



Structural Durability Time - History Data Validation Guidelines

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The purpose of this standard is to verify the validity of data sent to the structural durability laboratory and ensure the data conform to the standards defined for the structural durability laboratories. This data is time history data from either physically measured Road Load Data Acquisitions (RLDA) or analytical “virtual RLDA” (vRLDA). Standards described in this document: Standard Channel Measurement Conventions (Channel Nomenclature, Coordinate System, Positive Direction, Static Offsets), Data File Format and Data Quality Checks.

Note: Throughout this procedure, “RLDA” means both RLDA and vRLDA unless noted otherwise.

1.2 Applicability. This procedure is applicable to all structural durability related **time history** data. It will not guarantee perfect data every time, but using these suggested data quality checks will eliminate the most significant errors.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW15219

GMW15242

GMW15268

GMW15445

2.3 Additional References.

- Global Structural Durability Lab Expert Team (GSDLET) web site:
https://gmweb.gm.com/sites/GSDLET/Pages/PCpro_Processes.aspx

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. Not applicable.

3.3 Test Vehicle/Test Piece. Not applicable.

3.4 Test Time. Will vary depending on project scope.

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. Data that will be used in the structural durability laboratories is expected to incorporate the following standards. These standards include:

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- Remote Parameter Control (RPC) format files.
- The raw RLDA data should be received with a sample rate exceeding 1000 Hz to allow for adequate peak resolution for analyses. The lab will need to resample the data to either 409.6 or 512 points/s sample rate for compatibility with the controller being used.
- Frame size of 2048 points.
- Group size of 2048 points or 4096 points.
- Adherence to channel naming standards (see Appendix A), file naming standards (see GMW15219), and engineering units (Appendix C) with correct coordinate systems and polarity (Appendix D) is **strongly encouraged** but is not required. If alternatives are used for any of these, they must be documented in an RLDA Evaluation Report.
- Correctly driven (RLDA) or calculated (vRLDA).

4.1.1 These data should be verified to adhere to these guidelines using the following procedure both before delivery to the laboratories (RLDA engineer or Computer Aided Engineering (CAE) engineer) and after delivery, the laboratory engineer should use the same procedure as a means of becoming familiar with the data.

4.2 Conditions. Not applicable.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Data Integrity Check. Data issues fall into one of two categories: correctable and non-correctable. When using software programs to correct the data, take care to ensure that the engineering values are not accidentally changed in the time history. The user must consult an experienced RLDA or laboratory engineer if they are not familiar with the suggested corrective action. The following is a list of potential data issues, and suggested corrective actions. Some of the suggested actions are to rerecord (recalculate) the data. This may not be practical if the RLDA vehicle is already torn down, in which case the laboratory engineer must find the best repair of the data possible, using good engineering judgment and possibly with the aid of a CAE engineer. Several of these checks require visual inspection. Examples are included in Appendix B.

4.3.2 File Naming Convention. For data shareability, it is recommended that the schedule names adhere to the standard naming convention. See GMW15219 for the file naming convention.

Corrective Action: Rename to standard naming convention.

4.3.3 Uniform Channels. All the schedules must have the same channel arrangement (number and order).

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.4 Channel Naming Convention. Ensure that the standard channel naming convention is used. See Appendix A, Figure A1 and Table A1 for the channel naming convention.

Corrective Action: Rename to standard naming convention. For example, use RPC Pro Setup to create and correct the appropriate header, then create a Batch process using Channel Transformation and apply to all files using the batch tool. As an alternative, you may use the RPC Pro Header Modification tool instead, but this tends to be more mistake-prone.

Warning: If a given channel has a non-common full scale, this action will change the engineering data.

4.3.5 Engineering Units. Ensure that the standard engineering units are used. Special characters (e.g., m/s², μ, Σ) may not be correctly recognized by RPC software. See Figure B1 for an example. Appendix C, Table C1 contains a table with the preferred units for most common measurements.

Corrective Action: Correct the engineering units. For example, use RPC Pro Setup to create and correct the appropriate header and apply to all files using RPC Pro Header Modification tool.

Warning: If a given channel has a non-common full scale, this action will change the engineering data.

