

United States Army Warfighting Center
Fort Rucker, Alabama
OCTOBER 2006



STUDENT HANDOUT

TITLE: CH-47D AUXILIARY POWER UNIT

FILE NUMBER: 011-2108-1

PROPONENT FOR THIS STUDENT HANDOUT IS:

110th Aviation Training Brigade
ATTN: ATZQ-ATB-AD
Fort Rucker, Alabama 36362-5000

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CH-47D AUXILIARY POWER UNIT

STUDENT HANDOUT

TERMINAL LEARNING OBJECTIVE (TLO):

Action: Describe components, operational characteristics, functions, restrictions and limitations of the CH-47D Auxiliary Power Unit (APU).

Conditions: In a classroom, given a student handout.

Standards: Correctly answer in writing, without reference, three of four questions pertaining to components, operational characteristics, limitations, functions, and malfunctions of the CH-47D auxiliary power unit, In Accordance With (IAW) TM 1-1520-240-10 and the student handout.

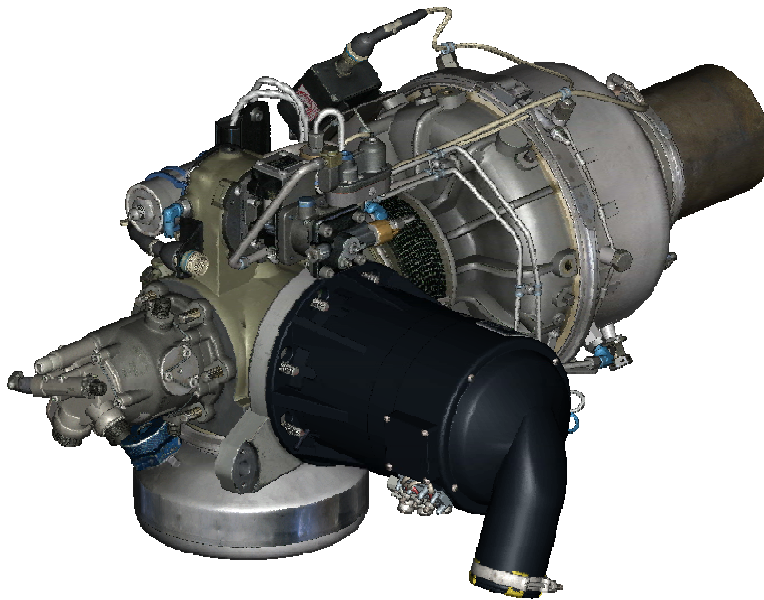
Safety Requirements: None.

Risk Assessment Level: Low.

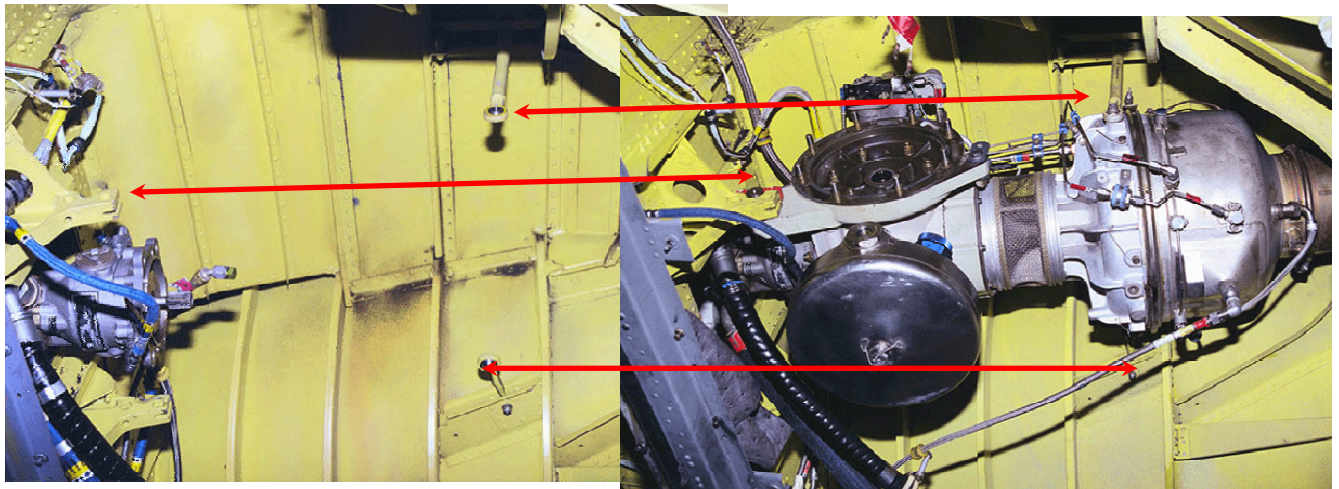
Environmental Considerations: None.

Evaluation: Each student will be evaluated on this block of instruction during the first written examination. This will be a criterion type examination requiring a GO on each scored unit. You will have 90 minutes for the exam.

1. **Learning Step/Activity 1 – Describe the operational Characteristics, of the APU Components.**
 - a. Auxiliary Power Unit (APU) provides hydraulic and electric power for engine starts, ground maintenance and limited emergency procedures.

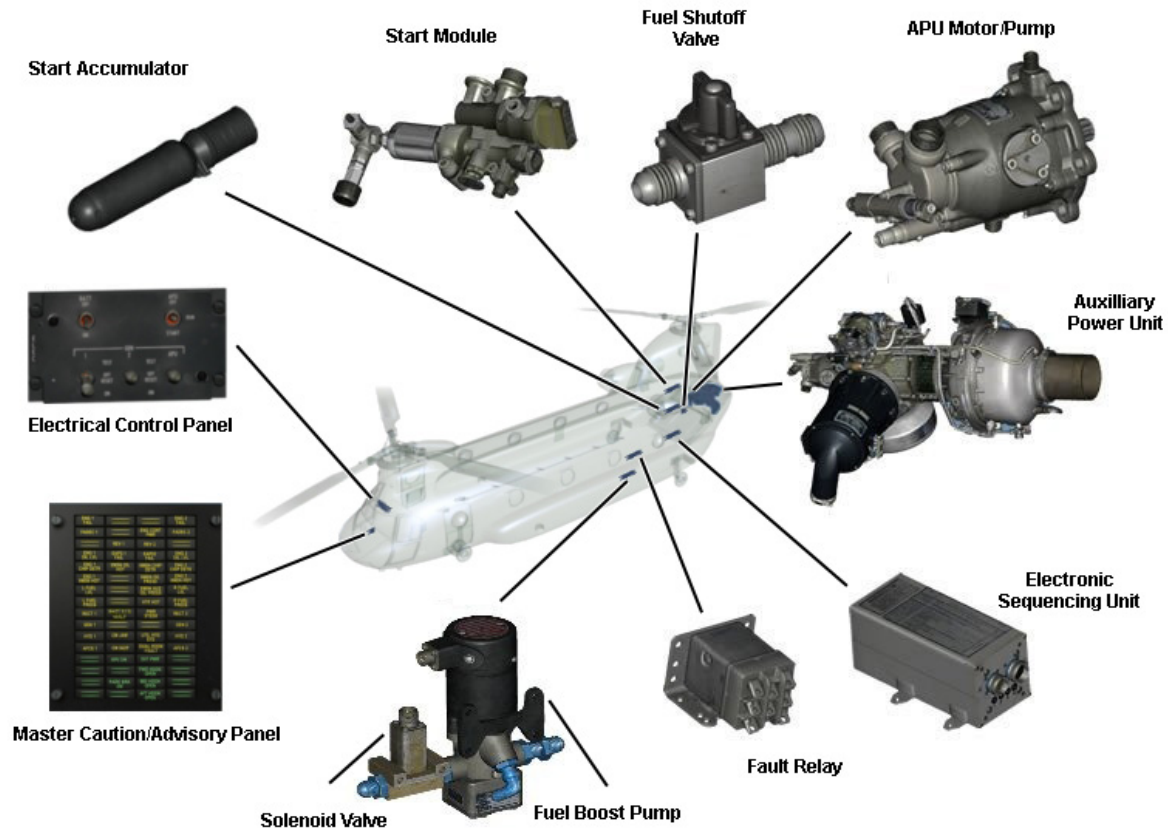


- (1) T62-T-2B.
- (2) Manufacture – Turbomach (a division of Hamilton Sundstrand Power Systems).
- (3) Dimensions:
 - (a) Weight (including residual fluids) – 74.8 Lbs.
 - (b) Length – 33 inches.
 - (c) Width – 14 inches.
 - (d) Height – 24 inches.
- (4) Normal rated – 66 SHP with a Maximum rated 95 SHP.
- (5) Operates on – JP-8, JP-5, JP-4 fuels.
- (6) Fuel consumption – 89 PPH at the normal rated power with a maximum consumption of 115 PPH, from the left main tank.
- (7) Single Stage Centrifugal Compressor & Power Turbine.
- (8) Mounted at Sta.600 above the ramp, using four attachment points.



- (a) Two mounts are forward on the accessory drive allowing APU to rotate down for ease of maintenance.
 - (b) Two rigid links attached to the turbine housing giving vertical and lateral support.
- (9) Drives a Motor/Pump to pressurize the utility hydraulic system for main engine starting and ground checks.
 - (10) Drives the APU generator to supply power to the electrical system.

b. System components.



(1) APU System Components.

(a) Electrical Control Panel (APU Switch):

1. Located on the overhead panel in the cockpit.
2. Provides the control for the operation of the APU.

(b) Start Accumulator:

1. Located on the No.2 side of the ramp compartment.
2. Stores hydraulic fluid under pressure for APU start.

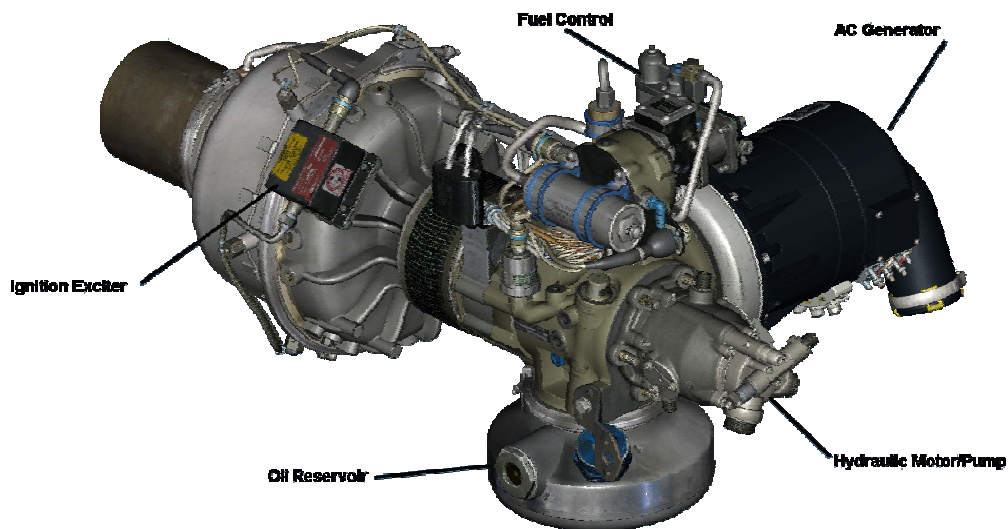
(c) Start Module – Provides signal pressure for the APU motor pump.

