



## M7 MIMIC Mode

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### Overview

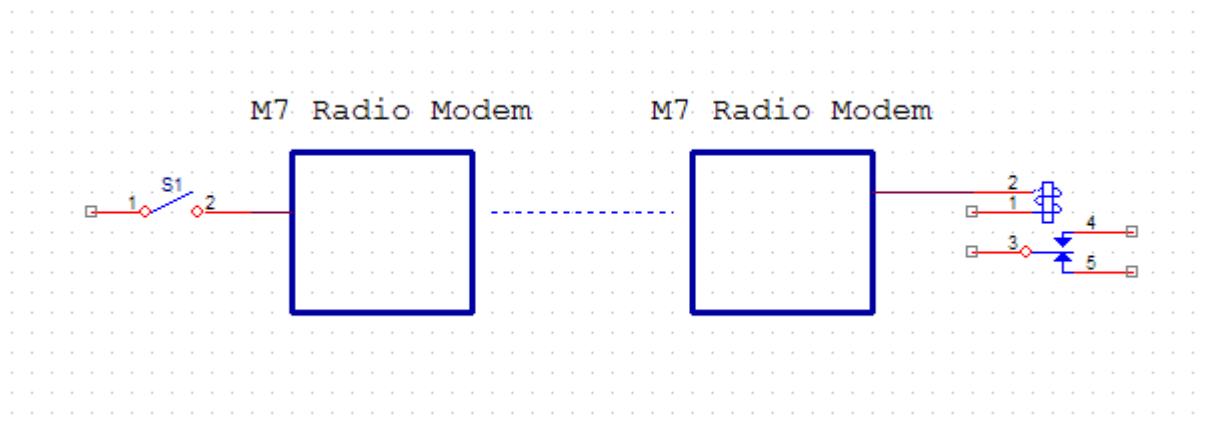
A MIMIC mode allows two or more M7s to mimic each other's digital I/O. When in the MIMIC mode, the M7 will periodically transmit its digital status. The M7 will also continue to operate as a radio modem, sending/receiving data using pins 2&3 of the DB9, but the other I/O pins of the DB9 will be used for digital input/output.

Normally, the Serial I/O connector operates like an RS232 serial 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 on the OUT0 and OUT1 pins.

There are two aspects to the MIMIC mode:

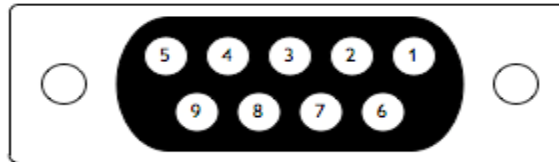
1. The transmitter that sends the status of its digital inputs. This is enabled with the **MIMIC X Y** command.
2. The unit that receives the over-the-air MIMIC message, and sets its digital outputs to match the inputs of the sending station. This function is enabled with the **ATIO 1** command. ATIO 1 configures the DB9 serial port to operate with RS232 signal levels, and use the digital control lines for digital I/O instead of RS232 flow control. ATIO 0 turns off MIMIC reception ability, and the digital I/O pins will operate as flow control signals.

The goal of the MIMIC mode is quite simple: Flip a switch at one location, and have something at another location turn on or off.



## DB9 Connector Pin-Out

The RS232 9-pin serial I/O connector on the M7 radio is a female 9-pin D-subminiature connector having the following pins configuration. It is pinned out so that it may be plugged directly into a computer or a PC's 9-pin COM port.



**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	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.	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	<b>INPUT0.</b> RS232 input levels. 0V or below ground is a low input. >3VDC input or open circuit is a digital 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.	Normally ignored by the M7 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	<b>OUT1.</b> RS232 output levels. <b>OUT1</b> is negative when INPUT1 is pulled to ground or below ground on the other MIMIC radio. <b>OUT1</b> will change to positive (>3V DC) if INPUT1 on the other MIMIC radio is high.	Normally is set to 0 when modem is powered on and running. Modem sets to a 1 when in low-power mode.
7	RTS	in	Request to send	<b>INPUT1.</b> RS232 input levels. 0V or below ground is a low input. >3VDC input or open circuit is a digital 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	<b>OUT0.</b> Open drain output to drive a light, LED, or relay. <b>OUT0</b> is pulled to ground when <b>INPUT0</b> is pulled to ground or below ground on the other MIMIC radio. <b>OUT0</b> will change to high impedance if <b>INPUT0</b> 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 M7. 0 = OK to send, 1 = don't send. If the M7 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.

