LANDING GEAR AND BRAKES

GENERAL

The landing gear is electrically controlled and hydraulically actuated. Each main landing gear assembly uses a trailing link gear design with a single wheel assembly and an air over oil strut. The nose gear has a chined tire for water and slush deflection. The main landing gear doors are mechanically connected to the main gear struts and extend and retract with the individual gear assemblies. The nose gear utilizes three doors. The rear door is mechanically connected to the nose gear strut and extends aft, or retracts forward with the nose gear assembly. The two forward double-action doors are mechanically linked to the nose gear. These doors close with the nose gear fully extended or retracted.

The gear actuators incorporate an internal lock to hold the gear in the extended position. They are held retracted by mechanical uplocks that are normally released hydraulically. The landing gear completes a retraction or extension cycle in less than 6 seconds. The gear can be extended and retracted (V_{LO}), and the airplane operated with the gear extended (V_{LE}) at airspeeds up to 186 KIAS.

CONTROL

The landing gear control panel contains the landing gear handle, an audible warning system and horn silence switch, three gear safe indicators and a red unlocked indicator. The landing gear handle has two positions: full down and full up. The gear handle must be pulled out to clear a detent before it can be repositioned. Operation of the gear and doors will not begin until the handle has been positioned in one of the two detents. A gear handle locking solenoid, activated by the left main gear squat switch, physically prevents inadvertent movement of the gear handle while on the ground.

Extension and Retraction

In a landing gear retraction cycle, the following takes place:

1. With weight off the left landing gear squat switch, power is applied to the solenoid lock, allowing the landing gear handle to be placed in the UP position.
2. Actuation of the gear handle to the UP position:
   a. Lights the GEAR UNLOCKED warning light when a gear unlocks.
   b. Closes the loading valve in the hydraulic return line, pressurizing the system as required.
   c. Positions the landing gear control valve to route hydraulic fluid to the retract side of the hydraulic cylinders.
3. The landing gear are mechanically snatched and held in place by the uplatches.
4. Actuation of the three gear up microswitches:
   a. Opens the loading valve in the hydraulic system returning it to open center operation and low pressure.
   b. Removes power from the landing gear control valve.
   c. Extinguishes GEAR UNLOCKED indicator light.

The sequence during a gear extension is identical with the following exceptions:

1. Solenoid lock on landing gear handle is not in use.
2. Gear handle to the DOWN position causes fluid to be routed by the control valve through the uplocks to release them, and then to the extend side of the actuating cylinders. The green LH, RH and NOSE gear indicating lights illuminate as each gear locks down. After all gear are down-and-locked, the gear down microswitches return the hydraulic system to open center operation.

