121st Air Refueling Wing
Fire Protection Branch

P-19 STUDY GUIDE

P-19 STUDY GUIDE

TABLE OF CONTENTS

ANNEX TO FIGURES

It is the intent of this overview to highlight the systems of the P-19. This booklet does not replace the T.O., nor is it intended to. A good operator must be able to deal with the vehicle's NOTES, CAUTIONS, and WARNINGS without reference. It is extremely important the operator knows where to find solutions within the T.O. This reference is designed to assist the operator in the familiarization of the P-19 while working towards licensing.

PURPOSE OF EQUIPMENT

1-1 The A/S32P-19 (T.O. 36A12-8-17-1) is primarily designed for aircraft crash and rescue operations. By rapidly discharging agents on a crash site, the truck can put out fires within seconds after arrival. This hastens the rescue of personnel.

OVERALL DESCRIPTION

1-2 The truck has a diesel engine powered, 4X4 all wheel drive chassis. A single diesel engine powers the truck drive train and water pump. The fire fighting systems of the truck are self-sufficient. No outside source for extinguishing agents is needed. The truck contains its own pressure pump and fire fighting equipment. Water, foam, and dry chemical are carried in tanks built into the truck body. The truck body is insulated, preventing heat loss from the truck interior during cold weather. The insulation also provides protection from fire heat.

Water or a combination of water and foam can be used to put out a fire. Agents are delivered through the cab-mounted roof turret, the bumper turret or the handline. The chassis design allows the truck to operate in all weather and on off-road terrain. The truck is equipped with Class II winterization equipment. This allows the truck to maintain standby status during cold weather without running its engine.

VEHICLE PERFORMANCE CHARACTERISTICS

1-3 There are certain characteristics of the P-19 vehicle which are different than other fire fighting vehicles. This study guide will cover some of the performance characteristics of the P-19. Specific characteristics are listed in the T.O.

Performance

Acceleration	0-50 MPH in 25 seconds
Top Speed	65 MPH
Gradability	Ascend & descend 60% grade
Obstacle climbing ability	Will negotiate an 18 inch wall

Dimensions

Weight loaded	32,000 lb.
Weight empty	22,000 lb.
Overall height	120 inches
Reducible height	102 inches
Overall length	325 inches
Overall width	96 inches
Wheel base	170 inches
Ground clearance	18 inches below axles
Angle of approach	30 degrees
Angle of departure	30 degrees
Turning Radius	80 feet

Engine

Make	Cummins
Model	NTC 400
Type	four stroke, in-line diesel
Oil capacity	11 gallons
Engine idle speed	600 – 650 RPM
Normal operating temperature	158 – 195°F
Minimum oil pressure at idle	8 PSI @ 225°F
Minimum oil pressure at governed speed	40 PSI @ 225°F

Fuel System

Fuel tank capacity	42 gallons
Primary fuel	VVF800 Grade 2 diesel
Emergency alternate fuels	JP-4, JP-5, and JP-8
	*See warning for use of JP-4
Primary pump type	Electric 24 VDC
Filter and water separator	Single spin-on cartridge

Booster Heater

Make	Webasto
Heat output	104,000 BTU / hour
Primary fuel	#2 Grade diesel
Emergency alternate fuels	JP-4, JP-5, or JP-8
Fuel consumption	9.1 Pints / hour
Operating voltage	24 Volts
Water pump flow	22 Gallons / minute

Cooling System

Radiator type	Fin and tube design
Cooling system capacity	20.5 gallons

Electrical System

Alternator output	100 Amp
Batteries	Two 24 Volt
Circuit protection	Automatic reset circuit breakers

Power Divider

Type	Oil cooled modulating clutch
Oil capacity	34.7 quarts

Transmission

Type	5 Speed automatic with lockup torque converter
Normal operating temperature	160 – 200°F
Oil capacity	8 gallons

Wheels and Tires

Make	Goodyear
Type	Three piece steel disc
Tires	Tubeless steel belted radial
Air pressure	60 PSI

Fire Fighting System

Water Tank

Capacity	1,000 gallons
Fill connection	One (1) - 2½" (driver's side)
Construction	Structural fiberglass

Foam Tank

Capacity	130 gallons
Fill connection	One (1) - 1½" (passenger side)
Construction	Fiberglass

Water Pump

Make	Hale (50 FO-P)
Type	Single stage centrifugal
Capacity	950 GPM, 200 PSI @ 2100 RPM
Drive	Power divider disconnect clutch

Foam Proportioning System

Type	Around the pump
Metering control	Multiple orifice
Metering percentage	3% or 6% AFFF foam

Roof Turret

Type	Non-aspirating
Control	Manual
Discharge pressure at pump	225±5 PSI
Discharge rate	500 GPM
Pattern	Variable
Maximum reach (Solid pattern)	175 Feet
(Fully dispersed)	75 feet @ 45º wide
Horizontal range	200º
Vertical range	45º above plane, 15ºbelow

Bumper Turret

Type	Non-aspirating
Control	Electric / pneumatic
Discharge pressure at pump	240±5 PSI
Discharge rate	250 GPM
Pattern	Variable
Maximum reach (Solid pattern)	150 Feet
(Fully dispersed)	60 Feet with 20 Foot width
Horizontal range	180º
Vertical range	36º above plane, 20º below

Handline

Type	1" rubber hose
Hose length	100'
Discharge pressure at pump	240±5 PSI
Nozzle type	Non-aspirating
Discharge rate	60 GPM @ 100 PSI
Pattern	Variable
Maximum reach (Solid pattern)	96 Feet
(Wide Fog)	38 Feet

DRY CHEMICAL SYSTEM

Tank

Type	Steel storage
Capacity	500 lbs.
Dry chemical agent	Powdered Potassium Bicarbonate
Operating pressure	220 to 230 PSI
Relief pressure PSI	250 PSI

Nitrogen cylinder

Make	DOT 3AA-2400
Capacity	300 Cubic feet

Handline

Type	1 Inch ID hose
Hose length	150 Feet
Working pressure	220 – 230 PSI
Burst pressure rating	800 PSI
Pattern	Conical
Discharge rate	5.5 to 7 lbs./second

REVIEW QUESTIONS

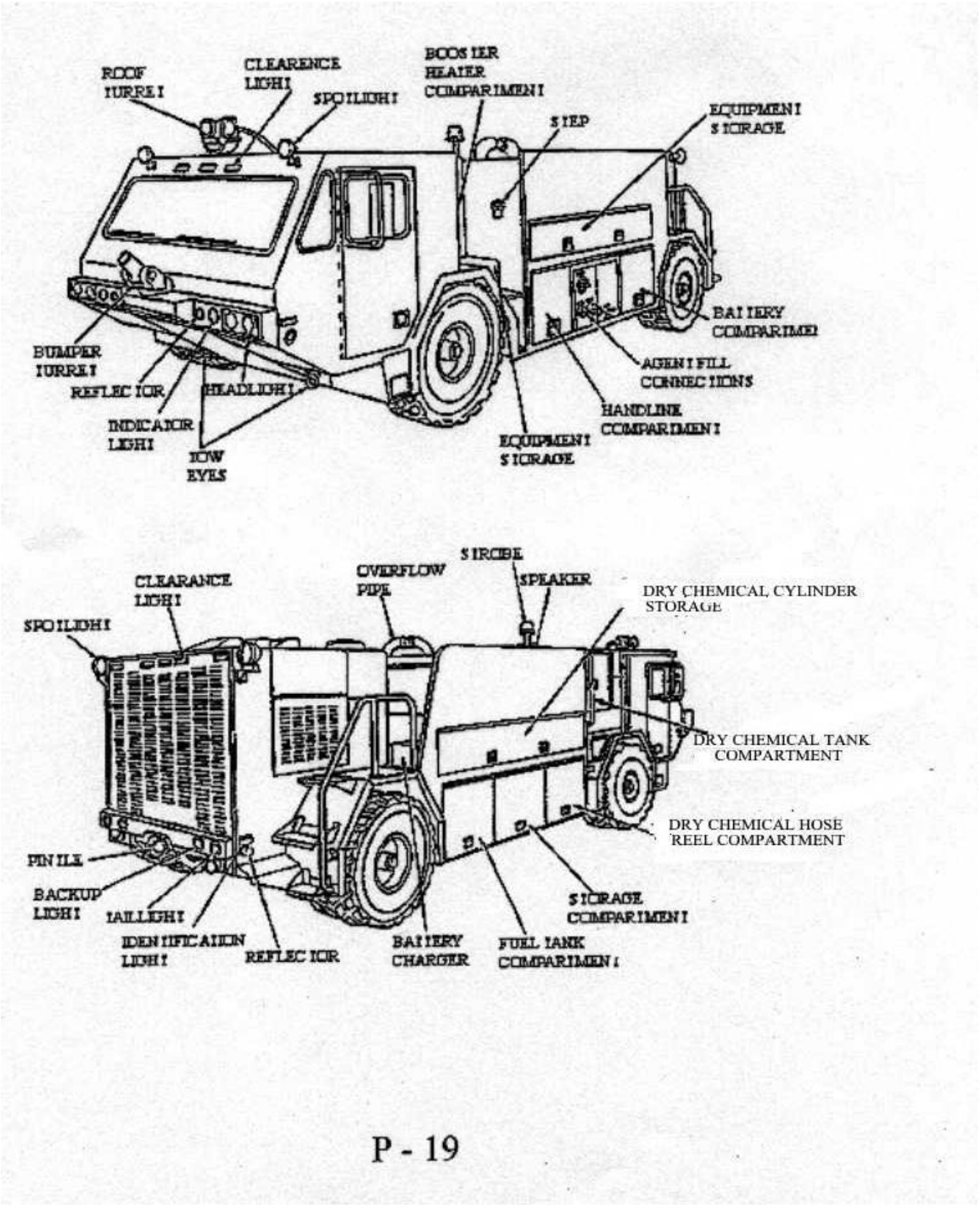
1. The alternator output is rated at _____ amps.

2. What is the discharge capacity of the bumper turret? _____

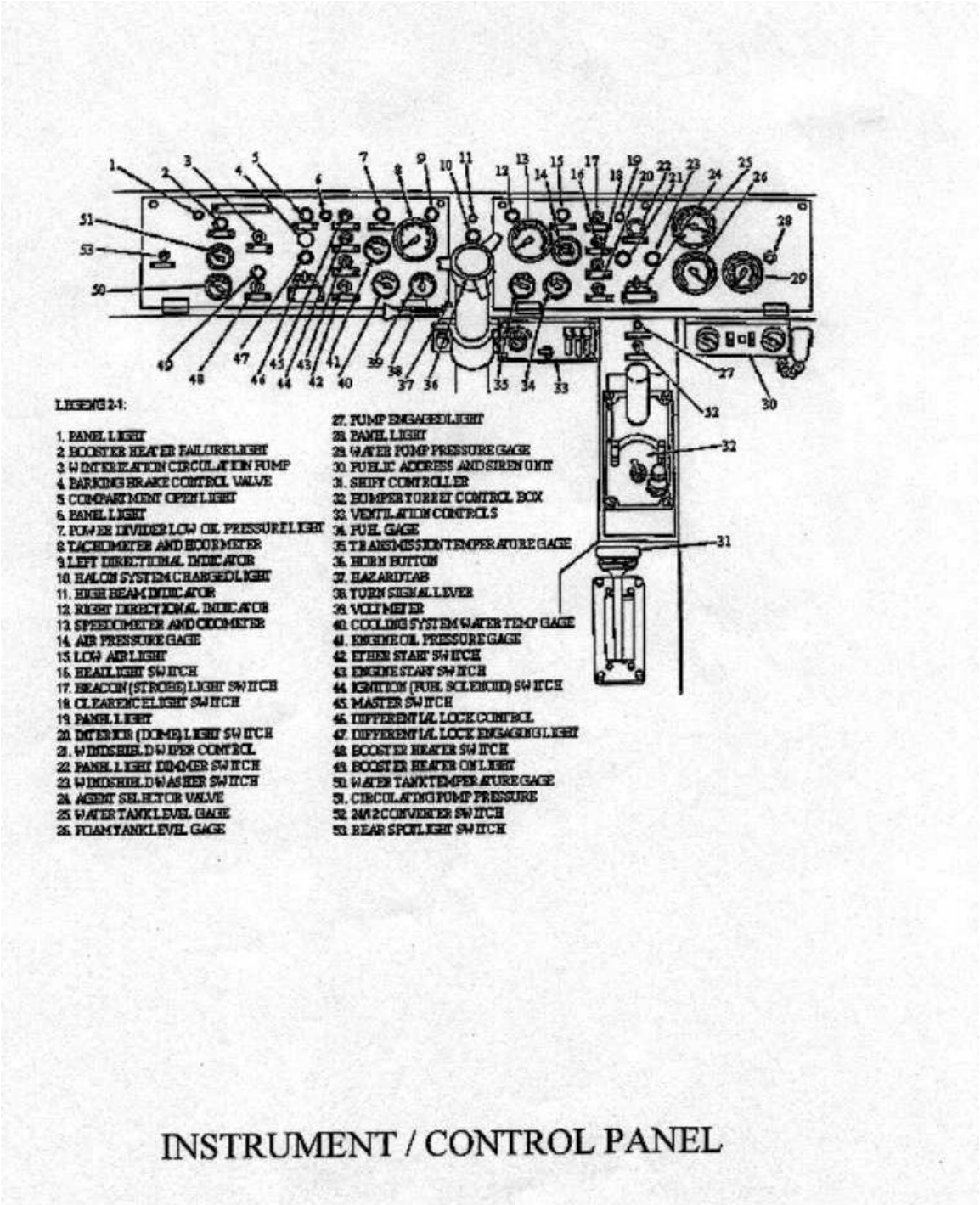
3. What is the capacity of the foam tank on the P-19? _____

