



MAINTENANCE MANUAL

AIRBRAKES SYSTEM — SYSTEM DESCRIPTION

1. General

A. Description

The aircraft is equipped with an inner and outer airbrake panel on the upper surface of each wing, between rib 7 and rib 15.

The airbrake system is controlled electrically and operated hydraulically with an angular travel for airbrake surfaces of 20° from retract position.

The airbrake system may be operated in flight at any airspeed and on the ground with throttles set at IDLE or below.

2. Subsystem Details

A. Airbrake Panels

Inner and outer airbrake panels are installed on each wing. Each panel is attached to the wing rear spar at four hinge points. Two lugs at each panel centerline provide attach points for the hydraulic actuators.

The airbrake panels are of composite construction and are made from aluminum skin with honeycomb core. See Figure 7.

B. Airbrake Actuators

There are four airbrake hydraulic actuators. See Figure 5, one for each airbrake surface.

- The inner and outer airbrake actuators are operated from the main hydraulic system, only when an airbrake system selector valve is activated. See Figure 3
- A self locking device is incorporated in each actuator to lock piston in retracted position. A minimum pressure of 250 psi is required to unlock the piston. See Figure 5
- Hydraulic pressure is applied through an airbrake manifold assembly. The manifold comprises check valves and restrictors which control the operating time of all four airbrakes. See Figure 5

C. Airbrake Switches

The GROUND/FLIGHT airbrake operating switches on the pedestal are on each side of the thrust reverser controls. The three position toggle switch on the left reads FLIGHT A/B, RETRACT/EXTEND (spring loaded to center OFF). The two position toggle switch on the right reads GROUND A/B, OFF/ON. See Figure 1.

The airbrake indication system comprises an amber warning lamp "AIRBRAKES" on the annunciator panel. The indication system is monitored by four double pole limit switches, one on each airbrake surface. Each of the four limit switches can operate the warning lamp independently to warn of improper deployment. A second section of each limit switch will open and prevent continued deployment of all panels in the event of initial asymmetric deployment of one or more panels (unless EXTEND position is held closed).

3. Operational Summary

A. Airbrakes System

Electrical control for each probable operating configuration is depicted in Figure 2. Each sheet is self-explanatory with the following exceptions:

In flight, extension is controlled only by the inner A / B Selector Valve (8C) which drives the manifold restrictor ports for a controlled deploy / retract time.



MAINTENANCE MANUAL

When GROUND A/B switch is OFF or FLIGHT A/B switch is in RETRACT/OFF position, Valves 5C and 8C have a ground applied to them. This ground shunts any reverse current produced by the valve solenoids which would increase the closing time (retract position) of the valve and delay surface retract.

When FLIGHT A/B EXTEND is selected and valve 8C begins to open, all four panels will begin to deploy. Once out of retract lock, the limit switches will close and cause Air Brake Flight (ABF) Latching Relay 148C to energize and hold Valve 8C open (extend). This ensures hydraulic pressure to maintain the panels deployed.

When GROUND A/B ON is selected and aircraft weight is on the right or left main landing gear, Valve 5C opens (extend) and Ground Air Brake (ABG) Latching Relay (4C) energizes. Relay 4C will hold Valve 5C open and transfer 28 Vdc to Valve 8C causing it to hold open. This ensures all panels remain deployed during rough landings or oleo strut bounce.

Hydraulic control is depicted in Figure 3 and Figure 4. The figures are self-explanatory when operation of selector valves and manifold is noted.

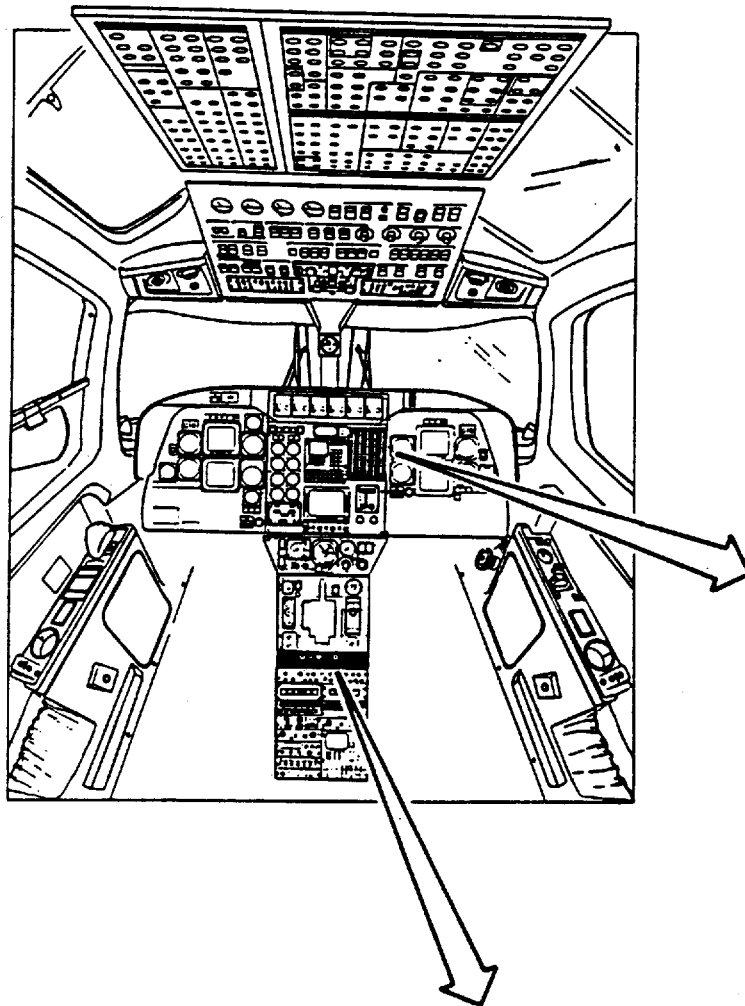
Inner A/B Valve (8C) applies hydraulic pressure to Speed Brake Extend (SBE), Speed Brake Retract (SBR) ports and associated restrictors, to control the rate of extend and retract.

When GROUND A/B is used, Valve 5C applies full pressure to manifold LDE/LDR ports to ensure rapid deployment.

