HARMAN v1.0 AMX Muse Automator

HARMAN v1.0 AMX Muse Automator Instruction Manual

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Installation & Setup

MUSE Automator is a no-code/low-code software application designed for use with AMX MUSE Controllers. It is built on Node-RED, a widely used flow-based programming tool.

Prerequisites
Before installing MUSE Automator, you must install several dependencies outlined below. If these dependencies are not installed first, Automator will not run correctly.

1. **Install NodeJS (v20.11.1+) & Node Package Manager (NPM) (v10.2.4+)**
   Automator is a custom version of the Node-RED software, so it requires NodeJS to run on your system. It also requires Node Package Manager (NPM) to be able to install third-party nodes. To install NodeJS and NPM, go to the following link and follow the installation instructions: **https://docs.npmjs.com/downloading-and-installing-node-js-and-npm**.
2. **Install Git (v2.43.0+)**
   Git is a version control system. For Automator, it enables the Project feature so that you can organize your flows into discrete projects. It also enables the Push/Pull functionality required to deploy your flows to a physical MUSE Controller. To install Git, go to the following link and follow the instructions: **https://git-scm.com/book/en/v2/Getting-Started-Installing-Git**.

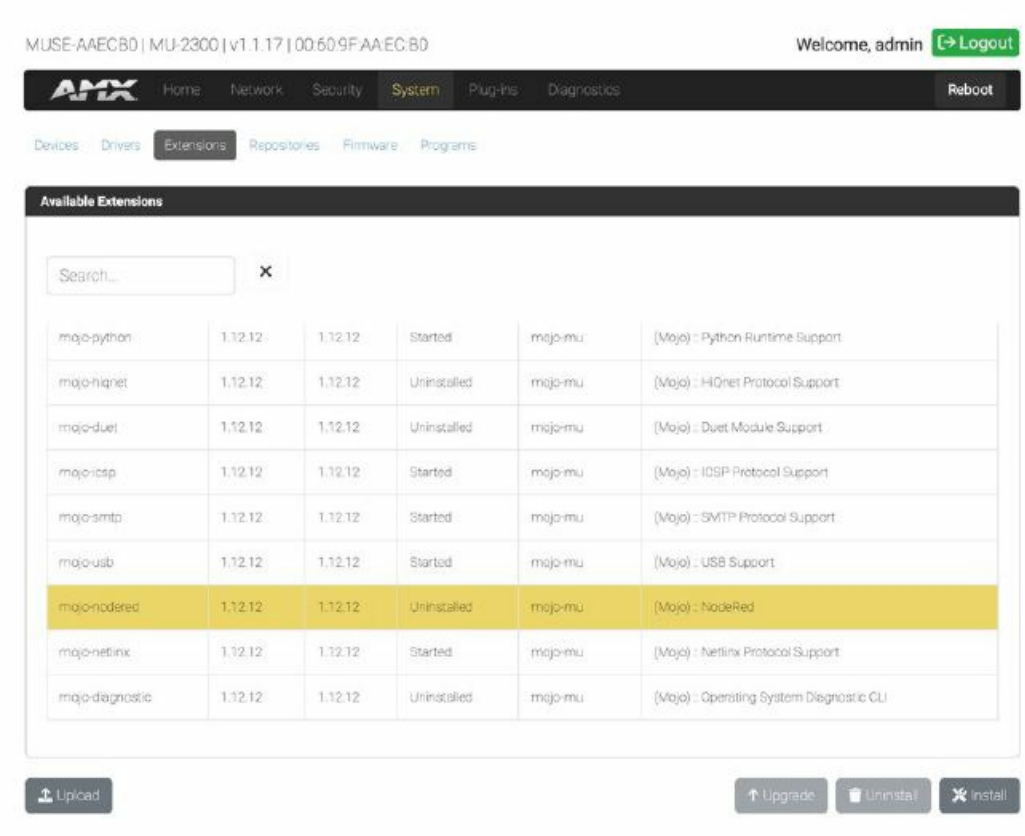
Note:
The Git installer will take you through a series of installation op-ons. It is recommended to use the default and installer-recommended options. Please refer to the Git documentation for more information.

Install MUSE Automator
Once Git, NodeJS, and NPM have been installed, you can install MUSE Automator. Install MUSE Automator on your Windows or MacOS PC and follow the respective installer instructions.

Install MUSE Controller Firmware
To use MUSE Automator with an AMX MUSE controller, you will need to update the MUSE controller firmware available on amx.com.

Enable Node-RED Support in the MUSE Controller

Node-RED is disabled on the MUSE controller by default. It must be manually enabled. To do this, log into your MUSE controller and navigate to System > Extensions. In the Available Extensions list, scroll down to mojo-nodded and click it to select it. Press the Install button to install the Node-RED extension and allow the controller to update. See the screenshot below for reference:



Other Information
If you have a firewall enabled on your PC, you will need to make sure you have Port 49152 open for Automator to communicate through this port properly.

Getting Started with MUSE Automator

Get to know Node-RED

- Since Automator is essentially a customized version of Node-RED, you should first become familiar with the Node-RED application. The software has a relatively shallow learning curve. There are hundreds of articles and instructional videos available to learn Node-RED, but a good place to start is in the Node-RED documentation: **https://nodered.org/docs**. In particular, read through the Tutorials, Cookbook, and Developing Flows to familiarize yourself with the application's features and user interface.
- This guide will not cover the basics of Node-RED or flow-based programming, so you must review the official Node-RED documentation before getting started.

Automator Interface Overview
The Automator editor interface is essentially the same as the Node-RED default editor with some tweaks to themes and some custom functionality that enables integration between the editor and a MUSE controller.

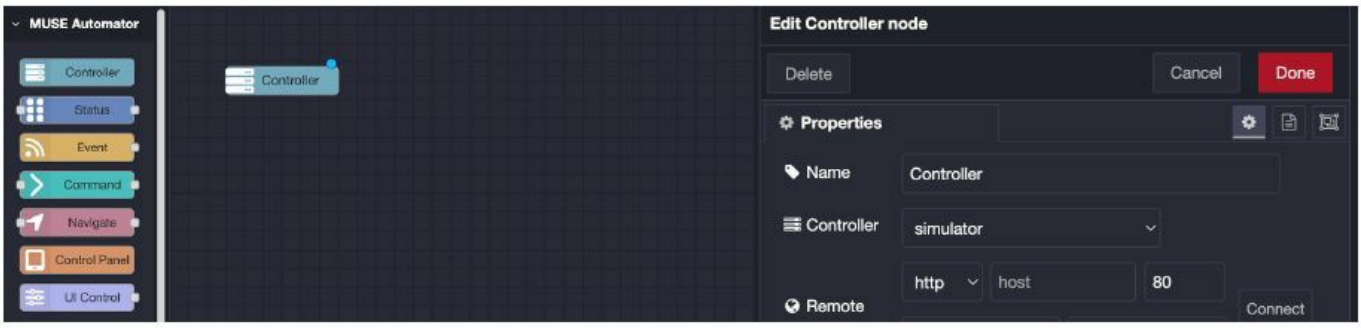
1. **MUSE Automator Palette** – custom nodes for working with HARMAN devices
2. **Flow Tab** – For switching between views of multiple flows
3. **Workspace** – Where you build your flows. Drag nodes from the left and drop them onto the workspace
4. **Push/Pull Tray** – For managing projects locally or on a controller. Push, pull, start, stop, delete a project.
5. **Deploy Buton/Tray** – For deploying flows from the editor to the local Node-RED server
6. **Hamburger Menu** – A main menu of the application. Create projects, open projects, manage flows, etc.

