TECHNICAL MANUAL

AVIATION UNIT AND AVIATION INTERMEDIATE MAINTENANCE MANUAL

CH-47D HELICOPTER

This manual together with TM 55-1520-240-23-1, TM 55-1520-240-23-2, TM 55-1520-240-23-3, TM 55-1520-240-23-4, TM 55-1520-240-23-5, TM 55-1520-240-23-7, TM 55-1520-240-23-8, TM 55-1520-240-23-9, TM 55-1520-240-23-10, TM 55-1520-240-23-11, supersedes TM 55-1520-240-23-1, TM 55-1520-240-23-2, TM 55-1520-240-23-3, TM 55-1520-240-23-4, TM 55-1520-240-23-5, TM 55-1520-240-23-7, TM 55-1520-240-23-8, TM 55-1520-240-23-9, TM 55-1520-240-23-10, 10 May 1983, and TM 55-1520-240-23-6, 6 May 1983, including all changes.

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HEADQUARTERS, DEPARTMENT OF THE ARMY
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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 19 SEPTEMBER 2002

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CH-47D HELICOPTER

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) located in the back of this manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

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*This manual together with TM 55-1520-240-23-1, TM 55-1520-240-23-2, TM 55-1520-240-23-3, TM 55-1520-240-23-4, TM 55-1520-240-23-5, TM 55-1520-240-23-7, TM 55-1520-240-23-8, TM 55-1520-240-23-9, TM 55-1520-240-23-10, TM 55-1520-240-23-11, supersedes TM 55-1520-240-23-1, TM 55-1520-240-23-2, TM 55-1520-240-23-3, TM 55-1520-240-23-4, TM 55-1520-240-23-5, TM 55-1520-240-23-7, TM 55-1520-240-23-8, TM 55-1520-240-23-9, TM 55-1520-240-23-10, 10 May 1983, and TM 55-1520-240-23-6, 6 May 1983, including all changes.

CHAPTER 7
HYDRAULIC SYSTEM

SECTION I
FLIGHT CONTROL HYDRAULIC SYSTEM
DESCRIPTION AND THEORY OF OPERATION

7-1 FLIGHT CONTROL HYDRAULIC SYSTEM 7-1

DESCRIPTION

The flight control hydraulic system consists of two identical but independent systems, identified as No. 1 and No. 2. They provide hydraulic assistance for operation of flight controls. The systems are parallel in operation, hydraulically separated, and electrically integrated. Each system operates at about **3,000 psi** hydraulic pressure. If one system fails, the flight controls can still be operated on the boost pressure provided by the other system.

Both systems can be operated by an external power source through external power connections. Connections for the No. 1 system are at the forward left side of the helicopter. Connections for the No. 2 system are at the aft right side. The system can also be powered by the auxiliary power unit when the engines are shut down.

In general, components of the No. 1 system are located in the forward fairing. No. 2 system components are in the aft pylon. The following components are common to both systems.

Fill Module

Hydraulic fluid is added to both systems through a fill module at the right side of the cabin in the ramp area. The same module is also used to fill the utility hydraulic system. All hydraulic systems may be serviced either static or while system is operating. Selection of the system to be serviced is by a rotary valve on the module.

Fluid added to the module is pulled through the fill cannister and into the selected system by operating a small hand pump on the module.

