

Adding a Fan

Background

The Pi Foundation IO board uses an EMC2301 chip to provide fan control but it is not on the same IIC bus as that on the 40-pin header, which is the only bus visible to RISC OS. The Waveshare Mini IO board also has the same issue. The RTC chip on the IO board is also inaccessible.

A neat solution therefore is to add an RTC board that plugs on to the 40-pin header (CJE Micros sell such a board). Taking this one step further we can make a HAT that carries both the CJE RTC board and an Adafruit EMC2101 fan controller.

Software to control the fan, automatically changing speed as processor temperature changes is available in !FanCon from !Store.

The fan controller

The Adafruit EMC2101 board connects to the 40 pin header using pins 1 (3V), 3 (SDA), 5 (SCL) and 6 (GND) and provides the 'FAN' and 'TACH' signals for the fan. Using the Waveshare Mini-A IO board (which has no RTC or fan controller and is thus slightly cheaper

at £24) a custom circuit board provides a carrier for RTC and fan controller.

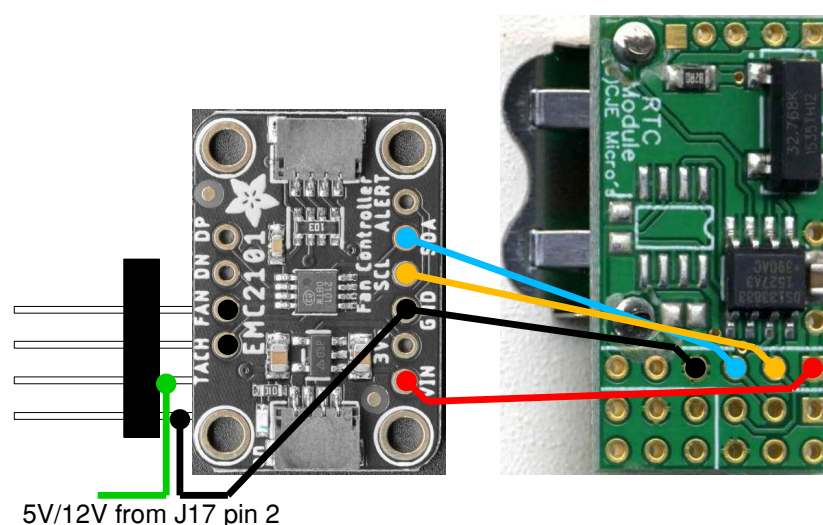
Software

We now have a hardware connection to control the fan, with the control chip, an EMC2101, connected to the IIC bus but software to make the requests for different fan speeds (depending on processor temperature) needs to be written.

The EMC2101 is on the IIC bus at a 7-bit address of &4C with the relevant control register at address &4C on the chip.

```
REM Set fan speed
DEFPROCset(z%)
!mem%=(&4C<<1):REM IIC address = &4C
mem%!4=mem%+40
mem%!8=2:REM write two bytes
REM select chip register &4C (fan speed)
mem%!40=&4C
mem%!41=z%:REM speed 00 .. &3F
SYS "OS_IICOp",mem%,(0<<24)+1
ENDPROC
```

A simple procedure to set the fan speed. With the fan plugged in and 5V power connected for the fan, the fan can be heard to change speed or stop as speed commands are issued.



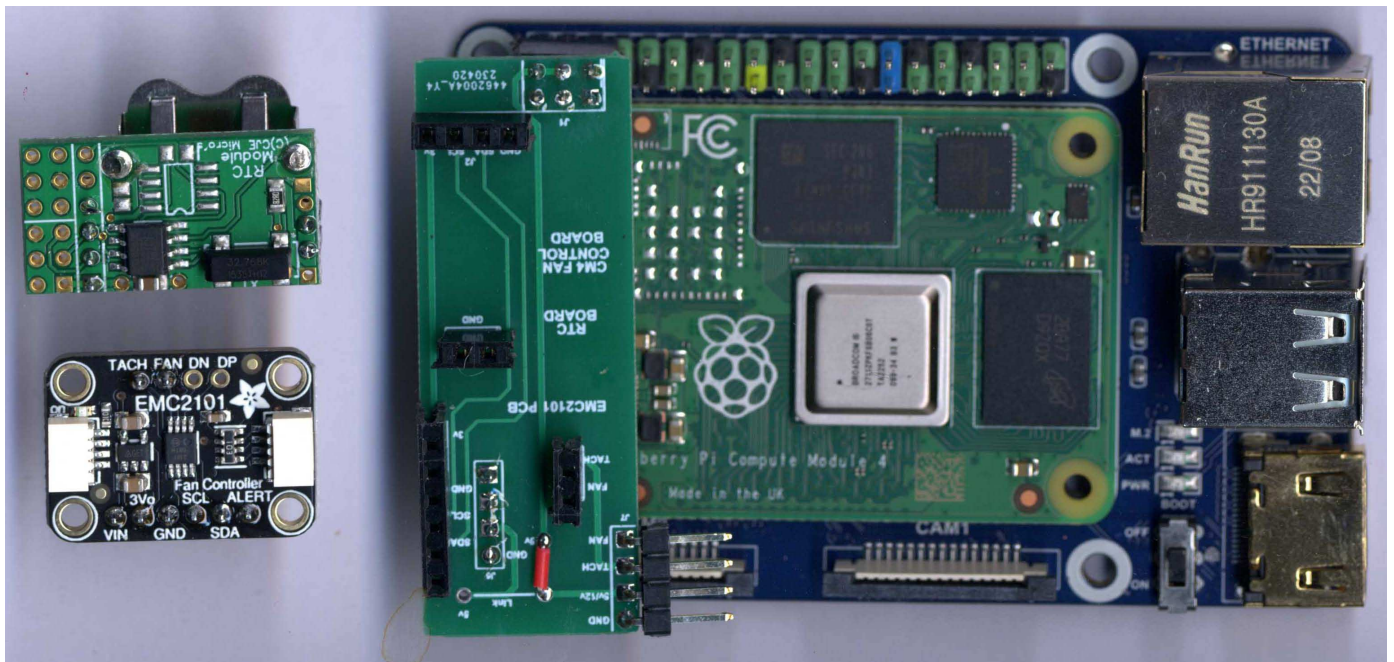
Above: Perhaps not the most elegant solution, the Adafruit EMC2101 board can be wired to the CJE RTC module and a 4-pin fan header can be added to control the fan.

