

A1-AV8BC-410-100

1 February 1990

Change 7 - 15 May 2004

TECHNICAL MANUAL

**ORGANIZATIONAL MAINTENANCE
PRINCIPLES OF OPERATION**

ENVIRONMENTAL CONTROL SYSTEM

NAVY MODEL

TAV-8B

162747 AND UP

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NATEC ELECTRONIC MANUAL

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Only those work packages/pages assigned to the manual are listed in this index. Insert Change 7, dated 15 May 2004. Dispose of superseded work packages/pages. Superseded classified work packages/pages shall be destroyed in accordance with applicable security regulations. If changed pages are issued to a work package, insert the changed pages in the applicable work package. The portion of text affected in a change or revision is indicated by change bars or the change symbol "R" in the outer margin of each column of text. Changes to illustrations are indicated by pointing hands, change bars, or MAJOR CHANGE symbols. Changes to diagrams may be indicated by shaded borders.

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2.....0		9.....0		007 00		29.....7	
3.....0		10.....0		1.....7		30.....7	
4.....0		11.....0		2.....7		31.....7	
5.....0		12.....0		2A.....7		32.....7	
6.....0		13.....0		2B blank.....7		33.....7	
7.....0		14.....0		3.....0		34.....7	
8.....0		15.....0		4.....0		009 00	
9.....0		16.....0		5.....0		1.....0	
10.....0		17.....0		6.....0		2.....0	
11.....0		18.....0		7.....0		3.....0	
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26.....	7						
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10.....	5						
11.....	7						
12 blank	7						

LIST OF TECHNICAL PUBLICATION DEFICIENCY REPORTS INCORPORATED

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

ENVIRONMENTAL CONTROL SYSTEM

This WP supersedes TPDR WP, dated 15 June 2003.

1. Deficiencies identified in this Technical Manual shall be submitted via OPNAV 4790/66 and forwarded to Defense Contract Management Command/Central Technical Manual Control Unit (DCMC/CTMCU), McDonnell Douglas Corporation, P.O. Box 516, St. Louis, MO 63166-0516.

2. The TPDRs listed below have been incorporated in this issue.

IDENTIFICATION NUMBER/ QA SEQUENCE NUMBER	LOCATION
NONE	

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ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

ENVIRONMENTAL CONTROL SYSTEM

This WP supersedes WP001 00, dated 1 March 1997.



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INTRODUCTION

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

ENVIRONMENTAL CONTROL SYSTEM

This WP supersedes WP002 00, dated 1 March 1997.

1. PURPOSE.

2. This manual provides the technician with a general understanding of how the various components function in the system.

3. REQUISITION AND AUTOMATIC DISTRIBUTION OF NAVAIR TECHNICAL MANUALS.

4. Procedures to be used by Naval activities and other Department of Defense activities requiring NAVAIR technical manuals are defined in NAVAIR 00-25-100 and NAVAIRINST 5605.5.4A.

5. To automatically receive future changes and revisions to NAVAIR technical manuals, an activity must be established on the Automatic Distribution Requirements List (ADRL) maintained by the Naval Air Technical Data and Engineering Service Command (NATEC). To become established on the ADRL, notify your activity central technical publications librarian. If your activity does not have a library, you may establish your automatic distribution by contacting the Commanding Officer, NATEC, Attn: Distribution, NAS North Island, Bldg. 90, P.O. Box 357031, San Diego CA 92135-7031. Annual reconfirmation of these requirements is necessary to remain on automatic distribution. Please use your NATEC assigned account number whenever referring to automatic distribution requirements.

6. If additional or replacement copies of this manual are required with no attendant changes in the ADRL, they may be ordered by submitting a MILSTRIP requisition in accordance with NAVSUP 485 to Routing Identifier Code "NFZ". MILSTRIP requisitions can be submitted through your supply office, Navy message, or SALTS to

DAAS (Defense Automated Address System), or through the DAAS or NAVSUP web sites. For assistance with a MILSTRIP requisition, contact the Naval Inventory Control Point (NAVICP) Publications and Forms Customer Service at DSN 442-2626 or (215) 697-2626, Monday through Friday, 0700 to 1600 Eastern Time.

7. CONTENT.

8. Work packages contain description and operation of systems, subsystems, and components. The text is supported by component locators, block diagrams and simplified schematics.

9. **COMPONENT LOCATOR.** The component locator shows aircraft component location. The illustration shows the technicians view when possible.

10. **BLOCK DIAGRAMS.** Block diagrams consist primarily of blocks connected by lines. These diagrams portray the function of a system or subsystem.

11. **SIMPLIFIED SCHEMATICS.** Simplified schematics consist primarily of blocks connected by single lines with limited use of symbols and pictorial drawings of units. These schematics simplify system functions as much as possible. All schematics are shown with electrical power off, switches in off positions, and relays in deenergized position unless noted on schematic.

12. SIMPLIFIED SCHEMATIC HIGHLIGHTS.

13. For simplified schematic highlights see figure 1.

14. MANUAL ISSUE DATE.

15. The manual issue date on the title page is the copy freeze date. No additions, deletions, or changes are made after the manual issue date, except last minute safety of flight or required maintenance changes. Data collected after the manual issue date will be included in later changes or revisions of the manual.

16. EFFECTIVITIES.

17. Effectivity notes on manual title pages, work package title pages, and within a work package indicate the aircraft or software program to which the data applies. If no effectivity note appears on the work package title page, the work package has

the same effectivity as shown on the manual title page. The effectivity notes may use:

- a. Type, model, and series
- b. Bureau number (tail number)
- c. Combination of type, model, series, and bureau numbers
- d. Part number or serial number
- e. Technical directive number
- f. Configuration/identification number

18. The table below shows examples of effectivity notes and their meanings:

Effectivity Note Examples

Effectivity Note	Definition
AV-8B 162942 AND UP, TAV-8B 162963 AND UP	Applicable to all AV-8B and TAV-8B for bureau numbers listed.
AV-8B	Applicable to all AV-8B, but not TAV-8B.
TAV-8B	Applicable to all TAV-8B, but not AV-8B.
AV-8B 161573 THRU 162745	Only applicable to some bureau numbers of AV-8B. Not applicable to any TAV-8B, even if a TAV-8B is within the numbers listed.
TAV-8B 162963 AND UP	Only applicable to some bureau numbers of TAV-8B. Not applicable to any AV-8B, even if an AV-8B is within the numbers listed.
AV-8B 161573 THRU 162973, TAV-8B 162747 THRU 162971 BEFORE AV8AFC-772	Applicable to aircraft before modification by technical directive.
AV-8B 163176 AND UP, TAV-8B 163180 AND UP; ALSO AV-8B 161573 THRU 162973, TAV-8B 162747 THRU 162971 AFTER AV8AFC-772	Applicable to aircraft modified during production; also applicable when affected aircraft have been modified by technical directive.
AV-8B 165384 AND UP; ALSO AV-8B 163853 THRU 164547 AFTER AV8AFC-354, AV-8B 164549 THRU 165383 AFTER AV8AFC-354 PART 2.	Applicable to aircraft modified during production; also applicable when affected aircraft have been modified by two or more technical directives that accomplish the same task on different blocks of aircraft.
AV-8B 161573 THRU 162746 WHEN NO. 2 CON- TROL PANEL P/N XXXX-X IS INSTALLED	Applicable to aircraft if panel P/N XXXX-X is installed (Configuration before AVC).

Effectivity Note Examples (Continued)

Effectivity Note	Definition
AV-8B 162942 AND UP, TAV-8B; ALSO AV-8B 161573 THRU 162746 WHEN NO. 2 CONTROL PANEL P/N XXXX-Y (AVC-102) IS INSTALLED	Applicable to aircraft modified during production; also applicable to aircraft components modified to production configuration by technical directive (configuration after AVC).
P/N 65101-9, 65101-10 & 65105-3	Applicable to assemblies which are interchangeable between aircraft.
F402-RR-406A, F402-RR-406B, F402-RR-408 & F402-RR-408A	Applicable to engine models which are interchangeable between aircraft.
CONFIG/IDENT NUMBER 88-D (DAY AND TAV-8B) 89-N (NIGHT ATTACK) 93-R (RADAR) 96-C (COMBINED NIGHT ATTACK AND RADAR)	The CONFIG/IDENT number is the first 4 characters of the operational flight program (OFP) identification. The number relates to the software program in a programmable assembly. A1-AV8BB-SCM-000, WP003 00 lists the use and applicability of software programs by OFP IDENT/program load identification (PLI) number.

19. DEFERRED SPECIFICATION COMPLIANCE CHANGES (DSCC). DSCC control design modifications on aircraft TAV-8B 162747. Until the aircraft is modified, before and after DSCC configurations exist in the manual. Aircraft effectivity may include reference to Engineering Job Sheet (EJS) and blueprint Engineering Order (EO). Examples of DSCC effectivities are shown below:

a. Before and after configurations for DSCC EJS:

TAV-8B 162747 BEFORE DSCC EJS
75-0014

TAV-8B 162963 AND UP; ALSO TAV-8B 162747 AFTER DSCC EJS 75-0014

b. Before and after configuration for DSCC EO when no EJS is assigned:

TAV-8B 162747 BEFORE DSCC EO
047626/75A787012

TAV-8B 162963 AND UP; ALSO TAV-8B 162747 AFTER DSCC EO 047626/75A787012

20. TECHNICAL DIRECTIVES.

21. Technical directives are documents which direct the accomplishment and recording of a retrofit

configuration or inspection to delivered aircraft or aircraft components.

22. AIRFRAME CHANGE (AFC) AND AIRBORNE SOFTWARE CHANGE (ASC). Technical directives which change configuration of aircraft structure or equipment installation, i.e. AFC, will list aircraft bureau numbers in effectivity notes and show before and after the AFC. Technical directives which change configuration of operational flight programs (OFP), i.e. ASC, will list the OFP CONFIG/IDENT NUMBER in effectivity notes and show the latest two authorized OFP programs. See AFC and ASC effectivity examples in Effectivity Note Example Table.

23. AIRCRAFT COMPONENT CHANGES. Technical directives which change configuration of aircraft components, i.e. AAC, ACC, AVC, AYC, and PPC will list part numbers in the effectivities. See AVC effectivity examples in Effectivity Note Examples table.

24. RECORD OF APPLICABLE TECHNICAL DIRECTIVES.

25. The technical directives affecting this manual are listed in the Record of Applicable Technical Directives of each affected work package. Because an ASC directs all aircraft be modified within 30 days, ASC's are not listed. When all affected

aircraft are modified, the before configuration is removed from the manual, and the technical directive entry is removed from the Record of Applicable Technical Directives.

26. **COCKPIT REFERENCE.**

27. In this manual, when referring to the AV-8B cockpit or TAV-8B forward cockpit, cockpit will be used. When referring to the TAV-8B rear cockpit, rear cockpit will be used.

28. **TECHNICAL PUBLICATIONS DEFICIENCY REPORT (TPDR).**

29. The TPDR (OPNAV FORM 4790/66) is the form for reporting errors and suspected omissions in

the technical manuals. Reporting procedures are in OPNAVINST 4790.2 SERIES.

30. **DIAGRAMS.**

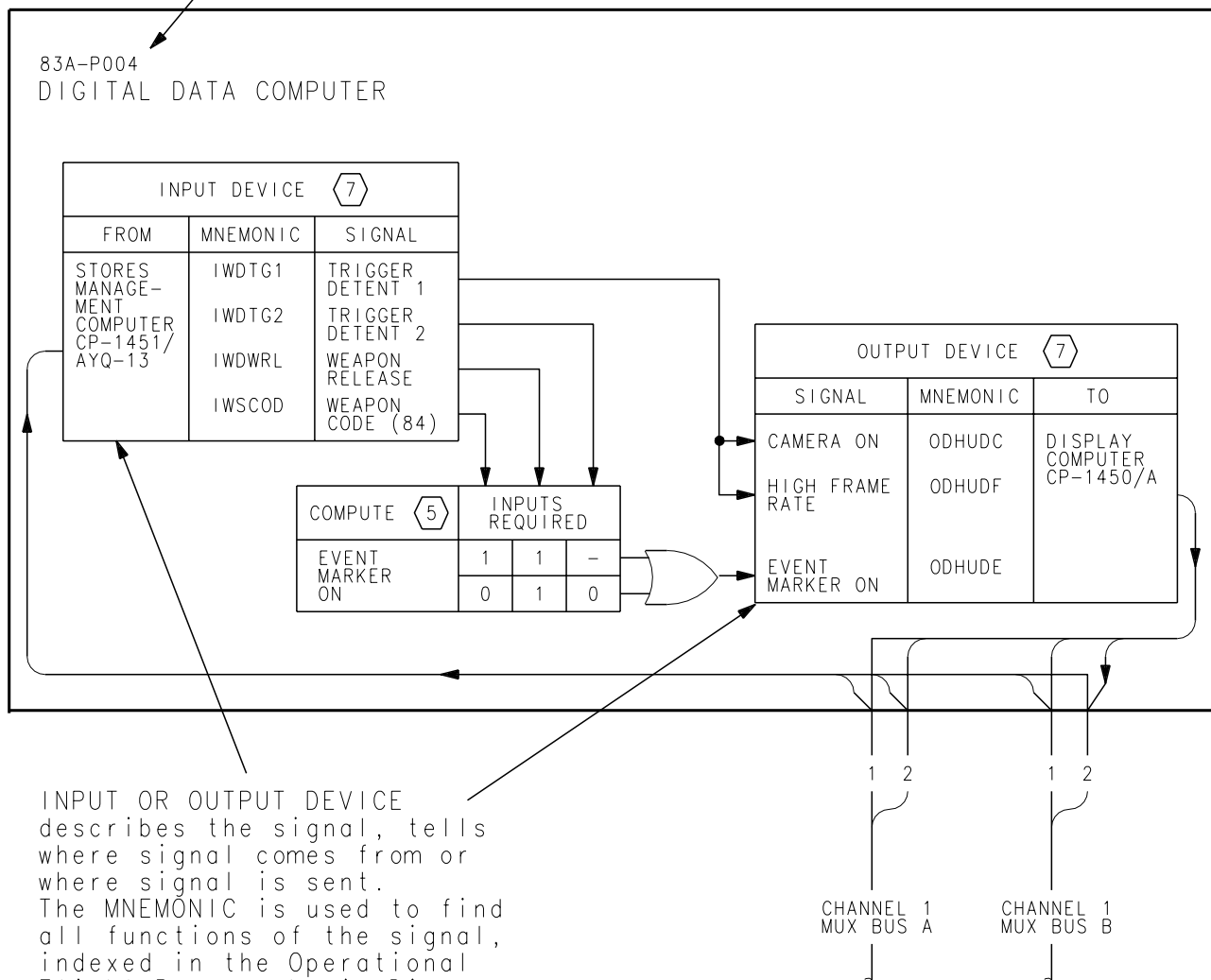
31. Simplified schematics and block diagrams are in this manual. System schematics are in A1-AV8B()-()-500 series manuals.

32. **NAVY (AN) STANDARD/COMMON NAME NOMENCLATURE.**

33. When an item has both Navy (AN) standard and common name nomenclature assigned, the common name nomenclature will be used in text and on illustrations. Full Navy (AN) standard nomenclature will be used in the Illustrated Parts Breakdown (IPB).

83A-P004 is the reference designator for a weapon replacable assembly (WRA). The reference designator may be used to get the part number of the item by cross referencing in the Parts List Index, A1-AV8BB-IPB-450. It may also be used as the entry point into the Wiring Diagram Manual, A1-AV8B()-WDM-000 or Wiring Repair Manual, A1-AV8BB-WRM-000.

TYPICAL SIMPLIFIED SCHEMATIC



INPUT OR OUTPUT DEVICE describes the signal, tells where signal comes from or where signal is sent. The MNEMONIC is used to find all functions of the signal, indexed in the Operational Flight Program Logic Diagrams Index, A1-AV8BB-GAI-700.

Figure 1. Simplified Schematic Highlights (Sheet 1)

TYPICAL SIMPLIFIED SCHEMATIC

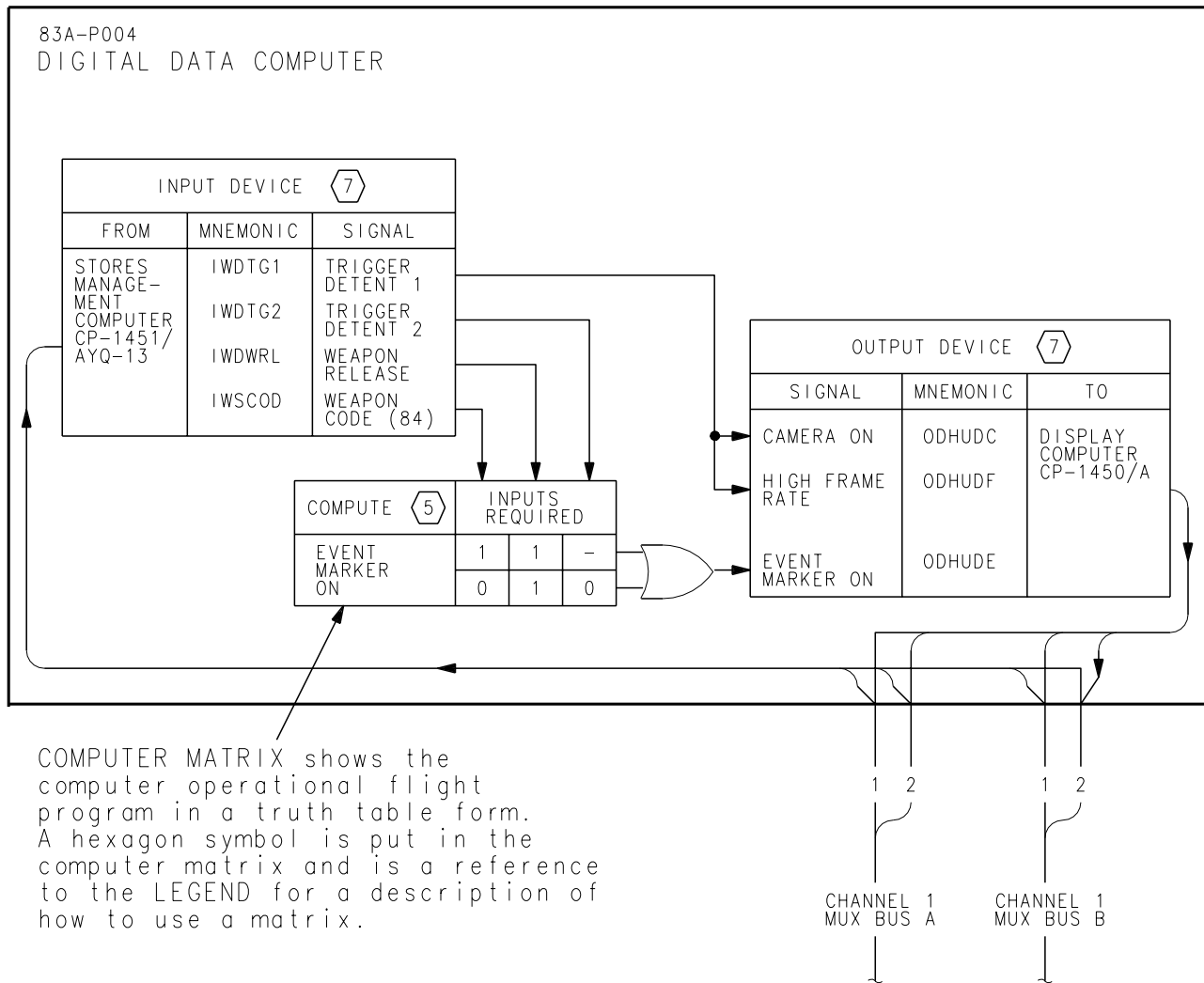
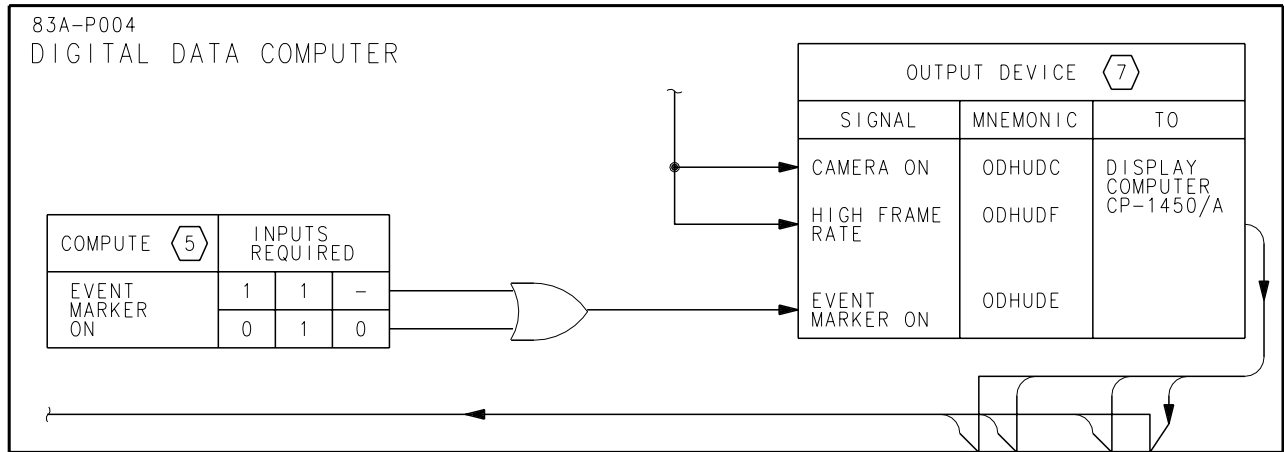


Figure 1. Simplified Schematic Highlights (Sheet 2)

TYPICAL SIMPLIFIED SCHEMATIC



HEXAGON SYMBOL contains a number. This symbol and number are used to reference the notes contained in the legend.

SQUARE SYMBOL contains a number that refers to the sheet of the schematic where the circuitry enters or leaves the highway.

BRANCHES make connections between components on the schematic. Branches enter or leave the highway with the same letter designation.

A HIGHWAY is a single line representing multiple wires with branches entering and leaving the highway. The same number designation is put on each highway or connection when it is continued from page to page.

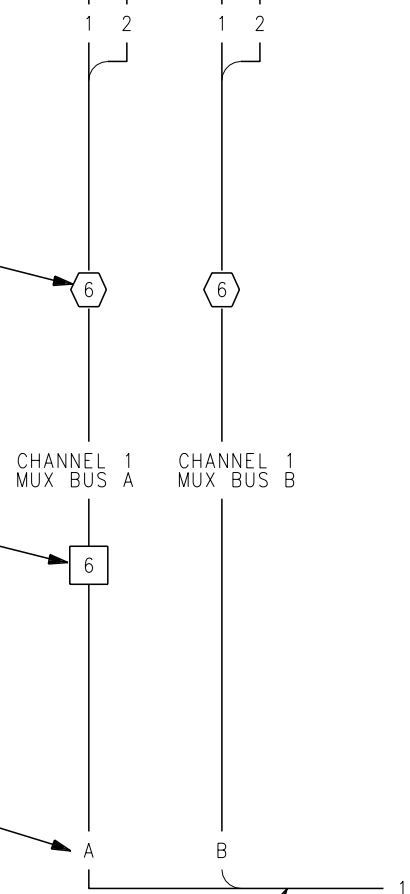


Figure 1. Simplified Schematic Highlights (Sheet 3)

TYPICAL SIMPLIFIED SCHEMATIC

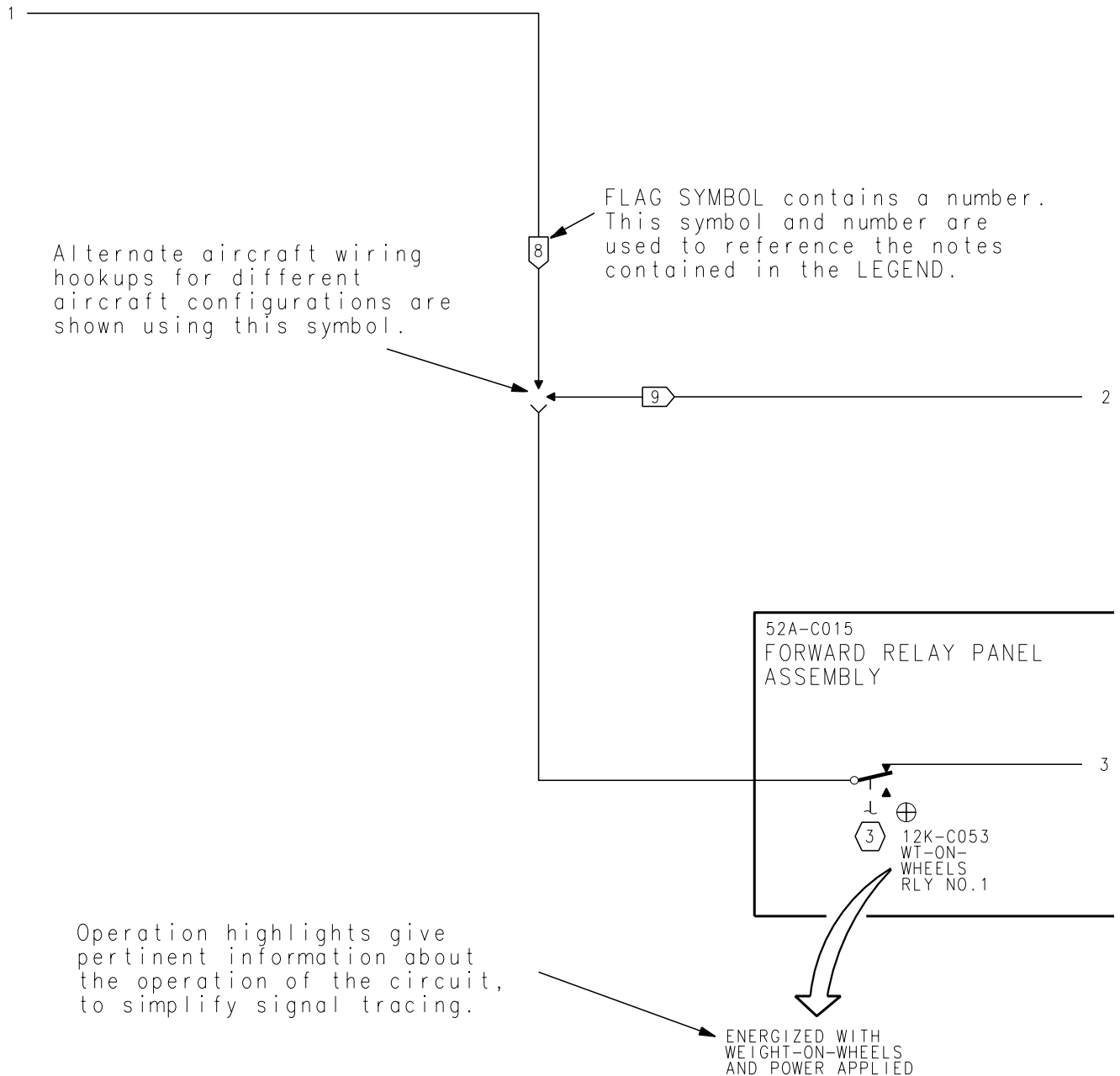
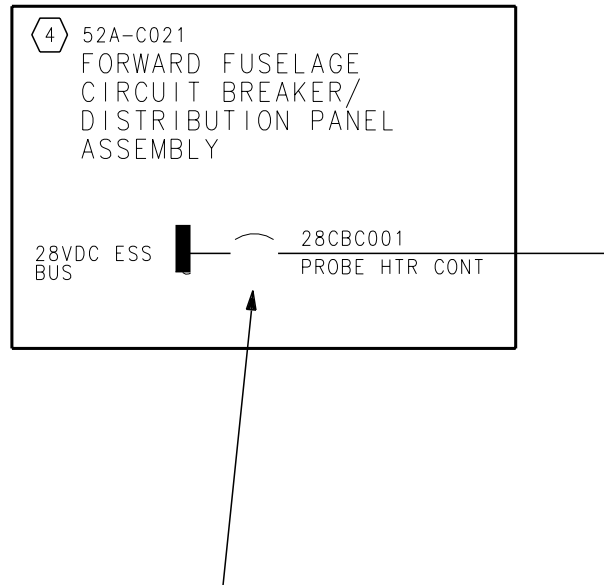


Figure 1. Simplified Schematic Highlights (Sheet 4)

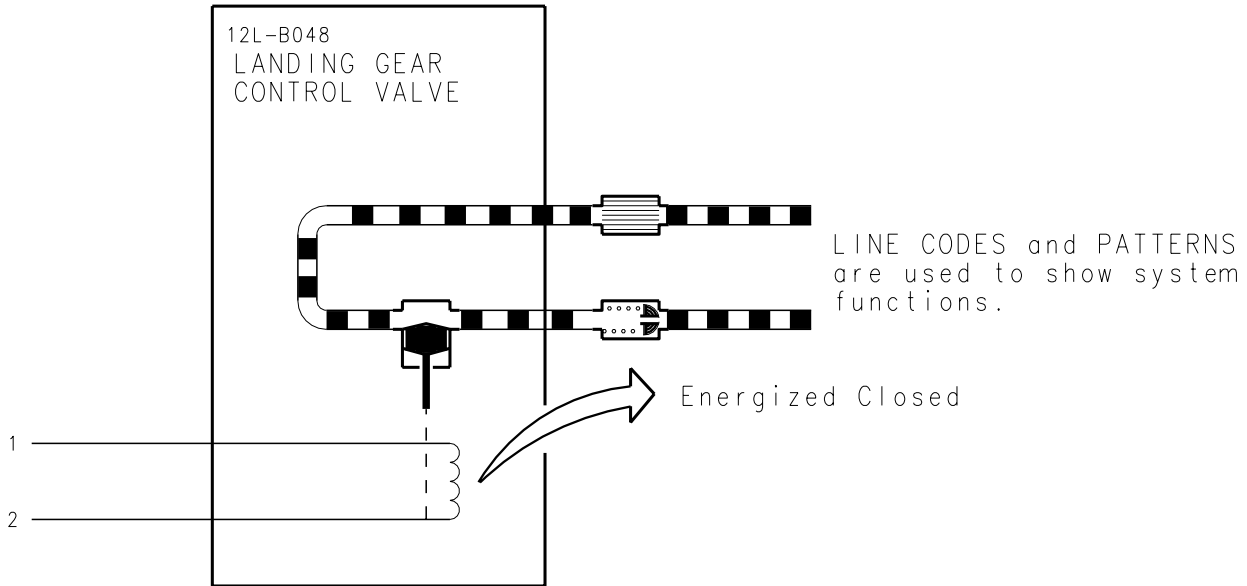
TYPICAL SIMPLIFIED SCHEMATIC



Information pertinent to circuit breaker is shown on schematics as listed below:

- 28VDC ESS BUS is the aircraft bus which supplies voltage to circuit breaker.
- 28CBC001 is the reference designator of circuit breaker and is located next to breaker on rear of panel.
- PROBE HTR CONT is the name of circuit breaker and is located next to breaker on front of panel.

TYPICAL SIMPLIFIED SCHEMATIC



ELECTRICAL and MECHANICAL functions are integrated to simplify use of schematic.

LEGEND

The legend contains all notes pertinent to the schematic as listed below:


-  LINE CODES and PATTERNS as defined in the legend
- 1 NUMBER listed with no symbol is general information about the schematic.
- ⊕ NONSTANDARD SYMBOLS and ABBREVIATIONS appearing on schematic are shown with definition.
- ⬡ HEXAGON SYMBOLS refer to another schematic or manual for continuation of a circuit or a description of data contained on schematic.
- ◁ FLAG SYMBOL indicates limited aircraft application, as defined in the legend.

Figure 1. Simplified Schematic Highlights (Sheet 6)

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

ENVIRONMENTAL CONTROL SYSTEM ORIENTATION

ENVIRONMENTAL CONTROL SYSTEM

Reference Material

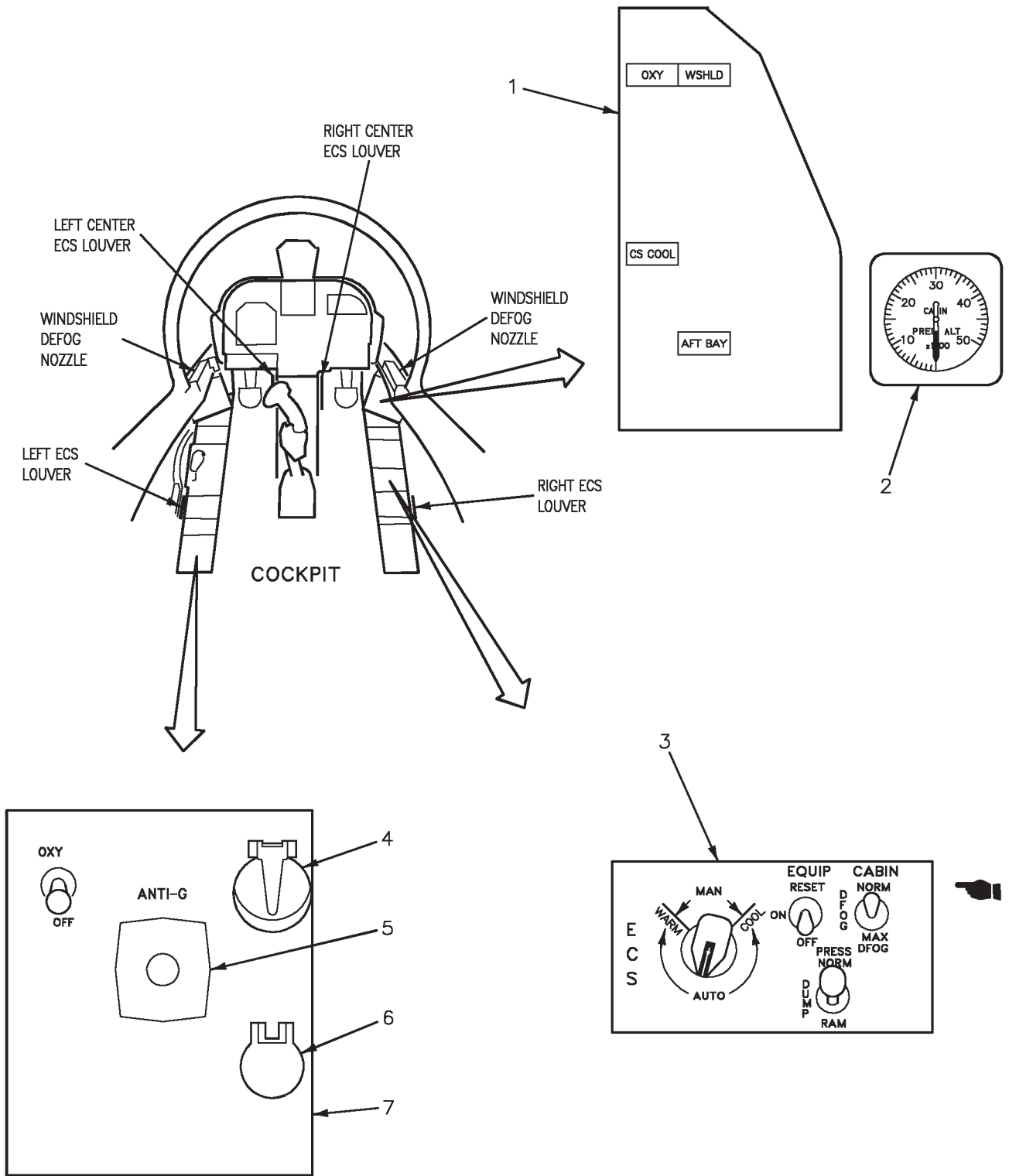
None

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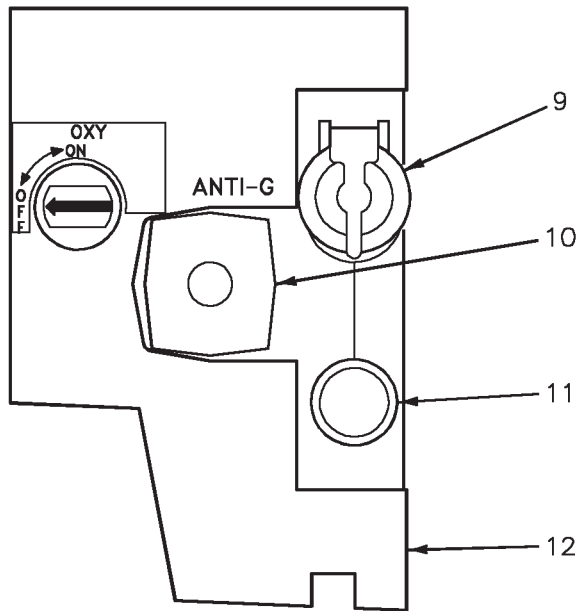
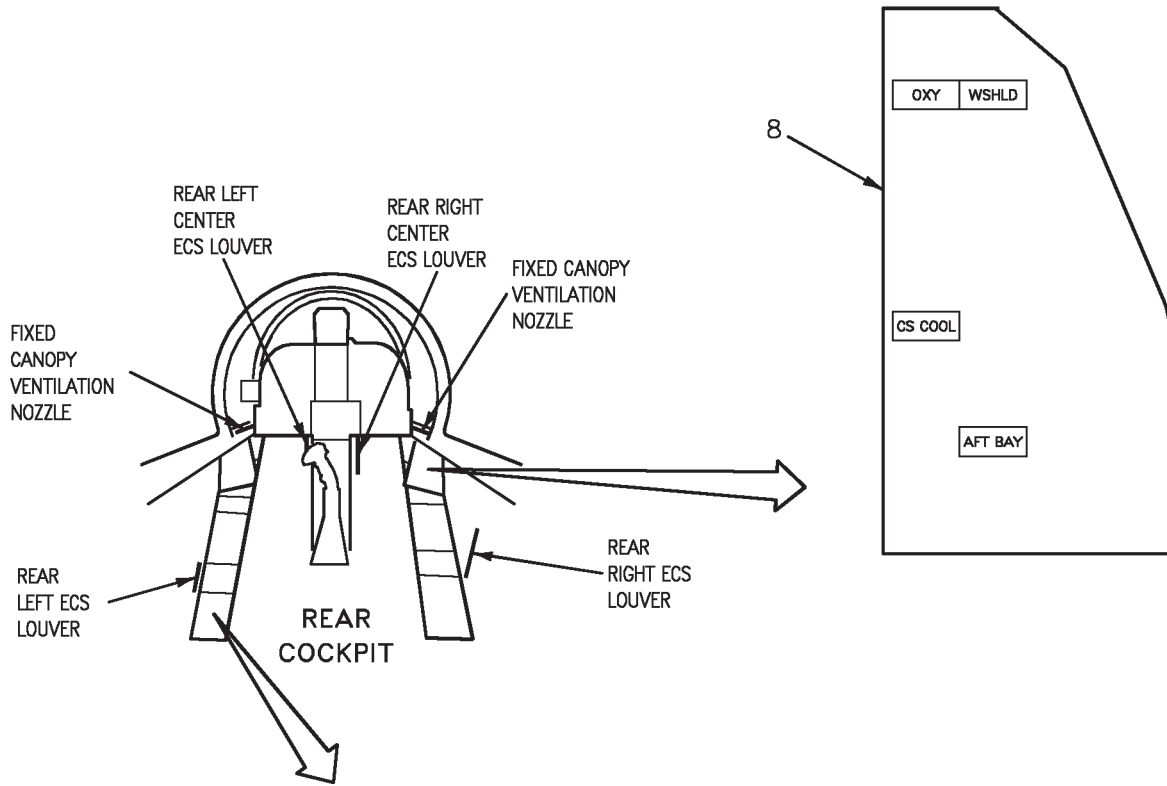
Record of Applicable Technical Directives

None



COCKPIT CONTROLS AND INDICATORS

Figure 1. Environmental Control System Orientation (Sheet 1)



REAR COCKPIT CONTROLS AND INDICATORS

Figure 1. Environmental Control System Orientation (Sheet 2)

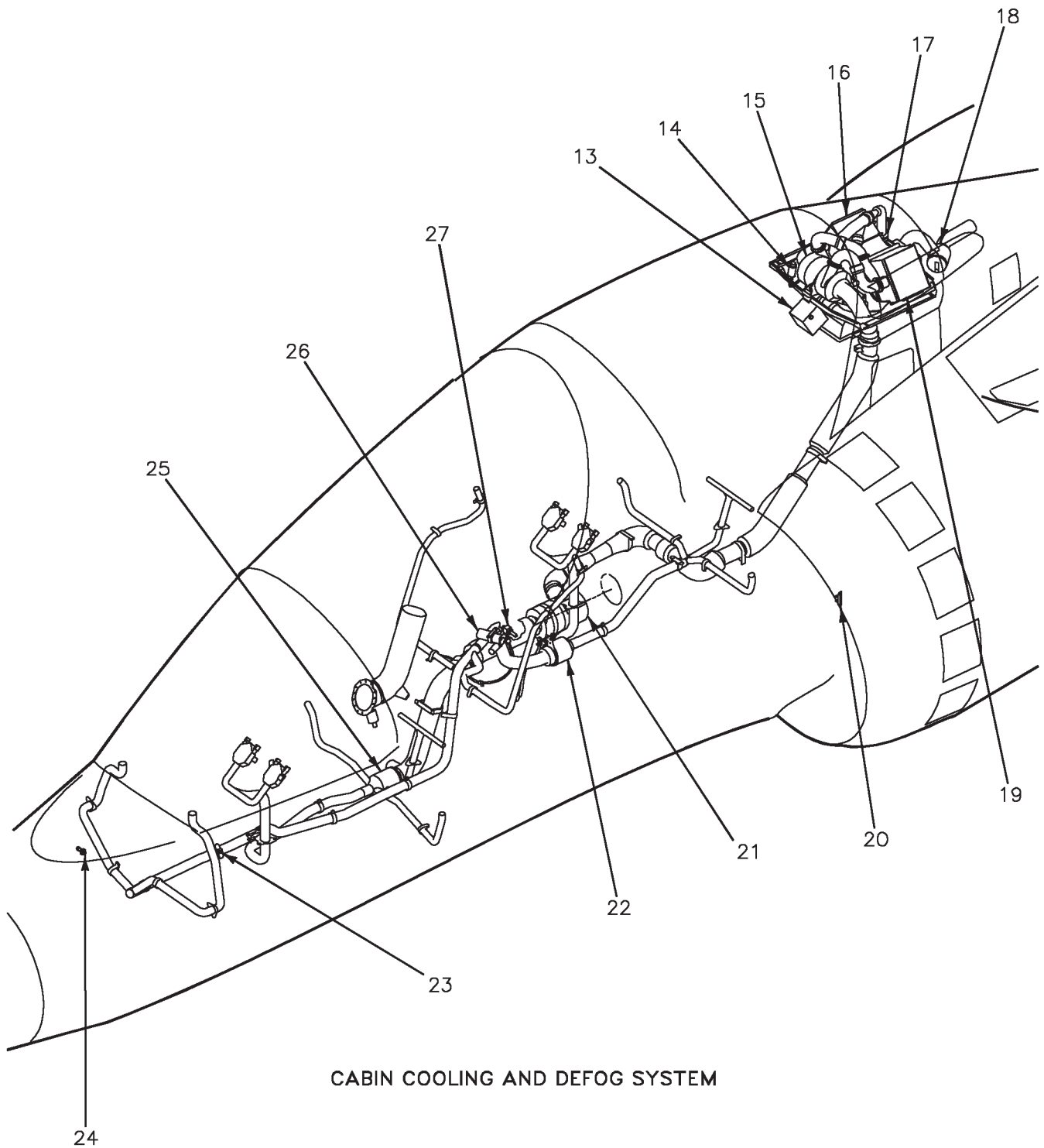
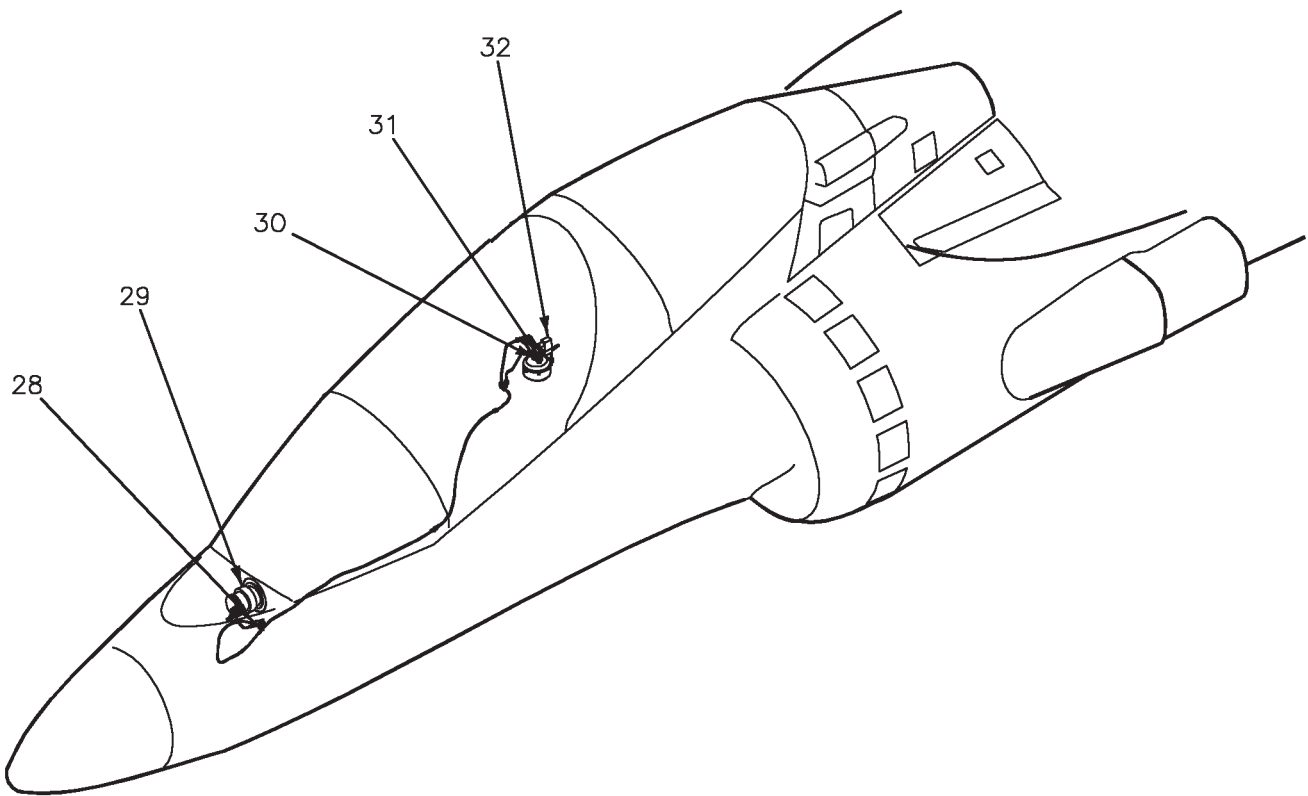
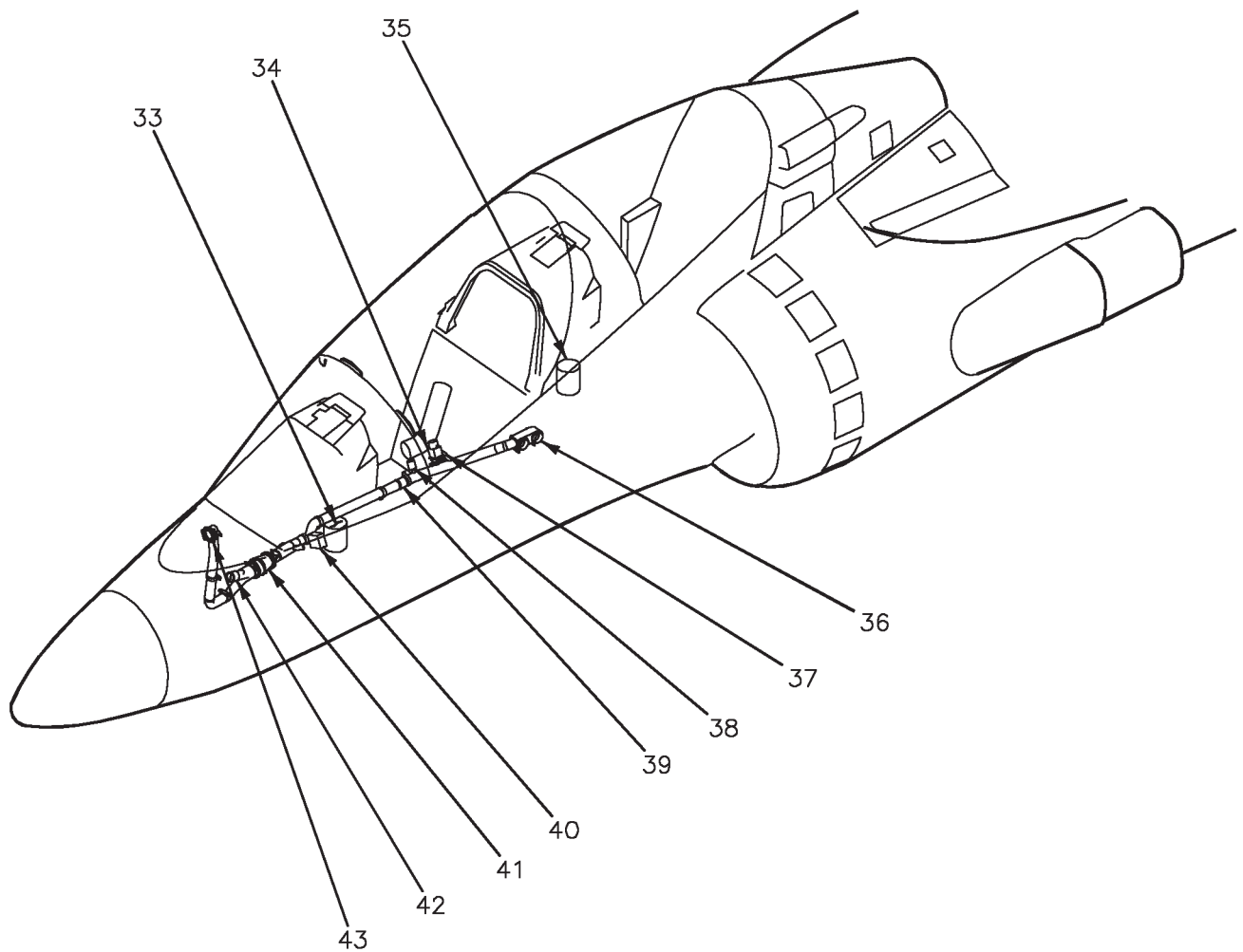


Figure 1. Environmental Control System Orientation (Sheet 3)



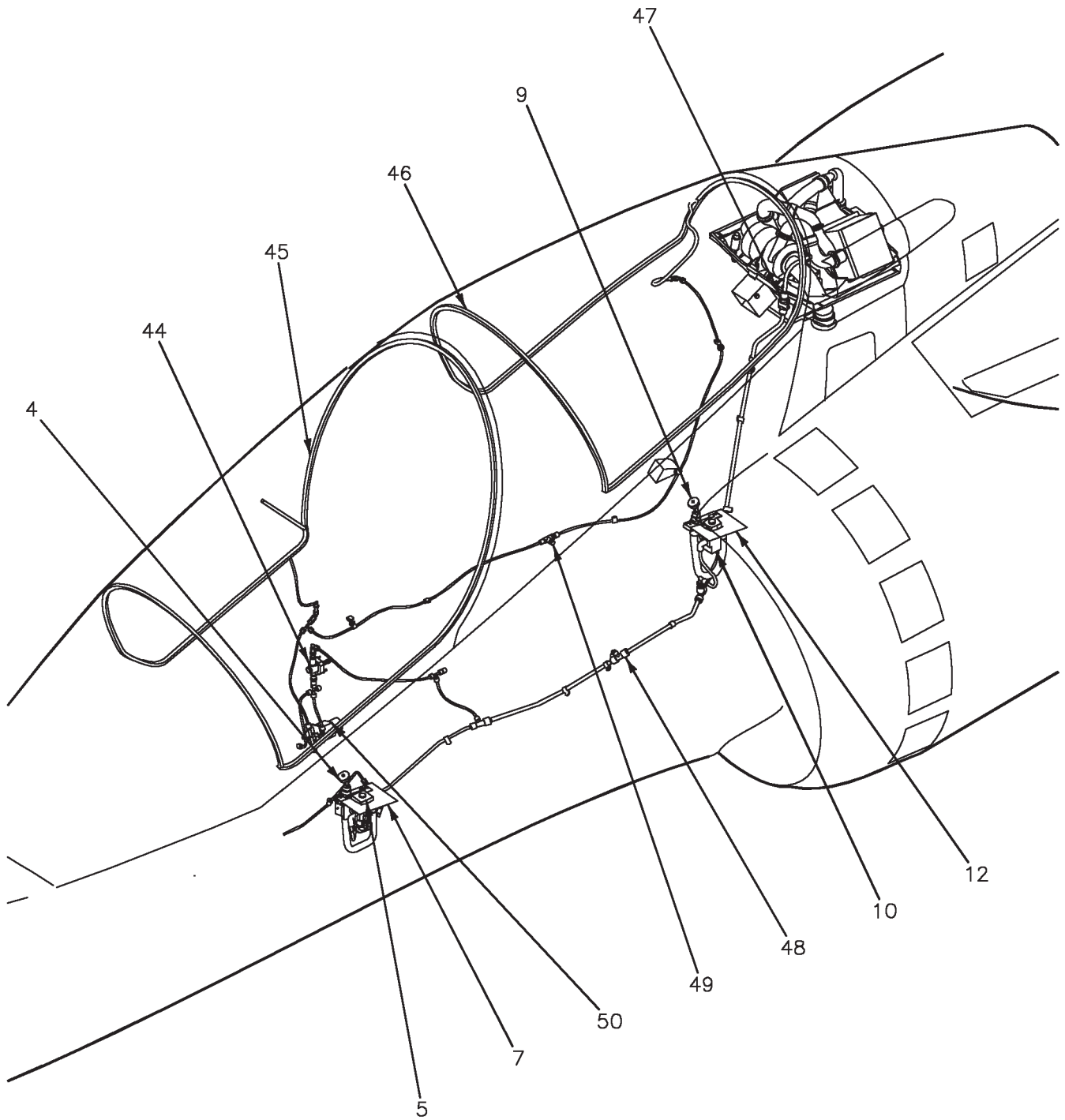
CABIN PRESSURIZATION SYSTEM

Figure 1. Environmental Control System Orientation (Sheet 4)



FORWARD AVIONICS COOLING SYSTEM

Figure 1. Environmental Control System Orientation (Sheet 5)



ANTI-G/CANOPY SEAL SYSTEMS

Figure 1. Environmental Control System Orientation (Sheet 6)

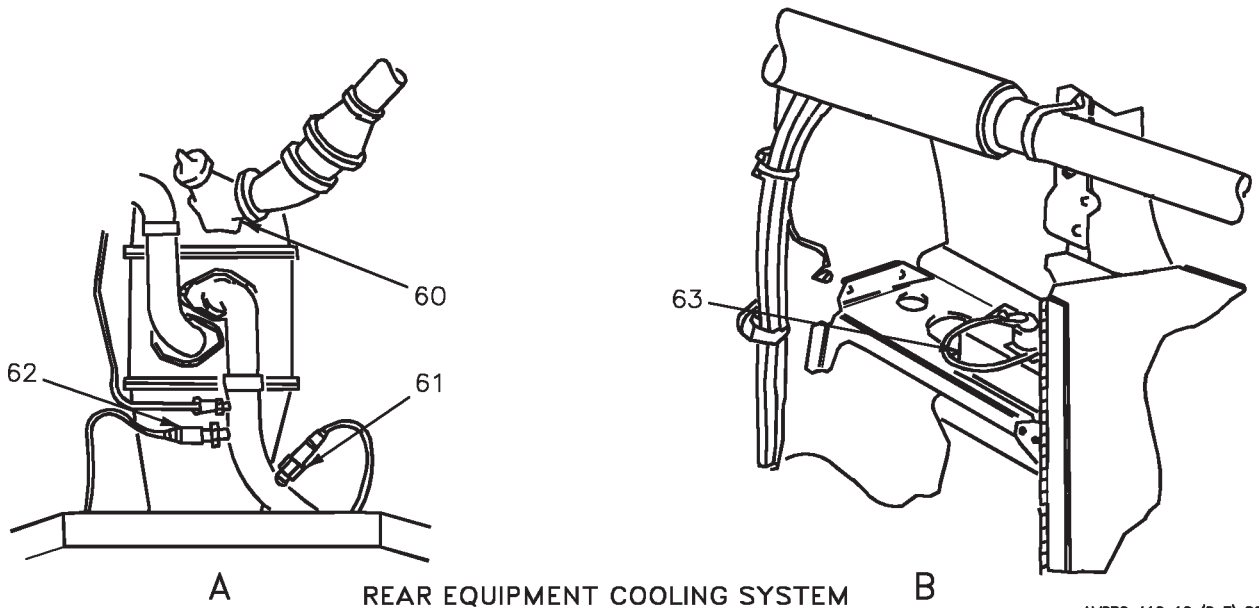
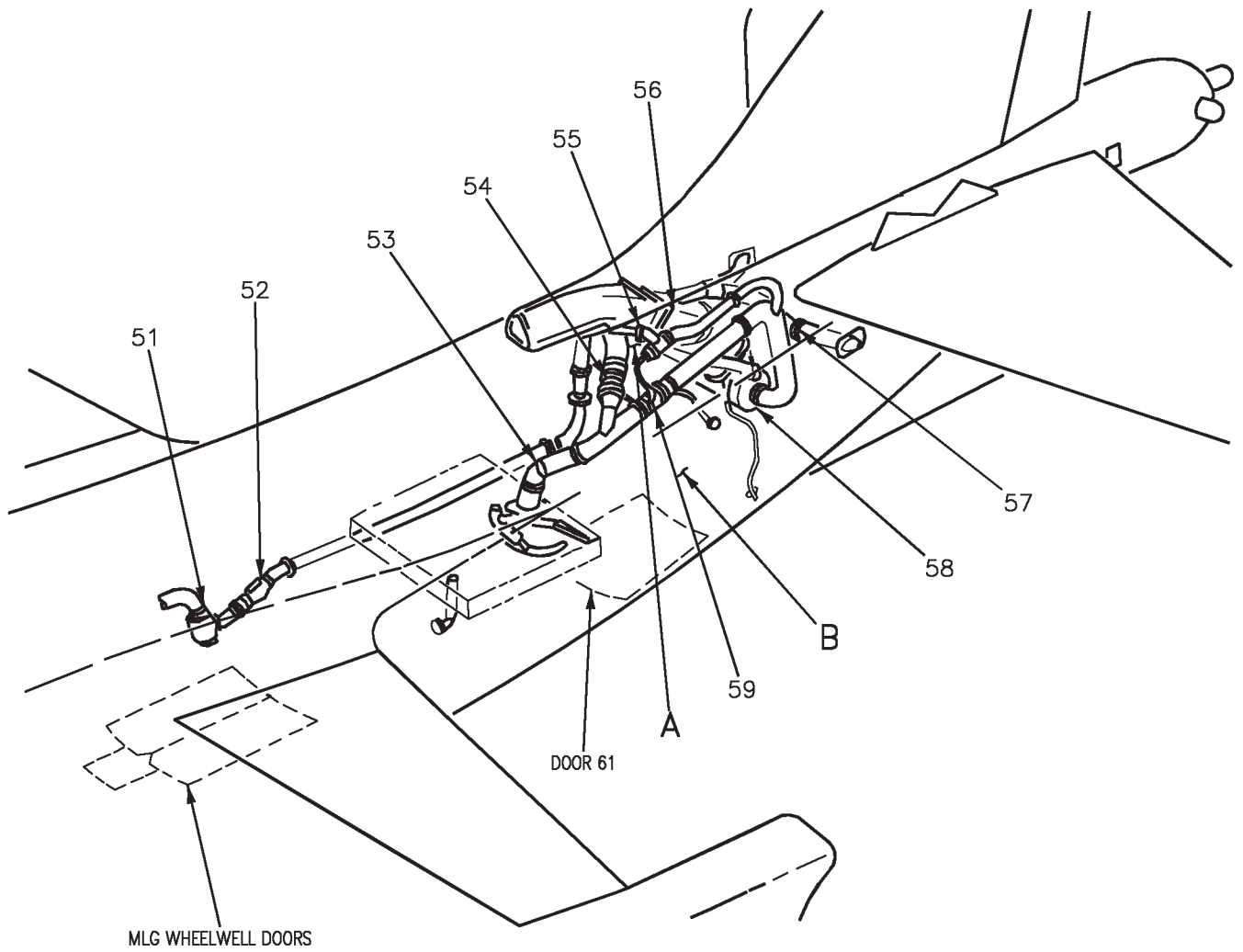
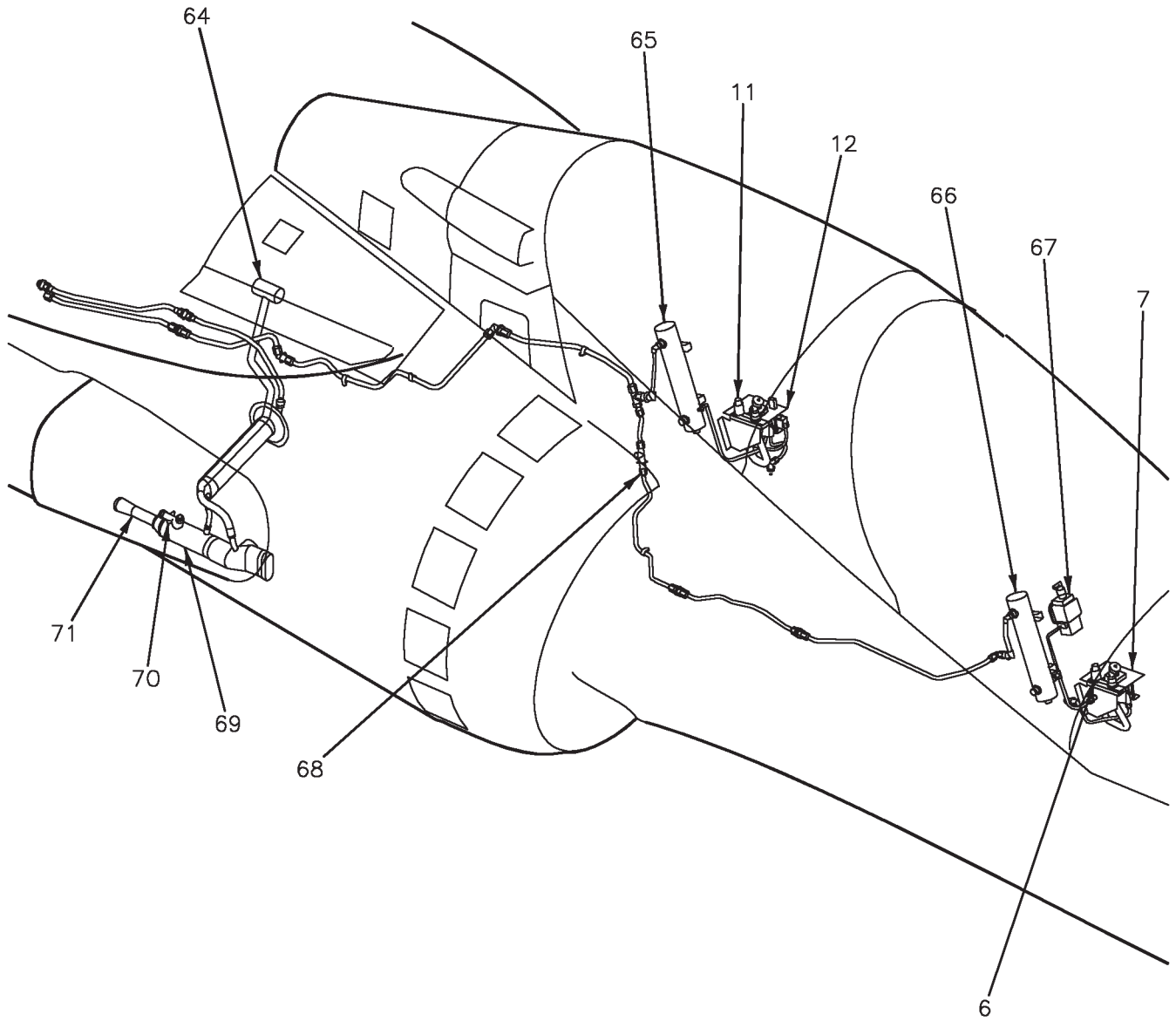
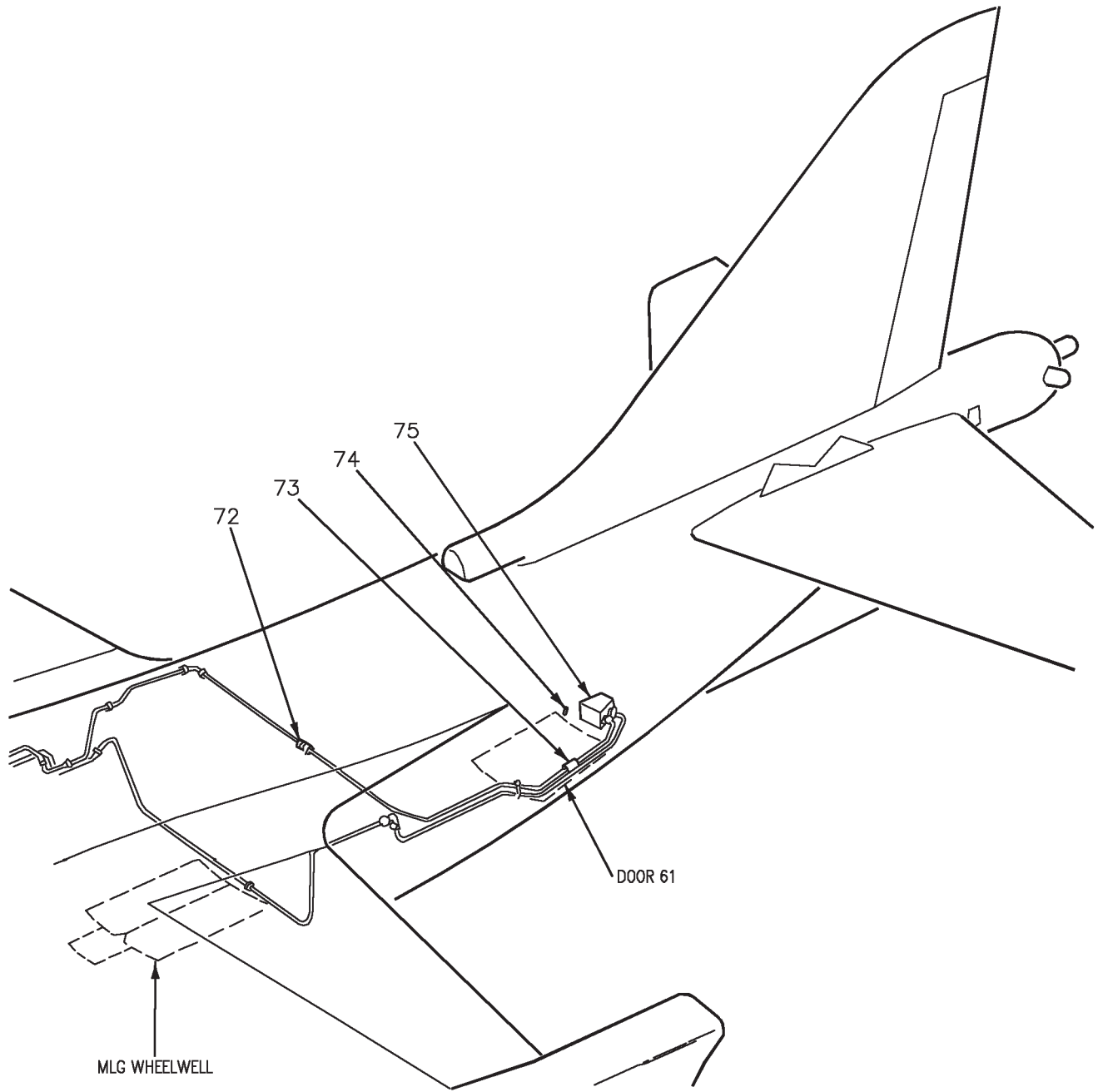


Figure 1. Environmental Control System Orientation (Sheet 7)



ON-BOARD OXYGEN GENERATING SYSTEM (OBOGS)

Figure 1. Environmental Control System Orientation (Sheet 8)



ON-BOARD OXYGEN GENERATING SYSTEM (OBOGS)

Figure 1. Environmental Control System Orientation (Sheet 9)

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4	ANTI-G DISCONNECT
5	ANTI-G VALVE
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8	REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY AFT BAY CAUTION LIGHT CS COOL CAUTION LIGHT OXY CAUTION LIGHT WSHLD CAUTION LIGHT
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31	SAFETY RELIEF VALVE
32	CABIN DUMP CONTROL VALVE
33	COCKPIT AVIONICS COOLING FAN
34	GROUND COOLING CONTROL VALVE
35	REAR COCKPIT AVIONICS COOLING FAN
1 36	INERTIAL NAVIGATION UNIT CN-1561/ASN-130A COOLING PLENUM ASSEMBLY
2 36	INERTIAL NAVIGATION UNIT CN-1649/ASN-139 COOLING PLENUM ASSEMBLY
37	INS PLENUM CHECK VALVE
38	COCKPIT DIFFERENTIAL PRESSURE SWITCH
39	INS CHECK VALVE
40	SPEED SENSOR
41	GROUND COOLING FAN
42	RAM AIR VENT CHECK VALVE

Figure 1. Environmental Control System Orientation (Sheet 11)

INDEX NO	NOMENCLATURE
43	GROUND COOLING VALVE
44	CANOPY SEAL PRESSURE REGULATOR AND CHECK VALVE
45	FORWARD CANOPY PRESSURE SEAL
46	AFT CANOPY PRESSURE SEAL
47	ANTI-G/CANOPY SEAL CHECK VALVE
48	CANOPY SEAL WATER DRAIN VALVE
49	ANTI-G/CANOPY SEAL TEST PORT
50	CANOPY SEAL CONTROL VALVE
51	REAR ECS AIR FILTER ASSEMBLY
52	REAR ECS PRESSURE REDUCING AND SHUTOFF VALVE
53	REAR ECS AIR INLET TEMPERATURE SWITCH
54	REAR ECS GROUND COOLING FAN
55	REAR ECS TEMPERATURE CONTROL VALVE
56	REAR ECS HEAT EXCHANGER
57	REAR ECS CHECK VALVE
58	REAR ECS COLD AIR UNIT
59	REAR ECS TEMPERATURE SENSOR
60	REAR ECS GROUND COOLING VALVE
61	REAR ECS COLD AIR UNIT PRESSURE SWITCH
62	REAR ECS GROUND COOLING FAN PRESSURE SWITCH
63	REAR ECS GROUND COOLING FAN SPEED SENSOR
64	OBOGS BLEED AIR SHUTOFF VALVE
65	REAR OXYGEN PLENUM
66	OXYGEN PLENUM
67	OXYGEN MONITOR ASSEMBLY CRU-91/A

