

TECHNICAL MANUAL

**OPERATION AND OPERATOR
MAINTENANCE INSTRUCTIONS**

**FLIGHTLINE
TOW TRACTOR
MODEL NO. 3**

NSN 1740-01-173-0520YW

PSI Mobile Products, Inc.
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INTRODUCTION

PURPOSE.

This publication presents operator instructions for the Flightline Tow Tractor, Model 3. This vehicle has been manufactured by PSI Mobile Products, Mt. Clemens, Michigan 48043.

SCOPE.

This manual provides a general description of the Flightline Tow Tractor as well as its major components and their functions. This manual also provides safety precautions, operating procedures and instructions for inspection, maintenance and lubrication procedures to be performed by the operator.

RELATED TECHNICAL MANUALS.

The Air Force manuals related to the Operation and Operator Maintenance Instructions are listed below:

TO 36A10-3-29-32

Maintenance/Overhaul Instructions,
Flightline Tow Tractor, Model No. 3

TO 36A10-3-29-34

Illustrated Parts Breakdown,
Flightline Tow Tractor, Model No. 3

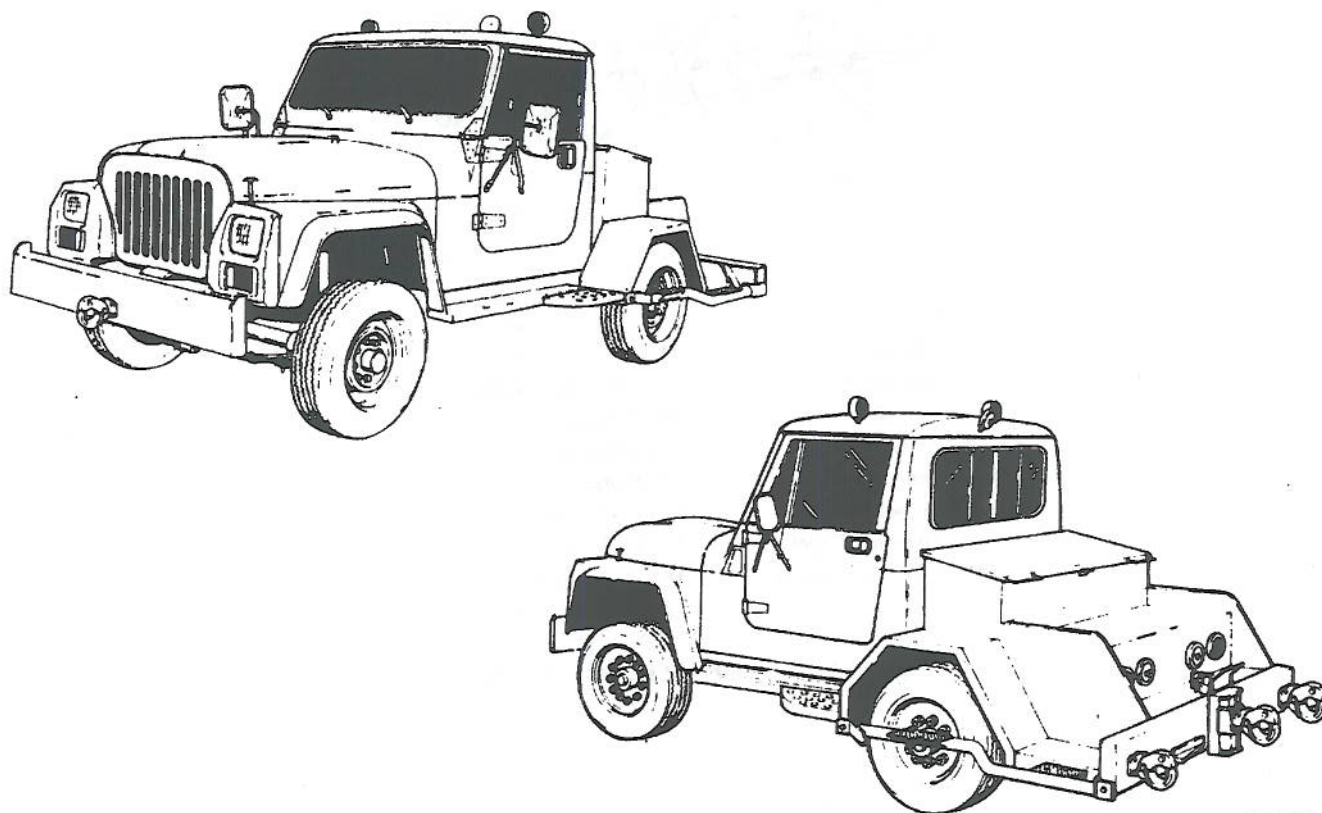
Chapter 1 DESCRIPTION

1-1 PURPOSE OF EQUIPMENT.

The USAF Flightline Tow Tractor, Model No. 3, (figure 1-1), is a diesel engine driven, four wheel, two-rear wheel drive vehicle. It is based on a commercial truck chassis and cab. The vehicle is designed to tow trailers, ground support equipment and other wheeled loads on runways, in and around warehouses, loading platforms and docks. It is capable of producing 4000 pounds (1816 kg) drawbar pull and of pulling trailing wheeled loads of up to 40,000 pounds (18,160 kg) on level surfaces, 25,000 pounds (11,350 kg) on 3% grades and 20,000 pounds (9080 kg) on 5% grades at a minimum speed of 10 mph (16 kph). top forward speed of vehicle is 25 mph (40 kph). The flightline tow tractor can perform all of its designed functions in ambient temperatures ranging from -25°F to $+125^{\circ}\text{F}$ (-32°C to $+51^{\circ}\text{C}$).

