



HVAC Blower Resistor Module

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 component performance, design, test, manufacture and acceptance requirements for an "HVAC blower resistor module", hereby termed "resistor" for simplicity. The part supplied to this specification shall meet all requirements defined herein unless specifically waived in writing by the GM Bill of Material Family Owner (BFO) for blower controllers, hereby termed "BFO" for simplicity. Components that do not meet the requirements specified herein are subject to rejection. This document specifies minimum requirements; the supplier shall perform any additional testing that the supplier feels is necessary to deliver a high quality component that meets all requirements for a component used in an automotive application.

1.2 Applicability. All GM resistors used in a Heating Ventilation Air Conditioning (HVAC) Module used in the front of the vehicle, rear, and console.

1.3 Remarks. The resistor regulates the voltage supplied to a blower motor to control the blower motor's speed, which will provide various air flow levels for an automotive HVAC module.

1.4 Terminology. The items in the following explain the terminology of resistor speed settings in this standard.

- The term "resistor" shall be used in this specification synonymously with the terms "resistor card", "resistor module", "relay resistor module", or "blower speed control resistor assembly".
- The term "LO" (Low) shall mean the lowest blower voltage setting on the resistor.
- The term "ML" (Medium Low) shall mean the second lowest blower voltage setting on the resistor.
- The term "MH" (Medium High) shall mean the third lowest blower voltage setting on the resistor.
- The term "HI" (High) shall mean the highest blower voltage setting, which bypasses the resistor.
- The term "open" shall be used to describe the process of the thermal fuse becoming open circuit after it reaches the intentional and reproducible melting temperature, also called the "cut-off temperature".

2 References

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

2.1 External Standards/Specifications.

EWCAP-001	ISO 20653	SAE J1344	SAE J1351
FMVSS 302			

2.2 GM Standards/Specifications.

GMW3059	GMW3191	GMW15634	GMW16331
GMW3103	GMW3235	GMW15635	GMW17205
GMW3116	GMW14089	GMW15760	GMW17625
GMW3172	GMW14780	GMW16044	

2.3 Additional References.

- GM Best Practice HVAC PTC-115.
- Yazaki 7282-6469-40 Available at www.perfectelectronicparts.com/productdetail.php.

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January 2018

Page 1 of 10

3 Requirements

Note: The part will meet or exceed **all** requirements stated in this standard. If a supplier has any concerns about meeting any of the requirements as stated herein, they must note those concerns in all quotes or proposals to GM. All exceptions to the content of this standard must be clearly stated, in bold print, at the front of the quote or proposal, and must reference the exact section number of the exception. Design Failure Mode and Effects Analysis (DFMEA) will be baselined for sourced Program and any subsequent changes to the design Fit, Form, or Function as described in GMW17205 will be appropriately communicated to the downstream customer(s).

3.1 Physical Requirements.

3.1.1 Color. All external surfaces visible after installation into the HVAC module (except part number label) shall be black.

3.1.2 Materials.

3.1.2.1 Materials must comply with GMW3059 – GM Material Requirements, GMW15634, and GMW15635.

3.1.2.2 Supplier is responsible for designing recyclable and recoverable parts using GMW3116.

3.1.2.3 The resistor must be lead-compliant per GMW3059.

3.1.2.4 The resistor must not use rare earth materials unless approved by the BFO.

3.1.2.5 Silicone products (such as mold release) are prohibited in the resistor and manufacturing process, including at sub-suppliers. Silicone can degrade the blower motor's commutator.

3.1.3 Label Requirements. The labeling shall comply with GMW14089 Label Design Criteria, and GMW16331 Identification and Branding Requirements. The label shall at least include the GM part number, manufacture date, and country of origin. The phrase "DO NOT REPAIR" shall be clearly written in all capital letters either on the label or molded into the plastic holder.

3.1.3.1 Traceability. Parts shall have traceability back to End of Line (EOL) testing based on the serial number, and be retained for a period of ten (10) years.

3.1.4 Marking of Plastic Parts. Plastic parts shall be marked per SAE J1344 to designate the type of material from which the part was fabricated. Where applicable, cavity number shall be marked.

3.1.5 Finish. Unless specifically defined on the engineering drawings, external surfaces of parts shall conform to good commercial practice (reasonably free of gates, flash, ridges, roughness, tool marks, and mold and tool lubricants and other contaminants).

3.1.6 Cleanliness. All parts and surfaces shall be free from dirt, oil, grease, scale, and other foreign materials that may detrimentally impact appearance, performance, durability, or assembly.

3.1.7 Safe Handling. The resistor and its component parts must be free from flash, burrs or other surface conditions, which could prohibit safe handling of the product. Dropped components or assemblies shall be scrapped and not reworked. The resistor must withstand reasonable customer handling in the vehicle.