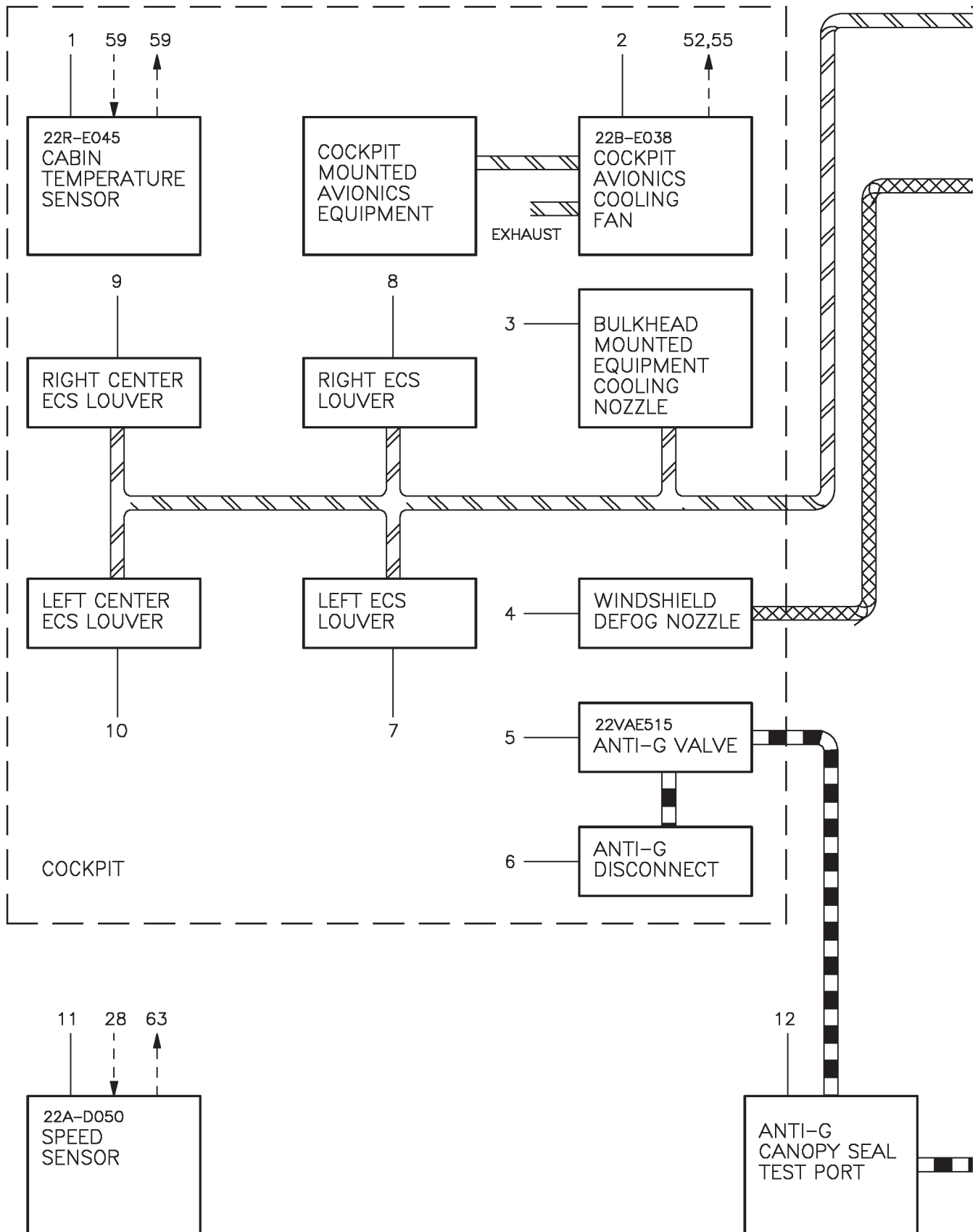
Figure 1. Environmental Control System Orientation (Sheet 12)

INDEX NO	NOMENCLATURE
68	OBOGS PRESSURE RELIEF VALVE
69	OBOGS HEAT EXCHANGER
70	OBOGS HEAT EXCHANGER EJECTOR FILTER
71	MIXER/DIFFUSER DUCT
72	OBOGS TEST PORT
73	OBOGS OVERTEMPERATURE SWITCH
74	OBOGS O TEMP INDICATOR
75	OXYGEN CONCENTRATOR GGU-7/A

LEGEND

1 TAV-8B 162747 THRU 164137.

2 TAV-8B 164138 AND UP.



AV8BC-410-10-(16-1)-CAT1

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 1)

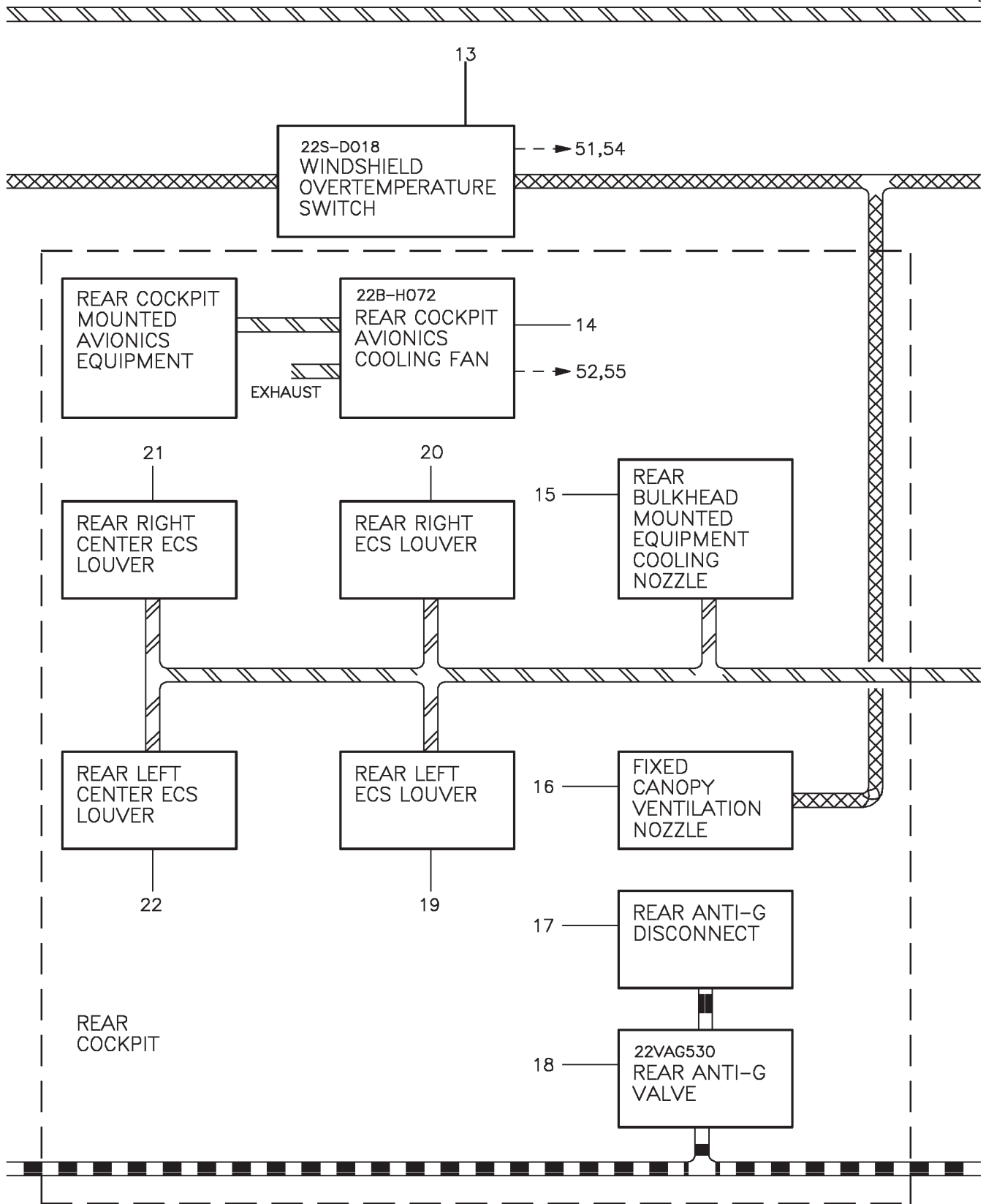


Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 2)

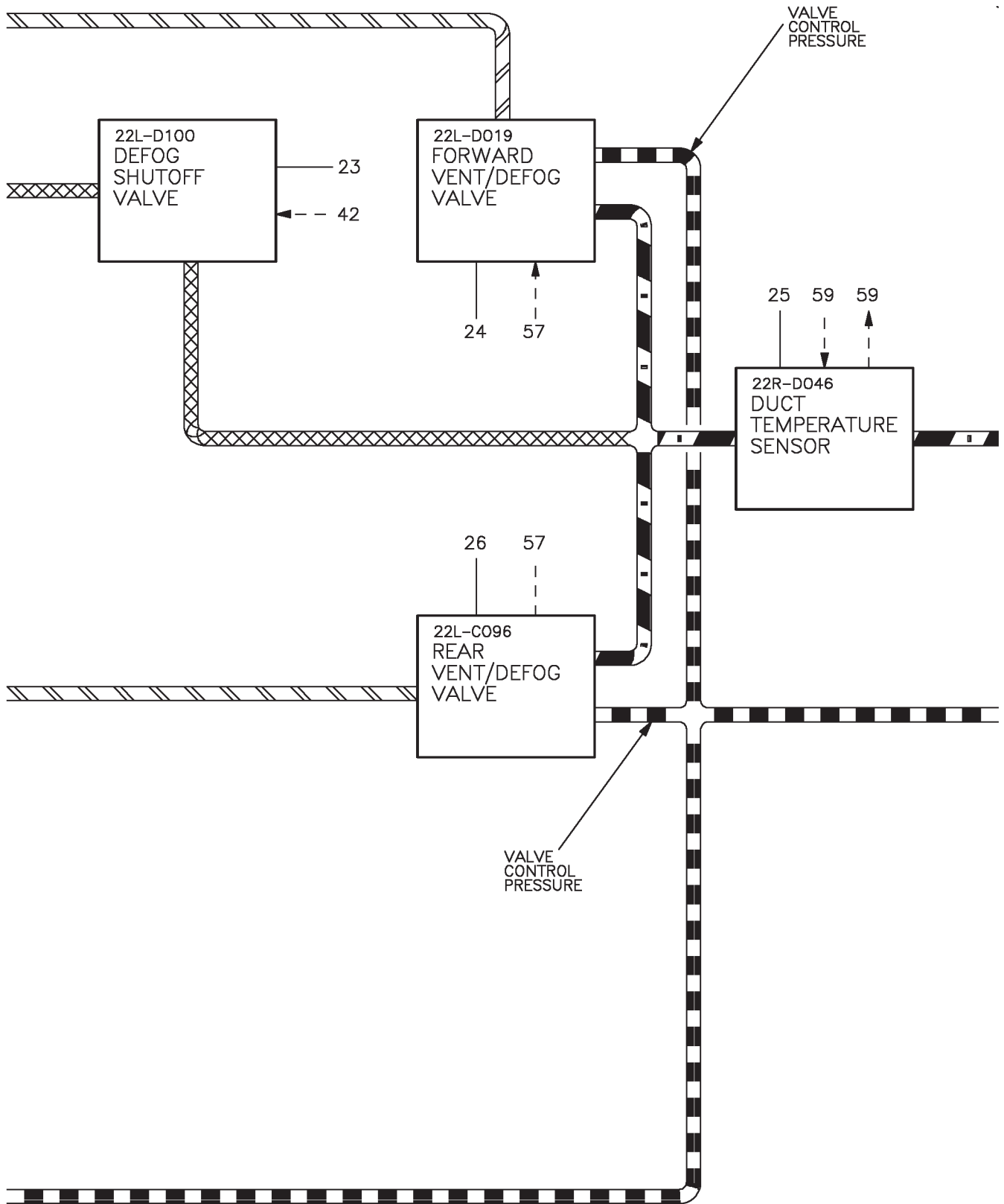
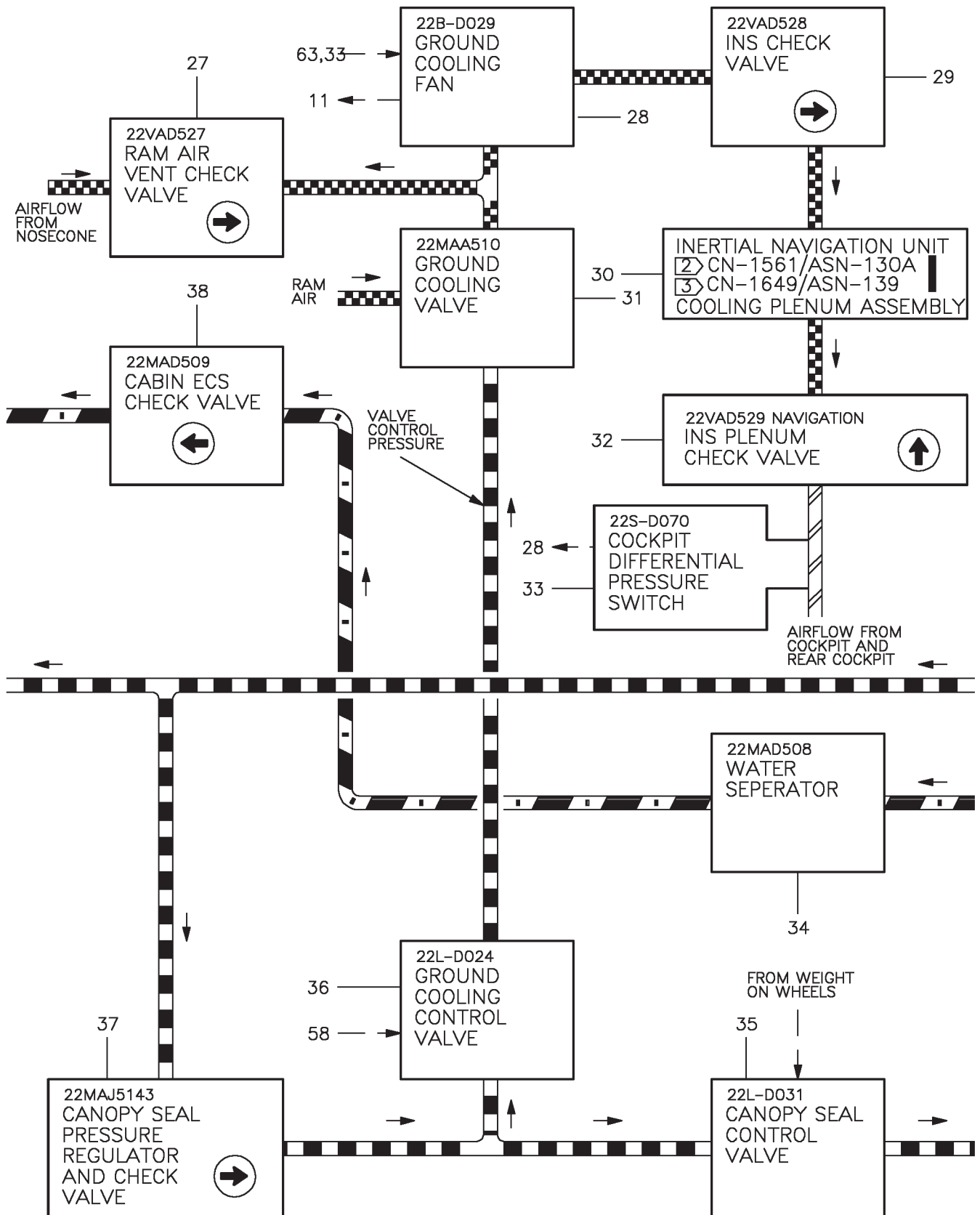
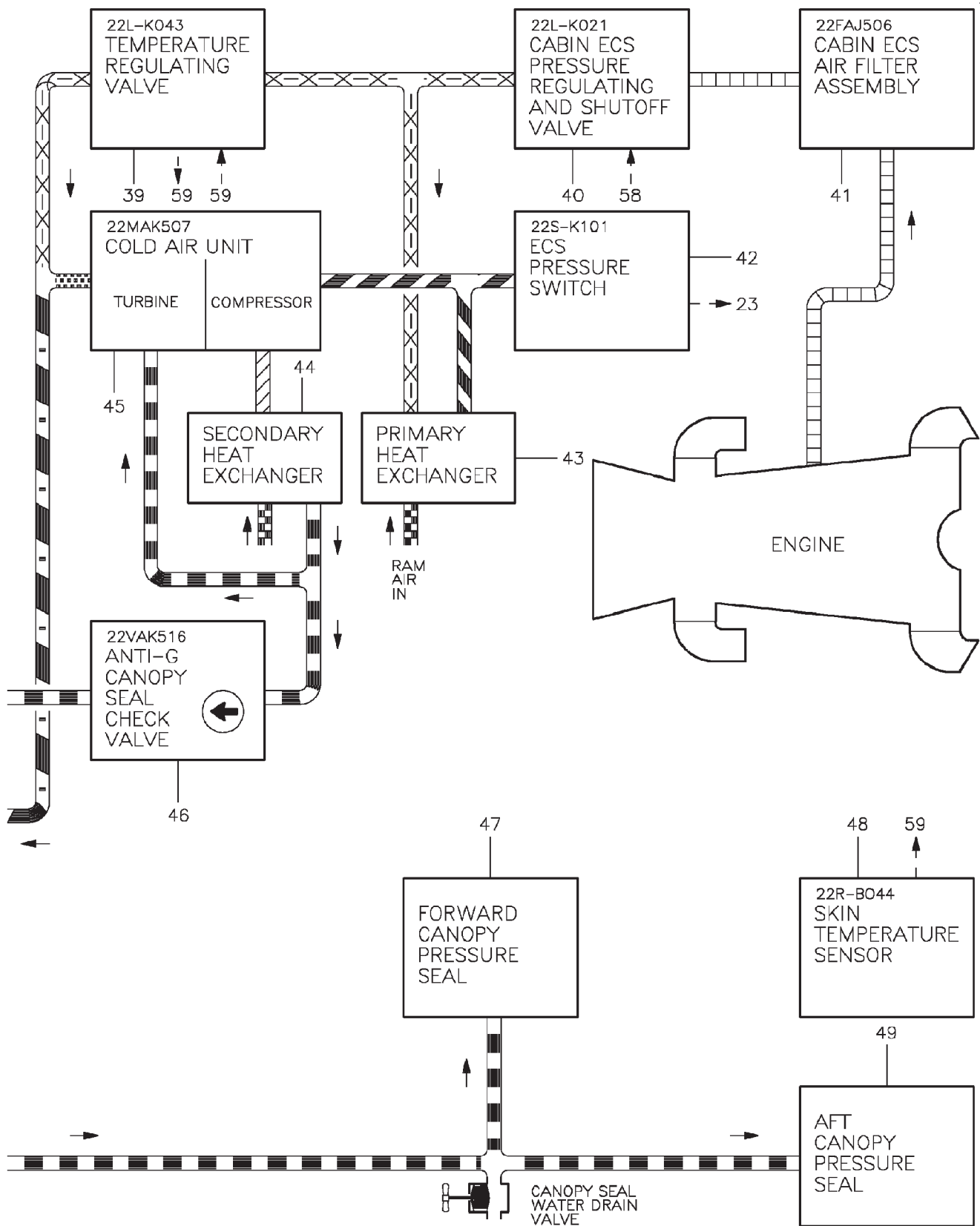


Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 3)



AVBBC-410-10-(16-4)06-CAT1

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 4)



AV8BC-410-10-(16-5)-CAT1

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 5)

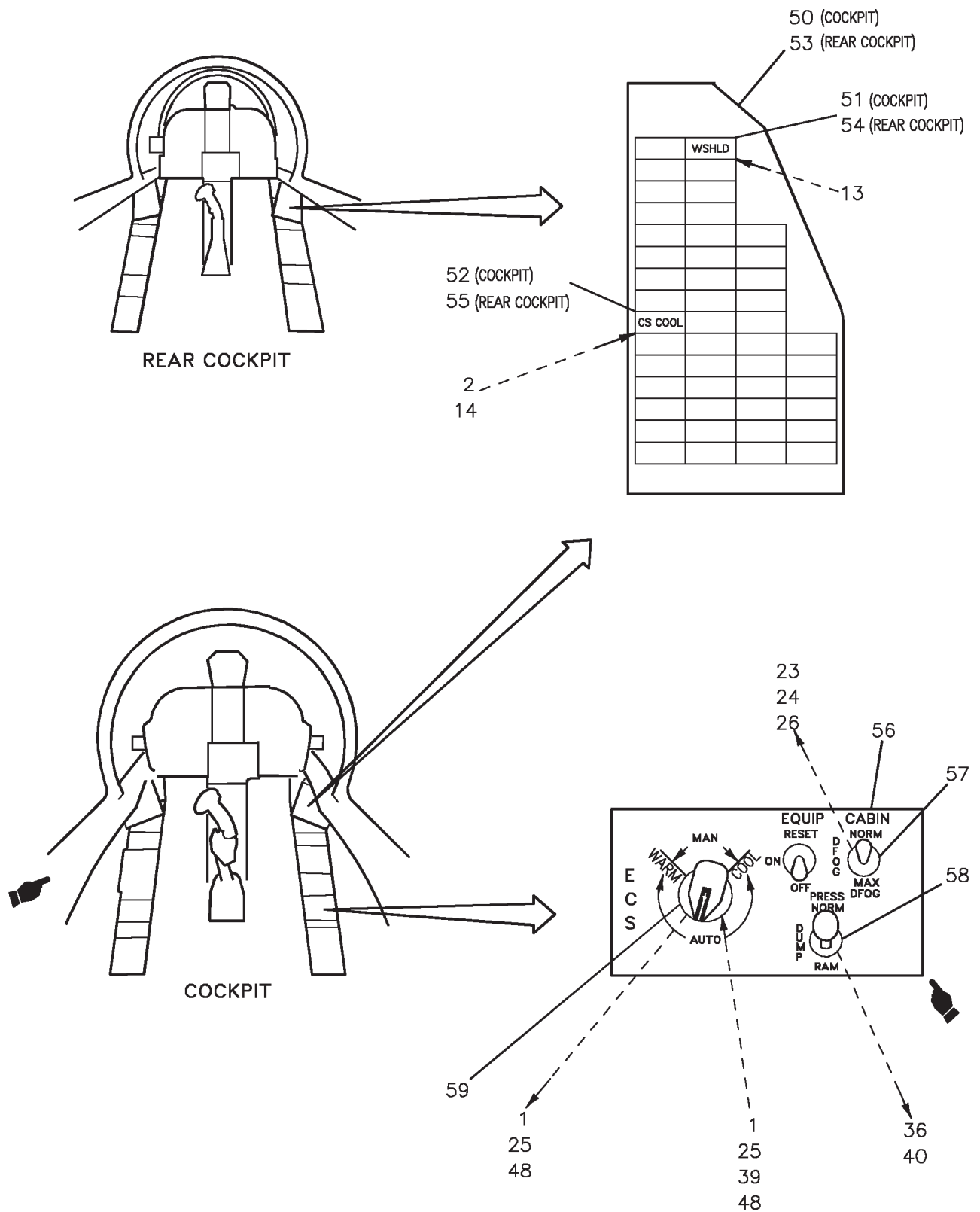
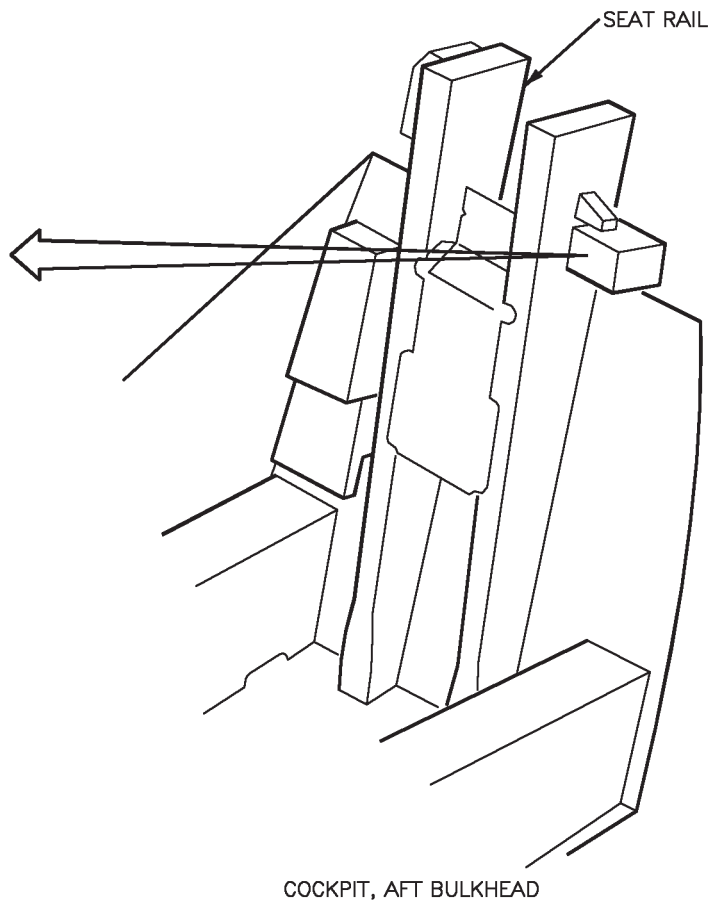
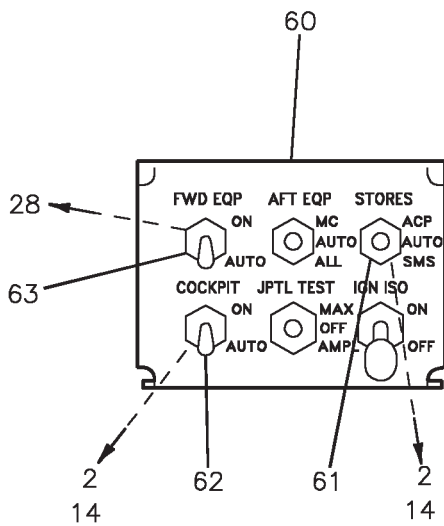


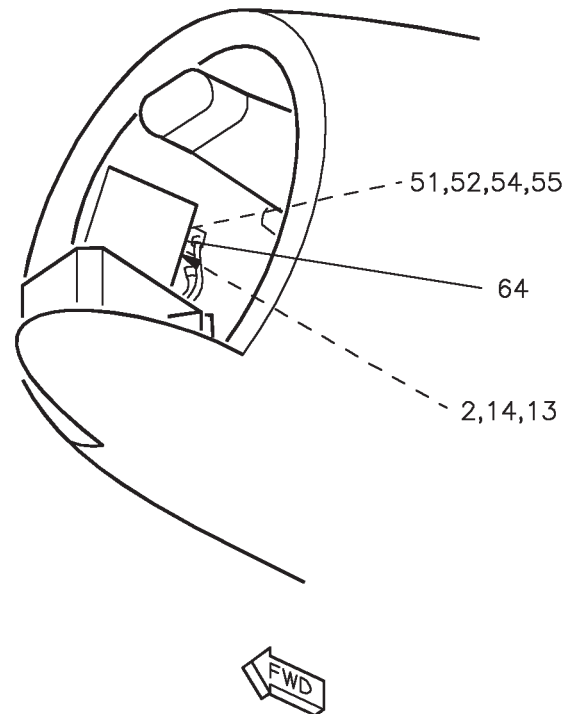
Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 6)



LEGEND

1. NONSTANDARD SYMBOLS

	COOLED BLEED AIR
	SUPPLY AIR
	COLD AIR
	CABIN AIR
	DEFOG AIR
	RAM AIR
	BLEED AIR
	WARM AIR
	REGULATED BLEED AIR
	PRECONDITIONED BLEED AIR
	ELECTRICAL SIGNAL TO ITEM NUMBER
	ELECTRICAL SIGNAL FROM ITEM NUMBER
	DIRECTION OF FLOW
	ITEM NUMBER
	CHECK VALVE



2 162747 THRU 164137

3 164138 AND UP

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 7)

ITEM NO	NOMENCLATURE
1	CABIN TEMPERATURE SENSOR
2	COCKPIT AVIONICS COOLING FAN
3	BULKHEAD MOUNTED EQUIPMENT COOLING NOZZLE
4	WINDSHIELD DEFOG NOZZLE
5	ANTI-G VALVE
6	ANTI-G DISCONNECT
7	LEFT ECS LOUVER
8	RIGHT ECS LOUVER
9	RIGHT CENTER ECS LOUVER
10	LEFT CENTER ECS LOUVER
11	SPEED SENSOR
12	ANTI-G/CANOPY SEAL TEST PORT
13	WINDSHIELD OVERTEMPERATURE SWITCH
14	REAR COCKPIT AVIONICS COOLING FAN
15	REAR BULKHEAD MOUNTED EQUIPMENT COOLING NOZZLE
16	FIXED CANOPY VENTILATION NOZZLE
17	REAR ANTI-G DISCONNECT
18	REAR ANTI-G VALVE
19	REAR LEFT ECS LOUVER
20	REAR RIGHT ECS LOUVER
21	REAR RIGHT CENTER ECS LOUVER
22	REAR LEFT CENTER ECS LOUVER 11
23	DEFOG SHUTOFF VALVE
24	FORWARD VENT/DEFOG VALVE
25	DUCT TEMPERATURE SENSOR

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 8)

ITEM NO	NOMENCLATURE
26	REAR VENT/DEFOG VALVE
27	RAM AIR VENT CHECK VALVE
28	GROUND COOLING FAN
29	INS CHECK VALVE
2 30	INERTIAL NAVIGATION UNIT CN-1561/ASN-130A COOLING PLENUM ASSEMBLY
3 30	INERTIAL NAVIGATION UNIT CN-1649/ASN-139 COOLING PLENUM ASSEMBLY
31	GROUND COOLING VALVE
32	INS PLENUM CHECK VALVE
33	COCKPIT DIFFERENTIAL PRESSURE SWITCH
34	WATER SEPARATOR
35	CANOPY SEAL CONTROL VALVE
36	GROUND COOLING CONTROL VALVE
37	CANOPY SEAL PRESSURE REGULATOR AND CHECK VALVE
38	CABIN ECS CHECK VALVE
39	TEMPERATURE REGULATING VALVE
40	CABIN ECS PRESSURE REGULATING AND SHUTOFF VALVE
41	CABIN ECS AIR FILTER ASSEMBLY
42	ECS PRESSURE SWITCH
43	PRIMARY HEAT EXCHANGER
44	SECONDARY HEAT EXCHANGER
45	COLD AIR UNIT
46	ANTI-G/CANOPY SEAL CHECK VALVE
47	FORWARD CANOPY PRESSURE SEAL
48	SKIN TEMPERATURE SENSOR
49	AFT CANOPY PRESSURE SEAL

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 9)

ITEM NO	NOMENCLATURE
50	CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
51	WSHLD CAUTION LIGHT
52	CS COOL CAUTION LIGHT
53	REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
54	WSHLD CAUTION LIGHT
55	CS COOL CAUTION LIGHT
56	ECS CONTROL PANEL ASSEMBLY
57	CABIN SWITCH
58	PRESS SWITCH
59	CABIN TEMPERATURE CONTROL
60	GROUND POWER PANEL ASSEMBLY
61	STORES SWITCH
62	COCKPIT SWITCH
63	FWD EQP SWITCH
64	ANNUNCIATOR LIGHT CONTROLLER

Figure 2. Forward Fuselage Environmental Control System Flow Diagram (Sheet 10)

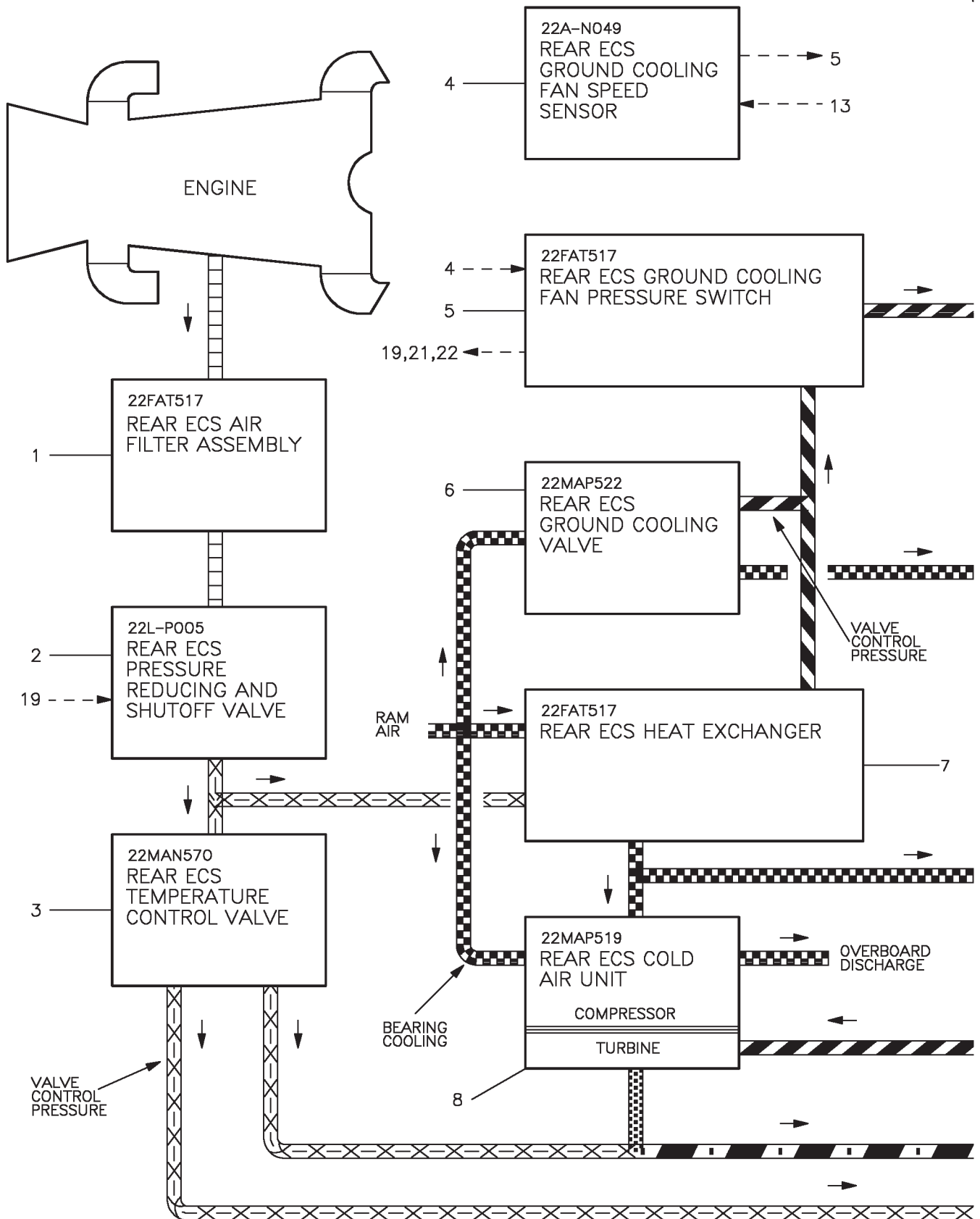


Figure 3. Rear Equipment Cooling System Flow Diagram (Sheet 1)

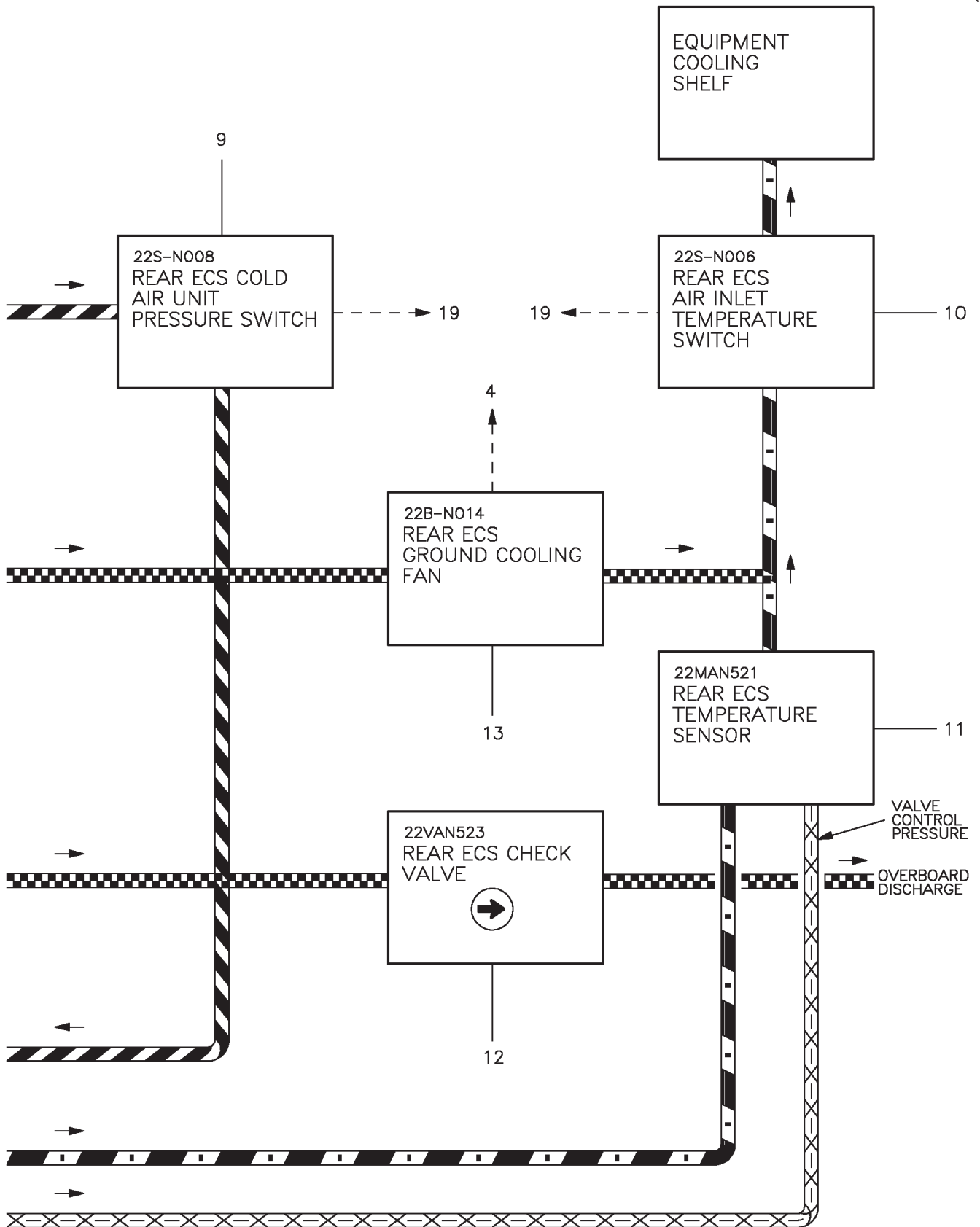


Figure 3. Rear Equipment Cooling System Flow Diagram (Sheet 2)

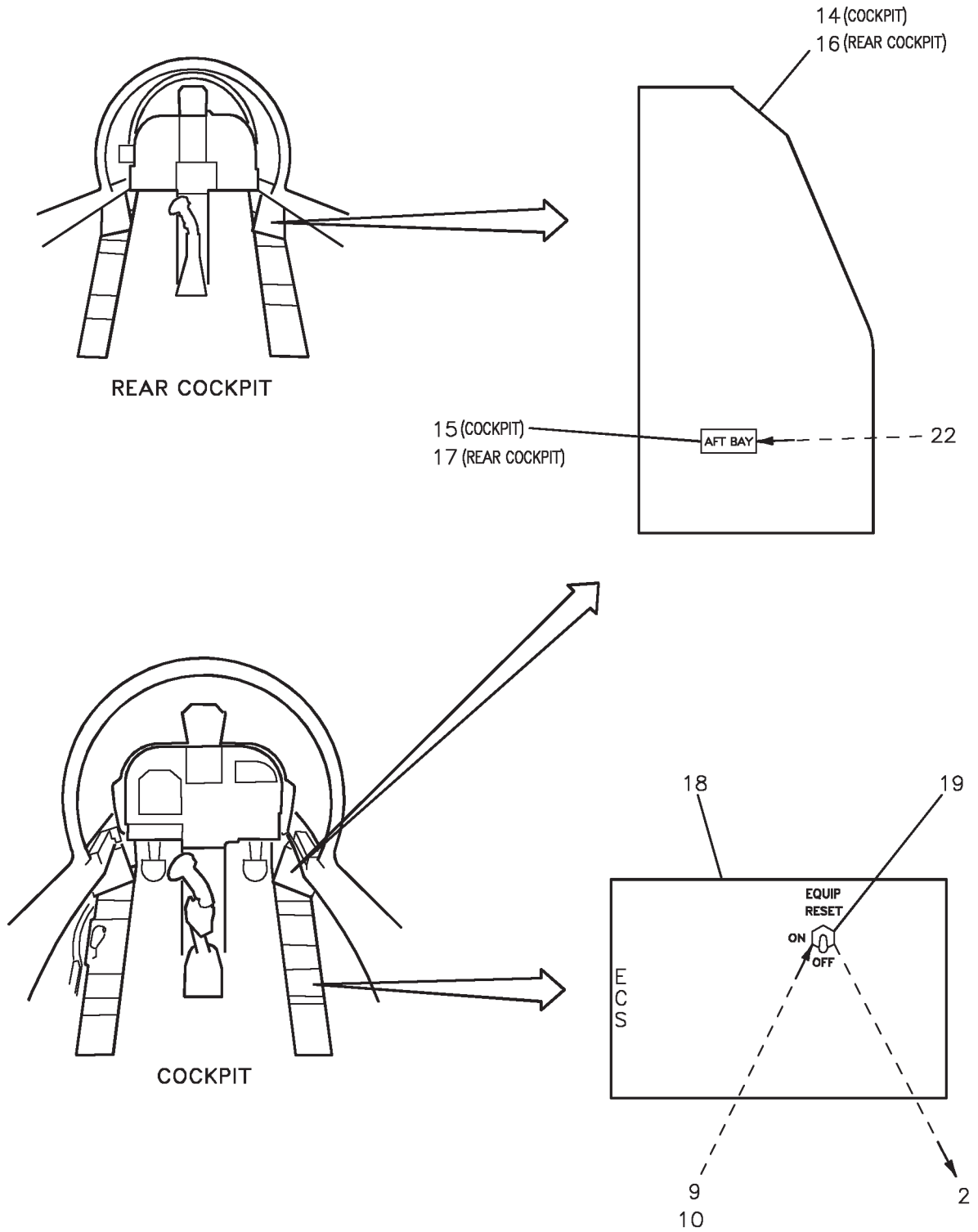


Figure 3. Rear Equipment Cooling System Flow Diagram (Sheet 3)

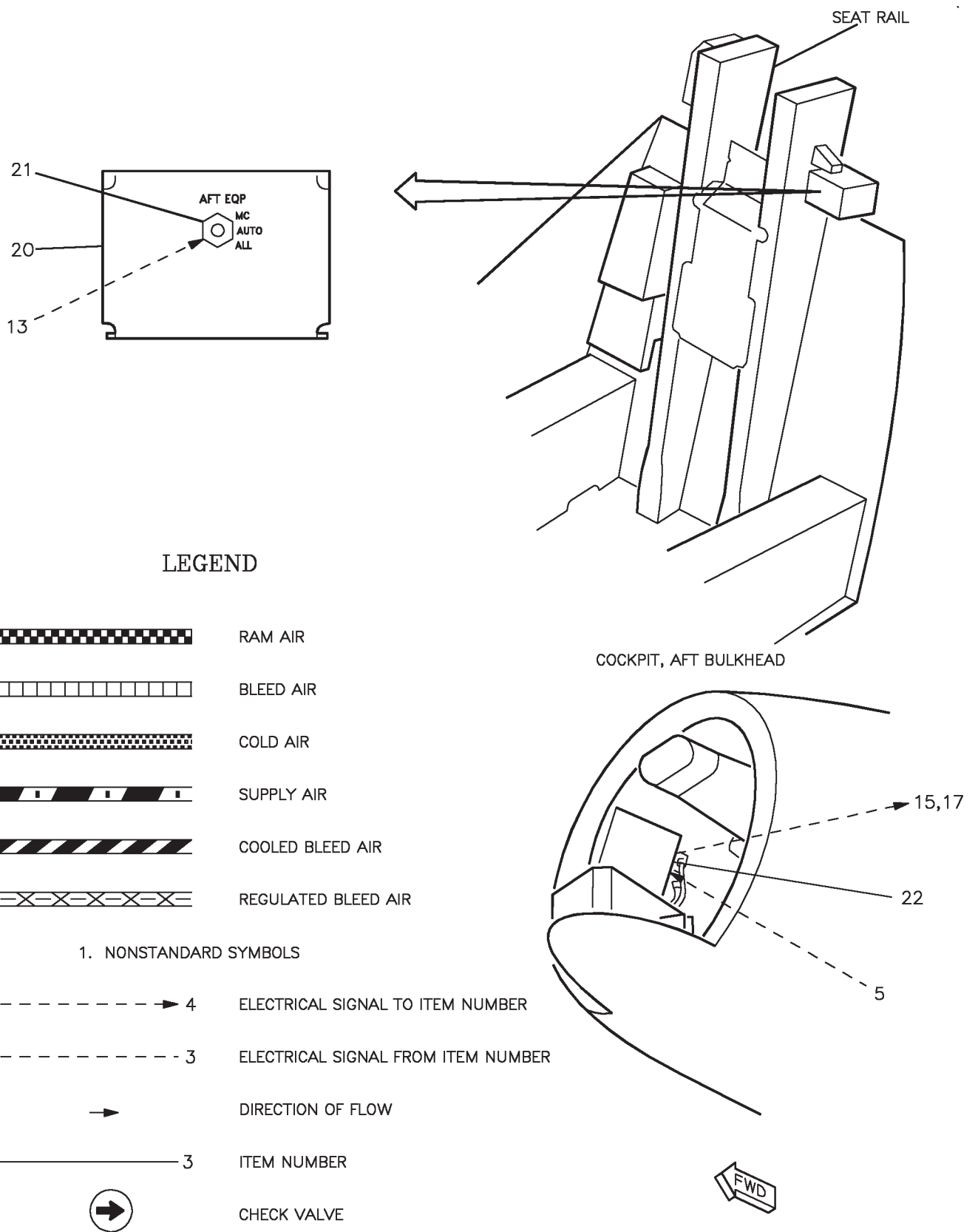


Figure 3. Rear Equipment Cooling System Flow Diagram (Sheet 4)

ITEM NO	NOMENCLATURE
1	REAR ECS AIR FILTER ASSEMBLY
2	REAR ECS PRESSURE REDUCING AND SHUTOFF VALVE
3	REAR ECS TEMPERATURE CONTROL VALVE
4	REAR ECS GROUND COOLING FAN SPEED SENSOR
5	REAR ECS GROUND COOLING FAN PRESSURE SWITCH
6	REAR ECS GROUND COOLING VALVE
7	REAR ECS HEAT EXCHANGER
8	REAR ECS COLD AIR UNIT
9	REAR ECS COLD AIR UNIT PRESSURE SWITCH
10	REAR ECS AIR INLET TEMPERATURE SWITCH
11	REAR ECS TEMPERATURE SENSOR
12	REAR ECS CHECK VALVE
13	REAR ECS GROUND COOLING FAN
14	CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
15	AFT BAY CAUTION LIGHT
16	REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
17	AFT BAY CAUTION LIGHT
18	ECS CONTROL PANEL ASSEMBLY
19	EQUIP SWITCH
20	GROUND POWER PANEL ASSEMBLY
21	AFT EQP SWITCH
22	ANNUNCIATOR LIGHT CONTROLLER

Figure 3. Rear Equipment Cooling System Flow Diagram (Sheet 5)

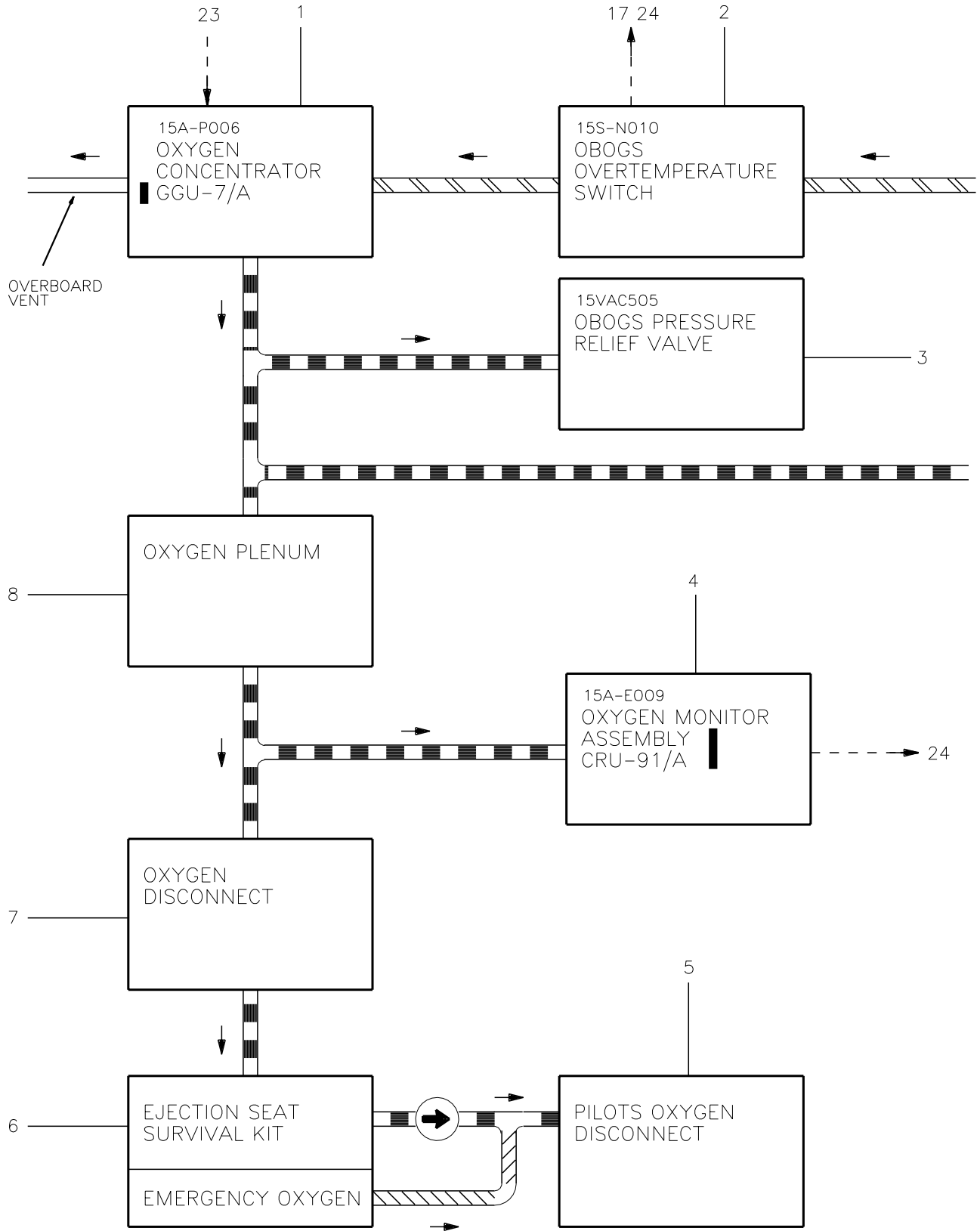


Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 1)

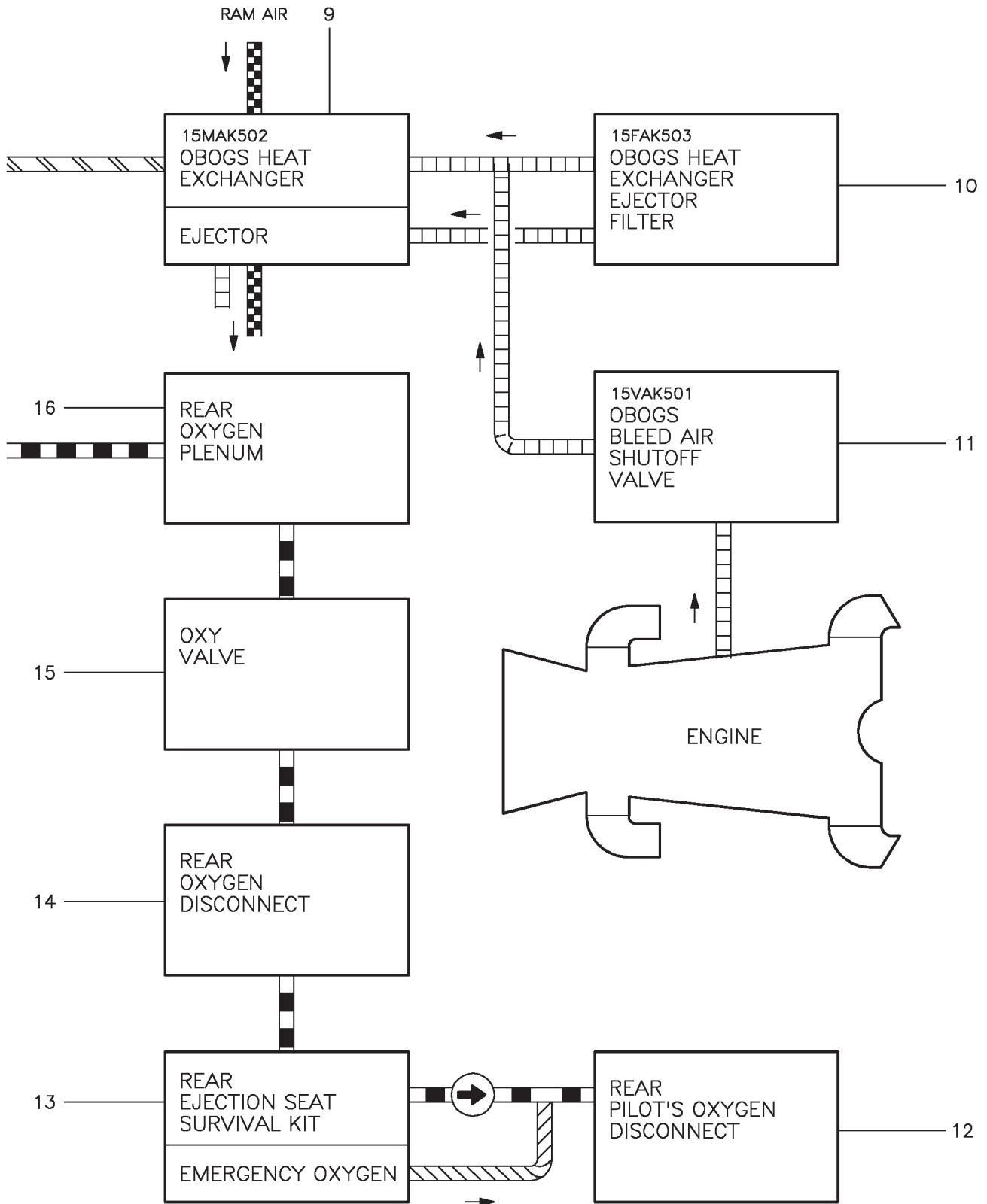


Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 2)

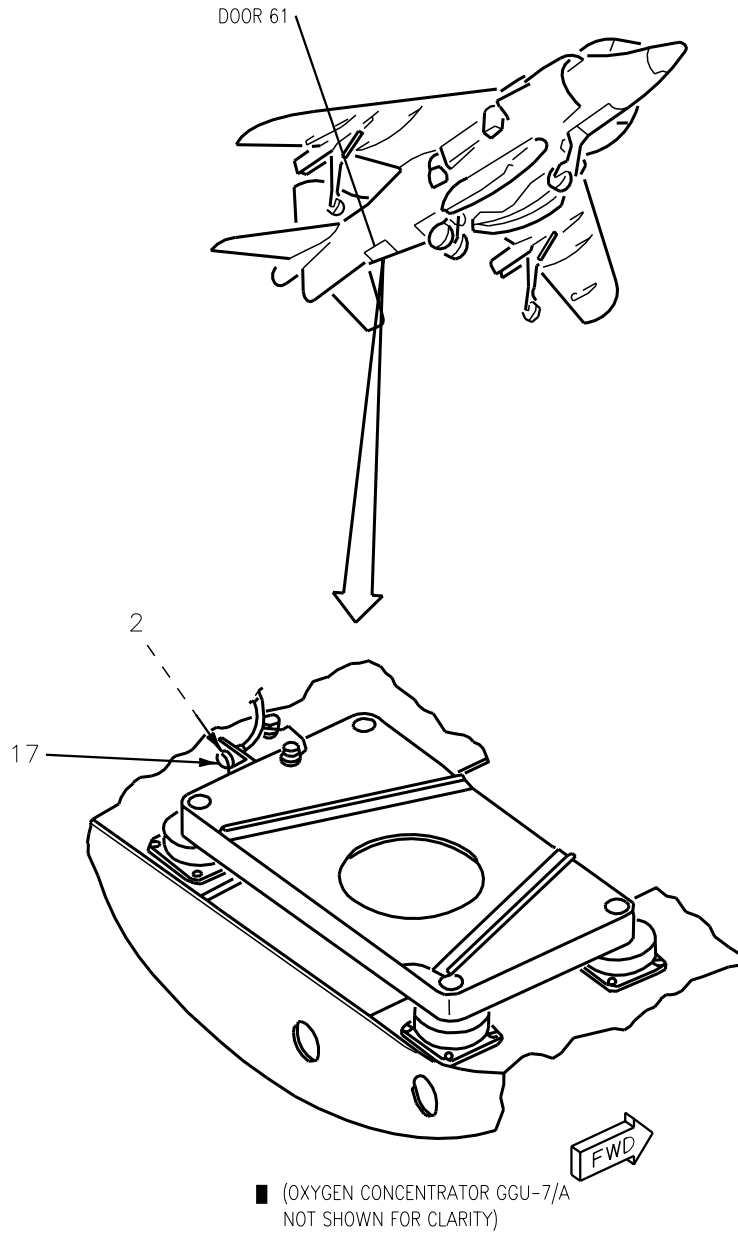


Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 3)

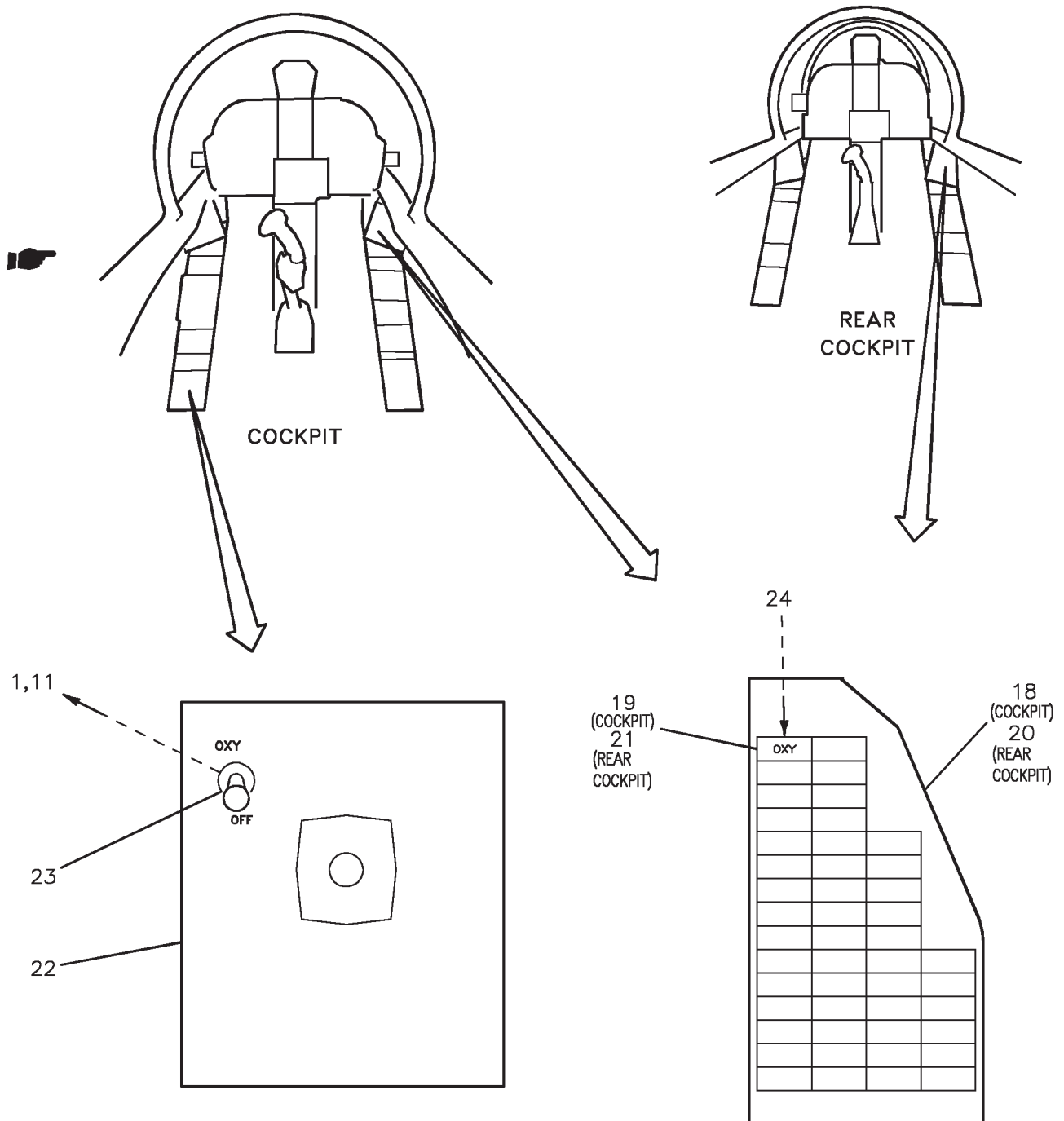
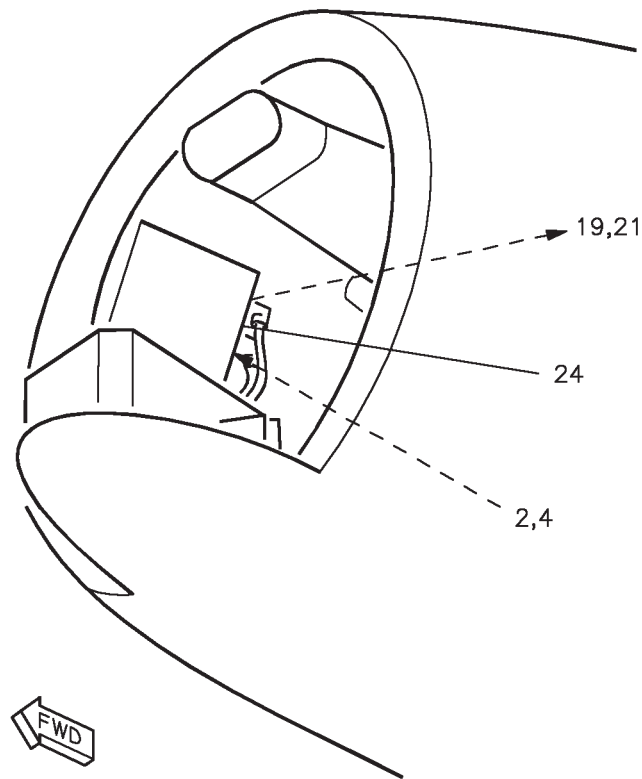


Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 4)



LEGEND

1. NONSTANDARD SYMBOLS











	RAM AIR
	BLEED AIR
	COOLED BLEED AIR
	NORMAL OXYGEN FLOW
	EMERGENCY OXYGEN FLOW
	ELECTRICAL SIGNAL TO ITEM NUMBER
	ELECTRICAL SIGNAL FROM ITEM NUMBER
	DIRECTION OF FLOW
	ITEM NUMBER
	CHECK VALVE

Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 5)

ITEM NO	NOMENCLATURE
1	OXYGEN CONCENTRATOR GGU-7/A
2	OBOGS OVERTEMPERATURE SWITCH
3	OBOGS PRESSURE RELIEF VALVE
4	OXYGEN MONITOR ASSEMBLY CRU-91/A
5	PILOTS OXYGEN DISCONNECT
6	EJECTION SEAT SURVIVAL KIT
7	OXYGEN DISCONNECT
8	OXYGEN PLENUM
9	OBOGS HEAT EXCHANGER
10	OBOGS HEAT EXCHANGER EJECTOR FILTER
11	OBOGS BLEED AIR SHUTOFF VALVE
12	REAR PILOTS OXYGEN DISCONNECT
13	REAR EJECTION SEAT SURVIVAL KIT
14	REAR OXYGEN DISCONNECT
15	OXY VALVE
16	REAR OXYGEN PLENUM
17	OBOGS O TEMP INDICATOR
18	CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
19	OXY CAUTION LIGHT
20	REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY
21	OXY CAUTION LIGHT
22	PILOT SERVICES PANEL ASSEMBLY
23	OXY SWITCH
24	ANNUNCIATOR LIGHT CONTROLLER

Figure 4. On-Board Oxygen Generating System Flow Diagram (Sheet 6)

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

DESCRIPTION AND OPERATION

CABIN COOLING AND DEFOG SYSTEM

Reference Material

Power Plant and Related Systems	A1-AV8BD-290-100
Basic Engine	WP003 00
Environmental Control System	A1-AV8BC-410-100
Cabin Pressurization System.....	WP006 00
Component Locator - Cabin Cooling And Defog System	WP005 00
Forward Avionics Cooling System.....	WP008 00
Electrical Systems.....	A1-AV8BB-420-100
DC Power System	WP004 00
Electrical Systems.....	A1-AV8BD-420-100
DC Power System	WP004 00
Lighting Systems.....	A1-AV8BB-440-100
Warning/Caution/Advisory Lighting System.....	WP007 00
Landing Gear And Related Systems.....	A1-AV8BB-130-100
Landing Gear System.....	WP003 00

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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. DESCRIPTION.

2. **SYSTEM DESCRIPTION.** The cabin cooling and defog system conditions hot sixth stage engine bleed air to satisfy cockpit environmental requirements.

3. **COMPONENT DESCRIPTION.** System components are described and listed in the paragraphs below. For component locator, refer to WP005 00.

4. **Cabin ECS Air Filter Assembly.** The cabin ECS air filter assembly is a reusable, steel mesh filter element encased in a housing with a spring loaded bypass valve.

5. **Cabin ECS Pressure Regulating and Shutoff Valve.** The cabin ECS pressure regulating and shutoff valve is an electrically controlled, pneumatically operated valve. The valve is made up of a solenoid controlled shutoff section and a pneumatically controlled pressure regulating section. The shutoff section is made up of a solenoid operated control valve and a spring loaded shutoff piston mounted on a shaft. The pressure regulating section is made up of two sensing chambers, a relief valve, and a spring loaded piston mounted on a shaft.

6. **Venturi/Choke.** The venturi/choke is a metal duct assembly with a constricted throat.

7. **Temperature Regulating Valve.** The temperature regulating valve is an electrically driven butterfly type valve. The valve is made up of a butterfly valve, actuator, an integral follow-up resistor and a brake.

8. **Cold Air Unit.** The cold air unit is a compressor turbine and expansion turbine, mounted at opposite ends of a common shaft, in a common housing. The cold air unit has a serviceable bearing lubrication system and a bearing cooling system.

9. **Water Separator.** The water separator is a swirl frame, a woven cloth coalescer, and a bypass valve in a common housing.

10. **Forward Vent/Defog Valve.** The vent/defog valve is a solenoid controlled, pneumatically actuated, two position valve. The valve is made up of a housing, movable piston and a control solenoid.

11. **ECS Louvers.** The ECS louvers are adjustable metal air outlets.

12. **Windshield Defog Nozzles/Fixed Canopy Ventilation Nozzles.** The windshield defog nozzles and fixed canopy ventilation nozzles are tapered, slotted, metal tubes.

13. **ECS Control Panel Assembly.** The ECS control panel is a console mounted, illuminated control panel which provides mounting for environmental control system controls.

14. **Windshield Overtemperature Switch.** The windshield overtemperature switch is an in-line temperature sensitive, bimetallic, electrical switch.

15. **Skin Temperature Sensor.** The skin temperature sensor is a thermometer element imbedded in a contact strip.

16. **Duct Temperature Sensor.** The duct temperature sensor is a thermistor enclosed in a threaded housing.

17. **Cabin Temperature Sensor.** The cabin temperature sensor is a thermistor enclosed in a housing attached to a mount bracket.

18. **Cabin ECS Check Valve.** The cabin ECS check valve is a flapper type, spring loaded closed check valve.

19. **Defog Shutoff Valve.** The defog shutoff valve is an electrically controlled, pneumatically actuated shutoff valve.

20. **ECS Pressure Switch.** The ECS pressure switch is a pneumatically actuated electrical switch.

21. **Rear Vent/Defog Valve.** The rear vent/defog valve is a solenoid controlled, pneumatically actuated, two position valve. The valve is made up of a housing, movable piston, and a control solenoid.

22. **Primary Heat Exchanger.** The primary heat exchanger is a crossflow, air to air heat exchanger. The heat exchanger is made up of a finned core enclosed in a housing.

23. **Secondary Heat Exchanger.** The secondary heat exchanger is a crossflow, air to air heat exchanger. The heat exchanger is made up of a finned core enclosed in a housing.

24. RELATED SYSTEMS.

25. **Power Plant and Related Systems.** Hot, high pressure bleed air is provided by the engine sixth stage compressor (A1-AV8BD-290-100, WP003 00).

26. **Warning/Caution/Advisory Lighting System.** The warning/caution/advisory lighting system (A1-AV8BB-440-100, WP007 00) provides visual indication of normal aircraft functions and system malfunctions affecting safety of flight operations. The warning/caution/advisory lighting system includes the annunciator light controller and the caution/advisory indicator light assembly. The annunciator light controller receives data from various aircraft systems and provides logic to turn on and off warning/caution/advisory lights.

27. The annunciator light controller will turn on the WSHLD caution lights and the MASTER CAUTION lights when defog air temperature exceeds 250° F.

28. **DC Power System.** The DC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP004 00) provides 28vdc essential and 28vdc emergency power for the cabin cooling and defog system.

29. **Landing Gear And Related Systems.** The landing gear system (A1-AV8BB-130-100, WP003 00) provides a weight on wheels signal for the cabin cooling and defog system through the

MLG weight on wheels (WOW) switch and the weight on wheels relay no. 1.

30. SYSTEM CONTROLS AND INDICATORS.

31. **CABIN Switch.** The CABIN switch, located on the ECS control panel assembly, is a single pole toggle switch. The switch controls airflow for cabin and windshield defogging. The switch has three positions: NORM, DFOG, and MAX DFOG.

32. Setting the CABIN switch to NORM does the below:

a. Applies essential 28vdc to energize the forward vent/defog valve and rear vent/defog valve, causing them to go to the unrestricted position.

b. Applies essential 28vdc through the weight on wheels relay no. 1 to the defog shutoff valve. The defog valve will close if the aircraft is weight on wheels and system pressure is less than 20 psi.

33. Setting the CABIN switch to DFOG does the below:

a. Removes essential 28vdc to deenergize the forward vent/defog valve and rear vent/defog valve, causing them to go to the restricted position.

b. Removes essential 28vdc to open the defog shutoff valve.

34. Setting the CABIN switch to MAX DFOG applies essential 28vdc power to energize the max defog relay causing an increase in system air temperature.

35. **PRESS Switch.** The PRESS switch, located on the ECS control panel assembly, is a four pole, lever lock toggle switch. The switch provides on/off control for the cabin cooling and defog system and mode selection for the cabin pressurization system. Refer to WP006 00 for operation of the cabin pressurization system. The switch has three positions; NORM, DUMP, and RAM.

36. Setting the PRESS switch to NORM prevents 28vdc essential or 28vdc emergency power from energizing the cabin ECS pressure regulating and shutoff valve, allowing normal system operation.

37. Setting the PRESS switch to RAM applies 28vdc essential and 28vdc emergency power to energize the cabin ECS pressure regulating and shutoff valve. The valve closes when energized, stopping system operation.

38. Setting the PRESS switch to DUMP has no affect on system operation.

39. **Cabin Temperature Control.** The cabin temperature control, located on the ECS control panel assembly, controls manual (MAN) and automatic (AUTO) cabin temperature selection.

40. In the MAN mode, setting and holding the cabin temperature control knob to the COOL or WARM settings applies emergency 28vdc power through the deenergized windshield overtemp relay to the open (warm) or closed (cool) contacts of the temperature regulating valve. Voltage is applied to the valve as long as the knob is held in COOL or WARM setting.

41. In the AUTO mode, the cabin temperature control functions as an electronic processor and as one leg of a temperature control bridge circuit. The other legs of the bridge circuit include the cabin temperature sensor, duct temperature sensor, and skin temperature sensor and follow-up resistor.

42. Selecting the desired setting in the AUTO mode applies emergency 28vdc power to the processing electronics and to the normally open contacts of the heat and cool relays, and provides a resistance value for one leg of the bridge. The cabin temperature control continuously receives signals from all legs of the bridge circuit. The bridge circuit compares the selected resistance of the AUTO setting with the sensed resistance of the other bridge circuit legs. Any difference in the signals is an unbalance. The unbalance is electronically processed and used to energize either the heat or cool relay. Energizing the relays applies emergency 28vdc power to the open (warm) or closed (cool) contacts of the temperature regulating valve. The valve moves as required, adding or removing hot air. Out of balance signals are proportional to sensed temperature changes. The resistance of the sensors and follow-up resistor changes as the valve opens and closes until a balance in the bridge circuit is arrived at.

