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a Cordon International
Company 10025 SHOEMAKER AVENUE
SANTA FE SPRINGS, CA. 90670

PYRONETICS

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N73-17590
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REPORT NO. QC & R 6-050

EVALUATION TEST PROGRAM

CASE FILE
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FINAL REPORT

VALVE, NORMALLY OPEN, TITANIUM

PYRONETICS MODEL 1425

JET PROPULSION LABORATORY

PURCHASE ORDER NO. ES-565923

PREPARED BY

EDWARD AVALOS
RELIABILITY ENGINEER

MAY 1973
RECEIVED
NASA STI FACILITY
ICO BRANCH

APPROVED BY

CROSBY NAGENGAST
SENIOR PROJECT ENGINEER

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RELIABILITY MANAGER

No. of Pages 41

2 March 1972
Date

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INTRODUCTION AND SUMMARY

The Evaluation Test Program for the Explosive Actuated, Normally Open, Titanium Valve, Model 1425, was conducted in compliance with JPL Purchase Order Number ES-565923.

The objective of this Evaluation Test Program was to demonstrate compliance of this valve with the requirements of JPL P. O. ES-565923 by a series of operating tests applied to two (2) valves.

There were no failures.

Compliance of the Explosive Actuated, Normally Open, Titanium Valve with all specification requirements was successfully demonstrated by this Test Program.

Additionally, within the testing parameters specified, the JPL cartridge P/N 10000029-1, demonstrated successfully its capability to properly actuate the Model 1425 valves which underwent this testing program.

DESCRIPTION OF CARTRIDGE ACTUATED, NORMALLY OPEN TITANIUM VALVE, MODEL 1425

The Model 1425 is a normally open, cartridge actuated titanium valve which will be utilized in the trajectory correction propulsion subsystem of the Thermoelectric Outer Planets Spacecraft. (TOPS).

The normally open valve will be used to control and isolate the flow of hydrazine to a 25 pound thrust monopropellant thruster.

The Model 1425 valves will be utilized in conjunction with the Pyronetics Model 1426, Cartridge Actuated, Normally Closed titanium valve in a manifolded assembly to provide a multiple start-stop capability. Each assembly is normally closed in the TOPS vehicle at launch. The projected usage of the propulsion subsystem is for trajectory correction during mission durations as long as ten years in the interplantary and outer space environments within the solar system.

Upon actuation, the normally open valves of each assembly will shut down the supply of fuel to the rocket engine assembly. Explosive valves are utilized in the propulsion subsystem to prevent leakage during long storage periods. Valve actuation is accomplished by explosive energy generated when the JPL cartridges, P/N 10000029-1 are ignited by the application of electrical power.

The valves are mounted in the propulsion subsystem by welding the inlet and outlet ports into a manifold tubular system. In the normally open position fluid flow is allowed by an unrestricted flow passage. Upon actuation, a tapered ram is driven through the flow passage, causing termination of flow and zero leakage.

EVALUATION TEST PROGRAM

EXPLOSIVE ACTUATED TITANIUM VALVE

MODEL 1425 NORMALLY OPEN

1.0 TEST PROGRAM

Two (2) normally open valves were submitted for evaluation testing in accordance with Pyronetics Test Procedure TS 1425. The objective of the test program was to verify design concept compatibility with the test requirements of JPL P.O. ES-565923 for a normally open explosive valve that will control the flow of hydrazine to a 25 pound thrust mono propellant thruster. The cartridge utilized for actuation testing (JPL P/N 10000029-1) was supplied by Jet Propulsion Laboratory and underwent only the actuation test.

The two valves were subjected to the following test sequences:

1. Proof Pressure and External Leakage Test (Body Subassembly)
2. Proof Pressure and Leakage Test (Actuator Assembly)
3. Gross Leak Test (Actuator Assembly)
4. Examination of Product
5. Actuation Test
6. Post Actuation Proof Pressure and Internal Leakage Test
7. Post Actuation Disassembly Inspection
8. Post Actuation Leakage (Actuator Assembly)
9. Post Actuation Leakage-Gross (Actuator Assembly)
10. External Leakage After Actuation (Valve Assembly Less Actuator Assembly)
11. Burst Pressure Test

2.0 REFERENCE DOCUMENTS

The following documents comprise the criteria for this test program.

2.1 Military

MIL-C-45662A	Calibration System Requirements 9 February 1962
MIL-P-27401B	Propellant, Pressurizing Agent Nitrogen 19 September 1962
MIL-P-27407	Propellant, Pressurizing Agent Helium, 8 June 1965

2.2 JPL

P. O. No. ES 565923	Requirements for Fabrication, Assembly, and Test of Normally Open and Normally Closed Explosive Actuated Valve
Drawing 10000029-1	Squib

2.3 Pyronetics

Drawing 1425	Valve, Normally Open, Titanium
TS 1425	Acceptance and Evaluation Test Procedure 7 December 1971

3.0 TEST DESCRIPTION AND RESULTS

The evaluation test requirements, descriptions and test results of the Normally Open Valves, Pyronetics Model 1425, employed in the evaluation test program (in accordance with Pyronetics Procedure TS 1425), are described in the following paragraphs.

3.1 Proof Pressure and External Leakage (Body Subassembly) 2 Units

Requirement

(Reference JPL P.O. ES-565923)

Subject the body subassembly to an external leakage test by applying a pressure of 1000 +30/-0 psig helium gas to the actuator cavity for a period of at least thirty (30) minutes. Measure the external leakage. The leakage shall not exceed 1×10^{-6} scc/sec.

Test Description

The proof and external leakage test was performed on the valve body subassembly during inprocess testing per TS 1425 prior to submitting the assembled valves to the functional evaluation tests. The normally open valves were subjected to a combined proof pressure and external leakage test (see Figure 1). Each valve was individually pressurized through the cartridge port, while installed in a bell jar to $1000 \begin{smallmatrix}+30\\-0\end{smallmatrix}$ psig with gaseous helium. The bell jar was connected to a helium mass spectrometer and subsequently evacuated to 10^{-4} torr. The external leakage was then monitored on the mass spectrometer for 30 minutes minimum for evidence of leakage in excess of 1×10^{-6} sccs of helium. Upon completion of test, the valves were removed from the test system and the cartridge port was blown off with gaseous nitrogen.

Test Results

None of the units tested sustained any evidence of yielding, permanent deformation, or other visible damage. Additionally, the valves did not exhibit any detectable leakage in excess of 1×10^{-6} sccs. Maximum external leakage recorded was 5.0×10^{-9} sccs. Reference test results in Appendix 1.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.2 Proof Pressure and Leakage Test (Actuator Assembly) 2 Units

Requirement

(Reference JPL P.O. ES-565923)

Each actuator assembly shall be installed in a suitable holding fixture and subjected to an external pressure of 500 +10/-0 psig with gaseous helium for thirty (30) minutes minimum. Following pressurization period, actuator assembly shall be removed from the helium pressurization and subjected to a helium mass spectrometer leak test. There shall be no evidence of leakage in excess of 1×10^{-6} scc/sec helium. There shall be no evidence of deformation or damage as a result of these tests.

Test Description

The combined proof pressure and leakage test was performed on each actuator assembly prior to assembling into valve body as an inprocess test per TS 1425. Each actuator sub-assembly was installed in a holding fixture as shown in Figure 2 and subjected to an external pressure of $500 \begin{smallmatrix}+10\\-0\end{smallmatrix}$ psig with gaseous helium for thirty minutes. The actuator assembly was then removed from the pressure fixture and blown off with gaseous nitrogen and within sixty seconds after removal from fixture was installed in the leakage test fixture. The test fixture was evacuated to 10^{-4} torr and the leakage rate from the actuator assembly was checked with a mass spectrometer for evidence of leakage in excess of 1×10^{-6} sccs. The initial value indicated by the mass spectrometer was recorded. The bellows assembly was then visually examined for evidence of damage or deformation as a result of the proof pressure test.

