem

RS-232 serial port using 2 input pins and 2 output pins for MIMIC

The M7 data radio modem historically used the MIMIC mode on its RS232 serial port interface.

The Tech Series Radios: RV-M21 RV-M22

A myriad of IO options are available, and most support MIMIC operation mode.

The Tech Series enclosures have many different I/O options:

- **RS-232** [S] RS-232 Serial data interface. MIMIC: 2 inputs, 2 outputs. OK to be MASTER
- **GPIO** [G] General Purpose IO (Switched DC, dig in, Measure voltage, Open Drain out)
MIMIC: 3 inputs, 3 outputs. Good to be SLAVE, OK to be MASTER

- **FIO** [D] Flexible IO. 8 IO pins can be setup as digital inputs or digital outputs. MIMIC: 3 inputs, 3 outputs. Good to be SLAVE, Good to be MASTER

For many SCADA systems, the GPIO and FIO interfaces are the ideal interface to monitor remote devices or control them.

OEM Radio Modem Modules: RV-M6 RV-M8 RV-M35

These OEM modules utilize a 20-pin IO connector we call the UWORC connector, and there are two input pins and two output pins that can be used for MIMIC mode remote controls.

To learn how to configure a Radio Modem in the MIMIC mode, see this section in this document: [Configuring a MODEM for MIMIC mode](#)

MIMIC Mode

The MIMIC mode allows two or more Tech Series products to mimic each other's digital I/O. The model numbers of radios modems enclosed in the Tech Series Enclosures are RV-M21 and RV-M22.

When the radio modem within the M2x is in the MIMIC mode, the M2x will periodically transmit its digital status over the radio channel. The M2x modem will also continue to operate as a radio modem, sending/receiving data using serial I/O pins. Refer to the Tech Series technical manual for details on all of its I/O options.

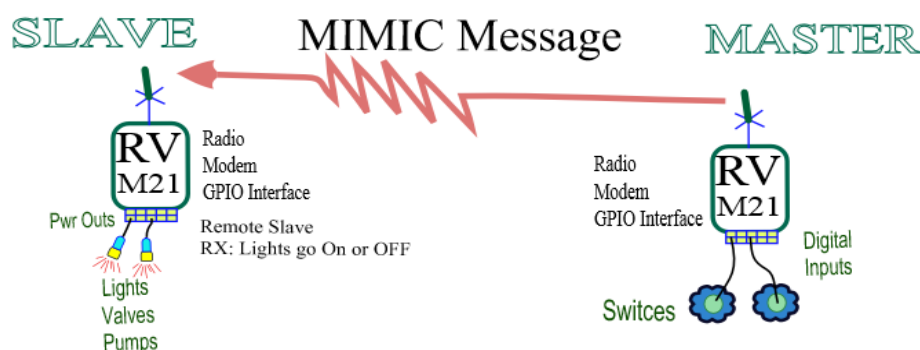
The RS232 serial I/O interface can be used in the MIMIC mode, but the best interface for most digital control systems is with the Tech Series enclosure's GPIO interface.

If the MIMIC mode is enabled, the operation of the radio is modified to transmit the digital status of the INPUT0 and INPUT1 pins across the radio link, and output their status goes onto the OUT0 and OUT1 pins of the receiving station.

There are two aspects to the MIMIC mode:

1. The Master transmitter that sends the status of its digital inputs. This is enabled with the **MIMIC X Y** command. RS-232, GPIO, FIO can be Masters.
2. The Slave unit receives the over-the-air MIMIC message, and sets its digital outputs to match the input status of the sending station. **GPIO** and **FIO** are great slaves.

Using a device in the MIMIC mode is quite simple: Flip a switch at one location, and have something at another location turn on or off.



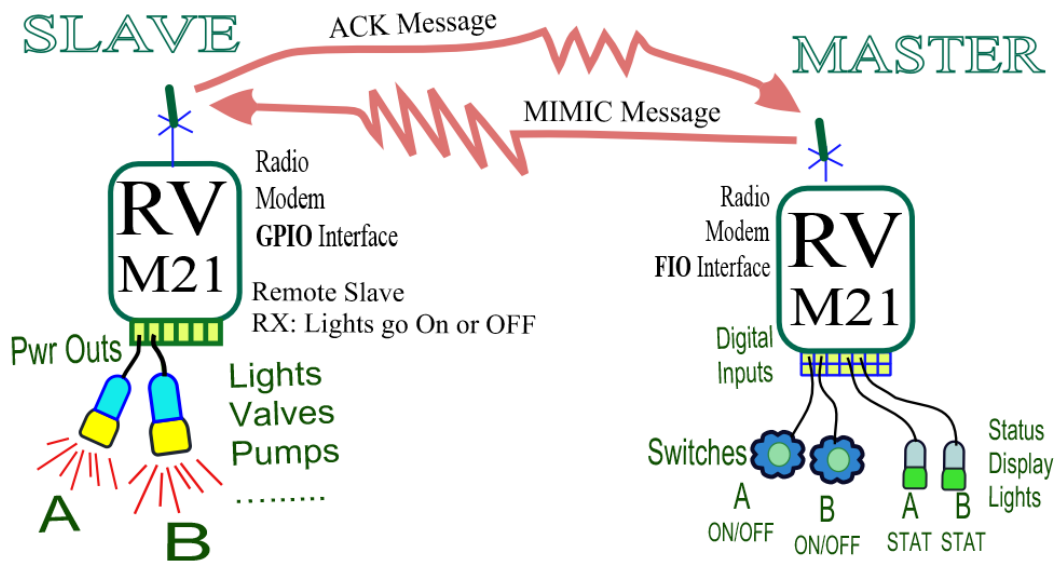
The MIMIC mode is a very simple and reliable way to digitally and remotely control many different kinds of devices, such as:

