CHAPTER 8

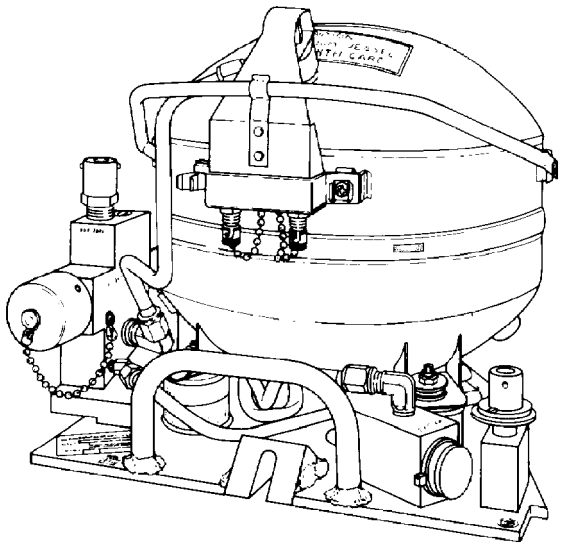
LIQUID OXYGEN CONVERTER ASSEMBLY

TYPE GCU-( )/A, P/N 3263004-0201

Section 8-1. Description

8-1. GENERAL.

8-2. The Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, is manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99251). The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewmember during flight (figure 8-1). Table 8-1 contains the leading particulars for the converter assembly.



008001

Figure 8-1. Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201

Table 8-1. Leading Particulars

Capacity (LOX) 3263004-0201	5 liters
Operating pressure	55 to 90 psig
Operating temperature range	-65°F (-54°C) to +260°F (+127°C)
Relief valve setting	100 to 120 psig
Pressure Control valve setting	55 to 90 psig
Delivery rate	120 lpm (min)
Filling time at 70°F	10 min
Buildup time (max)	5 min

8-3. Oxygen in its liquid state (approximately -297°F (-182°C)), is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated, creating a vacuum which prevents the transmittal of heat through the space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

8-4. CONFIGURATION.

8-5. The Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, consists of a container assembly, combination valve with relief valve incorporated, pressure closing valve, and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the container assembly. The quantity gage indicates the amount of LOX contained in the converter.

8-6. FUNCTION.

8-7. The operational characteristics and performance for which the GCU-( )/A converter assembly (P/N 3263004-0201) is designed are as follows:

1. The converter is filled by attaching the LOX servicing trailer filler valve to the filler port of the combination valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the combination valve. This automatically puts the converter into the fill mode (figure 8-2).

2. With the poppet depressed, the fill and vent ports of the combination valve are opened and the buildup port is closed. This condition allows gas pressure built up in the inner container to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure 30 psig), flows through the combination valve and into the converter.

3. As the LOX level rises in the container, pressure created by vaporization of liquid due to heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line coupling assembly.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the combination valve return to the extended position (figure 8-3). This automatically puts the converter into the buildup and supply mode. In this mode the fill and vent ports are closed and the buildup port is open.

5. In the buildup and supply mode, LOX is forced out of the bottom of the inner container and into the buildup coil by the weight of the liquid (figure 8-3). As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply coupling assembly and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the combination valve to the upper portion of the pressure closing valve. A bellows, inside the pressure closing valve, holds the valve in the open position. As pressure builds, the bellows senses the increase, contracts (at approximately 75 psig), and closes the valve.

8. If no demand is placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewmember, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the buildup coil passes through the valve and into the top of the converter. This pressure, coupled with the pressure created by vaporizing LOX contained in the converter, again builds to approximately 75 psig and closes the pressure closing valve. This process is repeated as long as a demand is placed on the converter.

10. A heat exchanger is incorporated into the aircraft tubing to further warm the gaseous oxygen to a breathable temperature.

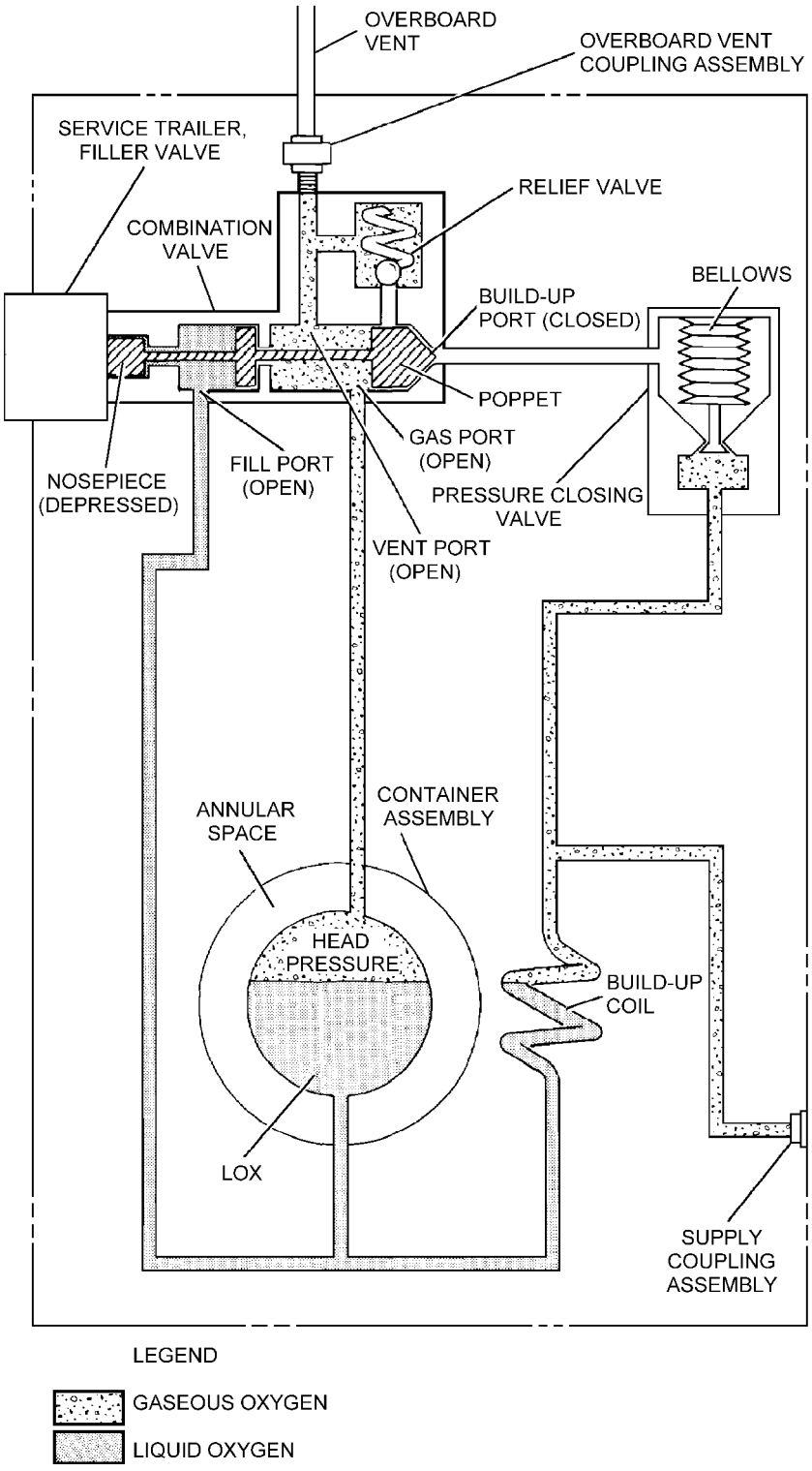
11. An additional relief valve, set at approximately 115 psig is installed in the aircraft oxygen plumbing to provide additional protection against over-pressurization of the converter and supply lines of the system.

8-8. SERVICE LIFE.

8-9. Liquid oxygen converters shall remain in service as long as they continue to function properly.

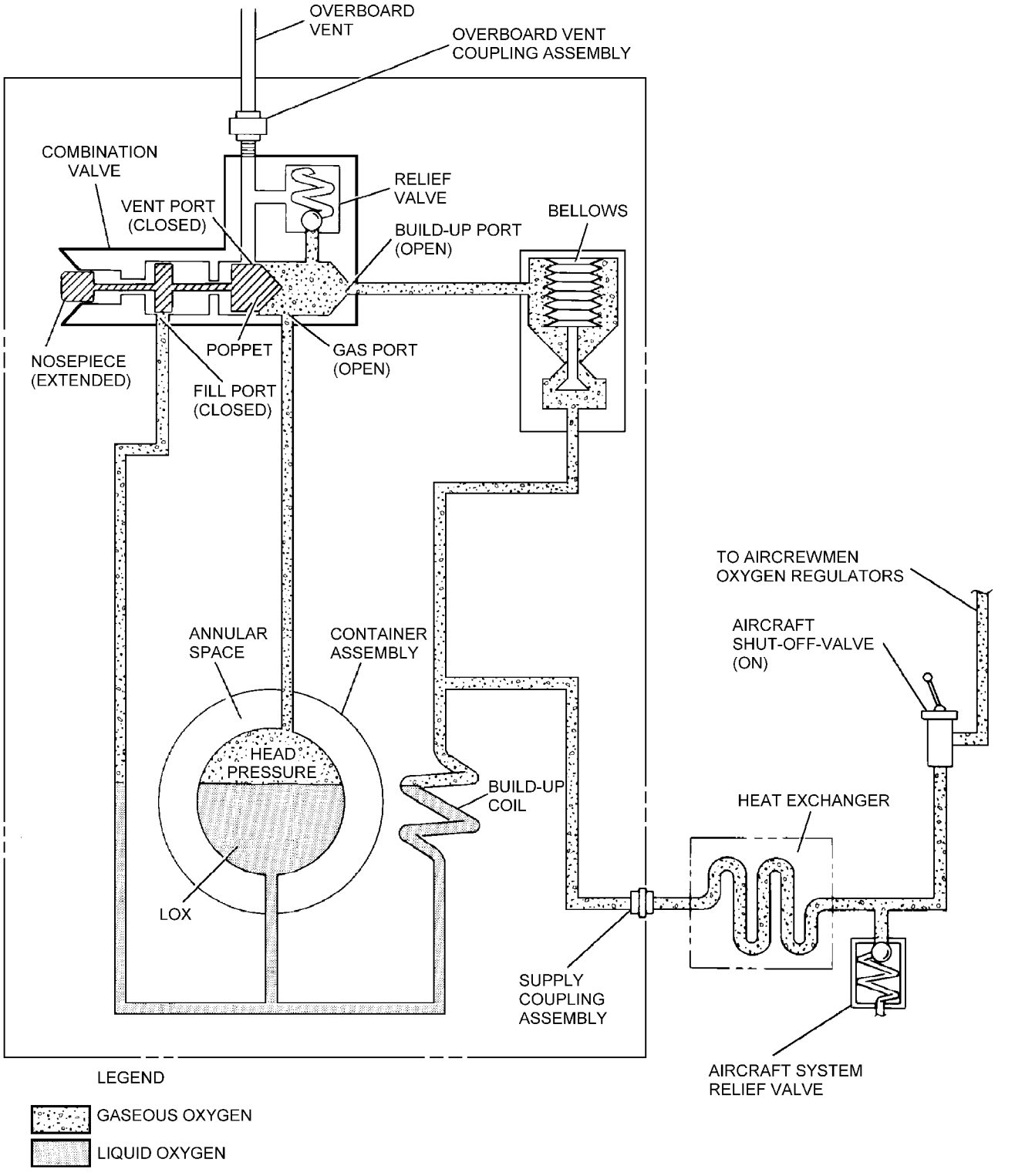
8-10. REFERENCE NUMBERS, ITEMS, AND SUPPLY DATA.

8-11. Section 8-5, Illustrated Parts Breakdown, contains information on the converter assembly, subassemblies, and component parts. Figure and index numbers, reference or part numbers, description, and units per assembly are provided with the breakdown.



008002

Figure 8-2. Fill Mode (Converter Removed from Aircraft)



008003

Figure 8-3. Buildup and Supply Mode (Converter Installed)

Section 8-2. Modifications

8-12. GENERAL.

8-13. There are no modifications to the GCU-( )/A, P/N 3263004-0201 required/authorized at this time.

Section 8-3. Performance Test Sheet Preparation

8-14. GENERAL.

8-15. Preparation of the Liquid Oxygen Converter Performance Test Sheet utilized during the bench test requires entering the appropriate indicated flows and pressures in the spaces provided (figure 8-4). The indicated flows and pressures shall be extracted from the test stand calibration correction cards. See appropriate ground support equipment manual.

8-16. The test stand calibration correction cards contain all actual flows and pressures required to test all known models of liquid oxygen converters presently in service. Converting actual flows and pressures to indicated flows and pressures is normally accomplished during calibration of the test stand. Refer to appropriate ground support equipment manual for calibration intervals.

8-17. The Performance Test Sheets shall be prepared as shown in figure 8-4. The Performance Test Sheet shown is a sample but can be reproduced for local use.

8-18. The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards:

1. Converter Leakage Test
2. Relief Valve Test
3. Fill and Buildup Time Test
4. Flow Test
5. Converter Charge

NOTE

For correction card numbers refer to appropriate ground support equipment manual.

8-19. CONVERTER PERFORMANCE TESTS.

8-20. CONVERTER LEAKAGE TEST. The Converter Leakage Test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

8-21. RELIEF VALVE TEST. The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 100 psig applied is 0.01 lpm. Make the following entries on the Performance Test Sheet:

1. Locate indicated inches of water (inH_2O) for 100 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 95, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

3. Locate indicated inH_2O for actual flow of 0.01 lpm on correction card number 7. Enter indicated inH_2O in space provided on Performance Test Sheet.

PERFORMANCE TEST SHEET
TYPE GCU-29/A LIQUID OXYGEN CONVERTER ASSEMBLY
(BENDIX CORPORATION P/N 3263004-0201)

DATE: _____ CONVERTER SERIAL NO: _____ TEST STAND SERIAL NO: _____

OPERATOR: _____ CDI: _____ TARE WEIGHT: _____

1. CONVERTER PURGE (PURGE 30 MINUTES AT 200°F (93°C) TO 250°F (121°C) AND AT 120 PSIG).

2. INSULATION RESISTANCE TEST (EMPTY).

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) _____

4. RELIEF VALVE TEST

VENT FLOW						LEAKAGE					
INLET PRESS (PSIG)			FLOW			INLET PRESS (PSIG)			FLOW		
ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING	ACTUAL	INDICATED	PG-1 READING	ACTUAL (LPM)	INDICATED (INH_2O)	PG-2 READING
100			100			95			0.01		
120											

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = _____ PSIG INDICATED, WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CONTROL VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST

A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) _____

B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 55 TO 90 PSIG IS 5 MINUTES) PSIG ACTUAL = _____ PSIG INDICATED TIME REQUIRED FOR BUILUP _____ MINUTES.

