Operation & Service Manual

Model: 15-7602-1000
Cabin Pressurization Unit

11/2001 – Rev. OR

Includes Illustrated Parts Lists

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APPENDICES I – VIII

Figure 1
Pneumatic Schematic

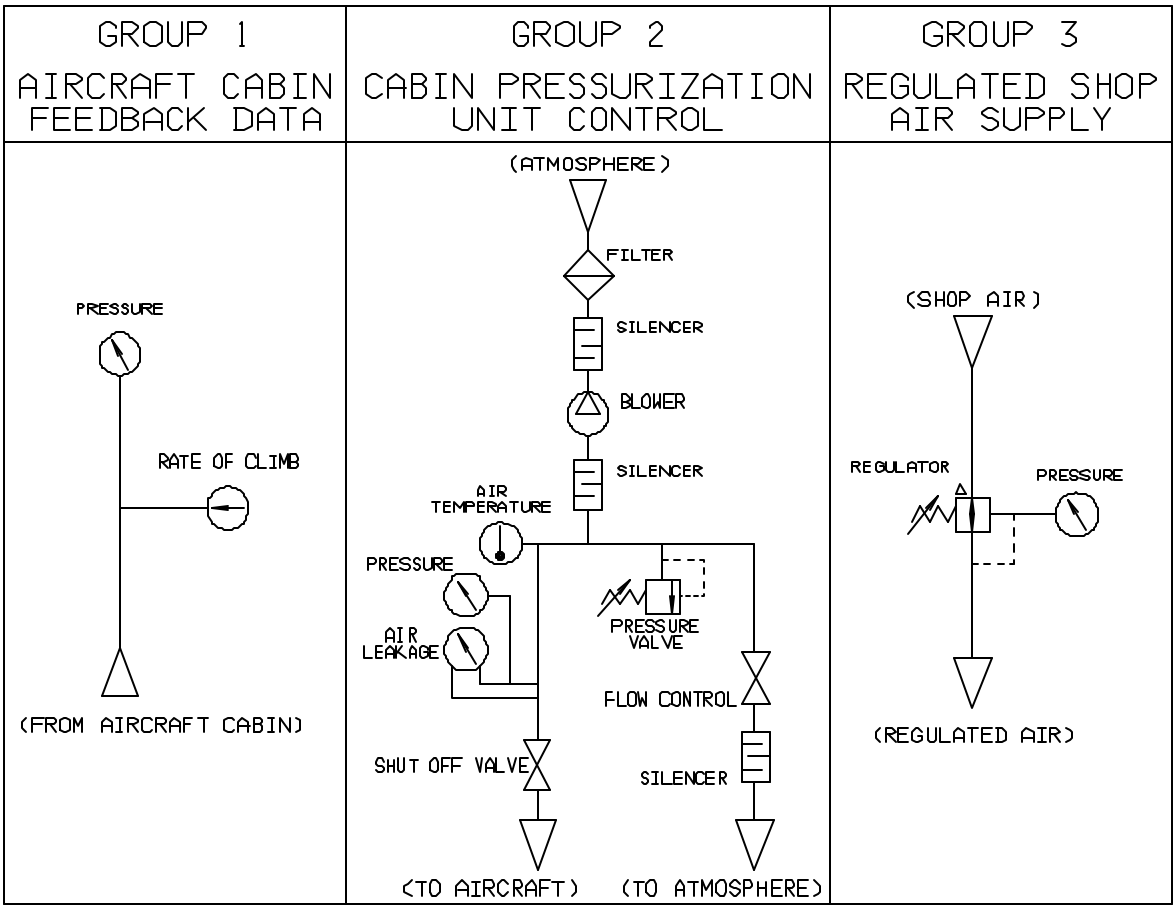


Figure 2
Electrical Schematic

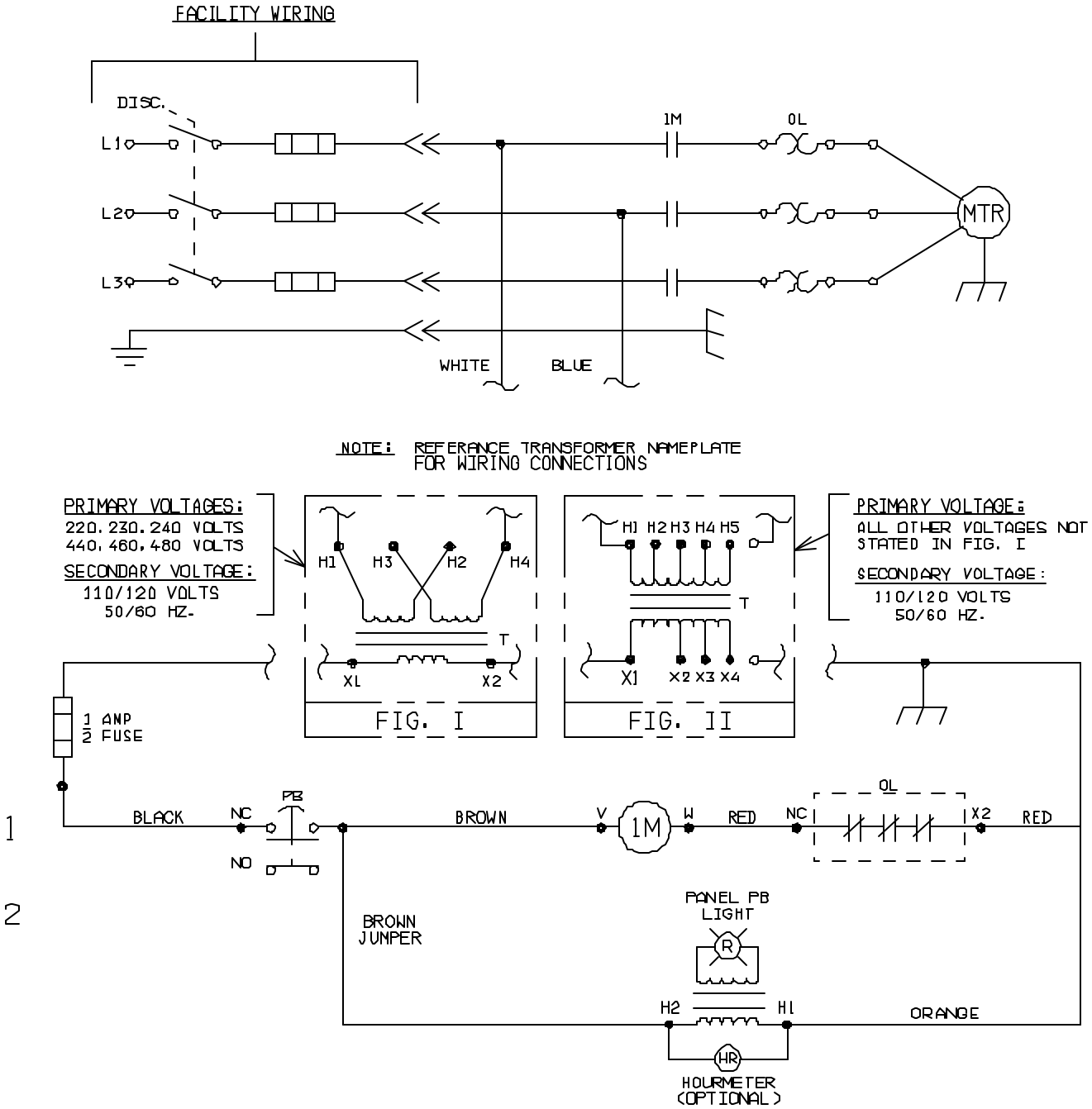


Figure 3
Cabin Pressurization Unit (CPU) Front and Left Side

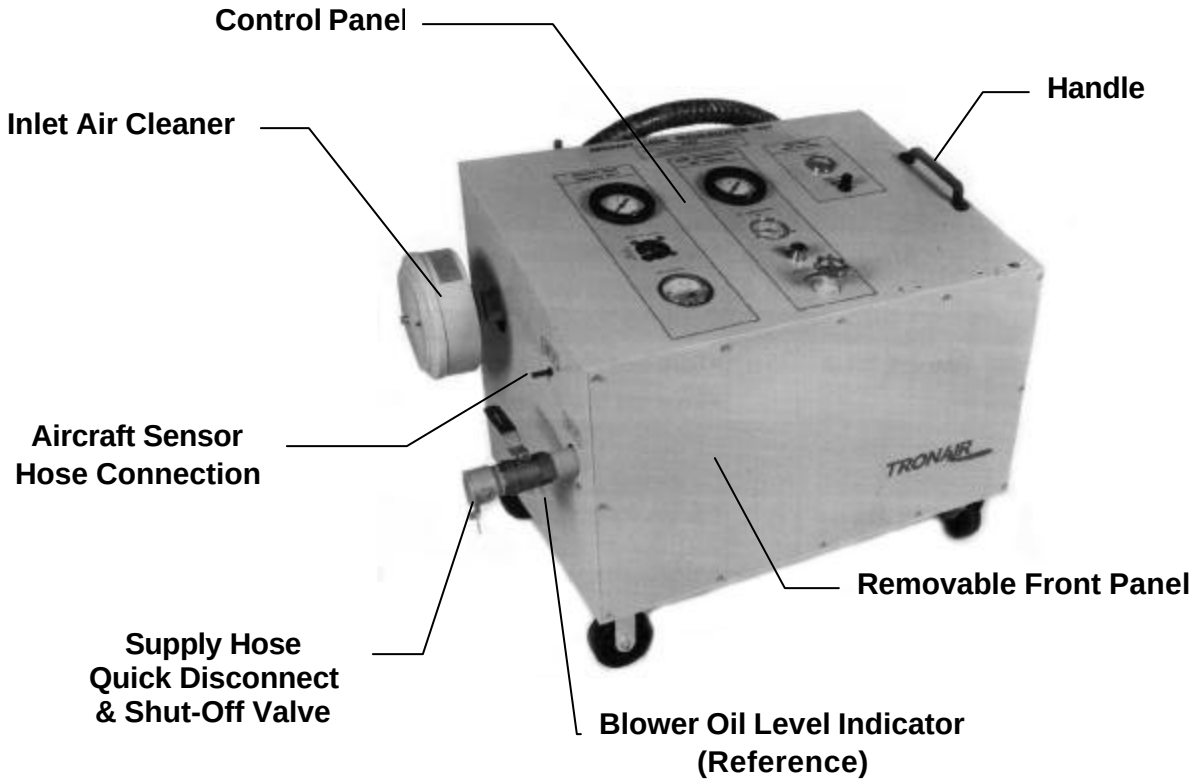


Figure 4
Cabin Pressurization Unit (CPU) Rear and Right Side

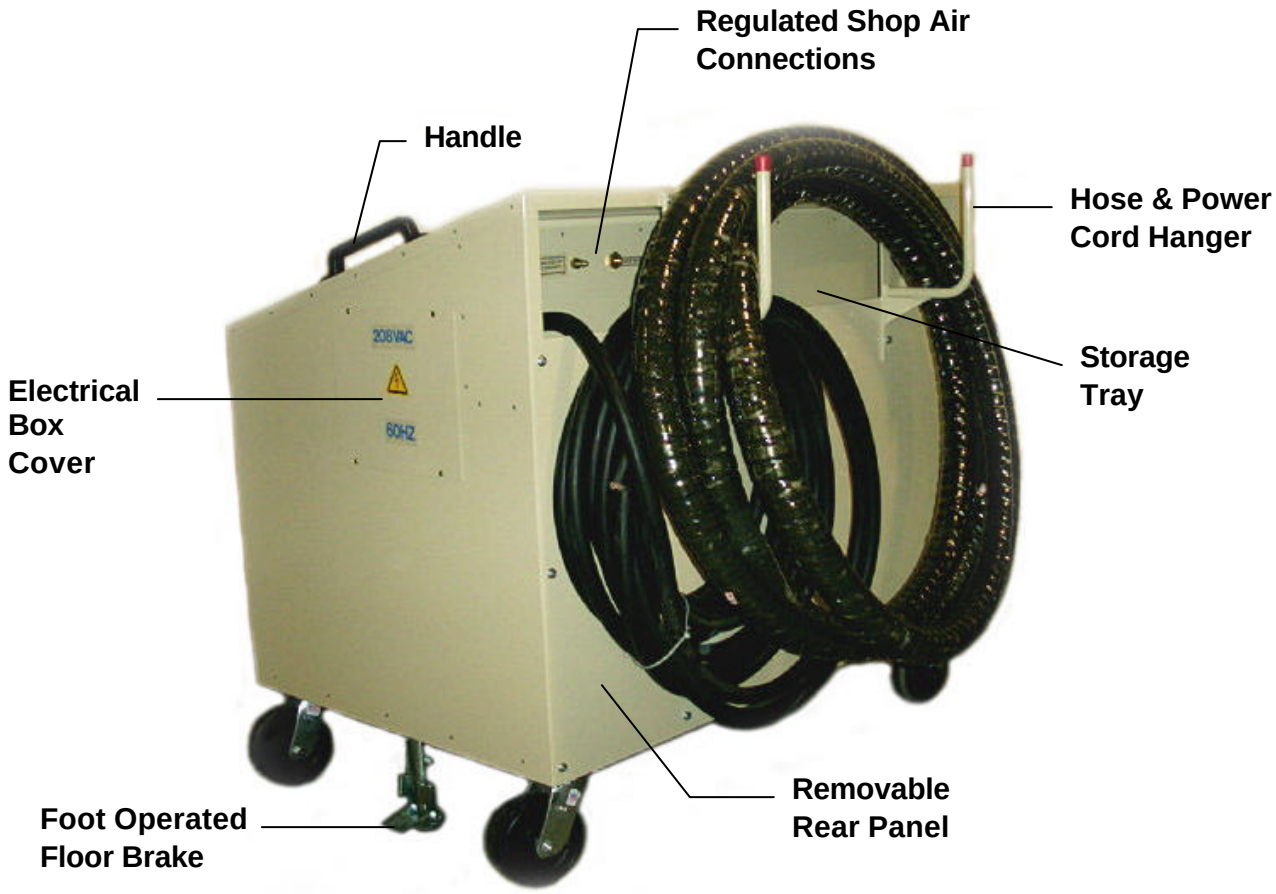


