

A-101-10/20/30, LT-A-101-10/20/30 VEHICLE SYSTEMS

Installation, Recharge, Inspection, and Maintenance Manual

This manual is intended for use with the ANSUL® A-101 Vehicle Fire Suppression System.

Those who install, operate, recharge, inspect, or maintain these fire suppression systems should read this entire manual. Specific sections will be of particular interest depending upon one's responsibilities.

Design, installation, recharge, and maintenance of the system must conform to the limitations detailed in this manual and performed by an individual who attended an ANSUL training program and became trained to design, install, recharge, and maintain the ANSUL system(s).

Fire suppression systems are mechanical devices. They need periodic care to provide maximum assurance that they will operate effectively and safely. Inspection frequency shall be performed monthly, or sooner, depending on operating and/or environmental conditions. Maintenance shall be performed semi-annually or sooner, depending on operating and/or environmental conditions.

This ANSUL systems manual is limited to uses herein described. For other applications, contact your local ANSUL distributor, Domestic District Manager, International Area Manager, or Ansul Incorporated – Technical Services Department, Marinette, Wisconsin 54143-2542.

REVISION RECORD

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INTRODUCTION

The ANSUL® A-101/LT-A-101 fire suppression system is a pre-engineered, fixed nozzle system for protection of off-highway vehicles, commercial vehicles, or industrial type applications. Typical applications include surface mining equipment, underground mining machines, forest harvesting equipment, construction equipment, farming machinery, and transportation vehicles such as municipal busses.

The A-101/LT-A-101 system consists of three major components: a container to store the dry chemical extinguisher agent; an actuation system operated manually or automatically, and an agent distribution system which delivers the agent from the tank through hydraulic hose and fixed nozzles to the hazard areas.

The fire system described is a suppression system only and is not designed or intended to extinguish all fires, particularly when unusual amounts of combustible materials and an ample oxygen supply are present. It is extremely important that supplement fire fighting equipment be available in case the system does not totally extinguish a fire.

If an automatic fire detection and actuation system has not been supplied or has been disconnected, system actuation and discharge will not occur unless the fire suppression system is manually actuated. (Use of manual system only must be approved by authority having jurisdiction.) Reliance on a manual release system usually results in a slower reaction to fire. Means to shut down the vehicle must be added to a manual or disconnected automatic system.

The basic agent storage container is a tank filled with ANSUL FORAY® (monoammonium phosphate base) dry chemical which is effective on Class A, B, and C fires. A gas expellant cartridge, either carbon dioxide or nitrogen, provides pressurization of the dry chemical upon actuation.

Automatic detection, either electric or pneumatic, and actuation, is recommended. The A-101/LT-A-101 system is actuated manually by a pneumatic actuator located on the dashboard or on the exterior of the vehicle.

The dry chemical extinguishing agent is delivered from the tank through hydraulic hose and pre-set nozzles into the fire hazard areas or onto the fire prone surfaces.

Along with the fire suppression system, the total system design must include a hand portable fire extinguisher(s) located on board the vehicle that can be used to manually suppress a fire that may be burning in an unprotected area. Refer to NFPA 10, "Standard For Portable Fire Extinguisher," for additional information.

FM APPROVAL

The ANSUL A-101/LT-A-101 fire suppression system has been tested and is FM approved. These tests require extinguishment of fire initiated in open vessels and within enclosures fueled with flammable liquid. In each case, these fires are allowed to progress to maximum intensity before the system is actuated. The time of actuation in these tests is well beyond the time that a detector would take to detect the fire and actuate the system. Other tests required by FMRC are as follows:

1. Fuel in depth splash tests under a minimum hose length, maximum temperature, and minimum clearance condition to ensure that the nozzle does not cause splashing of fuel.
2. Operational flow rate tests at the minimum, average, and the maximum temperatures, with maximum and minimum hose lengths.
3. Cycle tests on all mechanical and electrical devices to determine their structural integrity.

The A-101 systems which utilize carbon dioxide as the expellant gas are approved for temperature ranges of +32 °F to +120 °F (0 °C to 49 °C).

The LT-A-101 systems which utilize nitrogen as the expellant gas are approved for temperature ranges of –65 °F to +210 °F (–54 °C to 99 °C).

► TWIN AGENT SYSTEM (LVS PORTION NOT FM APPROVED)

The system consists of both dry chemical and liquid agent. The dry chemical portion of the system is the ANSUL A-101/LT-A-101, 50, 125, or 250 system (either standard discharge or extended discharge) and the liquid agent portion of the system consists of an agent storage tank containing a premixed solution of LVS wet chemical.

The LVS-30 (30 gallon) system is designed to discharge for approximately 2 minutes when two agent discharge nozzles are used.

The LVS Fire Suppression System is designed to operate within a temperature range of –40 °F to +120 °F (–40 °C to 49 °C).

The dry chemical system used in conjunction with the LVS system is the ANSUL A-101/LT-A-101, 50, 125 or 250. The dry chemical system is connected to the ANSUL CHECKFIRE Detection and Control System. The dry chemical system can be designed as a standard discharge or as an extended discharge system per the requirements of the A-101/LT-A-101 Vehicle Fire suppression Installation, Recharge, Inspection, and Maintenance Manual.

► Both systems are designed to discharge simultaneously when actuated either manually or automatically.

For detailed instructions, refer to manual Part No. 427865 regarding the LT-A-101-50/125/250 system. For detailed instructions, refer to manual Part No. 427109 regarding the LVS system.

SECTION I – GENERAL INFORMATION

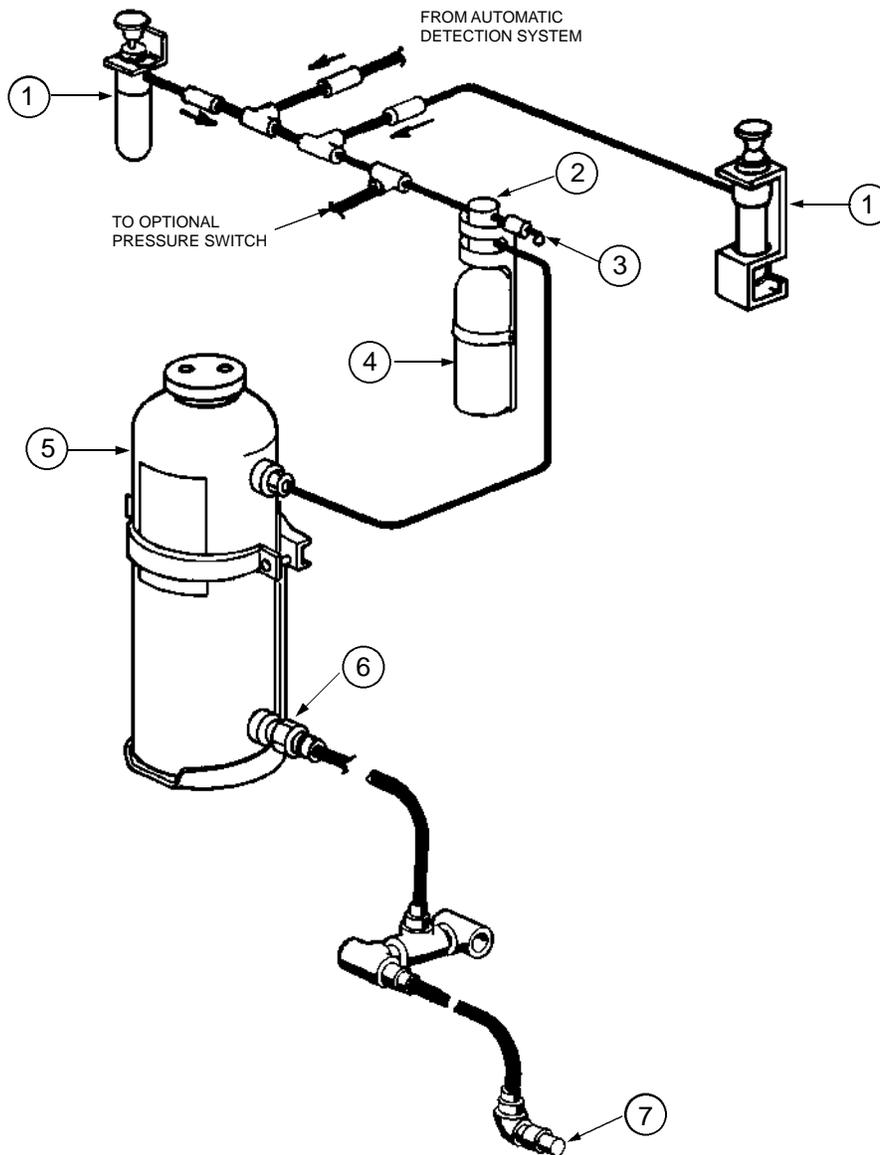


FIGURE 1

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HOW THE SYSTEM OPERATES

- ▶ Discharge of the A-101/LT-A-101 system manually is initiated from a remote actuator (1). Depressing the actuator plunger punctures the seal on the cartridge. The released pressure is transmitted to the pneumatic actuator/cartridge receiver (2). A safety relief valve (3) at this point prevents too high an actuation pressure build-up. The pressure drives a puncture pin through the seal in the expellant gas cartridge (4). This releases the expellant gas which is then transmitted to the dry chemical tank (5) where it fluidizes the dry chemical before carrying it to the fire hazard. A sealed burst disc assembly (6) prevents the flow of dry chemical until sufficient pressure is built up within the dry chemical tank. When the proper pressure is reached, the disc breaks allowing the gas/dry chemical mixture to flow to the nozzle(s) (7) and discharge onto the hazard.

Refer to appropriate CHECKFIRE design, installation and maintenance manual for information on the operation of the automatic detection system.

Note: Mechanical or electrical means must be provided to shut down vehicle upon system actuation.

IN CASE OF FIRE

When a fire starts, the way the operator reacts is very important. As soon as the operator is aware of a fire, he should do the following four things:

1. Turn the machine off and set the brake.
- ▶ 2. Quickly actuate the system by pulling the safety ring pin on the manual actuator and strike the red button.
3. Evacuate the vehicle.
4. Stand by with a fire extinguisher.



CAUTION

The fire system described in this manual is a suppression system only and is not designed or intended to extinguish all fires, particularly when unusual amounts of combustible materials and an ample oxygen supply are present. It is extremely important that supplemental firefighting equipment be available in case the system does not totally extinguish a fire.

APPLICATION METHOD

The A-101/LT-A-101 system provides fire protection using total flooding and local application methods. These methods are described below.

Local Application – Vehicle

When designing a local application system for vehicle protection, each individual hazard area must be surveyed and the correct type nozzle must be chosen to give the proper coverage. It must also be determined if certain local application hazard areas require screening to adequately protect them.

Total Flooding

Total flooding is described as “volume protection” and it is applied only when a hazard is located in an enclosure. Openings such as doors, windows, and grating shall not be more than 15% of the enclosure’s total surface area (ceiling, floors, and allwalls).

Openings of 5% or less of the total surface area are acceptable and do not require screening. Hazards with openings greater than 5% but not over 15% can be protected by screening.

Total flooding application is accomplished by introducing a sufficient quantity of FORAY dry chemical through fixed nozzles throughout the volume of the enclosure.

To enhance the effectiveness of the total flooding system in industrial applications, all fan air movements should be shut down and/or damped at discharge of the dry chemical system. Refer to NFPA 17, “Standard For Dry Chemical Extinguishing Systems,” for additional information.

PIPING ARRANGEMENT

The A-101/LT-A-101 system utilizes three methods of splitting the dry chemical flow from the tank to the nozzles. Each method is approved for use on vehicle or industrial type applications.

Two Nozzle System

The two nozzle system can be used in either vehicle or industrial hazard protection. It can be used in total flooding, or as a local application system on off-road vehicles. The supply line is split into two branch lines by the use of a 3/4 x 1/2 x 1/2 in. reducing tee. Two nozzle systems can be used with nominal 10, 20, and 30 lb tank sizes.

Four Nozzle System

The four nozzle system can be used in either vehicle or industrial hazard protection. It can be used in total flooding, or as a local application system on off-road vehicles. The supply line is divided into four branch lines by the use of a triple tee or a split tee. Four nozzle systems can only be used with nominal 20, and 30 lb tanks. Four nozzle 30 lb systems are preferred for all systems protecting hazards in environments which are extremely rugged, and very prone to Class A and Class B fuel build up in hard to protect areas, providing more agent per nozzle and longer discharge times.

Six Nozzle System

The six nozzle system can be used in vehicle or industrial hazard protection. It can only be used in local application systems on off-road vehicles, when minimal discharge time and agent discharge per nozzle is acceptable. The supply line is divided into six branch lines by the use of a distribution tee and three 1/2 in. tees. Six nozzle systems can only be used with 30 lb tanks.

DETECTION

Automatic electric detection is available for the A-101/LT-A-101 system.

Electric detection systems (CHECKFIRE MP-N*, Series I, and S C-N) are available to provide rugged, automatic detection for vehicle protection. These systems are either powered by the vehicle battery or by the internal module battery.

The electric detection systems can use either linear heat detection or spot thermal detectors, or pneumatic linear detectors.

* Not FM Approved

SECTION II – SYSTEM DESCRIPTION

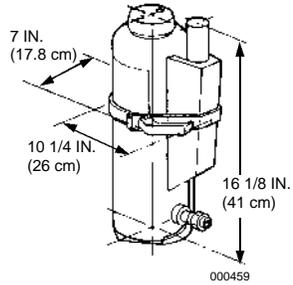
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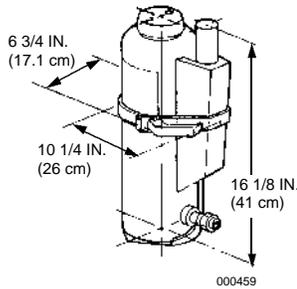
TANK ASSEMBLY

The tank assemblies, nominal 10, 20, and 30 lb size, are factory filled with 8.5, 17, and 25 lb respectively of FORAY dry chemical. Each tank is finished in red enamel paint. A nameplate is affixed to the exterior and contains information on recharge and maintenance. Two style of tanks are available: a tank containing a cartridge receiver and pneumatic actuator and a tank with 1/4 in. adapter for a pressure line from a remote cartridge. See Figure 1.

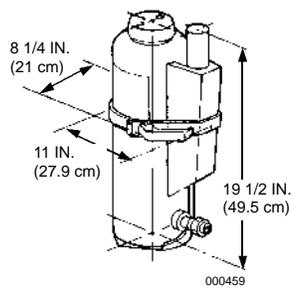
**A-101 MODEL 10
PART NO. 24855**



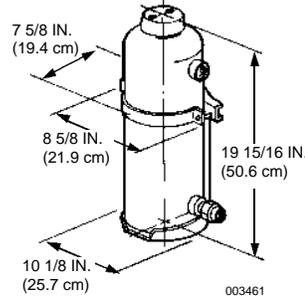
**LT-A-101 MODEL 10
PART NO. 24966**



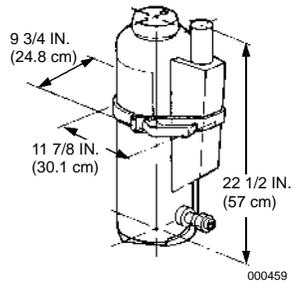
**A-101 MODEL 20
PART NO. 24970**



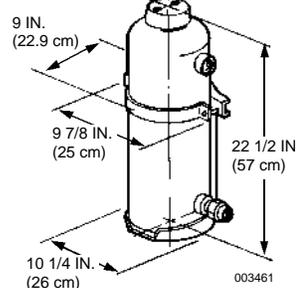
**LT-A-101 MODEL 20
PART NO. 24894**



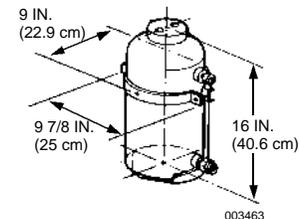
**A-101 MODEL 30
PART NO. 53000**



**LT-A-101 MODEL 30
PART NO. 29375**



**LP-A-101 MODEL 20-B
PART NO. 24427**



**LT-LP-A-101 MODEL 20-B
PART NO. 24425**

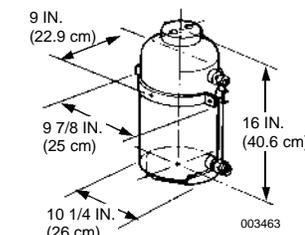
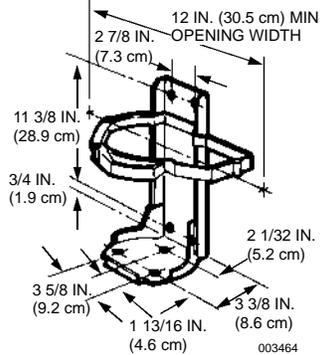


FIGURE 1

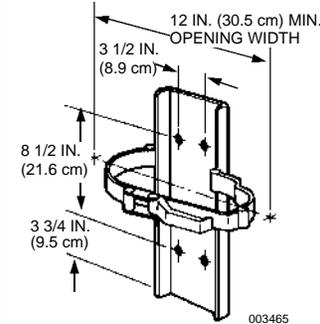
TANK BRACKET

The tank mounting bracket assemblies consist of heavy gauge steel back plates and clamp arms. Each style bracket is constructed to properly retain the agent tank from movement or damage in the rugged environment that these systems are normally used. Each tank bracket contains rubber pads to minimize the shock and vibration effect on the tank. The brackets are finished with red, air dry enamel paint. See Figure 2.

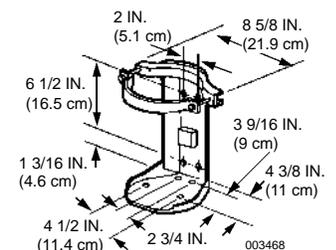
**A-101 MODEL 10 / LT-A-101 MODEL 10
PART NO. 24854**



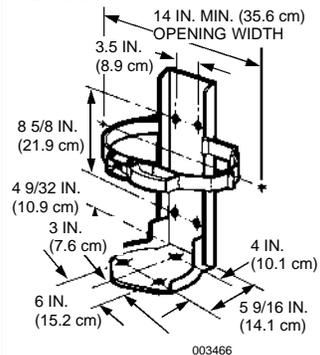
**A-101 MODEL 20
PART NO. 24971**



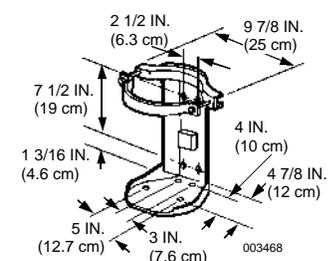
**LT-A-101 MODEL 20
PART NO. 24895**



**A-101 MODEL 30
PART NO. 14098**



**LT-A-101 MODEL 30
PART NO. 30494**



**LP-A-101 MODEL 20B / LT-LP-A-101 MODEL 20
PART NO. 31171**

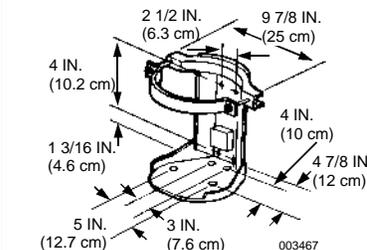


FIGURE 2

SECTION III – SYSTEM COMPONENTS

DRY CHEMICAL

FORAY is a monoammonium phosphate based dry chemical which is effective on Class A,B, C related fires. FORAY agent is color coded yellow for easy identification. FORAY dry chemical is shipped in 45 lb pails, Part No. 53080. See Figure 3.



FIGURE 3
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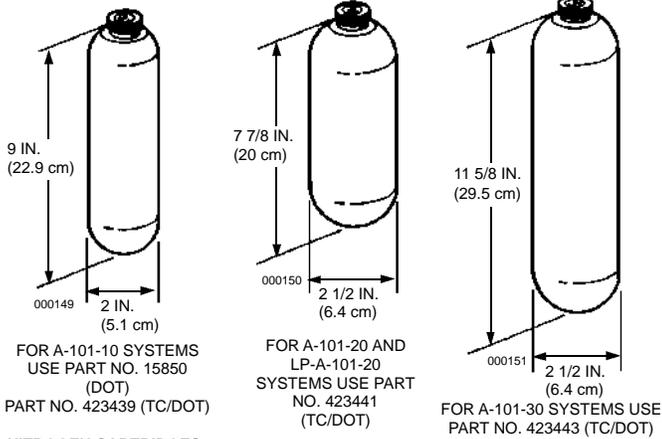
CARTRIDGE – EXPELLANT GAS

The expellant gas cartridges used on the A-101/LT-A-101 system contain either carbon dioxide or nitrogen as their expellant gas. The cartridge is a sealed pressure vessel containing gas under pressure. When the cartridge seal is punctured by the pneumatic actuator pin, the gas flows into the dry chemical tank, fluidizes the dry chemical, and carries it through the distribution piping network and out the nozzles.

The expellant gas cartridges meet the requirements of DOT 3A-2100 or 3AA-1800. See Figure 4.

Several cartridge Part No.s have been added to comply with the requirements of Transport Canada (TC). These cartridges have been approved for both DOT and TC.

CARBON DIOXIDE CARTRIDGES



NITROGEN CARTRIDGES

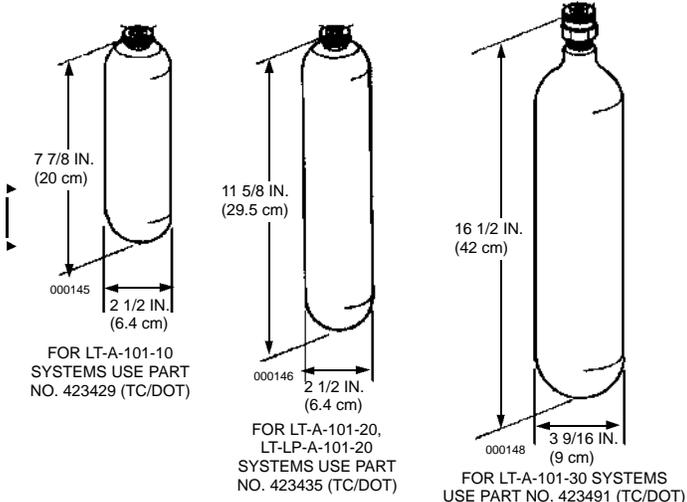


FIGURE 4

CARTRIDGE – ACTUATION GAS

The actuation gas cartridge used on the A-101/LT-A-101 system contains nitrogen as the actuation gas. The cartridge is a sealed pressure vessel containing gas under pressure. When the cartridge seal is punctured by the pin in the remote manual or pneumatic actuator, the gas flows to the actuator on the expellant gas cartridge, causing that actuator to puncture the seal in the expellant gas cartridge. The actuation gas cartridges meet the requirements of DOT 3E-1800. See Figure 5.

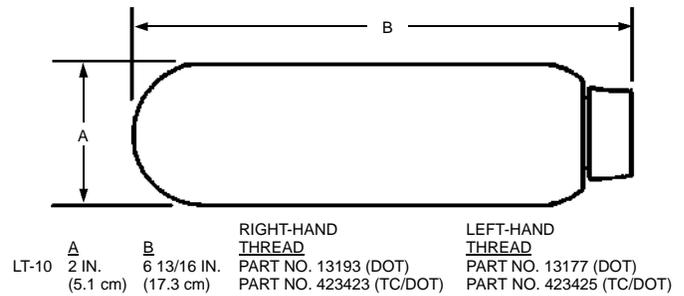


FIGURE 5
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CARTRIDGE BRACKET

The cartridge brackets for the expellant gas cartridges are constructed of heavy gauge steel and formed to protect and secure the cartridge. The cartridge brackets are painted with red, air dry enamel paint. See Figure 6.

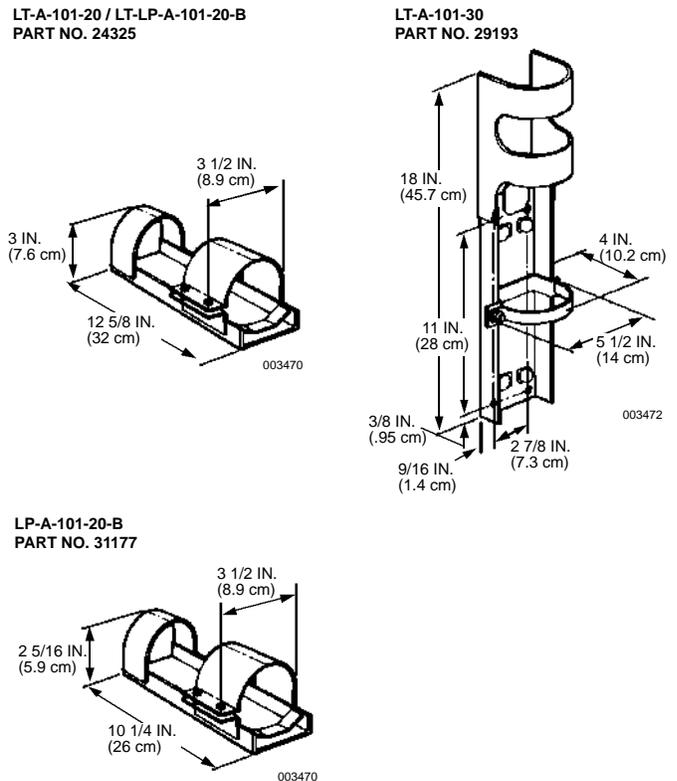


FIGURE 6

PNEUMATIC ACTUATOR

The pneumatic actuator, Part No. 430221, is constructed of brass and mounts on top of the expellant gas cartridge(s). When actuated, the actuator punctures a seal in the cartridge head, allowing the expellant gas to flow into the agent tank. See Figure 6a.

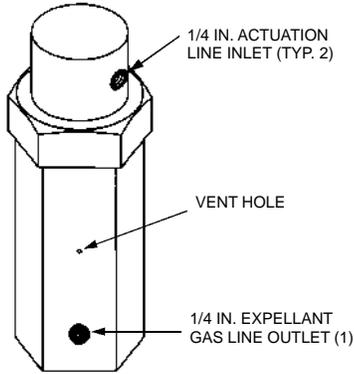
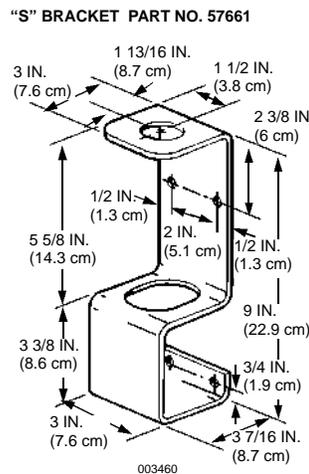
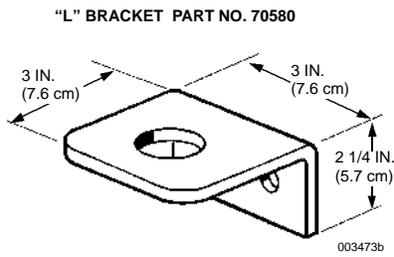
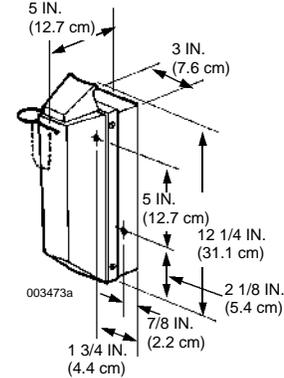


FIGURE 6a
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MANUAL ACTUATORS

The manual actuator is available for use with either right or left hand cartridges. Manual actuators should be mounted near the vehicle operator and/or at a point on the vehicle that can be reached from ground level. Two styles of manual actuators are available: the standard actuator with either the "S" type bracket or the "L" type bracket, and the cartridge guard type actuator. See Figure 7.

CARTRIDGE GUARD ACTUATOR FOR RIGHT HAND CARTRIDGES PART NO. 19330
 CARTRIDGE GUARD ACTUATOR FOR LEFT HAND CARTRIDGES PART NO. 16186



REMOTE ACTUATOR FOR RIGHT HAND CARTRIDGES PART NO. 57452
 REMOTE ACTUATOR FOR LEFT HAND CARTRIDGES PART NO. 70581

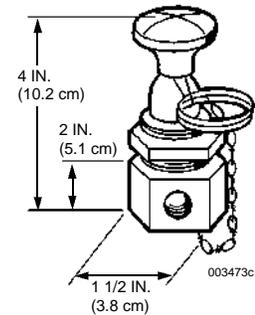


FIGURE 7

1/4 IN. CHECK VALVE

The 1/4 in. actuation line check valve, Part No. 25627, is used at the branch lines to each actuation device (whether manual or automatic). The check valve blocks the flow of actuation gas from the actuator that was actuated to the actuator(s) that was not actuated. This prevents actuation gas from escaping from an open actuator which may have had the cartridge removed. The check valve also keeps the gas from pressurizing all branch actuation lines thus allowing the main line to be of maximum length. See Figure 8.

CHECK VALVE PART NO. 25627

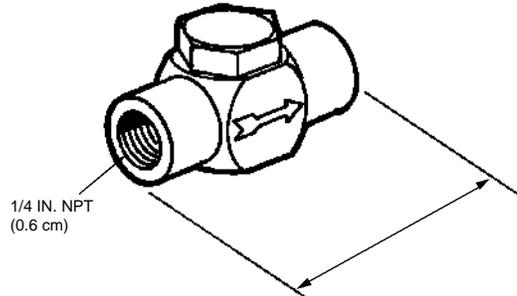


FIGURE 8
000899

DISTRIBUTION TEE

When six nozzles are to be fed from one dry chemical tank, the distribution supply line must enter the inlet of a distribution tee, Part No. 25031, and each branch line must exit from one of three outlets of the distribution tee. This is required to assure equal distribution of dry chemical to each nozzle. See Figure 9.

DISTRIBUTION TEE, 1/2 IN. X 1/2 IN. X 1/2 IN. X 3/4 IN. – PART NO. 25031

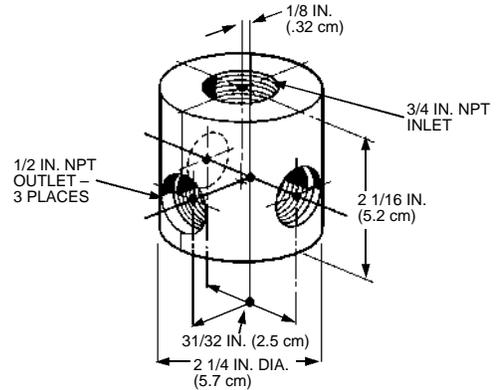


FIGURE 9
002583

SECTION III – SYSTEM COMPONENTS

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REV. 1

REDUCING TEE

When two or four nozzles are to be fed from a single dry chemical tank, a 1/2 x 1/2 x 3/4 in. reducing tee, Part No. 4655, is used to properly distribute the dry chemical from the supply line to two branch lines. See Figure 10.

REDUCING TEE, 1/2 IN. X 1/2 IN. X 3/4 IN. – PART NO. 4655

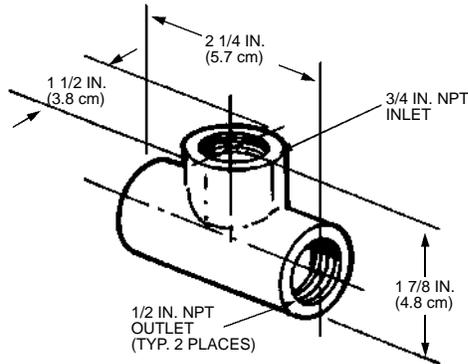


FIGURE 10
003456

TRIPLE TEE

When four nozzles are to be fed from a single dry chemical tank, a triple tee, Part No. 16424, can be used to properly distribute the dry chemical from the supply line to two branch lines. See Figure 11.

