



12 Volt and 24 Volt Jump Start

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 procedure is to test the +12 V and +24 V jump start voltage characteristics on a vehicle's electrical systems and subsystems.

1.2 Applicability. This procedure applies to all GM vehicles.

1.3 Remarks. This procedure can be used to verify the function of various electrical subsystems as installed on the vehicle, and to verify the function of the vehicle electrical system as a whole, when subjected to a jump start voltage. This test is limited to a 20% State-of-Charge (SOC) battery installed on a vehicle to represent a typical run-down battery.

IEC 60095-1, JIS D 5301, SAE J537 and GMW3092 can be used as reference information regarding batteries and performance.

2 References

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

2.1 External Standards/Specifications.

IEC 60095-1 JIS D 5301 SAE J537

2.2 GM Standards/Specifications.

GMW3092

2.3 Additional References.

- Global Hybrid Controls Jump Start Subsystem Technical Specification (SSTS) (if applicable)
- GM Best Practice BP112499 Jump Start Locations
- Owner's Manual Instructions
- Vehicle Technical Specification (VTS)

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.

3.1.3 Global facilities based on region. For example, Milford Proving Grounds for the U.S. region.

3.2 Equipment.

3.2.1 One 20% SOC battery for each jump start.

3.2.2 One 100% SOC battery for each 12 V jump start.

3.2.3 Two 100% SOC batteries for each 24 V jump start.

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3.2.4 One pair of jumper cables as follows.

- 16 mm² (5 American Wire Gauge (AWG)), length 2.5 m for a vehicle equipped with gasoline engine.
- 25 mm² (3 AWG), length 2.5 m for a vehicle equipped with diesel engine.

3.2.5 One battery jumper for 24 V jump starts, 25 mm² (3 AWG) minimum.

3.2.6 Tech 2 Diagnostic Tool or equivalent.

Note: For side-terminal batteries, two battery posts will be required to ensure good connection.

3.3 Test Vehicle/Test Piece. Production-intent electrical subsystems and components installed on a global GM platform vehicle. Test vehicle with production-intent layout of the wiring, components, and connections.

3.4 Test Time.

Calendar time:	2 to 4 days
Test hours:	6 to 16 hours
Coordination hours:	10 to 16 hours

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Engineers and technicians located at the facilities called out in 3.1 of this procedure can perform this test.

4 Procedure

4.1 Preparation.

Note: If these tests are to be performed on an alternative propulsion vehicle (e.g., hybrid or electric) contact the program Electrical Architect to ensure these tests can be performed without damaging components. Only perform 4.3.4 on advanced propulsion vehicles with the On-Board Jump Start feature.

4.1.1 Sample Preparation. Ensure the positive and negative cable connections to the vehicle meet the GM Best Practice BP112499 Jump Start Locations (the supplier shall work with the GM Design Responsible Engineer to comprehend this requirement). Remove any battery access inhibitors (e.g., panels or clamps) while conducting the test. Follow owner's manual instructions or Vehicle Technical Specification (VTS) for positive and negative cable connections to the vehicle.

4.1.2 Equipment Preparation.

4.1.2.1 Batteries. Condition the batteries to 100% SOC according to applicable standards and battery manufacturer instructions. Conditioning by the Constant Current method is recommended. Charge each battery at 2 times a constant current (I_{20}) until voltage stabilization is established. Voltage stabilization is considered established when three consecutive voltage or specific density measurements, corrected for the battery temperature and taken at 15 minute intervals, remain constant.

4.1.2.1.1 100% SOC (Twenty-Hour Capacity). The Twenty-Hour Capacity (C_{20}) is a measure of the total discharge ampere-hour capacity of a battery discharged from 100% capacity until the terminal voltage is 10.5 V, at +25 °C ± 2 °C at a constant 20 h discharge current (I_{20}) for 20 h.

The Twenty-Hour discharge current (I_{20}) can be calculated from the following equation:

$$C_{20} \times (Ah) = I_{20} (A) \times 20 (h)$$

Where:

C_{20} = Twenty-Hour Capacity

Ah = Ampere-hours

A = Amperes

Note: If neither the complete knowledge of the battery construction nor a specification from the manufacturer is available, then the battery should be charged by applying a constant voltage of 14.8 V ± 0.03 V for 20 h (current limited to 25 A), then applying a constant current of 4 A for 4 h.

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4.1.2.2 20% SOC Batteries. Take a 100% SOC battery (refer to 4.1.2.1) and calculate the Removal Ampere-Hours (AH_{REM}) using the following empirical formula:

$$AH_{REM} = AH_{REF} \times SOC_{REM}$$

Where:

AH_{REF} = Reference ampere-hours from the battery model specifications

SOC_{REM} = Amount of State-of-Charge to be removed

AH_{REM} = Removal ampere-hours

The ampere-hours should be removed at a 4.0 A discharge current (I_D).

Use the following equation to determine the discharge run-time (T_D):

$$T_D = AH_{REM}/I_D$$

Where:

T_D = Discharge

I_D = Run-time discharge current

AH_{REM} = Removed ampere-hours

Example:

If the battery label states 60 Ah and the battery is required to be at 20% SOC, then:

$$AH_{REF} = 60 \text{ Ah and } SOC_{REM} = 80\% = 0.80$$

Thus,

$$AH_{REM} = AH_{REF} \times SOC_{REM} = 60 \text{ Ah} \times 0.80 = 48 \text{ Ah}$$

Then the discharge time would be:

$$T_D = AH_{REM}/I_D = (48 \text{ Ah})/(4.0 \text{ A}) = 12 \text{ h}$$

Note: Batteries under 100% SOC tested at cold temperatures must soak at room temperature for 24 h before the cold soak.

4.2 Conditions.

4.2.1 Environmental Conditions. Recommendation: The 24 V portion of this test is performed at temperatures of 0 °C or colder to resemble the most likely real-world conditions. Therefore, in regions where weather conditions meet the 0 °C or colder temperatures, it is recommended to schedule the test during that season. This is not necessary if a cold chamber can be used.

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.

4.2.2.1 Sample Inspection. Check for proper functional operation of the vehicle electrical subsystems before and after testing.

4.3 Instructions.

4.3.1 Setup Instructions. Position the vehicle in the test environment. Install a 20% SOC battery in the vehicle. Have the jumper cables and the 100% SOC battery or batteries readily available.

4.3.2 Test Instructions for 12 V Jump Start.

4.3.2.1 Using the Tech 2 or equivalent, clear all Diagnostic Trouble Codes (DTCs) from all modules, then read codes from all modules, and record any codes that remain in Data Sheet B1.

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