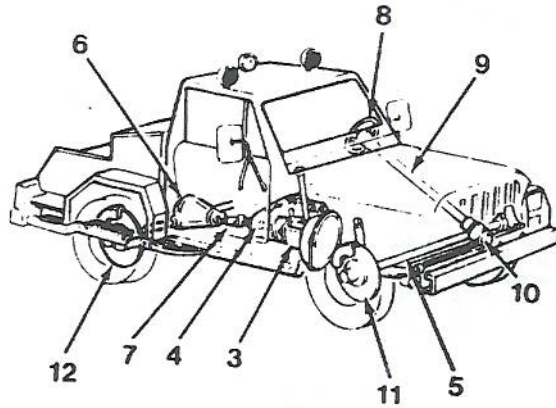
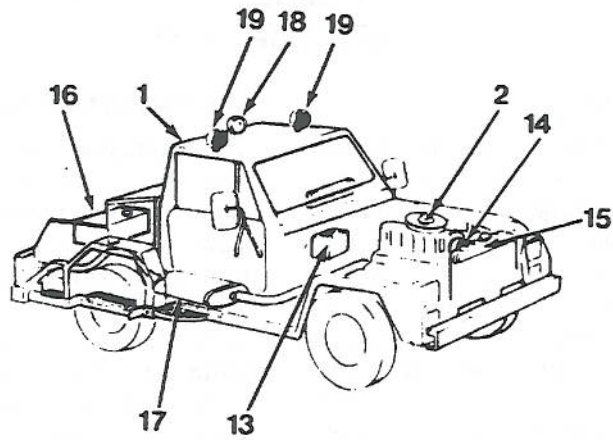
1-2 GENERAL DESCRIPTION.

The Flightline Tow Tractor, Model No. 3 (figure 1-2), consists of a standard commercial truck chassis and cab with a shortened wheel base. In addition, a floodlight, towing devices, trailer brake air system (when provided), trailer electrical receptacle, ballast, winterization system, and tool/cargo box have been added. References to the right-hand side and left-hand side of the tractor are made with respect to viewing the vehicle from the rear. The vehicle consists of 13 major systems and components. Refer to table 1-1 for performance, systems and components specifications.



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Figure 1-1. Flightline Tow Tractor



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- | | |
|--------------------|-----------------------|
| 1. Cab | 10. Steering Gear |
| 2. Engine | 11. Front Disc Brakes |
| 3. Transmission | 12. Rear Drum Brakes |
| 4. Transfer Case | 13. Battery |
| 5. Front Axle | 14. Alternator |
| 6. Rear Axle | 15. Radiator |
| 7. Propeller Shaft | 16. Fuel Tank |
| 8. Steering Wheel | 17. Muffler |
| 9. Steering Column | 18. Work Light |
| | 19. Warning Lights |

Figure 1-2. Major Vehicle Components

Table 1-1. Systems and Components Specifications

GENERAL

Vehicle Type	USAF Flightline Tow Tractor, Model No. 3
National Stock Number	1740-01-173-0520-YW
Overall Length	170 inches
Width	94 inches
Height	78 inches
Curb Weight	6000 pounds
Ground Clearance	6.5 inches
Fuel Tank Capacity (Diesel Fuel)	20 gallons (75.6 liters)

PERFORMANCE

Operating Temperature Range, Ambient	-25°F to +125°F
Maximum Speed	25 mph
Maximum Drawbar Pull	4000 pounds
Maximum Towed Load	
Level Ground	40,000 pounds
3% Grade	25,000 pounds
5% Grade	20,000 pounds

CHASSIS AND BODY

Type	Modified AMC CJ-10A
Cab	Automotive Type with Split Bench Seat
Tool/cargo Box Displacement	11.47 cubic feet
Front Towing Hitch	Pintle Type, Fixed
Rear Towing Hitch	Pintle Type, One Extendable (one person hookup), Two Fixed

ENGINE

Type	4 Cycle Diesel
Model	Nissan SD-33
Oil Capacity (quarts)	7.9
Oil Capacity (litres)	7.5
Number of Cylinders	6
Bore (inches)	3.268
Bore (mm)	83
Stroke (inches)	3.94
Stroke (mm)	100
Compression Ratio	20.8 to 1
Total Displacement (litres)	3.3
Number of Main Bearings	4

TRANSMISSION

Type	Full Automatic
Model	Chrysler Model 727
Fluid Capacity (pints)	8.5
Fluid Capacity (litres)	4.0
Range Selector Positions	P (PARK), R (REVERSE), N (NEUTRAL), D (DRIVE), 2 (DRIVE 2), 1 (DRIVE 1)

Table 1-1. Systems and Components Specifications (Continued)

Gear Ratios	
First	2.45 to 1
Second	1.45 to 1
Third	1.00 to 1
Reverse	2.20 to 1
TRANSFER CASE	
Model	Modified AMC Model 198
Reduction Ratio	2.61 to 1
Fluid Capacity (pints)	6.0
Fluid Capacity (litres)	2.8
FRONT AXLE	
Type	Steering, Non-Driving
Model	Dana #44DF
REAR AXLE AND DIFFERENTIAL	
Type	Driving, Full Float
Model	Dana Model 70 24
Reduction Ratio	4.88 to 1
Differential	
Type	Hypoid Limited Slip
Lubricant Capacity (pints)	6.75
Lubricant Capacity (litres)	3.2
WHEELS	
Size	16.5 x 6.75
TIRES	
Type	Tubeless, Bias Ply
Size	8.00 x 16.5
Ply Rating	8
Pressure	Rear Tires 75 psi Cold Front Tires 55 psi Cold
BRAKE SYSTEM	
Type	Vacuum Assisted Hydraulic
Front Wheel Brakes	Disc
Rear Wheel Brakes	Drum
STEERING SYSTEM	
Type	Hydraulically Assisted, Variable Rotation
Ratio	13/16 to 1
AIR COMPRESSOR	
Model	Nissan Model 92600-90000
Capacity	CFM
WINTERIZATION SYSTEM (engine compartment)	
Heater, Oil, Engine	
Model	Phillips-Temro Model 8500371
Voltage	115 VAC
Heater, Coolant, Engine	
Model	Phillips-Temro Model 8500045
Voltage	115 VAC
Heater, Blanket, Battery	
Model	Phillips-Temro Model 8500320
Voltage	115 VAC

1-3 DETAILED DESCRIPTION.

