LMA 121-72-02 Low Conductance Valve Life Cycle Test

1.0, 2nd sentence: The /flight/ valve shall be operated no more that->than 100 cycles ...

4.3.1.5: Valve may->will open.

4.3.1.12: The success of this test shall be that a noticable->(some quantifiable unit of pressure).

4.3.2.5: (Same as 4.3.1.5)

4.3.2.12: (Same as 4.3.1.12)

Figure 2: If there isn't /some/ sort of flow restriction at the end of the pipe which exhausts the valve, one wouldn't see any pressure change at the transducer during the open/close cycles. You must have something there; show it.

General: One may want a note that the Nitrogen ought to be pretty low humidity, lest one condense ice in the valve.

A comment up front ought to state the purpose of the other two valves (sorry, I meant hole-plugs).

To: Phil Bontemps

303-977-0829

From: Bob Goekie

5 Pages.

LMA 131-43-01 Vacuum Leak Test of Low Conductance Vent Valve

1.0 Really ought to explicity say: "Flight" ACIS low conductance valve....

General: We voted not to use a diffusion-pump-based He leak detector. It would be (a lot) easier to understand this document if a plumbing diagram had been included.

LMA 110-43-03 Vacuum Leak Test of Detector Housing

General: We voted not to use a diffusion-pump-based He leak detector. We voted not to include an Optical Blocking Filter (this was part of a package deal to test an irradiated engineering unit OBF, but we feel quite confident that this addition will be a tail which drives the testing dog on the flight hardware).

LMA 110-41-03 Detector Housing Performance Test

3.1.1 We probably want activation logs kept for the actuators.

4.2.1.1 Steps 4 and 5: You probably want to see >1K when measuring RT1, et al, but I would doubt that >100M was OK; you probably want an upper limit (3K?)

General: Is it true that "Re-actuation of door mechanism at actuator temperatures above 45C can damage hardware"? It's just a restriction we hadn't been aware of (and I'll probably put the "caution" in a touch larger type than the rest of the text in my version). ref 4.2.1.2 Step 5

LMA 110-74-01 Vibration Test of Detector Housing

Figure 5: The graph shows a peak/plateau value of 0.04 g**2/Hz, but the words say 0.03 g**2/Hz; pick one.

General: We think it might be more straight-forward to omit the OBF from this test (and the EU vent valve assembly which is needed to support it) and test the irradiated OBF with the CAM-SIM unit.

LMA # 121-72-02 Review 4/18/96

CSR DOCUMENT TRAVELER ACIS

Low Conductance Valve Life Cycle Test

DRAWING NO. 36-01362 REV. A ECO NO. 36-593

NAME & FUNCTION	Initial and Date	Review	SIGN ECO	RECEIVE A COPY
Demitrios Athens (Electronic Ground Support)				
Mark Bautz (Science)		✓		
Robert Blozie (Software Quality) (Systems Safety)				
Ed Boughan (Fabrication Manager)		✓		
Ann Davis				
John Doty (Science)				
Beverly Fergason (Calibration)				
Peter Ford (Software Management)				
Rick Foster (Systems)				
Jim Francis (Software - Science Instrument)				
Martin Furey (Structural)				
Bob Goeke (Project Engineer)	4/96	✓		
Gordon Gong (DEA Electronics)				
Dorothy Gordon (DPA Electronics)				
Hans Govaert				
Dan Hanlon				
Fred Kasparian (Packaging)				
Brian Klatt (Quality)		✓		
Bill Mayer (Project Manager)		✓		
Jim O'Connor (Fabrication Supervisor)				
Bob Renshaw (PSI)				
Ellen Sen (Thermal Dynamics)				
Matt Smith (QA - Contamination Control)				
Rita Somigliana				
Peter Tappan (Mechanical)		✓		
Kendra Tibbetts (Configuration Management)				
David Voutour				
Bill Ward (Purchasing)				
LMA (P. Bontemps, L. Feinstein, J. Montgomery)				
MSFC (Nes Cumings)				

TEST PROCEDURE
for
LOW CONDUCTANCE VENT VALVE LIFE CYCLE TEST

PROC ACIS-121-72-02

OPTION 2

PCN NEW

BASIC PROCEDURE APPROVAL

Organization	Signature	Date
Prepared by		
Test Engineering		
System Safety		
Engineering		
Quality		
Occupational Safety		

VALIDATION APPROVAL

Organization	Signature	Date
Prepared by		
Test Engineering		
System Safety		
Engineering		
Quality		
Occupational Safety		

REVISION PAGE

PCN	PAGE	DESCRIPTION	DATE

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

TABLE OF CONTENTS

The low conductance vent valve is mounted to a bracket mounted to the translation table at the +Y panel of the ISIM. The valve shall be operated no more that 100 cycles during ground operations and opened once in orbit. Predominately the ground operations will be performed at ambient temperature (nominal 70°F). Several of the ground cycles will be performed under vacuum at temperatures at or above 0°C. The seal integrity of the valve need not be maintained if it was closed at temperatures under 0°C, but shall come into specification after the valve has been warmed above 0°C.

In orbit, the valve shall be opened once and never closed. Therefore, seal integrity upon closing in orbit is not specified for this valve, only that it open at cold temperatures. The expected temperatures on the ISIM in orbit are from 0°C to -50°C.

This procedure defines the sequence of steps required to life test the ACIS low conductance vent valve. This procedure defines two environments for valve operation, ambient, and -60°C in vacuum. The total number of cycles shall be 256, 192 at ambient conditions and 64 *in-vacuo* at reduced temperature. The vacuum tests at reduced temperature are to establish the ability of the valve to open on orbit and to reestablish seal after rewarming above 0°C. Periodically the valve shall be leak checked to ensure that seal integrity has not been compromised by repeated cycling.

2.0 SUPPORT REQUIREMENTS.

2.1 TEST EQUIPMENT.

Equipment	ID #	Cal Date	QC
22 to 35 volt power supply			
+/- 12 volt power supply			
Calibrated voltmeter			
Low conductance vent valve test driver			
Pressure transducer and driver board			
Laboratory controller with Labview®			
ACIS thermal vacuum chamber			

2.1.1 Test equipment will be set up according to manufacturers' specifications.

2.2 DOCUMENTS.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

2.2.1 REFERENCE DOCUMENTS.

M51-68 Occupational Safety & Health Standards

Pressure transducer & driver board operating procedure

Vacuum Leak Testing of ACIS Low Conductance Vent Valve

2.2.2 SOURCE DOCUMENTS.

2.3 POWER. N/A

2.4 SOFTWARE. Low Conductance Vent Valve Automated Test Program.

Labview® automated test procedure. File ~~TBD~~ LCVVFEST, LBV

* MAY WANT TO REQUIRE "DAMN DRY" N_2 FOR -60C TESTS.

