

Gulfstream IV

OPERATING MANUAL

PNEUMATICS

2A-36-10: General

The purpose of the pneumatics system is to provide a common manifold, known as the bleed air manifold, with hot compressed air for use by other systems. Therefore, this section describes the sources of air for the bleed air manifold, their controls and the indications they provide to the flight crew. The airplane systems which use air from the bleed air manifold are described in the appropriate sections of this chapter.

The pneumatics system uses the following types of bleed air:

- Low pressure (LP) bleed air from the engines
- High pressure (HP) bleed air from the engines
- Bleed air from the single compressor stage of the Auxiliary Power Unit (APU)
- External air from a comparable bleed air source (external pneumatic rig)

The pneumatics system consists of two identical and independent systems that provide a temperature controlled, pressure regulated air supply for the various using systems, such as air conditioning, wing and nose cowl anti-icing, cabin pressure, engine starting and door seal systems. The pneumatics system receives its air supply from the mid-stage and high-stage ports of the engines. Cooling air is supplied to the precooler by a fan port while bleed air is extracted from either the mid-stage or high-stage port, depending on need. Temperature control is provided by both an electro-pneumatic control system (bleed air manifold temperature control) and a fully pneumatic subsystem (anti-ice augmentation temperature control). Pressure regulation is fully pneumatic for both manifold pressure regulation and dual setting high-stage switching pressure control.

The bleed air manifold can be termed that portion of the system from the right and left bleed air pressure regulator and shutoff valves and precoolers inboard. It is essentially a distribution point for all airplane pneumatic services, except those tapped off at each engine for engine services. The manifold is, as a whole, located in the tail compartment. Manifold air temperature is held to approximately 400° F; air pressure is held to approximately 40.5 ±3.5 psi (±5.5 psi under high input air flows).

Bleed air from the APU is used to pressurize the bleed air manifold for use by airplane services such as ground air conditioning and engine starting. The temperature of this air is held to a maximum of 591° F; air pressure is held to a maximum of 53.9 psi.

The airplane incorporates an external air connection which may be used on the ground for the same services as the APU. When used with a source comparable to the APU, the external air will pressurize the bleed air manifold. The external air connection point is located in the underside of the fuselage, just forward of the hydraulic system service access door.

Door seals requiring pneumatic pressure for inflation receive pressure from the bleed air manifold through the door seal regulator. The regulator reduces the pressure to 17-19 psi for this application. The door seal system is described in Section 2A-52-00, Doors.

Two ducts are tapped into the bleed air manifold: one for the cockpit air conditioning system; the other for the cabin air conditioning system. Each duct has an air conditioning shutoff valve, which is a combination shutoff and flow regulating valve. One of its functions is to maintain a constant flow to the system. It also has a shutoff function, which will close the valve when it is desirable to terminate airflow into this system. The remainder of the air conditioning system is described in Section 2A-21-00, Air Conditioning.

Two additional ducts are also tapped into the bleed air manifold: one for the left wing

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anti-icing; the other for the left wing anti-icing. Each duct has an anti-ice valve controlling the airflow. Downstream of the valves, the right wing and left wing ducts join, delivering part of the air into a crossover duct. When on, the wing anti-icing system creates the highest demand on the bleed air manifold. The wing anti-icing system is described in Section 2A-30-00, Ice and Rain Protection.

2A-36-20: Pneumatics Distribution and Indication System

1. General Description:

The pneumatics distribution and indication system supplies 7th stage or 12th stage bleed air to the bleed air manifold where it is available to the systems that require bleed air, and provides visual indication of the pressure and temperature of the bleed air within the bleed air manifold. System design is such that 7th stage (mid stage) bleed air is the preferred air source and 12th stage (high stage) bleed air serves as an alternate or supplemental source whenever 7th stage pressures are not adequate for the airplane's needs. A check valve is incorporated in the 7th stage duct to prevent backflow of the higher-pressure 12th stage air. This check valve is commonly referred to as the LP check valve.

In the standard airplane configuration, 7th stage bleed air will supply all bleed flow during takeoff, climb and cruise conditions. The 12th stage bleed valve will remain closed due to existing 7th stage pressure being greater than 18 ± 2 psi. Should 7th stage pressure fall below 18 ± 2 psi for any reason, the 12th stage bleed valve will open and regulate pressure to 18 ± 2 psi. In all cases, bleed air passes through manifold pressure regulator valves into the left or right bleed air manifold, where pressure is maintained at a maximum of 40.5 ± 3.5 psi by these valves. Under high input air flows, manifold pressure tolerance increases to ± 5.5 psi.

The pneumatics distribution and indication system consists of identical and independent left and right sides. For the purposes of this description, however, the following components are discussed in the singular sense to avoid repetition:

- HP Bleed Air Pressure Regulator and Shutoff Valve
- Bleed Air Pressure Regulator and Shutoff Valve
- Fan Air and Fan Air Modulating Valve
- Precooler
- Temperature and Pressure Sensors/Switches

In addition to the above-listed left and right side components, the following subsystems and components are included:

- Bleed Air Isolation Valve
- APU Bleed Air Distribution
- External Air Distribution
- Door Seal Pressure Distribution
- Total Air Temperature Probe Aspiration

2. Description of Subsystems, Units, and Components:

(See Figure 1, Figure 2 and Figure 3.)

NOTE:

Items A through E are identical to the left and right sides, therefore only one side will be discussed.

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A. HP Bleed Air Pressure Regulator and Shutoff Valve:

The HP bleed air pressure regulator and shutoff valve (commonly referred to as the HP valve) is a butterfly-type modulation valve installed in the high-stage bleed air line to regulate, modulate or shut off 12th stage bleed air. It works in conjunction with the solenoid "A" and "B" HP control valve and the dual port solenoid shutoff valve to provide three distinct modes of operation (these modes are described below). The valves receive power from the Essential 28V DC bus through the L BLEED AIR and R BLEED AIR circuit breakers, respectively. A description of this valve's two controlling components follows:

(1) 12th Stage Servo Controller (Solenoid A and B HP Control Valve):

The 12th stage servo controller (solenoid A and B HP control valve) provides the necessary commands to the HP bleed air pressure regulator and shutoff valve to achieve the proper mode of control. The controller is a remote pressure regulating servo with a solenoid shutoff feature, a relief valve, and a thermostat connection for sensing downstream temperature. It is linked to the bleed air temperature sensor and the bleed air temperature anticipator sensor via the dual port solenoid shutoff valve.

(2) Dual Port Solenoid Shutoff Valve:

The dual port solenoid shutoff valve is installed to give a desired mode of system operation. The unit is pneumatically linked between the 12th stage servo controller (solenoid A and B HP control valve), the HP bleed air pressure regulator and shutoff valve, and the bleed air temperature sensor/anticipator sensor control set. Pneumatic control air is received from the solenoid A and B HP control valve via the actuator port. Control sensor plumbing is connected to the control port. The pneumatic signal is then manipulated by the dual port solenoid shutoff valve to give the proper HP bleed air pressure regulator and shutoff valve control.