7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
2.33 X W + 64.0 = C (MAX)	
2.25 X W + 63.0 = C (MIN)	
READING	
C = CAPACITANCE IN UUF W = WEIGHT OF LOX IN POUNDS	

Figure 8-4. Converter Performance Test Sheet (Sheet 1 of 2)

8. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 90 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		PG-2 READING
ACTUAL	PG-1 INDICATED	ACTUAL	INDICATED	
55		120		
90				

9. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

   NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

   A. START TIME _____ START WEIGHT _____

   B. FINISH TIME _____ FINISH WEIGHT _____

10. EVAPORATION LOSS TEST (VENTED MODE)
    MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

    A. START TIME _____ START WEIGHT _____

    B. FINISH TIME _____ FINISH WEIGHT _____

11. CONVERTER CHARGE (OXYGEN)

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 8-4. Converter Performance Test Sheet (Sheet 2 of 2)

8-22. FILL AND BUILDUP TIME TEST. The time required to fill the converter (5 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

8-23. The time required for the filled converter to build up a working pressure of 55 to 90 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual psig pressure on correction card number 2. Enter indicated psig in space provided on Performance Test Sheet.

8-24. FLOW TEST. The converter shall be capable of delivering gaseous oxygen at the rate of 120 lpm while maintaining pressure of 55 to 90 psig. Make the following entries on the Performance Test Sheet:

1. Locate indicated inH_2O for actual flow of 120 lpm on correction card number 4. Enter indicated inH_2O in space provided on Performance Test Sheet.

2. Locate indicated psig for actual pressures of 55 to 90 psig on correction card number 2. Enter actual psig in spaces provided on Performance Test Sheet.

8-25. CONVERTER CHARGE. Upon completing the Bench Test, the converter shall be emptied of LOX and pressurized with gaseous oxygen 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate indicated psig for actual pressures of 25 and 30 psig on correction card number 2. Enter indicated psig in spaces provided on Performance Test Sheet.

Section 8-4. Maintenance

8-26. GENERAL.

8-27. This Section contains the procedural steps for the inspection, testing, troubleshooting, disassembly, cleaning, repair, assembly, and adjusting of the Liquid Oxygen Converter Assembly, Type (GCU-( )/A, (P/N 3263004-0201).

NOTE

Upon completion of any maintenance action (e.g., inspection, repair, modification, etc), be sure to complete the required Maintenance Data Collection System forms.

8-28. EMERGENCY PRESSURE RELIEF PROCEDURES. When filling the converter, or at anytime, if any of the following situations are encountered: Heavy frosting, icing, or excessive pressure buildup (in excess of 130 psig), perform the following immediately.

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 8-6

Support Equipment Required (Cont)

Quantity	Description	Reference Number
1	Line, Drain, Port, Vent	Fabricate IAW figure 8-7
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8

WARNING

LOX in a non-vented container will build to 12,000 psig. Converters however, will explode at approximately 1,200 psig.

Do not attempt to relieve pressure in LOX converters that indicate critical over-pressurization (figure 8-5). For these converters comply with procedures as prescribed in the individual station/ships emergency procedures bill.

1. Attach pressure gage/relief valve test fixture (figure 8-6) to supply quick-disconnect coupling (17).

2. Attach vent port drain line (figure 8-7) to converter vent port coupling (34). Ensure vent port drain line faces away from operator.

3. Ensure adapter knurl knob is backed out counterclockwise.

WARNING

When performing step 4, if excessive pressure does not relieve through vent port drain line, immediately comply with procedures as prescribed in the individual station/ships emergency procedures bill.

4. Install adapter to the fill port of fill, buildup, and vent valve (35) and relieve pressure from the converter by turning the knurl knob of the adapter clockwise four full turns (this places the converter in the vented mode).

5. Observe the pressure gage/relief valve test fixture until 70 psig is indicated.

6. Remove pressure gage/relief valve test fixture and adapter.

WARNING

When performing step 7, if LOX fails to drain from the converter, disconnect LOX converter drain line, attach adapter to fill, buildup, vent valve (34) and turn knurl knob clockwise 4 full turns. (Organizational Level transport defective converter to AIMD immediately).

7. Immediately place converter in a LOX drain pan, attach LOX converter drain line (figure 8-8) to supply quick-disconnect coupling (40) and drain LOX from the converter.

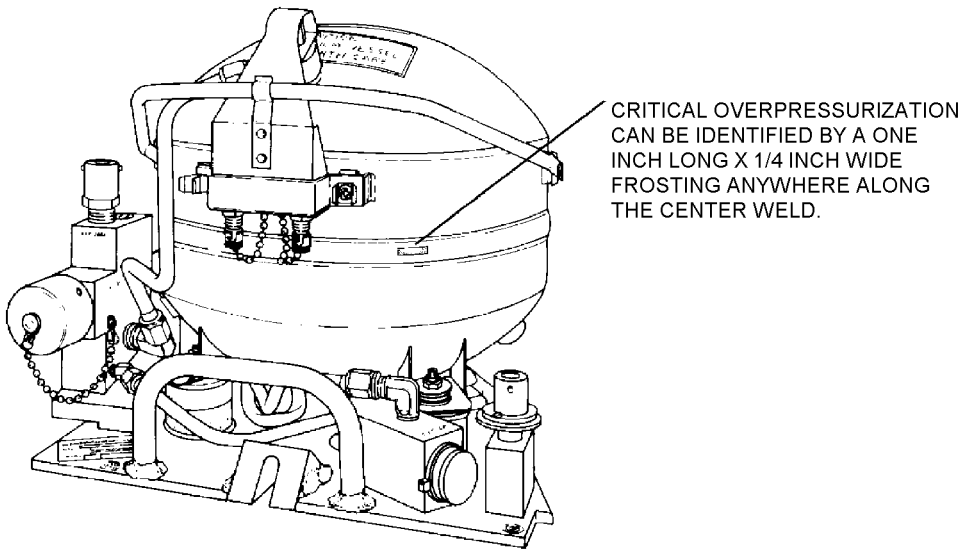
8. Organizational Level forward the defective LOX converter to AIMD for Bench Test.

8-29. INSPECTION.

WARNING

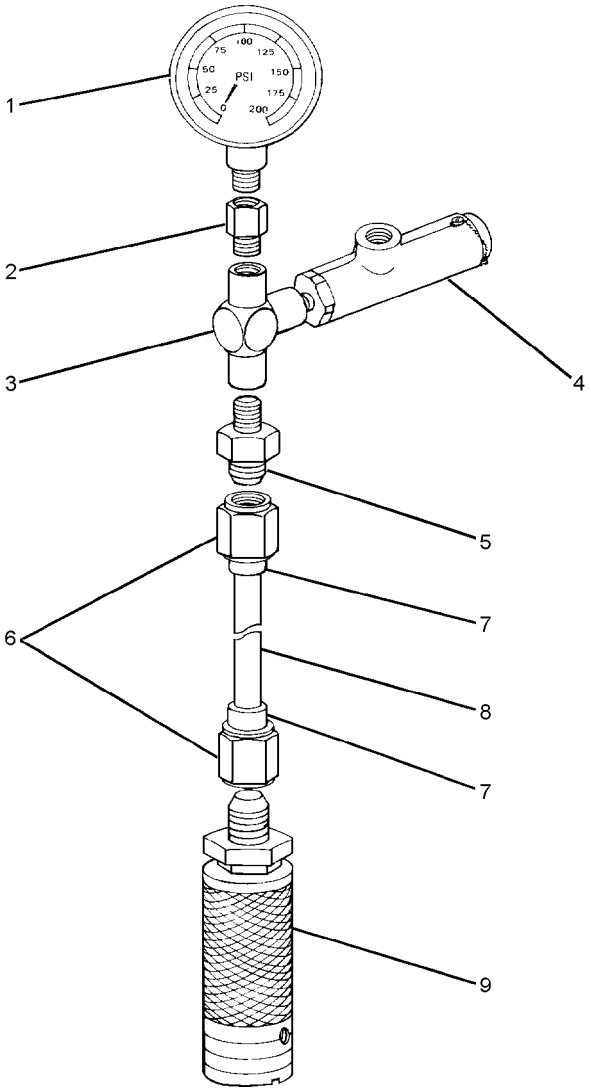
At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical overpressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

8-30. ACCEPTANCE/TURNAROUND/DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS. The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a Visual Inspection followed by a Functional Test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the converter is installed. Refer to table 8-2 for troubleshooting assistance.



008005

Figure 8-5. Critically Overpressurized Bendix LOX Converter, P/N 3263004-0201

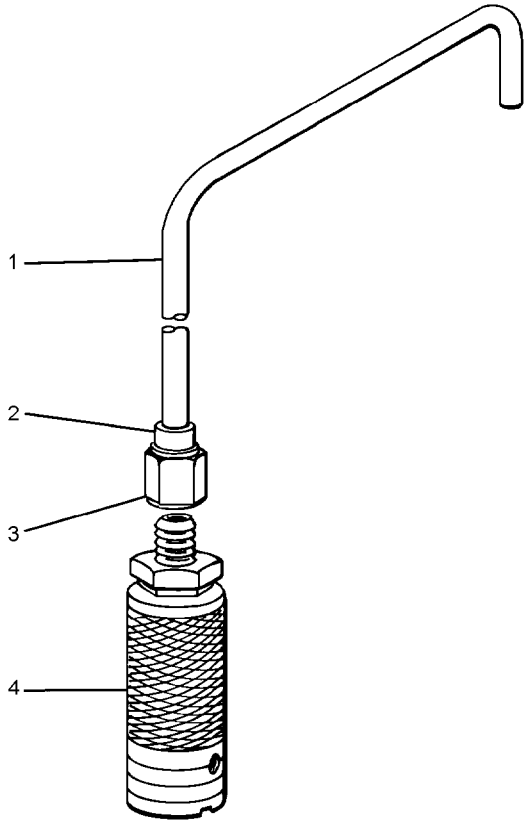


ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	200 PSIG Oxygen Gage	P/N 100204-18 (CAGE 42527) NIIN 00-961-1990	Anti-seize tape required (Note 1)
2	1/4 to 1/8 in. Reducer, Pipe	P/N 3200X4X2 (CAGE 79470)	Anti-seize tape required
3	Pipe Tee	AN917-1	—
4	Relief Valve	P/N 20C-0005-20 (CAGE 19062) MIL-V-9050D P/N 20C-0050-2	Adjust to relieve at 135 ±5 psig and flow a minimum of 100 lpm. (Note 1) Anti-seize tape required
5	Male Connector	AN816-5D	Anti-seize tape required
6	Tubenut	AN818-5	2 required
7	Tube Sleeve	MS20819-5	2 required
8	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut length 2 1/2 to 3 1/2 in.
9	Supply Quick-disconnect Coupling	MS22608-7 P/N 199000-1 (CAGE 83533)	—

Notes: 1. The Pressure Gage/Relief Valve Test Fixture shall be forwarded to AIMD for relief valve setting, flow test, and leakage test (same as converter relief valve test only higher setting). The 200 PSI Oxygen Gage shall be calibrated in accordance with the metrology and calibration (METCAL) program.

008006

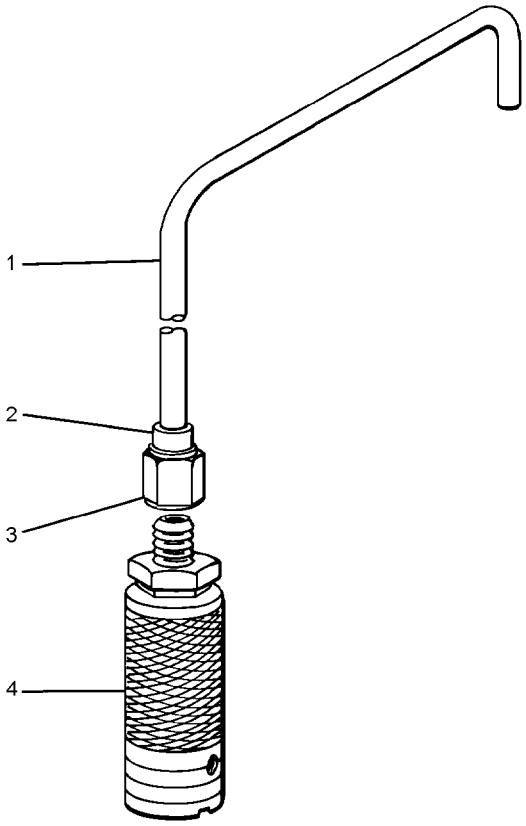
Figure 8-6. Pressure Gage/Relief Valve Test Fixture



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (1/2 O.D. Dia)	—	Cut to 14-inches; bend as shown above
2	Tube Sleeve Coupling	MS20819-8	—
3	Tubenut	AN818-8	—
4	Half Coupling Quick-disconnect	2560000-1 (CAGE 83533)	—

008007

Figure 8-7. Vent Port Drain Line



ITEM NO.	DESCRIPTION	REFERENCE NUMBER	ASSEMBLY INSTRUCTIONS
1	Flared Aluminum 6061-T6 Tube (5/16″ O.D. Dia)	—	Cut to 14-inch length; bend as desired
2	Tube Sleeve	MS20819-8	—
3	Tubenut	AN818-5	—
4	Quick-disconnect Coupling	MS22068-7 P/N 199000-1 (CAGE 83533)	—

008008

Figure 8-8. LOX Converter Drain Line

Table 8-2. Troubleshooting (Acceptance/Turnaround/Daily/Preflight/ Postflight and Transfer Inspections)

Trouble	Probable Cause	Remedy
Converter will not fill.	Ice in filler valve or filler obstructs LOX flow.	Thaw filler valve or filler line.
Converter does not fill in required time.	Filler line not properly purged prior to filling.	Purge and cool filler line.
	Converter not sub-cooled before filling.	Lower pressure in servicing trailer and sub-cool converter.
	Filling pressure too low.	Set fill pressure in accordance with servicing trailer operating instructions.
	Defective converter.	Replace converter with RFI converter.
Frost collects on entire outer jacket of converter.	Heat loss due to annular space leakage.	Replace converter with RFI converter.
Converter will fill only partially (gas only emitted from vent).	Converter not sub-cooled prior to filling.	Lower pressure in servicing trailer and sub-cool converter.
System will not build up.	Combination valve defective or partially open.	Replace converter, or thaw valve.
	Pressure relief valve open.	Replace converter with RFI converter.
Oxygen supply consumed too quickly.	Converter not completely filled during filling operation.	Refill converter.
	System leakage.	Locate and repair leaks.
	Combination valve partially open, venting gas.	Replace converter with RFI converter.
Filler line cannot be disconnected from filler valve.	Filler nozzle frozen to filler valve.	Thaw nozzle.
Low, or no system pressure.	System leakage.	Locate and repair leaks.
	Pressure closing valve out of adjustment.	Replace converter with RFI converter.
Quantity gage indicates empty.	System empty; defective probes or gage.	Refill converter; replace converter or gage.
LOX system contaminated.	Undesirable odors, or moisture.	Purge system.

