

STOCK NO. 0910-LP-123-2300

S9555-A6-MMA-010/HALON 1301 REV. 2

TECHNICAL MANUAL

**HALON 1301
FIRE EXTINGUISHING
SYSTEM**

DESCRIPTION, OPERATION AND MAINTENANCE



**THIS PUBLICATION SUPERSEDES NAVSEA S9555-A6-MMA-010 HALON 1301 REV. 1
DATED 30 DECEMBER 1986**

PUBLISHED BY DIRECTION OF COMMANDER NAVAL SEA SYSTEMS COMMAND

STOCK NO. 0910-LP-123-2300

1 JULY 1993

LIST OF EFFECTIVE PAGES

Date of original change pages is:

Original.....0..... 1 July 1993

Total number of pages in this publication is 106 consisting of the following:

Page No.	# Change No.
Title and A.....	0
Change Record 1.....	0
Change Record 2 blank.....	0
Foreword 1.....	0
Foreword 2 blank.....	0
i through ix.....	0
x blank.....	0
1-1 through 1-12.....	0
2-1 through 2-6.....	0
3-1 through 3-6.....	0
4-1 through 4-2.....	0
5-1 through 5-2.....	0
6-1 through 6-13.....	0
6-14 blank.....	0
7-1 through 7-40	0
8-1 through 8-7.....	0
8-8 blank.....	0

* Zero in this column indicates an original page.

CHANGE RECORD

CHANGE NO.	DATE	TITLE/BRIEF DESCRIPTION	VALIDATING SIGNATURE

FOREWORD

This technical manual covers Halon 1301 total flooding fire extinguishing systems in various classes of ships. Although the systems may vary from ship to ship and from space to space, the types of components and the basic system configuration are the same.

For this reason, all maintenance, repair, and operating procedures are the same, regardless of the class of ship or type of space.

The 310 lb bench-type beam scale and the liquid level indicator are not covered in this manual. The manufacturers of these items have provided documentation accompanying the equipment and users should refer to the manufacturer's documentation for information relating to these items.

Ships, training activities, supply points, Naval Shipyards, and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals. All errors, omissions, discrepancies, and suggestions for improvement to NAVSEA technical manuals shall be reported to the Commanding Officer, Naval Ship Weapon Systems Engineering Station (Code 5700), Port Hueneme, CA 93043 on the NAVSEA Technical Manual Deficiency/Evaluation Report, Form NAVSEA 9086/10. To facilitate such reporting, three copies of Form 9086/10 are included at the end of each unclassified bound portion of all technical manuals. All feedback comments shall be thoroughly investigated and originators will be advised of any action resulting therefrom. Extra copies of Form NAVSEA 9086/10 may be requisitioned from the Naval Publications and Forms Center (NPFC), Philadelphia, PA 19120.

TABLE OF CONTENTS

Chapter/Paragraph	Page
1 GENERAL INFORMATION AND SAFETY PRECAUTIONS.....	1-1
1-1 SAFETY PRECAUTIONS.....	1-1
1-2 INTRODUCTION.....	1-1
1-2.1 SYSTEM OVERVIEW.....	1-1
1-2.1.1 Halon 1301.....	1-1
1-2.1.2 Primary Function.....	1-1
1-2.1.3 Use and Limitations.....	1-1
1-2.1.4 System Actuation.....	1-1
1-2.2 SYSTEM CONFIGURATIONS.....	1-1
1-2.2.1 Modular Configuration.....	1-1
1-2.2.2 Banked Configuration.....	1-2
1-2.3 SYSTEM OPERATIONAL DESCRIPTION.....	1-2
1-2.3.1 Actuation.....	1-2
1-2.3.2 Time Delay.....	1-2
1-3 REFERENCE DATA.....	1-2
1-4. EQUIPMENT, ACCESSORIES, AND DOCUMENTS SUPPLIED.....	1-9
1-5 RELIABILITY IMPROVEMENT EQUIPMENT.....	1-9
2 OPERATION.....	2-1
2-1 INTRODUCTION.....	2-1
2-2 CONTROLS AND INDICATORS.....	2-1
2-2.1 MANUAL CO ₂ ACTUATOR LEVER.....	2-1
2-2.2 PRESSURE OPERATED SWITCH.....	2-1
2-2.3 HALON 1301 CYLINDER PRESSURE GAUGE.....	2-1
2-2.4 PRESSURE OPERATED TIME DELAY DEVICE.....	2-1
2-2.5 TIME DELAY OVERRIDE VALVE.....	2-2
2-2.6 LIQUID LEVEL TAGS.....	2-2
2-3 OPERATING PROCEDURES.....	2-2
2-3.1 NORMAL OPERATION.....	2-2
2-3.2 RETURNING SYSTEM TO READY.....	2-4
2-3.3 EMERGENCY REENTRY.....	2-4
2-3.4 EMERGENCY OPERATION.....	2-4
2-3.4.1 CO ₂ Actuator Failure.....	2-4
2-3.4.2 Time Delay Device Failure.....	2-4

TABLE OF CONTENTS (Cont)

Chapter/Paragraph	Page
2-3.4.3 Pressure Operated Switch Failure.....	2-6
3 FUNCTIONAL DESCRIPTION.....	3-1
3-1 INTRODUCTION.....	3-1
3-2 SYSTEM DESCRIPTION.....	3-1
3-3 MAJOR COMPONENT DESCRIPTION.....	3-2
3-3.1 MANUAL CO ₂ ACTUATOR ASSEMBLY.....	3-2
3-3.2 TIME DELAY DEVICE.....	3-3
3-3.3 TIME DELAY OVERRIDE VALVE.....	3-3
3-3.4 PRESSURE OPERATED SWITCH.....	3-4
3-3.5 HALON 1301 CYLINDER ASSEMBLY.....	3-4
3-4 MINOR COMPONENT DESCRIPTION.....	3-4
3-4.1 CHECK VALVE (1/4-INCH).....	3-4
3-4.2 HALON 1301 DISCHARGE NOZZLE.....	3-4
3-4.3 FLEXIBLE HOSE.....	3-4
3-4.4 FLEXIBLE TUBING LOOP.....	3-4
3-4.5 BRACKETS.....	3-4
3-4.6 VENT FITTING.....	3-6
3-4.7 SCALE.....	3-6
3-4.8 OPERATING INSTRUCTION AND LABEL PLATES.....	3-6
3-4.9 ACTUATION LINE FILTER.....	3-6
4 SCHEDULED MAINTENANCE.....	4-1
4-1 INTRODUCTION.....	4-1
5 TROUBLESHOOTING.....	5-1
5-1 INTRODUCTION.....	5-1
5-2 TROUBLESHOOTING.....	5-1
6 CORRECTIVE MAINTENANCE.....	6-1
6-1 INTRODUCTION.....	6-1
6-2 MAKE READY PROCEDURE.....	6-1
6-3 INSPECTION AND REPAIR OF MANUAL CO ₂ ACTUATOR ASSEMBLY (Figure 6-1).....	6-1
6-4 INSPECTION AND REPAIR OF PRESSURE SWITCH (Figure 6-2 and 6-3).....	6-3

TABLE OF CONTENTS (Cont)

Chapter/Paragraph	Page
6-5 REPAIR OF TIME DELAY (Figure 6-4).....	6-6
6-6 REPAIR OF HALON 1301 CYLINDER ASSEMBLY.....	6-6
6-6.1 DISCHARGING HALON 1301 CYLINDERS.....	6-6
6-6.2 CYLINDER DISASSEMBLY (FIGURE 6-6).....	6-9
6-6.3 INSPECTION.....	6-9
6-6.4 ASSEMBLY OF CYLINDER.....	6-12
6-7 RELIABILITY IMPROVEMENT EQUIPMENT	6-13
7 PARTS LIST.....	7-1
7-1 INTRODUCTION.....	7-1
8 INSTALLATION.....	8-1
8-1 INTRODUCTION.....	8-1
8-2 UNPACKING.....	8-1
8-3 INSTALLATION.....	8-1
8-3.1 MODULAR HALON 1301 SYSTEMS.....	8-4
8-3.2 BANKED HALON 1301 SYSTEMS.....	8-4
8-3.3 HALON CYLINDER MOUNTING.....	8-4
8-3.4 CO ₂ ACTUATION STATIONS.....	8-4
8-3.4.1 Definitions.....	8-4
8-3.4.2 Actuation Station Location.....	8-4
8-4 COMPONENT REMOVAL AND REPLACEMENT.....	8-5
8-4.1 GENERAL INSTALLATION INSTRUCTION.....	8-5
8-4.2 HALON 1301 CYLINDER.....	8-5
8-4.3 CO ₂ ACTUATOR.....	8-5
8-4.4 TIME DELAY DEVICE.....	8-5
8-4.5 PRESSURE SWITCH.....	8-6
8-4.6 FLEXIBLE ACTUATION TUBING (1/4 INCH)	8-6
8-4.7 FLEXIBLE DISCHARGE HOSE.....	8-6
8-4.8 INSTALLATION OF 1/4" CHECK VALVE AND 1/4" BYPASS VALVE	8-6

LIST OF ILLUSTRATIONS

FIGURE	TITLE	Page
1-1	TYPICAL HALON 1301 SYSTEM CONFIGURATION - MODULAR(PREENGINEERED) TYPE	1-7
1-2	TYPICAL HALON 1301 SYSTEM CONFIGURATION - BANKED (ENGINEERED) TYPE	1-8
2-1	CONTROLS AND INDICATORS	2-3
2-2	ACTIVATION OF HALON 1301 SYSTEM	2-5
2-3	CYLINDER PRESSURE VS. TEMPERATURE	2-6
3-1	TYPICAL SYSTEM DIAGRAM	3-1
3-2	MANUAL CO ₂ ACTUATOR FUNCTIONAL DIAGRAM	3-2
3-3	TIME DELAY DEVICE FUNCTIONAL DIAGRAM	3-3
3-4	PRESSURE OPERATED SWITCH FUNCTIONAL DIAGRAM	3-5
3-5	HALON 1301 CYLINDER ASSEMBLY FUNCTIONAL DIAGRAM	3-5
3-6	FLEXIBLE HOSE (CUTAWAY VIEW)	3-6
6-1	MANUAL CO ₂ ACTUATOR ASSEMBLY	6-2
6-2	PRESSURE SWITCH	6-4
6-3	PRESSURE SWITCH HOUSING ALIGNMENT	6-5
6-4	TIME DELAY	6-7
6-5	HALON 1301 CYLINDER DISCHARGE STATION	6-8
6-6	HALON 1301 CYLINDER	6-10
6-7	SPECIAL TOOLS	6-11
7-1	VALVE, 1/4 in., TIME DELAY OVERRIDE	7-11
7-2	DELAY, TIME, PRESSURE OPERATED, 60 SECOND, CLASS I	7-12
7-3	HOSE, FLEXIBLE, DISCHARGE, 1-1/2 in.	7-13
7-4	VALVE, CHECK, ACTUATION, 1/4 in., HARD SEAT	7-13
7-5	VALVE ASSEMBLY, CHECK, DISCHARGE, 1-1/2 in.	7-14
7-6	ACTUATOR, CO ₂ , MANUAL, 5 lb, CLASS I	7-15
7-7	FITTING, VENT, CO ₂ ACTUATION, 1/4 in.	7-15
7-8	SWITCH, PRESSURE OPERATED	7-16
7-9	BRACKET, CYLINDER, CO ₂ ACTUATOR	7-17
7-10	SCALE, BEAM, BENCH TYPE 2	7-18
7-11	INDICATOR, LIQUID LEVEL, HALON 1301	7-19

LIST OF ILLUSTRATIONS (Cont)

FIGURE	TITLE	Page
7-12	DELAY, TIME, PRESSURE OPERATED, 30 SECOND, CLASS I	7-20
7-13	TAGS, CYLINDER, LIQUID LEVEL	7-21
7-14	CAP, DISCHARGE, ANTI-RECOIL, HALON 1301	7-22
7-15	CAP, PROTECTION, VALVE ACTUATOR	7-22
7-16	BRACKET, CYLINDER, HALON 1301, 10 THROUGH 95 lb SIZES 1 THROUGH 4, CLASS I	7-23
7-17	BRACKET, CYLINDER, HALON 1301, 125 lb, SIZES 5, CLASS I	7-24
7-18	BRACKET, TIME DELAY	7-25
7-19	ADAPTER, DISCHARGE, 1.50", HALON 1301	7-26
7-20	CYLINDER ASSEMBLY, HALON 1301, 10 lb., SIZE 1, CLASS I	7-26
7-21	CYLINDER ASSEMBLY, HALON 1301, 15 lb., SIZE 2, CLASS I	7-27
7-22	CYLINDER ASSEMBLY, HALON 1301, 60 lb., SIZE 3, CLASS I	7-27
7-23	CYLINDER ASSEMBLY, HALON 1301, 95 lb., SIZE 4, CLASS I	7-28
7-24	CYLINDER ASSEMBLY, HALON 1301, 125 lb., SIZE 5, CLASS I	7-29
7-25	ACTUATOR, VALVE, PRESSURE OPERATED, HALON 1301	7-30
7-26	NOZZLE, DISCHARGE, HALON 1301, 180° AND 360° DISCHARGE PATTERN	7-30
7-27	TUBING, FLEXIBLE, ACTUATION, 0.25 in.,	7-31
7-28	VALVE ASSEMBLY, CYLINDER 0.25 in., HALON 1301	7-31
7-29	CAP, SHIPPING, HALON 1301 CYLINDER ASSEMBLY	7-32
7-30	VALVE, CYLINDER, CO ₂ ACTUATOR	7-33
7-31	FITTING END ADAPTER, 37° FLARED 0.25 in I.P.S. SOCKET WELD	7-33
7-32	VALVE ASSEMBLY, CHECK, 0.25 in., CARBON STEEL ENDS	7-34
7-33	VALVE ASSEMBLY, CHECK 0.25 IN., STAINLESS STEEL ENDS	7-35
7-34	DELAY, TIME, PRESSURE OPERATED, 60 SEC. CLASS I, WITH FILTER	7-36
7-35	DELAY, TIME, PRESSURE OPERATED, 30 SEC. CLASS I, WITH FILTER	7-37
7-36	VALVE ASSEMBLY, CYLINDER, 0.25 IN., HALON 1301	7-38
7-37	FILTER, IN-LINE, ACTUATION	7-39
7-38	TIME DELAY DEVICE, CARLETON TYPE, 30 OR 60 SECOND DELAY	7-40
7-39	HALON SYSTEM ACTUATION CHECK VALVE	7-41
8-1	TYPICAL HALON 1301 SYSTEM DIAGRAM	8-2
8-2	TYPICAL HALON 1301 WIRING DIAGRAM	8-3

LIST OF TABLES

NUMBER	TITLE	Page
1-1	REFERENCE DATA	1-2
1-2	SYSTEM CONFIGURATION BY SHIP	1-9
1-3	EQUIPMENT, ACCESSORIES, AND DOCUMENTS SUPPLIED	1-9
2-1	CONTROLS AND INDICATORS	2-1
4-1	SCHEDULED MAINTENANCE	4-1
5-1	TROUBLESHOOTING	5-1
7-1	LIST OF MAJOR COMPONENTS	7-1
7-2	PARTS LIST	7-3
8-1	COMPONENT INTERCONNECTION DATA	8-1
8-2	NOZZLE SIZES IN MODULAR INSTALLATIONS	8-4

SAFETY SUMMARY

While Halon 1301 is among the safest of the gaseous fire extinguishing agents, there are precautions to be taken and limitations to its use. In 1972, BUMED established the upper limits of concentration and time of exposure at which a healthy individual can be exposed to Halon 1301 gas without suffering harm. Other tests confirmed that Halon 1301 in design concentrations of 5 to 7 percent did not extinguish boiler fires when the gas was ingested into the combustion air of a firing boiler. An environmental impact assessment study of the Halon 1301 system was prepared in November 1975. A System Safety Study in accordance with MIL-STD-882 was prepared and major recommendations from the study are contained herein.

All Halon 1301 shipboard machinery space applications utilize a design concentration between 5 to 7 percent of Halon 1301 by volume in air. In an atmosphere where no fire exists and the concentration of Halon 1301 does not exceed 7 percent, exposed healthy individuals can be expected to function without undue damage to health or a dangerous impairment of performance of emergency task for a period not to exceed 10 minutes. In some compartments, the concentration of Halon 1301 may exceed 7 percent. If the Halon concentration is above 7 percent and below 10 percent, up to 1 minute exposure is not dangerous. If the Halon 1301 concentration is above 10 percent, no length of exposure to Halon 1301 is acceptable. Unnecessary exposure to Halon 1301 in its natural state should be avoided. All Halon 1301 systems are installed with discharge delay devices and alarms to warn personnel to shut down machinery and to evacuate the space.

Securing of Machinery Plant.

For all situations where the Halon 1301 system is actuated (either because of fire or inadvertently), the Central Control Station (CCS) should be alerted and an orderly

shutdown of the machinery plant should be conducted. Where an orderly machinery plant wrap-up is not possible, all machinery should be secured quickly from a remote location. Upon evacuation and last person out, all evacuees should be accounted for. All hatches shall be firmly secured during Halon 1301 discharge, and communications between all machinery spaces and CCS should be established as early as possible. Particular attention should be directed to the ventilation exhaust blowers. If the ventilation system is not secured prior to Halon 1301 discharge, the Halon 1301 concentration in the machinery space will be reduced because some Halon 1301 will be exhausted from the space.

The following information defines the safety risks associated with the use of shipboard Halon 1301 fire extinguishing systems. This guidance is provided for use aboard ship and should be included as a part of all training documents.

Hazards To Personnel.

Halon 1301 may be discharged in a fire situation or may be inadvertently released where no fire exists, in both cases potential hazards exist.

Where no fires exists, the following personnel hazards may arise upon Halon 1301 discharge.

1. Noise. Discharge of a system is noisy enough to be startling.
2. Turbulence. High pressure discharge from nozzles is sufficient to move unsecured paper and light objects.
3. Cold Temperature. Direct contact with vaporizing liquid being discharged from a Halon 1301 system may have a strong chilling effect on objects and can cause frostbite burns to the skin. The liquid phase

vaporizes rapidly when mixed with air and thus limits the hazard to the immediate vicinity of the nozzle.

4. Obscured Vision. Reduction in visibility occurs briefly because of condensation of water vapor in the air. Should personnel be trapped in a space while Halon 1301 is discharging and fogging of the atmosphere occurs, personnel are cautioned not to move until vision improves. Moving blindly in an obscured atmosphere could result in personnel injuries.

Where a fire exists, additional personnel hazards may arise upon Halon 1301 discharge. Extinguishment of fire by Halon 1301 results in the generation of toxic by-products. Decomposition occurs when Halon 1301 comes in contact with flames or surfaces above 900°F. Normally these by-products reach only low concentration levels where the fire is extinguished. The main decomposition products are hydrogen fluoride (HF), hydrogen bromide (HBr) and free bromine (Br₂). Hydrogen fluoride and hydrogen bromide in vapor form are colorless. However, even in minute concentrations of a few parts per million, these decomposition products have a characteristically sharp acrid odor. This characteristic provides a built-in warning system for these substances, but at the same time creates a noxious irritating atmosphere in addition to the smoke irritant for those who must enter the hazard area following a fire. As with all compartment fires, personnel outside the space should avoid fire gases and decomposition products discharged from ventilation exhausts and stacks. All reentry personnel shall wear oxygen breathing apparatus (OBA) and protective clothing. Reentry with an open flame or lighted cigarette shall not be made to a hazard area in which a fire has been extinguished until the area has been declared safe for normal entry. If possible, the hazard space should be kept tightly closed for at least 30 minutes after discharge of Halon

1301. Under no circumstances should reentry be made until at least 15 minutes after discharge of the Halon 1301. NSTM chapter 555 details reentry procedures and should be consulted. Note that the ventilation system can only be restarted after the ventilation shutdown pressure switch in the Halon 1301 system actuation piping has been reset.

Warning labels are posted at all accesses to the space and all personnel are cautioned to read and familiarize themselves with these warnings.

WARNING STATEMENTS

There are warnings and cautions throughout the text of the manual that alert operating and maintenance personnel to potentially hazardous situations. The following is a summary of the warnings and cautions contained in the manual.

WARNING/CAUTION	PAGE
All Halon 1301 cylinders and CO ₂ actuator cylinders installed in a system must be fully charged to ensure full protection in the event of a fire	2-2
The CO ₂ actuator lever must be restrained in the OPEN position in order to operate the Halon 1301 system	2-2
Alert and evacuate personnel from the hazard area immediately, and where possible, prior to actuation of the system. Close all hatches, doors, vents, and other openings with the least possible delay. Conduct an orderly shutdown of the machinery plant in the hazard area	2-2

WARNING/CAUTION	PAGE	WARNING/CAUTION	PAGE
Upon completion of reentry procedures, the ventilation system of a space where Halon 1301 has been used should be operated at high speed for at least 15 minutes before opening the space and entering without an OBA. Personnel without an OBA should enter the space only after it is certified gas free.....	2-7	Before disassembly, discharge cylinder contents in a well ventilated area. Oxygen may be displaced from a confined space in the event of discharge.....	6-6
Maintenance or testing of an active Halon 1301 total flooding system shall not be performed until all procedural steps of paragraph 6-2 have been accomplished.....	6-1	Before starting the disassembly of a cylinder, ensure that the contents have been discharged in accordance with paragraph 6-6.1 and that cylinder is empty.....	6-9
Before disassembly, discharge cylinder contents in a well ventilated area with the anti-recoil discharge cap in place. Oxygen may be displaced from a confined space in the event of discharge.....	6-1	Donot allow water to enter the cylinder. Water in a pressurized cylinder with Halon 1301 will damage cylinder.....	6-12
Turn off electrical power before removing cover assembly. Tag switch and Halon 1301 system actuators "OUT OF SERVICE".....	6-3	Insure piston is in the "UP" position prior to installing actuator assembly to valve.....	6-13
		High voltage may be present in pressure switch. To prevent serious injury or death, Halon 1301 equipment electrical circuits shall be deenergized and tagged OUT OF SERVICE before removal or replacement of pressure switches.....	8-8

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

1-1 SAFETY PRECAUTIONS.

Before operating and maintaining the Halon 1301 total flooding system, all personnel shall be thoroughly familiar with the Safety Summary and the Warning Statements in the front matter of this manual.

1-2 INTRODUCTION.

1-2.1 SYSTEM OVERVIEW. This manual provides Technical Instruction for the proper use and maintenance of components manufactured by Wormald U.S., Inc. The components are designed for use in piped systems installed in shipboard machinery spaces, fuel pump rooms, generator rooms and flammable materials storage rooms to extinguish fires. Bromotrifluoromethane (Halon 1301) is used as the extinguishing agent.

1-2.1.1 Halon 1301. Halon 1301 is a colorless, odorless, electrically nonconductive gas that is an effective agent for extinguishing fires by inhibiting the chemical reaction of fuel and oxygen. The extinguishing effect due to cooling or dilution of the oxygen or fuel vapor concentration is minor.

1-2.1.2 Primary Function. The primary function of the total flooding system is to extinguish Class B fires that are beyond the capabilities of other extinguishing system apparatus, and where abandonment of the space is necessary. A Halon 1301 system will extinguish both surface (spill) and spray types of fires.

1-2.1.3 Use and Limitations. Halon 1301 systems are useful for extinguishing fires in specific hazardous or equipments where an electrically nonconductive extinguishing agent is essential or desirable. The fact that Halon 1301 leaves no residue is useful where clean up of other agents presents a problem. The relative compactness of

Halon 1301 systems is useful where weight versus extinguishing potential is a factor. Halon 1301 will not extinguish fires involving the following materials:

a. Chemicals capable of undergoing autothermal decomposition, such as hydrazine and certain organic peroxides.

b. Pyrotechnics and compounds containing their own oxygen supply.

c. Reactive metals, including Lithium, Sodium, Potassium, Magnesium, Titanium, Zirconium, Uranium and Plutonium.

d. Metal hydrides such as Lithium Hydride.

1-2.1.4 System Actuation. A Halon 1301 system generally contains local and remote, manually controlled pressure actuators. These 5-pound capacity carbon dioxide (CO₂) cylinders can be actuated from at least two locations. Halon 1301 systems, except those installed in flammable materials storage rooms, can be actuated from within the space, as well as from outside, adjacent to each main access to the space.

A total flooding Halon 1301 system is designed to completely discharge all Halon 1301 into a designated space in approximately 10 seconds.

1-2.2 SYSTEM CONFIGURATIONS. Halon 1301 total flooding systems are installed in designated spaces of the ship. All systems are operationally similar, varying primarily in the number and placement of components.

1-2.2.1 Modular Configuration. Halon systems installed in machinery spaces by a ship alteration have a modular configuration as shown in figure 1-1, and have only a primary system. Halon 1301 systems installed in fuel pump rooms, generator rooms and flammable materials storage rooms also have a modular configuration,

with a primary system only. Refer to paragraph 8-3.1 for additional details on modular systems.

1-2.2.2 Banked Configuration. Halon 1301 systems installed in machinery rooms during ship construction have a banked configuration as shown in figure 1-2, and have both a primary and reserve Halon 1301 cylinder bank. Refer to paragraph 8-3.2 for additional details on banked systems.

1-2.3 SYSTEM OPERATIONAL DESCRIPTION. The system provides a means to extinguish fires by rapid, total flooding of spaces with Halon 1301 agent. Actuation of the system automatically turns on necessary alarms and shuts down ventilation to the affected space.

1-2.3.1 Actuation. Pressurized CO₂ provides the force to open pressure-

operated valves on Halon 1301 cylinders. Halon 1301 gas is then discharged through nozzles into the space.

1-2.3.2 Time Delay. A preset time delay assembly in the CO₂ piping provides an interval between the time that the CO₂ pressure operates the pressure switch to shut down ventilation and the time Halon 1301 is discharged.

1-3 REFERENCE DATA.

Reference data for the system and its major components, shown in figures 1-1 and 1-2, are contained in table 1-1.

Table 1-2 lists the ship classes that have modular and banked configurations.

Table 1-1. Reference Data

Name	Characteristic	Data
1/4 in. Time Delay Override Valve	Manufacturer	Wormald U.S., Inc.
	Part Number	23519N
	Type	Normally Closed
	Actuation	Manual
	Weight	3.2 lb.
	Length	4 in.
60 sec. Time Delay (Superseded by part No. 77554N)	Manufacturer	Wormald U.S., Inc.
	Part Number	23992N
	Type	Normally Closed
	Actuation	Pressurized Gas
	Time Delay (Preset by Manufacturer)	60 sec.
	Weight	11 lb.
	Height	19.25 in.
Diameter	4.19 in.	
1-1/2 in. Discharge Hose	Manufacturer	Wormald U.S. Inc.
	Part Number	26346N
	Type	Flexible Metal
	Minimum Burst Pressure	5000 psig
	Weight	15 lb.

Table 1-1 (Cont.)

Name	Characteristic	Data	
1/4 in. Check Valve (Superseded by part 72099N)	Manufacturer	Wormald U.S., Inc.	
	Part Number	27849N	
	Type	Hard Seat	
	Pressure-Temperature Rating	3000 psig @ 93°C	
	Weight	0.4 lb.	
	End Connections	Socket Weld	
1-1/2 in. Check Valve (Banked systems only)	Manufacturer	Wormald U.S., Inc.	
	Part Number	27850N	
	Pressure - Temperature Rating	3000 psig @ 93°C	
	Weight	3 lb. (±.50)	
Manual CO ₂ Actuator	Manufacturer	Wormald U.S., Inc.	
	Part Number	28034N	
	Actuation	Manual	
	CO ₂ Capacity	5 lb.	
	Weight, Full	17.5 lb.	
	Height	16.64 in.	
Diameter		6.75 in.	
Vent Fitting	Manufacturer	Wormald U.S., Inc.	
	Part Number	28037N	
	Weight	0.07 lb.	
Pressure Switch	Manufacturer	Wormald U.S., Inc.	
	Part Number	29825N	
	Type	3NH, 3 pole	
	Actuation	Pneumatic and Manual	
	Reset	Manual	
	Rating		30 amp, 250v, 60Hz
			20 amp, 600v, 60Hz
			3 HP, 120v, 60Hz
			7-1/2 HP, 240v, 60Hz
			15 HP, 600v, 60Hz
	3 Phase, 60Hz		
Weight	6.8 lb.		
Dimensions, Overall	9 x 4.88 x 4 in.		
CO ₂ Actuator Bracket Assembly	Manufacturer	Wormald U.S., Inc.	
	Part Number	33813N	
	Weight	2.8 lb.	
Bench Type Beam Scale	Manufacturer	Byron Miller and Associates	
	Part Number	Model No. 310	
	Capacity	310 lb.	
	Weight	55 lb.	
	Platform Dimensions	17 x 22 in.	

Table 1-1 (Cont.)

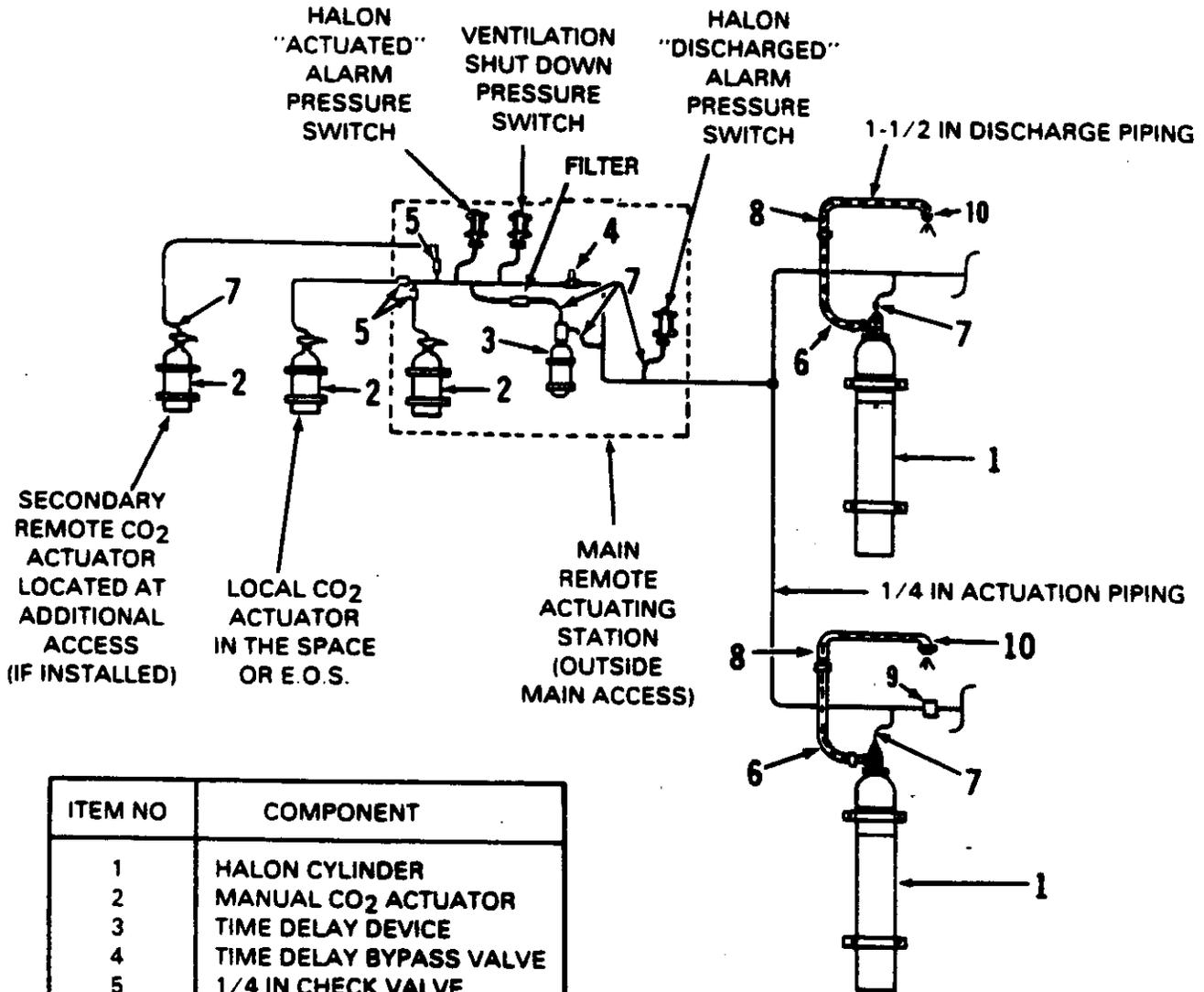
Name	Characteristic	Data
30 sec. Time Delay (Superseded by Part No. 77555N)	Manufacturer	Wormald U.S., Inc.
	Part Number	52173N
	Type	Normally Closed
	Actuation	Pressurized Gas
	Time Delay/Preset by	
	Manufacturer	30s
	Weight	11 lb.
	Height	19.25 in.
Cylinder Bracket Assembly for 10 to 95 lb Halon cylinders	Manufacturer	Wormald U.S., Inc.
	Part Number	52425N
	Weight	8 lb.
Cylinder Bracket Assembly for 125 lb. Halon 1301 cylinders	Manufacturer	Wormald U.S., Inc.
	Part Number	52425N
	Weight	8 lb.
Time Delay Mounting Bracket Assembly	Manufacturer	Wormald U.S., Inc.
	Part Number	52430N
	Weight	0.8 lb.
1-1/2 in. Discharge Adapter (Modular System only)	Manufacturer	Wormald U.S., Inc.
	Part Number	52443N
	Pressure-Temperature Rating	3000 psig @ 93°C
	Weight	3.2 lb.
10 lb. Halon 1301 Cylinder Assembly (Superseded by Part No. 77655N)	Manufacturer	Wormald U.S., Inc.
	Part Number	52701N
	Halon 1301 Capacity	10 lb. (± 1)
	Weight, Full	80 lb.
	Height w/o Shipping Cap	24.38 in. (± 1.00)
	Diameter	8.5 in.
15 lb Halon 1301 Cylinder Assembly (Superseded by Part No. 77656N)	Manufacturer	Wormald U.S., Inc.
	Part Number	52702N
	Halon 1301 Capacity	15 lb. (± 1)
	Weight, Full	88 lb
	Height w/o Shipping Cap	24.38 in (± 1.00)
	Diameter	8.5 in.
60 lb Halon 1301 Cylinder Assembly (Superseded by Part No. 77657N)	Manufacturer	Wormald U.S., Inc.
	Part Number	52703N
	Halon 1301 Capacity	60 lb (± 1)
	Weight, Full	156 lb
	Height w/o Shipping Cap	42.38 in (± 1.00)
	Diameter	8.5 in.

Table 1-1 (Cont.)

Name	Characteristic	Data
95 lb Halon 1301 Cylinder Assembly (Superseded by Part No. 77658N)	Manufacturer	Wormald U.S., Inc
	Part Number	52704N
	Halon 1301 Capacity	95 lb (± 1)
	Weight, Full	256 lb.
	Height w/o Shipping Cap Diameter	58.38 in. (± 1.00)
125 lb Halon 1301 Cylinder Assembly (Superseded by Part No. 77659N)	Manufacturer	Wormald U.S., Inc.
	Part Number	52705N
	Halon 1301 Capacity	125 lb (± 1)
	Weight, Full	302 lb
	Height w/o Shipping Cap Diameter	63.38 in (± 1.00) 8.5 in
Halon 1301 discharge , Nozzle, 180° and 360°	Manufacturer	Wormald U.S., Inc.
	Part Number	52921N
	Weight	0.2 lb
	Orifice Size	Various: Code Number Stamped on Nozzle body
1/4 in. Flexible Tubing CO ₂ Actuation	Manufacturer	Combination Pump Valve Co
	Part Number	A10895
	Type	CU. NI. 70-30
	Burst Pressure	8000 lb/in ² Minimum
	NAVSEA Drawing	53711-803-6397405
Fitting End Adapter	Manufacturer	Wormald U.S., Inc.
	Part Number	64569N
	Type	37° Flare x 0.25 in I.P.S.
1/4 in. Check Valve (Supersedes part number 27849N)	Manufacturer	Wormald U.S., Inc.
	Part Number	72099N
	Type	Soft Seat
	Pressure-Temperature Rating	3000 psig @ 93°C
	End Connections	Unions, Carbon Steel
1/4 in. Check Valve (Identical to 72099N except for end connection material)	Manufacturer	Wormald U.S., Inc.
	Part Number	77479N
	Type	Soft Seat
	Pressure-Temperature Rating	3000 psig @ 93°C
	End Connections	Unions, Stainless Steel
Actuation Line Filter	Manufacturer	Norman Equipment Company
	Part Number	U-275
	Filtration	10 Micron
	Pressure Rating	3000 psig
	Weight	0.66 lbs.

Table 1-1 (Cont.)

Name	Characteristic	Data
60 sec. Time Delay w/ Filter	Manufacturer	Wormald U.S., Inc.
	Part Number	77554N
	Type	Normally Closed
	Actuation	Pressurized Gas
	Time Delay	60 sec.
	Weight	11 lbs.
	Height	21.50 in.
30 sec. Time Delay w/ Filter	Manufacturer	Wormald U.S., Inc.
	Part Number	77555N
	Type	Normally Closed
	Actuation	Pressurized Gas
	Time Delay	30 sec.
	Weight	11 lbs.
	Height	21.50 in.
10 lb. Halon 1301 Cylinder Assembly (Supersedes 52701N)	Manufacturer	Wormald U.S., Inc.
	Part Number	77655N
	Halon 1301 Capacity	10 lb. (± 1)
	Weight, Full	80 lb.
	Height w/o Shipping Cap	24.38 in. (± 1.00)
	Diameter	8.5 in.
	15 lb. Halon 1301 Cylinder Assembly (Supersedes 52702N)	Manufacturer
Part Number		77656N
Halon 1301 Capacity		15 lb. (± 1)
Weight, Full		88 lb.
Height w/o Shipping Cap		24.38 in. (± 1.00)
Diameter		8.5 in.
60 lb. Halon 1301 Cylinder Assembly (Supersedes 52703N)		Manufacturer
	Part Number	77657N
	Halon 1301 Capacity	60 lb. (± 1)
	Weight, Full	156 lb.
	Height w/o Shipping Cap	42.38 in. (± 1.00)
	Diameter	8.5 in.
	95 lb. Halon 1301 Cylinder Assembly (Supersedes 52704N)	Manufacturer
Part Number		77658N
Halon 1301 Capacity		95 lb. (± 1)
Weight, Full		256 lb.
Height w/o Shipping Cap		58.38 in. (± 1.00)
Diameter		
125 lb Halon 1301 Cylinder Assembly (Supersedes 52705N)		Manufacturer
	Part Number	77659N
	Halon 1301 Capacity	125 lb. (± 1)
	Weight, Full	302 lb.
	Height w/o Shipping Cap	63.38 in. (± 1.00)
	Diameter	8.5 in.