4. What is the rated discharge of the water pump? _____

5. How much dry chemical agent can be carried in the tank? _____

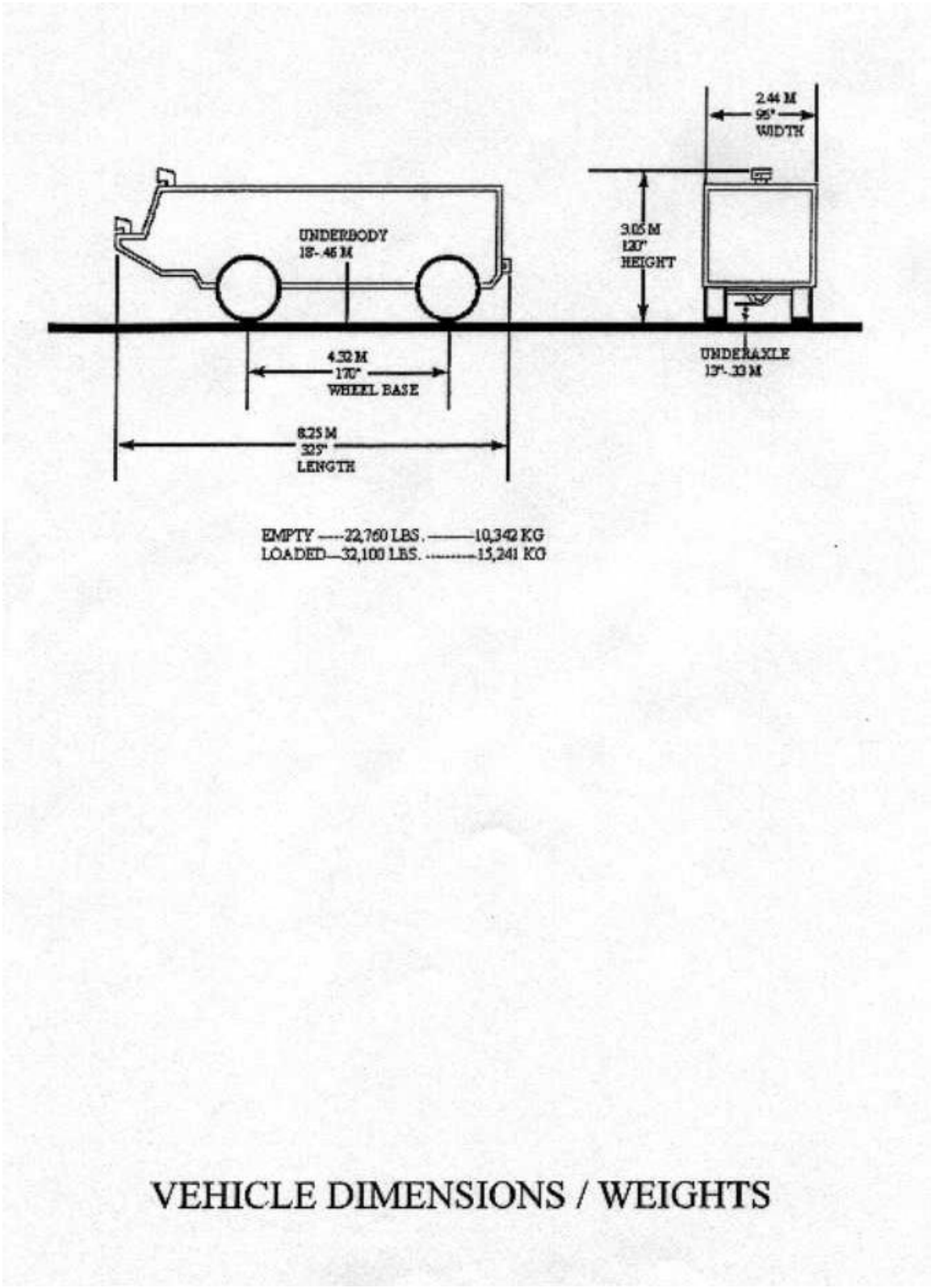

ROOF TURRET
CLEARANCE LIGHT
SPOTLIGHT
BOOSTER HEATER COMPARTMENT
STEP
EQUIPMENT STORAGE
BATTERY COMPARTMENT
AGENT FILL CONNECTIONS
HANDLINE COMPARTMENT
EQUIPMENT STORAGE
BUMPER TURRET
REFLECTOR
HEADLIGHT
INDICATOR LIGHT
TOW EYES
SIREN
OVERFLOW PIPE
SPEAKER
CLEARANCE LIGHT
SPOTLIGHT
DRY CHEMICAL CYLINDER STORAGE
DRY CHEMICAL TANK COMPARTMENT
DRY CHEMICAL HOSE REEL COMPARTMENT
PINTLE
BACKUP LIGHT
TAILLIGHT
IDENTIFICATION LIGHT
REFLECTOR
BATTERY CHARGER
FUEL TANK COMPARTMENT
STORAGE COMPARTMENT
P - 19

(FIGURE 1-1)



INSTRUMENT / CONTROL PANEL

(FIGURE 1-2)


2.44 M
96"
WIDTH
UNDERBODY
18'-.46 M
3.05 M
120"
HEIGHT
4.32 M
170"
WHEEL BASE
UNDERAXLE
13'-.33 M
8.25 M
325"
LENGTH
EMPTY ----22,760 LBS. ------10,342 KG
LOADED---32,100 LBS. ---------15,241 KG
VEHICLE DIMENSIONS / WEIGHTS

(FIGURE 1-3)

FUEL SYSTEMS

1-4 The fuel system on the P-19 consists of

1. Fuel / water separator
2. Fuel tank and vent
3. Fuel pump
4. Booster heater
5. Priming pumps

Each of the above listed systems require constant attention. A malfunction in any one of these systems may seriously damage or cause damage to a related system. All systems are dependent on each other. The inspector must not, under any circumstance, fail to make a complete and thorough inspection of their entire vehicle.

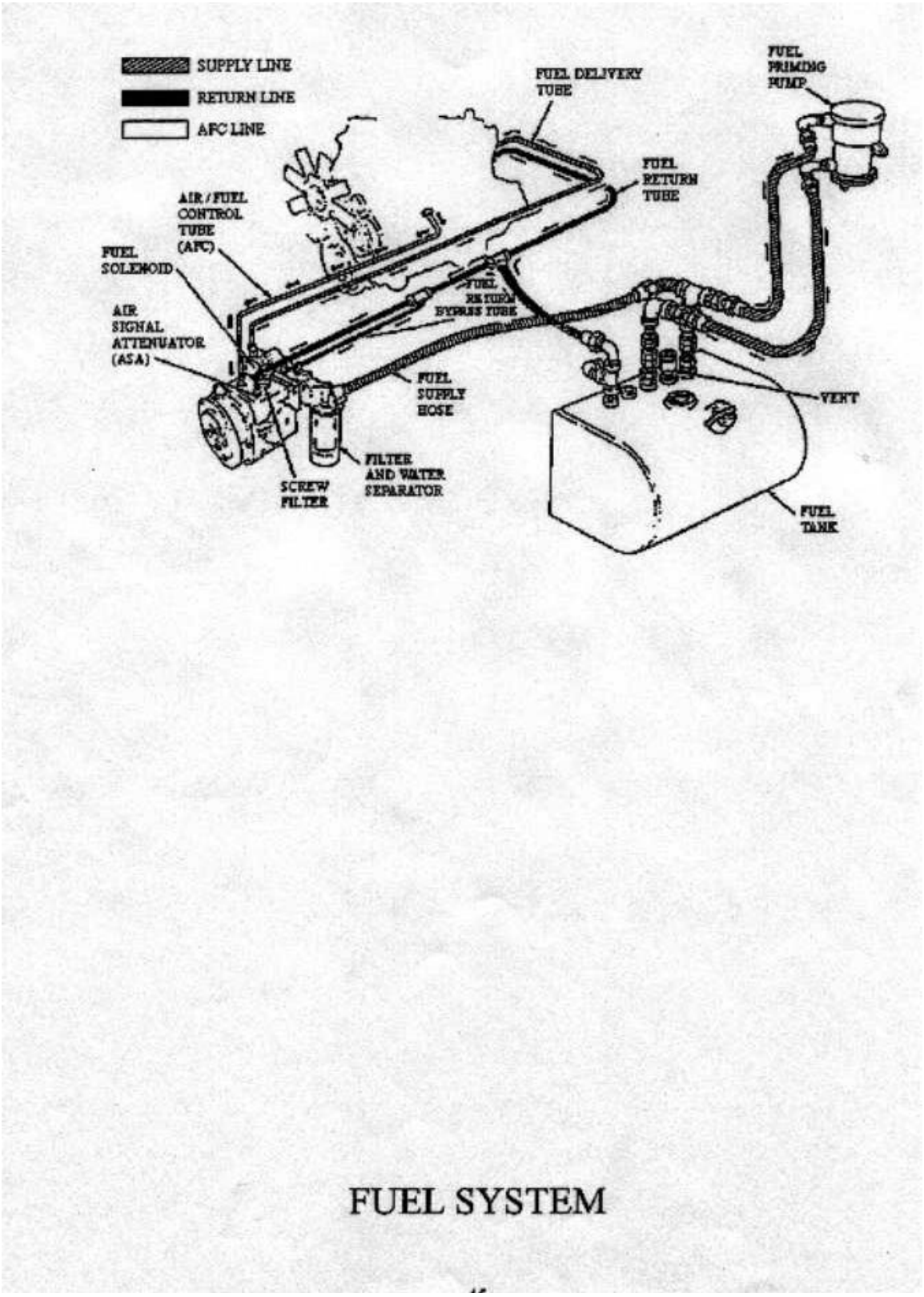
1-5 FUEL: The two components requiring fuel are the engine and the booster heater, both of which draw fuel from the common fuel tank. The 42 gallon fuel tank is located inside the passenger side rear compartment. When servicing with fuel, fill the tank to the bottom of the filler neck. Filling the tank to the top of the filler neck could result in fuel leaking from the tank, causing corrosion inside the compartments. The primary fuel used on the P-19 is #2 diesel fuel. JP-type fuels (JP-4, JP-5, and JP-8) may also be used during emergency tactical deployments. However, when using JP-type fuels, proper grounding and bonding procedures must be followed in accordance with T.O. 00-25-172. Any time the P-19 is carrying JP-type fuel it must always be grounded.

1-6 FUEL FILTER / WATER SEPARATOR: Separates water from the fuel while blocking any impurities. The fuel filter / water separator is mounted on the engine. It should be checked daily and drained of any water in the system.

1-7 TANK VENT: The vent is located on the top center of the tank. It allows for pressure of expanded fuel to escape as it allows air to enter the tank. Allowing air into the tank prevents the tank from collapsing during operation. The vent should be inspected daily to ensure it remains clear.

REVIEW QUESTIONS

1. Where is the fuel tank located? _____
2. During an emergency tactical deployment, what alternative fuels can be used as a substitute for #2 diesel fuel? _____
3. This truck has a fuel capacity of _____ gallons.



FUEL SYSTEM

(FIGURE 1-4)

ELECTRICAL SYSTEM

1-8 The electrical system on the P-19 consists of:

1. Alternator
2. Voltage regulator
3. Batteries
4. Battery charger

1-9 BATTERIES: The electrical system operates on 24 volt DC utilizing two 12 volt, quick connect type batteries to power the system. The main purpose of the batteries is to store power for the vehicle to start. It is highly recommended that the level of the electrolyte be checked daily even though the *DAILY* check in the T.O. refers to checking the hold down clasps.

