



Brake Booster Vacuum Hose/Pipe Assembly Technical Specification

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 specification establishes the quantitative requirements for the brake booster vacuum hose / pipe assemblies. This specification is derived from the deceleration section of the Vehicle Technical Specification (VTS).

1.2 Applicability. The brake booster vacuum hose / pipe assemblies are used to provide pressure transfer from the engine intake manifold or vacuum pump to the brake booster. Interfaces shall be flexible enough to support the diverse packaging and processing requirements of the corporation.

1.3 Remarks. This document applies to vehicles with brake power assist unit.

2 References

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

2.1 External Standards/Specifications.

CNCA-02C-063:2005	GB16987	SAE J2044
FMVSS 106	ISO/TS 16949	

2.2 GM Standards/Specifications.

GMW3059	GMW14375	GMW14820	GMW15986
GMW3172	GMW14562	GMW14872	GMW16501
GMW3286	GMW14640	GMW14888 (ID)	GMW16502

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

2.3 Additional References.

- Brake Apply Booster and Master Cylinder Assembly Technical Specification
- Brake Apply Subsystem Statement of Requirements
- GM Best Practice for Rubber Vacuum Hoses
- Program Technical Specification
- Vehicle Technical Specification (VTS)

3 Requirements

3.1 System/Subsystem/Component/Part Definition. The brake booster vacuum hose / pipe assemblies are used to provide vacuum from either the engine intake manifold or the vacuum pump to the brake booster. Unless otherwise noted, specifications referring to vacuum hoses are also applicable to vacuum pipes.

3.1.1 Appearance.

3.1.1.1 Color. The brake booster vacuum hose / pipe assembly and connector should be black. Any deviation requires program approval. See program technical specification.

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May 2015

Page 1 of 10



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3.1.1.2 Identification and Marking. The brake booster vacuum hose / pipe assembly marking must conform to requirements specified government regulations, such as United States of America Federal Motor Vehicle Safety Standard 106 (FMVSS 106). The vacuum hose must also meet requirements for vacuum brake hose marking specified in GMW16501 / GMW16502. See program technical specification. For China usage, the supplier is responsible to contact the China Quality Certificate Center for China Compulsory Certificate (CCC) activities and ensure the brake booster vacuum hose / pipe assembly meet the China Compulsory Certificate requirements. (Reference CNCA-02C-063:2005.) All saleable parts shall have CCC markings after proper authorization (which includes both a CCC label and the related GB16987 test standard). A copy of the certificate for the part shall be sent to GM engineering before Production Part Approval Process (PPAP). This applies to both production parts and parts for service.

3.1.2 Content.

3.1.2.1 Physical Content. The brake booster vacuum hose / pipe assembly includes the following, if applicable: booster vacuum pipe or hose; protective sleeves and clips for the hose; quick connect fittings; engine nipple; Vacuum sensor and check valves. See program technical specification.

3.1.2.2 Functional Content. Not applicable.

3.1.2.3 Test selection and number of test pieces for inspection testing shall be agreed upon between responsible engineering and supplier. In arbitrary cases it is up to the decision of the GM engineer to require complete comprehensive release testing.

3.1.3 Ambient Environment. No functional or cosmetic failures will be accepted within the defined environment. Furthermore, the brake booster vacuum hose / pipe assembly must be able to withstand being retained with metal clamps without loss of function or cosmetic failure through its target life. The booster vacuum hose must also be able to withstand minor abrasive contact with surrounding components in the engine compartment.

3.1.3.1 Temperature and Humidity Range. The brake booster vacuum hose / pipe assembly shall be designed to operate under hood under the temperature and humidity ranges shown in Table 1.

Table 1: Temperature and Humidity Range

Minimum Temperature	-40 °C
Maximum Sustained Temperature > 10 minutes	+120 °C
Maximum Excursion Temperature < 10 minutes (TMAX10)	+140 °C
Maximum Excursion Temperature < 5 minutes (TMAX5)	+150 °C
Relative Humidity Range	(0 to 100) %

3.1.3.2 Temperature Shock with Water Splash. The brake booster vacuum hose / pipe assembly will be exposed to five temperature shocks which occur when the component encounters splash for 60 s from freezing level salt water solution (1 % by mass sodium chloride) while at the maximum sustained temperature +120 °C.

3.1.3.3 Jet Spray. The brake booster vacuum hose / pipe assembly should be robust to exposure to a water jet spray of 70 bar and 9.8 l/minute typical of those encountered in a self-operated car wash, with no subsequent loss of function. The assembly should be exposed to spray from all directions possible as mounted in the vehicle.