As stated previously, the HP bleed air pressure regulator and shutoff valve provides three distinct modes of operation. These are the pressure regulation mode, the temperature modulation mode and the single pack mode. A description of these modes follows:

(3) Pressure Regulation Mode:

In the regulation mode, the HP bleed air pressure regulator and shutoff valve opens or closes to regulate bleed air to a constant pressure. If 7th stage pressure falls below 18 ± 2 psi during low power settings such as idle descent or taxi, solenoid A of the 12th stage servo controller is energized to regulate the HP bleed air pressure regulator and shutoff valve and maintain pressure at 18 ± 2 psi. During normal operations, the dual port solenoid shutoff valve remains closed.

It should be noted here that although 18 ± 2 psi is a design reference pressure, it may not always be attainable due to ambient conditions. Pressures in the range of 12-16 psi at idle power are not considered abnormal as long as they are stable.

On airplanes Serial Number (SN) 1310 and subsequent and airplanes SN 1000 through 1309 having Aircraft Service Change

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(ASC) 313, the rate at which cabin pressure changes during rapid power reductions at high altitudes is reduced. This ASC provides an electrical circuit, routed through the 2500 FT AGL horn mute relay, to reset bleed air pressure regulation from 18 psi to 30 psi when the power levers are retarded. In a retarded power lever descent (without anti-icing selected on) manifold pressure is maintained above 20 psi. Selection of any anti-icing on disables this circuit.

(4) Temperature Modulation Mode:

If wing and cowl anti-icing are selected on, pneumatic signals from the bleed air temperature sensor and the bleed air temperature anticipator sensor (both installed upstream of the precooler) coordinate with the 12th stage servo controller to reset the HP bleed air pressure regulator and shutoff valve. The valve then modulates mixed 7th and 12th stage air temperature to 520°-590° F (271°-310° C), thus modulating due to temperature, not pressure. With wing and cowl anti-icing are selected on, the dual port solenoid shutoff valve is de-energized open.

(5) Single Pack Mode:

With only one refrigeration pack selected on, both A and B solenoids of the 12th stage servo controller are energized. The HP bleed air pressure regulator and shutoff valve then resets to regulate pressure to 30 psi. This allows for increased performance due to single pack operations. Because the HP bleed air pressure regulator and shutoff valve is operating in single pack mode, the dual port solenoid shutoff valve remains closed.

If anti-icing is selected on during single pack operations, the system switches back to temperature control mode and the dual port solenoid shutoff valve is de-energized open.

B. Bleed Air Pressure Regulator and Shutoff Valve:

The bleed air pressure regulator and shutoff valve (also referred to the "40 psi valve") is an electrically controlled, pneumatically actuated, spring-loaded closed butterfly-type valve. Located immediately downstream of the 7th and 12th stage mixing junction, this valve regulates air having passed through the HP bleed air pressure regulator and shutoff valve to 40.5 psi nominal in the bleed air manifold. The valves receive power from the Essential 28V DC bus through the L BLEED AIR and R BLEED AIR circuit breakers, respectively.

The bleed air pressure regulator and shutoff valve is opened or closed by the flight crew using the L/R ENG BLEED AIR switches located in the BLEED AIR section of the cockpit overhead panel. Depressing the switch routes Essential 28V DC bus power to an electrically actuated solenoid, opening the valve and allowing pressure regulated bleed air through the precooler to the bleed air manifold. The OFF legend in the switch is extinguished.

C. Fan Air and Fan Air Modulating Valve:

Each engine's fan supplies low pressure bypass air (commonly referred to as LP or fan air) for use by both the airplane and its engines. For the engines, fan air is used to pressurize engine oil system components and cool various other engine components. For the airplane, fan air is routed

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through the precoolers to reduce the temperature of 7th and/or 12th stage bleed air.

The precooler fan air modulating valve (installed in the engine pylon) controls fan air airflow to the precooler in order to maintain a nominal 400° F (204° C) bleed air temperature. Precooler outlet air temperature is continuously monitored by a precooler outlet temperature sensor and a precooler temperature control anticipator sensor. Outputs from these sensors are transmitted to the precooler temperature controller. The controller, in turn, will change the output voltage to the servo air pressure regulator and torque motor. The servo air pressure regulator and torque motor then changes the electrical signal to a filtered pneumatic signal, positioning the precooler fan air modulating valve accordingly.

D. Precooler:

The precooler, located in the engine pylon, functions as a heat exchanger for the pneumatic system. HP bleed air flows from the bleed air pressure regulator and shutoff valve directly to the precooler, where fan air is introduced by the fan air modulating valve. Fan air and bleed air do not mix, rather, bleed air passes through the interior of the precooler while fan air flows around the exterior and exits through louvers in the bottom of the pylon.

E. Temperature and Pressure Sensors/Switches:

(1) Bleed Air Temperature Sensor:

The bleed air temperature sensor is located in the bleed air manifold, upstream of the precooler. It senses the mixed 7th and 12th stage air temperature and then modulates the HP bleed air pressure regulator and shutoff valve via the dual port solenoid shutoff valve and the 12th stage servo controller (solenoid "A" and "B" HP control valve) until a 520°-590° F (271°-310° C) temperature is maintained downstream of the mixing point.

(2) Bleed Air Temperature Anticipator Sensor:

The bleed air temperature anticipator sensor is also located in the bleed air manifold, upstream of the precooler. Functioning as a bleed-off anticipator, it responds to the rate of temperature change, not the temperature change itself. Rapid heating of the sensor causes an internal ball to become unseated which, in turn, bleeds off a portion of the pneumatic signal that modulates the HP bleed air pressure regulator and shutoff valve. This action prevents excessive overshoots of the HP bleed air pressure regulator and shutoff valve and bleed air temperature sensor combination which may cause unstable control.

(3) Precooler Outlet Temperature Sensor:

The precooler outlet temperature sensor is installed in the bleed air manifold, downstream of the precooler. As part of the engine fan air control system, it works in conjunction with the precooler temperature control anticipator sensor, the precooler outlet temperature controller and the precooler fan air modulating valve's servo air pressure regulator and torque motor to maintain engine fan airflow through the precooler at the desired amount. As the bleed air manifold temperature changes, the sensor reacts accordingly by

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changing resistance. This change in resistance is transmitted to the precooler outlet temperature controller, which in turn will change the output voltage to the servo air pressure regulator and torque motor. The servo air pressure regulator and torque motor then changes the electrical signal to a pneumatic signal to position the precooler fan air modulating valve accordingly. The temperature sensors (as well as the temperature controllers and servo air pressure regulator and torque motors) receive power from the Essential 28V DC bus through the L BLEED AIR and R BLEED AIR circuit breakers, respectively.

(4) **Precooler Temperature Control Anticipator Sensor:**

The precooler temperature control anticipator sensor is also installed in the bleed air manifold, downstream of the precooler. Like the bleed air temperature anticipator sensor, it responds to the rate of temperature change, not the temperature change itself. This prevents excessive overshoots of the fan air modulating valve and precooler outlet temperature sensor combination which may cause unstable control. The anticipator's outputs, combined with the precooler outlet temperature sensor outputs, are used by the precooler outlet temperature controller to create an electrical signal for the precooler valve servo air pressure regulator and torque motor which, in turn, controls the precooler fan air modulating valve. The temperature anticipator sensors receive power from the Essential 28V DC bus through the L BLEED AIR and R BLEED AIR circuit breakers, respectively.

