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SEPTEMBER 2004

STUDENT GUIDE

FOR

UH-60 HYDRAULICS

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SEPTEMBER 2004

HYDRAULICS

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SECTION I. - INTRODUCTION

TERMINAL LEARNING OBJECTIVE:

At the completion of this lesson you will:

ACTION: Identify the characteristics of the UH-60 Hydraulic systems.

CONDITIONS: As a UH-60 Maintenance Test Pilot.

STANDARD: In Accordance With (IAW) UH-60 Technical Manuals.

SAFETY REQUIREMENTS: Remove all watches, rings and other jewelry before operating, or maintaining electronic equipment.

RISK ASSESSMENT LEVEL: Low

ENVIRONMENTAL CONSIDERATIONS: None

EVALUATION: Evaluation will be accomplished with performance exam at the end of this module of instruction.

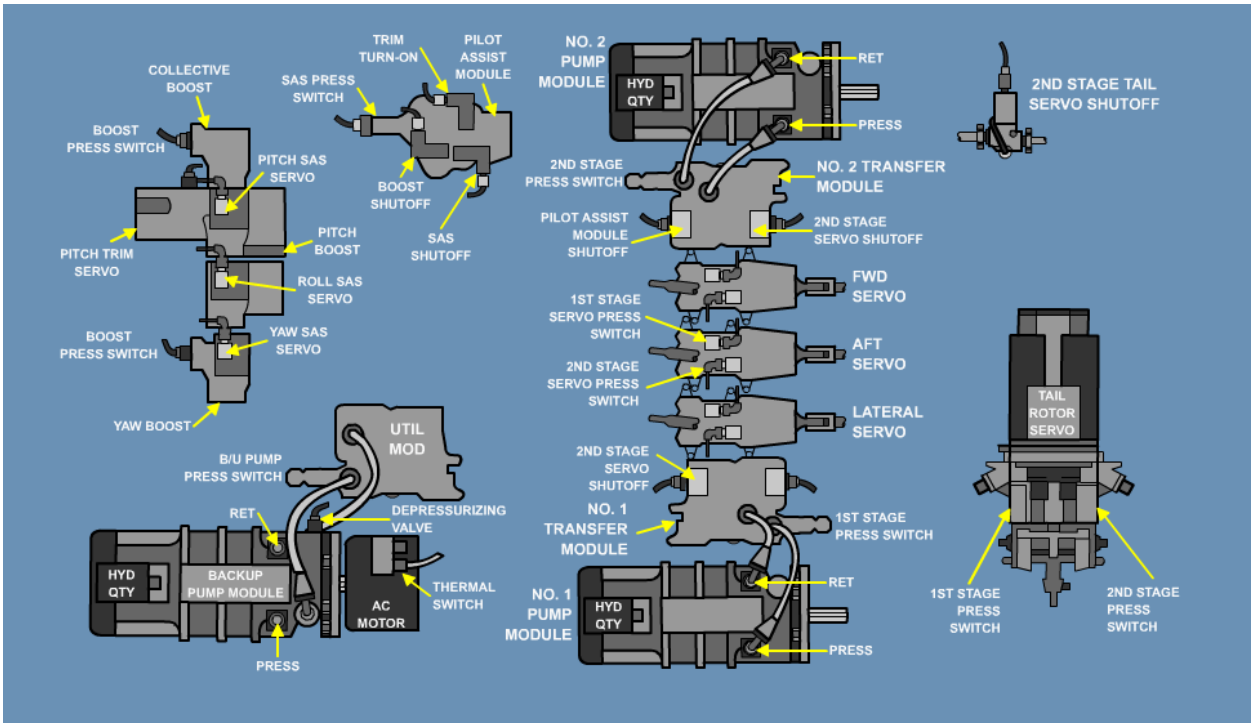
SECTION II. - PRESENTATION

A. ENABLING LEARNING OBJECTIVE ELO # 1

ACTION: Identify the function of the Hydraulic Systems.
CONDITIONS: As a UH-60 Maintenance test pilot.
STANDARD: IAW UH-60 technical manuals.

a. Hydraulic Systems Function

Frame #0025 (Hydraulic System Function)



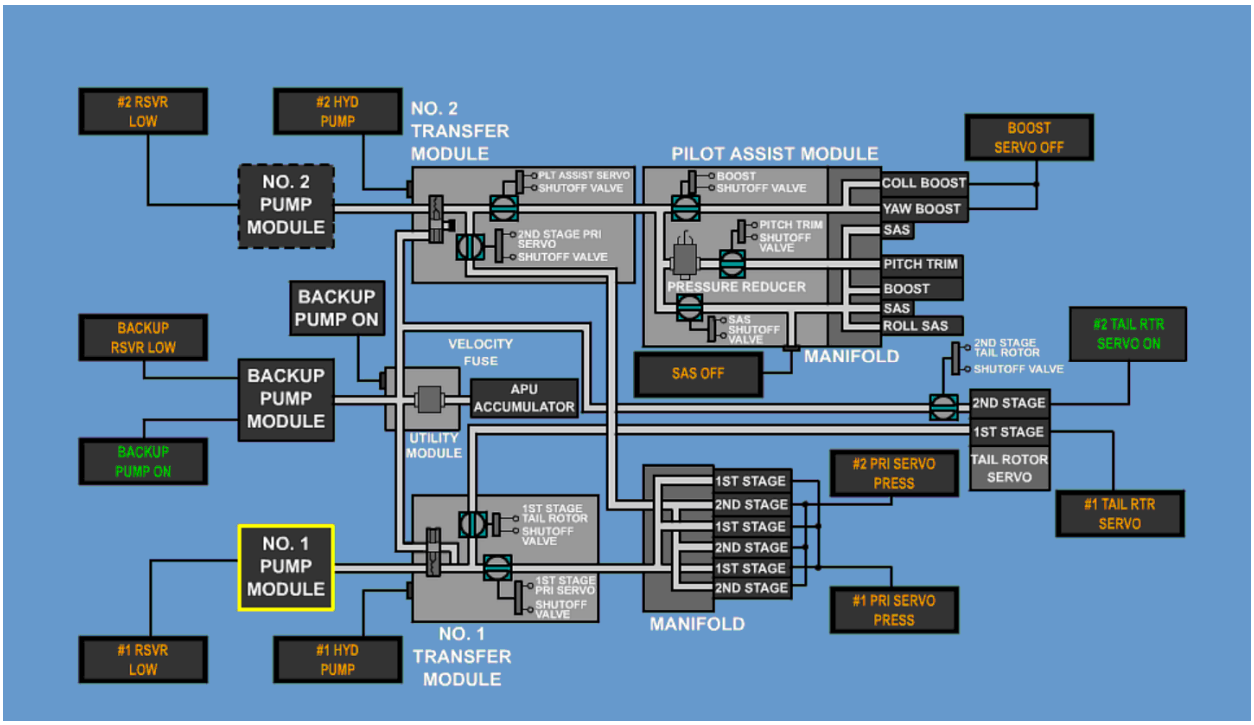
(1) The hydraulic systems provide hydraulic pressure to operate the primary servos, tail rotor servos, pilot assist servos, and APU start motor.

(2) There are three hydraulic systems: No. 1, No. 2, and Backup.

(3) This lesson is designed to familiarize you with the primary components of the hydraulic systems, their function, and their location on the helicopter.

(a) Hydraulic System Schematic

Frame #0030 (Hydraulic System Schematic)



1) The three hydraulic systems are designed to provide full flight control pressure.

2) The components of the hydraulic systems are three hydraulic pump modules, two transfer modules, a utility module, three dual primary servos, one dual tail rotor servo, four pilot-assist servos, an APU accumulator, APU hand pump, and a servicing hand pump.

3) There are three hydraulic pressure supply systems, No. 1, No. 2, and backup.

4) All are completely independent and each is fully capable of providing essential flight control pressure for maximum system redundancy.

5) Complete redundancy is accomplished by the backup pump providing hydraulic power to both No. 1 and/or No. 2 systems if one or both pumps fail.

6) If two systems lose pressure, there will be a slight restriction in the maximum rate of flight control movement due to only one pump supplying both stages with hydraulic power.

7) The No. 1 hydraulic system operates with the rotor turning, and supplies the first stage of all primary servos and the first stage of the tail rotor servo.

8) The system components are an integrated pump module, a transfer module, first stage primary servos, and first stage tail rotor servo.

9) The No. 2 hydraulic system, which also operates with the rotor turning, supplies the second stage primary servo and the pilot assist servos.

10) System components are the integrated pump module, transfer module, second stage primary servos, and pilot assist modules.

11) The backup hydraulic pump system supplies emergency pressure to the No. 1 and/or No. 2 hydraulic systems whenever a pressure loss occurs.

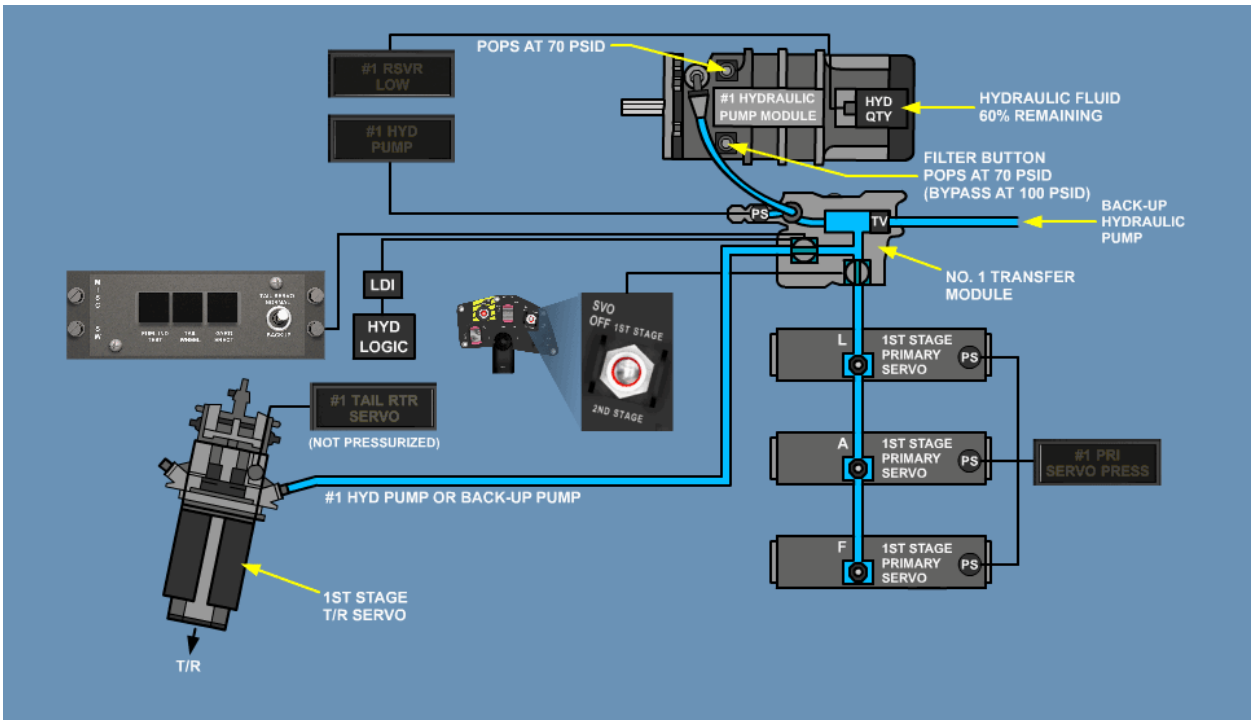
12) It also supplies pressure to the No. 2 stage of the tail rotor servo in case of a loss of pressure in the first stage of the tail rotor servo or #1 RSVR LOW indication.

13) This system supplies hydraulic pressure to all flight control components during ground checkout.

14) The backup system also provides a hydraulic pressure for automatic recharging of the APU start system accumulator.

a) No. 1 Hydraulic System

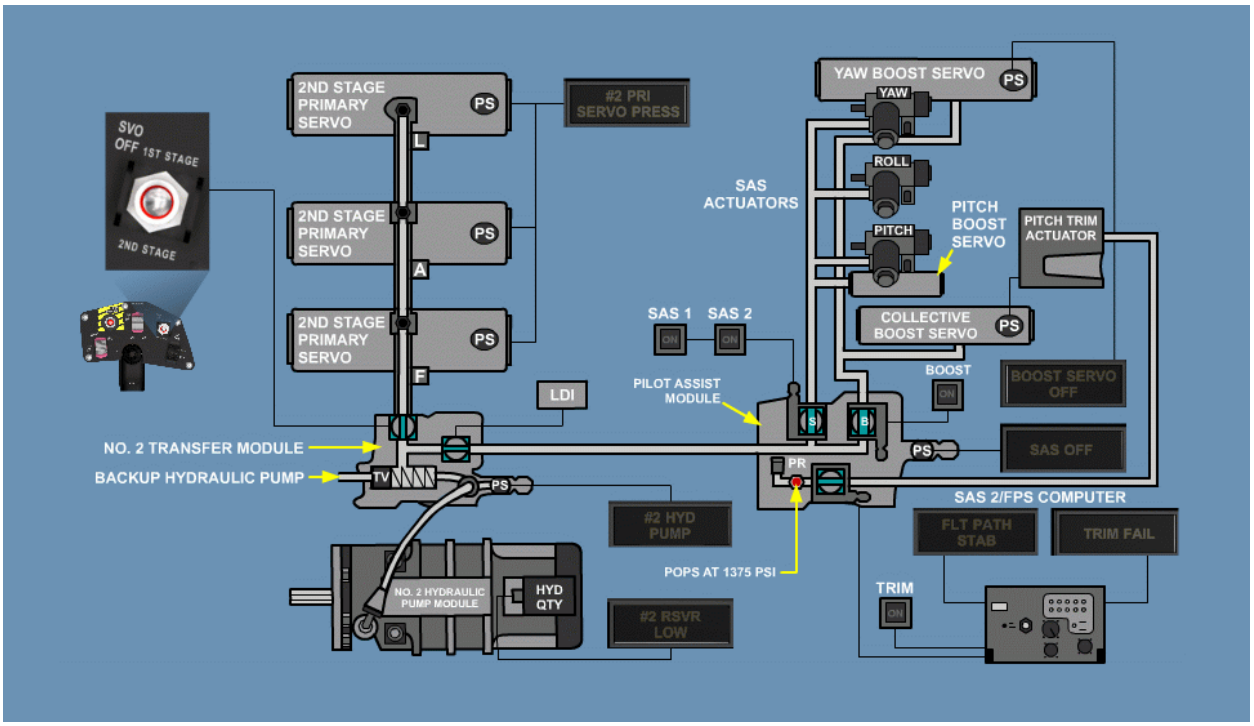
Frame #0032 (No. 1 Hydraulic Systems)



1 The No. 1 hydraulic system services the first stage of the primary servos and tail rotor servo.

b) No. 2 Hydraulic System

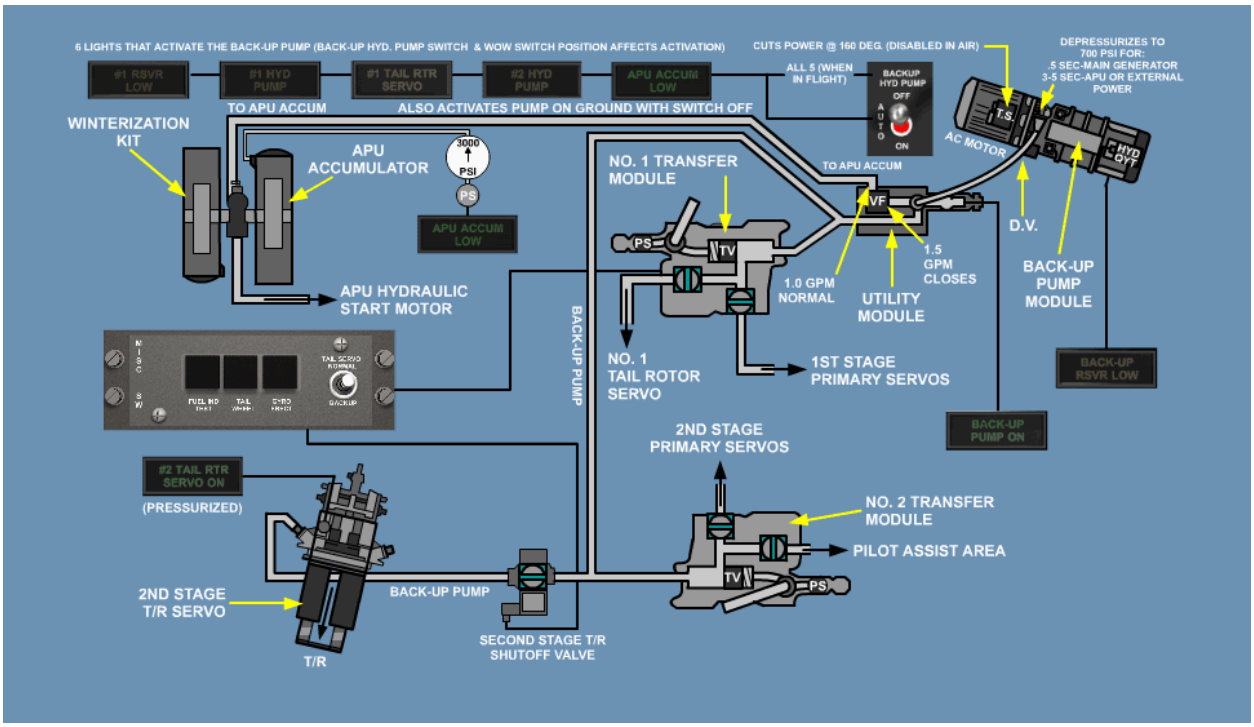
Frame #0035 (No. 2 Hydraulic System)



1 The No. 2 hydraulic system services the second stage of the primary servos and the pilot assist module.

c) Backup Hydraulic System

Frame #0040 (Backup Hydraulic System)



1 The backup will pressurize the No. 1 and No. 2 hydraulic systems, and in addition pressurizes the APU accumulator and 2nd stage tail rotor servo.