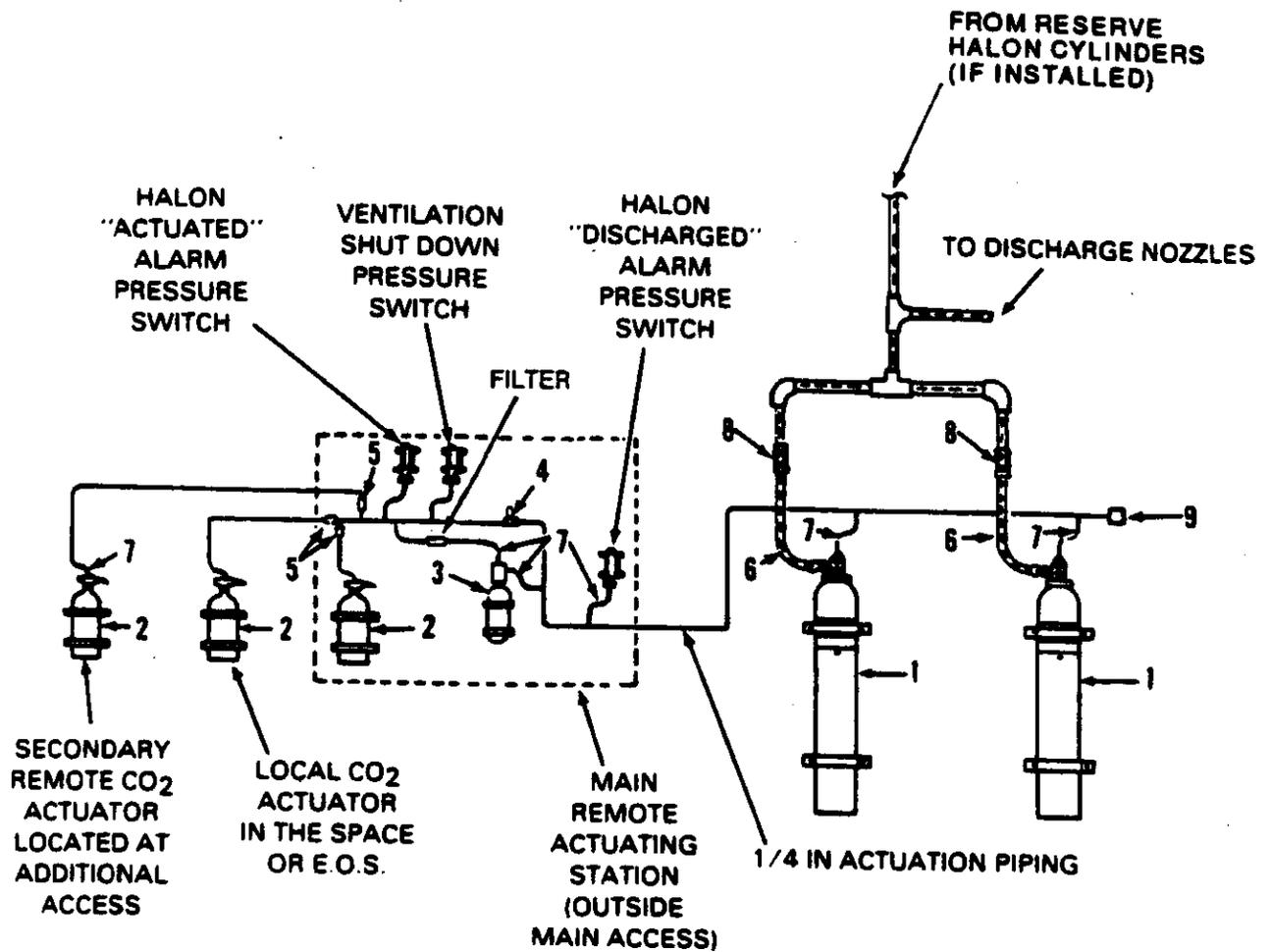
ITEM NO	COMPONENT
1	HALON CYLINDER
2	MANUAL CO ₂ ACTUATOR
3	TIME DELAY DEVICE
4	TIME DELAY BYPASS VALVE
5	1/4 IN CHECK VALVE
6	1-1/2 INCH FLEXIBLE HOSE
7	1/4 IN TUBING ASSY
8	1-1/2 IN ADAPTER
9	VENT FITTING
10	DISCHARGE NOZZLE

NOTES:

1. 1/4 IN ADAPTER FITTINGS ARE NOT SHOWN. LOCATION IS BETWEEN 1/4" PIPING AND 1/4" TUBING ASSEMBLY (7).
2. QUANTITY AND SIZE OF HALON CYLINDERS VARIES FOR EACH INSTALLATION.

———— = CO₂ FLOW
 - - - - - = HALON FLOW

Figure 1-1 Typical Halon 1301 System Configuration - Modular (Preengineered) Type



NOTES:

1. 1/4 IN ADAPTER FITTINGS ARE NOT SHOWN. LOCATION IS BETWEEN 1/4" PIPING AND 1/4" TUBING ASSEMBLY (7).
2. QUANTITY AND SIZE OF HALON CYLINDERS VARIES FOR EACH INSTALLATION.
3. 1-1/2 IN CHECK VALVE MAY NOT BE INSTALLED WHEN THERE IS ONLY ONE CYLINDER

———— = CO₂ FLOW
 - - - - - = HALON FLOW

ITEM NO	COMPONENT
1	HALON CYLINDER
2	MANUAL CO ₂ ACTUATOR
3	TIME DELAY DEVICE
4	TIME DELAY BYPASS VALVE
5	1/4 IN CHECK VALVE
6	1-1/2 IN FLEXIBLE HOSE
7	1/4 IN TUBING ASSY
8	1-1/2 IN CHECK VALVE
9	VENT FITTING

Figure 1-2. Typical Halon 1301 System Configuration - Banked (Engineered) Type

Table 1-2, Halon Modular and Banked Systems, By Ship Class

Ships With Modular Systems		Ships With Banked Systems
AVT-16	LCC-19, 20	AD-41 CLASS**
CV-41, 43, 59, 60, 64, and 67	LHA-1,2,3,4,5 LPD-1	AO-180, 186** ARS-50 CLASS
BB-61, 62	LPD-4 CLASS (LESS LPD-7)	CVN-71, 72, 73
DDG-37 CLASS	LPH-3, 7, 9, 10, 12	LSD-41 CLASS
CG-16 CLASS	LSD-36, 37, 39	LHD-1
CG-26 CLASS	AFS-1 CLASS	
DD-963 CLASS	LST-1179 CLASS	
AE-21, 22, 23,24, 25, and AE-26 CLASS	LKA-113 CLASS AS-36 CLASS	
AOE-2	AS-39 CLASS	
AOR-2 through 7	CVN-65	* Banked Auxiliary Boiler Room
AGF-11	CVN-69*	** Modular Pump Rooms and Emergency Generator Rooms
ARL-24		

1-4 EQUIPMENT, ACCESSORIES, AND DOCUMENTS SUPPLIED.

Equipment, accessories, and documents supplied for the Halon 1301 total flooding systems are shown in table 1-3. All supplied equipment is in accordance with military specification MIL-E-24572, with the exception of adapter fittings, which are not addressed in this specification. Piping and standard fittings are to be supplied by the installing activity.

1-5 RELIABILITY IMPROVEMENT EQUIPMENT.

ShipAlts have been developed to improve operational reliability of the Halon 1301 systems. The equipment installed by these ShipAlts is provided by various manufacturers. Ships that have been transferred to other services such as Military Sealift Command and Foreign Military Sales may or may not have any of these ShipAlts

accomplished. When accomplished, these ShipAlts provide for the following items;

(A) Time Delay Devices: The Original equipment devices are removed and replaced. The new time delay devices are hermetically sealed and pneumatically triggered as opposed to the originally installed pressure operated time delay devices. The new devices are manufactured by Carleton Technologies Inc. (CAGE 1W506).
(See figure 7-38)

(B) In-Line Filter, CO₂ Actuation: A 10 micron filter is installed in the CO₂ actuation system upstream of the time delay device. The filter element may be removed and cleaned or replaced with a new element.
(See figure 7-37)

(C) Flexible Tubing Loop, 1/4 inch, CO₂ Actuation: CO₂ actuation systems flexible 1/4 inch hoses are removed and replaced with 1/4 inch diameter by 30 inches long tubing assemblies.
(See figure 7-27)

(D) CO₂ Actuation System 1/4-Inch Check Valves: Check valves that are hard-welded into the piping are cut out and replaced with union end and soft seat (O-Ring type) check valves. Some check valves are Ansul part No. 415027 manufactured in accordance with NAVSEA Drawing 803-6397404 and have different size union nuts which prevents improper reinstallation.

(E) CO₂ Actuation System 1/4-Inch Carbon Steel Piping: Carbon steel piping is ripped out and replaced with 1/4-inch stainless steel pipe.

(F) CO₂ Actuator Valve Lever and Latch Mechanism: (See figure 6-1) Reliability is improved by installing Ansul P/N 408418N, an 11 part kit.

Table 1-3. Equipment, Accessories, and Documents Supplied

Name	Number
EQUIPMENT	
1/4 in. Time Delay Override Valve	23519N
60s Time Delay	23992N
1-1/2 in. Discharge Hose Assembly	26346N
1/4 in. Check Valve	27849N
(Superseded by part number 72099N)	
1-1/2 in. Check Valve (Banked systems only)	27850N
Manual CO ₂ Actuator	28034N
Vent Fitting	28037N
Pressure Switch	29825N
CO ₂ Actuator Bracket Assembly	33813N
30s Time Delay	52173N
Cylinder Bracket Assembly for 10 to 95 lb Halon 1301 Cylinders	52425N
Cylinder Bracket Assembly for 125 lb Halon 1301 Cylinders	52427N
Time Delay Mounting Bracket Assembly	52430N
1-1/2 in. Discharge Adapter (Modular system only)	52443N
10 lb Halon 1301 Cylinder Assembly	52701N
(Superseded by part number 77655N)	
15 lb Halon 1301 Cylinder Assembly	52702N
(Superseded by part number 77656N)	
60 lb Halon 1301 Cylinder Assembly	52703N
(Superseded by part number 77657N)	
95 lb Halon 1301 Cylinder Assembly	52704N
(Superseded by part number 77658N)	

Table 1-3. Equipment, Accessories, and Documents Supplied (cont.)

Name	Number
EQUIPMENT	
125 lb Halon 1301 Cylinder Assembly (Superseded by part number 77659N)	52705N
Halon 1301 Discharge Nozzle, 180° and 360°	52921N
1/4 in. Flexible Actuation Tubing Assembly Fitting End Adapter	A10895 64569N
1/4 in. Check Valve (w/ carbon steel ends) (Supersedes part number 27849N)	72099N
1/4 in. Check Valve (w/ stainless steel ends) (Supersedes part number 27849N)	77479N
30s Time Delay, with Filter (Supersedes part number 52173N)	77555N
60s Time Delay, with Filter (Supersedes part number 23992N)	77554N
10 lb. Halon 1301 Cylinder Assembly (Supersedes part number 52701N)	77655N
15 lb. Halon 1301 Cylinder Assembly (Supersedes part number 52702N)	77656N
60 lb. Halon 1301 Cylinder Assembly (Supersedes part number 52703N)	77657N
95 lb. Halon 1301 Cylinder Assembly (Supersedes part number 52704N)	77658N
125 lb. Halon 1301 Cylinder Assembly (Supersedes part number 52705N)	77659N
CO ₂ Actuation In-Line Filter	U-275
Time Delay, Carleton Type, 60 Sec.	B15830-60
Time Delay, Carleton Type, 30 Sec.	B15830-30
ACCESSORIES	
Bench Type Beam Scale	51992N
Liquid Level Indicator	HLI-287
DOCUMENTS	
Technical Manual	S9555-A6-MMA-010/HALON 1301

CHAPTER 2 OPERATION

2-1 INTRODUCTION.

This chapter describes all controls and indicators and gives operating procedures for Halon 1301 total flooding systems.

2-2 CONTROLS AND INDICATORS.

Refer to figure 2-1 and table 2-1 for illustrations and a listing of controls and indicators.

2-2.1 MANUAL CO₂ ACTUATOR LEVER.

This control, when in the up (horizontal), closed position, indicates that the CO₂ actuation system is ready. A ring pin secures the lever in the up position to prevent accidental movement of the lever down to the vertical (45°), open position, which actuates the system. The lever can only be moved manually.

2-2.2 PRESSURE OPERATED SWITCH.

Automatic control of electrical equipment (alarms and ventilation) during operation of the Halon 1301 system is provided by pressure

operated switches. These switches open or close electrical circuits in response to rising pressure brought about by activation of the CO₂ actuation system. The switch can be operated manually by pulling up on the plunger. To reset the switch, push down on the plunger after all CO₂ pressure has bled off.

2-2.3 HALON 1301 CYLINDER PRESSURE

GAGE. This indicator monitors the pressure within the Halon 1301 cylinder. The gage has a scale consisting of pressure ranges of 0-1500 psig.

2-2.4 PRESSURE OPERATED TIME DELAY

DEVICE. The time delay device enables personnel to clear the protected space after the system is actuated. The delay provides time for shutting down operating machinery (boilers, engines, pumps, etc.), closing hatches, and leaving the space before Halon 1301 is released.

Table 2-1. Controls and Indicators

Name	Position/Reading	Condition
Manual CO ₂ Actuator Lever	Up (Horizontal)	Actuator ready
	Down (45° below)	Actuator discharged
Pressure Operated Switch Plunger	Down	Ready (see note).
	Up	Actuated (see note).
Halon 1301 Cylinder Pressure Gage	Pressure guage shows pressure on or below "Minimum Acceptable Pressure" line on figure 2-3.	Cylinder pressure too low or discharged
	Pressure guage shows pressure between "Minimum Acceptable Pressure" line and "Maximum Acceptable Pressure" line on figure 2-3.	Cylinder pressure correct

Table 2-1. Controls and Indicators (cont.)

Name	Position/Reading	Condition
Halon 1301 Cylinder Pressure Gage (cont.)	Pressure guage shows pressure on or above "Maximum Acceptable Pressure" line on figure 2	Cylinder pressure too high
1/4 in. Time Delay Override	Perpendicular to pipe Parallel with pipe	Closed (Normal). Open (System actuated).

NOTE

The electrical switch in the pressure operated switch assembly may be connected to turn a circuit on or off (wired normally open or normally closed) depending on whether the electrical circuit is to be energized or deenergized when the switch is actuated. Pressure switches for Halon 1301 alarm systems should be wired normally open. Switches for ventilation shutdown should be wired normally closed. Refer to ship electrical system diagram.

2-2.5 TIME DELAY OVERRIDE VALVE.

This valve can be operated after the system is actuated to bypass the time delay device if the time delay should fail. This valve is normally closed.

NOTE

Utilize the override valve only if the time delay device fails to operate after specified delay period.

2-2.6 LIQUID LEVEL TAGS. Liquid level tags (see figure 7-13) are attached on all 60-lb, 95-lb and 125-lb Halon 1301 cylinders. The tags mark the level of liquid Halon in the cylinder at 70°F when charged with exactly 60, 95, or 125 pounds of Halon 1301. The actual liquid level

of the Halon 1301 in each cylinder is determined using the liquid level indicator (figure 7-11).

2-3 OPERATING PROCEDURES.**WARNING**

All Halon 1301 cylinders and CO₂ actuator cylinders installed in a system must be fully charged to ensure full protection in the event of a fire.

2-3.1 NORMAL OPERATION.**CAUTION**

The CO₂ actuator lever must be restrained in the OPEN position in order to operate the Halon 1301 system.

Alert and evacuate personnel from the hazard area immediately, and where possible, prior to actuation of the system. Close all hatches, doors, vents, and other openings with the least possible delay. Conduct an orderly shutdown of the machinery plant in the hazard area.

a. To activate the system, (a) pull the ring pin and (b) depress the manual CO₂ actuator lever to the locked open position. (See figure 2-2). This pressurizes the system

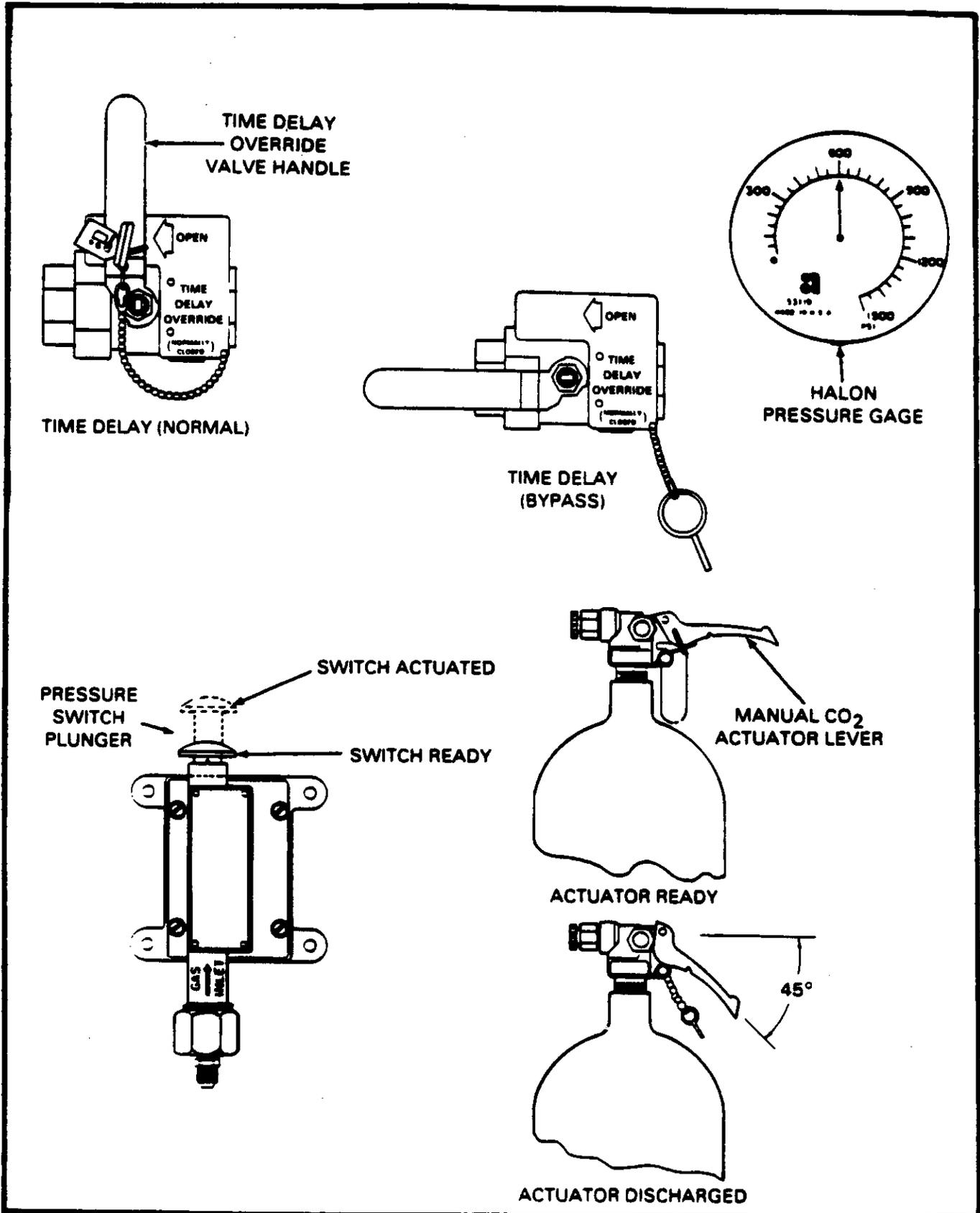


Figure 2-1. Controls and Indicators

between the CO₂ actuator and the time delay device and pressure operated switches. When the CO₂ pressure reaches approximately 100 psig, the pressure operated switches operate and sound alarms (bells and/or horns), turn on red rotating beacons or strobe lights, and turn off ventilation fans serving the compartment.

b. At approximately the preset time after opening the CO₂ actuator valve, the time delay device releases the CO₂, which opens the Halon 1301 cylinder valves, discharging all Halon 1301 into the designated space. At the same time, the CO₂ operates a pressure switch that actuates remote alarms indicating discharge of the Halon 1301 into the designated space.

c. Operation stops and total flooding is complete when all Halon 1301 is discharged and all CO₂ pressure has bled through the vent.

NOTE

CO₂ may still be venting upon reentry into space.

2-3.2 RETURNING SYSTEM TO READY. Do not return system to ready condition until authorized. To return the system to a normal or ready condition, proceed as follows:

a. Push down on knob on top of each actuated pressure operated switch to secure alarms and allow restart of compartment ventilation.

b. Remove discharged CO₂ actuator cylinder and replace with a charged unit. (See paragraph 8-4.3)

c. Remove discharged Halon 1301 cylinders and replace with charged units. (See paragraph 8-4.2)

2-3.3 EMERGENCY REENTRY. If emergency conditions exist such that immediate reentry is imperative, standard Navy reentry procedures, including the use of protective clothing, oxygen breathing apparatus (OBA), and fire fighting gear for a

space flooded with Halon 1301 or CO₂, are to be followed.

WARNING

Upon completion of reentry procedures, the ventilation system of a space where Halon 1301 has been used should be operated at high speed for at least 15 minutes before opening the space and entering without an OBA. Personnel without OBA should enter the space only after it is certified gas free.

2-3.4 EMERGENCY OPERATION.

2-3.4.1 CO₂ Actuator Failure. CO₂ actuator failure is apparent if the pressure operated switches do not actuate the alarms or shut down the ventilation system. If the CO₂ actuator fails:

a. Manually operate the pressure switches.

b. Operate another CO₂ actuator.

c. Wait 60 seconds and actuate the next CO₂ actuator (if installed).

d. Operate reserve Halon 1301 system (if installed).

e. Obtain CO₂ actuator from another Halon 1301 system or from spares. Disconnect failed CO₂ actuator. Connect full CO₂ actuator and actuate.

2-3.4.2 Time Delay Device Failure. If the time delay device fails, operate the time delay override valve as follows:

a. Break lead and wire seal and remove ring pin.

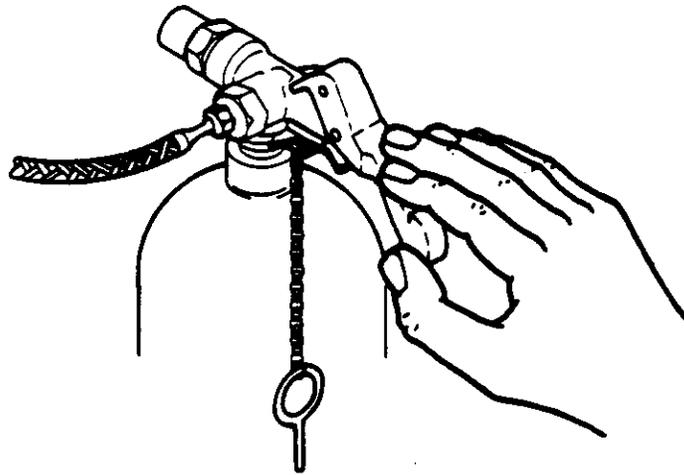
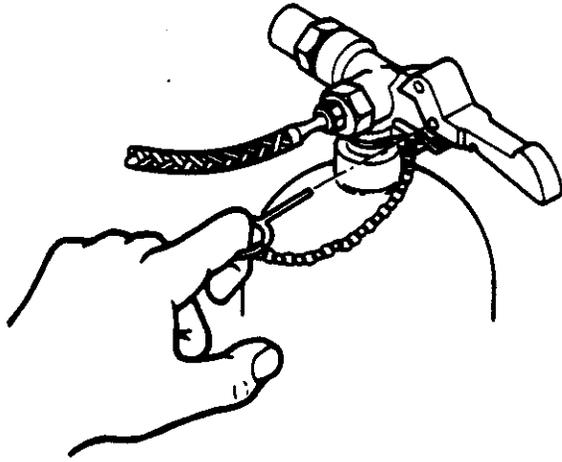


Figure 2-2. Activation of Halon 1301 System

b. Move lever of valve to open position. Halon 1301 will be discharged.

c. Replace defective time delay device at the same time the system is returned to the normally ready condition as described in paragraph 2-3.2.

2-3.4.3 Pressure Operated Switch Failure. If a pressure operated

switch fails to trip when the system is actuated, the switch may be manually tripped as follows:

a. Pull up sharply on knob to trip switch.

b. Replace defective pressure operated switch at the same time the system is returned to the ready condition as described in paragraph 2-3.2.

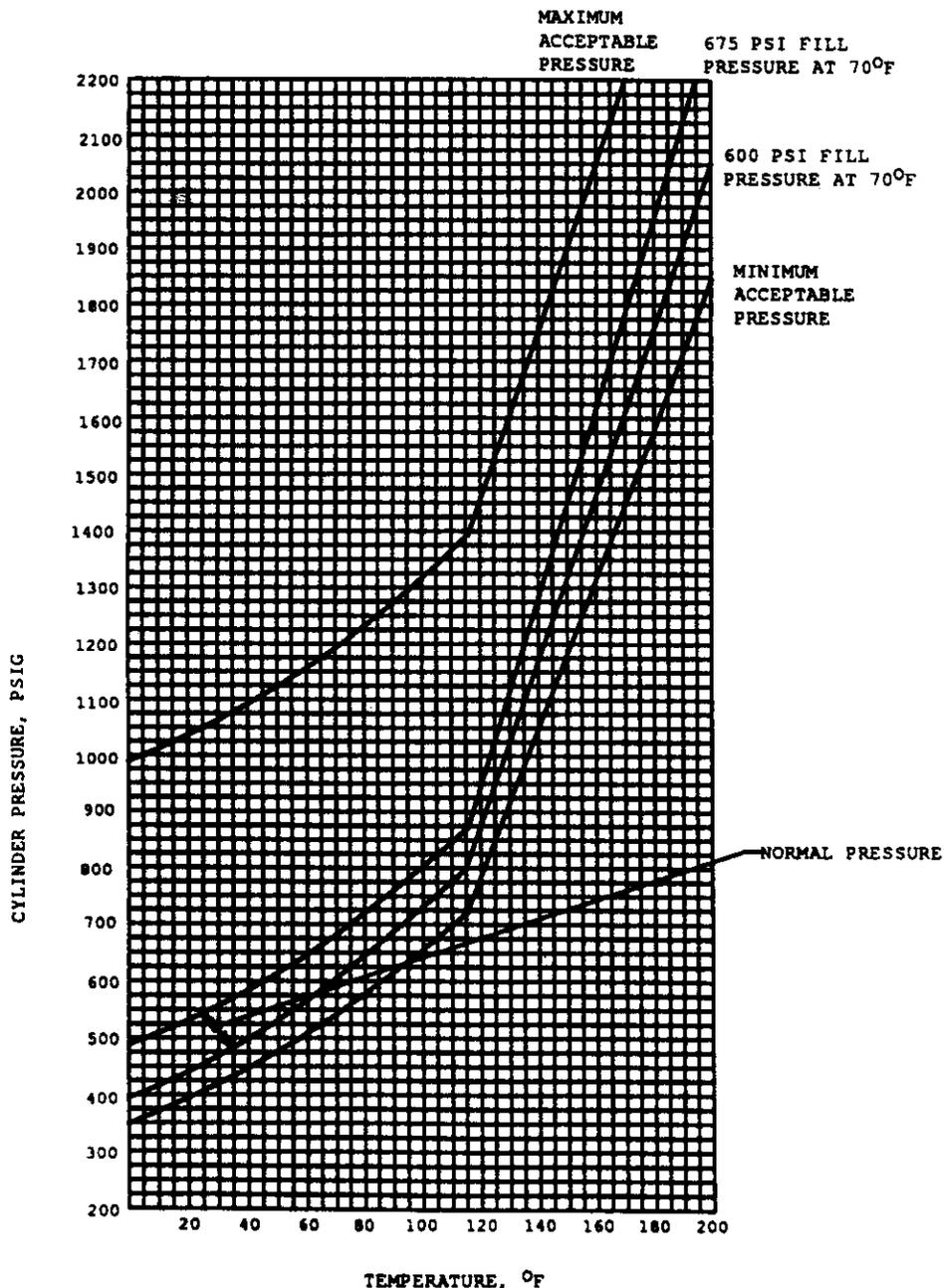


Figure 2-3. Pressure vs. Temperature Graph for Halon Cylinders

CHAPTER 3

FUNCTIONAL DESCRIPTION

3-1 INTRODUCTION.

This chapter contains a functional description of Halon 1301 total flooding systems. All systems dispense Halon 1301 extinguishing agent in a similar manner, differing primarily in the quantities of components in each system and in the amount of Halon 1301 they contain.

Reserve Halon 1301 systems, if installed, are identical to primary systems.

3-2 SYSTEM DESCRIPTION.

This section describes the principles of operation for a typical system and its components (See figure 3-1).

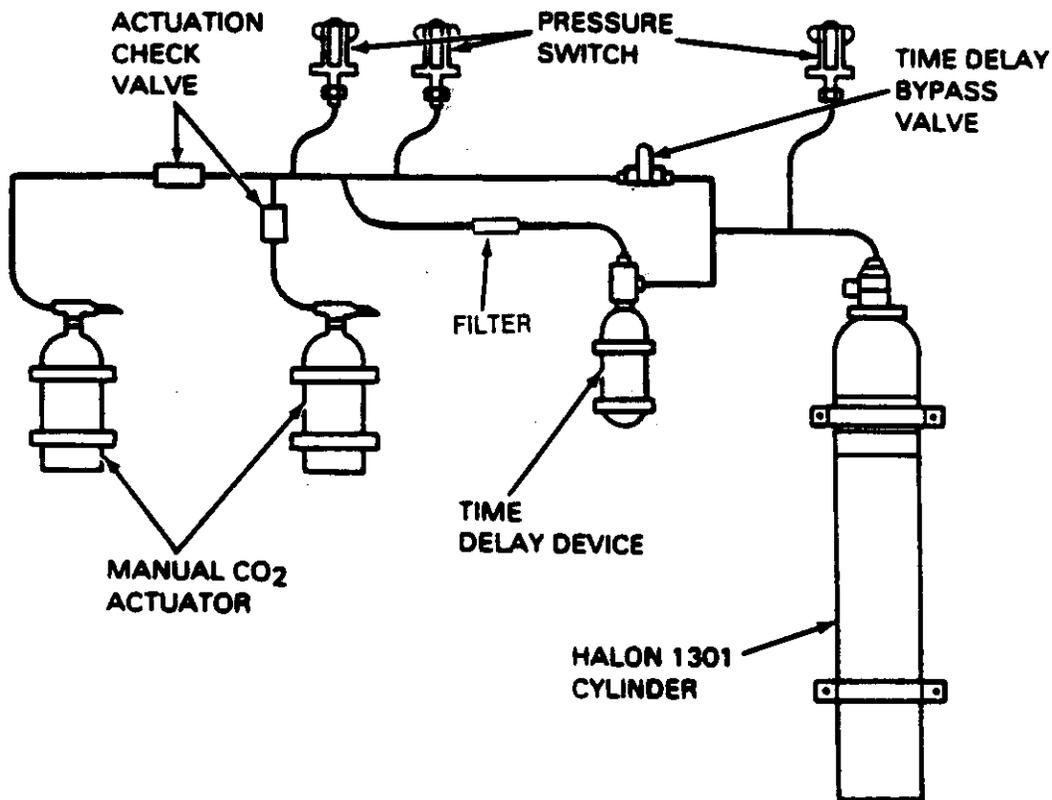


Figure 3-1. Typical System Diagram

When any of the CO₂ actuator valves are manually opened, compressed carbon dioxide in the CO₂ actuator cylinder is released into the 1/4" lines leading to the time delay device and the pressure operated switches controlling the compartment ventilation and evacuation alarms. After the CO₂ pressure in these lines reaches 100 psig, the pressure operated switches shut off the ventilation equipment and actuate the evacuation alarms.

After the specified 30 or 60 second delay, the time delay device releases the CO₂ into the lines leading to the Halon 1301 cylinder valves and the pressure operated switch controlling the Halon 1301 discharge indicators. The Halon 1301 cylinder valves then release the Halon 1301 from the cylinders and the pressure operated switch activates the discharge indicators.

If the time delay fails to operate and the Halon 1301 is not discharged, opening the time delay override valve allows the CO₂ to bypass the time delay device and immediately actuate the pressure operated switch for discharge indicators and Halon 1301 cylinder valves.

Following discharge of the Halon 1301, all valves and switches remain

in their actuated position until manually reset. CO₂ is released to the atmosphere through the vent fittings. Check valves at the CO₂ actuators prevent any backflow of CO₂. Check valves at the Halon 1301 cylinders in banked systems prevent backflow of Halon 1301.

3-3 MAJOR COMPONENT DESCRIPTION.

3-3.1 MANUAL CO₂ ACTUATOR ASSEMBLY.

(Figure 3-2) The CO₂ actuator assembly consists of a two-position, manually-operated valve mounted directly on a high pressure cylinder charged with compressed carbon dioxide. The valve contains a frangible metal safety disk that will rupture if the CO₂ pressure exceeds 2650 psig. The valve handle is held in the closed position with a locking ring pin. When the ring pin is removed and the handle is depressed, the valve opens and the CO₂ flows from the outlet port, actuating the associated pressure switches and time delay device, and subsequently discharging the Halon 1301 cylinders. The handle is equipped with a latch to hold the valve in the open position. The handle must be restrained in the open position to operate the Halon 1301 system.

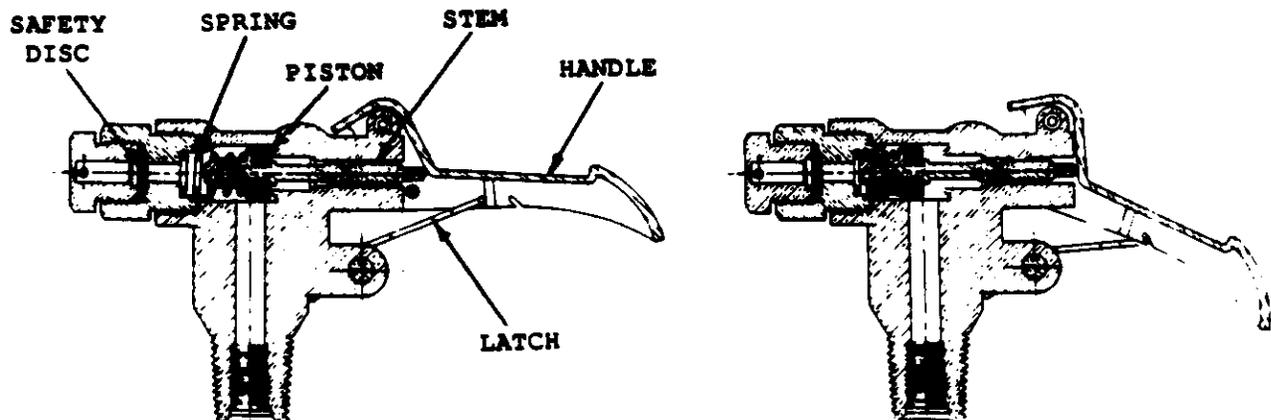


Figure 3-2. Manual CO₂ Actuator Functional Diagram

3-3.2 TIME DELAY DEVICE. (Figure 3-3). The time delay device consists of a gas-actuated, differential pressure controlled, 2-way valve mounted on an accumulator cylinder. The assembly has an integral, preset, orifice-type time delay feature which is not adjustable.

A time delay device will provide either a 30 or 60 second delay of Halon 1301 discharge after system activation using the pressure operated spool valve and accumulator cylinder. The spool valve has three piston surfaces (1, 2, and 3), which divide the housing in four chambers (A, B, C, and outlet). Initial gas pressure enters the inlet chamber (A) and forces the spool (piston) against a seat, sealing off the outlet chamber. A passage in the housing routes pressure from the inlet chamber to the center chamber (B). A drilled orifice in the bottom piston (3) bleeds pressure from center

chamber to the bottom (C) into the accumulator cylinder. Orifice size determines gas flow rate and controls the length of time delay. As chamber pressures equalize, the force on the larger surface area (the lower side) of piston 3 overcomes the downward force on piston 1 and moves the spool up, lifting piston off its seat and allowing pressure to flow from the inlet to the outlet chamber and into the downstream actuation lines.

3-3.3 TIME DELAY OVERRIDE VALVE. The time delay override valve is a ball valve connected to the inlet and outlet piping of the time delay device. When manually opened, the valve allows the CO₂ to bypass the time delay device and actuate the Halon 1301 "released" pressure operated switch and Halon 1301 cylinder valves. The time delay override valve is normally closed and lead and wire sealed.

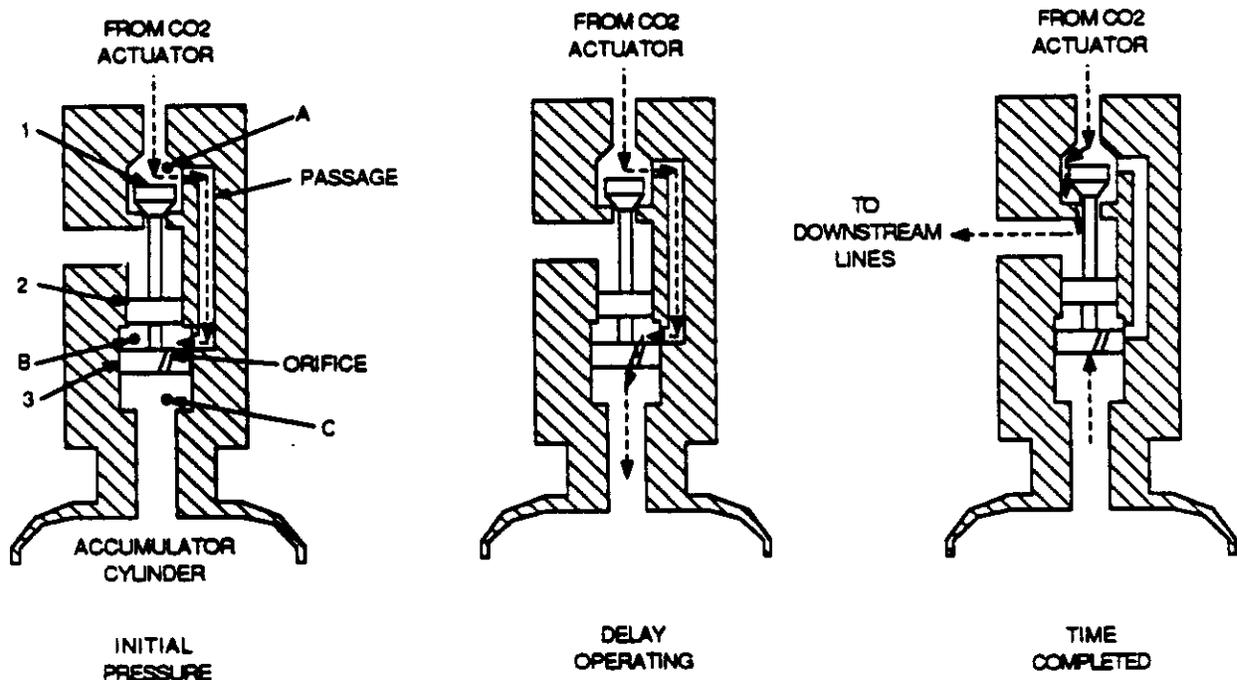


Figure 3-3. Time Delay Device Functional Diagram

3-3.4 PRESSURE OPERATED SWITCH. (Figure 3-4). The pressure operated switch consists of a two-position, three-pole contactor, mounted in a spray-tight enclosure. A pressure operated cylinder actuator moves the switch toggle from its normal (knob down) position to its actuated (knob up) position when pressure is applied to the cylinder. The knob permits manual actuation of the switch for testing and for resetting after system actuation.