(5) **Bleed Air Overpressure Switch:**

A bleed air overpressure switch is installed in the bleed air manifold duct to provide input signals when manifold pressures reach 75±5 psi. When this threshold is reached, an amber L-R BLEED PRESS HI caution message is displayed on CAS. The switches receive power from the warning lights power system.

(6) **Bleed Air Pressure Transmitter:**

A bleed air pressure transmitter (transducer) is installed in the bleed air manifold duct to provide input signals to the bleed air pressure indicator's digital readout of the bleed air system pressure. The transmitter also provides input signals used to present the L/R BLEED AIR PRESS readings on the APU/BLEED and ENGINE START system pages. The transmitters and the indicators receive power from the Essential 28V DC bus through the L BLEED AIR IND and R BLEED AIR IND circuit breakers, respectively.

(7) **Bleed Air Overtemperature Switch (550°F):**

A bleed air overtemperature switch is installed to alert the crew when manifold bleed discharge temperatures reach 550°F (288° C). When this threshold is reached, an amber L-R BLEED AIR HOT caution message is displayed on CAS. The switches receive power from the equipment overheat protection system.

F. Bleed Air Isolation Valve:

Located in the tail compartment, the bleed air isolation valve is installed in the crossover duct between the left and right bleed air manifolds. It

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provides a means to isolate the left and right side pneumatic systems when closed (its normal position). Conversely, when open, it joins the left and right side pneumatic systems, allowing the use of APU bleed air for both ECS packs during two pack air conditioning operations. In addition, it provides crossbleed capability during single engine operations to enable engine starting and cranking using the opposite side's pneumatic system, as well as APU bleed air. The bleed air isolation valve receives power from the Essential 115V AC bus (ϕA) through the BLEED AIR ISO S/O V circuit breaker.

During normal operations, the isolation valve is closed and the left and right side pneumatic systems are isolated from each other. Manual selection of the ISOLATION switch (cockpit overhead panel, BLEED AIR section) opens the isolation valve. A "bar" in the switch illuminates to fill in the crossover manifold line engraved on the BLEED AIR panel, signifying that the left and right side pneumatic systems are no longer isolated. In addition to the switch legend, a blue ISOLATION VLV OPEN advisory message is displayed on CAS. With the isolation valve open, crossbleed air and APU bleed air are available to both pneumatic systems for use by both refrigeration packs and for engine starting as required.

In addition to manual control, the bleed air isolation valve is capable of automatic control by certain bleed air configurations. If the isolation valve is closed, selection of APU BLEED AIR to ON or selection of either the MASTER CRANK or MASTER START switches to ON will automatically open the isolation valve. When APU BLEED AIR is selected off or the MASTER CRANK or MASTER START switches are selected off, the isolation valve will automatically close.

A manual override slot drive is provided on the valve itself so that the valve can be positioned with a screwdriver without the need for electrical power. The slot drive is connected to a common shaft, ensuring the synchronization of internal limit switches with valve position at all times regardless of whether the valve is actuated electrically or manually.

On airplanes SN 1445 and subsequent and SN 1000-1444 with ASC 422, the existing bleed air system wiring is modified to provide an annunciation for an incorrect bleed air configuration. This annunciation serves to caution the flight crew to the possibility of engine overtemperature if the isolation valve is open while the APU and/or engine bleed air switches are set to certain positions while on the ground. On SPZ-8400 equipped airplanes, an amber BLEED CONFIG caution message is displayed on CAS. On SPZ-8000 equipped airplanes, an amber BLEED CONFIG light illuminates above each navigation display. See Figure 5. After a five second delay, display of the annunciation is prompted when:

- Both ENG BLEED AIR switches are selected ON (OFF legend extinguished) with the isolation valve OPEN, **or**:
- Either or both ENG BLEED AIR switches are selected ON and APU BLEED AIR is selected ON (isolation valve opens automatically), **or**:
- Any two of the three available bleed sources (L ENG, R ENG and/or

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APU) are selected ON and either the MASTER CRANK or MASTER START switch is selected ON (isolation valve opens automatically)

NOTE:

To incorporate ASC 422 on SPZ-8000 equipped airplanes, ASC 327, 327A, 327B and any associated amendments must first be incorporated.

G. APU Bleed Air Distribution:

The APU bleed air duct is connected to the right side of the bleed air manifold. Selection of the APU BLEED AIR switch (cockpit overhead panel, BLEED AIR section) to ON opens the APU's load control valve and the isolation valve. The ON legend in the switch illuminates. APU bleed air then flows through a check valve in the APU bleed air duct into the bleed air manifold. Should bleed air manifold pressure exceed APU bleed air pressure, the check valve in the APU bleed air duct will close to prevent reverse flow.

APU bleed air is inhibited while airborne. Only electrical power is available from the APU.

H. External Air Distribution:

(See Figure 9.)

The external air duct is connected to the left side of the bleed air manifold. On the opposite end of the duct is a coupling where the external air cart is connected. The external air connection point is located in the underside of the fuselage, just forward of the hydraulic system service access door. With the proper external air cart connected, the flight crew may use external air as required for engine starting. Should bleed air manifold pressure exceed external air duct pressure, a check valve installed in the external air duct will close to prevent reverse flow.

I. Door Seal Pressure Distribution:

(See Figure 1, Figure 3 and Figure 6 through Figure 8.)

The door seal pressure line and pressure regulator are connected to the bleed air manifold. Location of the line on the manifold is such that either the left or right bleed air system can furnish a supply of bleed air. The regulator is designed to provide 18 ± 1 psi output to inflate the main entrance door and baggage door seals. For airplanes having the cargo door modification, door sealing is also provided by the door seal system for the cargo door.

On airplanes SN 1285 and subsequent and airplanes SN 1000 through 1284 having ASC 364, redundancy is added to the door seal system by routing an additional constant high pressure air source to the pressure regulator. (See Figure 2 and Figure 3 instead of Figure 1 and Figure 3.) This ensures maximum flow output from the pressure regulator to the door seals. Additional pressure lines, one for each engine, are ported into the 12th stage bleed air duct upstream of the HP bleed air pressure regulator and shutoff valve. The line is routed into the tail compartment, where it joins into the existing door seal pressure line. The existing door seal pressure line is then re-routed to separate the total air temperature probe aspiration pressure supply and water system pressure tap (for later outfitting) from

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the door seal system. Thus the door seal system and pressure regulator have a separate manifold.

J. Total Air Temperature Probe Aspiration:

A Total Air Temperature (TAT) probe aspiration pressure line and solenoid-operated shutoff valve (commonly referred to as the total temp valve) are connected to the bleed air manifold. Location of the line on the manifold is such that either the left or right bleed air system can furnish a supply of bleed air to the shutoff valve.

The TAT probe is located on the lower right side of the forward fuselage below the angle of attack probe. To ensure accurate calibration readings, bleed air is introduced through the TAT probe when the airplane is on the ground. Through this process, known as aspiration, bleed air is supplied to the probe from the shutoff valve when the nutcracker shifts to the ground mode. This shutoff valve receives power from the Right Main 28V DC bus.

