Atari ST Realtime Clock
Install Guide

Abstract

The purpose of this document is to assist/guide you through the installation of the RTC module provided by exxos.

It has been tested on ST and STE machines, and since it connects internally to the cartridge port, it should work on any ST.

Thanks to Chris Swinson, Thibaut Guillet and Troed Sangberg for all of their time, patience and input during my reverse engineering of this clock.

I'd also like to thank Techie Alison postumously, she sadly died in a road accident in 2011, but left a lasting Atari legacy, as it is her version of the ForgetMeClock II software, corrected to allow time setting beyond 1999, which I have ultimately used for this project.

Jon Whiteside

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Summary

There 2 recommended installation options for the RTC module.

Both options use the same common connections to a DS1315 clock chip, which is installed on a PCB that brings out the connections to the edge for ease of installation.

NOTE: Currently there has not been an opportunity to test with cartridges plugged in. It should work with no issues, but if option 1 does not, try option 2, with CEO passthrough.

NOTE: This document assumes you have already assembled the RTC PCB and all associated components. If not, you should probably do that now ☺

Option 1

We attach the RTC module internally to the cartridge port, but ignore CEI/CEO passthrough.

This appears very reliable this far in a test 520STFM, and uses the ForgetMeClock II software for setting and reading in this configuration.

Option 2

We attach the RTC module internally to the cartridge port, but replicate CEI/CEO passthrough as in the ForgetMeClock II.

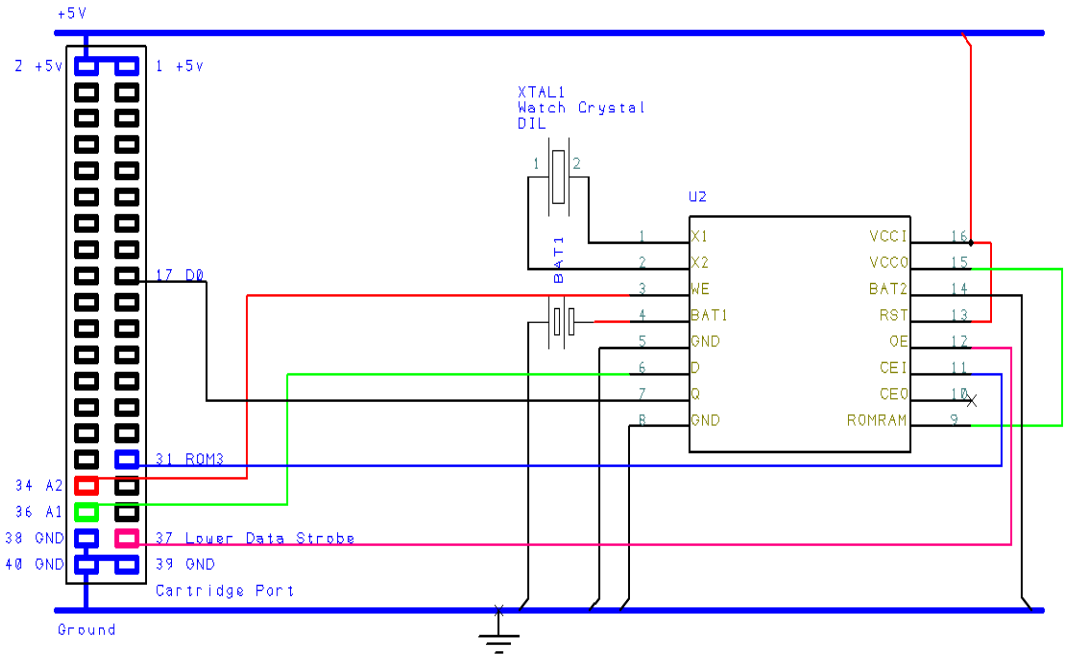
This is done by snipping the pin connecting the mainboard, to pin 31 of the cartridge port, and connecting pin 11 of the DS1315 to the end left in the mainboard and pin 10 of the DS1315 to the end left attached to the cartridge port.