TRIPLE TEE, 1/2 IN. X 1/2 IN. X 1/2 IN. X 3/4 IN. – PART NO. 16424

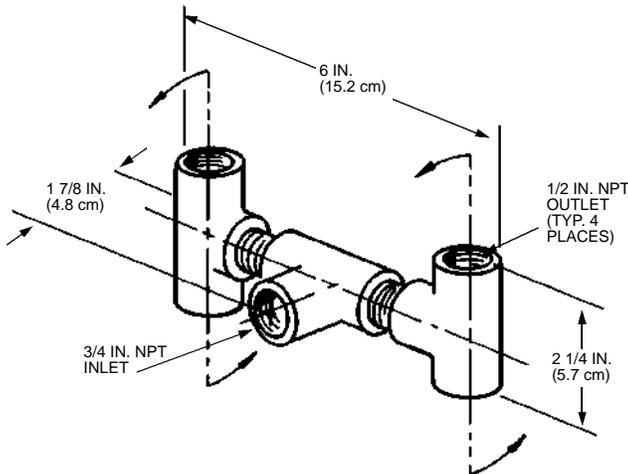


FIGURE 11
003462

SAFETY RELIEF VALVE

A spring-loaded pressure relief valve, Part No. 15677, is used to prevent excessive pressure from building up in the actuation line. The valve is set to relieve at 265 psi (18.3 bar). After system discharge, all pressure in the actuation line can be relieved by pulling the ring on the safety relief valve. See Figure 12.

SAFETY RELIEF VALVE PART – NO. 15677

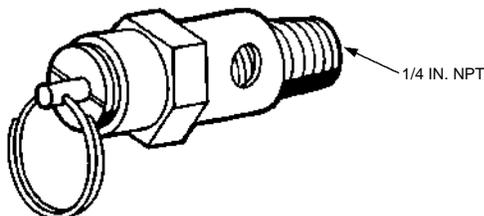


FIGURE 12
000437

AIR CYLINDER (OPTIONAL)

The air cylinder, Part No. 15733, is a system accessory whose function is to shut off the fuel supply to the engine when the fire suppression system is actuated. It is a piston operated by gas pressure from the actuation line. See Figure 13.

AIR CYLINDER PART NO. 15733

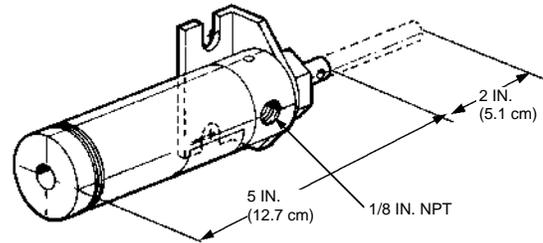


FIGURE 13
003459

PRESSURE SWITCH – WEATHERPROOF

The pressure switch, Part No. 46250, is a DPST (Double-Pole, Single Throw) pneumatically operated, resettable switch used to open or close electrical circuits to either shut down equipment or turn on lights or alarms. The pressure switch is constructed of malleable iron, painted red. A 1/4 in. NPT pressure inlet is used to connect the 1/4 in. hose from the actuation line. The switch rating is 2 HP-240 VAC/480 VAC, 2 HP-250 VDC, 30A-250 VAC/DC, 5A-480 VAC/DC. See Figure 14.

PRESSURE SWITCH PART – NO. 46250

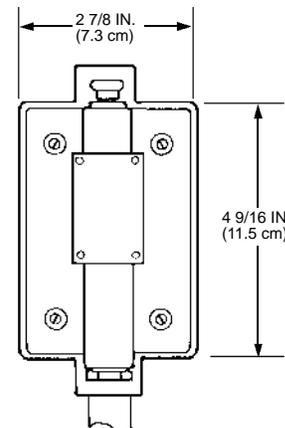
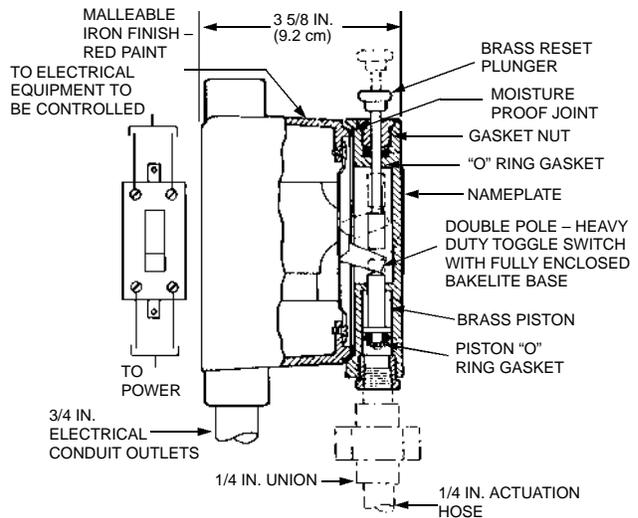


FIGURE 14
000716

PRESSURE SWITCH – NON-WEATHERPROOF

The Electric Pressure Switch, Part No. 8372, is a SPDT (Single Pole-Double Throw) pneumatically operated, resettable switch to be used for turning off pump motors, exhaust fans, conveyors and similar devices; or turning on alarms or electric door closures. The switch contacts are rated at 15 amp, 125, 250, or 480 VAC, 1/4 hp at 125 VAC, 1/2 hp at 250 VAC or 1/2 amp at 125 VDC, 1/4 amp at 250 VDC. See Figure 15.

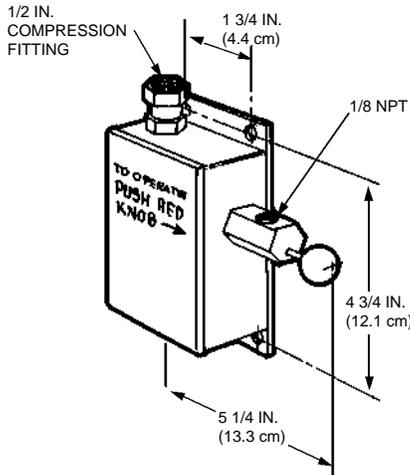


FIGURE 15
000453

Explosion-Proof Pressure Switch – DPDT

The Explosion-Proof Pressure Switch, Part No. 43241, is a DPDT (Double-Pole, Double-Throw) pneumatically operated, resettable switch to be used for turning off pump motors, exhaust fans, conveyors, and similar devices; or turning on alarms or electric door closures. The switch contacts are rated at 10 amp at 125 VAC or 5 amp at 250 VAC. The pressure switch is constructed with an explosion-proof housing suitable for hazardous environments. The switch operates off the nitrogen pressure from the ANSUL AUTOMAN release or remote pneumatic actuator.

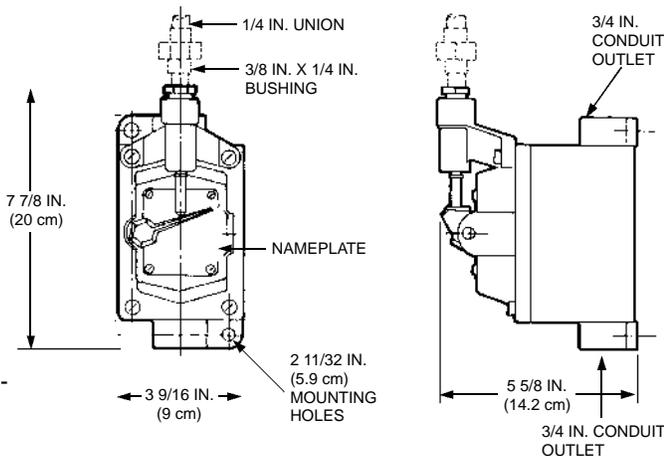
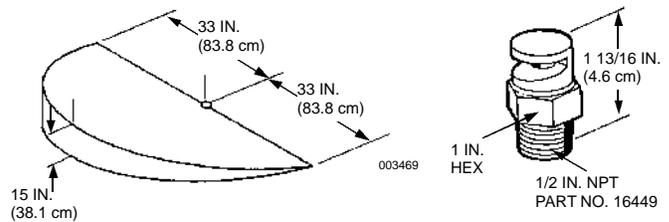


FIGURE 16
000454

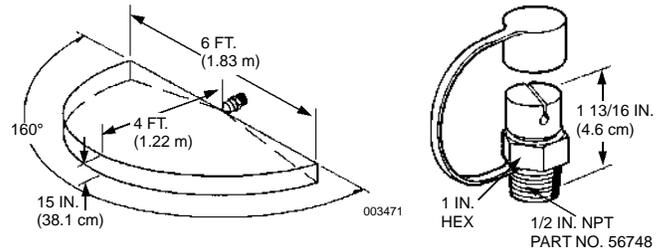
NOZZLES

► Three types of nozzles are approved for use with the A-101/LT-A-101 system. One type is the F-1/2 nozzle. This nozzle gives a 180° fan shape pattern and can be used for either total flooding or local application. The second type of nozzle is the C-1/2. This nozzle gives a cone pattern and is used for direct application to a vehicle component or burning surface. The third type of nozzle is the V-1/2. This nozzle produces a 160° fan shape pattern and is generally used for screening engine compartments, torque converters and all other hazard areas. All nozzles are constructed of brass and require protective blow-off caps. Exception: The F-1/2 nozzle can utilize either a blow-off cap or the opening can be packed with a good grade of extreme temperature silicone grease, such as Dow Corning No. 4. See Figure 17.

F-1/2 NOZZLE EFFECTIVE DISCHARGE PATTERN PART NO. 16449



V-1/2 NOZZLE EFFECTIVE DISCHARGE PATTERN PART NO. 56748



C-1/2 NOZZLE EFFECTIVE DISCHARGE PATTERN PART NO. 53791

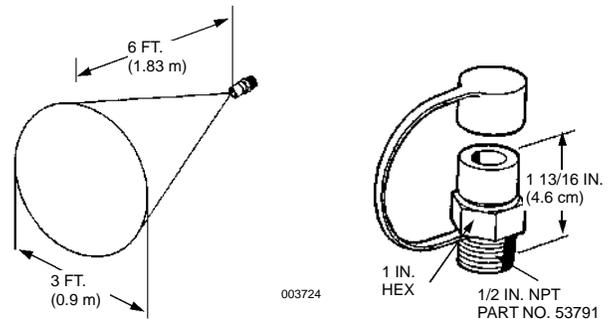


FIGURE 17

SECTION III – SYSTEM COMPONENTS

6-1-08 Page 3-6
REV. 3

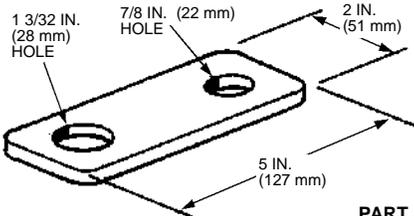
NOZZLE BRACKETS

Two styles of nozzle brackets are available for the A-101/LT-A-101 system. Each style of bracket is constructed of unpainted 1/4 in. (6.4 mm) steel. They contain pre-punched mounting holes for the nozzle.

An individual “L”-shaped bracket-shipping assembly, Part No. 427149, is available. This bracket is 2 in. x 3 in. (51 mm x 76 mm). The “L”-shaped bracket is also available in packs of 12 (Part No. 73871).

A straight bracket (in packs of 4), Part No. 427228, is available. This bracket is 5 in. x 2 in. (127 mm x 51 mm). See Figure 18.

PART NO. 427228



PART NO. 427149

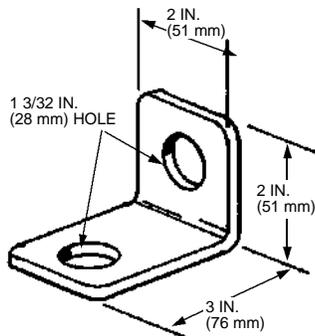


FIGURE 18

HOSE (SUPPLIED BY OTHERS)

To assure proper performance of an A-101/LT-A-101 system, the hose used must meet SAE 100 R5 or 100 R1 (minimum) hose specification. For underground mining applications, the hose must also be accepted by MSHA as flame resistant and marked as follows “Flame-Resistant, USMSHA No. _____”* at intervals not exceeding 3 ft. (.9 m). Letters and numbers must be at least 1/4 in. (.6 cm) high and comply all other SAE requirements including an operating temperature of -65 °F to +250 °F (-54 °C to 121 °C). (*This number is assigned to the manufacturer after samples have passed the required tests. The number will be different for each manufacturer.) See Figure 19.

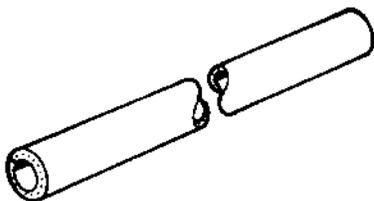


FIGURE 19

SEALED BURST DISC ASSEMBLY

The Sealed Burst Disc Assembly, Part No. 428271, is a machined brass component containing a stainless steel burst disc inside. The disc assembly is designed to rupture when the proper expellant gas pressure is built up within the tank. The disc assembly is part of the agent tank shipping assembly. After tank discharge, the complete burst disc assembly must be removed, discarded, and replaced with a new assembly. Replacement assemblies are available in a 15 pack, Part No. 428363.

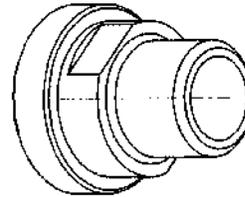


FIGURE 20

ENGINE SHUTDOWN DEVICE

The ANSUL Engine Shutdown Device, Part No. 427425, can be used to pneumatically shut down the vehicle fuel rack by venting the hydraulic pressure through the “safety system.” This can be accomplished by installing the shutdown device in the actuation line. When the fire suppression system is actuated, the actuation pressure opens the check valve located in the shutdown device, allowing the safety system pressure to bleed into the holding tank. The drop in pressure causes the valves in the fuel rack to close, thus shutting down the engine. See Figure 21.

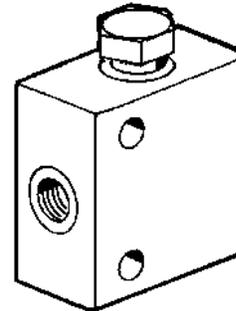


FIGURE 21

CHECKFIRE ELECTRIC DETECTION AND ACTUATION SYSTEM

Three styles of electric detection and actuation systems are available: CHECKFIRE Electric Series I, CHECKFIRE Electric SC-N, and CHECKFIRE Electric MP-N*. Each electric/pneumatic system consists of detection wiring, control module, actuator with nitrogen cartridge, mounting bracket, and squib (Series I and SC-N) or gas motor (MP-N). The CHECKFIRE Electric Series I requires power from the vehicle battery whereas the CHECKFIRE SC-N and MP-N contains its own internal Lithium batteries as the power source. All styles of CHECKFIRE electric* are FM Approved when consisting of all basic components.

* CHECKFIRE MP-N is not FM Approved

The temperature ratings of the system are as follows:

CHECKFIRE Series I: Manual Part No. 54894	-40 °F to +140 °F (-40 °C to +60 °C)
CHECKFIRE Series SC-N: Manual Part No. 79061	-40 °F to +140 °F (-40 °C to +60 °C)
CHECKFIRE Series MP-N: Manual Part No. 427310	+32 °F to +120 °F (0 °C to +49 °C)

HAZARD ANALYSIS

Individuals responsible for the design of an A-101/LT-A-101 system must be trained and hold a current ANSUL certificate in an A-101/LT-A-101 training program. Knowledge of the fire hazards that exist in the equipment to be protected is also required. Finally, a good understanding of federal and local fire protection codes and standards is necessary. No one should begin designing without previously becoming familiar with the applicable codes.

Having read about the A-101/LT-A-101 system and the basic terminology and operation of the system, you should now begin to identify the fire hazards in the equipment to be protected. Every foreseeable hazard must be identified now while you have design flexibility; once the system is installed, adding protection for another hazard becomes more difficult. Note that the A-101/LT-A-101 system is designed only for the protection of specified equipment for the foreseeable hazards that exist due to that equipment and its operation. The areas of protection are fixed at installation and are limited in number. **An A-101/LT-A-101 system does not remove the need for a hand portable fire extinguisher on the equipment.** Fuel spills, welding (repair) heat or other unforeseeable causes may result in fires not having A-101/LT-A-101 protection. The A-101/LT-A-101 system protects the areas with high likelihood of fire and potential for high damage; seldom would an A-101/LT-A-101 system be designed to protect every square inch of the equipment to be protected.

An effective system design is based on a through hazard analysis. Fire is made up of heat, fuel, and oxygen. A fire hazard is any place that these three elements could be brought together. Because oxygen is always present, identifying fuel and heat sources is most critical.

Large excavators must be considered special type hazards. See the Appendix Section for design information or contact ANSUL Application Engineering Department.

Operator safety is also a concern when designing a fire suppression system. The operator must have enough time to safely exit the vehicle. In some situations, an extended discharge dry chemical system (not FM Approved) may offer the operator the additional time he needs to get away from the burning vehicle. Consider egress time when designing the final system. See Appendix Section for extended discharge and twin agent design information.

Some common fuel sources in vehicles include flammable liquids and greases, rubber, plastics, upholstery, and environmental debris such as wood chips or coal dust.

Common vehicle heat sources are engine blocks, exhaust systems, pumps, and turbochargers, as well as bearings, gears, brakes, and electrical equipment. A potential hazard exists when a fuel comes in contact with any heat source.

Where there is dripping or leaking fuel, the hazard can become even more dangerous than initially considered. Consulting with experienced operators or owners of similar equipment can help to identify locations of previous fires and special hazards not normally considered as common hazards.

The following are typical vehicle fire hazards that require consideration:

Engine Compartment – The engine compartment contains an assortment of fluids, fuels, oils, and greases, as well as congested wires, hoses, and accumulated debris, all very near high heat sources.

Battery Compartments – Battery compartments are a potential fire hazard when combustible materials build up on the top of the battery. These materials, in the presents of moisture, can cause a short circuit.

Transmissions, Torque Converters, and Parking Brakes – All these components are a possible high heat source that could cause ignition to combustible material.

High Pressure Hoses – Hot fluid spraying from a ruptured high pressure hose, or leaking from a loose flange or fitting could find its way to a source of ignition.

Belly Pan – The belly pan can accumulate not only leaking fuel from the vehicle, but external debris, and because of its unique location, a fire starting in the belly pan could quickly engulf the entire vehicle.

Hydraulic/Fuel Pumps – Because of the high pressures involved with these pumps, fluid spraying from a leaking pump could find its way to a heat source and cause ignition.

After completing the hazard analysis, determine nozzle coverages.

NOZZLE COVERAGE AND LOCATION

The first step is to determine which nozzles are needed and where they should be placed to best protect the hazard.

Nozzle selection can be made by first determining the size of the hazard and then comparing that to the nozzle’s effective discharge pattern.

C-1/2 Nozzle Part No. 53791 – The cone-shape discharge pattern of the C-1/2 nozzle will widen to a 3 ft (0.9 m) diameter at the maximum effective discharge range of 6 ft (1.8 m). See Figure 1.

V-1/2 Nozzle Part No. 56748 – The V-1/2 nozzle creates a fan-shaped discharge pattern of 160° and has a maximum effective discharge range of 4 ft (1219 mm) in length by 15 in. (38.1 cm) in height with a maximum width of 6 ft. (1.8 m). See Figure 1.

F-1/2 Nozzle Part No. 16449 – The F-1/2 nozzle also produces a fan-shaped discharge pattern, but with a 180° pattern at a maximum effective range of 33 in. (83.8 cm) in length by 15 in. (38.1 cm) in height with a maximum width of 5 ft. 6 in. (1.7 m) See Figure 1.

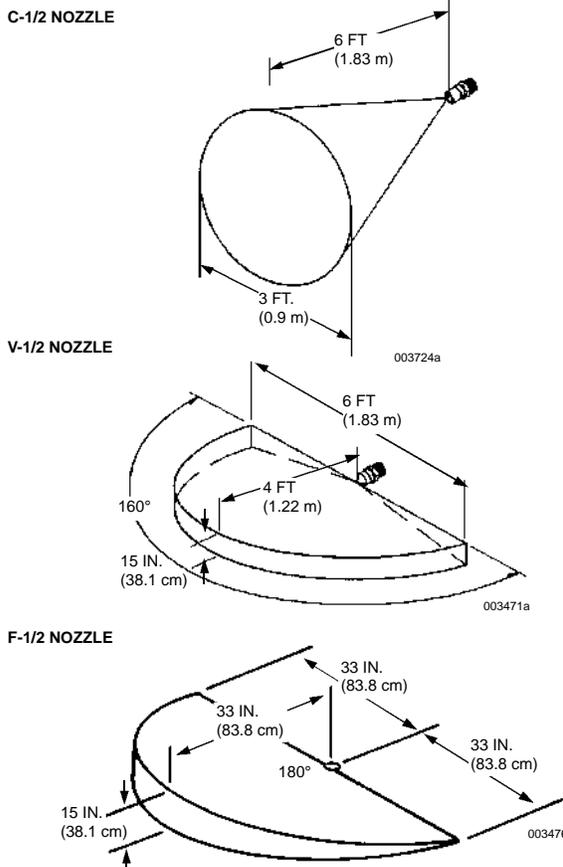


FIGURE 1

SECTION IV – SYSTEM DESIGN – VEHICLE

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REV. 1

NOZZLE COVERAGE AND LOCATION (Continued)

NOTICE

When using any of the nozzle types, make certain no obstructions interfere with the discharge pattern as it is directed to the hazard

The following rules apply to selecting nozzles and nozzle locations:

- When choosing the proper nozzle, remember the entire hazard area must be within the nozzle's pattern and maximum effective discharge range.
- The narrow pattern and longer discharge range of the C-1/2 nozzle make it a good selection for protecting small areas or hazards that are distant from the nozzle mounting location.
- Larger hazard areas may require the use of V-1/2 or F-1/2 nozzles.
- Some areas may exceed the area coverage of one nozzle and may require an additional nozzle(s) for protection.
- In some cases, a single nozzle can cover more than one area of a common hazard such as a transmission and torque converter. **Note:** Both areas must be within the discharge pattern of the nozzle.
- When planning nozzle locations, make certain the effective flow of dry chemical to all recognized hazard areas will not be obstructed.
- If obstructions cannot be avoided, an additional nozzle(s) may be needed to provide proper coverage.
- In areas where the environment may cause extreme build up of materials, such as wood debris, coal dust, garbage, or oil, it is always a good idea to use the largest system tank available and keep the nozzles per tank to a **maximum of four**. This allows the maximum amount of chemical per nozzle and gives the longest discharge time (excluding two nozzle systems).
- Never settle for less than full coverage of each fire hazard.

After establishing nozzle locations and number required, the type

- ▶ and quantity of A-101/LT-A-101 tanks can be determined.

TANK QUANTITY REQUIREMENTS

First consider the type of environment the vehicle will be operating in and its temperatures. This will determine the type of tank to choose.

- ▶ A-101/LT-A-101 systems are available in the standard model A-101 which has a temperature range of +32 °F +120 °F (0 °C to +49 °C) and are generally used on sub-surface mining equipment.

Also available is the extreme temperature model LT-A-101 which has a temperature range of –65 °F to +210 °F (–54 °C to +99 °C) and is typically used on above surface vehicles.

Knowing the number of nozzles required, next determine the type or size of tank(s) required. The following "System Selection Chart" will point out the various options.

System Selection Chart

Model <u>Capacity</u>	Nozzle <u>Quantity</u>	Effective <u>Discharge Time</u>	Agent <u>per Nozzle</u>
10	2	8.5 sec	4 1/4 lb (1.9 kg)
20	4	8.5 sec	4 1/4 lb (1.9 kg)
20	6	5.7 sec	2 7/8 lb (1.3 kg)
30	4	12.5 sec	6 1/4 lb (2.8 kg)
30	6	8.3 sec	4 1/8 lb (1.9 kg)

Nozzle quantities, discharge times and amount of agent per nozzle are all factors to consider in determining the proper tank size.

Keep in mind, a longer discharge time and a greater amount of agent discharge per nozzle will offer better hazard protection.

It is always best to choose the largest size tank available, but if space is a problem, choose a smaller tank or choose the low profile version.

When the number of tanks have been determined based on the number of nozzles for total protection, the next step in the design process is to determine the distribution hose network required.

DISTRIBUTION SYSTEM REQUIREMENTS

After the tank(s) and nozzle(s) location(s) have been determined, it is necessary to sketch the hose routings to each nozzle to make certain they can be run without interfering with vehicle components and that the length of the supply line(s) and branch line(s) are not exceeded.

Hose Specifications

- ▶ To ensure proper performance of the ANSUL A-101/LT-A-101 system, the hose used must meet either SAE 100 R5 or 100 R1 hose specifications as a **minimum**. The hose must have an operating temperature of –40 °F to +200 °F (–40 °C to +93 °C). The following list of appropriate standards is for reference.

SAE Selection, Installation, and Maintenance of Hose and Hose Assemblies	J1273 (latest revision)
SAE Hydraulic Hose Fitting Standard	J516 (latest revision)
SAE Hydraulic Hose Standard	J517 (latest revision)
SAE Test and Procedures For SAE 100R Series Hydraulic Hose and Hose Assembly Standard	J343 (latest revision)

For underground mining applications, hose must comply with USBM specified flame resistance acceptance and all applicable SAE requirements.

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Listed below is a partial list of hose manufacturers who manufacture hose that meets the required SAE specification noted on Page 4-2:

Aeroquip	Parker
Dayco	Swagelok
Gates	Weatherhead
Goodyear	

Critical Specifications from SAE J517 are listed below for reference:

SAE 100R1 Hose

Size	Hose ID	Maximum Operating Pressure	Minimum Burst Pressure	Minimum Bend Radius
1/4 in.	.250 in. +.023 -.008	2750 psi	11000 psi	4.0 in.
1/2 in.	.500 in. +.031 -.015	2000 psi	8000 psi	7.0 in.
3/4 in.	.750 in. +.031 -.015	1250 psi	5000 psi	9.5 in.
7/8 in.	.875 in. +.031 -.015	1250 psi	5000 psi	11.0 in.

SAE 100R5 Hose

1/4 in.	.250 in. +.031 -.000	3000 psi	12000 psi	3.4 in.
1/2 in.	.500 in. +.039 -.000	1750 psi	7000 psi	5.5 in.
3/4 in.	—	—	—	—
7/8 in.	.875 in. +.042 -.000	800 psi	3200 psi	7.4 in.

Hydraulic Hose Couplings

Before connecting a hydraulic hose to the A-101/LT-A-101 fire suppression system, it must first be assembled utilizing a hose coupling attached to each end of the hose. Hose couplings installed on hydraulic hose can be the permanent crimp-on type or the reusable type. Female or male swivel hose couplings of either the crimp-on type or the reusable type are also acceptable. All couplings used with SAE 100R1 or SAE 100R5 hydraulic hose must be suitable for the hose chosen and must comply with Hydraulic Hose Fitting Standard J516 as a minimum.

When attaching a hose coupling to a hose, it is very important to follow all manufacturer's installation instructions. SAE J1273, Selection, Installation, and Maintenance of Hose and Hose Assemblies, paragraph 3.2, requires that the manufacturer's assembly instructions be followed.

NOTICE

SAE J1273, paragraph 2.10, Proper End Fitting, states that, "Care must be taken to insure proper compatibility exists between the hose and coupling selected based on the manufacturer's recommendations substantiated by testing to industry standards such as SAE J517."

Under no circumstances should hose and couplings from different manufacturers be interchanged.

Many hose manufacturers require only the couplings that they supply to be used with their hose. One manufacturer warns that they "will not be responsible when interchanging their hose and/or couplings with hose and/or couplings of any other manufacturer"

Permanent Crimp-on Hose Couplings

A permanent crimp-on hose coupling is installed as a one-piece assembly attached to the hose end and crimped on. The crimp is to be made following the manufacturer's requirements for proper hose and coupling assembly, using a machine that will hydraulically or electrically crimp the coupling permanently to the hose end.

When using permanent crimp-on type couplings, lubricate the hose end, if necessary, and push the hose end all the way into the fitting in accordance with hose and hose coupling assembly instructions. Then place the hose end in the appropriate crimping machine and crimp the coupling. Follow all hose crimping machine operating instructions using equipment specified by the hose/coupling manufacturer.

Reusable Hose Couplings

Reusable hose couplings can be attached to new hose in the field with no other tools than a wrench and a vise (or two wrenches). When reusable hose couplings are used, make certain the corresponding couplings and the assembly procedures used are in accordance with the manufacturer's specifications. **Failure to follow the manufacturer's instructions in their entirety may result in plugged nozzle orifices at system discharge due to chips and pieces of rubber cut from the inside of the hose during improper assembly.**

Reusable hose couplings include a coupling shell that fits over the end of the hydraulic hose and a coupling insert that installs inside the end of the hose and mates with the coupling shell threads. A mandrel tool may be required when using 1/4 in. through 1/2 in. SAE 100R5 hose to facilitate installation of the coupling insert.

To attach a reusable coupling to the hose, clamp the coupling shell in a vise and turn the end of the hydraulic hose counter-clockwise into the coupling shell until the end is seated against the bottom of the shell. Then, back off 1/4 to 1/2 turn to allow for expansion.

Note: Some-rubber covered hydraulic hose ends must be skived (stripped of the rubber cover) before attaching the coupling. Refer to the appropriate manufacturer's instructions.

Lubricate the hose, coupling insert, and mandrel tool (when required) in accordance with manufacturer's instructions and screw the insert clockwise into the coupling shell and hose. Wrench tighten the insert until the hex on the insert contacts the shell. If a female swivel end is being used, use the appropriate assembly tool and leave approximately 1/32 in. to 1/16 in. (0.8 to 1.6 mm) clearance between the nut and the shell to allow the nut to swivel.

Note: It is important to lubricate only those surfaces specified by the manufacturer of the hose and coupling used. The lubricant will minimize the risk of cutting or shaving the inside of the hose. **Failure to use the proper lubricant or follow the appropriate lubrication instructions may result in pieces of hose plugging the gas tube in the agent storage tank or plugging a discharge nozzle orifice. Improper lubricant or lubrication procedures may also result in contamination of the hose due to the use of an incompatible lubricant.**

After attaching hose couplings to the hose, make certain that the hose is clean, dry and oil free. Use a solvent that is compatible with the hose, such as Stoddard Fluid or Varsol, to dissolve any oil remaining in the hose. Using dry air or nitrogen, blow out each hose length until dry and clear of metal or rubber shavings and any foreign matter before making any connections to the A-101 system.

SECTION IV – SYSTEM DESIGN – VEHICLE

5-15-02 Page 4-4

REV. 1

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

JIC Hose Fittings and 150 lb. Fittings

JIC hose fittings meeting Hydraulic Hose Fitting Standard J516 can be used in most applications. When using JIC hose fittings as elbows, use only elbows that have a radiused bend. 150 lb NPT elbows and tees can also be used to assemble hose or pipe and attach hose or pipe to the discharge nozzles. Make certain that all elbows used in the agent distribution line, are of the same type (i.e., either all JIC or all 150 lb NPT elbows). Refer to the Installation Section for maximum and minimum elbow requirements.

Note: When figuring the maximum and minimum amount of elbows in the A-101/LT-A-101 system, two (2) 45° fittings can be counted as one 90° fitting.

Heat Resistant Fire Jacket for Hydraulic Hose (Non-FM Approved)

All hose assemblies, including actuation lines, expellant gas lines, and agent distribution hose that will be normally exposed to or located in areas with temperatures exceeding 200 °F (93 °C), should be sleeved with an extreme temperature heat-resistant fire jacket. (Do not route actuation hose through fire hazard areas. If this cannot be avoided, the hose must be fire jacketed.) Information concerning fire jacketing should be available through your local hose supplier. If not, Bentley Harris manufactures a fire jacket that will withstand continuous operating temperatures from -65 °F to 500 °F (-54 °C to 260 °C) and short term exposures up to 2000 °F (1093 °C). For a listing of distributors in your area, call Bentley Harris at either 610-363-2600 or, 800-321-2295.

