Operation & Service Manual

Model: 15X7603-1000
Cabin Pressurization Unit

CE

01/2003 – AB – Rev. OR

Includes Illustrated Parts Lists

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1.0 PRODUCT INFORMATION

Cabin Pressurization Unit (CPU)

* Model 15***X***7603-1000 20 HP CE Compliant

Serial Number located on Nameplate.

Date of Manufacture located on Nameplate.

Location of Manufacture: ***Tronair***, Inc.
1740 Eber Road
Holland, Ohio 43528 USA

* ***X denotes Electrical Option. Reference Section 6.1.2 Full Load Amperage Table.***

1.1 Function

This Cabin Pressurization Unit is designed to provide a controllable air supply for the pressurization of aircraft cabin and cockpit areas for the purpose of cabin leakage testing, and/or outflow valve tests.

Adapter kits (sold separately) must be used to connect the Supply Hose from the CPU to the aircraft. (See Appendix VII for List of Adapter Kits)

This Cabin Pressurization Unit is to be operated only by qualified trained technicians.

This Operation and Service Manual is to be used only by qualified trained technicians.

1.2 List Of Drawings

- Outline Dimensions
- Pneumatic Schematic
- Electrical Schematic
- Wiring Diagram

1.3 Relevant Standards

a. The CPU has been designed to comply with the following directives:

— 89/392/EEC: Machinery Directive

— 89/336/EEC: Electromagnetic Compatibility

b. The following standards were used as guides to design the CPU:

— EN 292-1:1991

— EN 292-2:1991/1995

— BS EN 418:1992

— BS EN 954-1:1997

— BS EN 983:1996

— BS EN 1050:1997

— BS EN 60204-1:1998

— prEC 1915-1:1995

1.0 Product Information continued on following page.

1.0 PRODUCT INFORMATION

1.4 Overview

FIGURE 1 – Front View

FIGURE 2 – Rear View

2.0 SAFETY INFORMATION

2.1 Alarm and Warning Systems

This machine does not have any alarm or warning systems.

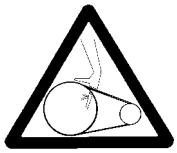
2.2 Explanation of Warning and Danger Signs

Misuse of machine can cause personal injury and/or property damage.

Operation of the Cabin Pressurization Unit must be in accordance with this manual, and the airframe manufacturers instructions

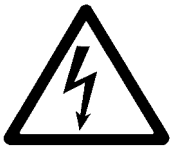
WARNING!

Warning is used to indicate the presence of a hazard that ***can cause severe personal injury, death, and/or substantial property damage*** if the warning notice is ignored.



HAND ENTANGLEMENT/BELT DRIVE!

This label warns of belt drive hazard inside cabinet ***that can cause severe personal injury.***



ELECTRICAL SHOCK!

Never touch electrical wires or components while electrical power is applied. Electrical wires can be sources of electrical shock.

Do not operate CPU with cabinet panels removed.

2.3 Component Safety Features

- Overload and short circuit protection
- Pressure relief valve for blower protection set at 13.5 psi/0.9 bars
- Emergency Stop button located on control panel
- Separate Start and Stop buttons
- Caster brakes and swivel locks on all four corners

2.4 Functional Safety Features

The pressure relief valve has been sized to bypass the full output of the blower. This feature provides operator and Cabin Pressurization Unit protection in the case where an operator may inadvertently start the machine with both the ball valve and the Airflow Control Valve closed.

Control circuit voltage is 24 V~, provided by the control circuit transformer.

2.5 Features for Operator Safety

In addition to the safety features listed above, the Cabin Pressurization Unit incorporates high attenuation industrial blower silencers for reduced noise levels.

2.5.1 Removable Guards

The front and rear removable guards provide access to the drive motor, belts, and blower. The fasteners for attaching these panels to the machine are captivated by O-rings.

2.0 Safety Information continued on following page.

2.0 SAFETY INFORMATION

DO NOT operate the machine with the guards removed

2.6 Personal Protective Equipment

Operators must use personal protective equipment in accordance with their employer's requirements.

The maximum sound level is 91 dB(a) at 3 foot (91.4 cm) distance from back of machine with unit operating at 12 psi (0.83 bars) system pressure and ball valve closed.

2.7 Safety Guidelines

Any uses other than those identified in section 1.1 of this manual are prohibited.

2.8 Conditions for Safe Use

Recommended Ambient Temperature Range = 32° to 90° F (0° to 32° C).
Do not operate outdoors while raining.

2.9 Technical Expertise For

2.9.1 Installation

The installation of this machine is to be completed by qualified electricians. See Section 6 for installation information.

2.9.2 Operation

This machine is to be used by skilled and trained aircraft technicians in accordance with this manual, and the airframe manufacturer's instructions. See Section 7 for Operation Instructions.

2.9.3 Maintenance

This machine is to be maintained by qualified maintenance personnel. See Section 9 for maintenance information.

2.10 Additional Safety Information

2.10.1 Always start the machine with the Airflow valve full open (counter-clockwise).

- **ALWAYS follow the airframe manufacturer's instructions when pressurizing an aircraft.**
- **NEVER open any aircraft door or access panel while there is any pressure within the cabin/cockpit.**
- **ALWAYS use applicable safety equipment required for aircraft pressurization tests.**

3.0 PACKAGING AND STORAGE

3.1 Packaging Requirements

Packaging for shipment should include a suitable pallet with surrounding crating to prevent damage to unit. The machine should be securely strapped to the pallet. Rings for this purpose are located at either end of the machine, on the bottom of the frame.

3.0 Packaging and Storage continued on following page.

3.0 PACKAGING AND STORAGE

3.2 Methods of Handling

The Cabin Pressurization Unit can be rolled freely by hand. If required, the unit may be lifted, by a suitable fork truck, from any side provided that the forks extend thru to the side opposite the fork truck.

No provisions for lifting by overhead crane are provided.

3.3 Storage

The Cabin Pressurization Unit is suitable for either indoor or outdoor storage. While moisture sensitive components are sealed from falling rain, it is recommended that a soft tarp be used to cover the machine if stored outdoors.

3.4 Storage Space and Handling Facilities

Minimum: 71 inches x 48 inches x 49 inches high (1,803 x 1,219 x 1,245 mm)

No specific handling facilities are required.

4.0 TRANSPORTATION

4.1 Handling Points

- Rings are provided at either end of the machine for tie down points.
- The unit may be lifted by a fork truck from any side, provided the forks extend to the side opposite the fork truck.
- A handle is provided for manually rolling the machine.
- No other handling points are provided.

4.2 Weight

1,100 lbs (500 kg)

5.0 ASSEMBLY

The Cabin Pressurization Unit is shipped complete and ready to use, however all fasteners and hose connections should be checked for tightness prior to use.

6.0 INSTALLATION

6.1 Installation Requirements

6.1.1 Electrical Power Supply

The Cabin Pressurization Unit is supplied with a 50 ft (15.24 m) power cord of the proper current rating for this length cord, and the motor/voltage of the machine. The end user must select and connect the proper cord termination plug per all local and federal requirements.

The Cabin Pressurization Unit is supplied with proper overload and short circuit protection.

The facilities connection to be used for the Cabin Pressurization Unit must be equipped with a properly sized disconnect.

6.1 Installation Requirements continued on following page.

6.0 INSTALLATION

6.1 Installation Requirements

6.1.2 Full Load Amperage Table

Electrical Option	Voltage	Frequency	FLA	Phase
A	208 V~	60	59.3	3
B	230 V~	60	53.6	3
C	380 V~	60	31.8	3
D	460 V~	60	26.8	3
E	575 V~	60	21.4	3
F	200 V~	50	61.6	3
G	220 V~	50	51.9	3
H	380 V~	50	30	3
J	415 V~	50	29.1	3
K	440 V~	50	28.1	3

6.1.3 Motor Overload Protection

The CPU is equipped with a solid-state overload relay. The trip point of the relay is factory set to the proper current level. Adjustment is not recommended.

6.1.4 Shop Air Connection

Shop air must be supplied to the Cabin Pressurization Unit. The connection is located on the right end of the machine, as viewed from the operator station.

- Maximum pressure: 150 psi (10.3 bars)
- Connection size: ¼ NPT

6.1.5 Blower

Check the blower oil level using the external sight gage. See Appendix VI for oil type and viscosity.

6.1.6 Relief Valve

The pressure relief valve is factory set at 13.5 psi (0.93 bars). ***Do not adjust the pressure relief valve.***

6.2 Personnel Requirements (Technical Expertise) for Installation

6.2.1 Electrical Connections

Electrical connections are to be made by a qualified electrician per all applicable codes and regulations.

6.2.2 Shop Air Connections

Shop air connections are to be made by qualified personnel per all applicable codes and regulations.

6.0 Installation continued on following page.

6.0 INSTALLATION

6.3 Inspection and Testing Procedure on Installation

6.3.1 Verify Rotation

After electrical connections to facilities supply is complete, open the ball valve, turn the airflow valve fully counter clockwise, and press the "Start" button. Verify air is blowing out of the ball valve. If not, switch any two power supply wires at the fuse block inside the electrical box on the machine.

7.0 OPERATION

7.1 Operating Parameters

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 that the operators read, and understand, this manual and the aircraft maintenance manual prior to using this equipment.

WARNING!

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 operation 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.**

7.1.1 General

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

7.1.1.a Compressed Air

As air is compressed, a tremendous amount of energy is stored. This is similar to the energy stored in a 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 (0.61 cm) wide by five (5) feet (152.4 cm) high with only one (1) psig (0.7 bar) is equal to 1,440 lbs (20.3 kg).