This appears very reliable this far in a 1040STE, and uses the ForgetMeClock II software for setting and reading in this configuration.

If after reading this, you have questions, I can be contacted using: atarifanboi@deep-core.co.uk

Option I

Schematic



You will need 7 wires of around the same length. Determine the length by the distance from where you plan to locate the RTC module. I used wires of about 4 inches in length for an install into a 520STFM, where there was adequate space quite close to the cartridge port.

I'd advise different colour wires for all connections to make your life easy. I didn't have enough, so I used one again, but it does cause confusion, it's easier if you buy more wire.

TIP: Leave the battery out of the RTC module until all the soldering is done. This avoids accidental shorts when manhandling the module.

TIP: Solder the wires to the cartridge port first. If you solder to the RTC module first, manoeuvring the wires as you solder to the cartridge port is much harder.

Connect the wires to the cartridge port and RTC module as follows:

+5v - Connect to any +5v source. You can use Pin 1 or 2 of the cartridge port

A2 - Connect to Pin 34 of the cartridge port

A1 - Connect to Pin 36 of the cartridge port

LD - Connect to Pin 37 of the cartridge port

D0 - Connect to Pin 17 of the cartridge port

R3 - Connect to Pin 31 of the cartridge port

C0 - Leave disconnected

0V - Connect to any ground. You can use Pin 39 or 40 of the cartridge port

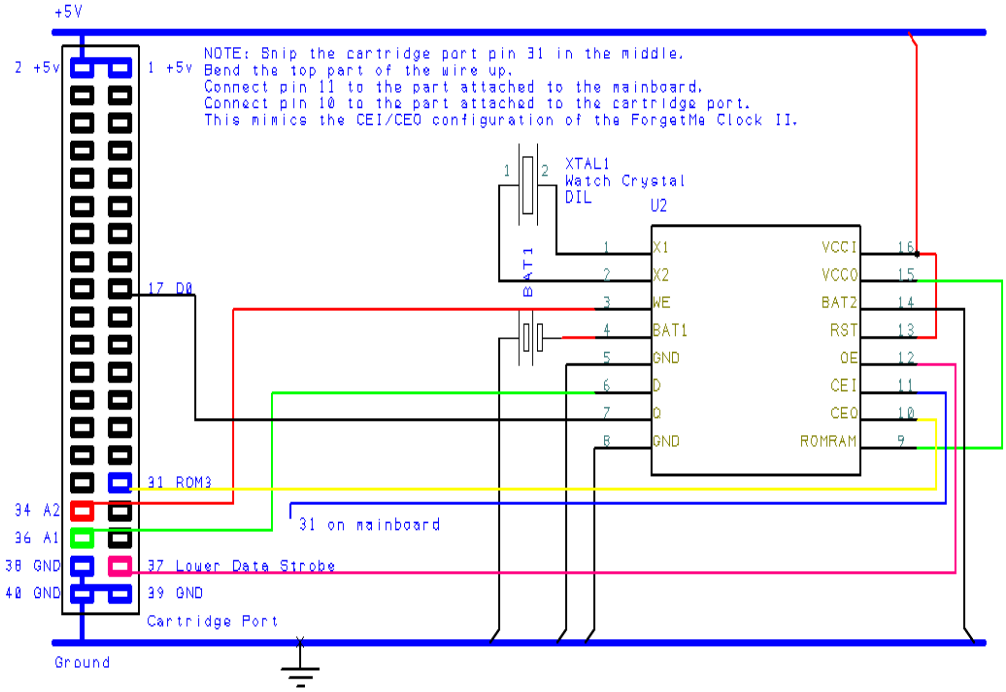
Once you have made all the connections from the cartridge port to the RTC Module, insert the battery, and test the time setting by using the procedure at the end of the document.

