

MODEL P210 SERIES SERVICE MANUAL

SECTION 5A

LANDING GEAR, BRAKES AND HYDRAULIC SYSTEM (BEGINNING WITH 1979 MODELS)

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

NOTE

This section covers 1979 thru 1983 models, and was added to avoid the confusion of serialization caused by major changes in the airplane hydraulic system. However, Section 5 contains information which is also applicable to these models. To avoid repetition, the reader is referred back to Section 5 for this information.

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5A-1. LANDING GEAR SYSTEM.

5A-2. DESCRIPTION. Retraction and extension of the landing gear is accomplished by a hydraulically-powered system, integrated with electrical circuits which help control and indicate gear position. Retraction and extension of the landing gear incorporates a nose gear actuator and two main gear actuators. The main gear actuators control the main gear struts through a sector gear arrangement. The nose gear doors are mechanically-operated. The doors are closed with the gear retracted and are open with the landing gear extended. The main gears have no doors. Hydraulic fluid is supplied to the landing gear actuating cylinders by an electrically-powered power pack assembly, located inside the center console. The hydraulic reservoir is an integral part of the power pack assembly. Gear selection is accomplished manually by moving a gear selector handle, located immediately left of center, in the switch panel. It is necessary to pull out on the gear selector to move the handle up or down. For emergency extension of the gear, the selector handle must be in the DOWN position before the hand pump will energize the system. A pressure switch is mounted on the pump body. This switch opens the electrical circuit to the pump solenoid when pressure in the system increases to approximately 1500 psi. The pressure switch will continue to hold the electrical circuit open

until pressure in the system drops to approximately 1000 psi. This will occur whether the gear selector handle is in either the UP or DOWN position. During a normal cycle, landing gear extended and locked can be detected by illumination of the gear DOWN indicator (green) light. Indication of gear retracted is provided by illumination of the UP indicator (amber) light. The nose gear squat switch, activated by the nose gear, electrically averts inadvertent retraction whenever the nose gear strut is compressed by the weight of the aircraft. Beginning with 1983 models the up indicator (amber) light is replaced with a GEAR UNSAFE indicator (red) light. The GEAR UNSAFE (red) light is on anytime the gear is in transit (retract or extend), or whenever system pressure drops below 1000 PSI with the safety (squat) switch closed.

NOTE

It is possible to have the red and green lights on momentarily at the same time after the completion of the extend cycle, or when rotating during takeoff. However, if both stay on after the completion of the extend cycle, or if the red light stays on longer than 5 to 7 seconds during the retract cycle, a malfunction has occurred.

SHOP NOTES:

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5A-3. TROUBLE SHOOTING.

Just because this chart lists a probable cause, proper checkout procedures cannot be deleted and the replacement of a part is not necessarily the proper solution to the problem. The mechanic should always look for obvious problems such as loose or broken parts, external leaks, broken wiring, etc. To find the exact cause of a problem, a mechanic should use a hand pump, pressure gage and a voltmeter to isolate each item in the system. Hydraulic fluid will foam if air is pumped into system, causing fluid to be blown overboard thru pack vent line.

The problems listed are all with the systems controls in their normal operating position: Master switch ON, hydraulic pump breaker IN and landing gear breaker IN. During landing gear system servicing, a power supply capable of maintaining 27.5 volts throughout the gear cycle must be used to augment the ship's battery.

CAUTION

Prior to using Hydro-Test unit with power pack, remove and dry off filler plug and dipstick. Adjust cap tension so that no movement of cap is apparent. Failure to accomplish these procedures could result in filler cap coming loose from power pack.