The Adafruit board is quite cheap, just under £6 and the Waveshare fan is about £15 (available in both 5V and 12V versions).

The Waveshare IO board also provides an NVMe slot for a solid state disc. If we had a RISC OS driver for NVMe ...

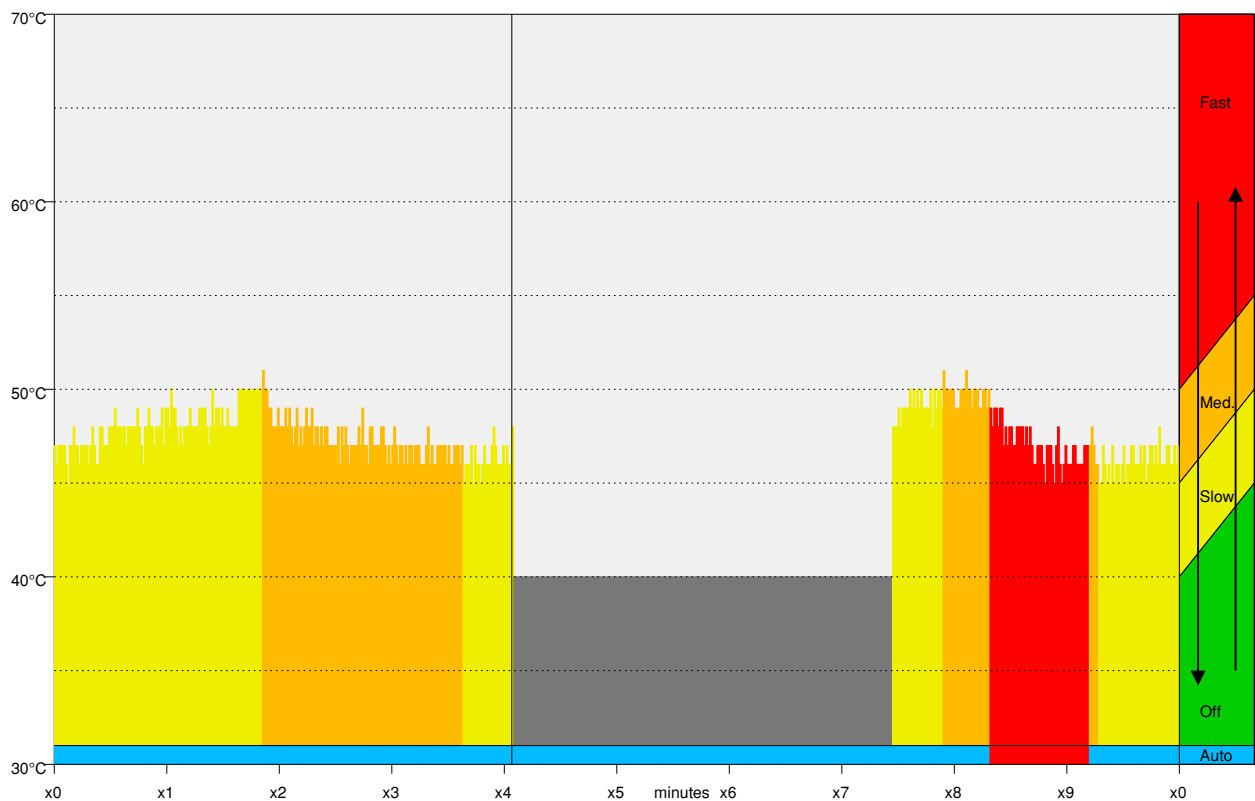
The software !FanCon will control temperature by adjusting the speed of the fan to keep it as silent as possible.

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A neater solution: a carrier board for RTC and fan control boards, designed to leave (just) enough room for a Waveshare fan mounted on the CM4.

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The utility 'FanCon' generates a temperature graph. The unit is steady at 49°C (01:17:30) on auto control and fan speed increases as it touches 50°C to medium (orange). It is switched manually to full speed (Red) at 01:18:20 and then put back on auto at 01:19:20. As workload eases, the temperature drops again.