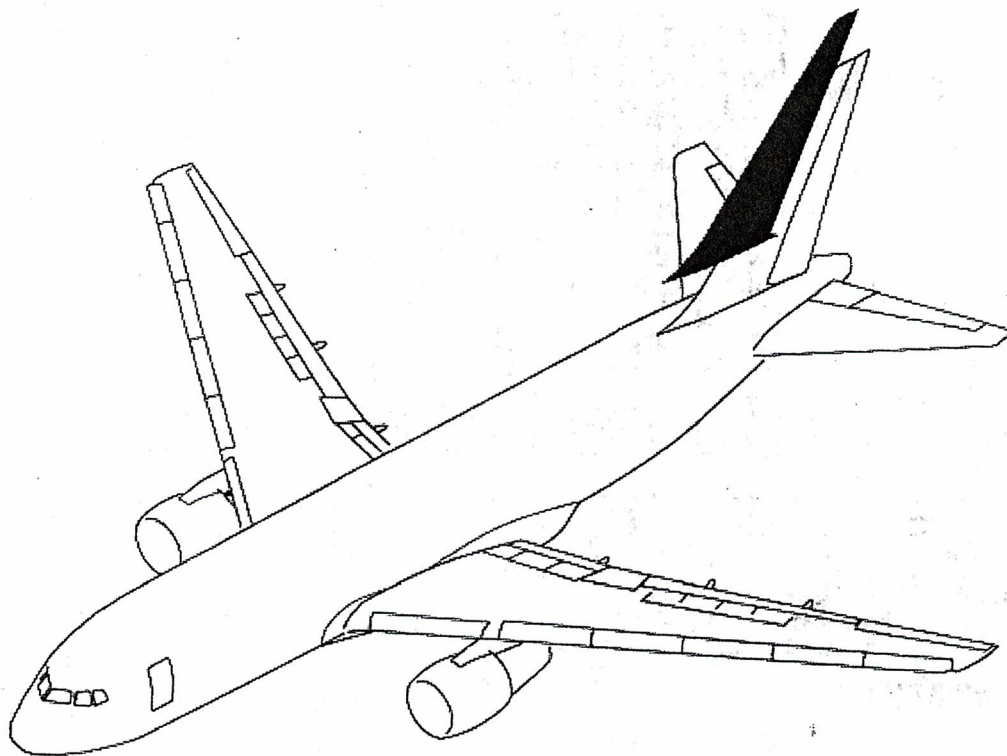
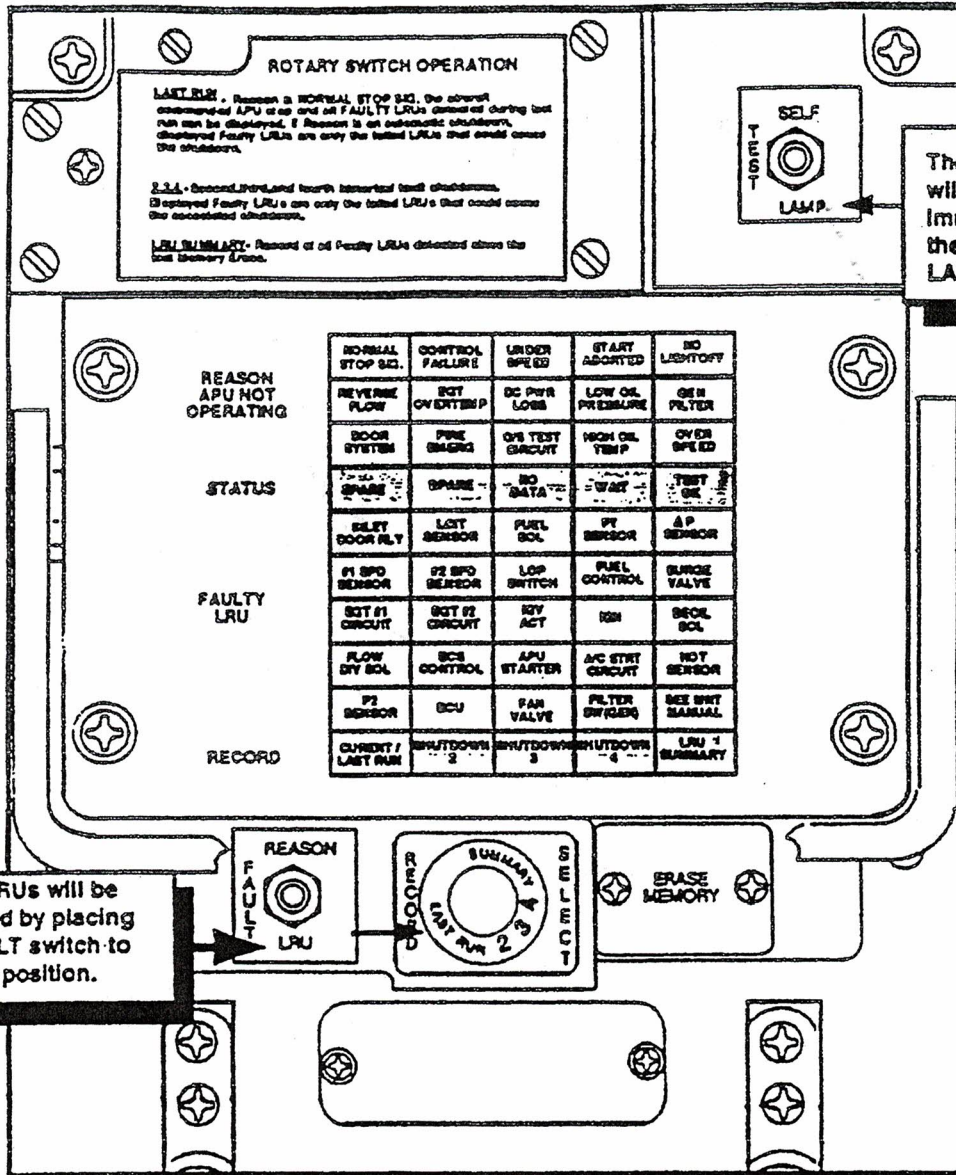


BOEING 757 / 767



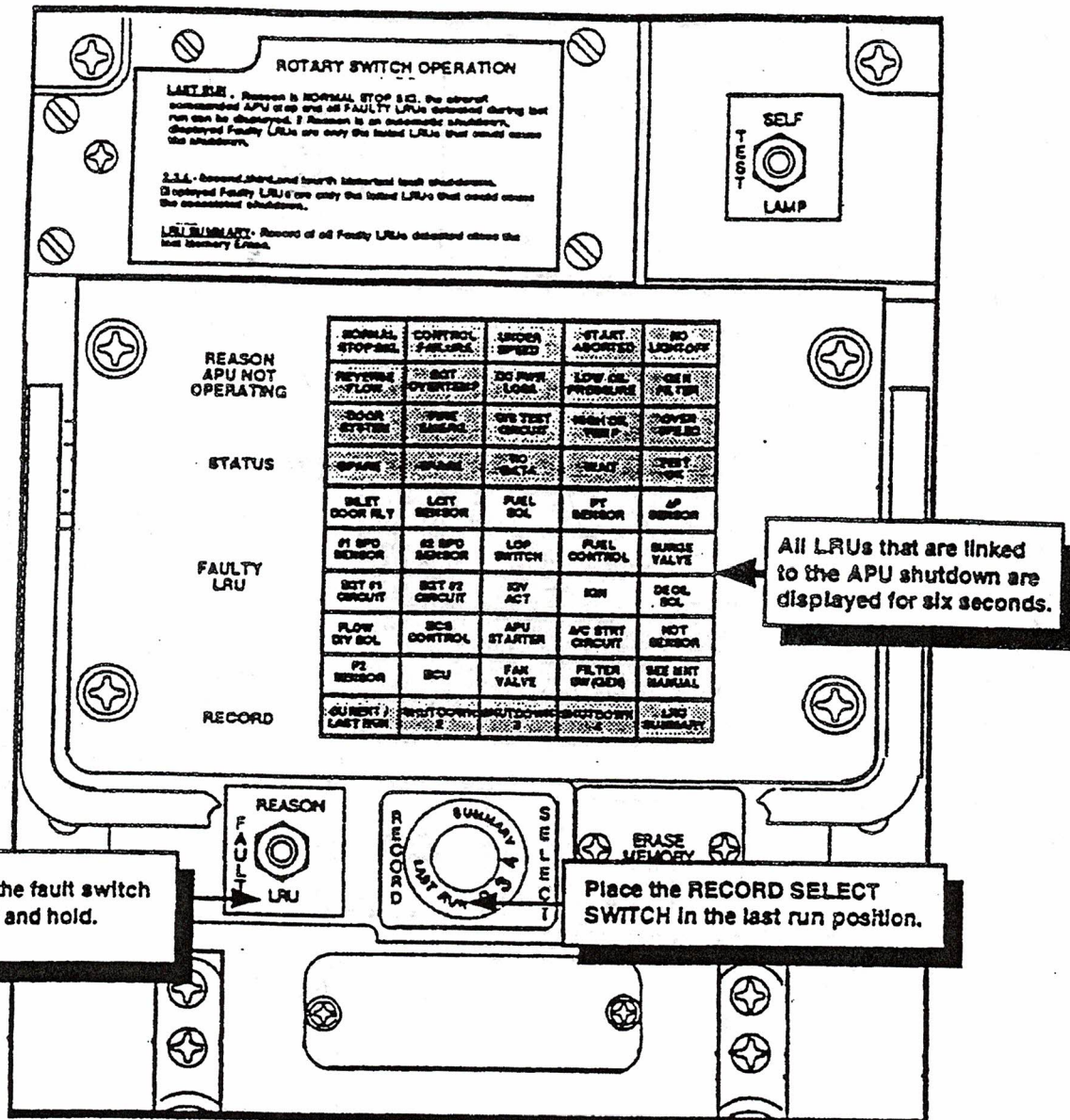
APU ECU – BITE MINI – FLAG

AlliedSignal Aerospace BITE Interrogation Study Guide
For the B757-767 331-200 Auxiliary Power Unit
Dash 19 and 20 Electronic Control Unit, Part Number 2117342-19 and 20



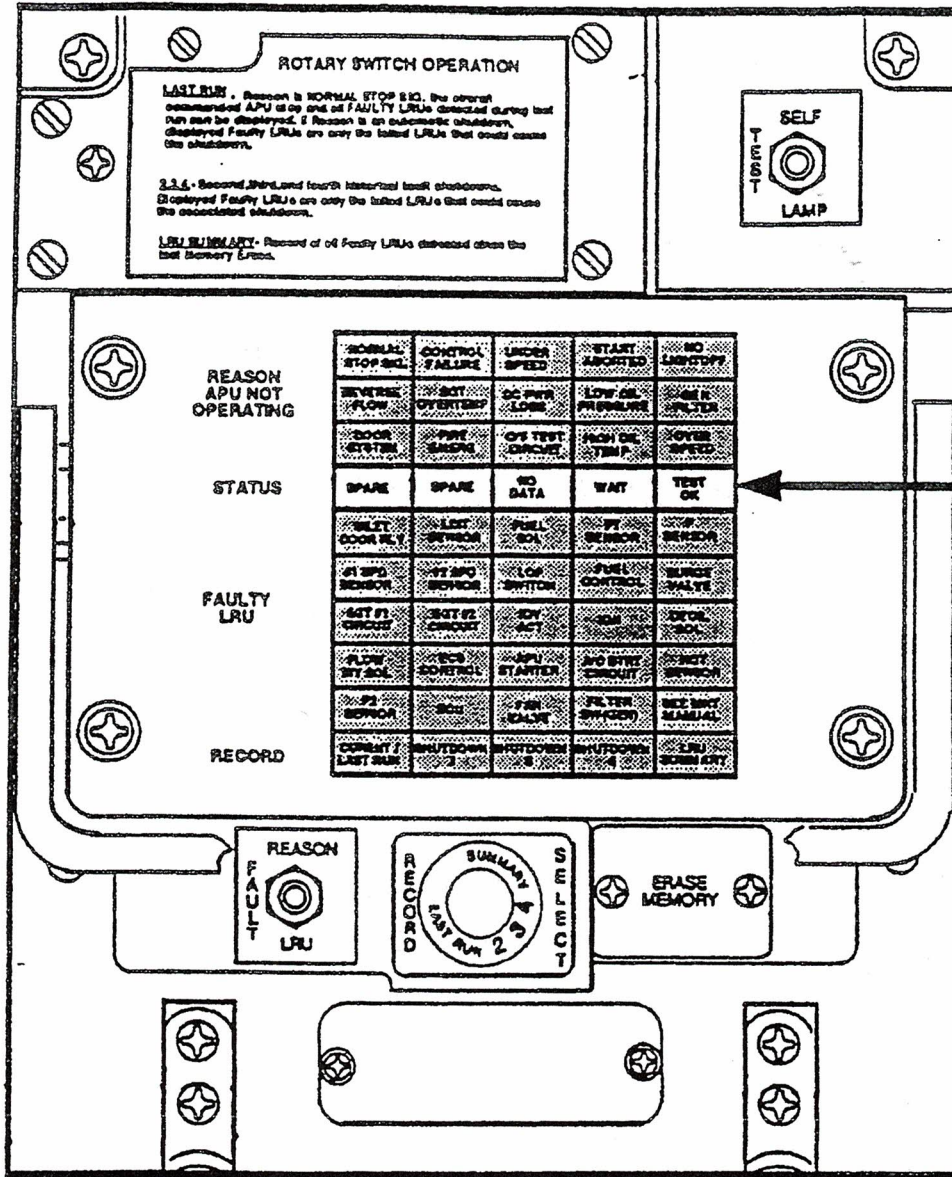
BITE INTERROGATION WITH APU OPERATING

The ECU BITE can be interrogated with the APU operating.



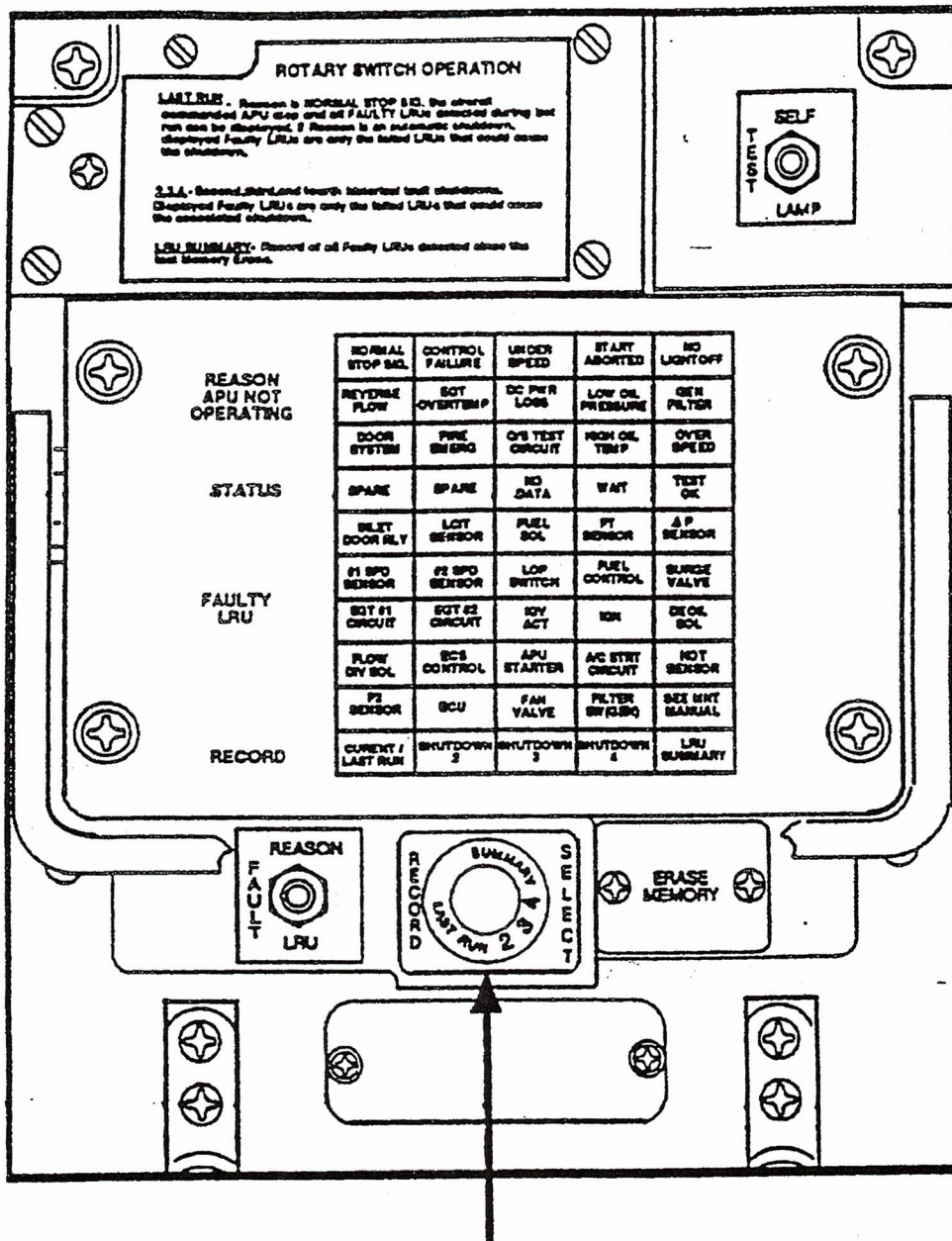
FAULTY LRU DISPLAY

LRU'S that have been detected as failed during prestart BITE and monitor BITE mode.



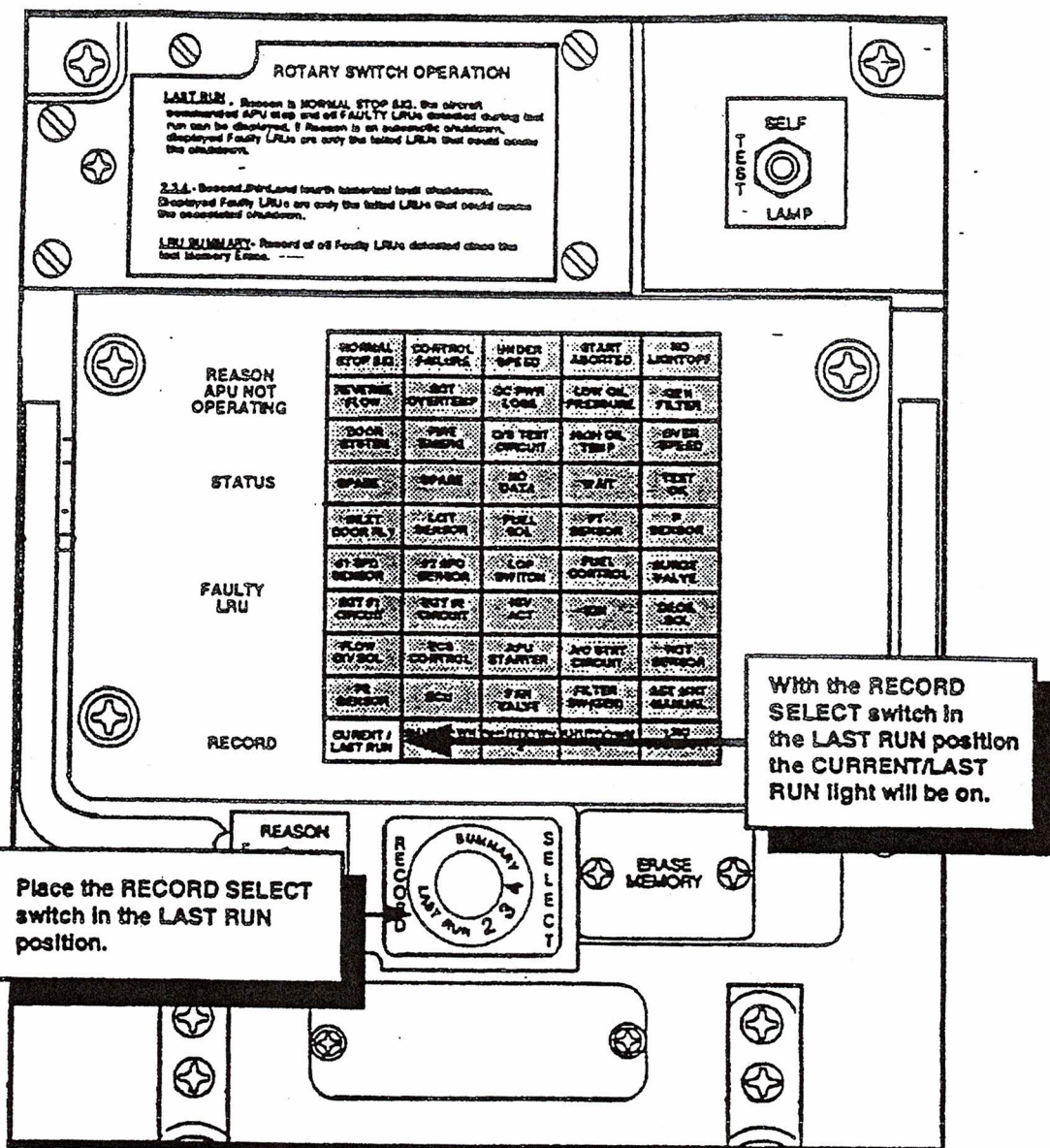
STATUS DISPLAY

The STATUS middle display line displays processing information for either the REASON NOT OPERATING or FAULTY LRU displays.



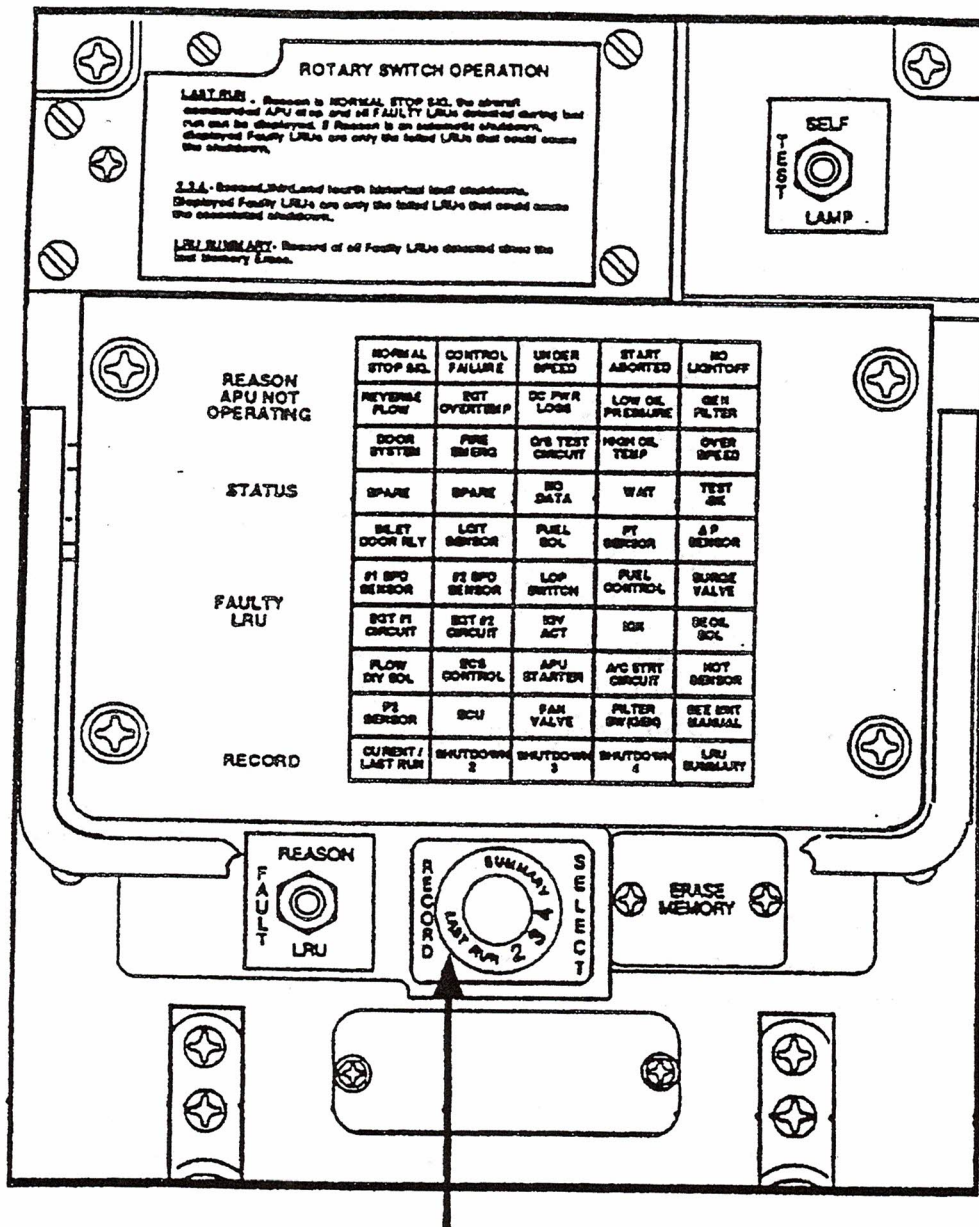
RECORD SELECT SWITCH

The RECORD SELECT TEST switch selects which previous shutdown information is to be displayed.



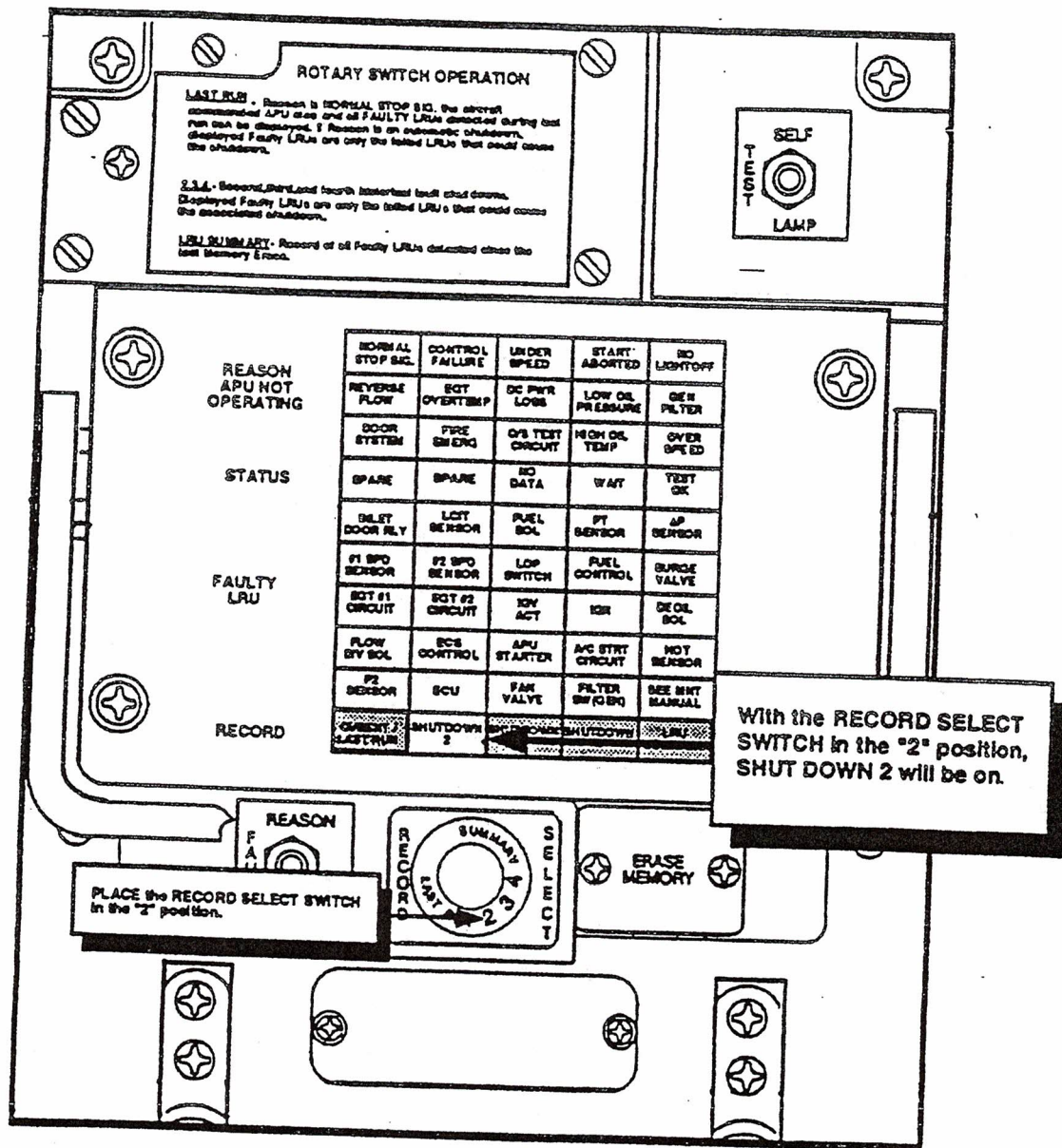
RECORD DISPLAY

The RECORD DISPLAY shows the position of the RECORD DISPLAY switch. The display light is on continuously when the ECU is powered except during a request for SELF TEST, LAMP TEST or MINIFLAGS.



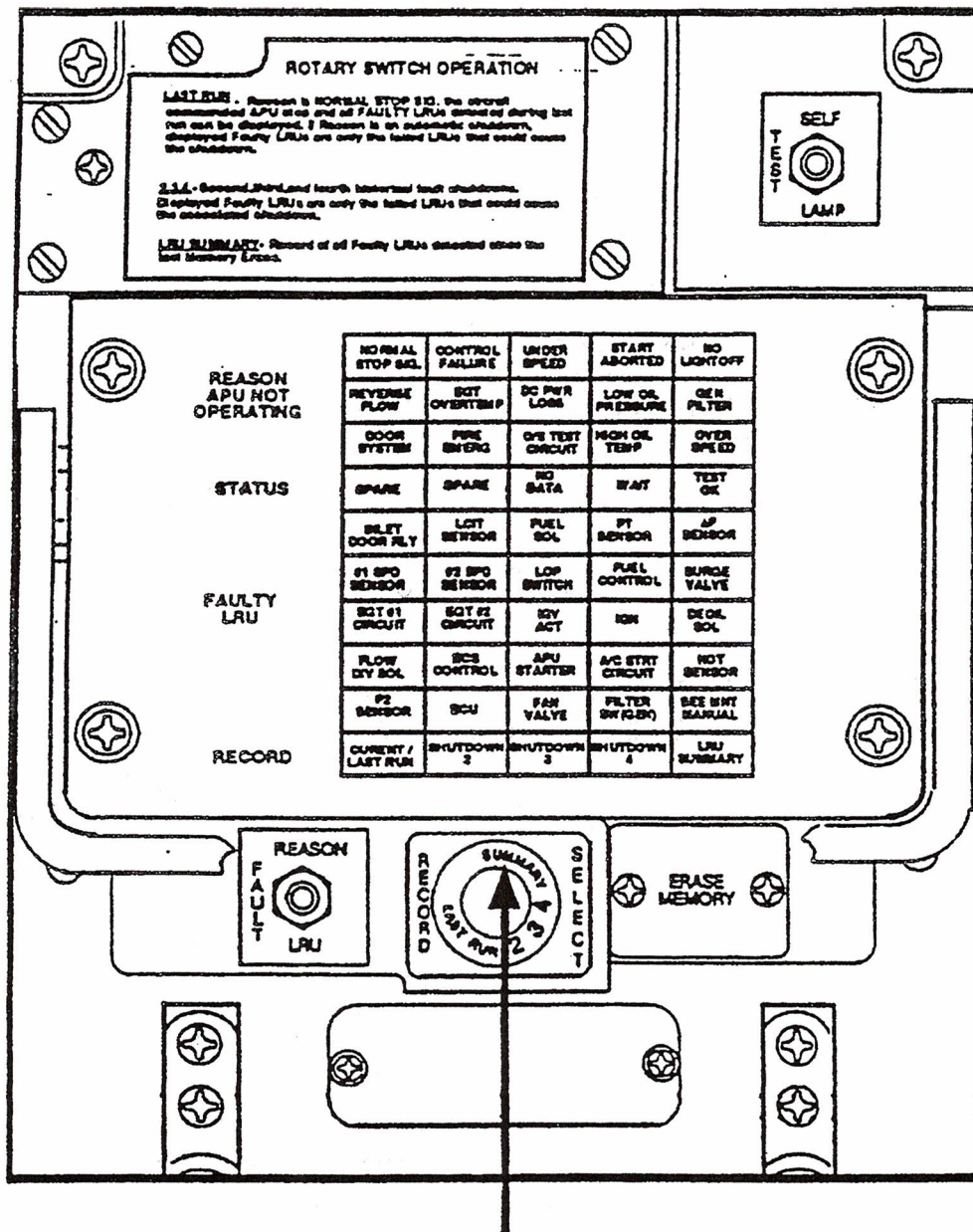
LAST RUN POSITION

The LAST RUN position displays the most recent shutdown or normal stop.



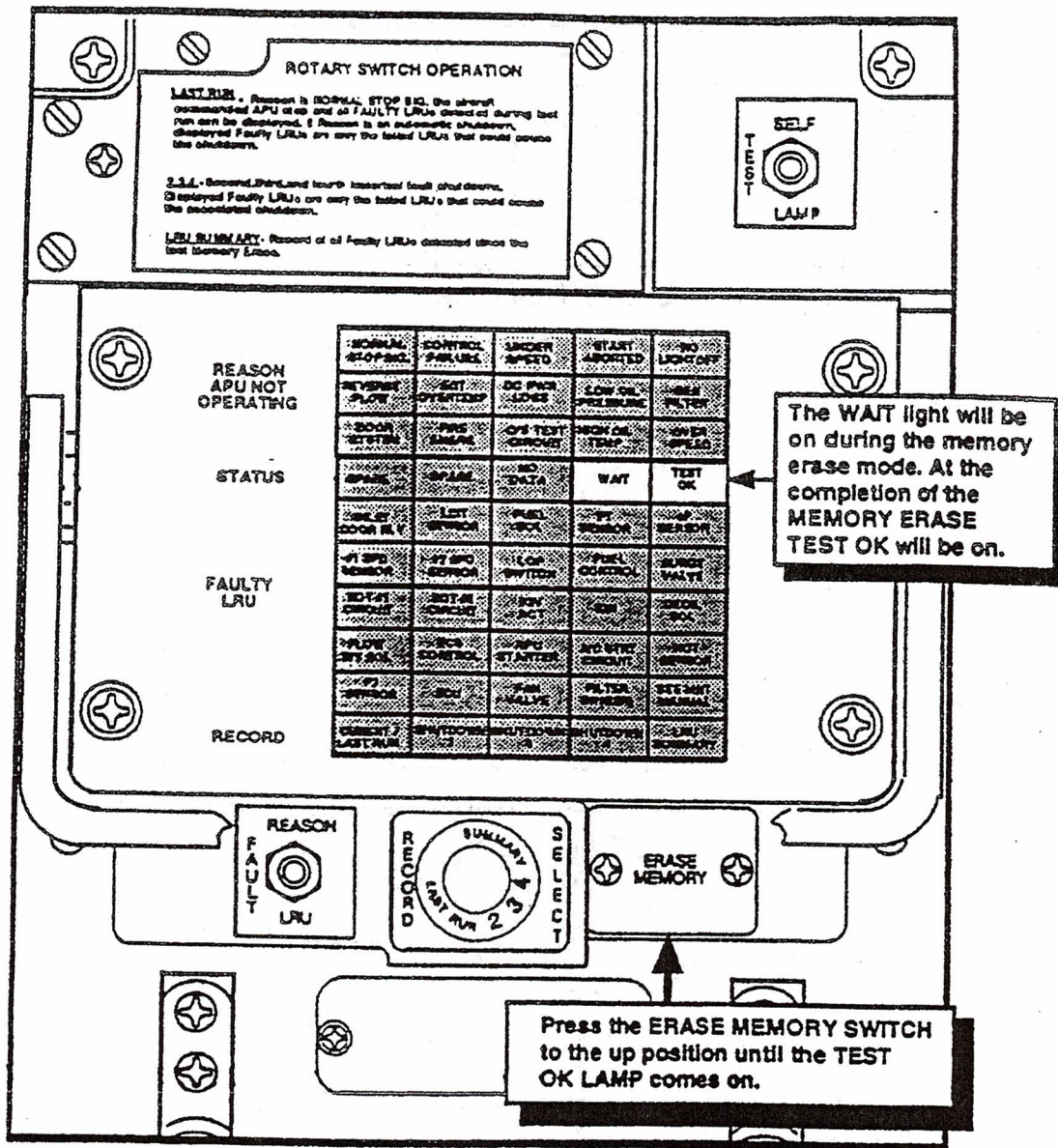
RECORD SELECT SWITCH POSITIONS 2, 3 AND 4.