3. Controls and Indications:

(See Figure 4.)

A. Circuit Breakers:

Circuit Breaker Name	CB Panel	Location	Power Source
L BLEED AIR	PO	A-10	ESS DC Bus
R BLEED AIR	PO	B-10	ESS DC Bus
BLEED AIR ISO S/O V	PO	D-12	ESS AC Bus ϕ A
L BLEED AIR IND	PO	B-12	ESS DC Bus
R BLEED AIR IND	PO	C-12	ESS DC Bus

B. Caution (Amber) Crew Alerting System (CAS) Messages:

CAS Message	Cause or Meaning
L-R BLEED AIR HOT	Bleed air temperature is above 550° F (288° C).
BLEED CONFIG	(1) Programmable custom message activated as desired during outfitting. (2) Isolation valve is OPEN with engine bleed selected ON.
L-R BLEED PRESS HI	Bleed air pressure has exceeded 75 psi.
DOOR SEAL PRESSURE	Programmable custom message activated as desired during outfitting.

NOTE(S):

- (1) Airplanes not having ASC 422.
- (2) Airplanes SN 1445 & subs; SN 1000-1444 having ASC 422.

C. Advisory (Blue) CAS Messages:

CAS Message	Cause or Meaning
DR SUPPLY PRES LOW	Programmable custom message activated as desired during outfitting.
ISOLATION VLV OPEN	Isolation valve is open.

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NOTE:

A description of the Engine Instruments and Crew Alerting System (EICAS) can be found in Section 5 of Honeywell's SPZ-8000 (or SPZ-8400) Digital Automatic Flight Control System Pilot's Manual for the Gulfstream IV.

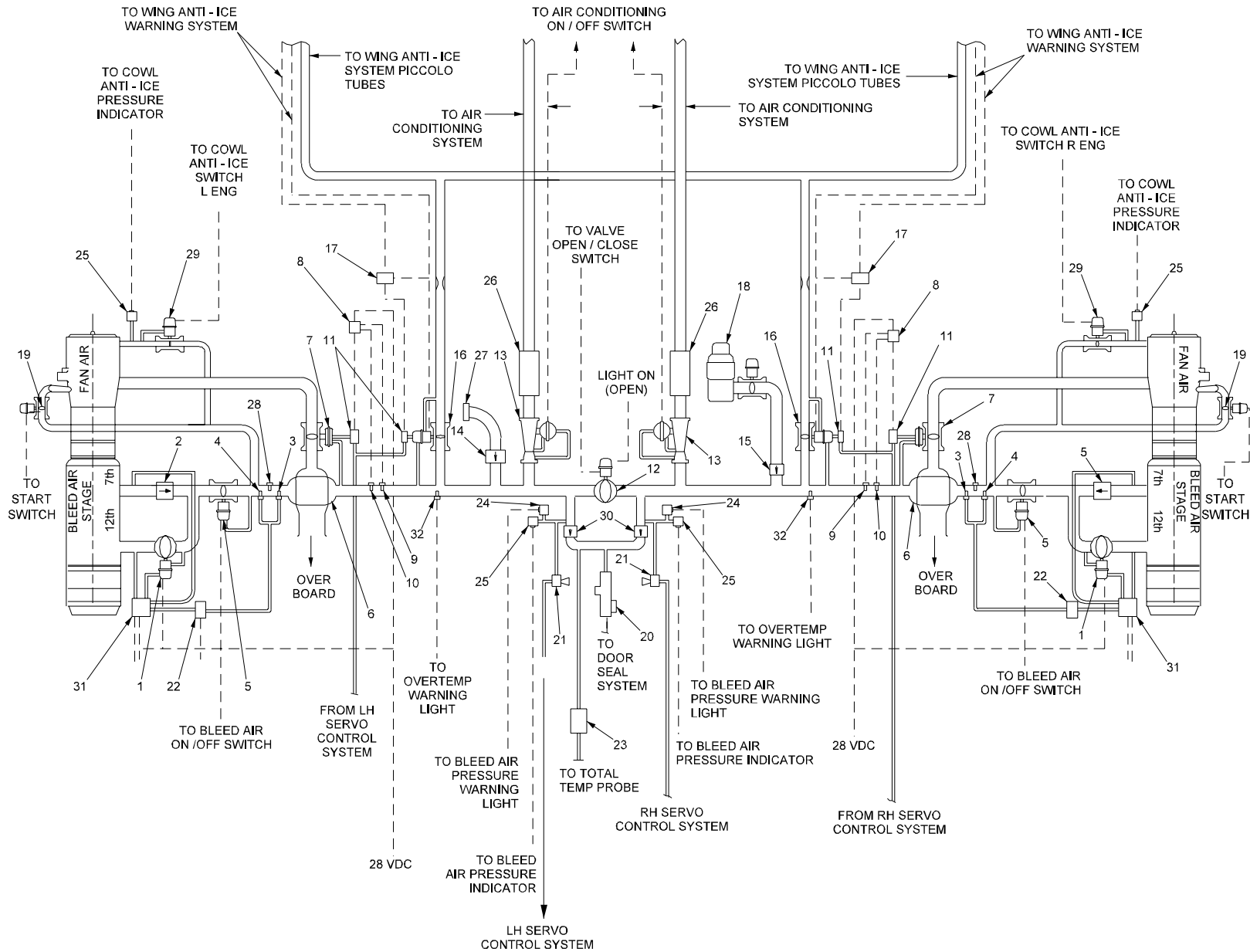
4. Limitations:

A. Flight Manual Limitations:

Do not operate above 41,000 ft without both engine bleeds ON and each engine being bled by either the air conditioning system or engine cowl anti-ice. See Section 05-01-10, Air Conditioning System Shut Down Or Inoperative.