NOTE

Charge the converter in accordance with paragraph 8-53; ensuring strict compliance with all steps, especially steps 5 and 6.

8-31. Any liquid oxygen converter which does not pass the visual inspection or functional test shall be removed from the aircraft, drained immediately, and replaced by a Ready For Issue (RFI) liquid oxygen converter. To drain the liquid oxygen converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8

NOTE

If no LOX converter drain line is available, fabricate one in accordance with figure 8-8.

1. Place converter in LOX drain pan in an area free from dirt and hydrocarbons.

WARNING

Ensure that draining LOX is directed away from all personnel.

2. Attach drain line to converter supply quick-disconnect coupling, which will immediately begin draining the converter.

3. Notify Maintenance Control for action to be taken.

8-32. Visual Inspection. Visually inspect the converter assembly and surrounding area for the following:

WARNING

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any other combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

1. Freedom from dirt and hydrocarbons.

2. Correct installation and positioning of all components.

3. Legibility of all markings.

4. Cracks, dents, or other damage to tubing, valves, and electrical connections.

5. Corrosion on converter assembly and surrounding areas.

6. Obstructions in aircraft overboard vent line.

7. Security of supply, vent, and electrical quick-disconnects.

8. Excessive frosting and/or constant venting of converter assembly.

9. Current date (within last 231 days) on converter bench test decal.

8-33. Functional Test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

NOTE

The Functional Test should also be performed whenever a component of the aircraft oxygen system is removed/replaced.

1. Ensure all fuses associated with the LOX quantity indicating system are operational.

NOTE

Refer to applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) low warning light should illuminate.

2. Ensure electrical power is on. Check quantity gage and low warning light for proper operation.

3. Ensure oxygen shutoff valve is in the OFF position.

4. Attach an oxygen mask, regulator, and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

5. Turn oxygen shutoff valve to the ON position. Ensure regulator is in the 100% oxygen position. There should be a flow of oxygen through the mask.

NOTE

Resistance during exhalation is due to the positive pressure feature of the regulator.

6. Place mask against face and breathe. There should be a slight resistance during exhalation.

7. Upon completion of Functional Test, turn oxygen shutoff valve to OFF. Disconnect regulator-to-seat kit hose from aircraft supply connection.

8-34. If discrepancies are found or suspected, Maintenance Control shall be notified.

8-35. Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components. Forward defective components to AIMD for Bench Test.

8-36. CALENDAR INSPECTION. The Calendar Inspection shall be performed on all liquid oxygen converters that incorporate a quick-disconnect mounting plate prior to placing in service and at intervals not exceeding 231 days thereafter. This interval applies to all converters: aircraft-installed, shop spares, and those maintained in a servicing pool.

8-37. The Calendar Inspection consists of a Visual Inspection followed by a Bench Test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the affected part or parts. After repair, repeat the Bench Test.

NOTE

Liquid oxygen converters new from supply, manufacture, or from NARF overhaul do not require the bench test decal. The bench test decal shall be placed on the converter by the local AIMD when the converter is placed in service and after each Bench Test.

8-38. Visual Inspection. Inspect the converter assembly in accordance with table 8-3.

8-39. Liquid oxygen converters failing the Visual Inspection or Bench Test (paragraph 8-40) shall be repaired if specific repair is authorized. SM&R codes define repairable components and levels of maintenance authorized to perform repairs. Further explanation is found in Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 Series.

8-40. BENCH TEST.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any other combustible material. Fire or explosion can result when even slight traces of combustible material come in contact with oxygen under pressure.

Prior to use, inspect leak detection compound. Compound which is not clear and free from suspended material/sediment is considered contaminated and shall be disposed of. Compound exhibiting peculiar odors such as acetone or alcohol is considered contaminated and shall be disposed of.

When using leak detection compound carefully avoid getting it on Probe Wire connections as moisture will cause incorrect capacitance/insulation reading.

NOTE

Tests are arranged so that they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables are provided following each test.

Some in service liquid oxygen converter test stands that bear part numbers other then those mentioned in paragraph 8-41 still exist. Use of these test stands is authorized if they are capable of monitoring converter performance as specified in the Bench Test.

Table 8-3. Visual Inspection of the Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-12.			
Identification and performance plates.	-52 and -54	Legibility, condition and security.	Secure in place or replace.
Warning and bench test decals.	-51 and -53	Presence and condition.	Replace or apply as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -46	Cracks, dents, nicks, scratches, twists, and proper clearance. Damaged connectors and tube nuts.	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance from other converter components.
Elbows and nipples.	All.	Cracks, dents and scratches.	Replace.
Male coupling assemblies.	-34 and -40	Visible damage.	Replace.
Shock mounts and cup-shock pads.	-29, -30, and -32	Security and condition.	Replace.
Combination valve.	-35	Cracks, damaged poppet valve or nosepiece, or worn helical grooves.	Replace.
Clamps.	-47	Security and condition.	Tighten or replace.
Pressure closing valve.	-44	Cracks or other visible damage.	Replace.
Mounting pad assembly.	-50	Cracks, broken welds, or other visible damage.	Replace damaged components.
Container assembly.	-9	Excessive dents, chipped paint, or other damage.	Refer to paragraph 8-64 for size of acceptable dents. Restore finish by painting (paragraph 8-64).
Converter assembly.	No Index.	Freedom from dirt, hydrocarbons, and corrosion.	Clean (paragraph 8-60) and/or refinish (paragraph 8-64).

8-41. The Bench Test shall be performed using Liquid Oxygen Converter Test Stand P/Ns 59A120, 31TB19951, 1455AS100-1, or 31TB1995-4. Refer to appropriate ground support equipment manual for identification of test stand controls and indicators referenced in Bench Test procedures. Do not attempt to perform any Bench Test without first becoming thoroughly familiar with the test stand (refer to appropriate ground support equipment manual). Utilize Performance Test Sheet (figure 8-4) when performing Bench Test.

8-42. TARE WEIGHT. To find the Tare Weight of the complete converter assembly, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

Tare Weight is the weight of the complete converter assembly less the weight of the LOX.

1. Ensure that all LOX has been removed from converter.

2. Place converter assembly on scale of at least 50-lb capacity. Record weight in space provided on Performance Test Sheet.

8-43. CONVERTER ASSEMBLY PURGE. To purge the converter assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2 ea	Cap Assembly	AN929-5
1	Coupling, Quick-disconnect, Half	256000-1 MS22068-8 (CAGE 83533)
1	Expander, Thread, Screw, Bushing	AN894-8-4
1	Line, Drain, Converter, LOX	Fabricate IAW figure 8-8
1	Purging Unit, Gas/LOX, Model A/M26M-3	3447AS100-1

WARNING

Use only oil-free nitrogen for purging LOX converters.

Purging unit model A/M26M-3 has two specially designed 3500 psig nitrogen cylinders. Do not substitute these cylinders with other nitrogen cylinders such as NAN cart cylinders.

While operating purging unit model A/M26M-3, protective gloves must be worn by operator. Discharge fittings and hoses can reach temperatures that will cause burns if grasped with bare hands.

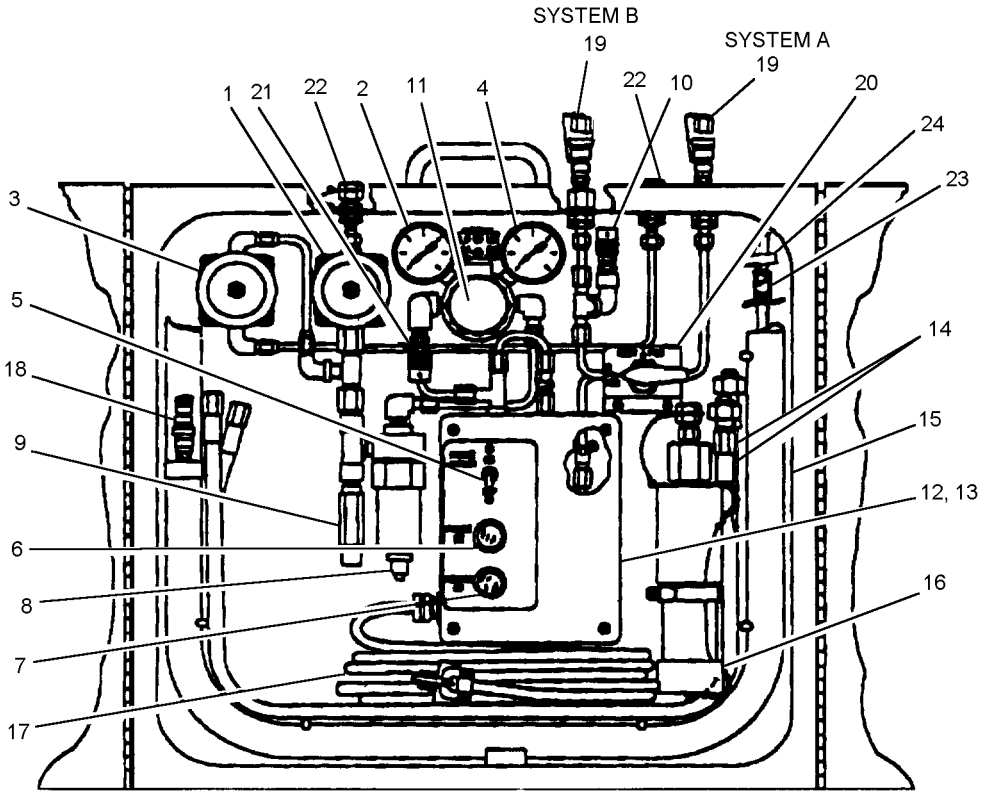
NOTE

Personnel operating purging unit model A/M26M-3 should be thoroughly familiar with all valves and controls prior to operating. Refer to appropriate support equipment manual. Personnel operating purging unit model A/M26M-3 shall be licensed in accordance with OPNAVINST 4790.2 series.

Liquid oxygen converters shall be emptied of all LOX and allowed to warm to ambient temperature prior to purging.

Index numbers in parentheses for LOX converter assembly, refer to figure 8-12.

Index numbers for purging unit model A/M26M-3, refer to figure 8-9.



Description	Function
1. Hand Shutoff Valve	Controls Supply Gas Flow
2. Low Pressure Gage	Indicates Delivery Gas Pressure (0-200 PSIG)
3. Hand Shutoff Valve	Controls Supply Gas Flow
4. High Pressure Gage	Indicates Supply Gas Pressure (0-4000 PSIG)
5. Power Switch	Master On/Off Switch/Circuit Breaker
6. Power On Light	Indicates Master Switch is On and Set is Operational
7. Heater On Light	Indicates Operation of Heater
8. Priority Valve	Stops Gas Flow When Supply Gas Pressure Falls Below 200 PSIG
9. Relief Valve	Relieves Supply Pressure Exceeding 3750 PSIG
10. Low Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 705 PSIG
11. Pressure Regulator Assembly	Regulates Pressure to 0-200 PSIG
12. Temperature Control Switch (Under Plate)	Cycles Off and On to Control Exit Gas
13. High Temperature Shutdown (Under Plate)	Shuts Off Heater when Heater Block Temperature Reaches 285°F
14. Supply Line	Connects Supply Cylinders to Housing Assembly
15. Insulated Hose Assembly	Connects Housing Assembly
16. Filler Valve	Connects Insulated Hose Assembly to Converter
17. Power Cable	Connects Unit to Electrical Power
18. Quick Disconnect	Connects Insulated Hose to 19 System A or B
19. Quick Disconnect	Connection for Insulated Hose to 19 System A or B
20. 3-Way Valve	Selects A or B Outlet Ports
21. High Pressure Relief Valve	Relieves Service Line Supply Pressure Exceeding 1355 PSIG
22. Supply Pressure Inlet	Connects Supply Line 14 to Purge Unit
23. B-Nut	Connects Insulated Hose to Filler Valve 16 or Adapter (Not Shown)
24. Adapter	Connects Insulated Hose to P-3 Aircraft Filler Port

008009

Figure 8-9. A/M26M-3 Purging Unit

1. Remove two supply lines (14) from purge unit cabinet. Connect one end of each supply line (14) to nitrogen supply cylinders and the other ends to the supply inlet connections (22) of purge unit.

2. Remove insulated hose (15) from purge unit cabinet. Connect quick-disconnect (18) of insulated hose (15) to system (A) quick-disconnect (19) of purge unit.

3. Screw boss to pipe fitting onto quick-disconnect coupling and attach to B-nut (23) of insulated hose (15).

4. Turn purge unit 3-way valve (20) to system (A) position.

5. Ensure power switch (5) is OFF.

6. Remove power cable (17) from purge unit cabinet and plug into 110 volt outlet.

7. Open both nitrogen supply cylinder valves.

8. Open hand shutoff valves (1) and (3). High pressure gage (4) will indicate nitrogen supply cylinder pressure.

9. Connect quick-disconnect coupling, attached to insulated hose (15), to LOX converter vent port of fill, build up, and vent valve (43).

10. Attach adapter to fill port of LOX converter fill, build up, and vent valve (43). Turn knurl knob of adapter clockwise until it seats, then back off counterclockwise two (2) full turns. This will place the fill, build up, and vent valve half way between the fill/vent and build up/vent modes.

11. Attach LOX converter drain lines (figure 8-8) to LOX converter supply quick-disconnect coupling (16).

12. Turn power switch (5) to ON position. Power on light (6) should illuminate.

13. Turn pressure regulator (11) clockwise until 120 psig is indicated on low pressure gage (2).

NOTE

For LOX converters that show indications of internal probe short, it may be necessary to purge the converter for a longer period of time when performing step 14.

14. Observe heater on light (7). When light cycles from on to off, purge the converter for 30 minutes, with a minimum discharge temperature of 90°F.

15. When purging is completed, turn purging unit power switch (5) to off.

16. Close nitrogen supply cylinder valves.

17. Observe low pressure gage (2) and high pressure gage (4) until they indicate 0 psig. Back out counterclockwise on pressure regulator (11).

18. Close hand shutoff valves (1) and (3).

19. Disconnect insulated hose (15) from LOX converter vent port fitting of fill, build up, and vent valve (43) and purging unit system (A) quick-disconnect (19).

20. Remove drain lines (figure 8-8) from LOX converter supply quick-disconnect coupling (16).

21. Remove adapter from filler port of fill, build up, and vent valve (43).

22. Stow all lines and accessories and secure from purging.

8-44. INSULATION RESISTANCE TEST (EMPTY). To perform the Insulation Resistance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Prior to proceeding, it should be noted that the minimum acceptable megohm readings have been changed as follows: between A to B, 2.0 megohms; between A to ground and B to ground, 1.0 megohm. These readings are acceptable as long as the converter passes the Capacitance Test (Empty) and Capacitance Test (Full).

1. Secure empty converter in rack provided on test stand counter top.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (16 and 17) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power switch ON and allow tester to warm up 10 minutes prior to proceeding.