The following components and systems comprise the major divisions of the flightline tow tractor. Each major component/system contained in the vehicle is described in the following paragraphs.

1-3.1 Chassis and Body. The chassis and body contain all components with the exception of those associated with the power plant.

1-3.1.1 Chassis. The chassis consists of a three-speed automatic transmission, a chain drive transfer case with a rear output shaft, a rear propeller shaft, front and rear axles, a hydraulic brake system and a power steering gear and pump. Other components of the chassis include four wheels and tires, steering column, steering linkage and leaf spring suspension.

1-3.1.2 Body. The body consists of body and frame components and is of all steel construction. Insulated mounting points are provided for secure attachment of body to frame. All major body panels, such as hoods and doors, are of heavy gauge steel, reinforced, flanged and welded. The body is completely detachable from the chassis and insulated from the frame by body spacers. These insulate against vibrations and road noise. Other components which make up the body include the hardtop enclosure, seat assembly, rear window, lighting systems, horn system and windshield wipers. The frame is the foundation and structural center of the vehicle. It is constructed of heavy-channel-steel side rails and crossmembers. The crossmembers maintain the proper position of the side rails in direct relationship to each other, providing maximum resistance to torsional twist and strains.

1-3.2 Engine. The engine (figure 1-3) is a four-cycle, six cylinder, in-line, swirl combustion chamber diesel engine. Listed below are some of the components and features of the engine. Table 1-2 lists engine performance specifications.

1-3.2.1 Spherical-Swirl Combustion Chamber. A spherical-swirl combustion chamber contributes to rapid and effective combustion of the air/fuel mixture and to quiet operation, easy starting and fuel economy.

1-3.2.2 Glow Plugs. Glow plugs are installed at each cylinder to promote quick starts under cold operating conditions.

1-3.2.3 Replaceable Cylinder Liners. The dry-type cylinder liners are replaceable, improving serviceability and long engine life.

1-3.2.4 Lubrication. A full-flow oil filter and large oil cooler extend intervals between oil changes and maintain proper oil temperature. Oil jets cool the pistons.

1-3.2.5 Piston Rings. The piston rings are hard chromium plated to improve wear resistance.

1-3.2.6 Vibration Dampening. A rubber damper is attached to the end of the crankshaft to absorb torsional vibration.

1-3.2.7 Vacuum Pump. A rotary-vane-type pump generates vacuum for the power brake unit and other systems. The pump is driven on the same shaft as the alternator.

1-3.3 Transmission. The automatic transmission (figure 1-3) used in the vehicle is a fully automatic, three-speed, hydraulically operated unit with a compound planetary gear system. A manually operated gearshift linkage is used to select the desired gear range. Gear selection is made by using the control lever on the steering column. The shift points on this model range with throttle opening.

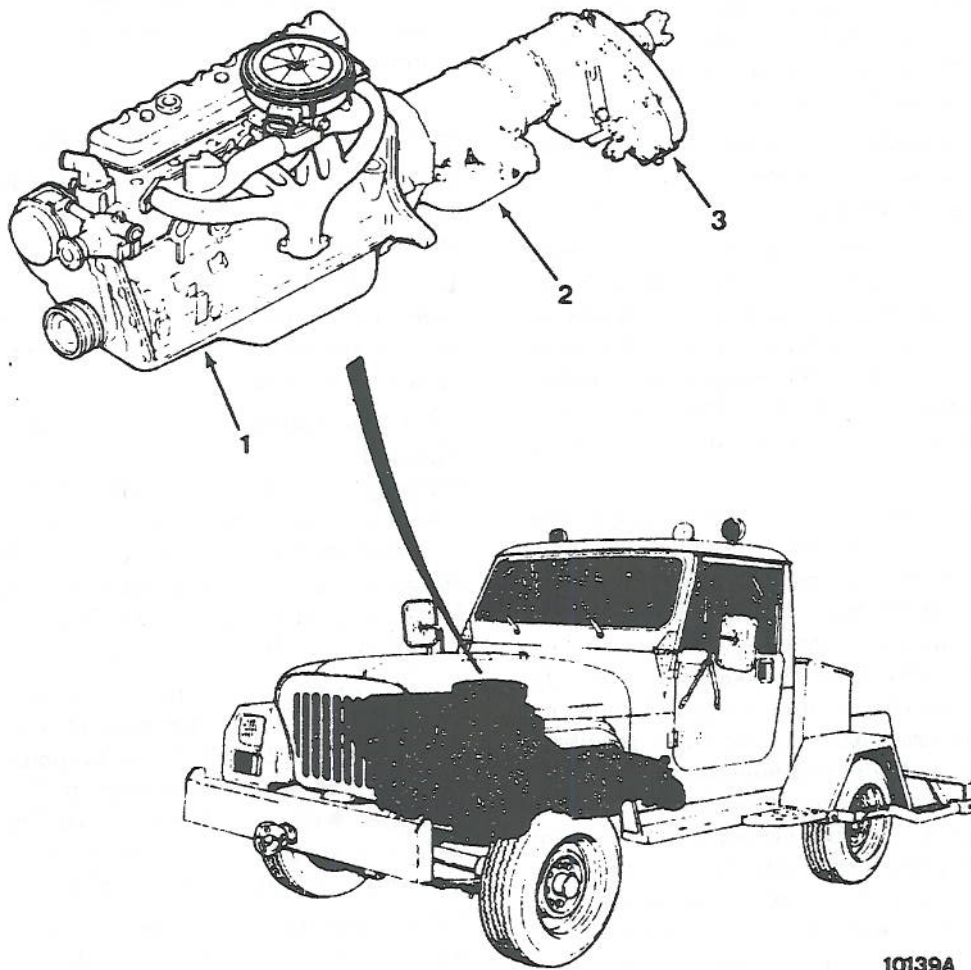
1-3.4 Transfer Case. The transfer case (figure 1-3) is a chain drive unit consisting of a two-piece aluminum case. The transfer case is mounted directly on the rear end of the transmission. The vehicle is not equipped with a reduction gear. The transfer case locks the vehicle into a low gear range which can generate a maximum speed of 25 mph.