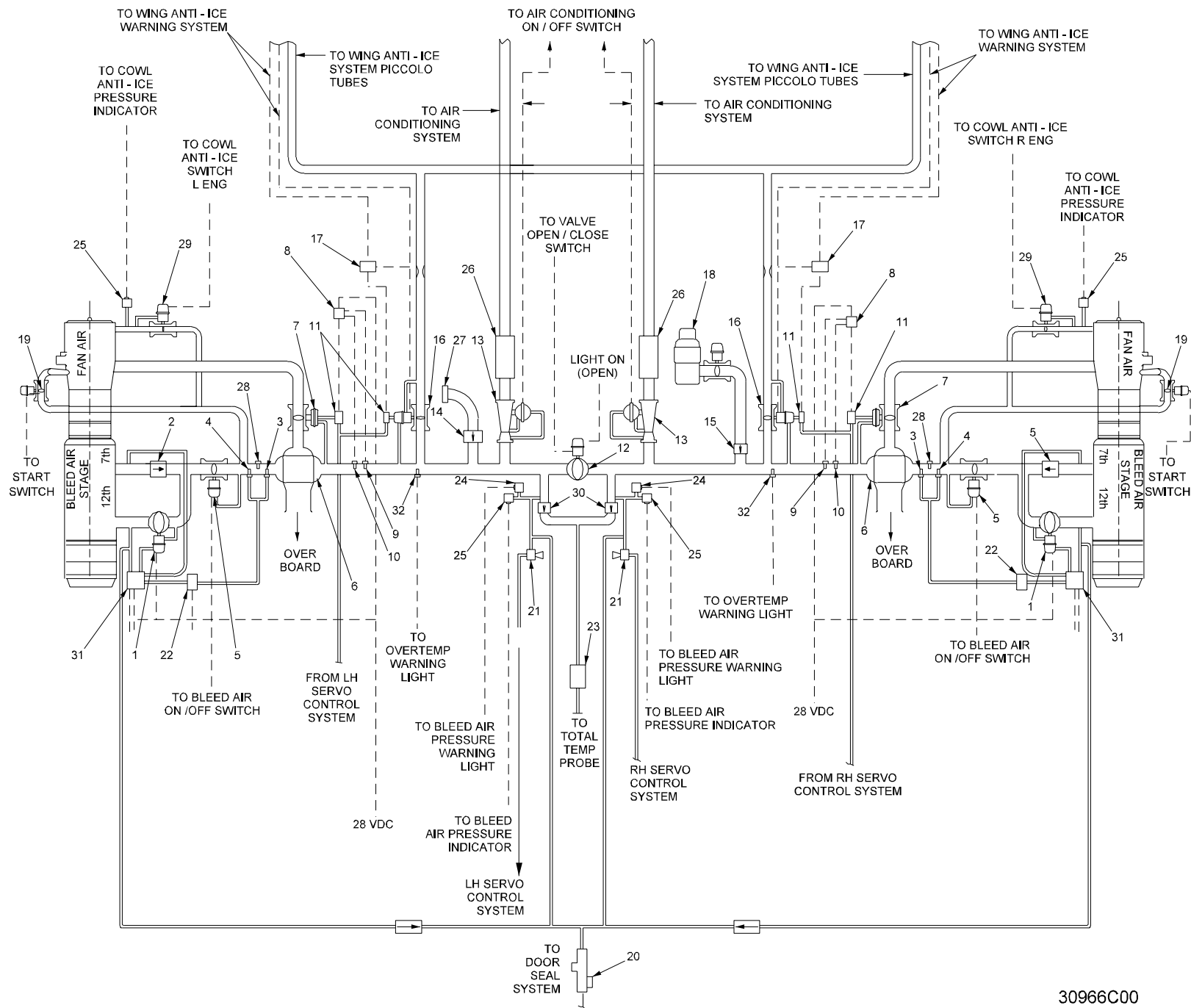
B. System Notes:

- (1) The bleed air isolation valve must be closed and APU bleed air OFF before the autothrottle can be engaged.
- (2) Only one source of bleed air, either APU or engines, should be selected after engines are started during normal operations. This is to prevent thermal transients on the APU or possible damage to the APU when the power levers are moved from idle. With the engines as the source of bleed air, ensure the isolation valve is closed.
- (3) To provide cooling air flow to the cabin during warm weather operations (if taxi operations are conducted with engine bleed air as the source for the ECS packs), it is recommended that one power lever be advanced above idle with the isolation valve open and the opposite engine bleed air be selected off.



Pneumatics System Block
Diagram: SN 1000-1284
Not Having ASC 364
Figure 1

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Pneumatics System Block Diagram: SN 1285 and Subsequent; SN 1000-1284 Having ASC 364
Figure 2

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<u>ITEM NO.</u>	<u>DESCRIPTION</u>
1	VALVE, H.P. BLEED AIR PRESSURE REG. & S/O
2	VALVE, L.P. BLEED AIR CHECK
3	SENSOR, BLEED AIR TEMPERATURE
4	SENSOR, BLEED AIR TEMPERATURE ANTICIPATOR
5	VALVE, BLEED AIR PRESSURE REG. & S/O
6	HEAT EXCHANGER, BLEED AIR PRECOOLER
7	VALVE, PRECOOLER FAN AIR MODULATING, 4" DIA
8	CONTROLLER, PRECOOLER OUTLET TEMPERATURE
9	SENSOR, PRECOOLER OUTLET TEMPERATURE
10	SENSOR, PRECOOLER TEMPERATURE CONTROL ANTICIPATOR
11	VALVE, SERVO AIR PRESSURE REG
12	VALVE, BLEED AIR ISOLATION S/O
13	VALVE, AIR CONDITIONING SYSTEM SHUTOFF & FLOW CONTROL
14	VALVE, EXTERNAL AIR CHECK
15	VALVE, AUX POWER UNIT AIR CHECK.
16	VALVE, WING ANTI-ICE PRESSURE REG S/O & TEMPERATURE CONTROL
17	CONTROLLER, WING ANTI-ICE SYSTEM TEMPERATURE
18	AUXILIARY POWER UNIT (APU)
19	AIR TURBINE STARTER & BLEED CONTROL VALVE
20	VALVE, DOOR SEAL PRESSURE REGULATOR
21	FILTER, SERVO AIR PRESSURE
22	VALVE, DUAL PORT SOLENOID SHUTOFF
23	VALVE, SOLENOID SHUTOFF, TOTAL TEMP PROBE
24	SWITCH, BLEED AIR OVERPRESSURE (65 PSI)
25	TRANSMITTER, BLEED AIR/COWL PRESSURE
26	FILTER, CABIN/COCKPIT OZONE
27	NIPPLE, EXTERNAL AIR
28	SWITCH, COWL ANTI-ICE DUCT OVERHEAT (675° F)
29	VALVE, COWL ANTI-ICE PRESSURE REGULATOR & SHUTOFF
30	VALVE, CHECK BLEED AIR DOOR SEAL SYSTEM
31	VALVE, SOLENOID A & B, H.P. VALVE CONTROL
32	SWITCH, BLEED AIR OVERTEMP (550° F)

LEGEND

—————	BLEED AIR & AIR COND.
—————	DISTRIBUTION LINES
=====	PNEUMATIC CONTROL SYSTEM
- - - - -	ELECTRICAL LINES

31256C00

Pneumatics System Block Diagram Key
Figure 3

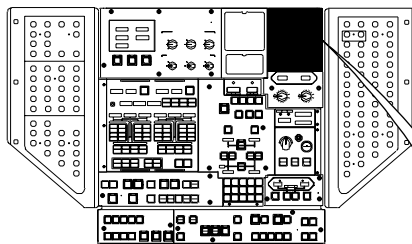
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L ENG / R ENG BLEED AIR Pressure Indicator

Provides digital display (in psi) of bleed air system pressure sensed by associated manifold's bleed air pressure transmitter. Adjacent color range bar shows acceptable range of 0-60 psi and a caution range of greater than 60 psi.

NOTE: Pressures exceeding 75 psi cause an amber L-R BLEED PRESS HI caution message to be displayed on CAS.

ISOLATION Valve

Closed (Normal Position):

- Left and right side pneumatic systems are isolated from each other
- APU bleed air is available to only right side pneumatic system
- External bleed air is available to only left side pneumatic system
- Bar legend in switch is extinguished

Open (Manually or Automatically - on Ground Only):

- Bar legend in switch illuminates
- ESS 115V AC power is supplied to isolation valve
- Left and right side pneumatic systems are joined
- APU bleed air available for "two pack" air conditioning ground operations
- Crossbleed capability available for single engine ground operations, enabling engine cranking/starting using opposite side pneumatic system or APU bleed air
- Blue ISOLATION VLV OPEN advisory message is displayed on CAS

Automatic Operation:

If closed, selection of following automatically opens isolation valve (on ground only):

- APU BLEED AIR to ON
- MASTER CRANK to ON
- MASTER START to ON

When selected off, isolation valve automatically closes.