43. An unbalance will occur by changing the selected temperature or by any change in temperature as sensed by any leg of the bridge. Such changes may be a drastic change in ambient temperature because of increased or decreased altitude. The cabin temperature control will automatically compensate for these changes to maintain the selected temperature.

44. **WSHLD Caution Light.** The WSHLD caution light, located on the caution/advisory indicator light assembly, is a dual lamp, indicator light.

45. The WSHLD caution light is controlled by the windshield overtemperature switch through the windshield overtemp relay and the warning/caution/advisory lighting system.

46. **Rear WSHLD Caution Light.** The rear WSHLD caution light, located on the rear caution/advisory indicator light assembly, is a dual lamp indicator light.

47. The rear WSHLD caution light is functionally identical to the WSHLD caution light.

48. **Windshield Overtemperature Relay.** The windshield overtemperature relay, located on the forward relay no. 1 panel assembly, is a dual pole, double throw, 5 amperes, permanent magnet drive, armature relay.

49. The relay is energized when the windshield overtemperature switch senses defog air temperature is more than $250^{\circ} \pm 8^{\circ} \text{F}$. With the relay energized:

a. Emergency 28vdc is removed from the cabin temperature control and is applied directly to the close (cool) contacts of the temperature regulating valve, causing a decrease in system temperature.

b. A ground is removed to enable the WSHLD caution light and the rear WSHLD caution light.

50. With the relay deenergized:

a. Emergency 28vdc is applied to the cabin temperature control allowing removal system operation.

b. A ground is provided to disable the WSHLD caution light and rear WSHLD caution light.

51. **Max Defog Relay.** The max defog relay, located on the forward relay no. 1 panel assembly, is a dual pole, double throw, 5 amperes, permanent magnet drive, armature relay.

52. The relay is energized when the CABIN switch is set to MAX DFOG. The relay allows windshield defogging air temperature to increase in the MAX DFOG setting. With the relay energized, signals from the cabin temperature sensor and duct

temperature sensor are routed through three fixed valve resistors. The three resistors increase the total signal resistance, causing an imbalance in the temperature control bridge circuit. The cabin temperature control will increase air temperature until the bridge circuit is brought back into balance.

53. With the relay deenergized, cabin temperature sensor and duct temperature sensor signals are routed directly through the cabin temperature control bridge circuit.

54. OPERATION.

55. COMPONENT OPERATION.

56. **Cabin ECS Air Filter Assembly.** The cabin ECS air filter assembly is located in door 11L. Sixth stage engine bleed air is sent by way of ducting to the filter assembly. The filter assembly removes particulate contamination before it can cause damage further downstream in the environmental control systems. If the filter element becomes blocked, pressure build up opens a bypass valve allowing air to bypass the filter element. The bypass valve opens at 4 psid. The filter element is replaceable independent of the housing or may be cleaned and reused. With the filter element removed, a ground air source can be adapted and used for ground testing.

57. **Cabin ECS Pressure Regulating and Shutoff Valve.** The cabin pressure regulating and shutoff valve is located in the bleed air duct between the cabin ECS air filter assembly and primary heat exchanger in door 128. Operation of the pressure regulating section and shutoff section is separate. Both sections require engine bleed air for operation.

58. The shutoff section is controlled by the PRESS switch on the ECS control panel assembly. With the solenoid deenergized, bleed air is applied to the upstream side of the shutoff piston, moving it to the open position. With the solenoid energized the control valve opens equalizing bleed air pressure on both sides of the shutoff piston which closes by spring tension. In the event of an aircraft or valve electrical failure, the valve will fail to the open position. The shutoff section will be inoperative, but the pressure regulation section will continue to operate.

59. The pressure regulating section operates only with the shutoff section open. Bleed air pressure enters both sensing chambers. Pressure in one

chamber is held constant by the relief valve. Differences of pressure between the two chambers determines piston position, controlling air pressure passing into the system. Pressure is regulated to approximately 62 psi.

60. **Temperature Regulating Valve.** The temperature regulating valve is located in door 128 between the cabin pressure regulator and shutoff valve and the water separator. The valve is electrically controlled and electrically actuated.

61. Acting in response to electrical signals from the cabin temperature control, the valve moves open or closed. Opening the valve allows more hot air to mix with cold discharge air from the cold air unit. Closing the valve allows less hot air mixing. Cycle time of the valve from fully open to fully closed is approximately 15 seconds.

The valve motor has limit switches and a brake to prevent overtravel of the valve. The closed limit switch is open when the valve is closed. The limit switch opens the circuit for the valve and deenergizes the brake coil. Power to the motor is interrupted and the brake engages. As the valve opens, the closed limit switch closes. When the valve is fully open, the process repeats for the open limit switch.

62. The follow-up resistor is a variable resistor mechanically controlled by position of the valve actuator. Resistance values increase as the valve moves to open, decrease as the valve moves to closed. The resistance value range is approximately 0 to 33 ohms. The resistance value is supplied to the automatic mode of the cabin temperature control as part of one leg of the bridge circuit.

63. **Primary Heat Exchanger.** The primary heat exchanger is located in door 128 between the cabin ECS pressure regulating and shutoff valve and the cold air unit. Hot bleed air passes through the heat exchanger core where ram air, forced across the core, absorbs heat from the bleed air. The bleed air passes through the heat exchanger then to the cold air unit compressor turbine. The pre-cooled, compressed bleed air is then sent to the secondary heat exchanger.

64. After passing across the primary heat exchanger, the ram air exits through either the ECS bay or the engine intake, depending on flight conditions. In low speed flight or ground operation, flapper valves at the bottom of the heat exchanger

are pulled open by suction in the engine air intake, allowing engine intake suction to pull ram air across the heat exchanger core. In normal flight, ram air flow causes a positive pressure in the ram air ducts, pulling the flapper valves closed. The ram air then exits to the ECS bay and then overboard.

65. **Secondary Heat Exchanger.** The secondary heat exchanger is located in door 128 between the cold air unit compressor turbine outlet and expansion turbine inlet. Pre-cooled, compressed bleed air from the cold air unit compressor turbine passes through the heat exchanger core where ram air, forced across the core, absorbs heat gained through compression. The cooled air then passes to the expansion turbine inlet of the cold air unit.

66. The exit path of the ram air is the same as the primary heat exchanger.

67. **Cold Air Unit.** The cold air unit is located in door 128 between the heat exchangers and the water separator. The compressor turbine receives pre-cooled air from the primary heat exchanger where it is compressed to approximately two times its inlet value. The compressed air then passes to the secondary heat exchanger where the heat from compression is lost, then to the expansion turbine end of the cold air unit where heat energy is converted to mechanical energy by spinning the expansion turbine. The expansion turbine drives the compressor turbine through the common shaft. With the heat lost, cold air is left and sent by way of ducting to mix with hot air from the temperature regulating valve.

68. Lubrication for the common shaft is provided by oil stored in a cotton wool pack sump and transported to the shaft by a system of oil wicks. The sump has fill and drain plugs located to allow periodic servicing of oil while the cold air unit is still in the aircraft.

69. Shaft bearing cooling is provided by a flexible tube. Expansion turbine discharge air is used to cool the bearings as the common shaft spins.

70. **Water Separator.** The water separator is located between the cold air unit and the cabin ECS check valve in internal door NWA. Cool moist air enters the water separator coalescer. The coalescer converts moisture in the air into water droplets through the wetttable, high surface area of the woven cloth coalescer. The swirl frame sends these droplets to the outer wall of the collector sump area

by centrifugal force. The droplets are collected by the sump assembly and allowed to drain overboard.

71. If the coalescer becomes blocked, normally because of freezing, a bypass valve will open at a 10 psi differential pressure.

72. **Cabin ECS Check Valve.** The cabin ECS check valve is located between the water separator and the duct temperature sensor in internal door NWA. The valve prevents cabin depressurization by stopping the reverse flow of cabin air, through ECS louvers, windshield defog nozzles, and fixed canopy ventilation nozzles when cabin cooling and defog system is not operating. The valve flappers are held closed by spring tension and are normally closed with no air pressure applied. Approximately 4 psi is required to open the check valve.

73. **Forward Vent/Defog Valve.** The forward vent/defog valve, located between the water separator and the cockpit ECS louvers in door 10, provides restricted or unrestricted flow. The valve solenoid is energized when the CABIN switch is set to NORM and deenergized when the CABIN switch is set to DFOG or MAX DFOG. With the solenoid energized, pneumatic pressure is turned off, allowing system pressure to force the movable piston to the unrestricted position. With the valve in the unrestricted position, most of the airflow will be directed to the cockpit ECS louvers.

74. Deenergizing the solenoid applies pneumatic pressure to the movable piston, causing it to move to the restricted position; most of the airflow will then be directed to the windshield defog nozzles and the fixed canopy ventilation nozzles.

75. **Rear Vent/Defog Valve.** The rear vent/defog valve, located between the duct temperature sensor and the rear cockpit ECS louvers in door 121, provides restricted or unrestricted flow. The valve solenoid is energized when the CABIN switch is set to NORM and deenergized with the CABIN switch set to DFOG or MAX DFOG. With the solenoid energized, pneumatic pressure is turned off allowing system pressure to force the movable piston to the unrestricted position. With the valve in the unrestricted position, most of the airflow will be directed to the rear cockpit ECS louvers.

76. Deenergizing the solenoid applies pneumatic pressure to the movable piston, causing it to move to the restricted position; most of the airflow will

then be directed to the fixed canopy ventilation nozzles and windshield defog nozzles.

77. **ECS Louvers.** The ECS louvers, located in the cockpit and rear cockpit, provide desired distribution of air entering the cockpits. Each of the louvers has adjustable vanes at the openings. The vanes can be adjusted by the pilot for his own heating and cooling comfort. Airflow to the ECS louvers is controlled by the forward vent/defog valve and the rear vent/defog valve. The louvers also act as an air inlet for cabin pressurization (WP006 00).

78. **Windshield Defog Nozzles.** The windshield defog nozzles, at the base of the windshield, provide even flow of air across the windshield and canopy. Cabin air is used for windshield and canopy defogging. Air flow to the nozzles is controlled by the forward vent/defog valve, rear vent/defog valve, and defog shutoff valve. The nozzles also act as an air inlet for cabin pressurization (WP006 00).

79. **Fixed Canopy Ventilation Nozzles.** The fixed canopy ventilation nozzles at the base of the fixed canopy provide an even flow of air across the fixed canopy. Cabin air is used for fixed canopy defogging. The nozzles also provide thorough ventilation in and around the rear cockpit. Airflow to the nozzles is controlled by the forward vent/defog valve, rear vent/defog valve and defog shutoff valve. The nozzles also act as an air inlet for cabin pressurization (WP006 00).

80. **Defog Shutoff Valve.** The defog shutoff valve is located in the common windshield defog and fixed canopy ventilation duct in door 121. The valve controls the flow of air to the windshield defog nozzles and fixed canopy ventilation nozzles when the aircraft is on the ground and system pressure is low. The valve is electrically controlled and pneumatically actuated. The valve is controlled by the weight on wheels relay no. 1 and the ECS pressure switch.

81. With aircraft weight on wheels and system pressure less than 20 psi, the defog shutoff valve is closed. The valve is energized and pneumatic pressure is allowed to pass. The pressure, acting on a diaphragm, overcomes spring tension to close the valve butterfly by way of a mechanical linkage. With aircraft weight off wheels or system pressure greater than 20 psi, the defog shutoff valve is open. The valve is deenergized and pneumatic pressure is

shut off. Spring tension overcomes pneumatic pressure to open the valve.

82. **ECS Pressure Switch.** The ECS pressure switch is located in door 128 in the primary heat exchanger outlet. The switch is pneumatically operated and controls electrical signals to the defog shutoff valve.

83. With system pressure less than 20 psi, a ground is supplied to energize the defog shutoff valve. With system pressure greater than 20 psi, the pneumatic switch opens to remove the ground signal, to deenergize the defog shutoff valve.

84. **ECS Control Panel Assembly.** The ECS control panel assembly is located in the cockpit on the right console. The panel provides mounting for the PRESS switch, CABIN switch, cabin temperature control, and EQUIP switch (WP008 00).

85. **Windshield Overtemperature Switch.** The windshield overtemperature switch is located in door 120 in the defog shutoff valve outlet duct. A bimetallic temperature sensitive device senses an overtemperature condition. The bimetallic properties allow the device to expand and contract to actuate the switch.

86. The switch is calibrated to close its contacts at $250 \pm 8^\circ\text{F}$ increasing temperature and open at $220 \pm 10^\circ\text{F}$ decreasing temperature.

87. Closing the switch contacts provides a ground to complete a circuit which applies emergency 28vdc power to energize the windshield overtemperature relay.

88. **Skin Temperature Sensor.** The skin temperature sensor is located on the left side nose landing gear wheelwell. The sensor senses changes in aircraft skin temperature. The sensing device contact strip is attached directly to the aircraft skin. A dielectric compound is used between the sensor and the aircraft skin to make sure the sensor is electrically isolated from the skin, but still able to measure temperature.

89. As sensed temperature increases, sensor resistance increases. As sensed temperature decreases, sensor resistance decreases. At a temperature range of 0 to 100°F (-17 to 40°C), sensor resistance is approximately 38 to 57 ohms. The resistance values are supplied to the automatic mode of the cabin temperature control as part of one leg of the bridge circuit.

90. **Duct Temperature Sensor.** The duct temperature sensor is located in a duct between the water separator and the vent/defog valves in door 121. The sensor senses changes of air temperature in the cabin ECS duct.

91. As sensed temperature increases, sensor resistance decreases. As sensed temperature decreases, sensor resistance increases. At a temperature range of 32 to 100° F (0 to 40°C), sensor resistance is approximately 1075 to 4850 ohms. The resistance values are supplied to the automatic mode of the cabin temperature control as one leg of the bridge circuit.

92. **Cabin Temperature Sensor.** The cabin temperature sensor is located on the forward pressure bulkhead, in door 7L. The sensor senses changes in cabin air temperature.

93. As sensed temperature increases, sensor resistance decreases. As sensed temperature decreases, sensor resistance increases. At a temperature range of 32 to 100° F (0 to 40°C), sensor resistance is approximately 1075 to 5000 ohms. The resistance values are supplied to the automatic mode of the cabin temperature control as one leg of the bridge circuit.

94. **SYSTEM OPERATION.**

95. **Normal Operation.** In normal operation, hot engine bleed air passes through the cabin ECS air filter (figure 1) to the cabin ECS pressure regulating and shutoff valve which regulates pressure to approximately 62 psi. The regulated air passes through the venturi/choke where airflow is limited to approximately 36 pounds per minute. Regulated air then passes into two circuits, one remains hot, the other passes to the primary heat exchanger to be cooled. Hot air entering the primary heat exchanger is cooled by cross flowing ram air. Partly cooled air is then transported by way of ducting to the compressor turbine of the cold air unit where it is compressed to approximately two times its inlet value. Heat gained from the cold air unit compressor turbine is lost in the secondary heat exchanger. Air from the secondary heat exchanger is cooled further by rapid expansion in the cold air unit expansion turbine section.

96. The temperature regulating valve controls the amount of hot bleed air to be mixed with cold air unit discharge air. Hot and cold air are mixed to the required temperature.

97. Distribution of air in the cockpits is determined by the forward vent/defog valve and the rear vent/defog valve through the ECS louvers. With CABIN switch set to NORM, most of the airflow will pass unrestricted to the ECS louvers. With the CABIN switch set to DFOG or MAX DFOG, most of the airflow will be directed to the windshield defog nozzles and fixed canopy ventilation nozzles.

98. With weight on wheels and system pressure less than 20 psi, the defog shutoff valve is closed to direct all airflow to the crewmembers through the ECS louvers. With weight off wheels and system pressure greater than 20 psi, the defog shutoff valve opens to allow a more balanced airflow between nozzles and louvers.

99. Cabin temperature can be controlled automatically or manually. In automatic operation, the cabin temperature control working with the cabin temperature sensor, duct temperature sensor, and skin temperature sensor and follow-up resistor automatically adjust temperature regulating valve position to control the temperature of air entering the cabin.

100. With the cabin temperature control set to MAN WARM or MAN COOL, 28vdc is applied to the temperature regulating valve to control the temperature of the air entering the cabin.

101. Air for canopy and windshield defogging and fixed canopy ventilation is provided through the windshield defog nozzles and fixed canopy ventilation nozzles. Setting the CABIN switch to DFOG will direct most of the airflow to the windshield defog nozzles. With CABIN switch set to MAX DFOG, the max defog relay is energized, causing the temperature of the airflow to increase. The windshield overtemperature switch limits windshield defog air temperature to approximately 250° F. If an overtemperature condition exists, the switch provides a ground to energize the windshield overtemperature relay. With the relay energized, the temperature regulating valve will close and the WSHLD caution lights are enabled.

102. **EMERGENCY OPERATION.** If the cabin cooling and defog system fails or is off, ram air can be used to ventilate the cockpit. Setting the PRESS switch to RAM closes the cabin ECS pressure regulating and shutoff valve. Control air pressure to

the ground cooling valve is shut off, causing the valve to open (WP008 00). With the ground cooling valve open, ram air can enter the cockpits through the ECS louvers, windshield defog nozzles and fixed canopy ventilation nozzles.

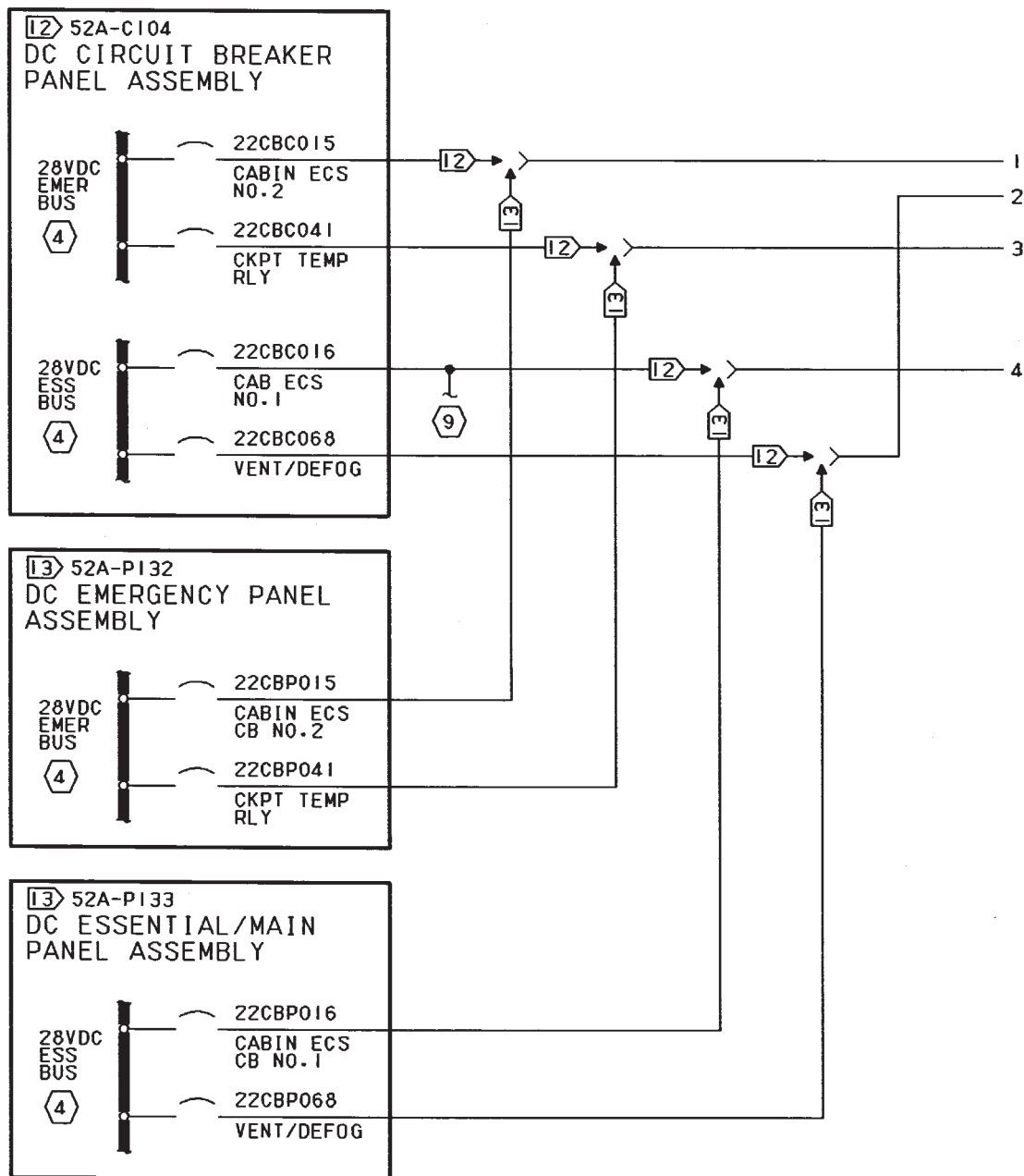


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 1)

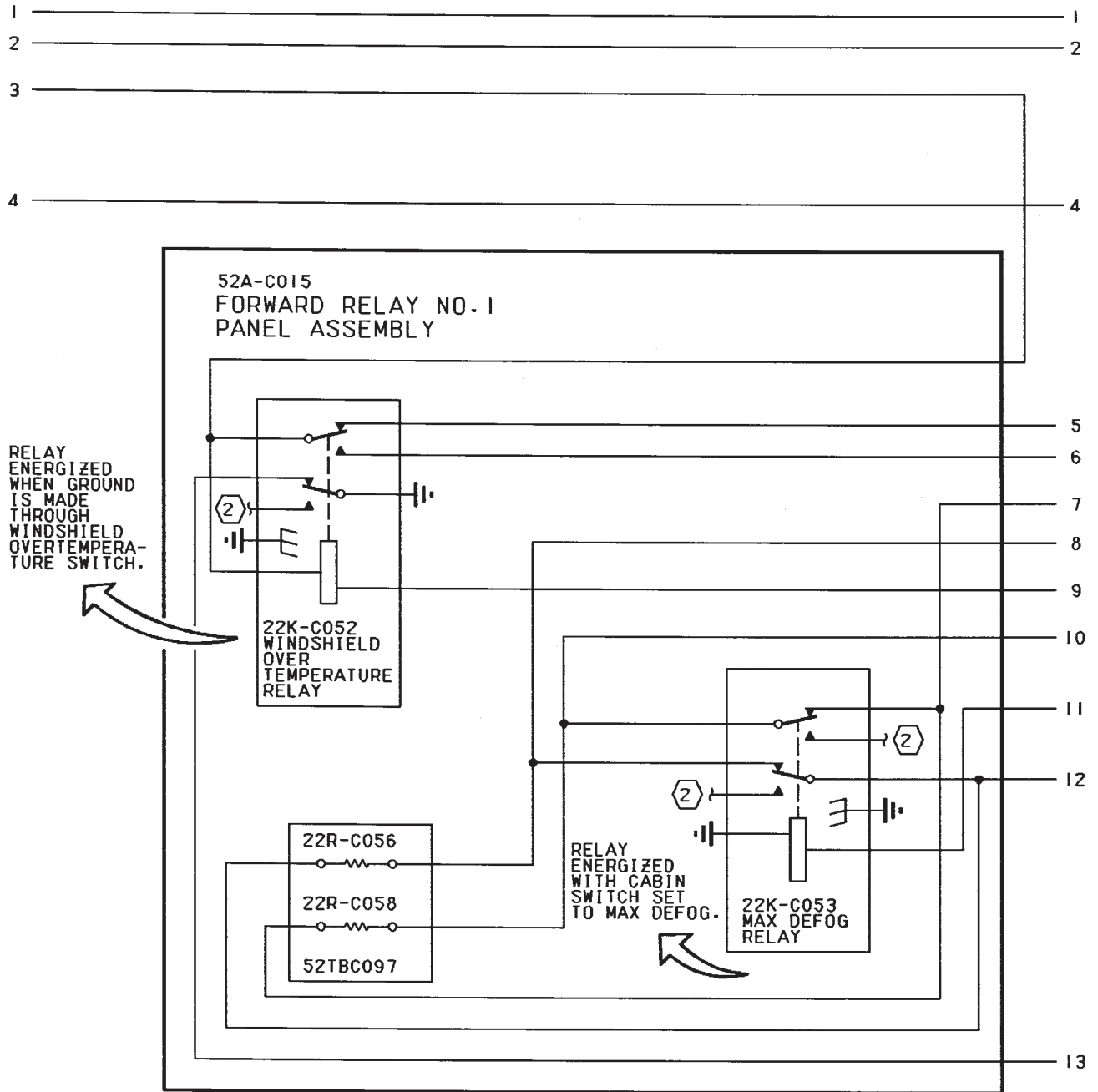


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 2)

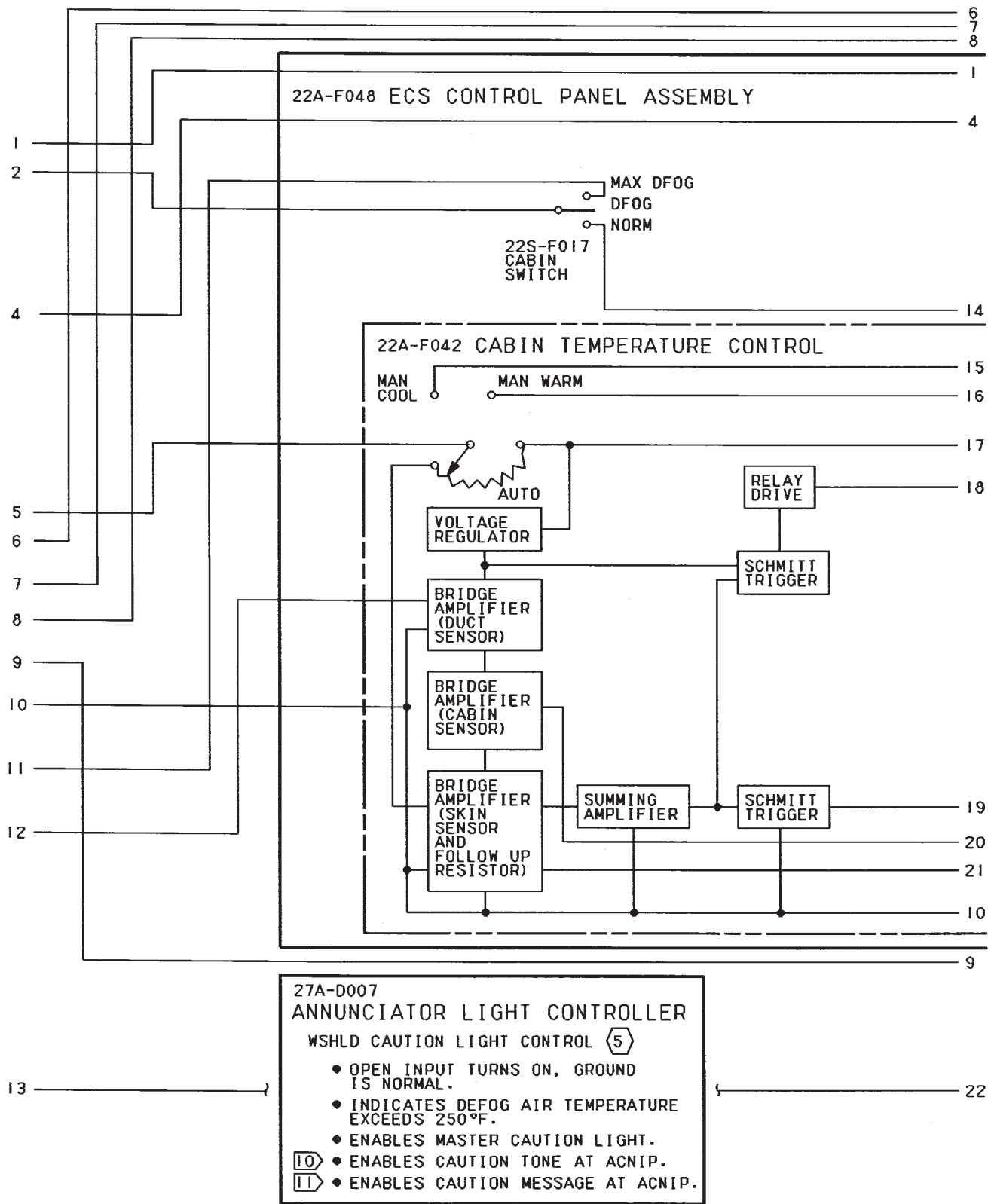


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 3)

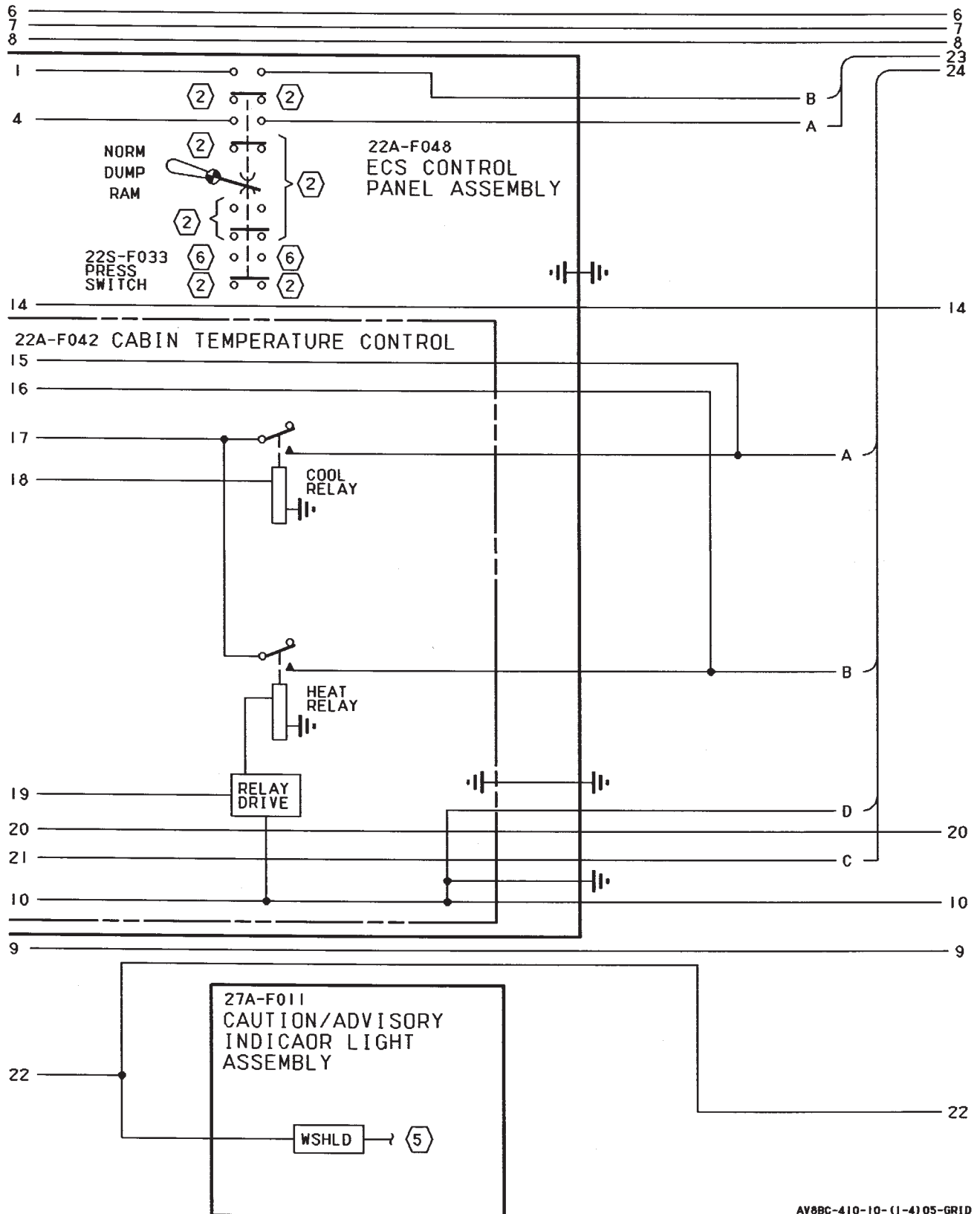


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 4)

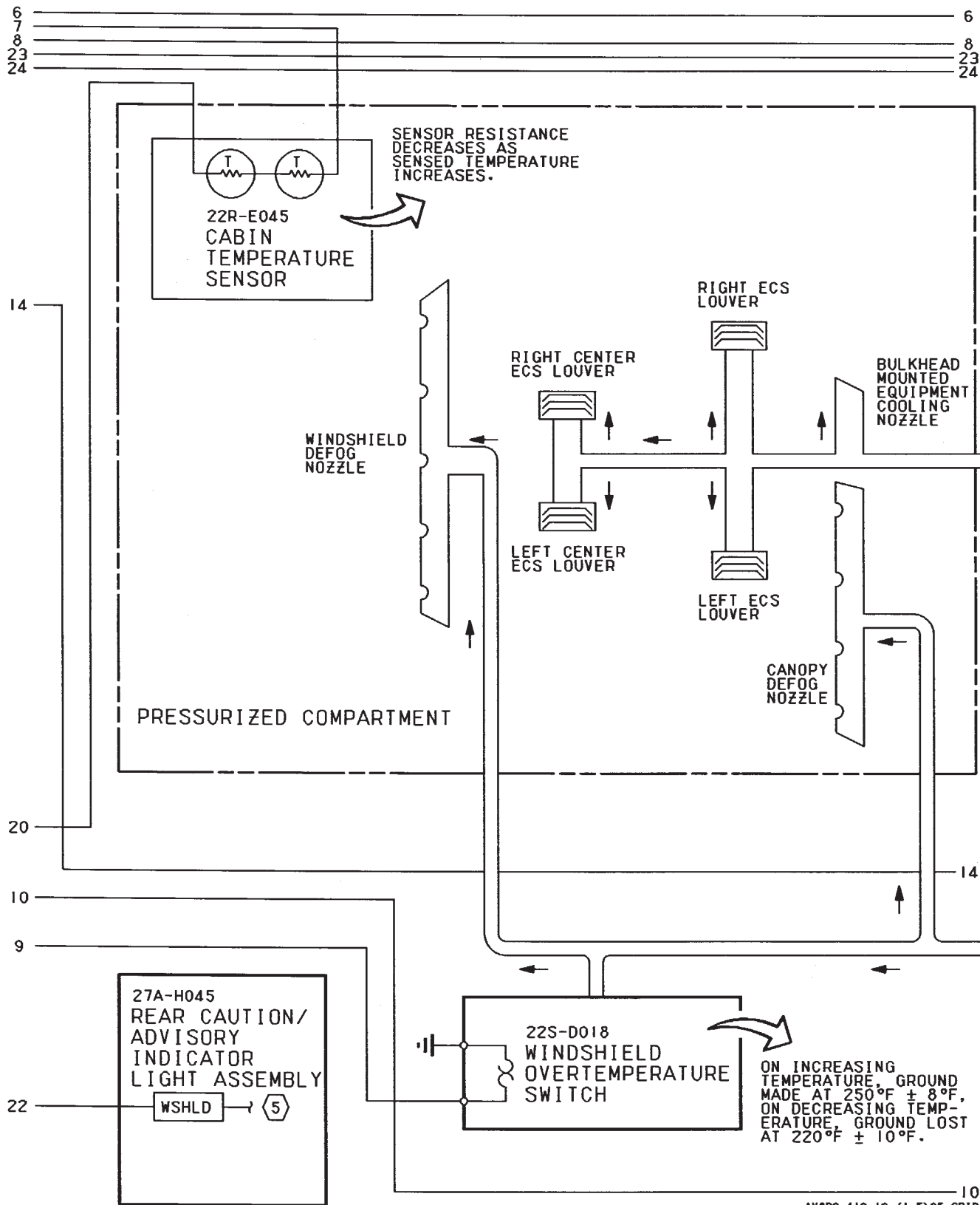


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 5)

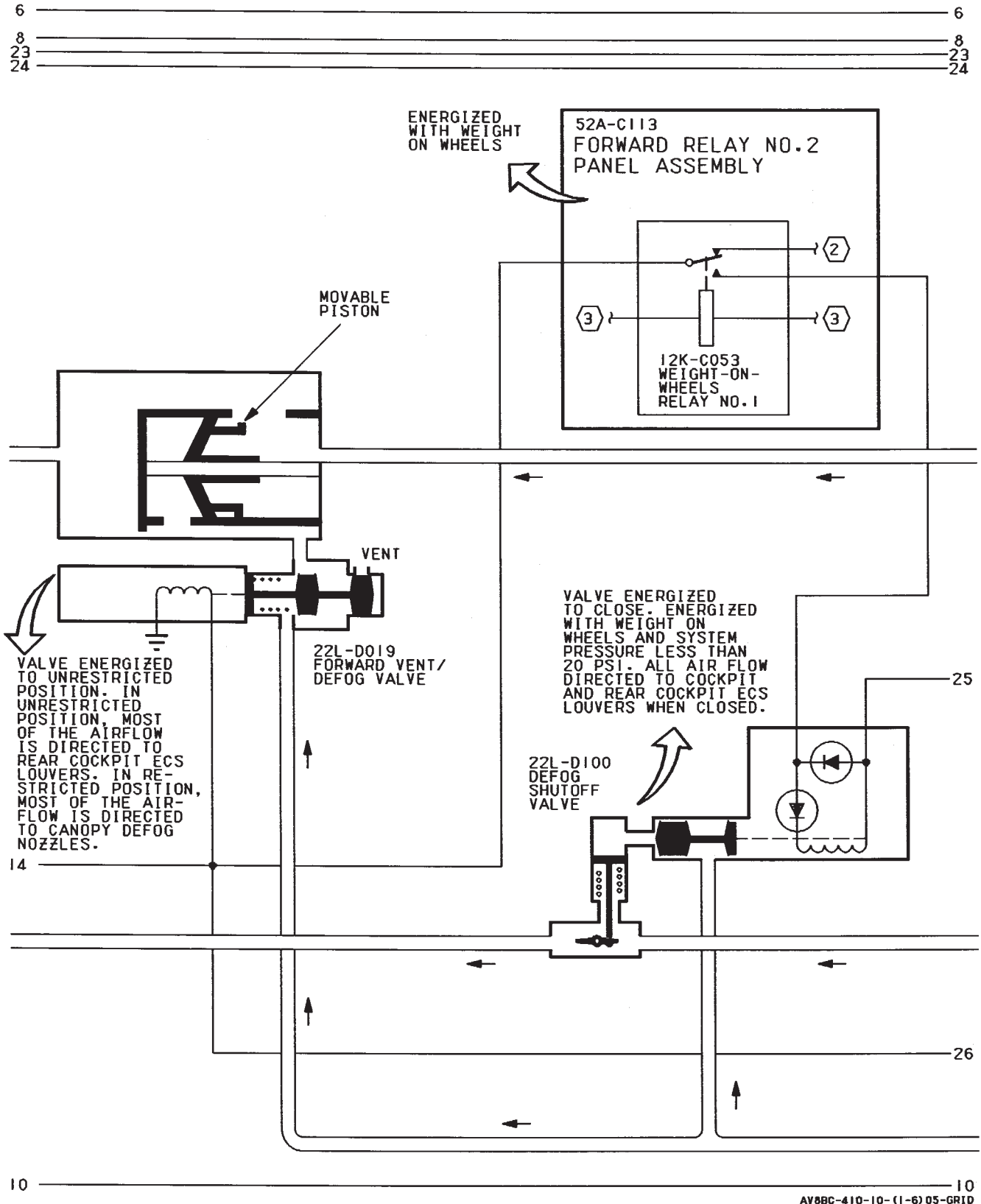


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 6)

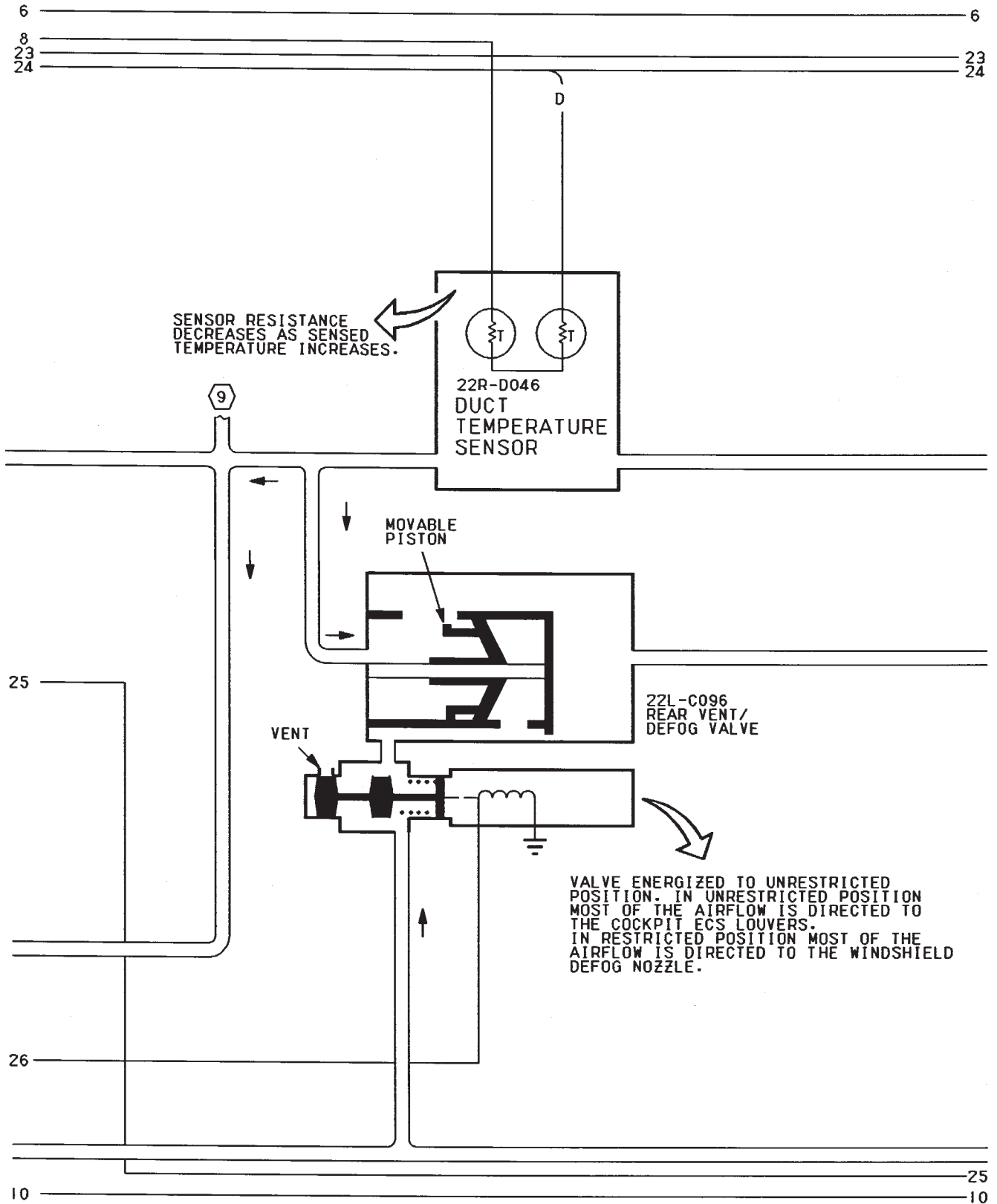
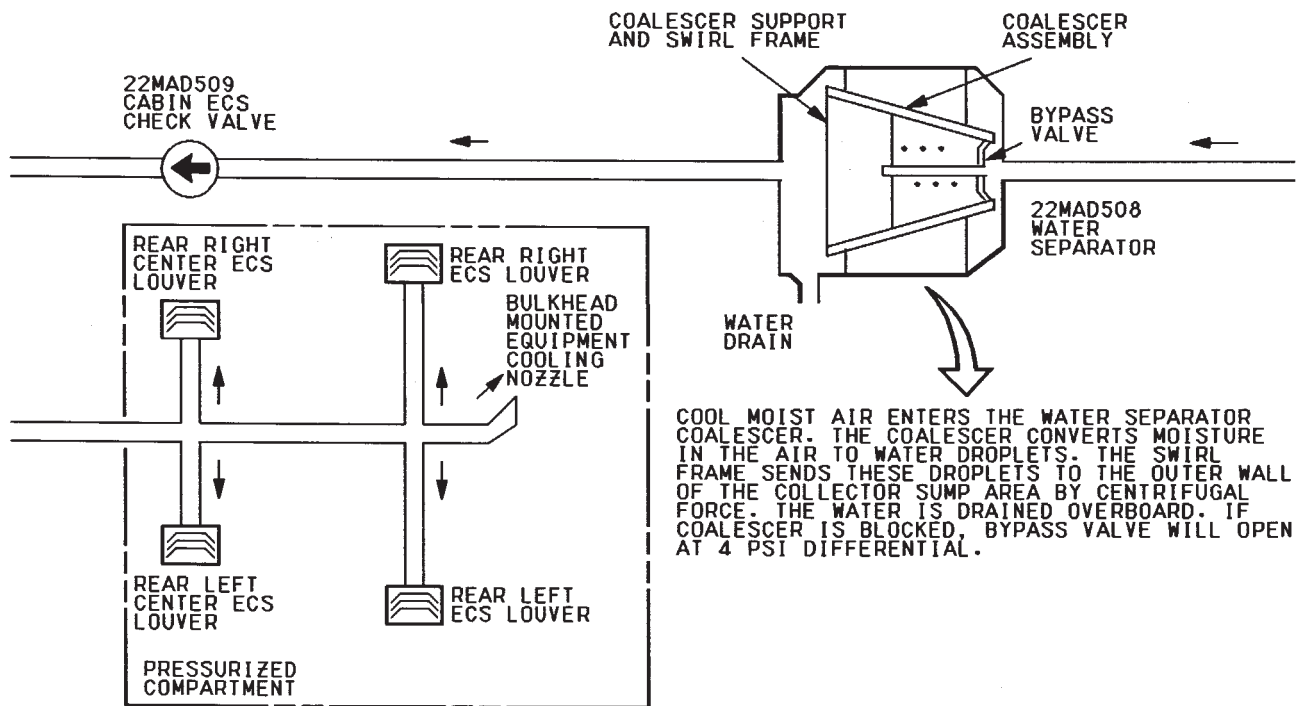


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 7)

6 _____ 6
23 _____ 23
24 _____ 24



25 _____ 25
10 _____ 10

Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 8)

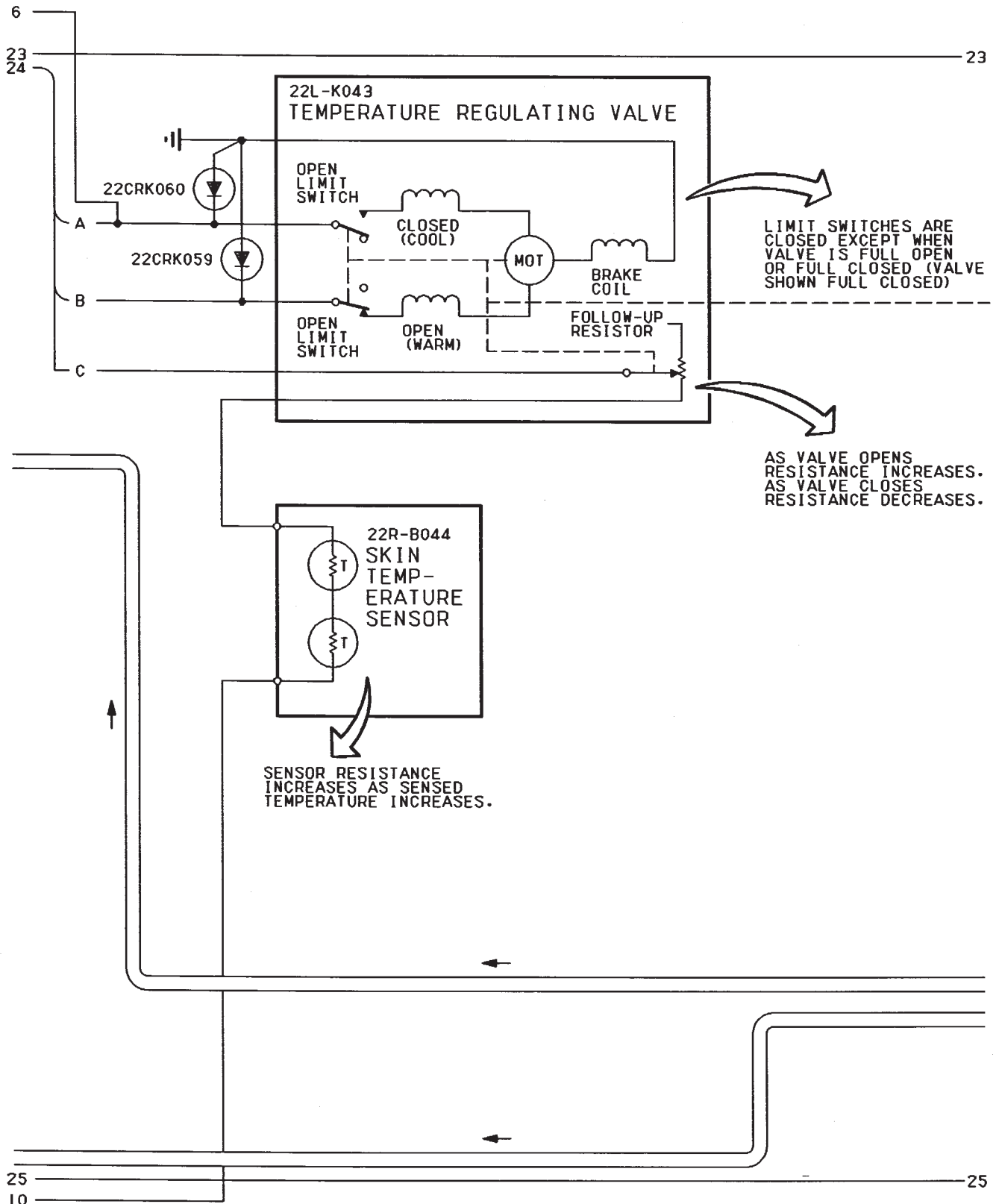
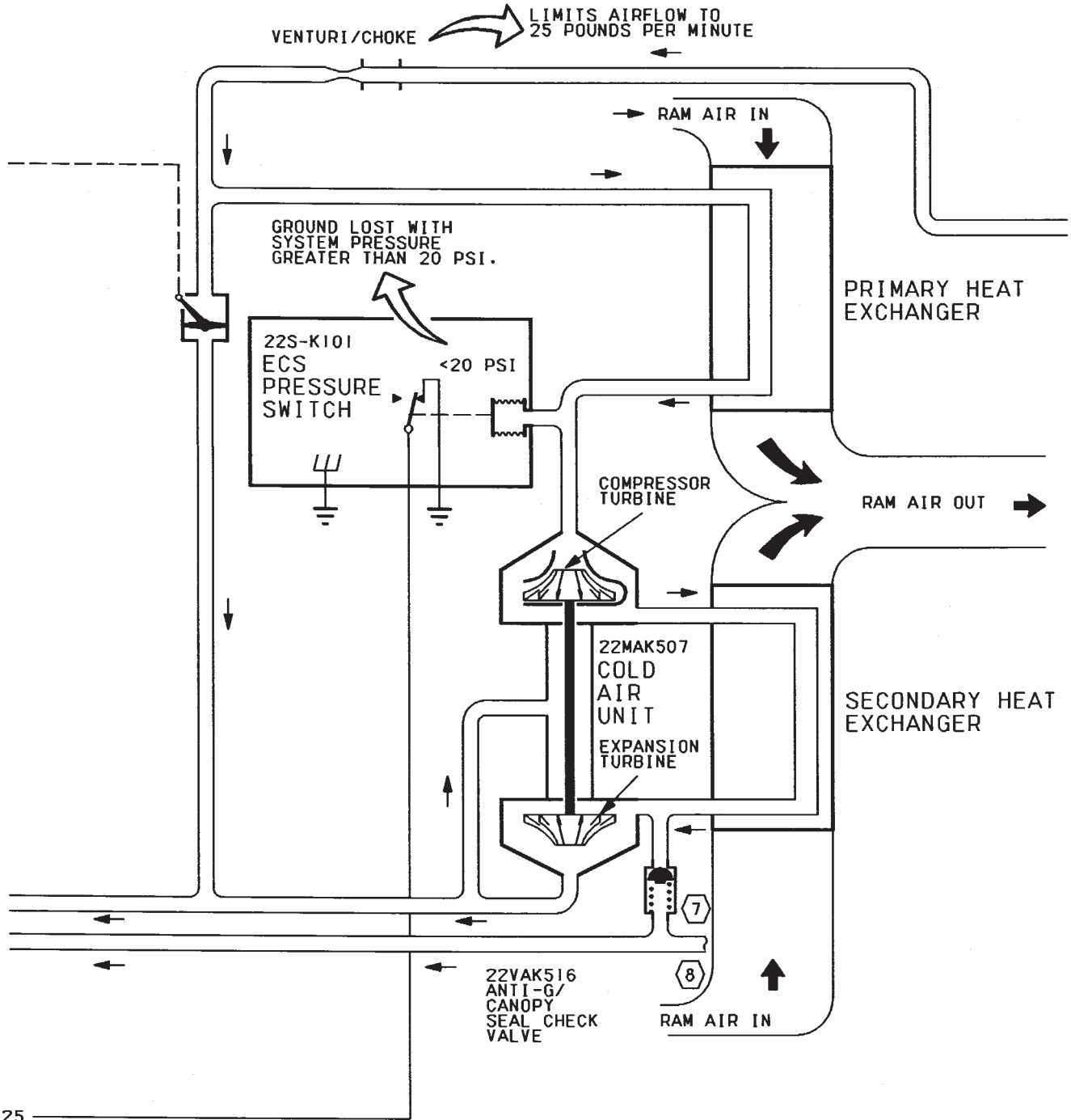


Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 9)

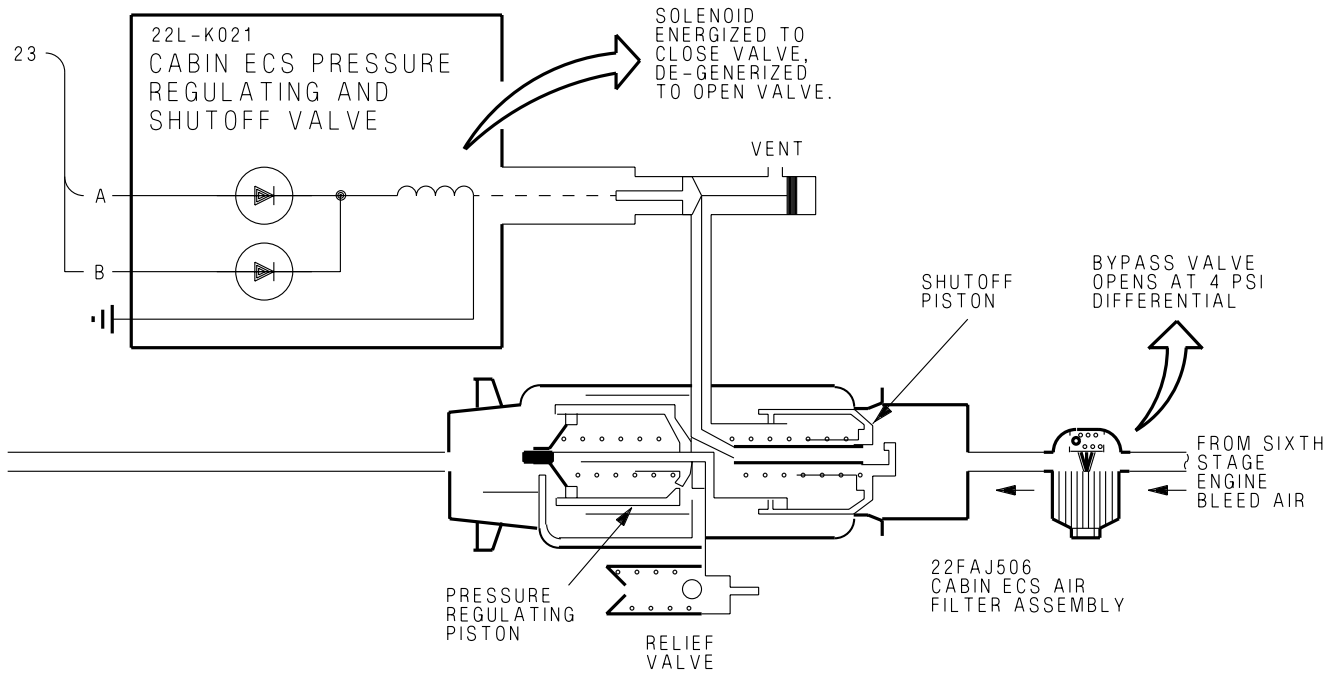
23

23



25

Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 10)



LEGEND

1. NONSTANDARD SYMBOL:



- 2 PIN NOT USED.
- 3 LANDING GEAR CONTROLLED RELAYS SIMPLIFIED SCHEMATIC, A1-AV8BB-130-100, WP005 00.
- 4 12 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP005 00.
- 13 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP005 00.
- 5 WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-440-100, WP008 00.
- 6 CABIN PRESSURIZATION SYSTEM SIMPLIFIED SCHEMATIC, WP006 00.
- 7 ANTI-G SYSTEM SIMPLIFIED SCHEMATIC, WP009 00.
- 8 CANOPY SEAL SYSTEM SIMPLIFIED SCHEMATIC, WP007 00.
- 9 12 FORWARD AVIONICS COOLING SYSTEM SIMPLIFIED SCHEMATIC - 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416, WP008 00.
- 13 FORWARD AVIONICS COOLING SYSTEM SIMPLIFIED SCHEMATIC - 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416, WP008 00.
- 10 162747 THRU 163207.
- 11 163856 AND UP.
- 12 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.
- 13 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 1. Cabin Cooling and Defog System Simplified Schematic (Sheet 11)

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

COMPONENT LOCATOR

CABIN COOLING AND DEFOG SYSTEM

This WP supersedes WP005 00, dated 15 June 2003.

Reference Material

None

Alphabetical Index

Subject	Page No.
Cabin Cooling and Defog System Component Locator, Figure 1	2

Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

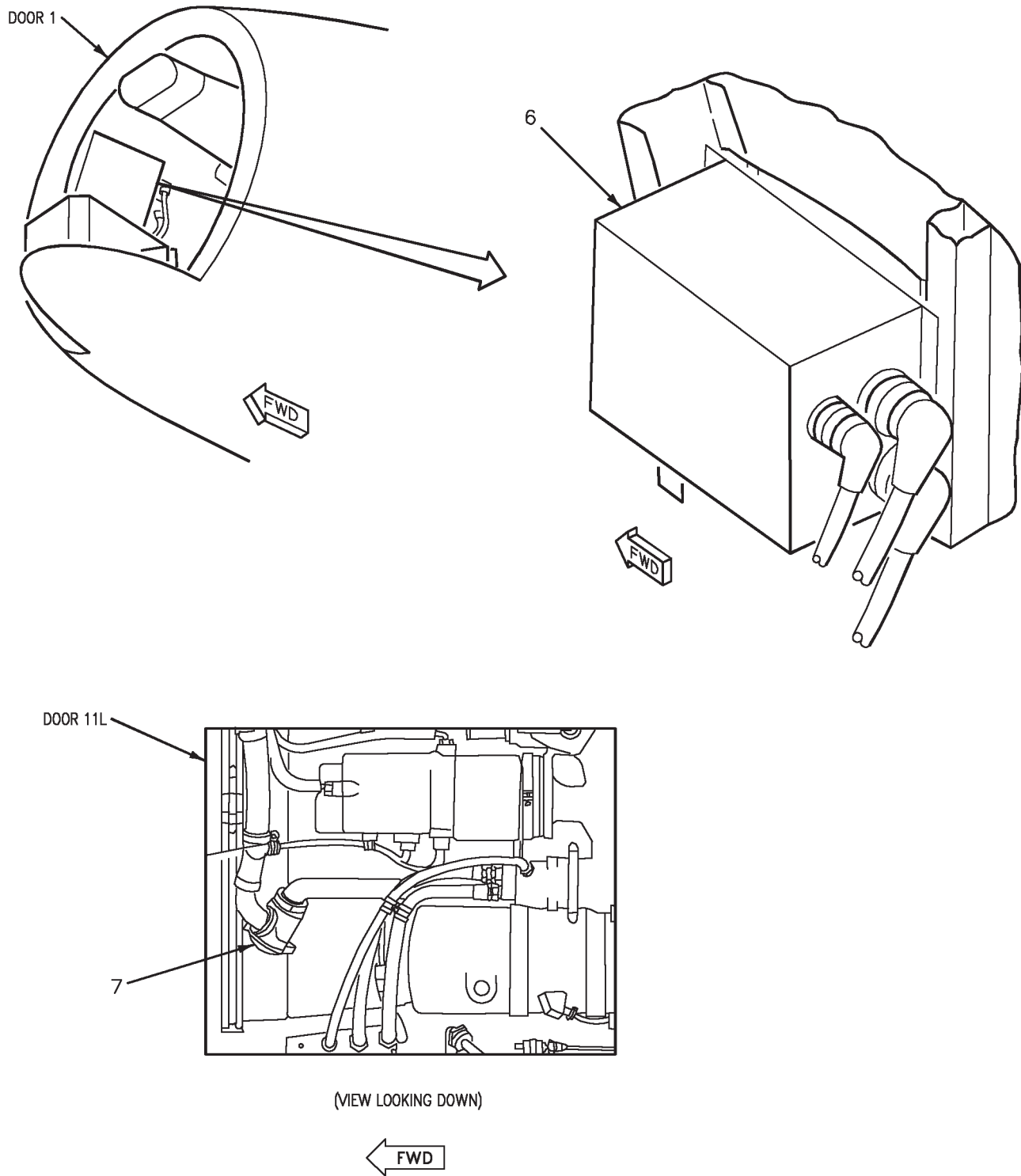
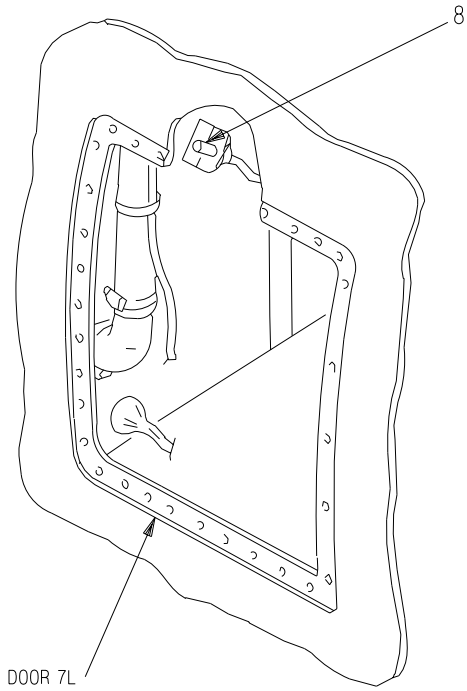
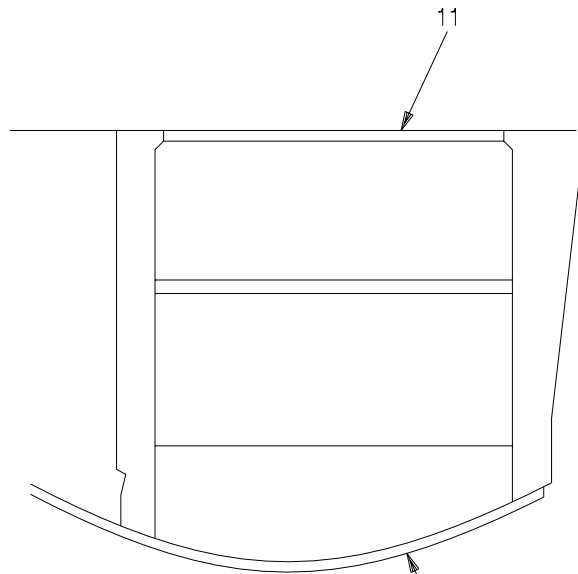
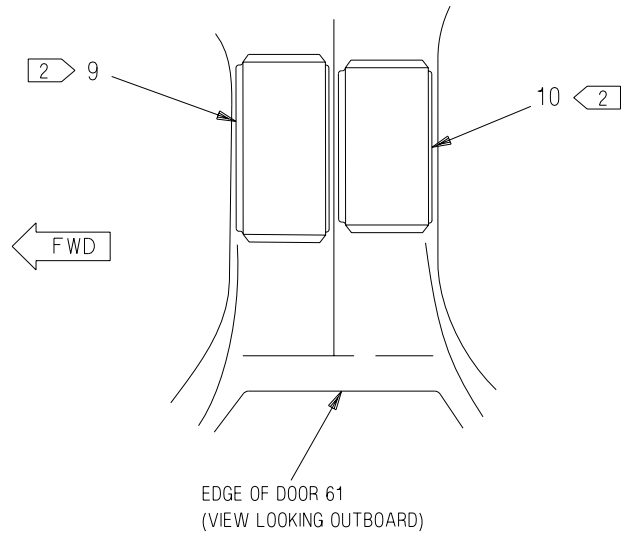


Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 2)



INTERNAL DOOR CPE NOT SHOWN FOR CLARITY



EDGE OF DOOR 10
(VIEW LOOKING AFT)

Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 3)

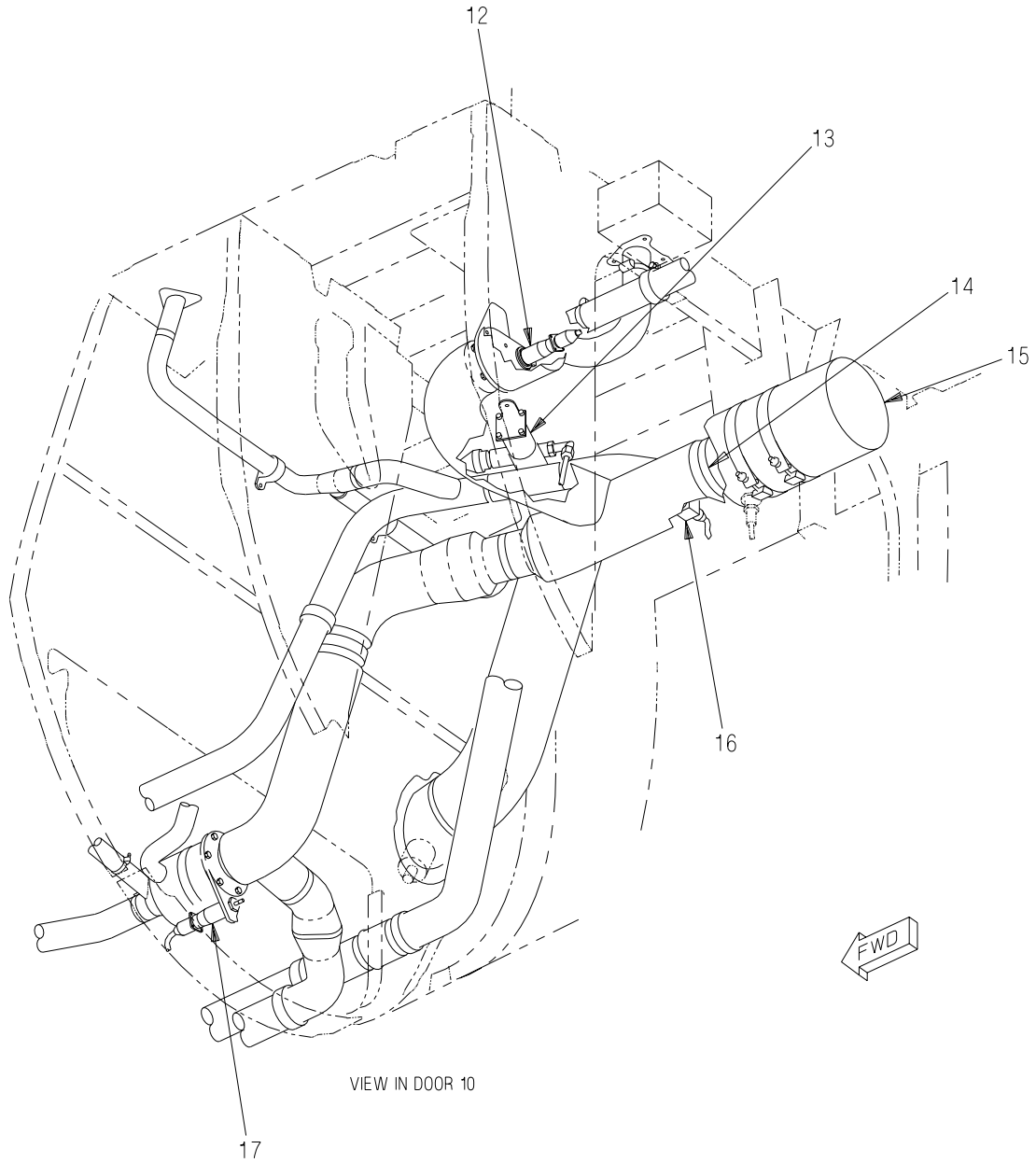
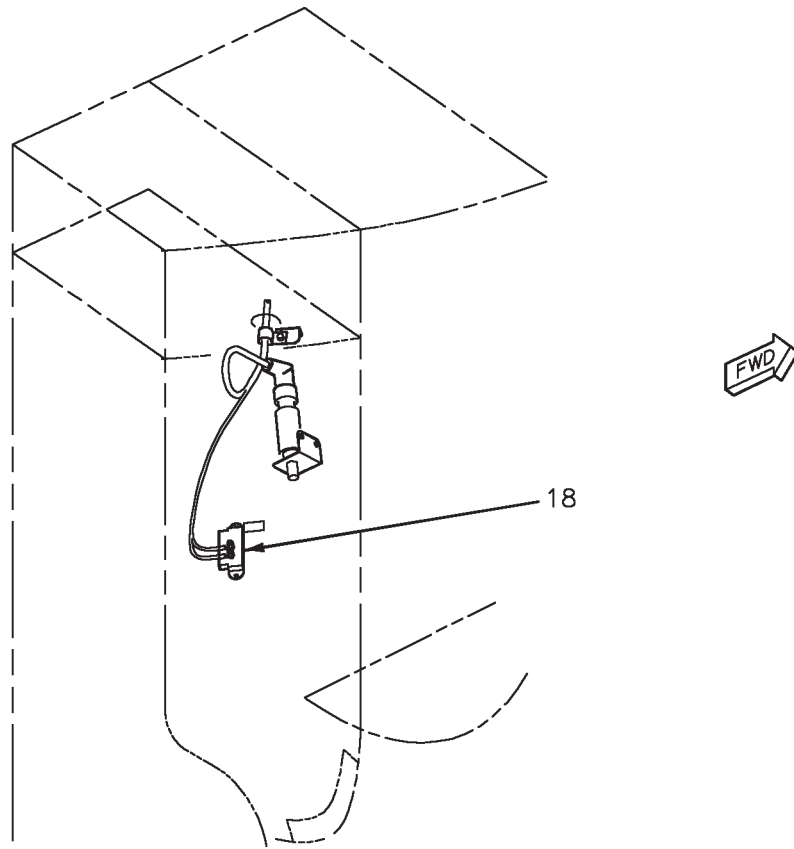


Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 4)



(VIEW LOOKING UP, LEFT SIDE NLG WHEEL WELL)

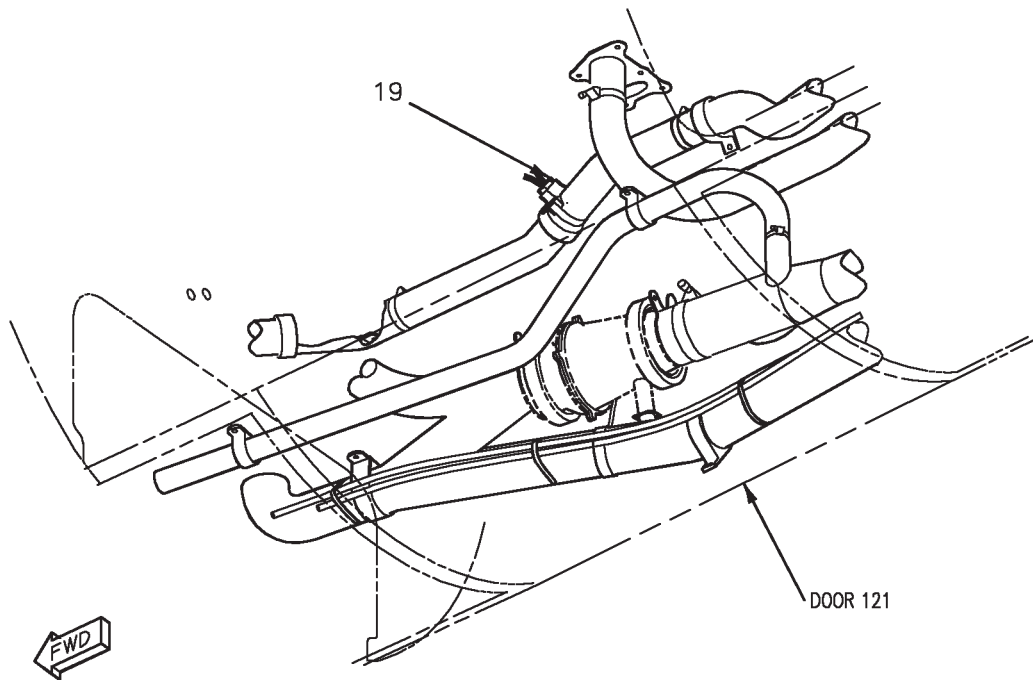


Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 5)