* WHY 3 VALVES?

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

3.0 SPECIAL CONSIDERATIONS

Liquid Nitrogen (LN2) is employed in both of the cold traps. Avoid contact of skin with LN2 or its cold boil-off gas. Use loose fitting gloves of impermeable material (such as leather) and chemical goggles or safety glasses when handling containers of LN2. Flush LN2 spill with water to disperse. Ventilate enclosed areas to prevent formation of oxygen-deficient atmospheres caused by the evaporation of LN2 or the release of gaseous nitrogen. Prevent entrapment of liquid in closed systems.

The items under test are or contain **fracture critical parts,** and require special handling and labeling as such. as a minimum, parts shall be double wrapped in polyethylene foam sheet (05311800 or equivalent) and transported in a rigid container.

3.1 DEFINITIONS

None

3.2 SAFETY CONSIDERATIONS

Personnel operating, or working near the test setup shall be aware of the hazards associated with, and be familiar with proper handling techniques for, liquid nitrogen.

Personnel conducting the test shall have the Hazard Communication certification.

This requirement does not apply to visitors observing the test, provided solvents or chemicals will not be used by these persons. All visitors shall be under the direct supervision of the test conductor.

3.3 OPERATING CONSIDERATIONS

Always be sure power is off when servicing instruments.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

4.0 OPERATIONS.

4.1 PREREQUISITES.

4.1.1 All equipment used to obtain test essential data during this test shall be in calibration (as required) and shall remain so for the duration of the test.

_____ _____

4.1.2 Quality shall verify the following:

4.1.2.1 The procedure to be used as the official test copy has been stamped as the "Official Test Copy" by Quality and the PCN level recorded is the PCN level of the procedure being run.

_____ _____

4.1.2.2 For a validation run (a first time run of a procedure) a validation team (those disciplines described on the cover sheet) shall be in attendance unless they have waived their right.

_____ _____

4.1.2.3 For a validation run, "VALIDATION COPY" shall be stamped on the cover.

_____ _____

4.2 PREPARATIONS.

4.2.1 Verify that all prerequisite items in the manufacturing log(s) have been completed and the baffle is satisfactory for test. No open items or steps allowed that affect the test.

Q_____

4.2.2 Record the test valves part numbers and serial numbers in appendix A.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC
4.3	TEST METHOD		
4.3.1	AMBIENT TEMPERATURE TEST		
4.3.1.1	Mount three test valves to the engineering unit valve block as shown in Figure 1. Torque valves to 6.0 +/- 0.2 in-lbs.	_____	_____
4.3.1.2	Configure the test setup as shown in Figure 2. Connect nitrogen, pressure transducer and thermocouple.		
4.3.1.3	Connect power supplies and interconnecting wires as shown in Figure 2.	_____	_____
4.3.1.4	Turn on power supplies		
4.3.1.5	Test setup by momentarily pressing valve open button. Valve may open, audible click heard.		
4.3.1.6	Turn on nitrogen flow and set pressure to be between 2 and 10 psig. Nitrogen should be heard flowing out of valve body.	_____	_____
4.3.1.7	Close valve by pressing valve close button. Valve will close, audible click will be heard. Nitrogen will stop flowing.		
NOTE:	Cycle time shall be adjusted to prevent the temperature of the valve from rising more than 10°C above ambient. This adjustment may be performed by hand at any time during the test if the valve temperature begins to rise or at the test conductor's discretion. A note of when this adjustment was performed, valve temperature, new cycle time and cycle number shall be recorded in appendix A or with the data file being collected.		
4.3.1.8	Set up automated data acquisition system to cycle valve every 1 to 5 minutes. Record date and time of cycle, pressure reading, temperature and cycle number for each cycle. At the test conductors discretion, other data may be recorded for each cycle.	_____	_____
4.3.1.9	Record name and version number of Labview® test sequence. Record serial number of valve being tested, test conductor, start date and time, in Appendix A. At the test conductor's discretion this data may be recorded with the data set as part of the file.	_____	_____
4.3.1.10	Cycle valve 192 times at ambient temperature 15°C to 30°C.	_____	_____

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC
4.3.1.11	At the end of 192 cycles the data file shall be printed out. A copy of the data file and the Labview® automated test sequence shall be copied onto a 3.5" disk to be included with the data set.		
4.3.1.12	The success of this test shall be that a noticeable pressure change will have been seen at every valve opening and closing.	_____	_____
4.3.1.13	The valve shall now be leaktested to assure that operation has not compromised seal integrity. Use LCVV LEAK TEST PROCEDURE Test procedure number ~~TBD.~~ ACIS-121-43-01		
4.3.2	-60 DEGREE TEST		
4.3.2.1	Mount three test valves to the engineering unit valve block as shown in Figure 1. Torque valves to 6.0 +/- 0.2 in-lbs. This may already have been done during the prior test. IF APPLICABLE otherwise mark N/A.	_____	_____
4.3.2.2	Configure the test setup as shown in Figure 3. Connect nitrogen, pressure transducer and thermocouple.		
4.3.2.3	Connect power supplies and interconnecting wires as shown in Figure 3.	_____	_____
4.3.2.4	Turn on power supplies.		
4.3.2.5	Test setup by momentarily pressing valve open button. Valve may open, audible click heard.		
4.3.2.6	Turn on nitrogen flow and set pressure to be between 2 and 10 psig. Nitrogen should be heard flowing out of valve body.	_____	_____
4.3.2.7	Close valve by pressing valve close button. Valve will close, audible click will be heard. Nitrogen will stop flowing.		
NOTE:	Cycle time shall be adjusted to prevent the temperature of the valve from rising above specified temperature range. This adjustment may be performed by hand at any time during the test if the valve temperature begins to rise or at the test conductor's discretion. A note of when this adjustment was performed, valve temperature, new cycle time and cycle number shall be recorded in appendix A or with the data file being collected.		
4.3.2.8	Set up automated data acquisition system to cycle valve every 1 to 5 minutes. Record date and time of cycle, pressure reading, temperature and		

