

# RaSCSI for 68k Macs

**Background, Current Status  
and Roadmap**

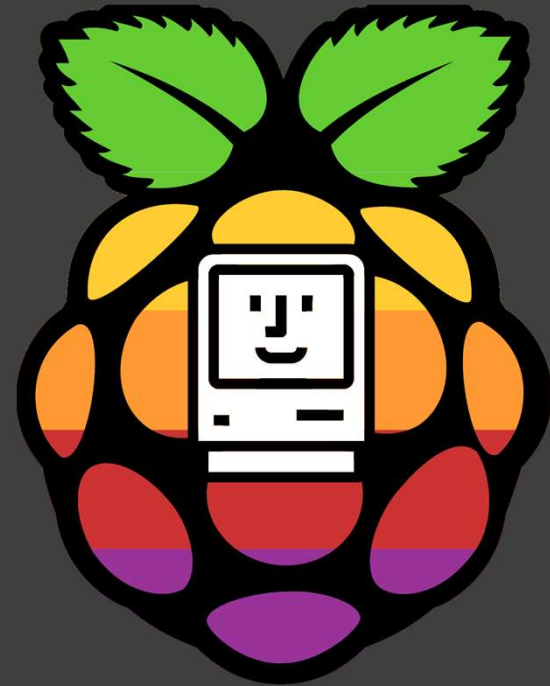
FOSDEM 21

Tony Kuker

07-Feb-2020

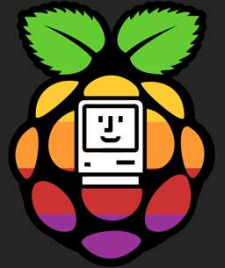


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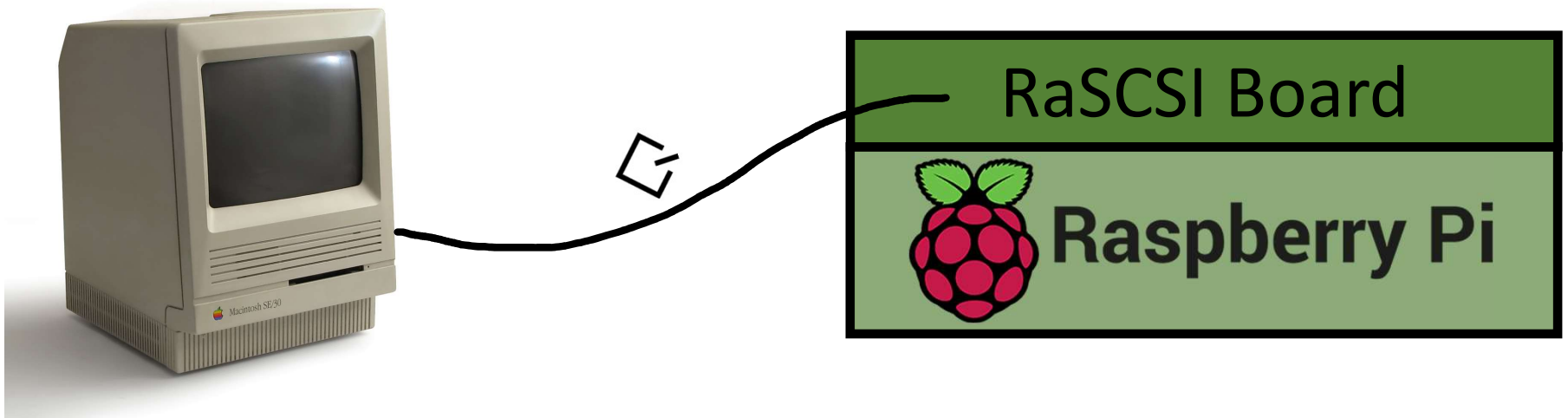




# What is RaSCSI?



Raspberry Pi + Parallel SCSI = RaSCSI



[Mac SE/30](#) – CC BY SA 2.5 Danamania

[SCSI Logo](#) – Public Domain

Raspberry Pi Logo – Copyright Raspberry Pi Foundation

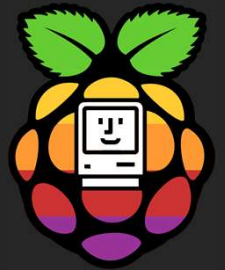


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*SCSI: Small Computer System Interface*