Automator Modes of Working
There are three different ways of working with Automator. These are not constrictive “modes” per se, but just methods of using Automator. We use the term mode here for simplicity.

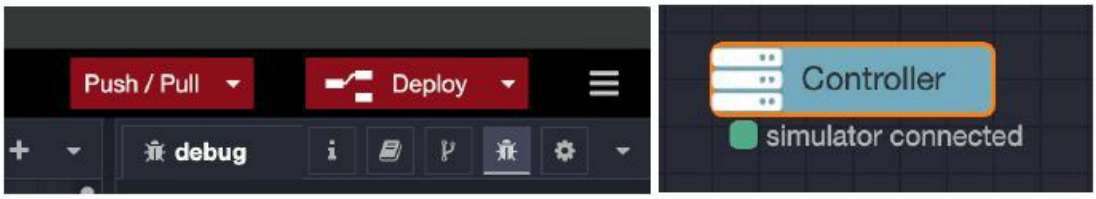
1. **Simulation** – Flows are deployed locally and run on a MUSE simulator so you can test without a physical controller.
2. **Connected** – You are connected to a physical MUSE controller and flows are deployed and then run locally on a PC. If you shut down Automator, the flows will cease to operate.
3. **Standalone** – You have pushed your deployed flows to a MUSE controller to run independently on the controller.

Regardless of which mode you are running, you should know which devices you intend to control or automate, and then load their respective drivers to either the simulator or a physical controller. The method for loading drivers to either target is very different. Loading drivers to the simulator occurs in the Automator Controller node edit dialog (see Adding Drivers & Devices). Loading drivers to a MUSE controller is done in the controller’s web interface. To learn more about loading drivers to your MUSE controller, refer to the documentation at **https://www.amx.com/products/mu-3300#downloads**.

Simulation Mode
To use Automator in Simulation Mode, drag a Controller node to the workspace and open its edit dialogue. Select the simulator from the dropdown box and click the Done button. You can now use nodes that can access the endpoints of the simulator device.



Click the Deploy button and you should see the simulator status indicated as connected with a solid green indicator box:

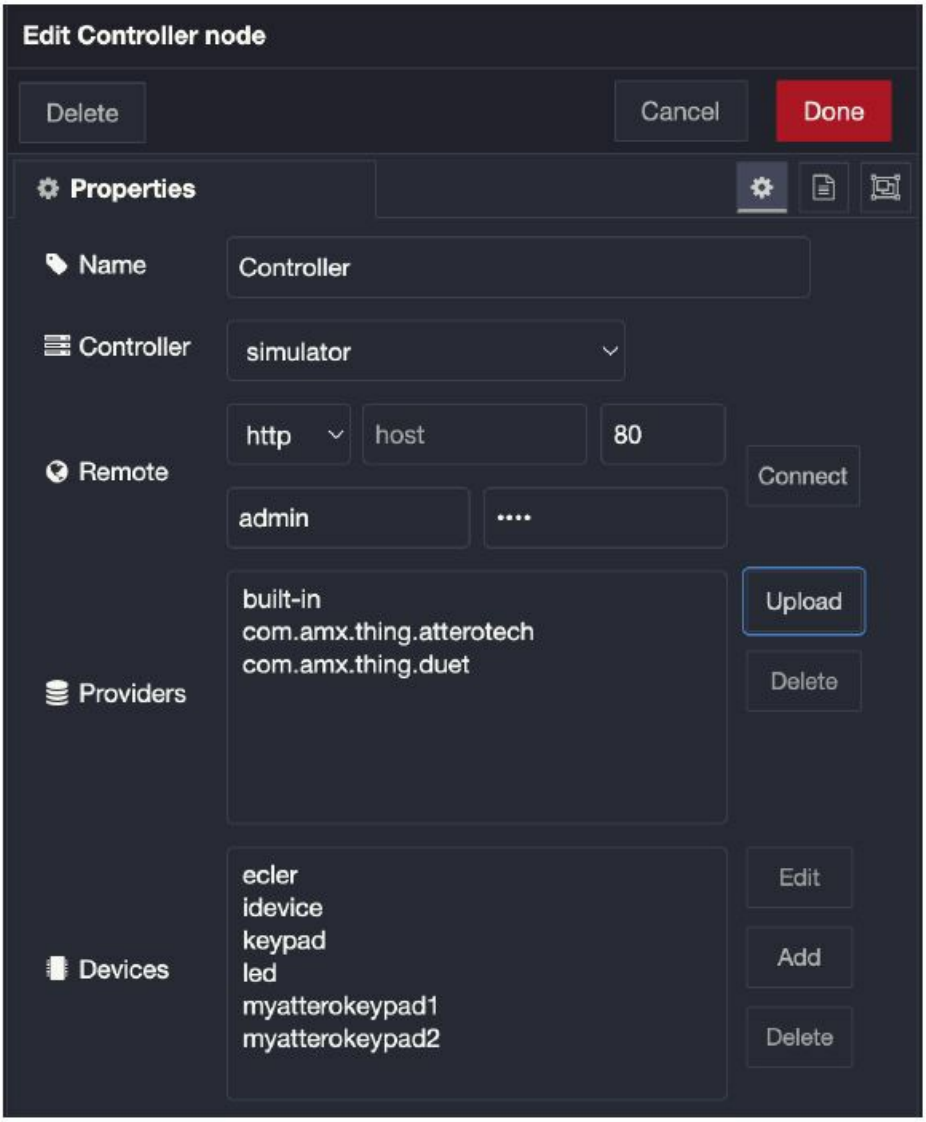


Add Drivers & Devices
There are several simulators already built into the Automator Controller Node:

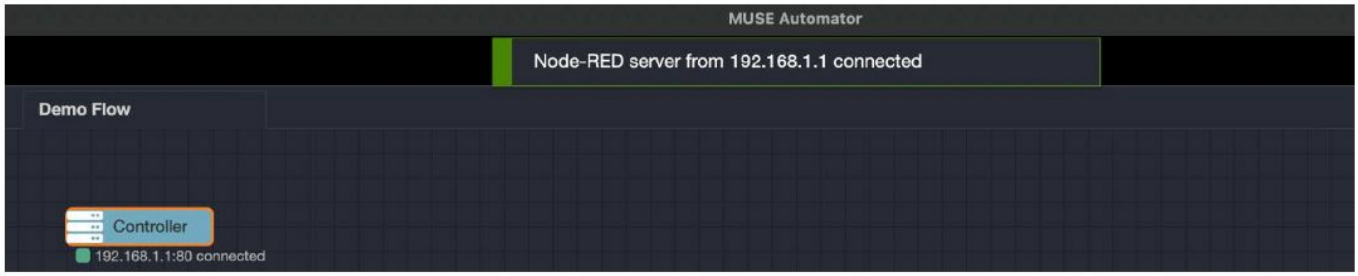
- **CE Series IO Extenders:** CE-IO4, CE-IRS4, CE-REL8, CE-COM2
- **MU Series Controller I/O ports:** MU-1300, MU-2300, MU-3300
- **MU Series Controller front panel LED:** MU-2300, MU-3300
- A generic NetLinx ICSP device

To add devices to your simulator:

1. Click the Upload button next to the list of Providers. This will open your file system dialogue. Select the corresponding driver for the intended device. Note: the following driver types can be uploaded:
    - DUET modules (Retrieve from developer.amx.com)
    - Native MUSE drivers
    - Simulator files
2. Once the driver has been uploaded, you can add the respective device by clicking the Add button next to the Devices list.