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC
	cycle number for each cycle. At the test conductors discretion, other data may be recorded for each cycle.		
4.3.2.9	Record name and version number of Labview® test sequence. Record serial number of valve being tested, test conductor, start date and time, in Appendix A. At the test conductor's discretion this data may be recorded with the data set as part of the file.		
4.3.2.10	Evacuate vacuum chamber. Using cold GN2 cool the valve to -60°C ± 10°C. Once valve is cold, turn on power supplies again.		
4.3.2.11	Cycle valve 64 times at temperature.		
4.3.2.12	At the end of 64 cycles the data file shall be printed out. A copy of the data file and the Labview® automated test sequence shall be copied onto a 3.5" disk to be included with the data set.		
4.3.2.13	Turn off cold GN2 and allow vale to come to ambient temperature. Once valve temperature is above 0°C the vacuum chamber may be vented with nitrogen.		
4.3.2.14	Remove valve block from setup. The valve shall now be leaktested to assure that operation has not compromised seal integrity. Use LCVV LEAK TEST PROCEDURE Test procedure number ~~TBD~~ ACIS-121-43-01		
4.3.2.15	The success of this test shall be that a noticeable pressure change will have been seen at every valve opening and closing.		
4.4	SHUT DOWN.		
4.4.1	Disconnect all electrical connections.		
4.4.2	Disassembly mechanical connections.		
4.4.3	Mark all three valves as TEST USAGE ONLY. Mark with orange dot and place in TEST USAGE cabinets.		
4.4.4	Store test tooling in cabinets and police area.		