- Turn lights on/off
- Turn pumps on/off
- Turn valves on/off
- Lock or unlock a gate

Radio modems in the MIMIC mode can also be used to remotely monitor the status of things such as:

- Gate open/closed,
- Water tank full or empty,
- Button pressed or a switch pushed.
- Light on or off,
- Over-pressure or Under pressure sensors.
- Car parking information

The Acknowledgement feature (ACK) can be enable to have the SLAVE send and an ACK message to the MASTER to confirm the reception and output the status of the SLAVE at the MASTER's output pins.

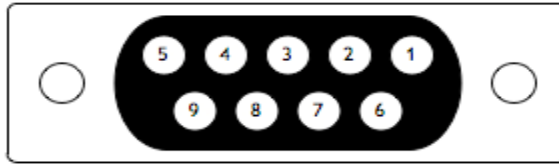


Radio Modem Interfaces for MIMIC operation

DB9 RS-232 Connector Pin-Out

MIMIC was invented years ago using RS-232. Here is how it works, and there are many other IO options now such as GPIO and FIO.

The RS232 9-pin serial I/O connector on is a female 9-pin D-subminiature connector having the following pins configuration. MIMIC Output pins are 8 & 1, MIMIC input pins are 4 & 7.



Front-view of DB-9 connector on modem (female)

Pin	Name	Dir	Function	MIMIC Mode Level/Specification	RS232 Level / Specification
1	CD	out	Carrier detect	Carrier Detect Output. OUT1 . OUT1 is negative when INPUT1 is pulled to ground or below ground on the other MIMIC radio. OUT1 will change to positive (>3V DC) if INPUT1 on the other MIMIC radio is high. ATR1 command sets use of this pin. Set ATR1 4 to use this as OUT1 in MIMIC mode instead of carrier detect signal.	If enabled, indicates presence of carrier. Logical 0 (+ voltage on RS-232) means carrier is present. If disabled, it is asserted (0) whenever the modem is operational, and not in the configuration mode. It will be a 1 when the modem is in the configuration mode.
2	RxD	out	Receive data	Data out of the modem.	Data out of the modem.
3	TxD	in	Transmit data	Data into the modem.	Data into the modem.
4	DTR	in	Data terminal ready	INPUT0 . RS232 input levels. 0V or below ground is a high input (digital 1). It is recommended that a 2K pull-up resistor be connected between this pin a +5V if it is used as a switch input.	Normally ignored by the <i>MODEM</i> modem. May control the power-state of the modem in low-power mode if this feature is enabled.
5	GND		Ground	Signal and power ground	Signal and power ground
6	DSR	out	Data Set Ready		Normally is set to 0 when modem is powered on and running.
7	RTS	in	Request to send	INPUT1 . RS232 input levels. 0V or below ground is a high input. It is recommended that a 2K pull-up resistor be connected between this pin a +5V if it is used as a switch input.	Used to stop/start the flow of data coming out of the modem TxD pin. 0 = OK to send, 1 = don't send. Leave disconnected if not used.
8	CTS	out	Clear to send	OUT0 . Open drain output to drive a light, LED, or relay. OUT0 is pulled to ground when INPUT0 is pulled to ground or below ground on the other MIMIC radio. OUT0 will change to high impedance if INPUT0 on the other MIMIC radio is high. Maximum current draw should be <100mA. Protect this input from inductive voltage spikes if it drives a relay.	Used to stop the flow of data going into the RxD pin from the device connected to the <i>MODEM</i> . 0 = OK to send, 1 = don't send. If the <i>MODEM</i> cannot accept more data, it will negate this signal (set to a 1).
9	Power	In/ou t	DC power (not Ring signal)	User may supply the DC power to the modem on this pin or he may draw DC power from this pin (200mA max).	User may supply the DC power to the modem on this pin.

Note: RS-232 signals use positive and negative voltages to represent digital 1s and 0s. A positive voltage is a 0, and a negative voltage is a digital 1.

Raveon data radio modems use a special RS232 driver/receiver IC chip to condition and protect all of the data pins on the DB9 RS232 port.

RS232 serial interfaces with DB9 connectors have two digital input pins and two outputs. If the radio module is incorporated into a Tech Series enclosure with the GPIO interface. There are 3 pins available for input or output.

With RS-232 and OEM radio modem modules, The MIMIC mode bits are transferred like this:

Master to Slave MIMIC Messages

DTR (Input0) is sent to CTS (Out 0)

RTS (Input1) is sent to CD (Out 1)

If ACK is enabled, the Slave will send and ACK message back.

Master From Slave ACK Messages

CTS (Out 0) is received in from Slave CTS (Out 0) status

CD (Out 1) is received in from Slave to CD (Out 1) status

G GPIO Interface Pin-Out

The 6 pin General Purpose Input and Output (GPIO) connector option on the Tech Series Enclosure is a rugged miniature SDACA connector having the following pins configuration. It has 2 pins for RS232 communications (TX and RX) and 3 GPIO pins, and one ground.