# What use cases is RaSCSI \*NOT\* trying to fill?



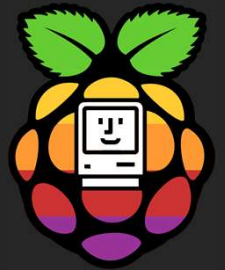
- Wide SCSI, high performance SCSI
- Serial Attached SCSI (SAS)
- Mission critical use cases



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# What use cases is RaSCSI trying to fill?



## Replacement for failing vintage mechanical drives

- Hard disks, CD-ROM, Magnetic Media

## Emulation of rare vintage SCSI Peripherals

- SCSI Ethernet Interface
- SCSI Display Adapter (ex: Scuzzy Graph)

## “Host Bridge” (X68000)





# Where has it successfully been used?



<https://github.com/akuker/RASCSI/wiki/Compatibility>

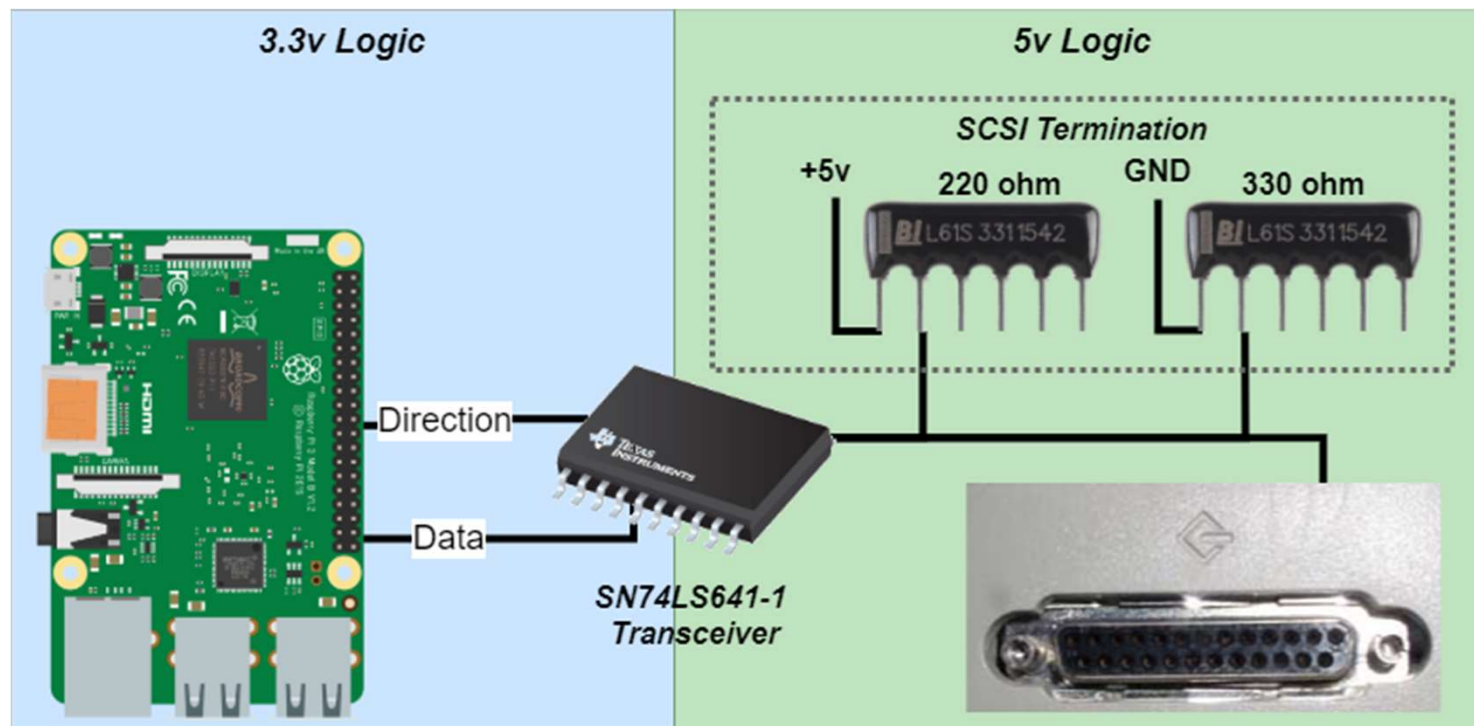
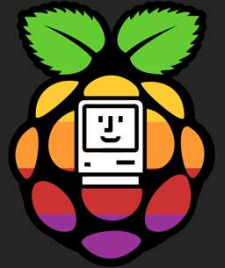
Mac Images licensed under CC-SA by Danamania  
X68000 image licensed under CC BY-SA by Manupkp  
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# How does it work?



