



## **NWLD Nixie Watch**

### **User Manual**

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## Introduction

The Cathode Corner Square Nixie Watch is just about the most unusual yet practical timepiece you can wear on your wrist. It is a two-digit Nixie tube wristwatch designed for everyday use. It's guaranteed to get attention. People will ask you, "What is that? Is it a watch? Show me how it works."

The Nixie Watch is water-resistant and rugged. The battery is easily charged via the Micro USB port on the side. The watch requires no button pushing to operate – it shows the hours, minutes and seconds in sequence at the flick of the wrist. It provides a bit of theater with every reading.

The large crystal shows off the workings of the watch: the tubes, battery, and high-voltage power supply are all visible.

The watch features 12 or 24-hour time display mode, user-settable tilt angle, and easy time setting operation. The timekeeping rate is adjustable and the watch comes pre-adjusted to within a second a week.

The two Nixie tubes are the widely available B-5870 type and are socketed for easy replacement in case of damage. These tubes have 0.6" (14mm) tall digits for easy reading in adverse conditions.

The case is made of strong, lightweight aircraft aluminum. The rear half is hard anodized for long life on your wrist. The front of the case is gently contoured for comfort in all-day use, and is available in a variety of colors. O-ring seals keep out water, dust and dirt. The strap is a standard 22mm size, so a replacement strap is available at any fine jeweler.

**Specifications**

Size: 48mm wide 53mm tall by 16mm thick

(1.9" wide 2.1" tall by 0.63" thick)

Weight: 2 oz. (60g) exclusive of strap

Crystal window: 32.5mm x 27.4mm x 1mm thick mineral glass

Strap width: 22mm between lugs

Battery life: Approximately 2-4 weeks at 50 viewings per day

Charging time: 3 hours at 5V USB, 80 mA max.

**Replaceable Parts**

Battery: 631235 size Li-poly (rechargeable), 3.7 Volt, 200mA-hour

Case O-Ring: 40 to 42mm ID x 0.70mm

Button O-rings: 2.2mm ID x 0.50mm

Screws: Four 0-80 x 3/16" stainless steel socket head cap screws

Nixie tubes: Two B-5870 or equivalent, 0.6" (14mm) tall digit side-view

## Warranty

Thank you for your purchase.

The Nixie Watch is guaranteed for a period of one year after date of purchase to be free of defects in materials and workmanship. In case of malfunction, the watch will be repaired or replaced at the discretion of Cathode Corner. The customer must send the watch at their expense to the address given below on this page (or as listed on the website mentioned below). This warranty does not cover the cost of shipping the watch to Cathode Corner for evaluation. It does cover the return postage to the customer.

The software programmed into the microprocessor in the watch is licensed under the General Public License and carries NO WARRANTY WHATSOEVER, including merchantability and fitness for a particular purpose. See the source code files on the [www.cathodecorner.com](http://www.cathodecorner.com) website for more information.

## Contacting Cathode Corner

Cathode Corner wants to have only satisfied customers. If you are having trouble with your watch or you just want to talk with us about fun things, you may contact Cathode Corner in any of the following ways.

Visit Cathode Corner on the Web at [www.cathodecorner.com](http://www.cathodecorner.com)

Phone: 520-989-1491

Email: [david@cathodecorner.com](mailto:david@cathodecorner.com)

Mailing address:

Cathode Corner  
260 E Ross Pl.  
Tucson AZ 85716  
USA

## Operating Instructions

### ***Charging the Battery***

The watch is shipped with a charged battery. When the battery runs down to about 20% remaining charge, the watch will indicate this by causing the display of the minutes to flicker. This is a warning that you should charge the watch in the next day or so.

Charge the battery by connecting the watch to any USB charger or computer via a micro-USB cable. These cables are so common that you probably already have several. Charging time is under three hours. The watch has a built-in charge controller that automatically shuts off when the battery is full, preventing overcharging.

If the battery is allowed to run down fully, the watch will stop displaying the time altogether, although it will enter time-setting mode. There is an undervoltage protection circuit built into the battery to prevent a dangerous complete discharge. Nonetheless, the battery lifetime will be reduced if left discharged for several months.