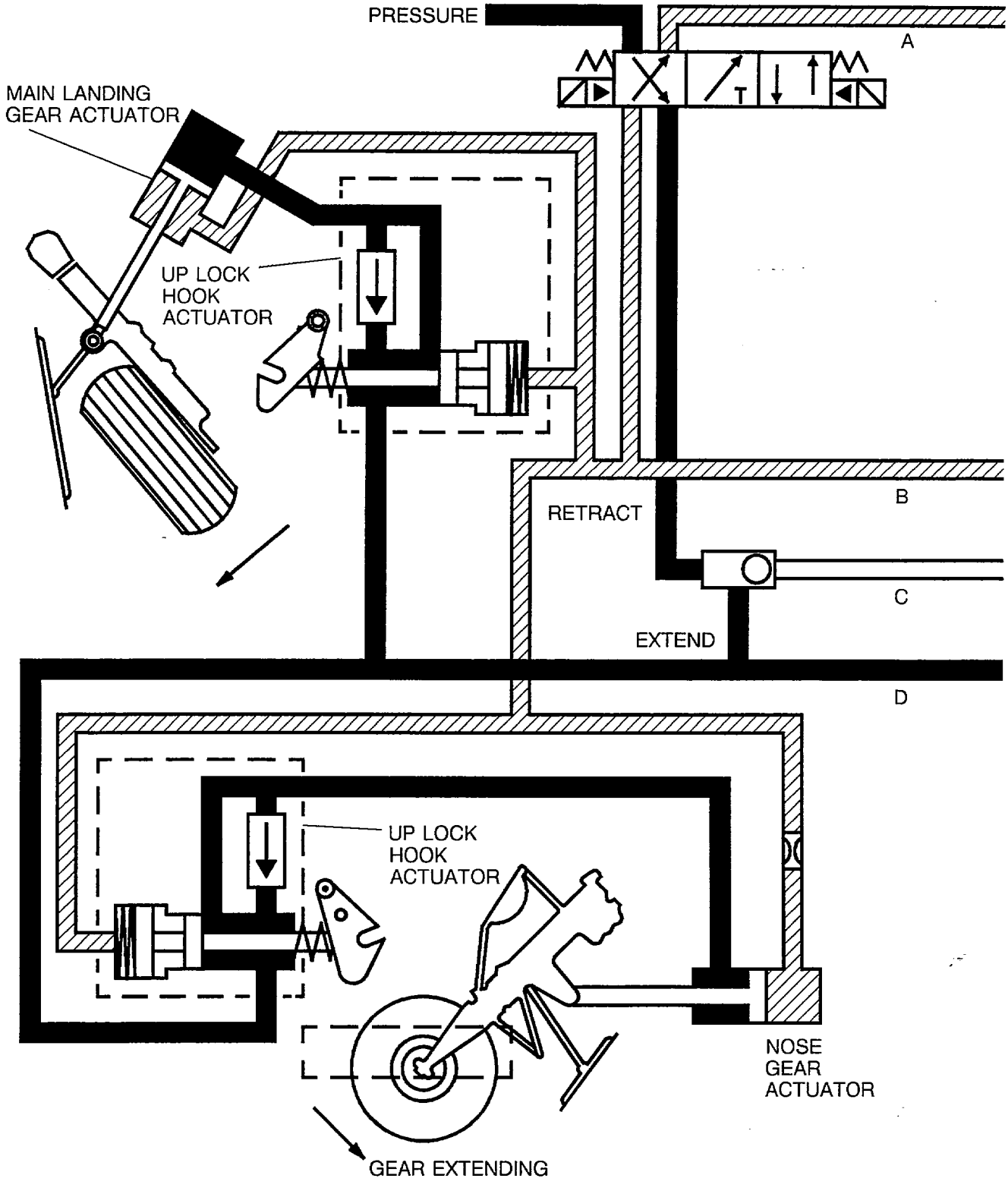

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 1 of 6)

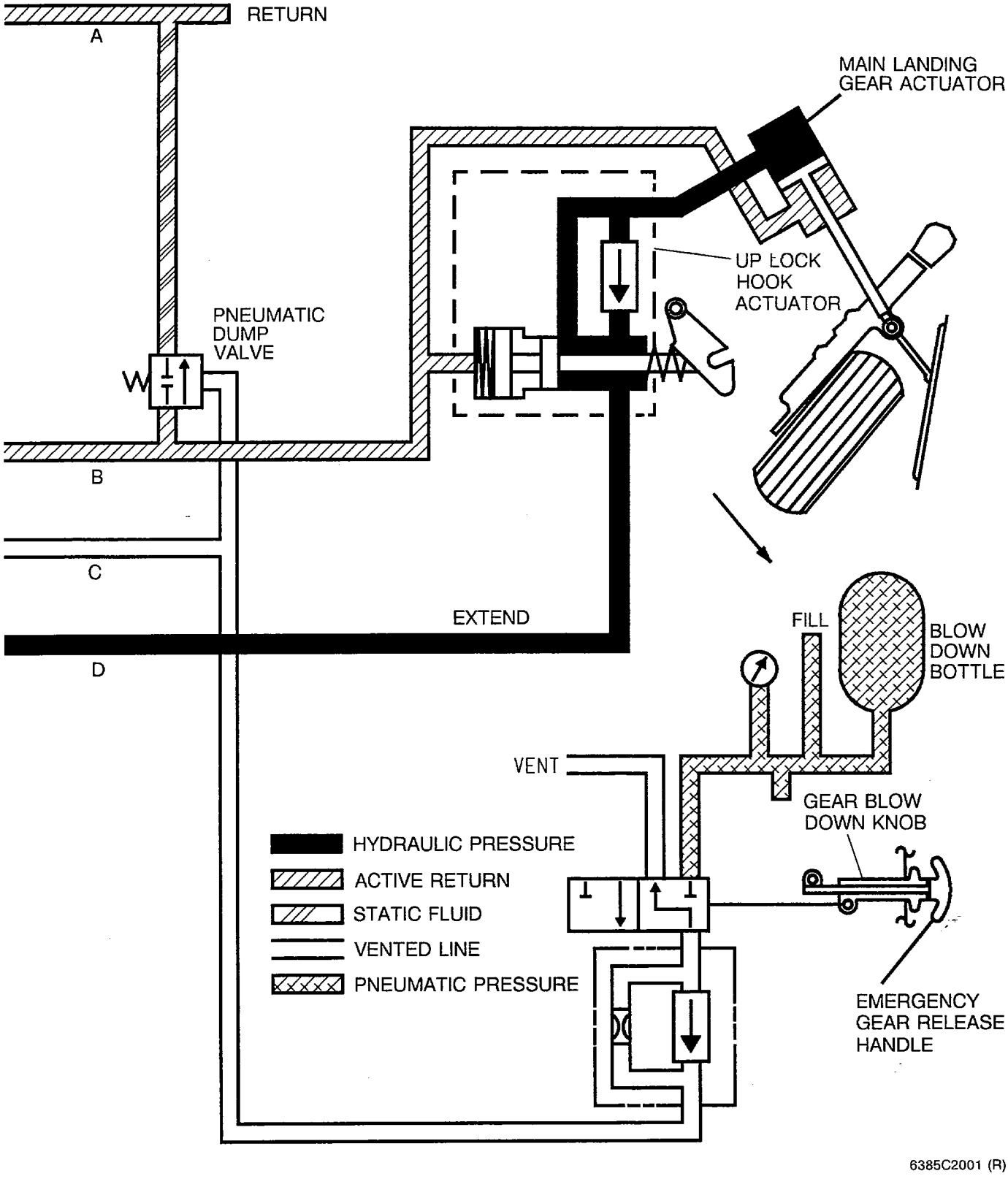

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 2)