(d) Manual Fuel Shutoff valve – Alternate means of shutting fuel off to the APU.

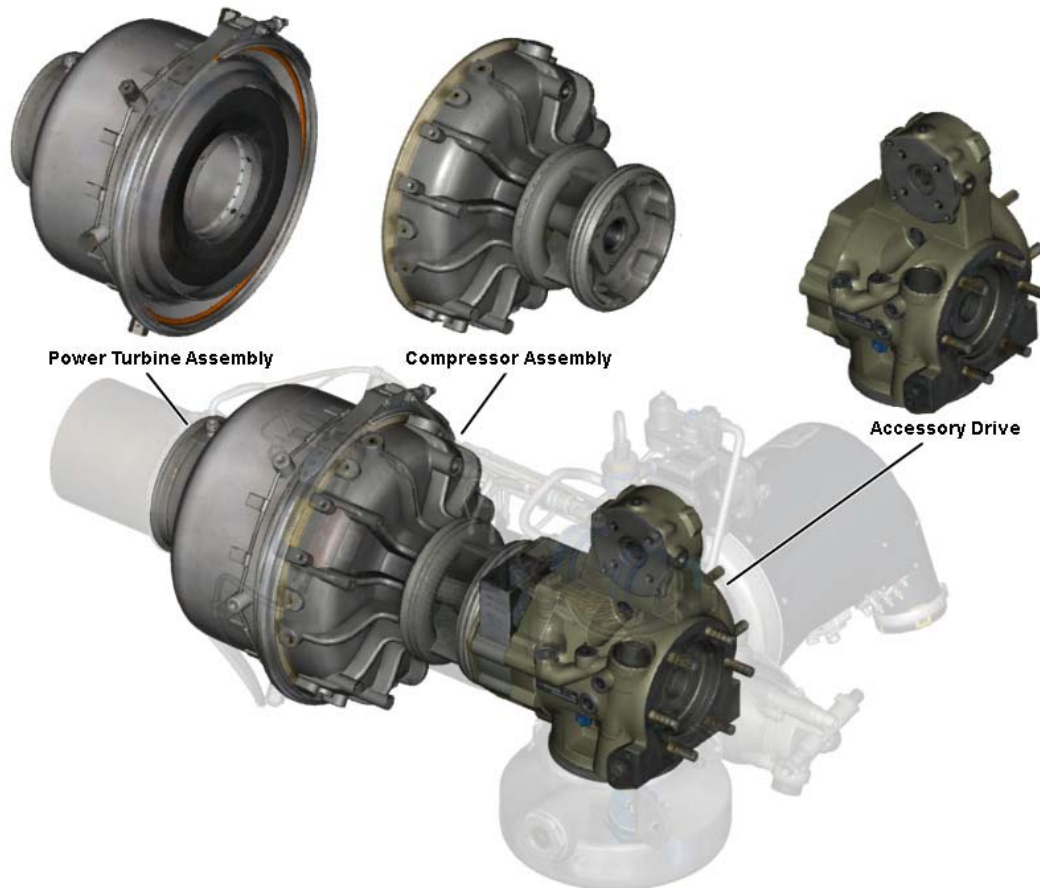
(e) Motor/Pump:

1. Located on the forward portion of the APU.
2. Motor drives the APU during the start sequence.

3. Pump provides the pressure for the utility hydraulic system during ground operations.
- (f) APU/AC Generator:
1. Is used for ground operations.
 2. APU generator provides electrical power.
- (g) Electronic Sequencing Unit (ESU):
1. Located on the L/H side of the ramp area.
 2. Monitors the APU during start and shut down.
- (h) Fault Relay – Closes the fuel solenoid valve during ESU shut down of the APU.
- (i) Fuel boost pump – Boost fuel pressure during APU start.
- (j) Fuel solenoid valve – Stop fuel flow to the APU.
- (k) Master Caution/Advisory Panel – Indicate the APU ON light and utility ON light.
- (2) APU assembly:



- (a) Hydraulic Motor/Pump (3350 PSI) – Motors the APU during start and pumps provides utility hydraulic pressure to the system.
- (d) Accessory drive – Provide a mounting for the generator, motor/pump, and fuel control unit.
- (c) Fuel Control – Controls the fuel flow to the APU.
- (d) Ignition Exciter – Provides the power for ignition during start.

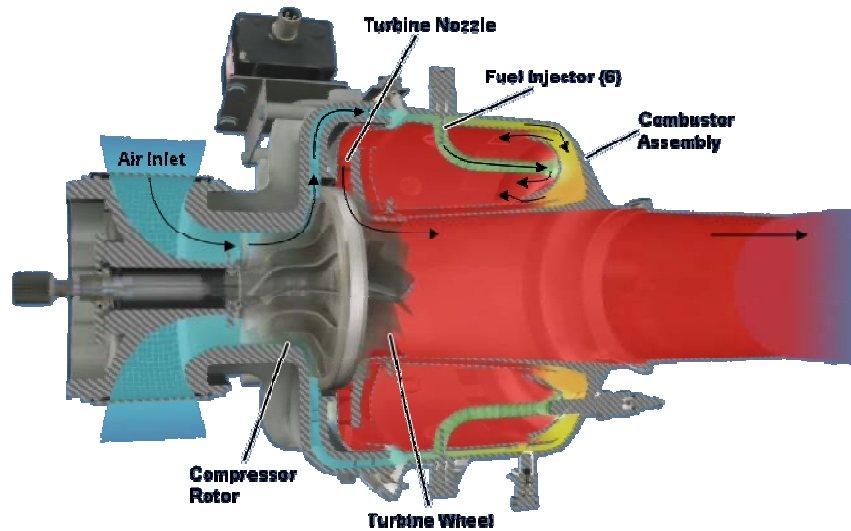


- (e) Turbine Assembly – Provides the power to drive the APU Accessories.
- (f) Compressor Assembly – Compresses the air during APU start.
- (g) AC Generator (20 KVA) – Provides electrical power for ground operation and some in-flight emergency.
- (h) Oil Reservoir – Stores oil for the APU.

2. Learning Step/Activity 2 – Describe the principles of Operation for the APU.

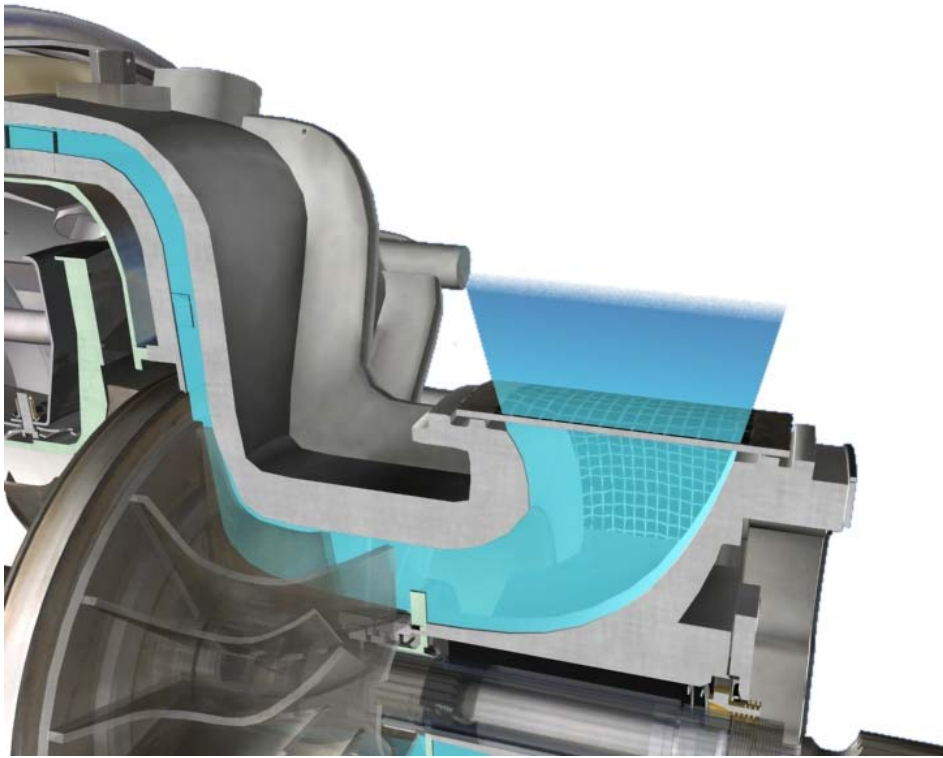
- a. Power plant assembly consists of three sections: The air inlet, compressor, and power turbine assembly, combustor assembly, and the Reduction drive assembly.

(1) Air inlet section.



- (a) Provides the intake of ambient air to the compressor.
- (b) The air inlet opening is covered by a wire mesh screen to protect against FOD ingestion.
- (c) During operation air is drawn in by the compressor rotor.

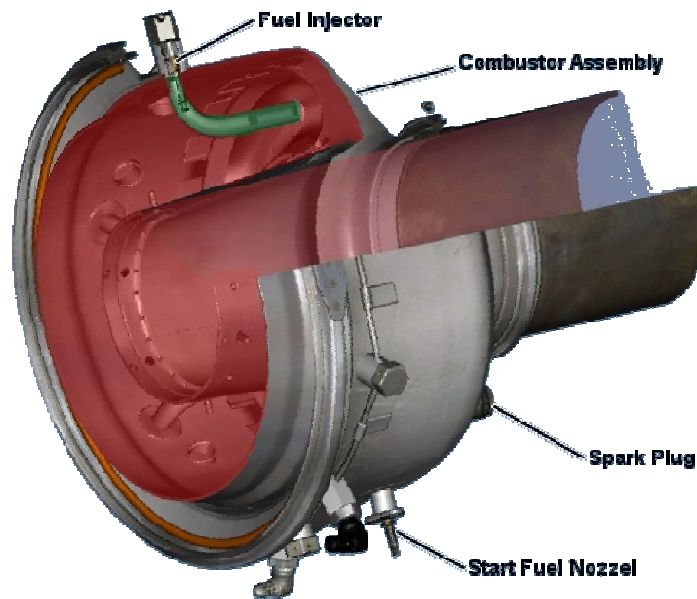
(2) Compressor section.



- (a) Single stage centrifugal-flow (impeller) type compressor rotor.
- (b) Air drawn in through the inlet is compressed by the centrifugal impeller.
- (c) The compressed air exits the impeller, it enters a diffuser, which changes the direction of the airflow and sends it to the combustor.