4. Turn MEGOHMMETER RANGE SELECTOR to X-1 position.

5. Turn FUNCTION SELECTOR knob to A to B position. Record reading in space provided on Performance Test Sheet. Reading should not be less than 2.0 megohms.

6. Turn FUNCTION SELECTOR knob to A to GROUND and B to GROUND positions, respectively. Record readings in spaces provided on Performance Test Sheet. Readings shall not be less than 1.0 megohm in either position.

NOTE

If insulation resistance readings are within the minimum acceptable megohm requirements, proceed to Capacitance Test (Empty).

NOTE

If insulation resistance readings are less than the minimum acceptable megohm requirements, moisture may still be present in container assembly. Proceed to step 7.

7. Purge converter in accordance with paragraph 8-43 and repeat Insulation Resistance Test (Empty).

NOTE

Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

8. Leave all connections unchanged.

8-45. CAPACITANCE TEST (EMPTY). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Turn CAPACITANCE RANGE SELECTOR knob to X-10 position.

2. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

3. Record reading in space provided on Performance Test Sheet. Reading shall be 62.5 to micromicrofarads (μμF).

NOTE

If reading is acceptable, proceed to step 5. If reading is not within 63.0 to 64.0 micromicrofarads, moisture may still be present within the container assembly. Proceed to step 4.

4. Purge converter in accordance with paragraph 8-43, and repeat Capacitance Test (Empty).

NOTE

Converter assemblies that fail the Capacitance Test and cannot be corrected by purging shall be forwarded to the next higher maintenance repair facility.

5. Secure power to tester and disconnect test stand cable assembly from converter and test stand.

8-46. CONVERTER LEAKAGE TEST. To perform the Converter Leakage Test, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Fitting, Tee	MS20825-5D
1	Hose Assembly, Stand, Test	59A120-B5-14
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 8-12.

Converters which have been previously bench tested using these procedures have a tee fitting and cap assembly installed in place of the elbow (7). If so, proceed to step 3.

1. Disconnect tube nut of manifold assembly (46) attached to elbow (7). Remove elbow (7) and install a tee fitting into elbow (8).

2. Connect tube nut of manifold assembly (46) to tee fitting installed in step 1.

3. Using test stand hose assembly connect test stand BELL JAR BOTTOM COUPLING (C-1) to tee fitting.

4. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

5. Slowly opening OXYGEN SUPPLY valve (V-6) apply 95 psig, as indicated on TEST PRESSURE gage (PG-1) to converter.

6. Maintain 95 psig and inspect for leakage at all connections using leak detection compound. There is no allowable leakage. If leakage is indicated, locate probable cause using troubleshooting table (table 8-4).

7. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

8-47. RELIEF VALVE TEST. To perform the Relief Valve Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cap, Tube	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-14
1	Hose Assembly, Stand, Test	59A120-B5-52
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

Table 8-4. Troubleshooting (Converter Leakage Test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking.	Loose connection.	Tighten connection.
Elbow or nipple fitting leaking.	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose.	Tighten or replace fitting(s).
Tubing leaking.	Dents, kinks, deep scratches, twisted tubing, improperly flared ends, or damaged connectors.	Replace tubing.

NOTE

Index numbers in parentheses refer to figure 8-12.

1. Ensure that test stand hose assembly (P/N 59A120-B5-14), connecting BELL JAR BOTTOM COUPLING (C-1) to tee fitting, is in place.

2. Using test stand hose assembly (P/N 59A120-B5-52), connect converter vent coupling assembly to test stand FLOWMETER connection (NIP-4).

3. Turn FLOWMETER SELECTOR valve (V-1) to the 0-150 lpm position. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

Open OXYGEN SUPPLY valve (V-6) slowly, and observe TEST PRESSURE gage (PG-1), and FLOWMETER INDICATOR gage (PG-2) when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Slowly open OXYGEN SUPPLY valve (V-6) until 100 lpm flow is indicated on FLOWMETER INDICATOR gage (PG-2).

5. With a 100 lpm indicated on FLOWMETER INDICATOR gage (PG-2), reading on TEST PRESSURE gage (PG-1) shall be 100 to 120 psig. Record reading from TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2) on Performance Test Sheet.

6. Using OXYGEN SUPPLY valve (V-6) and SYSTEM BLEED valve (V-5), reduce pressure applied to converter to 95 psig as indicated on TEST PRESSURE gage PG-1.

7. Disconnect test stand hose (P/N 59A120-B5-52) from FLOWMETER connection (NIP-4).

CAUTION

When attaching test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1) attach slowly while observing FLOWMETER INDICATOR gage (PG-2). Excessive relief valve leakage could damage FLOWMETER INDICATOR gage (PG-2).

8. Turn FLOWMETER SELECTOR valve (V-1) to the 0.0-0.25 position and slowly connect test stand hose (P/N 59A120-B5-52) to FLOWMETER connection (NIP-1).

9. While maintaining 95 psig to the converter with OXYGEN SUPPLY valve (V-6), check for leakage indicated on FLOWMETER INDICATOR gage (PG-2). Maximum allowable leakage is 0.01 lpm. Record reading on Performance Test Sheet.

10. If leakage is excessive or if relief valve fails to vent at required flow and pressure, locate probable cause using troubleshooting table (table 8-5).

Table 8-5. Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relieving above 120 psig.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relief valve fails to vent 100 lpm.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Leakage in excess of 0.01 lpm.	Relief valve out of adjustment.	Adjust relief valve (refer to paragraph 8-70, step 21).
Relief valve cannot be adjusted to tolerances.	Defective parts.	Replace defective parts.

11. Close OXYGEN SUPPLY valve (V-6). Bleed test stand using SYSTEM BLEED valve (V-5). Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

12. Disconnect test stand hose assemblies from converter and from test stand.

NOTE

The tee fitting which was installed in paragraph 8-46 shall be left on the converter to provide a test port for Bench Test procedures.

13. Cap tee fitting, using a tube cap.

14. Remove converter assembly from test stand.

8-48. FILL AND BUILDUP TIME TEST. To perform the Fill and Buildup Time Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Fixture, Test, Valve, Gage/Relief, Pressure	Fabricate IAW figure 8-6
1	Line, Drain, Port, Vent	Fabricate IAW figure 8-7

WARNING

Because of the extremely low temperature of LOX, use extreme care at all times when handling LOX. Ensure prescribed protective clothing is worn and all safety precautions are observed (Chapter 3).

Ensure venting LOX is directed away from all personnel in the area.

NOTE

Personnel servicing LOX converters and operating LOX transfer equipment shall be qualified and licensed in accordance with OPNAVINST 4790.2 Series.

To perform this test, it will be necessary to take the converter to a LOX servicing area or to use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method that meets the requirements of the test and does not violate safety precautions outlined in Chapter 3 is acceptable.

1. Connect the converter to the servicing trailer.

NOTE

If servicing trailer being used is not the closed loop type, attach a vent port drain line (figure 8-7) to the vent port coupling (34). Ensure vent port drain line is attached to route, venting LOX away from all personnel.

2. Note the time, and fill the converter, following applicable instructions for specific ground support equipment servicing trailer being used.

3. When converter is full, note the time. Time required to fill the converter shall not exceed 10 minutes. Record the fill time in space provided on Performance Test Sheet.

4. Note the time and disconnect and secure the servicing trailer, (remove vent port drain line if installed). Time noted is beginning of Fill and Buildup Time Test.

NOTE

The test pressure gage relief valve test fixture shall be forwarded to the Intermediate Maintenance activity every 6 months for pressure gage calibration and relief valve adjustment and leakage test.

5. Immediately after servicing, attach pressure gage/relief valve test fixture (figure 8-6) to converter supply quick-disconnect coupling (16) and observe for 5 minutes; the following actions should occur:

a. The converter should begin to build head pressure as indicated on the pressure gage/relief valve test fixture. Initially the converter will build a pressure that will cause the LOX converter relief valve to relieve (110 to 120 psig). This action may occur twice.

WARNING

When performing step 5b, if pressure fails to stabilize, drain the LOX converter and forward to Intermediate Level maintenance.

b. After step 5a occurs, pressure indication on the pressure gage/relief valve test fixture should stabilize at LOX converter pressure closing valve setting of 55 to 90 psig (a slight fluctuation of 2 to 3 psig on the pressure gage/relief valve test fixture will be present).

6. Disconnect pressure gage/relief valve test fixture from supply quick-disconnect coupling.

7. If converter fails to build head pressure, converter relief valve fails to relieve between 110 to 120 psig, or converter fails to stabilize between 55 to 90 psig, refer to troubleshooting table (table 8-6).

8-49. CAPACITANCE TEST (FULL). To perform the Capacitance Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Cable Assembly, Stand, Test	59A120-B5-32-2
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

NOTE

This test requires simultaneous use of the 50-lb capacity scale and the quantity gage capacitance type tester incorporated in the test stand. Ensure that scale is positioned close to tester.

1. Place full converter on a scale of at least 50-lb capacity.

2. Using test stand cable assembly, connect converter probe assembly electrical connectors (16 and 17) to terminals marked A and B of liquid oxygen quantity gage capacitance type tester.

3. Turn power ON and allow tester to warm up 10 minutes before proceeding.

4. Turn CAPACITANCE RANGE SELECTOR knob to 10X position.

Table 8-6. Troubleshooting (LOX Converter After Servicing)

Trouble	Probable Cause	Remedy
Converter fails to build head pressure.	Converter fill, buildup, and vent valve failed to return to build-up and supply mode.	Foward converter to AIMD for purge or valve replacement and Bench Test. Drain converter by removing tube assembly (index number 6, figure 8-12). Place converter upside down in drain pan and allow to drain by gravity flow process.
Converter relief valve fails to relieve between 110 to 120 psig.	Converter relief valve out of adjustment or defective.	Forward converter to AIMD for relief valve adjustment or replacement and Bench Test.
Converter pressure continues to build and will not stabilize.	Converter pressure closing valve defective.	Forward converter to AIMD for pressure closing valve replacement and Bench Test.

5. Turn FUNCTION SELECTOR knob to CAPACITANCE (UUF) position.

6. Enter total weight of full converter in space provided on Performance Test Sheet.

7. Enter Tare Weight of converter in space provided on Performance Test Sheet.

NOTE

If the weight of the LOX in the converter is 24 lbs 4 oz, 24 lbs 8 oz, and etc.; the ounces must be converted to decimal.

Example

24 lb 4 oz = 24-4/16 lbs
24-4/16 lbs = 24.25 lbs

Enter 24.25 on the Performance Test Sheet.

8. Subtract Tare Weight of converter from total weight. Enter this figure on Performance Test Sheet. This is weight of LOX in converter.

9. Calculate the capacitance maximum (C-max) by multiplying the weight of the LOX (W) by 2.33, and adding 64.0 to the result (2.33(W) + 64.0 = C-max). Enter the result in the space provided on the Performance Test Sheet.

10. Calculate the capacitance minimum (C-min) by multiplying the weight of the LOX (W) by 2.25 and adding 63.0 to the result (2.25(W) + 63.0 = C-min). Enter the result in space provided on Performance Test Sheet.

11. Observe and record capacitance reading from test stand capacitance gage in space provided on Performance Test Sheet. Reading shall be between minimum and maximum established in steps 9 and 10.

NOTE

If capacitance reading is acceptable, proceed to step 14.

If capacitance reading is not within the calculated limits and the converter has not been purged in previous tests, moisture may be present within the container assembly. Proceed to steps 12 and 13.

12. Purge converter in accordance with paragraph 8-43.

13. Fill converter with LOX, and repeat Capacitance Test (Full).

NOTE

If capacitance reading is still not within the calculated limits, the converter shall be forwarded to the next higher maintenance repair facility.

14. Secure tester, and disconnect cable from converter and tester. If converter passes Capacitance Test proceed to flow test, paragraph 8-50.

8-50. FLOW TEST. To perform the Flow Test, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Hose Assembly, Stand, Test	59A120-B51
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Secure converter in rack provided on test stand counter top.

2. Close TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

3. Using test stand hose assembly (P/N 59A120-B5-12), interconnect test stand FLOWMETER connection (NIP-4) to CONVERTER SUPPLY OUTLET connection (NIP-5).

4. Using test stand hose assembly (P/N 59A120-B51), connect test stand SUPPLY-TO-CONVERTER connection (NIP-6) to converter supply quick-disconnect coupling (40).

NOTE

If TEST PRESSURE gage (PG-1) reads above 90 psig, attach fill vent adapter to the fill, buildup, and vent valve. Vent converter system pressure to 70 psig by turning knurled knob clockwise.

5. Place test stand FLOWMETER SELECTOR valve (V-1) in the 0-150 lpm position. Open TEST PRESSURE gage BUILD-UP AND FLOW valve (V-10).

CAUTION

Open CONVERTER SUPPLY FLOW CONTROL valve (V-9) slowly. Because of the buildup of pressure within the converter, damage to test stand gages could result from a rapid surge of pressure.

6. Slowly open CONVERTER SUPPLY FLOW CONTROL valve (V-9) and observe FLOWMETER INDICATOR gage (PG-2). Allow flow to the converter for 5 minutes.

7. Using CONVERTER SUPPLY FLOW CONTROL valve (V-9) maintain a 120 lpm flow. The converter shall maintain pressure of 55 to 90 psig as indicated on test pressure gage (PG-1). Record pressure in space provided on Performance Test Sheet.

8. If converter supply pressure is not within limits, locate probable cause using troubleshooting table (table 8-7).

9. Remove the converter from test stand and allow it to remain undisturbed for 1 hour.

8-51. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE). To perform the Evaporation Loss Test in the buildup and supply mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

1. Gently place converter on scale and record time and converter weight on Performance Test Sheet.

2. Place converter assembly aside and allow it to remain undisturbed for 24 hours.

3. Carefully place converter on scale and record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 3.0 lbs.

4. If weight loss is 3.0 lbs or less, and there is no excessive frosting of the sphere assembly, drain LOX from converter and proceed to converter charge paragraph. If weight loss is in excess of 3.0 lbs or if there is sphere assembly frosting, consult troubleshooting table (table 8-8), then proceed to paragraph 8-52.

8-52. EVAPORATION LOSS TEST (VENTED MODE). To perform the Evaporation Loss Test in the vented mode, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
1	Scale (At Least 50-lb Capacity)	Fed Spec AAA-S-108D or equivalent

Table 8-7. Troubleshooting (Flow Test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure.	Pressure closing valve out of adjustment.	Adjust (paragraph 8-72, step 17).
	Pressure closing valve damaged.	Rebuild or replace.

