

SURFACE VEHICLE INFORMATION REPORT

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(R) Information Relating to Duty Cycles and Average Power Requirements of Truck and Bus Engine Accessories

Foreword—The objective of this report is to estimate a typical accessory drive load for heavy truck and bus applications. The accessory drive load is defined as the power needed for non-propulsion and non-required engine systems.

- 1. Scope**—This report is intended to provide the information to estimate the accessory load of a typical heavy truck or bus. The components covered include: air compressors, alternators, refrigerant compressors, engine cooling fans and power steering pumps. The values show an estimate of the average power requirements and duty cycles for these accessories.

This report does not address loads required for engine operation. Required systems include those needed for engine performance such as fuel pumps and electronic control modules (ECM).

2. References

- 2.1 Applicable Publications**—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1339—Test Method for Measuring Power Consumption of Truck and Bus Engine Fans

SAE J1341—Test Method for Measuring Power Consumption of Hydraulic Pumps for Trucks and Buses

- 3. Total Power Consumption**—The total power consumption of engine driven accessories is the sum of the individual loads. A maximum possible load can be determined by totaling the maximum loads of each accessory. The typical, or average, load for a single accessory can be estimated by multiplying its maximum load by a duty cycle representing the percentage of time it is used. The duty cycle will also represent the average power requirement of the accessory if it has a variable load potential. For example, a light may be on 35% of the time, resulting in a 0.35 duty cycle multiplier. A hydraulic pump may be used 20% of the time and average 50% of its maximum load, resulting in a 0.10 duty cycle multiplier. The duty cycle of many accessories will vary with operating conditions such as day or night (e.g., head lights) and warm or cold ambient temperatures (e.g., refrigerant compressors). The total, typical accessory load for a vehicle is the sum of the typical loads for the individual accessories in a particular operating condition. This report lists estimates and duty cycles considered representative for the heavy truck and bus industry.

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4. Individual Components—The typical accessories common to heavy trucks and busses are listed below. Estimated loads and duty cycles are given.

4.1 Air Brake Compressors—The loads and duty cycles for air compressors for the applications are defined on Figure 1.

Type of Operation	Engine Type	Compressor Intake	Duty Cycle (% On)	Pumping Power		Unloaded Power		Average Power	
				kW	HP	kW	HP	kW	HP
Line Haul:	Gasoline	NA	10	3.0	4.0	1.1	1.5	1.3	1.8
	Diesel	Turbocharged	5	6.0	8.0	2.4	3.2	2.3	3.0
Short Haul	Gasoline	NA	20	3.0	4.0	1.1	1.5	1.5	2.0
	Diesel	Turbocharged	10	6.0	8.0	2.4	3.2	2.8	3.8
Local Haul	Gasoline	NA	60	3.0	4.0	1.1	1.5	2.2	3.0
	Diesel	Turbocharged	30	6.0	8.0	2.4	3.2	3.5	4.6

Notes:

1. NA: Naturally Aspirated
2. Gasoline Engines using compressor with approx. 10 C.I.D. Diesel Engines using 17 C.I.D.
3. Average power = % duty x pumping power + (100-% duty) x unloaded power

FIGURE 1—COMPRESSOR LOAD AND DUTY CYCLES

4.2 Alternators—The power demand to the alternator(s) can be determined by estimating the average amperage draw from the electrical accessories installed on the trucks and multiplying it by the voltage of the system. Most trucks in the USA use 12 V systems while European systems tend to be 24 V. Figure 2 shows the typical current demand for 12 V electrical components. All required loads (e.g., ignition and/or ECMs) are included in the engine net power definition and should not be included as accessories.

Components	Typical Draw	Load	
	Amps	kW	HP
Headlights: Highbeam - pair	10.0	0.120	0.161
Lowbeam - pair	8.2	0.098	0.132
Dash Mounted Indicator Lamp	0.12	0.0014	0.0019
Stoplights – pair ¹	4.3	0.052	0.069
Taillights – pair	1.2	0.014	0.019
Turn Signal Lights ¹ 2 lights	4.4	0.053	0.071
3 lights	6.6	0.079	0.106
Hazard Signal Lights - pair ¹	8.4	0.100	0.130
Clearance Lights - set of 4	1.2	0.014	0.019
Identification Lights - set of 3	1.8	0.022	0.029
Marker Lights – set of 8	0.54	0.0065	0.0087
License Plate Light	0.59	0.0071	0.0095
Dome Light ¹ 1 light	1.5	0.018	0.024
4 lights	5.9	0.071	0.095
Parking Lights – pair	1.3	0.016	0.021
Backup Lights – pair ¹	4.3	0.052	0.069
Instrument Lights	1.0	0.012	0.016
Instruments – analog gages	1.0	0.012	0.016
Electric Wipers LO	2.0	0.024	0.032
HI	3.4	0.041	0.055
Field Current Alternators: light duty	2.0	0.024	0.032
heavy duty	3.5	0.042	0.056
Electric Fuel Pump	2.6	0.031	0.042
Electric Windows Run	7.0	0.084	0.110
Stall	18.5	0.222	0.298
Electromagnetic Fan Clutch	5.0	0.060	0.080
Radio	4.4	0.053	0.071
Heater/Defroster Fan – 1 Motor Truck LO	11.4	0.137	0.183
HI	16.5	0.198	0.265
Heater/Defroster Fan with air conditioner- Truck	30.0	0.360	0.480
Bunk Heater-Truck LO	4.2	0.050	0.068
MED	7.9	0.095	0.127
HI	11.4	0.137	0.183
Condenser Fans-Bus	70.0	0.840	1.100
Air Circulation Fan-Bus	65.0	0.780	1.000

- Notes:
1. Normally intermittent load
 2. All loads are constant loads unless otherwise noted
 3. Load (kW) = amperage draw x 12 V / 1000 (HP = amps x 12V / 746)

FIGURE 2—TYPICAL DRAW OF ELECTRICAL ACCESSORIES (WHEN SWITCHED ON)