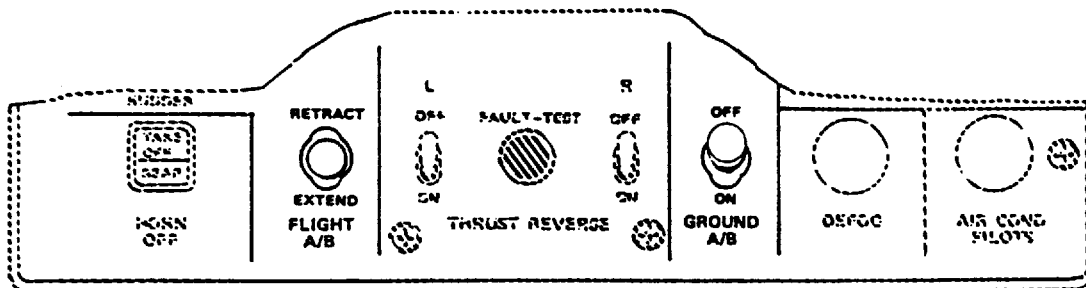
Ground operation of flight A/B panels is possible with GROUND A/B switch OFF by selecting FLIGHT A/B EXTEND (or RETRACT). GROUND A/B operation is controlled by either MLG Oleo Strut Switches.

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MAINTENANCE MANUAL



OIL PRESS	FUEL LOW	CABIN 10,000	OIL PRESS
BLEED AIR LEAK	BLEED PRESS HI	DUCT TEMP HI	BLEED AIR LEAK
FUEL PRESS	AUX HYD OFF	AILERON FAIL	FUEL PRESS
AC BUS FAIL			AC BUS FAIL
GEN OVERHT	FUEL XFER	BLOWER FAIL	GEN OVERHT
WINDSHIELD HEAT FAIL	HYD TANK PRESS	EMERG LT SW	
HYD PRESS	HYD LEVEL	AUX HYD LEVEL	HYD PRESS
STBY PUMP ON		AIR BRAKES	STBY PUMP ON
ANNUNCIATOR PANEL			
FUEL MAN MODE	FLAP UNBAL	SLAT UNBAL	FUEL MAN MODE
DIST FEEDER	AUTO SLAT	SLAT OUT	DIST FEEDER
BATT OVERHT	SURF DE ICE	NAC ANTI-ICE	BATT OVERHT
BATT OFF	BAGG DOOR	CABIN DOOR	BATT OFF
GEN OFF		A O A PREHT	GEN OFF
PITOT HEAT	SAT TAS HEAT	A O A HEAT	PITOT HEAT
	STALL FAIL	STALL WARN	A O A XMTR OFF

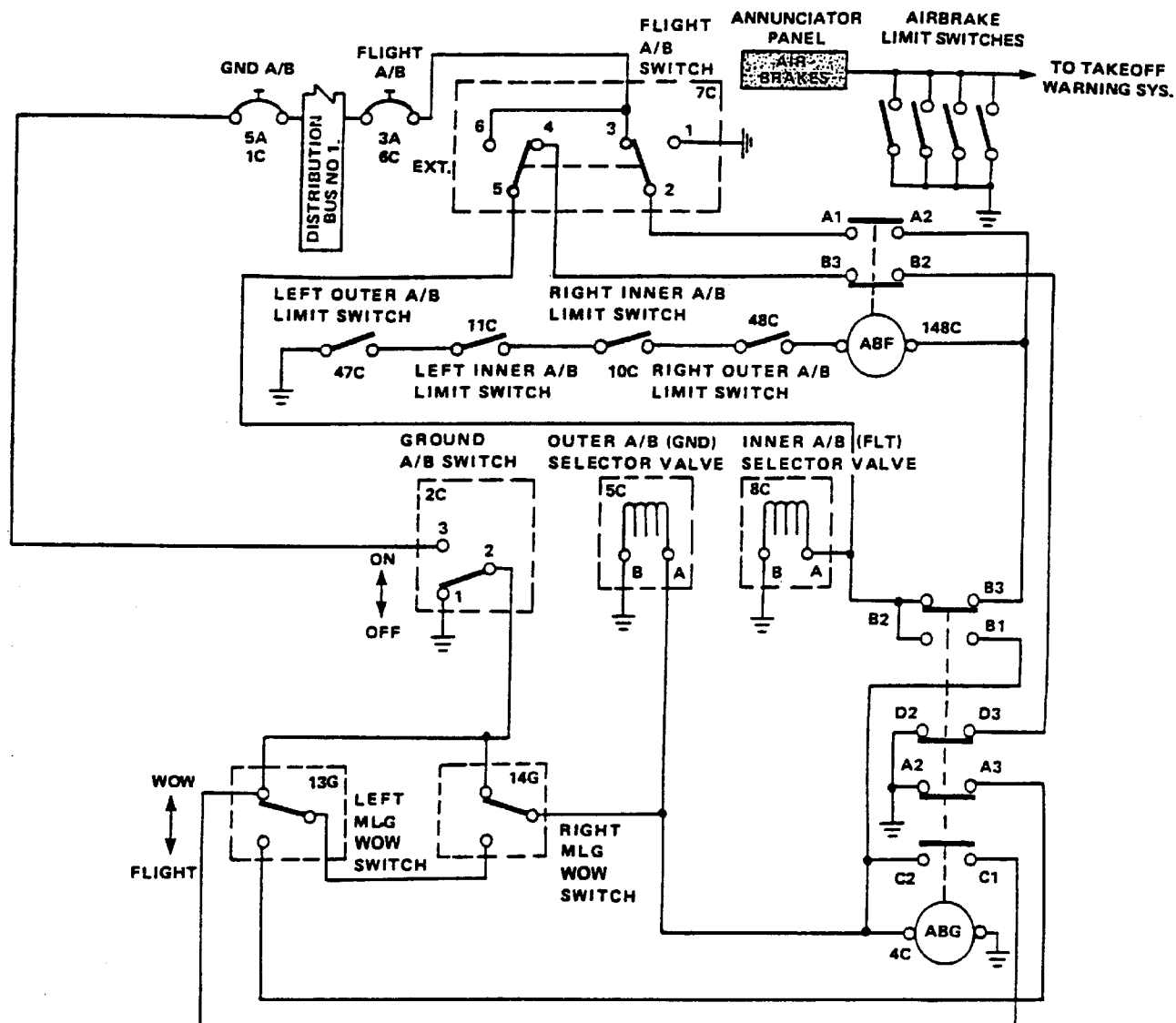


Airbrakes Control System
Figure 1

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1. BOTH VALVES CLOSED, PANELS RETRACTED, ANNUNCIATOR OFF
2. AIRCRAFT ON GROUND- WEIGHT ON WHEELS (WOW)
3. FLIGHT A/B SWITCH- CENTER OFF
4. GND A/B SWITCH- OFF
5. THROTTLES AT IDLE

