NEW CAR ASSESSMENT PROGRAM
FORWARD COLLISION WARNING CONFIRMATION TEST
OCAS-DRI-FCW-20-06

2020 Honda Civic 2.0L 4D Sport

DYNAMIC RESEARCH, INC.
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Torrance, California 90501

6 February 2020

Final Report

Prepared Under Contract No. DTNH22-14-D-00333

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
New Car Assessment Program
1200 New Jersey Avenue, SE
West Building, 4th Floor (NRM-110)
Washington, DC 20590

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16. Abstract These tests were conducted on the subject 2020 Honda Civic 2.0L 4D Sport in accordance with the specifications of the New Car Assessment Program's (NCAP) most current Test Procedure in docket NHTSA-2006-26555-0134 to confirm the performance of a forward collision warning system. The vehicle passed the requirements of the test for all three FCW test scenarios.			
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Section I

INTRODUCTION

This test evaluates the ability of a Forward Collision Warning (FCW) system to detect and alert drivers to potential hazards in the path of the vehicle as specified in the New Car Assessment Program's "Forward Collision Warning Confirmation" test procedure, dated February 2013. Three driving scenarios are utilized to assess this technology. In the first test, a subject vehicle (SV) approaches a stopped principle other vehicle (POV) in the same lane of travel. The second test begins with the SV initially following the POV at the same constant speed. After a short while, the POV stops suddenly. The third test consists of the SV, traveling at a constant speed, approaching a slower moving POV, which is also being driven at a constant speed.

Section II

DATA SHEETS

FORWARD COLLISION WARNING

DATA SHEET 1: TEST RESULTS SUMMARY

(Page 1 of 1)

2020 Honda Civic 2.0L 4D Sport

VIN: *2HGFC2F80LH5xxxx*

Test Date: *1/16/2020*

Forward Collision Warning setting: *Long*

Test 1 -	Subject Vehicle Encounters Stopped Principal Other Vehicle:	***Pass***
Test 2 -	Subject Vehicle Encounters Decelerating Principal Other Vehicle:	***Pass***
Test 3 -	Subject Vehicle Encounters Slower Principal Other Vehicle:	***Pass***
	Overall:	***Pass***

Notes: Notes:

FORWARD COLLISION WARNING

DATA SHEET 2: VEHICLE DATA

(Page 1 of 1)

2020 Honda Civic 2.0L 4D Sport

TEST VEHICLE INFORMATION

VIN: *2HGFC2F80LH5xxxx*

Body Style: *4-door sedan* Color: *Lunar Silver*

Date Received: *12/30/2019* Odometer Reading: *7 mi*

DATA FROM VEHICLE'S CERTIFICATON LABEL

Vehicle manufactured by: *Honda of Canada Mfg.*

Date of manufacture: *11/19*

Vehicle Type: *Passenger Car*

DATA FROM TIRE PLACARD

Tires size as stated on Tire Placard: Front: *235/40R18 91W*

Rear: *235/40R18 91W*

Recommended cold tire pressure: Front: *225 kPa (33 psi)*

Rear: *220 kPa (32 psi)*

TIRES

Tire manufacturer and model: *Goodyear Eagle Sport*

Front tire size: *235/40R18*

Rear tire size: *235/40R18*

Front tire DOT prefix: *4B2R LB1R*

Rear tire DOT prefix: *4B2R LB1R*

FORWARD COLLISION WARNING

DATA SHEET 3: TEST CONDITIONS

(Page 1 of 2)

2020 Honda Civic 2.0L 4D Sport

GENERAL INFORMATION

Test date: *1/16/2020*

AMBIENT CONDITIONS

Air temperature: *13.9 C (57 F)*

Wind speed: *3.1 m/s (6.9 mph)*

X Wind speed ≤ 10 m/s (22 mph).

X Tests were not performed during periods of inclement weather. This includes, but is not limited to, rain, snow, hail, fog, smoke, or ash.

X Tests were conducted during daylight hours with good atmospheric visibility (defined as an absence of fog and the ability to see clearly for more than 5000 meters). The tests were not conducted with the vehicle oriented into the sun during very low sun angle conditions, where the sun is oriented 15 degrees or less from horizontal, and camera "washout" or system inoperability results.

VEHICLE PREPARATION

Verify the following:

All non-consumable fluids at 100 % capacity: **X**

Fuel tank is full: **X**

Tire pressures are set to manufacturer's recommended cold tire pressure: **X**

Front: *225 kPa (33 psi)*

Rear: *220 kPa (32 psi)*

FORWARD COLLISION WARNING

DATA SHEET 3: TEST CONDITIONS

(Page 2 of 2)

2020 Honda Civic 2.0L 4D Sport

WEIGHT

Weight of vehicle as tested including driver and instrumentation:

Left Front:	*420.0 kg (926 lb)*	Right Front	*414.6 kg (914 lb)*
Left Rear	*295.3 kg (651 lb)*	Right Rear	*262.2 kg (578 lb)*
		Total:	*1392.1 kg (3069 lb)*

FORWARD COLLISION WARNING

DATA SHEET 4: FORWARD COLLISION WARNING SYSTEM OPERATION

(Page 1 of 2)

2020 Honda Civic 2.0L 4D Sport

Name of the FCW option, option package, etc.

FCW is incorporated in Collision Mitigation Braking System (CMBS)

Forward Collision Warning Setting used in test: *Long*

Type of sensors the system uses:

Millimeter wave radar and camera

How is the Forward Collision Warning presented to the driver? (Check all that apply)

X	Warning light
X	Buzzer or audible alarm
	Vibration
	Other _____

Describe the method by which the driver is alerted. For example, if the warning is a light, where is it located, its color, size, words or symbol, does it flash on and off, etc. If it is a sound, describe if it is a constant beep or a repeated beep. If it is a vibration, describe where it is felt (e.g., pedals, steering wheel), the dominant frequency (and possibly magnitude), the type of warning (light, audible, vibration, or combination), etc.

The auditory alert is presented as a pulsed tone centered at 1290 Hz and pulsed at approximately 5 pulses/minute. The visual alert is displayed in the center of the tachometer and shows the word "BRAKE" in black letters against an orange background. See Figure A16 in Appendix A.

FORWARD COLLISION WARNING

DATA SHEET 4: FORWARD COLLISION WARNING SYSTEM OPERATION

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2020 Honda Civic 2.0L 4D Sport

Is the vehicle equipped with a switch whose purpose is to render FCW inoperable? **X** Yes ____ No

If yes, please provide a full description including the switch location and method of operation, any associated instrument panel indicator, etc.

A switch is provided on the fascia to the lower left of the steering wheel as shown in Appendix A, Figure A15. To turn the system on or off, press and hold the button until a beeper sounds. A message on the driver information center interface indicates that the system is off. CMBS is reset to ON with each ignition cycle.

Is the vehicle equipped with a control whose purpose is to adjust the range setting or otherwise influence the operation of FCW? **X** Yes ____ No

If yes, please provide a full description.

The setting can be adjusted by accessing the vehicle settings menu using buttons on the left side of the steering wheel. See Appendix A, Figure A13 and pages B-9 and B-10 in Appendix B. The hierarchy is:

Vehicle Settings

Driver Assist System Setup

Forward Collision Warning Distance

Select Long, Normal (Default), or Short

Are there other driving modes or conditions that render FCW inoperable or reduce its effectiveness? **X** Yes ____ No

If yes, please provide a full description.

For a detailed description of the system limitations see Owner's Manual pages 475 through 479, in Appendix B pages B-17 through B-21.

Notes:

Section III

TEST PROCEDURES

A. Test Procedure Overview

Three test procedures were used, as follows:

Test 1. Subject Vehicle (SV) Encounters Stopped Principal Other Vehicle (POV)

Test 2. Subject Vehicle Encounters Decelerating Principal Other Vehicle

Test 3. Subject Vehicle Encounters Slower Principal Other Vehicle

With the exception of trials associated with Test 1, all trials were performed with SV and POV automatic transmissions in ‘‘Drive’’ or with manual transmissions in the highest gear capable of sustaining the desired test speed. Manual transmission clutches remained engaged during all maneuvers. Except for Test 2, the brake lights of the POV were not illuminated.

In order to pass the test, if the FCW system provides a warning timing adjustment for the driver, at least one setting must meet the criterion of the test procedure. Therefore, if the vehicle was equipped with a warning timing adjustment, only the most “conservative” (earliest warning) setting was tested.

An overview of each of the test procedures follows.

1. TEST 1 – SUBJECT VEHICLE ENCOUNTERS STOPPED PRINCIPAL OTHER VEHICLE ON A STRAIGHT ROAD

This test evaluates the ability of the FCW function to detect a stopped lead vehicle, as depicted in Figure 1.

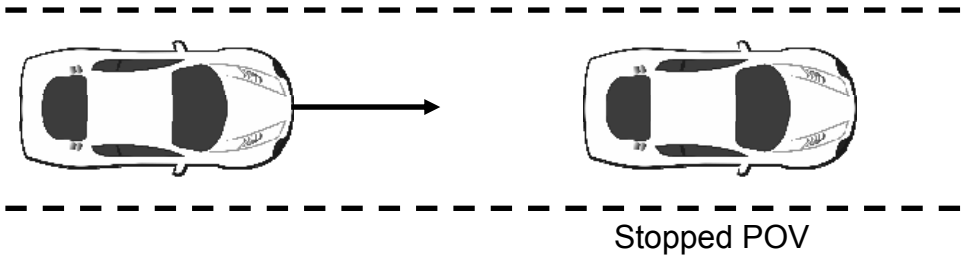


Figure 1. Depiction of Test 1

a. Alert Criteria

In order to pass the test, the FCW alert must be issued when the time-to-collision (TTC) is at least 2.1 seconds. The TTC for this test was calculated by considering the speeds of the SV and the POV at the time of the FCW alert (i.e., when the SV and POV speeds are nominally equal to 45 and 0 mph (72.4 and 0 km/h), respectively).

b. Procedure

The POV was parked in the center of a travel lane, with its longitudinal axis oriented parallel to the roadway edge and facing the same direction as the SV so that the SV approaches the rear of the POV.

The SV was driven at a nominal speed of 45 mph (72.4 km/h) in the center of the lane of travel, toward the parked POV. The test began when the SV was 492 ft (150 m) from the POV and ended when either of the following occurred:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e., TTC = 1.9 sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

- The SV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 km/h) for a period of three seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The SV driver could not apply any force to the brake pedal before (1) the required FCW alert occurred or (2) the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rate of the SV could not exceed ±1 deg/sec during the test.

Nominally, the Test 1 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

2. TEST 2 – SUBJECT VEHICLE ENCOUNTERS DECELERATING PRINCIPAL OTHER VEHICLE

The SV in this test initially followed the POV at a constant time gap and then the POV suddenly decelerated, as depicted in Figure 2. The test evaluates the ability of the FCW to recognize a decelerating lead vehicle and to issue an alert to SV driver in a timely manner.

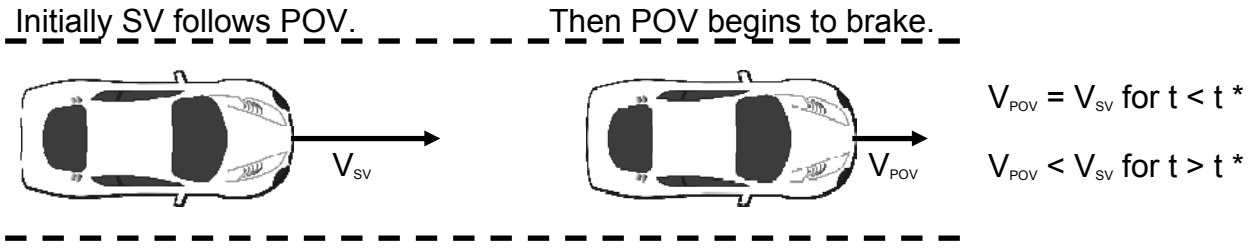


Figure 2. Depiction of Test 2

a. Alert Criteria

In order to pass the test, the FCW alert must be issued when TTC is at least 2.4 seconds. The TTC for this test, a prediction of the time it would take for the SV to collide with the POV, was calculated by considering three factors at the time of the FCW alert: (1) the speed of the SV, (2) the speed of the POV, and (3) the deceleration of the POV[1].

b. Procedure

Test 2 began with the SV and the POV traveling on a straight, flat road at a constant speed of 45.0 mph (72.4 km/h), in the center of the lane of travel. The headway from the SV to the POV was nominally maintained at 98.4 ft (30 m) until the POV braking was initiated.

The test began approximately 7 seconds before the driver of the POV started a braking maneuver in which the POV brakes were rapidly applied and modulated such that a constant deceleration of 0.3 g was achieved within 1.5 seconds after braking is initiated. The test ended when either of the following conditions was satisfied:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e., TTC = 2.2 sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

[1]To simplify calculation of the TTC for Test 2, the deceleration of the POV is assumed to remain constant from the time of the FCW alert until the POV comes to a stop (i.e., a “constant” rate of slowing is assumed).

- The initial POV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 km/h) for a period of 3 seconds prior to the initiation of POV braking.
- The speed of the SV could not deviate from the nominal speed by more than 1.0 mph (1.6 km/h) for a period of 3 seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rates of the SV and POV could not exceed ±1 deg/sec during the test.
- The POV deceleration level was nominally required to be 0.3 g within 1.5 seconds after initiation of POV braking. The acceptable error magnitude of the POV deceleration was ±0.03g, measured at the time the FCW alert first occurred. An initial overshoot beyond the deceleration target was acceptable, however the first local deceleration peak observed during an individual trial could not exceed 0.375 g for more than 50 ms. Additionally, the deceleration could not exceed 0.33 g over a period defined from 500 ms after the first local deceleration peak occurs, to the time when the FCW alert first occurred.
- The tolerance for the headway from the SV to the POV was ±8.2 ft (±2.5 m), measured at two instants in time: (1) three seconds prior to the time the POV brake application was initiated and (2) at the time the POV brake application was initiated.
- SV driver could not apply any force to the brake pedal before (1) the required FCW alert occurred or (2) the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.

Nominally, the Test 2 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

3. TEST 3 – SUBJECT VEHICLE ENCOUNTERS SLOWER PRINCIPAL OTHER VEHICLE

This test examines the ability of the FCW system to recognize a slower lead vehicle being driven with a constant speed and to issue a timely alert. As depicted in Figure 3, the scenario was conducted with a closing speed equal to 25.0 mph (40.2 km/h).

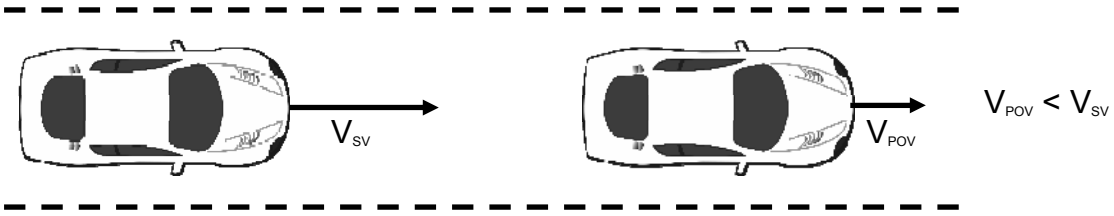


Figure 3. Depiction of Test 3

a. Alert Criteria

In order to pass the test, the FCW alert must be issued when TTC is at least 2.0 seconds. The TTC for this test, a prediction of the time it would take for the SV to collide with the POV, was calculated by considering the speeds of the SV and POV at the time of the FCW alert.

b. Procedure

Throughout the test, the POV was driven at a constant 20.0 mph (32.2 km/h) in the center of the lane of travel.

The SV was driven at 45.0 mph (72.4 km/h), in the center lane of travel, toward the slow-moving POV.

The test began when the headway from the SV to the POV was 329 ft (100 m) and ended when either of the following occurred:

- The required FCW alert occurred.
- The TTC to the POV fell to less than 90% of the minimum allowable range (i.e., TT = 1.8 sec) for the onset of the required FCW alert.

The SV driver then steered and/or braked to keep the SV from striking the POV.

For an individual test trial to be valid, the following was required throughout the test:

- The SV vehicle speed could not deviate from the nominal speed by more than 1.0 mph (1.6 km/h) for a period of 3 seconds prior to (1) the required FCW alert or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.
- Speed of the POV could not deviate from the nominal speed by more than 1.0 mph (1.6 km/h) during the test.
- The lateral distance between the centerline of the SV, relative to the centerline of the POV, in road coordinates, could not exceed 2.0 ft (0.6 m).
- The yaw rates of the SV and POV could not exceed ±1 deg/sec during the test.
- SV driver could not apply any force to the brake pedal before (1) the required

FCW alert occurred or (2) before the range fell to less than 90% of the minimum allowable range for onset of the required FCW alert.

Nominally, the Test 3 series was comprised of seven individual trials. The FCW system must satisfy the TTC alert criteria for at least five of the seven test trials.

B. Principal Other Vehicle

The vehicle used as the Principal Other Vehicle (POV) was a 2006 Acura RL. This satisfied the test requirement that the POV be a mid-size sedan. The vehicle had a rear license plate in order to provide a suitable representative radar profile. Vehicle loading consisted of the driver plus equipment and instrumentation.

C. Automatic Braking System

The POV was equipped with an automatic braking system, which was used in Test 2. The braking system consisted of the following components:

- High pressure nitrogen bottle, strapped to the front passenger seat, with regulator and pressure gauges
- Pneumatic piston-type actuator, with solenoid valve
- “Pickle” switch to activate brakes

D. Instrumentation

Table 1 lists the sensors, signal conditioning, and data acquisition equipment used for these tests.

TABLE 1. TEST INSTRUMENTATION AND EQUIPMENT

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Tire Pressure Gauge	Vehicle Tire Pressure	0-100 psi 0-690 kPa	< 1% error between 20 and	Omega DPG8001	17042707002	By: DRI Date: 7/3/2019 Due: 7/3/2020
Platform Scales	Vehicle Total, Wheel, and Axle Load	2200 lb/platform 5338 N/	0.5% of applied load	Intercomp SWI	1110M206352	By: DRI Date: 1/6/2020 Due: 1/6/2021
Differential Global Positioning System	Position, Velocity	Latitude: ±90 deg Longitude: ±180 deg Altitude: 0-18 km Velocity: 0-1000 knots	Horizontal Position: ±1 cm Vertical Position: ±2 cm Velocity: 0.05 km/h	Trimble GPS Receiver, 5700 (base station and in-vehicle)	00440100989	NA
Multi-Axis Inertial Sensing System	Position; Longitudinal, Lateral, and Vertical Accels; Lateral, Longitudinal and Vertical Velocities; Roll, Pitch, Yaw Rates; Roll, Pitch, Yaw Angles	Accels ± 10g, Angular Rat	Accels .01g, Angular Rate	Oxford Inertial +		By: Oxford Technical Solutions
					2258	Date: 5/3/2019 Due: 5/3/2021
					2176	Date: 4/11/2018 Due: 4/11/2020
Real-Time Calculation of Position and Velocity Relative to Lane Markings (LDW) and POV (FCW)	Distance and Velocity to lane markings (LDW) and POV (FCW)	Lateral Lane Dist: ±30 m Lateral Lane Velocity: ±20 m/sec Longitudinal Range to POV: ±200 m Longitudinal Range Rate: ±50 m/sec	Lateral Distance to Lane Marking: ±2 cm Lateral Velocity to Lane Marking: ±0.02m/sec Longitudinal Range: ±3 cm Longitudinal Range Rate: ±0.02 m/sec	Oxford Technical Solutions (OXTS), RT-Range	97	NA

TABLE 1. TEST INSTRUMENTATION AND EQUIPMENT (continued)

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Microphone	Sound (to measure time at auditory alert)	Frequency Response: 80 Hz – 20 kHz	Signal-to-noise: 64 dB, 1 kHz at 1 Pa	Audio-Technica AT899	NA	NA
Light Sensor	Light intensity (to measure time at visual alert)	Spectral Bandwidth: 440-800 nm	Rise time < 10 msec	DRI designed and developed Light Sensor	NA	NA
Accelerometer	Acceleration (to measure time at haptic alert)	±5g	≤ 3% of full range	Silicon Designs, 2210-005	NA	NA
Coordinate Measurement Machine	Inertial Sensing System Coordinates	0-8 ft 0-2.4 m	±.0020 in. ±.051 mm (Single point articulation accuracy)	Faro Arm, Fusion	UO8-05-08-06636	By: DRI Date: 1/6/2020 Due: 1/6/2021

Type	Description	Mfr, Model	Serial Number
Data Acquisition System	Data acquisition is achieved using a dSPACE MicroAutoBox II. Data from the Oxford IMU, including Longitudinal, Lateral, and Vertical Acceleration, Roll, Yaw, and Pitch Rate, Forward and Lateral Velocity, Roll and Pitch Angle are sent over Ethernet to the MicroAutoBox. The Oxford IMUs are calibrated per the manufacturer's recommended schedule (listed above).	dSPACE Micro-Autobox II 1401/1513	
		Base Board	549068
		I/O Board	588523

For systems that implement audible or haptic alerts, part of the pre-test instrumentation verification process is to determine the tonal frequency of the audible warning or the vibration frequency of the tactile warning through use of the PSD (Power Spectral Density) function in Matlab. This is accomplished in order to identify the center frequency around which a band-pass filter is applied to subsequent audible or tactile warning data so that the beginning of such warnings can be programmatically determined. The bandpass filter used for these warning signal types is a phaseless, forward-reverse pass, elliptical (Cauer) digital filter, with filter parameters as listed in Table 2.

Table 2. Audible and Tactile Warning Filter Parameters

Warning Type	Filter Order	Peak-to-Peak Ripple	Minimum Stop Band Attenuation	Pass-Band Frequency Range
Audible	5^{th}	3 dB	60 dB	Identified Center Frequency ± 5%
Tactile	5^{th}	3 dB	60 dB	Identified Center Frequency ± 20%

APPENDIX A

Photographs

LIST OF FIGURES

Figure A1. Front View of Subject Vehicle

Figure A2. Rear View of Subject Vehicle

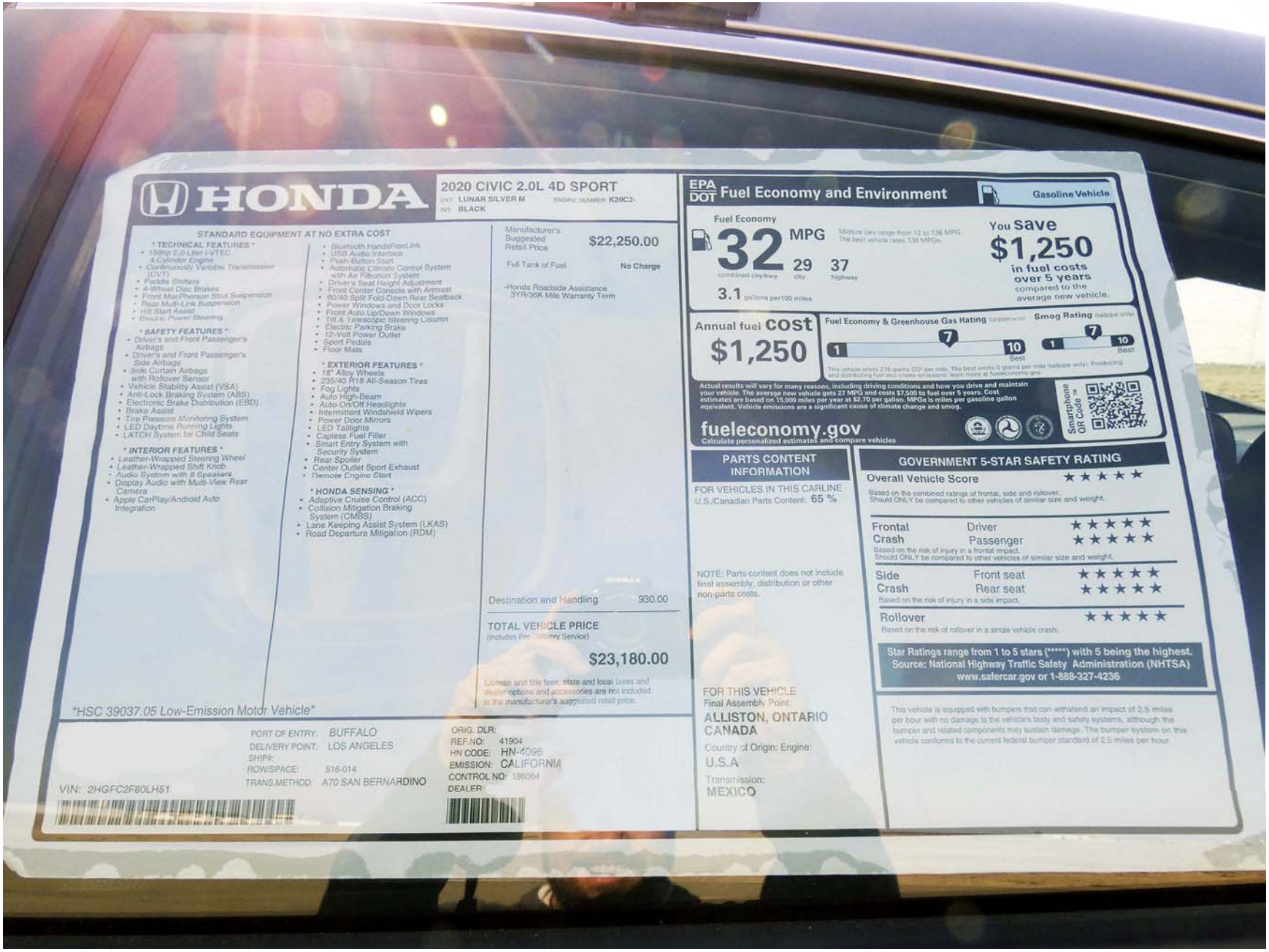


Figure A3. Window Sticker (Monroney Label)

Figure A4. Vehicle Certification Label

Figure A5. Tire Placard

Figure A6. Front View of Principal Other Vehicle

Figure A7. Rear View of Principal Other Vehicle

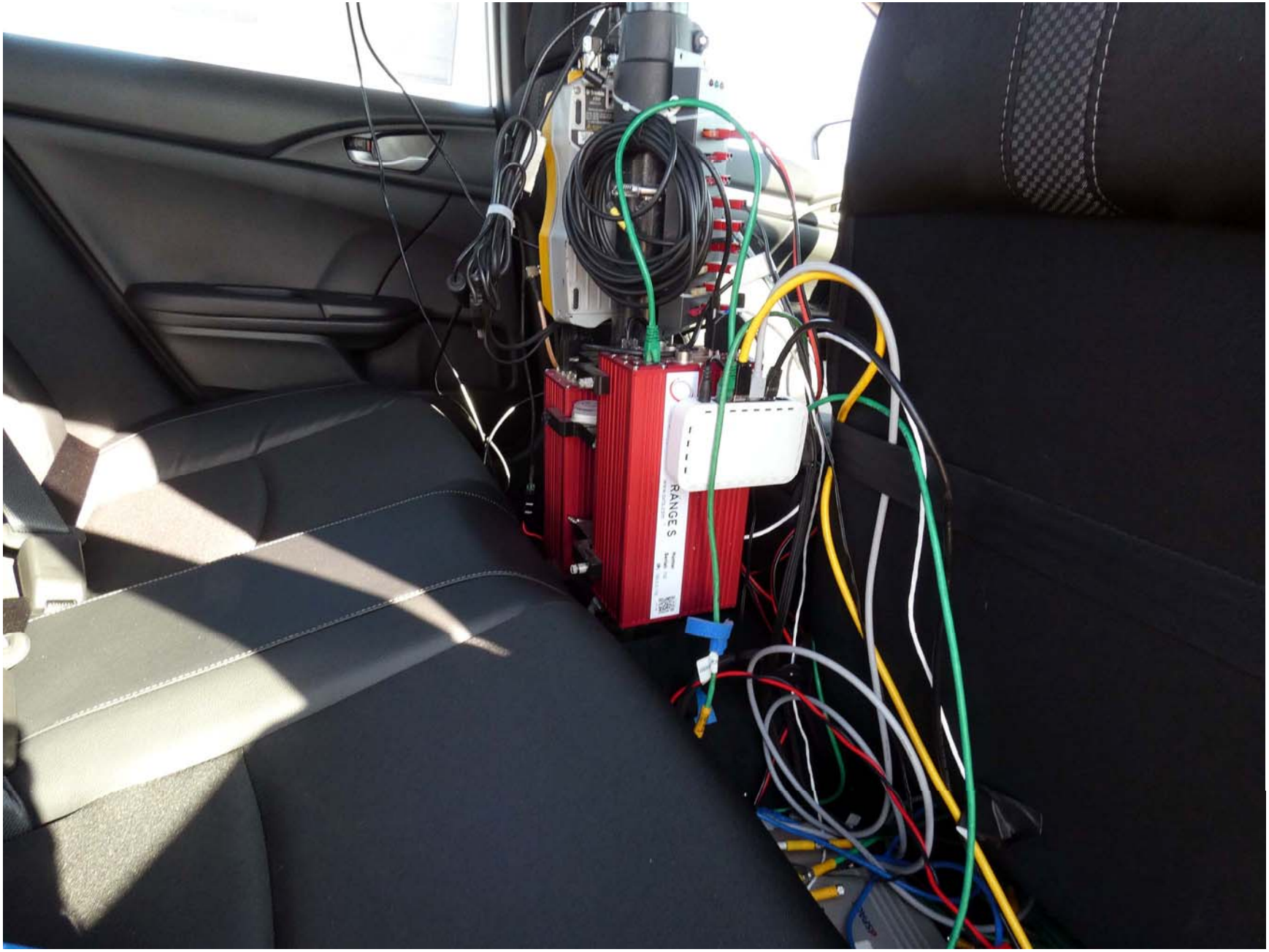


Figure A8. DGPS, Inertial Measurement Unit, and MicroAutoBox Installed in Subject Vehicle