1-10 ALTERNATOR: The alternator produces power for the electrical system while the vehicle is running. The alternator is belt driven and is located on the right front of the engine. Its output is rated at 24 volts @ 100 amps.

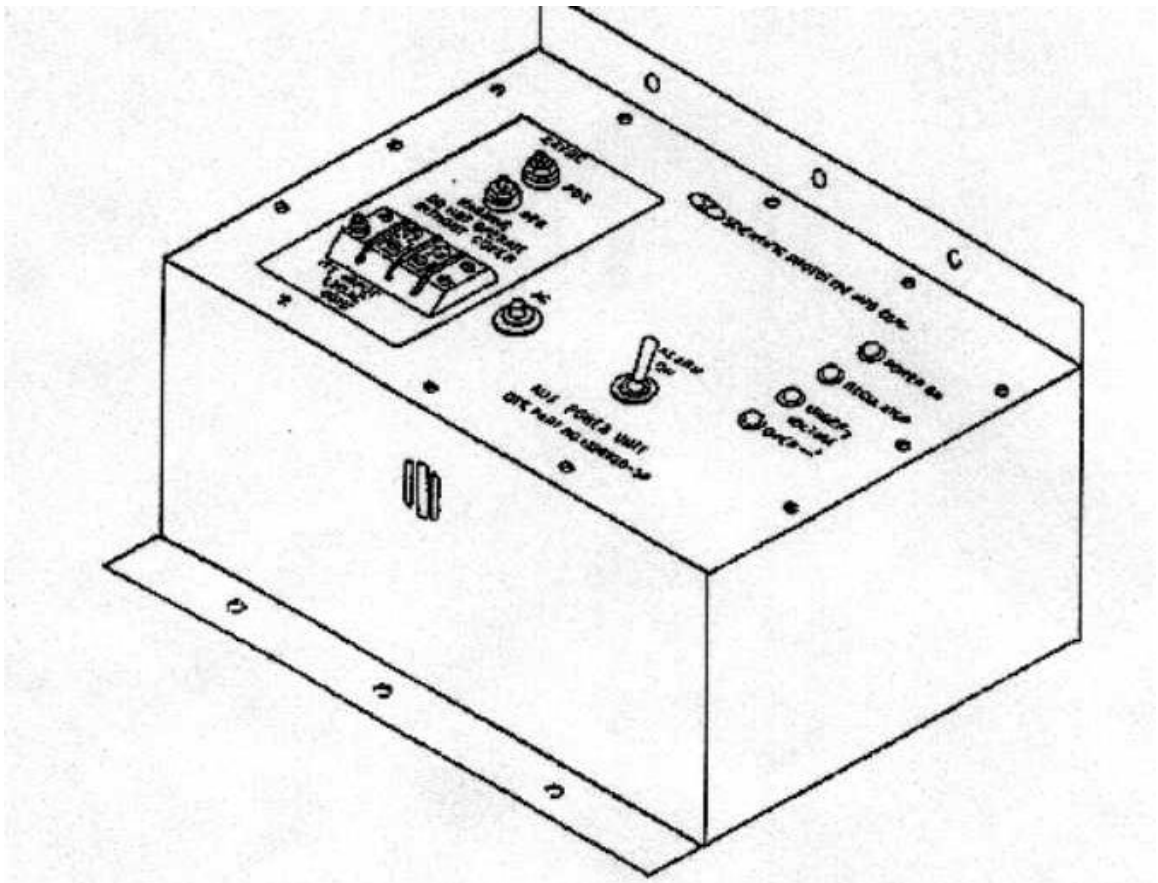
1-11 24 VOLT-DC SLAVE RECEPTACLES (NAOT PLUG): This receptacle is located at the right rear of the truck, and is used to supply or receive power from other vehicles and/or equipment. It can also be used to jump start another vehicle.

1-12 110 VOLT-AC RECEPTACLE: This receptacle is located at the left rear of the truck, and is used to maintain the charge of the battery.

1-13 BATTERY CHARGER: The charger is located above the right rear wheel and is protected with a box-like cover. It is rated at a maximum output of 24 volt-DC @ 60 amps.

1-14 AUTOMATIC RESETTING CIRCUIT BREAKERS: These type of the circuit breakers are used to protect the electrical circuit from overloading. They are activated by the heat caused in an overload and will automatically reset when cooled. They are located in the cab, below the left hinged panel in front of the driver.

1-15 MANUAL RESET CIRCUIT BREAKERS: Like the automatic resetting circuit, the manual reset circuit breakers also protect circuits from being overloaded. They are located in the booster heater compartment.



BATTERY CHARGER

48

(FIGURE 1-5)

REVIEW QUESTIONS

1. The electrical system is designed to run on _____ volts-DC.
2. The alternator produces _____ volts-DC.
3. What type of power is delivered or received via the NATO Plug? _____
4. Where is the onboard battery charger located? _____
5. What is the location of the automatic resetting circuit breakers? _____
6. What is the location of the manual reset circuit breakers? _____

ENGINE AND DRIVE TRAIN SYSTEMS

1-16 The engine and drive train systems on the P-19 consists of:

1. Diesel engine
2. Power divider
3. Transmission
4. Nose box assembly
5. Differential / Axles
6. Wheels / tires

1-17 DIESEL ENGINE: The P-19 is powered by a Cummins, KTC400, four stroke in line diesel engine, equipped with a turbocharger and an aftercooler. The engine is lubricated with OE Grade 15W-40 oil. The normal operating pressure is 10 – 30 psi at idle speed. The pressure range should not fall below 8 psi at idle speed, nor should it rise above 40 psi at governed speed. If this happens, immediately bring the truck to a stop, and shut the engine down. NOTE: After responses or stringent usage the vehicle must idled for at least 30 seconds so that turbo-charger damage does not accur.

1-18 POWER DIVIDER: The power dividers main function is to split the power provided by the engine. This allows full function of the fire pump while allowing the vehicle to continue maneuvering to the crash site (pump and roll). The device is manufactured by Oshkosh, and is mounted on the flywheel. The lubricant for the power divider is a 10W, HTO grade, and can be checked either hot or cold with the engine OFF.

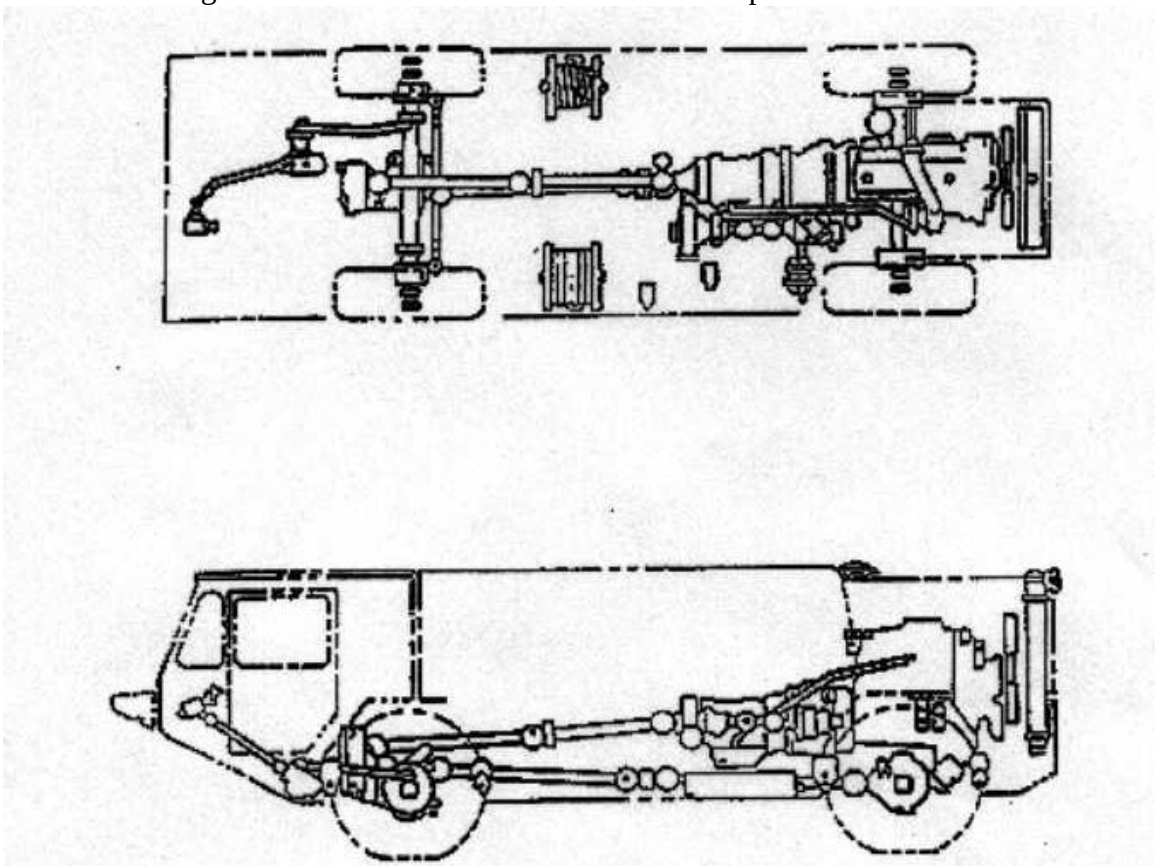
1-19 TRANSMISSION: The transmission is an Allison, 750 DRD, five speed automatic, and is mounted to the power divider. It is lubricated with HTO Grade 10W oil. There are two procedures for checking the oil. The cold check is done with the engine running and the oil temperature between 60ºF and 120ºF. The hot check is performed with the engine running and the oil temperature between 160ºF and 200ºF. Both checks need to be done with the transmission in neutral. The normal operating temperature is between 160ºF and 200ºF, and should never go above 250ºF. CAUTION: If the temperature does exceed 250ºF, downshift to the next lowest gear and drive the vehicle, allowing the heat to be dissipated through the oil cooler.

1-20 NOSE BOX ASSEMBLY: The nose gear box is manufactured my Oshkosh and is located on the front axle. It receives power from the transmission and sends it to the front and rear differentials (similar to a transfer case). The nose gear box should be checked daily for leaks.

1-21 DIFFERENTIALS / AXLES: Transmits power to the wheels. The P-19 is a 4X4 equipped vehicle, which supplies power to all four wheels at all times with locking capabilities.

ENGINE AND DRIVE TRAIN SYSTEMS (CON'T)

1-22 WHEELS / TIRES: The P-19 is equipped with a split rim type wheel. Because of this, anytime a tire's pressure drops below 20 psi, it must be taken to motorpool where it will be removed and filled to a proper operating pressure of 60 psi within a tire cage. The tires are non-directional and FOD proof.



ENGINE AND DRIVE TRAIN

(FIGURE 1-6)

VEHICLE DOWNSHIFTING

GEAR RANG		MAXIMIUM VEHICLE SPEED
5 TO 4	@	43 MPH
4 TO 3	@	28 MPH
3 TO 2	@	19 MPH
2 TO 1	@	5 MPH

The transmission can be downshifted or upshifted. However, downshifting should be avoided when the vehicle is above the maximum speed attainable in the next lower gear. Downshifting may be used for vehicle deceleration. Shown here are the recommended vehicle speeds for proper downshifting.

