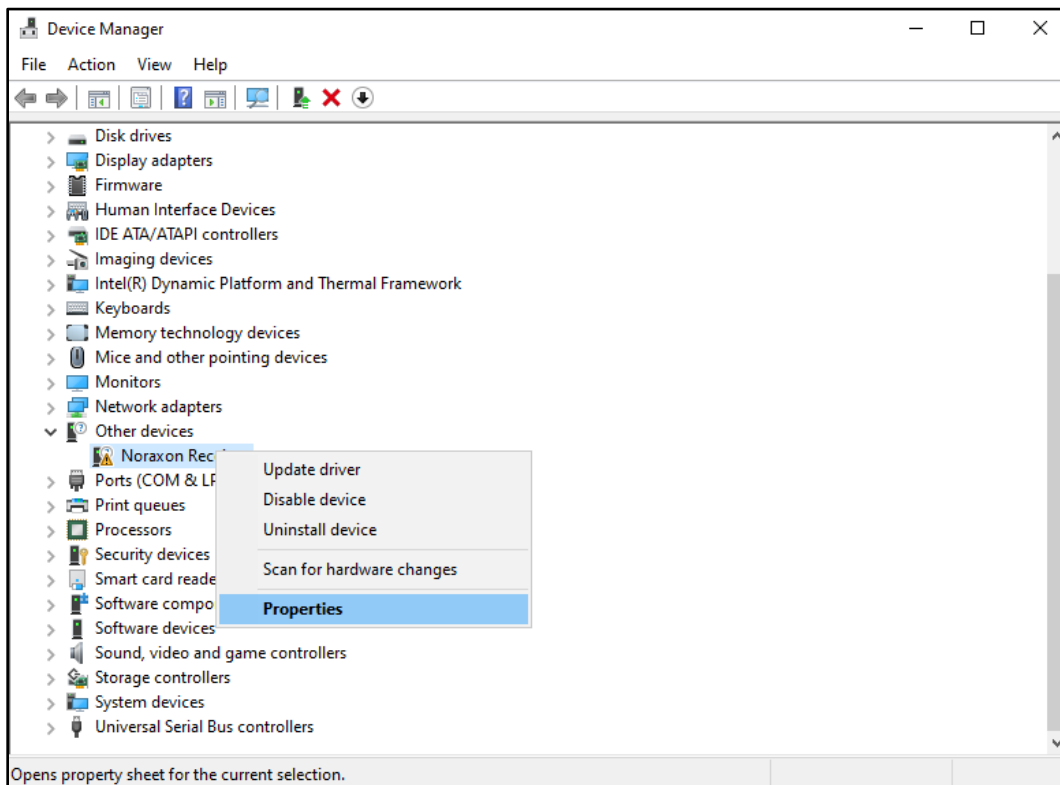


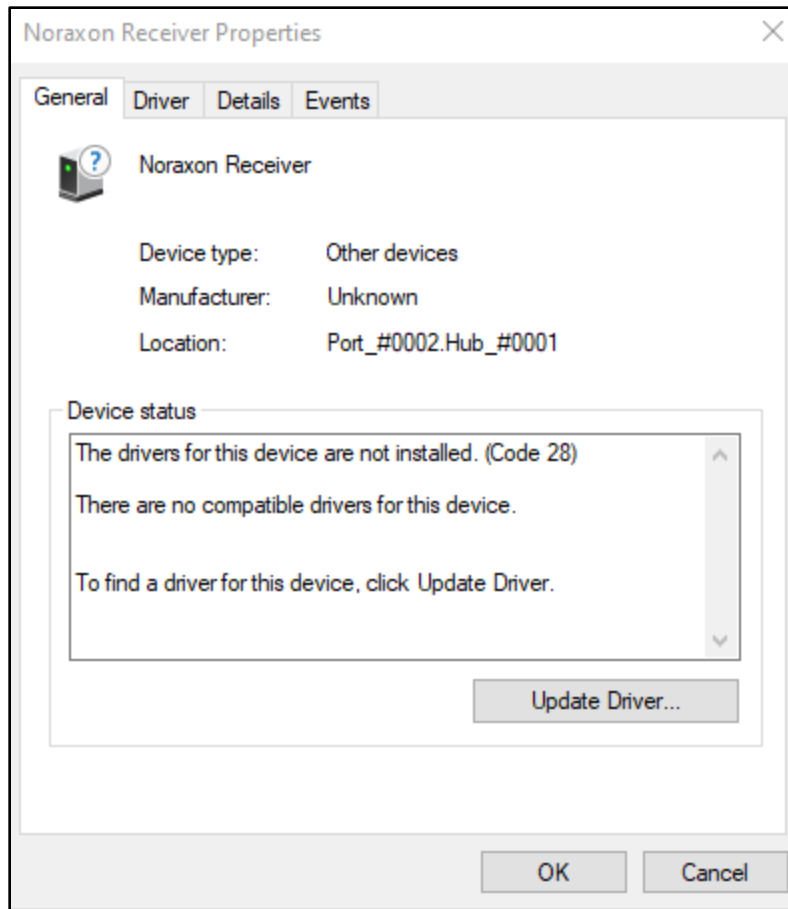
The MotionMonitor xGen Hardware Guide: USB based Noraxon EMG Device Configuration