Figure A9. Sensor for Detecting Visual Alerts

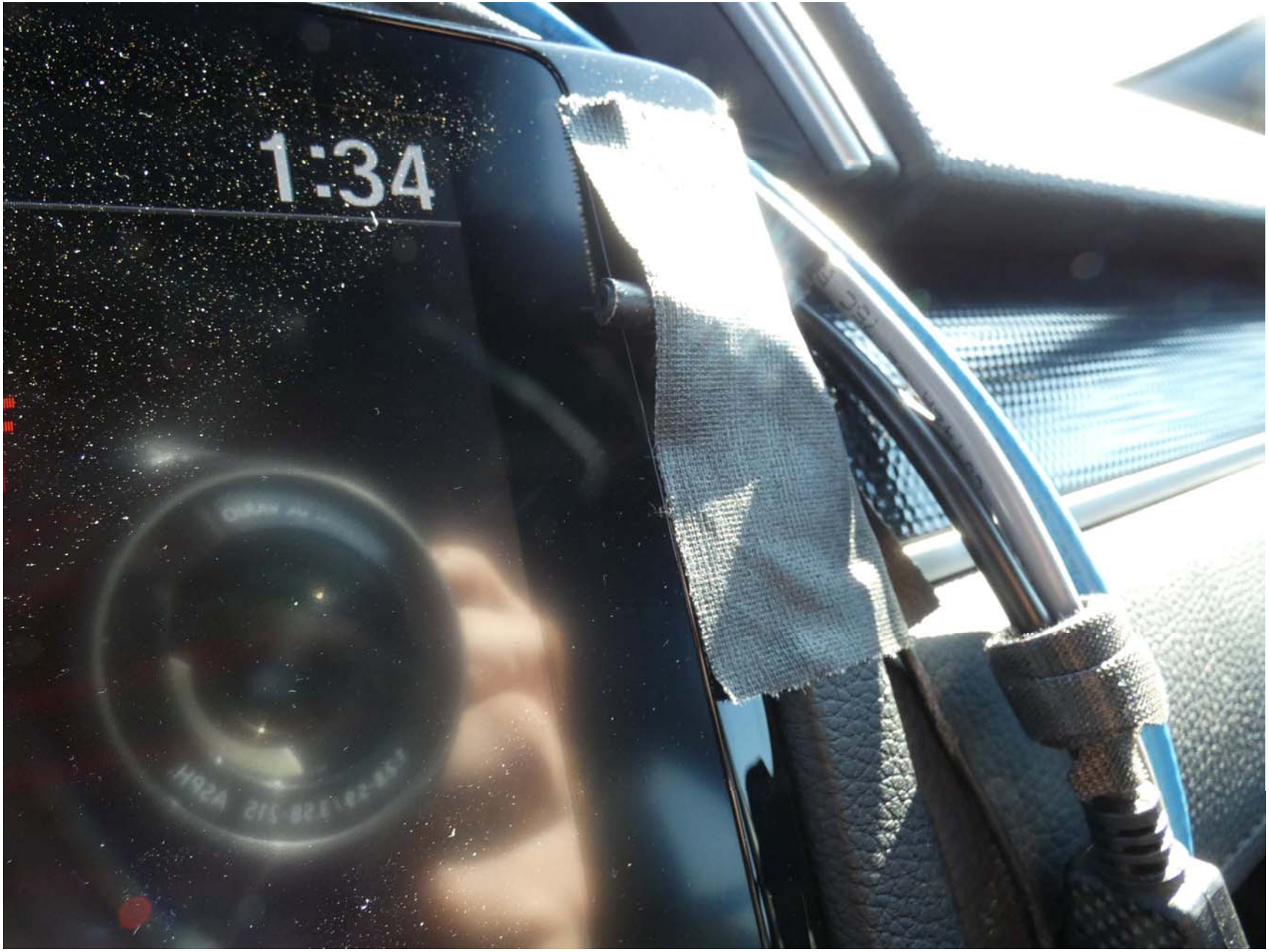


Figure A10. Sensor for Detecting Auditory Alerts

Figure A11. Computer Installed in Subject Vehicle

Figure A12. Brake Actuation System Installed in Principal Other Vehicle

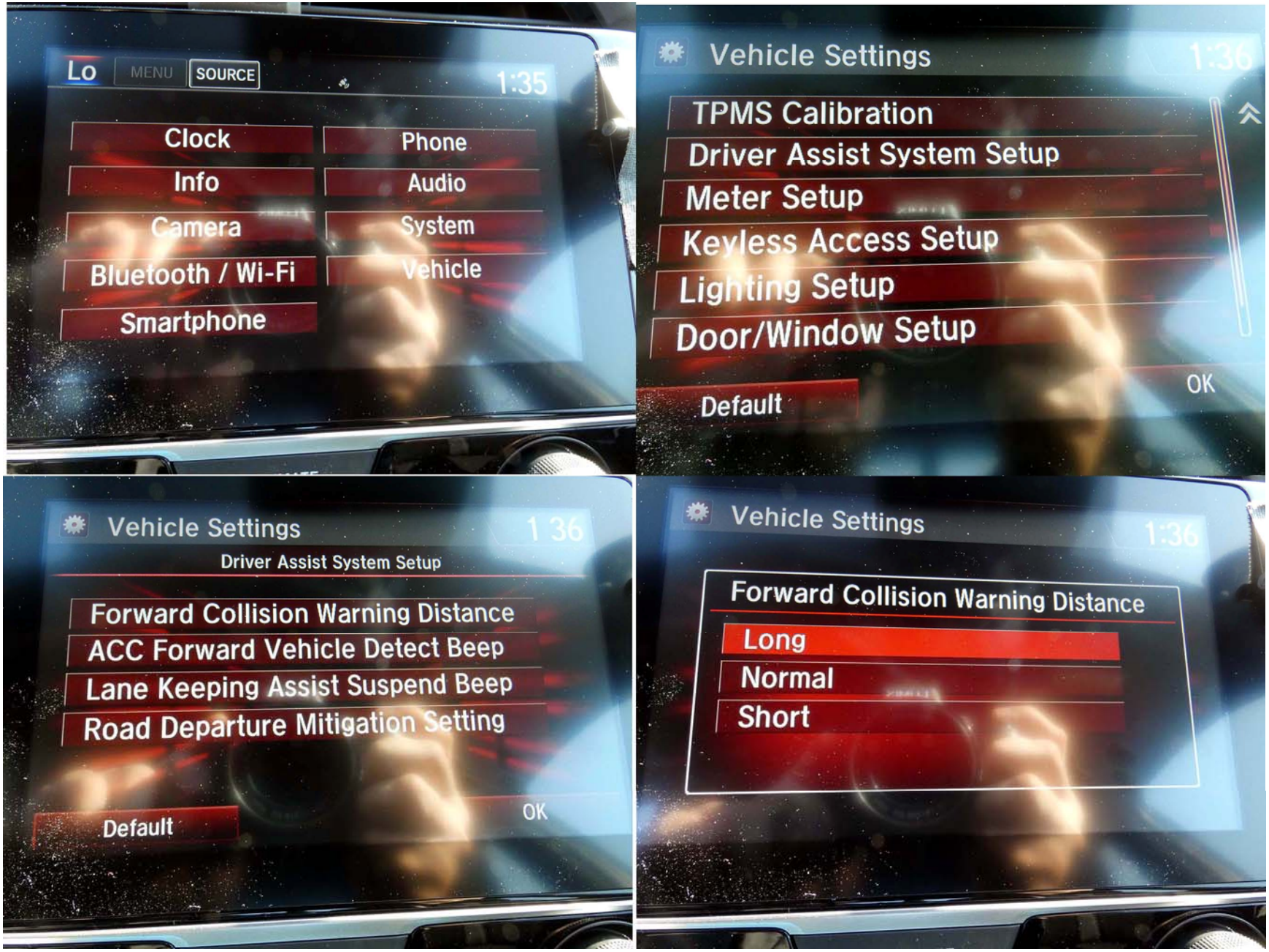


Figure A13. CMBS (FCW) System Setting Menus

Figure A14. Steering Wheel Mounted Controls for Adjusting Settings

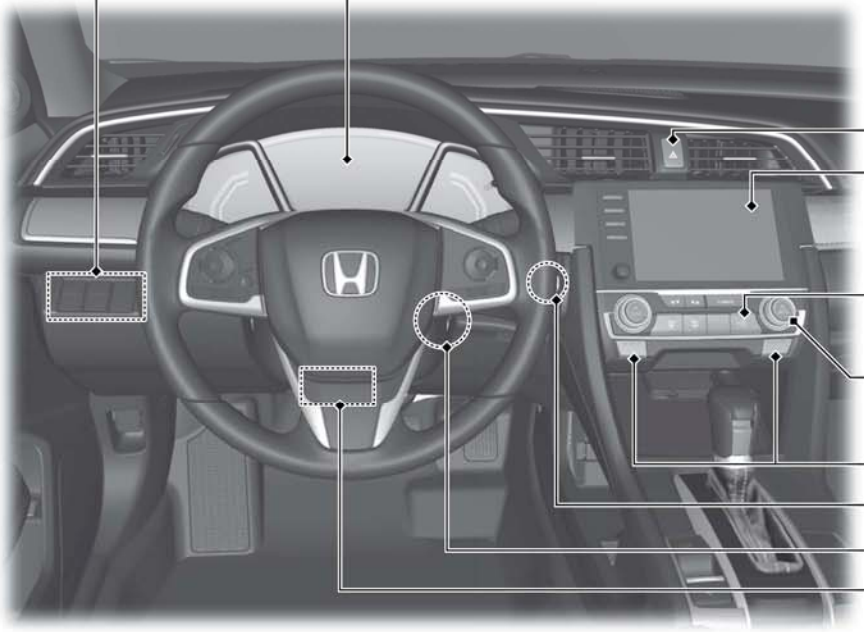
Figure A15. CMBS (FCW) On/Off Switch

Figure A16. CMBS (FCW) Visual Alert

APPENDIX B

Excerpts from Owner's Manual

Visual Index



System Indicators P. 76
Gauges P. 111
Driver Information Interface P. 113

(Vehicle Stability Assist® (VSA®) System OFF) Button P. 457
Road Departure Mitigation (RDM) Button P. 520
Collision Mitigation Braking System™ (CMBS™) OFF Button P. 474

Hazard Warning Button
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Navigation System*
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Rear Defogger P. 175
Heated Door Mirror Button* P. 175
Heating System* P. 201
Climate Control System* P. 204
Front Seat Heater Buttons* P. 199
ENGINE START/STOP Button*1 P. 161
Ignition Switch* P. 160
Steering Wheel Adjustments P. 177

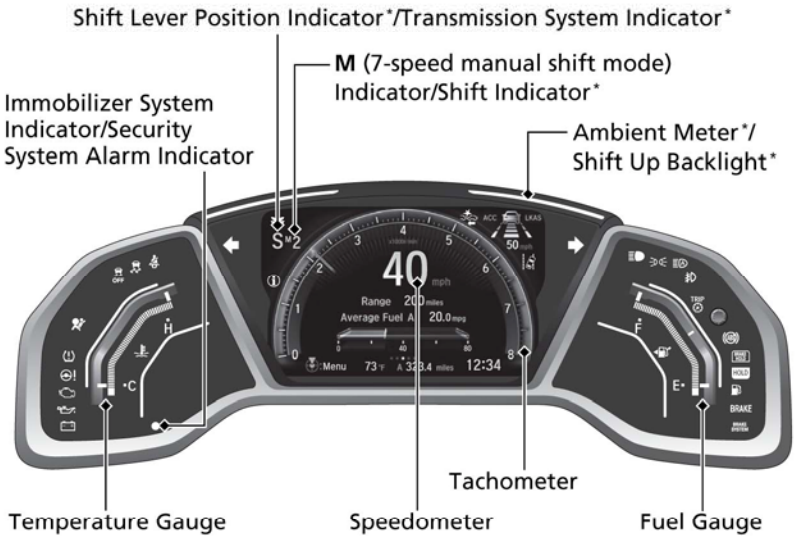
*1: Models with the smart entry system have an **ENGINE START/STOP** button instead of an ignition switch.

Instrument Panel P. 75

Gauges P. 111/Driver Information Interface P. 113/System Indicators P. 76

System Indicators

- Malfunction Indicator Lamp
- Low Oil Pressure Indicator
- Charging System Indicator
- Anti-lock Brake System (**ABS**) Indicator
- Vehicle Stability Assist® (VSA®) System Indicator
- Vehicle Stability Assist® (VSA®) **OFF** Indicator
- Automatic Brake Hold System Indicator
- Automatic Brake Hold Indicator (U.S. / Canada)
- ECON Mode Indicator*
- Parking Brake and Brake System Indicator (Red) (U.S. / Canada)
- Parking Brake and Brake System Indicator (Amber) (U.S. / Canada)



System Indicators

- System Message Indicator
- Low Tire Pressure/ TPMS Indicator*
- **SPORT** Mode Indicator*
- Auto High-Beam Indicator*
- Shift Up Indicator*
- Shift Down Indicator*

Lights Indicators

- Lights On Indicator
- High Beam Indicator
- Fog Light Indicator*

System Indicators

- Turn Signal and Hazard Warning Indicators
- Electric Power Steering (EPS) System Indicator
- Low Fuel Indicator
- Seat Belt Reminder Indicator
- Supplemental Restraint System Indicator
- Adaptive Cruise Control (ACC) with Low Speed Follow* Indicator (Amber/ Green)
- Road Departure Mitigation (RDM) Indicator
- Collision Mitigation Braking System™ (CMBS™) Indicator
- Lane Keeping Assist System (LKAS) Indicator (Amber/ Green)

* Not available on all models

VSA® On and Off P. 457

- The Vehicle Stability Assist® (VSA®) system helps stabilize the vehicle during cornering, and helps maintain traction while accelerating on loose or slippery road surfaces.
- VSA® comes on automatically every time you start the engine.
- To partially disable or fully restore VSA® function, press and hold the button until you hear a beep.

CMBS™ On and Off P. 474

- When a possible collision is likely unavoidable, the CMBS™ can help you to reduce the vehicle speed and the severity of the collision.
- The CMBS™ is turned on every time you start the engine.
- To turn the CMBS™ on or off, press and hold the button until you hear a beep.

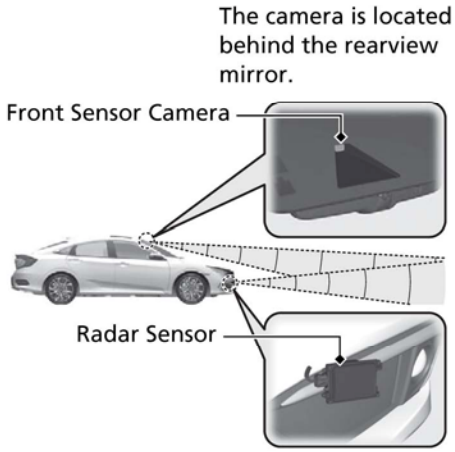
U.S. models

Tire Pressure Monitoring System (TPMS) P. 459

- Detects a change in tire conditions and overall dimensions due to decrease in tire pressures.
- The TPMS is turned on automatically every time you start the engine.
- A calibration procedure must be performed when certain conditions arise.

Honda Sensing® P. 467

Honda Sensing® is a driver support system which employs the use of two distinctly different kinds of sensors, a radar sensor located in the lower bumper and a front sensor camera mounted to the interior side of the windshield, behind the rearview mirror.



Collision Mitigation Braking System™ (CMBS™) P. 470

Can assist you when there is a possibility of your vehicle colliding with a vehicle or a pedestrian detected in front of yours. The CMBS™ is designed to alert you when a potential collision is determined, as well as to reduce your vehicle speed to help minimize collision severity when a collision is deemed unavoidable.

Adaptive Cruise Control (ACC) with Low Speed Follow* P. 480

Helps maintain a constant vehicle speed and a set following interval behind a vehicle detected ahead of yours and, if the detected vehicle comes to a stop, can decelerate and stop your vehicle, without you having to keep your foot on the brake or the accelerator.

Adaptive Cruise Control (ACC)* P. 496

Helps maintain a constant vehicle speed and a set following-interval behind a vehicle detected ahead of yours, without you having to keep your foot on the brake or the accelerator.

Lane Keeping Assist System (LKAS) P. 511

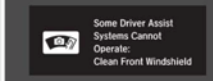
Provides steering input to help keep the vehicle in the middle of a detected lane and provides tactile and visual alerts if the vehicle is detected drifting out of its lane.

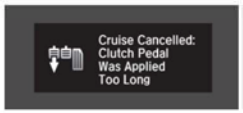
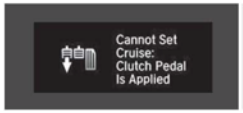
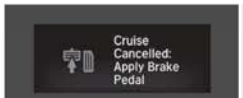
Road Departure Mitigation (RDM) System P. 519

Alerts and helps to assist you when the system detects a possibility of your vehicle unintentionally crossing over detected lane markings and/or leaving the roadway altogether.

Indicator	Name	On/Blinking	Explanation	Message
	Collision Mitigation Braking System™ (CMBS™) Indicator	• Comes on for a few seconds when you turn the ignition switch to ON II *1, then goes off. • Comes on when you deactivate the CMBS™. A driver information interface message appears for five seconds. • Comes on if there is a problem with the CMBS™.	• **Stays on constantly without the CMBS™ off** - Have your vehicle checked by a dealer. ➡ **Collision Mitigation Braking System™ (CMBS™)** P. 470	 
		• Comes on if the CMBS™ is deactivated temporarily after the battery has been disconnected, then re-connected.	• Drive a short distance at more than 12 mph (20 km/h). The indicator should go off. If it does not, have your vehicle checked by a dealer.	

*1:Models with the smart entry system have an **ENGINE START/STOP** button instead of an ignition switch.

Indicator	Name	On/Blinking	Explanation	Message
	Collision Mitigation Braking System™ (CMBS™) Indicator	• Comes on when the CMBS™ shuts itself off.	• **Stays on** - The area around the camera is blocked by dirt, mud, etc. Stop your vehicle in a safe place, and wipe it off with a soft cloth. ➡ **Front Sensor Camera** P. 523	
			• When the radar sensor gets dirty, stop your vehicle in a safe place, and wipe off dirt using a soft cloth. Indicator may take some time to go off after the radar sensor is cleaned. • Have your vehicle checked by a dealer if the indicator does not go off even after you clean the sensor cover. ➡ **Collision Mitigation Braking System™ (CMBS™)** P. 470 ➡ **Radar Sensor** P. 525	
			• **Stays on** - The temperature inside the camera is too high. Use the climate control system to cool down the camera. The system activates when the temperature inside the camera cools down. ➡ **Front Sensor Camera** P. 523	
		• Comes on if there is a problem with the CMBS™. • Indicator may come on temporarily when the Maximum Load Limit is exceeded.	• Make sure the total load is within the Maximum Load Limit. ➡ **Maximum Load Limit** P. 431 • **Stays on constantly** - Have your vehicle checked by a dealer.	—

Message	Condition	Explanation
	• Appears when the clutch pedal is applied too long while ACC is in operation.	• ACC has been automatically canceled. ➡ **Adaptive Cruise Control (ACC)*** P. 496
	• Appears when pressing the **–/SET** button while the vehicle is moving and the clutch pedal is depressed.	• ACC cannot be set. ➡ **Adaptive Cruise Control (ACC)*** P. 496
	• Appears if ACC with Low Speed Follow is canceled while your vehicle is automatically stopped by ACC with Low Speed Follow.	• Immediately depress the brake pedal.
	• Flashes when the system senses a likely collision with a vehicle in front of you.	• Take the appropriate means to prevent a collision (apply the brakes, change lanes, etc.) ➡ **Collision Mitigation Braking System™ (CMBS™)** P. 470 ➡ **Adaptive Cruise Control (ACC) with Low Speed Follow*** P. 480 ➡ **Adaptive Cruise Control (ACC)*** P. 496

* Not available on all models

Continued

■ **List of customizable options**

Setup Group	Customizable Features	Description	Selectable Settings
TPMS Calibration*	—	Calibrates the TPMS.	**Cancel/Calibrate**
Driver Assist System Setup	**Forward Collision Warning Distance**	Changes at which distance the CMBS™ alerts.	**Long/Normal*1/Short**
	ACC Forward Vehicle Detect Beep	Causes the system to beep when the system detects a vehicle, or when the vehicle goes out of ACC range.	**ON/OFF*1**
	Road Departure Mitigation Setting	Changes the setting for the road departure mitigation system.	**Normal*1/Wide/Warning Only**
	Lane Keeping Assist Suspend Beep	Causes the system to beep when the LKAS is suspended.	**ON/OFF*1**

*1: Default Setting

* Not available on all models

Continued

Setup Group	Customizable Features		Description	Selectable Settings
System	Others	**Climate Screen Timeout**	Changes the length of time the climate control display stays on when you press the **CLIMATE** button.	**Never/5 Seconds/10 Seconds*1/20 Seconds**
		Detail Information	Displays the details of the head unit and operating system information.	—
	Default		Cancels/Resets all customized items in the **System** group as default.	**Yes/No**
Vehicle	**TPMS Calibration***		Cancels/Calibrates the TPMS.	**Cancel/Calibrate**
	Driver Assist System Setup	**Forward Collision Warning Distance**	Changes CMBS™ alert distance.	**Long/Normal*1/Short**
		ACC Forward Vehicle Detect Beep	Causes the system to beep when the system detects a vehicle, or when the vehicle goes out of the ACC/ACC with Low Speed Follow range.	**On/Off*1**
		Lane Keeping Assist Suspend Beep	Causes the system to beep when LKAS is suspended.	**On/Off*1**
		Road Departure Mitigation Setting	Changes the setting for the road departure mitigation system.	**Normal*1/Wide/ Warning Only**

*1:Default Setting

 * Not available on all models

Honda Sensing®

Honda Sensing® is a driver support system which employs the use of two distinctly different kinds of sensors: a radar sensor located in the lower bumper and a front sensor camera mounted to the interior side of the windshield, behind the rearview mirror.

Honda Sensing® has following functions.

■ The functions which do not require switch operations to activate

- Collision Mitigation Braking System™ (CMBS™) ➡ P. 470
- Road Departure Mitigation (RDM) System ➡ P. 519

■ The functions which require switch operations to activate

- Adaptive Cruise Control (ACC) with Low Speed Follow* ➡ P. 480
- Adaptive Cruise Control (ACC)* ➡ P. 496
- Lane Keeping Assist System (LKAS) ➡ P. 511

* Not available on all models

Continued

Collision Mitigation Braking System™ (CMBS™)

Can assist you when there is a possibility of your vehicle colliding with a vehicle or a pedestrian detected in front of yours. The CMBS™ is designed to alert you when a potential collision is determined, as well as to reduce your vehicle speed to help minimize collision severity when a collision is deemed unavoidable.

Collision Mitigation Braking System™ (CMBS™)

Important Safety Reminder

The CMBS™ is designed to reduce the severity of an unavoidable collision. It does not prevent collision nor stop the vehicle automatically. It is still your responsibility to operate the brake pedal and steering wheel appropriately according to the driving conditions.

Manual transmission models

When the CMBS™ activates, the engine may stop automatically.

Start the engine by normal operation if the engine stops.

Starting the Engine P. 434, 437

The CMBS™ may not activate or may not detect a vehicle in front of your vehicle under certain conditions:

CMBS™ Conditions and Limitations P. 475

You can read about handling information for the camera equipped with this system.

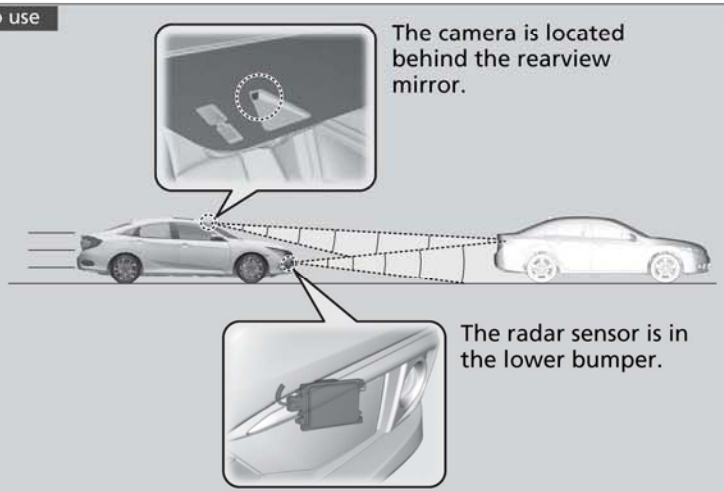
Front Sensor Camera P. 523

For directions on the proper handling of the radar sensor, refer to the following page.

Radar Sensor P. 525

■ How the system works

When to use



The system starts monitoring the roadway ahead when your vehicle speed is about 3 mph (5 km/h) and there is a vehicle in front of you.

The CMBS™ activates when:

- The speed difference between your vehicle and a vehicle or pedestrian detected in front of you becomes about 3 mph (5 km/h) and over with a chance of a collision.
- Your vehicle speed is about 62 mph (100 km/h) or less and the system determines there is a chance of a collision with:

- Vehicles detected in front of you that are stationary, oncoming, or traveling in your same direction.
- A pedestrian who is detected in front of you.

- Your vehicle speed is above 62 mph (100 km/h), and the system determines there is a chance of a collision with a vehicle detected in front of you traveling in your same direction.

Continued

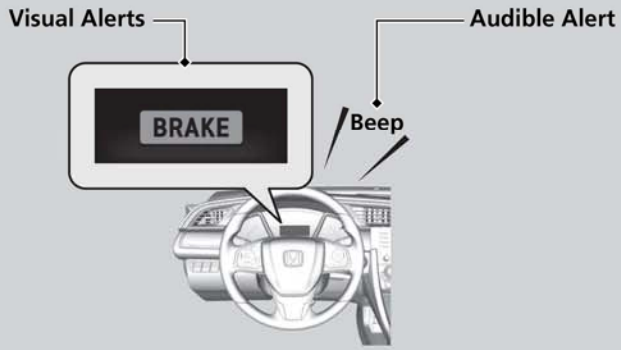
How the system works

When the CMBS™ activates, it may automatically apply the brake. It will be canceled when your vehicle stops or a potential collision is not determined.

■ When the system activates

The system provides visual and audible alerts of a possible collision, and stops if the collision is avoided.

▶ Take appropriate action to prevent a collision (apply the brakes, change lanes, etc.)



At system's earliest collision alert stage, you can change the distance (**Long/Normal/Short**) between vehicles at which alerts will come on through driver information interface or audio/information screen setting options.

➡ **List of customizable options** P. 127, 345

When the system activates

The camera in the CMBS™ is also designed to detect pedestrians.

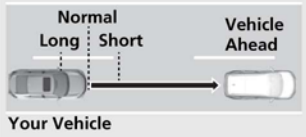
However, this pedestrian detection feature may not activate or may not detect a pedestrian in front of your vehicle under certain conditions.

Refer to the ones indicating the pedestrian detection limitations from the list.

➡ **CMBS™ Conditions and Limitations** P. 475

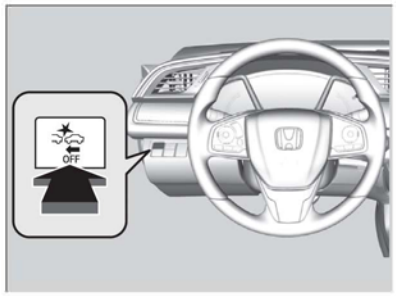
Collision Alert Stages

The system has three alert stages for a possible collision. However, depending on circumstances, the CMBS™ may not go through all of the stages before initiating the last stage.

Distance between vehicles		CMBS™		
		The radar sensor detects a vehicle	Audible & Visual WARNINGS	Braking
Stage one		There is a risk of a collision with the vehicle ahead of you.	When in **Long**, visual and audible alerts come on at a longer distance from a vehicle ahead than in **Normal** setting, and in **Short**, at a shorter distance than in **Normal**.	—
Stage two		The risk of a collision has increased, time to respond is reduced.	Visual and audible alerts.	Lightly applied
Stage three		The CMBS™ determines that a collision is unavoidable.		Forcefully applied

Continued

CMBS™ On and Off



Press and hold the button until the beeper sounds to switch the system on or off.

When the CMBS™ is off:

- The CMBS™ indicator in the instrument panel comes on.
- A message on the driver information interface reminds you that the system is off.

The CMBS™ is turned on every time you start the engine, even if you turned it off the last time you drove the vehicle.

Collision Mitigation Braking System™ (CMBS™)

The CMBS™ may automatically shut off, and the CMBS™ indicator will come and stay on under certain conditions:

CMBS™ Conditions and Limitations P. 475

When the CMBS™ is activated, it will continue to operate even if the accelerator pedal is partially depressed. However, it will be canceled if the accelerator pedal is deeply depressed.

The indicators for the Adaptive Cruise Control (ACC)*, Adaptive Cruise Control (ACC) with Low Speed Follow*, Road Departure Mitigation (RDM), Vehicle Stability Assist® (VSA®) system, Vehicle Stability Assist® (VSA®) OFF, Low Tire Pressure/TPMS* and Collision Mitigation Braking System™ (CMBS™) may come on after reconnecting the battery. Drive a short distance at more than 12 mph (20 km/h). The indicators should go off. If they do not, have your vehicle checked by a dealer.

* Not available on all models

CMBS™ Conditions and Limitations

The system may automatically shut off and the CMBS™ indicator will come on under certain conditions. Some examples of these conditions are listed below. Other conditions may reduce some of the CMBS™ functions.

Front Sensor Camera P. 523

Environmental conditions

- Driving in bad weather (rain, fog, snow, etc.).
- Sudden changes in ambient light, such as an entrance or exit of a tunnel.
- There is little contrast between objects and the background.
- Driving into low sunlight (e.g., at dawn or dusk).
- Strong light is reflected onto the roadway.
- Driving in the shadows of trees, buildings, etc.
- Roadway objects or structures are misinterpreted as vehicles and pedestrians.
- Reflections on the interior of the windshield.
- A vehicle or a pedestrian is not clearly lit by the headlights while driving at night or in a dark lighting conditon such as in a tunnel.

Roadway conditions

- Driving on a snowy or wet roadway (obscured lane marking, vehicle tracks, reflected lights, road spray).
- Driving on curvy, winding, or undulating roads.
- The road is hilly or the vehicle is approaching the crest of a hill.

CMBS™ Conditions and Limitations

Have your vehicle checked by a dealer if you find any unusual behavior of the system (e.g., the warning message appears too frequently).

Continued

■ **Vehicle conditions**

- Headlight lenses are dirty or the headlights are not properly adjusted.
- The outside of the windshield is blocked by dirt, mud, leaves, wet snow, etc.
- The inside of the windshield is fogged.
- An abnormal tire or wheel condition (wrong size, varied size or construction, improperly inflated, compact spare tire, etc.).
- When tire chains are installed.
- The vehicle is tilted due to a heavy load or suspension modifications.
- The camera temperature gets too high.
- Driving with the parking brake applied.
- When the radar sensor in the lower bumper gets dirty.
- Driving at night or in a dark condition such as a tunnel with the headlights turned off.

■ **Detection limitations**

- A vehicle or pedestrian suddenly crosses in front of you.
- The distance between your vehicle and the vehicle or pedestrian ahead of you is too short.
- A vehicle cuts in front of you at a slow speed, and it brakes suddenly.
- When you accelerate rapidly and approach the vehicle or pedestrian ahead of you at high speed.
- The vehicle ahead of you is a motorcycle, bicycle, mobility scooter or other small vehicle.
- When there are animals in front of your vehicle.
- When you drive on a curved, winding or undulating road that makes it difficult for the sensor to properly detect a vehicle in front of you.
- The speed difference between your vehicle and a vehicle or pedestrian in front of you is significantly large.
- An oncoming vehicle suddenly comes in front of you.
- Another vehicle suddenly comes in front of you at an intersection, etc.
- Your vehicle abruptly crosses over in front of an oncoming vehicle.
- When driving through a narrow iron bridge.
- When the lead vehicle suddenly slows down.

Limitations applicable to pedestrian detection only

- When there is a group of people in front of your vehicle walking together side by side.
- Surrounding conditions or belongings of the pedestrian alter the pedestrian's shape, preventing the system from recognizing that the person is a pedestrian.
- When the pedestrian is shorter than about 3.3 feet (1 meter) or taller than about 6.6 feet (2 meters) in height.
- When a pedestrian blends in with the background.
- When a pedestrian is bent over or squatting, or when their hands are raised or they are running.
- When several pedestrians are walking ahead in a group.
- When the camera cannot correctly identify that a pedestrian is present due to an unusual shape (holding luggage, body position, size).

■ Automatic shutoff

The CMBS™ may automatically shut itself off and the CMBS™ indicator comes and stays on when:

- The temperature inside the system is high.
- You drive off-road or on a mountain road, or curved and winding road for an extended period.
- An abnormal tire condition is detected (wrong tire size, flat tire, etc.).
- The camera behind the rearview mirror, or the area around the camera, including the windshield, gets dirty.

Once the conditions that caused the CMBS™ to shut off improve or are addressed (e.g., cleaning), the system comes back on.

Continued

With Little Chance of a Collision

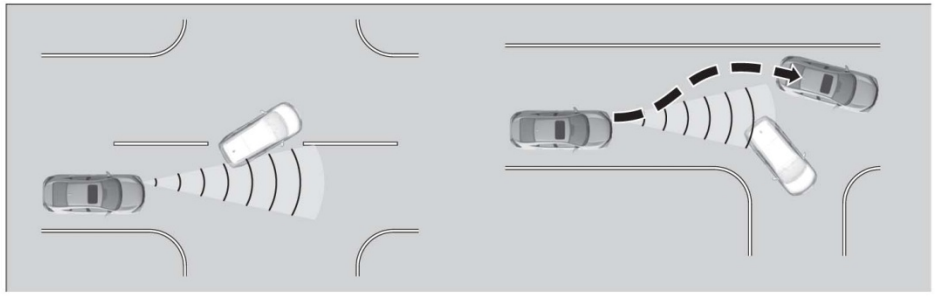
The CMBS™ may activate even when you are aware of a vehicle ahead of you, or when there is no vehicle ahead. Some examples of this are:

When Passing

Your vehicle approaches another vehicle ahead of you and you change lanes to pass.