REVIEW QUESTIONS

1. The oil pressure at idle should not drop below _____ psi or exceed _____ psi at governed speed.

2. At what transmission oil temperature should downshifting into the next lower gear be done so that the heat can be dissipated through the oil cooler? _____

3. The nose gear box is similar to what? _____

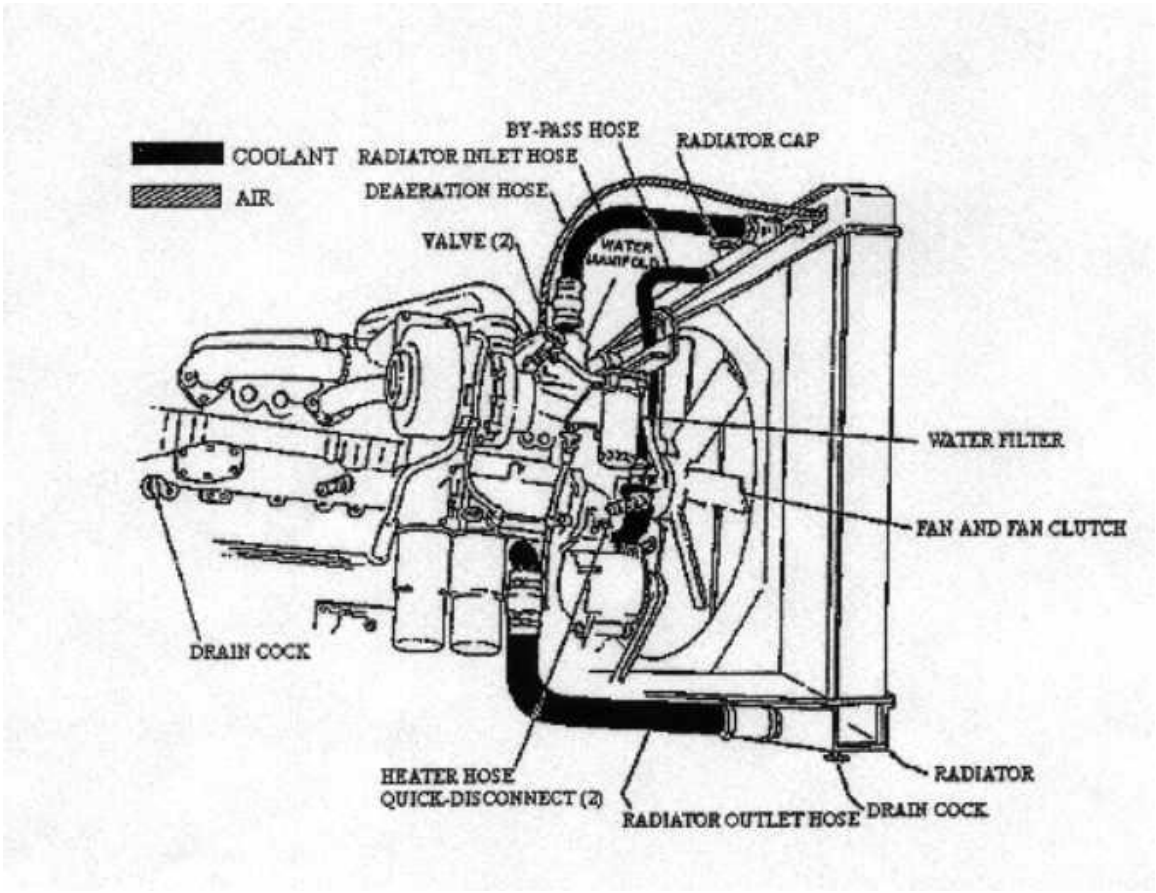
4. If the tire pressure drops below _____ psi, and needs to be removed and filled to _____ psi within a _____ _____.

HEATING, COOLING, AND WINTERIZATION SYSTEM

1-23 HEATING AND COOLING SYSTEMS: The heating, cooling and winterization systems allow the P-19 to operate in a variety of climates. All P-19's are equipped with a Class II winterization system, which gives the truck the ability to operate in outside temperatures ranging from -40ºF to 125ºF. The normal operating temperature for the P-19 is 160ºF to 190ºF.

1-24 COOLING SYSTEM: The engine cooling system is a normal type system where the thermostat regulates the hot coolant flow from the engine to the radiator. The coolant is cooled in the radiator by air from the fan and returned to the engine. An expansion tank on the radiator top section contains a pressure control and fill cap which prevents loss of coolant. A fill line connects the expansion tank to the suction side of the engine water pump. When filling the cooling system, a vent line releases trapped air in the engine to the expansion tank. The engine water pump is a centrifugal type, belt driven and mounted on the front of the engine.

1-25 WINTERIZATION SYSTEM (BOOSTER HEATER): The winterization system is self-contained and its function is to maintain the temperature in the cab, several compartments, and the engine. The system is filled with anti-freeze. The anti-freeze is heated and then circulated to the heater cores. Each heater core uses an electric fan to pass air through the heater core and warm it. This prevents pipes from freezing and keeps the truck ready for emergency operations in sub-freezing weather. The system draws fuel from the truck's fuel tank. Electrical power can come from the batteries, however if the heater is to be operated for a long period of time without the engine running, an external power source must be connected to one of the power receptacles on the back of the truck. Controls for this system are located on the left dash panel. A second part of this system prevents the freezing of the main water tank. Water is routed from the tank through the heat exchanger and back to the tank.



ENGINE COOLING SYSTEM

(FIGURE 1-7)

REVIEW QUESTIONS

1. All P-19's are equipped with a _____ winterization system allowing operation in such extremes as -40ºF to 125ºF.

2. The normal operating temperature of the P-19 is _____ .

3. The engine water pump is a _____ type, _____ driven and is mounted of the _____ of the engine.

4. The second part of the winterization system prevents freezing of what? _____

PNEUMATIC SYSTEM

1-26 The pneumatic system of the P-19 consists of:

1. Air compressor and governor
2. Air dryer
3. Air storage tanks
4. Throttle air system
5. Brake system
6. Differential lock system

1-27 AIR COMPRESSOR AND GOVERNOR: The air compressor supplies air for the system while the vehicle is in operation. The compressor receives air from the engine's air inlet tube. The compressor is gear driven off the engine. The air compressor governor is mounted on top of the air compressor and controls the air output of the compressor so that is stops the airflow at 130 psi. Airflow returns at 110 psi.

1-28 AIR DRYER: As the air leaves the compressor, it travels through the air dryer, taking the moisture out of it. The moisture must be removed from the air to prevent condensation from occurring in the line.

1-29 AIR STORAGE TANKS: There are three air storage tanks. One is a quick build-up and the other two are large storage tanks. A built in safety valve is set to activate at 150 psi. This same valve will also close if the air bleeds to 135 psi. A low air warning buzzer and warning light will activate when are pressure drops below 65 psi.

1-30 QUICK DISCONNECT: A quick disconnect coupling is located at the rear of the vehicle. This coupling is designed to maintain air pressure in the truck when it is not running.

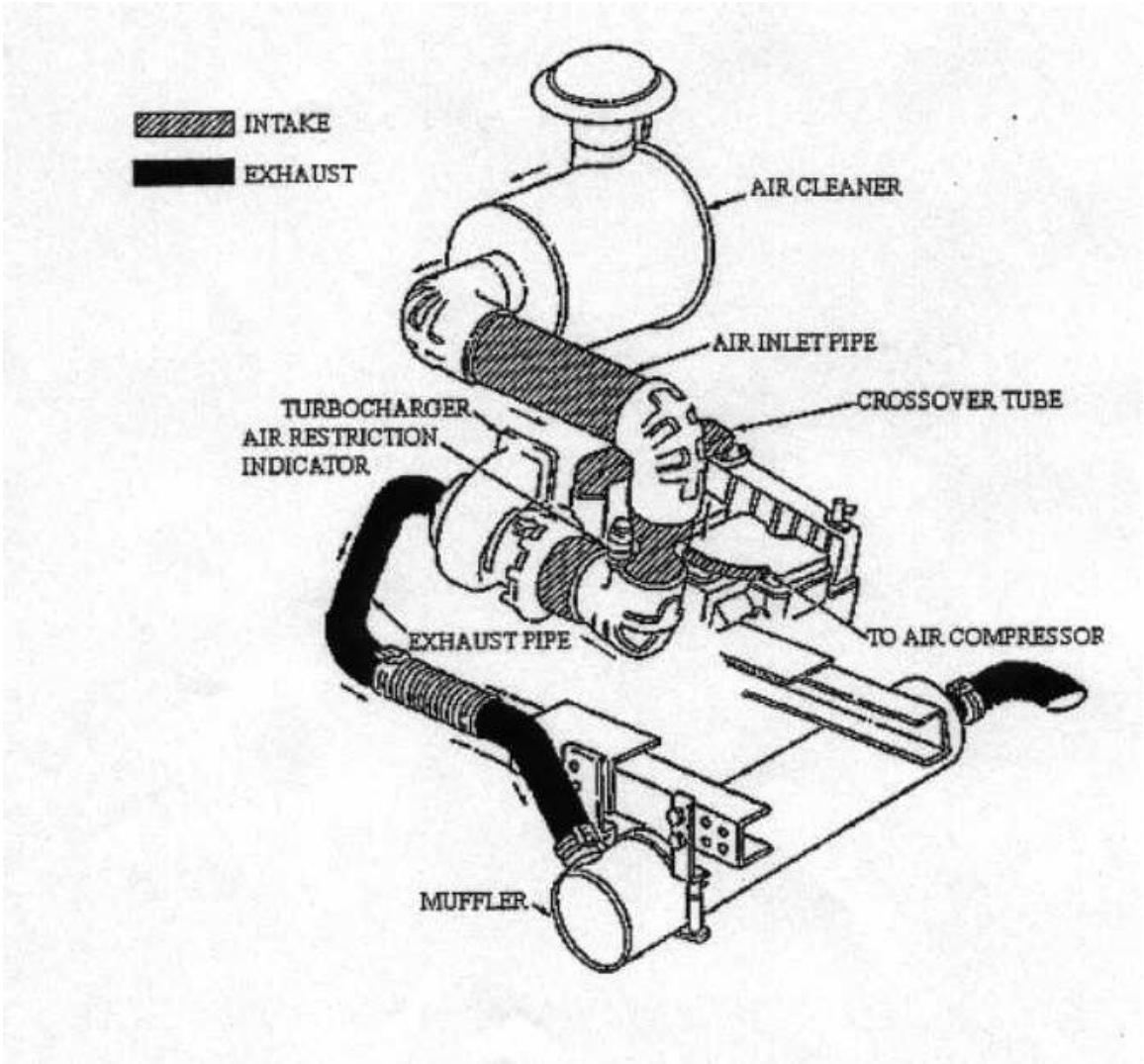
1-31 THROTTLE AIR SYSTEM: The throttle treadle valve (accelerator pedal) controls the air pressure to the air cylinder. When activated, the throttle linkage is pushed out to open the throttle on the mechanical fuel pump and engine RPM's increase. When air leaves the throttle cylinder the linkage is pulled back by a spring and the RPM's decrease.

1-32 SERVICE BRAKES: Air pressure for the service brakes is controlled by the brake pedal. The dual system splits the air pressure for the front and rear brake chambers. These brakes are air applied and spring released.

PNEUMATIC SYSTEM (CON'T)

1-33 PARKING SERVICE BRAKES: This system is activated by the parking brake knob located on the driver's left dash panel. The parking brakes are spring applied and air released. There are two piggy-back air chambers mounted on the service chambers on the rear axle.

1-34 DIFFERENTIAL LOCK SYSTEM: This system provides positive traction under poor traction conditions. The three locks in this system are located on the nose gearbox and an air shift unit on each differential. The system should be engaged prior to entering areas with poor traction. **WARNING- NEVER ENGAGE WHEN WHEELS ARE SPINNING, DRIVELINE DAMAGE WILL OCCUR.** Disengage after regaining normal traction conditions. Always remove your foot from the accelerator prior to engaging or disengaging the differential lock.



