



Specification for Brake, Accelerator, Clutch Pedal Module Subsystem

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. This standard establishes the quantitative requirements for Brake Pedal alone or Brake/Clutch/Accelerator Pedal Subsystem including requirements for Adjustable, Variable Ratio, and/or Crash Releasing pedals if required depending on program need. The functions, performance, reliability, and validation required of the subsystem are defined in this document.

1.2 Applicability. The pedal subsystem consists of components designed to perform three (3) major functions through the service of brake, clutch, and accelerator pedal.

1.2.1 The service brake pedal function is to transmit driver input to the booster and master cylinder via a pushrod connection to retard vehicle velocity. Actuation of the pedal also operates a sensor system to activate brake lights, deactivate engine speed control systems, and provide other Powertrain functions.

1.2.2 The accelerator pedal function is to transmit driver input to the Powertrain to control engine speed and vehicle velocity.

1.2.3 The service clutch pedal function is to transmit driver input to the Clutch and Clutch Apply system. Actuation of the clutch pedal will offer the driver to make a gearshift or a status of a non-torque transmitted situation. Actuation of the pedal also operates a sensor system to deactivate engine speed control systems and provide other Powertrain functions as well as Clutch Interlock function.

1.3 Remarks. Optional Electrical Adjustable Pedal assemblies replace the conventional fixed Pedal Modules (PM) to provide increased occupant comfort and convenience by adjustment of the pedals including a larger percentage of the customer population sizes. Crash Releasing Pedals are intended to reduce leg injuries if front of dash and push rod movement rearward. Variable Ratio Pedals can modify Brake pedal feel and reduce total pedal travel.

2 References

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

2.1 External Standards/Specifications.

2000/53/EC	CMVSS 124	FMVSS 135	SAE J1100
ABNT NBR10967 99 (MB-3160)	CMVSS 135	IATF 16949	SAE J4004
ADR 31/01	Contran 463/73	ISO 1431-1	SFS 1997:788
ADR 7/00	Contran 519/2015	ISO 12103-1	UN R35
ANSI/J-STD-001C	EEC/71/320	KMVSS 13	UN R13.09
ASTM A228	E/ECE/324	KMVSS 15/90	UN R13H
ASTM A1000	FMVSS 101	KMVSS 87/13	
CMVSS 101	FMVSS 124	SAE J826	

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2.2 GM Standards/Specifications.

GMW3013	GMW3110	GMW14377	GMW15272
GMW3059	GMW3172	GMW14444	GMW15335
GMW3091	GMW7293	GMW14551	GMW17000
GMW3097	GMW14154	GMW14872	
GMW3103	GMW14155	GMW15150	

2.3 Additional References.

The Supplier shall work with the GM Design Release Engineer to comprehend Best Practice requirements.

- 1987 "C" Car Customer Measurement Program Final report
- 1993/94 Opel/Vauxhall "J" Car Final Report (Manual Transmission)
- 1996 T Utility Customer Vehicle Usage Measurement Program Final Report
- 1998 Pontiac Grand Prix, customer Usage Report 3rd Interim Report
- Brake Controls Technical Specification.
- Emergency Brake and Parking Brake Requirements
- GM1724 Shipping Parts Identifications Label Standards
- GM1738 Packaging and Identification Requirements for Production Parts
- GM1797 Shipping and Delivery Performance Requirements
- GM1829 Supplier Validation Plan
- GM Pedal Best Practices E2KS COP Brakes: 10, 11, 12, 79, 82, 84, 89, 115, 119, 164, 185, and 196.
- Program Specific Subsystem Technical Specification (SSTS)
- SOR Appendices F3, F9, H
- USA state laws for Mercury content and labeling of the PM: Connecticut, Maine, Minnesota, New York, Rhode Island, Vermont, Maryland, and Washington
- Validation Cross Reference Index

3 Requirements

3.1 Subsystem Definition. The Electrical Adjustable Pedal Subsystem, if included, provides movement of all the pedals (e.g., brake, accelerator and clutch (if required)) rearward and forward in the vehicle. It maintains functionality and signal system of the basic non-adjustable pedal design. The Electrical Adjustable Pedal Subsystem is designed to move as a unit and maintain the positional relationship of all pedals in correlation to the non-adjustable design. Nominal design position is defined as full forward in the vehicle, all adjustment is rearward of the nominal design position. Crash Releasing Pedals shall reduce pedal movement rearward during front of dash deformation caused by a crash. Variable Ratio Pedals shall deliver specified force versus displacement curves even after overloads, durability, and vehicle usage.