Dry Chemical Flow Characteristics

The assembly of piping (hose) for a dry chemical system probably lends itself to the greatest chance for error when installing the system. Dry chemical-gas mixtures do not flow like liquids, and, as a result, certain basic rules must be followed to assure correct dry chemical distribution to the nozzles.

In order to obtain equal distribution at a tee, the dry chemical must enter the center opening (bull) of the tee and exist the two side opening which are 180° apart. See Figure 2.

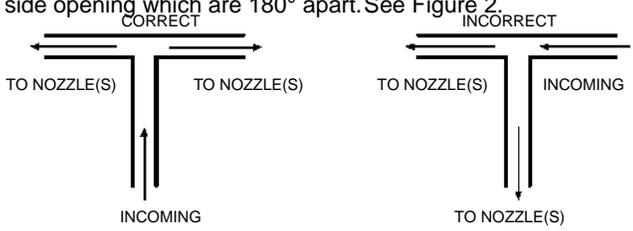


FIGURE 2
003477

When dry chemical makes a change of direction through an elbow, a tee, or a hose bend, a separation of the dry chemical and gas mixture occurs. If a tee follows this change of direction where separation can occur, and if this tee lies in the same plane as the change in direction through an elbow, tee, or hose bend, more dry chemical will discharge through one of the tee outlets and more gas will discharge out the other tee outlet. A certain minimum length of hose must be allowed from the bend (elbow) to the tee or from the first tee to the second tee in order to permit the dry chemical and gas to intermix before striking the tee. The minimum length required is equal to 20 hose diameters. 18 in. (457 mm) is required for 7/8 in. hose, 15 in. (381 mm) is required for 3/4 in. hose, and 10 in. (254 mm) is required for 1/2 in. hose.

See Figure 3.

Note: When using the distribution tee, Part No. 25031, a minimum length of 15 in. (381 mm) of 3/4 in. or 18 in. (457 mm) of 7/8 in. hose, will always be required between any bend or elbow and the distribution tee.

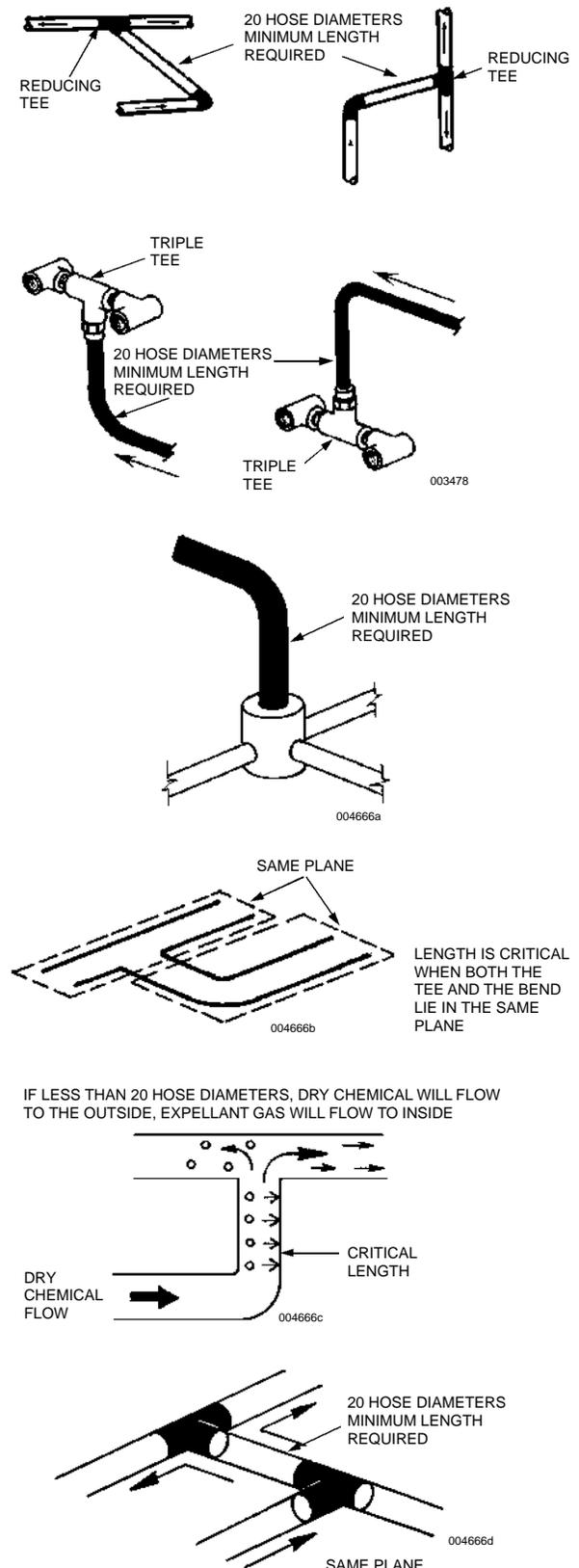


FIGURE 3

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Dry Chemical Flow Characteristics (Continued)

If a tee follows a change in direction through an elbow, another tee, or a hose bend and the directional change is in a plane that is perpendicular to the plane of the tee following, the dry chemical particles and gas will strike the rear of the tee before branching, intermixing of the dry chemical and gas will occur through turbulence and the length of hose from the bend (elbow) or tee preceding it is not critical. See Figure 4.

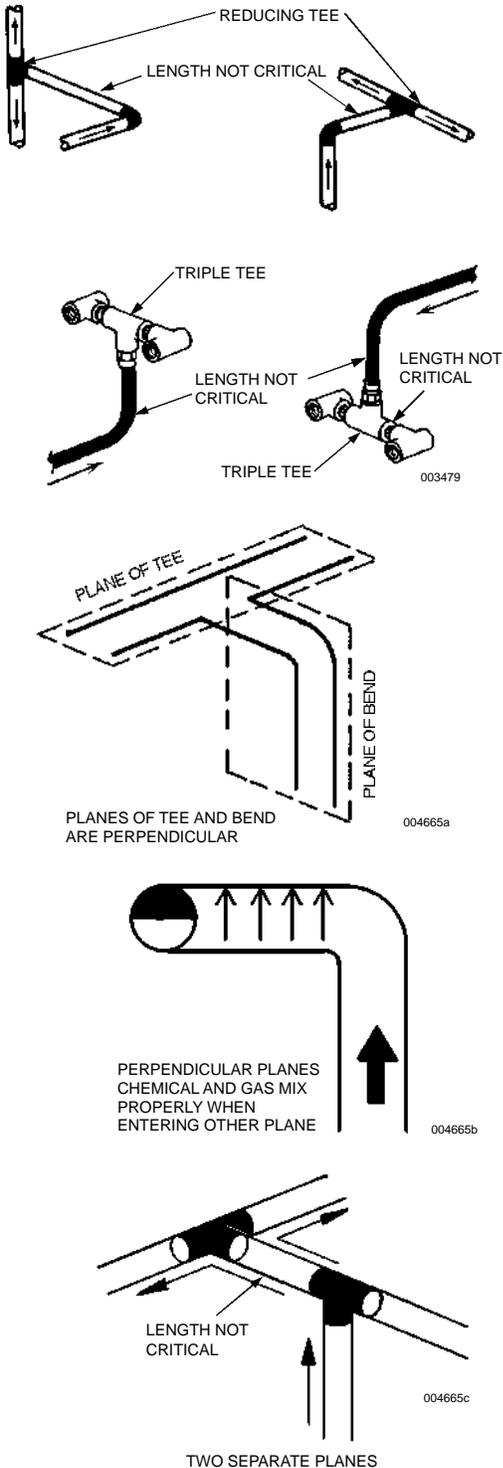


FIGURE 4

SECTION IV – SYSTEM DESIGN – VEHICLE

5-15-02 Page 4-6

REV. 1

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements

Supply and branch lines for the A-101/LT-A-101 system are defined as follows:

TWO NOZZLE SYSTEM – Two nozzle systems consist of a 3/4 in. or 7/8 in. supply line, a 3/4 in. x 1/2 in. x 1/2 in. reducing tee, and 1/2 in. branch lines each connected to one nozzle. See Figure 5.

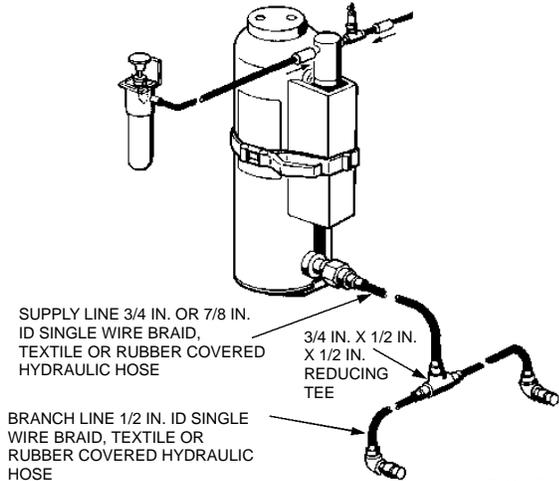


FIGURE 5
003480

FOUR NOZZLE SYSTEM – Four nozzle systems are divided into two types: Four nozzle triple tee arrangement and four nozzle split tee arrangement. Four nozzle triple tee systems consist of a 3/4 in. or 7/8 in. supply line into a triple tee assembly consisting of a 1/2 in. x 1/2 in. x 3/4 in. reducing tee, two close nipples, and two 1/2 in. tees. The primary branch line is the close nipple that connects the 1/2 in. tee to the reducing tee. Four separate secondary branch lines are run from the 1/2 in. tee outlets each connected to one nozzle. See Figure 6.

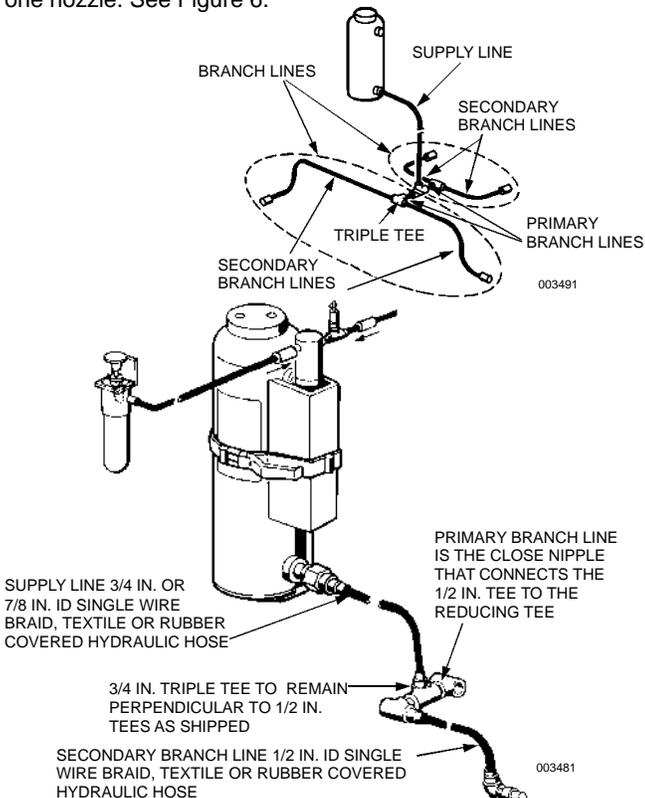


FIGURE 6

The four nozzle split tee arrangement consists of a 3/4 in. or 7/8 in. supply line, a 1/2 in. x 1/2 in. x 3/4 in. reducing tee, two 1/2 in. primary branch lines, two 1/2 in. tees, and four 1/2 in. secondary branch lines each connected to one nozzle. See Figure 7.

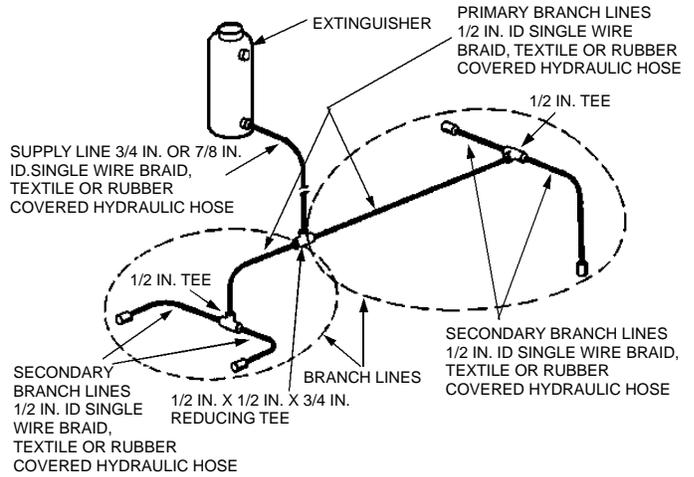


FIGURE 7
003482

Note: On split tee arrangements, if the 1/2 in. secondary branch line tee is not more than 20 hose diameters from the 1/2 x 1/2 x 3/4 in. primary branch line tee, then the orientation of the tees must be perpendicular to each other as they are in a triple tee arrangement.

SIX NOZZLE SYSTEM – Six nozzle systems consist of a 3/4 in. or 7/8 in. supply line, a special three outlet distribution tee, three 1/2 in. primary branch lines, three 1/2 in. tees, and six secondary branch lines each connected to one nozzle. See Figure 8.

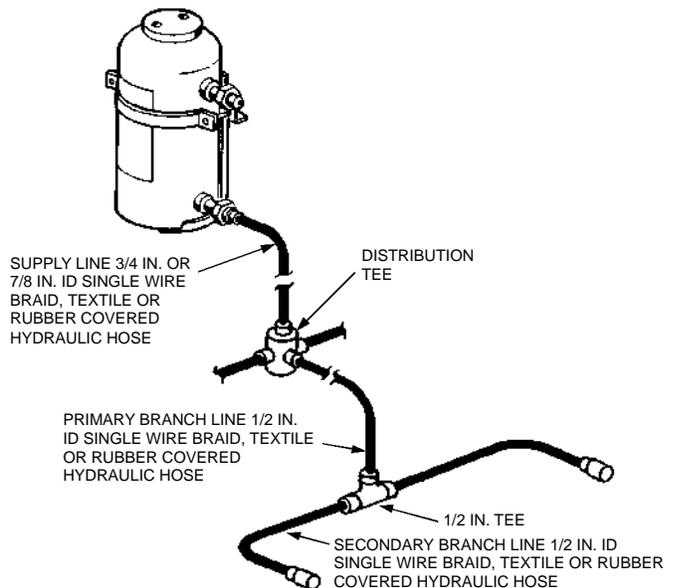


FIGURE 8
003483

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

Depending upon the hazards to be protected and the placement of the system components, a selection can be made from several balanced and unbalanced distribution network arrangements:

- A balanced system must be a distribution network where the linear length of the primary branch line on one side of the primary tee to the secondary tee must be within 10% of the linear length of the other primary branch line from the primary tee to the secondary tee. Also, the linear length of the secondary branch line on one side of the secondary tee must be within 10% of the linear length of the other secondary branch line sharing the same tee. A balanced system can be used with two, four, or six nozzle systems. See Figure 9A.

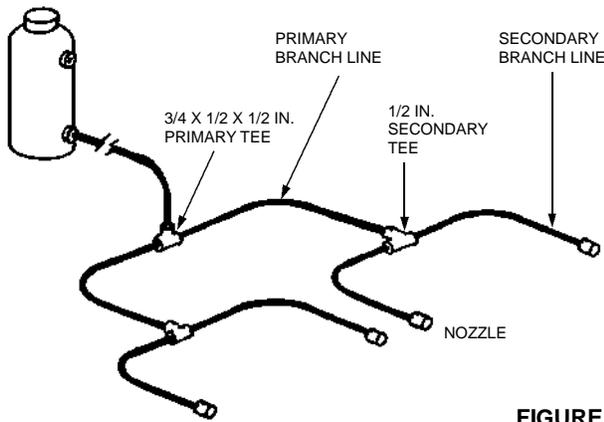


FIGURE 9A
003484

- In an unbalanced system, the longest branch line must be no longer in length than 3 times that of the shortest branch line, with a maximum of 18 ft total (primary plus two secondary branches). See Figure 9B.

6 NOZZLE UNBALANCED DISTRIBUTION TEE

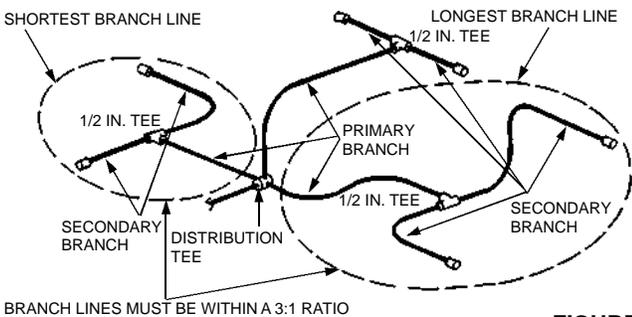


FIGURE 9B
003485

- Unbalanced secondary branch line lengths must also be within a 3 to 1 ratio when they are located in the same branch line. See Figure 9C.

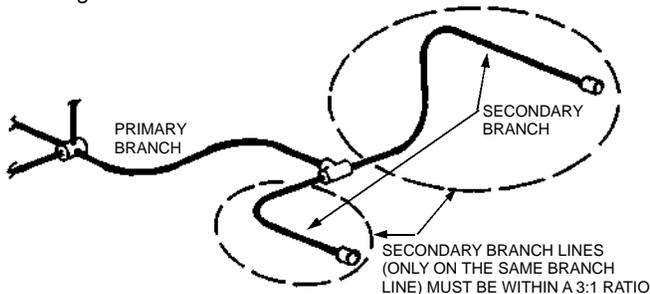


FIGURE 9C
003486

- The ten pound system must be a balanced system having two branch lines within 10% of each other, utilizing one reducing tee and a maximum of two nozzles. See Figure 9D.

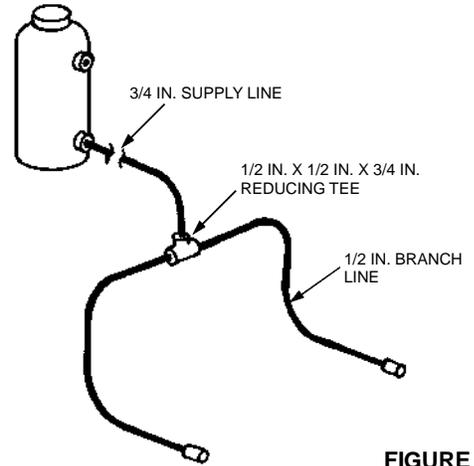


FIGURE 9D
003487

- The twenty and thirty pound systems can be either balanced or unbalanced systems, and can be arranged utilizing three different network combinations. These include the triple tee arrangement which utilizes the triple tee and four nozzles (See Figure 9E), the split tee arrangement utilizing one 3/4 in. x 1/2 in. x 1/2 in. reducing tee, two 1/2 in. tees, and four nozzles (See Figure 9F), and the distribution tee arrangement which utilizes a distribution tee, three 1/2 in. tees, and six nozzles (See Figure 9G).

4 NOZZLE UNBALANCED TRIPLE TEE

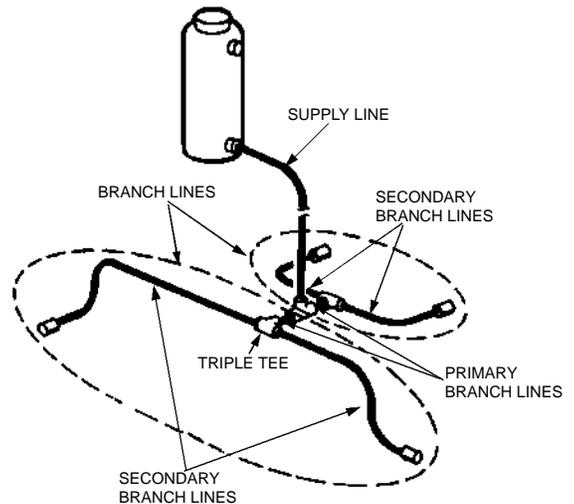


FIGURE 9E
003491

SECTION IV – SYSTEM DESIGN – VEHICLE

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

4 NOZZLE UNBALANCED SPLIT TEE

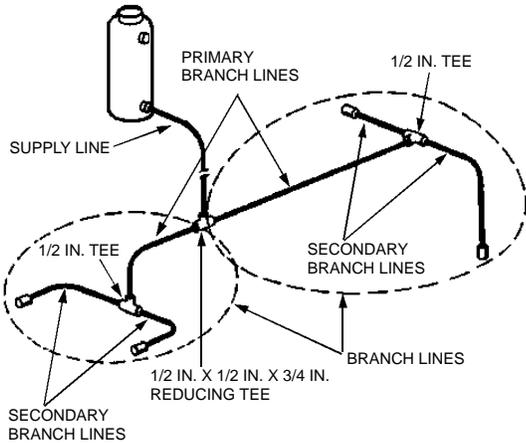


FIGURE 9F
003482

6 NOZZLE UNBALANCED DISTRIBUTION TEE

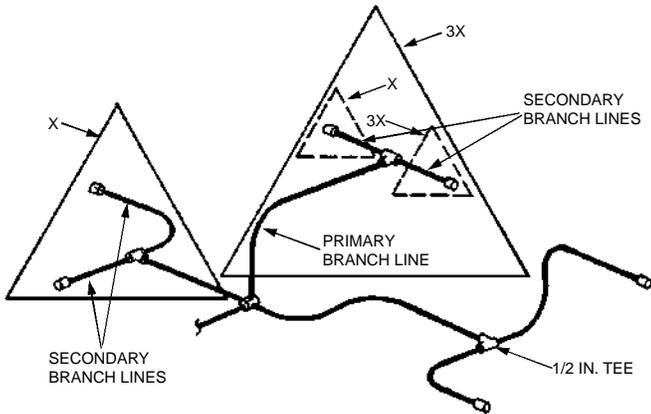


FIGURE 9G
003490

10 lb. 2 Nozzle Balanced System With Reducing Tee
See Figure 10 and 10A.

- Maximum supply line length from extinguisher to reducing tee is 30 ft 0 in. (9.1 m).
- Maximum total length from extinguisher to farthest nozzle is 50 ft 0 in. (15.2 m).
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Two (2) nozzles maximum.
- Maximum unbalanced allowed on the total system is 10% different in length from reducing tee to nozzle on one line compared to the same distance between reducing tee to nozzle on the other line.

Note: See Page 6-5 for fitting and bend limitations.

2 NOZZLE BALANCED WITH REDUCING TEE – 10 LB. SYSTEM

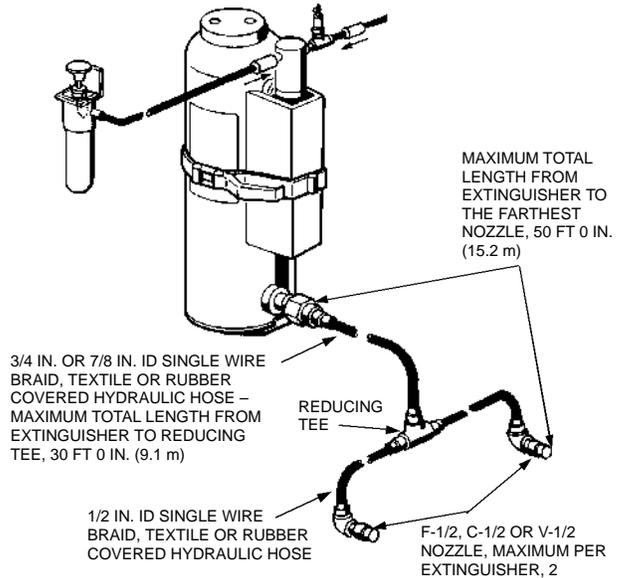


FIGURE 10
003480

EXAMPLES OF TYPICAL 2 NOZZLE SYSTEMS

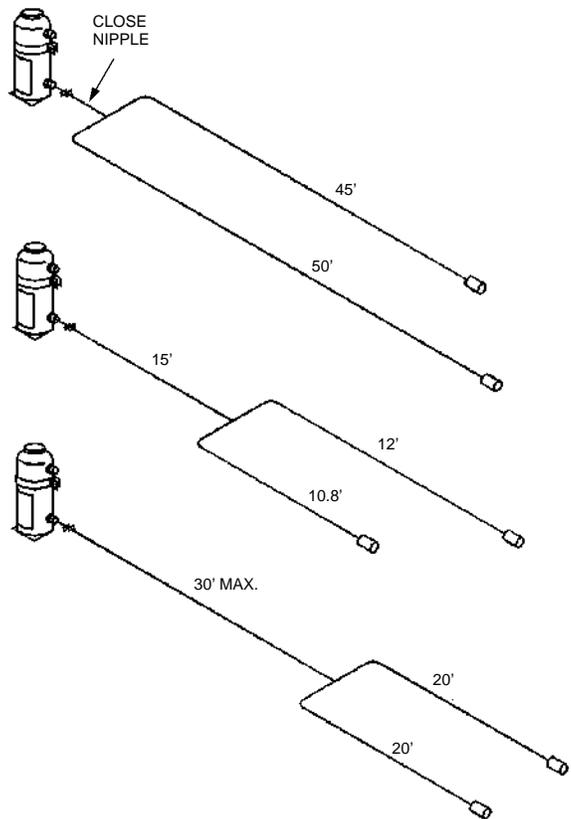


FIGURE 10A
003492

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

20, 30 lb 2 Nozzle Balanced System With Reducing Tee
See Figure 11 and 11A.

- Maximum supply line length from extinguisher to reducing tee is 40 ft 0 in. (12.2 m).
- Maximum total length from extinguisher to farthest nozzle is 50 ft 0 in. (15.2 m).
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Two (2) nozzles maximum.
- Maximum unbalanced allowed on the total system is 10% difference in length from reducing tee to nozzle on one line compared to the same distance between reducing tee to nozzle on the other line.

Note: See Page 6-5 for fitting and bend limitations.

2 NOZZLE BALANCED WITH REDUCING TEE – 20 LB-30 LB SYSTEMS

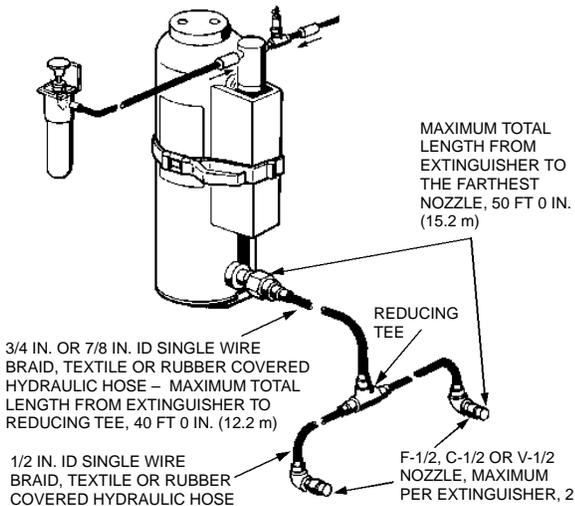


FIGURE 11
003480

EXAMPLES OF TYPICAL 2 NOZZLE SYSTEMS

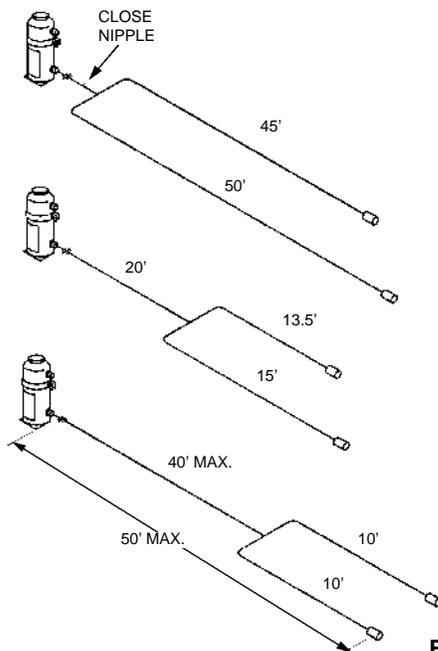


FIGURE 11A
003494

20, 30 lb 4 Nozzle Balanced System With Triple Tee
See Figure 12 and 12A.

- Maximum supply line length from extinguisher to triple tee is 40 ft 0 in. (12.2 m)
- Maximum total length from extinguisher to farthest nozzle is 50 ft 0 in. (15.2 m).
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Four (4) nozzles maximum.
- Maximum unbalanced allowed on the total system is 10% different in length from 1/2 in. tee to nozzle on one line compared to the same distance between the same 1/2 in. tee to nozzle on the other line.

Note: See Page 6-5 for fitting and bend limitations.

4 NOZZLE BALANCED WITH TRIPLE TEE – 20 LB-30 LB SYSTEMS

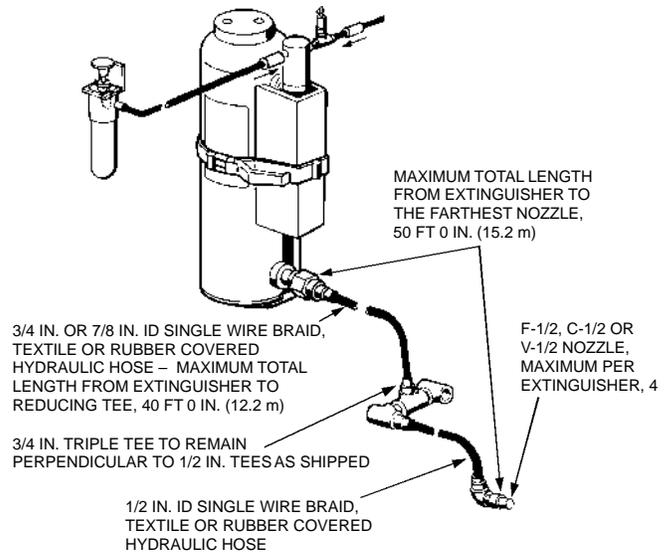


FIGURE 12
003481

EXAMPLES OF TYPICAL 4 NOZZLE SYSTEMS

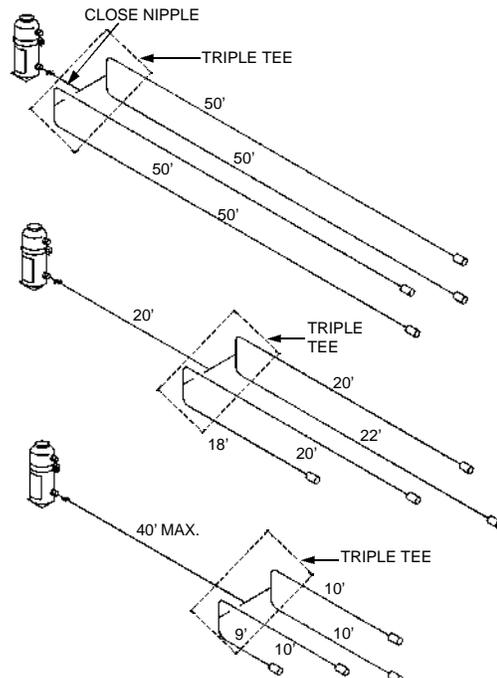


FIGURE 12A
003496

SECTION IV – SYSTEM DESIGN – VEHICLE

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REV. 1

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

20, 30 lb 4 Nozzle Unbalance System With Triple Tee
See Figure 13 and 13A.

- Maximum supply line length from extinguisher to the triple tee is 40 ft 0 in. (12.2 m).
- The longest branch line (including one primary and two secondary) is 18 ft 0 in. (5.5 m) and must not exceed a 3:1 ratio of any other branch line(s).
- The triple tee assembled using close nipples. It must remain in the configuration as shown in Figure 13.
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Four (4) nozzles maximum.
- Secondary branch lines located on the same branch line (sharing the same tee) must not exceed a 3:1 ratio between each other but are not required to be within a 3:1 ratio with secondary branch line located on other branch lines.