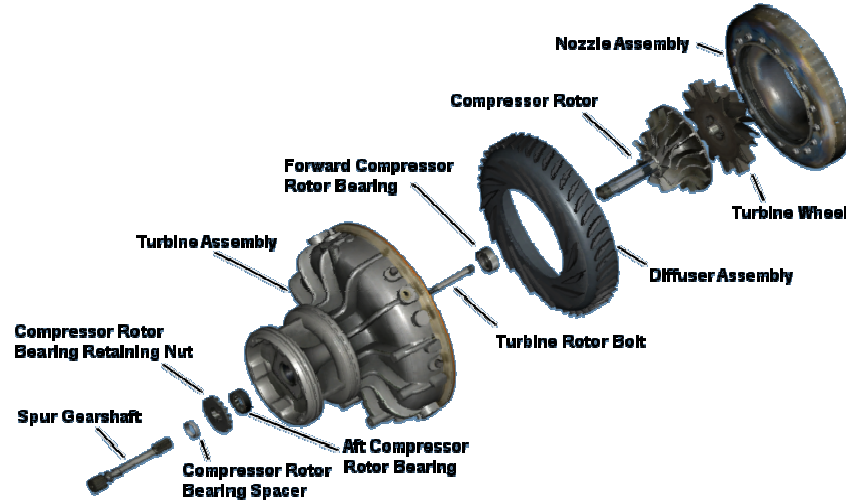
NOTE: The APU is not a free-air type turbine. The compressor rotor and power turbine rotor are directly mounted to a common shaft. This is different from the T55-GA-714 Engine where the compressor section and power turbine section are free to rotate independently of one another.

(3) Combustor assembly.



- (a) Combustor housing holds the liner, and its inner wall forms a circular exhaust duct.
- (b) Clamped to the aft end of the power turbine housing.
- (c) Receives air from the compressor diffuser.
- (d) A portion of the air supplied to the combustor is mixed with fuel and used in the combustion process (expanded).
- (e) Air that is not used in the combustion process is used as cooling air.
- (f) Combustor assembly consists of a liner within a housing.
- (g) Combustor housing has threaded bosses for installation of a spark plug, start fuel nozzle, and fuel manifold.
- (h) Directs the combusted (expanded) gasses through the turbine nozzle and onto the power turbine rotor.

(4) Power turbine section.



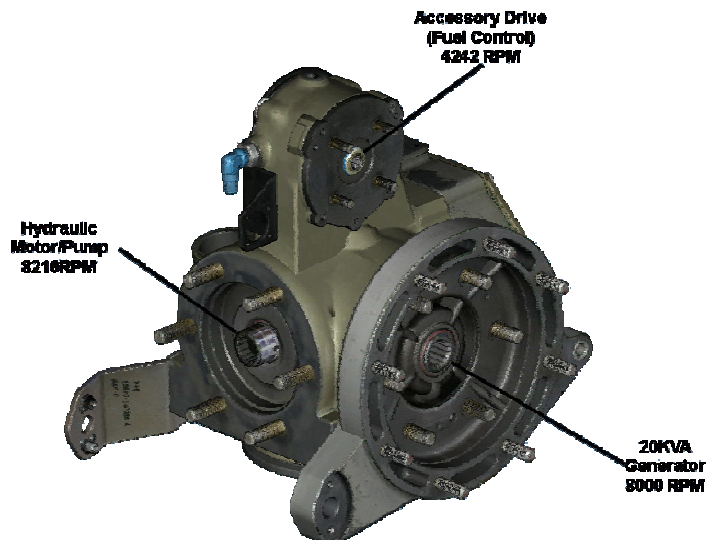
(a) Impeller type turbine rotor.

(b) Secured by a clamp to the aft end of the turbine assembly.

(5) Reduction gear assembly.

(a) Reduces power turbine shaft rotational speed to the components mounted on the drive pads through the use of a planetary gear system.

(b) Equipped with three mounting pads to drive accessories.



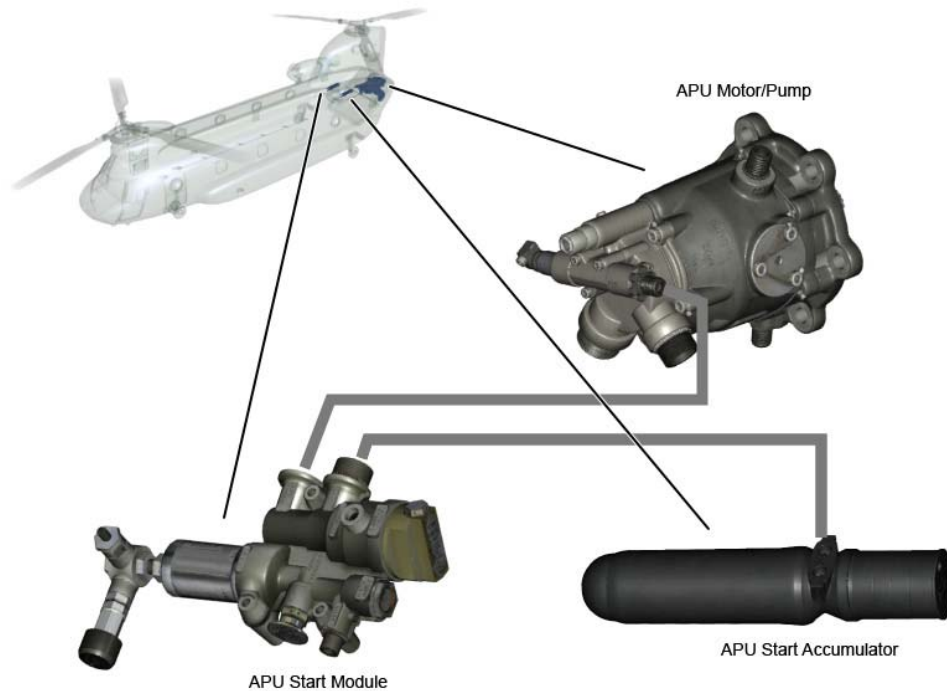
1. Axial pad drives the hydraulic motor/pump at 8216 RPM.

2. Right angle pad drives the 20 Kilo Volt Ampere (KVA) generator 8000 RPM.

3. Accessory pad drives the APU fuel control assembly 4242 RPM.

(c) The reduction drive housing has an integral oil system.

b. APU hydraulic system.



(1) APU Start accumulator.



(a) Located at Sta.555 on the right side underneath the aft transmission.

(b) Pressure is used to operate the utility hydraulic subsystems during an emergency or while on the ground with the APU off.

(c) Accumulator is 30 inches long and weighs 28 pounds empty.

(d) Accumulator capacity is 375 cubic inches of hydraulic fluid.

- (e) A pressure indication gauge is attached on the APU start accumulator. Check pressure on preflight (3,000 psi).

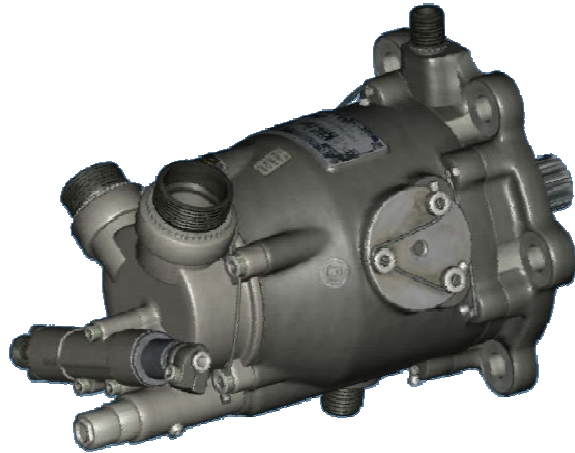
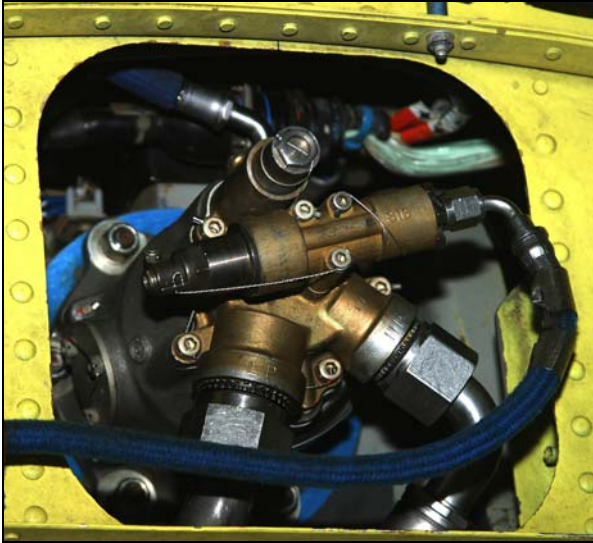


(2) APU Start module.



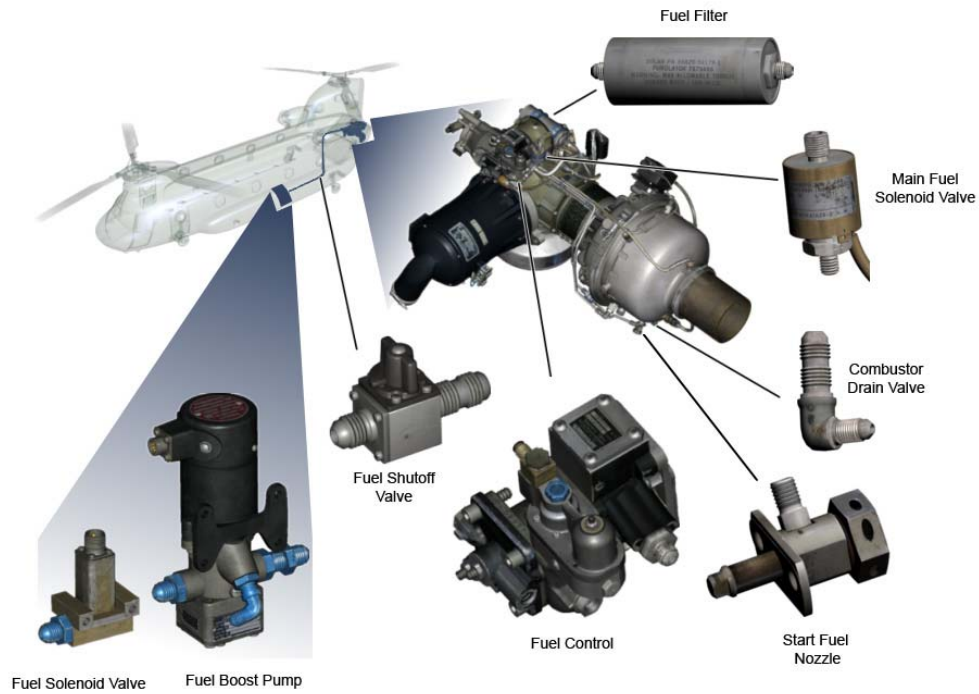
- (a) Located at Sta.570 on the right side of the canted deck just aft of the APU start accumulator.
- (b) Provides a signal pressure to the APU/Motor Pump compensator and start pressure to the APU motor.
- (c) Controls the mode of operations of the APU motor/pump by applying or removing the signal pressure to the motor/pump compensator.
- (d) Contains a manual depressurization valve, which is used to depressurize the APU start accumulator and the reservoir pressurization accumulator to facilitate maintenance on the utility system. The valve is located on the bottom center of the module.
- (e) Pressure indicator should indicate system pressure in the APU start accumulator.