7.1.1.b ACFM versus SCFM

Air is a compressible fluid and is affected by pressure and temperature. Airflow measurements are normally corrected to "standard" temperature and pressure. Uncorrected airflow measurements carry the unit ACFM (Actual Cubic Feet per Minute). Corrected airflow measurements carry the unit SCFM (Standard Cubic Feet per Minute). Reference *Appendix I.*

7.0 Operation continued on following page.

7.0 OPERATION

7.2 Numerical Values and Limits

7.2.1 General

Pressure Range:	0 – 13 psi (0 – 0.90 bars)
Flow Range:	0-275 SCFM
Relief Valve setting:	13.5 psi (0.93 bars)
Maximum permitted outlet air temperature:	300° F (150° C)
Motor:	3ϕ 20 hp (voltage optional)
Max Shop Air Supply Pressure:	150 psi (10.3 bars)
Maximum Noise Level:	84 dB(a) @ 10 ft (3.0 m) @ 0 psi (0 bars) 91 dB(a) @ 3 ft (0.9 m) @ 12 psi (0.83 bars)
Maximum Noise Level @ Operator Station:	83 dB(a) @ 0 psi 90 dB(a) @ 12 psi (0.83 bars) [measured with 55 dB(a) ambient conditions]

7.2.2 Dimensions

Overall:	70 x 48 x 49 inches (180 x 122 x 125 cm)
Cabin Supply Hose:	2 inches (5 cm) diameter x 25 ft (7.6 m) long
Cabin Sensor Feedback Hose:	1/4 inch (0.6 cm) diameter x 30 ft (9.1 m) long
Door Seal Supply Hose:	1/4 inch (0.6 cm) diameter x 30 ft (9.1 m) long

7.2.3 Instrumentation

7.2.3.a Aircraft Cabin Data

Cabin pressure gage:	0 – 15 psi (0 – 1.03 bars)
Rate of Climb:	0 – 4000 ft/min (0 – 2,032 cm/sec)

7.2.3.b Airflow Measurement Data

System pressure gage:	0 – 15 psi (0 – 1.03 bars)
Differential pressure:	0 – 8 inches (0 – 2 kPa) of water
Air Temperature:	30 – 300° F (0-150° C)

7.2.3.c Regulated Shop Air

Pressure gage:	0 – 30 psi (0 – 2.0 bars)

7.3 Features

7.3.1 Cabin Air Supply

The 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, air is drawn through a dry element filter located outside of the cabinet by the rotary blower. After the air is discharged from the blower, it is either directed to the aircraft or returned to the atmosphere via the airflow control valve. A pressure relief valve is provided to protect the blower from a dead head start-up and is adjusted to open at 13.5 psig (0.95 bars).

7.3 Features continued on following page.

7.0 OPERATION

7.3 Features

7.3.2 Airflow Control Valve

The Airflow Control Valve is used to divert the output from the blower to atmosphere. With the Airflow Control Valve closed (turned fully clockwise), the full output from the blower is directed to the aircraft. Opening this valve allows regulation of cabin pressure.

The Airflow Control Valve is also used to control the rate of pressure increase in the cabin (rate of climb or descent). When beginning to pressurize the cabin, the Airflow Control Valve is fully open (counter clockwise). Closing the Airflow Control Valve directs progressively more air towards the cabin, thereby increasing the pressure inside the cabin. The faster the Airflow Control Valve is closed, the higher the rate of climb or descent.

7.3.3 Aircraft Cabin Instrumentation

Instruments are provided to measure the cabin pressure and rate of climb or descent inside the cabin. These instruments are provided, along with the Airflow Control Valve, within the Aircraft Cabin Data area on the instrument panel. Grouping these instruments together with the Airflow Control Valve provides easy operator monitoring of cabin conditions during the pressurization and testing process.

7.3.4 Airflow Measurement

The CPU is equipped with the instrumentation required to determine airflow into the cabin in terms of Standard Cubic Feet per Minute (SCFM). The airflow is determined by measuring the differential pressure caused by the flowing air over a known length within the CPU piping. This differential pressure is indicated on the Pressure Differential gage located in the Airflow Measurement area of the instrument panel. Instruments are also provided in this area for system pressure, and airflow temperature. These two measurements are used to calculate SCFM from the indicated Pressure Differential.

7.3.5 Regulated Shop Air

The CPU is equipped with a regulator and pressure gauge for the purpose of supplying regulated air to the aircraft door/canopy seals. These items are located in the Regulated Shop Air area on the instrument panel.

7.3.6 Power Controls

The Power Controls section on the instrument panel contains operators for “START”, “STOP”, and “EMERGENCY STOP” functions. A green light is also provided to indicate that the machine is running.

7.3.7 Additional Features

- External blower oil level indication
- External intake air filter
- Four (4) swiveling casters with brakes and swivel locks
- Hose hangers
- Lightweight removable maintenance panels with handles
- CE Marked (Machinery Directive)

7.0 Operation continued on following page.

7.0 OPERATION

7.4 Location and Layout of Controls

7.4.1 Instrument Panel

FIGURE 3 – Instrument Panel

7.4.2 Description of Controls

7.4.2.a Regulated Shop Air

- Regulator – provides for regulation of shop air to aircraft door and canopy seals.

7.4.2.b Power Controls

- OFF – Removes power from the drive motor
- ON – enables supply of power to the drive motor
- Green Pilot Light – illuminated when drive motor is running
- Emergency Stop - removes power from the drive motor

7.4.2.c Aircraft Cabin Data

- Airflow Control Valve – Vents output from blower to atmosphere. Full counter clockwise rotation of handle opens valve completely. Full clockwise rotation of handle closes valve completely, forcing full output of blower into aircraft cabin.
- Cabin Pressure Gage – indicates air pressure inside aircraft cabin.
- Rate of Climb – This is a Vertical Speed Indicator that displays the rate of climb or descent (rate of pressure change) inside the aircraft cabin in ft/min.

7.4.2.d Airflow Measurement Data

- Pressure Differential – indicates the pressure drop across a known length of pipe within the CPU piping system in inches of water column. The reading from this gage is used on the vertical axis on the curves contained in Appendix I.
- System Pressure – indicates the pressure within the CPU piping system. The reading from this gage is used to identify the curves in Appendix I.
- Temperature – indicates the temperature of the airflow within the CPU piping. This reading is used to make the temperature correction to derive SCFM.

7.4 Locations and Layout of Controls continued on following page.

7.0 OPERATION

7.4 Location and Layout of Controls

7.4.3 Connection Locations

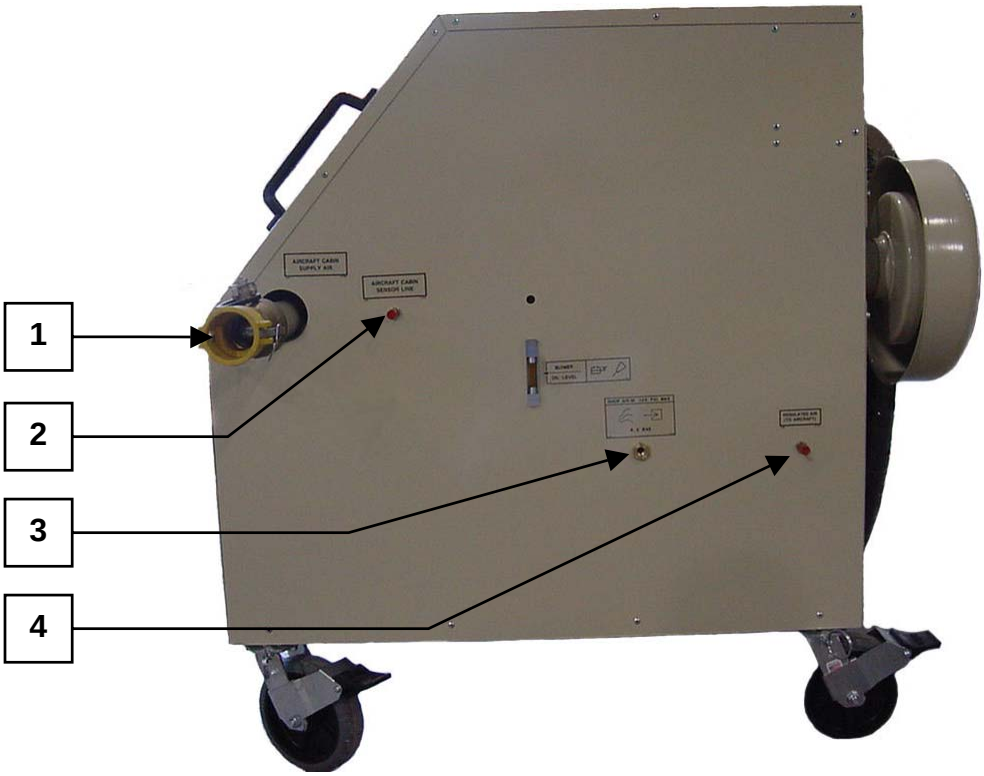


FIGURE 4 – Connection Locations

1. Aircraft Cabin Supply Air – Supply hose connection with ball valve.
2. Aircraft Cabin Sensor Line – Feedback connection to aircraft.
3. Shop Air In – Connection to facilities compressed air supply.
4. Regulated Air (to aircraft) – Regulated air supply for aircraft door seals.

7.5 Preparation Prior to First Use

1. Verify correct blower oil level
2. Verify correct blower rotation prior to connecting any hoses to aircraft.
   - Open the ball valve
   - Quickly start, then stop, the CPU verifying that air is blowing out of the Aircraft Cabin Supply connection. If air is not blowing out, switch any two of the input power leads. ***NOTE: This procedure must be completed by qualified technician(s).***
3. Visually inspect the machine for loose fasteners, shipping damage, loose internal air connections, etc. Repair any faults found.

7.0 Operation continued on following page.

7.0 OPERATION

7.6 Personal Protective Equipment

Personal protective equipment must be used in accordance with employer's instructions, and local and federal regulations.

7.7 Checks Prior to Start Up

1. Verify correct blower oil level
2. Open Airflow valve by rotating handle fully counter clockwise.
3. Open regulator in "Regulated Shop Air" section by rotating knob fully counter-clockwise.
4. Close ball valve.
5. Verify that facilities compressed air supply is connected to "Shop Air In" connection.

7.8 Start Up Procedure

CAUTION!

To prevent personal injury and/or damage to aircraft:

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

1. Ensure that steps in 7.7 have been completed.
2. **Do not start CPU with both the airflow valve and the ball valve closed.**
3. Connect hoses from CPU to aircraft (Adapter kit required to connect cabin supply hose to aircraft is sold separately – See Appendix IV).

7.9 Operating Procedures

7.9.1 Basic Operation

Follow aircraft manufacturer's instructions on cabin pressurization. See Appendix II & III for more detailed instructions.

7.9.1.a Cabin Pressurization

1. Secure the aircraft per aircraft manufacturer's instructions.
2. Inflate door seals, using the regulator and gage located in the "Regulated Shop Air" section, per aircraft manufacturer's instructions.

   NOTE: The CPU does not need to be running for these controls to function.
3. Ensure that the Airflow Control Valve, located in the "Aircraft Cabin Data" section, is fully open (turned counter clockwise).

7.9.1.a Cabin Pressurization continued on following page.

7.9.1.a Cabin Pressurization, continued

4. Press the "START" button.
5. Open the ball valve to allow air to begin entering the aircraft cabin.

   NOTE: Do not exceed the rate of descent specified by the aircraft manufacturer.

6. Slowly rotate the handle on the Airflow Control Valve clockwise to begin increasing the pressure inside the aircraft cabin.

Do not exceed the rate of descent specified by the aircraft manufacturer.

7. As the cabin pressure approaches the test pressure specified by the aircraft manufacturer, begin opening the Airflow Control Valve to slow down the rate of pressure increase.
8. When the specified cabin test pressure has been reached, adjust the Airflow Control Valve as required to maintain the test pressure.

Do not exceed the maximum cabin pressure specified by aircraft manufacturer.