Note: See Page 6-5 for fitting and bend limitations.

EXAMPLES OF TYPICAL 4 NOZZLE SYSTEMS

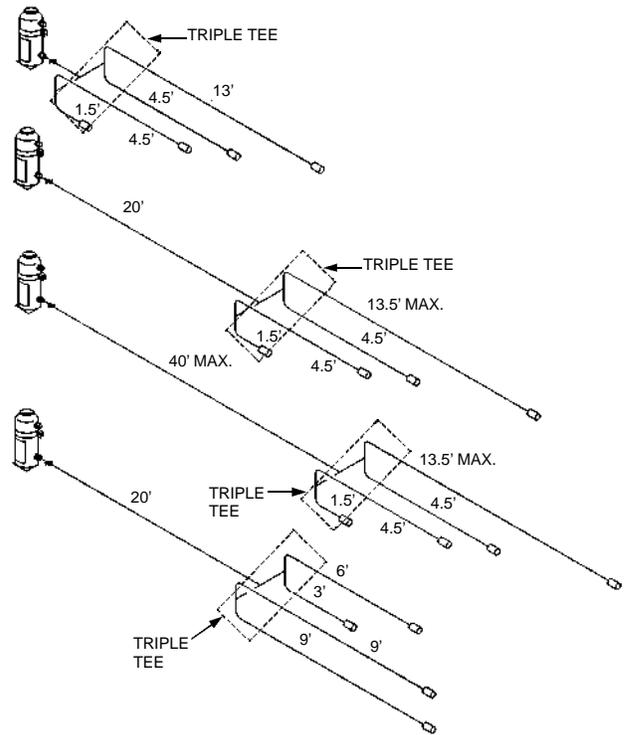


FIGURE 13A
003498

4 NOZZLE UNBALANCED WITH TRIPLE TEE – 20 LB-30 LB SYSTEMS

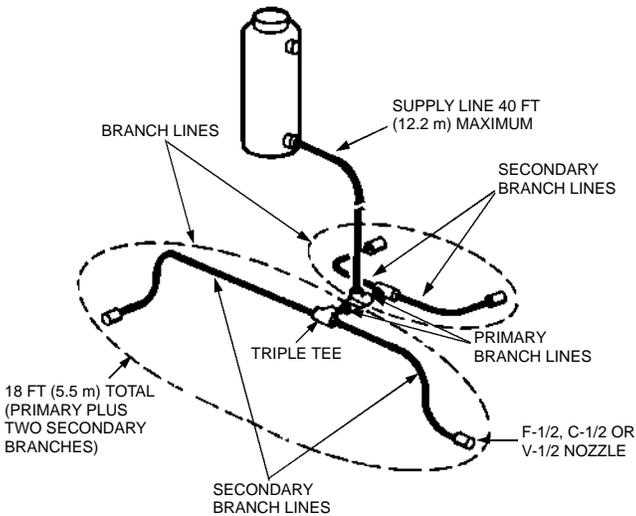
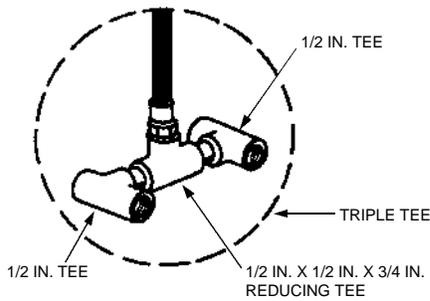


FIGURE 13
003497

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

20, 30 lb 4 Nozzle Balanced System With Reducing Tee
See Figure 14 and 14A.

- Maximum supply line length from extinguisher to triple tee is 40 ft 0 in. (12.2 m).
- Maximum total length from extinguisher to farthest nozzle is 50 ft 0 in. (15.2 m).
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Four (4) nozzles maximum.
- Linear length of the primary branch line on one side of the primary tee to the secondary tee must be within 10% of the linear length of the other primary branch line from the primary tee to the secondary tee.

Also, the linear length of the secondary branch line on one side of the secondary tee must be within 10% of the linear length of the other secondary branch line sharing the same tee.

Note: See Page 6-5 for fitting and bend limitations.

4 NOZZLE BALANCED WITH REDUCING TEE – 20 LB-30 LB SYSTEMS

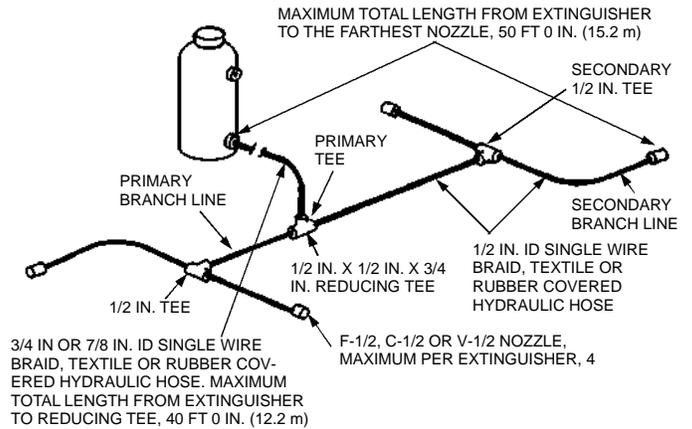
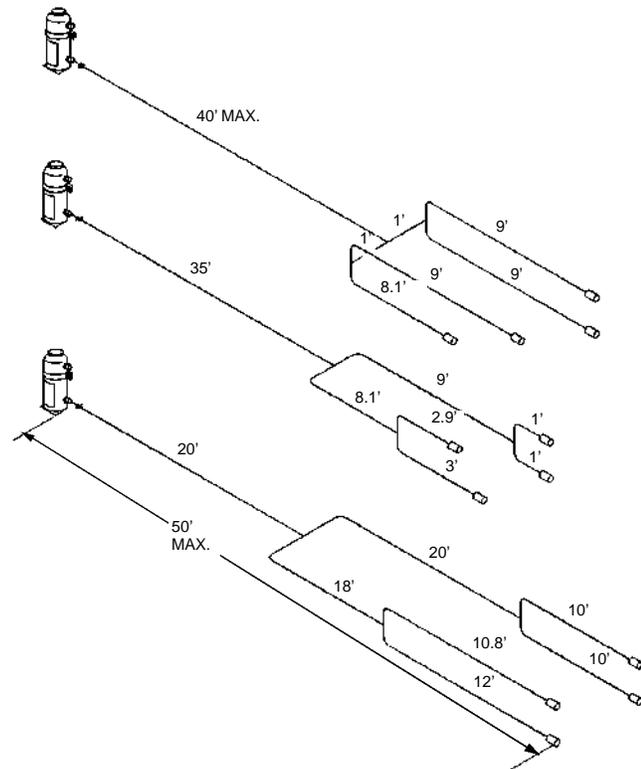


FIGURE 14
003499

EXAMPLES OF TYPICAL 4 NOZZLE SYSTEMS



EXAMPLES OF TYPICAL 4 NOZZLE SYSTEMS

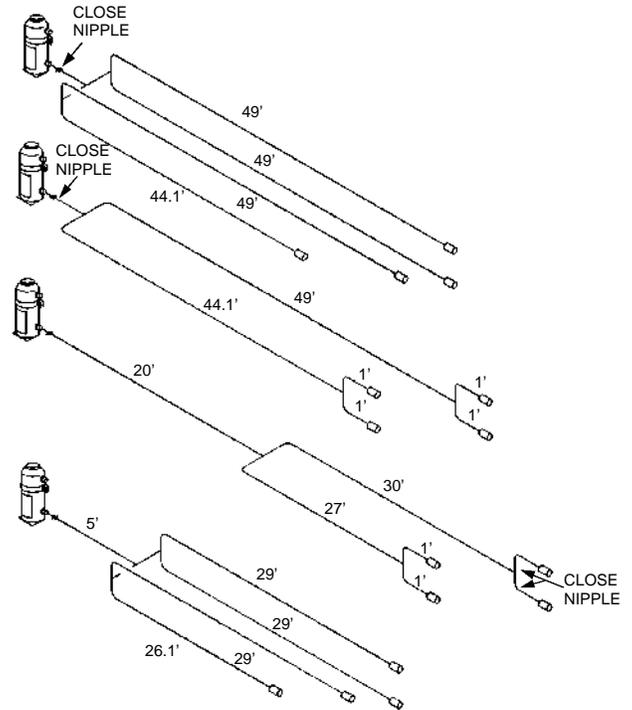


FIGURE 14A
003500

SECTION IV – SYSTEM DESIGN – VEHICLE

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

► **20, 30 lb 4 Nozzle and 6 Nozzle (30 lb only) Unbalanced System With Reducing Tee**
 See Figures 15 and 15A, 16 and 16A.

- Maximum supply line length from extinguisher to the reducing tee is 40 ft 0 in. (12.2 m).
- The longest branch line (including one primary plus two secondary) length is 18 ft 0 in. (5.5 m) and must not exceed a 3:1 ratio of any other branch line(s).
- Two secondary branch lines located on the same branch line (sharing the same tee) must not exceed a 3:1 ratio between other but are not required to be within a 3:1 ratio with secondary branch lines located on other branch line.
- Any combination of F-1/2, C-1/2, or V-1/2 nozzles are acceptable. Four (4) nozzles maximum.

Note: See Page 6-5 for fitting and bend limitations.

4 NOZZLE UNBALANCED WITH TEE REDUCING

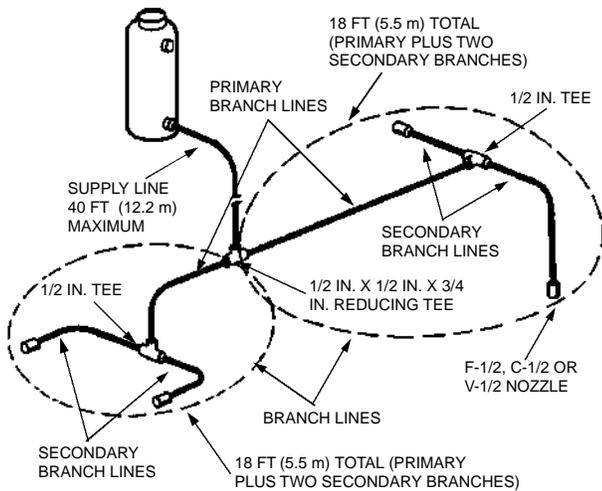


FIGURE 15

003482

EXAMPLE OF TYPICAL 4 NOZZLE SYSTEMS

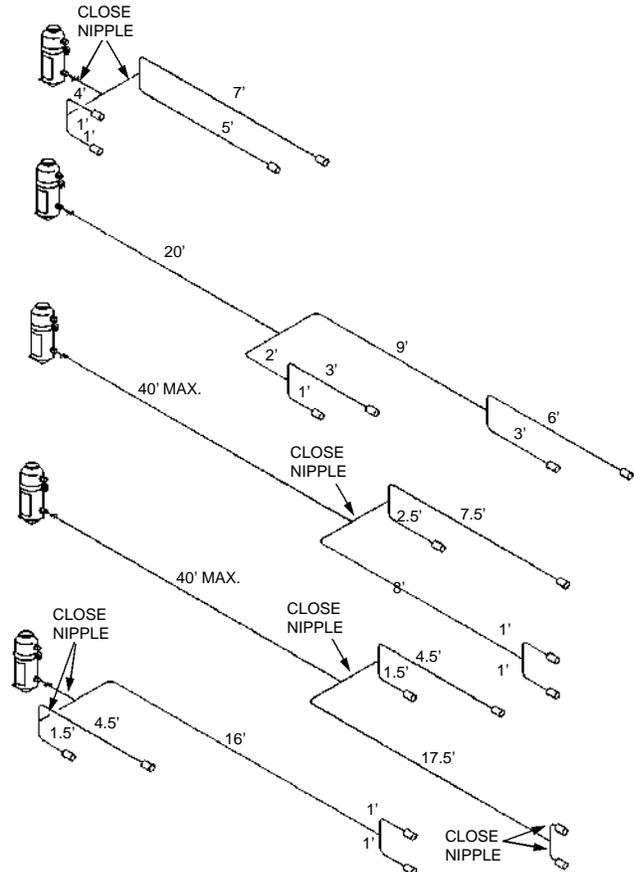


FIGURE 15A

003502

DISTRIBUTION SYSTEM REQUIREMENTS (Continued)

Supply and Branch Line Requirements (Continued)

► 30 lb 6 Nozzle Unbalanced System With Distribution Tee
See Figure 16 and 16A.

► 6 NOZZLE UNBALANCED WITH DISTRIBUTION TEE – 30 LB SYSTEMS

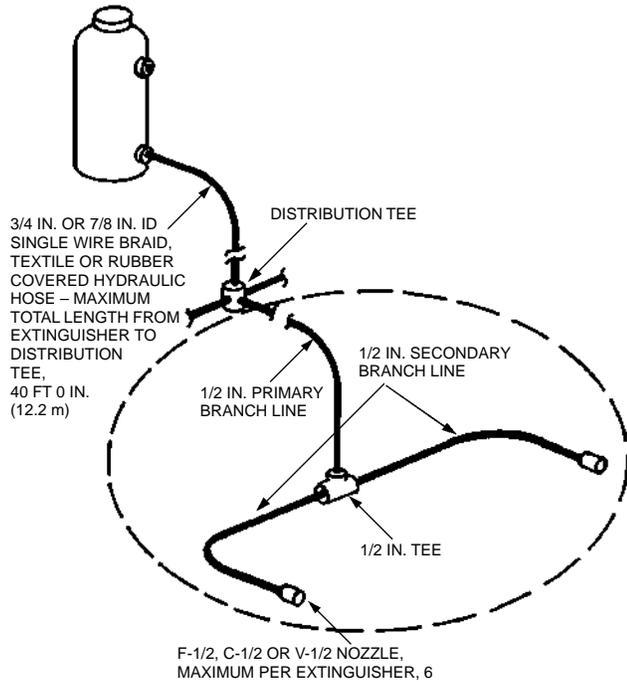


FIGURE 16

003503

EXAMPLE OF TYPICAL 6 NOZZLE SYSTEMS

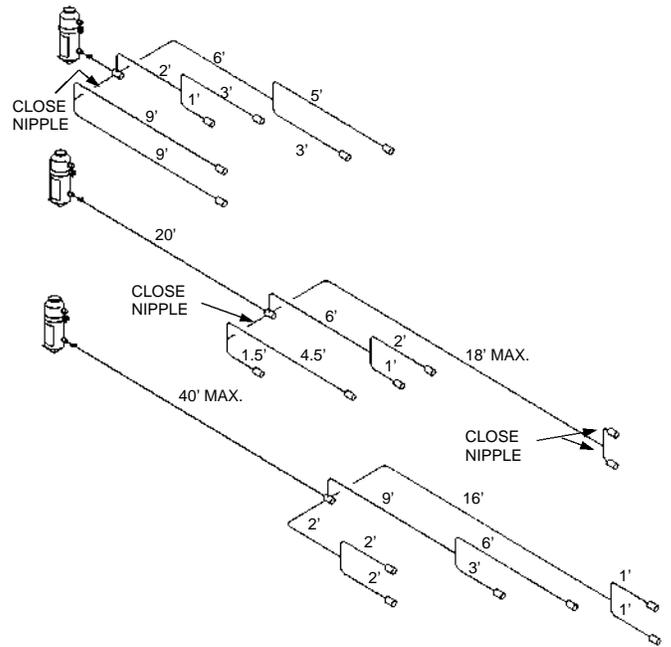


FIGURE 16A

003504

SECTION IV – SYSTEM DESIGN – VEHICLE

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REV. 1

ACTUATION AND EXPELLANT GAS LINE REQUIREMENTS

Actuation Gas Line

The actuation gas line is the line from the manual remote actuators and/or the gas cartridge on the automatic detection system to the gas cartridge actuator located on the last A-101/LT-A-101 tank or the gas cartridge actuator for the last LT or LP style tanks. The maximum number of actuators that can be actuated from a single actuator cartridge is ten (10). The actuation line can be a maximum of 100 ft (30.5 m) when using an LT-10 cartridge. When more than one actuation cartridge is in the system, a 1/4 in. check valve, Part No. 25627, must be installed to prevent the lose of actuation gas from an actuator that may have a cartridge removed. See Figure 17.

Note 1: If only eight (8) or less actuators are used, the actuation line can be extended to 125 ft (38.1 m).

Note 2: The actuation line can also utilize an LT-5 cartridge. When this is done, only eight (8) actuators or less can be used, with a maximum length of 75 ft (22.9 m).

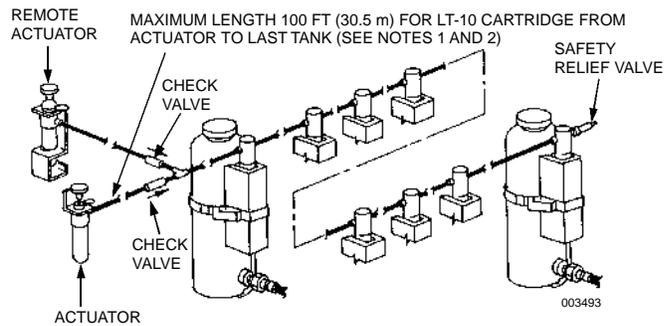
If more than one actuator is in the system, the total length of actuation line allowed from the actuator to the last tank must also include any amount of hose in the other actuation lines up to the check valves located in those lines.

The hose for the actuation system must meet the same specifications as the hose used for the dry chemical distribution network. See Pages 4-2 and 4-3 for hose and fitting specifications.

Expellant Gas Line

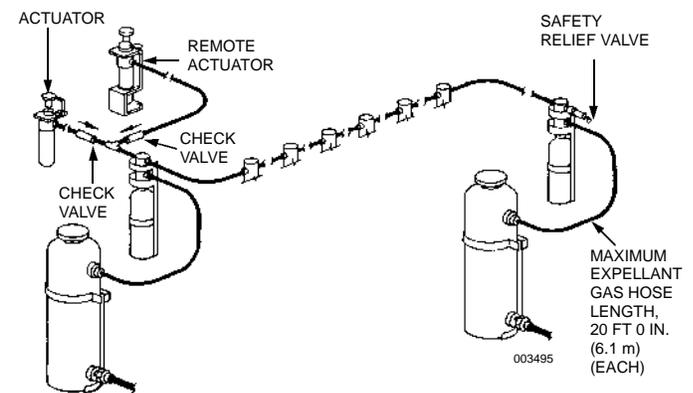
The expellant gas line is the length of 1/4 in. hose located between the remote expellant gas cartridge (required for LT and LP style tanks), and the expellant gas inlet on the tank. The maximum length of this line is 20 ft (6.1 m). See Figure 17.

A-101 SYSTEM



NOTE: A MAXIMUM OF (10) TEN A-101/LT-A-101 SYSTEMS CAN BE ACTUATED SIMULTANEOUSLY IN ANY COMBINATION (I.E., A-101, LT-A-101, LP-A-101, OR LT-LP-A-101) (SEE NOTES 1 AND 2)

LT-A-101 SYSTEM



NOTE: REDUCE THE MAXIMUM ALLOWABLE NUMBER OF BASIC EXTINGUISHING UNITS BY ONE FOR EACH NON-EXTINGUISHING PNEUMATICALLY OPERATED DEVICE EMPLOYED, I.E., BRAKE CONTROL VALVE, FUEL CONTROL AIR CYLINDER.

FIGURE 17

The hose for the expellant gas line must meet the same specifications as the hose used for the dry chemical distribution network. See Pages 4-3 through 4-4 for hose and fitting specifications.

DETECTION SYSTEM REQUIREMENTS

Several types of automatic detection is available for use with the A-101 Fire Suppression System. Three types of electric detection and one type of pneumatic.

See the following Installation Manuals for detailed information on each type of system:

- CHECKFIRE MP-N ELECTRIC SYSTEM – Manual Part No. 427310
- CHECKFIRE SC-N ELECTRIC SYSTEM – Manual Part No. 423522
- CHECKFIRE ELECTRIC SERIES I SYSTEM – Manual Part No. 54894

SHUTDOWN REQUIREMENTS

When protecting any vehicle, especially vehicles with large amounts of hydraulic fluid and fuel on board, the engine must be shut down and hydraulic pumps shut off and lines depressurized. To accomplish this, it is necessary to wire the shutdown of these devices into the CHECKFIRE SC-N Module shutdown relay contacts. A brief description of how this is accomplished is as follows:

Engine Shutdown – Engine shutdown can be accomplished through a normally energized fuel solenoid (supplied by others) which is wired in series with the normally closed “shutdown” relay contacts of the CHECKFIRE SC-N Control Module or in a pressure switch. These “shutdown” relay contacts will operate (open) after the first time delay cycle is complete on the module.

Hydraulic Fluid Tank Air Shut Off and Venting – Solenoid valves (supplied by others) can be connected to air vents of the hydraulic tank. They can be wired to N.O. contacts on a relay (supplied by others). A solenoid (supplied by others), connected to the air supply line, if used, going to the hydraulic tank, can be wired to N.C. contracts of the same relay. The coil to the relay is

wired in series with N.C. pressure switch contacts. The pressure switch is connected to the pneumatic actuation line of the dry chemical system. The relay coil is normally energized. When the pressure switch is activated by pressure in the actuation line, the switch contacts will open. Loss of power or an open circuit will cause the solenoid valves to transfer, thus shutting down the air supply.

Another means available for fuel shutdown is to pneumatically shutdown the fuel rack by venting the hydraulic pressure through the “safety system.” This can be accomplished by installing the ANSUL Engine Shutdown Device, Part No. 427425, in the dry chemical system actuation line. (This is normally only an option on some underground mining applications.) When the ANSUL fire suppression system is actuated, the actuation pressure opens the check valve located in the engine shutdown device, allowing the safety system pressure to bleed into the holding tank. The drop in pressure causes the valves in the fuel rack to close, thus shutting down the engine. See Figure 18.

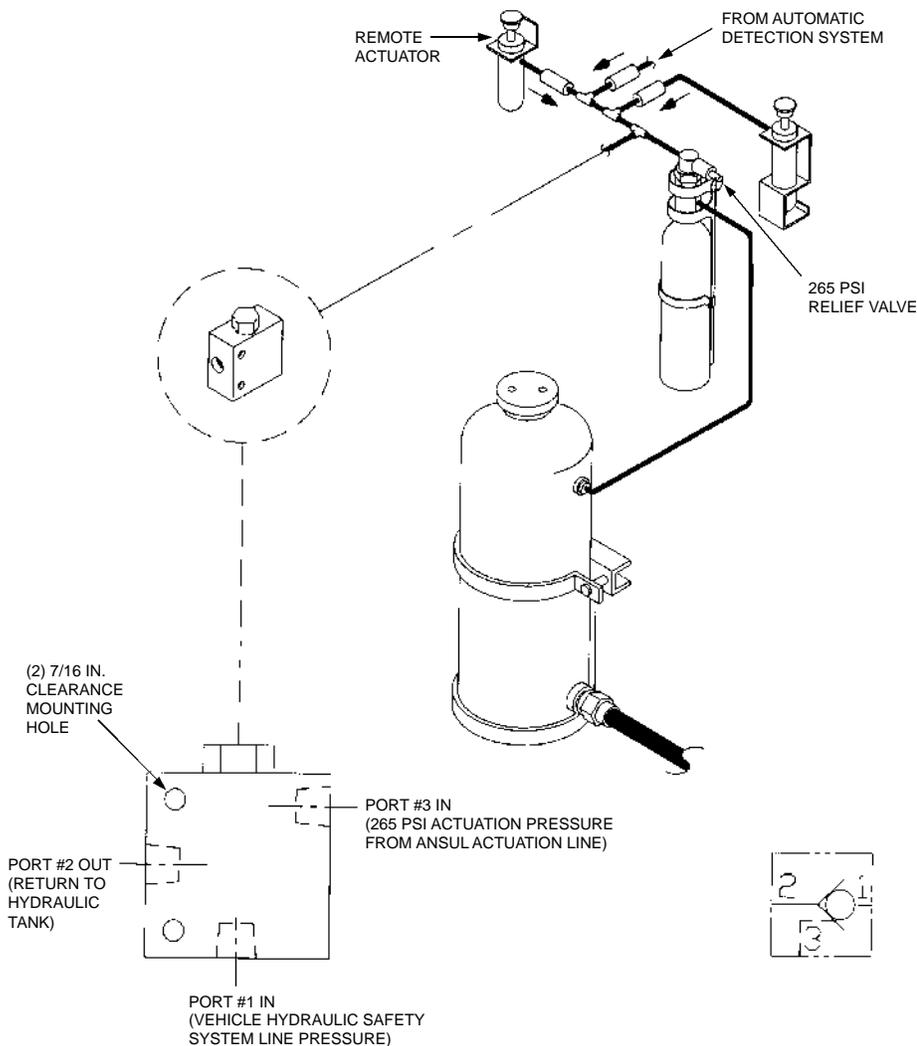


FIGURE 18
004668

ACCESSORIES

Accessories can be added to the pneumatic actuation line to mechanically shut off fuel, electrically shut off engines, and electrically sound alarms.

Air Cylinder

This component is a system accessory whose function is to shut off the fuel supply to the engine when the fire suppression system is actuated.

The fuel shut-off is a spring-return rocker arm on the side of the engine which has a cable link to the vehicle dashboard. The air cylinder rod will tie into this rocker arm, in parallel to, but not interfering with, the operator's cable control. See Figure 19.

NOTE: WHEN USING AN LT-10 CARTRIDGE, AT 125 FT OF HOSE, THE MAXIMUM FORCE AT THE AIR CYLINDER IS 70 LB

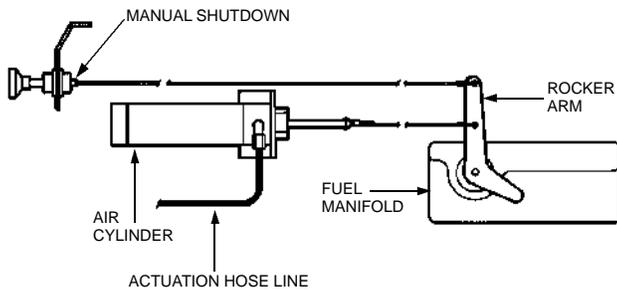


FIGURE 19

003489

Pressure Switch

Two styles of pressure switches are available for various electrical functions:

PRESSURE SWITCH PART NO. 46250 (Weatherproof) – This pressure switch is a single pole, double throw (SPDT) pressure switch constructed with a gasketed, water tight housing. The switch is rated at 10A – 125V, 5A – 250 VAC. This switch is suitable for outdoor applications.

PRESSURE SWITCH PART NO. 8372 (Non-Weatherproof) – This pressure switch is a single pole, double throw (SPDT) pressure switch. It is rated at 15A, 125, 250, or 480 VAC, 1/4 HP at 125 VAC, 1/2 HP at 250 VAC, or 1/2 A at 125 VDC. This switch is not weather-proof and should not be used for outdoor applications.

PRESSURE SWITCH PART NO. 43241 – This pressure switch is a double-pole, double-throw (DPDT) pressure switch. The switch is constructed with an explosion-proof housing suitable for hazardous environments. The switch contacts are rated at 10 amp at 125 VAC or 5 amp at 250 VAC.

Note: When installing pressure switches in the actuation line, the hose running to the switch must always be located downstream of any actuation check valves.

The following are typical industrial type hazards which can be protected by using the total flooding method: flammable liquid storage, dip tanks, solvent cleaning tanks, transformer vaults, quench tanks, and furnace rooms.

HAZARD ANALYSIS

A thorough hazard analysis is required to determine the type and quantity of protection required.

Review each of the following requirements when doing a hazard analysis:

1. Hazard Type

Record the size of the hazard, any obstructions, unclosable openings, size and location of external ductwork or anything else which would concern system performance. Briefly describe the type of hazard being protected. If protecting pre-fabricated booths, record the manufacturer model number and anything unique about the hazard.

2. Hazard Atmosphere

The A-101/LT-A-101 system can be used in most industrial environments. If the hazard atmosphere is considered corrosive, such that the solvents, chemicals, or gases present are damaging to the A-101 system tank or actuators, the hardware should not be located in the hazard. When protecting an area defined as hazardous per NFPA 70 National Electric Code, Article 500, only equipment that has been listed or approved for the hazardous location, may be located in that area.

3. Hazardous Materials

The A-101/LT-A-101 system uses FORAY (ABC) dry chemical as the extinguishing agent. The agent effectiveness and limitation is based on its ability to suppress the fire with the design parameters of the pre-engineered system.

- a. FORAY dry chemical is effective on the following types of fire materials:

Class A – Surface Fires: These fires involve ordinary combustible materials such as cloth, paper, rubber, and many plastics.

Class B – Flammable Liquid and Gas Fires: These fires involve such materials as oils, grease, tars, oil-based paints, lacquers, and gasoline.

Class C – Energized Electrical Equipment Fires: Common Class C devices include control rooms, transformers, oil switches, circuit breakers, rotating equipment, pumps, and motors

- b. FORAY dry chemical is **NOT** effective on the following types of fire materials:

Deep-seated Class A Materials: Deep-seated or burrowing fires in ordinary combustibles where the FORAY dry chemical cannot reach the point of combustion.

Class D – Combustible Metals: Class D type materials are reactive such as sodium, potassium, magnesium, and titanium.

Chemicals Capable of Rapid Oxidation: Chemicals or mixtures of chemicals such as cellulose nitrate.

4. Ventilation Considerations

The hazard ventilation system is very important when considering total flooding application, but should also be considered for local application overhead and tankside.

The ventilation system should be shut down and/or damped before or simultaneously with the start of the A-101/LT-A-101 system discharge.

5. Electrical Considerations

It is recommended that all electrical power sources associated with the protected hazard be shut down before system discharge. This eliminates the potential of a fire being electrically-reignited.

6. Temperature Range

The following temperature ranges must be determined and noted to ensure proper placement and operation of the A-101 system:

Hazard Area: Determine the minimum and maximum temperature of the hazard to be protected. This temperature may be any temperature that the distribution piping and detectors can withstand – only if the agent tank and accessories are located outside of the hazard area.

Agent Tank: The temperature range for all applications is +32 °F to +120 °F (0 °C to +48 °C) for standard type A-101 tanks and –65 °F to +210 °F (–54 °C to +99 °C) for LT-A-101 low temperature type tanks.

DISTRIBUTION SYSTEM REQUIREMENTS

The distribution system for industrial hazards must follow the same requirements as listed for vehicle systems. See Section IV, SYSTEM DESIGN – VEHICLE, for detailed hose requirements for agent distribution and actuation/expellant gas lines.

Exception: For industrial hazards, only F-1/2 nozzles, Part No. 16449, are approved for total flood.

NOZZLE COVERAGE

The only nozzle approved for use with A-101/LT-A-101 industrial total flooding protection is the F-1/2 nozzle.

Single System Capabilities

Model	10 lb	20 lb	30 lb
Total	350 cu ft	700 cu ft	1000 cu ft
	Maximum	Maximum	Maximum
Flooding	(9.9 cu m)	(19.8 cu m)	(28.3 cu m)
	5 ft x 10 ft x 7 ft high (1.5 x 3.0 x 2.1 m)	10 ft x 10 ft x 7 ft high (3.0 x 3.0 x 2.1 m)	10 ft x 10 ft x 10 ft high (3.0 x 3.0 x 3.0 m)
Maximum No. of Nozzles	(2) Two F-1/2	(4) Four F-1/2	(4) Four F-1/2
See Figures 1 through 3 for nozzle layouts.			