(3) APU Motor/Pump.

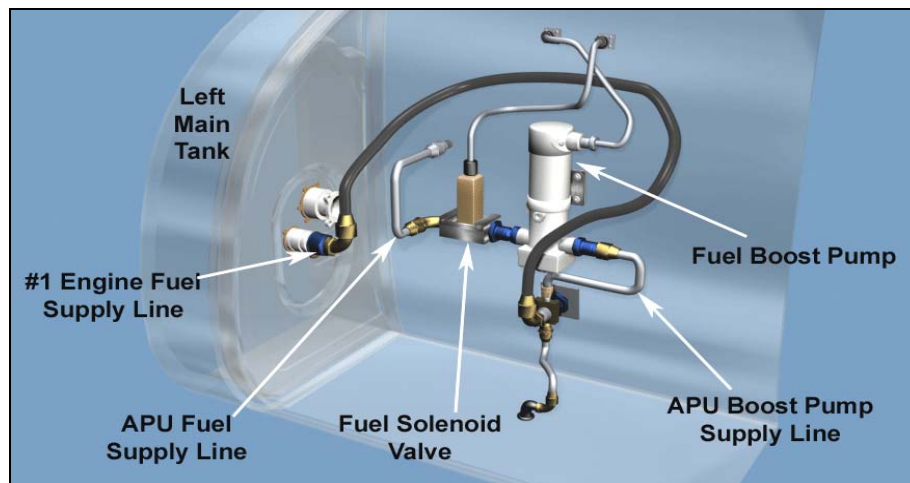


- (a) Mounted on the FWD end of the APU assembly. The primary function of the motor is to provide the RPM to start the APU.
- (b) Function of the Pump:
 - 1. Provides 3350 PSI of hydraulic pressure to start the main engines.
 - 2. Provides system pressure at a flow rate of 16.5 GPM and 100% RRPM for the utility hydraulic system.
- (c) The pump is a two delivery type pump.
 - 1. During APU start the motor/pump is a constant delivery motor.
 - 2. During normal operations the motor/pump is a variable delivery pump.

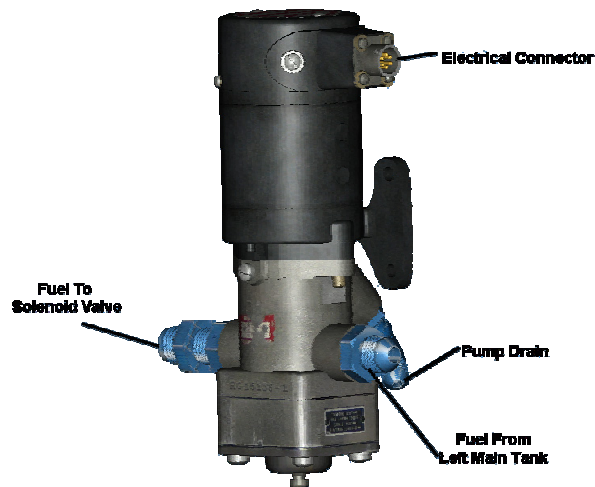
c. APU Fuel system.



NOTE: Fuel is supplied to the APU from the left main fuel cell by a fuel feed connector in the No.1 engine fuel supply line.



(1) Airframe mounted APU fuel boost pump.



(a) Rotary vane pump mounted in the aft left inter-tank area Sta.444.

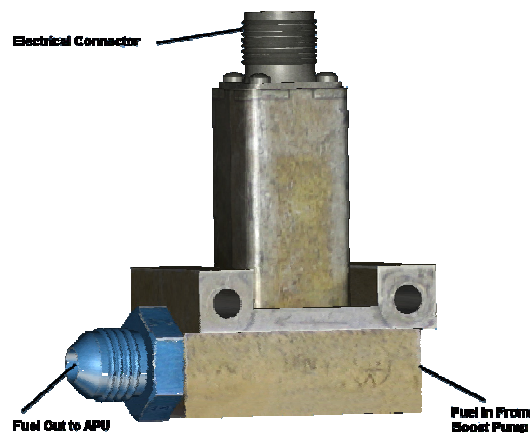
(c) Supplies fuel at 7–40 PSI to the APU driven fuel pump.

(d) Operates on 24/28 Volts Direct Current (VDC) off the hot battery bus, or the essential bus depending on the position of the battery switch.

(e) Energized when the APU start switch is placed to the “RUN” position.

(f) De-energized when APU switch is moved to the “OFF” position or when the APU fault relay is opened during an Electronic Sequence Unit (ESU) shutdown.

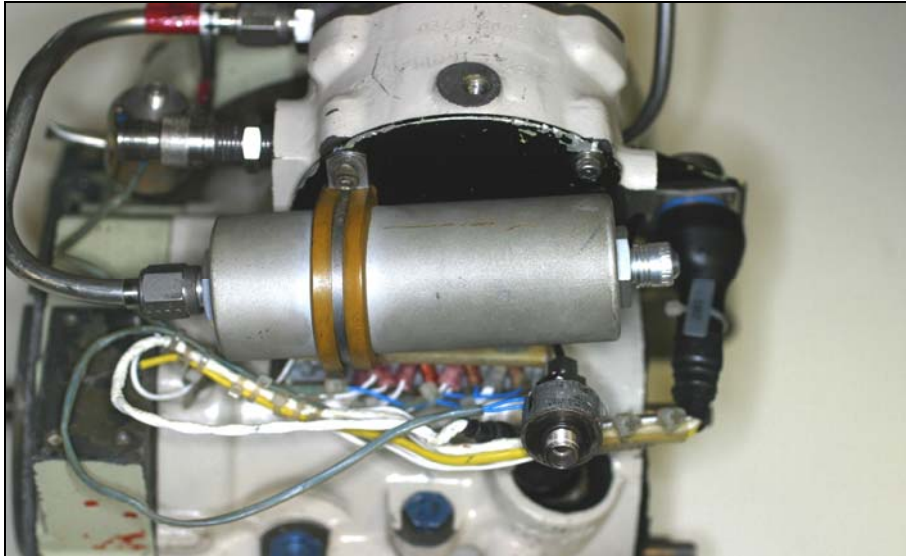
(2) APU Fuel solenoid valve.



(a) Mounted on the boost pump.

(b) It is normally closed, electrically opened valve.

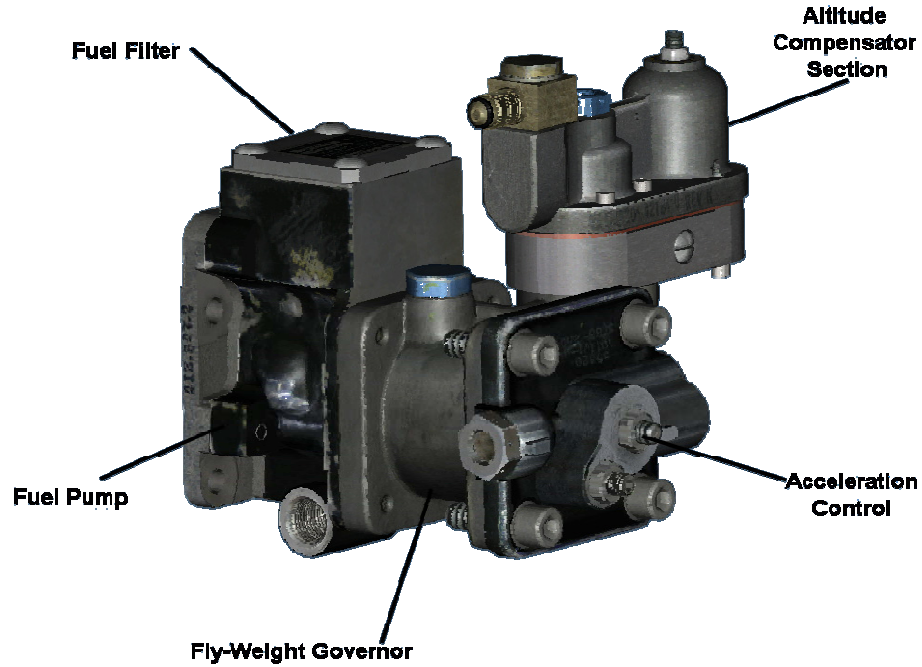
- (c) Stops the flow of fuel to the APU during an ESU shutdown of the APU.
 - (d) Operates on 24/28V DC off the hot battery bus, or the essential bus depending on the position of the battery switch.
 - (e) Energized open when the APU start switch is placed to the **"RUN"** position.
 - (f) De-energized when APU switch is moved to the **"OFF"** position or when the APU fault relay is opened (ESU shutdown).
- (3) Pressure fluid filter (APU inline fuel filter).



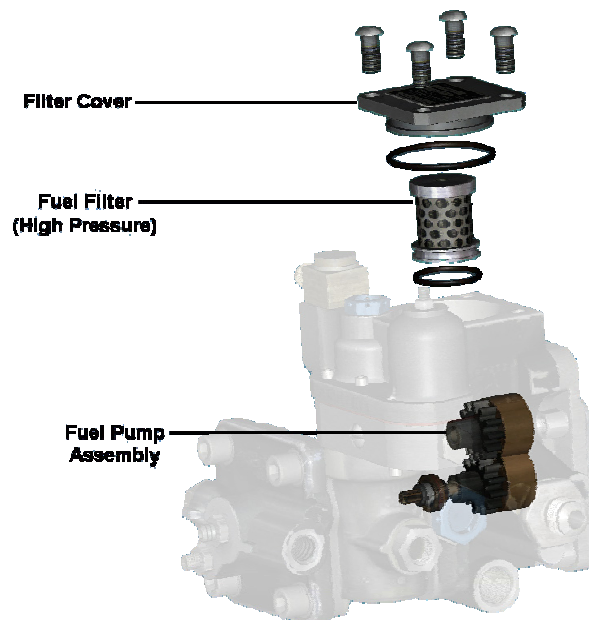
- (a) Paper filter element within an aluminum housing (disposable type filter element).
- (b) Mounted on top of the reduction drive assembly at the 3 O'clock position.
- (c) An arrow on the filter housing indicates proper direction of fuel flow.

NOTE: A unit of length equal to one-millionth of a meter. One Micron = 39 millionths of an inch (.000039"). Contaminant size is usually described in microns. Relatively speaking, a grain of salt is about 60 microns and the eye can see particles to about 40 microns. Many hydraulic filters are required to be efficient in capturing a substantial percentage of contaminant particles as small as 5 microns. A micron is also known as a micrometer.

(5) APU Fuel Control.



(a) APU fuel pump.