3-3.5 HALON 1301 CYLINDER ASSEMBLY. (Figure 3-5). The Halon 1301 cylinder assembly consists of a high-pressure cylinder, a siphon tube that reaches to within approximately 1-1/2 inches of the bottom of the cylinder, and a pressure operated valve with a pressure gage.

Halon 1301 has a vapor pressure of 199 psig at 70° F, which allows discharge of the Halon 1301 only at a relatively low flow rate. To increase the discharge flow rate to the speed required for effective fire extinguishment, the Halon 1301 cylinder is super pressurized with nitrogen gas to 600-675 psig at 70° F. This allows the rapid discharge of Halon 1301 under normally encountered ambient temperatures and piping constraints.

With no CO₂ pressure at the CO₂ inlet of the cylinder valve, Halon 1301 gas from the cylinder bleeds past the ball in the spool passage and into the space above the spool until the pressures are equal in the cylinder and the space above the spool. The pressure on the greater area of the top of the spool creates a net force to keep the spool down and seal off the Halon 1301 outlet.

When CO₂ pressure is supplied at the CO₂ inlet, the piston moves down and depresses the stem of the Schrader valve. This releases the pressurized Halon 1301 in the space above the spool through the vents to the atmosphere. Then the greater pressure in the Halon 1301 cylinder pushes the spool up and Halon 1301 is

released through the Halon 1301 outlet.

The pressure gage indicates Halon 1301 cylinder pressure. A blowout in the back of the gage case prevents a gage explosion.

3-4 MINOR COMPONENT DESCRIPTION.

3-4.1 CHECK VALVE (1/4 IN.). Check valves in the CO₂ actuation piping allow gas flow in one direction only (marked by an arrow on the valve). This prevents backup of gas pressure in the opposite direction.

NOTE

When replacement of 1/4-inch check valve is required, use part number 72099N or 77479N, which supersedes part number 27849N.

3-4.2 HALON 1301 DISCHARGE NOZZLE. The nozzles cause the Halon 1301 to be discharged uniformly at the proper rate to completely cover each space.

NOTE

Flexible hoses are not to be painted.

3-4.3 FLEXIBLE HOSE. Flexible hoses route the Halon 1301 to the fixed piping from each Halon cylinder. This hose provides a convenient disconnect point for removing Halon cylinders for charging or maintenance. The flexible hoses are of all steel construction (see figure 3-6).

3-4.4 FLEXIBLE TUBING LOOP. Flexible tubing loops route the CO₂ to the fixed actuation piping from each major component of the system. This tubing provides a convenient disconnect point for removing each component for charging or maintenance. The flexible tubing assemblies are constructed of 1/4 inch diameter 70-30 copper-nickel tubing, Class 3300.

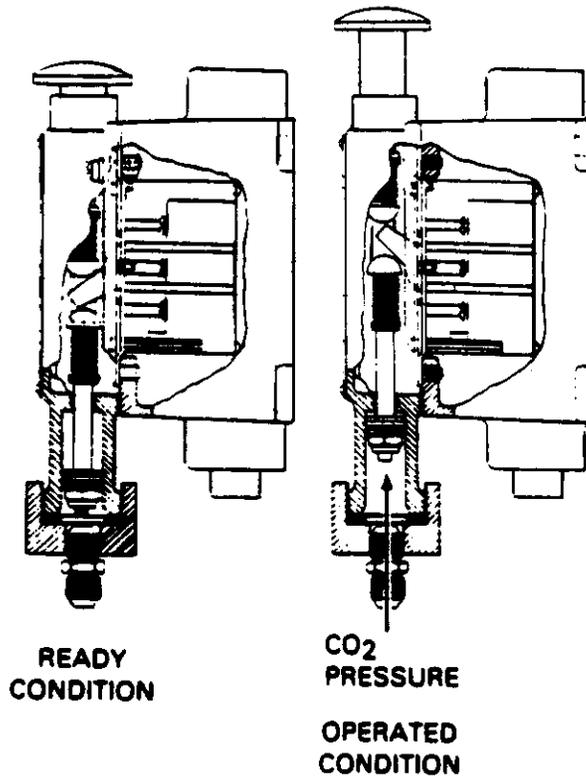


Figure 3-4. Pressure Operated Switch Functional Diagram

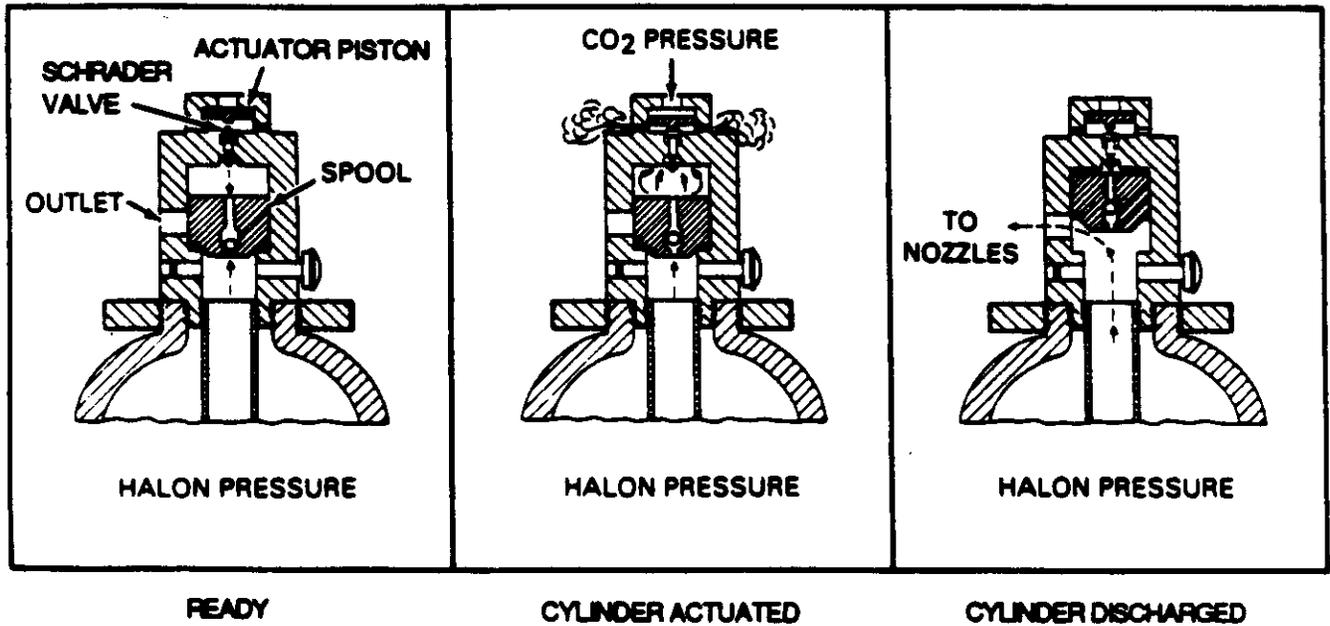


Figure 3-5. Halon 1301 Cylinder Assembly Functional Diagram

3-4.5 BRACKETS. Brackets secure the CO₂ actuators, time delay devices, and Halon 1301 cylinders to the ship's structure. The brackets must be securely mounted to hold the actuators, time delay devices, and cylinders in the event of a shock.

3-4.6 VENT FITTING. Vent fittings installed in the ends of the CO₂ actuation piping manifolds release excess CO₂ from the manifolds to the atmosphere.

3-4.7 SCALE. A 310 lb capacity bench-type beam scale is provided to weigh Halon 1301 cylinders when required.

NOTE

CO₂ actuator cylinders are to be weighed on scales provided on board for weighing 15 lb portable CO₂ fire extinguishers.

3-4.8 OPERATING INSTRUCTIONS AND LABEL PLATES. Various label plates are provided for identification, warnings, and instructions. Label plates shall be located as directed by the ship's drawings.

3-4.9 ACTUATION LINE FILTER. Filters are provided upstream of each time delay device to collect any contamination that may exist in the CO₂ actuation piping. This filter is rated at 10-microns and protects the small metering orifice in the time delay device.

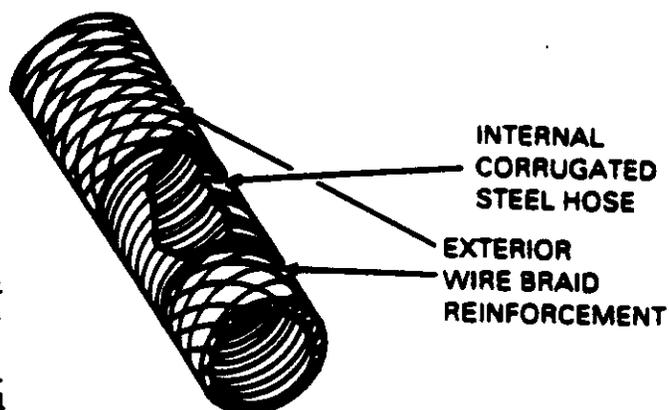


Figure 3-6. Flexible Hose (Cutaway View)

CHAPTER 4
SCHEDULED MAINTENANCE

4-1 INTRODUCTION.

Preventive maintenance procedures to be performed on a scheduled basis are provided in Planned Maintenance System (PMS) documentation. OPNAVINST 4790.4 describes this equipment, and covers departmental and work center record keeping, as well as the Maintenance Index Page (MIP) and Maintenance Requirements Cards (MRCs). MIP

5553/026 applies to the equipment covered in this manual. The extensive and comprehensive scheduled maintenance provided by the MRCs eliminates any need for coverage within this chapter. Specific corrective maintenance (repair/replacement) is covered in Chapter 6 of this manual.

CHAPTER 5
TROUBLESHOOTING

5-1 INTRODUCTION.

The Halon 1301 system requires a conscientious preventive maintenance program to ensure operation in an emergency. Any malfunctioning components should be repaired or replaced immediately.

5-2 TROUBLESHOOTING.

Table 5-1 lists system troubles, probable causes, and corrections for malfunctions that may occur during operation of this system.

Table 5-1, Troubleshooting

Symptom	Immediate Action (see para 2-3.4 for emergency operating procedures)	Probable Cause	Correction
1. Halon 1301 system does not discharge.	1. Operate time delay bypass valve. If Halon 1301 system still fails to discharge, see probable cause 2.	1. Time delay device failed to operate.	1. Repair time delay device (see paragraph 6-5).
	2. Operate another CO ₂ actuator.	2. Insufficient CO ₂ charge in actuator cylinder.	2. Recharge CO ₂ actuator (see paragraph 6-3).
	3. a. Tighten leaking connection. b. Operate another CO ₂ actuator.	3. 1/4" flex tube, time delay, or 1/4" check valve connection is loose or not connected.	3. Check connections for tightness as directed by MRC.
	4. Operate another CO ₂ actuator.	4. Valve on CO ₂ actuator cylinder defective.	4. Repair CO ₂ actuator (see paragraph 6-3).
2. Individual Halon 1301 cylinder fails to discharge.	1. None	1. Flexible tube leaking. Check tube for leakage. If tube is not leaking, see probable cause 2.	1. Replace flexible tube (see paragraph 8-4.7).
	2. None	2. Halon 1301 cylinder valve is defective.	2. Replace Halon 1301 cylinder (see paragraph 8-4.2).

Table 5-1 (Cont)

Symptom	Immediate Action (see para 2-3.4 for emergency operating procedures)	Probable Cause	Correction
3. Ventilation does not shut down.	1. Manually shut off ventilation supply and exhaust fans.	1. Pressure switch defective.	1. Replace or repair pressure switch (see paragraph 6-4).
4. Alarms do not operate, but white "POWER ON" light is on.	1. Warn personnel in affected space and in Central Control.	1. Pressure switch defective.	1. Replace or repair pressure switch (see paragraph 6-4).
5. Alarms do not operate, but white "POWER ON" light is off.	1. Warn personnel in affected space and in Central Control.	1. Electrical circuit defective.	1. Repair circuit. Refer to ship's electrical diagram.
6. Time delay device slower or faster than permitted on MRC.	1. Operate time delay bypass valve.	1. Time delay device defective.	1. Repair time delay device (see paragraph 6-5).
7. CO ₂ pressure does not bleed off after system actuation.	1. Disconnect 1/4 in. flexible tube from the actuation piping.	1. Vent fitting plugged.	1. Clean piping. Replace vent plug if necessary.

CHAPTER 6

CORRECTIVE MAINTENANCE

6-1 INTRODUCTION.

This chapter contains instructions for disassembly, cleaning, inspection, parts replacement, and assembly of the repairable components of the Halon 1301 total flooding systems.

WARNING

Maintenance or testing of an active Halon 1301 total flooding system shall not be performed until all procedural steps of paragraph 6-2 have been accomplished.

6-2 MAKEREADY PROCEDURE.

a. Obtain permission from the Engineering Officer Of the Watch (EOOW) prior to conducting tests or repair of the Halon 1301 systems.

b. Inform personnel in the spaces where tests are to be performed.

c. Post warning signs at access to spaces protected by the Halon 1301 System, warning personnel of work in progress.

d. Tag Halon 1301 system actuators "OUT OF SERVICE".

6-3 INSPECTION AND REPAIR OF MANUAL CO₂ ACTUATOR ASSEMBLY (Figure 6-1).

a. Inspect for leaks. Submerge actuator in clean fresh water or apply soap solution to cylinder valve assembly and check for gas bubbles, which indicate leakage.

b. Inspect cylinder and valve for damage and evidence of corrosion.

NOTE

Except for replacement of retainer (5), disk (3), and gasket (4), damaged or defective valves should be replaced.

c. Repair manual CO₂ actuators as necessary.

WARNING

Before disassembly, discharge cylinder contents in a well ventilated area with the anti-recoil discharge cap in place. Oxygen may be displaced from a confined space in the event of discharge.

1. Remove valve from cylinder.

2. Inspect outside of cylinder for corrosion, fire damage, dents or other damage that may be cause for cylinder replacement.

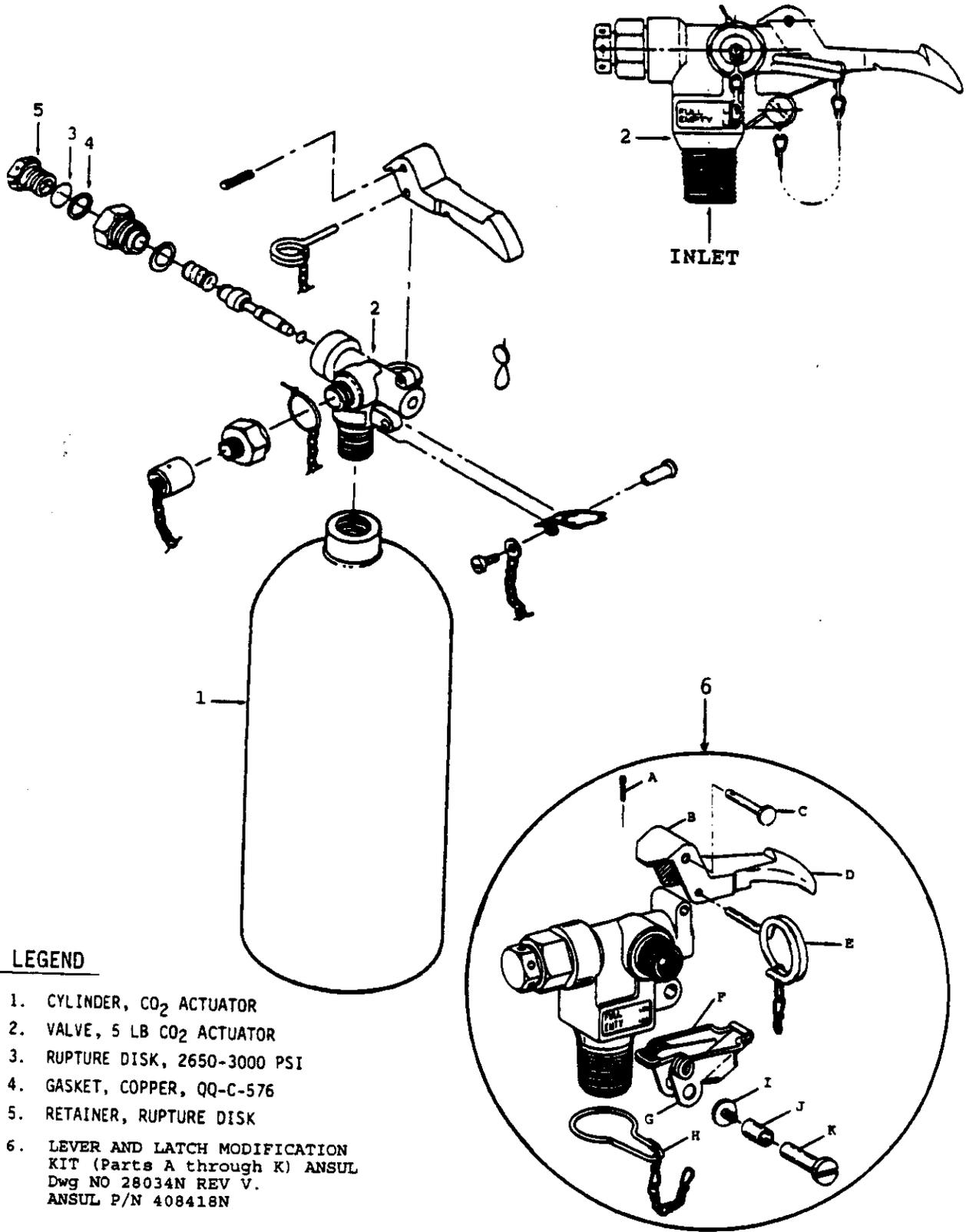
3. Ensure that interior of cylinder is clean, dry, and free of corrosion.

4. If rupture disk is ruptured, remove retainer (5) and replace disk (3) and gasket (4) with new disk and gasket. Prior to reassembly, lubricate lightly with MIL-S-8660 or equivalent. Torque rupture disk retainer to 30 ft-lbs.

NOTE

Safety disks and gaskets removed and found intact should be discarded and replaced with new disks and gasket.

5. Assemble valve and cylinder in reverse order of disassembly. Apply sealant (Teflon tape and Teflon rapid seal or equivalent) on valve to cylinder threads before installing valve in cylinder.



LEGEND

1. CYLINDER, CO₂ ACTUATOR
2. VALVE, 5 LB CO₂ ACTUATOR
3. RUPTURE DISK, 2650-3000 PSI
4. GASKET, COPPER, QQ-C-576
5. RETAINER, RUPTURE DISK
6. LEVER AND LATCH MODIFICATION KIT (Parts A through K) ANSUL
Dwg NO 28034N REV V.
ANSUL P/N 408418N

Figure 6-1. Manual CO₂ Actuator Assembly

6. Charge CO₂ actuator assembly with 80 ounces Carbon Dioxide in accordance with Grade B Type II of BB-C-101 and inspect for leaks in accordance with paragraph a. above.

6-4 INSPECTION AND REPAIR OF PRESSURE SWITCH (Figure 6-2 and 6-3).

WARNING

Turn off electrical power before removing cover assembly. Tag switch and Halon 1301 system actuators "OUT OF SERVICE."

- a. Disconnect 1/4 in. flexible tubing loop from pressure switch.
- b. Plug 1/4 in. flexible tubing loop using a 7/16-20 UNF 37-degree flare plug. DO NOT use pipe plug
- c. Remove screw and washers (1) and remove cover assembly (2).
- d. Turn electrical power on.
- e. Trip manual contactor switch (3). Determine that alarms operate or ventilation fans shut down, as applicable. Flip switch back to ready position.
- f. Turn off electrical power.
- g. If alarms did not operate or ventilation fans did not shut down, go to step i.
- h. If alarms operated or ventilation fans were shut off, replace cover assembly. Ensure that gasket is in good condition or replace it. Ensure that manual contactor switch is in ready position. Go to step p.
- i. Using volt/ohm meter, determine if manual contactor (4) is operating correctly. If necessary, remove contactor from housing by removing screws (5) and disconnecting wiring from manual contactor.

j. If manual contactor is not operating correctly, disconnect wiring from contactor. Replace contactor. Go to step 1.

k. If manual contactor operates correctly, check electrical circuits for continuity. Repair circuitry as required. Go to step 1.

l. Reconnect wiring to manual contactor, as necessary. Ensure that wiring is attached to correct terminals and that contacts are good. Clean terminals and wire as necessary.

m. Ensure that manual contactor switch is in "ready" position.

n. Align manual contactor so that switch, in "ready" position, points down or toward flexible tube connection on 1/4 in. Halon 1301 actuation piping.

o. Assemble manual contactor to housing.

p. Ensure that plunger on cover assembly is pressed down, in "ready" position.

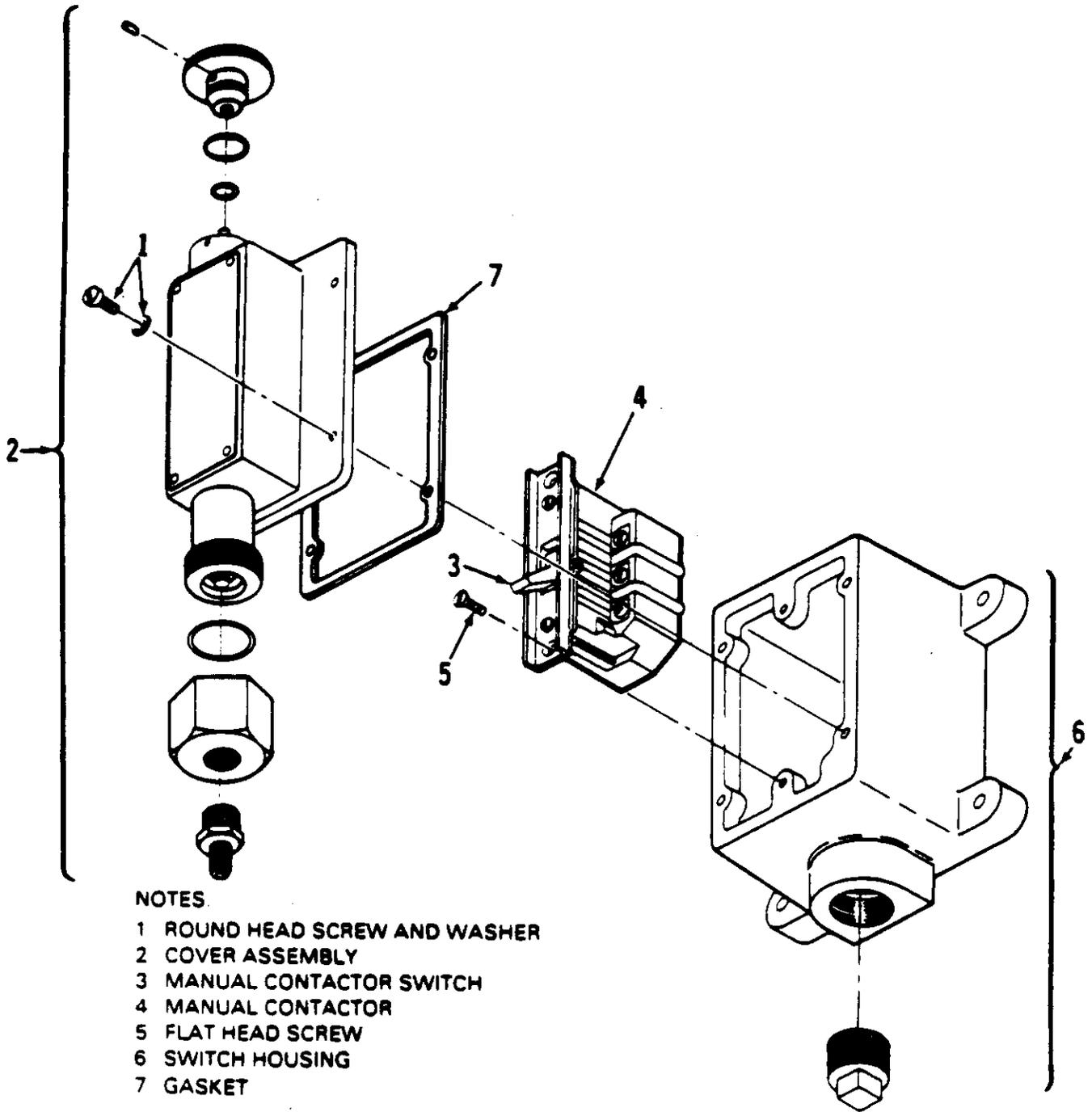
q. Align cover assembly so that threaded flexible tube connection on cover assembly points in same direction as manual contactor switch. Refer to figure 6-3 before assembling cover assembly to housing, to ensure alignment is correct.

r. Assemble cover assembly to housing. Ensure that gasket is in good condition and in place.

s. Remove plug from flexible tube and connect flexible tube to pressure switch.

t. Restore electrical power to circuitry.

u. Perform pressure switch test, table 4-1 to ensure correct operation.



NOTES

- 1 ROUND HEAD SCREW AND WASHER
- 2 COVER ASSEMBLY
- 3 MANUAL CONTACTOR SWITCH
- 4 MANUAL CONTACTOR
- 5 FLAT HEAD SCREW
- 6 SWITCH HOUSING
- 7 GASKET

Figure 6-2 Pressure Switch

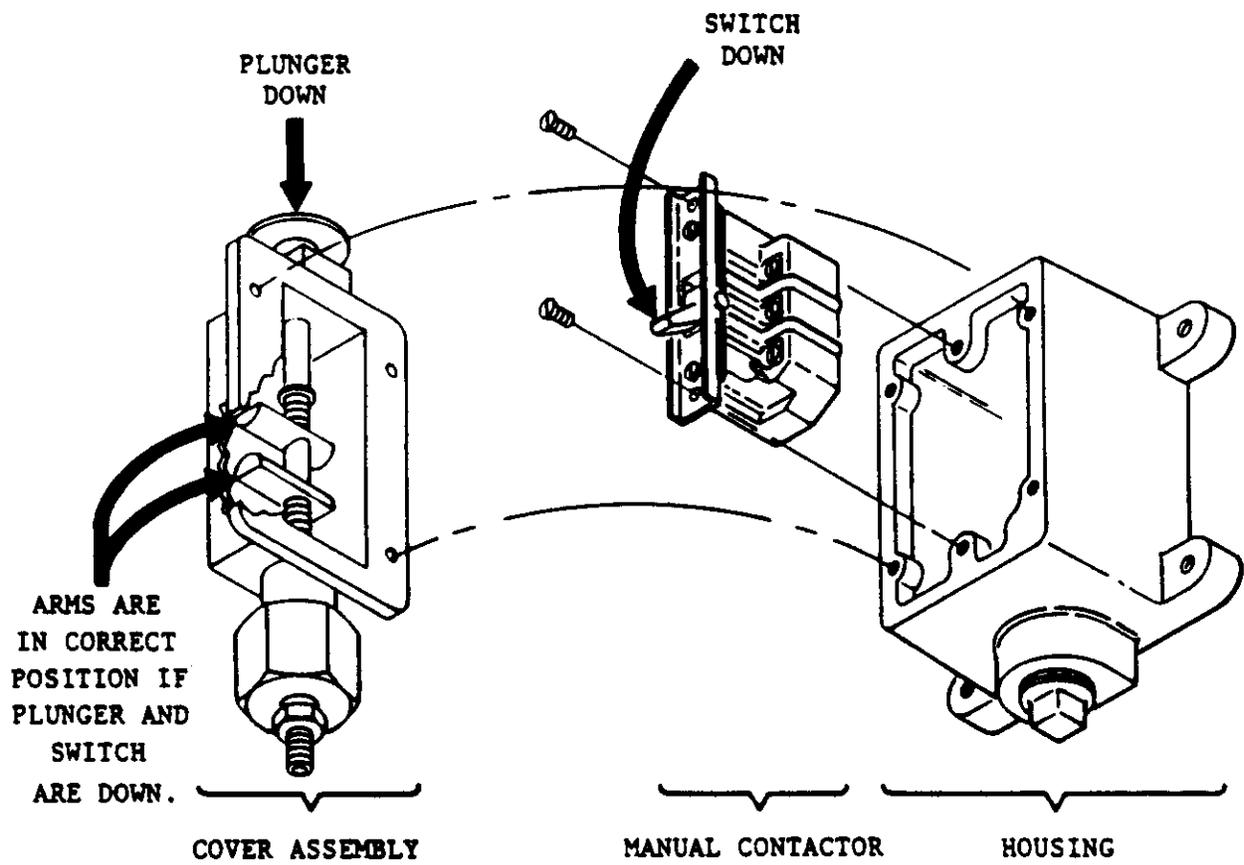


Figure 6-3. Pressure Switch Housing Alignment

6-5 REPAIR OF ANSUL TIME DELAY
(figure 6-4)

- a. Remove valve control head (1) from cartridge (2).
- b. Remove valve cap (3) and O-ring (4).
- c. Secure piston (9) with time delay valve tool (P/N T-12844). Disengage nut (5). Remove nut (5), threaded seal retainer (6), and seal (7) from top of valve body (12) as an assembly. Remove stem (8), piston (9), and Q-rings (10,11) from bottom of valve body (12). Refer to figure 6-7 for description of special tools.

NOTE

Nut (5), retainer (6), seal (7), and stem (8) may separate upward from body (12) as an assembly. Stem (8) should be disengaged from piston (9) for ease of reassembly.

d. Inspect all removed items and replace if necessary.

e. Clean assembly parts with suitable cleaning agent (Brulin General Cleaner or equivalent). If necessary, check clear opening of orifice through piston (9) with 0.0217" diameter pin for a 30 second or 0.0165" diameter pin for a 60 second time delay device.

f. Remove any water or debris from inside cartridge.

g. Assemble seal (7), seal retainer (6), and valve stem (8). Torque threaded seal retainer to the valve stem to 20 in. - lb.

h. Lubricate Q-rings (10 and 11) and inside walls of valve body (12) where piston (9) slides with fine film of silicone lubricant (MIL-S-8660 or equivalent).

NOTE

Exercise care to not block orifice through piston (9) or any other

passages inside valve body (12) with lubricant.

i. Apply thread adhesive (Pro-Lock 51404 or equal) to male threads of valve stem (8) after completion of step g. above.

j. Reassemble valve (1). Torque nut (5) to 20 in. lbs. Wrap threads of cartridge (2) with teflon tape and assemble valve (1) and cartridge (2).

k. Test in accordance with MRC or table 4-1 prior to installing time delay.

6-6 REPAIR OF HALON 1301
CYLINDER ASSEMBLY.

WARNING

Before disassembly, discharge cylinder contents in a well-ventilated area. Oxygen may be displaced from a confined space in the event of discharge.

NOTE

Depressurization, repair, and recharge of Halon cylinder/valve assemblies shall be performed by depot level activities only. Halon cylinder/valve assemblies which have low weight as determined during PMS checks shall be replaced and unsatisfactory cylinders turned in to the supply system.

6-6.1 DISCHARGING HALON 1301
CYLINDERS.

a. Set up discharge station as shown in figure 6-5. Place cylinder assembly (8) on scale (12).

b. Remove cylinder shipping cap assembly, valve actuator assembly, and anti-recoil discharge cap.

c. Immediately install Halon 1301 fill adapter (10) handtight,

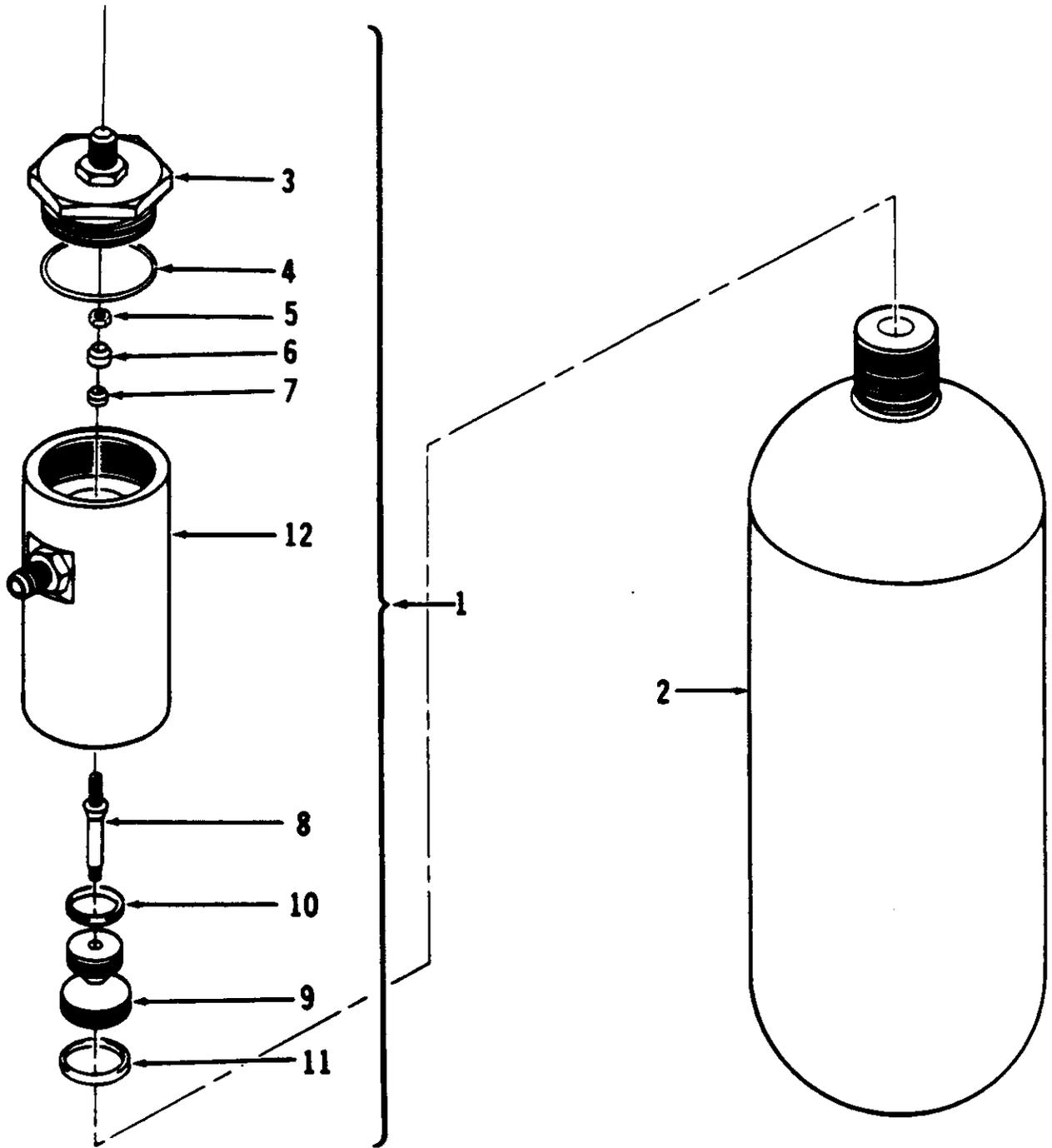


Figure 6-4. Time Delay

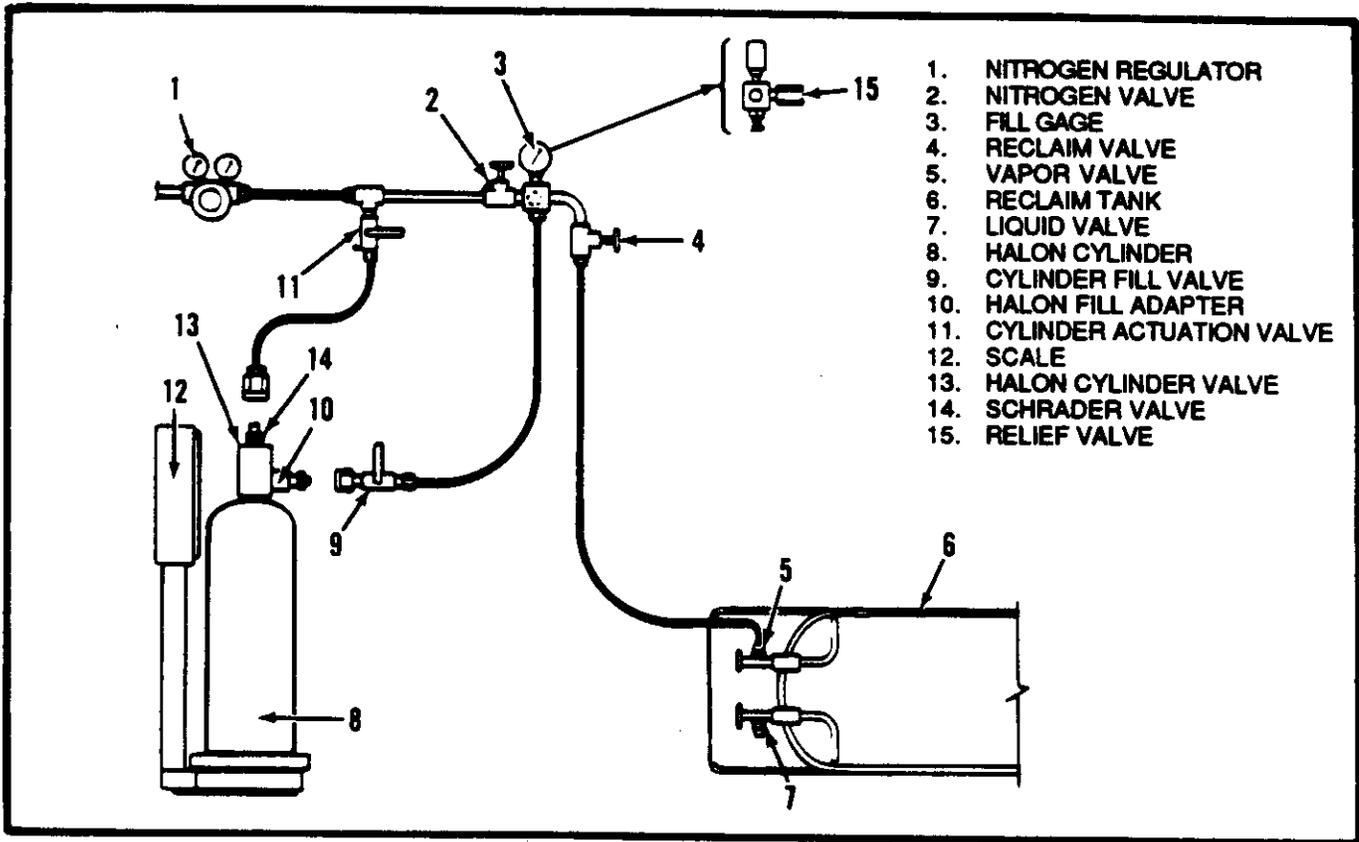


Figure 6-5. Halon 1301 Cylinder Discharge Station

then tighten adapter an additional 1/8 to 1/4 revolution with wrench.

d. Immediately connect cylinder fill valve (9) to Halon 1301 fill adapter (10) and open cylinder fill valve.

e. Set nitrogen regulator (1) at 600 psig.

f. Open nitrogen valve (2) to pressurize Halon 1301 line, then close valve.

g. Depress the Schrader valve (14) momentarily to open Halon 1301 cylinder valve.

h. Open reclaim tank vapor valve (5) and reclaim valve (4). Pressure in cylinder will then force Halon 1301 into reclaim tank (6).

i. Monitor change in cylinder weight on scale as Halon 1301 is reclaimed.