Connected Mode
Connected mode requires that you have a physical MUSE controller on your network to which you can connect. Open your Controller node and enter the address of your MUSE controller. The Port is 80 and set by default. Enter the username and password for your controller and then press the Connect button. You should observe a notification that Automator has connected to the Node-RED server on the MUSE Controller. See the screenshot below.

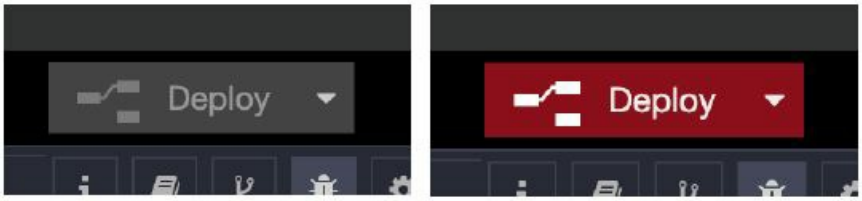


Standalone Mode
This mode of working with Automator simply involves pushing your flows from your local PC to the Node-RED server running on a MUSE controller. This requires Projects to be enabled (which requires the installation of git). Read below to learn more about Projects and Push/Pull.

Deploying
Anytime you make a change to a node you will need to deploy those changes from the editor to the Node-RED server to make the flows run. There are some options for what and how to deploy your flows in the Deploy

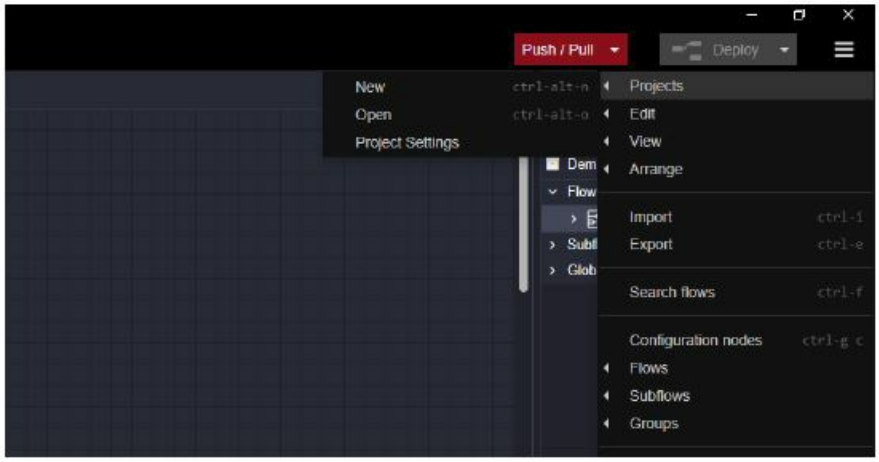
dropdown. To learn more about deploying in Node-RED, please see the Node-RED documentation.

- When deploying in Automator, flows are deployed to the local Node-RED server running on your PC. Then, the deployed flows must be “pushed” from your local PC to the Node-RED server running on the MUSE Controller.
- A good way to determine if you have any undeployed changes to your flows/nodes is in the Deploy button in the upper right corner of the application. If it is greyed out and non-interactive, then you have no undeployed changes in your flows. If it is red and interactive, then you have undeployed changes in your flows. See the screenshots below.

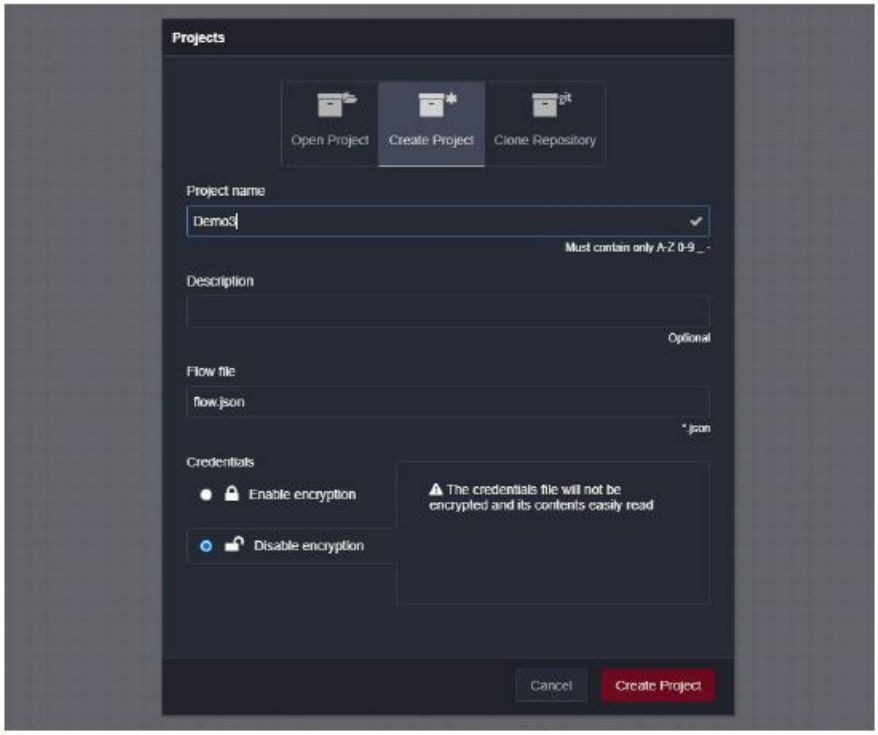


Projects

- To Push/Pull from your local Node-RED server to the server running on your controller, the Projects feature needs to be enabled in Automator. The Projects feature is automatically enabled if git is installed on your PC. To learn how to install Git, see the Install Git section of this guide.
- Assuming, you’ve installed git and restarted MUSE Automator, you can create a new project by clicking the hamburger menu in the upper-right corner of the application.



- Enter a project name (no spaces or special characters allowed), and for now, select the Disable encryption option under Credentials. Press the Create Project button to complete the project creation.