Option 1 Prototype installation in a 520STFM:

NOTE: Here the +5v and GND are picked up from the ROM VCC rail and edge ground plane. This is a prototype board, but all connections to the cartridge port are the same. You could just as easily pick off +5v and GND from the cartridge port.

Option 2

Schematic



You will need 8 wires of around the same length. Determine the length by the distance from where you plan to locate the RTC module. I used wires of about 6 inches in length for an install into a 1040STE, where there was adequate space quite close to the cartridge port.

I'd advise different colour wires for all connections to make your life easy. I didn't have enough, so I used a couple again, but it does cause confusion, it's easier if you buy more wire.

TIP: Leave the battery out of the RTC module until all the soldering is done. This avoids accidental shorts when manhandling the module.

TIP: Solder the wires to the cartridge port first. If you solder to the RTC module first, manoeuvring the wires as you solder to the cartridge port is much harder.

Connect the wires to the cartridge port and RTC module as follows:

+5v - Connect to any +5v source. You can use Pin 1 or 2 of the cartridge port

A2 - Connect to Pin 34 of the cartridge port

A1 - Connect to Pin 36 of the cartridge port

LD - Connect to Pin 37 of the cartridge port

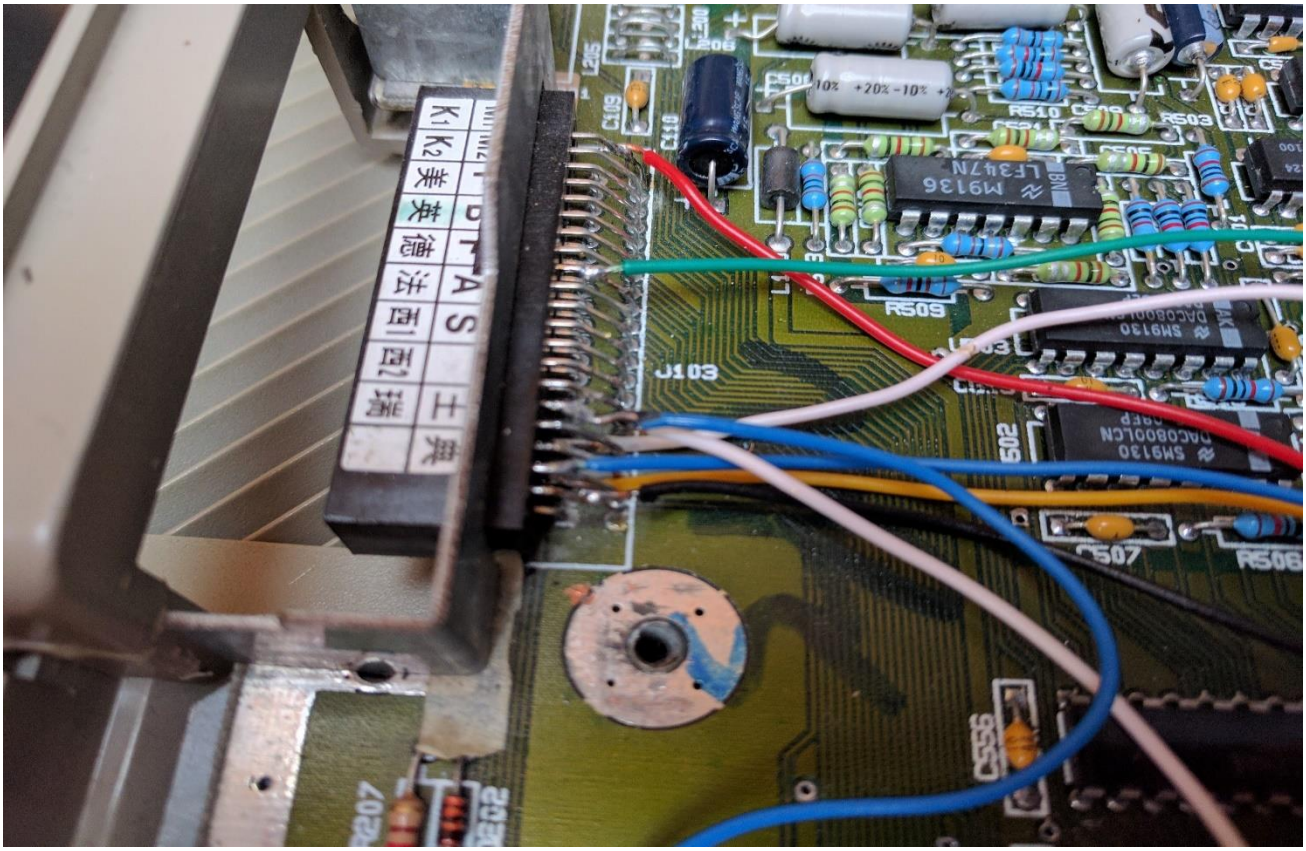
D0 - Connect to Pin 17 of the cartridge port

