

OVERVIEW

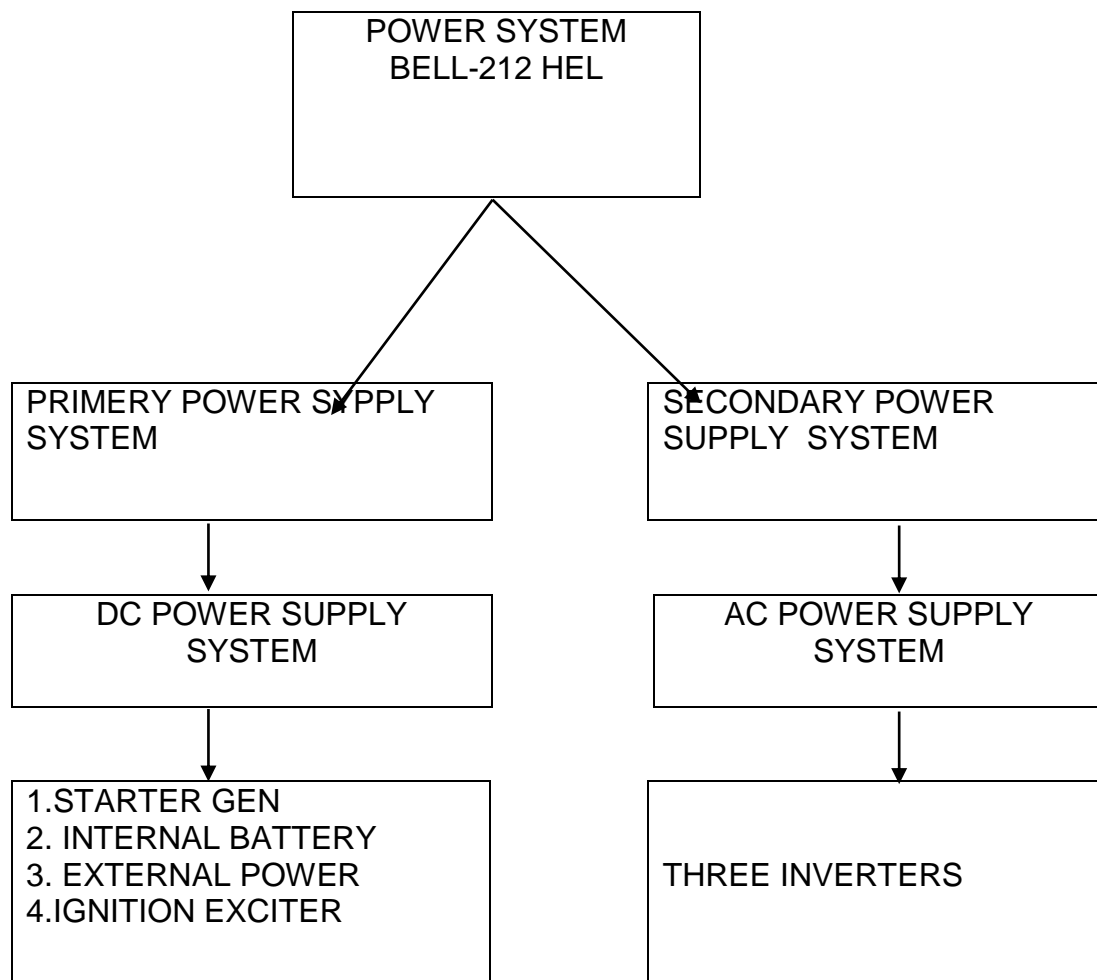
ELECTRIC:

1. DC Power supply system
2. AC Power supply system
3. Bus arrangements
4. Interior lighting system
5. Exterior lighting system
6. Caution & Warning system
7. Engine Control & Accessories system
8. Flight Control system
9. Heating system
10. Miscellaneous electrical system
11. Air conditioning system
12. Rescue hoisting system
13. under sling system
14. Nite-sun

INSTRUMENT:

1. Introduction
2. Flight Instrument
3. Navigation Instrument
4. Engine propulsion instrument
5. Miscellaneous Instrument

Power Supply System



Note: Primary power supply sys : All DC power supply sys
Secondary power supply sys : All AC power supply sys

DC power supply sys:

DC power supply system consists of-

- a. Battery
- b. Starter Generator
- c. External power
- d. Ignition exciter

a. **Battery** : It is an electrical device. It converts electrical energy to chemical energy during charging and chemical energy to electrical energy during discharging. It is the emergency source of power supply.



Type : Nickel cadmium

Purpose : To provide power for eng starting and back up source in emergency period.

Location : It is located at the nose compartment.

Technical data:

- a. Rated voltage : 24 volt
- b. Total no of cell : 19
- c. Per cell volt : 1.3 volt full charge, on load condition 1.2 volt
- d. Duration : 23.5 min with all essential load if both gen failed
- e. Amp hour capacity: 34 amp hour
- f. Internal temp : 145⁰ F
- g. Case temp : 130⁰ F
- h. Red light come on: 145⁰ F and above

How to charge the Battery:

Battery is charged with no-2 Battery bus during Engine running or external Battery connected. After completion of both the Eng start and both the generator taken over when N₁ gain 71% RPM or greater at that time no -1 Battery bus s/w goes off automatically.

How we understand Battery is fully charged:

During Engine running with no-1 Battery bus s/w off, a fully charged Battery can be determined by moving Battery bus no-2 s/w from on to off and then off to on. At that time observed the effect on Ammeter. If the meter reading is less than 05 amps then we understood that the Battery is fully charged.

Battery temperature indicator (BTI)

Purpose : The purpose of Battery temperature indicator is to indicate Battery temperature.

Location : BTI is located in Instruments panel.

Technical Data:

Battery Internal temperature= 145± 3°F

Battery case temperature = 130 ±3°F

Red Lights comes on = 145±3°F

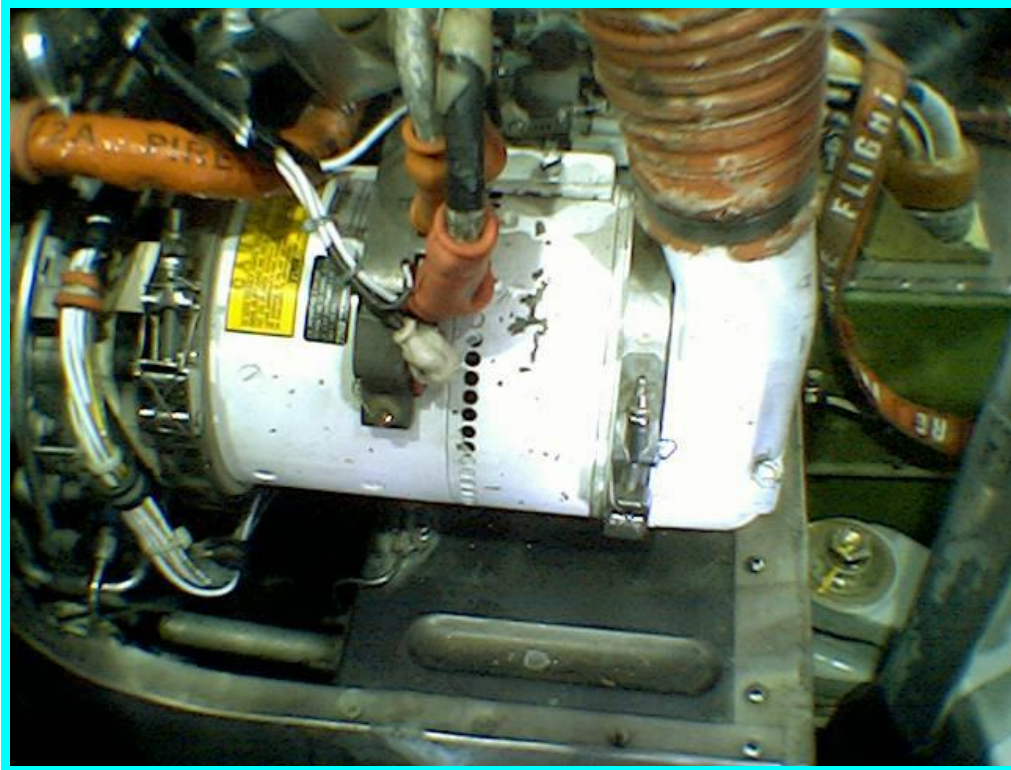
Construction :