9. Once the cabin pressure has been stabilized at the test pressure, write down the readings indicated on all of the gages located in the "Airflow Measurement" section on the instrument panel. See Appendix II.
10. See Appendix I for instructions on how to determine leakage rate from the above measurements.

7.9.1.b Cabin Depressurization

Follow aircraft manufacturer's instructions on cabin pressurization. See Appendix II & III for more detailed instructions.

1. With CPU still running, slowly open the Airflow Control Valve (turn counter-clockwise) to reduce the pressure inside the cabin.

Do not exceed the rate of climb specified by the aircraft manufacturer.

2. After the Airflow Control Valve has reached its full open position, close the ball valve, and press the "STOP" button.
3. Any remaining pressure inside the cabin will bleed off naturally.

NEVER open ANY aircraft cabin door or access panel if there is any pressure in the cabin.

7.9 Operating Procedures

7.9.2 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.

7.9.2 General Plan continued on following page.

7.0 OPERATION

7.9 Operating Procedures

7.9.2 General Plan

c. Repair cabin leaks, starting with major leaks first. Use low-pressure air, 1 – 2 psi (0.07 – 0.14 bars).

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.

7.9.3 Test Methods

Two different test methods are generally specified by aircraft manufacturers to determine aircraft cabin leakage rates:

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.

a. Flow Measurement:

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

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

b. 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 1/10 of a second may be used for this test.

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

7.9.4 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

7.9 Operating Procedures continued on following page.

7.0 OPERATION

7.9 Operating Procedures

7.9.5 Locating Aircraft Cabin Leaks

a. It does not require high-pressure air to find leakage points in the aircraft cabin. Whenever possible, all leakage investigations should be performed at aircraft cabin pressures of between 1 and 2 psig (0.07 – 0.14 kgs/sq cm). 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.

7.10 Stopping Procedures

To stop the output of the CPU, press the "STOP" button.

An "EMERGENCY STOP" button is provided in addition to the "STOP" button.

CAUTION!

Stopping the CPU without shutting the ball valve may cause rapid depressurization of the aircraft.

7.11 Emergency Stopping Procedures

7.11.1 If The Aircraft Is NOT Pressurized:

a. Press the "EMERGENCY STOP" button.

7.11.2 If The Aircraft IS Pressurized

a. Shut the ball valve.

b. Press the "EMERGENCY STOP" button.

CAUTION!

Stopping the CPU without shutting the ball valve may cause rapid depressurization of the aircraft.

8.0 TRAINING

8.1 Training Requirements

- CPU operators **MUST** be properly trained in all aspects of aircraft cabin pressurization tests.
- It is the employer's responsibility to ensure that the operator is qualified to perform aircraft cabin pressurization and testing.
- This CPU Operation and Maintenance Manual does not provide qualified training to perform aircraft cabin pressurization and testing.

8.0 Training continued on following page.

8.0 TRAINING

8.2 Training Programs, Manuals, Methods, Supervisors, and Operators

- Tronair does not provide training materials beyond the scope of this manual.
- It is the employer's responsibility to provide any training requirements beyond the scope of this manual.

9.0 MAINTENANCE

9.1 Description of Equipment

- Blower – Roots positive displacement rotary blower. See Appendix VI for blower manufacturer maintenance manual.
- Motor – 3 phase electric motor – 20 Hp. See Appendix VII for motor manufacturer maintenance data.
- Air Filter – Dry element inlet air filter
- Blower Drive – Dual V-belt
- Airflow control valve – Brass gate valve
- Pressure Differential sensor - Meriam Instruments Accutube
- Pressure Differential measurement – Dwyer Instruments magnehelic pressure differential gage (inches of water column)

9.2 Description of Control System

- The momentary "ON" button energizes the coil on the motor contactor, sending input voltage to the motor windings starting the machine. A set of auxiliary contacts creates a latching circuit holding the contactor "in".
- The momentary "OFF" button uses redundant N.C. contacts to break the latching circuit, eliminating voltage to the motor contactor coil, thereby stopping the machine.
- The "EMERGENCY STOP" button is the same as the "OFF" button, except that the operator is a maintained twist to release type.
- The Airflow control valve is a gate valve used to vent blower output to atmosphere.
- The ball valve opens or closes the air output from the machine

9.3 Layout of Control Panel

9.3.1 Front of Panel

FIGURE 5 – Front Panel

9.0 Maintenance continued on following page.

9.0 MAINTENANCE

9.4 Description of Power Supply and Wiring Circuits

- See ***Figure 9 – Wiring Diagram***

9.5 Description of Mechanical and Electrical Protection Systems

9.5.1 Mechanical

- The blower and gages are protected against over-pressurization by a pressure relief valve set at 13.5 psi (0.95 bars).
- **DO NOT adjust the pressure relief valve.**
- The CPU enclosure complies with EN 953 Guards, fixed and removable.

9.5.2 Electrical

- The CPU electrical system includes short circuit protection on the facilities power circuit, and the control circuit transformer primary and secondary windings.
- The CPU electrical system includes solid state motor overload protection.
- All electrical system components are CE Marked.
- The electrical system is designed per EN 60294-1:1998

9.6 Engineering Drawings and Wiring Diagrams

9.6.1 Outline Dimensions

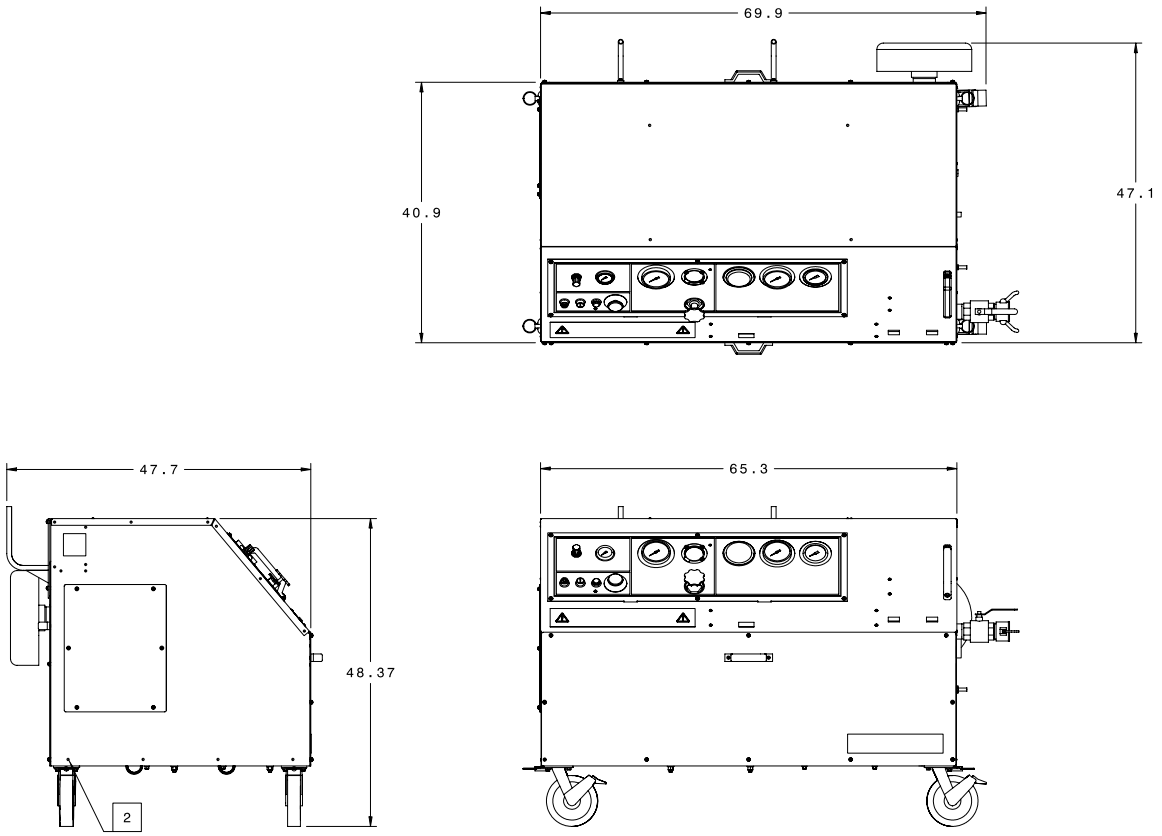


FIGURE 6 – Outline Dimensions

9.6 Engineering Drawings and Wiring Diagrams continued on following page.

9.6 Engineering Drawings and Wiring Diagrams

9.6.2 Pneumatic Schematic

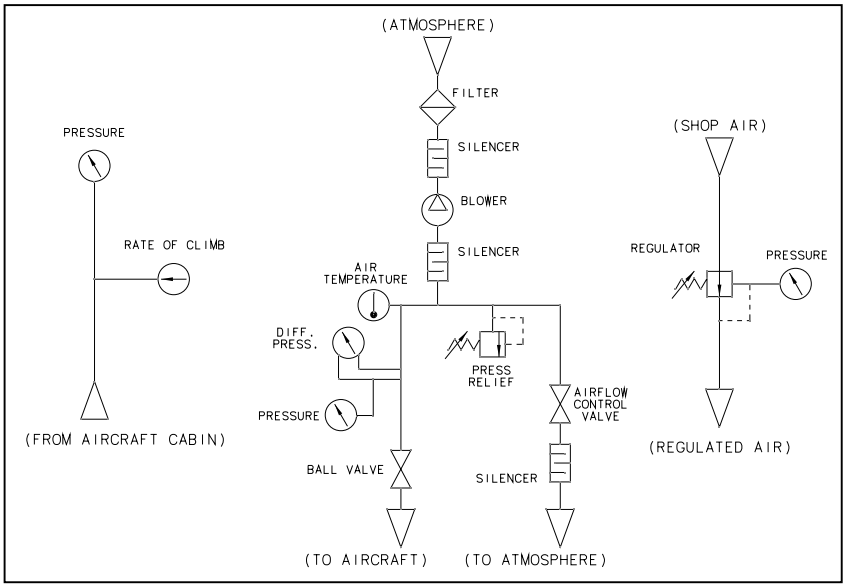


FIGURE 7 – Pneumatic Schematic

9.6.3 Electrical Schematic

VOLTS/ HERTZ	FUSE AMPS
208 / 60	80
230 / 60	70
380 / 60	40
460 / 60	35
575 / 60	30
200 / 50	80
220 / 50	70
380 / 50	40
415 / 50	40
440 / 50	40