3.1.1 Appearance.

3.1.1.1 Appearance by Design. All components of Clutch Pedal assembly visible under dash shall have a quality appearance and be black and/or silver in color. For Pedal arms fabricated in steel, the black coating shall have no cracking, peeling or runs. No bruises, oxidations or breakups, which could affect the function are allowed. Plastic material components shall be free of mold marks, material flow and other visible defects. No Supplier Logo shall appear on a customer visible portion of the part. Each component must have indications for identifying the Supplier, date of manufacture, material, Regular Production Option (RPO) or other GM specified code to differentiate different versions on the same application, and other marks, as specified on the drawing. Final appearance approval shall be made by GM Engineering.

3.1.1.2 Appearance After Durability. Portions of the PM visible from below the lower dash panel area shall not degrade, and wear on the pedal pad foot surface shall be < 0.5 mm after any vehicle or component test referenced in this specification.

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3.1.2 Content. The required physical and functional content for the Pedal subsystem are identified in the 3.1.2.1 thru 3.1.2.1.13:

3.1.2.1 Physical Content. See program specific Subsystem Technical Specification (SSTS).

3.1.2.1.1 Pedal Bracket Strategy. See program specific SSTS.

3.1.2.1.2 Pedal Bracket Material. See program specific SSTS.

3.1.2.1.3 Pedal Lever Material. See program specific SSTS.

3.1.2.1.4 Pedal Pivot Material. The pedal pivot shall be steel.

3.1.2.1.5 Pedal Pad Cover Material. See Program Specific SSTS.

3.1.2.1.6 Pad Retention. See Program Specific SSTS.

3.1.2.1.7 Pad Sizes and Design. See Program Specific SSTS.

3.1.2.1.8 Pad Foot Guide. See Program Specific SSTS.

3.1.2.1.9 Brake Pedal Pushrod Attachment. See program specific SSTS.

3.1.2.1.10 Pedal Intrusion Reducing Devices. See program specific SSTS.

3.1.2.1.11 Position Adjustable Pedals. See program specific SSTS.

3.1.2.1.12 Lubrication. See program specific SSTS.

3.1.2.1.13 Pedal Position Detection See program Specific SSTS.

3.1.2.2 Functional Content. See program specific SSTS.

3.1.3 Ambient Environment.

3.1.3.1 Operational Environment. PM shall meet all operational performance requirements (3.2.1), without loss of functions or degradation of service life when exposed to the following environments:

3.1.3.1.1 Temperature. The following range encompasses the temperatures that the PM may be exposed to during its service life:

- Air Temperature: -40 °C to +60 °C

3.1.3.1.2 Pressure. The following range encompasses the pressures that the PM may be exposed to during its service life:

- Atmosphere Pressure: 57 kPa to 106 kPa

3.1.3.1.3 Chemicals.

3.1.3.1.3.1 Humidity. The following range encompasses the range of humidity that the PM may be exposed to during its service life:

- Relative Humidity: 0% to 100%

3.1.3.1.3.2 Contaminants. Table 1 is a list of cleaners, fluids, and contaminants that the PM may be exposed to during its service life.

Table 1: Contaminants ^{Note 1}

Contaminant	Content	Exposure Area and Time
Water, Snow, Ice	Common	Entire Assembly, 168 h
Coffee	Commercially available	Foot pad and lever, 1 h
Cola	Commercially available	Foot pad and lever, 1 h
Acid Rain	62% Sulfuric, 32% Nitric, and 6% Hydrochloric acids at a pH of 3.0 and 4.0	Foot pad and lever, 1 h
Road Salt	NaCl, CaCl ₂ , Calcium Magnesium Acetate (CMA)	Foot pad and lever, 1 h
Sand, Dust	ISO 12103-1 A2 Fine Grade Dust	See 3.1.3.1.4