Test Results

None of the units tested exhibited any evidence of yielding, permanent deformation or other visible damage. There was no evidence of leakage in excess of 1×10^{-6} sccs. Maximum leak rate recorded was 6.8×10^{-9} sccs. Reference test results in Appendix 2.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.3 Gross Leak Test (Actuator Assembly) 2 Units

(Reference JPL P.O. ES-565923)

The actuator assembly shall be tested for gross leakage by submerging in hot deionized water at +180 $\pm$15°F and checked for evidence of bubbles.

Test Description

The gross leak test on the actuator assembly was performed prior to assembling into valve body as an in process test per TS 1425. Each actuator assembly was immersed in hot water (+180 $\pm$15°F) with axis in a horizontal position and the entrapped air in the bellows was removed by slightly agitating the assembly, reference Figure 3. Actuator assembly was maintained immersed in the hot water for one minute minimum while visually observing for bubble emission from the bellows of the actuator assembly as an indication of gross leakage.

Test Results

No evidence of bubble emission was detected from any of the actuator assemblies during the test. Hence, no gross leaks were found in the bellows area of the actuator assembly as recorded on the data sheet of Appendix 2.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.4 Examination of Product (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

Each valve body and components shall be visually examined for freedom from blemishes, tool marks, burrs, legibility and correctness of markings and any other characteristics which reflect the general quality of workmanship. The size, configuration and mounting dimensions shall be in accordance with the dimensions noted on the appropriate drawings. These units shall be inspected with suitable gauges and/or instruments for conformance to the dimensions noted on the appropriate drawings, reference drawing 1425. The specimens shall be deemed acceptable for testing if they conform to the drawing requirements and are free from damage.

Test Description

The examination of product was performed upon completion of all the inprocess tests and prior to assembling the valve. Each valve body and components were visually examined for freedom from blemishes, tool marks, and burrs, legibility and correctness of markings and other characteristics which reflected the general quality of workmanship. The size, configuration and mounting dimensions were inspected for conformance to the appropriate drawing.

Test Results

All of the major dimensions and characteristics were one hundred percent inspected and were per print. The requirements, results and verification of special processes are on file at Pyronetics. Appendix 3 includes the Configuration Identification Index indicating the as built configuration of the valves, and inspection buy-off records. The index indicates all documents, by revision letter, necessary for the manufacture of the parts.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.5 Actuation Test (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

The actuation test shall be performed on samples selected at random from the production lot. The valve shall be actuated while a water pressure of 500 psig is flowing through the valve. The response time shall be measured from bridgewire burnout to first indication of pressure decay on the downstream side of the valve. Response time shall not exceed 10 milliseconds.

Test Description

The valves were mounted in a holding fixture as indicated in Figure 4. A pressure transducer was connected on the downstream side of the valves to detect response time. The bridgewire resistance of each bridgewire on the 10000029-1 JPL cartridge was measured and recorded with an Alinco Ohmmeter. The normally-open tube ports were pressurized to 500 $^{+10}_{-0}$ psig with water. The valves were actuated individually upon application of 5.0 amperes from a constant-current power supply to one bridgewire of the cartridge while flowing 500 psig of water through the normally-open tubes. The response time was measured by the transducer installed on the downstream side of the valve with an oscilloscope and camera. Upon actuation of the valve, transfer of the valve to the closed mode caused the pressure to decay on the downstream side as the water flow was shut off. Hence, response time was measured from bridgewire burnout to first indication of pressure drop on the downstream side of the valve.

Test Results

The valves actuated to the closed mode satisfactorily without any detectable evidence of damage to the structural integrity of the valves. The bridgewire burnout times were 1.75 and 1.80 milliseconds; response time for both valves was 1.80 milliseconds. Hence all of the valves complied with the 10.0 millisecond (maximum) response-time requirement. Since both units met the actuation test requirements, and both passed the subsequent post actuation leakage test, the test was deemed successful. Reference test results in Appendix 4.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.6 Post Actuation Proof Pressure and Internal Leakage (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

Each valve shall be internally pressurized through one nipple tube to 1000 +30/-0 psig with gaseous helium for thirty (30) minutes minimum. There shall be no evidence of internal leakage in excess of 1×10^{-6} scc/sec of helium measured at the opposite port.

Test Description

The actuated valves were installed in a pressure fixture (reference Figure 5) and only one of the tube ports was pressurized to $1000 \, ^{+30}_{-0}$ psig with helium, the other tube port was connected to a mass spectrometer and then evacuated to 10^{-4} torr. The leakage rate was monitored for 30 minutes for evidence of leakage in excess of 1×10^{-6} sccs.

Test Results

No internal leakage in excess of 1×10^{-6} sccs of helium was detected during the 30 minute test period. The post actuation internal leakage was 1.1×10^{-8} and 1.4×10^{-8} sccs. Reference test results in Appendix 5.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.7 Disassembly Inspection (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

The JPL 10000029-1 squib shall be removed from the actuator assembly and the actuator assembly shall be removed from the valve body. Valve and actuator assembly shall be examined for proper actuation and there shall be no evidence of abnormal deformation, cracks, etc. on the actuator assembly bellows.

Test Description

The fired JPL 10000029-1 cartridge was removed from the actuator assembly first, then the actuator assembly was removed from the valve body. Examination of the actuator assembly was then performed under a 40X microscope for evidence of abnormal deformation, cracks, etc. on the bellows and all observations were recorded. The valve body was also visually examined for proper actuation.

Test Results

No cracks or other anomalies were detected on the actuator assembly bellows exterior. There was no evidence of cartridge gas blowby. No visual evidence of abnormal deformation was found in the valve bodies. The structural integrity of the actuated valves appeared sound. Reference test results in Appendix 5.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.8 Post Actuation Leakage (Actuator Assembly) 2 Units

Requirement

(Reference JPL P.O. ES-565923)

Each actuator assembly shall be installed in a suitable holding fixture and subjected to an external pressure of 500 +10/-0 psig with gaseous helium for thirty (30) minutes minimum. Following pressurization period, actuator assembly shall be removed from the helium pressurization and subjected to a helium mass spectrometer leak test. There shall be no evidence of leakage in excess of 1×10^{-6} scc/sec helium. There shall be no evidence of deformation or damage as a result of these tests.

Test Description

The actuator assembly from each actuated valve was installed in a holding fixture as shown in Figure 3 and externally pressurized with helium to 500 $^{+10}_{-0}$ psig for 30 minutes. Upon completion of the pressurization period the actuator assembly was removed from the test fixture and within 60 seconds was blown off externally with gaseous nitrogen and subjected to a leak check. A mass spectrometer was utilized to check for evidence of leakage in excess of 1×10^{-6} sccs.

Test Results

No evidence of leakage in excess of 1×10^{-6} sccs of helium was detected on any of the actuator assemblies. Maximum leakage rate detected was 1.5×10^{-8} sccs. Reference actual test results in Appendix 5.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.9 Post Actuation Gross Leakage (Actuator Assembly) 2 Units

Requirement

(Reference JPL P.O. ES-565923)

The actuator assemblies from the actuated valves shall be tested for gross leakage by submerging in hot deionized water at +180 ±15°F and checking for evidence of bubbles.