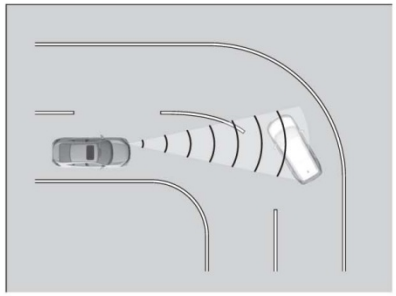
At an intersection

Your vehicle approaches or passes another vehicle that is making a left or right turn.



■ **On a curve**

When driving through curves, your vehicle comes to a point where an oncoming vehicle is right in front of you.

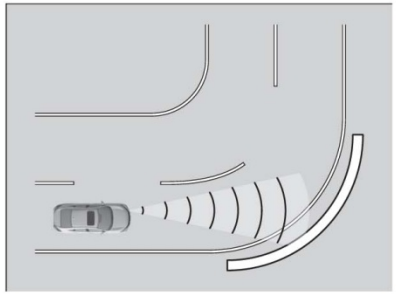


■ **Through a low bridge at high speed**

You drive under a low or narrow bridge at high speed.

■ **Speed bumps, road work sites, train tracks, roadside objects, etc.**

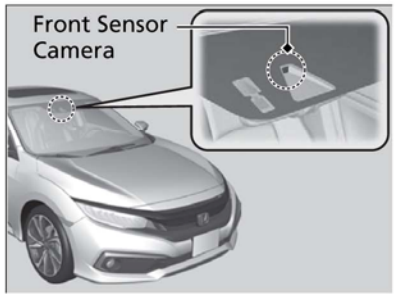
You drive over speed bumps, steel road plates, etc., or your vehicle approaches train tracks or roadside objects (such as a traffic sign and guard rail) on a curve or, when parking, stationary vehicles and walls.



Front Sensor Camera

The camera, used in systems such as LKAS, RDM, ACC*, ACC with Low Speed Follow*, and CMBS™, is designed to detect an object that triggers any of the systems to operate its functions.

Camera Location and Handling Tips



This camera is located behind the rearview mirror.

To help reduce the likelihood that high interior temperatures will cause the camera's sensing system to shut off, when parking, find a shady area or face the front of the vehicle away from the sun. If you use a reflective sun shade, do not allow it to cover the camera housing. Covering the camera can concentrate heat on it.

Front Sensor Camera

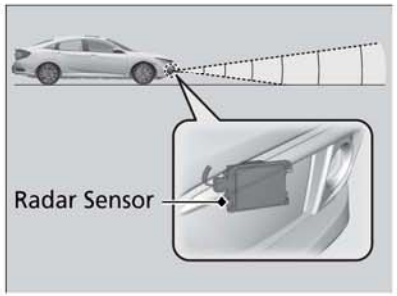
Never apply a film or attach any objects to the windshield, the hood, or the front grille that could obstruct the camera's field of vision and cause the system to operate abnormally.
Scratches, nicks, and other damage to the windshield within the camera's field of vision can cause the system to operate abnormally. If this occurs, we recommend that you replace the windshield with a genuine Honda replacement windshield. Making even minor repairs within the camera's field of vision or installing an aftermarket replacement windshield may also cause the system to operate abnormally. After replacing the windshield, have a dealer recalibrate the camera. Proper calibration of the camera is necessary for the system to operate properly.

Do not place an object on the top of the instrument panel. It may reflect onto the windshield and prevent the system from detecting lane lines properly.

* Not available on all models

Continued

Radar Sensor



The radar sensor is in the lower bumper.

Radar Sensor

Avoid strong impacts to the radar sensor cover.

For the CMBS to work properly:
- Always keep the radar sensor cover clean.
- Never use chemical solvents or polishing powder for cleaning the sensor cover. Clean it with water or a mild detergent.
- Do not put a sticker on the radar sensor cover or replace the radar sensor cover.

If you need the radar sensor to be repaired, or removed, or the radar sensor cover is strongly impacted, turn off the system by using the CMBS OFF button and take your vehicle to a dealer.

CMBS™ On and Off P. 474

If the vehicle is involved in any of the following situations, the radar sensor may not work properly. Have your vehicle checked by a dealer:
- Your vehicle is involved in a frontal collision.
- Your vehicle drives through deep water or is submerged in deep water.
- Your vehicle strongly strikes a bump, curb, chock, or embankment that could jar the radar sensor.

APPENDIX C

Run Log

Subject Vehicle: **2020 Honda Civic 2.0L 4D Sport** Test Date: **1/16/2020**

Principal Other Vehicle: **2006 Acura RL**

Run	Test Type	Valid Run?	TTCW Sound (sec)	TTCW Light (sec)	TTCW Margin (sec)	Pass/Fail	Notes
1	**Stopped POV**	Y	2.73	2.65	0.63	Pass	
2		Y	2.61	2.55	0.51	Pass	
3		Y	2.76	2.68	0.66	Pass	
4		Y	2.70	2.59	0.60	Pass	
5		Y	2.76	2.71	0.66	Pass	
6		Y	2.61	2.56	0.51	Pass	
7		Y	2.69	2.65	0.59	Pass	
15	**Decelerating POV, 45**	N					Speed, yaw rate
16		Y	2.93	3.02	0.62	Pass	
17		Y	2.72	3.12	0.72	Pass	
18		Y	2.66	2.93	0.53	Pass	
19		N					SV tapped brake pedal
20		Y	2.98	3.17	0.77	Pass	
21		Y	2.86	3.05	0.65	Pass	
22		Y	3.09	3.12	0.72	Pass	
23		Y	2.90	3.11	0.71	Pass	
8	**Slower POV, 45 vs 20**	Y	2.64	2.77	0.77	Pass	

Run	Test Type	Valid Run?	TTCW Sound (sec)	TTCW Light (sec)	TTCW Margin (sec)	Pass/Fail	Notes
9		Y	2.51	2.74	0.74	Pass	
10		Y	2.61	2.83	0.83	Pass	
11		Y	2.61	2.83	0.83	Pass	
12		Y	2.54	2.72	0.72	Pass	
13		Y	2.69	2.81	0.81	Pass	
14		Y	2.49	2.52	0.52	Pass	

APPENDIX D

Time History Plots

LIST OF FIGURES

Description of Time History Plots

A set of time history plots is provided for each valid run in the test series. Each set of plots comprises time varying data from both the Subject Vehicle (SV) and the Principal Other Vehicle (POV), as well as pass/fail envelopes and thresholds. The following is a description of data types shown in the time history plots, as well as a description of the color code indicating to which vehicle the data pertain.

Each time history plot consists of data pertinent to the test type under consideration, and therefore the data channels plotted vary according to test type. The test types (shown in the plot titles) include:

- FCW Test 1 – Stopped POV (SV at 45 mph)
- FCW Test 2 – Decelerating POV (Both vehicles at 45 mph with a 30 m gap, POV brakes at 0.3 g)
- FCW Test 3 – Slower Moving POV (SV at 45 mph, POV at 20 mph)

Time history figures include the following sub-plots:

- Warning – Displays the Forward Collision Warning Alert (which can be audible, visual, or haptic). Depending on the type of FCW alert or instrumentation used to measure the alert, this can be any of the following:
    - Filtered, rectified, and normalized sound signal. The vertical scale is 0 to 1.
    - Filtered, rectified, and normalized acceleration (e.g., haptic alert, such as steering wheel vibration). The vertical scale is 0 to 1.
    - Light sensor signal
- TTC (sec) – Indicates the Time to Collision as calculated up to the point of FCW alert issuance. The value of TTCW (Time to Collision at Warning) is given numerically on the right side of the figure. A passing value is indicated in green, while a failing value is indicated in red.
- SV Speed (mph) – Speed of the Subject Vehicle
- POV Speed (mph) – Speed of the Principal Other Vehicle
- Yaw Rate (deg/sec) – Yaw rate of both the Subject Vehicle and Principal Other Vehicle

- Lateral Offset (ft) – Lateral offset within the lane from the Subject Vehicle to the Principal Other Vehicle
- Ax (g) – Longitudinal acceleration of both the Subject Vehicle and Principal Other Vehicle
- Headway (ft) – Longitudinal separation between front of Subject Vehicle to rear of Principal Other Vehicle (Exclusive to test type 2)

Note that the minimum (worst) GPS fix type is displayed in the lower right corner of each page. The only valid fix type is RTK fixed (displayed in green). If the fix type during any portion of the test was anything other than RTK fixed, then "RTK Fixed OR LESS!!" is displayed in red.

Envelopes and Thresholds

Each of the time history plot figures can contain either green or yellow envelopes and/or black threshold lines. These envelopes and thresholds are used to programmatically and visually determine the validity of a given test run. Envelope and threshold exceedances are indicated with either red shading or red asterisks, and red text is placed to the right side of the plot indicating the type of exceedance.

Green envelopes indicate that the time-varying data should not exceed the envelope boundaries at any time within the envelope. Exceedances of a green envelope are indicated by red shading in the area between the measured time-varying data and the envelope boundaries.

Yellow envelopes indicate that the time-varying data should not exceed the envelope only at the left and/or right ends. Exceedances at the left or right extent of a yellow envelope are indicated by red asterisks.

For the warning plot, a dashed black threshold line indicates the threshold used to determine the onset of the FCW alert. The alert is considered on the first time the alert signal crosses this threshold line.

For the TTC plot, a dashed black threshold line indicates the minimum allowable TTC for the given test scenario. If the FCW alert occurs before this minimum allowable TTC, a green dot appears. However, if there is no alert or the alert occurs after the minimum allowable TTC, a red asterisk is shown on the plot.

For the Ax plot, a dashed black threshold line is given for at a value of -0.05 g. For a test run to be valid, the longitudinal acceleration of the Subject Vehicle must not fall below this threshold (i.e. the driver cannot apply any brakes). Additionally, for test type 2, the plot indicating the longitudinal acceleration of the Principal Other Vehicle

includes a yellow envelope indicating the deceleration (0.3 g ± 0.03 g) allowed while braking. Exceedance of this threshold is indicated with red asterisks at the beginning and/or end of the threshold boundary.

Color Codes

Color codes have been adopted to easily identify which data correspond to which vehicle, as well as to indicate the types of envelopes and thresholds used in the plots.

Color codes can be broken into four categories:

1. Time-varying data
2. Validation envelopes and thresholds
3. Instantaneous samplings
4. Text

1. Time-varying data color codes:
   - Blue = Subject Vehicle data
   - Magenta = Principal Other Vehicle data
   - Brown = Relative data between SV and POV (i.e., TTC, lateral offset and headway distance)

2. Validation envelope and threshold color codes:
   - Green envelope = time varying data must be within the envelope at all times in order to be valid
   - Yellow envelope = time varying data must be within limits at left and/or right ends
   - Black threshold (Solid) = time varying data must not exceed this threshold in order to be valid
   - Black threshold (Dashed) = for reference only – this can include warning level thresholds, TTC thresholds, and acceleration thresholds

3. Instantaneous sampling color codes:
   - Green circle = passing or valid value at a given moment in time
   - Red asterisk = failing or invalid value at a given moment in time

4. Text color codes:
    - Green = passing or valid value
    - Red = failing or invalid value

Examples of time history plots for each test type (including passing, failing and invalid runs) are shown in Figure D1 through Figure D6. Actual time history data plots for the vehicle under consideration are provided subsequently.

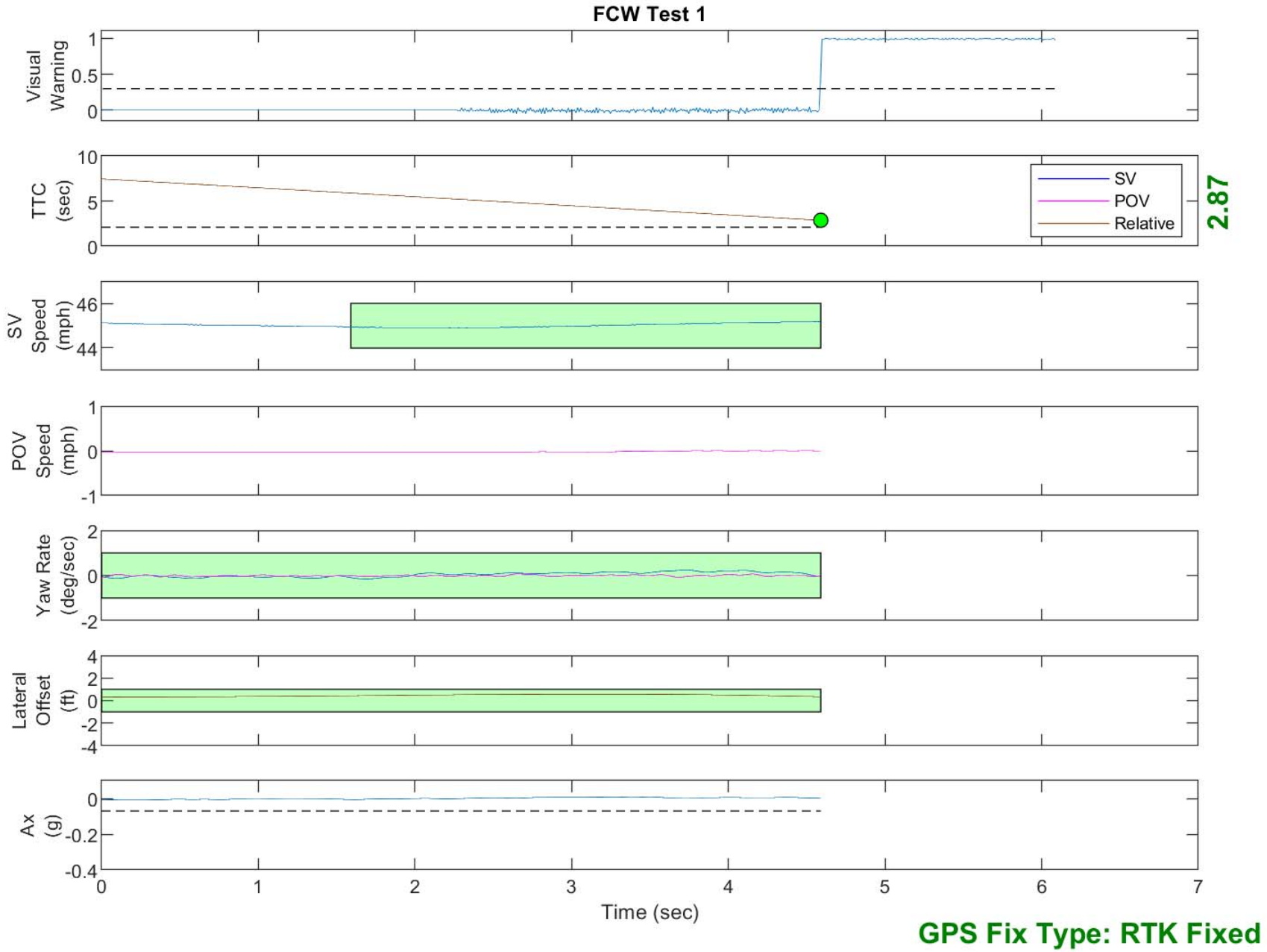


Figure D1. Example Time History for Test Type 1, Passing

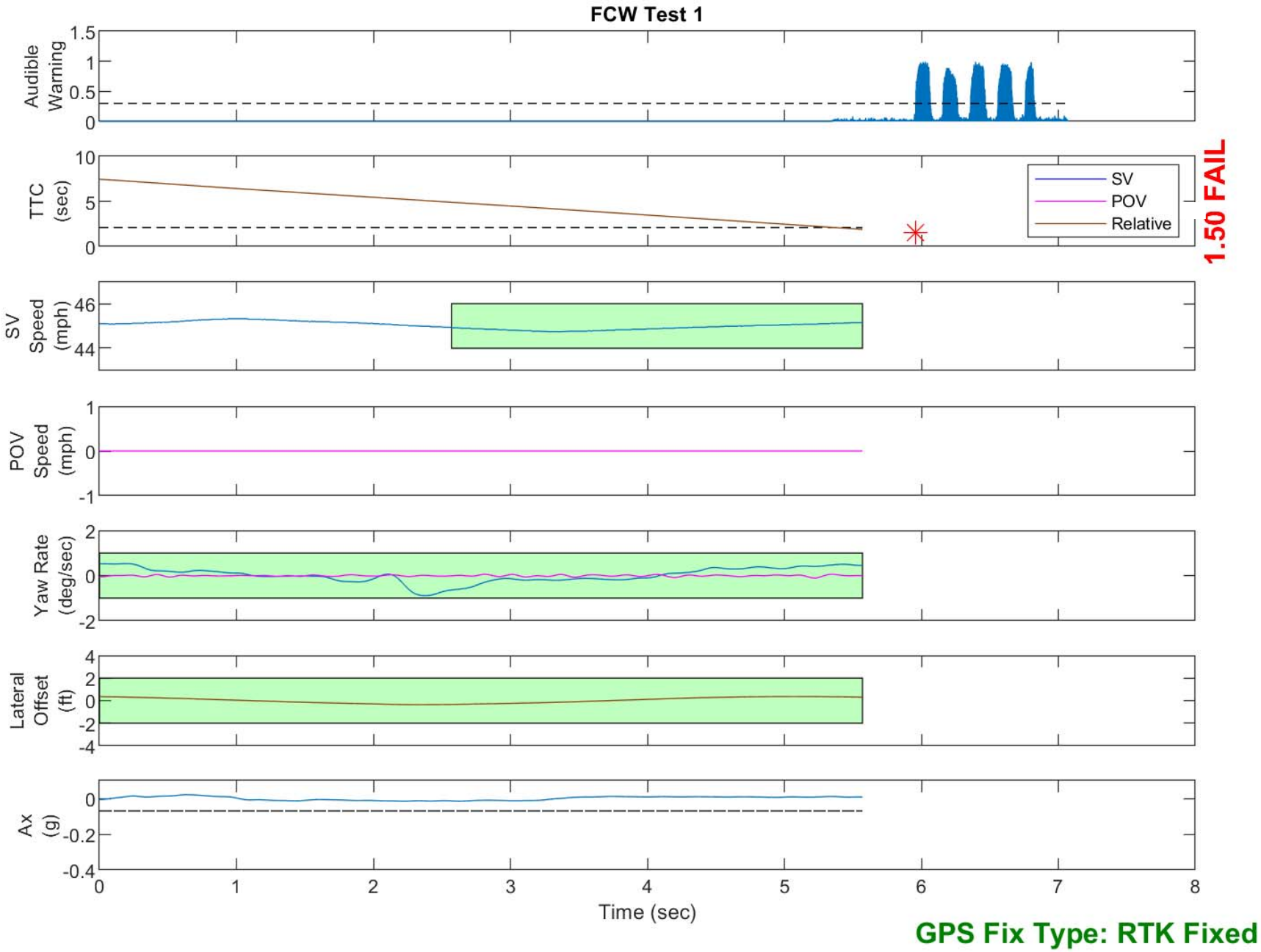


Figure D2. Example Time History for Test Type 1, Failing

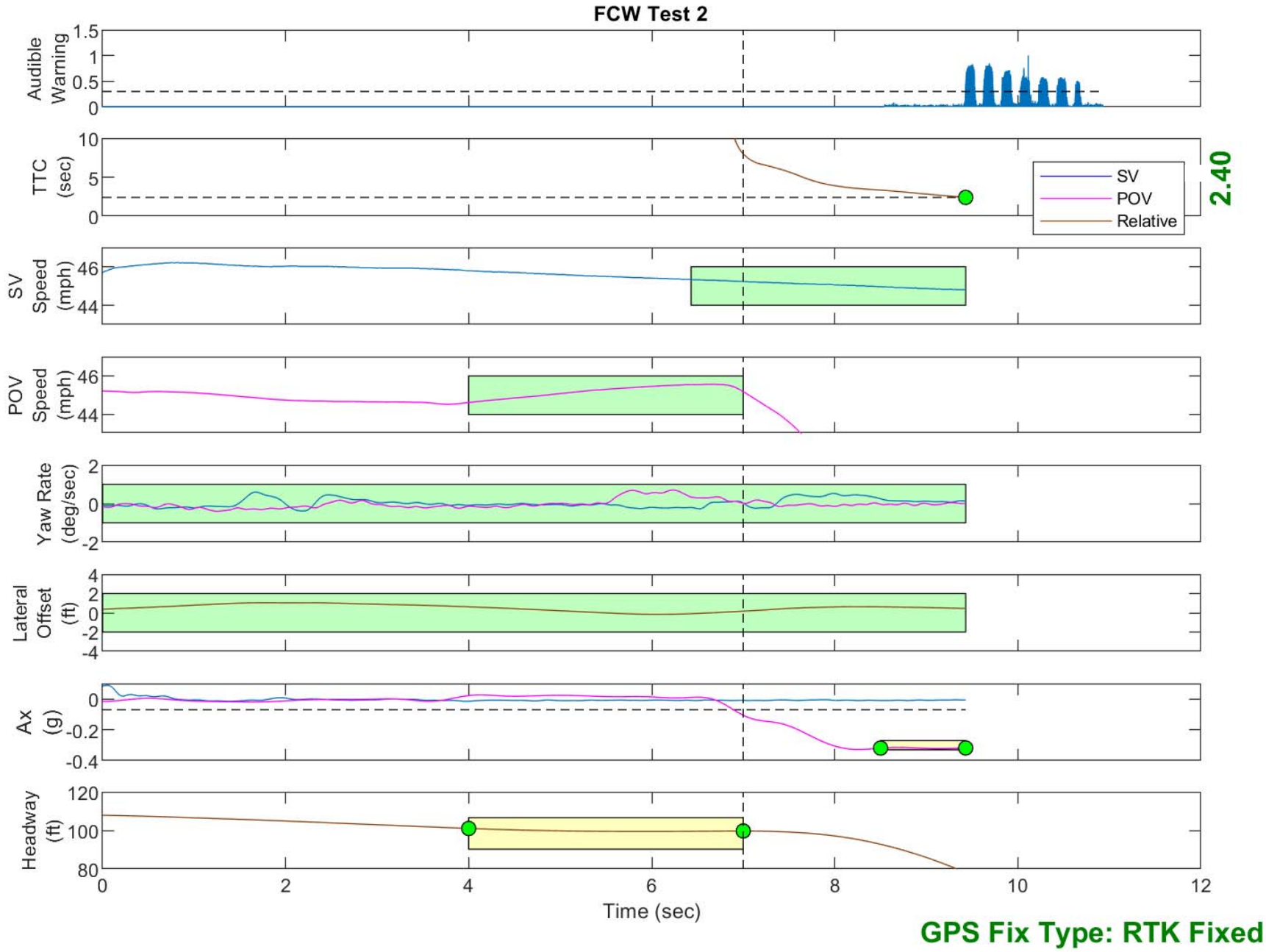


Figure D3. Example Time History for Test Type 2, Passing

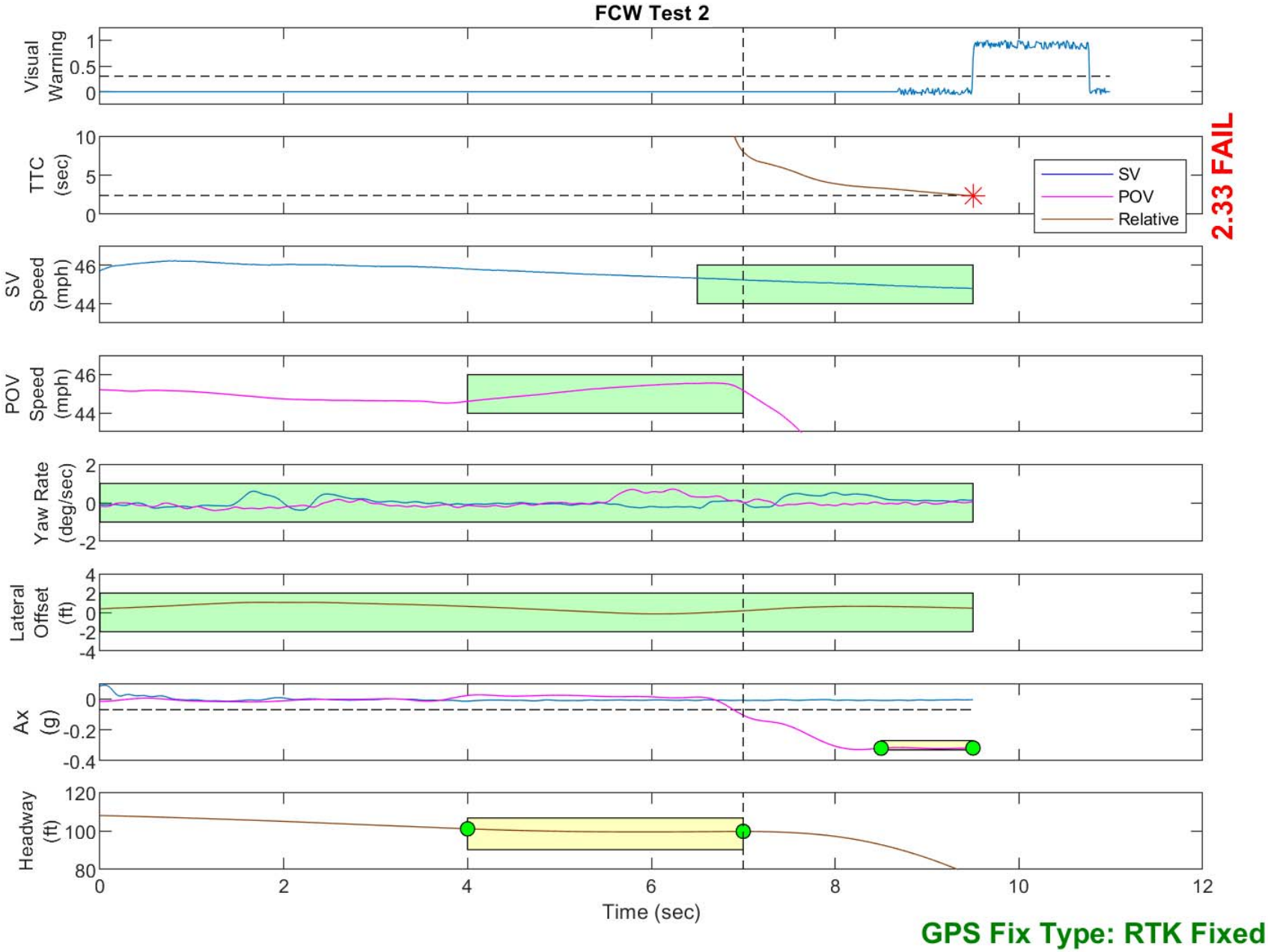


Figure D4. Example Time History for Test Type 2, Failing

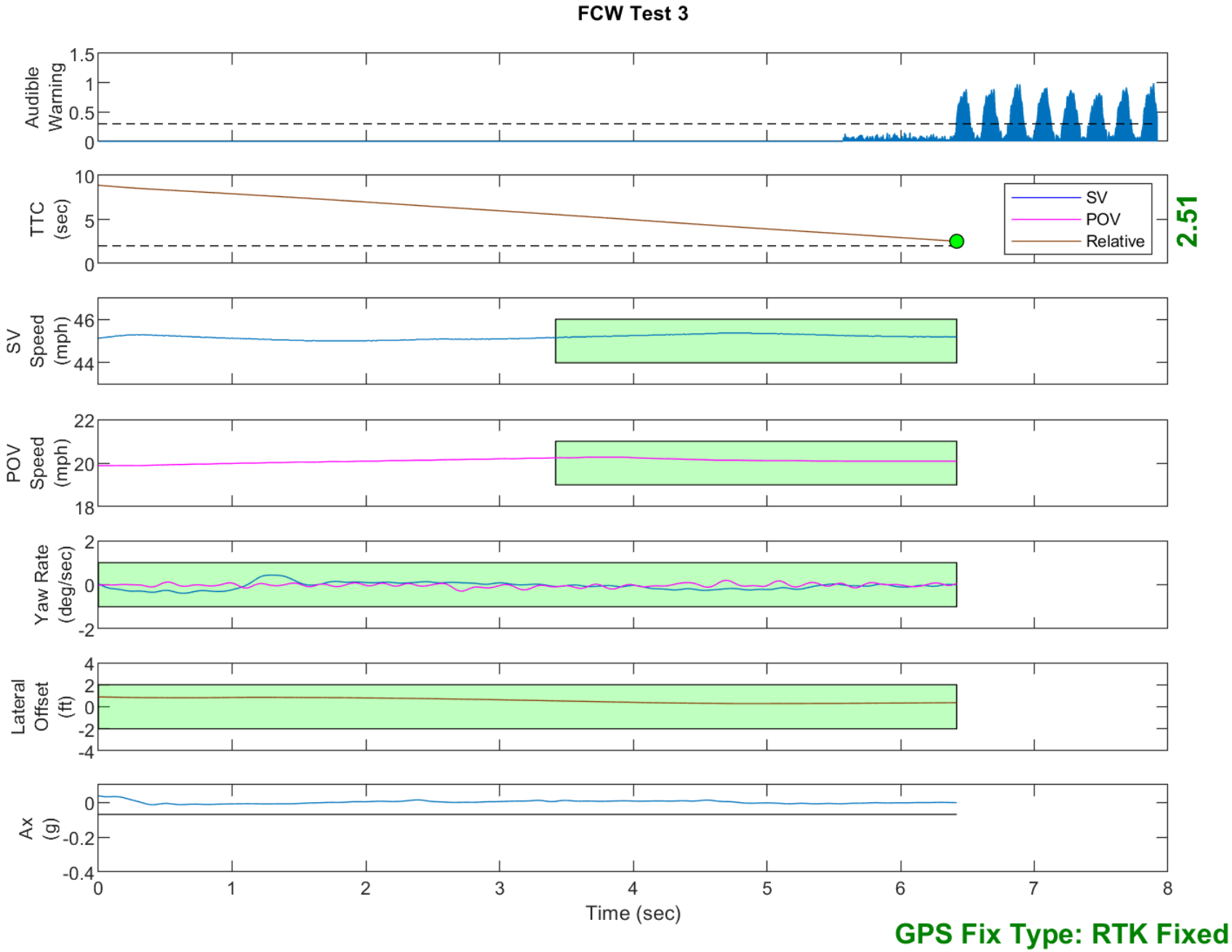


Figure D5. Example Time History for Test Type 3, Passing

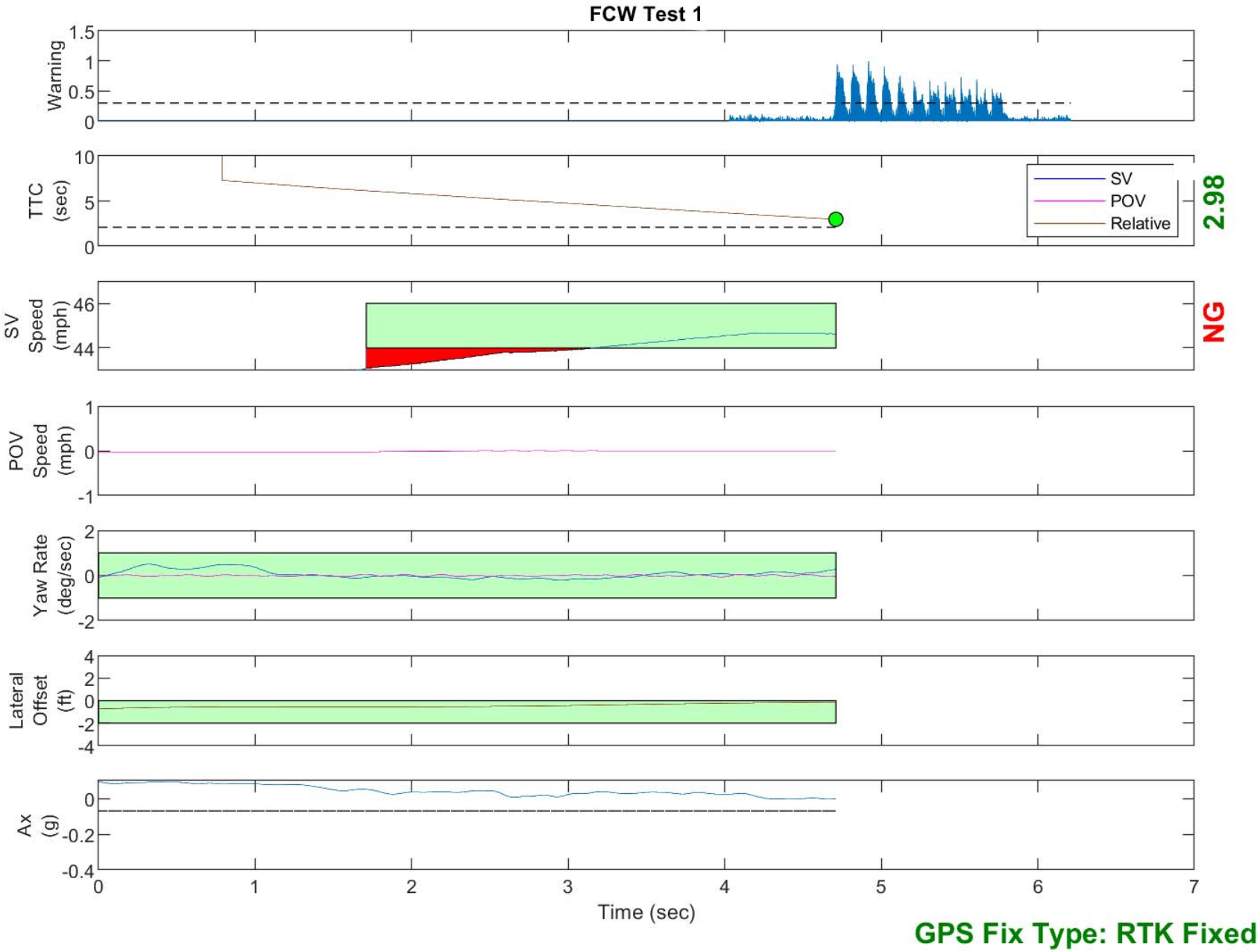


Figure D6. Example Time History for Test Type 2, Invalid Run Due to Subject Vehicle Speed