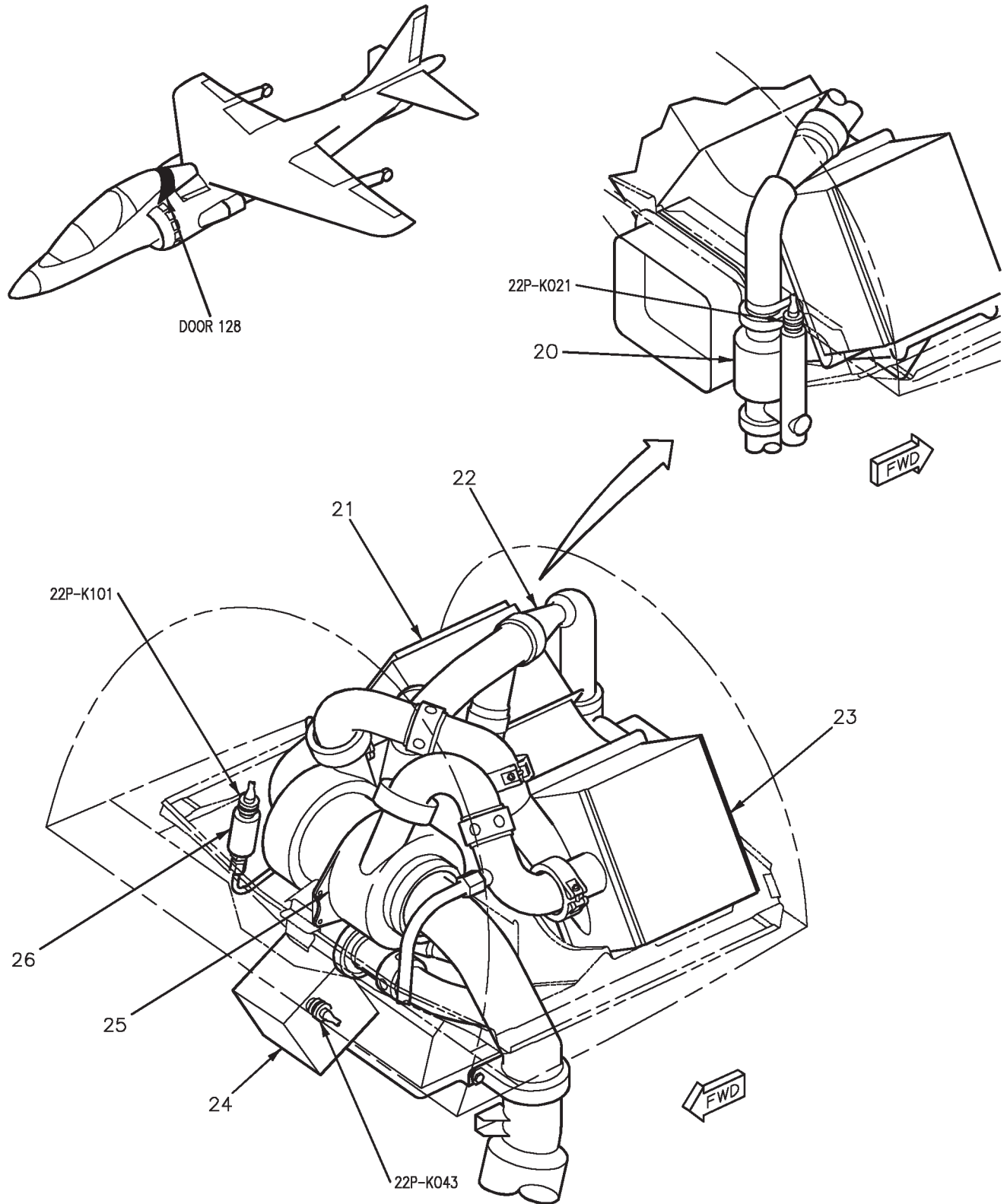
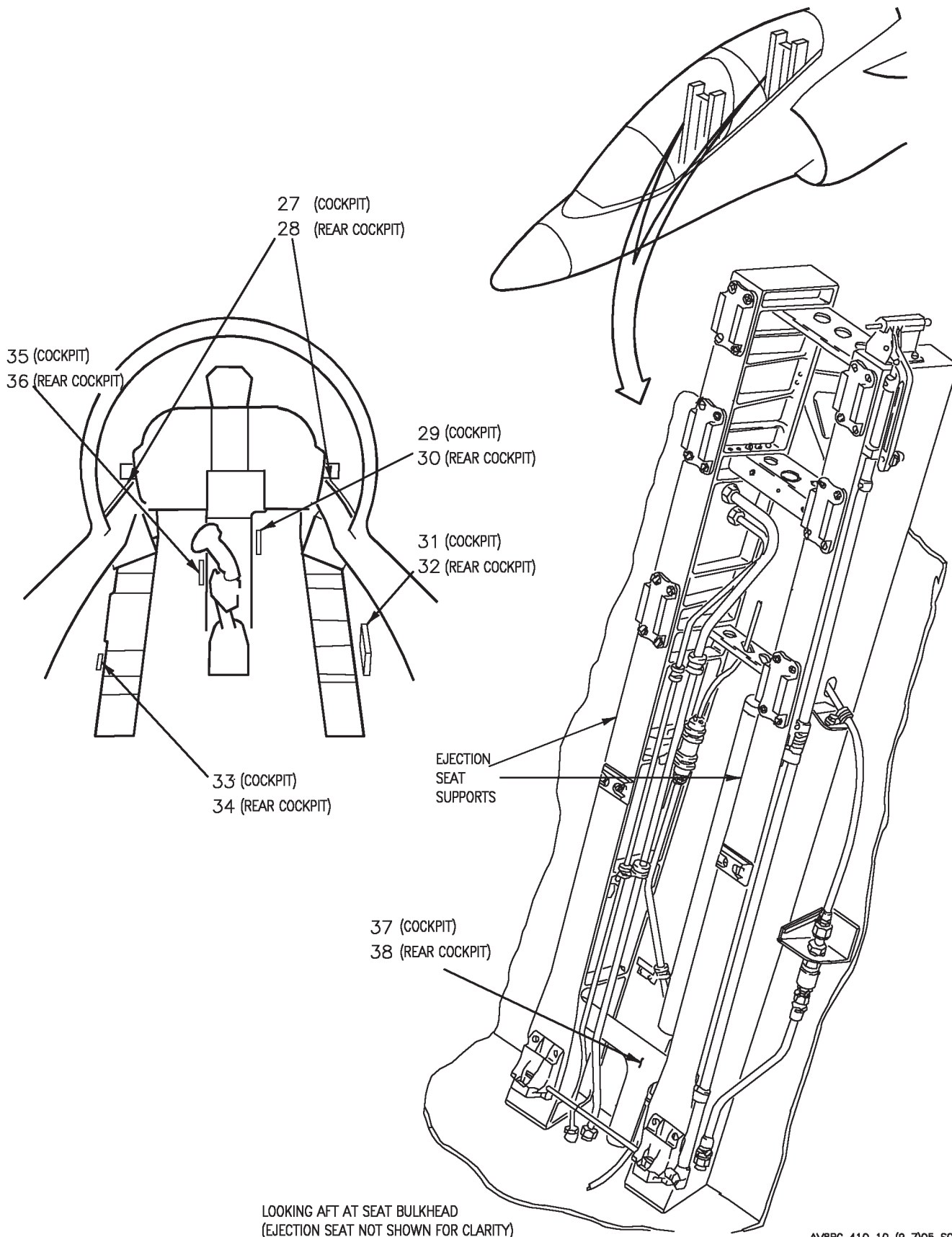


Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 6)



LOOKING AFT AT SEAT BULKHEAD
(EJECTION SEAT NOT SHOWN FOR CLARITY)

Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 7)

Nomenclature	Index No.	Ref Des
ANNUNCIATOR LIGHT CONTROLLER	6	27A-D007
BULKHEAD MOUNTED EQUIPMENT COOLING NOZZLE	37	—
CABIN ECS AIR FILTER ASSEMBLY	7	22FAJ506
CABIN ECS CHECK VALVE	14	22MAD509
CABIN ECS PRESSURE REGULATING AND SHUTOFF VALVE	20	22L-K021
CABIN TEMPERATURE SENSOR	8	22R-E045
CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY WSHLD CAUTION LIGHT	3	27A-F011 —
COLD AIR UNIT	25	22MAK507
<div style="border: 1px solid black; display: inline-block; padding: 2px;">1</div> DC CIRCUIT BREAKER PANEL ASSEMBLY CABIN ECS NO. 2 (ZONE B3) CAB ECS NO. 1 (ZONE D7) CKPT TEMP RLY (ZONE B12) VENT/DEFOG (ZONE D8)	1	52A-C104 22CBC015 22CBC016 22CBC041 22CBC068
<div style="border: 1px solid black; display: inline-block; padding: 2px;">2</div> DC EMERGENCY PANEL ASSEMBLY CABIN ECS CB NO. 2 (ZONE F8) CKPT TEMP RELAY (ZONE F10)	10	52A-P132 22CBP015 22CBP068
<div style="border: 1px solid black; display: inline-block; padding: 2px;">2</div> DC ESSENTIAL/MAIN PANEL ASSEMBLY CABIN ECS CB NO. 1 (ZONE D3) VENT/DEFOG (ZONE E5)	9	52A-P133 22CBP016 22CBP068
DEFOG SHUTOFF VALVE	13	22L-D100
DUCT TEMPERATURE SENSOR	16	22R-D046
ECS CONTROL PANEL ASSEMBLY CABIN SWITCH CABIN TEMPERATURE CONTROL PRESS SWITCH	5	22A-F048 22S-F017 22A-F042 22S-F033
ECS PRESSURE SWITCH	26	22S-K101
FIXED CANOPY VENTILATION NOZZLES	28	—
FORWARD RELAY NO. 1 PANEL ASSEMBLY WINDSHIELD OVERTEMPERATURE RELAY MAX DEFOG RELAY	11	52A-C015 22K-C052 22K-C053

Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 8)

Nomenclature	Index No.	Ref Des
FORWARD RELAY NO. 2 PANEL ASSEMBLY WEIGHT ON WHEELS RELAY NO. 1	2	52A-C113 12K-C053
FORWARD VENT/DEFOG VALVE	17	22L-D019
LEFT CENTER ECS LOUVER	35	—
LEFT ECS LOUVER	33	—
PRIMARY HEAT EXCHANGER	21	—
REAR BULKHEAD MOUNTED EQUIPMENT COOLING NOZZLE	38	—
REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY WSHLD CAUTION LIGHT	4	27A-H045 —
REAR LEFT CENTER ECS LOUVER	36	—
REAR LEFT ECS LOUVER	34	—
REAR RIGHT CENTER ECS LOUVER	30	—
REAR RIGHT ECS LOUVER	32	—
REAR VENT/DEFOG VALVE	12	22L-C096
RIGHT CENTER ECS LOUVER	29	—
RIGHT ECS LOUVER	31	—
SECONDARY HEAT EXCHANGER	23	—
SKIN TEMPERATURE SENSOR	18	22R-B044
TEMPERATURE REGULATING VALVE	24	22L-K043
VENTURI/CHOKE	22	—
WATER SEPARATOR	15	22MAD508
WINDSHIELD DEFOG NOZZLES	27	—
WINDSHIELD OVERTEMPERATURE SWITCH	19	22S-D018

LEGEND

1 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.

2 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 1. Cabin Cooling and Defog System Component Locator (Sheet 9)

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

CABIN PRESSURIZATION SYSTEM

Reference Material

Electrical Systems.....	A1-AV8BB-420-100
DC Power System	WP004 00
Electrical Systems.....	A1-AV8BD-420-100
DC Power System	WP004 00
Environmental Control System	A1-AV8BC-410-100
Canopy Seal System	WP007 00
Description and Operation - Cabin Cooling and Defog System	WP004 00
Lighting Systems.....	A1-AV8BB-440-100
Interior Lighting System	WP005 00
Ejection Seat and Canopy System	A1-AV8BB-120-100
Canopy System Description and Operation.....	WP007 00

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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. DESCRIPTION.

check valves. The valve body is threaded at each end.

2. SYSTEM DESCRIPTION. The cabin is pressurized by conditioned air from the cabin cooling and defog system (WP004 00) to provide a comfortable, less fatiguing environment for the pilot. Pressurization is done by controlling the rate of airflow from the sealed cabin. The airflow is routed to equipment bays, where it augments avionics cooling.

3. COMPONENT DESCRIPTION. System components shown in figure 1 are described and listed in paragraphs below.

4. Cabin Dump Control Valve. The cabin dump control valve is a solenoid operated, two position air control valve. The valve is made up of a body with inlet and outlet connections and a solenoid with an electrical connection. The solenoid is mounted to the valve body.

5. Cabin Pressure Regulator and Safety Relief Check Valves. The cabin pressure regulator and safety relief check valves are poppet type, in line

6. Cabin Pressure Regulator. The cabin pressure regulator is an outflow valve and a self contained controller in a single unit. The outflow valve is made up of a base, outflow valve, actuator diaphragm, valve return spring, and a control chamber. The base includes the valve seat and forms the passage for discharge air from the pressurized area. The controller is made up of an orifice, filter, ground test valve, and two control systems: the isobaric control system and the differential control system.

7. Pressurized Compartment Altimeter AAU-38/A. The Pressurized Compartment Altimeter AAU-38/A is a self contained aneroid, single pointer, integrally lighted instrument. The altimeter measures and indicates cabin pressure from 0 to 50,000 feet. The altimeter face is graduated every 1000 feet, major increments each 5000 feet, and markings at the even major increments.

8. **Safety Relief Valve.** The safety relief valve is an outflow valve made up of a head section and a base section. The head section consists of a pressure relief metering valve, pressure relief calibration spring and two pressure relief control diaphragms. The base section consists of an outflow valve, mounting base and operating mechanism. The outflow valve provides the passage for discharge air from the pressurized area.

9. **Cabin Inlet Pressure Test Port.** The cabin inlet pressure test port is a capped port installed through the rear cockpit floor.

10. **Cabin Static Pressure Test Port.** The cabin static pressure test port is a capped port installed through the rear cockpit floor.

11. **RELATED SYSTEMS.** Related systems are described in paragraphs below.

12. **Cabin Cooling and Defog System.** The cabin cooling and defog system (WP004 00) provides conditioned air to pressurize the cabin. Air enters the sealed cabin through the cockpit ECS louvers, windshield defog nozzles and fixed canopy ventilation nozzles.

13. **Canopy Seal System.** The canopy seal system (WP007 00) provides an inflatable seal interface between the forward canopy, aft canopy, windshield arch, fixed canopy, and aircraft structure.

14. **Interior Lighting System.** The interior lighting system (A1-AV8BB-440-100, WP005 00) provides illumination for the Pressurized Compartment Altimeter AAU-38/A. Rotating the CONSL control, on the INTR LT control panel, varies altimeter lighting from off to bright. A lights test function is also provided.

15. **Aircraft Structure.** Cockpit floors, aft seat bulkhead, aircraft side skins, forward pressure bulkhead, windshield, and fixed canopy provide the pressurized area.

16. **Canopies.** The forward and aft canopies (A1-AV8BB-120-100, WP007 00), when locked closed, complete the pressurized area.

17. **DC Power System.** The DC power system on ■ 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or ■ 164113 AND UP; ALSO 162963 THRU 163861

AFTER AV8AFC-416 (A1-AV8BD-420-100, WP004 00) supplies emergency 28vdc power for the cabin pressurization system.

18. **SYSTEM CONTROLS AND INDICATORS.** System controls and indicators are described in paragraphs below.

19. **PRESS Switch.** The PRESS switch, located on the ECS control panel assembly, is a four pole lever lock toggle switch. The switch provides mode selection for cabin pressurization and on/off control of the cabin cooling and defog system. Refer to WP004 00 for cabin cooling and defog system. The switch has three positions; NORM, DUMP, and RAM. The switch is locked in all positions.

20. Setting the switch to DUMP or RAM from NORM, applies emergency 28vdc power to energize the cabin dump control valve.

21. Setting the switch to NORM from RAM or DUMP, removes emergency 28vdc power to deenergize the cabin dump control valve.

22. **Pressurized Compartment Altimeter AAU-38/A.** The Pressurized Compartment Altimeter AAU-38/A is located in the cockpit on the right vertical console. The altimeter senses and indicates cabin altitude. Cabin altitude is artificially created by the cabin pressurization system by regulating pressurized air exiting the sealed cabin. The altimeter has an aneroid (evacuated bellows) which expands and contracts in response to sensed changes in pressure. As the aneroid moves, a mechanical linkage moves the pointer to indicate cabin altitude.

23. The pilot can use the cabin altitude to compare with aircraft altitude. With this comparison, the pilot can determine whether the cabin is over, under, or correctly pressurized.

24. Illumination of the altimeter is provided by the interior lighting system.

25. **Ground Test Valve.** The ground test valve, located on the face of the cabin pressure regulator, is a manually operated three position selector valve. The valve handle is rotated to select normal flight or test positions. The three settings are FLIGHT, TEST ONLY DIFF ON, and TEST ONLY ALL OFF.

26. The FLIGHT position is used to provide automatic in-flight cabin pressurization control.

Cabin pressure will maintain the prescribed schedule as the aircraft altitude increases or decreases. The valve handle is lockwired to the FLIGHT position.

27. The TEST ONLY DIFF ON position is used to test the differential control portion of the cabin pressure regulator. Setting the handle to this position, renders the isobaric control portion of the regulator inoperative by closing the isobaric metering valve outlet. Only the differential control portion will operate.

28. The TEST ONLY ALL OFF position is used to test safety relief valve operation. Setting the handle to this position renders both the isobaric and differential control positions of the regulator inoperative by closing both the isobaric and differential metering valve outlets. The regulator will not operate and cabin pressure will be controlled by the safety relief valve.

29. **OPERATION.**

30. **COMPONENT OPERATION.**

NOTE

During normal operation of the cabin pressurization system, cabin pressure is controlled by air pressure measured in pounds per square inch (psi). Cabin pressure is the difference between cabin atmospheric pressure and ambient atmospheric pressure, expressed in pounds per square inch differential (psid). The psid value is used only during ground testing of the system. During normal flight, the cabin pressure is expressed as pressure altitude.

31. **Cabin Dump Control Valve.** The cabin dump control valve is located in the rear cockpit under the right vertical console. The valve is connected pneumatically to the cabin pressure regulator and safety relief valve. The valve allows the pilot to rapidly remove (dump) cabin pressure, if required.

32. Valve operation is controlled by the PRESS switch. With the valve deenergized, spring pressure in the valve closes the valve poppet. The poppet prevents control chamber pressure in the cabin pressure regulator and safety relief valve from venting to atmosphere. This allows normal operation of the regulator and relief valve.

33. With the valve energized, cabin pressure regulator and safety relief valve control chamber pressure is lost. Spring tension will open both regulator and relief valve allowing cabin pressure to dump.

34. **Cabin Pressure Regulator Check Valve.** The cabin pressure regulator check valve is located in door 1 in the cabin pressure regulator atmospheric vent line. The check valve will prevent a dual failure if the safety relief valve fails or leaks internally.

35. The cabin pressure regulator and safety relief valve control chambers are connected pneumatically. Without the check valve installed in the atmospheric vent line, if the safety relief valve failed or developed an internal leak, regulator control chamber pressure would also be lost. The check valve prevents control chamber pressure loss.

36. **Safety Relief Check Valve.** The safety relief check valve is located in the rear cockpit under the right vertical console in the atmospheric port of the safety relief valve. The check valve will prevent a dual failure if the cabin pressure regulator fails or leaks internally.

37. The safety relief valve and cabin pressure regulator control chambers are connected pneumatically. Without the check valve installed in the atmospheric vent line, relief valve control chamber pressure would be lost if the regulator developed an internal leak or failed. The check valve prevents control chamber pressure loss.

38. **Cabin Pressure Regulator.** The cabin pressure regulator, located outside the pressurized compartment in door 1, automatically controls cabin pressure throughout the aircraft flight envelope. The regulator has a three mode normal operating capability and a two mode ground test capability.

39. During normal flight, the regulator ground test valve handle is set to FLIGHT. This allows the regulator to operate in its three normal modes; unpressurized, isobaric, and differential.

40. In the unpressurized mode, pressure in the cabin is maintained slightly higher than atmospheric pressure. The unpressurized mode is from sea level to approximately 8000 feet. Control chamber pressure is enough to compress the isobaric bellows, keeping the isobaric metering valve open to the atmosphere. Control chamber pressure

A1-AV8BC-410-100

Change 6

006 00

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is cabin air that has entered the control chamber through the air filter and orifice. Since the orifice is smaller than the open isobaric metering valve port, control chamber pressure is slightly lower than outflow valve spring tension. The outflow valve will remain open, venting cabin air to atmosphere. Since

the amount of air venting from the cabin is less than the amount of air entering the cabin, cabin pressure will be slightly higher than ambient pressure. This mode will function until the aircraft altitude is approximately 8000 feet. The isobaric mode will then function.

41. In the isobaric mode, cabin pressure is maintained at a pressure equal to approximately 8000 feet while aircraft altitude is approximately 8000 to 23,100 feet.

42. Control chamber pressure constantly decreases with an increase in aircraft altitude. The decreased control chamber pressure cannot compress the isobaric bellows as much and the isobaric metering bellows begin to close. As metering valve closes, less control chamber pressure is vented. Pressure coming into the control chamber through the orifice and pressure venting to atmosphere through the now closing metering valve is balanced as aircraft altitude increases from 8000 to approximately 23,100 feet. The balanced pressures allow the cabin pressure regulator to maintain a constant cabin pressure in the isobaric mode.

43. As aircraft altitude increases above approximately 23,100 feet, the isobaric metering valve is fully closed. Closing the metering valve builds sufficient control chamber pressure to begin the differential mode of operation.

44. In the differential mode, cabin pressure is maintained at a constant differential pressure versus ambient pressure. The constant differential pressure is 5.00 ± 0.23 psid.

45. As aircraft altitude exceeds approximately 23,100 feet, the increasing control chamber pressure overcomes spring tension and moves the differential diaphragm mechanism. Moving the mechanism opens the differential metering valve which vents control chamber pressure. The venting causes a lower control chamber pressure which allows spring tension to open the outflow valve. The open valve vents enough cabin pressure to maintain a constant differential pressure of 5.00 ± 0.23 psid between cabin and ambient.

46. **Safety Relief Valve.** The safety relief valve is located in the rear cockpit under the right vertical console. The valve will limit cabin pressure to 5.35 ± 0.23 psid and provide negative pressure relief.

47. Cabin pressure enters the control chamber through the air filter screen. Control chamber pressure overrides outflow valve return spring tension and holds the outflow valve closed through the cabin pressure schedule. As control chamber pressure increases with cabin pressure to 5.35 ± 0.23 psid, control chamber pressure acts on the metering valve assembly diaphragm. Pressure on the

diaphragm overrides the pressure relief calibration spring. The metering valve assembly moves and the metering valve is off seated by the pressure relief calibration screw. The open metering valve vents the control chamber and allows the outflow valve return spring to open the outflow valve and vent excess cabin pressure. The safety relief valve works with smooth modulation rather than erratic relief.

48. Negative pressure is ambient pressure greater than cabin pressure. This occurs during rapid aircraft descent. Normal operation of the system cannot always react to change cabin pressure as fast as the aircraft can descend. When this occurs, the safety relief valve will open and allow ambient pressure to enter the cabin to equalize pressure.

49. The higher ambient pressure overrides the lower cabin and control chamber pressure and outflow valve return spring. The higher ambient pressure moves the outflow valve open to allow ambient pressure to enter the cabin. As the pressures equalize, the outflow valve will close under pressure from the outflow valve return spring.

50. **Cabin Inlet Pressure Test Port.** The cabin inlet pressure test port is located in the nose landing gear wheelwell. The test port allows a ground air source and a cabin pressure tester to be used for ground testing of the cabin pressurization system. The test port allows the external air to enter the cabin.

51. **Cabin Static Pressure Test Port.** The cabin static pressure test port is located in the nose landing gear wheelwell. The test port allows a ground air source and a cabin pressure tester to be used for ground testing of the cabin pressurization system. The test port allows the cabin pressure to be measured externally.

52. SYSTEM OPERATION.

53. Conditioned air from the cabin cooling and defog system (WP004 00) is controlled to maintain cabin pressure. The system operates in three modes, normal flight, ground test, and dump.

54. **Normal Flight.** During normal flight, air pressure entering the cabin also enters the control chambers of the cabin pressure regulator and the safety relief valve. The relief valve will remain closed until cabin pressure exceeds 5.35 ± 0.23 psid. The control chamber pressure in the regulator is not enough to close the outflow valve from sea level

to 8000 feet. Thus, cabin pressure will remain at slightly above ambient pressure until the aircraft arrives at 8000 feet.

55. As the aircraft reaches 8000 feet, cabin pressure entering the regulator control chamber is enough to act on the isobaric bellows which begins to move and close the isobaric metering valve. The closing metering valve allows control chamber pressure to build and close the outflow valve as required to maintain a cabin altitude of 8000 feet while aircraft altitude increases from 8000 to 23,100 feet.

56. As the aircraft reaches 23,100 feet, cabin pressure entering the regulator control chamber has fully closed the isobaric metering valve and begins to open the differential metering valve. The opening differential metering valve vents control chamber pressure to allow the regulator to maintain $5.00 \pm 0.23^{\circ}$ ba psid between cabin and ambient pressure. This schedule is maintained from 23,100 feet and higher.

57. If cabin pressure exceeds the regulator setting, the safety relief valve will open and relieve pressure. As cabin pressure increases to 5.35 ± 0.23 psid, control pressure in the relief valve which has held it closed is vented and the outflow valve return spring opens the valve.

58. In the event of negative cabin pressure, (cabin pressure less than ambient pressure) the lower control chamber pressure in the safety relief valve is not enough to hold the valve closed. The outflow

valve return spring opens the valve to equalize pressure.

59. **Ground Test.** The cabin pressure regulator has a ground test valve which allows the system to be tested on the ground. The ground test has two modes, TEST ONLY DIFF ON and TEST ONLY ALL OFF. The TEST ONLY DIFF ON mode allows the cabin pressure regulator to bypass the unpressurized and isobaric modes and maintain cabin pressure at the 5.00 ± 0.23 psid differential mode. The TEST ONLY ALL OFF mode allows the safety relief valve to regulate cabin pressure at 5.35 ± 0.23 psid and bypass the regulator setting entirely.

60. During ground testing, an external air source and special test equipment is required. Three test fittings are located in the nose landing gear wheelwell for test equipment hookup. One port provides an air inlet to the cabin, one provides cabin pressure sensing, and one provides pressure to the canopy pressure seal. Refer to WP007 00 for canopy seal system.

61. **Dump.** The dump mode allows all cabin pressure to be removed (dump) from the cabin. If fumes or smoke enter the cabin, the pilot can select DUMP with the PRESS switch. This will open the cabin dump control valve, venting control chamber pressure and opening the cabin pressure regulator and relief valve. Cabin pressure drops and vents the cabin. Selecting RAM with the PRESS switch will also dump cabin pressure and disable the cabin cooling and defog system (WP004 00).

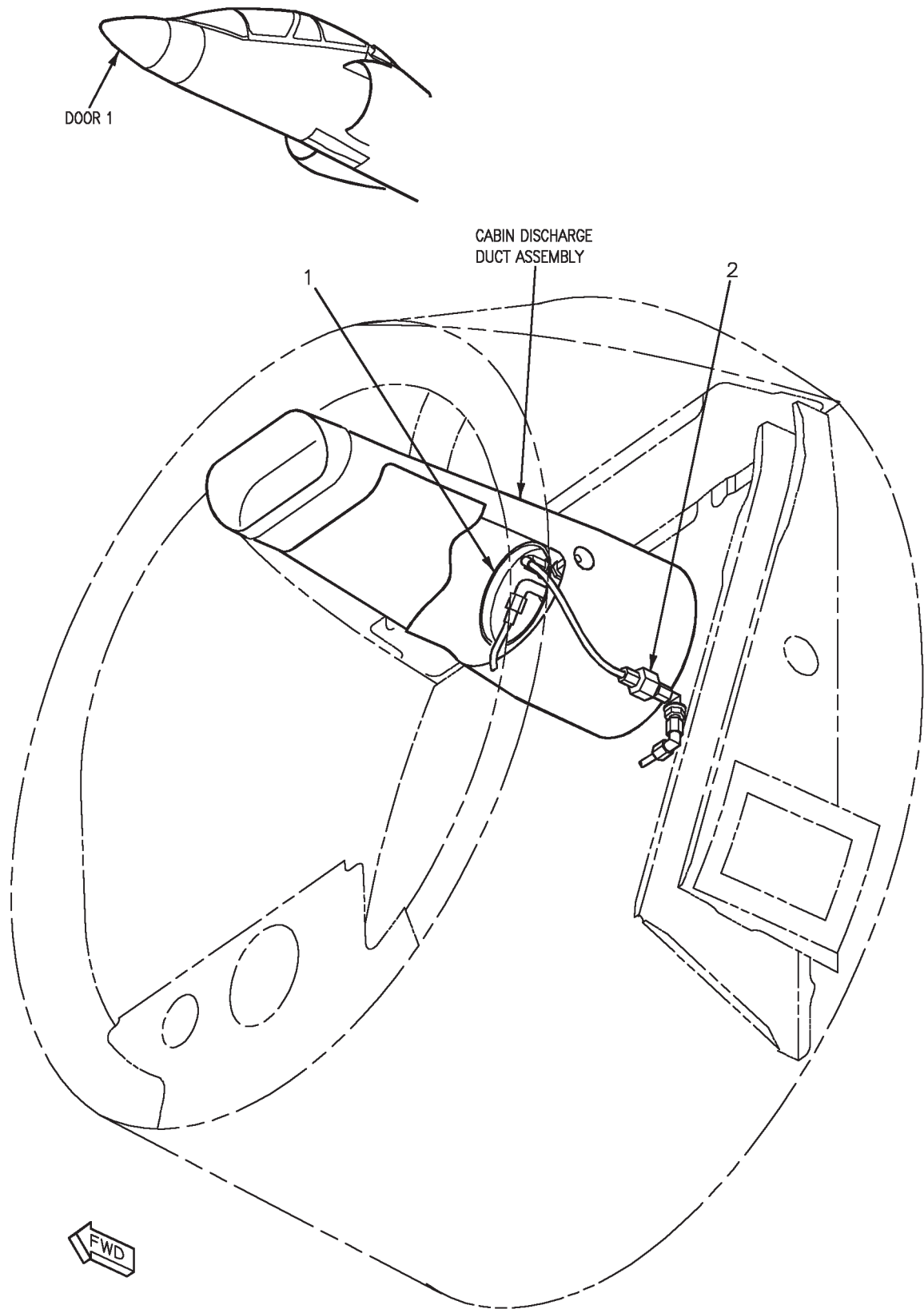


Figure 1. Cabin Pressurization System Component Locator (Sheet 1)

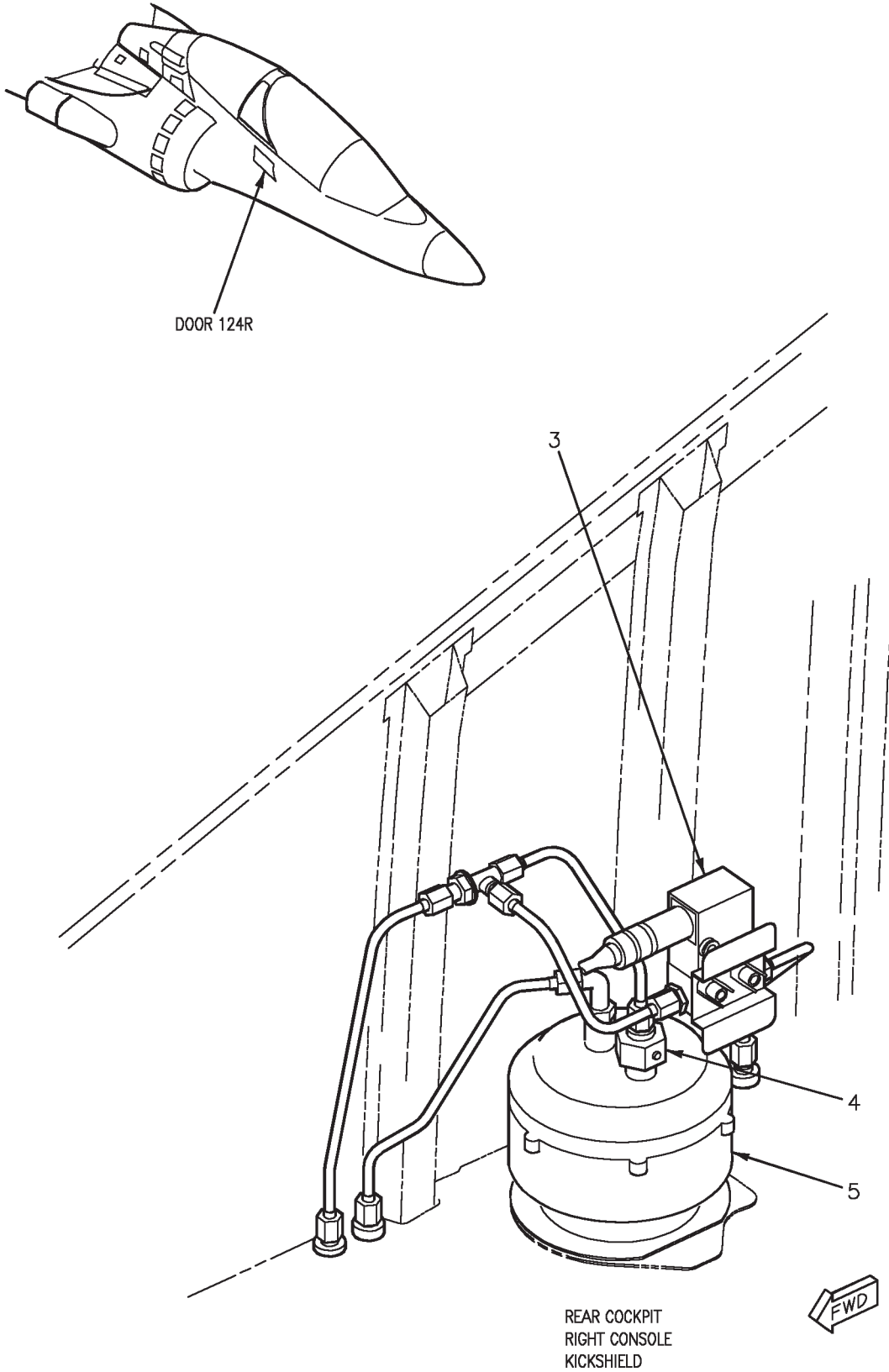


Figure 1. Cabin Pressurization System Component Locator (Sheet 2)

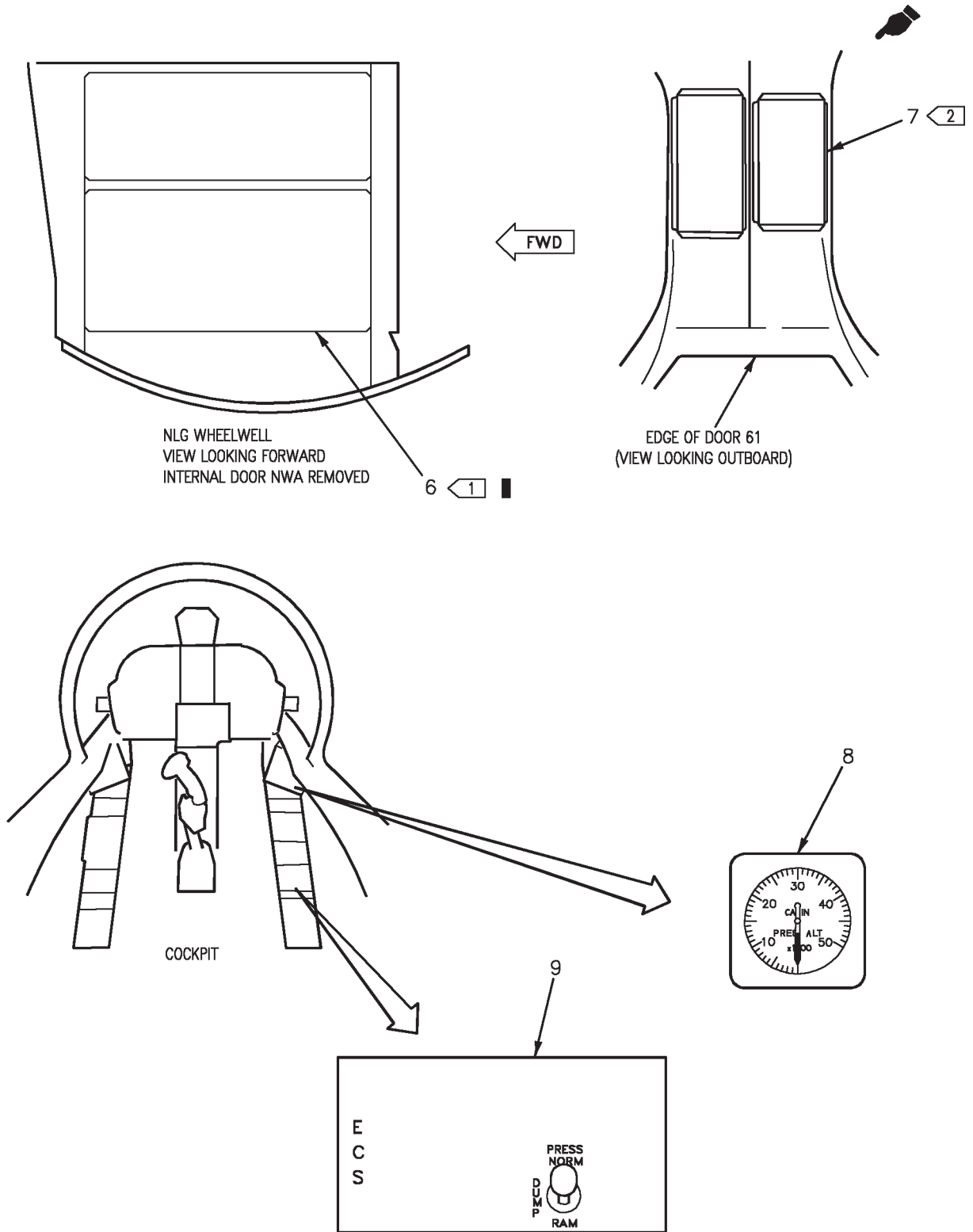


Figure 1. Cabin Pressurization System Component Locator (Sheet 3)

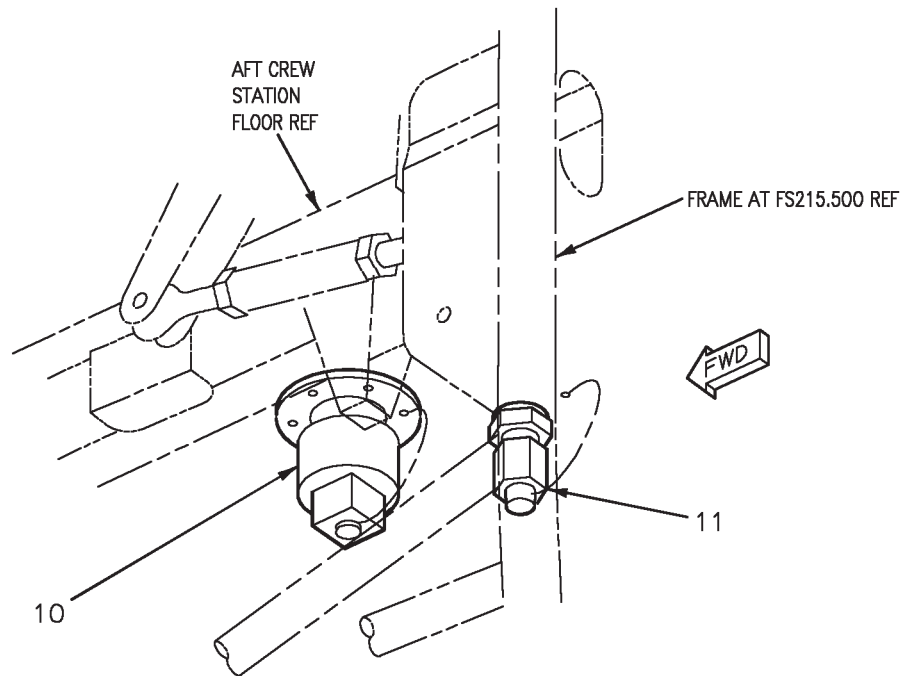
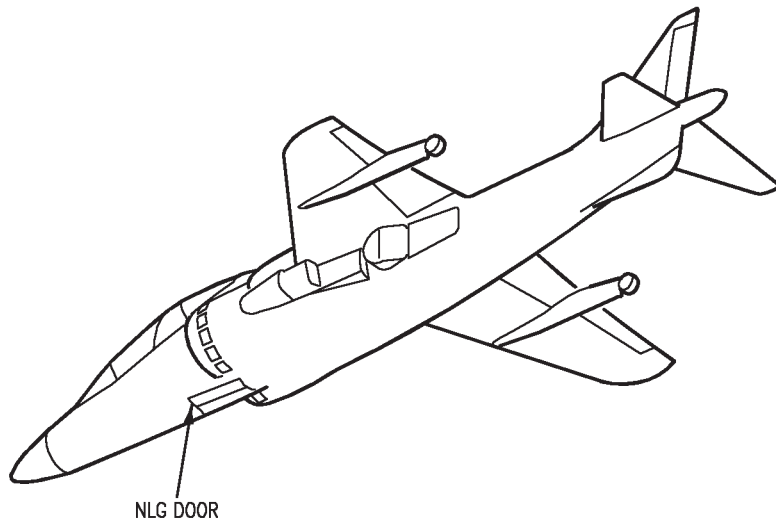


Figure 1. Cabin Pressurization System Component Locator (Sheet 4)

Nomenclature	Index No.	Ref Des
CABIN DUMP CONTROL VALVE	3	22L-H034
CABIN INLET PRESSURE TEST PORT	10	—
CABIN PRESSURE REGULATOR	1	22VAA504
CABIN PRESSURE REGULATOR CHECK VALVE	2	22VAA501
CABIN STATIC PRESSURE TEST PORT	11	—
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">1</div> DC CIRCUIT BREAKER PANEL ASSEMBLY CAB DMP CONT CB (ZONE B2)	6	52A-C104 22CBC032
<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">2</div> DC EMERGENCY PANEL ASSEMBLY CAB PRESS CONTROL CB (ZONE F9)	7	52A-P132 22CBP032
ECS CONTROL PANEL ASSEMBLY PRESS SWITCH	9	22A-F048 22S-F033
PRESSURIZED COMPARTMENT ALTIMETER AAU-38/A	8	8M-F072
SAFETY RELIEF CHECK VALVE	4	22VAH524
SAFETY RELIEF VALVE	5	22VAH525

LEGEND

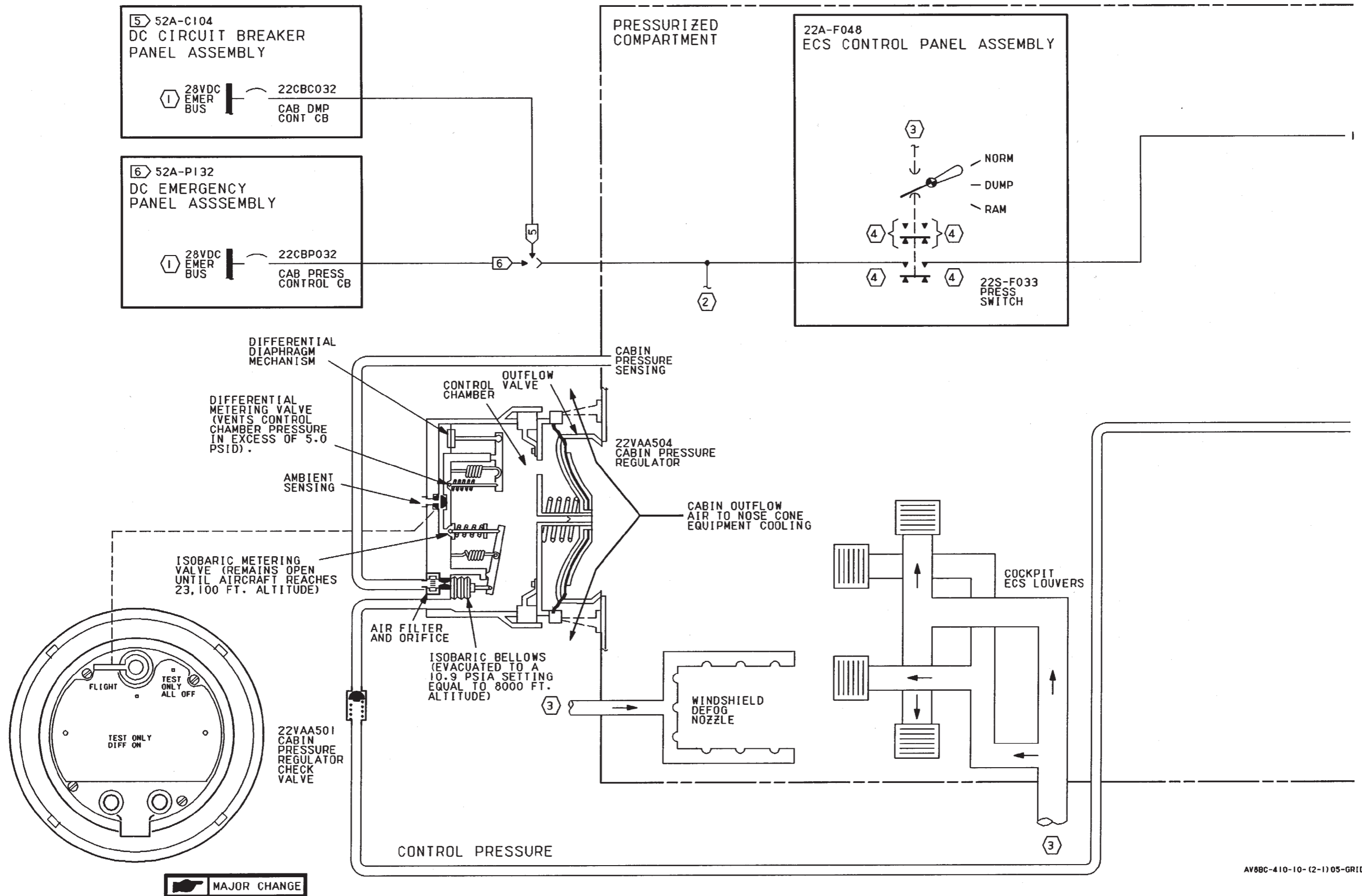
1

 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.

2

 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 1. Cabin Pressurization System Component Locator (Sheet 5)

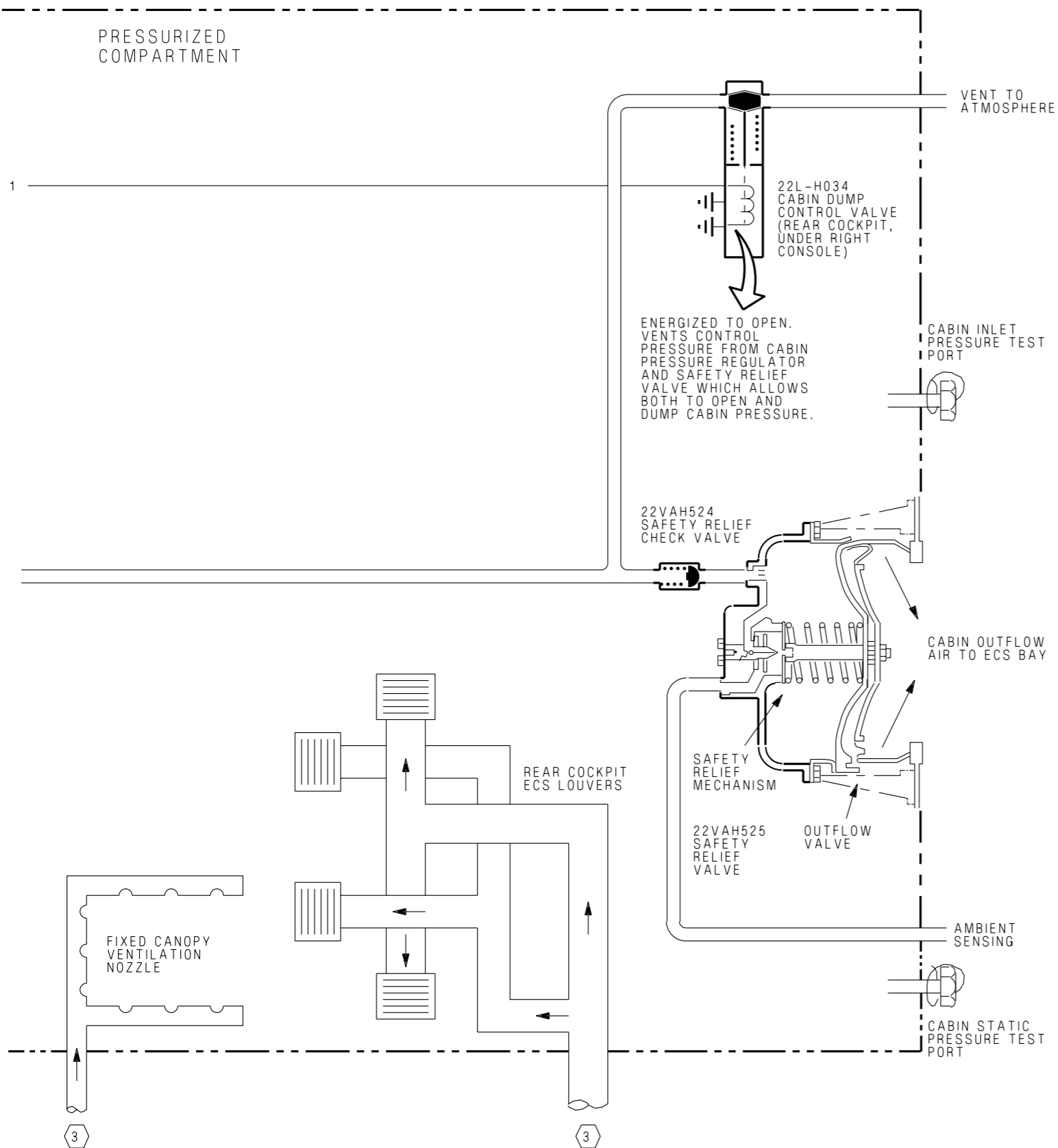


AV8BC-410-10-(2-1)05-GRID

Figure 2. Cabin Pressurization System Simplified Schematic (Sheet 1)

Figure 2.

Figure 2.



LEGEND

- 1 5 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP005 00.
- 6 6 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP005 00.
- 2 CANOPY SEAL SYSTEM SIMPLIFIED SCHEMATIC, WP007 00.
- 3 CABIN COOLING AND DEFOG SYSTEM SIMPLIFIED SCHEMATIC, WP004 00.
- 4 PIN NOT USED.
- 5 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.
- 6 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 2.

Figure 2. Cabin Pressurization System Simplified Schematic (Sheet 2)

Figure 2.

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

CANOPY SEAL SYSTEM

Reference Material

Ejection Seat and Canopy System	A1-AV8BB-120-100
Canopy System Description and Operation.....	WP007 00
Environmental Control System	A1-AV8BC-410-100
Description and Operation - Cabin Cooling and Defog System	WP004 00
Description and Operation - Cabin Pressurization System.....	WP006 00
Description and Operation - Anti-G System	WP009 00
Electrical Systems.....	A1-AV8BB-420-100
DC Power System	WP004 00
Electrical Systems.....	A1-AV8BD-420-100
DC Power System	WP004 00
Landing Gear and Related Systems.....	A1-AV8BB-130-100
Landing Gear System.....	WP003 00

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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. DESCRIPTION.

2. SYSTEM DESCRIPTION. The canopy seal system provides a pressure regulated seal between the windshield arch, canopy sills, forward canopy, aft canopy, and fixed canopy. Pneumatic pressure for the canopy seal system is supplied from the cabin cooling and defog system (WP004 00) or from an external air source through the anti-g/canopy seal test port.

3. COMPONENT DESCRIPTION. System components shown in figure 1 are described and listed in paragraphs below.

4. Anti-G/Canopy Seal Check Valve. The anti-g/canopy seal check valve is a poppet type in line check valve.

5. Anti-G/Canopy Seal Test Port. The anti-g/canopy seal test port is an in line capped tee.

6. Forward Canopy Pressure Seal. The forward canopy pressure seal is a single piece, tubular inflatable seal. The seal is made of silicone rubber reinforced with polyester.

7. Aft Canopy Pressure Seal. The aft canopy pressure seal is a single piece, tubular, inflatable

seal. The seal is made of silicone rubber reinforced with polyester.

8. Canopy Seal Control Valve. The canopy seal control valve is a solenoid operated, double acting air control valve. The valve is made up of a solenoid and a valve body with inlet, outlet, and vent connections.

9. Canopy Seal Pressure Regulator and Check Valve. The canopy seal pressure regulator and check valve is a pressure reducing valve, a check valve, and a pressure relief valve in a single unit.

10. RELATED SYSTEMS. Related systems are described in paragraphs below.

11. Cabin Cooling and Defog System. The cabin cooling and defog system (WP004 00) provides conditioned air to pressurize the forward and aft canopy pressure seals. Conditioned air is tapped off the outlet of the secondary heat exchanger. The air is transported by way of tubing to the canopy seal system.

12. Canopy System. The forward and aft canopy pressure seals are mounted in a track on the periphery of each canopy (A1-AV8BB-120-100, WP007 00).

A1-AV8BC-410-100

Change 7

007 00

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13. **DC Power System.** The DC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP004 00) supplies emergency 28vdc power for the canopy seal system.

14. **Landing Gear and Related Systems.** The landing gear system (A1-AV8BB-130-100, WP003 00) provides a weight on wheels signal for the canopy seal system through the MLG weight on wheels (WOW) switch and the weight on wheels relay no. 1.

15. **Aircraft Structure.** The forward and aft canopy pressure seals, when inflated, mate with and provide a pressure seal between the canopy sills, windshield arch, and fixed canopy.

16. SYSTEM CONTROLS AND INDICATORS.

17. **PRESS Switch.** The PRESS switch, located on the ECS control panel assembly, provides on/off control for the cabin cooling and defog system (WP004 00) and mode selection for the cabin pressurization system (WP006 00). The switch has three positions; NORM, DUMP and RAM.

18. Setting the PRESS switch to RAM applies emergency 28vdc to energize the solenoid of the canopy seal control valve. With the canopy seal control valve energized both canopy pressure seals will deflate.

19. OPERATION.

20. COMPONENT OPERATION.

21. **Anti-G/Canopy Seal Check Valve.** The anti-g/canopy seal check valve is located between the primary heat exchanger and the expansion turbine inlet of the cold air unit (WP004 00). The check valve allows air flow in one direction only. With air pressure applied, spring tension is overcome by air pressure and the check valve opens to allow air flow. With no air pressure applied, the valve is held closed by spring tension, allowing no reverse air flow. If cabin cooling and defog system pressure is lost, the check valve will hold canopy seal system and anti-g system (WP009 00) pressure.

22. The check valve also isolates the canopy seal system for ground operation. With the normal air source off, a ground air source can be connected to the anti-g/canopy seal test port. The check valve will prevent loss of ground air source air through the nonoperating normal system.

23. **Anti-G/Canopy Seal Test Port.** The anti-g/canopy seal test port is a capped tee located in the nose wheelwell. The test port allows a ground air source to be used for ground testing of the canopy seal system.

24. The test port is tapped into the anti-g/canopy seal line between the anti-g/canopy seal check valve and the canopy seal pressure regulator and check valve. The ground air source connected to the test port is isolated by the anti-g/canopy seal check

valve. The system operates identically with either the normal air source or ground air source in use.

25. **Forward Canopy Pressure Seal.** The forward canopy pressure seal is installed in a track on the periphery of the forward canopy. A flexible inlet tube on the aft end of the seal connects the seal pneumatically with the canopy seal system.

26. The seal is inflated to provide a pressure tight air seal between the forward canopy sill, windshield arch, fixed canopy, and forward canopy frame. The seal is inflated to approximately 20 ± 1 psi with regulated air from the canopy seal control valve. When inflated, the seal expands approximately 3/8 inch. When deflated, the seal collapses into itself so not to interfere with canopy opening and closing.

27. **Aft Canopy Pressure Seal.** The aft canopy pressure seal is installed in a track on the periphery of the aft canopy. It is functionally identical to the forward canopy pressure seal.

28. **Canopy Seal Control Valve.** The canopy seal control valve is located in door 10. The valve passes conditioned air to inflate the forward and aft canopy pressure seals when deenergized and deflate the seals when energized.

29. The canopy seal control valve is energized through the PRESS switch when set to RAM and the weight on wheels relay no. 1 when aircraft weight is on wheels. The energized solenoid opens a vent and closes the supply to deflate the forward and aft canopy pressure seals.

30. The valve is deenergized with the PRESS switch set to NORM or DUMP and through the weight on wheels relay no. 1 when aircraft is weight off wheels. The deenergized solenoid closes a vent and opens the supply to inflate the forward and aft canopy pressure seals.

31. The canopy seal control valve functions identically whether the air source is from the cabin cooling and defog system or from a ground air source.

32. If an electrical failure of the aircraft or valve occurs, the valve solenoid will fail to the deenergized position, allowing the canopy pressure seals to inflate.

33. **Canopy Seal Pressure Regulator and Check Valve.** The canopy seal pressure regulator and check valve is located in door 10. The valve regulates conditioned air from the cabin cooling and defog system (WP004 00) or air from a ground air source to approximately 20 ±1 psi.

34. Air pressure enters the canopy seal pressure regulator and check valve through the check valve. The air pressure acts on the diaphragm moving it down against spring tension. Moving the diaphragm down begins to move the inlet valve towards its seat. The inlet valve will pass 20 ±1 psi. When the air pressure acting on the diaphragm is above 20 ±1 psi, the inlet valve will be closed. Further increasing pressure will move the diaphragm down away from the relief valve plate. An opening in the diaphragm and spring cup will pass air pressure in excess of 20 ±1 psi to the pressure relief valve.

35. The check valve prevents loss of canopy pressure seal pressure if the cabin cooling and defog system or ground air source pressure is lost.

36. **SYSTEM OPERATION.**

37. The canopy seal system (figure 2), provides an inflated seal between the canopies and surrounding structure. The forward canopy pressure seal and aft canopy pressure seal can be inflated by one of two air sources; the cabin cooling and defog system or a ground air source.

38. **Normal Operation.** The cabin cooling and defog system provides air to the canopy seal system

for normal operation. Conditioned air is tapped off the air duct between the secondary heat exchanger and the cold air unit. The air passes through the anti-g/canopy seal check valve. The check valve prevents loss of canopy seal system pressure if cabin cooling and defog system pressure is lost. The air is transported by way of tubing to the canopy seal pressure regulator and check valve where pressure is regulated to 20 ±1 psi. The regulated air then passes to the canopy seal control valve.

39. The canopy seal control valve is controlled electrically through the PRESS switch and the weight on wheels relay no. 1.

40. With the PRESS switch set to NORM or DUMP and aircraft weight off wheels, the canopy seal control valve is deenergized. Deenergizing the control valve closes a vent and opens the supply port allowing regulated air to pass through the control valve and inflate both canopy pressure seals.

41. Setting the PRESS switch to RAM or with aircraft weight on wheels the control valve is energized. Energizing the control valve closes the supply port and opens the vent. Air exits through the vent and both canopy seals deflate.

42. **Ground Operation.** Ground operation of the canopy seal system is the same as normal operation except for the air source. For ground operation, the anti-g/canopy seal test port is used to connect a ground air source to the system.

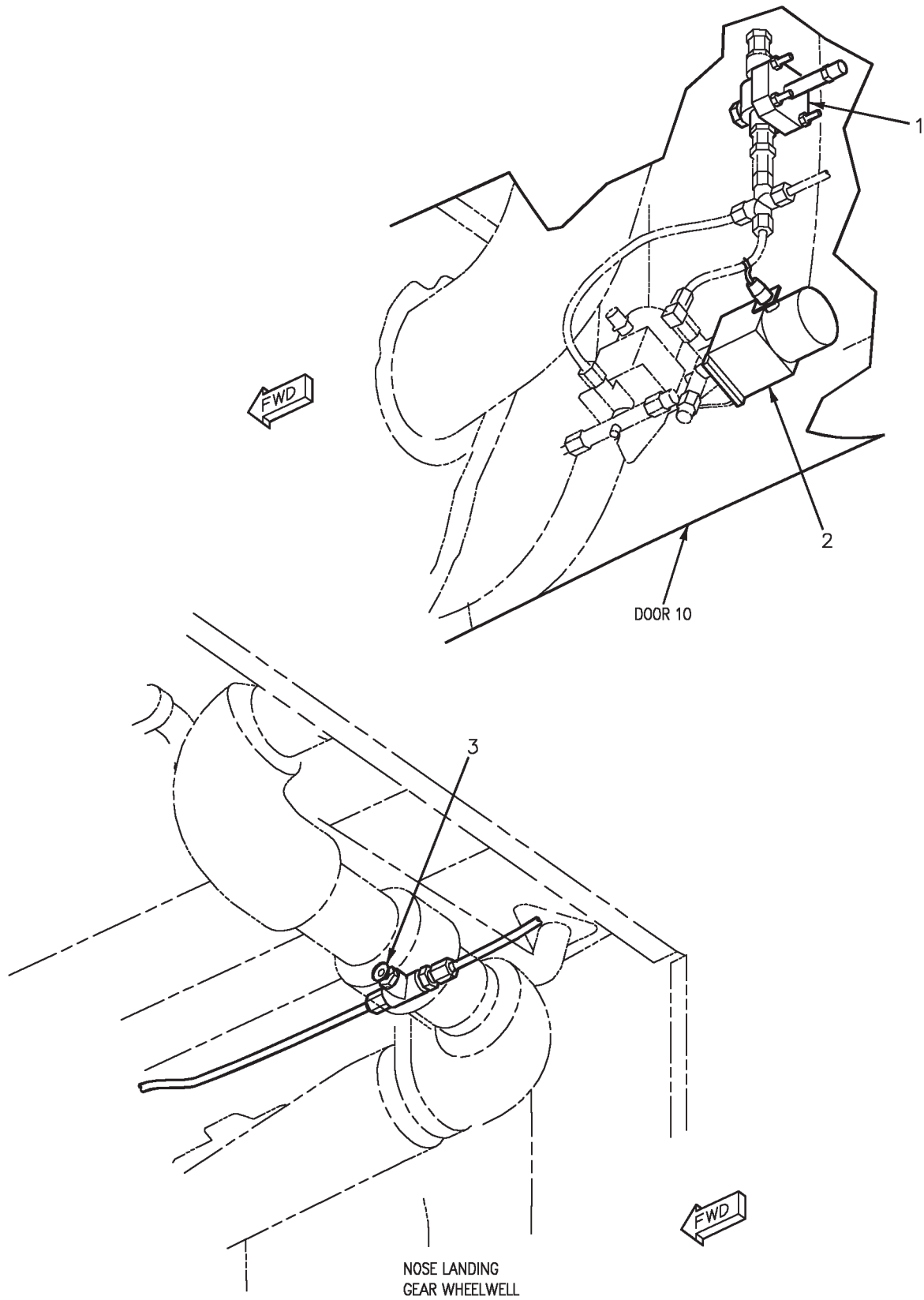


Figure 1. Canopy Seal System Component Locator (Sheet 1)

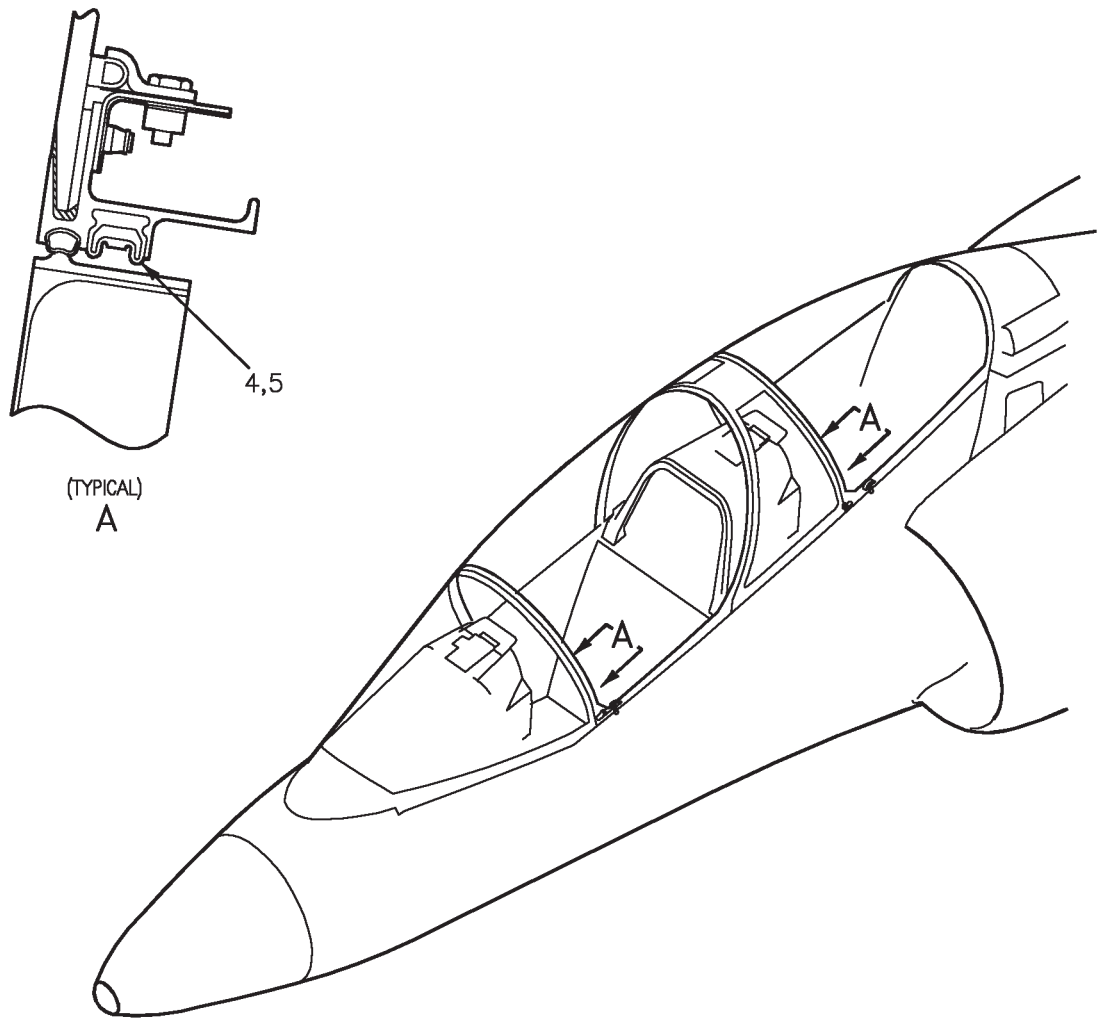


Figure 1. Canopy Seal System Component Locator (Sheet 2)

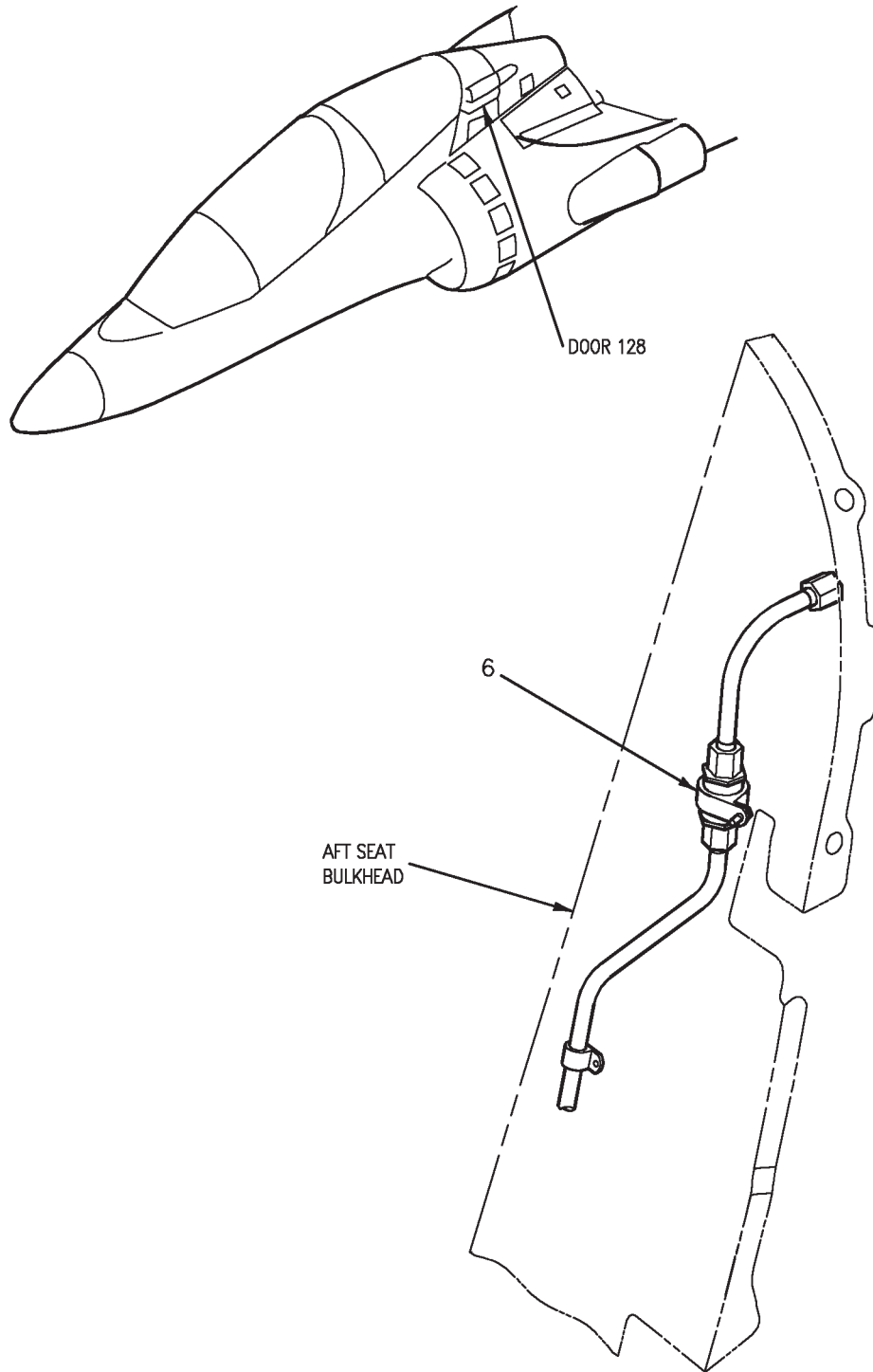


Figure 1. Canopy Seal System Component Locator (Sheet 3)

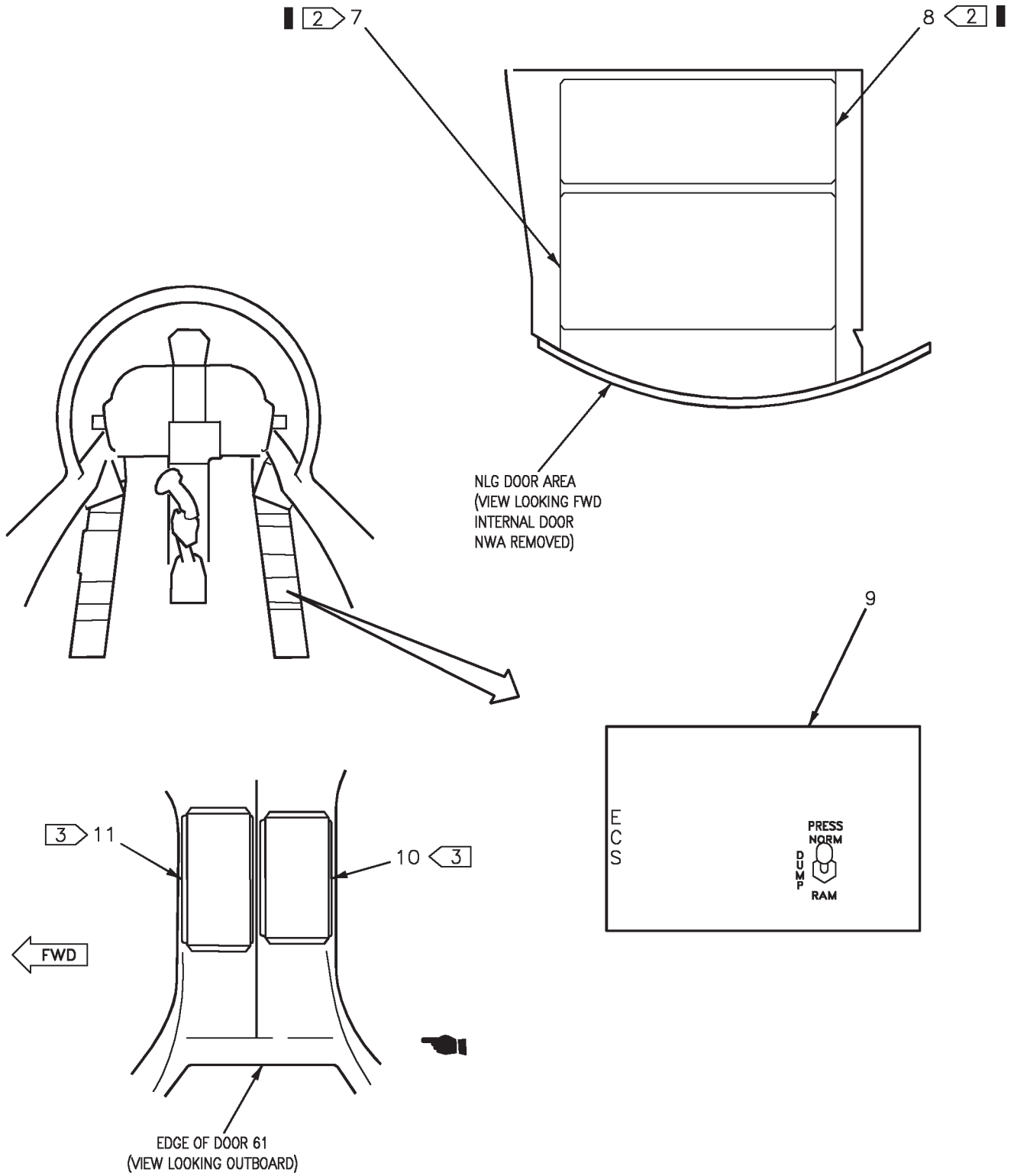


Figure 1. Canopy Seal System Component Locator (Sheet 4)

Nomenclature	Index No.	Ref Des
AFT CANOPY PRESSURE SEAL	5	—
ANTI-G/CANOPY SEAL CHECK VALVE	6	22VAK516
CANOPY SEAL CONTROL VALVE	2	22L-D031
CANOPY SEAL PRESSURE REGULATOR AND CHECK VALVE	1	22MAJ514
CANOPY SEAL WATER DRAIN VALVE	3	—
1 DC CIRCUIT BREAKER PANEL ASSEMBLY CAB ECS NO. 1 (ZONE D7) CABIN ECS NO. 2 (ZONE B3)	7	52A-C104 22CBC016 22CBC015
2 DC EMERGENCY PANEL ASSEMBLY CABIN ECS CB NO. 2 (ZONE F8)	10	52A-P132 22CBP015
2 DC ESSENTIAL/MAIN PANEL ASSEMBLY CABIN ECS CB NO. 1 (ZONE D3)	11	52A-P133 22CBP016
ECS CONTROL PANEL ASSEMBLY PRESS SWITCH	9	22A-F048 22S-F033
FORWARD CANOPY PRESSURE SEAL	4	—
FORWARD NO. 2 RELAY PANEL ASSEMBLY WEIGHT ON WHEELS RELAY NO. 1	8	52A-C113 12K-C053

LEGEND

1 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.