### ***Setting the time***

You may set the time on the Nixie watch by pushing the two buttons on the right side in the proper sequence. The lower button is the Set button. It selects the time-setting mode. The upper button is the Adv button. It advances that portion of the time that is selected for setting. If you push the Adv button first, nothing will happen.

The Set button cycles through a sequence as follows:

Normal display mode  
12/24 hour select (displays '12' or '24')  
Hour setting (both digits flash)

Tens of minutes setting (left digit flashes)  
Units of minutes setting (right digit flashes)  
Seconds reset (counting seconds shown)  
Tilt angle (displays '45')  
Normal display mode

Go ahead and press the lower Set button seven times to observe the modes listed above. When you have finished the cycling through the setting modes, the display will be blank again.

To begin setting the time, press the Set button once. The display will show 12. Pressing the Adv button causes this number to alternate between 12 and 24. When 24 is selected, the watch is in 24 hour display mode and the hours will range from 00 to 23. When 12 is selected (the default), then the watch is in 12 hour mode and the hours will range from 01 to 12.

Press Set to enter hour setting mode. The watch displays a blinking 01. This is the hours. To increment the hours, press the Adv button repeatedly until the proper hour is displayed.

Press Set to set the tens of minutes. The watch displays the current minutes with the left digit blinking. Press Adv repeatedly to set the left digit of the minutes properly.

Press Set to set the units of minutes. The watch displays the current minutes with the right digit blinking. Press Adv repeatedly to set the right digit of the minutes properly. It's a good idea to set it one minute ahead so that the seconds reset that follows will leave the watch set to the correct minute.

Press Set to enter the seconds reset mode. If you like, you may reset the seconds to 00 when your reference clock reaches the top of the minute. However, the setting mode automatically turns itself off after 30 seconds have elapsed without any button pushes, so press Adv every few seconds to stay in time-setting mode.

Press Set to enter the tilt angle setting mode. The watch will display 45, which is a hint of the angle (in degrees) to hold the watch at when setting the tilt angle. Hold the watch at a comfortable viewing angle with the tubes facing up and toward your face, and press the Adv button. The display will blink once as the tilt sensor is read and its angle stored for reference.

Press Set again to exit time setting mode. The display will be blank. Hold the watch steady at the tilt angle you set it to, and the display should flash the hours and minutes. If you have difficulty getting it to display the time, try setting the tilt angle again at a slightly different angle.

### ***Using the watch***

The Nixie watch is simple to use. Once it is set, it will activate the display when tilted to the desired viewing angle. The hours are displayed first, then the minutes, then finally an incrementing seconds display if held at the viewing angle.

It may take some practice to get the watch to display the time every time you tilt it to viewing angle. In the current version of the software, the tilt angle sensitivity is variable depending on exactly what angle the watch is set to. So if it's not sensitive enough, try setting the tilt angle again. That will usually clear up the problem.

After a while, your arm will seek the correct angle automatically.

The seconds display is designed to indicate the passing seconds while minimizing the power used. The seconds will only show up as long as the watch is held at the proper viewing angle. Also, the duty cycle of the display diminishes to zero over a period of twenty seconds. You will notice that the time that each number is displayed grows shorter, until the display is flashing each passing second very briefly. In spite of this, it is easy to read the displayed number since you know what it will be.

## **Maintenance**

### ***Changing the battery***

The battery is expected to last for several years. If it fails to hold a charge, it will require replacement. Contact Cathode Corner as shown on page 8 for a replacement battery.

### ***Water resistance***

The Nixie watch is designed to be water resistant, but it is not sealed against pressure. It should withstand rainfall, splashes and other everyday liquid events. However, the seal is not necessarily sufficient to protect the watch against submersion in water. If it should be submerged, remove it from water right away, remove the cover with the four .050" (1.3mm) hex head screws on the rear, and check for water ingress. If the insides have gotten wet, first remove the battery, then shake out any loose water and dry the watch by placing it in a warm, dry area with the cover off.

If the inside of the watch has been soaked in water, it is best to remove the module using a 0.050" (1.3mm) hex key, then thoroughly dry the module and the inside of the case by blowing it dry with compressed air.