BTI consist of

- 1. Two press Button S/W (One for Battery temperature test, One for less 50°F)
- 2. One spherical dial (Scale range of BTI is 120°-180° F)
- 3. One indicator needle.

Battery temperature indicator is design for total reading (deduct 50°F.

Generator : generator is an electrical device which converts mechanical energy to elect energy. It is a primary source of power supply. No of gen are two each for one eng. The generator is a 200 ampere, 30 volt DC unit. Both generators are operated in parallel to provide the helicopter with DC power for normal operation. If both generators fail, the battery becomes the alternate source of DC power for the helicopter. Each generator is limited to 150 amps maximum output.



Starter generator

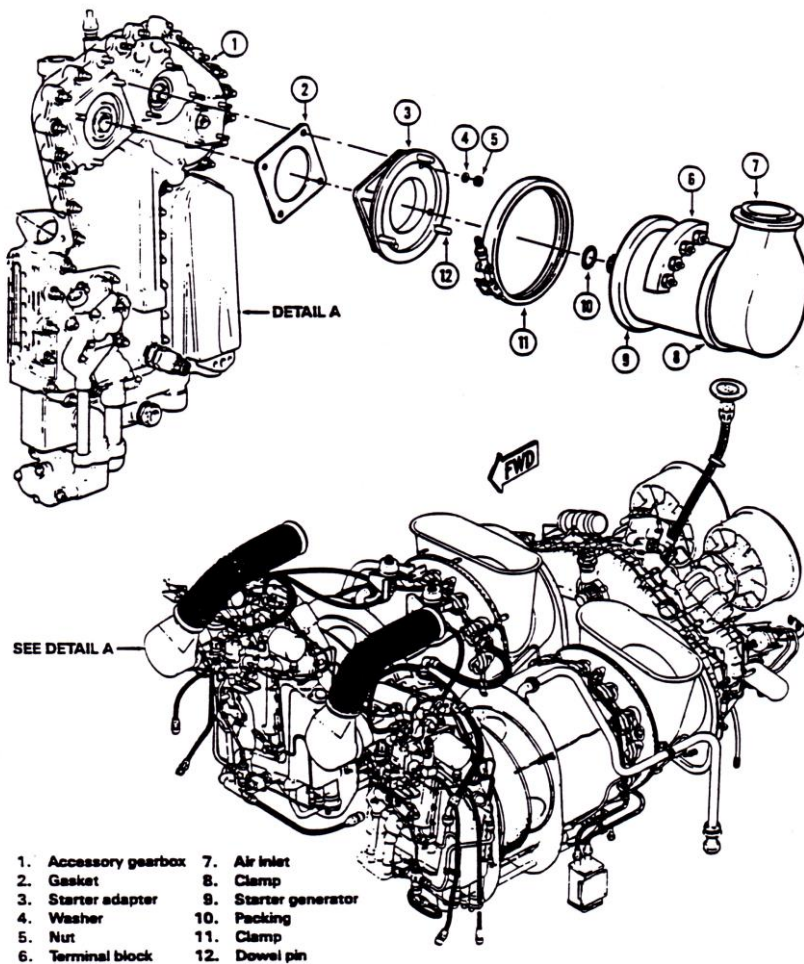


Fig: Starter generator

Location : Located in front of the engine accessories gear box.

Construction:

Starter generator consists of

- a. Stator
- b. Commutator
- c. A pair of brush
- d. Starting winding
- e. Two pairs main pole and a inter pole
- f. Fan assembly.

Starter generator :

Initially gen works as starter motor so it is called starter gen. The third source of DC electrical power is the starter-generator units. These are combined units, at first it works as starter for rotating the N1 section and then as a generator when driven by the N1 section. A starter-generator is located on the upper right-hand accessory drive pad of each power section accessory gearbox.

Tech data:

- | | | | | |
|----|----------------------------------|---|---------|-----------|
| a. | Rated volt and current | : | 30v | 200 amps |
| b. | De-rated output volt and current | : | 28 v DC | 150 amps |
| c. | Over heat temp | : | 310° F | or 155° C |

Characteristics:

- Gen switch should not on till engine speed of N₁ 70% RPM or greater.
- External power cut signal is to be given when N₁ rises 71% RPM or greater.
- Generator voltage regulated by DC control unit,

DC control unit:



Purpose: The purpose of DC control unit is to maintain pre- determined voltage with various ranges and speed.

Location: Two starter generator having two DC control unit and located under the nose compartment.

Function:

1. To regulate the output of both the st, generator volt'
2. To parallel both generator volts.
3. To protect reverse current flows.
4. To protect all DC circuit.
5. To protect over voltage.

Seasonal Temperature

Max daily ambient temp does not
Exceed 14° C (58° F)

Voltage setting

28.0 ± .1 VDC

Max daily ambient temp exceed
14⁰ C (58⁰ F)

27.0 ± 0.1 VDC

Note: Load equalization may be affected by,

- Temperature
- Gen. load &
- Gen speed.

Starter generator “over heat” light will illuminates at 310⁰ F.

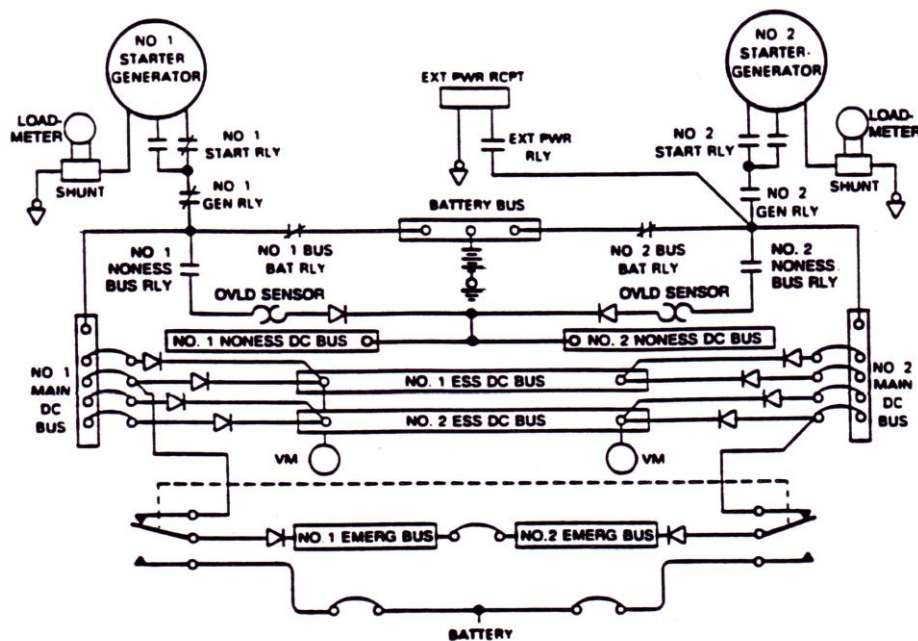
Cooling period for starter gen:

<u>Start cycle</u>	<u>Interval time</u>
First start	1 minute
Second start	5 minutes
Third start	15 minutes

No of DC bus: 06

Main buss bar 1
Main buss bar 2
Essential buss bar 1
Essential buss bar 2
Non Essential buss bar 1
Non Essential buss bar 2

DC bus:



STARTER SYSTEM OPERATION

The starter switch receives power from the 28 volt DC essential bus #1 and engine #2 from essential bus #2.