Figure 5
Cabin Pressurization Unit (CPU) Control Panel Layout

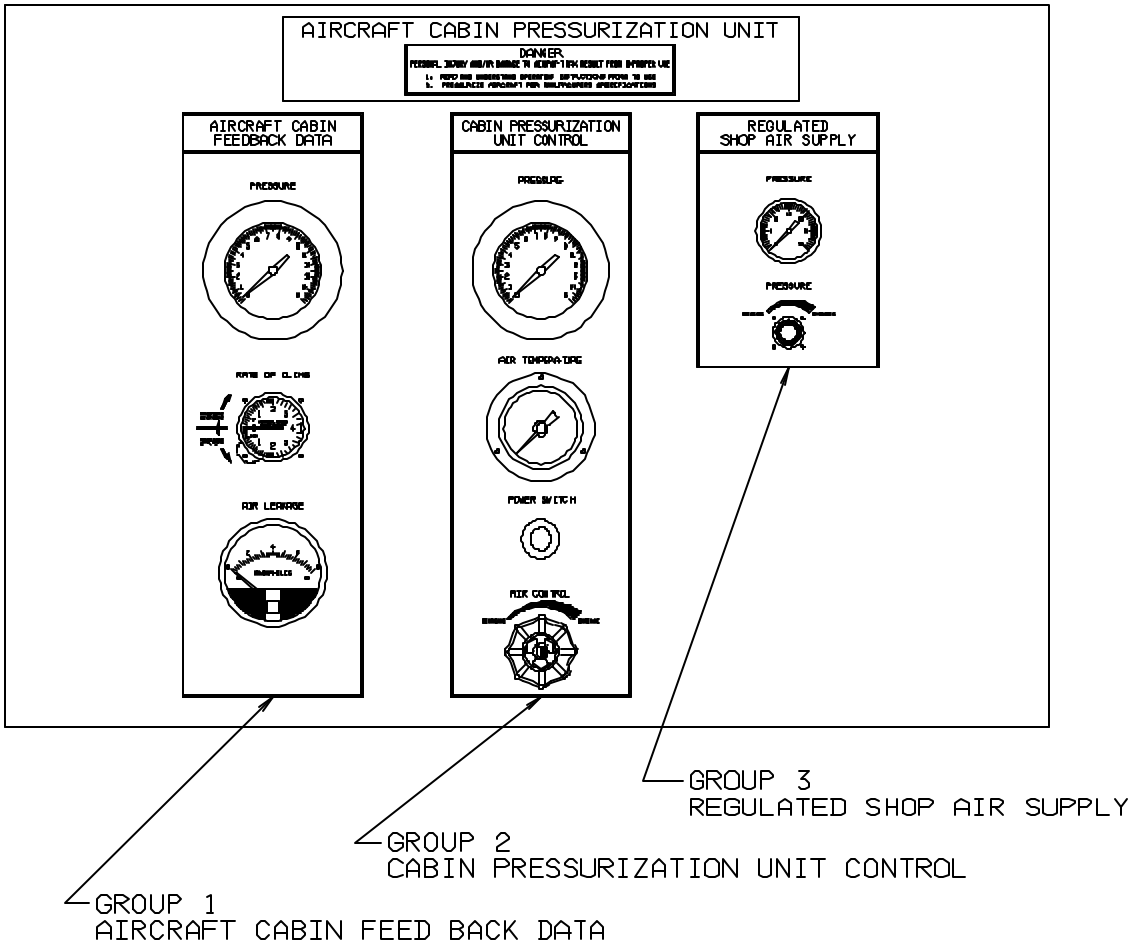


Figure 6
Aircraft Cabin Feed Back Data

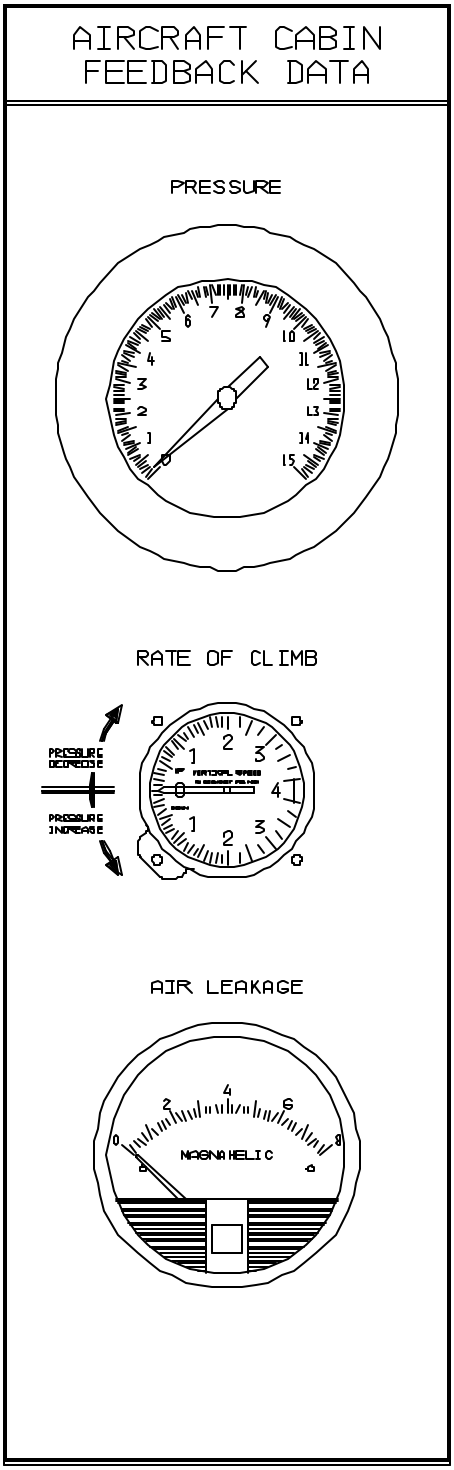


Figure 7
Cabin Pressurization Unit Control

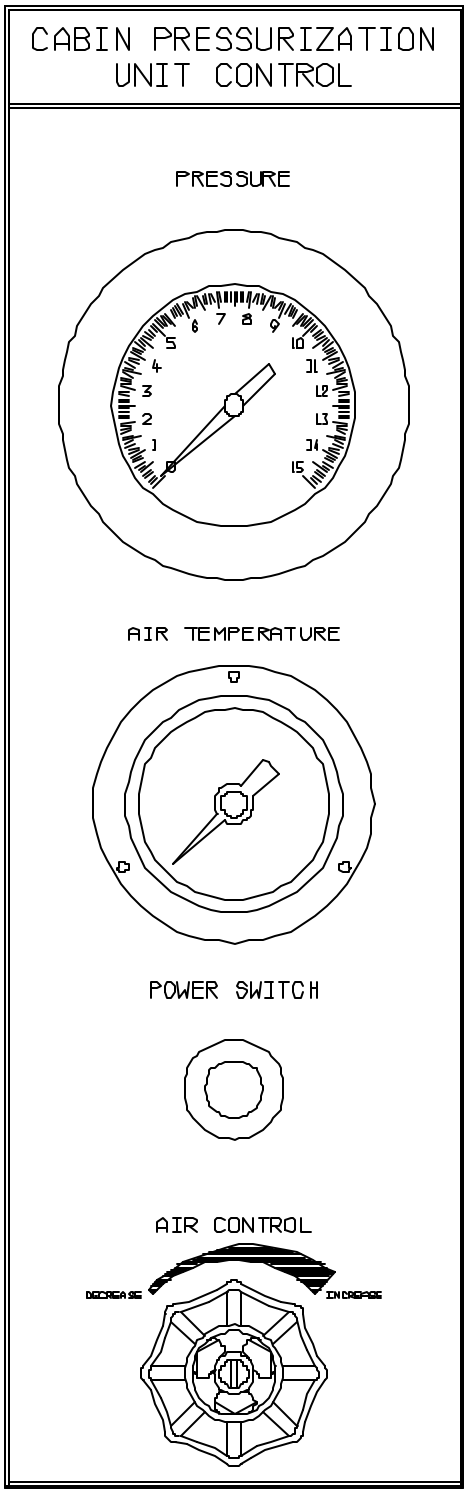
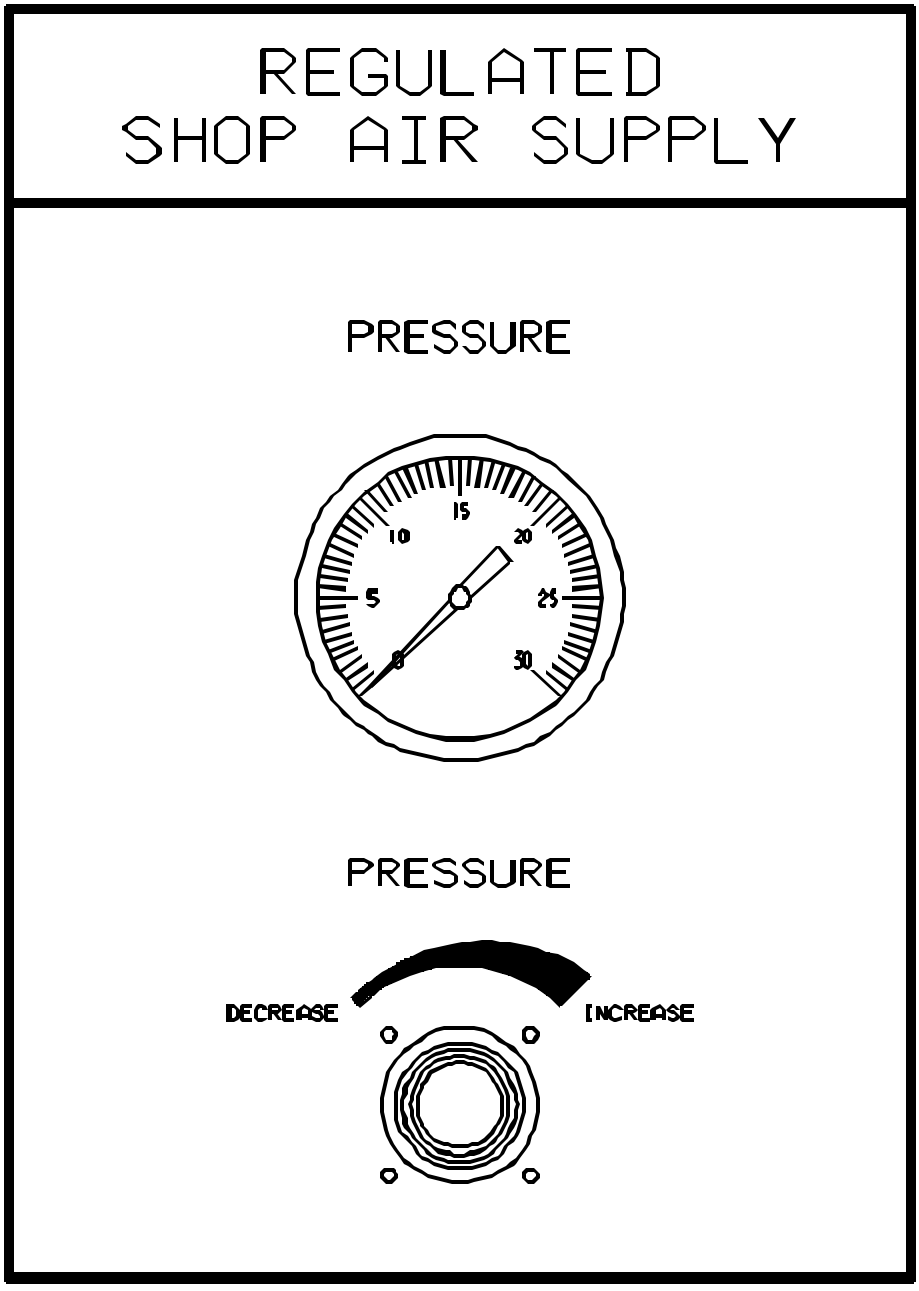


Figure 8
Regulated Shop Air Supply



1.0 GENERAL DESCRIPTION

The Tronair Model 15-7602-1000 Aircraft Cabin Pressurization Unit (CPU) provides a source of clean, low pressure air for performing required aircraft maintenance.