The switch positions 2, 3 and 4 displays the second third, and fourth previous shutdowns.



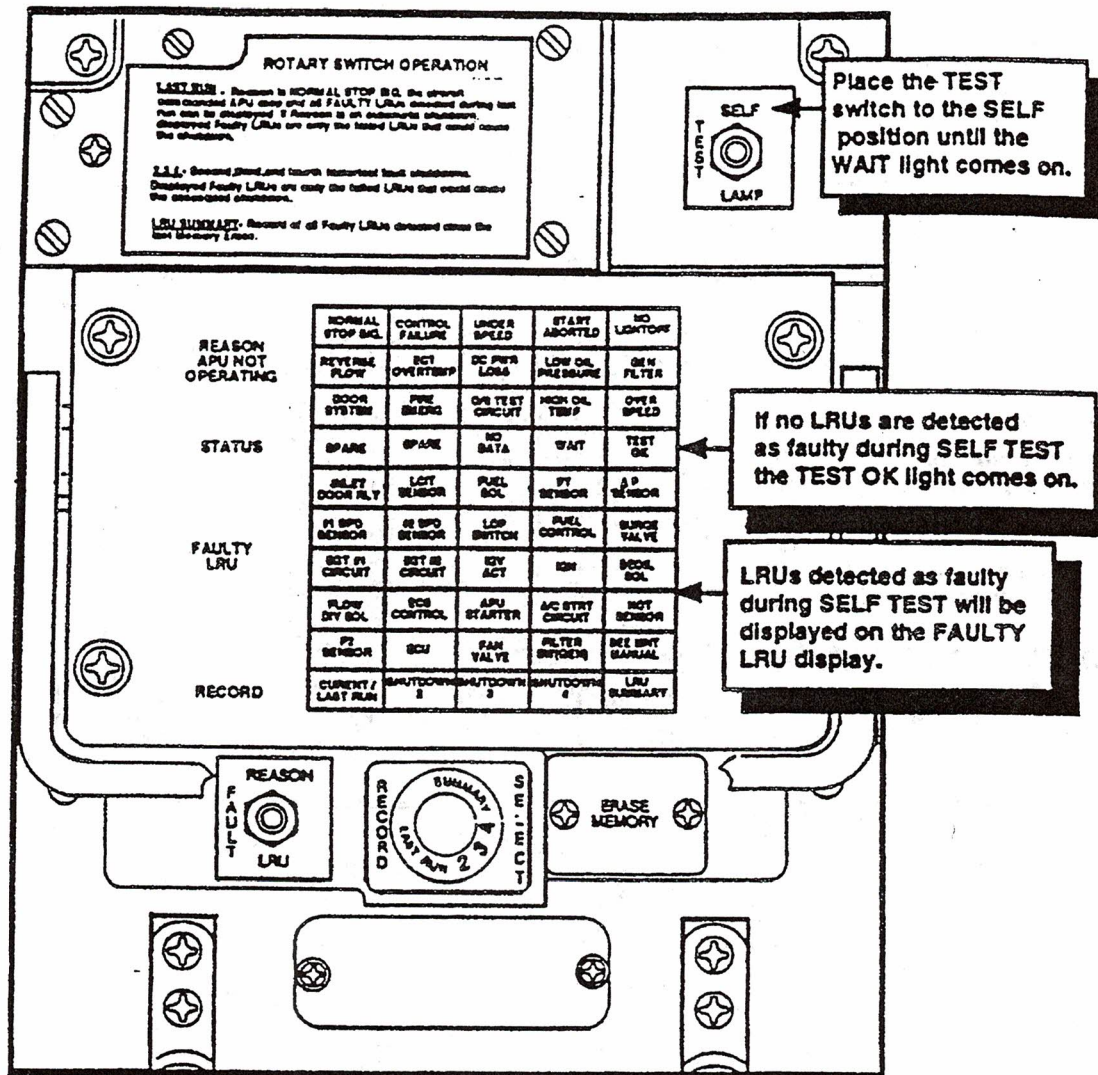
SUMMARY SWITCH POSITION

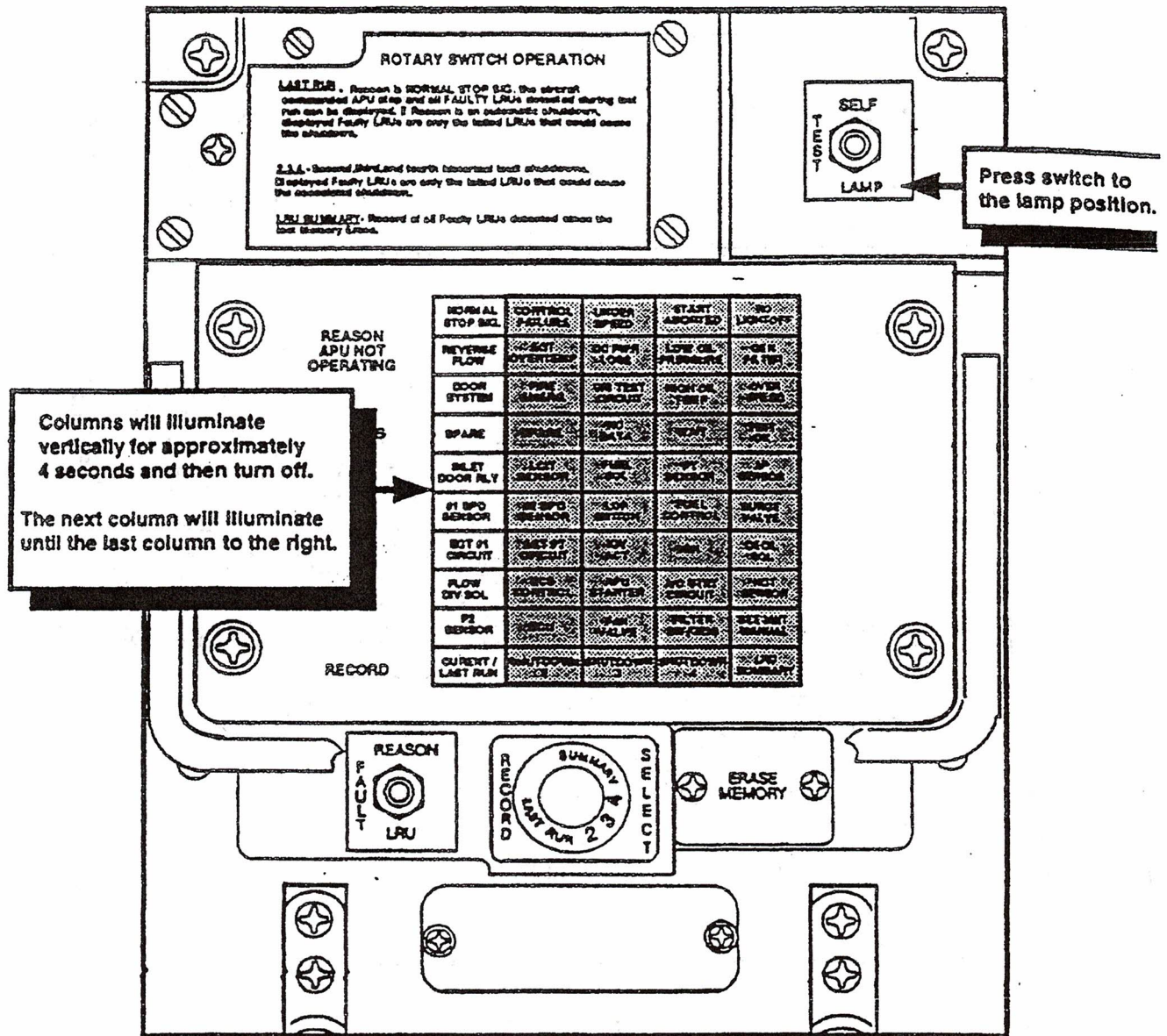
The summary switch position displays all the LRU's recorded since the last ECU memory erase.



ERASE MEMORY SWITCH

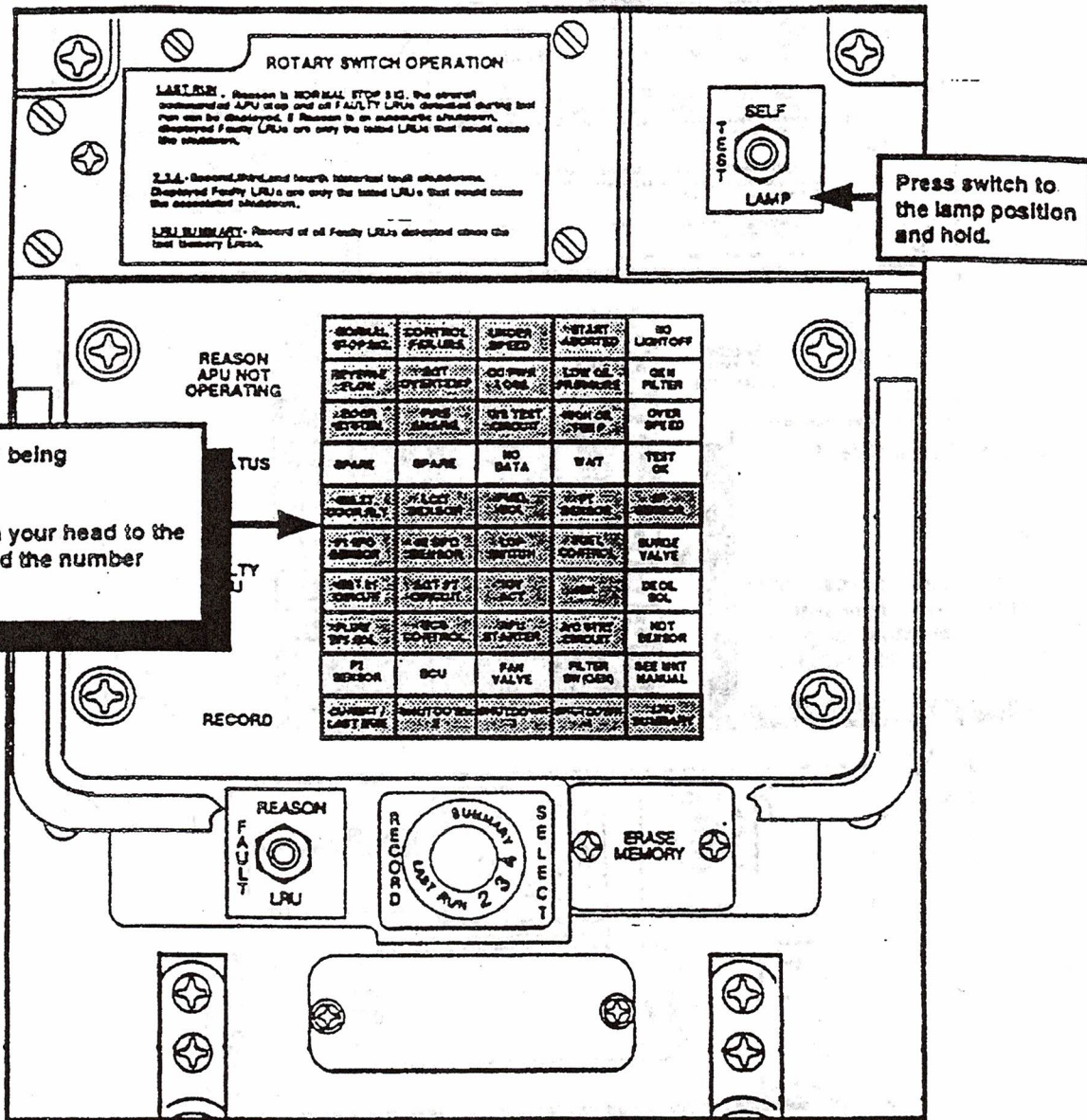
Pressing the momentary ERASE MEMORY switch causes all fault memory to be erased from the system. Erasing the memory requires 15 to 20 seconds. During that time, the WAIT light will be on. At the completion of the memory erase, the TEST OK light will come on.





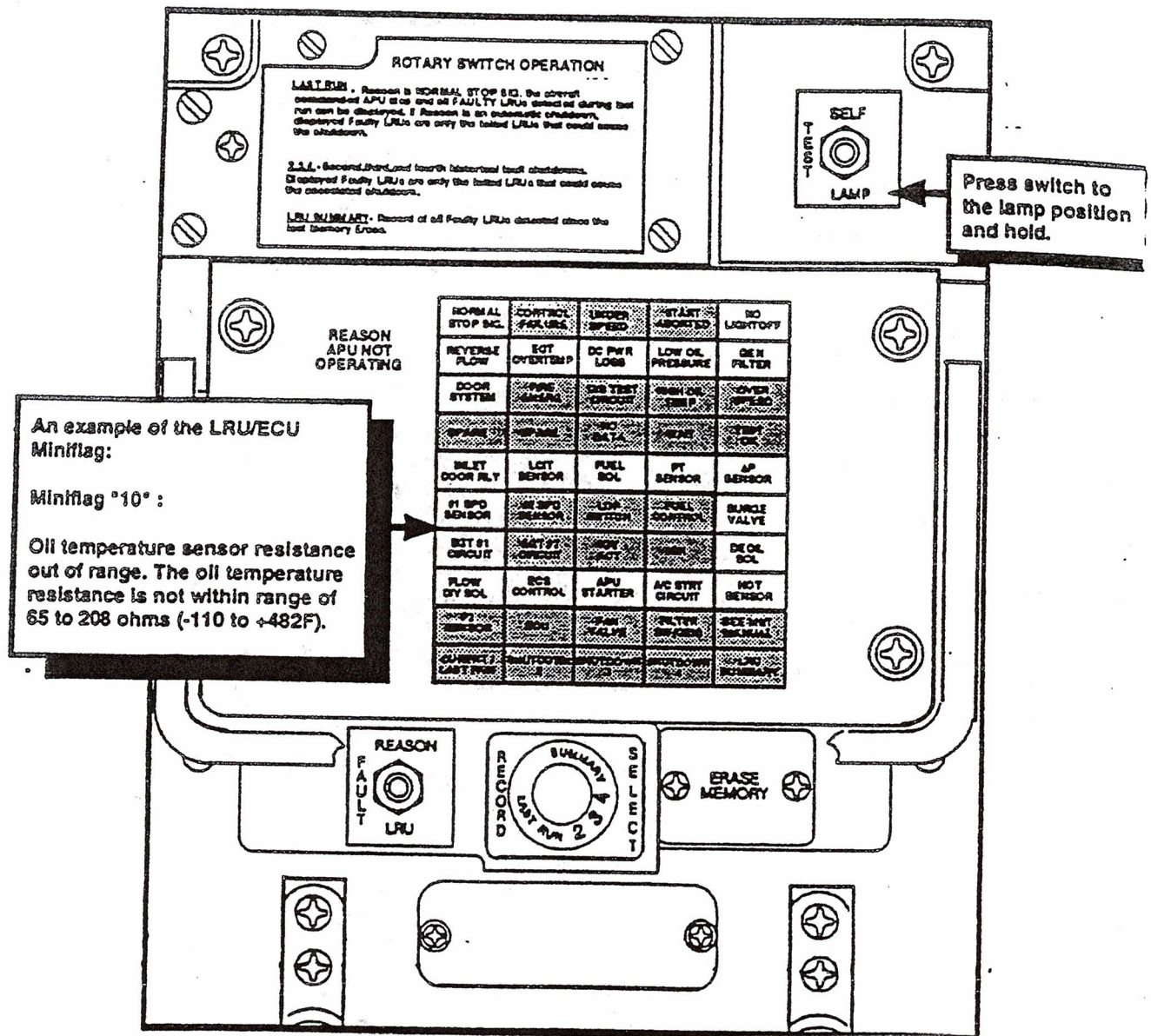
LAMP TEST

The LAMP TEST mode is initiated by pressing the TEST switch to the down position. The display will illuminate vertical columns beginning with the left and sequentially moving to the far right column.



MINIFLAG TEST

The MINIFLAG TEST mode is initiated by pressing the TEST switch to the down position and hold. If the APU is not running, the LAMP TEST will be initiated first and then the MINIFLAG TEST begins. If the APU is running, the MINIFLAG TEST will be initiated immediately.

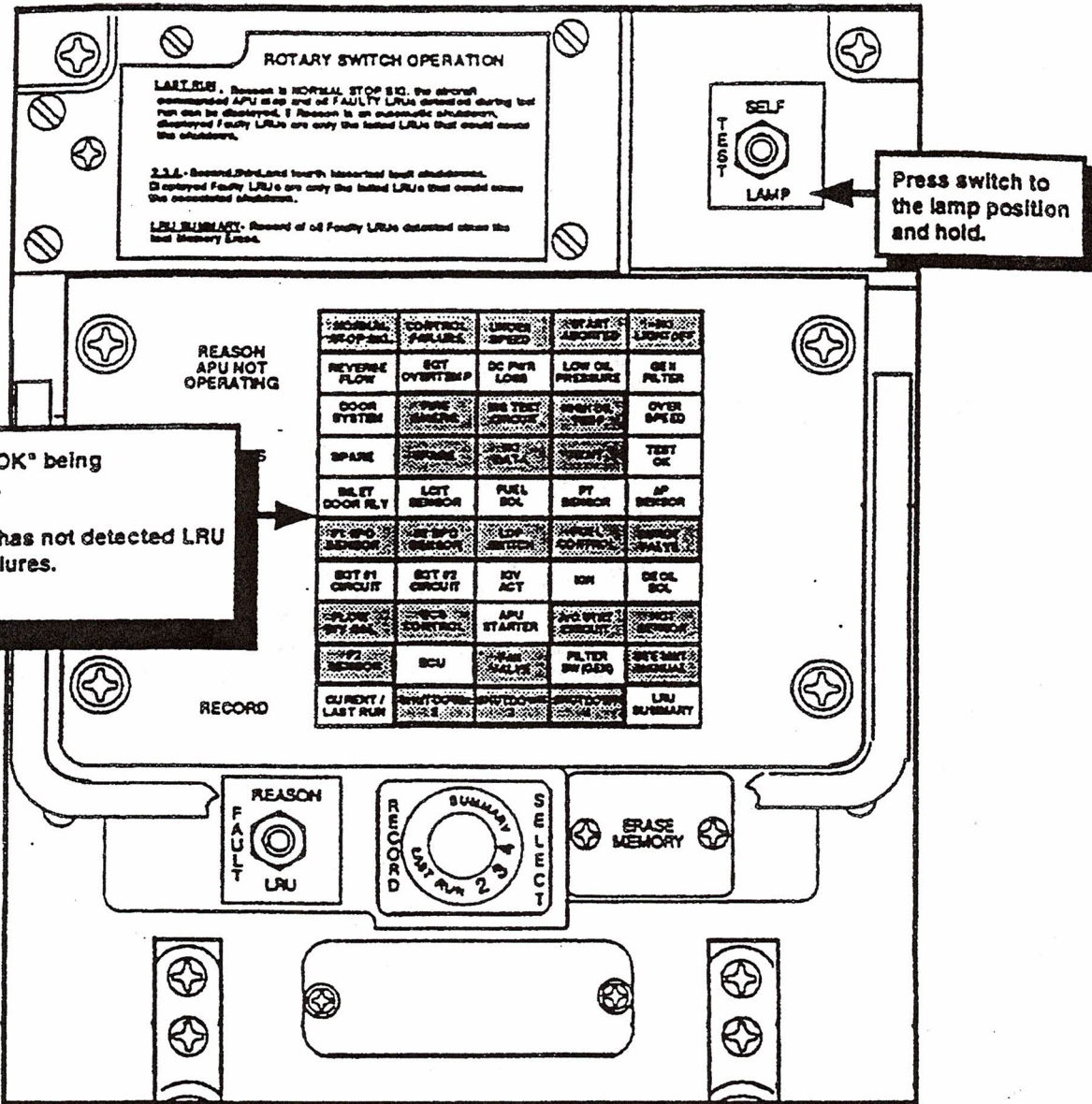


MINIFLAG TEST

Mini-flags are intended to provide more detailed diagnostics than are available from the faulty LRU display. Miniflags are number 1 through 199 and are grouped as follows:

- 1 to 128 :LRU and ECU miniflags.
- 129 to 199: APU system miniflags.

During self-test mode, all LRU and ECU miniflags are recorded. During prestart and monitor BITE modes, only those mini-flags that have been detected during the current run are available for display.

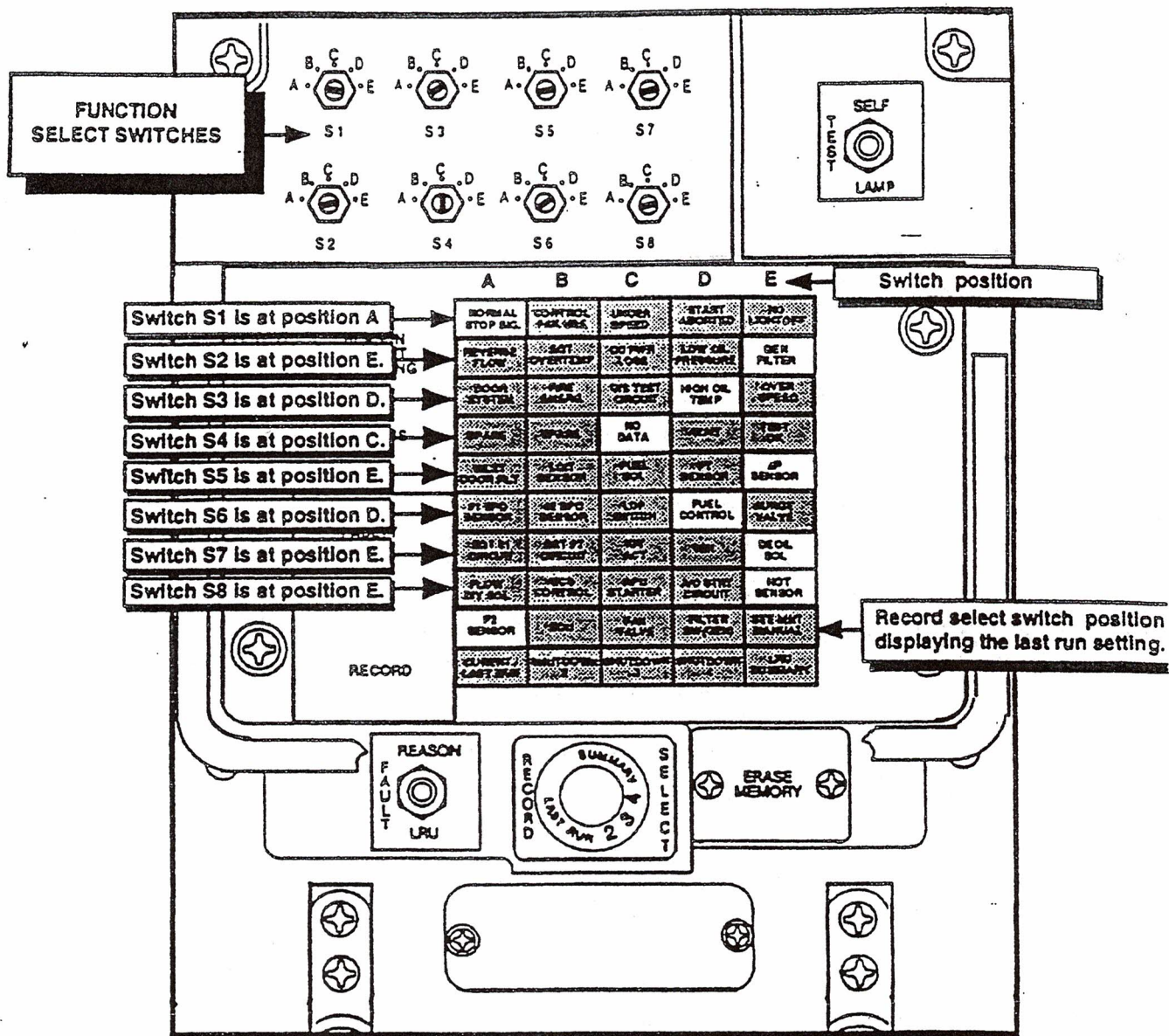


Miniflag "OK" being displayed.

The ECU has not detected LRU or ECU failures.

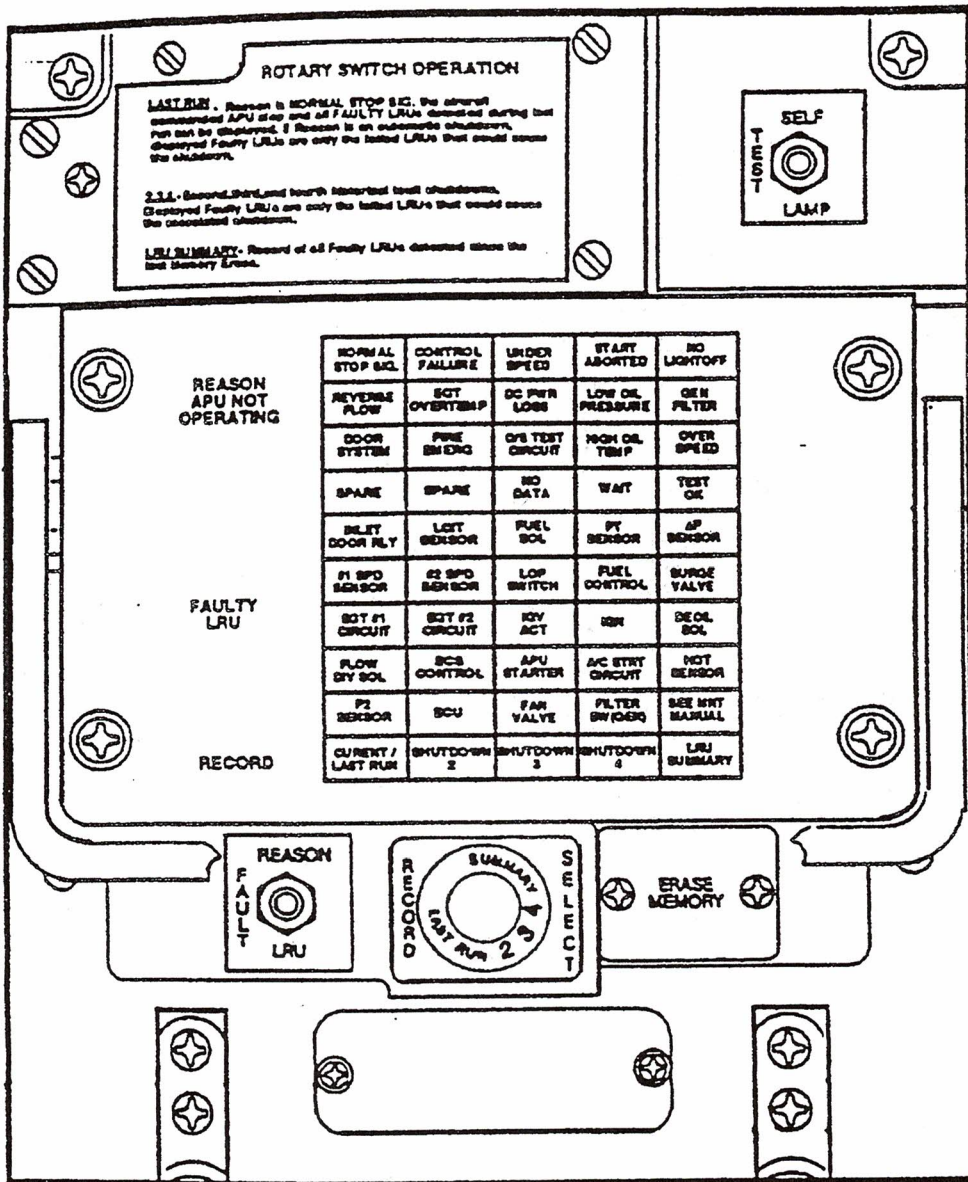
MINIFLAG TEST (CONT.)

If there has been no LRU or ECU failures detected the MINIFLAG DISPLAY will show "OK".



FUNCTION SELECT SWITCH DISPLAY

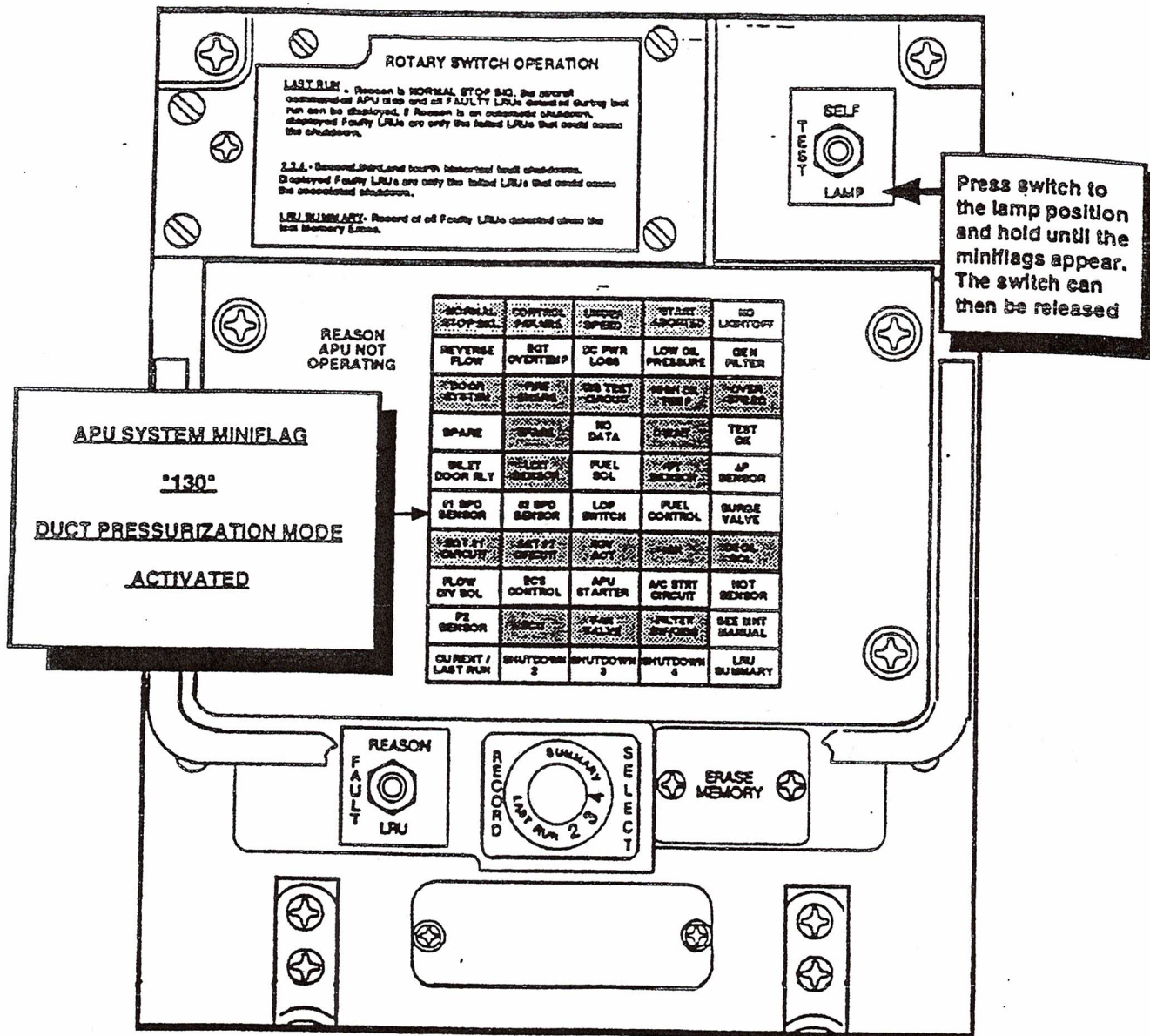
At the completion of the MINIFLAG TEST, the FUNCTION SELECT switch positions are displayed. Switch S1 is displayed in the top horizontal row with the switch setting number counting out from the left to right. The position of FUNCTION SELECT switch is displayed in the next to the bottom row.



APU SYSTEM MINIFLAGS

APU system miniflags are used for troubleshooting while the APU is operating. The miniflags are continuously updated if there is a fault detected. If the fault is not detected, the miniflag is removed.