With the starter circuit breakers depressed, and the fuel switches ON, placing the switch to ENG. 1 will energize the switch holding coil to hold the switch in the ENG. 1 start position. This will energize three relays in the starting system: #1 start relay, #1 start control relay, and #1 generator relay.

When the start-control relay is energized, the generator shunt field is opened and simultaneously shorted to prevent a "bucking" voltage from being generated that would oppose starter operation. The ignition circuit is also completed, permitting ignition exciter operation. Power is also applied to energize the generator relay to connect battery voltage to drive the starter.

Energizing the start relay connects the series winding of the starter-generator to the circuit, and will control the GENERATOR fail caution light segment causing the light to come ON. Power is applied through the generator relay to the start relay, and then to the starter generator series (START) winding.

The generator relay is energized by power applied through the start-control relay contacts to the generator relay coil. This connects the starting power source to the starting circuit through the start relay to the starter-generator.

The #1 start switch is moved to the OFF position at an indicated N_1 speed of 55%. This action will de-energize the start control relay, the starter relay, and the generator relay. It will also de-energize the ignition exciter.

Starting engine #2 is accomplished in the same manner with either engine being started first. Either external power or battery power may be used for starting, but the battery relays will only energize if sufficient voltage is provided from the battery to the relay coils. For an APU emergency start with very low battery voltage, the battery relays will not close without pressing the 2S11 switch on the right side forward center console while holding the #2 battery switch on. It takes two people to do this procedure. This will allow APU voltage on the battery bus for starting the #1 engine.

External power or ground power :

Battery Trolley, Power truck, Star pack etc. are the external or ground power.

External power may be connected to hell electrical system through ext. power receptacle to carry out pre, thru, post flight insp and Eng start up. If ext, power is connected in correct polarity then ext, power relay close automatically and connects power to primary DC bus no 2.

No 1 & no 2 DC essential buses may be energized by closing DC intcon, both DC control & all essential bus feeders CB.

Non essential bus may be energized by placing non essential bus switch to manual. One micro switch is connected with ext power door. If door is open master caution ext power light will illuminate.

Battery Trolley



POWER TRUCK



START PACK



All these ground power gives 28 volt DC for Pre- Flt, Post Flt, Thru Flt and to start the engine on ground.

Ignition exciter :

Purpose: The purpose of ignition exciter is to convert low voltage to high voltage for ignition to the eng combustion chamber. Total ignition box is two, each for one eng.



Location : Located at the combustion chamber wall. One for each Engine.

Tech data:

- | | | |
|----|------------------|-----------------------|
| a. | Sparking plug | : 04, 02 for each eng |
| b. | Input connector | : 02 ea for 1 eng |
| c. | Output connector | : 04, 02 for ea eng |
| d. | Input volt | : (9-30V DC) |
| e. | Output volt | : 2700 to 3100 V DC |

Ignition test procedure:

- Ignition CB in.
- Start relay CB in.
- Fuel shut off valve on,
- Fuel boost pump off.
- Throttle close fully.
- Battery switch on in reverse way,
- Starter switch engage.

Limitation: (0 – 30) sec.

Observation:

Then “click click” sound comes from ignition system.

Note:

During no-1 eng test, no -2 battery switch should be on. Simultaneously during no-2 eng test no-1 battery switch to be on.

STARTING SYSTEM

The starting cycle is completed by under going procedure:

If electrical power is supplied to series or start winding of starter generator, will produce a rotational torque for engine starting on which it is mounted in front section of engine accessories gear box.

Starting power may be from battery installed in hell or from external power source 28 VDC plug in to external power receptacle.

Engine starting procedure:

Eng no-1 starting accomplished by

- a. Close eng no- 1 start relay CB,
- a. Close eng no-1 ignition CB.
- b. Set eng no-1 fuel shut off valve on.
- c. Set eng no-1 fuel boost pump on.
- d. Engage eng start switch to eng no -1 position.

In this way energized no-1 start control relay and no-1 start relay which energized the no -1 starter generator relay and also energized the engine no -1 ignition unit. Through relay current now flow through contact no -1 start relay to series or starting winding of starter generator no -1. Now no -1 engine will start,

Eng no-2 starting accomplished by

- a. Close eng no- 2 start relay CB,
- e. Close eng no-2 ignition CB.
- f. Set eng no-2 fuel shut off valve on.
- g. Set eng no-2 fuel boost pump on.
- h. Engage eng start switch to eng no -2 position.

In this way energized no-2 start control relay and no-2 start relay which energized the no -2 starter generator relay and also energized the engine no -2 ignition unit, through relay current now flow through contact no -2 start relay to series or starting winding of starter generator no -2. Now no -2 engine will start,

AC POWER SUPPLY SYSTEM

In Bell-212 hell, AC power is supplied by three 115/26 VAC, 400 Hz, single phase, 250 VA solid state inverters.

Inverter : It is secondary source of power supply. It converts electrical power from DC to AC. Total no of inverter is 03. No 1 for co-pilot or no 1 eng, no 2 for pilot or no 2 eng, no 3 is standby for both. The type of inverter is ASH 584-5.]



Inverter

Location: no -1 & no- 3 are located under the nose compartment and no 2 is located in battery compartment.

Tech data:

- Input power volt: 28v DC/ 24 v DC
- Output volt: 115±10 and 26 v AC
- Output power : 250 v amp
- Weight: 7.2 lbs

Input connection:

No-1 inverter is connected to essential DC bus no-1.
No-2 inverter is connected to essential DC bus no-2.
No-3 inverter is connected to main DC bus no -1 & 2.

Output power range:

115 VAC +5, -7	(120.75 – 106.95) VAC
26 VAC +5, -7	(27.2 – 24.8) VAC

AC power is distributed by a dual bus arrangement. Each inverter normally power supplies its own buses independently through each respective AC voltage sensing relay and AC bus control relay.

Bus connection: Total AC buss : 05

No -1 inverter supplied power to	115 VAC essential bus no -1
	26 VAC essential bus no -1
No -2 inverter supplied power to	115 VAC essential bus no -2
	26 VAC essential bus no -2
No -1 inverter supplied power to	115 VAC non essential bus n0 -1



Note:

When no -1 or no -2 inverter fail at that time no -3 inverter take over automatically. At that time no -3 inverter drops to supply the non - essential bus 115 VAC.