Table 8-8. Troubleshooting (Evaporation Loss Test, Buildup and Supply Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss.	Loss of vacuum in container assembly.	BCM converter assembly.
Excessive weight loss (evaporation loss test (buildup and supply mode)).	Excessively leaking valves, tubing, and/or fittings.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 8-46).
	Pressure closing valve out of adjustment or defective.	Adjust pressure closing valve in accordance with paragraph 8-72, step 17. Replace pressure closing valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

NOTE

This test is required only if converter fails Evaporation Loss Test in buildup and supply mode. By comparing the weight loss of this test to that recorded during the buildup and supply Evaporation Loss Test, it is possible to determine whether sphere assembly degradation, vacuum loss, fitting leakage, or valve malfunction was responsible for converter failure during the buildup and supply Evaporation Loss Test.

1. With converter still on scale, attach test stand fill valve adapter to combination valve on converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from the vent port (figure 8-12, item 34). Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

2. Turn knurled knob of adapter clockwise until it seats. This will place converter in vented mode.

3. After converter stabilizes, record time and weight in spaces provided on Performance Test Sheet.

4. Place converter aside and allow it to remain undisturbed in vented mode for 24 hours.

5. At end of 24-hour period, carefully place converter on scale.

6. Record time and weight in spaces provided on Performance Test Sheet. Weight loss in 24 hours shall not exceed 5.0 lbs.

NOTE

A converter that loses 5.0 lbs or less in the vented mode and the weight loss is more than in the buildup and supply mode (example A) shall be considered an acceptable unit. If the weight loss is more than 5.0 lbs (example B) or if the weight loss is less than it was in the buildup and supply mode (example C) locate probable cause using troubleshooting table (table 8-9).

Example A:
Weight loss
buildup and supply mode = 3.5 lbs.
Weight loss vented mode = 4.0 lbs.
Converter is RFI.

Example B:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 6.0 lbs.
Locate probable cause
using troubleshooting chart.

Example C:
Weight loss
buildup and supply mode = 4.0 lbs.
Weight loss vented mode = 3.0 lbs.
Locate probable cause
using troubleshooting chart.

Table 8-9. Troubleshooting (Evaporation Loss Test, Vented Mode)

Trouble	Probable Cause	Remedy
Excessive weight loss evaporation loss test (vented).	Loss of vacuum in container assembly.	BCM converter assembly.
Weight loss in vented mode is less than in the buildup and supply mode.	Excessively leaking valves, tubing, and/or fittings when unit failed buildup and supply mode evaporation loss test.	Replace valves. Tighten or replace fittings. Repeat converter leakage test (paragraph 8-46).
	Pressure closing valve out of adjustment or defective when unit failed buildup and supply mode evaporation loss test.	Adjust pressure closing valve in accordance with paragraph 8-72, step 17.
		Replace pressure control valve.
Excessive frosting of container assembly.	Loss of vacuum in container.	BCM converter assembly.

7. Remove fill valve adapter installed in step 1.

WARNING

Ensure that all personnel safety precautions are observed during converter drain.

8. Place converter in a LOX drain pan and drain converter completely of all LOX.

8-53. CONVERTER CHARGE. To charge the converter, proceed as follows:

Support Equipment Required

Quantity	Description	Reference Number
1	Hose Assembly, Stand, Test	59A120-B5-47
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

CAUTION

Upon completion of bench test, converter shall be charged with gaseous oxygen 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage.

NOTE

Liquid oxygen converters that fail bench test and are beyond capability of maintenance (BCM) do not require converter charge.

1. Secure converter in rack provided on test stand counter top.

2. Using test stand hose assembly, connect test stand BELL JAR BOTTOM COUPLING (C-1) to converter coupling assembly (39).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

CAUTION

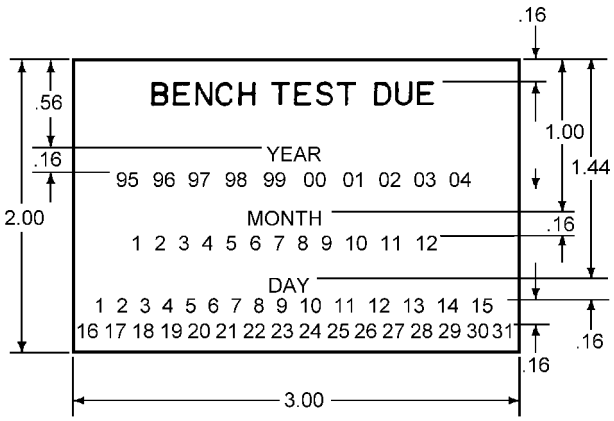
Open OXYGEN SUPPLY valve (V-6) slowly when applying pressure to the converter. Damage to test stand gages could result from rapid surges in pressure.

4. Using OXYGEN SUPPLY VALVE (V-6), charge converter to 25 to 30 psig. Pressure will be indicated on TEST PRESSURE gage (PG-1).

5. Close OXYGEN SUPPLY valve (V-6), disconnect hose assembly connected in step 2, and bleed test stand using SYSTEM BLEED valve (V-5). Secure all test stand valves.

6. Test stand operator and CDI sign Performance Test Sheet. Retain Performance Test Sheet until next scheduled Bench Test is performed.

7. Mark due date of next Bench Test on bench test decal (figure 8-10). Due date shall be 231 days from last Bench Test date. Affix decal to converter in a position in which will be visible when converter is installed in aircraft.



NOTES:

1 MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-43719, TYPE I, CLASS 1.
2 ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3 BENCH TEST DUE SHALL BE 18-POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

008010

Figure 8-10. Bench Test Decal

8. Annotate station/ship performing Bench Test on a serviceable condition label and affix to bench test decal so as not to interfere with marked due date.

NOTE

Bench test decals may be procured from Customer Service at the nearest NARF.

9. Install dust covers or plugs in/on all open couplings prior to shipping of storage converter.

8-54. DISASSEMBLY.

WARNING

At any time when filling, inspecting or testing the LOX converter and any of the following situations are encountered; heavy frosting, icing, excessive pressure build-up (in excess of 130 psig) or critical over-pressurization, immediately comply with the emergency pressure relief procedures given in paragraph 8-28 at the beginning of this section.

8-55. LIQUID OXYGEN CONVERTER ASSEMBLY. To disassemble the liquid oxygen converter, use index numbers assigned to figure 8-12 unless otherwise noted. Disassemble the converter only as far as necessary to correct any malfunctions or damage. Disassemble the converter as follows:

CAUTION

All disassembly, inspection, repair, and assembly must be done on benches having good lighting and in an area provided with air conditioning. Walls, floor, and ceiling should have a smooth finish and should be painted with a non-chalking paint which can be kept clean and dust free. It is desirable to keep all parts for each individual LOX converter separated. Make careful note of the location, angle of fitting, and quantity of all parts. Plastic-partitioned boxes should be used to keep the parts segregated and protected from dirt and moisture. Plastic bags are also useful for storing subassemblies and component parts after cleaning and inspection until ready for assembly.

NOTE

Discard all O-rings, gaskets, seals, and teflon sealing tape removed from connections during disassembly.

No special tools are required to disassemble, adjust, or assemble this converter.

1. Remove handle (1) by removing two screws (2), two washers (3), two bushings (5), and two nuts (4).

NOTE

Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and cap assembly installed in place of the elbow (7). The following disassembly procedures refer to the tee fittings and cap assembly vice elbow (7).

2. Loosen top tube nut on vent tube assembly (6) and tube nut on manifold assembly (46) connected to tee fitting on container. Remove tee fitting and cap assembly and elbow (8) from container assembly.

3. Remove container assembly (9) by removing screws (10), nuts (11), and shock mount assemblies.

NOTE

A shock mount assembly consists of two washers (31), shock mount (32), two cup-shock pads (29), and two shock mounts (30).

4. Remove vent tube assembly (6) by loosening the other tube nut on the combination valve assembly (35).

5. Remove build-up port tube (33) by loosening tube at each end.

6. Remove coupling assembly (34) from combination valve.

7. Disconnect manifold assembly (46) by loosening tube nuts from combination valve (35), pressure closing valve (44), and manifold block (42).

8. Remove combination valve (35) and valve mounting plate (39) from mounting pad assembly (50) by removing two screws (36).

9. Remove combination valve (35) from valve mounting plate (39) by removing four screws (37).

10. Remove pressure closing valve (44) by removing two screws (45).

11. Remove coupling assembly (40), and remove manifold block assembly (42) by removing two screws (43).

12. Remove manifold assembly (46) by removing screws (48) and nuts (49) which release securing clamps (47).

8-56. CONTAINER ASSEMBLY. To disassemble the container assembly, proceed as follows:

1. Disconnect cap and chain assemblies (20, 21) by removing screw (22) and nut (23).

2. Remove two nuts and two washers holding electrical connectors (16, 17) in place on bracket (24).

3. Remove connector bracket (24) and shield assembly (25) by removing screws (13), washers (14), nuts (15), and fuse clips (12).

4. Remove tube nipple (26).

8-57. COMBINATION VALVE ASSEMBLY. To disassemble the combination valve, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-13.

1. Remove elbow (1), elbow (2), and nipple (3) from combination valve assembly.

WARNING

Buildup seat (4) is spring loaded. Use caution when removing.

2. Remove buildup seat (4), clamping spacer (6), washer (7), and preformed packing (8) from combination valve housing (45) by removing screws (5). Remove helical compression spring (9) and ball valve (11) with attached ring (10) from buildup port.

3. Using retaining ring pliers, remove ring (10) from ball valve (11).

4. Remove cap assembly (12) from combination valve housing (45) by removing screw (13) and washer (14).

5. Remove bristo setscrew (15). Using a strap wrench, remove filler head (16) and gasket (18) from combination valve housing.

6. Extract shaft (26) with preformed packing (19), ring (20), washer (21), spring (22), washer (23), sleeve (24), and ring (25) attached, from housing (45).

7. Remove preformed packing (19) from shaft (26).

8. Using retaining ring pliers, remove ring (20) and slide off washer (21), spring (22), washer (23), and

sleeve (24); then using retaining ring pliers, remove ring (25).

9. Extract expansion plug (27) from housing (45).

10. Using retaining ring pliers, remove ring (28) and extract washer (29), spring (30), check valve head (31), sleeve (32), seat (33), and O-ring (34).

11. Using a spanner wrench, remove retainer (35) from housing (45) and extract spring (38), bellows (39), gasket (40), valve (41), spring (42), screen (43), and cup (44).

NOTE

If disassembly of retainer (35) is required, note the relative position of stop screw (36) and adjusting screw (37). This will allow for a good starting point for assembly and adjustment.

12. Disassemble retainer (35), by removing stop screw (36) and adjusting screw (37).

8-58. PRESSURE CLOSING VALVE ASSEMBLY. To disassemble the pressure closing valve, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-14.

1. Remove elbows (1) and (2) from housing (16).

2. Using retaining ring pliers, remove ring (3) and extract filter (4), spring (5), stem (6), and disc (7).

3. Cut off strap (8) and remove cover (9) and disc.

4. Using a spanner wrench, remove bellows assembly (13) and O-ring (14).

NOTE

If disassembly of bellows assembly (13) is required, note relative position of adjusting screw (11). This will provide initial adjustment used later in assembly.

5. Disassemble bellows assembly (13) by removing O-ring (14), adjusting screw (11), and spring (12).

8-59. CLEANING.

8-60. To clean the disassembled converter, proceed as follows:

Materials Required

Quantity	Description	Reference Number
1	Wash Bottle	MS36070A
As Required	Bag, Plastic	MIL-B-117
As Required	Nitrogen, Oil-free, Water Pumped, Type I, Class I, Grade B	Fed Spec BB-N-411 NIIN 00-985-7275

WARNING

Do not use oil or any material containing oil in conjunction with oxygen equipment. Even in a minute quantity, oil that comes into contact with oxygen can cause explosion or fire. Dust, lint, or fine metal particles are also dangerous.

1. Clean all metallic parts using procedures outlined in NAVAIR 13-1-6.4-1. Blow dry with oil-free nitrogen.

2. Prior to installation, wash all silicone rubber parts in distilled water and blow dry with oil-free nitrogen.

3. After cleaning, surfaces shall be examined for cleanliness. Should further contamination be found, reclean parts in accordance with step 1.

4. Seal cleaned parts in plastic bags for storage. Bag all complete assemblies that are not immediately returned to service.

8-61. INSPECTION OF DISASSEMBLED PARTS.

8-62. Inspect the disassembled converter and component parts in accordance with table 8-10 and the following special instructions:

1. Inspect all hardware items (nipples, elbows, etc) for stripped threads, burrs, nicks, distortion, rust, corrosion, or other defects.

NOTE

Due to the method of suspension of shock-mounting of the inner container, some looseness can be detected in most containers by shaking the converter vigorously. Some models employ a spring type suspension that eventually loses some tension; others have a nylon type spacer that experiences slight shrinkage. Looseness and rattles become more apparent with age. Some looseness can be detected in many new containers. Looseness or rattles are not a criterion for determining serviceability. The integrity of the container is determined by the 24-hour Evaporation Loss Test.

8-63. REPAIR.

8-64. Repair of the converter assembly is limited to replacing defective components, minor repairs (small dents, scratches, abrasions, nicks, etc.) of tubing and assembly, attachment of pinch-off-tube protective cover, and touching up painted surfaces. To make minor repairs, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Paint, Green, (Color 14187)	(Note 1)
As Required	Lacquer-Cellulose Nitrate, Gloss Color 622, Jet Black	MIL-L-7178

Materials Required (Cont)

Quantity	Description	Reference Number
As Required	Adhesive	NIIN 00-738-6429

Notes: 1. Use any available green paint, chip color 14187, approved by local Environmental Protection Agency.

1. Consider tubing assemblies with minor dents not causing flow restriction serviceable. Smooth small scratches, abrasions, and nicks with a burnishing tool or aluminum wool.

2. To avoid burnishing the same area more than once, on each burnished area paint a band of the color and size specified as follows:

a. Color bands shall cover an area not less than 2 inches nor more than 3 inches in length.

b. Green paint shall be used on aluminum tubing.

3. Condemn nicked, abraded, or scratched tubing in an area previously identified as burnished.

4. Consider container assemblies having minor dents serviceable, provided the converter passes the vented Evaporation Loss Test. Normally, dents up to 3/8-inch deep will not affect the function of the converter.

WARNING

When painting converter, ensure fittings, tubing, and valves are removed or masked prior to painting. Paint and other foreign matter associated with painting introduced into these components could create an explosion hazard when contacting oxygen.

5. On converter assemblies passing the vented Evaporation Loss Test and having dents, paint a 3/4-inch diameter dot over each dent using black lacquer.

