Configuring the Newport XPS Motion Controller

Figure 1: Our XPS is located on the unistrut super-structure above the optical table in the laser lab.

1. Process Description:

There are numerous examples of precision measurements requiring reliable and repeatable motion of a translation stage, e.g. Frequency Resolved Optical Gating (FROG) or Fourier Transform Interferometry (FTIR),[1] generally with motion on the sub-micron scale. While measurements of this type are certainly possible by hand, higher accuracy can be achieved through the use of motorized actuators connected to our translation stage. Our lab has access to Newport motorized actuators, e.g. LTA-HS, that are compatible with the Newport XPS-Q8 Motion Controller (Fig 1). In order for the XPS to communicate with a new actuator, the motion controller must be configured correctly. This SOP will go through the steps necessary to configure the XPS for a new set of actuators.

[1] The FROG enables the temporal characterization of ultrafast pulses, whereas the FTIR enables a corresponding spectral characterization.

2. Instrument Description:

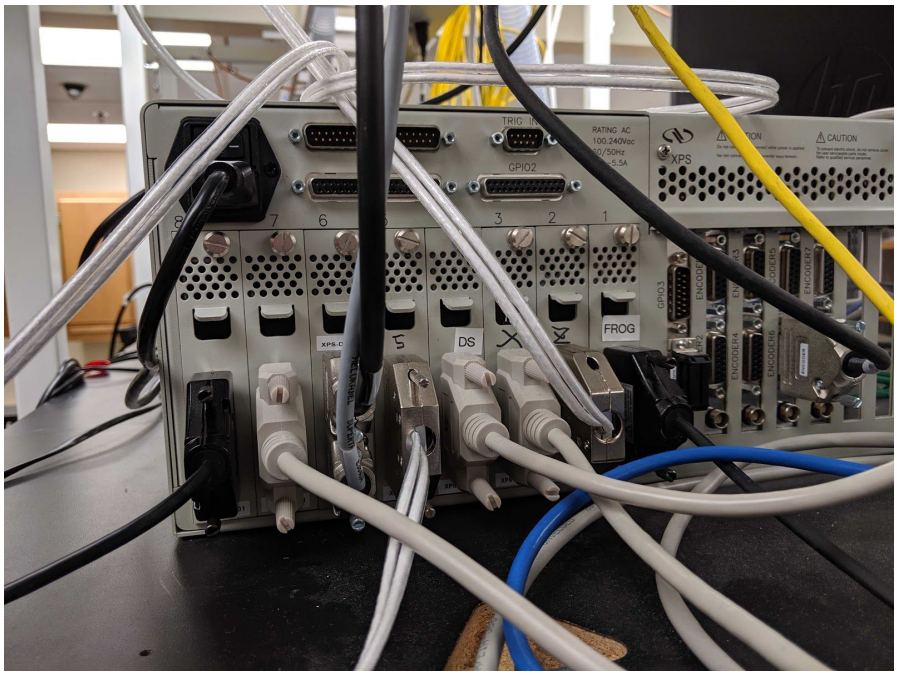


Figure 2: Back side of XPS with card slots visible.

The XPS-Q8 Motion Controller comes with eight available slots for driving eight separate Newport motorized actuators. The slots can be found on the back side of the XPS below the power switch and are labeled 1-8 (Fig 2). The slots accept actuator driver cards from Newport, e.g. DRV-01 or DRV-02, and can simply be plugged and unplugged. The XPS is connected via ethernet to the three computers on the super-structure (Catan, Candyland and Sorry), the configuration can be performed using your preferred computer. To access the XPS on a computer its IP address can be entered into a web browser or through the command prompt. Accessing the XPS through a browser will open an interactive session that enables control of the various configured actuators. In order to begin working with a motorized actuator through the XPS the driver card must first be installed. The proper method of installing a new driver card is as follows:

1. Turn off XPS. **Any time an actuator or driver card is plugged into/unplugged from the XPS ensure that the XPS is off. Otherwise, this can lead to damage.**
2. **MAKE SURE YOU TURNED OFF THE XPS.**
3. Unplug all cables from the driver card and unscrew the flathead screw at the top of the card.
4. Firmly, but not forcefully, pull the card straight out of the slot. There are two rows of ridges on the top and the bottom of the XPS that act as rails to allow the cards to slide in and out straight.