Front-view of 6 Pin GPIO connector

Pin	Name	Dir	Function	
1	TXD	in	Transmit serial data	Data into the modem. RS232 levels
2	RXD	Out	Receive serial data	Data out of the modem. RS232 levels
3	GPIO 0	I/O	IOPIN Modes: A,B,C,D	General Purpose I/O. In/Out mode configured with the IOPIN command. High Z input. If set to TTL Output (B), it is low-current open drain output. A:TTL input, C=Open Drain driver output, D:Switched DC output.
3	GPIO 1	I/O	IOPIN Modes: A,B,C,D	General Purpose I/O. In/Out mode configured with the IOPIN command. A:TTL input, B:TTL output, C=Open Drain driver output, D:Switched DC output.
3	GPIO 2	I/O	IOPIN Modes: C,D	General Purpose I/O. In/Out mode configured with the IOPIN command. C=Open Drain driver output, D:Switched DC output.
6	Ground		Power and Chassis ground connection	Use for GPIO ground signals and power. DC input and DC ground are primarily connected via the 3-pin power connector..

The **IOPIN** command is used to configure IO pins to various input or output modes. The primary types of IO modes are:

A: TTL input. Digital logic input. 3V logic states. For 0, input must be less than 0.7V. For 1, input must be greater than 2.6V. Output impedance is 220 ohms.

B: TTL output. Digital logic output. 3V logic states. For 0 output is < 0.7V. For 1, output is greater than 2.6V. Output impedance is 220 ohms.

C: Open Drain. Used as output. When the state of the bit is set to 0, then the pin is open drain high impedance. When the state of the bit is set to 1, then the FET driver transistor shorts the pin to ground.

D: Switched DC. Used as output. When the state of the bit is set to 0, then the pin is open drain high impedance. When the state of the bit is set to 1, then the DC voltage powering the Tech Series enclosure is switched on to the output pin.

The M2x radio modem has a couple commands to set an output bit to a 1. One the IOPIN command has configured the particular bit to be an output bit, the **SBIT** or **TBIT** command can be used to set the bit to a 1 state. The CBIT command can be used to clear bits to the 0 state.

SBIT XX is Set Bit command. It sets the state of designated output pins to 1.

TBIT XX MMMM is a Time Bit Set command. It sets the designated output pin state to 1, and after a certain number of milliseconds, the designated bits will reset to 0.

To configure a Tech Series GPIO us the IOPIN x y where x identifies the bits being configured, and y is the IO mode they will be in. **A:**Digital TTL Input, **B:**Digital TTL Output. **C:**Open Drain MOSFET output, **D:**DC Power switch output.

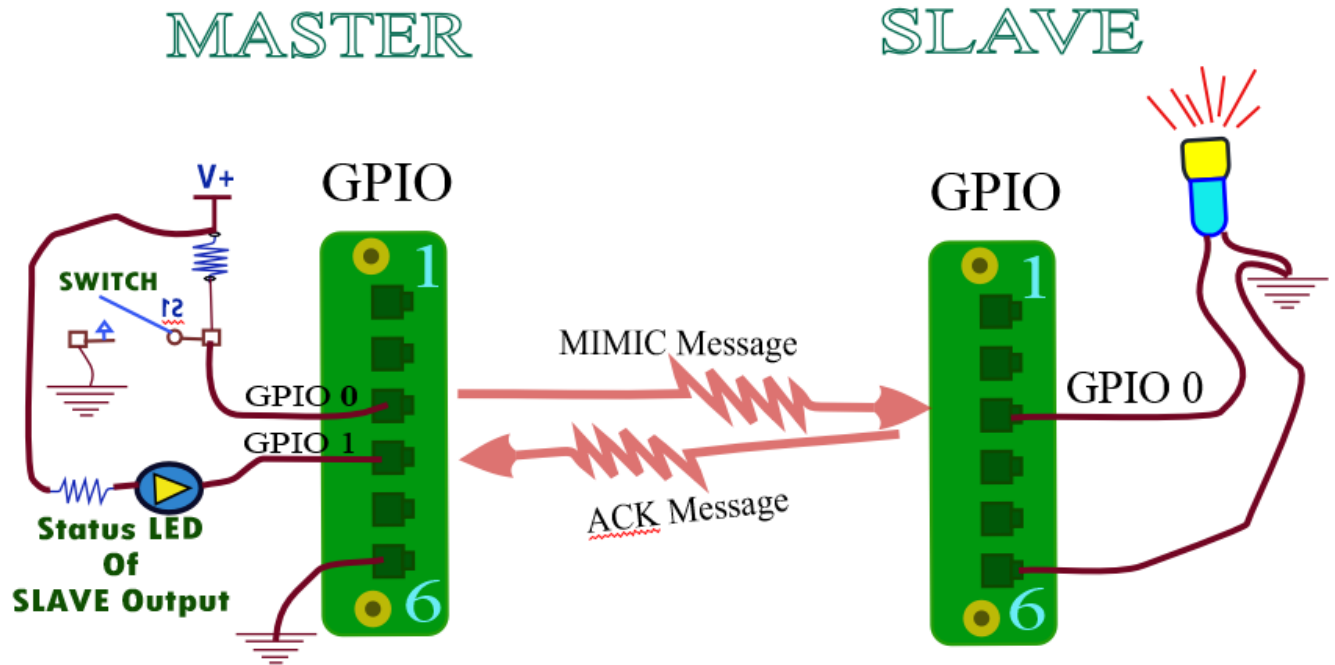
MIMIC Inputs can utilize 1-3 input pins. MIMIC Slave always uses GPIO1 for the first input pin to send over the air. GPIO1 is the second, and GPIO2 is the third, if they are setup as digital input pins.