TROUBLE	PROBABLE CAUSE	REMEDY
MOTOR PUMP WILL NOT OPERATE GEAR BUT EMERGENCY HAND PUMP WILL OPERATE GEAR.	Low voltage (in flight).	Check alternator and wiring.
	Fluid level low in reservoir.	Refill reservoir.
	Motor pump failure.	Replace pump.
	Faulty check valve	Replace valve
	NOTE Motor and pump are not repairable and must be replaced.	
	Pump frozen.	Remove motor and coupling from top of power pack and replace pump.
	Broken pump or motor drive shaft or coupling.	Remove motor and pump from top of power pack and replace motor, pump and coupling.
	If motor was not turning, check wiring and motor.	Check motor for loose or broken connections; check for frozen pump or coupling. Check circuit breaker in pedestal.
	Bad pump shaft seal.	Replace pump.
	External leakage around top of pump assembly	Remove motor and pump assemblies from top of power pack and replace upper packing and/or back-up rings
	Air lock in pump (new pack installation or pump replacement).	Remove filter and intermittently bump start switch until fluid flows. Replace filter.
PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM.	No fluid in reservoir.	Refill reservoir.

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TROUBLE SHOOTING (Cont)

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP OR EMERGENCY PUMP WILL NOT BUILD PRESSURE IN SYSTEM. (Cont).	Broken hydraulic line.	Check for evidence of leakage and repair or replace line. Flush out system and refill reservoir.
	Bad O-ring actuator piston; O-ring left out after repair.	Disconnect line upstream from actuator and check for pressure. Perform this check for all actuators in system.
	Bad O-ring on gear control valve.	Replace O-ring.
	Thermal relief valve stuck open.	Replace valve.
HAND PUMP DOES NOT BUILD PRESSURE, BUT ELECTRIC PUMP OPERATES PROPERLY.	Check valve in hand pump sticking.	Inspect check valve.
	Defective hand pump outlet check valve.	Replace valve.
	Main gear or downlock actuator O-ring leaking.	Disassemble actuator and replace O-rings.
	Filter in outlet check valve improperly positioned in filter body, or seal between filter and check valve improperly positioned.	Replace seal and position filter in retainer with Petrolatum.
LANDING GEAR OPERATION EXTREMELY SLOW.	Downlock rod adjustment incorrect (mainly LH rod).	Adjust rod end to lengthen actuator one turn.
	Pump failure.	Replace pump.
	Low voltage in electrical system.	Check alternator and wiring.
	Pump motor brushes worn.	Replace pump motor.
	Fluid leak in gear line.	Locate and repair or replace broken line or fitting.
	Excessive internal power pack leakage.	Remove and repair or replace power pack.
POWER PACK EXTERNAL LEAKAGE.	Static seals (all fittings).	Remove and replace O-rings and/or back-up rings as required. Check tubing flares for leaks.
	Reservoir cover.	Remove power pack and remove cover; replace seals.
GEAR DOWN-LOCK WILL NOT RETURN TO FULL-LOCK POSITION.	Binding in spring and tube assemblies.	Check operation to locate binding and eliminate.

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5A-3. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR FAILS TO RETRACT.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset breaker. Determine cause for tripped breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Instrument panel gear indicator circuit wires disconnected or open.	Repair or replace wiring.
	Nose gear squat switch inoperative.	Install new switch.
	Pressure switch defective.	Install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Hydraulic pump motor ground.	Check for ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid.
	Battery low or dead.	Check battery condition. Install new battery.
GEAR RETRACTION OR EXTENSION EXTREMELY SLOW.	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid (Refer to Section 2).
	Restriction in hydraulic system.	Isolate and remove restrictions.
PUMP MOTOR STOPS BEFORE GEAR IS RETRACTED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. Determine cause of tripped circuit breaker.
	Pressure switch out of adjustment.	Remove, adjust or install new switch.
	Restriction in hydraulic system, allowing pressure to build up and shut off pump motor before gear is retracted.	Isolate and determine cause. Remove restriction.
PUMP MOTOR STOPS BEFORE GEAR IS EXTENDED.	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. Determine cause of tripped circuit breaker.