4.3.6 Full Scales. Ensure that the individual channel full scales are the same across all the schedules.

Corrective Action: If the full scale is not the same across all schedules, a common full scale should be chosen and applied. For example, use the RPC Pro Header Modification Tool.

Warning: The value chosen for a given channel must be greater than the largest absolute peak observed across all schedules for that channel, or data will be clipped.

4.3.7 Correct Channels in Dataset. Ensure that all needed channels are included in data. GMW15268 provides the MINIMUM channels that should be included.

Corrective Action: Either re-extract data or rerecord so that correct, required channels are included.

4.3.8 Sample Rate. Check the sample rate. All GM RLDA groups typically record data with a sample rate of at least 1000 Hz (1 kHz). The standard sample rate for RPC laboratory data is either exactly 409.6 points/s or 512 points/s so that the physical test controller can use the data. RLDA data will need to be resampled to a laboratory-acceptable data rate. The sample rate must be the same for all files. Sample rates which are slightly off (i.e., 409.599 points/s) indicate a data processing issue and must be corrected before using the data.

Note: Some data acquisitions may require a higher sample rate to adequately characterize the content of the data.

Corrective Action: Correct the data. For example, this may require the use of RPC Pro Resample tool to filter the data (to prevent aliasing), and adjust the sample rate.

4.3.9 Frame Size. Check the frame size. Data received with a sample rate of 409.6 points/s should have a frame size of 2048 points, providing a frequency resolution of 0.2 Hz. For adequate frequency resolution, the laboratory typically needs at least 0.25 Hz or smaller resolution. Data with inconsistent frame sizes needs to be corrected.

Corrective Action: Adjust the data to the correct (2048) frame size. For example, use RPC Pro Setup to create and correct the appropriate header and apply to all files using RPC Pro Header Modification tool.

Warning: If a given channel has a non-common full scale, this action will change the engineering data.

4.3.10 Points per Group. The points/group must be an integer value when divided by the frame size. The points/group must be 2048 or 4096, when the frame size is 2048.

Corrective Action: Correct to the correct points per group. For example, use RPC Pro Setup to create and correct the appropriate header and apply to all files using RPC Pro Header Modification tool.

Warning: If a given channel has a non-common full scale, this action will change the engineering data.

4.3.11 Recorded Maneuvers. Ensure that the modules were driven per test procedure instructions. Check for the proper time length (usually documented in the driving procedure) and internal events. For example, in the Full Brakes Snubs durability event (GMW15556) there should be a total of five (5) forward/reverse Full Brake Snub maneuvers (15 forward snubs and 5 reverse snubs). If the user is not familiar with the proper number of maneuvers that should have been recorded, read the applicable test procedure. See Figure B2 for an example. If available, reference a “**speed template**” for the road surface in question. Also ensure that the filenames accurately represent the module recorded.

Corrective Action: Resolve discrepancies by adjusting the repeat counts (if possible) or recollecting the data. An alternative method is to duplicate the existing laps to create a file with the proper number of laps.

4.3.12 Polarity. Visually check the data polarity for consistency with the RLDA Workbook. During known test maneuvers, the time history plots must be consistent with the polarity stated in the RLDA Workbook. See Figure B3 for an example. Appendix D contains the coordinate system standards.

Corrective Action: Correct the RLDA Workbook or invert the data. For example, use RPC Pro Time History Math tool. If the data are corrected by inverting, correct the source of the inversion in the lab, or the same issue will re-emerge during laboratory testing if the same instrumentation is used on the road and in the laboratory.

