

TIMTER™ Multi-mode Digital Telemetry Transmitter

RF Troubleshooting Guide



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1 RF Output Notes for Troubleshooting

There are three methods of muting the RF output. If you do not have RF output, check these conditions:

1. **RF On / Off command** – From the control terminal, type **RF** to query the current state of the RF On/Off variable. If it is 0, type **RF 1** to turn the output back on.
2. **External clock removal** – If the unit is configured to use the external clock (CS = 0), that clock's presence is detected. If it is not present AND the unit is not running in Clock Free mode, the RF output automatically shuts OFF (unless the AC or ACS option is present, in which case the RF output switches to just a carrier at the center frequency with no modulation on loss of clock). When the data clock comes back, the RF output automatically turns on. The lag from data clock state change to RF output change is about 0.1 seconds, but varies based on settings.

If the unit IS running in Clock Free mode, no clock is required, but the loss of data transitions is detected. This will cause the RF to shut OFF (or if AC or ACS option and AC is set to 1, change to a carrier on center frequency). When the data transitions begin again (or when an external clock is reapplied if NOT in Clock Free mode), the RF output turns on again.

3. **RF On / Off pin** – The RF On / Off pin is a hard OFF control for the RF output. The polarity of this pin is selectable using the RZ command. The RF On /Off pin (in the inactive state) forces RF OFF; the RF On /Off pin can only allow RF to turn on, but it cannot force it to turn on.

If RZ = 1 then a high level on the RF On / Off pin allows RF On.

If RZ = 0, then a low level (ground the RF On / Off pin) allows RF On.

The RZ command is described in Quasonix transmitter user manuals.

1.1 Troubleshooting the RF on a Quasonix Transmitter

The following is a quick, three-part test to verify that the RF output on the transmitter is working correctly. This procedure should work for most transmitters with no modifications, however the sheer number of extra options and variations means that some units will need some special instructions or may work slightly differently. Examples are auto-carrier (-AC option), clock free (-CF option) and recall-holdoff (-RH option). If the procedure below does not demonstrate the working RF output on the transmitter, please contact Quasonix technical support for further help in resolving the issue.

The three sections below demonstrate RF output functionality one step at a time: first a carrier, then a waveform based on internal clock and data, and finally the waveform using the user supplied external clock and data. Part one demonstrates a simple carrier output at the desired frequency. Part two demonstrates proper waveform modulation using internal clock and data generated by the transmitter itself. Part three switches to the user supplied external clock and data for normal operation. If the first two parts work correctly, then the only missing piece is the external clock and data, so resolving any final issues becomes easier.

Part 1: Checking for carrier power output on frequency

4. Turn on power to the transmitter.
5. Set the mode to 6 (carrier only) using command **MO 6**.
6. Set transmitter to the desired frequency using the **FR** command. For example, **FR 2200.5**.
 - To see the allowed frequencies on your unit, type **FR ?**.
7. Turn the soft RF control on with **RF 1**.

8. Use a Spectrum Analyzer to determine whether there is a stick at the desired frequency. If there is, go on to Part 2.
9. If there is no output, check the state of the RF On/Off pin.
 - If the pin appears to be in the correct state to enable the output, check the RF On/Off pin polarity using the **RZ** command.
 - If the polarity is incorrect, change it.
 - **RZ 1** sets the transmitter output to turn ON when the RF On/Off pin is high (3.3 VDC).
 - **RZ 0** sets the transmitter output to turn ON when the RF On/Off pin is low.
10. Is the output present now? If so, go on to Part 2 below. If not, call Quasonix for technical support.