Some important features are:

- High quality rotary blower
- Blower oil level indicator
- Low noise level
- Motor: Heavy duty 3 phase electric motor with 5 year warranty, 15 HP

1.1 AIRCRAFT ADAPTER KITS

Aircraft adapter kits for specific aircraft are offered, please contact Tronair for the appropriate kit number. A partial listing of available kits is given in Appendix VIII.

2.0 TECHNICAL SPECIFICATIONS

2.1 PNEUMATIC (Reference Pneumatic Schematic, ***Figure 1***)

2.1.1 Cabin Supply

- Rotary blower, belt-driven
- Pressure range: 1 to 12 PSIG
- Air Flow: 0 to 240 ACFM
- Air inlet filter; dry element
- Pressure relief valve set at 13 PSIG
- 12 foot cabin air supply hose; 2 inch diameter
- Quick disconnect couplings on air supply hose

2.1.2 Cabin Pressurization Unit Control

- Pressure gauge: 0-15 PSIG (1/2 % Accuracy)
- Temperature indicator: 0-240°F
- Air control valve
- Ball Shut-off Valve, aircraft cabin air supply

2.1.3. Regulated Shop Air Supply

- Pressure gauge: 0-30 PSIG
- Pressure regulator

2.1.4 Noise Level: 87 dBa

2.0 TECHNICAL SPECIFICATIONS continued on following page.

2.0 TECHNICAL SPECIFICATIONS

2.2 ELECTRICAL

(Reference Electrical Schematic, ***Figure 2***)

- Air cooled induction motor, 15 HP
- Master power switch with light
- Magnetic start with overload protection
- 50 foot electrical power input cable less plug
- Power Requirements: Full Load AMPS, Voltage, & Hertz (See table below)

AMP	VOLTAGE	HERTZ
44.4	208	60
40	230	60
22.2	380	60
20	460	60
16	575	60
40	200, 220	50
20	380, 514, 440	50

2.3 INSTRUMENTATION/CONTROLS

(Reference **Figures 5 through 7** for the location of the following:)

2.3.1 Aircraft Cabin Feed Back Data

- Pressure gauge: 0-15 PSIG (1/2 % Accuracy)
- Rate of climb: 0-4000 foot per minute (ft/minute)
- Air leakage gauge: 0-8 inches water gauge (WG)
- 15 foot cabin pressure sensor hose

2.4 MECHANICAL

- Dimensions: Length.....57 inches
  Width.....39 inches
  Height.....43 inches
- Weight: 700 lbs.
- Casters: 6 inch, 2 swivel and 2 rigid
- Foot operated floor brake

3.0 DETAILED DESCRIPTION

The aircraft Cabin Pressurization Unit (CPU) uses a rotary blower driven by a 3 phase electric motor to provide a source of clean, low pressure air. As shown in the pneumatic system schematic, (***Figure 1***) air enters the unit through a dry element filter located outside of the cabinet. After the air has passed through the blower, it is either directed to the aircraft or returned to the atmosphere via the air flow control valve. A pressure relief valve has been provided to protect the blower from dead head start-up and is adjusted to open at 13 PSIG.

The exterior panels and components of the CPU are shown in ***Figures 3 through 5***.

The CPU control panel is broken down into three distinct sections for ease of operation and data gathering:

- Group 1 - Aircraft Cabin Feedback Data
- Group 2 - Cabin Pressurization Unit Control
- Group 3 - Regulated Shop Air Supply

3.1 GROUP 1 - AIRCRAFT CABIN FEEDBACK DATA

The aircraft cabin feedback data section is located on the far left side of the CPU control panel as shown in ***Figure 5***. It is this group of instruments that tell what is happening inside the aircraft.

The instruments in this group include the following as shown in ***Figure 6***:

- 0-15 PSIG pressure gauge
- 0-4000 ft/minute rate of climb gauge
- 0-8 inch WG air leakage gauge

3.1.1 Pressure Gauge

The pressure gauge is connected directly to the aircraft via the sensor hose, and senses the *actual* pressure within the aircraft (see ***Figure 1***). A gauge with an accuracy of one-half percent (1/2 %) has been selected for this purpose to assure accurate representation of cabin pressure.

3.1.2 Rate of Climb Gauge

The rate of climb gauge is also connected directly to the aircraft via the sensor hose and senses the cabin pressure rate of change (see ***Figure 1***). Most aircraft manufacturers require the cabin be pressurized or depressurized in terms of “rate of climb” or thousands of feet per minute. By controlling the rate of aircraft cabin pressurization, the affect on sensitive pneumatically operated flight gauges is minimized.

The operator must be aware that the rate of climb reads:

a. Increasing Pressure: Needle moves in the "Down" direction, counter-clockwise Rotation (CCW)

b. Decreasing Pressure: Needle Moves in the "Up" Direction, clockwise Rotation (CW)

3.1 GROUP 1 - AIRCRAFT CABIN FEEDBACK DATA continued on following page.

3.0 DETAILED DESCRIPTION

3.1 GROUP 1 - AIRCRAFT CABIN FEEDBACK DATA

3.1.3 Air Leakage Gauge

The air leakage gauge is the only gauge in Group 1 that is not connected to the aircraft sensor hose. As shown in ***Figure 1***, the air leakage gauge senses differential pressure in the aircraft air supply line. This differential pressure is translated into an air leakage flow reading via Curve 2 or 3 in ***Appendix I***.

When the aircraft cabin pressure is held in a state of equilibrium, as indicated by a *zero* reading on the rate of climb gauge, the air going to the aircraft cabin is equal to the air leaking from the aircraft cabin.

3.2 GROUP 2 - CABIN PRESSURIZATION UNIT CONTROL

The cabin pressurization unit control section is located in the middle of the control panel as shown in ***Figure 5***. It is the group of instruments and controls that govern CPU operation.

This group includes the following as shown in ***Figure 7***:

- 0-15 PSIG pressure gauge
- 0-240° F temperature indicator
- Power switch
- Air control
- Cabin air supply valve (see ***Figure 3***)

3.2.1 Pressure Gauge

The pressure gauge in this group indicates the pressure level within the CPU.

This pressure gauge will read higher than the aircraft cabin pressure gauge in Group 1. The difference in readings is the pressure drop of the system. In those aircraft where the supply air flows directly into the aircraft cabin the difference will be minimal. However, on those aircraft where the supply air must flow through a mass flow control valve, heat exchanger, check valve, etc. the difference may be significant. For example, in the Lear 35 aircraft the Group 2 pressure gauge will read 5 to 6 PSIG before the mass flow control valve opens and allows air to enter the aircraft cabin. At the leakage pressure level, the difference between the aircraft cabin pressure and the CPU pressure is about 3 PSIG on the Lear 35.

In some instances it may be necessary, depending on the aircraft system, to attach the aircraft air supply hose downstream of those back pressure devices in order to achieve the required pressure level for testing; check with the aircraft manufacturer first.

CAUTION

To prevent bodily injury or damage to aircraft:

Always follow the aircraft manufacturer's instructions when pressurizing aircraft.

It is the CPU pressure indication that is used in the air leakage determination - NOT the aircraft cabin pressure from Group 1.

3.2 GROUP 2 - CABIN PRESSURIZATION UNIT CONTROL continued on following page.

3.0 DETAILED DESCRIPTION

3.2 GROUP 2 - CABIN PRESSURIZATION UNIT CONTROL, Continued . . .

3.2.2 Temperature Indicator

The temperature indicator in this group senses the temperature of the air passing by the flow measuring station. This temperature reading has a two fold purpose. First, for correcting the actual air flow data (ACFM) to standard cubic foot per minute (SCFM) values, and second, to indicate the temperature of the make-up air going to the aircraft.

Appendix I gives the method for correcting ACFM data to SCFM.

As air is compressed, the temperature of the air is increased at the approximate rate of 13° F per 1 PSIG pressure over the ambient air temperature. It is expected to see higher air temperatures as the ambient temperature rises and as higher pressure levels are obtained. Temperatures of 220°F are possible under certain conditions.

However, due to the volume of air in the aircraft cabin, the amount of air being supplied and the heat loss between CPU and aircraft, little effect on cabin interior temperature will be seen for short runs of twenty minutes or less.

3.2.2.a Calculation of anticipated CPU air out temperature:

$T_o = T_a + (13 \times P_{cpu})$

Where: T_o = CPU air out temperature

T_a = Ambient temperature
13 = Degrees F used per CPU control group pressure

P_{cpu} = CPU control group pressure level

For example, on a 90°F day where the CPU must generate 10 PSIG air in order to get the aircraft cabin up to 8 PSIG.

$T_o = 90°F + (13 \times 10 \text{ PSIG})$

$T_o = 90°F + (130)$

$T_o = 220°F$

3.2.3 Power Switch

The power switch in Group 2, see ***Figure 7***, is the main electrical power switch for the CPU. It is a push/pull switch with ON being in the pulled direction and OFF being in the pushed direction.

3.2.4 Air Control

The air control in Group 2 is a valve that controls the amount of air directed to the aircraft, reference ***Figure 1***.

As shown in the pneumatic schematic, air from the blower is either directed to the aircraft or dumped to atmosphere. By opening this valve (full counter-clockwise position), the greatest amount of air is dumped to atmosphere, and as it is closed (clockwise rotation), air flow is increased to the aircraft along with a corresponding increase in pressure.

WARNING! ALWAYS start & stop the CPU with air control in FULL open (counter-clockwise) position. Failure to do this may cause damage to aircraft instruments.

3.0 DETAILED DESCRIPTION

3.3 GROUP 3 - REGULATED SHOP AIR SUPPLY

The regulated shop air supply section is located on the far right side of the control panel as shown in ***Figure 5***. There is no interconnection of this group with either Groups 1 or 2, as shown in ***Figure 1***.

The purpose of this group is to provide a supply of regulated shop air up to 30 PSIG for pressurizing aircraft cabin door seals. This group includes the following as shown in ***Figure 8:***

1. 0 - 30 PSIG pressure gauge
2. Air regulator

The inlet and outlet connections for this group are on the upper left corner of the cabinet rear panel, see ***Figure 4***.

4.0 PREPARATION FOR USE

The Aircraft Cabin Pressurization Unit (CPU) is shipped fully assembled and only the following steps are required to make the unit operational.

4.1 GENERAL INSPECTION

Visually check unit for loose nuts, bolts, etc. that may have resulted from shipment. Remove both front and rear panels to accomplish this check.

4.2 BLOWER

Check the blower oil level. A sight gauge is provided, shown in ***Figure 3***, on the left side panel.

NOTE: If oil is required, See ***Appendix IV-Blower Maintenance Data***, for oil type and filling procedure.

4.3 CONNECTING ELECTRICAL LEADS

Install plug (not supplied) onto the electrical cord. Check for proper motor rotation as follows:

1. Turn "air control valve" fully counter-clockwise to full "OPEN" position.
2. Fully "OPEN" the aircraft cabin air supply shut-off valve.
3. Power switch in "OFF" position.
4. Connect to electrical power supply.
5. Check motor rotation by "bumping" the master switch on-off. Rotation should be in the direction of the arrows affixed to the blower.
6. To correct motor rotation, change any two of the three input power leads at the plug.
7. Re-install both front and rear panels.