1-3.5 Front Axle. The front axle is a non-drive type, with open-end steering knuckles mounted on ball studs. The axle has an adjustable toe-in and caster, but camber is built into the axle during manufacture and cannot be adjusted. The front axle turning angle is also adjustable.

1-3.6 Rear Axle. The rear axle transmits the torque to the rear wheels, thus providing traction.

1-3.7 Brakes. The vehicle is equipped with single-piston, low-drag, floating caliper front disc brakes (figure 1-4). A dual-reservoir master cylinder provides separate hydraulic systems for the front and rear brakes. The rear drum brakes have linkage-operated adjusters. A vacuum pump, located on the rear cover of the alternator, produces vacuum for the power brakes and other components.

1-3.8 Steering System. The power steering system (figure 1-5) forms a closed system consisting of a power steering gear, hydraulic pump and interconnecting hoses. The system fluid supply is contained in a reservoir mounted on the pump. Fluid from the pump is supplied to the gear through the interconnecting pressure and return hoses. The pump is



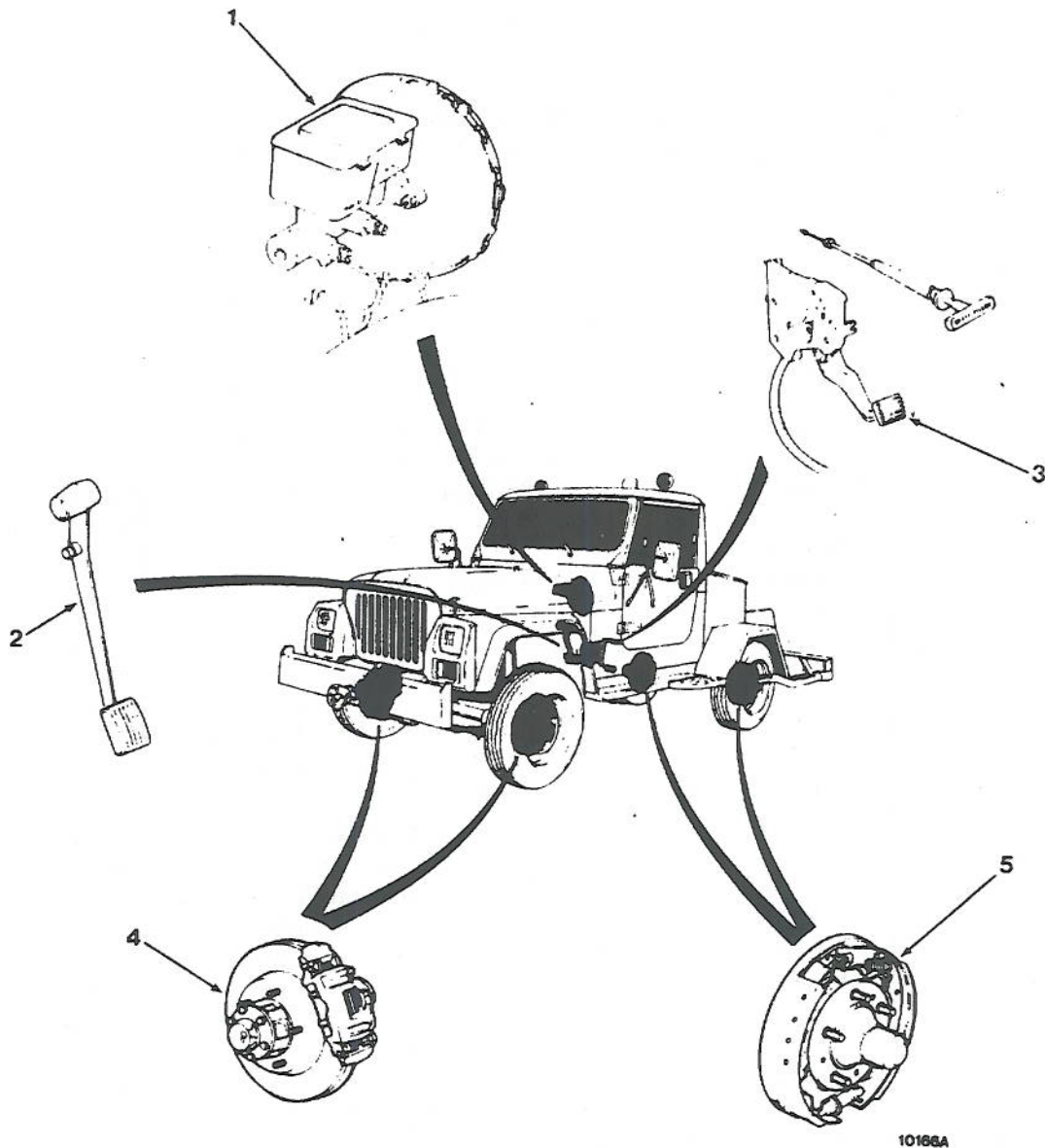
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- 1. Engine
- 2. Transmission
- 3. Transfer Case

