

## ChronoArt II service guidelines for the do it yourself person.

Trouble shooting ideas for a product that is new and never failed is more general than I would like, but here goes. I expect this clock to be very reliable but there are always things that go wrong.

**The batteries:** Make sure to change them every three years. They can leak and eat the circuitry right off of the circuit board. It rarely is that bad but it is better to be safe.

**The fuse:** Every time the clock has power go on/off the fuse element can actually bend a little and after many years have a fatigue failure. It is a 3/4 amp. If a fuse immediately pops again check that one of the big filter capacitors hasn't shorted out -- very rare.

**The big filter Capacitors:** After 15 to 20 years power supply filter capacitors frequently fail by opening up. Check for high AC ripple > 1VAC. See attached photo for most the parts most likely to fail.

**Power regulators:** There are 3 in the clock but only the two that supply power to the LEDs are likely to start intermittently opening up after 20-30 years. If a large group of light blink *off*, then after it cools down goes back *on* for a couple of minutes, and does it much more when almost all the lights are on, this is the first thing I would replace. The one that is labeled Blue-Green is the most likely to fail because it is working the hardest.

**Solder connections:** The number of times that I have been surprised to find a *totally unsoldered* connection after a product has been working reliable for 20 years is rather amazing. *Cold solder joints* almost always show up *immediately* because the soldering rosin is an insulator, but *unsoldered* connections can work an amazing long time by just touching. Remember this clock has 900 solder connections so a 5 minute inspection can be worthwhile! Also note that a lot of solder connections for the LEDs are made from the top of the board so what looks unsoldered from the bottom is probably normal and okay

**Microprocessor clock speed:** I wouldn't touch this pot unless you find the time keeping when the power is off very inaccurate. When running off the batteries (turn on the clock, set any time, and then unplug) the clock output period, on pin 26, should be 687 usec. You need a counter that can do a multiple period average to set this pot. The adjustment setting will be more accurate, on average over the life of the batteries, if you have batteries that are only putting out about 4.0 VDC.

**Brightening or Dimming the lights:** There are two potentiometers controlling the power to the LEDs. Both are set to same voltage. One controls the Blue-Green on the ovals. The other regulator controls the Reds on the ovals. They can be adjusted to dim the LEDs so they last longer or to brighten them up for a brightly lit office or to brighten them up after 20-25 years of use has made them dimmer than you like.

**LED's:** There are 66 LEDs in this clock. Other clocks that I made in 1987 and 1990 that had 176 and 296 LED's in each respectively, are still having very close to a zero failure rate, so I do not expect you to have any failures. Even the slow dimming that LEDs are supposed to do seems unnoticeable to me so far. Nevertheless, if you ever have to change one and it is much dimmer or brighter than the others the same color, remember you can remove, replace, increase, decrease the resistor in series with the LED to get the brightness equal to the others.

**LED test mode:** When you first power up the clock if you try to set the hours first you will enter a mode that lights all the LED's. We use this mode to check for equal brightness. When you set the minutes the LEDs will be back to normal lighting.

**Reset Switch:** The reset switch on the back of the clock resets the microprocessor. To get the best reset, unplug the power, remove the batteries, and hold down the reset switch for 10 seconds to discharge the power supply capacitors. Then plug it back in. Finally reinstall the batteries.

**Cleaning the insides and opening the clock:** It can be amazing the layer of film/dirt and cobwebs that can accumulate inside a clock over the years. To open it up loosen the screws on the sides at the top, back of the clock. Slide off the top edge of the frame. Now slide up the rear piece of acrylic. In the lower right hand corner you will see the two brightness adjustment potentiometers. You can also see the fuse near the transformer. The whole guts of the clock can be lifted out now. You should be able to clean any scum/film from the inside of the acrylic or cobwebs from the oval lenses now. CAUTION. Don't put any pressure or knock by accident the oval lens light diffusers. It is easy to break them loose. If you do you can re-glue them with the gel type of super glue.

**The Oval Lenses:** If one of the ovals should fall out, it can be glued back. Just disassemble the clock as described above. The electronics are held on to the mask-lense-oval sheet with 6 screws: remove these screws holding on the mask sheet. The lenses must be pushed in from the back side of the mask sheet. The mask sheet is made out of PETG a very tough material, you are not going to crack or break it. The oval/lens has two sides. The side with the smooth edges is smaller and it must be pushed in from the back. They are a very tight fit of 90% of the holes. You will have to push very hard with your thumb while supporting the sheet from the other side with your other hand. Once you have it flush use a small amount of the gel type of super glue on the edge on the back side.