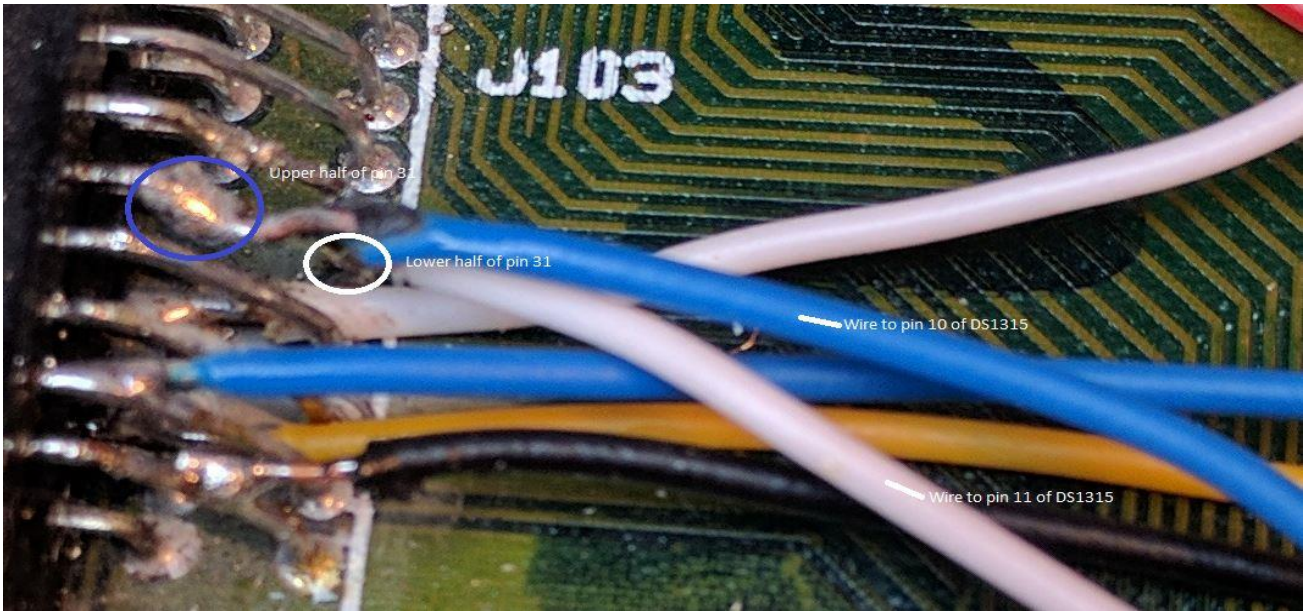
R3 - Connect to Pin 31 on the mainboard (Pin 31 of the cartridge port is snipped in the middle)

C0 - Connect to Pin 31 on the cartridge port (Pin 31 of the cartridge port is snipped in the middle)