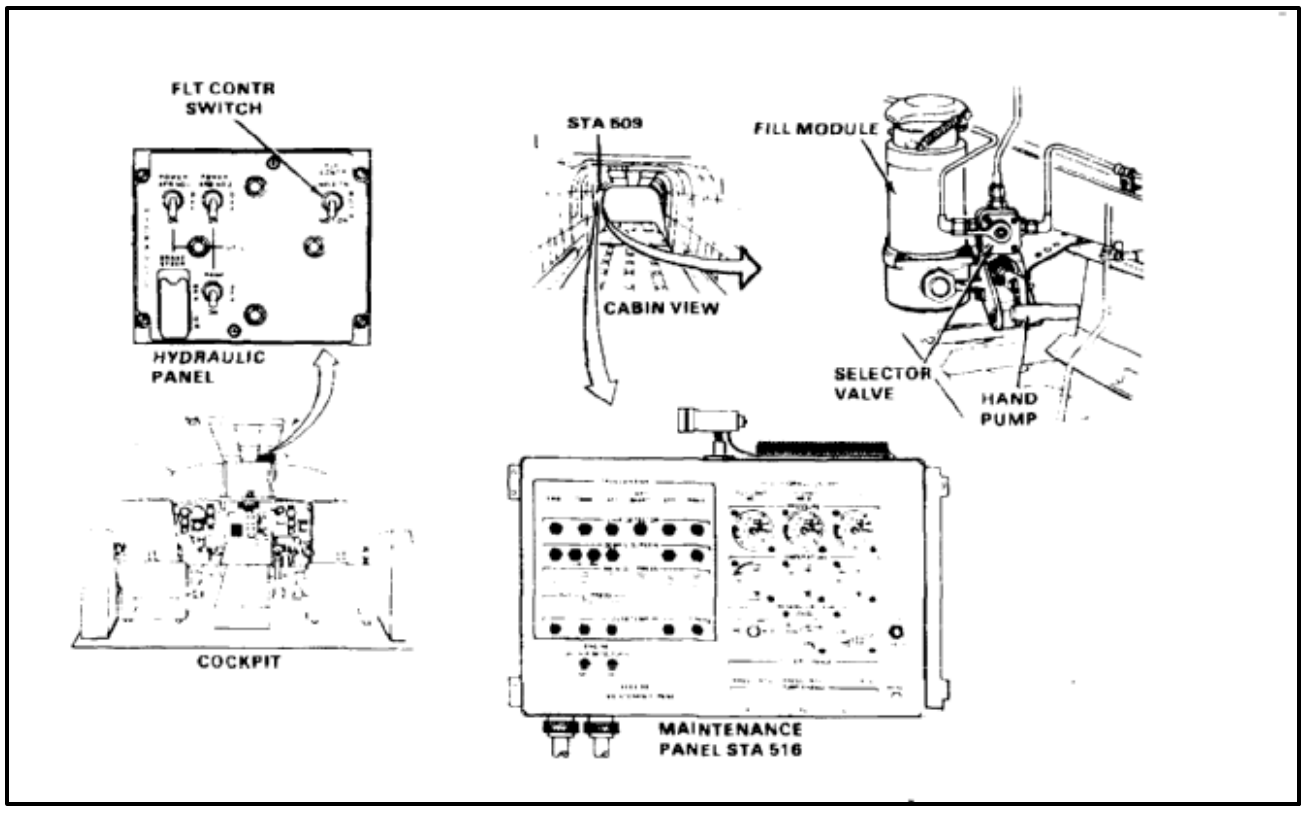
Hydraulic Panel

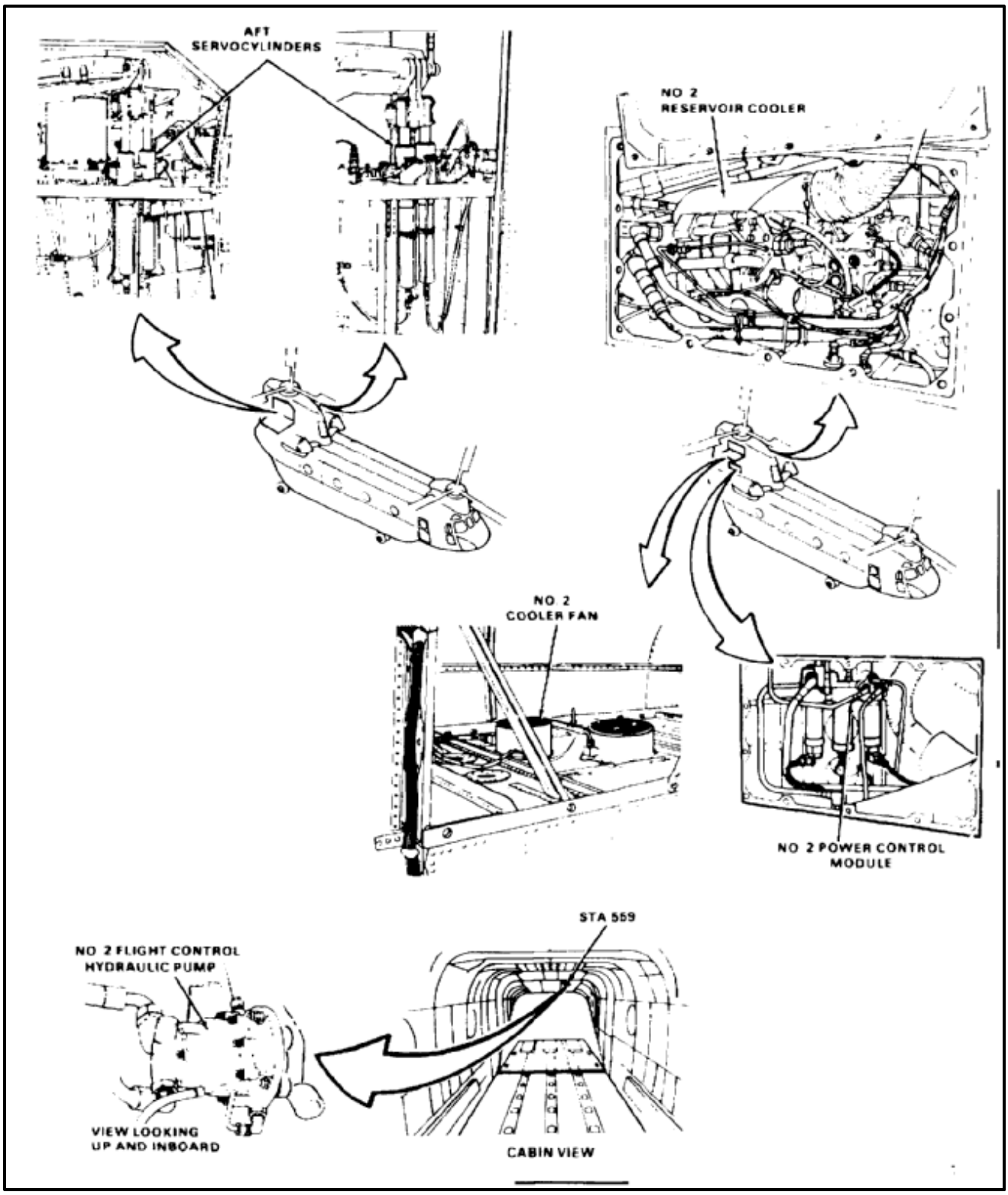
A three-position switch is on the HYDRAULIC panel in the cockpit overhead panel. The switch is marked FLT CONTR, with switch positions of NO. 1 ON, BOTH, and NO. 2 ON. At BOTH, the two systems work together to provide boost to the controls. Turning the switch to either of the individual systems disables and isolates the opposite system.

There are two PWR XFR switches on the panel, one for each system. If the engines are shut down, and the auxiliary