5. The new card can then be slid into the slot. Make sure the top and bottom of the card fits within the lines of ridges.
6. Once all the cards and actuators are reconnected, turn on the XPS.

Each actuator needs to be plugged into a compatible card for use. If purchasing a new actuator from Newport the corresponding card will need to be ordered separately.

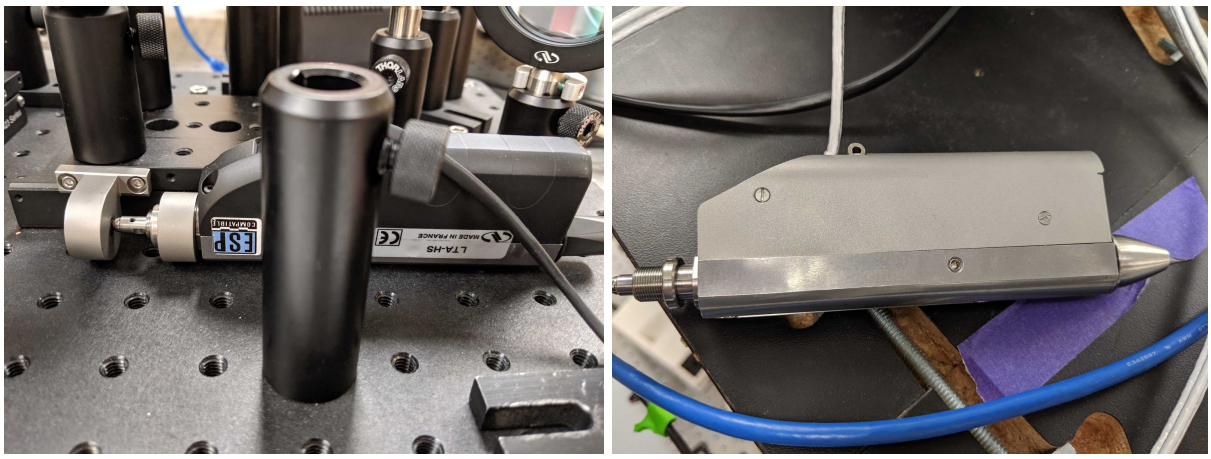


Figure 3. Two types of motorized actuators in the lab. a) LTA-HS which is designed for high speed travel. b) LTA-HSPPV6 high speed actuator designed for vacuum use.

3. Configuring XPS:

The process to configure the XPS is straightforward. The steps are laid out below:

1. Login to the XPS through a web browser. The IP address is currently 192.168.0.254 for computers on the local network. After typing the IP address into the search bar the screen should look similar to below.

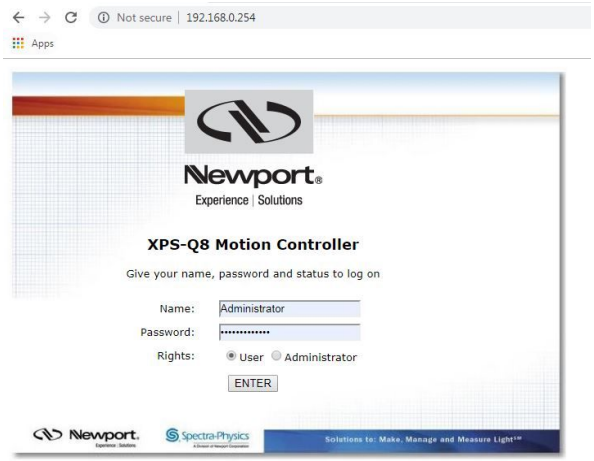


Figure 4. Login screen for XPS-Q8 Motion Controller.

2. Login to XPS. The username and password are both “Administrator”. In order to configure the XPS you will need to log in with Administrator rights. Normal use of the XPS can be performed in User mode. After successful login the screen will change to the XPS overview.

Figure 5. Overview screen of the XPS as seen in administrator mode. The individual tabs lead to various sections of the XPS.

3. The manual configuration can be found from selecting the Manual configuration option under the system tab. The configuration of the XPS begins here. To choose a new single axis actuator, start by entering your desired Group named into the Single Axis text box and then click “Add.”

