

# AStuff Lexus



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## Overview

The **AStuff Lexus RX450h** automated research development vehicle allows for full drive by-wire capability. Installed with the latest firmware and the **AStuff PACMod 3.0** drive by-wire system, the Lexus RX450h is fully **customizable**, includes extra large trunk space and has multiple cooling options, making it perfect for your automated project.

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## Key Features

Major features on the AStuff Lexus RX450h are:

- CAN interface
  - Mode status indication
  - Visually-audible advanced fault detection interface
  - Joystick control interface
  - Speed and steering controller available
  - ROS node available
  - Full DBC file available
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## Feedback and Control

AStuff's Lexus RX450h installed with the latest firmware has the following capabilities:

### *Feedback Capability*

- Throttle percentage (0% - 100%)
- Brake percentage (0% - 100%)
- Vehicle speed
- Steering angle
- Individual wheel speeds
- Turn signal status
- Brake light status
- Vehicle stationary status
- Hazard light status
- Vehicle date/time
- Parking brake status
- Stock vehicle cross traffic alert status
- Blind spot information status
- Stock Vehicle IMU (yaw rate only)
- Stock Vehicle GPS (lat/long)

### *Control Capability*

- Accelerator
  - Brake
  - Steering
  - Shifting
  - Horn
  - Turn signals
  - Hazard lights
  - Headlights (off/on & high beam/low beam)
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## About AutonomouStuff

AutonomouStuff is the leader in supplying components, engineering services and software that enable autonomy. We take advantage of today's most innovative technologies to help ensure your success. Contact us today to take your project to the next level.

**Tel: 309 291-0966**

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## Safety first

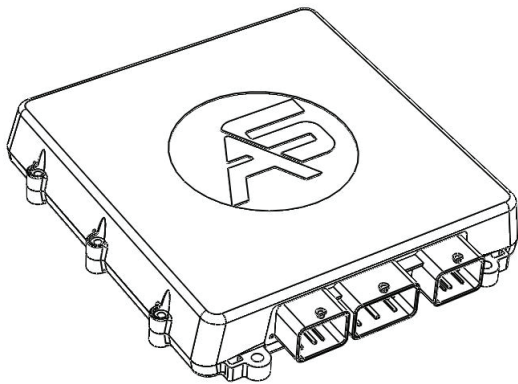
Safety is a top priority for AStuff. Our Lexus RX450h automated research and development platform has been designed to allow operators to easily regain control of the vehicle at any time, as well as alert operators of numerous faults.

While in autonomous mode, operators can at any time regain manual control of the vehicle by:

- pressing the emergency stop button.
- actuating the brake pedal.
- actuating the accelerator.
- turning the steering wheel.

This PACMod 3.0 system has been designed to detect certain faults in the vehicle control modules. The current fault detections on the latest firmware release for the AStuff Lexus RX450h are below:

- Braking
- Acceleration
- Shifting



*The AStuff PACMod*

### What is the PACMod 3.0 system?

The AStuff Platform Actuation and Control Module (PACMod) 3.0 system allows for drive by-wire control and can be installed into virtually any vehicle. At a minimum PACMod will always provide control of acceleration, braking, steering, shifting, and turn signals. It is highly customizable to fit into any research and development platform.