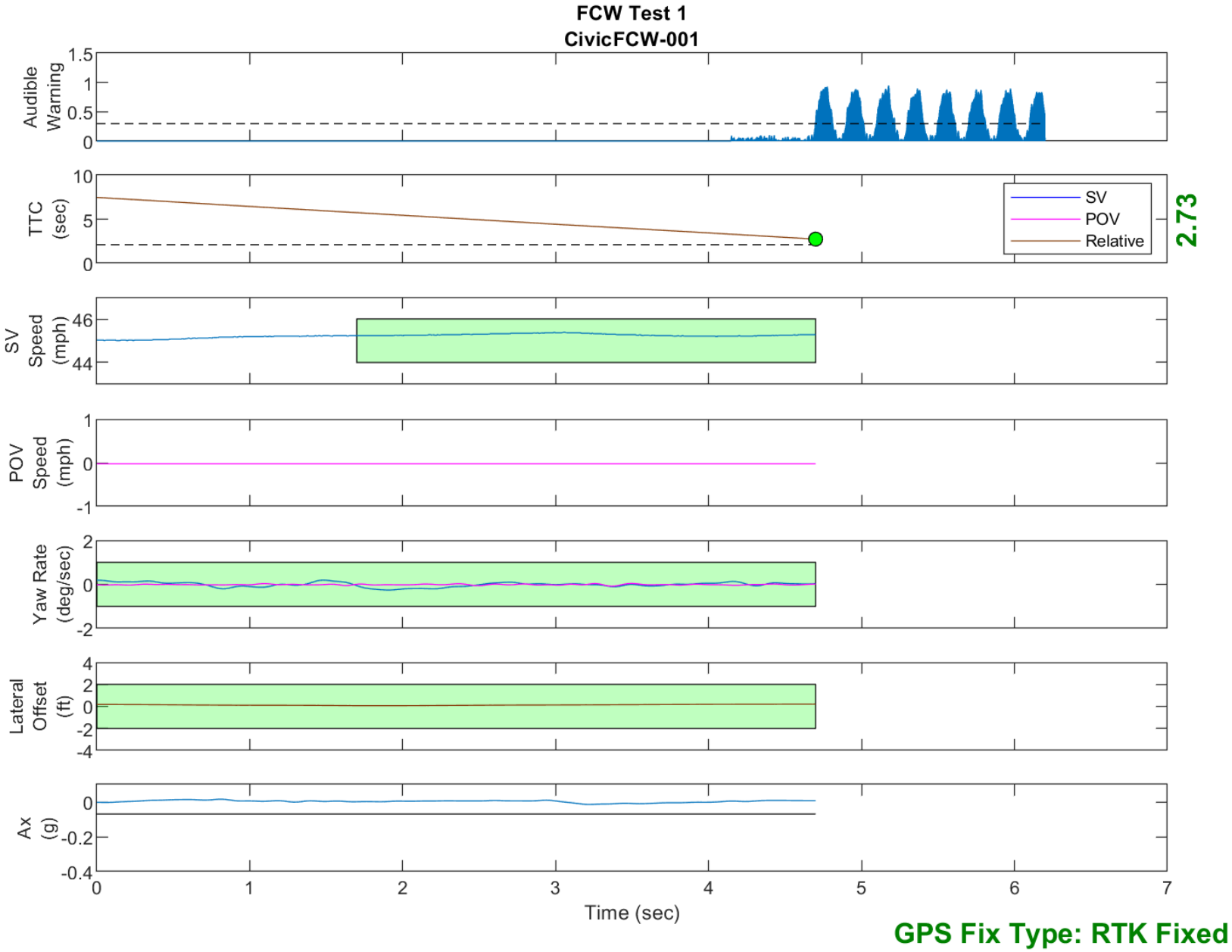


Figure D7. Time History for Run 01, FCW Test 1, Audible Warning

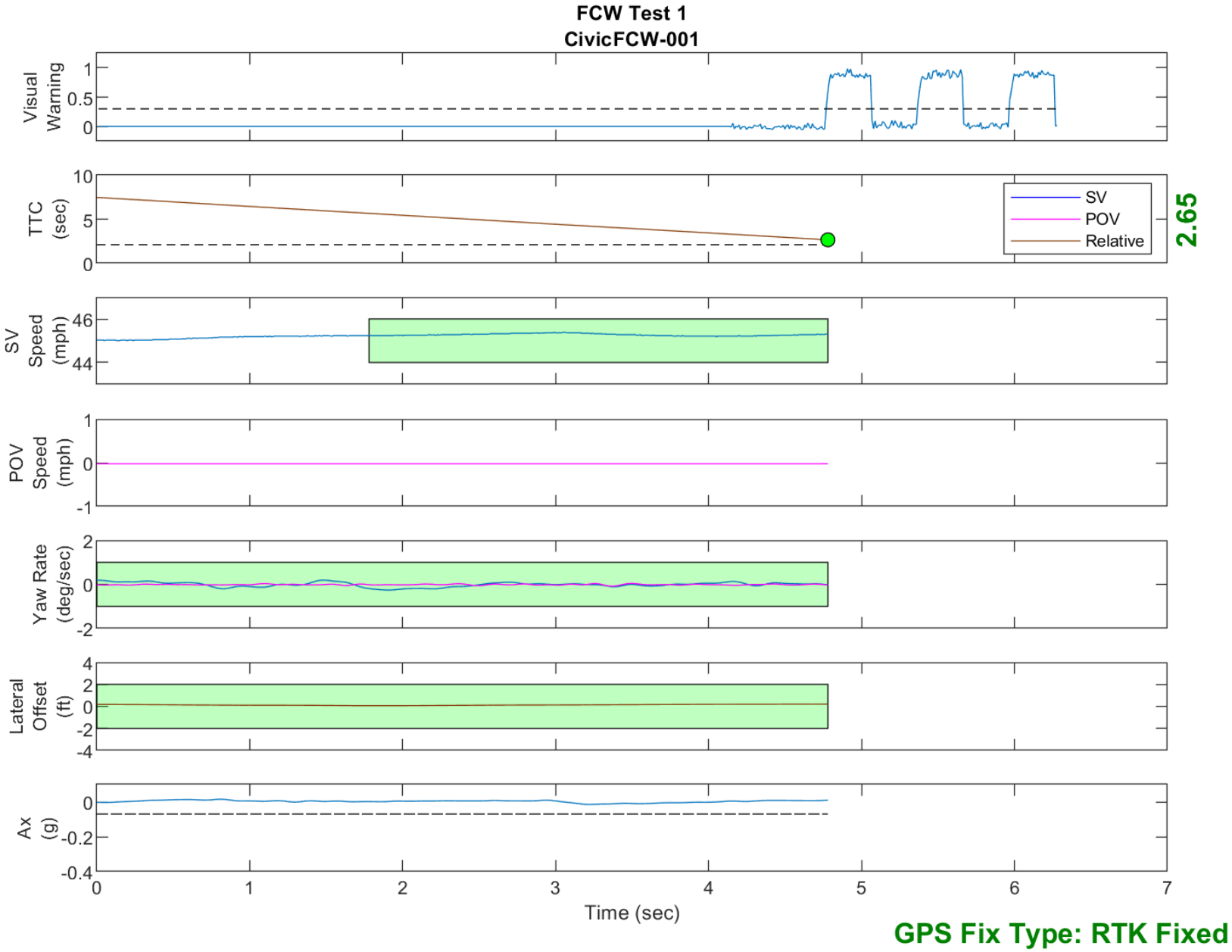


Figure D8. Time History for Run 01, FCW Test 1, Visual Warning

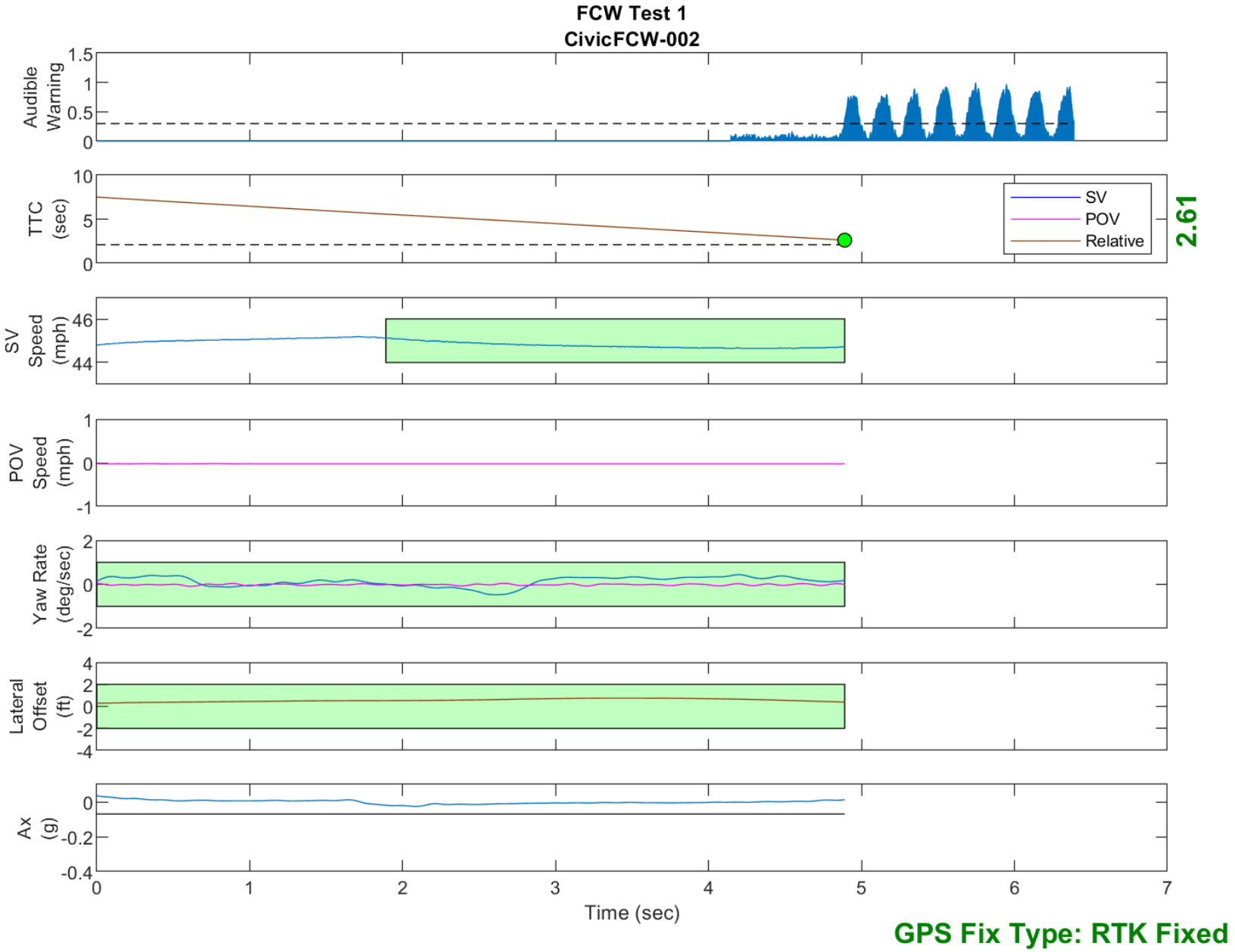


Figure D9. Time History for Run 02, FCW Test 1, Audible Warning

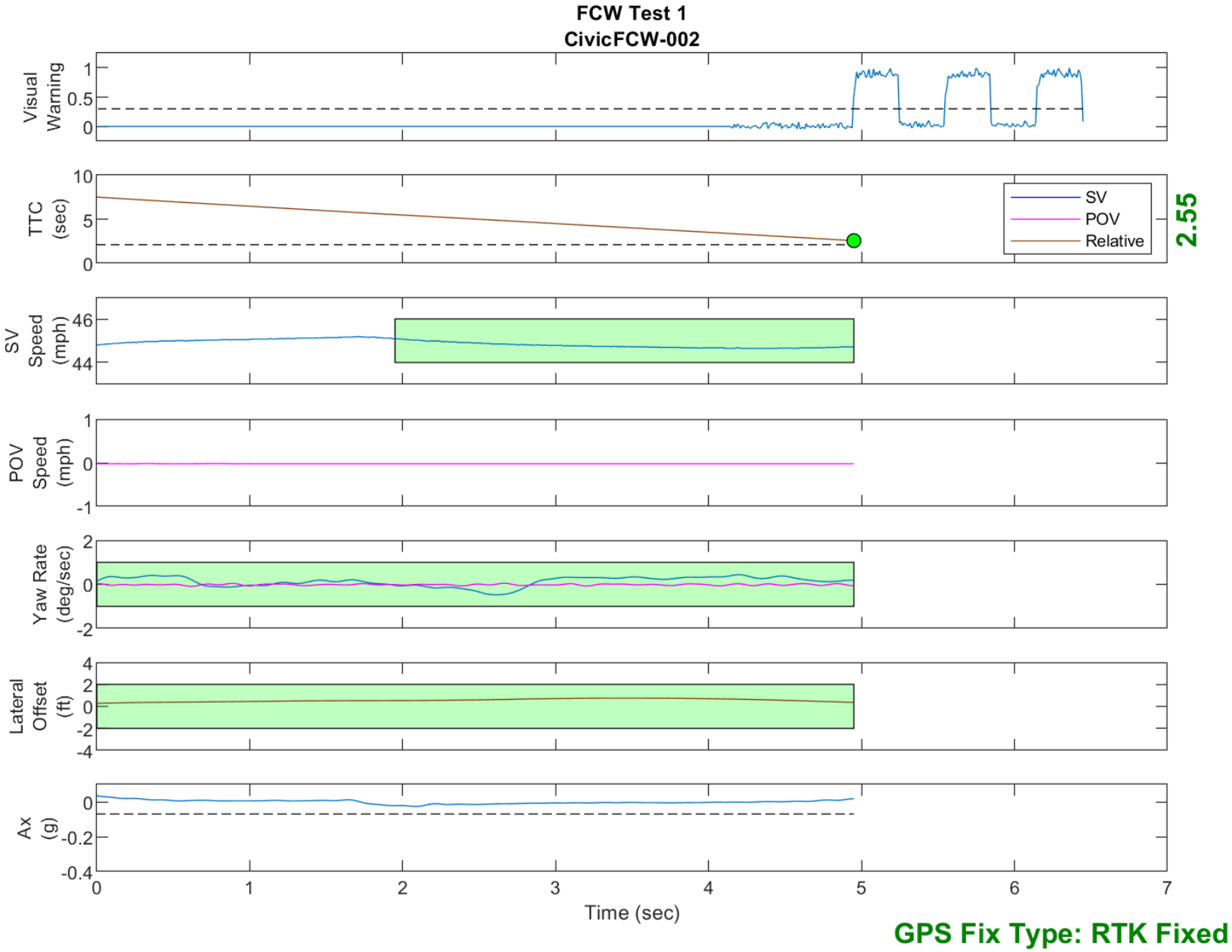


Figure D10. Time History for Run 02, FCW Test 1, Visual Warning

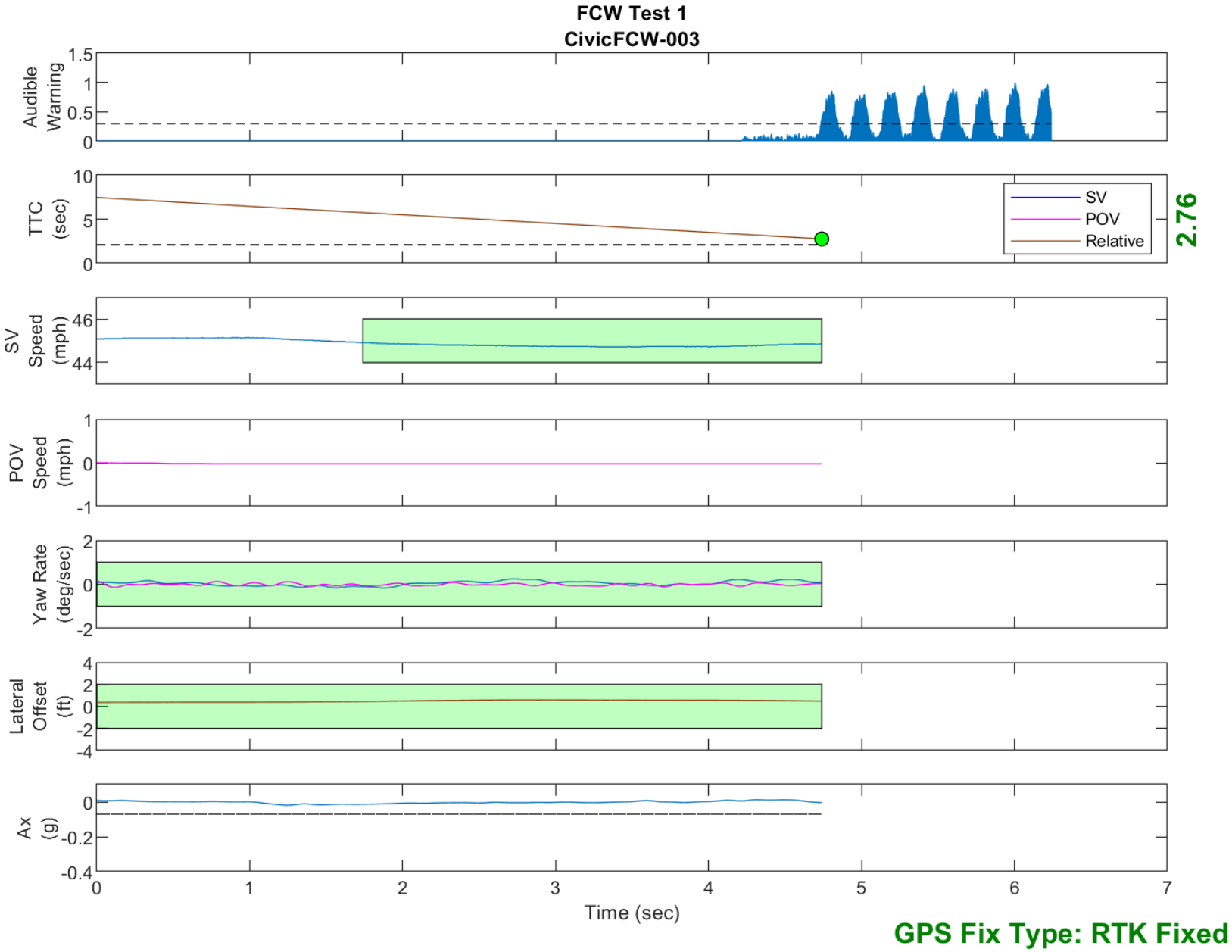


Figure D11. Time History for Run 03, FCW Test 1, Audible Warning

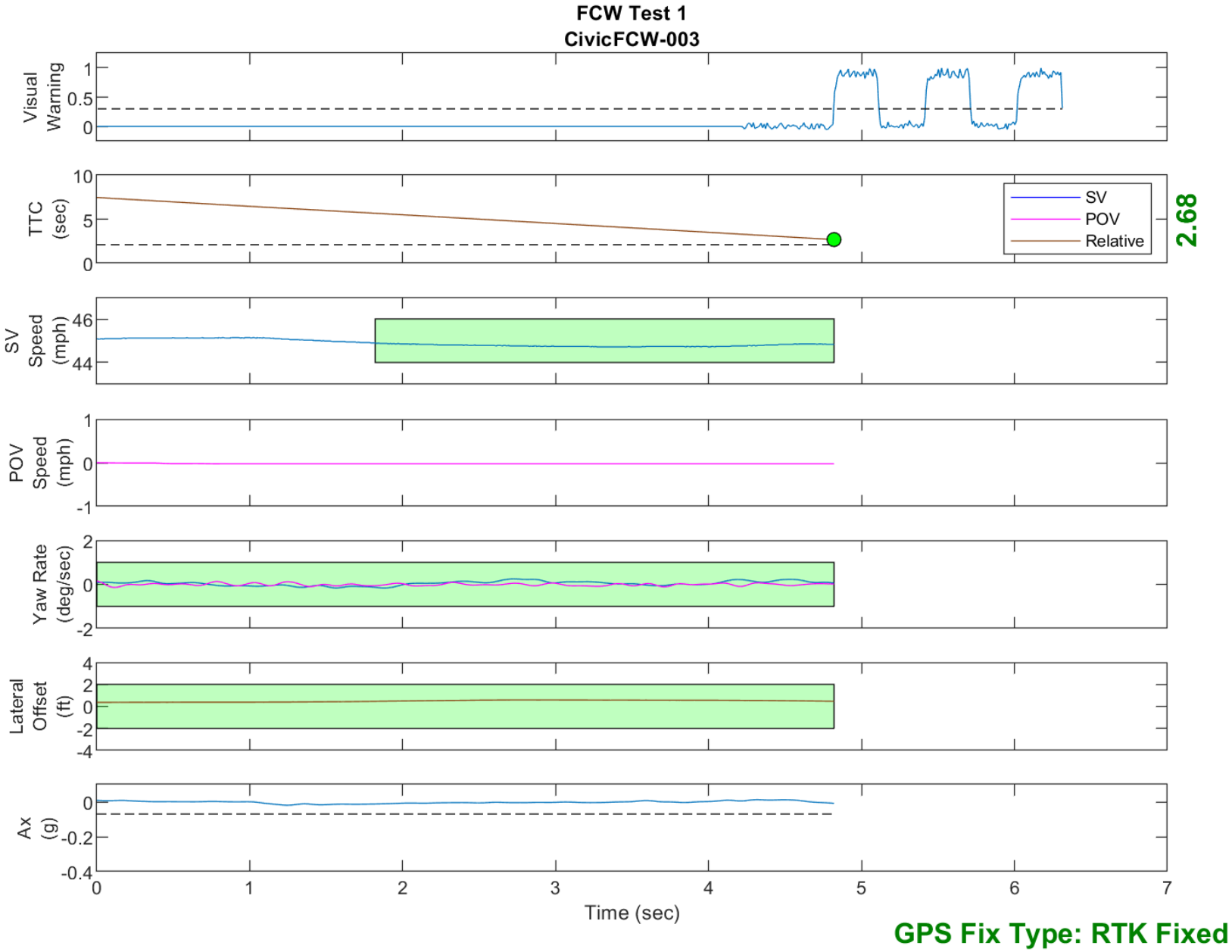


Figure D12. Time History for Run 03, FCW Test 1, Visual Warning

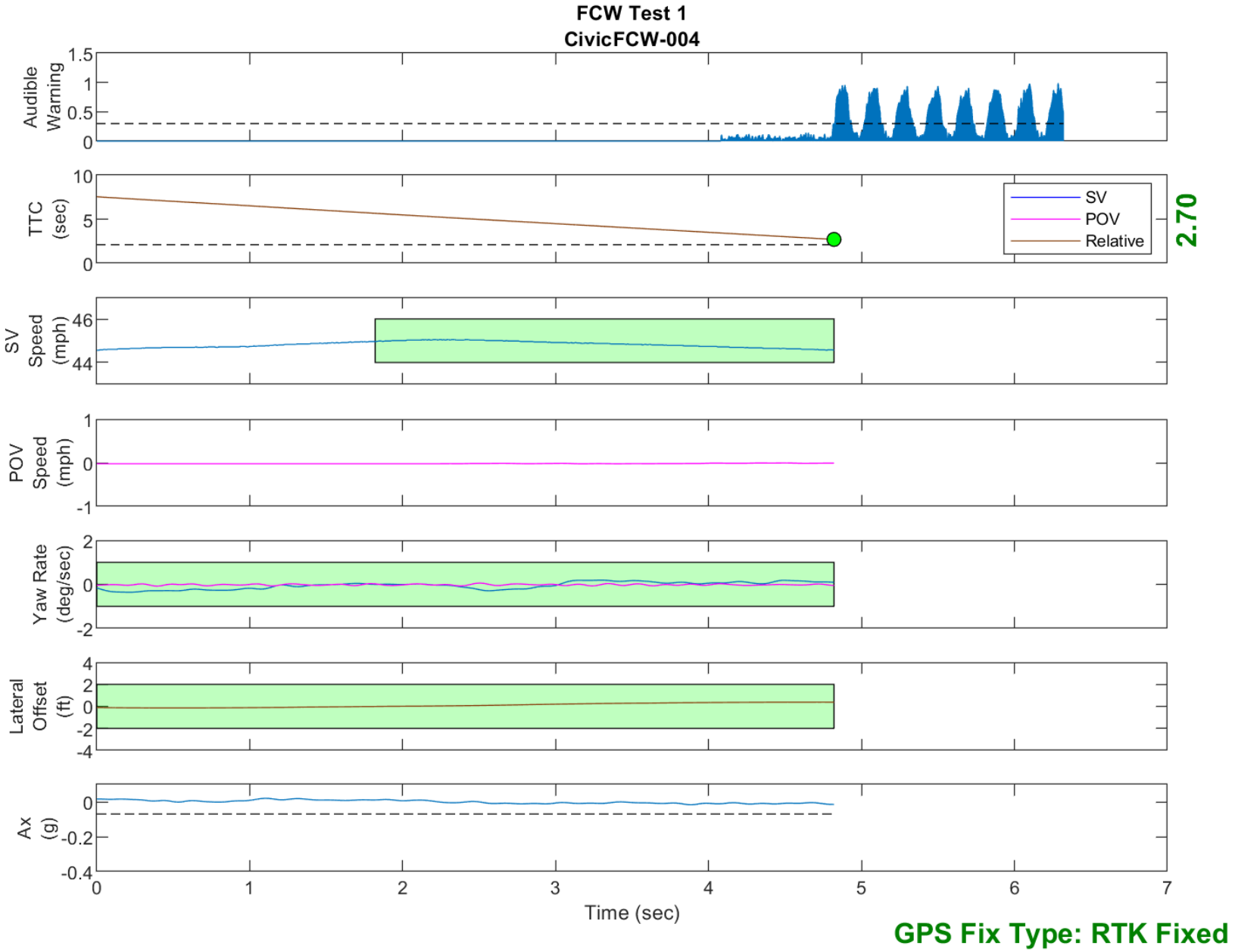


Figure D13. Time History for Run 04, FCW Test 1, Audible Warning

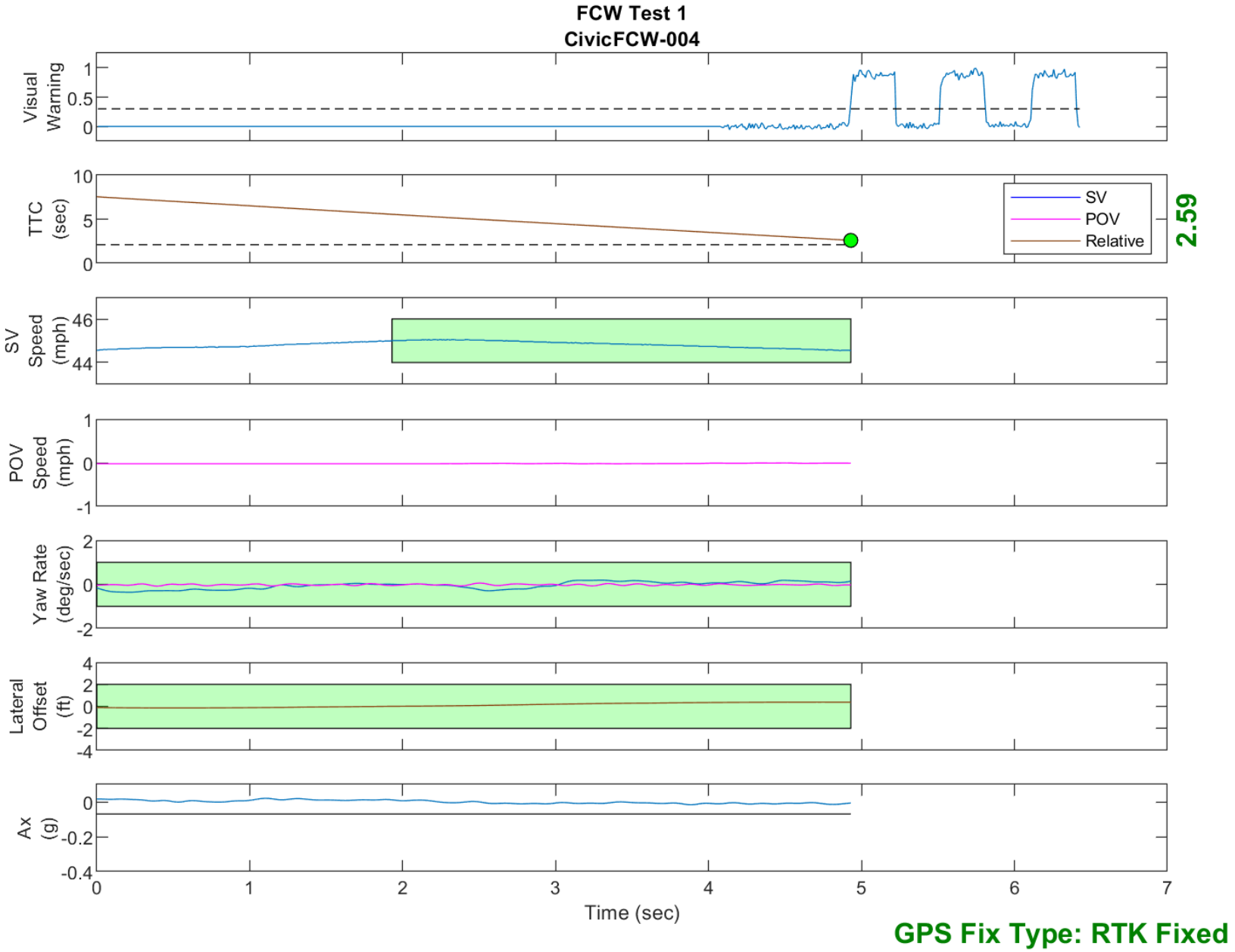


Figure D14. Time History for Run 04, FCW Test 1, Visual Warning

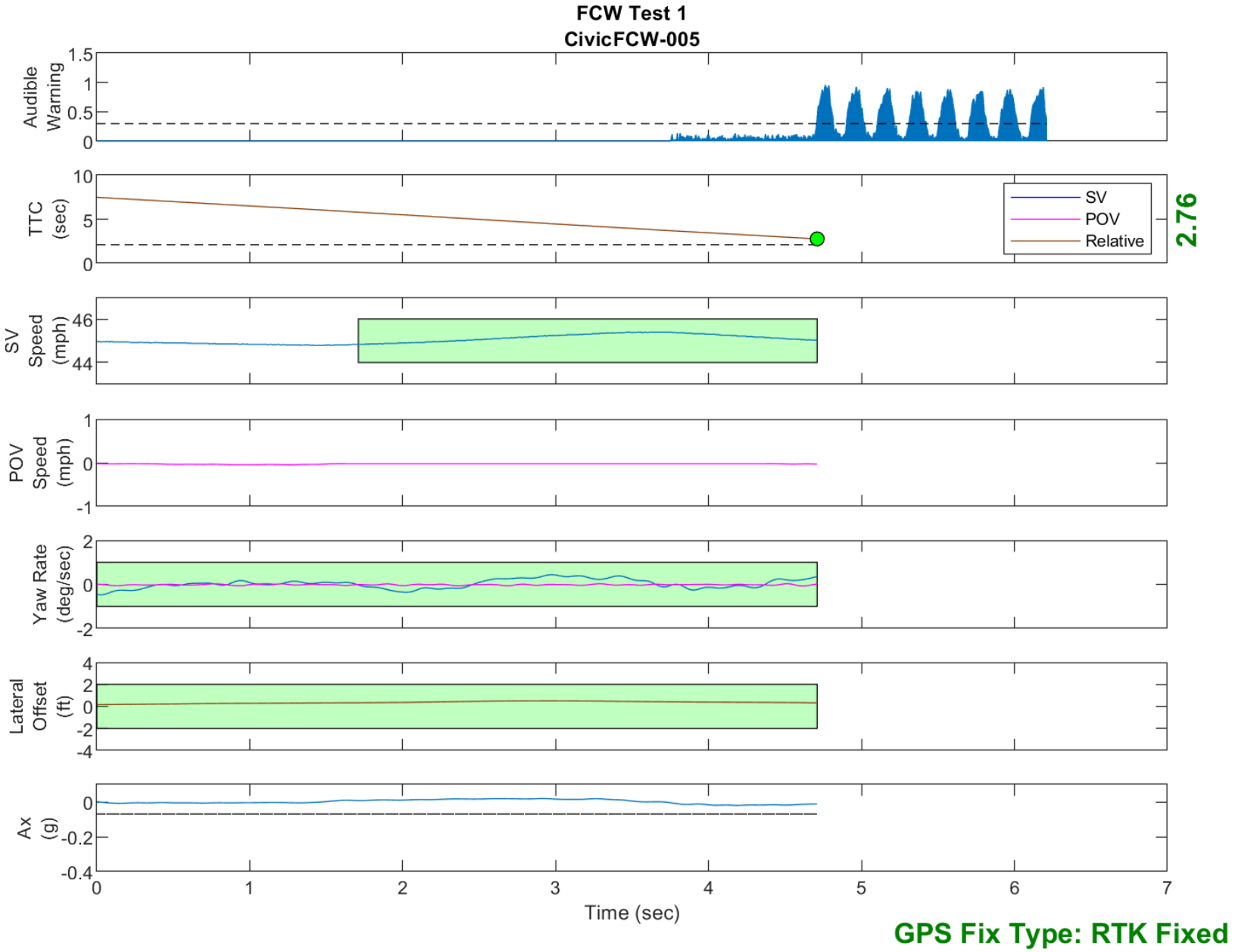