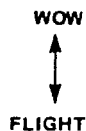
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Airbrakes - Electrical Schematic
Figure 2 (Sheet 1 of 5)

27-60-00

Page 4
September 20/06

MAINTENANCE MANUAL

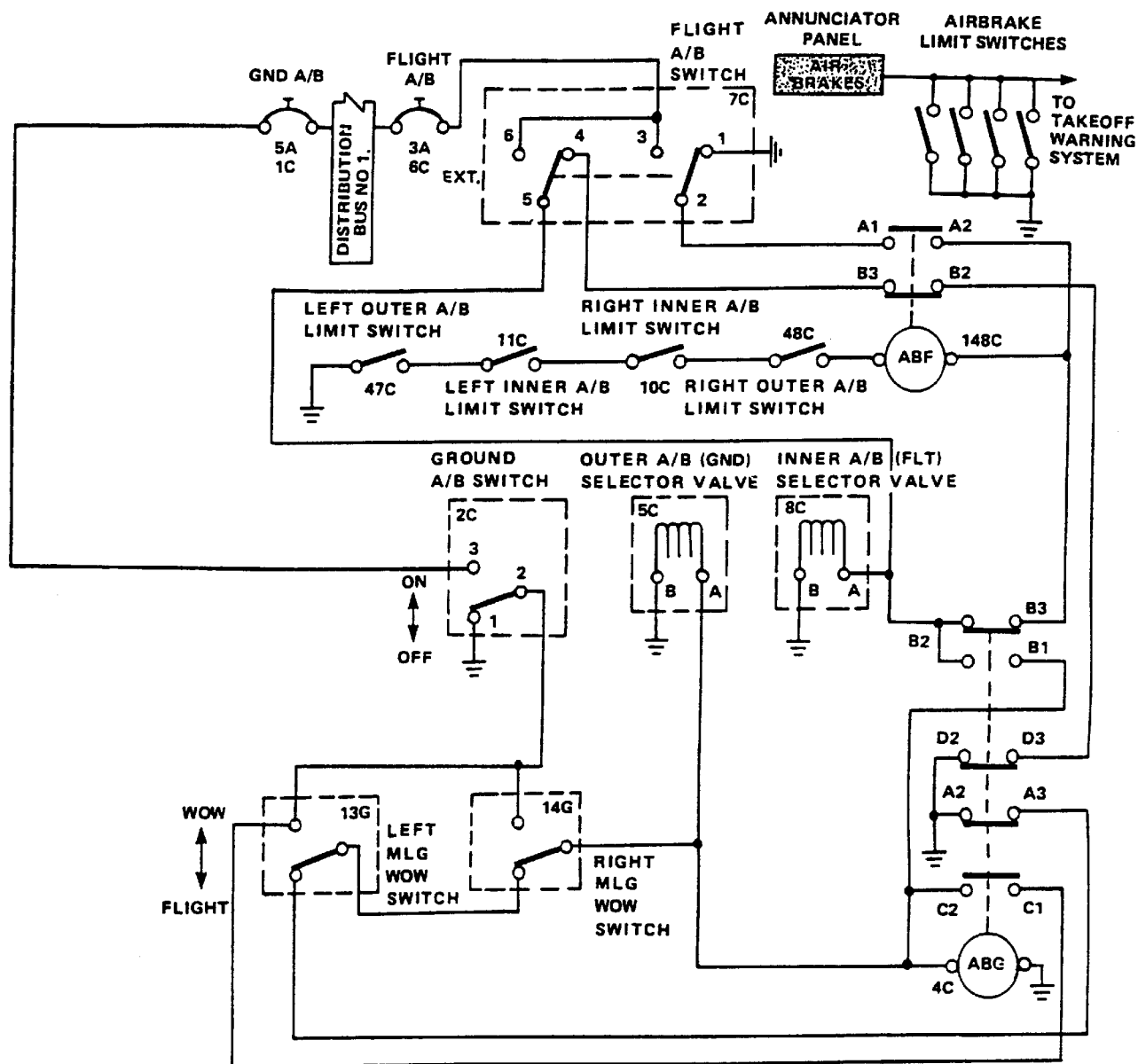


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Airbrakes - Electrical Schematic
Figure 2 (Sheet 2 of 5)

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1. BOTH VALVES CLOSED, PANELS RETRACTED, ANNUNCIATOR OFF
2. AIRCRAFT IN FLIGHT
3. FLIGHT A/B SWITCH- RETRACT (MOMENTARY ONLY)
4. GND A/B SWITCH-OFF