[Resistor](#): CC BY 2.0 – Sparkfun

[SN74LS641](#) – © Texas Instruments, Fair Use

[SCSI Port](#) – CC BY-SA 3.0 Charles Bunnell CB1226

[Raspberry Pi](#) – CC BY-SA 4.0 Butix, based on works by Lucasbosch and Cmykey



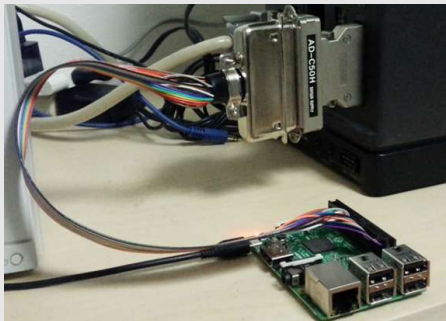
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# Types / Configurations



## Direct Link



- No transceivers
- Directly connect Pi GPIO to SCSI
- Cable & PCB versions
- Potential for long-term damage to Pi

## Target Only



- Operates as SCSI Target Only
- Direction of data lines hard-wired to IO signal

## Full spec



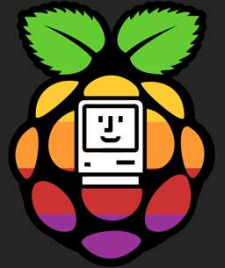
- Supports SCSI Target or Initiator modes
- Able to create disk images



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# Comparison to other SCSI emulator devices