NOTE

Up to 10 percent of the total Halon 1301 weight may remain in cylinder after reclaiming.

j. Close reclaim valve (4) and cylinder fill valve (9).

k. Vent remaining Halon 1301 from cylinder by slightly loosening Halon 1301 fill adapter (10) until all pressure in cylinder is bled and cylinder is ready for disassembly.

6-6.2 CYLINDER DISASSEMBLY. (figure 6-6)

WARNING

Before starting the disassembly of cylinder, ensure that cylinder contents have been discharged in accordance with paragraph 6-6.1 and that cylinder is completely empty.

a. If not already removed, remove cylinder shipping cap (1).

b. Remove valve actuator (2).

c. Remove valve assembly (3) and attached siphon tube (4).

d. Remove the following from the valve assembly (3):

(1) Siphon tube (4)

(2) Cap w/Schrader valve (5)

(3) Spring (10)

(4) Piston assembly (11)

(5) Pressure gage (6)

(6) Safety disk nut (7), burst disk (8), and washer (9)

e. Place piston assembly (11) in collet (P/N 57589) and secure in a vice. Using the Halon valve wrench (P/N 57586), remove check assembly composed of plug (15), ball (16), and housing (17). Refer to figure 6-7 for description of the special tools.

f. Remove O-rings (12, 13, 18 and 21).

g. On old style valves only, remove external boss and washer from valve assembly.

NOTE

New style Halon 1301 cylinder valve assemblies do not have a removable external boss. External boss is integral and machined with valve body (3).

6-6.3 INSPECTION.

a. Inspect outside of cylinder (20) and neck ring (19) for corrosion, fire damage, dents or other damage that may be cause for cylinder replacement.

b. Ensure that interior of cylinder (20) is clean, dry and free of corrosion.

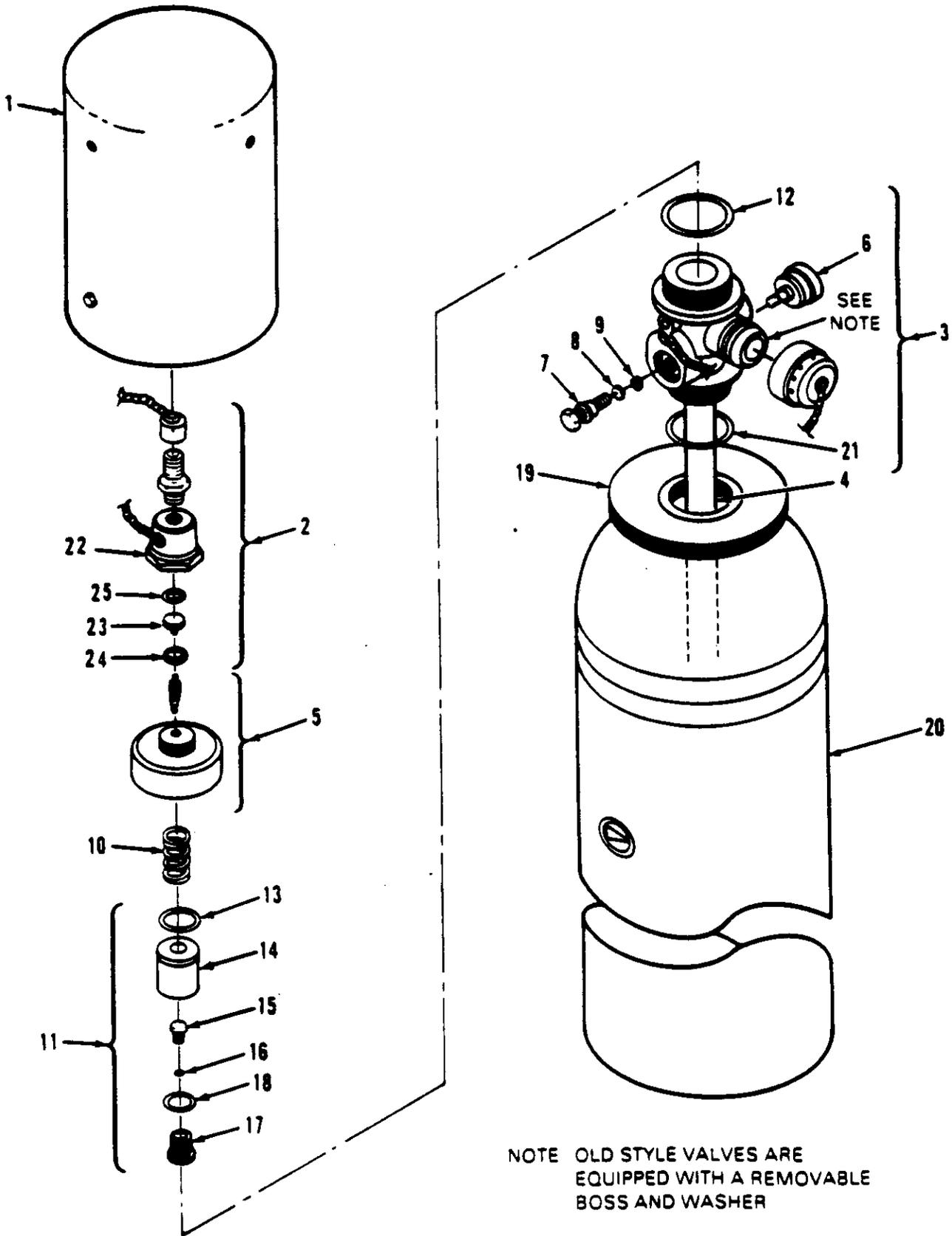


Figure 6-6. Halon 1301 Cylinder

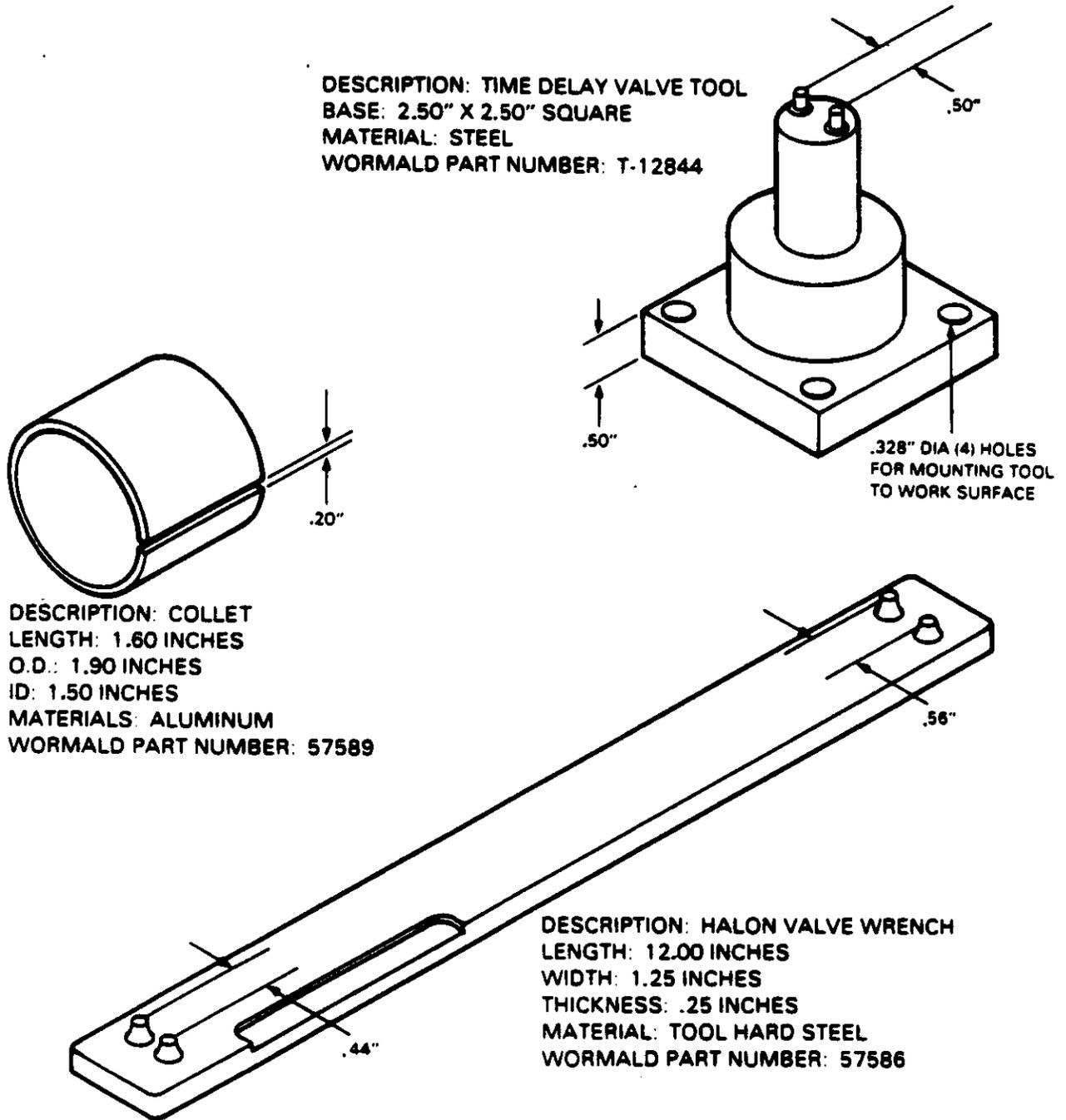


Figure 6-7. Special Tools

CAUTION

Do not allow water to enter cylinder. Water in a pressurized cylinder with Halon 1301 will damage cylinder.

c. Inspect all valve parts and siphon tube for corrosion, fire damage, dents or other damage. Replace as necessary.

d. Inspect check assembly composed of plug (15), ball (16), and housing (17) to determine if ball (16) is in place and free floating. If not, check assembly must be disassembled, and ball (16) replaced. To disassemble, hold the housing (17) in place with wrench (P/N 57586) and remove plug (15) using a standard 9/16 in. 6-point hex head wrench. Replace items 15 and 17 if damaged. If ball is in place and free floating, and if check assembly is not damaged, do not disassemble.

e. Inspect valve cap w/Schrader valve (5) for any type of damage or corrosion. The top of Schrader valve stem should be flush or 0.020 in. below valve cap surface. If cap is damaged or corroded or Schrader valve is not at correct depth, replace entire cap assembly.

f. Insert valve actuator (2) for piston (23) freedom of movement. If piston does not move freely or O-ring (25) has been previously reported to be damaged/leaking by, O-ring (25) must be replaced. To disassemble, remove retaining ring (24), piston (23) and O-ring (25) from cylinder (22). When disassembled inspect and clean piston (23) and interior of cylinder (22) if applicable. If piston (23) moves freely and no damage to O-ring (25) has been reported, do not disassemble.

6-6.4 ASSEMBLY OF CYLINDER.

a. If check assembly has been disassembled, place ball (16) inside check house (17), engage plug (15) a minimum of 2 turns into housing (17), apply Pro-Lock 51404 or equal to plug

threads, and fully engage into housing.

b. Apply silicone lubricant MIL-S-8660 or equal to O-ring (18) and place in bottom of piston (14). Apply thread adhesive (Pro-Lock 51404 or equal) to check housing (17) threads and install check assembly into piston.

NOTE

Check plug (15) and housing (17) must be clean and free of old thread adhesive before applying new thread adhesive for assembly.

c. Apply silicone lubricant MIL-S-8660 or equal to new O-ring (13) and install on piston (14).

d. Install piston assembly (11), spring (10), and valve cap with Schrader valve.

e. Install new burst disc and washer. Apply light coating of silicone lubricant MIL-S-8660 or equal to both sides of burst disc (8) and install washer (9), burst disk (8), and safety disk nut (7). Torque safety disk nut to 230 in.-lb. (\pm 10 in.-lb.).

f. Apply teflon tape to threads of gage and tighten gage until 600 psig marking is at top center in relation to cylinder. Gage shall not move under torque of 20 in.-lb. Teflon tape is not to overlap lead thread on gage.

g. Apply silicone lubricant MIL-S-8660 or equal to new O-rings (12 and 21) and install.

NOTE

Different valve configurations require a different O-ring (21). Refer to figure 7-28 for appropriate part numbers.

h. On old style valves install external boss with washer. Torque

external boss to 180 in.-lb. (\pm 10 in.-lb.).

i. Ensure that internal and external threads of Halon 1301 valve (3), internal threads of cylinder (20) and siphon tube (4) are clean and free of old thread adhesive.

j. Use Pro-Lock 51404 or equal on threads of siphon tube and internal Halon 1301 valve threads and assemble siphon tube to valve.

k. Use Pro-Lock Primer 51481 and Pro-Lock Thread adhesive 51404 or equal on external threads of Halon 1301 valve and internal threads of cylinder. Assemble valve with siphon tube to cylinder. Torque cylinder valve to 100 ft.-lb.

l. If valve actuator (2) has been disassembled, lubricate new O-ring (25) with silicone compound MIL-S-8660 or equal. Place O-ring on piston (23), insert piston and O-ring into cylinder (22) and install retaining ring (24).

CAUTION

Insure piston is in the "UP" position prior to installing actuator assembly to valve.

m. Assemble valve actuator to valve.

n. Recharge cylinder.

6-7 RELIABILITY IMPROVEMENT EQUIPMENT

Repairs to reliability improvement equipment will normally be limited to the following;

(A) Time Delay Device: Carleton time delay devices are replacing all other time delay devices in all halon 1301 systems aboard U S Navy ships. (figure 7-38) Carleton time delays are not repairable aboard ship. Any Carleton time delay that malfunctions must be turned in for repair

(B) In-Line CO₂ Filter: (Refer to figure 7-37). Other than cleaning or replacing the filter element and the O-rings, a defective unit should be replaced. The filter element should be cleaned by backflushing with low pressure air, soaking in solvent Spec P-D-680 or similar, or ultrasonically.

(C) Flexible Tubing Loop, 1/4 Inch: (Refer to figure 7-27). A defective tubing loop should be discarded and replaced with a new flexible tubing loop.

(D) Check Valve, 1/4 Inch, CO₂ Actuation: (Refer to figure 7-33) Other than cleaning and replacement of the O-Ring Seat, a defective valve should be discarded and replaced with a new check valve.

CHAPTER 7

PARTS LIST

7-1 INTRODUCTION.

This chapter contains a list of maintenance parts for the Halon 1301 total flooding fire extinguishing systems. Table 7-1 contains a total list of components used in the system. Components are listed in part number order and show the figure

number. Table 7-2 is the parts list. Assemblies and parts are referenced by index number within the illustration. Manufacturers' FSCM numbers are listed for each part or subassembly.

Table 7-1. List of Major Components

National Stock Number (NSN)	Figure	Drawing/Part Number	Nomenclature
9C 4820-01-169-3720	7-1	23519N	Valve, 1/4in, Time Delay Override
9N 5945-01-142-9537	7-2	23992N (old)	Delay, Time, Pressure, 60 sec. Class I
1H 4210-01-041-3071	7-3	26346N	Hose, Flexible, Discharge, 1-1/2in
9C 2820-01-085-3347	7-4 7-5	27849N (old) 27850N	Valve Check, Actuation, 1/4in Valve Assembly Check, Discharge, 1-1/2in
9C 4210-01-038-8883	7-6	28034N	Actuator, CO ₂ , Manual, 5lb Class I
9C 4820-01-122-3631	7-7	28037N	Fitting, Vent, CO ₂ Actuation, 1/4in
1H 5930-01-045-1678	7-8	29825N	Switch, Pressure Operated
9C 4210-01-153-8445	7-9	33813N	Bracket, Cylinder, CO ₂ Actuator
9G 6670-01-140-6207	7-10 7-11	51992N 51993N	Scale, Beam, Bench Type Indicator, Liquid Level, Halon 1301
9C 4210-01-162-8895	7-12	52173N (old)	Delay, Time, Pressure Operated, 30 sec. Class I
9Q 8135-01-197-2991	7-13	52395N	Tags, Cylinder Liquid Level
9C 4210-01-149-3807	7-14	52414N	Cap, Discharge, Anti-Recoil, Halon 1301
9C 4210-01-164-0049-	7-15	52415N	Cap, Protection, Valve Actuator
9C 4210-01-154-6544	7-16	52425N	Bracket, Cylinder, Halon 1301, 10 Through 95 lb Sizes 1 Through 4, Class I
9C 4210-01-141-4027	7-17	52427N	Bracket, Cylinder, Halon 1301, 125 lb, Size 5, Class I
9N 4210-01-142-9538	7-18	52430N	Bracket, Time Delay
9C 4210-01-156-0377	7-19	52443N	Adapter, Discharge, 1.50, Halon 1301
9C 4210-01-171-7361	7-20	52701N (old) 77655N (new)	Cylinder Assembly, Halon 1301, 10 lb, Size 1, Class I

Table 7-1 (Cont)

National Stock Number (NSN)	Figure	Drawing/Part Number	Nomenclature
9C 4210-01-221-2192	7-21	52702N (old) 77656N (new)	Cylinder Assembly, Halon 1301, 15 lb, Size 2, Class I
9C 4210-LL-HDT-D060	7-22	52703N (old) 77657N (new)	Cylinder Assembly, Halon 1301, 60 lb, Size 3, Class I
9C 4210-01-196-8338	7-23	52704N (old) 77658N (new)	Cylinder Assembly, Halon 1301, 95 lb, Size 4, Class I
9C 4210-01-140-6150	7-24	52705N (old) 77659N (new)	Cylinder Assembly, Halon 1301, 125 lb, Size 5, Class I
9C 4210-01-151-6198	7-25	52719N	Actuator, Valve, Pressure, Halon 1301
	7-26	52921N	Nozzle, discharge, Halon 1301, 180° and 360° Discharge Pattern
	7-27	A10895	Tubing, Flexible, Actuation, 1/4 in.
	7-28	53161N (old)	Valve Assembly, Cylinder, Halon 1301
9Z 5340-01-205-9936	7-29	63144N	Cap, Shipping, Halon 1301 Cylinder
	7-30	64550N	Valve, Cylinder, CO ₂ Actuator
9C 4210-01-199-3121	7-31	64569N	Fitting End Adapter, 37° Flared X 1/4 in. I.P.S., Socket Weld
9C 4201-01-123-8325	7-32	72099N (new)	Valve Assembly, Check, 0.25 in (Carbon Steel Ends)
	7-33	77479N (new)	Valve Assembly, Check, 0.25 in (Stainless Steel Ends)
	7-34	77554N (new)	Delay, Time, Pressure Operated 60 sec., Class I (with filter).
	7-35	77555N (new)	Delay, Time, Pressure Operated 30 sec., Class I (with filter).
	7-36	77654N (new)	Valve Assembly, Cylinder, Halon 1301
	7-37	U-275	Filter, CO ₂ Actuation, In-Line
	7-38	B15830-30 B15830-60	Time Delay, Carleton, 30 Second Time Delay, Carleton, 60 Second

Table 7-2. Parts List

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
7-1	VALVE, 1/4" TIME DELAY OVERRIDE	REF	03670	23519N
-1	VALVE, BALL, 1/4" TIME DELAY OVERRIDE	1	03670	23564
-2	RIVET, POP, 3/16" SS 316 or 316L	2	03670	75863
-3	BRACKET NAMEPLATE, SS 316 or 316L	1	03670	23565
-4	CHAIN, SAFETY (10-LINKS) SS 302	1	03670	75864
-5	PIN, RING, SS 316 or 316L	1	03670	75862
-6	SEAL, VISUAL, POLYPROPYLENE	1	03670	25940
7-2	DELAY, TIME, PRESSURE OPERATED, 60 SECOND-CLASS I	REF	03670	23992N
-1	VALVE BODY	1	03670	23778
-2	VALVE STEM-TYPE 304 CRES	1	03670	27946
-3	PISTON-TYPE 304 CRES	1	03670	27947
-4	SEAL-NITRILE (90 DUROMETER)	1	03670	27206
-5	SEAL RETAINER-TYPE 304 CRES	1	03670	27950
-6	CARTRIDGE, DOT 3AA 2015	1	03670	35382
-7	QUAD RING, 0.50 I.D X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	27220
-8	QUAD RING, 0.75 I.D X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	5362
-9	ADAPTER, SS PER UNS-S31400	1	03670	27949
-10	MALE CONNECTOR, 1/4" (37° FLARE), BRASS	2	03670	35341
-11	O-RING, 1.5 I.D.X 0.094 C.S.M.R COMPOUND 366Y	1	03670	27580
-12	NUT, HEX, 10-32 UNF, SST 300 SERIES	1	03670	14732
7-3	HOSE, FLEXIBLE, DISCHARGE, 1.50"	REF	03670	26346N
7-4	VALVE, CHECK, ACTUATION, 1/4"	REF	03670	27849N
7-5	VALVE ASSEMBLY, CHECK, DISCHARGE 1-1/2"	REF	03670	27850N
7-6	ACTUATOR, CO ₂ , MANUAL, 5 LB, CLASS I	REF	03670	28034N
-1	VALVE, CYLINDER, CO ₂ ACTUATOR	1	03670	64550
-2	SEAL, LEAD WIRE	1	03670	25524
-3	CYLINDER, PAINTED, CO ₂ ACTUATOR	1	03670	67247
7-7	FITTING, VENT, CO ₂ ACTUATION, 1/4"	REF	03670	28037N
7-8	SWITCH, PRESSURE OPERATED	REF	03670	29825N
-1	NAMEPLATE, IDENTIFICATION	1	03670	33368
-2	KNOB, RESET	1	03670	42358
-3	COVER, MACHINED	1	03670	42351
-4	ROD, PISTON, SST, TYPE 303	1	03670	42354
-5	GASKET	1	03670	42361
-6	ADAPTER	1	03670	27967
-7	CONNECTOR, MALE, 0.25 (37° FLARE)	1	03670	35341
-8	HOUSING	1	03670	42345
-9	MANUAL CONTACTOR	1	28432	TC2368S
-10	PIN, GROOVE, SST	2	03670	42349

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-11	SPRING, PHOSPHOR BRONZE, 8 NUMBERS HARD	2	03670	42357
-12	ARM, HALF-ROUND, BRASS ROD S.A.E SPEC NO. 72	2	03670	42364
-13	SPACER, HARD DRAWN ROUND SEAMLESS BRASS TUBE	1	03670	42365
-14	WASHER, SPRING SHOULDER, BRASS ROD S.A.E SPEC NO.72	1	03670	42356
-15	PISTON, BRASS ROD S.A.E. SPEC NO.72	1	03670	42355
-16	PLUG, PIPE, BRASS	1	03670	40537
-17	SCREW, SET, HEXAGON, SOCKET HEAD, SST	1	03670	42347
-18	LOCK RING, SNAP, PHORPHOR BRONZE	1	03670	42353
-19	SCREW, FLAT HEAD, 10-32 X 3/8" LONG, BRASS	2	03670	40028
-20	SCREW, FILLISTER HEAD, 12-24 X 1/2" LONG, BRASS	4	03670	40290
-21	WASHER, LOCK, NO. 12, BRONZE	4	03670	42362
-22	DRIVE SCREW, NO. 2X3/16", SST, TYPE U	4	03670	40308
-23	O-RING, 0.419/0.429 I.D. X 0.100/0.106 DIA., SYN. RUBBER	1	03670	42252
-24	O-RING, 0.296/0.306 I.D. X 0.067/0.073 DIA., SYN. RUBBER	1	03670	42251
-25	O-RING, 0.983/0.995 I.D. X 0.067/0.073 DIA., SYN. RUBBER	1	03670	45602
-26	STOP NUT, 1/4-28, CADMIUM PLATED STEEL	1	03670	42350
7-9	BRACKET, CYLINDER, CO2 ACTUATOR	REF	03670	33813N
-1	SADDLE ASSEMBLY, CYLINDER, CO2 ACTUATOR	1	03670	67339
-2	CLAMP, CYLINDER, CO2 ACTUATOR	2	03670	33811
-3	NUT, 3/8, UNC-2B HEX., SST, TYPE 18-8	4	03670	14928
-4	BOLT, HEX HEAD, 3/8 X 1-1/2, THREAD 3/8 X 16 UNC-2A, SST, TYPE 18-8	4	03670	16512
7-10	SCALE, BEAM, BENCH TYPE	REF	03670	51992N
7-11	INDICATOR, LIQUID LEVEL, HALON 1301	REF	4U270	HLI-287
-1	DETECTOR UNIT, PORTABLE	1	4U270	HLI-287-1
-2	TRANSDUCER ENCAPSULATED IN URETHANE	1	4U270	HLI-287-6
-3	CONNECTING CABLE, SENSOR-TO-DETECTOR	1	4U270	HLI-287-6A
-4	OPERATOR HEADPHONES, MONAURAL, WITH INTEGRAL CABLE	1	4U270	HLI-287-7
-5	BATTERY CHARGER UNIT, AC-POWERED, WITH INTEGRAL CABLE	1	4U270	HLI-287-5A
-6	CARRYING CASE, PADDED	1	4U270	HLI-287-8
-7	ACOUSTIC COUPLING GEL	1	4U270	HLI-287-9A
-8	SPARE PARTS KIT	1	4U270	HLI-287-11
-9	TECHNICAL MANUAL (NOT SHOWN)		S9555-CV-MMA-010/4U270	
7-12	DELAY, TIME, PRESSURE OPERATED 30 SECOND-CLASS 1	REF	03670	52173N
-1	VALVE BODY	1	03670	23778

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-2	VALVE STEM, TYPE 304 CRES	1	03670	27946
-3	PISTON, TYPE 303 OR 304 CRES	1	03670	52153
-4	SEAL, NITRILE (90 DUROMETER)	1	03670	27206
-5	SEAL RETAINER, TYPE 304 CRES	1	03670	27950
-6	CARTRIDGE, DOT 3AA 2015	1	03670	35382
-7	QUAD RING, 0.75 I.D. X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	27220
-8	QUAD RING, 0.75 I.D. X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	5362
-9	ADAPTER, TYPE 304 CRES	1	03670	27949
-10	MALE CONNECTOR, 1/4" (37° FLARE), BRASS	2	03670	35341
-11	O-RING, 1.5 I.D. X 0.094 C.S.M.R.	1	03670	27580
-12	NUT, HEX, 10-32 UNF, SST, 300 SERIES	1	03670	14732
7-13	TAGS, CYLINDER, LIQUID LEVEL	REF	03670	52395N
7-14	CAP, DISCHARGE, ANTI-RECOIL, WARNING LABEL	REF 1	03670	52414N
-1	CAP, ANTI-RECOIL DISCHARGE	1	03670	77646
-2	SAFETY CHAIN, TYPE 1/0.	1	03670	27458
-3	DRIVE SCREW, NO. 4 (5/16) TYPE U COMM'L TOLERANCES TO APPLY SST (18-8)	2	03670	27857
7-15	CAP, PROTECTION, VALVE ACTUATOR	REF	03670	52415N
-1	SAFETY CAP, BRASS, ALLOY NO. 360 OF QQ-B-626	1	03670	33661
-2	SAFETY CHAIN, TYPE 1/0, 10 LINKS, BRASS WITH ZINC OR CADMIUM PLATE AND IRIDITE FINISH	1	03670	2367
-3	DRIVE SCREW, MATERIAL-SST (18-8) NO. 4, TYPE U, COMM'L TOLERANCES	2	03670	27857
7-16	BRACKET, CYLINDER, , HALON 1301, 10 THROUGH 95 LB, SIZES 1 THROUGH 4 CLASS 1	REF	03670	52425N
-1	SADDLE, CYLINDER, HALON 1301	2	03670	57708
-2	STRAP, CYLINDER, HALON 1301	2	03670	57709
-3	CARRIAGE BOLT W/ NUT, 8-1/2 IN. LG 5/8-11 UNC-2A, 1-7/8 MIN THD LENGTH, GALVANIZED STEEL	4	03670	40356
-4	NUT, 5/8-11 UNC-2B, GALVANIZED STEEL 4 (PART OF ITEM 3)	4		MS16285-7
7-17	BRACKET, CYLINDER, HALON 1301, 125 LB SIZE 5 CLASS 1	REF	03670	52427N
-1	SADDLE ASSEMBLY, CYLINDER, HALON 1301	2	03670	57706
-2	STRAP, CYLINDER, HALON 1301	2	03670	57707
-3	CARRIAGE BOLT W/ NUT, 8-1/2 IN. LG 5/8-11 UNC-2A, 1-7/8 MIN THD LENGTH, GALVANIZED STEEL	4	03670	40356
-4	NUT, 5/8-11 UNC-2B, GALVANIZED STEEL 4 (PART OF ITEM 3)	4		MS16285-7

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
7-18	BRACKET, TIME DELAY	REF	03670	52430N
-1	CLAMP, TIME DELAY	2	03670	34829
7-19	ADAPTER, DISCHARGE, 1.50, HALON 1301	REF	03670	52443N
7-20	CYLINDER ASSEMBLY, HALON 1301, 10 LB, SIZE 1, CLASS 1	REF	03670	77655N
-1	VALVE ASSEMBLY, CYLINDER, HALON 1301	1	03670	77654
-2	SIPHON TUBE, 10 LB AND 15 LB CYLINDER ASSEMBLIES	1	03670	35343
-3	CYLINDER, HALON 1301, 10 LB AND 15 LB (PAINTED)	1	03670	77732
-4	CAP, SHIPPING, HALON 1301	1	03670	63144
-5	ACTUATOR, VALVE, PRESSURE OPERATED	1	03670	52719
-6	TAGS, CYLINDER, LIQUID LEVEL (FOR 60 REPLACEMENT TAGS, ORDER P/N 52395)	1	03670	63344
7-21	CYLINDER ASSEMBLY, HALON 1301, 15 LB, SIZE 2, CLASS 1	REF	03670	77656N
-1	VALVE ASSEMBLY, CYLINDER, HALON 1301	1	03670	77654
-2	SIPHON TUBE, 10 LB AND 15 LB CYLINDER ASSEMBLIES	1	03670	35343
-3	CYLINDER, HALON 1301, 10 LB AND 15 LB (PAINTED)	1	03670	77733
-4	CAP, SHIPPING, HALON 1301	1	03670	63144
-5	ACTUATOR, VALVE, PRESSURE OPERATED	1	03670	52719
-6	TAGS, CYLINDER, LIQUID LEVEL (FOR 60 REPLACEMENT TAGS, ORDER P/N 52395)	1	03670	63344
7-22	CYLINDER ASSEMBLY, HALON 1301, 60 LB, SIZE 3, CLASS 1	REF	03670	77657N
-1	VALVE ASSEMBLY, CYLINDER, HALON 1301	1	03670	77654
-2	SIPHON TUBE, 60 LB CYLINDER ASSEMBLIES	1	03670	35343
-3	CYLINDER, HALON 1301, 60 LB (PAINTED)	1	03670	77734
-4	CAP, SHIPPING, HALON 1301	1	03670	63144
-5	ACTUATOR, VALVE, PRESSURE OPERATED	1	03670	52719
-6	TAGS, CYLINDER, LIQUID LEVEL (FOR 60 REPLACEMENT TAGS, ORDER P/N 52395)	1	03670	63344
7-23	CYLINDER ASSEMBLY, HALON 1301, 95 LB, SIZE 4, CLASS 1	REF	03670	77658N
-1	VALVE ASSEMBLY, CYLINDER, HALON 1301	1	03670	77654
-2	SIPHON TUBE, 95 LB CYLINDER ASSEMBLIES	1	03670	35344
-3	CYLINDER, HALON 1301, 95 LB (PAINTED)	1	03670	77735
-4	CAP, SHIPPING, HALON 1301	1	03670	63144

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-5	ACTUATOR, VALVE, PRESSURE OPERATED	1	03670	52719
-6	TAGS, CYLINDER, LIQUID LEVEL (FOR 60 REPLACEMENT TAGS, ORDER P/N 52395)	1	03670	63344
7-24	CYLINDER ASSEMBLY, HALON 1301, 125 LB, SIZE 5, CLASS 1	REF	03670	77659N
-1	VALVE ASSEMBLY, CYLINDER, HALON 1301	1	03670	77654
-2	SIPHON TUBE, 125 LB CYLINDER ASSEMBLIES	1	03670	35346
-3	CYLINDER, HALON 1301, 125 LB (PAINTED)	1	03670	77736
-4	CAP, SHIPPING, HALON 1301	1	03670	63144
-5	ACTUATOR, VALVE, PRESSURE OPERATED	1	03670	52719
-6	TAGS, CYLINDER, LIQUID LEVEL (FOR 60 REPLACEMENT TAGS, ORDER P/N 52395)	1	03670	63344
7-25	ACTUATOR, VALVE PRESSURE HALON 1301	REF	03670	52719N
-1	CAP, PROTECTION, VALVE ACTUATOR	1	03670	52415
-2	CONNECTOR, MALE	1	03670	35341
-3	PISTON	1	03670	32005
-4	CYLINDER AND COUPLING NUT ASSEMBLY	1	03670	67348
-5	RETAINING RING	1	03670	32137
-6	O-RING, 0.609/0.619 I.D. X 0.067/0.073 DIA. (SYNTHETIC RUBBER)	1	03670	42337
7-26	NOZZLE, DISCHARGE, HALON 1301 180° AND 360° DISCHARGE PATTERN	REF	03670	52921N
7-27	TUBING, FLEXIBLE, ACTUATION, 0.25 IN.	REF	99565	A10895
7-28	VALVE ASSEMBLY, CYLINDER, HALON 1301	REF	03670	53161N
-1	VALVE CORE	1	03670	31712
-2	CAP, VALVE	1	03670	53199
-3	SPRING, COMPRESSION	1	03670	53423
-4	CHECK PLUG, BRASS, 0.375-16 UNC-2A	1	03670	31704
-5	BODY, VALVE, CYLINDER	1	03670	57820
-6	SPOOL, BRASS-UNS C36000, 0.75-16 UNF-2B	1	03670	53198
-7	GAGE, PRESSURE, 0.125 IN. ANPT	1	03670	53119
-8	SAFETY DISK NUT, BRASS-UNS C36000	1	03670	34869
-9	CAP, ANTI-RECOIL DISCHARGE WITH LABEL	1	03670	52414
-10	CHECK HOUSING, BRASS-UNS C36000, 0.75-16 UNF-2A EXTERNAL, 0.375-16 UNF-2B	1	03670	31701
-11	INTERNAL BALL, RUBBER, 0.19 DIA.	1	03670	31699
-12	DISK, SAFETY, PHOSPHOR BRONZE, GOLD COVERED, 0.006 THICK X 0.549 DIA.	1	03670	45010
-13	DISK, SAFETY, WASHER, COPPER, QQ-C-576 0.031 THICK X 0.334 I.D. X 0.549 O.D.	1	03670	45011

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-14	O-RING, 2.25 I.D. X 0.13 C.S. -70 DUROMETER	1	03670	16647
-15	O-RING, 1.313 I.D. X 0.094 C.S. -70 DUROMETER	1	03670	31715
-16	O-RING, 0.938 I.D. X 0.125 C.S. -70 DUROMETER	1	03670	31716
-17	O-RING, 2.337 (+0.010) I.D. X 0.118 (+0.004) C.S. -70 DUROMETER	1	03670	76021
7-29	CAP, SHIPPING, HALON 1301 CYLINDER ASSEMBLY	REF	03670	63144N
-1	SHELL, SHIPPING CAP	1	03670	57723
-2	COLLAR, SHIPPING CAP	1	03670	63140
-3	LOCK WASHER, STEEL, 0.375	3	03670	906
-4	HEX HEAD BOLT, STL. GRADE 2, 0.375- 16 UNC-2A X 0.50 LENGTH	3	03670	63248
-5	CAP PLUG, NO. 1 -7/16 DIA. X 3/8 LG. TAPERED, RED POLYETHYLENE	3	03670	25155
7-30	VALVE CYLINDER, CO ₂ ACTUATOR	REF	03670	64550N
-1	BODY, VALVE	1	58553	P5970BM-1-D
-2	PLUG, SAFETY, BRASS	1	58553	P5970BM-9
-3	DISK, SAFETY, PHOSPHOR BRONZE, GOLD COVERED	1	58553	P5970BM-16
-4	GASKET, SAFETY, COPPER, FED SPEC QQ-C-576	1	58553	P5608-15SF
-5	BONNET, BRASS	1	58553	P5970BX22
-6	CAP, PROTECTION, VALVE ACTUATOR	1	03670	52415
-7	TIE, CABLE, MOLDED NYLON	1	03670	19897
-8	STEM AND SEAT ASSY, NEOPRENE RUBBER AND BRASS	1	58553	P5970A-21
-9	GASKET, BONNET, COPPER, FED SPEC QQ-C-576	1	58553	P5970B-5
-10	SPRING, OPERATING, PHOSPHOR BRONZE	1	58553	P5608-5
-11	O-RING, 0.125 X 0.25 X 0.063 (#006), NEOPRENE RUBBER	1	58553	P6037-15
-12	LEVER, OPERATING, CRES	1	58553	P5970BMX1-8
-13	PIN, LEVER, CRES	1	58553	P5970B-6
-14	RETAINER, SPRING, LOCKING, BRASS	1	58553	P5970-BMX1-9
-15	RING ASSEMBLY, LOCK, CRES AND BRASS	1	58553	P5970BM-23
-16	SCREW, RETAINER, BRASS	1	58553	P5970-BMX1-14
-17	SPRING, LOCKING, VALVE, PHOSPHOR BRONZE	1	58553	P5970-BMX1-11
-18	CONNECTOR, 0.438-20 UNF-2A X 0.375 NPT BRASS CONFORMING TO UNS C36000	1	03670	33660
7-31	FITTING END ADAPTER, 37° FLARED X 0.25 I.P.S. SOCKET WELD	REF	03670	64569N
7-32	VALVE ASSEMBLY, CHECK, 0.25 IN.	REF	03670	77479
-1	UNION, SOCKET WELD, CHECK VALVE, 0.25 IN.	2	03670	68605
-2	BODY, CHECK VALVE	1	03670	72261
-3	CHECK, CHECK VALVE, 0.25 IN.	1	03670	68093

