

## 2 LeCroy 7200 Restoration



Model: 7200 Mainframe with 7242B plug-in

Purchased price: \$450 + shipping

Original Owner: Keesler AFB

Date of restoration: 3/12/2001 - 3/18/2001

### 2.1 Background

If you are not a service technician or designer, do not attempt to repair or restore one of these units. If you do decide to do any repair work make sure you work with static mats, keep the unit un-plugged and discharge the picture tube (not using your body as the conductor!!). The CRT can contain lethal voltage/current levels even after the unit has been off and unplugged.

The scope was purchased for resale and to recover the 7242B plug-in for a different project. Initial investigation showed that the 7242B seemed to work at lower sampling rates but fails at higher frequencies. The mainframe appears in poor shape and does not have video. The author at this stage has refurbished two 7200 units similar to this one that were also from Keesler AFB.

The first thing you may want to do if you get one of these units is, don't try and plug it in and see if it works if you have been told it doesn't. You may do more damage than good. The parts for the 7200 are hard to come by. You may want to consider procuring a second unit for spare parts. I'm not going to even try and explain how to go about fixing one of these units. I can tell you that my first step was to get a copy of all the manuals from LeCroy. The total cost is around \$400. If you're going to fix it on your own at least get the service manual.

### 2.2 Frame

This unit came to me in very poor condition. The unit not only looked poor cosmetically, it had some damage to the frame. You could tell that someone was into it before and it was not the LeCroy service department. Wires were protruding from the covers and screws were missing. Screws that were holding the unit together had heads that were stripped. The 7200 uses all metric sizes. My suggestion is to check out the following link for your hardware:

- [Metric hardware you won't find at the Local store](#)

They have all the 3.5 sizes used in the 7200A.

Below, the 7200 has been disassembled to the bare frame. This was done because the unit appears to have been dropped. The frame had been bent along with the case and some of the welds had broken. This picture was taken after brazing the brackets and straightening the frame.

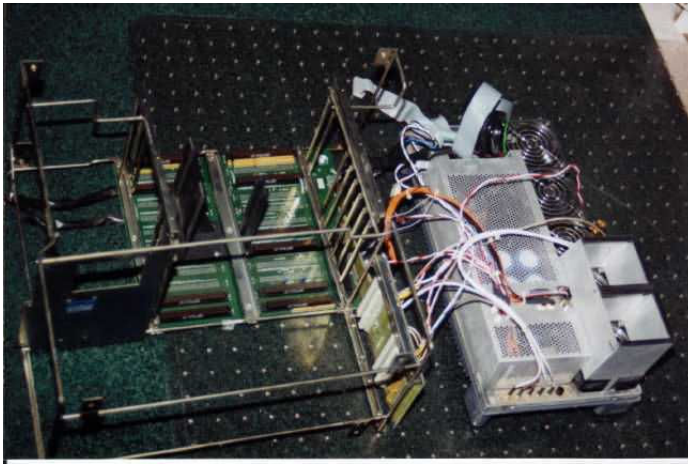


It may not look like much now, but if your going to restore one you may as well do it right.

### 2.3 Power Supply

Below, the power supply has been tested and the back plane is ready to be installed. Notice that both the plug-ins and the VME have a back plane,

which are interconnected.



These scopes need a lot of airflow. If you think any of the fans are suspect, just get rid of them. The two fans located to the right side with the shrouds over them are the most critical. These supply the airflow to the plug-ins. The plug-ins have a thermal cutout switch in case of an over temperature condition. If you try and run the unit without the covers you may cause damage to the plug-in. During calibration this is difficult to avoid. It is best to have some portable fans around to get some airflow once you get to this stage.

#### 2.4 VME Chassis and Hard Disk

All of the CPU cards and DC to DC converter have now been tested and are installed. At this stage I use a known good frame to test each card, one at a time. The 7200 has two CPU cards both based on Motorola's 68020RC16E processor. This is a 68000 core running at 16MHz.