Figure D15. Time History for Run 05, FCW Test 1, Audible Warning

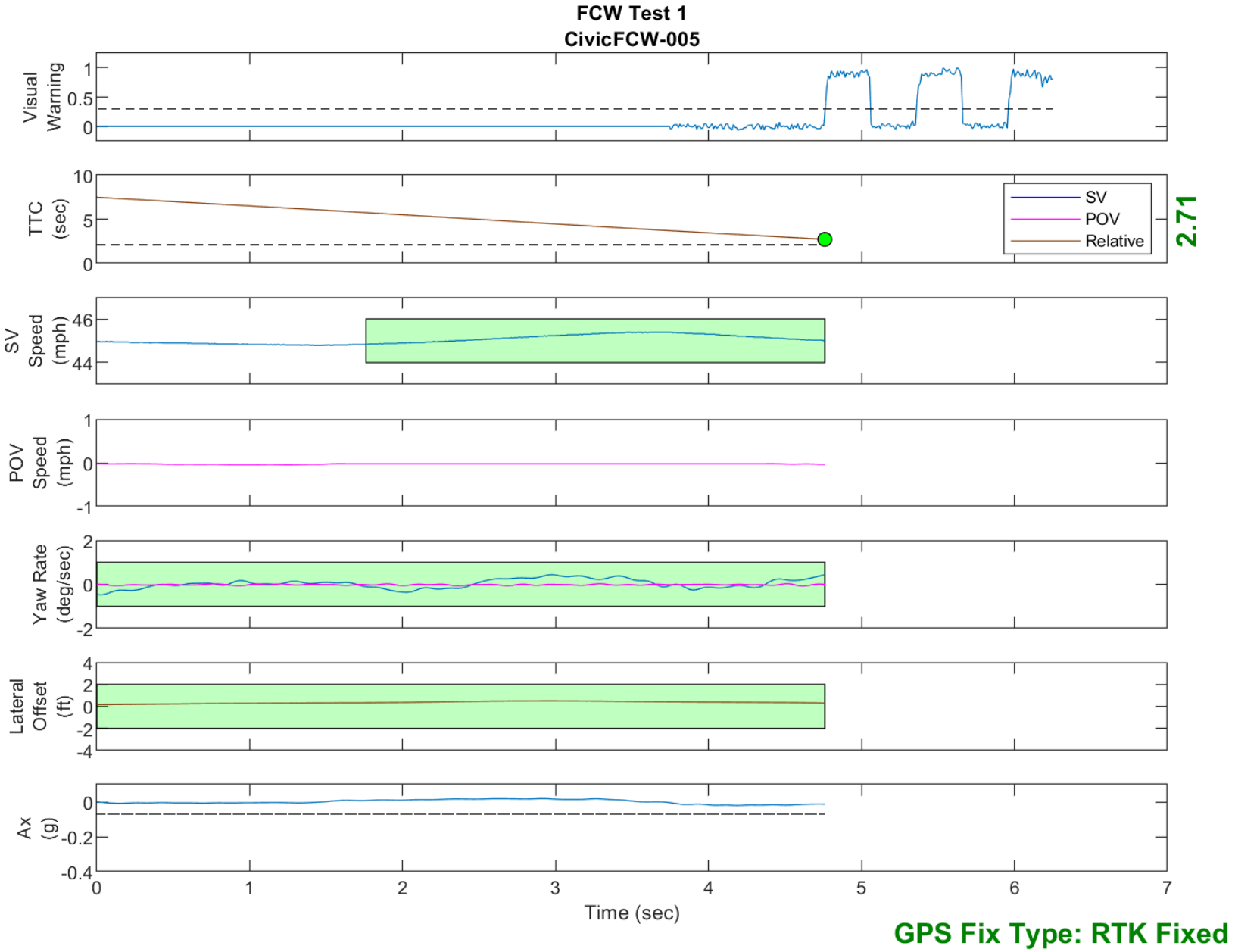


Figure D16. Time History for Run 05, FCW Test 1, Visual Warning

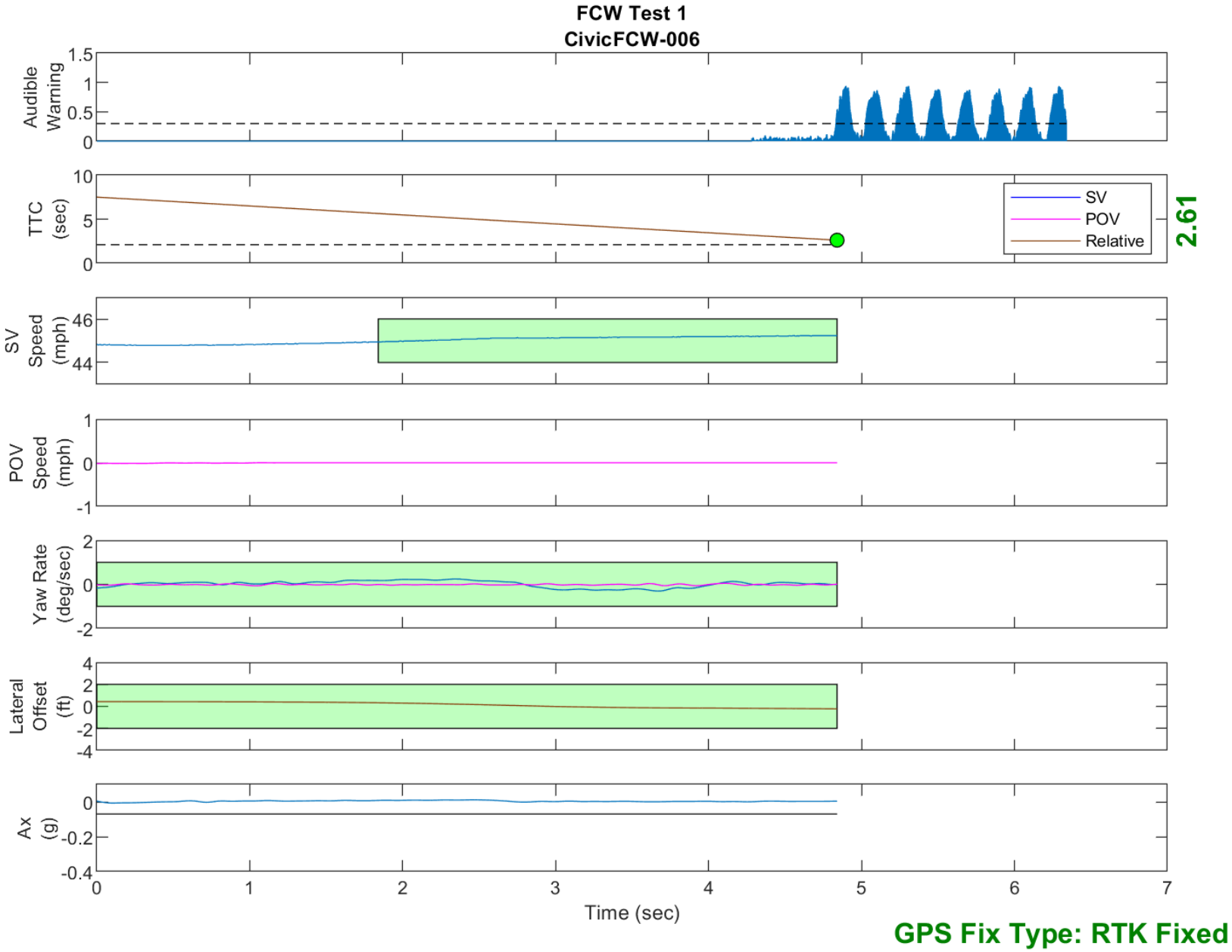


Figure D17. Time History for Run 06, FCW Test 1, Audible Warning

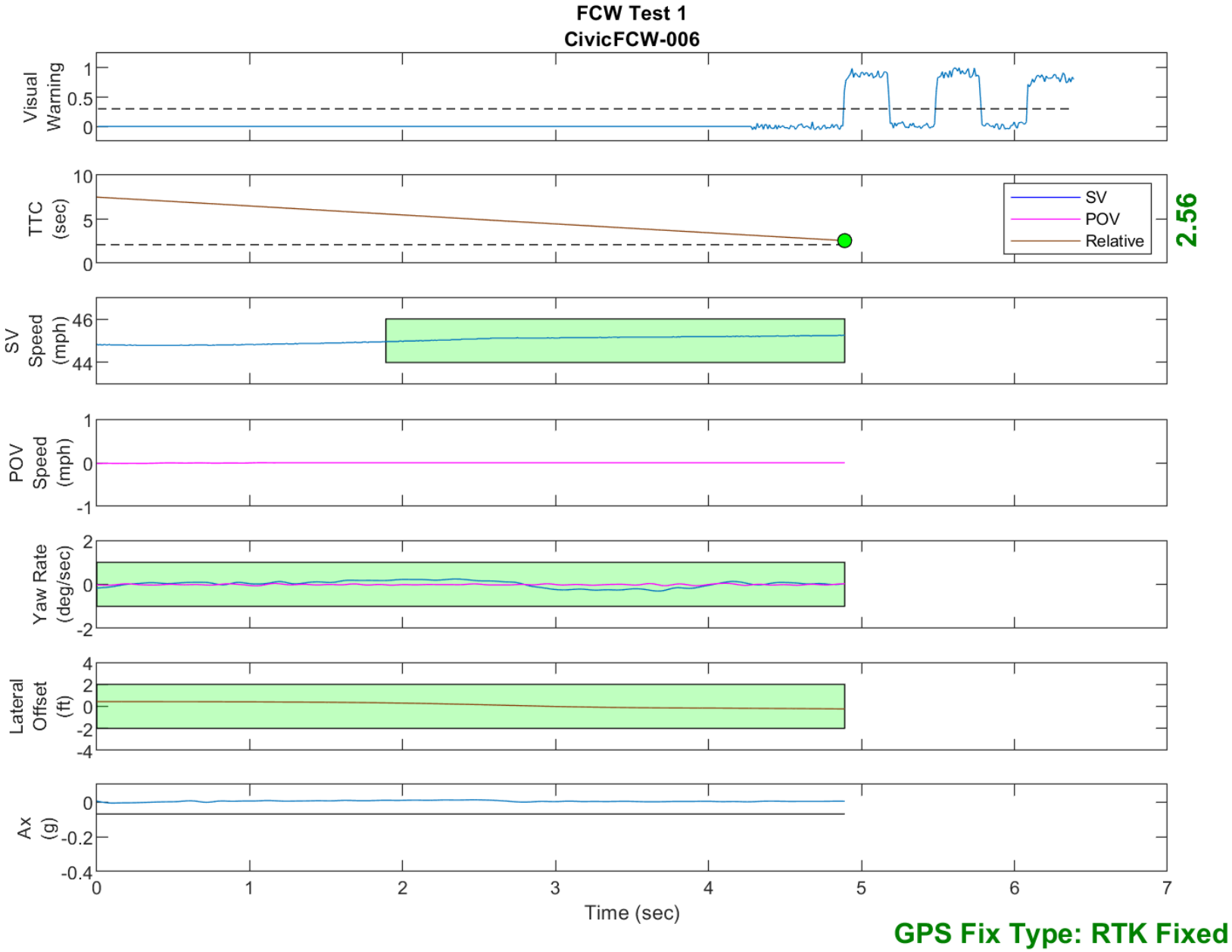


Figure D18. Time History for Run 06, FCW Test 1, Visual Warning

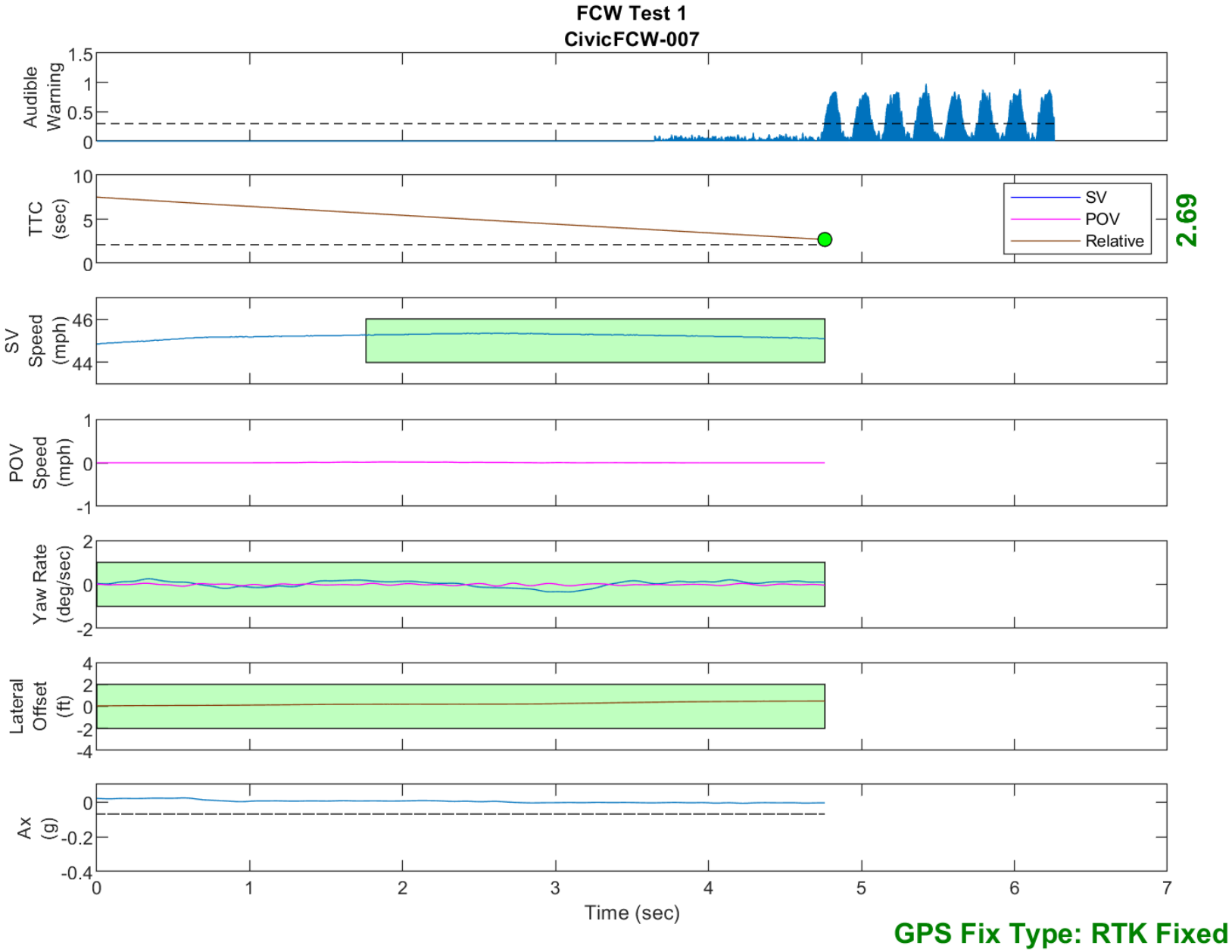


Figure D19. Time History for Run 07, FCW Test 1, Audible Warning

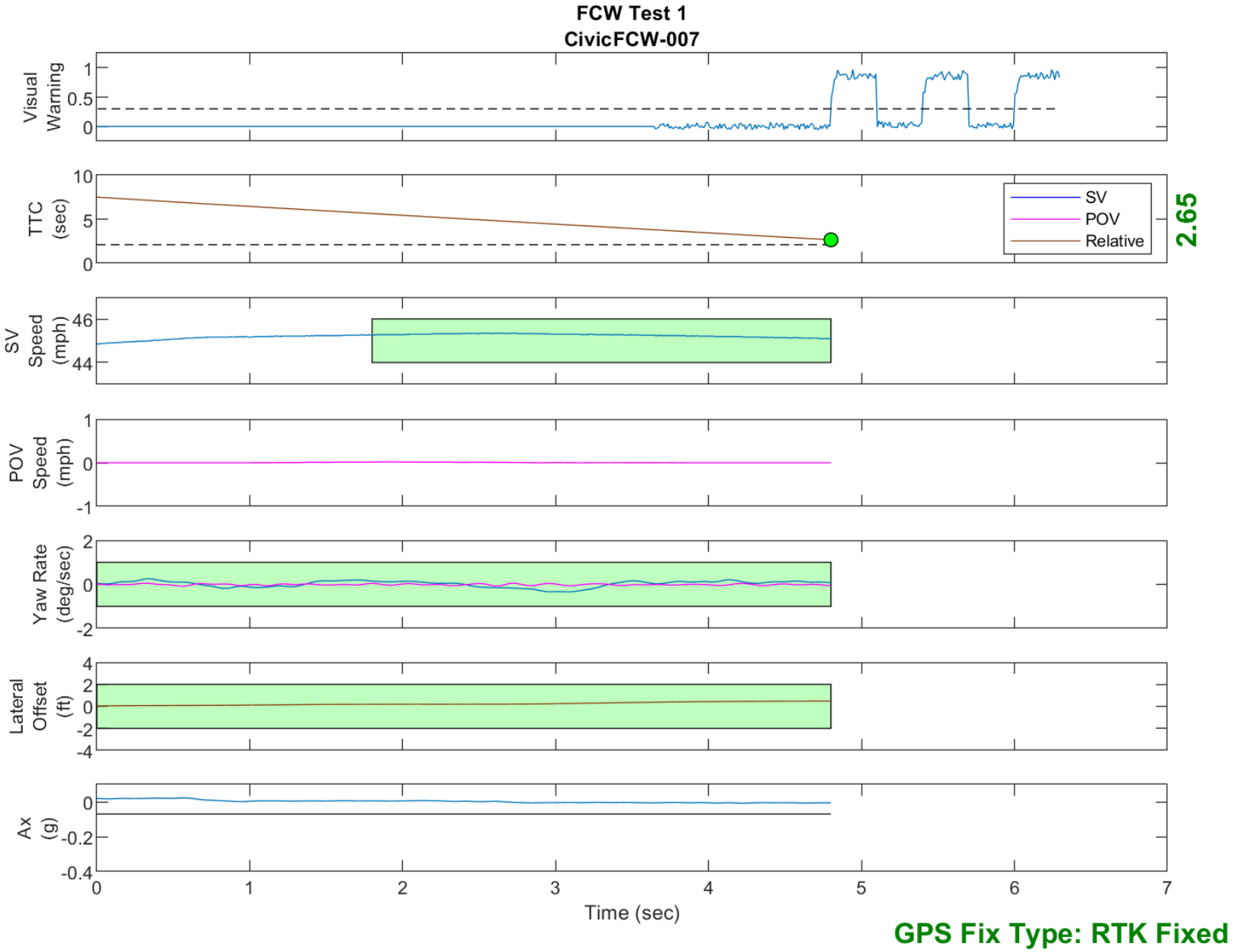


Figure D20. Time History for Run 07, FCW Test 1, Visual Warning

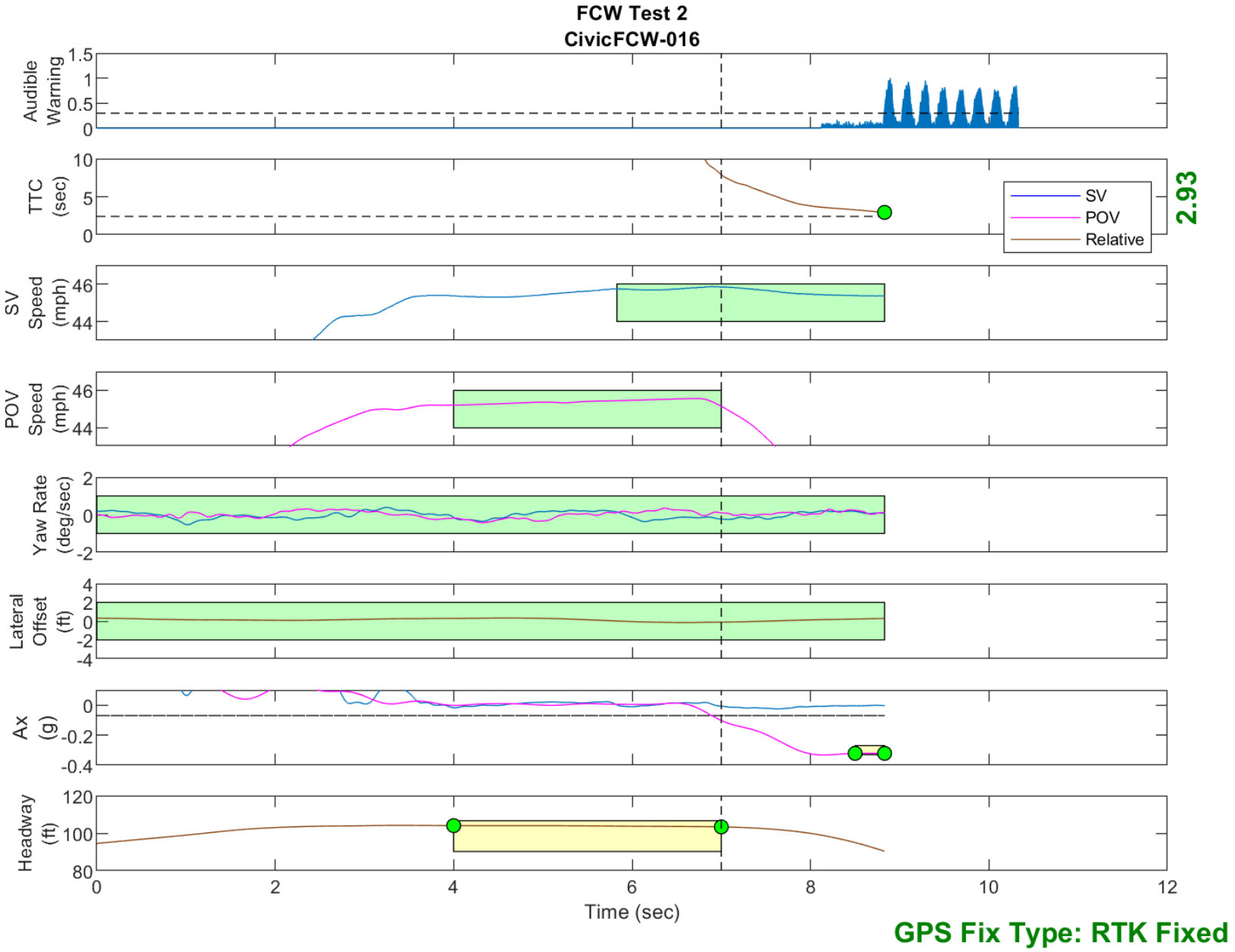


Figure D21. Time History for Run 16, FCW Test 2, Audible Warning

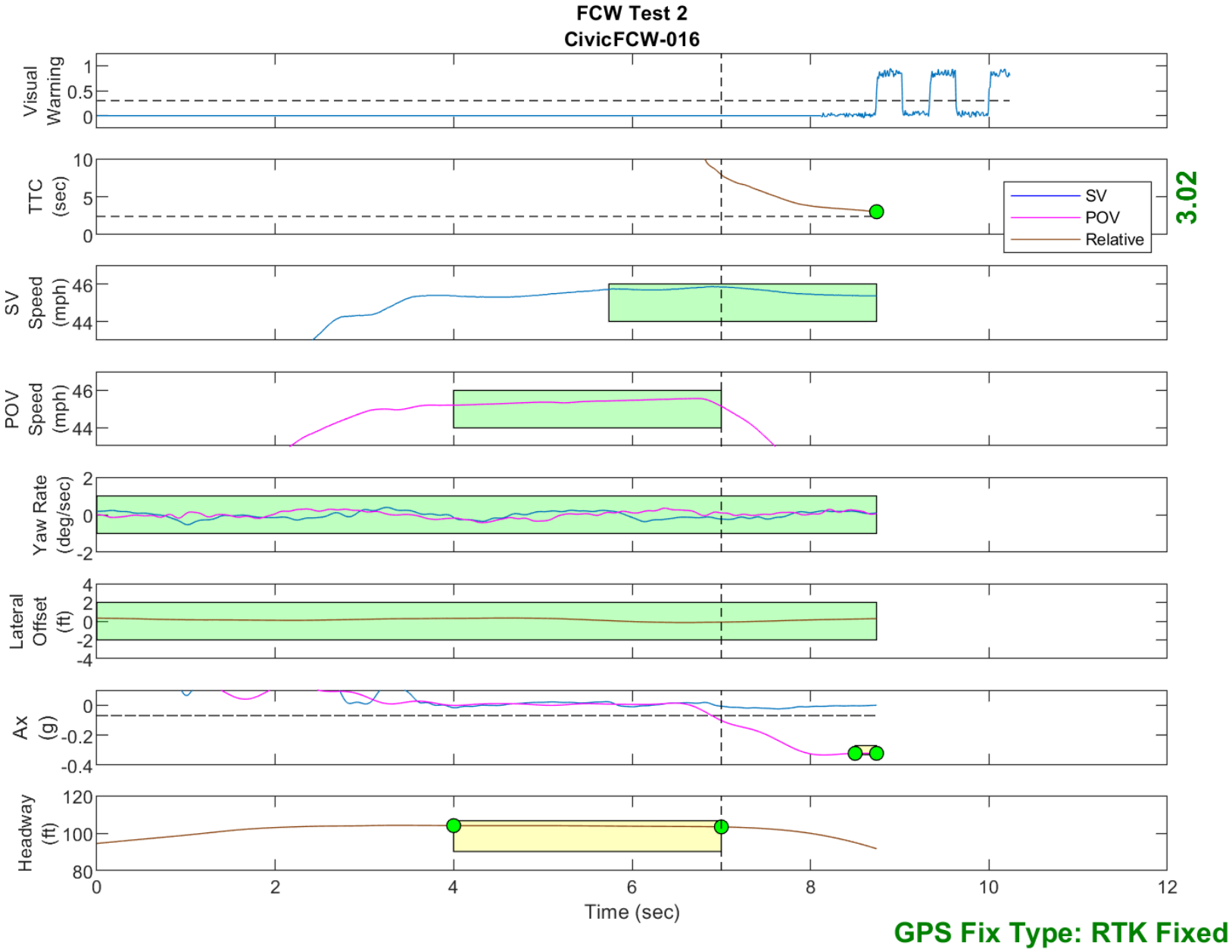


Figure D22. Time History for Run 16, FCW Test 2, Visual Warning

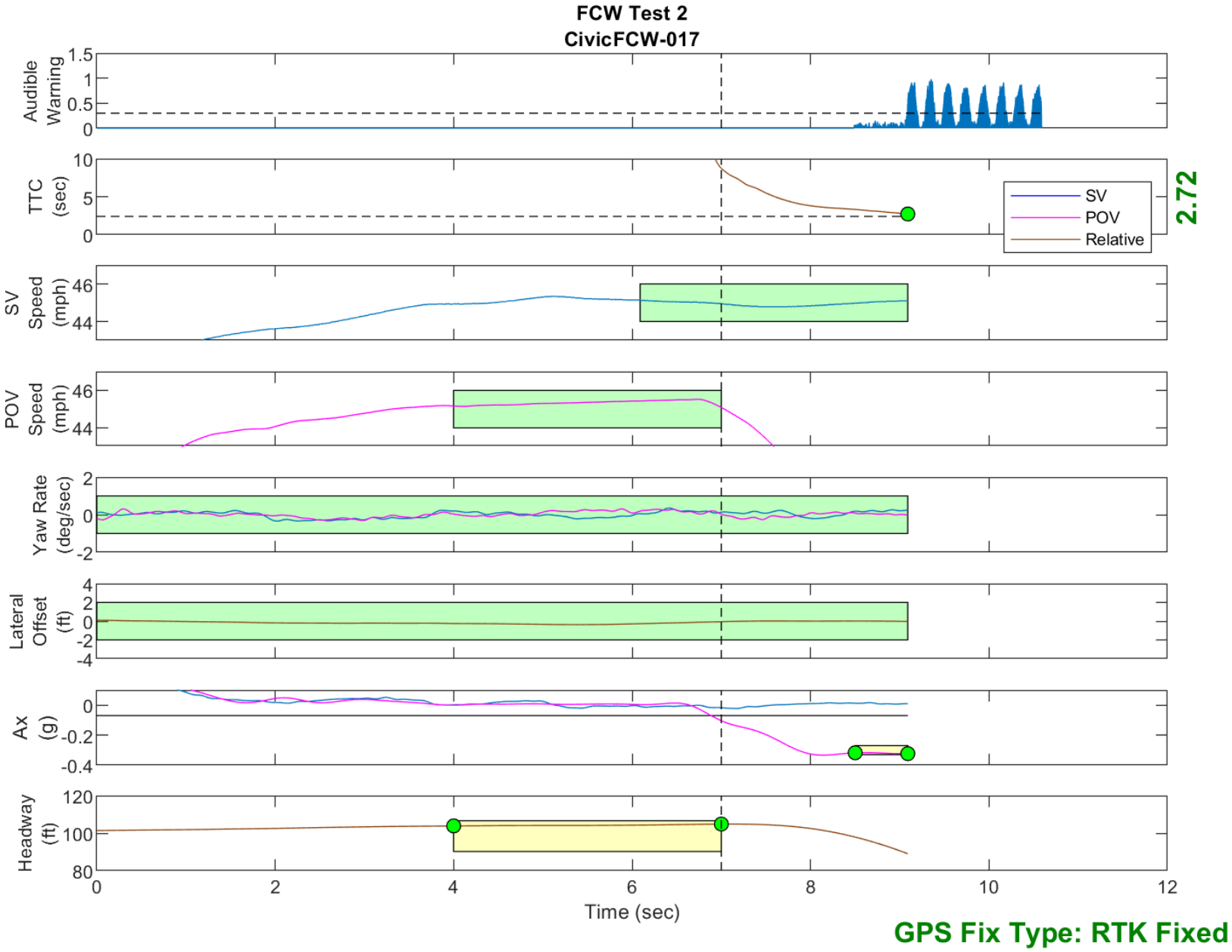


Figure D23. Time History for Run 17, FCW Test 2, Audible Warning