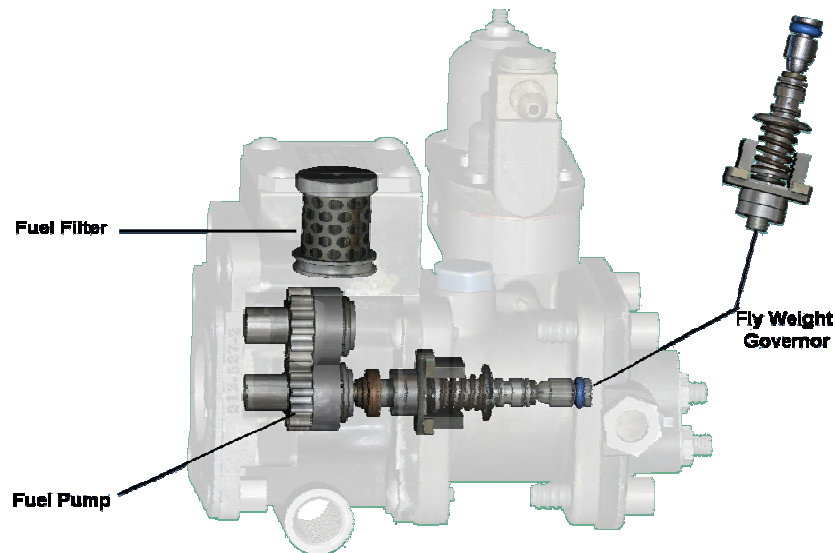


1. Mounted to and driven by the accessory drive pad.
2. A positive displacement, gear type pump.
3. At approx. 95% APU speed (4000 rpm), the pump can deliver 400 pph at 400 psi.
4. The pump contains a 25 micron wire mesh type filter.

NOTE: The APU fuel pump and the acceleration control assembly combined make up the fuel control.

NOTE: A positive displacement pump consist of two meshed spur gears in a housing. As gears rotate, fluid is carried in the space between the teeth. The positive displacement pump differs from centrifugal pumps, which deliver a continuous flow for any given pump speed. A relief device is provided on the discharge line to prevent over pressure and damage to pump if discharge line is closed off or severely restricted.

(b) Acceleration control assembly.



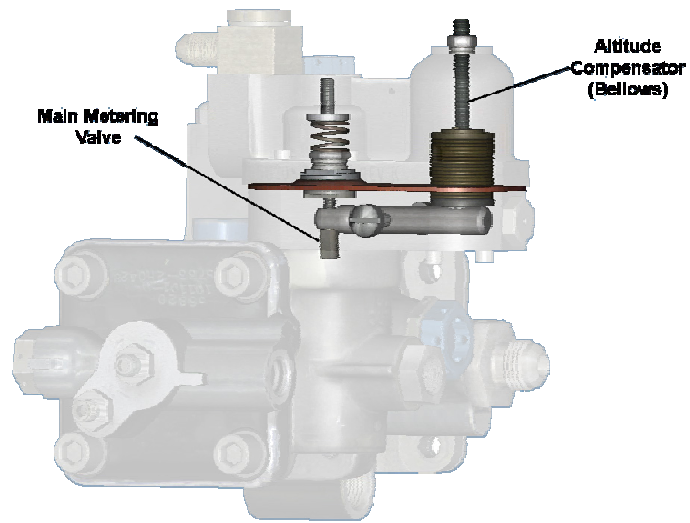
1. Contains a fly-weight governor section.

a. Driven by the fuel pump.

b. Controls the maximum operating speed of the APU.

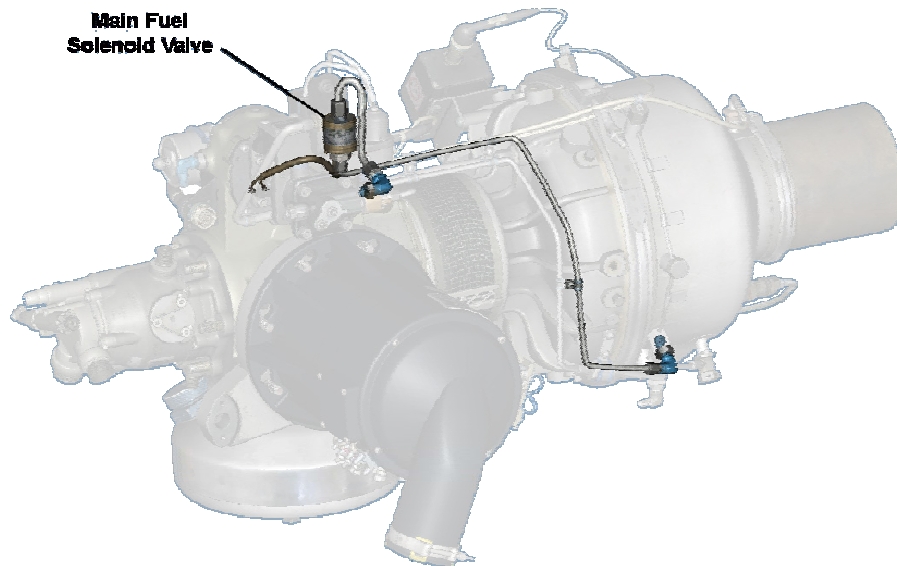
NOTE: A Fly-Weight governor measures engine speed, and makes adjustments to keep engine operating at or near the desired speed. When you place a load on the engine the drag of the additional load will slow down the fly-weight speed which in turn will increase the fuel flow to the fuel control. As the engine regains speed from the increased fuel the fly-weights will extend outwards reducing the fuel flow to maintain a constant RPM on the engine. The governor usually does this through a centrifugal force method, using flyweights.

2. Main metering valve.



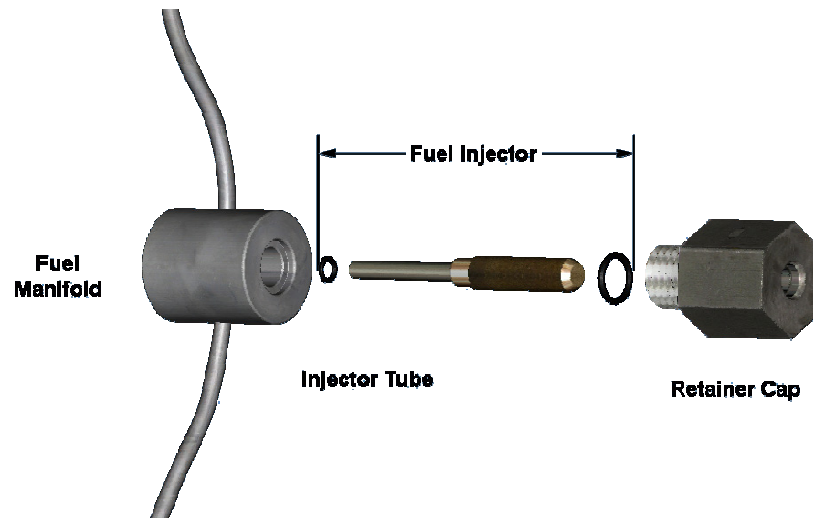
- a. Controls the amount of main fuel delivered to the combustor during the start sequence.
- b. Has automatic altitude compensation up to 15,000 feet.

(6) Main fuel solenoid valve.



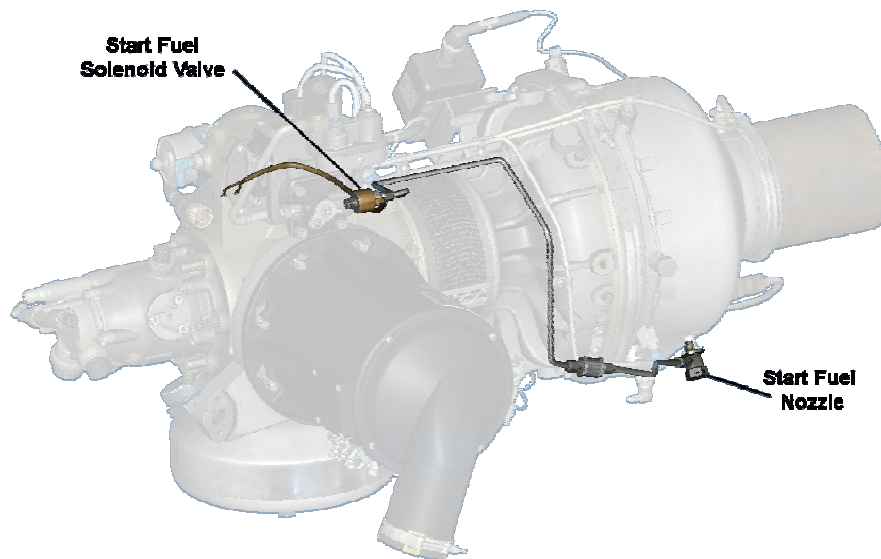
- (a) Operated by 28V DC from the ESU.
- (b) When opened, allows fuel to flow to the six main fuel injectors.
- (c) Energized open during the start sequence at 14% rated speed and remains open until the APU switch is placed to the "OFF" position.

(7) Fuel manifold.



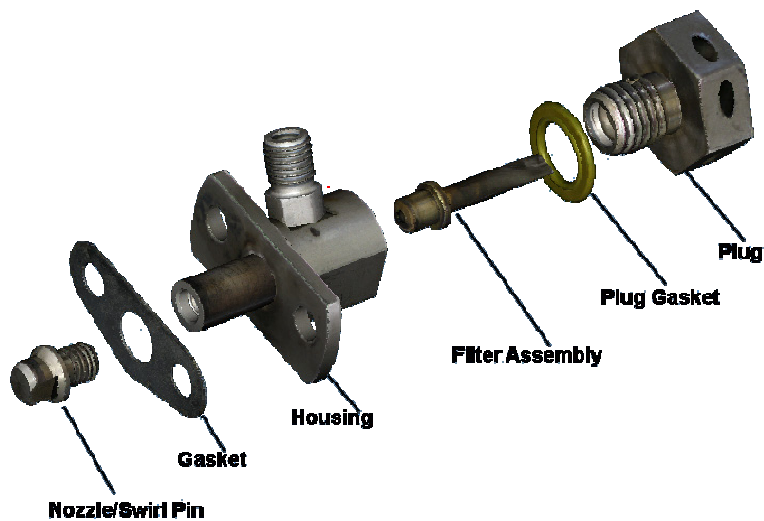
- (a) Consists of a metal fuel line attached to the outside of the combustor housing.
 - (b) Has six bosses equally spaced around the circumference of the manifold to hold the fuel injectors.
- (8) Fuel injectors.
- (a) Six fuel injectors are interconnected and equally spaced around the circumference of the combustor housing.
 - (b) Spray fuel into the injector (vaporizer) tubes which direct the fuel into the internal chamber of the combustor liner.
 - (c) The upper end of the injector is a porous metal filter which protects the fuel orifice.
 - (d) A packing seals the injector to the combustor housing.

(9) Start fuel solenoid valve.



- (a) Is a normally closed, electrically opened valve.
- (b) When open, allows fuel to flow to the start fuel nozzle.
- (c) Valve is energized open from 5–70% rated speed during the APU Start sequence.

(10) Start fuel nozzle assembly.



- (a) Mounted on the combustor housing at approx. 7 O'clock position.
- (b) Sprays fuel directly in front of the spark plug.
- (c) Fuel to the nozzle is controlled by the start fuel solenoid valve.

