ATTENTION:
GENERAL MANAGER ❑
PARTS MANAGER ❑
CLAIMS PERSONNEL ❑
SERVICE MANAGER ❑

IMPORTANT - All Service Personnel Should Read and Initial in the boxes provided, right.

SUBARU

QUALITY DRIVEN® SERVICE

SERVICE BULLETIN

APPLICABILITY: 2020-24MY Legacy & Outback
2022-24MY WRX (A/T Only)
2019-24MY Ascent

NUMBER: 16-151-24

DATE: 10/22/24

SUBJECT: TR690 Chain Slip, Judder, Shudder, & Hesitation Concerns

INTRODUCTION:

This bulletin provides guidance when diagnosing chain slip, judder, shudder, and hesitation concerns on the TR690 model CVT transmissions used in the models listed above. The information below outlines the diagnostic flow in addition to the previously released related reference material. Always refer to the information within this bulletin prior to any other previously released material when addressing chain slip, judder, shudder, and hesitation concerns experienced by a customer.

SERVICE BULLETIN SUMMARY TABLE:

The following table below displays TR690 DTC related bulletins. Use this tables as reference as you may be directed to one of these documents using the service procedure information in this bulletin.

SERVICE BULLETIN SUMMARY TABLE					
Status	**TSB #**	**Subject**	**Starting MY**	**Ending MY**	**Model**
DTC Related Bulletin	16-135-21R	DTC P0871 – Transmission Fluid Pressure Sensor/Switch "C" Circuit Range/ Performance	2022	2022	Outback Wilderness
DTC Related Bulletin	16-145-23	DTC P2797 / Reprogramming Files	2023	2024	Legacy & Outback 2.4L Turbo
DTC Related Bulletin	16-142-23	DTC P2715 (Pressure Control Solenoid "D" Stuck On) Diagnosis	2022	2022	Legacy & Outback 2.4L Turbo
			2022	2022	Outback Wilderness
			2022	2022	Ascent
DTC Related Bulletin	16-144-23	DTC P0711, P0712, P0713 Diagnostic Procedure	2019	2023	Ascent

CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.
Subaru Service Bulletins are intended for use by professional technicians ONLY. They are written to inform those technicians of conditions that may occur in some vehicles, or to provide information that could assist in the proper servicing of the vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do the job correctly and safely. If a condition is described, DO NOT assume that this Service Bulletin applies to your vehicle, or that your vehicle will have that condition.

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ISO 14001 is the international standard for excellence in Environmental Management Systems. Please recycle or dispose of automotive products in a manner that is friendly to our environment and in accordance with all local, state and federal laws and regulations.

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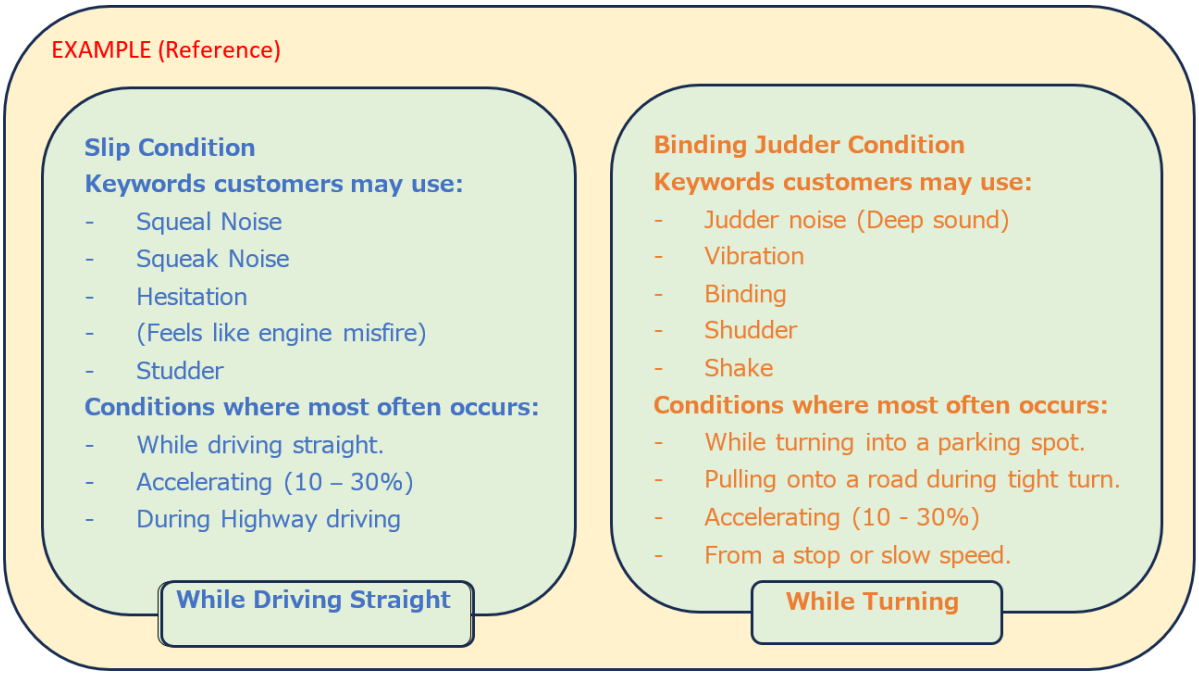
CUSTOMER INTERVIEW INFORMATION:

The customer interview is a vital part of performing an accurate diagnosis. Listed below are some examples of key wording/phrasing and conditions to be used to help accurately pinpoint the appropriate diagnostic strategy. When interviewing the customer, referencing the below diagram will help both the customer and retailer grasp the type of condition to be considered for diagnosis.



NOTE: This bulletin requires a test drive for concern replication. Technicians must follow instructions, refer to relevant appendices, and record data using the Select Monitor. This ensures accurate diagnosis and avoids repetitive test drives.

To ensure all necessary data is collected during the road test, record all TCM PIDS. For the diagnostic strategy of this Technical Service Bulletin, the following PIDS should be focused on:

- **Engine Rev Speed**
- **Primary Rev Speed**
- **Secondary Rev Speed**
- **Turbine Speed**
- **Actual Gear Ratio**
- **Primary UP Duty**
- **Front Wheel Speed**

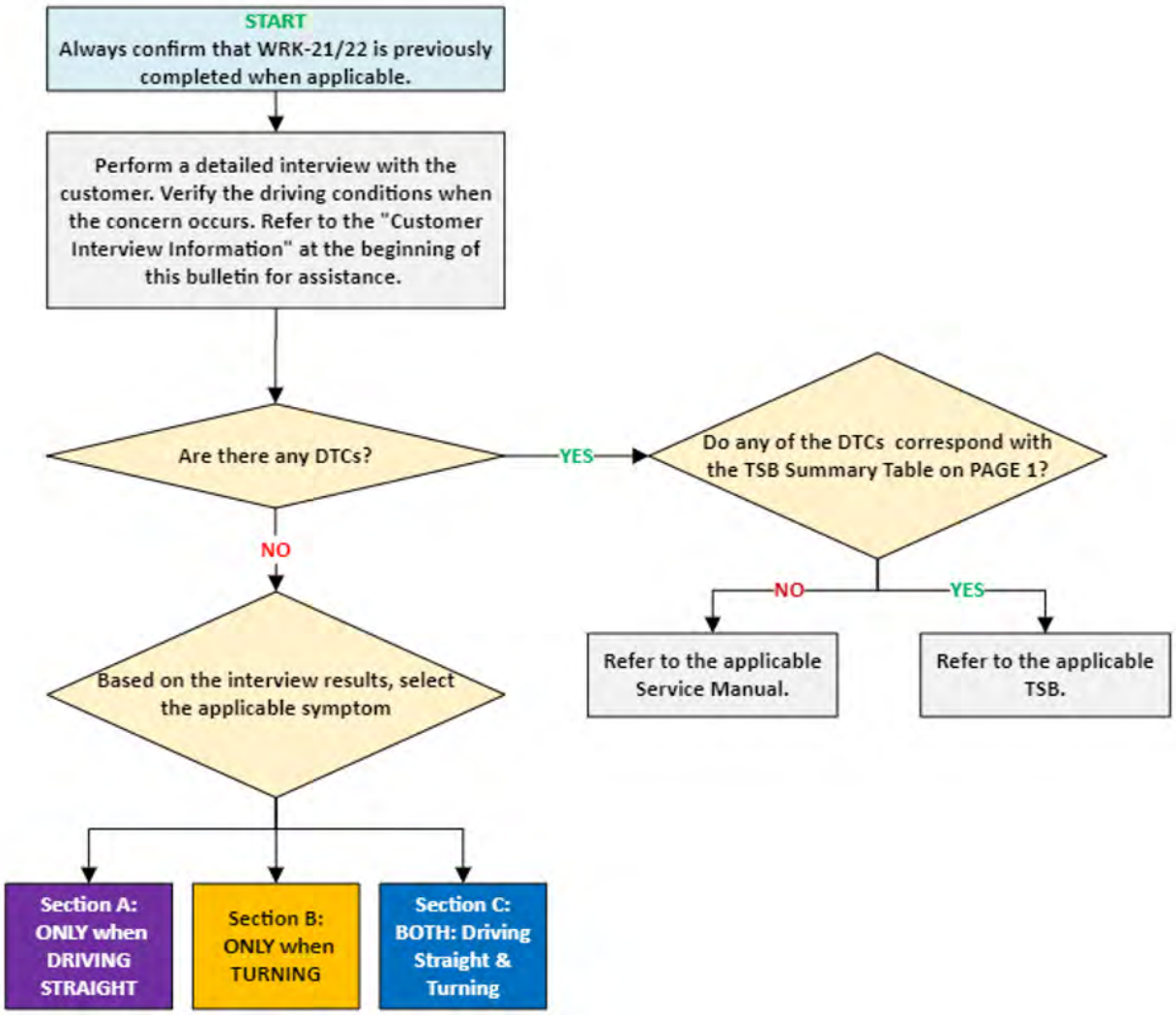
Depending on the diagnosis and repair procedures, the vehicle may need the latest software. The table below is a general guide to recent reprogramming file improvements. ALWAYS REFER TO THE LATEST TSB FOR REPROGRAMMING FILE APPLICATION AND AVAILABILITY.