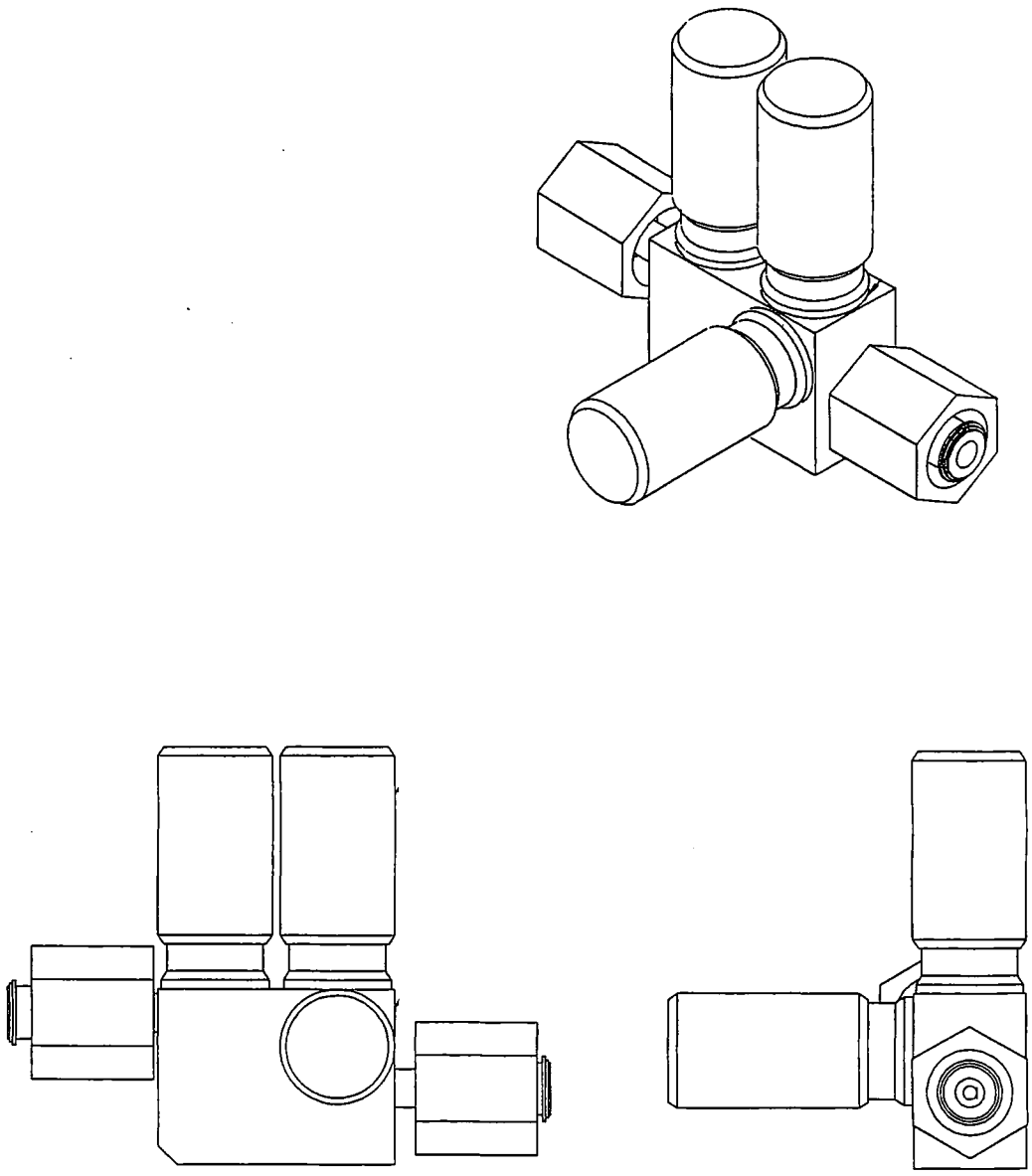

Figure 1. Valve Block Assembly

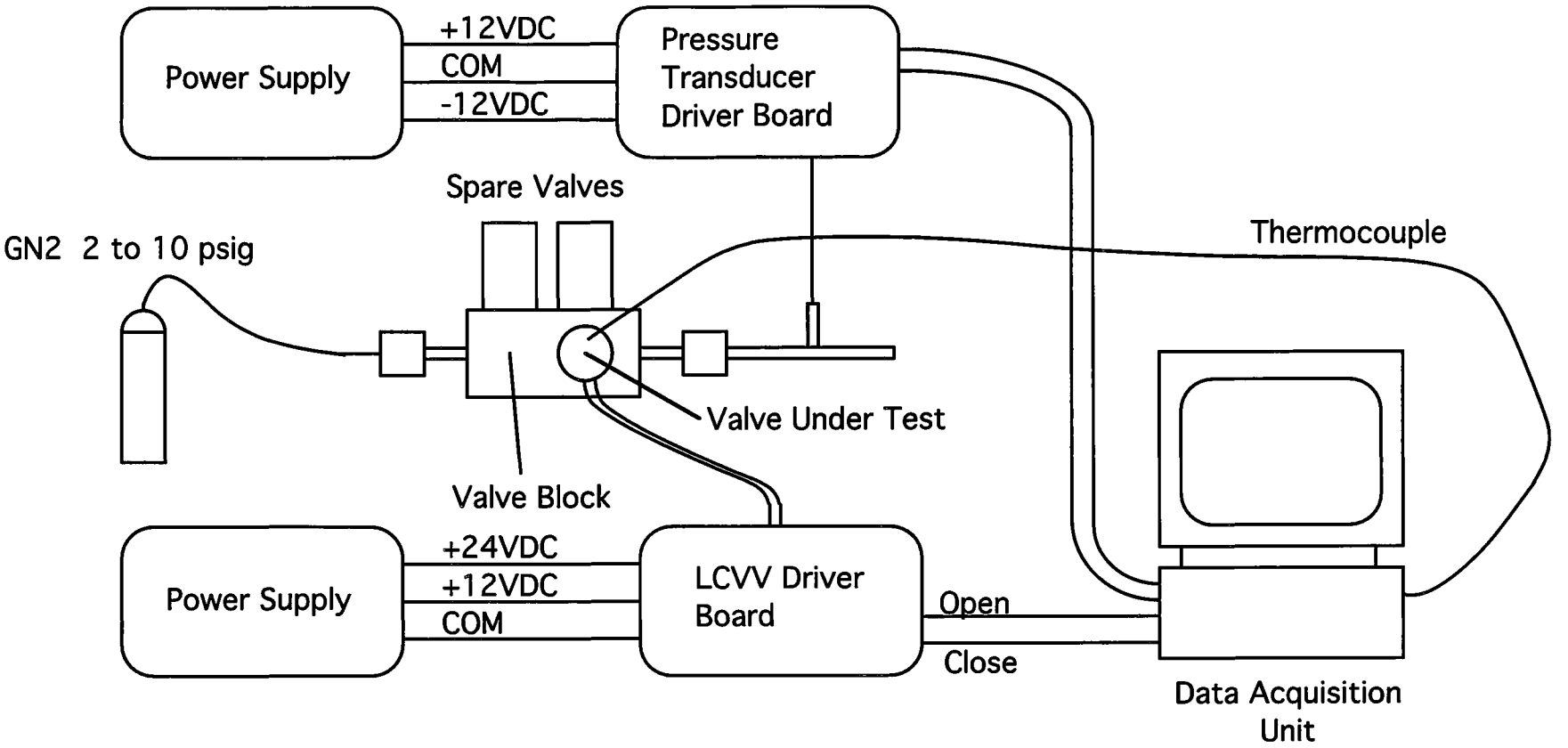

Figure 2. Ambient Temperature Test Configuration

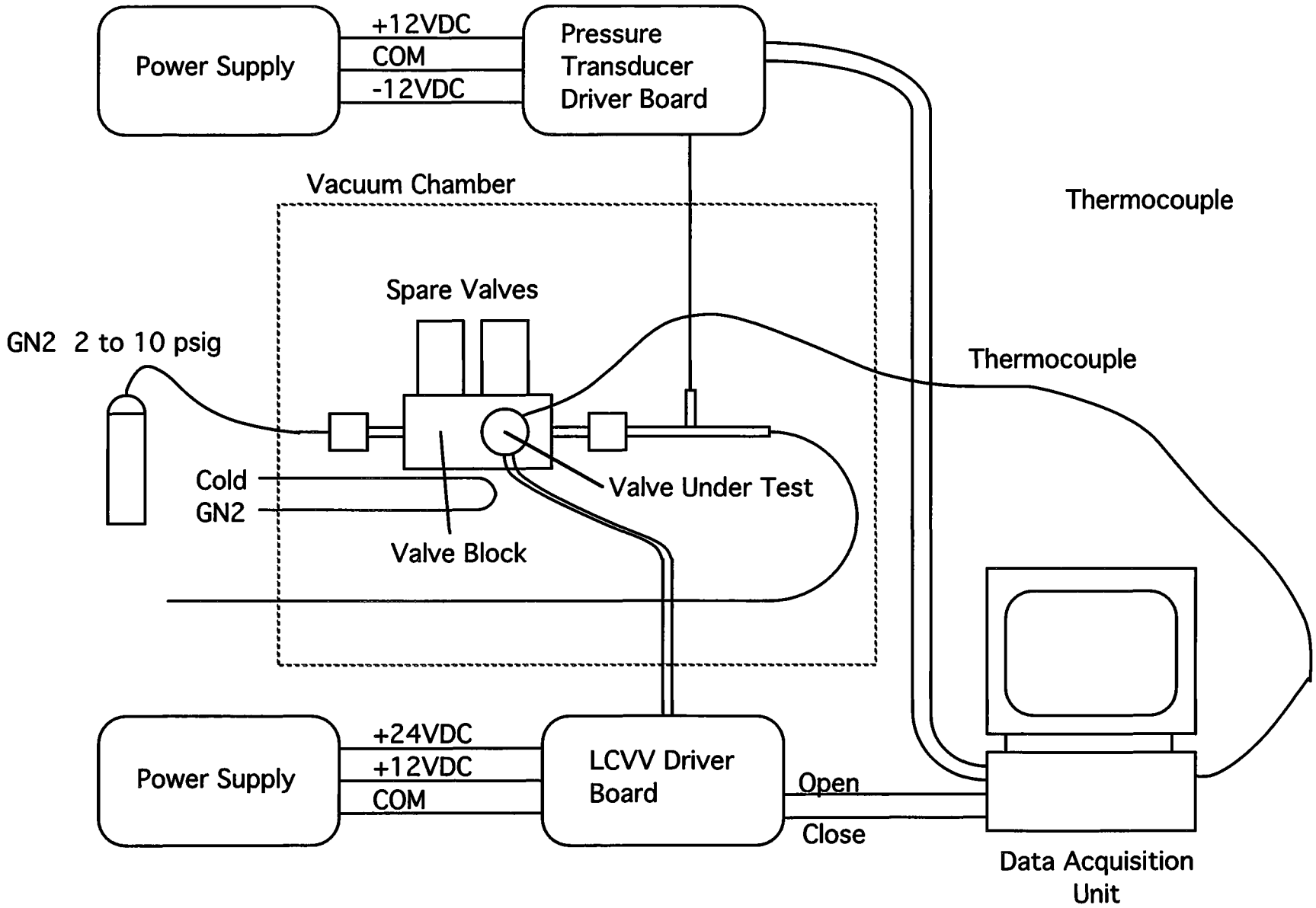

Figure 3. -60°C Temperature Test Configuration

APPENDIX A

PROCEDURE HISTORY SHEET

SERIAL NO._____

ITEM	DATE	PARA	ENTRY	ORIG.	QUAL. VERIFY.	QUAL. ACCEP.

This Procedure History Sheet Contains Items _____ thru _____.