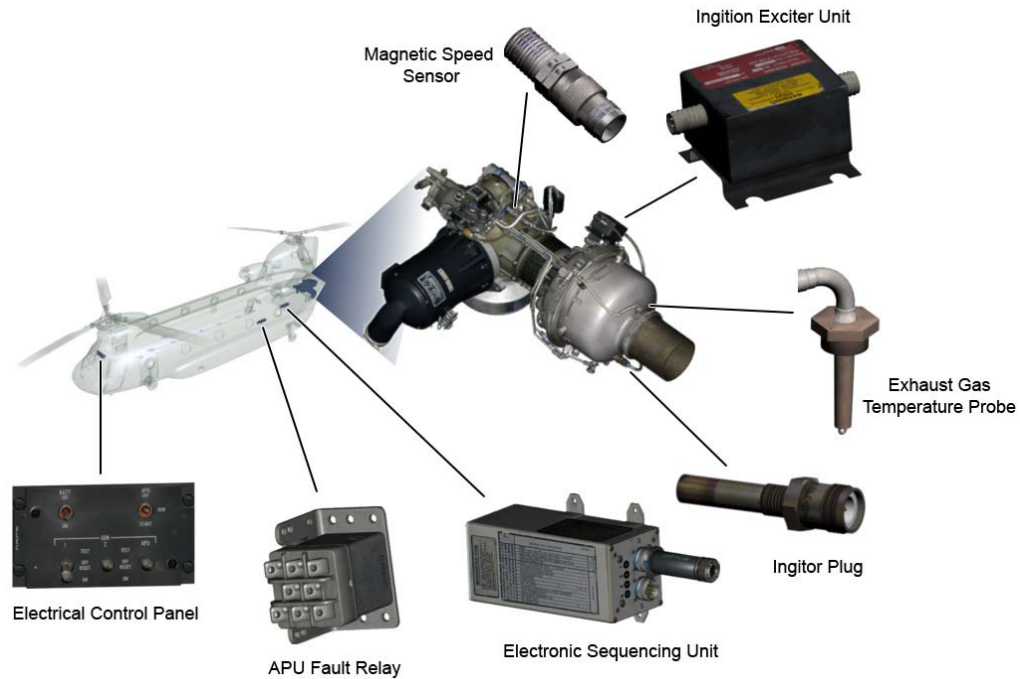
(13) Combustor drain valve.

(a) Located at the 6 O'clock position on the combustor assembly.

(b) Spring loaded open to allow residual and unburned fuel to drain from the combustor.

(c) Compressor discharge pressure closes the valve during APU operation.

d. APU Electrical system.



(1) Electrical panel.



(a) Battery switch is a two position switch.

1. The "ON" position provides Normal starting of the APU using the 24/28V DC

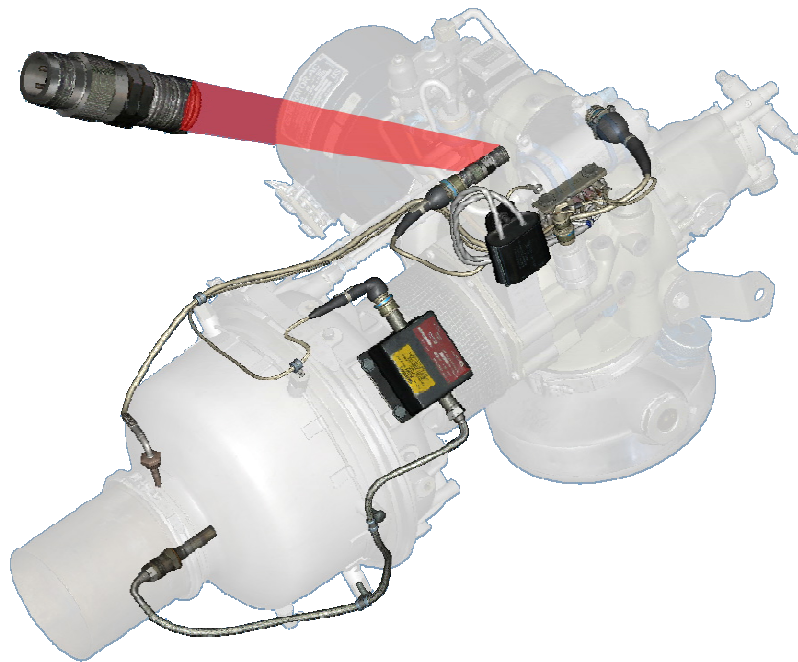
essential bus.

2. The “**OFF**” position provides Emergency starting of the APU using the 24/28V DC battery bus.

(b) The APU switch, a three position switch connects DC power to the APU system.

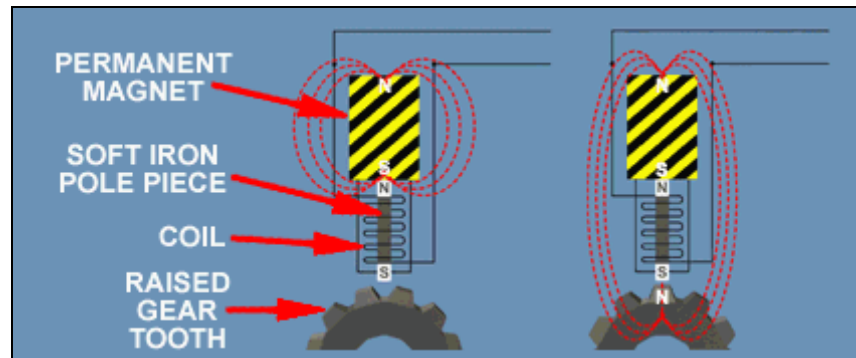
1. The “**RUN**” position.
 - a. Sends 28V DC to the ESU to provide power and to reset the BITE indicators.
 - b. Sends 28V DC through the fault relay to electrically open the fuel solenoid valve, energizing the airframe mounted fuel boost pump providing fuel pressure to the APU.
2. The “**START**” position connects 28V DC to the ESU which controls the APU Start.
3. The “**OFF**” position removes power from the ESU, shutting down the APU.

(2) Magnetic pickup.

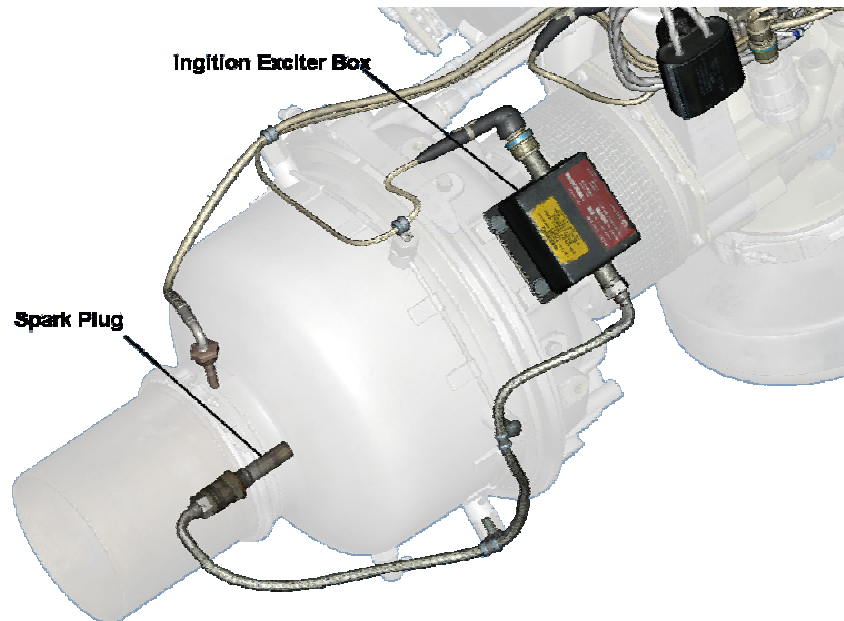


- (a) The magnetic pickup sends a speed signal to the ESU.
- (b) Installed in the aft side of the accessory drive pad, positioned directly behind the accessory drive gear.
- (c) Generates a pulsating signal (AC Voltage) at a frequency that is proportional to APU speed (RPM) that is transmitted to the ESU.

NOTE: An overspeed is an operating speed greater than 110% rated speed. An underspeed is an operating speed less than 90% rated speed after 90% + 1.5 seconds. An overspeed or an underspeed signal will result in ESU shutdown of the APU by closing the APU fault relay removing power from the APU fuel pump and solenoid valve.



(3) Ignition exciter box.



(a) Capacitor discharge type exciter mounted on the upper right side of the turbine housing.

(b) Converts the DC input to high energy AC output which is supplied to the spark plug.

(c) Requires a minimum of 14V DC to operate.

(4) Spark plug.

(a) Installed in a threaded boss at the 7 O'clock position of the combustor housing.

(b) It is a shunted gap type spark plug.

(5) Event/Time Meter.



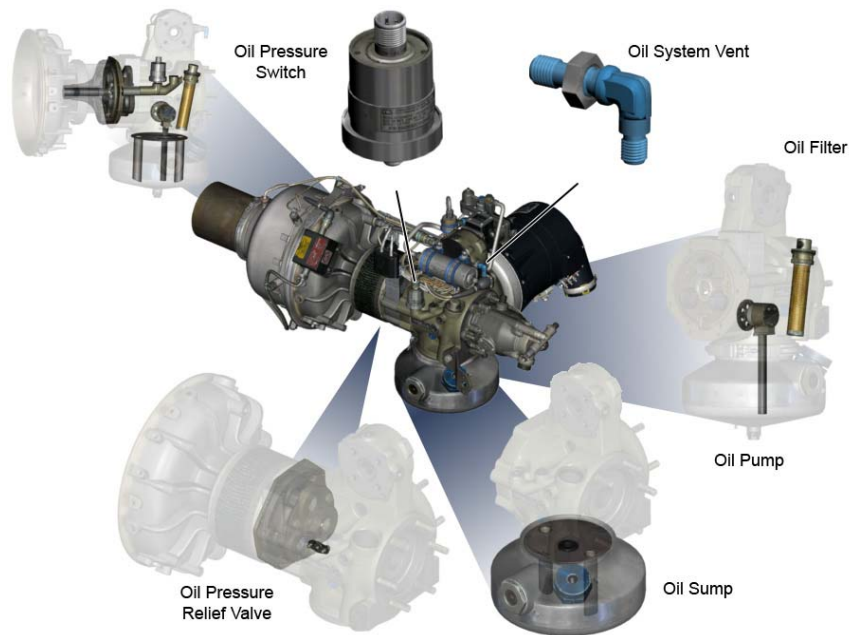
(a) Tracks starts on the rotor assembly.

1. Compressor rotor has a 6000 start life limit.
2. Counts the number of times the start fuel solenoid valve is energized during the start process (14% N_1).

(b) Tracks APU operational time.

1. Terminal 1 is energized at 14% N_1 as the main fuel solenoid valve is opened.
2. Continues to track the time while the main fuel solenoid valve is opened.

d. APU Oil system.



(1) Oil Sump.



- (a) Bowl type, with a three quart capacity container.
- (b) Mounted on the lower portion of the reduction drive, held in position by a clamp and sealed with a packing.
- (c) Has an oil level sight gage that faces the No.1 side of the aircraft.