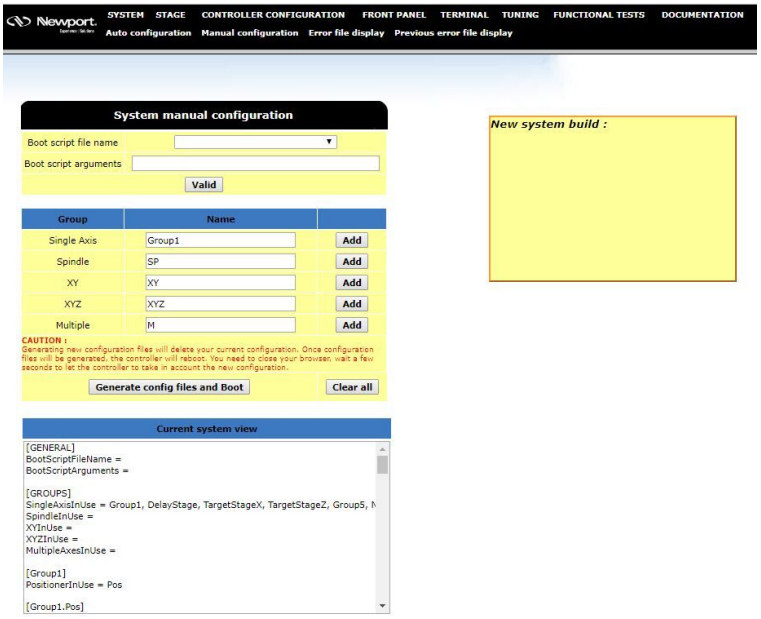
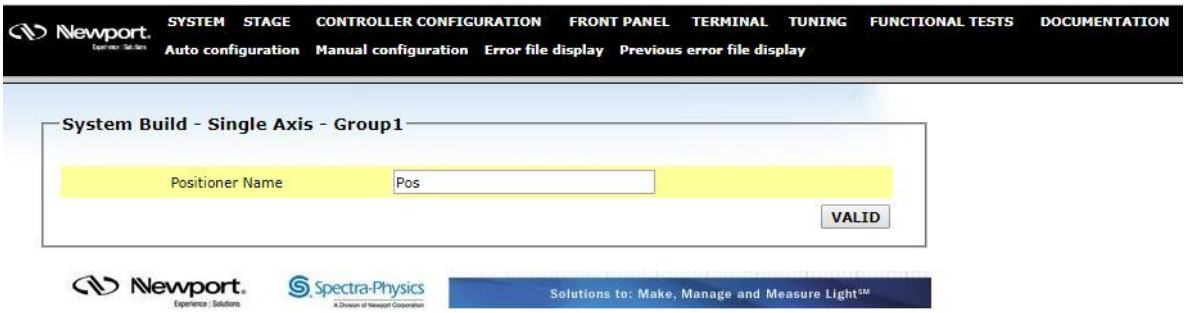


Figure 6. Manual Configuration page with actuator “Group1” entered into the Single Axis name box.

4. The next page will ask you to provide names for the individual positioners. For a single axis this is almost redundant, so we leave it as the default “Pos.” More complex groups such as an XY group will ask for the names of multiple positioners on this screen. Once the desired names are entered press “Valid.”

Figure 7. Positioner naming page. Default of “Pos” is entered.



5. Finally, you will be asked to select the plug number and stage name. The plug number is the physical slot that the driver and actuator is plugged into the XPS. The stage name is the actuator stage and the corresponding driver. For Group1 that is an LTA-HS stage plugged into a DRV-01 driver this corresponds to Slot 1 and LTA-HS@XPS-DRV01.