4.4 PRESSURE RELIEF VALVE (INTERNAL)

The pressure relief valve is factory set at 13.0 PSIG and should NOT be re-set by the customer to open at any pressure above 13.0 PSIG.

5.0 OPERATION

Due to the complexities, differences, and changes in aircraft pneumatic systems, no attempt has been made to relate to any specific aircraft. The customer must ALWAYS follow the aircraft manufacturer's instructions regarding aircraft cabin pressurization procedures and pressure levels. It is mandatory for safety reasons that the operator read and understand this manual and the aircraft maintenance manual prior to using this equipment.

Refer to the pages illustrating the control panel, ***Figure 5***, left side and front, ***Figure 3***, right side and rear, ***Figure 4***, pneumatic system schematic, ***Figure 1***, and internal component pages in the customer parts list for clarification while reading this manual.

CAUTION!

To prevent personal injury and/or damage to aircraft:

1. **ALWAYS follow aircraft manual procedures for aircraft pressurization.**
2. **NEVER exceed specified aircraft pressure levels.**
3. **NEVER operate this CPU prior to reading this manual.**
4. **NEVER open ANY aircraft cabin door or access panel if there is any pressure in the cabin.**
5. **ALWAYS use applicable safety equipment required for aircraft pressurization tests.**

5.1 GENERAL

This aircraft cabin pressurization unit (CPU) is a pneumatic device and as such is influenced by the laws of compressible fluids. The operator should be aware of the following information.

5.1.1 Compressed Air

As air is compressed, a tremendous amount of energy is stored. This is similar to the energy stored in a car coil spring when compressed. Under NO circumstances are aircraft doors or access panels to be opened if there is any pressure at all in the aircraft above atmospheric pressure.

As an example, the force produced on a door two (2) feet wide by five (5) feet high with only one (1) PSIG is equal to 1440 lbs.

5.1.2 ACFM vs. SCFM

Since air is a compressible fluid and is affected by pressure and temperature, the data taken represents "actual" cubic foot per minute (ACFM) air flows. By correcting for pressure and temperature, ACFM air flows are corrected to "standard" cubic foot per minute (SCFM) air flows. This is necessary so that leakage rates can be compared to aircraft specification values regardless of ambient conditions. Reference Appendix I.

5.0 OPERATION continued on following page.

5.0 OPERATION

5.2 OPERATING PROCEDURE

5.2.1 General Plan

In general, aircraft cabin leakage testing should be done as follows:

a. Using the CPU, establish actual aircraft leakage rate.

b. Compare the leakage rate (SCFM) to the aircraft manufacturer's specification.

c. Repair cabin leaks, starting with major leaks first. Use low pressure air, 1-2 PSI.

d. After repair, using the CPU again, determine the new leakage rate (SCFM) and compare to aircraft specification.

e. Repeat steps c and d above until the cabin leakage rate meets or is less than that required by the aircraft manufacturer's specifications.

5.2.2 Test Methods

Two different test methods are used to determine aircraft cabin leakage rates. One of these is generally specified by the aircraft manufacturer:

a. Flow measurement method

b. Pressure decay method

The following paragraphs explain each of the above methods.

CAUTION!

To prevent personal injury and/or damage to the aircraft, always follow the aircraft manufacturer's instructions for pressurizing aircraft.

1. Flow Measurement

   The flow measurement method measures the flow of air leakage from the aircraft cabin.

   The step-by-step test procedure for this test method is given in ***Appendix II***.

2. Pressure Decay Method

   The pressure decay method determines cabin air leakage by timing the rate of climb de-pressurization from a set pressure. The time is normally measured in seconds. A stopwatch readable in 0.10 of a second may be used for this test.

   The step by step test procedure for this test method is given in ***Appendix III***.

5.2 OPERATING PROCEDURE continued on following page.

5.0 OPERATION

5.2 OPERATING PROCEDURE

5.2.3 Aircraft Leakage

Aircraft cabins generally leak in the following areas:

- Door seals
- Outflow valves and valve gaskets
- Safety valves and valve gaskets
- Pneumatic air line connections
- Control cable seals in pressure bulkheads
- Electrical wiring bundles through pressure bulkheads
- Window seals
- Fuselage rivets and overlapping fuselage panels

5.2.4 Locating Aircraft Cabin Leaks

a. It does not require high pressure air to find leakage points in the aircraft cabins. Whenever possible, all leakage investigations should be performed at aircraft cabin pressures of between 1 and 2 PSIG. In this way:

   1. Less heat build-up will occur during extended running.
   2. Lower CPU noise is generated, allowing audible leaks to be found.
   3. Lower power consumption by the CPU.

b. Non-audible leaks can be found by spraying the aircraft exterior with a soap and water solution. Leaks are revealed by the bubbles generated and can be marked with a colored grease pencil for later correction.

6.0 MAINTENANCE

6.1 PRESSURE GAUGES

It is MANDATORY for safe unit operation that the pressure gauges reading aircraft cabin pressure and CPU pressure be calibrated and certified by an authorized repair station annually or sooner if they are suspected to be reading incorrectly.

These gauges must read within 1/2 % accuracy.

CAUTION!
Serious bodily injury caused by cabin over-pressurization may result by failure to comply with pressure gauge calibration and certification.

6.0 MAINTENANCE continued on following page.

6.0 MAINTENANCE

6.2 INSTRUMENTATION

All other instrumentation gauges should be calibrated annually in order to maintain unit over-all accuracy.

6.3 BLOWER OIL LEVEL

Prior to each use, the blower oil level should be checked and replenished as required:

a. An oil level gauge is located on the left side panel.

b. To replenish, remove CPU front panel, remove blower vent cap and add oil as required.

c. Do Not Overfill

d. Use a high grade of SAE 40 Non-Detergent Oil.

e. See ***Appendix IV*** for Maintenance Data

6.4 BELTS

The drive belts must remain tight for proper power transmission from the motor to the blower.

- Belts can be inspected by removing the rear panel.
- Adjustment is made by loosening the motor adjustment plate bolts and tightening the bolt located on the left end of the adjustment plate. After adjustment, re-tighten all motor bolts.

6.5 CASTER LUBRICATION

Once a year, lubricate all casters with general purpose grease.

6.6 BLOWER ROUTINE MAINTENANCE AND REPAIR

See ***Appendix IV*** for Maintenance Data.

6.7 ELECTRIC MOTOR

The electric motor selected for this CPU is of high quality and should provide years of trouble free service. See ***Appendix V***.

6.8 INLET AIR FILTER

Depending upon conditions, clean periodically and replace annually.

- See the Illustrated Parts List for the part number of the replacement filter.

7.0 TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
Cannot build required cabin air pressure -Flow HIGH -CPU Pressure LOWER	Excessive cabin leakage	Assure all aircraft inspection panels in place.
		Assure door seal inflated.
		Assure aircraft cabin air controls are properly set. Check outflow and safety valves.
Cannot build required cabin air pressure -Flow LOWER -CPU Pressure HIGH	Back pressure loss in aircraft system	ASSURE aircraft cabin air controls are set properly.
		Common on aircraft where CPU air enters upstream of aircraft mass air flow valve. Re-plumb downstream of aircraft mass air flow valve.
CPU output pressure and/or flow low.	Loose belts	Tighten belt/Replace belts
	Dirty inlet filter	Replace filter
	Low power	Check for facility blown fuse, loose wire or CPU motor starter heater.
No CPU output (Motor not running)	No inlet power	Check facility
	Motor heaters tripped	Power switch in OFF position, allow unit to cool, reset heaters and restart unit
	Failed motor	Replace motor
No CPU output (Motor running)	Blocked inlet	Inspect inlet silencer/filter for blockage and correct
	Leakage between unit and aircraft	Leak check hose connections and over all hose
	Drive belts failed	Inspect and tighten or replace
	Failed blower	Refer to ***Appendix IV***-Blower Maintenance

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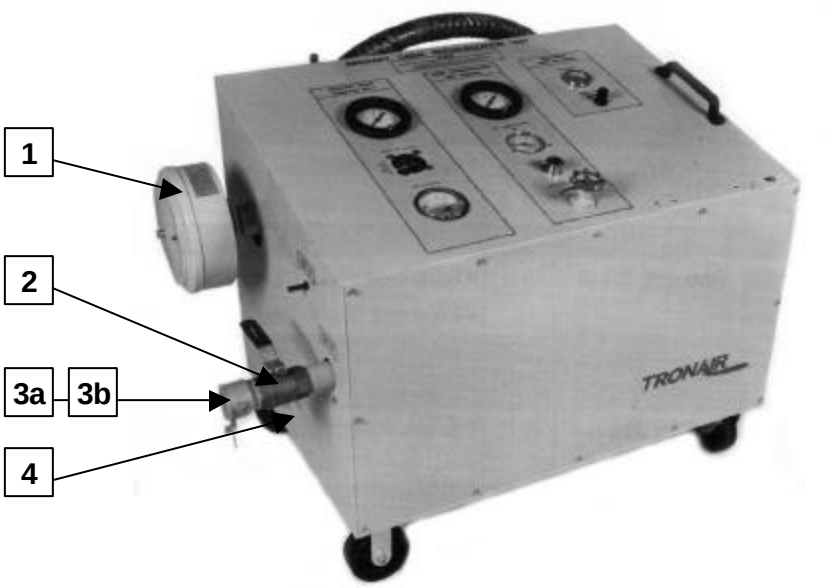
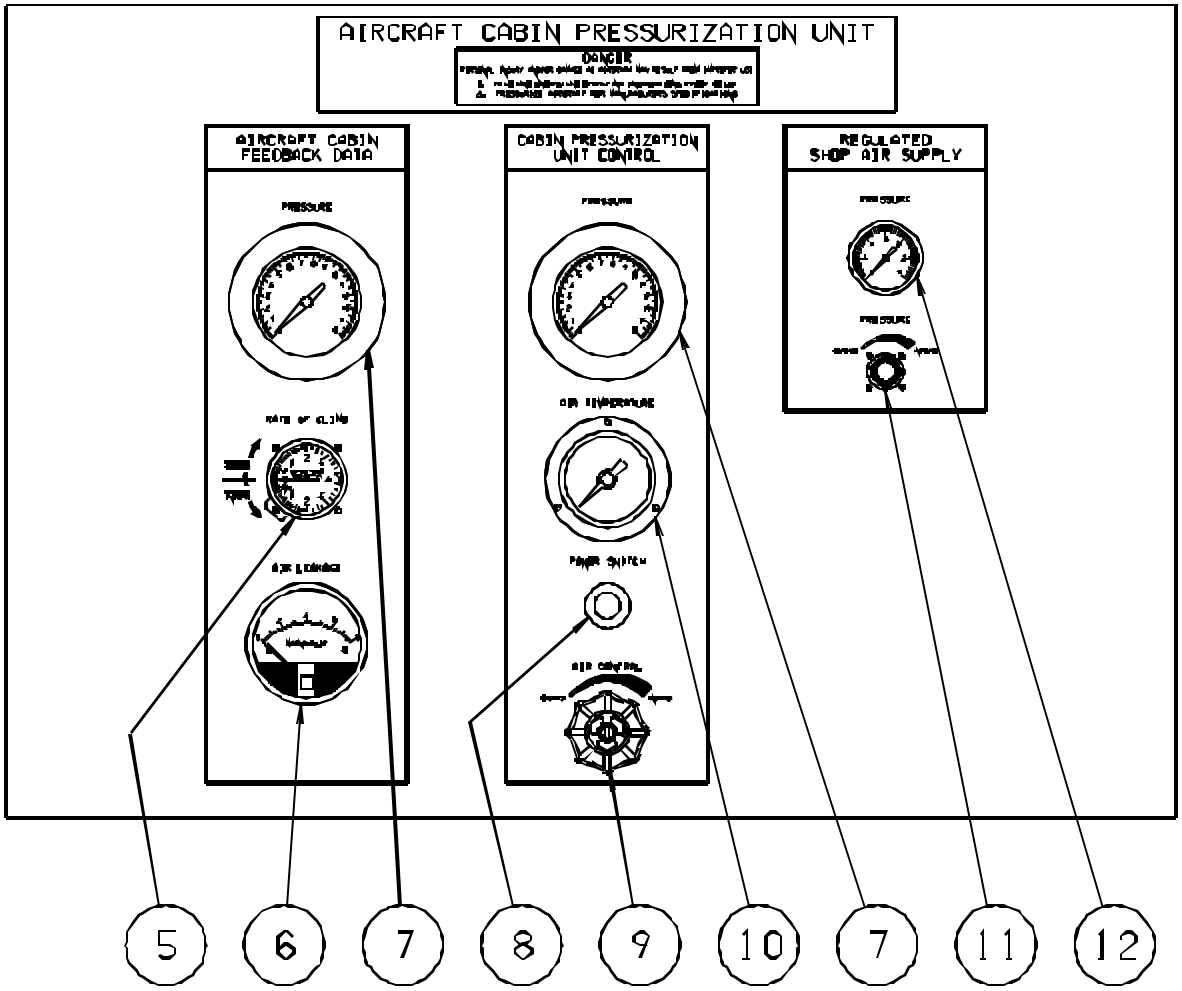
External Components