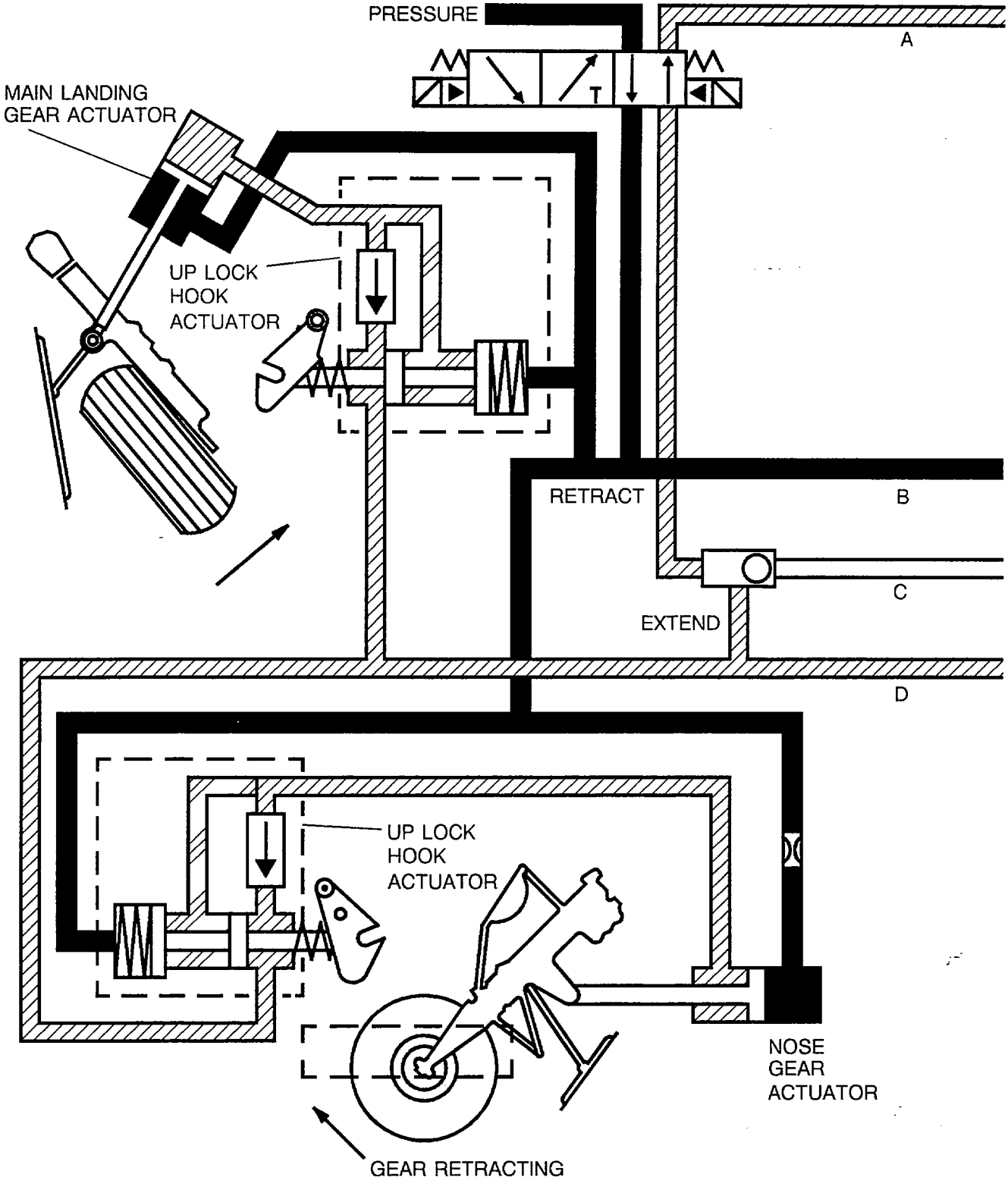

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 3)