CHECK ON LEARNING

1. What systems does the No. 1 hydraulic system service?

2. What systems does the No. 2 hydraulic system service?

3. What systems does the backup hydraulic system operate?

SECTION III. - SUMMARY

1. REVIEW/SUMMARIZE:

You have completed the lesson on the function of the UH-60 Hydraulic System. The key points to remember are:

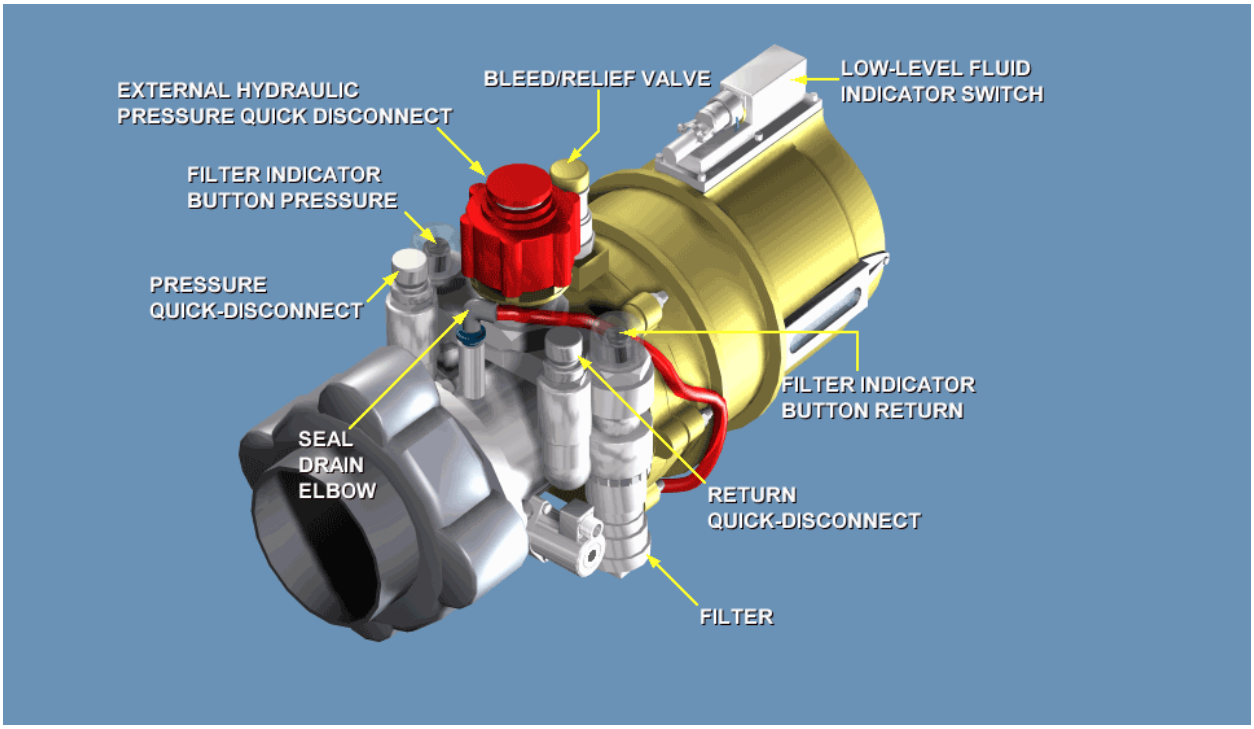
- There are three hydraulic systems on the UH-60 helicopter: No. 1, No. 2, and the Backup system.
- The No. 1 system services the first stage of the primary servos and tail rotor servo.
- The No. 2 system services the second stage of the primary servos and pilot assist module.
- The backup will pressurize the number 1and 2 hydraulic system and in the addition pressurizes the APU accumulator and the 2nd stage tail rotor servo.

B. ENABLING LEARNING OBJECTIVE ELO # 2

ACTION: Identify the major components of the Hydraulic systems.
CONDITIONS: As a UH-60 Maintenance Test Pilot.
STANDARD: IAW UH-60 Technical Manuals.

a. Hydraulic Pump Module

Frame #0126 (Hydraulic Pump Module)



(1) The pump has two valves:

(a) A high pressure relief valve.

(b) A bleed relief valve.

(2) The pump also has two filters:

(a) A pressure filter

1) The pressure filter has no bypass.

(b) A return filter.

1) The return filter has a bypass valve that opens when return pressure reaches between 90 and 110 psid.

(c) A red indicator button on each filter housing will pop out when differential pressure across the filter reaches 60 to 80 psid.

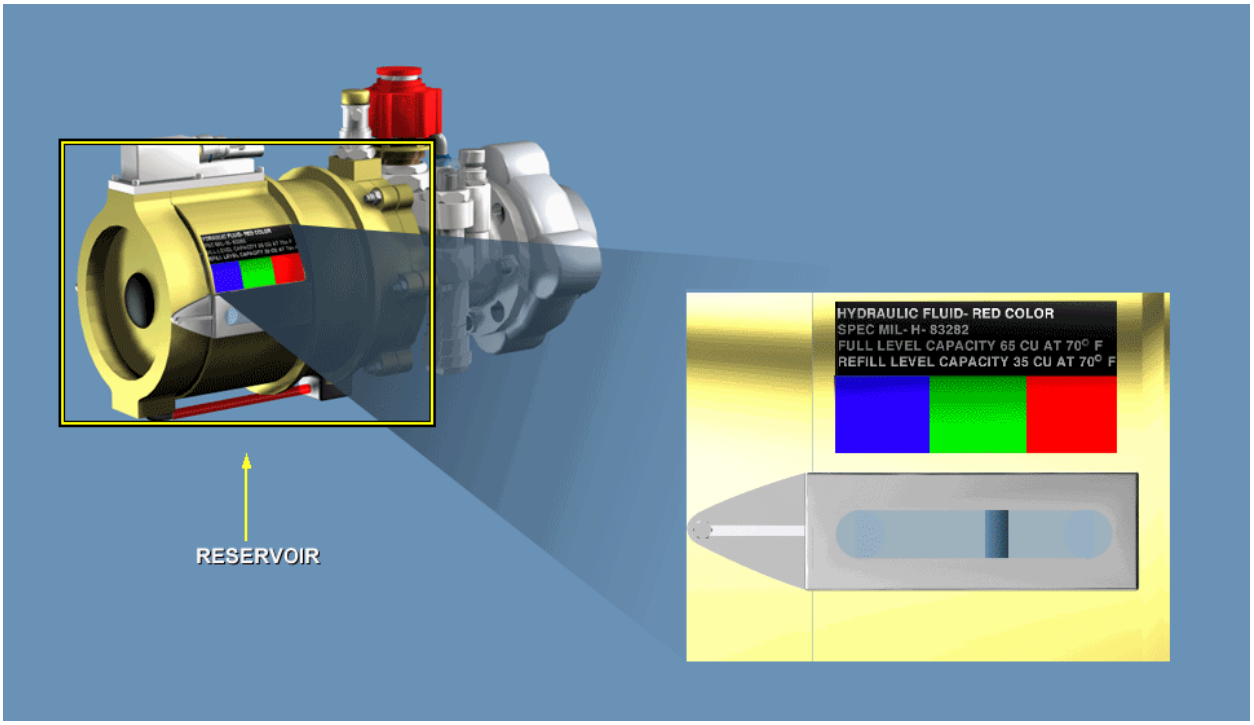
(d) Each pump has three internal check valves:

1) one at the external ground coupling.

2) one at the pressure side

3) one at the return side.

Frame #0125 (Hydraulic Pump Module)

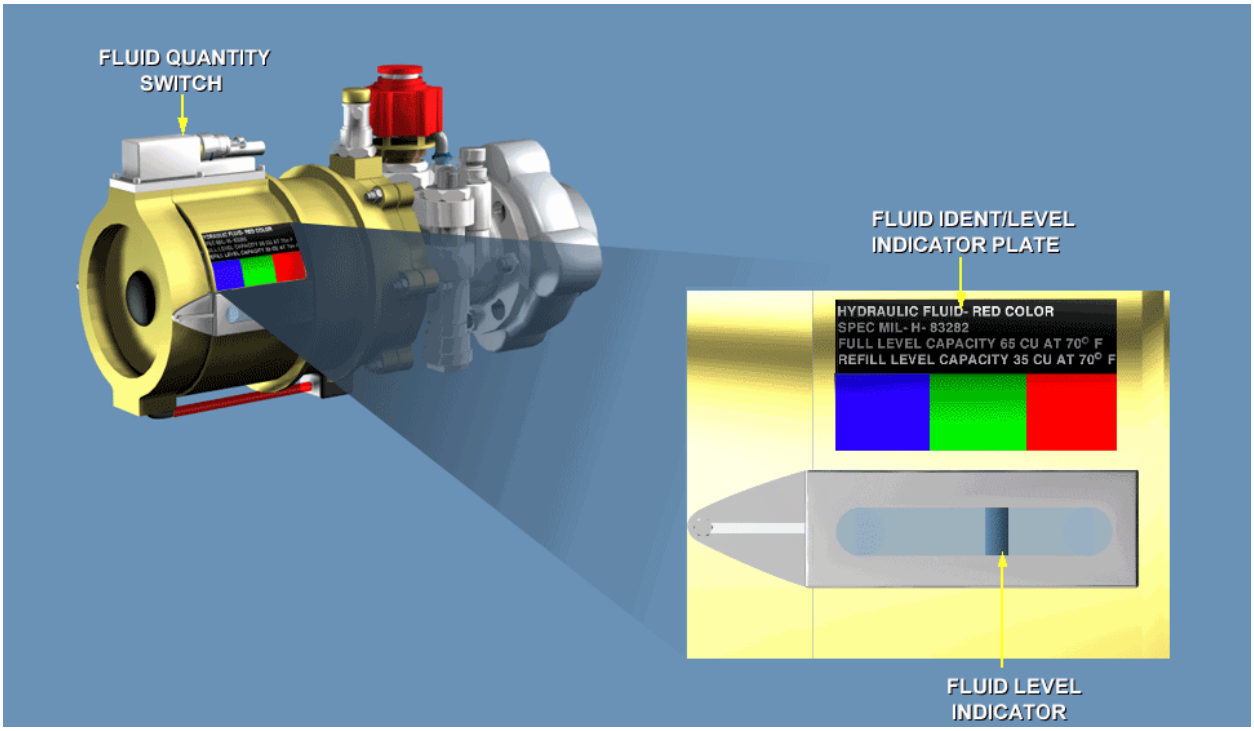


(3) The hydraulic pump modules are combination hydraulic pumps and reservoirs.

(4) The No. 1, No. 2, and backup pump modules are identical and interchangeable with each other.

(5) The pumps are serviced with MIL-H-5606 or MIL-H-83282 hydraulic fluid. Refer to the Technical Manual (TM) prior to servicing.

Frame #0125 (Hydraulic Pump Module)



(6) The reservoir part of each pump module has a color coded fluid level indicator window marked:

(a) BLUE for Hydraulic Fluid Expansion (movement of piston up to 3/8-inch into overfill zone is acceptable, but when piston moves more than 3/8-inch into overfill zone, bleed the system until piston indicates 3/8-inch above full level)

(b) RED for REFILL (pump under serviced, requires servicing)

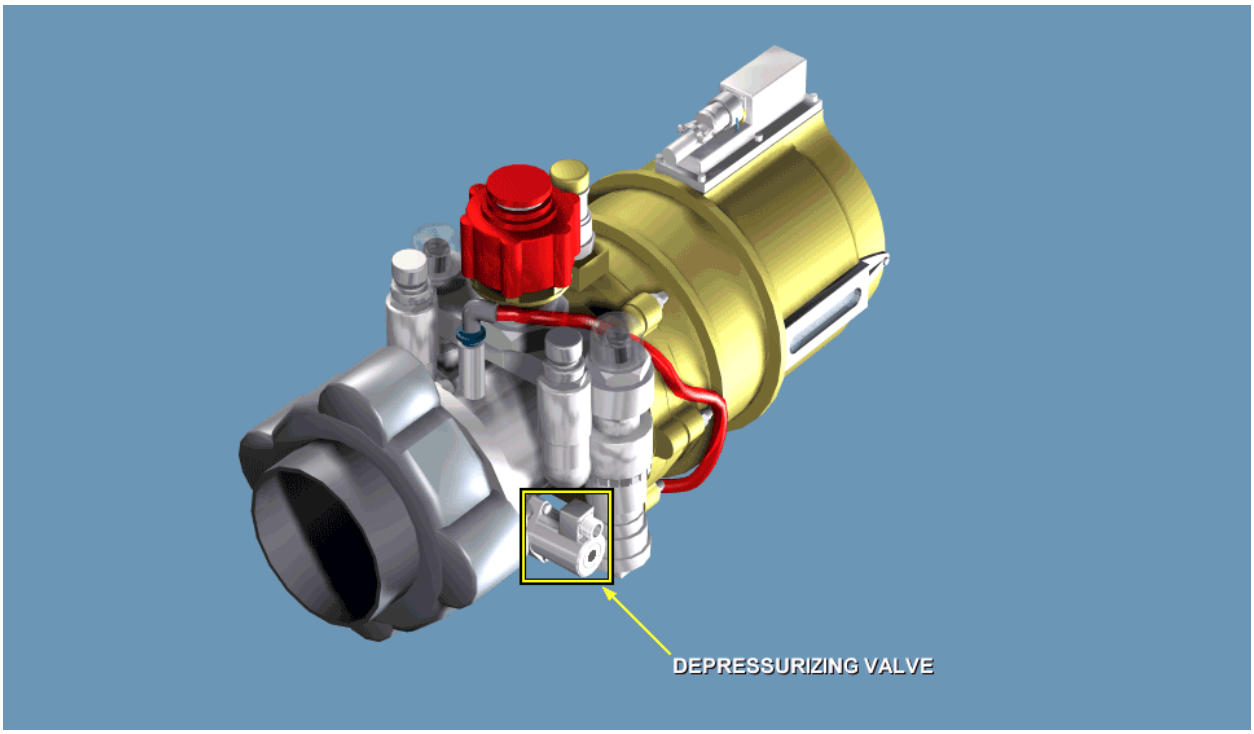
(c) GREEN for FULL. The position of the piston indicator stripe, viewed through the sight glass of the pump module, compared to the fluid ident and level indicator plate, indicates the amount of hydraulic fluid in the pumps reservoir.

(d) There is a fluid quantity switch mounted on top of each reservoir that senses reservoir fluid quantity for that system.