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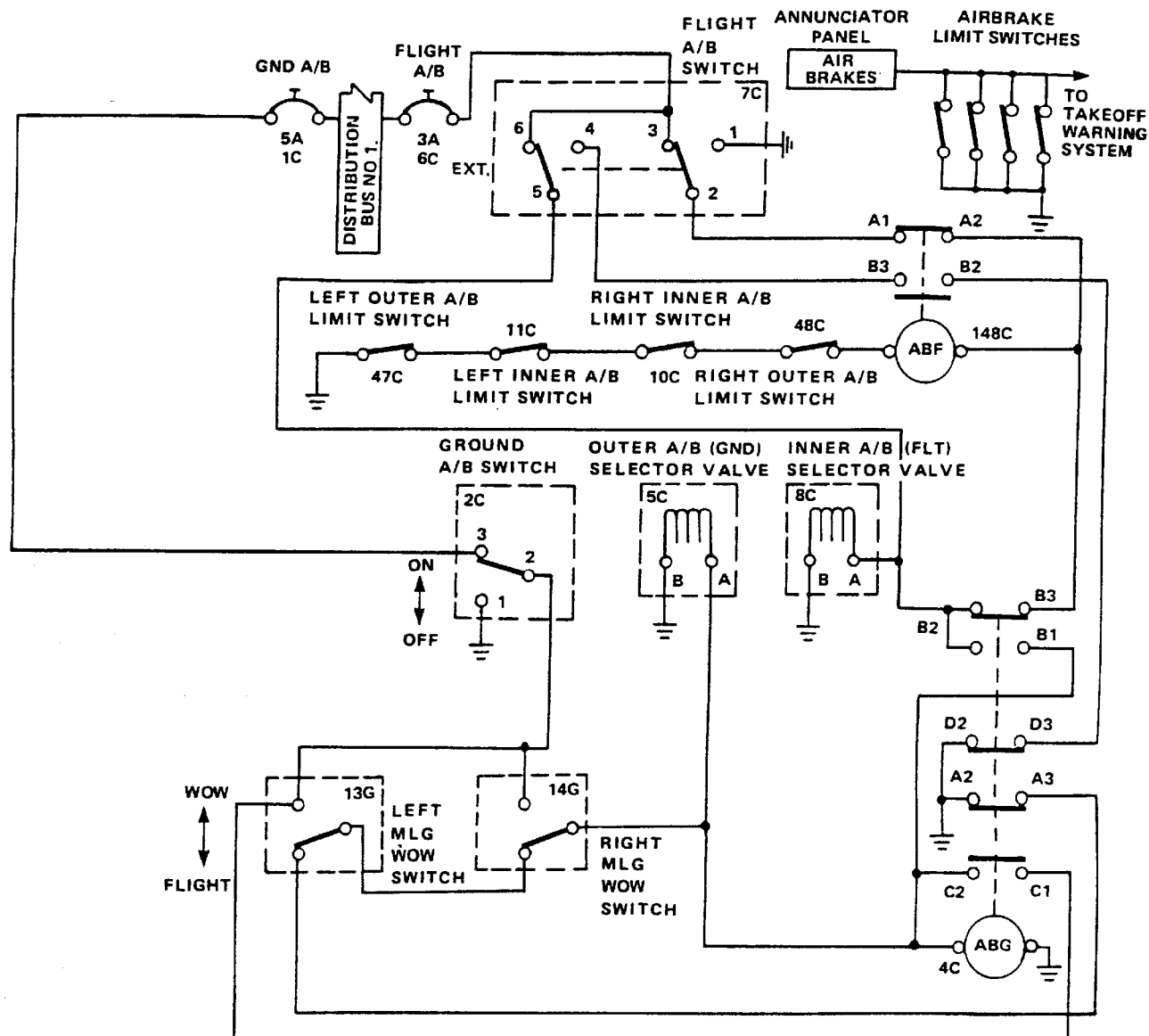
Airbrakes - Electrical Schematic
Figure 2 (Sheet 3 of 5)

27-60-00

Page 6
September 20/06

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1. INNER A/B (FLT) VALVE OPEN, PANELS DEPLOYED, ANNUNCIATOR ON
2. AT TOUCHDOWN, RELAY 4C ENERGIZES WITH GND A/B VALVE (SEE NEXT PAGE)
3. AIRCRAFT IN FLIGHT
4. FLIGHT A/B SWITCH- EXTEND (MOMENTARY ONLY)
5. GND A/B SWITCH- ON

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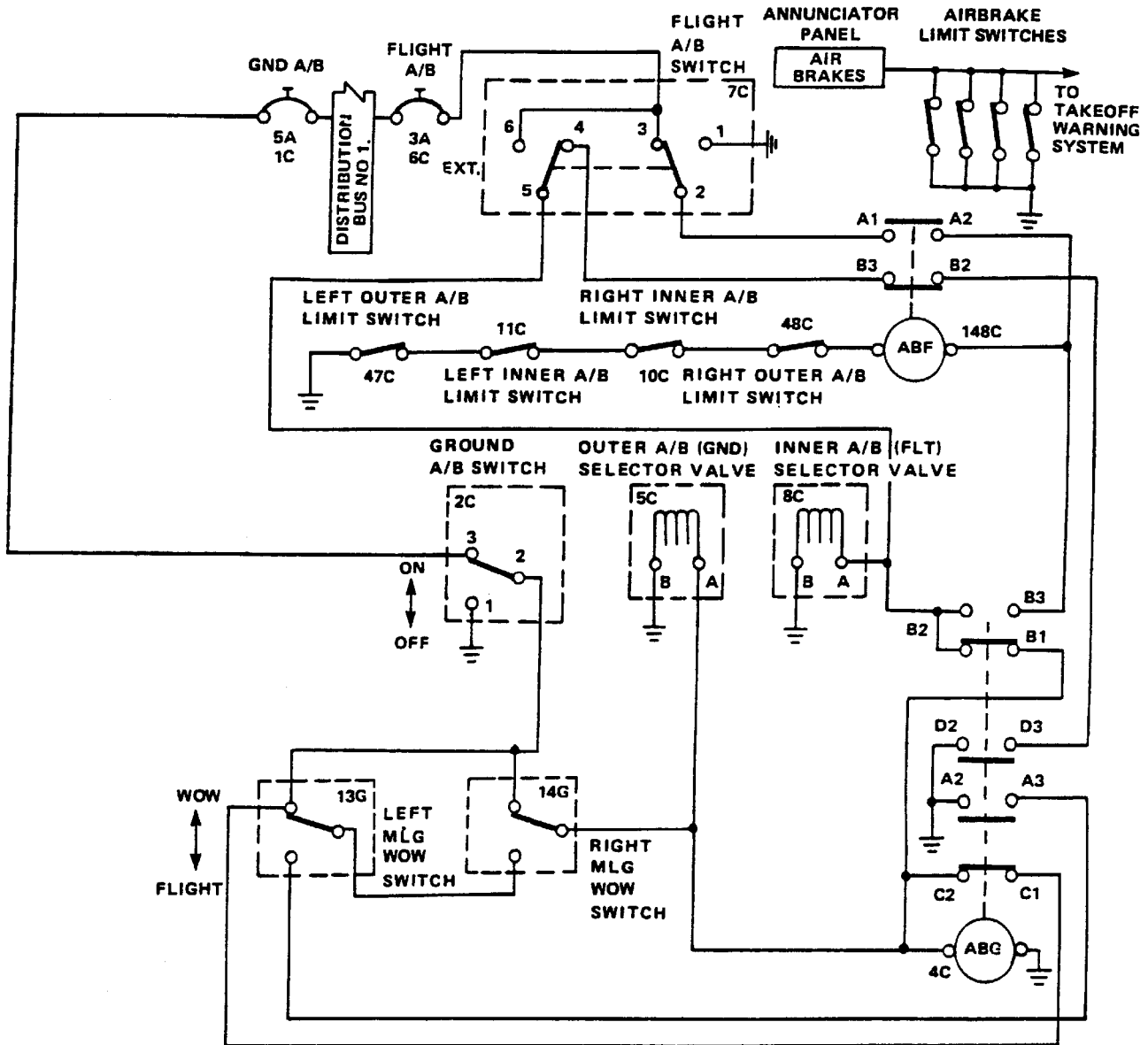
Airbrakes - Electrical Schematic
Figure 2 (Sheet 4 of 5)

