LOS ANGELES FIRE DEPARTMENT

APPARATUS-LOGBOOK

To All Members:

This logbook is to serve as a source of information, a guide to proper maintenance, and a continuing service record for the apparatus indicated.

Members assigned to operate this apparatus are to be familiar with the information contained herein and are responsible for the prescribed maintenance. Records shall be kept by proper entries substantiating performance of required maintenance.

Each logbook has been prepared for a specific apparatus and is not easily replaced. All officers and members are to exercise care with regard to maintenance and condition of the logbook.

For necessary revision or replacement, please refer to the Manual of Operation, Section 7/1-01.72.

DONALD 0. MANNING
Chief Engineer and General Manager

CITY OF LOS ANGELES

DEPARTMENT OF FIRE

APPARATUS LOGBOOK

I N S T R U C T I O N S

This Log Book is to be maintained in accordance with the Manual of operation, 7/1-01.72. It is to be kept at a designated place in quarters, properly cared for, and ready for inspection at any time.

If any change is made to the apparatus which will cause the information, or instructions to become obsolete or in error the officer(s) concerned shall notify Supply and Maintenance Division, Bureau of Support Services, in writing.

ANNUAL PERFORMANCE TEST (retain permanently)

PREVENTIVE MAINTENANCE RECORD (F-377) : Make entries as indicated in Preventive Maintenance Instructions. Retain last six copies.

APPARATUS STATISTICAL INFOP ATION (F-701): Original entries will be made by Supply and Maintenance; additions or corrections will be made by responsible members. (retain permanently)

ASSIGNMENT RECORD (F-702) : When apparatus is detailed or transferred, the receiving officer is to check the apparatus and inventory and make entries required. (retain permanently)

MAINTENANCE RECORD (F-704): Make entries as indicated by check mark under date/mileage column and across from "Operation Number". (Retain until filled; one year after date of last entry may be discarded.)

REPAIR RECORD (F-705):' Make entries as indicated. If repaired in quarters, enter mechanic's name in "Repaired By" column. If repaired at

Supply and Maintenance facility, enter "Shops". (retain permanently)

BATTERY RECORD (F-706): Make entries as indicated. (When filled, may be discarded.)

INVENTORY (F-708): Mechanical Tools - list all tools (e.g., wrenches, screwdrivers, pliers, et cetera.)

TIRE RECORD *(F-710):* Make entries*as indicated. NOTE: All records on one sheet, not a separate sheet foch tire. (retain permanently)

OPERATIONS SECTION

1986	SEAGRAVE	AERIAL
Year	Make	Type

The information contained in this section of the Lo Book applies to the operation of Shop # _____ and is in many ways pertinent to this apparatus only.

General information as to practices and procedures of driving, aerial an pump operations is contained in the Apparatus Operator’s manual.

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icense #_____ DEPARTMENT OF FIRE Shop #_____

APPARATUS STATISTICAL INFORMATION

ake SEAGRAVE Model HT 07DH Year 1986

aden Weight 42,240 Front 12,600 Rear 16,180 Trailer 13,780

ire Size: Front 12R -22.5 Rear 12R -22.5 Trailer 16.5 - 22.5

ire Pressure: Front 100 Rear 75 Trailer 60

ake of Engine DETROIT Model 8V92TA Horsepower 445@2100 RPM

o. of Cylinders 8 Cubic Inches 736

apacity: Fuel	50 GAL.		
Crankcase	25 QTS.	SAE 15W-40 Multivis Motor Oil	
Transmission	7-3/4 GAL.	SAE DEXRON II	
Pump Transmission	NA PTS.	SAE	
Differential	28 PTS.	SAE 90-140 Multivis Gear Lube	
Power Steering Reservoir	AR* PTS.	10 Weight Motor Oil	
Steering Housing	AR* PTS.	80-90 Multivis Gear Lube	
Aerial Reservoir	22.5GAL.	DEXRON II Maintain oil level at approx. 4" below top of tank.	
Cooling System	67 QTS.		

ransmission HT 754 ALLISON AUTOMATIC

ain Pump NA Type

Rated Capacity GPM at PSI

ooster Pump NA Type

Rated Capacity GPM at PSI

riming Pump NA Type

AR - As Required

ABBREVIATIONS FOUND IN THIS LOGBOOK

A. R.	- As Required
A.T.F.	- Automatic Transmission Fluid
C.G.	- Chassis Grease
C.I.D.	- Cubic Inch Displacement
Volt	- Electrical Pressure
Amp	- Electrical Volume
Gal.	- Gallon
G. P. 14.	- Gallons Per Minute
G.C.W.	- Gross Combines Weight (Includes Towed Vehicle)
G.V.W.	- Gross Vehicle Weight
G.V.W.R.	- Gross Vehicle Weight Rating
H.P.	- Horsepower
Max.	- maximum
Min.	- Minimum
M.O.	- Motor Oil
M.P.	- Multi-Purpose Gear Lube
Multi Vis. Oil	- Multi-Viscosity Motor Oil 15W-40
N.A.	- Not Applicable
PTS.	- Pints
PSI	- Pounds Per Square Inch
P.S.I.G.	- Pounds Per Square Inch Gauged
P.T.O.	- Power Take Off
QTS.	- Quarts
Rev.	- Reverse
RPM	- Revolutions Per Minute
Sp. Gr.	- Specific Gravity
Temp.	- Temperature
W.B.	- Wheel Bearing Grease

1986 SEAGRAVE 100' AERIAL TRUCK

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ENGINE

This vehicle is powered by a DETROIT DIESEL ALLISON (DDA) two (2) cycle engine. The engine is an eight (8.) cylinder "V" type, having 736 cubic inches displacement. The engine is turbocharged and 'after-cooled; Model 8v92TA.

The engine, Model 8V92TA, is a simplificaton of the written description of the engine, i.e., eight (8) cylinder, "V" block configuration, 92 cubic inches displacement per cylinder, turbocharged and after-cooled.

The DETROIT DIESEL engine is the only engine manufactured for heavy truck use which uses the two (2) cycle system, although the two cycle system is used throughout the world in high horsepower marine, railroad, and stationary engines.

ENGINE COMPONENTS AND OPERATION

FUEL SYSTEM COMPONENTS

The system contains a 50 gallon fuel tank, supply and return fuel lines, shutoffs, fuel filters, fuel strainer, fuel pumps and injectors. The operation of the system is as follow: Fuel is pumped from the tack through the fuel lines, the filters, the pump, the injectors, and into the-cylinders at high pressure. Excess fuel is returned through a restrictor and fuel lines to the tank, the return fuel also cools the injectors.

Fuel Injectors

The fuel injectors are a unit type, installed in the cylinder heads immediately above the piston. They are cam operated through push rods and rocker arms. The unit fuel injector has all the parts necessary to provide complete precise fuel injection to each cylinder. The fuel quantities injected into the cylinders are controlled by a rack which is in turn controlled by the governor.

Fuel Pump

The fuel pump is a positive displacement gear type, which drafts fuel from the fuel tank and pressurizes it to the injector. It is driven by the blower shaft.

Governor

The governor is a. limiting speed type with double centrifugal weights. This mechanism controls the fuel rod which actuates the injector rack. This device also turns the fuel on and off .

Filters

Disposable cannister type fuel filter are provided to clean the fuel prior to entering any mechanical parts of the fuel system.

Fuel Tank

The truck has a steel 50 gallon fuel tank mounted at the rear of the tractor. It is mounted below engine level as prescribed by the engine manufactures. The tank has a conventional fill and a pipe plug drain. Fuel is drawn from the top of the tank through pick up tube.

INDUCTION SYSTEM.

Air Cleaner

The air cleaner is a pleated paper type which is mounted horizontally behind the engine. The surface. area of the filter is of sufficient area to allow the engine to operate for extended periods under normal conditions before the filter will clog and require service.

Turbocharger

The turbocharger is a low pressure, high volume compressor which is driven by exhaust gas. The exhaust gases drive a turbine wheel which is connected on a common shaft to a compressor wheel. Compression makes the air charge denser so more fuel can be injected into the cylinder creating more power without creating additional emissions. The turbocharger also allows the engine to operate more efficiently at high altitudes. The design of the turbocharger will raise manifold pressure approximately 12 PSI when the engine is fully fueled and loaded. The system design will not allow over-speeding of the turbocharger that would result in dangerous pressure levels . The turbocharger is cooled and lubricated by the engine oil system.

Compressor, Mechanically Driven (Roots Blower)

The design of the two (2) cycle engine requires it be equipped with a positive drive compressor (blower). The blower forces air into the engine at approximately 2-1/2 PSI at all RPM'S. The blower consist of two (2) gear driven, helical, three (3) lobed rotors revolving with very c lose tolerance within a housing which is bolted to the air box between the cylinder heads. The blower is driven from the g Far train a t the r ear of the engine. It runs at 2. 05 x engine RPM. The continual one-way air flow is necessary due to the lack o f intake valves and enhances air flow and burnt gas removal from the cylinders.

Air Box

The air box which is located between the banks of the "V" on the engine is the intake manifold of the two (2) cycle engine. Air compressed by the turbocharger and blower passes through the inter-cooler and into the air box which surrounds the intake ports of the cylinder liners. The ports in the cylinder liners open when the piston reaches the bottom of its power stroke allowing the pressurized air to enter the cylinder, forcing all the burned exhaust gases to exit out the already open exhaust valves. The action stops when the piston rises in the cylinder shutting off the intake ports.

During engine operation, water vapor from the air charge as well as a slight amount of fuel and lubricating oil fumes condense and settle to the bottom of the air box. This condensation is removed from air box by the air pressure forcing the condensate out two (2) air box drains which go to atmosphere beneath the truck. These drains must be kept. clear . Oil coming from the drains are sometimes mistaken for oil leaks.

After - Cooler

Compressed air passes through the after-cooler which is located in the air box. The after-cooler is a radiator type device which uses the engine cooling system liquid to extract the heat of compression from the compressed air. The removal of the heat creates a more dense air charge which permits more power, more efficient combustion, and enhances engine life.

Retarder

This engine is equipped with a JACOBS ENGINE BRAKE (JAKE BRAKE). This device, which is hydraulically operated using engine oil pressure, opens the exhaust valves during the compression stroke which wastes the energy created during the compression stroke. This energy normally assist the engine rotation; when removal, the engine motion is retarded which inturn helps to slow the vehicle.

Cooling Systerm

The cooling system is a pressurized system containing many components which are necessary to make the truck perform efficiently in varied climatic and operating conditions.

Radiator

The radiator is of tube and fin construction with bolted headers. It has a surface area of 1,500 square inches. Within the radiator top tank is a deaeration tank. This component removes air from the coolant system.

Oil Cooler, Engine, and Transmission

Two (2) heat exchanger type oil coolers are mounted on the right side of the engine. One for engine oil and one for transmission oil. Oil from the engine and transmission is circulated through the coolers . Heat is transferred from the oils to the coolant that blows through the coolers and out through the radiator.

Fan

The fan, manufactured by BENDIX WESTINGHOUSE, is belt driven through a thermostatically controlled, pneumatically operated clutch. The system operates at approximately 195° F and helps control operating temperature by clutching and declutching the fan.

Water Filter

The water filter is a bypass, disposable cannister type. It contains a sacrificial plate and additives to sustain the chemical and ph balance of the coolant.

Engine Heater

The engine is equipped with a 1,000 watt, 110 volt electric water heater.

Water Pump

The engine is equipped with a gear driven centrifugal water pump, mounted on the right front o f the engine.

Thermostat

The engine is equipped with a 180° F thermostat. Its operating range is 180° (start of opening) to 197° (full open).

Transmission

This truck is equipped with a DETROIT DIESEL ALLISON, Model HT 754, general series automatic transmission. The transmission is a five speed that is direct in fifth gear and utilized a locking type torque converter.