Test Description

Each actuator assembly that had been removed from the actuated valve was immersed in hot water (+180 ±15°F) with axis in a horizontal position and the entrapped air in the bellows was removed by slightly agitating the assembly, reference Figure 3, and checked for gross leakage. Actuator assembly was maintained immersed in hot water for one minute minimum while visually observing for bubble emission from the bellows in the actuator assembly as an indication of gross leakage.

Test Results

No evidence of bubble emission was detected in the bellows area during the time the actuator assembly was immersed in the hot water. Reference test results in Appendix 6.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.10 External Leakage After Actuation (Valve Assembly Less Actuator Assembly (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

The external leakage after actuation of each valve shall be determined. The tube ports shall be pressurized to 1000 +30/-0 psig with helium gas for a minimum duration of thirty (30) minutes. The external leakage shall not exceed 1×10^{-6} scc/sec of helium. The actuator assembly shall be removed for this test.

Test Description

Following the actuation test, the actuator assembly was removed from the valve body. The actuated valves were then secured in a pressure fixture, reference Figure 6, placed in a bell jar and both tube ports were simultaneously pressurized to $1000 \, ^{+10}_{-0}$ psig with helium gas. The bell jar was connected to a helium mass spectrometer and then evacuated to 10^{-4} torr. The valves were leak checked for evidence of external leakage by monitoring a mass spectrometer for leakage in excess of 1×10^{-6} sccs of helium for 30 minutes.

Test Results

None of the valves tested exhibited any detectable external leakage in excess of 1×10^{-6} sccs during the 30 minute test period. The post actuation leakage rate recorded ranged from 1.7×10^{-8} to 2.9×10^{-8} sccs. Therefore, test was considered acceptable since no leakage in excess of 1×10^{-6} sccs was detected. Reference test results in Appendix 6.

3.0 TEST DESCRIPTION AND RESULTS (Continued)

3.11 Post Actuation Burst Pressure Test (2 Units)

Requirement

(Reference JPL P.O. ES-565923)

The valve assembly (actuator assembly removed) shall be subjected to a burst pressure test and burst pressure determined. One nipple tube shall be capped and the other pressurized with hydrostatic pressure from 0 to 10,000 psig in increments of 1000 psig. Minimum burst pressure shall be 2000 psig. If unit fails to burst at 10,000 psig pressure, discontinue test.

Test Description

The actuated valves were firmly secured in a burst test holding fixture (reference Figure 7) and one nipple tube was capped and the other was connected to a hydrostatic pressure source. The valves were placed behind a safety barricade and the nipple tube was slowly pressurized in increments of 1000 psig and maintained for 15 seconds at each level up to 10,000 psig with water. During the test, valves were visually examined for evidence of leakage with the aid of a mirror.

Test Results

None of the actuated valves burst tested exhibited any visual evidence of external leakage. The test was considered successful since the valves did not burst and no evidence of structural damage was observed as a result of the burst pressure. Reference test results in Appendix 7.

4.0 TEST PROGRAM CONCLUSIONS

Accomplishment of the evaluation tests in accordance with Pyronetics Test Procedure TS 1425, dated 7 December 1971, signify the acceptance of the Normally Open, Explosive Actuated, Titanium Valve, Pyronetics Model 1425, as having fulfilled the test requirements of JPL Purchase Order No. ES-565923. The evaluation test program was conducted by Pyronetics, and witnessed and acknowledged by JPL Engineering.

Examination of the data included herein indicates excellent repeatability of all functional characteristics, i.e., ignition time and response time. Additionally, post actuation proof and leakage test of the actuator assembly and valve body revealed adequacy of the taper lock (metal-to-metal seal) between the ram and valve body after actuation. It should also be noted that the internal proof pressure had no effect on the integrity of the shear section of the normally open tubes.

The structural integrity of the valve assemblies was successfully demonstrated by the post actuation 10,000 psig burst test and in the fact that the pre-actuation and post-actuation leak rates detected were less than the 1×10^{-6} sccs requirements. The fact that no anomalies or degradation in performance was experienced further testifies to the soundness of the design.

Finally, it should be noted, that the bellows which is incorporated into the valve design to positively prevent any cartridge products of combustion from entering the flow stream, performed exactly as required. Positive retention of all contamination was achieved.

Therefore, based on the data described herein, no changes to valve design are recommended.

5.0 TEST EQUIPMENT AND SETUPS

The test equipment and environmental apparatus employed in the performance of the various tests described herein are listed below. All equipment was checked for reliable performance prior to initiation of specific tests. Accuracy and capability is as specified and all calibrations are traceable to the National Bureau of Standards.

5.1 Test Equipment - Proof Pressure and Leakage

Instrument	Mass Spectrometer
Manufacturer	Consolidated Electrodynamics
Model No.	24-120B S/N 9593
Range	5×10^{-11} sccs
Type	Helium Detector
Calib. Frequency	Prior to use

Instrument	Sensitivity Calibrator
Manufacturer	Consolidated Electrodynamics
Model No.	25643 S/N 122G6
Range	Helium Leak Rate 8.8×10^{-7} sccs
Accuracy	± 10% of indicated leak rate

Instrument	Pressure Gauge
Manufacturer	Marsh Instrument Co.
Model No.	100 S/N 507
Range	0-1500 psi
Accuracy	± 0.5%
Calib. Due	4-29-72

Instrument	Stop Watch
Manufacturer	Minerva
Model No.	136-L S/N 1355
Range	0-15 Min x .01 sec
Accuracy	± 0.05 min/hr
Calib. Due	2-5-72

5.2 Test Equipment - Gross Leakage

Instrument	Hot Plate
Manufacturer	Thermolyne Corp.
Model No.	HP-A1915B
Range	100-500° F
Accuracy	N/A
Calib. Frequency	N/A

Instrument	Thermometer
Manufactuere	Van Waters Rodgers
Model No.	N/A
Range	0-230° F
Accuracy	± 1%

5.3 Test Equipment - Examination of Product

As examination of products consists of visual inspections, dimensional measurements, surface finish inspection measurements, all of the equipment necessary to perform these inspections will not be listed below. However, all inspection tools utilized in the accomplishment of this task were verified to be within calibration prior to use.

5.4 Test Equipment - Actuation Test

Instrument	Ignition Circuit Tester
Manufacturer	Alinco
Model No.	1015 AF S/N 501
Range	0-10, 0-20 ohms
Accuracy	± 0.02 ohms
Calib. Due	6-13-72

Instrument	Constant Current Pulse Generator
Manufacturer	E & R Development Co.
Model No.	PS-4A S/N 653
Range	0 to 10 amp; 0 to 100 m'sec
Accuracy	± 0.5 %
Calib. Due	4-4-72

5.4 Test Equipment - Actuation Test (continued)

Instrument	Charge Amplifier
Manufacturer	Kistler Corp.
Model No.	503 S/N 746
Type	Dial Calibration
Range	0-10 volts
Calib. Frequency	Prior to use

Instrument	Oscilloscope Camera
Manufacturer	Tektronix
Model No.	C12 S/N 003939

Instrument	Oscilloscope
Manufacturer	Tektronix
Model No.	502 S/N 002367
Type	Dual Beam
Range	100μ to 20 v/centimeter
Accuracy	$\pm$ 3%
Calib. Due	2-12-72

Instrument	Pressure Transducer
Manufacturer	Kistler Corp.
Model No.	603H S/N 2773
Range	0-15,000 psi
Accuracy	$\pm$ 1%
Calib. Frequency	Prior to use

5.5 Test Equipment - Burst Pressure

Instrument	Pressure Gauge
Manufacturer	U.S. Gauge
Model	19035, Serial No. 669
Range	0-20,000 psig
Accuracy	$\pm$ 0.5 %
Last Calibration	4-18-72