27-60-00

Page 7
September 20/06

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MAINTENANCE MANUAL



1. BOTH VALVES OPEN, PANELS DEPLOYED, ANNUNCIATOR ON
2. AIRCRAFT ON GROUND- WEIGHT ON WHEELS (WOW)
3. FLIGHT A/B SWITCH- CENTER OFF
4. GND A/B SWITCH- ON
5. THROTTLES AT IDLE

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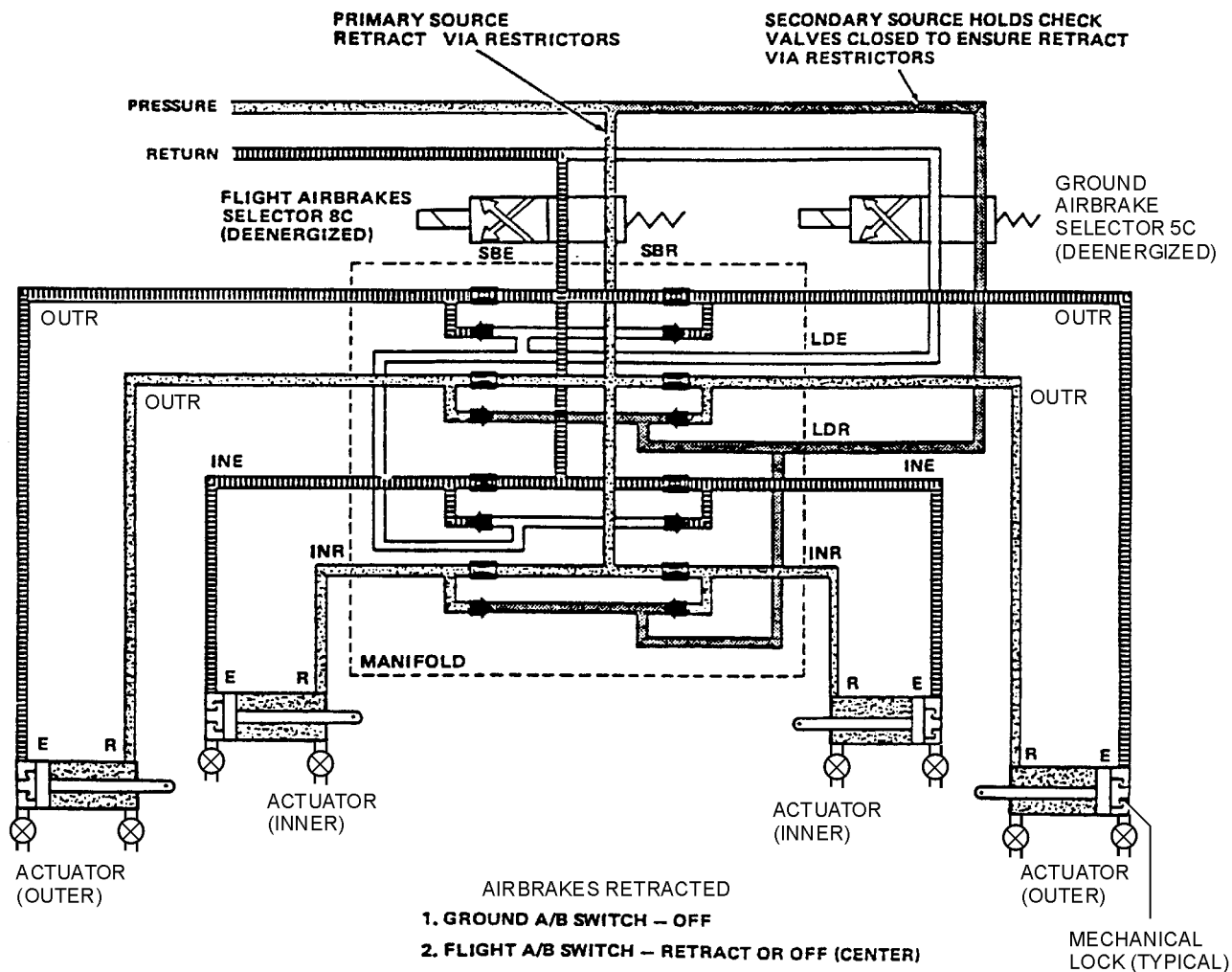
Airbrakes - Electrical Schematic
Figure 2 (Sheet 5 of 5)