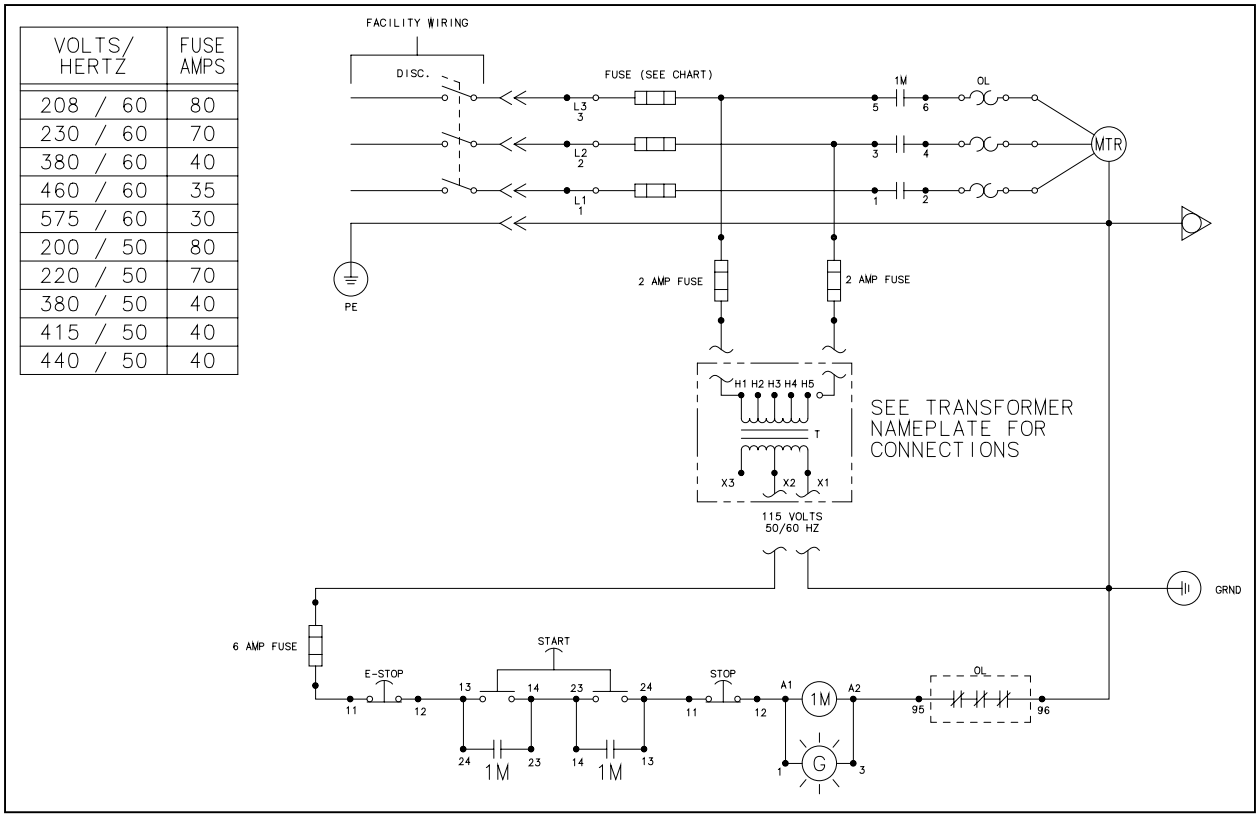
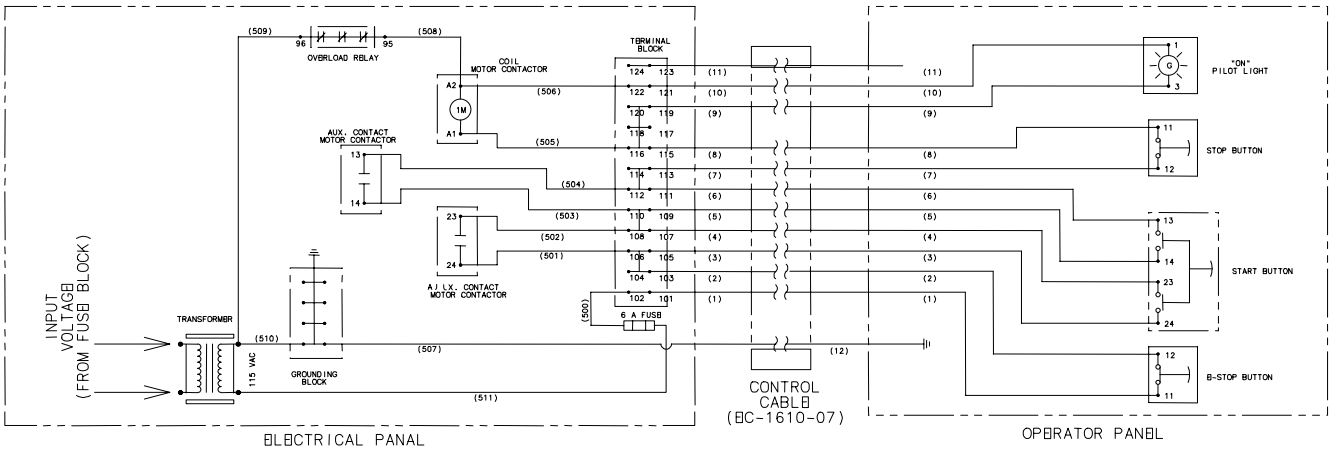


FIGURE 8 – Electrical Schematic

9.6 Engineering Drawings and Wiring Diagrams continued on following page.

9.6.4 Wiring Diagram



CONTROL WIRES-ELECTRICAL PANEL					
A.W.G./PART #	WIRE #	COLOR	TERMINAL BLOCK LOCATION	TERMINATION LOCATION	OPERATOR PANEL TERM. BLOCK LOCATION
#14	1	BLACK	101		201(E-STOP BTN TERM #11)
#14/EC-1252-01	500	RED	102	JUMPER FROM FUSE	
#14	2	BLACK	103		203(E-STOP BTN TERM #12)
		2-POLE JMPR	104	103-104 TO 105-106	
#14	3	BLACK	105		205(START BTN TERM. #13)
#14/EC-1252-01	501	RED	106	AUX. CONTACT #24	
#14	4	BLACK	107		207(START BTN TERM. #14)
#14/EC-1252-01	502	RED	108	AUX. CONTACT #23	
#14	5	BLACK	109	(JUMPER 107-108 TO 109-110)	209(START BTN TERM. #23)
#14/EC-1252-01	503	RED	110	AUX. CONTACT #14	
#14	6	BLACK	111		211 (START BTN TERM. #24)
#14/EC-1252-01	504	RED	112	AUX. CONTACT #13	
#14	7	BLACK	113		213 (STOP BTN TERM #11)
			114	111-112 TO 113-114	
#14	8	BLACK	115		215 (STOP BTN TERM #12)
#14/EC-1252-01	505	RED	116	STARTER COIL #A1	
		3-POLE JMPR	117	115-116 TO 117-118 TO 119-120	
			118		
#14	9	BLACK	119		219 (PILOT LIGHT TERM #1)
			120		
#14	10	BLACK	121		221 (PILOT LIGHT TERM #3)
#14/EC-1252-01	506	RED	122	STARTER COIL #A2	
#14	11	BLACK	123		223 (PILOT LIGHT TERM #3)
#14	507	GRN/YEL	GROUNDING BLOCK TO GROUNDING BLOCK (PART OF CONTROL CABLE)		
#14/EC-1252-01	508	RED	JUMPER FROM A2 TO 95 ON O.L.		
#14/EC-1256-01	509	LT. BLUE	NUETRAL FROM 96 TO X1		
#14/EC-1572-01	510	GRN/YEL	FROM X1 TO GROUNDING BLOCK		
#14/EC-1252-01	511	RED	FROM X2 TO FUSE BLOCK		

CONTROL WIRES-OPERATOR INTERFACE			
A.W.G./PART #	WIRE #	COLOR	DEVICE TERMINAL
#14	1	BLACK	E-STOP BTN TERM. #11
#14	2	BLACK	E-STOP BTN TERM. #12
#14	3	BLACK	START BTN TERM. #24
#14	4	BLACK	START BTN TERM. #23
#14	5	BLACK	START BTN TERM. #14
#14	6	BLACK	START BTN TERM. #13
#14	7	BLACK	STOP BTN TERM. #12
#14	8	BLACK	STOP BTN TERM. #11
#14	9	BLACK	PILOT LIGHT TERM. #3
#14	10	BLACK	PILOT LIGHT TERM. #1
#14	11	BLACK	
#14	12	GRN/YEL	GROUND STUD

FIGURE 9 – Wiring Diagram

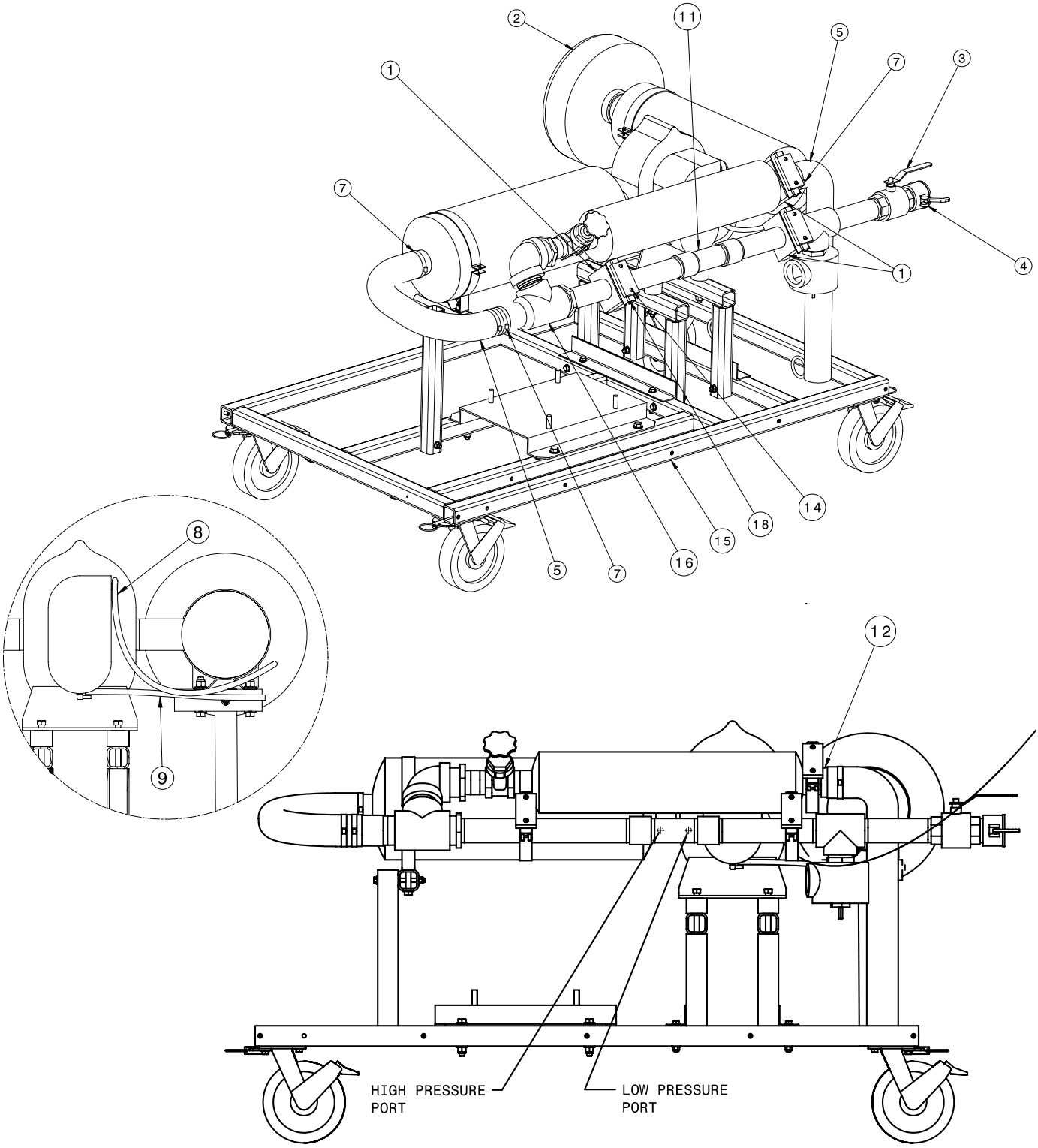
9.0 Maintenance continued on following page.