Instrument	Hydrostatic Test Console
Manufacturer	Pyronetics, Inc.
Model No.	N/A
Range	0-20,000 psig
Calib. Frequency	N/A

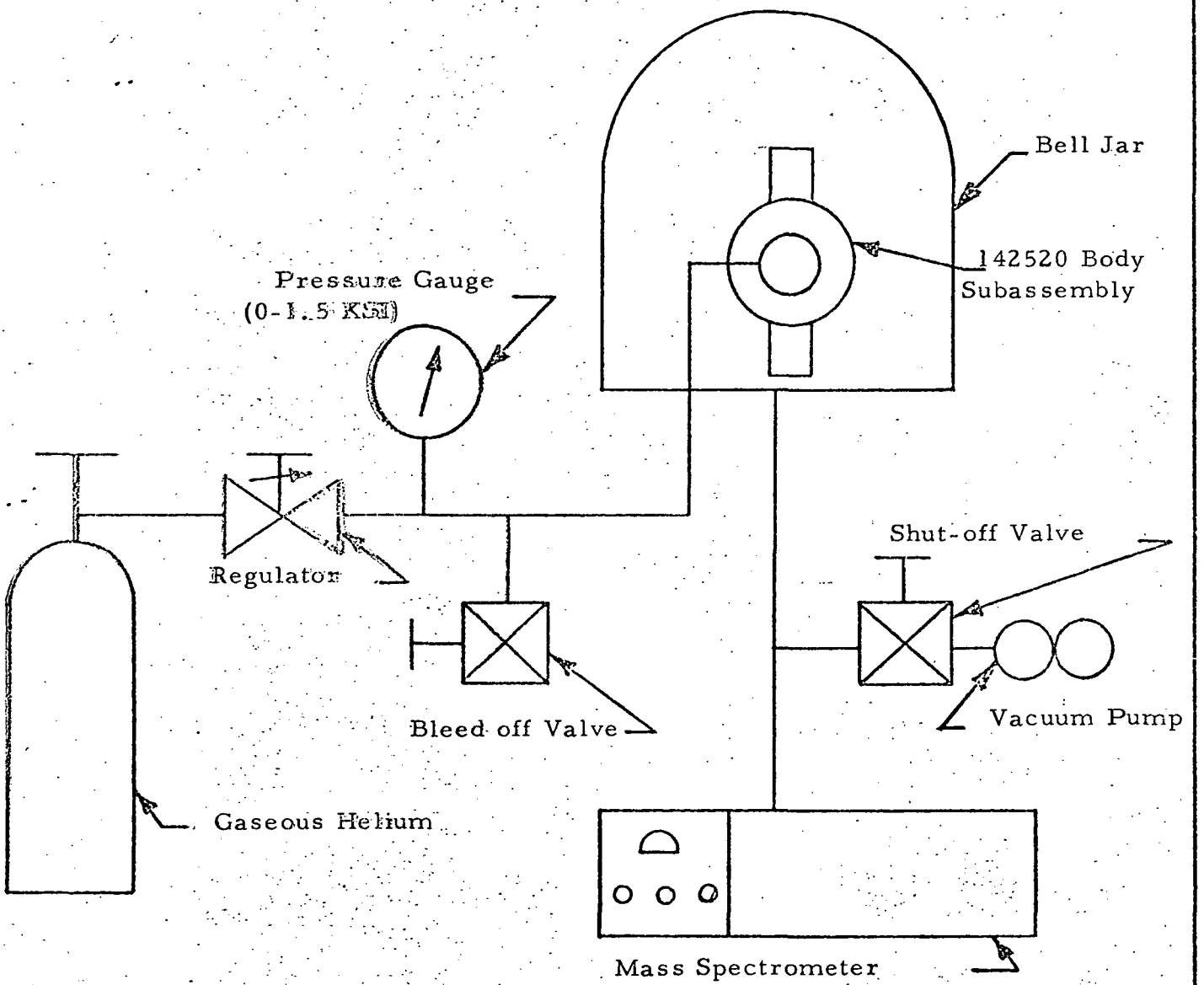
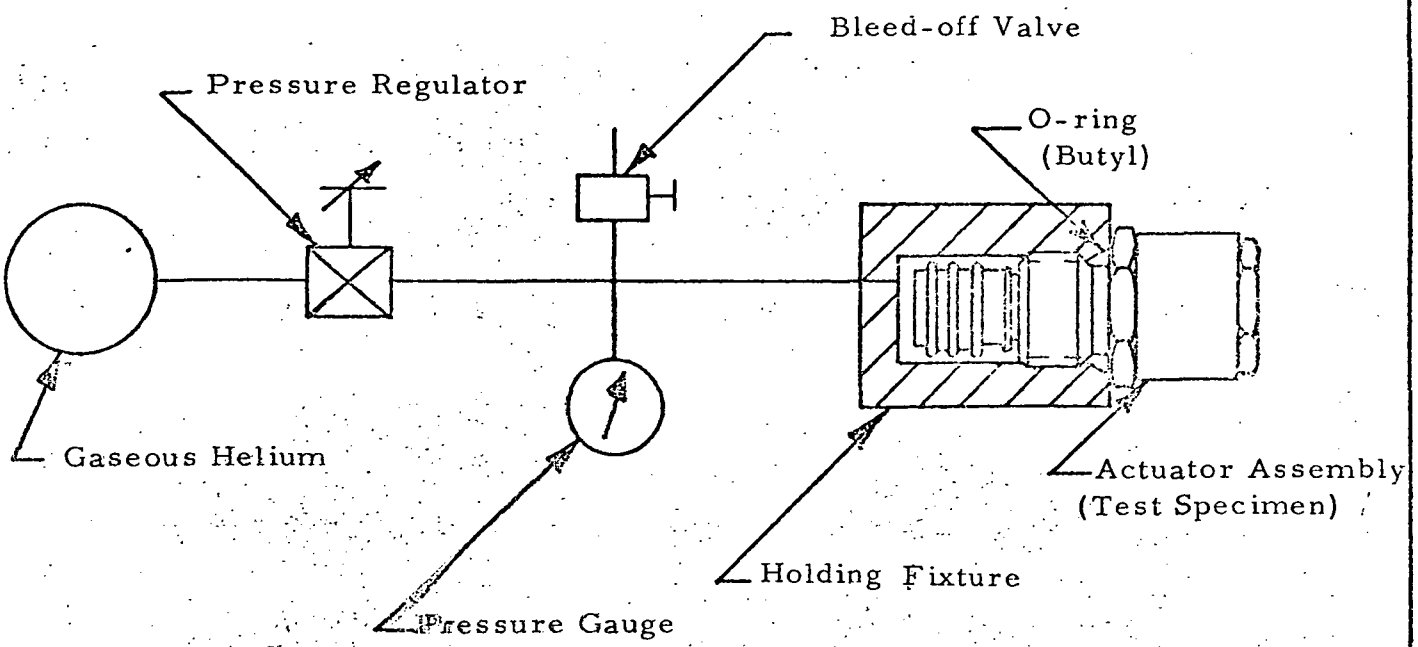
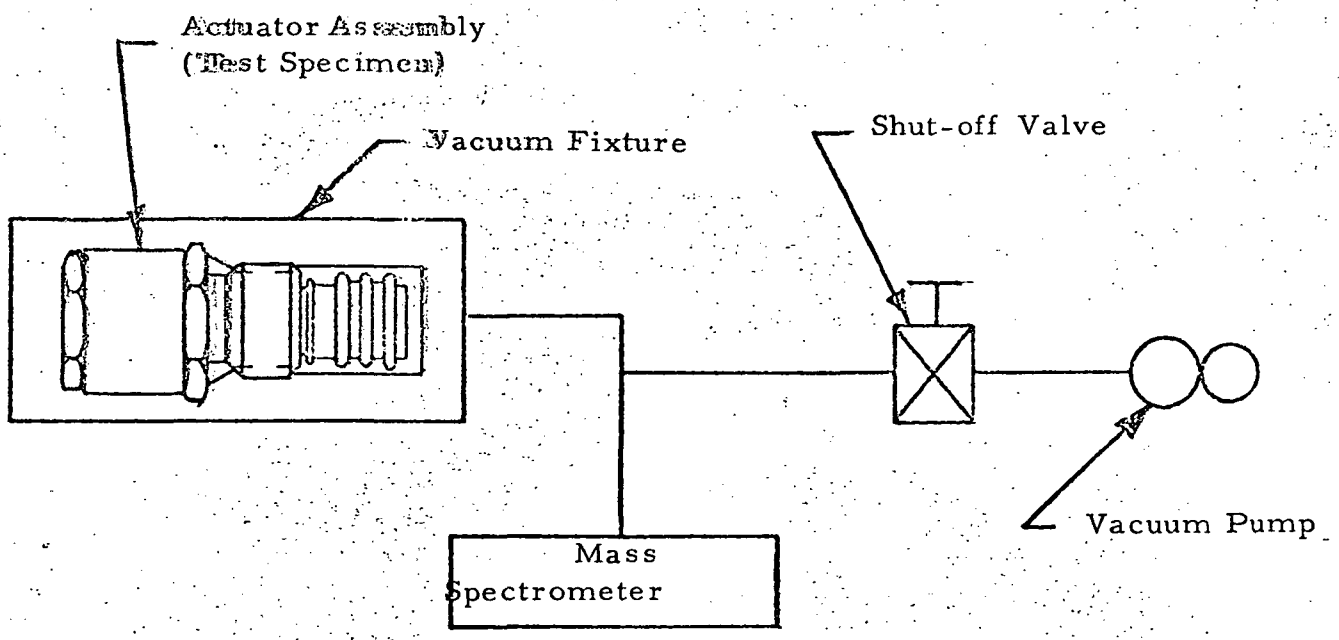