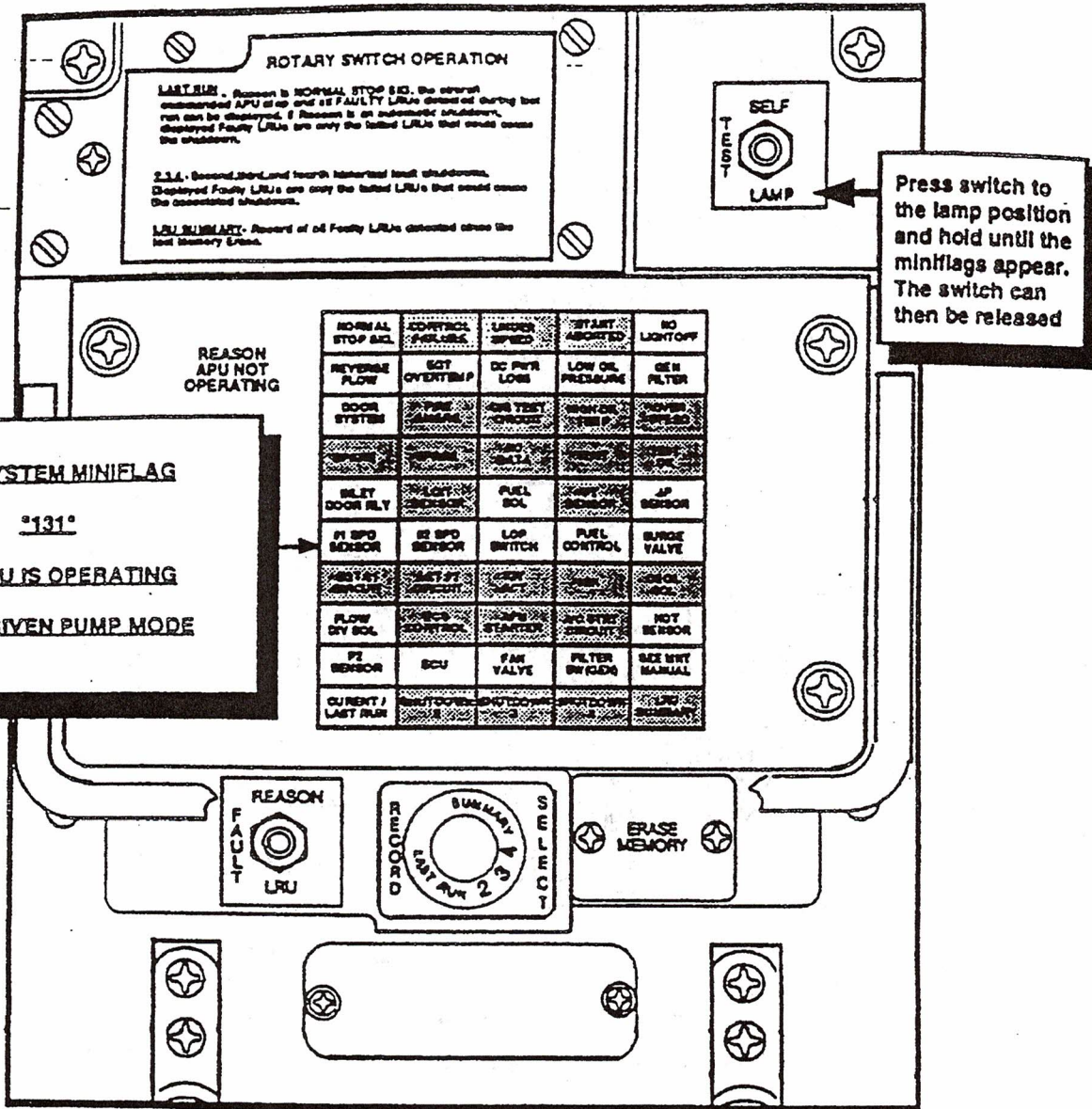
Real time - No faults - No flags codes



APU SYSTEM MINIFLAG "130"

DUCT PRESSURIZATION MODE ACTIVE

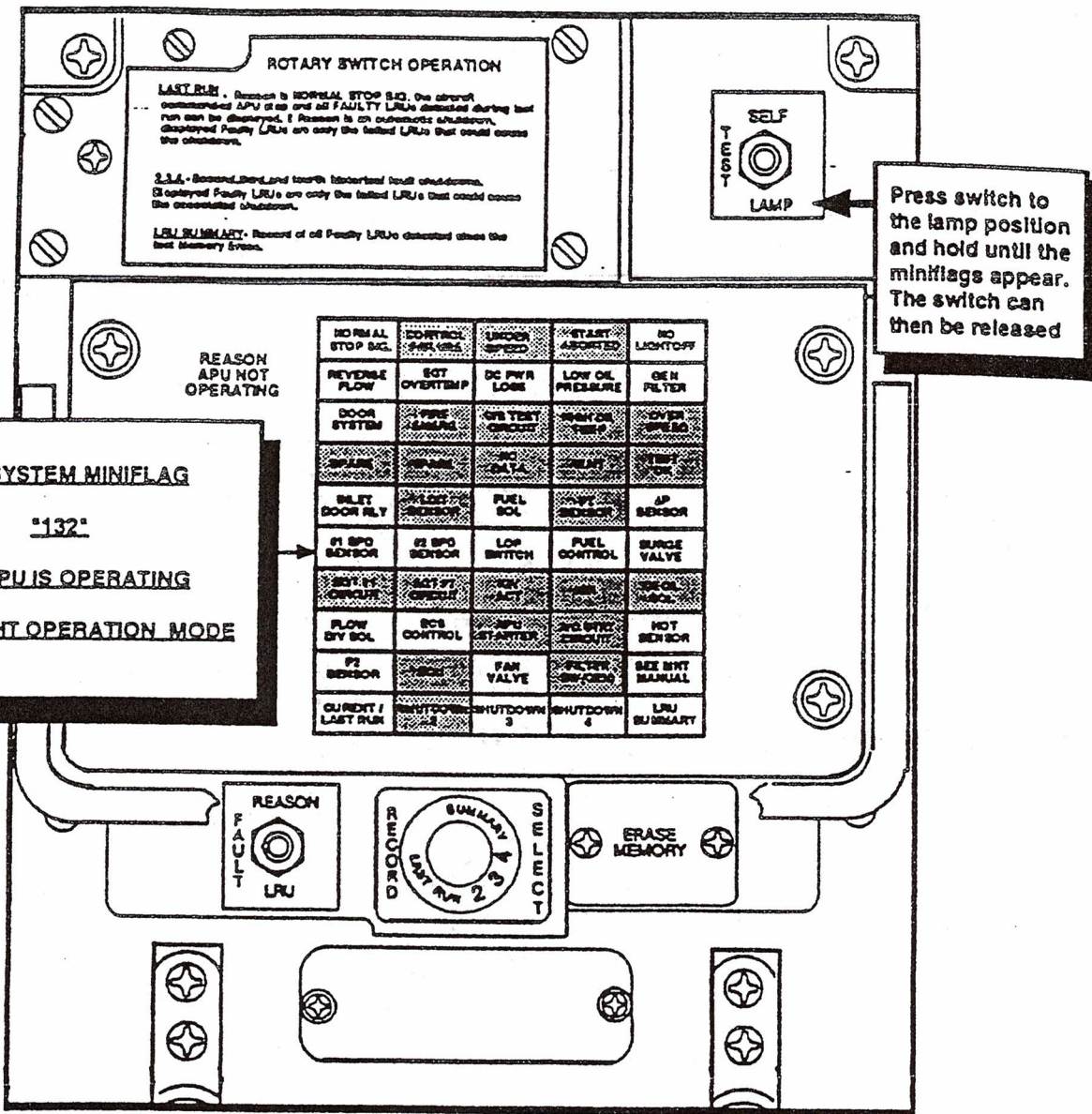
APU system miniflag "130" is displayed when the ECU has received an active command for the duct pressurization mode.



APU SYSTEM MINIFLAG "131"

AIR DRIVEN PUMP MODE ACTIVE

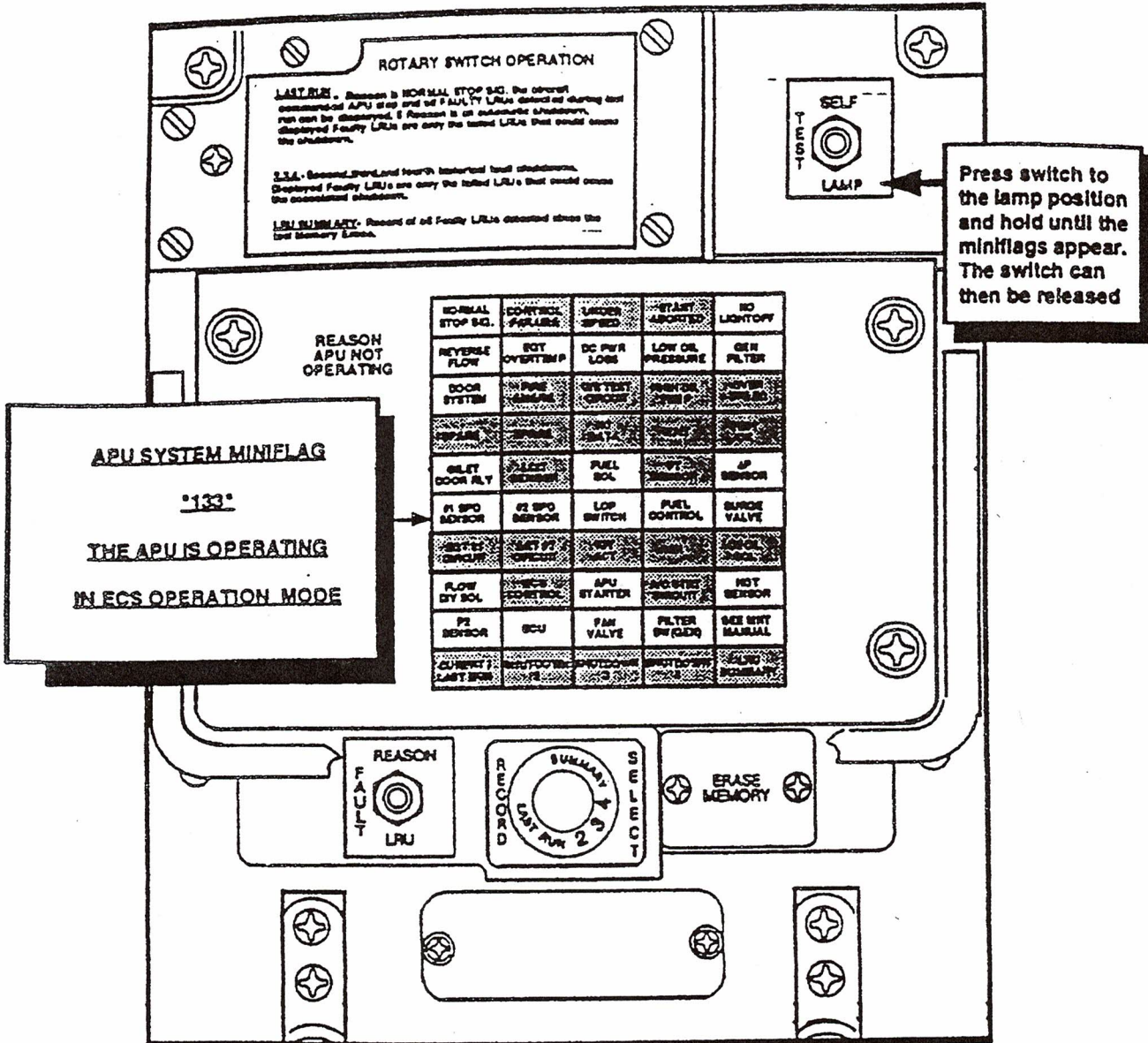
APU system miniflag "131" is displayed when the ECU has received an active command for the AIR DRIVEN PUMP mode (767 only).



APU SYSTEM MINIFLAG "132"

IN-FLIGHT OPERATION MODE ACTIVE

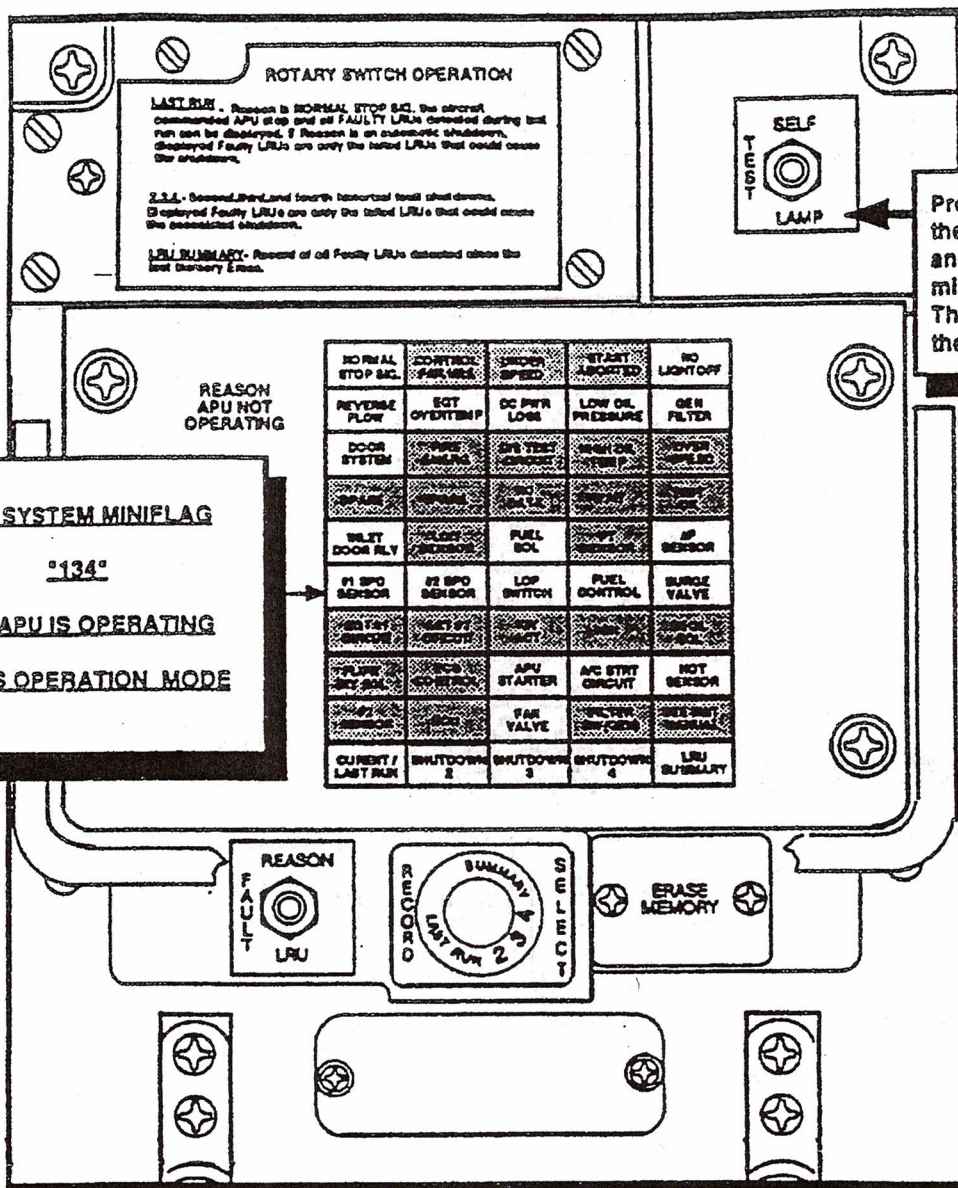
APU system miniflag "132" is displayed when the ECU has received an in-flight operational command.



APU SYSTEM MINIFLAG "133"

ENVIRONMENTAL CONTROL SYSTEM (ECS) MODE ACTIVE

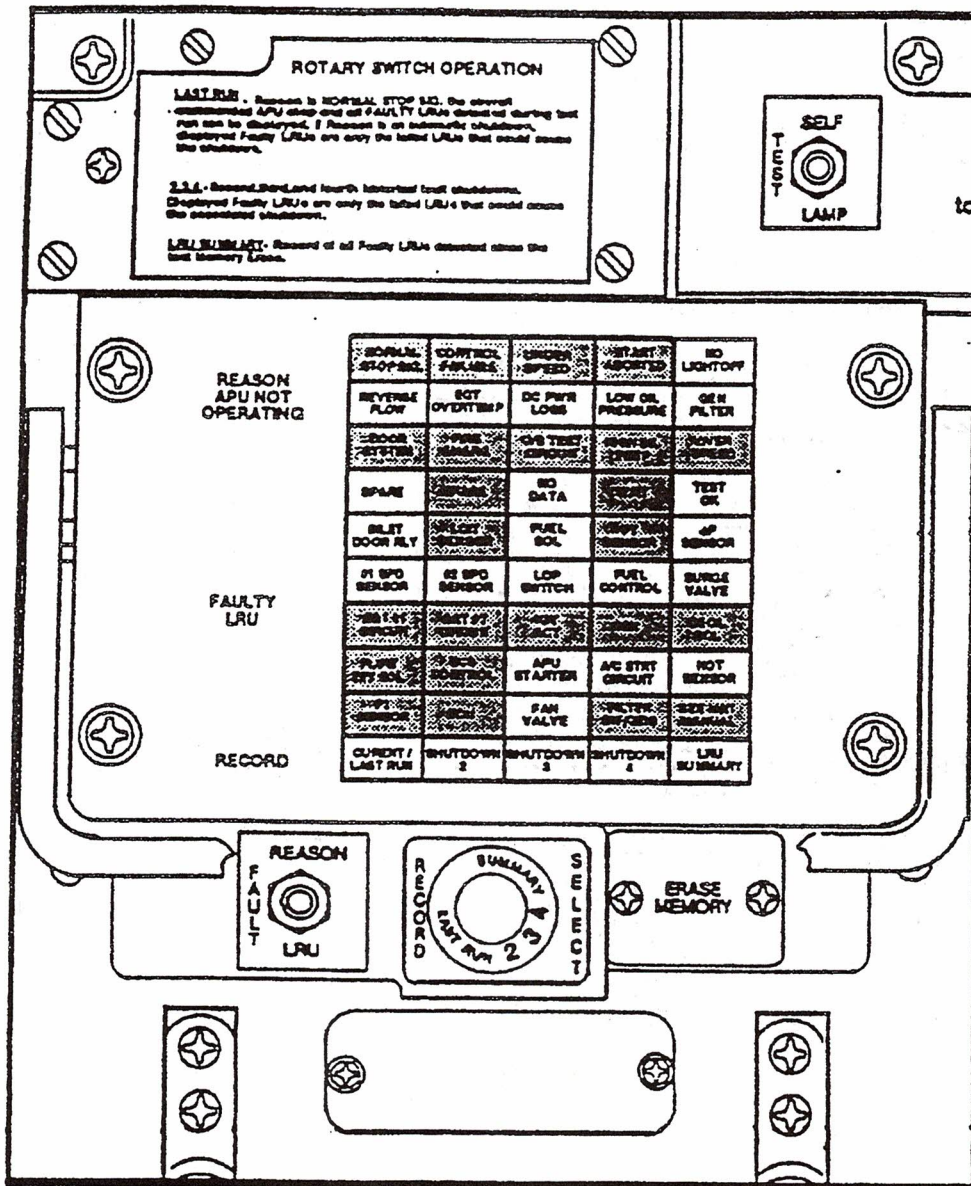
APU system miniflag "133" is displayed when the ECU has received an ENVIRONMENTAL CONTROL SYSTEM operational command.



APU SYSTEM MINIFLAG "134"

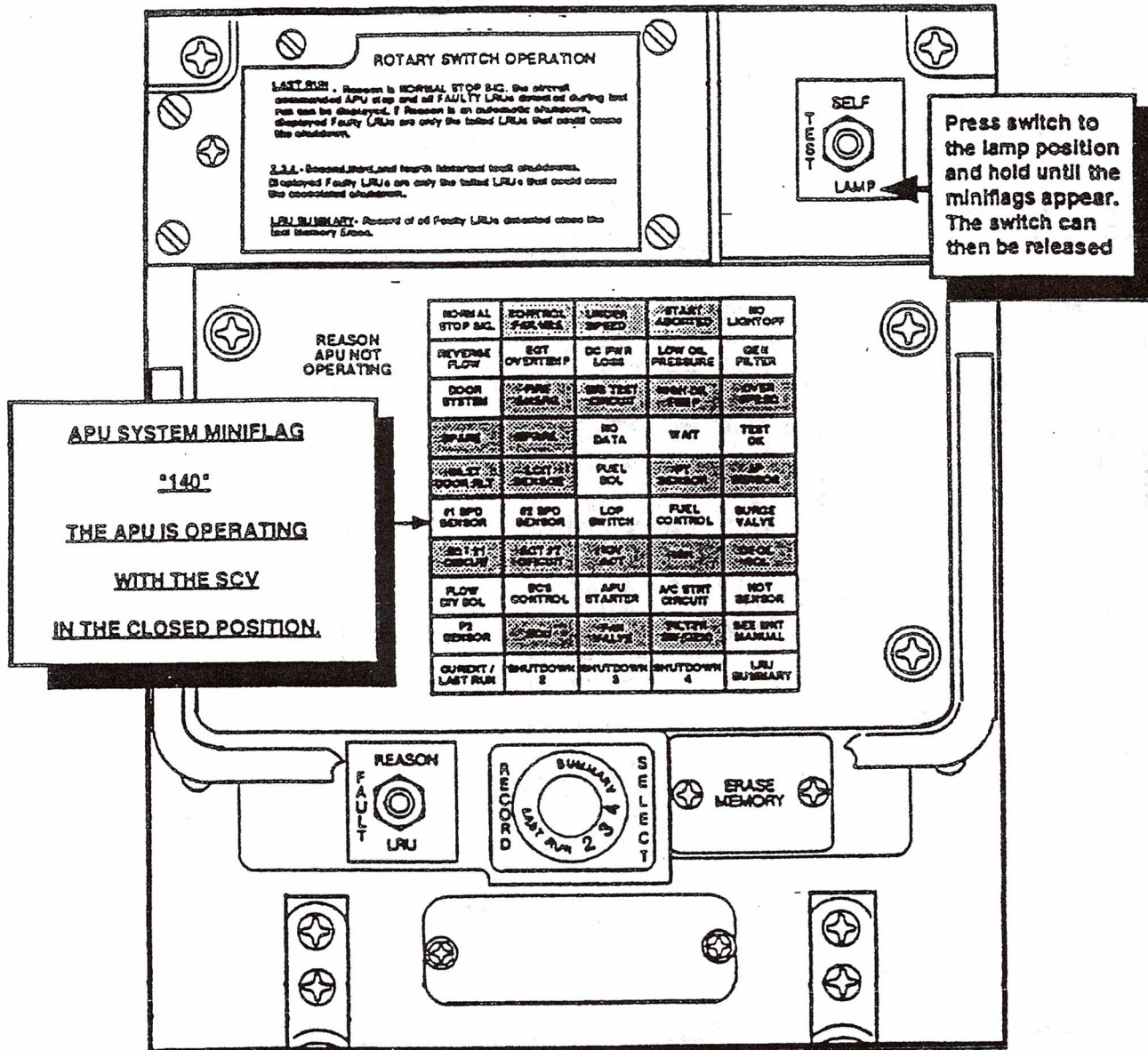
MAIN ENGINE START (MES) MODE ACTIVE

APU system miniflag "134" is displayed when the ECU has received a MAIN ENGINE START operational command.



APU SYSTEM MINIFLAGS

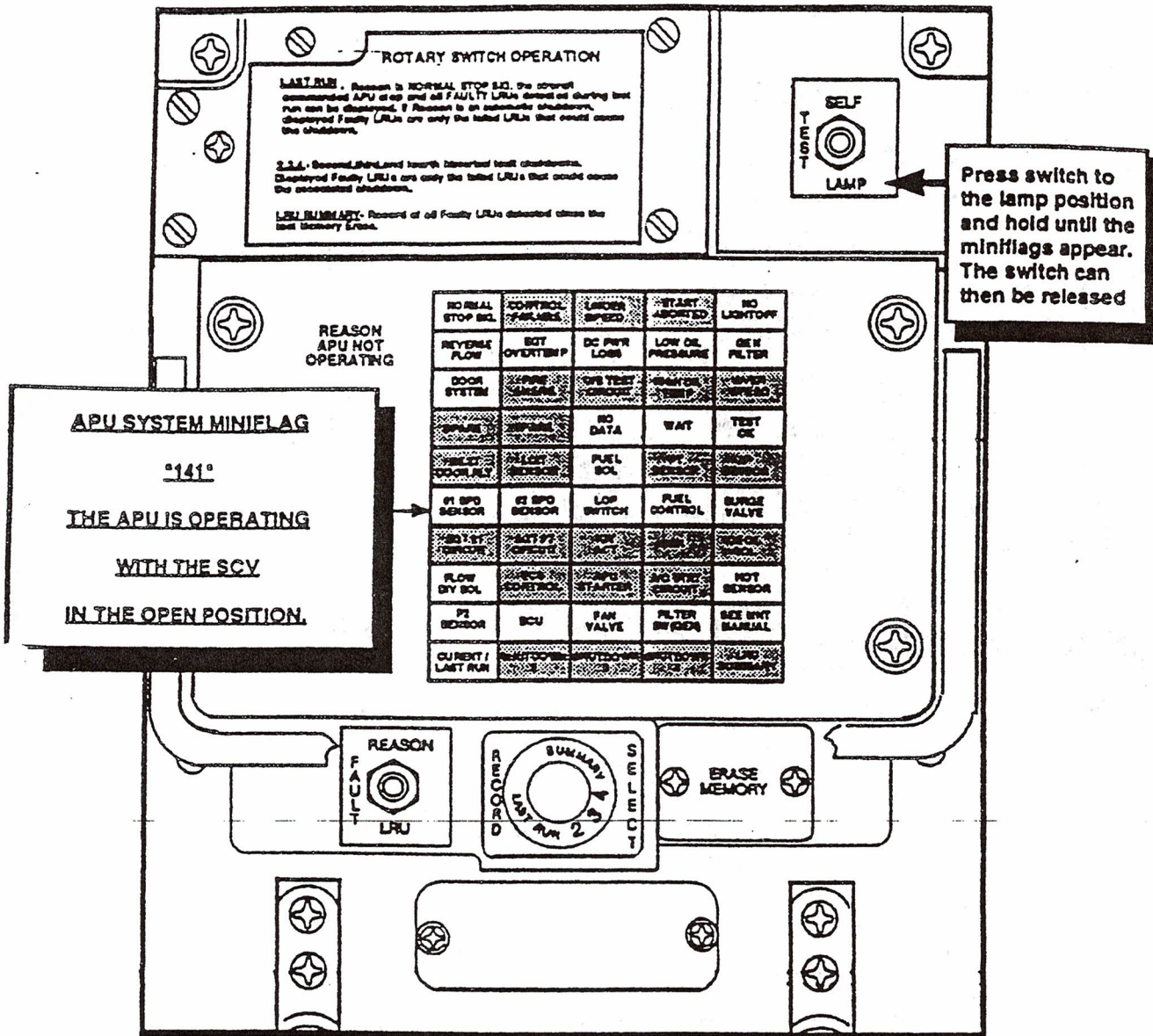
APU system miniflags "135" through "139" are not active.



APU SYSTEM MINIFLAG "140"

THE APU IS OPERATING WITH THE SURGE CONTROL VALVE IN THE CLOSED POSITION.

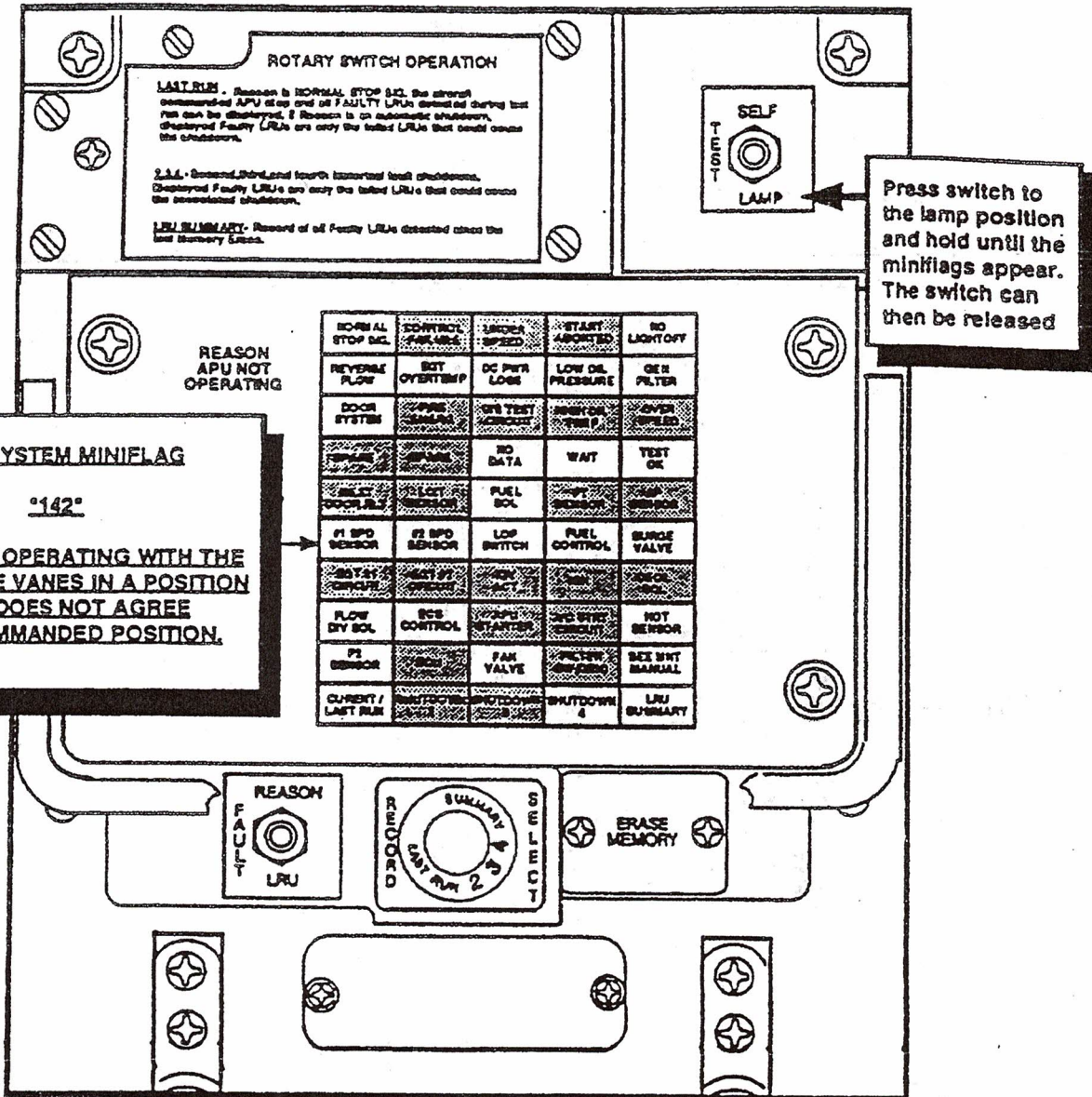
APU system miniflag "140" is displayed when the ECU has commanded the SURGE CONTROL VALVE closed. The SCV torque motor command from the ECU is greater than 95 milli-amps.



APU SYSTEM MINIFLAG "141"

THE APU IS OPERATING WITH THE SURGE CONTROL VALVE IN THE OPEN POSITION.

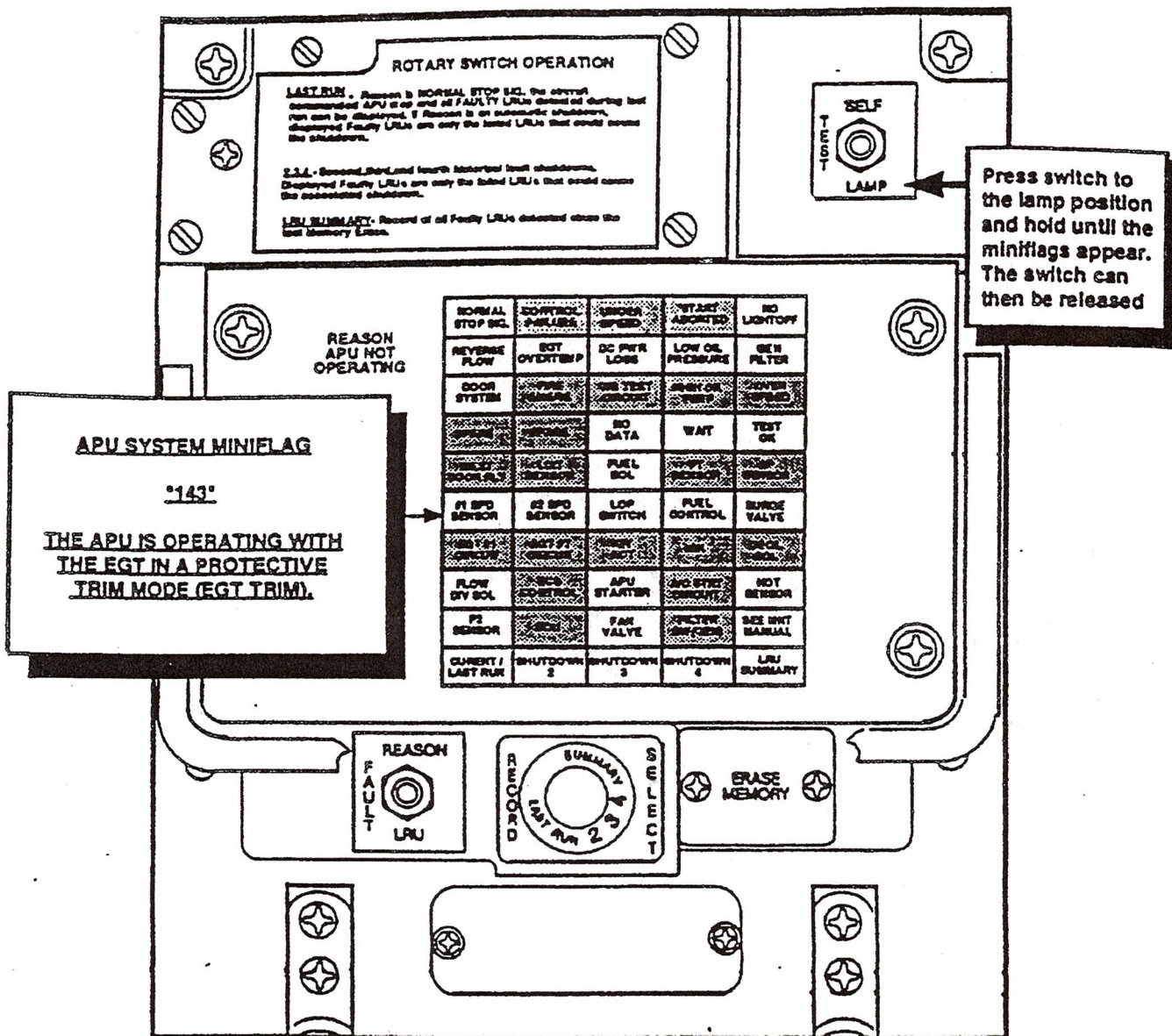
APU system miniflag "141" is displayed when the ECU has commanded the SURGE CONTROL VALVE open. The SCV torque motor command from the ECU is less than 10 milli-amps.



APU SYSTEM MINIFLAG "142"

THE APU IS OPERATING WITH THE INLET GUIDE VANES IN A POSITION THAT DOES NOT AGREE WITH COMMANDED POSITION.