Warning:

In event of any inverter voltage drops to below 105 VAC or raise above 125 VAC, The bus control relay automatically disconnect the respective inverter bus and AC voltage sensing relay energized and that respective inverter caution light illuminates in the caution panel with master caution light. That shows the inverter fail.

Function of NAV AC switch:

If no -1 & 3 inverters are failed at that time navigation equipments (HIS, Gyro) does not get power from no -2 inverter by not placing NAV AC switch from normal to NAV AC bus no -2 position

INTERIOR LIGHTING SYSTEM

The interior lighting system consists of

- a. Cockpit light
- b. Dome light
- c. Pilot copilot instrument light
- d. Eng instrument light
- e. Instrument secondary light
- f. Pedestal light
- g. Overhead console light
- h. Baggage compartment lights
- i. Troops dis-embergation light

1.Cockpit light:

Cockpit lights are multi-purpose utility lights designed to selectively provide either red or white illumination utilizing a narrow spot light beam of a wide flood light beam control necessary to obtain operation mode On/Off, Dim/bright, Spot/Flood and Red/ White illumination are incorporated into lamp body.

2.Dome light:

The aft dome light can be illuminates red or white by setting red or white position. Brightness level of dome lights are designed by aft dome lights dimmer control rheostat.

Location : In the packs cabin ceiling.

Tech data :

Qty	: 03 set
Input power	: 28 VDC
Output power	: 10 W
Control switch	: 02

3.Pilot & copilot instrument panel light:

Pilot & copilot instrument panel lighting system consists of

1. Two circuit breaker on overhead console.
2. Pilot and copilot inst light cont rheostat on overhead console.

Data:

Input power: 5VDC, power supplied by power supply change over box on nose compartment. (28 -to- 5) VDC.

4.Eng instrument light:

The eng instrument lighting system consists of

1. A circuit breaker on overhead console.
2. A control rheostat on overhead console.
3. Power supply change over box. (28 to 5)VDC

5.Instrument secondary light:

The instrument secondary lighting system consists of

1. A circuit breaker on overhead console.
2. A control rheostat on overhead console.
3. Power supply change over box. (28 to 5)VDC

6.Pedestal light:

The pedestal lighting system consists of

1. A circuit breaker on overhead console.
2. A control rheostat on overhead console.
3. Transistor

Data:

Input power: 28 VDC

7.Overhead console light:

The overhead console lighting system consists of

1. A circuit breaker on overhead console.
2. A control rheostat on overhead console.
3. Transistor

Data:

Input power: 28 VDC

8.Baggage compartment light:

The baggage compartment lighting system consists of

1. A circuit breaker on overhead console.
2. A control rheostat on overhead console.
3. Two baggage compartment light assemble
4. Door micro switch.

Data:

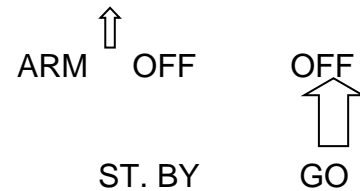
Input power: 28 VDC

9. Troops embarkation light.

The lighting system consists of

1. Two green and two red lights.
2. Two switches

Location: At the top of the sliding door.



Operation:

1. First set arm position
2. Stand by or go (go indicates by green and stand by indicates by red light)

Tech data:

1. Qty: : 02 set (each set having one red and one green light)
2. Control switch : In the central pedestal (executes by captain)

EXTERIOR LIGHTING SYSTEM:

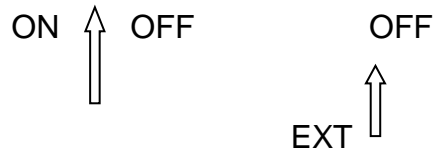
The exterior lighting system includes:

1. Landing light
2. Search light
3. Anti-collision light
4. Position light
5. Utility light

11.Landing light:

The landing light assemble consists of

1. Sealed beam type lamp.
2. Extend and retract motor.
3. A control relay.
RETR
4. Light limit micro switch.
5. Light light ON/OFF switch (three position for the switch)



12.Operation:

The landing light ON/OFF switch controls ON/OFF function. The three position of landing light controls the EXT/OFF/RETR movement of landing light.

Location: Under the belly

Tech data :

1. Input volt : 28/24 V DC
2. Wattage of filament : 600 watt
3. Extension angle : 120° fwd position
4. Operation : continuous

13.Search light.

The search light assemble consists of

1. A sealed beam type lamp.
2. Rotational motor.
3. Extend & retract motor.
4. Control relay.
5. Limit switch.
6. ON/OFF/STOWED switch
7. EXT/RETR/LT/RT switch.

Operation:

The ON/OFF/STOW Switch for ON/OFF AND Stowed. by selecting "Stowed" light will come back its original position. EXT/RETR/LT/RT switch for extend, retract, left and right movement of light.

Location: Under the belly right fwd section.

Tech data :

1. Input volt : 28/24 V DC
2. Wattage of filament : 450 watt
3. Extension angle : 120⁰ fwd
4. Rotational angle : 360⁰ sideward position

14.Anti collision light:

Purpose: to minimize anti-collision of aircraft.

Location : one in engine compartment cowling
One in under the fuselage

Tech data :

1. Qty : 02 set , per set two bulb
2. Input power : 28 VDC
3. wattage : 40 W
4. Flashing rate : 80 flash/min

15.NAV/ position light.

Total position lights are six. Two red (left , two green(right) and two white(tail)

Tech data :

1. Input volt : 28V DC
2. wattage : Tail lamp 10W other four light 26 watt

16.Utility/ foot step light.

Utility lights assemble consists of:-

1. 5 amps CB
2. Utility lights switch at overhead console

Location : Above the foot step

Tech data:

1. Qty : 02
2. Input power : 28 VDC
3. wattage :10W

Caution and warning system

The caution and warning system consists of :-

1. Master caution light.
2. RPM warning light
3. Eng 1 & 2 out light.
4. Eng Fire & Warning Light
5. Baggage Fire Warning Light
6. Annunciator Panel Light

1. Master caution light:



The master caution light is illuminated simultaneously when one or more capsule indicator illuminates. Indicator lights on annunciator panels are controlled by monitored system.

2. RPM warning light
At setting $92.6 \pm 2\%$ rotor RPM audio sound and RPM light comes.
Low RPM warning system test:

<u>If on at</u>	<u>goes off before</u>	
90.6%	93.4%	Diff = 2.8%
92.6%	95.4%	
94.6%	97.4%	

- 3.
4. Eng out caution light:



Initially the eng out caution light is illuminated. The caution light goes off at $52.5 \pm 2\%$ N_1

Test:

Set eng RPM $N_1 = 56\%$. Slowly decrease eng RPM. Eng out light comes with in $52.5 \pm 2\%$.

54.5% -	57.4%	diff = 2.9%
50.5% -	53.4%	
52.5% -	55.4%	

4. Eng Fire & Warning Light



The system consists of

1. Eng 1 & 2 'T' handles with warning light.
2. Left fwd & aft heat sensing element (highly electrically resistive)
3. Right fwd & aft sensing element (highly electrically resistive)
4. Relay 1&2
5. Fire detector. Located at left & right cabin roof.

5. Baggage fire :

Baggage compartment fire detection system consists of

1. Smoke detector: Closed assembled, solid state electronic component and light sensitive. It is located at baggage compartment.
2. Amplifier: located below the nose compartment.
3. Warning light
4. Test button.