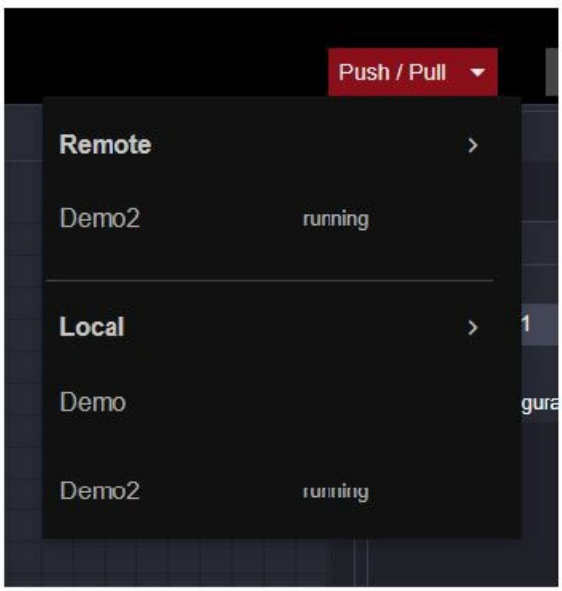


- Now that you have created a project, you can Push/Pull to a physical MUSE controller.

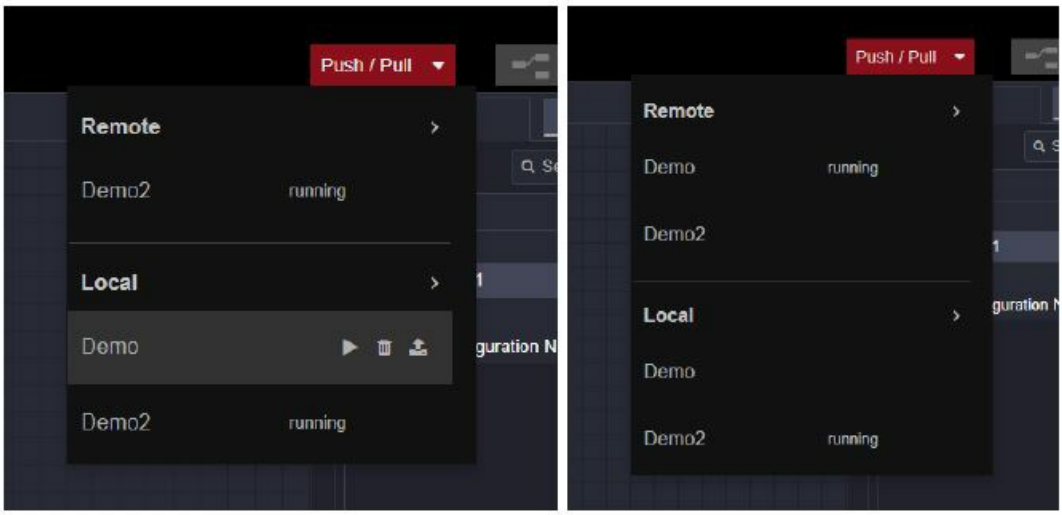
Pushing/Pulling Projects
Pushing and pulling your flows from your PC to the Node-RED server on a MUSE controller is a unique feature in Automator. A couple of steps need to be performed before you can Push/Pull

1. Make sure you are connected to your MUSE controller via the Controller node
2. Make sure you have deployed any changes in your flows (the Deploy button should be greyed out)

To push your deployed flows from your PC, click the Push/Pull down arrow.



Hover over the Local project and click the upload icon to push the project from your local Node-RED server to the Node-RED server on your MUSE controller.



- After pushing your local project to the controller, press the Push/Pull (not the arrow) button and the project should appear to be running on the controller.
- In the same way, a project that's been pushed to a controller can be pulled from the controller to your PC. Hover over the Remote project and click the download icon to pull the project.

Run a Project
Projects that are running on the controller or running on your local Node-RED server will be indicated by a label of running. To run a different project on either the Remote server or the Local server, hover over the project and click on the play icon. Note: only one project can run at a time on Local or Remote.

Delete a Project
To delete a project, hover over the project name under Local or Remote and click the trash can icon. Warning: be cautious about what you are deleting, or you may lose work.

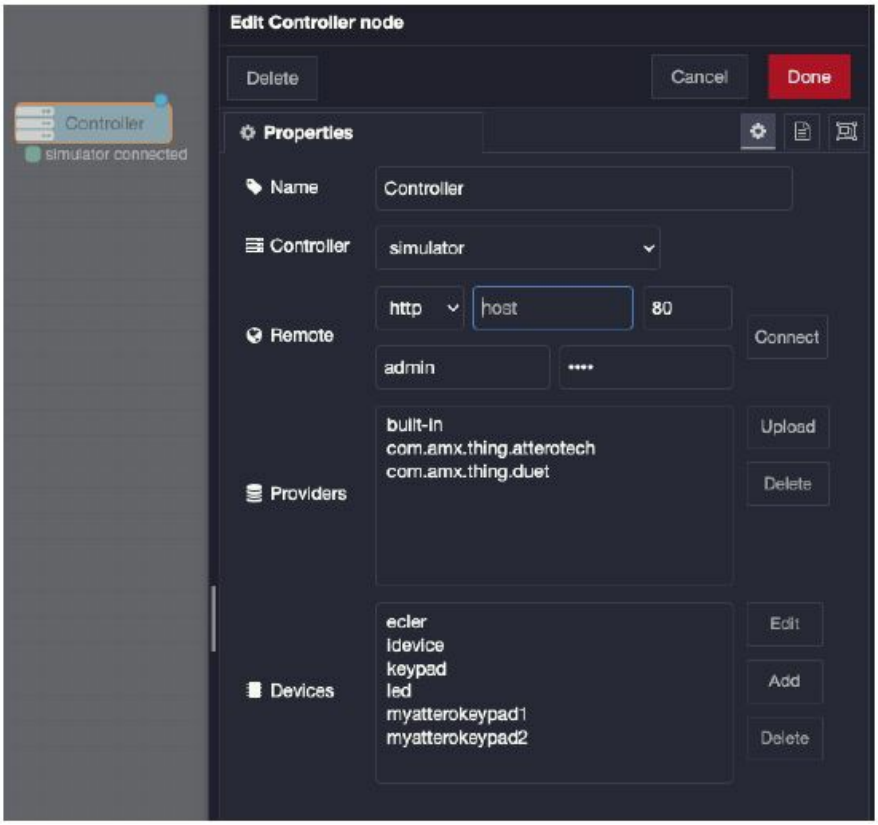
Stopping a Project
There may be scenarios where you want to stop or start an Automator project locally or remotely on the controller. Automator provides the ability to start or stop any project as needed. To stop a project, click to expand the Push/Pull tray. Hover over any running project in either the Remote or Local list and then click on the stop icon.

MUSE Automator Node Palete

Automator ships with our custom node palette also titled MUSE Automator. There are currently seven nodes provided which enable functionality and interaction with the simulator and MUSE controllers.