9.0 MAINTENANCE

9.7 Parts Lists

9.7.1 Internal Parts

Reference Parts List on following page.



9.7 Parts Lists

9.7.1 Internal Parts

Reference Illustrations on previous page.

ITEM	PART NUMBER	NOMENCLATURE	QUANTITY
1	H-2495	Clamp, Pipe (2 inch)	3
2	H-1402-01	Filter, Inlet	1
3	H-2666-08	Valve, Ball	1
4	N-1521	Coupling, Hose	1
5	TF-1113*032.0	Hose, Flexible	2
7	H-1426-14	Clamp, Hose (3.25" I.D. maximum)	4
8	TF-1047-01*28.0	Hose, 1/4" Push-on	1
9	TF-1047-01*19.0	Hose, 1/4" Gray	1
10	G-1351-19	Rivet, Steel (Blind)	1
11	N-2443-07	Connection, Male	2
12	N-2217-09	Coupling, Extra Heavy 2" NPT	1
13	L-1000	Lubricant, Pump	1
14	G-1476-105004	Screw, 25-20 Soc But Hd Cap	6
15	Z-4726	Assembly, Internal CPU-300	1
16	Z-4650	Assembly, Pipe	1
17	Z-4611	Assembly, Sheet Metal	1
18	Z-5458-01	Weldment, Mounting Rail	3

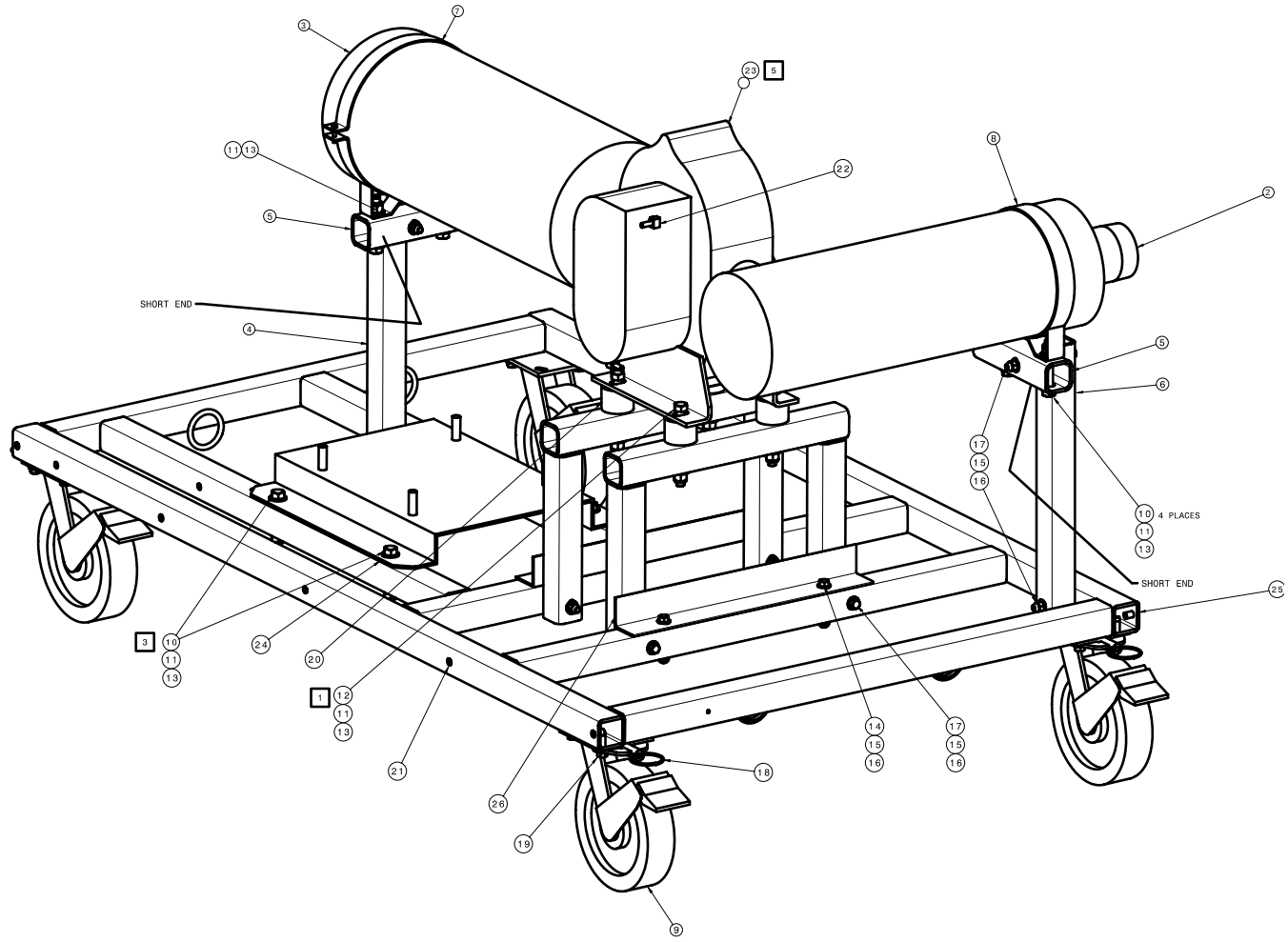
9.7 Parts List continued on following page.

9.0 MAINTENANCE

9.7 Parts Lists

9.7.2 Internal Parts

Reference Parts List Table on following page.



9.7 Parts List continued on following page.

9.7 Parts Lists

9.7.2 Internal Parts

Reference Illustration on previous page.

ITEM	PART NUMBER	NOMENCLATURE	QUANTITY
1	H-1400-08	Blower, Roots 53 Frame	1
2	H-2365-00	Silencer, Intake	1
3	H-2364-00	Silencer, Exhaust	1
4	TS-1882-01	Tube, Exhaust Silencer Post	1
5	TS-1780-01	Tube, Silencer Mount	2
6	TS-1880-01	Tube, Intake Silencer Post	1
7	H-2377-00	Mount, Silencer Modified	1
8	H-2376-00	Mount, Silencer Modified	1
9	U-1085	Caster, Swivel	4
10	G-1100-109532	Bolt, Hex Head, Grade 5, 0.5-20 x 3.25" long	8
11	G-1250-1090N	Flatwasher, 0.5 Narrow	20
12	G-1100-109550	Bolt, Hex Head, Grade 5, 0.5-20 x 5" long	4
13	G-1202-1095	Stopnut, 0.5-20 Elastic	12
14	G-1100-107526	Bolt, Hex Head, Grade 5, 0.375-24 x 2.75" long	4
15	G-1250-1070N	Flatwasher, 0.375 Narrow	24
16	G-1202-1075	Stopnut, 0.375-20 Elastic	12
17	G-1100-107546	Bolt, Hex Head, Grade 5, 0.375-24 x 4.75" long	8
18	U-1087	Lock, Swivel	4
19	G-1180-107006	Bolt, Hex Head, Self-Tap, 0.375-16 x 1.25" long	10
20	R-2076	Spacer, Blower	4
21	G-1440-1050-S	Nutsert, Thickwall, 0.25-20	10
22	N-2410-02	Elbow, Male Pipe to Hose Barb	2
23	V-1219	Label, Rotation	1
24	H-1392-08	Base, Motor	1
25	Z-4625-01	Weldment, Frame	1
26	Z-5120-01	Weldment, Blower Mount	2

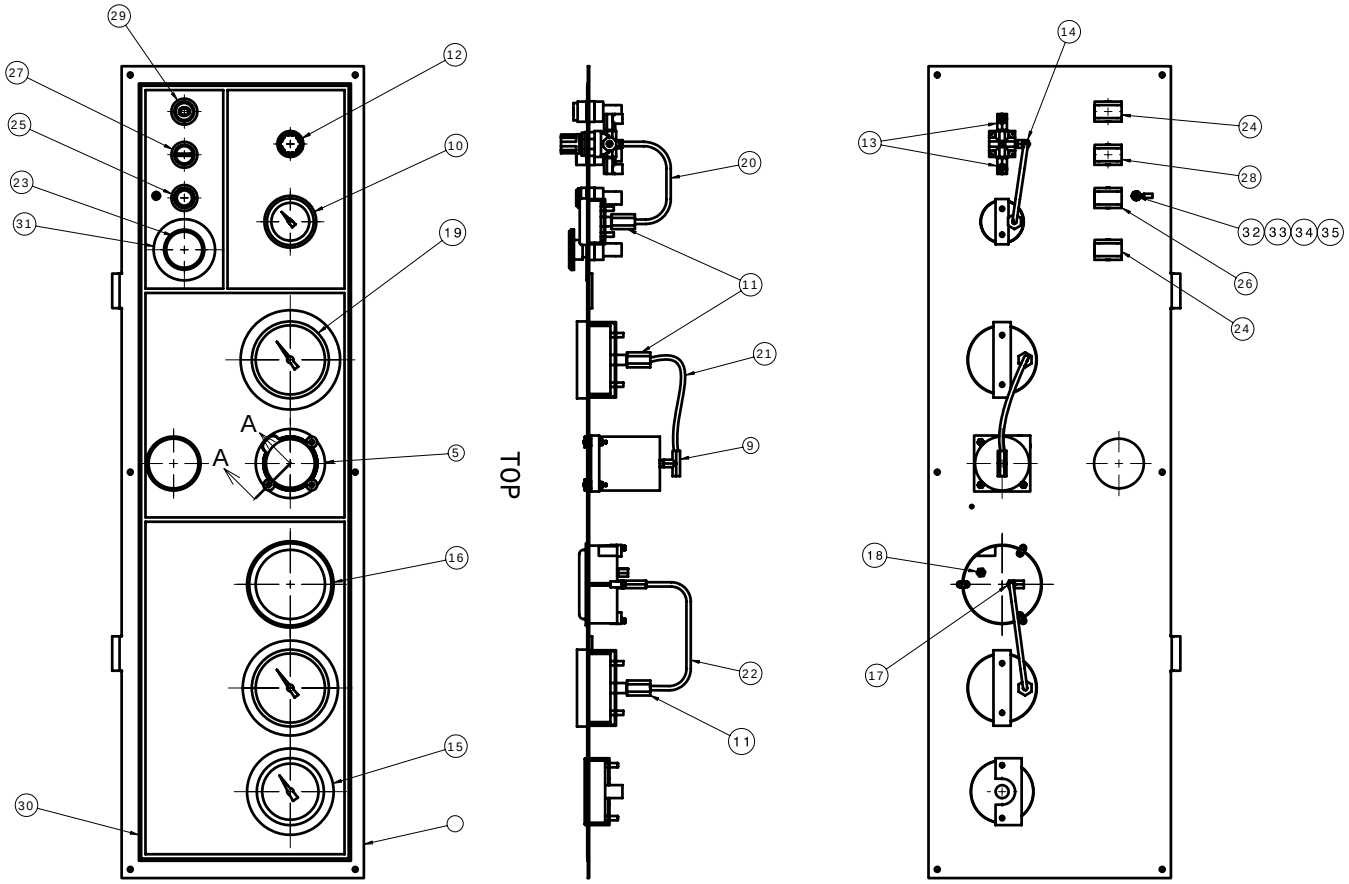
9.7 Parts List continued on following page.