MIMIC Output bits can utilize 1-3 output pins. When a MIMIC message comes in from a Master to a slave, the MIMIC Slave will output the Master's input bits onto its Output bits. For the GPIO interface, outputs can be: **C** or **D**.

The first GPIO pin setup as an output will be used to MIMIC the Master's first input pin.

The second GPIO pin setup as an output will be used to MIMIC the Master's second input pin.

For example, the image below shows a switch on input 0 of the Master radio. The MIMIC messages send it to the Slave. Because it is In0, the slave device looks for the first output pin, and send it out. GPIO 0 is setup as switched DC, to the light is controlled by the master's switch. The slave sends an ACK message back, and when the ACK comes in, the Master's software looks for the first output pin, which is GPIO1 setup as Open Drain sot he LED powered by V= turns on when the Slave's GPIO 0 output is on.



FIO Flexible Digital Inputs and Outputs.

The Tech Series FIO Flexible IO version of the RV-M21 and RV-M22 series radio modems is ideal for SCADA, telemetry, and MIMIC mode. Here is a summary of the standard FIO features. If you need other IO features or additional IO, please contact Raveon sales personnel.

The FIO connector on the product is DB15 female. The IO modes FIO pins can be set to are: **A**: Digital TTL Input, **B**: Digital TTL Output, **C**: Open Drain MOSFET output. Please see the following table to see which FIO ports can be used for which IO modes. The FIO is great for the MIMIC Master device, because 3 inputs can be setup and 3 outputs can be setup to control the Slave and monitor the Slave.



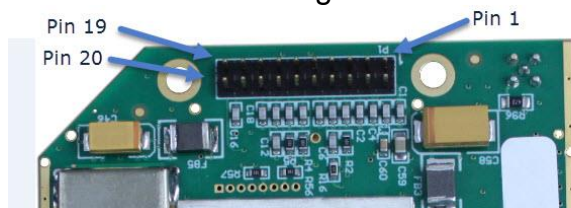
Pin #	Name	Direction	Function	Level / Specification	GPIO Modes this pin can be configured as:
1	VIN		DC Voltage Input		
2	TxD	In	Serial Data Input. Data to TX or command inputs.		
3	OD0	Out	Open Drain Out		C

4	IO0	I/O	I/O Pin 0 (digital bit 0)	Digital IO pin. Input or output.	A, B
12	IO1	I/O	I/O Pin 1	Digital IO pin. Input or output.	A, B
5	IO2	I/O	I/O Pin 2	Digital IO pin. Input or output.	A, B
13	IO3	I/O	I/O Pin 3	Digital IO pin. Input or output.	A, B
6	IO4	I/O	I/O Pin 4	Digital IO pin. Input or output.	A, B
14	IO5	I/O	I/O Pin 5	Digital IO pin. Input or output.	A, B
7	IO6	I/O	I/O Pin 6	Digital IO pin. Input or output.	A, B
15	IO7	I/O	I/O Pin 7	Digital IO pin. Input or output.	A, B
9	RxD	Out	RX serial data output.	RS232	
10	VDIG		Digital Voltage	The internal IO port voltage regulator outputs its voltage on this pin.	A, B, C, D, E
8, 11	GND	-	Ground		

UWORK 20 Pin Connector Pin-Out

For reference information, this I/O pin description is for the Universal Wireless Radio Connector (UWRK) that every Raveon radio modem module uses for connection to external devices. Within the M21, M22 enclosure is a radio modem module that has the UWORK connector on it. In the MIMIC mode, these are the pins on the UWRK connector that implement MIMIC functions.

All Raveon OEM radio modem modules use the UWORK connector technology, and most all have the MIMIC mode feature. You can incorporate this low-cost OEM module into your product for data communications or transmitting data with MIMIC mode enabled.



Pin #	Function	I/O	Function
1	GND	-	Ground. Connect to power ground (negative)
2	Vcc	I	DC Input
3	DCD	O	Carrier Detect Out. Output Bit #1 in MIMIC mode. IN MIMIC mode, this pin will mimic the sender's RTS pin.
5	Data In (TXD)	I	Transmit serial data input.
6	Data Out (RXD)	O	Receive serial data output.
7	Enable	I	Low (<.7V) to shut down the module. High (>2.5V) to enable it.
8	DTR/Sleep	i	Digital Input Bit 0 . Status controls the MIMIC reporting rate.
9	CTS	O	Clear to send output. Digital Output Bit 0 . In MIMIC mode, this pin will MIMIC the senders DTR pin.
10	RTS	I	Digital Input Bit 1 in MIMIC mode.
12	3.3V out	O	3.3V out of the M6 module. 50mA max current draw.
13	IOA AUDIO IN	I/O	General purpose digital I/O. 3V digital logic from CPU on M6. If the Audio option is used, this pin is used to input transmit audio.

14	IOB	I/O	General purpose I/O. 3V digital logic from CPU on M6. By default functions as DSR. 0= ready&running. 1=sleeping. If enable=0, this line will =0.
15	Decode Mode	I	3V digital logic with 10k pull-up. High/open = POCSAG paging receive mode, Low/ground=data modem mode. This feature enabled by setting the alternate protocol with the ATMA command.
16	STAT1	O	Output to drive external dual-color LED. Connect led between STAT1 and STAT2.
17			Unused. Do not connect to anything.
18	STAT2	O	Output to drive external dual-color LED. Do not connect the LED to ground or DC voltage.
19	GND	-	System Ground to M6
20			Unused. Do not connect to anything.