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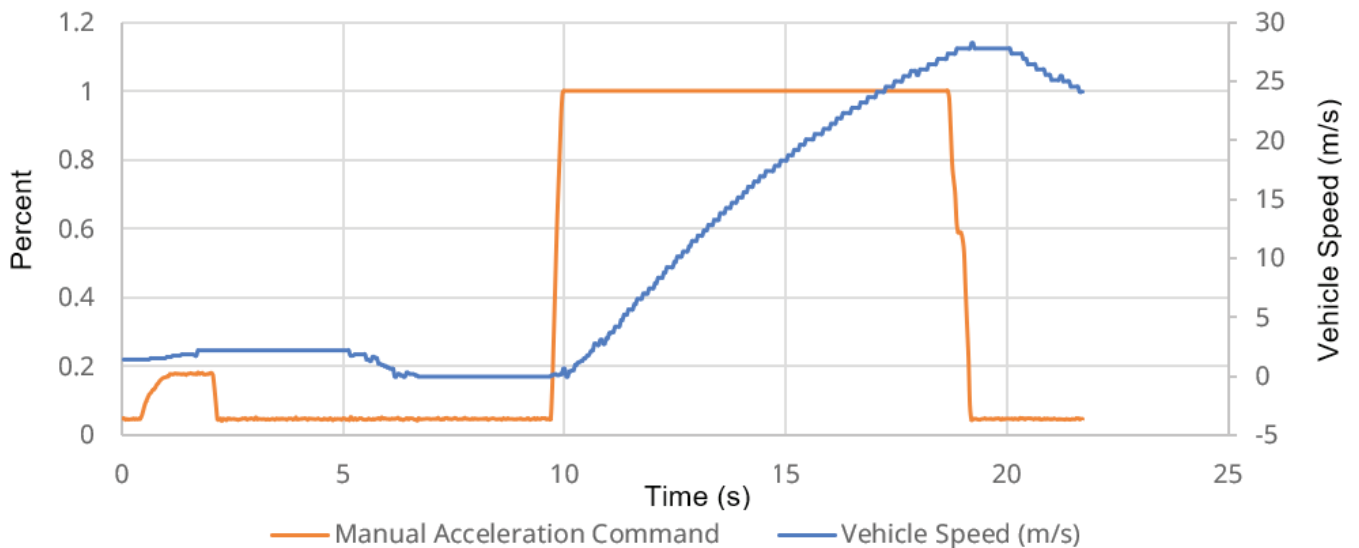
## Data tables

The following graphs are from data collected using a single 2018 Lexus RX450h with the AStuff PACMod 3.0 system installed.

### Acceleration

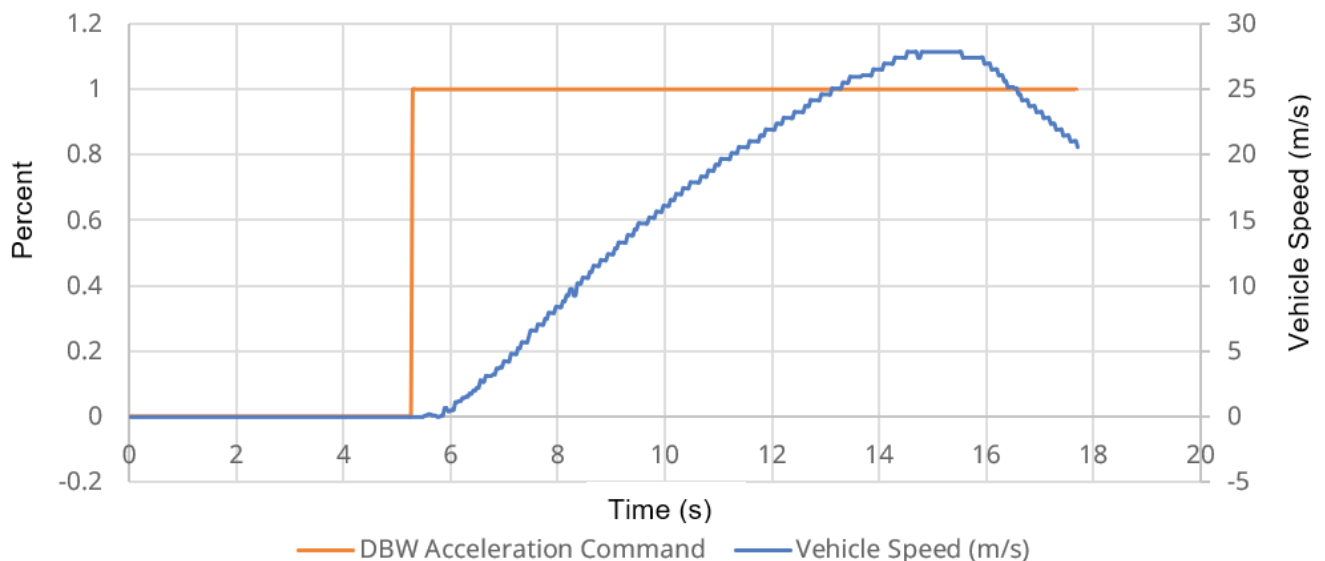
*Manual acceleration and vehicle speed against time on a Lexus RX450h modified by AutonomouStuff.*