AIR INTAKE

(FIGURE 1-8)

REVIEW QUESTIONS

1. How is the moisture removed from the air cylinder? _____

2. The service brakes are air applied and _____ released.

3. The parking brake is _____ applied and _____ released.

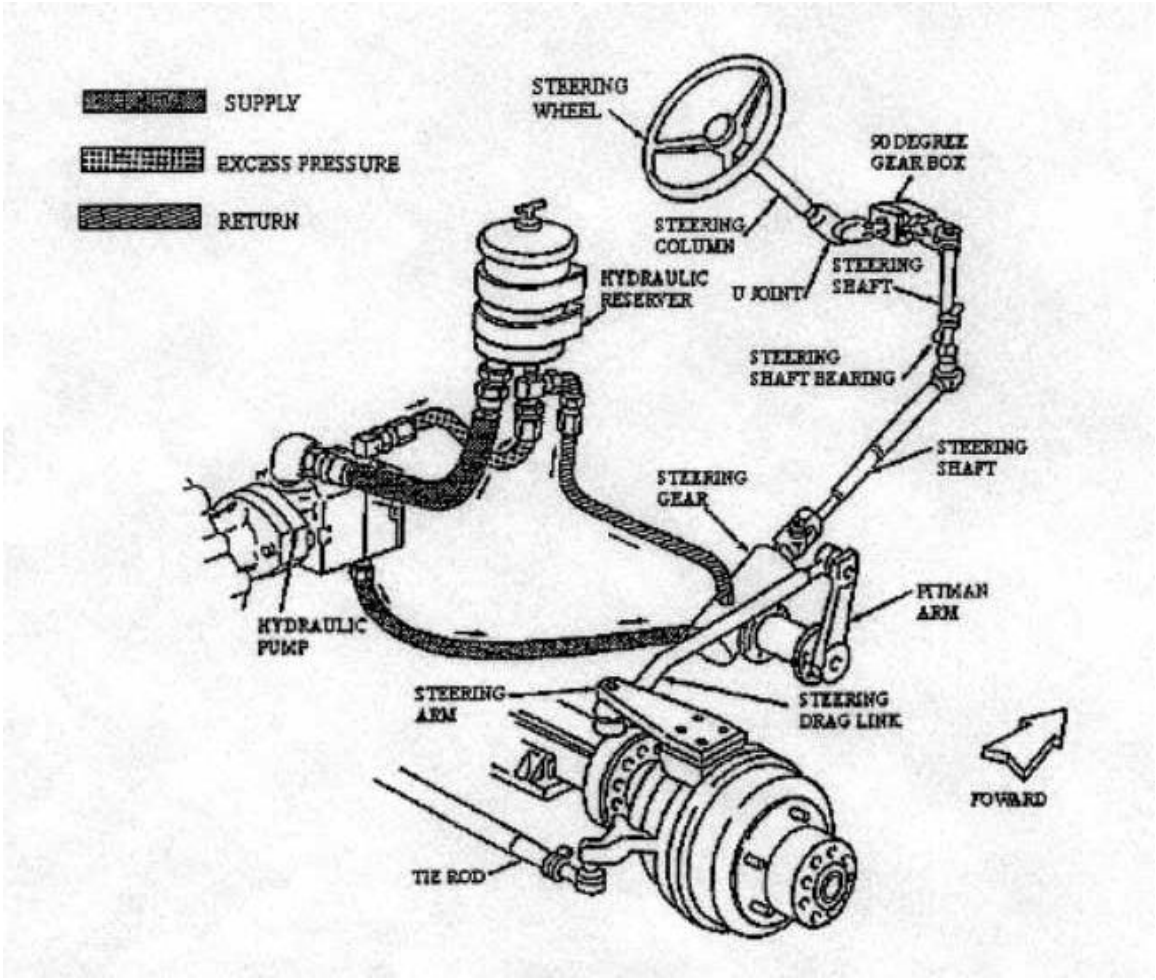
4. What might happen if the differential is engaged or disengaged when the wheels are still moving? _____

5. What controls the air pressure into the air cylinders? _____

HYDRAULIC SYSTEM

1-35 POWER STEERING: The power steering reservoir contains HTO Grade 10W oil and is located just inside the right engine compartment. The pump draws fluid from the reservoir and sends it to the steering gear box.

1-36 CONVENTIONAL STEERING: The steering gear box is the conventional component where hydraulic assistance takes place. Steering stops are located on each front wheel. These stops prevent over steering and help maintain front end alignment. They also limit the wheel's turning movement, providing an 80 foot turning circle.



POWER STEERING SYSTEM

(FIGURE 1-9)

FIRE FIGHTING SYSTEMS

1-37 AGENT TANKS: The fire fighting system is capable of selectively delivering either water or 3% or 6% foam solution from all discharge points on the truck. Foam concentrate and water are stored in separate tanks and flow through separate piping. The agent selection valve located in the cab controls water and foam discharge mode. When activated, the fire pump will engage and the engine's RPM's will increase to 2100. Water flows directly to the handline, the roof and bumper turrets. During foam operations, the agent flows from the tank to the multi-metering manifold. This manifold delivers foam into the water piping, at the correct percentage. Foam is then delivered to the handline, roof and bumper turrets by way of an eductor and fire pump.

1-38 The fiberglass water tank has a capacity of 1,000 gallons and can be serviced by gravity or pressure filling. The tank also contains baffles to restrict water movement while stopping and turning the vehicle. At the base of the tank there is a swirl plate to prevent the whirlpool effect, keeping air out of the pump. The foam tank is also constructed of fiberglass and holds 130 gallons of agent. This tank can also be serviced by the same two methods as the water tank. Both water and foam tanks can be monitored be the agent level gauges in the cab, but should be checked visually at the start of each shift.

1-39 The P-19 is equipped with a Hale single stage centrifugal fire pump. This pump is rated at 950 GPM @ 200 PSI.

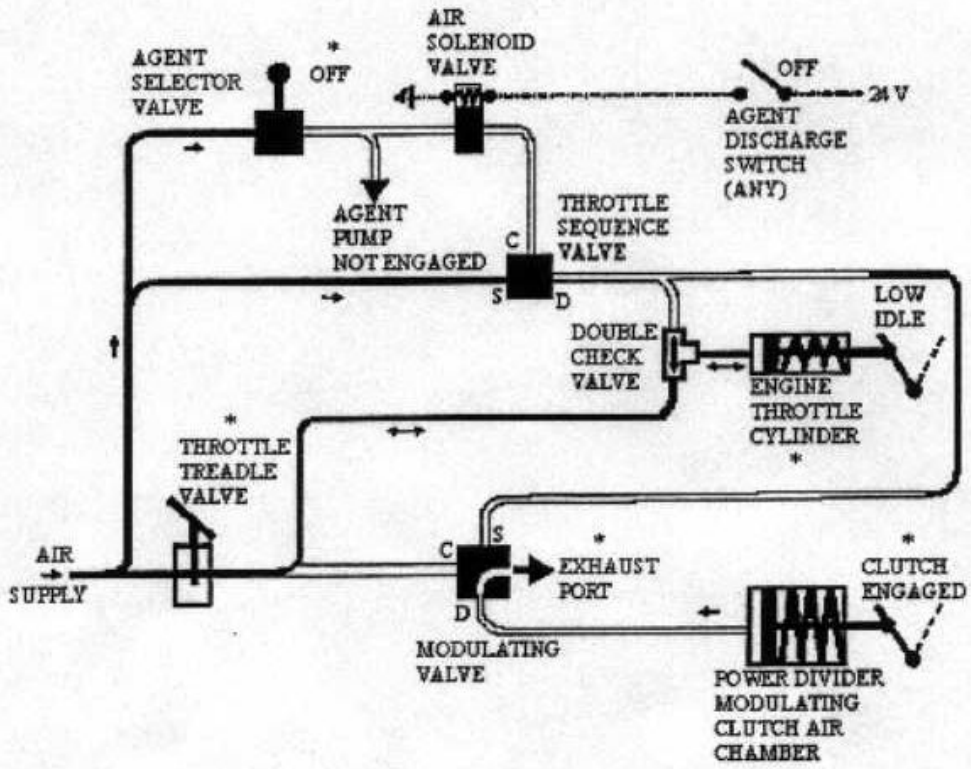
1-40 The Akron, non-aspirating roof turret is rated at 500 gpm at 225 $\pm$ 5 at the pump, with a maximum reach of 175 feet. The roof turret is manually operated and can be removed for transportation.

1-41 The Fecon, non-aspirating bumper turret is operated by air/electric controls. The turret discharge rate is 250 GPM @ 240$\pm$5 psi at the pump, with a maximum reach of 150 feet.

1-42 The handline is 100 feet of one inch rubber hose, rated at 240$\pm$5 psi at the pump. The pressure is reduced due to the piping and length of the hoseline. The nozzle is rated at 60 gpm @ 100 psi.

1-43 When re-servicing agent tank it is important to open the top hatches and not to exceed 100 psi for water and 75 gpm for foam.

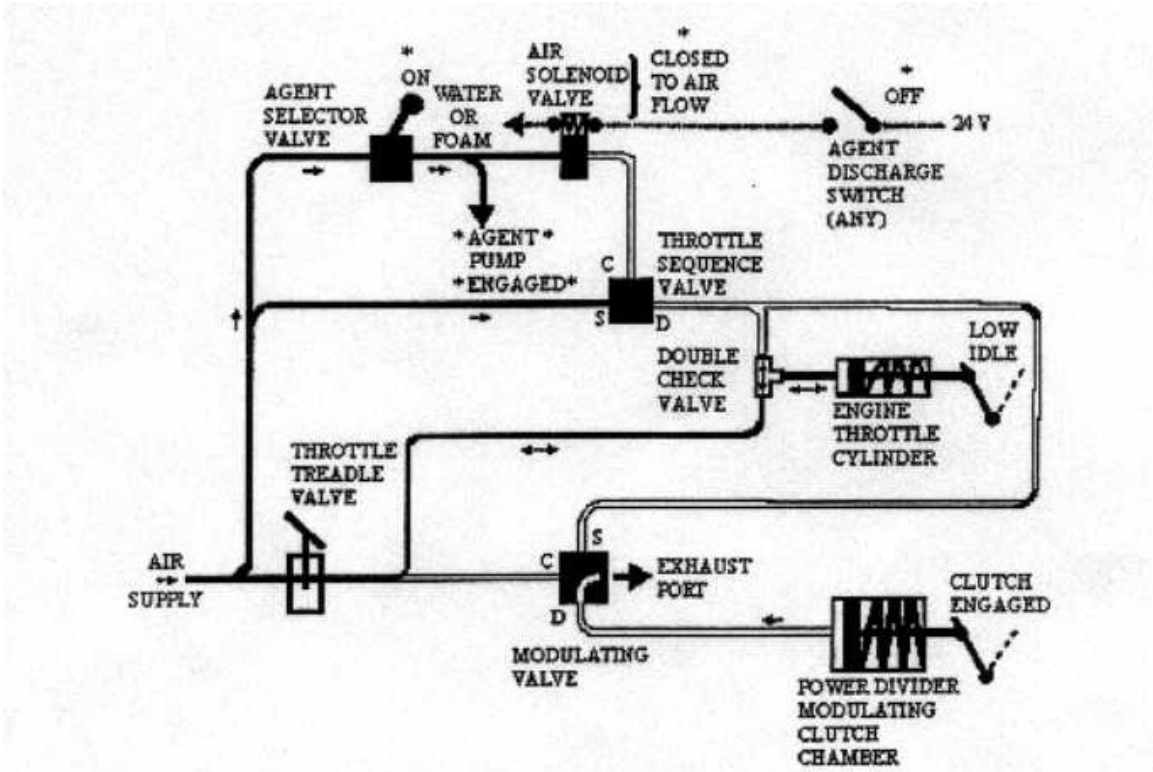
1-44 For additional information and instructions on utilizing the pump, refer to T.O.36A12-8-17-1, Chapter 2-5, page 2-12.1.



Operation of the throttle pedal will differ when changing modes of vehicle operation. Operation of the vehicle throttle when the agent pump is not engaged. Solid lines contain normal air system pressure and the double, no air pressure. With agent selector valve in the "off" position, the lack of air pressure to the throttle relay valve and to the modulating valve, will retain the normal driver operating control of the vehicle. During this mode, when the agent pump is not engaged, the lack of supply air pressure for the modulating valve allows air from the power divider modulating clutch air chamber to exhaust through the modulating valve exhaust port, engaging the clutch. With the power divider clutch fully engaged, the engine is connected directly to the transmission. So during normal operation, as the throttle pedal is depressed, air pressure (dash line) will pass through the throttle treadle valve and the double check valve, extending the piston of the engine throttle cylinder, increasing the engine RPM. Increased pedal depression will increase engine RPM.