The following document outlines the steps required to configure and collect data from a Noraxon EMG unit that is connected to The MotionMonitor computer via a USB connection. The USB device must first be installed on the computer before it is configured within The MotionMonitor xGen. Before beginning, ensure that the Noraxon drivers, supplied by your Client Support Engineer, are saved on the computer. **Note:** The driver and settings for your Noraxon USB device may vary from the Noraxon Ultium system what was used in this guide. However, the procedures that follow are generally the same across all Noraxon USB devices. The MotionMonitor xGen version 3.71.1.0 incorporated Noraxon SDK version 1.7.91.0 and added support for Ultium EMG accelerometer and IMU data as well as various SmartLeads including the BioMonitor SmartLead. All IMU data streamed through the SDK is raw data only, there is no fusion algorithm or calibration process applied to this data.

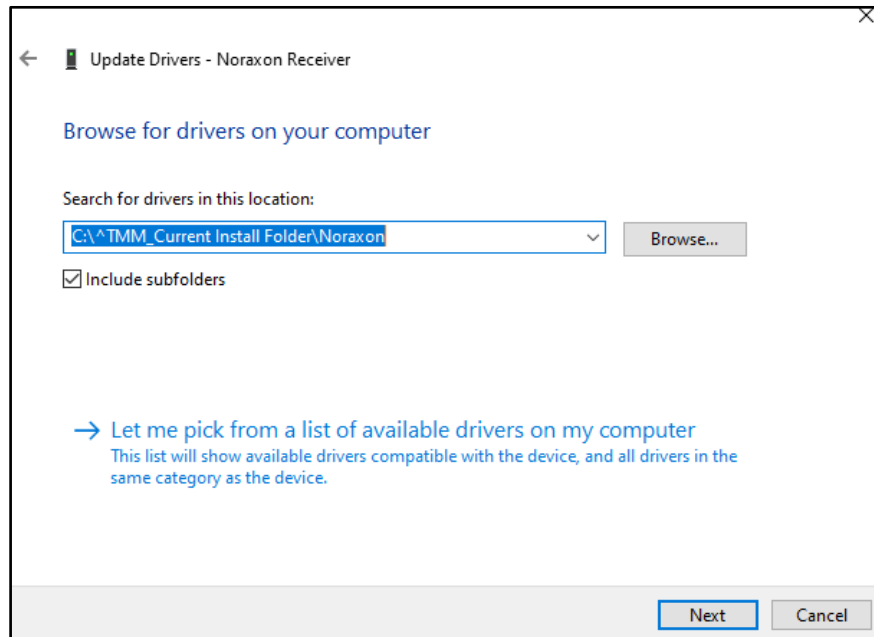
1. Power on the EMG unit and connect it to the computer. Launch the Windows Device Manager. Go to Start| Control Panel| Device Manager. Right click on the Noraxon Receiver under Other Devices and select properties.