Continued...

Current Reprogramming File Improvement Description (Always refer to Applicable TSB for Details)	Applicable TSB
Noise & Vibration When Turning (Appendix A- Section 5) Chain Slip Feeling Countermeasure	16-136-22R
Ascent Long Lockup Judder (Appendix A- Section 2)	16-140-23
Ascent P0711 Transmission oil temperature sensor A system circuit characteristic error	16-141-23R
Ascent Lock-up Judder- (Appendix A- Section 2)	TBD
Vibration during FWD clutch slip (Appendix A- Section 3)	TBD
23MY Legacy/Outback P2797 Shock upon restart from ISS	16-145-23R
23-25MY Legacy/Outback/Ascent/WRX Shudder during Deceleration W/ AC ON (Appendix A-Section 4)	16-150-24
23-24MY Legacy/Outback/Ascent/WRX Input Clutch Slip	TBD

TR690 DRIVABILITY CONCERN DIAGNOSTIC PROCEDURE:

Refer to the work flow chart below to confirm the next course of action.



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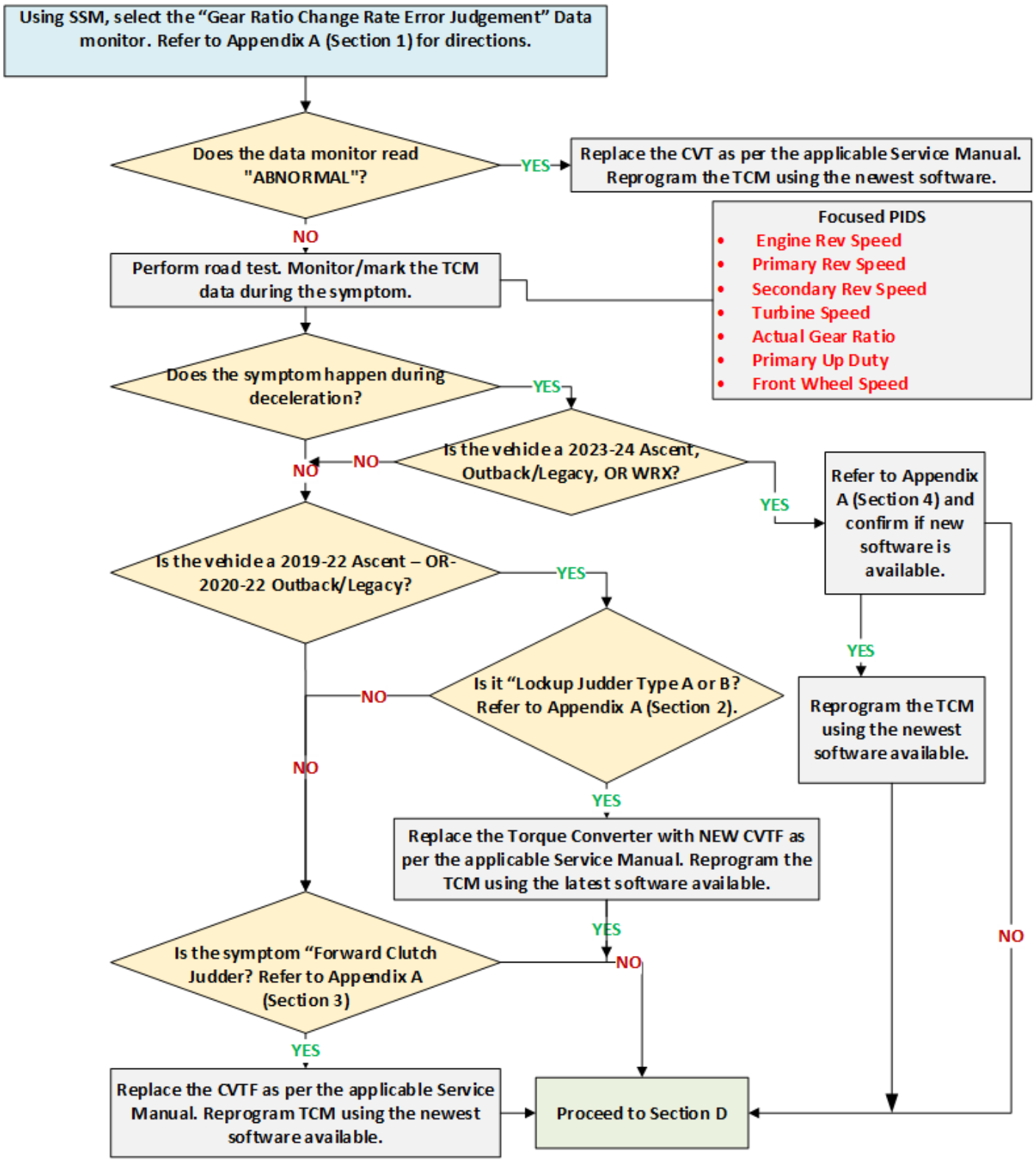
SECTION A: [While Drive Straight]

Refer to the work flow chart below to confirm the next course of action.



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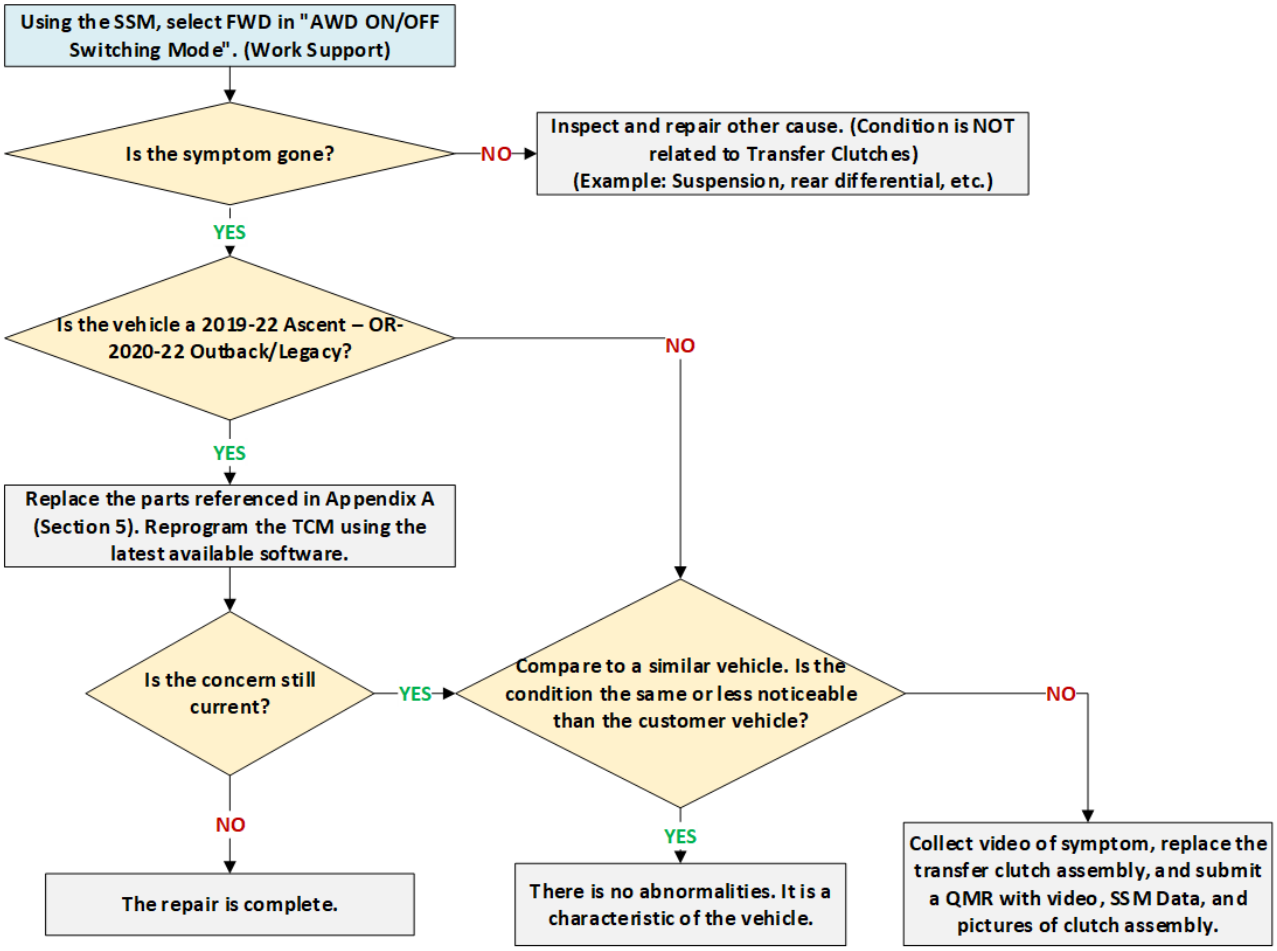
SECTION B: [When Turning]