SECTION V – SYSTEM DESIGN – INDUSTRIAL

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REV. 1

NOZZLE COVERAGE (Continued)

► 10 LB FIRE SUPPRESSION SYSTEM – TOTAL FLOODING APPLICATION (2 NOZZLES)

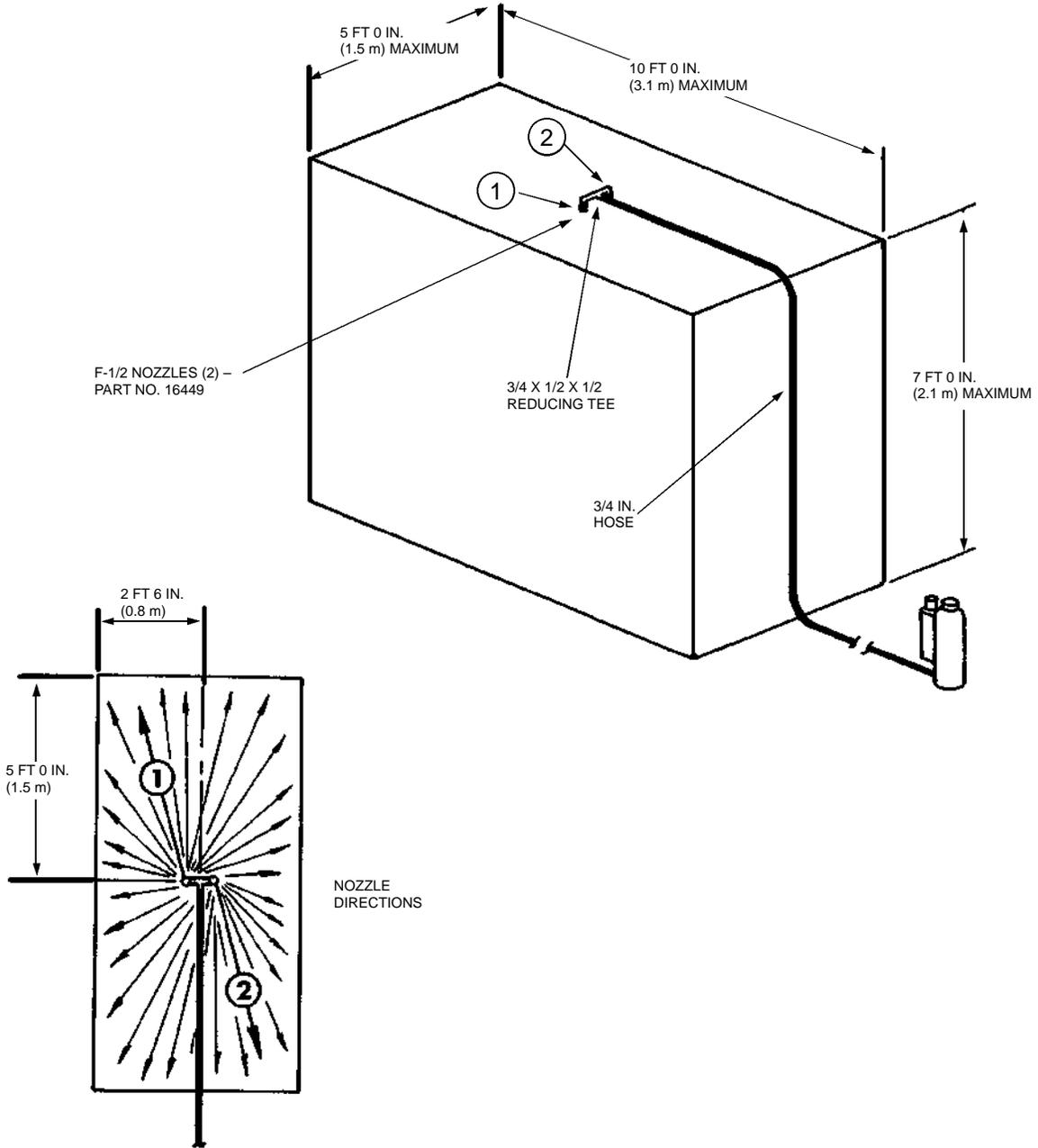


FIGURE 1
003501

Nozzle Coverage (Continued)

► 20 LB FIRE SUPPRESSION SYSTEM – TOTAL FLOODING APPLICATION

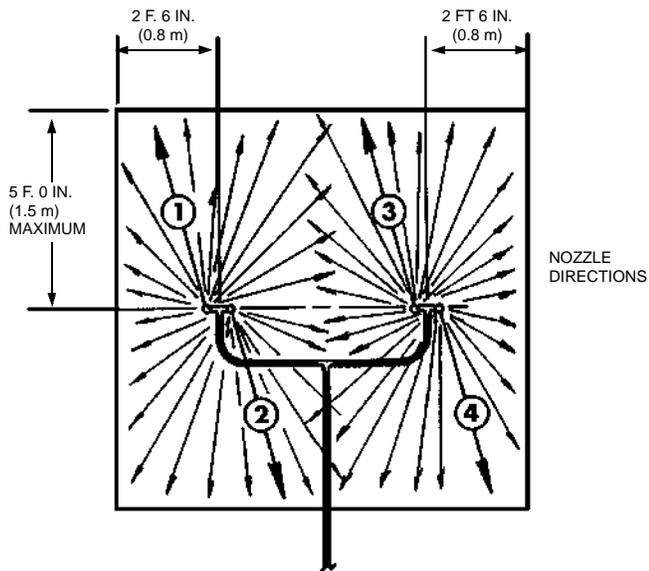
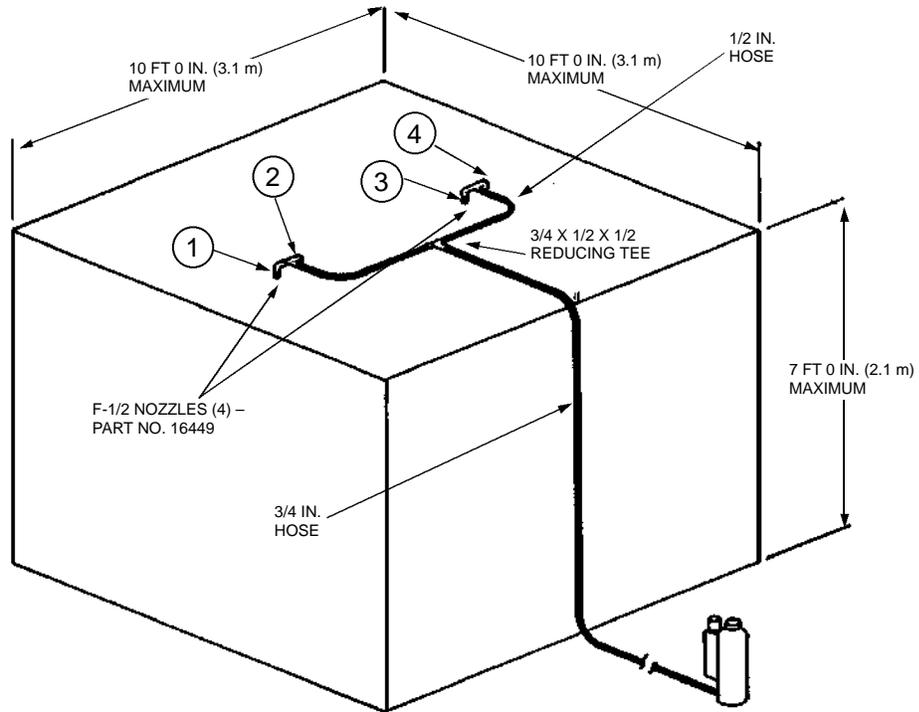


FIGURE 2
003505

SECTION V – SYSTEM DESIGN – INDUSTRIAL

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REV. 1

Nozzle Coverage (Continued)

► 30 LB FIRE SUPPRESSION SYSTEM – TOTAL FLOODING APPLICATION

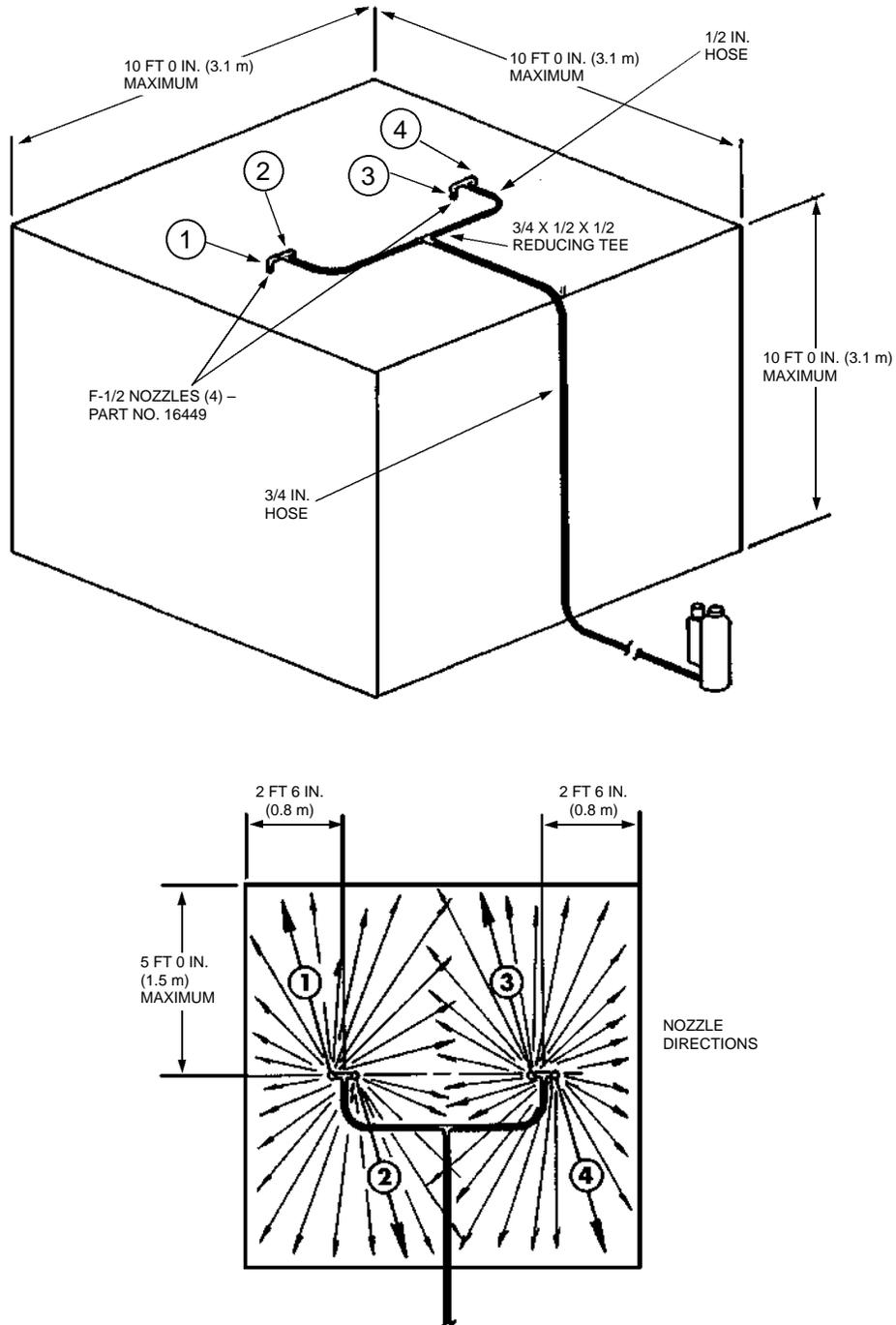


FIGURE 3
003505

► The installation of an ANSUL A-101/LT-A-101 Fire Suppression system is based on the sketch developed in the System Design Section IV.

When deciding on locations for mounting the agent tanks, pneumatic actuators and manual actuators, locate areas where the components will not be abused or will not interfere with vehicle operation. Keep in mind not only the requirements for each individual component, but how the components are connected, and the maximum hose lengths required between each component.

Although the sequence of installation steps may vary with each installation, a basic A-101/LT-A-101 installation consists of four general procedures: mounting the brackets, installing the components, connecting the hoselines, and finally, installing the gas cartridges.

MOUNTING THE BRACKETS

Nozzle Bracket

The first step is to mount the nozzle brackets. Plan to attach nozzle brackets to secure places that will not be subjected to abuse and make sure the locations will not interfere with operator or vehicle functions.

NOTICE

When mounting the nozzle brackets, make certain the mounting surface is rigid and that it is allowed by the vehicle manufacturer to weld or bolt onto that surface.

1. Based on the layout sketch, locate a secure place for mounting the nozzle bracket so that the nozzle will be properly aimed, and weld the bracket to the mounting surface. When welding the bracket, make certain there is enough weld to keep the bracket properly in place. See Figure 1.

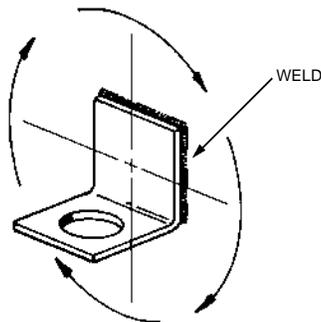


FIGURE 1
003507

If welding is not possible, the bracket can be drilled and bolted to the mounting surface with the appropriate fasteners. Make certain the bolting method does not allow the mounting bracket to rotate out of position or interfere with the nozzle discharge.

Note: A minimum of two bolts are required for proper mounting.

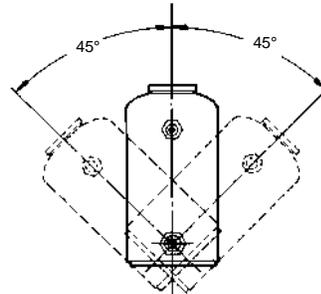
Tank Bracket

NOTICE

The location of the tank must not cause the hose length limitations to be exceeded.

When deciding on a mounting location for the agent tank, locate a rigid area where the tank can be mounted in an upright position. If necessary, the tank can be mounted up to 45° tilted to the left or right of true vertical, or tipped 45° forward from true vertical. The agent tank cannot be tipped backwards. See Figure 2.

Note: The tank must be located in an area that will not exceed temperature limitations or be subject to fire or damage.



NOTE: TANK SHOULD BE MOUNTED IN THE UPRIGHT POSITION SHOWN (SOLID LINES), BUT DISCHARGE WILL NOT BE IMPAIRED IF THE CENTER LINE OF THE MOUNTED TANK DOES NOT EXCEED 45° LEFT OR RIGHT OF TRUE VERTICAL.

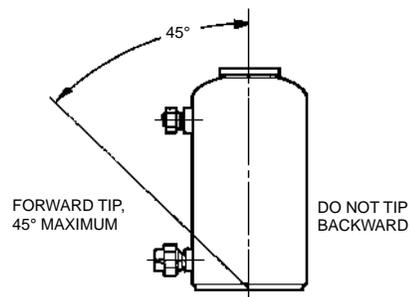
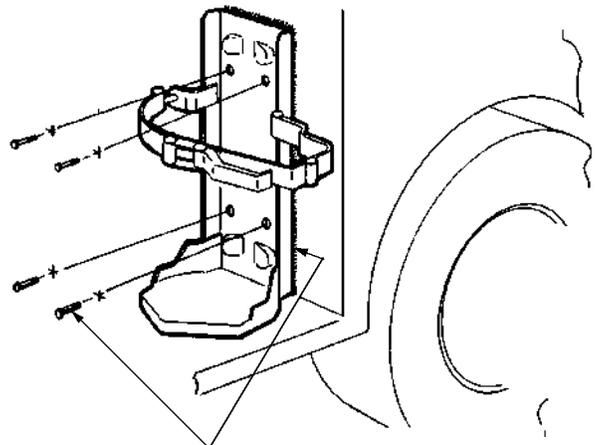


FIGURE 2
003508

1. Remove the agent tank from the bracket and weld the bracket to the mounted surface. The bracket can be secured at the base, at the back, or both, depending on the mounting surface. If the bracket cannot be welded, bolting is acceptable. 7/16 in. mounting holes are provided in the bracket to accommodate 3/8 in. fasteners. See Figure 3. Make certain when mounting the bracket that the clamp arms can swing open wide enough for removal of the tank when required.



BOLT OR WELD EXTINGUISHER TO VEHICLE –
3/8 IN. DIAMETER BOLT REQUIRED

FIGURE 3
003509

SECTION VI – INSTALLATION INSTRUCTIONS

Cartridge Bracket

When installing low temperature or low profile type systems, it is necessary to mount the remote cartridge bracket also. The location of this bracket must be such that the length of 1/4 in. hose between the bracket and the pneumatic inlet on the agent tank does not exceed 20 ft (6.1 m) and the 1/4 in. hose from each remote actuator does not exceed 100 ft (30.5 m) with 10 actuators maximum or 125 ft (38.1 m) with 8 actuators maximum for LT-10 cartridges.

1. Remove the cartridge from the bracket. Locate a rigid, protected surface and weld or bolt the cartridge bracket securely. When bolting the bracket, use 5/16 in. fasteners. Make certain mounting location allows for easy removal of the cartridge when required.

Note The cartridge must be located in an area that will not exceed temperature limitations or be subject to fire or damage.

Remote Actuator Bracket

A remote manual actuator must be located in the drivers compartment within reach of the operator, and a remote manual actuator should be located at a point on the vehicle accessible from ground level. When mounting any actuator, make certain the length of hose between the actuator and the tank or remote expellant gas cartridge does not exceed 100 ft (30.5 m) with 10 actuators maximum or 125 ft (38.1 m) with 8 actuators maximum for LT-10 cartridges or 75 ft (22.9 m) with 8 actuators maximum using an LT-5 cartridge. Also, make certain there is enough room for cartridge removal.

Note: The actuator must be located in an area that will not exceed temperature limitations or be subject to fire or damage. Try to avoid mounting actuator near engine compartment.

1. Choose a suitable mounting location and weld or bolt each actuator bracket in place. If bolting the bracket(s), use 3/8 in. fasteners. If welding, to avoid corrosion, paint welded surface. See Figure 4.
2. If mounting the remote manual actuator in the dashboard of a vehicle, the actuator can be mounted by drilling a 1 5/16 in. (33.3 mm) diameter hole as shown in Figure 4. Make certain there is enough room for the actuator body, cartridge and 1/4 in. actuation line connection under the dash.

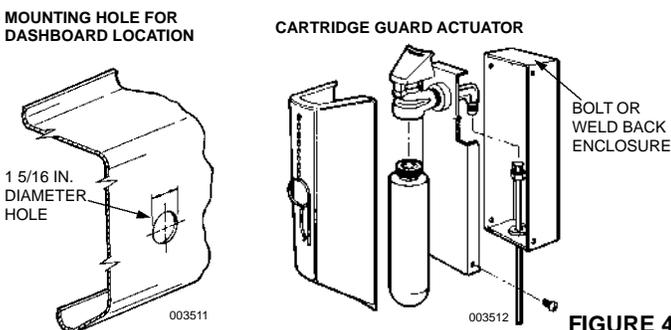
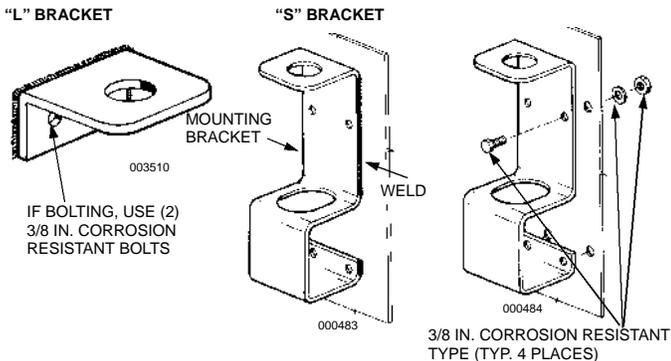


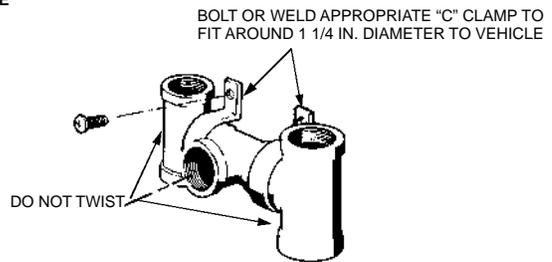
FIGURE 4

MOUNTING THE DISTRIBUTION, REDUCING, AND TRIPLE TEES

Based on the sketch done in the Design Section, locate each tee at a point which will not cause the supply line and branch line lengths to be exceeded.

1. All distribution network fittings must be welded or clamped to the mounting surface. See Figure 5. All welds must be made before any hose has been installed to avoid damage to the hose due to high welding temperatures.
2. When locating tees, make certain the locations do not cause the hose to be exposed to extreme heat or physical abuse.
3. Make certain the end tees on the triple tee are not twisted from their original position. See Figure 5.

TRIPLE TEE



DISTRIBUTION TEE



REDUCING TEE, 1/2 IN. X 1/2 IN. X 3/4 IN.

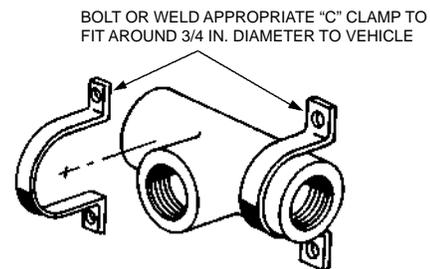


FIGURE 5
003513

INSTALLING THE COMPONENTS

Installing the Tank

1. Check each tank to make certain it is filled to its rated capacity with FORAY dry chemical. Then, re-tighten fill cap.
2. Unscrew the bursting disc union and check that the disc is free from wrinkles, dents or other deformities.
3. Reconnect the bursting disc union. Use a good grade of extreme temperature silicone grease, such as Dow Corning No. 4 or equal, on the male threads to facilitate removal during maintenance.
4. Position the tank(s) in the mounting bracket(s), and secure clamps or retaining bolts.

Installing the Nozzles

1. Refer to this system layout sketch from the Design Section IV. This sketch should give you the information concerning what nozzle to use where and the correct aiming point.
2. Choose the correct nozzle(s) for each hazard area.
3. Install nozzle(s) in bracket by using two lockwashers, and either 1/2 in. elbow(s) or coupling. See Figure 6. **Aim the nozzle correctly and securely tighten.**

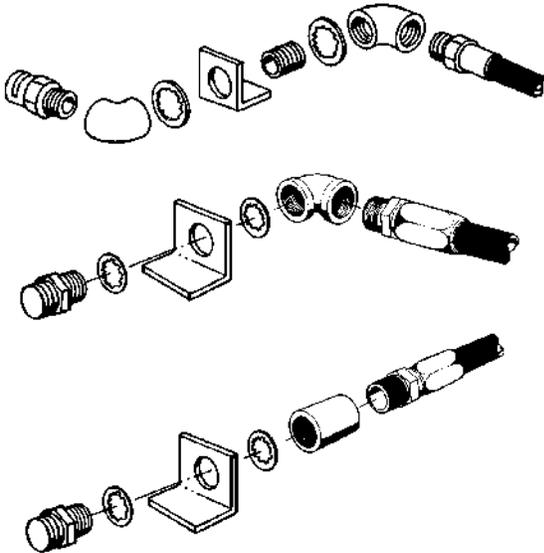


FIGURE 6
003515

4. Either install nozzle blow-off cap(s) or pack nozzle opening(s) with silicone grease to avoid build-up of foreign materials. **Note:** The F-1/2 nozzle is the only nozzle which silicone grease can be used in the opening.

Installing Manual Actuators

- Three types of manual actuators brackets are available for the A-101/LT-A-101 system: "S" bracket, "L" bracket, and cartridge guard. Location of all actuators must be visible and easily reached by operator. Location must not expose actuator to physical abuse. Actuators using the "S" bracket and the cartridge guard type bracket are suitable for both internal and external mounting.
- ▶ The "L" type bracket is not suitable for external mounting and must be installed in a way that will provide protection for the exposed cartridge.

REMOTE MANUAL ACTUATOR WITH "S" BRACKET

1. If not already done, weld or bolt mounting bracket to the selected surface. If welding, to avoid corrosion, paint welded surface. See Figure 4.

NOTICE

Where bolting the mounting bracket is performed, use 3/8 in. (corrosion-resistant) bolts of appropriate length with lockwashers and nuts.

2. Unscrew the RED actuator button from the actuator stem, remove locknut, and slide actuator body through mounting hole on bracket. See Figure 7.
3. Rotate actuator body for desired location of actuation hose outlet connection. Screw locknut firmly onto actuator body and insert ring pin. Apply a non-permanent thread adhesive, such as Locktite 242 or equal, to the RED actuator button threads and then screw button onto the stem. See Figure 7.

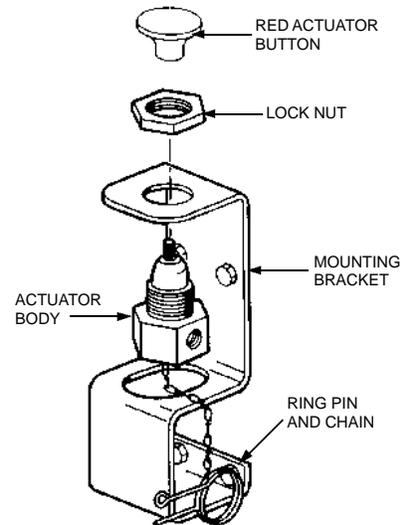


FIGURE 7
000485

SECTION VI – INSTALLATION INSTRUCTIONS

5-15-02 Page 6-4

REV. 2

INSTALLING THE COMPONENTS (Continued)

Installing Manual Actuators (Continued)

4. Affix the appropriate operating nameplate adjacent to the manual actuator so that it is visible to attending personnel. See Figure 8.

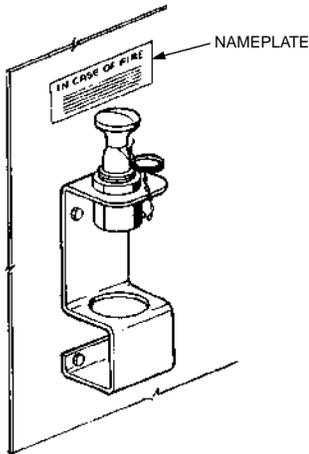


FIGURE 8
000486

5. Make certain ring pin is inserted through the RED actuator button to ensure safe cartridge installation. See Figure 9.
6. Seal ring pin to actuator stem with visual inspection seal, Part No. 197. Make certain visual inspection seal is looped through ring pin and around actuator stem. Do not wrap seal around the boot cover. See Figure 9. **DO NOT INSTALL CARTRIDGE AT THIS TIME.**

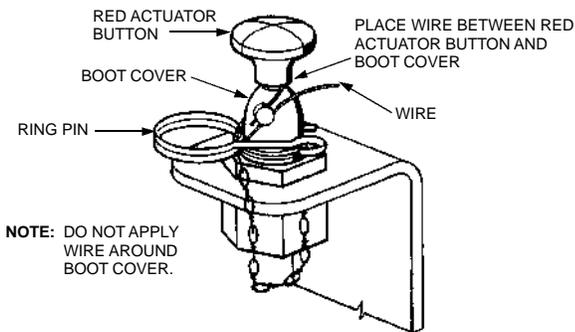


FIGURE 9
000487

REMOTE MANUAL ACTUATOR MOUNTED IN DASHBOARD

1. Punch or drill a 1 5/16 in. (33.3 mm) diameter hole for mounting the actuator body. See Figure 10. Make certain there is enough room under the dash for the actuator body, cartridge, and the 1/4 actuation hose connection.

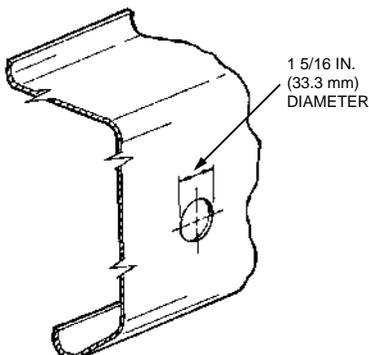


FIGURE 10
003511

2. Unscrew RED actuator button from actuator stem, remove locknut, and slide actuator body through mounting hole. See Figure 11.
3. Rotate actuator body for desired location of actuation hose outlet connection. Screw locknut firmly onto actuator body and insert ring pin. Apply a non-permanent thread adhesive, such as Locktite 242 or equal, to the RED actuator button threads and then screw the button onto the stem. See Figure 11.

NOTICE

The ring pin chain may not be long enough in certain dashboard mounted locations. When this occurs, remove the chain from the drive pin in actuator body and attach it to an appropriate location using either a pop rivet or a sheet metal screw. See Figure 11.

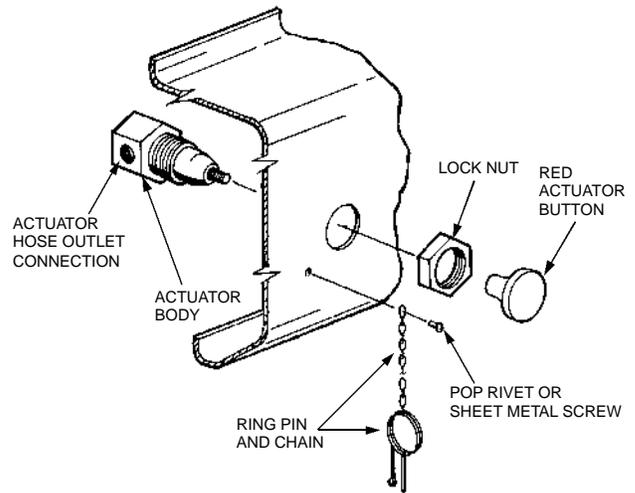


FIGURE 11
003517

4. Affix the appropriate operating nameplate adjacent to the manual actuator and visible for attending operator. See Figure 12.
5. Make certain ring pin is inserted through the RED actuator button to ensure safe cartridge installation. See Figure 12.
6. Seal ring pin to actuator stem with visual inspection seal, Part No. 197. Make certain visual inspection seal is looped through ring pin and around actuator stem. Do not wrap seal around the boot cover. See Figure 12. **DO NOT INSTALL CARTRIDGE AT THIS TIME.**

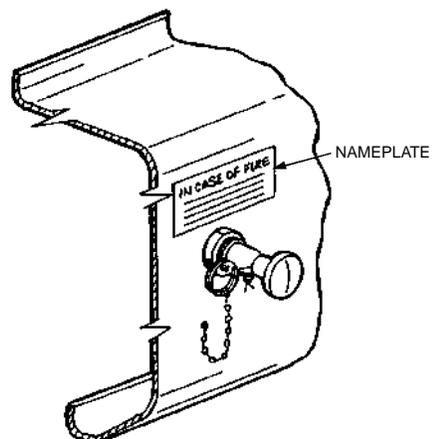


FIGURE 12
003518

INSTALLING THE COMPONENTS (Continued)**Installing Manual Actuators (Continued)**

REMOTE MANUAL ACTUATOR WITH “L” BRACKET

NOTICE

Actuator must be installed in a way that will provide protection for the exposed cartridge from physical damage.

1. If not already done, weld or bolt mounting bracket to the selected surface. If welding, to avoid corrosion, paint welded surface. See Figure 4.

NOTICE

Where bolting the mounting bracket is performed, use 3/8 in. (corrosion-resistant) bolts of appropriate length with lockwashers and nuts.

2. Unscrew the RED actuator button from the actuator stem and slide actuator body through mounting hole on bracket.
3. Rotate actuator body for desired location of actuation hose outlet connection. Screw locknut firmly onto actuator body and insert ring pin. Apply a non-permanent thread adhesive, such as Loctite 242 or equal, to the RED actuator button threads and then screw button onto the stem.
4. Affix the appropriate operating nameplate adjacent to the manual actuator so that it is visible to attending personnel.
5. Make certain ring pin is inserted through the RED actuator button to ensure safe cartridge installation.
6. Seal ring pin to actuator stem with visual inspection seal, Part No. 197. Make certain visual inspection seal is looped through ring pin and around actuator stem. Do not wrap seal around the boot cover. See Figure 9. **DO NOT INSTALL CARTRIDGE AT THIS TIME.**

REMOTE MANUAL ACTUATOR WITH CARTRIDGE GUARD

1. Remove back box from actuator assembly.
2. If not already done, weld or bolt back enclosure to the selected surface. If welding, to avoid corrosion, paint welded surface. See Figure 4.