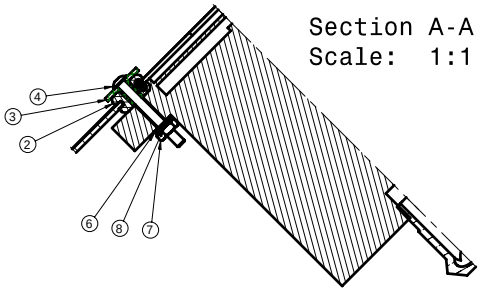
9.0 MAINTENANCE

9.7 Parts Lists

9.7.3 Instrument Panel Components

Reference Parts List Table on following page.





9.7 Parts List continued on following page.

9.7 Parts Lists

9.7.3.1 Instrument Panel Component Bill of Material

Reference Illustration on previous page.

ITEM	PART NUMBER	NOMENCLATURE	QUANTITY
1	S-1828-01	Panel, Operator	
2	H-1484-01	Grommet, Vibrations	
3	H-1487	Spacer, Grommet	
4	G-1476-101012	Screw, #6-32 Soc But Hd Cap	
5	H-1396	Gage, Vertical Speed	
6	G-1250-1010N	Flatwasher, #6 Narrow	
7	G-1200-1010	Nut, Hex #6-32	
8	G-1251-1010R	Lockwasher, #6 Regular	
9	N-2448-03	Tee, Swivel Male Pipe/Tube	
10	H-2657	Gage, Pressure, 0-30 psi (0-2.06 bars)	
11	N-24464-05	Connector, Swivel Female Pipe/Tube	
12	H-1397	Regulator	
13	N-2446-05	Elbow, Male Pipe/Tubing	
14	N-2446-04	Elbow, NPT/Tube	
15	H-2656	Thermometer, Panel Mount	
16	H-1409	Gage, Magnehelic	
17	N-2447-03	Swivel, Male Run Tee	
18	N-2443-07	Connector, Male	
19	H-2658	Gage, Pressure, 0-15 psi (0-1.03 bars)	
20	TF-1012*012.00	Hose	
21	TF-1012*008.00	Hose	
22	TF-1012*013.50	Tube	
23	EC-1523	Pushbutton, Emergency Stop	
24	EC-1582	Block, IEC Contact	
25	EC-1521	Indicator, IEC Pilot Light	
26	EC-1579-03	Block, IEC Pilot Light Contact	
27	EC-1527	Pushbutton, IEC Stop	
28	EC-1646	Block, IEC Contact	
29	EC-1526	Pushbutton, IEC Stop	
30	V-1865-00	Label, CPU-300 Controls	
31	EC-1529	Plate, Emergency Stop Legend	
32	G-1476-105012	Screw, #0.25-20 Soc But Hd Cap	
33	G-1200-1050	Nut, Hex 0.25-20	
34	G-1251-1050R	Lockwasher, 0.25 I D	
35	EC-1180-23	Terminal, Ring 0.25 Hole 18-14 AWG	
36	EC-1610-07*72.0	Cable, Control (14 AWG)	
37	INS-1622	Wiring Diagram 20 hp CPU	

9.7 Parts List continued on following page.

9.0 MAINTENANCE

9.7 Parts Lists

9.7.3.2 Electrical Components

MOTOR

PART NUMBER	APPLICATION
EC-1480-17	208V/60 Hz
EC-1480-17	230V/60 Hz
EC-1480-16	380V/60 Hz
EC-1480-17	460V/60 Hz
EC-1480-18	575V/60 Hz
EC-1480-17	200V/50 Hz
EC-1480-19	220V/50 Hz
EC-1480-19	380V/50 Hz
EC-1480-17	415V/50 Hz
EC-1480-17	440V/50 Hz

MOTOR STARTER CONTACTOR

PART NUMBER	APPLICATION
EC-1587	208V/60 Hz
EC-1587	230V/60 Hz
EC-1586	380V/60 Hz
EC-1586	460V/60 Hz
EC-1586	575V/60 Hz
EC-1587	200V/50 Hz
EC-1587	220V/50 Hz
EC-1586	380V/50 Hz
EC-1586	415V/50 Hz
EC-1586	440V/50 Hz

OVERLOAD RELAY

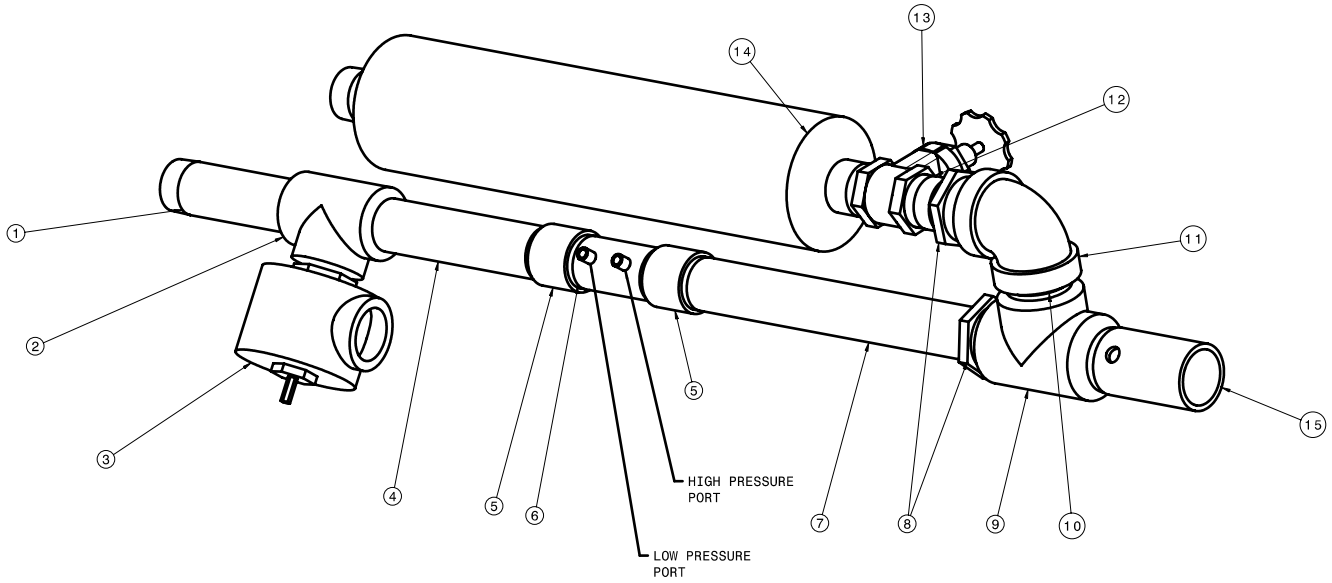
PART NUMBER	APPLICATION
EC-1590	208V/60 Hz
EC-1590	230V/60 Hz
EC-1589	380V/60 Hz
EC-1589	460V/60 Hz
EC-1589	575V/60 Hz
EC-1590	200V/50 Hz
EC-1590	220V/50 Hz
EC-1589	380V/50 Hz
EC-1589	415V/50 Hz
EC-1589	440V/50 Hz

9.7 Parts List continued on following page.

9.0 MAINTENANCE

9.7 Parts Lists

9.7.4 Pipe Assembly



ITEM	PART NUMBER	NOMENCLATURE	QUANTITY
1	N-2695	Nipple, Painted Black Pipe, 2" NPT x 8" long	1
2	N-2207-17-S	Tee, Female Pipe, 2" NPT	1
3	H-2597	Valve, Pressure Relief	1
4	N-2236-09-41	Nipple, Black Pipe, 2" NPT x 11" long	1
5	N-1019	Coupling, 2" NPT	2
6	H-1408	Sensor, Airflow – Inline	1
7	N-2236-09-45	Nipple, Black Pipe, 18" long	1
8	N-2696-28	Bushing, Reducer Pipe	2
9	N-2207-18-S	Tee, 2.5" NPT	1
10	N-2236-10-29	Nipple, Black Pipe, 2.5" NPT x 2.5" long	1
11	N-1031	Elbow, 2.5" NPT	1
12	N-2236-09-30	Nipple, Black Pipe, 2" NPT x 3" long	1
13	H-1407	Valve, Gate	1
14	H-2595-00	Silencer, Absorptive, 2" NPT	1
15	TR-1716	Tube, Temperature	1

9.0 Maintenance continued on following page.

9.0 MAINTENANCE

9.8 Recommended Spare Parts

PART NUMBER	DESCRIPTION
H-1439	Replacement Filter Element
H-2378	V-Belt for 60 HZ applications (2 req'd)
H-2410	V-Belt for 50 HZ applications (2 req'd)
EC-1542-11	Fuse, Control Transformer Primary Side (2 per machine)
EC-1542-22	Fuse, Control Transformer Secondary Side (1 per machine)

POWER FUSES AS NEEDED (3 per machine)		
PART NUMBER	**DESCRIPTION**	**APPLICATION**
EC-1556-02	Fuse	208V/60HZ
EC-1556-01	Fuse	230V/60HZ
EC-1557-28	Fuse	380V/60HZ
EC-1557-27	Fuse	460V/60HZ
EC-1557-26	Fuse	575V/60HZ
EC-1556-02	Fuse	200V/50HZ
EC-1556-01	Fuse	220V/50HZ
EC-1557-28	Fuse	380V/50HZ
EC-1557-28	Fuse	415V/50HZ
EC-1557-28	Fuse	440V/50HZ

9.9 Inspection Points

- Blower oil level – each use
- Drive belt tension – after first use, then semi-annually thereafter
  - The proper tension is the minimum required to drive the load. Tighten the belts by adjusting the motor base until the belts feel alive and springy when struck with the hand. Ensure that the pulleys remain in alignment, both axially and in parallel, while adjusting.
- Vertical Speed Indicator zeroing – each use
- Instrument Calibration – verify last calibration is within previous 12 months
  - Instruments are to be calibrated annually

9.10 Scheduled Maintenance

9.10.1 Instrumentation

All instruments should be calibrated annually to maintain accuracy of machine

9.10.2 Blower Lubrication

- Initial oil change – 6 months or 100 hours
- Regular oil change – every 1,000 hours maximum
- Bearing lubrication per Appendix VI
- See Appendix VI for detailed Blower maintenance data.

