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## blah

1 message

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Sun, Mar 21, 2021 at 2:14 PM

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## Computer control of J2010 filament

The J2010 has an analog control of the filament. This to the user is a knob with numbers between 1 and 10 with a mechanical stop that is set to the correct value for a particular filament.

Behind the knob is a micro-switch that is activated when the knob goes beyond zero and a 100k Ohm potentiometer that has 0 V and 65 V on each end and the wiper appears to be used to send a voltage proportional to the knob position to somewhere in the HT tank.

The filament control to the user is a knob, but to the TEM is a voltage between 0 and 65 V.

When a user turns on the filament they would normally turn the knob slowly, over about 30 seconds.

## Proposed internet connected filament

The proposal is to setup a single board computer (SBC) running a web page that has two pages, a configuration page to allow setting the maximum value i.e. replace the mechanical stop and a user page with ON and OFF buttons and a STATE value. i.e. what the system is doing now.

Pressing the OFF button will turn the "wiper" voltage to 0 V. Pressing the ON button will turn the "wiper" voltage from 0 to the configuration page value over 30 seconds.

We will have users that interact directly with the TEM and for them a web page is a complication. To solve this the TEM will have a toggle switch that will turn the control back to the knob AND will report its state to the SBC. It will also have two momentary push buttons labeled ON and OFF that do what the user webpage does and a red-green LED that is green when there is a voltage ON, red when it is OFF and flash green when the voltage is coming up and flashing red when it is turning off.

## Hardware

The SBC needs to be a Ethernet attached device for reliability. In the initial incarnation this will be a raspberry Pi2 as we have one available.

The analog control of the 65V will be via a MCP 4725 breakout board from AdaFruit a \$5 12 bit DAC on a tiny PCB and a OPA462 evaluation board from TI set to non-inverting with the gain set to 19.7 (default gain is 11) this means an input voltage of 3.3 Volts would output 65 V so the system. The gain resistor R3 needs to be 167 k, but 169 k is the nearest 1% value and should be used.

The OPA462 is a 180V range op amp capable of single rail operations and so is ideal for this application. Conveniently TI supply a demo board so no PCB need to be built for a one off system.

## Webpages

The web address "<http://J2010filament>" should take a user to the user page from inside Gatan. The unit should not be accessible from outside the building unless a VPN is used.

## **User page**

### **Elements**

Text field "Control status" showing either "knob control" or "computer control" found by reading back the switch that switches the wiper voltage between the computer controller voltage and the pot.

The next elements are only visible IF the system is in "Computer Control" state.

Button "ON"...start program to ramp filament up

Button "OFF"...start program to ramp filament down

Text field "Status" showing either "On", "Off", "ramping up...", "ramping down" and the current "virtual knob" setting, a number between 1 and 10.

## **Configuration page**

### **elements**

Text box with label "Stop value" the text box should allow values between 0.0 and 9.9 i.e. "n.n"

Button with label "Save" which saves the value so the user page element know how high to set the filament.

## **Background processes**

The system will log every-time someone turns the filament on or off, noting the time, IP address and interaction.

The system will turn the beam off automatically if it has been on for 8 hours.