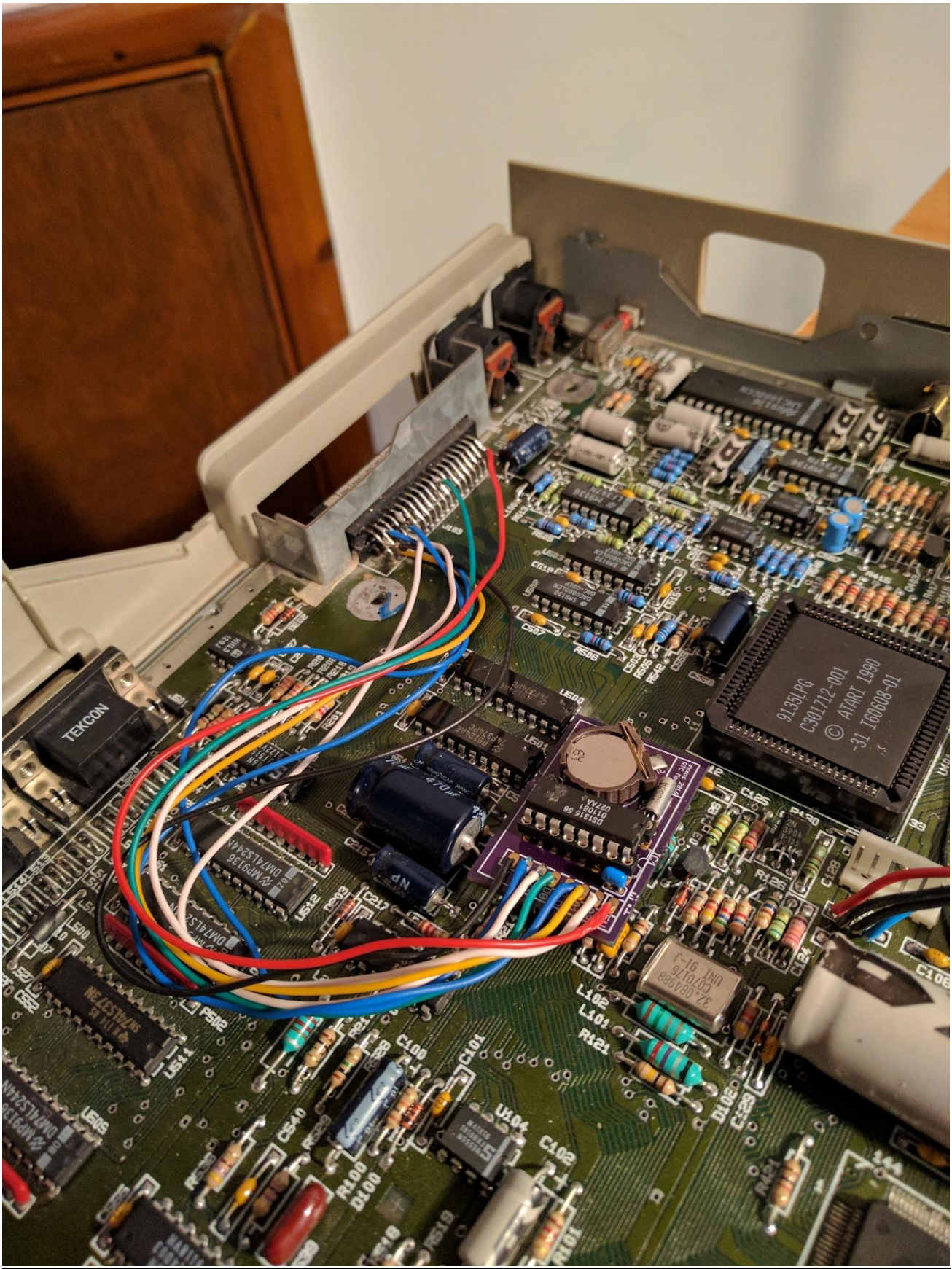
0V - Connect to any ground. You can use Pin 39 or 40 of the cartridge portOnce you have made all the connections from the cartridge port to the RTC Module, insert the battery, and test the time setting by using the procedure at the end of the document.