(7) The pressure relief and bleed valve protect the pump from high pressure in the return system.

b. Depressurizing Valve

Frame #0124 (Depressurizing Valve)

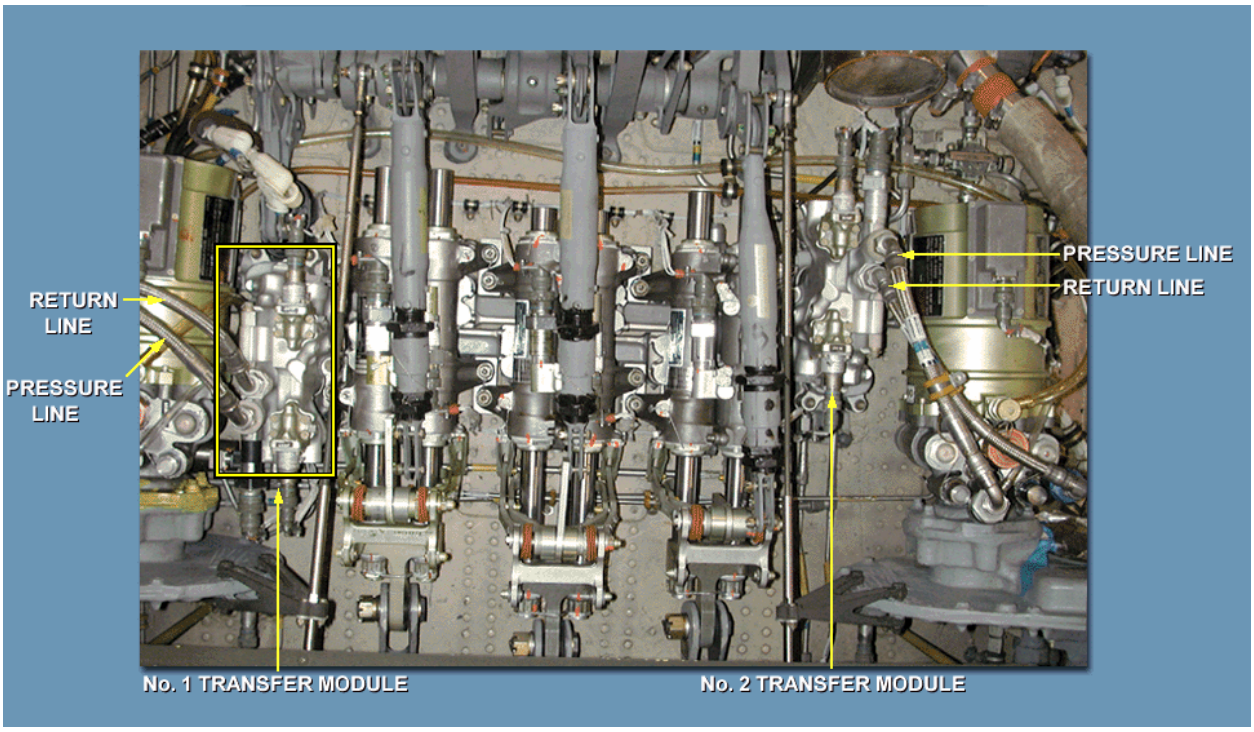


(1) A depressurization valve in the backup pump module allows the motor to reach its rated speed before a load is applied.

(2) When the depressurizing solenoid is actuated, the path opens and fluid is depressurized to 700 psi for .5 or 4 seconds depending on the power source, 4 seconds on APU generator supplying power and .5 seconds for the main generators.

c. Transfer Module

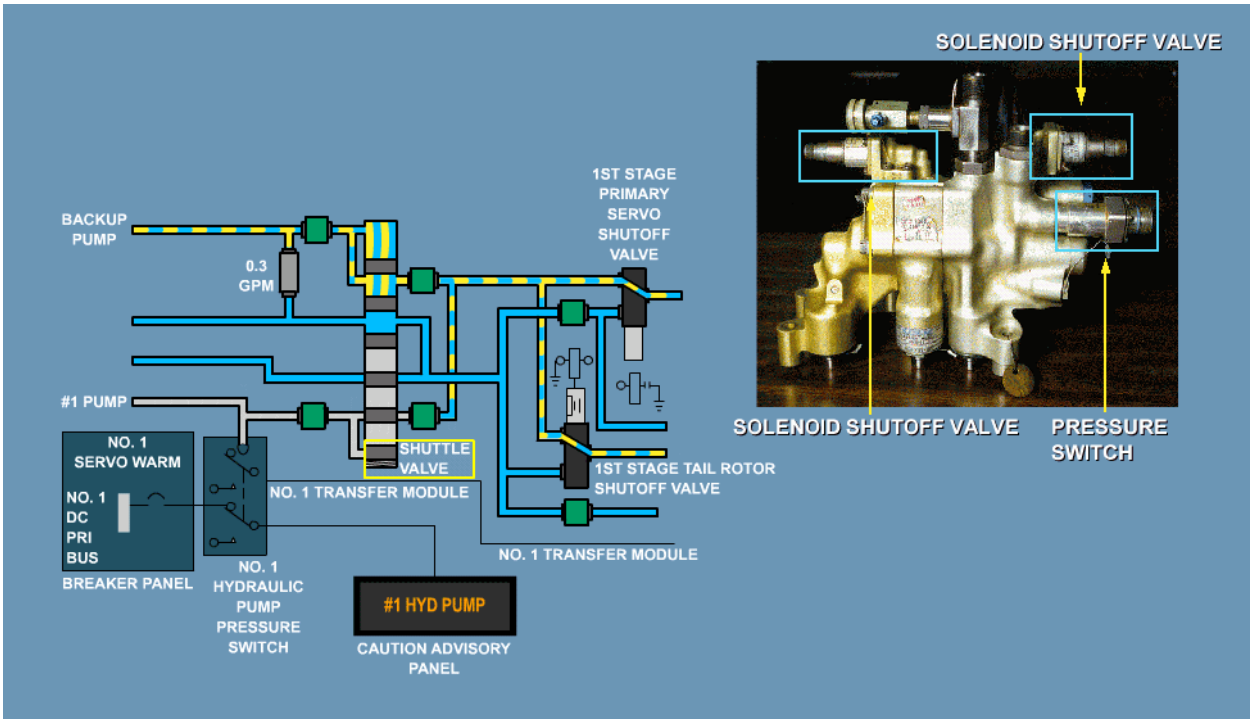
Frame #0130 (Transfer Module Location)



(1) The No. 1 and No. 2 transfer modules are located on the right and left side of the primary servos on the hydraulic deck.

(2) They connect hydraulic pressure from the pump modules to the flight control servos.

Frame #0132 (Transfer Module System Flow FLASH)

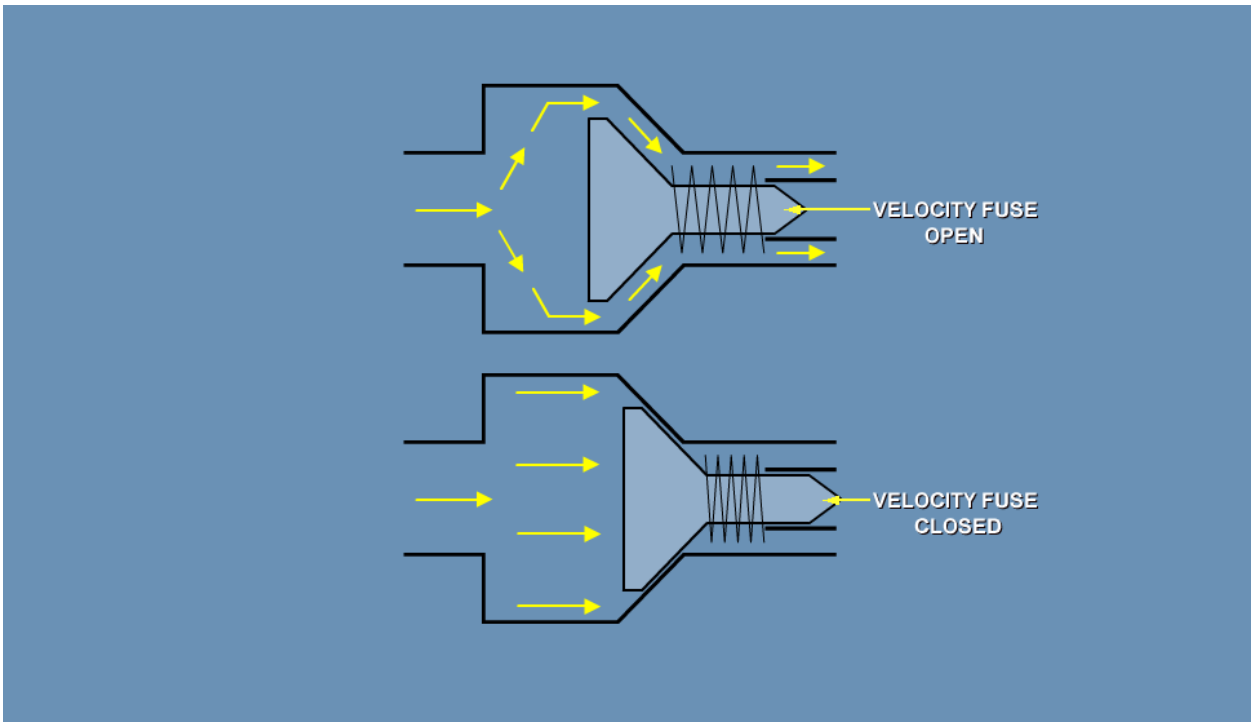


(a) Each module is an integrated assembly of shutoff valves, pressure switches, check valves, shuttle valves, and restrictor.

(b) The transfer valve is spring loaded to the open or (normal) position.

d. Hydraulic System Velocity Fuse

Frame #0133(Hydraulic System Velocity Fuse)



(1) Velocity fuses are incorporated in hydraulic systems to prevent continued loss of fluid in cases of serious leakage.

(2) The velocity fuses are strictly safety devices and are not needed for operation of the system.

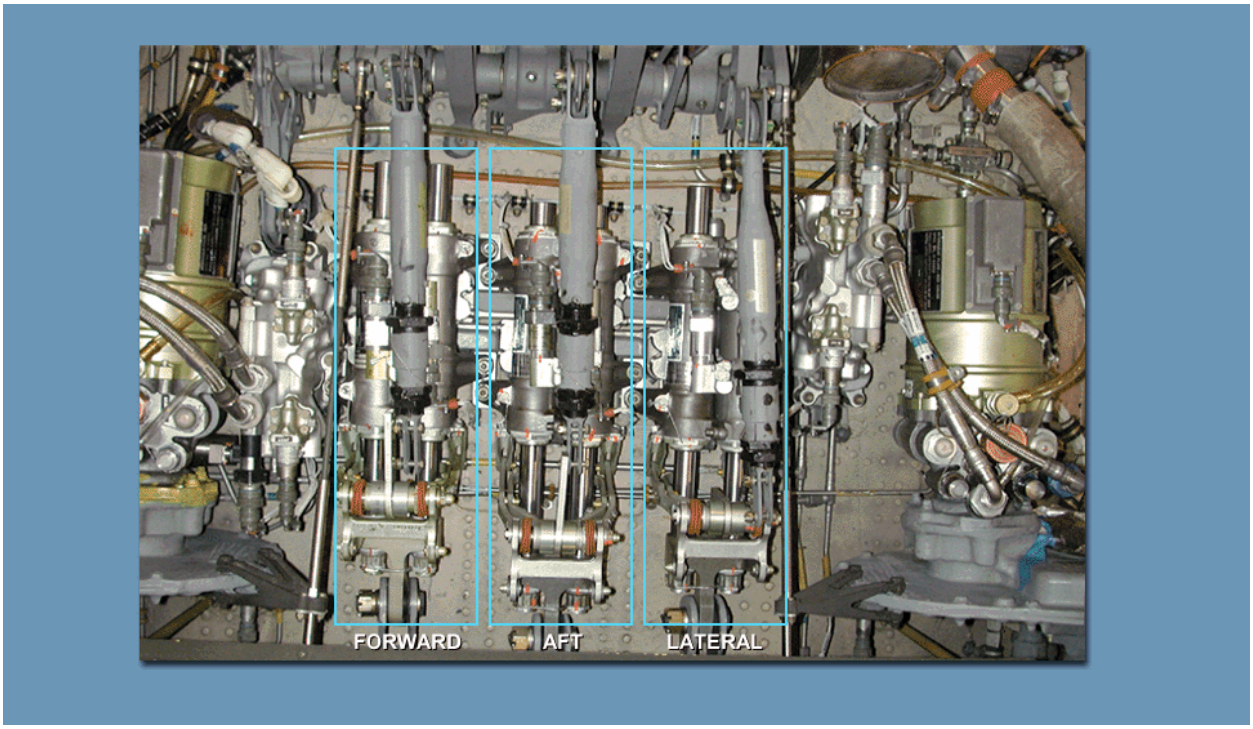
(3) Velocity fuses are usually installed in the hydraulic lines and can only be used in lines through which fluid flows in one direction.

(4) A hydraulic fuse is designed to permit only a limited quantity of fluid to pass through it.

(5) When this limit is reached, the velocity fuse automatically shuts off further flow.

e. Primary Servo

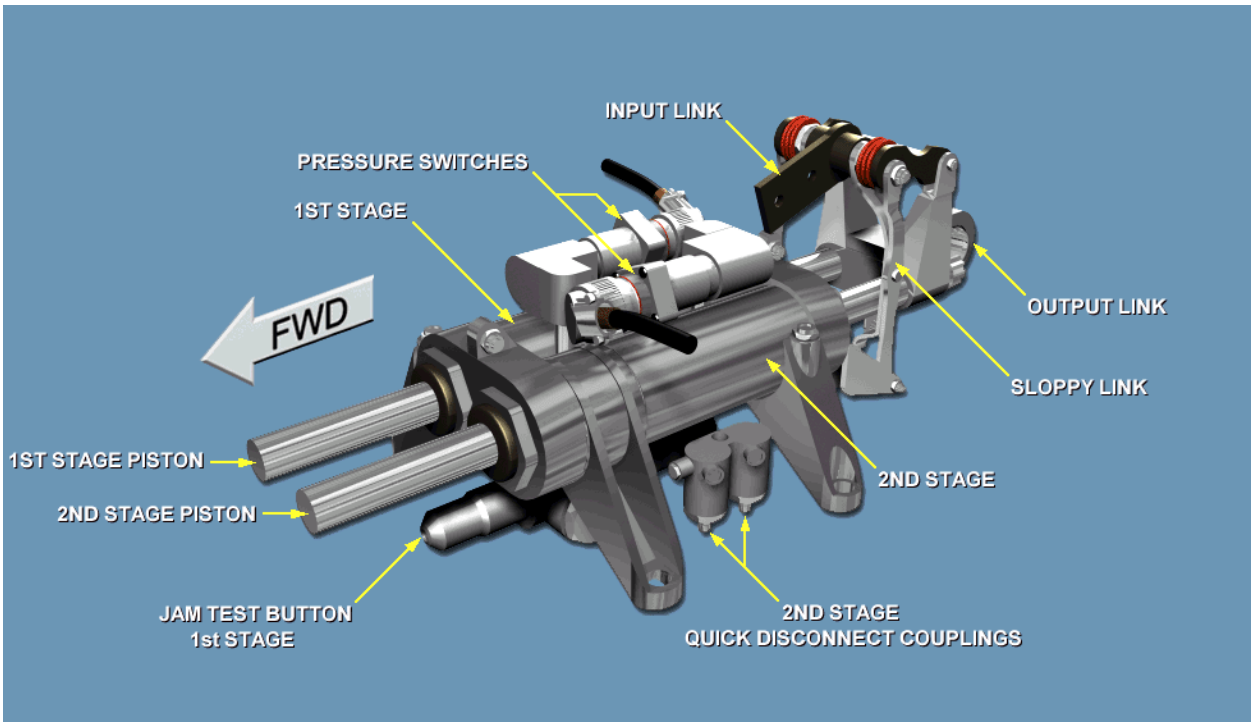
Frame #0134 (Primary Servo)



(1) Main rotor control loads are reacted by three, two-stage primary servos (the forward servo, aft servo, and lateral servo) mounted on the upper deck above the cabin, forward of the main gear box.

(2) Each primary servo contains two independent, redundant stages with only the mechanical input linkage in common.

Frame #0135 (Primary Servo)



(3) Each servo has two independent stages (first stage and second stage).

(4) Each stage has an independent piston, valve housing, and hydraulic supply.

(5) The input linkage is common.

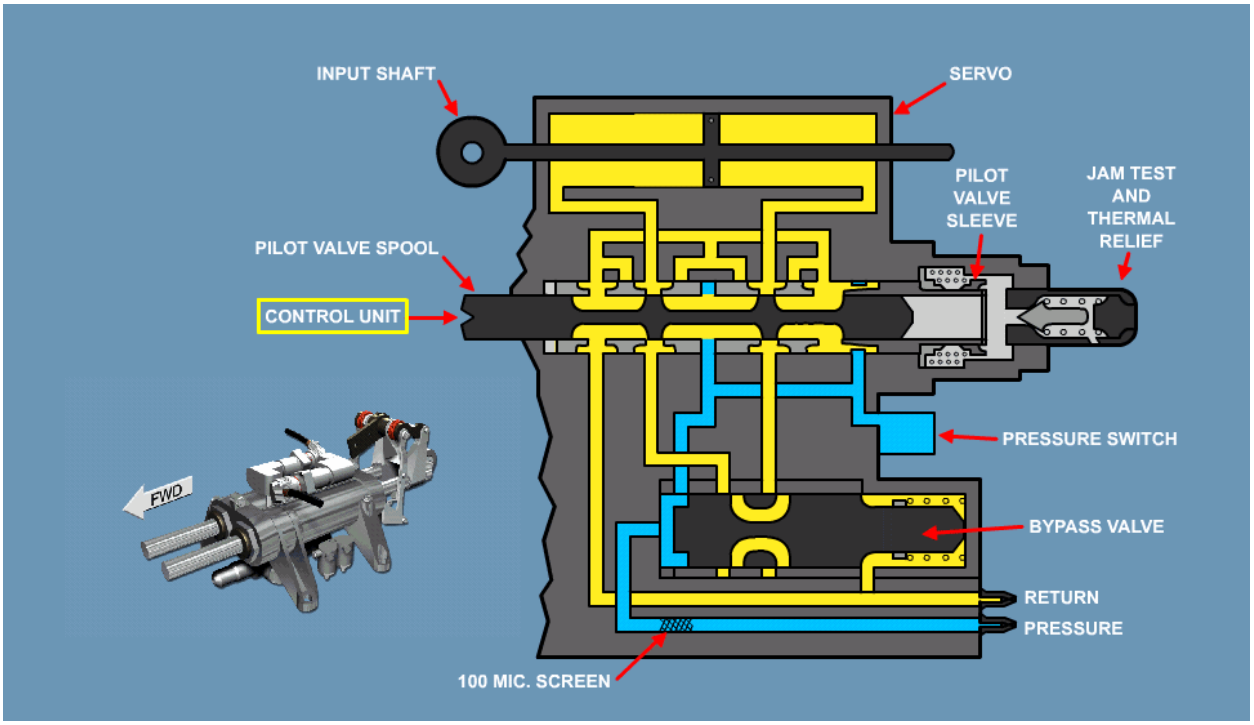
(6) The servos are interchangeable. Each stage of the servo has a jam simulation button.