Driveline

The driveline is a SPICER, Model 1810, rated at 1,250 ft. pounds torque.

BRAKE SYSTEM

General

This air brake system is the latest state of the art system meeting DOT 121 brake regulations.

BRAKE COMPONENTS

Compressor

The air compressor, a BENDIX WESTINGHOUSE TU-FLOW 700, is a water cooled, engine oil lubricated unit. It is gear driven and provides a regulated 16 cubic feet of air per minute. It is mounted on the r ear o f the engine.

Application Valve

The brake treddle valve supplies control air for the dual brake system.

Air Dryer

A BENDIX WESTINGHOUSE, Model AD-2, air driver is provided. This device removes water condensate with a desiccant system before the compressed air is allowed into the primary air reservoir. The dryer expels automatically each time the compressor governor actuates, it is mounted on the right side of the frame behind the front bumper.

Reservoirs

The truck is equipped with a 640 cubic inches wet tank; a 640 cubic inches and a 1,250 cubic inches primary tank; a 1,250 cubic inches secondary tank; a 1,250 cubic inches trailer primary tank and 1,250 cubic inches trailer secondary tank. In addition, a tank is provided on the tractor and trailer for release of the spring brakes.

Brakes

The brakes are a ROCKWELL DURA-MASTER, Model No. ADB 1560-1, disc brake. They have a 15 inch ventilated rotor and 60 square inch of lining area per brake.

Emergency Brake (Maxi-Brake)

This brake is a ANCHOR-LOK 30" x 36" spring actuated unit which is automatically and manually actuated. The spring brakes are on the tractor drive and the tiller axle. - Controls are located in the cab (adjacent to driver).

Brake Adjusters

This vehicle is equipped with ROCKWELL AUTOMATIC BRAKE (slack) adjusters. The unit adjusts brakes automatically whenever lining wears.

Aerial Brake

All wheel brake for aerial operation is mounted on the console to the right of the driver.

AXLES

Front

The front axle is a ROCKWELL, Model FL941, rated at 20,000 pounds.

Drive Axle

The drive axle is a ROCKWELL, Model R170, rated at 24,000 pounds.

Rear (Trailer)

The rear axle is a ROCKWELL, Model FL941, rated at 20,000 pounds.

WHEELS

The tractor wheels are BUDD, Model R91480, 22.5 x 8.25 tubeless type rated at 7,400 pounds at 120 PSI.

The tiller wheels are FIRESTONE 16.5 x 22.5 duplex tubeless, rated at 9,230 pounds at 90 PSI.

TIRES

Tractor: 12R x 22'.5 MICHELIN X tubeless rated at 7,200 pounds at 115 PSI.

Trailer: 16.5 x 22.5 FIRESTONE tubeless rated at 9,230 at 90 PSI.

STEERING

The tractor is equipped with a ROSS, Model HP74, integral power steering gear. The tiller axle is equipped with a GARRISON slave type system. The power for the steering system is supplied by a single gear driven VICKERS pump.

SUSPENSION

Tractor

The tract or axles are equipped paralled over slung leaf springs with fixed ends and a military wrapper leaf.

Tiller

The tiller is equipped with WESTERN, Model 901, air suspension system which is rated at 20,000 pounds. The unit automatically adjust heights by maintaining constant air pressure in the air bags using the vehicles air system.

Electrical System

This vehicle is equipped with a heavy duty 12 volt direct current, negative ground, electrical system and a 110 volt power inverter.

Alternator

The alternator is a DELCO REMY belt drive, Model 51, rated at 160 amperes at 14 volts, mounted on the top rear of the engine.

Starter

The starter is a heavy duty DELCO REMY #40MT 450, Model #1114098, mounted on the lower left rear of the engine.

Batteries

The system uses two (2) 8D Heavy Duty, 900 Cold Cranking Ampere (CCA) batteries, mounted right and left beneath jump seat floor area.

AC Generator, Onboard 120-Volt AC

Tractor mounted 6,000 watt diesel powered 120-volt 60 cycle generator is provided for lighting and electrical devices.

Battery Charger, Onboard

CONDOR, Model 12LC102T12, 12 volt, 10 ampere, self tapering charger is provided which is mounted beneath driver's seat.

Battery Changeover Switch

COLE HERSEE, Model M714REV, is mounted on the console to the right of the operator.

AERIAL HYDRAULIC SYSTEM

The aerial hydraulic system is driven by the engine using componentry which is located on the tractor and the trailer.

Reservoir

A hydraulic oil reservoir is located at the back of the tractor. it has a capacity of 22.5 gallons. The filler cap which is similar to a fuel cap is located on top of the tank. It has a bolted protection device to prevent accidental addition of fuel to the hydraulic system.

Filters

A suction side strainer and a return line replaceable element filter are provided. A shutoff valve is provided on the suction side of the tank to facilitate servicing.

Pump

The pump is a VICKERS 25 VQ vane type direct' mount hydraulic pump. The pump is driven by a CHELSEA HOT-SHIFT Power Take Off (PTO). The PTO has hydraulically actuated clutches which allows instantaneous shifting.

Swivel

A hydraulic swivel is provided at the base of the turntable to allow hydraulic oil to be supplied to, and returned from the aerial ladder controls.

Control Valves

The control valves are a hydraulically balanced type made by SEAGRAVE. The hoist and extension control valves are within a common valve unit located in the center of the turntable. The rotation valve i s on the control pedestal. This system is used on all SEAGRAVE trucks.

Hoist Cylinders

The hoist cylinders are constructed of heavy seamless tubing. The diameter is six (6) inches. The hoisting arm radius is 20-1/2 inches. Operating pressures range from 850 to 1,000 PSI.

Pilot Operated Check Valves

Each cylinder is equipped with a pilot operated check valve. This valve will hold oil in the cylinder if a line should break. The hoist cylinders will not lower unless the hydraulic system has sufficient pressure to overcome the system load.

Motors, Extension, and Rotation

These hydraulic motors are a GEROTOR-ORBIT type offering a 6:1 ratio within the motor. They are rotated by fluid that is directed through then. The rotation motor is larger than the extension motor.

Turntable

The turntable consists of the top equipment and walking platform which includes the aerial ladder base. This assembly rotates on a large diameter ball race bearing. The base is attached to a TRUNNION assembly which is attached to the tractor frame. The turntable uses a large externally toothed gear for rotation which is driven by a small pinion gear. The total gear reduction is 262.5:1.

Ladder

The aerial ladder is fabricated entirely of high tensile steel. It has f our sections, each section nesting within the other it is hydraulically elevated and extended. The extension system uses a winch and a cable system. The ladder uses wear plates and rollers to prevent wear between the sections.

Spring Immobilization Locks

These devices lock the tractor frame to the axles eliminating the action of the tractor rear springs. The spring locks are air actuated .

Outriggers

Hydraulic outriggers are installed on the right and left front side of the trailer. They can be actuated from either side.

Emergency, Hydraulic Pump

An electric emergency hydraulic pump is provided for use in the event of main system failure.

OIL PRESSURE

Observe the oil pressure gauge immediately, after starting the engine. If -there is no pressure indicated within 10 to 15 seconds and the low oil pressure warning light remains on, immediately stop the engine and check the engine oil level. If- the level is OK, call the Shops for further instruction. After the engine is at normal operating temperature, the oil pressure should be 25 PSI minimum at 1,200, and 30 PSI minimum at 2,100 RPM.

CAUTION: The oil level should not be allowed to drop below the low mark on the dipstick. Where low oil may damage an engine, over filling the crankcase can cause abnormal oil consumption and high oil temperatures, and may also result in oil leaking past the crankshaft oil seals.

To obtain the true oil level, the engine should be stopped and sufficient time allowed for the oil to drain back from the various parts of the engine. If more oil is required, add only enough to bring it to the proper level on the dipstick. Due to the inherent design of the DETROIT diesel engine, the dash oil pressure gauge will read low and the dash oil warning light may flash off and on at idle speed. This condition is considered normal. If the oil system is functioning properly, the low oil pressure warning light will go out above idle speed.

LUBRICATION SYSTEM

Oil pressure is supplied by a gear type oil pump located in the crankshaft front cover. Oil is drawn by suction from the oil pan through the intake screen and pipe to the oil pump where At is pressurized. The oil then passes from the pump into a short galley in the cylinder block to the oil cooler adapter plate. At the same time, oil from the pump is directed to a spring-loaded pressure relief valve mounted on the cylinder block. This valve discharges excess oil directly to the oil sump when the pump pressure exceeds 105 PSI. Fran the cooler adapter plate, oil flows through the full flow oil filter, through the oil cooler then to the oil galley.

AIR CLEANER

The dry type air cleaner is designed to remove foreign matter from the air, pass the required volume of air for proper combustion and scavenging, and maintain efficient operation for a reasonable period .of time before requiring service.

The importance of keeping dust and grit-laden air out of an engine cannot b e over-emphasized since clean air is 'extremely essential to satisfactory engine operation and long engine life. The air cleaner must be able to remove fine materials such as dust and blown sand, as well as coarse materials such as ashes and air-borne fire debris. I t must also have a reserve capacity large enough to retain the material separated from the air to permit operation for a reasonable period before cleaning and servicing are required.

Dust and dirt entering an engine will cause rapid wear of piston rings, cylinder liners, pistons, and the exhaust valve mechanism with a resultant loss of power and high lubricating oil consumption. Also, dust and dirt which are allowed to build up in the air cleaner passages will eventually restrict the air supply to the engine and result in heavy carbon deposits on pistons and valves due to incomplete combustion. The air cleaner element will be serviced or replaced at Annual Ladder Test time or sooner, if necessary.

Correct procedure in determining the need to replace the air filter is:

1. At top governed RPM'S, obtain a reading on the air restriction gauge, when the air filter is new.

2. Note this reading (usually two to eight inches of H_20) . When there is an increase of 10 inches above the original reading, notify the Shops for replacement.

NOTE:

When washing the apparatus with a water hose, DO NOT direct the stream at the filter intake. This can damage the filter element as well as allowing water to find its way into the engine and cause severe damage.

FUEL SYSTEM

The fuel system consists of the 50 gallon fuel storage tank, fuel injectors, fuel pipes (inlet and outlet), fuel manifolds, (integral with the cylinder head), fuel pump, fuel strainer, fuel filter, and the fuel shutoff air cylinder. A restrictive fitting is located in the outlet passage in one of the cylinder heads to maintain the pressure in the fuel system.

Fuel is drawn from the fuel tank through the fuel - strainer and enters the fuel pump at the inlet side. Leaving the pump under pressure, the fuel is forced into the inlet fuel manifold, then through the fuel pipes to the inlet side of the injectors.

The fuel is filtered through strainers in the injectors and atomized through small spray tip orifices into the combustion chamber. Surplus fuel, which has been heated by this route returns from the injectors, passes through the fuel return manifold and connecting fuel lines back to the fuel tank. The continuous flow of fuel through the injectors lubricates, cools, and removes air from the fuel system. This return fuel brings a great deal of heat from the engine which can greatly increase the condensation, in the fuel tank. It is important to maintain a full tank of diesel when ever possible to prevent condensation from forming on the exposed tank walls.

TURBOCHARGER MAINTENANCE

The turbocharger does not need any special maintenance as its lubricating and cooling is furnished by the oiling system of the engine. However, certain practices and cautions are necessary for long, dependable service.

1. A periodic check of the air cleaner is very essential as a clogged air cleaner element will result in high exhaust temperatures which, in turn, will damage the turbine, bearings and shaft.

2. A monthly inspection of the connections, clamps and couplings between the air cleaner and turbocharger is important as unfiltered air can cause excessive wear and damage to the

TURBOCHARGER MAINTENANCE (cont' d.)

compressor section of the turbocharger. Call the Shops immediately if a defect in the system is noted. Make a. temporary repair or a resealing job as best as possible until a permanent repair or replacement to the defective component is made .