If smoke reduce the transmission of light 30- 35%. Warning light flashing on off.

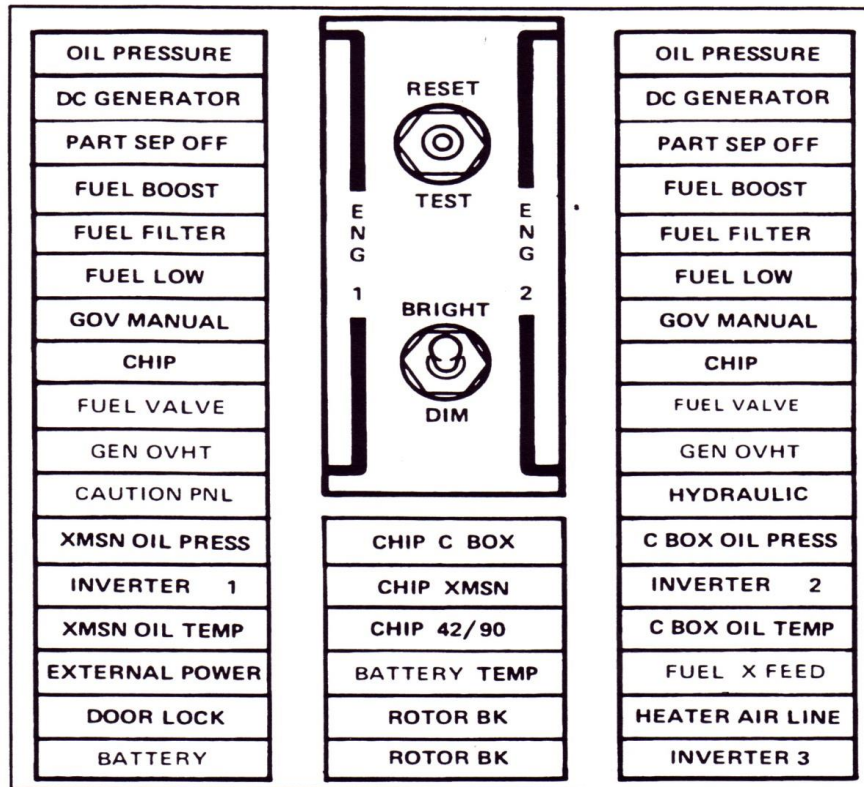
6. Caution panel lights

Total no of segments 40. Red 07 and yellow/amber 33.

Red color seven are:

- a. Transmission oil pressure
- b. Transmission oil Temp

- c. CGB oil pressure
- d. CGB oil Temp
- e. Battery temp
- f. Rotor brake X 02



The caution panel is a multi-capsule. Each capsule is including an indicator light. Each indicator light is in series with respective caution light system. Caution light containing switch and associate component.

Operation of caution and warning system:

Master caution can be reset by momentarily depress "Test/Reset" switch. Individual indicator light illuminates as long as fault condition exists. Momentarily pressing test switch all indicator lights illuminates on caution panel.

Dim or brightness of master caution system:

All indicator lights, master caution light, eng 1 & 2 out light, RPM warning lights will illuminate as bright at initial application of power. Manual condition of dim / bright is provided by dim/ bright switch on caution.

Momentarily placing bright/dim switch to dim, momentarily dimmed caution panel indicator light, master caution light RPM warning light, eng 1 & 2 out light will dim and remain of pilot instrument lights rheostat is rotate clock wise from off.

Light can be bright by momentarily placing bright or dim switch to bright or dim by rotating pilot rheostat to counter clock to on.

1. No -1 & 2 Eng oil pressure caution lights:

In normal operation and ground run condition Eng oil pressure start to raise. When oil pressure raises at 40 PSI at that time the switching device start to work and oil pressure light will goes off. Again when Eng oil pressure drops to 31 ± 1.5 PSI, light will illuminates.

2. Generator 1 & 2 caution lights:

When hell is on ground or normal operation condition when N_1 RPM gains 71% or greater then generator switch is on. At that time caution light will off. If any malfunction of any generator occurs then the caution light may come.

3. No 1&2 Particle separator caution lights:

Particle separator caution light will extinguishes if particle separator switch "over ride on" position. At that time particle separator door opened. When switch place to normal position caution light will illuminates with master caution light.

Particle separator light goes off when eng gains $52.5 \pm 2\%$ RPM.

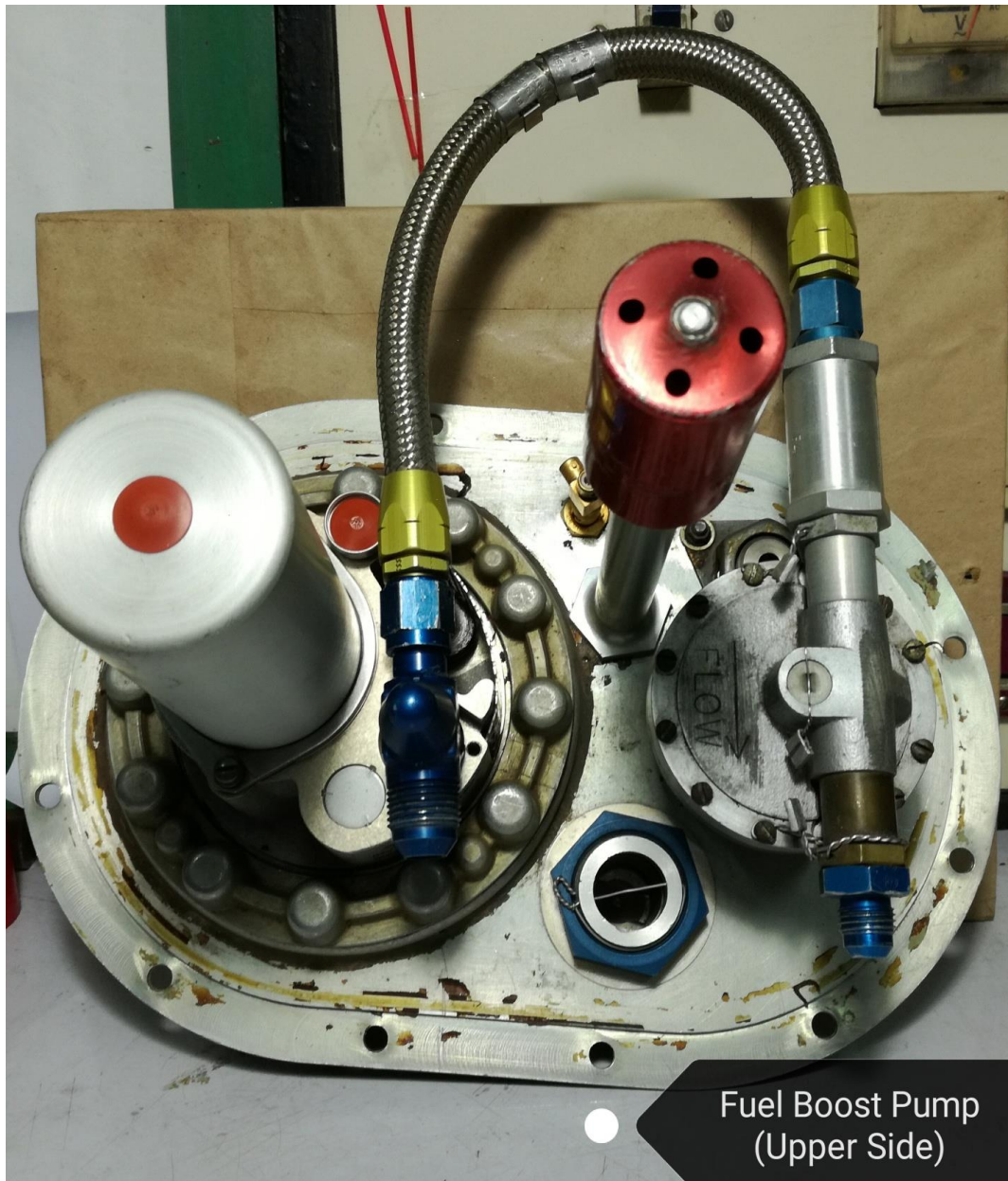
4. No -1&2 boost pump caution lights:

Fuel boost pump caution light extinguishes when the pump switch is on. And light will illuminates when fuel boost pump is failed. Fuel press range is 4-35 PSI.