Q_____

TEST CONDUCTOR _____ DATE_____

QUALITY _____ DATE_____

ENGINEERING (A/R) _____ DATE_____

QUALITY ENG. (A/R) _____ DATE_____

CUSTOMER (A/R) _____ DATE_____

TEST LEAD _____ DATE_____

CSR

ENGINEERING CHANGE ORDER
CENTER FOR SPACE RESEARCH
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ACIS

ECO 36-593

DWG. NO.	NEW REV.	DRAWING TITLE
36-01362	A	Low Conductance Valve Life Cycle Test
36-		
36-		
36-		

REASON FOR CHANGE:

Initial Release

DESCRIPTION OF CHANGE:

This is LMA 121-72-02

	SIGNATURE	DATE	REMARKS:
ORIGINATOR	LMA		Must go to MSFC for approval before use.
FABRICATION MGR			
STRUCTURE			
QUALITY ASSURANCE	Brian Hall	4/18/96	Structural Category
DEPUTY PROGECT MGR	B Blank	4/18/96	
PROJECT MGR	W. Mayer	4/18/96	

	Ref.Number	Rev	Description	Comments
	36-01310		..EMC Test Procedure	
	36-01311		..Electrical Power Measurement and Test Procedure	
	36-01312		..Software Diagnostic Test Procedure	
	36-01313		..Purge and Vent Test Procedure	
	36-01314		..Mass Properties Measurement Procedure	
	36-01315		..(moved to 36-02015)	
	36-01316		..(moved to 36-02016)	
	36-01317		..(moved to 36-02017)	
	36-01318		..(moved to 36-02018)	
	36-01319		..(moved to 36-02019)	
	36-01320		..(moved to 36-02020)	
	36-01321		..(moved to 36-02021)	
	36-01322		..(moved to 36-02022)	
10T	36-01323	A	..CCD Calibration Test Plan	
	36-01360		..Thermal Balance Test Procedure	LMA ACIS-500-77-01
	36-01361		..TCS Shades Structural Loads Test Procedure	LMA ACIS-500-42-01
14T	36-01362	A	..Low Conductance Vent Valve Life Cycle Test Procedure	LMA ACIS-121-72-02
	36-01363		..TCS/OBF Acoustic Test Procedure	LMA ACIS-500-74-02
	36-01400		Other Documents	
	36-01401	C	..WBS Dictionary	
28T	36-01402	03	..SA02 - Safety Compliance Data	
282T	36-01403	03	..VR02 - Verification Requirements and Specification Document	
	36-01404		..Risk Management Summary	
25T	36-01405	A	..PA02 - Approved EEE Parts List	
92T	36-01406	03	..PA04 - Failure Mode and Effects Analysis	LMA document/Released with comments
8T	36-01407	02	..PA05 - Critical Items List	
36T	36-01408	02	..HF02 - Material & Processes Specification List	
	36-01409	01	..HF03 - Material Identification & Usage List	
46T	36-01410	A	..SE10 - Instrument Program and Command List	
30T	36-01411	01	..SE04 - Engineering Drawings, Documents, Specs & Standards List	
	36-01412		..OP01 - Science Instrument Operations Handbook	
	36-01413		..SE11 - Inputs, SI to Design Reference Mission	
	36-01414		..SE06 - Diagrams, Schematics & Lists, Electrical	
	36-01415		..CM07 - Spares List	
	36-01416		..SE05 - Drawings	
	36-01417		..HF04 - Material Usage Agreement	
34T	36-01418	02	..Verification Requirements & Specification Compliance Document	
8T	36-01419	02	..Spares List	
4T	36-01420	01	..Limited Life Items List	
	36-01500		Reports	
	36-01501	01	..VR04 - Verification Test and Assessment Reports	
	36-01502	01	..SE03 - Technical Analyses & Models	

36-525

TEST PROCEDURE
for
LOW CONDUCTANCE VENT VALVE LIFE CYCLE TEST

PROC ACIS-121-72-02

OPTION 2

PCN NEW

BASIC PROCEDURE APPROVAL

Organization	Signature	Date
Prepared by		
Test Engineering		
System Safety		
Engineering		
Quality		
Occupational Safety		

VALIDATION APPROVAL

Organization	Signature	Date
Prepared by		
Test Engineering		
System Safety		
Engineering		
Quality		
Occupational Safety		

REVISION PAGE

PCN	PAGE	DESCRIPTION	DATE

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

TABLE OF CONTENTS

The low conductance vent valve is mounted to a bracket mounted to the translation table at the +Y panel of the ISIM. The valve shall be operated no more that 100 cycles during ground operations and opened once in orbit. Predominately the ground operations will be performed at ambient temperature (nominal 70°F). Several of the ground cycles will be performed under vacuum at temperatures at or above 0°C. The seal integrity of the valve need not be maintained if it was closed at temperatures under 0°C, but shall come into specification after the valve has been warmed above 0°C.

In orbit, the valve shall be opened once and never closed. Therefore, seal integrity upon closing in orbit is not specified for this valve, only that it open at cold temperatures. The expected temperatures on the ISIM in orbit are from 0°C to -50°C.

This procedure defines the sequence of steps required to life test the ACIS low conductance vent valve. This procedure defines two environments for valve operation, ambient, and -60°C in vacuum. The total number of cycles shall be 256, 192 at ambient conditions and 64 *in-vacuo* at reduced temperature. The vacuum tests at reduced temperature are to establish the ability of the valve to open on orbit and to reestablish seal after rewarming above 0°C. Periodically the valve shall be leak checked to ensure that seal integrity has not been compromised by repeated cycling.

2.0 SUPPORT REQUIREMENTS.

2.1 TEST EQUIPMENT.

Equipment	ID #	Cal Date	QC
22 to 35 volt power supply			
+/- 12 volt power supply			
Calibrated voltmeter			
Low conductance vent valve test driver			
Pressure transducer and driver board			
Laboratory controller with Labview®			
ACIS thermal vacuum chamber			

2.1.1 Test equipment will be set up according to manufacturers' specifications.

2.2 DOCUMENTS.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

2.2.1 REFERENCE DOCUMENTS.

M51-68 Occupational Safety & Health Standards

Pressure transducer & driver board operating procedure

Vacuum Leak Testing of ACIS Low Conductance Vent Valve

2.2.2 SOURCE DOCUMENTS.

2.3 POWER. N/A

2.4 SOFTWARE. Low Conductance Vent Valve Automated Test Program.

Labview® automated test procedure. File ~~TBD~~ LCVVTEST, LBV

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

3.0 SPECIAL CONSIDERATIONS

Liquid Nitrogen (LN2) is employed in both of the cold traps. Avoid contact of skin with LN2 or its cold boil-off gas. Use loose fitting gloves of impermeable material (such as leather) and chemical goggles or safety glasses when handling containers of LN2. Flush LN2 spill with water to disperse. Ventilate enclosed areas to prevent formation of oxygen-deficient atmospheres caused by the evaporation of LN2 or the release of gaseous nitrogen. Prevent entrapment of liquid in closed systems.