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Contaminant	Content	Exposure Area and Time
Mud, Gravel	No test needed	Foot pad and lever, n/a
Leaves, Mold, Fungus	No test needed	Foot pad and lever, n/a
Sap, Insects, Animal, Animal Waste	No test needed	Foot pad and lever, n/a
Brake Fluid	Commercially available	Entire Assembly, 168 h
Engine Coolant	Commercially available	Entire Assembly, 168 h
Air Conditioning Refrigerant	No test needed	Foot pad and lever, n/a
Battery Fluid	Commercially available	Foot pad and lever, 1 h
Rust Proofing or Undercoating	Commercially available	Foot pad and lever, 1 h
Dust Control Chemicals (Calcium Chloride, Magnesium Chloride)	Commercially available	Foot pad and lever, 1 h
Degreasers and Cleaners		
Windshield Washer Fluid	Commercially available	Entire Assembly, 168 h
Alcohol Base Cleanser	10% alcohol to water by volume	Foot pad and lever, 1 h
Carpet Cleaner	Available at GM dealer or from Certified Service web site	Foot pad and lever, 1 h
Ammonia Base Cleanser	Commercial (10% by volume)	Foot pad and lever, 1 h
Vinyl Plasticizers	Armor All or equivalent	Foot pad and lever, 1 h
Hand Cleanser	Commercially available	Foot pad and lever, 1 h
Laundry Detergent	Commercially available	Foot pad and lever, 1 h
Tire Cleaners	Commercially available	Foot pad and lever, 1 h
Engine Cleaners	Commercially available	Foot pad and lever, 1 h
Tar Remover	Commercially available	Foot pad and lever, 1 h
Fuels		
Unleaded Gasoline	Commercially available	Foot pad and lever, 1 minute
Diesel Fuel	Commercially available	Foot pad and lever, 1 minute
Fuel Additives	Available at GM dealer, or from Certified Service web site	Foot pad and lever, 1 minute
Lubricants		
Engine Oil	Commercially available	Foot pad and lever, 1 h
Synthetic Motor Oil	Commercially available 5W30 Synthetic Motor Oil	Foot pad and lever, 1 h
Transmission Fluid	Commercially available	Foot pad and lever, 1 h
Differential Fluid	Commercially available	Foot pad and lever, 1 h
Wheel Bearing Lube	Commercially available	Foot pad and lever, 1 h

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Contaminant	Content	Exposure Area and Time
Constant Velocity Joint Lube	Commercially available	Foot pad and lever, 1 h
Power Steering Fluid	Commercially available	Foot pad and lever, 1 h
Transaxle, Differential Lube	Commercially available	Foot pad and lever, 1 h
Multipurpose Grease	Commercially available	Foot pad and lever, 1 h

Note 1: Some contaminants may come through a leaky Front of Dash or HVAC unit.

Note: n/a = Not applicable

3.1.3.1.3.3 Ozone. Table 2 indicates ozone levels as a function of temperature and time duration for the PM. This is an expected worst-case lifetime profile. See GMW14444.

Table 2: Ozone Contaminants

Time: At ambient temperature and ozone concentration										
Total Time: 10 years = 87 600 h for Passenger Cars, 12 years = 105 120 h for Trucks										
Total Ozone Exposure: 27 700 parts per million (ppm) for Passenger Cars, 33 324 ppm for Trucks Location: Los Angeles, CA										
Temp (°C)	Ozone Concentration (ppm)									
	0.00	0.01 to 0.05	0.06 to 0.10	0.11 to 0.15	0.16 to 0.20	0.21 to 0.25	0.26 to 0.30	0.31 to 0.35	0.36 to 0.40	
	Percent (%) Total Vehicle Life									% Total Time In Band
38 to 43	0.01	0.07	0.08	0.08	0.07	0.02	0.02	0.01	0.01	0.35
32 to 38	0.07	0.72	0.97	0.74	0.56	0.29	0.09	0.02	0.01	3.46
27 to 32	0.92	3.32	3.03	2.34	1.13	0.35	0.07	0.01	0	11.18
21 to 27	4.53	8.97	4.44	1.23	0.17	0.01	0	0	0	19.38
16 to 21	10.23	16.02	1.07	0.01	0	0	0	0	0	27.34
10 to 16	10.73	14.25	0.03	0	0	0	0	0	0	25.01
4 to 10	4.82	7.32	0	0	0	0	0	0	0	12.13
-1 to 4	0.38	0.76	0	0	0	0	0	0	0	1.14
Total:	31.70	51.43	9.62	4.40	1.93	0.67	0.17	0.03	0.01	100