The Raveon M7 data radio modem uses a special RS232 driver/receiver IC chip to condition and protect all of the data pins on the DB9 RS232 port. The chip used is an *ICL3238*. Refer to the datasheet on this chip for information about its capabilities, voltages, and thresholds. Its data sheet is available here: <http://www.intersil.com/products/deviceinfo.asp?pn=ICL3238>.

## ***Configuring an M7 for MIMIC mode***

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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.

### ***MIMIC Command settings***

If digital input INPUT0 is low, every X seconds, the M7 will automatically transmit the digital status of both the the INPUT0 and INPUT1 pins. If INPUT0 is high, every Y seconds, the M7 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 M7 Technical Manual for information on how to configure the M7 using the built-in commands.

The MIMIC transmissions are the same over-the-air format as a standard data transmission from an M7 radio modem, except they contain no user-data, only digital I/O information. An M7 radio modem configured as a repeater will repeat the MIMIC messages.

### ***Failsafe Settings***

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 M7 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. The power-on condition of the OUT0 and OUT1 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

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

### On the transmitting M7

1. Connect a terminal to the M7, 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 M7 will begin automatically transmitting every X/Y seconds.

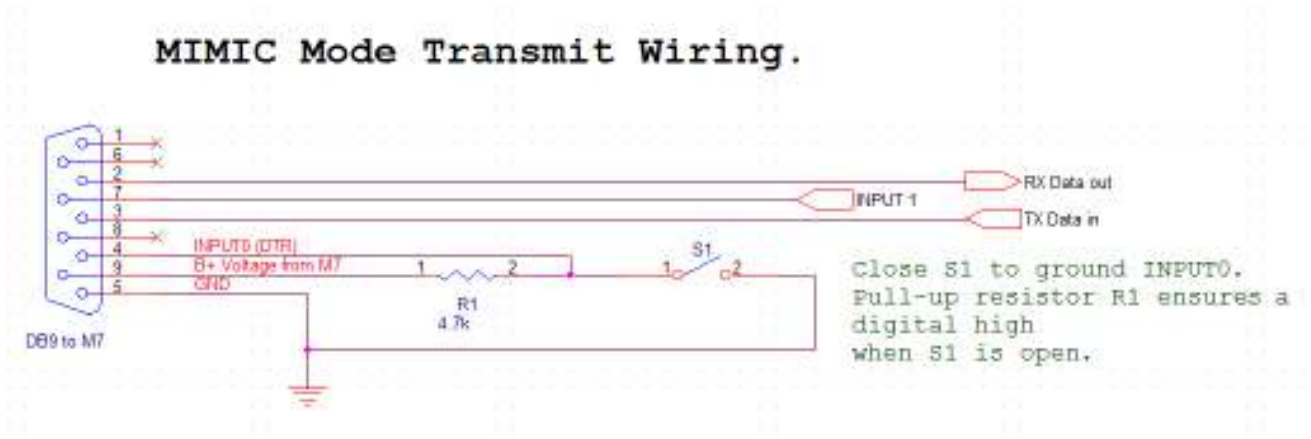
### On the Receiving M7

1. Connect a terminal to the M7, and put it into the command mode (+++).
2. Enter the **ATIO 1** command. This tells the M7 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