NOTICE

Where bolting the back enclosure is performed, use 3/8 in. (corrosion-resistant) bolts of appropriate length with lockwashers and nuts.

INSTALLING THE DISTRIBUTION NETWORK**General Requirements**

Refer to the system layout sketch completed in the Design Section IV. Make certain all hose lengths do not exceed the maximum allowed.

When installing the distribution hose, once again remember the following:

1. Make certain the proper type and size of hose is used.
2. In order to obtain equal distribution at a tee, the center opening must be used as an inlet and the opposing openings used as outlets.
3. When any 90° bend or elbow is located in the distribution hoseline preceding a tee, a minimum length of 20 hose diameters is required between the 90° bend and the tee. This length of hose is called a “critical length” and exists only when the 90° bend and the tee lie in the same plane.
4. The use of street elbows is not allowed.
5. Per SAE J1273, “Care must be taken to insure that fluid and ambient temperatures, both static and transient, do not exceed the limitations of the hose. Special care must be taken when routing near hot manifolds.”
6. Use of 90° elbows is allowed if the following requirements are not exceeded:
 - Maximum of 4 elbows from the agent tank to any nozzle
 - Maximum of 2 elbows in a primary branch line
 - Maximum of 2 elbows in a secondary branchline
 - Minimum of 1 elbow from agent tank to a nozzle
7. When bends are formed in the distribution hose, the following minimum bend radius must not be exceeded:

<u>Hose Size</u>	<u>100RI</u>	<u>100R5</u>
1/4 in.	4 in.	3 in.
1/2 in.	7 in.	5 1/2 in.
3/4 in.	9 1/2 in.	—
7/8 in.	11 in.	7 3/8 in.

Note: Minimum bend radius measured to inside of hose radius.

Distribution Hose Installation

1. Starting at the tank outlet, connect the distribution hose from the bursting disc union to the triple, distribution, or reducing tee. Make certain hose is routed in an ordering manner and avoid routing hose through fire hazard areas if possible.
2. After hose has been connected, tighten bursting disc union.
3. Follow the sketch (completed in Hazard Analysis portion of Design Section IV) and complete all hose branch line runs.
4. When connecting the hose to each nozzle, make certain the aiming angle of each nozzle is not disturbed.
5. When routing hose through bulkheads, take precautions to protect the hose from excessive wear due to constant vehicle vibration.
6. When all distribution hose has been routed, make certain all fittings are wrench tightened.
7. Finally, clamp the discharge hose securely at least every five feet using industrial duty cable ties or conduit clamps.
8. When passing through bulkheads or grates, Schedule 40 nipples up to 6 in. in length may be used in the distribution line. (Refer to NFPA17, Section 2-5 (Pipe and Fittings)).

Note: 3/4 in. and 1/2 in. Quik-Seal Adaptors can also be used.

SECTION VI – INSTALLATION INSTRUCTIONS

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REV. 2

INSTALLING ACTUATION AND EXPELLANT GAS LINES

General Requirements

1. Use only 1/4 in. hose for actuation and expellant gas lines when used on mobile or vibrating type of installations. Hose must meet the specifications noted in Design Section, Pages 4-3 through 4-4.
2. On non-mobile or non-vibrating type installations, 1/4 in. pipe is acceptable. Pipe must be 1/4 in. Schedule 40 black iron, hot-dipped galvanized, chrome-plated, or stainless steel pipe and fittings conforming to ASTM A120, A53, or A106. Refer to Design Section for maximum allowable lengths.
3. When using pipe, make certain all ends are carefully reamed and blown clear of chips and scale. Inside of pipe and fittings must be free of oil and dirt.
4. When using pipe, the pipe and fitting connections must be sealed with pipe tape. When applying pipe tape, start at the second male thread and wrap the tape (two turns maximum) clockwise around the threads, away from the pipe opening.

NOTICE

Do not allow tape to overlap the pipe opening, as this could cause possible blockage of the gas pressure. **Thread sealant or compound must not be used.**

5. When passing through bulkheads or grates, up to 6 in. of Schedule 40 pipe may be used in the actuation and/or expellant gas lines. (Refer to NFPA17, Section 2-5 (Pipe and Fittings)). **Note:** 1/4 in. Quik-Seal Adaptors can also be used.
6. Cast iron pipe and fittings are not allowed.
7. Per SAE J1273, "Care must be taken to insure that fluid and ambient temperatures, both static and transient, do not exceed the limitations of the hose. Special care must be taken when routing near hot manifolds."

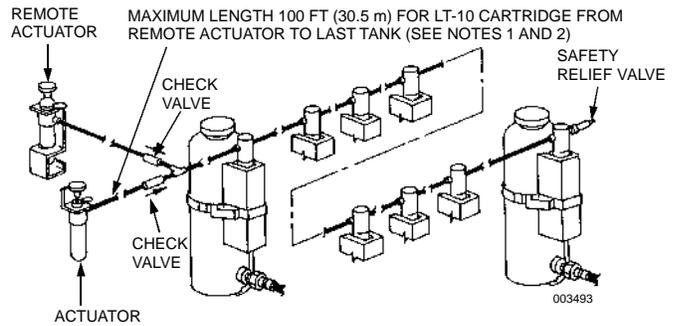
▶ Installing The Actuation Gas line(s) and Pneumatic Actuator(s)

NOTICE

When installing actuation gas lines, teflon tape must be utilized on all male threads. Do not allow tape to overlap the pipe opening, as this could cause possible blockage of the gas pressure. **Thread sealant or compound must not be used.**

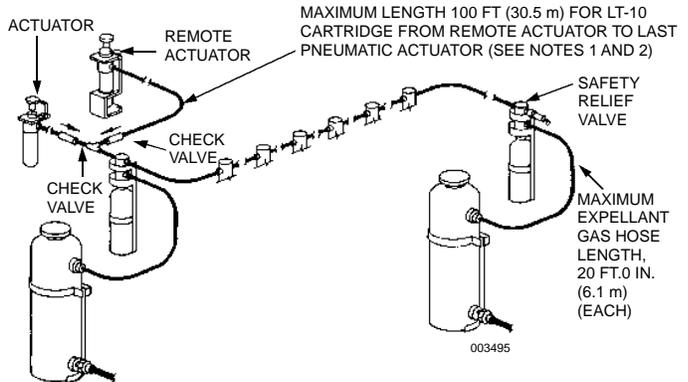
The actuation gas line is the 1/4 in. hose installed from the remote manual/automatic actuator(s) to the pneumatic actuator(s) on the agent tank expellant gas cartridge(s). See Figure 13.

A-101 SYSTEM



NOTE: A MAXIMUM OF (10) TEN A-101 SYSTEMS CAN BE ACTUATED SIMULTANEOUSLY IN ANY COMBINATION (I.E., A-101, LT-A-101, LP-A-101, OR LT-LP-A-101) (SEE NOTES 1 AND 2)

LT-A-101 SYSTEM



NOTE: REDUCE THE MAXIMUM ALLOWABLE NUMBER OF BASIC EXTINGUISHING UNITS BY ONE FOR EACH NON-EXTINGUISHING PNEUMATICALLY OPERATED DEVICE EMPLOYED, I.E., BRAKE CONTROL VALVE, FUEL CONTROL AIR CYLINDER.

FIGURE 13

If more than one remote actuator is in the system, the total length of actuation line allowed from the actuator to the last tank must also include any amount of hose in the other actuation lines up to the check valves located in those lines.

Note 1: If only eight (8) or less actuators are used, the actuation line can be extended to 125 ft (38.1 m) when using an IT-10 nitrogen cartridge.

Note 2: The actuation line can also utilize an LT-5 cartridge. ▶ When this is done, only eight (8) actuators or less can be used, with a maximum length of 75 ft (22.9 m).

INSTALLING ACTUATION AND EXPELLANT GAS LINES (Continued)

Installing The Actuation Gas line(s) and Pneumatic Actuator(s) (Continued)

Complete the installation of all dry chemical actuation lines and components by completing the following:

1. Install all pneumatic actuators as follows:
 - a. When removing actuator from the carton, check pin to make certain it is in the upright position. See Figure 14.

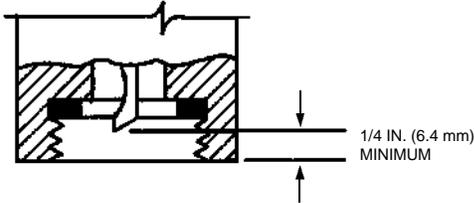


FIGURE 14
004357

- b. Securely hand tighten the pneumatic actuator cartridge body to cartridge.
- c. Position actuator and cartridge assembly into bracket.
- d. Using two wrenches, one on the swivel nut and one on the bottom portion, loosen the swivel nut, and rotate the top portion of the actuator to the correct position to align the two actuation line ports with the incoming and outgoing 1/4 in. actuation line(s).

CAUTION

Each actuator contains two (2) 1/4 in. actuation ports. If both ports are not utilized, the open port must be plugged with a 1/4 in. pipe plug. Failure to plug the port will cause loss of actuation gas pressure upon system actuation.

2. Install required 1/4 in. actuation lines from the remote actuator outlet port to all actuation ports on the upper portion of each pneumatic actuator.
3. Once all lines are securely installed, wrench tighten the swivel nut on the upper portion of each pneumatic actuator.

Installing Expellant Gas Line(s)

The expellant gas line is the 1/4 in. line between the remote expellant gas cartridge and the agent tank. The gas line is only required when the system is using either an LT or LP type tank. See Figure 13.

The maximum length of 1/4 in. expellant gas line is 20 ft (6.1m).

Make certain the hose meets all the requirements as stated in the Design section.

INSTALLING THE DETECTION SYSTEM

When automatic detection is part of the total system design, see the appropriate Design, Installation Manual for detailed Information.

- CHECKFIRE ELECTRIC SERIES I SYSTEM – Manual Part No. 54894
- CHECKFIRE SC-N ELECTRIC SYSTEM – Manual Part No. 423522
- CHECKFIRE MP-N ELECTRIC SYSTEM – Manual Part No. 427310

INSTALLING ACTUATION CARTRIDGES

1. Weigh each manual actuator cartridge to make certain it is within the weight specifications stamped on the cartridge body. This weight check must be performed with the shipping cap removed. Refer to appropriate manual for detailed installation instructions if the system contains an automatic CHECKFIRE Detection System.
2. Check that the puncture pin in each manual actuator is fully retracted so that the pin will not pierce the cartridge seal during installation.
3. Install an LT-10 nitrogen cartridge into each manual actuator and hand tighten firmly.
4. At this time, the cartridge may be installed in the CHECK-FIRE detection system actuator.
5. Finally, document the entire installation with drawing, photographs, and/or written description of the entire vehicle system and store these documents in a permanent file for future reference.

SECTION VI – INSTALLATION INSTRUCTIONS

► 5-15-02 Page 6-8

NOTES:

Inspection is a “quick check” that the system is operable. It is intended to give reasonable assurance that the system is fully charged and will operate. This is done by seeing that the system has not been tampered with and there is no obvious physical damage, or condition, to prevent operation. The value of an inspection lies in the frequency, and thoroughness with which it is conducted.

- ▶ Inspection frequency shall be performed monthly, or sooner,
- ▶ depending on operating and/or environmental conditions.

To provide reasonable assurance that your ANSUL A-101/LT-A-101 system is charged and operable:

1. Note general appearance of system components for mechanical damage or corrosion.
2. Check all hose to make certain it is securely fastened and not cut or show signs of abrasion.
3. Make certain all hose fittings are tight.
4. Make certain the nozzles are correctly aimed, openings are clean and not obstructed and the blow off caps are properly installed. **Note:** Blow off caps must be replaced annually
- ▶ 5. Check nameplate(s) for readability and make certain they are properly attached.
6. The automatic detection system should be inspected as follows: If system is equipped with a CHECKFIRE SC-N or MP-N electric automatic detection system, make certain green “Power” LED is blinking. If system is equipped with a CHECKFIRE Series I, push button on top of module and note illumination of indicator light. If the system is equipped with a CHECKFIRE Series II, push and hold the test/control button momentarily. The internal alarm will sound and the two outside LED’s will flash. If system is equipped with a CHECK-FIRE pneumatic detection system, make certain yellow “Low Pressure” indicator light is not on.
7. Check to make certain hazard size or components being protected have not changed since original installaton.
8. If there are any broken or missing lead and wire seals, or any other deficiency is noted, immediately contact the authorized ANSUL Distributor.
9. Keep a permanent record of each inspection.

SECTION VII – INSPECTION

5-15-96 Page 7-2

NOTES:

Maintenance is a "thorough check" of the system. It is intended to give maximum assurance that the system will operate effectively and safely. It includes a thorough examination and any necessary repair or replacement. It will normally reveal if there is a need for hydrostatic testing of the tank.

Maintenance shall be performed semi-annually or sooner, depending on operating and/or environmental conditions. The fire suppression system including alarms, shutdown and associated equipment shall be thoroughly examined and checked for proper operation by the fire protection manufacturer, authorized distributor or their designee in accordance with this manual.

SEMI-ANNUAL MAINTENANCE

To provide maximum assurance that your ANSUL A-101/LT-A-101 system will operate effectively and safely:

1. Check to see that the hazard has not changed.
2. Remove all cartridges, install safety shipping caps, and put in a safe place for future reinstalling.
3. Note the general appearance of the system components checking for mechanical damage or corrosion, and check that the components are securely fastened and all hose fittings are tight.
4. Check nameplates to make certain they are clean, readable, and properly attached.
5. Remove tank fill cap(s) and check that the agent tank is filled to the proper level with ANSUL FORAY dry chemical. The following table indicates the proper level for each size tank.

Note: This table applies to both A-101 and LT-A-101 tanks. All measurements should be taken from the TOP of the fill opening (top of threaded fill collar).

Tank Size	Maximum Depth of Dry Chemical in. (mm)
101-10	5 1/4 (133)
101-20	6 1/4 (159)
101-20 Low Profile	5 (127)
101-30	7 1/2 (191)

Important: If the depth of dry chemical exceeds the maximum, **do not add additional dry chemical.** Tank(s) must be emptied and refilled with the correct amount of dry chemical as specified in Section IX, RECHARGE.

Check the dry chemical for lumps. If lumps are present, drop one from a height of 4 in. (102 mm) onto a hard surface. If the lump does not break up completely, the dry chemical must be replaced.

6. Inspect threads on fill cap and on tank fill opening for nicks, burrs, or cross-threading.
7. Check fill cap gasket and quad ring for elasticity, cuts, or checking, and lightly coat them with an extreme temperature silicone grease, such as Dow Corning No. 4 or equal.
8. Disconnect sealed bursting disc assembly
9. Examine the disc to ensure that it is not wrinkled, kinked, dented, or deformed in any way and then apply a thin coat of a good grade of extreme temperature silicone grease, such as Dow Corning No. 4 or equal, to the male threads and reconnect the sealed burst disc assembly. **Note:** Before reconnecting, blow all lines clear with dry air or nitrogen.
10. Check that the nozzle openings are not obstructed and that the nozzles are properly aimed and have not rotated out of position.

- ▶ 11. **Make certain each nozzle has a blow-off cap properly installed** (the opening of an F-1/2 nozzle can be packed with an extreme temperature silicone grease, such as Dow Corning No. 4 or equal, to avoid build-up of foreign material) and check that the caps are pliable and free of cuts and checks. **Note: Blow-off caps must be replaced annually.**
- ▶ 12. Unscrew the pneumatic actuator(s) from the cartridge receiver(s) and inspect all threaded areas for nicks, burrs, and cross threads.
- ▶ 13. Clean actuator(s) (Part No. 430221) as follows: (see Figure1)
 - Using two wrenches, one positioned on the swivel nut, and one positioned on the bottom portion of the actuator, loosen the swivel nut and remove the top portion of the actuator.
 - Using a wooden dowel, push pin assembly and spring out of the actuator body.
 - Remove the gasket from inside the cartridge thread port. Inspect, clean, apply a good grade of low temperature grease, such as Dow Corning No. 4, or equal, and reinstall the gasket. Replace if necessary
 - Remove the O-Rings from the pin assembly and swivel adaptor. Inspect, clean, apply a good grade of low temperature grease, such as Dow Corning No. 4, or equal, and reinstall the O-Rings. Replace if necessary.
 - Apply a small amount of grease to the puncture pin shaft. There is a U-Cup guide inside the actuator body and when the pin is reinstalled into the body, the grease on the shaft will lubricate the U-Cup.
 - Clean the inner surface of the actuator body and, using a small diameter wire, clean the vent hole. **Make certain not to scratch the inner surface.**
 - To minimize the potential of moisture or dirt entering the actuator, apply a thin coat of a good grade of extreme temperature silicone grease, such as Dow Corning No. 4 or equal, over the vent hole.
 - Reinstall spring onto puncture pin shaft and insert into actuator body. Push pin down several times to allow grease to coat U-Cup. When positioned back in body, make certain the tip of the pin is above the gasket in the bottom of the actuator.
 - Reinstall the actuator unto the cartridge. Hand tighten.
 - Reinstall swivel adaptor in the correct position for the actuation lines and wrench tighten the swivel nut. Make certain all actuation and expellant lines are properly tightened into the actuator.

SECTION VIII – MAINTENANCE

■ 6-1-07 Page 8-2
REV. 3

SEMI-ANNUAL MAINTENANCE (Continued)

- Secure the assembly into the bracket.

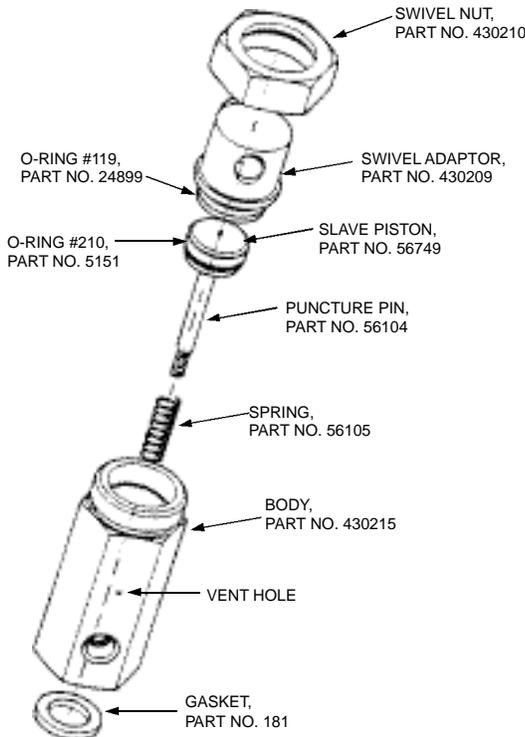


FIGURE 1

006195

14. Weigh the gas cartridge which was removed earlier. It must be $\pm 1/2$ oz. from the weight stamped on the cartridge. Weigh cartridge with shipping cap removed.
15. Hand tighten the cartridge into the actuator.
16. Next, remove the gaskets from the manual remote actuators. Examine them for elasticity, cuts, and check and lubricate them with a light coat of extreme temperature silicone grease, such as Dow Corning No. 4 or equal.
17. Inspect the threaded areas for nicks, burrs, or cross threading and clean them with a stiff bristle brush.
18. Make certain cartridge is removed. Pull the ring pin and operate the manual actuator to test the puncture lever for free movement.
19. Next, remove the puncture pin by disassembling the actuator and examine the pin to ensure it is sharp, straight, free of corrosion.
20. Lubricate the puncture pin O-ring and reassemble the actuator.
21. Insert ring pin and install visual seal, Part No. 197, to each actuator stem.
22. Weigh each actuator cartridge. Weight must be $\pm 1/4$ oz. from weight stamped on cartridge. Weight cartridge with shipping cap removed.
23. Install cartridge into each remote actuator Hand tighten.
24. Refer to appropriate manual for detailed maintenance instructions if the system contains an automatic CHECKFIRE Detection System.
25. After all actuation devices are re-armed, record date of maintenance and inform personnel that the system is back in operation.

12-YEAR MAINTENANCE EXAMINATION

At the 12-year maintenance examination, along with completing the semi-annual maintenance requirements, some A-101 components require hydrostatic testing.

The components requiring hydrostatic testing are:

- Tank – 600 psi (40.8 bar) hydro pressure.
- Actuation hose – 1000 psi (69 bar) hydro pressure
- Cartridges – After properly discharging cartridge, return to ANSUL for hydrotesting

See appropriate hydrotest requirements in NFPA 17, "Standard For Dry Chemical Extinguishing Systems," and Ansul Technical Bulletin No. 50, "Hydrostatic Retest Requirements for ANSUL Portables, Wheeled Units, and Pre-Engineered Vessels," Form No. F-81301.

The first concern in Recharge is to determine the cause of the system discharge and to have the problem corrected before re-arming the fire suppression system.

In the event of system discharge, the vehicle must not be returned to service until the system has been recharged.

The system must be recharged immediately after use. A fire condition could cause damage to the hose and nozzles and possibly support members. Check all hose supports, hose, and all fitting connections. Take the nozzles off, inspect for damage, corrosion, or obstructions, clean and re-install, making certain they are aimed correctly. Blow-off caps must also be replaced.

See Figure 1 when following the recharge steps.

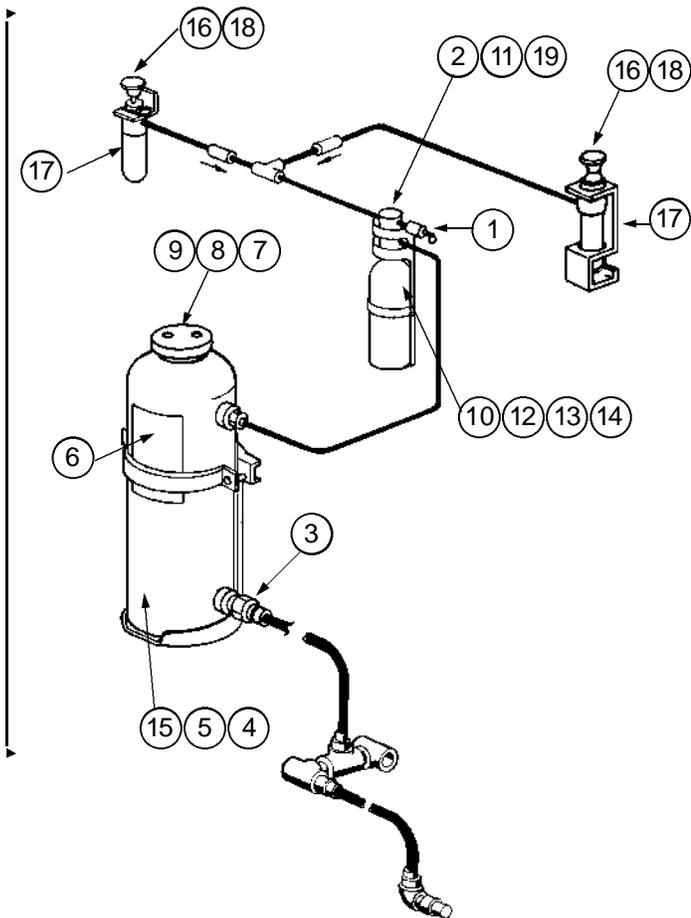


FIGURE 1

003519

1. Pull ring on safety relief valve to relieve actuation pressure.
2. Disconnect actuation system hose at cartridge receiver/actuation assembly.
3. Open sealed burst disc assembly.
4. Remove dry chemical tank from its bracket.
5. Replace ruptured sealed burst disc assembly. Remove used sealed disc assembly from tank outlet. Clean tank threads. Apply a non-permanent thread sealant or Teflon tape to male threads on new sealed burst disc assembly. Install to tank outlet. Wrench tighten. **Note:** Before reconnecting, blow all lines clear with dry air or nitrogen.

6. Remove the tank fill cap, discard any remaining dry chemical, and fill each tank to its rated capacity with ANSUL FORAY dry chemical.

Fill Weight and Tolerance

Tank Size	Amount of Recharge
101-10	8.5 lb +1/-0 (3.9 kg +.5/-0)
101-20	17.0 lb +1/-0 (7.7 kg +.5/-0)
101-30	25.0 lb +1/-0 (11.3 kg +.5/-0)

7. Check inside of tank for any signs of corrosion. Check for any signs of moisture and/or chemical caking. Make certain gas tube and rubber check are securely in place.
8. Before securing the fill cap, brush the dry chemical from the threads on the fill cap and tank, and clean the gasket seating surface on the tank opening. Coat the gasket lightly with a good grade of extreme temperature silicone grease, such as Dow Corning No. 4 or equal.
9. Secure the fill cap, hand tighten.
10. Loosen the bolts on the expellant gas cartridge bracket or remove the cartridge guard on the tank.
11. Unscrew and remove the empty expellant gas cartridge.
12. Disassemble and clean the cartridge actuator by following the instructions stated in Step No. 13, Section VIII – Maintenance.

13. Install new cartridge per the following chart. Before installing, weigh cartridge to determine if it is within specifications stamped on the cartridge. Weigh cartridge with shipping cap removed.

Type of System	Cartridge Part No.
A-101-10	15850 (DOT) 423439 (TC/DOT)
LT-A-101-10	423429 (TC/DOT)
A-101-20	423441 (TC/DOT)
LT-A-101-20	423435 (TC/DOT)
LT-LP-A-101-20	423435 (TC/DOT)
A-101-30	423443 (TC/DOT)
LT-A-101-30	423491 (TC/DOT)

14. Re-install cartridge guard or retaining bolts on cartridge bracket.
15. Return tank(s) to its bracket, reconnect sealed burst disc assembly to distribution hose, and tighten securely.
16. Depending on the type of manual actuator, either pull up the red button or pull up the puncture lever.
17. Remove spent cartridge. Weigh fully charged LT-10 cartridge. Make certain cartridge is within +/- 1/4 oz. (7.1 g) from weight stamped on cartridge. Install cartridge.

NOTICE

If automatic detection system was used, refer to appropriate Installation, Recharge Manual for detailed recharge instructions.

18. Insert ring pin in actuator stem and seal with visual seal, Part No. 197.
19. Reconnect actuation and, if necessary, expellant gas hose. Wrench tighten.
20. Notify operating personnel that the suppression system is back in service and record date of recharge.

SECTION IX – RECHARGE

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NOTES:

In order to help understand the design process, the following example hazards are covered in this section. There may be different design approaches that can be taken for each hazard, but the examples are only intended to show the typical areas requiring protection and the number of nozzles and tanks required. They will give the designer an idea of what to look for on these types of vehicles. Also, refer to appropriate CHECKFIRE Design, Installation manual for detailed information concerning detection system requirements.

NOTICE

These are conceptual drawings. They were prepared from information provided through vendor's sales literature to assist field installations. The fire suppression system illustrated constitutes nominal hardware requirements. The detection system has not been shown for the purpose of clarity. The final system design must consider other potential ignition and fuel source areas not in the vendor's literature, meaning a pre-installation in-depth analysis of all likely areas of probable fire incident.

Nozzle No. 3 and 4 – Located to provide protection for the sides of the engine. Each is mounted on the side of the engine compartment in front and aimed toward the rear and center to completely cover the engine sides.

Nozzle No. 5 and 6 – Located at the top of the engine compartment toward each side. Each is positioned to discharge toward the rear and center of the engine and the turbocharger.

Nozzle No. 7 – Located under the operator's compartment toward one side and aimed to discharge across the pan area. In addition to the pan, its discharge will protect the parking brake disc.

Nozzle No. 8 – Located under the operator's compartment but is positioned to discharge dry chemical on the hydraulic lines in the compartment. It is oriented so a portion of its discharge will pass through the front bulkhead to protect the hydraulic lines leading to the front bucket.

► **Note:** Larger front end loaders will require additional protection.

► FRONT END LOADER (TYPICAL 2 TANK DESIGN)

Nozzle No. 1 and 2 – Located toward the lower rear of the engine compartment and are aimed forward and toward the center. They are positioned to provide complete coverage of the entire pan area.

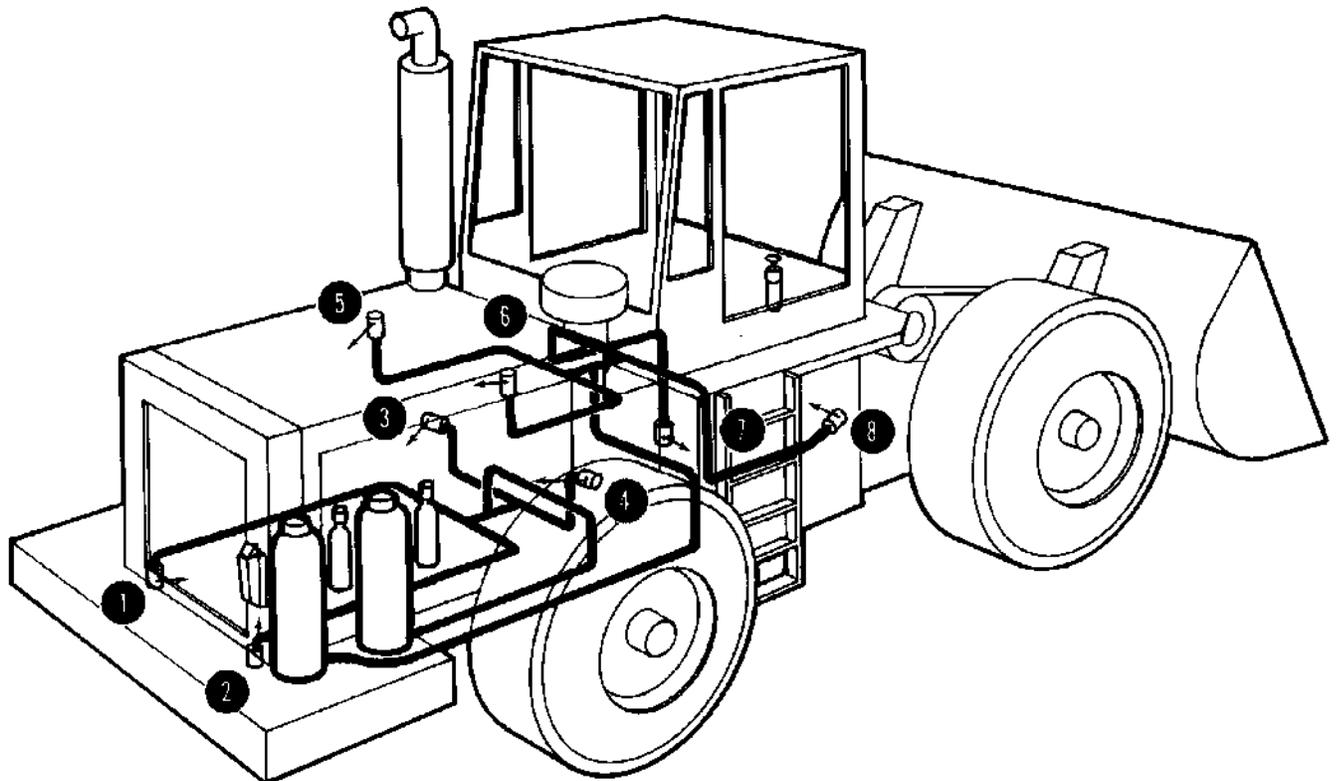


FIGURE 1

003520

SECTION X – SYSTEM APPLICATION OPTIONS

► DOZER (TYPICAL 3 TANK DESIGN)

Nozzle No. 1 (N1) – Locate (1) C 1/2 nozzle to discharge dry chemical into the engine pan from front to back.

Nozzle No. 2 (N2) – Locate (1) V 1/2 nozzle to discharge dry chemical diagonally over the top of the engine.

Nozzle No. 3 (N3) – Locate (1) V 1/2 nozzle to discharge dry chemical screening right side of engine under exhaust manifold.