2 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 1. Canopy Seal System Component Locator (Sheet 5)

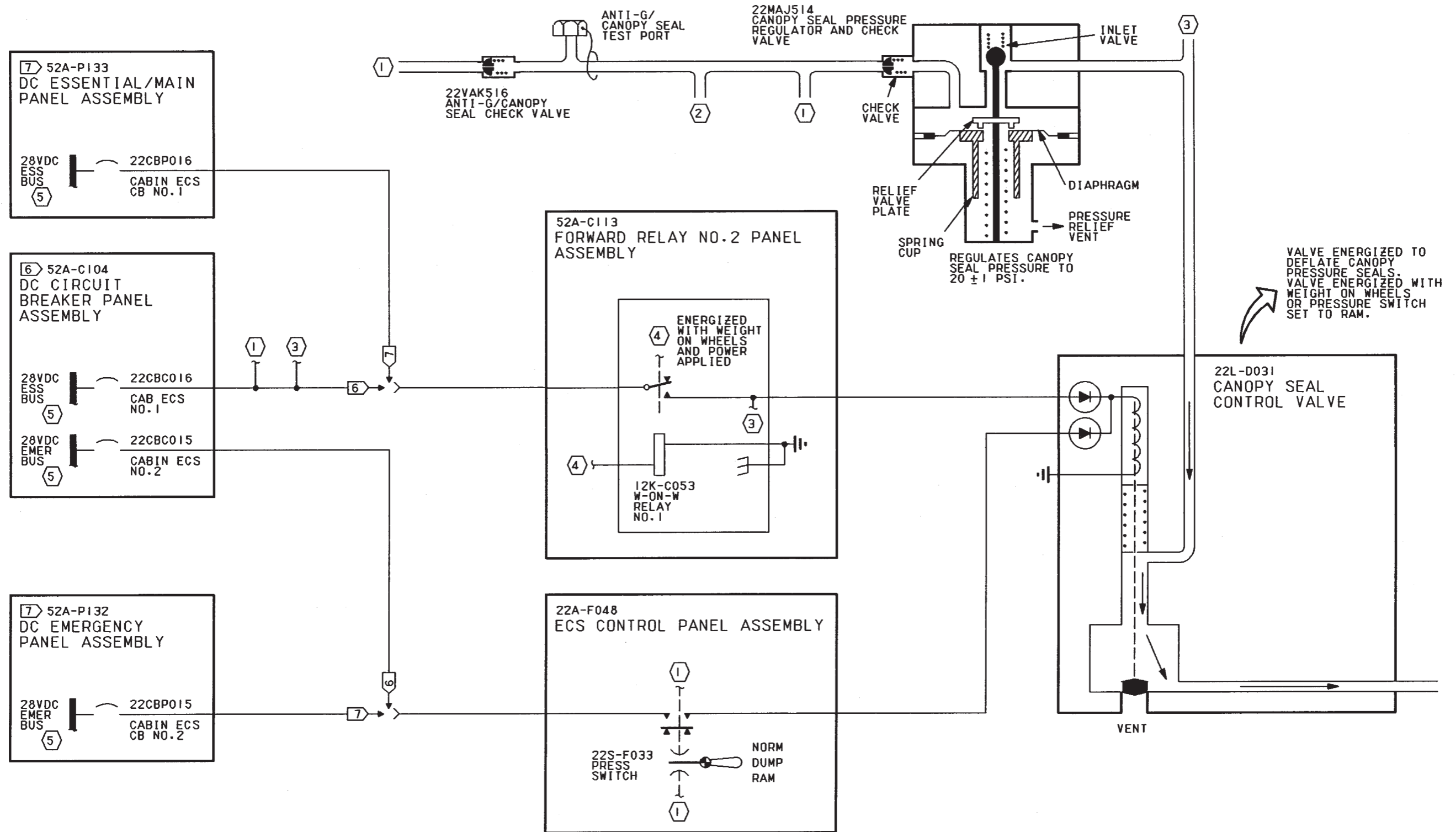
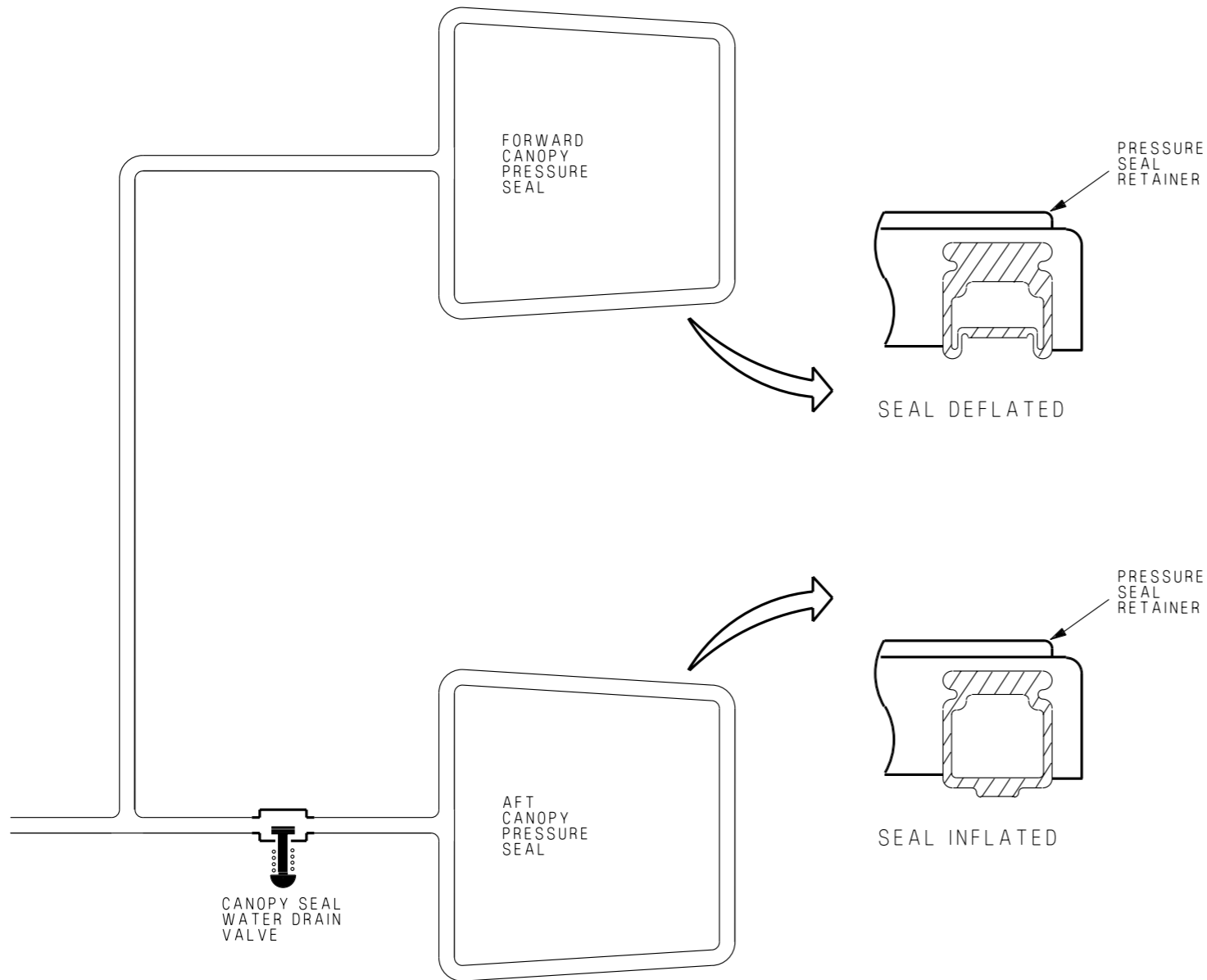


Figure 2. Canopy Seal System Simplified Schematic (Sheet 1)

Figure 2.

Figure 2.



LEGEND

- 1 CABIN COOLING AND DEFOG SYSTEM SIMPLIFIED SCHEMATIC, WP004 00.
- 2 ANTI-G SYSTEM SIMPLIFIED SCHEMATIC, WP009 00.
- 3 6 FORWARD AVIONICS COOLING SYSTEM SIMPLIFIED SCHEMATIC - 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416, WP008 00.
- 7 FORWARD AVIONICS COOLING SYSTEM SIMPLIFIED SCHEMATIC - 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416, WP008 00.
- 4 LANDING GEAR CONTROLLED RELAYS SIMPLIFIED SCHEMATIC, A1-AV8BB-130-100, WP005 00.
- 5 6 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP005 00.
- 7 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP005 00.
- 6 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.
- 7 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

Figure 2.

Figure 2. Canopy Seal System Simplified Schematic (Sheet 2)

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

FORWARD AVIONICS COOLING SYSTEM

Reference Material

Air Data Computer System	A1-AV8BB-560-100
Operation.....	WP005 00
Electrical Systems.....	A1-AV8BB-420-100
AC Power System	WP003 00
DC Power System	WP004 00
External Electrical Power System.....	WP006 00
Electrical Systems.....	A1-AV8BD-420-100
AC Power System	WP003 00
DC Power System	WP004 00
External Electrical Power System.....	WP006 00
Environmental Control System	A1-AV8BC-410-100
Description and Operation - Cabin Cooling and Defog System	WP004 00
Cabin Pressurization System.....	WP006 00
Landing Gear and Related Systems.....	A1-AV8BB-130-100
Landing Gear System.....	WP003 00
Lighting System	A1-AV8BB-440-100
Warning/Caution/Advisory Lighting System.....	WP007 00

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Ground Cooling Fan	3
Ground Cooling Valve	3
INS Check Valve.....	3
INS Plenum Check Valve	3
Ram Air Inlet.....	3
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INS Plenum Check Valve	7
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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. DESCRIPTION.

2. **SYSTEM DESCRIPTION.** The forward avionics cooling system provides a temperature controlled environment for forward fuselage mounted avionics equipment. Avionics equipment mounted in the forward and rear cockpits is cooled by air pulled across the equipment by the cooling fans. Forward fuselage mounted equipment is cooled several ways. During normal operation, conditioned air from the cabin cooling and defog system (WP004 00) is transported, by way of ducting, to individual components. Airflow from the cabin pressurization system (WP006 00) is routed to equipment bays, where it augments avionics cooling. During ground or emergency operation, ambient air is pulled in by the ground cooling fan and transported, by way of ducting, to individual components.

3. **COMPONENT DESCRIPTION.** System components shown in figure 1 are described and listed in paragraphs below.

4. **Anti-G/Canopy Seal Test Port.** The anti-g/canopy seal test port is an inline capped tee fitting.

5. **Avionics Cooling Air Fittings.** Several different types of fittings are used. Cooling requirements and mounting provisions vary for different avionics units. Some fittings are collapsible, self sealing assemblies. Other fittings are duct flanges. Fittings may or may not include filters and/or orifices.

6. **Cockpit Avionics Cooling Fan.** The cockpit avionics cooling fan is an electrically driven, axial flow fan. The fan includes a flow sensor, 3 phase 400 Hz electrical motor and shaft, rotor assembly, and housing.

7. **Rear Cockpit Avionics Cooling Fan.** The rear cockpit avionics cooling fan is identical to the cockpit avionics cooling fan.

8. **Ground Cooling Control Valve.** The ground cooling control valve is a solenoid operated, double acting air control valve.

9. **Ground Cooling Fan.** The ground cooling fan is an electrically driven axial flow fan. The fan is made up of a flow impeller mounted directly to the shaft of a 3 phase, 400 Hz electrical motor.

10. **Ground Cooling Valve.** The ground cooling valve is a pneumatically controlled and actuated shutoff valve. The valve is made up of a housing which contains a piston attached to a springloaded diaphragm that controls a hinged valve. The valve has an air inlet port.

11. **Ram Air Inlet.** The ram air inlet is an opening in aircraft skin at the base of the windshield.

12. **Ram Air Vent Check Valve.** The ram air vent check valve is a flapper type, spring loaded, check valve.

13. **Speed Sensor.** The speed sensor is an electronic processing unit in a sealed case.

14. **INS Check Valve.** The INS check valve is a flapper type spring loaded check valve.

15. **INS Plenum Check Valve.** The INS plenum check valve is a spring loaded check valve.

16. **Cockpit Differential Pressure Switch.** The cockpit differential pressure switch is a normally closed, pneumatically controlled, pressure switch. The switch is threaded to be installed in a duct.

17. **RELATED SYSTEMS.** Related systems are described in paragraphs below.

18. **Cabin Cooling and Defog System.** The cabin cooling and defog system (WP004 00) provides conditioned air for normal forward avionics cooling system operation.

19. **AC Power System.** The AC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP003 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP003 00) provides essential 115 vac power for the forward avionics cooling system.
20. **DC Power System.** The DC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD- 420-100, WP004 00) provides essential 28vdc power for the forward avionics cooling system.
21. **Warning/Caution/Advisory Lighting System.** The warning/caution/advisory lighting system (A1-AV8BB-440-100, WP007 00) provides visual indication of normal aircraft functions and system malfunctions affecting safety of flight operations. The warning/caution/advisory lighting system includes the annunciator light controller and the caution/advisory indicator light assembly. The annunciator light controller receives data from various aircraft systems and provides logic to turn on and off warning/caution/advisory lights.
22. The annunciator light controller will turn on the CS COOL caution lights and the MASTER CAUTION lights if either cockpit avionics cooling fan fails.
23. **Landing Gear System.** The landing gear system (A1-AV8BB-130-100, WP003 00) provides ground control for the ground cooling fan and the ground cooling control valve through the weight on wheels relay no. 1.
24. **External Electrical Power System.** The external electrical power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP006 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP006 00) provides electrical power for the forward avionics cooling system.
25. **Air Data Computer System.** The air data computer system (A1-AV8BB-560-100, WP005 00) provides an altitude signal to the forward avionics cooling system, through the 20K ft alt relay.
26. **SYSTEM CONTROLS AND INDICATORS.** System controls and indicators are described in the paragraphs below.
27. **PRESS Switch.** The PRESS switch, located on the ECS control panel assembly (WP004 00), is a four pole, lever lock, toggle switch. The switch provides mode selection for the forward avionics cooling system. The switch has three positions; NORM, DUMP, and RAM. The switch is locked in all positions.
28. Setting the PRESS switch to NORM or RAM, allows cabin cooling and defog system (WP004 00) air to be tapped and transported by way of ducting to the avionics equipment.
29. Setting the PRESS switch to RAM, applies 28vdc to energize the ground cooling control valve and the fwd fus cooling fan control relay. The ground cooling valve will open and the ground cooling fan will start to run.
30. **Cockpit Cool Cancel Relay.** The cockpit cool cancel relay, located on the forward relay no. 2 panel assembly, is a 5 amperes, 2 pole, double throw, permanent magnet drive, armature relay. The relay is energized when the MASTER CAUTION light is reset.
31. When energized, the relay provides a ground to turn off the rear CS COOL caution light. A holding circuit keeps the relay energized until the cockpit avionics cooling fan resumes operation.
32. **Cockpit Cooling Fan Relay.** The cockpit cooling fan relay, located on the forward relay no. 1 panel assembly, is a 5 amperes, 4 pole, double throw, permanent magnet drive, armature relay. The relay is energized when the cockpit avionics cooling fan thermal protector is closed.
33. When energized, the relay provides 115vac power to the cockpit avionics cooling fan. When deenergized, the relay removes 115vac power from the fan.
34. **Cockpit Fan Fail Relay.** The cockpit fan fail relay, located on the forward relay no. 2 panel assembly, is a 5 amperes, 2 pole, double throw, permanent magnet drive, armature relay. The relay is energized when the cockpit avionics cooling fan speed is approximately 60 percent rpm or greater.

35. When energized, the relay disables the CS COOL caution lights by providing a ground to the warning/caution/advisory lighting system.

■ 36. When deenergized, the relay;

a. Removes a ground to the warning/caution/advisory lighting system to enable the CS COOL caution lights.

b. Provides a ground to the rear cockpit cooling cancel relay holding circuit.

37. **Fwd Fus Cooling Fan Control Relay.** The fwd fus cooling fan control relay, located on the forward relay no. 1 panel assembly, is a four pole, double throw, 5 amperes, permanent magnet drive, armature relay.

38. The relay is energized with aircraft weight on wheels, or aircraft altitude less than 20,000 feet, or cabin pressure less than 2.00 ± 0.5 psi, or PRESS switch set to RAM. With the relay energized, essential 115 vac power is applied to three phases of the ground cooling fan motor. With the relay deenergized, essential 115 vac power to the fan motor is lost.

39. **Fwd Fus Fan Fail Relay.** The fwd fus fan fail relay, located on the forward relay no. 2 panel assembly, is a 2 pole, double throw, 5 amperes, permanent magnet drive, armature relay. The relay is energized when the speed sensor senses ground cooling fan speed of approximately 60 percent rpm or less.

40. With the relay energized, 28vdc is removed to deenergize the fwd fus cooling fan control relay. With the relay deenergized, 28vdc is applied to energize the fwd fus cooling fan control relay.

41. **Gnd Pwr Fan Control Relay.** The gnd pwr fan control relay, located on the forward relay no. 1 panel assembly, is a 5 amperes, double pole, double throw permanent magnet drive, armature relay. The relay is energized when the rear cockpit avionics cooling fan speed is approximately 60 percent rpm or greater.

42. With the relay energized, a ground signal is provided to the COCKPIT switch of the external electrical power system.

43. **Rear Cockpit Cool Cancel Relay.** The rear cockpit cool cancel relay, located on the forward

relay no. 2 panel assembly, is a 5 amperes, 2 pole, double throw, permanent magnet drive, armature relay. The relay is energized when the MASTER CAUTION light is reset.

44. When energized, the relay provides a ground to turn off the CS COOL caution light. A holding circuit keeps the relay energized until the rear cockpit avionics cooling fan resumes operation.

45. **Rear Cockpit Cooling Fan Relay.** The rear cockpit cooling fan relay, located on the forward relay no. 1 panel assembly, is a 5 amperes, 4 pole, double throw, permanent magnet drive, armature relay. The relay is energized with the rear cockpit avionics cooling fan thermal protector closed.

46. With the relay energized, 115vac is applied to the rear cockpit avionics cooling fan. With the relay deenergized, 115vac power is removed from the rear cockpit avionics cooling fan.

47. **Rear Cockpit Fan Fail Relay.** The rear cockpit fan fail relay, located on the forward relay no. 2 panel assembly, is a 5 amperes, 2 pole, double throw, permanent magnet drive, armature relay. The relay is energized when the rear cockpit avionics cooling fan is operating at 60 percent rpm or greater. ■

48. When energized, the relay disables the rear CS COOL caution light by providing a ground to the warning/caution/advisory lighting system.

49. When deenergized, the relay;

a. Removes a ground to the warning/caution/advisory lighting system to enable the CS COOL caution lights.

b. Provides a ground to the cockpit cooling cancel relay holding circuit.

50. **CS COOL Caution Lights.** The CS COOL caution lights are located on the caution/advisory indicator light assembly and the rear caution/advisory indicator light assembly.

51. The CS COOL caution lights are controlled by the cockpit avionics cooling fan, rear cockpit avionics cooling fan, cockpit fan fail relay, rear cockpit fan fail relay, cockpit cool cancel relay, and rear cockpit cool cancel relay through the warning/caution/advisory lighting system.

52. Both CS COOL lights will come on and flash if the cockpit avionics cooling fan or the rear cockpit

avionics cooling fan fail. Resetting the master caution will cause the CS COOL light in the affected cockpit to come on steady, the light in the unaffected cockpit will go off.

53. **OPERATION.**

54. **COMPONENT OPERATION.**

55. **Anti-G/Canopy Seal Test Port.** The anti-g/canopy seal test port is located in the forward end of the nose landing gear wheelwell. The test port allows a ground air source to be used to test the operation of the ground cooling control valve and ground cooling valve. With either ground air source or normal air source used, the valves operate the same.

56. **Avionics Cooling Air Fittings.** Avionics cooling air fittings, located on equipment mounting racks in the cockpit, rear cockpit, and door 125L, provide the cooling system interface between rack mounted equipment and equipment rack. When a unit is installed on the equipment rack, it makes contact with a cooling air fitting. The fitting makes a seal between the unit and the rack, allowing cooling air to flow through the unit. Some fittings contact the unit on the back and some contact on the bottom, depending on unit mounting. The different types of fittings used are required for the different cooling requirements of each unit.

57. **Cockpit Avionics Cooling Fan.** The cockpit avionics cooling fan, located in the cockpit under the main instrument panel, pulls cabin air through cockpit mounted avionics equipment. The fan operates when the cockpit cooling fan relay is energized.

58. The rotor assembly is mounted on the end of the shaft, which is driven by the motor. The spinning rotor assembly pulls cockpit air across the cockpit mounted avionics equipment. The fan exhaust air is directed to the rudder pedal area.

59. The flow sensor is made up of electrical circuits, an open ended tube and two temperature sensing devices. The tube faces the airstream and directs a small amount of air over the temperature sensing devices. The temperature sensing devices produce an output voltage proportional to their temperature. One temperature sensing device is heated at a constant rate. Its voltage output and temperature are proportional to the amount of cooling air passing over it, which changes with fan airflow.

Electrical circuits in the flow sensor compare voltage outputs of the two temperature sensing devices. If the voltage difference exceeds a predetermined limit, which corresponds to approximately less than 60 percent of normal fan speed, the CS COOL caution lights are enabled and avionics ground power application is inhibited.

60. The fan has a built in thermal protector. The thermal protector is normally closed and will open when the fan motor overheats. Opening the thermal protector will deenergize the cockpit cooling fan relay and remove essential 115vac power from the fan motor. The thermal protector will close when the fan motor cools.

61. **Rear Cockpit Avionics Cooling Fan.** The rear cockpit avionics cooling fan, located in the rear cockpit under the main instrument panel, pulls cabin air through rear cockpit mounted avionics equipment. The fan operation is identical to the cockpit avionics cooling fan.

62. **Ground Cooling Control Valve.** The ground cooling control valve is located in door 121. When deenergized by weight off wheels or the PRESS switch in other than RAM, the valve allows air from the cabin cooling and defog system (WP004 00) to flow through and hold the ground cooling valve closed. With the valve energized by weight on wheels or the PRESS switch in RAM, air is vented to atmosphere and the ground cooling valve opens by spring tension.

63. **Ground Cooling Fan.** The ground cooling fan is located in door 121. The motor and impeller are enclosed in a housing which has guide vanes built in on the outlet side of the impeller. The guide vanes straighten the airflow before discharge from the fan. The motor includes an electrical sensing unit and overheat protection devices. The electrical sensing unit provides an electrical signal to the speed sensor based on fan speed. The overheat protection devices will automatically stop the fan if an overheat occurs. When the overheat condition no longer exists, the fan will resume normal operation. The fan motor is cooled by its own airflow.

64. With the fan operating, cooling air is pulled in through the ground cooling valve. The cooling air is given a high velocity by the fan impeller and is transported by way of ducting to forward fuselage mounted avionics equipment. The fan will operate when electrical power is applied and weight is on

wheels, or aircraft altitude less than 20,000 feet, or cabin pressure less than 2.00 ± 0.5 psi, or PRESS switch set to RAM.

65. **Ground Cooling Valve.** The ground cooling valve is located in the ram air inlet. When air pressure tapped from the cabin cooling and defog system (WP004 00) is applied to the valve inlet port through the ground cooling control valve, the spring loaded diaphragm is compressed, the piston moves and closes the valve. When air pressure is not applied or is lost, the spring loaded diaphragm moves the piston and opens the valve. The valve, with the ground cooling fan, allows ambient air to flow and cool forward fuselage mounted avionics equipment for ground operation or inflight if a cooling system failure occurs.

66. **Ram Air Inlet.** The ram air inlet, located on the windshield forward fairing, allows ram or ambient air to enter the forward avionics cooling system during ground or emergency operation. The inlet faces forward so aircraft forward motion will force air into the inlet. During ground operation, the ground cooling valve will open and allow ambient air to be pulled in the inlet. During inflight emergency operation, ram air flows to equipment cooling system and to each cockpit.

67. **Ram Air Vent Check Valve.** The ram air vent check valve is located in door 10. The check valve prevents loss of ambient air through the nose cone during ground cooling fan operation. The valve flappers are spring loaded closed and allow airflow in one direction only.

68. **Speed Sensor.** The speed sensor is located in door 121. The speed sensor receives an electrical signal from the ground cooling fan electronic sensing unit. The signal is proportional to fan rotational speed. If the signal received by the speed sensor is within a predetermined limit, the speed sensor will complete an electrical circuit and allow avionics ground power to be applied. If the signal is out of limits, the speed sensor will inhibit application of avionics ground power.

69. **INS Check Valve.** The INS check valve is located in the equipment cooling distribution duct between the Inertial Navigation Unit CN-1561/ASN-130A or CN-1649/ASN-139 cooling plenum assembly and the ground cooling fan. The check valve prevents the loss of cockpit air through the non-operating ground cooling fan. The valve

flappers are spring loaded closed and allow airflow in one direction only.

70. **INS Plenum Check Valve.** The INS plenum check valve is located in the distribution duct between the air communication duct and the Inertial Navigation Unit CN-1516/ASN-130A or CN-1649/ASN-139 cooling plenum assembly. The check valve prevents loss of equipment cooling air through the cockpit and rear cockpit during ground operation. The valve flappers are spring loaded closed and allow airflow in one direction only.

71. **Cockpit Differential Pressure Switch.** The cockpit differential pressure switch is located in the air communication duct in door 10. The switch senses cabin pressure. When cabin pressure is less than 2.0 ± 0.5 psid, the switch is closed and applies 28vdc power to energize the fwd fus cooling fan control relay. When cabin pressure is greater than 2.0 ± 0.5 psid, the switch opens and removes 28vdc power to deenergize the fwd fus cooling fan control relay.

72. SYSTEM OPERATION.

73. **Normal Operation.** The forward avionics cooling system (figure 2) provides conditioned air for cooling avionics equipment. Conditioned air is tapped off the cabin cooling and defog system (WP004 00). The conditioned air is transported by way of ducting to forward fuselage mounted avionics equipment. Check valves in the distribution ducting prevent loss of airflow through the ram air inlet and ground cooling fan. Cockpit and rear cockpit mounted avionics equipment is cooled by cockpit avionics cooling fans. Cabin air is pulled across the equipment by the fans. Caution lights warn the crewmembers of a fan malfunction.

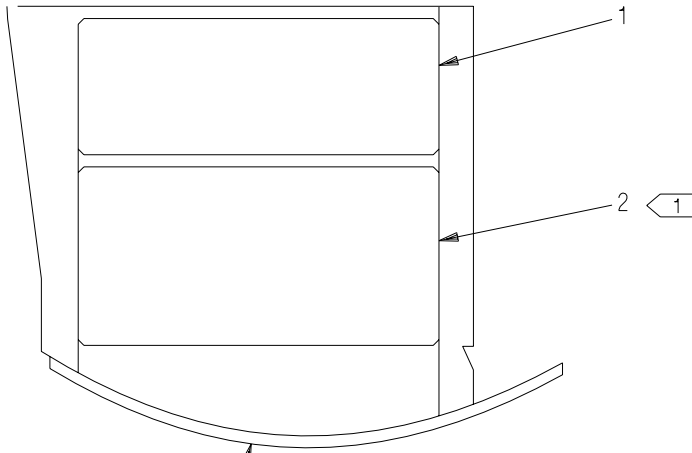
74. The ground cooling fan operates with aircraft weight on wheels, or altitude less than 20,000 feet, or cabin pressure less than 2.0 ± 0.5 psig.

75. **Ground Operation.** During ground operation, the ground cooling fan pulls ambient air in through the open ground cooling valve. The cooling air is transported by way of ducting to the avionics equipment. A check valve prevents loss of airflow through the cabin cooling and defog system (WP004 00).

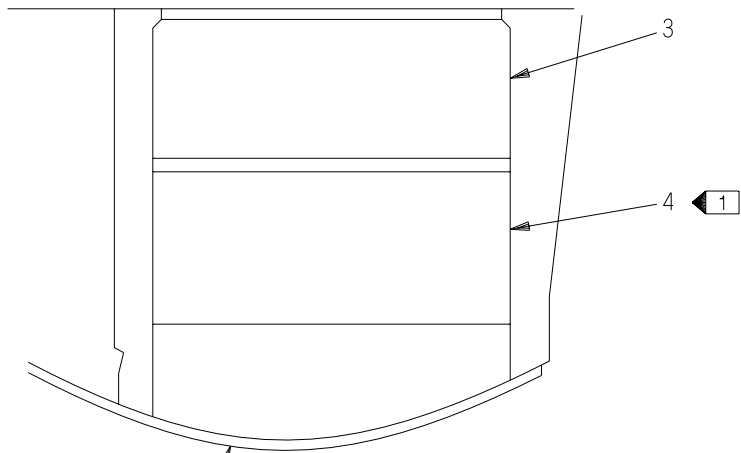
76. **Emergency Operation.** In flight during a forward avionics cooling system failure, the pilot

can open the ground cooling valve by setting the PRESS switch to RAM. Ram air will flow to forward fuselage mounted avionics equipment by

way of ducting for emergency cooling. Ram air also flows to the cockpit and rear cockpit.



NLG DOOR AREA
(VIEW LOOKING FWD
INTERNAL DOOR
NWA REMOVED)



EDGE OF DOOR 10
(VIEW LOOKING AFT)

Figure 1. Forward Avionics Cooling System Component Locator (Sheet 1)

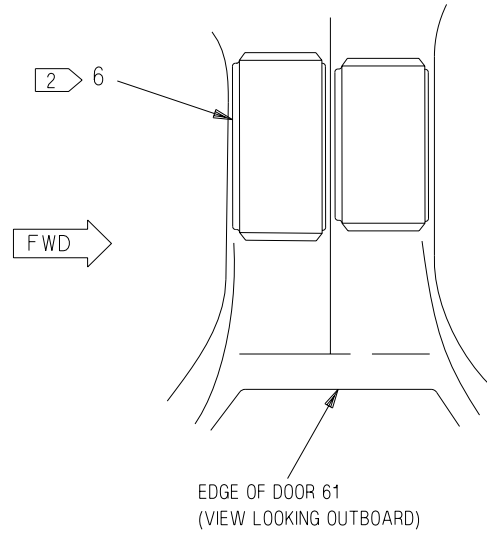
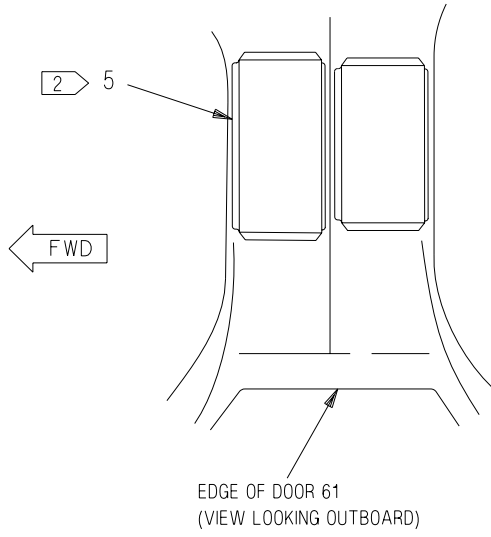


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 2)

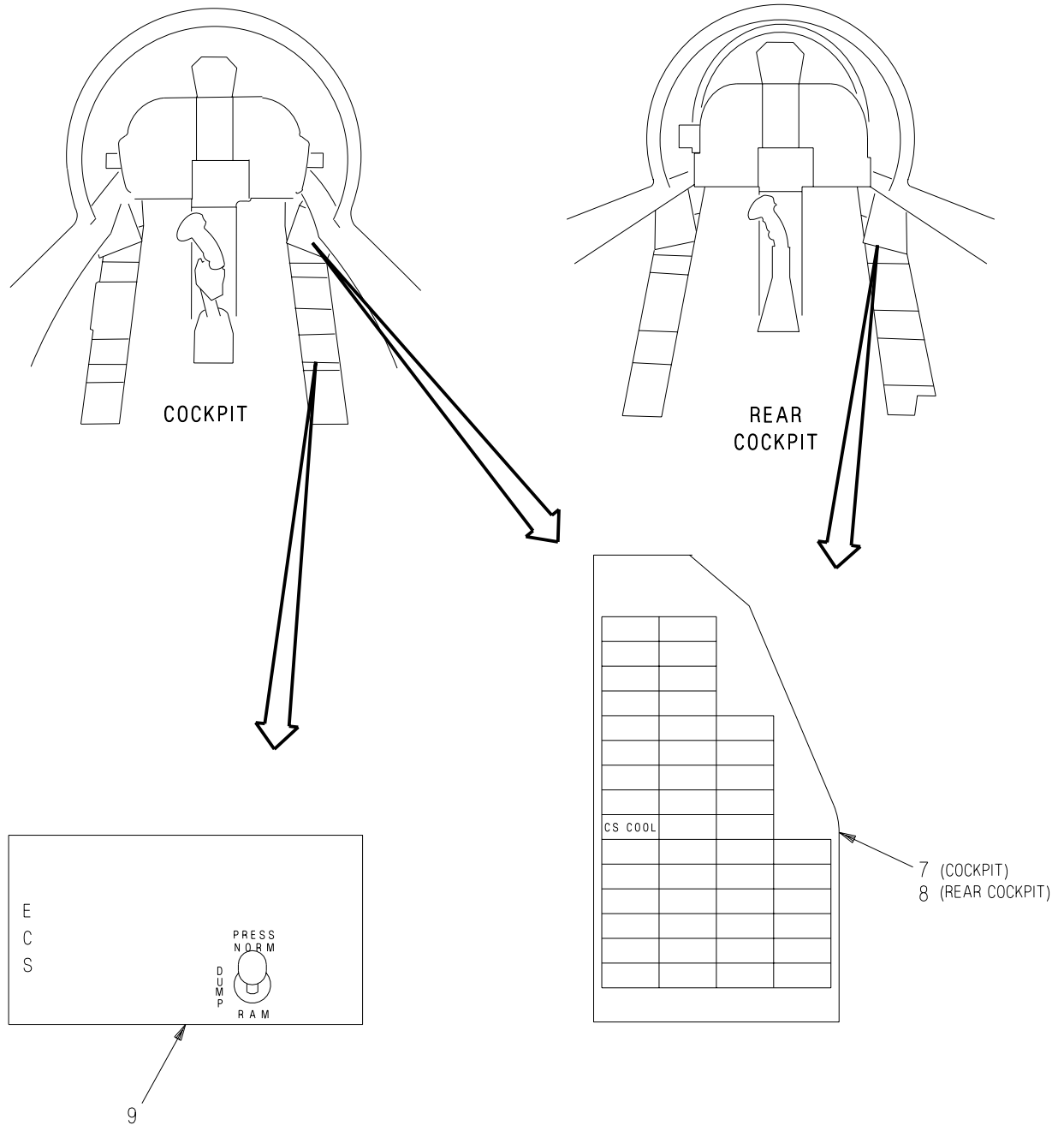


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 3)

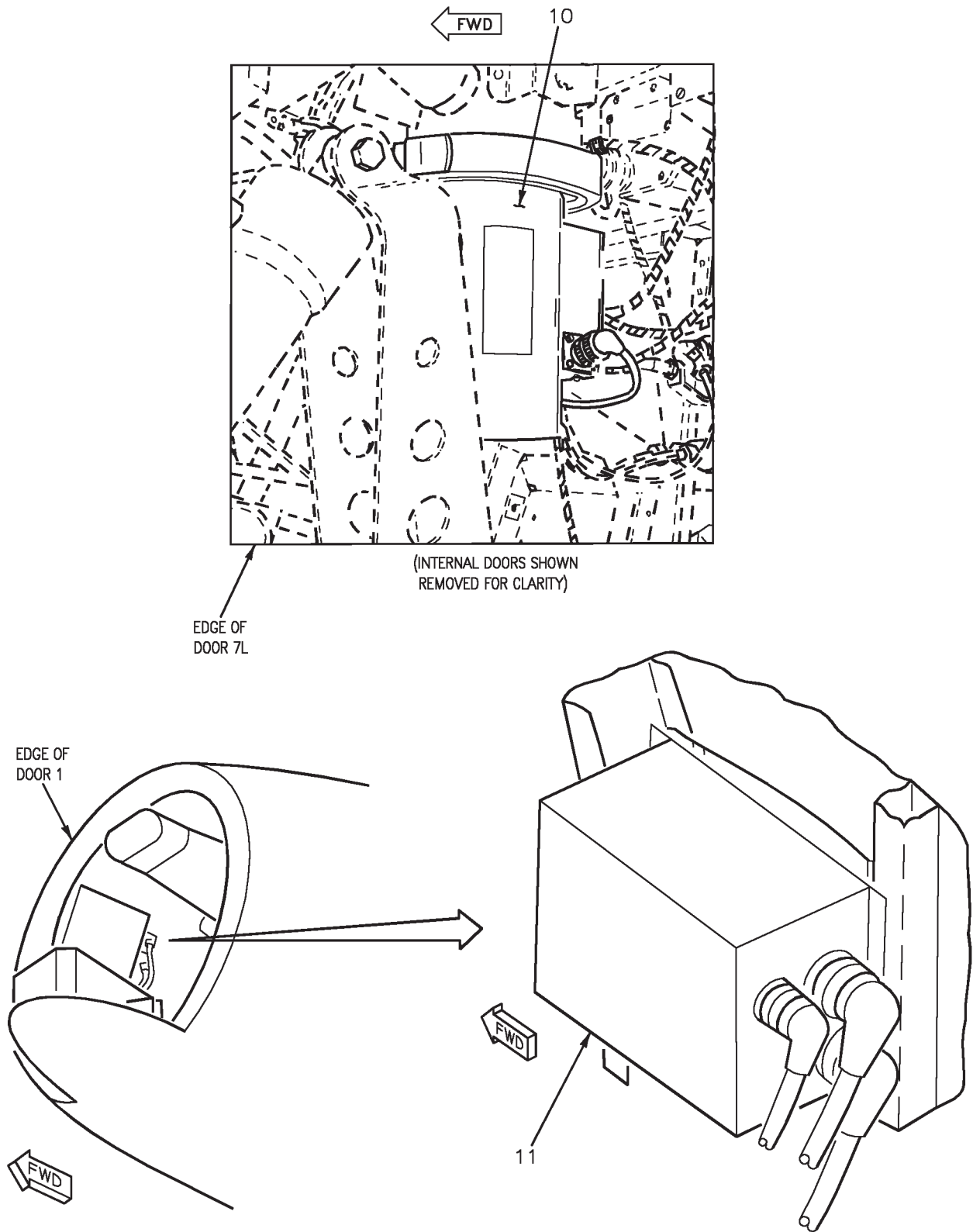


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 4)

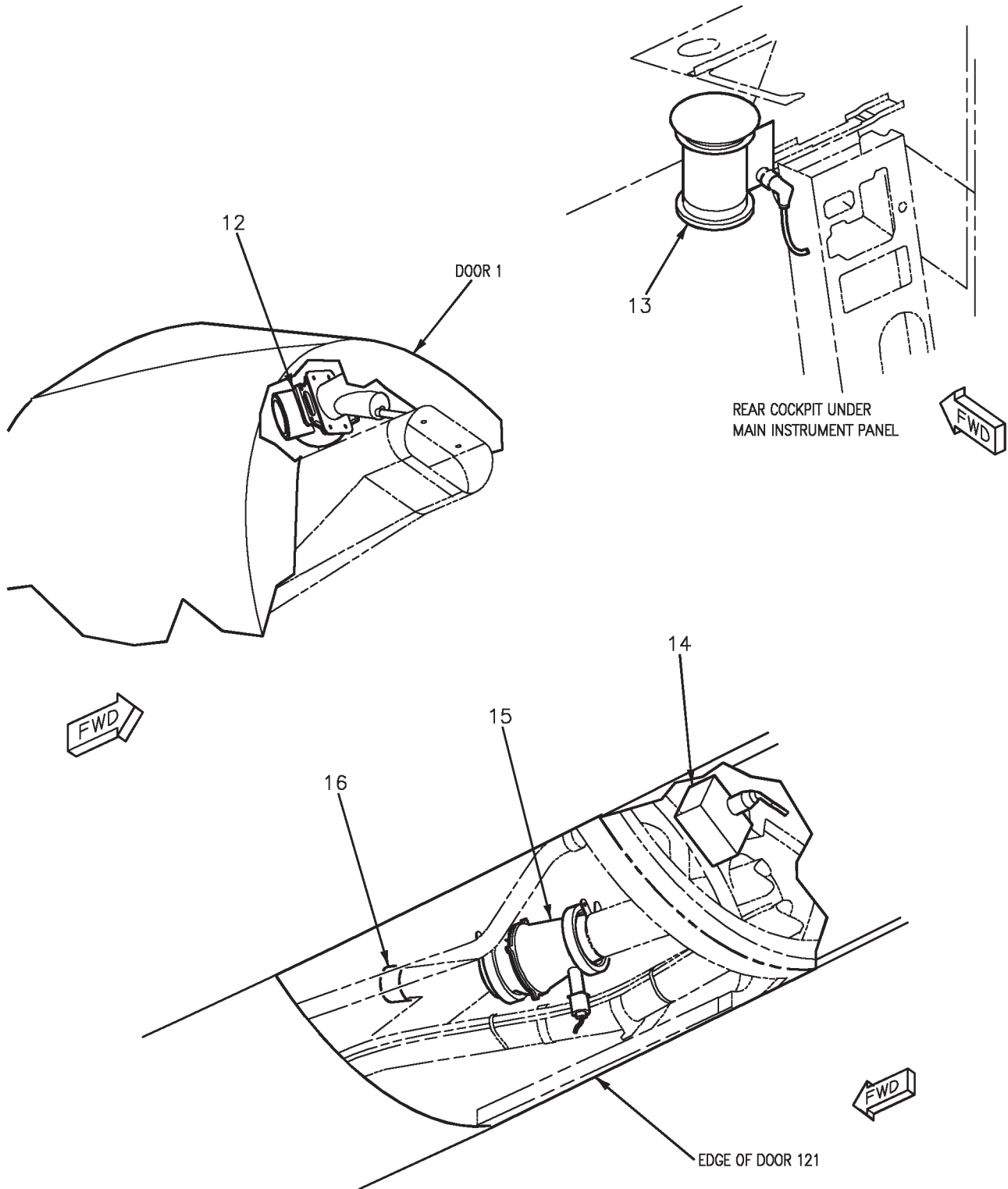


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 5)

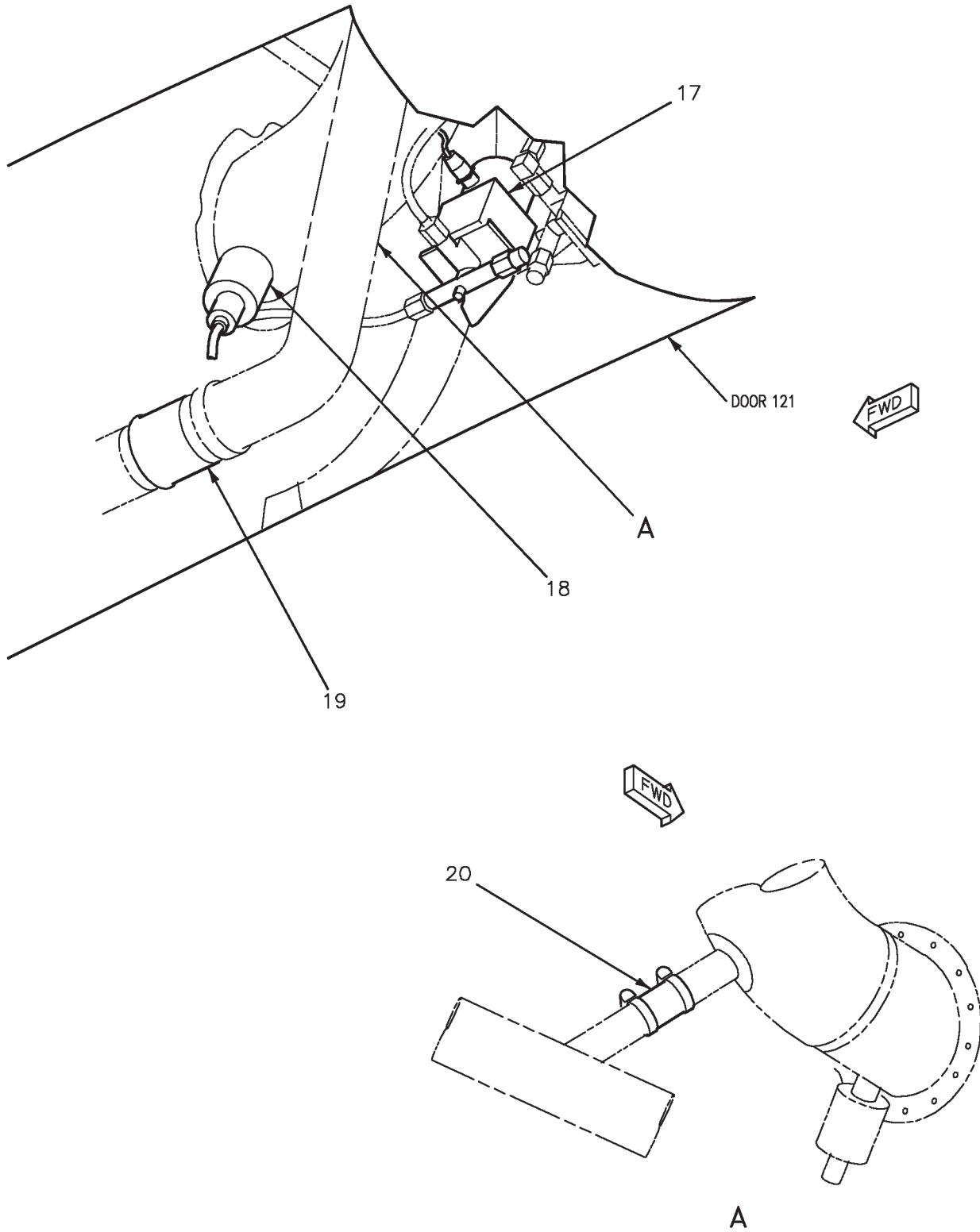
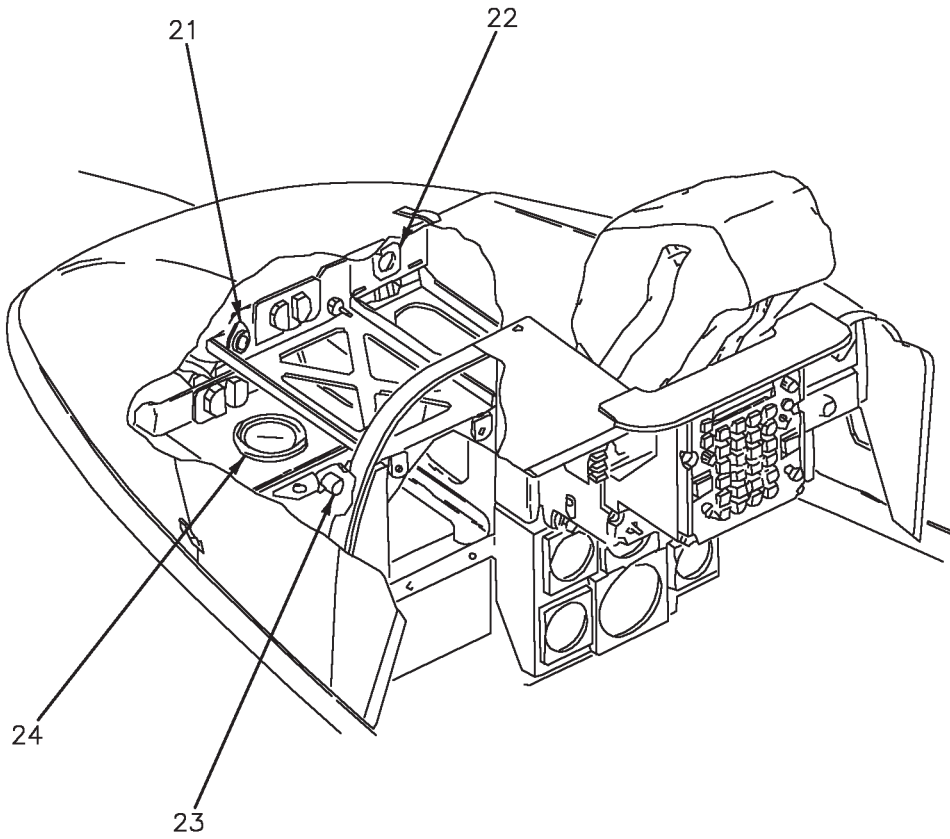
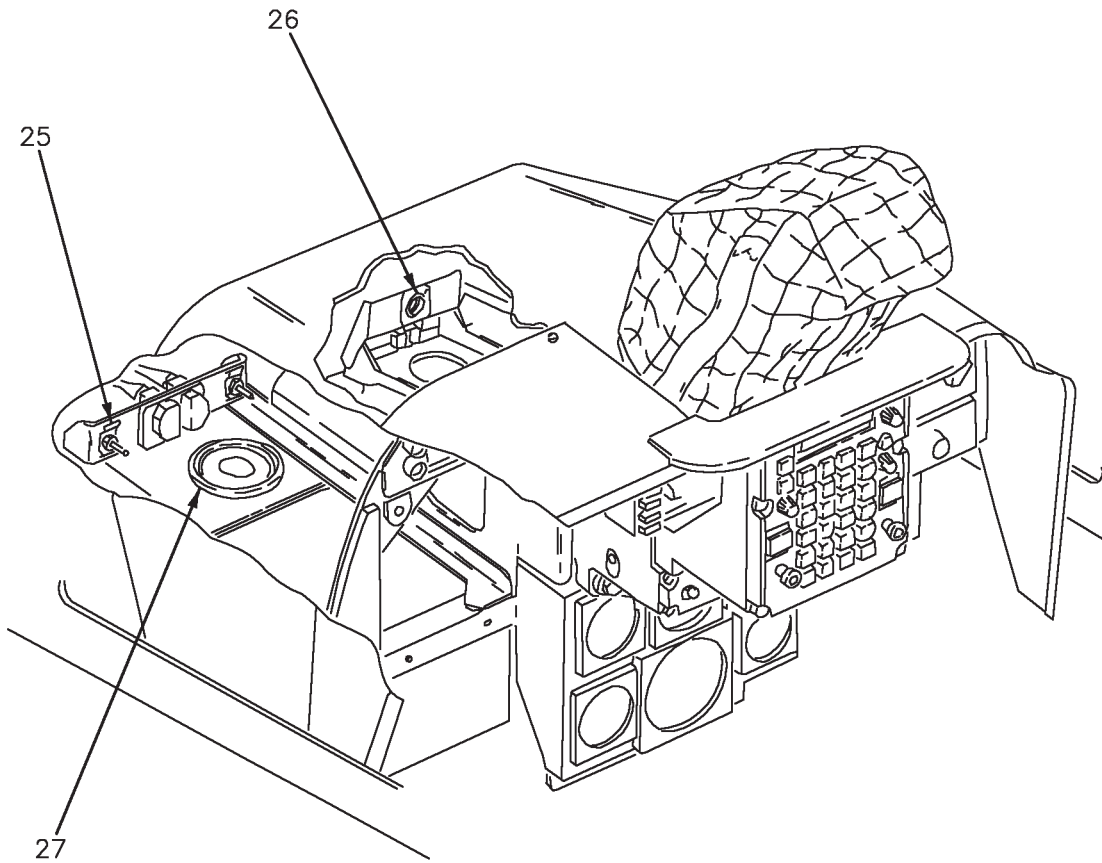


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 6)



MAIN INSTRUMENT PANEL

Figure 1. Forward Avionics Cooling System Component Locator (Sheet 7)



REAR INSTRUMENT PANEL ASSEMBLY

Figure 1. Forward Avionics Cooling System Component Locator (Sheet 8)

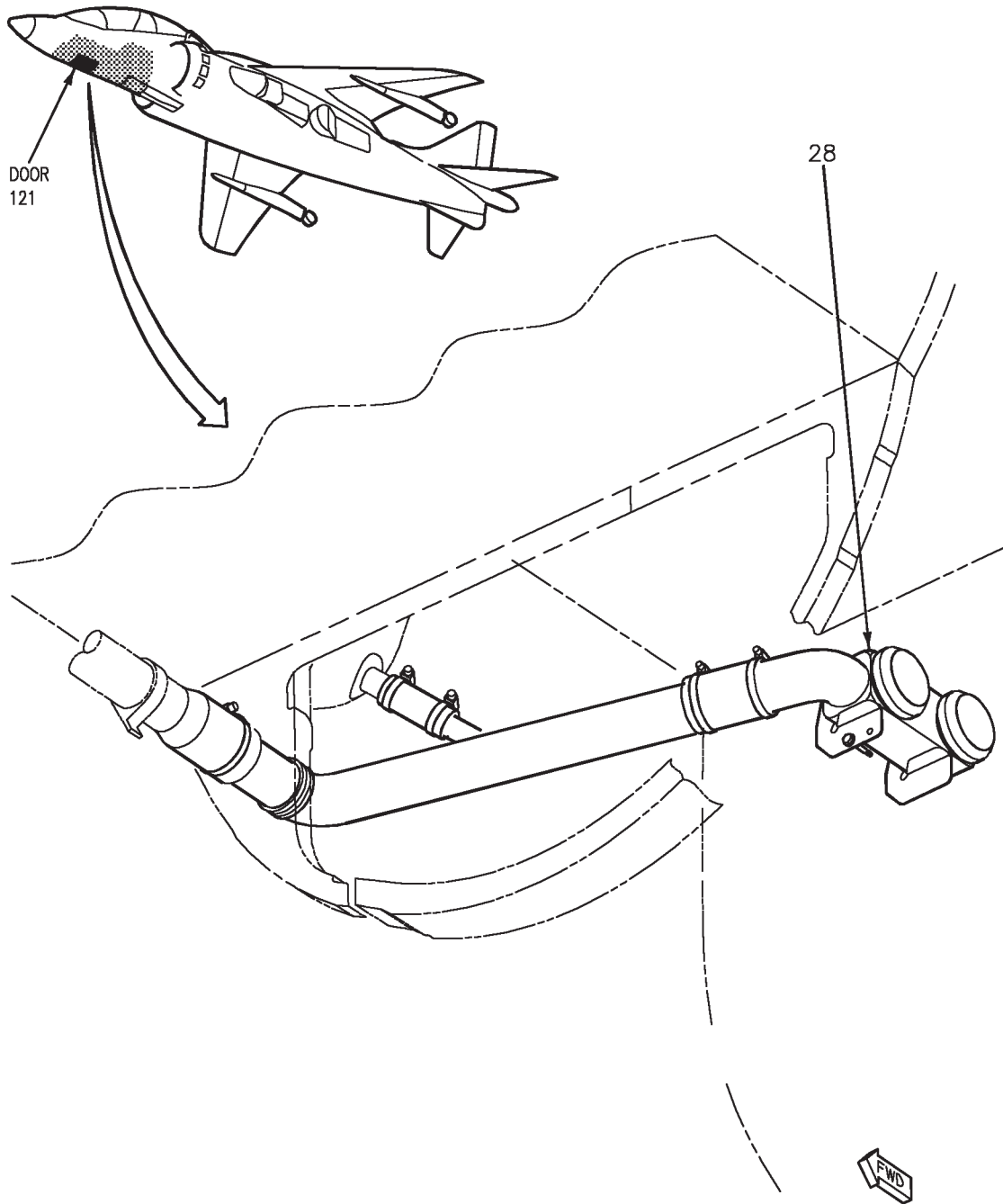


Figure 1. Forward Avionics Cooling System Component Locator (Sheet 9)

Nomenclature	Index No.	Ref Des
1 AC CIRCUIT BREAKER PANEL ASSEMBLY FWD FUS FAN A (ZONE A3) FWD FUS FAN B (ZONE B3) FWD FUS FAN C (ZONE C3) AFT CKPT FAN A (ZONE A4) AFT CKPT FAN B (ZONE B4) AFT CKPT FAN C (ZONE C4) FWD CKPT FAN A (ZONE A5) FWD CKPT FAN B (ZONE B5) FWD CKPT FAN C (ZONE C5)	4	52A-C105 22CBC025 22CBC026 22CBC027 22CBC061 22CBC062 22CBC063 22CBC035 22CBC036 22CBC037
2 AC ESSENTIAL PANEL ASSEMBLY FWD FUS COOL FAN (ZONE C6) FWD FUS COOL FAN (ZONE D6) FWD FUS COOL FAN (ZONE E6) CKPT COOL FAN (ZONE C7) CKPT COOL FAN (ZONE D7) CKPT COOL FAN (ZONE E7) AFT CKPT FAN (ZONE C11) AFT CKPT FAN (ZONE D11) AFT CKPT FAN (ZONE E11)	6	52A-N131 22CBN025 22CBN026 22CBN027 22CBN035 22CBN036 22CBN037 22CBN061 22CBN062 22CBN063
ANNUNCIATOR LIGHT CONTROLLER	11	27A-D007
ARMT STORES MANAGEMENT CONTROL - INDICATOR C-10940/AYQ-13 COOLING AIR FITTING	23	—
CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY	7	27A-F011
COCKPIT AVIONICS COOLING FAN	10	22B-F038
COCKPIT DIFFERENTIAL PRESSURE SWITCH	18	22S-D070
COORDINATE DATA MONITOR ID-2251/ASQ-179 COOLING AIR FITTING	21	—
1 DC CIRCUIT BREAKER PANEL ASSEMBLY CAB ECS NO. 1 (ZONE D7) CKPT FAN CONT (ZONE E4)	2	52A-C104 22CBC016 22CBC074
2 DC ESSENTIAL/MAIN PANEL ASSEMBLY CABIN ECS CB NO. 1 (ZONE D4) CKPT COOL FAN (ZONE E4)	5	52A-P133 22CBP016 22CBP074
DIGITAL DISPLAY INDICATOR IP-1318/A COOLING AIR FITTING	24	—

Figure 1. Forward Avionics Cooling System Component Locator (Sheet 10)

Nomenclature	Index No.	Ref Des
ECS CONTROL PANEL ASSEMBLY PRESS SWITCH	9	22A-F048 22S-F033
FORWARD RELAY NO. 1 PANEL ASSEMBLY GND PWR FAN CONTROL RELAY COCKPIT COOLING FAN RELAY REAR COCKPIT COOLING FAN RELAY ASDCI GND PWR RELAY	3	52A-C015 22K-C077 22K-C075 22K-C076 1K-C097
FORWARD RELAY NO. 2 PANEL ASSEMBLY 20K FT ALT RELAY FWD FUS COOLING FAN CONTROL RELAY COCKPIT COOL CANCEL RELAY WEIGHT ON WHEELS RELAY NO. 1 REAR COCKPIT FAN FAIL RELAY COCKPIT FAN FAIL RELAY REAR COCKPIT COOL CANCEL RELAY FWD FUS FAN FAIL RELAY	1	52A-C113 70K-C028 22K-C028 22K-C066 12K-C053 22K-C064 22K-C065 22K-C067 22K-C071
GROUND COOLING CONTROL VALVE	17	22L-D040
GROUND COOLING FAN	15	22B-D029
GROUND COOLING VALVE	12	22MAA510
HEAD-UP DISPLAY UNIT SU-128/A COOLING AIR FITTING	22	—
3 INERTIAL NAVIGATION UNIT CN-1561/ASN-130A COOLING PLENUM ASSEMBLY	28	—
4 INERTIAL NAVIGATION UNIT CN-1649/ASN-139 COOLING PLENUM ASSEMBLY	28	—
INS CHECK VALVE	19	22VAD528
INS PLENUM CHECK VALVE	20	22VAD529
RAM-AIR VENT CHECK VALVE	16	22VAD527
REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY	8	27A-H045
REAR COCKPIT AVIONICS COOLING FAN	13	22B-H072
REAR COORDINATE DATA MONITOR ID-2251/ ASQ-179 COOLING AIR FITTING	25	—
REAR DIGITAL DISPLAY INDICATOR IP-1318/A COOLING AIR FITTING	27	—

Figure 1. Forward Avionics Cooling System Component Locator (Sheet 11)

Nomenclature	Index No.	Ref Des
REAR HEAD-UP DISPLAY UNIT SU-128/A COOLING AIR FITTING	26	—
SPEED SENSOR	14	22A-D050

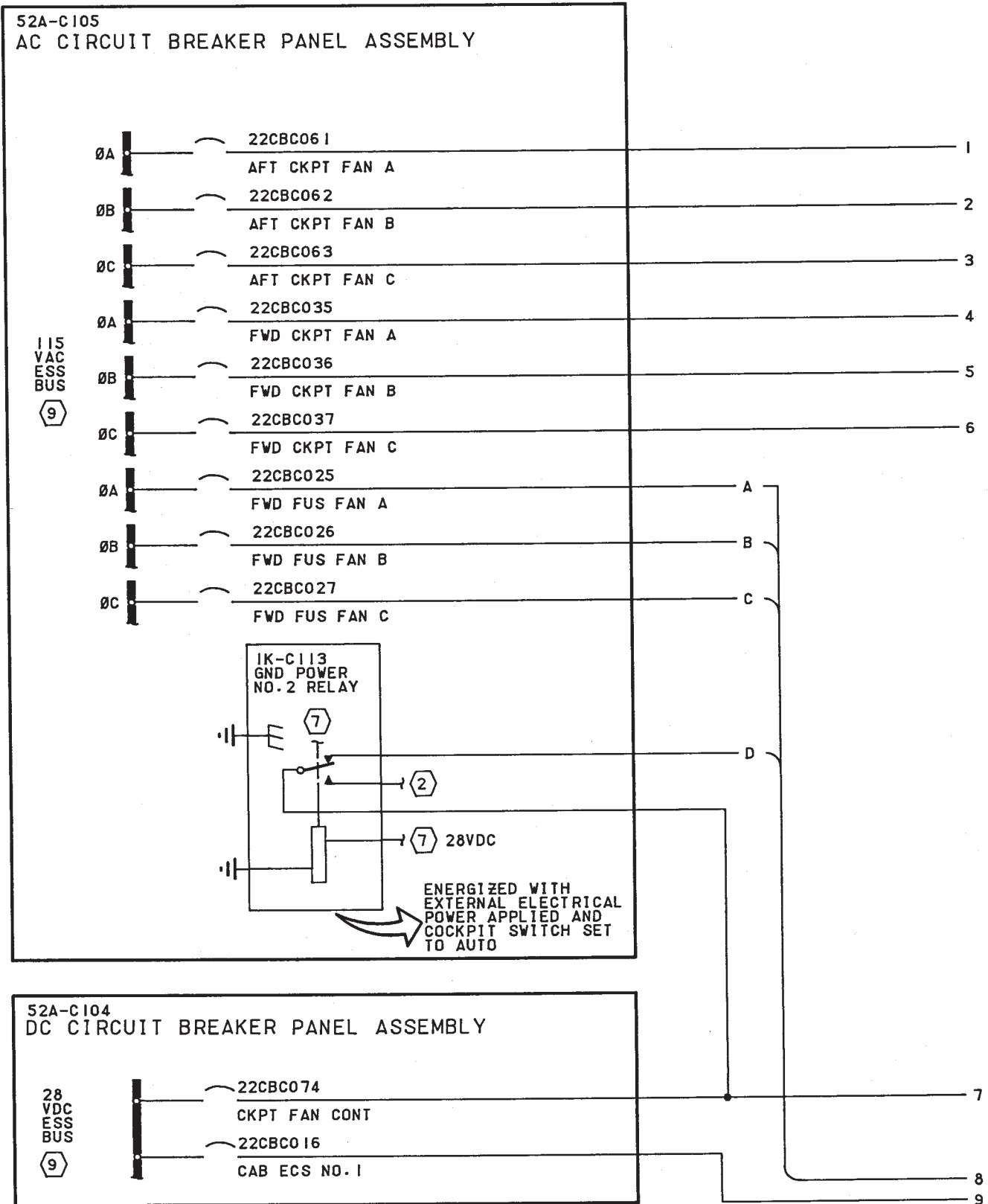
LEGEND

1 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.

2 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.

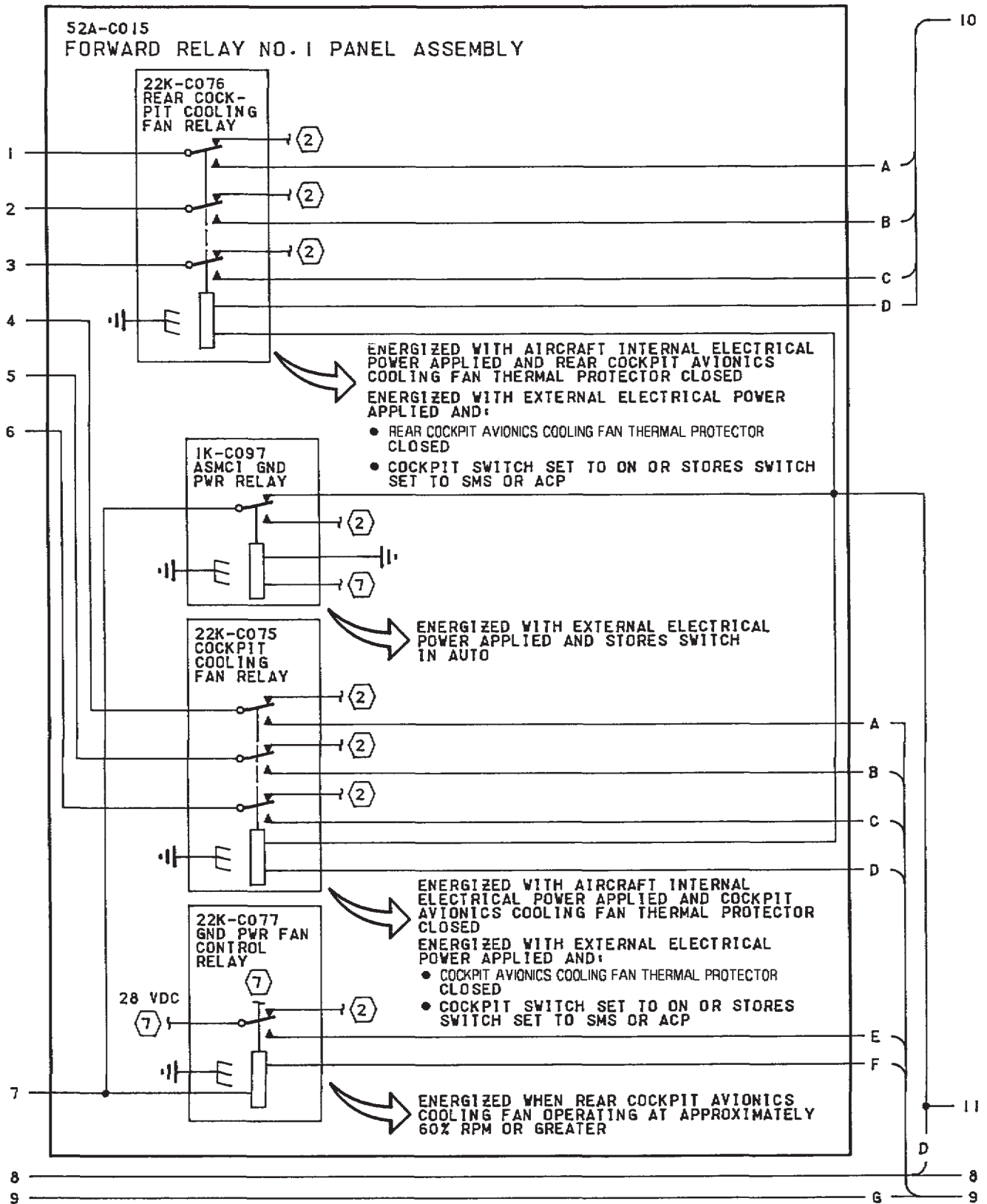
3 162747 THRU 164137.