The items under test are or contain **fracture critical parts,** and require special handling and labeling as such. as a minimum, parts shall be double wrapped in polyethylene foam sheet (05311800 or equivalent) and transported in a rigid container.

3.1 DEFINITIONS

None

3.2 SAFETY CONSIDERATIONS

Personnel operating, or working near the test setup shall be aware of the hazards associated with, and be familiar with proper handling techniques for, liquid nitrogen.

Personnel conducting the test shall have the Hazard Communication certification.

This requirement does not apply to visitors observing the test, provided solvents or chemicals will not be used by these persons. All visitors shall be under the direct supervision of the test conductor.

3.3 OPERATING CONSIDERATIONS

Always be sure power is off when servicing instruments.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

4.0 OPERATIONS.

4.1 PREREQUISITES.

4.1.1 All equipment used to obtain test essential data during this test shall be in calibration (as required) and shall remain so for the duration of the test.

_____ _____

4.1.2 Quality shall verify the following:

4.1.2.1 The procedure to be used as the official test copy has been stamped as the "Official Test Copy" by Quality and the PCN level recorded is the PCN level of the procedure being run.

_____ _____

4.1.2.2 For a validation run (a first time run of a procedure) a validation team (those disciplines described on the cover sheet) shall be in attendance unless they have waived their right.

[illegible] _____ [illegible]

4.1.2.3 For a validation run, "VALIDATION COPY" shall be stamped on the cover.

So _____ _____

4.2 PREPARATIONS.

4.2.1 Verify that all prerequisite items in the manufacturing log(s) have been completed and the baffle is satisfactory for test. No open items or steps allowed that affect the test.

Q_____

4.2.2 Record the test valves part numbers and serial numbers in appendix A.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

4.3 TEST METHOD

4.3.1 AMBIENT TEMPERATURE TEST

4.3.1.1 Mount three test valves to the engineering unit valve block as shown in Figure 1. Torque valves to 6.0 +/- 0.2 in-lbs.

4.3.1.2 Configure the test setup as shown in Figure 2. Connect nitrogen, pressure transducer and thermocouple.

4.3.1.3 Connect power supplies and interconnecting wires as shown in Figure 2.

4.3.1.4 Turn on power supplies

4.3.1.5 Test setup by momentarily pressing valve open button. Valve may open, audible click heard.

4.3.1.6 Turn on nitrogen flow and set pressure to be between 2 and 10 psig. Nitrogen should be heard flowing out of valve body.

4.3.1.7 Close valve by pressing valve close button. Valve will close, audible click will be heard. Nitrogen will stop flowing.

NOTE: Cycle time shall be adjusted to prevent the temperature of the valve from rising more than 10°C above ambient. This adjustment may be performed by hand at any time during the test if the valve temperature begins to rise or at the test conductor's discretion. A note of when this adjustment was performed, valve temperature, new cycle time and cycle number shall be recorded in appendix A or with the data file being collected.

4.3.1.8 Set up automated data acquisition system to cycle valve every 1 to 5 minutes. Record date and time of cycle, pressure reading, temperature and cycle number for each cycle. At the test conductors discretion, other data may be recorded for each cycle.

4.3.1.9 Record name and version number of Labview® test sequence. Record serial number of valve being tested, test conductor, start date and time, in Appendix A. At the test conductor's discretion this data may be recorded with the data set as part of the file.

4.3.1.10 Cycle valve 192 times at ambient temperature 15°C to 30°C.

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

4.3.1.11 At the end of 192 cycles the data file shall be printed out. A copy of the data file and the Labview® automated test sequence shall be copied onto a 3.5" disk to be included with the data set.

4.3.1.12 The success of this test shall be that a noticeable pressure change will have been seen at every valve opening and closing.

4.3.1.13 The valve shall now be leaktested to assure that operation has not compromised seal integrity. Use LCVV LEAK TEST PROCEDURE Test procedure number ~~TBD.~~ ACIS-121-43-01

4.3.2 -60 DEGREE TEST

4.3.2.1 Mount three test valves to the engineering unit valve block as shown in Figure 1. Torque valves to 6.0 +/- 0.2 in-lbs. This may already have been done during the prior test.
IF APPLICABLE otherwise mark N/A.

4.3.2.2 Configure the test setup as shown in Figure 3. Connect nitrogen, pressure transducer and thermocouple.

4.3.2.3 Connect power supplies and interconnecting wires as shown in Figure 3.

4.3.2.4 Turn on power supplies.

4.3.2.5 Test setup by momentarily pressing valve open button. Valve may open, audible click heard.

4.3.2.6 Turn on nitrogen flow and set pressure to be between 2 and 10 psig. Nitrogen should be heard flowing out of valve body.

4.3.2.7 Close valve by pressing valve close button. Valve will close, audible click will be heard. Nitrogen will stop flowing.

NOTE: Cycle time shall be adjusted to prevent the temperature of the valve from rising above specified temperature range. This adjustment may be performed by hand at any time during the test if the valve temperature begins to rise or at the test conductor's discretion. A note of when this adjustment was performed, valve temperature, new cycle time and cycle number shall be recorded in appendix A or with the data file being collected.

4.3.2.8 Set up automated data acquisition system to cycle valve every 1 to 5 minutes. Record date and time of cycle, pressure reading, temperature and

STEP NO.	ACTION	REQUIREMENT/ RESPONSE	QC

cycle number for each cycle. At the test conductors discretion, other data may be recorded for each cycle.

4.3.2.9 Record name and version number of Labview® test sequence. Record serial number of valve being tested, test conductor, start date and time, in Appendix A. At the test conductor's discretion this data may be recorded with the data set as part of the file.

4.3.2.10 Evacuate vacuum chamber. Using cold GN2 cool the valve to -60°C ± 10°C. Once valve is cold, turn on power supplies again.

4.3.2.11 Cycle valve 64 times at temperature.

4.3.2.12 At the end of 64 cycles the data file shall be printed out. A copy of the data file and the Labview® automated test sequence shall be copied onto a 3.5" disk to be included with the data set.