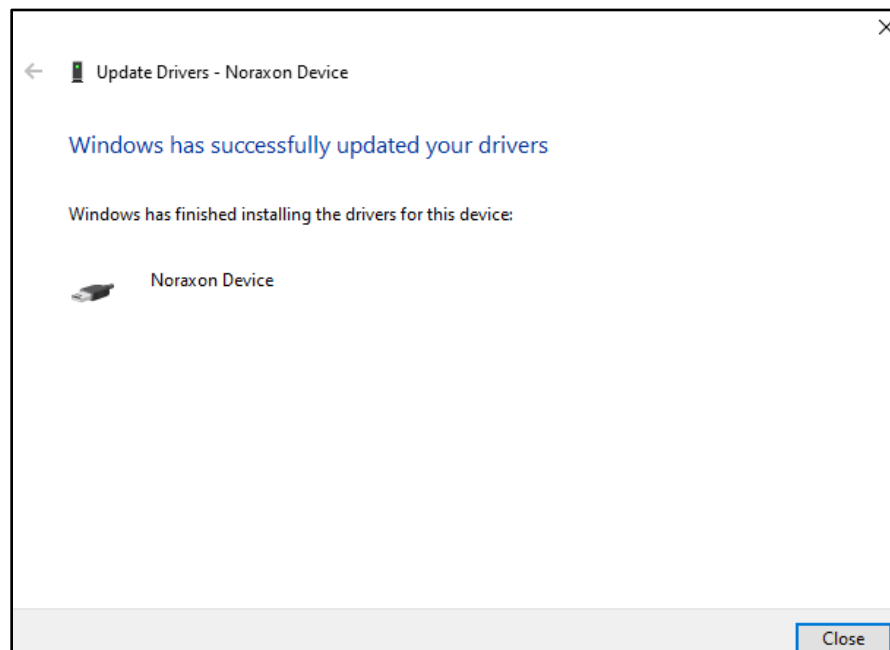
2. Go to the General tab and select Update Driver. Select “Browse my computer for driver software.”



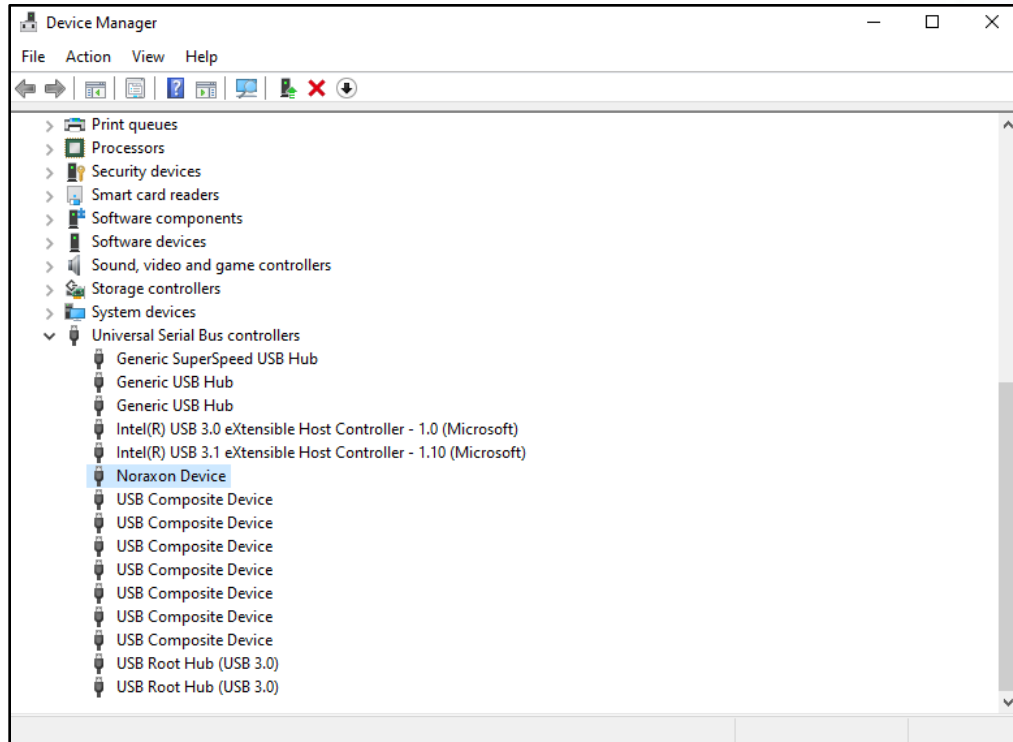
3. In the next window, use the Browse button to browse to the folder where the drivers are stored. Click Next. Depending on your computer security settings, you may be prompted by Windows Security to give permission to install the Noraxon driver. If prompted, click "Install".