#### Manual Acceleration + Vehicle Speed vs Time



*Acceleration and vehicle speed against time with drive by-wire on a Lexus RX450h modified by AutonomouStuff.*

#### DBW Acceleration + Vehicle Speed vs Time



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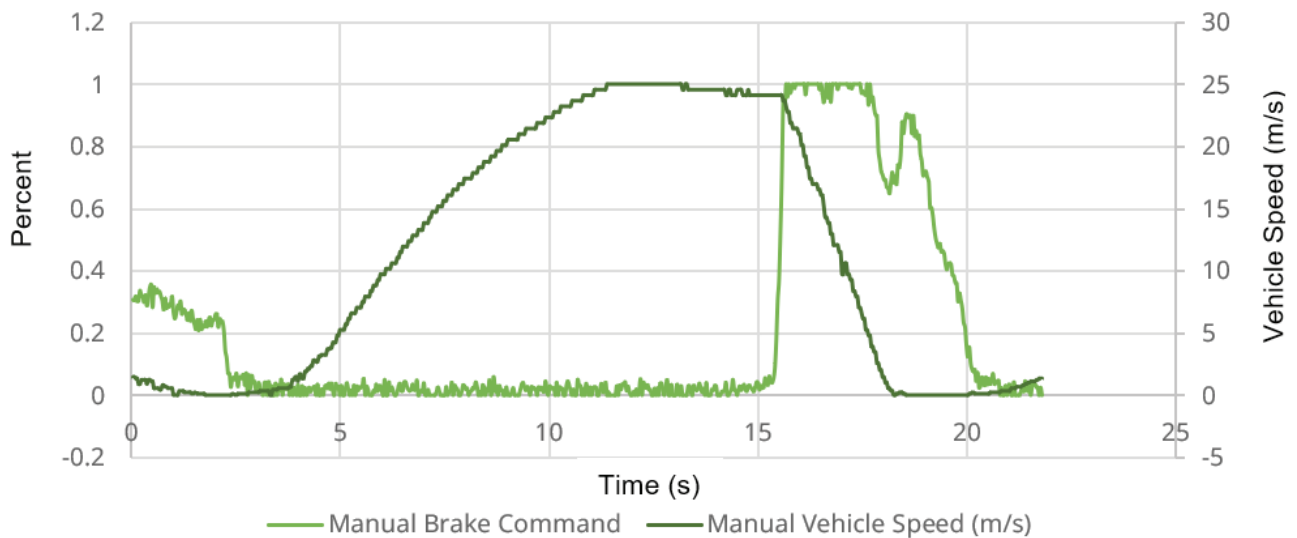
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## Braking

