

FEDERAL TRANSIT BUS TEST

Performed for the Federal Transit Administration U.S. DOT
In accordance with 49 CFR, Part 665

Altoona Bus Testing and Research Center Test Bus Procedure

4. PERFORMANCE – DYNAMOMETER-BASED ACCELERATION, GRADEABILITY AND TOP SPEED TEST

Pass/Fail
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**LTI BUS RESEARCH
AND TESTING CENTER**

ABBREVIATIONS

ABTC	Altoona Bus Test Center
A/C	Air Conditioner
ADB	Advance design bus
CBD	Central business district
CI	Compression ignition
CNG	Compressed natural gas
CW	Curb weight (bus weight including maximum fuel, oil, and coolant; but without passengers or driver)
dB(A)	Decibels with reference to 0.0002 microbar as measured on the “A” scale
DIR	Test director
DR	Bus driver
EPA	Environmental Protection Agency
FFS	Free floor space (floor area available to standees, excluding ingress/egress areas, area under seats, area occupied by feet of seated passengers, and the vestibule area)
FTA	Federal Transit Administration
GAWR	Gross axle weight rating
GL	Gross load (150 lb. for every designed passenger seating position, for the driver, and for each 1.5 sq. ft. of free floor space)
GVW	Gross vehicle weight (curb weight plus gross vehicle load)
GVWR	Gross vehicle weight rating
hr.	Hour
LNG	Liquefied natural gas
LTI	Larson Transportation Institute
mpg	Miles per gallon
mph	Miles per hour
NBM	New bus models
PSTT	Penn State Test Track
rpm	Revolutions per minute
SAE	Society of Automotive Engineers
SCF	Standard cubic feet
SCFM	Standard cubic feet per minute
SCH	Test scheduler
SA	Staff Assistant
SI	Spark ignition
SLW	Seated load weight (curb weight plus 150 lb. for every designated passenger seating position and for the driver)
TD	Test driver
TM	Track manager
TP	Test personnel

4-I. TEST OBJECTIVE

The objective of this test is to determine the acceleration, gradeability, and top speed capabilities of the bus.

4-II. TEST DESCRIPTION

In this test, the bus will be operated at SLW on a chassis dynamometer. The bus will be accelerated at full throttle from a standstill to a maximum “geared,” maximum “governed,” or maximum “safe” speed not exceeding 80 mph. The maximum “geared” speed is defined as the limited output capabilities of the test vehicle’s engine and drivetrain. The maximum “governed” speed, if applicable, is the top speed as limited by the engine control system. The maximum “safe” speed is defined as the maximum speed that the dynamometer is limited to. The test vehicle speed will be measured using a speed encoder built in the chassis dynamometer. The time intervals between 10 mph increments will be recorded using a Data Acquisitions System. Time-speed data and the top speed attained will be recorded on the Performance Data Form. The recorded data will be used to generate a percent grade versus speed table and a speed versus time curve.

4-III. TEST ARTICLE

The test article is a transit bus with a minimum service life of 4, 5,7,10 or 12 years.

4-IV. TEST EQUIPMENT/FACILITIES/PERSONNEL

1. Test Equipment –Chassis dynamometer
2. Test Facility – Vehicle Testing Laboratory at the PSTT
 - a. Ambient temperature between 30° F and 90° F
3. Test Personnel – The PSTT personnel consists of the following:
 - a. Test driver (TD)
 - b. Test personnel (TP)

4-V. TEST DATA

The test data consist of the completed attached Performance Data Form. Ambient conditions, including temperature, barometric pressure and relative humidity will be recorded for reference. All forms must be filled out using a pen. Upon completion of this test, data shall be forwarded to the ABTC manager.

4-VI. TEST PREPARATION AND PROCEDURES

The detailed test preparation and procedures are listed in Procedure 4. This section also includes Performance Data Form. Results are shown in Performance Summary Sheet

4. DETAILED TEST PROCEDURES		TITLE: 4. Performance
Procedure 4	NOMENCLATURE: 4. Performance – An Acceleration, Gradeability, and Top Speed Test	
OPER STEP	ACTION BY	TEST PREPARATION AND PROCEDURE
1	TP	Record the bus number, date and persons performing the test on the data sheet.
2	TP	Check tire air pressure and set to manufacturer's specifications.
3	TP	Verify the bus is loaded to SLW.
4	TP	Secure the bus to the chassis dynamometer following the SOP for the same.
5	TD	Drive the bus at least 20 minutes on the chassis dynamometer at approximately 45 mph.
6	TP	Record the environmental data on the data form. Make sure the temperature is between 30° and 90° F. If not, delay the test until such time the conditions are acceptable.
7	TD	<p>Set the bus accessories as follows:</p> <ol style="list-style-type: none"> 1. Air conditioning compressor – OFF 2. Ventilation fans – ON HIGH 3. Heater pump motor – OFF 4. Defroster – OFF 5. Exterior and interior lights – ON 6. Windows and doors – CLOSED <p>The driver's window may be left open for comfort. During cold weather, the defroster can be run between tests, but not during the test. During warm weather, the A/C may be run between tests, but not during the test.</p>
8	TP	Confirm that all preparations have been completed properly.
9	TP	Verify the operation of the speed measuring instrumentation.
10	TP	Signal driver to begin test when the chassis dynamometer is ready.

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OPER STEP	ACTION BY	TEST PREPARATION AND PROCEDURE
11	TD	Begin full acceleration from a standstill. Accelerate at maximum throttle. Continue accelerating until the bus reaches maximum geared speed, maximum safe speed or maximum governed speed. Hold maximum speed for about five seconds. Decelerate and come to a complete stop.
12	TP/TD	Repeat step 11 above at least four times.
13	TP	Indicate whether the maximum speed was “geared,” “governed,” or “safe” at the bottom of the test data form.
14	TP	Using the output from data acquisition system, calculate the time to each speed from the three test runs.
15	SA	Run the performance computer program to perform gradeability calculations. Using the output from the performance computer program, generate speed verses time plot and the percent grade versus speed curve. Return the output from the performance computer program and plots to ABTC manager.
16	TP	Remove all test instrumentation not needed for future tests.