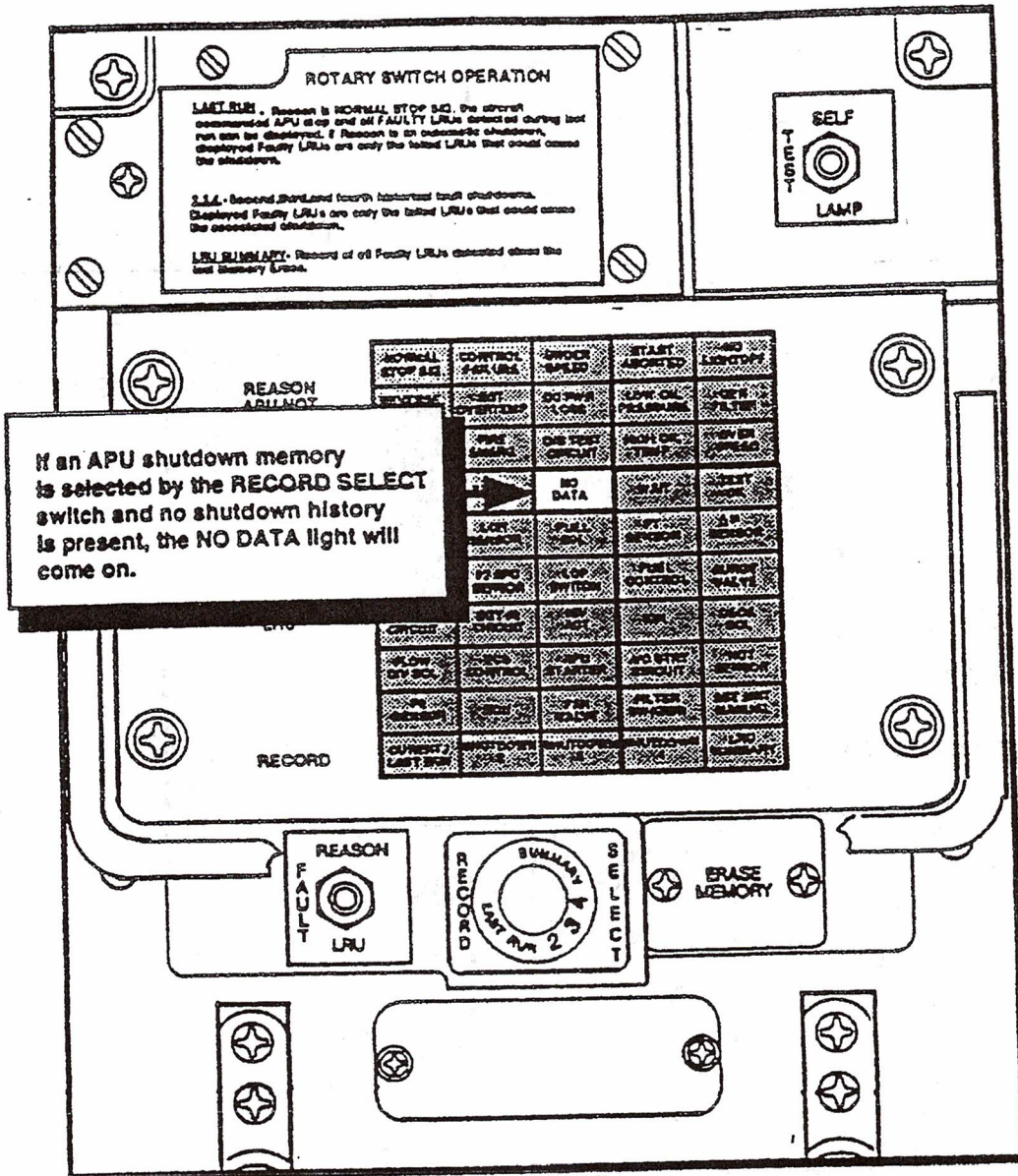
APU system miniflag "142" is displayed when the ECU has detected the IGV commanded position to be more than 5 degrees different than the actual IGV position.



APU SYSTEM MINIFLAG "143"

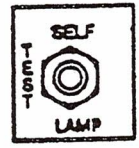
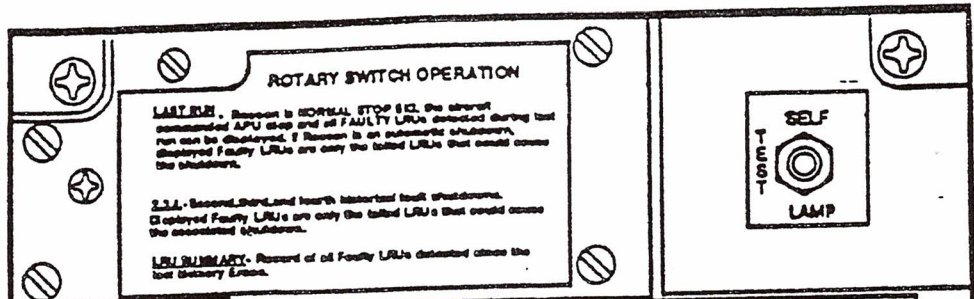
THE APU IS OPERATING WITH THE EGT IN A PROTECTIVE TRIM MODE (EGT TRIM).

APU system miniflag "143" is displayed when the ECU has detected the APU is operating on EGT TEMPERATURE TRIM. The typical cause of the EGT trim mode is a deteriorated APU power section which can result in reduced pneumatic output.



NO DATA LIGHT

The NO DATA light comes on if the ECU fault history is interrogated and there is no APU shutdown or faulty LRU recorded in the ECU memory location.

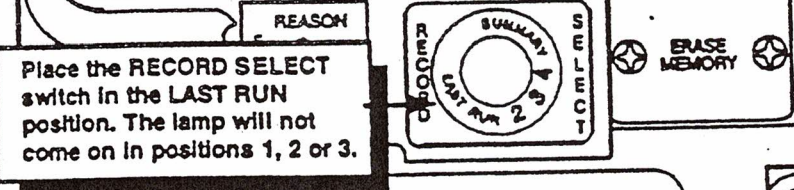


With the NORMAL STOP SIG. will come on only with switch in the LAST RUN position. The NORMAL STOP SIG. memory will be erased on the next APU start.

| NORMAL STOP SIG. | CONTROL FUEL LRU | SWITCH APPLIED | START ABORTED | WIND LIGHTS OFF |
|------------------|------------------|-----------------|------------------|------------------|
| ENGINE OIL ON | RIGHT OVERTEMP | DO NOT EXCEED | LOW OIL PRESSURE | PLATE TEMP |
| ENGINE SYSTEM | WIRE SWAGE | DO NOT EXCEED | FROM OIL AT TEMP | ENGINE OIL PRESS |
| ENGINE OIL ON | APU OIL | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |
| APU OIL ON | WIND LIGHTS OFF | WIND LIGHTS ON | WIND LIGHTS OFF | WIND LIGHTS ON |

FAULTY LRU

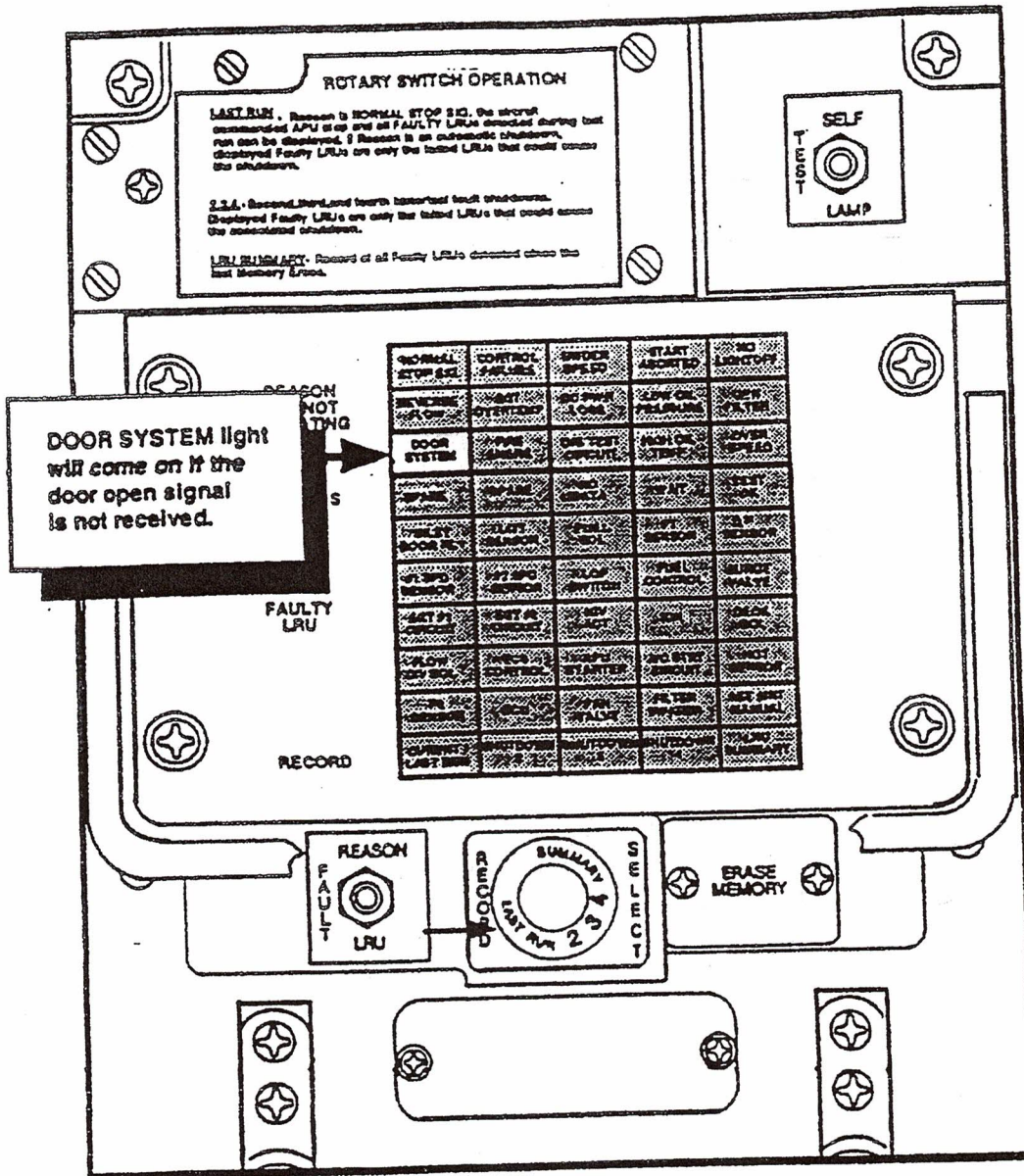
RECORD



Place the RECORD SELECT switch in the LAST RUN position. The lamp will not come on in positions 1, 2 or 3.

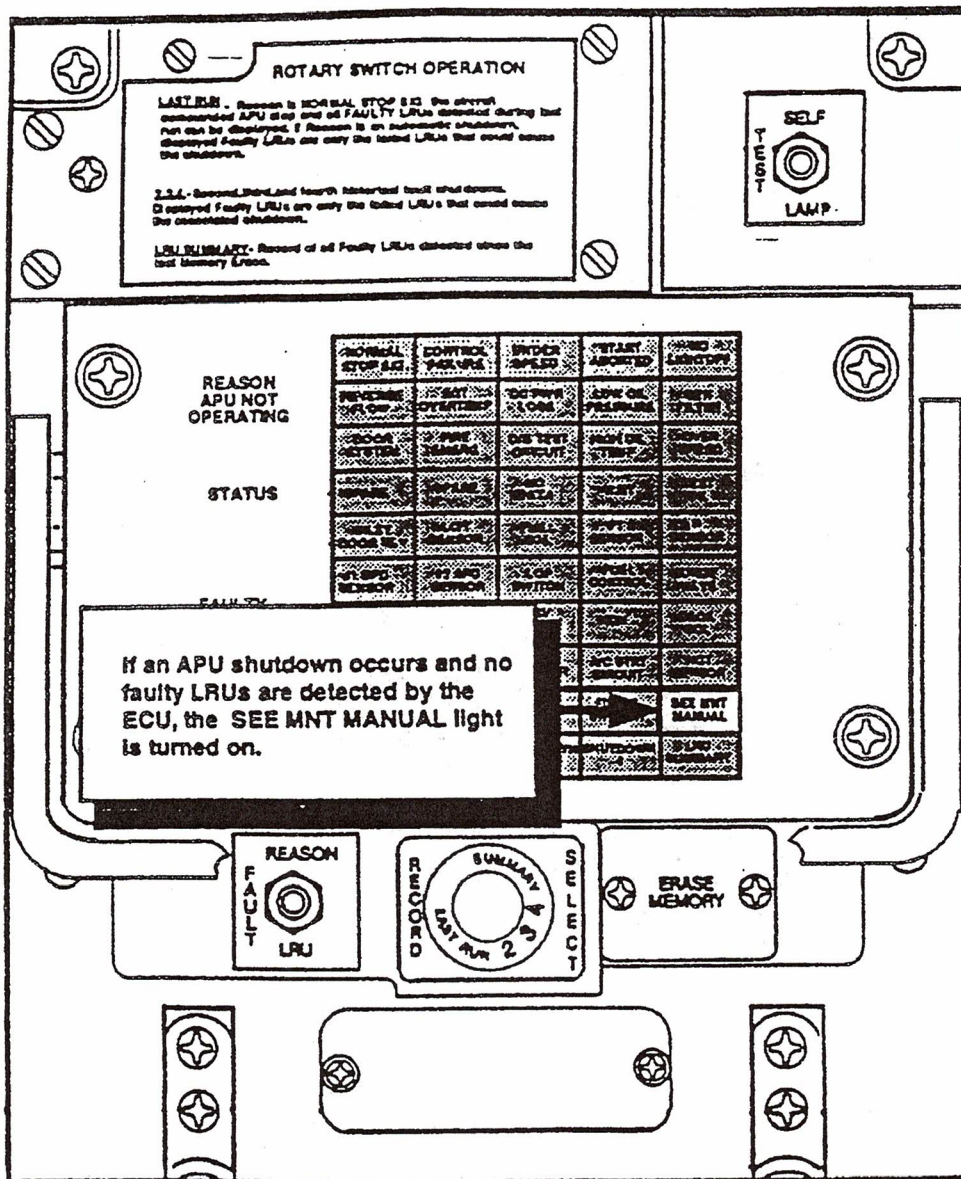
NORMAL STOP SIGNAL

The NORMAL STOP SIG light comes on if the ECU shuts down due to the loss of the aircraft RUN signal. The light will help detect aircraft master switch and associated circuitry failures that could cause APU shutdowns with no BITE indications.



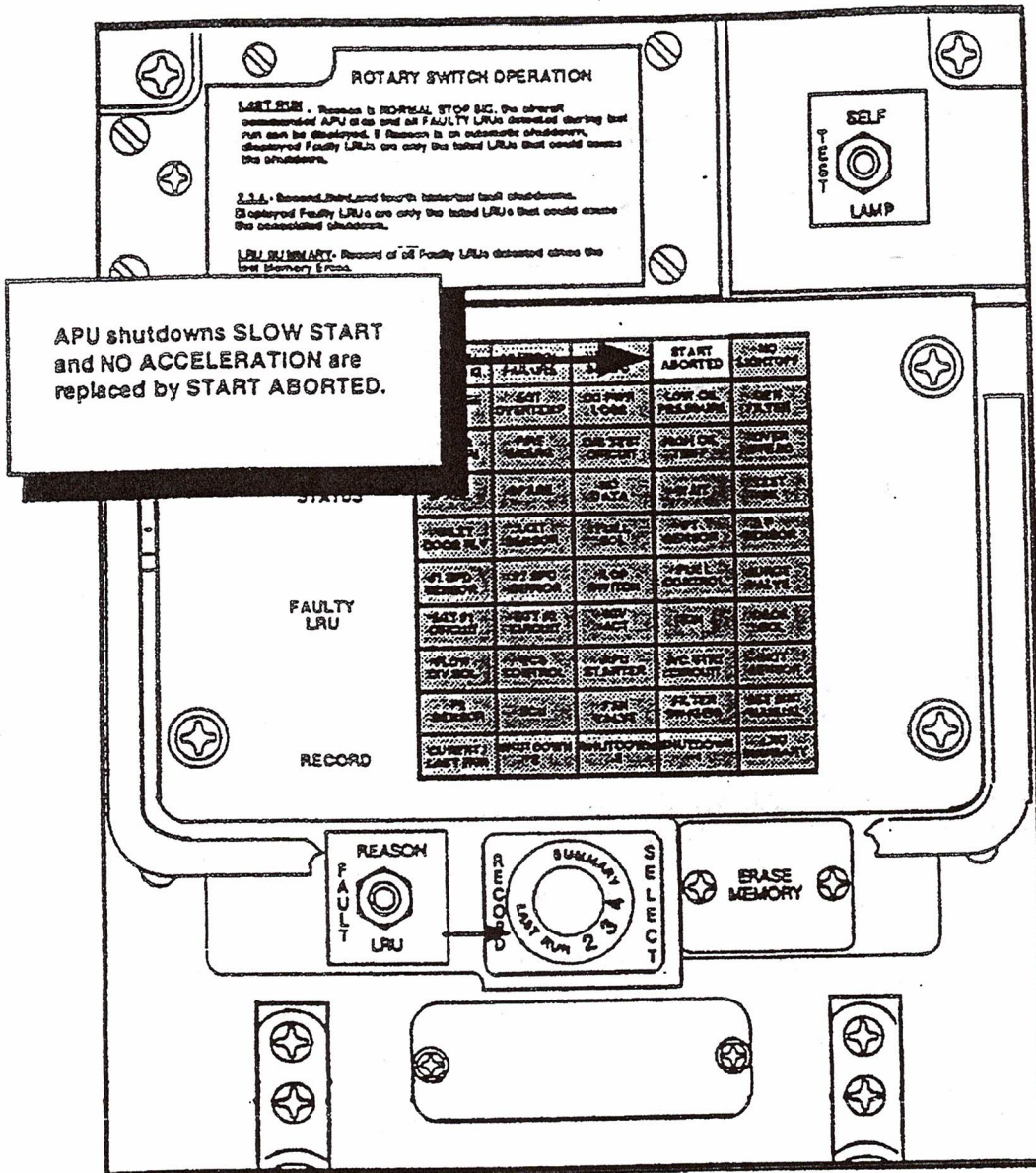
APU DOOR SYSTEM FAILURE

The DOOR SYSTEM light comes on if the ECU does not detect the APU door open switch signal within 30 seconds of the start sequence.



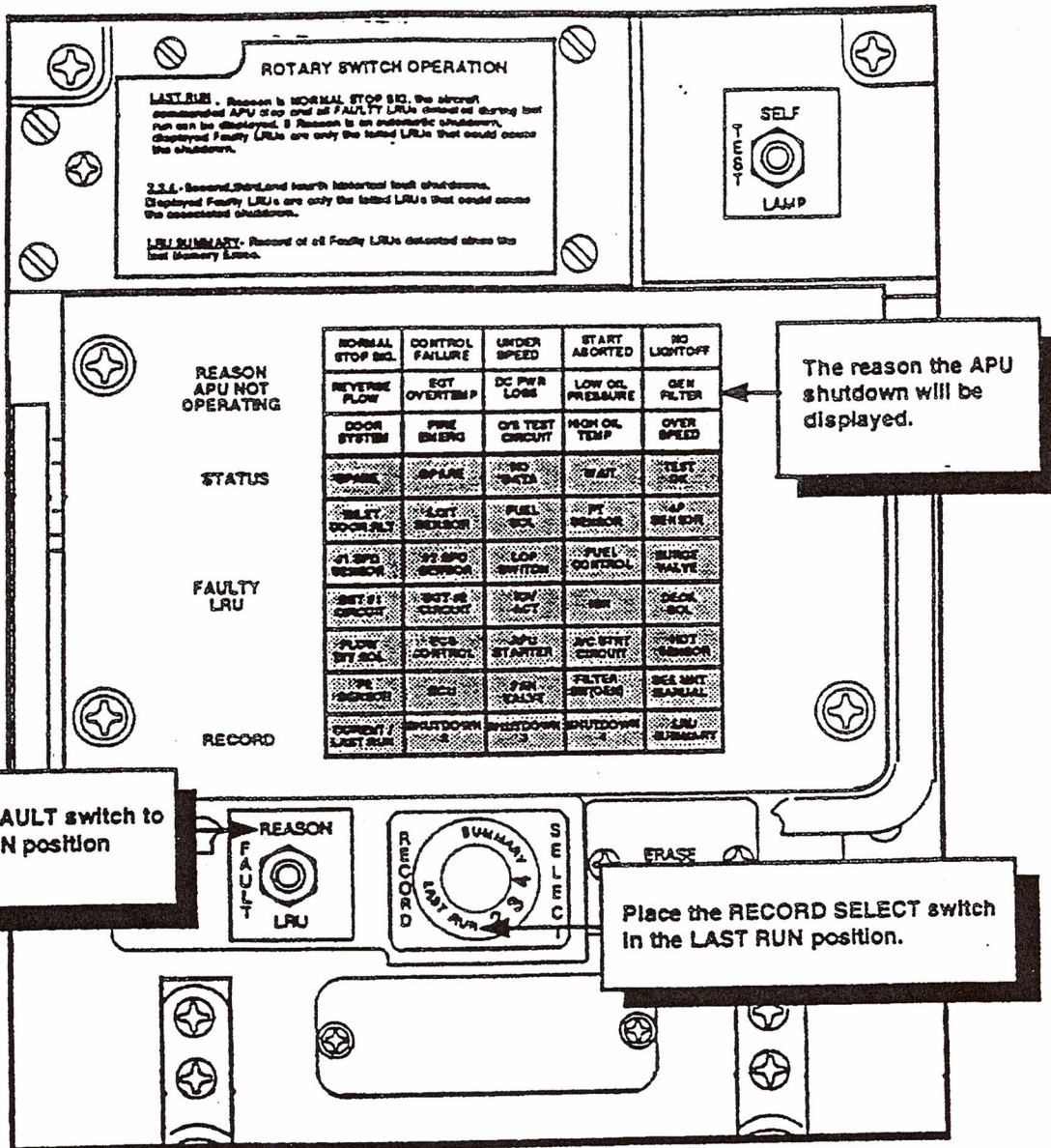
SEE MAINTENANCE MANUAL

The SEE MNT MANUAL light comes on if there is an APU shutdown and the ECU does not detect a faulty LRU. The Boeing Line Maintenance Fault Isolation Manual should be consulted.



START ABORTED SHUTDOWN

The START ABORTED light comes on if the ECU detects the APU speed during start is less than 95% and the APU acceleration rate is less than .20% per second for 15 seconds. The START ABORTED shutdown will also occur if there is a loss of EGT.



REASON APU NOT OPERATING DISPLAY

REASON APU NOT OPERATING DISPLAY provides the specific APU fault reason when the ECU detects a condition that causes an APU shutdown.

MINI FLAGS
FOR THE
DASH 19 ECU
(FOR USE WITH DASH 19 ECU ONLY)

FOR TRAINING PURPOSES ONLY

| | |
|----|---|
| 1 | SPEED SIGNAL NO. 1 IS NOT FUNCTIONING. THE SPEED SENSOR NO. 1 OR WIRING IS NOT PROVIDING PROPER INPUT AT SPEEDS GREATER THAN 50%. |
| 2 | SPEED SIGNAL NO. 2 IS NOT FUNCTIONING. THE SPEED SENSOR NO. 2 OR WIRING IS NOT PROVIDING PROPER INPUT AT SPEEDS GREATER THAN 50%. |
| 3 | ECU SPEED CONVERTER CIRCUIT IS FAILED. THE ECU SPEED CONVERTER CIRCUIT DOES NOT INTERPRET THE SPEED SIGNAL PROPERLY WHEN THE APU IS OPERATING AT SPEEDS GREATER THAN 50%. |
| 4 | FAILED ECU N/DC CONVERTOR NO. 1 CIRCUIT. THE ECU CIRCUIT THAT CONVERTS THE NO. 1 SPEED SIGNAL TO A DC VOLTAGE IS NOT FUNCTIONING PROPERLY. |
| 5 | FAILED ECU N/DC CONVERTER NO. 2 CIRCUIT. THE ECU CIRCUIT THAT CONVERTS THE NO. 2 SPPEED SIGNAL TO A DC VOLTAGE IS NOT FUNCTIONING PROPERLY. |
| 6 | FAILED ECU N/DC CONVERTER NO. 3 CIRCUIT. THE ECU REDUNDANT CIRCUIT THAT CONVERTS THE HIGHEST SPEED SIGNAL TO A DC VOLTAGE IS NOT FUNCTIONING PROPERLY. |
| 7 | THIS MINIFLAG IS DISPLAYED ONLY IN THE "SUMMARY" ROTARY SELECT SWITCH POSITION AND INDICATES AIRPLANE FAULTS PER MINIFLAGS 75-78. |
| 9 | LCIT SENSOR SIGNAL OUT OF RANGE. THE LCIT SENSOR CIRCUIT READS LESS THAN -100F. |
| 10 | OIL TEMPERATURE SENSOR RESISTANCE OUT OF RANGE. THE OIL TEMPERATURE RESISTANCE IS NOT WITHIN THE RANGE OF 65 TO 208 OHMS (-110 TO +482F). |

| | |
|----|---|
| 11 | <p>FAILED EGT THERMOCOUPLE CIRCUIT NO. 1 SIGNAL OUT OF RANGE. THE THERMOCOUPLE CIRCUIT READS LESS THAN -100F ABSOLUTE OR EGT THERMOCOUPLE NO 2 READS +130F MORE THAN EGT NO. 1. SEVERE POWER SECTION DISTRESS CAN ALSO CAUSE A LARGE VARIATION IN EGT NO. 1 AND NO. 2 READINGS.</p> |
| 12 | <p>FAILED EGT THERMOCOUPLE CIRCUIT NO. 1 SIGNAL OUT OF RANGE. THE THERMOCOUPLE CIRCUIT READS LESS THAN -100F ABSOLUTE OR EGT THERMOCOUPLE NO. 1 READS +150F MORE THAN EGT NO. 2. SEVERE POWER SECTION DISTRESS CAN ALSO CAUSE A LARGE VARIATION IN EGT NO. 1 AND NO. 2 READINGS.</p> |
| 13 | <p>SPARE</p> |
| 14 | <p>FAILED TOTAL PRESSURE SENSOR/CIRCUIT. THE PT VALUE IS OUT OF ITS NORMAL OPERATING RANGE OR DIFFERS BY MORE THAN 3 PSIG FROM THE P2 SENSOR READING ON THE GROUND AT SPEEDS LESS THAN 12%. A MODERATELY SHIFTED P2 SENSOR OUTPUT COULD ALSO CAUSE THIS MINIFLAG. THIS MINIFLAG CAN BE SET BY MINIFLAG 120.</p> |
| 15 | <p>FAILED DIFFERENTIAL PRESSURE SENSOR/CIRCUIT. THE DP VALUE IS OUT OF ITS NORMAL OPERATING RANGE OR HAS AN OUTPUT OF LESS THAN 0.25 PSIG WHEN THE IGV POSITION IS 60 DEGREES (MOSTLY OPEN). THIS MINIFLAG CAN BE SET BY MINIFLAG 120.</p> |
| 16 | <p>FAILED AMBIENT PRESSURE (P2) SENSOR/CIRCUIT. THE P2 VALUE IS OUT OF ITS NORMAL OPERATING RANGE OR LESS THAN 8 PSIG ON THE GROUND. THIS MINIFLAG CAN BE SET BY MINIFLAG 120.</p> |
| 17 | <p>GENERATOR OIL FILTER SWITCH FAILED OPEN. THE NORMALLY CLOSED GENERATOR OIL FILTER SWITCH IS OPEN PRIOR TO APU OPERATION.</p> |
| 18 | <p>COOLING FAN ISOLATION VALVE FAILED. THE NORMALLY OPEN COOLING FAN ISOLATION VALVE SWITCH IS CLOSED PRIOR TO OPERATION OR OPEN DURING APU OPERATION.</p> |
| 19 | <p>LOP SWITCH CIRCUIT FAILED CLOSED. THE LOP SWITCH CIRCUIT IS CLOSED (SHORTED) PRIOR TO START.</p> |
| 20 | <p>SPARE</p> |

| | |
|----|---|
| 21 | ECU FLOW DIVIDER DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |
| 23 | ECS DEMAND SIGNAL OUT OF RANGE. THE ECS DEMAND SIGNAL IS LESS THAN -0.3V DC OR GREATER THAN 9.9V DC DURING APU OPERATION IN ECB MODE (MINIFLAG 133). |
| 24 | SPARE |
| 25 | FUEL SOLENOID CIRCUIT FAILED. THE FUEL SOLENOID CIRCUIT IS OPEN OR SHORTED. |
| 26 | DEOIL SOLENOID CIRCUIT FAILED. THE DEOIL SOLENOID CIRCUIT IS OPEN OR SHORTED. |
| 27 | FLOW DIVIDER SOLENOID CIRCUIT FAILED. THE FLOW DIVIDER SOLENOID CIRCUIT IS OPEN OR SHORTED. |
| 28 | IGNITION UNIT CIRCUIT FAILED. THE IGNITION UNIT CIRCUIT IS OPEN OR SHORTED. |
| 29 | ECU DEOIL SOLENOID DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |
| 30 | ECU FUEL SOLENOID DRIVER OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 31 | SPARE |
| 32 | ECU IGNITION UNIT DRIVER OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 33 | ECU STARTER CIRCUIT DRIVER OPEN. INTERNAL ECU FAILURE WAS FOUND |

| | |
|----|--|
| 34 | AIRPLANE STARTER CIRCUIT FAILED. VOLTAGE WAS FOUND AT THE START MOTOR AT GREATER THAN 93% SPEED OR NO START MOTOR VOLTAGE IS FOUND DURING START CYCLE |
| 35 | START MOTOR FAILED. VOLTAGE EXISTS ON THE START MOTOR OUT NO APU ROTATION IS FOUND AFTER 14.5 SECONDS. |
| 36 | ECU SCV DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |
| 37 | ECU FUEL CONTROL TORQUE MOTOR DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |
| 38 | ECU IGV ACTUATOR DRIVER OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 39 | ECU FUEL CONTROL TORQUE MOTOR DRIVER OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 40 | SPARE |
| 41 | FUEL CONTROL TORQUE MOTOR FAILED. THE FUEL CONTROL TORQUE MOTOR CIRCUIT IS OPEN OR SHORTED. |
| 42 | IGV ACUTATOR FAILED. THE IGV TORQUE MOTOR OR LVDT IS SHORTED OR OPEN OR COMMANDED IGV POSITION DOES NOT AGREE WITH ACTUAL IGV POSITION BY 10 DEGREES FOR MORE THAN 6 SECONDS (SEE MINIFLAGS 66, 106, 126, AND 127 FIRST IF PRESENT). |
| 43 | SURGE CONTROL VALVE TORQUE MOTOR FAILED. THE SURGE CONTROL VALVE TORQUE MOTOR CIRCUIT IS OPEN OR SHORTED. |
| 44 | ECU EGT NO.1 SIGNAL CONDITIONER FAILED. INTERNAL ECU FAILURE WAS FOUND. |

| | |
|----------------|--|
| 45 | ECU EGT NO. 2 SIGNAL CONDITIONER FAILED. INTERNAL ECU FAILURE WAS FOUND. |
| 46 | ECU OVERTEMPERATURE TEST FAILURE. INTERNAL ECU FAILURE WAS FOUND DURING APU SHUTDOWN. - |
| 47 | INLET DOOR RELAY FAILED. AN OVERCURRENT WAS FOUND ON THE INLET DOOR RELAY CIRCUIT. |
| 48 | ECU FAILED. THIS MINIFLAG INDICATES INTERNAL ECU FAILURES AND IS SET BY MINIFLAGS 3-6, 21, 29-33, 37, 39, 44, 45, 46, 65, 82-89, 98-100, 105 107, 112-119, 121-125 OR 128. IT CAN ALSO BE SET BY MINIFLAGS 36 OR 38. |
| 49 TO 64 | SPARE |
| 65 | ECU HI WINS SPEED CIRCUIT FAILURE. INTERNAL ECU FAILURE WAS FOUND. |
| 66 | IGV POSITION DOES NOT MATCH COMMAND. COMMANDED IGV POSITION DOES NOT AGREE WITH ACTUAL IGV POSITION BY 10 DEGREES FOR MORE THAN 6 SECONDS DURING APU OPERATION. |
| 67 TO 74 | SPARE |
| 75 | AIRPLANE MAINTENANCE LAMP CIRCUIT OVERCURRENT. |
| 76 | AIRPLANE BLEED AIR RELAY OVERCURRENT |
| 77 | AIRPLANE GENERATOR AVAILABLE RELAY OVERCURRENT |
| 78 | AIRPLANE FAULT RELAY OVERCURRENT. |
| 79 TO 81 | SPARE |

| | |
|----------------|--|
| 82 | FUEL TORQUE MOTOR OVERCURRENT. THE FUEL CONTROL TORQUE MOTOR CIRCUIT IS SHORTED. |
| 83 | ECU LCIT CONDITIONER FAILED. INTERNAL ECU FAILURE WAS FOUND. |
| 84 | ECU DEOIL SOLENOID DRIVER FAILED OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 85 | SPARE |
| 86 | ECU AIRPLANE BLEED RELAY OPEN. INTERNAL ECU FAILURE WAS FOUND. |
| 87 TO 88 | SPARE |

89 ECU FUEL SOLENOID DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER.

| | |
|----|--|
| 90 | FUEL SOLENOID CIRCUIT OPEN. THIS MINIFLAG OUTS MINIFLAG 25. |
| 91 | IGNITION UNIT CIRCUIT FAILED OPEN. THIS MINIFLAG SETS MINIFLAG 28. |
| 92 | ECU IGNITION UNIT DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |
| 93 | SPARE |
| 94 | ECU BLEED AIR DRIVER SHORTED. +28V DC WAS FOUND ON THE ECU DRIVER WHEN THE DRIVER IS IN THE OFF POSITION. THERE IS A POSSIBLE ECU FAILURE OR A +28V DC EXTERNAL SHORT TO THE DRIVER. |

757/767 APU TROUBLESHOOTING

**NOTE TO USERS: THIS GUIDE CONTAINS EXTRACTS OF THE APU TRAINING MATERIAL
BASED ON THE AIRCRAFT MAINTENANCE MANUAL. IN ALL CASES THE AIRCRAFT
MAINTENANCE MANUAL TAKES PRECEDENCE OVER ANY INFORMATION IN THIS GUIDE.**