3. Do not over-rev the engine on cold starts. Oil lag or oil starvation to the turbo will cause premature wear on the bearings (bushings).

COOLING SYSTEM COMPONENTS

Radiator Cap

The cap is a pressure relief type with a seven (7) lb. rating. This cap allows voter temperature to rise to 233 degrees before boiling.

Water Filter

The filter offers protect ion to the cooling system through a constant addition of chemicals such as rust inhibitors, and the use of a sacrificial plate to help in electrolytic protection.

Oil Coolers

The system has a transmission oil and engine oil cooler mounted on the right side of the engine. The heat generated in the engine and transmission is transferred to the oil, through the coolers to the coolant,, then transferred to the air through the radiator.

Radiator Cooling Fan

This cooling system i s equipped with a BENDIX WESTINGHOUSE air actuated thermostatically controlled fan. This fan. only operates when the coolant temperature exceeds 195^0 F.

The FD-l fan clutch replaces. the standard fan hub on the engine and is controlled by a temperature sensitive air valve. The control valve directly senses coolant temperature. If the coolant temperature remains below the temperature setting of the valve, air passes through it disengaging the fan clutch. When coolant

Radiator Cooling Fan (cont'd)

temperature rises to the valve setting, it closes and exhausts air pressure from the f an clutch, which engages the fan. Spring pressure is used to engage the clutch, this fail safe design prevents overheating in the event of air loss or air line failure.

Normal operating temperature 170 - 195 degrees.

Lubrication of FD-l Fan Hub Assembly

If a grease fitting is noted, lube with two cubic inches of general purpose grease or equivalent every 25,000 miles. If no lube fitting or plug is visible, permanently lubricated bearings are used and need no further service.

Engine Heater

A 120 volts AC cooling system heater power is provided. This unit maintains the engine temperature at approximately 140^0 F. This unit shall be connected whenever the vehicle is parked on the apparatus floor.

Deaeration Tank

The deaeration tank, which is located in the radiator top tank, purges air which could become trapped in the cooling system from circulating through the system. Air in the system can cause hot spots, cavitation, and, as a result, electrolysis, which substantially decreases cooling system life.

COOLING SYSTEM MAINTENANCE

The cooling system should never be filled with plain water only as it will create scale deposits, corrosion and sludge. An inhibitor shall be added to the cooling system whenever the cooling system has been drained (see F-377, para. 7, a). A bi-monthly inspection of the cooling system shall be performed.

COOLING SYSTEM OPERATION

To effectively dissipate the heat generated by the engine, a liquid cooling system is utilized. A gear driven centrifugal type water Pump draws the coolant from the lower portion of the radiator and then forces the coolant through the oil cooler - housing and into the

COOLING SYSTEM OPERATION (cont'd)

cylinder block. The coolant then passes through the cylinder heads and, when the engine is at normal operating temperature, through the thermostat housings and into the upper portion of the radiator. The coolant then passes down the radiator (core), tubes where the temperature is lowered by the air stream created by the fan.

When the engine is cold and the coolant is below operating temperature, the coolant is restricted at the thermostat housing and bypasses back to the water pump. This Provides water circulation within the engine during the warmup period.

JACOBS ENGINE BRAKE

The JACOBS ENGINE BRAKE (JAKE BRAKE) is a hydraulic engine attachment that when activated converts a diesel engine into an air compressor. Compressed air from the compression stroke is released prematurely that prevents the pistons from being forced down which results in engine slowing. The engine then becomes an effective vehicle retarder.

The engine brake should not be construed as a primary or service braking system.

The engine brake, when energized, alters the engine exhaust valve operation so the diesel engine works as an air compressor. Thus providing a retarding effort.

The JAKE WAKE control consists of a HIGH/LOW/OFF switch, a throttle switch, the JAKE oil servo-valve and the transmission converter lockup servo-valve.

The dash switch is manually controlled by the driver. The throttle switch is actuated when the driver depresses or removes his foot from the pedal. The JAKE when activated locks the torque converter lockup clutch and changes the exhaust valve timing. This provides retarding effect to 150 RPM over idle. When this point is reached, the converter clutch disengages.

JACOBS ENGINE MAKE (cont'd)

The engine brake may be used for descending grades, in-city traffic, approching stop lights and, in general, whenever vehicle retarding is required .

The engine brake reacts quickly. It should activate or deactivate in less than 1/4 of a second.

Engine brake efficiency increases as engine speed increases, with maximum retarding occurring at rated engine speeds.

Since the engine brake is most effective at rated engine speeds, gear selection is very important. Gearing down the vehicle, within the limits of rated engine speed, makes the engine brake a more effective retarder. Obviously, maximum retarding occurs with the selection of the lowest gear that does not exceed rated engine speed.

The "rule-of-thumb" for gear selections is that the driver should estimate the gear he would use to climb the grade he is about to descend. Generally, this same gear can be used for controlled descent o f the hill with the engine brake.

ELECTRIC AL SYSTEMS

Starting Motor

A large heavy-duty, 12 volt starting motor is provided. Due to the heavy current draw and the danger of overheating, do not crank the engine for more than 30 seconds at a time and hesitate about 30 seconds before making another attempt. Frequently inspect the external connections and wiring for looseness and corrosion. Be certain that mounting bolts are properly tightened.

Starter Button

Two starter buttons are provided, one for each battery. Use the button as indicated by the position of the battery changeover switch. Once the engine starts over, release the starter button.

Battery Change over Switch

A rotary battery changeover switch is used in this electrical system. It is a COLE HERSEE #M705 rated at 175 amperes continuous rating. It has four (4) positions 1, 2, both and off.

Batteries

The apparatus is equipped with two group 8D lead-acid, 12 volt batteries. The negative poles are grounded to the chassis. Since one battery will be in service and the other will be in reserve, provision for changing from one battery to the other is through the operation of a changeover switch.

A Departmental order governing the use of two battery systems is quoted below:

Apparatus equipped with two lead-acid batteries and changeover switches will b e operated in the following manner: One battery only will be used at any one time to operate all electrical equipment on apparatus; this includes starter, ignition, lights, radio, and any other battery operated equipment. Under no condition will part of the electrical equipment b e operated on one battery and part on the other. In normal operation, the use of the batteries will be alternated daily.

NOTE : Do not change from one system to the other with the engine running.

"If battery becomes discharged during extended periods of operation, all equipment will b e switched over to the fully charged battery and that fact reported immediately by radio, otherwise, to the officer in charge of the fire who will arrange for the installation of a replacement battery."

In actual practice, except under extremely unusual conditions, the batteries on this apparatus should never become fully discharged. If the engine is allowed to operate at slightly above idle speed, the generating system should adequately handle all electrical needs and maintain the battery in a charged condition.

Batteries (cont'd)

When checking the specific gravity of batteries and ’the readings are below the level of "full charge", or if the battery overcharges and the liquid has been boiling, notify the Department Shops so that the voltage regulator setting can be adjusted. When the correct setting is reached, both the specific gravity and water level are maintained over a period of many months without appreciable change.

Onboard Battery Charger Operation

Battery charger will only function when the 110 volt power cord is plugged into the electrical receptacle in drivers side step well.

Charger is self tapering and under normal operating condition will not overcharge the batteries.

To operate system:

1. Connect 110 power cord into apparatus electrical receptacle.

2. Turn off all apparatus electrical systems and radios.

3. Turn charger switch to "ON" position at receptacle.

4. Set timer on charger to desired charging hours.

5. Select battery to b e charged with master battery switch.

NOTE: Both batteries can -be charged at the same time, if selector switch is placed into "both" position.

Generating System

This electrical system is powered by a DELCO REMY 160 amperere internally rectified and regulated alternator.

The alternator derives is name because it generates alternating (AC) current which is rectified by transistors to 14 volt direct current (DC).

Generating System (cont'd)

If the voltmeter fails to show a charge, check all connections for tightness, wiring for breaks, and belts for tightness. If the problem cannot be remedied through these check and adjustment, call the Shops.

CHARGING SYSTEM QUICK CHECK

ENGINE MODE	VOLTMETER READING	CONDITION
BATTERY SWITCH ON IGNITION SWITCH ON ENGINE NOT RUNNING NO ELECTRICAL LOAD	12.2 - 12.8	BATTERIES OK
SAME CONDITION A S ABOVE	BELOW 12	RECHARGE BATT.
ENGINE RUNNING (1 min. or more) APPROX. 1,000 RPM NO LOAD	14 - 14.8	CHARGING SYSTEM 0,.
SAME AS ABOVE	BELOW 13.8	CHECK ALTERNATOR .BELT TENSION ALTERNATOR B.O.
ENGINE RUNNING (1 min. or more) APPROX. 1,000 RPM FULL LOAD (all lights on)	13.5 - 14	CHARGING SYSTEM Oh
SAME AS ABOVE	BELOW 13.5	CHECK ALTERNATOR BELT TENSION CHECK BATT. COND. ALTERNATOR B.O.

CHARGING SYSTEM QUICK CHECK (cont' d)

The preceeding information does not supercede the standard battery maintenance program as recommended in the F-377, but is intended to be followed only as a quick daily check to make sure the charging system is functioning in a normal manner. Keep batteries fully charged a t all times.

Battery Charging

When using house charger DO NOT remove battery fill caps, where, applicable. The design of the caps is such that gases produced during charging will escape into the atmosphere while keeping liquid loss to a minimum.

Charging the batteries with the caps off greatly increases liquid loss, as well as adding to battery cable and compartment corrosion.

Battery Gases

CAUTION: The gases hydrogen and oxygen emitted from a charging battery can explode with great force if a spark or flame is brought too close during charging. Whenever a cable is removed at the battery, or the battery is replaced, the battery master switch MUST BE in the "OEF" position. Removing a cable with any electrical component ON will cause a spark at the cable terminal end.

Circuit Protection (Direct Current)

Circuit Breakers are provided in the electrical system circuits for protection in the event of an electrical short develops. If a short occurs, the heat in the circuit breaker causes the points within the breakers to open. As the circuit breaker cools, the points will close. This opening and closing of the points will cause a "clicking" sound which will continue until the switch controlling the faulty circuit has been turned off or the short itself has been repaired.

In fuse protected circuits, an overload will cause the fuse to blow and break the circuit.

If a circuit shorts out, the Shops should be notified even though the short has been isolated and eliminated.

Ground Fault Interrupter (GFI) (cont'd)

The user may receive a small shock if the tool he is using does short out, but it will be small enough to be non-injurious. When any alternating current source is equipped with a GFI, particular attention must be paid to having good, clean dry connections; moist connections will be sufficient to cause the GFI to trip. The GFI will also trip more easily as the extension cord length is increased. Try to keep the cord length as short as possible. The GFI has to be reset after each fault.

Circuit Breaker

The circuit breaker is used to open the power supply whenever a fault path offers low resistance (high amperage) and massive current flows. Reset this unit if current flow is interrupted.

ELECTRIC CABLE REEL

CAUTION: To keep reel from jamming when retracting, keep wire cable neatly coiled on reel; one coil should not cross lay over another.

AIR SYSTEM

Air Compressor

The 16 cubic feet per minute BENDIX TU-FLOW 700 air compressor is lubricated by the engine oil and cooled by the engine coolant. The air compressor runs continuously when the engine is running. A governor, acting in conjunction with an unloading mechanism in the compressor head, stops and starts the compression of air when the desired maximum and minimum air pressures are present in the system.

Air Storage Tanks

The air reservoir system consists of four (4) tanks. One of the tanks is the primary tank and is separated from the others by a regulating valve. This valve allows the primary tank to fill to 90 PSI before the secondary tanks are filled, thus providing a rapid buildup of air pressure in the primary tank for immediate use.

Manual Bleeder Valve

Operate bleeder valve by hand daily. For ease of operation, there is a pull ring mounted on the right side under the running board.