With OEM radio modem modules, The MIMIC mode bits are transferred like this:

Master to Slave MIMIC Messages

DTR (Input0) is sent to CTS (Out 0)

RTS (Input1) is sent to CD (Out 1)

If ACK is enabled, the Slave will send and ACK message back.

Master From Slave ACK Messages

CTS (Out 0) is received in from Slave CTS (Out 0) status

CD (Out 1) is received in from Slave to CD (Out 1) status

MIMIC, SCADA, and GPIO mode Commands

These commands relate to controlling and reading I/O pins on the RV-M21 and RV-M22 interfaces.

Command	Command Description	Parameters	Factory Default
FAILSAFE	FAILSAFE A B command sets the minimum message interval, and the default digital output state if an over-the-air MIMIC message is not received within the failsafe period. A is the minimum period in seconds, Set A to 0 to disable FAILSAFE feature. B is the power-on ASCII hex value of the digital outputs, and also B default values are used if the failsafe interval passes and no MIMIC messages are receive. The B values are output again if MIMIC was enabled and no messages received during the MIMIC interval.	A: Required Message Interval or interface to transmit MIMIC data (Seconds) 0 - 99999 B: Default Ascii hex value to set outputs to. 00-FF	Disabled
DEFOUT	DEFOUT xx Set the default output bit state. Xx is a hexadecimal variable, for all bits. In firmware E3+.	The bit status of output bits in HEX. 0-FF	0
GOUT	GOUT Get the output bit register in hexadecimal format. Example: will return C3 if bits 0, 1, 14, 15 are set(1) and all other clear (0).	Returns Hex value, 16 bits max.	
GINP	GINP Get the input bit register in hexadecimal format. Example: will return C3 if bits 0, 1, 14, 15 are set(1) and all other clear (0).	Returns Hex value, 16 bits max.	
CBIT	CBIT X Clears output bits, X is hexadecimal format. Any bit in x set to 1 will cause the same output bit in the modem's output register to be cleared to 0. No bits get set. X=C3 to set bits 0, 1, 14, 15. To read the output bit register, enter CLRBIT with no parameter or better to use GETOUT command.	0-FF	

MIMIC	MIMIC mode. MIMIC X Y X number of seconds to TX if input 0 is low. X=0 to disable MIMIC mode. Y is number of seconds between transmissions when the input 0 is high.	X: 0-255 Y:0-255	0 disabled
SBIT	SBIT X Sets output bits, X is hexadecimal format. Any bit in x set to 1 will cause the same output bit in the modem's output register to be set. No bits get cleared. X=C3 to set bits 0, 1, 14, 15. To read the output bit register, enter SETBIT with no parameter or better to use GETOUT command.	0-FF	
TRIGBITS	TRIGBITS This command enables or disables individual bits for use as input triggers.	0-FF	
IOPIN	IOPIN XX M Set the GPIO bits on the Tech Series GPIO front panel to inputs or outputs. XX parameter are the hexadecimal representation of the pins being configured. M is the mode for the XX pins. Mode M values: A :Digital TTL Input, B :Digital TTL Output, C : Open Drain MOSFET output, D :DC Power switch output, E :Analog Input	XX=Hex 00-FF M=(A,B,C,D)	A 03 C 04
ATRB	Number of retries. If this modem does not get an ACK back when it sends data, this is the number of times it will re-transmit the packet and wait for an ACK. 0=disabled feature.	Range: 0-99	0 (ACKs are not used)

Configuring a MODEM for MIMIC mode

Receiving MIMIC messages

Receiving MIMIC messages over the air and outputting them to the I/O pins in RV-M8 or RV-M6 OEM modules, is done by setting the **ATIO** command to 1 (**ATIO 1**). If the radio modem module used is incorporated into a Tech Series enclosure (M21 or M21), then keep the I/O mode set to 8 (**ATIO 8**). Don't change **ATIO** mode with Tech Series Radios (M21 M22).

The MIMIC mode will be enabled automatically when the GPIO front panel or the FIO digital IO panel Tech Series Enclosure is installed on the unit. The RV-M21 and RV-M22 radio utilize these Tech Series enclosures with GPIO and FIO input/output options.

Transmitting MIMIC messages

MIMIC transmissions are enabled with the **MIMIC X Y** command. **MIMIC 0** disables MIMIC mode and puts the unit in standard radio modem operation mode. **MIMIC X Y** with X and Y being any positive number will enable the MIMIC feature. The **MIMIC X Y** command sets the unit to transmit a MIMIC over-the-air message every X seconds when INPUT0 is low, and to every Y seconds when INPUT0 is high. INPUT0 which is DTR on RS-232 IOs is the digital pi that controls the MIMIC reporting rate.

If the radio modem is receiving inbound data over the air when it comes time to transmit the MIMIC data, it will wait until the reception is over, and then send the MIMIC data.

MIMIC Command settings

If digital input INPUT0 is low, every X seconds, the unit will automatically transmit the digital status of both the INPUT0 and INPUT1 pins. If INPUT0 is high, every Y seconds, the unit will automatically transmit the digital status of the INPUT0 and INPUT1 pins.

For example, **MIMIC 2 60** configures the radio to send the state of INPUT0 and INPUT1 pins every 2 seconds if INPUT0 is low, and every minute if INPUT0 is high.

Radio addressing operates as it does in the standard mode. When a unit receives a MIMIC transmission intended for its ID, it will set its OUT0 and OUT1 pins as determined by the sending stations INPUT 0 and INPUT1.