9.10 Scheduled Maintenance continued on following page.

9.10 Scheduled Maintenance

9.10.3 Drive Belt Tension

- Adjust as required
  — The proper tension is the minimum required to drive the load. Tighten the belts by adjusting the motor base until the belts feel alive and springy when struck with the hand. Ensure that the pulleys remain in alignment, both axially and in parallel, while adjusting.

9.10.4 Caster Lubrication

- Grease all lube points on casters annually

9.10.5 Motor

- Periodically inspect the motor for excessive dirt, friction or vibration. Dust may be blown from an inaccessible location using compressed air. Keep the ventilation openings clear to allow free passage of air. Make sure the drain holes in the motor are kept open. Grease or oil can be wiped by using a petroleum solvent.
- See Appendix VII for additional maintenance data.

9.10.6 Intake Air Filter

- Clean periodically and replace annually.

9.11 Technical Specifications

- Blower: Roots RAI-53
- Motor: 20 Hp 3 phase open drip proof foot-mount
- V-belts: B section Gripnotch
- Control Circuit Voltage: 24 VAC
- Solid state motor overload protection

VOLT/AMP/FUSE SIZE TABLE
(Fuses must be UL Class J dual element time delay)

ELECTRICAL OPTION	VOLTAGE	FREQUENCY	FLA	FUSE SIZE	PHASE
A	208 V~	60	59.3	80 A	3
B	230 V~	60	53.6	70 A	3
C	380 V~	60	31.8	40 A	3
D	460 V~	60	26.8	35 A	3
E	575 V~	60	21.4	30 A	3
F	200 V~	50	61.6	80 A	3
G	220 V~	50	51.9	70 A	3
H	380 V~	50	30	40 A	3
J	415 V~	50	29.1	40 A	3
K	440 V~	50	28.1	40 A	3

9.0 Maintenance continued on following page.

9.0 MAINTENANCE

9.12 Maintenance Personnel Requirements

Maintenance personnel should have a basic knowledge of mechanical, electrical, and pneumatic systems.

9.13 Troubleshooting Guide

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.
Low CPU output pressure and/or flow	Loose belts	Tighten belt/Replace belts (Reference Section 9.8)
	Dirty inlet filter	Replace filter (Reference Section 9.8)
	Low power	Check for facility blown fuse, loose wire. (Reference Section 9.8)
No CPU output (Motor not running)	No inlet power	Check facility
	Overload relay tripped	Power switch in OFF position, allow unit to cool, reset overload relay and restart unit
	Failed motor	Replace motor (Reference Section 9.7)
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 VI –*** Blower Maintenance

10.0 PROVISION OF SPARES

10.1 Spare Parts can be Obtained from the Manufacturer

Tronair, Inc.
1740 Eber Road
Holland, Ohio 43528-9794 USA
Website: www.tronair.com

Telephone: 419-866-6301
800-426-6301
Fax: 419-867-0634
Email: mail@tronair.com

10.2 Recommended Level of Spare Parts to be Held

Part Number	Description	Qty. Held
• H-1439	Replacement Filter Element	1 on hand
• H-2378 or H-2410	V-Belt	2 on hand
• EC-1542-11	Fuse, Control Transformer Primary Side	4 on hand
• EC-1542-22	Fuse, Control Transformer Secondary Side	2 on hand
• Power Fuses as Needed		6 on hand

11.0 IN-SERVICE SUPPORT

Contact Tronair for Technical Services and information.

12.0 GUARANTEES

Tronair products are warranted to be free of manufacturing or material defects for a period of one year after shipment to the original customer. This warranty does not cover the following items:

a) Parts required for normal maintenance.
b) Parts covered by a component manufacturer's warranty.

If you have a problem that may require service, contact Tronair immediately. Do not attempt to repair or disassemble a product without first contacting Tronair since any such action may affect warranty coverage. When you contact Tronair, be prepared to provide the following information:

a) Product Model Number
b) Product Serial Number
c) Description of the problem

If warranty coverage is approved, either replacement parts will be sent or the product will have to be returned to Tronair for repairs. If the product is to be returned, a Return Material Authorization (RMA) number will be issued for reference purposes on ay shipping documents. A decision on the extent of warranty coverage on returned products is reserved pending inspection at Tronair. Any shipments to Tronair must be shipped freight prepaid. Freight costs on shipments to customers will be paid by Tronair on any warranty claims.

13.0 APPENDICES

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

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 (21.1° C):**
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 (2 kPa) water (differential pressure), assuming a line air temperature of 70° F.

Curve #2 **Pressure Compensated Flow at 70° F (21.1° C):**
This curve is used to determine aircraft leakage rate where the CPU unit pressure gauge (Group 2) is reading between 3 and 7 psi (0.21 and 0.48 bars), assuming a line air temperature of 70° F (21.1° C).

Curve #3 **Pressure Compensated Flow at 70° F (21.1° C):**
This curve is used to determine aircraft leakage rate where the CPU unit pressure gauge (Group 2) is reading between 7 and 11 psi (0.48 and 0.76 bars), assuming a line air temperature of 70° F (21.1° C).

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* (21.1° C).**

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 (1.013 bars) and 60° F (15.6° C)).

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

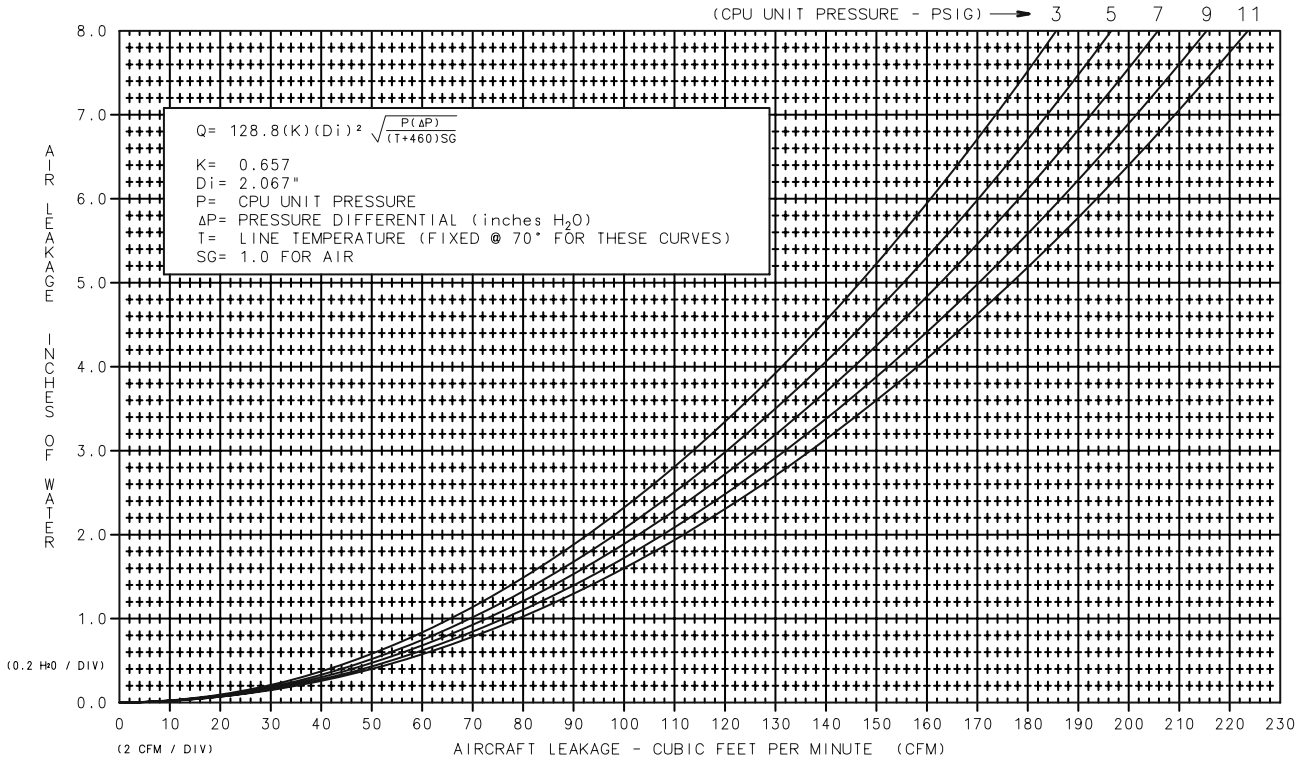
ACFM DETERMINATION

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:

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

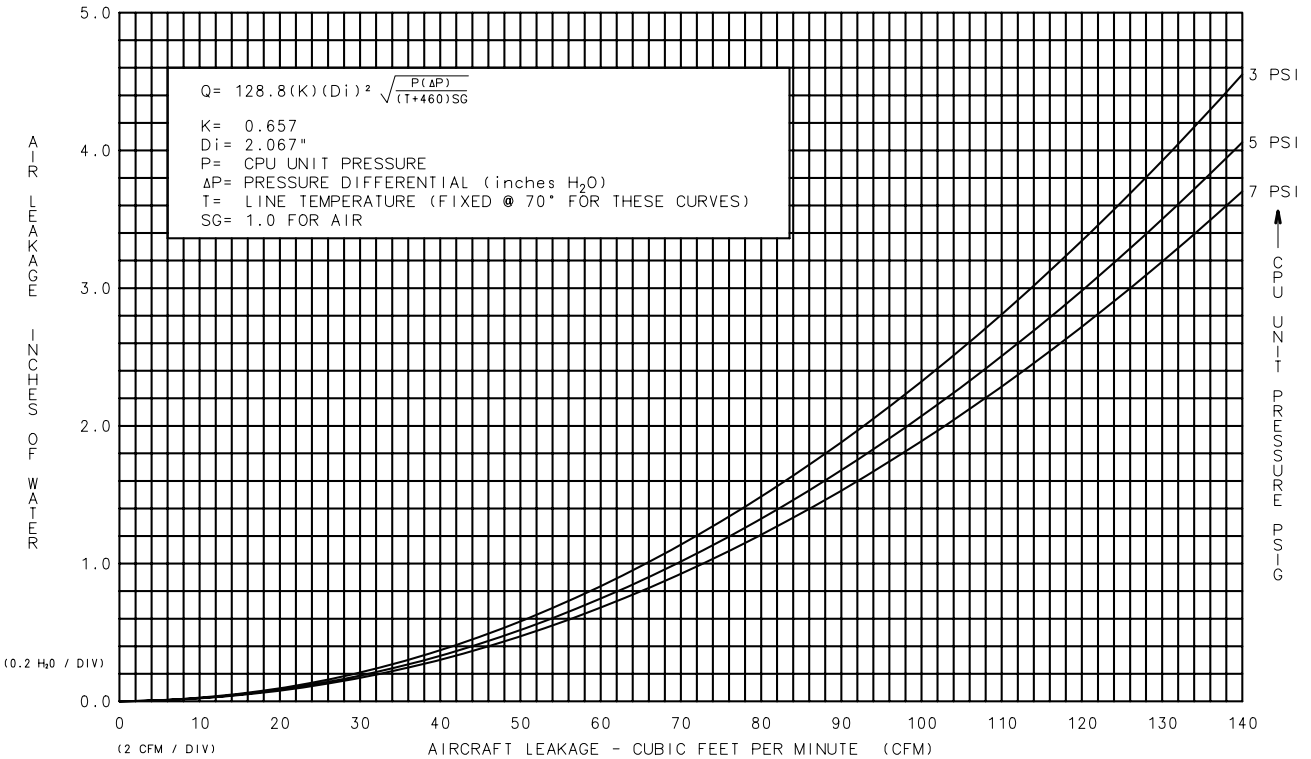
CURVE #1 PRESSURE COMPENSATED FLOW @ 70°: INCHES OF H_2O vs. LEAKAGE

Reference full size drawing included with this manual.

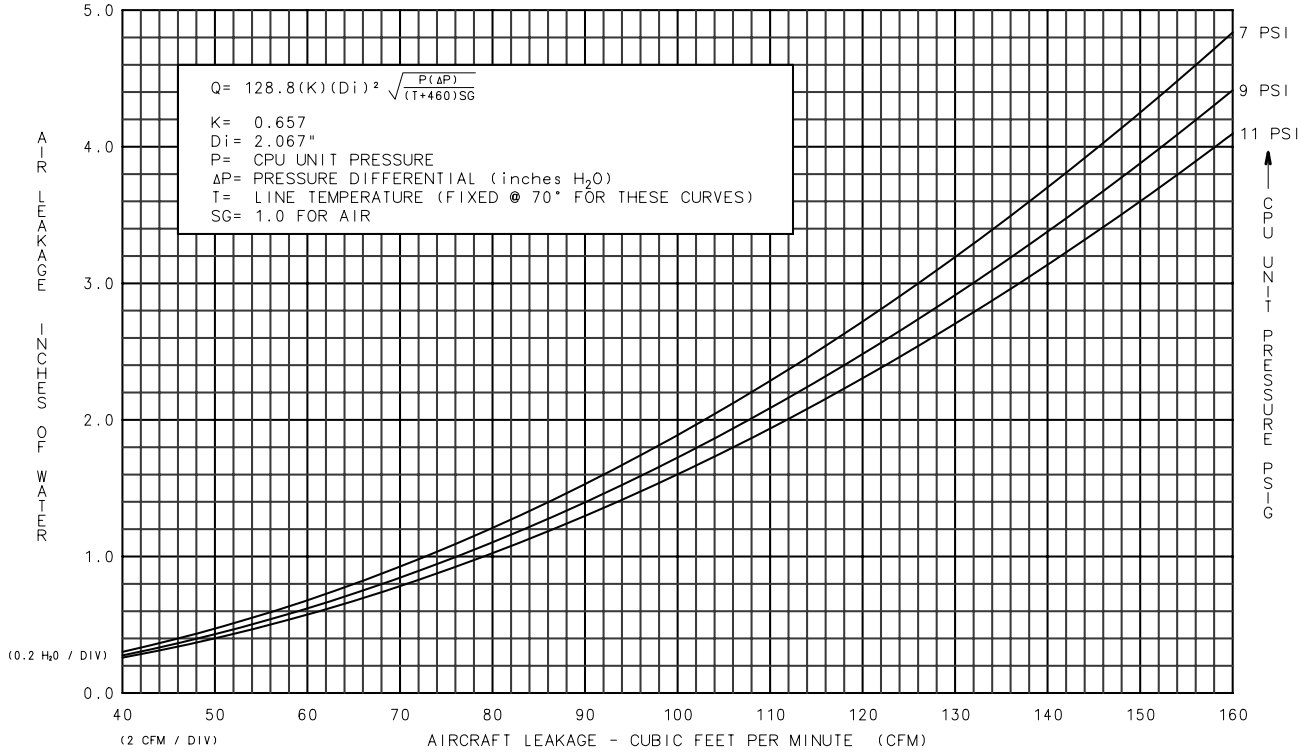


CURVE #2 PRESSURE COMPENSATED FLOW @ 70° F: INCHES OF H_2O vs. LEAKAGE

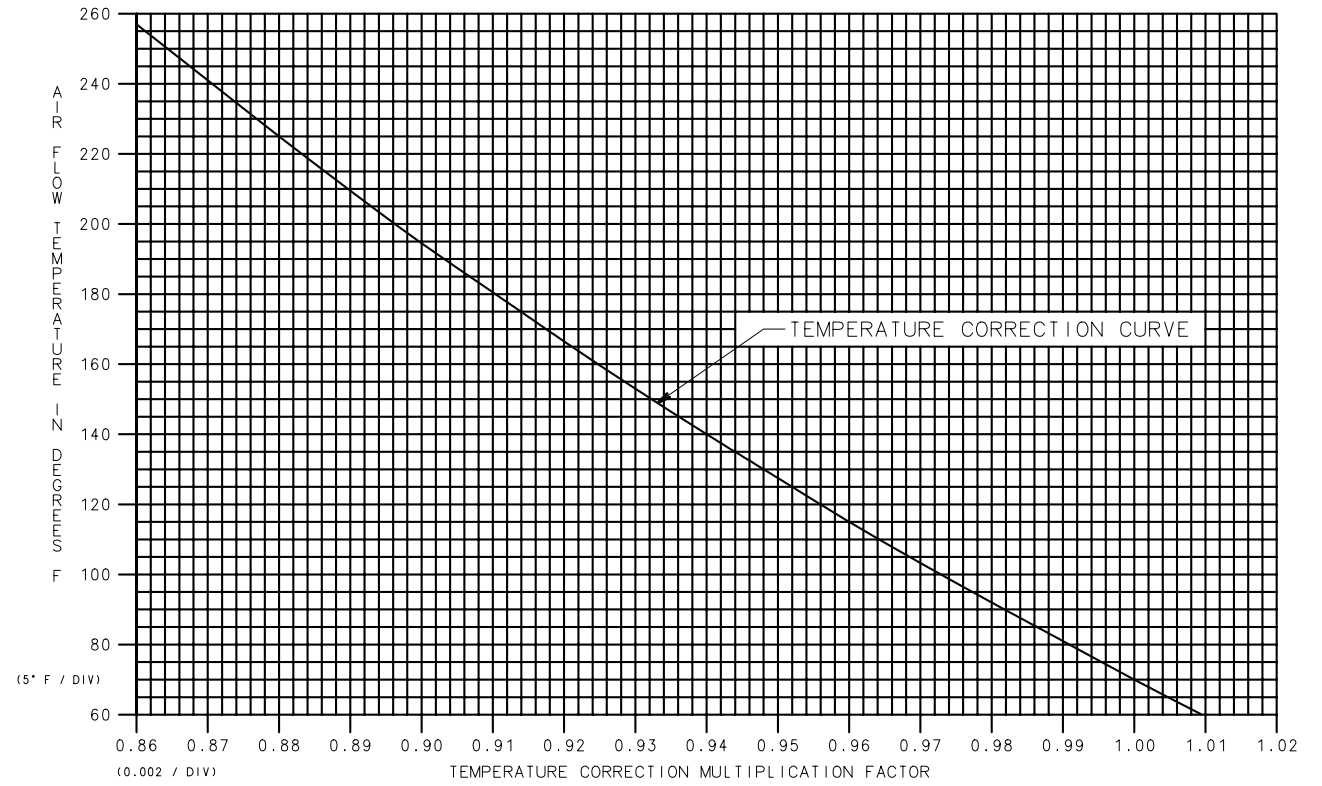
Reference full size drawing included with this manual.



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



CURVE #4 TEMPERATURE CORRECTION - DESIGN FLOW TEMP = 7



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

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).

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.

APPENDIX II

FLOW MEASUREMENT TEST PROCEDURE

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 - Flow Rate _____ in. of water - System Pressure ♦ _____psig - Unit Air Supply Temp _____° F • From Curves #2 & #3 in. of water = _____ACFM • From Curve #4 Temp. Factor x (_____ACFM) =_____SCFM ♦ **Record and calculate using** System 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:

- **Always follow the aircraft manufacturer's instructions for pressurizing aircraft.**
- **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 1/10 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 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 takeoff.

CAUTION!

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

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.

Pressure Decay Test Procedure continued on following page.

APPENDIX III

PRESSURE DECAY 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, 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 open the Airflow Control Valve 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.
    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.**

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:_____	
AIRCRAFT CABIN PRESSURE, NOT CPU SYSTEM PRESSURE	

APPENDIX IV

CPU ADAPTERS

APPENDIX IV

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.

APPENDIX V

DECLARATION OF CONFORMITY

DECLARATION of CONFORMITY

CABIN PRESSURIZATION UNIT

Relevant provisions complied with by the machinery:

89/392/EEC
89/336/EEC

Relevant standards complied with by the machinery:

EN 292-1:1991
EN 292-2:1991/1995
BS EN 418:1992
BS EN 954-1:1997
BS EN 983:1996
BS EN 1050:1997
BS EN 60204-1:1998
prEC 1915-1:1995

Identification of person empowered to sign on behalf of the manufacturer:

_____

Quality Assurance Manager

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APPENDIX VI

BLOWER MAINTENANCE DATA

APPENDIX VII

MOTOR MAINTENANCE DATA

APPENDIX VIII

AIR FLOW GAUGE (MAGNEHELIC)
CALIBRATION & MAINTENANCE DATA

APPENDIX IX

PRESSURE GAUGE CALIBRATION DATA