Refer to the work flow chart below to confirm the next course of action.



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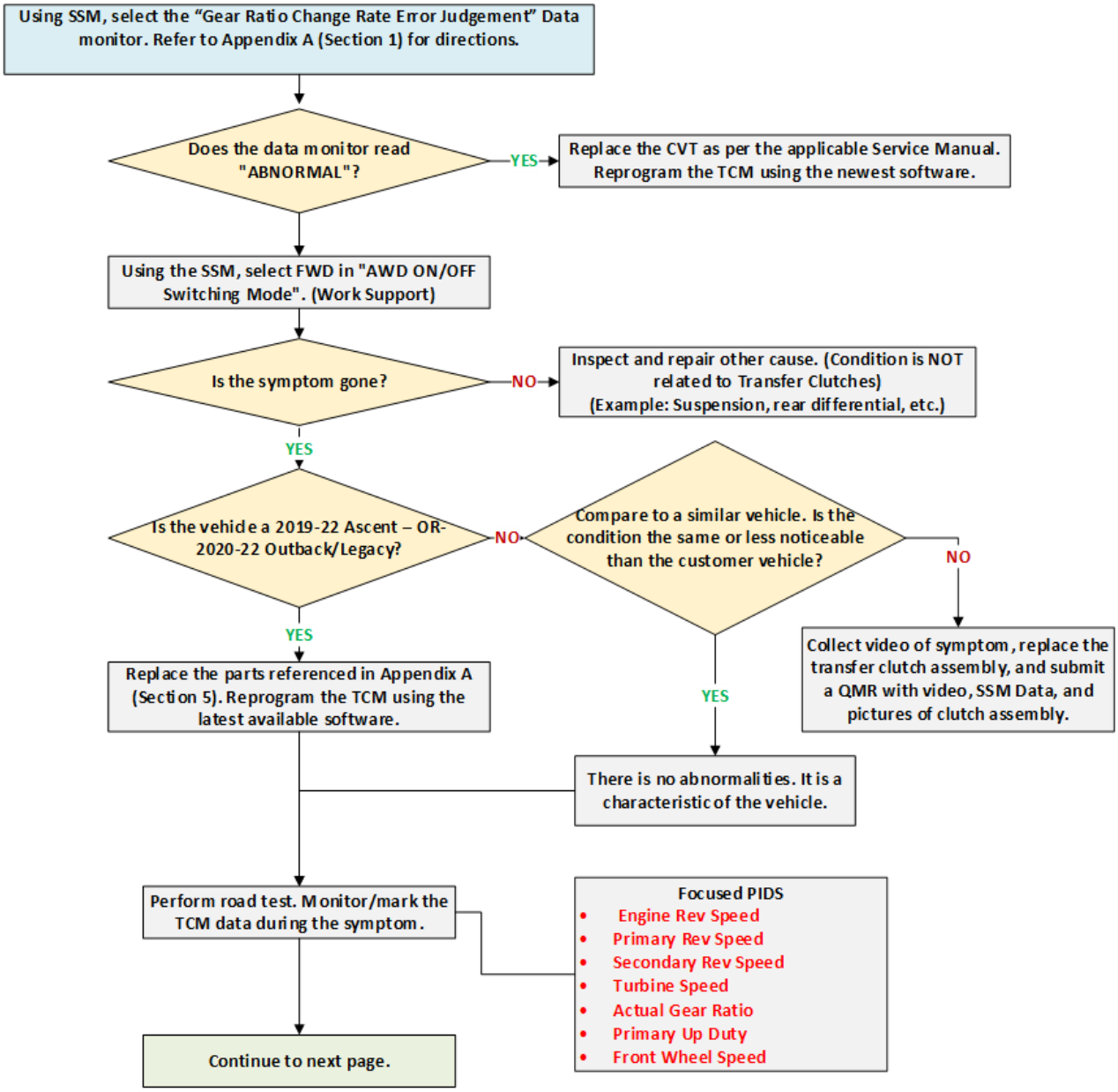
SECTION C: [Both Driving Straight & Turning]

Refer to the work flow chart below to confirm the next course of action.



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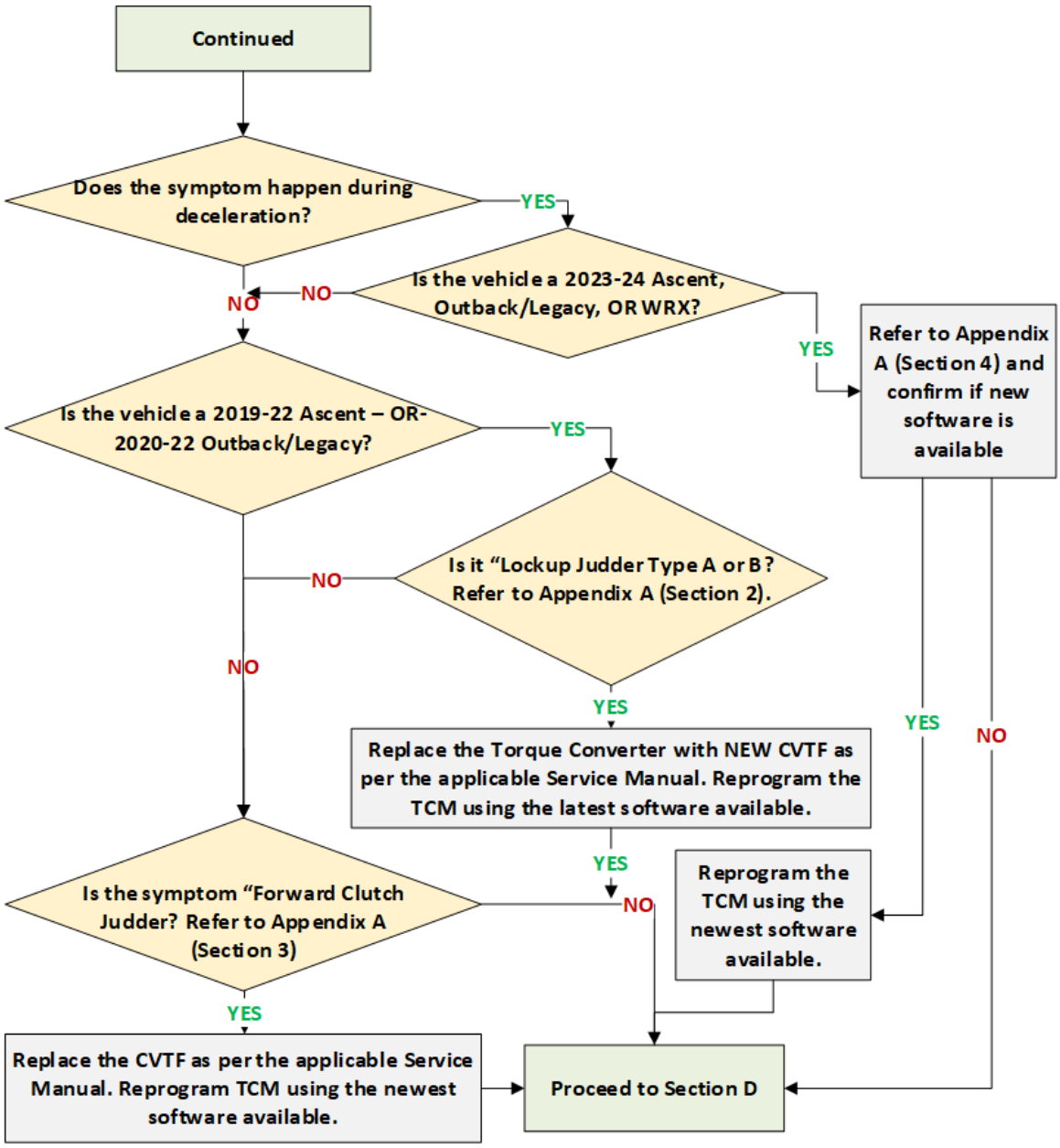
SECTION C: [Both Driving Straight & Turning] (Continued)