3.2 Mechanical Requirements.

3.2.1 Mass. The mass of the resistor including plastic housing shall be ≤ 50 g.

3.2.2 Mounting to Scroll. The resistor shall be mounted into the HVAC module via a plastic holder. The resistor mounting position shall not be oriented to collect water or condensates (GM Best Practice HVAC Powertrain Cooling (PTC) -115 covers this, and can be explained from the program's GM HVAC Engineer).

3.2.3 Resistor Type. GM allows only ceramic resistors and plate/card type resistors for HVAC module applications. Open coil resistors are strictly prohibited. Resistors which include a high speed blower setting are not allowed, to reduce enterprise cost, unless approved by the BFO. Front HVAC modules shall have four (4) speed settings: LO, ML, MH, and HI (where HI bypasses the resistor).

3.2.4 Micro Thermal Fuse. The resistor shall use a Micro Thermal Fuse (MTF) to protect against the unintended release of thermal energy. The MTF shall open at a consistent melting temperature per the drawing requirement, with a maximum tolerance of $+5$ °C/ -0 °C, and a process capability > 1.33 cpk. The MTF shall withstand high current impulses up to 120 A for up to a 300 ms in duration, to ensure the inrush of the blower start up does not cause damage to the MTF. The MTF shall have low self-heating from current draw and must have contact resistance < 1 m Ω from inlet lead to outlet lead.

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January 2018

Page 2 of 10

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3.3 Environmental Requirements.

3.3.1 Environmental and Durability. The resistor shall meet all requirements of GMW3172.

3.3.2 Operating Temperature Range. The resistor operating temperature range shall be -40 °C to +85 °C.

3.3.3 Storage Temperature Range. The resistor storage temperature range shall be -40 °C to 105 °C.

3.3.4 Odor. Materials shall have an odor scale rating of three (3) or less when tested per SAE J1351 and GMW14780.

3.3.5 Fogging. Materials shall meet specifications per GMW3235 – B - T - 2 mg maximum.

3.3.6 Federal Motor Vehicle Safety Standard (FMVSS) 302. All components shall comply with FMVSS 302 where applicable.

3.4 Electrical Requirements.

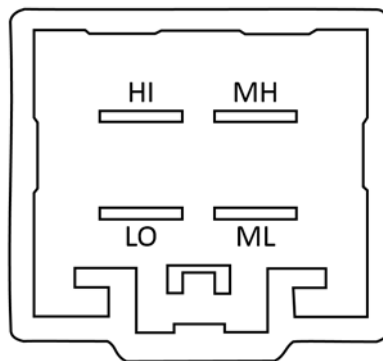
3.4.1 Operating Voltage. The resistor shall operate in a vehicle voltage range of 9.0 Volt Direct Current (VDC) to 16.0 VDC.

3.4.2 Load Point. The HVAC supplier shall use the HVAC total air-side system resistance defined in GMW17625 to determine the worst case blower motor load point (maximum current draw). This maximum current shall be documented on the resistor drawing(s), and will be used in this specification hereby termed "load point".

3.4.3 Resistance Characteristics. The resistor circuit diagram and resistance values of each speed setting shall be sent to the BFO for reference. Each resistance value shall have a maximum tolerance of $\pm 10\%$.

3.4.4 Connector Requirements. The resistor shall use a connector housing per Yazaki 7282-6469-40 (see 2.3). The connector housing must meet GMW3191. The recommended pin-out is shown in the following Figure 1. Any discrepancies are superceded by the application specific Interface Control Document (ICD). No deviation is allowed to use a different connector. Silver plating shall be applied to the terminals as specified in EWCAP-001, unless the supplier can prove through testing 4.5.2.2 and 4.5.2.3 that the terminal will never reach $> 120^{\circ}\text{C}$ in the worst case conditions (ambient, voltage, locked rotor, etc.) If $\leq 120^{\circ}\text{C}$, tin plating may be used.

Figure 1: Yazaki 7282-6469-40 Connector Pin-Out Example



3.4.5 Interfaces. The supplier shall provide all applicable interfaces to complete application specific ICD, at a minimum the electrical circuit, maximum power, and connector pinout.

3.5 Reliability. The supplier shall demonstrate a reliability of 99% at a 50% confidence level (R99C50) by using Weibull analysis to determine sample size and number of lives. Supplier to provide the data and calculations to BFO. The profile usage can be found in 4.5.2.1.1 Durability Test. Supplier shall demonstrate this reliability for Design Validation (DV) and Process Validation (PV) separately. PV parts shall be selected per GMW15760.

4 Validation

4.1 General. The supplier shall run all applicable validation tests as defined in GMW3172, in addition to all other resistor specific validation tests required in this specification.

4.2 Validation Cross Reference Index. Not applicable.

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January 2018

Page 3 of 10



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