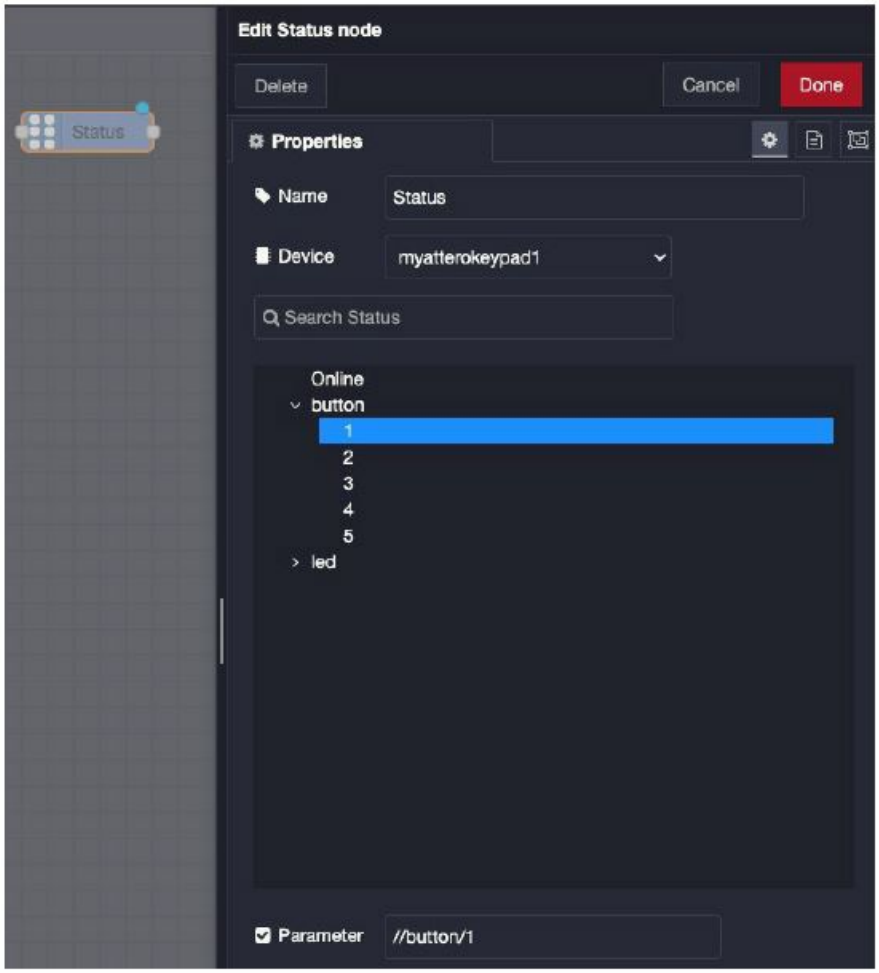
Controller
The Controller node is what provides your flows simulator or MUSE controller context and programmatic access to the devices that have been added to the controller. It has the following fields that can be configured:

- **Name** – universal name property for all nodes.
- **Controller** – the controller or simulator to which you want to connect. Select the simulator to connect to the simulated MUSE controller. To connect to a physical controller, make sure it is connected to your network and enter its IP address in the host field. Press the Connect button to connect to the controller.
- **Providers** – the list of drivers that have been uploaded to your simulator or controller. Press the Upload button to add a driver. Select a driver and press Delete to delete a driver from the list.
- **Devices** – the list of devices that have been added to the simulator or controller.
    - **Edit** – Select a device from the list and click Edit to edit its properties
    - **Add** – Click to add a new device (based on the drivers in the Providers list).
        - Instance – When adding a new device a unique instance name is required.
        - Name – Optional. Name of the device
        - Description – Optional. Description of the device.
        - Driver – Select the appropriate driver (based on the drivers in the Providers list).
    - Delete – Select a device from the list and click Delete to delete the device.



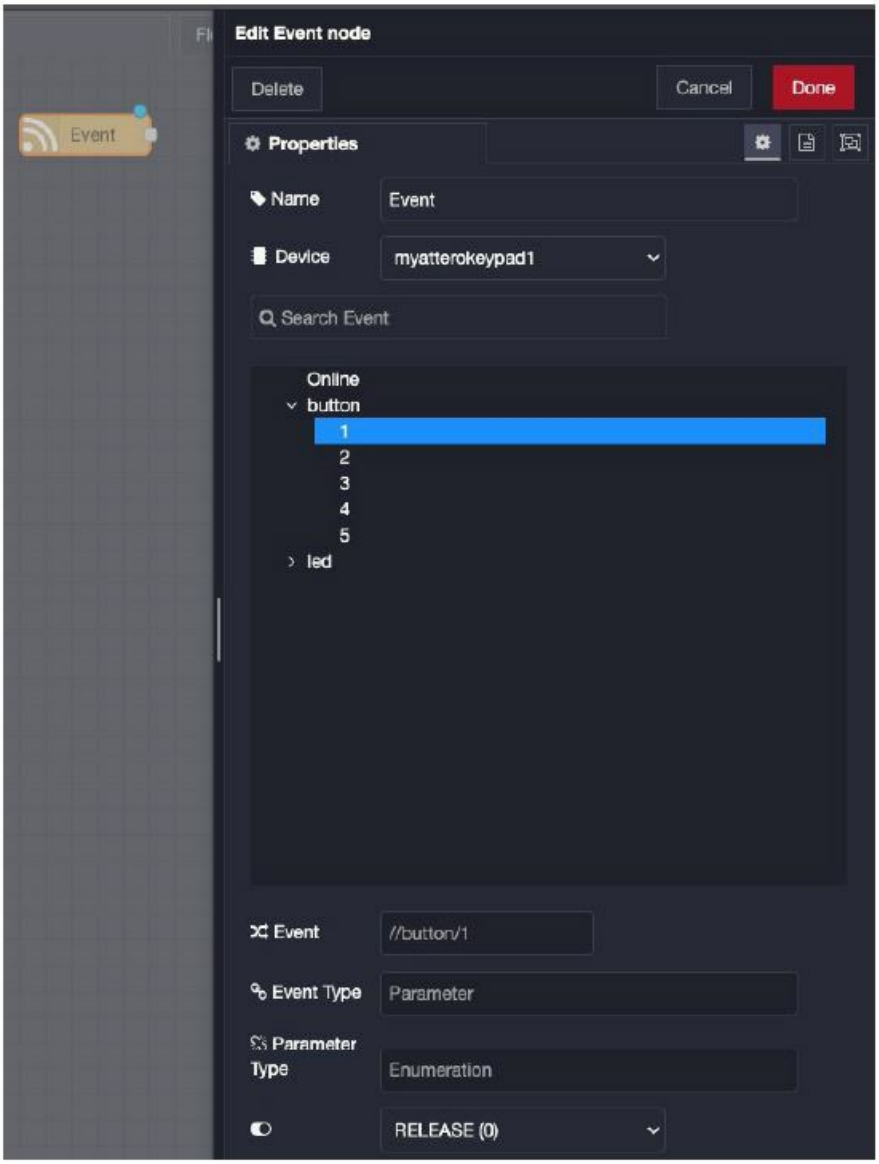
Status
Use the Status node to get the status or state of a specific device parameter.

- **Name** – universal name property for all nodes.
- **Device** – select the device (based on the Devices list in the Controller node). This will generate a parameters tree in the list below. Select the parameter for status retrieval.
- **Parameter** – Read-only field which shows the parameter path of the selected parameter.