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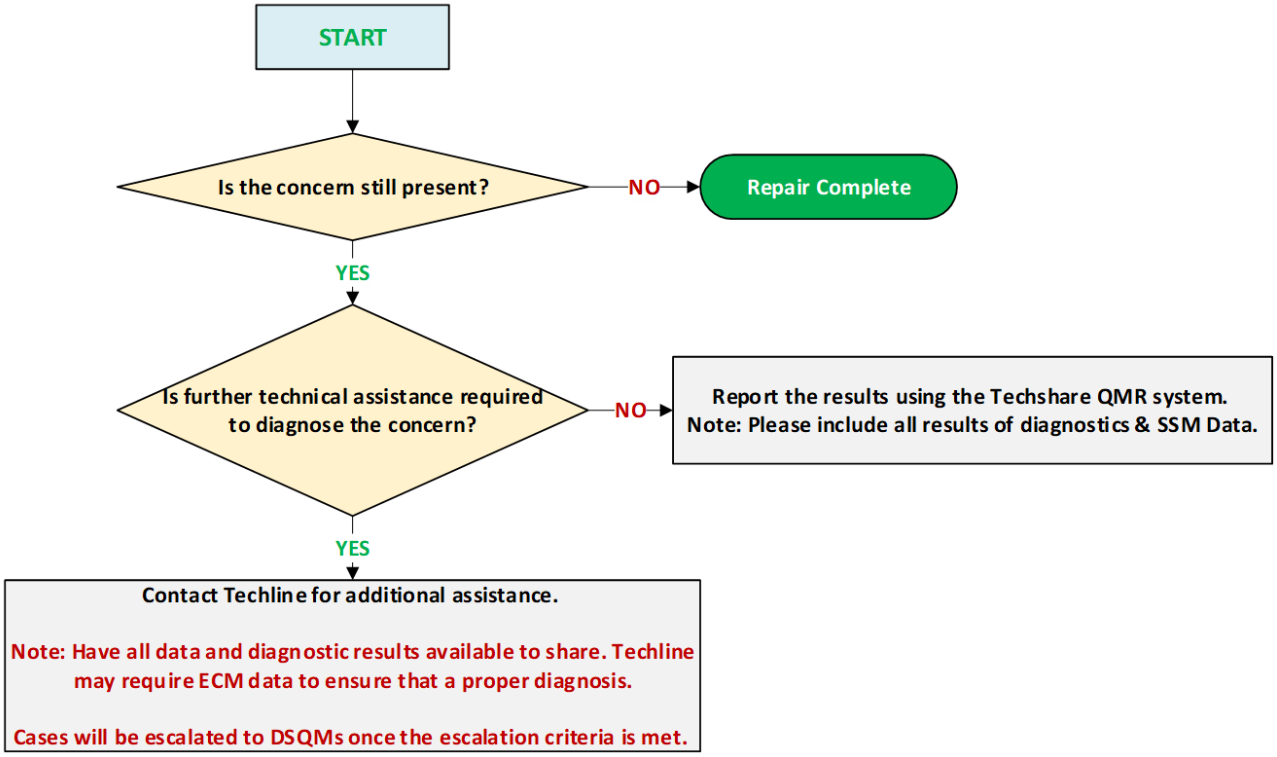
SECTION D: (Confirmation of Repair)



WARRANTY / CLAIM INFORMATION:

For vehicles within the Basic New Car Limited Warranty period or covered by an active Subaru Added Security Classic or Gold plan, this repair may be submitted using the following claim information:

Flow Chart A:

Labor Description	Labor Operation #	Labor Time: Ascent	Labor Time: Outback/Legacy	Labor Time: WRX	Fail Code
CVT Diagnosis	B303986	0.6	0.6	0.6	
CVT Replace and TCM Update/Check *	C303186	5.2	5.2	4.8	MQJ-24
QMR Submission with CVT Replace**	C303386	0.2			
CVTF Replacement and TCM Update/Check *	C303686	0.5	0.5	0.5	MQU-26
Torque Converter & CVTF replacement and TCM Update/Check *	C303286	5	N/A	N/A	LAA-26

***Include current or New CID# in warranty claim.**

Continued...

Flow Chart B:

Labor Description	Labor Operation #	Labor Time: Outback/ Legacy/Ascent	Labor Time: WRX	Fail Code
CVT Diagnosis	B303986	0.6	0.6	MSP-26
Transfer Clutch R&R and TCM Update/Check *	C303486	5.7	N/A	

***Include current or New CID# in warranty claim.**

Flow Chart C:

Labor Description	Labor Operation #	Labor Time: Ascent	Labor Time Outback/Legacy	Labor Time: WRX	Fail Code
CVT Diagnosis	B303986	0.6	0.6	0.6	
CVT Replace and TCM Update/Check *	C303186	5.2	5.2	4.8	MQJ-24
QMR Submission with CVT Replace**	C303386	0.2			
CVTF Replacement and TCM Update/ Check *	C303686	0.5	0.5	0.5	MQU-26
Torque Converter & CVTF replacement and TCM Update/Check *	C303286	5	N/A	N/A	LAA-26
Transfer Clutch R&R and TCM Update/ Check*	C303486	5.7	5.7	N/A	MSP-26

***Include current or New CID# in warranty claim.**

****Use QMR submission Labor Operation when Replacing CVT ONLY**

Flow Chart D:

Labor Description	Labor Operation #	Labor Time:	Fail Code
CVT Diagnosis	B303986	0.6	MK0-00
See Labor Operations per Flow Chart Used			
Diagnosis and No Fault Found/QMR Submitted	C303386	0.2	

IMPORTANT REMINDERS:

- SOA strongly discourages the printing and/or local storage of service information as previously released information and electronic publications may be updated at any time.
- Always check for any open recalls or campaigns anytime a vehicle is in for servicing.
- Always refer to STIS for the latest service information before performing any repairs.

Continued...

APPENDIX A (Section 1)

IMPORTANT: 2023MY Legacy & Outback 2.4L vehicles, refer to TSB 16-145-23R.

Function of "Gear Ratio Change Rate Error Judgement"

Description: When feeling shocks or vehicle body vibrations during acceleration, this function will support the diagnostic process to determine whether a chain slip occurs in the CVT or not.

Precautions for road testing:

- Use a USB cable to connect the DST-i or DST-010 to a PC. Wireless communication may lead to a wrong determination
- When driving on public roads, pay attention to the surrounding traffic conditions and drive safely incompliance with the law.
- To ensure accurate detection of abnormal gear ratio changes, please refrain from the following actions during the test drive:
  - Sudden deceleration or acceleration
  - Driving on rough roads
  - Driving the vehicle with the four wheels not stably contacting the ground, such as driving over bumps and/or putting the vehicle on lift before completing the detection process.

SSM Workflow

1. On the [Start] screen, select [Diagnosis].
2. On the [Select Vehicle] screen, enter the vehicle information and select [Confirm].
3. On the [Main Menu] screen, select [Each System].
4. On the [Select System] screen, select [Transmission].
5. On the [Select Function] screen, select [Work Support].
6. On the [Work Support] screen, select [Gear Ratio Change Rate Error Judgement].
7. Follow the instruction displayed on the screen and perform a road test.
8. Once the concern is replicated, end the testing and the results will automatically populate. When the message "Gear Ratio Change Rate Error Judgment is Complete" is displayed, the detection process has finished. Testing automatically ends after a time period approximately 50 minutes. If an additional measurement is desired, restart the Subaru Select Monitor after saving the data.

Continued...

Road Test Pattern:

No.	Accelerator Opening Degree	Vehicle Speed	Number Of Times Implemented	Note
1	30%	0 → 30mph	Each 1 time	If the customer's suggestions are specific, such as vehicle speed and accel pedal opening, implement that driving pattern.
2	50%	0 → 30mph		
3	100%	0 → 30mph		
4	After driving at a constant speed for 20s at the vehicle speed shown on the right, accelerate by stepping on the accelerator opening 10% more.	30(constant speed) → 40mph		
5		40(constant speed) → 50mph		
6		50(constant speed) → 60mph		

Continued...