27-60-00

Page 8
September 20/06

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MAINTENANCE MANUAL



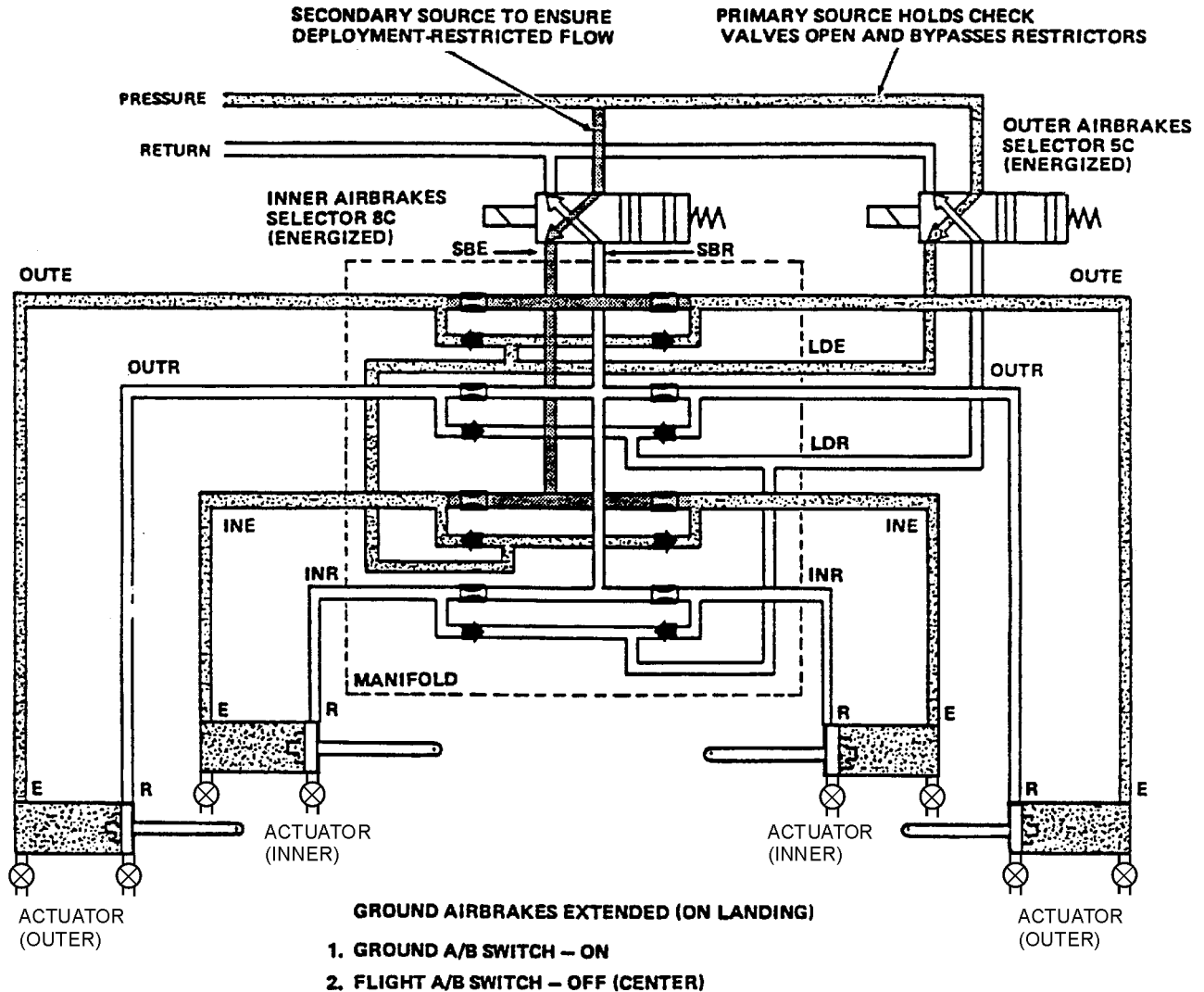
-  – RESTRICTOR
-  – CHECK VALVE (OPENS WITH HIGH PRESSURE IN DIRECTION OF ARROW)
-  – PRIMARY PRESSURE
-  – SECONDARY PRESSURE
-  – RETURN PRESSURE
-  – BLEED VALVE (FOR AIRCRAFT WITH AIRBRAKE ACTUATOR P/N D25W713010-505)

Airbrakes - Hydraulic System
Figure 3 (Sheet 1 of 3)

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-  – RESTRICTOR
-  – CHECK VALVE (OPENS WITH HIGH PRESSURE IN DIRECTION OF ARROW)
-  – PRIMARY PRESSURE
-  – SECONDARY PRESSURE
-  – RETURN PRESSURE
-  – BLEED VALVE (FOR AIRCRAFT WITH AIRBRAKE ACTUATOR P/N D25W713010-505)

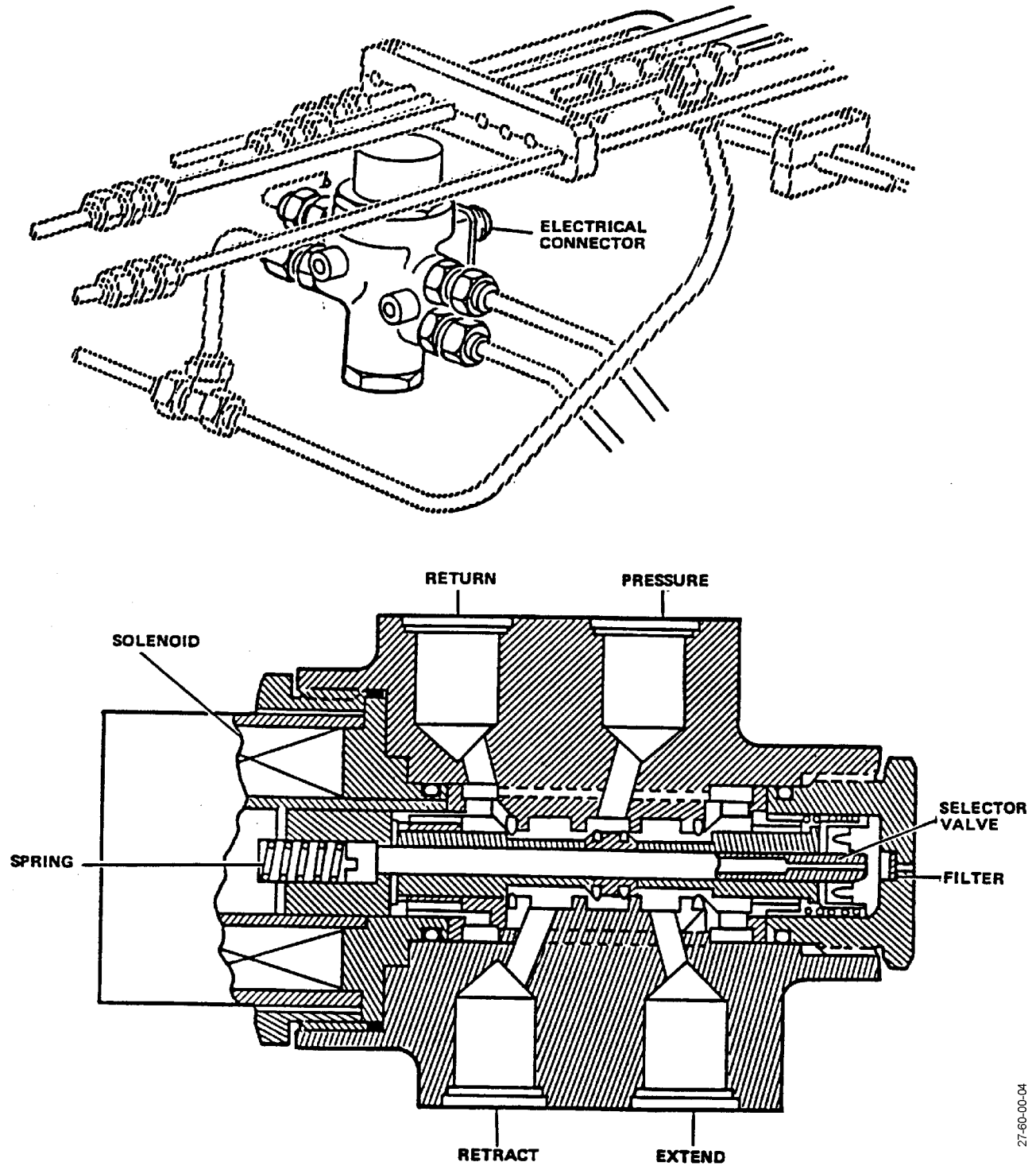
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Airbrakes - Hydraulic System
Figure 3 (Sheet 2 of 3)