powerplant is running, either or both of the flight control systems can be pressurized by turning the appropriate switch to ON.

Maintenance Panel

A maintenance panel is mounted on the right side of the cabin in the ramp area. The panel contains a HYDRAULICS section that has gages and indicator lights for various system parameters.

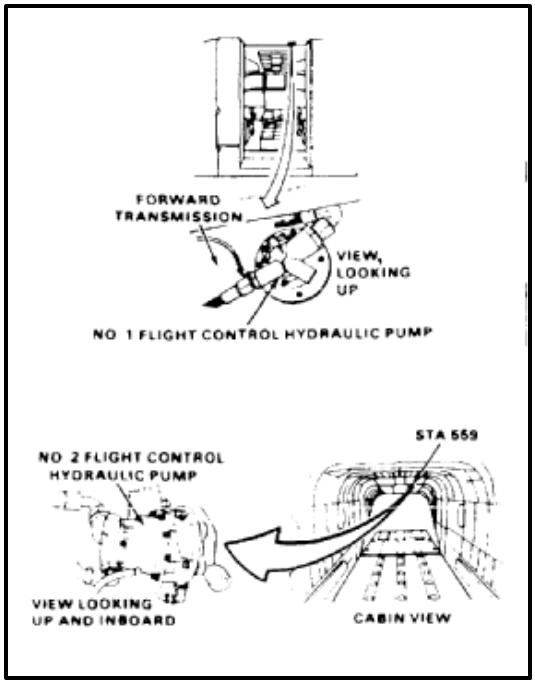



AFT SERVOCYLINDERS
NO 2 RESERVOIR COOLER
NO 2 COOLER FAN
NO 2 POWER CONTROL MODULE
STA 559
NO 2 FLIGHT CONTROL HYDRAULIC PUMP
VIEW LOOKING UP AND INBOARD
CABIN VIEW