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-4	COMPRESSION SPRING	1	03670	68539
-5	PISTON	1	03670	68092
-6	O-RING, 0.75 I.D. X 0.09 WIDTH NITRILE (BUNA N) PER MIL-P-25732, 75 DUROMETER +5	2	03670	68363
-7	O-RING, CHECK, CHECK VALVE, 0.25 IN.	1	03670	71319
7-33	VALVE ASSEMBLY, CHECK, 0.25 IN.	REF	03670	77479N
-1	NUT, UNION, SS PER UNS	2	03670	77688
-2	BODY, CHECK VALVE	1	03670	77480
-3	CHECK, CHECK VALVE, 0.25 IN.	1	03670	68093
-4	COMPRESSION SPRING	1	03670	68539
-5	PISTON	1	03670	68092
-6	O-RING, 0.75 I.D. X 0.09 WIDTH NITRILE (BUNA N) PER MIL-P-25732, 75 DUROMETER +5	2	03670	68363
-7	O-RING, CHECK, CHECK VALVE, 0.25 IN.	1	03670	71319
-8	SOCKET, UNION, M SS PER UNS-S31603	2	03670	77689
7-34	DELAY, TIME, PRESSURE OPERATED, 60 SEC., CLASS I	REF	03670	77554N
-1	VALVE BODY	1	03670	23778
-2	VALVE STEM-TYPE 304 CRES	1	03670	27946
-3	PISTON-TYPE 304 CRES	1	03670	27947
-4	SEAL-NITRILE (90 DUROMETER)	1	03670	27206
-5	SEAL RETAINER-TYPE 304 CRES	1	03670	27950
-6	CARTRIDGE, DOT 3AA 2015	1	03670	35382
-7	QUAD RING, 0.50 I.D. X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	27220
-8	QUAD RING, 0.75 I.D. X 0.125 C.S.	1	03670	5362
-9	ADAPTER, SS PER UNS-S31400	1	03670	77553
-10	MALE CONNECTOR, 1/4" (37° FLARE), BRASS	1	03670	35341
-11	O-RING, MINNESOTA RUBBER COMPOUND 366YY (NBR)	1	03670	27850
-12	NUT, HEX, 10-32 UNF, SST 300 SERIES	1	03670	14732
-13	FILTER, W/ O-RING	1	03670	77820
7-35	DELAY, TIME, PRESSURE OPERATED, 30 SEC., CLASS I	REF	03670	77555N
-1	VALVE BODY	1	03670	23778
-2	VALVE STEM-TYPE 304 CRES	1	03670	27946
-3	PISTON-TYPE 304 CRES	1	03670	52153
-4	SEAL-NITRILE (90 DUROMETER)	1	03670	27206
-5	SEAL RETAINER-TYPE 304 CRES	1	03670	27950
-6	CARTRIDGE, DOT 3AA 2015	1	03670	35382
-7	QUAD RING, 0.50 I.D. X 0.125 C.S. (NOMINAL) RUBBER COMPOUND 366Y	1	03670	27220
-8	QUAD RING, 0.75 I.D. X 0.125 C.S.	1	03670	5362
-9	ADAPTER, SS PER UNS-S31400	1	03670	77553
-10	MALE CONNECTOR, 1/4" (37° FLARE), BRASS	1	03670	35341
-11	O-RING, MINNESOTA RUBBER COMPOUND 366YY (NBR)	1	03670	27850

Table 7-2 (Cont)

Figure and Index Number	Name and Description	Qty	Federal Supply Code for Manufacturers (FSCM)	Part Number
-12	NUT, HEX, 10-32 UNF, SST 300 SERIES	1	03670	14732
-13	FILTER, W/ O-RING	1	03670	77820
7-36	VALVE ASSEMBLY, CYLINDER, HALON 1301	REF	03670	77654N
-1	BODY, VALVE	1	03670	77602
-2	CAP	1	03670	77801
-3	SPOOL, BRASS, UNS C36000	1	03670	53198
-4	CORE, VALVE	1	03670	31712
-5	NUT, SAFETY DISC, BRASS UNS C36000	1	03670	77366
-6	DISC, SAFETY, 14K DOUBLE GOLD CLAD ON 90/10 COMM BRONZE W/ PURE NICKEL INTER LINER	1	03670	77650
-7	WASHER, SAFETY DISC, DEAD SOFT COPPER, QQ- -576	1	03670	77653
-8	PLUG, CHECK, BRASS UNS C36000	1	03670	31704
-9	BALL, MINNESOTA RUBBER COMPOUND 525K	1	03670	31699
-10	O-RING, MINNESOTA RUBBER COMPOUND 523HW - 70 DUROMETER	1	03670	31716
-11	HOUSING, CHECK, BRASS UNS C36000	1	03670	31701
-12	O-RING, MINNESOTA RUBBER COMPOUND 523HW - 70 DUROMETER	1	03670	16647
-13	O-RING, MINNESOTA RUBBER COMPOUND 523HW - 70 DUROMETER	1	03670	31715
-14	GUAGE	1	03670	53119
-15	CAP, ANTI-RECOIL DISCHARGE	1	03670	52414
-16	SPRING	1	03670	53423
-17	O-RING, MINNESOTA RUBBER COMPOUND 523HW - 70 DUROMETER	1	03670	76021
7-37	CO2 FILTER, IN-LINE	REF	59165	U-275
-1	FILTER ELEMENT, 10 MICRON	1	59165	U-273
-2	O-RING, FILTER ELEMENT	1	NSN 9Z 5330-01-011-4057	
-3	CASE FITTING (CAP)	1	59165	U-274-C
-4	O-RING, CASE	1	NSN 9Z 5330-00-167-5173	
-5	FILTER HOUSING	1	59165	U-274
7-38	TIME DELAY DEVICE, CARLETON TYPE	REF	1W506	B15830-30 B15830-60
7-39	HALON SYSTEM ACTUATION CHECK VALVE NAVSEA DWG. NO. 803-6397404	REF	03670	415027
-1	BODY, VALVE	1	03670	415028
-2	GUIDE, VALVE	1	03670	415030
-3	RETAINER, SEAL	1	03670	415031
-4	SPRING	1	03670	415032
-5	TAILPIECE, 1/4 IN.	1	03670	415033
-6	TAILPIECE, 3/8 IN.	1	03670	415034
-7	UNION NUT, 1/4 IN.	1	03670	415035
-8	UNION NUT, 3/8 IN.	1	03670	415036
-9	O-RING, SEAT, MIL-R-83248/2-111	1	NSN 9Z 5330-01-258-6855	
-10	O-RING, INLET, MIL-R-83248/2-019	1	NSN 9Z 5330-01-058-4008	
-11	O-RING, OUTLET, MIL-R-83248/2-022	1	NSN 9Z 5330-00-166-1091	

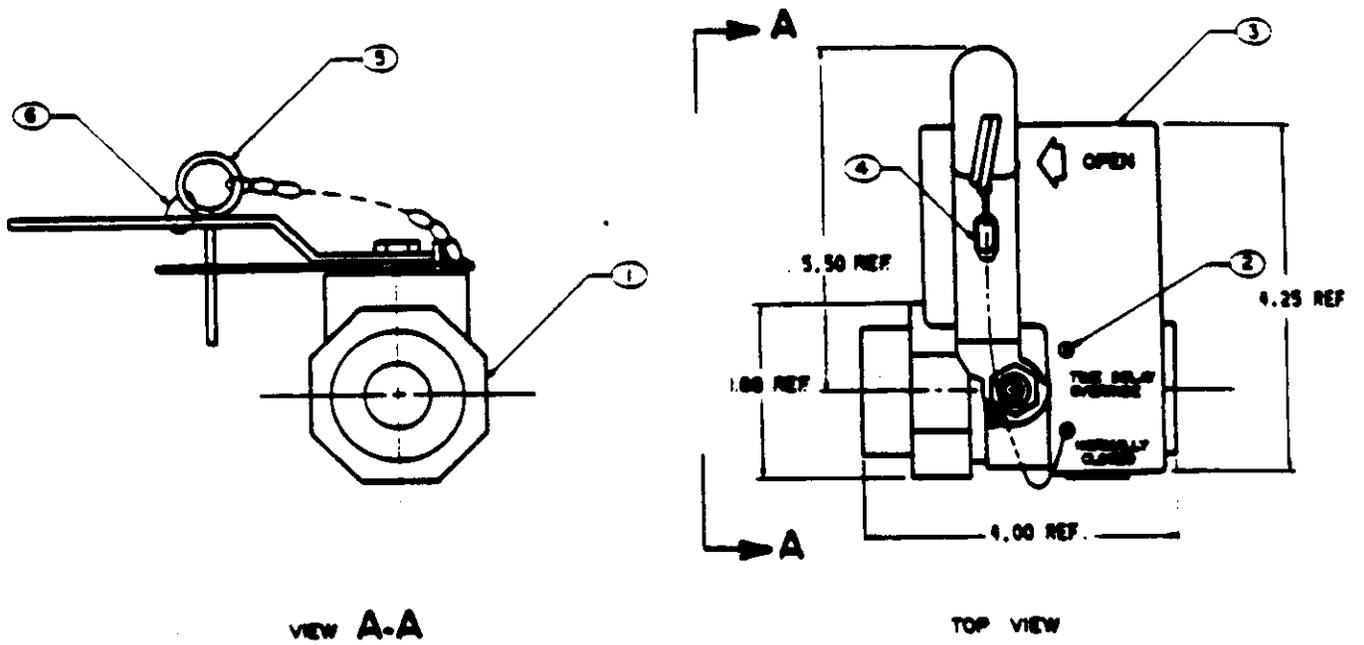
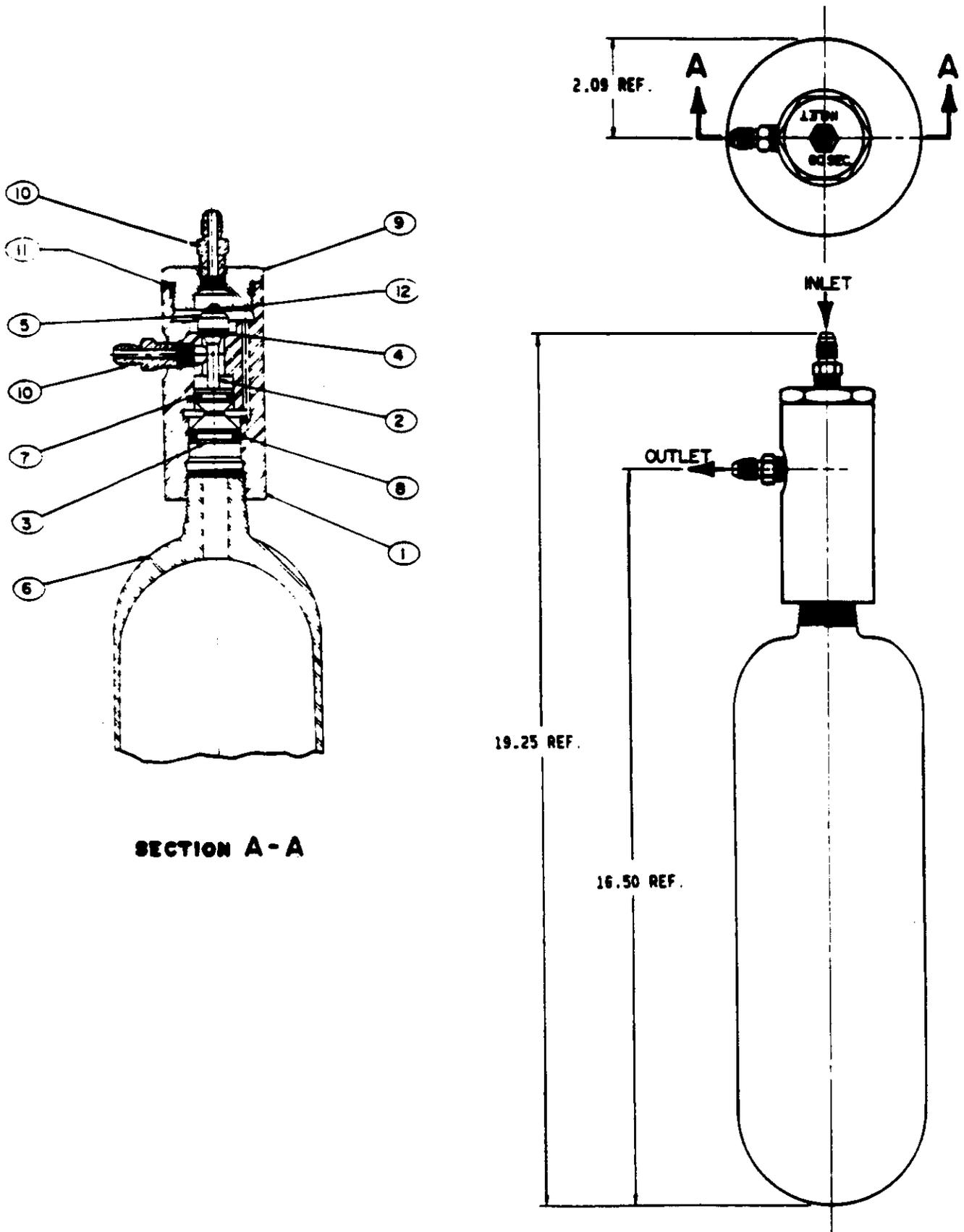


Figure 7-1. Valve, 1/4 in., Time Delay Override



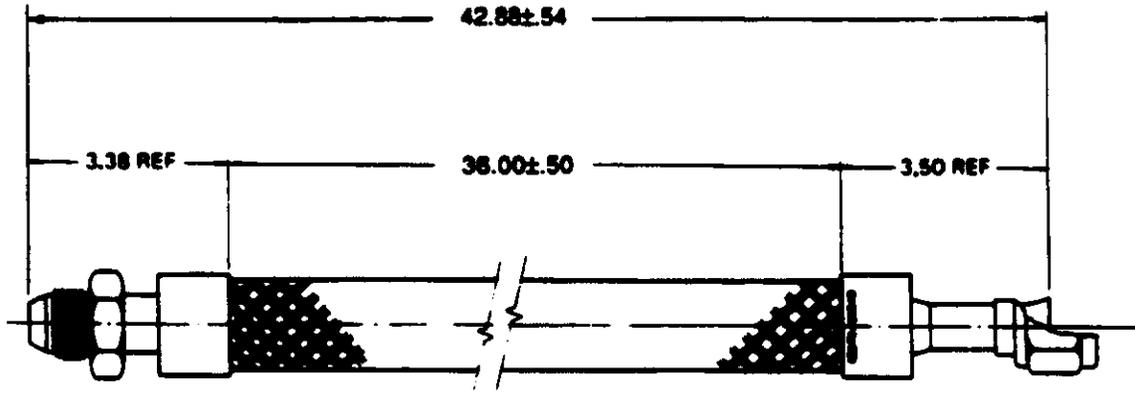


Figure 7-3. Hose, Flexible, Discharge, 1-1/2 in.

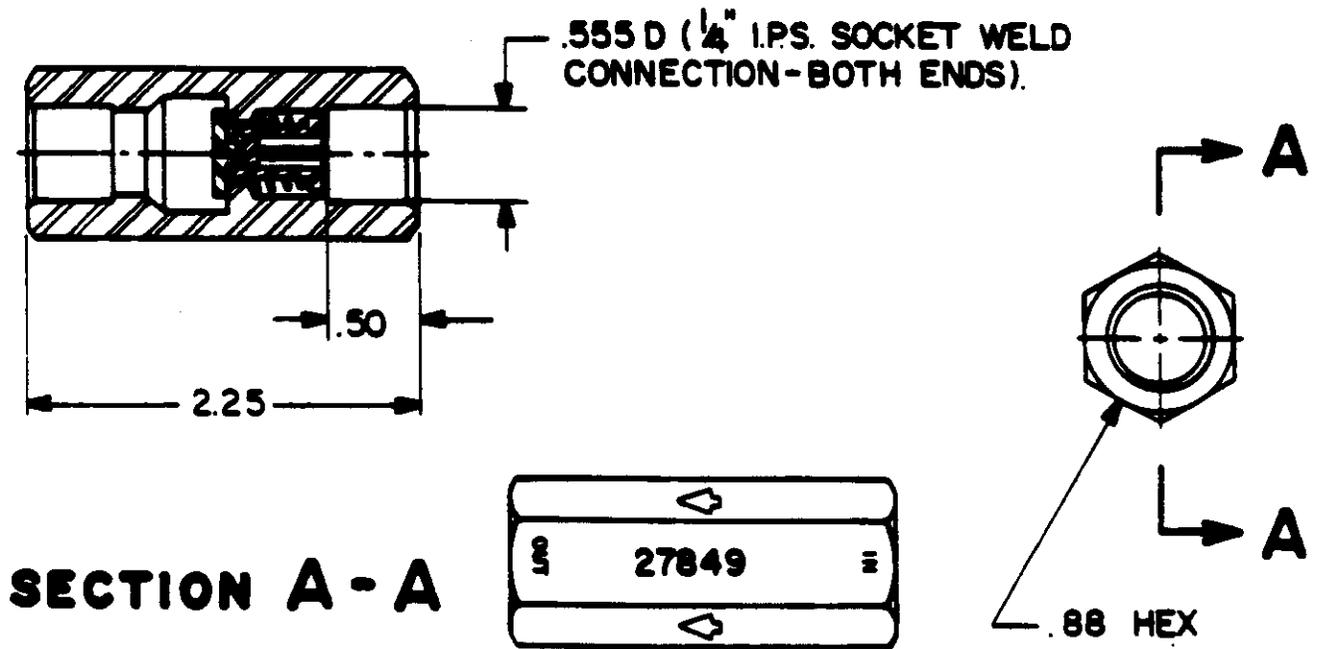
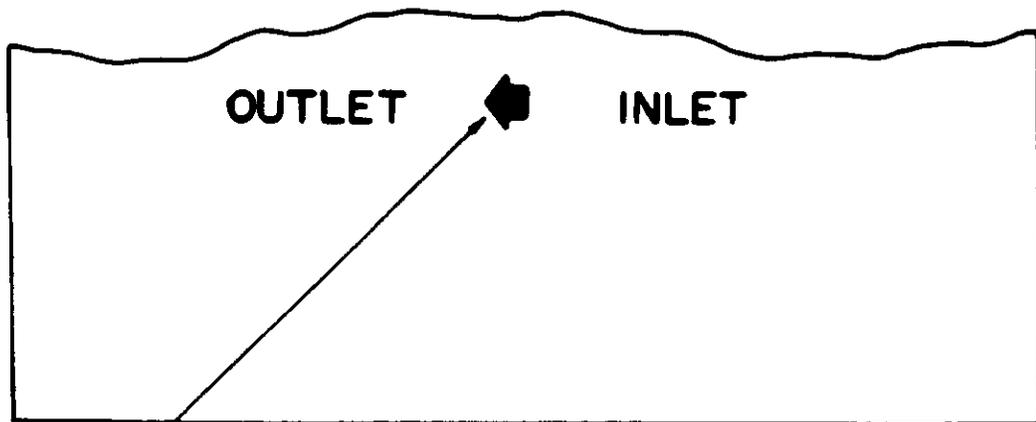
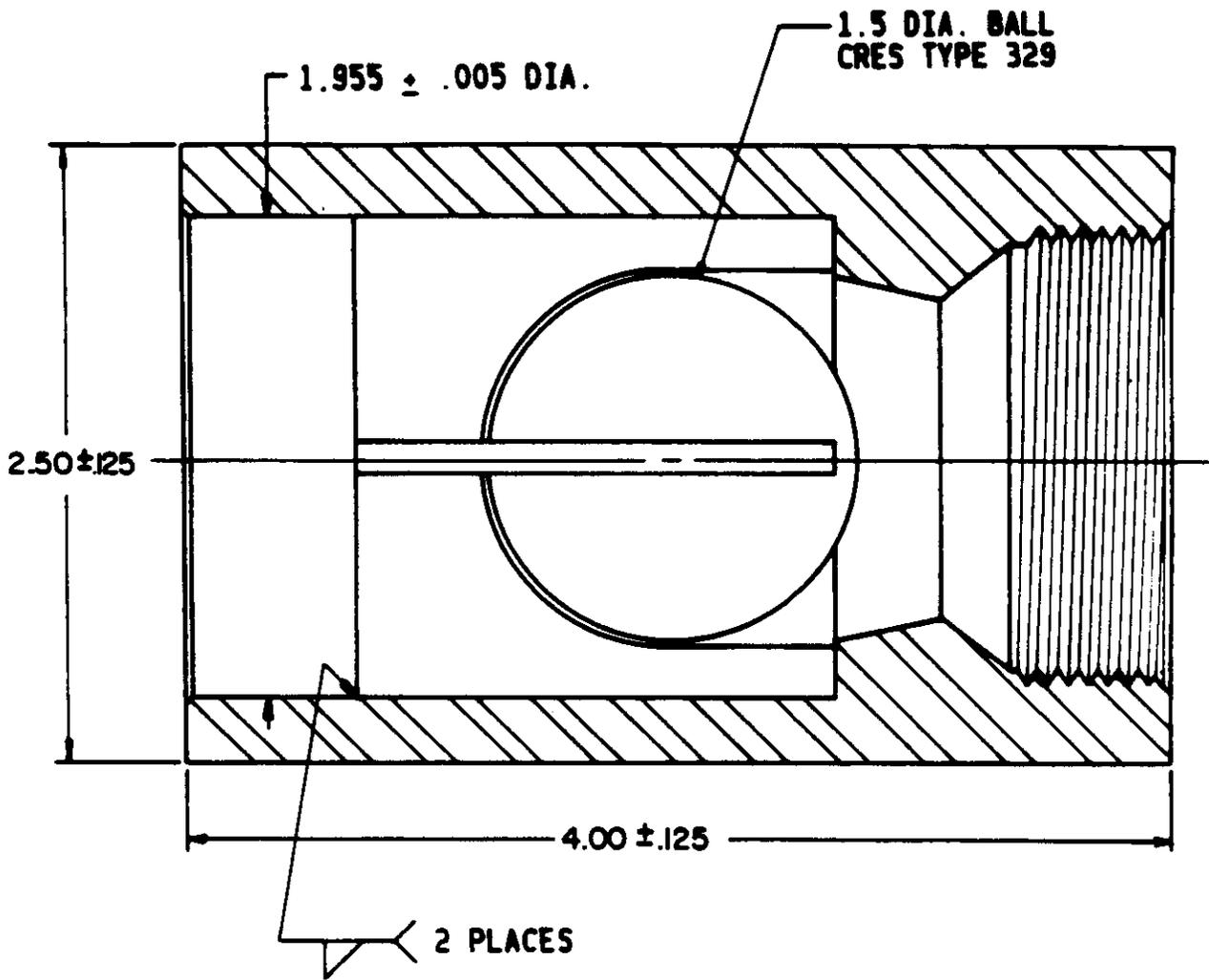


Figure 7-4. Valve, Check Actuation, 1/4 in



INLET AND OUTLET ENDS SHALL BE CLEARLY MARKED. AN ARROW DESIGNATING THE DIRECTION OF FLOW SHALL BE STAMPED ON THE BODY.

Figure 7-5 Valve Assembly, Check, Discharge, 1-1/2

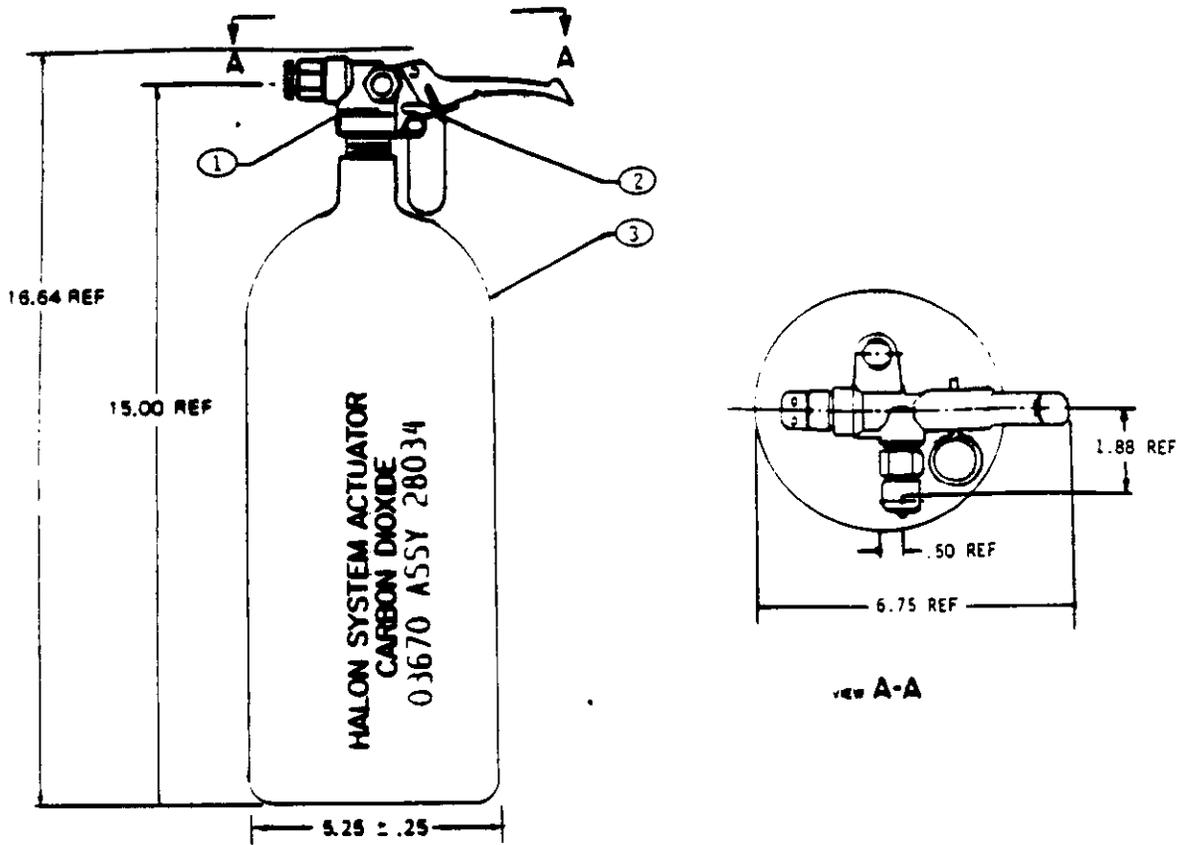


Figure 7-6. Actuator, CO₂ Manual, 5lb., Class I

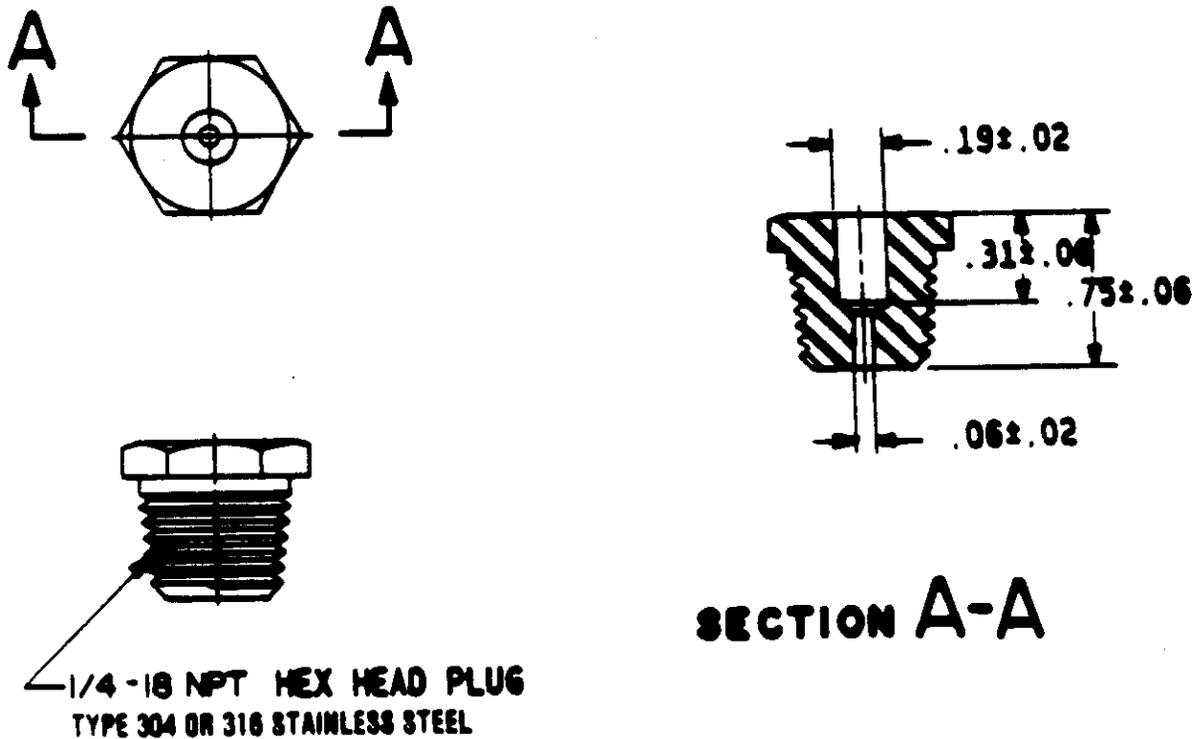


Figure 7-7 Fitting, Vent, CO₂ Actuation, 1/4 in

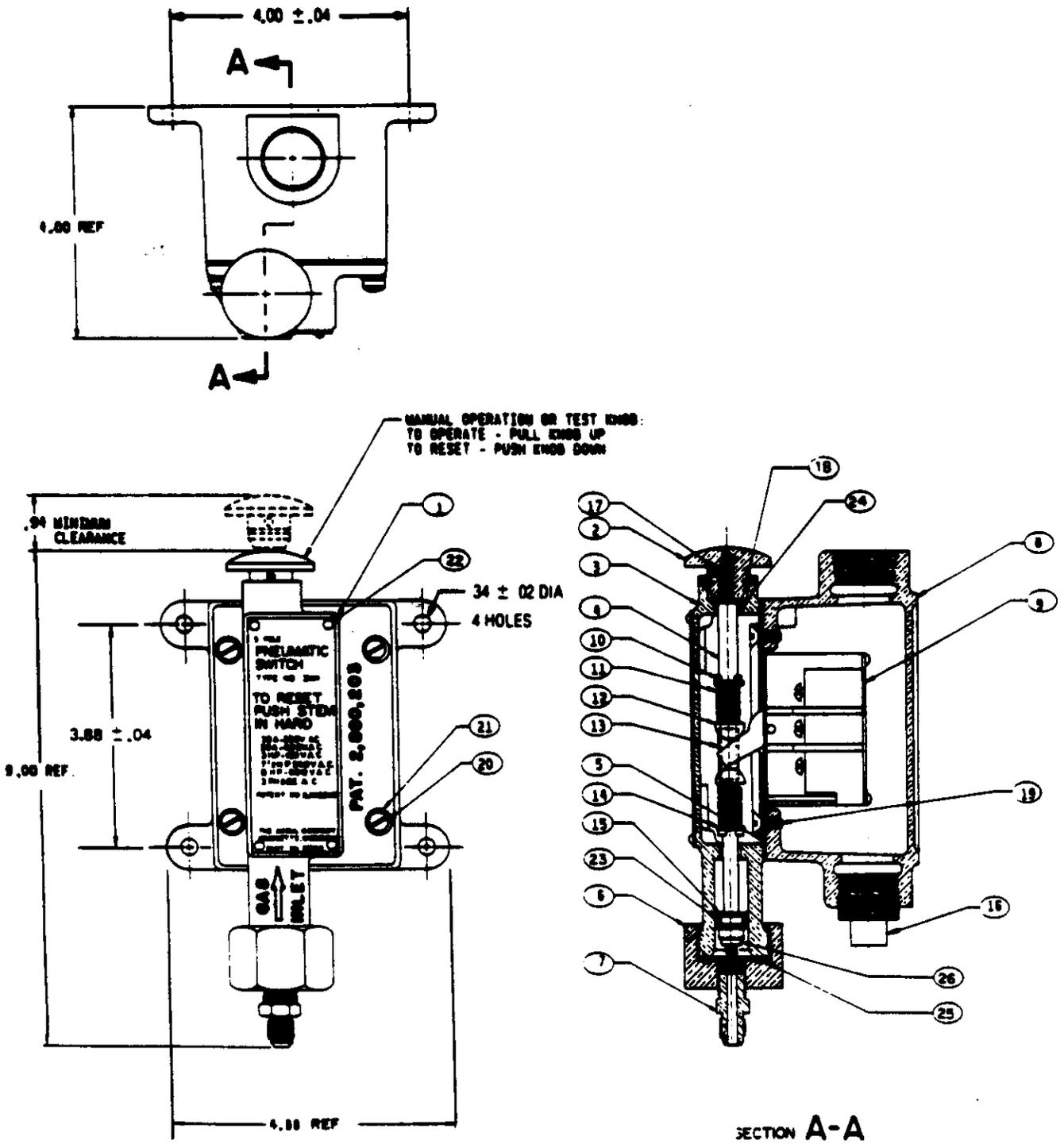


Figure 7-8 Switch, Pressure Operated

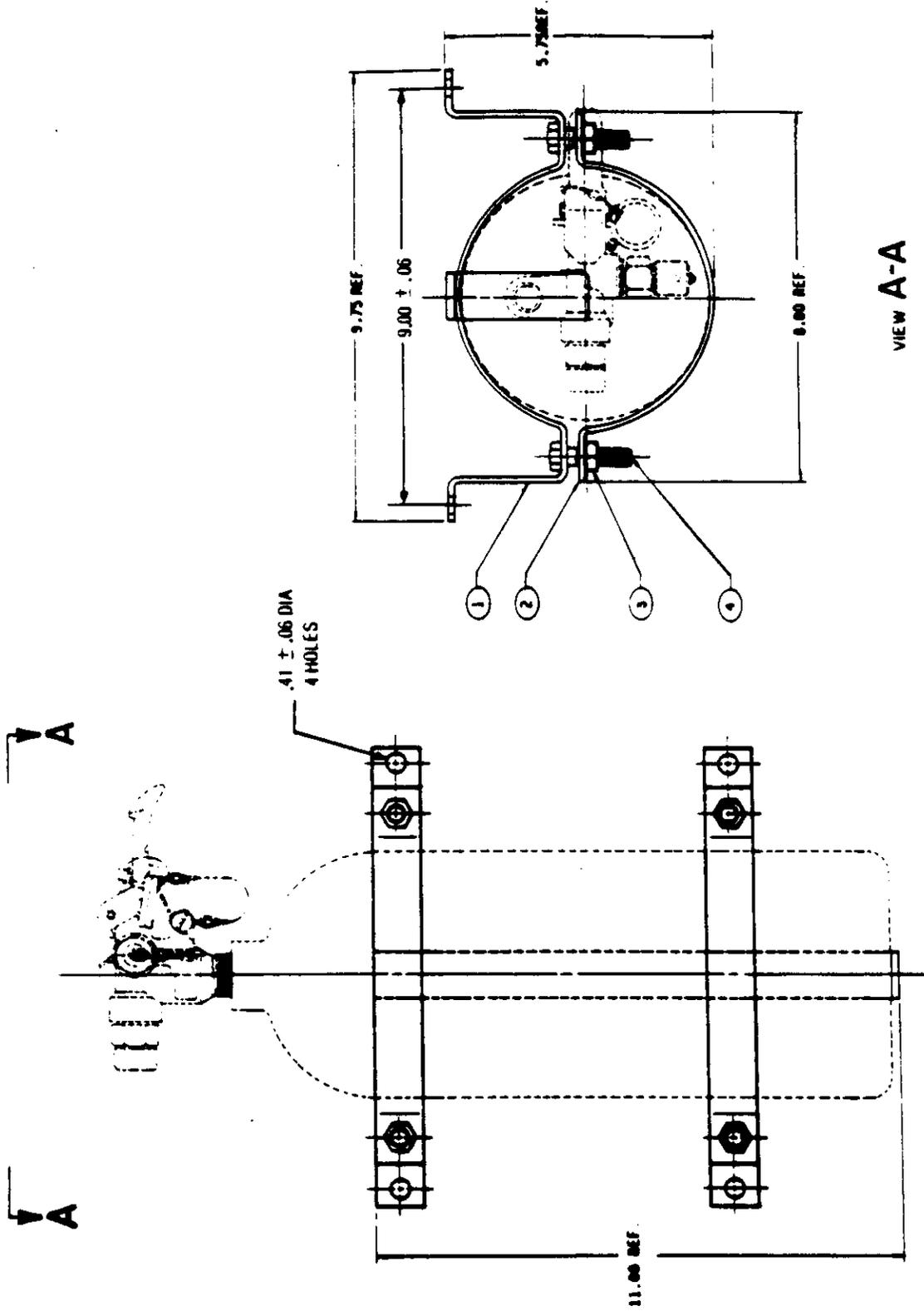
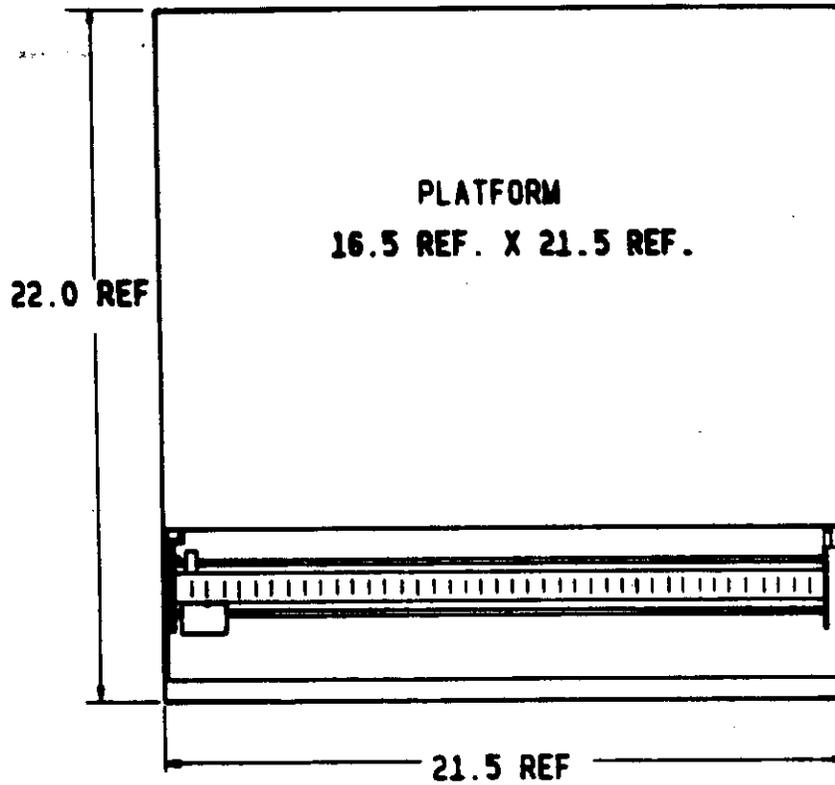
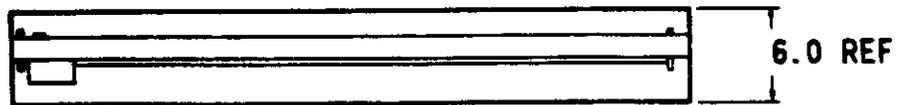