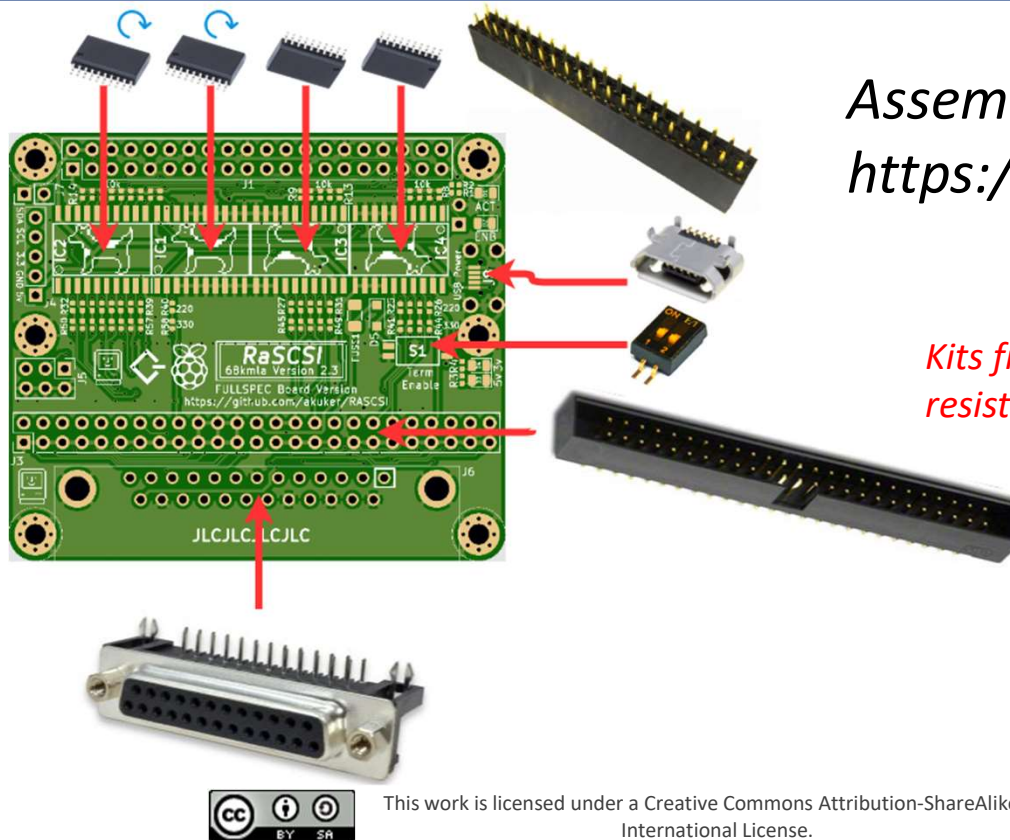
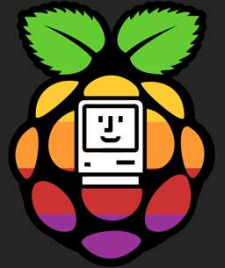
	<a href="#">RaSCSI</a> (68kmla edition)	<a href="#">RaSCSI</a> (GIMONS)	<a href="#">BlueSCSI</a>	<a href="#">SCSI2SD</a>	<a href="#">MacSD</a>
Hard Disk	✓	✓	✓	✓	✓
CD-ROM	✓	✓	✗	✓	✓
Floppy Disk	✗	✗	✗	✓	✗
Magneto-Optical	✓	✓	✗	✓	✗
Ethernet	✓ (Beta)	✓	✗	✗	✗
CD Audio	✗	✗	✗	✗	✓
Cost	<a href="#">\$45 (\$30 kit)</a> + Pi Approx €37 (€25)	<a href="#">7,200 JPY + Pi</a> Approx \$65 Approx €57	\$25 (complete kit) Approx €20	<a href="#">\$62</a> Approx €51	<a href="#">\$129</a> Approx €107



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# Assembly



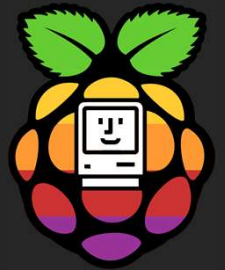
Assembly demonstration:  
<https://youtu.be/tUgxcchH2yg>

*Kits from Tindie have small surface mount resistors, LEDs, fuse and diode pre-installed*

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# Assembly Options



Standard Configuration	Any Raspberry Pi (Except Raspberry Pi 1)	
Compact Configuration	Raspberry Pi Zero Only	