When the unit is in the Command mode, MIMIC transmissions will not take place. The command mode is entered by sending +++ into the serial port. See the MODEM Technical Manual for information on how to configure the MODEM using the built-in commands.

The MIMIC transmissions are the same over-the-air format as a standard data transmission from an MODEM radio modem, except they contain no user-data, only digital I/O information. An MODEM radio modem configured as a repeater will repeat the MIMIC messages.

Failsafe Settings

No communication system can be 100% reliable under all conditions. Especially long-range wireless communication systems can fail to communicate due to interference, power-loss, lightning, antennas breaking or being blocked, or many other circumstances. Incorporated into this product are some additional settings called *Failsafe*, than can alleviate some problems if the radio communications fails for some reason.

To ensure failsafe operation, a **FAILSAFE A B** command sets the minimum message interval, and the default digital output state if an over-the-air MIMIC message is not received within the failsafe period. A is the minimum period, and B is the ASCII hex value of the digital outputs if the failsafe interval passes and no MIMIC messages are receive. B is also the power-on default value of the digital outputs.

For example, **FAILSAFE 60 1** configures the unit to require a MIMIC message at least every minute. If one is not received within 60 seconds, OUT0 will go high (open drain), and OUT1 will go low (below ground).

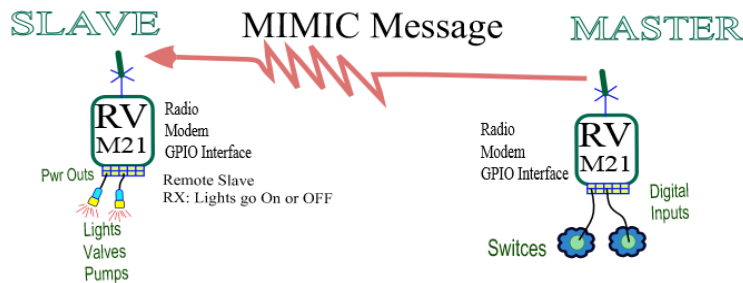
It is recommended that the **A** value for the **FAILSAFE** command be about 2.5 times longer than the largest of the **X** and **Y** values of the **MIMIC** command. This allows for one MIMIC message to be missed. For example if MIMIC transmissions are set to **MIMIC 2 60**, a reasonable **FAILSAFE A B** setting would be a value of 150 for A. This will allow one **MIMIC** message to be missed and the **FAILSAFE** value not kick in. If more than two **MIMIC** messages did not get received, after 150 seconds, the MODEM would revert to the failsafe values.

To disable failsafe operation, issue the **FAILSAFE 0** command. This disables failsafe operation. In this case, the outputs will stay latched at the last condition that was received over the air.

Note: the power-on condition of the OUT0, OUT1, OUT2 are indeterminate.

You will need to set the **MIMIC** and **FAILSAFE** values to match the needs of your system.

Configuring a One-Way MIMIC Link



To setup a MIMIC radio link from one point to another, follow these steps:

On the transmitting MODEM

1. Connect a terminal to the MODEM, and put it into the command mode (+++).
2. Enter the command **MIMIC X Y** where **X** is the transmission rate when INPUT0 is low, and **Y** is the transmission rate when INPUT0 is high.
3. Exit the command mode. The MODEM will begin automatically transmitting every X/Y seconds.

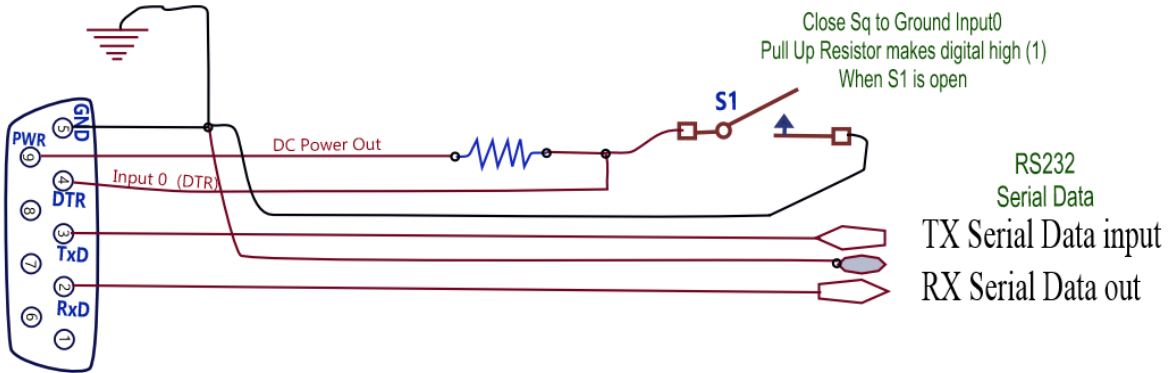
On the Receiving MODEM

1. Connect a terminal to the MODEM, and put it into the command mode (+++).
2. If the modem is an OEM module like RV-M6 or RV-M8, enter the **ATIO 1** command. This tells the MODEM to reconfigure its serial IO port to allow the digital outputs to be controlled via over-the-air messages.
3. Enter the **FAILSAFE A B** command. The **A** parameter will be the maximum amount of time that should ever pass without receiving a MIMIC message. The **B** parameter is the digital output state if the time set by A passes and no MIMIC messages are received.
4. Exit the command mode. The unit is ready to receive MIMIC messages from the transmitting station.