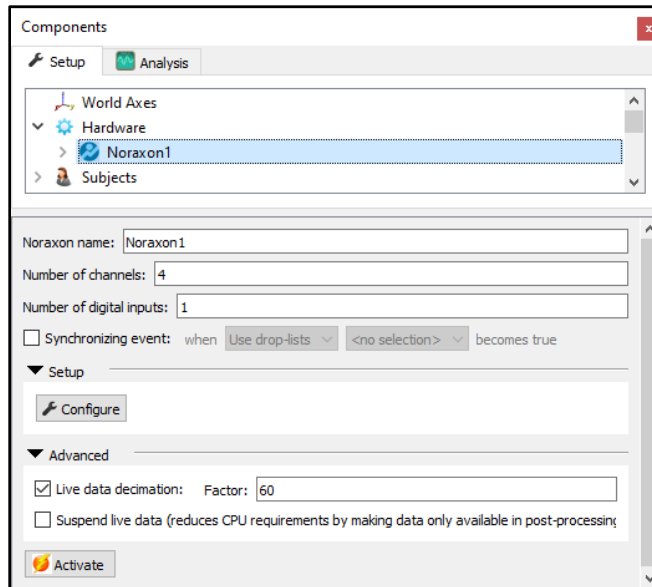
4. Once the device is installed you will receive a notice that Windows has successfully installed the driver software.



5. Return to the Device Manager and confirm that the “Noraxon Device” is listed under the Universal Serial Bus controllers. If the device is not recognized and listed below, contact a Client Support Engineer for assistance.



- Start The MotionMonitor xGen and go to the Hardware node in the Components Setup tab. Add a Noraxon device from the Add button in the parameters panel at the bottom of the Components window or by right clicking the Hardware node and adding the device through the cascading drop list.



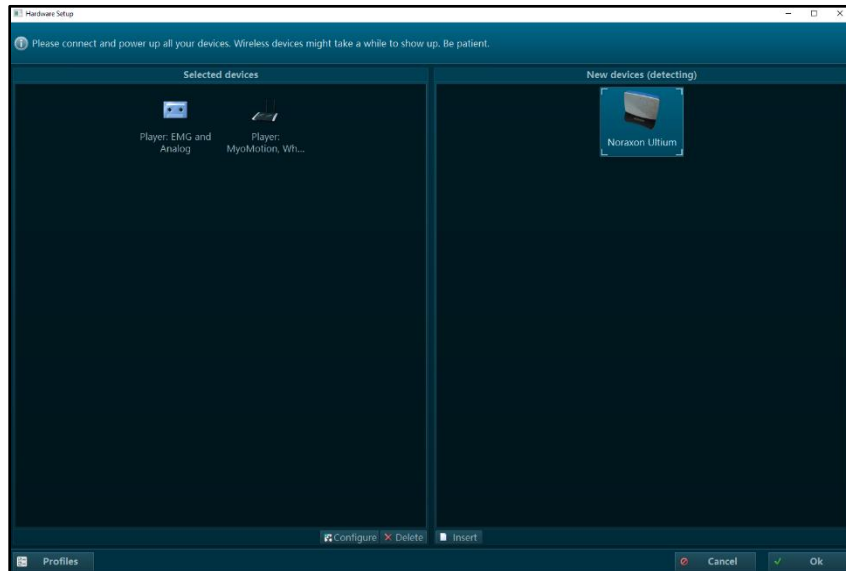
The number of channels and number of digital inputs that will be collected should be specified here, although the number of channels will be updated according to what has been configured in the Noraxon Hardware Setup tabs accessed through the “Configure” button. Digital devices include items like the Sync signal connected to the Ultium Dash Receiver. In the example shown above, 4 EMG channels will be activated, and 1 digital input is configured.

The “Synchronizing event” Boolean condition can be specified for performing an active alignment of the Noraxon data stream with synchronous events from other hardware data streams. The synchronizing event used here must be defined from Noraxon data such as the Sync signal connected to the Ultium Dash Receiver.