## 3D Printed case

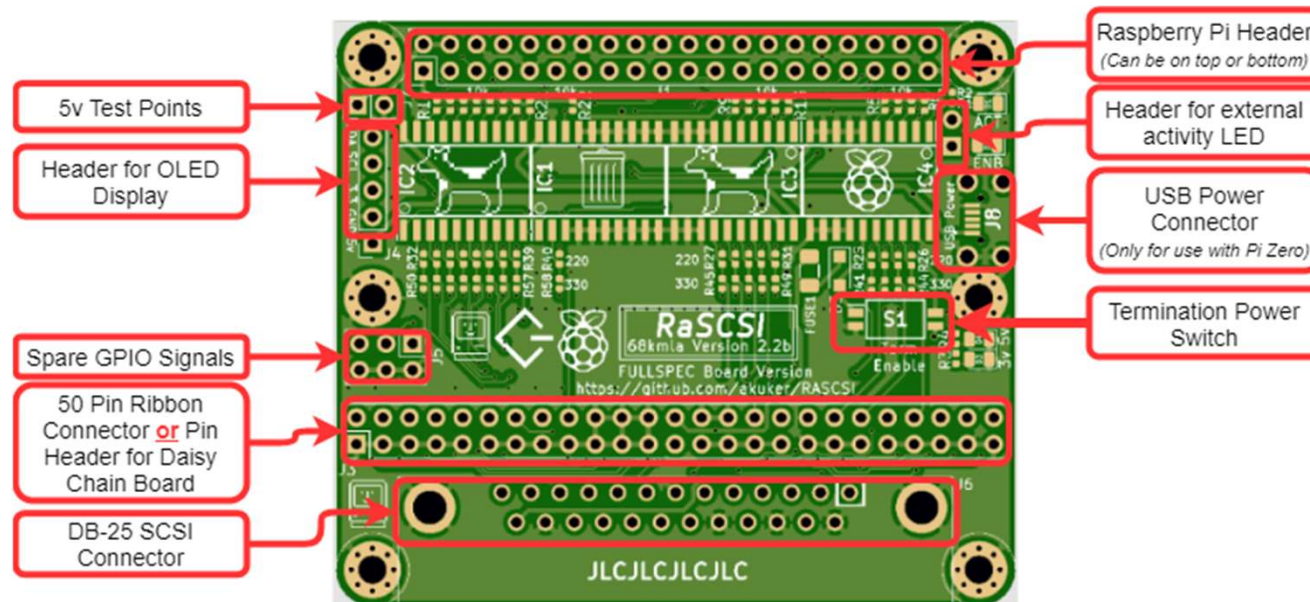
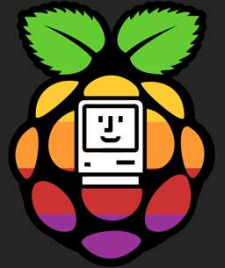
<https://www.etsy.com/shop/PotatoFi>



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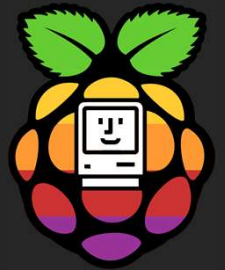
# Anatomy of a RaSCSI



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# How to Control RaSCSI



## Web Interface

RaSCSI Control Page - Mozilla Firefox

RaSCSI Control Page x +

localhost

Service Running

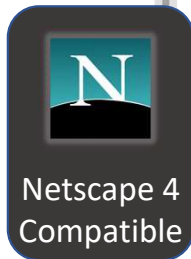
**RaSCSI - 68kmla Edition**

Current RaSCSI Configuration

ID	Type	File	Action
0	SCHD	/home/pi/images/RaSCSI-BootstrapV0.hda	Detach
1	-	-	Detach
2	SCHD	/home/pi/images/newdisk.hda	Detach
3	-	-	Detach
4	-	-	Detach
5	-	-	Detach
6	SCCD	/home/pi/images/MacOS_71.iso(WRITEPROTECT)	Eject
7	-	Host Machine	-

Image File Management

File	Size	Actions
Mac_OSX_10_1_3.iso	648 MB ↓	5 ▾ Attach Delete
System_7.iso	81 MB ↓	5 ▾ Attach Delete