AIR SYSTEM OPERATION

Air Reservoir Gauge

The air reservoir gauges are located on the dash. The left hand gauge indicates the amount of air in the primary tank and the right hand gauge in the secondary tanks.

When the air pressure is below 90 PSI, the primary hand gauge will move to 90 PSI before the secondary hand gauge will begin to move. When the primary system has reached 90 PSI, the apparatus may be moved. However, only the rear brakes will have full braking pressure until the, secondary system has reached 90 PSI.

All of the auxiliary air-powered equipment is supplied from the secondary system. Until the secondary system has reached 90 PSI, the auxiliary equipment will not function correctly. Only the brake system is supplied via the primary system. The primary system will always fill before the secondary system, however, some bleeding may occur as the primary system is filling.

Red Light and Buzzer

The low pressure indicator switch causes the low air pressure buzzer and light at the driver's instrument panel to warn of low air pressure in the system. The buzzer will sound whenever the reservoir pressure falls below 70 PSI and the ignition switch is on.

Braking System Components

The air brake system consists of an air compressor, air dryer, air reservoir tanks, air pressure governor, brake application valve, rear axle relay valve, low air pressure indicator switch, quick release valves, safety valve, check valves and brake chambers at each wheel.

Dual Brake System

Your apparatus is equipped with a dual brake system, also called a split brake system. The heart of the system is the BENDIX-WESTINGHOUSE E-4 brake application valve. Two separate supply and delivery air circuits are utilized for service and emergency braking. The E-4 brake valve provides a graduated control for applying and releasing the apparatus brakes.

Dual Brake System (con t' d)

The circuits in the E-4 Dual Brake Valve are identified as follows: the primary circuit portion is that portion of the valve between the spring seat which contacts the plunger and the relay piston and the .exhaust cavity.

The primary circuit portion of the valve is similar in operation to a standard, single-circuit air brake valve and, under normal operating conditions.., the secondary circuit portion is similar in operation to a relay valve.

Both primary and secondary circuit portion of the E-4 Dual Brake Valve use a common exhaust protected by an exhaust check valve.

BRAKE OPERATION

Applying: Normal Operation - Primary Circuit Portion

When the brake pedal is depressed, the plunger exerts force on the spring seat, rubber graduating spring, and primary piston. The primary piston which contains the exhaust valve seat, closes the primary exhaust valve. As the exhaust valve closes, the primary inlet valve is moved off its seat allowing primary air pressure to flow out the primary delivery port.

Applying: Normal Operation - Secondary Circuit Portion

When the primary inlet valve is moved off its seat, air is permitted to pass through the bleed passage and enters the relay cavity. The air pressure moves the relay piston and the relay piston, which contains the exhaust seat, closes the secondary exhaust valve. As the secondary exhaust valve closes, the secondary inlet valve is moved off its seat allowing secondary air pressure to flow out the secondary delivery port. Because of the small volume of air required to move the relay piston, the action of the secondary circuit portion of the valve is almost simultaneous with the primary circuit portion.

Applying: Loss of Air in Secondary Circuit

Should air be lost in the secondary circuit, the primary circuit portion will continue to function as described above under "Normal Operation: Primary Circuit Portion."

Applying: Loss of Air in Primary Circuit

Should air be lost in the primary circuit, the function will be as follows: As the brake pedal is depressed and no air pressure is present in the primary circuit supply and delivery ports, the primary piston will mechanically move the relay piston allowing the piston to close the secondary exhaust valve and open the secondary inlet valve and allow air pressure to flow out the secondary delivery port.

Balanced: Primary Circuit Portion

When air pressure delivered to the brake actuators and air pressure in the cavity on the delivery side of the primary piston equals the mechanical force of the brake pedal application, the primary piston will move and the primary inlet. valve will close, stopping the further flow of air from the primary supply line through the valve. The exhaust valve remains closed preventing any escape of air through the exhaust port.

SELF-ADJUSTING BRAKES

The need for periodic brake adjustments has been eliminated on your apparatus. Regular inspection of lining wear, lubrication and slack adjuster travel must still be checked as per F-377 maintenance schedule.

If slack adjuster travel goes beyond its maximum allowable travel, the following steps will generally correct the condition.

1. Start the engine and allow the air system to build to its maximum pressure (120 PSI).

2. Depress the brake pedal to FULL application travel, hold for one second, then release. Repeat the procedure. Four (4) or more applications will be sufficient to bring the automatic slack adjuster back to specified limits.

3. Shut the engine off .

4. Recheck the slack adjuster travel. If still incorrect, call the Shops for needed repair.

SPRING BRAKES

The truck is equipped with ANCHORLOK spring brakes. They are located on the tractor (drive) axle and trailer axle. The spring brake chamber consists of dual diaphragm chamber, one for service and one for emergency braking. It is important to understand that spring brake of this type are not applied by air pressure but by the absence of air instead. The spring loaded piston is caged by the pressure fran the main system.

Application

"Do apply the spring brakes, pull the yellow button on the console. By pulling this button, you release air pressure in the spring brake chambers, thus allowing spring pressure to apply the brakes. To release the spring brakes, push the yellow button until air pressure compresses the mechanical spring tension releasing brakes.

There are three primary uses for spring brakes.

1. As an emergency brake: Spring brakes will automatically bring a vehicle to a safe, gentle stop should the vehicle's air pressure fall below a level which renders the service brakes unsafe.

2. As a parking brake: Once applied, spring brakes cannot be released unless adequate air pressure is available from the vehicle's air system.

3. As a "low pressure starting" protective device: Spring brakes will hold a vehicle firmly in place until the air pressure rises to a safe operating level and the system is manually released.

TOWING

In the event that the ANCHORLOK spring brakes cannot be released and the apparatus must be towed, remove the breather cap from each brake diaphragm, install the release stud, and unscrew (clockwise) the release stud until shoes are free from drums. (See instruction Sheet.)

WARNING: DO NOT release spring brakes unless vehicle is properly blocked.

AERIAL OPERATION BRAKE SYSTEM

Aerial ladder operation requires all brakes *shall be* applied when in operation. After apparatus is spotted in its operational location:

1. Apply spring brake. This will lock the tractor duals and trailer wheels.

2. Move aerial brake lock lever (located on console at right of A/0) to "ON" position. This directs air pressure to the front tractor brakes.

NOTE:

Aerial brake will not function unless spring brake is applied.

MOISTURE EJECTION SYSTEM

The air dryer a BEND IX WESTINGHOUSE, Model AD-2, is a desiccant type, in-line filtration system that removes both liquid and water vapor from the compressor discharge before it reaches the air brake reservoir. The air dryer utilizes a replaceable desiccant material which has the unique ability to strip water vapor from moisture laden air. The desiccant material is regenerative in that its absorptive properties are renewed each time the compressor is unloaded. The air dryer end cover is equipped with an automatic drain valve, controlled by the air system governor and is equipped with an integral heating element. The desiccant cartridge and pleated paper oil filter are removable and comprise a complete, serviceable unit. Yearly service to be performed by Shops personnel only.

The desiccant beads, which are referred to as the "drying bed", are a drying substance that has the unique property of exposing a tremendous surf ace area i n proportion to its bulk. One pound of the desiccant beads has about two million square feet of adsorptive area made up,. of a large number of submicroscopic cavities in each bead. Each desiccant bead adsorbs or collects moisture.

MOISTURE EJECTION SYSTEM (cont' d)

The heater and thermostat assembly prevent freeze-up in the purge drain valve when the dryer is used in severe winter conditions. The 60 watt , 12 volt DC heater and thermostat assembly has an .operating range of between 50 and 85 degrees.

Air Dryer Operation

The operation of the air dryer can best be described by separating the operation into two cycles; the charge cycle and the purge cycle.

Charge Cycle - Compressor in Compressing Cycle: With the compressor in its "loaded" or compressing cycle, air from the compressor enters the air dryer through the discharge line. When the air, along with the water and contaminents, enters the air dryer, the velocity or speed o f the air reduces substantially and much of the entrained liquid drops to the bottom or sump of the air dryer. The initial flow is toward the bottom of the dryer, but air flow direction changes 180 at the bottom of the air dryer, dropping some water and oil.

The air now passes through the oil filter which removes some oil and foreign material but does not remove water vapor. At this point, the air remains saturated with water. The filtered air and vapors penetrate the desiccant drying bed and the absorption process begins. Water vapor is removed from the air by the desiccant.

The unsaturated "dry air" passes through the ball check valve and purge orifice into the purge volume. From the purge volume, air flows through a check valve and into the first reservoir.

Purge Cycle: When desired system pressure is reached, the governor cuts out, pressurizing the unloader cavity of the compressor which unloads the compressor (non-compressing cycle). The line connecting the governor unloader port to the end cover purge valve port (bottom of the air dryer) is also pressurized, opening the exhaust of the purge valve to atmosphere. With the exhaust of the purge valve open, contaminents in the discharge line and dryer sump are purged or forced past the open exhaust out to atmosphere.

Air Dryer Operation (cont'd)

The reverse air flows across the desiccant start the removal process of moisture from the desiccant surface. Dry air flowing from the Purge volume through the purge orifice and across the drying bed -further dries the desiccant.

The combination of these reverse flows strips the water vapor from the desiccant (drying bed). This normally takes between 12 - 15 seconds.

The desiccant becomes activated from this cycle and is now ready for another charge cycle, which occurs when the compressor returns to the compressing cycle. It is for this reason the air dryer must be purged for 20 seconds after receiving moisture saturated air for a maximum of 60 seconds from a 16 CFM compressor.

TRACTOR STEERING

This apparatus is equipped with the ROSS HP74 integral power steering gear assembly. The whole power assist system is built into the steering gear box except for the VICKERS gear driven oil pump.

Operating Principals

The actuating shaft is connected to the steering column. The actuating valve is threaded to accommodate the actuating. shaft and is centered within the piston by reversing springs. When the steering wheel is turned, the valve moves in a linear motion within the piston permitting the edges of the valve to overlap mating edges on the inside of the piston. This causes high pressure oil to build up at one end of the piston. This higher pressure on one end of the piston causes the piston to move in the bore of the gear housing. The output' shaft and pinion gear are engaged to a rack gear machined into one side of the piston. As the piston moves, the steering shaft and pitman arm are rotated by the rack and pinion gear and the steering operation is performed. When rotation or input from the actuating shaft ceases, pressure on or movement of the actuating valve stops, and the reversing springs at the ends of the valve center the valve in the piston relieving the high pressure and power to the steering ceases.

Operating Principals (cont'd)

Movement of the actuating valve ¯to control oil pressure is controlled by the deflection of the reversing spring at either end of the valve. Total movement of the valve is approximately .040 of an inch. Relief valve plungers or adjustable stops are provided at the bearing cap and cylinder head. When the plungers are adjusted properly, they will automatically unload the hydraulic system if the wheels turn to either extreme direction.

When the engine is running, there is constant oil flow through the steering gear at low pressure. This constant oil flow provides for instant response and absorbs road shock to help eliminate steering wheel kick and protect the steering gear. Pressure is equal throughout the steering gear and oil cooling and lubrication are assured.

TILLER STEERING

The tiller steering gear is a ROSS, with a GARRISON power steering booster. Oil is supplied by a gear driven VICKERS S 20 vane type pump that supplies oil for the same tractor steering.

The power steering booster system consists of a gear driven hydraulic pump, a hydraulic oil reservoir, a flow divider, a drag link control valve, a double acting hydraulic power cylinder located on the tie rod.

When the steering wheel is turned, a valve opens which admits oil under pressure to one end of the piston, forcing the piston to move within the cylinder. The tie rod is moved as a result of the piston travel, thus turning the tiller wheels as required.