FIGURE 1 PROOF PRESSURE & EXTERNAL LEAKAGE TEST SETUP



(A) PROOF PRESSURE



(B) LEAK TEST

FIGURE 2 PROOF PRESSURE & LEAK TEST SETUP (ACTUATOR ASSEMBLY)

Pyronetics
a Cordon International
Company 10025 SHOEMAKER AVENUE
SANTA FE SPRINGS, CA. 90670

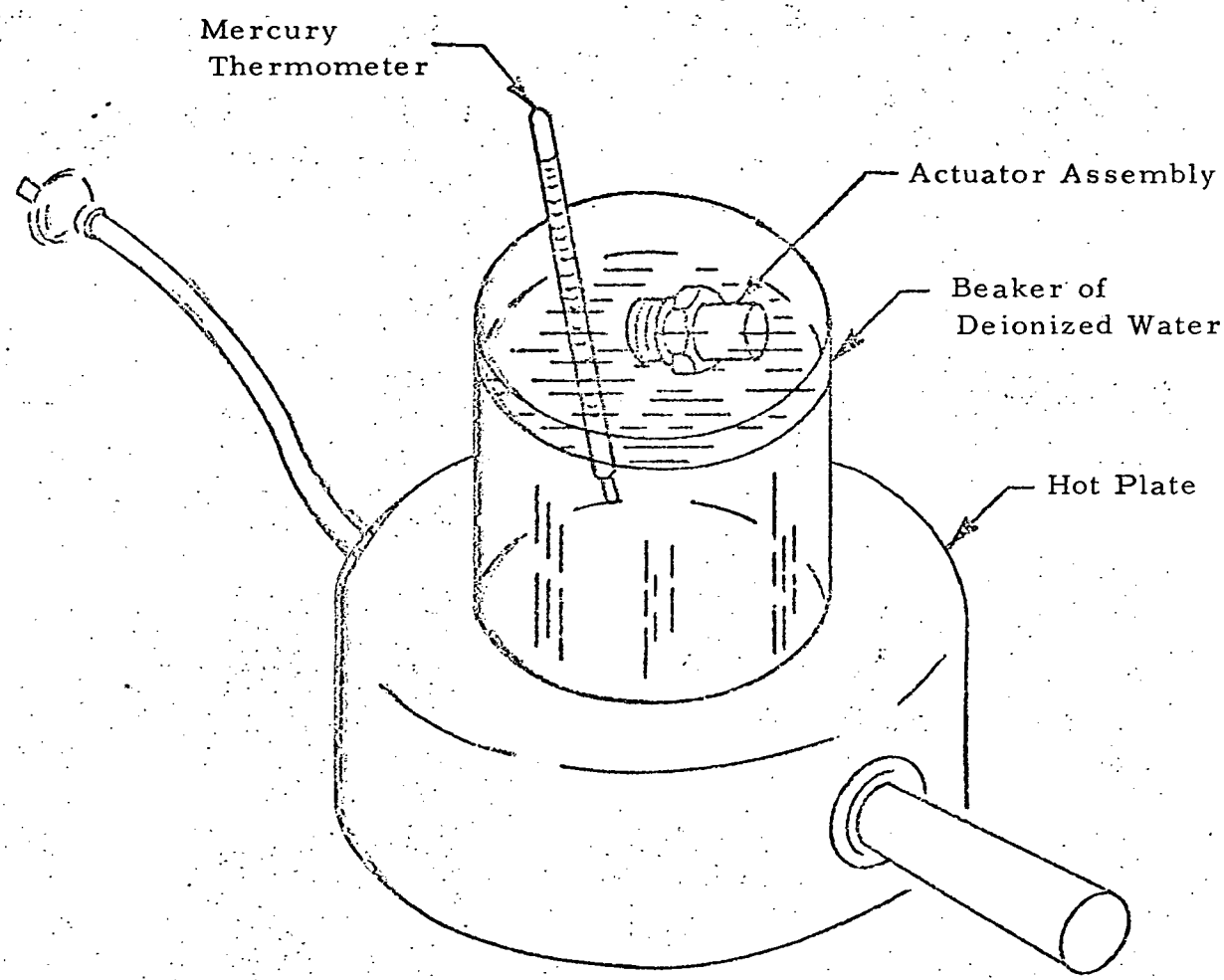


FIGURE 3 LEAK TEST (GROSS LEAK) SETUP

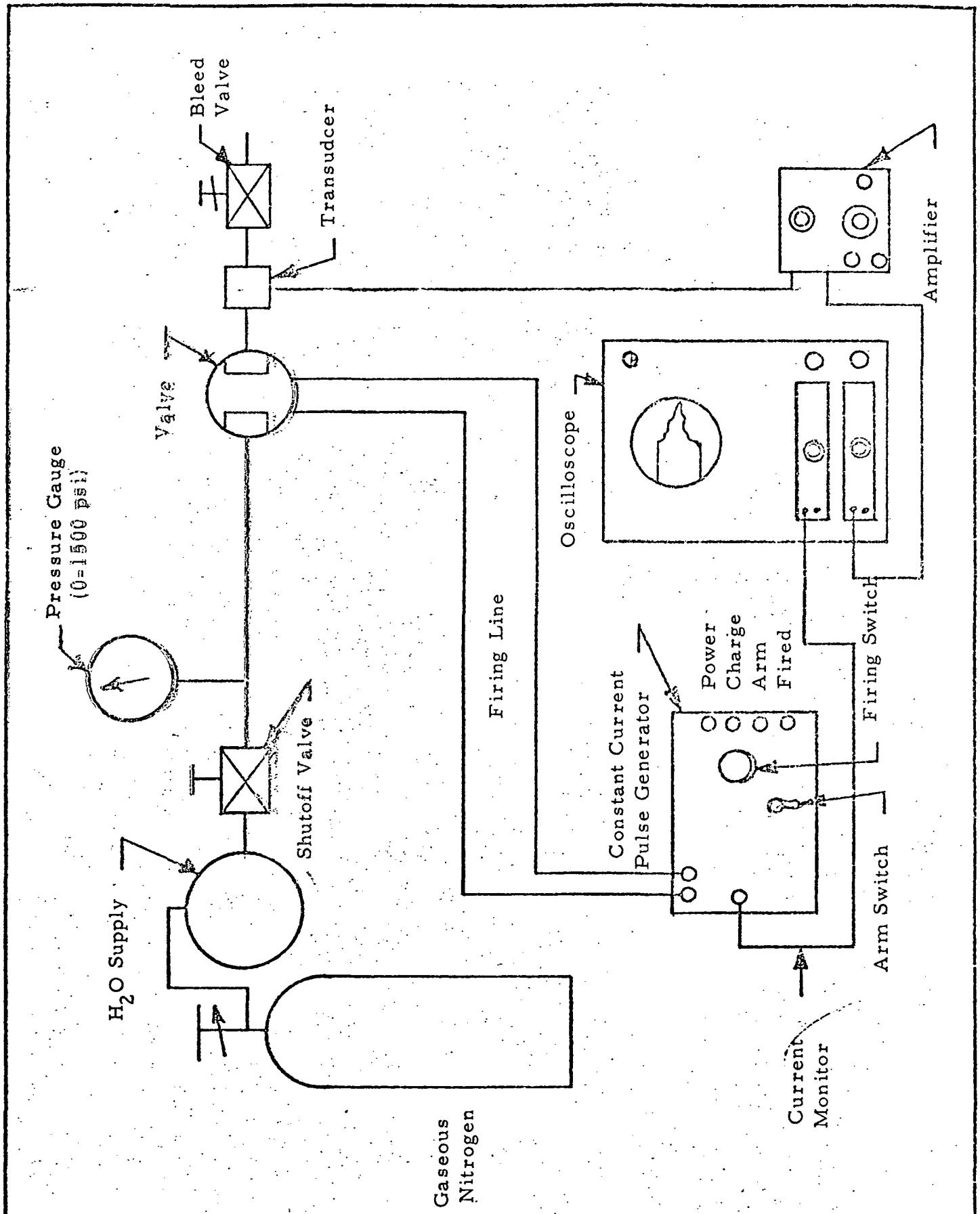


FIGURE 4 ACTUATION TEST SETUP

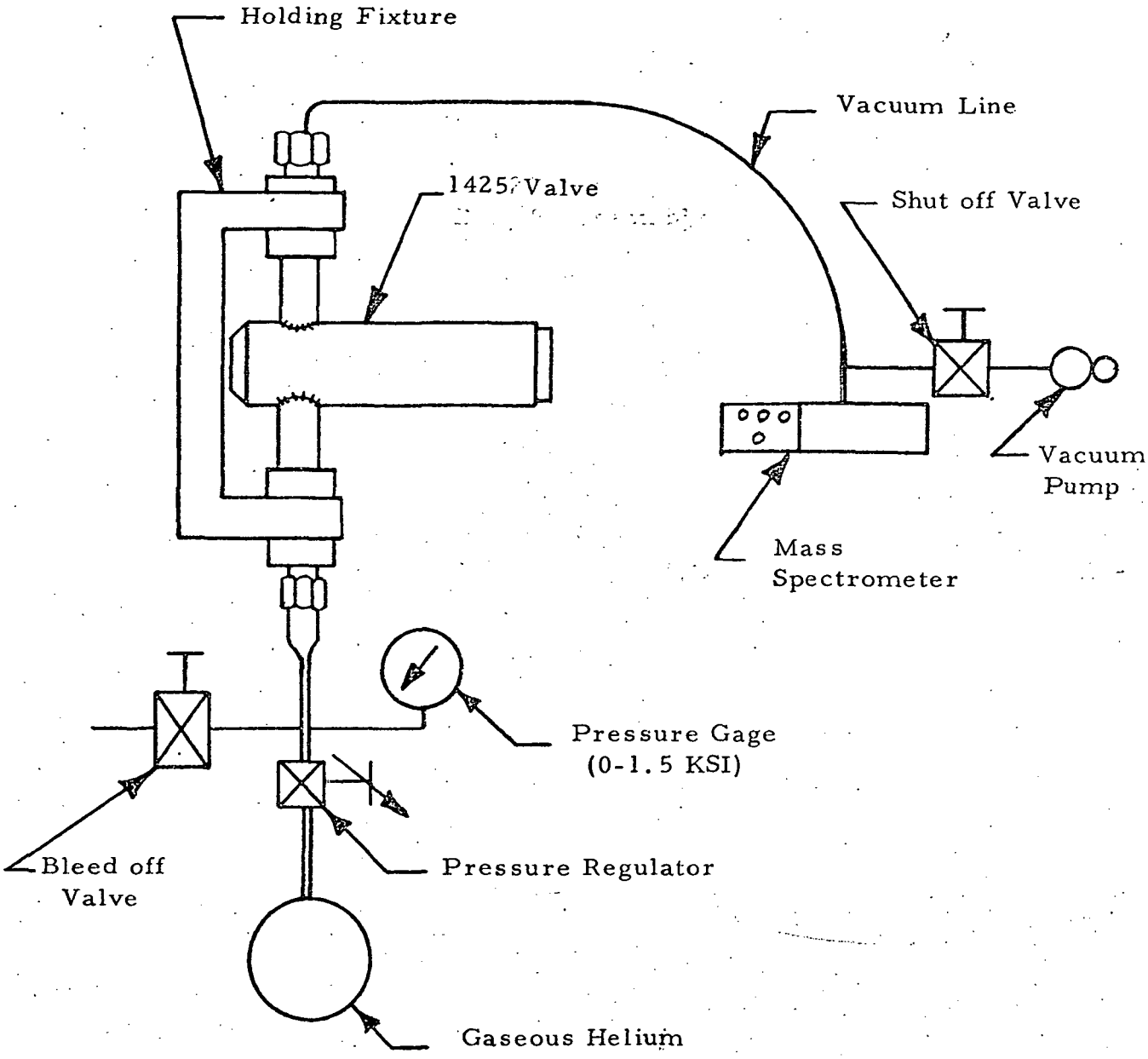


FIGURE 5 PROOF PRESSURE & INTERNAL LEAKAGE TEST SETUP

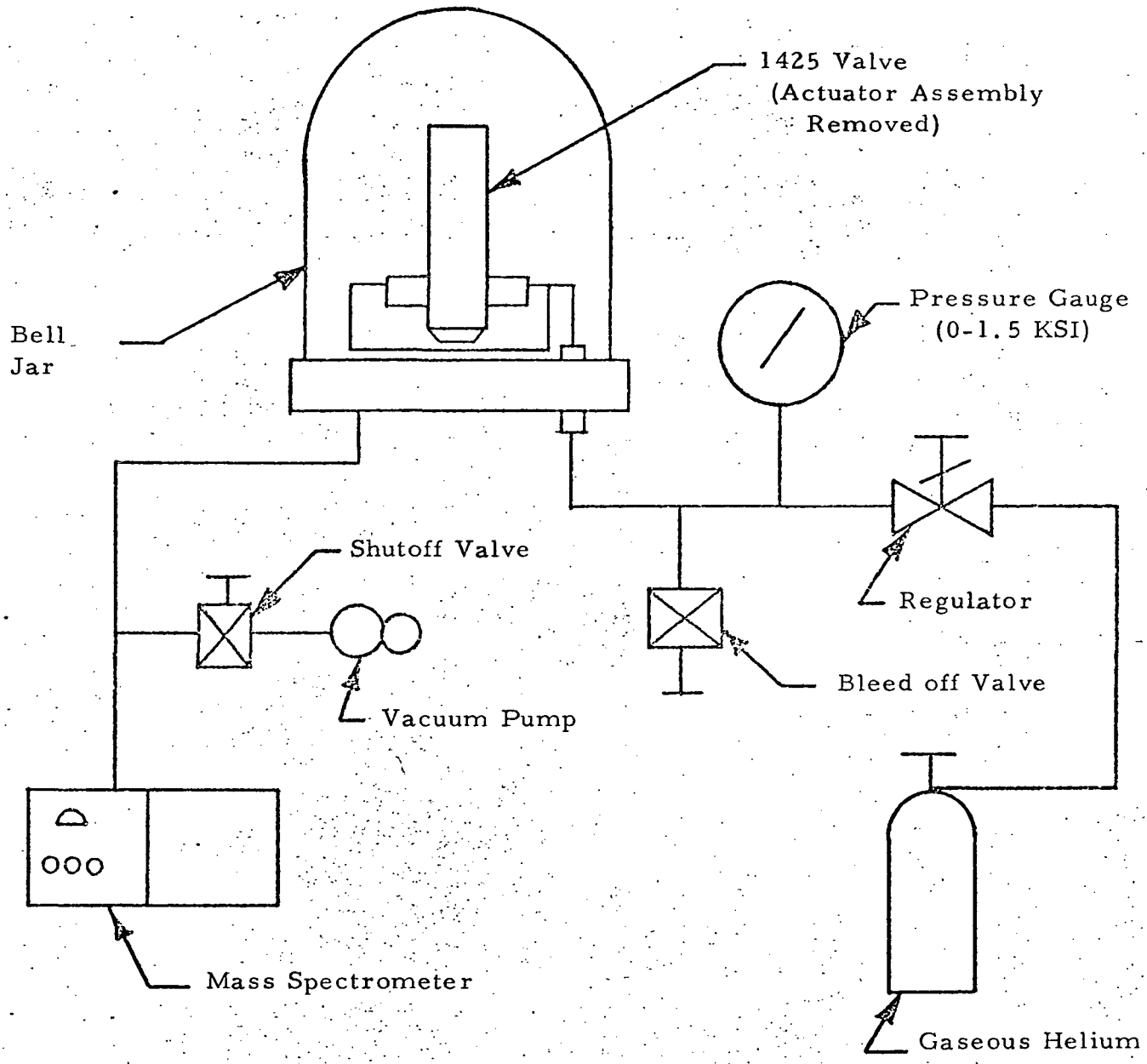


FIGURE 6 POST ACTUATION LEAKAGE TEST SETUP (LESS ACTUATOR ASSY)

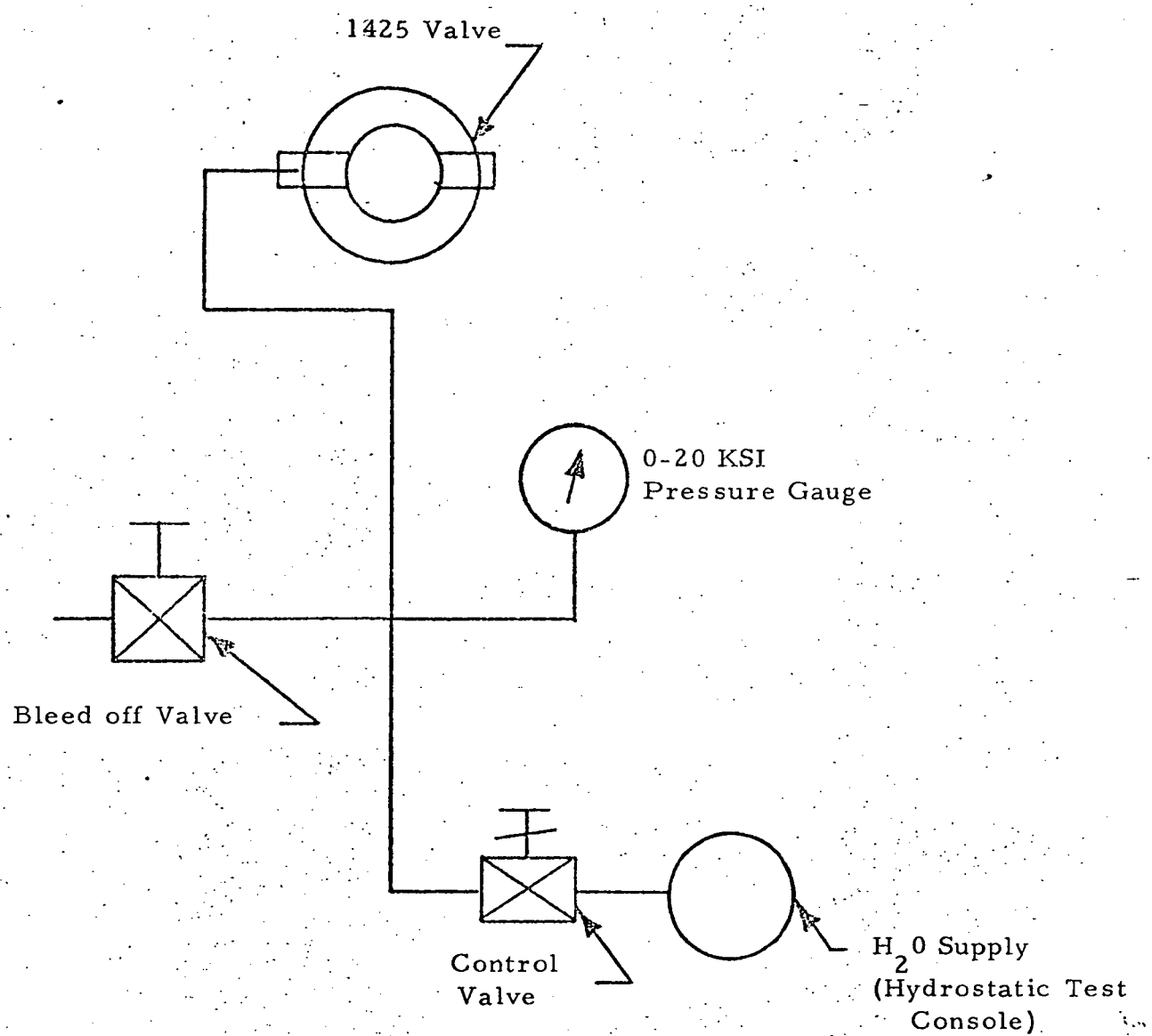