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TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
PUMP MOTOR CONTINUES TO RUN AFTER GEAR IS FULLY RETRACTED OR EXTENDED.	Pressure switch defective.	Install new switch.
	Pressure switch out of adjust.	Remove, adjust or install new switch.
	Hydraulic pump motor solenoid defective.	Install new solenoid.
	Internal leakage in system.	Check actuators for internal leakage. Repair or install new actuators.
	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.
	Power pack relief valve out of adjustment.	Disassemble and repair or replace valve assembly.
	Hydraulic motor solenoid defective.	Install new solenoid.
PUMP MOTOR CYCLES EXCESSIVELY AFTER GEAR IS RETRACTED.	Pressure switch out of adjustment.	Remove, adjust or install new switch.
	Internal leakage in system.	Check actuators for internal leakage. Repair or install new actuators.
	External system leakage.	Check all lines and hose for leakage. Repair or install new parts.
GEAR DOES NOT FULLY RETRACT, BUT PUMP MOTOR CONTINUES TO RUN.	Internal leakage in system.	Check actuators for internal leakage. Repair or install new actuators.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid (Refer to Section 2).
LANDING GEAR FAILS TO EXTEND.	Battery low or dead.	Check battery condition. Install new battery.
	Hydraulic pump motor circuit breaker open.	Reset, determine cause for opening. Repair or replace components as necessary.
	Instrument panel gear indicator circuit breaker open.	Reset circuit breaker. Determine cause of tripped circuit breaker.
	Hydraulic pump motor circuit wires disconnected or broken.	Repair or replace wiring.
	Hydraulic pump motor solenoid defective.	Install new solenoid.

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TROUBLE SHOOTING (Cont.)

TROUBLE	PROBABLE CAUSE	REMEDY
LANDING GEAR FAILS TO EXTEND (cont).	Hydraulic pump motor ground.	Check ground.
	Hydraulic pump motor defective.	Replace motor.
	Reservoir fluid level below operating level.	Fill reservoir with hydraulic fluid (Refer to Section 2.)
	Nose gear contacts stop bolts.	Adjust stop bolts to obtain proper clearance. (Refer to paragraph 5A-87).
RH GEAR UNLOCKS BUT LH GEAR WILL NOT UNLOCK.	Improper setting of RH downlock actuator rod.	Check rigging procedures outlined in this Section.
BOTH RH AND LH MAIN GEAR UNLOCK BUT ONLY NOSE GEAR WILL RETRACT.	Improper setting of LH downlock actuator rod.	Check rigging procedures outlined in this Section.
MOTOR PUMP WILL NOT TURN ON BY WORKING SELECTOR SWITCH. HAND PUMP WILL PUT GEAR DOWN.	Defective pressure switch circuit.	Check circuit continuity.
		Check switch adjustment
SET SCREW ON CAM NOT EXTENDED ENOUGH FOR GEAR TO MOVE CAM OVER CENTER.	Check washers under bolt on downlock arm assembly.	Add AN960-10 washer under bolt downlock arm assembly
MAIN GEAR WILL NOT LOCK OVER CENTER.	Main gear not centered in support.	Rerig saddle per rigging instructions.
MALFUNCTION OF GEAR INDICATOR LIGHTS.	1. Both lights on at same time. 2. Light will change from green to amber or in reverse when gear control switch is moved.	Check ground wire for proper connection.

5A-3A. HYDRAULIC SYSTEM LEAK CHECK.

- Jack aircraft in accordance with procedures outlined in Section 2 of this Manual.
- To relieve system pressure, pull the GEAR PUMP circuit breaker to OFF and move the gear selector handle to UP and back to the DOWN position.
- Install a 0-2000 PSI gage at the service tee on the right-hand side of the power pack.
- Push the GEAR PUMP circuit breaker to the ON position, turn ON the master switch and move the gear selector handle to the UP position.
- Monitor pressure gage after retraction cycle is complete for pressure bleed down.
- If bleed down occurs, it can be an internal or external leak anywhere in the system.

NOTE

When any line is disconnected, be prepared for fluid leakage.

- Disconnect the return line from the gear selector. If fluid comes from the selector, the internal leak is in the system.
- If no leak is found, it can be assumed there is an internal leak in the power pack. If leak is found proceed to step "j". Reconnect the return line.
- Power pack internal leakage can only be attributed to a bad thermal relief valve, check valve or check valve O-ring. There is no way to isolate the part that is leaking, so, first replace check valve O-ring, check valve and then thermal relief valve. Repeat leak test after replacement of each part to