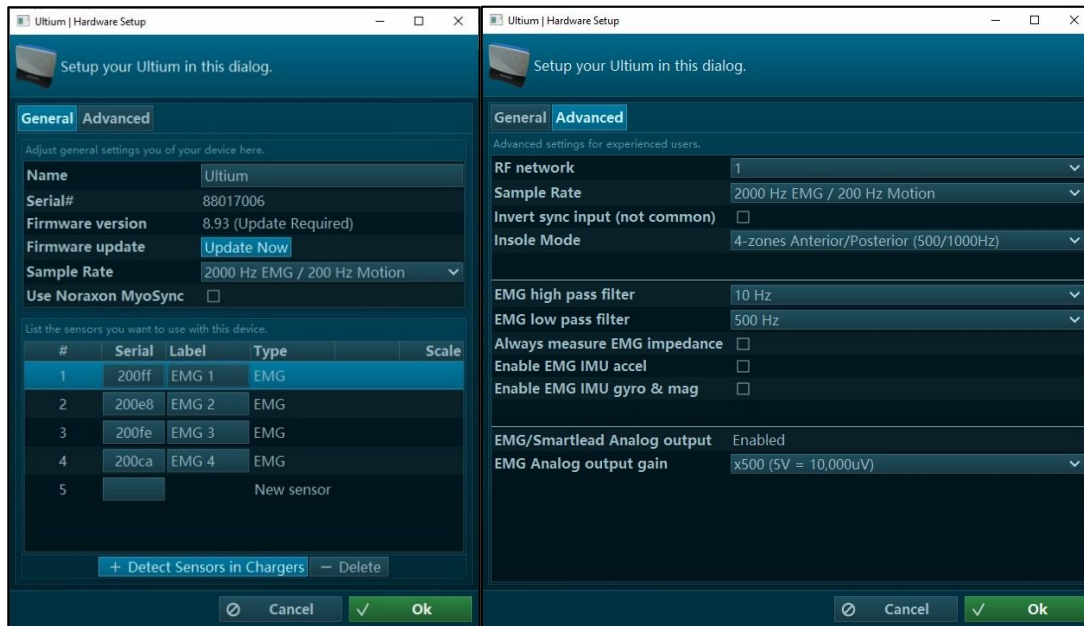
Under the Advanced node, a decimation factor can be set for the EMG data. This is a means for limiting the computer resources being used while running in the Live Window by displaying only a fraction of captured data points in real-time. This does not affect the measurement rate as data will still be captured at its full resolution. If visualizing the EMG data in real-time is not desired, the suspend live data checkbox will suppress any data from the Noraxon device from being displayed in graphs or used in any equations. However, the data would immediately be available and presented in a recorded activity. **Note:** The Noraxon data stream will not be able to be displayed in a graph without enabling a Live data decimation factor. Data can be displayed at the full measurement rate in post processing.

Please follow the steps below for configuring the Noraxon device.

7. Click the “Configure” button under the Setup dropdown in the Noraxon parameters panel to access the Noraxon settings. The Noraxon Ultium should be displayed under “New Devices (detecting)” if this is the first time connecting to the device. Select the device and click “Insert” to add the device to your “Selected devices” list. Click the “Configure” button at the bottom of this Hardware Setup window to access the Noraxon Ultium settings. Make certain to also remove any other devices that may be listed under the Selected devices, such as previously used Noraxon devices or any of the Players, as these will interfere with the collection of data from your Noraxon device.



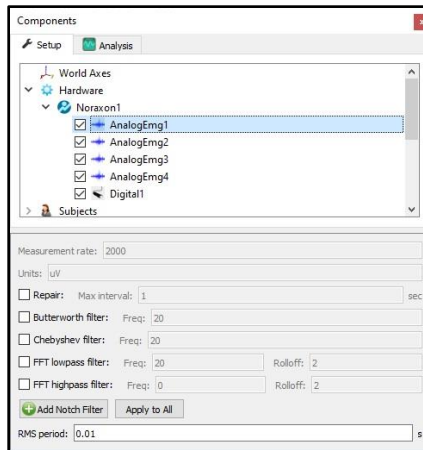
8. Select the measurement rate for the Noraxon Ultium device through the Sample Rate drop list. Specify the RF network, filters, and any other settings to the desired selection. Ensure that all sensors which will be used for data collection appear under the “General” tab. To establish connection to the sensors, select “Detect Sensors in Chargers” or manually input the sensors using their serial number (found on the back of the sensor). During this process the sensors should still be connected to the docking station. Select “OK” once this process has been completed. The number of sensors listed in the Sensors tab displayed below should match the number of channels specified in the Noraxon Parameters panel in Step 6.