THROTTLE PEDAL OPERATION AGENT PUMP NOT ENGAGED

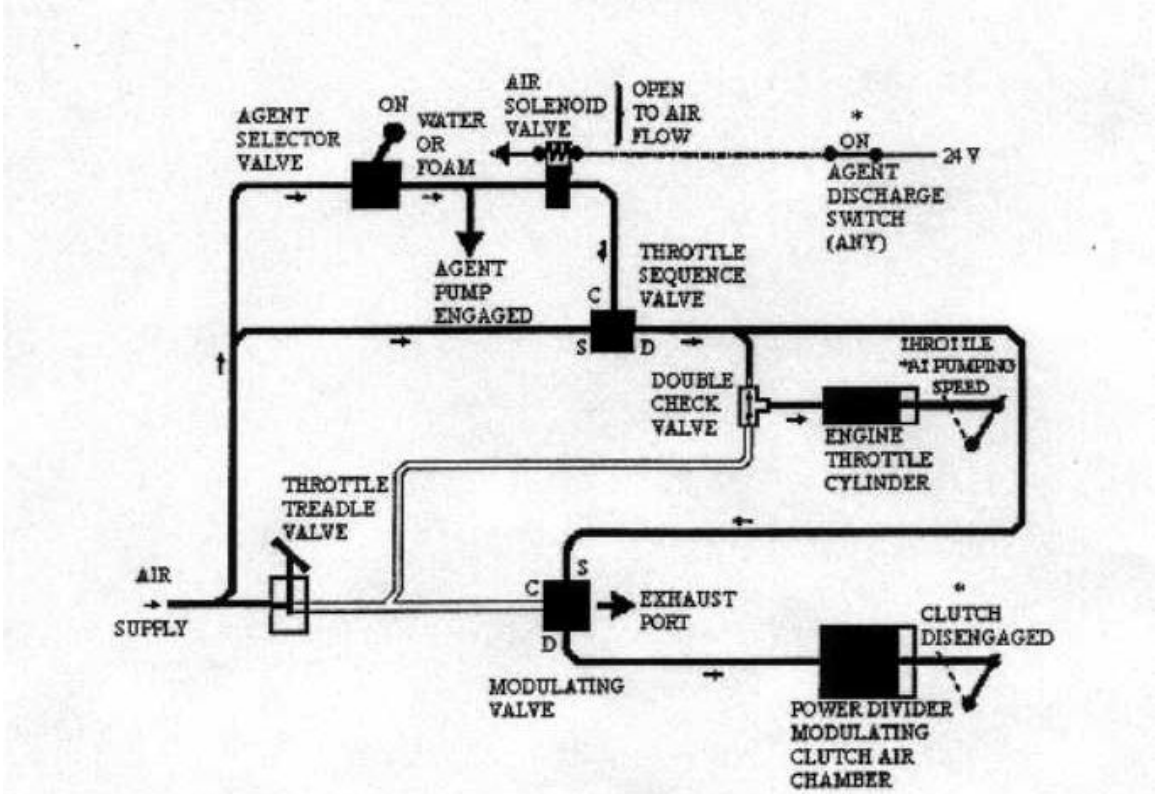
(FIGURE 1-10)



Operation of the vehicle throttle when the agent pump is engaged. When the agent selector valve switch is "on" to the "foam" or "water" position, the line is pressurized to the air solenoid valve which is closed to air flow, and to the agent pump which will then engage. An increase in the engine speed will now also increase agent pump speed in this mode while the agent is not being discharged. Operation in this mode for any prolonged period of time will cause the pump to over heat. Therefore this mode is engaged when at the crash site only.

THROTTLE PEDAL OPERATION AGENT PUMP ENGAGED

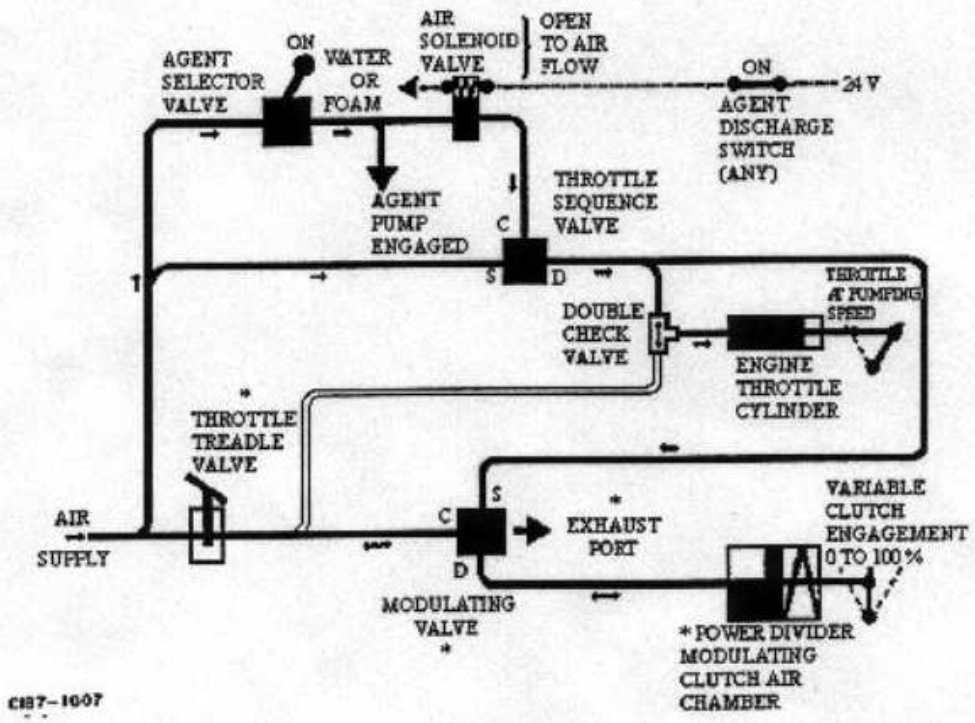
(FIGURE 1-11)



Operation of the vehicle throttle while discharging agent. When the agent discharge switch is turned "on" the air solenoid valve is then opened to air flow pressurizing the line to the control port of the throttle relay valve, which in turn directs supply air pressure to the engine throttle cylinder, extending the piston, increasing the engine RPM to pumping speed. At the same time, the line to the modulating valve is pressurized allowing supply air to pass through the modulating valve, extending the piston of the power divider modulating clutch air chamber, disengaging the clutch. With the power divider clutch completely disengaged, connection between the engine and transmission is broken, preventing vehicle movement at this time, while engine throttle is at pumping speed.

THROTTLE PEDAL OPERATION DISCHARGING AGENT

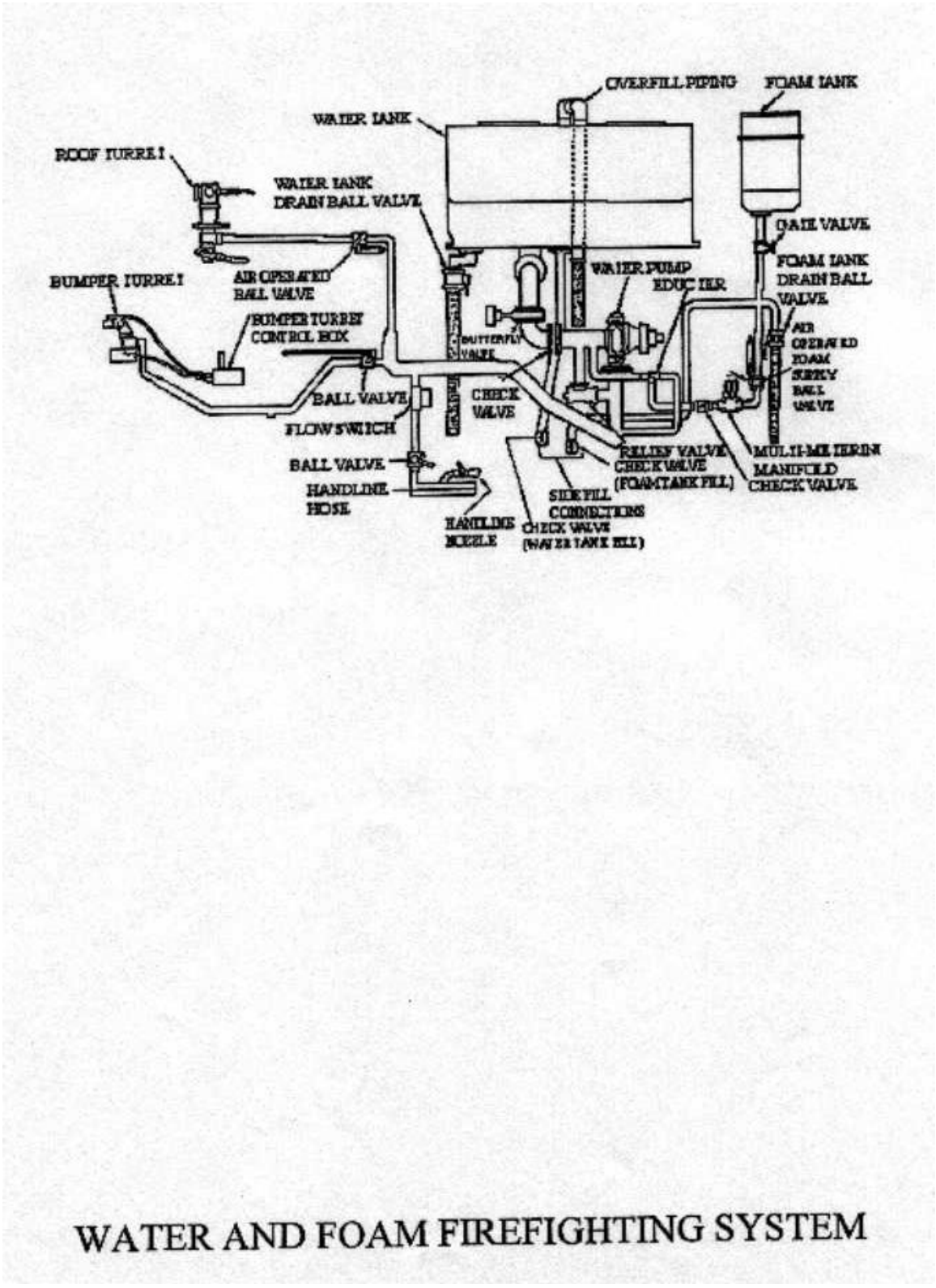
(FIGURE 1-12)



Movement of vehicle while discharging agent. As the throttle pedal is gradually depressed, air pressure (dash line) will pass through it to the modulating valve. The modulating valve then reacts in direct proportion by exhausting the same amount of air pressure from the modulating clutch air chamber, thus permitting an infinite variable clutch engagement from 0 to 100%.

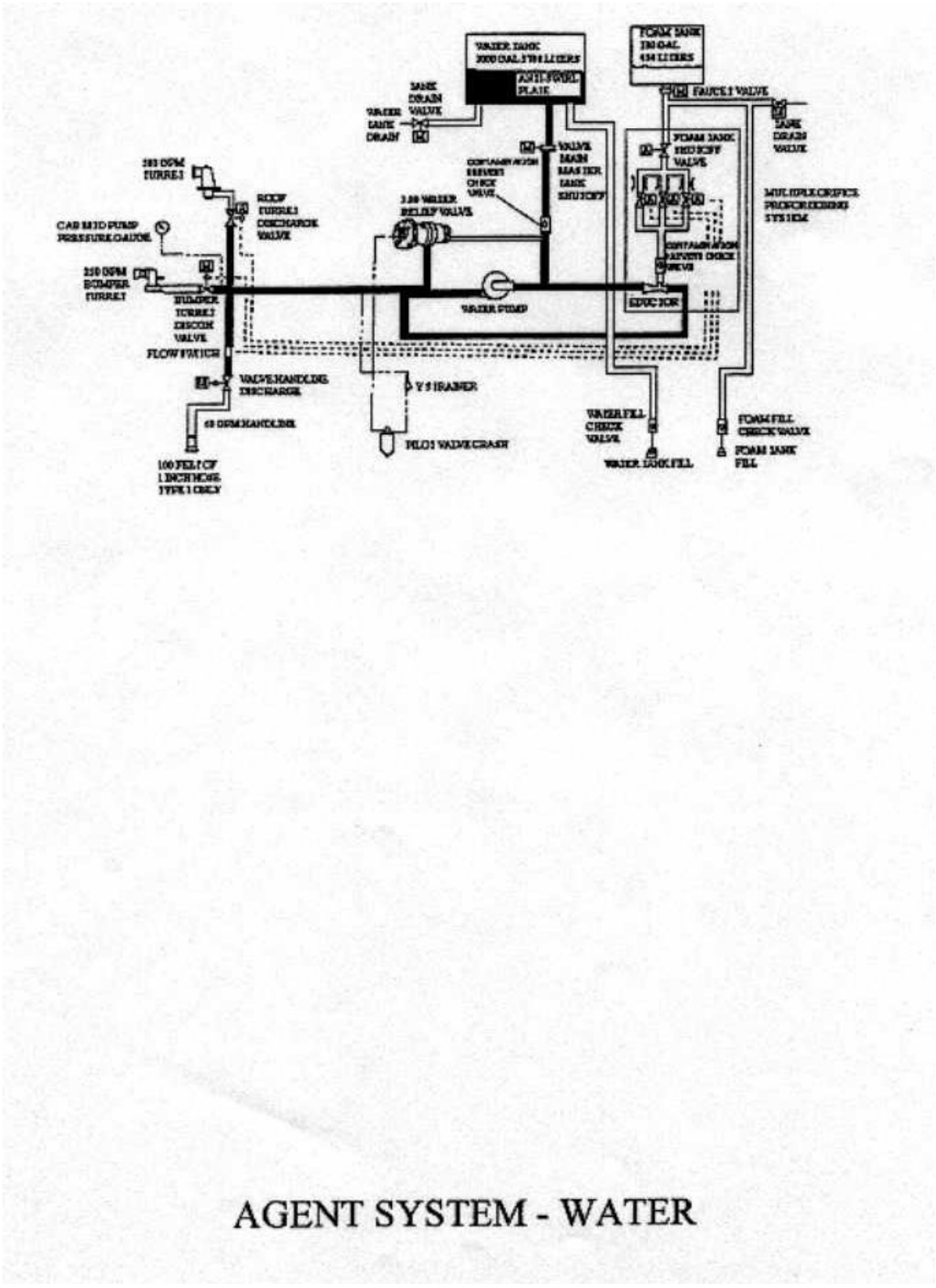
THROTTLE PEDAL OPERATION VEHICLE MOVEMENT / DISCHARGING AGENT

(FIGURE 1-13)