Nozzle No. 4 (N4) – Locate (1) V 1/2 nozzle to discharge dry chemical screening left side of engine under exhaust manifold.

Nozzle No. 5 (N5) – Locate (1) C 1/2 nozzle to discharge dry chemical onto the side of engine diagonally from top to bottom.

Nozzle No. 6 (N6) – Locate (1) V 1/2 nozzle to discharge dry chemical diagonally over the top of the engine.

Nozzle No. 7 (N7) – Locate (1) V 1/2 nozzle to discharge dry chemical across front of engine from top to bottom.

Nozzle No. 8 (N8) – Locate (1) C 1/2 nozzle to discharge dry chemical onto the side of engine diagonally from top to bottom.

Nozzle No. 9 and 12 (N9 and N12) – Locate (2) V 1/2 nozzles back to back to discharge dry chemical screening hydraulic lines and top of transmission, discharging from center to right and left sides.

Nozzle No. 10 (N10) – Locate (1) C 1/2 nozzle to discharge dry chemical into the belly pan and bottom of the transmission.

Nozzle No. 11 (N11) – Locate (1) V 1/2 nozzle to discharge dry chemical over the top of the transmission from back to front screening opening under cab and rear end.

► NOTE: Larger dozers may require additional protection.

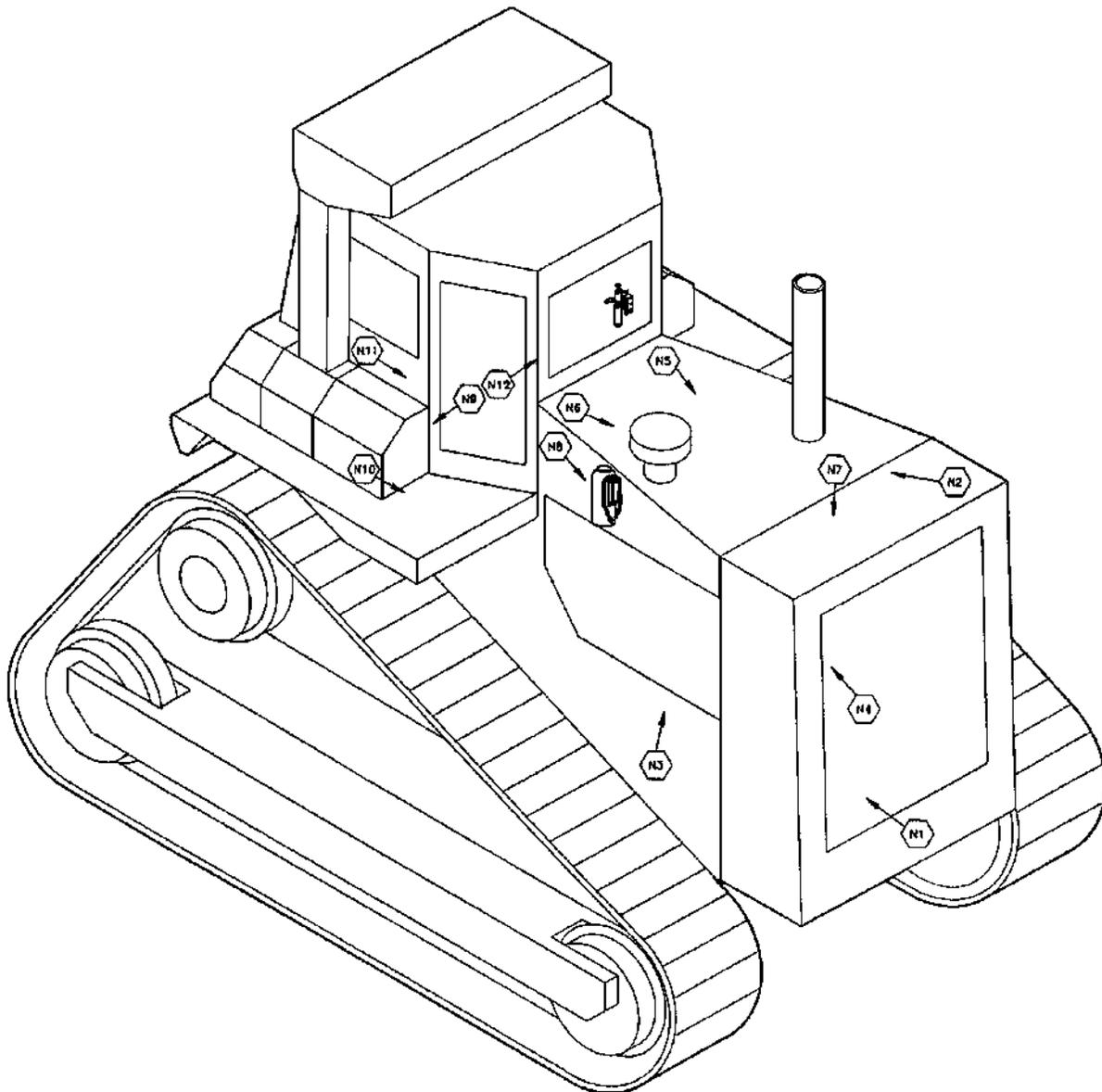


FIGURE 2

► TRANSIT BUS (TYPICAL 1 TANK DESIGN)

Nozzle No. 1 (N1) – Locate (1) V 1/2 nozzle at upper left rear end of engine compartment aimed to discharge diagonally across engine rear from top left to bottom rear protecting front of engine and pump filters.

Nozzle No. 2 (N2) – Locate (1) V 1/2 nozzle at top rear aimed at center to discharge horizontally across engine top and turbo charger.

Nozzle No. 3 (N3) – Locate (1) V 1/2 nozzle on left side of engine midway from front to back aimed from rear at an angle to discharge across rear left side of engine, back of engine, and hydraulic lines protecting the generator as well as discharging into transmission area.

Nozzle No. 4 (N4) – Locate (1) V 1/2 nozzle at right side of engine midway from front to back aimed from rear to discharge across steering pump and air compressor at engine front.

Nozzle No. 5 (N5) – Locate (1) V 1/2 nozzle at right side of engine between engine and bus right side aimed from back to front to discharge horizontally across battery connections and hydraulic reservoir.

Nozzle No. 6 (N6) – Locate (1) V 1/2 nozzle midway up at right side of engine rear aimed from back to front to screen right side of engine and starter.

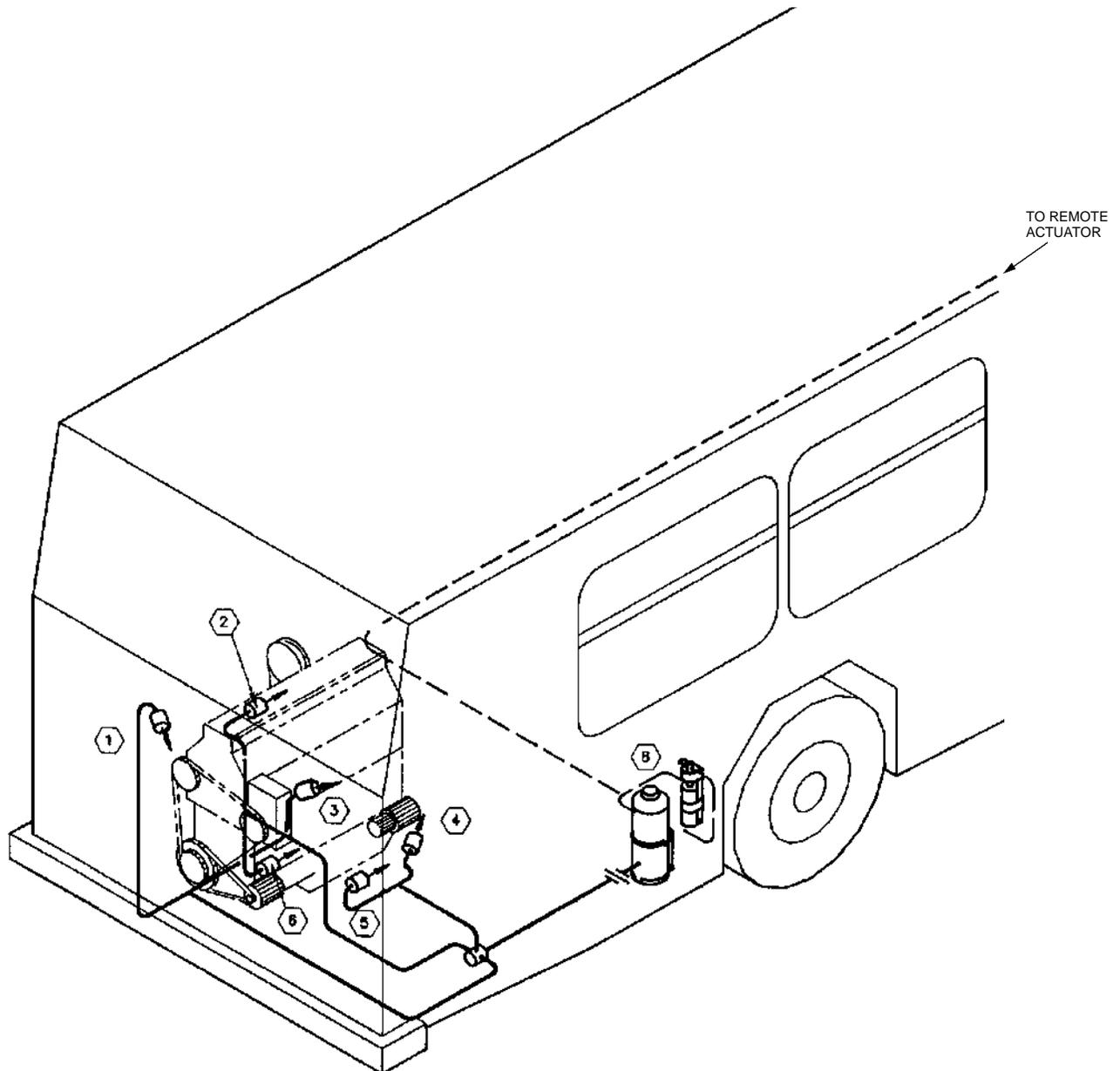


FIGURE 3

003522

SECTION X – SYSTEM APPLICATION OPTIONS

► **LANDFILL COMPACTOR (TYPICAL 3 TANK DESIGN)**

Nozzle No. 1 and 12 (N1 and N12) – Locate (2) V 1/2 nozzles to discharge dry chemical under engine in the pan area.

Nozzle No. 2 and 3 (N2 and N3) – Locate (2) V 1/2 nozzles at each side of engine at bottom attached to engine mount-gusset, aimed up to screen engine sides.

Nozzle No. 4 (N4) – Locate (1) V 1/2 nozzle at top middle of engine compartment, in front aimed down at 45° angle, discharging vertically onto center of engine front and top.

Nozzle No. 5 (N5) – Locate (1) V 1/2 nozzle to discharge dry chemical from top left rear of engine compartment onto engine top and turbo.

Nozzle No. 6 and 7 (N6 and N7) – Locate (2) V 1/2 nozzles to discharge dry chemical from front of machine, 1/2 way up in transmission area aimed back at engine screening transmission sides and discharging into bottom of pan area with a vertical discharge pattern.

Nozzle No. 8 and 9 (N8 and N9) – Locate (2) V 1/2 nozzles to discharge dry chemical from top of transmission area aimed to discharge horizontally from rear of compartment to front of transmission top and also under cab area.

Nozzle No. 10 (N10) – Locate (1) V 1/2 nozzle at front under cab aimed to discharge dry chemical horizontally from front to back under cab protecting valve banks.

Nozzle No. 11 (N11) – Locate (1) V 1/2 nozzle up in articulation area aimed down with discharge pattern following vehicle center line, discharging into loader tower and onto hydraulic lines in articulation area.

► **Note:** Larger landfill compactors may require additional protection.

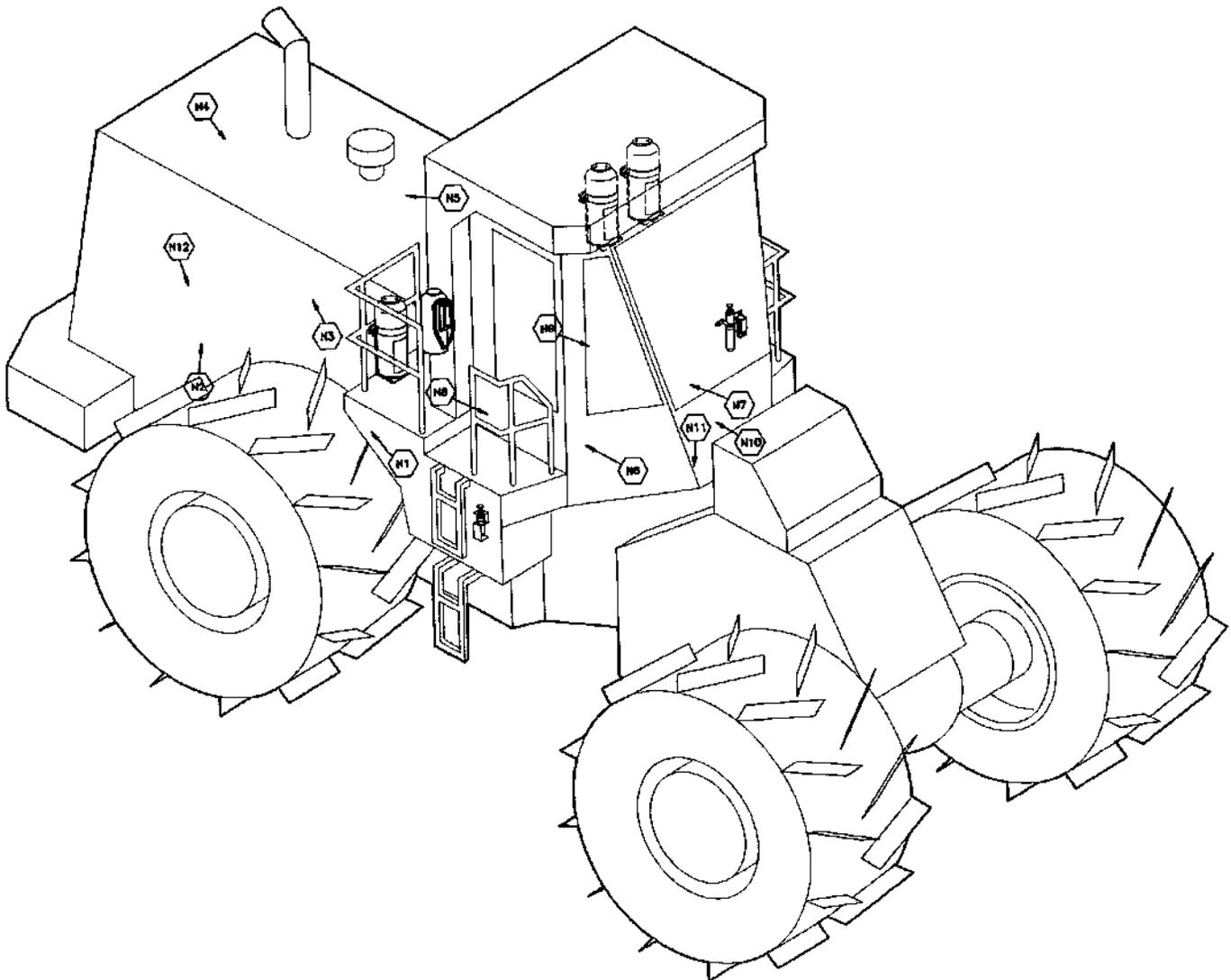


FIGURE 4
003523

► **ORE HAULAGE TRUCK (TYPICAL 2 TANK DESIGN)**

Nozzle No. 1 – Located at the top center of the engine compartment aimed toward the turbocharger at the rear of the engine. It is designed to protect the top of the engine and the front of the turbocharger.

Nozzle No. 2 – Located on the right rear corner of the engine compartment aimed toward the front corner with the pattern oriented vertically. This is intended to screen and protect the right side of the engine.

Nozzle No. 3 – Located at the top right corner of the engine compartment and is aimed across the top of the engine to the opposite corner. Its purpose is to protect the top of the engine and parts of the turbocharger and exhaust manifold.

Nozzle No. 4 – Located at mid-engine height in the right rear corner of the engine compartment. The nozzle pattern is aimed across the rear portion of the engine at the transmission housing. This nozzle is intended to protect the lower portion of the exhaust manifold, and the right side of the transmission and accessory equipment area such as hydraulic pumps, etc.

Nozzle No. 5 – Located at the top left corner of the engine compartment and aimed across the top of the engine to the opposite corner. Its purpose is to protect the top of the engine and parts of the turbocharger and exhaust manifold.

Nozzle No. 6 – Located on the left rear corner of the engine compartment and aimed toward the front corner with the discharge pattern oriented vertically. Its purpose is to screen and protect the left side of the engine.

Nozzle No. 7 – Located at mid-engine height in the left rear corner of the engine compartment. The nozzle pattern is aimed across the rear portion of the engine at the transmission housing. This is done to protect the lower portion of the exhaust manifold, and the left side of the transmission and accessory equipment area such as the hydraulic pumps, etc.

Nozzle No. 8 – Located such that the dry chemical stream will hit the parking break area.

► **Note** : Larger ore haulage trucks may require additional protection.

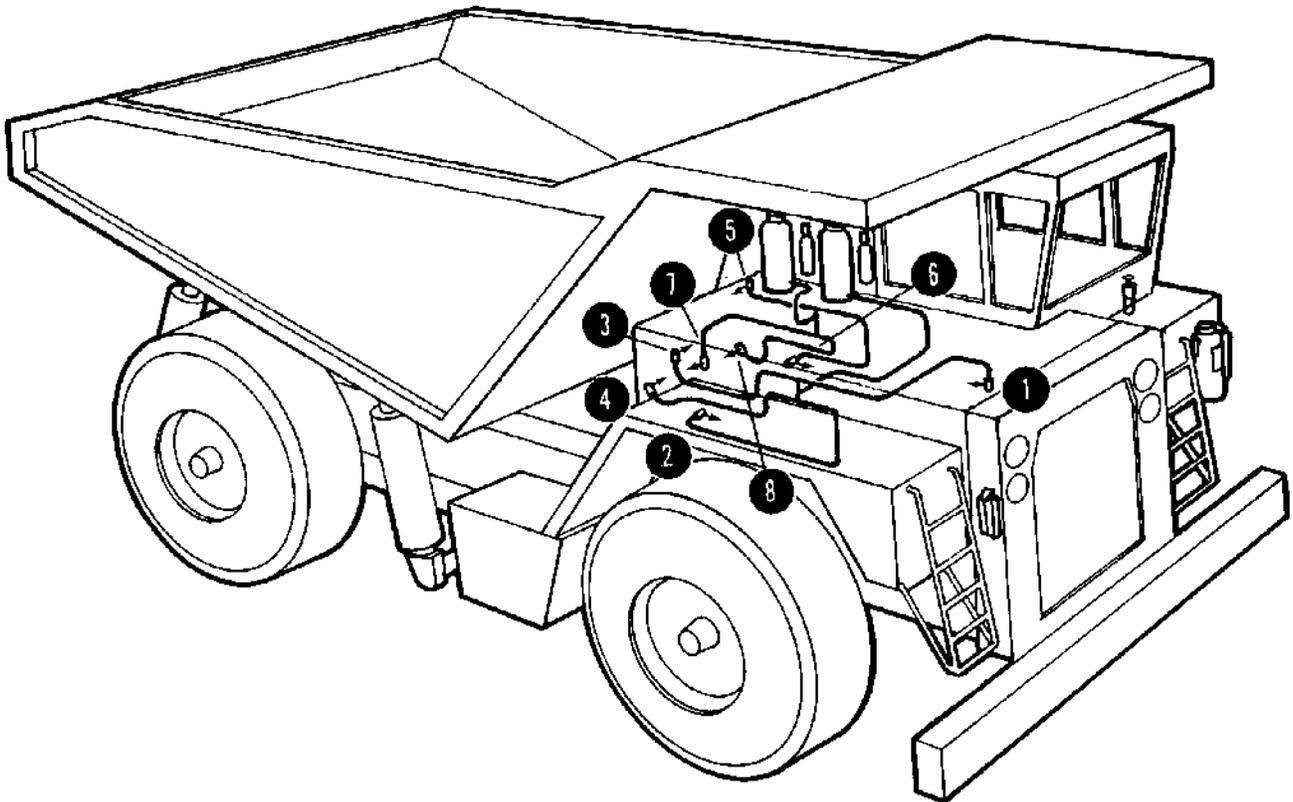


FIGURE 5

003524

SECTION X – SYSTEM APPLICATION OPTIONS

5-15-02 Page 10-6

REV. 1

► LOG SKIDDER (TYPICAL 2 TANK DESIGN)

Nozzle No. 1 and 2 – Located to discharge horizontally in the front lower portion of each side of the engine compartment. This allows each nozzle to be aimed upward and toward the center of the engine's side to completely cover the side of the engine with dry chemical.

Nozzle No. 3 – Located just above the belly pan, aimed to completely cover the pan area.

Nozzle No. 4 – Located toward the rear and top of the engine compartment. It is oriented to discharge dry chemical diagonally across the top of the engine.

Nozzle No. 5 – Located in the compartment directly under the operator's seat. It provides protection for the hydraulic lines, pump and pan area.

Nozzle No. 6 – Located to discharge dry chemical on the parking disc located on the rear portion of the skidder

Nozzle No. 7 and 8 – Located to provide protection for both sides of the hydraulic cable reel assembly. They are located on the rear portion of the skidder and are aimed toward each side of the reel assembly.

► **Note** : Larger log skidders may require additional protection.

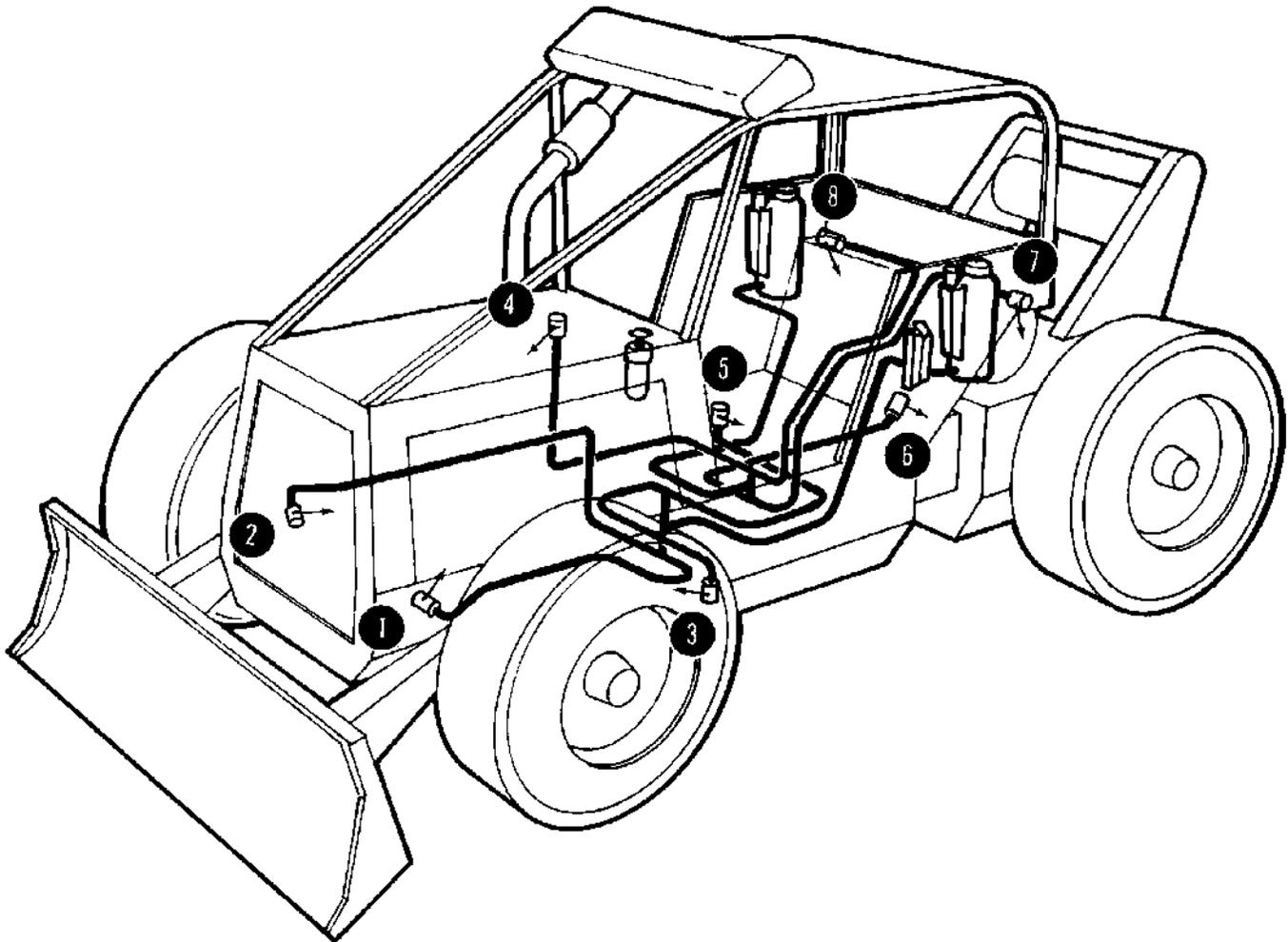


FIGURE 6

003525

SYSTEM COMPONENT INDEX**BASIC UNIT**

16559	A-101-10 Includes: Agent Tank, Tank Mounting Bracket, 101-10 Cartridge
16430	A-101-20 Includes: Agent Tank, Tank Mounting Bracket, 101-20 Cartridge
16131	A-101-30 Includes: Agent Tank, Tank Mounting Bracket, 101-30 Cartridge
31581	LT-A-101-10 Includes: Agent Tank, Tank Mounting Bracket, LT-20-R Cartridge
24306	LT-A-101-20 Includes: Agent Tank, Tank Mounting Bracket, LT-30-R Cartridge, Cartridge Bracket, and Pneumatic Actuator
53003	LT-A-101-30 Includes: Agent Tank, Tank Mounting Bracket, (Does Not Include Cartridge, Cartridge Bracket or Pneumatic Actuator)
24883	LT-A-101-30 Cartridge, Cartridge Bracket, and Pneumatic Actuator for LT-A-101-30 Unit
31344	LP-A-101-20-B Includes: Agent Tank, Tank Mounting Bracket, 101-20 Cartridge, Cartridge Bracket, and Pneumatic Actuator
24307	LT-LP-A-101-20-B Includes: Agent Tank, Tank Mounting Bracket, LT-30-R Cartridge, Cartridge Bracket, and Pneumatic Actuator

DISTRIBUTION TEES

53036	Distribution Tee Package Includes: 4 Distribution Tees
25031	Distribution Tee
53038	Triple Tee Package Includes: 2 Triple Tees
16424	Triple Tee
53040	Reducing Tee Package Includes: 2 Reducing Tees (1/2 in. x 1/2 in. x 3/4 in.)
4655	Reducing Tee (1/2 in. x 1/2 in. x 3/4 in.)
▶ 419695	Y Lateral

NOZZLES

57046	C-1/2 Nozzle Package Includes: 4 Nozzles, 4 Nozzle Brackets, 4 Blow-Off Caps and 8 Lockwashers
57044	V-1/2 Nozzle Package Includes: 4 Nozzles, 4 Nozzle Brackets, 4 Blow-Off Caps and 8 Lockwashers
53042	F-1/2 Nozzle Package Includes: 4 Nozzles, 4 Nozzle Brackets, 4 Blow-Off Caps and 8 Lockwashers
53791	Nozzle C-1/2 Includes: Nozzle, Blow-Off Cap
56748	Nozzle V-1/2 Includes: Nozzle, Blow-Off Cap
16449	Nozzle F-1/2 Includes: Nozzle Only
415192	Blow-Off Cap With Retaining Strap Package Includes: 50 Blow-Off Caps (Part No. 415108) For V-1/2 and C-1/2 Nozzle Only
73870	Blow-Off Cap Package: Includes: 50 Blow-Off Caps, Part No. 4120, For F-1/2 Nozzle
73871	Nozzle Bracket Package: Includes: 12 Brackets, 2 in. x 2 in. Angle
▶ 427149	Nozzle Bracket, 2 in. x 3 in. Angle
▶ 427228	Nozzle Bracket, Straight 5 in. x 2 in., 4 Brackets
73872	Nozzle Lockwasher Package: Includes: 50 Lock washers, Part No. 25581

ACTUATION DEVICE

▶ 70584	Remote Manual Actuator Package Includes: LT-10-L (Left Hand) Cartridge, "S" Bracket, Elbow Check Valve, Seal, Operating Instruction Labels and Installation Instructions
▶ 71699	Remote Manual Actuator Package Includes: LT-10-L (Left Hand) Cartridge "L" Bracket, Elbow Check Valve, Seal, Operating Instruction Labels and Installation Instructions
▶ 57484	Remote Manual Actuator Package Includes: LT-10-R (Right Hand) Cartridge, "S" Bracket, Elbow Check Valve, Seal, Operating Instruction Labels and Installation Instructions
▶ 71804	Remote Manual Actuator Package Includes: LT-10-R (Right Hand) Cartridge, "L" Bracket, Elbow Check Valve, Seal, Operating Instruction Labels and Installation Instructions
▶ 70581	Remote Manual Actuator for LT-10-L (Left Hand) Cartridge Only
▶ 57452	Remote Manual Actuator for LT-10-R (Right Hand) Cartridge Only
57661	"S" Type Mounting Bracket for Dashboard Actuator, Part No. 70581 and 57452
70580	"L" Type Mounting Bracket for Remote Manual Actuator, Part No. 70581 and 57452
32747	Remote Actuator Package, Cartridge Guard Type (Left Hand) Includes: Actuator, LT-10-L Cartridge, Check Valve, Operating Instruction Labels, Lead Wire Seal
▶ 32739	Remote Actuator Package, Cartridge Guard Type (Right Hand) Includes: Actuator, LT-10-R Cartridge, Check Valve, Operating Instruction Labels, Lead Wire Seal
▶ 16033	Operating Instruction Labels for Manual Actuator Includes: Nameplate "IN CASE OF FIRE 1. SHUT OFF ENGINE 2. PULL RING PIN 3. PUSH LEVER"
16459	Operating Instruction Labels for Manual Actuator Includes: Nameplate "IN CASE OF FIRE 1. SHUT OFF POWER 2. PULL RING PIN 3. STRIKE BUTTON"

ACTUATION LINE DEVICES

15677	Safety Vent Relief Valve
53050	Safety Vent Relief Valve Package Includes: 2 Safety Vent Relief Valves
53051	1/4 in. Check Valve (Package of 2)
57488	LT and LP Model Pneumatic Actuator Assembly
16408	A-101 Pneumatic Actuator with Cartridge Receiver Assembly
31579	LT-A-101-10 Pneumatic Actuator Assembly
8372	Pressure Switch (Shutdown)
▶ 46250	Pressure Switch, Weather Proof, DPST (shutdown)
427425	Engine Shutdown Device

SECTION XI – APPENDIX

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REV. 3

SYSTEM COMPONENT INDEX (Continued)

SYSTEM TANKS

24855	A-101-10 Includes: Charged Agent Tank with Cartridge
24970	A-101-20 Includes: Charged Agent Tank with Cartridge
53000	A-101-30 Includes: Charged Agent Tank with Cartridge
24966	LT-A-101-10 Includes: Charged Agent Tank with Cartridge
24894	LT-A-101-20 Includes: Charged Agent Tank without Cartridge
29375	LT-A-101-30 Includes: Charged Agent Tank without Cartridge
24427	LP-A-101-20-B Includes: Charged Agent Tank without Cartridge
24425	LT-LP-A-101-20-B Includes: Charged Agent Tank without Cartridge

SYSTEM BRACKETS

24854	A-101-10, LT-A-101-10 Tank Mounting Bracket (1)
24971	A-101-20 Tank Mounting Bracket (1)
14098	A-101-30 Tank Mounting Bracket (1)
24910	A-101-30 Tank Mounting Bracket (1) (Extra Heavy)
24895	LT-A-101-20 Tank Mounting Bracket (1)
30494	LT-A-101-30 Tank Mounting Bracket (1)
31171	LP-A-101-20-B, LT-LP-A-101-20-B Tank Mounting Bracket (1)
31177	Cartridge Bracket Assembly for LP-A-101-20-B
24325	Cartridge Bracket Assembly for LT-A-101-20 or LT-LP-A-101-20-B
29193	Cartridge Bracket Assembly for LT-A-101-30

RECHARGE EQUIPMENT AND MATERIAL

53080	FORAY Multi-Purpose Dry Chemical 45 lb. Pail
16511	Fill Cap Spanner Wrench (Low Profile)
428363	Bursting Disc Package (Includes: 15 Bursting Disc Assemblies, Part No. 428271)
75382	Cartridge Scale and Hook Assembly (LT-A-101-30)
3923	Cartridge Scale and Hook Assembly
197	Lead Wire Seal
15496	Bursting Disc Union Assembly
24327	A-101 Installation, Recharge, Inspection and Maintenance Manual
53081	Owner's Manual

SYSTEM CARTRIDGES

15850	A-101-10 Cartridge (DOT)
423439	A-101-10 Cartridge (TC/DOT)
423441	A-101-20, LP-A-101-20-B Cartridge (TC/DOT)
423443	A-101-30 Cartridge (TC/DOT)
423429	LT-A-101-10 Cartridge (TC/DOT)
▶ 423435	LT-30-R Cartridge (TC/DOT)
423491	LT-A-101-30 Cartridge (TC/DOT)
13193	LT-10-R Cartridge (DOT)
423423	LT-10-R Cartridge (TC/DOT)
13177	LT-10-L Cartridge (DOT)
423425	LT-10-L Cartridge (TC/DOT)

FOR SYSTEM COMPONENT INDEX FOR THE CHECKFIRE AUTOMATIC DETECTION AND ACTUATION SYSTEMS, SEE THE FOLLOWING INSTALLATION MANUALS:

- CHECKFIRE MP-N ELECTRIC SYSTEM – Manual Part No. 427310
- CHECKFIRE SC-N ELECTRIC SYSTEM – Manual Part No. 423522
- CHECKFIRE ELECTRIC SERIES I SYSTEM – Manual Part No. 54894

▶ **STAINLESS STEEL OPTIONAL COMPONENTS FOR AN/FO
LOADER APPLICATIONS (NOT FM APPROVED)**

ANSUL LT-A-101 systems are being used in mining applications throughout the world. One such application is on an AN/FO Loader. AN/FO is an abbreviation for ammonium nitrate and fuel oil which are utilized in mining as explosive media. Though we know of no incidents, a potentially hazardous condition can occur over time when copper materials and/or the copper in brass fittings are exposed to Ammonium Nitrate, forming Copper Tetramine Nitrate. **This is an impact sensitive self-explosive.** Copper Tetramine Nitrate may be present when a buildup of a blue composition on copper or brass fittings is evident. The proximity of the fittings to the ammonium nitrate will determine the level of buildup that may result.