5. No 1&2 Fuel filter caution lights:

If fuel filter clogged at that time fuel pressure differs approximately 1.4 ± 1 in differential fuel press switch and an electrical signal produce on the switch and caution light will be illuminates.

6. No 1&2 Fuel low caution lights:



If fuel cells have less than 10% of basic fuel, low level fuel caution light will illuminate.

Basic fuel quantity is 1409 lbs. Low level light comes at less than 150 ± 15 lbs.

7. Eng no 1&2 governor manual control caution lights:

Normally the governor manual control solenoid is de-energized. On power on check governor manual control solenoid is in auto position and the cautions lights are in extinguish condition. When governor manual control valve on manual setting then caution solenoid is in energized condition and light will illuminate on caution panel.

8. Chip detectors caution lights:

When in ground run or operational condition at that time if any metal particle is torn from any gear then the metal chip shorts that chip detector and closes the circuit and caution light will illuminate on the caution panel.

Total qty 10. Eng 05 & airframe 05.

9. Eng no 1&2 fuel valve caution lights:

Both eng fuel valve caution light normally in off condition. If fuel switch is on then the respective caution light momentarily comes on and goes off.

10. No 1&2 Generator overheat caution lights:

Generator overheat caution light comes through generator overheat sensor located inside each generator

Generator overheat light comes on when temp at 310°F.

11. Inverter 1, 2&3 fail caution lights:

Inverter caution light will illuminate if any inverter failed in flight or normal operation of hell. Individual caution light will illuminate continuously which inverter is failed. Inverter will fail when drops below 105 VAC and raise above 125 VAC.

12. Transmission oil press caution light:

When transmission oil press raise 38 PSI then caution light extinguish and when press drops 30±3 PSI then transmission oil pressure caution light illuminates.

13. CGB oil pressure caution light/:

When hell in operational condition, oil pressure raise at 40 PSI then caution light will extinguishes again when pressure relief at 3±1.5 PSI, the will illuminate.

14. Cross feed caution light:

In case of any boost pump failed, fuel is cross feeding by cross valve at that time caution light being blinker on the caution panel.

Note:

When any boost failed at that time a relay activates and open the cross feed valve for by pass supply from remain pump.

15. Battery temp caution light:

The battery probe send electrical signal to the BTI and BTI will shows the temperature of the battery. When battery temp is 145±3 F at that time battery temp caution light illuminates.

16. Rotor brake caution light:

Rotor brakes normally in extinguish condition, when brake is applied at that time the micro switch contacts the circuit and rotor brake caution light illuminates on the caution panel.

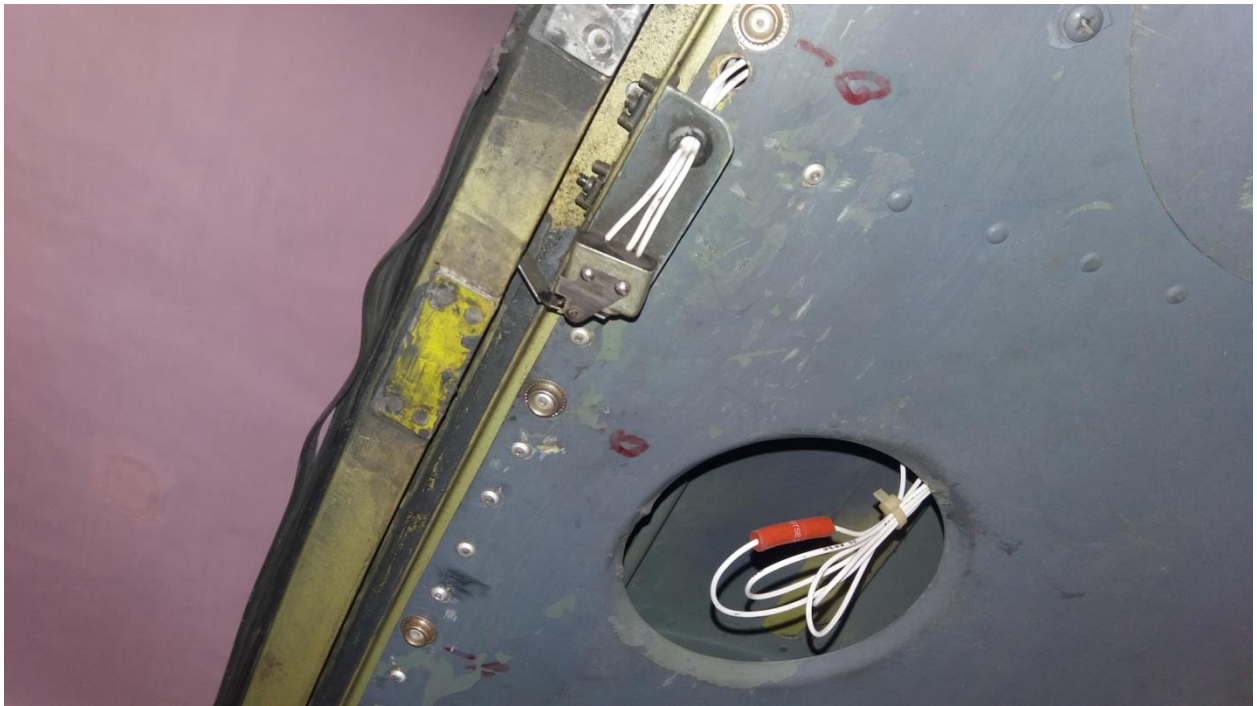
Note:

Don't apply the rotor brake above 40% RPM.

17. External power caution light:

There is a micro switch on the external power receptacle. When the receptacle door is closed, the caution light is extinguished. If we open the door, the micro switch contacts a circuit and caution light illuminates on caution panel.

18. Door lock caution light:



There are micro switches in passenger door and baggage compartment door. When all the doors are closed, the caution light is extinguished. If all or any door opened then the micro switch complete a circuit and caution light illuminates on caution panel.

19. Hydraulic caution light:

This system consists with two temp valves and two hydraulic press switch on hydraulic reserver.



Hydraulic temp range: 15°- 88° C
 Caution light remain on: up to 650 PSI
 Caution light goes off: 750 – 1100 PSI

20. **CGB oil temp caution light:**

Normally the caution light is in extinguished condition. If temp rises extremely high then the caution light illuminates.