Figure 1-3. Engine and Transmission Assembly

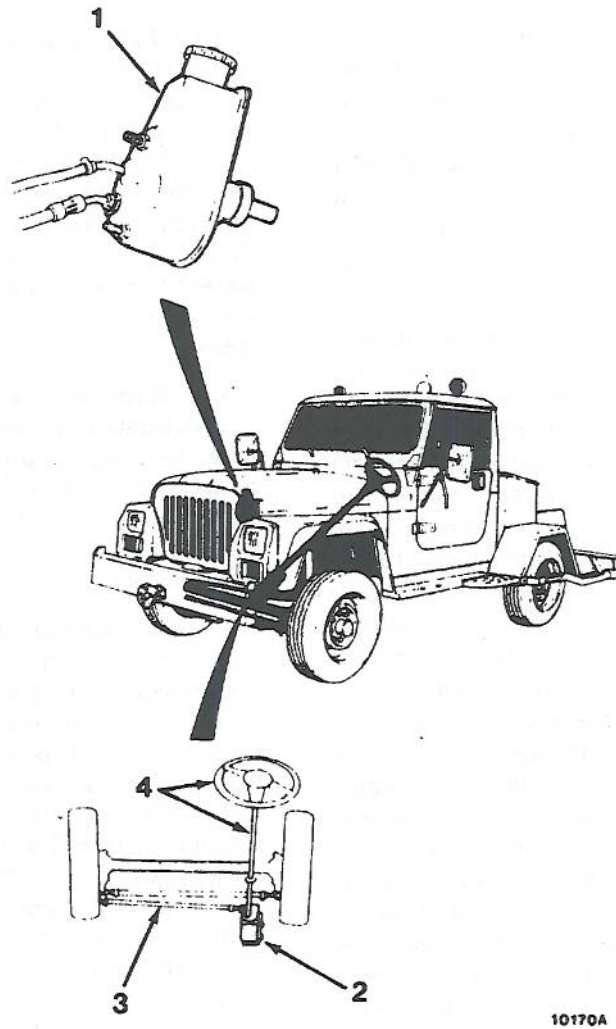
Table 1-2. Engine Performance Specifications

Item	Nominal Dimension	Maintenance Standard	Repair Limit	Remarks
Idling	rpm —	600	—	Engine as single unit. Idling speed should be stabilized.
Engine Oil Pressure	at 1500 rpm —	44.1-45.5 psi	28.4 psi	Oil temperature: 158-176°F
	at Idling —	14.223 psi	7.1 psi	
Compression Pressure	Pressure —	426.7 psi	270.2 psi	Engine rpm: 200 ± 20 rpm (warm engine)
	Difference Between Cylinders —	56.9 psi	—	
Engine Oil Consumption	h/L —	—	Less than 40% of initial value when operated under the same condition	Observe the color of exhaust fumes.
Fuel Consumption	h/L —	—	Less than 60% of initial value when operated under the same condition.	Observe the color of exhaust fumes.
Valve Timing	Inlet Valve	Open 28° B.T.D.C.	—	When valve clearance is adjusted to greater than 0.012 inch and less than 0.016 inch.
		Close 67° A.B.D.C.	—	
	Exhaust Valve	Open 67° B.B.D.C.	—	
		Close 28° A.T.D.C.	—	
Fuel Injection Timing	B.T.D.C. 20°	—	—	Measured by crank angle.



- 1. Master Cylinder and Power Booster
- 2. Brake Pedal
- 3. Parking Brake Pedal and Handle
- 4. Front Disc Brakes
- 5. Rear Drum Brakes

Figure 1-4. Brake System



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- 1. Steering Pump
- 2. Steering Gear
- 3. Steering Linkage
- 4. Steering Wheel and Column

Figure 1-5. Steering System

operated by a drive belt mounted on pulleys attached to the pump shaft and engine crankshaft. The power steering gear is designed to operate manually if a system malfunction should ever occur. This feature provides the driver with continued steering control of the vehicle. In this condition, the gear operates like a manual steering gear; hydraulic fluid is bypassed through the gear valve body to allow manual operation.

1-3.9 Electrical System. The vehicle is equipped with a 12-volt battery containing low-antimony-lead compound plates. In addition to helping reduce overall vehicle weight, they require less frequent electrolyte inspections, have a decreased self-discharge rate from local action and have a longer shelf life. Electrolyte level inspections are required only at the beginning of each winter season and every 15,000 miles. The negative ground alternator used has an internally mounted integrated circuit (IC) voltage regulator that is sealed in plastic. The alternator is a rotating field, three-phase AC alternator with 60 ampere output. The vehicle has a main wiring harness connector located at the left upper corner of the dash panel. This connector is made up of the engine forward lamp harness at the engine compartment side and the fuse and instrument panel harness at the passenger compartment side. The switch for the lighting system has a 24-ampere circuit breaker. The upper and lower headlamp beams are controlled by a foot switch located on the floorboard. The vehicle is equipped with a rectangular, single headlamp system. Both lamps contain two elements: one low beam and one high beam. The vehicle also contains backup lamps, a dome lamp, instrument cluster lamps, parking and directional lamps, rear directional lamps, stop lamps, and taillamps and a four-way emergency flasher. Fuses protecting the vehicle's electrical system are located in the fuse panel and bulkhead connector, located on the passenger compartment side of the dash panel. They are attached to the main harness connector. The horn system includes horn, horn relay, steering column wiring harness and horn contact.