1. When the oil level is at the bottom of the sight glass, approximately one pint of oil needs to be added.
2. A hollow aluminum ball is caged in the sight glass.

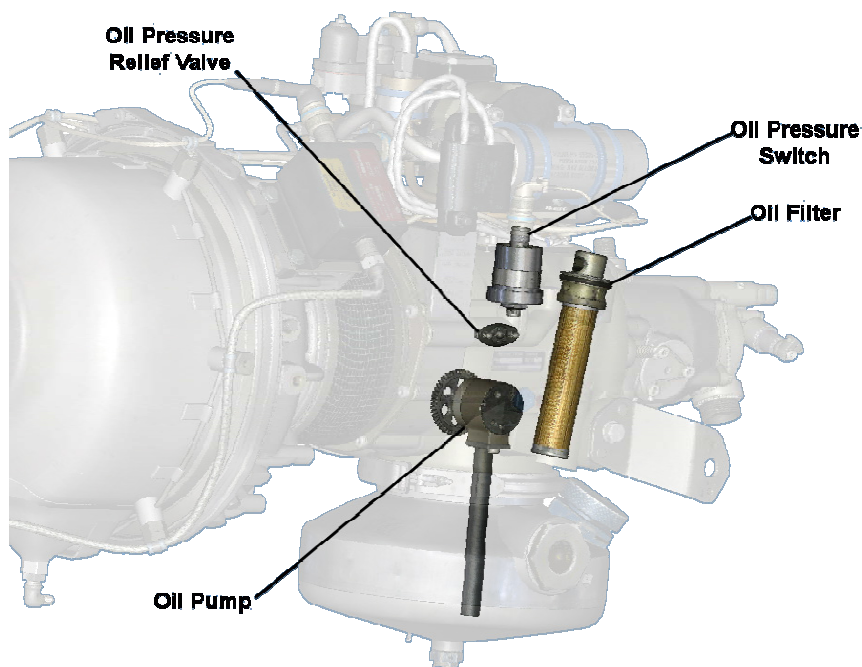
(d) Fill cap.

1. Used as a dipstick to check oil level.
2. Contains a screen to prevent contamination when servicing the sump.

(e) A magnetic plug and drain plug are installed at the bottom of the sump.

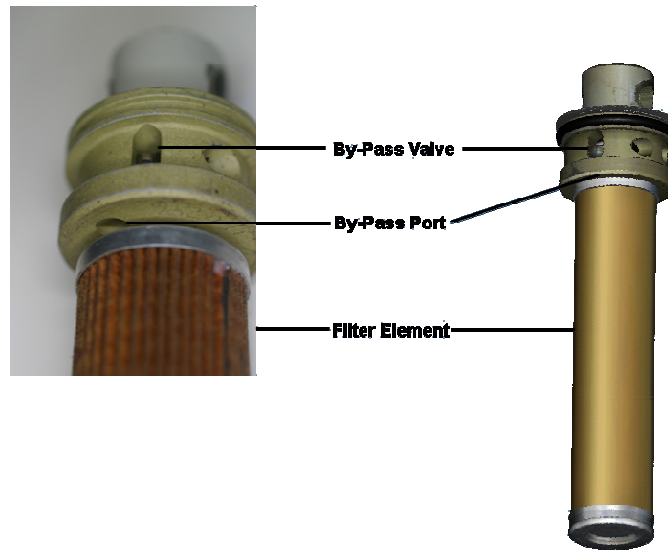
1. A drain plug is provided to facilitate ease of maintenance.
2. A magnetic plug is provided for collection and inspection of ferrous wear metals.

(2) Oil Pump.



- (a) Gear type pump driven by reduction drive assembly.
- (b) Draws oil up from the sump through a pick-up tube.
- (c) Forces the oil through passages to the oil filter housing.
- (d) Produces 15–40 PSI at the rated speed.

(3) Oil Filter.



(a) Contains a ten micron disposable filter element.

(b) An oil filter bypass valve incorporated in the filter cap will bypass oil at 15–40 psid.

(4) Oil pressure switch.



(a) Mounted on the accessory drive housing.

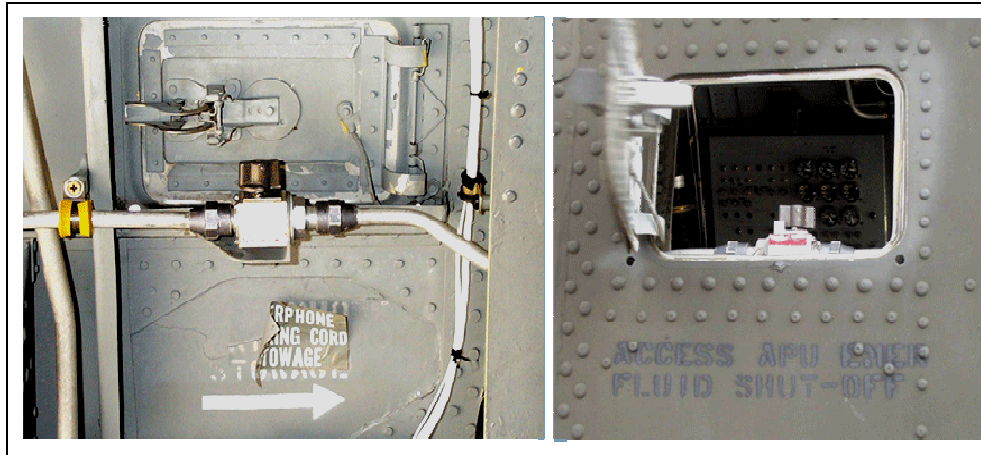
(b) Installed to preclude turbine and reduction drive failures.

(c) Monitors oil pressure and sends signal to ESU.

(d) Measures oil pressure after the oil flow has passed through the oil filter.

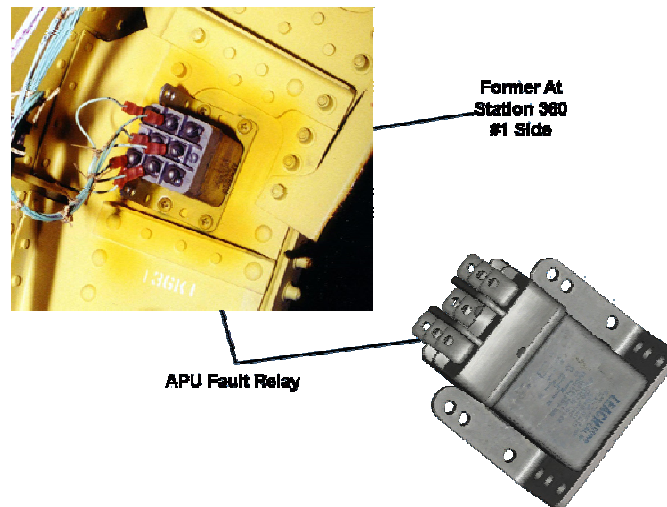
(f) ESU will initiate shutdown if oil pressure drops below 18 PSI during operation, and give a low oil pressure BITE code.

(3) Manual shutoff valve.



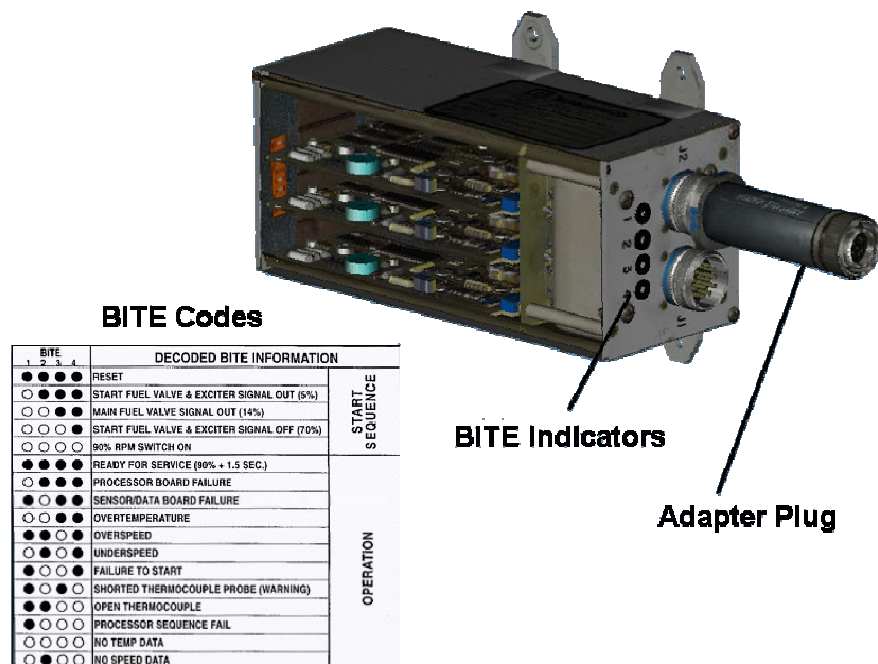
- (a) Installed in the APU fuel feed line at Sta.540 L/H side of ramp area.
- (b) Has an airframe access panel for operation while outside the aircraft.
- (c) Can be used to shut down the APU during an emergency when performing maintenance without direct access to the APU switch on the overhead panel.

(4) APU Fault relay.



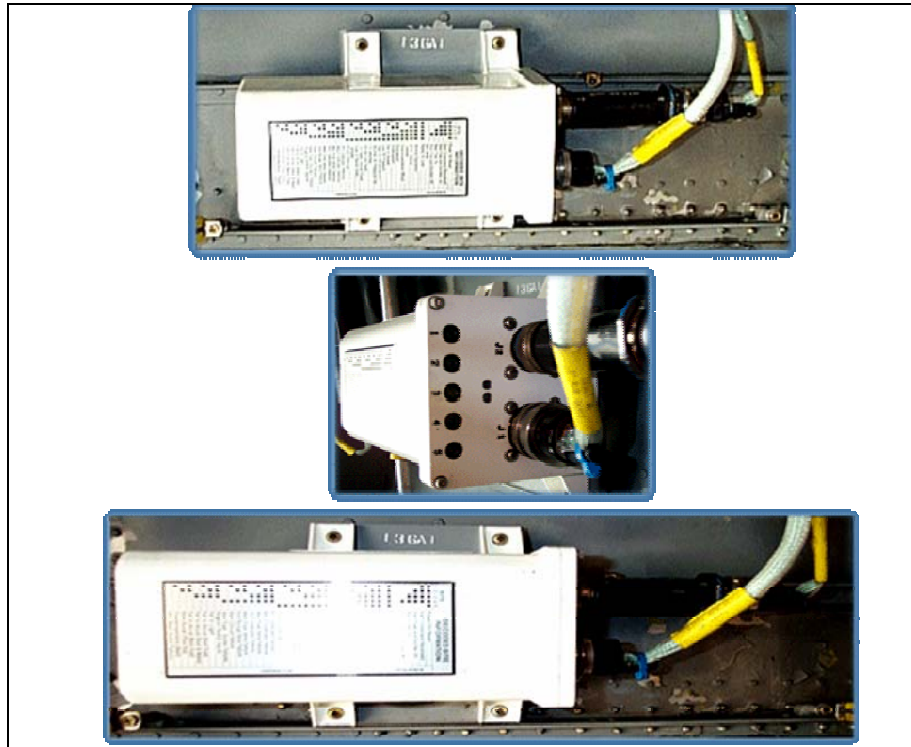
- (1) Mounted on a former at Sta.360 L/H side WL +40.
- (2) It is a normally closed relay.
- (3) The relay is operated by a 28V DC signal from the ESU.
- (4) De-energizes the airframe mounted fuel APU fuel boost pump and the APU fuel solenoid valve located in the aft left inter-tank area during an ESU shutdown of the APU.