(7) Each stage of a primary servo has a ballistic tolerant feature built in so that if a projectile should damage one stage, that stage will be inoperative, but will not stop the other stage from operating properly.

(8) The systems are electrically interlocked through the opposite system's servo pressure switch to prevent both systems from being shut off at the same time.

(9) As an example, when the SERVO switch is placed to 1ST STG, second stage pressure must be above 2350 psig before the first stage shutoff valve closes, and the #1 PRI SERVO PRESS capsule goes on.

Frame #0136 (Primary Servo Flow FLASH)



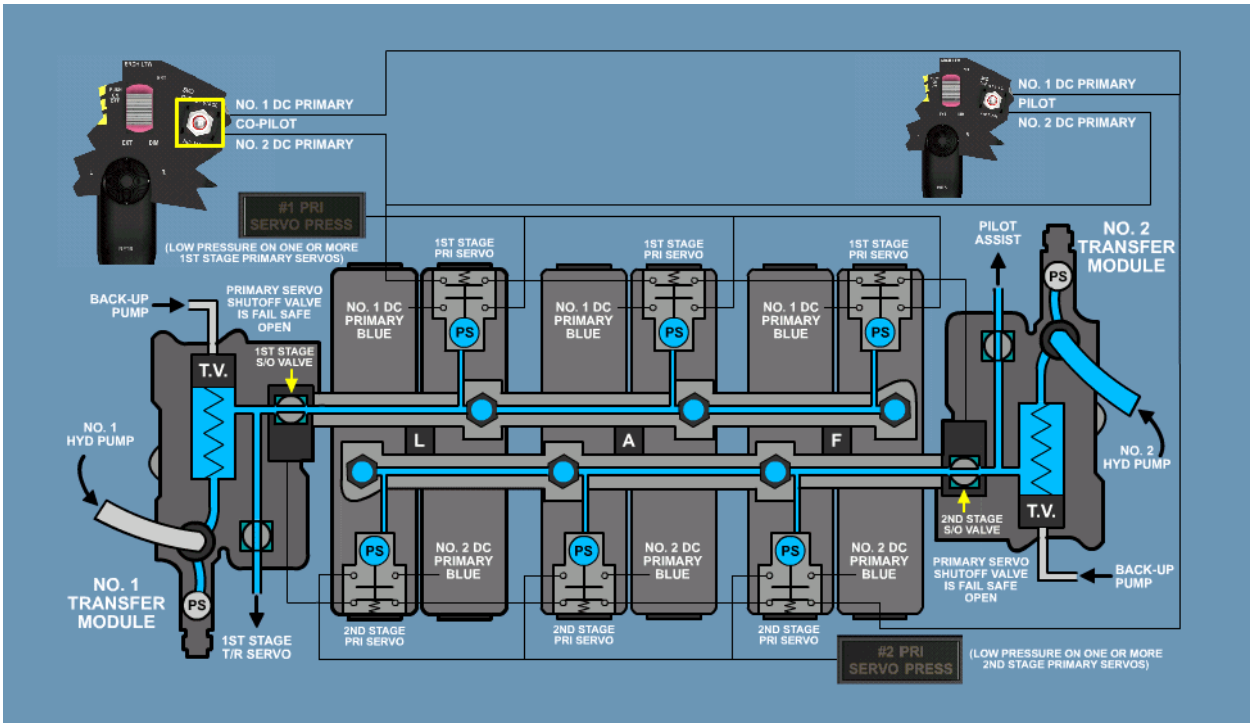
(a) Primary Servo Flow

1) The pilot, or AFCS, moves the control unit, which ports hydraulic fluid from one side of the input shaft of the servo to the other side.

2) If a bypass condition should occur, the bypass valve moves inside the servo, allowing for continued flight control movement.

3) When pressed, the jam simulation button displaces the spool valve sleeve, causing the #1 or #2 PRI SERVO PRESS caution light on the caution/advisory panel to illuminate.

Frame #0137 (Primary Servo Shut-off Electrical Interlock Flash)



(b) Primary Servo Shut-off Electrical Interlock

1) The 1st and 2nd stage primary servos can't be shut off simultaneously, this would render the aircraft uncontrollable.

2) If a lack of pressure in any stage opens the circuit to the other stages shut-off valve, which is a fail safe open.

3) PILOT AND COPILOT CAN'T SIMULTANEOUSLY SHUT OFF BOTH STAGES:

4) With the copilot switch to 2nd stage OFF, No. 2 DC primary bus power closes the 2nd stage S/O valve, a lack of pressure in all three 2nd stage primary servos opens the circuit to the 1st stage S/O valve, the pilot 1st stage switch can't complete the circuit to close the valve on the only remaining servos.

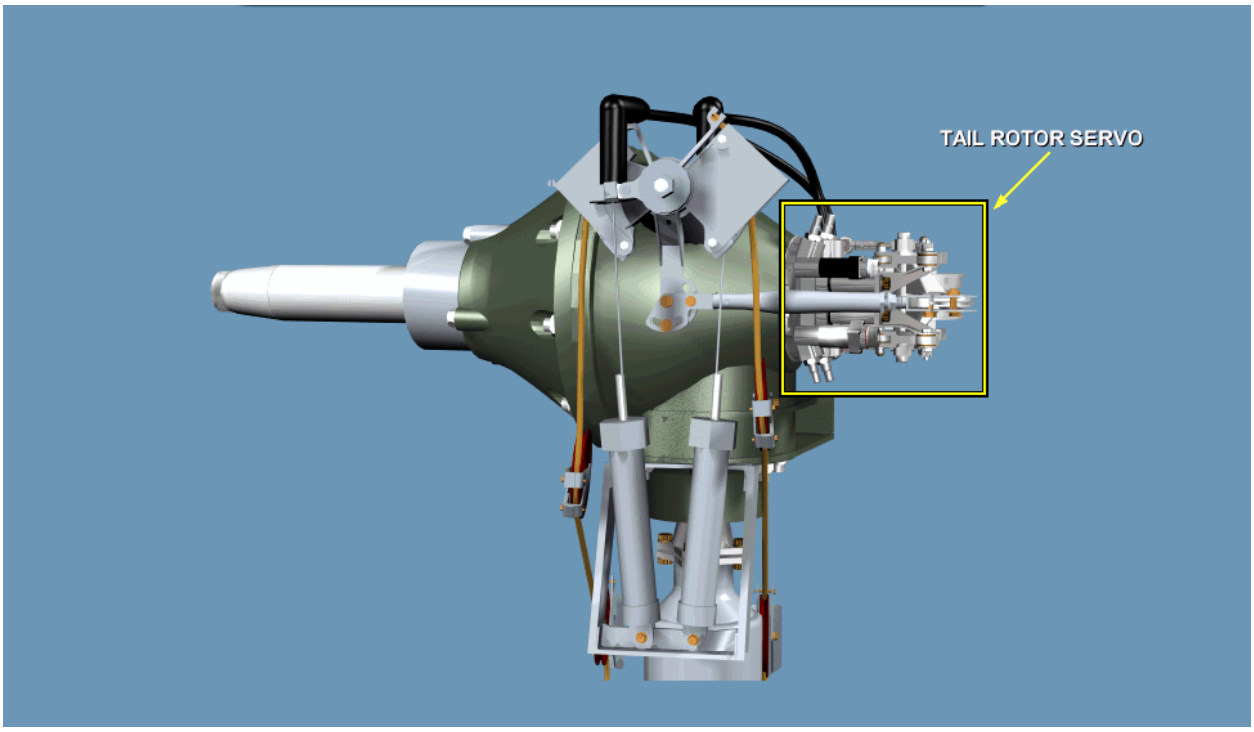
5) LACK OF PRESSURE IN ANY STAGE PREVENTS THE COCKPIT SHUT OFF OF THE OTHER STAGE:

6) With the copilot switch to 2nd stage OFF, No. 2 DC primary bus power closes the 2nd stage S/O valve.

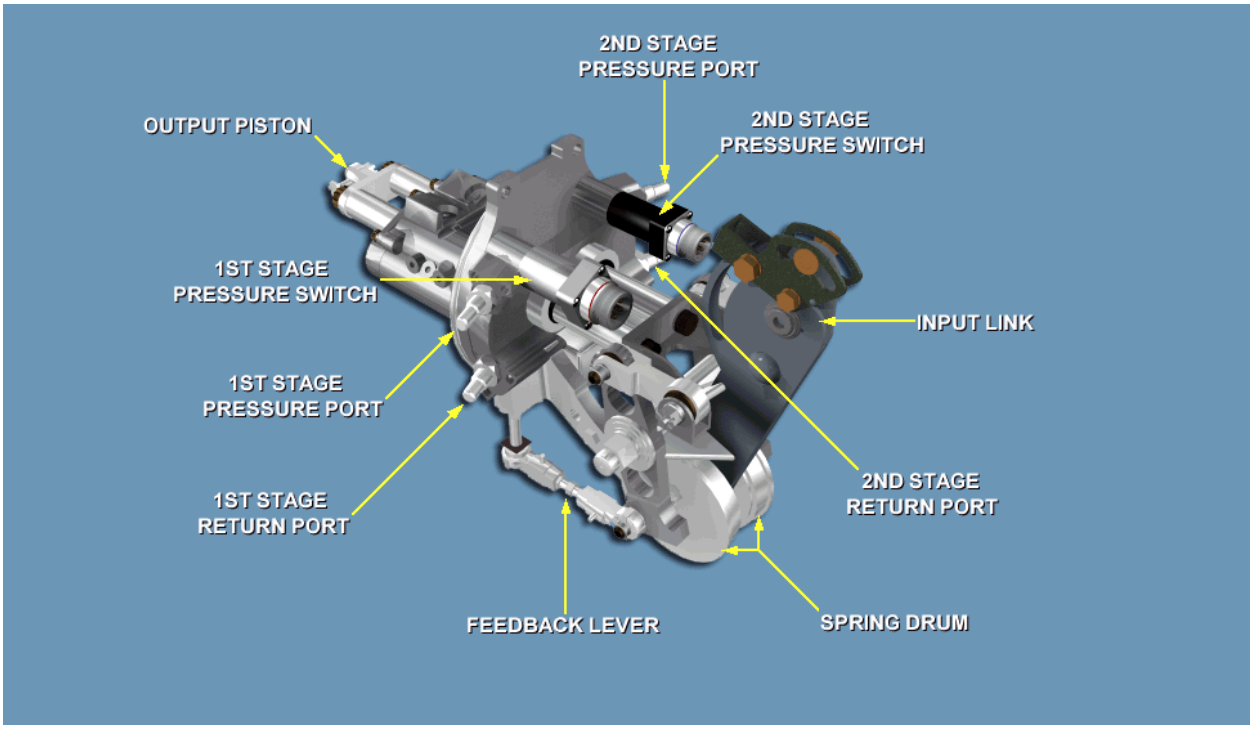
7) If pressure drops in the 1st stage, the lack of pressure in the 1st stage opens the circuit to the 2nd stage S/O valve and it reopens.

f. Tail Rotor Servo

Frame #0140 Tail Rotor Servo)



(1) The tail rotor servo is located on the tail rotor gearbox and furnishes a power boost to the tail rotor flight controls.



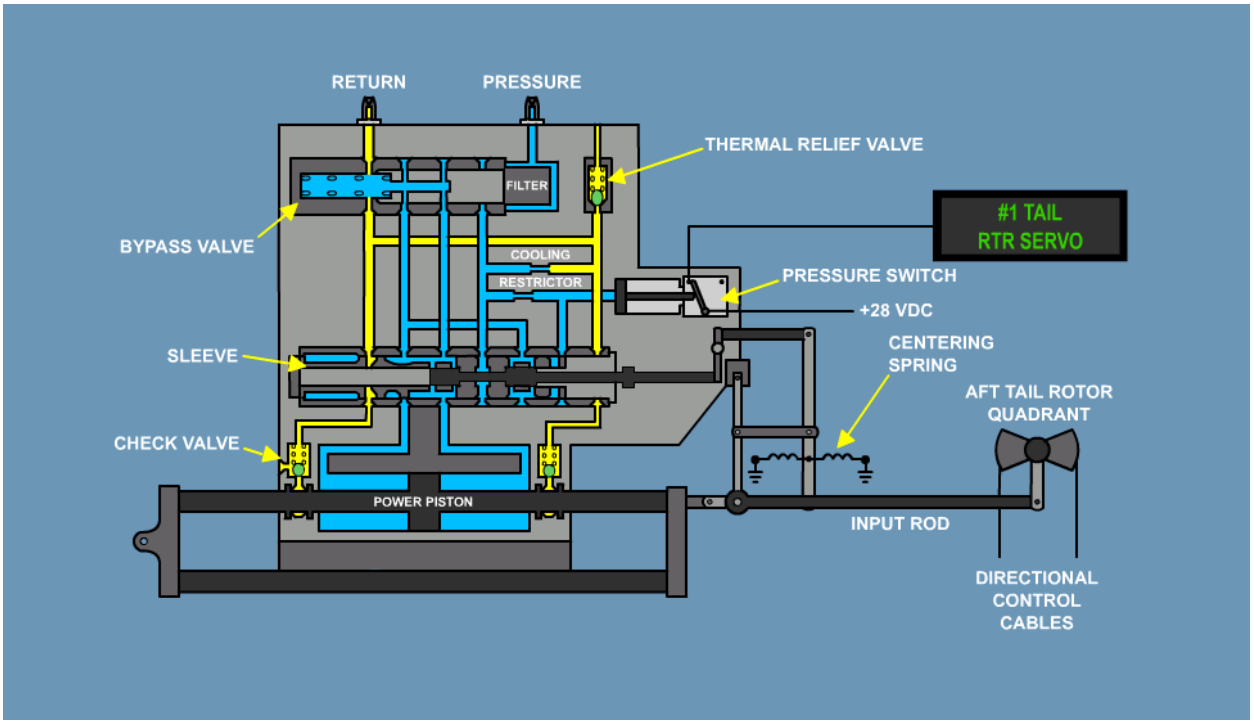
(2) With the TAIL SERVO switch at NORMAL, the first stage of this servo is powered by the No. 1 hydraulic system.

(3) When the TAIL SERVO switch is moved to BACKUP, the second stage is powered by the backup system.

(4) Should the first stage become inoperative, the backup pump will come on and power the second stage.

(5) All aerodynamic loads are then reacted by the second stage.