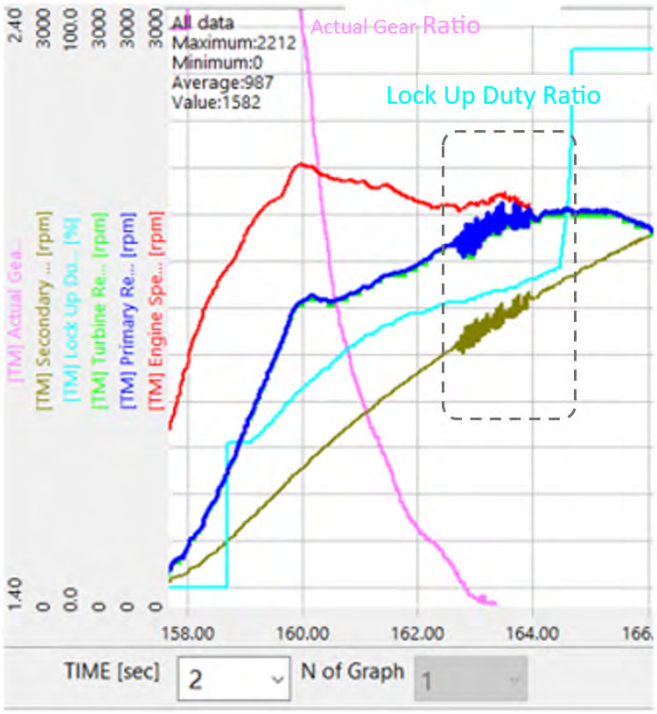
APPENDIX A (Section 2)

Lockup Judder <u>Type A</u> Diagnosis Procedure.

CAUTION: Confirm WRK-21/22 Has Previously Been Performed.

After the test drive has been completed with replication of the symptom, refer to the judgement criteria and example graph below to determine if the condition matches Lockup Judder Type A. If replication has not been completed, refer to the replication steps below.

Example Graph for Lockup Judder Type A:



<u>Suggested Graph Scale</u>

Time: 2sec /1division

Revolution speeds: Width of 3000 rpm

Actual Gear Ratio: Width of 1.0

Engine Speed
Primary Rev Speed
Turbine Revolution Speed
Secondary Rev Speed

Replication Method

STEP 1: Warm up the CVT until CVTF temperature reaches 122-158 degrees F (50-70 degrees C).

STEP 2: Make a complete stop, then accelerate the vehicle with throttle opening of approx. 15%.

STEP 3: As soon as the lockup operation begins at around 13mph with a slight drop of engine speed, open the throttle further to 25% quickly.

STEP 4: Repeat the Step 2 and 3, 10 (ten) times.

STEP 5: In case a when a judder sensation is felt, the vehicle is presenting <Lockup Judder Type A>.

Continued...

APPENDIX A (Section 2)

Lockup Judder Type B Diagnosis Procedure:

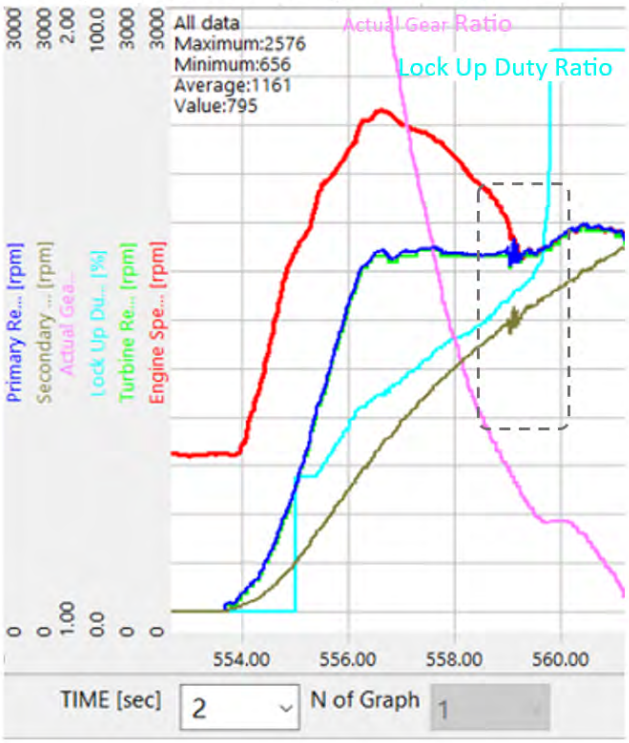
After the test drive has been completed with replication of the symptom, refer to the judgement criteria and example graph below to determine if the condition matches Lockup Judder Type B. If replication has not been completed, refer to the replication steps below.

Judgement Criteria

- There are fluctuations in Turbine Revolution and Primary Rev Speed:

  Peak to Peak > 50 rpm Duration < 1 second

Example Graph for Lockup Judder Type B:



Suggested Graph Scale

Time: 2sec /1division

Revolution Speeds: Width of 3000 rpm

Actual Gear Ratio: Width of 1.0

Engine Speed
Primary Rev Speed
Turbine Revolution Speed
Secondary Rev Speed

Replication Method

STEP 1: Warm up the CVT until CVTF temperature reaches 68-122 degrees F (20-50 degrees C).

STEP 2: Make a complete stop, then accelerate the vehicle with constant throttle opening of 15-20%.

STEP 3: Repeat the Step 2, 10 (ten) times.

STEP 4: In a case when a judder sensation is felt, the vehicle is presenting <Lockup Judder Type B>.

Continued...

APPENDIX A (Section 3)

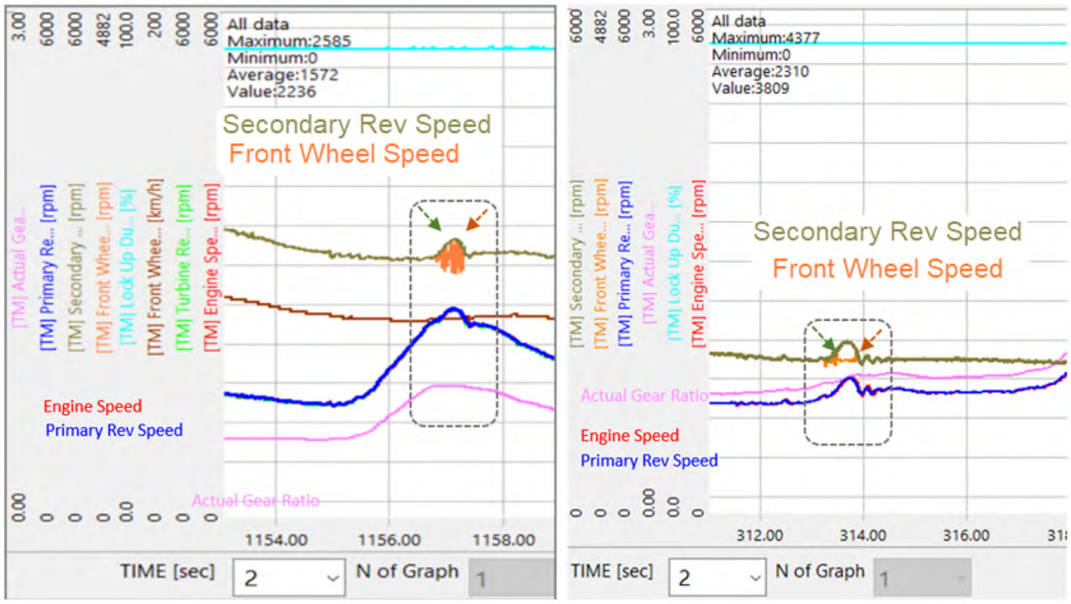
Forward Clutch Judder Diagnosis Procedure:

Judgement Criteria

The rotational speeds of the upstream and downstream sides of the forward clutch do not synchronize during driving.

Upstream side of the forward clutch: Secondary Rev Speed
Downstream side of the forward clutch: Front Wheel Speed

Examples Graph for Forward Clutch Judder:



Suggested Graph Scale

Time: 2sec /1division **Engine Speed:** 0 - 6000 rpm **Primary Rev Speed:** 0 - 6000 rpm

Secondary Rev Speed: 0 - 6000 rpm **Front Wheel Speed:** 0 - 4882* rpm

Actual Gear Ratio: 0.0 - 3.0 **Lock Up Duty Ratio:** 0 - 100 %

*Due to the secondary reduction gear ratio 1.229.

Replication Method

STEP 1: Warm up the CVT until CVTF temperature reaches 104-140 degrees F (40-60 degrees C).

STEP 2: Using Eyesight Adaptive Cruise Control (without using gas pedal,) drive the vehicle at 50-60mh for more than 7 (seven) miles.