Although there is only a remote possibility for the above mentioned hazardous condition to occur, optional stainless steel components are now available for the LT-A-101-30 Vehicle Fire Suppression System.

Stainless Steel Assemblies for LT-A-101-30 Systems

Note: These assemblies are designed for AN/FO Loader applications where stainless steel components are recommended in place of brass components and do not replace the components on standard LT-A-101 Systems.

<u>Part No.</u>	<u>Description</u>
53003*	LT-A-101-30 Agent Tank, Agent, Bracket
431775*	TC LT-A-101-30 Agent Tank, Agent, Bracket
32028	Fill Cap Assembly, SS
432840	Pneumatic Actuator Assembly, SS
433147	Manual Actuator, SS
432824	Actuator Assembly, SS (Included w/Part No. 433149)
432831	Nozzle, V-1/2, SS (single)
432841	Nozzle, C-1/2, SS (single)
432817	Valve, Safety Vent Relief, SS (single)
432820	Sealed Burst Disc Assembly, SS (single)
432830	Check Valve, 1/4 in., Threaded (single)
433149	CHECKFIRE SC-N Assembly (Includes Part No. 432824)

***For new installations, order Fill Cap (Part No. 32028) and Sealed Burst Disc Assembly (Part No. 432820).**

As with all fire suppression systems, regular maintenance coupled with good housekeeping practices will maximize performance.

SECTION XI – APPENDIX

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REV. 2

LARGE EXCAVATORS

Hazards and Protection

The following are generally considered to be fire hazard areas. Hazard areas exist when an ignition source can come in contact with a fuel source. This may be due to the close proximity of the ignition source to the fuel source or due to the configuration of the machine that may allow running or spraying fuel to come in contact with an ignition source. A hazard analysis of the excavator should determine which of the following components will require protection. A hazard analysis should also determine any other areas not listed below that potentially could be considered hazard areas requiring protection.

1. Engine. The engine consists of various components that contain or transfer fuels, components involved with lubrication, and electrical contacts and controls as well as components that generate heat. Protection should include but not be limited to the following components:
 - Manifolds
 - Turbochargers
 - Heat exchangers
 - Fuel lines
 - Engine block
 - Electrical equipment, such as starters, generators, alternators, etc.
 - Exhaust systems
 - Bottom of engine, belly pan or floor area
2. Hydraulic pump(s) and control valve banks/manifolds.
3. Hydraulic hoses and fuel lines, including those under operator's compartment.
4. Transmissions/gear reduction boxes.
5. Brakes and brake valves. **Note:** Brakes located in the track mechanism are not required to be protected.
6. Drive train bearings.
7. Swing gear motors and travel clutches.
8. Ring Gear area.
9. Lubrication systems.
10. Hydraulic oil tank and fuel tank fill and outlet connections.
11. Batteries.
12. Large electrical generators and motors.

Design Parameters

- ▶ 1. Extended Discharge System (Not FM Approved) – Fire suppression on large excavators may require an extended agent discharge time to allow for operator egress from the machine. In order to extend the time of agent discharge from A-101 system nozzles, the number of tanks determined by hazard analysis must be doubled. (Refer to drawings for revised actuation and discharge hose connection parameters and system operation.)
 - 3/4 in. Extended Discharge Supply Hose Line Connection. See Figure 1. (**Note:** Maximum of 24 in. from each adjacent tank to the common “Y” fitting.)
 - 1/4 in. Actuation Hose Detail. See Figure 2.
 - CHECKFIRE SC-N Wiring Diagrams. See Figures 3 and 4.
- ▶ 2. Each four nozzle agent distribution network will be connected to two adjacent tanks using a “Y” fitting. See Figure 1. **Six nozzles systems are not allowed.**
- ▶ 3. An automatic detection and actuation system will be required, using the CHECKFIRE SC-N Detection and Actuation system.

4. The fire suppression system must automatically perform the following functions:

- Engine shutdown.
- Pressurized hydraulic tank and fuel tank venting.
- Fuel shutoff.
- Electrical disconnect (Optional).

If mine personnel refuse to allow any of the above items to be performed, it should be **documented** and kept in the job file.

5. The system must also include a Remote High Level Alarm Horn, Part No. 79559 and should also include a remote visual alarm.
6. As part of the total fire suppression system package, training for mine personnel and the machine operator(s) must be conducted and documented. Training should include but not be limited to:
 - A-101 and CHECKFIRE SC-N system description.
 - System operation.
 - System limitations and primary intent.
 - What to do in case of fire.
 - Vehicle maintenance and fire suppression system maintenance.
7. An A-101/CHECKFIRE SC-N Maintenance Contract allowing periodic service and maintenance at scheduled intervals should also be included.

▶ **Note:** Extended discharge can also be obtained by using the larger LT-A-101-125/250 tanks. Refer to manual, Part No. 427865, for details.

LARGE EXCAVATORS (Continued)

Design Parameters (Continued)

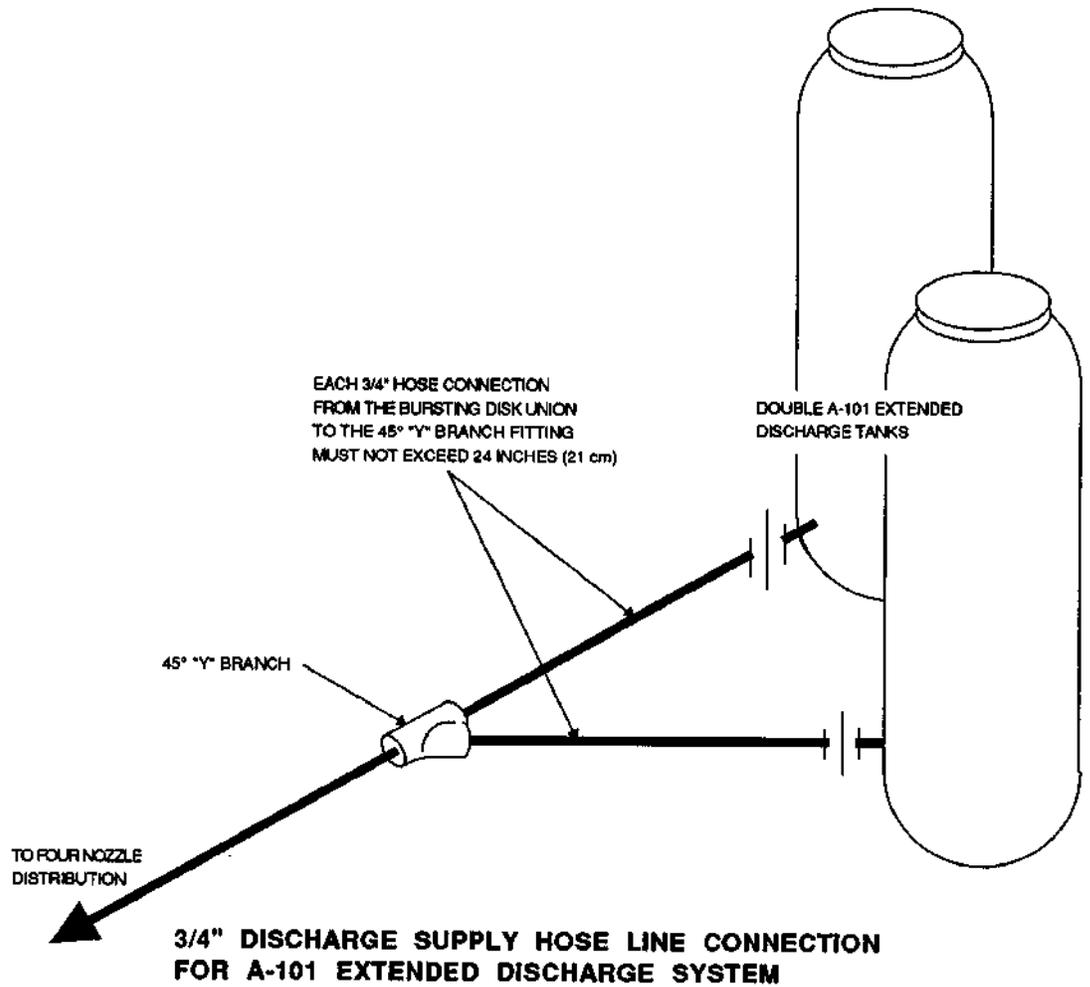
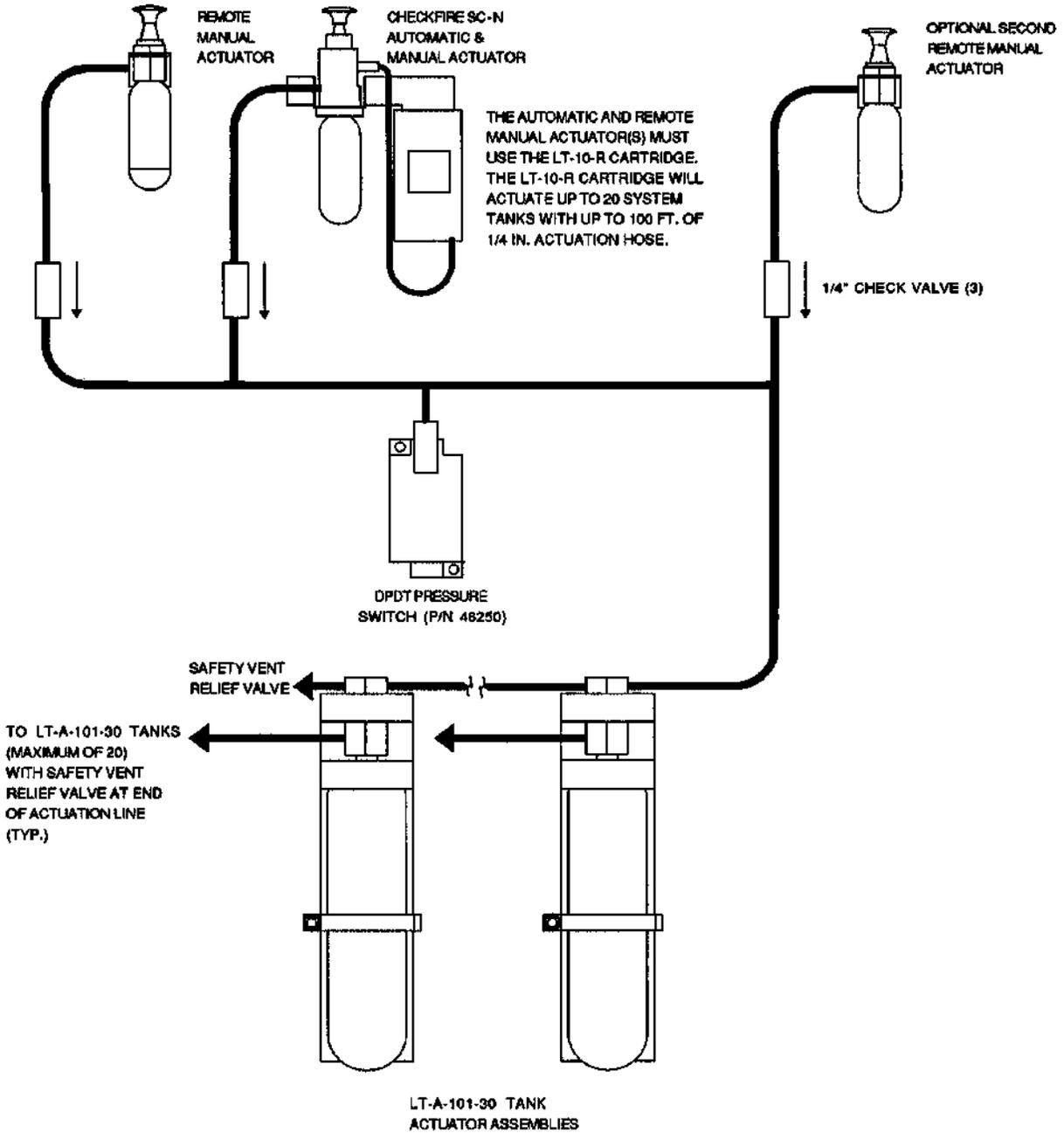


FIGURE 1

003526

LARGE EXCAVATORS (Continued)

Design Parameters (Continued)



**1/4" ACTUATION HOSE DETAIL FOR A-101
EXTENDED DISCHARGE SYSTEM
(Not FMRC Approved)**

FIGURE 2

003527

LARGE EXCAVATORS (Continued)

Design Parameters (Continued)

CHECKFIRE SC-N WIRING DIAGRAM
(NORMALLY ENERGIZED SHUTDOWN DEVICE)

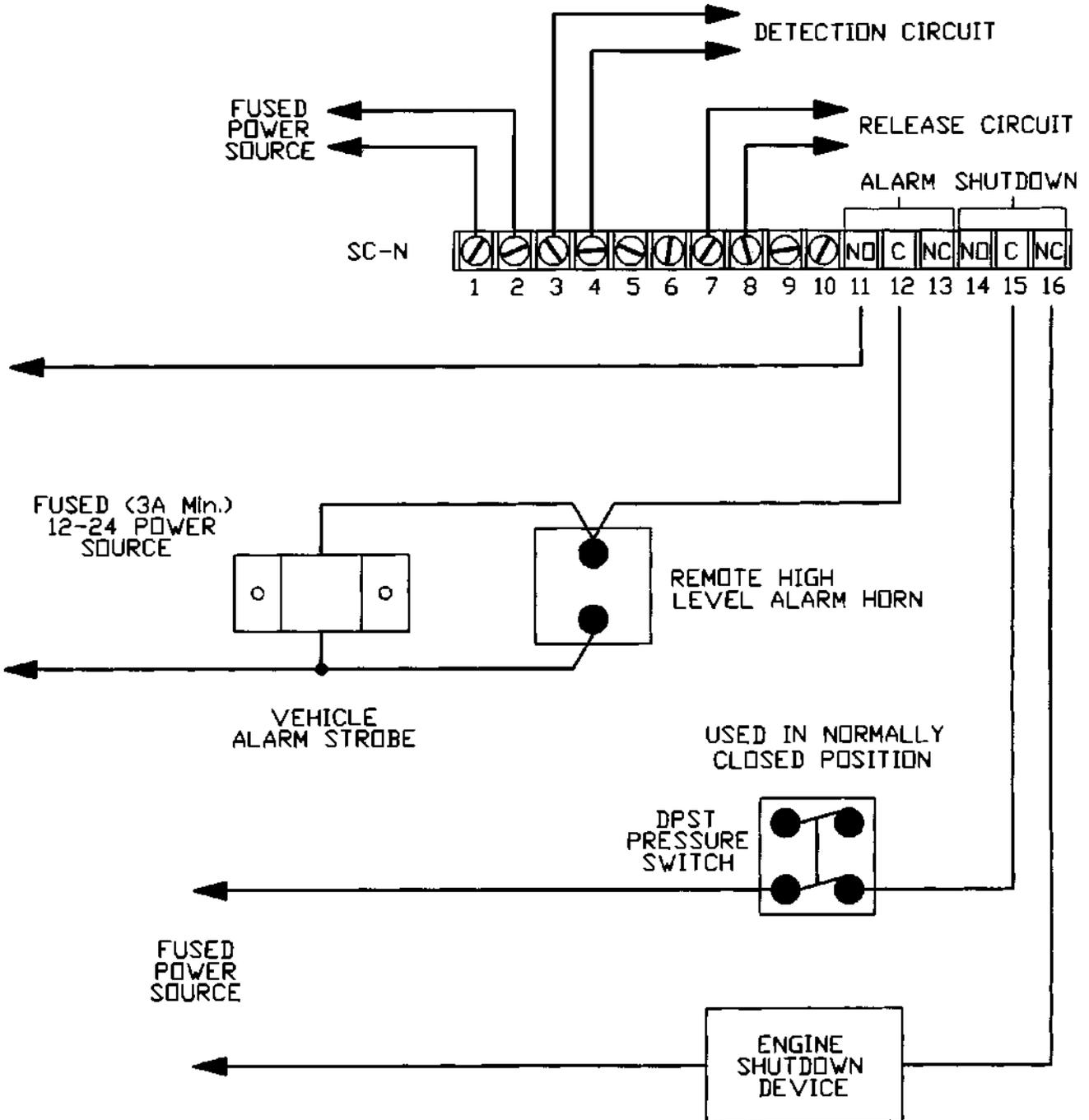


FIGURE 3
006435

GENERAL INFORMATION

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REV. 1

LARGE EXCAVATORS (Continued)

Design Parameters (Continued)

CHECKFIRE SC-N WIRING DIAGRAM
(NORMALLY DE-ENERGIZED SHUTDOWN DEVICE)

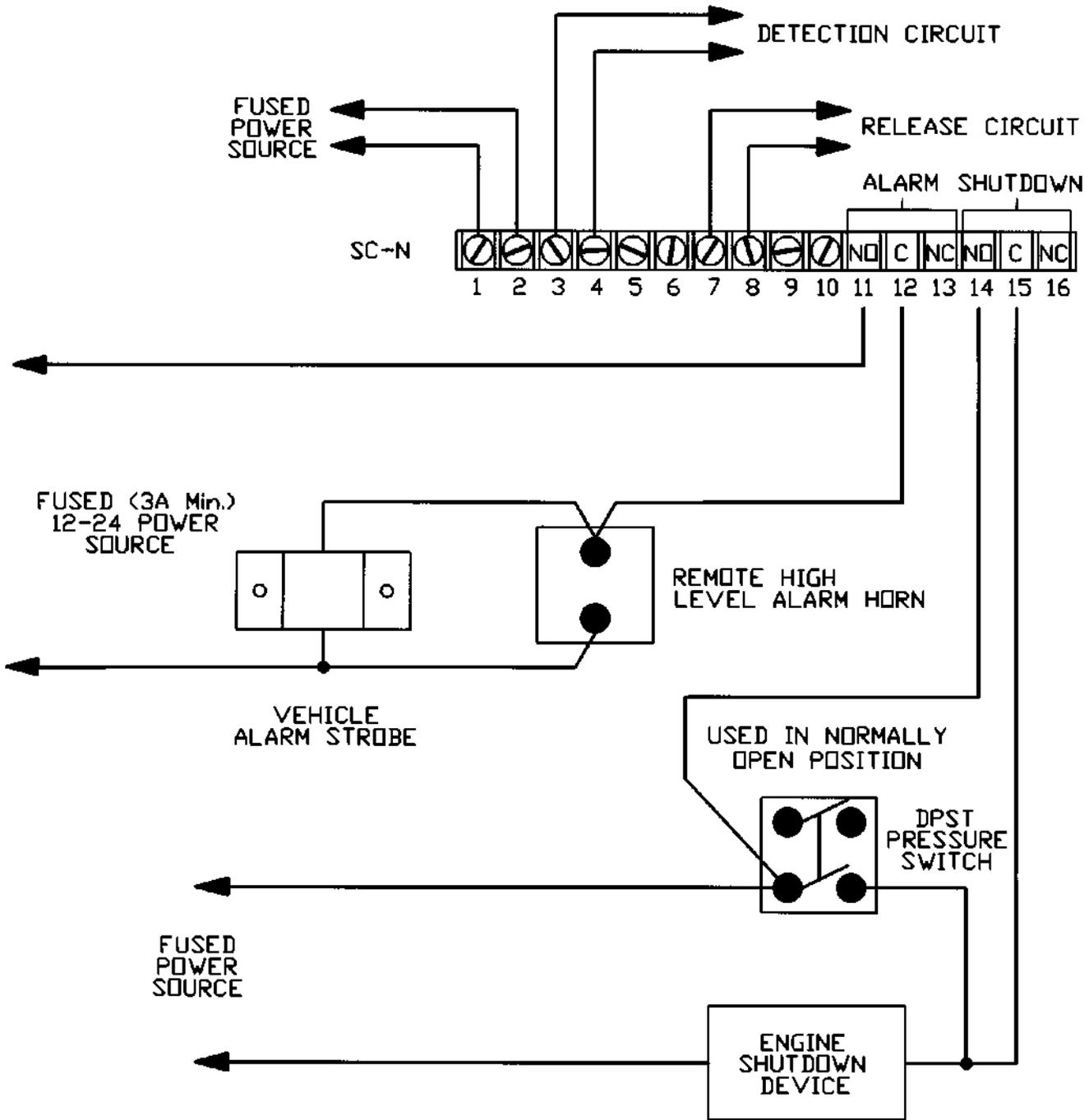


FIGURE 4
006436

EXCAVATOR PROTECTION

Excavators can be classified into three categories, depending on their hydraulic fluid capacity. ANSUL has researched the hydraulic fluid capacities in regard to size of equipment (operating weight).

With the introduction of the LVS™ Liquid Agent Suppression System (not FM Approved), we can now offer an enhanced protection scheme for large excavators, as well as other non-road mobile equipment. **The following protection schemes are required for excavator of these specified sizes. They are as follows:**

- **Standard Discharge Application: Small Equipment (Operating Weight: 99,000 to 200,000 lb (44,906 to 90,720 kg))**

Standard discharge application of an A-101 dry chemical system can be used for this smallest class of excavators. Design of the suppression system shall be in accordance with the LT-A-101-30 or LT-A-101-125/250 Installation, Recharge, Inspection, and Maintenance Manual.

Excavators that fall into this class of machine include but are not limited to:

- Caterpillar: 345BL-VG, 350, 350L, 375, 375L, 5080
- Hitachi: UH261, UH30
- Komatsu/DeMag: H65, PC 750-6
- Liebherr: R982
- Link-Belt: 5800, 6000
- O&K: RH 25D, RH 30E
- Poclain: 300, 400

- **Twin-Agent Application: Mid-Size Equipment [Operating Weight 200,000 to 1,000,000 lb (90,720 to 453,600 kg)]**

Use of a twin-agent system consisting of the LVS liquid agent system connected to an A-101 dry chemical (extended or standard discharge) system. The A-101 system can utilize 250 lb., 125 lb or 30 lb (nominal) agent containers.

Note 1: When utilizing a standard discharge design, all hazard areas will require protection using both agents.

Note 2: When utilizing an extended discharge design, the liquid portion of the twin-agent scheme need only protect the engine(s) and hydraulic devices (i.e., pumps, control valves, valve banks).

Note 3: Existing systems installed in compliance with Product Service Bulletin No. 77 utilizing an extended discharge design, do not need to be changed to twin-agent systems. However, for new system installations or major changes to an existing hydraulic excavator, the design must follow the guidelines in this manual using a twin-agent system.

Excavators that fall into this class of machine include but are not limited to:

- Caterpillar: 5130, 5130B, 5130ME, 5130FS, 5230, 5230ME
- DeMag: H95, H135S, H185S, H255S, H285S
- Hitachi: EX1000, EX1100, EX1800, EX 2500, EX3500, EX 3600, UH501, UH80, UH801
- Komatsu: PC1000-6, PC1100-6, PC1400, PC1500-1, PC1600-1, PC1800-6, PC 3000, 3560 B, PC4000
- Liebherr: R984, R992, R991, R994, R995
- NW Engineering: 100-DH
- O&K: RH 40E, RH 75, RH 90C, RH 120C, RH 170
- Poclain: 600, 1000
- P&H: 1200

- **Twin-Agent Application: Large Equipment [Operating Weight: 1,000,000 lb (453,600 kg) and greater]**

Use of a twin-agent system consisting of the LVS liquid agent system connected to an A-101-125/250 dry chemical (extended discharge) system.

Note 1: The liquid portion of the twin-agent scheme, at a minimum, must protect the engine(s) and hydraulic devices (i.e., pumps, control valves, valve banks). Additional LVS liquid agent systems may be added at the designer's discretion to cover other areas.

Note 2: Existing systems installed in compliance with Product Service Bulletin No. 77 utilizing an extended discharge design, do not need to be changed to twin-agent system. However, for new system installations or major changes to an existing hydraulic excavator, the design must follow the guidelines in this manual using a twin-agent system.

Excavators that fall into this class of machine include but are not limited to:

- DeMag: H455S, H485S, H485SP, H655S
- Hitachi: EX5500, EX7500
- Komatsu: PC5500, PC8000
- Liebherr: R996
- O&K: RH 200, RH 300, RH 400

General Discussion

Special design consideration must be given when protecting large excavators to reduce the potential for reflash and provide additional time. ANSUL requires the following as a minimum:

1. Two large size agent tanks are available: a 125 lb (56.7 kg) tank and a 250 lb (113.4 kg) tank. The LT-A-101-125 tank can utilize an 8-nozzle extended discharge or 12- or 16-nozzle standard discharge distribution system. The LT-A-101-250 tank can utilize either an 8, 12, or 16 nozzle extended discharge or a 24 nozzle standard discharge system. Both the 125 lb and 250 lb tanks can be used where an extended discharge is required. See "Extended Discharge" to determine type of system required.
2. When utilizing 30 lb agent containers, use four nozzles maximum for each single or two-tank (when used as extended discharge) system to provide additional agent per nozzle and maximum system discharge time. Single tank, two-nozzle systems may also be used for extended discharge.
 - Note:** When protecting the engine, hydraulic devices (i.e. pumps, control valves, valve banks), hoses and connections on large non-road mobile equipment used in surface mining, landfill equipment, or other large specialized machines; only 4-nozzle 30 lb tank systems, or large capacity (125 lb and 250 lb) type systems are to be used.
3. Fully automatic system, including automatic engine shutdown, hydraulic oil/fuel shutoff, and agent discharge.
4. Remote high level alarm and flashing alarm strobe to enhance machine operator warning.
5. A safe means of egress from the operator's compartment without having to exit past fire hazard areas.

EXCAVATOR PROTECTION (Continued)

General Discussion (Continued)

In addition to the LT-A-101 dry chemical system and/or LT-A-101/LVS twin-agent system with CHECKFIRE Electric Detection and Control equipment, supplemental fire protection should be included when considering protection of large non-road mobile equipment:

1. Cartridge operated hand portable fire extinguishers
2. Secondary means of fire suppression

For any fire protection to be effective, training is critical. As a minimum, comprehensive training for the machine operator and site representatives should include:

1. Fire suppression system operation
2. Fire suppression system performance
3. Fire suppression system capabilities
4. Fire suppression system limitations
5. Response procedures
6. Safe egress procedures

It is important to make sure the site representative understands the LT-A-101/LVS/CHECKFIRE system capabilities as well as limitations. This information needs to be discussed and reviewed with the appropriate end-user personnel.

► FUME HOOD PROTECTION (Not FM Approved)

Fume Hood can utilize an ANSUL A-101-20 or A-101-30 system with 6 nozzles. See Figure 5.

FUME HOOD

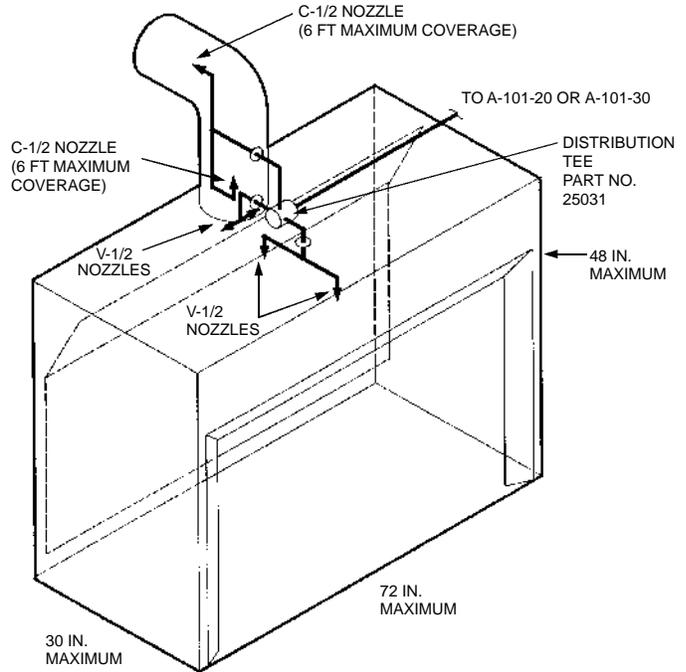


FIGURE 5
003530

The system can utilize a distribution tee and 3/4 in. supply piping and 1/2 in. branch piping.

Standard A-101 nozzles are used for dry chemical discharge. C-1/2 nozzles are used in the duct and V-1/2 nozzles are used in the plenum and hood area.

The pipe length must not exceed the maximum requirement as stated on Page 4-11 and 4-12 of this manual.

When utilizing an ANSUL AUTOMAN Release, use an LT-10-R
► Cartridge to supply the required actuation gas pressure to the tank cartridge.

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