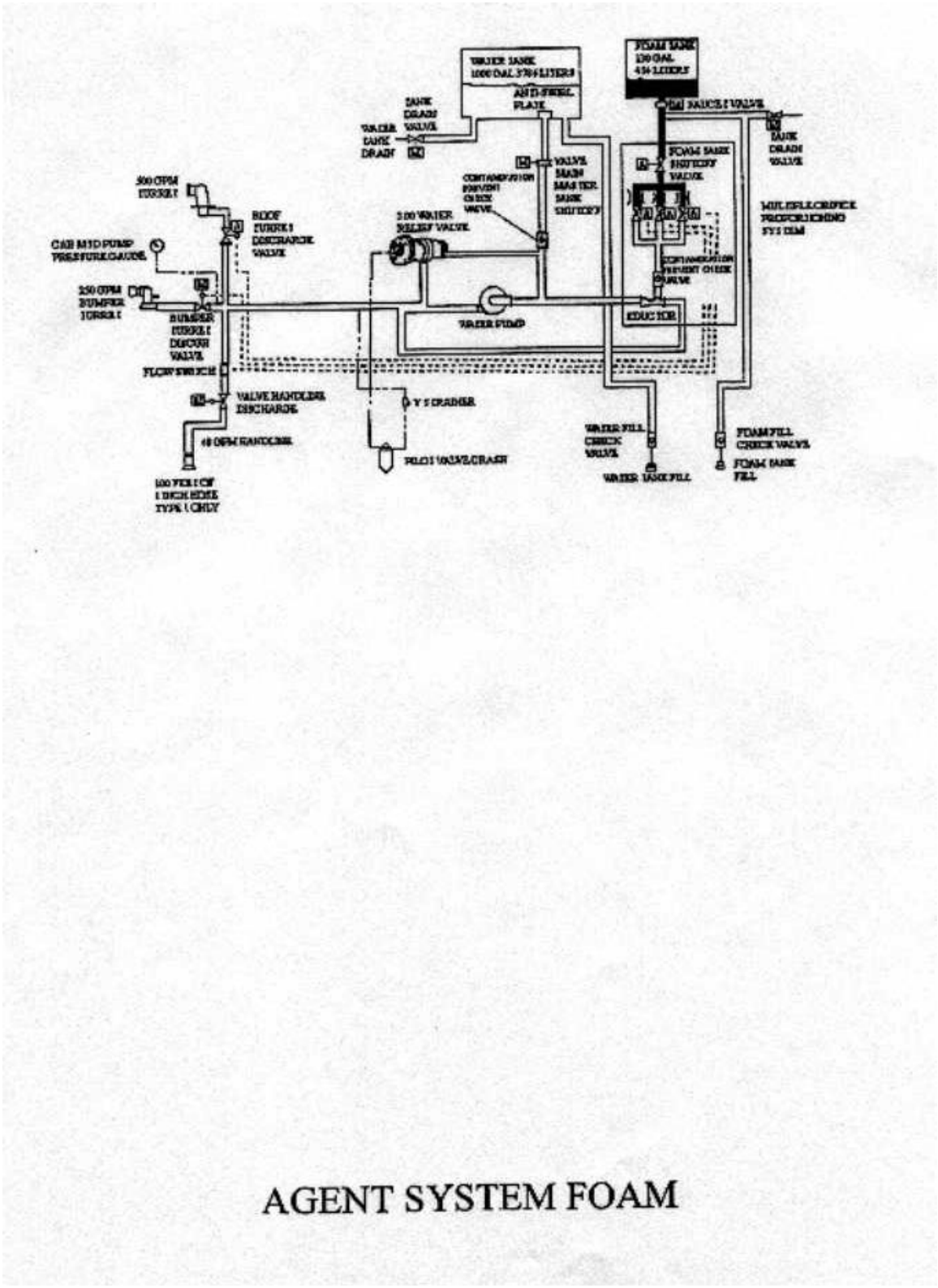
WATER AND FOAM FIREFIGHTING SYSTEM

(FIGURE 1-14)



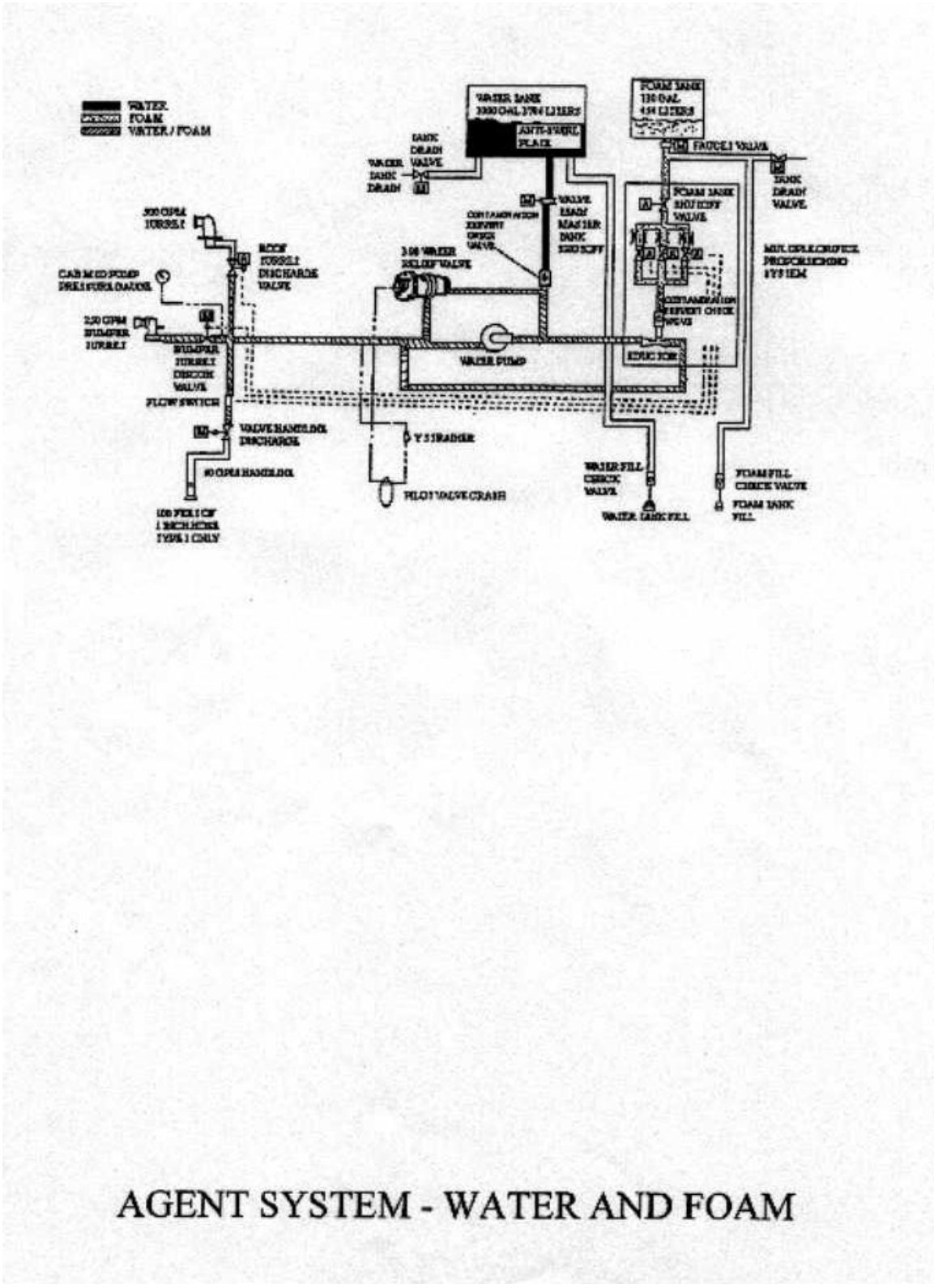
AGENT SYSTEM - WATER

(FIGURE 1-15)



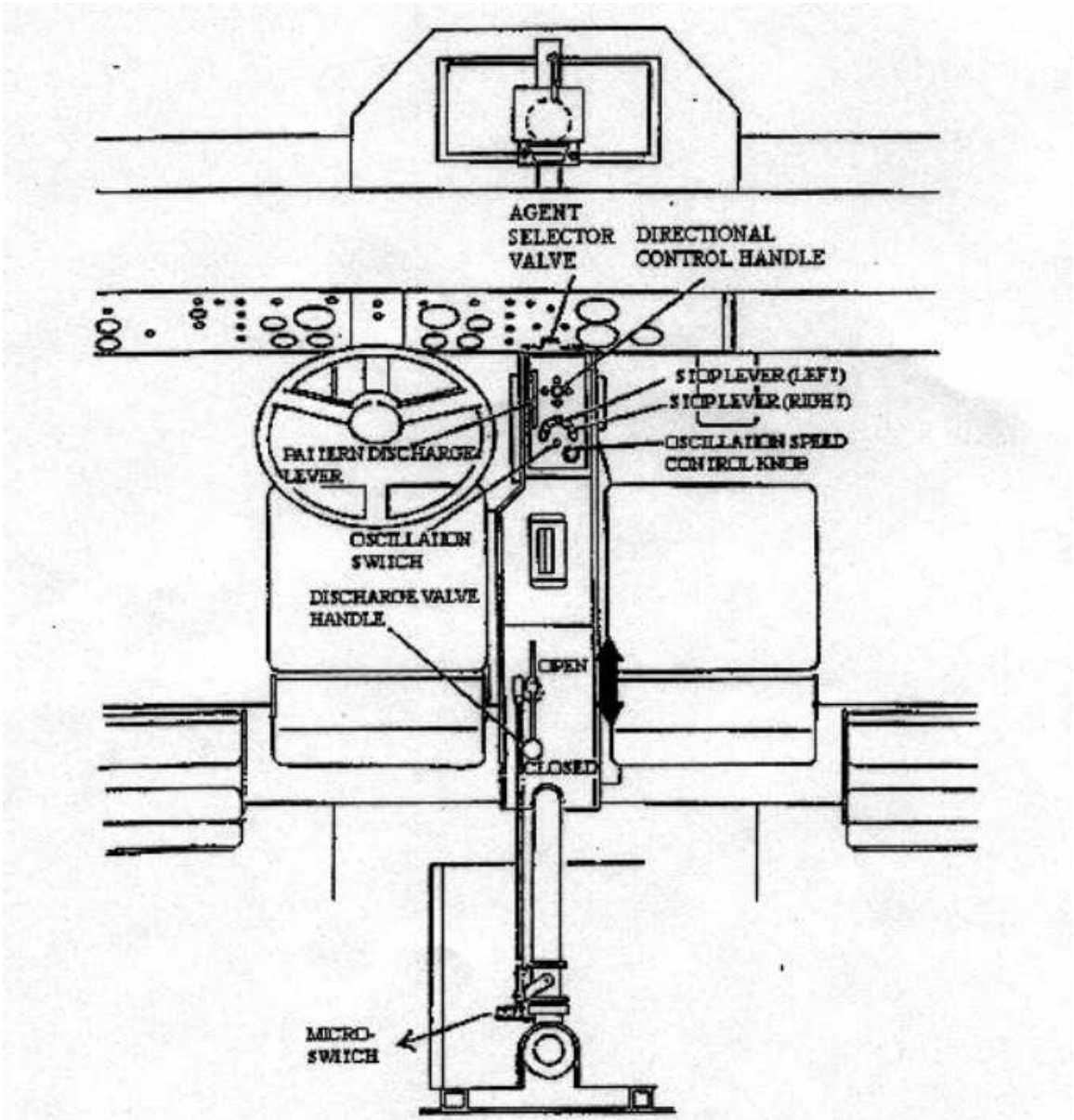
AGENT SYSTEM FOAM

(FIGURE 1-16)



AGENT SYSTEM - WATER AND FOAM

(FIGURE 1-17)



BUMPER TURRET CONTROLS

(FIGURE 1-18)

REVIEW QUESTIONS

1. The water tank capacity is _____ gallons.
2. The foam tank capacity is _____ gallons.
3. What keeps water from sloshing around in the tank? _____
4. What is the maximum reach of the roof turret? _____
5. What is the maximum reach of the bumper turret? _____
6. Both the roof and bumper turrets are _____-_____ type turrets.