STEP 3: Turn the Eyesight Adaptive Cruise Control off and keep constant speed of 40-60mph using gas pedal.

STEP 4: Depress gas pedal to increase throttle opening by 3-4% per second up to 30%.

STEP 5: Repeat Step 3 and Step 4 10 (ten) times.

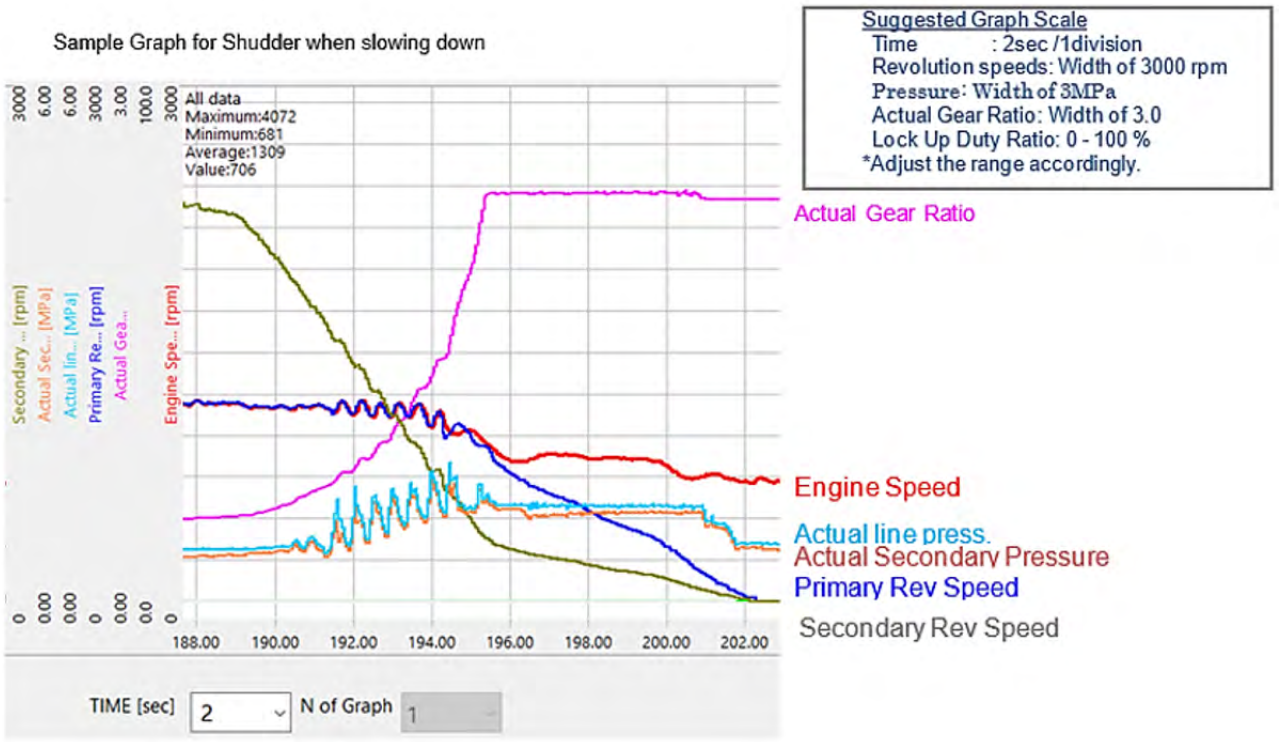
STEP 6: In a case when a judder sensation is felt, the vehicle is presenting < Forward Clutch Judder >.

Continued...

APPENDIX A (Section 4)

A jerk or judder sensation felt from the powertrain during braking with the air conditioning on.

IMPORTANT: 2023-24MY Legacy & Outback 2.4L, 2023-24MY Ascent, and 2023-24MY WRX vehicles, refer to TSB 16-150-24



For vehicles within the Basic New Car Limited Warranty period or covered by an active Subaru Added Security Classic or Gold plan, this repair may be submitted using the following claim information:

Labor Description	Labor Operation #	Labor Time:	Fail Code
TRANSMISSION CONTROL MODULE REPROGRAMMING	B860-686	0.5	MJZ-48
TRANSMISSION CONTROL MODULE R&R INCLUDING RELEARN	B860-786	0.8	MJT-43
TCM UPDATE AFTER REPLACEMENT	C860-118	0.3	

Continued...

APPENDIX A (Section 5)

Noise and/or Judder While Turning Symptom Diagnosis Procedure:

NOTE: The noise/vibration typically occurs under cold conditions.

STEP 1: With the SSM connected confirm the CVT temperature is below 176 degrees F (80C) before driving to collect data. If 176F (80C) or above, let the CVT cool before evaluating it.

STEP 2: Confirm if the noise/vibration appears by driving the vehicle under the conditions below. Pay full attention when performing a road test. Conducting the road test in closed area and with an additional person is recommended.

Items	Conditions
CVT oil pan temperature	Up to 176Deg F*
Accelerator opening angle	10 to 30%
Steering angle	Full Steer
Vehicles speed	Under 20mph

NOTE: *The noise/vibration may not occur when the CVTF temperature is higher than 176 degrees F (80 C).

Countermeasure Service Procedures:

Lockup Judder Type A & B: Torque Convertor (p.n. 31100AB460) replacement, CVT Fluid (p.n. 31333AA160) replacement, and TCM software reprogramming (newest software available).

Forward Clutch Judder: CVT Fluid (p.n. 31333AA160) replacement and TCM software reprogramming (newest software available).

Noise and/or Judder While Turning Symptom: TCM software reprogramming (newest software available). Replacement of the referenced parts below. See the tables below for applicability.

LEGACY & OUTBACK			ASCENT & OUTBACK WILDERNESS		
Part Description	**Part Number**	**Qty**	**Part Description**	**Part Number**	**Qty**
CLUTCH ASSY-TRF	33119AA740	1	CLUTCH ASSY-TRF	33119AA720	1
THRUST BEARING	806536020 806535030 806535040 806535050 806535060 806535070 806535090	1*	THRUST BEARING	806536020 806535030 806535040 806535050 806535060 806535070 806535090	1*
GASKET	803916010	1	GASKET	803916010	1
GASKET	803918060	1	GASKET	803918060	1
RING-SEAL	31377AA490	3	RING-SEAL	31377AA490	3
High Torque CVT-LV (As Needed)			**High Torque CVT-LV** (As Needed)		

Continued...

Model	Transmission Fluid	Part Number	Quantity/Unit/Pack	Warranty Part #
ALL	High Torque CVTF-LV	SOA748V0300	5 Gallon Pail	SOA635312
		SOA748V0310	16-Gallon Keg	

Continued...

APPENDIX B: (INFORMATIONAL PURPOSES ONLY)

CVT Chain Slip Diagnosis Procedure:

There are three main forms of CVT chain slip.

1. Continuous Micro-Slip
2. Short-Time Slip
3. Long-Time Slip

Using Subaru Select Monitor (SSM), check and record data monitors and compare to the three examples listed below. If the recorded data from the vehicle matches the examples below, the CVT will require replacement. The SSM data will be required for claim submission. A QMR containing the same information will also be required.

1. Continuous Micro-Slip

Judgement Criteria

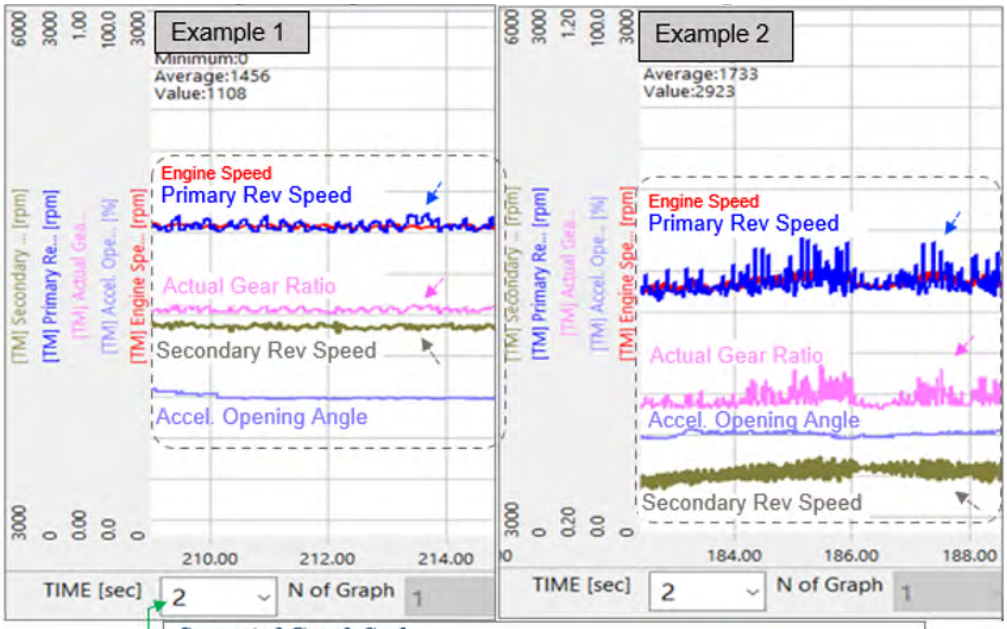
During a continuous micro-slip, while the Accelerator Opening Angle monitor displays a stable value for more than one second, there are fluctuations in the Actual Gear Ratio monitor:

Peak to Peak > 0.02 **Frequency > 3 cycles per 1 second**

There are fluctuations in the Primary Rev Speed and/or Secondary Rev Speed monitor:

Peak to Peak > 50 rpm **Frequency > 3 cycles per 1 second**

Examples of the data monitoring during Continuous Micro-Slip:



Suggested Graph Scale
Time: 2sec /1division **Revolution Speeds**: Width* of 3000 rpm
Actual Gear Ratio: Width* of 1.0

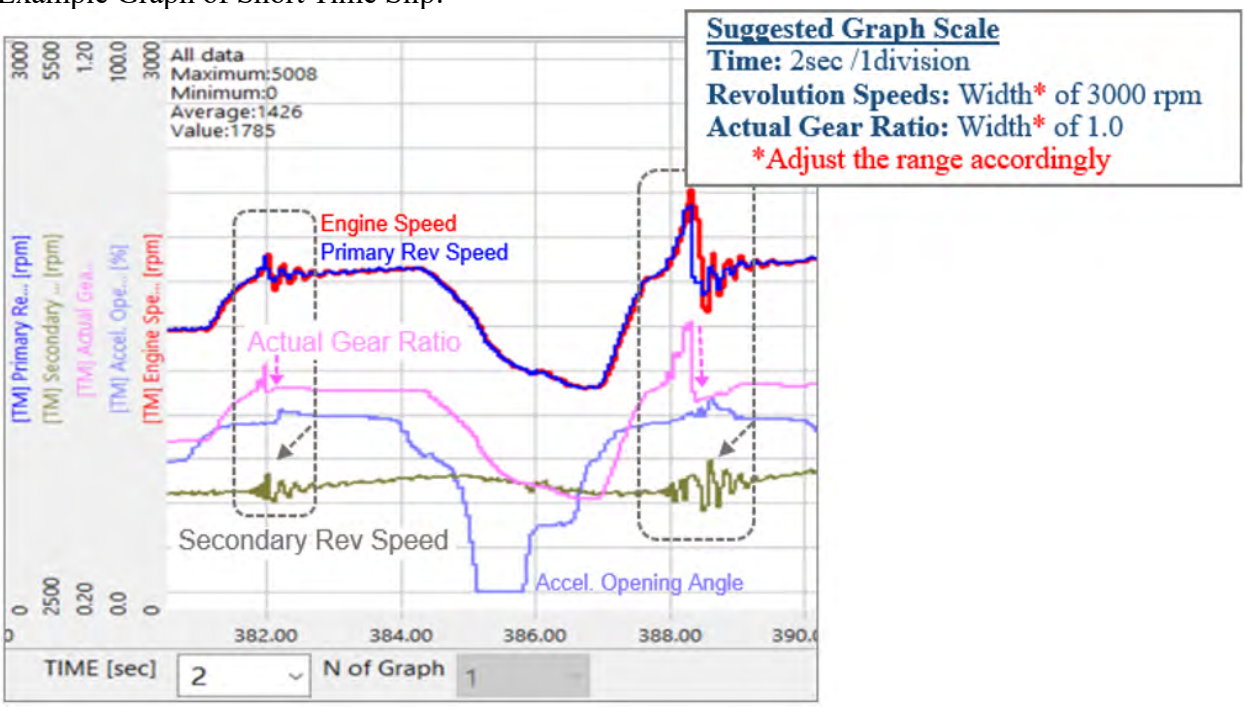
*Adjust the range accordingly.

Continued...

2. Short-Time Slip

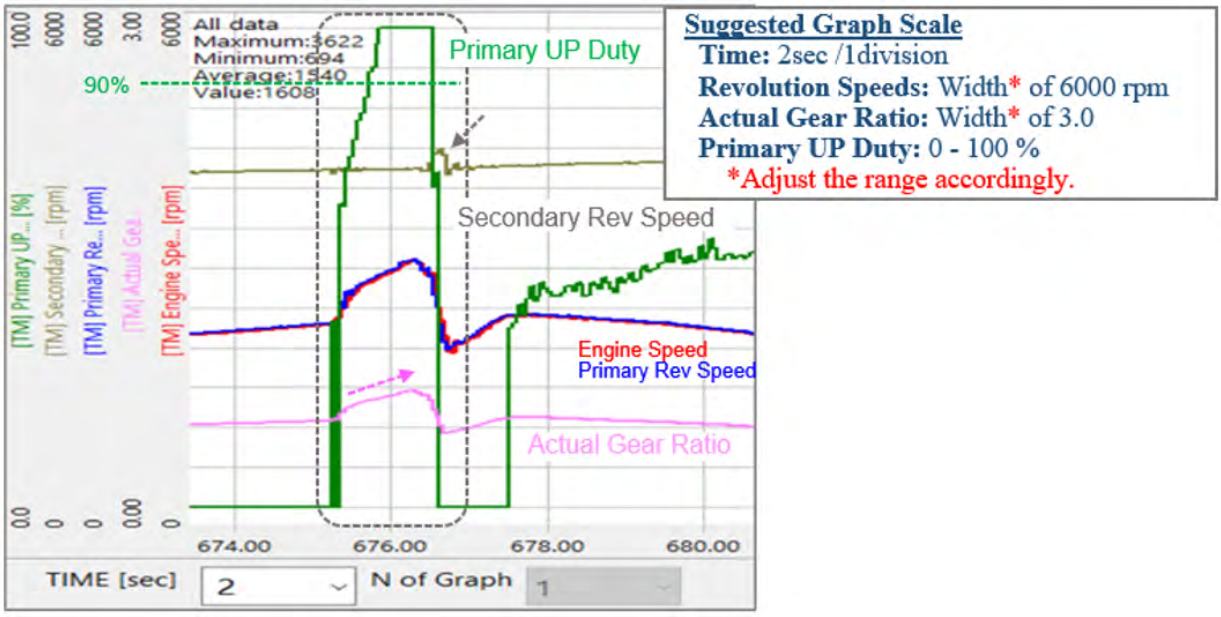
When a short-time slip occurs, the changes in the Actual Gear Ratio monitor will be larger than 0.1 per 0.1 second. After the Actual Gear Ratio monitor resumes to stable conditions, distinct fluctuations in revolution speed continues.

Example Graph of Short Time Slip:



3. Long-Time Slip

When a long-time slip occurs, the Primary UP Duty monitor will be larger than 90% and the Actual Pulley Ratio monitor lowers for a duration of 0.5 seconds or more. Even after the Actual Gear Ratio monitor resumes to stable conditions, distinct fluctuations in revolution speed continues.



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REFERENCE MATERIAL:

Symptoms Similar to CVT Chain Slip:

1. Forward Clutch Slip Shock

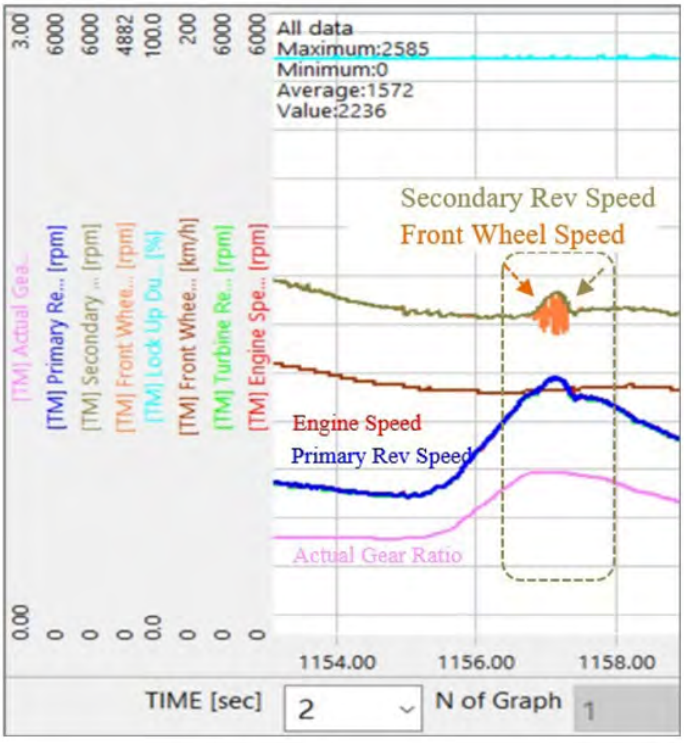
This shock can occur when the forward clutch slips. If this situation is reported, reprogram the TCM with the newest software available.