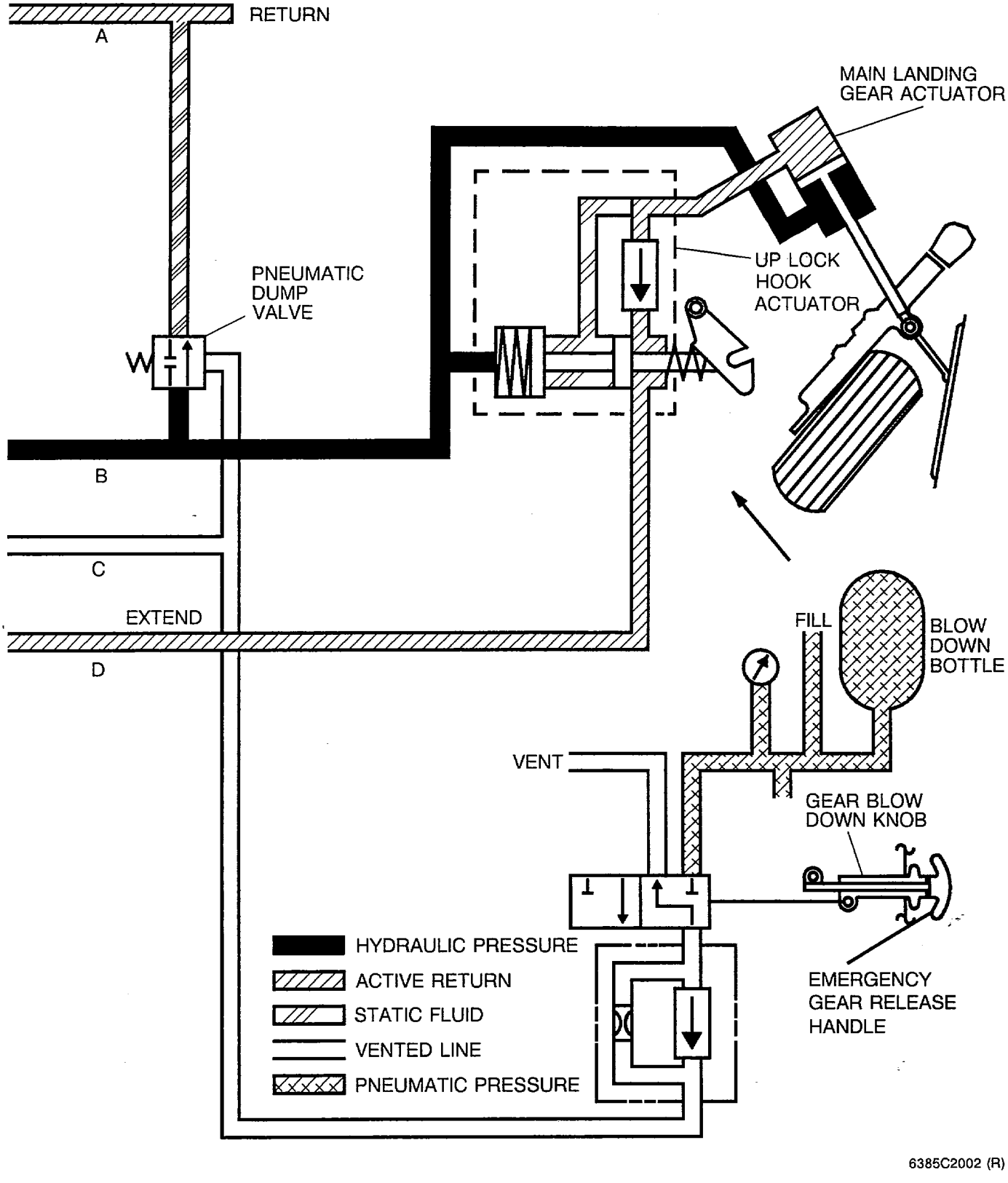

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 4)