TORQUE CONVERTER

The torque converter is a single-stage, three element unit consisting of pump, stator and turbine. The converter provides maximum torque when load conditions demand. Oil for converter charging pressure comes from the sump and is supplied by the transmission oil pump.

Lockup Clutch

The lockup clutch consists of a single clutch plate, back plate and piston located between the converter turbine assembly and the transmission flywheel assembly (or converter drive housing). The lockup clutch plate i s splined to the hub of the converter turbine assembly. When the lockup clutch is applied, the turbine and the converter pump are locked together and rotate as a unit. Engine output is then directed to the transmission gearing at a speed ratio of 1:1, bypassing the torque converter. Lockup occurs in all forward gears, but not in reverse or neutral.

Converter Ratios

Torque converters are available in a number of ratios designed to match various engine and vehicle requirements.

Torque Converter Operation

The torque converter serves two primary functions. First, it acts as a fluid coupling to smoothly connect engine power through oil to the transmission gear train. Second, it multiplies the torque, or twisting effort, of the engine when additional performance is desired.

The torque converter consists of three basic elements; the pump (driving member) the turbine (driven or output member), and the stator (reaction member). The converter pump cover is bolted directly to, the engine flexplate which is bolted directly to the engine crankshaft.

The converter pump is, therefore, mechanically connected to the engine and turns at engine speed whenever the engine is operating.

When the engine is running and the converter pump is spinning, it acts as a centrifugal pump, picking up oil at its center and discharging this oil at its rim between the blades. The shape of the converter pump shells and blades causes the oil to leave the pump spinning in a clockwise direction toward the *blades of the turbine. As the oil strikes the turbine blades, it imparts a force to the turbine causing it to turn. When the engine is idling and

Torque Converter Operation (cont'd)

the converter pump is not spinning fast, the force of the oil leaving the pump is not great enough to turn the turbine with any efficiency.

This allows the vehicle to stand in gear with the engine idling. As the throttle is opened and the pump speed increases, the force of the oil increases and engine power is more efficiently transmitted to the turbine member and the gear train.

TRANSMISSION

The vehicle is equipped with an ALLISON automatic transmission, Model HD 754D. It has five (5) speeds forward and one (1) reverse. The transmission i s equipped with a torque converter with a ratio of 2.2.1. The torque converter offers variable ratios in gear. The transmission gear ratios are:

1ST 7. 97: 1
2ND 3.69: 1
3RD 2. 07: 1
4TH 1.40 :1
5TH 1.00:1
REV 4.47

This transmission torque converter combination is selected to enable this vehicle, fully laden, to start on any hill within the City. When starting on severe grades, the engine should be accelerated until the converter is in a stall condition before the foot brakes are released. This will allow smooth acceleration, eliminating any rollback which could damage the driveline components.

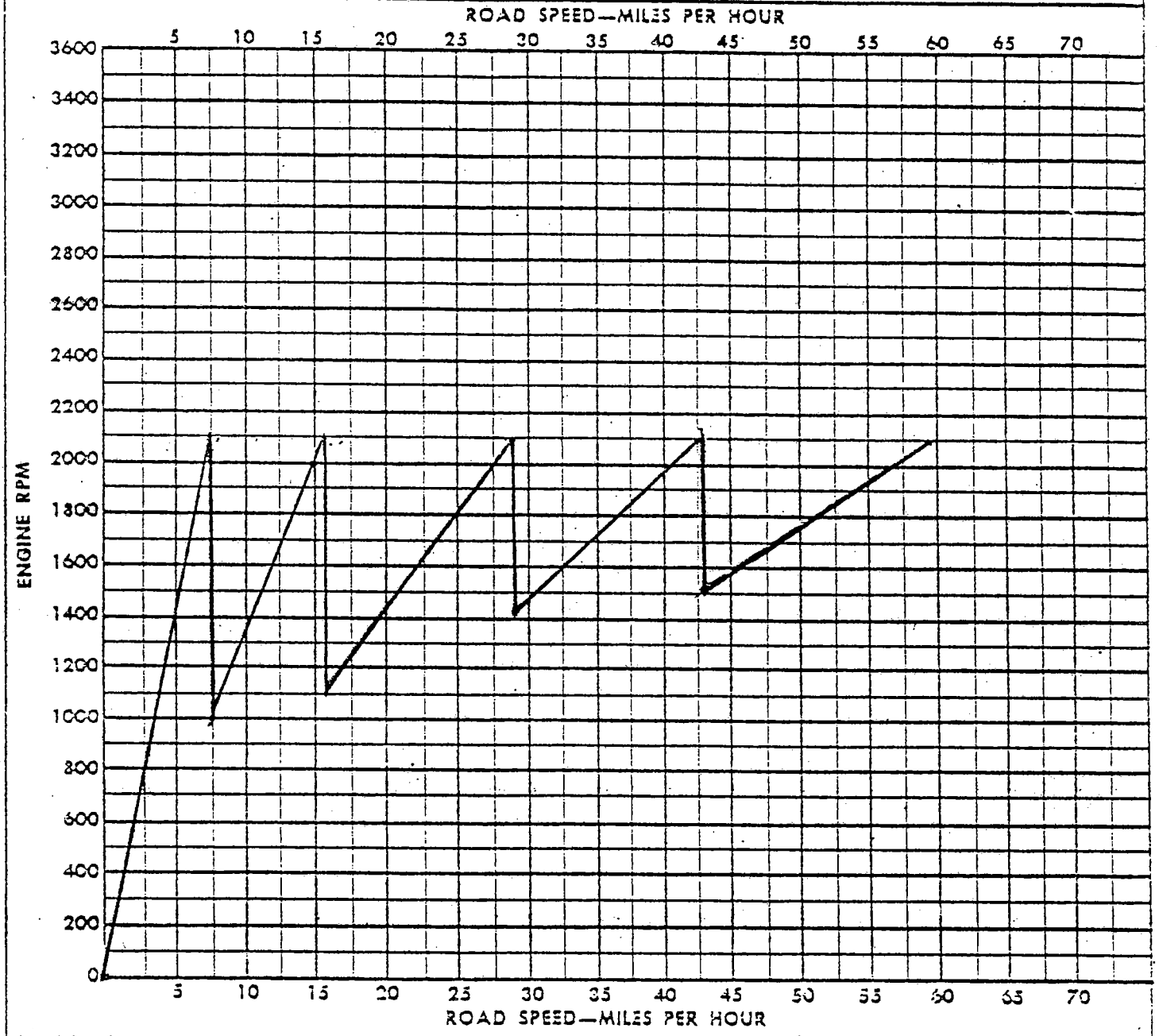
The transmission should operate at approximately 50 PSI with normal oil temperature- of approximately 150 degrees. Oil temperature will rise considerable when the vehicle is driven in converter in a high range or when the degree of hill is excessive. Make sure the right range is selected for the hill. If the transmission oil temperature exceeds 250 degrees, stop the vehicle, shift to neutral and cause the engine to run at 1,000 to 1,200 RPM. This should immediately cool the oil to normal. If not, notify the Shops. The transmission also has a heat exchanger which is located on the right side of the cylinder block in the lower front corner.

TRANSMISSION (cont'd)

CAUTION: The transmission can be downshifted or, upshifted, even at full throttle, and although there is no speed limitation on upshifting, there is on downshifting and reverse. Good driving practice indicates that downshifting should be avoided when the vehicle is above the maximum speed attainable in the next, lower gear. However, protection against improper downshifts and reverse shifts is inherent in the design of the hydraulic system. If a downshift or reverse shift is made at too high a speed, the hydraulic system automatically prevents the shift from taking effect until a safe, lower speed as reached. It will automatically downshift when the correct speed is reached.

GEAR SPLIT CHART

GROSS WEIGHT 42,240
VEHICLE, MODEL HT-07DH TYPE DIESEL
ENGINE, MODEL DDA 8V92TA GOVERNED RPM 2100
TIRES, SIZE 12R22.5XZA REVOLUTIONS PER MILE 487



TRANSMISSION GEAR RATIOS

MAKE ALLISON MODEL HD 750 D

	Ratio	MPH		Ratio	MPH
1ST	7.97	7.4	9TH		
2ND	3.69	16.1	10TH		
3RD	2.07	28.86	11TH		
4TH	1.40	42.67	12TH		
5TH	1.00	59.75	13TH		
6TH			14TH		
7TH			15TH		
8TH			16TH		

CONVERTER

MAKE ALLISON MODEL

RATIO 2.2:1

MAX. GEAR REDUCTION 34.51:1
EST. GRADEABILITY 49.0% x C.R
EST. SPEEDABILITY 59.75

DRIVE AXLE RATIOS

MAKE ROCKWELL MODEL R-170

HIGH 4.33:1 LOW NA

Planetary Gearing

The planetary gear train is made up of four constant mesh, straight spur gear planetary sets. The forward set is arranged for direct drive and is called the splitter planetary. The three rear set are intermediate, low, and reverse range planetaries. By the engagement of the clutches in various combinations, the planetary sets act singly or together to provide five (5) forward speeds and one (1) reverse.

Clutches

The clutches direct the flow of torque through transmission in accordance with the gear selected. All clutches are hydraulically applied. The friction surfaces are sintered bronze against steel. Any wear is automatically compensated, thus no adjustment is ever necessary except when rebuilding the transmission.

Hydraulic System

A single, pressurized hydraulic system serves the converter and trans mi ss ion. Oil for the hydraulic operation, lubrication, and cooling comes fron the sump and is supplied by the same pump.

Although your ALLISON transmission is rugged in design, certain precautions --and procedures must be followed to insure long, trouble-free service.

Towing or Pushing

NOTE: The engine cannot be started by towing or pushing. Before towing or pushing beyond a few blocks, the driveline must be disconnected .

Coasting in Neutral

Under no circumstances should you allow your apparatus to coast in neutral. When coasting in neutral or being towed with the drive shaft connected, the rear wheels become the driving force, causing th.e planetary gears in the transmission to overdrive. Since the multiple clutch sets are not applied in neutral and are spaced very close together, they will soon be destroyed by heat and lack of lubrication. Coasting in neutral does not allow the engine to help slow your apparatus.

Using the Engine to Help Braking

Downshifting should be avoided when the apparatus engine RPM is above the maximum speed attainable in the next lower gear. Use the service brake to slow the vehicle to an acceptable speed where the transmission may be downshifted safely. Use transmission for braking as you would use a manual shift.

Engine Stall Test

If the engine must be stall tested, that is, to engage the transmission in drive 1 - 5 range with the brake applied, wheels chocked and then opening the throttle full to check for engine or transmission malfunction; 30 seconds is the maximum time allowed for this test. Prolonged operation of this type will cause the transmission oil temperature to become excessive enough to cause severe internal damage. If stall test must be repeated, shift to neutral and accelerate the engine to 1,200 RPM and run until temperature lowers to operational level, 160 - 220.

Maximum Transmission Operating Temperature

If transmission overheats during normal operation, check the oil level in the transmission. (Refer to oil check procedure.) Add oil if necessary. Do 'not continue operation if transmission temperature rises above 250 degrees; call the Shops for assistance in locating the overheating problem.

Shift Characteristics

Since the basic design of the ALLISON Automatic Transmission used in this fire apparatus has been adjusted for optimum full throttle shifts, the light throttle shifts may seem harsh or slightly severe. This condition is normal.

If, however, over a period of time the shift pattern changes from its normal operation, contact the Shops immediately for an inspection of the condition.

NOTE:

Full throttle up-shifts should occur at approximately 1,900 RPM in each gear.

TRANSMISSION PREVENTIVE MAINTENANCE

1. CHECKING OIL LEVEL

A. Cold Check: The purpose of the cold check (engine not running) is to make sure there is sufficient oil in the transmission to safely start the engine especially if the equipment has been standing idle for some time. The oil level must reach the full mark on the dipstick. Before operating the vehicle, be sure to check the transmission oil level as described in

B. Hot Check: Check oil level with the engine running at 1,000 RPM, transmission in neutral and with the oil at normal operating temperature (160 to 220 degrees).