ITEM	PART NUMBER	DESCRIPTION	QTY
1	H-1402	Filter	1
	H-1439	Element Replacement	1
2	HC-1179	Valve, Ball	1
3A	N-1521	Coupling, Hose (M.P.T. Socket)	1
3B	N-1522	Coupling, Hose (F.P.T. Plug)	1
4	HC-1220	Gauge, Flush Channel	1

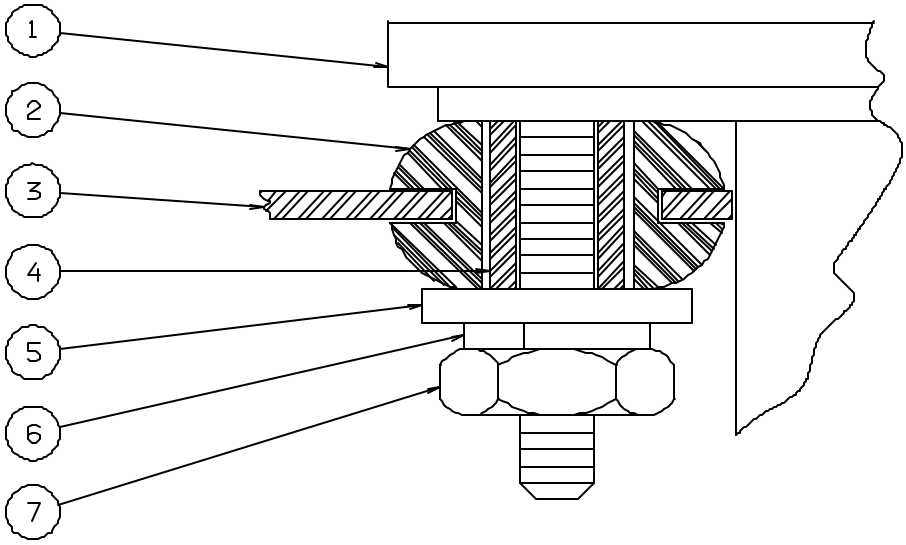
External Components



ITEM	PART NUMBER	DESCRIPTION	QTY
5	H-1396	Indicator, Vertical Speed	1
6	H-1409	Gauge, Magnehelic	1
7	H-1394	Gauge, Pressure (0-15 PSI)	2
8	EC-1058	Switch	1
	EC-1073	Bulb, Replacement Light	1
9	H-1407	Valve, Bypass	1
10	HC-1134-01	Gauge, Pyrometer	1
11	H-1397	Regulator	1
12	H-1395	Gauge, Pressure (0-30 PSI)	1

NOTE: For installation of Items 5 and 7, see Pressure Gauge, Page 23 and Vertical Speed Indicator Mounting, Page 24 in External Components Parts List.

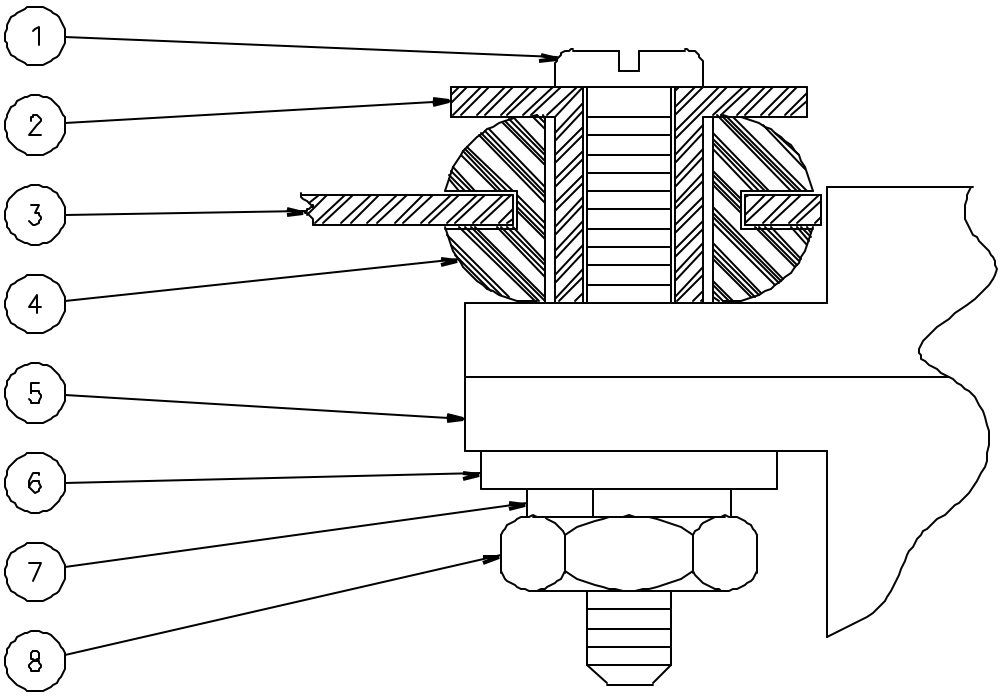
Pressure Gauge Mounting



ITEM	PART NUMBER	DESCRIPTION	QTY
1	H-1394	Gauge, Pressure (0-15 PSI)	2
♦2	H-1484-03	Grommet, Vibration	6
3	-----	Panel, Control	Reference
♦4	TR-1198	Spacer, Grommet	6
♦5	G-1250-1030N	Flatwasher, #10 Narrow	6
♦6	G-1251-1030R	Lockwasher, #10 Regular	6
♦7	G-1200-1030	Nut, 10-24 Hex	6

♦ Items indicated can be purchased as K-1354, Gauge Vibration Kit.

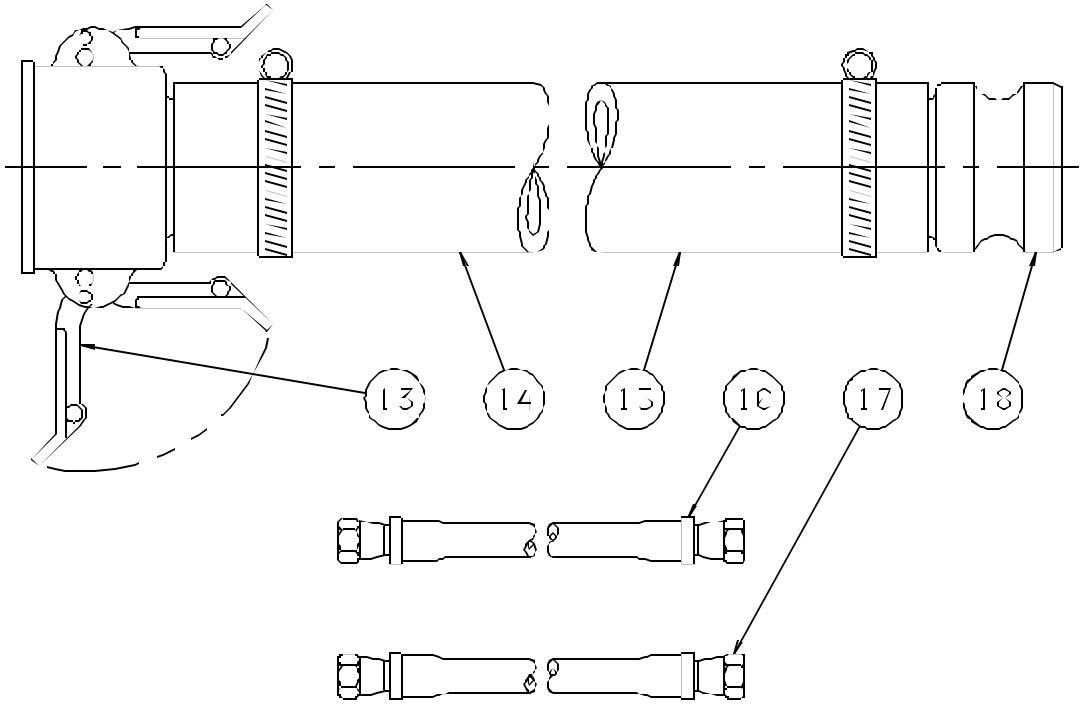
Vertical Speed Indicator Mounting



ITEM	PART NUMBER	DESCRIPTION	QTY
♦1	G-1159-101012	Screw, Pan Head Machine, 6-32 x 1-1/4" long	3
♦2	H-1487	Spacer, Grommet	3
3	-----	Panel, Control	Reference
♦4	H-1484-01	Grommet, Vibration	3
5	H-1396	Indicator, Vertical Speed	1
♦6	G-1250-1010N	Flatwasher, #6 Narrow	3
♦7	G-1251-1010R	Lockwasher, #6 Regular	3
♦8	G-1200-1010	Nut, 6-32 Hex	3

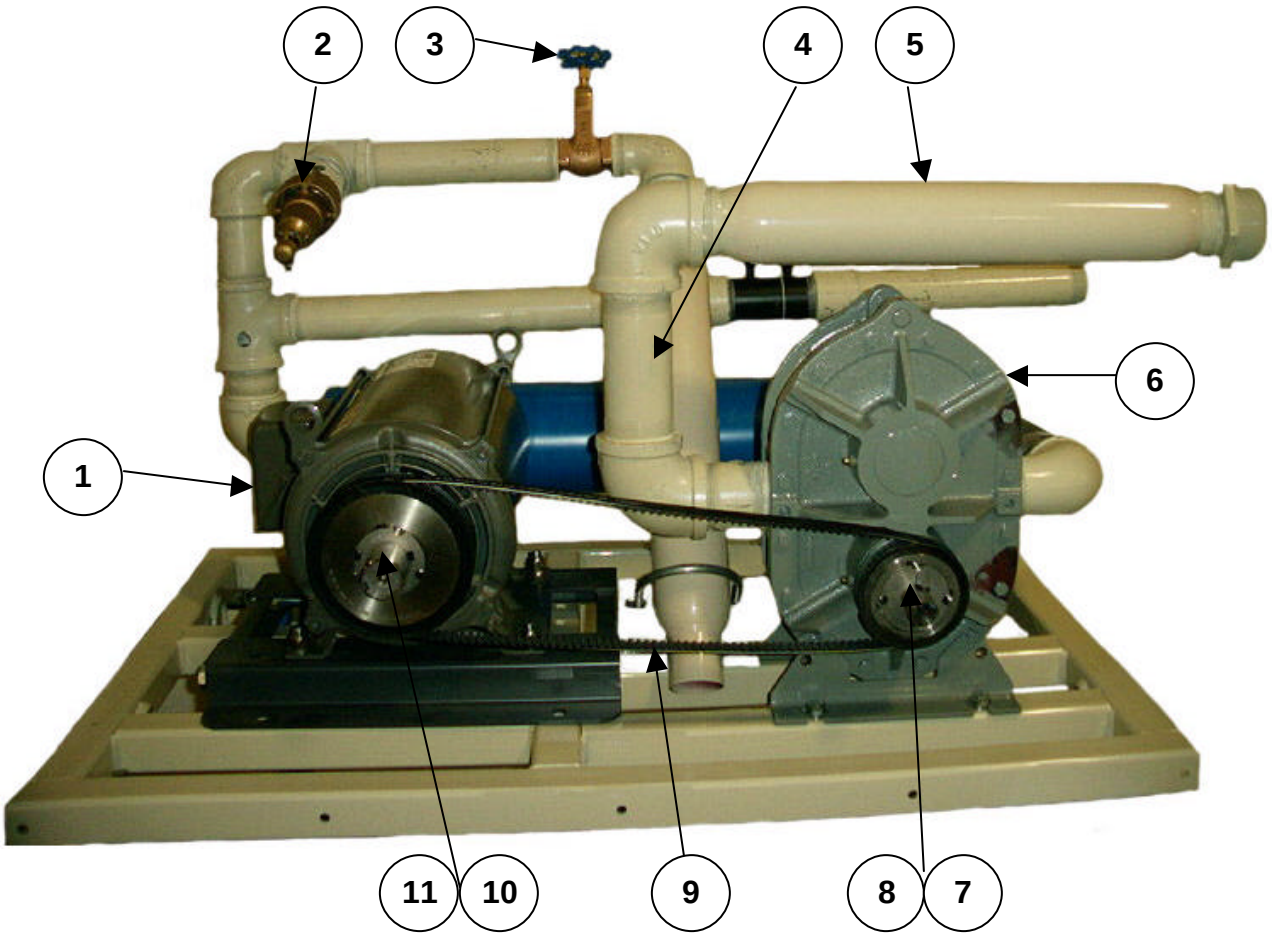
♦ Items indicated can be purchased as K-1354, Gauge Vibration Kit.