4 164138 AND UP.



AV8BC-410-10-(4-1)A-GR1D

Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 1)



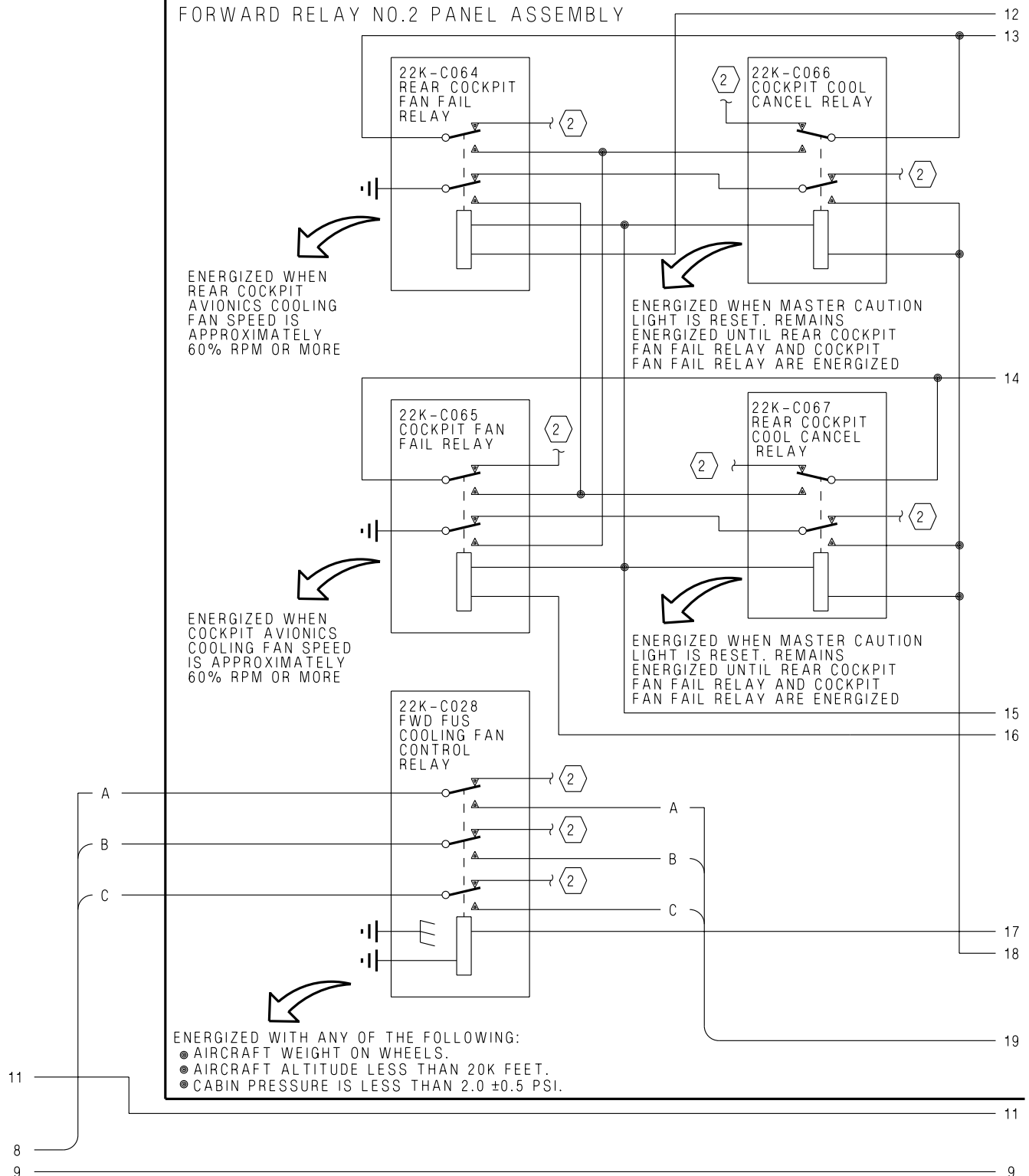
AHR540-4-2-012

Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 2)

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52A-C113
FORWARD RELAY NO.2 PANEL ASSEMBLY



AHR540-4-3-013

Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 3)

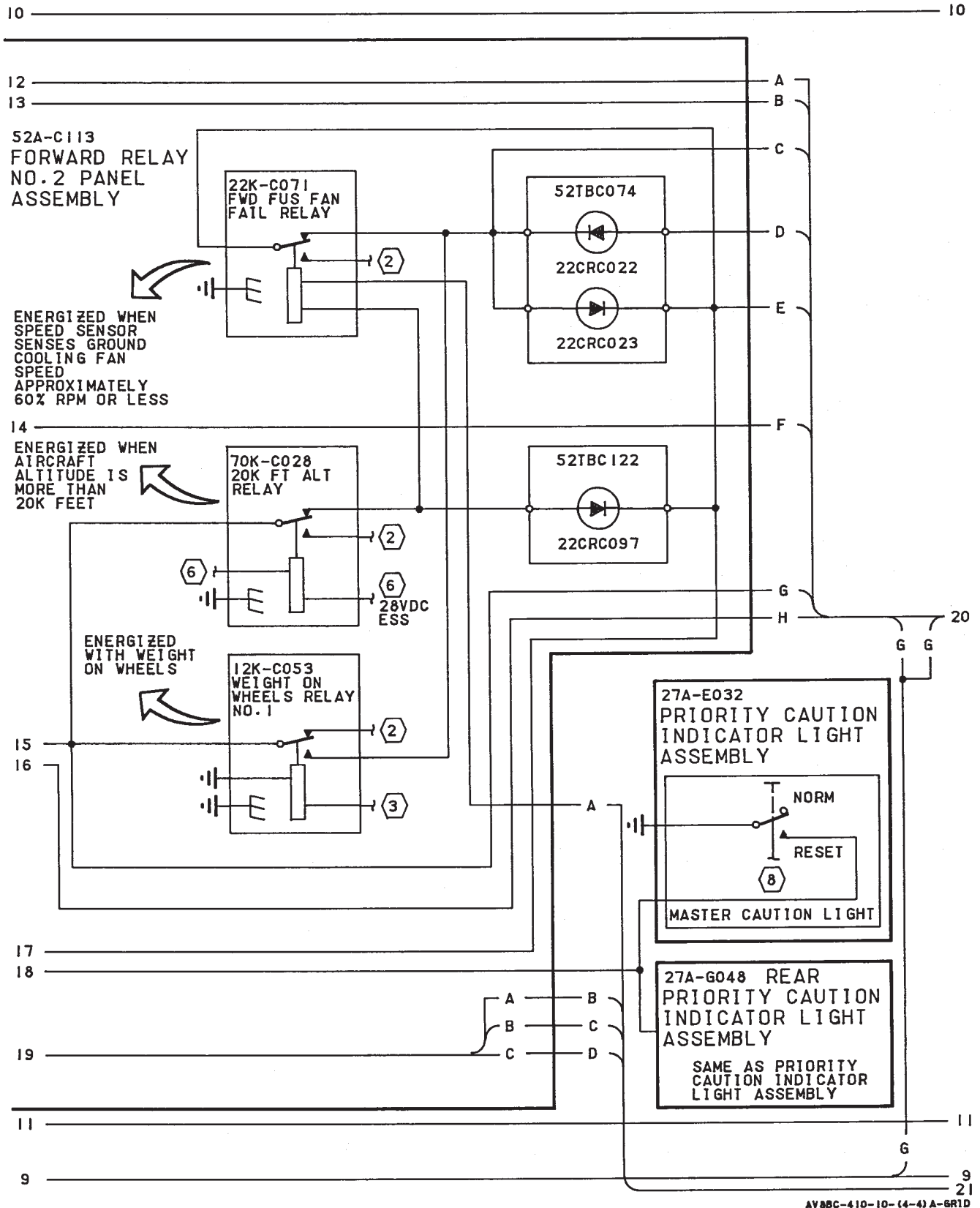


Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 4)

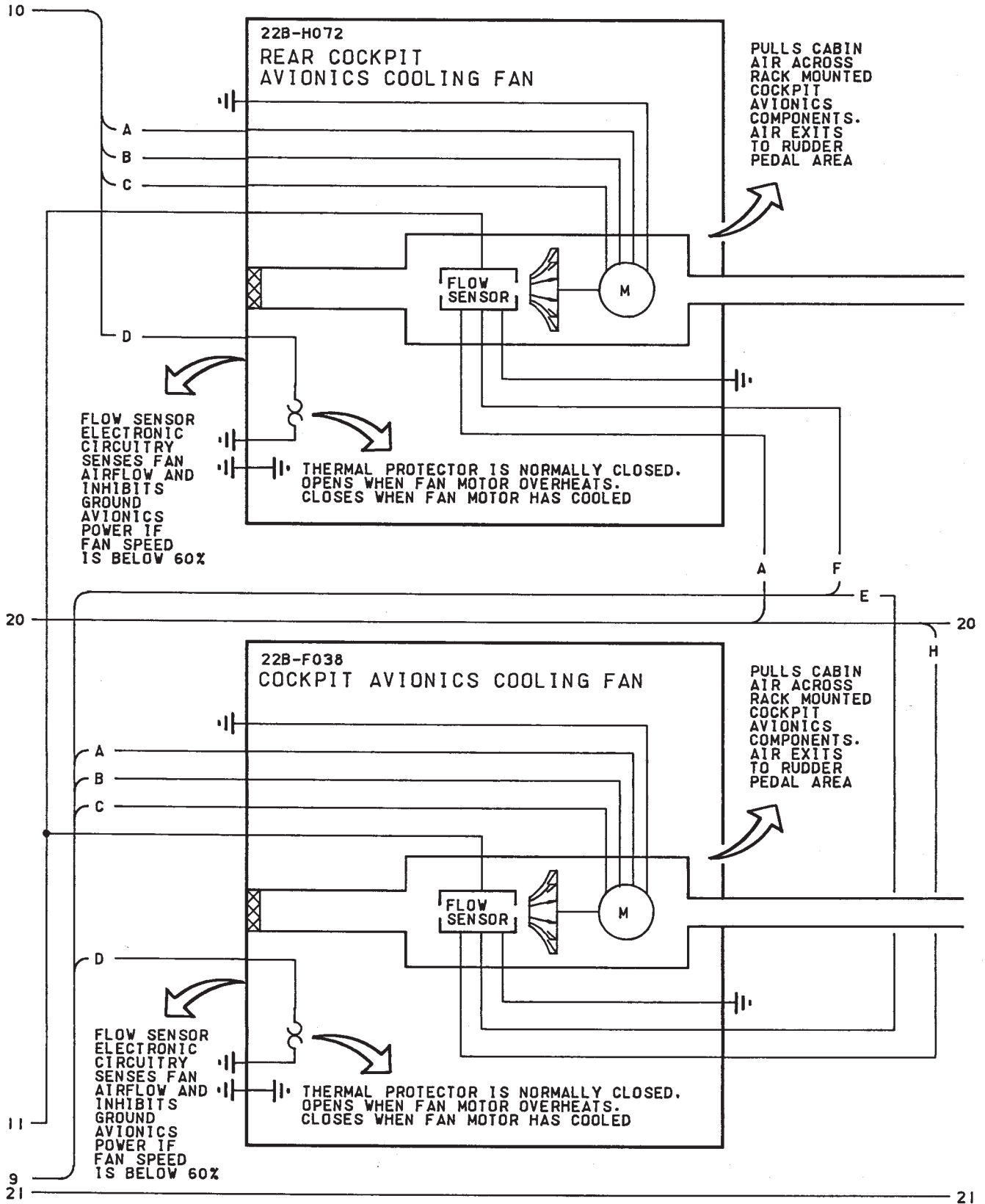
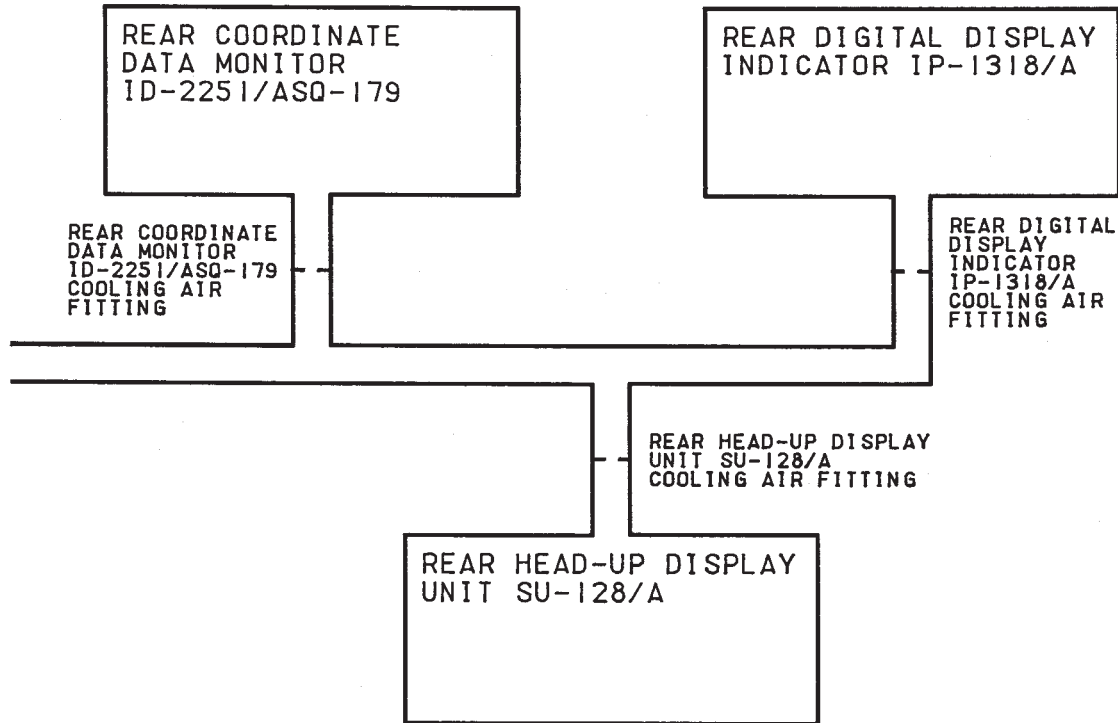
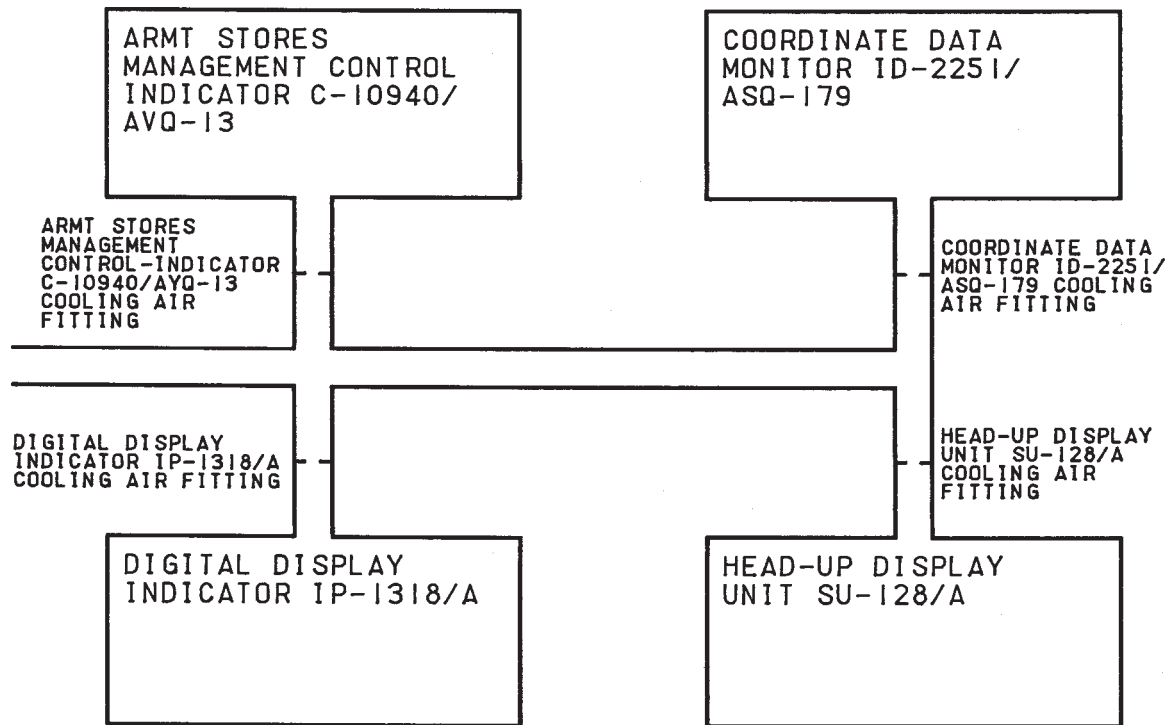


Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 5)



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21

AV8BC-410-10-(4-6)A-6R1D

Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 6)

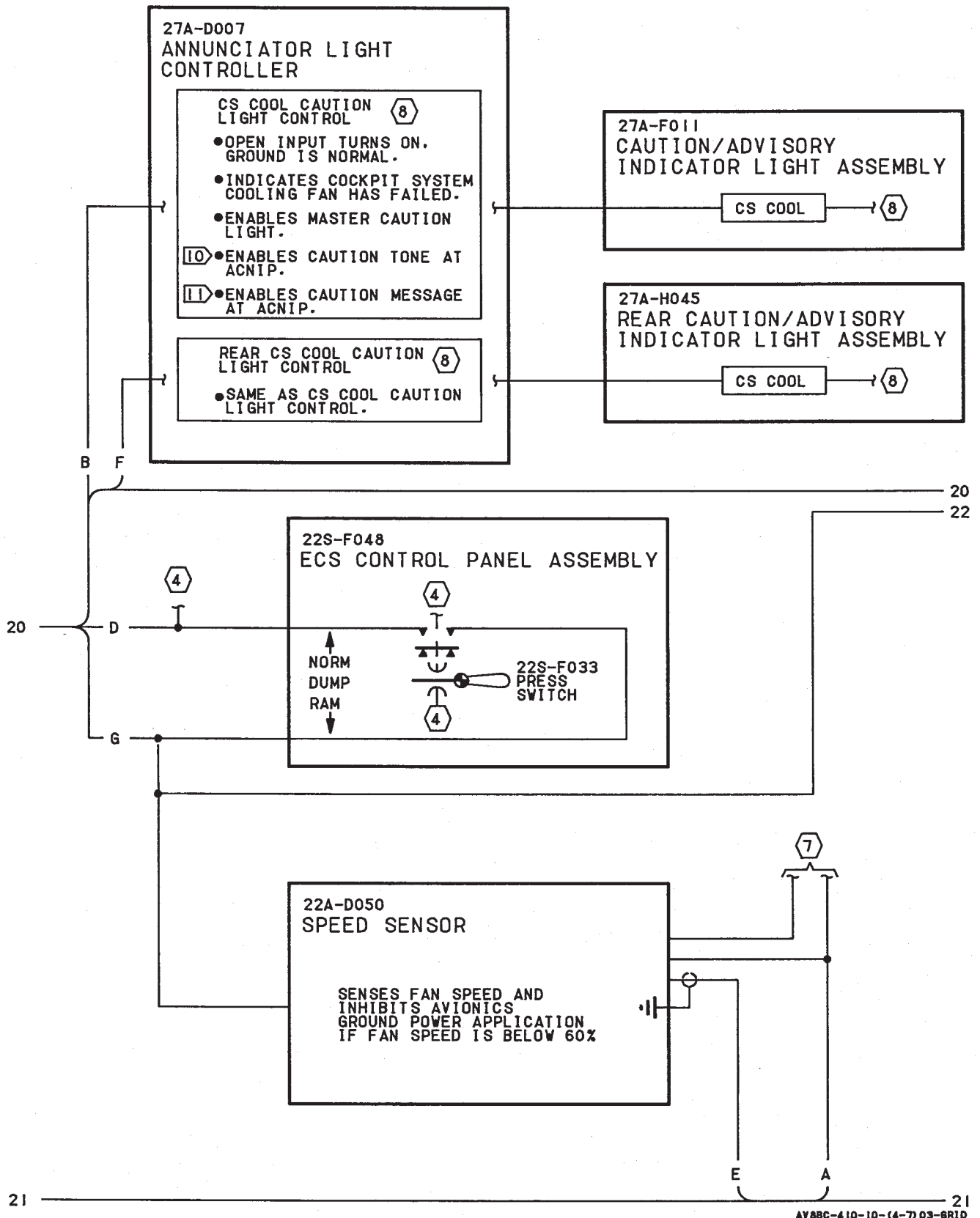
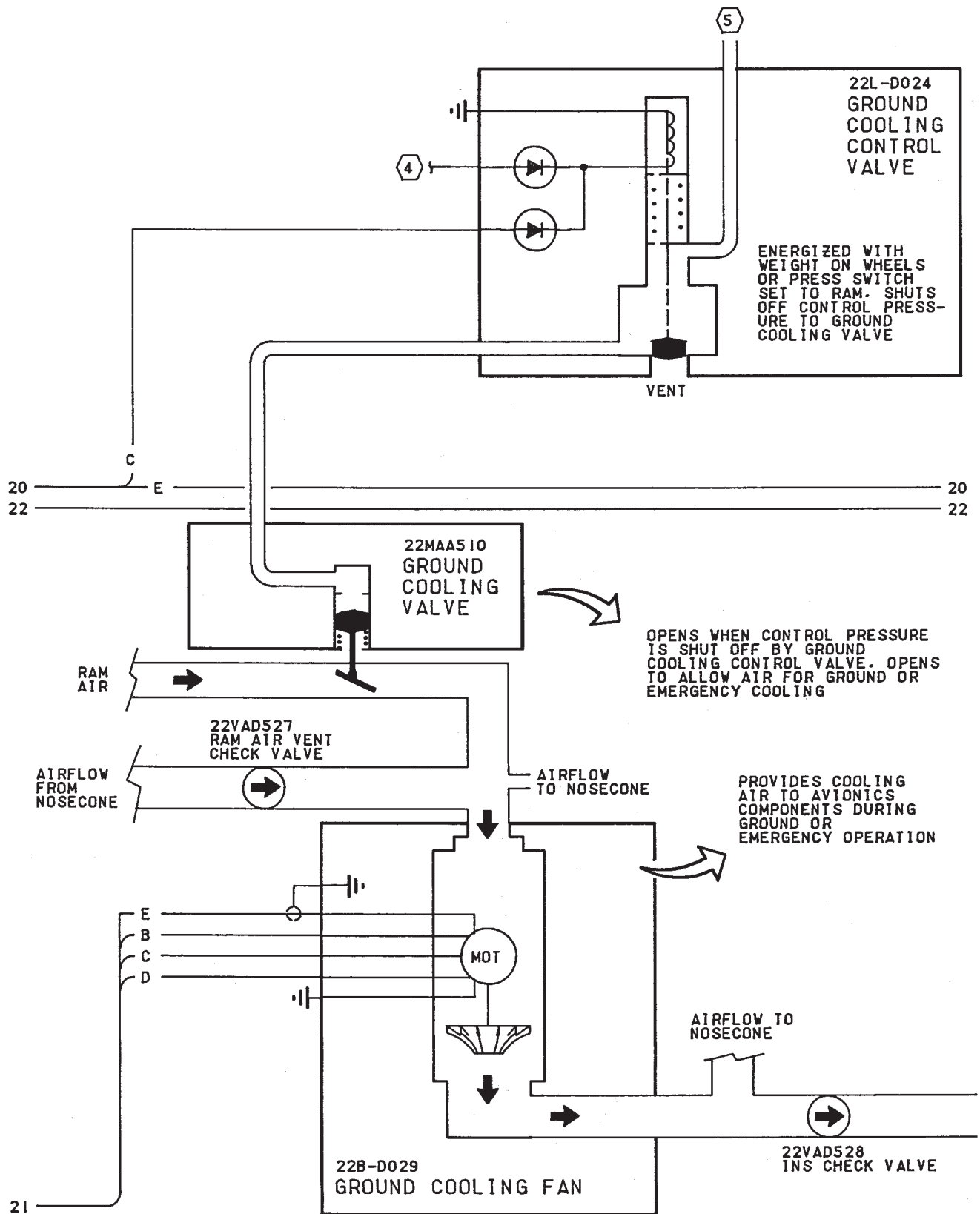


Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 7)



AV8BC-410-10-(4-8) A-6RTD

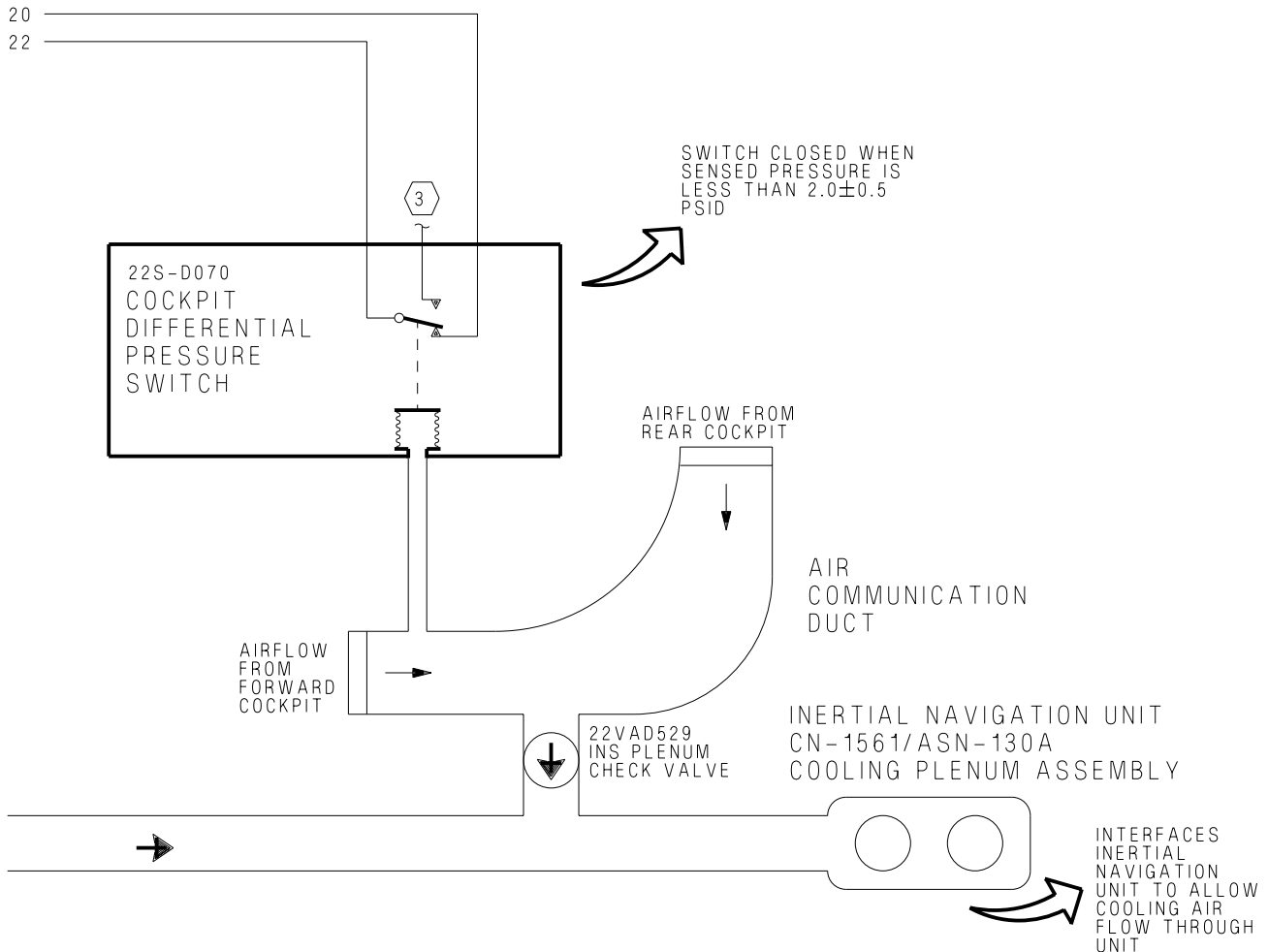
Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 8)

LEGEND

1. NONSTANDARD SYMBOL:



- ② PIN NOT USED.
- ③ LANDING GEAR CONTROLLED RELAYS SIMPLIFIED SCHEMATIC, A1-AV8BB-130-100, WP005 00.
- ④ CABIN COOLING AND DEFOG SYSTEM SIMPLIFIED SCHEMATIC, WP004 00.
- ⑤ CANOPY SEAL SYSTEM SIMPLIFIED SCHEMATIC, WP007 00.
- ⑥ AIR DATA SIMPLIFIED SCHEMATIC, A1-AV8BB-560-100, WP007 00.
- ⑦ EXTERNAL ELECTRICAL POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP006 00.
- ⑧ WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-440-100, WP008 00.
- ⑨ POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP005 00.
- ⑩ 162747 THRU 163207.
- ⑪ 163856 THUR 163861.



AHR540-4-9-012

Figure 2. Forward Avionics Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 9)

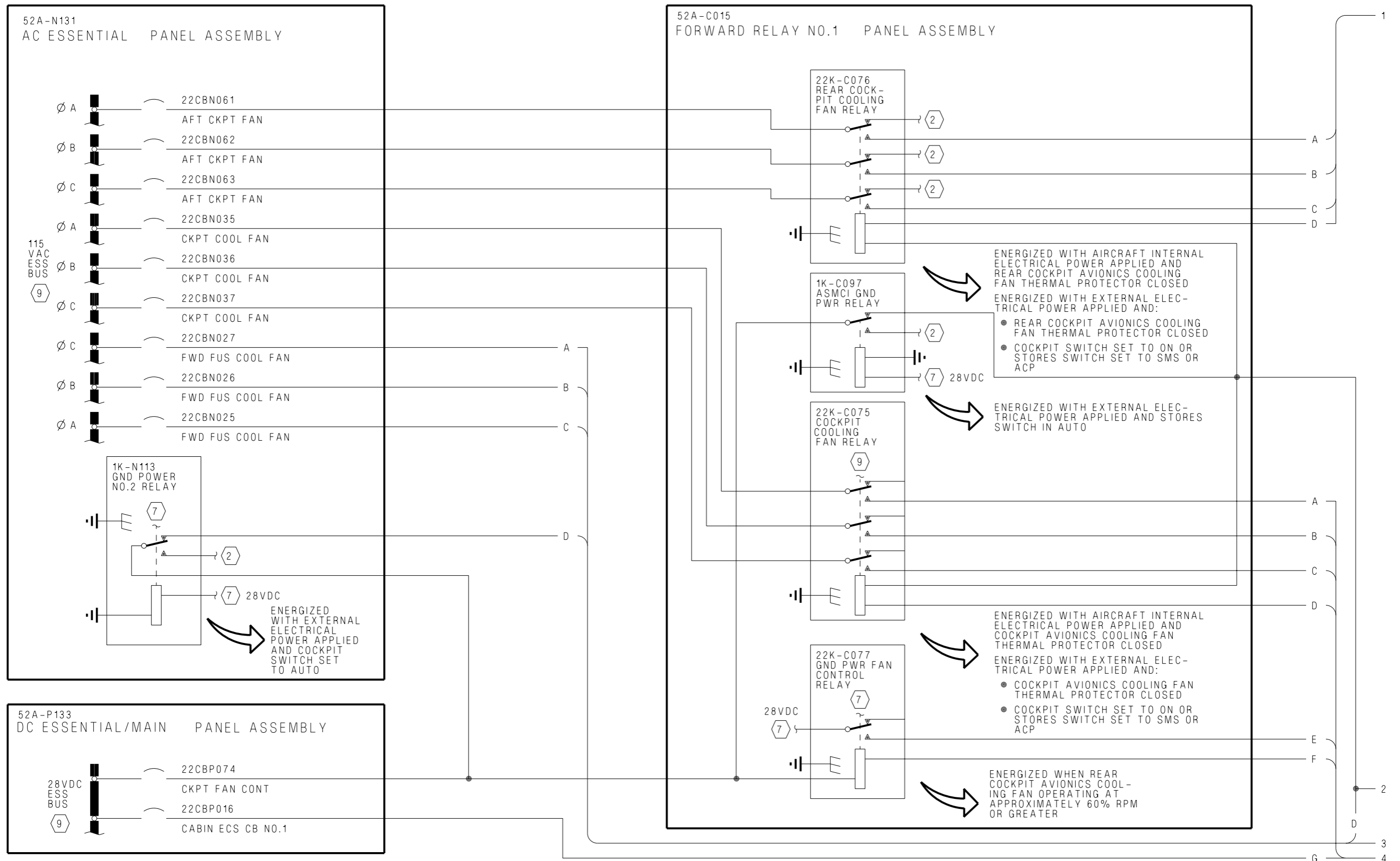
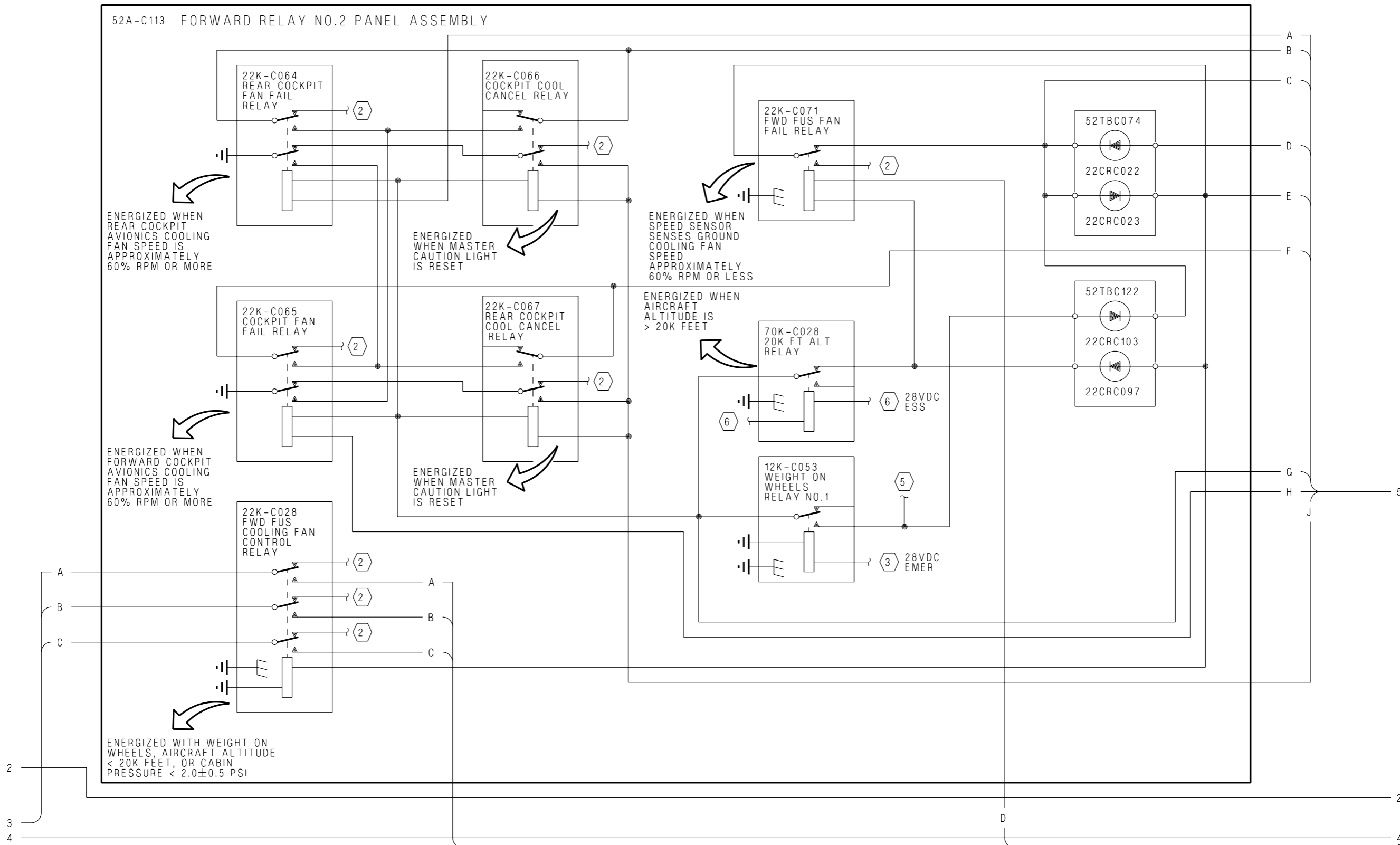


Figure 3. Figure 3. Forward Avionics Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 1)

Figure 3. ■

1 1



AHR540-20-2-013

Figure 3. Figure 3. Forward Avionics Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 2)

Figure 3. ■

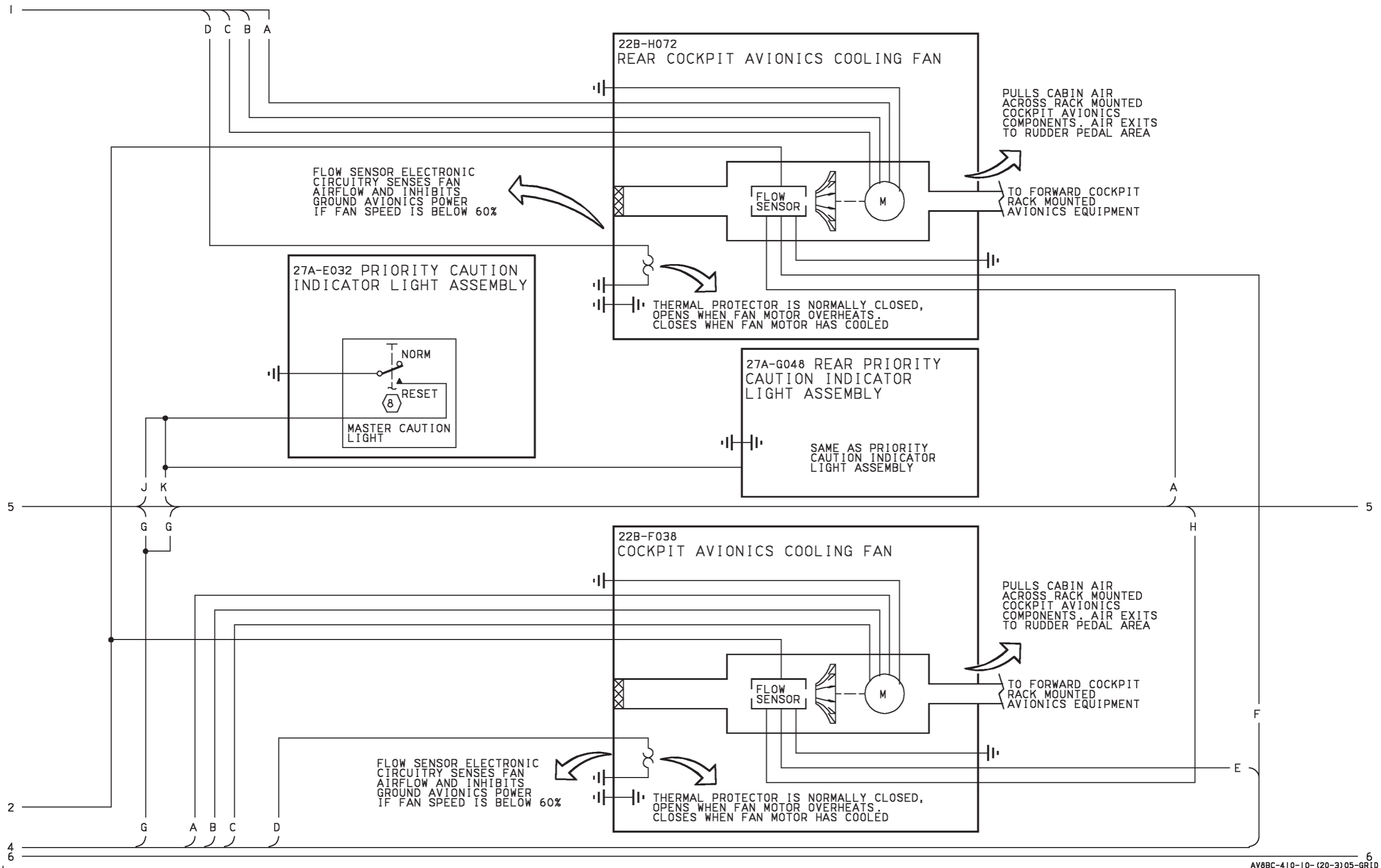


Figure 3. Figure 3. Forward Avionics Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 3)

Figure 3. ■

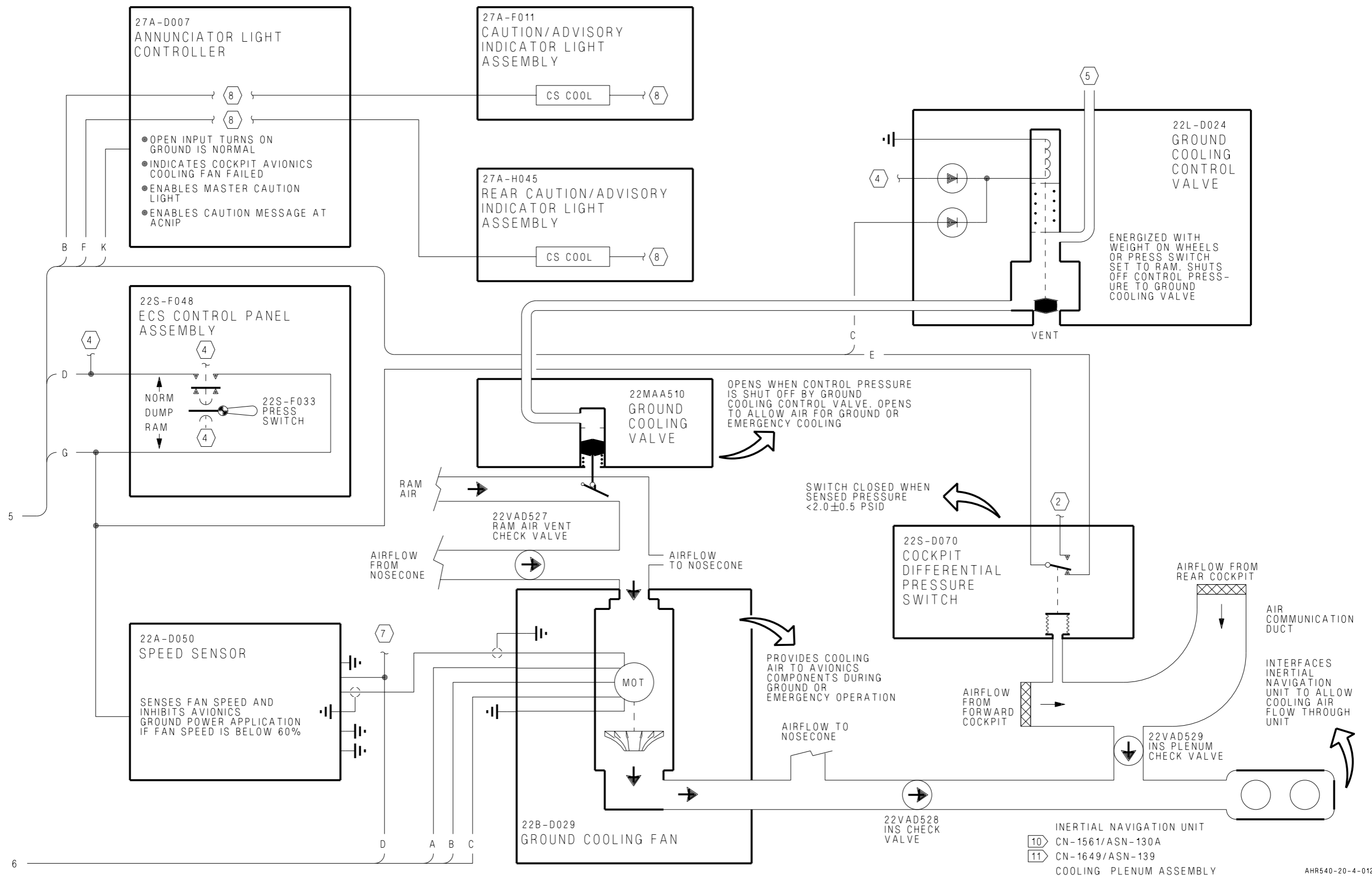


Figure 3. Figure 3. Forward Avionics Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 4)

Figure 3. ■

AHR540-20-4-012

LEGEND

1. NONSTANDARD SYMBOL:



2 PIN NOT USED.

3 LANDING GEAR CONTROLLED RELAYS SIMPLIFIED SCHEMATIC,
A1-AV8BB-130-100, WP005 00.

4 CABIN COOLING AND DEFOG SYSTEM SIMPLIFIED SCHEMATIC,
WP004 00.

5 CANOPY SEAL SYSTEM SIMPLIFIED SCHEMATIC, WP007 00.

6 AIR DATA SIMPLIFIED SCHEMATIC, A1-AV8BB-560-100, WP007 00.

7 EXTERNAL ELECTRICAL POWER SYSTEM SIMPLIFIED SCHEMATIC,
A1-AV8BD-420-100, WP006 00.

8 WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED
SCHEMATIC, A1-AV8BB-440-100, WP008 00.

9 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC,
A1-AV8BD-420-500, WP005 00.

10 164113 THRU 164137.

11 164138 AND UP.

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

ANTI-G SYSTEM

Reference Material

Environmental Control System	A1-AV8BC-410-100
Description and Operation - Cabin Cooling And Defog System	WP004 00

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Rear Anti-G Disconnect	2
Rear Anti-G Valve	2
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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP No.	Date Incorp.	Remarks
AV8AFC-284	-	ANTI-G Valve Replacement (ECP MDC-AV-8B-0131C1)	15 Oct 88	-

1. DESCRIPTION.

2. **SYSTEM DESCRIPTION.** The anti-g system automatically regulates air pressure to the crewmembers anti-g suits to increase their tolerance to high acceleration levels. The anti-g suit reduces the fatiguing effect of repeated exposure to high acceleration which can cause grayout or blackout because of lack of oxygen-rich blood to the brain. The anti-g suit applies a regulated pressure to the crewmembers lower torso to keep oxygen-rich blood in the upper torso.

3. **COMPONENT DESCRIPTION.** System components shown in figure 1 are described and listed in paragraphs below.

4. **Anti-G Valve.** The anti-g valve is a pressure regulating valve made up of a demand valve, relief valve, and an activating weight.

5. **Anti-G Disconnect.** The anti-g disconnect is a console mounted quick release disconnect.

6. **Anti-G/Canopy Seal Check Valve.** The anti-g/canopy seal check valve is an in line poppet type check valve. The check valve is threaded at each end.

7. **Anti-G/Canopy Seal Test Port.** The anti-g/canopy seal test port is an in line capped tee fitting.

8. **Rear Anti-G Disconnect.** The rear anti-g disconnect is a console mounted, quick release disconnect.

9. **Rear Anti-G Valve.** The rear anti-g valve is a pressure regulating valve made up of a demand valve, relief valve, and an activating weight.

10. **RELATED SYSTEMS.** Related systems are described in paragraphs below.

11. **Cabin Cooling and Defog System.** The cabin cooling and defog system (WP004 00) provides air pressure to the anti-g system. Air is tapped from a duct between the secondary heat exchanger and the cold air unit expansion turbine inlet.

12. **SYSTEM CONTROLS AND INDICATORS.** System controls and indicators are described in paragraphs below.

13. **Manual Inflation Buttons.** The manual inflation buttons on the anti-g valve and rear anti-g valve allow the crewmembers anti-g suits to be manually inflated. All other operation is automatically controlled and no indicators are provided.

14. OPERATION.

15. COMPONENT OPERATION.

16. **Anti-G Valve.** The anti-g valve is located in the pilot services panel assembly. The valve regulates air pressure to the crewmembers anti-g suit to no more than 12 psi. The valve is automatically controlled by G forces on an activating weight in the valve or manually by pressing the manual inflation button. In the suit inflation condition, the activating weight is pressed down by positive G force which opens a demand valve allowing air pressure to inflate the anti-g suit. When suit pressure is enough to counteract the G force on the activating weight, the demand valve closes and a constant suit pressure is held during the G force condition. When G force is reduced, the activating weight is moved up by spring tension and suit pressure is exhausted to the cockpit. This condition is held during suit exhaust and static conditions. A relief valve prevents anti-g valve outlet pressure from exceeding 12 psi.

17. **Rear Anti-G Valve.** The rear anti-g valve is located in the rear pilot services panel assembly. The valve regulates air pressure to the crewmembers anti-g suit to no more than 12 psi. The valve is automatically controlled by G forces on

an activating weight in the valve or manually by pressing the manual inflation button. In the suit inflation condition, the activating weight is pressed down by positive G force which opens a demand valve allowing air pressure to inflate the anti-g suit. When suit pressure is enough to counteract the G force on the activating weight, the demand valve closes and constant suit pressure is held during the G force condition. When G force is reduced, the activating weight is moved up by spring tension and suit pressure is exhausted to the rear cockpit. This condition is held during suit exhaust and static conditions. A relief valve prevents anti-g valve outlet pressure from exceeding 12 psi.

18. Anti-G Disconnect. The anti-g disconnect, located inboard of the pilot services panel assembly, provides the quick disconnect interface between the anti-g system and the crewmembers anti-g suit.

19. Rear Anti-G Disconnect. The rear anti-g disconnect, located inboard of the rear pilot services panel assembly, provides the quick disconnect interface between the anti-g system and the crewmembers anti-g suit.

20. Anti-G/Canopy Seal Check Valve. The anti-g/canopy seal check valve is a one way check valve. The valve is located in the air duct between the secondary heat exchanger and the cold air unit expansion turbine inlet. The check valve will prevent loss of anti-g system pressure if loss of cabin cooling and defog system (WP004 00) pressure occurs. The check valve also isolates the anti-g system so a ground air source can be used.

21. Anti-G/Canopy Seal Test Port. The anti-g/canopy seal test port is located in the forward end of the nose wheelwell. The test port allows a ground air source to be used for ground testing of the anti-g system.

22. SYSTEM OPERATION.

23. Automatic Mode. Air pressure, tapped from the cabin cooling and defog system (WP004 00), passes through the anti-g/canopy seal check valve (figure 2) to the anti-g valves. Positive G forces move an activating weight down opening a demand valve allowing air pressure to inflate the anti-g suit. When G forces decrease the activating weight is moved up by spring tension closing the demand valve and opening an exhaust valve, allowing the anti-g suit to deflate.

24. Manual Mode. Air pressure, tapped from the cabin cooling and defog system (WP004 00), passes through the anti-g/canopy seal check valve (figure 2) to the anti-g valves. Pressing the manual inflation button moves an activating weight down opening a demand valve allowing air pressure to inflate the anti-g suit. When the manual inflation button is released, the activating weight is moved up by spring tension, closing the demand valve and opening an exhaust valve, allowing the anti-g suit to deflate.

25. Ground Test. With a ground air source applied, the anti-g system can be operated manually. The system operation is the same for ground test or in-flight manual operation.

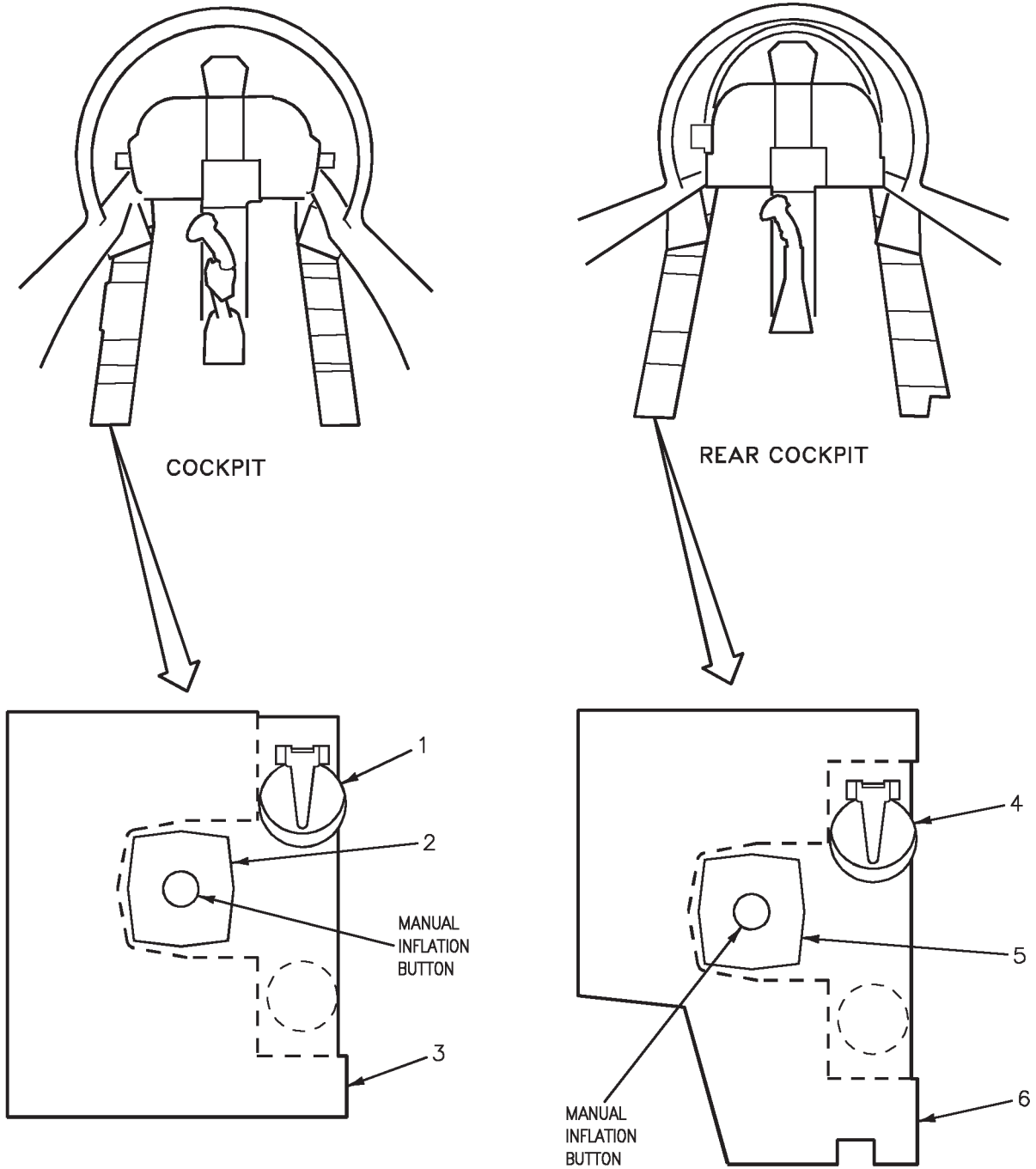


Figure 1. Anti-G System Component Locator (Sheet 1)

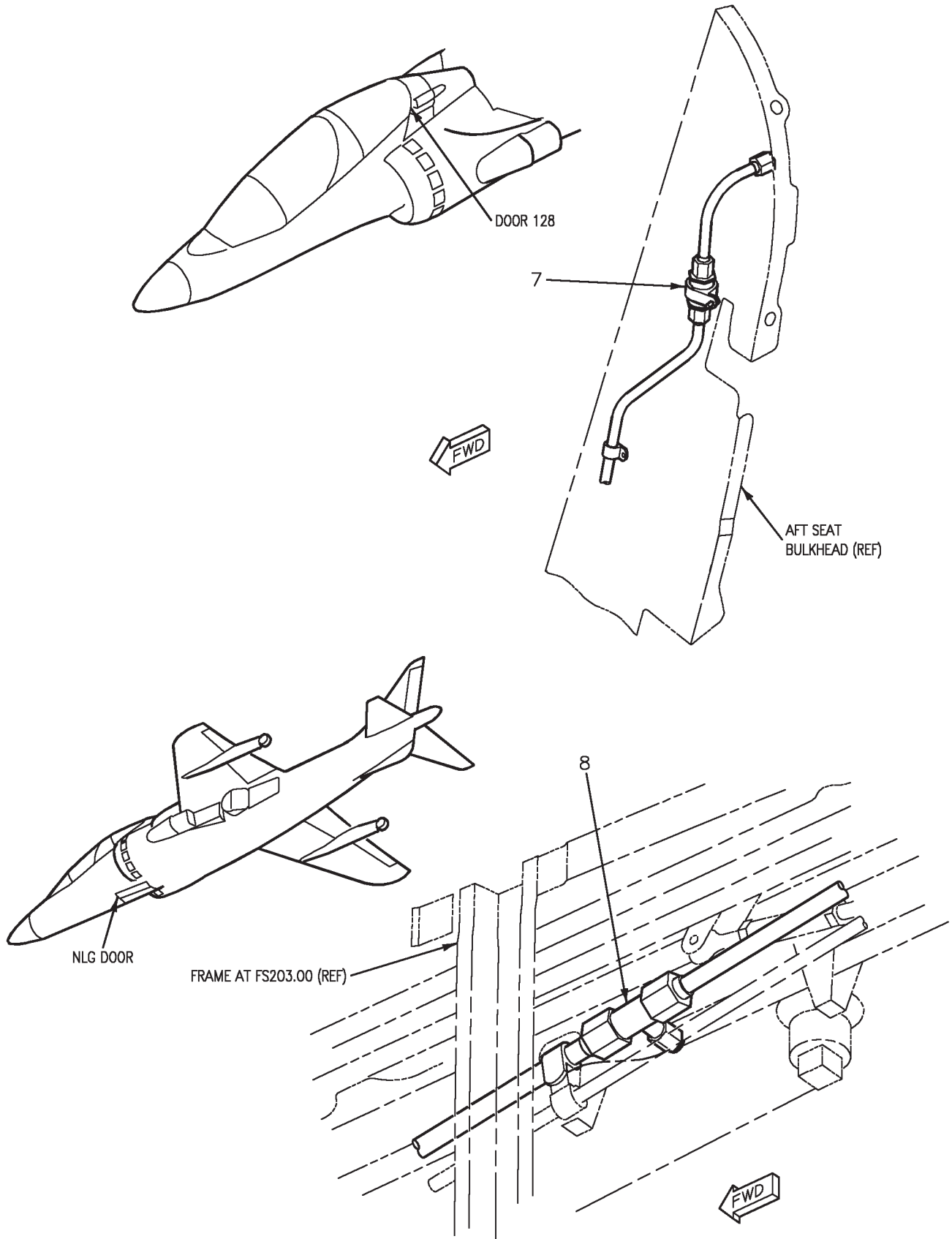


Figure 1. Anti-G System Component Locator (Sheet 2)

Nomenclature	Index No.	Ref Des
ANTI-G/CANOPY SEAL CHECK VALVE	7	22VAK516
ANTI-G/CANOPY SEAL TEST PORT	8	—
ANTI-G DISCONNECT	1	—
ANTI-G VALVE	2	22VAE515
PILOT SERVICES PANEL ASSEMBLY	3	52A-E060
REAR ANTI-G DISCONNECT	4	—
REAR ANTI-G VALVE	5	22VAG530
REAR PILOT SERVICES PANEL ASSEMBLY	6	8A-G195

Figure 1. Anti-G System Component Locator (Sheet 3)

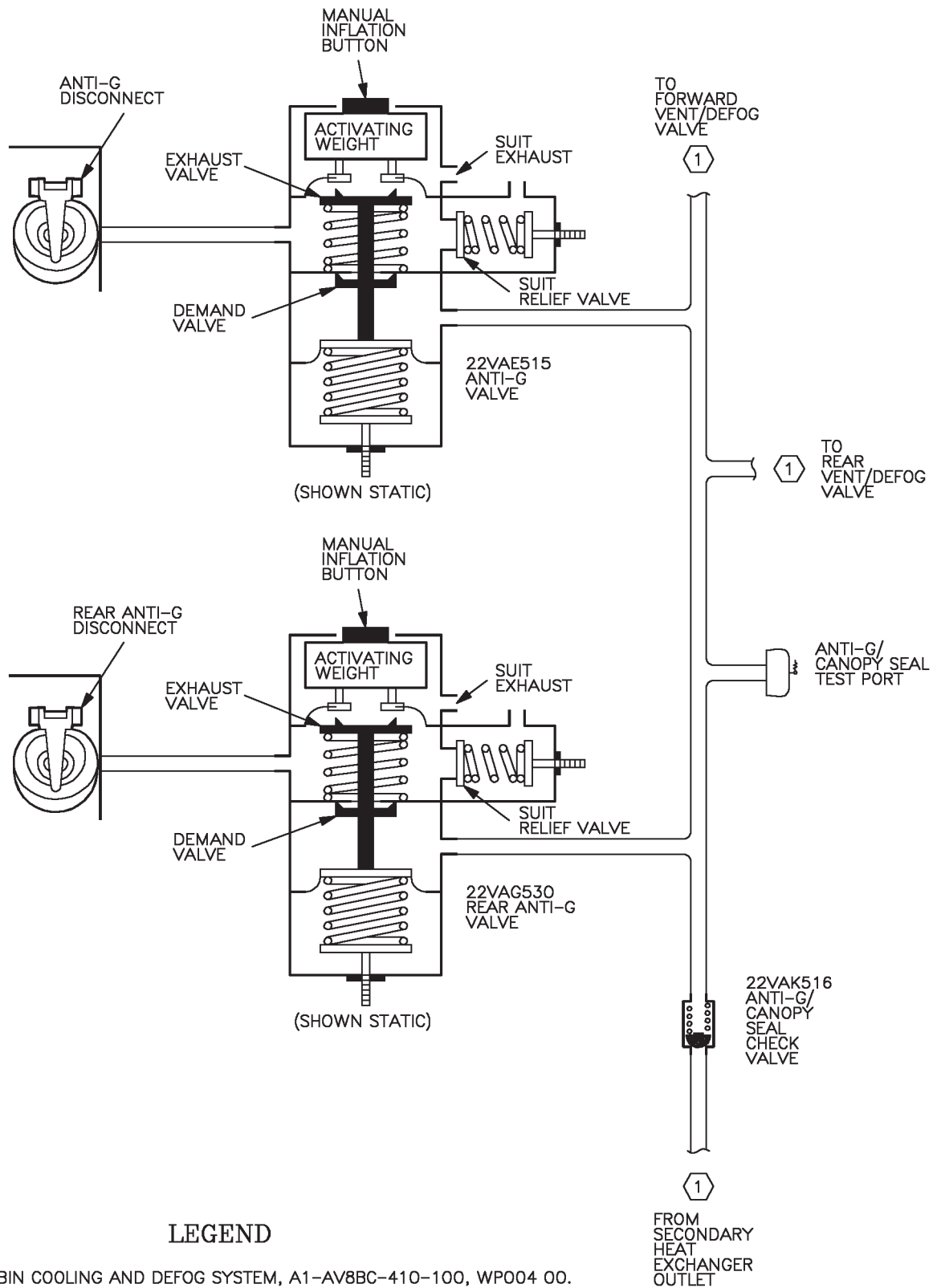


Figure 2. Anti-G System Simplified Schematic

ORGANIZATIONAL MAINTENANCE
PRINCIPLES OF OPERATION
REAR EQUIPMENT COOLING SYSTEM

Reference Material

Electrical Systems.....	A1-AV8BB-420-100
AC Power System	WP003 00
DC Power System	WP004 00
Electrical Systems.....	A1-AV8BD-420-100
AC Power System	WP003 00
DC Power System	WP004 00
Lighting Systems.....	A1-AV8BB-440-100
Warning/Caution/Advisory Lighting System.....	WP007 00
Power Plant and Related Systems	A1-AV8BD-290-100
Basic Engine	WP003 00

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Rear ECS Ground Cooling Fan Pressure Switch	3
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Rear ECS Heat Exchanger	3
Rear ECS Pressure Reducing and Shutoff Valve.....	3
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Rear ECS Cold Air Unit Pressure Switch.....	5
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Rear ECS Ground Cooling Fan Pressure Switch	6
Rear ECS Ground Cooling Fan Speed Sensor.....	6
Rear ECS Ground Cooling Valve.....	6
Rear ECS Heat Exchanger	6
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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-354	30 Jun 94	Global Positioning System (GPS) Provisions and Mini TACAN Incorporation of (ECP MDC-AV8-0168C1)	1 Mar 97	—
AV8AFC-393	3 Sep 99	Addition of Digital Flap Controller (DFC) (ECP MDC-AV8-00255R1)	15 May 99	—
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B-0277)	15 May 04	—

1. **DESCRIPTION.**

2. **SYSTEM DESCRIPTION.** Aft fuselage mounted avionics equipment is cooled by the rear equipment cooling system. Engine bleed air, extracted from the sixth stage of compression, is conditioned and distributed to the rack mounted avionics equipment to provide required cooling.

3. **COMPONENT DESCRIPTION.** System components shown in figure 1 are described and listed in paragraphs below.

4. **Avionics Cooling Air Fittings.** Several different types of fittings are used. Cooling requirements and mounting provisions vary for different avionics units. Some fittings are collapsible, self sealing assemblies. Others are duct flanges. Fittings may or may not include filters and/or orifices. ■

5. **Rear ECS Air Filter Assembly.** The rear ECS air filter assembly is a reusable, steel mesh filter element encased in a housing with a spring loaded bypass valve. ■

6. **Rear ECS Air Inlet Temperature Switch.** The rear ECS air inlet temperature switch is a temperature sensitive switch encased in a threaded housing.

7. **Rear ECS Check Valve.** The rear ECS check valve is a flapper type, in line, spring loaded closed, check valve.

8. **Rear ECS Cold Air Unit.** The rear ECS cold air unit is an expansion turbine and axial flow fan, mounted at opposite ends of a common shaft, in a common housing. The unit has a serviceable bearing lubrication system and a bearing cooling system.

9. **Rear ECS Cold Air Unit Pressure Switch.** The rear ECS cold air unit pressure switch is a pressure sensitive electrical switch encased in a threaded housing.

10. **Rear ECS Ground Cooling Fan.** The rear ECS ground cooling fan is an electrically driven axial flow fan. The fan is made up of a flow impeller mounted directly to the shaft of a 3 phase, 400 Hz electrical motor. The motor and impeller are enclosed in a housing with guide vanes built in on the outlet end of the impeller. The motor has an electrical sensing unit and overheat protection devices.

11. **Rear ECS Ground Cooling Fan Pressure Switch.** The rear ECS ground cooling fan pressure switch is a pressure sensitive electrical switch encased in a threaded housing.

12. **Rear ECS Ground Cooling Fan Speed Sensor.** The rear ECS ground cooling fan speed sensor is an electronic processing unit in a sealed case.

13. **Rear ECS Ground Cooling Valve.** The rear ECS ground cooling valve is a two position pneumatically actuated and controlled valve. The valve is made up of a housing which contains a piston attached to a spring loaded diaphragm that controls a hinged valve.

14. **Rear ECS Heat Exchanger.** The rear ECS heat exchanger is a single pass, cross flow, air to air heat exchanger. The heat exchanger is made up of a finned core inside a welded housing.

15. **Rear ECS Pressure Reducing and Shutoff Valve.** The rear ECS pressure reducing and shutoff valve is a solenoid controlled pressure regulating and shutoff valve in a single unit. Both the pressure

regulating section and shutoff valve section are made up of a piston sliding within a cylinder on a hollow shaft. The shutoff valve section piston is spring loaded closed and the pressure regulating section piston is spring loaded open. The pressure regulating section also has a blowoff valve.

16. **Rear ECS Temperature Sensor.** The rear ECS temperature sensor is a temperature sensitive control device made up of a body, a bimetallic temperature sensitive strip with a valve seat connected to one end, and an orifice adapter.

17. **Rear ECS Temperature Control Valve.** The rear ECS temperature control valve is a pneumatically controlled and actuated flow control valve. The valve is made up of a body enclosing a spring-loaded double-action piston and hollow shaft attached to a poppet valve and an orifice filter. The valve is spring loaded closed.

18. **RELATED SYSTEMS.** Related systems are described in paragraphs below.

19. **Power Plant and Related Systems.** Hot, high pressure bleed air is provided by the engine sixth stage compressor (A1-AV8BD-290-100, WP003 00).

20. **DC Power System.** The DC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP004 00) provides 28vdc essential power for the rear equipment cooling system.

21. **AC Power System.** The AC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP003 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP003 00) provides essential 115vac for the rear equipment cooling system.

22. **Warning/Caution/Advisory Lighting System.** The warning/caution/advisory lighting system (A1-AV8BB-440-100, WP007 00) provides visual indication of normal aircraft functions and system malfunctions affecting safety of flight operations. The warning/caution/advisory lighting system includes the annunciator light controller and the caution/advisory indicator light assembly. The annunciator light controller receives data from various aircraft systems and provides logic to turn on and off warning/caution/advisory lights.

23. The annunciator light controller will turn on the AFT BAY caution lights and the MASTER CAUTION lights when the rear equipment cooling system is off.

24. **SYSTEM CONTROLS AND INDICATORS.**

System controls and indicators are described in paragraphs below.

25. **EQUIP Switch.** The EQUIP switch, located on the ECS control panel assembly, is a dual pole toggle switch. The switch provides electrical control for the rear ECS pressure reducing and shutoff valve. The switch has three positions: RESET, ON, and OFF. The switch must be held in RESET.

26. Setting the EQUIP switch to ON applies essential 28vdc power to contacts of the rear equipment bay cooling control relay.

27. Setting the EQUIP switch to OFF applies essential 28vdc power to a contact of the rear equipment bay cooling control relay and energizes the rear ECS pressure reducing and shutoff valve solenoid. Energizing the solenoid closes the valve. Power applied to rear equipment bay cooling control relay contacts with the EQUIP switch ON is removed with the EQUIP switch OFF.

28. Setting and holding the EQUIP switch to RESET removes essential 28vdc power from the rear equipment bay cooling control relay contact and from the rear ECS pressure reducing and shutoff valve solenoid, opening the valve.

29. **AFT BAY Caution Lights.** The AFT BAY caution lights, located on the caution/advisory indicator light assembly and the rear caution/advisory indicator light assembly are yellow lens, dual lamp, indicator lights.

30. The AFT BAY caution lights are controlled by the rear ECS air inlet temperature switch, or the rear ECS cold air unit pressure switch, through the warning/caution/ advisory lighting system.

31. **Rear Cool Fan Control Relay.** The rear cool fan control relay, located on the distribution panel assembly, is a four pole, double throw, 5 amperes, permanent magnet drive, armature relay.

32. The relay is controlled by the rear ECS ground cooling fan pressure switch. With the relay energized, essential 115vac is removed from the rear ECS ground cooling fan. With the relay

deenergized, essential 115vac is applied to the rear ECS ground cooling fan.

33. **Rear Equipment Bay Cooling Control Relay.**

The rear equipment bay cooling control relay, located on the distribution panel assembly, is a dual pole, double throw, 5 amperes, permanent magnet drive, armature relay.

34. The relay is controlled by the rear ECS air inlet temperature switch or the rear ECS cold air unit pressure unit switch. With the relay energized, the following occurs:

a. Essential 28vdc power is applied to energize the rear ECS pressure reducing and shutoff valve solenoid.

b. Essential 28vdc power is removed from the annunciator light controller to enable the AFT BAY caution lights.

35. With the relay deenergized, the following occurs:

a. Essential 28vdc power is removed to deenergize the rear ECS pressure reducing and shutoff valve solenoid.

b. Essential 28vdc power is applied to the annunciator light controller to disable the AFT BAY caution lights.

36. **60 Sec Delay ECS Relay.** The 60 sec delay ECS relay, located on the aft relay panel assembly is a time delay, 10 amperes, dual pole, double throw, armature. The relay contacts move 60 seconds after the relay is energized. When deenergized, the contacts move immediately.

37. The relay is controlled by the rear ECS cold air unit pressure switch. With the relay energized, essential 28vdc power is applied to the input of the rear ECS air inlet temperature switch. With the relay deenergized, essential 28vdc power is removed from the input of the rear ECS air inlet temperature switch.

38. **OPERATION.**

39. **COMPONENT OPERATION.**

40. **Avionics Cooling Air Fittings.** Avionics cooling air fittings, located on the equipment cooling rack, provide the cooling system interface between rack

mounted equipment and the equipment rack. When a unit is installed on the equipment rack, it makes contact with a cooling air fitting. The fitting makes a seal between the unit and the rack, allowing cooling air to flow through the unit. Some fittings contact the unit on the back and some contact the bottom, depending on unit mounting. The different types of fittings used are required for the different cooling requirements of each unit.