4.3.13 Symmetry. Check for symmetry between similar channels. For example, the left front Fore/Aft peak load should be similar to the right front Fore/Aft peak load. This check should be done between all channels where similar magnitudes would be expected. See Figure B4 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.14 Saturation. Ensure that the data do not reach the full scale value. Look for flat tops in the data (due to reaching a previously used full scale value). Figure B5 gives an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.15 Auto-Spectral Density (ASD) Plots. Look for unusual spikes or frequency roll-offs in the ASD plots. Symmetrical channels should have similar ASDs. Also, integrally-related channels, such as acceleration, displacement and velocity should have the appropriate relation, e.g., velocity is the integral of acceleration so the velocity ASD should approximately roll off as the inverse of frequency from the acceleration ASD. See Figure B6 for an example of symmetric channels.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.16 Signal Resolution. Confirm that there is an acceptable signal resolution. When closely viewing the data, the bit resolution (stair stepping) should not be visible and the peak loads should be a reasonable percentage of the full scale value. Ideally the peak loads should be about 80% of the full scale value. Using less than 10% of the full scale value is unacceptable. See Figure B7 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.17 Signal to Noise Ratio. Ideally, the RLDA engineer will have run a “noise test” where the individual transducers are un-powered but data are recorded. This test will allow review of data for Electro-Motive Force (EMF)-type noise issues. A less effective option is to review the before-run zeroes before the vehicle is moving. See Figure B8 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.18 Wheel Force Transducer (WFT) Ripple. Although not often seen on newer WFTs, verify that the ripple on the WFT channels is acceptable (Fore/Aft and vertical) in all files. The maximum acceptable value is 600N peak-peak. Ripple is best viewed during the smoothest section of each module. See Figure B9 for an example.

Corrective Action: Discuss with the RLDA Engineer and correct as required. Options include: recollect the data, replace a bad WFT and recollect the data, or post-process the data with appropriate software tools. These options should be executed by the RLDA Engineer.

4.3.19 Signal Loss. Look for any signal loss. For example, when looking at a file where there is no expected change in magnitude, ensure that the signal doesn't suddenly get larger or smaller. See Figure B10 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.20 Switched Channels. Check for switched channels. For example, a lateral load channel should not look like a Fore/Aft load channel, or vice-versa. See Figure B11 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required. Correction may include modifying header to correct channel name(s), and/or scaling data for swapped transducers.

4.3.21 Channel Relationships. For channels that may have a relationship, plot in XY-mode to check data. For example, a spring force and spring displacement should have a nearly linear relationship.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required. Correction may include modifying header to correct channel name(s), and/or scale data for swapped transducers.

4.3.22 Shipping Simulation. If included, verify that the shipping simulation files are named correctly. The standard convention is SX (15 minutes of Rail Shipping, 90 repeats), SY (Rail Humps, 2 repeats) and CU (9 minutes of Haulaway, 100 repeats). Note that a Rail Hump consists of one forward and one rearward impact. See Figure B12 for an example.

Corrective Action: Discuss with the RLDA Engineer and rename the data files as required.

4.3.23 Potholes. Typically (but not always) the vertical loads will increase from Pothole No. 1 to Pothole No. 2 to Pothole No. 3. See Figure B13 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.24 Mean Shifts. Look for any non-continuous data. For example, look for data that suddenly shift to a new mean value. See Figure B14 for an example. This may indicate transducer yield or fastener slip.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.25 Drift. Check for any zero drifting. Look for drifts during the longer schedules. Some data offsets may be generated due to the pre-run and post-run zero procedure not being followed. See Figure B15 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required. Some drift may not be corrected by rerunning, e.g., drift due to brake heating as a result of the maneuvers.

4.3.26 Steer Angle. Ensure that the steer angle (used for WFT and ball joint corrections) makes physical sense (magnitude and positive sense). Most vehicles are not able to achieve a steer angle greater than 40 degrees. See Figure B16 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.27 Lateral WFT Loads. WFT static lateral loads should be close to zero. These loads should be checked with the vehicle rolled to a stop on a level surface without using excessive braking or steering, the transmission

in neutral, the service and parking brakes released, and the steering wheel straight ahead. Examine these loads at the beginning and end of the data files (assumes the pre-run and post-run zero procedures have been followed). Values in excess of 500 N could indicate a bad transducer or a vehicle out of alignment. Values that are different in a forward rollout versus a rearward rollout could indicate a possible toe alignment problem. See Figure B17 for an example.

Corrective Action: Have the RLDA Engineer check the vehicle's alignment. Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.28 WFT Camber Moments.

Note: Some WFT design, notably the MTS Spinning Wheel Integrated Force Transducer (SWIFT), automatically zero the static zeroes for Camber Moment. WFT static camber moments should be between 400 N·m and 900 N·m inboard.