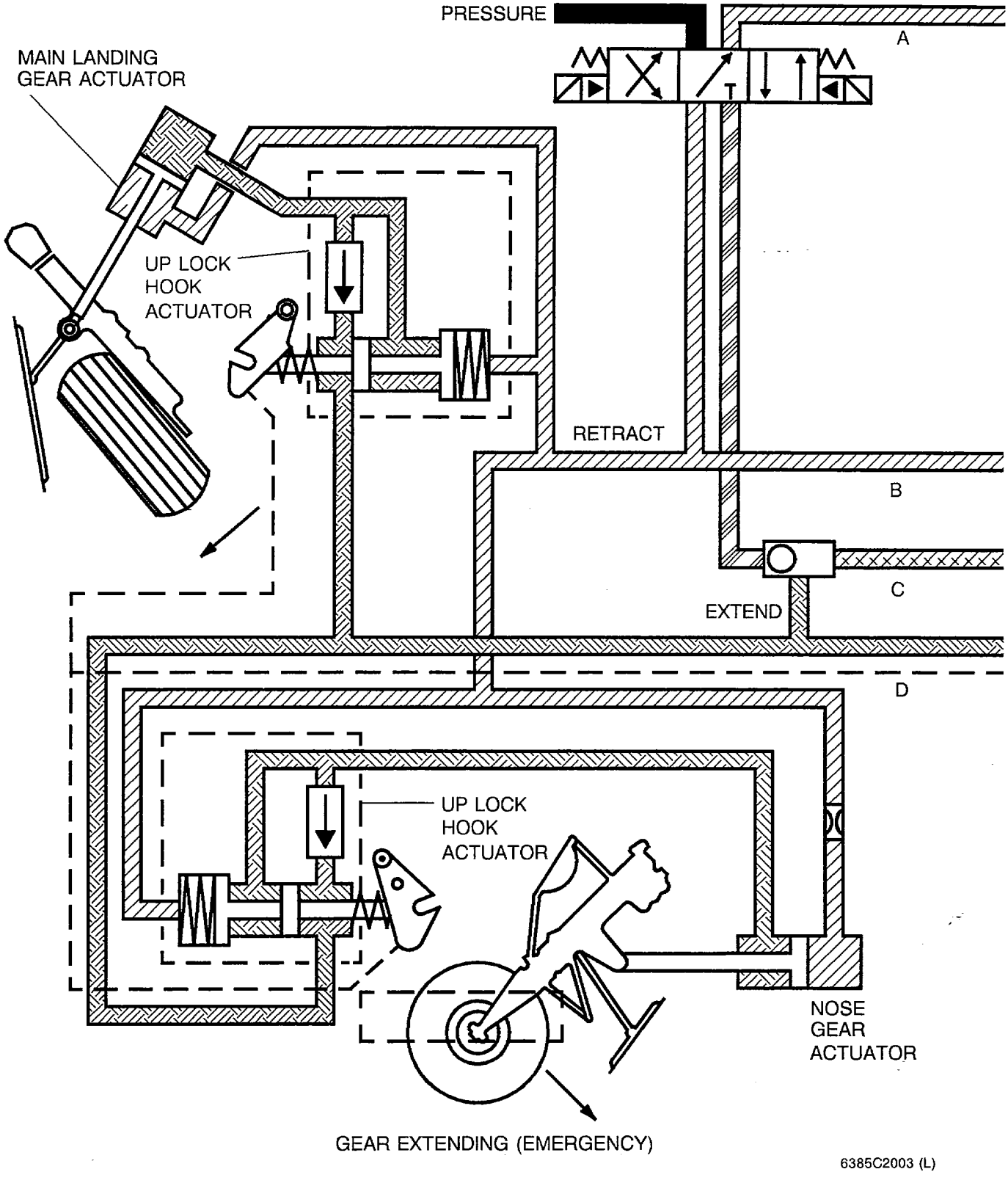

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 5)

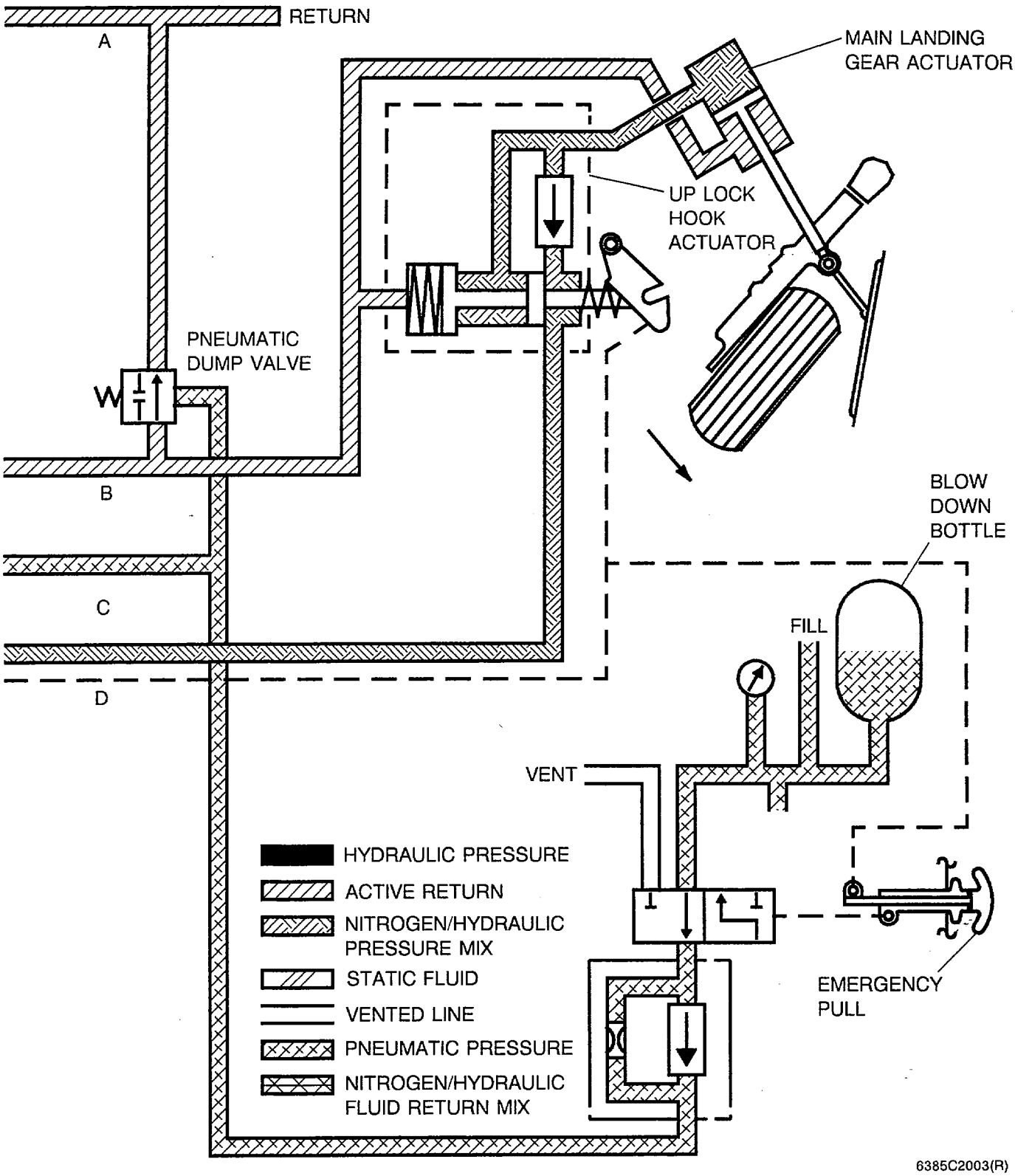

Figure 2-10. Landing Gear Extension and Retraction Flow Diagram (Sheet 6)