Table 8-10. Inspection of Disassembled Parts

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-12.			
Identification and performance plates.	-52 and -54	Security, condition and legibility.	Secure in place or replace if damaged or illegible.
Warning and bench test decals.	-51 and -53	Presence and condition.	Apply or replace as required.
Handle.	-1	Bends and cracks.	Replace.
Tubing assemblies and manifold assembly.	-6, -33, and -46	Cracks, dents, nicks, scratches, twists or damaged connectors and tube nuts.	Replace.
Elbows and nipples.	All.	Cracks, dents, scratches and damaged threads.	Replace.
Male coupling assemblies.	-34 and -40	Visible damage.	Replace.
Shock mount assemblies.	-29, -30, and -32	Visible damage.	Replace.
Clamps.	-47	Condition.	Tighten or replace.
Mounting pad assembly.	-50	Cracks, broken welds, or other visible damage.	Replace.
Container assembly.	-9	Dents, chipped paint, or other visible damage.	Refer to paragraph 8-64 for size of acceptable dents. Restore finish by painting (paragraph 8-64).
Dust caps.	-20 and -21	Broken chain or damaged caps.	Replace.
Fuse clips.	-12	Damage.	Replace.
Note: Index numbers in this table refer to figure 8-13.			
Buildup seat.	-4	Scratches, nicks, or wear on sealing surfaces.	Replace.
Filler head.	-16	Cracks, wear, or any visible damage of sealing surfaces.	Replace.
Shaft.	-26	Bend, nicks, scratches, or wear.	Replace.
Combination valve housing.	-45	Scratches, nicks, or any visible damage to sealing surfaces.	Replace.

Table 8-10. Inspection of Disassembled Parts (Cont)

Part Nomenclature	Index Number	Inspect For	Remedy
Note: Index numbers in this table refer to figure 8-14.			
Pressure closing valve housing.	-16	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Stem.	-6	Scratches, nicks, wear, or any visible damage on sealing surfaces.	Replace.
Filter.	-4	Clogged pores or visible damage.	Clean and/or replace.

NOTE

Prior to replacing pinch-off tube protective cover, perform an Evaporation Loss Test (vented condition) in accordance with paragraph 8-52. This will ensure that the pinch-off tube was not damaged by whatever force loosened the protective cover.

6. Secure pinch-off tube protective covers back in place over the pin-off tube as follows:

a. Clean area surrounding pinch-off tube and flange area of protective cover by sanding followed by cleaning area using procedures outlined in NAVAIR 13-1-6.4-1.

b. Mix equal portions of part "A" resin and part "B" activator. Mix thoroughly following instructions provided with adhesive.

c. Apply adhesive to flange of protective cover. Place cover over pinch-off tube, pressing in place to achieve a good bond. Wipe off excess adhesive and allow cover to remain undisturbed for approximately 8 hours.

8-65. ASSEMBLY.

8-66. Assembly of the liquid oxygen converter assembly is essentially the reverse of disassembly. Tests and adjustments are required on certain subassemblies as they are assembled to the converter.

CAUTION

Use anti-seize tape (MIL-T-27730) on all male pipe thread fittings. Apply single layer of tape, overlapping ends just enough to avoid gap in tape when fitting is installed. To prevent tube blockage, ensure tape is clear of last thread.

Do not use anti-seize tape on flared or straight thread fittings.

NOTE

Using converter overhaul parts kit (P/N 160128-1) install new O-rings, gaskets, seals, and replacement parts wherever possible, depending on extent of disassembly.

8-67. ASSEMBLY OF PRESSURE CLOSING VALVE. To assemble the pressure closing valve, proceed as follows:

NOTE

Assemble the pressure closing valve using index numbers assigned to figure 8-14.

1. Assemble bellows assembly (13) by installing O-ring (14), spring (12), and adjusting screw (11). Install adjusting screw to position noted before disassembly.

2. Using a spanner wrench, install assembled bellows into pressure closing valve housing (16).

NOTE

Tiedown strap (8), cover (9), and disc (10) are not installed at this time. These parts will be installed after entire converter assembly is assembled and adjusted for correct operation.

3. Install disc (7) onto stem (6). Insert stem (6), spring (5), and filter (4) (coarse side up) into housing (16).

4. Using retaining ring pliers, install ring (3), securing parts inserted in step 3. Ensure that retaining ring is properly seated in groove provided.

5. Install elbows (1, 2) into housing (16). Position where noted before disassembly.

8-68. Delivery Pressure Verification/Leakage Test of Pressure Closing Valve. To verify delivery pressure and to leak-test the pressure closing valve following assembly, proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

NOTE

Index numbers in parentheses refer to figure 8-14.

1. Attach gage to elbow (1).

2. Attach buildup coil port elbow (2) to BELL JAR BOTTOM COUPLING (C-1).

3. Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 120 psig as indicated on TEST PRESSURE gage (PG-1). Pressure gage attached to elbow (1) should read between 55 and 90 psig.

NOTE

If outlet pressure does not fall within the 55 to 90 psig limit, adjust the pressure closing valve in accordance with paragraph 8-72, step 17.

5. Ensure that 120 psig is indicated on TEST PRESSURE gage (PG-1). Hold pressure for 5 minutes. Any increase of pressure shown on gage attached to elbow (1) indicates internal leakage and cause for rejection.

6. Apply leak detection compound to elbows (1 and 2) and bellows assembly (13). No leakage is allowed. Correct any leakage prior to proceeding.

7. Close OXYGEN SUPPLY valve (V-6) and bleed test pressure using SYSTEM BLEED valve (V-5).

8. Remove pressure closing valve from test stand and remove gage installed in step 1.

9. Remove any excess leak detection compound from valve assembly and set aside.

NOTE

Pressure closing valve will be installed and adjusted in paragraph 8-72.

8-69. ASSEMBLY OF COMBINATION VALVE. To assemble the combination valve, proceed as follows:

NOTE

Assemble the combination valve using figure 8-11 and index numbers assigned to figure 8-13.

1. If required, assemble retainer (35) by installing stop screw (36) and adjusting screw (37) to positions noted prior to disassembly.

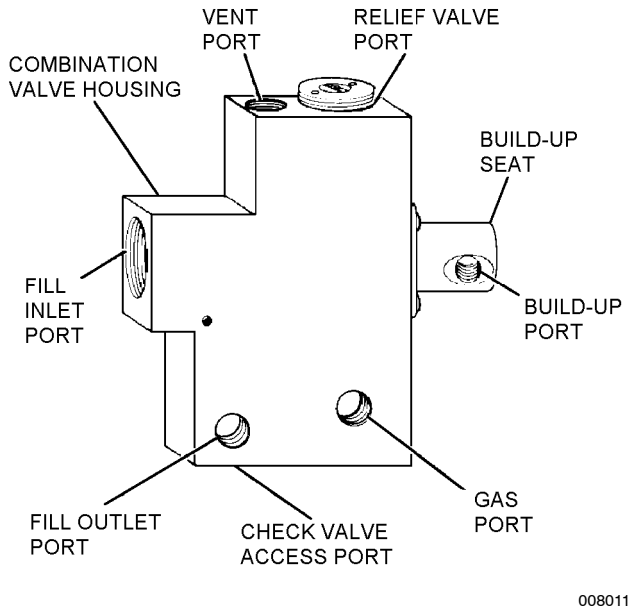


Figure 8-11. Location of Ports on Combination Valve Assembly

2. Insert filter screen (43) into spring cup (44), and carefully place cup into relief valve port with filter screen facing up.

3. Place spring (42) on valve (41), and insert unit into relief valve port with spring (42) resting in spring cup (44).

4. Place gasket (40) onto bellows (39) and insert into relief valve port.

5. Insert spring (38) into bellows (39) and install assembled retainer (35). Tighten retainer in place using a spanner wrench.

6. Place O-ring (34) onto check valve seat (33) and insert unit check valve access port of housing (45), O-ring side first.

7. Insert sleeve (32), check valve head (31) (dimple side first), spring (30), and washer (29) (collar side first) into check valve access port.

8. Using retaining ring pliers, secure inserted parts in place with ring (28). Ensure that retaining ring is properly seated in groove provided.

9. Install expansion plug (27) into check valve access port.

10. Using retaining ring pliers, install ring (10) in groove provided on ball (11) and insert unit into buildup port of housing (45).

11. Place spring (9) on ball (11).

12. Place washer (7) and preformed packing (8) onto buildup seat (4) and insert into buildup port of housing (45).

13. Secure buildup seat (4) to housing using spacer (6) and four screws (5). Position buildup seat where noted prior to disassembly.

14. Using retaining ring pliers, install ring (25) into appropriate groove on shaft (26).

15. Place plunger sleeve (24), washer (23), spring (22), and washer (21) onto shaft (26). Using retaining ring pliers, secure items with ring (20). Ensure ring is seated in groove provided.

16. Install preformed packing (19) into groove provided on shaft (26).

17. Insert assembled shaft into fill inlet port of housing (45).

18. Install filler head insert (17) into filler head (16), if required.

19. Place gasket (18) on filler head (16) and install filler head into fill inlet port. Tighten filler head with strap wrench and secure with bristo setscrew (15).

20. Attach cap assembly (12) with screw (13) and washer (14).

21. Install elbow (1), elbow (2), and nipple (3) to position noted before disassembly.

8-70. LEAKAGE TEST PORT ASSEMBLY OF COMBINATION VALVE. To perform the various leakage tests on the assembled combination valve proceed as follows:

Materials Required

Quantity	Description	Reference Number
As Required	Compound, Leak Detection, Type 1	MIL-L-25567

Support Equipment Required

Quantity	Description	Reference Number
1	Adapter Assembly	59A120-D5-46
2	Capnut	AN929-5
1	Hose Assembly, Stand, Test	59A120-B5-12
1	Plug, Pipe	MS20913-C-3
1	LOX Converter Test Stand	59A120 or 31TB1995-1 or 31TB1995-4 or 1455AS100-1

1. Using capnut, cap the gas port elbow.

2. Attach adapter to filler head of combination valve and turn knurled knob clockwise.

3. Attach vent port of combination valve to BELL JAR BOTTOM COUPLING (C-1). Open TEST PRESSURE GAGE-TO-BELL JAR valve (V-2).

4. Open OXYGEN SUPPLY valve (V-6) and apply 35 psig as indicated on TEST PRESSURE gage (PG-1).

5. Apply leak detection compound to fill port, no leakage allowed.

6. Close OXYGEN SUPPLY valve (V-6) and bleed test stand using SYSTEM BLEED valve (V-5).

7. Remove adapter from filler head of combination valve and disconnect test stand BELL JAR BOTTOM COUPLING (C-1) from vent port of combination valve.

8. Connect test stand BELL JAR BOTTOM COUPLING (C-1) to buildup port elbow (3).

9. Using pipe plug, plug vent port of combination valve.

10. Open OXYGEN SUPPLY valve (V-6) and apply 100 psig as indicated TEST PRESSURE gage (PG-1).

11. Apply leak detection compound to combination valve. No leakage is allowed.

12. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

13. Place combination valve in the vented position by attaching adapter to filler head of combination valve and uncap gas port (1).

14. Place test stand bell jar over combination valve and secure in place.

15. Place FLOWMETER SELECTOR valve (V-1) in the 0.0-0.25 lpm position.

16. Using OXYGEN SUPPLY valve (V-6), apply 35 psig to the combination valve as indicated on TEST PRESSURE gage (PG-1).

17. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-1) while observing FLOWMETER INDICATOR gage (PG-2).

18. Maintain 35 psig to the combination valve for 2 minutes. Leakage on FLOWMETER INDICATOR gage (PG-2) shall not exceed 0.25 lpm.

19. Close OXYGEN SUPPLY valve (V-6) and bleed pressure from test stand using SYSTEM BLEED valve (V-5).

20. Disconnect combination valve from test stand, unplug vent port and remove adapter.

21. Test and adjust relief valve as follows:

a. Cap gas port nipple (2) with capnut.

b. Connect buildup port nipple (3) to test stand BELL JAR BOTTOM COUPLING (C-1). Install and secure bell jar.

c. Using hose assembly, interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-4).

d. Turn FLOWMETER SELECTOR valve (V-1) to 0-150 lpm position.

CAUTION

Do not apply pressure above 130 psig.

When pressure is applied through OXYGEN SUPPLY valve (V-6), observe TEST PRESSURE gage (PG-1) and FLOWMETER INDICATOR gage (PG-2). Rapid surges of pressure could damage test stand gages.

e. Open OXYGEN SUPPLY valve (V-6) slowly and apply pressure to the relief valve. Pressure will be indicated on TEST PRESSURE gage (PG-1).

f. When pressure reaches 100 to 120 psig, relief valve shall be venting a minimum 100 lpm as indicated on FLOWMETER INDICATOR gage (PG-2).

g. Disconnect test stand hose assembly from FLOWMETER connection (NIP-4) and connect it to FLOWMETER connection (NIP-1).

h. Turn FLOWMETER SELECTOR valve (V-1) to 0.0-0.25 lpm position.

i. Using test stand hose assembly, slowly interconnect BELL JAR TOP COUPLING (C-2) to FLOWMETER connection (NIP-I) while observing FLOWMETER INDICATOR gage (PG-2).

j. With 95 psig applied to the relief valve as indicated on TEST PRESSURE gage (PG-1), maximum allowable leakage, indicated on FLOWMETER INDICATOR gage (PG-2), shall be 0.01 lpm.

NOTE

If readings in steps f and i are acceptable, proceed to step n.

If readings are not acceptable, adjust relief valve in accordance with steps k thru m.

k. Remove bell jar from combination valve.

l. If valve relieves below 100 psig, turn adjusting screw (37) clockwise. If valve relieves above 120 psig, turn adjusting screw (37) counterclockwise. Turn stopscrew (36) to obtain the required flow.

NOTE

Turning stopscrew clockwise will increase flow, counterclockwise will decrease flow.

m. Place bell jar over combination valve and secure in place. Repeat steps c thru j.

NOTE

It may be necessary to repeat steps k thru m several times to obtain proper pressure and flow settings.

n. At completion of test and adjustment, close OXYGEN SUPPLY valve (V-6) and open SYSTEM BLEED valve (V-5), remove bell jar, disconnect combination valve, uncap all ports, and set valve aside, ready for installation.

8-71. ASSEMBLY OF CONTAINER. To assemble the container assembly, proceed as follows:

NOTE

Assemble the container assembly using index numbers assigned to figure 8-12.

1. Secure connection bracket (24) and fuse clips (12) with screws (13), washers (14), and nuts (15).

2. Assemble and attach electrical connectors (16, 17) to bracket (24) with respective nuts and washers.

3. Attach cap and chain assemblies (20, 21) with screw (22) and nut (23).

8-72. COMPLETION OF ASSEMBLY. To complete the assembly of the converter, proceed as follows:

CAUTION

When installing tube assemblies, ensure fittings to which tube nuts are to be attached are properly aligned with tube to prevent cross-threading. Hold connecting fittings with open end wrench to avoid straining or breakage when tightening. Hold tubing away from other components of converter assembly while tightening so that a minimum 1/16-inch clearance is maintained. It may be necessary to slightly bend some tube assemblies to maintain this clearance. Ensure tubing is not crimped after bending process.

NOTE

To complete the assembly of the converter use index numbers assigned to figure 8-12, unless otherwise noted.

1. Install coupling assembly (40) in manifold block (42).

2. Install nipple assembly (41) into manifold block (42), and attach assembled manifold block to mounting pad (50) using two screws (43).