4.3.2.13 Turn off cold GN2 and allow vale to come to ambient temperature. Once valve temperature is above 0°C the vacuum chamber may be vented with nitrogen.

4.3.2.14 Remove valve block from setup. The valve shall now be leaktested to assure that operation has not compromised seal integrity. Use LCVV LEAK TEST PROCEDURE Test procedure number ~~TBD~~ ACIS-121-43-01

4.3.2.15 The success of this test shall be that a noticeable pressure change will have been seen at every valve opening and closing.

4.4 SHUT DOWN.

4.4.1 Disconnect all electrical connections.

4.4.2 Disassembly mechanical connections.

4.4.3 Mark all three valves as TEST USAGE ONLY. Mark with orange dot and place in TEST USAGE cabinets.

4.4.4 Store test tooling in cabinets and police area.

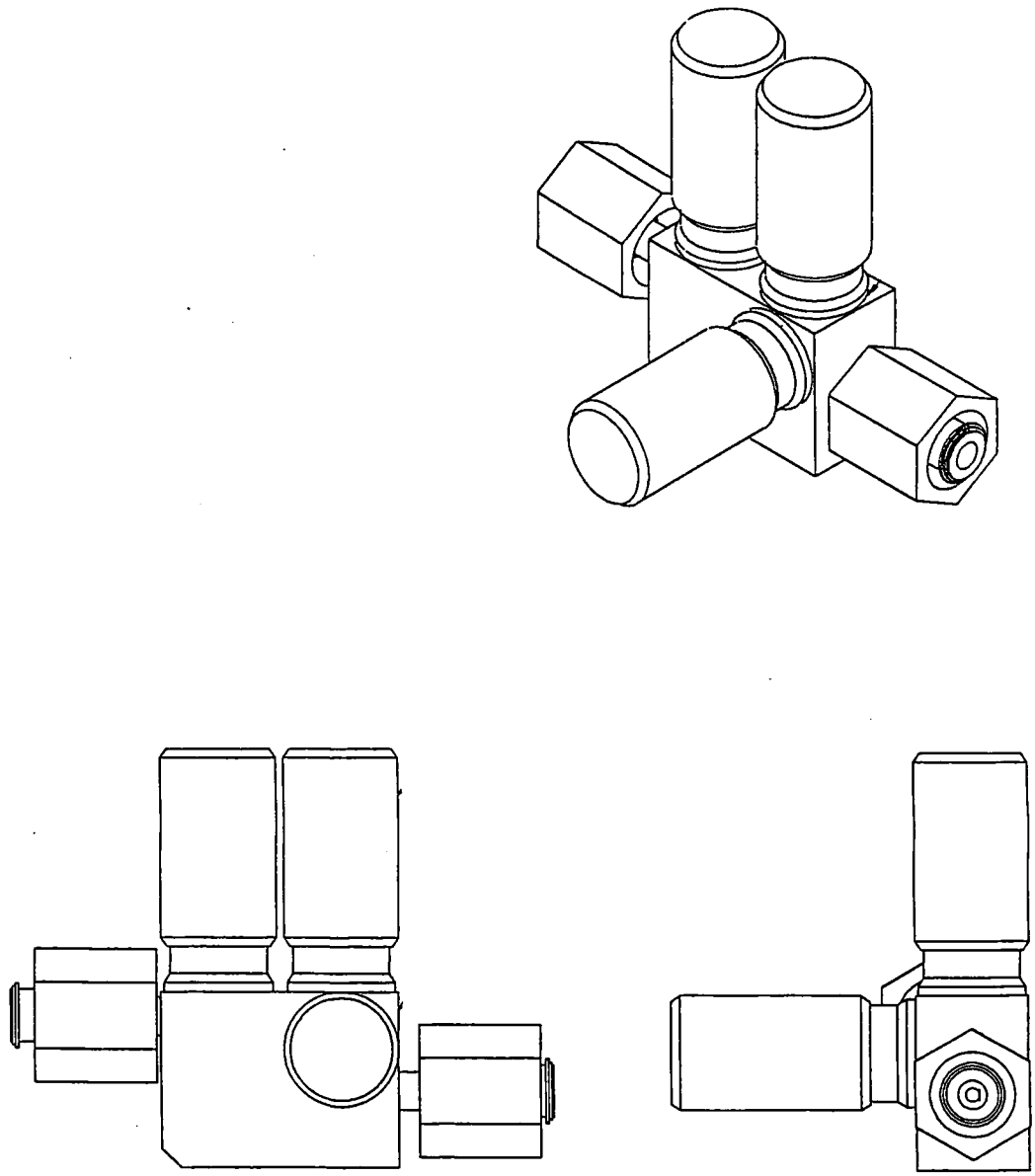

Figure 1. Valve Block Assembly

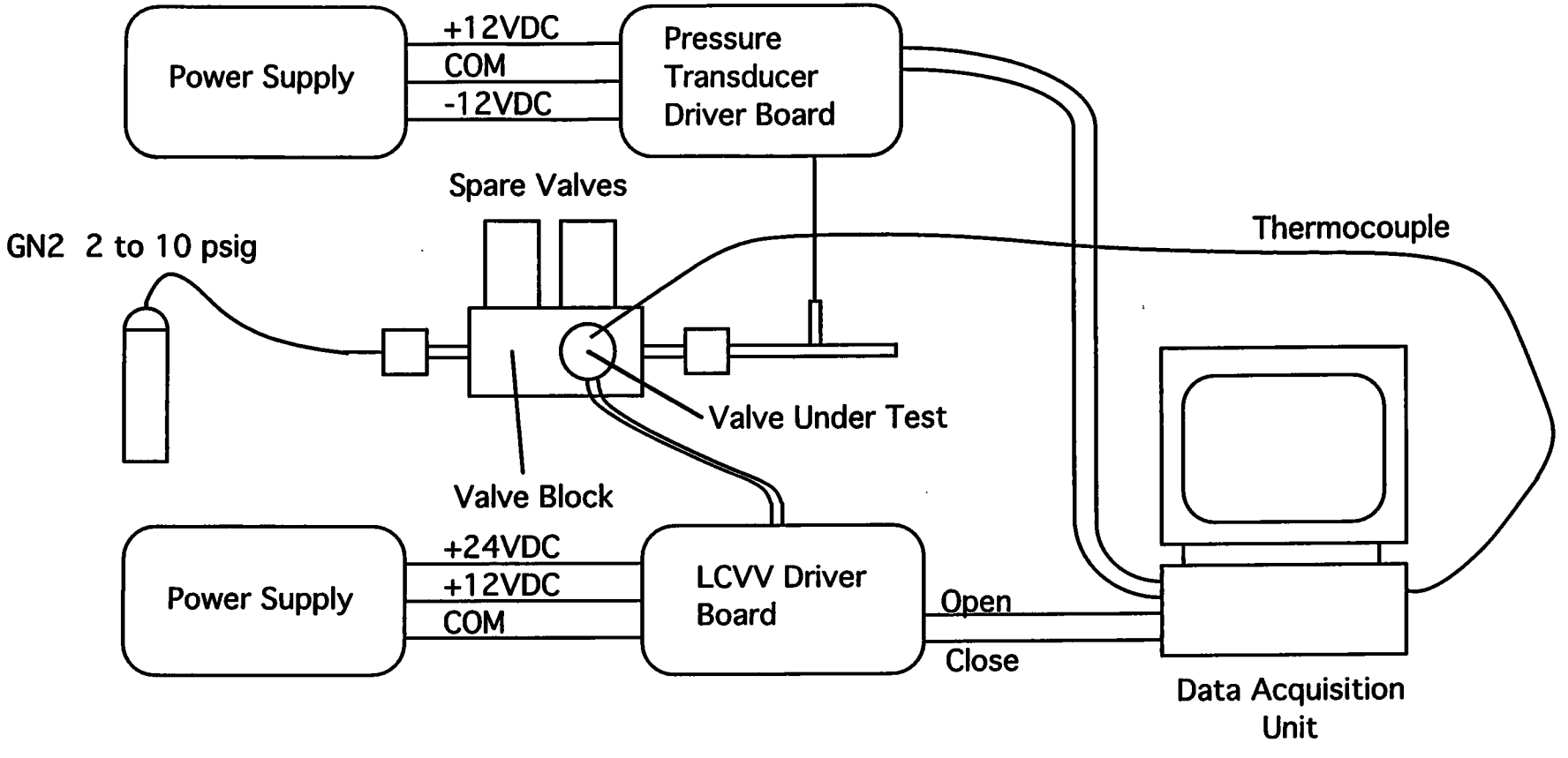

Figure 2. Ambient Temperature Test Configuration

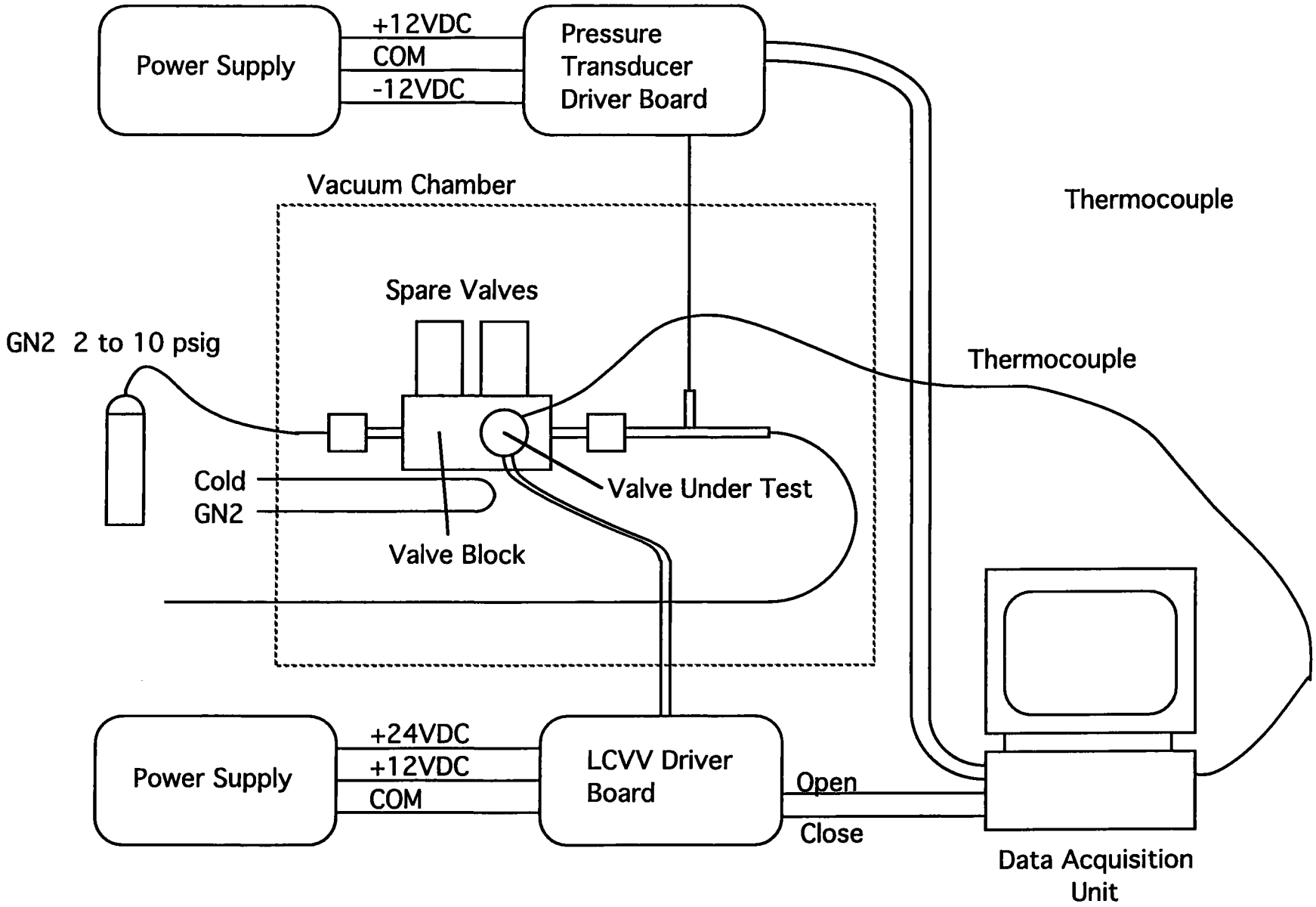

Figure 3. -60°C Temperature Test Configuration

APPENDIX A

PROCEDURE HISTORY SHEET

SERIAL NO._____

ITEM	DATE	PARA	ENTRY	ORIG.	QUAL. VERIFY.	QUAL. ACCEP.

This Procedure History Sheet Contains Items _____ thru _____.

Q_____

TEST CONDUCTOR _____ DATE_____

QUALITY _____ DATE_____

ENGINEERING (A/R) _____ DATE_____

QUALITY ENG. (A/R) _____ DATE_____

CUSTOMER (A/R) _____ DATE_____

TEST LEAD _____ DATE_____