2. CHANGING TRANSMISSION OIL

A. When to change the oil: The oil should be changed ever 1000 hours or mDre often, depending on the operating conditions. Also, the oil must be changed whenever it shows traces of dirt or metal contamination or the effects of high operating temperatures, evidenced by. discoloration or strong odor.

If the above conditions are noted before the normal change interval time, please contact the Shops for further assistance and advice.

When draining the system, be sure to have the filter element changed and the oil screen in the sump cleaned. This operation should be done with the oil warm.

B. Draining the Transmission: Remove the drain plug from the right side of the sump and drain the oil.

2. CHAN CTNG TRANSMISSION OIL (cont' d)

C. Filling. the Transmission

1) Insert the drain plug into the right side of the sump.

2) Before starting the engine, fill the transmission to the full level with transmission fluid (approximately 6-1/2 gallons) . Depending on the type of installation, the transmission must be filled through the dipstick tube. The complete transmission and filter change must be made by qualified Shop personnel only.

3. INSPECTION

A. Intervals: The type of service and operating conditions wi 11 deter mine the frequency of regular inspection. However, check the transmission system oil level each day or at the start of each shift. At the same time, check for oil leaks.

B. Keeping the Oil Clean: Because the hydraulic system is the basic means of power transfer and control of the transmission, it is especially important that the oil be kept clean. The area around the oil filter hole should be kept clean and the oil containers. must be kept free from water, dirt, mud, or other harmful matter.

C. Water or Dirt in Oil: At each oil change, examine the oil that is drained for evidence of dirt or water. A normal amount of condensation will emulsify in the oil during the operation of the transmission. However, if there is evidence of water, check the cooler (heat exchanger) for leakage between the water and oil area. Oil in the water side of the cooler (vehicle radiator) is another sign of leakage. However, this may indicate leakage of oil from the engine into the cooling system.

3. INSPECTION (cont' d)

Any accumulation of sludge or soft dirt in the transmission sump should be removed by use of "flushing oil". Contact the Shops if there is any question as to the condition of the transmission fluid.

NOTE:

If engine coolant leaks into the transmission oil system, immediate action must be taken to prevent malfunction and possible serious damage. The transmission must be completely disassembled, inspected and cleaned. All traces of the coolant and varnish deposits resulting from coolant contamination must be removed.

CAUTION: Do not overfill any automatic transmission. Overfill conditions permit the fluid to contact the rotating member (drums, gears, Etc.) This increases oil temperature, boiling away additives and detergents. It also aerates (foams) the fluid. Aerated fluid does not effectively lubricate the transmission and could cause serious internal damage.

TIRES

Proper inflation is vital , therefore, use the F-377 as a guide for inflation check intervals. Thumping with a bar or hammer should be used on duals to check for a flat tire only and NOT for checking inflation.

Underinflation causes excessive flexing within the tire, resulting in heat build-up which can cause a blow-out. An underinflated tire running at high speeds and under heavy load can cause severe handling problems.

Underinflation can also result in general deterioration of the tire body, including extreme wear at both outer edges of the tread while showing little wear at the center, and could include fatigue breaks in the body cords. Remember, if one tire on a dual assembly is severely underinflated, the other tire is prone to failure from overloading.

TIRES (cont'd)

Overinflation detracts from, a tire's ability. to endure road shocks. The tire is rare rigid, resulting in carcass and bead failures. Overinflated tires often exhibit groove cracking and rapid center tread wear, and are more likely to be cut or punctured.

Excessive pressure build-up resulting from overloading or high speed can cause the rim to fail. Remember, the load carrying capacity of a tire cannot be increased over the maximum rated load by increasing the inflation pressure. A tire which has become hot from normal use will have a higher pressure than specified. Never bleed a hot tire!

Matching and Spacing of Duals

If the tires on a dual assembly are not closely matched in size, the smaller tire suffers from fast, irregular. Wear as it scuffs against the road. The larger tire is often subjected to overloading and excessive flexing which may lead to overheating, internal damage and possible blow out. Problems are likely to result if tires on a dual assembly differ by more than ½" in diameter.

If a slight mismatch does occur, the smaller of the two tires should be installed on the inside. The most accurate way to measure an inflated tire is to measure the circumference with a steel tape.

Tire spacing between duals is also important. If spaced too close, sidewalls will rub together when the vehicle is heavily loaded. If spaced too far apart, the outside tire will suffer from excessive scuffing when the vehicle makes a turn.

It is very important for the Apparatus Operator or Engineer to measure the wheel dish match whenever a wheel change is made.

PART II

1985 SEAGRAVE AERIAL LADDER TRUCK

DRIVING AND OPERATION

RECOMMENDED ENGINE STARTING PROCEDURE

1. Shift selector into neutral position.

2. Switch Cole Hersee battery selector switch to either #1 or #2 position (whichever is applicable).

3. Ignition switch "ON".

4. Warning light master switch "OFF".

5. Headlight switch "OFF".

NOTE : Due to the high amperable battery draw during starting, be sure headlight and learning light switches are in the "OFF" Position.

6. Signal tillerman for start procedure.

7. Depress applicable starter button on dash.

After the engine starts, check the engine oil pressure and alternator output. If normal, proceed with required lighting and driving components needed .

IMPORTANT: When shutting down engine, DO NOT switch battery master switch and ignition switch to "OFF" position until engine is completely stowed. Turning the switch "OFF" while engine is still in operation can damage the voltage regulator and destroy the alternator diodes.

NOTE: The foot throttle system on this apparatus is air-actuated, therefore, if the engine is started with no air pressure in the system, the engine will idle until approximately 30 lbs. of air is pumped into the system.

ENGINE SPEED GOVERNOR

The governor used on the 8V92 is a mechanical double weight type and performs two (2) functions.

1. Controls engine idling speed.

2. Limits the maximum operational speed of the engine.

ENGINE OPERATION

The diesel system furnishes a measured amount of fuel for each revolution. The diesel engine can easily be overfueled, by lugging when climbing a grade (where road speed decreases and the throttle setting stays the same) or by constant operation at low RPM's. The results are loss of power, smoking, and overheating. This condition can also result in excessive carbon build-up on the turbocharger turbine wheel, carbon build-up in the engine and an increase in the contaminants in the engine oil.

ENGINE TEMPERATURE

This gauge indicates engine coolant temperature. Operating range is between 170 and 195 degrees. The red warning light is set to go on at 212 degrees.

UNNECESSARY ENGINE IDLING

During long engine idling periods, the engine coolant temperature will f all below the normal operating range. The incomplete combustion of fuel in a cold engine will cause plugged fuel injectors, crankcase dilution, formation of lacquer or gummy deposits on the valves, piston, and rings and rapid accumulation of sludge in the engine.

NOTE:

When prolonged engine idling is necessary, maintain at least 800 RPM. Use auxiliary throttle to increase RPM's.

ENGINE SHUTDOWN

A turbocharged engine MUST NOT be shut down if excessively hot (over 200 degrees) . The heat from the engine will transfer to the turbo and burn the lubricating and cooling oil causing the bearings to seize. Let the engine run at 900 to 1,000 RPM in neutral until the temperature returns to normal and then at idle for about 30 seconds before shutting down.

TACH

A diesel engine must be driven by the tach. Under even moderate loads, engine "speed" should be maintained at about 1,900 RPM. The diesel engine should never be "lugged". Lugging an engine is running it in a gear that will not provide immediate acceleration when the throttle pedal is depressed. This definition applies to all gears and at all engine speeds.

OIL PRESSURE GAUGE

When engine is at normal operating temperature, the oil pressure should be 25 PSI minimum at 1,200. RPM and 30 PSI minimum at 2,100 RPM. At idle, the oil pressure gauge will only show about 10 PSI. This is normal for a DETROIT DIESEL ENGINE.

AIR CLEANER RESTRICTION GAUGE

Located on the dash, the air cleaner restriction gauge measures restriction to the air intake system. As the air filter element becomes dirty, the vacuum reading will increase. Restriction gauge must not exceed 25" vacuum. Call the Shops for filter service.

ENGINE TUNE UP

There is no scheduled interval for performing an engine tune up. As long as the engine performance is satisfactory, no tune up should be needed. Minor adjustments and fuel filter change will be done at the Shops at aerial test time.

NOTE: Do not remove or paint the I.D. tag located on the left (driver's) side of the engine valve cover. This tag is a built-in parts book for the DETROIT DIESEL ENGINE installed in this apparatus.

JAKE BRAKE OPERATING INSTRUCTIONS

1. Start engine.

2. Engine should be fairly warm before engaging JAKE BRAKE. Engine preheater water temperature is sufficient.

3. Move dash mounted mul ti-position switch to one of the following anticipated retarding requirements.

   OFF - JAKE BRAKE non-operational
   LO - Minimum engine retarding
   HI - Maximum engine retarding

4. Selector switch position can be changed at the discretion of the operator, at any time, without the fear of damaging any of the engine components.

IMPORTANT: There is no time limit with respect to the operation of your JACOBS BRAKE. The engine's cooling system will continually absorb and dissipate the heat generated by its continual use.

JAKE BRAKE "CAUTIONS"

WET STREET OPERATION

The use of the JAKE BRAKE on wet streets is not recommended. The additional braking effort on the drive wheels (duals) can cause them to lock up which could result in an uncontrollable skid.

FREEWAY OPERATION

Use of the JAKE BRAKE on freeway or similar open road should be dictated by traffic conditions and the operator's good judgement. Desirable coast of apparatus is eliminated by JAKE BRAKE retardation.

USAGE GUIDE

Light Traffic Condition

1. Minimum JAKE BRAKE switch setting medium traffic condition.

2. Minimum to moderate JAKE BRAKE switch setting.

3. Heavy traff is condition and surface street emergency responses - maximum JAKE BRAKE switch setting.

Remember, the off throttle deceleration rate of the apparatus with the JAKE BRAKE in operation is severe enough to cause following vehicles to run into the back of your apparatus. The brake warning lights work only on brake pedal application.

EMERGENCY ENGINE SHUTOFF PROCEDURE

This apparatus is equipped with a push button engine shutoff Pushing the button will shut off the fuel to the injectors. If a push button failure occurs, the following steps must be taken for engine shut down.

1. Leave the ignition switch and battery master switch in the "ON" position.

2. Open engine hood on driver's side and locate turbocharger housing.

3. If engine is hot, wear gloves for protection against hot exhaust.

4. Note the two side-by-side throttle return springs located in front of the turbocharger housing. Below the springs, note the fuel shutoff lever. Rotating the lever clockwise to its stop will shut off the engine.

EMERGENCY ENGINE SHUTOFF PROCEDURE (cont'd)

5. Turn ignition switch "OFF".

6. Turn off the battery master switch if necessary.

Apparatus Operator's should practice this manual shutoff procedure from time to time.

RUNNING OUT OF FUEL

When operating your apparatus for extended periods of time, be aware of fuel consumption. If you anticipate running out of fuel before you complete your assignment, notify the incident commander of the pending situation.

Restarting a diesel engine that has been run out of fuel is made difficult by the fact that fuel, after it is exhausted from the fuel tank, is then pumped from the primary filter assembly and sometimes partially from the secondary filter assembly before the fuel supply becomes insufficient to sustain engine running. These assemblies must be refilled with fuel and the fuel lines purged of air before the system can provide adequate fuel to the injectors on which to start the engine.

Follow these steps in restarting a fuel-depleted engine.

1. Fill the fuel tank with diesel fuel. If only partial filling of the tank is possible, add a minimum of ten gallons of fuel.

2. Remove and fill the fuel strainer and fuel assemblies with diesel fuel. Install the strainer assembly on its cover and the filter assembly on its cover.