Position and Warning System

The landing gear position and warning system provides visual and audible indication of landing gear position. Three green safe lights and a red GEAR UNLOCKED light are located in a group adjacent to the gear control handle. Each green light corresponds to one gear, NOSE, LH or RH and indicates that it is in the down and locked position. The red light indicates an unsafe gear position (in transit or not locked). The landing gear warning system sounds an audible warning when the airspeed is below approximately 130 knots if either throttle is retarded below approximately 85 percent N_2 and the gear is not down and locked. The audible tone or "LANDING GEAR" voice advisory can be silenced for this condition by depressing the "horn silence" switch. The advisory will reset if the throttle is advanced. If the flaps are extended beyond the T.O. & APPR. (15 degrees) position and the gear is not down and locked, there will be an audible warning that cannot be silenced by the "horn silence" switch.

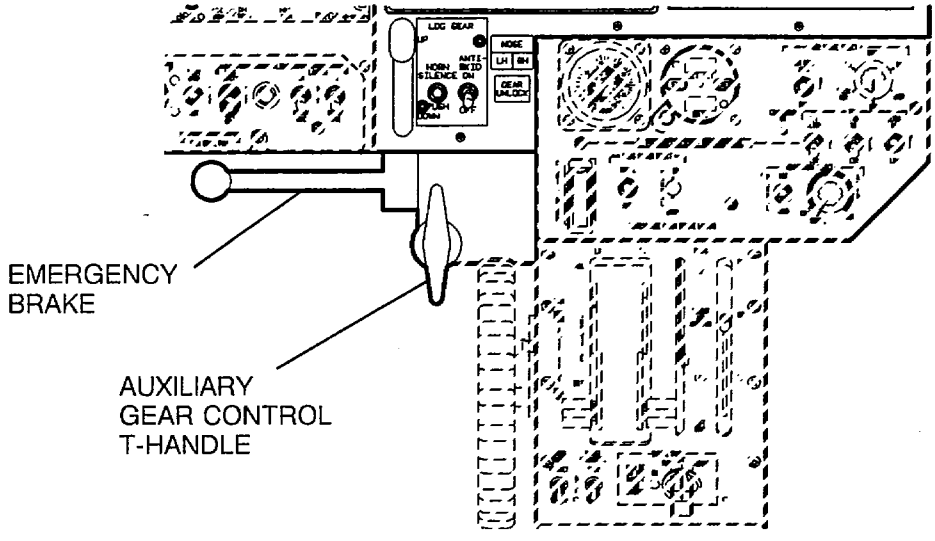

Figure 2-11. Landing Gear Position Warning

EMERGENCY EXTENSION

In the event of normal system malfunction, a manually operated system is provided to release the landing gear for free-fall extension. A pneumatic system is installed to assure positive locking of all three gear actuators.

The manual system is actuated by the red AUX GEAR CONTROL T-handle located under the pilot's instrument panel. The handle is pulled and rotated 90° clockwise to lock. This action mechanically disengages the landing gear uplocks, allowing the landing gear to free-fall to the down and locked position and also unlocks the red, collar-type, blow down knob. Approximately 150 KIAS with flaps up is the optimum speed/configuration for free fall extension. Yawing the airplane may be required to achieve green light indications. The pneumatic system should always be used in conjunction with the manual system in order to assure positive locking of all three gear actuators.

Pulling the red, collar-type knob on the T-handle shaft mechanically ports the emergency air bottle into the uplocks and then into the extend side of all three landing gear. If the uplocks had not released mechanically, the air charge will release them. The gear is driven to the down and locked position and normal indications will appear in the cockpit providing the gear handle is down. After actuation of the pneumatic system, the knob and T-handle should be left in the extended position. After each use, the system must be reserviced.

WHEEL BRAKES

Toe-actuated multiple disc brakes are installed on the main gear wheels. Braking can be accomplished by either of two independent systems: the power brake hydraulic system or the back-up pneumatic system. Normal braking can be applied from either cockpit seat. The emergency brake control is installed under the left instrument panel only.

ANTISKID/POWER BRAKE

A Crane-Hydro Aire digital antiskid system is installed in the Citation 525A. Skid control is provided by modulating the power brakes through a servo valve. The servo valve is controlled by an electronic control module that interprets wheel speed information from sensors on each main wheel. A skid signal releases brake pressure to both brakes simultaneously. A switch is provided to turn the antiskid system off and and annunciator light indicates if the antiskid system is inoperative. In the event of anti-skid failure, power braking is still available but without antiskid protection.