41. Rear ECS Air Filter Assembly. The rear ECS air filter element assembly is located in the MLG wheelwell. Sixth stage engine bleed air is sent by way of ducting to the filter assembly. The filter removes particulate contamination before it can cause damage further downstream in the rear equipment cooling system. If the filter element becomes blocked, pressure build up opens a bypass valve allowing air to bypass the filter element. The bypass valve opens at 4 psid. The filter element is replaceable independent of the housing or may be cleaned and reused. With the element removed, the housing allows a ground air source to be adapted and used for ground operational checkout.

42. Rear ECS Air Inlet Temperature Switch. The rear ECS air inlet temperature switch is located in the equipment cooling shelf supply duct. If equipment cooling air exceeds 131° F, the temperature switch closes and applies essential 28vdc to energize the rear equipment bay cooling control relay. When equipment cooling air decreases to less than 130° F, the temperature switch opens to enable the rear equipment bay cooling control relay to be manually reset. After an overheat occurs, the system must be manually reset, using the EQUIP switch located on the ECS control panel assembly.

43. Rear ECS Check Valve. The rear ECS check valve is located in the left hand rear equipment cooling system exhaust duct. The check valve prevents reverse airflow from being induced into the system during ground operation. The check valve also prevents the ingestion of foreign objects into the system.

44. Rear ECS Cold Air Unit. The rear ECS cold air unit is located at the base of the rear ECS heat exchanger in door 61. The expansion turbine receives pre-cooled air from the rear ECS heat exchanger. Heat energy is converted to mechanical energy by spinning the expansion turbine. The turbine drives the axial flow fan through the common shaft. With the heat lost, cold air is left

and sent by way of ducting to mix with hot air from the rear ECS temperature control valve.

45. During ground operation, the driven axial flow fan draws ram air across the rear ECS heat exchanger. The ram air then exits through the ram air exhaust.

46. Lubrication for the common shaft is provided by oil stored in a cotton wool pack sump and transported to the shaft by a system of oil wicks. The sump has fill and drain plugs located to allow periodic servicing of oil while the unit is still in the aircraft.

47. Shaft bearing cooling is provided by a tube, tapped into the ram air inlet, which transports cooling air to the shaft bearings.

48. Rear ECS Cold Air Unit Pressure Switch. The rear ECS cold air unit pressure switch is located in the rear ECS cold air unit expansion turbine inlet duct. When turbine inlet pressure exceeds 72 psi, the pressure switch closes and applies essential 28vdc to energize the rear equipment bay cooling control relay. When turbine inlet pressure decreases to below 72 psi, the switch opens to enable the rear equipment bay cooling control relay to be manually reset. After an overpressure occurs, the system must be manually reset, using the EQUIP switch located on the ECS control panel assembly.

49. Rear ECS Ground Cooling Fan. The rear ECS ground cooling fan is located in a duct tapped from the rear ECS ram air inlet in door 61. With the fan operating, air is pulled in through the rear ECS ram air inlet. The cooling air is given a high velocity by the fan impeller and is transported by way of ducting to the equipment cooling rack. The fan will operate when electrical power is applied and rear equipment cooling system pressure is less than 5.0 psi.

50. The guide vanes straighten the airflow before discharge from the fan. The electrical sensing unit provides an electrical signal to the rear ECS ground cooling fan speed sensor based on fan speed. The overheat protection devices will automatically stop the fan, if an overheat condition occurs. When the overheat condition no longer exists, the fan will resume normal operation. The fan motor is cooled by its own airflow.

51. Rear ECS Ground Cooling Fan Pressure

Switch. The rear ECS ground cooling fan pressure switch is located in the rear ECS heat exchanger outlet duct in door 61. When system pressure is greater than 5.0 psi the switch does the following:

- a. Applies essential 28vdc to energize the rear cooling fan control relay.
- b. Applies essential 28vdc to disable the AFT BAY caution lights.
- c. Removes essential 28vdc from the rear ECS ground cooling fan speed sensor. When system pressure is less than 5.0 psi, the switch does the following:
 - d. Removes essential 28vdc to deenergize the rear cooling fan control relay.
 - e. Applies essential 28vdc to the rear ECS ground cooling fan speed sensor.
 - f. Removes essential 28vdc to enable the AFT BAY caution lights.

52. Rear ECS Ground Cooling Fan Speed Sensor.

The rear ECS ground cooling fan speed sensor is located on the left side of the rear equipment bay in door 61. The speed sensor receives an electrical signal from the rear ECS ground cooling fan electronic sensing unit. The signal is proportional to fan rotational speed. If the signal received by the speed sensor is within a predetermined limit, the speed sensor will complete an electrical circuit and allow avionics ground power to be applied. If the signal is out of limits, the speed sensor will inhibit application of power to the avionics equipment.

53. Rear ECS Ground Cooling Valve. The rear ECS ground cooling valve is located on the rear ECS ram air inlet duct in door 61. When air pressure is applied to the valve (rear equipment cooling system operating normally), the spring loaded diaphragm is compressed and the valve is held closed. When air pressure is lost (rear equipment cooling system shutdown), the spring force moves the piston to open the valve. The valve, with the rear ECS ground cooling fan, allows ambient air to flow and cool aircraft equipment for ground operation and inflight if a cooling system failure occurs.

54. Rear ECS Heat Exchanger. The rear ECS heat exchanger is located in the rear ECS ram air inlet

duct in door 61. The heat exchanger initially cools sixth stage engine bleed air for use in the rear equipment cooling system. The engine bleed air enters the heat exchanger core and is cooled by ram air forced across the core by aircraft forward motion. During ground operation, ram air is pulled across the core by the axial flow fan of the rear ECS cold air unit. The partly cooled bleed air is then sent to the turbine section of the rear ECS cold air unit. In the heat exchanger core, the engine bleed air makes two passes, the cooling air makes only one pass.

55. Rear ECS Pressure Reducing And Shutoff

Valve. The rear ECS pressure reducing and shutoff valve is located in the engine bleed air supply duct, in the MLG wheelwell. The valve assembly encloses a small solenoid operated valve and provides a flange for the attachment of the valve solenoid. The solenoid is energized by essential 28vdc to close the valve and deenergized to open the valve. This valve, which is spring loaded, controls two ports, one opening to atmosphere and the other to system pressure; the spring keeps the port to atmosphere open and the other port shut. The body also encloses the assembly which controls the shutoff and regulating functions, and also has a safety valve, inlet and outlet connection. The shutoff valve is spring loaded and free to slide over a fixed cylinder located by a hollow shaft. This shaft carries a collar over which slides a spring loaded sleeve, which controls the regulating function by varying the size of the annular port based on the system demand. Various drillings in the assembly allows atmospheric pressure or system pressure to enter the space between the shutoff valve and the cylinder (depending on the position of the controlling valve) and system pressure only to the rest of the assembly.

56. If an electrical system failure occurs, the rear ECS pressure reducing and shutoff valve will move to the open (deenergized) position.

57. Rear ECS Temperature Sensor. The rear ECS temperature sensor is located in the equipment cooling supply duct, in door 61. The sensor senses air temperature and adjusts the rear ECS temperature control valve to provide the required temperature. The sensor bi-metal strip is connected to the inside of the sensor body so the valve seat fits centrally on the face of the orifice adapter. The orifice adapter is connected to an air connection of the rear ECS temperature control valve. An increase

or decrease in sensed temperature causes the bi-metal strip to deflect and move the valve seat on to, or off of the orifice adapter. The change in air pressure in the rear ECS temperature control valve control chamber moves the valve open or closed as required to provide the required temperature.

58. Rear ECS Temperature Control Valve. The rear ECS temperature control valve is located in a hot air bypass duct between the engine bleed air duct and the equipment cooling supply duct in door 61. The valve mixes hot engine bleed air with conditioned air to provide the required air temperature for equipment cooling. With the rear equipment cooling system off, spring pressure holds the poppet valve closed. With the system operating, engine bleed air passes through the hollow shaft and orifice filter to the control chamber. During normal operation, pressure will increase in the control chamber. When control chamber pressure increases to a point greater than spring tension, the valve will open. When the rear ECS temperature sensor senses the air temperature is too hot, control chamber pressure is lost and the valve will move toward closed.

59. SYSTEM OPERATION.

60. Normal Operation. Sixth stage engine bleed air is routed to the rear ECS air filter assembly (figure 2) where particulate contaminants are removed. The bleed air is then sent to the rear ECS pressure reducing and shutoff valve where pressure is regulated to approximately 75 psi. The regulated air then passes through a flow limiting venturi and is then divided into two circuits. The main circuit flows through the rear ECS heat exchanger where the air temperature is reduced through exchange with ram air. The conditioned air is then sent to the expansion turbine section of the rear ECS cold air unit, where it is again cooled by rapid expansion. The spinning turbine drives an axial flow fan on a common shaft in the rear ECS cold air unit, which pulls more ram air across the rear ECS heat exchanger. If the rear ECS cold air unit expansion

turbine inlet pressure is too high, the rear ECS cold air unit pressure switch will energize the rear equipment bay cooling control relay. The energized relay applies power to energize the rear ECS pressure reducing and shutoff valve solenoid. The valve will then close. Emergency/ground operation will then start.

61. The cooled air from the rear ECS cold air unit expansion turbine is mixed with hot engine bleed air from the secondary circuit through the rear ECS temperature control valve. The mixed air is then sent through the rear ECS temperature sensor. The sensor will control the rear ECS temperature control valve and maintain the correct mixture of hot and cooled air. The air then passes to the equipment cooling rack, where the temperature is monitored by the rear ECS air inlet temperature switch. If air temperature is too hot, the switch closes and energizes the rear equipment bay cooling control relay. The energized relay applies power to energize the rear ECS pressure reducing and shutoff valve solenoid. The valve will then close. Emergency/ground operation will then start.

62. Emergency/Ground Operation. On the ground with the engine not running, or in flight and rear equipment cooling system pressure is lost or system shut down, the rear ECS ground cooling fan (figure 2) will operate and cool the equipment. When system pressure is lost or low, the rear ECS cooling valve opens and the rear ECS ground cooling fan pressure switch trips. The switch deenergizes the rear cool fan control relay. The deenergized relay applies power to the rear ECS ground cooling fan and allows cooling air to be pulled through the rear ECS ground cooling valve by the rear ECS ground cooling fan. The fan forces air through the equipment cooling rack.

63. The AFT BAY caution lights will be on if system pressure is too high as sensed by the rear ECS cold air unit pressure switch, or if system temperature is too high as sensed by the rear ECS air inlet temperature switch.

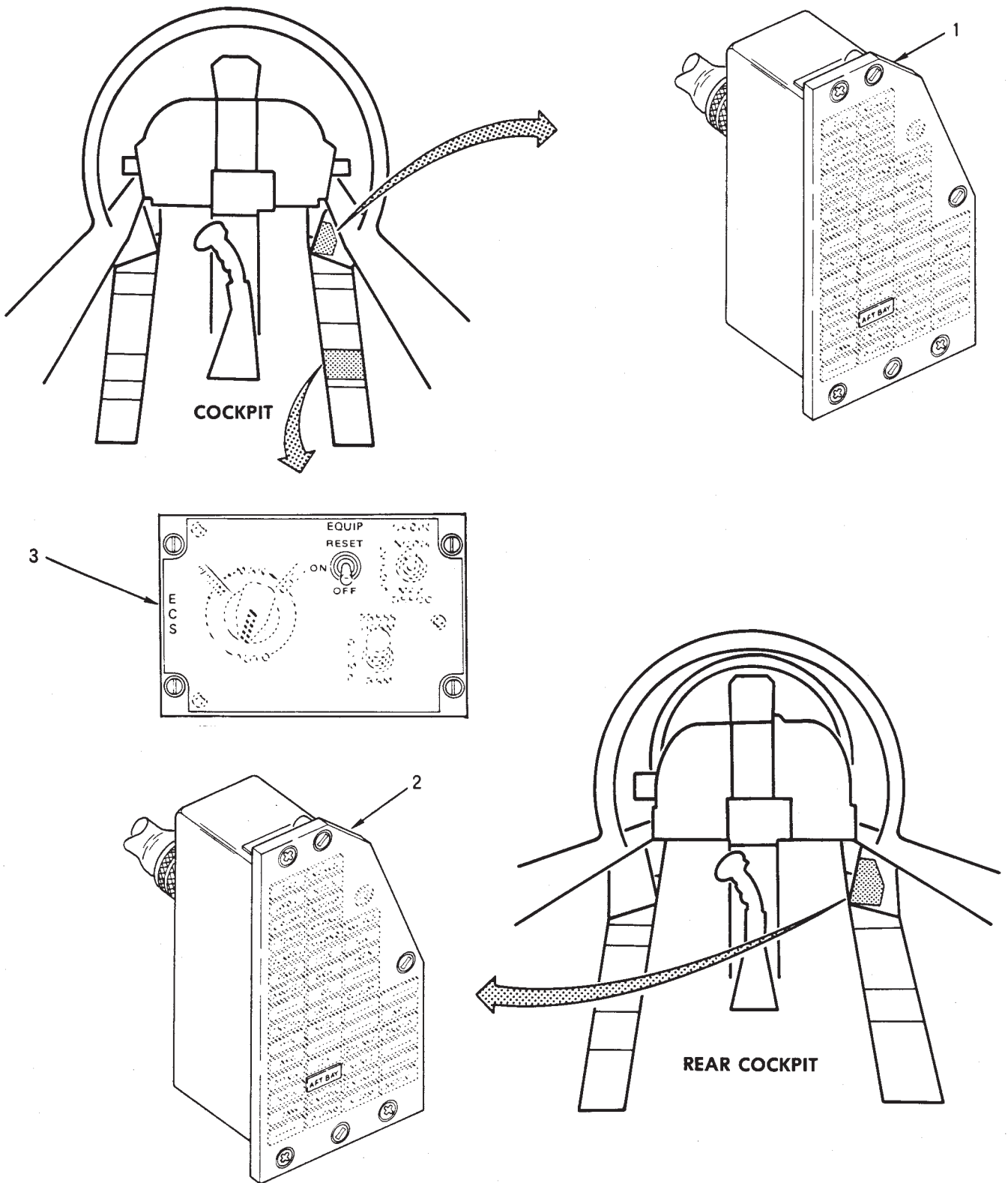


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 1)

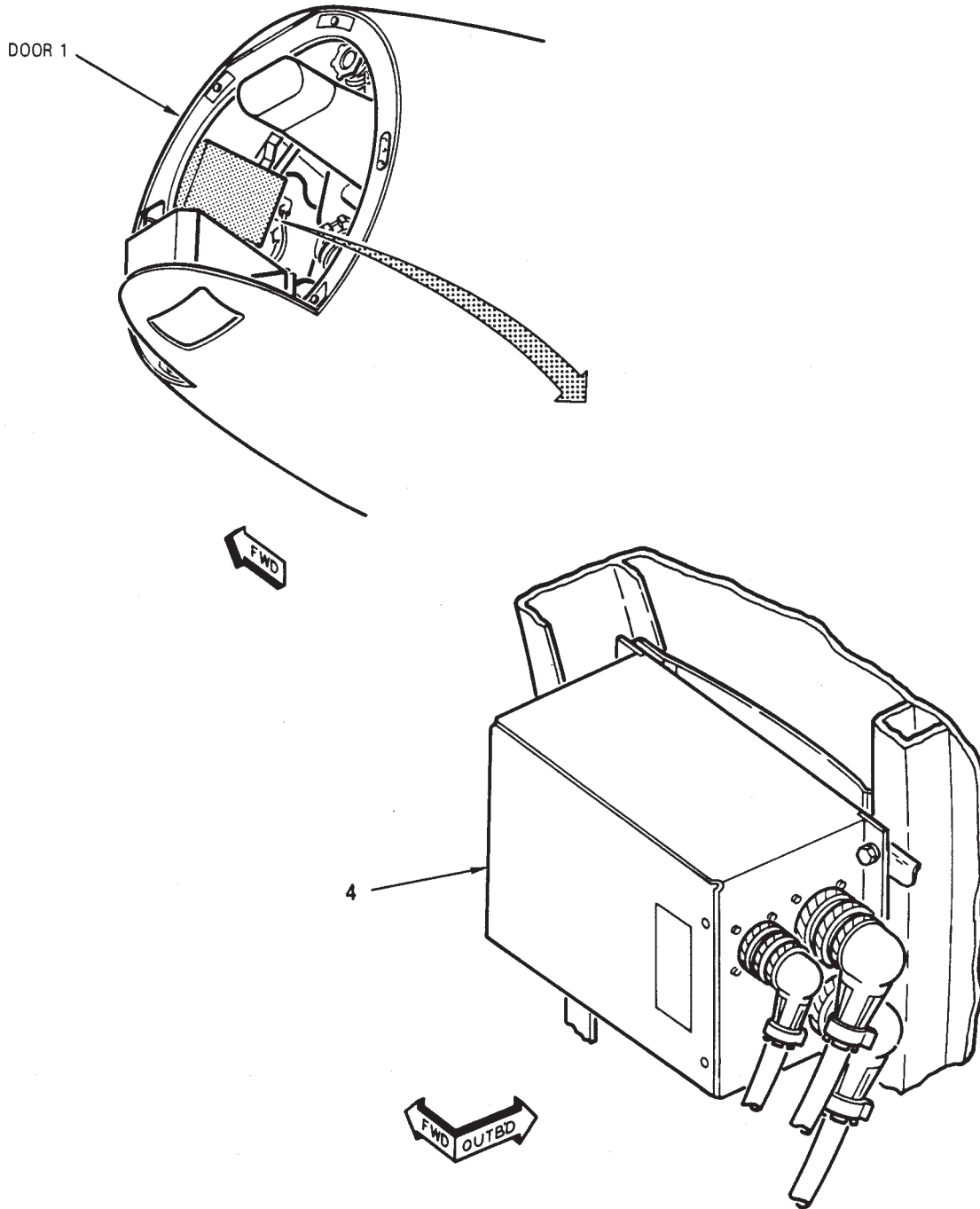


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 2)

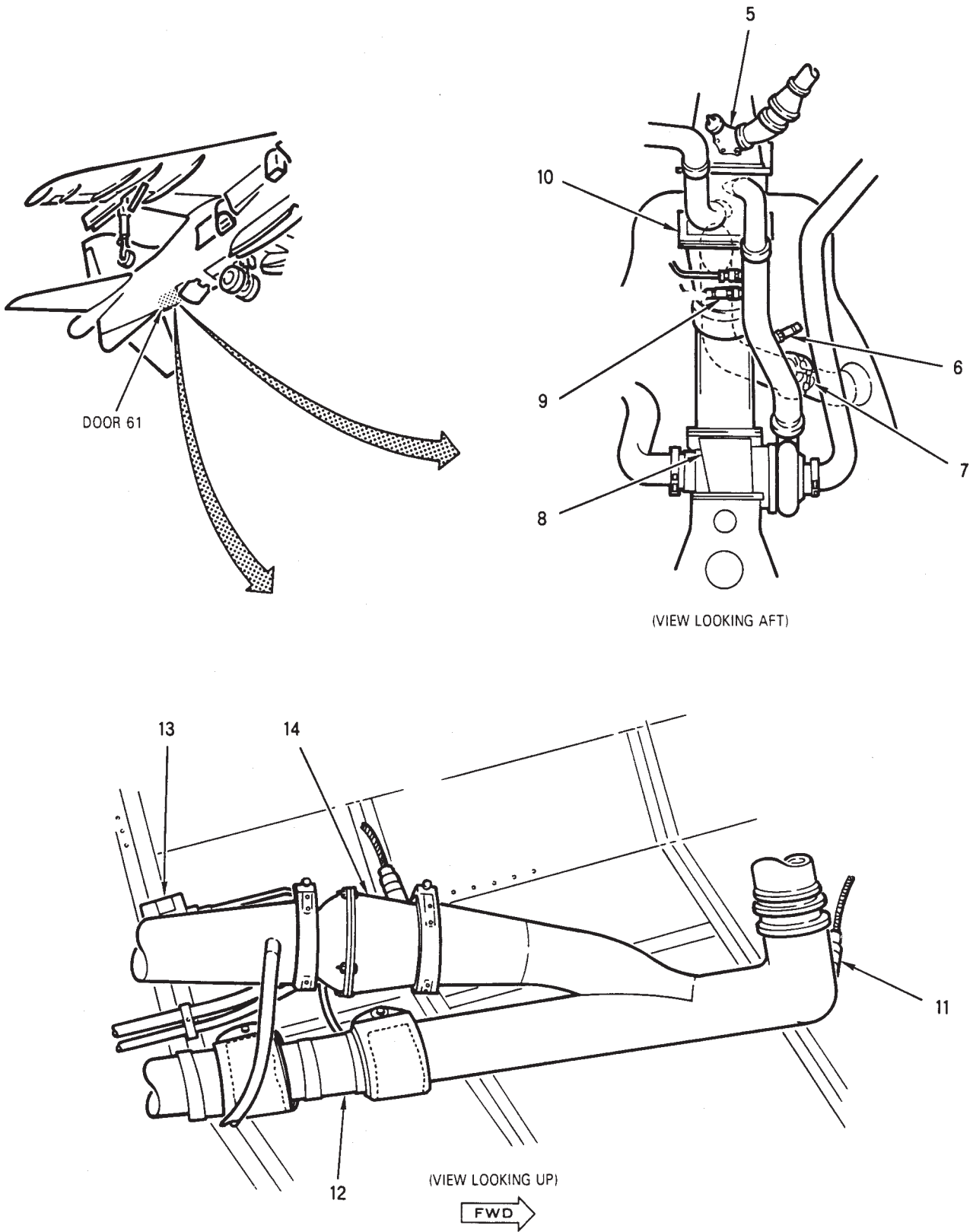


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 3)

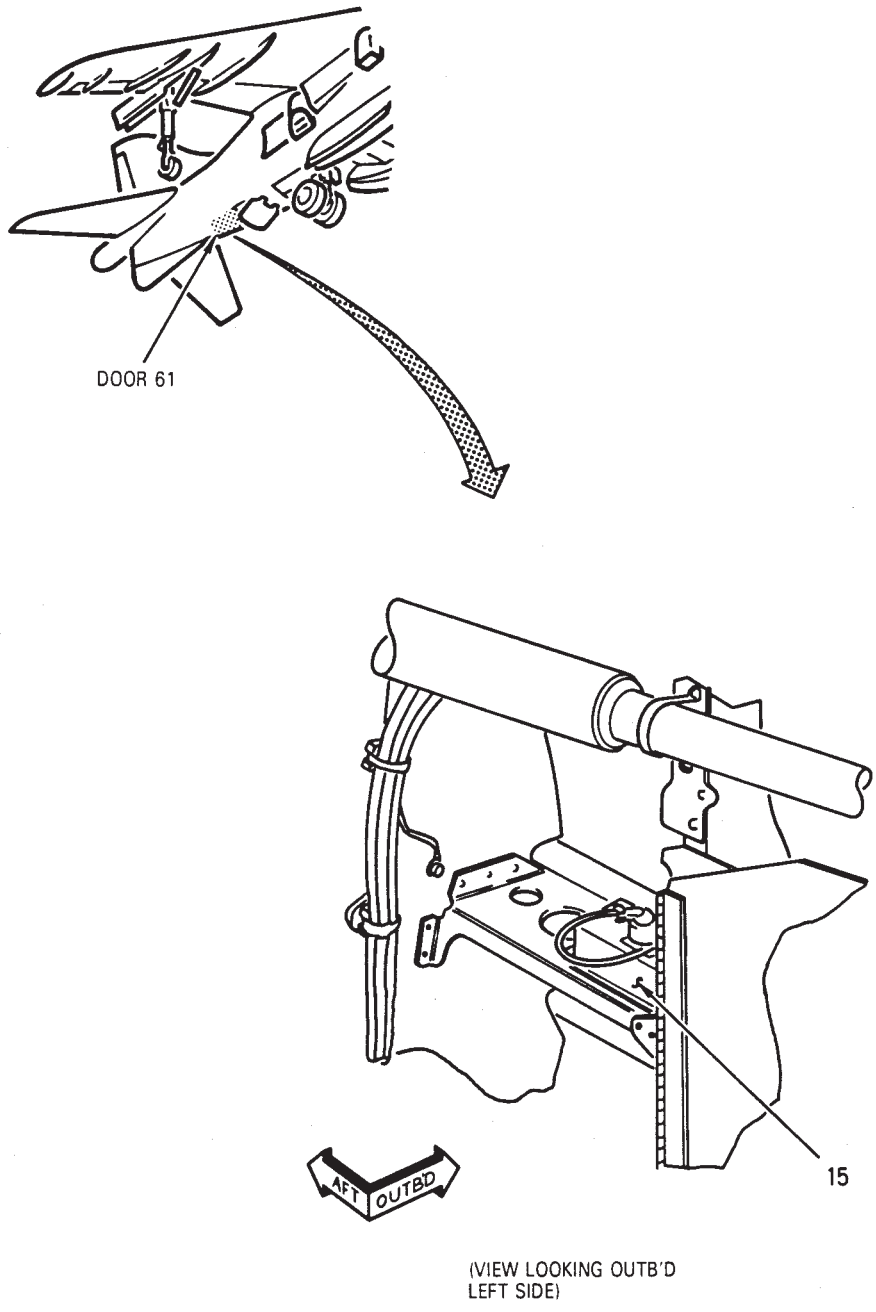


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 4)

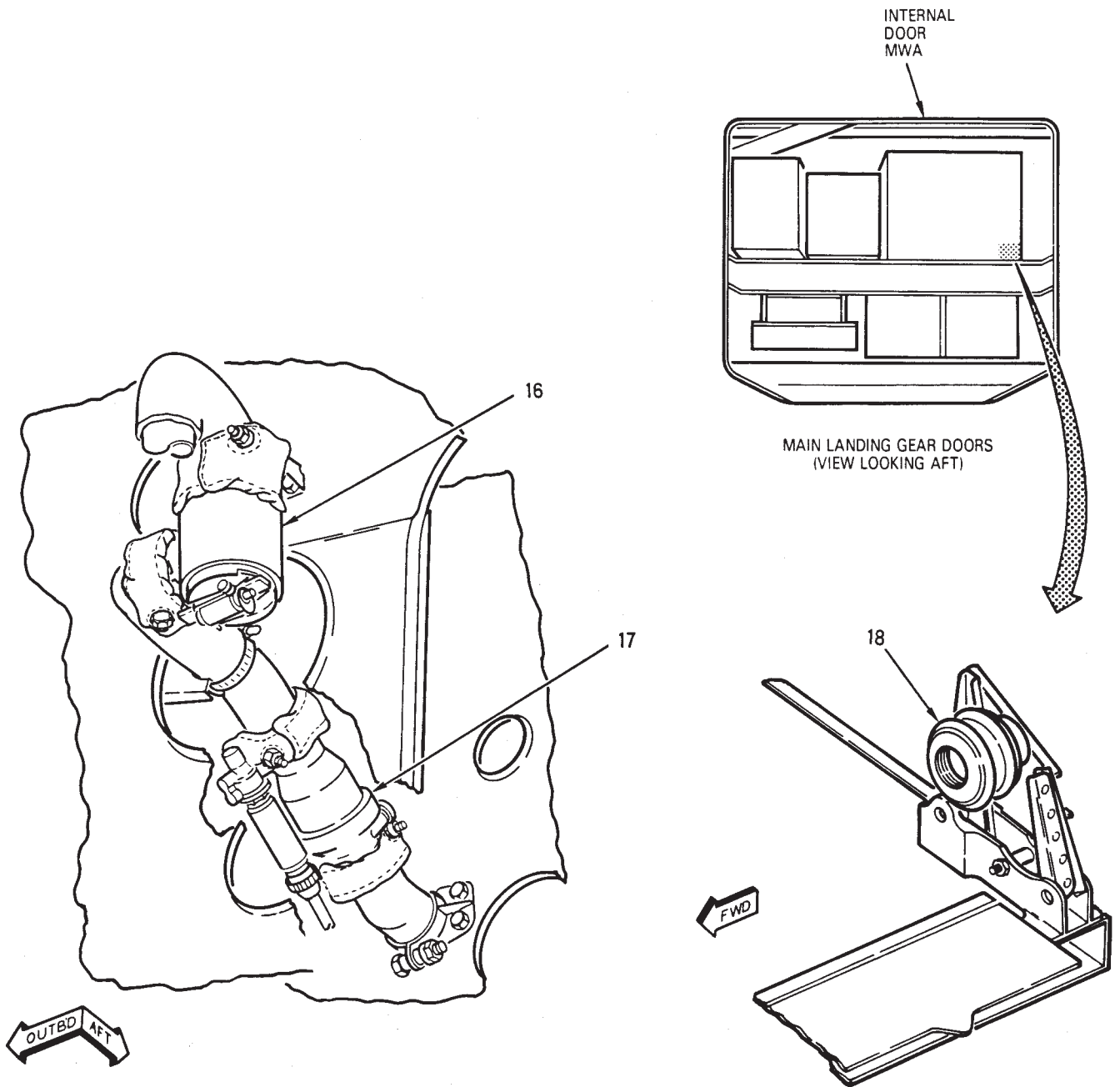


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 5)

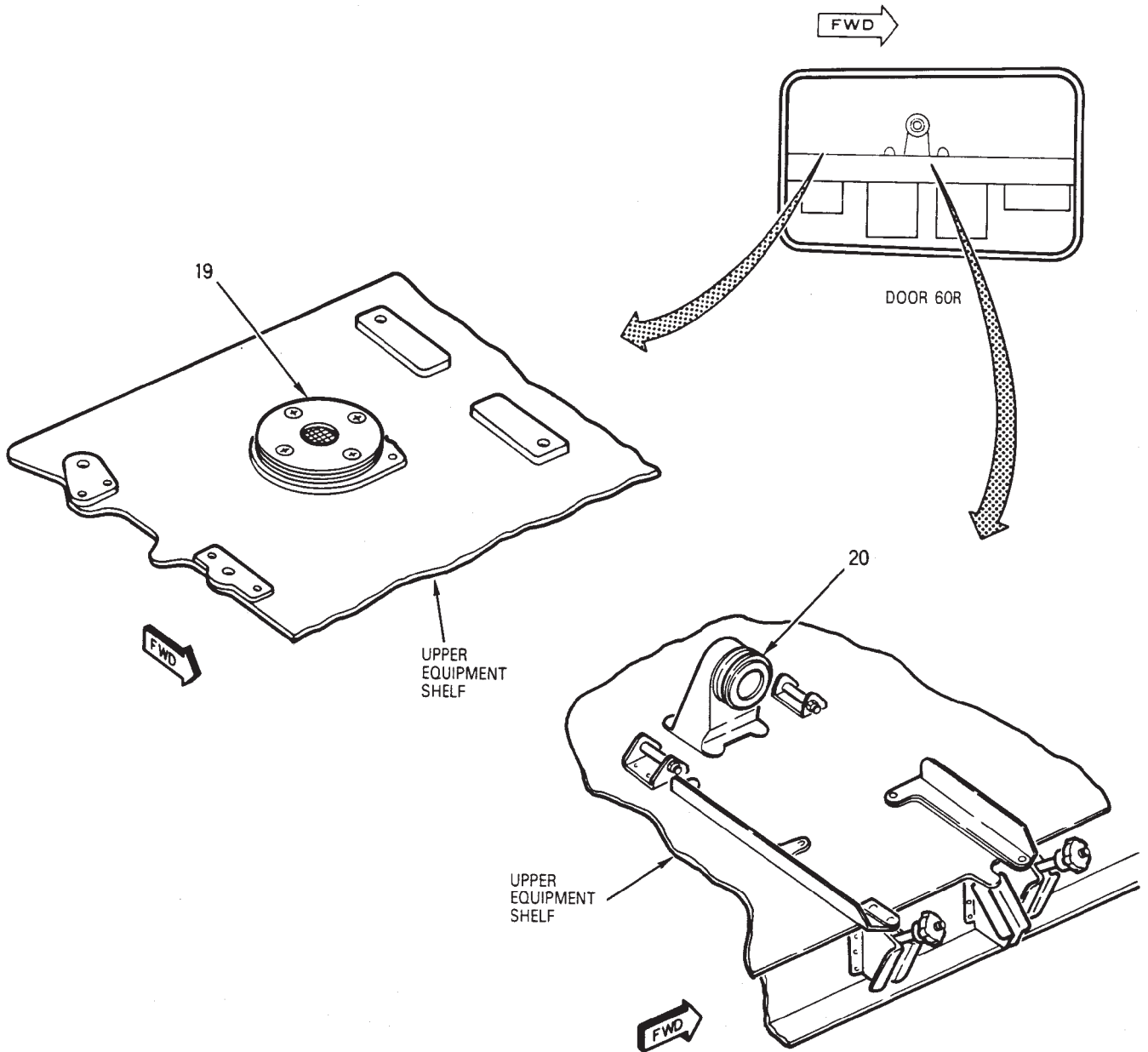


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 6)

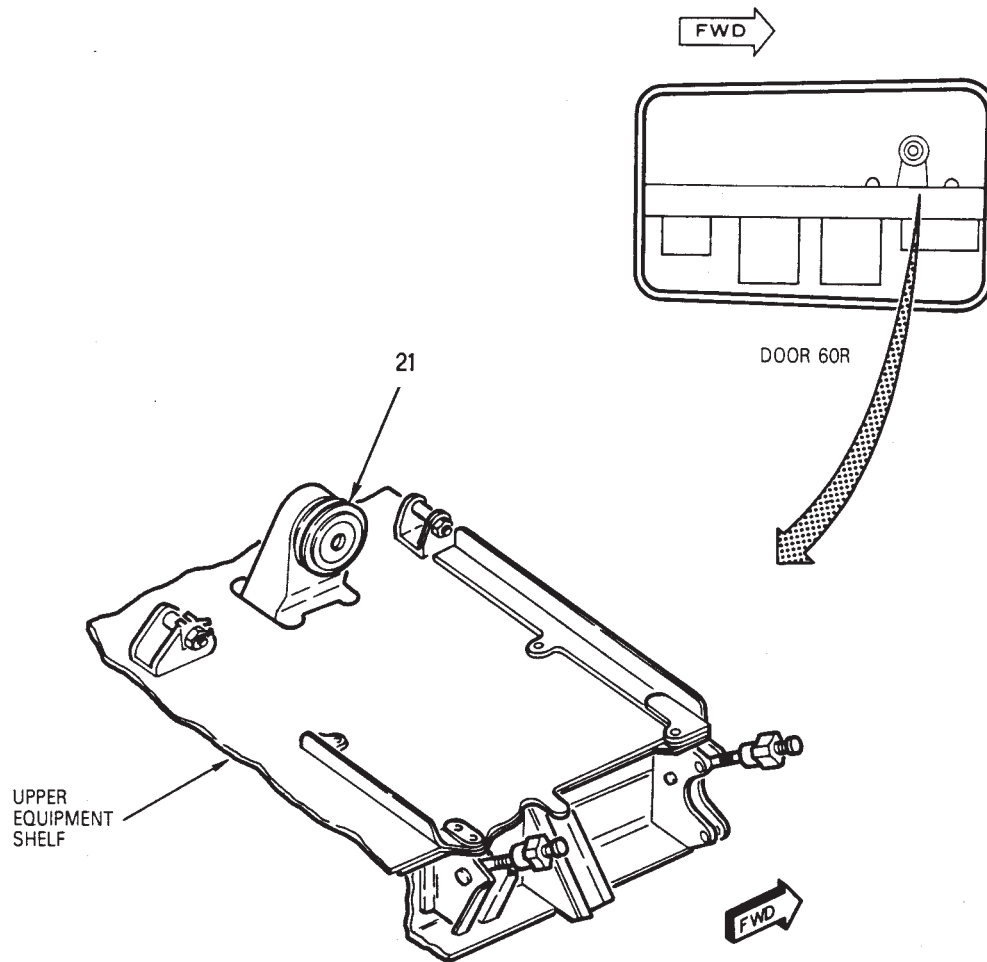


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 7)

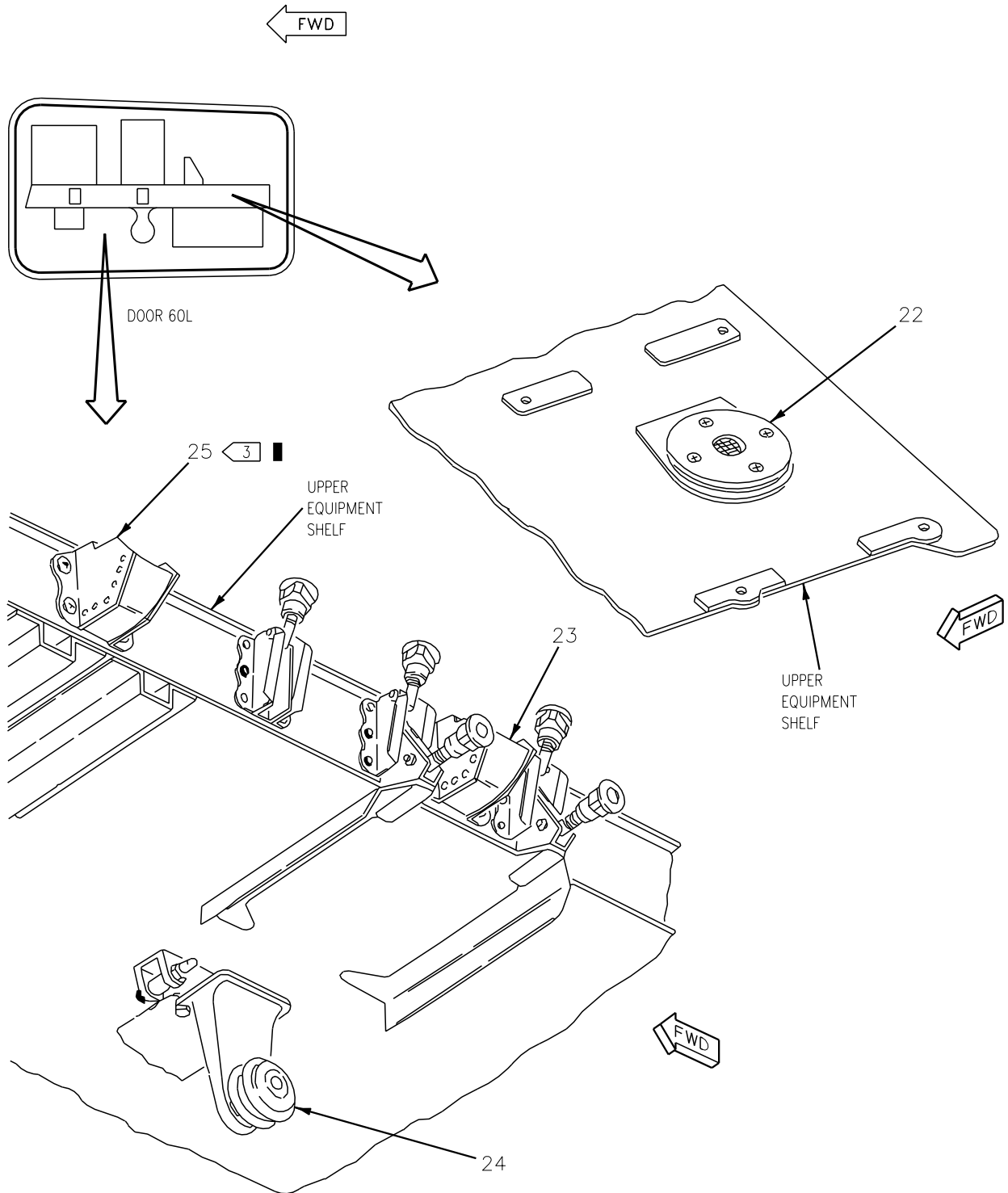


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 8)

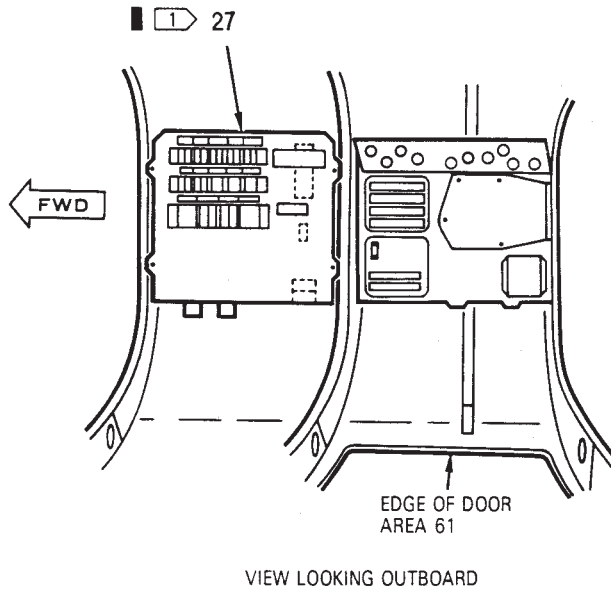
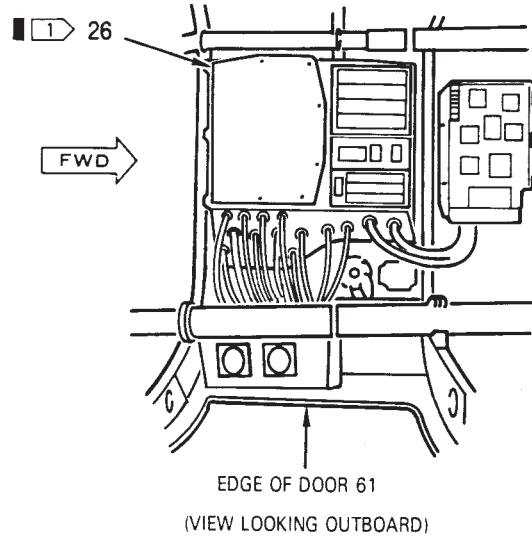


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 9)

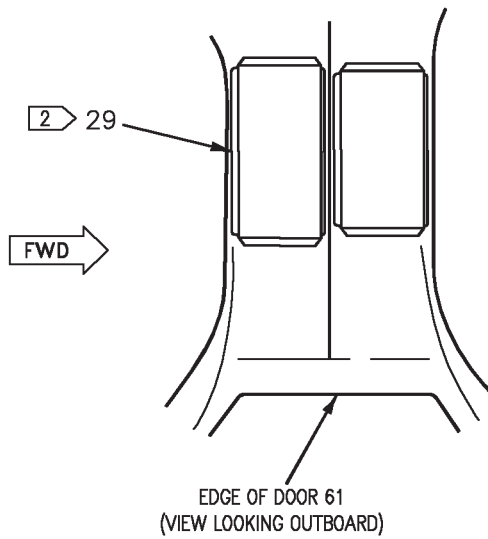
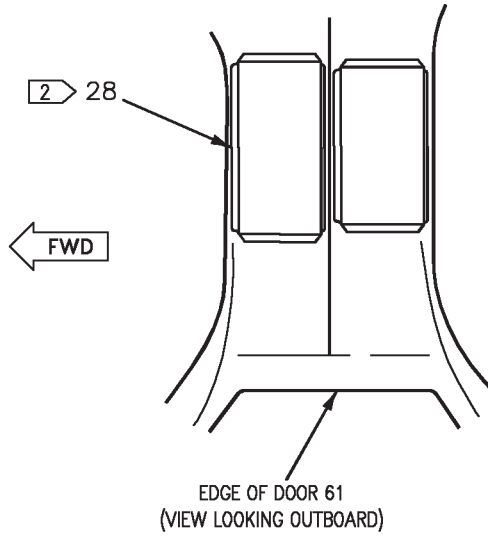


Figure 1. Rear Equipment Cooling System Component Locator (Sheet 10)

	Nomenclature	Index No.	Ref Des
2	AC ESSENTIAL PANEL ASSEMBLY REAR COOL FAN (ZONE C5) REAR COOL FAN (ZONE D5) REAR COOL FAN (ZONE E5) TERMINAL BOARD 60 SECOND DELAY ECS RELAY REAR COOL FAN CONTROL RELAY	29	52A-N131 22CBN010 22CBN011 22CBN012 52TBN139 22K-N056 22K-N013
	ANNUNCIATOR LIGHT CONTROLLER	4	27A-D007
1	AFT RELAY PANEL ASSEMBLY 60 SEC DELAY ECS RELAY	27	52A-P016 22K-P056
	CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY AFT BAY CAUTION LIGHT	1	27A-F011
	COMPUTER CP-1293/ALR-67(V) COOLING AIR OUTLET	23	—
2	DC ESSENTIAL/MAIN PANEL ASSEMBLY ECS REAR (ZONE D4) REAR EQUIPMENT COOLING CONTROL RELAY	28	52A-P133 22CBP001 22K-P004
	DIGITAL DATA COMPUTER COOLING AIR FITTING	21	—
1	DISTRIBUTION PANEL ASSEMBLY ECS REAR (ZONE B7) REAR COOL FAN (ZONE C7) REAR COOL FAN (ZONE D7) REAR COOL FAN (ZONE E7) TERMINAL BOARD REAR EQP BAY COOLING CONTROL RELAY REAR COOLING FAN CONTROL RELAY	26	52A-N025 22CBN001 22CBN010 22CBN011 22CBN012 52TBN091 22K-N004 22K-N013
	ECS CONTROL PANEL ASSEMBLY EQUIPMENT SWITCH	3	22A-F048 22S-F003
4	FLAP ELECTRONIC CONTROLLER COOLING AIR FITTING	20	—
5	DIGITAL FLAP CONTROLLER COOLING AIR FIT- TING	20	—
	FLIGHT CONTROL COMPUTER CP-1743/ ASW-46(V) COOLING AIR FITTING	22	—
	GENERATOR CONTROL UNIT COOLING AIR FIT- TING	24	—

Figure 1. Rear Equipment Cooling System Component Locator (Sheet 11)

Nomenclature	Index No.	Ref Des
3 ► RADIO-RECEIVER TRANSMITTER RT-1159/A COOLING AIR OUTLET	25	—
REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY AFT BAY CAUTION LIGHT	2	27A-H045
REAR ECS AIR FILTER ASSEMBLY	16	22FAT517
REAR ECS AIR INLET TEMPERATURE SWITCH	11	22S-N006
REAR ECS CHECK VALVE	7	22VAN523
REAR ECS COLD AIR UNIT	8	22MAP519
REAR ECS COLD AIR UNIT PRESSURE SWITCH	6	22S-N008
REAR ECS GROUND COOLING FAN	14	22B-N014
REAR ECS GROUND COOLING FAN PRESSURE SWITCH	9	22S-P009
REAR ECS GROUND COOLING FAN SPEED SENSOR	15	22A-N049
REAR ECS GROUND COOLING VALVE	5	22MAP522
REAR ECS HEAT EXCHANGER	10	22MAP518
REAR ECS PRESSURE REDUCING AND SHUTOFF VALVE	17	22L-T005
REAR ECS TEMPERATURE CONTROL VALVE	13	22MAN520
REAR ECS TEMPERATURE SENSOR	12	22MAN521
SIGNAL DATA CONVERTER CV-3736/A COOLING AIR FITTING	19	—
STORES MANAGEMENT COMPUTER CP-1451/ AYQ-13 COOLING AIR FITTING	18	—

LEGEND

- 1 ► 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.
- 2 ► 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.
- 3 ► BEFORE AV8AFC-354.
- 4 ► BEFORE AV8AFC-393.
- 5 ► AFTER AV8AFC-393.

Figure 1. Rear Equipment Cooling System Component Locator (Sheet 12)

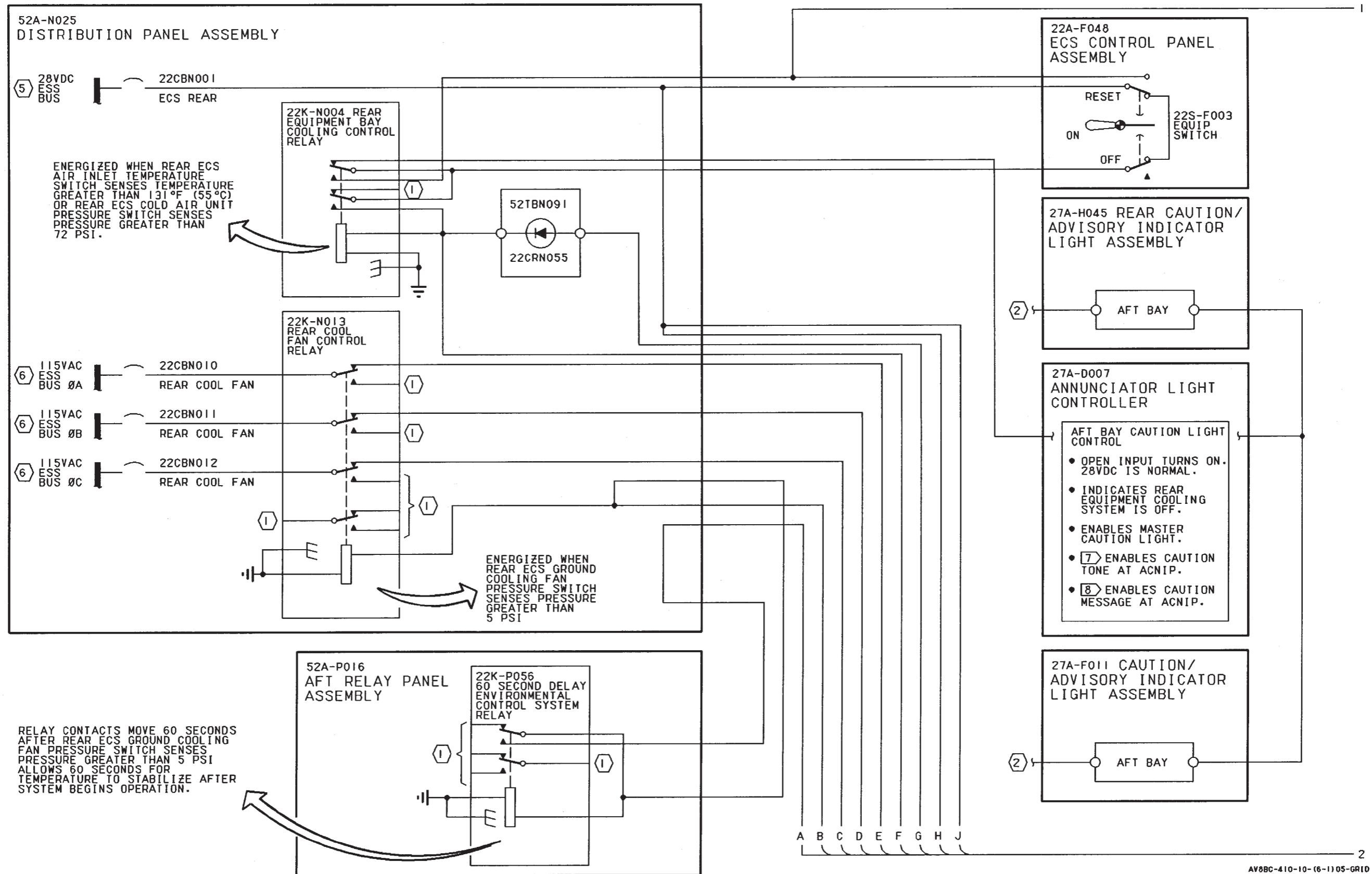


Figure 2. Rear Equipment Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 1)

Figure 2.

Figure 2.

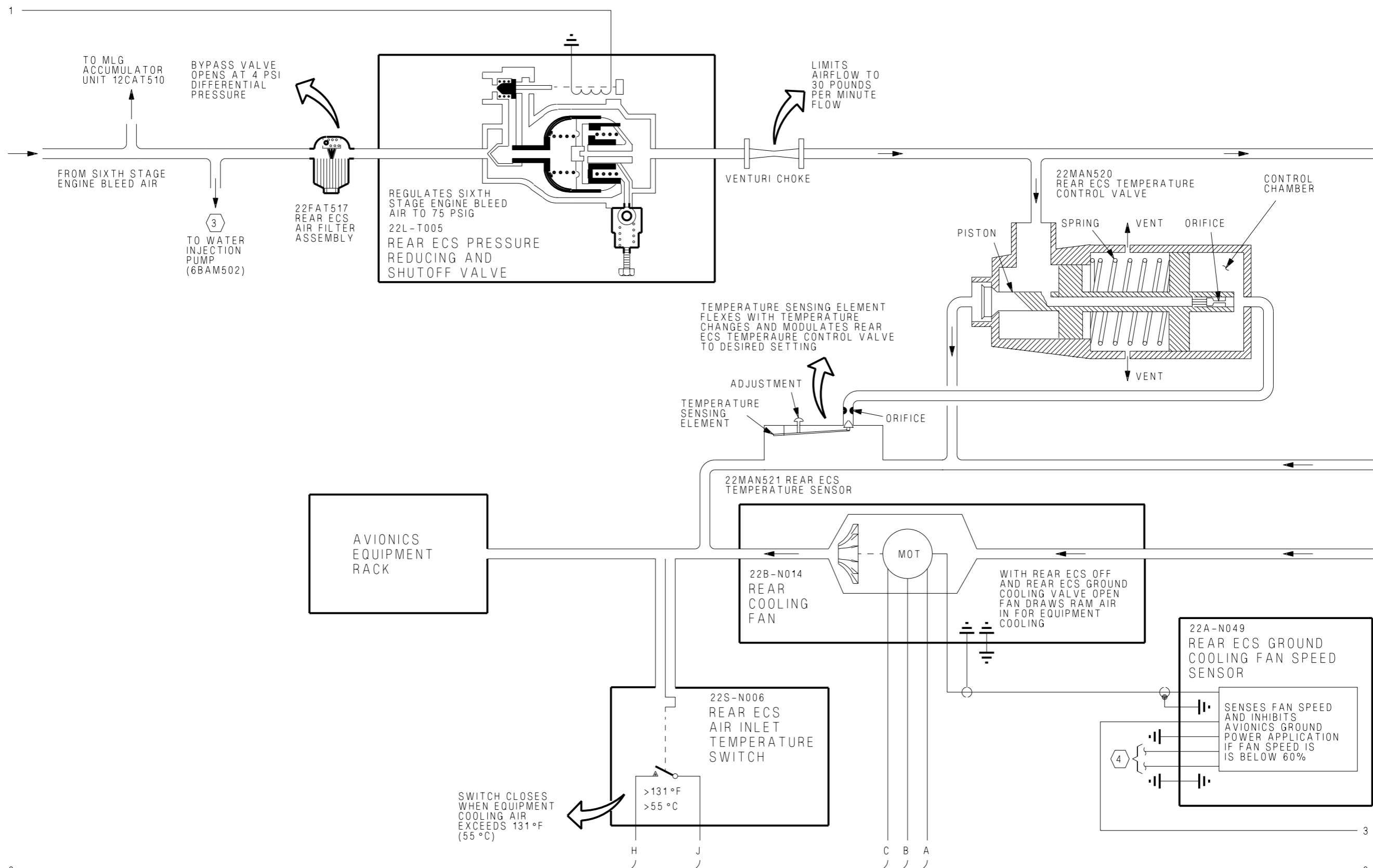


Figure 2. Rear Equipment Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 2)

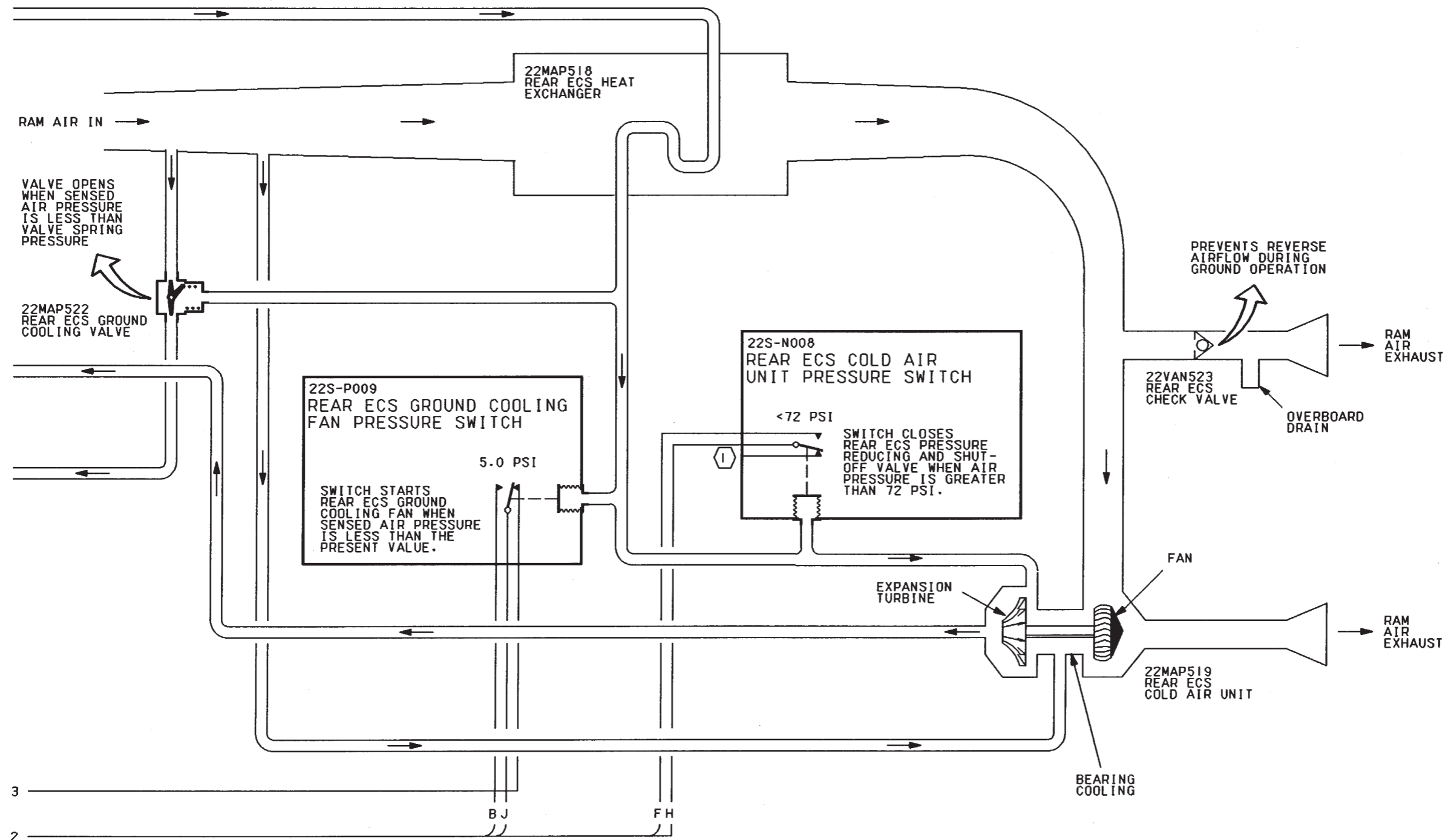


Figure 2. Rear Equipment Cooling System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 3)

AV8BC-410-10-(6-3)05-GR10

Figure 2.

Figure 2.

LEGEND

- ① PIN NOT USED.
- ② WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-440-100, WP008 00.
- ③ WATER INJECTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-290-100, WP009 00.
- ④ EXTERNAL ELECTRICAL POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP006 00.
- ⑤ DC POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP004 00.
- ⑥ AC POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100, WP003 00.
- ⑦ 162747 THRU 163207.
- ⑧ 163856 THRU 163861.

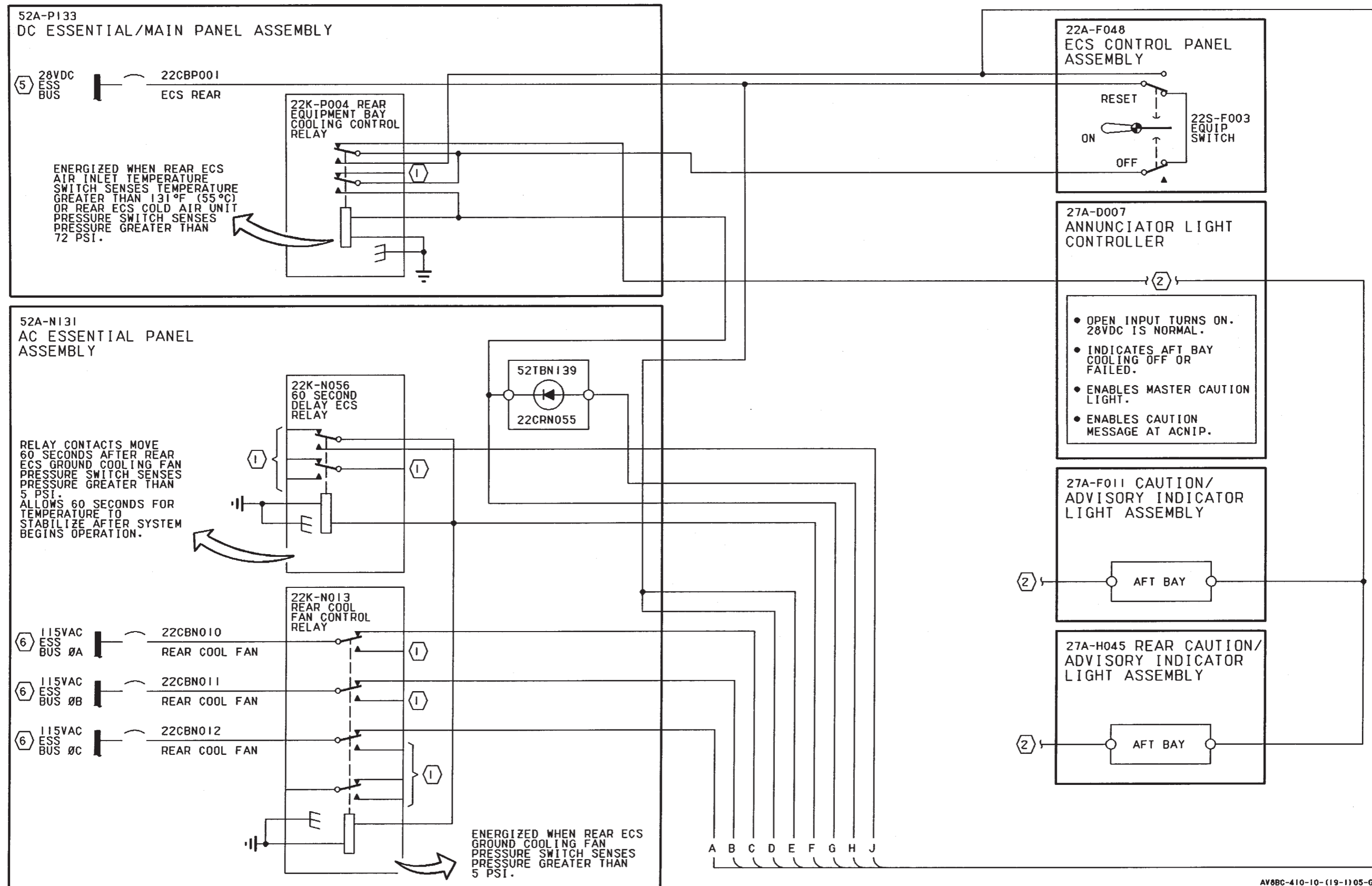


Figure 3. Rear Equipment Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 1)

Figure 3.

Figure 3.

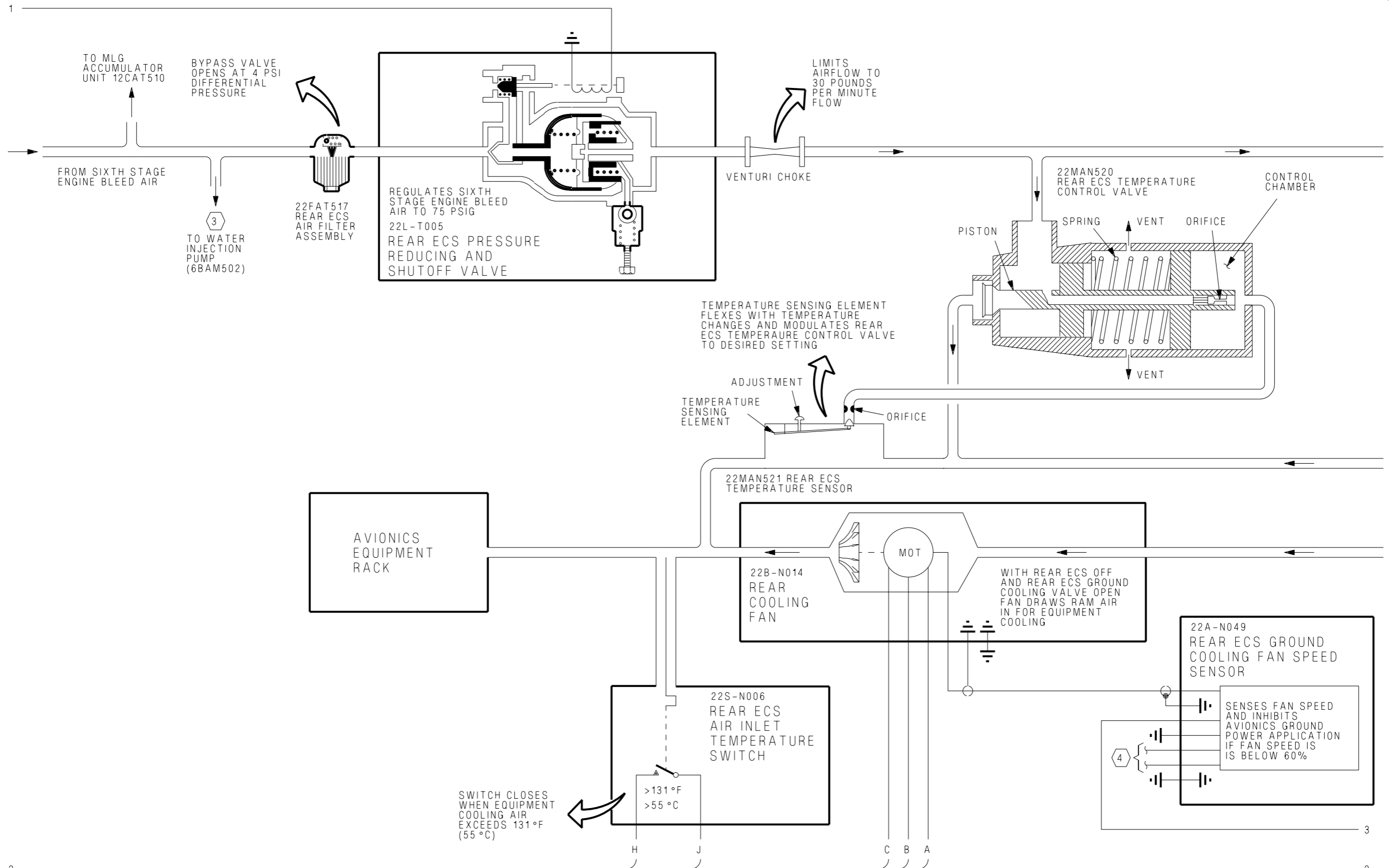


Figure 3. Rear Equipment Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 2)

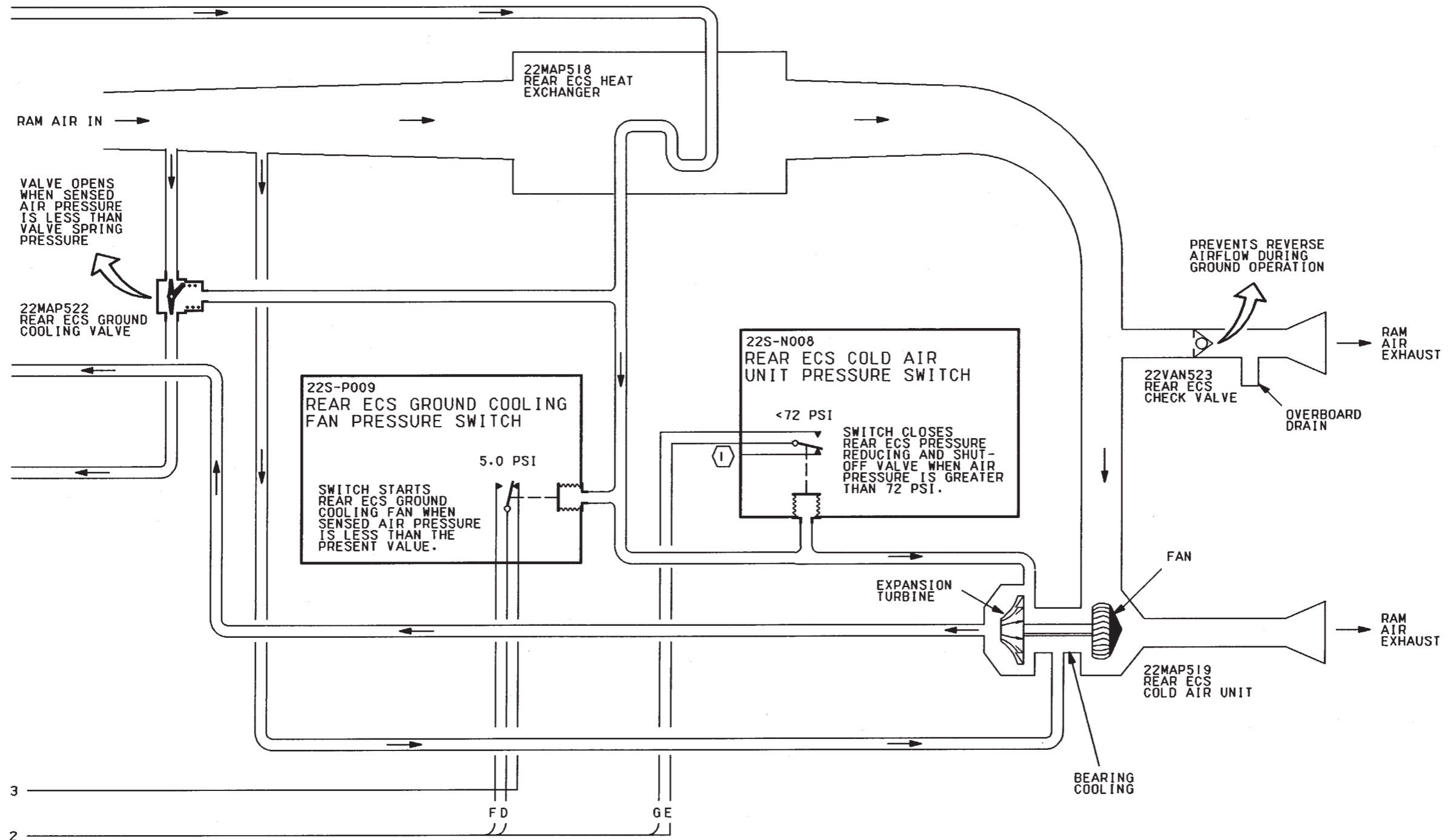


Figure 3. Rear Equipment Cooling System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 3)

AV8BC-410-10-(19-3)05-GRID

Figure 3.

Figure 3.

LEGEND

- ① PIN NOT USED.
- ② WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-440-100, WP008 00.
- ③ WATER INJECTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-290-100, WP009 00.
- ④ EXTERNAL ELECTRICAL POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP006 00.
- ⑤ DC POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP004 00.
- ⑥ AC POWER SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BD-420-100, WP003 00.

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

DESCRIPTION AND OPERATION

ON-BOARD OXYGEN GENERATING SYSTEM

Reference Material

Ejection Seat and Canopy System	A1-AV8BB-120-100
Description - Ejection Seat System	WP003 00
Environmental Control System	A1-AV8BC-410-100
Component Locator - On-Board Oxygen Generating System	WP012 00
Power Plant and Related Systems	A1-AV8BD-290-100
Basic Engine	WP003 00
Electrical Systems.....	A1-AV8BB-420-100
DC Power System	WP004 00
Electrical Systems.....	A1-AV8BD-420-100
DC Power System	WP004 00
Lighting Systems.....	A1-AV8BB-440-100
Warning/Caution/Advisory Lighting System.....	WP007 00

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Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. DESCRIPTION.

remaining gas is an oxygen rich breathing mixture for crewmembers.

2. SYSTEM DESCRIPTION. The on-board oxygen generating system (OBOGS) removes nitrogen and other contaminants from engine bleed air. The

3. **COMPONENT DESCRIPTION.** System components are described and listed in paragraphs below. For component locator, refer to WP012 00.

4. **OBOGS Bleed Air Shutoff Valve.** The OBOGS bleed air shutoff valve is a motor driven, butterfly type shutoff valve. The valve is made up of an actuator, electric drive motor, limit switches, a housing, and an external position indicator.

5. **OBOGS Heat Exchanger.** The OBOGS heat exchanger is a cross-flow air to air heat exchanger. The heat exchanger is made up of a tubular core, ejector, and ejector filter enclosed in a stainless steel case. The heat exchanger case is wrapped with insulation.