FIGURE 7 BURST PRESSURE TEST SETUP

APPENDIX 1

PROOF PRESSURE AND EXTERNAL LEAKAGE

IN 142820

Lynnetics Inc
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LABORATORY TEST REPORT

LOG S/N 1440

JOB NO. 1081 MODEL 1425 Tests Conducted By [illegible]

Instruments and Procedure Per: TS 1425 DATE 1-27-[illegible]

Witnessed By _____ Source Insp. _____

Traveler S/N 4985

PARAGRAPH NO. 4.1

SERIAL No. 1081-	HELIUM PRESSURE CNCT PRES PSIG	TIME MIN.	LEAK RATE SCCS								
002	1000	35	5.0×10^{-9}	(P)							
003	1000	36	4.4×10^{-9}	(P)							

APPENDIX 2

PROOF PRESSURE AND LEAKAGE; ACTUATOR ASSEMBLY

Edwards Electronics, Inc.
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

P/N 142624

LABORATORY TEST REPORT

LOG S/N 1439-1

JOB NO. 1051 MODEL 1425 Tests Conducted By R.D. (P11)

Instruments and Procedure Per: TS 1425 DATE 1-27-72

Witnessed By: _____ Source Insp. _____

Traveler S/N 4782

PARAGRAPH NO. 4.3 4.4

Serial No.	Pressurized w/Helium @ 500 PSIG Min.	External GN_2 Purge	Leak Rate sccs		Submerged in H_2O °F	Leakage					
001	31	O.K.	5.0×10^{-9}	(P11)	+180	Zero	(P11)				
002	31	O.K.	6.8×10^{-9}	(P11)	+180	Zero	(P11)				

APPENDIX 3

EXAMINATION OF PRODUCT

Pyronetics inc
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LOG S/N 1443

LABORATORY TEST REPORT

JOB NO. 1081 MODEL 1425 Tests Conducted By F. V.