Option 2 wired in.





You can see the blue wire going to the top portion of the snipped pin 31 on the cartridge port, and a white wire going to the bottom portion that is left attached to the mainboard.



Completed installation in 1040STE, using the RTC PCB supplied by exxos.

Clock Setting and Checking

I have included a link below which has a pre prepped boot disk image, which you can use with a Gotek or similar if you have one, or use something like FloImg to write to a physical floppy for use with a standard floppy drive.

Before attempting to set the clock, it is imperative that you have a fully functional battery. The clock won't respond if there is no battery, and you will go mad trying to set it!!

In order to work correctly, DALLRTC.PRG must load before AUTOFMC.PRG. If you are making your own disk with auto folder, be sure to put DALLRTC.PRG in the auto folder first.

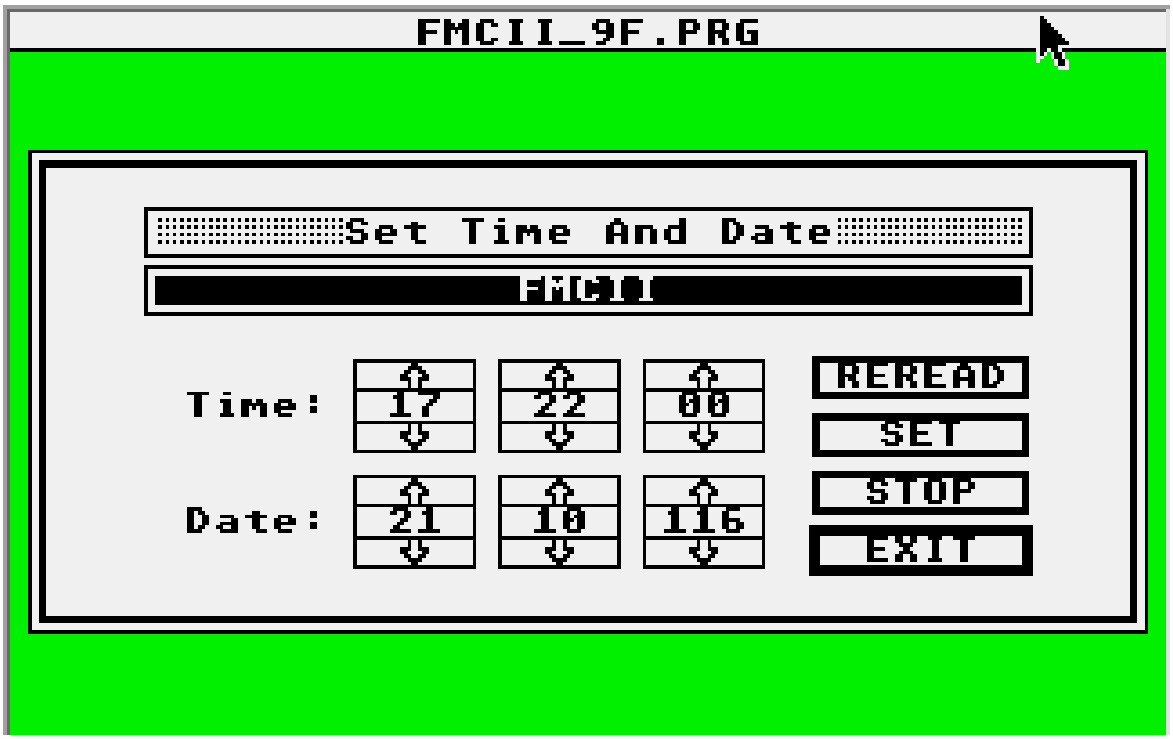
For initial setting, you DO NOT need to boot with anything in your auto folder.

To set the clock, after boot, run FMCII_9F.PRG. It may say there is no clock present, but if you have installed it correctly, it is just waiting to be set.

