

# MTRA repair

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The Advanced Matrix ROM (MTRA mnemonic) was loaded into Flash memory incorrectly, and cannot be used. Placing this image correctly requires moving two other images and modifying the Image Database accordingly. The instructions below will take you step-by-step through the required procedure. The entire procedure can be done from the keyboard.

**This procedure is only for V3 boards, with the larger Flash memory.**

**You should be familiar with the chapter “Working With Flash” in the 41CL manual before attempting this procedure. It is advisable to use new batteries for this procedure.**

## The Problem

The Advanced Matrix ROM was loaded into Flash memory as shown in the table below. This arrangement would work if this image was designed to be loaded into four successive pages.

0x100000	advmtx1	MTRA	Advanced Matrix ROM, page 1
0x101000	advmtx2		Advanced Matrix ROM, page 2
0x102000	advmtx3		Advanced Matrix ROM, page 3
0x103000			Blank (loaded as Advanced Matrix ROM, page 4)
0x104000	ccdadv	CCDA	CCD Advanced ROM
0x105000	geomtry	GMTY	Geometry 11 ROM
0x106000	numthry	NTHY	Number Theory ROM
0x107000	digitpac	DIGT	DigitPAC ROM

But this image was actually designed to be loaded into two pages, with two banks used in the second page. This arrangement is identical to that used by the HP-41 Advantage ROM,

which was the starting point for the Advanced Matrix ROM. In order for the image to load properly, we must rearrange the contents of this Flash sector as in the table below.

0x100000	advmtx1	MTRA	Advanced Matrix ROM, page 1, bank 1
0x101000	advmtx1		Advanced Matrix ROM, page 1, bank 2
0x102000	ccdadv	CCDA	CCD Advanced ROM
0x103000	geomtry	GMTY	Geometry 11 ROM
0x104000	advmtx2		Advanced Matrix ROM, page 2, bank 1
0x105000	advmtx3		Advanced Matrix ROM, page 2, bank 2
0x106000	numthry	NTHY	Number Theory ROM
0x107000	digitpac	DIGT	DigitPAC ROM

The arrangement above takes advantage of the fact that the Advanced Matrix ROM only uses banks 1 and 2 in the two pages, so the space reserved for banks 3 and 4 can actually be used to hold other images.

## Initial setup

Since this procedure requires modifying the Image Database, we need to use the 41CL Extra Function Plus (mnemonic YFNP, located at address 0x00F000). We can't use the 41CL Extra Function Plus directly because we will be writing to Flash memory, so first we need to copy this image to RAM.

The RAM locations used here are arbitrary, but I don't recommend changing them unless you understand exactly what we are doing here. Any Port for YFNP will do, but I use Port 1L here.

In addition, because modifying the Image Database will be required, we need to load it to RAM to make the modification.

```
ALPHA 00F>817 ALPHA
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 817-RAM ALPHA
XEQ ALPHA PLUG1L ALPHA
```

```
XEQ ALPHA IMDBCPY ALPHA
XEQ ALPHA IMDBR ALPHA
```

## Copy the images to RAM

We need to copy the seven images currently loaded in this Flash sector to RAM. I will use the seven RAM pages starting at address 0x810000.

```
ALPHA 100>810 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 101>811 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 102>812 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 104>813 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 105>814 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 106>815 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

```
ALPHA 107>816 ALPHA  
XEQ ALPHA YMCPY ALPHA
```

## Erase the Flash and write the images back

Next, we need to erase the Flash sector that we just copied to RAM, and then write the images back in the correct order. We are writing eight pages back to the Flash, in accordance with the table above.

```
ALPHA 100000 ALPHA  
XEQ ALPHA YFERASE ALPHA
```

```
ALPHA 810>100 ALPHA  
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 810>101 ALPHA  
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 813>102 ALPHA  
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 814>103 ALPHA
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 811>104 ALPHA
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 812>105 ALPHA
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 815>106 ALPHA
XEQ ALPHA YFWR ALPHA
```

```
ALPHA 816>107 ALPHA
XEQ ALPHA YFWR ALPHA
```

## Update the Image Database

Now that the Flash memory is correctly organized, we just need to update the Image Database. We need to modify the entry for the Advanced Matrix ROM with the correct image type, as well as the starting address information for the CCD Advanced ROM and Geometry 11 ROM. We then erase the Flash sector that contains the image database and copy the new Image Database from RAM to Flash memory.

I assume that the remainder of the Flash sector that contains the Image Database is empty. If this is not the case, you will need to copy that information to RAM before erasing the sector and then write the information back to the Flash memory after updating the Image Database

```
ALPHA MTRA-4-100 ALPHA
XEQ ALPHA IMDBINS ALPHA
```

```
ALPHA CCDA-0-102 ALPHA
XEQ ALPHA IMDBINS ALPHA
```

```
ALPHA GMTY-0-103 ALPHA
XEQ ALPHA IMDBINS ALPHA
```

```
ALPHA 0D8000 ALPHA
XEQ ALPHA YFERASE ALPHA
```

```
XEQ ALPHA IMDBUPD ALPHA
```

## Finishing up

At this point we can switch back to the regular 41CL Extra Functions Plus in Flash. This will automatically prevent any accidental writes to Flash. It is probably a good idea to check that the Image Database in Flash is correct also. The values returned by the `IMDB?` function should agree with those we write above.

Since everything should be repaired, so you can also try using the `PLUG` command with the various images in this Flash sector (`MTRA`, `CCDA`, `GMTY`, `NTHY` and `DIGT`) to make sure that they are working properly.

```
ALPHA YFNP ALPHA
XEQ ALPHA PLUG1L ALPHA
```

```
XEQ ALPHA IMDBF ALPHA
```

```
ALPHA MTRA ALPHA
XEQ ALPHA IMDB? ALPHA
```

```
ALPHA CCDA ALPHA
XEQ ALPHA IMDB? ALPHA
```

```
ALPHA GMTY ALPHA
XEQ ALPHA IMDB? ALPHA
```