NOTE: APU bleed air is inhibited while airborne.

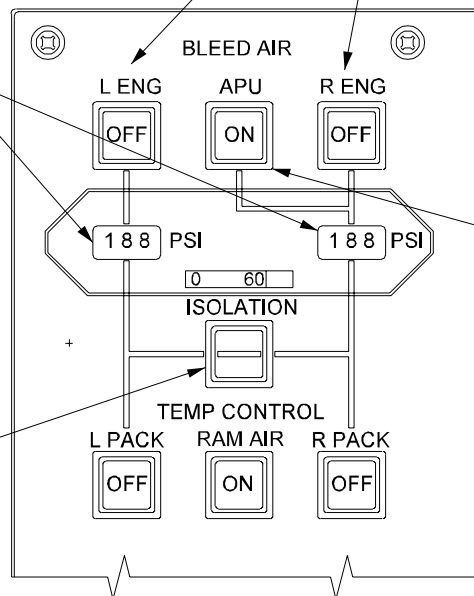
L ENG / R ENG BLEED AIR

On:

- OFF legend extinguishes
- ESS 28V DC power is supplied to associated bleed air pressure regulator and shutoff valve
- Associated bleed air pressure regulator and shutoff valve opens, allowing pressure regulated bleed air to bleed air manifold

OFF:

- OFF legend illuminates
- ESS 28V DC power is removed from associated bleed air pressure regulator and shutoff valve
- Associated bleed air pressure regulator and shutoff valve closes, inhibiting bleed air to bleed air manifold



APU BLEED AIR

(Assumes APU running)

ON:

- ON legend illuminates
- APU load control valve opens
- APU bleed air is supplied to bleed air manifold

Off:

- ON legend extinguishes
- APU load control valve closes
- APU bleed air flow is inhibited

NOTE: APU bleed air is inhibited while airborne.

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BLEED AIR Control Panel
Figure 4

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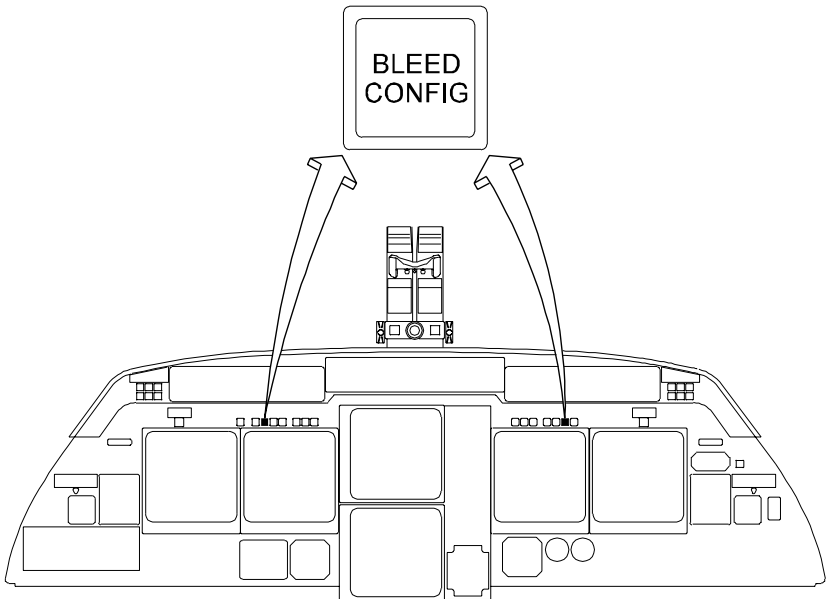
OPERATING MANUAL

BLEED CONFIG

(SPZ-8000 equipped airplanes having ASC 422)

Illuminates amber when:

- Both ENG BLEED AIR switches are selected ON with the isolation valve OPEN, or:
- Either or both ENG BLEED AIR switches are selected ON and APU BLEED AIR is selected ON, or:
- Any two of the three available bleed sources (L ENG, R ENG and/or APU) are selected ON and either the MASTER CRANK or MASTER START switch is selected ON.



35655C00

BLEED CONFIG Indicator: SPZ-8000 Equipped Airplanes Having ASC 422
Figure 5

PRODUCTION AIRCRAFT SYSTEMS

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Gulfstream IV

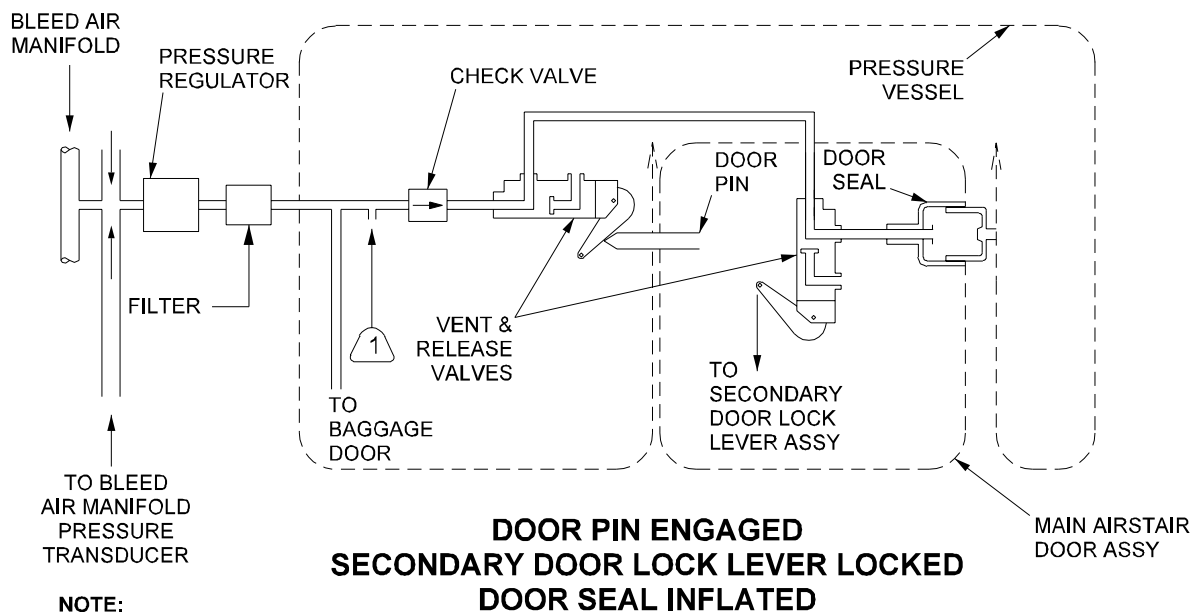
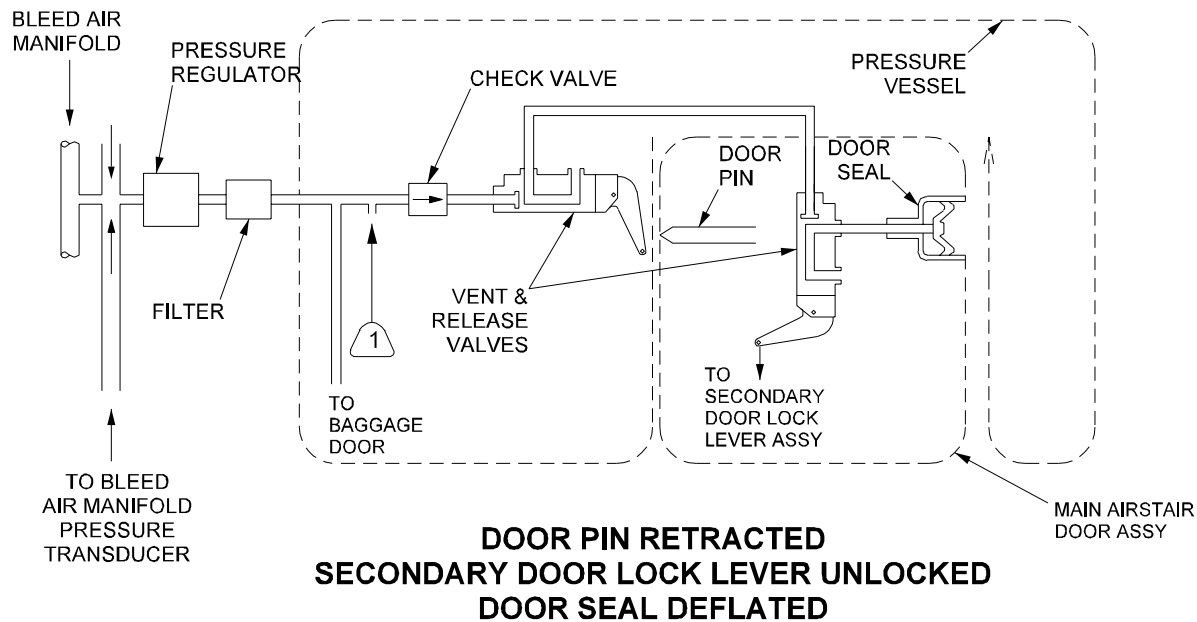
OPERATING MANUAL