Examine the data at the beginning and end of the data files are usually good places to examine these loads (if the pre-run and post-run zero procedures have been followed). Examine and understand values outside of the range of 400 N·m to 900 N·m. See Figure B18 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.29 WFT Fore/Aft Forces. WFT static Fore/Aft forces should normally be near zero. Examine the beginning and end of the data files for these loads (assumes the pre-run and post-run zero procedures have been followed). Understand and address values not close to zero. See Figure B19 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.30 Front Suspension WFT Brake Moments. The front suspension WFT Brake Moment channels will contain data during turning events when the brakes are **not** applied. This data is real. Anytime there is a steer event there is a resulting moment on the front wheels (RMx) in the wheel coordinate system. When this is related to the vehicle coordinate system it will show up as both a Camber Moment (VMx) and Brake Moment (VM_y), depending on the steer angle. Unfortunately, on full vehicle and suspension multi-axial tests this brake moment force due to steering cannot be reproduced.

Corrective Action: Non-brake events must be separated out from the brake events and zeroed out. This is done to eliminate acceleration torque on a drive axle, eliminate brake moment forces during turning events, and provide representative fatigue damage comparison due to braking. A Separate Brake Events process has been created to assist in performing this step. Refer to the Global Structural Durability Lab Expert Team (GSDLET) web site: https://gmweb.gm.com/sites/GSDLET/Pages/RPCpro_Processes.aspx.

Note: The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

4.3.31 Dropouts. Look for any data dropouts. For example, look for data suddenly approaching full scale or zero. The data may remain at this amplitude for very short or extended periods. Examine the brake switch/light channel for dropouts or noise that makes it unusable for automatically marking brake events. See Figure B20 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.32 Spikes. Ensure there are no glitches or spikes in the data. Check for data that suddenly change magnitude within a few data points. See Figure B21 and Figure B22 for examples.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required. Some minor spikes may be removed via “**point maneuver**” type tools, but this should be avoided if possible. The RPC Pro Spike and Jump Detection tools are good tools to detect spikes.

4.3.33 Ballast Distribution. Ensure that the ballast is uniformly distributed per the applicable procedure. The static WFT vertical loads should be approximately equal to vehicle corner weights for each ballast condition. Ballast should be uniformly distributed unless specified otherwise in procedure (GMW15445). See Figure B23 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.34 Zeroing. Make sure that real loads are not being removed from the data due to excessive or inappropriate zeroing. It is preferred that wheel to body displacements be zeroed once on the hoist, and not zeroed for the remainder of the RLDA. When WFTs are included, this may not be practical, so in a less than desirable solution, the displacements are zeroed at full rebound each time the WFTs are zeroed. Other channels should not be zeroed out unless the vehicle is on a level pad and has been “**rolled out**”. Significant offsets should be root

caused and not just removed by zeroing. Zeroing out “real loads” can show up as offsets at the completion of the surface as the vehicle is rolled out onto a level pad. See Figure B24 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.35 Groundouts. Check for mechanical groundouts that may show up as flat tops within the data or mathematical sums that do not make sense (e.g., symmetric left and right engine mounts that do not sum to zero during a torque event or the summation of left and right wheel torques not equaling the propshaft torque adjusted for axle ratio). See Figure B25 for an example.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.36 Brake Events. Check the significant brake events for proper deceleration rate. The rate should be examined at or near the peak brake torque. Check the deceleration rate using a Fore/Aft body mounted accelerometer or hand-calculated from vehicle speed before and after the stop. Some events may be difficult to achieve the specified deceleration range with certain vehicles. Some drivers do not use a decelerometer, so the critical brake events must be checked for proper rate. Note that the moderate acceleration and braking event is considered to be a critical brake event, since it is a singular event and has a large number of repeats applied to it. See Figure B26 and Figure B27 for examples.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.37 Pre-Run and Post-Run Zeros. If the approved pre-run and post-run zero procedure was followed, all of the data files should start and end with the vehicle in neutral and brakes not applied (vehicle allowed to coast to a stop with minimal use of brakes and the steering wheel straight ahead). Check for offsets on the Fore/Aft, lateral, and braking load channels. Make sure that sufficient “dead time” (minimum 1 s) is available before and after the maneuver, particularly high-amplitude maneuvers such as potholes, to allow for data manipulation.

Corrective Action: Discuss with the RLDA Engineer to implement the approved procedure.

4.3.38 Summed Load Cells. On the channels where load cells were summed, ensure the loads make physical sense.

Corrective Action: Discuss with the RLDA Engineer to understand, correct and/or recollect the data as required.