3. Secure manifold assembly (46) to mounting pad (50) using screws (48), clamps (47), and nuts (49).

NOTE

A shock mount assembly consists of two washers (31), shock mount (31), two cup-shock pads (29), and two shock mounts (30).

4. Secure container assembly (9) to mounting pad assembly (50) using screws (10), shock mount assemblies and nuts (11).

5. Tighten screw (10) and nut (11) at each shock mount so that the distance from the top of the mounting pad to the bottom of each foot of the container assembly is 1.5 ±06 inches.

NOTE

Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and cap assembly installed in place of elbow (7). The following assembly procedures will refer to the tee fitting and cap assembly.

6. Assemble elbow (8) and tee fitting onto container assembly (9).

7. Install a cap assembly to the tee fitting.

8. Mount pressure closing valve (44) to mounting pad assembly (50) with two screws (45).

9. Carefully mount combination valve (35) to valve mounting plate (39) with four screws (37).

10. Attach combination valve and valve mounting plate to mounting pad (50) with two screws (36).

11. Connect tube nuts of manifold assembly (46) to combination valve (35), pressure closing valve (44), tee fitting, and manifold block (42).

12. Attach coupling assembly (34) to combination valve (34).

13. Attach pressure closing valve to buildup port tube (33) to elbow (1) (figure 8-14) atop pressure closing valve (44) and buildup port nipple (3, figure 8-13) of combination valve (35).

14. Attach vent tube assembly (6) at container and at gas port elbow (2, figure 8-13) of combination valve.

15. Attach handle (1) with two screws (2), two washers (3), two bushings (5), and two bushings (5), and two nuts (4).

16. After completion of assembly, Bench Test the converter in accordance with paragraph 8-40.

17. During post assembly Bench Test, it may be necessary to adjust pressure closing valve (44) while performing the Flow Test (paragraph 8-50). If so, proceed as follows:

NOTE

Index numbers in parentheses refer to figure 8-14.

The 70 to 75-psig operating pressure is for adjustment purposes only. If converter maintains 55 to 90 psig, no adjustment is required. If converter pressure is above or below this range, adjust pressure closing valve to maintain 70 to 75 psig.

a. If required, remove disc (10) by cutting strap (8) and removing cover (9).

b. Using a screwdriver, turn adjusting screw (11) until a supply pressure of 70 to 75 psig is maintained with a flow of 120 lpm.

NOTE

Turn adjusting screw (11) clockwise to increase valve closing pressure and counterclockwise to decrease valve closing pressure. Flow converter at least 30 minutes to ensure pressure is constant.

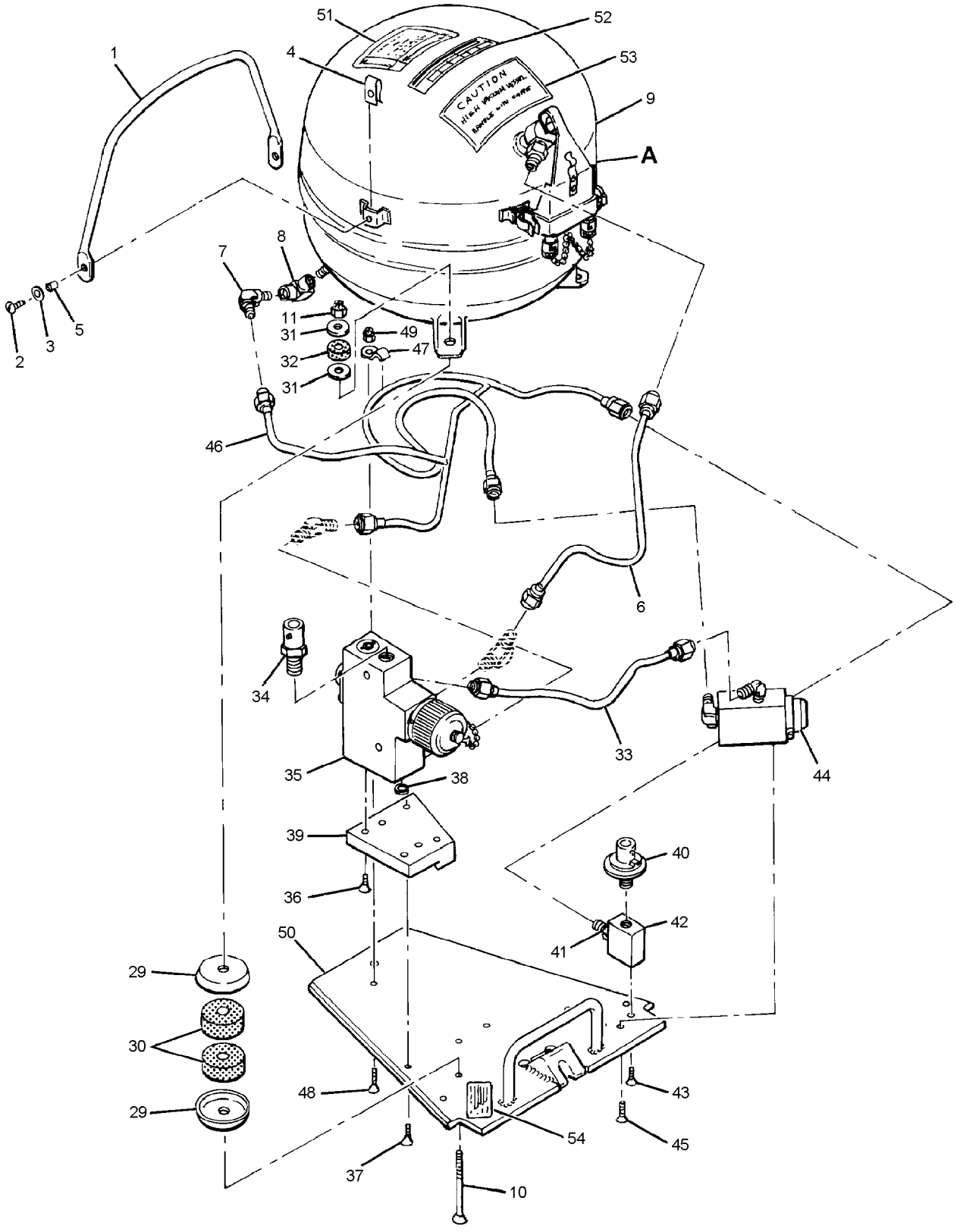
c. After correct setting of pressure closing valve is ensured, install cupped disc (10) (convex side up) and cover (9). Secure cover (9) in place using strap (8).

Section 8-5. Illustrated Parts Breakdown

8-73. GENERAL.

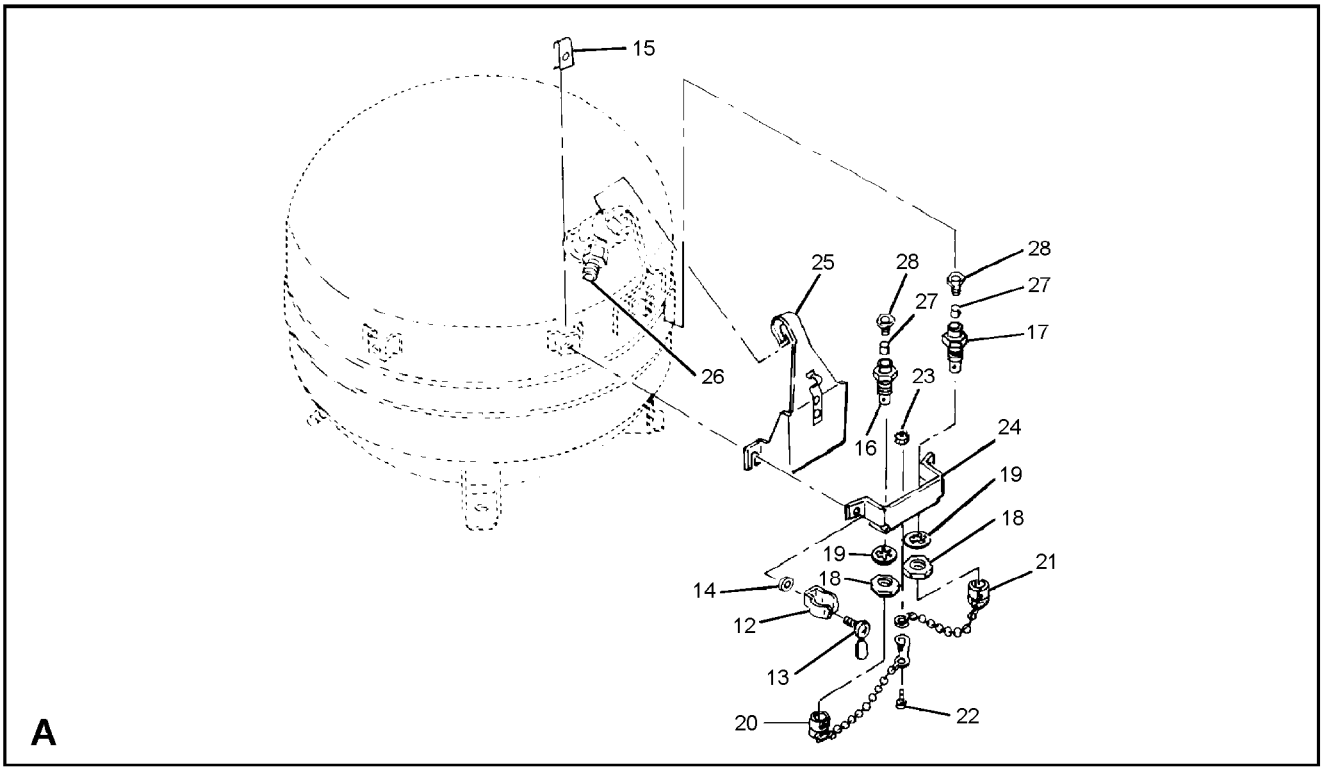
8-74. This section lists and illustrates the assemblies and detail parts of the Liquid Oxygen Converter Assembly, Type GCU-( )/A, P/N 3263004-0201, manufactured by Litton Life Support, formerly Bendix Corporation (CAGE 99257).

8-75. The Illustrated Parts Breakdown should be used during maintenance when requisitioning and identifying parts.



00801201

Figure 8-12. 5 Liter Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201 (Sheet 1 of 2)

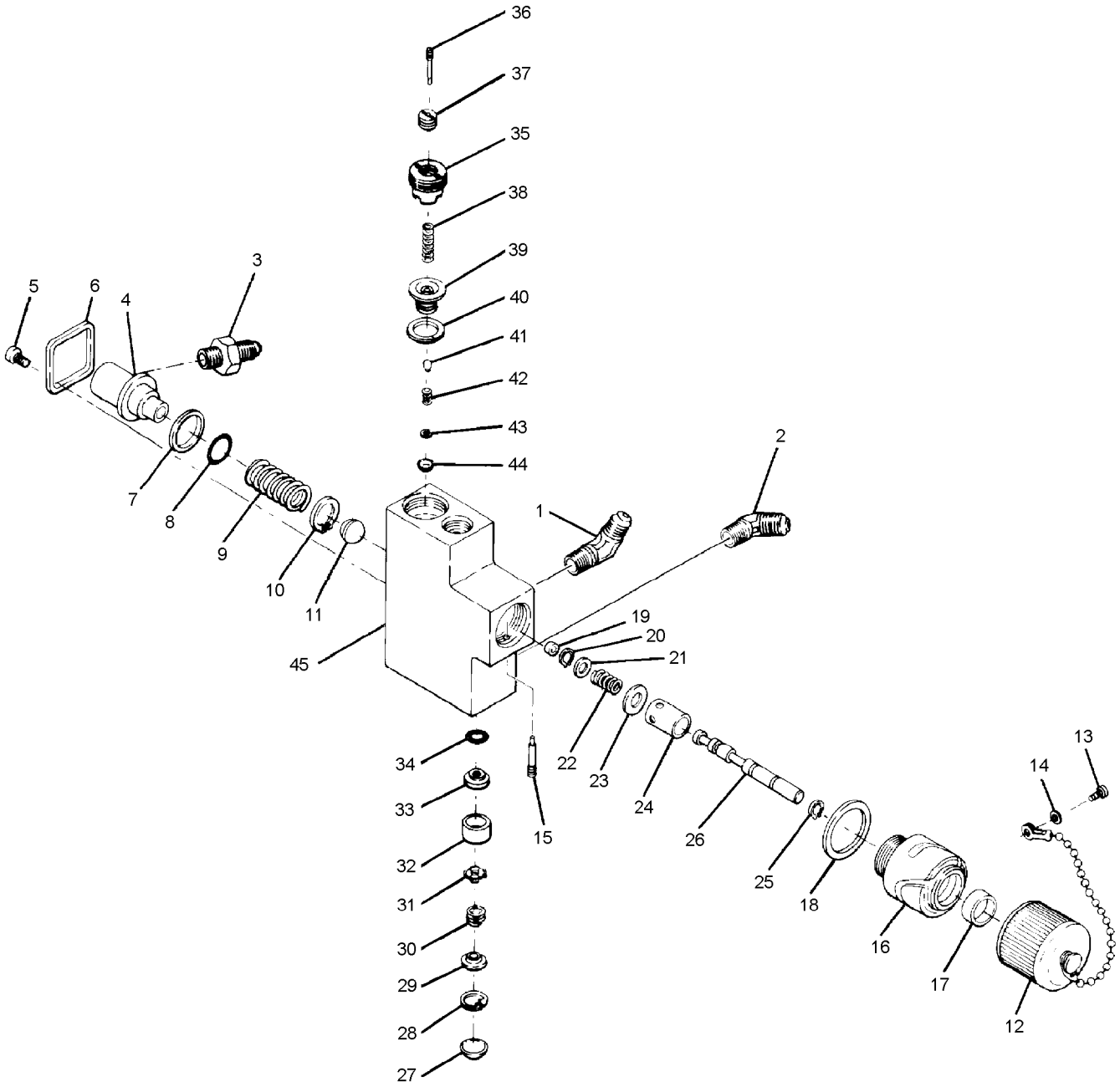


00801202

Figure 8-12. 5 Liter Liquid Oxygen Converter, Type GCU-( )/A, P/N 3263004-0201 (Sheet 2 of 2)