Set the time in 24 hour clock, HH:MM:SS, and the date, DD:MM:YYY.

The date is strange to account for Y2K, if you want to set for 2016, set YYY to be 116, 2017 would be 117 and so on.

It will look something like this:



Then hit the set button, and if you have connected everything correctly, it will blink and the clock is set.

If you click "REREAD", the software will go and retrieve the current time, and you will see the seconds increment.

This worked for TOS 1.04 and TOS 1.62.

When using TOS 2.06, I encountered some odd behaviour when setting the clock as above. I found it was first necessary to boot without loading DALLRTC.PRG, so you may as well boot with an empty AUTO folder.

It was then necessary to use FMCII.PRG to set to the correct time, but a date below Y2K, such as 99 (1999).

From there, it was possible to use FMCII_9F.PRG to set a date of 116 (2016) successfully.

After that you can happily boot with DALLRTC.PRG and AUTOFMC.PRG in your AUTO folder.

Don't forget, the DS1315 is Y2K compliant, so setting it isn't really the issue with the right combination of software, but reading the clock and passing the data through to TOS is where the Y2K fix is needed in order for everything to behave correctly.

There is a clock ACC available in the AREAL software suite linked to below in the 'Web Links' section. It's called AREAL37.ACC, simply use as you would other ACC files.

You can use this to show a clock in the top right hand corner of your screen once set. It does not show the date sadly, but there are probably other ACCs available which will work for this.

Testing/Troubleshooting

In order to verify clock operations, I carried out the following:

1. Created a folder on disk, and checked the date/time of the folder using the 'Show Information) option from the GEM menu.
2. Used SYSINFO.PRG to confirm the date/time in TOS.
3. Powered down the ST/STE for extended periods, with the power lead removed (About a week is the longest so far), then test clock operation by booting up with the disk provided below, and test using the methods in the previous 2 steps.

In reality, there is not a massive amount of troubleshooting you can do, but good areas to check are:

1. Is the battery good? It just won't behave well without.
2. Are your solder connections good? Soldering to A1 & A2 on the topside of the mainboard is extremely difficult, as the pins are obscured by the top pins of the cartridge port, so you may wish to pick these off on the underside of the cartridge port, or elsewhere on the mainboard to make life easier. Re-check all joints regardless, as a single dry joint will stop this working.
3. If FMCII.PRG or FMCII_9F.PRG say the clock is not running, or that you have the incorrect number of days for the month, it usually indicates the clock has never been set. This might be after a battery change. Set the date to something like 1/1/99, and the time to anything other than what is shown when the software boots. Hit the set button, and it should take this. Hit reread, and you should see the seconds increment. You can now set to the correct time.

Web Links

Atari ST and Ste users on Facebook: https://www.facebook.com/groups/133161394213/

Chris' projects and web store: http://www.exxoshost.co.uk/atari/last/index.htm

Atari Bible:

http://fr.meric.free.fr/Articles/articlesba/forgetmeclockinside/forgetmeclockinside.html

Troed's blog: https://blog.troed.se/projects/dallas-rtc-sync-tos-y2k-fix/

DS1216 datasheet: http://pdfserv.maximintegrated.com/en/ds/DS1216-DS1216H.pdf

DS1315 datasheet: http://pdfserv.maximintegrated.com/en/ds/DS1216-DS1216H.pdf

AREAL software: http://storage.atari-source.org/atari/mirrors/kurobox.serveftp.net/utilities/clocks/

Boot disk image ready to run, including FMCII, FMCII_9F, AUTOFMC and DALLRTC : https://drive.google.com/file/d/0B8c04HGf1tP3QklpdU1iSzR3ZFE/view?usp=sharing

Other RTC documentation by me, some of which is included here. Mostly for historical interest:

https://drive.google.com/open?id=0B8c04HGf1tP3WlRBS3RiZ3BfQUE