Part 2: Verifying modulation output on frequency with internal data

1. Turn on the transmitter.
2. Set the mode to one of the available modes on your unit. For example, **MO 0** for PCM/FM, **MO 1** for SOQPSK, etc.
3. Set transmitter to the desired frequency using the **FR** command. For example, **FR 2200.5**.
 - To see the allowed frequencies on your unit, type **FR ?**.
4. Turn the soft RF control ON with **RF 1**.
5. Enable the internal clock source with **CS 1**.
6. Enable the internal data source with **DS 1**.
7. Set the internal clock rate to 5 Mbps with **IC 5**.
8. Set the internal data pattern to PN15 with **ID PN15**.
9. Use a spectrum analyzer to verify the desired waveform on the RF output at the desired frequency.
10. If the waveform is NOT present, check the state of the RF On/Off pin. Use the **RZ** command to check the current polarity of the RF On/Off pin.
 - **RZ 1** sets the transmitter output to turn ON when the RF On/Off pin is high (3.3 VDC).
 - **RZ 0** sets the transmitter output to turn ON when the RF On/Off pin is low.
11. Change either the RF On/Off pin or the polarity to turn the RF output ON.
12. Check for the RF output on the spectrum analyzer.
 - Is the output present now? If so, go on to Part 3.
 - If not, call Quasonix for technical support.

Part 3: Verifying modulation output on frequency with user data

1. Turn on the transmitter.
2. Set the mode to one of the available modes on your unit. For example, **MO 0** for PCM/FM, **MO 1** for SOQPSK, etc.
3. Set transmitter to the desired frequency using the **FR** command. For example, **FR 2200.5**.
To see the allowed frequencies on your unit, type **FR ?**.

4. Turn the soft RF control on using **RF 1**.
5. Disable the internal clock source with **CS 0**. This is the normal state on power up for most units.
6. Disable the internal data source with **DS 0**. This is the normal state on power up for most units.
7. Be sure that a clock source is connected to the correct pins of the transmitter input connector with the correct type (TTL or RS-422) of signal and in the case of RS-422, the correct polarity.
8. Be sure that the clock source is ON and that the clock rate is within the allowed range for the mode selected. Typically this is 100 kbps to 28 Mbps for Tier 1 and 2 waveforms and 50 kbps to 14 Mbps for Tier 0.
9. Be sure that a data source is connected to the correct pins, with the correct type (TTL or RS-422) and polarity as above.
10. Use a spectrum analyzer to verify the desired waveform on the RF output at the desired frequency.
11. If the waveform is NOT present, check the state of the RF On/Off pin. Use the **RZ** command to check the current polarity of the RF On/Off pin.
 - **RZ 1** sets the transmitter output to turn ON when the RF On/Off pin is high (3.3 VDC).
 - **RZ 0** sets the transmitter output to turn ON when the RF On/Off pin is low.
12. Change either the RF On/Off pin or the polarity to turn the RF output ON.

You may issue the RF command and observe the status which is returned. This status indicates whether the transmitter believes the RF output is actually ON or not.

The **SY** command may be issued to check the actual clock rate that the transmitter sees if no RF output is detected. One of the most common problems is a clock rate that is too high or too low (or missing) for the desired modulation.

Finally, if you have a full RF loop running with a BERT and are having trouble achieving a zero bit error rate or lock, try the loop using internal data with the standard PN15 bit pattern. Be sure the BERT pattern is set to match the selected data pattern (**ID** command) on the transmitter. Assuming the internal data syncs and produces a zero bit error rate, you can switch back to the external clock and data. In this case, you can also check (and change) the clock polarity (**CP**) the data polarity (**DP**), the randomizer (**RA**), and the differential encoder (**DE** - normally on for SOQPSK and off for other waveforms) to resolve the sync and bit error rate issues.

If you are still having difficulties at this point, then contact Quasonix technical support.

Quasonix Technical Support
(1-513-942-1287) or email (support@quasonix.com)

When calling technical support, it will speed things up if you have the following information handy:

- Model number (obtained with the **ZZ** command) ***Note that this is different from the customer part number.***
- Serial number (obtained with the **SN** command)
- Software Version (obtained with the **VE** command)

It is also helpful if you can call from a phone in your lab so our tech support people can actually walk you through setting, checking, and controlling your transmitter).