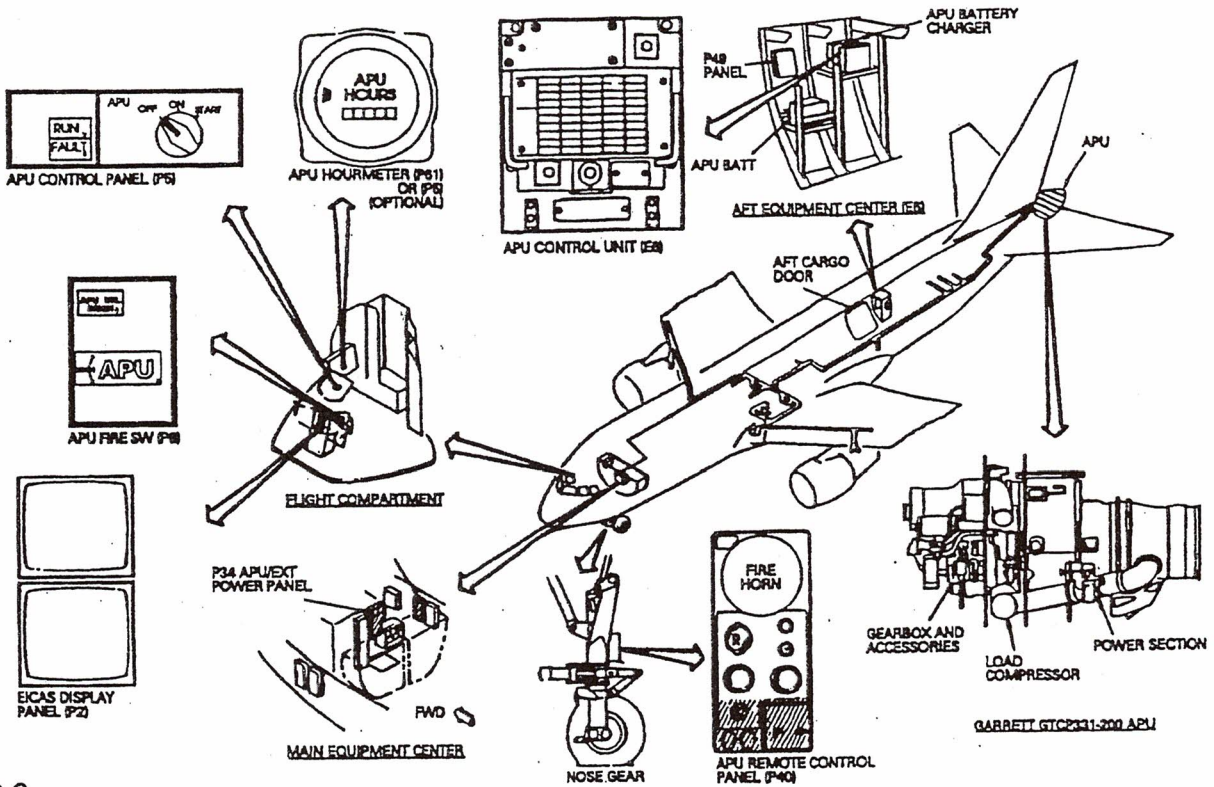
FOR TRAINING USE ONLY
DECEMBER 1992

Allied-Signal Aerospace Company



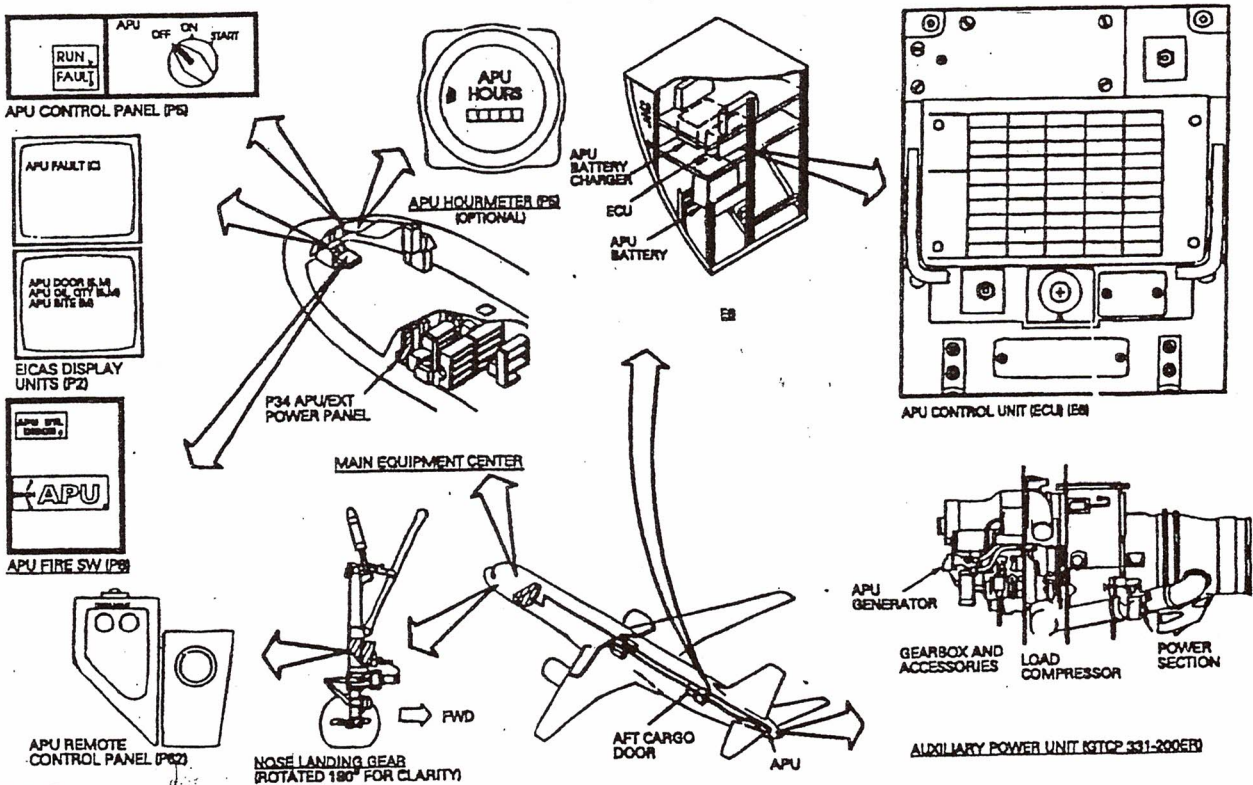
GASD600.1

767 AUXILIARY POWER SYSTEM



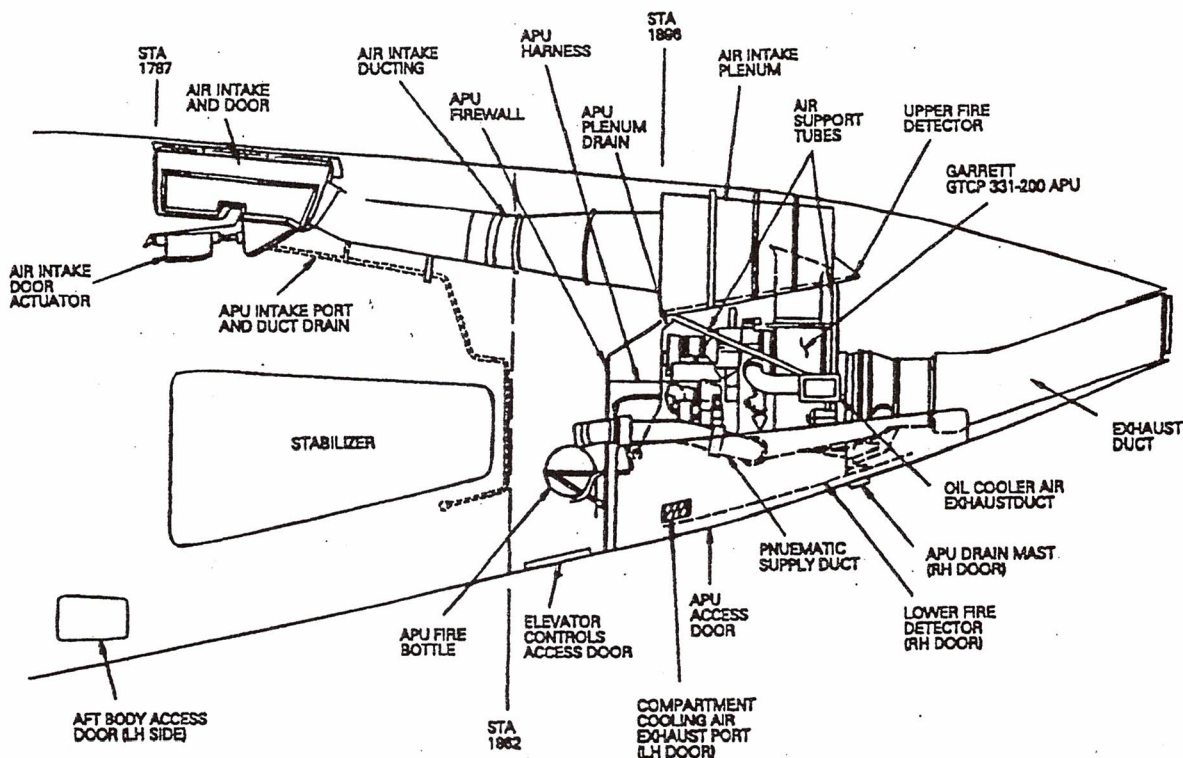
GASD600.2

757 AUXILIARY POWER SYSTEM



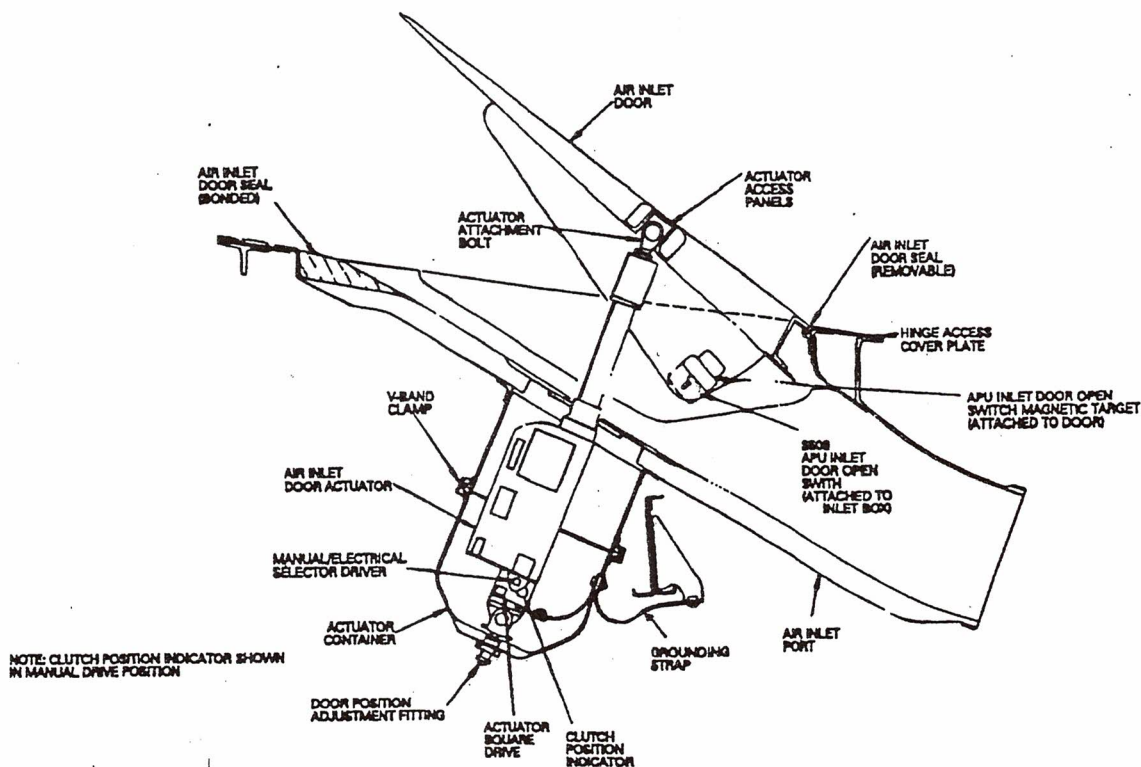
GASD600.3

APU INSTALLATION (757 SHOWN - 767 SIMILAR)



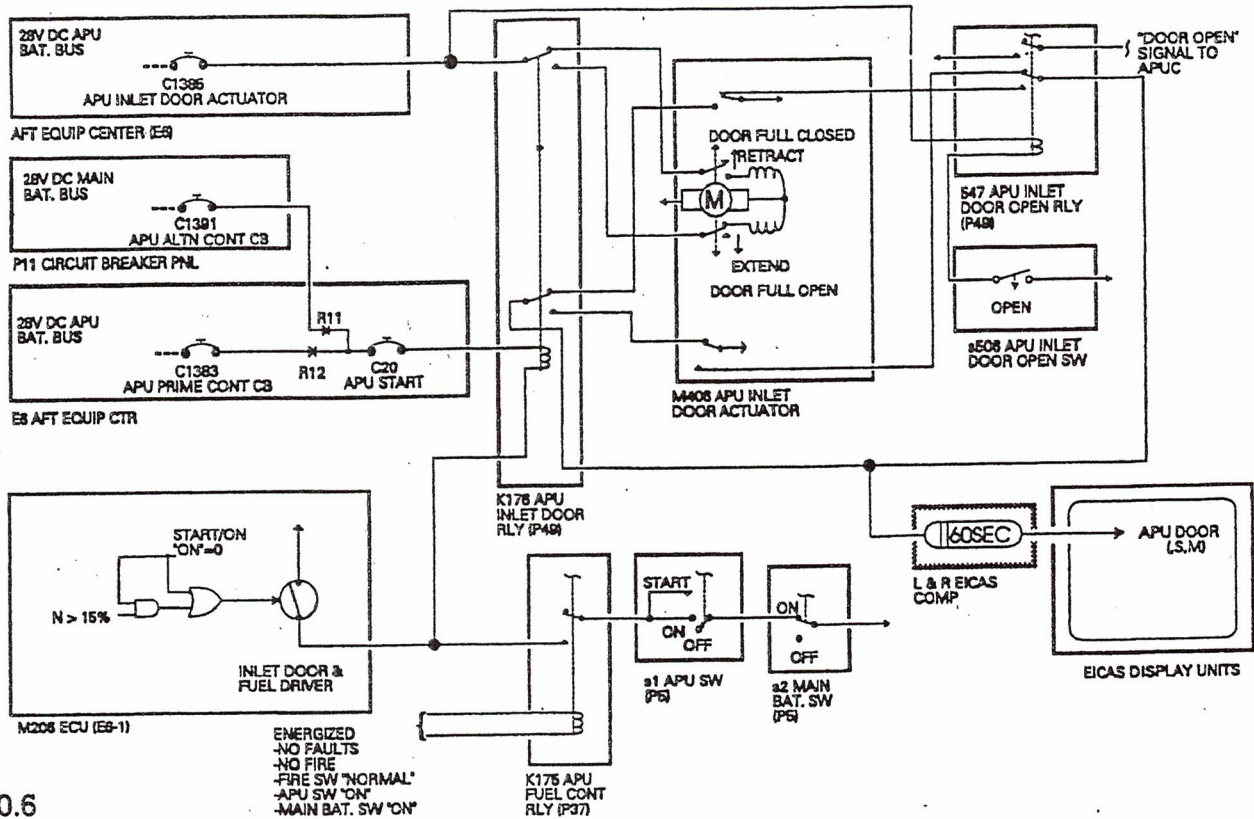
GASD600.4

APU AIR INLET DOOR AND ACTUATOR (767)



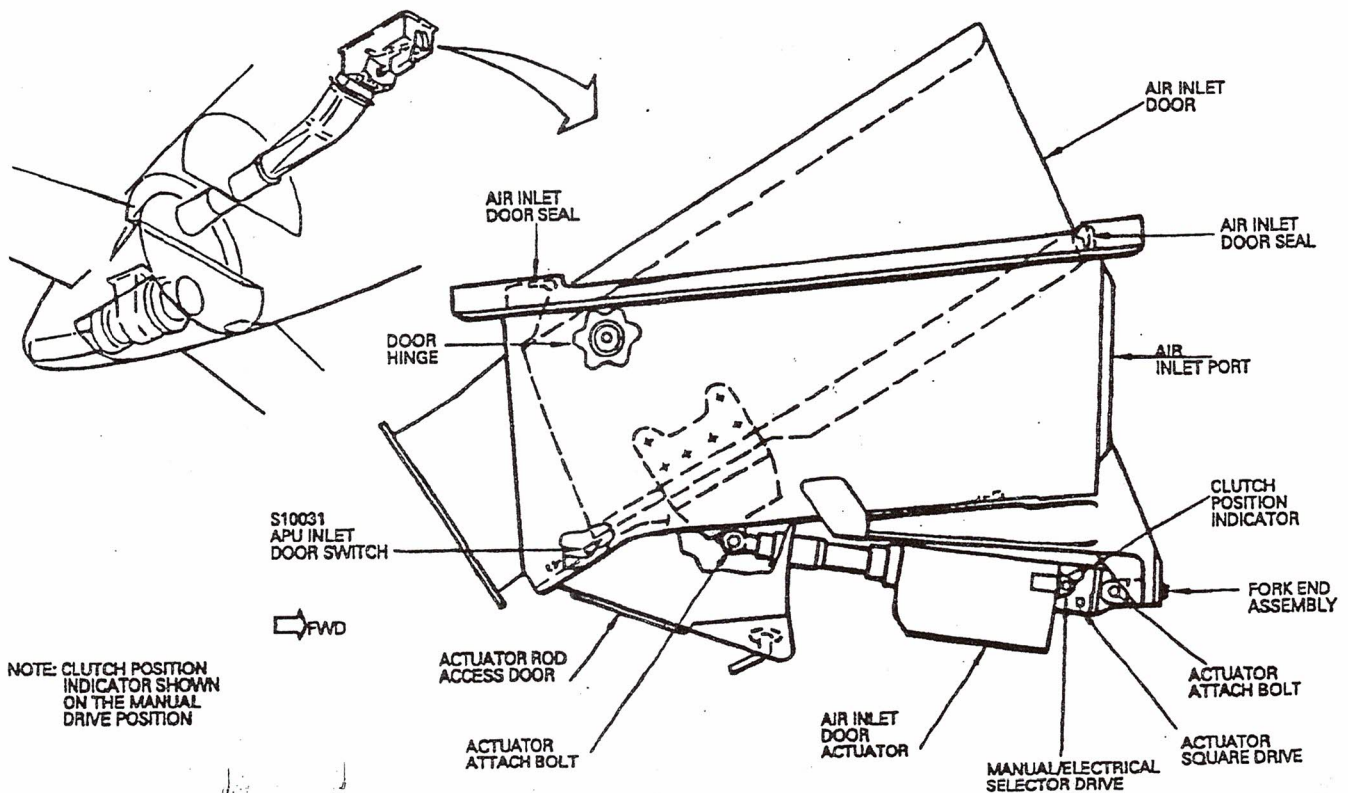
GASD600.5

APU AIR INLET DOOR OPERATION (767)



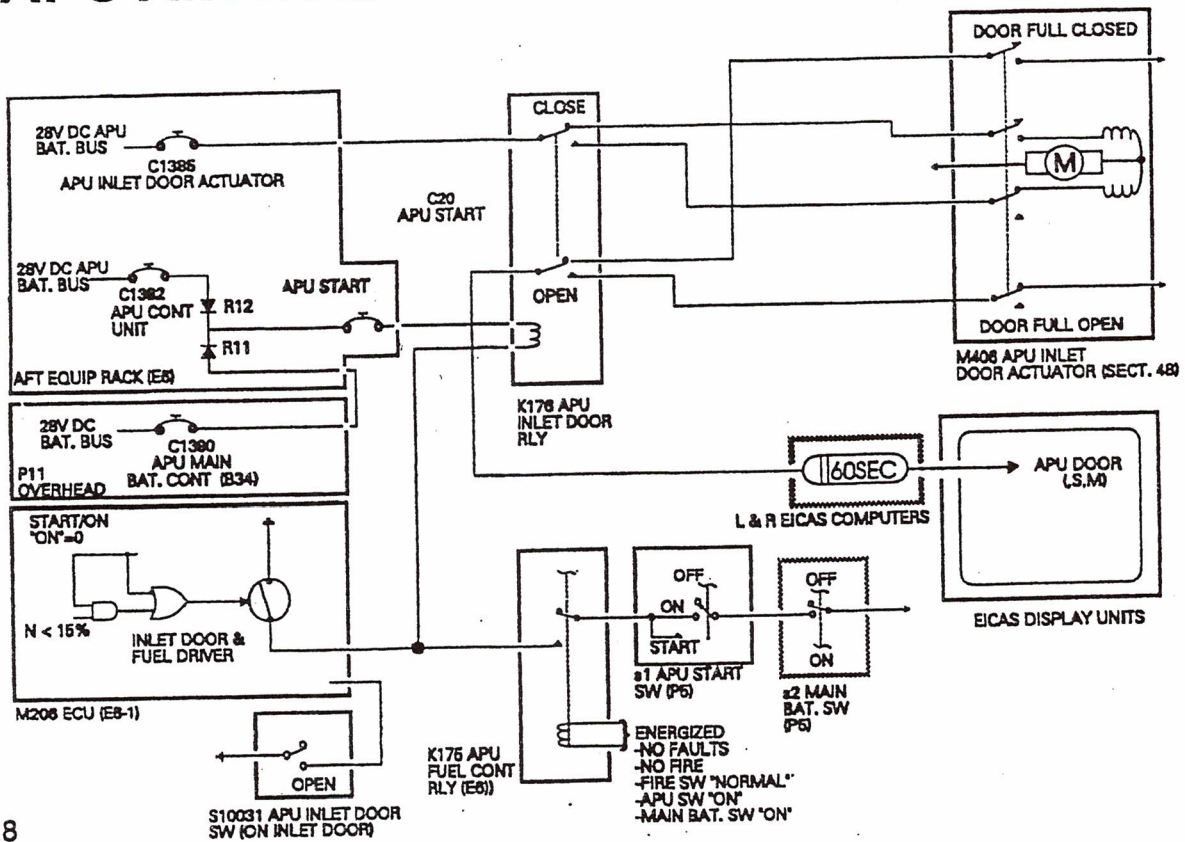
GASD600.6

APU AIR INLET DOOR AND ACTUATOR (767)



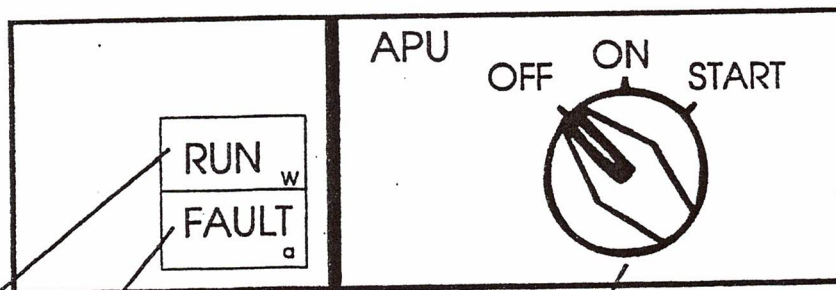
GASD600.7

APU AIR INLET DOOR OPERATION (757)



GASD600.8

APU UNIT



APU RUN LIGHT (White)
Comes on when APU is at operating speed.

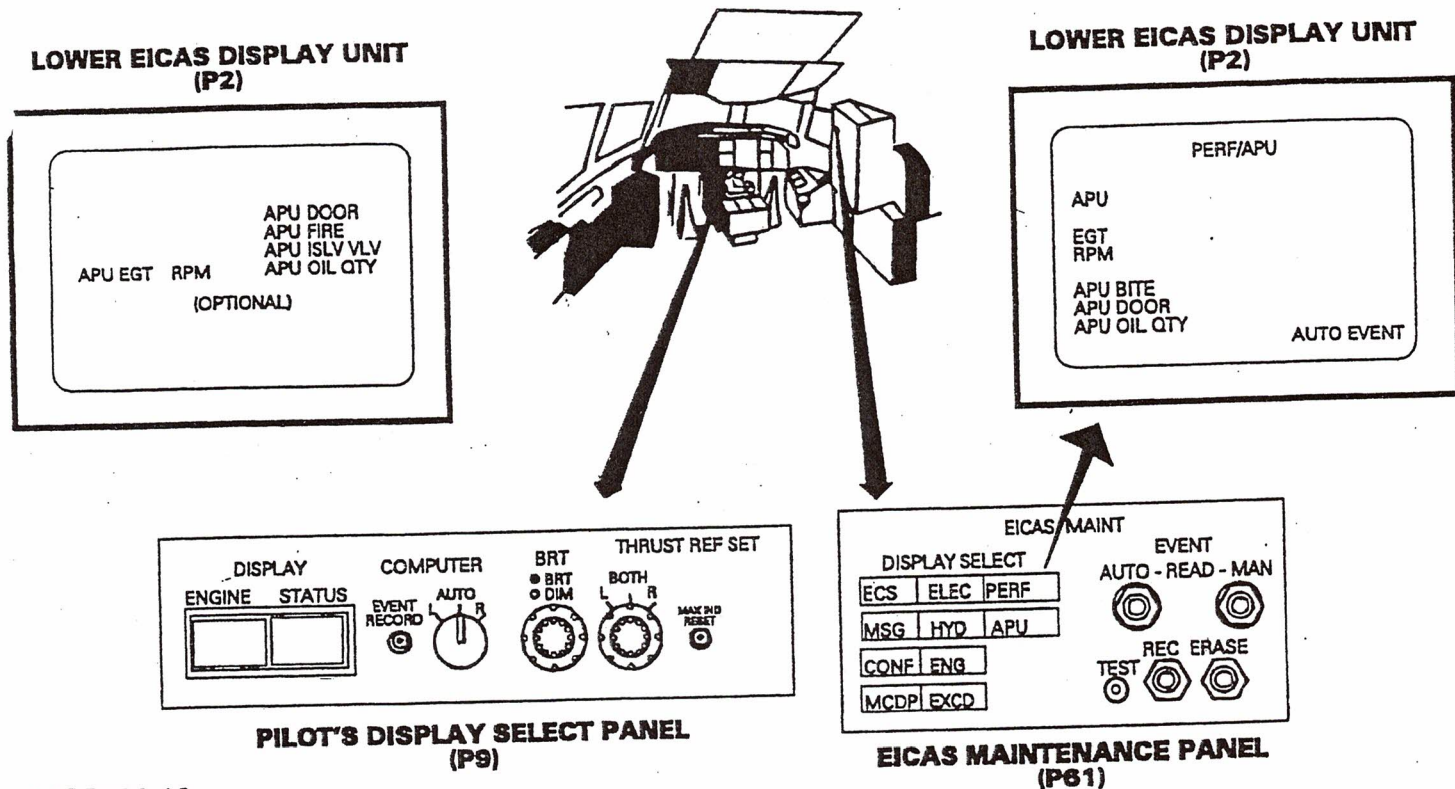
APU FAULT LIGHT (Amber)
ON -When protection circuits detect a fault.
-Momentary during start and normal shutdown when fuel valve is not in commanded position.

APU SELECTOR

- ON** -Operating position. Opens APU inlet door and fuel valve, and if AC power not available starts the DC fuel pump. Provides arming circuit for APU bleed valve.
- START** -Momentary position spring loaded to ON when released. Initiates starting sequence.
- OFF** -Closes APU bleed valve if open. Initiates 60 second APU cool down cycle. If bleed valve was closed for longer than 60 seconds, APU will shut down immediately. Resets fault circuit.

GASD600.9

EICAS DISPLAYS



GASD600.10

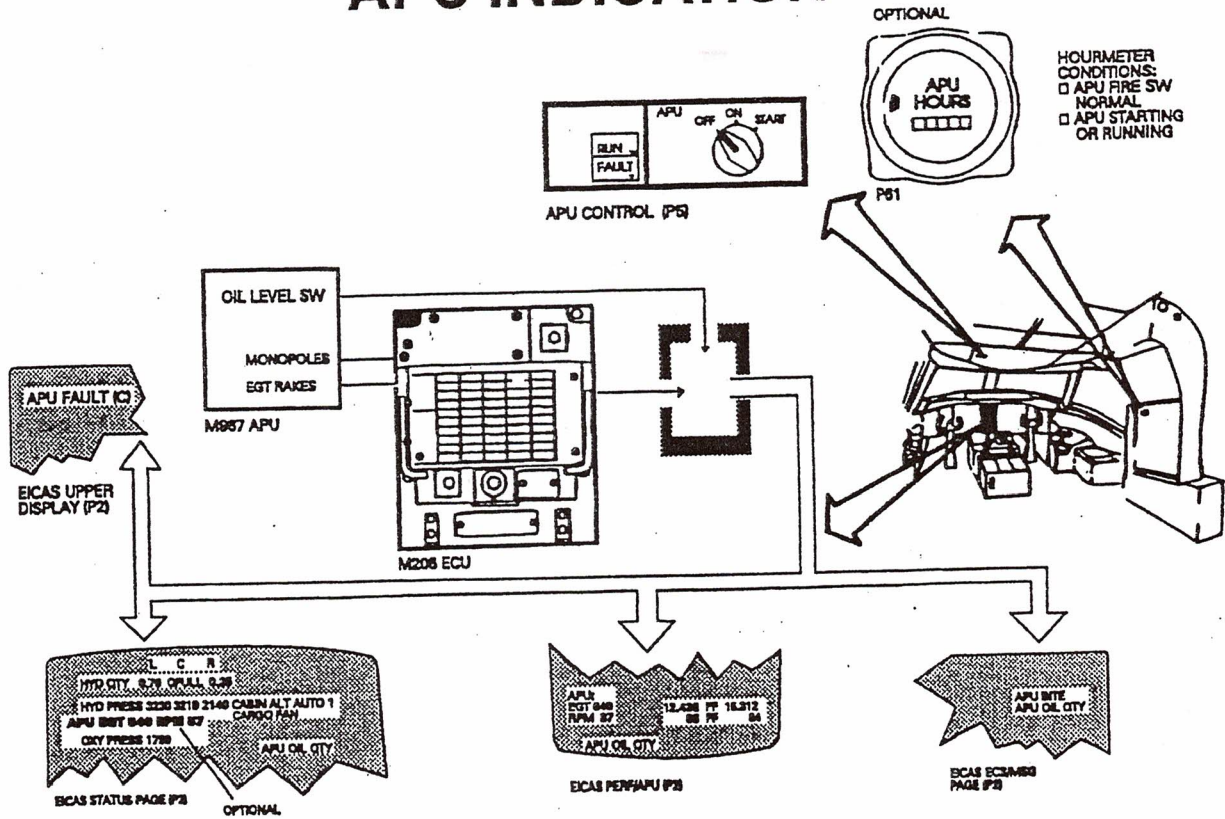
APU SPEED SWITCH POINTS

| Loads | Start Signal | Percent of APU Speed | | | | | |
|--------------------------|--------------|----------------------|-------|-----|---------|-----|-----|
| | | 7 | 50 | 85 | 95 | 107 | 109 |
| Fuel Solenoid | Off | On | --- | --- | --- | Off | Off |
| Fuel Torquemotor | Active | --- | --- | --- | --- | --- | Off |
| Ignition | Off | On | --- | --- | Off | Off | Off |
| Start Relay | On | --- | Off** | --- | --- | Off | Off |
| SCV Torquemotor | Active | --- | --- | --- | --- | --- | --- |
| IGV TM | Off | --- | --- | --- | Active* | --- | --- |
| Fault Relay | --- | --- | --- | --- | --- | On | On |
| Generator Load Available | Off | --- | --- | --- | On* | Off | Off |
| Flow Divider Solenoid | Off | --- | --- | ON | --- | Off | Off |
| Bleed Air Valve Relay | --- | --- | --- | --- | On* | Off | Off |
| Deoil Solenoid | --- | Off | --- | --- | On*** | Off | Off |
| APU Shutdown | On**** | --- | --- | --- | --- | --- | --- |

* After 2 sec. delay.
 ** For P2 ≤ 3.29 psia only, for -18 ECU only, starter cutoff will be switched to 55%. For ground starts only, the starter cutoff will be switched to 42-50% engine speed if the engine acceleration is greater than 1% for 3.5 continuous seconds at any time over 35% engine speed.
 *** On rolldown only.
 **** Turned off if N < 15% and shutdown or stop is in progress.