(5) Electronic Sequence Unit (ESU).



- (a) The ESU sequences the start procedure of the APU and continuously monitors the APU operation.
- (b) After releasing the APU start switch, the ESU automatically sequences the steps for a successful start of the APU.
- (c) During operation, the ESU runs a check on itself and the APU.
- (d) Powered by 24/28V DC from the essential bus or battery bus (depending on BATT switch position).
- (e) The box has a decal that lists possible faults for the codes displayed by the fault indicators.
- (f) Contains built-in test equipment (bite) indicators.
 1. Four magnetically latched fault indicators are displayed on the ESU.
 2. The indicators display a code indicating 1 of 17 different APU system conditions.
 3. During the start sequence, the bite indicators display the last successfully completed step.
 4. During ESU shutdown of the APU, the bite indicators display the cause of the shutdown.
 5. Bite information can be decoded using TM 55-1520-240-T-3, chapter 15 of the troubleshooting manual.

- (g) Contains three circuit boards one of which has a microprocessor that runs a program in ROM (Read Only Memory).
- (h) The new modification ESU has five magnetic latch indicators (BITE).



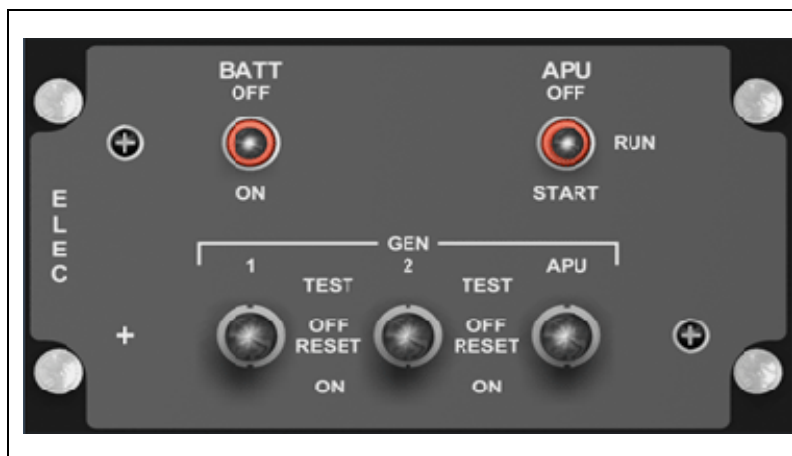
- (i) Two canon plugs for input and output of power and signals.
 - 1. Canon plug J1 is primarily used to interface with the APU.
 - 2. Canon plug J2 is primarily used to interface with the aircraft systems.
- (j) Adapter plug is provided to connect the ESU to the CH-47 aircraft wiring system.

3. Learning Step/Activity 3 – Describe Start Procedures, Operational Restrictions and Emergency Procedures of the APU.

a. Start procedures.

APU SW	CONDITIONS				APU SPEED						
	OFF	RUN	START	START PLUS 0.3 SEC	0% +	5%	14%	20%	70%	90%	90% + 1.5 SEC
AIRFRAME/ BOOST PUMP	DEENERGIZED (STOPPED)	ENERGIZED (RUNNING)									
AIRFRAME FUEL/ SOLENOID VALVE	DEENERGIZED (CLOSED)	ENERGIZED (OPEN)									
ESU MALFUNCTION/ (BITE) CKT	SHOWING LAST FAILURE INDICATION	RESET ●●●●				START/FUEL EXCIT. SIG OUT ○●●●	MAIN/FUEL SOL. SIG OUT ○○●●		START/FUEL EXCIT. SIG OFF ○○○●	90% SW ON ○○○○	READY FOR SERVICE ●●●●
APU START ACCUMULATOR	3000 PSI INDICATION				STARTING TO DEplete			DEPLETED		STARTS TO RECHARGE	3000 PSI
APU ON ADVISORY LIGHT	OFF										ON
FAILURE RELAY 136K1	DEENERGIZED										
HYD. START MODULE PILOT SOL VALVE	DEENERGIZED (CLOSED)		ENERGIZED (OPEN)							DEENERGIZED (CLOSED)	
HYD START MODULE PRESSURE OPERATED VALVE	CLOSED		STARTS TO OPEN	OPEN				CLOSED			
MOTOR PUMP	PUMP MODE		START (MOTOR) MODE		TURNING APU			SHIFT TO NEUTRAL MODE		PUMP MODE	
MAG PICKUP	NO SIGNALS TO ESU				SIGNALS TO ESU						
THERMOCOUPLE					INDICATING CHANGES TO ESU						
IGNITION EXCITER/ SPARK PLUG	OFF				ON				OFF		
START FUEL SOLENOID	DEENERGIZED (CLOSED)				ENERGIZED (OPEN)				DEENERGIZED (CLOSED)		
ESU 40 SEC TIMER CKT	OFF				ON					OFF	
MAIN FUEL SOLENOID	DEENERGIZED (CLOSED)						ENERGIZED (OPEN)				
OIL PRESSURE SWITCH									18 PSI		
EVENT METER							START REGISTERED				

- (1) Placing the APU start Switch from **OFF** to **RUN** for 3 to 5 second closes terminal 4. 28V DC from terminal 4 of the APU switch is applied thru the fault relay contacts to open the circuits on the ESU, Fuel Pump and Start Fuel Solenoid Valve. Voltage is applied to the ESU for power to RESET the BITE indicators.



- (2) Setting the switch to **START** for 2 seconds, closes terminal 1 and 2. Voltage from terminal 1 goes to ESU and provides a start signal. Once released to the **RUN** position, it

opens the pressure operated valve on the APU start module. Pressurized fluid from the accumulator flows thru the valve and motors the motor/pump and the APU.

- (3) APU Control unit or ESU. Located on the L/H side of the ramp area at Sta.519 WL 50 and is accessible from the ramp area.
 - (a) Controls and monitors start and operation of the APU. As the APU starts to rotate a magnetic pickup generates a signal proportional to the APU speed. The APU process this speed signal which schedules events at 5, 15, 70 and 90% rated speed. The ESU also monitors exhaust gas temperature. A thermocouple in the combustor assembly generates a signal which is proportional to the EGT. When the APU reaches 5% of rated speed a 40 second timer starts. If the APU does not complete a start in 40 seconds, the fault relay operates and stops the fuel flow to the APU.
 - (b) At 5% rated speed, the ESU applies a start fuel signal (28V) to the APU. This signal opens the start fuel valve and powers the exciter. The exciter provides a high-energy pulse to the spark plug. Fuel is directed thru the start fuel nozzle and vaporized in the combustor where it is ignited by the spark plug. This action increases APU speed.
 - (c) At 14% rated speed, the ESU applies the main fuel signal to the APU. This signal opens the main fuel valve. From this valve, fuel flows thru the fuel manifold and six vaporized tubes to the combustor. This additional fuel accelerates the APU.
 - (d) At about 20% of rated speed, the APU start accumulator depletes its charge. This will cause the motor/pump to shift to neutral.
 - (e) At 70% rated speed, the start fuel signal stops. The exciter and start fuel are turned off. Combustion is self sustaining.
- (4) The ESU monitors speed and exhaust gas temperature on the APU.
 - (a) Over temperature – 1250°F.
 - (b) Normal Temperature – 1150°F.
- (5) Shuts down APU when a limit is exceeded:
 - (a) Over speed – 110%.
 - (b) Under speed – 90% (1.5 sec).
- (6) After start is complete, the ESU monitors APU and itself.
- (7) If the APU start is not completed or the APU is automatically shutdown:
 - (a) Set the APU switch to off.
 - (b) Record the BITE information on the –13.
 - (c) Turn the battery switch off.

(8) Master Caution/Advisory panel.



(a) APU ON advisory light indicates the APU is running properly.

(b) **UTIL HYD SYS** caution light must go out within 30 seconds after the APU ON advisory light comes on.

NOTE: During the start operation the APU start is automatically controlled by the ESU. If the APU does not complete a start in 40 seconds, the fault relay operates and fuel flow to the APU will stop.

b. APU Operational restrictions.



(1) The APU is intended for ground operation only. The APU operation in flight is prohibited except, during emergencies.

(2) The APU shall not be started with a tail wind in excess of 25 knots.

NOTE: The instructor will explain the current –10 procedures.

CAUTION: When the rotors stop turning, no hydraulic pressure is available to motor the engines. In the event of internal engine fire when engine motoring cannot be accomplished, use fire extinguishing equipment as necessary to extinguish the fire.

NOTE: Normally an over-temperature condition will cause the over-temperature switch to stop APU operation; however, should a fire other than normal combustion occur at the APU, complete the following:

c. Emergency procedures.

(1) APU Fire.

(a) **APU switch – OFF.**

(b) **ABORT START.**

NOTE: Immediately motor engines alternately, until rotors are stopped, to reduce the possibility of engine residual fire.

Appendix C – Practical Exercises and Solutions

CH-47D AUXILIARY POWER UNIT

PRACTICAL EXERCISE

NOTE: This practical exercise covers the instruction you received in this handout. Completion is optional, but strongly encouraged!

1. What information should be entered on the -13 if the APU ON caution light fails to come on?
2. The APU switch should be place to OFF if the APU fails to start or automatically shuts down. When this happens where should the battery switch be positioned?
3. What action should you take if the UTIL HYD SYS caution light has not gone out within 30 seconds after the APU ON caution light comes on?
4. What 2 components are driven by the APU?
5. Control and monitoring of the APU is accomplished through what components.
6. What restriction is placed on APU operation during flight?
7. How long do you delay in the RUN position before going to START?
8. What does the APU ON caution light indicate?
9. How long must the APU switch be held at the START position during the start procedure?
10. What is the maximum tail wind for starting the APU?
11. After the APU control caution light comes on, how long may the utility Hydraulic caution capsule remain on?
12. When the APU is shutdown, how long should you wait before attempting a restart?

CH-47D AUXILIARY POWER UNIT
PRACTICAL EXERCISE SOLUTIONS

1. Record the BITE information from the ESU.
2. Leave the battery switch on.
3. Place the APU switch to OFF position.
4. APU motor/pump, and APU generator.
5. The ESU.
6. Emergencies only.
7. 3 – 5 seconds.
8. APU is operating properly.
9. 2 seconds.
10. 25 Knots.
11. 30 seconds.
12. 1 minute.