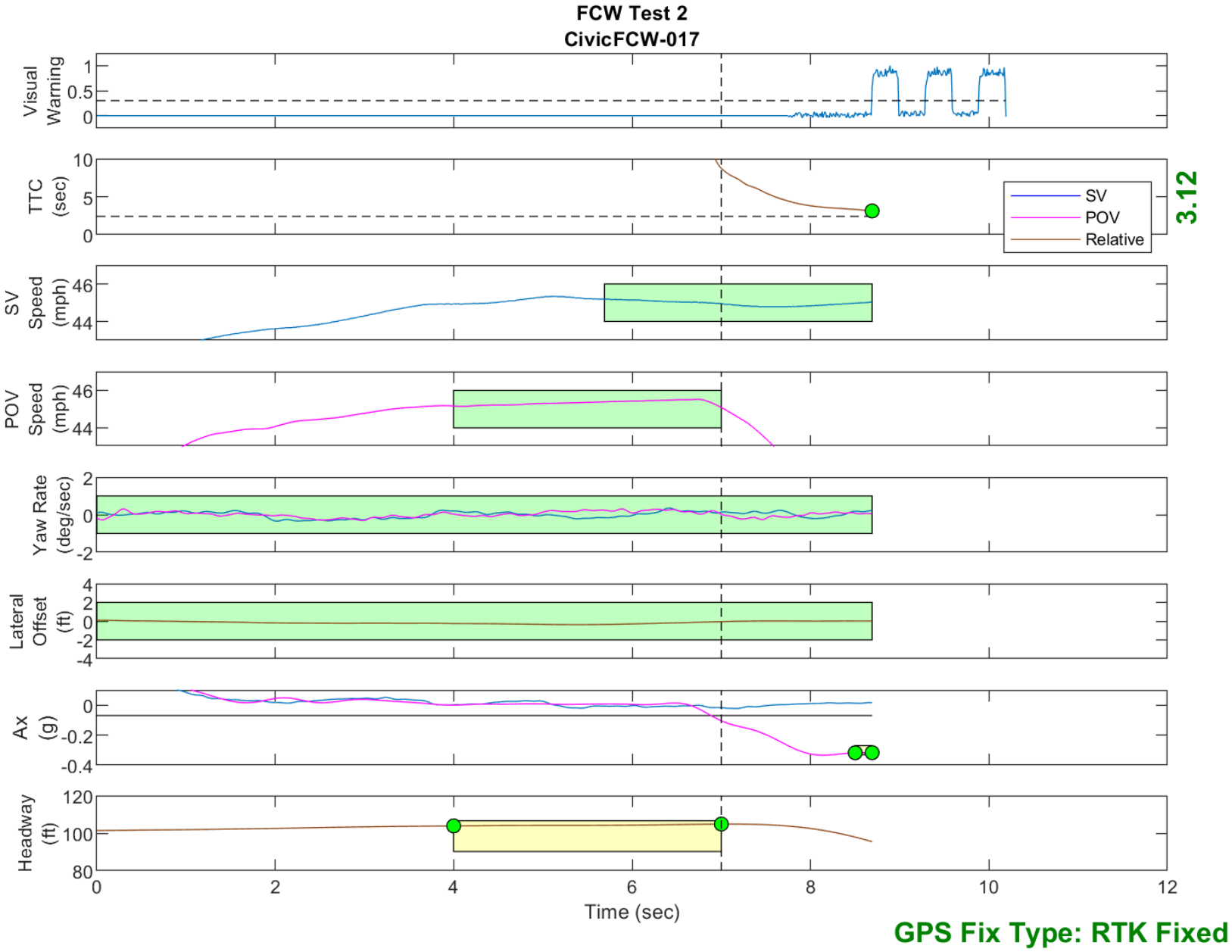


Figure D24. Time History for Run 17, FCW Test 2, Visual Warning

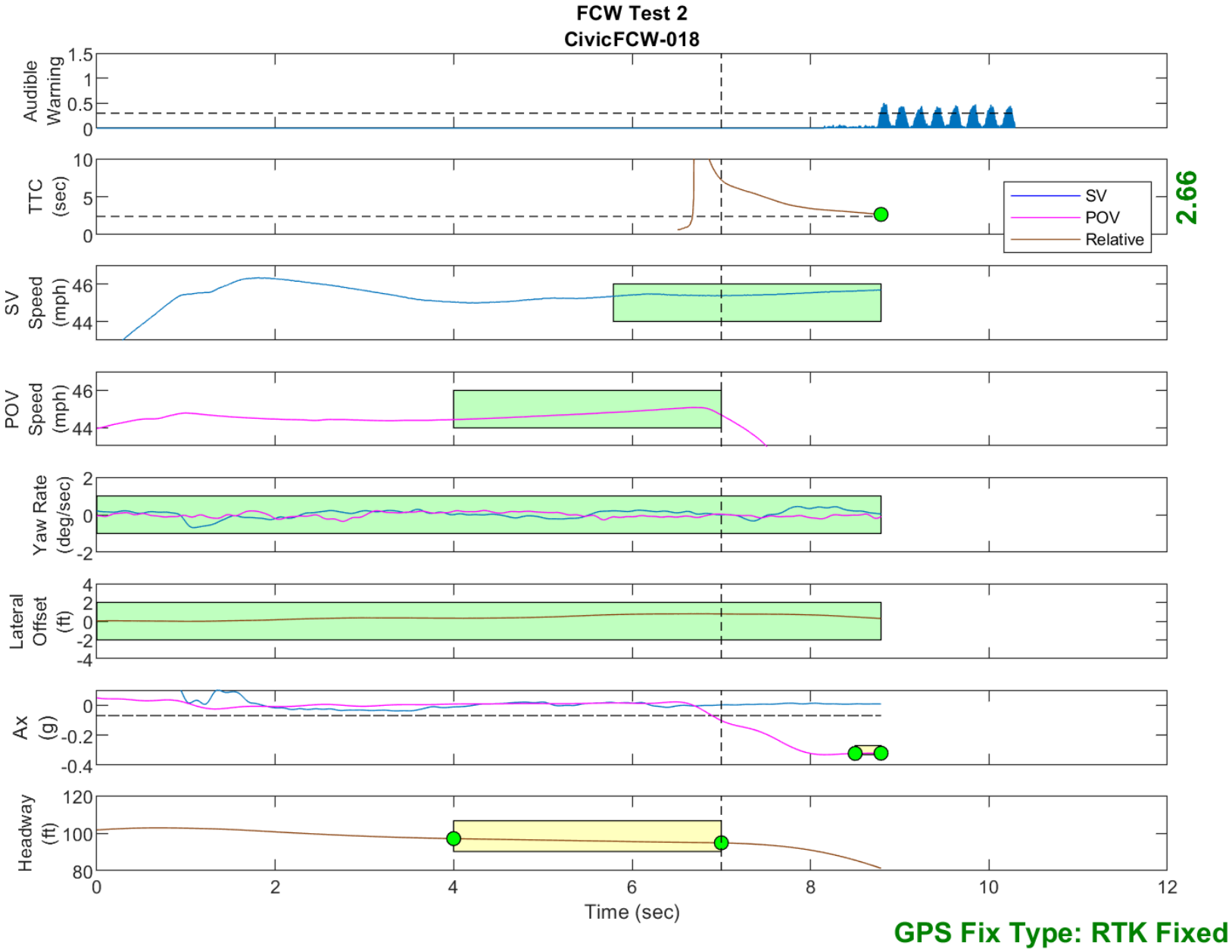


Figure D25. Time History for Run 18, FCW Test 2, Audible Warning

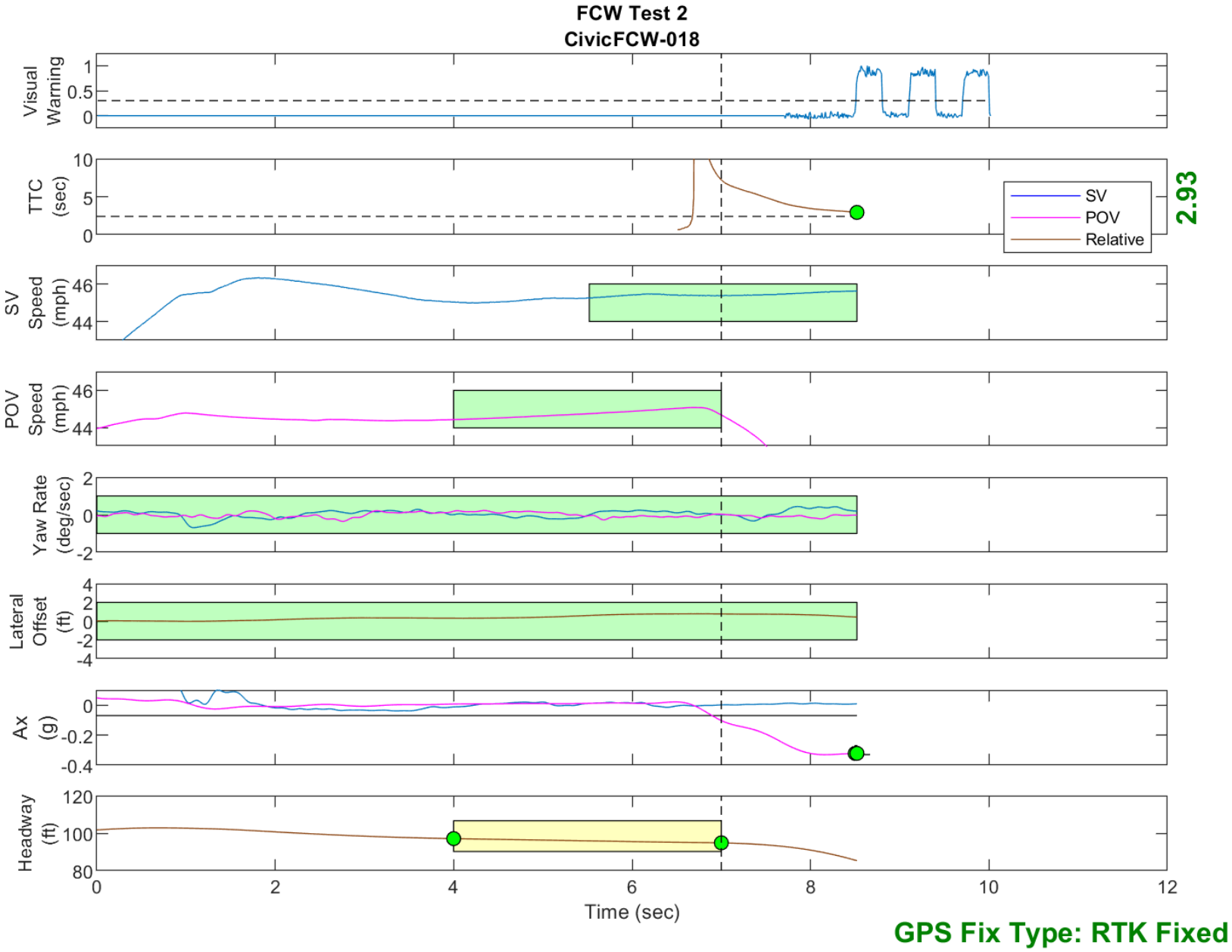


Figure D26. Time History for Run 18, FCW Test 2, Visual Warning

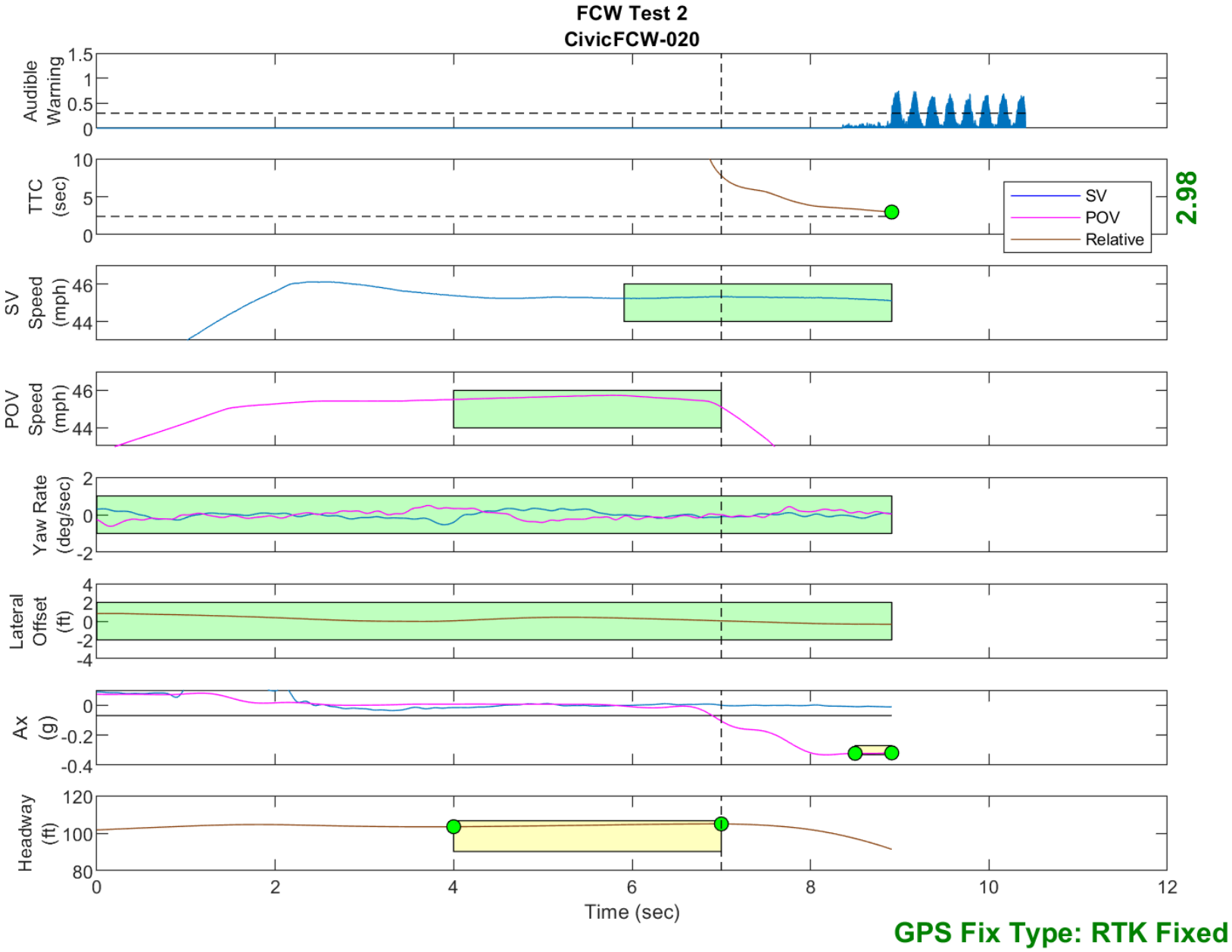


Figure D27. Time History for Run 20, FCW Test 2, Audible Warning

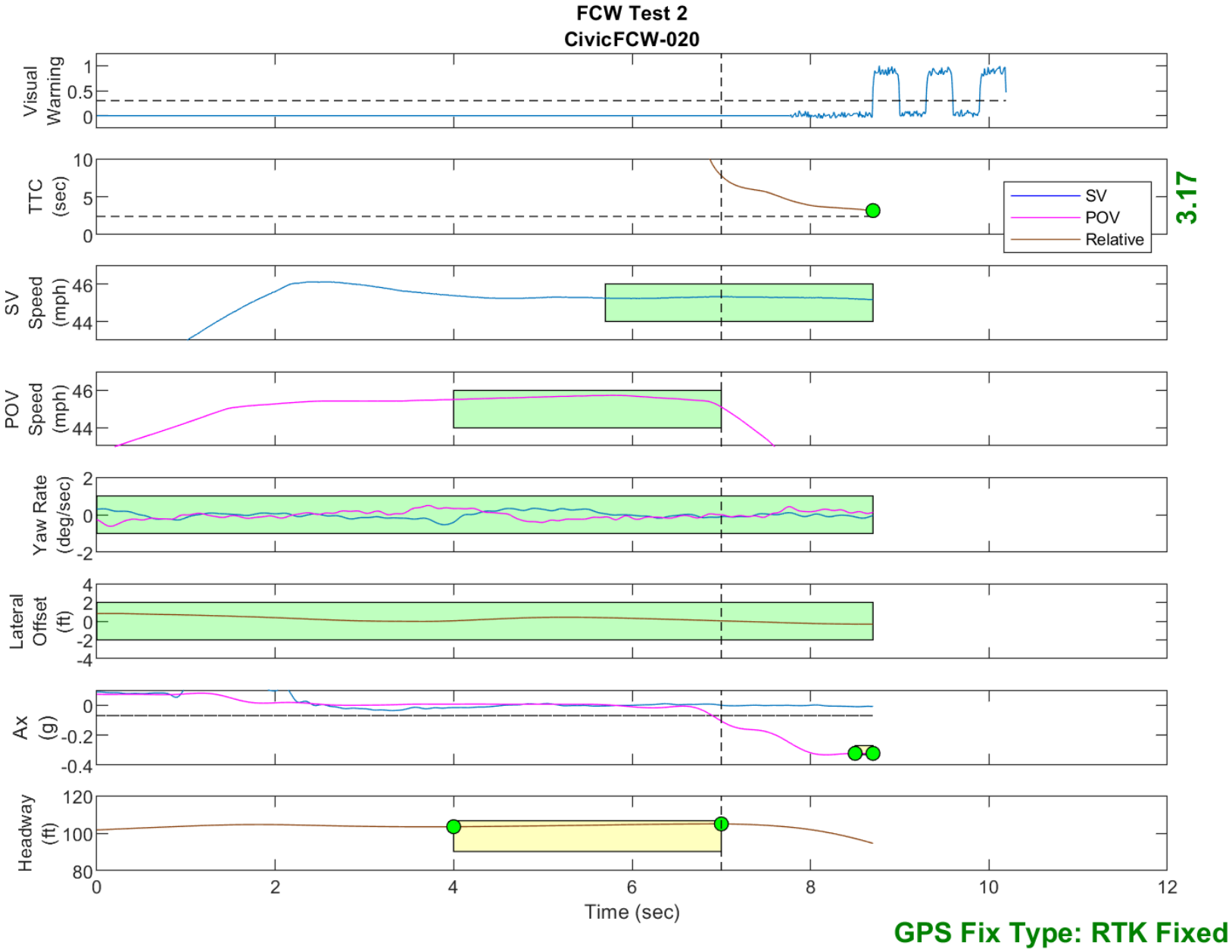


Figure D28. Time History for Run 20, FCW Test 2, Visual Warning

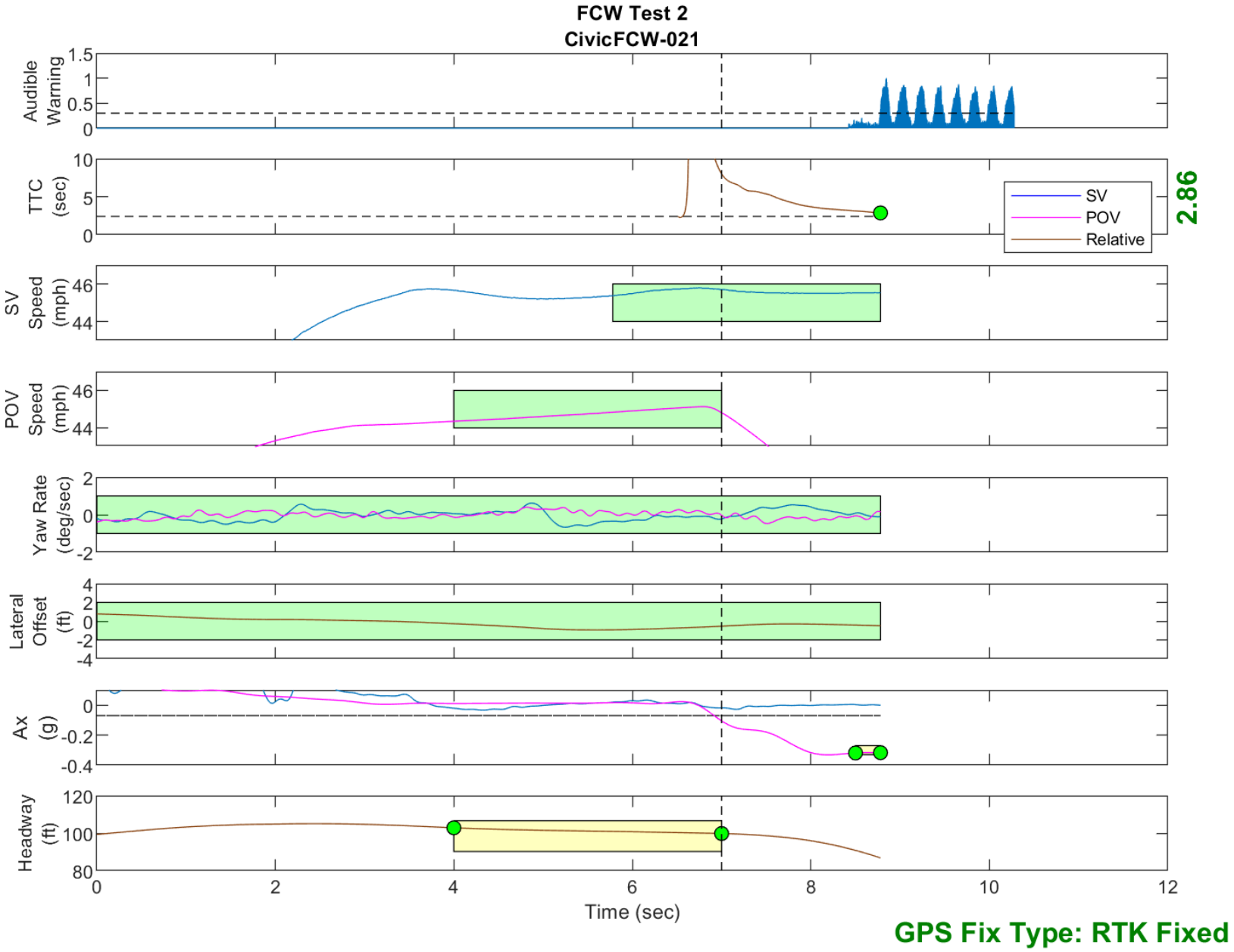


Figure D29. Time History for Run 21, FCW Test 2, Audible Warning

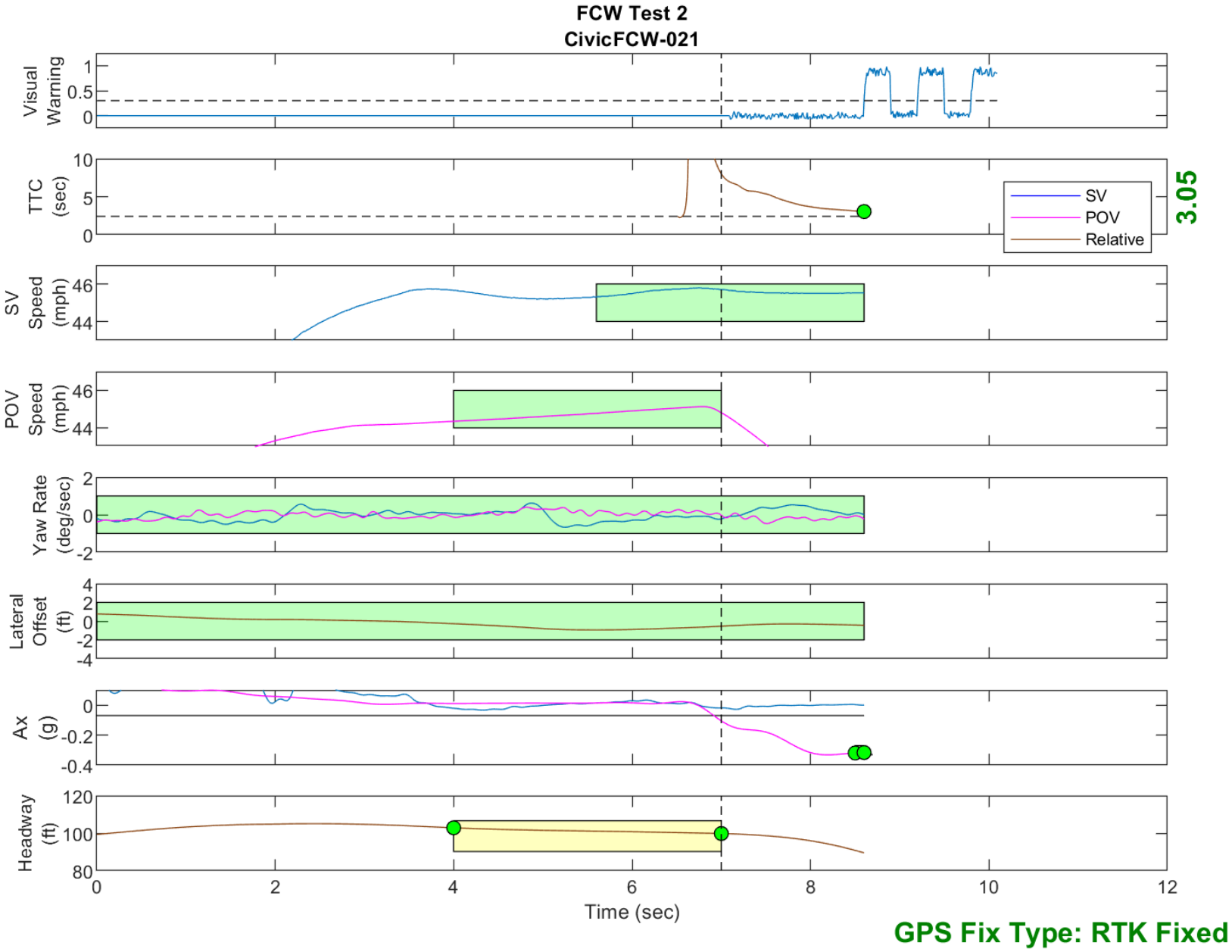


Figure D30. Time History for Run 21, FCW Test 2, Visual Warning

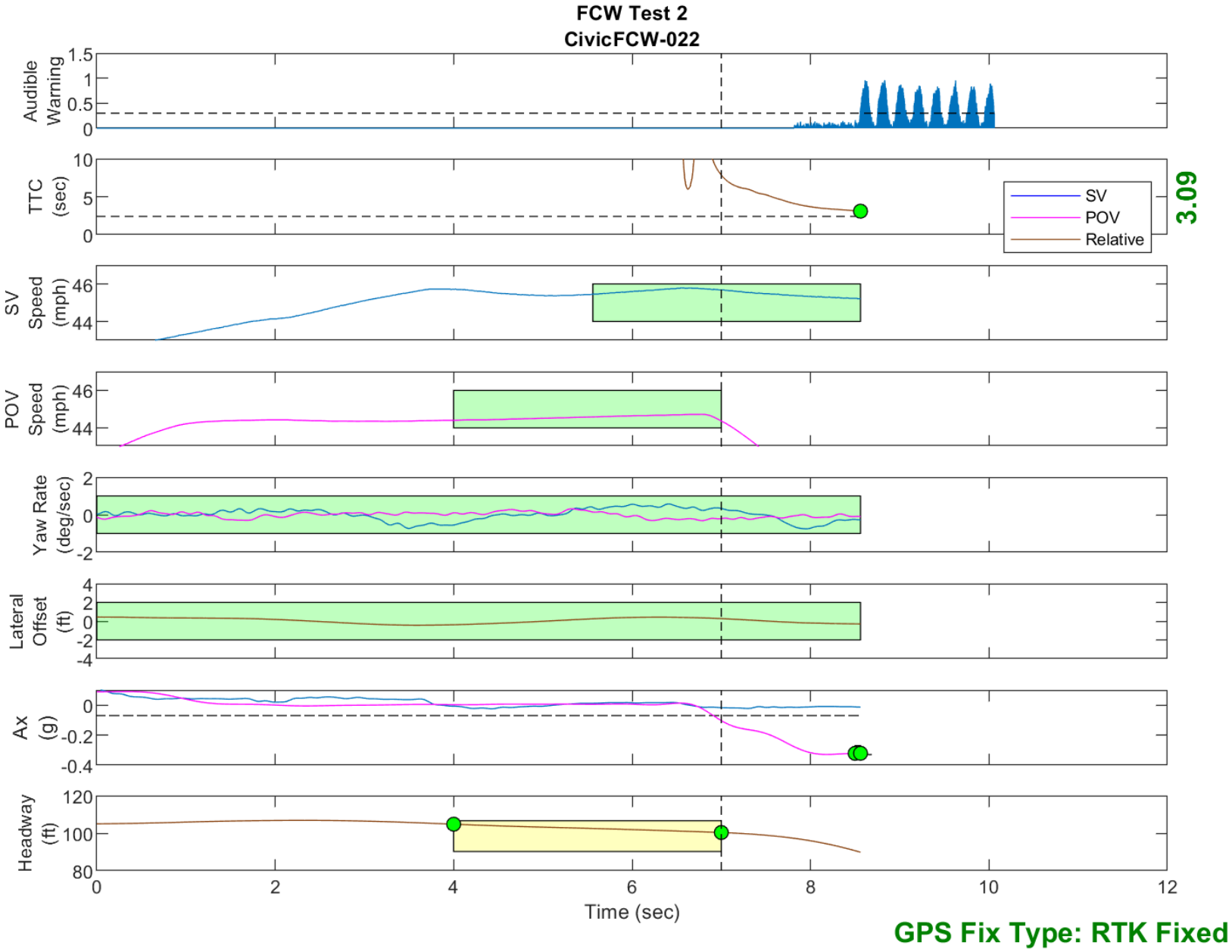


Figure D31. Time History for Run 22, FCW Test 2, Audible Warning