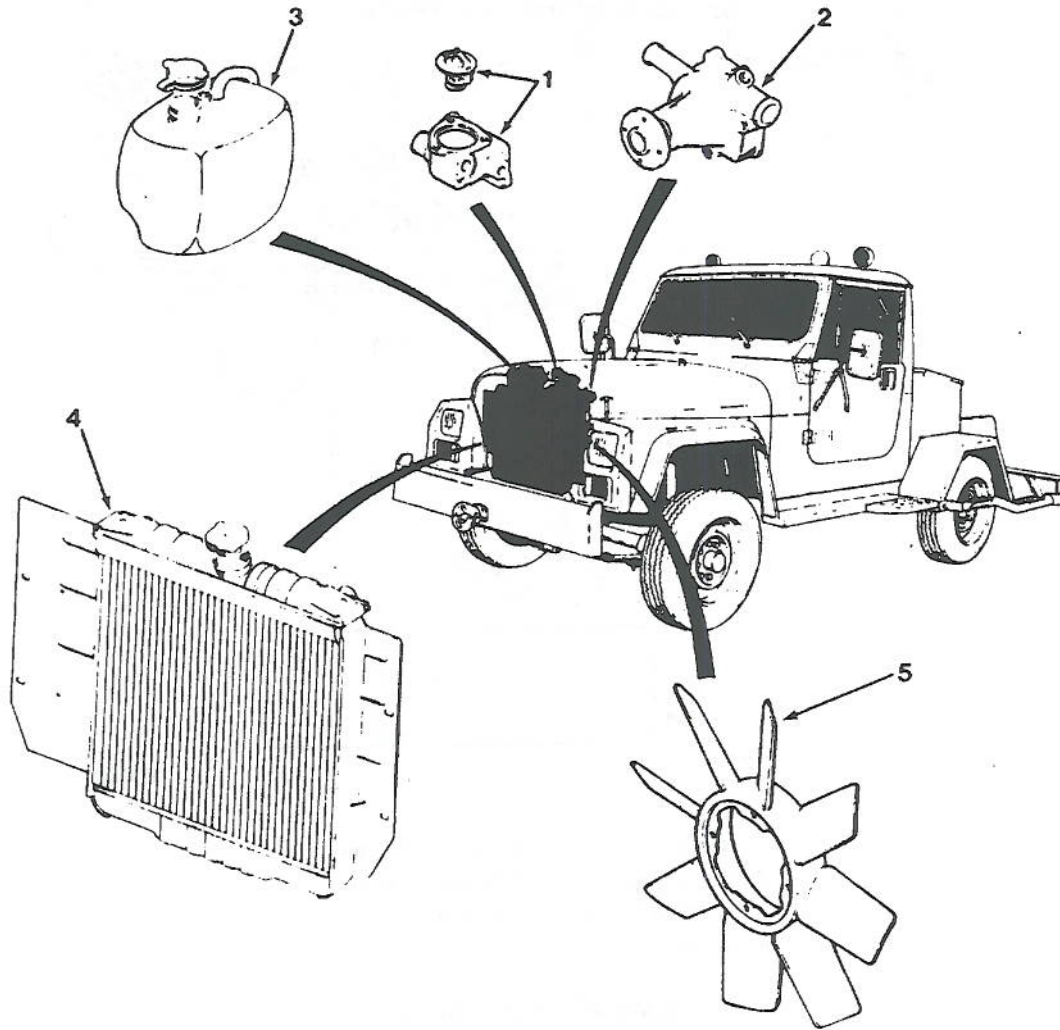
1-3.10 Cooling System. The vehicle's cooling system (figure 1-6) regulates engine operating temperature by allowing the engine to reach normal operating temperature as soon as possible, maintaining normal operating temperature and preventing engine overheating. The cooling system also provides a means of heating the passenger compartment and cooling the automatic transmission fluid. The cooling system is pressurized and uses a centrifugal water pump to circulate coolant through the system.

1-3.11 Fuel System. In the vehicle's fuel system (figure 1-7), fuel is drawn from the tank and delivered through the water separator and fuel filter to the injection pump. The injection pump feeds fuel through the nozzles to the combustion chambers. The filter overflow valve maintains specified fuel pressure and prevents excessive fuel temperature. Any excess fuel to the nozzles or to the filter overflow valve bypasses the nozzles or valves and is returned to the fuel tank. A mechanical governor controls engine speed.

1-3.12 Exhaust System. The vehicle's exhaust system consists of an exhaust manifold, front exhaust pipe, muffler, tailpipe and spark arrestor. The exhaust system must be properly aligned to prevent stress, leakage and chassis contact. If the exhaust system contacts any body panel, it may amplify objectionable noise.

1-3.13 Air System. An air compressor mounted on engine and driven by a belt off crankshaft generates air pressure for system (figure 1-8). Maximum air pressure is regulated by an adjustable air governor assembly, which is designed to unload air pressure from the compressor when pressure exceeds the adjustable limit of 100 to 125 psi. Air flows through an alcohol injector that introduces alcohol, into the air system, to prevent freeze up during cold weather. The flow continues through to the left and right hand air tanks. Both air tanks are equipped with drain valves and heaters. The left hand tank also supplies air to the governor which aids in regulating air pressure. Air from the right hand tank is split, part going to right hand side, remote shutoff valve operated, gladhand coupling (emergency side). Air from right hand tank also goes to a hand operated valve located in cab of vehicle. When this valve is opened air is allowed to flow to left hand side gladhand couplings (service side). There is also a pressure gauge located on dashboard that indicates air pressure. This system allows operator of tractor to engage air brakes on towed trailer to aid in stopping vehicle.