Frame #0141 (Tail Rotor Servo, Flash)

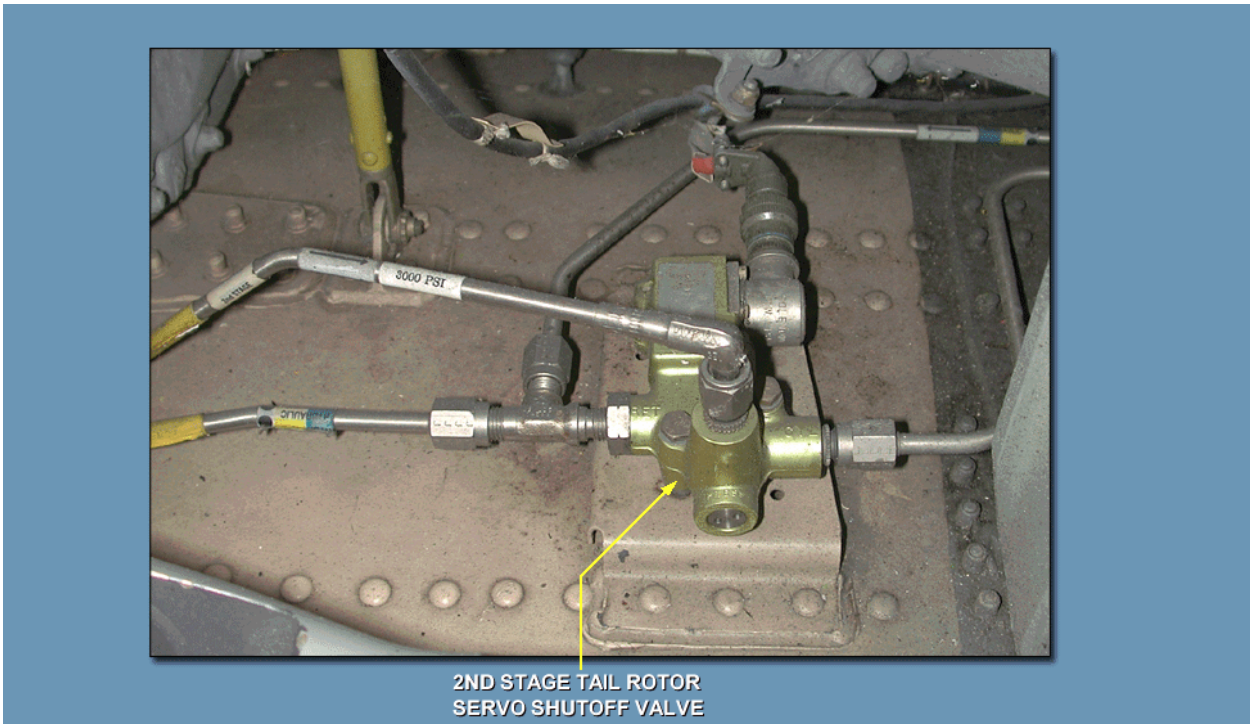


(6) The stages of the servo are controlled by the TAIL SERVO switch located on the miscellaneous switch panel on the lower console, and the No. 1 and No. 2 logic modules.

(7) A cooling restrictor is installed for the No. 1 pump module. Normally, only the first stage of the servo is pressurized.

(a) 2nd Stage Tail Rotor Servo Shutoff Valve

Frame #0142 (2nd Stage Tail Rotor Servo Shutoff Valve)



1) The shutoff valve controlling the 2nd stage tail rotor servo is the 2nd stage servo shutoff valve.

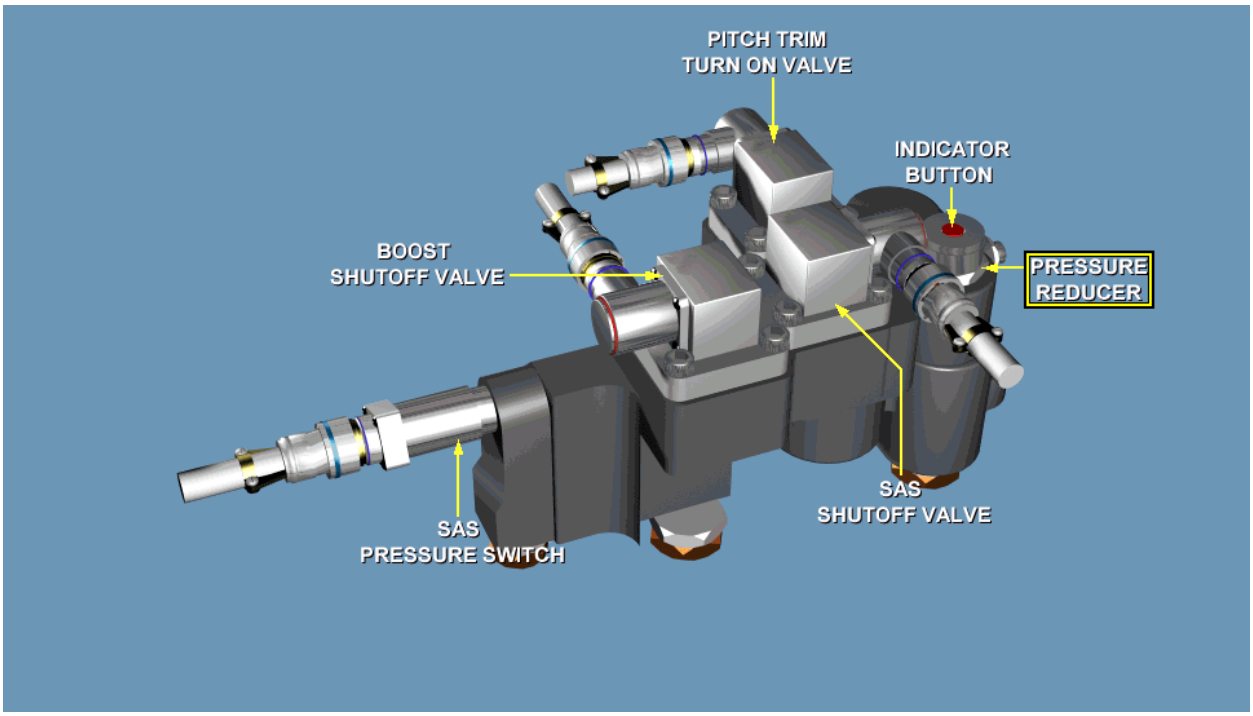
2) The 2nd stage tail rotor servo shutoff valve is located on the right hand side of the hydraulic deck, just forward of the forward bellcrank support.

3) When the TAIL SERVO switch, located on the MISC SW panel, is moved to BACKUP, the 2nd stage is powered by the backup system.

4) Should the 1st stage become inoperative, the backup pump will come on and power the 2nd stage.

g. Pilot Assist Servo Module

Frame #0155 (Pilot Assist Servo Module)



(1) The pilot assist servo module is located on the hydraulic deck, just forward of the mixer assembly.

(2) The pilot assist module consists of a thermal relief valve, a pressure reducer, a Stability Augmentation System (SAS) shutoff valve, a boost shutoff valve, a pitch/trim turn-on valve, a pressure switch, and self-sealing quick-disconnect couplings.

(3) The thermal relief valve has no function when the module is installed on the helicopter.

(4) Its purpose is to protect the module from damage due to thermal expansion of hydraulic fluid during storage.

(5) The pressure reducer valve reduces system pressure from 3000 to 1000 psi for pitch/trim servo operation.

(6) An internal relief valve protects the pitch/trim servo from adverse system pressure.

(7) If the pressure reducer fails, the relief valve goes into bypass, and a visual indicator, on the pressure reducer, pops.

(8) The SAS shutoff valve turns off/on pressure to the SAS actuators and pitch boost servo.

(9) The boost shutoff valve turns off system pressure to the collective and yaw boost servos.

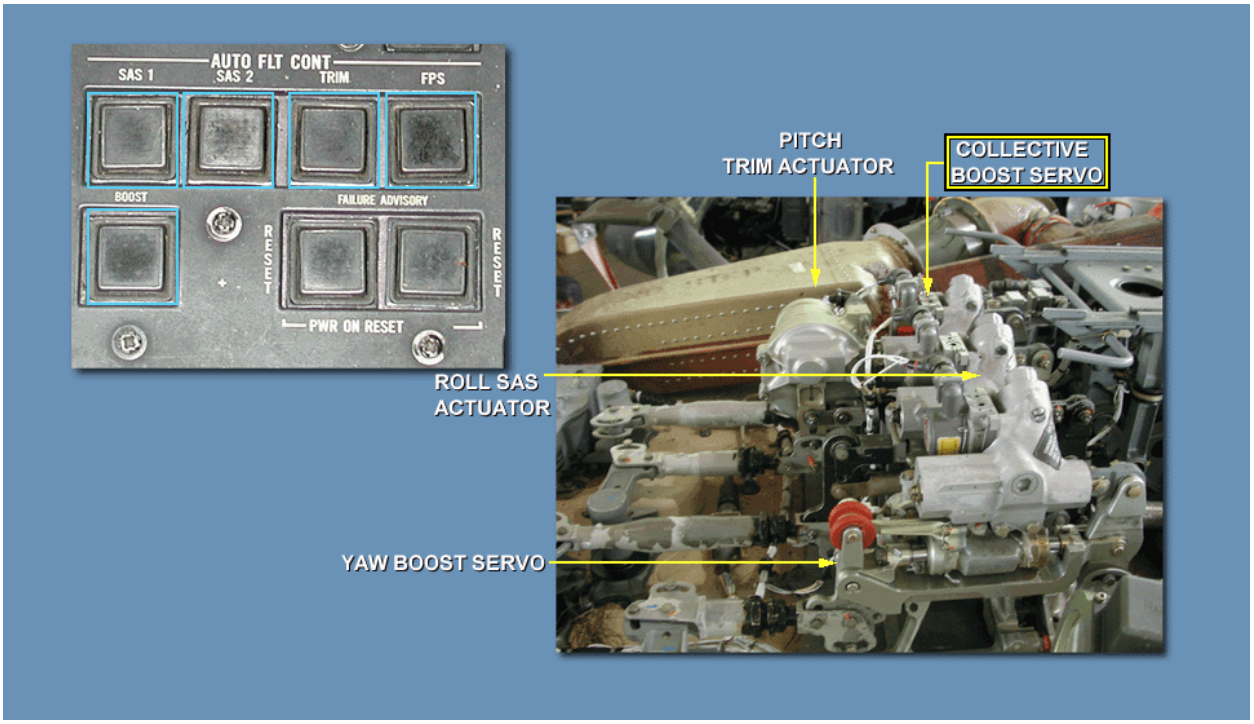
(10) The pitch/trim turn-on valve turns on system pressure to the pitch/trim servo.

(11) The pressure switch on the module turns on the SAS OFF light on the caution/advisory panel when pressure drops below limits.

(12) The module also has self-sealing, quick-disconnect couplings on all input and output ports.

(a) Pilot Assist Servos

Frame #0156 (Pilot Assist Servos)



1) The collective and yaw boost servos reduce cockpit control forces.

2) They are turned on and off by pressing the button marked "BOOST" on the auto flight control panel.

3) Pitch boost is turned on and off by pressing SAS 1 and 2 on and off.

4) There are 3 SAS actuators which enhance dynamic stability and provide short term rate damping in the pitch, roll, and yaw axes.

5) SAS inputs are not felt in the cockpit flight controls, they are manifested aft of the pilot assist area.

6) SAS 1 and SAS 2 are turned on and off by pressing the switches on the AFCS panel marked SAS 1 and SAS 2.

7) The pitch trim assembly is controlled by the trim switch on the AFCS panel.

8) The collective boost servo reduces stick and flight control friction.

9) The servo is controlled by a button marked BOOST on the STABILATOR CONTROLS/AUTO FLIGHT CONTROL panel.

10) The collective boost servo has a jam simulation button.

11) When pressed, the button displaces the spool valve sleeve and causes the BOOST SERVO OFF capsule on the caution/advisory panel to go on.

12) The yaw boost servo reduces stick and flight control friction.

13) The yaw boost servo is the same as the collective boost except for the addition of a SAS actuator, which provides rate damping.

14) The servo is controlled by a button marked BOOST, on the STABILATOR CONTROLS/AUTO FLIGHT CONTROL panel.

15) The yaw boost servo has a jam simulation button.

16) When pressed, the button displaces the spool valve sleeve and causes the BOOST SERVO OFF capsule on the caution/advisory panel to go on.

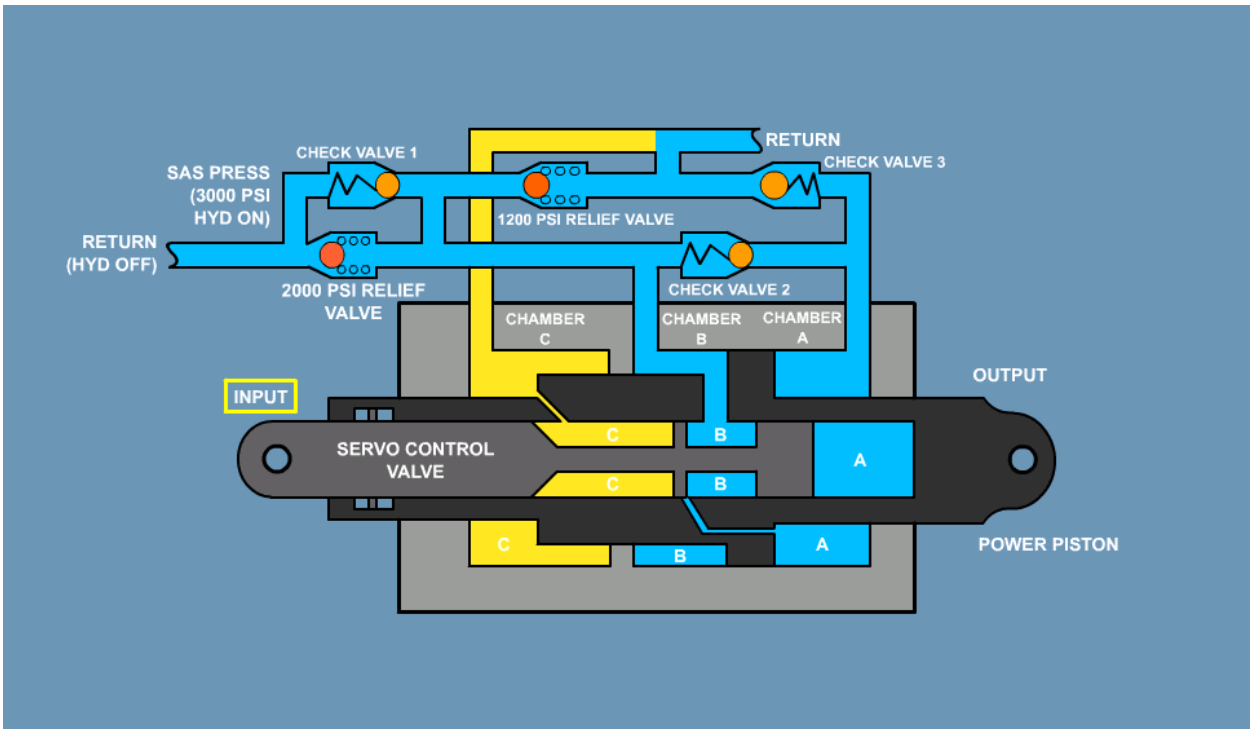
17) The pitch/trim actuator assembly is controlled by the SAS1, SAS2, TRIM and FPS buttons on the STABILATOR CONTROLS/AUTO FLIGHT CONTROL panel.

18) The pitch/trim actuator assembly controls the longitudinal axis and the attitude of the helicopter.