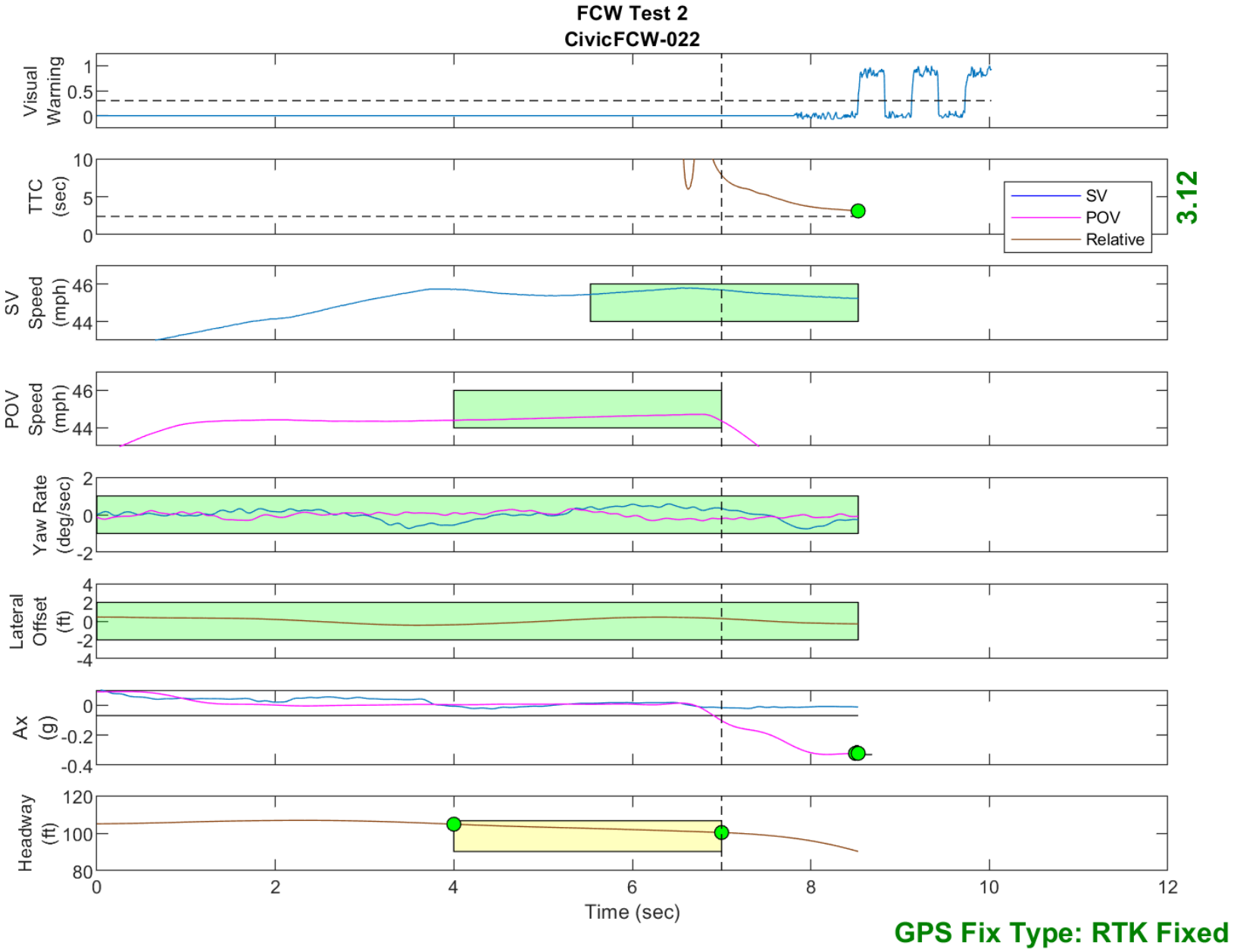


Figure D32. Time History for Run 22, FCW Test 2, Visual Warning

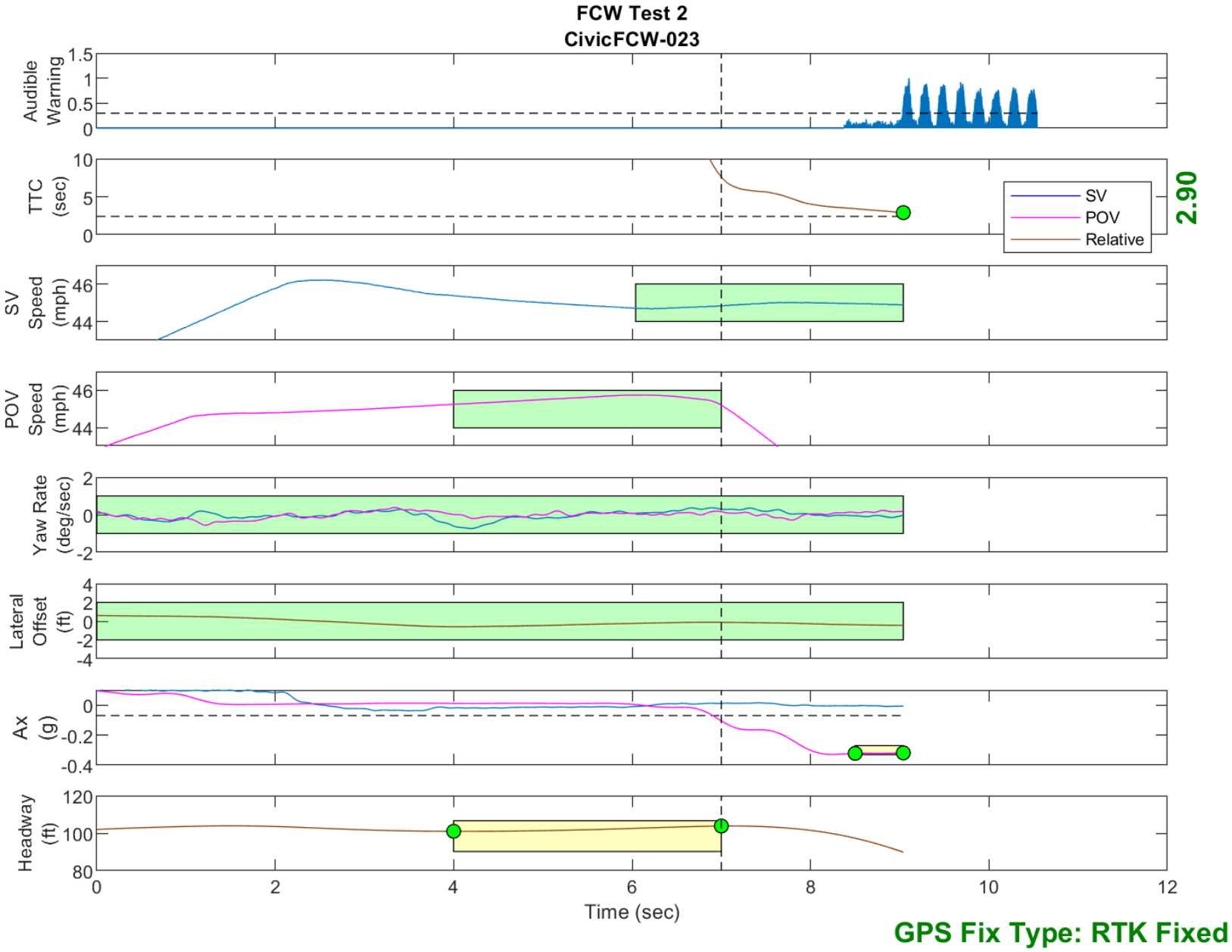


Figure D33. Time History for Run 23, FCW Test 2, Audible Warning

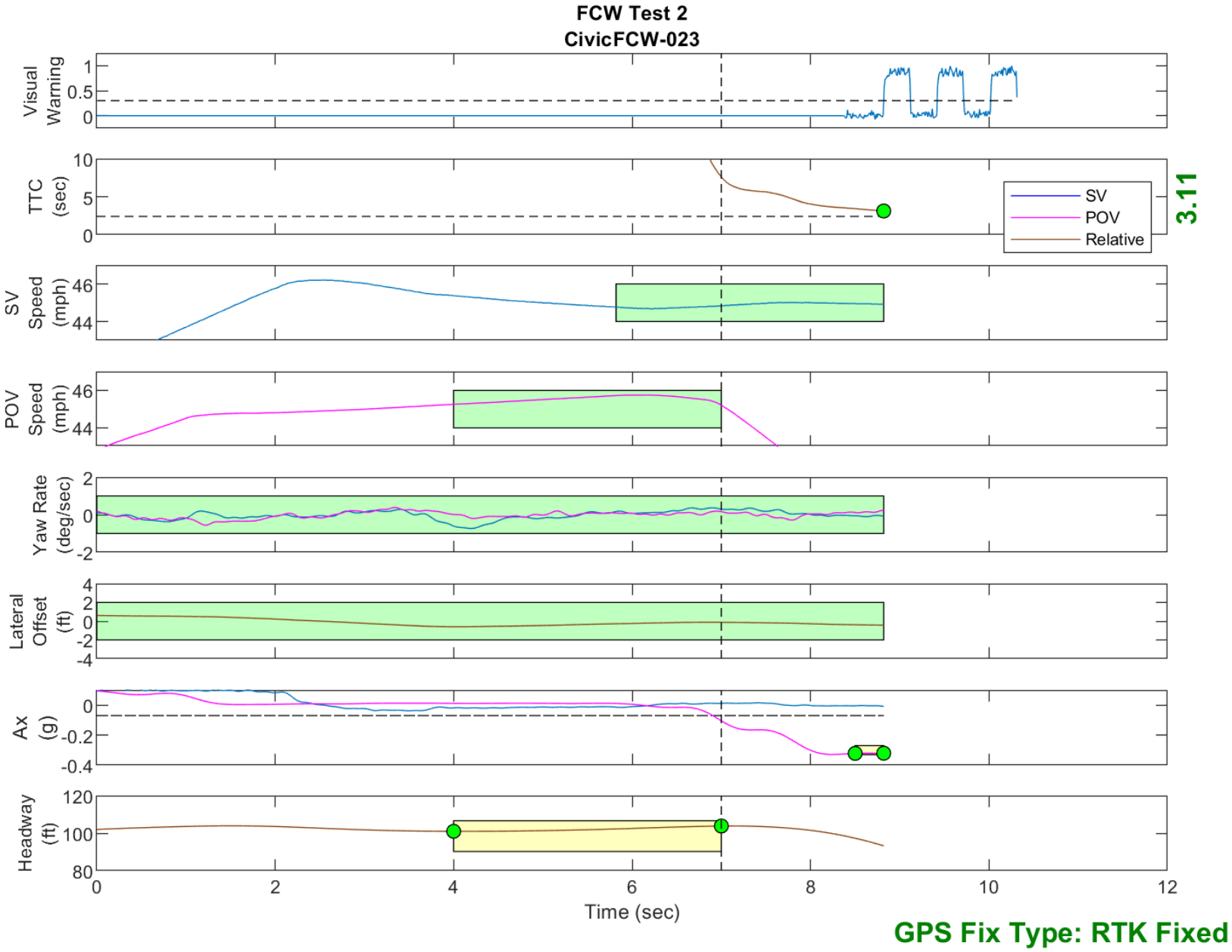


Figure D34. Time History for Run 23, FCW Test 2, Visual Warning

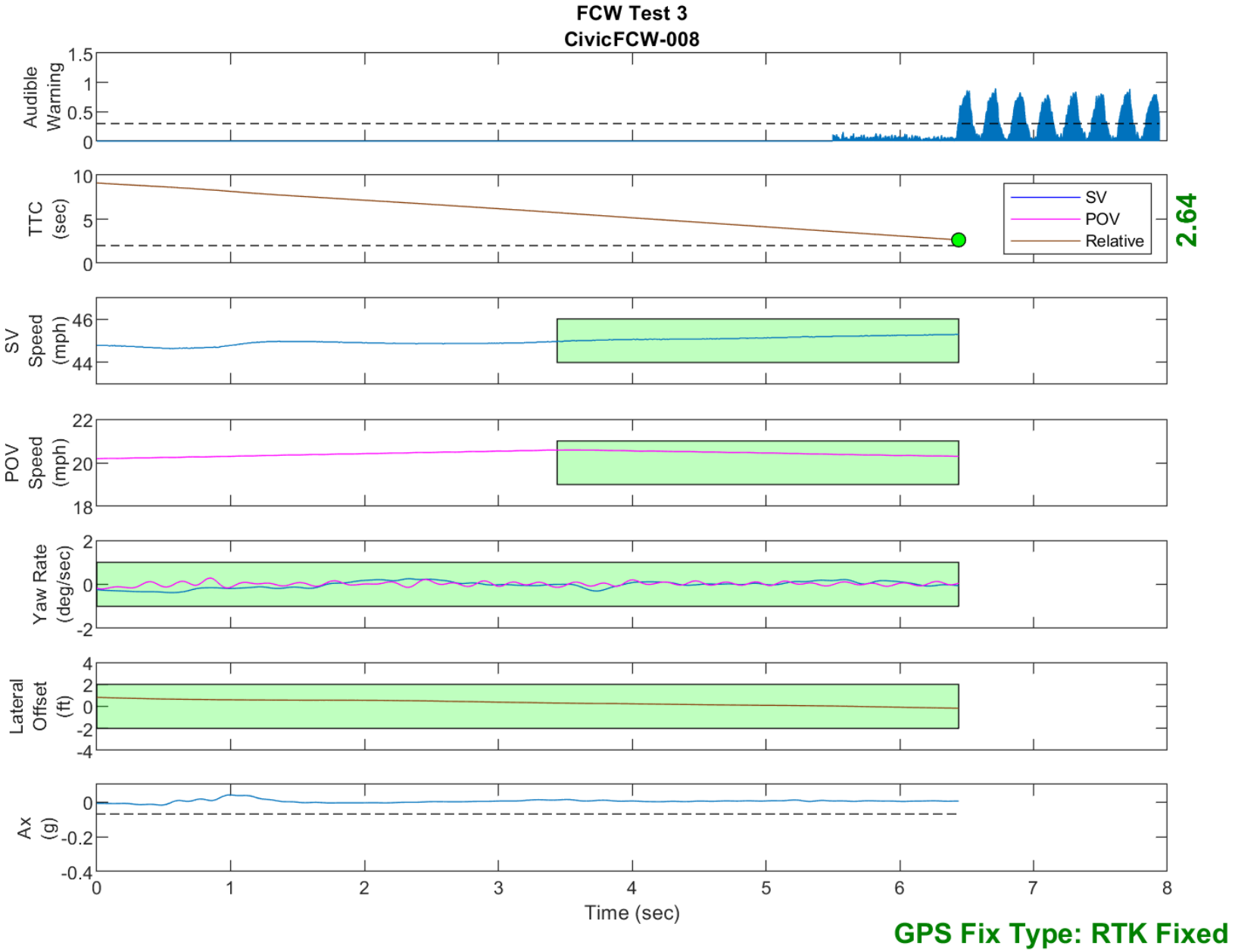


Figure D35. Time History for Run 08, FCW Test 3, Audible Warning

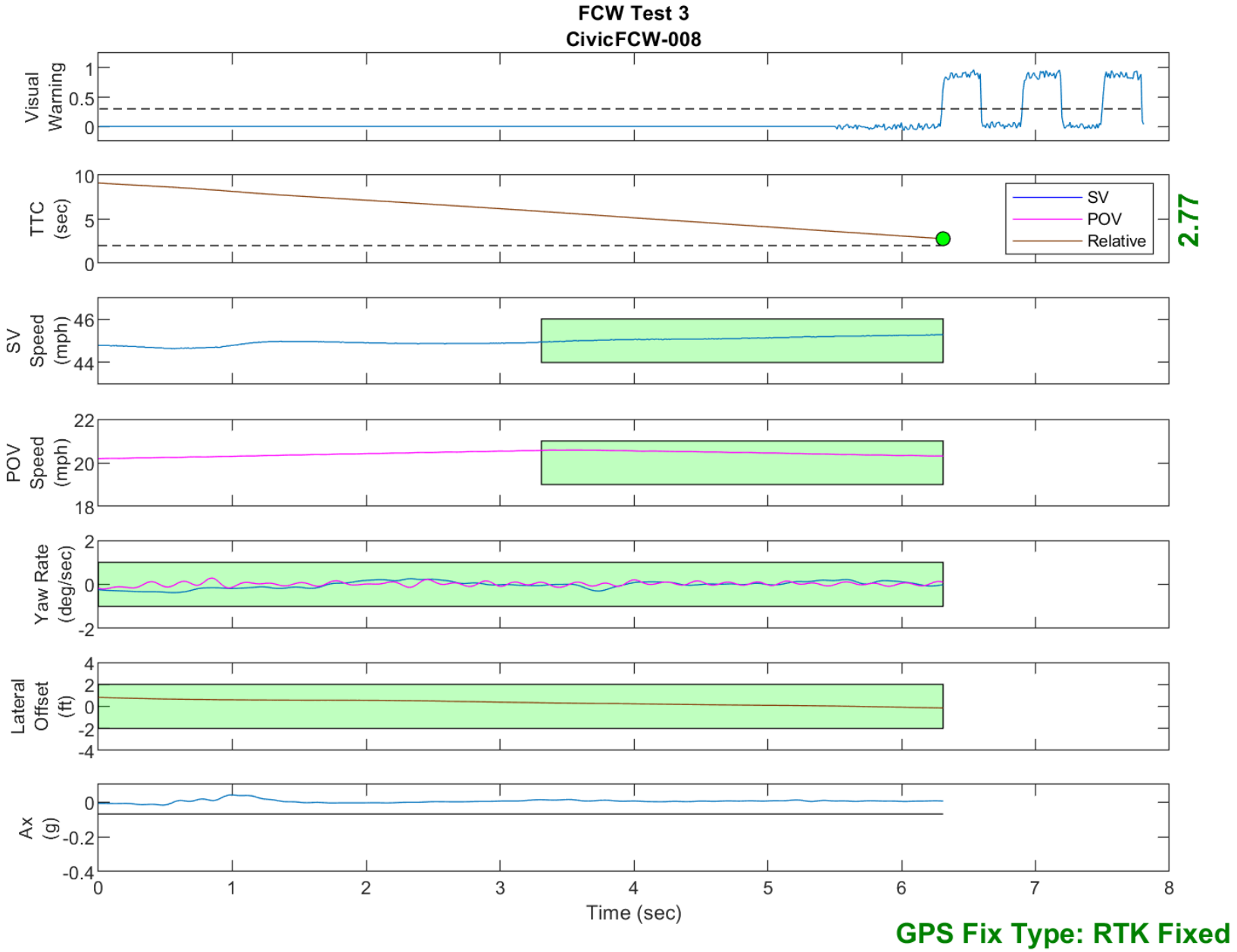


Figure D36. Time History for Run 08, FCW Test 3, Visual Warning

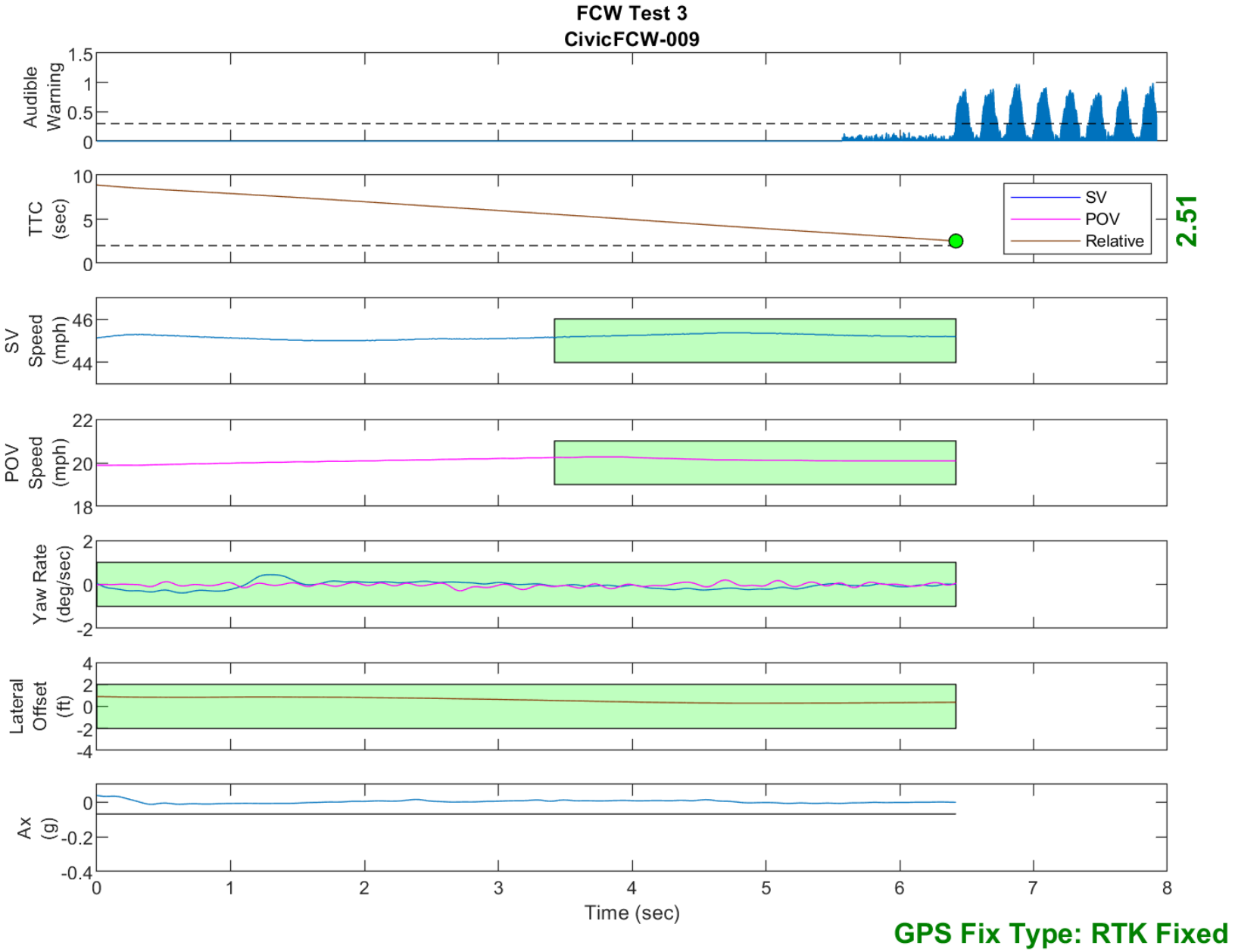


Figure D37. Time History for Run 09, FCW Test 3, Audible Warning

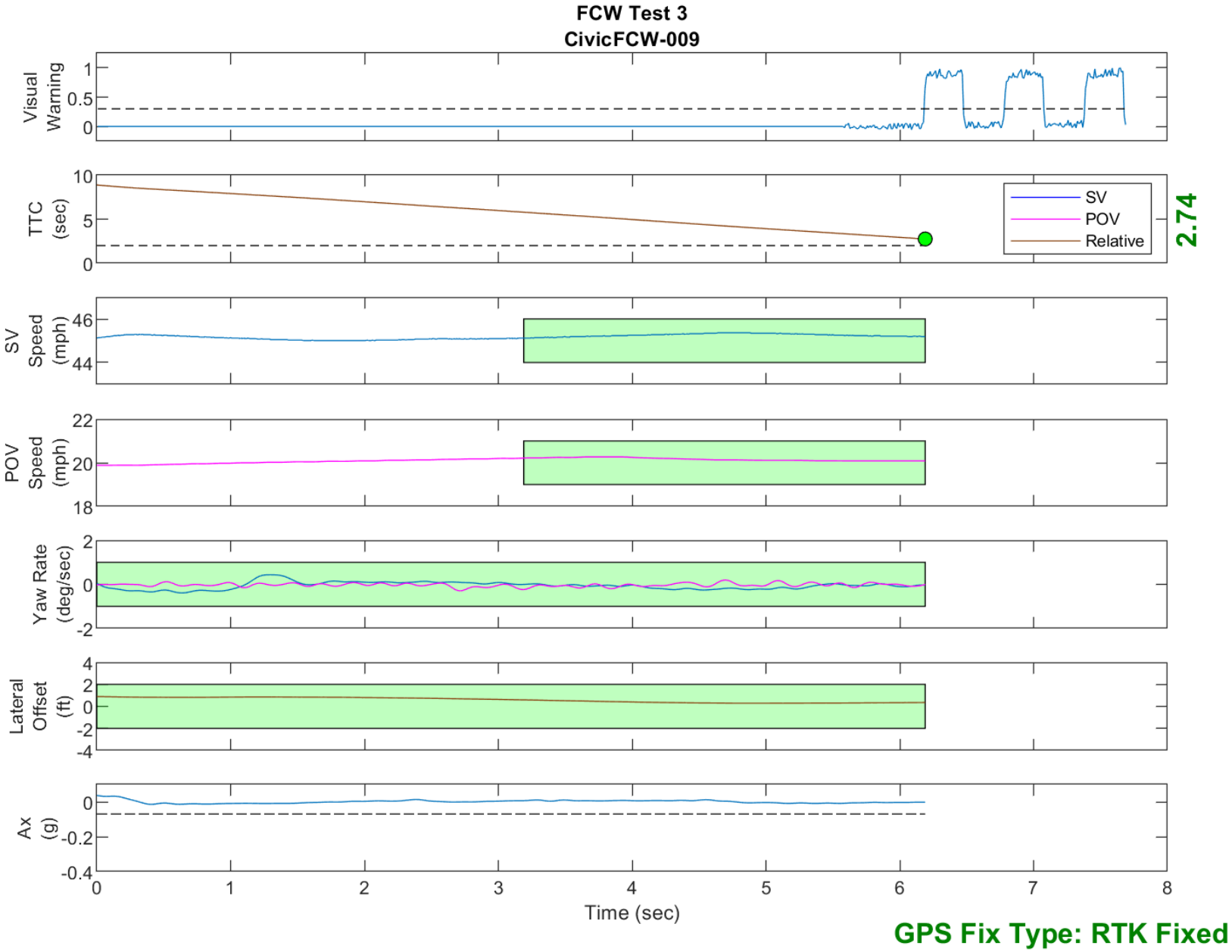


Figure D38. Time History for Run 09, FCW Test 3, Visual Warning

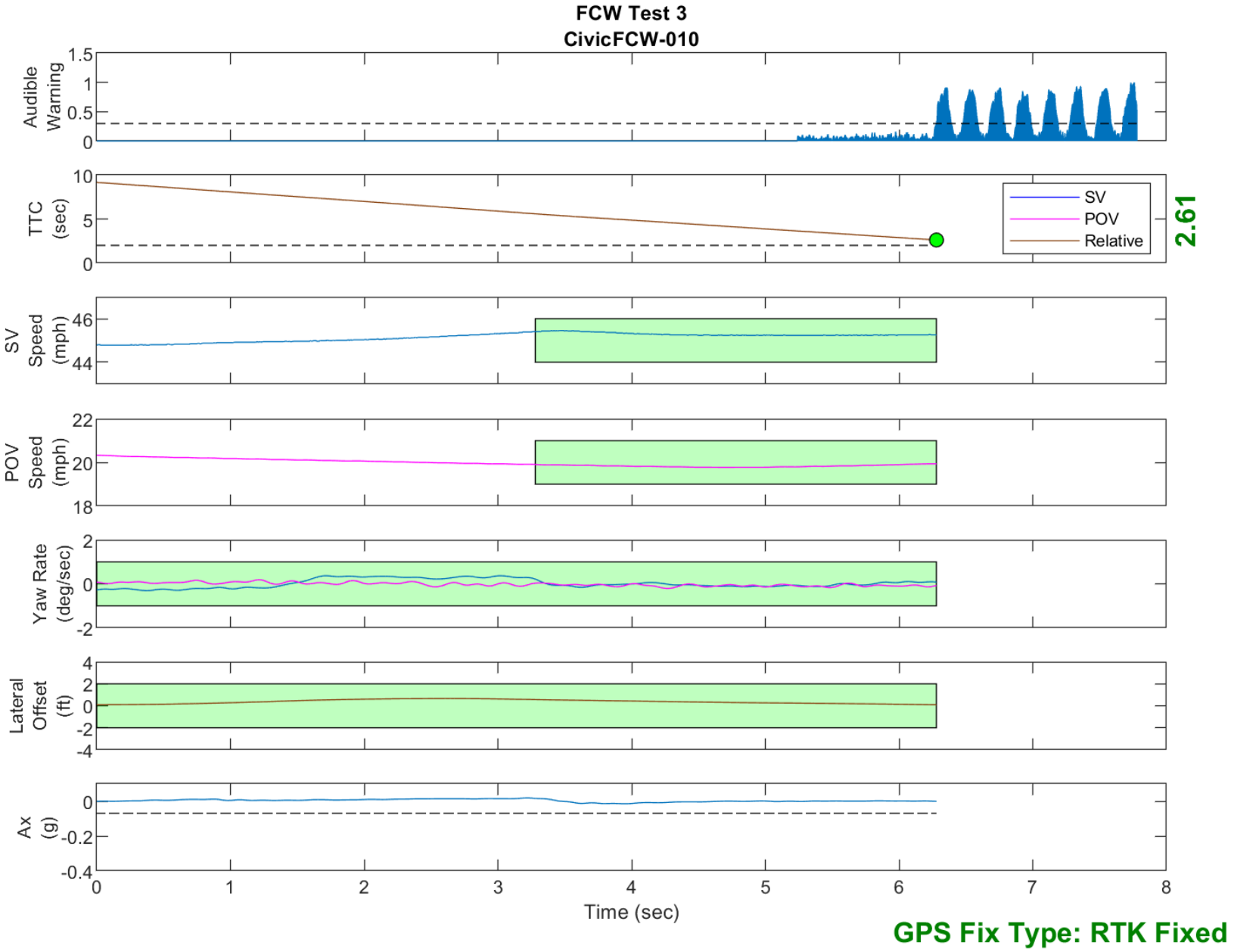


Figure D39. Time History for Run 10, FCW Test 3, Audible Warning

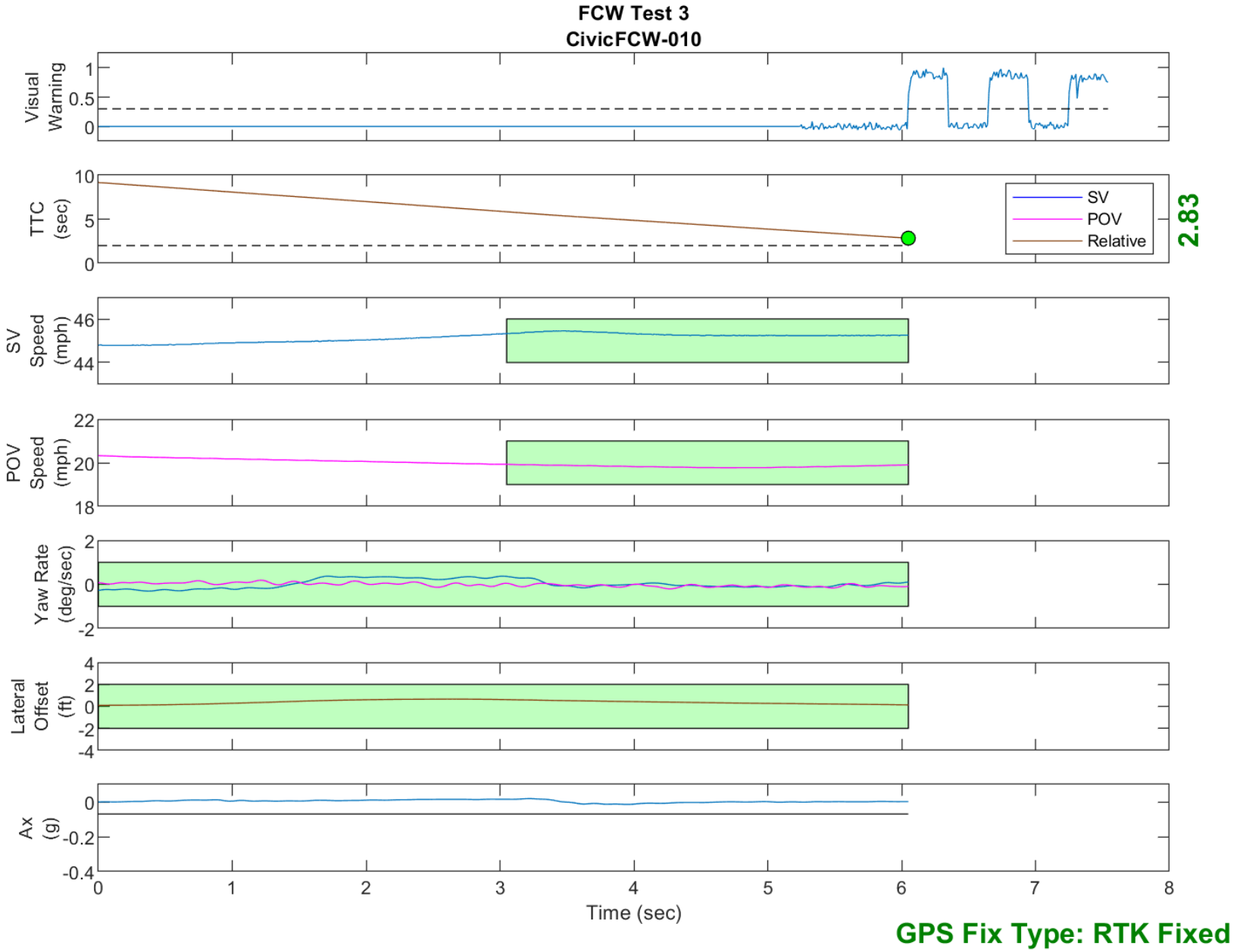