Instruments and Procedure Per: TS 1425 DATE 1-31-72

Witnessed By _____ Source Insp. _____

Traveler S/N 5050

PARAGRAPH NO. 4.4 Examination of Product

Serial No. 1081-	Visual	Dimensional	Identification								
002	P10	P10	P10								
003	↕	↕	↕								
004	↕	↕	↕								
005	P10	P10	P10								

CRESTICS Inc.
A SUBSIDIARY OF COLUMBIA
10035 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

CONFIGURATION IDENTIFICATION INDEX

CUSTOMER INFORMATION

Date 15 February 1972

CUSTOMER Jet Propulsion Lab. P.O. NO. ES-565923 CONTRACT NO. NAS 7-100

PART NO. 1425 MODEL NO. 1425 SERIAL NO. [S] 1081-

CHG. LET.	PART NO.	QTY	PART DESCRIPTION	S/N or Lot No.	DCN No.
	1425	1	Valve, N. O.	1081-	
	142500	1	Valve Assembly	1081-	
	142520	1	Housing, Subassembly	lot1081	
	142521	1	Housing	lot 1081	
	142522	1	Tube	lot 1081	
	142624	1	Actuator Subassembly	lot 1081	
A	142625	1	Body	lot 1081	5531
A	142626	1	Piston	lot 1081	5529
	16343D	1	Bellows	lot 1081	
	2-010 (E515-8)	2	O-Ring	lot 1081	
	MS28774-010	2	Retainer	lot 1081	
	3-907 (E515-8)	2	O-Ring	lot 1081	
	107858	1	Closure	lot 1081	
	142523	1	Ram	lot 1081	
	G-283		Cleaning of Details and Assemblies		
			Cleaning Per JPL Spec. F5504574 Level D2		
A	G-251		Passivation of Stainless Steel		5035
	G-302		Fusion Welding		
	G-252		Electro-Chemical Etching for Identification		
	TS-1425		Acceptance Test Procedure		

APPENDIX 4

ACTUATION TEST

P/N 142500 IV-C

LOG S/N 1443

Pyronetics Inc.
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LABORATORY TEST REPORT

JOB NO. 1081 MODEL 1425 Tests Conducted By E.A. & K.D.

Instruments and Procedure Per: TS 1425 DATE 1-31-72

Witnessed By: _____ Source Insp. RAY HAGLER JPL

Traveler S/N 5050 L.A.T.

PARAGRAPH NO. 4.6

Serial No. 1081-	Cartridge S/N	Bridgewire Resistance 1.05 ± 0.05 ohms A-B	Bridgewire Resistance 1.05 ± 0.05 ohms C-D	H_2O Pressure Flowing PSIG	Firing Current AMPS	Response Time M'SEC.	Bridgewire Burnout M'SEC.	Actuation [illegible]			
002	65806	1.05	1.04	500	5.0	1.80	1.80	O.K.	(P 11)		
003	65826	1.02	1.04	500	5.0	1.80	1.75	O.K	(P 11)		

APPRNDIX 5

POST ACTUATION PROOF PRESSURE AND INTERNAL LEAKAGE

DISASSEMBLY INSPECTION

POST ACTUATION LEAKAGE (ACT. ASSY.)

Dynatics® Inc
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LABORATORY TEST REPORT

LOG S/N 1443

JOB NO. 1081 MODEL 1425 Tests Conducted By E.A. & P.D. (P11)

Instruments and Procedure Per: TS 1425 DATE 1-31-72

Witnessed By _____ Source Insp. _____

Traveler S/N 5050

PARAGRAPH NO. 4.7					4.8			4.9			
SERIAL NO. 1081-	HELIUM PRESSURE INLET PSIG	TIME MIN.	LEAK RATE SCCS		DISASSEMBLY INSPECTION			HELIUM PRESSURE PSIG	TIME MIN.	EXTERNAL GN_2 PURGE	LEAK RATE SCCS
002	1000	30	1.1×10^{-8}	(P11)	O.K.	(P11)	(P11)→	500	30	O.K.	$1.5 \times 10^{-}$
003	1000	30	1.4×10^{-8}	(P11)	O.K.	(P11)	(P11)→	500	30	O.K.	$1.3 \times 10^{-}$

APPENDIX 6

POST ACTUATION GROSS LEAKAGE; ACTUATOR ASSEMBLY

EXTERNAL LEAKAGE

Pyronetics® Inc
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LOG S/N 1443

LABORATORY TEST REPORT

JOB NO. 1081 MODEL 1425 Tests Conducted By E.A. + R.D. (P II)

Instruments and Procedure Per: TS 1425 DATE 1-31-72

Witnessed By _____ Source Insp. _____

Traveler S/N 5050

PARAGRAPH NO.	4.10			4.11							
Serial No. 1081-	H_2O Submerged °F	Leakage		Actuator S/N		Helium Pressure Both Tubes PSIG	Time MIN.	Leak Rate SCCS			
002	+180	Zero	(P II)	002	(P II)	1000	30	2.9×10^{-8}	(P II)		
003	+180	Zero	(P II)	001	(P II)	1000	30	1.7×10^{-8}	(P II)		

APPENDIX 7

BURST PRESSURE TEST

Dynetics Inc
10025 SHOEMAKER AVE.
SANTA FE SPRINGS, CALIF.

LABORATORY TEST REPORT

LOG S/N 1443

JOB NO. 1081 MODEL 1425 Tests Conducted By E.A. & A.D.

Instruments and Procedure Per: T.S. 1425 DATE 1-31-72

Witnessed By _____ Source Insp. _____

Traveler S/N 5050

PARAGRAPH NO. 4.12

SERIAL NO. 1081-	HYDRO. PRESSURE INLET PSIG	TIME SEC.	RESULTS		SERIAL NO. 1081-	HYDRO. PRESSURE INLET PSIG	TIME SEC.	RESULTS			
002	1000	15	O.K.	P11	003	1000	15	O.K.	P11		
	2000	15	O.K.	P11		2000	15	O.K.	P11		
	3000	15	O.K.	P11		3000	15	O.K.	P11		
	4000	15	O.K.	P11		4000	15	O.K.	P11		
	5000	15	O.K.	P11		5000	15	O.K.	P11		
	6000	15	O.K.	P11		6000	15	O.K.	P11		
	7000	15	O.K.	P11		7000	15	O.K.	P11		
	8000	15	O.K.	P11		8000	15	O.K.	P11		
	9000	15	O.K.	P11		9000	15	O.K.	P11		
	10,000	15	O.K.	P11		10,000	15	O.K.	P11		