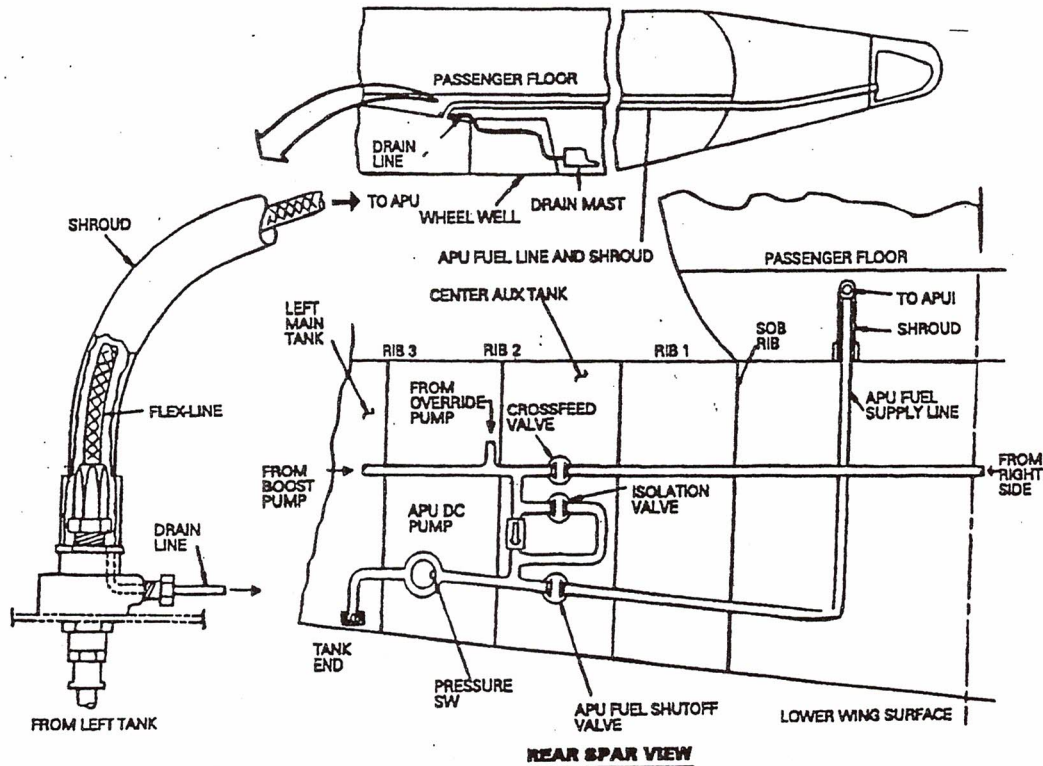
GASD600.11

APU INDICATION



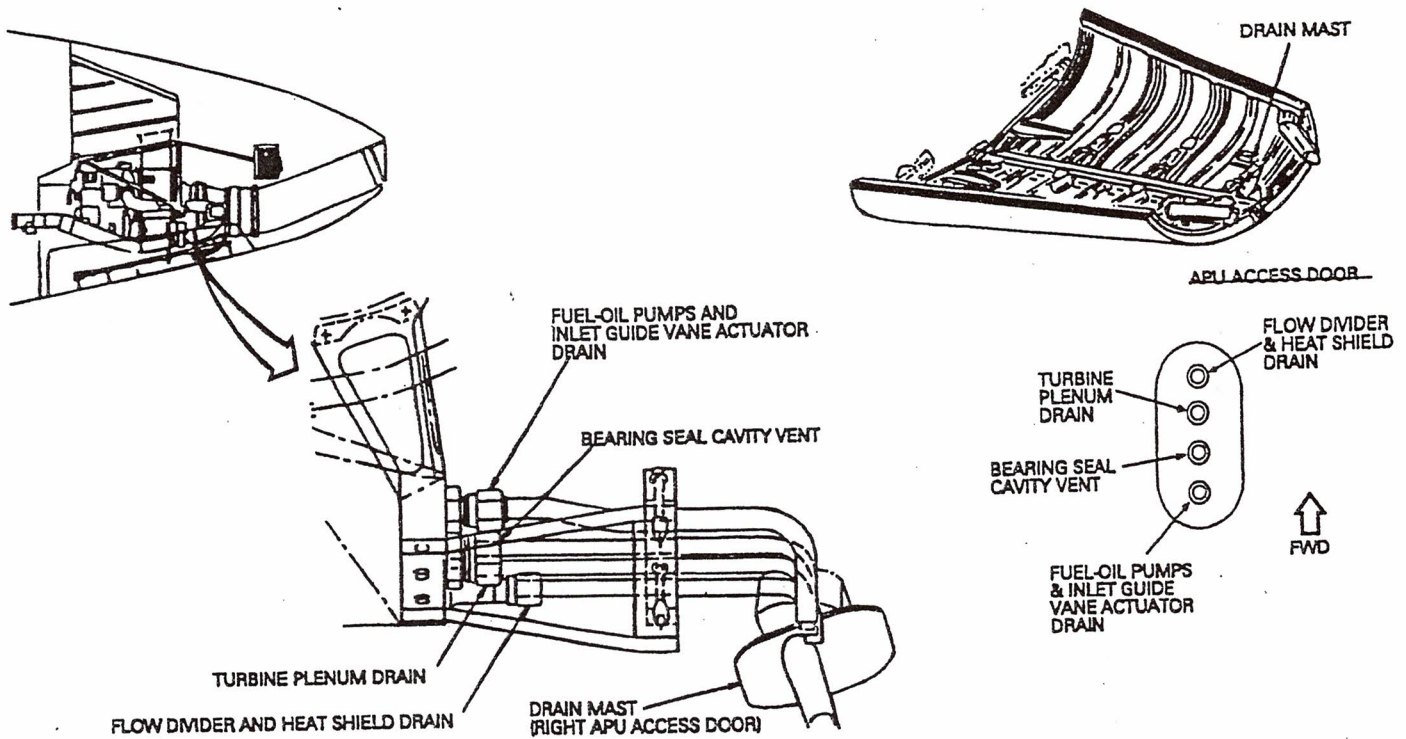
GASD600.12

767 APU FUEL FEED SYSTEM (757 SIMILAR)



GASD600.13

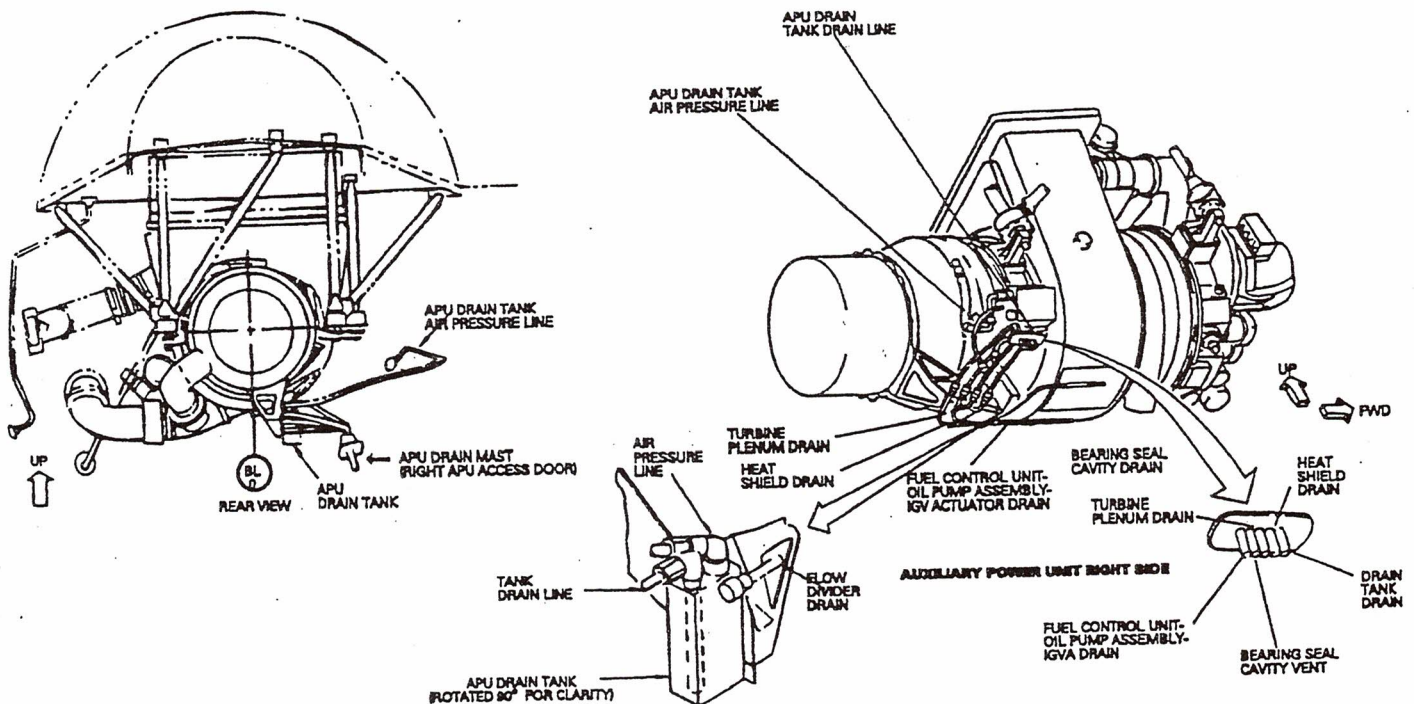
767 APU DRAIN AND VENT ASSEMBLY



GASD600.14

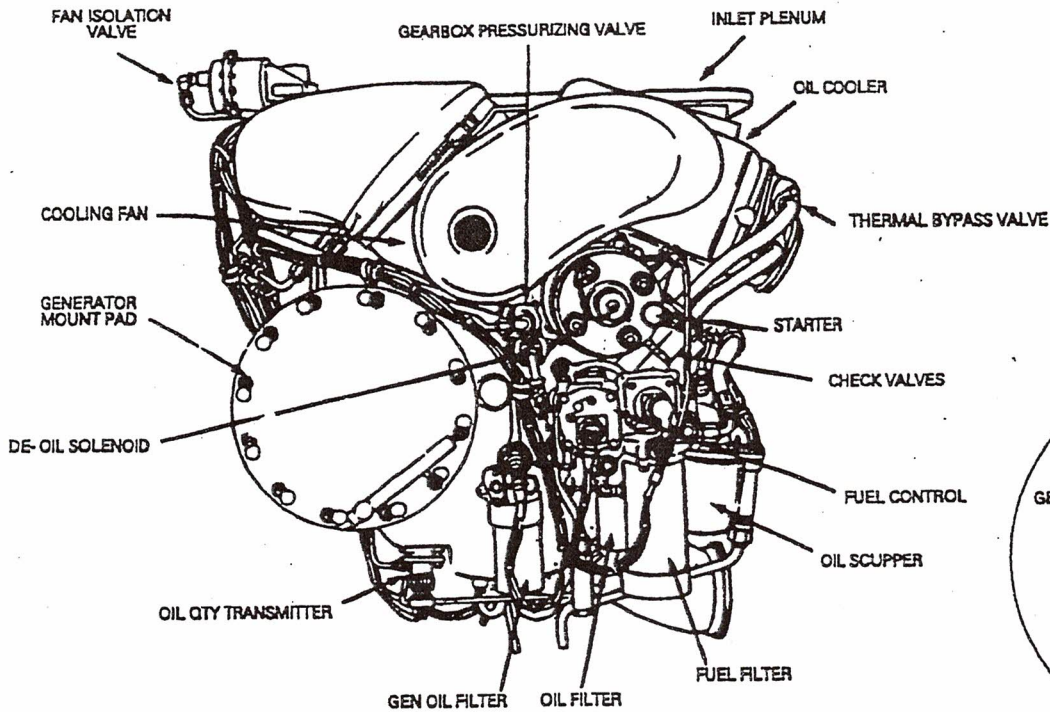
ROTATED 90° FOR CLARITY

757 APU DRAIN AND VENT ASSEMBLY



GASD600.15

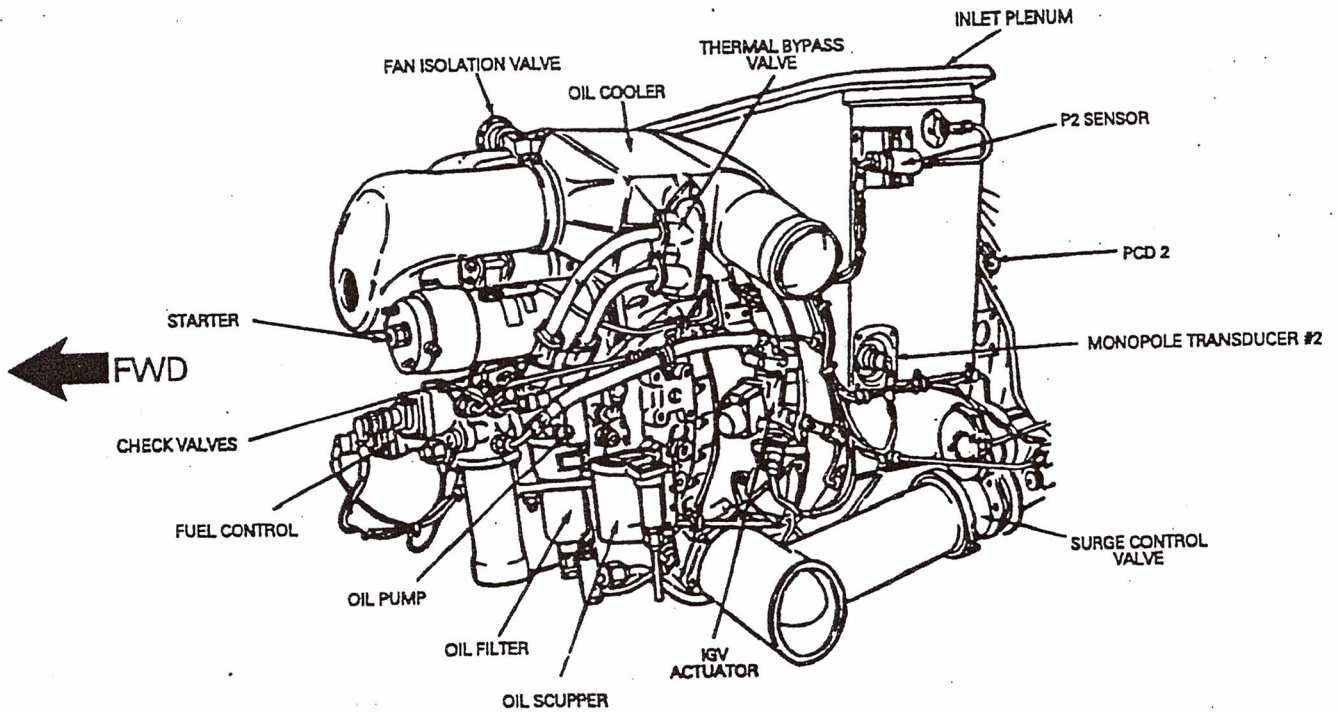
GTCP331-200 FRONT VIEW



For Reference Only

GASD600.16

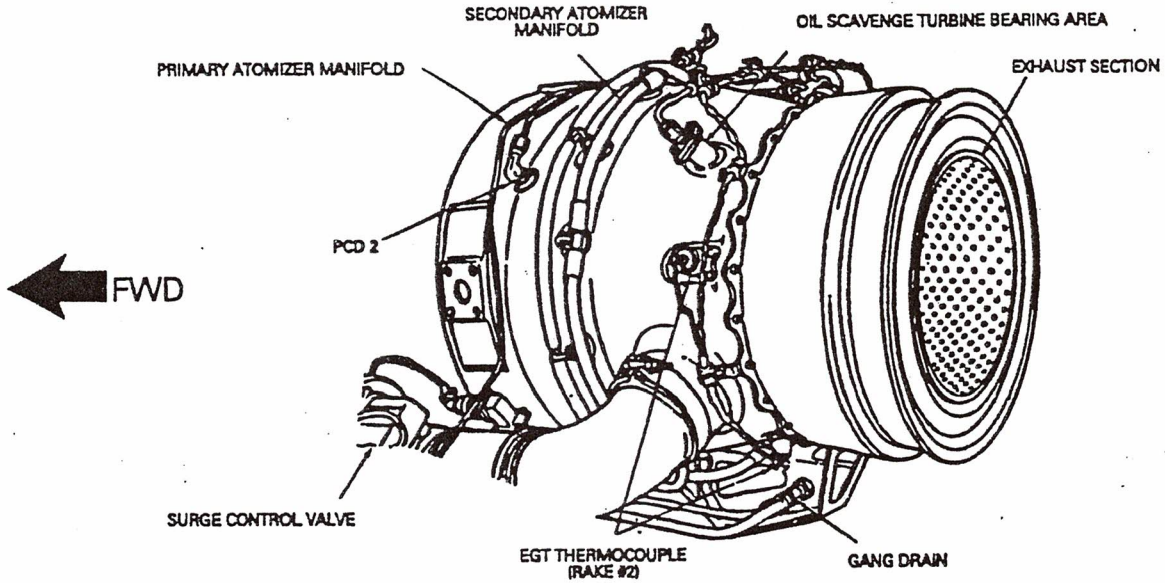
GTCP331-200 LEFT SIDE VIEW



For Reference Only

GASD600.17

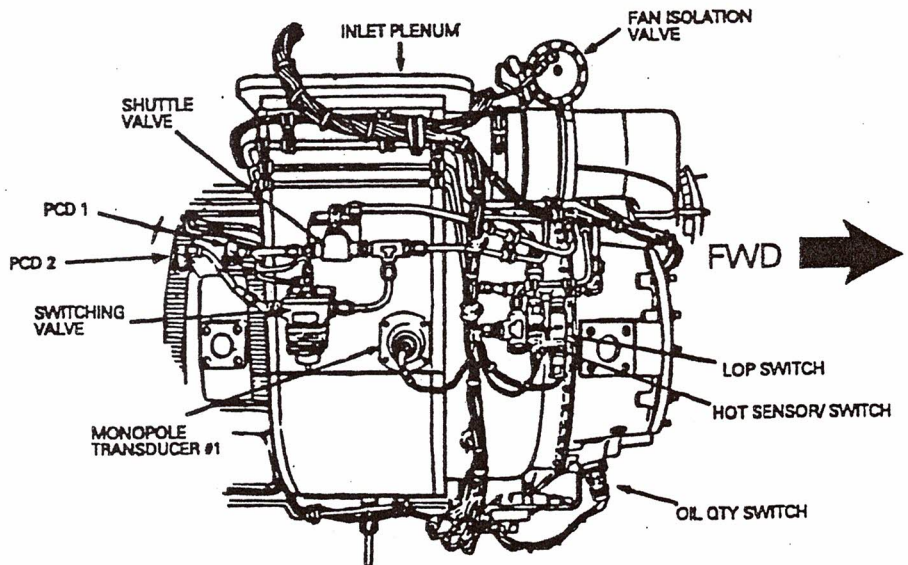
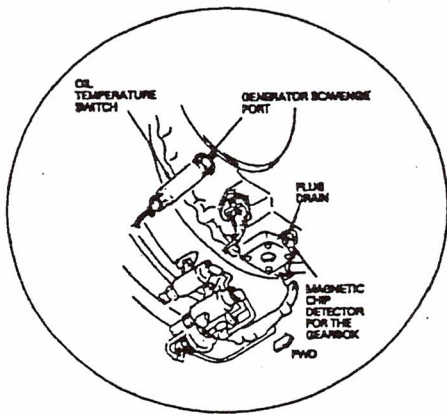
GTCP331-200 LEFT SIDE VIEW



For Reference Only

GASD600.18

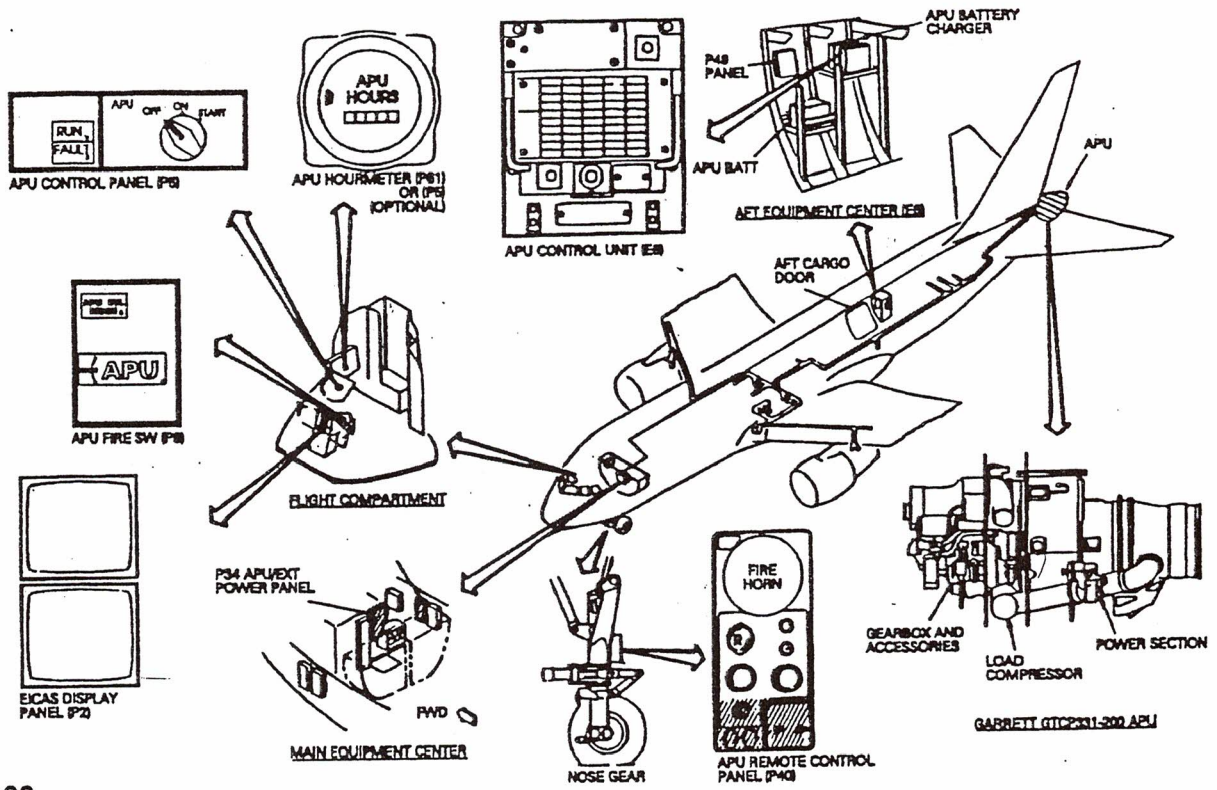
GTCP331-200 RIGHT SIDE VIEW



For Reference Only

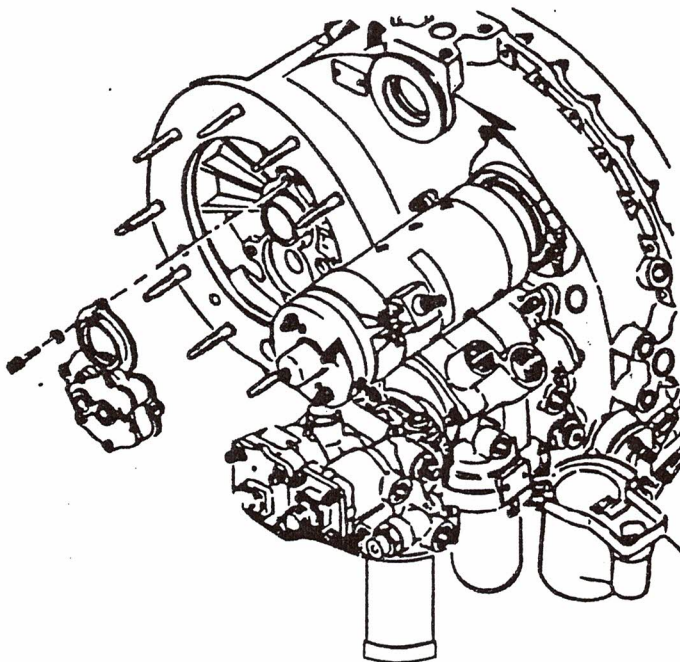
GASD600.19

GTCP331-200 LEFT SIDE VIEW



GASD600.20

GENERATOR SCAVENGE PUMP

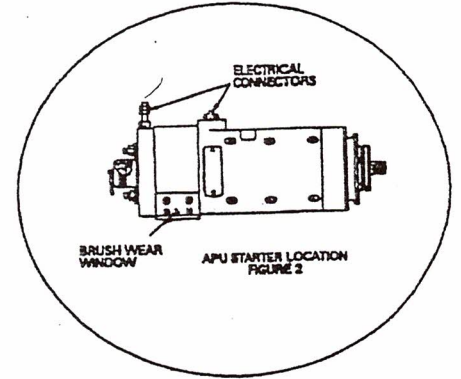
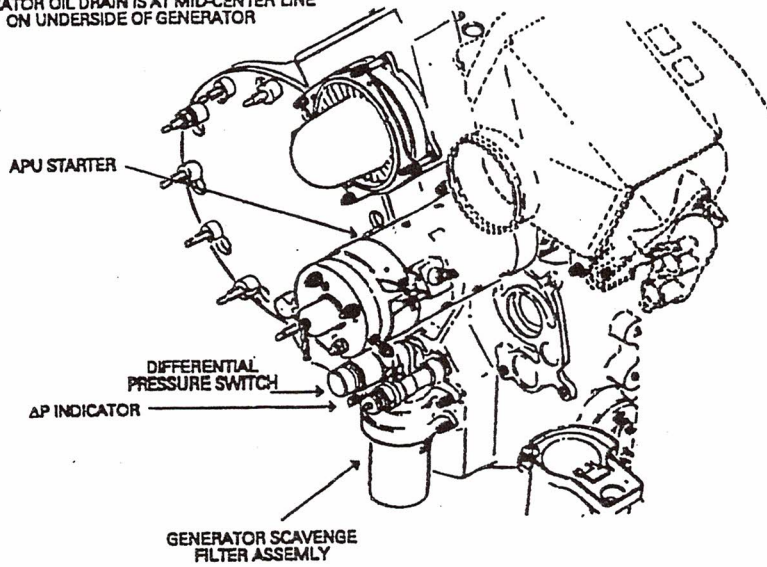


For Reference Only

GASD600.21

GENERATOR SCAVENGE FILTER/ Δ P INDICATOR/ Δ P SWITCH

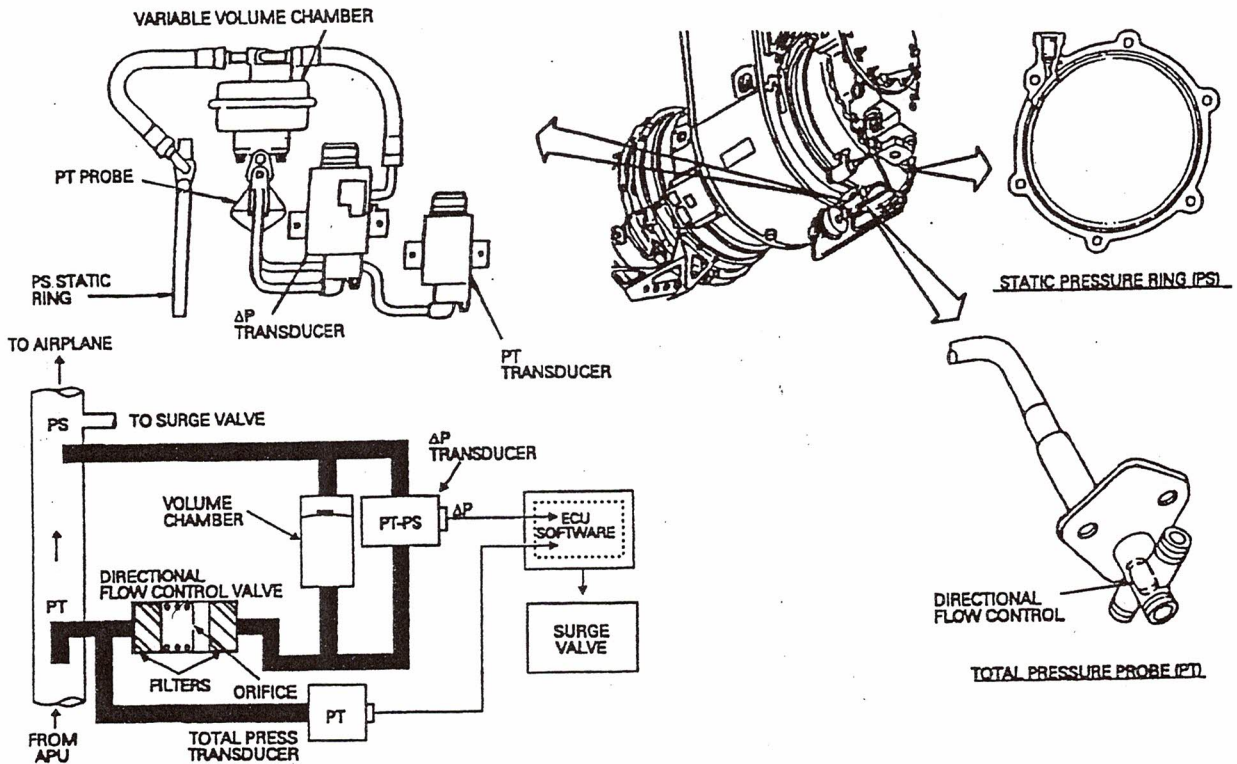
* NOTE
GENERATOR OIL DRAIN IS AT MID-CENTER LINE
ON UNDERSIDE OF GENERATOR



For Reference Only

GASD600.22

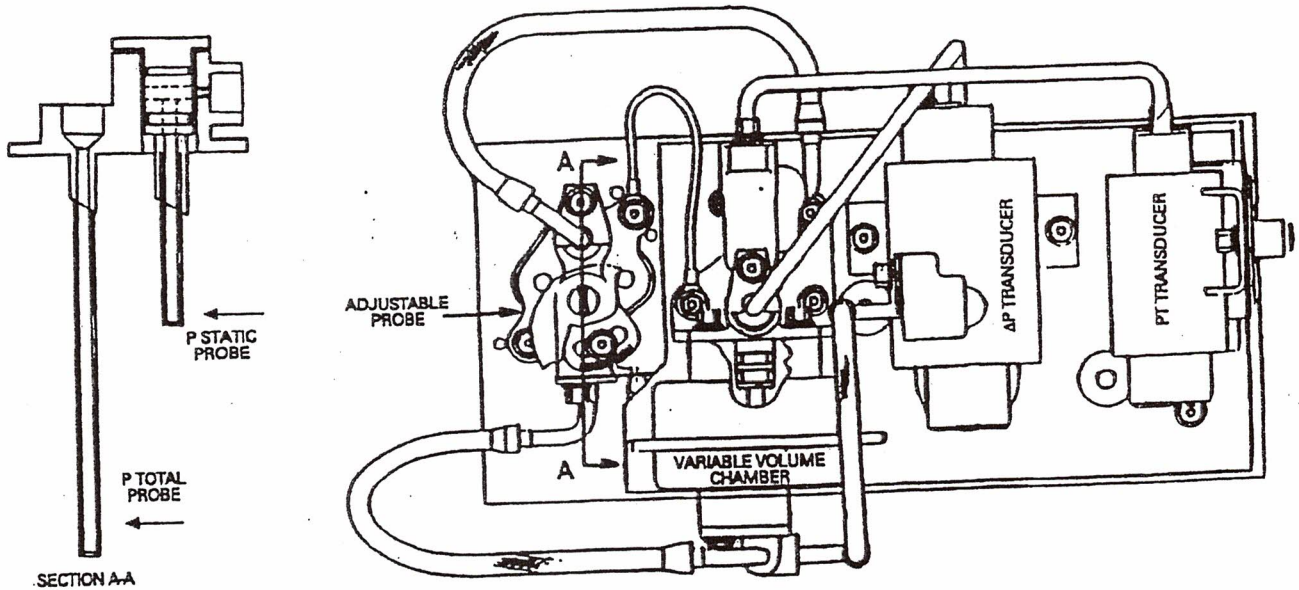
FLOW SENSORS AND TRANSDUCERS



For Reference Only

GASD600.23

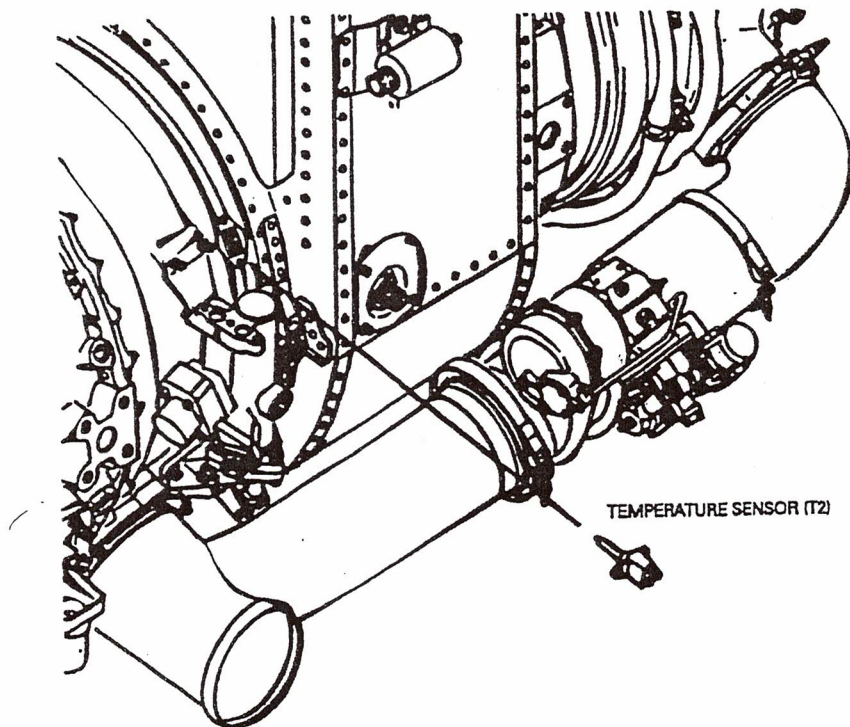
ALTERNATE FLOW SENSOR CONFIGURATION (MODULE ASSEMBLY)



For Reference Only

GASD600.24

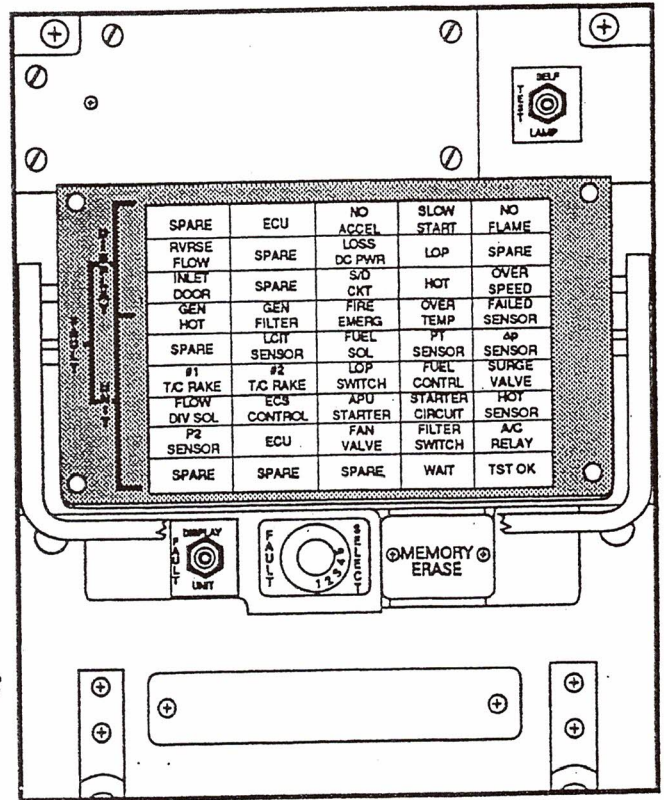
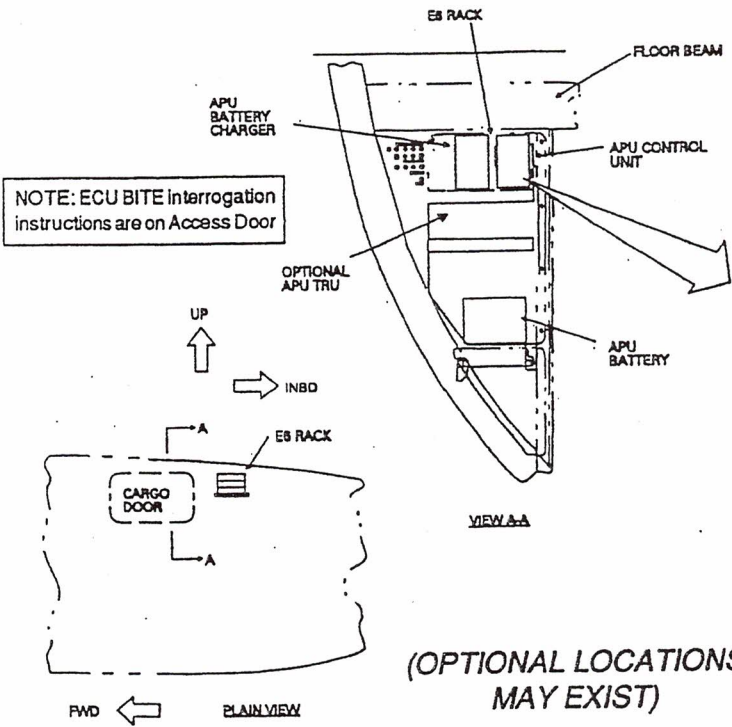
LOAD COMPRESSOR INLET TEMPERATURE SENSOR



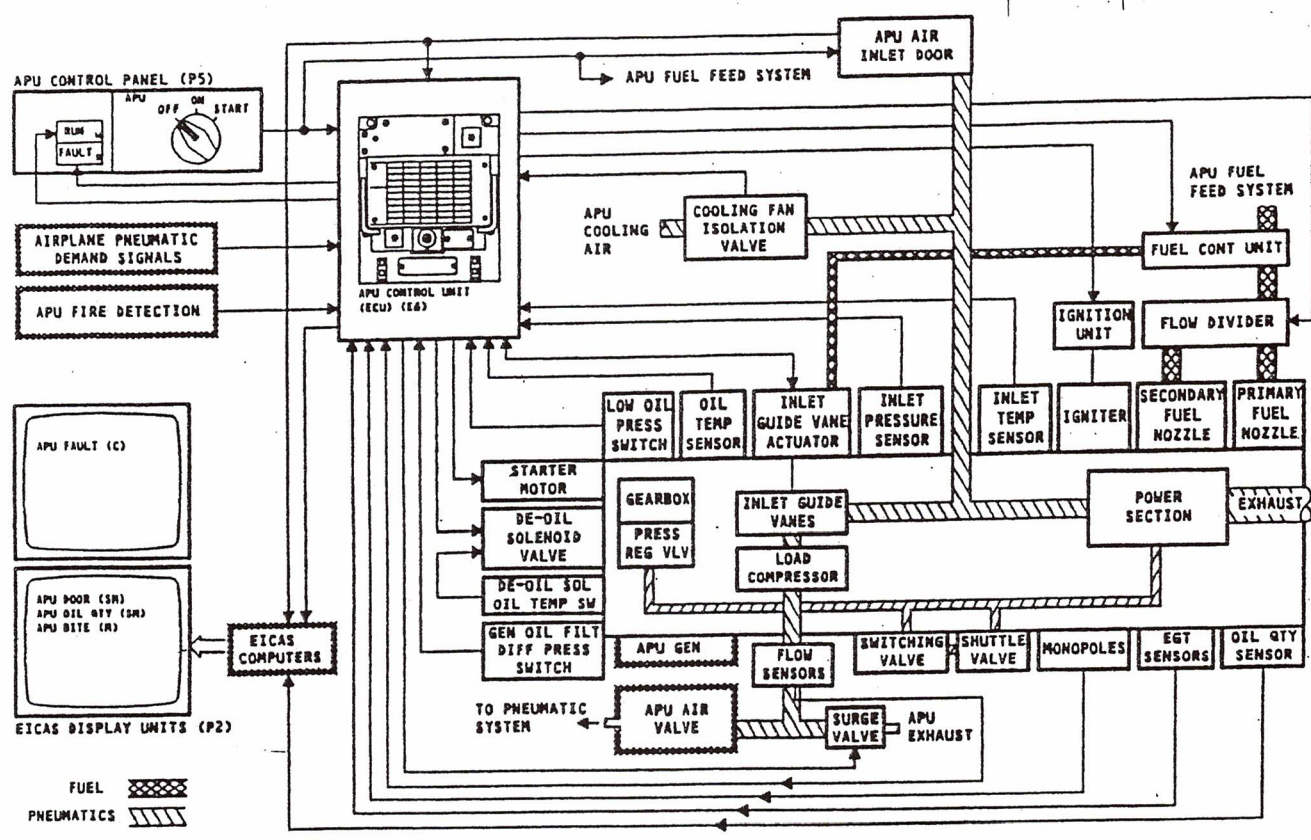
For Reference Only

APU CONTROL UNIT (ECU)