6. **OBOGS Heat Exchanger Ejector Filter.** The OBOGS heat exchanger ejector filter is an in-line wire mesh filter. The filter element is brazed to a threaded cap. The filter can be cleaned and replaced independent of the OBOGS heat exchanger.

7. **Mixer/Diffuser Duct.** The mixer/diffuser duct is a stainless steel machined duct.

8. **OBOGS Pressure Relief Valve.** The OBOGS pressure relief valve is an in-line, mechanical, pressure relief valve.

9. **OBOGS Overtemperature Switch.** The OBOGS overtemperature switch is a sealed, bi-metallic electrical switch designed into a threaded plug for in-line mounting.

10. **Oxygen Concentrator GGU-7/A.** The oxygen concentrator GGU-7/A is an electrical/mechanical device. The concentrator is made up of a rotary valve, two molecular sieve beds, drive/servo motor, temperature control circuit, plenum assembly, air heater, inlet filter, pressure reducer, and an insulating shroud.

11. **Oxygen Plenum.** The oxygen plenum is an in-line, 100 cubic inch, aluminum storage cylinder.

12. **Rear Oxygen Plenum.** The rear oxygen plenum is an in-line, 100 cubic inch, aluminum storage cylinder.

13. **Oxygen Monitor Assembly CRU-91/A.** The oxygen monitor assembly CRU-91/A is an electronic processor. The monitor is made up of an oxygen

sensor, processing electronics, built-in test (BIT), a circuit heater and a pressure controlled sensing chamber.

14. **Oxygen Monitor Assembly CRU-99/A.** The oxygen monitor assembly CRU-99/A is a solid state electronic processor. The monitor is made up of processing electronics, two built-in test (BIT) buttons, a circuit heater and a pressure controlled sensing chamber.

15. **Oxygen Disconnect.** The oxygen disconnect is a console mounted, quick release disconnect.

16. **Rear Oxygen Disconnect.** The rear oxygen disconnect is a console mounted, quick release disconnect.

17. **OBOGS Test Port.** The OBOGS test port is an in-line, capped, tee fitting.

18. **RELATED SYSTEMS.** Related systems are described in paragraphs below.

19. **Ejection Seat System.** The ejection seats (A1-AV8BB-120-100, WP003 00) have an emergency oxygen cylinder stored in each survival kit. The emergency oxygen supply can be manually actuated if OBOGS is off or fails, or automatically actuated during emergency egress.

20. **Basic Engine.** The engine (A1-AV8BD-290-100, WP003 00) provides hot, eighth stage compressor bleed air to the on-board oxygen generating system.

21. **DC Power System.** The DC power system on 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (A1-AV8BB-420-100, WP004 00) or 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (A1-AV8BD-420-100, WP004 00) provides emergency and main 28vdc power to the on-board oxygen generating system.

22. **Warning/Caution/Advisory Lighting System.** The warning/caution/advisory lighting system (A1-AV8BB-440-100, WP007 00) provides visual indication of normal aircraft functions and system malfunctions affecting safety of flight operations. The warning/caution/advisory lighting system includes the annunciator light controller and the caution/advisory indicator light assembly. The annunciator light controller receives data from various aircraft systems and provides logic to turn on and off warning/caution/advisory lights.

23. The annunciator light controller will turn on the OXY caution lights and the MASTER CAUTION lights when the oxygen monitor assembly senses that oxygen concentration has fallen below a safe minimum or the OBOGS overtemperature switch senses temperature greater than 250° F (121°C).

24. **SYSTEM CONTROLS AND INDICATORS.** System controls and indicators are described in paragraphs below.

25. **OXY Switch.** The OXY switch, located on the pilot services panel assembly, is a two pole, double throw, lever lock toggle switch. The switch has two positions; OFF and OXY. The switch is locked in the OXY position.

■ 26. With the switch in the OFF position, the following occurs:

- A ground is removed to deenergize the OEAS htr control relay.

- Emergency 28vdc power is removed from the open contact of the OBOGS bleed air shutoff valve.

- Emergency 28vdc power is applied to the close contact of the OBOGS bleed air shutoff valve.

■ 27. With the switch in the OXY position, the following occurs:

- A ground is applied to energize the OEAS htr control relay.

- Emergency 28vdc power is removed from the close contact of the OBOGS bleed air shutoff valve.

- Emergency 28vdc power is applied to the open contact of the OBOGS bleed air shutoff valve.

28. **OBOGS O Temp Indicator.** The OBOGS O TEMP indicator, located on the oxygen concentrator shelf, is a fault locating, flag indicating mechanical reset indicator. The indicator provides a visual indication when oxygen concentrator inlet temperature exceeds 250° F (121°C).

29. When oxygen concentrator GGU-7/A inlet temperature exceeds 250° F (121°C), the OBOGS overtemperature switch closes and provides a ground to allow main 28vdc power to be applied to the indicator coil. The coil trips the indicator from the normal, all black indication to the fault locating,

black and white flag indication. The indicator is mechanically reset by pressing the indicator face.

30. **OXY Caution Lights.** The OXY caution lights, located on the caution/advisory indicator light assembly, and rear caution/advisory indicator light assembly, are dual lamp, indicator lights.

31. The OXY caution lights are controlled by the oxygen monitor assembly or OBOGS overtemperature switch, through the warning/caution/advisory lighting system.

32. **OEAS Htr Control Relay.** The OEAS htr control relay, located on the distribution panel assembly, is a two pole, double throw, 10 amperes, permanent magnet drive, armature relay.

33. The relay is controlled by the OXY switch. With the relay energized, main 28vdc power is applied to the two heater circuits in the oxygen concentrator. With the relay deenergized, main 28vdc power is removed from the concentrator heater circuits.

34. **OXY Shutoff Valve.** The OXY shutoff valve located on the rear pilot services panel assembly, is an in-line, mechanical, shutoff valve. The valve has two positions; ON and OFF.

35. With the OXY shutoff valve set to ON, oxygen is provided to the rear oxygen disconnect. ■

36. **OPERATION.**

37. **COMPONENT OPERATION.**

38. **OBOGS Bleed Air Shutoff Valve.** The OBOGS bleed air shutoff valve is located in door 11R. The valve is electrically controlled and electrically actuated.

39. The valve is driven open or closed by an electric motor in response to electrical signals controlled by the OXY switch. Emergency 28vdc power is applied to the open or closed contacts. The valve motor moves as required, driving the actuator which moves the valve butterfly.

40. The motor has limit switches to prevent valve motor overrun. When the valve butterfly has reached its fully open or fully closed limit, the associated limit switch is mechanically opened and electrical power is removed from the motor.

41. The valve has an external position indicator to allow a visual indication of the valve position. The indicator is driven by the actuator. It is visible on the valve housing.

42. **OBOGS Heat Exchanger.** The OBOGS heat exchanger is located at the right forward nozzle fairing, in door 13R. Hot engine bleed air passes through the heat exchanger core. Ram air, which is forced across the heat exchanger core by aircraft forward motion, absorbs the heat and is exhausted overboard through the mixer/diffuser duct.

43. During low speed, vertical flight, or ground operation, ram air is pulled across the heat exchanger core. An ejector nozzle in the heat exchanger directs some of the hot engine bleed air overboard through the mixer/diffuser duct. The ejected hot air causes a suction which pulls ram air in across the heat exchanger core.

44. **OBOGS Heat Exchanger Ejector Filter.** The OBOGS heat exchanger ejector filter is installed in the OBOGS heat exchanger. Engine bleed air is filtered before passing through the OBOGS heat exchanger ejector nozzle.

45. **Mixer/Diffuser Duct.** The mixer/diffuser duct is located in the right forward nozzle fairing, aft of the OBOGS heat exchanger. Hot air from the OBOGS heat exchanger ejector nozzle is ejected into the mixer/diffuser duct. The suction created pulls ram air in across the heat exchanger core. The ejector air and ram air pass through the mixer/diffuser duct and are exhausted overboard.

46. **OBOGS Overtemperature Switch.** The OBOGS overtemperature switch is installed in a duct in door 61. A bimetallic temperature device senses an excessive temperature. The bimetallic properties allow the device to expand and compress to actuate the switch.

47. The switch is calibrated to close its contact at 250° F (121°C). When the switch contact closes, the following occurs:

a. A ground signal is provided to allow main 28vdc power to energize the OBOGS O temp indicator coil.

b. A ground signal is applied to the annunciator controller to enable the OXY caution lights.

48. When the switch contact opens at a temperature below 250° F (121°C), the following occurs:

a. A ground signal is removed to remove main 28vdc power from the OBOGS O temp indicator coil.

b. A ground signal is removed from the annunciator controller to disable the OXY caution lights.

49. **OBOGS Pressure Relief Valve.** The OBOGS pressure relief valve is located in the nose landing gear wheelwell, in the product gas delivery line. The relief valve is threaded into one end of a tee. If OBOGS product gas pressure exceeds 75.0±3.75 psi, the relief valve will open and relieve excess pressure.

50. **Oxygen Concentrator GGU-7/A.** The oxygen concentrator GGU-7/A is located in door 61. Cooled, pressure regulated engine bleed air is alternately directed through one of two molecular sieve beds in the concentrator by a rotary valve. One bed absorbs nitrogen and other contaminants and passes an oxygen rich gas mixture to the cockpit for consumption. The other bed is simultaneously purged of nitrogen and other contaminants which have been absorbed. The cycle is repeated from sieve bed to sieve bed 12 times per minute. Purging is done by back flushing the sieve beds with some of the oxygen rich gas mixture.

51. The temperature control circuit uses electrical signals from an air temperature sensor, shroud temperature sensor, and temperature controller to control an air heater. The air heater raises the temperature of the air for best oxygen concentrator GGU-7/A operation.

52. Before the absorption process, the air passes through an inlet filter and pressure reducer. After the absorption process, the oxygen rich gas is stored in a plenum, providing a constant supply for delivery to the cockpit.

53. **Oxygen Plenum.** The oxygen plenum is located on the ejection seat bulkhead, in back of the ejection seat. The plenum stores a supply of oxygen rich gas from the oxygen concentrator GGU-7/A, for peak demand use. The plenum also allows the oxygen rich gas temperature to stabilize to cockpit temperature. An air duct, near the plenum, directs cockpit air around the plenum.

54. **Rear Oxygen Plenum.** The rear oxygen plenum is located on the rear ejection seat bulkhead, in back of the ejection seat. The plenum stores a supply of rich gas from the oxygen concentrator GGU-7/A for peak demand use. The plenum also allows the oxygen rich gas temperature to stabilize to cockpit temperature. An air duct, near the plenum, directs rear cockpit air around the plenum.

55. **Oxygen Monitor Assembly CRU-91/A or CRU-99/A.** The oxygen monitor assembly is located in the cockpit, on the left side of the ejection seat bulkhead. The monitor receives and analyzes a sample of the oxygen rich gas. If analysis shows the gas to have a low oxygen concentration, a signal is provided to the warning/caution/advisory lighting system.

56. The oxygen concentration of the breathing gas delivered to the pilot ranges from approximately 29 percent at sea level to approximately 94 percent at 50,000 feet. The higher oxygen concentration at higher altitudes is required to overpower the lower ambient pressure at high altitudes.

57. The monitor analyzes the oxygen rich gas by passing a sample of the gas over an oxygen sensor. The sensor is an electrochemical device which is sensitive to partial pressure oxygen. An electrical bias voltage and temperature compensating circuits provide an output voltage which is proportional to the partial pressure oxygen in the gas sample. If the oxygen concentration is out of limits, the monitor will provide a warning signal.

58. On the CRU-91/A, a BIT button is provided. The BIT button, when pressed, vents OBOGS gas, creating a lower pressure in the sensor cavity. This pulls ambient air into the sensor cavity. Since the oxygen concentration of ambient air is less than the minimum required, the oxygen monitor assembly CRU-91/A will provide a warning signal.

59. On the CRU-99/A, two BIT buttons are provided. A pneumatic BIT button and an electronic BIT button. The pneumatic BIT button, when pressed, vents OBOGS gas, creating a lower pressure in the sensor cavity. This pulls ambient air into the sensor cavity. Since the oxygen concentration of ambient air is less than the minimum required, the monitor will provide a warning signal. The electronic BIT button when pressed, initiates a BIT similar to the automatic power-up BIT. The BIT checks monitory circuitry, the microprocessor program, random access memory

(RAM), the pressure sensor, and the oxygen sensor tips.

60. During operation in low ambient temperatures, the monitor has a built in circuit heater. This allows rapid warm up of the monitor.

61. **Oxygen Disconnect.** The oxygen disconnect is located inboard of the pilot services panel assembly. The disconnect provides the interface between the crewmembers personal equipment and the OBOGS. The oxygen disconnect is connected to the ejection seat survival kit. The crewmember connects his personal equipment to the survival kit.

62. **Rear Oxygen Disconnect.** The rear oxygen disconnect is located inboard of the rear pilot services panel assembly. The disconnect provides the interface between the crewmembers personal equipment and the OBOGS. The oxygen disconnect is connected to the ejection seat survival kit. The crewmember connects his personal equipment to the survival kit.

63. **OBOGS Test Port.** The OBOGS test port is located in the main landing gear wheelwell. The test port allows a ground air source to be used for ground testing of the OBOGS. During ground test, the air source bypasses the OBOGS bleed air shutoff valve, OBOGS heat exchanger, OBOGS and OBOGS overtemperature switch.

64. **SYSTEM OPERATION.**

65. **Normal Operation.** In normal operation, hot engine bleed air passes through the OBOGS bleed air shutoff valve (figure 1) to the OBOGS heat exchanger. An ejector in the heat exchanger directs some of the high pressure engine bleed air overboard, pulling ram air through the heat exchanger. Heat from the engine bleed air is absorbed by the ram air, reducing air temperature. Heated ram air and ejector air are exhausted overboard through the mixer/diffuser duct.

66. The conditioned air is directed to the OBOGS pressure relief valve. The relief valve will limit system pressure to 75.0 ± 3.75 psig.

67. An overtemperature switch provides warning to the pilot when conditioned air temperatures exceed operating limits of the oxygen concentrator GGU-7/A.

68. The oxygen concentrator GGU-7/A removes nitrogen and other contaminants from the conditioned air, leaving an oxygen rich breathing gas mixture. Nitrogen and other contaminants are purged from the concentrator and exhausted overboard.

69. The oxygen rich gas mixture is routed to the oxygen plenum in the cockpit and the rear oxygen plenum in the rear cockpit. The plenums store the mixture for peak demand periods and provide temperature stabilization. A sample of the mixture is supplied to the oxygen monitor assembly, which warns the pilot if oxygen concentration falls below a safe limit. The breathing gas mixture flows from the oxygen plenum to the oxygen disconnect, inboard of the pilot services panel. Breathing gas is then routed to the cockpit through the survival kit and torso mounted oxygen regulator to the crewmember.

70. Breathing gas is routed to the rear cockpit through the survival kit and torso mounted oxygen regulator to the crewmember.

71. **Emergency Operation.** A 15 minute supply of oxygen is stored in an emergency oxygen cylinder in the ejection seat survival kit in both the cockpit and rear cockpit (figure 1). The emergency oxygen supply can be activated manually, by pulling the manual emergency oxygen control (green ring), or automatically on ejection. A check valve prevents loss of oxygen pressure to the OBOGS when emergency oxygen is actuated. ■

72. The OBOGS and emergency oxygen are not related in any way, except they share a common manifold in each ejection seat survival kit.

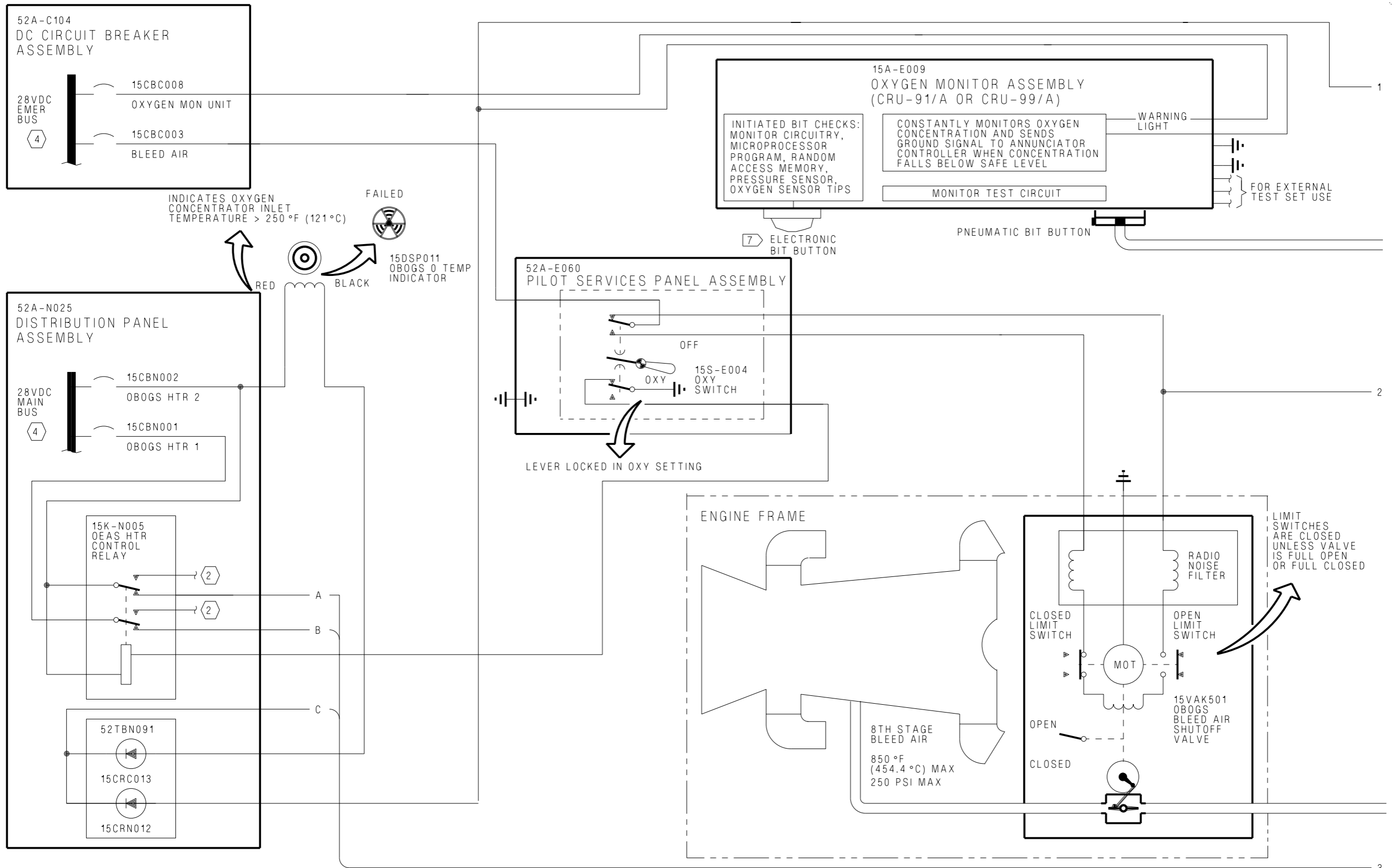


Figure 1.

Figure 1. On-Board Oxygen Generating System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 1)

Figure 1. ■

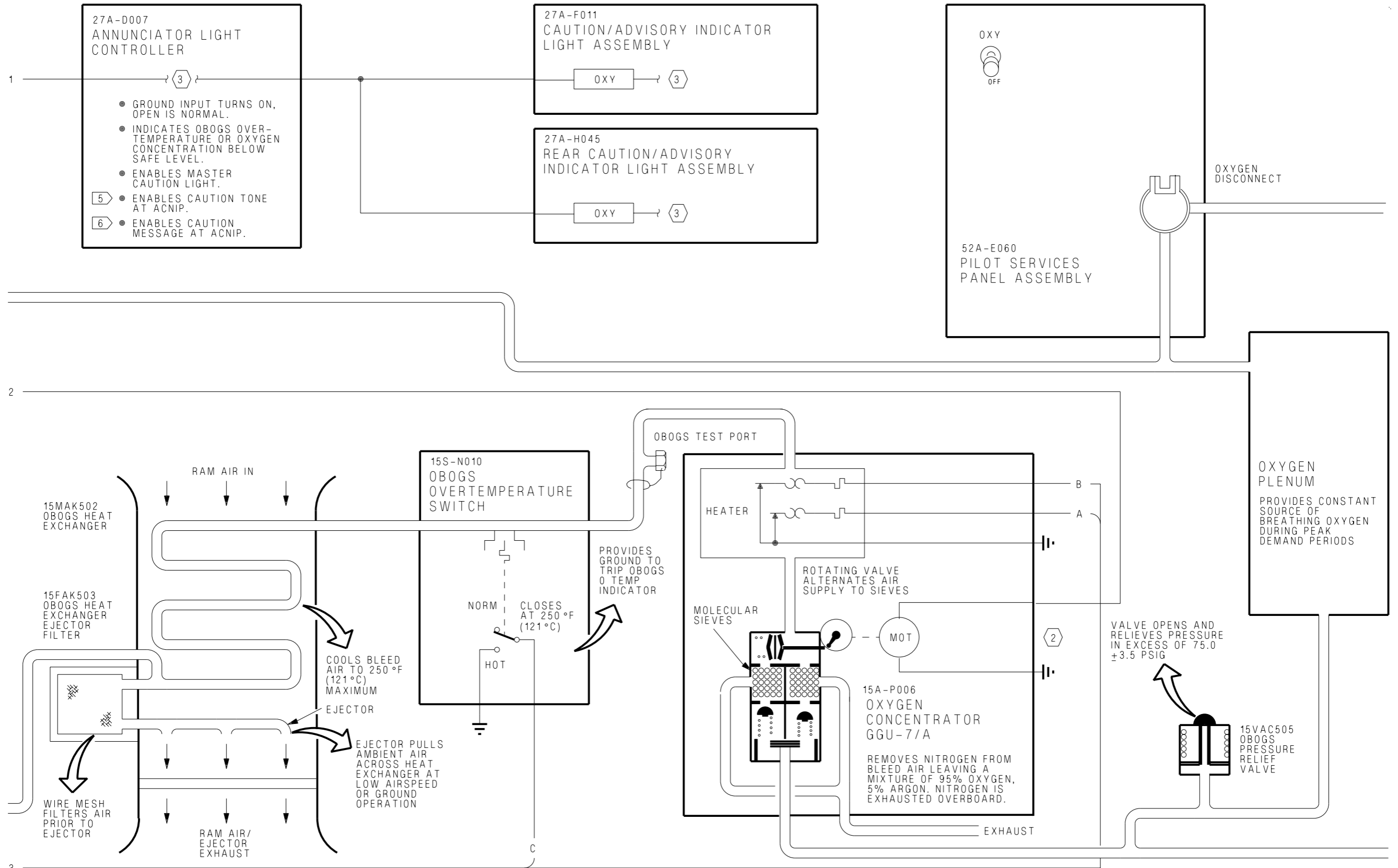


Figure 1.

Figure 1. On-Board Oxygen Generating System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 2)

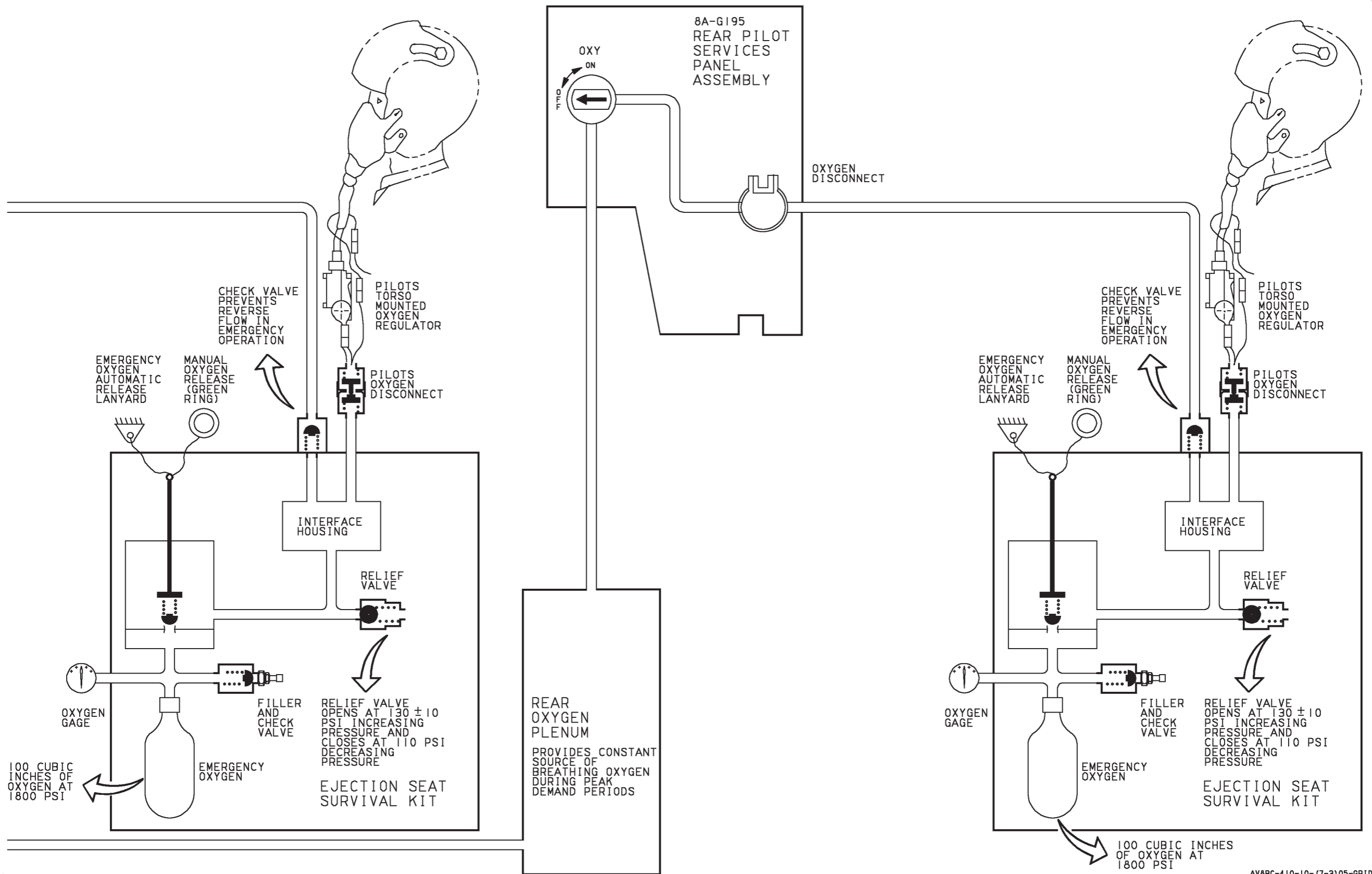


Figure 1.

Figure 1. On-Board Oxygen Generating System Simplified Schematic-162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416 (Sheet 3)

Figure 1. ■

LEGEND

1. NONSTANDARD SYMBOLS:

 IDENTIFIES STRUCTURAL ATTACHMENT.

FAULT INDICATORS
(BLACK AND WHITE)



FAILED POSITION SHOWN


 PIN NOT USED.

 WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC,
A1-AV8BB-440-100, WP008 00.

 POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC, A1-AV8BB-420-100,
WP005 00.

 162747 THRU 163207.

 163856 THRU 163861.

 CRU-99/A ONLY.

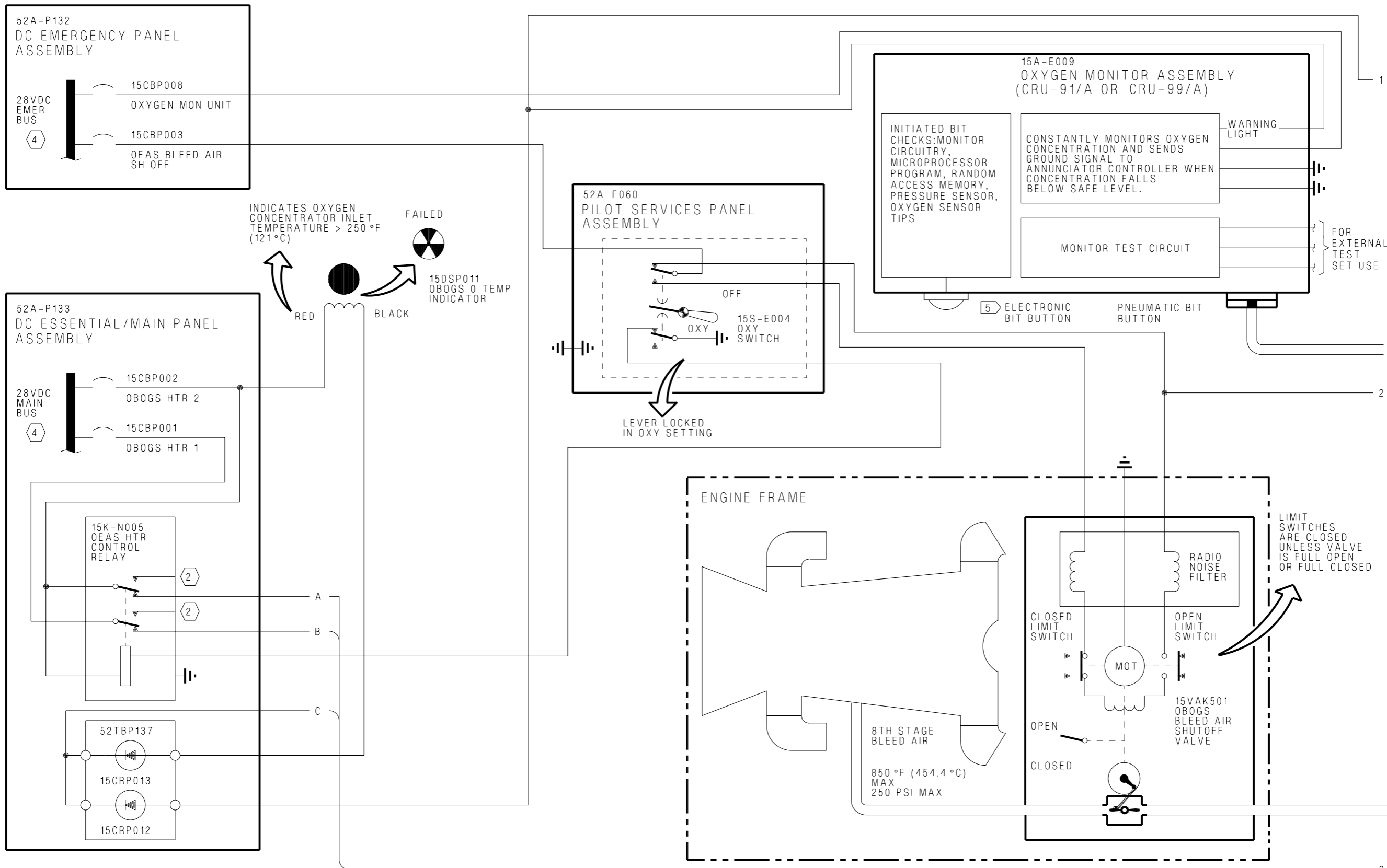


Figure 2. Figure 2. On-Board Oxygen Generating System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 1)

3
AHR540-21-1-012

Figure 2. ■

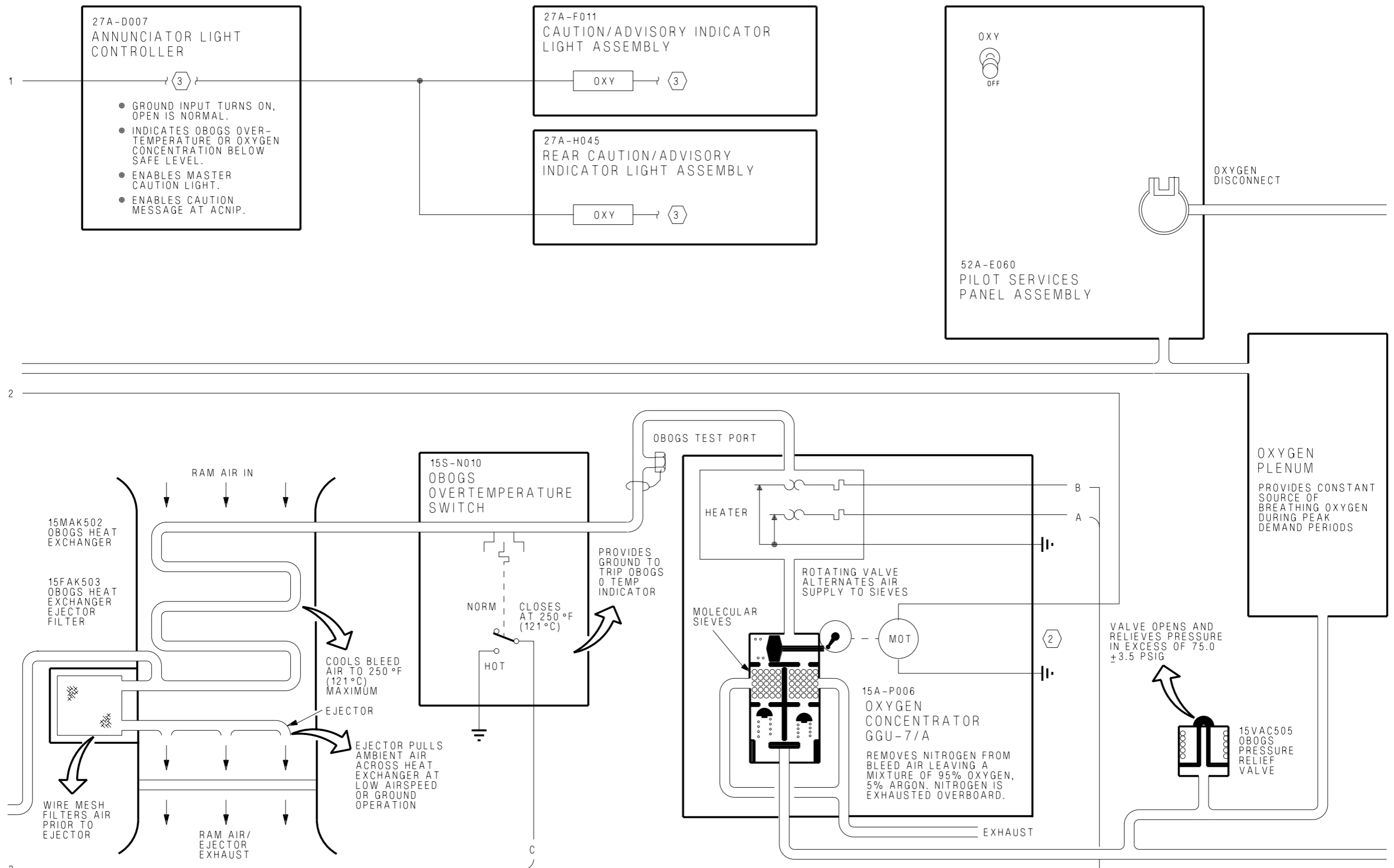


Figure 2. Figure 2. On-Board Oxygen Generating System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 2)

Figure 2. ■

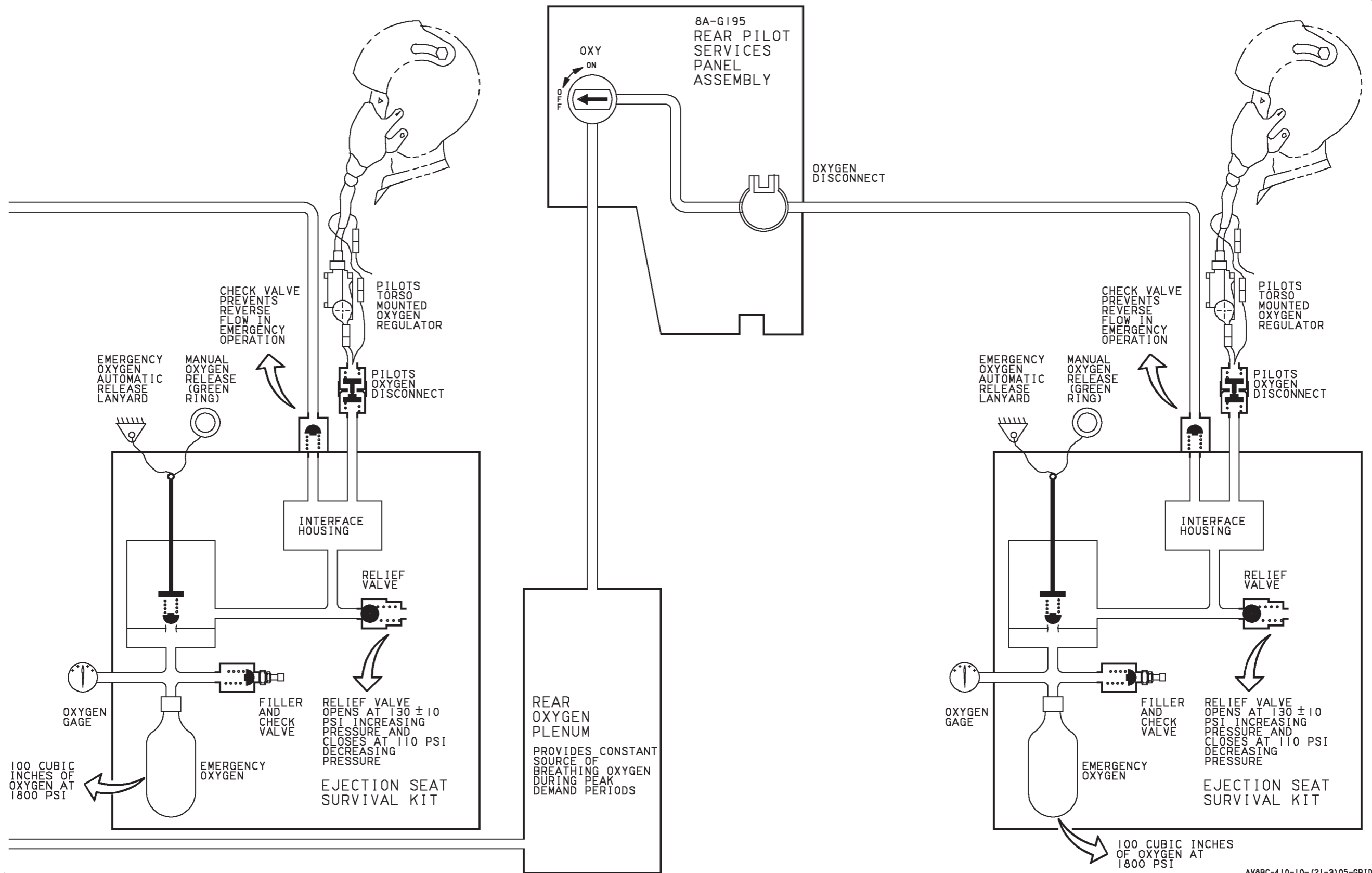


Figure 2. On-Board Oxygen Generating System Simplified Schematic-164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416 (Sheet 3) Figure 2. ■

LEGEND

1. NONSTANDARD SYMBOLS:



IDENTIFIES STRUCTURAL ATTACHMENT.

FAULT INDICATORS
(BLACK AND WHITE)



FAILED POSITION SHOWN



PIN NOT USED.



WARNING/CAUTION/ADVISORY LIGHTING SYSTEM SIMPLIFIED SCHEMATIC.
A1-AV8BB-440-100, WP008 00.



POWER DISTRIBUTION SYSTEM SIMPLIFIED SCHEMATIC.
A1-AV8BD-420-100, WP005 00.



CRU-99/A ONLY.

ORGANIZATIONAL MAINTENANCE

PRINCIPLES OF OPERATION

COMPONENT LOCATOR

ON-BOARD OXYGEN GENERATING SYSTEM

Reference Material

Environmental Control Systems.....	A1-AV8BC-410-100
Description and Operation - On-Board Oxygen Generating System	WP011 00

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On-Board Oxygen Generating System Component Locator, Figure 1	2
System Components	1

Record of Applicable Technical Directives

Type/ Number	Date	Title and ECP or RAMEC No.	Date Incorp.	Remarks
AV8AFC-416	—	TAV-8B Polyimide Wire Replacement/ Power Wire Separation (ECP MDA-AV8B- 0277)	15 May 04	—

1. SYSTEM COMPONENTS.

2. System components are shown in figure 1. For description and operation of the On-Board Oxygen Generating System, refer to WP011 00.

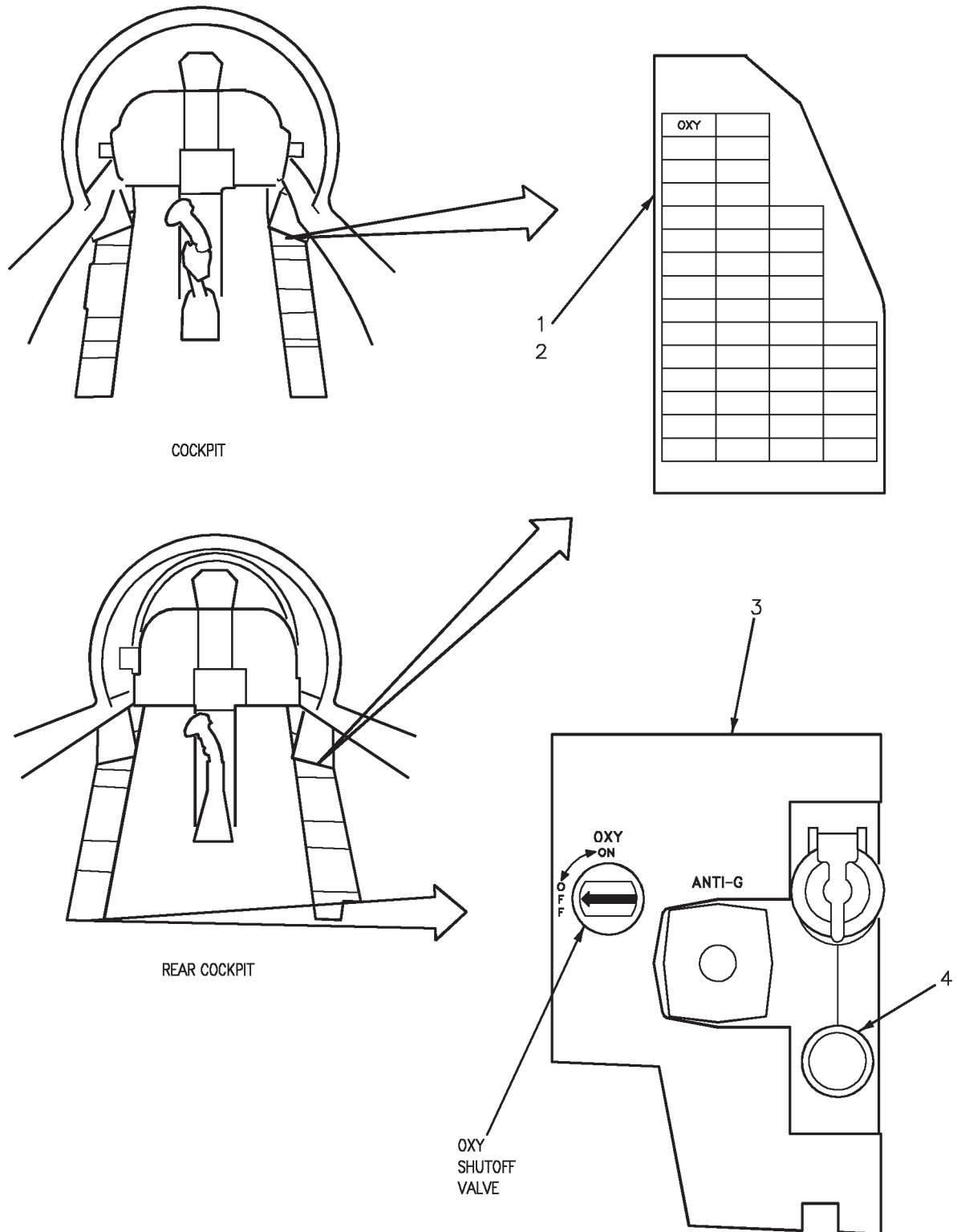


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 1)

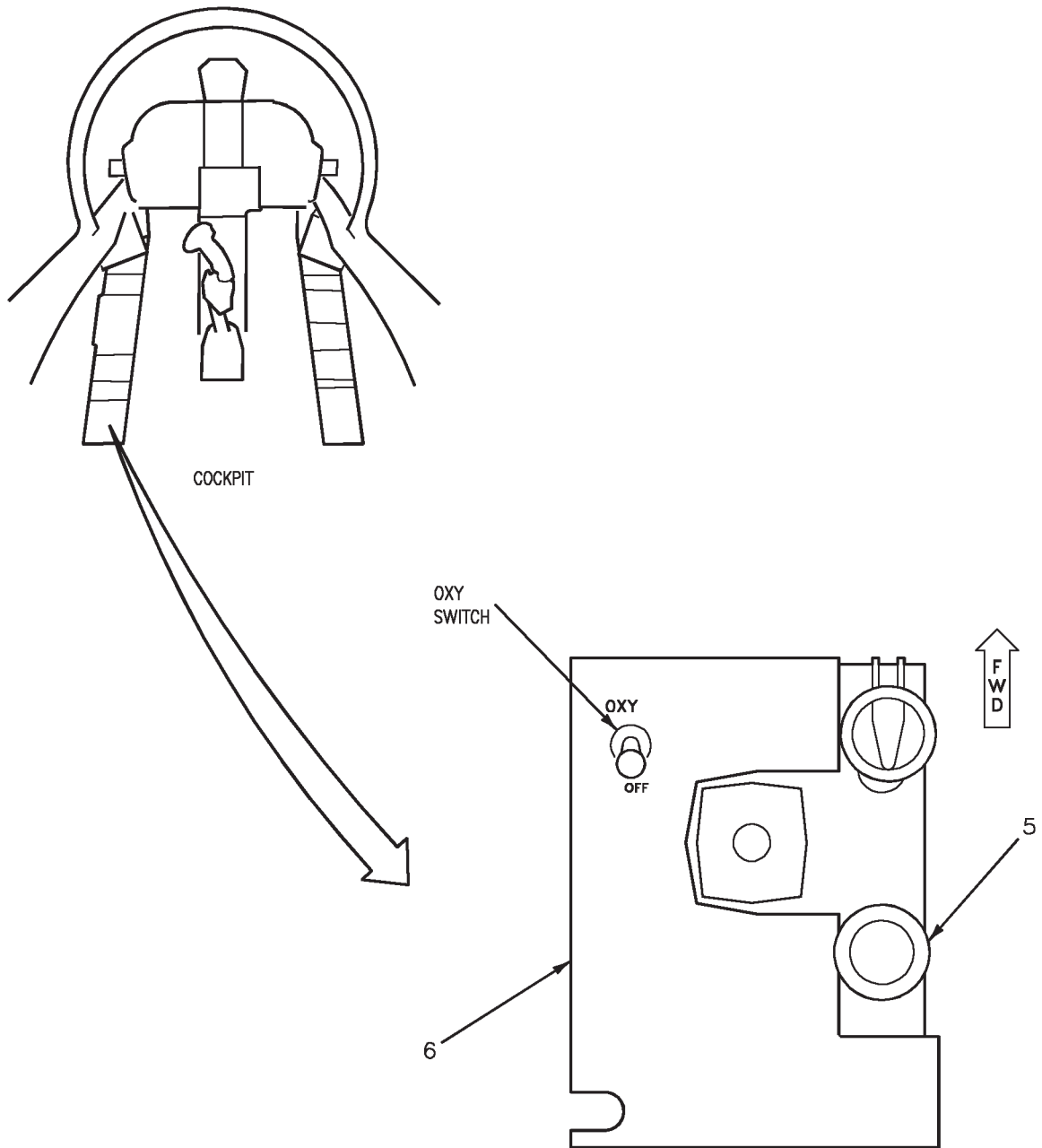


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 2)

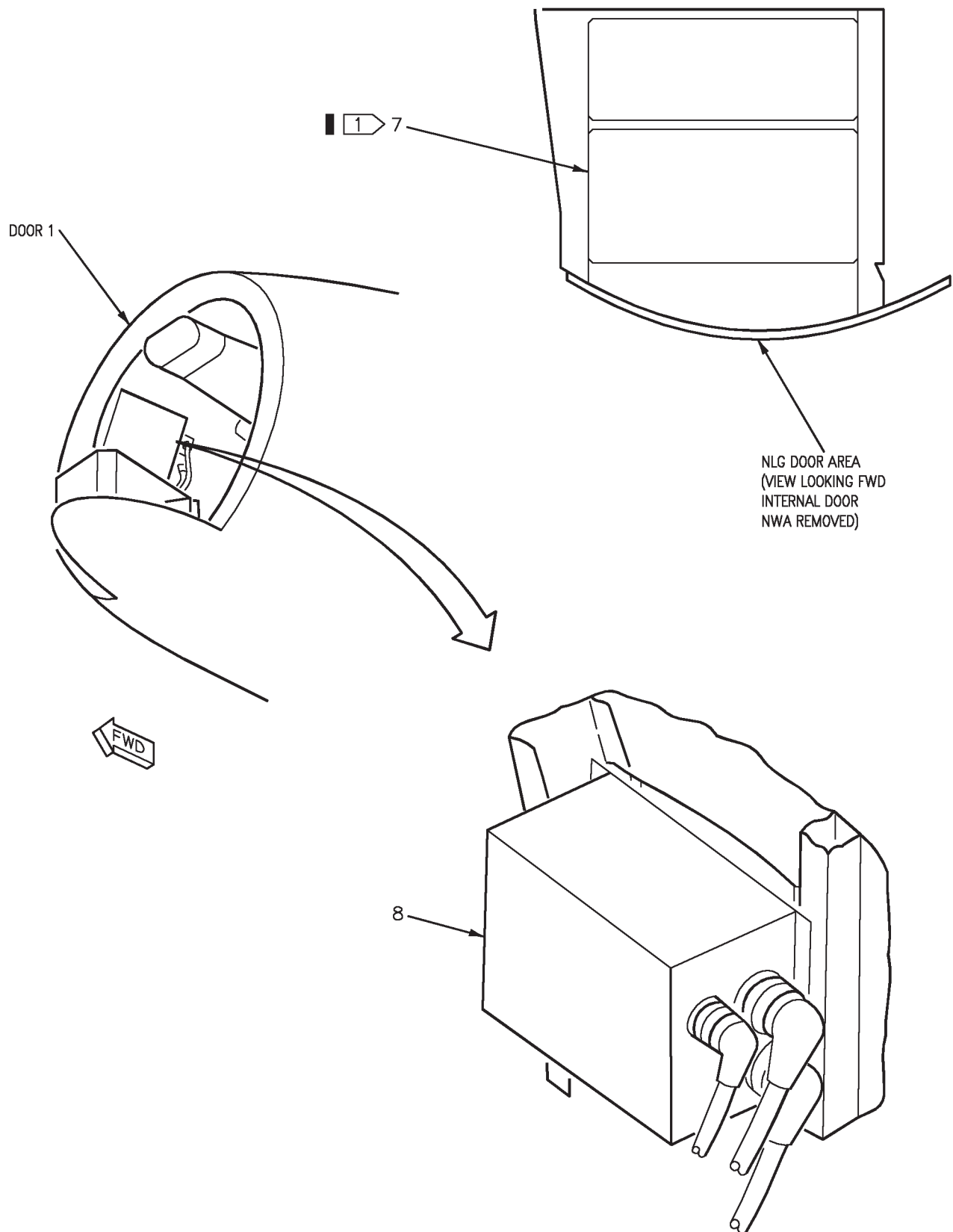


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 3)

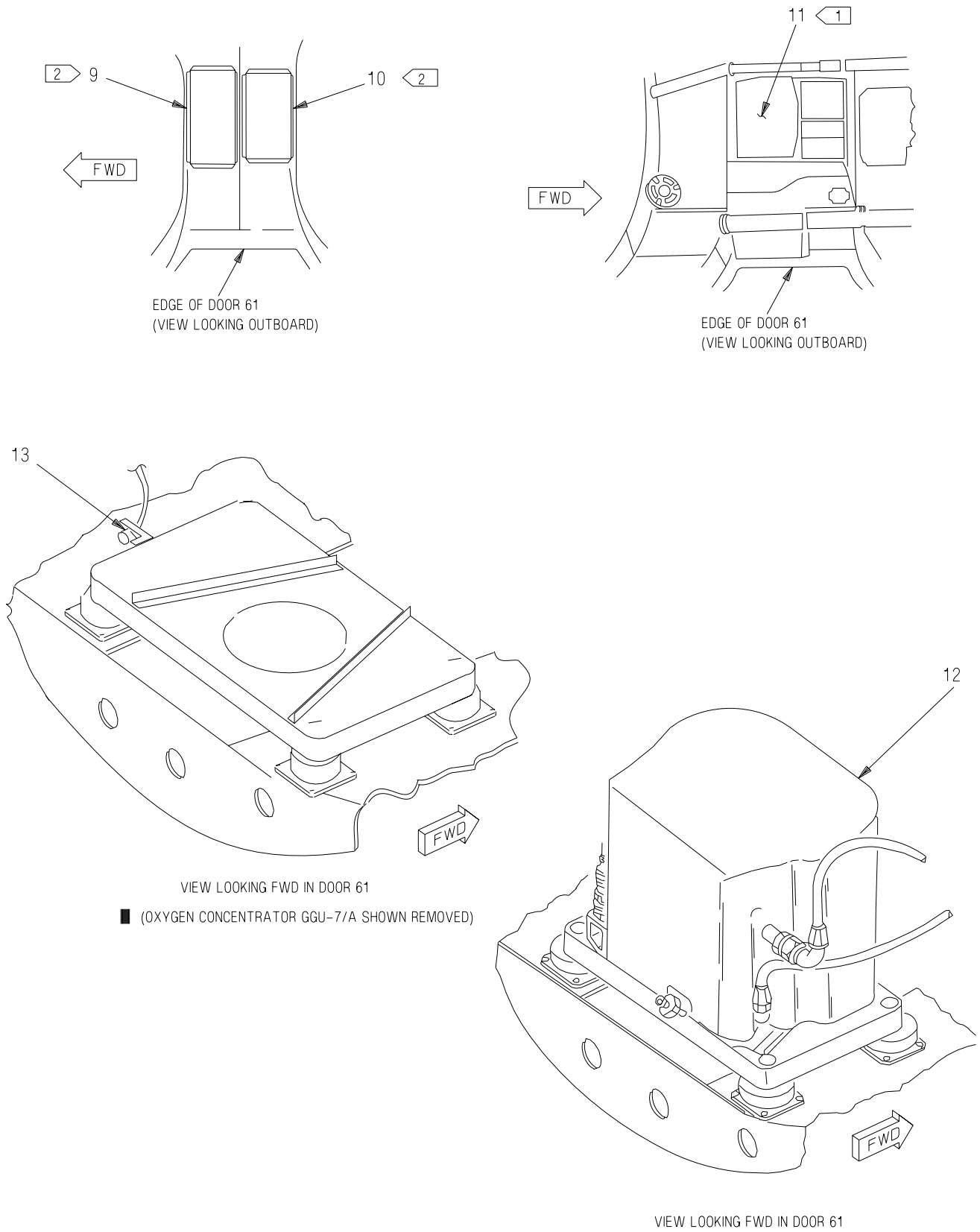


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 4)

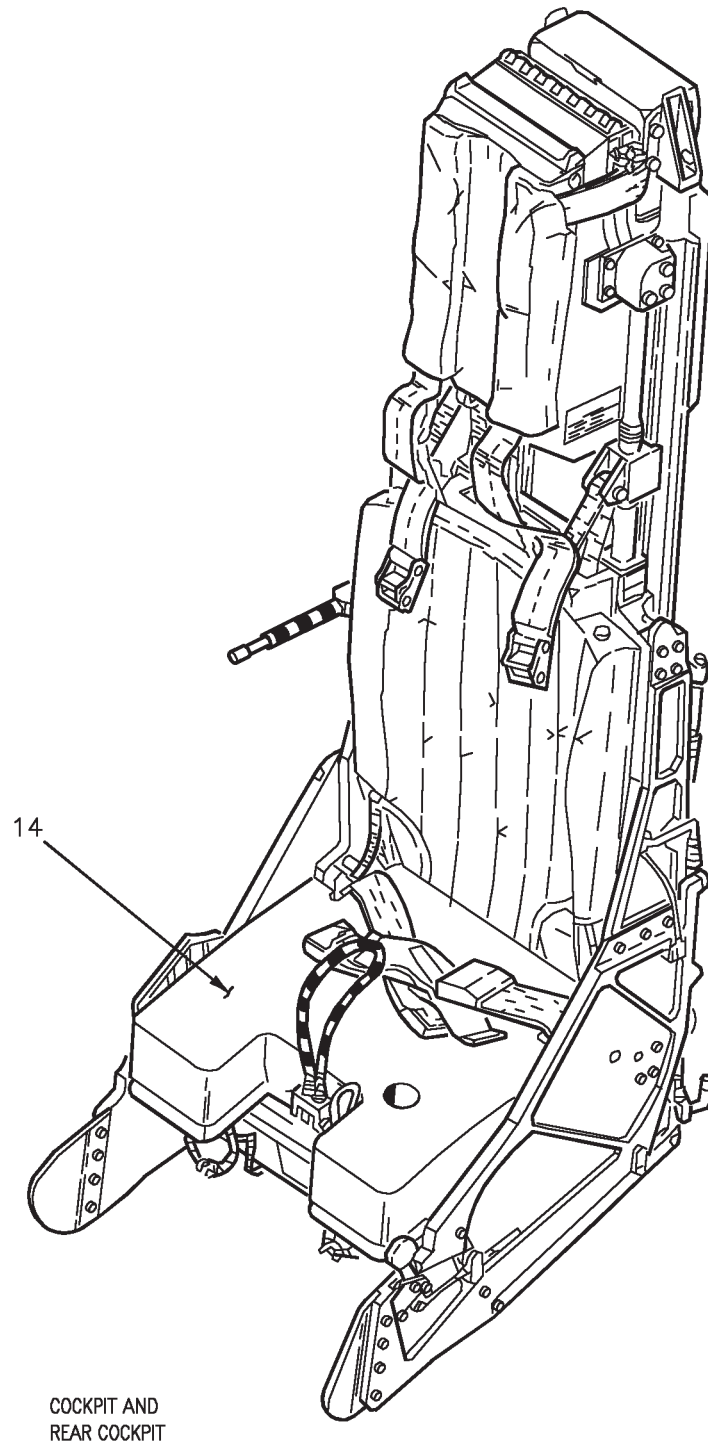


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 5)

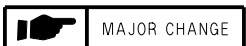
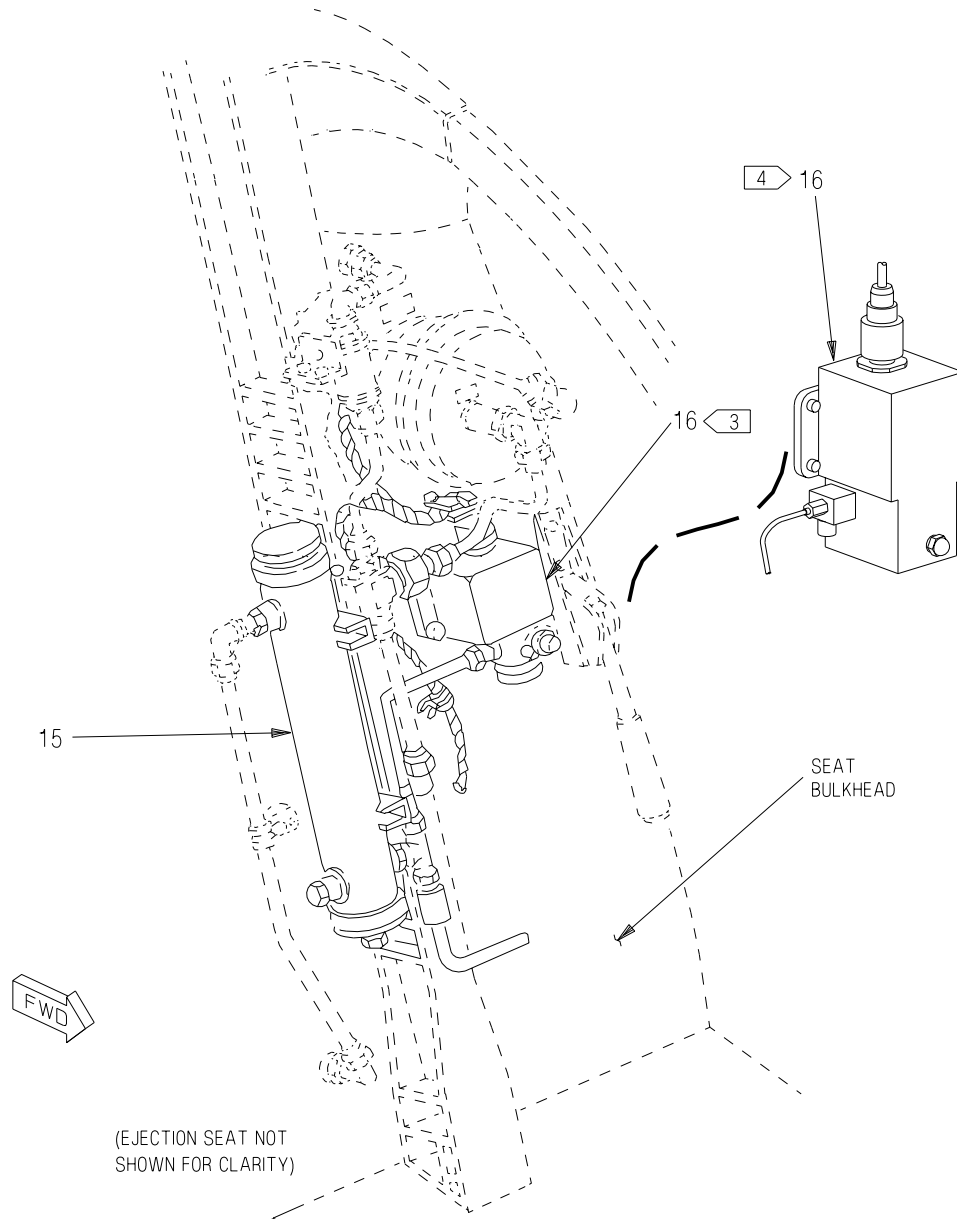


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 6)

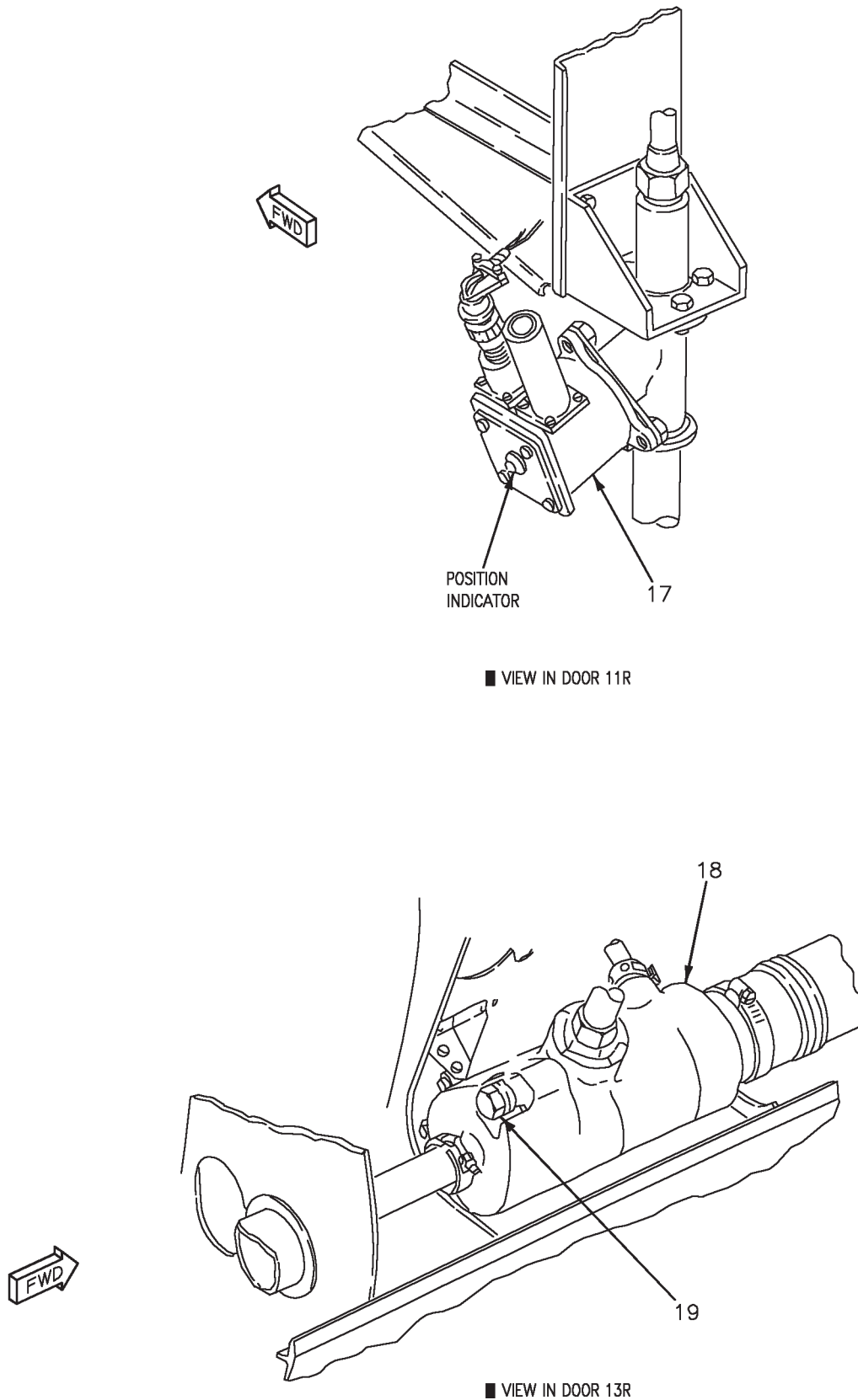


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 7)

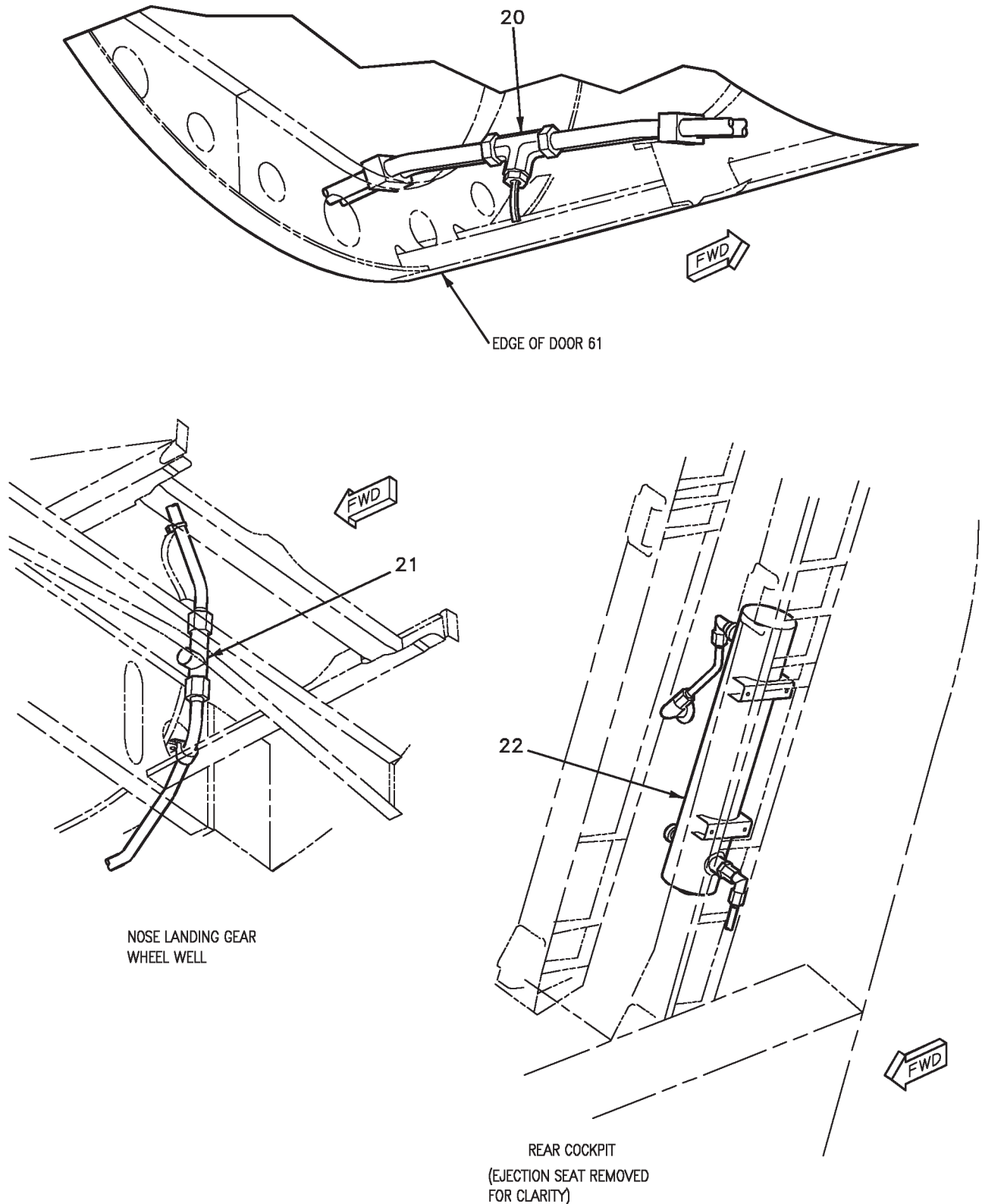


Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 8)

Nomenclature	Index No.	Ref Des
ANNUNCIATOR LIGHT CONTROLLER	8	27A-D007
CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY	1	27A-F011
1 DC CIRCUIT BREAKER PANEL ASSEMBLY BLEED AIR (ZONE C7) OXYGEN MON UNIT (ZONE B4)	7	52A-C104 15CBC003 15CBC008
2 DC EMERGENCY PANEL ASSEMBLY OXYGEN MON UNIT (ZONE F7) OEAS BLEED AIR SH OFF (ZONE F6)	10	52A-P132 15CBP008 15CBP003
2 DC ESSENTIAL/MAIN PANEL ASSEMBLY OBOGS HEATER 1 (ZONE A10) OBOGS HEATER 2 (ZONE A9)	9	52A-P133 15CBP008 15CBP002
1 DISTRIBUTION PANEL ASSEMBLY OBOGS HTR 1 (ZONE G5) OBOGS HTR 2 (ZONE G6)	11	52A-N025 15CBN001 15CBN002
EJECTION SEAT SURVIVAL KITS	14	—
OBOGS BLEED AIR SHUTOFF VALVE	17	15VAK501
OBOGS HEAT EXCHANGER	18	15MAK502
OBOGS HEAT EXCHANGER EJECTOR FILTER	19	15FAK503
OBOGS O TEMP INDICATOR	13	15DSP011
OBOGS OVERTEMPERATURE SWITCH	20	15S-N010
OBOGS PRESSURE RELIEF VALVE	21	15VAC505
OXYGEN CONCENTRATOR GGU-7/A	12	15A-P006
OXYGEN DISCONNECT	4	—
3 OXYGEN MONITOR ASSEMBLY CRU-91/A	16	15A-E009
4 OXYGEN MONITOR ASSEMBLY CRU-99/A	16	15A-E00A
OXYGEN PLENUM	15	—
PILOT SERVICES PANEL ASSEMBLY	3	52A-E060
OXY SWITCH		15S-E004
REAR CAUTION/ADVISORY INDICATOR LIGHT ASSEMBLY	2	27A-H045
REAR OXYGEN DISCONNECT	5	—

Figure 1. On-Board Oxygen Generating System Component Locator (Sheet 9)

Nomenclature	Index No.	Ref Des
REAR OXYGEN PLENUM	22	—
REAR PILOT SERVICES PANEL ASSEMBLY OXY SHUTOFF VALVE	6	8A-G195 15VAC506

LEGEND

- 1 162747; ALSO 162963 THRU 163861 BEFORE AV8AFC-416.
- 2 164113 AND UP; ALSO 162963 THRU 163861 AFTER AV8AFC-416.
- 3 CRU-91/A.
- 4 CRU-99/A.