External Components



ITEM	PART NUMBER	DESCRIPTION	QTY
13	N-1523	Coupling, Hose (Hose Socket)	1
14	Z-1675-01	Assembly, Hose (includes Item 13, 15A, 18)	1
15	TF-1015*150	Hose	1
16	Z-1698-01	Assembly, Hose (Gray-Cabin Sensor Line)	1
17	Z-1697-01	Assembly, Hose (Red-Regulated Shop Air)	1
18	N-1520	Coupling, Hose (Hose Plug)	1
Not Shown	H-1584	Handle	1

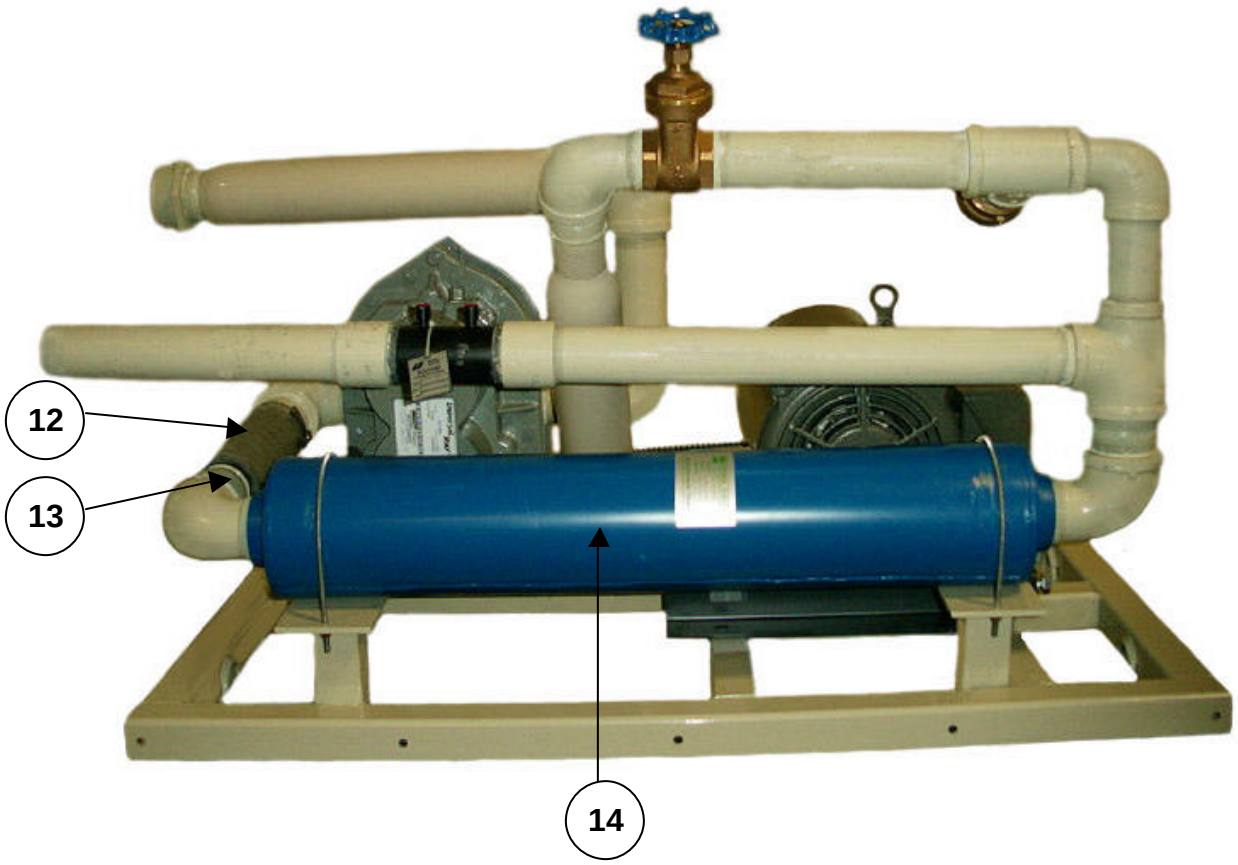
Internal Components



ITEM	PART NUMBER	DESCRIPTION
1	EC-1480-XX	Motor (See "Electrical Components)
2	H-1486	Valve, Relief
3	H-1407	Valve, Bypass
4	Z-1662	Assembly, Piping
5	Z-1657	Weldment, Muffler
6	H-1400-08	Blower
7	H-2438-13	Sprocket, Blower
8	H-2440-1.125	Bushing, Blower
9	H-1765-09-21	Belt, Poly Chain
10	H-2438-17	Sprocket, Motor
11	H-2439-1.625	Bushing, Motor

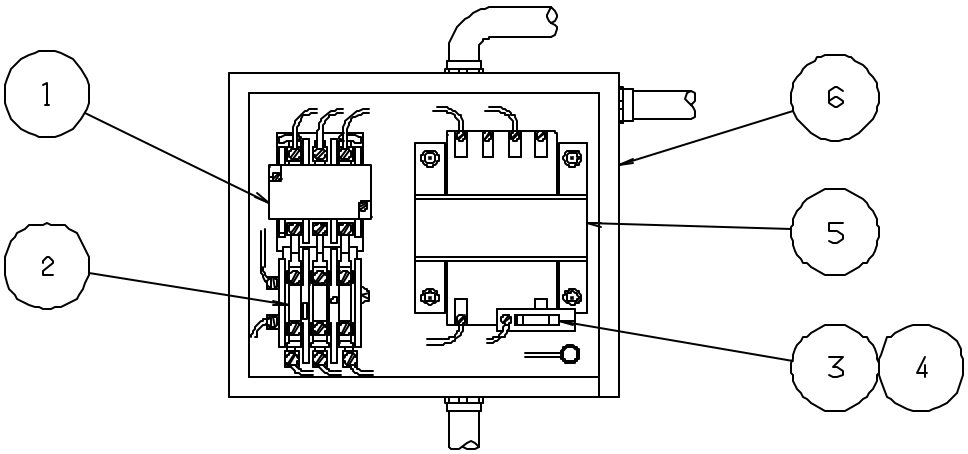
Internal Components continued on following page.

Internal Components



ITEM	PART NUMBER	DESCRIPTION	QTY
12	TF-1014*08.0	Hose	1
13	H-1426-12	Clamp, Hose	4
14	H-1403	Silencer	1
Not Shown	H-1437	Caster Wheel Replacement Kit	Reference

Electrical Components



ITEM	PART NUMBER	DESCRIPTION	QTY
1	SEE TABLE A	Starter	1
* 2	EC-1207	Heater	3
3	EC-1071	Holder, Fuse	1
4	EC-1094	Fuse	1
5	SEE TABLE B	Transformer	1
6	EC-1067	Electrical Box	1
Not Shown	EC-1058	Switch	1
Not Shown	See Table C	Motor	1

NOTE: 1. Specify proper voltage and Hertz when ordering.

TABLE A										
STARTER	60 Hz					50 Hz				
	208V	230V	380V	460V	575V	200V	220V	380V	415V	440V
EC-1203-03-F			X	X	X			X	X	X
EC-1204-08-F		X				X	X			
EC-1205-03-F	X									

TABLE B						
TRANSFORMER	60 Hz			50 Hz		
EC-1069	208V	380V	575V	200V	380V	415V
EC-1147	230V		460V	220V		440V

TABLE C							
MOTOR	60 Hz		50 Hz				
EC-1480-13	208V	380V	---				
EC-1480-14	230V	460V	200V	220V	380V	415V	440V
EC-1480-15	575V		---				

APPENDICES

I. LEAKAGE AIR FLOW DETERMINATION AND SCFM PROCEDURE
II. FLOW MEASUREMENT TEST PROCEDURE
III. PRESSURE DECAY TEST PROCEDURE
IV. BLOWER MAINTENANCE DATA
V. MOTOR MAINTENANCE DATA
VI. AIR FLOW GAUGE (MAGNEHELIC) CALIBRATION AND MAINTENANCE DATA
VII. PRESSURE GAUGE CALIBRATION DATA
VIII. AIRCRAFT ADAPTER KITS (PARTIAL LISTING)

APPENDIX I

LEAKAGE AIR FLOW DETERMINATION AND SCFM CORRECTION PROCEDURE

This procedure is used to determine aircraft SCFM (standard cubic feet per minute) leakage from data read from the cabin pressurization unit gauges.

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Four curves are used and provided herein. ***Reference Illustrations on Pages 3 & 4***

Curve #1 **Pressure Compensated Flow at 70° F:**
This curve is an expanded curve for reference only and allows the operator to determine aircraft leakage rates to the maximum "Air Leakage" gauge reading of 8.0 inches water (differential pressure), assuming a line air temperature of 70° F.

Curve #2 **Pressure Compensated Flow at 70° F:**
This curve is used to determine aircraft leakage rate where the CPU unit pressure gauge (Group 2) is reading between 3 and 7 PSI, assuming a line air temperature of 70° F.

Curve #3 **Pressure Compensated Flow at 70° F:**
This curve is used to determine aircraft leakage rate where the CPU unit pressure gauge (Group 2) is reading between 7 and 11 PSI, assuming a line air temperature of 70° F.

Curve #4 **Temperature Correction:**
This curve is used to provide a temperature correction multiplication factor that is used to convert the flow found using Curves 1, 2, or 3 to SCFM.

CFM DETERMINATION

Convert the reading (inches of WG) obtained from the air leakage gauge (Group 1) to CFM air flow by using Curves 2 or 3.

1. Determine which curve to use, curve 2 or 3, based on the level of CPU pressure.
2. Find inches of WG. value on the vertical scale.
3. Move horizontally across graph to the appropriate CPU pressure curve.
   a. CPU pressure Group 2 pressure is used to calculate leakage flow and not aircraft cabin pressure.
   b. Interpolate if the CPU pressure falls between the pressure lines provided.
4. At the intersection of inches of WG. and the CPU pressure curve, move downward on the graph and read air flow (CFM) from the horizontal scale.

NOTE: ***This value is the leakage air flow assuming an air flow temperature of 70° F.***

LEAKAGE AIR FLOW DETERMINATION AND SCFM CORRECTION PROCEDURE continued on following page.

APPENDIX I

LEAKAGE AIR FLOW DETERMINATION AND SCFM CORRECTION PROCEDURE

SCFM DETERMINATION

Correct the air flow value (CFM) obtained in CFM Determination section on previous page by multiplying this value by the temperature correction factor obtained from Curve 4. The result is leakage air flow corrected to standard conditions; SCFM (standard conditions are 14.696 PSI and 60° F).

1. Find the air flow temperature value read from the temperature gauge (Group 2) on the vertical scale of Curve 4.
2. Move horizontally across the graph to the temperature correction curve.
3. At the intersection of temperature and the temperature correction curve, move downward on the graph and read the Temperature Correction Multiplication Factor.
4. Multiply the air flow value obtained in CFM Determination section, Step 4 by this temperature correction factor. Leakage air flow is now in SCFM terms.