19) Trim maintains a position of the cyclic stick in the longitudinal axis.

a) Pitch Boost Servo

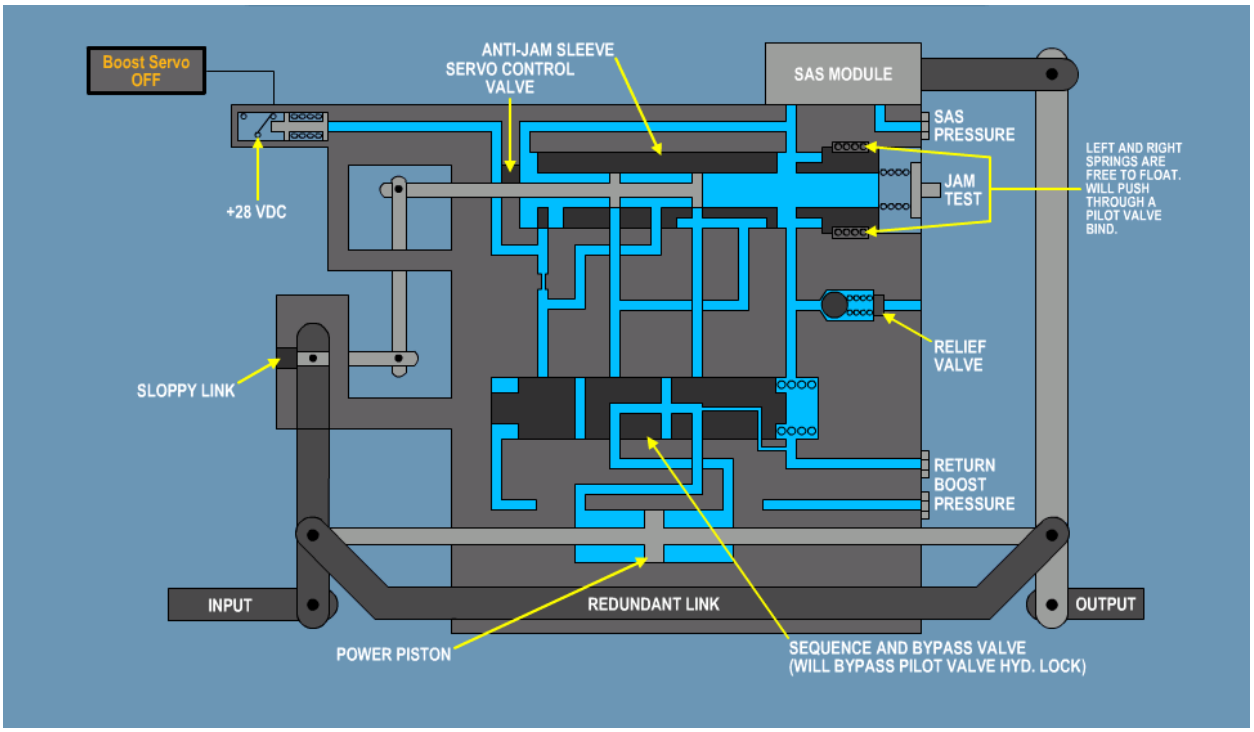
Frame #0157 (Pitch/Trim Boost Servo)



1 Internally, the pitch boost servo contains three chambers where the direction of hydraulic fluid flow is directed by a series of valves and a servo control piston.

b) Yaw Boost Servo

Frame #0158 (Yaw Boost Servo)

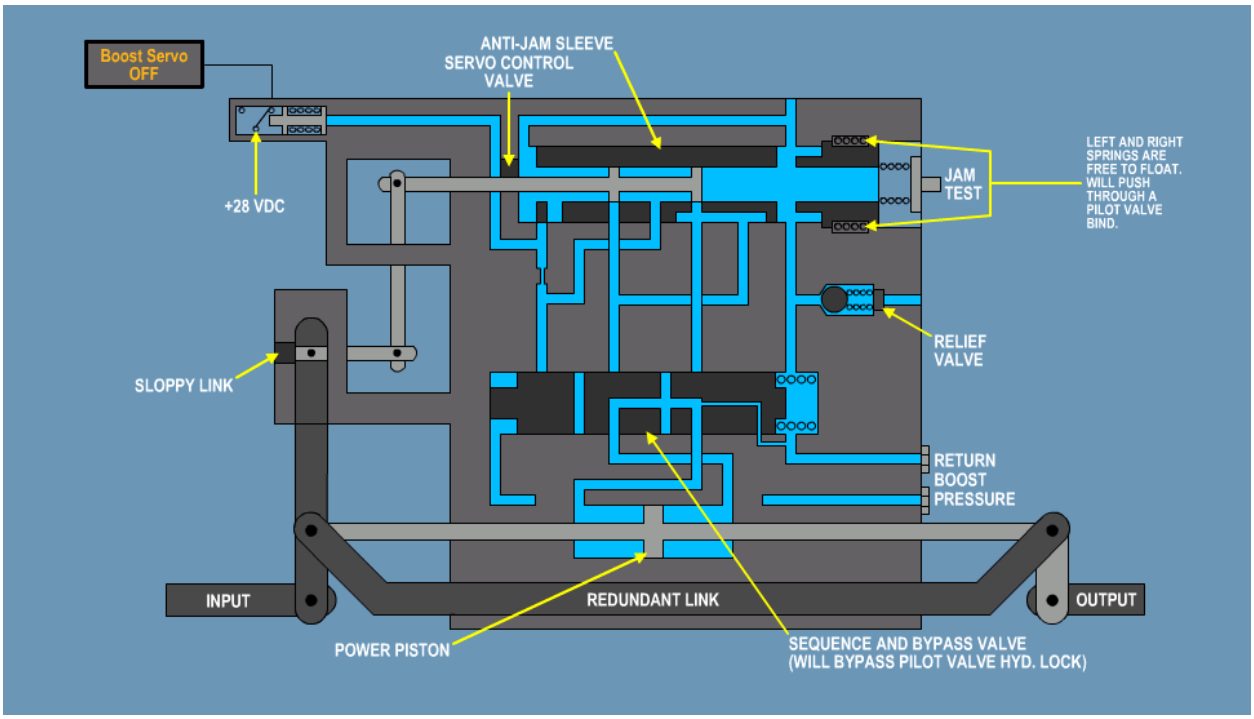


1 The yaw boost servo internally contains a servo control valve, anti-jam sleeve, relief valve, and a sequence and bypass valve.

2 Externally, the yaw boost servo has a SAS module mounted to the housing and connected to the yaw boost servo linkage.

c) Collective Boost Servo

Frame #0159 (Collective Boost Servo)



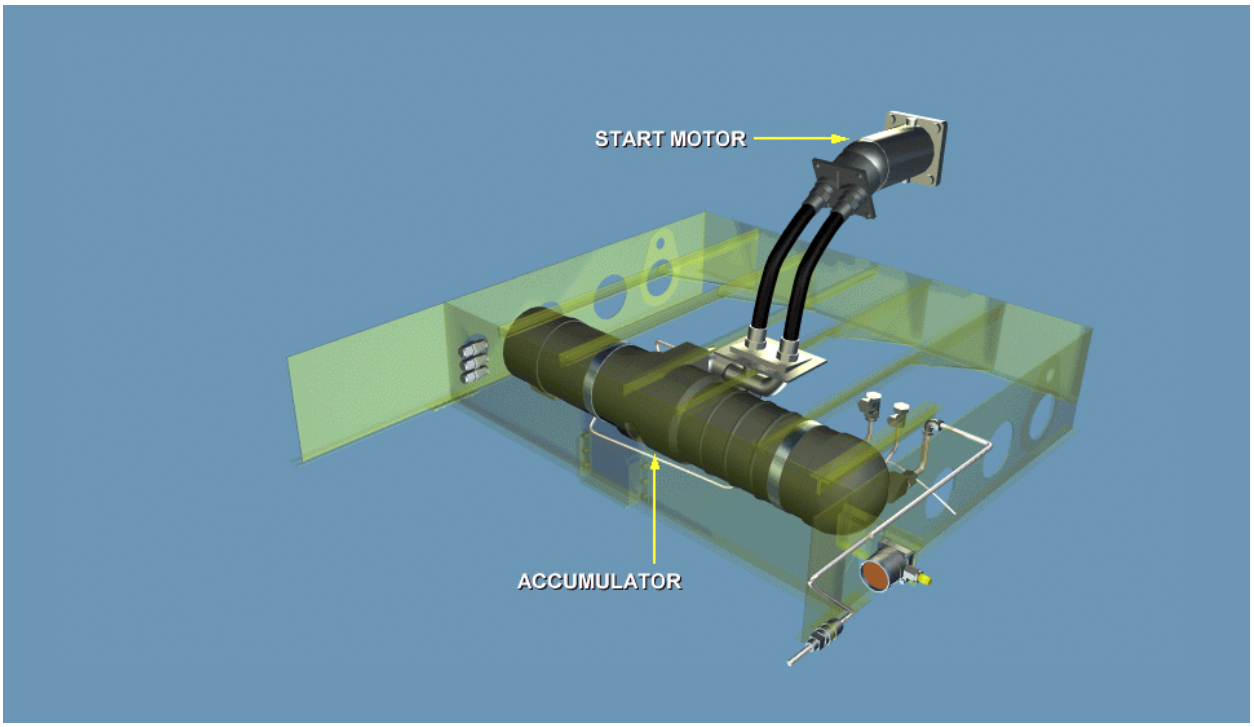
1 The collective boost servo is identical to the yaw boost servo internally, containing a servo control valve, anti-jam sleeve, relief valve, and a sequence and bypass valve.

2 Externally, the collective boost servo differs from the yaw boost servo.

3 The collective boost servo does not have a SAS module mounted to the housing.

h. APU Accumulator

Frame #0160 (APU Accumulator Location/Function)

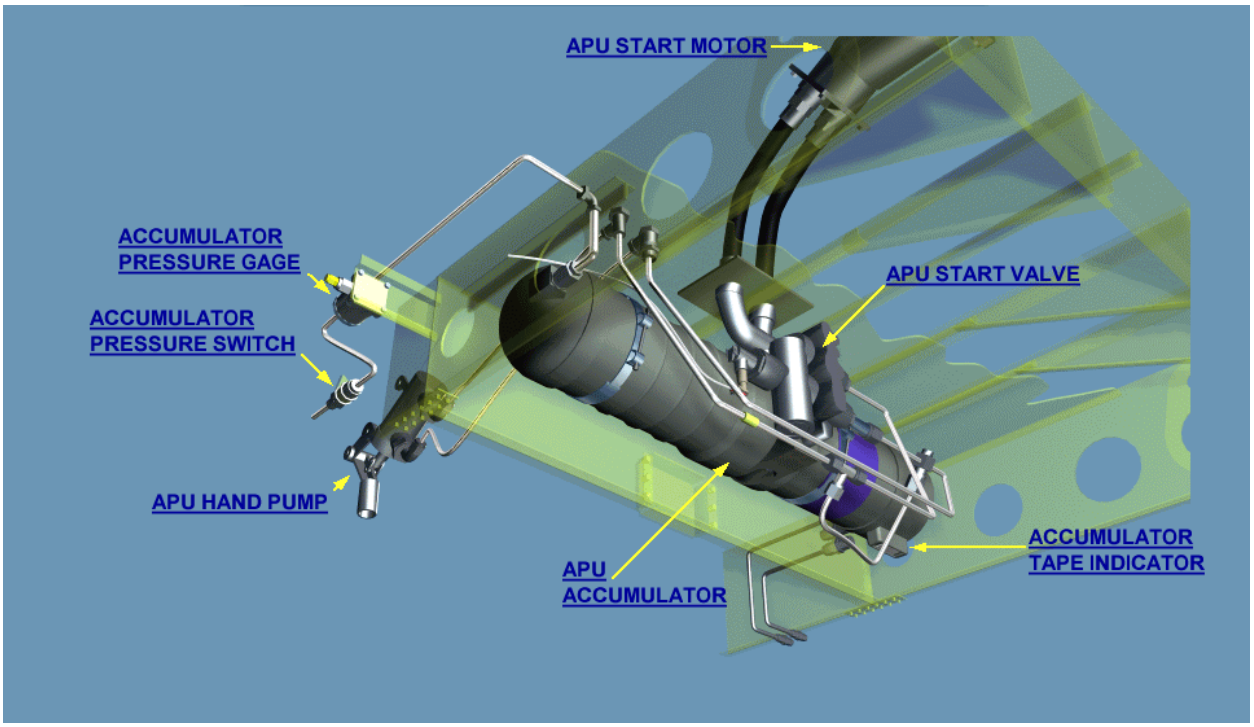


(1) In the hydraulic system, the accumulator and start motor are used to start the APU.

(2) The accumulator is located above the fuel cells in the aft cabin ceiling, while the start motor is attached to the accessory drive assembly on the APU.

i. APU Hydraulic System

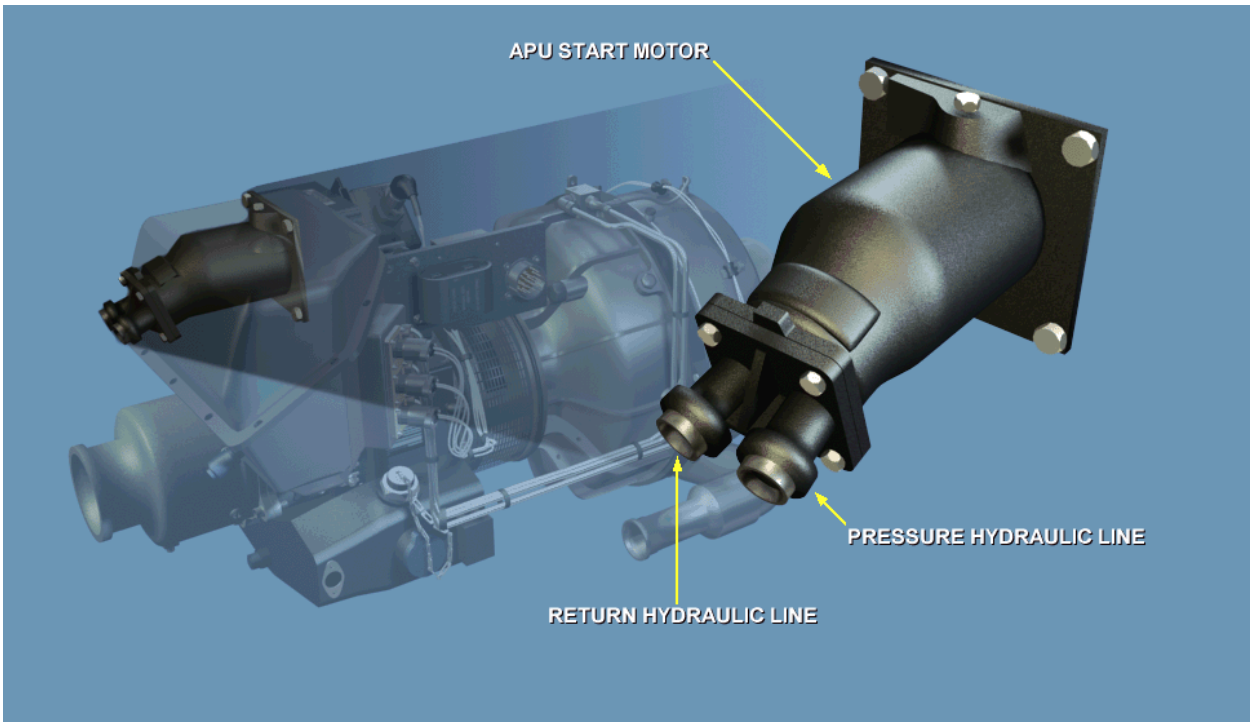
Frame #0166 APU Hydraulic System)



(1) The hydraulic system can be broken down into seven major components, APU start motor, APU start valve, APU accumulator, accumulator tape indicator, APU hand pump, accumulator pressure switch, and the accumulator pressure gage.

(a) APU Start Motor

Frame #0171 (APU Start Motor)



1) The APU start motor, controlled by the ESU, is hydraulically driven to 20% - 30% speed, and drops out when the APU reaches 70% speed during the start sequence.

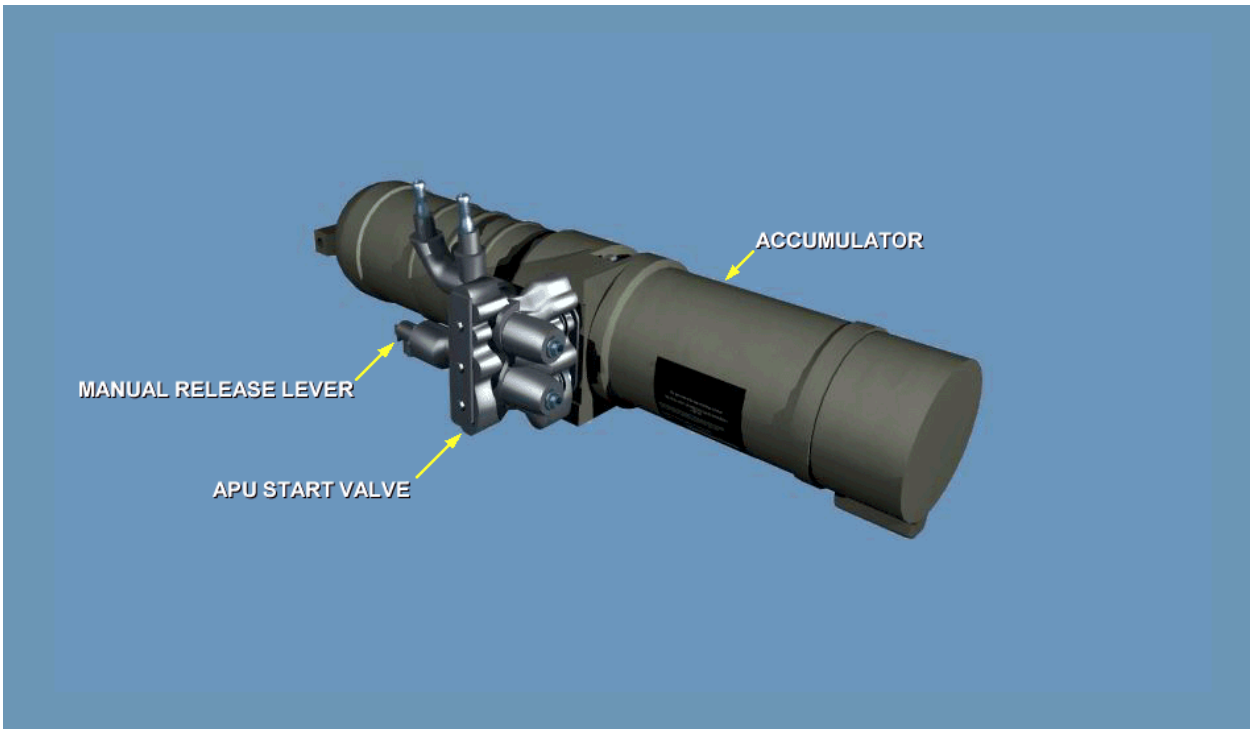
2) After the APU reaches 70% speed, the start motor becomes a free wheeling unit.

3) The hydraulic fluid used to drive the start motor, enters from the accumulator, through the pressure line, and returns to the accumulator through the return line.