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NOTE:

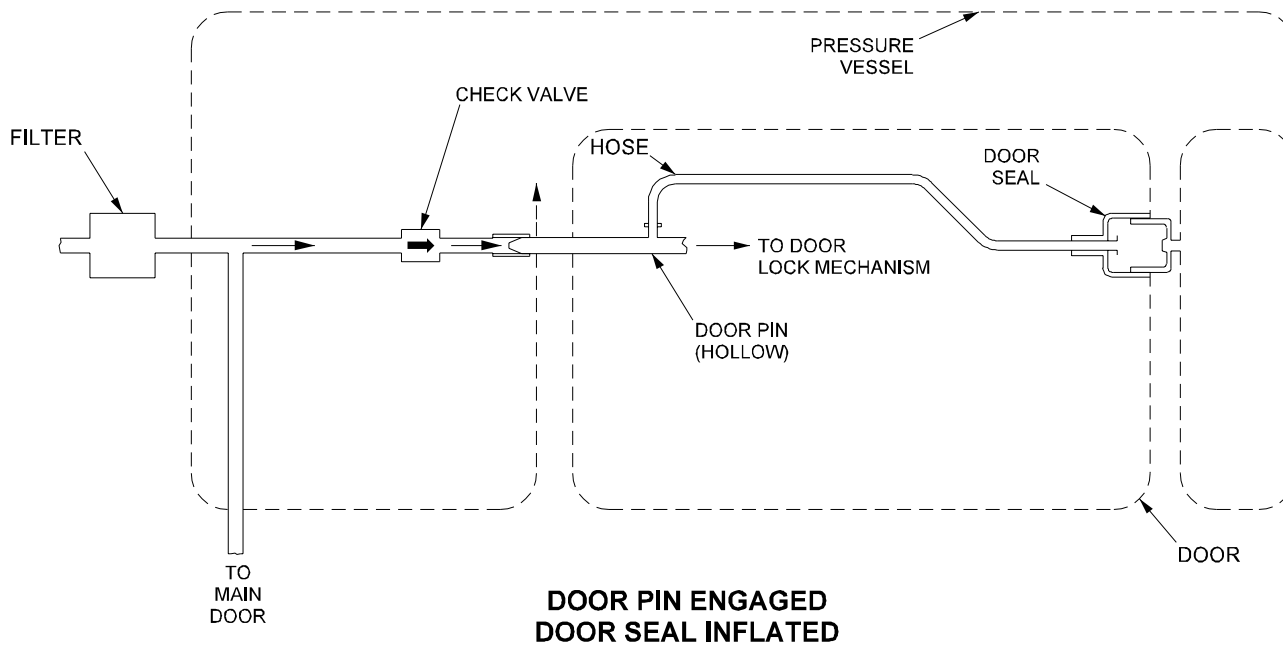
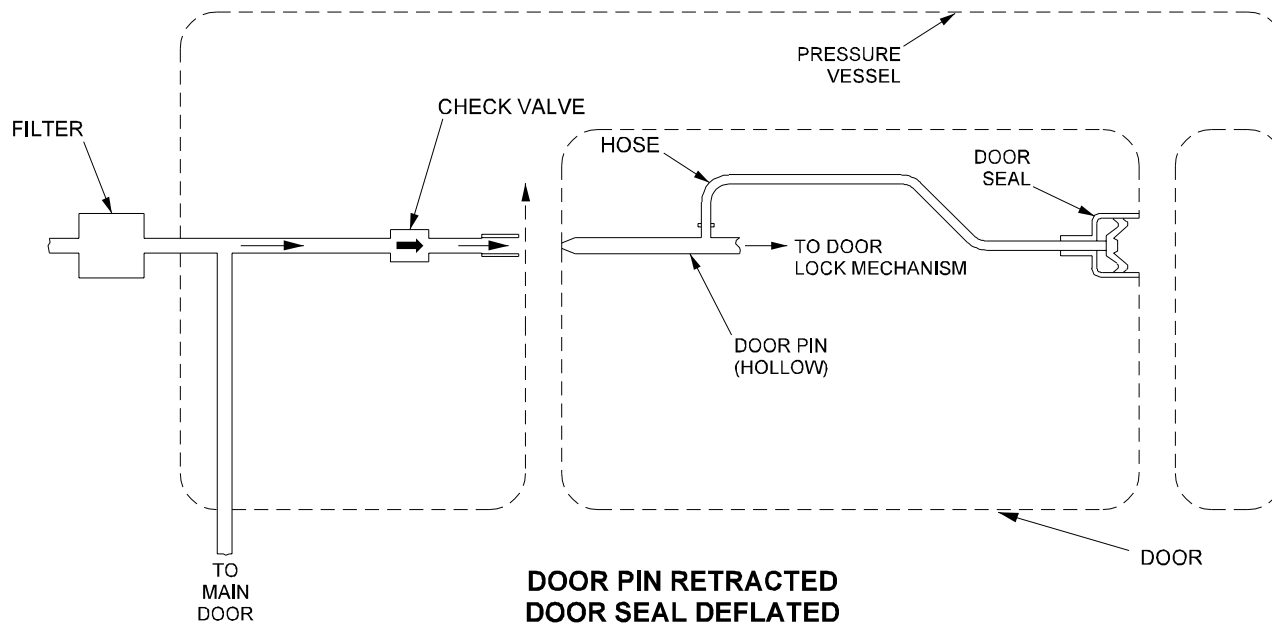
① HOLE (0.027" - 0.032" DIA.)