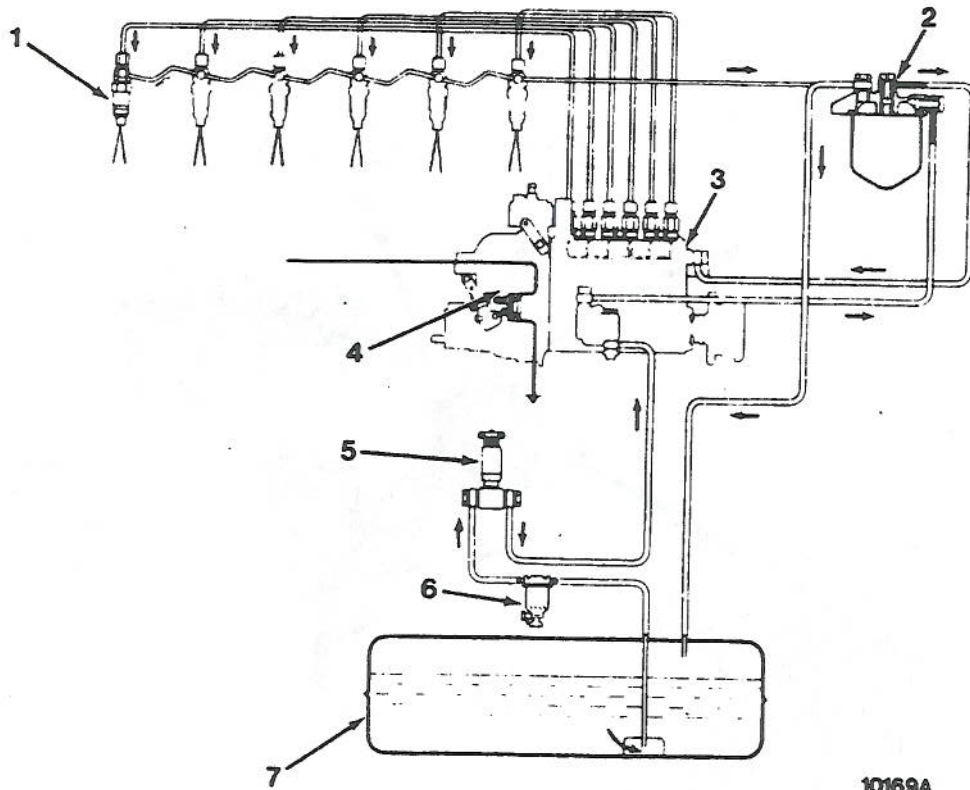
1-3.14 Winterization System. The system (figure 1-9) receives 115 VAC from an outside source that is connected to the external receptacle. Current flows to the individual components through the junction box. All components are protected from an overload by a 20 amp replaceable fuse located in the junction box. Except for battery warmer each component has a thermostat that automatically opens when maximum temperature is reached and closed when temperature drops below this limit. Once system is connected, operation is automatic and keeps coolant, engine oil, and battery warm.



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- 1. Thermostat and Housing
- 2. Water Pump
- 3. Coolant Recovery Bottle
- 4. Radiator
- 5. Fan