4.3.39 Static Offsets. Check for static offsets that may have been added in during RLDA post-processing. If the data have static offsets added in, ensure that the polarity of the offsets make physical sense. Appendix E contains tables of channels typically requiring static load measurements and those not requiring static measurements. Unless the static offset can be reproduced in the laboratory, it should be removed for laboratory use. Typical channels for which it is removed are: powertrain mounts, rear differential, and stabilizer bars. See Figure B28 for an example.

Corrective Action: Remove select offsets noted in the RLDA Workbook. For example, use RPC Pro Time History Math tool.

4.3.40 Segmented Files. Append segmented files. This action is only required if files are segmented.

Corrective Action: When concatenating the segmented files, be aware any end of file conditions (e.g., zero fill) that may cause physically unrealizable data.

4.4 Suggestions for Efficiency. Sections 4.3.5 through 4.3.10, 4.3.12 and 4.3.39 can be resolved using GSDLET Chassis Sub-Team Data Preparation process posted on the web page: https://gmweb.gm.com/sites/GSDLET/Pages/RPCpro_Processes.aspx.

Note: The supplier shall work with the GM Design Responsible Engineer to comprehend this requirement.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation. If this standard is being applied to recorded or analytically derived data, all data is to be archived per local process in RPCIII file format. Data archival does not apply for this procedure if the data is being validated after retrieval or transfer (later processing will be archived).

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary.

Note: Refer also to GMW15242 for additional glossary items.

CAE Engineer: Engineer who conducts math analyses, including possibly vRLDAs.

LLDA: Laboratory Load Data Acquisition: The process of taking time-domain measurements on a test vehicle while it is being exposed to inputs during a laboratory test.

Loads: A generic term that encompasses, but is not limited to, measured or simulated forces, accelerations, displacements, and strains.

MTS: Corporation headquartered in Minneapolis, Minnesota, suppliers of many test rigs, equipment and software.

nSoft: Software supplied by nCode International.

RLDA Engineer: Engineer who conducts RLDAs.

RLDA Workbook: A Microsoft Excel file containing all documentation and support information pertaining to the RLDA.

RPC Engineer: Engineer who performs laboratory test developments using RPC software.

RPC Pro: MTS Corporation's latest generation of RPC software.

7.2 Acronyms, Abbreviations, and Symbols.

ABS	Anti-lock Braking System
ASD	Auto-Spectral Density
CAE	Computer Aided Engineer
EMF	Electro-Motive Force
F/A	Fore/Aft
GSDLET	Global Structural Durability Lab Expert Team
GVW	Gross Vehicle Weight
LCA	Lower Control Arm
LVW	Light Vehicle Weight
MAP	Manifold Absolute Pressure
N/A	Not Applicable
No.	Number
RLDA	Road Load Data Acquisition
RPC	Remote Parameter Control
SWIFT	Spinning Wheel Integrated Force Transducer.
UCA	Upper Control Arm
UPC	Uniform Parts Classification
VPPS	Vehicle Partitioning and Product Structure
vRLDA	Virtual RLDA
WFT	Wheel Force Transducer
WRT	with Respect to

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW15243

9 Release and Revisions

This standard was originated in March 2006. It was first approved by the Global Structural Durability Laboratory Expert Team in September 2008. It was first published in September 2008.

Issue	Publication Date	Description (Organization)
1	SEP 2008	Initial publication.
2	NOV 2013	Various minor updates, including updated template format. (Global Structural Durability Laboratory Expert Team)
3	APR 2017	Reviewed template, references and technical content for 5 year refresh (pull-ahead). (Body - Global Structural Durability Laboratory Expert Team)