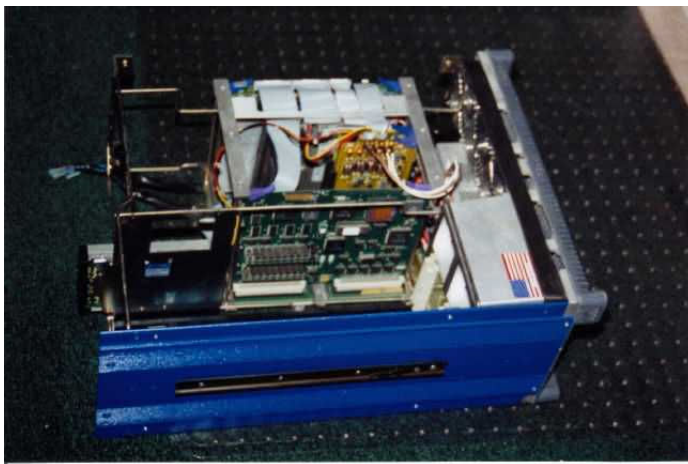
A re-certified hard disk has also been installed. These units used the old MFM drives used in some of the early AT clones. Only a few different disk drives are supported. All of these drives are in a 3.5" form factor, have 4 heads, 615 cylinders and 17 sectors per track. The 8425F which was a faster version of the 8425 will not work based on my testing. It is possible to use the KALOK OCTAGON KL320 disk drives. There are a couple of companies that are taking the old MFM drives and rebuilding them. You can get a drive like this for around \$200 with a trade-in. These companies will replace the heads if needed, the media and motors. The drives go through a burn-in and are then re-certified. You can also try to find an old used one. Good luck! I found a guy that had a few and I bought him out.

I have a couple of items worth mentioning at this point. You can not use an old AT style PC to low format the disk drive, nor can you use it to mirror the drives. The 7200 used a AMD disk controller where the PC's used a Western Digital. The two parts are not even close.

The second item that needs to be stated. The disk drive you use can not have any media errors!!! LeCroy used to make custom installation disks for each scope based upon the bad sector table. They no longer have this software available. The version that was archived assumes no errors.

~~I have thought about designing a small solid-state-disk drive to replace the mechanical unit. I started to look into it and think the circuit could be done with a few drivers, and EPROM, FLASH and some RAM (high-speed writes). If I decide to do this, I'll post the design.~~ I spent some time researching this and it looks like the old mechanical drive is still the way to go. The cost to build the drive is going to be at least as much as a rebuilt 8425. Looks like about \$150 for the parts, not to mention the PCB layout.

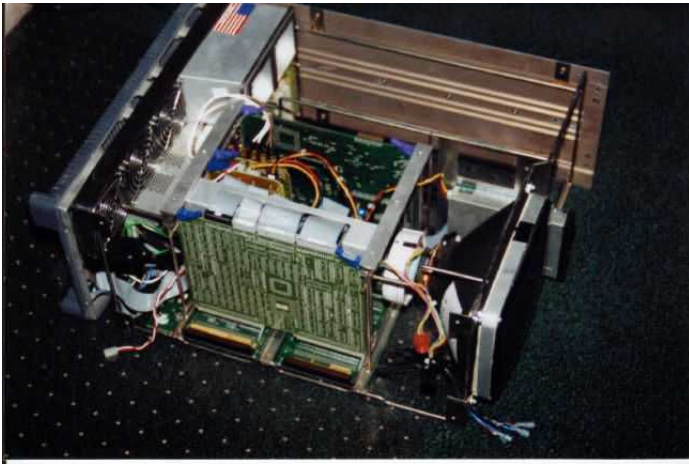
This unit now has a MiniScribe 8425 installed.



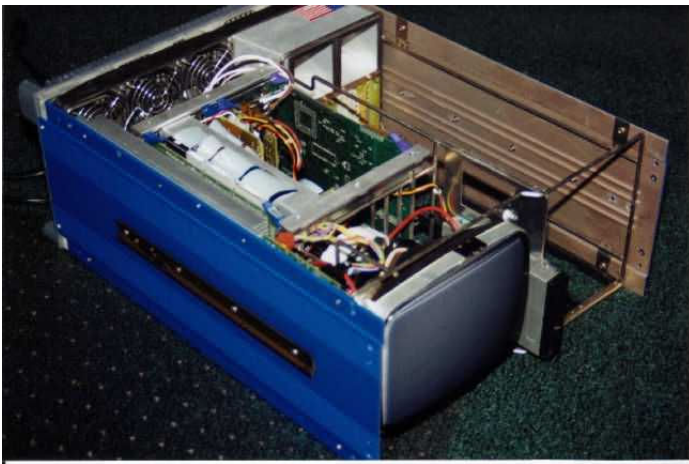
The case for the unit was again in poor condition. It was cleaned and repainted with the blue/gray scheme you see. LeCroy does not offer the original colors.