NOTE: ECU BITE interrogation instructions are on Access Door

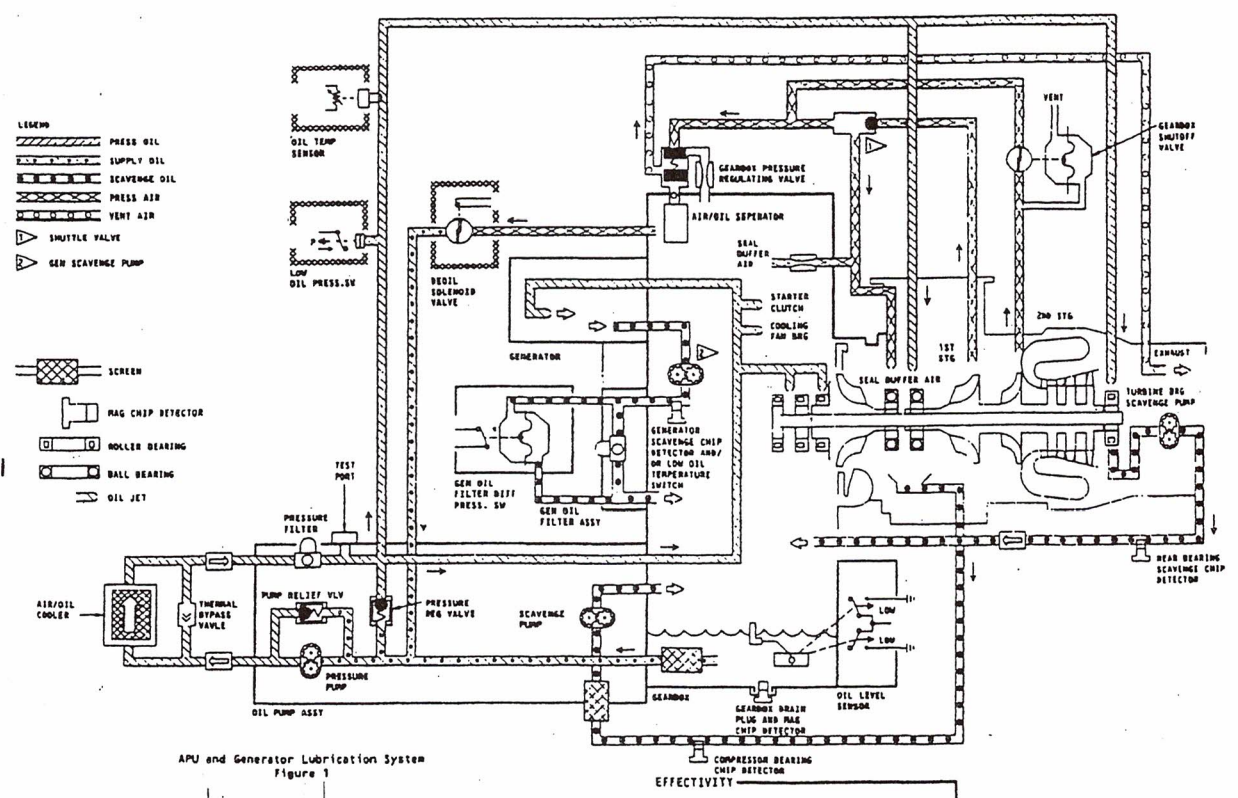


GASD600.26



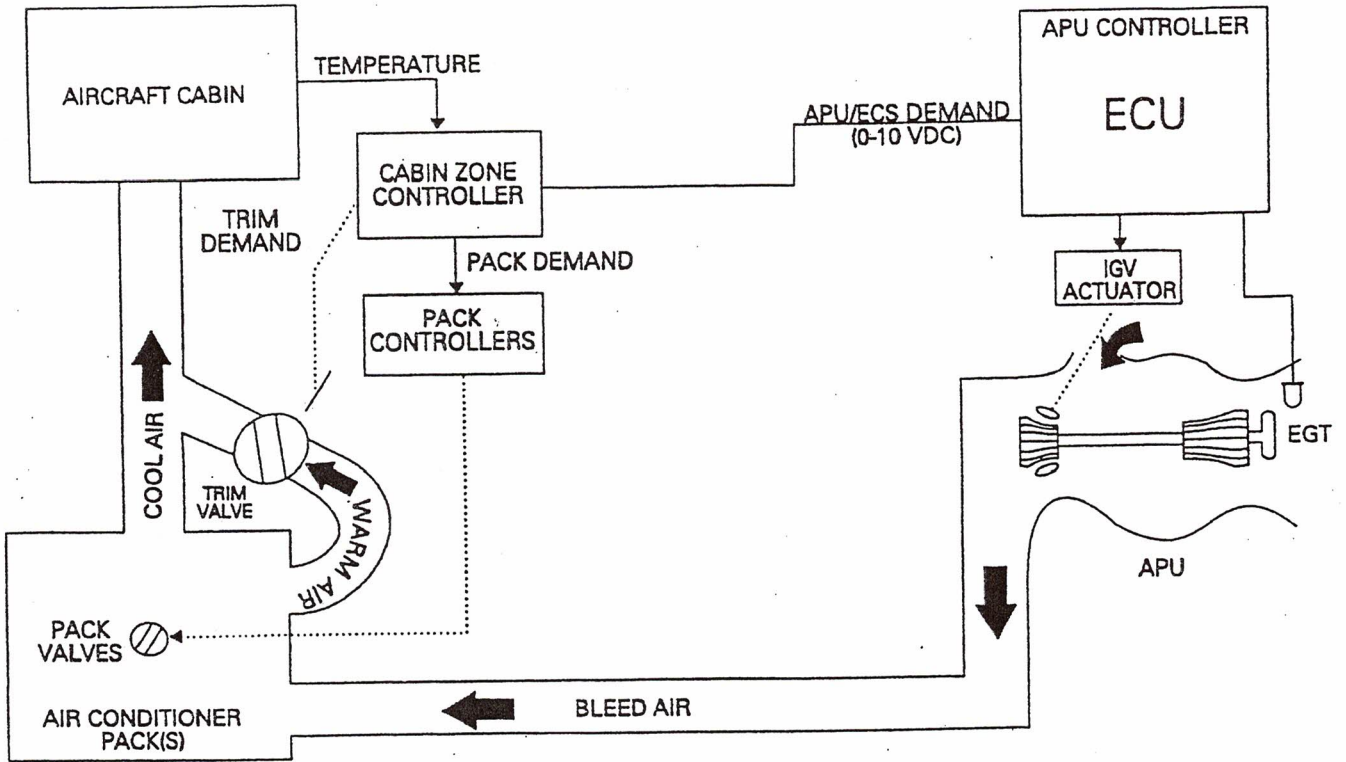
GASD600.27

APU AND GENERATOR LUBRICATION SYSTEM



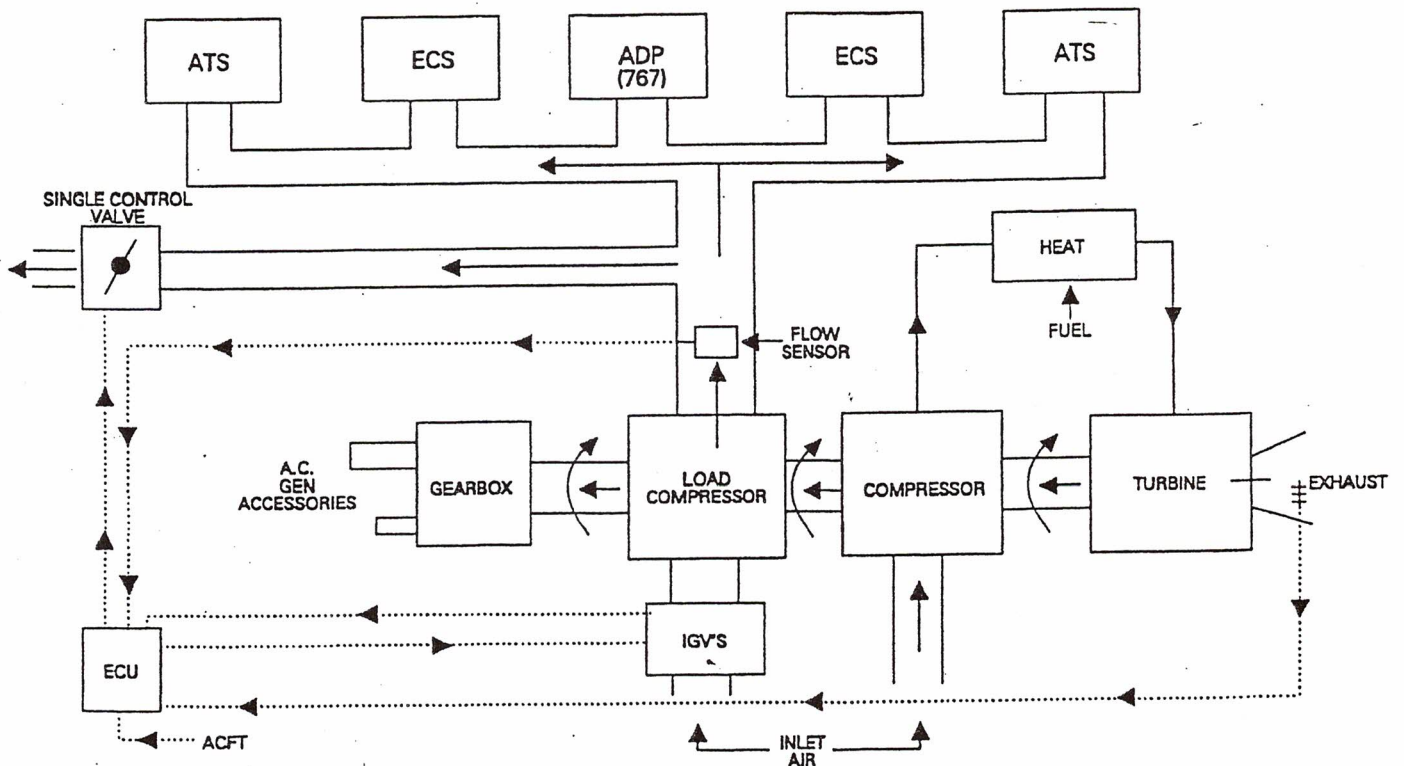
GASD600.28

APU/ECS CONTROL LOOPS



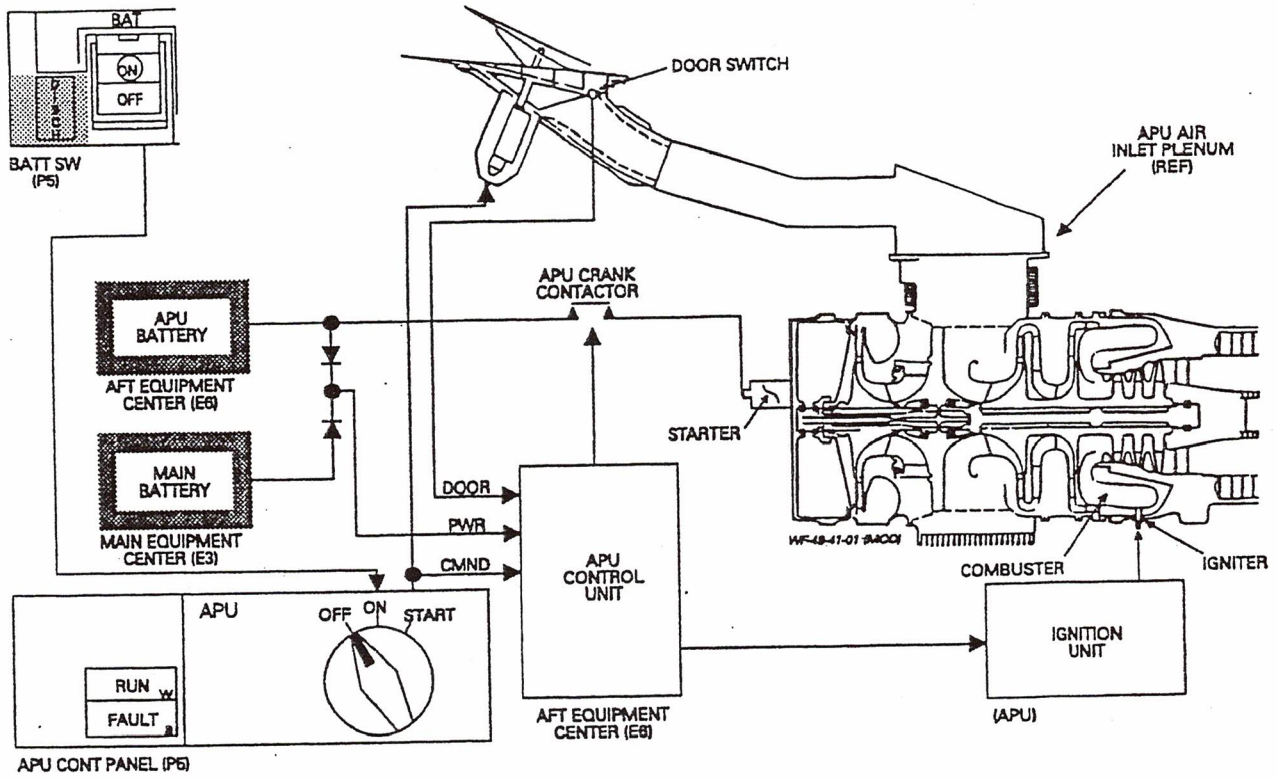
GASD600.29

SURGE CONTROL SYSTEM



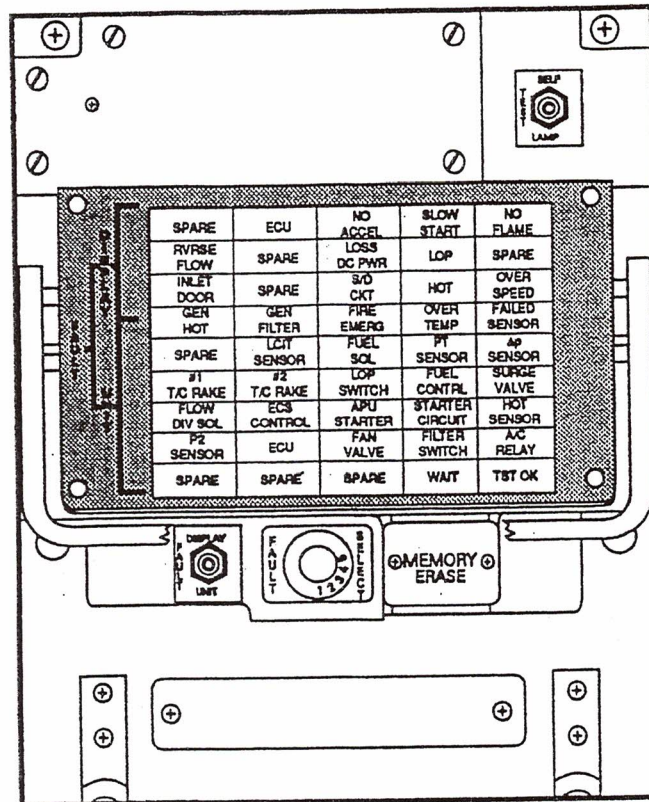
GASD600.30

APU IGNITION/STARTING SYSTEM



GASD600.31

ECU FRONT PANEL DISPLAY



GASD600.32

ECU INTERROGATION PROCEDURE

Position TEST switch to LAMP position and hold for approximately 1 second. Record any blocks with faulty lamps.
 Position TEST switch to the SELF position and hold for approximately 1 second. The WAIT light will illuminate for 2 seconds and then extinguish. Record any LRU's displayed. If TST OK illuminates record TST OK.

BOEING AIRCRAFT: Position FAULT SELECT switch to position 1 Position FAULT switch to the DISPLAY position and hold for approximately 1 second. Record FAULT DISPLAY (auto-shutdown on upper matrix) and FAULTY UNIT (LRU on lower matrix). If TST OK illuminates on the lower matrix, record TST OK. To observe previous auto shut-down history, position FAULT SELECT switch to position 2 through 5. Position FAULT switch to the DISPLAY position at each FAULT SELECT switch position (2 through 5) and hold for approximately 1 second. Record FAULT DISPLAY (auto-shutdown on upper matrix) and FAULTY UNIT (LRU on lower matrix) at each FAULT SELECT switch position (2 through 5). If TST OK illuminates on the lower matrix, record TST OK, reset FAULT SELECT switch to position 1.

THE SELF TEST BITE ROUTINE is a "REAL TIME" test routine performed at the ECU/ECB and checks the electrical integrity of the circuit within the ECU/ECB, and the APU harness, and certain associated LRU's mounted to the APU.

Any FAULTY UNITS (LRU's on lower matrix) illuminated during self test bite routine indicate a fault within that circuit. The most probable cause of the failure would be the actual LRU's.

THE FAULT DISPLAY BITE ROUTINE is a auto-shutdown "HISTORY" check performed at the ECU/ECS and illuminates the auto-shutdown history on the upper matrix followed by a faulty unit on the lower matrix beginning with the most recent auto-shutdown.

THE FAULTY UNIT BITE ROUTINE is a faulty unit "HISTORY" check performed at the ECU/ECB and illuminates all faulty units (LRU's on lower matrix) that have failed since the last ECU/ECB memory erase was performed. The important thing to note here is, in some cases there will be faulty units (LRU's on lower matrix) that will be illuminated and may be faulty at this time but will not be illuminated during a self test bite interrogation.

THE MEMORY ERASE ROUTINE is a fault display and faulty unit "HISTORY" erase routine performed at the ECU/ECB and Garrett recommends memory erase be used after every corrective action to insure accurate information will be illuminated at the next ECU/ECB bits interrogation.

ECU BITE AUTOMATIC SHUTDOWN/START INHIBIT FAULT INDICATIONS

GASD600.34

OVERSPEED

APU speed exceeds 107 percent.

OVERTEMP

EGT exceeds the overtemperature schedule (1150F/621C on speed, higher during starts) for 2 seconds.

LOP

Speed is greater than 95 percent and the LOP signal (from LOP switch) is present long enough to allow pump priming (15.5 seconds in flight, generally 1 second on the ground). For -18 ECU and later, two consecutive LOP shut down buttons on start will blink the LOP light on the ECU front panel (during BITE interrogation) and inhibit further starts until the ECU memory is cleared (ground operation only).

HOT

Oil temperature has exceeded 310 ± 30 F for 10 seconds while over 95 APU speed.

NO FLAME

(1) APU speed has exceeded 7 percent for 14 seconds (30 seconds if P2 is less than 4.69 psia (above approx. 30,000 ft.) and EGT has not exceeded 400 ± 40 F.

OR

(2) After the 14 (or 30) second timer has expired EGT decreases below 400F.

FIRE EMERG

A "Fire Shutdown" signal has been received from the aircraft.

SLOW START

After starter energization the APU has not reached 7 percent speed within 30 seconds or 20 percent speed within 50 seconds or 50 percent speed within 70 seconds (100 seconds if P2 is less than 4.69 psia (above approx. 30,000 ft.)).

FAILED SENSOR

(1) Both EGT signals (there are a total of 4 EGT probes with 2 TC's each connected into 2 separate circuits) are sensed as being open (less than -100F) for 1/2 second.

OR

(2) Both speed monopoles are sensed as being failed (will only be flagged if the APU speed exceeds 50 percent when the failure occurs).

INLET DOOR

The "inlet door open" signal from the aircraft has been lost for 1/2 second after the APU speed exceeds 7 Percent. If the inlet door does not open to begin an APU start or the door switch is faulty the APU will not start and there will be no fault displayed.

REVERSE FLOW

APU speed is greater than 50 percent and LCIT has either exceeded 400F or has increased at a very rapid rate indicating either a reverse flow from main engine bleed or APU load compressor surge.

NO ACCEL

(1) During starts - when APU speed is between 7 percent and 95 percent, EGT is greater than $400 \pm 40F$, and acceleration is less than 0.2 percent/second for 12.5 seconds.

(2) On speed - APU speed falls below commanded speed and acceleration is less than 0.2 percent/second for 5 seconds.

GASD600.36

GEN FILTER

Oil temperature is greater than $115 \pm 15F$ and the generator oil filter delta P switch is sensed as open for 1/2 second.

DC PWR LOSS

The APU will shutdown if DC power to the ECU is interrupted for more than 50 msec. When power is lost the fault cannot be immediately stored in the memory for the BITE display, so ECU interrogation will not show the DC PWR LOSS fault until after the next start attempt (which is inhibited). Subsequent start attempts will be normal.

S/D CIRCUIT

This fault indicates a sensed internal failure of the ECU overspeed protection circuit which is tested on every normal APU shutdown. This fault trips an internal latch in the ECU which prevents further operation. The ECU must be replaced.

ECU

This fault indicates a sensed internal failure of the ECU which could affect safe operation of the APU. If sensed during operation the APU will shutdown. If sensed during the prestart test the start will be inhibited.

GEN HOT

This light is not used.

ECU FAULTY UNIT LAMP DESCRIPTIONS

GASD600.38

LCIT SENSOR

-- Indicates that a failure of the load compressor inlet temperature sensor was detected.
The signal from the load compressor inlet temperature sensor is tested for circuit integrity, i.e., that the received signal is greater than -100F. It is tested in all three BITE modes.

FUEL SOL

-- Indicates that a failure of the fuel solenoid was detected.
The fuel solenoid is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes. In the monitor mode it is tested for overcurrent and if verified for three seconds, the fuel solenoid is de-energized by the ECU.

FUEL SENSOR

-- Indicates that a failure of the total pressure sensor was detected.
The signal from the PT sensor must be between 16.5 and -5.6 psia in the prestart and self-test BITE modes. In the monitor mode the signal must fall between 100 and -10 psia. In addition the PT sensor is compared to the P2 (inlet pressure) sensor during rolldown on every ground shutdown. The PT sensor signal must be within +3 psia of the P2 sensor when the APU is below 12 percent speed. If PT sensor fails, the inlet guide vanes (IGV's) are closed, the surge control valve is opened, and the APU continues to run.

AP SENSOR

-- Indicates that a failure of the differential pressure sensor was detected.
The signal from the differential pressure sensor must be between 0.5 and -0.75 psid in the prestart and self-test BITE modes. In the monitor mode the signal must fall between 14 and minus 0.75 psid. If the differential pressure sensor fails, the inlet guide vanes are closed, the surge control valve is opened, and the APU continues to run.

GASD600.39

#1 AND #2 SPD SENSOR

- Indicates that a failure of the speed sensor switch was detected.

Once APU speed exceeds 50 percent, the speed sensor signal must remain above 30 percent (with a 40 millisecond time delay) unless a shutdown is in progress. The speed sensors are not checked in the prestart or self-test BITE modes. The APU can operate with only one speed sensor.

LOP SWITCH

- Indicates that a failure of the low oil pressure switch was detected.

The low oil pressure switch is tested for the proper state (open) with the engine off in prestart and self-test BITE modes. If the switch is closed, an LRU fault is recorded in memory and the APU starts and operates without low oil pressure protection. The presence of an LRU failure in memory also causes the ECU to produce a signal to EICAS which results in the display of an APU BITE message.

FUEL CONTROL

- Indicates that a failure of the fuel control torque motor was detected.

The fuel control torque motor is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes. In the monitor mode it is tested for overcurrent.

SURGE VALVE

- Indicates that a failure of the surge valve torque motor was detected.

The surge valve torque motor is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes.

GASD600.40

#1 & #2 T/C RAKE

- Indicates that a failure of a thermocouple rake was detected.

The thermocouple rakes are tested for circuit integrity (signal greater than -100F) in all BITE modes. Additionally in the monitor mode, when speed is greater than 95 percent and the internal EGT conditioning circuits are operating normally, the #1 and #2 signals are compared. If the signals disagree by more than 150F, the lower T/C RAKE is assumed to have failed.

IGV ACT

- Indicates that a failure of the inlet guide vane (IGV) torque motor or LVDT position transducer was detected or the IGVs have not moved to the commanded position.

The IGV torque motor is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes. In all BITE modes, the LVDT primary and secondary voltages are monitored for proper limits. In the monitor BITE mode, the IGV LVDT (feedback) position signal is compared to the commanded position and this light will illuminate if the sensed position does not correspond to the commanded position within 6 seconds. Binding or seized IGVs could also result in this fault light.

IGN UNIT

- Indicates that a failure of the ignition unit was detected.

The ignition unit is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes. In the monitor mode it is tested for overcurrent.

DEOIL SOL

- Indicates that a failure of the deoiling solenoid was detected.

The deoiling solenoid is energized and tested for open and short circuit conditions during the prestart and self-test BITE modes. In the monitor mode it is tested for overcurrent, and if verified for 3 seconds, the driver is latched off.

FLOW DIV SOL

- Indicates that a failure of the flow divider solenoid was detected.

The flow divider solenoid is energized and tested for open and short circuit conditions during the prestart and selftest BITE modes. In the monitor mode it is tested for overcurrent, and if verified for 3 seconds, the driver is latched off.

ECS CONTROL

- Indicates that a failure of the ECS demand signal from the aircraft air conditioning system was detected.

In the monitor mode when operation in the ECS pneumatic mode, the ECS demand signal from the aircraft cabin temperature controller must be between 0.3 and 9.9 vdc. If the demand signal is outside these limits, the inlet guide vanes are positioned to the maximum ECS limit position.

APU STARTER

- Indicates that a failure of the starter motor was detected.

In the monitor mode when voltage is applied to the starter motor, APU speed must exceed 7 percent within 30 seconds or the starter is assumed to have failed. Loss of the signal from both speed monopoles will also result in this fault light due to lack of speed signal being interpreted as no APU rotation (the monopoles cannot be faulted until the APU exceeds 50 percent speed).

STARTER CIRCUIT

- Indicates that a failure of the aircraft starter circuit (relays, contactor, wiring) was detected.

In the monitor mode, the aircraft starter circuit is assumed to have failed if the starter relay is energized, speed is below 20 percent and no voltage is detected at the starter motor for 5 seconds or the start relay is not energized, speed is above 95 percent, and voltage is still detected at the starter motor.

GASD600.42

HOT SENSOR

- Indicates that a failure of the oil temperature sensor was detected.

In all BITE modes, the signal from the oil temperature sensor must be between -100F and 482F. After a failure, the APU continues to operate but without oil temperature shutdown protection. The ECU programs the oil temperature to 60F initially, and to 120F after 3 minutes of operation.

P2 SENSOR

- Indicates that a failure of the ambient pressure sensor was detected.

In the prestart and self-test BITE modes, the signal from the P2 sensor must be between 16.5 and 1.7 psia. In the monitor mode the P2 signal must be between 20 and -2 psia. If the P2 sensor fails, the ECU programs P2 to be 13.66 psia on the ground and programs P2 as a function of PT when in flight. Also in-flight, a P2 sensor failure causes the inlet guide vanes to be closed and the surge control valve to be opened.

ECU

- Indicates that an internal ECU failure was detected.

The ECU performs extensive self-tests on its internal circuitry in all modes of BITE and APU operation. This fault light indicates that the ECU failed one or more of those tests. If this light is illuminated the APU will continue to be operable (possibly in a degraded mode depending on the specific failure) unless the failure affects the ability to safely operate the APU. In which case it will result in an automatic shutdown or a start inhibit and an "ECU" light on the automatic shutdown fault display.

GASD600.43

FAN VALVE

- Indicates that a failure of the fan valve or the fan valve switch is detected.

The fan valve switch is checked for the proper state (open, indicating that the valve is closed) with the APU not running in the prestart and self-test BITE modes. In the monitor mode, the fan valve switch is tested for the proper state (closed, indicating that the valve is open) when the speed is greater than 95 percent with a 5 second time delay. The fan valve may also fail to open, resulting in this fault light if the muscle air supply to the valve is plugged, leaking, or disconnected.

FILTER SWITCH

- Indicates that a failure of the generator oil filter differential pressure switch was detected.

The filter switch is tested for the normal (closed) state with the APU off in the prestart and self-test BITE modes. If the switch has failed, the APU will start and run without generator clogged filter protection.

A/C RELAY

- Indicates that a failure of the aircraft relay was detected.

The aircraft relay is tested for an overcurrent condition continuously in the monitor mode of BITE. If an overcurrent is present for 3 seconds, the ECU de-energizes the relay. The A/C relay controls the fuel supply to the APU, and when de-energized, would cause the APU to shutdown.

MINI-FLAG DESCRIPTION

The ECU offers another troubleshooting tool in addition to the front panel BITE lamp display. This tool, called Mini-Flags, was primarily intended for bench troubleshooting of the ECU and is comprised of 128 numerical fault codes (1 through 128) which identify detected faults external to the ECU corresponding to the front panel FAULTY UNIT lamps as well as a comprehensive breakdown of internal ECU failure modes to aid shop personnel in repair of the ECU. THERE ARE NO APU COMPONENTS (EXCEPT THE ECU IN RARE CASES) WHICH WILL BE SHOWN AS FAULTY IN THE MINI-FLAGS THAT ARE NOT ALSO IDENTIFIED AN THE FRONT PANEL FAULTY UNIT DISPLAY. There are several ECU failure modes (identified in the fault code table) which do not affect normal APU operation, but will provide a Mini-Flag code. There are also several very rare ECU failure modes which do affect APU operation and provide a Mini-Flag code without lighting the front panel ECU lamp.

In all cases except RAM or ROM failure of the ECU, the front panel FAULTY UNIT lamp "ECU" will correspond to Mini-Flag number 48 "Failed ECU". In the case of RAM or ROM failure the front panel lamp will illuminate, but there will be no Mini-Flag.

MINI-FLAG INTERROGATION PROCEDURE

The Mini-Flag faults are stored in memory such that interrogation will display all faults accumulated since the last time the ECU memory was cleared via the MEMORY ERASE switch. There is no way to determine when the fault was detected.

Reading the Mini-Flags can be tricky and requires concentration. It is necessary to have pencil and paper at hand to quickly record the codes and it may be necessary to interrogate the ECU more than once to successfully record all of the faults. In most cases there will be more than one since most of the internal ECU faults also produce fault code number 48 "Failed ECU".

Mini-Flag interrogation is performed by holding the LAMP TEST switch down through the entire lamp test procedure and continuing to hold it until all of the Mini-Flag codes have been displayed. Approximately 10 seconds after the last lamp column has illuminated the ECU will start to display Mini-Flag codes one at a time using the front panel lamps as a matrix to form numbers and letters. It is necessary to tilt your head to the right to read the codes which will be displayed sideways on the panel. If there are no Mini-Flag faults in memory, the ECU will display "OK" (see figure 1). If there are Mini-Flag faults in memory they will be displayed one at a time in numerical order (from lowest number to highest). Each number is displayed for only four seconds. Figure 2 shows the number 128 as an example of how the codes will appear.

GASD600.45

TROUBLESHOOTING USING MINI-FLAGS

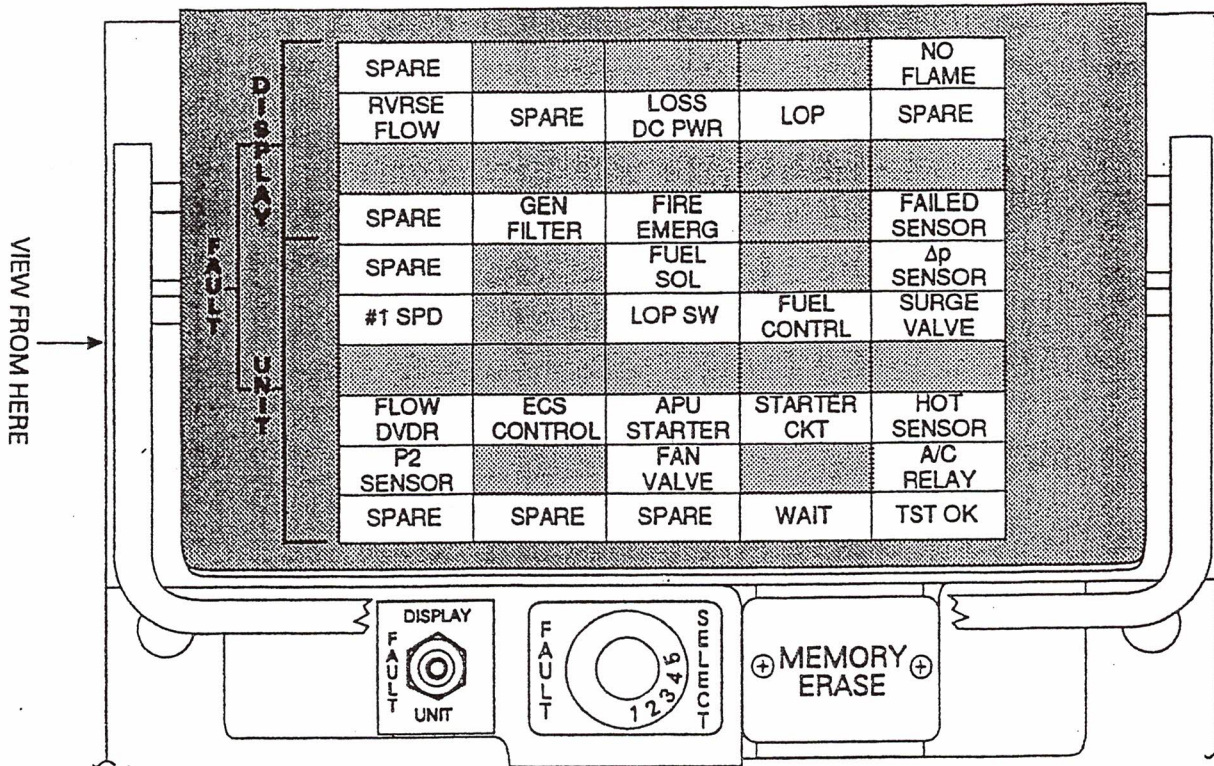
Each Mini-Flag code corresponds to a specific detected fault as shown in the table. For each FAULT CODE the table shows the corresponding front panel (BITE LAMP) lamp that will be illuminated along with the meaning of the fault (MINI-FLAG INTERPRETATION) and the component(s) that may cause the fault (PROBABLE FAULTY UNIT(S)). The PROBABLE FAULTY UNITS are listed in order of probability with the most likely cause shown first.