Figure 7 9 Bracket, Cylinder, CO2 Actuator



TOP VIEW



FRONT VIEW

Figure 7-10. Scale, Beam, Bench Type2

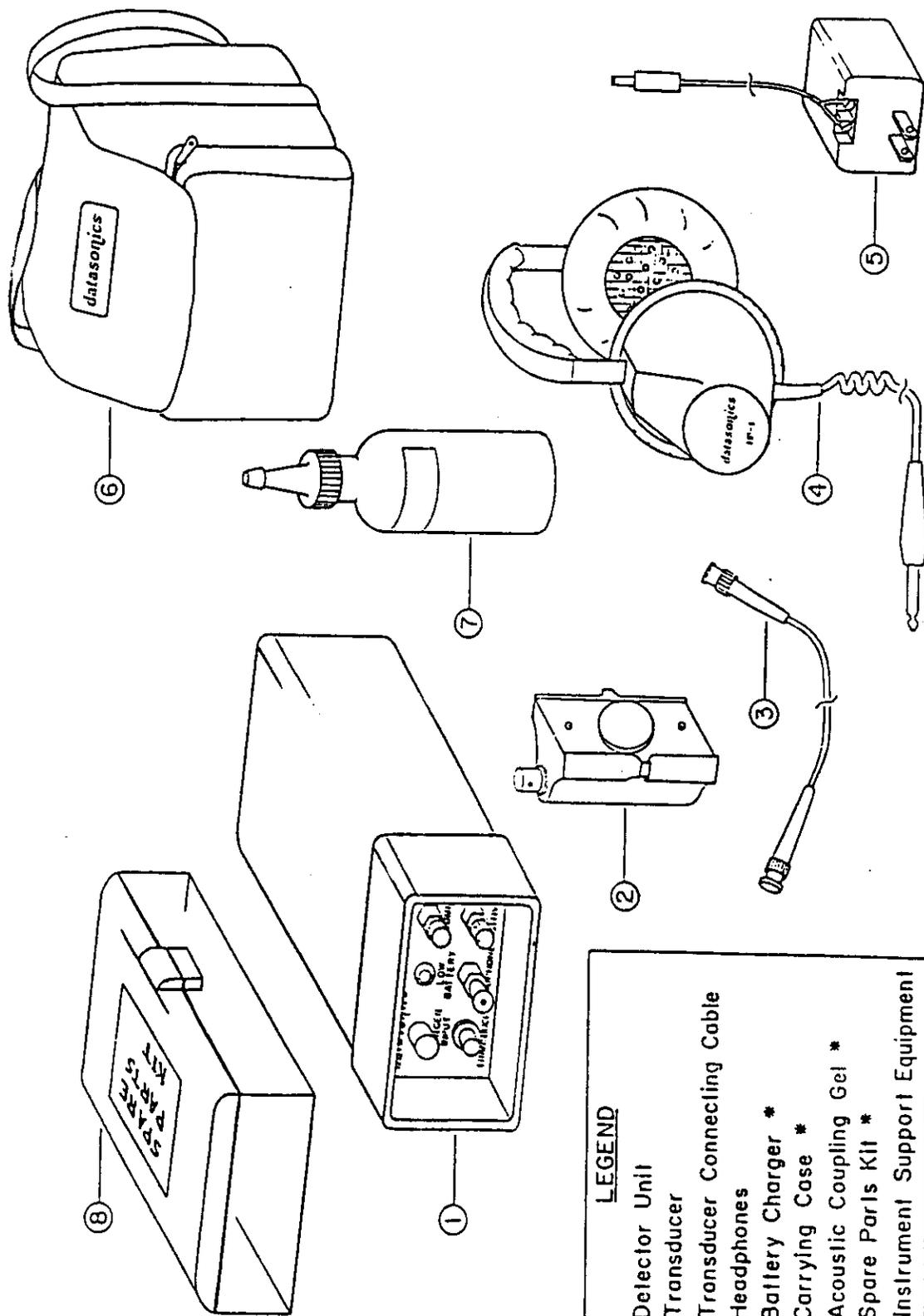
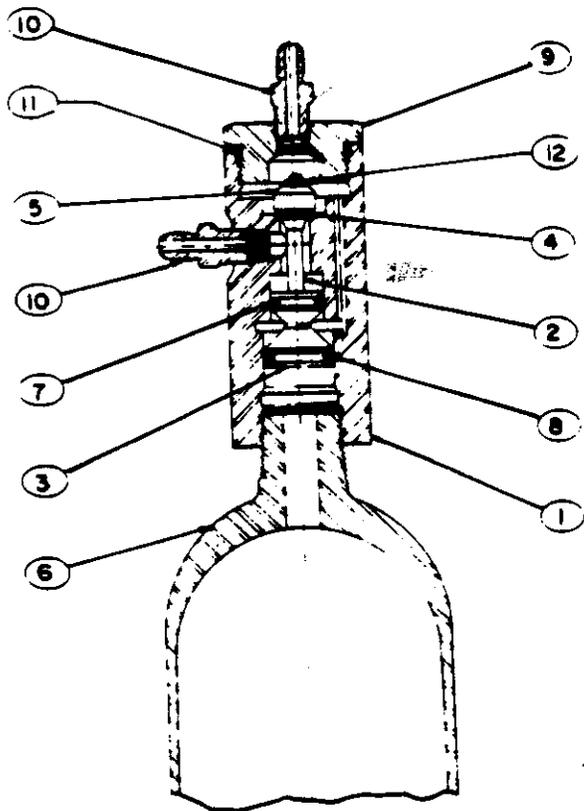


FIGURE 7-11 HLI-287 LIQUID LEVEL INDICATOR

- LEGEND**
- 1. Detector Unit
 - 2. Transducer
 - 3. Transducer Connecting Cable
 - 4. Headphones
 - 5. Battery Charger *
 - 6. Carrying Case *
 - 7. Acoustic Coupling Gel *
 - 8. Spare Parts Kit *
 - * Instrument Support Equipment



SECTION A - A

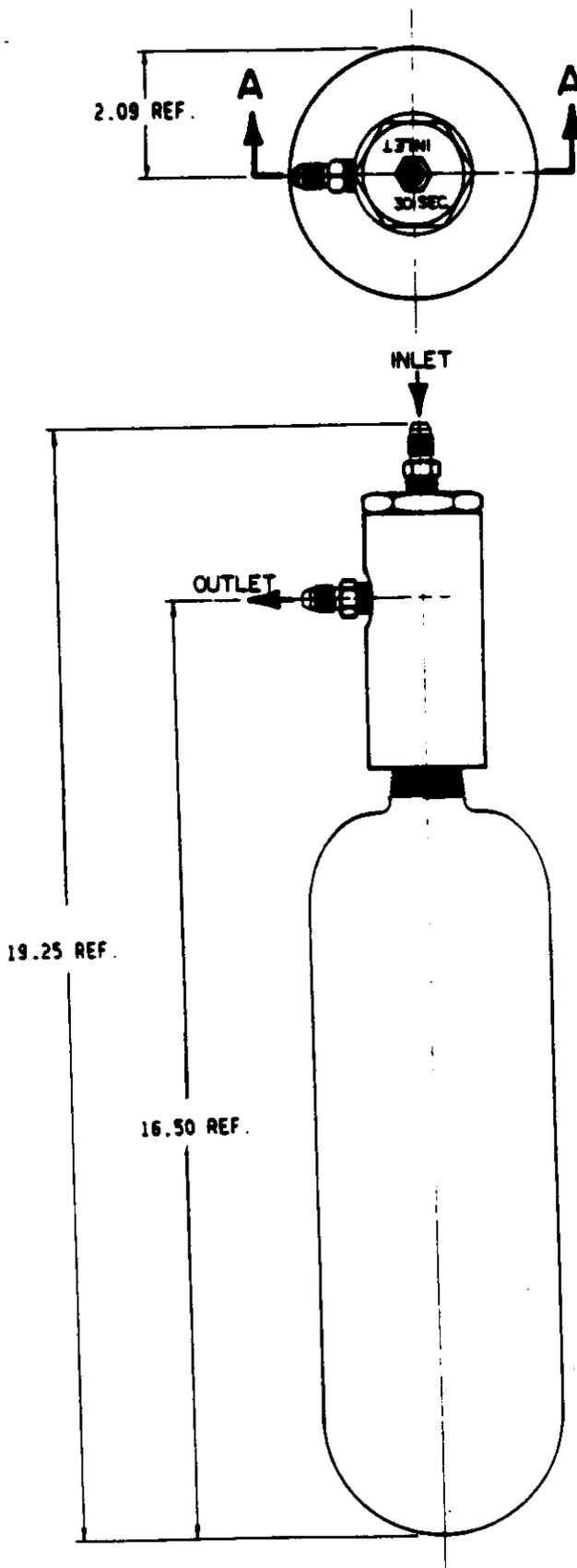
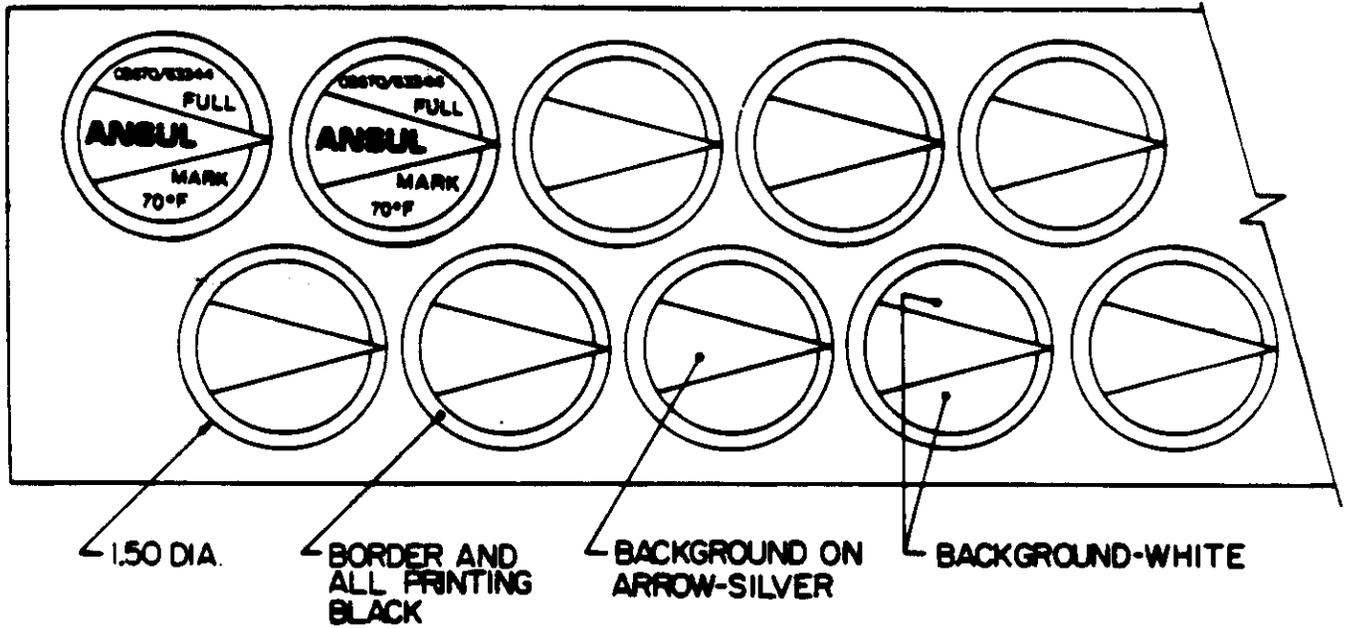


Figure 7-12. Delay, Time, Pressure Operated, 30 Second, Class I



**DESCRIPTION: TAGS, CYLINDER, LIQUID LEVEL,
60 TAGS - 4 PAGES WITH 15 TAGS
PER PAGE.**

Figure 7-13 Tags, Cylinder, Liquid Level

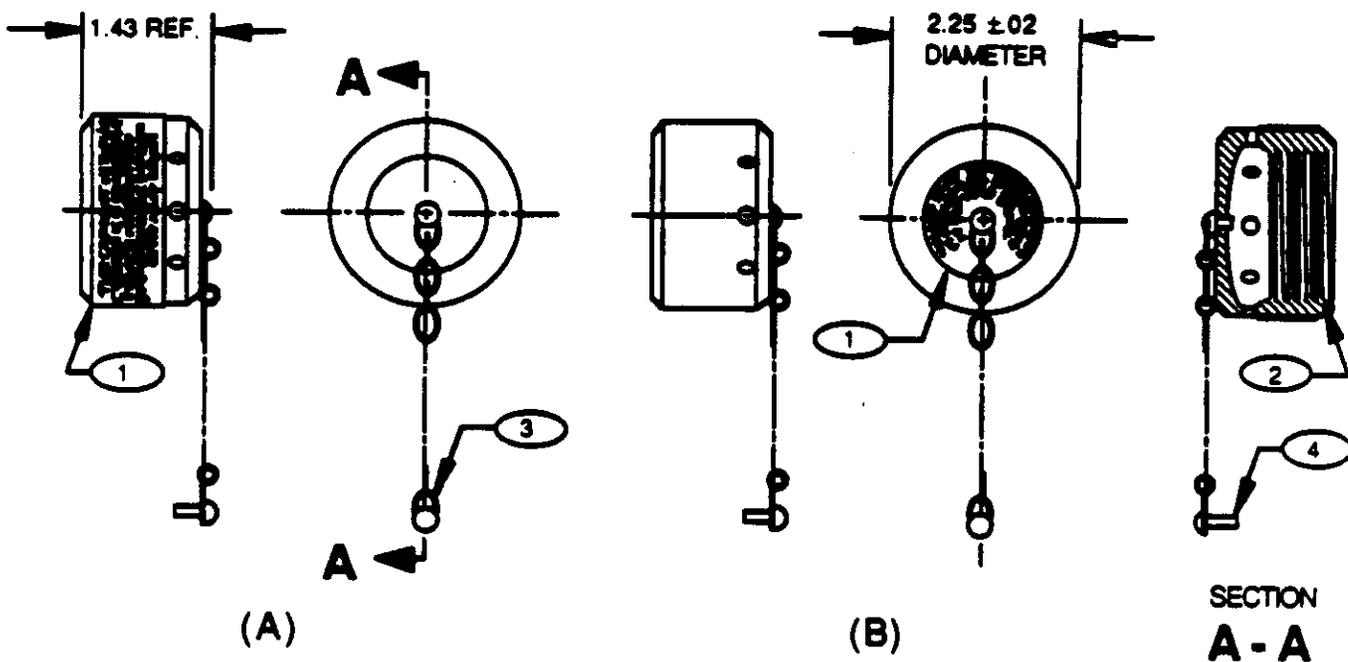


Figure 7-14 Cap. Discharge, Anti-Recoil, Halon 1301

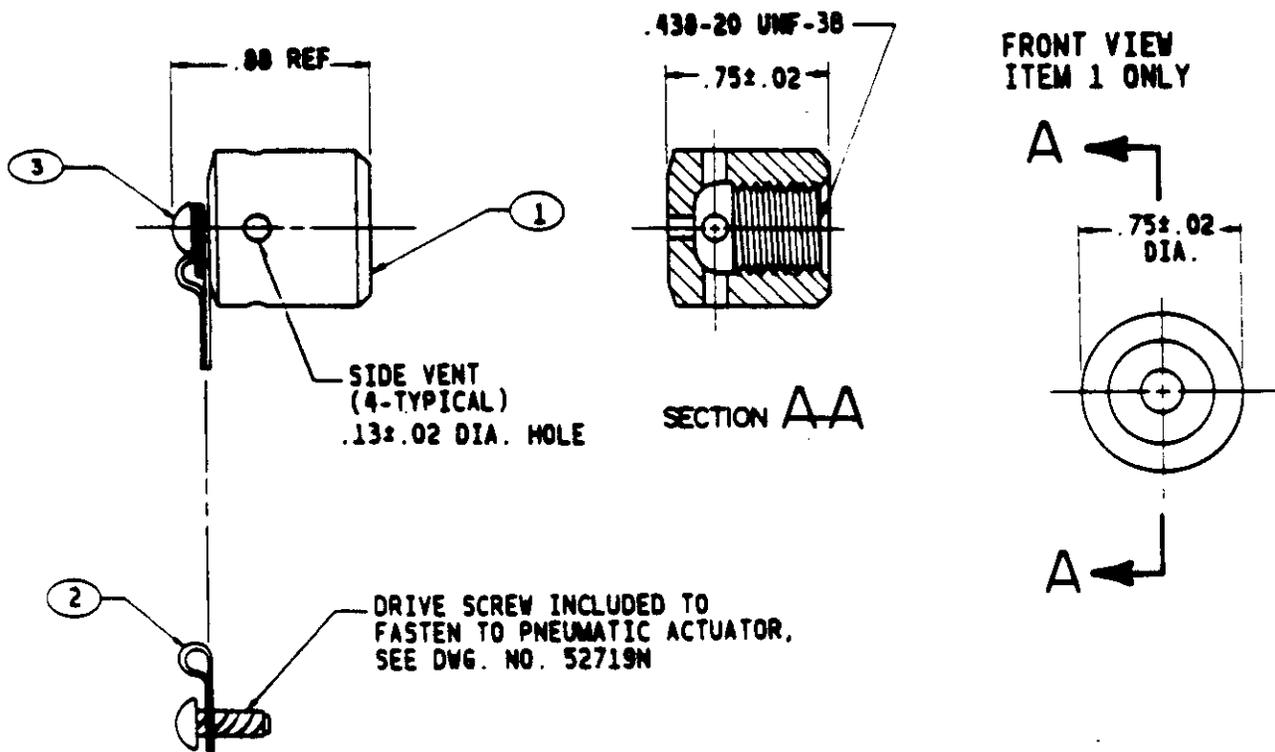
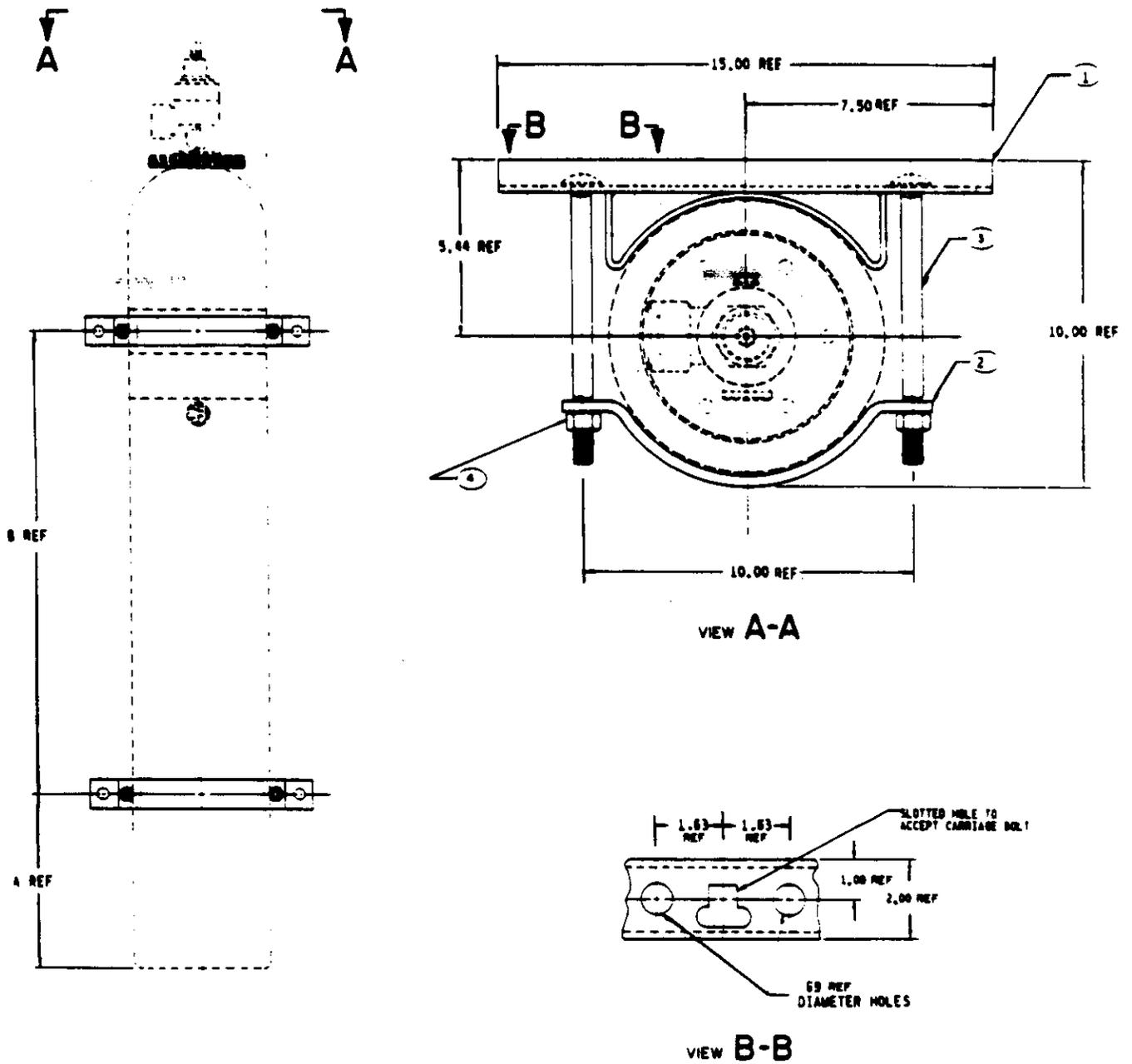


Figure 7-15 Cap. Protection, Valve Actuator



Cylinder Size, Lbs.	10	15	60	95
Dimension "A"	2.00	2.00	12.00	12.00
Dimension "B"	10.00	10.00	15.00	28.00

Figure 7-16. Bracket, Cylinder, Halon 1301, 10 Through 95 lb, Sizes 1 Through 4, Class 1