Wiring a MIMIC Link

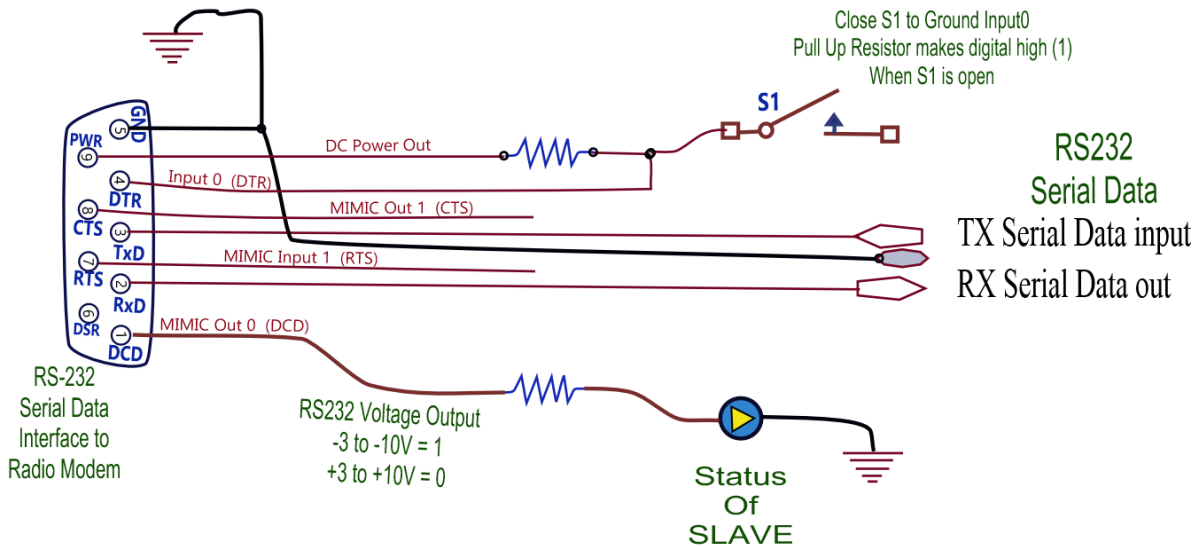
To wire a Raveon RS232 Data Modem with a switch that will be "MIMICed", follow the diagram below:

MIMIC Mode Master Transmit Wiring with RS232 Interfaces



When switch S1 is closed, the MODEM will transmit at the X rate, and when it is open, it will transmit at the Y rate. INPUT0 uses RS232 level, and a connection to ground is considered a "low". An open circuit or any voltage above about 1V is considered a high. R1 is shown to ensure that the input goes high when S1 opens. A DPDT switch could be used instead.

To wire an RS-232 master Modem to receive MIMIC digital ACK signals, follow the diagram below:



When a MIMIC signal is received over the air, OUT0 will follow INPUT0 on the sending station. OUT1 will follow INPUT1. This will cause the LED lamp to light, or the relay to close if a relay is used. Do not load the OUT0 with a device that will draw more than 100mA. NEVER connect OUT0 to a power source. Out 0 and Out 1 can be connected to digital relay drivers that can drive the device you need to use to display the status of the slave's outputs.

Optional MOSFET Open Drain Driver

The Tech Series radio modem has a GPIO interface options with a MOSFET output driver on the three outputs. If this option is

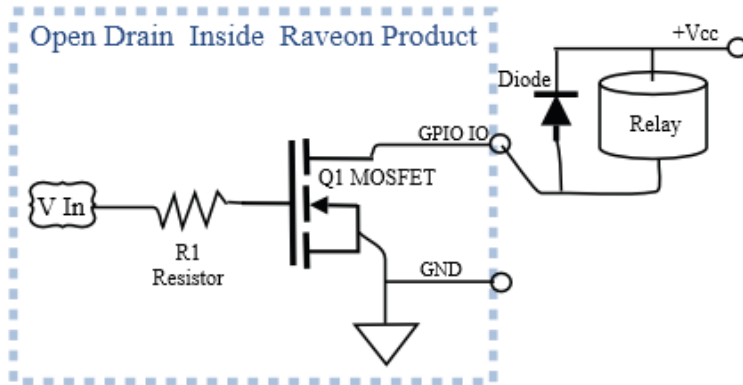


GPIO Inputs And Outputs
Open Drain, Switch DC,
Voltage Read, Digital In,

used and the GPIO is setup for Open Drain outputs, OUT0 will be pulled to ground to energize an external relay or lamp whenever OUT0 was supposed to go low.

So closing switch 1 S1 on the sending station will cause OUT0 to go low, energizing the relay/lamp/led...