<u>Eng model</u>	<u>Oil temp range</u>
PT6T-3	O -107° C
PT6T-3B	O M-115° C

21. **Transmission oil temp caution light:**

Transmission oil temp caution light normally in extinguished. Sensed by temp switch. If temp reach high then the caution light illuminates.

Temp range: 15° -110° C

22. **Heater air line caution light:**

The caution light normally in extinguished. If system air temp is 220° F it may rapture the system hose that time the heater air line caution light illuminates on caution panel.

23. **Battery caution light:**

Battery caution normally on. If anyone battery switch on then the caution light extinguished. Again if both the battery switch on that time the caution light will illuminates.

24. Caution panel fail light:

Applied voltage of all other segment of caution panel drops below 75% of rated voltage with bright/ dim switch either position then caution panel light comes on.

Note: Out of Master Caution Panel Lights the following additional Caution and Warning Systems are used in Bell-212 Hel.

1. Hydraulic filter clogged warning:

Hydraulic clogged indicator located above the chin babul. Normally it shows green colour. If (any four filter) press difference 70 PSI, indicator shows red dot, viewing from sight glass. If red dot comes, manually set it to green.

2. High RPM warning test:

Manual (Gov s/w), slowly increase the throttle, light illuminates at $103 \pm 2\%$, audio sound have not in head set.

Decrease rotor speed and verify light extinguishing within 2.8%.

<u>If on at</u>	<u>Off at</u>
101%	98.2%
103%	100.2%
105%	102.2%

3. CGB oil clogged indicator:

Normal oil press is 60 -80 PSI. if CGB oil filter inlet and outlet differential press more than 27 PSI then clogged indicator pops out.

Eng Control Accessories System

Eng control and accessories system consists of

1. Fuel control heater
2. Fuel boost pump
3. Fuel shut off valve
4. Fuel control valve
5. Fuel inter connector valve.
6. Fuel cross feed valve
7. Governor RPM actuator
8. Sump drain valve
9. Eng particle separator
10. Idle stop release solenoid



Eng control panel

1. Fuel control heater:

Prevent ice accumulation in eng governing parts, MFCU, AFCU by maintaining 40°F (4°C) temp at least. Powered by Essential DC bus through fuel control heater CB. Eng no 1&2 controls the system.

2. Boost pump:

There are two fuel boost pump in two front fuel cells, two CB for two pumps and the fuel boost pumps are controlled by two fuel control switch located in eng control panel.

Data:

Fuel press: 4-35 PSI

Flow rate: 300 lbs per hour
Input current: 28VDC

3. **Fuel shut off valve:**

The purpose of fuel shut off valve is to control the fuel flow to eng. There are two valves; one for each eng. Power is supplied by essential dc bus. There are two CB for two fuel shut off valves and controlled by two switch located in eng control panel.

Note:

If fire 'T' handle pull then fuel shut off valves are closed automatically.

4. **Eng fuel control valve:**

Two solenoid valves, one for each eng, provide for by passing fuel for eng control governor AFCU to MFCU. Eng fuel control valves are operated by a control switch located eng control panel.

Note:

Always set the eng fuel control switch in auto position.
Auto position --- valve de-energized.
Manual position—valve energized.

5. **Fuel interconnect valves:**

The purpose of fuel interconnect valves are to balance the fuel quantity of left and right fuel cells.

Operating system of fuel interconnect valves consists of

- a. CB on overhead console.
- b. Fwd and aft interconnect valves.
- c. Fuel interconnect switch on eng control panel

The switch of fuel interconnect valve have two positions, normal and open. Fuel interconnect valve opens when fuel quantity approximately 650 lbs.

6. **Fuel cross feed valve:**

In case one of the boost pump failed, cross feed valve allow cross-feed fuel to next eng.

Fuel cross feeding system consists of

- a. Fuel cross feed valve
- b. Fuel cross feed valve CB, (Bus 1&2)
- c. Cross feed valve relay
- d. Fuel cross feed test switch on eng control panel.

Fuel cross feed caution light normally extinguished. When cross feed valve change its position at that time the caution light 'on then off'

7. Governor rpm actuator:

Governor rpm actuator is also termed as beep actuator. This actuator allows engine rpm to be adjusted over a small range. Centered about valve determined by the eng governor. Actuator has no effect when in manual mode. The actuator is controlled by rpm increase/decrease switches.

Set the switch to increase, actuator retracted and rpm increased.

Set \Rightarrow increase \Rightarrow actuator retract \Rightarrow RPM \Uparrow increase

Single engine beep range 95%-97%(N₂)

Double engine beep range 97%-101.5%(N₂).

8. Sump drain valve:

The purpose of sump drain valve is to drain the fuel in any sediment inside fuel.

Location:

Fwd left & right fuel cells.

Operation:

- a. 28 VDC supplied from essential bus.
- b. Battery switch on.
- c. Fuel switch off.
- d. Push sump drain button.

9. Eng particle separator:

The purpose of eng particle separator is to provide a means of controlling intake air to engines in which FOD will be by pass and prevented from entering engines.

Eng particle operating system consists of:

- a. Two particle separators.
- b. Two control switches (off & overhead on), located on eng control panel.
- c. Control relays -02
- d. Two caution lights on caution panel

10. Eng Idle Stop Solenoid:

The purpose of Idle Stop Solenoid is to keep Eng Speed at Idle condition by using Idle Stop Solenoid Valve. It keeps the Eng RPM at 61% N₁. It consists of:

- a. 02 X Solenoid Valves
- b. 02 X Time Delay Relays (05 Seconds)
- c. 01 X Selector S/w

Eng Start Procedure:

Starting accomplished by-

- a. Close eng no- 2 start relay CB.
- b. Close eng no-2 ignition CB.
- c. Set eng no-2 fuel shut off valve on.
- d. Set eng no-2 fuel boost pump on.

Engage eng start switch to eng no -2 position.

FLIGHT CONTROL SYSTEM

Flight control consists of

1. Force trim
2. Hydraulic by pass solenoid system.

1. Force trim:

The purpose of force trim is to minimize fatigue of pilot. The force trim system consists of

- a. Anti-torque magnetic brake - FT(L8)
- b. Fwd & aft magnetic brake - FT(L8)
- c. Lateral magnetic brake - FT(L8)
- d. Switch located on miscellaneous panel
- e. Push button on both cyclic stick.

Force trim switch located on miscellaneous control panel, remain on position. If need in flight system de- energized switch place to off position. One push button located on each cyclic head to operate. All magnetic brake operates at a time.

2. Hydraulic by pass solenoid:

There are two solenoid valves:

- a. Hydraulic system no-1
- b. Hydraulic sys

<u>S/W position</u>	<u>Electrical action</u>	<u>Valves condition</u>
ON	De-energized	Open
OFF	Energized	Close

Note:

Valves are normally de-energized (open) when switches are in ON position. And when valves are energized (close) switch are in OFF position.

If hydraulic switches are in OFF then pressure is not build up in the system. The system operated by 28VDC essential bus no-2.

HEATING SYSTEM

The heating system includes:

1. Pitot tube heater
2. Static port heater
3. Cabin heater
4. Cabin temperature control
5. Vent blower.

1. Pitot tube heater:

Pitot tube heater used to prevent pitot tube from icing. The switch of pitot tube heater switch located in over head consol. Input power of pitot heater is 28VDC.

2. Static port heater:

3. Cabin heater:

Bleed air cabin heater mixes engine bleed air with ambient air and distribution mixed air into cabin area.