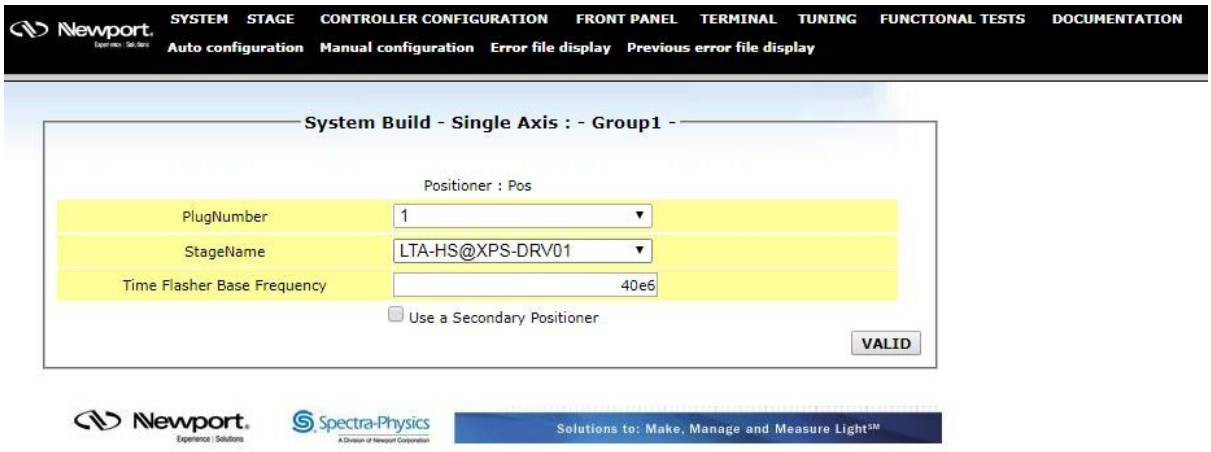
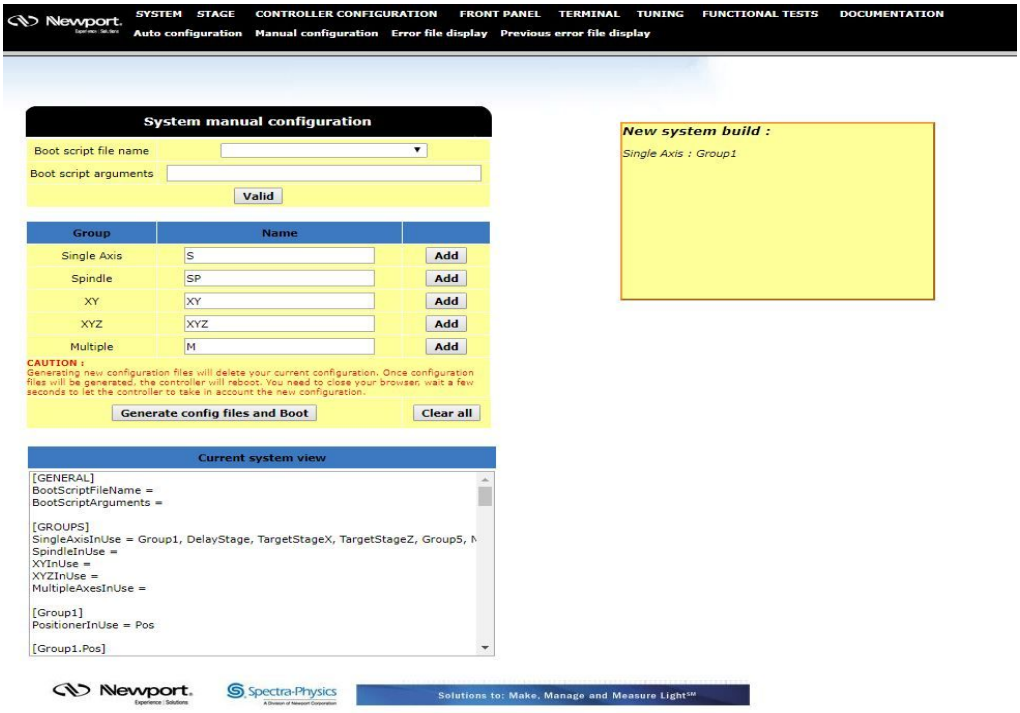


Figure 8. Final page for the system build. The Group1 LTA-HS actuator is plugged into the DRV01 driver card installed in Slot 1 of the XPS.

6. After entering all the information for the actuator you will return to the manual configuration screen. You can follow steps 3-5 for additional actuators if desired. Once all actuators have had their information entered the screen should display a New system build dialog box with a list of the actuators that will be configured. In this example only “Group1” will be configured and useable. To finish configuration select “Generate config files and Boot” on the left side of the