A wheel speed generator is bolted into each main gear axle with the drive shaft connected through a drive cap to the main wheel. As the wheel turns, the generator generates a 36 Hz signal for each wheel revolution that is sent to the control module as a variable frequency. The control module accepts the output of the left and right wheel speed generators and converts these signals to a direct current (DC) voltage that is directly proportional to wheel speed. The voltage from the left and right wheels is averaged to provide a composite or reference voltage. Any significant variation between either wheel speed voltage and the reference voltage produces an error signal that activates the power brake and antiskid valve which controls the amount of braking being applied against each wheel. At touchdown, the generator voltage reaches maximum as soon as the wheel spins up. As long as no skid occurs, the generator voltage follows wheel speed and the reference voltage follows the voltage of the generator. When excessive deceleration of a wheel occurs, generator voltage suddenly drops. An error signal is generated which energizes the servo valve segment of the power brake and antiskid valve. The servo valve controls the movement of spools within the main body of the power brake and antiskid valve which modulate the braking pressure being applied to the brakes as required to maintain generator voltage and reference voltage within the skid limits, preventing the skid condition. When the airplane speed drops below approximately 12 knots, the antiskid function disengages.

CAUTION

DO NOT PULL THE BRAKE SYSTEM CIRCUIT BREAKER TO PREVENT THE POWER BRAKE PUMP FROM CYCLING. WITH THE CIRCUIT BREAKER DISENGAGED, THE POWER BRAKE SYSTEM IS INOPERATIVE AND THE RUDDER PEDAL TOE BRAKES ARE DISABLED. BRAKING IS THEN AVAILABLE ONLY BY USE OF THE PNEUMATIC BRAKE SYSTEM.

To ensure optimum braking on water, snow and ice-covered, hard-surface runways and all unimproved surfaces, it is necessary for the pilot to apply maximum effort to the brake pedals throughout the braking run. When the system anticipates a skid and releases the applied brake pressure, any attempt by the pilot to modulate braking can result in an interruption of the applied brake signal and may increase stopping distance significantly. Hydraulic power for the power brake/antiskid system is provided by an electrically driven hydraulic pump located in the left nose of the airplane. An accumulator is installed in the system to maintain system pressure when the pump is not running. The pump is controlled by a pressure switch that opens when the pressure approaches 1300 PSI and closes when the system pressure approaches 900 PSI. The power brake system is enabled through a switch activated by the landing gear control. When the landing gear is down, the switch is closed providing a ground for the power brake hydraulic pump motor.