3. Start the engine. Check the filter and strainer assemblies for leaks.

If the engine does not start, notify the Shops for additional assistance.

DRIVING

The automatic transmission installed in this apparatus has five (5) forward speeds, reverse, and neutral. The shifting quadrant located i n the cab i s divided into five (5) positions. Movement of the selector lever determines the gear in which the start will be made and also the highest gear the shift will be made. The following table will serve as a guide in selection of the particular range to be used.

(R) Use this for backing the vehicle. The vehicle should be completely stopped before shifting from a forward gear to reverse gear or from reverse to forward. The reverse warning signal is activated when the range selector is in this position. Reverse has only one gear. Reverse operation also provides the greatest tractive advantage.

(N) Use this position when you start the engine. If the engine starts in any other position, the neutral start switch is malfunctioning. This position is also used during stationary operation of the power takeoff aerial operation. Use this position when the vehicle will be left unattended while the engine is running; always apply the parking brake.

1-5 Use this one for all normal driving conditions. The vehicle will start in Is t gear and, as you depress the accelerator, the transmission will upshift to 2nd gear, 3rd gear, 4th gear, and 5th g ear auto ma tic ally. As the vehicle slows down, the transmission will automatically downshift to the correct gear.

1-4 Occasionally the road, load, or traffic conditions will make it
1-3 desirable to restrict the automatic shifting to a higher range.
1-2 When the conditions improve, return the range selector to the normal driving position. These positions also provide progressively greater engine braking power (the lower the gear range, the greater the braking effect).

(1) This is low gear. Use this one when pulling through mud or driving up steep grades. This position also provides maximum engine braking power.

WARNING: In the low ranges (1st, 2nd, 3rd, and 4th) the transmission will not upshift above the highest gear. selected unless the recommended engine govered speed for that gear is exceeded.

STEERING

This apparatus is equipped with tractor and trailer power steering. The ease of operation and increased maneuverability afforded by the power steering unit is quickly appreciated by the driver. However, he must guard against the tendency to forget that, although the apparatus will handle almost as easily as a passenger car, this is still a heavy apparatus and must be handled accordingly.

The power steering unit is so designed to retain the tendency of the front wheels to return to the normal straight ahead position after completing a turn. However, do not rely upon the steering to return to center automatically. It is always wiser to steer--both turning and straightening-with both hands on the wheel. Hydraulic failure will not result in loss of control over the apparatus as the steering merely reverts to a full manual mode.

DIRECTIONAL SIGNALS

Directional signals, or turn indicators, are provided as a useful aid in signaling for a turn. They should be used, but be sure that they are functioning properly and can be seen under all lighting conditions. The directional signals on this apparatus will automatically cancel when the turn is completed.

BRAKING

Operating the brakes of an air equipped vehicle is extremely simple. The effort required to depress the brake pedal is only slightly more than depressing the average accelerator. In case of an emergency, there is practically an unlimited supply of braking power available. It must be remembered that this is a powerful and heavy vehicle and that the driver must still use all his knowledge of, the speed, load, and road traffic conditions when bring his vehicle to a stop.

CAUTION: Do not attempt to move the apparatus with less then sixty (60) lbs. of reservoir air pressure. Spring brake will still be applied.

BRAKING (cont'd)

The best possible stop will be made when the first brake application is as hard as the speed, condition of the road and passenger comfort. permit; then graduated off as the speed is reduced so that at the end of the stop, little pressure remains in the brake chamber. Never apply the brakes lightly at first and then increase the pressure as the speed diminishes. This stop not only requires more time, but the high pressure at the end will produce a severe final stop.

Do not "fan" the brake pedal. On and off application of the brake does not increase the braking efficiency--it only lowers the reservoir and line pressure.

DIESEL DRIVING HINTS

Improper downhill driving can be devastating to engine parts. . When descending, the driver will often downshift to control speed and to avoid excessive use of the brakes. What actually happens is that the load is pushing the vehicle downhill and, the governor cannot control the engine speed. The wheels are turning the driveshaft and the engine. When the engine rotation exceeds 200 to 300 RPM above rated speed, it could result in the valves hitting the pistons (valve float), increased oil consumption, injector plunger seizure or possible engine damage requiring major overhaul. Operators should select a lower gear when descending, remain in that gear at all times, and use a combination of JAKE BRAKE, service brakes, and gears to prevent overspeeding the governor (engine).

Never turn off the ignition while in motion. When the ignition is off, fuel flow is cut off from the injectors. Fuel flow through the injectors is required for lubrication any time the injector plunger is moving.

When the ignition is off, fuel pressure can build up behind the shutoff. valve and prevent the valve from opening.

DIESEL DRIVING HINTS (cont'd)

Excessive idling creates two serious problems. First, it wastes fuel, since a diesel engine will burn about 1/2 gallon per hour. Second, excessive idling causes engines to operate at dangerously low temperatures and this causes a build up of carbon deposits around injectors, valves, pistons and valve seats. It can also cause misfiring due to injector carboning and damage to the turbocharger shaft seals.

When you must idle, set the throttle at 900 to 1,100 RPM. This will bring the operating temperature up to a safe level.

Don't be too quick to shut down a hot engine. Shutting down the engine without a suitable cooling off period results in; 1) immediate increase of engine temperature due to lack of coolant circulation, 2) oil film burns on hot surfaces, 3) no oil on surfaces for the next cold start, 4) possible damage to the heads and exhaust manifolds and, 5) possible damage to the turbocharger that could result in turbocharger seizure. Allow an overheated engine to cool do can from three (3) to five (5) minutes, or until normal operating temperature is reached, before shutting it down.

EXTERIOR BODY MAINTENANCE .

The exterior finish applied to this apparatus is DITZLER DELTRON TEAK RED enamel. This finish is very durable but requires that no type o f abrasive polish or cleaner be used on it.

Wash painted surfaces with a mild detergent and, if polishing is necessary, use K.S. Custom Body Jelly, storeroom item #932 5408 or equivalent.

AERIAL HYDRAULIC SYSTEM

The SEAGRAVE hydraulic system is a medium pressure system. The hydraulic components, other than the pump, motors, filters and fittings, are manufactured by the SEAGRAVE Corporation. The controls are an open center type with a manually operated internal bypass. This means the system is continually flowing (60 to 125 PSI) until the bypass is closed by actuation of a control lever. This allows the pilot operated relief valve to actuate, stops the free f low of the fluid and directs it to the proper cylinder or motor at operating pressure.

AERIAL LADDER AND HOIST

OPERATING SAFETY

The aerial ladder is only as good or as safe as the operator is competent. Allow only qualified operators with good fire service background and a cool-headed nature to operate an aerial ladder. It is best to have regular operators assigned and adequate relief operators qualified.

Never permit men to climb an aerial ladder until the operator indicates that the ladder is set for climbing.

Avoid moving the la die r while men are on it as this places a serious live-load on the ladder, , and may also result in injuries if men are caught by moving parts.

Do not elevate or lower the ladder while men are climbing the ladder. Do not allow men to use a leg lock on the aerial.

Always consider the stability of any structure supporting the ladder. Also, note dangerous cornices or other objects that might endanger men on the ladder.

At night, keep the top of the ladder and the rungs well lighted. It may be a good idea to paint the top of the ladder for spotting.

Avoid forcefully extending the end of the ladder against a structure.

Never use the ladder as a battering ram. This may result in damage that could cause failure later in an emergency.

Never allow an aerial ladder to be used for stunting of any sort. This is not a circus rig, but a machine designed for specific fire service functions.

OPERATING SAFETY (cont'd)

After every use and periodically, inspect cables, pulleys, rails and rungs for wear and tightness.

Always use jacks, with ground plates if needed, when using the aerial.

Operate the ladder with deliberate motions and smooth application of power. Jerky or erratic application of power is dangerous. Do not slam controls as this will create erratic operation and induce severe stresses in the ladder.

Do one thing at a time, and in the proper operating sequence. Do not try to raise, rotate, and extend the ladder simultaneously except where special conditions warrant this, such as raising under wires, etc.

Always make certain that the truck is properly set for ladder operation before leaving the cab. See that the spring brake and service brakes are set and locked; see that wheel chocks are properly closed. This is extremely important on hills.

Never use the ladder itself for pulling down walls or structural members. If necessary, secure a line to the object to be moved by using the ladder in cantilever position. Make certain that the ladder truck is in a safe location where it will not be struck by debris, then use a winch or other proper source of power for demolition. The ladder is not constructed for this purpose.

Never willingly or intentionally abuse an aerial by careless handling, overloading or use for which it was designed.

Limit the number of men permitted on the ladder, and on each section of the ladder, in accordance with instructions.

Always observe the inclinometer for the safe angle of operation and safe loadings. It is a good idea to make a record of each extension at fires and the angle used, and whether the ladder was in cantilever or supported position.

OPERATING SAFETY (cont' d)

Take special care when working around electric wires. In case of contact with live wires, do not allow anyone standing on the ground to touch the truck as they may provide an electrical patch to ground.

(Men on the ladder, like birds on a wire, are usually safe unless in the patch or the current at the point where the ladder touches a wire.)

Keep children off the truck during operations. The operation of a ladder involves moving machinery and is no place for children or spectators.

Always have the operator remain close to his truck while the aerial is in use and the engine is running (just as the pump operator must be with his apparatus while it is in use). This is necessary to protect persons using the ladder, to prevent destruction of the ladder if flames suddenly burst around it, or to prevent unauthorized movement of ladder controls.

POWER TAKE OFF

This vehicle is equipped with a power take off (PTO) which has a direct mounted hydraulic pump which operates the aerial ladder. The PTO is shifted by air from a control on the dashboard. The transmission must be in gear to engage the PTO. Return gear selector to neutral after PTO is engaged and secure neutral selector lock into position.

SPRING LOCKS

The air operated spring immobilization locks are provided on the rear tractor axle. To lock springs, throw throttle switch to "ON" Position.

LADDER LOCKS

The ladder locks obtains its power from the throttle switch, but the ladder locks will not disengage until both ground jacks are firmly on the ground. There is also a light on the dashboard that will

LADDER LOCKS (cont'd)

light up when the ladder unlocks. There is also an over-ride button for the ladder locks located in the same compartment as the ground jack controls. The over-ride button takes two persons to use. First person to hold the button while the second person hoist the aerial out of the bed. When lowering the ladder into the bed, you need not hold the button, the ladder will automatically self-lock.

GROUND JACKS

The vehicle is equipped with hydraulically operated ground jacks. There axe two sets of control levers located on each side of the trailer inside the most forward compartment. Inside the compartment besides the control levers for the left and right ground jack, there are two over-ride buttons. One controls the ground jacks when the aerial is out of the bed. The other button releases the ladder lock when both jacks cannot be rested on the ground.

To operate jacks, apply spring brakes and aerial brake lock lever to "ON", engage PTO, turn aerial throttle switch "ON". Starting with the down hill side, jacks shall be lowered to achieve a firm contact with the ground. Over extension of the jacks in an effort to level the turntable, shall be avoided. This places undue strain on the jack system and may result in a binding condition.

WARNING

Operators must use extreme caution before retracting the hydraulic ground jack outriggers. Be absolutely certain that all persons, firefighter or spectator, are a respectable distance from the truck before retracting the ground jack outriggers. The truck body may have been elevated a few inches from ground level when the ground jack outriggers were set in place. When they are retracted, the rear of the truck body may settle down quickly and could severely injure a human knee, leg, etc., that may be in the path of travel of the lowering vehicle body or rear step.

WARNING (cont' d)

NOTE: Do not attempt to raise or lower ground jacks while the aerial ladder is being lowered into the bed.

It is not necessary that operations be performed in the exact sequence as listed. Actually, many of the operations may be performed in an order different than listed here, and some operations may be done simultaneously.

Use the procedure or sequence which produces the desired results with due consideration for the safety of personnel and the care of the apparatus.