Appendix A

Channel Naming Convention

Maximum Number of Characters = 40

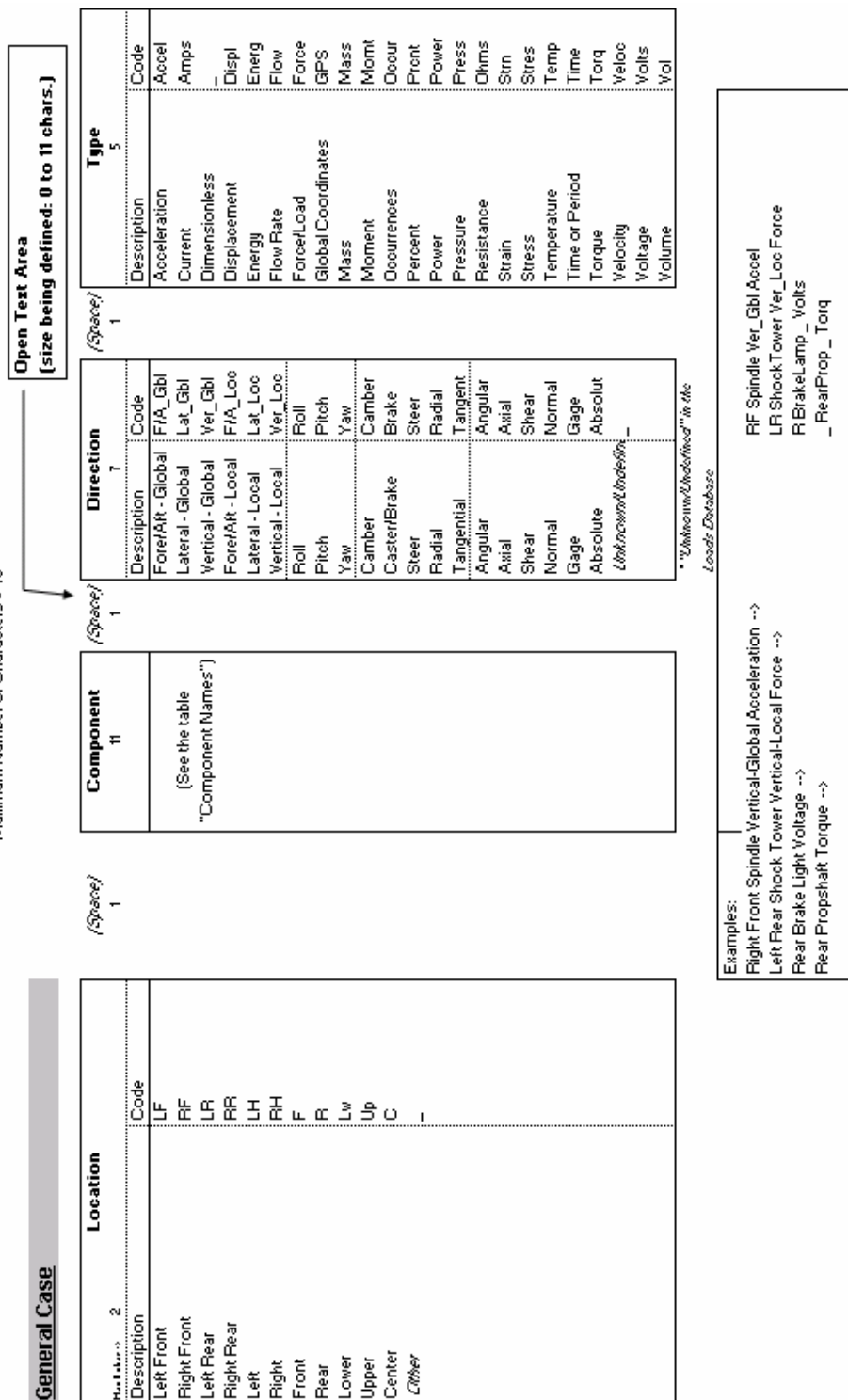


Figure A1: Channel Naming

Note: Component codes for the channel names are shown in the following table.

Note: The following component names are derived from a combination of Vehicle Partitioning and Product Structure (VPPS) names and Uniform Parts Classification (UPC) names where the VPPS was not specific enough.