Figure D40. Time History for Run 10, FCW Test 3, Visual Warning

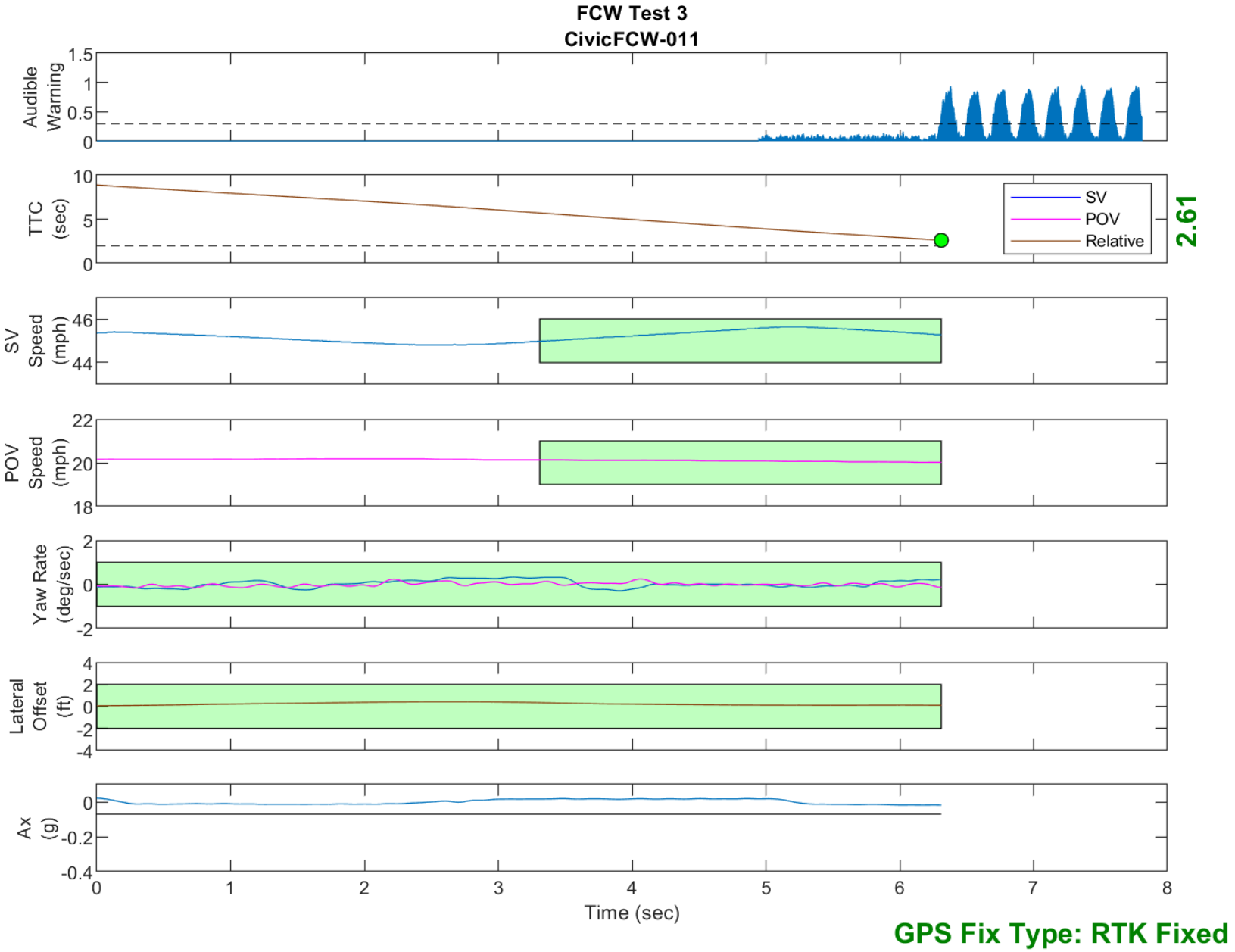


Figure D41. Time History for Run 11, FCW Test 3, Audible Warning

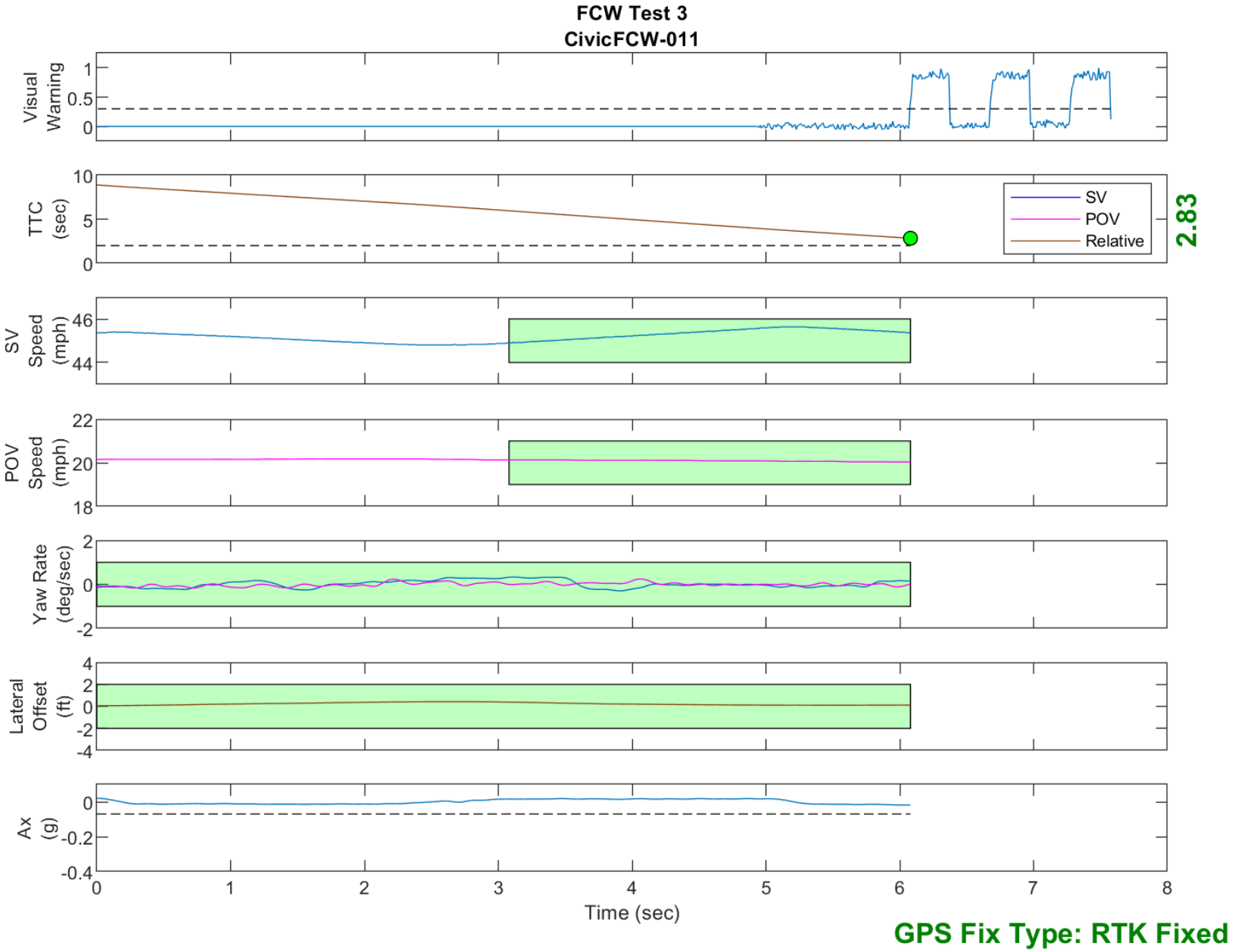


Figure D42. Time History for Run 11, FCW Test 3, Visual Warning

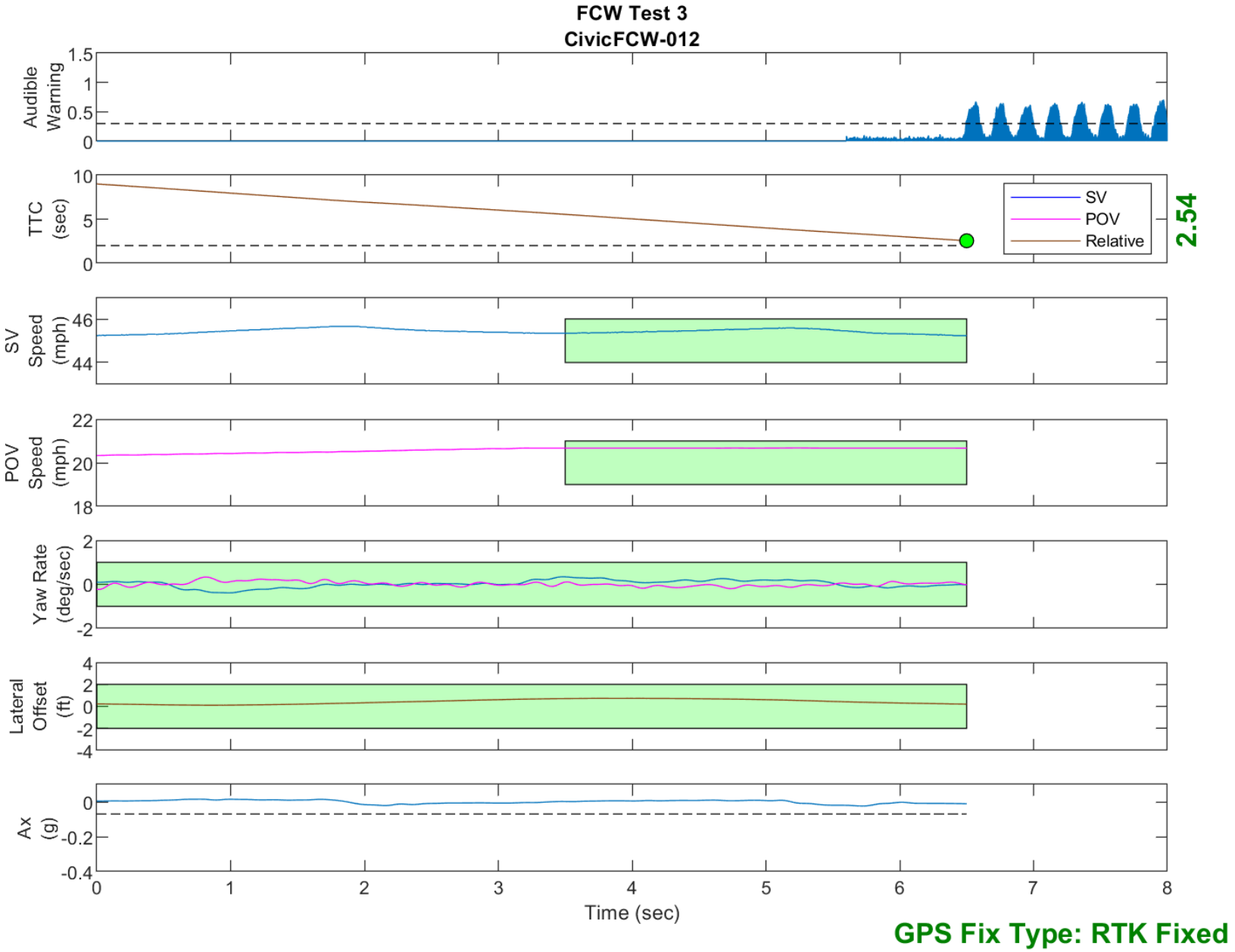


Figure D43. Time History for Run 12, FCW Test 3, Audible Warning

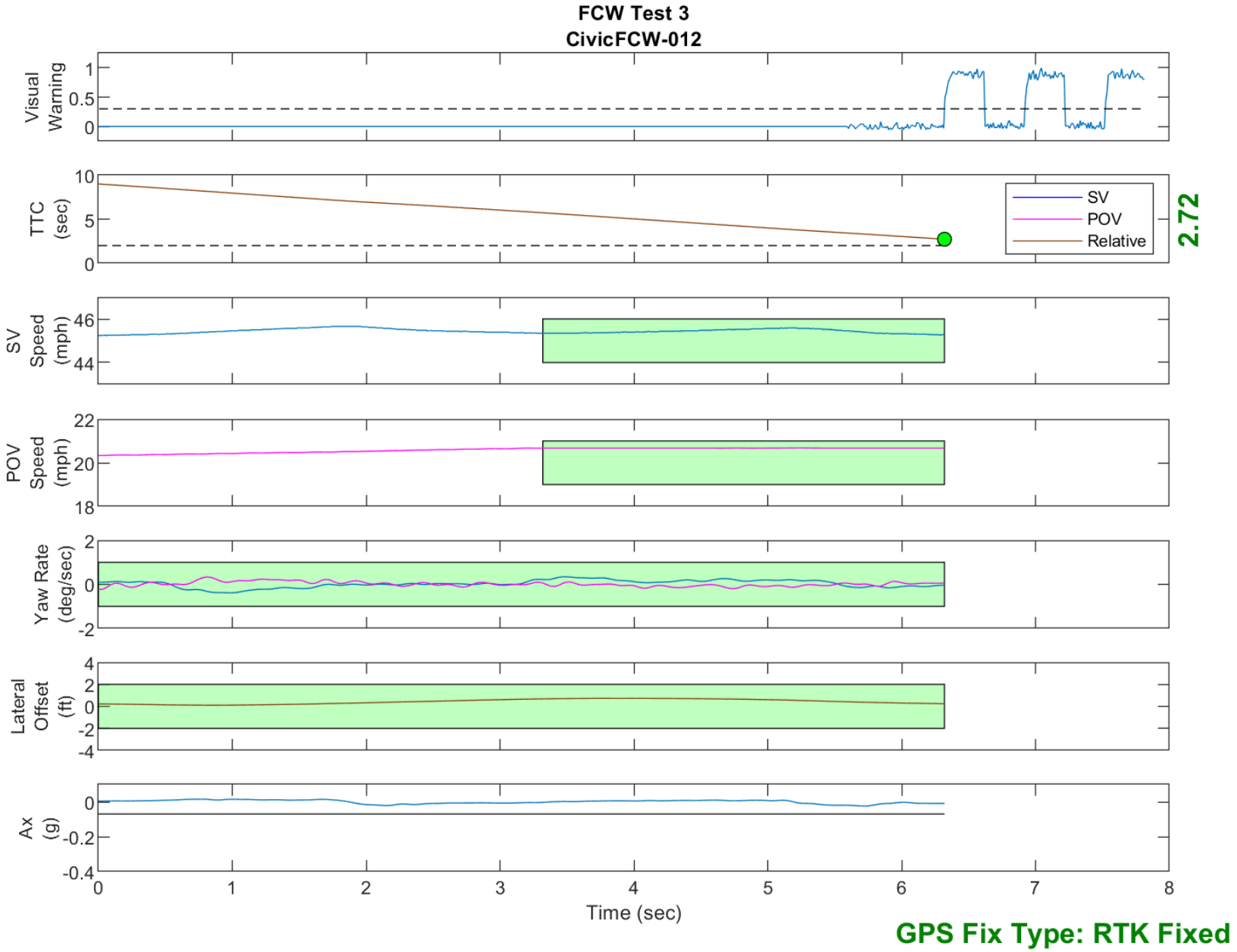


Figure D44. Time History for Run 12, FCW Test 3, Visual Warning

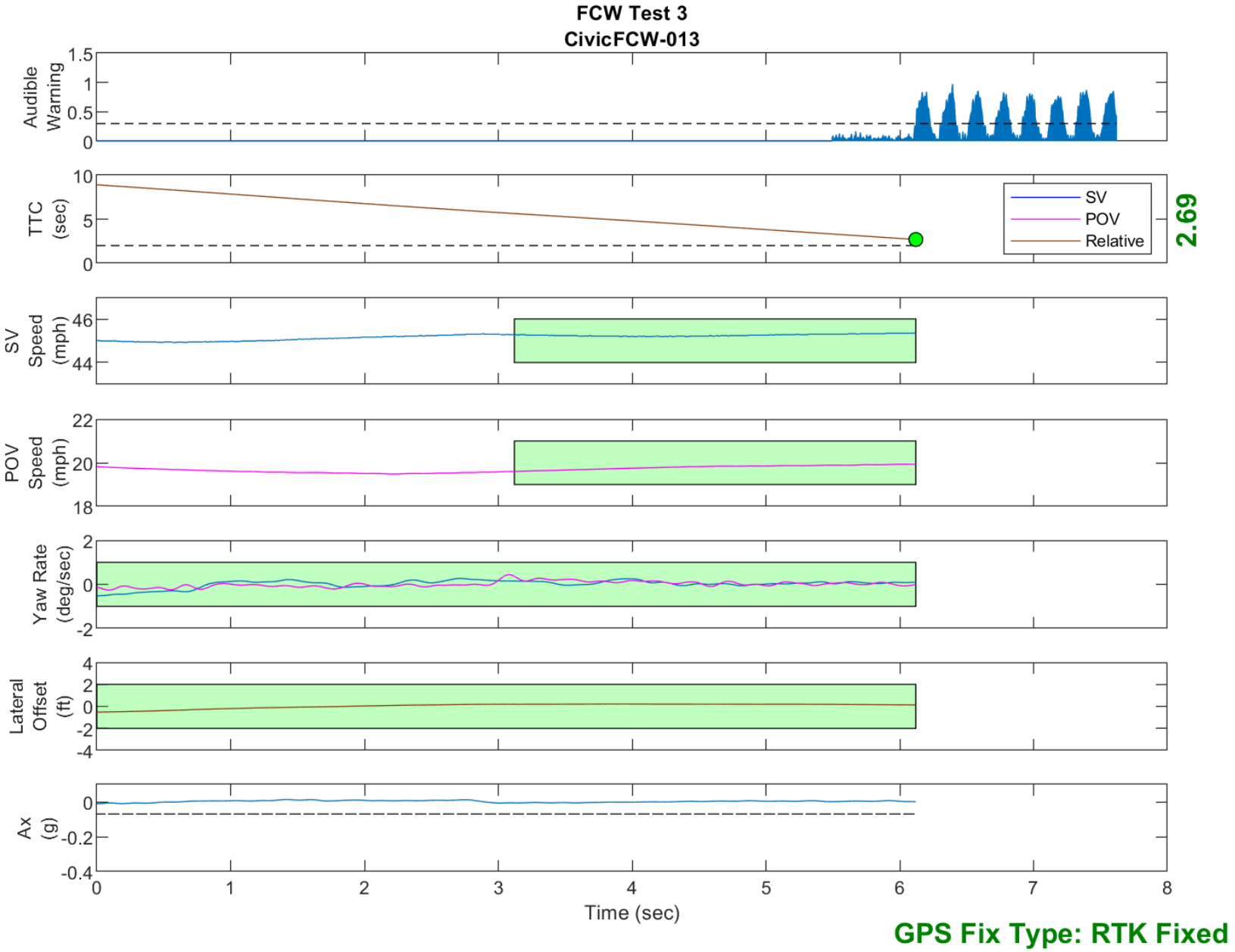


Figure D45. Time History for Run 13, FCW Test 3, Audible Warning

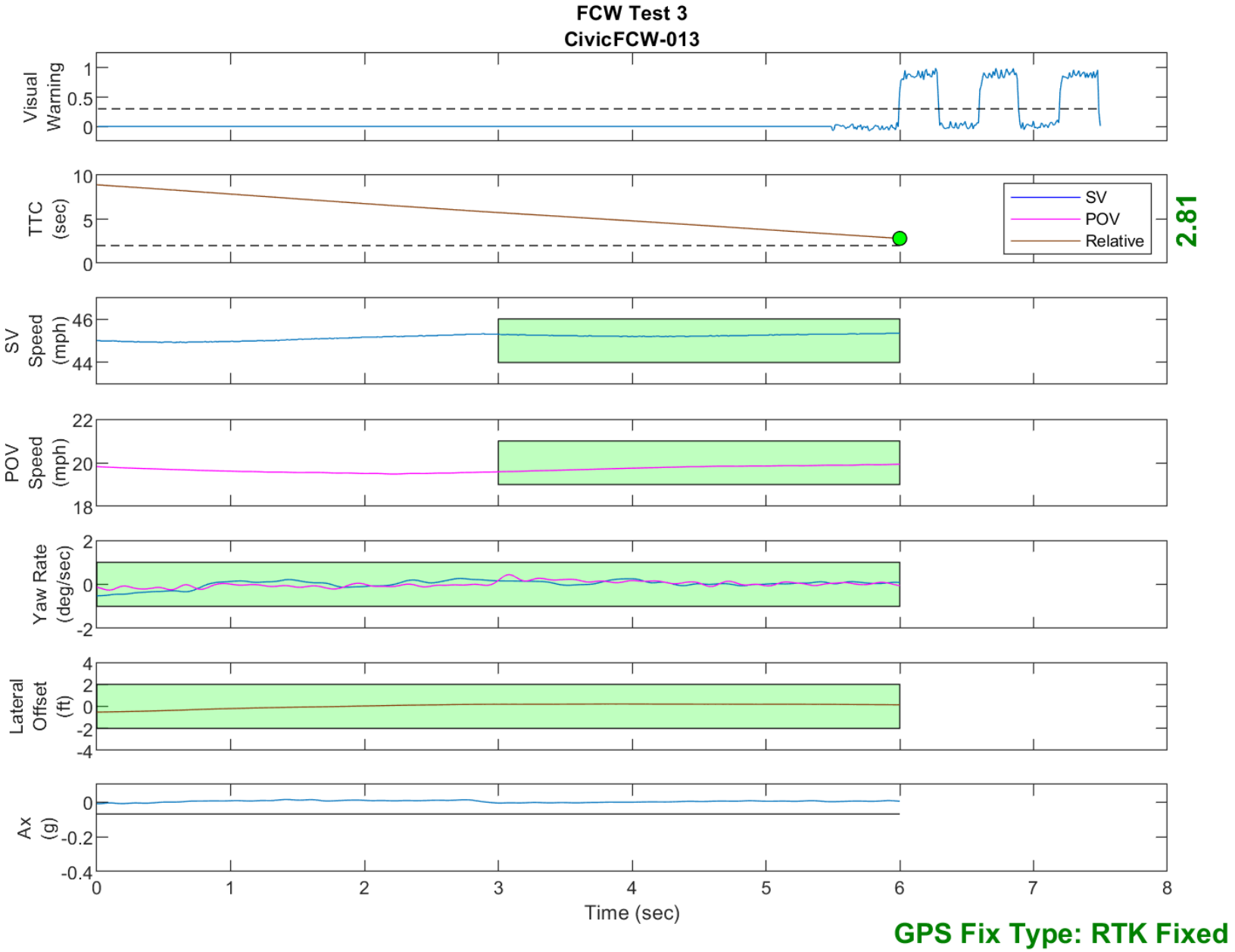


Figure D46. Time History for Run 13, FCW Test 3, Visual Warning

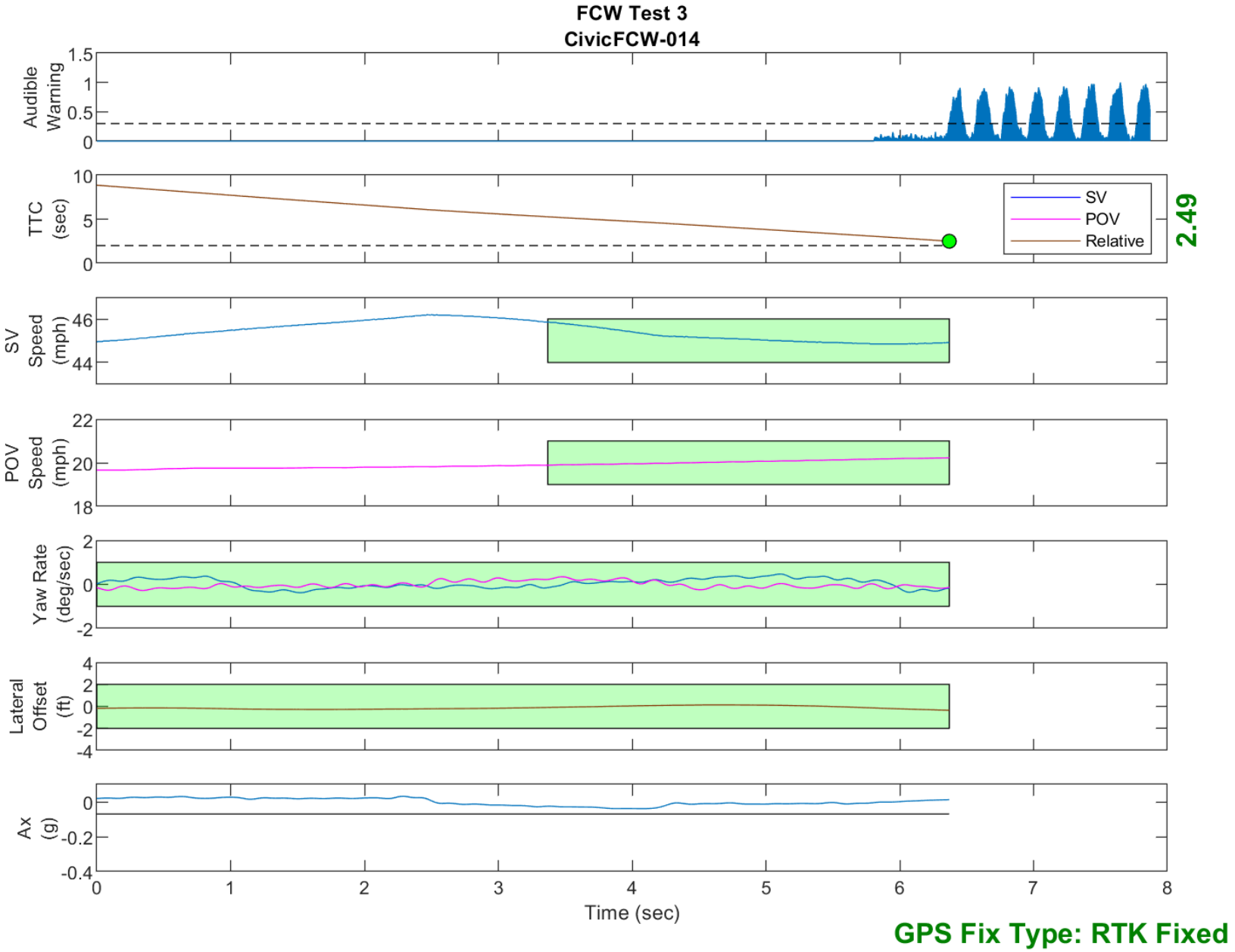


Figure D47. Time History for Run 14, FCW Test 3, Audible Warning

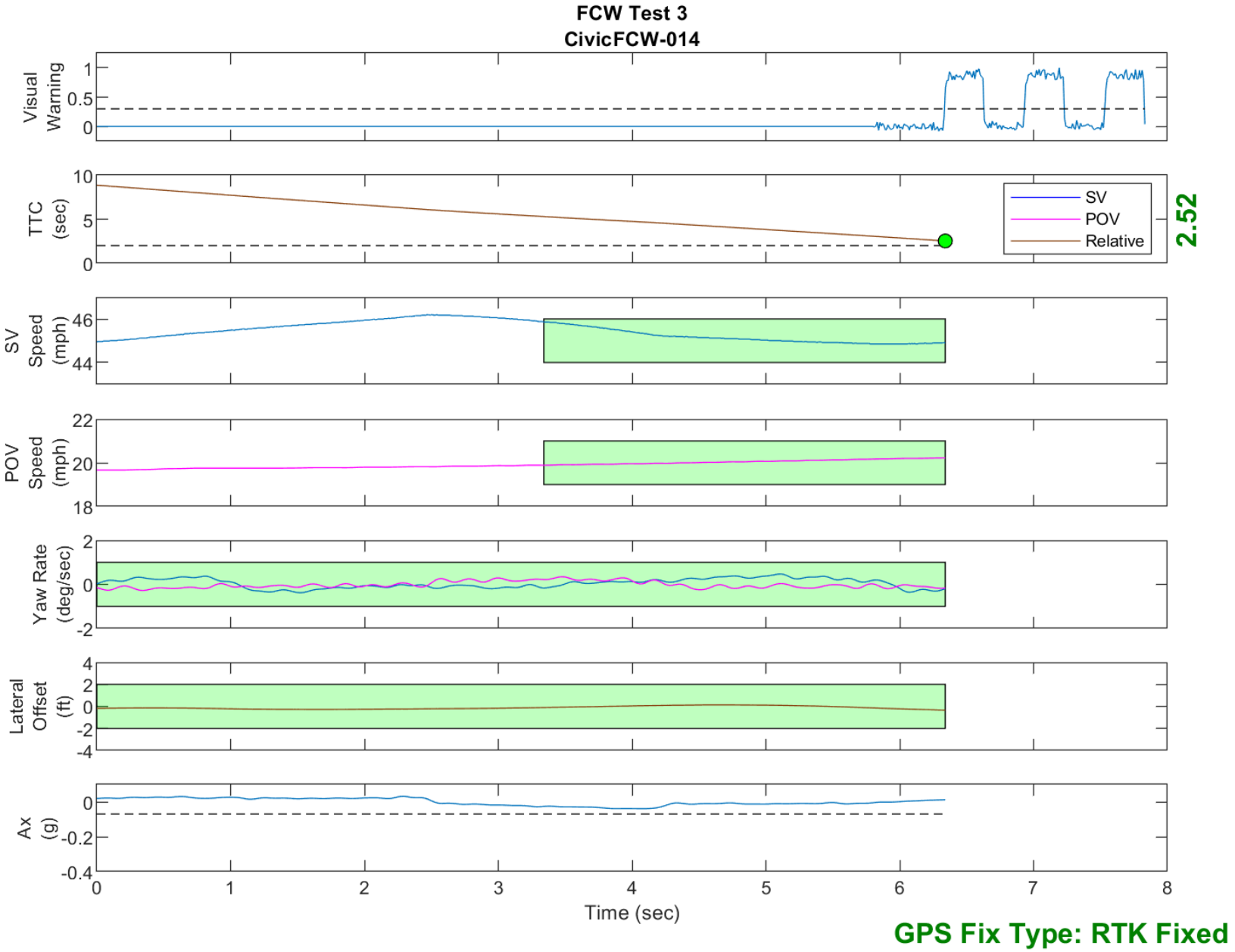


Figure D48. Time History for Run 14, FCW Test 3, Visual Warning