27-60-00

Page 10
September 20/06

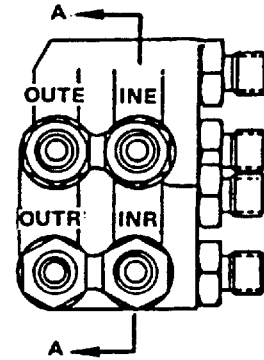
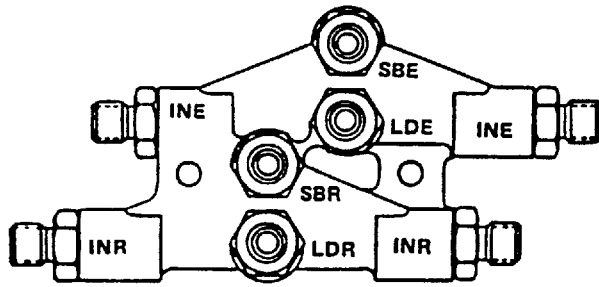
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Airbrakes Selector Valve (5c & 8c)
Figure 4

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INE – INNER PANEL EXTEND
 INR – INNER PANEL RETRACT
 OUTE – OUTER PANEL EXTEND
 OUTR – OUTER PANEL RETRACT

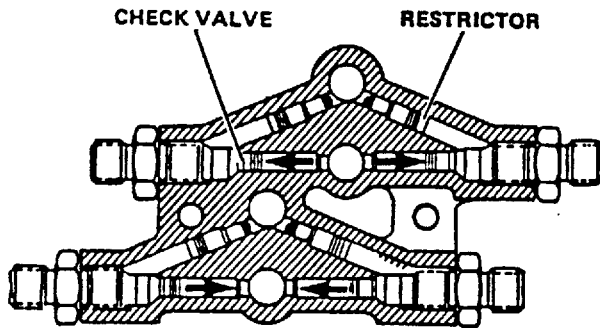
TO/FROM PANEL ACTUATORS

SBE – SPEED BRAKE (INNER) EXTEND
 SBR – SPEED BRAKE (INNER) RETRACT

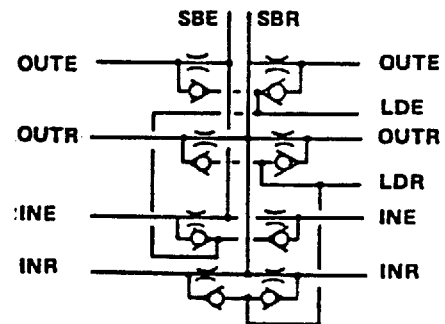
FROM FLIGHT AIRBRAKE
 SELECTOR VALVE 8C

LDE – LIFT DUMP (OUTER) EXTEND
 LDR – LIFT DUMP (OUTER) RETRACT

FROM GROUND AIRBRAKE
 SELECTOR VALVE 5C



SECTION A-A



SCHEMATIC DESCRIPTION

CHECK VALVES:

PRESSURE —> = CLOSED
 OPEN = —> PRESSURE

Airbrakes Manifold Assembly
 Figure 5

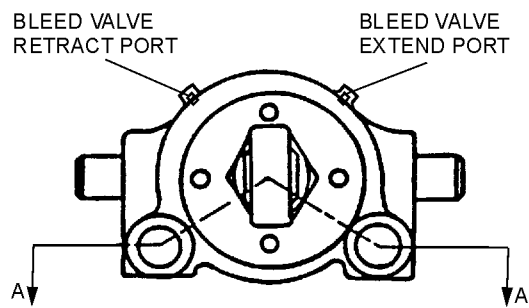
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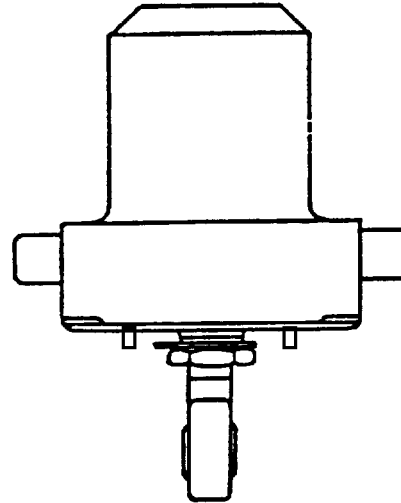
Page 12
 September 20/06