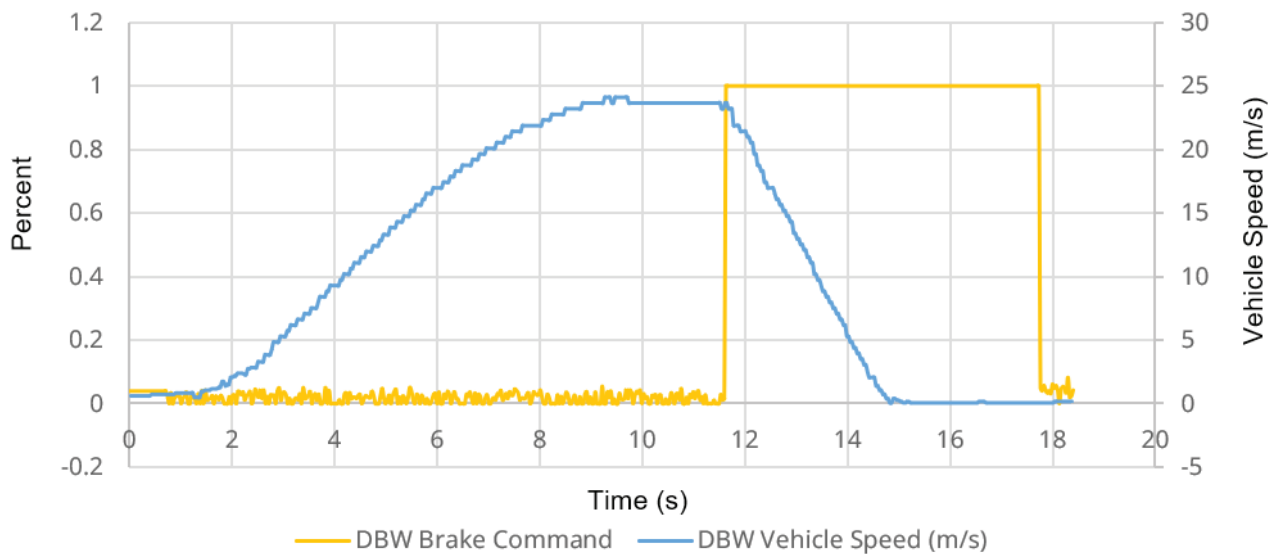
*Manual brake command and vehicle speed against time on a Lexus RX450h modified by AutonomouStuff.*

### Manual Brake Command + Vehicle Speed vs Time



*Brake command and vehicle speed against time with drive by-wire on a Lexus RX450h modified by AutonomouStuff.*

### DBW Brake Command + Vehicle Speed over Time



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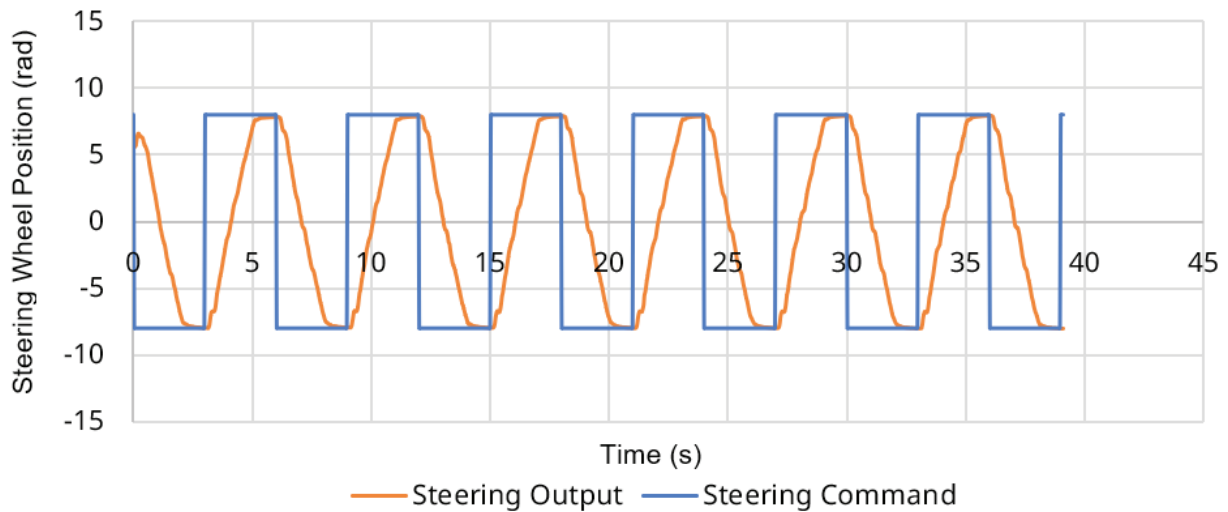
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## Lock Steering\*