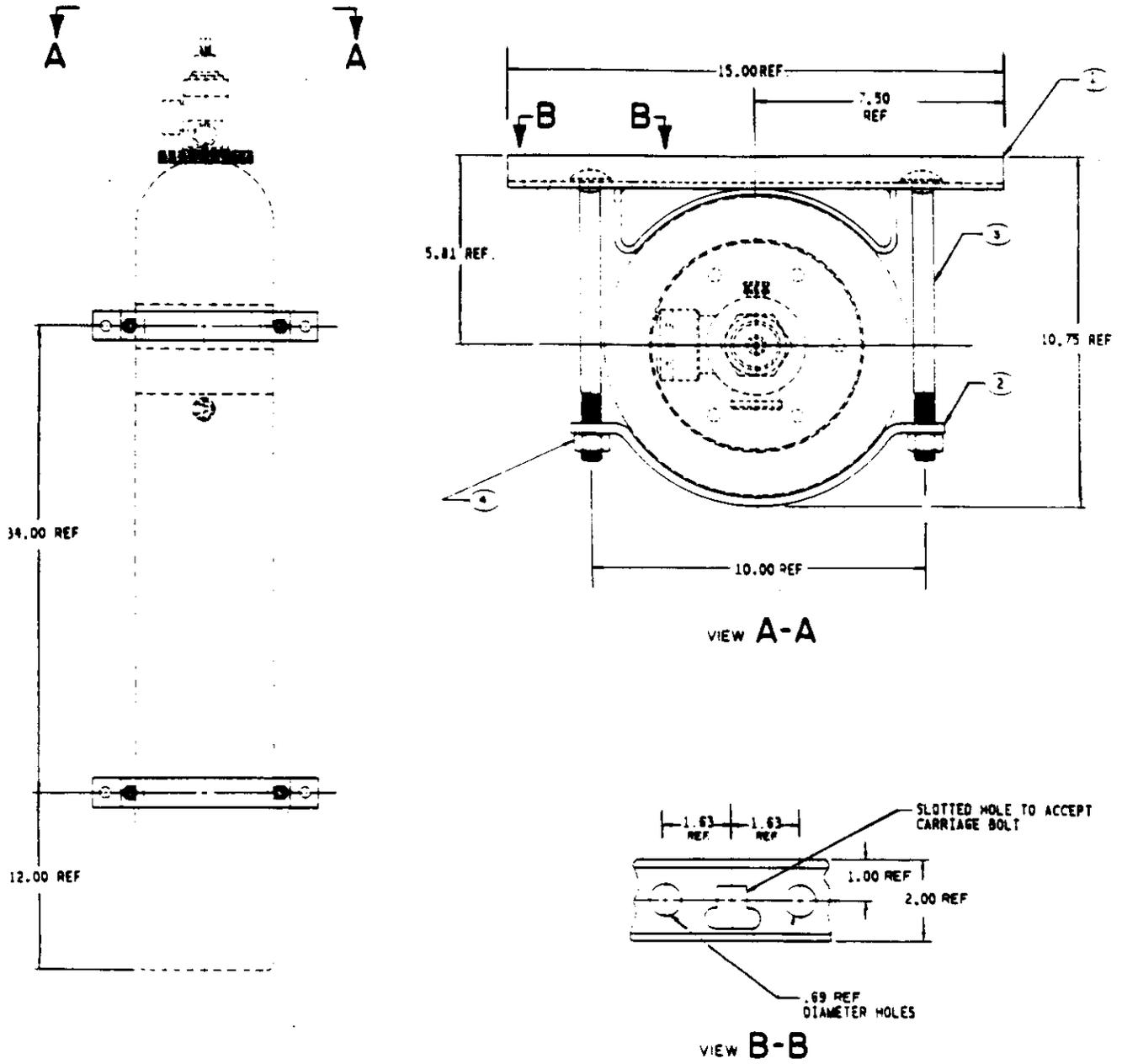


Figure 7-17 Bracket, Cylinder, Halon 1301, 125 lb. Size 5, Class I

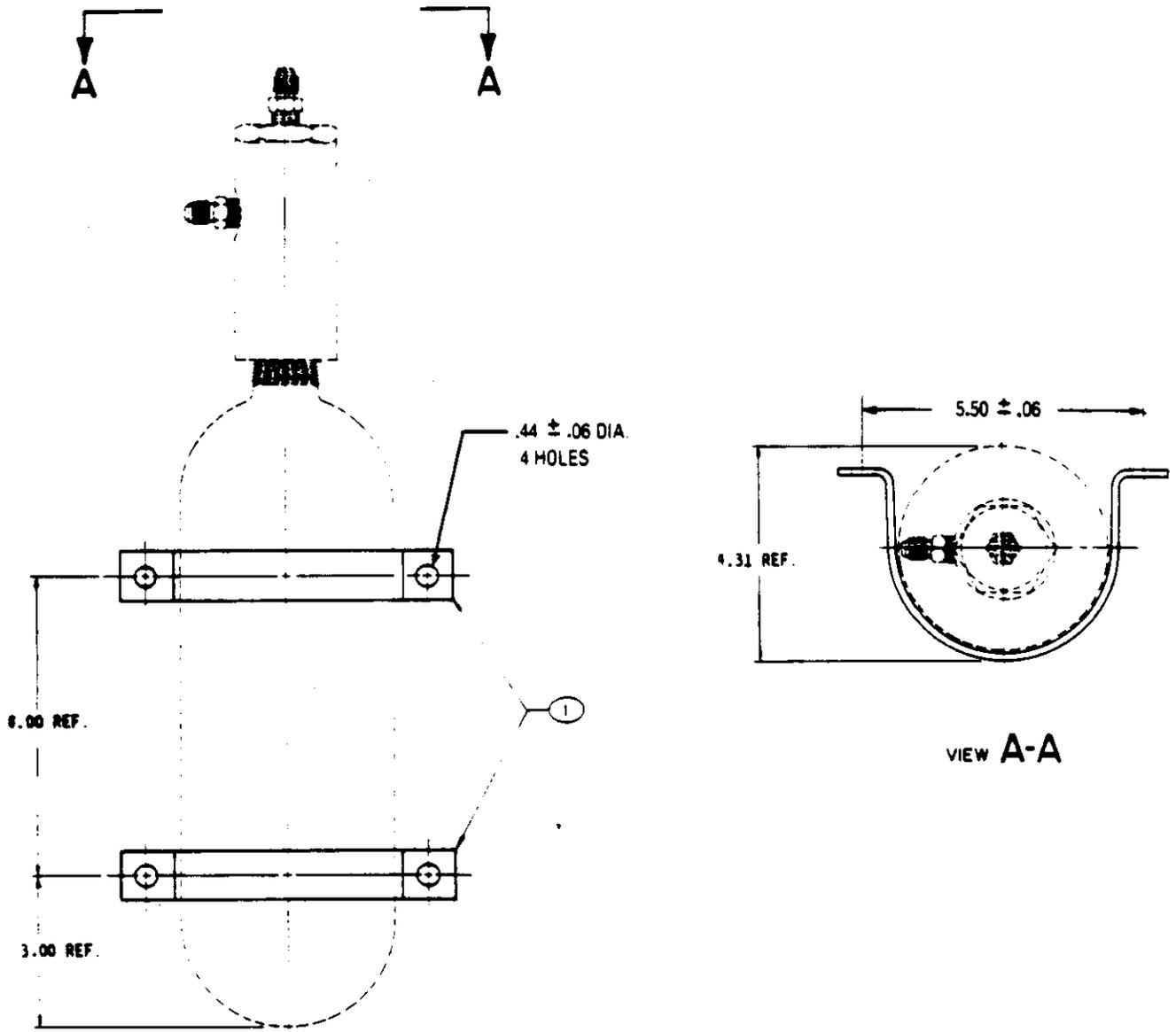


Figure 7-18 Bracket, Time Delay

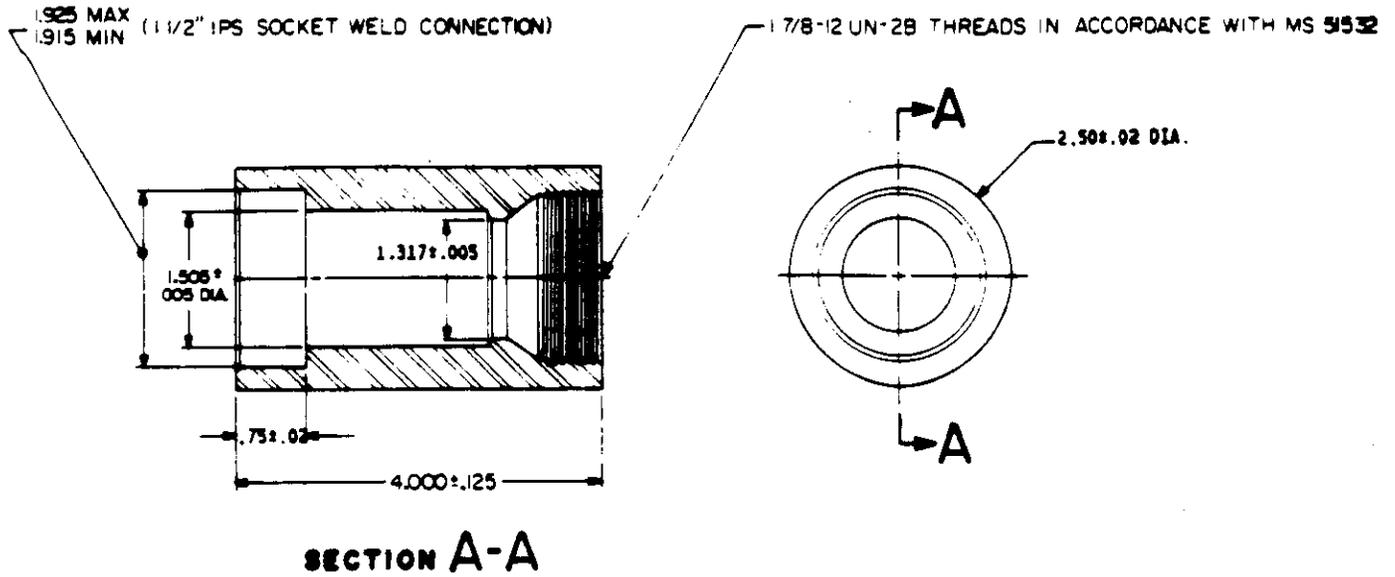


Figure 7-19 Adapter, Discharge, 1.50, Halon 1301

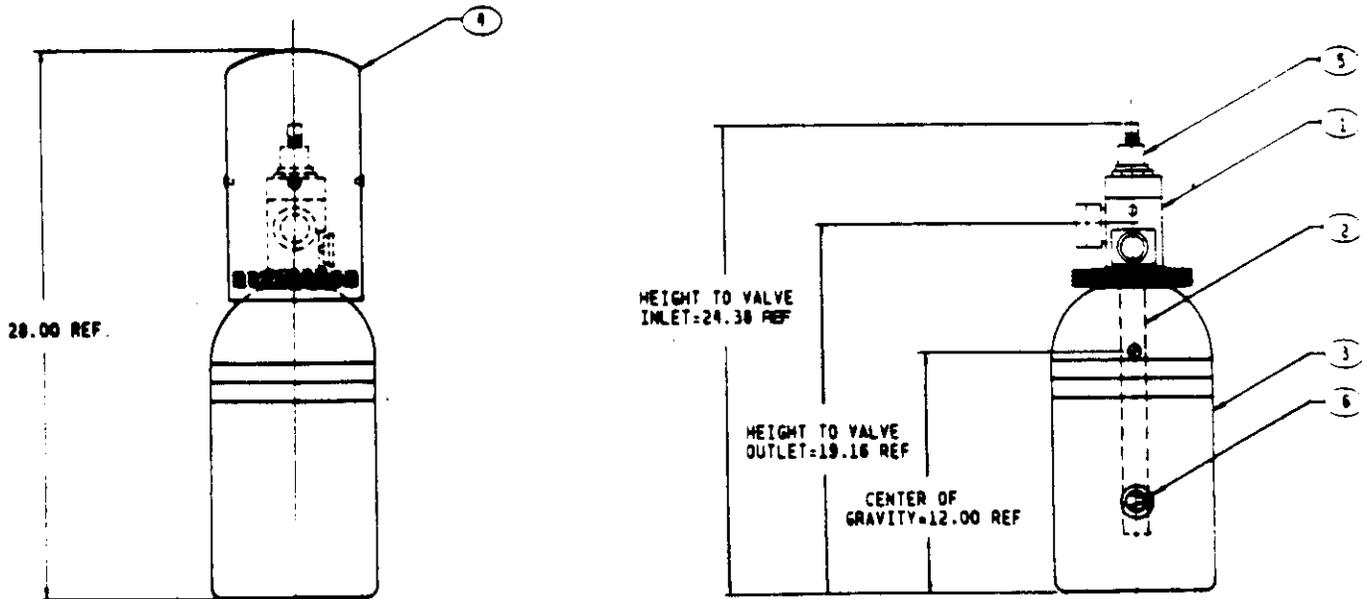


Figure 7-20 Cylinder Assembly, Halon 1301, 10 lb. Size 1, Class I

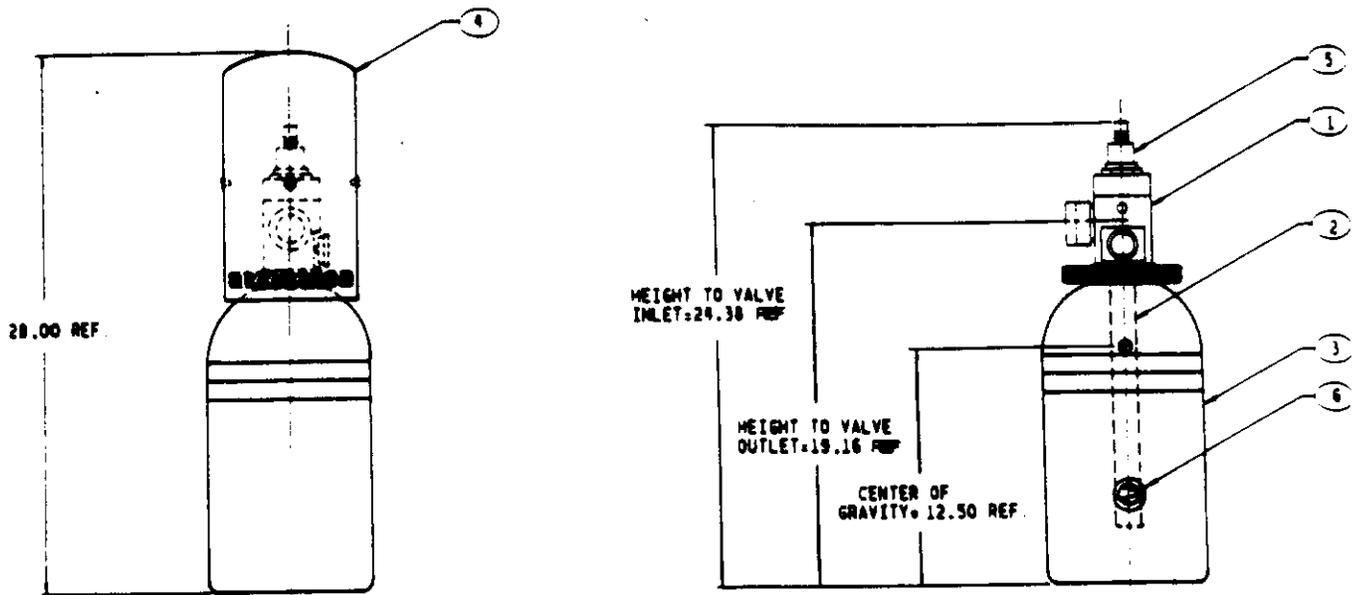


Figure 7-21 Cylinder Assembly, Halon 1301, 15 lb. Size 2, Class I

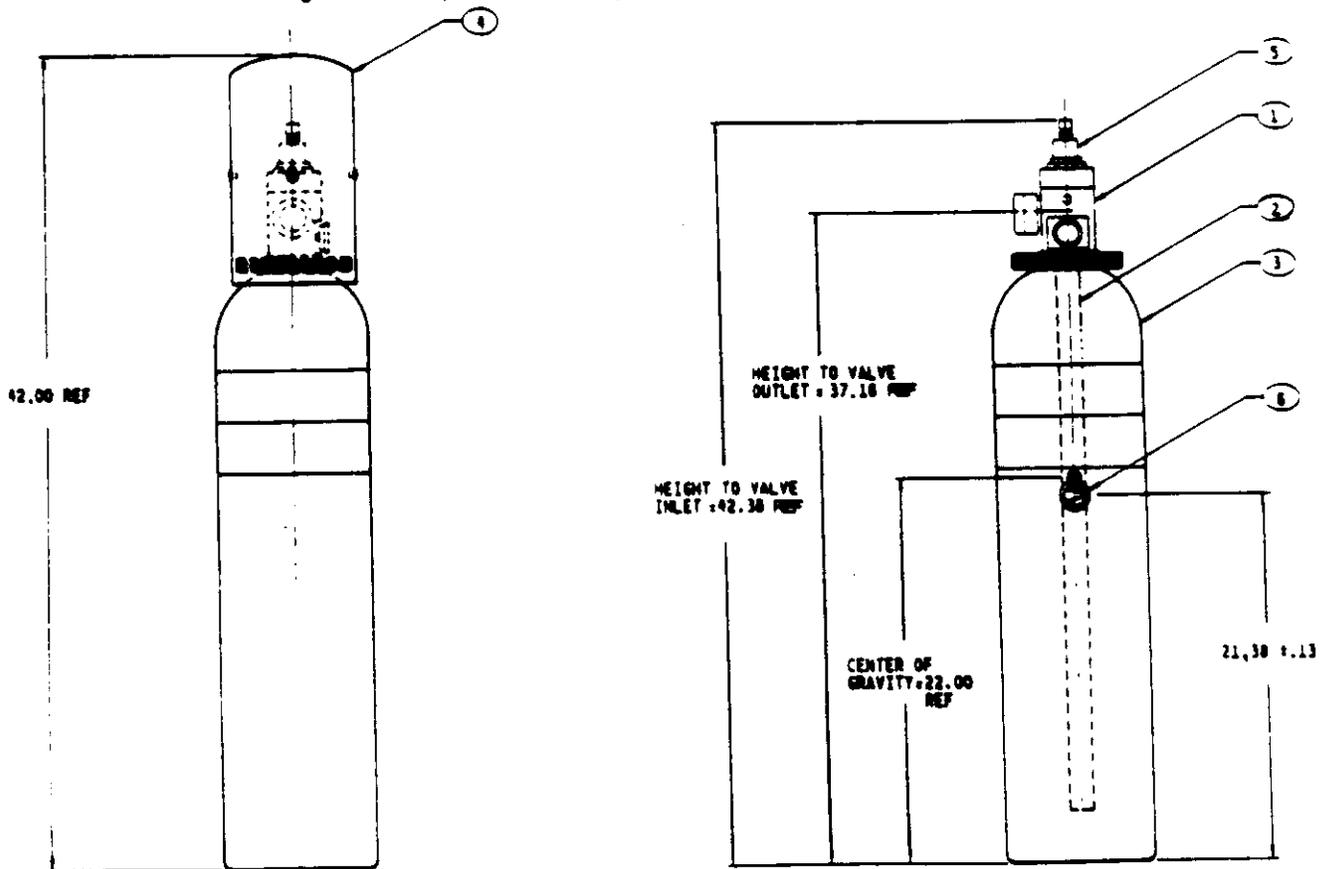


Figure 7-22 Cylinder Assembly, Halon 1301, 60 lb. Size 3, Class I

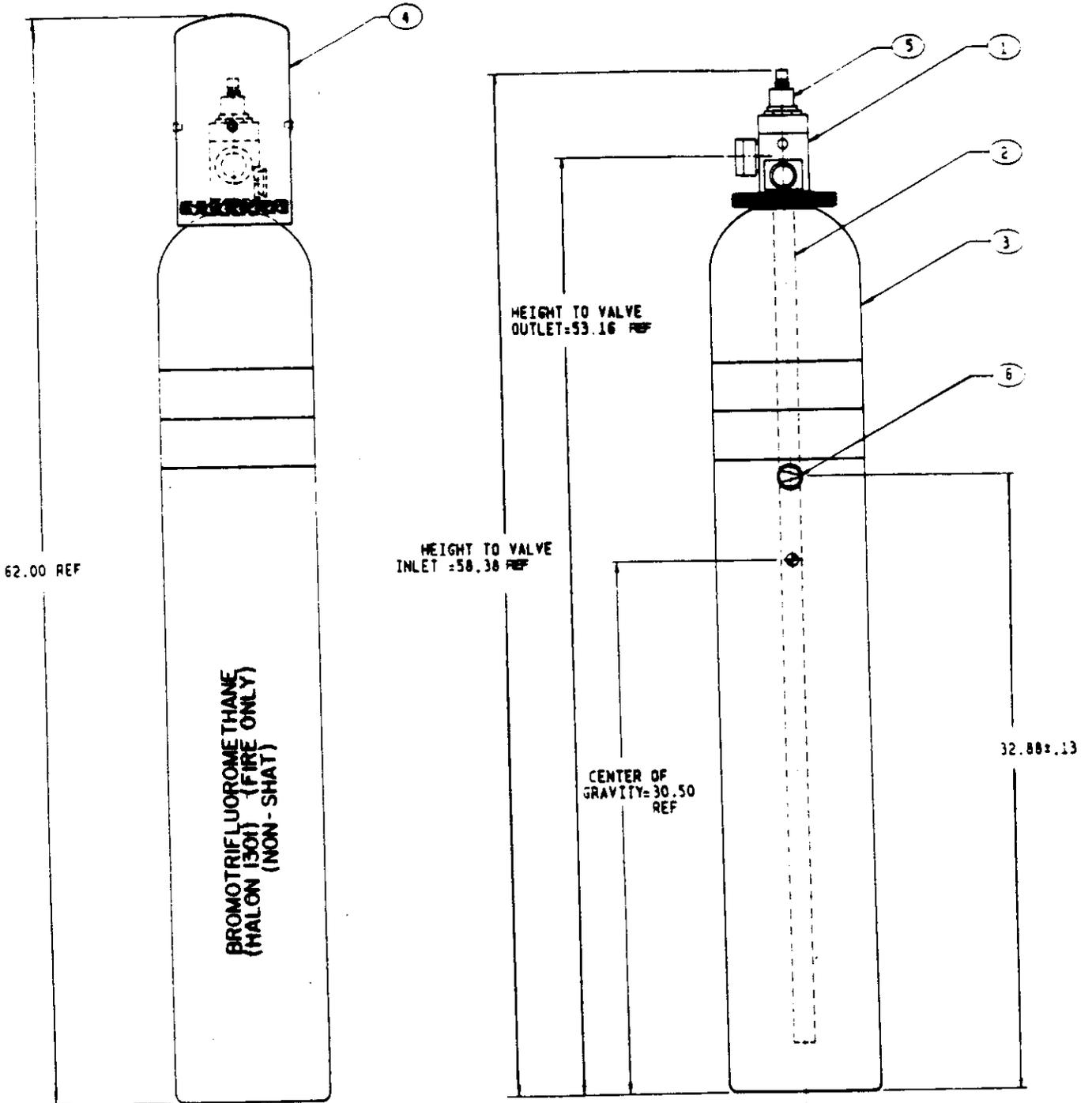


Figure 7-23 Cylinder Assembly, Halon 1301, 95 lb. Size 4, Class I

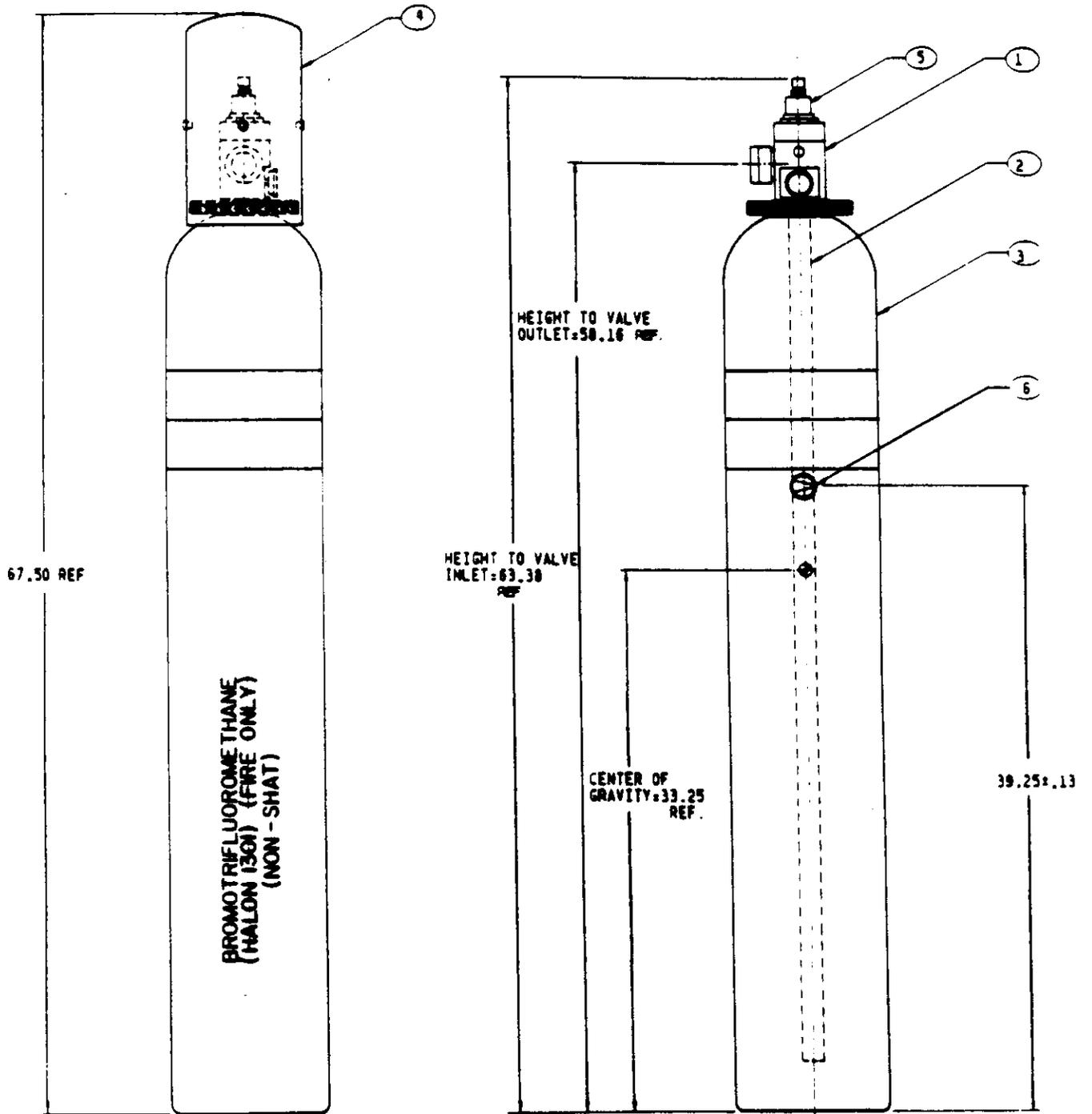


Figure 7-24 Cylinder Assembly, Halon 1301, 125 lb. Size 5, Class I

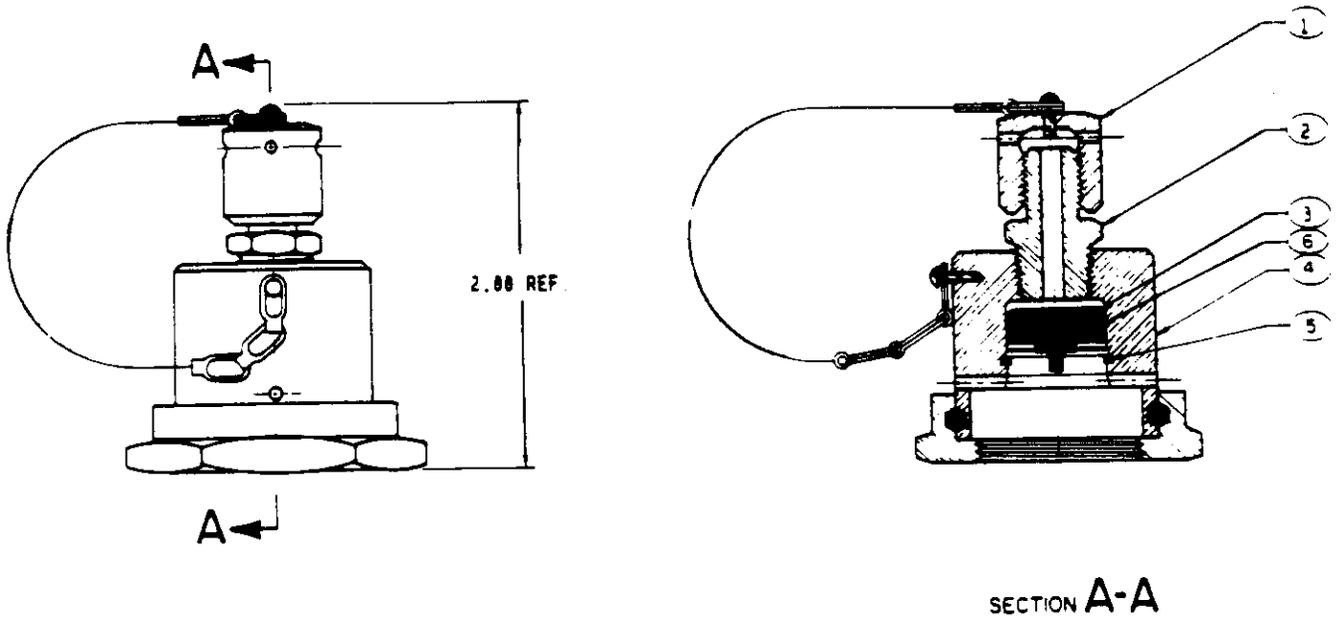


Figure 7-25 Actuator, Valve, Pressure Operated, Halon 1301

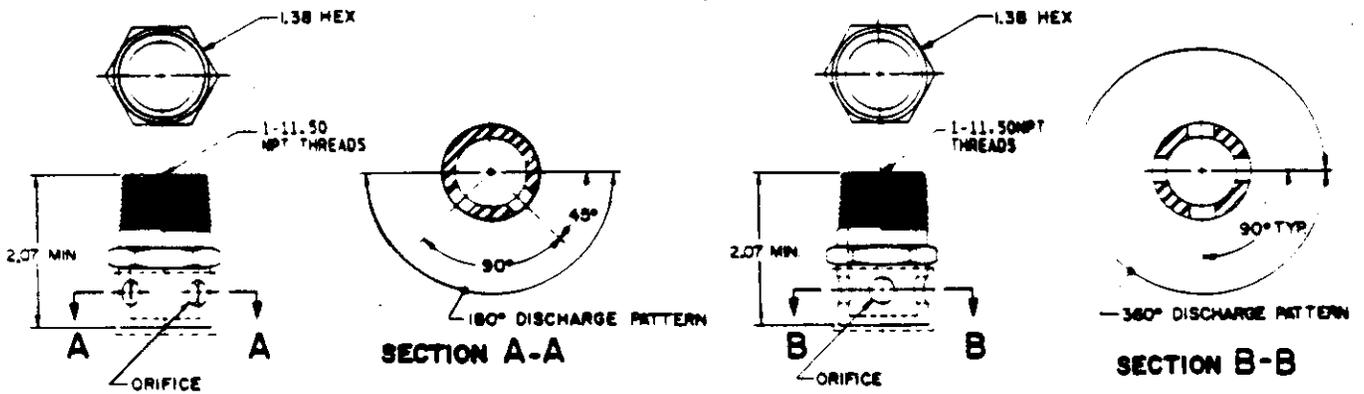
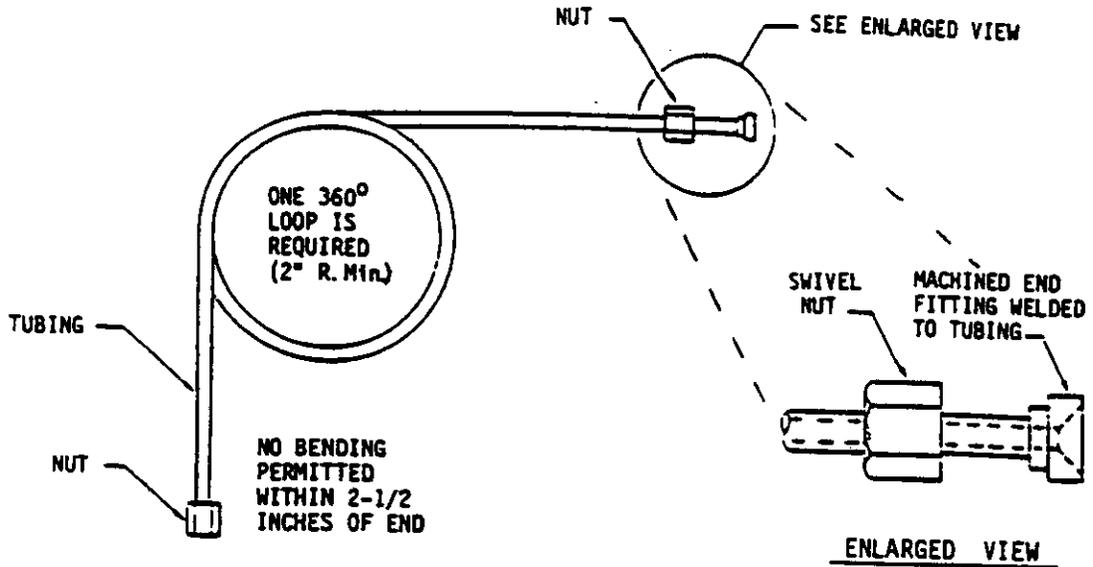


Figure 7-26 Nozzle, Discharge Halon 1301 180 and 360° Discharge Pattern



Note: Original Equipment Manufacturer;
 COMBINATION PUMP AND VALVE CO
 CAGEC 99565 P/N- A10895
 (NAVSEA Dwg 803-6397405)

Figure 7-27. Cu Ni Tubing Assembly, 1/4 inch X 30 inch long, 70-30 Cu Ni

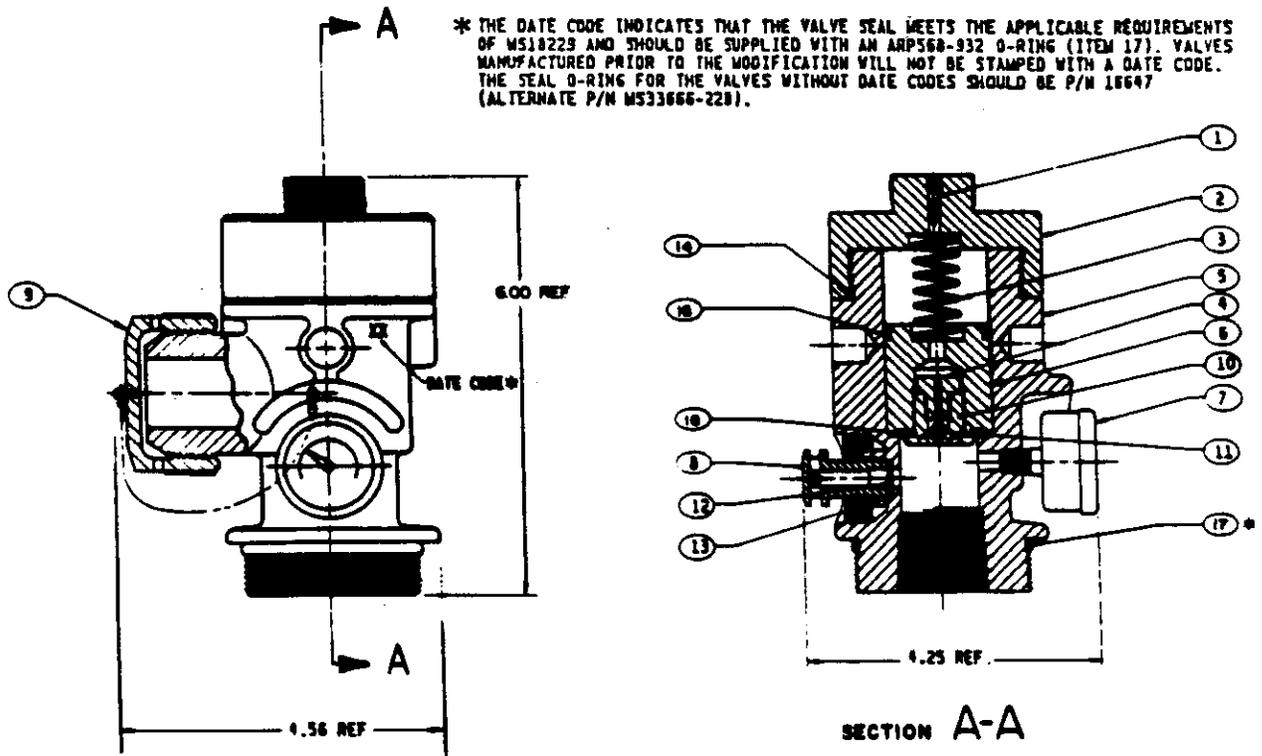


Figure 7-28. Valve Assembly, Cylinder.

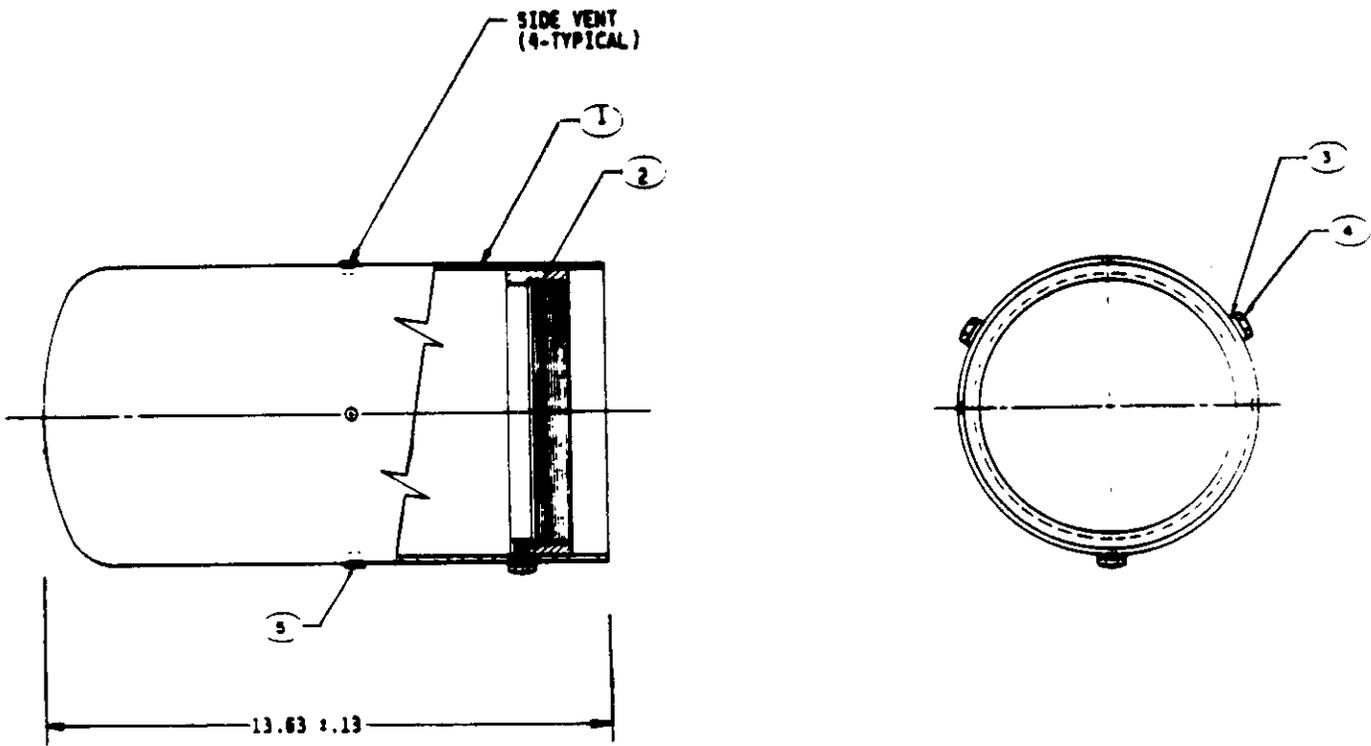


Figure 7-29 Cap. Shipping. Halon 1301 Cylinder Assembly

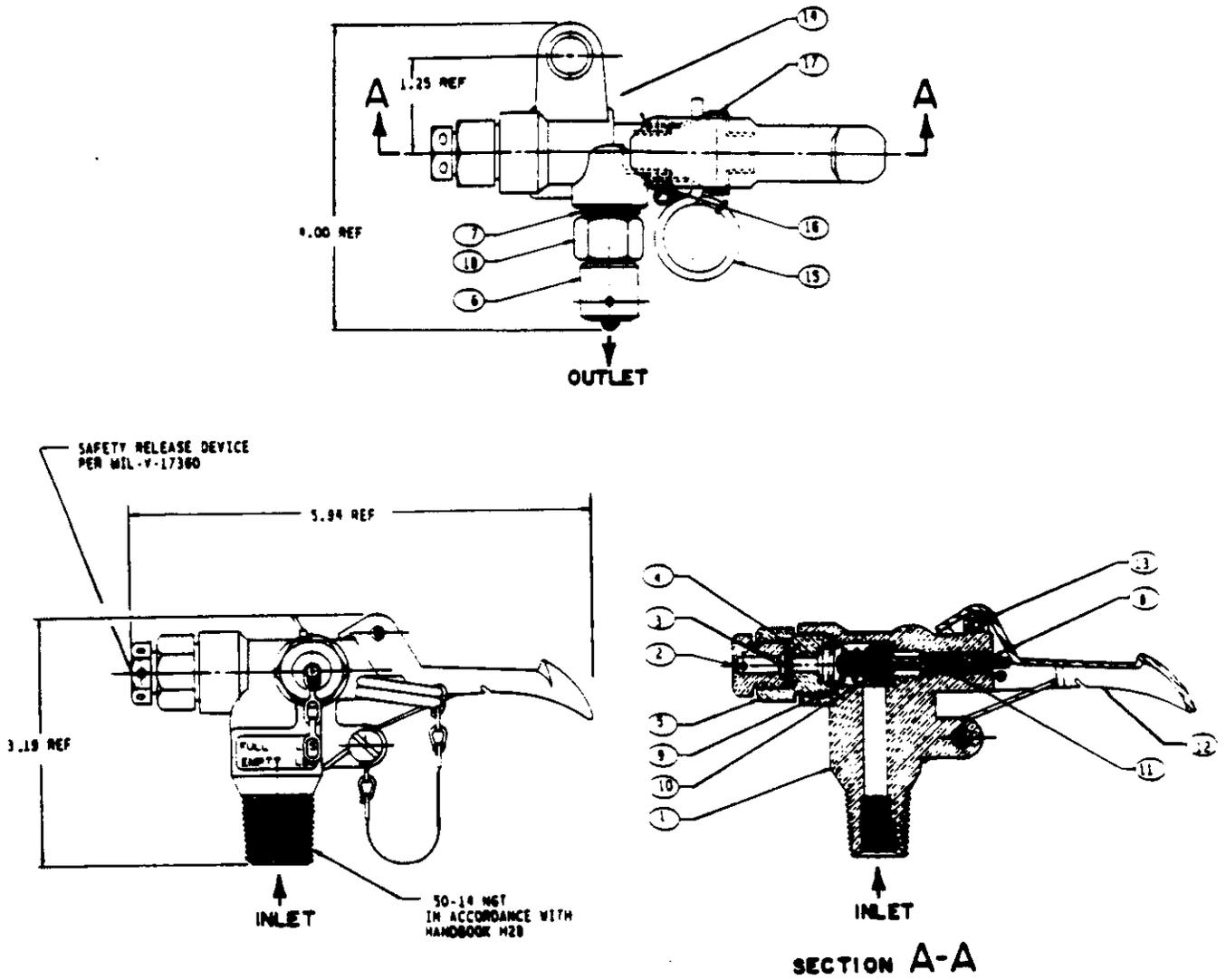


Figure 7-30. Valve, Cylinder, CO₂ Actuator

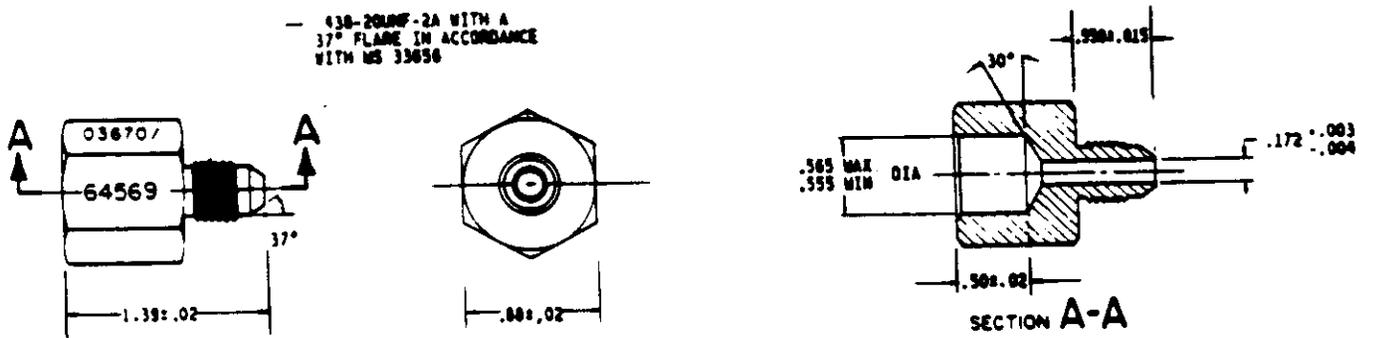
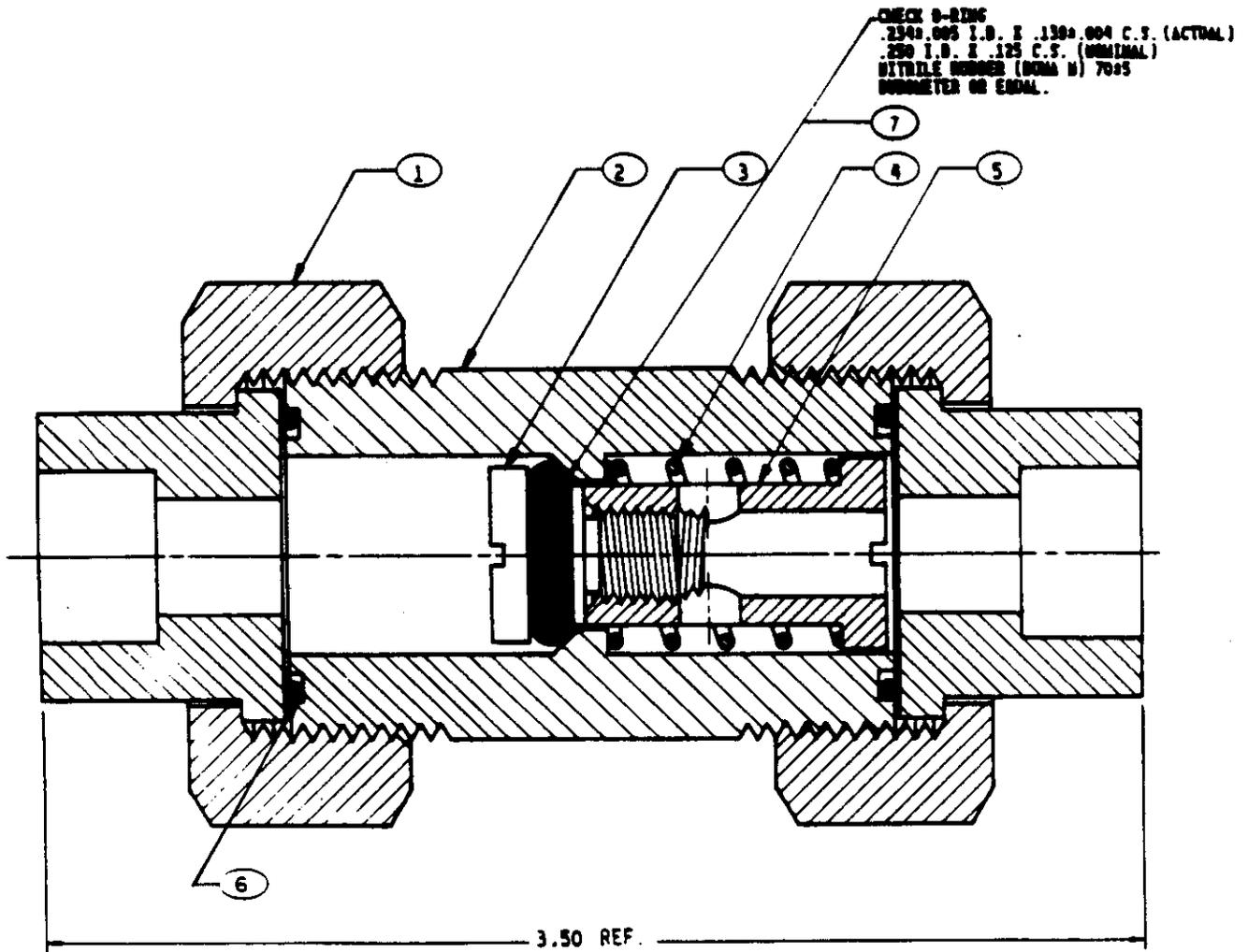
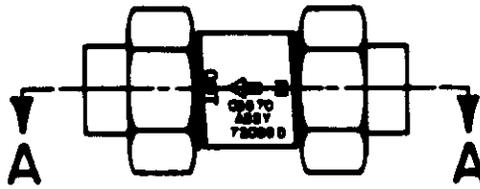