The rotation speeds for the upstream and downstream sides of the forward clutch do not synchronize when driving.

Example for
2.4L Turbo or 3.6L NA equipped vehicles

Upstream side of the forward clutch-
Secondary Rev Speed

Downstream side of the forward clutch-
Front Wheel Speed



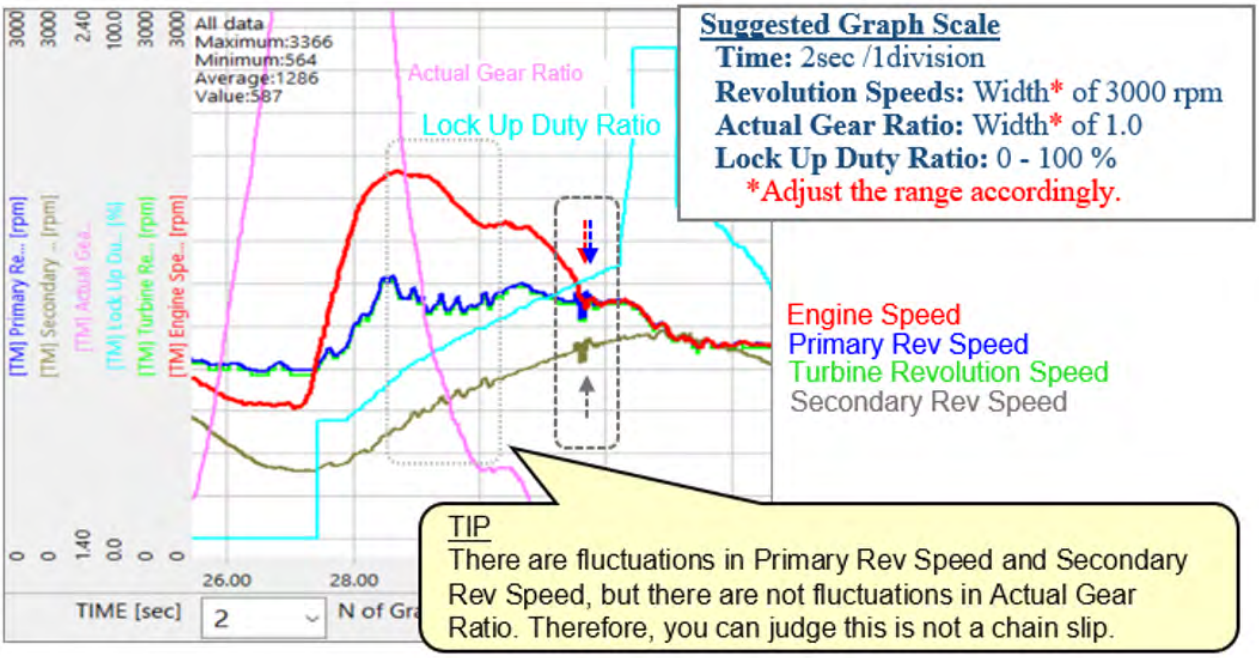
Suggested Graph Scale

Time: 2sec /1division
Engine Speed: 0-6000 rpm
Primary Rev Speed: 0-6000 rpm
Secondary Rev Speed: 0-6000 rpm
Front Wheel Speed: 0-4882* rpm
Actual Gear Ratio: 0.0-3.0
Lock Up Duty Ratio: 0-100%
*Due to the secondary reduction gear ratio 1.229.

Continued...

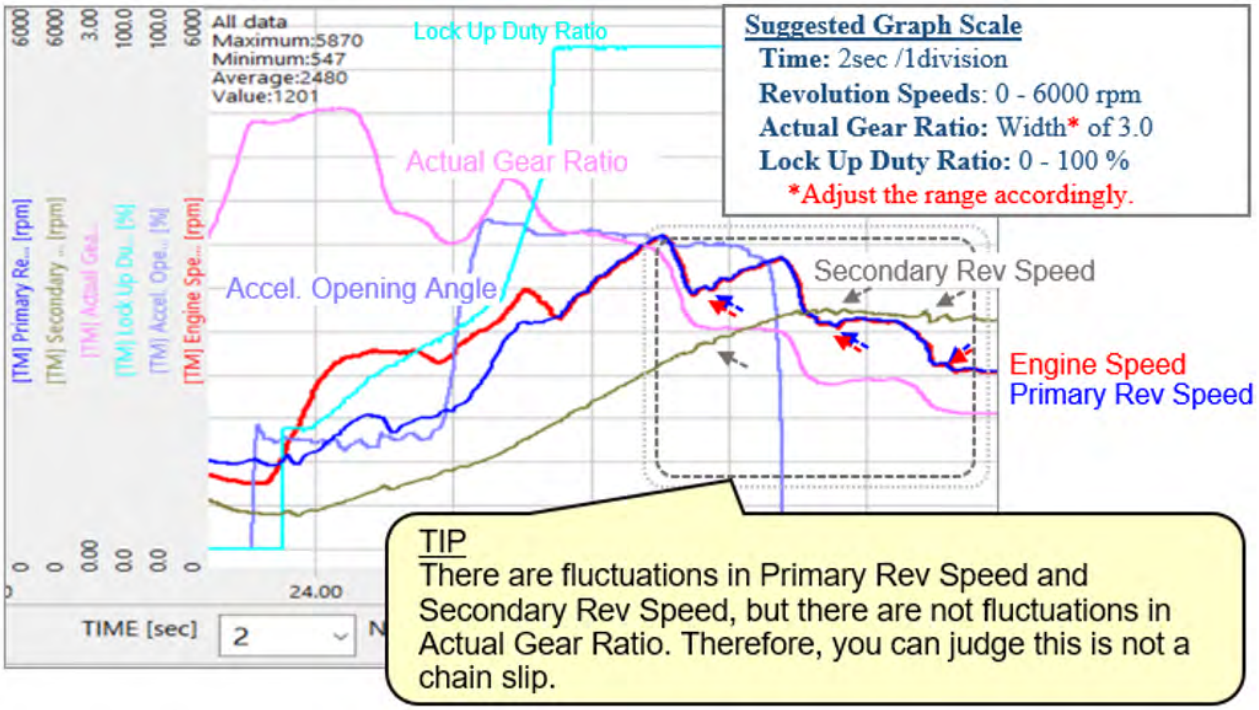
2. Lock Up Clutch Engagement Shock:

This shock can occur when the lock up engages rapidly. If this situation is reported, reprogram the TCM with the newest software available.



3. Shift Up Shock:

This shock can occur when the CVT upshifts. If this situation is reported, reprogram the TCM with new software if it is available. If there is no new software available or the reprograming does not remedy the issue, report the situation to Techline.



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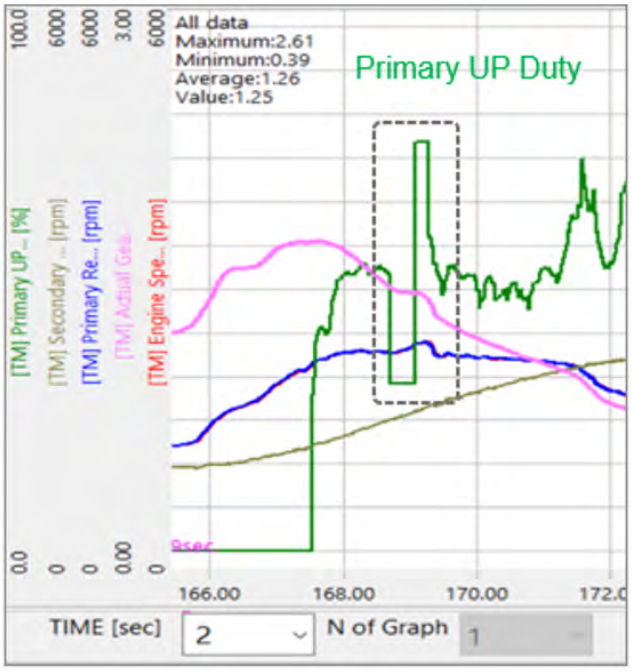
4. Primary Up Duty Square Control (Ascent Models up to 2021MY):



Suggested Graph Scale
Time: 2sec /1division
Revolution Speeds: 0 - 6000 rpm
Actual Gear Ratio: Width* of 3.0
Primary UP Duty: 0 - 100 %
*Adjust the range accordingly.

Engine Speed
Primary Rev Speed
Actual Gear Ratio

A harsh shift can be felt while driving. If this situation is reported, reprogram the TCM with new software if it is available. If there is no new software available or the reprograming does not remedy the issue, report the situation to Techline.