3.1.3.4 Atmospheric Pressure. The brake booster vacuum hose / pipe assembly will be exposed to between 17 kPa and 115 kPa during operation and storage and shipment. The assembly shall be robust to this exposure even if it has an in-line check valve and if the brake booster assembly is shipped with vacuum.

3.1.3.5 Shipment. Brake booster vacuum hose / pipe assemblies shipped by air should be robust to exposure to a temperature of -50 °C.

3.1.3.6 Corrosion. The brake booster vacuum hose / pipe assembly will be exposed to the corrosive environment which occurs in the northeast United States and southeast Canada. This environment is composed of appropriate combinations of temperature, humidity, salt, splash, dust, mud, and component usage. The GM Validation Centers road tests include corrosion, which is correlated to this field severity.

3.1.3.6.1 The brake booster vacuum hose / pipe assembly should have no loss of function as a result of corrosion within 15 years. Note that this requirement includes serviceability of the components.

3.1.3.6.2 The brake booster vacuum hose / pipe assembly fasteners shall meet corrosion appearance requirements as follows.

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3.1.3.6.2.1 Cosmetic under hood requirement of two years/eight points or better on GM Engineering Corrosion Standards according to GMW14872.

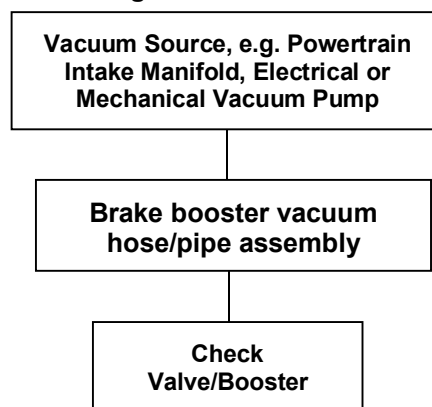
3.1.3.6.2.2 After 168 h salt spray test < 10 % red rust. Reference GMW3286.

3.1.3.7 External Contaminants. The brake booster vacuum hose / pipe assembly must withstand prolonged exposure to brake fluid, engine oil, transmission fluid, power steering fluid, coolant/anti-freeze, windshield washer fluid, gasoline, transaxle or differential lube, air conditioning refrigerant, battery acid, water, snow, ice, salt (NaCl and CaCl₂), dirt, grit, sand, dust, Ozone (O₃), steam cleaning, car wash chemicals and detergents, and engine cleaners.

3.1.3.8 Internal Contaminants. The brake booster vacuum hose / pipe assembly must withstand internal contaminants, which include but are not restricted to humidity and fuel vapors.

3.1.4 Interfaces. The brake booster vacuum hose / pipe assembly should be designed to interface with the subsystems and components described below and shown in Figure 1. Underhood packaging will be as shown on GM layouts. See program technical specification.

Figure 1: Interfaces



3.1.4.1 Vacuum Hose/Pipe Assembly to Vacuum Source Attachments. The assembly attachment requirements are dependent on the type of vacuum hose / pipe. See program technical specification.

3.1.4.1.1 For rubber booster vacuum hoses, the booster vacuum hose will interface with the engine via a rubber hose connection nipple. The vacuum hose assembly shall attach to and seal to all manifold nipple designs of the program engines. Control of the inner diameter and outer diameter of the booster vacuum hose according to GMW16501 and GMW16502 is required to ensure proper fit and sealing to engine manifold outlet port and the booster check valve. The manifold outlet design(s) shall be accessed in appropriate math data files or in provided dimensional graphics. See program technical specification. For vacuum pump connections, a quick connect fitting should be used which complies with SAE J2044.

3.1.4.1.2 For plastic vacuum pipes, the vacuum pipe (female end) will interface with the vacuum pump or intake manifold via a male quick fitting connection.

3.1.4.2 Assembly Lubricant. When assembly lubricant is used, only GM approved assembly lubricant is to be used to assemble the brake booster vacuum hose / pipe assembly to interfacing parts (e.g., quick connects, booster check valve, or engine intake manifold quick connects). Any lubricants used shall be applied sparingly. The lubricant must not affect the check valve or vacuum sensor function. In case of doubt the installed check valve shall be tested for compliance to GMW14562.

3.1.4.3 Booster Check Valve Attachment. For rubber vacuum hose, the booster check valve will interface with the vacuum hose assembly as shown in appropriate math data files or in provided dimensional graphics. The hose is pushed over the barbed end of the booster check valve. In some applications of plastic vacuum pipes, the vacuum pipe assembly will be assembled with the brake booster in the production plant. See platform technical specification. Any check valves used must comply with GMW14562.

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May 2015

Page 3 of 10



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