DRY CHEMICAL SYSTEM (T.O. 36A12-8-17-1-1)

1-45 The P-19 was originally designed with a Halon Extinguisher System. Because halon has been found to deplete the ozone in the atmosphere, it has been replaced with dry chemical.

1-46 The dry chemical fire fighting system consists of:

1. Dry chemical storage tank

Type	Steel Storage
Capacity	500 Pounds
Dry Chemical Agent	Powered Potassium Bicarbonate
Operating Pressure	220-230 PSI
Relief Pressure PSI	250 PSI

2. Pressurized nitrogen cylinder

Make	DOT 3AA-2400
Capacity	300 Cubic Feet

3. Hose and pistol grip nozzle

Type	1 Inch ID Hose
Hose Length	150 Feet
Working Pressure	220-230 PSI
Burst Pressure Rating	800 PSI
Pattern	Conical
Discharge Rate	5.5 – 7 pounds/sec.

1-47 All system discharge valves are remote controlled pneumatically actuated, except the discharge valve in the handline nozzle. The system may be activated from either the hose reel switches in the Hose Reel compartment, or the switches located on the right hand side of the center cab instrument panel. An indicator light, mounted of the left hand cab instrument panel, is provided to show when the system is pressurized.

1-48 This system is designed for USAF firefighters to suppress fire from occurring in aircraft weapon systems. The dry chemical fire fighting system is completely separate from the water and foam fire fighting systems. It can be used at any time and does not require the engine or water pump to be running. The system discharges Powdered Potassium Bicarbonate (PKP) fire extinguishing agent.

1-49 INSPECTION

(1) Check the general condition of the tanks, hose, fittings, and all other components.
(2) Check nitrogen pressure (1750-2400 PSI)

WARNING

Do not remove dry chemical tank cap unless system has been depressurize.

Use gloves, goggles, and protective clothing prior to coming in contact with PKP.

(3) Check the level and condition of the dry chemical.
(4) Ensure valves are in their normal position.
    a. Charge Valve (Normally Open) Controls the flow of nitrogen into the dry chemical.
    b. Hose Blow down Valve (Normally Closed) Allows nitrogen to bypass the dry chemical tank and clean out the hose and nozzle after use.
    c. Nitrogen Actuation Valve (Normally Closed) Controls the flow of nitrogen from the nitrogen cylinder to the dry chemical tank.
    d. Dry Chemical (AGENT) Valve (Normally Closed) Controls the flow of dry chemical out of the tank to the handline nozzle.
    e. Tank Blow down Valve (Normally Closed) Relieves nitrogen pressure in the dry chemical tank.
    f. Nitrogen Cylinder Handline Valve (Normally Open) Turns nitrogen flow on/off.
    g. Handline nozzle (Normally Closed) Controls discharge of dry chemical during operation.
(5) Check dry chemical hose and nozzle for free movement. The nozzle should open and close easily without binding.
(6) Check for secure connections on all dry chemical and nitrogen hoses. Notify maintenance if leaks are observed.

1-50 GENERAL OPERATION

WARNING

Do not turn or attempt to adjust the nitrogen pressure regulator adjustment screw. The pressure is factory preset and locked internally. Failure to observe this warning can result in serious injury or death.

CAUTION

Do not turn or force red actuator position indicators. These items are not handles. Failure to observe these precautions can result in damage to equipment.

NOTE

- The dry chemical system can be activated from either the hose reel compartment or drivers cab.
- Operation of the dry chemical fire fighting system requires system air. Ensure system is completely charged prior to operating dry chemical fire fighting system.
- Manual operation of the actuators can be done by moving the small red indicator on the solenoid body to open position. The actuators can also be opened or closed manually by removing the red indicators and using a wrench to turn the pin.

(1) Charge the dry chemical system with nitrogen. Done by either charging the DRY CHEMICAL SYSTEM CHARGE located in the cab or hose reel compartment.

(2) Wait for the dry chemical tank to reach 220-230 psig, and then place the DRY CHEMICAL AGENT DISCHARGE to ON. (Switch in cab or hose reel comp.)
(3) Pull all the hose from the dry chemical hose reel.
(4) Open the dry chemical nozzle fully. Be prepared for a strong nozzle reaction.
(5) Direct the dry chemical stream at the fire area. Close the nozzle when discharge is complete.

1-51 DRY CHEMICAL SYSTEM SHUT DOWN

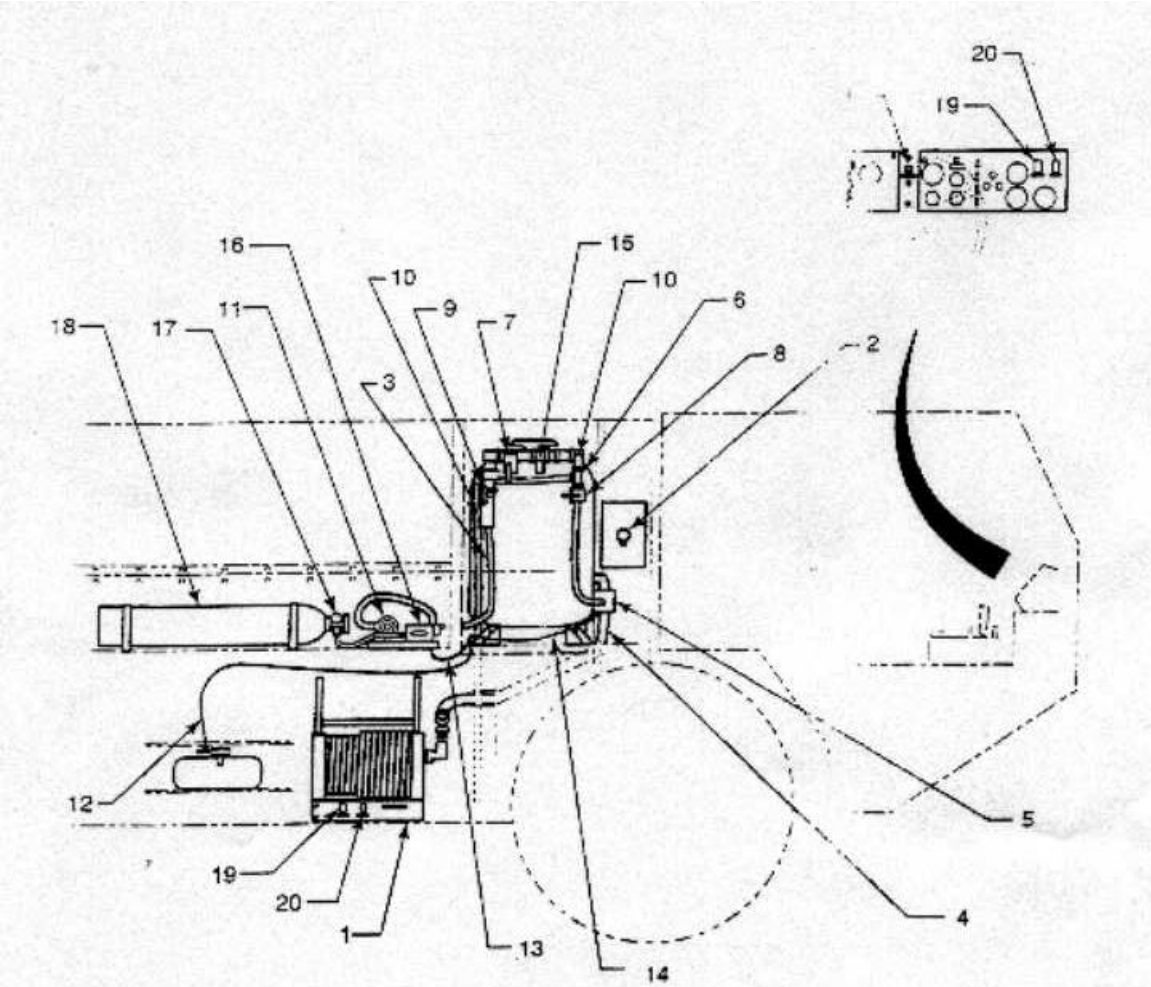
(1) Pull ring pin and close red CHARGE VALVE.
(2) Place DRY CHEMICAL SYSTEM CHARGE and DRY CHEMICAL AGENT DISCHARGE switches in the OFF position.
(3) Pull ring pin and open blue HOSE BLOW DOWN VALVE.
(4) Place DRY CHEMICAL SYSTEM CHARGE switch in the ON position.
(5) Open nozzle fully until stream is clear of dry chemical; then close nozzle.
(6) Place DRY CHEMICAL SYSTEM CHARGE switch in the OFF position.
(7) Open handline nozzle fully to relieve any pressure remaining in lines and hose; close nozzle.
(8) Close blue HOSE BLOW DOWN VALVE and install ring.
(9) Pull ring pin and open yellow TANK BLOW DOWN VALVE and vent tank for 10 seconds. This will relieve all nitrogen pressure in the tank. Close and pin TANK BLOW DOWN VALVE.
(10) Open and pin red CHARGE VALVE.
(11) Ensure ring pins on blue HOSE BLOW DOWN VALVE, red TANK BLOW DOWN VALVE, and yellow CHARGE VALVE are properly installed.
(12) Check the nozzle. The handle should be fully forward in the CLOSED position.
(13) Refill dry chemical tank.

1-52 FILLING THE DRY CHEMCIAL TANK

(1) Close nitrogen cylinder valve hand wheel and open tank blow down valve to relieve pressure in dry chemical tank.
(2) Slowly unscrew and remove tank fill cap.
(3) Inspect dry chemical for lumps.
(4) Fill in accordance with T.O. instructions.
(5) Using the funnel provided with the system, fill tank to proper level.
(6) Install fill cap and hand tighten.

1-53 REFILLING NITROGEN CYLINDERS

(1) See T.O. instructions.



1. Hose Reel
2. Dry Chemical Tank Pressure Gage
3. Nitrogen Supply Hose
4. Dry Chemical Hose Assy
5. Dry Chemical Agent Valve
6. Dry Chemical Agent Tank
7. Tank Blowdown Valve
8. Hose Blowdown Valve
9. Charge Valve
10. Check Valve
11. Pressure Regulator
12. Air Line, Air Tank-to-Tee
13. Air Line, Actuation System-to-Tee
14. Air Line, Tee-to-Agent Valve
15. Relief Valve (250 psi)
16. Nitrogen Actuation Valve
17. Nitrogen Cylinder Handwheel Valve
18. Nitrogen Cylinder, 300 Cubic Feet
19. DRY CHEMICAL SYSTEM DISCHARGE Switch (2)
20. DRY CHEMICAL AGENT DISCHARGE Switch (2)
21. Indicator Light, System Activation

DRY CHEMICAL SYSTEM

(FIGURE 1-19)

FIRE EYE VIDEO SYSTEM

1-54 The Fire Eye Video System was installed to provide feedback from training and to improve post incident analysis.

1. Dual video cameras - mounted to optimize systems view.

2. Video recorder - located behind the driver's side passenger's seat. Locked in a vault, separate from the camera.

3. Monitor - situated on the center of the dashboard

4. Scanner – Programmed to record on the videotape.

5. Control mechanisms - to allow an audio and video recording to be made of the response to an incident and of the activities at the scene.

1-55 As soon as the vehicle's master power switch is turned on, the system powers up and starts recording. One tape is capable of recording eight hours of video. The time displayed is the time left on the tape. The audio component records three radio channels:

1. Tower

2. Navy F-3

3. ANG F-4

(FIGURE 1-20) CONTROL CENTER

FIRE COM INTERCOM SYSTEM

1-56 Installed to protect crew from high noise decibels. ALL MEMBERS MUST WHERE HEADSETS WHILE IN THE VEHICLE. Radio transmissions as well as conversations among the crewmembers of the truck can be heard. In order to transmit over the radio system, the crewmember must depress the red "Transmit" button next to the volume control on the headset. Channels must be manually changed on the mobile radio.

1-57 For further information, see the attached Fire Maintenance Operating Instruction 32-10.

1-58 HOMELITE SAW: Saw comes equipped with an extra drive belt, tool kit, and safety goggles. All kit items are housed in a heavy-duty aluminum carrying case. Extra concrete (white band), steel (red/green band0 and carbide saw blades are located in a wooden box located with the saw. The carbide tipped blade will be kept on the saw at all times unless another type of blade is needed. The saw runs off a 50:1 fuel to oil mixture. Refer to lesson plan for the operation of the saw.