4) The APU start motor is mounted to the accessory drive, and motors the compressor assembly during the start sequence.

(b) APU Start Valve

Frame #0170 APU Start Valve)



1) The APU start valve, controlled by the ESU, releases the accumulator hydraulic charge to APU start motor during the APU start sequence.

2) Located on the APU start valve, is the manual release lever.

3) During maintenance procedures, the manual release lever will release the hydraulic fluid charge from the accumulator, to the APU start motor, without the APU start sequence being initiated.

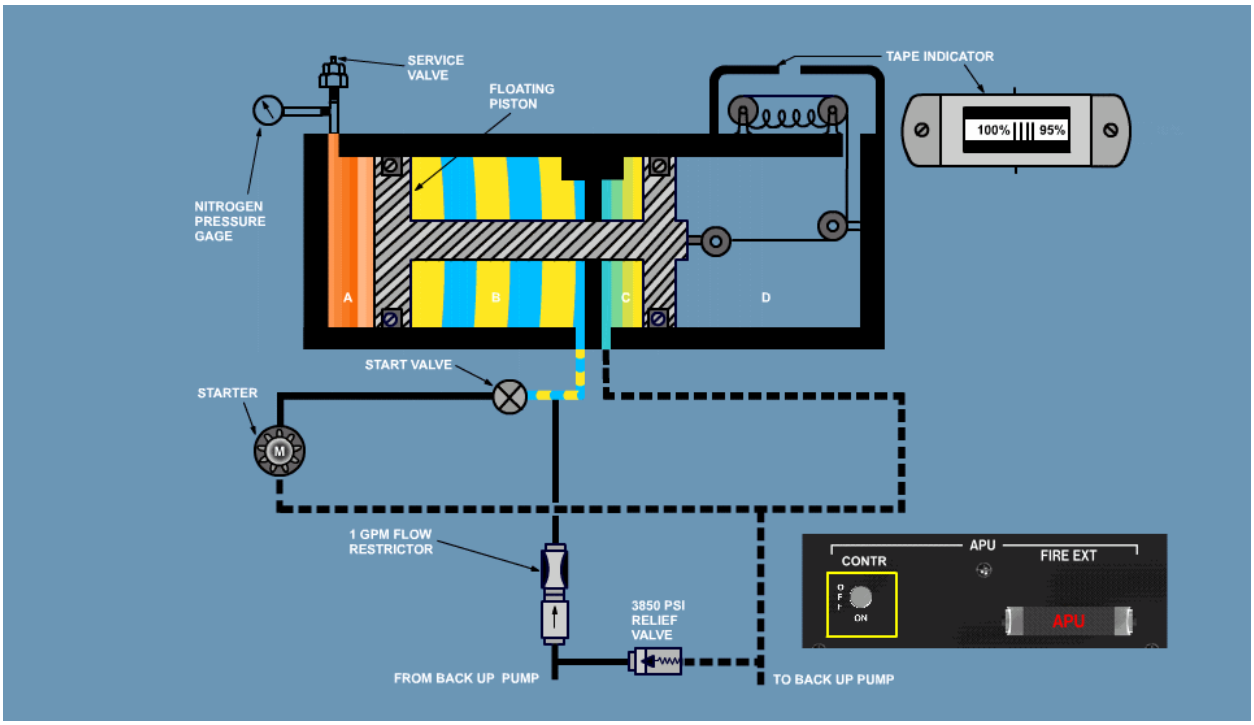
(c) Accumulator Tape Indicator

Frame #0167 (Accumulator Tape Indicator)

1) The accumulator tape indicator, on the APU accumulator displays the percent of pressure charge in the accumulator.

(d) APU Accumulator Flow

Frame #0173 (APU Accumulator Flow FLASH)



1) Inside the APU accumulator, there are two chambers.

2) The first chamber contains a nitrogen pre-charge, hydraulic fluid, and is separated by a floating piston.

3) A service valve is connected to the nitrogen end of the chamber with a pressure gage (0 - 5000 psi) attached.

4) Before operating, the nitrogen pressure gage should read 2600 - 2850 psi.

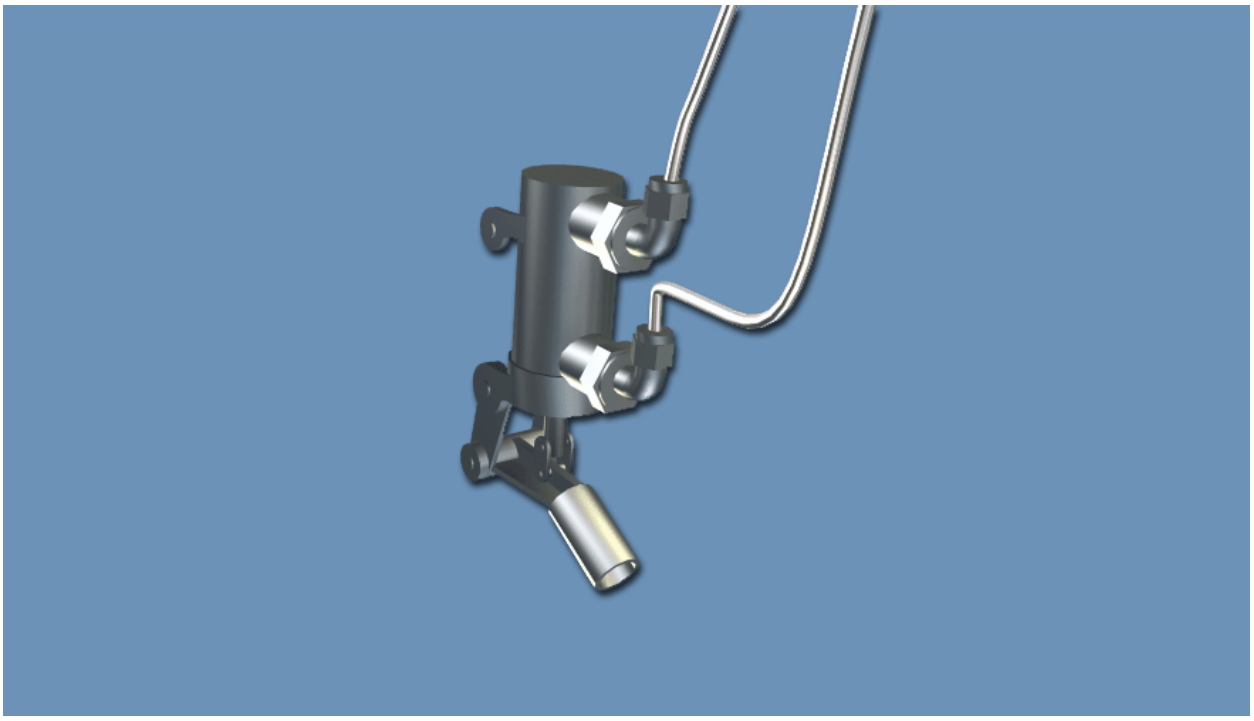
5) The pressurized nitrogen provides the force to move the floating piston, pushing the hydraulic fluid out of the first chamber.

6) The hydraulic fluid in the first chamber supplies pressurized hydraulic fluid to the APU starter through a start valve.

7) Once the start valve closes, the backup pump supplies hydraulic fluid back to the chamber.

(e) APU Hand Pump

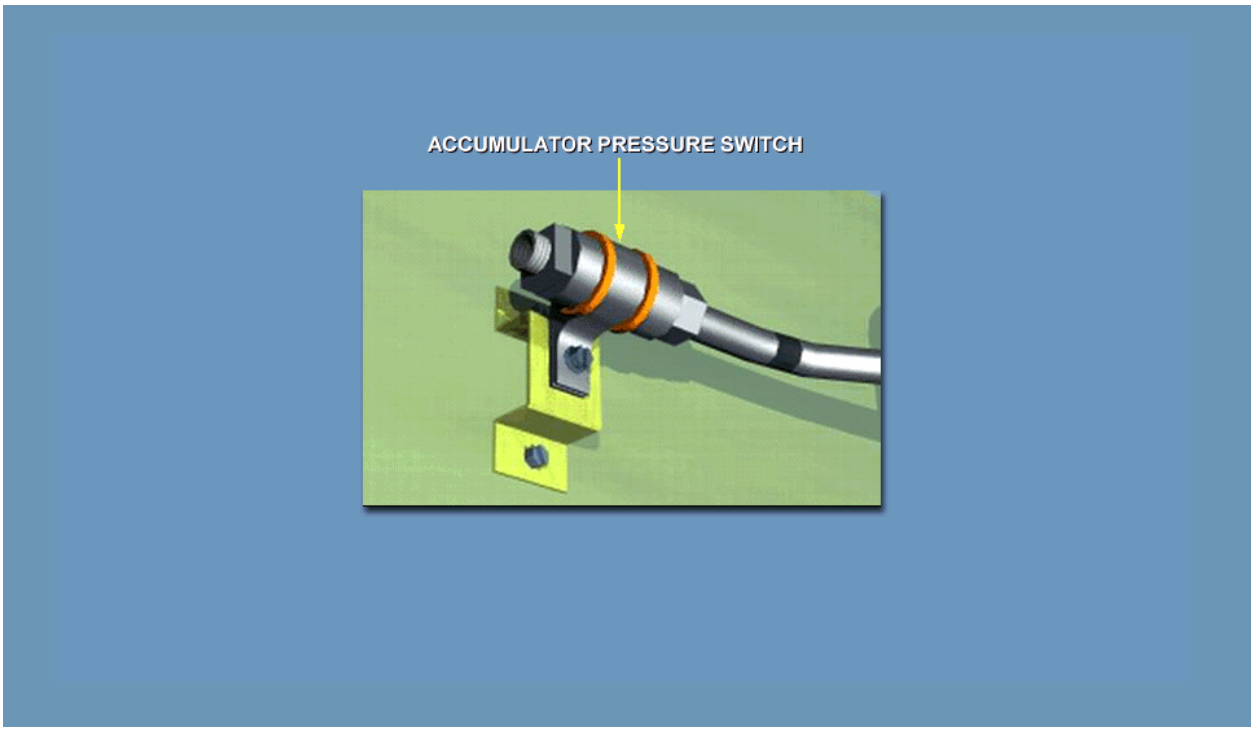
Frame #0172 (APU Hand Pump)



1) The APU hand pump is bidirectional, used for manually recharging the APU accumulator.

(f) Accumulator Pressure Switch.

Fame #0169 (Accumulator Pressure Switch)



1) The accumulator pressure switch sends a signal, when the accumulator precharge pressure drops below 2535 ± 50 psi, through the right hand relay panel, illuminating the APU ACCUM LOW caution advisory light.

(g) Accumulator Pressure Gage

Frame #0168 (Accumulator Pressure Gage)

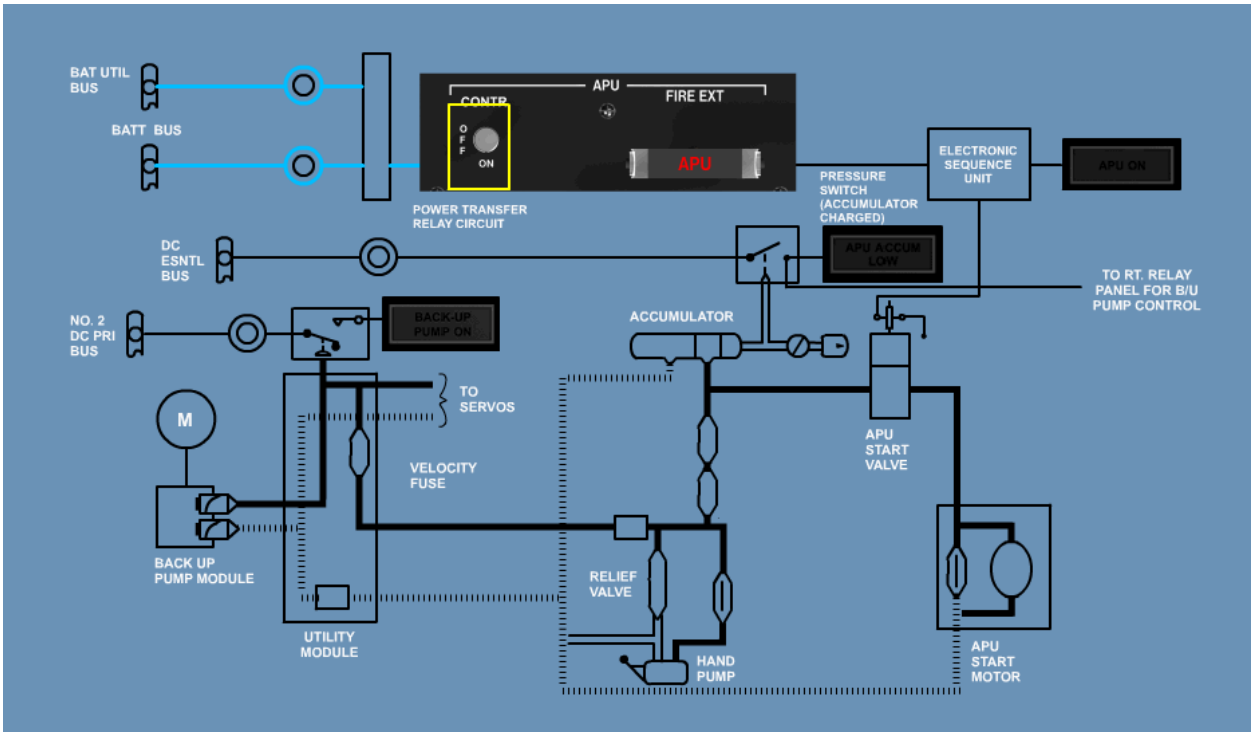
1) The accumulator pressure gage shows the pressure of the nitrogen precharge inside the APU accumulator.

2) The acceptable pressure range before starting the APU is 2700 - 3100 psi.

3) The accumulator nitrogen precharge is serviced at the pressure gage through the nitrogen servicing valve.

(h) APU Start Up Flow

Frame #0174 (APU Start Up Flow FLASH)



1) When the APU control switch is placed in the ON position, a signal is applied to the ESU.

2) The ESU sends a signal that opens the APU hydraulic start valve, releasing the hydraulic accumulator charge.

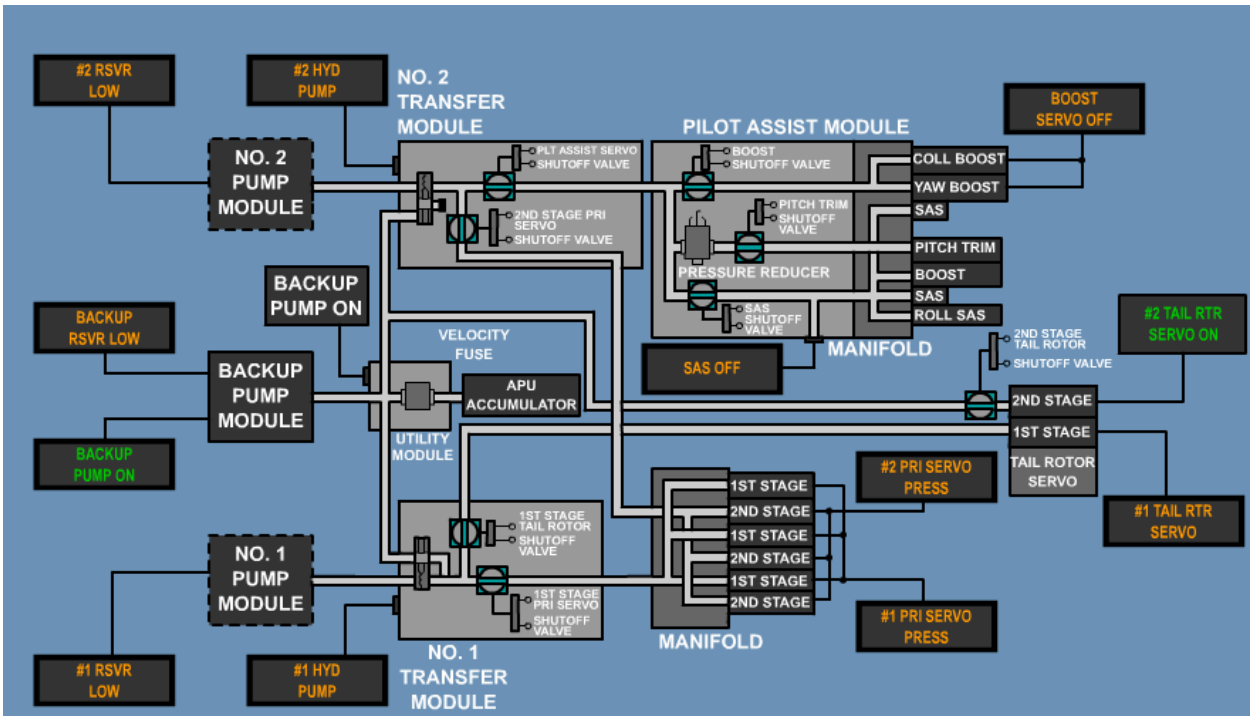
3) This charge turns the APU hydraulic start motor, and starts the APU compressor, and fuel pump rotating.