NOTE: Any fault with PROBABLE FAULTY UNITS other than the ECU could be caused by the listed component, the ECU, or the wiring in between.

NOTE: ECU in the PROBABLE FAULTY UNITS column indicates that although an internal failure of the ECU has been detected it will not affect normal APU operation.

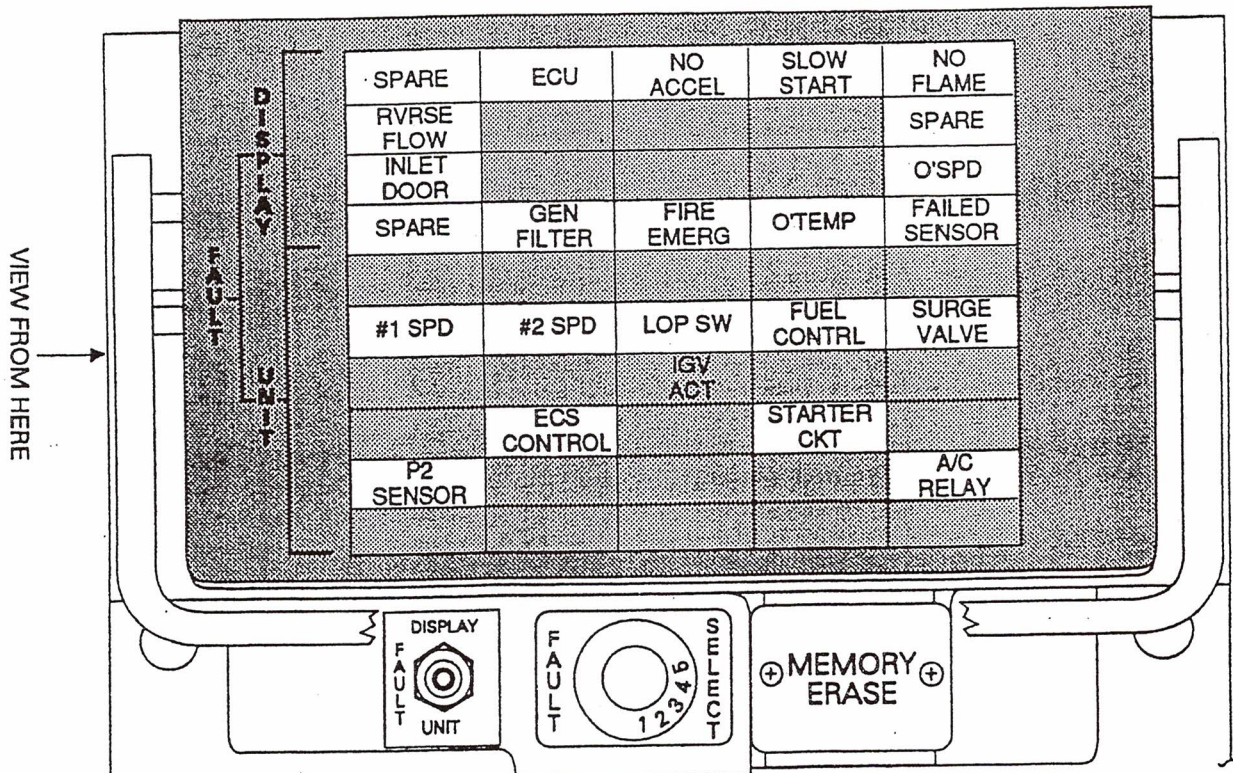
GASD600.46

MINIFLAGS DISPLAY INDICATORS FORM AN "OK"



GASD600.47

MINIFLAGS DISPLAY INDICATORS FORM AN "128"



GASD600.48

| FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) | FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) |
|------------|---------------|--------------------------|---------------------------|------------|---------------|---|--|
| 1 | #1 SPD SENSOR | Failed speed input 1 | #1 Monopole(right) or ECU | 13 | none | Spare | none |
| 2 | #2 SPD SENSOR | Failed speed input 2 | #2 Monopole(left) or ECU | 14 | PT SENSOR | Failed PT pressure transducer | PT Transducer or ECU |
| 3 | ECU | Failed speed input 3 | ECU | 15 | P SENSOR | Failed Delta P pressure transducer | Delta P Transducer or ECU |
| 4 | ECU | Failed N/DC converter 1 | ECU | 16 | P2 SENSOR | Failed P2 pressure transducer | P2 Transducer or ECU |
| 5 | ECU | Failed N/DC converter 2 | ECU | 17 | FILTER SWITCH | Generator oil filter switch failed open | Gen Filter Switch or ECU |
| 6 | ECU | Failed N/DC converter 3 | ECU | 18 | FAN VALVE | Failed fan valve switch | Fan Valve Switch or ECU |
| 7 | none | Spare | none | 19 | LOP SWITCH | LOP switch failed closed | LOP Switch or ECU |
| 8 | none | Spare | none | 20 | none | Spare | none |
| 9 | LCIT SENSOR | Failed LCIT sensor | LCIT Sensor or ECU | 21 | ECU | Failed flow divider driver (energized) | ECU |
| 10 | HOT SENSOR | Failed oil temp sensor | Oil Temp Sensor or ECU | 22 | GEN FILTER | Clogged generator filter | Generator Filter or Gen Filter Switch or ECU |
| 11 | #1 T/C RAKE | Failed EGT1 thermocouple | #1 EGT Rake(left) or ECU | 23 | ECS CONTROL | Failed ECS demand input | Zone Temp Control or ECU |
| 12 | #2 T/C RAKE | Failed EGT2 thermocouple | #2 EGT Rake(left) or ECU | | | | |

GASD600.49

| FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) | FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) |
|------------|-----------------|---|-------------------------|------------|--------------|---|--|
| 24 | none | Spare | none | 35 | APU STARTER | Failed starter motor | Starter Motor or Starter Clutch or APU (sleazed) or Monopoles or ECU |
| 25 | FUEL SOL | Failed fuel solenoid | Fuel Shutoff Sol ECU | 36 | ECU | Failed surge control valve driver (energized) | ECU |
| 26 | DEOIL SOL | Failed de-oil solenoid | De-oil solenoid or ECU | 37 | ECU | Failed fuel torque driver (energized) | ECU |
| 27 | FLOW DIV SOL | Failed flow divider solenoid | Flow divider or ECU | 38 | ECU | Failed IGA actuator driver (energized) | ECU |
| 28 | IGN UNIT | Failed ignition unit | Ignition Unit or ECU | 39 | ECU | Failed fuel torque motor driver (non-energized) | ECU |
| 29 | ECU | Failed de-oil solenoid driver (energized) | ECU | 40 | none | Spare | none |
| 30 | ECU | Failed fuel solenoid driver (non-energized) | ECU | 41 | FUEL CONTROL | Failed fuel torque motor | Fuel control or ECU |
| 31 | none | Spare | none | 42 | IGV ACT | Failed IGV Actuator | IGA Actuator or IGA Assy/Linkage or ECU |
| 32 | ECU | Failed ignition driver (non-energized) | ECU | 43 | SURGE VALVE | Failed surge control valve torque motor | Surge Valve or ECU |
| 33 | ECU | Failed starter driver low (non-energized) | ECU | | | | |
| 34 | STARTER CIRCUIT | Failed aircraft starter circuit | Start relays or ECU | | | | |

| FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) | FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) |
|------------|-----------|---|-------------------------|------------|-----------|---|-------------------------|
| 44 | ECU | Failed EGT1 signal conditioner | ECU | 76 | none | Bleed air driver overcurrent | ECU |
| 45 | ECU | Failed EGT2 signal conditioner | ECU | 77 | none | Generator available relay overcurrent | ECU |
| 46 | none | Failed overtemperature test | ***ECU | 78 | none | Fault relay overcurrent | ***ECU |
| 47 | A/C RELAY | Failed S/D relay | Aircraft S/D Relay | 79 | none | Spare | none |
| 48 | ECU | Failed ECU. This message is generated by any of the other faults which light the ECU lamp | ECU | 80 | none | LOP lamp overcurrent | ***ECU |
| 49 | none | Spare | none | 81 | none | HOT lamp overcurrent | ***ECU |
| through 64 | none | Spare | none | 82 | none | Spare | none |
| 65 | ECU | Failed speed High - Wins circuit | ECU | 83 | ECU | Failed LCIT amplifier | ECU |
| 66 | none | Spare | none | 84 | ECU | Failed de-oil solenoid driver (non-energized) | ECU |
| through 74 | none | Spare | none | 85 | none | Spare | none |
| 75 | none | Maintenance lamp overcurrent | ***ECU | 86 | none | Failed bleed air driver (non-energized) | ECU |
| | | | | 87 | none | Spare | none |
| | | | | 88 | none | Spare | none |
| | | | | 89 | ECU | Failed fuel solenoid driver (energized) | ECU |

NOTE: ***ECU indicates that although an internal failure of the ECU has been detected it will not affect normal APU operation.

GASD600.51

| FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) | FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) |
|------------|-----------|--|-------------------------|------------|-----------|--|-------------------------|
| 90 | none | Spare | none | 103 | none | Failed IGV D/A | ECU |
| 91 | none | Spare | none | 104 | none | Failed surge valve D/A | ECU |
| 92 | ECU | Failed ignition driver (energized) | ECU | 105 | ECU | Failed IGV driver (non-energized) | ECU |
| 93 | none | Spare | none | 106 | IGV ACT | Failed IGV actuator torque motor | IGV actuator or ECU |
| 94 | none | Failed bleed air driver (energized) | ***ECU | 107 | ECU | Failed surge valve driver (non-energized) | ECU |
| 95 | ECU | Failed flow divider driver (non-energized) | ECU | 108 | none | Spare | none |
| 96 | none | Spare | none | 109 | none | Failed fuel torque motor driver wrap around | ***ECU |
| 97 | ECU | Failed starter relay driver (energized) | ECU | 110 | none | Failed IGV torque motor driver wrap around | ***ECU |
| 98 | none | Spare | none | 111 | none | Failed surge valve torque motor driver wrap around | ***ECU |
| 99 | none | Failed bleed air driver (non-energized) | ECU | 112 | none | Failed ECU mag latch relay | ***ECU |
| 100 | none | Failed bleed air driver (energized) | ***ECU | 113 | none | Spare | none |
| 101 | none | Spare | none | 114 | none | Failed stop timer | ***ECU |
| 102 | none | Failed fuel D/A | ECU | 115 | none | Spare | none |

NOTE: ***ECU indicates that although an internal failure of the ECU has been detected it will not affect normal APU operation.

GASD600.52

| FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) | FAULT CODE | BITE LAMP | MINI-FLAG INTERPRETATION | PROBABLE FAULTY UNIT(S) |
|------------|-----------|--|-------------------------|------------|-----------|--|-------------------------|
| 116 | ECU | Failed +15 vdc power supply | ECU | 122 | ECU | Failed +10 vdc power supply (high) | ECU |
| 117 | ECU | Failed -10 vdc power supply | ECU | 123 | ECU | Failed 0 v reference (low) | ECU |
| 118 | ECU | Failed -15 vdc power supply | ECU | 124 | ECU | Failed 0 v reference (high) | ECU |
| 119 | ECU | Failed +5 vdc power supply | ECU | 125 | none | Spare | none |
| 120 | ECU | Failed pressure reference power supply | ECU | 126 | none | Failed IGV LVDT BITE Voltage | ***ECU |
| 121 | ECU | Failed +10 vdc power supply (low) | ECU | 127 | none | Failed IGV LVDT secondary | ECU |
| | | | | 128 | ECU | Failed IGV LVDT primary excitation voltage | ECU |

NOTE: ***ECU indicates that although an internal failure of the ECU has been detected it will not affect normal APU operation.

GA5D600.53

Troubleshooting Procedures

| <u>No.</u> | <u>Symptom</u> |
|------------|---------------------------------------|
| 1 | NO START |
| 2 | AUTO SHUTDOWN FROM ON-SPEED OPERATION |
| 2A | LOP |
| 2B | HOT |
| 2C | REVERSE FLOW |
| 2D | NO ACCEL |
| 2E | OVER SPEED |
| 2F | OVER TEMP |
| 2G | DC PWR LOSS |
| 2H | FAILED SENSOR |
| 2I | GEN FILTER |
| 2J | INLET DOOR |
| 2K | FIRE EMERG |
| 2L | ECU |

GASD600.54

Troubleshooting Procedures (Contd)

| <u>No.</u> | <u>Symptom</u> |
|------------|---|
| 3 | PNEUMATIC SYSTEM PROBLEMS |
| 3A | NO DUCT PRESSURE |
| 3B | LOW DUCT PRESSURE - ALL MODES |
| 3C | LOW DUCT PRESSURE - SOME MODES |
| 3D | FLUCTUATING DUCT PRESSURE |
| 4 | OIL/FUEL SYSTEM PROBLEMS |
| 4A | HIGH OIL CONSUMPTION |
| 4B | FUEL OR OIL LEAKS FROM DRAIN MAST |
| 4C | APU OIL LEVEL CHANGES |
| 4D | FUEL IN THE OIL |
| 4E | LOW OIL QUANTITY MESSAGE |
| 5 | APU GENERATOR FAILS TO LOAD OR DROPS OFF LINE |

PROCEDURE 1

| Symptom | Isolation Procedure | Probable Cause | Notes |
|-------------|---|---|--|
| No Start | Attempt to start APU. Note minimum battery voltage, EGT and speed at shutdown. If battery voltage drops below 18V | Discharged battery | |
| No rotation | Run light does not blink twice after activating start switch. | Start switch No power to ECU | |
| | Run lights blinks, but APU does not crank with no APU fault light. "APU DOOR" message on EICAS after 60 seconds | APU Inlet door not opening Inlet door switch Inlet door actuator | Door open Door closed |
| | APU fault light - check ECU BITE | Component identified by ECU BITE: ECU, #1 and #2 T/C RAKE, FUEL CONTROL, FUEL SOL, IGN UNIT, FAN VALVE | BITE indication for any component can be caused by the component, the ECU or the wiring in between |
| | ECU BITE Faulty Unit Light is "APU Starter" | <ul style="list-style-type: none"> • Starter appears damaged, burned or brushwear indicator shows less than 1/8 inch • Hand cranking APU through starter is not easy • Starter rotates when removed from APU, APU does not • APU rotates by hand but not during start • During start attempt, APU rotates with no speed indication | Starter Starter APU Starter clutch, starter Speed monopoles, wiring |

GASD600.56

PROCEDURE 1 (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|---|--|---|
| No rotation APU rotates with no EGT rise ("NO FLAME" on BITE) APU lights off but does not reach governed speed ("SLOW START", "NOACCEL", "OVERTEMP" on BITE) | ECU BITE Faulty Unit Light is "STARTER CIRCUIT" | Aircraft start circuit (relays, wiring battery) | ECU powers aircraft start relay but no voltage is detected at starter |
| | Ignitor plug cannot be heard firing during start. Perform ECU BITE check. | Ignition unit Ignition lead Ignitor plug ECU Wiring | |
| | Fuel is not available at FCU Inlet Disconnect fuel control to flow divider line. Fuel does not flow when APU is motored. More than 1 cup flows in 15 seconds. | Aircraft fuel system ECU fuel filter FCU Oil Pump FCU ECU Flow divider | Shaft Sheared Internal leak |
| | Disconnect secondary manifold output from flow divider and motor APU (ignition unit disconnected). More than 15 drops comes from flow divider secondary port or drain port while starter energized. Fuel supply and ignition are good. | Primary fuel manifold | Coked or plugged nozzles |
| Shutdown occurs below 45 percent speed and max EGT exceeds 700C. • Visually inspect starter for damaged burned or brushwear indicator shows less than 1/8 inch | Starter | | |
| * NOTE: If APU FAULT light illuminates when start is initiated and does not extinguish, APU fuel shutoff valve in left wing may not be open | | | |

GASD600.57

PROCEDURE 1 (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|---|--|--|
| APU lights off but does not reach governed speed ("SLOW START", "NOACCEL", "OVERTEMP" on BITE) (Contd) | <ul style="list-style-type: none"> Hand cranking APU through starter is not easy | Starter Generator APU | Internal drag Internal drag |
| | <ul style="list-style-type: none"> APU does not rotate or does not rotate smoothly with starter hand rotation Disconnect fuel solenoid and motor APU, APU does not reach 16% speed even though hand cranking is free Excessive noise from gearbox during motoring Visually inspect IGV's and linkage IGV's partially open with actuator rod fully extended (1 inch) IGV actuator rod not fully extended(1 inch) with IGV's/linkage not binding IGV pull check exceeds 50 pounds With IGV linkage cover removed, observe if IGV's actuate open during start Check APU inlet screen for obstruction Check flow divider for internal leakage per NO EGT RISE procedure | Starter clutch Starter Starter clutch Start relay, K-197 Start contactor, K-117 IGV's broken/missing Linkage damaged worn IGV rigging IGV actuator IGV assembly ECU Ignition Unit Inlet screen blockage Flow divider | Chattering contacts Disconnect APU battery cable prior to replacing Replace APU Repair Recommend rerigging in APU shop or test cell Replace APU EMI source |

GASD600.58

PROCEDURE 1 (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|---|--|--------------------------|
| APU lights off but does not reach governed speed ("SLOW START", "NO ACCEL", "OVERTEMP" on BITE) (Contd) | <ul style="list-style-type: none"> If all above checks are good, these LRU's could cause the problem with no good isolation procedure | FCU ECU Primary fuel manifold | Coked or plugged nozzles |
| | Shutdown occurs above 45% speed and max EGT exceeds 700C <ul style="list-style-type: none"> Troubleshooting is same as above except starter and starter clutch can be eliminated EGT does not reach 700C during failed start <ul style="list-style-type: none"> Check flow divider for internal leakage per NO EGT RISE procedure These LRU's could cause the problem with no good isolation procedure | Flow divider P2 sensor FCU ECU Primary fuel manifold | Calibration shift |
| APU does not start in-flight or immediately after landing, but starts normally otherwise | Reported no EGT rise with shutdown below 25% speed ("NO FLAME" on BITE) <ul style="list-style-type: none"> Check flow divider for internal leakage per NO EGT RISE procedure Check tube from inlet plenum to P2 sensor and port in plenum for blockage (high altitude no-starts only) | Flow divider Blocked tube | |

GASD600.59

PROCEDURE 2 (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|---|----------------|--|
| Automatic shutdown from on-speed operation (Contd) | <ul style="list-style-type: none"> EGT exceeds 600C at shutdown Speed exceeds 105 percent FCU Shutdown occurs during bleed load go to "REVERSE FLOW" troubleshooting procedure (2C) Autoshutdown is followed by inhibited start. Cycle APU switch to "OFF" followed by another start attempt. <ul style="list-style-type: none"> If second attempt is inhibited, go to "LOP" troubleshooting procedure (2A) If second attempt is allowed, go to "DC PWR LOSS" troubleshooting procedure (2G) | FCU ECU | |
| | <ul style="list-style-type: none"> Shutdowns occur after more than 15 minutes of operation under heavy load, go to "HOT" troubleshooting procedure (2B) Shutdowns occur randomly. If fault repeats after ECU replacement and connector check shutdown fault from ECU BITE is crucial for further troubleshooting | ECU | Check connectors for bent or broken pins |

GASD600.62

PROCEDURE 2A

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--------------------|--|--|---|
| Autoshutdown - LOP | <ul style="list-style-type: none"> Check APU oil level <ul style="list-style-type: none"> If low If overserviced, remove excess oil | Low oil level leakage/consumtion Overservice | Check APU for Check for fuel odor |
| | <ul style="list-style-type: none"> Start APU (after oil level confirmed good) and operate in ECS mode. (Start may be inhibited until ECU memory is cleared) <ul style="list-style-type: none"> If APU operates more than 20 seconds after reaching 95 percent sped before LOP shutdown If LOP autoshutdown occurs within 20 seconds after 95 percent speed, check oil filter Connect pressure gauge to lube pump discharge test port <ul style="list-style-type: none"> Oil pressure is greater than 40 psig Oil pressure is less than 60 psig | LOP switch Oil foaming Oil filter LOP switch Wiring ECU Lube pump Deoil solenoid valve Oil cooler, lines or Check valves APU | Intermittent contact Contamination Plugged Calibration shift Stuck open (confirm by removing and visually inspecting) Plugged Internal leak |

GASD600.63

PROCEDURE 2B

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|--|--|--|
| Autoshutdown -HOT | Check oil cooler air path for dirt/plugging | Dirty oil cooler | Check cooling fan for oil leak |
| | Check air path from inlet screen in APU plenum to oil cooler discharge from airplane for obstructions or leaks | Blocked inlet screen plugged, collapsed or delaminated ducts | If cooling fan inlet duct delaminated, check fan Isolation valve for proper muscle air supply operation. |
| | Cooling fan is broken or does not rotate with APU rotation. | Cooling fan | May need to check gearbox for damage or metal contamination. |
| | Shutdown occurs within 15 seconds of APU reaching governed speed after start with cool oil. ECU | HOT sensor Wiring | |
| | Remove HOT sensor and place in an ice bath. Using an Ohm meter resistance should be 88-92 ohms. | HOT sensor | |
| If no physical abnormalities are found, these may cause the shutdown | HOT sensor Wiring ECU Oil cooler | Thermostat stuck or oil passage plugged | |

GASD600.64

PROCEDURE 1 (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|------------------------------|---|--|--|
| Autoshutdown REVERSE FLOW | LCIT sensor has loose or broken connection | Loose wires | Intermittent connection |
| | Check surge valve position indicator with APU not running. If not fully open- | Surge valve | |
| | Shutdown occurs when APU is running with bleed valve closed and main engines not running. | LCIT sensor Wiring ECU | |
| | Shutdown occurs only when main engines are running | APU check valve | |
| | Shutdown occurs during APU bleed load operation. <ul style="list-style-type: none"> • These components are most likely cause problem • Check P Total probe for plugging • Check static sensor ring or probe plugging, obstruction, or broken • Check pressure sensing system plumbing for leaks or obstructions • Borescope load compressor | Surge valve Delta P transducer P total Transducer P Total probe Static sensor Sensor plumbing Load compressor damage | Possible filter plugging or muscle air problem Calibration shift Calibration shift * On many APU's the entire pressure sensor assembly is replaced as a module Replace APU |

GASD600.65

PROCEDURE 2D

| Symptom | Isolation Procedure | Probable Cause | Notes |
|-------------------------|---|---------------------|-------------------|
| Autoshutdown - NO ACCEL | APU runs normally at idle but speed droops when load is applied | FCU P2 sensor | Calibration shift |
| | Idle EGT exceeds 370C | APU internal damage | Replace APU |

GASD600.66

PROCEDURE 2E

| Symptom | Isolation Procedure | Probable Cause | Notes |
|----------------------------|---|----------------|-------|
| Autoshutdown- OVERSPEED | Perform ECU BITE self test. If ECU FAULTY UNIT light comes on: | ECU | |
| | Start APU. If APU shuts down during start for "NO FLAME", "OVERTEMP", or "OVERSPEED", or shutdown occurs just after shedding load | FCU | |
| | Shutdown occurs without APU speed indication exceeding 102 percent | ECU | |

GASD600.67

PROCEDURE 2F

| Symptom | Isolation Procedure | Probable Cause | Notes |
|-----------------------|---|---|--------------------------------------|
| Autoshutdown-OVERTEMP | Most "OVERTEMP" autoshutdowns from on-speed will be followed by inability to start the APU | | |
| | APU will not successfully start <ul style="list-style-type: none"> IGV ACT flagged on ECU BITE Hand rotate APU through starter checking for drag or unusual noise No FAULTY UNITS on ECU BITE and APU rotation is free | IGV actuator IGV's binding IGV linkage APU internal damage generator FCU | Replace APU Repair Replace APU |
| | APU starts and has autoshutdown from on-speed (load generator and run ECS) <ul style="list-style-type: none"> EGT exceeds 600C EGT is less than 600C (may be unstable) | FCU EGT sensors/wiring ECU EGT sensors/wiring | |

GASD600.68

PROCEDURE 2G

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--------------------------|---|----------------|--|
| Autoshutdown-DC PWR LOSS | Shutdown occurs if DC power supply to the ECU is interrupted for more than 50 msec. BITE display will not occur until after next start attempt which is inhibited | | |
| | If there was a DC power loss or unusual power transient during APU operation the APU system is normal | | Ensure "ALT CONT" or "APU MN BAT CONT" circuit breaker on cockpit overhead panel is closed |
| | Start APU, load generator, and operate ECS. If fault repeats | ECU | Could be wiring or connectors |

GASD600.69

PROCEDURE 2H

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--------------------------------|---|--|-------|
| Autoshutdown- FAILED SENSOR | Are either both #1 and #2 SPD SENSOR or both #1 and #2 T/C RAKE FAULTY UNIT lights on? <ul style="list-style-type: none"> Yes | EGT Thermocouples Speed Monopoles Wiring | |
| | <ul style="list-style-type: none"> No | ECU | |

GASD600.70

PROCEDURE2I

| Symptom | Isolation Procedure | Probable Cause | Notes |
|------------------------------|---|--|--|
| Autoshutdown - GEN FILTER | Replace generator filter element | Generator Oil Filter | |
| | Start APU. If shutdown repeats, check generator filter differential pressure switch for continuity with APU not running <ul style="list-style-type: none"> Continuity | Generator Oil Filter Pressure Switch | |
| | <ul style="list-style-type: none"> Open Shutdowns occur randomly | ECU Generator Oil Filter Pressure Switch | Intermittently closes due to vibration |

GASD600.71

PROCEDURE 2J

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--------------------------|---|--|-----------------------|
| Autoshutdown- INLET DOOR | <p>Check APU Inlet door system and switch. Autoshutdown can only occur after the door-open switch signal is received to allow APU to start.</p> <p>If fault repeats after door, switch and input wiring checkout.</p> | <p>Inlet Door Switch Wiring Door Actuation System</p> <p>ECU</p> | Probable Intermittent |

GASD600.72

PROCEDURE 2K

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---------------------------|--|-----------------------|-------|
| Autoshutdown - FIRE EMERG | APU shutdown occurs due to receipt of a "FIRE SHUTDOWN" signal from the airplane | | |
| | If shutdown repeats, check airplane fire shutdown circuit to ECU | APU fire relay Wiring | |
| | If no fault found in airplane circuit, replace ECU | ECU | |

GASD600.73

PROCEDURE 2L

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--------------------|---|------------------------------|-------|
| Autoshutdown - ECU | <p>Check ECU connectors for bent or broken pins</p> <p>If connectors okay and fault repeats</p> | <p>Connectors</p> <p>ECU</p> | |

GASD600.74

PROCEDURE 3A

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|---|--|--|
| No duct pressure (< 3psi duct pressure) | <p>Start APU. Ensure main engine bleed air switches are in the OFF position. Open isolation valve. Select APU bleed valve to the open position.</p> <ul style="list-style-type: none"> • If left and right engine bleed "OFF" lights are not illuminated and "VALVE" light on APU bleed valve switch does not illuminate and then extinguish after 3-10 seconds • If left and right engine bleed "OFF" lights are illuminated and APU bleed valve switch does not illuminate and then extinguish • If "VALVE" light on APU bleed valve switch does illuminate and then extinguish after 3-10 seconds | <p>Left or right PRSOV</p> <p>APU bleed valve Bleed valve relay</p> <p>ECU/wiring IGV actuator AP sensor P total sensor P2 sensor</p> <p>IGV assembly</p> <p>ECU</p> | <p>Closed switch not contracting</p> <p>Refer to Boeing FIM, AT A36 "BLEED OFF light not illuminated" procedures</p> <p>Refer to Boeing FIM, AT A36 "APU VALVE light" procedures.</p> <p>No bleed signal BITE = IGV ACT BITE = AP sensor BITE = PT sensor Calibration Shift No BITE Binding/BITE = IGV ACT</p> |

PROCEDURE 3B

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|--|--|--|
| Low duct pressure in all pneumatic modes. (Low air > 2 psi) | Start APU. Ensure main engine bleed air switches are off. Activate bleed air valve switch, open Isolation valve. <ul style="list-style-type: none"> Duct pressure is low in DPM, ECS MES, and de-ice | Surge control valve ΔP sensor P total sensor LCIT sensor Flow sensor probes Aircraft duct leaks | No BITE Info-internal leakage, mechanical problem or leaking muscle air supply No BITE Info-transducer shifted low No BITE Info-transducer shifted low No BITE Info-output shift Broken or dirty |

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PROCEDURE 3C

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|---|--|--|
| Low duct pressure <u>not</u> in all pneumatic modes. (Low air > 2 psi.) | Start APU. Ensure main engine bleed air switches are off. Activate bleed air switch and open Isolation valve. (APU now in duct pressure mode) <ul style="list-style-type: none"> Low duct pressure in DPM only? Turn on packs, one at a time. <ul style="list-style-type: none"> Low duct pressure in one pack only (Isolate which one.) Low duct pressure with both packs on, or either pack? (But not DPM and not MES) Turn off packs. Turn on MES Low duct pressure in MES, one main engine only? Low duct pressure in MES only, either engine? | Surge valve Pack controller Aircraft PRSOV Leak in aircraft ducting Cabin temp controller Aircraft Isolation valve Starter valve or valve controller Aircraft ducting IGV actuator or IGV assembly | No BITE info - valve quick dump instability No BITE info No BITE Info Check all clamps, weld seams NO BITE INFO Leaking valve No BITE info No BITE Info-valve not closing properly Leaks - check clamps and weld seams BITE Info-"IGV ACT" - IGV mechanism will not open fully |

PROCEDURE 3C (Contd)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|--|--|--|
| | <ul style="list-style-type: none"> Put APU in duct pressure mode. If EGT exceeds 500C, the APU performance has deteriorated to the point that should be overhauled. | <p>APU performance deterioration</p> <p>Load compressor damage</p> | <p>No BITE Info - APU will not hold EGT and pressur with excessive hot section deterioration</p> <p>No BITE Info</p> |
| <p>Note: For all problems where "Probable Cause" is not an APU component, refer to Boeing FIM, ATA Chapter 36.</p> | | | |

GASD600.78

PROCEDURE 3D

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---------------------------|--|---|--|
| Fluctuating duct pressure | <p>Start APU. Ensure main engine bleed switches are off. Activate bleed air switch and open isolation valve.</p> <ul style="list-style-type: none"> Duct pressure unsteady? ±5 to ±10 psi fluctuation Duct pressure "dumping" at regular intervals (± 0 to -20 psi fluctuation) Duct pressure "dumping" at regular intervals (± 0 to -20 psi fluctuation) | <p>Surge valve IGV actuator</p> <p>P total transducer DP transducer</p> <p>Load compressor damage LCIT sensor</p> | <p>No BITE Info-valve internal leak or mechanical problem</p> <p>No BITE Info-transducer calibration shift. APU operating too close to surge</p> <p>No BITE Info-APU removal required</p> <p>No BITE Info-check leads for tight connection</p> |
| | <p>Turn on packs one at a time</p> <ul style="list-style-type: none"> Fluctuating duct pressure in one pack only? (Isolate left or right) | <p>Pack controller Pack valve</p> <p>Surge valve PT, DP Transducers</p> | <p>No BITE Info</p> <p>No BITE Info-mechanical problem</p> |
| | <p>Turn on both packs</p> <ul style="list-style-type: none"> Fluctuating duct pressure in both packs? | <p>Cabin temp control Surge valve, PT, DP transducers</p> | <p>No BITE Info</p> <p>No BITE Info, mechanical problem</p> |

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PROCEDURE 3D (CONTD)

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|---|---|--|
| Fluctuating duct pressure (Contd.) | Turn off packs. Turn on MES, Fluctuating duct pressure in MES? | Surge valve DP, PT transducers IGV actuator Main engine starter valve | No BITE Info-mechanical problem No BITE Info-mechanical problem |
| Note: For all problems where "Probable Cause" is not an APU component, refer to Boeing FIM, ATA Chapter 36. | | | |

GASD600.80

PROCEDURE 4A

| Symptom | Isolation Procedure | Probable Cause | Notes |
|----------------------|--|--|--|
| High oil consumption | <p>Check APU for external leaks as evidenced by oil on compartment doors or oil on fittings lines, flanges, ect.</p> <p>Check cooling fan discharge port and firewall for evidence of cooling fan shaft leak</p> <p>Check drain mast for fluid leakage. If leakage evident, go to Procedure 4B.</p> <p>If oil consumption has been confirmed and there is either white smoke or oil in the exhaust or there is no evidence of external leaks, unclamp and pull back the tailpipe and look up the APU exhaust.</p> <ul style="list-style-type: none"> • If oil around the gearbox vent discharge, check to see if the gearbox shutoff valve is stuck open. • If shutoff valve is closed • If oil is evident around the turbine bearing housing on the turbine blades | <p>External leaks</p> <p>Cooling fan</p> <p>Gearbox shutoff valve</p> <p>Internal seal leak Turbine scavenge pump, turbine seal</p> | <p>Tighten or replace components as required</p> <p>Oil cooler will probably require cleaning</p> <p>Replace APU Replace APU</p> |

PROCEDURE 4B

| Symptom | Isolation Procedure | Probable Cause | Notes |
|--|---|---------------------|---|
| Fuel or oil leaks from drain mast during APU operation | Determine which drain mast port is leaking. | | |
| | Forward (767)/second from the (757) port is the flow divider drain (fuel discharge from this port at APU is normal) | Flow divider | |
| | Aft most port is for the FCU and IGV actuator. Oil leak from this port indicates FCU | FCU | Shaft seal leak |
| | Fuel leak from the aft port can come from either the FCU or IGV actuator. Break the drain line at the T fitting between the two to determine which one is leaking | FCU IGV actuator | Shaft seal leak |
| | The second from the aft port is for internal bearing seal cavity vents. Oil leakage from this port indicates internal APU seal problems. | APU | Oil leakage within overall APU consumption limit is allowable |

GASD600.82

PROCEDURE 4C

| Symptom | Isolation Procedure | Probable Cause | Notes |
|-----------------------|---|-----------------------------|--|
| APU oil level changes | Oil level is at running FULL mark on sight gauge with APU running and above static FULL mark after shutdown or at static FULL when shutdown and below running full when running. | Oil cooler check valves | Leaking |
| | Oil level is at running FULL mark on sight gauge with APU running and below static FULL mark after shutdown or at static FULL when shutdown and above running FULL when running (may be intermittent) | Deoil solenoid Valve/wiring | Will show up on ECU BITE if electronically faulty or wiring is bad, but not if mechanically sticking |

PROCEDURE 5

| Symptom | Isolation Procedure | Probable Cause | Notes |
|---|--|--------------------------------------|-------------------|
| APU generator fails to load or drops off line | With no pneumatic load on the APU attempt to transfer electric load to APU generator. If APU speed drops more than 2 percent- | FCU ECU P2 sensor | Calibration shift |
| | Check for ECU generator load relat output signal. If not present when APU speed is over 95 percent- | ECU | |
| | Check generator scavenge chip collector. If generator failed, remove chip collector assembly, if more than 1 cup of oil drains out - | Generator Generator scavenge pump | |
| | Troubleshoot generator and generator system (Chapter 24) | | |

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