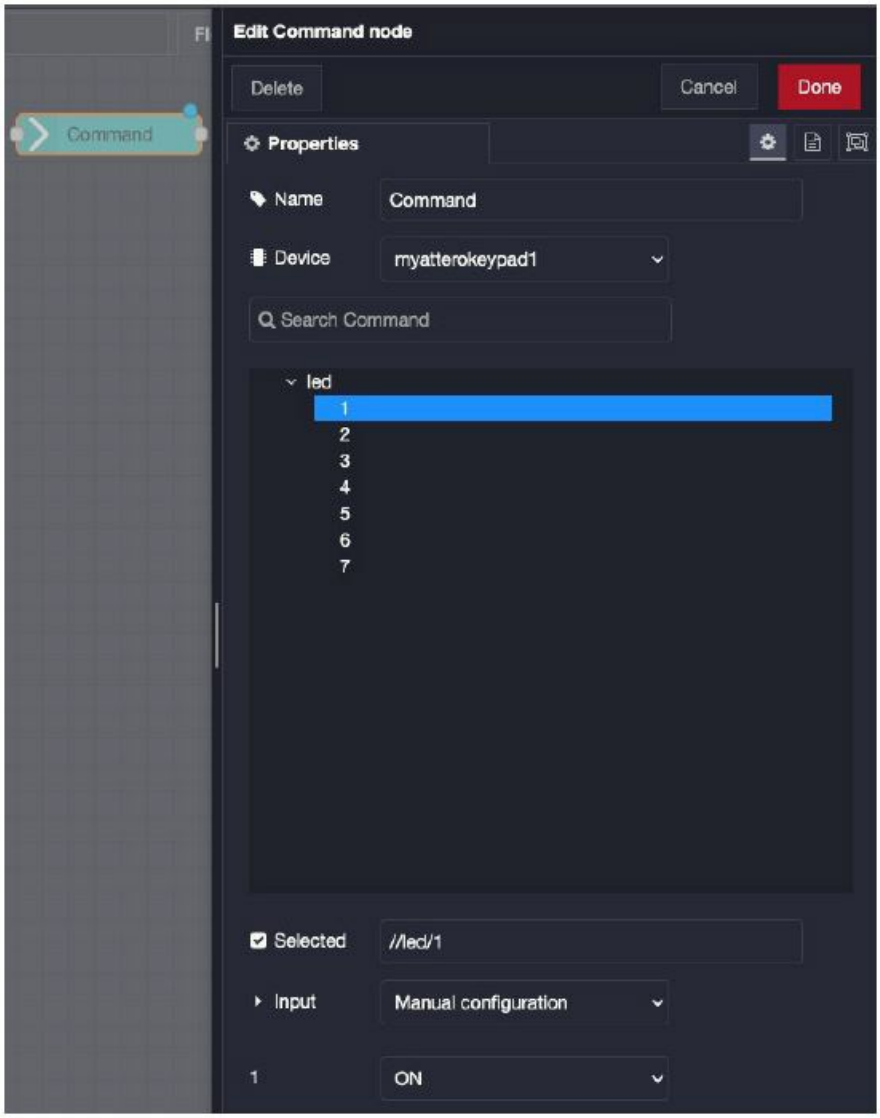
Event
Use the Event node to listen for device events such as changes in state to trigger an action (such as a command)

- **Name** – universal name property for all nodes.
- **Device** – select the device (based on the Devices list in the Controller node). This will generate a parameters tree in the list below. Select a parameter from the list.
- **Event** – Read-only field which shows the parameter path
- **Event Type** – Read-only type of the selected parameter event.
- **Parameter Type** – Read-only data type of the selected parameter.
- **Event (unlabeled)** – Dropdown box with the list of events that can be listened for



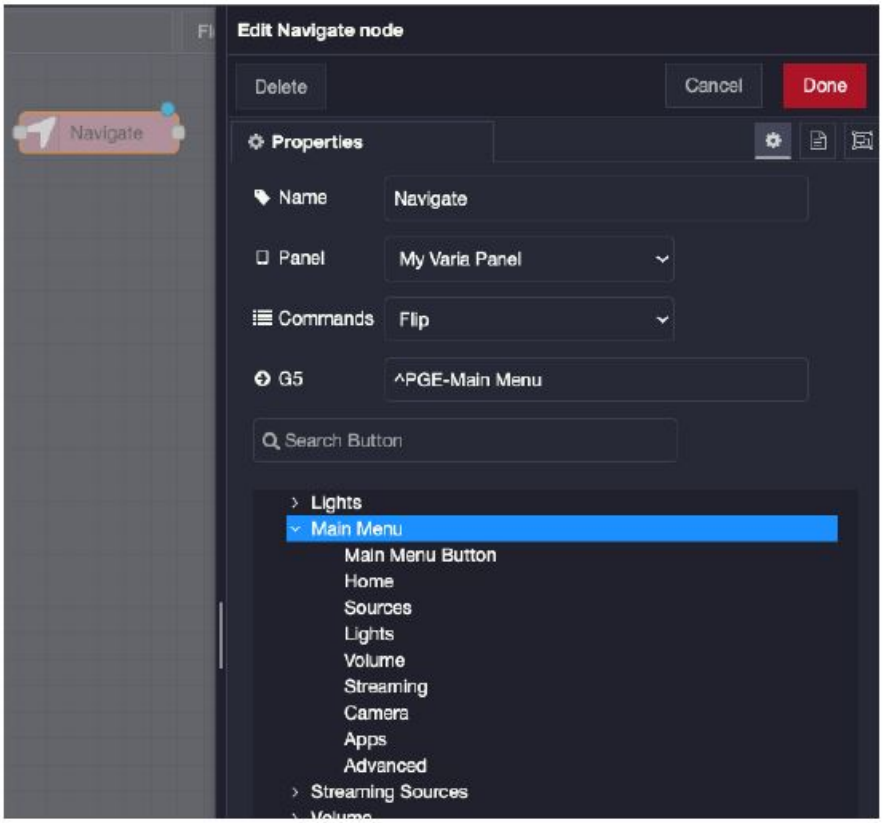
Command
Use the Command node to send a command to a device.

- **Name** – universal name property for all nodes.
- **Device** – select the device (based on the Devices list in the Controller node). This will generate a parameters tree in the list below. Only parameters that can be set will be shown.
- **Selected** – Read-only field which shows the parameter path.
- **Input** – Choose Manual configuration to see the available commands in the dropdown box that can be executed.