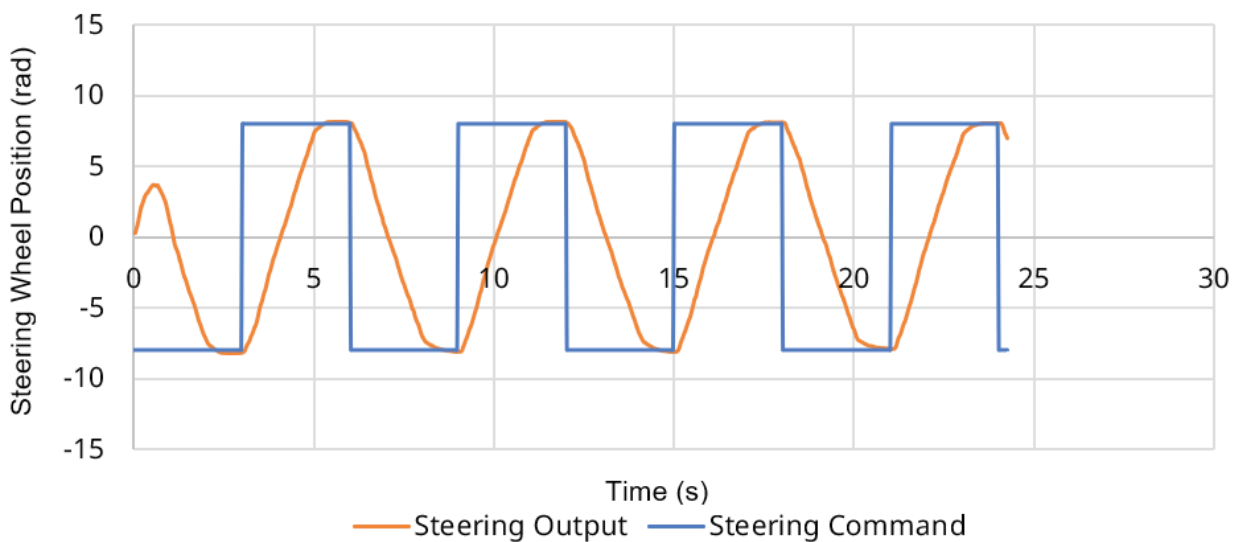
*Applying steering commands (full rotations) with the drive by-wire system, while not moving, against time on a Lexus RX450h modified by AutonomouStuff.*

### Steering Command (not moving) vs Report



*Applying steering commands (full rotations) with the drive by-wire system, while moving at 5mph, against time on a Lexus RX450h modified by AutonomouStuff.*

### Steering Command (at 5mph) vs Report



\*The commanded rotation rate for steering is measured at 3.3 rad/s.