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-12	3263004-0201	CONVERTER ASSEMBLY, Liquid oxygen, 5-liter (parts kit available)	REF	
-1	1611453-1	. HANDLE	1	
		(ATTACHING PARTS)		
-2	AN525-832-6	. SCREW	2	
-3	WO-8SS	. WASHER	2	
-4	C14938SS832	. NUT, "U" Type (CAGE 78553)	2	
		---*---		
-5	1611434-1	. BUSHING	2	
-6	1627130-1	. TUBE ASSEMBLY, Vent	1	
-7	MS20822-5D	. ELBOW (Note 1)	1	
-8	AN916-1D	. ELBOW	1	
-9	3264001-0201	. CONTAINER ASSEMBLY, Liquid oxygen	1	
		(ATTACHING PARTS)		
-10	MS24694-C125	. SCREW, Machine	3	
-11	MS21045C4	. NUT, Self locking	3	
		---*---		
-12	104002	. . CLIP, Fuse (CAGE 75915)	2	
		(ATTACHING PARTS)		
-13	MS51957-43	. . SCREW, Machine	2	
-14	WO-8SS	. . WASHER	2	
-15	C14938SS832	. . NUT, "U" Type (CAGE 78553)	2	
		---*---		
-16	6690-1	. . CONNECTOR, Electrical miniature, coaxial, "B" polarity	1	
-17	6691-1	. . CONNECTOR, Electrical miniature, coaxial, "E" polarity	1	
-18	No Number	. . . NUT (Note 2)	1	
-19	No Number	. . . LOCKWASHER (Note 2)	1	
-20	1-606-1	. . CAP AND CHAIN	1	
-21	1-606-2	. . CAP AND CHAIN	1	
		(ATTACHING PARTS FOR INDEX NUMBERS 20 and 21)		
-22	RO-405SS	. . SCREW, Round head	1	
-23	NTNO-4SCP	. . STOPNUT	1	
		---*---		
-24	1627127-1	. . BRACKET, Connector	1	
-25	1627123-1	. . SHIELD ASSEMBLY, Probe wire	1	
-26	AN816-5D	. . NIPPLE, Flared Tube	1	
-27	1611421-1	. . SPACER, Connector	1	
-28	1611420-1	. . ADAPTER, Armored wire	1	
-29	1611428-2	. CUP, Shock pad	6	
-30	1622347-1	. SHOCK MOUNT	6	
-31	1627687-1	. WASHER	6	
-32	1622347-2	. SHOCK MOUNT	3	
-33	1627128-1	. TUBE ASSEMBLY, Pressure closing to buildup	1	
-34	MS22068-6	. COUPLING ASSEMBLY	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-12-35	1620660-2	. VALVE ASSEMBLY, Combination . . . . . (figure 8-13 for BKDN) (ATTACHING PARTS)	1	
-36	MS24693-C52	. SCREW, Machine	2	
-37	MS24693-C50	. SCREW, Machine . . . . . ---*---	4	
-38	1602321-17	. PACKING, Preformed	1	
-39	1627124-1	. PLATE, Valve mounting	1	
-40	MS22068-4	. COUPLING ASSEMBLY	1	
-41	1627160-1	. NIPPLE ASSEMBLY	1	
-42	1627126-1	. MANIFOLD BLOCK . . . . . (ATTACHING PARTS)	1	
-43	MS24693-C95	. SCREW, Machine . . . . . ---*---	2	
-44	1616733-2	. VALVE ASSEMBLY, Pressure closing . . . . . (figure 8-14 for BKDN) (ATTACHING PARTS)	1	
-45	MS24693-C27	. SCREW, Machine . . . . . ---*---	2	
-46	1627132-1	. MANIFOLD ASSEMBLY . . . . . (ATTACHING PARTS)	1	
-47	1611433-1	. CLAMP, Tube	3	
-48	MS24693-C6	. SCREW, Machine	3	
-49	MS20365-440	. NUT . . . . . ---*---	3	
-50	1627133 1	. PAD ASSEMBLY, Mounting	1	
-51	CL227C2-1	. DECAL, Bench test date		
-52	1616834-1	. PLATE, Test data	1	
-53	1600482-1	. PLATE, Warning	1	
-54	1616833-1	. PLATE, Identification	1	
	1601217-1	. PARTS KIT, Converter overhaul	1	
	Notes: 1. Converters which have been previously bench tested using the procedures in this chapter have a tee fitting and a cap assembly installed in place of elbow. 2. Nut and lockwasher come as part of the electrical connector and are used as attaching parts.			

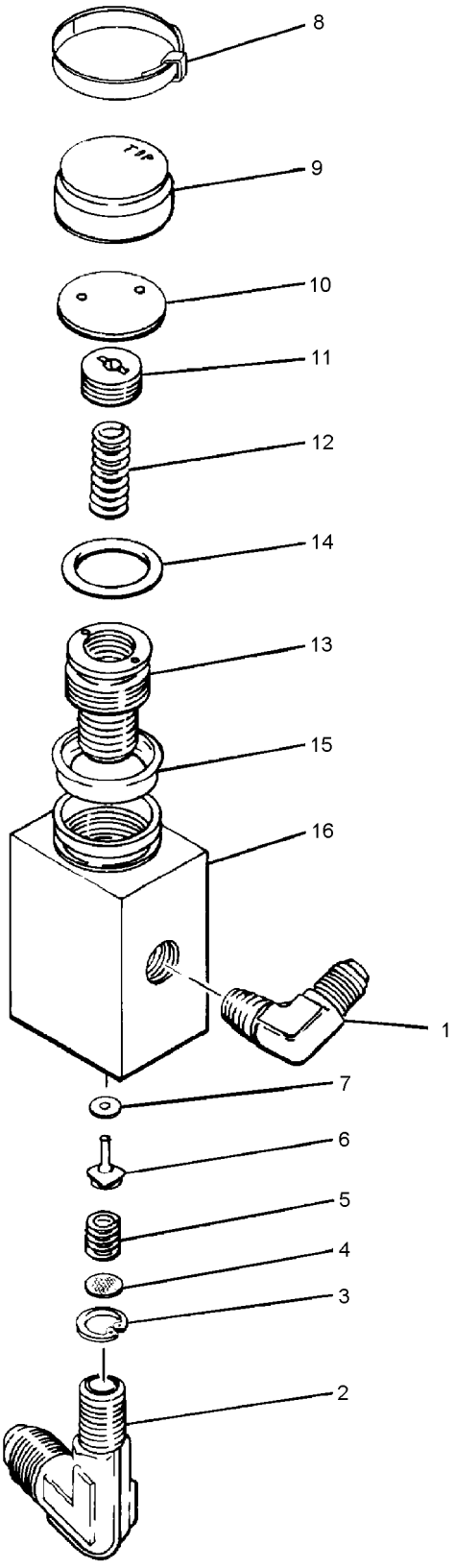


008013

Figure 8-13. Combination Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-13	1620660-2	VALVE ASSEMBLY, Combination . . . . . (figure 8-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW, 90°	1	
-2	MS20823-5D	. ELBOW, 45°	1	
-3	AN816-5D	. NIPPLE	1	
-4	1620659-1	. SEAT, Buildup	1	
		(ATTACHING PARTS)		
-5	MS51957-27	. SCREW, Machine	4	
-6	1620654-1	. SPACER, Clamping	1	
		---*---		
-7	1603661-69	. WASHER, Nonmetallic	1	
-8	1602321-35	. PACKING, Preformed	1	
-9	815404	. SPRING, Helical compression	1	
-10	MS16626-4050	. RING, Retaining	1	
-11	1620663-1	. BALL, Valve	1	
-12	MS27566-1	. CAP ASSEMBLY	1	
		(ATTACHING PARTS)		
-13	MS51957-27	. SCREW, Machine	1	
-14	AN960C6L	. WASHER	1	
		---*---		
-15	MBFS404SCP	. SETSCREW, Bristo	1	
-16	16203041	. HEAD, Filler	1	
-17	1602412-1	. INSERT, Filler head	1	
-18	1620305-1	. GASKET	1	
-19	816919-14	. PACKING, Preformed	1	
-20	MS16624-4025	. RING, Retaining	1	
-21	1603660-123	. WASHER	1	
-22	1611448-1	. SPRING, Helical compression	1	
-23	1603660-113	. WASHER	1	
-24	1611449-1	. SLEEVE, Plunger	1	
-25	MS16624-4025	. RING, Retaining	1	
-26	1620656-1	. SHAFT	1	
-27	778488-5	. PLUG, Expansion	1	
-28	MS16625-4056	. RING, Retaining	1	
-29	1600818	. WASHER, Spring guide	1	
-30	815395	. SPRING, Helical compression	1	
-31	1600820	. HEAD, Valve, check	1	
-32	1616784-1	. SLEEVE, Hold down	1	
-33	1600821	. SEAT, Valve, check	1	
-34	813752	. O-RING	1	
-35	1620550-1	. RETAINER	1	
-36	1620657-1	. SCREW, Stop	1	
-37	1620658-1	. SCREW, Adjusting	1	
-38	1613622-1	. SPRING, Helical compression	1	
-39	1613617-1	. BELLOWS ASSEMBLY	1	
-40	1613610-1	. GASKET	1	

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-13-41	1613614-1	. VALVE	1	
-42	1613616-1	. SPRING, Helical compression	1	
-43	1620570-1	. SCREEN, Filter	1	
-44	1620655-1	. CUP, Spring	1	
-45	1620606-1	. HOUSING, Combination valve	1	



008014

Figure 8-14. Pressure Closing Valve Assembly

Figure and Index Number	Part Number	Description 1 2 3 4 5 6 7	Units Per Assembly	Usable On Code
8-14	1616733-2	VALVE ASSEMBLY, Pressure closing . . . . . (figure 8-12 for NHA)	REF	
-1	MS20822-5D	. ELBOW	1	
-2	MS20822-5-4D	. ELBOW	1	
-3	MS16625-4037	. RING, Retaining	1	
-4	815634-7	. FILTER	1	
-5	1616732-1	. SPRING, Helical compression	1	
-6	1616730-1	. STEM	1	
-7	1616728-1	. DISC	1	
-8	MS3367-5-8	. STRAP, Tiedown	AR	
-9	1611857-1	. COVER	1	
-10	1611319-1	. DISC, Cupped	1	
-11	1616788-1	. SCREW, Spring adjusting	1	
-12	815735	. SPRING, Helical compression	1	
-13	1616790-1	. BELLOWS ASSEMBLY	1	
-14	815743	. PACKING, O-ring	1	
-15	1627280-1	. RING, Vibration damper	1	
-16	1616697-1	. HOUSING	1	

NUMERICAL INDEX

Part Number	Figure and Index Number	SM&R Code
AN525-832-6	8-12-2	
AN816-5D	8-13-3	PAOZZ
	8-12-26	
AN916-1D	8-12-8	PAOZZ
AN960C61	8-13-14	
C1227C2-1	8-12-51	
C14938SS832	8-12-4	PAGZZ
	8-12-15	
MBFS404SCP	8-13-15	
MS16624-4025	8-13-20	PAOOZ
	8-13-25	
MS16625-4037	8-14-3	PAOZZ
MS16625-4056	8-13-28	PAOZZ
MS16626-4050	8-13-10	PAOZZ
MS20365-440	8-12-49	PAGZZ
MS20822-5-4D	8-14-2	PAOZZ
MS20822-5D	8-12-7	PAOZZ
	8-13-1	
	8-14-1	
MS20823-5D	8-13-2	PAOZZ
MS21045C4	8-12-11	PAOZZ
MS22068-4	8-12-40	PAOZZ
MS22068-6	8-12-34	PAOZZ
MS24693-C27	8-12-45	PAOZZ
MS24693-C50	8-12-37	PAOZZ
MS24693-C52	8-12-36	PAOZZ
MS24693-C6	8-12-48	PAOOZ
MS24693-C95	8-12-43	PAOZZ
MS24694-C125	8-12-10	PAGZZ
MS27566-1	8-13-12	PAOZZ
MS3367-5-8	8-14-8	PAOZZ
MS51957-27	8-13-5	PAOOZ
	8-13-13	
MS51957-43	8-12-13	PAOOZ
NTNO-4SCP	8-12-23	PAOZZ
RO-405SS	8-12-22	PAOZZ
WO-8SS	8-12-3	
	8-12-14	
1-606-1	8-12-20	PAOZZ
1-606-2	8-12-21	
104002	8-12-12	PAOZZ
1600482-1	8-12-53	
1600818	8-13-29	PAGZZ
1600820	8-13-31	PAGZZ
1600821	8-13-33	PAGZZ
1601217-1	8-12	
1602321-17	8-12-38	PAGZZ
1602321-35	8-13-8	PAOZZ
1602412-1	8-13-17	PAOZZ
1603660-113	8-13-23	PAOZZ
1603360-123	8-13-21	
1603661-69	8-13-7	PAGZZ
1611319-1	8-14-10	PAGZZ
1611420-1	8-12-28	
1611421-1	8-12-27	
1611428-2	8-12-29	PAOZZ
1611433-1	8-12-47	PAOZZ
1611434-1	8-12-5	PAGZZ
1611448-1	8-13-22	PAGZZ
1611449-1	8-13-24	PAGZZ
1611453-1	8-12-1	PAOZZ
1611857-1	8-14-9	PAGZZ
1613610-1	8-13-40	PAGZZ
1613614-1	8-13-41	
1613616-1	8-13-42	PAGZZ
1613617-1	8-13-39	PAGZZ
1613622-1	8-13-38	PAGZZ
1616697-1	8-14-16	
1616728-1	8-14-7	PAGZZ
1616730-1	8-14-6	PAGZZ
1616732-1	8-14-5	PAGZZ
1616733-2	8-12-44	PAGZZ
	8-14	
1616784-1	8-13-32	PAGZZ
1616788-1	8-14-11	PAGZZ
1616790-1	8-14-13	PAGZZ
1616833-1	8-12-54	
1616834-1	8-12-52	
1620304-1	8-13-16	
1620305-1	8-13-18	
1620550-1	8-13-35	PAGZZ
1620570-1	8-13-43	PAGZZ
1620606-1	8-13-45	
1620654-1	8-13-6	
1620655-1	8-13-44	PAGZZ
1620656-1	8-13-26	PAOZZ
1620657-1	8-13-36	PAGZZ
1620658-1	8-13-37	PAOZZ
1620659-1	8-13-4	PAOZZ
1620660-2	8-12-35	PAGZZ
	8-13	
1620663-1	8-13-11	PAGZZ
1622347-1	8-12-30	PAGZZ
1622347-2	8-12-32	PAGZZ

NUMERICAL INDEX (Cont)

Part Number	Figure and Index Number	SM&R Code
1627123-1	8-12-25	
1627124-1	8-12-39	
1627126-1	8-12-42	PAGZZ
1627127-1	8-12-24	
1627128-1	8-12-33	
1627130-1	8-12-6	
1627132-1	8-12-46	
1627133-1	8-12-50	
1627160-1	8-12-41	PAGZZ
1627280-1	8-14-15	
1627687-1	8-12-31	PAGZZ
3263004-0201	8-12	PAOGD
3264001-0201	8-12-9	PAGBZ
6690-1	8-12-16	PAOZZ
6691-1	8-12-17	
778488-5	8-13-27	PAGZZ
813752	8-13-32	KCGZZ
815395	8-13-30	PAGZZ
815404	8-13-9	PAGZZ
815634-7	8-14-4	PAGZZ
815735	8-14-12	PAGZZ
815743	8-14-14	PAGZZ
816919-14	8-13-19	PAGZZ

THIS PAGE INTENTIONALLY LEFT BLANK.