#### 2.5 Video Processor

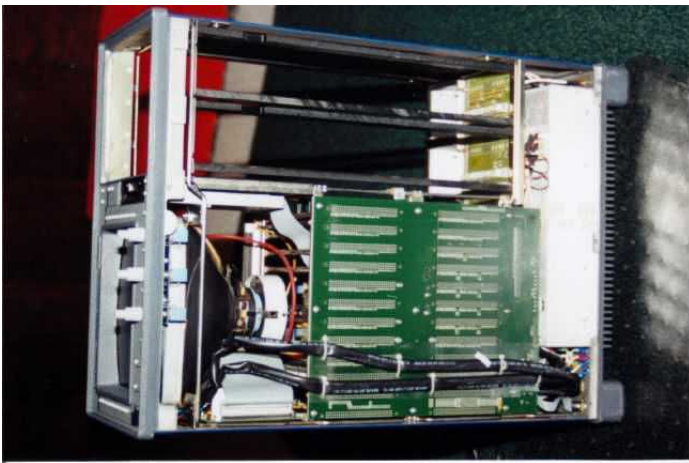
The video processor card is installed next. The CRT was in good shape with no burn marks. It was just cleaned up and re-installed.



Both covers are now installed and the front keypad assembly is ready to be installed.



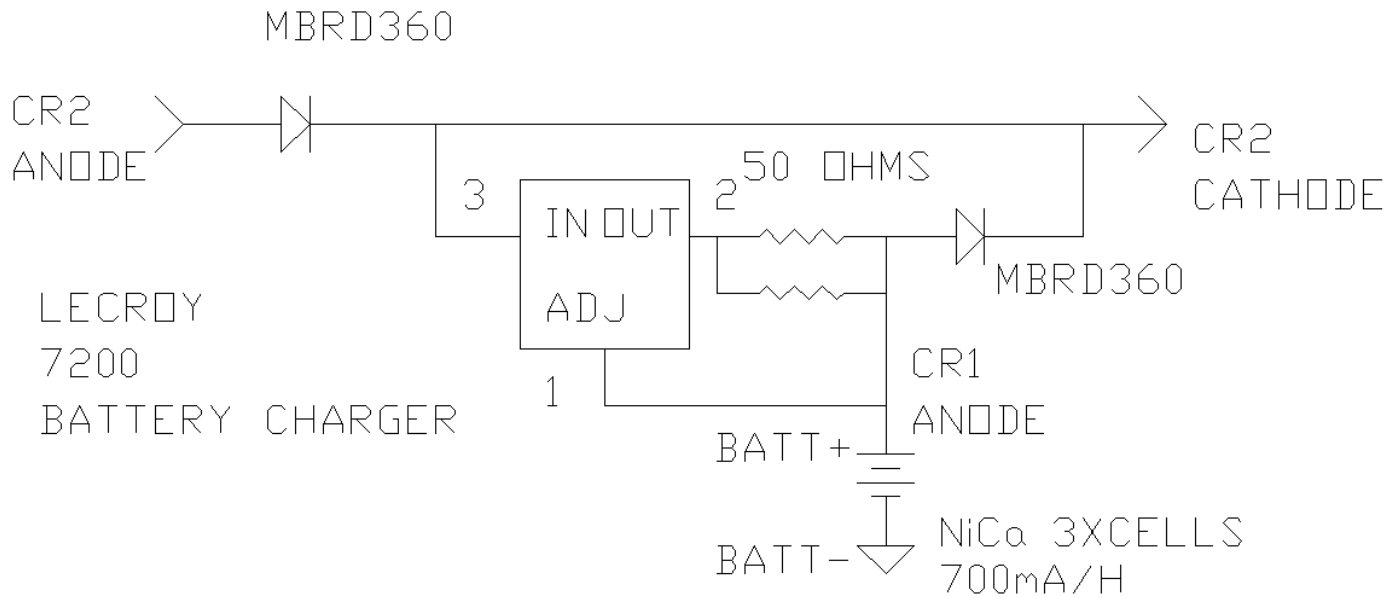
The front bezel and keypad are now installed. The front bezel around the CRT had cracked one of the mounting posts. This is a common problem for these scopes. Epoxy was used for the repairs.



