



## **WWVB Radio Controlled Clock Fact Sheet**

### **HOW THEY WORK**

- Radio Controlled (RC) clocks, sometimes incorrectly referred to as Atomic Clocks, receive a radio signal from the National Institute of Standards and Technology (NIST) radio station WWVB, located near Fort Collins, Colorado. NIST maintains time and frequency standards for the United States of America and distributes these standards to the American public. WWVB broadcasts on a frequency of 60 kHz and your radio controlled clock has a miniature antenna and radio receiver inside that is permanently tuned to receive the 60 kHz signal. The WWVB broadcast is based on data received from an atomic clock that is maintained and housed at NIST laboratories.
- The time signal is broadcast continuously, 24 hours a day, 7 days a week with a complete time message (time code) sent every minute. However, RC clocks only attempt to read the time code periodically, often only once every 24 hours, typically during the night when the signal is strongest. The time code contains the year, day of year, hour, minute, and second.
- A properly functioning RC clock always displays the correct time, down to the exact second. They never need to be adjusted and will automatically adjust for daylight savings time (DST).
- The WWVB broadcast is Coordinated Universal Time (UTC) or the time kept at the Prime Meridian that passes through Greenwich, England and does not contain time zone information. Once your RC clock has decoded the signal from WWVB, it will synchronize its own clock to the message received by the radio. It will apply a time zone correction based on the time zone setting that you entered.

### **WHERE THEY WORK**

- The WWVB signal is strongest at night. During nighttime hours the signal is capable of synchronizing clocks in the 48 continental United States, parts of Alaska and Hawaii, all of Mexico, in most of the populated areas of Canada, and in some regions of Central and South America.
- RC clock reception depends on the size of the time signal compared to the electrical noise near the same frequency. For example, if the RC clock is near a source of interference (such as a computer monitor) the clock might not be able to synchronize. If your RC clock is in a building with a metal roof, much of the signal will be blocked.

### **POTENTIAL SOURCES OF INTERFERENCE**

- Computer monitors and televisions. Some monitors have a scan frequency at or near 60 kHz. Place RC clocks at least 3 to 6 feet away for best results.
- Refrigerators, air conditioners, household appliances or other devices with electric motors. Electric motors can generate radio frequency of 60 Hz. Place RC clocks at least 3 to 6 feet away for best results.
- Basements. Signal quality is lessened if an RC clock is placed in a basement or other underground locations.
- Buildings made out of metal or buildings with metal roofs or steel siding might prevent the clock from working by blocking or weakening the incoming signal. Place the clock near a window to give it the best chance of synchronizing.
- Electrical storms. This problem is temporary and should cease when the storm is over.
- Overhead electrical wires. The 60 Hz emitted by electrical wires or power generating equipment can be a problem. Move the RC clock as far from the RFI source as possible.

## **WHAT TO DO IF THEY DON'T WORK**

### **1) *My clock doesn't synchronize at all..***

- Check and replace the batteries if necessary.
- If you have a desktop unit try rotating it 90 degrees. If you have a wall clock try mounting it on a wall perpendicular to the one it is currently on (e.g. if it is on a north-south wall try an east-west wall). The antennas are directional and you might be able to improve the signal strength by turning the antenna.
- Place the clock along a wall or near a window that faces Fort Collins, Colorado.
- Locate the clock at least 3 to 6 feet away from any computer monitors which can cause interference.
- If nothing else works, take the clock outdoors at night and power it down (remove the batteries), then power it up again to force it to look for the WWVB signal. If it works outdoors but not indoors, you probably have a local interference problem inside your house or building.
- The shielding provided by a metal building might prevent the clock from working. For example, if you live in a mobile home or a house with steel siding the clock might not work.

### **2) *My clock is off by one or more hours.***

- Remember, minutes and seconds are the same in all time zones, only hours are different. If your clock is off by one or more hours, it probably has to do with a time zone setting. Make sure you have properly selected your time zone using the instructions that came with your RC clock.
- If you live in an area that does not observe Daylight Savings Time, make sure that DST is disabled on your RC clock. Not all clocks have this feature, so you might have to select another time zone to make your clock display the correct time when DST is in effect.

### **3) *My clock is off by a few minutes or seconds.***

#### ***Reception Problem:***

- If your clock isn't currently receiving the signal, the time will gradually get further and further from the correct time. If the signal isn't being received, your clock isn't radio controlled any longer, it's just a regular clock.
- Most digital RC clocks have an indicator on the display that tells you if the signal is being properly received. If you are not sure if the signal is being received, try powering down the clock (remove the batteries), then turn it on again to see if it can synchronize. If it doesn't, see the tips above for improving your reception.

#### ***Alignment Problem:***

- If you have an analog clock, it is possible that the hands aren't properly aligned. This could cause the clock to be off by a second or more even if it is receiving the signal properly. The clock might not have been properly aligned at the factory or it might have been jostled during shipment, causing the hands to move.

#### ***Checking Your Clock:***

- There is no need to check a properly working WWVB clock, it should always display the correct time. However, you might want to check it if you suspect you have a problem. You can check the clock by listening to NIST Radio Station WWV using a short wave radio, by telephone (303-499-7111) or by using the NIST web clock (see below "The Official United States Time").
- When checking an analog clock, make sure you are looking straight at the clock face, and not viewing it from an angle, which could make it appear to be off by a few seconds even if it is not.

### **4) *We switched to Daylight Savings Time and my clock didn't change:***

- This is probably due to a reception problem. Your clock hasn't received the signal recently so it didn't know about the time change. Most digital RC clocks have an indicator on the display that tells you if the signal is being received properly. If you are not sure if the signal is being received, power down the clock (remove the batteries) then turn it on again to see if it can synchronize. If it doesn't, see the tips above for improving your reception.

## **ADDITIONAL INFORMATION**

To learn more about radio controlled clocks and radio station WWVB visit the National Institute of Standards and Technology website at [www.tf.nist.gov](http://www.tf.nist.gov).

Popular links;

[Radio Station WWVB](#)

[The Official United States Time](#)

[Information About WWVB Radio Controlled Clocks](#)