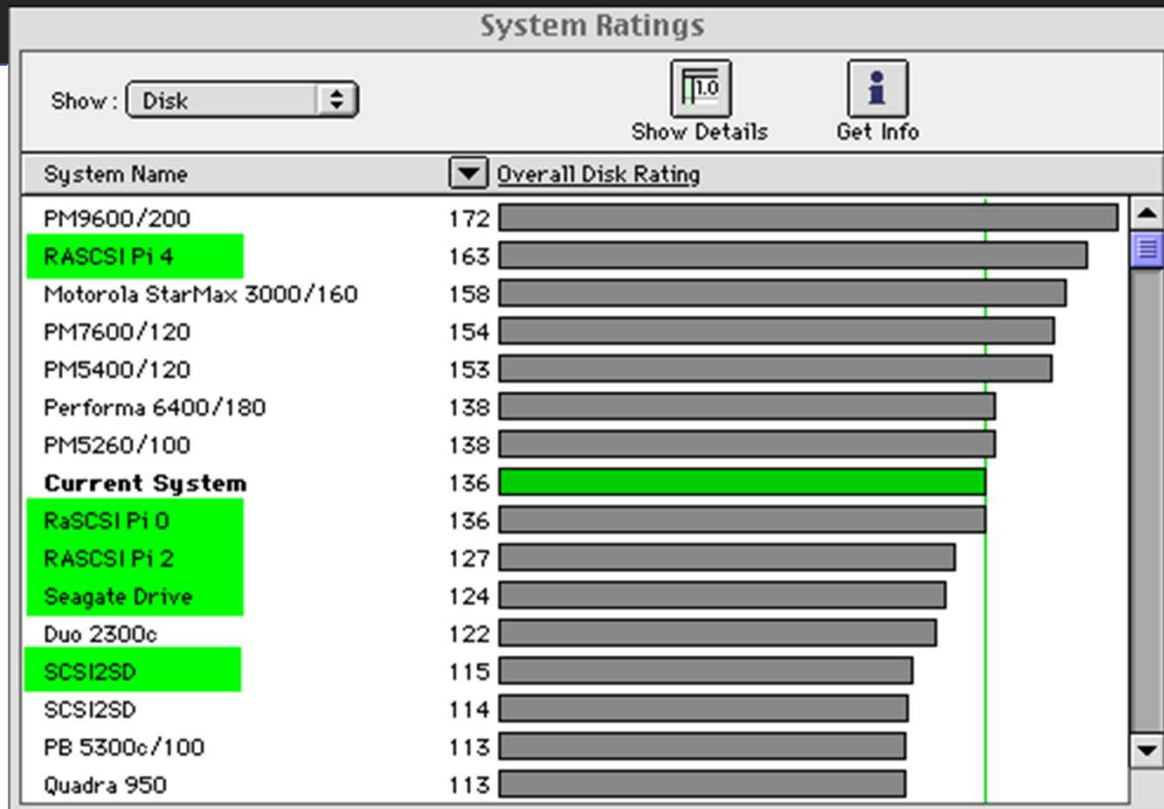
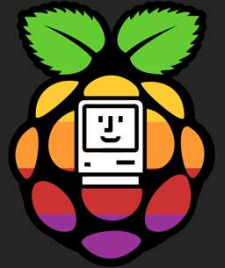
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## Command Line Utility

```
pi@rascsi-dev: ~  
File Edit Tabs Help  
pi@rascsi-dev:~$ rasctl -l  
-----  
| ID | UN | TYPE | DEVICE STATUS  
-----  
| 0 | 0 | SCHD | /home/pi/images/RaSCSI-BootstrapV0.hda  
| 2 | 0 | SCHD | /home/pi/images/newdisk.hda  
| 3 | 0 | SCCD | /home/pi/images/System_6.0.8_Mac_OS.toast.iso(WRITEPROTECT)  
| 6 | 0 | SCCD | /home/pi/images/MacOS_71.iso(WRITEPROTECT)  
-----  
pi@rascsi-dev:~$ rasctl -c eject -i 3  
pi@rascsi-dev:~$ rasctl -l  
-----  
| ID | UN | TYPE | DEVICE STATUS  
-----  
| 0 | 0 | SCHD | /home/pi/images/RaSCSI-BootstrapV0.hda  
| 2 | 0 | SCHD | /home/pi/images/newdisk.hda  
| 3 | 0 | SCCD | NO MEDIA  
| 6 | 0 | SCCD | /home/pi/images/MacOS_71.iso(WRITEPROTECT)  
-----  
pi@rascsi-dev:~$ rasctl -c attach -i 4 -f /home/pi/images/rominator.hda  
pi@rascsi-dev:~$
```



# Benchmarks



Test platform:

## Macintosh Quadra 840av

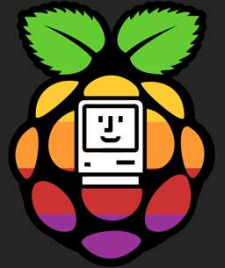
- 68040 Processor at 40MHz
- 128MB RAM
- 1MB VRAM
- Seagate ST3600N 500MB HD w/stock Apple firmware
- MacOS 8.1
- Drive cache configured at 128KB
- Norton System Info 3.5