CFM multiplied by Temperature correction Factor = SCFM

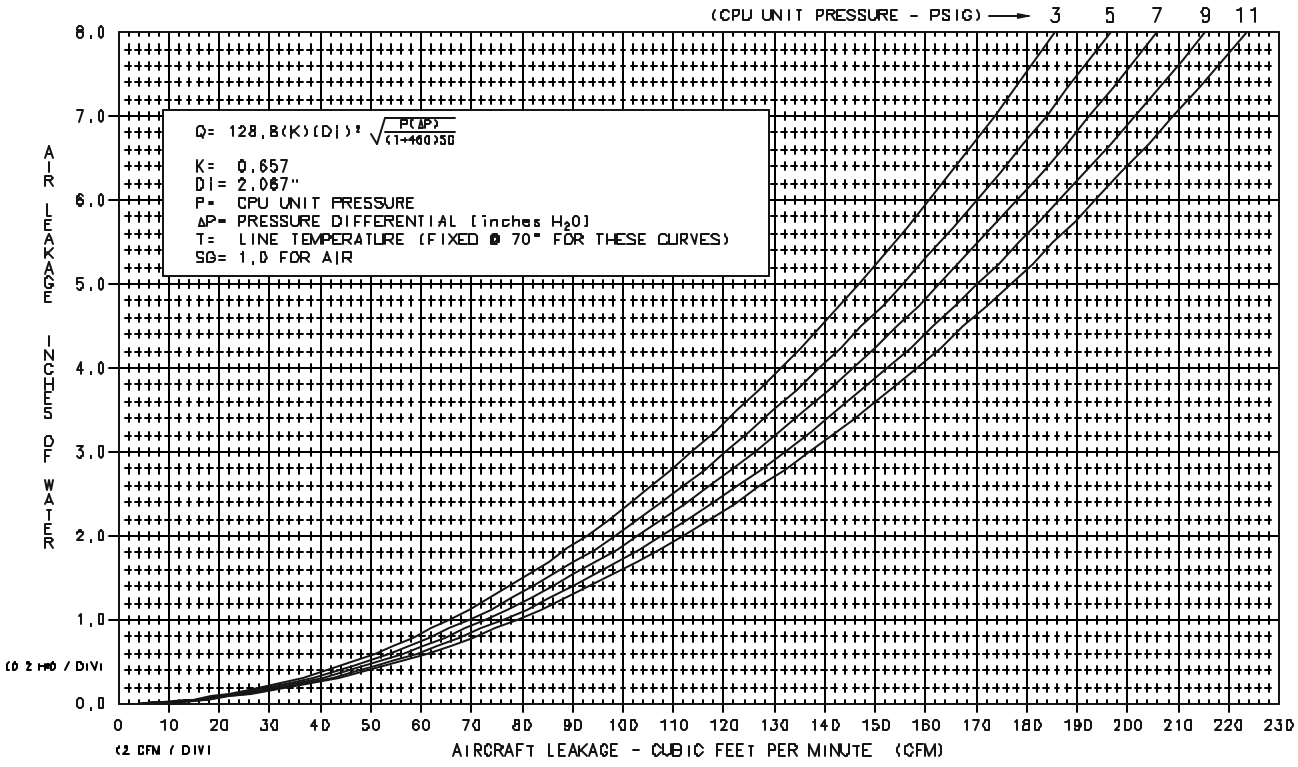
ACFM DETERMINATION

If required by aircraft manufacturer test specifications, the leakage flow rate can be expressed in ACFM. Determine SCFM using the above process, then convert SCFM to ACFM by using the following formula:

$$\text{ACFM} = \text{SCFM}\left(\frac{LineTemp + 460}{520}\right)\left(\frac{14.696}{CPU\ \text{Pr}essure + 14.696}\right)$$

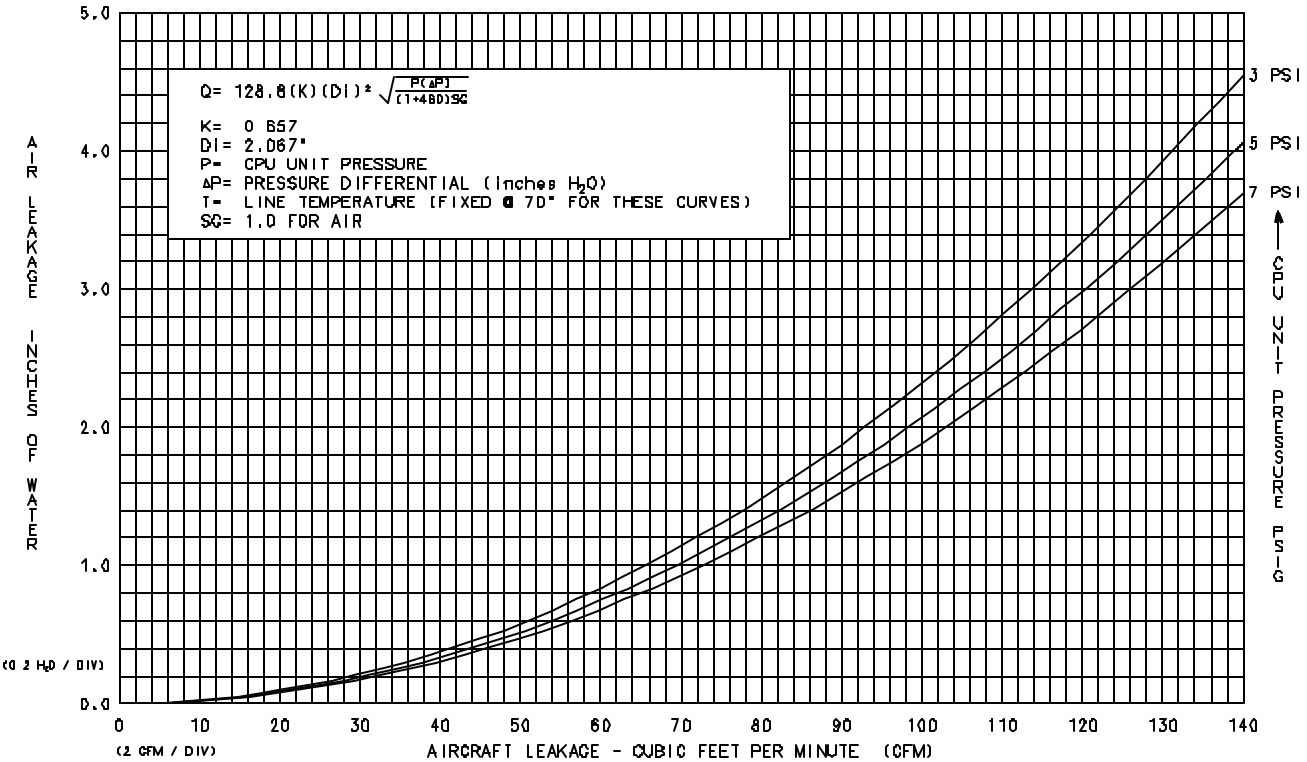
CURVE #1 PRESSURE COMPENSATED FLOW @ 70°: INCHES OF H_2O vs. LEAKAGE

Reference full size drawing included with this manual.

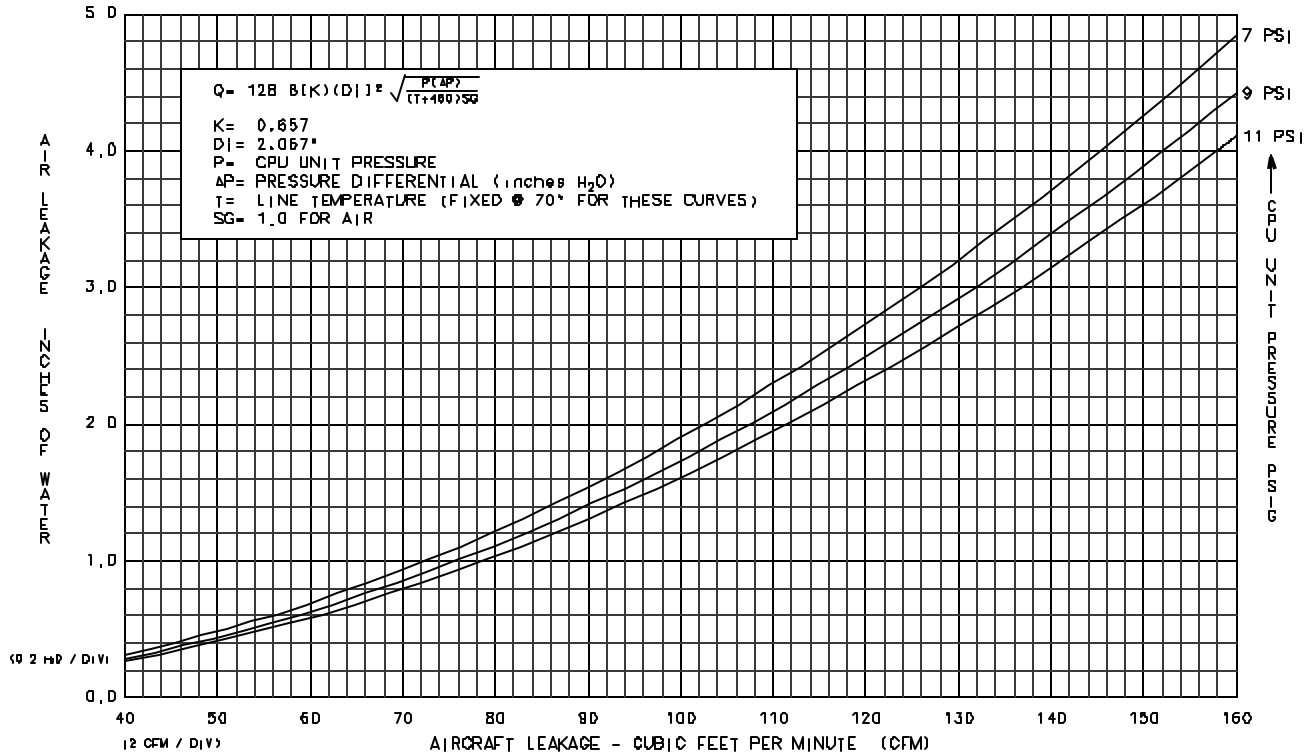


CURVE #2 PRESSURE COMPENSATED FLOW @ 70° F: INCHES OF H_2O vs. LEAKAGE

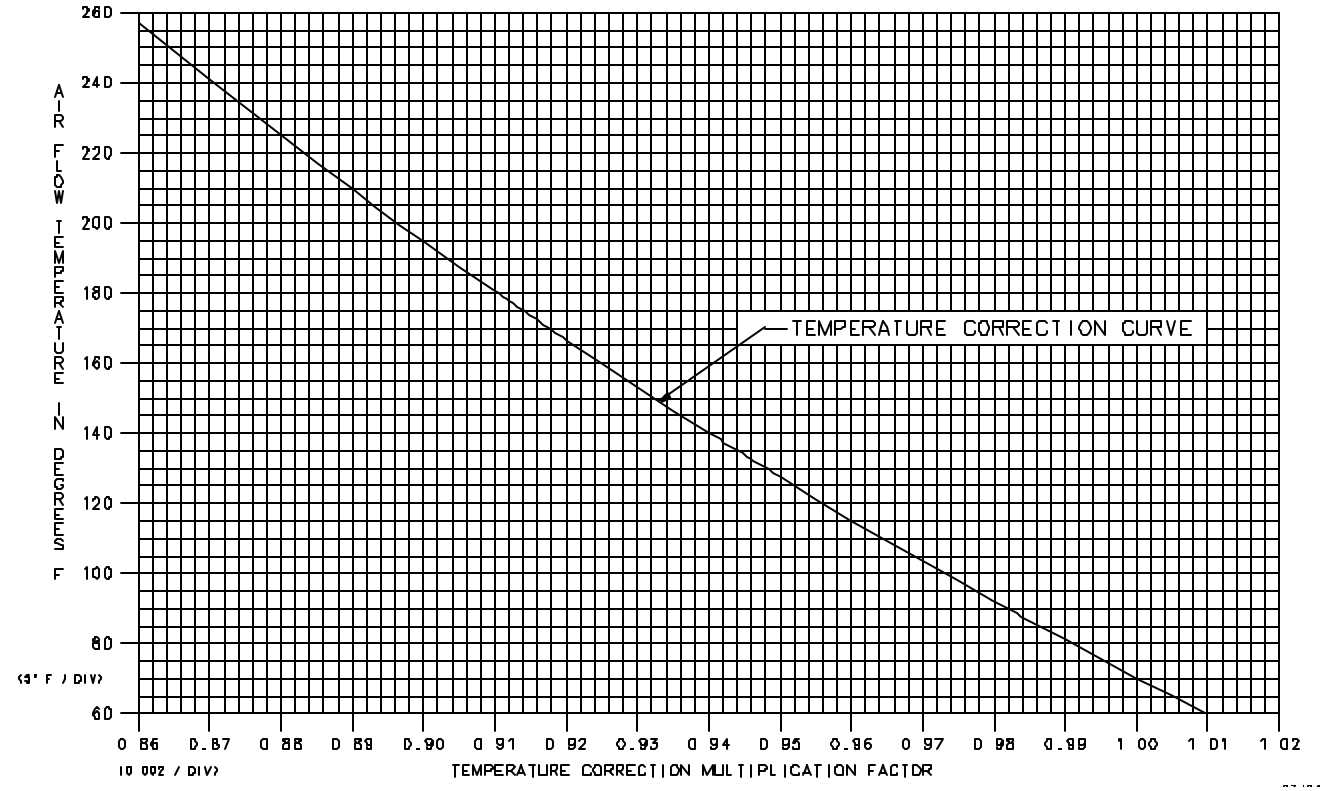
Reference full size drawing included with this manual.