30967C00

Main Entrance Door Seal
System
Figure 6

2A-36-00

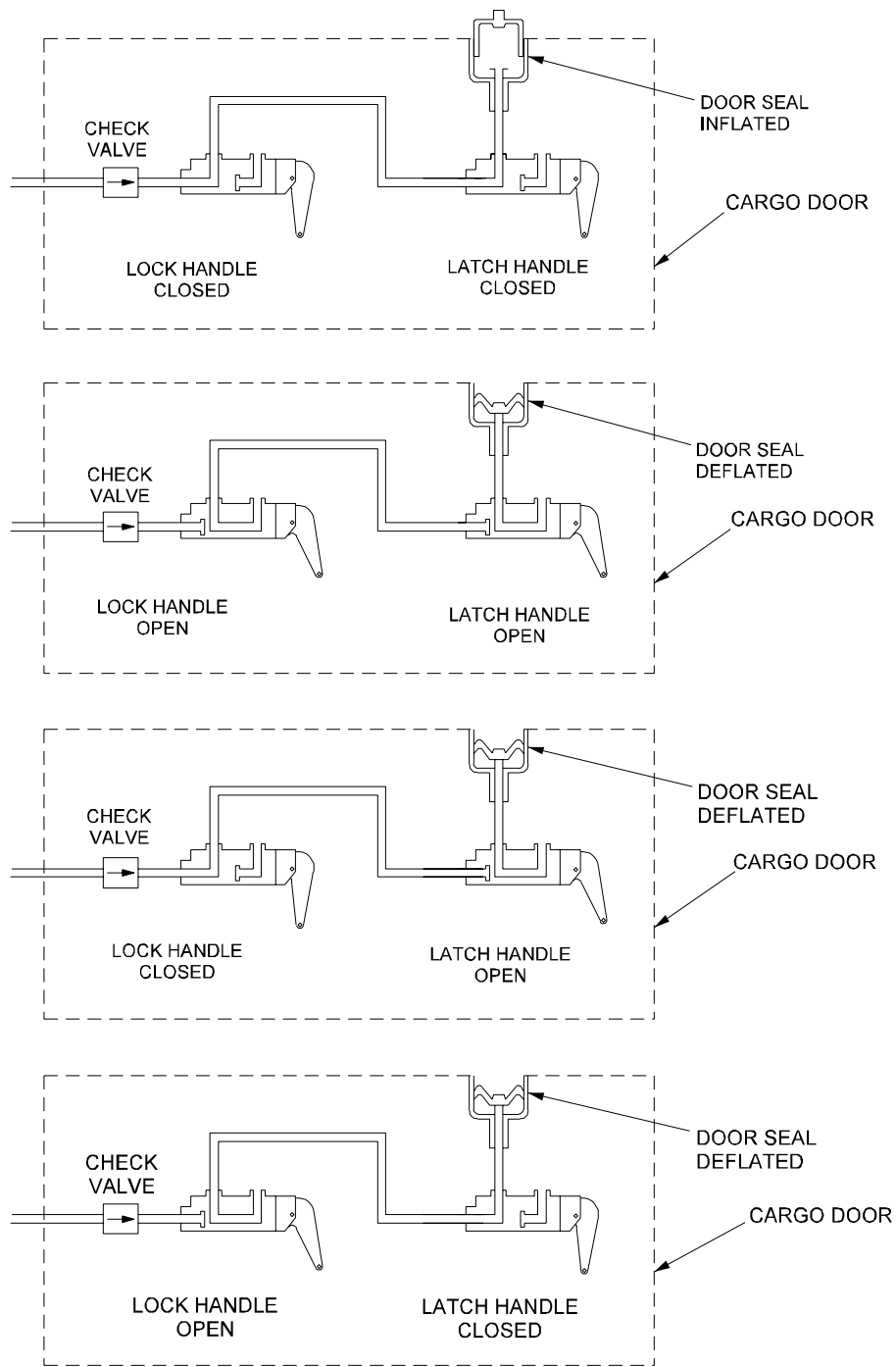
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30968C00

Baggage Door Seal
System
Figure 7

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30969C00

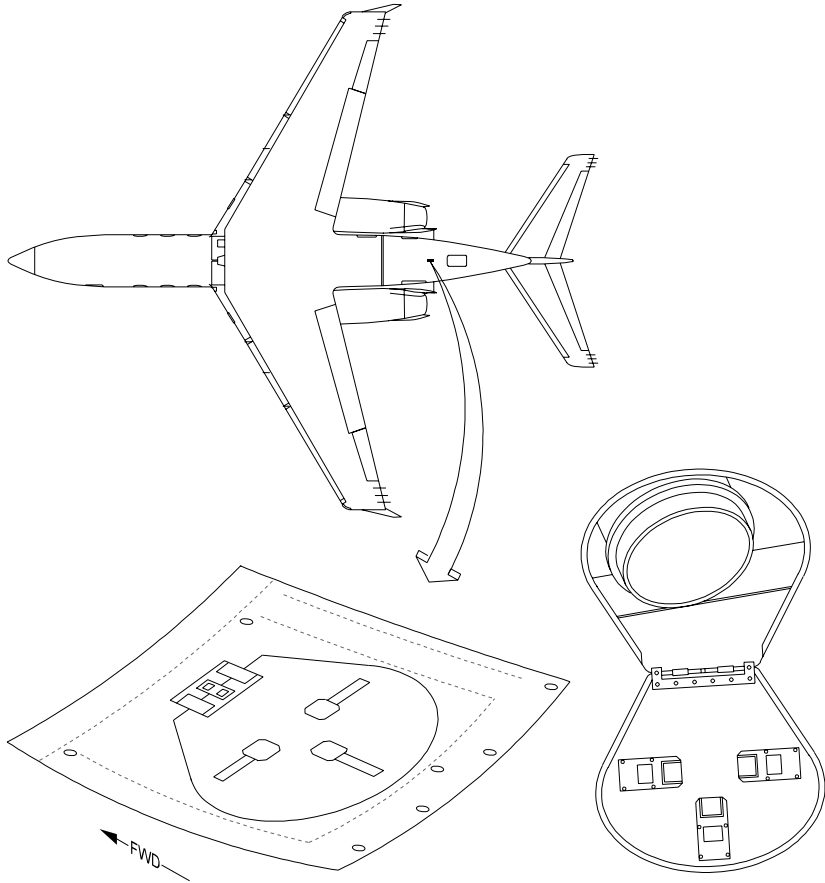
Cargo Door Seal System
Figure 8

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Gulfstream IV

OPERATING MANUAL



25619C00

External Starting Air Connection
Figure 9

Gulfstream IV

OPERATING MANUAL

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PRODUCTION AIRCRAFT SYSTEMS