Table A1: Channel Naming Component Codes

Component Description	11 Character Naming Code
Body	Body
Body mount (frame to body)	BodyMount
Bumper	Bumper
Door	Door
Fender	Fender
Floorpan	Floorpan
Front end sheet metal	FESM
Hood	Hood
Instrument panel	IP
Decklid	Decklid
Pick-up box	PUBox
Rear compartment	RearCompant
Tailgate	Tailgate
Trunk	Trunk
Seat	Seat
Seat track	SeatTrack
Side glass	Glass
Windshield	Windshield
Vehicle	Vehicle
A/C accumulator	ACAccumulat
A/C compressor	ACCompress
A/C condenser	ACCondenser
A/C evaporator	ACEvaporat
Body rail	BodyRail
Frame rail	FrameRail
Cradle	Cradle
Cradle to body mount no.(X)	CradleMntX
Crossmember	CrossMember
Rear cradle	RearCradle
Drive axle shaft	AxleShaft
Axle housing	AxleHousing
Twist axle	TwistAxle
Front prop	FrontProp
Rear prop	RearProp
Intermediate shaft	IntermShaft
Spring	Spring
Front half of leaf spring	FLeafSpring
Rear half of leaf spring	RLeafSpring
Upper spring seat	USpringSeat
Lower spring seat	LSpringSeat
Shock rod	ShockRod
Shock tower	ShockTower
Strut rod	StrutRod
Strut tower	StrutTower
Ball joints	BallJoint
Upper ball joints	UpBallJoint
Lower ball joints	LwBallJoint
Control arm	ControlArm

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Component Description	11 Character Naming Code
Upper control arm (UCA)	UCA
Lower control arm (LCA)	LCA
Lateral link	LateralLink
Trailing link	TrailLink
Spindle/knuckle (not WFT)	Spindle
Stabilizer bar	StabBar
Jounce bumper	JouncBumper
UCA bushing	UCABushing
UCA front bushing	UCABushingF
UCA rear bushing	UCABushingR
LCA front bushing	LCABushingF
LCA rear bushing	LCABushingR
LCA bushing	LCABushing
Spring bushing	SpringBush
Spring shackle	SpringShackl
Accelerator pedal	AccelPedal
Clutch pedal	ClutchPedal
Parking brake	PrkBrake
Parking brake pedal	PrkBrakePed
Service brake	ServicBrake
Service brake pedal	BrakePedal
Shift lever	ShiftLever
Brake master cylinder	MasterCylin
Anti-lock Braking System (ABS) Module	ABSModule
Power brake booster	BrakeBoostr
Brake light/lamp	BrakeLamp
Condenser radiator fan module	CRFM
Crankshaft	Crankshaft
Engine	Engine
Engine compartment	EngCompart
Manifold absolute pressure (MAP)	MAP
Radiator	Radiator
Throttle position (sensor)	TPS
Engine mount	EngMnt
Engine mount, torque axis	EngMntTAxis
Engine mount, torque reaction	EngMntTRctn
Torque strut	TorqStrut
Transmission	Trans
Transfer case	TCase
Transmission mount	TransMnt
Differential	Diff
Differential front mount	DiffFrtMnt
Differential left rear mount	DiffLRMnt
Differential right rear mount	DiffRRMnt
Engine control module	ECM
Powertrain control module	PCM
Transmission control module	TCM
Torque converter	TConverter
Torque converter clutch plate	TCCPlate

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Component Description	11 Character Naming Code
Torque converter clutch hub	TCCHub
Turbine shaft	TurbShaft
Stator	Stator
Drive sprocket	DriveSprkt
Driven sprocket	DrivenSprkt
Input shaft	InputShaft
Output shaft	OutputShaft
Carrier gear, X=I,R,F,O	x_CarGear
Pinion gear	x_PinGear
Sun gear	x_SunGear
Internal gear	x_IntGear
Flexplate	Flexplate
Clutch, X=ID	xxxxxClutch
Band, X=ID	xxxxxBand
Shift solenoid, X=A, B, C	ShiftSol_x
Differential ring gear	DiffRngGear
Differential pinion gear	DiffPinGear
Fuel tank	FuelTank
Exhaust	Exhaust
Steering column	SteerColumn
Steering gear	SteerGear
Steering linkage	SteerLink
Steering pump	SteerPump
Steering rack	SteerRack
Steering wheel	SteeringWhl
Pitman arm	PitmanArm
Tie rod	TieRod
Idler arm	IdlerArm
Wheel force transducer (WFT)	(see WFT naming)
Wheel	Wheel
Wheel housing	WheelHouse
Spare tire	SpareTire
Battery	Battery
Battery tray	BatteryTray
Tail lamp	TailLamp
Headlamp	Headlamp
Backlight	Backlight
Headlight	Headlight