CURVE #3 PRESSURE COMPENSATED FLOW @ 70° F: INCHES OF H_2O vs. LEAKAGE



CURVE #4 TEMPERATURE CORRECTION - DESIGN FLOW TEMP = 70° F



APPENDIX II

FLOW MEASUREMENT TEST PROCEDURE

This test procedure should be used when the aircraft manufacturer requires cabin air leakage be measured in terms of air flow; SCFM (standard cubic feet per minute).

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FLOW MEASUREMENT TEST PROCEDURE

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DANGER!

To prevent personal injury and/or damage to the aircraft:

1. **ALWAYS follow the aircraft manufacturer's instructions for pressurizing aircraft.**
2. **NEVER operate this CPU prior to reading the CPU operation and service manual.**

1. Determine the aircraft pressurization limits and leakage rates from the aircraft manufacturer's manual. A handy form for recording this data is provided at the end of this procedure.
2. Connect the air supply hose to the aircraft with the appropriate adapter.
3. Connect the sensor hose to the aircraft.

CAUTION!

To obtain true aircraft cabin feedback data and prevent over pressurizing the aircraft cabin:

1. **All connections must be tight and free of leaks.**
2. **Aircraft connection port must be unobstructed and connected directly to the cabin and/or cockpit area.**

4. If required, connect the regulated shop air hose to the aircraft in order to pressurize door seals, etc.

NOTE: It is suggested that prior to each use, the regulator be adjusted to its minimum setting and re-set as required.

5. Set aircraft cabin pressurization controls in the cockpit in accordance with the aircraft manufacturer's instructions for ground pressurization testing using external air source.
6. Secure all aircraft windows, access panels, and doors as if preparing the aircraft for take off.

CAUTION!

To prevent personal injury, attach warning tags to all door handles.

7. Close the CPU aircraft cabin air supply valve.
8. Fully open the CPU air control valve (full counter-clockwise position).
9. Turn power "ON" to CPU.

FLOW MEASUREMENT TEST PROCEDURE continued on following page.

APPENDIX II

FLOW MEASUREMENT TEST PROCEDURE

10. Slowly open the aircraft cabin air supply valve.
    a. The CPU rate of climb gauge will start reading (on most aircraft) showing air is going into the aircraft.
    b. The rate of climb gauge indicates an INCREASE in pressure when the needle moves in the down direction; (counter-clockwise).
    c. Check and correct any leaks in the air supply hose connections between CPU and aircraft as these will contribute to the aircraft leakage rate and give erroneous readings.
11. Increase aircraft cabin pressure, read off the CPU panel (Group 1), by turning the CPU air control valve clockwise. The cabin rate of climb gauge will respond directly with the turning of this valve.

WARNING!

- **Damage to the aircraft instrumentation is possible.**
- **DO NOT exceed aircraft manufacturer's rate of climb specification.**

12. As the aircraft cabin pressure approaches the required level, gradually back-off the CPU cabin air control valve so that at the required pressure level, the rate of climb reads zero (0).

    NOTE: If the leakage rate is too high, the required pressure may not be attainable. At this point, record the data stated in Step 13 below.

13. Maintaining the CPU rate of climb at zero, ♦record the following data:
    a. Aircraft cabin pressure (PSIG)
    b. Air leakage rate, inch (WG)
    c. CPU pressure (PSIG)
    d. CPU air temperature (°F)

♦ ***See form at end of Appendix II.***

14. After the data has been recorded, reduce the aircraft cabin pressure to zero (0) using the CPU aircraft cabin air control valve. Turn the valve counter-clockwise while maintaining an acceptable rate of descent on the rate of climb gauge.

    NOTE: The rate of climb gauge shows a DECREASE in cabin pressure when the needle moves in the up direction; clockwise.

WARNING!

- **Damage to the aircraft instrumentation is possible.**
- **DO NOT exceed aircraft manufacturer's rate of descent specification.**

15. If there is still pressure in the aircraft after the aircraft cabin air control valve is in the full counter-clockwise position, close the aircraft cabin AIR SUPPLY VALVE and shut off the CPU.

    The remaining aircraft cabin pressure will bleed off naturally. Opening the aircraft cabin supply valve slightly will increase the bleed off rate, however, do not exceed rate-of-descent limits.

FLOW MEASUREMENT TEST PROCEDURE continued on following page.

APPENDIX II

FLOW MEASUREMENT TEST PROCEDURE

16. Ensure ALL cabin pressure is bled off.

DANGER!

Under possibility of bodily injury, do not open cabin door until:

1. **"Tapped" cabin feed back pressure gauge reads zero (0),**
2. **Disconnected air supply hose from cabin pressurization unit is checked to assure no air is coming from aircraft,**
3. **Slowly unlatch cabin door.**

17. See Appendix I for leakage data correction to SCFM.

FLOW MEASUREMENT TEST PROCEDURE continued on following page.

APPENDIX II

DATA SHEET: FLOW TEST METHOD

Aircraft :	**Notes:**
Aircraft Registration No:	
Pressures: • Not to exceed _____PSIG • Safety Valve Operation _____PSIG • Leakage Test _____PSIG	
Rate of Climb (not to exceed): Ascent _____FT/MIN Descent _____FT/MIN	
Cabin Leakage Limit: • Test Data - Unit Air Supply Temp _____° F - Flow Rate _____"WG - CPU Pressure♦ _____PSIG • From Curves #2 & #3 "WG = _____ACFM • From Curve #4 Temp. Factor x (_____ACFM) =_____SCFM ♦**Record and calculate** CPU Pressure, not aircraft cabin pressure	
Tested By: Date:	
Repair Station Cert. No:	

APPENDIX III

PRESSURE DECAY TEST PROCEDURE

This test procedure should be used when the aircraft manufacturer requires cabin air leakage be measured in terms of pressure decay during a period of time; seconds.

APPENDIX III

PRESSURE DECAY TEST PROCEDURE

This test procedure should be used when the aircraft manufacturer requires cabin air leakage be measured in terms of pressure decay during a period of time; seconds.

DANGER!

To prevent personal injury and/or damage to the aircraft:

1. **Always follow the aircraft manufacturer's instructions for pressurizing aircraft.**
2. **Never operate this CPU prior to reading the CPU operation and service manual.**

The pressure decay method determines cabin air leakage by timing the rate of cabin depressurization from a set pressure. The time is normally measured in seconds. A stopwatch readable in tenths of a second may be used for this test.

1. Determine the aircraft pressurization limits and leakage rates from the aircraft manufacturer's manual. A handy form for recording this data is provided at the end of this procedure.
2. Connect the air supply hose to the aircraft with the appropriate adapter.
3. Connect the sensor hose to the aircraft.

CAUTION!

To obtain true aircraft cabin feedback data and prevent over- pressurizing the aircraft cabin:

1. **All connections must be tight and free of leaks.**
2. **Aircraft connection port must be unobstructed and connected directly to the cabin and/or cockpit area.**

4. If required, connect the regulated shop air hose to the aircraft in order to pressurize door seals, etc.

NOTE: It is suggested that prior to each use, the regulator be adjusted to its minimum setting and reset as required.

5. Set aircraft cabin pressurization controls in the cockpit in accordance with the aircraft manufacturer's instructions for ground pressurization testing using an external air source.
6. Secure all aircraft windows, access panels, and doors as if preparing the aircraft for take off.

CAUTION!

To prevent personal injury, attach warning tags to all door handles: "DO NOT OPEN".

7. Close the CPU aircraft cabin air supply valve.

PRESSURE DECAY TEST PROCEDURE continued on following page.

APPENDIX III

PRESSURE DECAY TEST PROCEDURE

8. Fully open the CPU air control valve (full counter-clockwise position).
9. Turn power "ON" to CPU.
10. Slowly open the aircraft cabin air supply valve.
    a. The CPU rate of climb gauge will start reading (on most aircraft) showing air is going into the aircraft.
    b. The rate of climb gauge indicates an INCREASE in pressure when the needle moves in the down direction (counter-clockwise).
    c. Check and correct any leaks in the air supply hose connections between CPU and aircraft as these will contribute to the aircraft leakage rate and give erroneous readings.
11. Increase aircraft cabin pressure, read off the CPU panel (Group 1), by turning the CPU air control valve clockwise. The cabin rate of climb gauge will respond directly with the turning of this valve.

WARNING!

- **Damage to the aircraft instrumentation is possible.**
- **DO NOT exceed aircraft manufacturer's rate of climb specification.**

12. As the aircraft cabin pressure approaches the required level, gradually back-off the CPU cabin air control so that at the required pressure level, the rate of climb reads zero (0).
13. With the rate of climb gauges stabilized at zero (0), the following tasks must be performed in rapid succession:
    a. Close the aircraft cabin air supply valve.
    b. Start the stop watch.
    c. Shut off the CPU master switch.
    d. Record the elapsed time rate between the two specified pressure levels.
14. After the data has been obtained, bleed off the aircraft cabin pressure to zero (0).

NOTES: ***1. If the bleed off rate is low, open the supply valve slightly to increase bleed off rate, however, do not exceed rate of descent limits.***
2. The rate of climb gauge shows DECREASE in cabin pressure when the needle moves in the UP direction, (clockwise).

15. Ensure all cabin pressure is bled off.

DANGER!

Under possibility of bodily injury, DO NOT open cabin door until:

1. **Tapped cabin feed back pressure gauge reads zero (0).**
2. **Disconnected air supply hose from cabin pressurization unit is checked to assure no air is coming from aircraft.**
3. **Slowly unlatch cabin door.**

APPENDIX III

DATA SHEET: PRESSURE DECAY METHOD

Aircraft :	**Notes**
Aircraft Registration No:	
Pressures: • Not to exceed _____PSIG • Safety Valve Operation _____PSIG • Leakage Test: Initial Pressure _____PSIG Final Pressure _____PSIG	
Rate of Climb (not to exceed): • Ascent _____FT/MIN • Descent _____FT/MIN	
Cabin Pressure Decay: • Specification Time Limit _____SEC • Actual Time _____SEC	
Tested By:_____Date:_____	
Repair Station Cert. No:_____	
CPU Pressure, not aircraft cabin pressure	

APPENDIX IV

BLOWER MAINTENANCE DATA

APPENDIX V

MOTOR MAINTENANCE DATA

APPENDIX VI

AIR FLOW GAUGE (MAGNEHELIC) CALIBRATION & MAINTENANCE DATA

APPENDIX VII

PRESSURE GAUGE CALIBRATION DATA

APPENDIX VIII

CPU ADAPTERS

APPENDIX VIII

CPU ADAPTERS

The following CPU aircraft adapters are available from Tronair. If you cannot find the specific adapter you require, please contact Tronair sales.

ADAPTER KIT NUMBER	AIRCRAFT
K-1285	Beech King Air
K-1286	Lear 35
K-2601	Cessna Citation I, II, V, S/II & Ultra
♦ K-1288	Cessna Citation III
K-1358	Citation I & II (Threaded)
K-1359	Cessna 421, 425, 441
K-1360	Lear 55 & Embraer 120
K-1381	Pa-31T Cheyenne
K-1456	Beech Duke
K-1491	Cessna 337
K-2610	Raytheon Hawker
K-1622	Falcon 10, 20, 50, 100, 200, 900
K-1623	Aero Commander
K-1660	MU-2 & Beech Jet (Diamond)
K-1661	Lear 24
K-1943	Beech Starship
♦♦ K-2182	Lear 55 (Prior To S/N 124), Lear 60
K-2403	Sabre 65
K-2418	Westwind
K-2453	Pilatus PC-12
K-3317	SJ 30-2
K-3372	Galaxy

♦ Citation III must use the kit only; deflector for temperature dissipation.

♦♦ A/C must have LearJet part number S419057-8 duct.