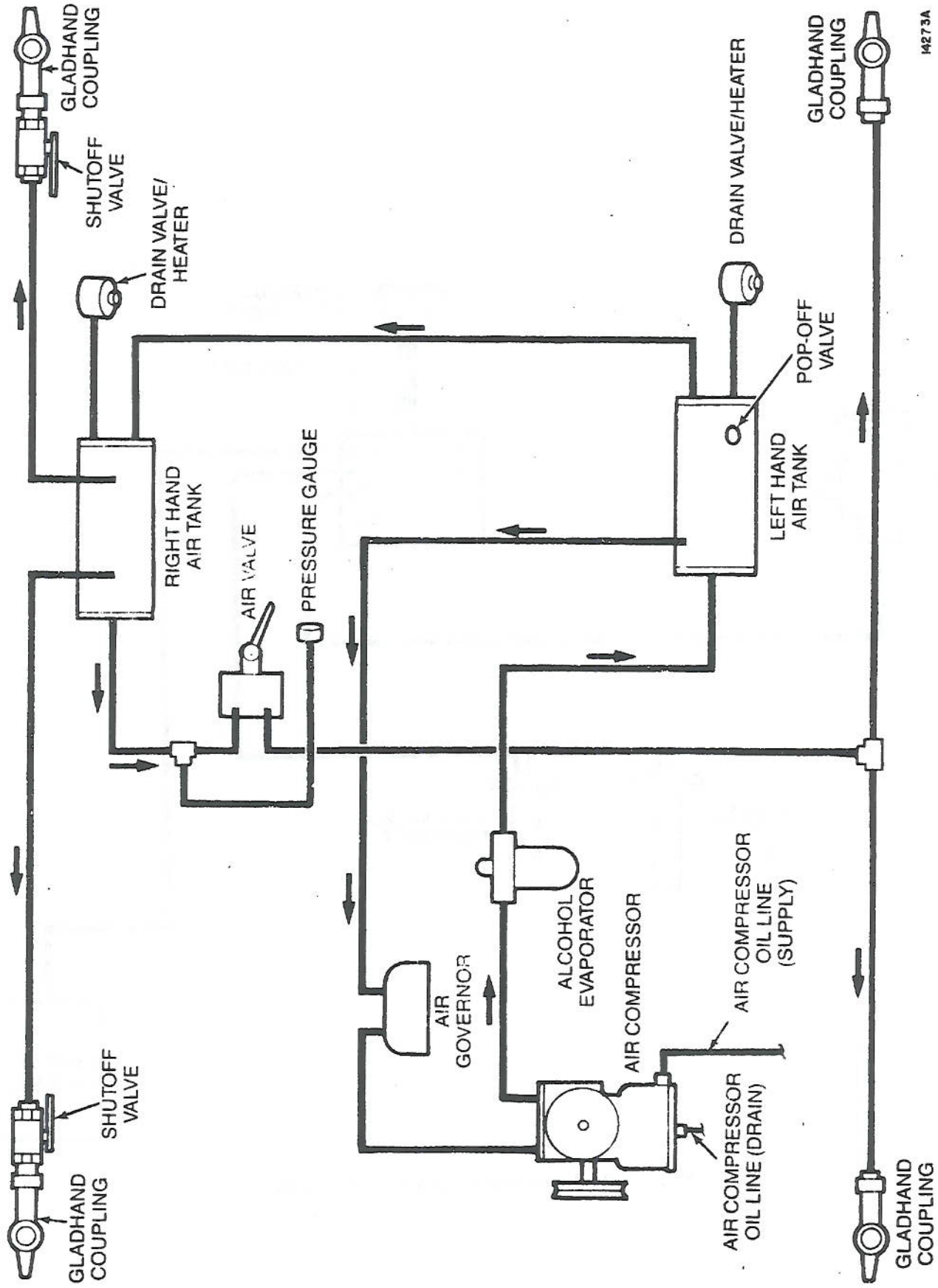
Figure 1-6. Cooling System



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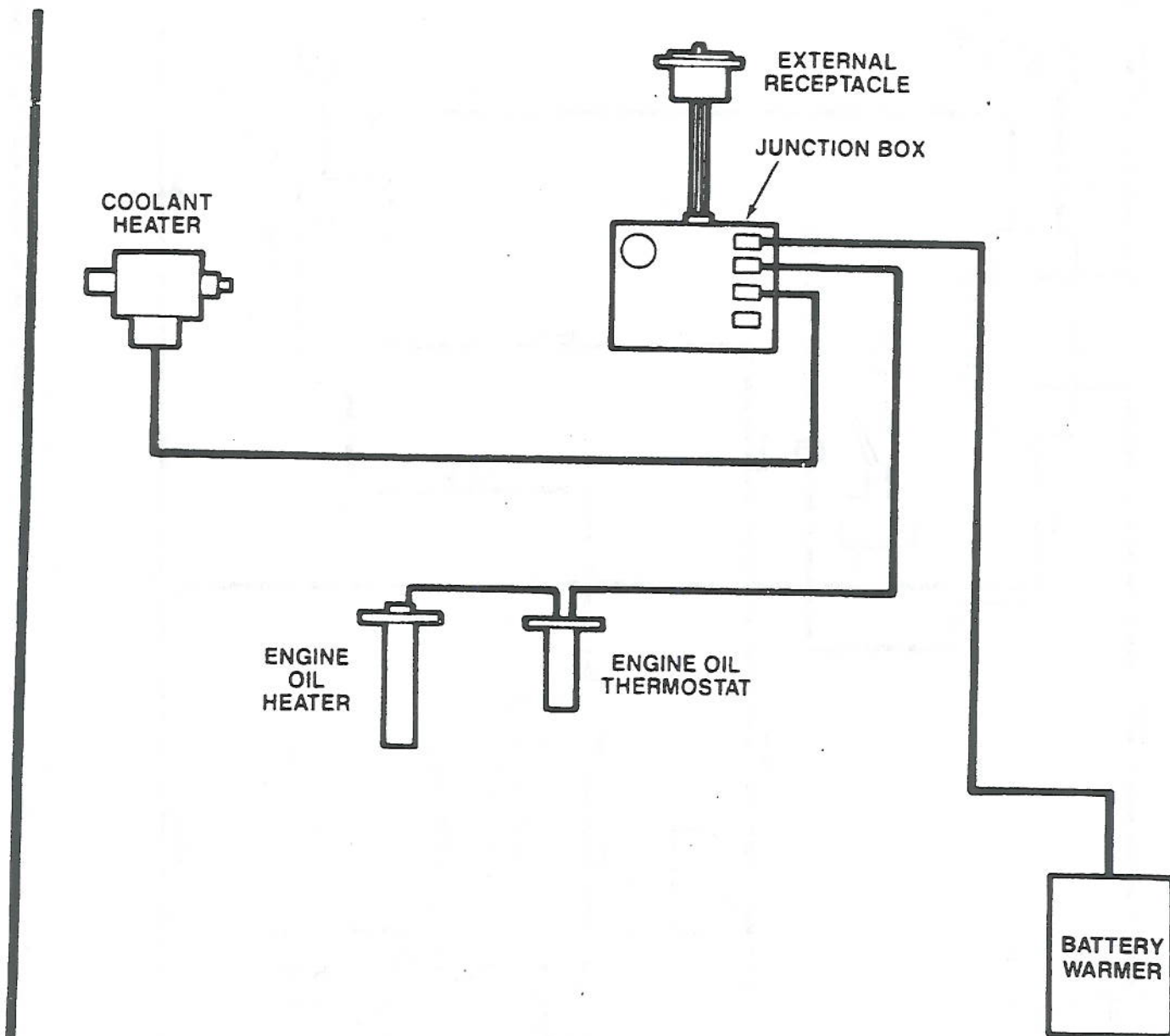
- | | |
|-------------------|--------------------|
| 1. Nozzles | 5. Fuel Feed Pump |
| 2. Fuel Filter | 6. Water Separator |
| 3. Injection Pump | 7. Fuel Tank |
| 4. Governor | |

Figure 1-7. Fuel System



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Figure 1-8. Air System Arrangement



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Figure 1-9. Winterization System Arrangement