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# History



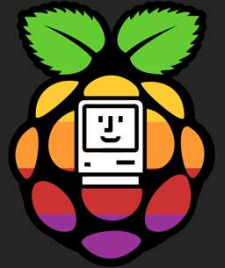
- [2017](#) – Original RaSCSI version created by [Gimons](#)
  - Support for Hard disks, Magneto-Optical, CD-ROM and X68000 Host Interface
- [2017](#) - [K55](#) started thread on 68kmla.org
- 2020 – Created version with DB-25 and 50-pin SCSI connectors ([akuker](#))
- 2020 – Code translated to English and uploaded to [Github](#) ([akuker](#))
- 2020 – rascsi.com [wiki page](#) created & organized ([phrax0](#), [nulleric](#), [akuker](#))
- 2020 – OLED status display added ([akuker](#))
- 2020 – Python-based rascsi-web control interface ([nulleric](#))
- 2020 – Easy install script created ([sonique6784](#) & [nulleric](#))
- 2020 – [System 6 screen mirroring proof of concept](#) ([jcs](#))
- 2021 – Beta SCSI Ethernet functionality released ([akuker](#))



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# Plans for 2021



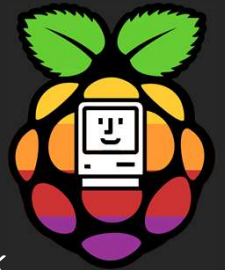
- Release Ethernet over SCSI into production build
- PowerBook compatible hardware version
- Add support for un-patched Apple CD-ROM driver
- Better support for different disk image formats
  - .toast .img
- Configuration & Logging improvements



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# Reverse Engineering - SCSIMON

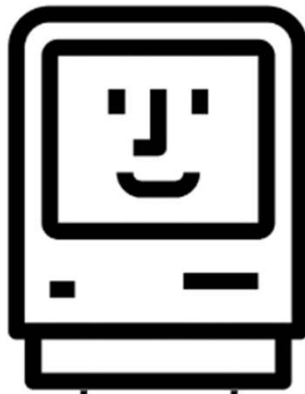


*Note: Farallon EtherMac SCSI is a rebranded DaynaPort SCSI/Link*

FloppyEMU  
(Configured as HD20)



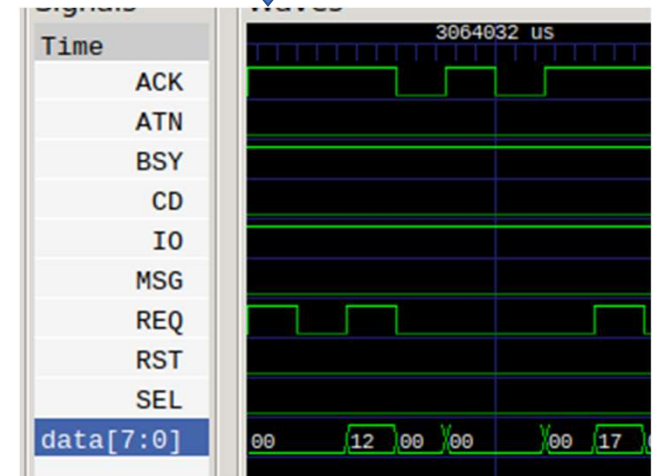
Macintosh SE/30  
w/ ROM-inator II



Farallon EtherMac  
SCSI



RaSCSI with  
SCSIMON



*Special thank you to @PotatoFi for generously loaning out his Farallon EtherMac SCSI for this project!*



ROM-inator II – [BMOW](#)  
Floppy EMU – [BMOW](#)  
Farallon EtherMac – [PotatoFi](#)  
GTKWave – [GTKWave Project](#)



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# How can I get involved?

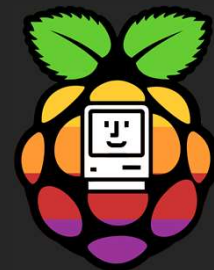


- Build your own
  - Schematics, Gerber files, bill of materials available on [Github](#)
- Order one from [Tindie](#) – Kit or Pre-Assembled
  - *If out of stock – more will be coming in late February*
- Join us on Discord - <https://discord.gg/et8ENMGU3X>
- Join the discussion on [68k Mac Liberation Army](#)
- Try it out on your vintage hardware!



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# Thank you!



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