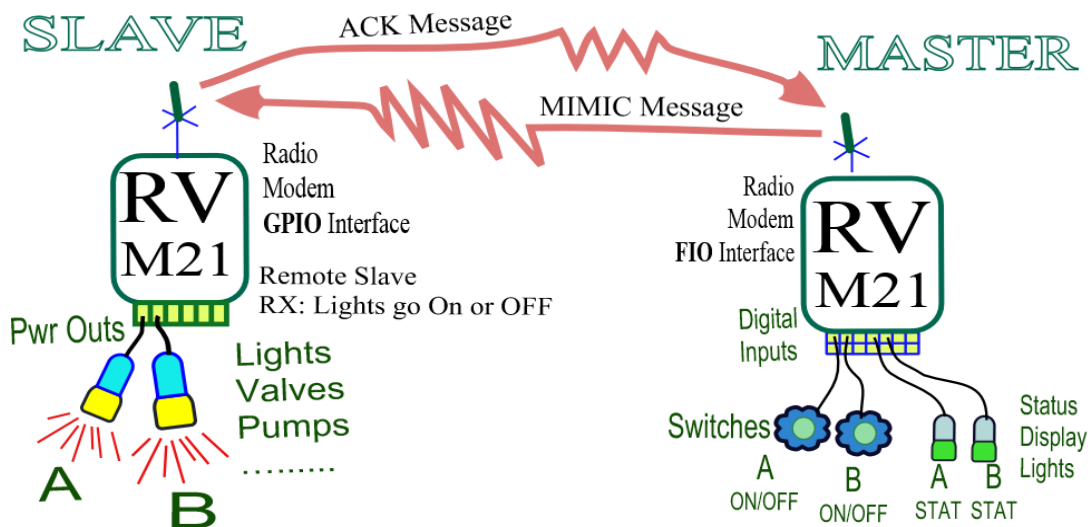
An Open Drain output enabled on the GPIO interface can drive a relay. And good relays can power almost anything you would want to control. Its always good to put a protection diode on the relay to avoid electrical noise pulses.



Raveon’s application note *AP238 GPIO_OD* describes all the technical features and operation of a GPIO interface with open Drain outputs.

Two-Way MIMIC using Master-Slave Radio Modems

In the *Master-Slave* configuration, one “Master” unit transmits MIMIC digital data to a Slave unit. This configuration is ideal for point-to-point two-way MIMICing. The slave responds with an ACK message that returns its IO status and then the mast unit receives the ACK and outputs the slave’s output status on the master’s outputs.



Remember to configure the ID addressing (**ATDT**, **ATMY**, and **ATMK** parameters), so that the MODEM radio modems communicate to the units with the correct IDs. See the MODEM Technical Manual for information about addressing and IDs.

ATDT: Destination ID for transmissions. The ID this radio sends messages to.

ATMY MY ID this radio's ID. It sets the message ID this radio will receive.

ATMK Address Mask. Mask lets you setup groups or receive groups or all messages.

The Slave can be configured to respond with an *ACK packet* each time it receives an over-the-air message from the Master, and embedded in the ACK packet is the digital status of the Slave. The **ATAK** command configures the receiver to automatically send ACK packet back to the ID of the unit that sent it data. When the Master receives the ACK packet back from the Slave, it updates its output pins OUT0 and OUT1 to match the values of the Slave INPUT0 and INPUT1. To have a slave send an ACK, turn ACK on **ATAK 1** command. **ATAK 0** disables the unit from sending an ACK.

Configure the "Master" as follows

1. Set **ATRB 1** to configure the modem to send messages that will require an ACK back from the Slave. By default **ATRB** is **0** (no ACK transmissions). MIMIC output does not need to require and ACK. It is up to your system if you want the ACK sent.
2. Configure the **MIMIC X Y** *command* where **X** is the transmission rate when INPUT0 is low, and **Y** is the transmission rate when INPUT0 is high. These are the rates at which the master will transmit.
3. Set the **FAILSAFE A B** parameter. The **A** parameter will be the maximum amount of time that should ever pass without the Master receiving a MIMIC message from the Slave. The **B** parameter is the digital output state if the time set by A passes and no MIMIC messages are received.
4. On RV-M8 or RV-M6 radios, execute the **ATIO 1** command. On Tech Series RV-M21 and RV-m22 radios do not change this ATIO parameter.
This tells the Master MODEM to reconfigure its serial IO port output pins to allow the digital status from ACK response message over-the-air from the Slave to be put out on the Master. In Tech Series radios M21 M22, this is automatically enabled if MIMIC mode is used by setting up **MIMIC X Y**.

On the "Slave", as follows:

1. Set **ATAK 1** to enable the Slave unit to send ACK packets back to the Master whenever it receives a message from the Master. Embedded in these ACK packets are the Slave's digital I/O status bits.
2. On the OEM M6 M8 radio board, execute the **ATIO 1** command. Do not use this command on the M21 M22 Tech Series products. M21 M22 will output MIMIC bit status as long as the **FAILSAFE** parameter is setup.
This tells the Slave modem to reconfigure its serial IO port to allow the digital outputs to be controlled via over-the-air messages from the Master.
3. Set the **MIMIC X Y** parameters to something very long. The Slave will respond to transmissions from the Master, so the X Y settings should not be set too short.
MIMIC 120 120 will tell the Slave to send its input status every 2 minutes. But it will only send its I/O status automatically if the Master has not sent MIMIC data to it, causing the Slave to send an ACK and the I/O status. If the Master fails to send, then this **X Y** setting will determine how often the Slave transmits.

4. Set the **FAILSAFE A B** parameter. The **A** parameter will be the maximum amount of time in seconds that should ever pass without the Master receiving a MIMIC message from the Slave. The **B** parameter is the digital output state in HEX if the time set by A passes and no MIMIC messages are received.

Autonomous Two-Way MIMIC

When configured for autonomous MIMIC transmissions, all radios modems will transmit the digital I/O status at the preset intervals as configured with the **MIMIC X Y** command. When operating in a multi-point configuration, this type of setup is probably preferable to the Master-Slave configuration described above.

Remember to configure the addressing (**ATDT**, **ATMY**, and **ATMK** parameters) of all MODEM radios, so that the MODEM radio modems communicates to the units with the correct IDs. See the MODEM Technical Manual for information about addressing and IDs.

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