Ladder bed lock will not release until the ground jacks are down. Do not operate the aerial ladder unless ground jacks are down.

NOTE: Due to situation where only one ground jack can be lowered, you can force the aerial out of the locks.

RAISING THE LADDER

1. Locate the apparatus in the proper position with the engine running.

2. Set spring brake and aerial operation brake; place gear selector lever in a forward speed position, engage the power take off control handle, move selector lever to neutral, and set gear selector lock.

NOTE: Normally, the road transmission will be left in neutral, but if it is necessary to move the apparatus, the power take off need not be taken out of gear while maneuvering limited distances. PTO must be taken out of gear before driving on the street.

3. Move aerial switch to "ON". Master switch must be on.

4. Throw throttle switch to "ON" which will also release aerial ladder "travel" locks and set spring locks.

RAISING THE LADDER (cont'd)

5. Place. chock blocks as conditions warrant.

6. Set ground jacks, low side first.

7. Raise aerial ladder to desired angle by moving the hoist control lever to the "raise" position.

8. Rotate the turntable to the necessary position by moving the rotation control lever.

9. Extend the ladder to the' desired height by moving the extension control lever to the "extend" position.

10. Move the ladder lock control lever to the "lock" position.

11. Retract the ladder slowly against the ladder locks by moving the extension control lever to the "retract" position. An indication that the ladder locks, or pawls, are engaged is when the extension cable begins to slacken.

12. Lower the ladder slowly to the desired point by carefully depressing the hoist control lever to the "lower" position and allowing the ladder to slowly drift down until desired point is reached.

NOTE:
Slack in the extension cable will be removed when lowering into your objective.

13. When the ladder has been properly placed in position, lock the turntable with the turntable lock wheel. Close the hydraulic system lock valve. If the ladder is to remain in a raised position for an extended period of time, disengage the power take off and shut off the engine.

RAISING THE LADDER (cont'd)

NOTE: Should it be necessary to move the apparatus after the ladder has been hoisted out of the bed (even slightly) and the ground jacks have been set, an interlock override located above to the outrigger controls on the right side must be depressed in order to release ground jacks from set position. Use extreme caution if this is to be used.

LOWERING THE LADDER

1. As necessary, start engine, engage power take off, and release turntable lock wheel.

2. Raise ladder, if supported, by moving the hoist control lever to, the "raise" position. (If the ladder is fully extended and against a building at an extremely low angle, it may be necessary to retract the extension some distance before raising the ladder. This will decrease the leverage exerted by the ladder against the hoisting cylinder.)

3. Extend the ladder a few inches by moving the extension control lever. At the same time, disengage the ladder locks.

4. Retract the ladder slowly by moving the extension control lever to the "retract" position until certain the ladder locks have disengaged. Continue to retract the ladder.

5. Rotate the turntable until the indicator marks line up indicating the ladder will line up with its bed.

6. Lower ladder slowly by moving the hoist control lever to the "lower" position. Observe ladder closely while it is being lowered to make certain it is centering between the guides at rear of ladder bed and to make sure the ladder has not moved from the completely retracted position. (Clearance between the tiller windshield and the end of the ladder is very close.)

LOWERING THE LADDER (cont'd)

7. After ladder has been "bedded", adjust retraction cable so that retraction cable pistons protrude about two inches. This will maintain tension on the upper ladder sections and prevent their drifting back.

8. Return all control levers to the "neutral" position.

9. Release ground jacks.

10. Remove chock blocks if apparatus is to be moved.

11. Move automatic throttle control switch to the "OFF" position.

NOTE:

Because this apparatus has a pilot operated relief valve which operates the hoist system, instead of a lock valve, it is very important that after disengaging the power take off, check the top and bottom cylinder pressure gauges on the control pedestal. If it shows pressure, which it is likely it will, move the hoist control lever momentarily to the hoist and lower position, then back to neutral. This will relieve the pressure, in both the top and bottom of the cylinders.

EMERGENCY OPERATION

(See ELECTRICALLY OPERATED AERIAL HYDRAULIC PUMP)

In the event of failure of the hydraulic system, no provision is made for manual hoisting of the aerial ladder. However, if the ladder is in the raised position, it can be operated sufficiently by hand to lower it into the bed.

Two hand cranks are provided for extending, retracting and rotating the ladder. Lowering is accomplished by gravity (weight of ladder).

EMERGENCY OPERATION (cont'd)

CAUTION: Anytime the hand crank is used, be extremely careful that the crank does not get out of control and injure someone. When any cranking operation is completed, remove the crank from the shaft immediately.

RETRACTING

1. Remove cap on end of hand extension shaft and install long hand crank.

2. Open extension bypass valve.

3. Extend ladder sections until ladder rungs are clear of ladder locks.

4. Close extension bypass valve.

5. Move ladder lock control lever to the unlock position.

6. Open extension bypass valve. If ladder sections will drift down, release control pawl on hand extension shaft and control the retraction by the extension bypass valve. If ladder will not drift down, use hand crank and control pawl on extension shaft to lower ladder.

ROTATING

1. Open rotation bypass, place short hand crank on end of hand rotation shaft, rotate turntable in direction desired.

NOTE : The rotation bypass valve must be kept closed except when rotating turntable by hand.

2. Close rotation bypass valve.

LOWERING

1. Open pilot operated relief valve bypass valve.

2. Move the hoist control lever to the "lower" position and bed ladder.

3. Return hoist control lever to the "neutral" position.

4. Close pilot operated relief valve bypass valve.

WATER TOWER

High pressure is not normally available in the hydraulic system for lowering the ladder from the hoist position, since the initial pressure is ample for all ordinary purposes. However, under certain conditions, such as lowering the ladder against nozzle reaction when the ladder is being used as a water tower, high pressure might be necessary.

CAUTION: Changes in nozzle pressure should be avoided during this operation.

1. Hold the throttle button down; close the test valve.

2. While holding the throttle button down, lower the ladder by moving the hoist control lever to the "lower" position.

3. As soon as ladder is located, return hoist control lever to neutral; open test valve and release throttle button.

ELECTRICALLY OPERATED AERIAL HYDRAULIC PUMP

This apparatus is equipped with an electrically operated motor to drive the aerial hydraulic pump in case of engine or transmission failure.

ELECTRICALLY OPERATED AERIAL HYDRAULIC PUMP (cont' d)

If the engine stalls and will not restart during aerial operation, proceed as follows.

1. Disengage transmission power take off (PTO) lever.

2. Move dash switch to emergency position.

3. Continue aerial operation as previously planned.

Aerial control levers will energize the emergency hydraulic pump through the throttle circuit in the control levers.

NOTE: There is no throttle circuit in the lowering position, therefore, to lower ladder press throttle button on pedestal and move the hoist control lever to lower.

In case of transmission or power take off (PTO) failure in aerial operation, follow the above engine failure procedure and complete aerial operation as required.

NOTE: This emergency operated system must be tested for proper operation at thirty (30) day intervals. Due to the high battery drain needed to operate the emergency system, it will be necessary to keep the batteries as close to full charge as possible at all times.

To test the emergency system, the following procedure must be followed.

1. Start the engine and move auxiliary throttle to "ON", this will give you 1,100 RPM. This will allow the alternator to supply most of the current needed for the test.

2. Leave the transmission PTO lever in the disengaged position.

ELECTRICALLY OPERATED AERIAL HYDRAULIC PUMP (cont'd)

3. Move the dash switch to emergency position.

4. Operate and set ground jacks.

5. Operate ladder control levers normally, as they will energize the emergency hydraulic drive motor.

PILOT OPERATED RELIEF VALVES ON HOIST CYLINDER

The pilot operated relief valves are safety valves installed on the hoist cylinders. Their primary function is to prevent the ladder from inadvertantly lowering in case of a hydraulic system failure, i.e., hydraulic line breakage, control valve malfunction, engine or transmission failure during aerial operation.

The design of the system is such that the engine must be running with the PTO engaged and sufficient hydraulic pressure available to achieve hoist operation.

If the ladder is to be used unsupported for long periods of time with the engine off, the pilot operated relief valves will not allow the ladder to be lowered if the hoist lever is accidentally moved.

PILOT OPERATED RELIEF VALVE EMERGENCY BYPASS PROCEDURE

In an emergency, the pilot operated relief valves can be bypassed in the event the ladder must be lowered without available power or hydraulic system failure.

The bypass valve is located on the base of the inboard side of the left hoist cylinder. To operate, slowly open bypass valve making sure the area is clear under the ladder. Carefully proceed with ladder lowering operation. After the ladder is lowered, CLOSE the bypass valve.

INTERCOM

This vehicle is equipped with two (2) intercom units; (1) between the turntable and end of fly section and (1) between cab and tiller seat. The master, or control units, are located at the turntable and in the cab. The master units have the controls and have to be manually keyed to talk. The crew end has no control and is operated by voice alone.

OPERATION

The Master. Control Amplifier is always "listening" to the Talkback Speaker at the top o f the ladder or the tiller seat except when the Push-to-Talk switch is pushed. The firefighter on the ladder and the tiller has "hands-off" communication (he has no controls to operate) and anything he says is heard clearly by the ladder operator. The intercom is specially designed with two separate volume controls so the ladder operator and the captain can adjust his incoming volume without changing the outgoing volume at the top of the ladder or the tiller seat. Powerful enough to use as an aerial public address system, the intercom provides two-way communication with firefighters working on roofs or in buildings near the ladder, as well as men on the ladder itself.

TRAILER

TRAILER AXLE SUSPENSION

SERVICE NOTES

INSPECTION

After your Western Unit Stabilaire Suspension has been in operation for approximately 1, 000 miles, all nuts, bolts and air connections must be checked and tightened. Repeat at 3,000 miles. To assure continued trouble-free operation, a regular periodic inspection is essential.

LUBRICATION

Your Western Unit Stabilaire Suspension requires no lubrication at any time. Lubricate axle according to axle manufacturers recommendations.

The double ball race turntable should be flushed with acid free, extreme pressure grease, applied through the four fittings provided, approximately every three months, and, at this time, the connector bolted should be checked for tightness.

FIRST 1,000 AND 3,000 MILES - PHYSICAL INSPECTION

1. Check all nuts, bolts and air connections for tightness.

2. Check air springs for equally inflated firmness.

DAILY - VISUAL INSPECTION

1. Check air springs for inflation.

2. Check for loose or broken parts.

EVERY 30 DAYS - VISUAL INSPECTION

1. Check all nuts, bolts and air connections for tightness.

2. Check air springs for equally inflated firmness.

EVERY 30 DAYS - VISUAL INSPECTION (cont'd)

3. Check for broken and abnormally worn parts.

4. Check for wear from insufficient clearance around air springs, shock absorbers, air brake chambers and tires.

EVERY 90 DAYS - PHYSICAL INSPECTION

1. Thoroughly check all items listed for 30 day inspection

2. Block up frame until tires clear floor and suspension is fully extended. Check the following:

   A. Air springs should have completely deflated.
   B. Inspect air springs for wear at its connection to pedestal.
   C. Check shock absorbers for oil leakage and worn rubber bushings.

3. Remove blocks to let frame down. Air springs should equally inflate if height control valves function properly and air reservoir pressure is maintained in excess of 65 PSI.

IMPORTANT

Safe air brake pressure of 65 PSI is automatically maintained by a Brake Protection Valve in the event of air loss due to a failure on the suspension air system.

Rubber bumpers inside the air springs carry the loaded trailer, should all springs go flat.

If an air spring develops a leak, height control valve should be shut off by disconnecting the height control valve link from the actuating lever. Bleed both air springs down until the bumpers in the bags are contacted. With the suspension in this condition (on bumpers), the trailer and its load can be driven at 30 MPH back to the station.

IMPORTANT (cont' d)

Broken or worn shock absorbers, rubber bushings or other components should be replaced as soon as possible.