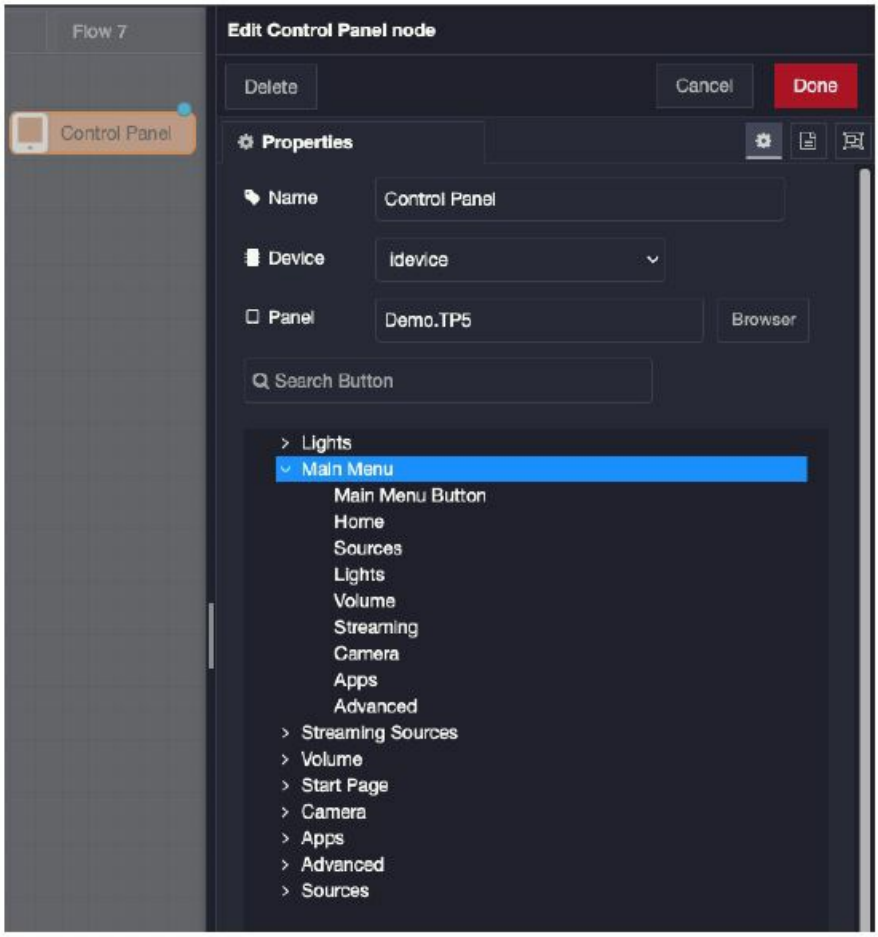
Navigate
Use the Navigate node to perform a page flip to a TP5 touch panel

- **Name** – universal name property for all nodes.
- **Panel** – Select the touch panel (added via the Control Panel node)
- **Commands** – Choose the Flip command.
- **G5** – An editable string of the command to send. Select the page from the generated list of panel pages to populate this field.



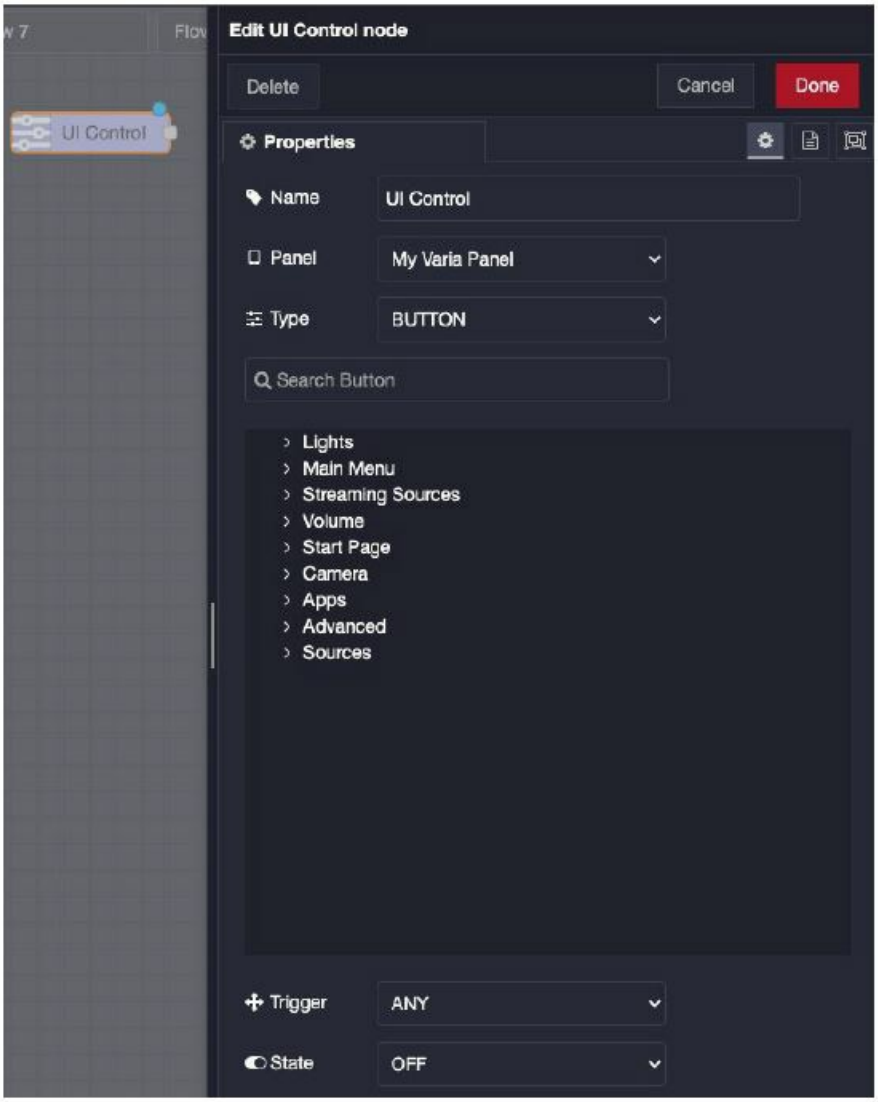
Control Panel
Use the Control Panel node to add touch panel context to the flow.

- **Name** – universal name property for all nodes.
- **Device** – Select the touch panel device
- **Panel** – Click Browse to upload a .TP5 file. This will generate a read-only tree of the touch panel file pages and buttons. Reference this list as verification of the file.



UI Control
Use the UI Control node to program buttons or other controls from the touch panel file.

- **Name** – universal name property for all nodes.
- **Device** – Select the touch panel device
- **Type** – Select the UI control type. Select the UI control from the page/button tree below
- **Trigger** – Choose the trigger for the UI control (for example, PUSH or RELEASE)
- **State** – Set the state of the UI control when it is triggered (for example, ON or OFF)