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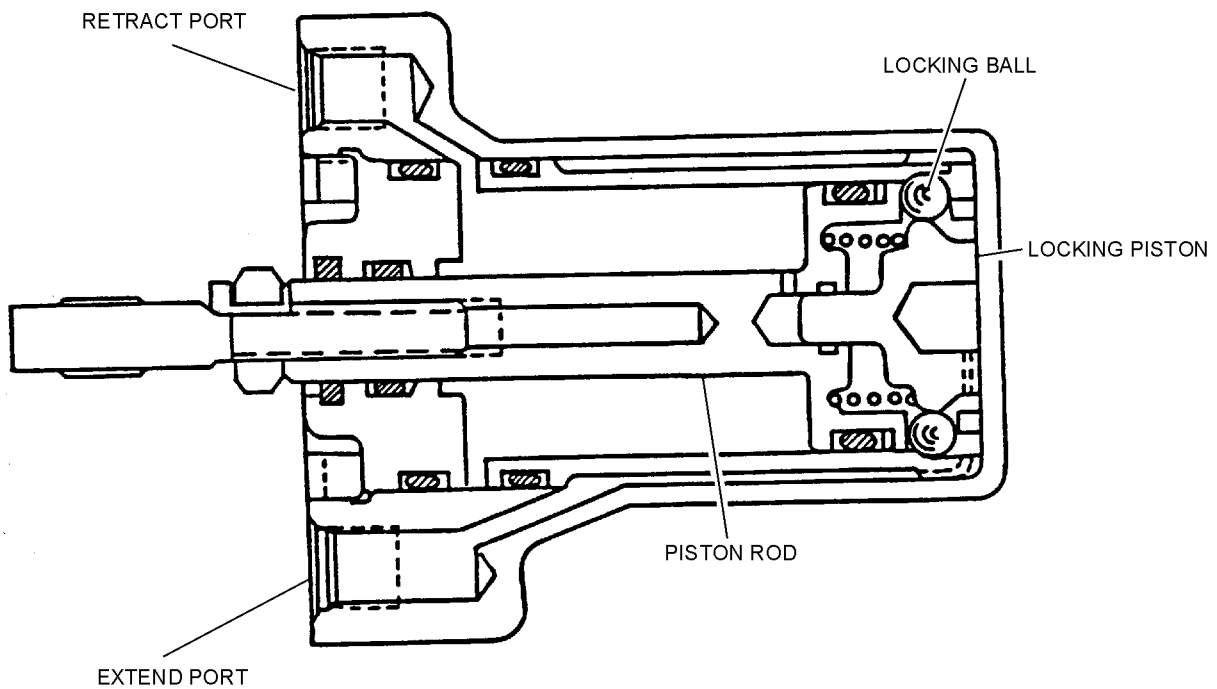
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FRONT VIEW



PLAN VIEW



SECTION A-A

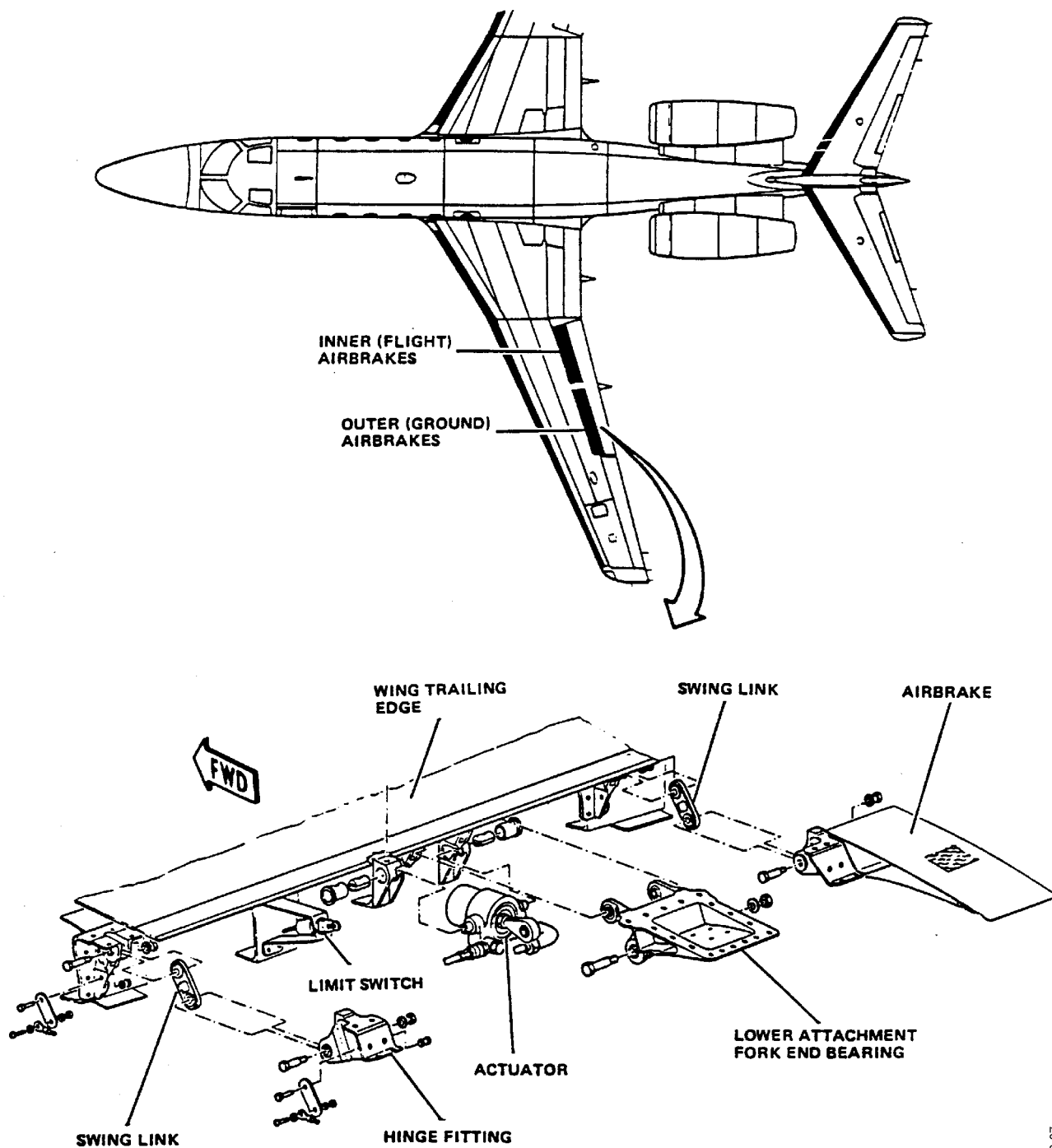
NOTE:

THE BLEED VALVE IS INTALLED
ON AIRBRAKE ACTUATOR
P/N D25W713010-505 ONLY.

Airbrake Actuator
Figure 6

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Airbrakes - System Description
Figure 7

27-60-00

Page 14
September 20/06