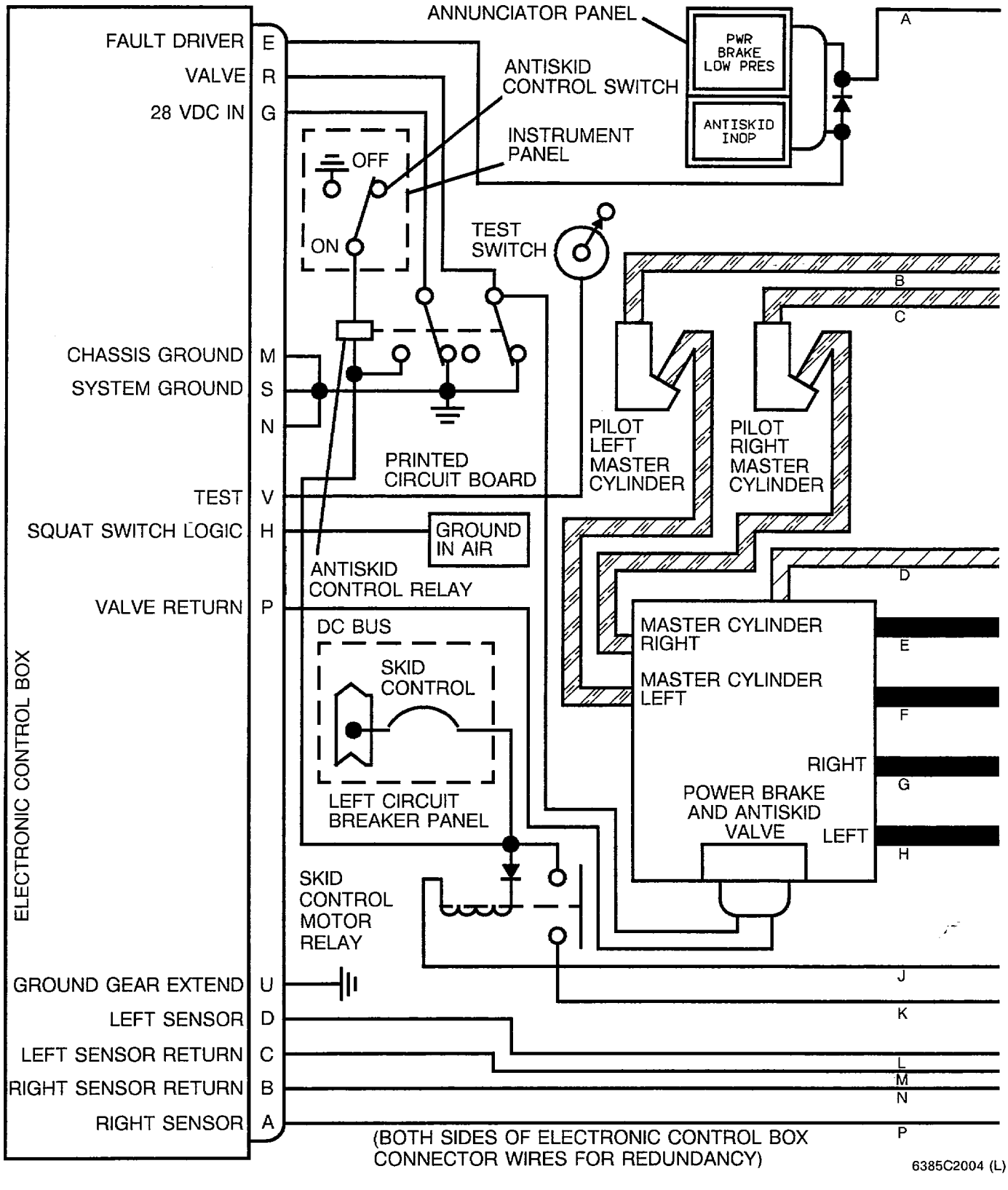

Figure 2-12. Wheel Brake Hydraulic System Schematic (Sheet 1 of 2)

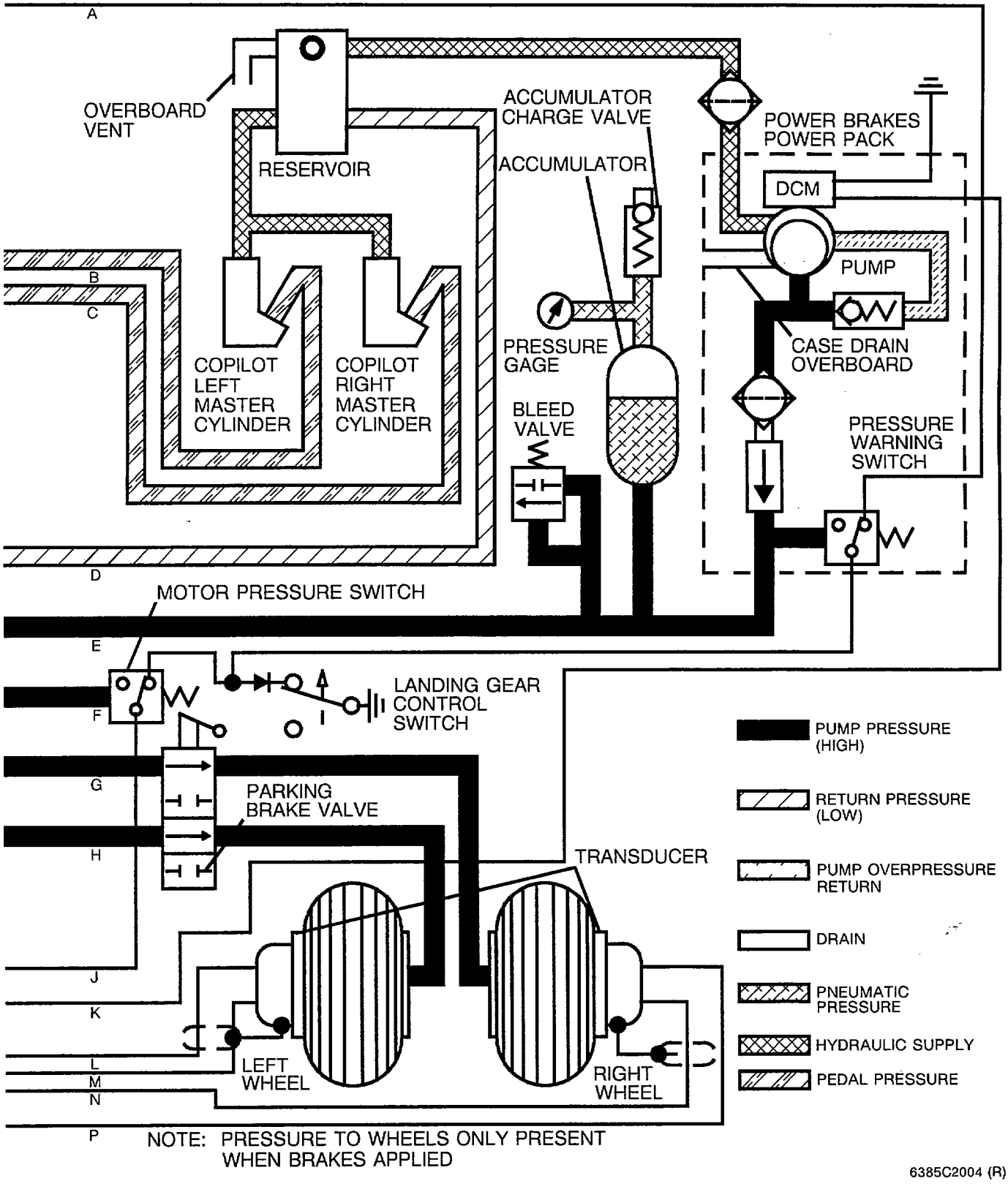

Figure 2-12. Wheel Brake Hydraulic System Schematic (Sheet 2)