4) The APU accumulator low light will go on when the pressure switch detects low pressure, and the backup pump will begin to recharge the accumulator.

5) A pressure switch on the utility module will sense the backup pump is operating, and turns on the BACKUP PUMP ON light at the caution advisory panel.

j. Hydraulic Leak Test/Isolation

Frame #0175 (Hydraulic Leak Detection/Isolation System)



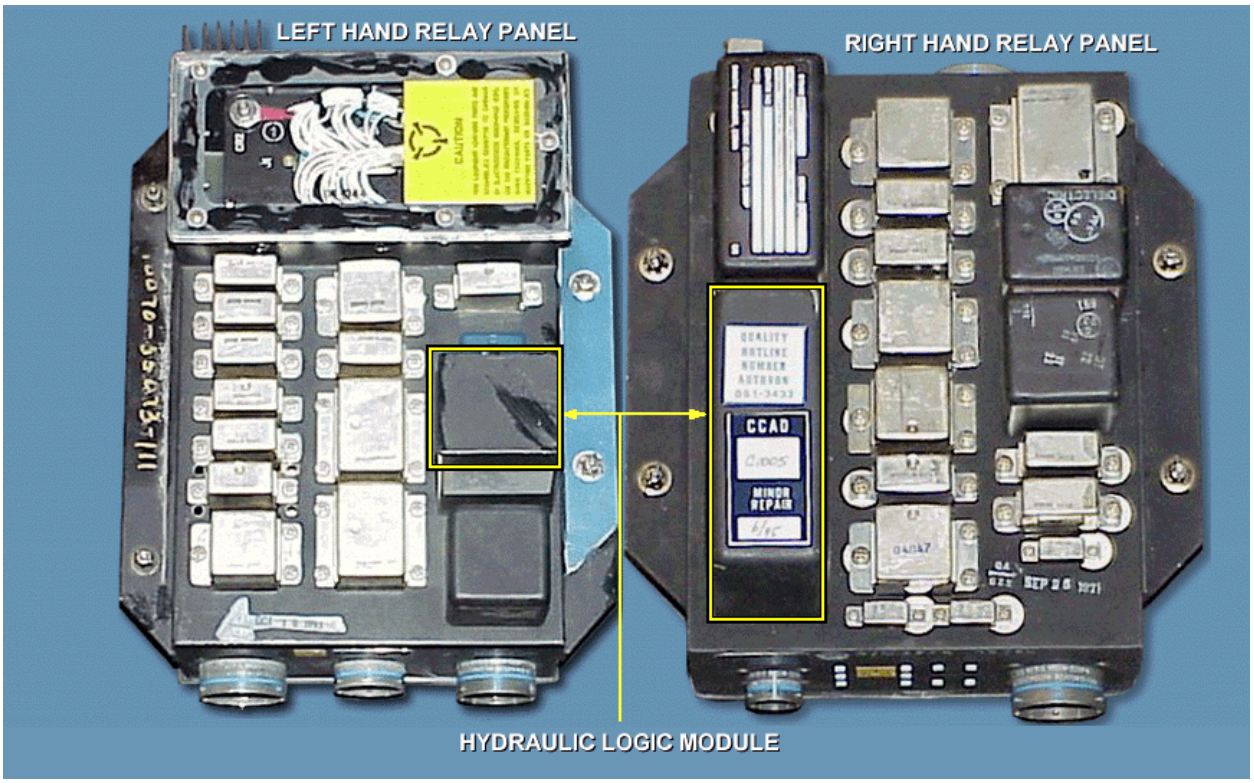
(1) The hydraulic Leak Detection/Isolation (LDI) system consists of components of the No.1, No. 2, and backup hydraulic systems.

(2) The LDI system protects the flight control hydraulic system by preventing the further loss of hydraulic fluid in case of a leak.

(3) The LDI system uses pressure switches and fluid level sensors for monitoring pump hydraulic fluid level, and pump pressure for primary and tail rotor servos, and pilot assist servos.

(a) Hydraulic System Logic Modules

Frame #0180 (Hydraulic System Logic Modules)



1) The hydraulic system logic modules are mounted on the right and left relay panel, located in the cabin overhead just aft overhead center console.

2) The logic modules continually monitor the hydraulic systems by inputs received from pressure switches, fluid level switches on the pump modules, and inputs received from control switches in the hydraulic system.

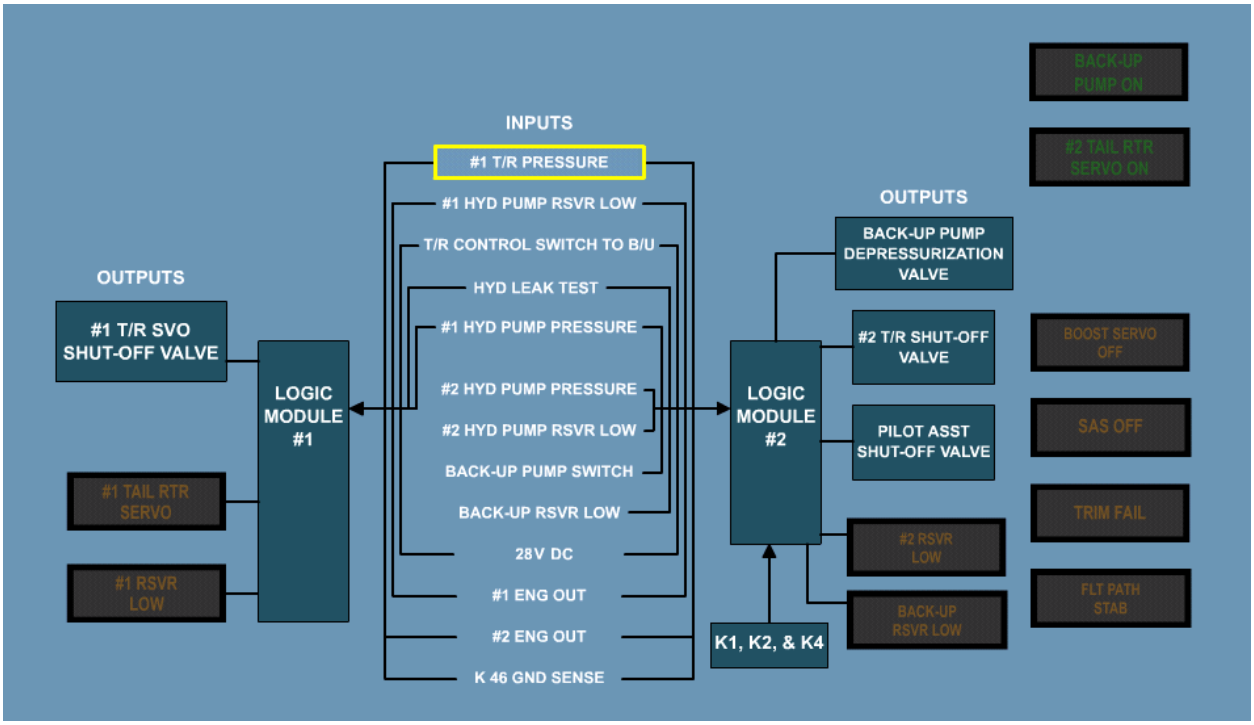
3) The outputs of the logic modules will turn on capsules on the caution/advisory panel, notifying the pilot of a failure, turn off a valve due to a system malfunction, or command the backup pump to operate.

4) When a pump module reservoir fluid level switch detects a fluid loss, the logic module follows the sequence detailed in the TM to isolate the leak.

5) To accomplish this, the logic module operates the required shutoff valve(s) to isolate the leak and turns on the backup pump when required.

a) Leak Detection/Isolation

Frame #0185 (Leak Detection/Isolation FLASH)



1 When there is a loss of pressure in the #1 tail rotor servo system, a signal is sent to the #1 and #2 logic modules.

2 The #1 logic module sends a signal to the #1 T/R SVO SHUT-OFF VALVE and illuminates the #1 TAIL RTR SERVO caution/advisory light.

3 A signal from the #2 logic module is sent to the BACK-UP PUMP, DEPRESSURIZATION VALVE, #2 SHUT-OFF VALVE, and illuminates the BACK-UP PUMP and #2 TAIL RTR SERVO ON caution/advisory lights.

4 With a loss of pressure detected at the #1 hydraulic pump, a signal is sent to both logic modules.

5 The #1 LOGIC MODULE sends a signal to the caution/advisory panel in the cockpit illuminating the #1RSVR LOW capsule light.

6 Additionally, a loss of pressure is detected at the #1 T/R SERVO sending a signal to the #1 LOGIC MODULE, which sends a signal to the #1 T/R SVO SHUT-OFF VALVE, and illuminated the #1 TAIL RTR SERVO caution/advisory capsule light.

7 A signal from the #2 logic module is sent to the BACK-UP PUMP, DEPRESSURIZATION VALVE, and illuminates the BACK-UP PUMP ON caution/advisory light.

8 When the loss of pressure was detected at the #1 T/R SERVO, a signal was also sent to the #2 LOGIC MODULE.

9 With the T/R CONTROL SWITCH placed in the B/U position, a signal is sent to the logic modules.

10 The #1 LOGIC MODULE sends a signal to the #1 T/R SVO SHUT-OFF VALVE, a loss of pressure is detected at the #1 T/R SERVO sending a signal to the #1 LOGIC MODULE, which sends a signal to the #1 T/R SVO SHUT-OFF VALVE, and illuminated the #1 TAIL RTR SERVO caution/advisory capsule light.

11 The #2 LOGIC MODULE sends a signal to the BACK-UP PUMP, DEPRESSURIZATION VALVE AND the #2 TAIL RTR SERVO ON capsule light on the caution/advisory panel.

12 When the Hydraulic Leak Test is performed on the #1 hydraulic system, a signal is sent to the logic modules.

13 The #1 LOGIC MODULE sends a signal to the #1T/R SVO SHUT-OFF VALVE, a loss of pressure is detected at the #1 T/R SERVO sending a signal to the #1 LOGIC MODULE, which sends a signal to the #1 T/R SVO SHUT-OFF VALVE, and illuminated the #1 TAIL RTR SERVO caution/advisory capsule light.

14 When the Hydraulic Leak Test is performed on the #2 hydraulic system, a signal is sent to the #2 logic module.

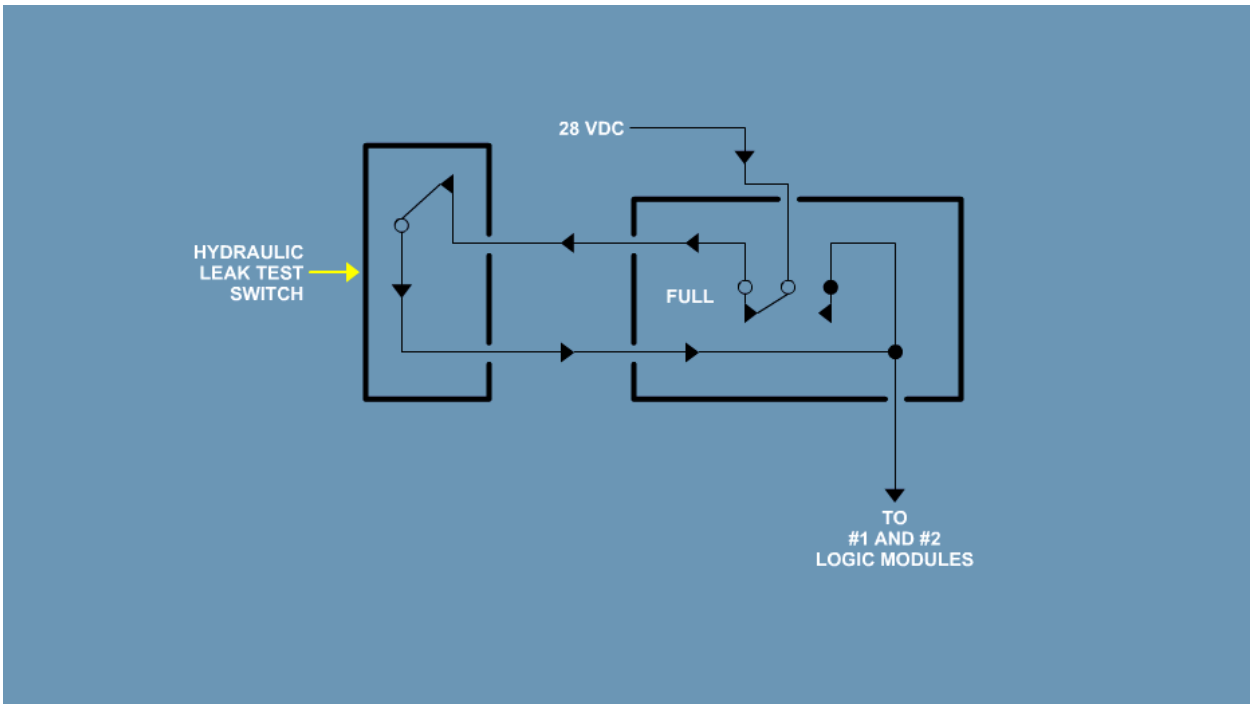
15 The #2 LOGIC MODULE sends a signal to the PILOT ASST SHUT-OFF VALVE, and illuminates the #2 RSVR LOW, BOOST SERVO OFF, SAS OFF, TRIM FAIL, and FLT PATH STAB capsule lights at the caution/advisory panel.

16 When the Hydraulic Leak Test is performed on the back-up hydraulic system, a signal is sent to the #2 logic module.

17 The #2 LOGIC MODULE sends a signal that illuminates the BACK-UP RSVR LOW capsule light on the caution/advisory panel.

b) Leak Detection/Isolation

Frame #0190 (Leak Detection/Isolation)



1 The HYD LEAK TEST switch is located on the upper console panel.

2 Power to operate the hydraulic leak test system is from the NO. 2 DC PRIMARY BUS and the DC ESSENTIAL BUS.

3 The Weight on Wheel (WOW) switch contact prevents hydraulic leak tests from being made in flight.

CHECK ON LEARNING

1. What hydraulic systems provides power to the tail rotor servo?

2. Which of the pump modules are interchangeable?

3. What pump are used to replenish the hydraulic charge on the APU accumulator?

4. What is the purpose of the RESET position on the Leak Detection/Isolation system?

SECTION IV. - SUMMARY

1. REVIEW/SUMMARIZE:

You have completed the lesson on the function of the UH-60 Hydraulic Systems. The Key Points to remember are:

- Each of the systems have a pump/reservoir combination.
- The Transfer module connects hydraulic pressure from the pump module to the flight controls.
- The primary servo provides a power boost to the main rotor flight controls.
- The tail rotor servo furnishes a power boost to the tail rotor flight controls.
- The pilot assist module reduces pilot work load by providing control boost, stick trimming, stability augmentation, and control inputs from the AFCS.
- The APU start system supplies a hydraulic charge to the APU start motor.
- The leak detection/isolation system protects the flight control hydraulic system by preventing the further loss of hydraulic fluid in case of a leak.

APPENDIX A

ILLUSTRATION LISTING

Frame #	FRAME TITLE
0025	Hydraulic System Function
0030	Hydraulic System Schematic
0032	No. 1 Hydraulic System
0035	No. 2 Hydraulic System
0040	Backup Hydraulic System
0120	Hydraulic System Components Menu
0126	Hydraulic Pump Module
0125	Hydraulic Pump Module
0124	Depressurizing Valve
0127	Pump Module FLASH
0130	Transfer Module
0132	Transfer Module System Flow FLASH
0133	Hydraulic System Velocity Fuse
0134	Primary Servo
0135	Primary Servo
0136	Primary Servo Flow FLASH
0137	Primary Servo Shut-off Electrical Interlock
0140	Tail Rotor Servo
0141	Tail Rotor Servo
0142	2nd Stage Tail Rotor Servo Shutoff Valve
0155	Pilot Assist Servo Module
0156	Pilot Assist Servos
0157	Pitch Boost Servo FLASH
0158	Yaw Boost Servo
0159	Collective Boost Servo
0160	APU Accumulator Location/Function
0166	APU Hydraulic System
0171	APU Start Motor
0170	APU Start Valve
0167	Accumulator Tape Indicator
0173	APU Accumulator Flow FLASH
0172	APU Hand Pump
0169	Accumulator Pressure Switch
0168	Accumulator Pressure Gage
0174	APU Start Up Flow FLASH
0175	Hydraulic Leak Detection/Isolation System
0180	Hydraulic System Logic Modules
0185	Leak Detection/Isolation FLASH
0190	Leak Detection/Isolation

APPENDIX B

TEST AND TEST SOLUTIONS

1. This appendix is only used when the test and solutions are internal to the POI file.

2. When the test and solutions are internal to the POI file, then the POI file becomes a FOR OFFICIAL USE ONLY document.