The system has two electrical control circuits

- a. Outlet control circuit
- b. Temperature control

Operating power – Both system controlled by 28VDC.

4. Outlet air control system:

The system controls amount of heater air and defrosting. The system consists of:

- a. Aft outlet valve
- b. Aft outlet limit switch
- c. Heat outlet switch.

5. Cabin temp control:

The system controls engine bleed air with outside air for distribution in heater system. The system consists of:

- a. Bleed air press valve
- b. Particle separator relay
- c. Heater valve
- d. Overheat switch
- e. Heater relay
- f. System selector switch
- g. Bleed air solenoid valve.

6. **Vent blower:**

Two vent blower (left & right) compressed ambient air and distributes pilot and copilot air scope.

The system consists of:

- a. Two blower motor
- b. Control switch
- c. Vent blower CB

Location: Nose compartment.

MISCELLANEOUS ELECTRICAL SYSTEM

Miscellaneous electrical system includes

1. Wind shield wiper
2. Engine Fire Extinguisher and
3. Power Passenger step.

1. Wind shield wiper:

Two wind shield wiper located on over the wind shield, use to sweep the rain and fog. The wind shield wiper system consists of:

- a. Selector switch (Three positions: pilot, co-pilot & both)
- b. Speed control switch (Five positions: High, medium, low, off & park)
- c. Rotary motor
- d. Arm assemble
- e. Blade assembles.

Data:

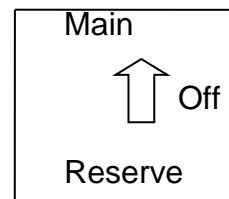
Operation power: 28 VDC.
Speed control by resistor on the circuit
Travelling angle of wiper blade is 64°

2. Eng fire extinguishing system:

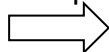
The purpose of eng fire extinguishing system is to extinguish the eng fire.

The system consists of

- a. Two bottle of gas (N_2 + Freon)
Gas ratio: 6 : 1
- b. Two sets of fire element around the fire wall.
Z-19, Z-21 for Eng No-1
Z-18, Z-20 for Eng No-2
- c. Fire detector amplifier
- d. Selector switch at eng inst panel
- e. Fire pull handle (Eng 1&2)
- f. CB (02, main & reserve)



In event of fire extinguish action is required, at first select the main or reserve selector switch then



Pull the fire pull handle (which light is illuminates),

At that time four actions would occur:

- a. Fire bottle explosive is ARM position
- b. Particle separator door close
- c. Fuel shut off valve close
- d. Shut off both eng hot air bleed press valve.

3. Power passenger step:

Left and right two power passenger step powered by 28 VDC (Essential bus -2)

The system includes

- a. CB at overhead console
- b. Actuator motor
- c. Step switch at miscellaneous control panel



Raise Off Stow

The foot step raise from skid approx 14 inch.

Air Condition System

HELI- DYNE systems Freon air conditioner installed on bell-212 hell SI No 31297&31298.

Total capacity: 02 tons
Powered by: 28VDC
Total load: 125-145 amps approx.

1. Construction:

Air condition system consists of

- a. Blower
- b. Compressor
- c. Evaporator
- d. Condenser
- e. Reservoir
- f. Compress motor
- g. Expansion valve
- h. Associate switches, CB, relay and power diodes.

2. Charging procedure:

- a. Power from 28 VDC non essential bus.
- b. Two CB on position
- c. Blower switch on and then
- d. Charge with F-12 at 35-40 PSI.

3. Caution:

- a. Air condition system must not be on during takeoff and landing.
- b. During air condition position do not close the right side sliding door, because condenser blower outlet air blocked if passenger door is open.
- c. On 781A pre- flight inspection is to be carrying out for power diode check for security and burning smell.

Under Sling system

1. Under sling Operation

Bell-212 hell can carry 5000 lbs external loads by its under sling operation system.

There are two types of releasing system of under sling:

- a. Mechanically operated push lever located in the cockpit under the captains RT leg pedestal.
- b. Electrically operated from the control stick.

Under sling mechanism can be locked by three systems:

- a. By pushing the mechanical push lever from the cockpit Under the captains RT leg pedestal, thus the releasing mechanism should be opened then hooked the under sling hook.
- b. By pulling the electric pull lever on the control stick the releasing mechanism should be opened and then hooked the under sling hook.
- c. Turn on the manual releasing lever mechanism of the under sling under the cargo cabin, hooked the under sling hook and turn off the manual releasing

HOISTING SYSTEM

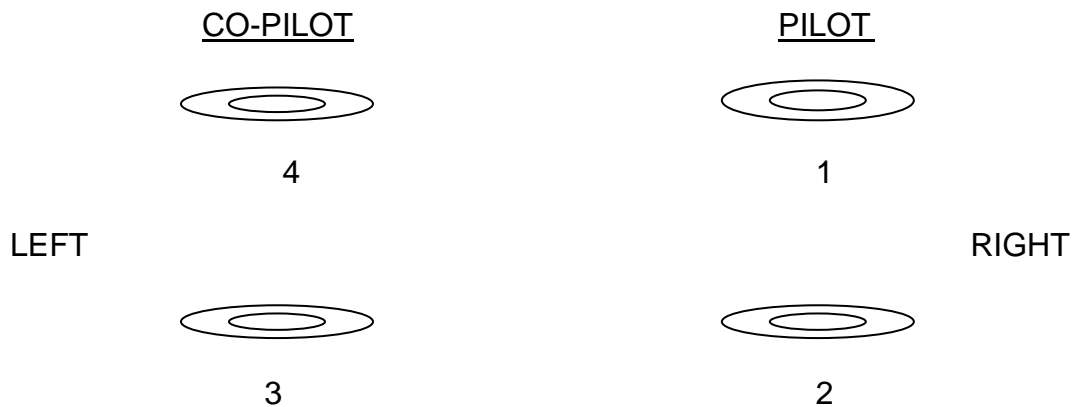
The rescue hoist is an electrically powered unit. The part no of rescue is 42035 R₁ & R₂.

1. Construction:

The rescue hoist power unit consists of

- a. Winch assemble
- b. Boom head assemble
- c. Boom position assemble
- d. Control panel assemble
- e. Control pendent assemble

2. Installation point:



3. Leading particulars:

Operation:	continuous
Rated load	600 lbs(272.4 kg)
Rated speed	250 Feet/Min at 300 lbs 125 Feet/Min at 600 lbs
Input voltage	28 VDC
Input current	140 amps
Hoist life	8500 cycles
Length	33.58 inch (85.29 cm)
Width	35.38 inch (89.86 cm)
Height	13.50 inch
Weight	180 lbs (72 Kg)

Night sun SX-16 (only ser no - 102)

1. Approved by:

Federal Aviation Administration (FAA)

2. Use:

In night flying, aerial reconnaissance from hell and fixed wing aircraft.

- a. Surveillance of borders
- b. Coast lines
- c. Power lines and critical installations
- d. For precise observation
- e. Photography at night

3. Construction:

The sx-16 Search light system consists of

- a. Control box assemble
- b. Junction box
- c. Gamble assemble
- d. Search light assemble

4. Location :

Under the belly fwd fuselage

5. Tech data:

Qty : 01
Input power : 27.5 VDC
Wattage : 1600 W
Movement : Up 10⁰ down 70⁰ and sideward 350⁰
Input current : 70 amps
1st min ops current : 80 – 85 amps.