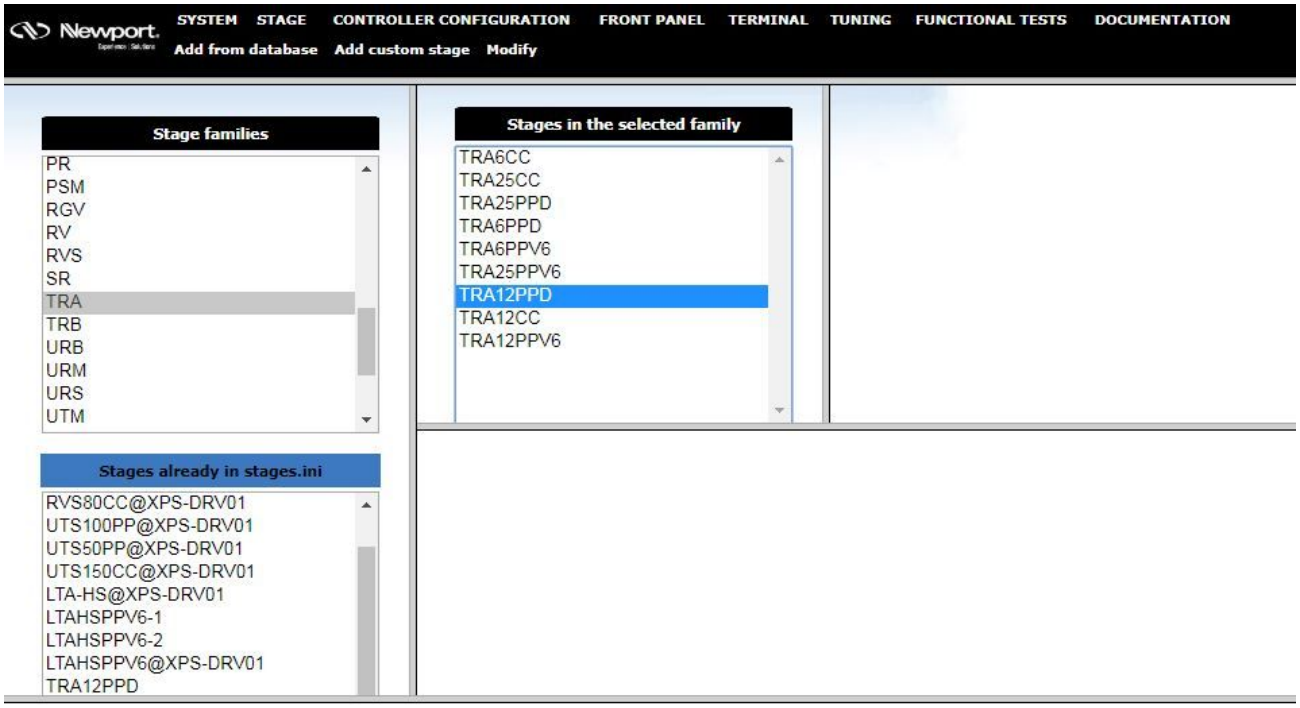
screen. This will reboot this XPS as it generates a new configuration for the actuators. As it restarts you should be able to hear an audible click as it activates the actuator for use. If the configuration process the XPS will produce a happy sound, otherwise a sad sound will be heard.[2] This sad sound can also be heard if an actuator that has been configured is unplugged with the XPS off and is not plugged back in when the XPS is turned on.



After the boot sequence is completed the XPS will now be able to move the connected actuators either through the Newport page or other software such as Labview or Python.

Final note: New actuators might be different from those already in use, so the stage name might not be loaded into the XPS software. To find a new stage navigate to controller configuration screen and select the “Add from database” page (see image below). The stage name can be found from a list of actuator stages in a stage family. Select the stage to add it to the list of actuators recognized by the XPS.

[2] The difference between the happy and sad sound is hard to describe. But it should become obviously clear which sound the XPS is making on boot-up.


Newport
SYSTEM
STAGE
CONTROLLER CONFIGURATION
FRONT PANEL
TERMINAL
TUNING
FUNCTIONAL TESTS
DOCUMENTATION
Add from database
Add custom stage
Modify
Stage families
PR
PSM
RGV
RV
RVS
SR
TRA
TRB
URB
URM
URS
UTM
Stages in the selected family
TRA6CC
TRA25CC
TRA25PPD
TRA6PPD
TRA6PPV6
TRA25PPV6
TRA12PPD
TRA12CC
TRA12PPV6
Stages already in stages.ini
RVS80CC@XPS-DRV01
UTS100PP@XPS-DRV01
UTS50PP@XPS-DRV01
UTS150CC@XPS-DRV01
LTA-HS@XPS-DRV01
LTAHSPPV6-1
LTAHSPPV6-2
LTAHSPPV6@XPS-DRV01
TRA12PPD