Figure 7-31 Fitting End Adapter 37° Flared X 0.25 I P S Socket Weld



SECTION A-A

Figure 7-32. Valve Assembly, Check 0.25 in., Carbon Steel Ends

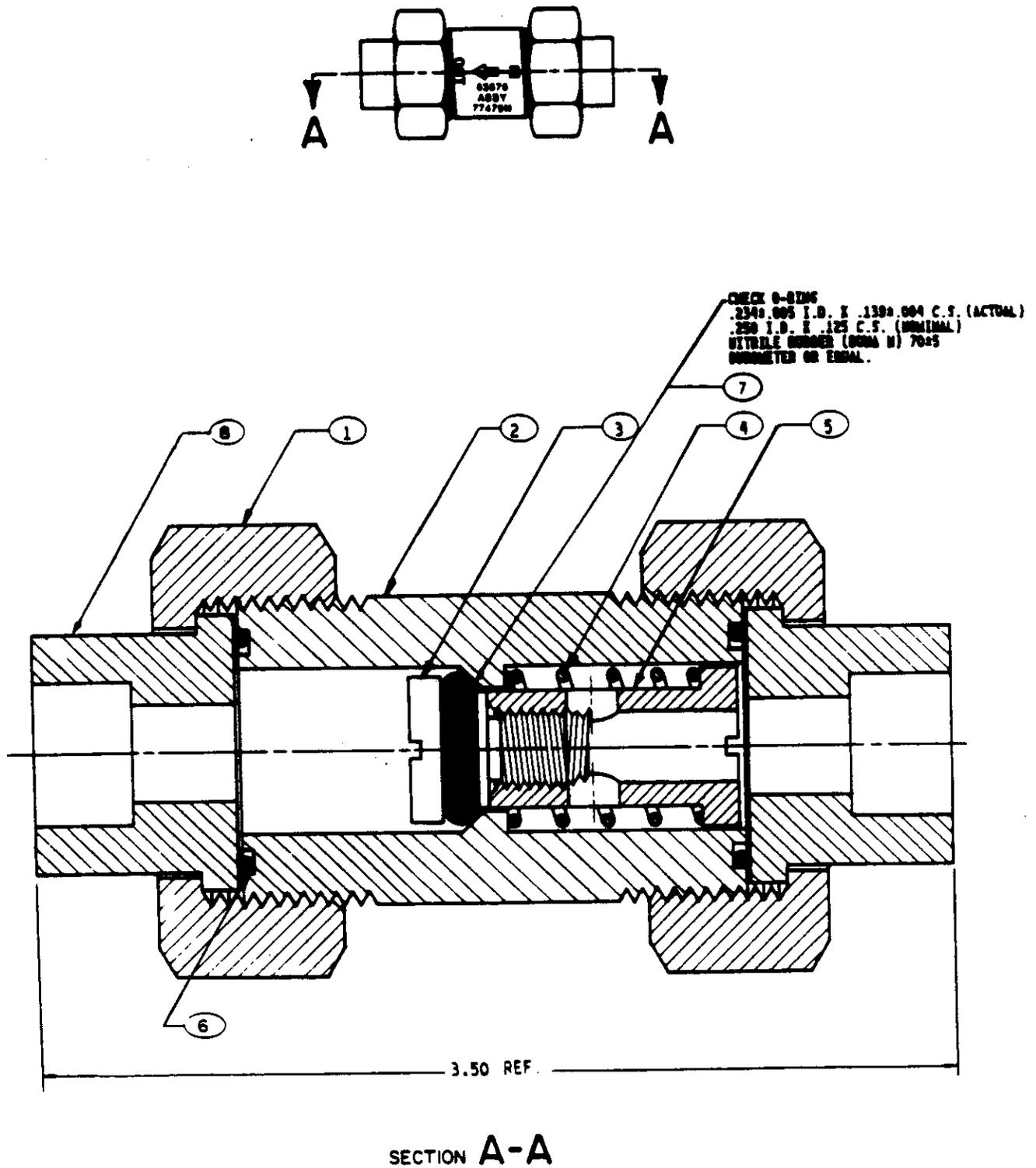


Figure 7-33. Valve Assembly, Check 0.25 in., Stainless Steel Ends

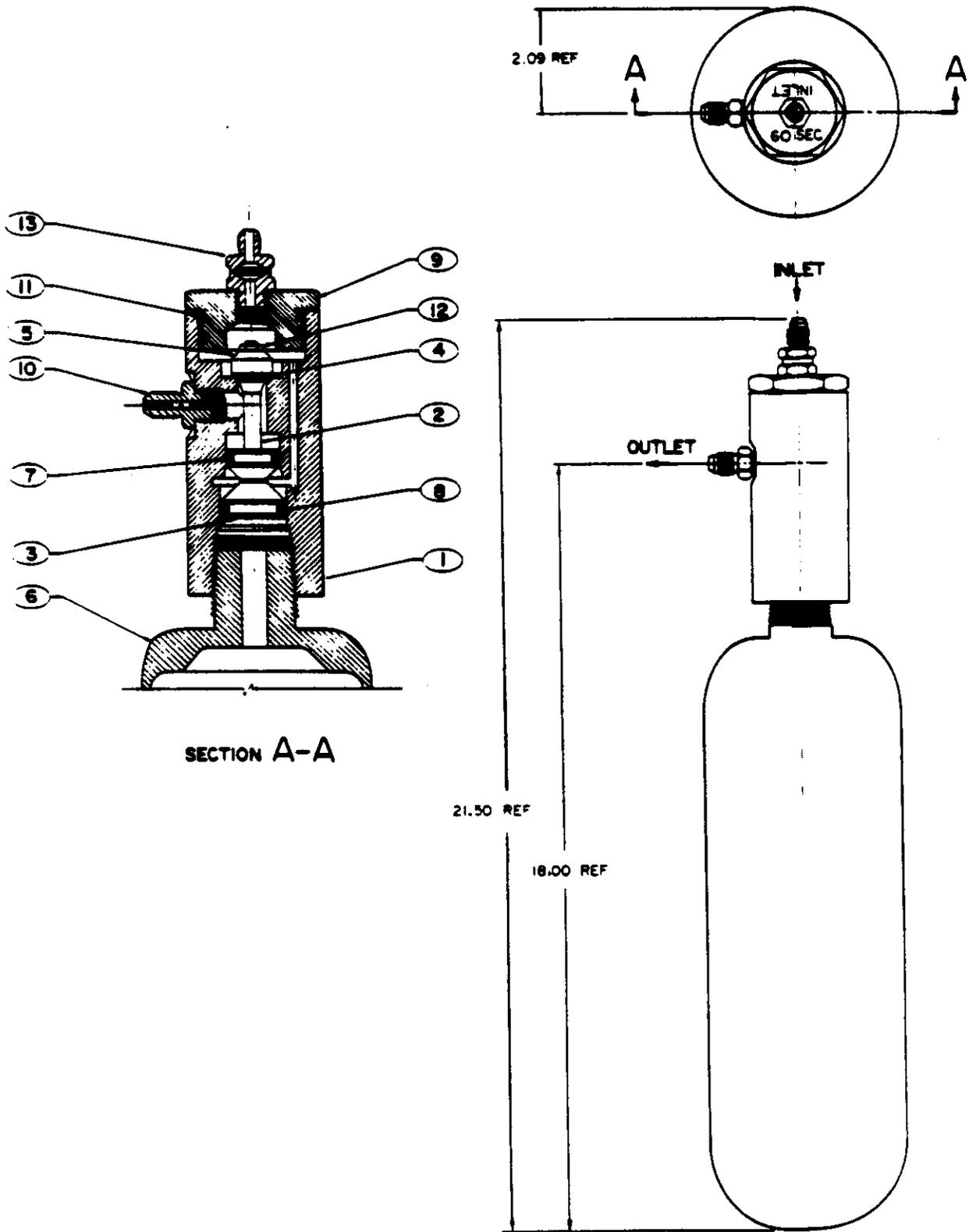


Figure 7-34. Delay, Time, Pressure Operated, 60 Second, Class I, with Filter

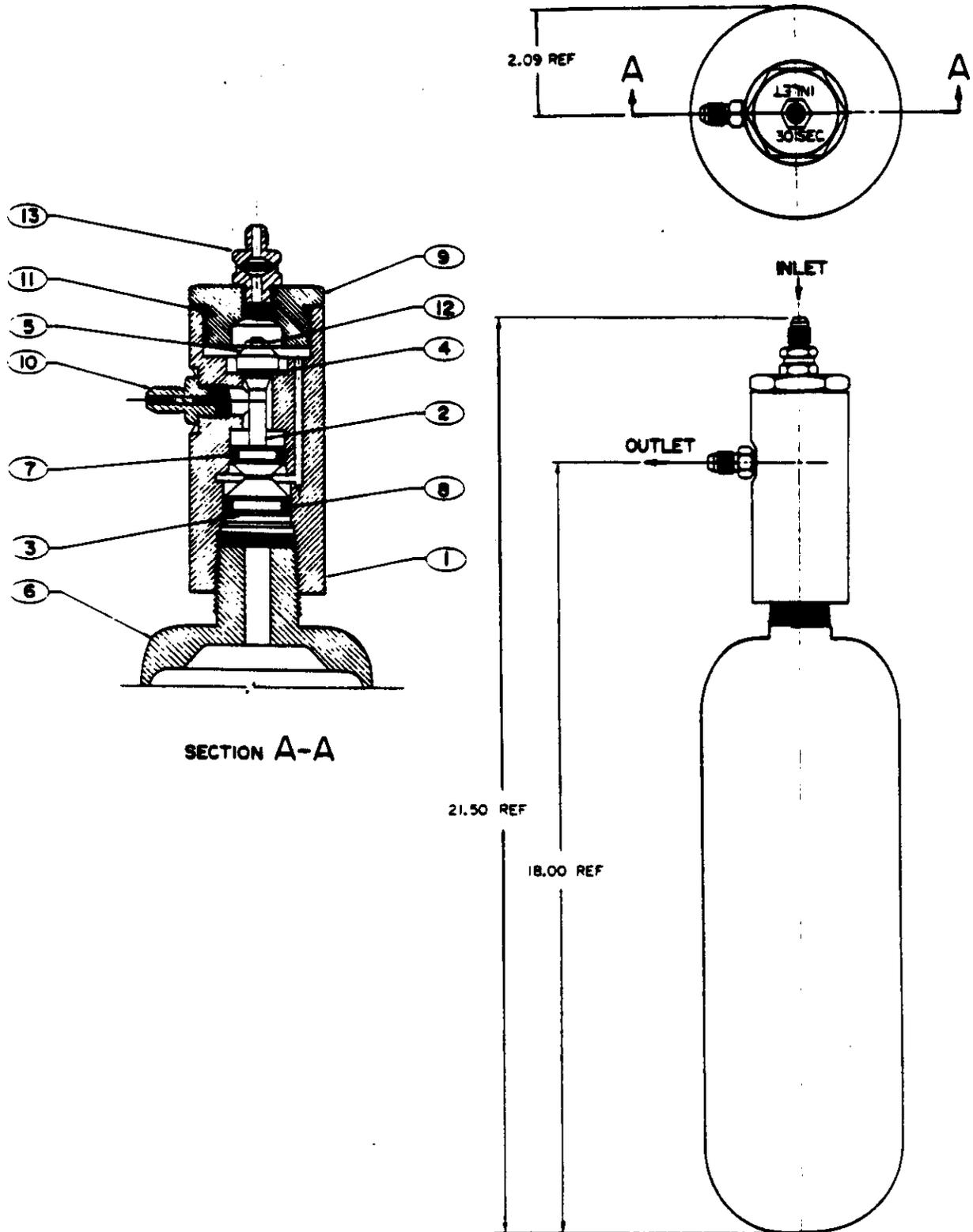
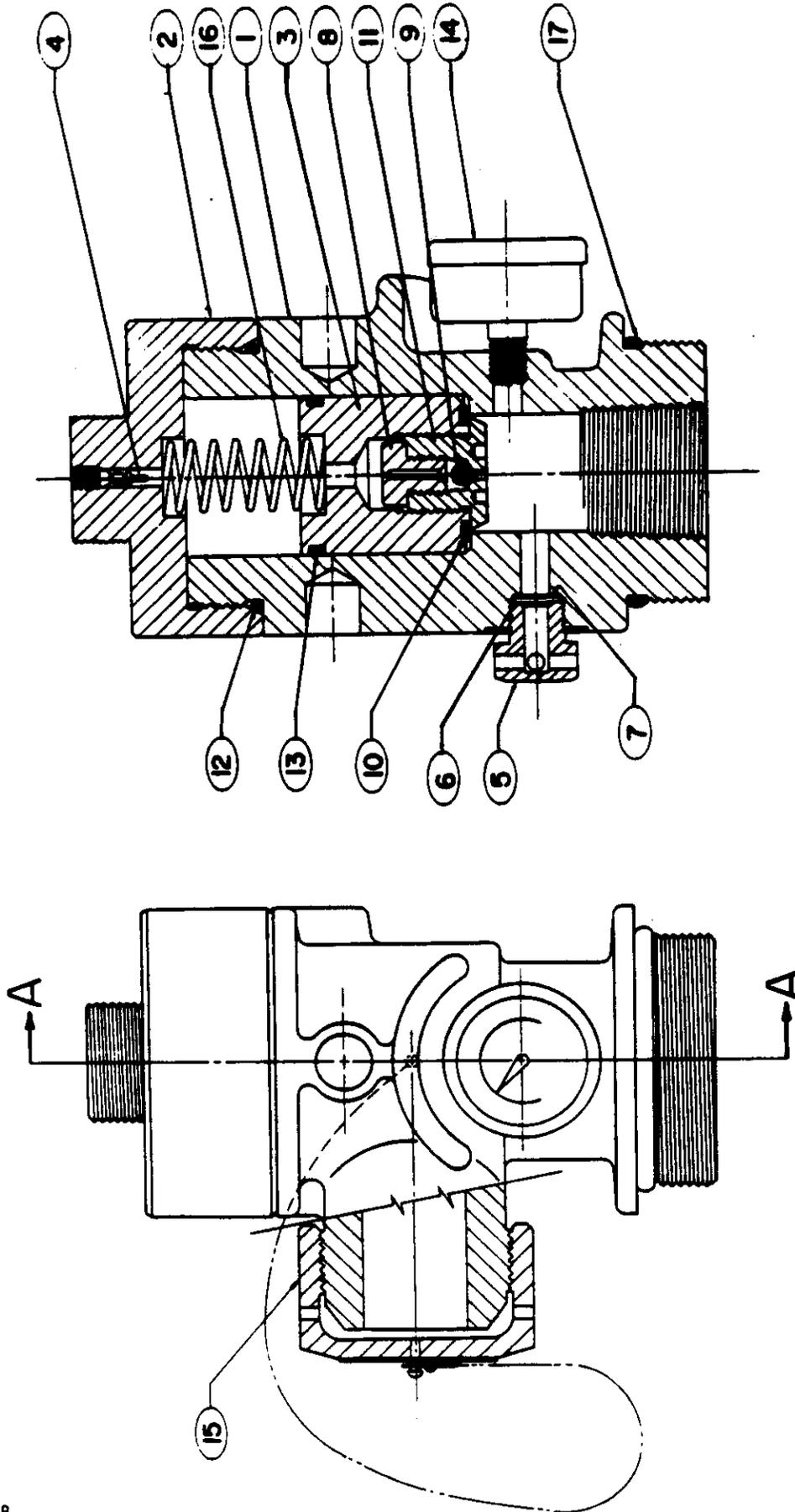
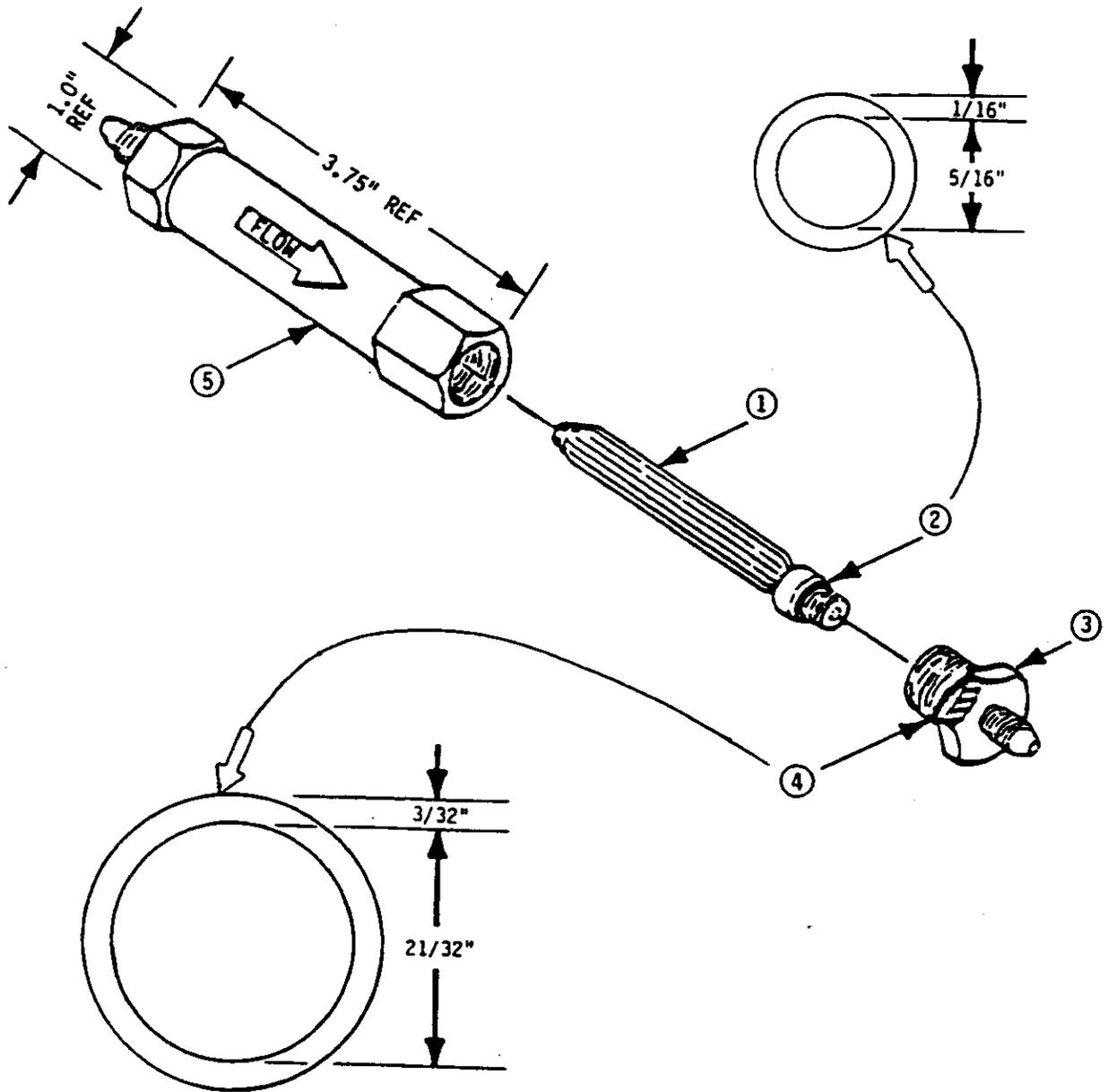


Figure 7-35. Delay, Time, Pressure Operated, 30 Second, Class I, with Filter



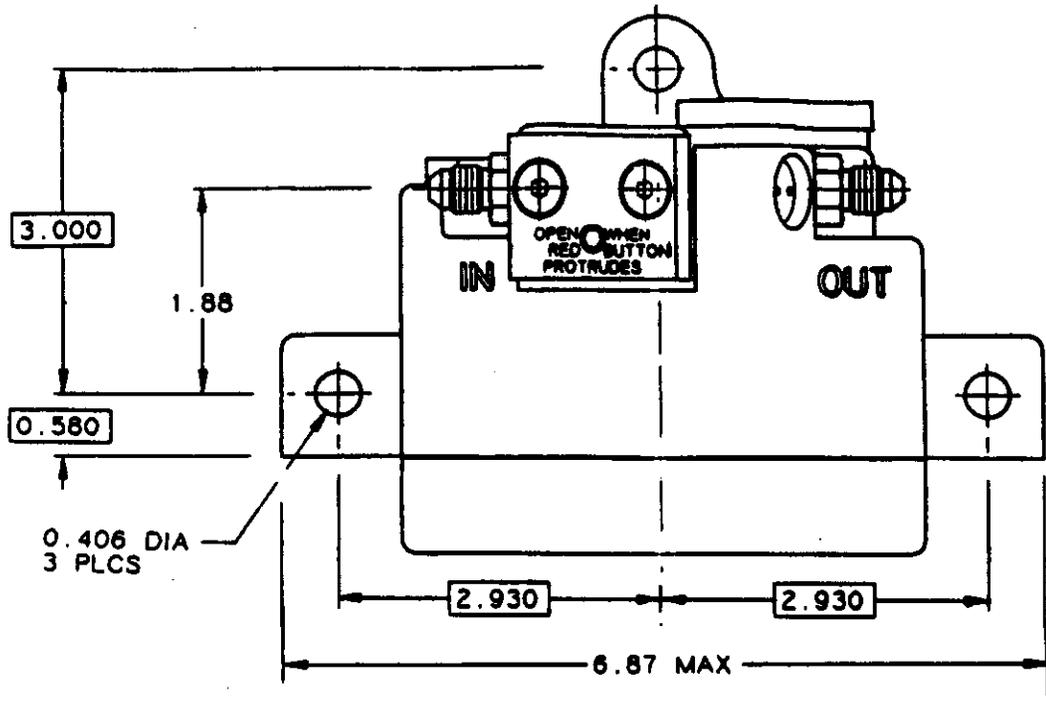
SECTION A-A

Figure 7-36. Valve Assembly, Cylinder, Halon 1301

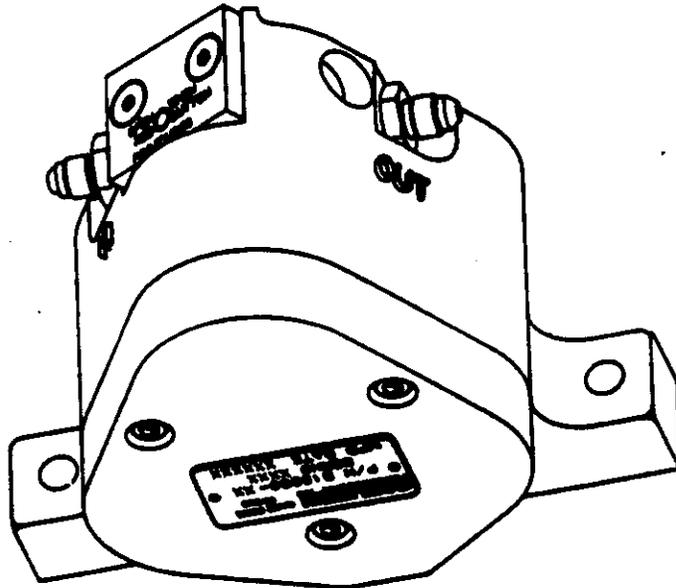


NOTE: Original Manufacturer;
NORMAN ULTRAPOROUS FILTER COMPANY
NORMAN EQUIPMENT COMPANY
BRIDGEVIEW, IL 60455
P/N U-275

Figure 7-37. CO₂ Filter, In-Line, CO₂ Actuation



FRONT VIEW



NOTE: Original Manufacturer;
CARLETON TECHNOLOGIES INC
P/N B15830-30 for 30 Second Delay
P/N B15830-60 for 60 Second Delay

Figure 7-38. Time Delay Device, Carleton type, 30 or 60 Second Time Delay

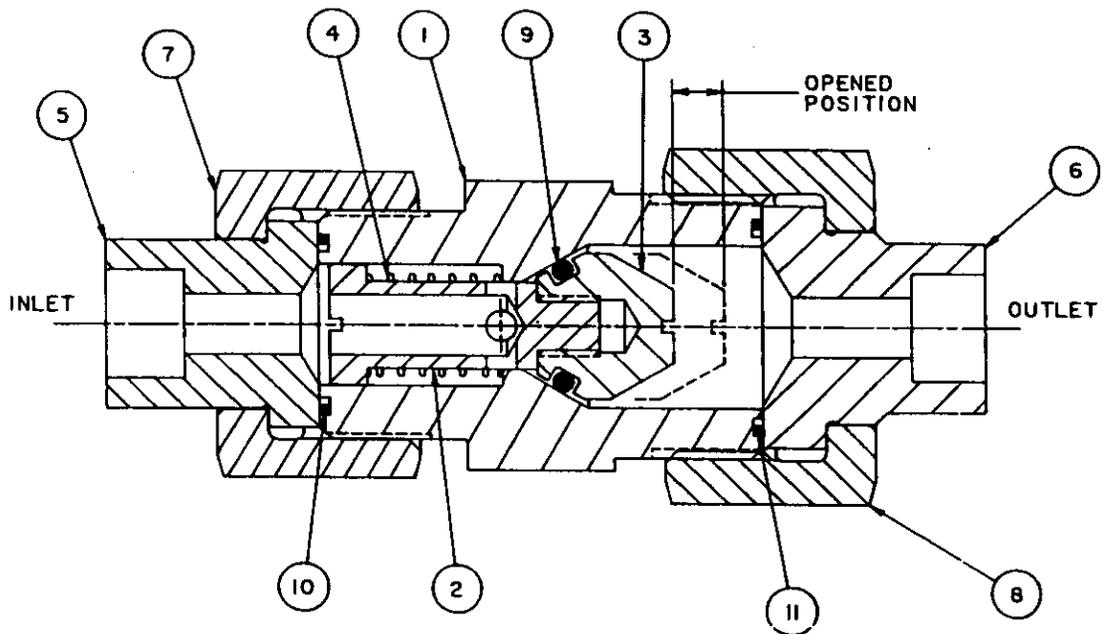


Figure 7-39. Halon System Actuation Check Valve
NAVSEA Drawing No. 803-6397404

CHAPTER 8
INSTALLATION

8-1 INTRODUCTION.

This chapter contains general instructions for unpacking and installing the Halon 1301 system components on board ship. Table 8-1 indicates the component interconnection data required to connect the components within a system.

8-2 UNPACKING.

a. The equipment for Halon 1301 systems is packed in separate cartons. A mechanical lifting device is required to remove some of the system components from the cartons.

b. After unpacking, ensure that all required items are present.

c. Inspect all components for shipping damage. Report any deficiencies immediately.

8-3 INSTALLATION.

Refer to NAVSEA Standard Drawing No. 803-5773930 for the detailed installation requirements for modular Halon 1301 systems. Refer to NAVSEA Standard Drawing No. 803-5959326 for the detailed installation requirements for banked Halon 1301 systems.

Table 8-1. Component Interconnection Data

Item No. (Fig. 8-1)	Component	Type of Mating Fitting Required of Installing Activity	Outline Drawing Figure No.
1	Halon 1301 cylinder	Supplied	7-20 through 7-24
2	Manual CO ₂ actuator	Supplied	7-6
3	Time delay device	Supplied	7-2, 7-12, 7-34, 7-35
4	Pressure switch	5/16 in. bolt, lockwasher, and nut	7-8
5	Nozzle	1 in. NPT	7-26
6	1/4 in. check valve	1/4 in. IPS socket weld both ends	7-32
7	1-1/2 in. flexible hose	(see item 9)	7-3
8	1/4 in. tubing assy.	(see item 12)	7-27
9	1-1/2 in. discharge adapter or 1-1/2 in. check valve	1-1/2 in. IPS Socket weld	7-5, 7-19
10	Vent fitting	1/4 in NPT	7-7
11	Override valve	1/4 in. IPS socket weld both ends	7-1
12	1/4 in. fitting end adapter	1/4 in. IPS socket weld	7-31
13	Halon 1301 cylinder brackets	welded	7-16, 7-17
14	CO ₂ Actuator brackets	3/8 in. bolt, lockwasher, and nut	7-9
15	Time delay brackets	3/8 in. bolt, lockwasher, and nut	7-18

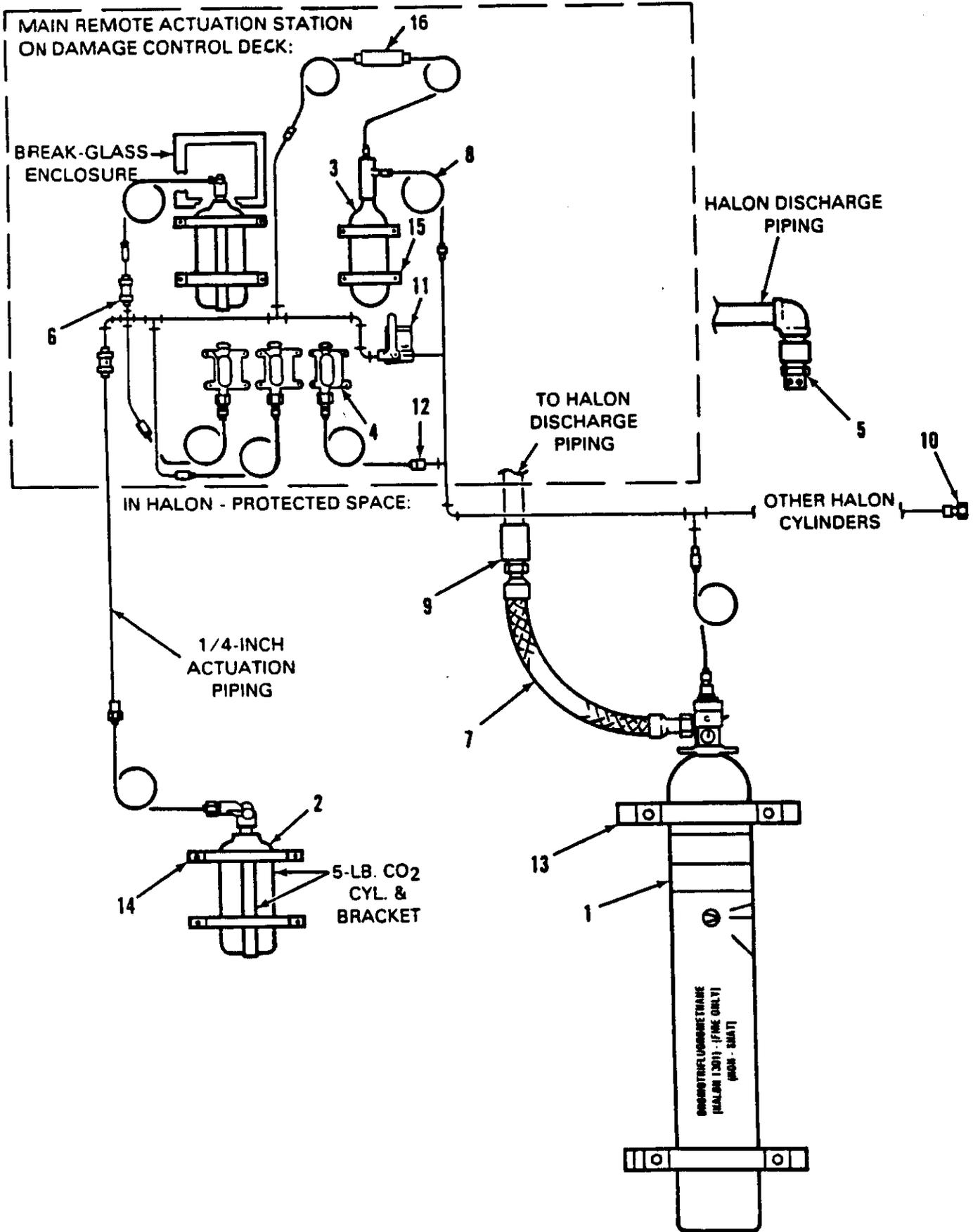


Figure 8-1. Typical Halon 1301 System Configuration

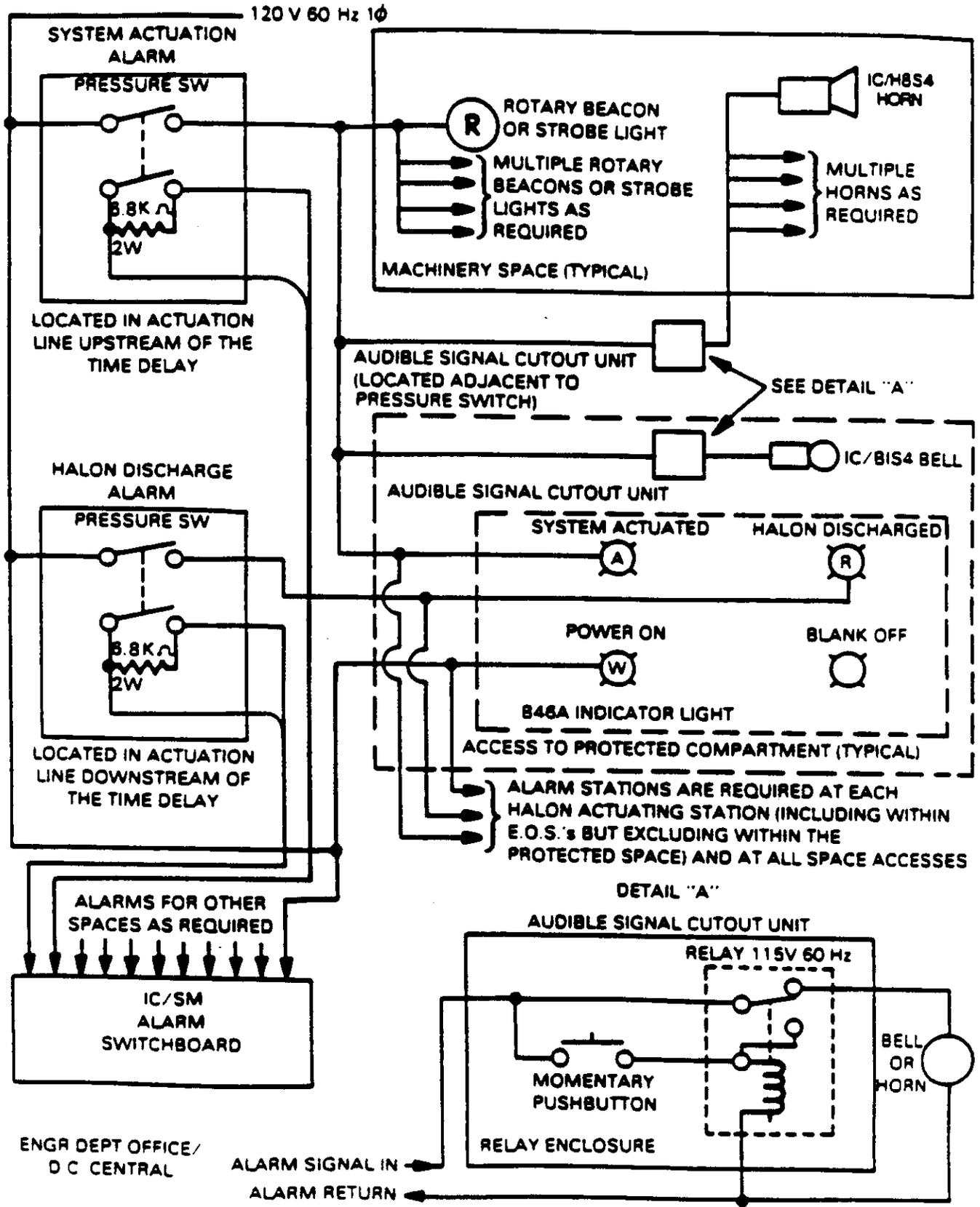


Figure 8-2 Typical Halon 1301 Wiring Diagram

Figures 7-1 through 7-36 provide dimensions of the various components of the systems and are for use in the selection of appropriate mounting locations.

Connect ship's electrical wiring, according to ship's installation drawings, to the appropriate contacts of the pressure switches to provide for the securing of ventilation and alarm actuation. (See figure 8-2 for typical wiring diagram.)

8-3.1 MODULAR HALON 1301 SYSTEMS.

Table 8-2. Nozzle Size in Modular Installation

Halon 1301 Cylinder Size (lb)	Nozzle Orifice Code
10	7
15	8+
60	16
95	20
125	24

8-3.2 BANKED HALON 1301 SYSTEMS. In banked Halon 1301 systems, Halon 1301 cylinders are normally piped to a distribution network with multiple nozzles. Refer to ship's installation drawings to determine the nozzle orifice code, location, and discharge pattern. Metal label plates indicating the nozzle orifice code number should be attached to the distribution piping, immediately upstream of each nozzle.

8-3.3 HALON CYLINDER MOUNTING.

Halon 1301 cylinders are installed upright in two of the manufacturer's brackets (See figures 7-16 and 7-17.) For 60, 95, and 125 lb. Halon 1301 cylinders, the upper bracket should be installed six to eight inches above the liquid level mark to leave a clear area for the liquid level indicator.

8-3.4 CO₂ ACTUATION STATIONS.

8-3.4.1 Definitions.

a. Local Actuation Station - An actuation station located within the space protected or located in the

In modular Halon 1301 systems, one Halon 1301 cylinder is normally piped to only one nozzle. Table 8-2 lists the nozzle orifice code for each size Halon 1301 cylinder (one nozzle per cylinder only). The same code applies to 180 and 360 degree pattern nozzles. If a cylinder is piped to more than one nozzle, refer to the ship's installation drawings for the proper nozzle orifice codes. Wormald drawing No. 52921N lists the drill diameters for each nozzle size and discharge pattern.

enclosed operating area of a main machinery room, fire room, engine room, in the switchgear room of a ship service or emergency generator room, or in a pump control room.

b. Main Remote Actuation Station - An actuation station located outside the protected space at which the Halon 1301 system pressure switches, time delay(s), time delay bypass(es), and 1/4 in. check valves are located. Each system has a main remote actuation station.

c. Secondary Remote Actuation Station - An actuation station located outside the protected space, other than the main remote actuation station.

8-3.4.2 Actuation Station Locations.

The main remote actuation stations for machinery spaces, pump rooms, and generator rooms are usually located on the damage control deck, at the access to the spaces. If a space has two normal accesses, the main remote actuation station is provided at one access, and a secondary remote

actuation station is installed at the other access.

Other spaces such as flammable liquid storerooms do not have a local actuation station, but have a main remote actuation station and a secondary remote actuation station. The main remote actuation station is usually adjacent to the space access, and the secondary remote actuation station is installed in the exit passageway from the space. Machinery spaces having a Central Control Station (CCS) installed will also normally have a Halon 1301 actuation station located within the CCS.

An instruction plate with the system diagram should be installed at each actuation station. A plate listing the location(s) of ventilation supply and exhaust controllers should also be provided.

8-4 COMPONENT REMOVAL AND REPLACEMENT.

8-4.1 GENERAL INSTALLATION INSTRUCTIONS.

a. Before performing any removal or replacement of components of an active Halon 1301 system, ship's instructions for notifying personnel in charge, for equipment deactivation and for marking equipment **OUT OF SERVICE**, must be followed.

b. Do not use pipe wrenches when removing or reinstalling components. Use correctly sized open-end wrenches or adjustable wrenches.

c. When tightening threaded connections, exercise care to avoid stripping the threads.

d. Halon cylinders, CO₂ actuators, and time delay devices are held secure by brackets. Brackets must be secure to prevent shock damage to Halon 1301 system components.

8-4.2 HALON 1301 CYLINDER. (Figures 7-20 through 7-24)

a. Remove flexible hose couplings from valve fittings. If a swivel elbow is attached between the 1-1/2 in. flexible hose and the cylinder valve outlet, keep the elbow attached to the flexible hose and remove the elbow from the cylinder valve.

b. Install safety caps on valve fittings.

c. Install shipping cap on neck ring.

d. Remove bracket nuts and clamps that secure cylinder to saddle end and remove cylinder.

e. Follow steps 8-4.2.a through 8-4.2.d in reverse order to install replacement cylinder. Align cylinder so that pressure gauge faces service and 1-1/2 in. flexible hose is bent least amount. (Minimum bend radius for 1-1/2 in. flexible hoses is 22 in.) To reduce twisting of a flexible hose while tightening the nut, hold hose tightly with one hand. Nuts securing clamps to brackets shall be torqued to 90 ft.-lb.

8-4.3 CO₂ Actuator. (Figure 7-6)

a. Remove flexible tubing coupling from valve outlet fitting.

b. Install safety cap on outlet fitting.

c. Remove bracket nuts and clamps that secure actuator to saddle and remove actuator.

d. Follow steps 8-4.3.a through 8-4.3.c in reverse order to install replacement cylinder.

8-4.4 Time Delay Device. (Figures 7-2, 7-12, 7-34, 7-35, and 7-38)

a. Mark flexible tubing couplings to identify attachment to inlet or outlet. Remove flexible tubing couplings from time delay fittings.

b. Remove bolts and brackets attaching time delay device to

bulkhead and remove time delay device.

c. Follow steps 8-4.4.a and 8-4.4.b in reverse order to install replacement time delay device.

8-4.5 Pressure Switch. (Figure 6-2).

WARNING

High voltage may be present in pressure switch. To prevent serious injury or death, Halon 1301 equipment electrical circuits shall be deenergized and tagged OUT OF SERVICE before removal or replacement of switches.

a. Remove flexible tubing coupling from gas inlet fitting.

b. Remove screws and lockwashers (1), cover (2), and gasket (7) from housing (6).

c. Mark wires to identify proper location. Loosen contactor screw posts and remove wires.

d. Remove screws (5) securing contactor (4) and remove contactor (4).

e. Remove housing mounting bolts and disconnect housing (6) from ship's wiring conduit.

f. Remove cover assembly (2) from housing (6) of new pressure switch.

g. Remove screws (5) securing contactor (4) to housing (6) and remove contactor (4).

h. Connect housing (6) of new pressure switch to wiring conduit and mount housing (6) with bolts.

i. Complete installation of the new pressure switch by following the procedure of paragraph 6-4 steps 1 through u.

8-4.6 Flexible Actuation Tubing (1/4 inch). Figure 7-37

a. Use correct size open-end wrench or an adjustable wrench and remove tubing by turning end coupling swivel nuts to the left (right hand threads).

b. Install replacement tubing assemblies by turning end coupling swivels to the right until snug. DO NOT over tighten.

NOTE

The minimum bend radius for the 1/4 inch flexible tubing assembly is 1-1/4 inches.

8-4.7 Flexible Discharge Hose (1-1/2 in.) (Figure 7-3).

a. Use correct size open-end wrench or an adjustable wrench and disconnect hose from Halon 1301 valve by turning the swivel nut to the left (right-hand threads).

b. Disconnect from discharge adapter or 1-1/2 in. check valve by turning the male thread connector to the left (right-hand threads).

c. Install replacement hose by reversing steps 8-4.7.a and 8-4.7.b.

NOTE

Minimum bend radius for the 1-1/2 in. flexible hose is 22 inches.

8-4.8 Installation of 1/4 in. Check Valve and 1/4 in. Bypass Valve (Figures 7-1, 7-32, and 7-33).

a. Prior to welding, remove unions from valve body.

b. Weld union ends to ship's piping using the appropriate welding procedures.

c. After unions have cooled, placed valve body between unions and tighten unions by turning nuts to the right (right-hand threads).

NOTE

Ensure that valve body is installed with arrow pointing in direction of carbon dioxide gas flow.

d. To remove valve body, turn the union nuts to left.

(Insert Classif. of TMDER Here and At Bottom of Page) **CLASSIFICATION:**

**NAVSEA (USER) TECHNICAL MANUAL DEFICIENCY/EVALUATION REPORT (TMDER)
(NAVSEA S0005-AA-GYD-030/TMMP & NAVSEARST 4160.3)**

INSTRUCTIONS: Insert classification at top and bottom of page. Read the following before completing this form. Continue on 8 1/2" x 11" paper if additional space is needed.

1. USE THIS REPORT TO INDICATE DEFICIENCIES, USER REMARKS, AND RECOMMENDATIONS RELATING TO PUBLICATION.
2. BLOCKS MARKED WITH "*" ARE TO BE FILLED IN BY THE CONTRACTOR BEFORE PRINTING.
3. FOR UNCLASSIFIED TMDER'S, FILL IN YOUR RETURN ADDRESS IN SPACE PROVIDED ON THE BACK, FOLD AND TAPE WHERE INDICATED, AND MAIL. (SEE OPNAVINST 5510.1E FOR MAILING CLASSIFIED TMDER'S.)
4. FOR ADDITIONAL INFORMATION, CALL AUTOVON 380-4805/5084 OR COMMERCIAL 805-922-4805/5084.

1. NAVSEA NO. * S9555-A6-MMA-010/HALON1301 REV2	2. VOL. PART * N/A	3. TITLE * HALON 1301 FIRE EXTINGUISHING SYSTEM
--	-----------------------	--

4. REV. DATE OR TM CH. DATE	5. SYSTEM/EQUIPMENT	6. IDENTIFICATION/NOMENCLATURE (MK/MOD/AN)
-----------------------------	---------------------	--

7. USER'S EVALUATION OF MANUAL (Check Appropriate blocks)

A. EXCEL- LENT	B. GOOD	C. FAIR	D. POOR	E. COM- PLETE	F. INCOM- PLETE
-------------------	---------	---------	---------	------------------	--------------------

8. GENERAL COMMENTS

9. RECOMMENDED CHANGES TO PUBLICATION

PAGE NO. A.	PARA-GRAPH B.	LINE NO. C.	FIG. NO. D.	TABLE E.	F. RECOMMENDED CHANGES AND REASONS

10. ORIGINATOR AND WORK CENTER (PRINT)	11. ORIGINATOR'S RANK, RATE OR GRADE, AND TITLE	12. DATE SIGNED
--	---	-----------------

13. SIGNATURE OF WORK CENTER HEAD	14. SIGNATURE OF DEPARTMENT OFFICER	15. AUTOVON/COMM. NO.
-----------------------------------	-------------------------------------	-----------------------

16. SHIP HULL NO. AND/OR STATION ADDRESS (DO NOT ABBREVIATE)

17. THIS SPACE ONLY FOR NSDSA

A. CONTROL NO.	B. COG ISEA	C. DATE	D. PRIORITY	E. TRANSMITTED TO:			
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">RECEIVED</td> <td style="width: 33%;">FORWARDED</td> <td style="width: 33%;">DUE</td> </tr> </table>	RECEIVED	FORWARDED	DUE		
RECEIVED	FORWARDED	DUE					

PLEASE CLOSE WITH TAPE - DO NOT STAPLE - THANK YOU

Fold Here

DEPARTMENT OF THE NAVY

Official Business
Penalty for Private Use \$300



Postage and Fees Paid
Department of the Navy
DOD-316

COMMANDING OFFICER
NAVAL SHIP WEAPON SYSTEMS ENGINEERING STATION
NAVAL SEA DATA SUPPORT ACTIVITY (Code 5H00)
PORT HUENEME, CA 93043-5007

Fold Here