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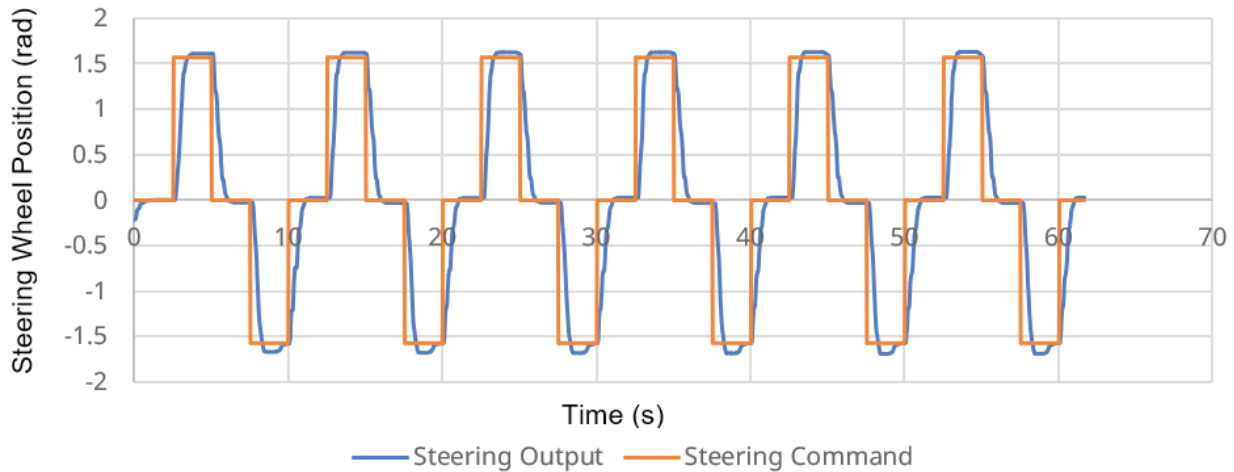
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## Step Steering\*

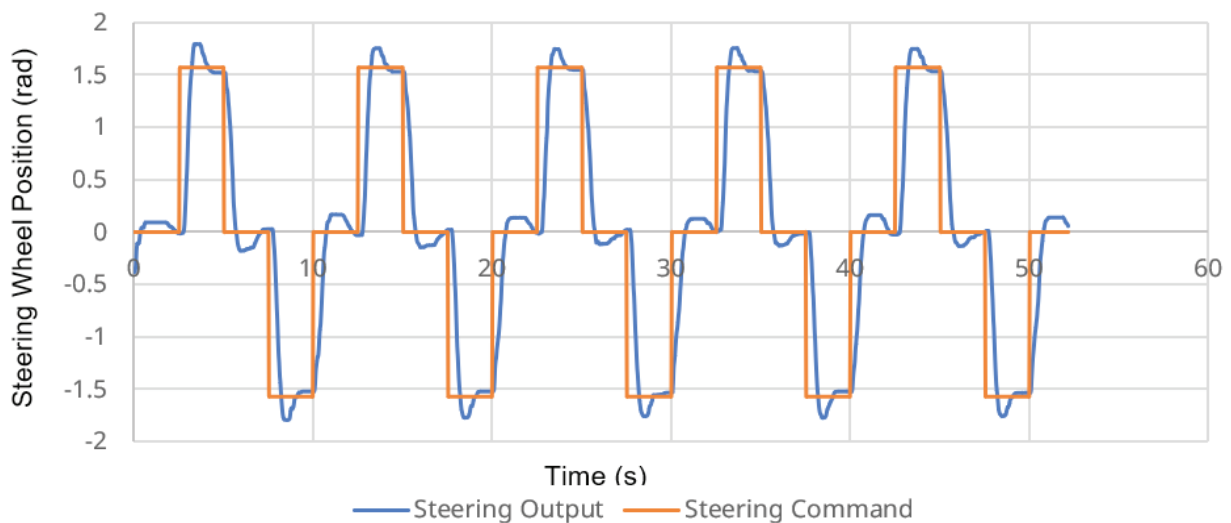
*Applying steering commands (rotating from full rotation to zero radians to full opposite rotation) with the drive by-wire system, while not moving, against time on a Lexus RX450h modified by AutonomouStuff.*

### Steering Command (not moving) vs Report



*Applying steering commands (rotating from full rotation to zero radians to full opposite rotation) with the drive by-wire system, while moving at 5mph, against time on a Lexus RX450h modified by AutonomouStuff.*

### Steering Command (at 5mph) vs Report



\*The commanded rotation rate for steering is measured at 3.3 rad/s.

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