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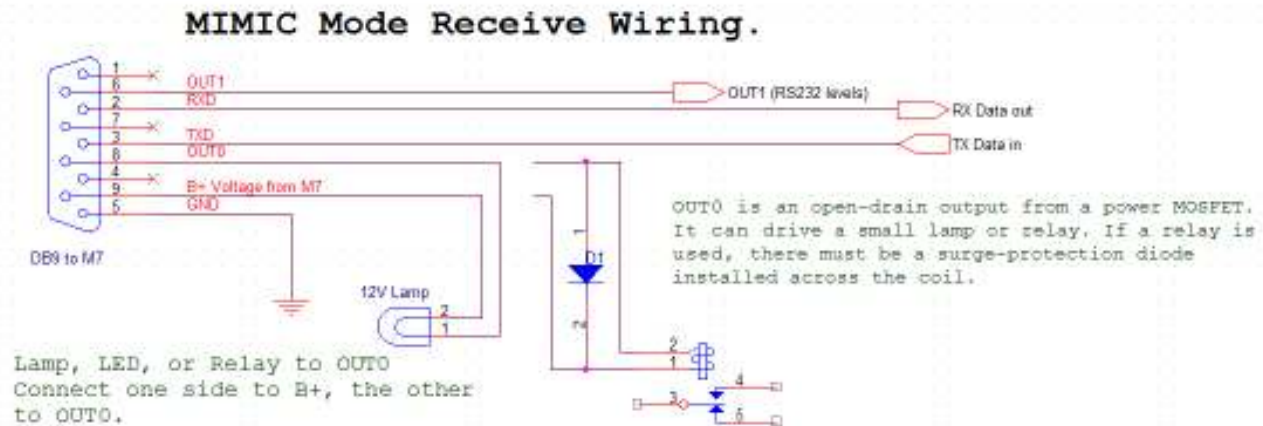
To wire an M7 with a switch that will be “MIMICed”, follow the diagram below:



When switch S1 is closed, the M7 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 M7 to receive MIMIC digital 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 12V 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.

### Optional MOSFET Driver

The M7 radio modem has an optional MOSFET output driver on the OUT0 output. (Only the OUT0, not the OUT1 output). If this option is installed, OUT0 will be pulled to ground to energize an external relay or lamp whenever OUT0 was supposed to go low. So closing S1 on the sending station will cause OUT0 to go low, energizing the relay/lamp/led...

The MOSFET that drives OUT0 is a 2N7002 type device. Do not connect a lamp/relay that draws more than 100mA to OUT0. Also, if OUT0 is driving an inductive load, use a surge-protection diode such as a 1N4001 across the load to prevent high-voltage transients.

If the optional MOSFET driver is not installed, OUT0 will simply follow INPUT0 with RS232 signal levels.

## Two-Way MIMIC using Master-Slave

In the *Master-Slave* configuration, one “Master” unit transmits its MIMIC digital data to a Slave unit. This configuration is ideal for point-to-point two-way MIMICing.

Remember to configure the addressing (**ATDT**, **ATMY**, and **ATMK** parameters), so that the M7 radio modems communicate to the units with the correct IDs. See the M7 Technical Manual for information about addressing and IDs.

The Slave is 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 **ATRB** command configures the ability to send ACK packets. 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.

### Configure the "Master" as follows

1. Set **ATRB 1** to configure the M7 to send messages that will require an ACK back from the Slave. By default **ATRB** is **0** (no ACK transmissions).
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. Execute the **ATIO 1** command. This tells the Master M7 to reconfigure its serial IO port to allow the digital outputs to be controlled via over-the-air messages.

### On the "Slave" M7, 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. Execute the **ATIO 1** command. This tells the Slave M7 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 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.

## Autonomous Two-Way MIMIC

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When configured for autonomous MIMIC transmissions, all M7 radios 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 M7 radios, so that the M7 radio modems communicate to the units with the correct IDs. See the M7 Technical Manual for information about addressing and IDs.

### Configure the M7 radio mode as follows

1. 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 at. In systems with many radios, you should consider setting **X** and **Y** to different values for each radio.

2. 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.
3. Execute the **ATIO 1** command. This tells the Master M7 to reconfigure its serial IO port to allow the digital outputs to be controlled via over-the-air messages.
4. You may want to enable "Busy Channel Defer". Set **ATBC 1** to enable Busy Channel Defer. When **ATBC** is set to **1**, the M7 radio will check to make sure the radio channel is not busy before it transmits, and if it is, it will defer until the channel is clear. If **ATBC** is set to **0**, then this feature is off, and the M7 will transmit when it needs to transmit, regardless of the channel status. By default, ATBC is 0 (unit does not defer to other radios on the channel).

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