## 2.6 Battery Dead, No More

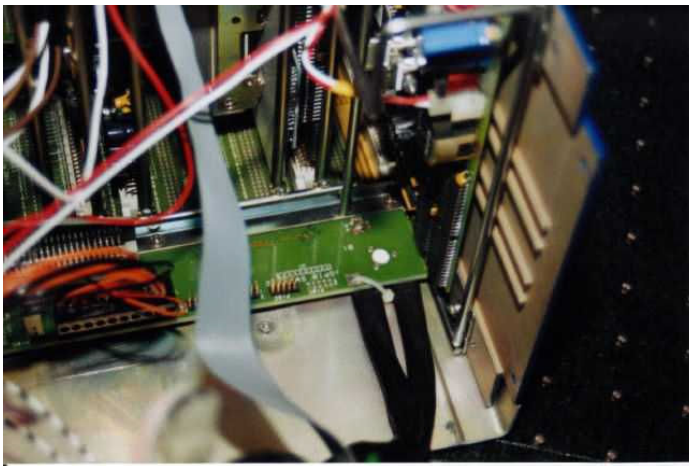
The 7200 uses a lithium battery, Tadiran TL-2200, for the NVRAM source. This battery goes bad way too often, causing the inability to save your setup. When you turn on the unit, you will get the old "BRAM failure" message. LeCroy made a little adapter for the 7200 to use the C size cells,

but to me, it's still not a good fix. I have implemented the following circuit:



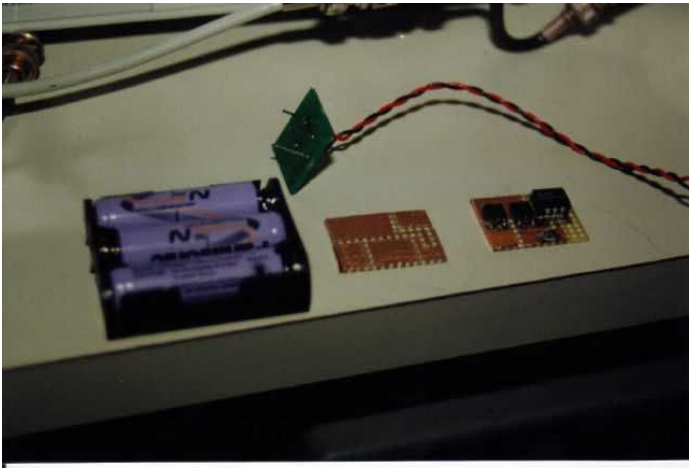
The circuit can directly plug into the backplane. Simply remove CR1 and CR2 and install the circuit. Replace the lithium battery with a set of three AA, NiCa cells and you are set to go for a long time. The MBRD360s are just what I had in my drawer. I used two 50 ohms parts so I could use 1/8W surface mount 1206 packages.

This is the rear view of the 7200s VME back plane. Notice the small white dot with three small dots surrounding it. This is where the battery was installed. Just above this there are three small diodes. I removed these diodes and replaced them with the charger circuit shown.

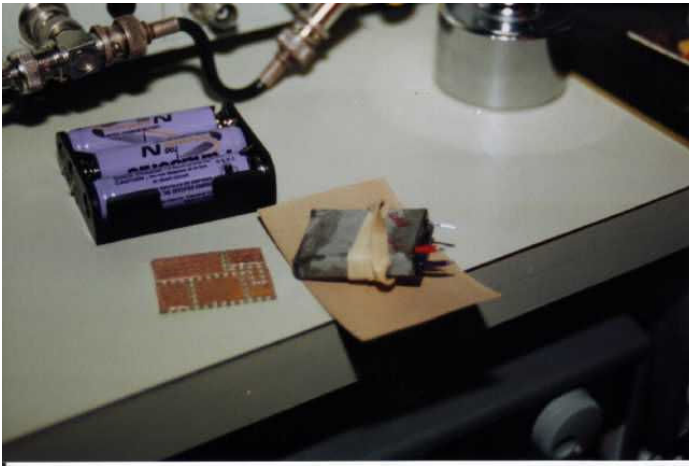


We are now ready to build the small charger.