***Replacing the Nixie tubes***

The Nixie tubes are somewhat delicate and may crack or develop shorts between two adjacent cathodes after a drop or a hard bump. The only known cure is to replace the bad tube. Replacement tubes are available from Cathode Corner at nominal cost.

It is wise to have Cathode Corner replace the tube(s) for you unless you are a skilled technician with access to a stereo microscope. If you still wish to do it yourself, then please take the time to read all the instructions below. This may change your mind.

If you would like Cathode Corner to do the work, send the watch and appropriate payment to the address on page 8. You may also elect to have a watch repair shop do the work, but they are not likely to have any more experience at it than you do. They should have the necessary magnification eyewear, however, and they might be amused to see such an unusual watch.

To replace a tube, it is necessary to remove the module from the case as described below.

Remove the cover by removing the four screws on the rear, using a .050" (1.3mm) hex key.

Unscrew the two socket head screws near the USB connector, using a .050" (1.3mm) hex key.

Put the screws in a safe place such as inside the case cover.

The module is held in place by double-sided tape under the left side. The tubes are held in place by double-sided foam tape. To free the module from the case back, pull up gently on the battery and the circuit board at the base of the tubes.

Lift the module out by prying up on the left side of the circuit board with a tiny flat screwdriver to release the double-side tape that holds it down. Don't worry, there are no circuit traces below that part of the board.

The old tubes may be removed by simply pulling its nipple end up to clear the transformer, then pulling it out of the socket. The tube is held in place with a small pad of double-sticky foam tape. This tape must be cut away to remove the tube. The foam pad is a piece of 3M foam mounting tape.

Peel off the old foam pad slowly to prevent tearing. Clean off the old adhesive with your fingernail.

Remove the covering from one side of a new foam pad and press it into place where the old one was, in about the center of the space left by the tube. Leave the top cover sheet on the foam pad intact. It will be removed after the tube is plugged into the socket.

Installing the new tube can requires patience and a steady hand. It is done most easily under a microscope, but any magnifying lens is helpful. It is best to use a self-supported magnifier since both hands are needed to install the tube. A pair of fine point tweezers or a fine-tipped prod tool is also very helpful to coax the tube pins into the socket.

The tube pins are made of thin wire and are flexible. This is good in that it's easy to align them, but bad because they need to be aligned. The tube comes with a plastic spacer that keeps the pins aligned moderately well.

First, the tube pins should be prepared. Inspect them and bend the pins so that they point straight out from the plastic spacer. Check that the rows of pins are straight. Then pull the spacer off the tube and set it aside.

The two pairs of pins nearest the back of the tube often have trouble entering the socket unless they are bent just a little bit towards the other pins. So do that. A distance of .020" (0.5 mm) is sufficient.

Now hold the module in one hand while holding the tube in the other hand, and guide the tube into place. The front pins will engage first, followed by the rear pins. The tube may just slide into place, or one or more pins may get hung up on the socket. This happens because the pin ends are cut square and the sockets have an insert with a little shelf for the pin to get stuck on.

This is where the tweezers or prod come into play. Push gently on the stuck pin in the proper direction to center it in the socket, and it should pop into place. If that doesn't work, then try removing the tube and bending the affected pin the proper way to allow it to fit on the next try. It may take a few tries, but it will eventually go in. Only the factory workers are able to get all the pins in on the first try.

Check to be sure that all twelve pins went into their sockets. One might have bent rather than going in. If so, remove the tube, bend the errant pin into place and try again. It will be easier next time.

After the tubes are installed, the foam pads need to be installed. Do this by using the tweezers or prod to remove the top covering from the pad, then making sure the tube is aligned with the other tube and pressing it down into place on the foam pad.

After the tube(s) have been replaced, the module may be reinstalled in the case. Drop the module into the case and align the two screw holes in the module with the holes in the case. Place a screw on the hex key tip and guide it into position in one of the screw holes. Screw it down nearly all the way. Install the other screw using the same method, then tighten both of them finger-tight with the hex driver.

Install the battery and replace the cover, then set the time. Check that the tubes are displaying all digits (0-5 for the left tube, 0-9 for the right tube) properly.

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