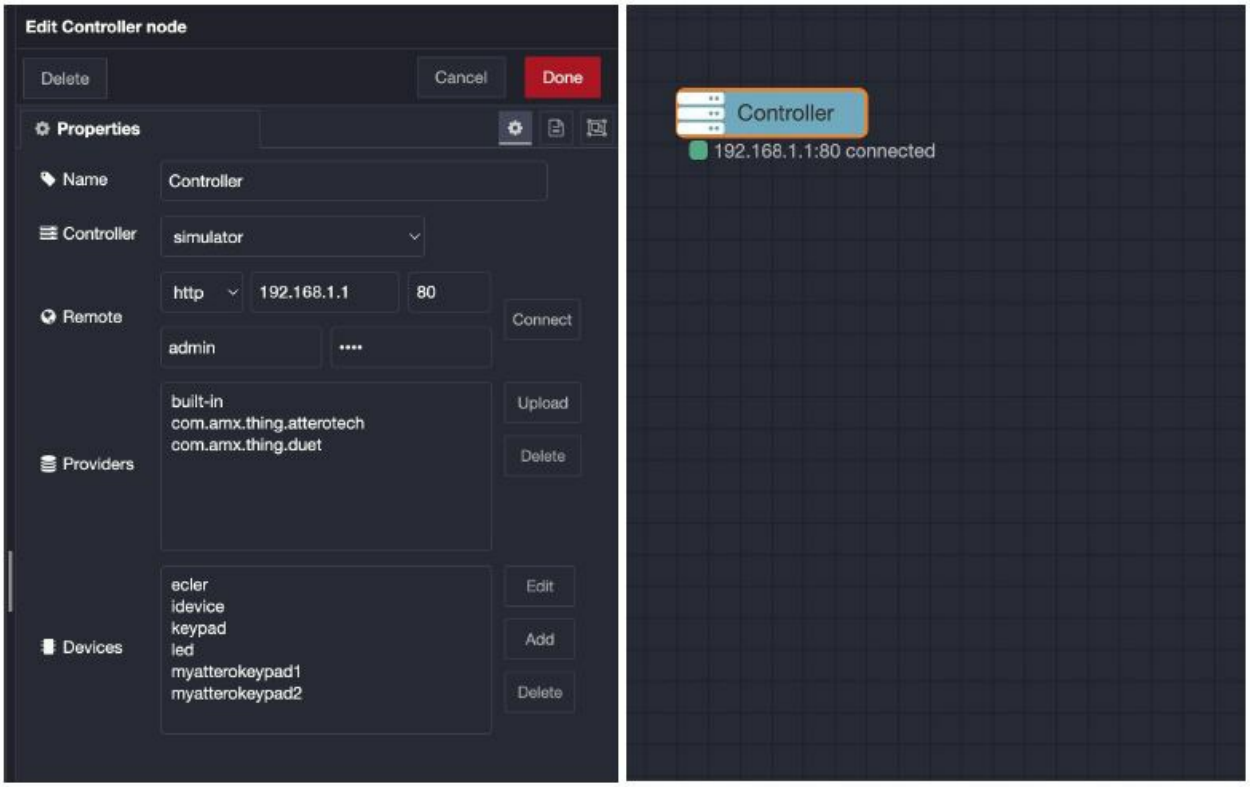
Example Workflow

In this example workflow, we will:

- Connect to a MUSE controller
- Build out a flow that allows us to toggle the state of a relay on a MU-2300
- Deploy the flow to our local Node-RED server

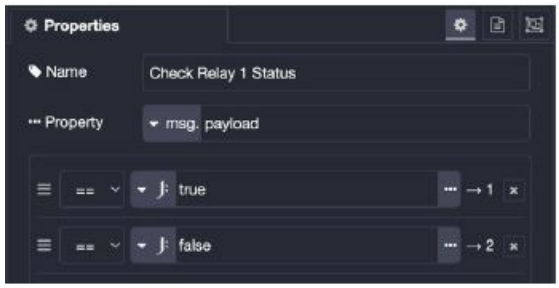
Connect to MUSE Controller

1. Set up your MUSE controller. Refer to the documentation at
2. Drag a Controller node from the MUSE Automator node palette to the canvas and double-click it to open its edit dialogue.
3. Input the IP address of your MUSE controller press the Connect button and then the Done button. Then press the Deploy button. Your dialogue and Controller node should look like this:



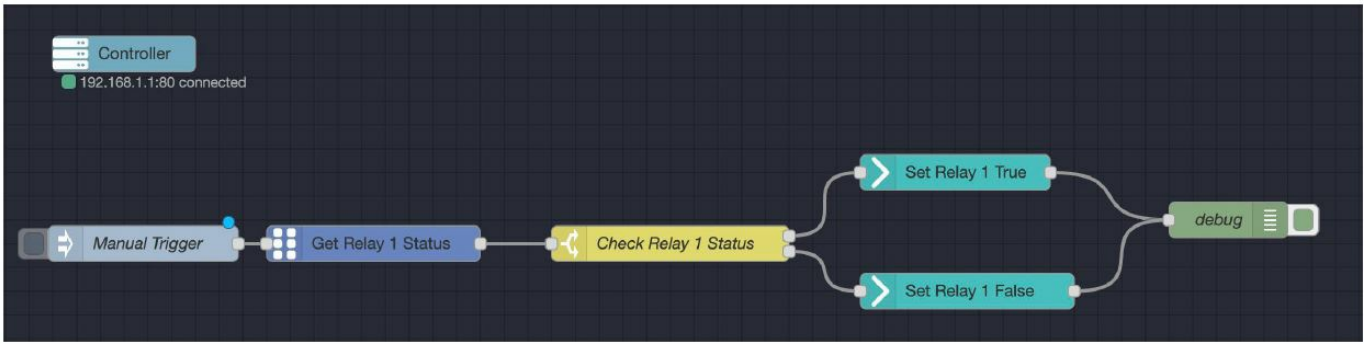
Build & Deploy a Flow

1. Next, let's start building a flow by dragging several nodes to the canvas. Drag the following nodes and place in left to right order:
    - Inject
    - Status
    - Switch (under the function palette)
    - Command (drag two)
    - Debug
2. Double-click the Inject node change its name to "Manual Trigger" and press Done
3. Double-click the Status node and modify the following properties:
    - Change its name to "Get Relay 1 Status"
    - From the Device dropdown, select idevice
    - Expand the relay leaf node in the tree select 1 and then state
    - Press Done
4. Double-click the Switch node and modify the following properties:
    - Change the name to "Check Relay 1 Status"
    - Click the +add button at the bottom of the dialogue. You should now have two rules in the list. One points to 1 port and two points to 2 port
    - Type true into the first field and set the type to expression
    - Type false into the second field and set the type to expression
    - Your switch node properties should look like so:



5. Double-click the first Command node and modify the following properties:
    - Change the name to “Set Relay 1 False”
    - From the Device dropdown, select idevice
    - Expand the relay leaf node in the tree select 1 and then state then press Done
6. Double-click the second Command node and modify the following properties:
    - Change the name to “Set Relay 1 True”
    - From the Device dropdown, select iDevice
    - Expand the relay leaf node in the tree select 1 and then state then press Done
7. Wire all the nodes together like so:
    - Inject the node to the Status node
    - Status node to the Switch node
    - Switch node port 1 to the Command node named “Set Relay 1 False”
    - Switch node port 2 to the Command node named “Set Relay 1 True”
    - Wire both Command nodes to the debug node

Once you’ve completed configuring and wiring your node, your flow canvas should look something like so:



You are now ready to deploy your flow. In the upper right-hand corner, of the application click the Deploy button to deploy your flow to the local Node-RED server. If you are connected to a MUSE controller, you should now be able to continually press the button on the inject node and see the relay state changing from true to false in the debug pane (and see/hear the relay switching on the controller itself!).

Additional Resources

- **AMX YouTube Channel** – https://www.youtube.com/@AMXbyHARMAN
- **AMX Developer Resources** – https://developer.amx.com/#!/main
- **Node-RED YouTube Channel** – https://www.youtube.com/@Node-RED
- **Node-RED Documentation** – https://nodered.org/docs/

Documents / Resources

	HARMAN v1.0 AMX Muse Automator [pdf] Instruction Manual v1.0 AMX Muse Automator, AMX Muse Automator, Muse Automator, Automator

References

- User Manual