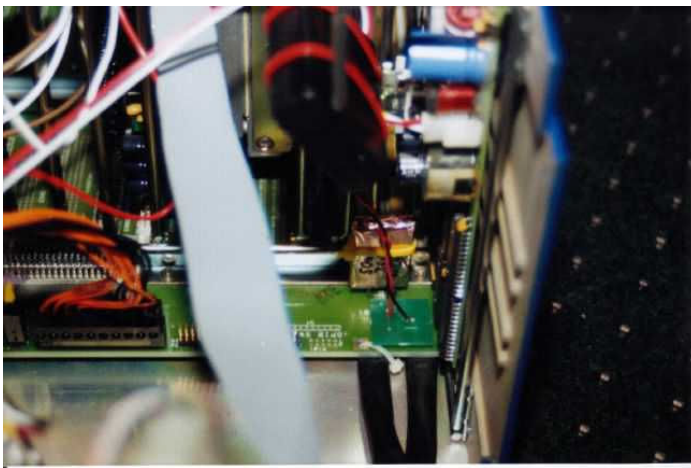




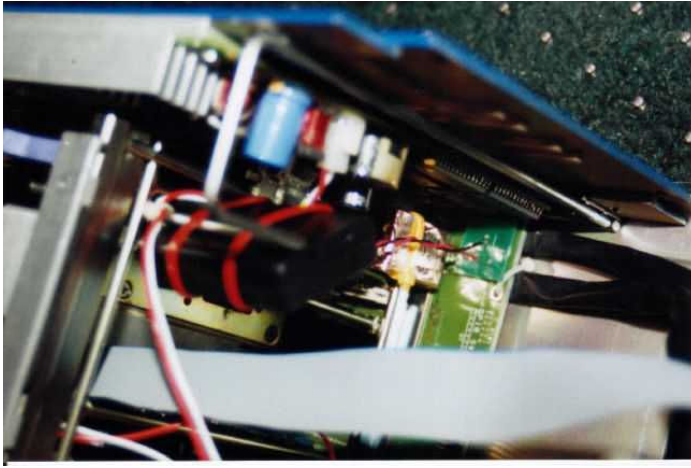
I have used 5-minute epoxy to enclose the charger circuit.



Copper foil is then wrapped around the unit and it is tied down to the back rail of the VME frame.



I ended up using sealed battery packs. This is held to the top of the frame. I reused the old battery quick connect. So far I have not seen any problems doing this with.



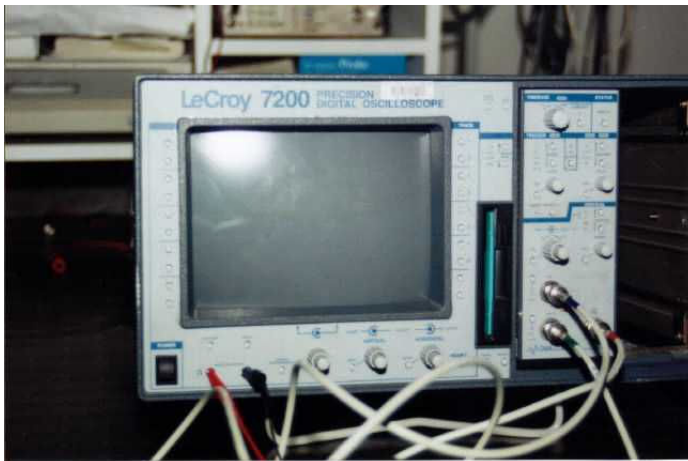
## 2.7 System Checkout

The lower cover has now been installed and the unit is powered up for the first time as a single unit. The LeCroy software is now used to perform the hard disk low-level format and initial software installation. The system is also run through some basic tests at this stage.

NOTE You can not use an old PC to low-format the MFM drives. It must be done using the LeCroy software. Also you can not use a PC to back up the hard drive. The 7200 used an AMD AM9580A-10LC/30 hard disk controller. This controller is different than the WD chips used in the old PCs.



A plug-in is now installed for the final checkout.



The top cover is now installed. This is all new paint on the bottom and top.

Notice the LeCroy logo cast into the heat-sink. The attention to the design detail goes beyond what one could imagine.



The unit is now shown ready for service.



This next unit was also purchased on EBay for about \$500. It also came from the Keesler AFB. This unit was one of the first units I rebuilt. The people who had originally purchased the unit tried to repair it. The main problem was the video card, battery and disk drive were dead. They had mentioned that their tech. had left it running while they were working on it and that it no longer did anything. I think he had been running it without the covers and the thermal switch had tripped inside the plug-in. These units won't run without airflow! This one is painted with the dark blue and metal gray scheme. It looks much better than the picture. If you decide to paint one of these units do it while the unit is apart. The heatsink is a treat to get down to the bare metal. The front bezel is easiest to prep. by masking off the keypad area. Don't try and remove the plastic lettering.

I left the Asset plates on the units in fear of the damage it would cause by attempting to remove them. If you have an idea how to get these off without damage, let me know.



Same unit from the rear. The yellow caps came from Caplugs, PN# EP 8.



The following are some of the data sheets for devices used in the 7200.

[Motorola MC68020 users manual](#)

[ines-IEEE488.2 manual](#)

[Phillips PLS100 PAL](#)