Hydraulic Pump

A variable delivery pump supplies **3,000 psi** hydraulic pressure at a flow rate of **15 gpm** to each flight control system. The No. 1 system pump is driven by the forward transmission, and is accessible from the passageway. The pump for the No. 2 system is driven by the aft transmission. It is accessible from the ramp.

There are four ports in each pump: inlet, outlet, seal drain (SD), and case drain (CD). Both pumps are identical and interchangeable, with each other and with the utility system hydraulic pump on the aft transmission.



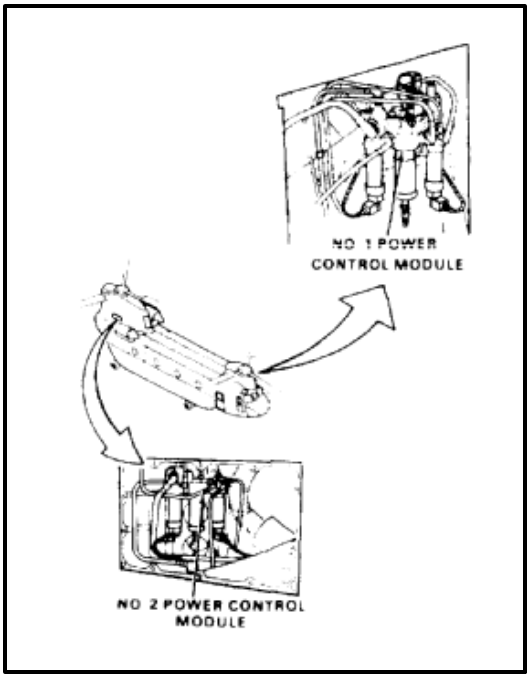
Power Control Module

Each power control module (PCM) controls the flow of all pressure and return fluid through its flight control hydraulic system. The No. 1 module is located in the forward transmission fairing, aft of the transmission. The module for the No. 2 system is in the aft pylon, at the right side.

Each module has ten major components: pressure and return filters and indicators; four different valves, a pressure switch and transmitter, a pump change indicator, and an accumulator. All of the components are installed in a manifold. The accumulator dampens low frequency pressure surges and provides stored hydraulic power for peak loads.

Functions of the PCM's are to direct pressure and flow to either #1 or #2 flight boost system.

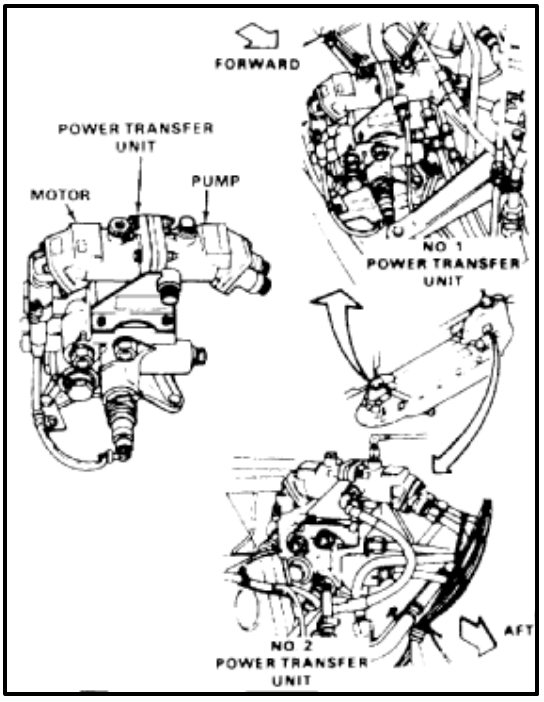
- Operates on **3000 psi** at **7-8 GPM**
- Electrical power from #2 DC bus **28 vdc**
- Controlled by boost select switch on overhead panel in cockpit
- Weight **17.2 pounds** dry