Note: Temp = temperature

Note: Source: Purchaser Validation Center, Product Usage Measurements and Application, Los Angeles Area Ozone Data

3.1.3.1.3.4 Corrosive. The PM may be exposed to highly corrosive environments, such as near seashores. This environment may include various temperatures, humidity, salt, dust, sand, and mud. See 3.2.1.6 for test requirements.

3.1.3.1.4 Particulates. Table 3 represents exposure profile of sand and dust that the PM may see repeated exposure during its service life.

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Table 3: Sand and Dust Exposure Times

Concentration milligram per cubic meter (mg/m ³)	Exposure Time (h)
70	74.5
350	25.0
1600	5.0
3900	1.0

3.1.3.1.5 Driver Applied Forces. Any of the pedals in the PM, as installed in vehicle, may often be exposed to the following operator applied load conditions to any point on any of the pedal pads during its service life:

- 668 N (150 lb) force in pedal apply direction
- 178 N (40 lb) force in the upward direction
- 178 N (40 lb) force in both lateral directions
- 556 N (125 lb) force 45 degrees each side from normal in the horizontal plane

3.1.3.1.6 Vehicle Deceleration. The following is an environment that the PM may be exposed to during its service life:

- 14.7 m/s² vehicle decelerations

3.1.3.1.7 Spray Washes.

3.1.3.1.7.1 Washes at Cold Temperature. The following is an environment that the PM may be exposed to during its service life:

Spray wash with 8274 kPa (1200 psi) (minimum) nozzle pressure sprayer with a flow rate of at least 9.8 L/minute at a distance of 50 mm. Apply spray in a sweeping motion to simulate cleaning over portions of the pedal visible from the foot well area using 25 °C water for 5 s when the component is at -7 °C, then soaked at -40 °C for at least 8 h.

3.1.3.1.7.2 Washes at Warm Temperature. The following is an environment that the PM may be exposed to during its service life:

Spray wash with 8274 kPa (1200 psi) (minimum), nozzle pressure sprayer with a flow rate of at least 9.8 L/minute at a distance of 50 mm. Apply spray in a sweeping motion to simulate cleaning over portions of the pedal visible from the foot well area using 10 °C ± 5 °C water for 5 s, when the component is at 50 °C.

3.1.3.1.8 Impact. The following is an environment that any of the pedals may be exposed to during its service life: 200 impacts with a steel vacuum cleaner nozzle (0.2 kg moving at 0.3 m/s) to any portion of the PM which is 50 mm or more below the lower dash panel.

3.1.3.1.9 Vibration. The Random Vibration – Mounting Location Sprung Masses, process as stated in GMW3172.

3.1.3.1.10 Voltage. Unless otherwise agreed upon in writing by GM, all of the pedal sensors shall utilize 5 V regulated reference voltages, 0 V to 5 V outputs, and 0.0 V returns. Motor shall utilize normal 12 V to 14 V, but the vehicle could operate down to 9 V.

3.1.3.1.11 Electromagnetic Compatibility (EMC). The PM may be subjected to EMC environments per GMW3091, GMW3097, and GMW3103.

3.1.3.1.12 Radiation.

3.1.3.1.12.1 Total Solar Radiation. The maximum solar radiation exposure that portions of the accelerator pedal module below the dash are expected to receive per year is 18 500 g cal/cm² (775 MJ/m²).

3.1.3.1.12.2 Ultraviolet Radiation. Ultraviolet radiation is defined as wave lengths between 295 N·m and 385 N·m. The maximum ultraviolet radiation exposure for portions of the accelerator pedal below the dash per year is 826 g cal/cm² (34.6 MJ/m²).

3.1.3.2 Extreme Operating Environment (On Vehicle). The PM shall meet specified extreme environmental operational performance requirements listed in 3.2.1. The PM shall not exhibit any permanent failure modes,

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