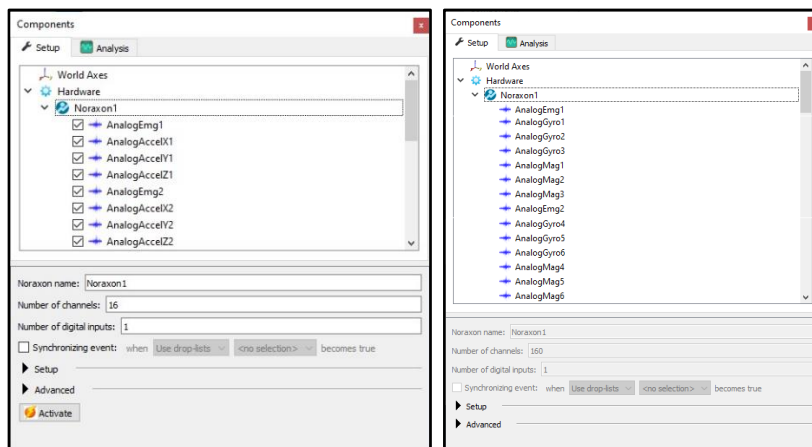
Auxiliary data can be enabled by placing a check in the box for “Enable EMG IMU accel” and “Enable EMG IMU gyro & mag” for sensors that support these capabilities. These settings can be saved as a profile to quickly switch between configurations with different general settings or number of sensors. Note, all IMU data streamed through the SDK is raw data only, there is no fusion algorithm or calibration process applied to this data. Also, if the “Enable EMG IMU gyro & mag” auxiliary data are enabled, EMG/Smartlead Analog output will automatically be disabled. The two selections cannot operate concurrently.

Some models of Noraxon sensors can also be shut down through a “Shutdown Sensors” button at the bottom of the tab in the Hardware Setup dialog. Other sensors can be powered off individually, sensor by sensor, or by pressing the power button on the Ultium DASH Receiver to power on/off sensors inserted into connected chargers.

Click the “Activate” button in the Noraxon parameters panel or the “Activate/Deactivate Hardware” icon in the Setup toolbar to activate the Noraxon hardware. Smoothing parameters can be enabled or disabled at any time through the nodes for Channels listed under the Noraxon Hardware device in the Setup Components tab, as shown below. If changes are made in the Noraxon settings in steps 7 & 8, smoothing parameters may be reset. Following activation, the names of the channels received from Noraxon will be displayed along with their measurement rate when the channel is selected. **Note:** Versions prior to The MotionMonitor xGen version 3.71.1.0 scaled and displayed all Noraxon data as volts. Data are now displayed in the units received by Noraxon, which are also displayed in the parameters panel for each channel. **Note:** Some Noraxon devices require that the sensors be removed from the docking station prior to activation.



When the auxiliary data are enabled through the Hardware Setup window in step 8, the additional channels will be displayed as seen below. The example below on the left shows the available channels when “Enable EMG IMU accel” is enabled. Following the EMG signal for each sensor, the acceleration data will be listed in X, Y, Z order. Similarly, on the right below, the Gyro and Mag channels would follow each EMG signal for each sensor, listed in X, Y, Z order, in this instance with a cumulative count.



Within the Live workspace, individual channels can be disabled by unchecking them in the Noraxon parameters panel under the Noraxon device. When disabled, The MotionMonitor xGen will not receive streamed data for the specified channel. If using the Noraxon analog output module, the first 16 channels listed in the Noraxon parameters panel are what will be streamed out. The order in which data is streamed is based on the order they are listed here. Disabling a channel here will not prevent its data from still streaming out through the Noraxon analog output module.

- The following image shows the Raw Voltage being defined for the first EMG channel. RMS Voltage, Raw Voltage, Voltage Mean Frequency and Mean Frequency can also be selected from the drop-list as well. RMS voltage calculates the RMS for the defined variable using the smoothing settings enabled for that Channel under the Setup Components Hardware node. Raw Voltage will always return the raw voltage, regardless of any enabled smoothing parameters. Voltage will report the voltage including any smoothing, if enabled. Also displayed are the variable definitions for the X acceleration channel of the first sensor and the Digital channel for the Sync signal connected to the Ultium Dash Receiver described in step 6.