Power Transfer Unit

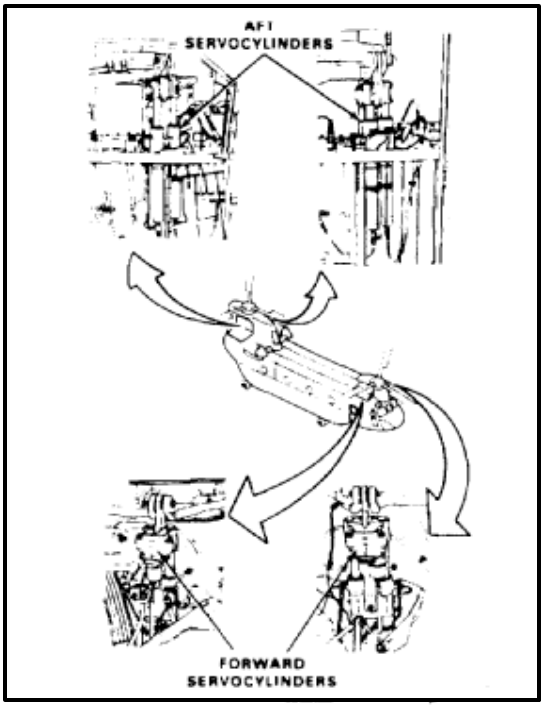
A power transfer unit (PTU) in each hydraulic system allows boost to be applied to the flight controls when the drive system is shut down. Each PTU consists of a pump driven by a hydraulic motor. The motor is hydraulically powered by the auxiliary power unit motor pump, utility hydraulic pump or ground support equipment. It drives the pump through splined coupling to supply hydraulic pressure of **3,000 psi at 3.5 gpm** to the controls.

The No. 1 PTU is in the forward transmission fairing, aft and right of the forward transmission. The No. 2 PTU is in the aft pylon, on the left side.



Servocylinders

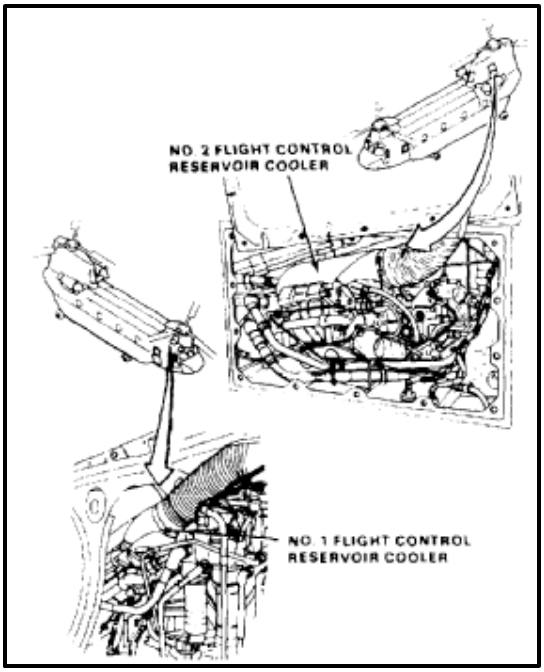
A pivoting and a swiveling servocylinder are installed at each rotor head. At the forward head, lower (fixed) part of each servocylinder is mounted on the forward transmission and the upper (movable) part is attached to the forward swashplate stationary ring. At the aft head, the lower part is mounted to aft pylon structure. The upper part is attached to the aft swashplate stationary ring. Each servocylinder receives **3,000 psi** boost pressure from each flight control system. The pressure lifts dual pistons, raising the swashplate on the rotor shaft. Each servocylinder has individual manifolds and cylinders for each of the hydraulic systems.



Reservoir Cooler

Fluid storage and cooling for each system is provided by an integrated reservoir cooler module with a separate fan. The reservoir section of the module stores fluid for system operation. The cooler is mounted on top of the reservoir. It is connected by flexible ducting to a fan that is activated by a thermal switch in the cooler. Sensors in the unit send information on fluid level and temperature to the maintenance panel in the ramp area. An indicating rod on the reservoir provides another indication of system fluid level.

The reservoir cooler and fan for the No. 1 system are in the forward fairing, aft of the forward transmission. The No. 2 system module is in the aft pylon on the left side.

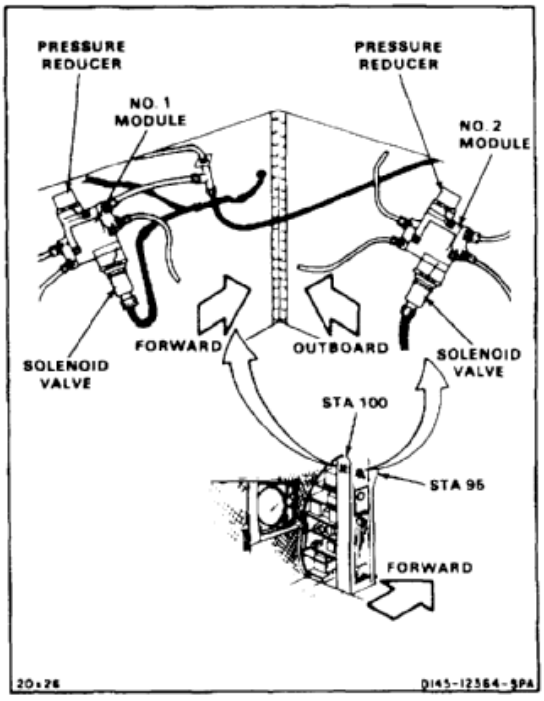


Lower Controls Modules

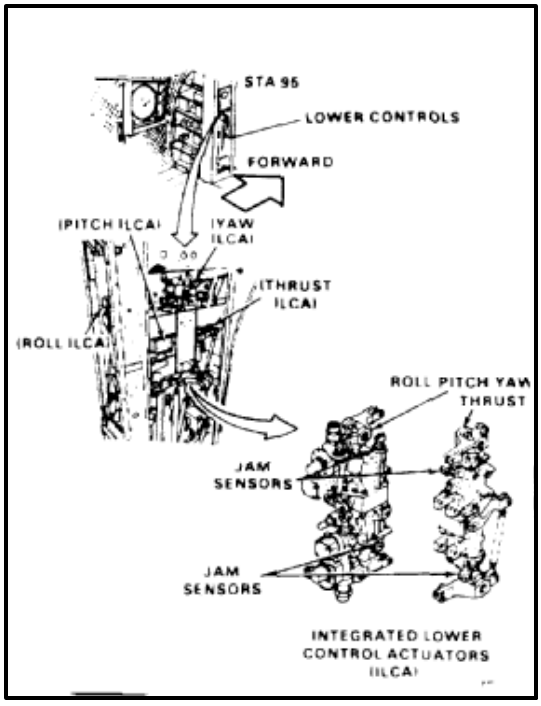
A lower controls module in each system reduces hydraulic pressure to the integrated lower controls actuators (ILCA) from **3,000 to 1,500 psi**.

A solenoid valve in each module shuts off hydraulic pressure to the AFCS extensible links in each ILCA. It is actuated by either manual or automatic shutdown of the AFCS.

The modules for both systems are located in the upper part of the flight controls closet. The No. 1 system module is at sta. 100. The No. 2 module is at sta. 95.



Integrated Lower Control Actuators

Four integrated lower control actuators (ILCA) are in the flight controls closet between sta. 95 and 120. The actuators operate on **1,500 psi** hydraulic pressure to provide cockpit control boost in the pitch, roll, yaw, and thrust axes and advanced flight control system (AFCS) augmentation in the pitch, roll, and yaw axes. The actuators are similar, but not directly interchangeable unless the authority covers are transferred because the actuators are assembled for the particular flight axis in which they are installed.

Each ILCA assembly has two independent boost actuator systems and two AFCS extensible links. Both systems are mounted together but operate independently of each other. System No. 1 is the upper half and system No. 2 is the lower half. Each extensible link has a servo valve, relief valve, jam sensors, and self feedback transducers. The thrust ILCA does not have an AFCS extensible link, although it has two independent boost actuator systems.