

U.S.C.G. Merchant Marine Exam

DDE – 1000/4000 HP

Q632 Gas Turbine Plants

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions.

1. Why is the cycle efficiency higher in the intercooled-recuperated cycle as compared to a simple cycle gas turbine? Illustration GT-0026
- (A) The intercooler serves to increase the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease turbine inlet temperature.
 - (B) The intercooler serves to reduce the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease turbine inlet temperature.
 - (C) The intercooler serves to reduce the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to decrease required fuel to achieve the turbine inlet temperature.
 - (D) The intercooler serves to increase the required high-pressure compressor power while the recuperator utilizes waste heat from the exhaust to increase turbine inlet temperature.

If choice C is selected set score to 1.

2. The acronym CDP stands for which of the following?
- (A) Compressor Discharge Pyrometer.
 - (B) Coupling Disassembly Point.
 - (C) Compressor Discharge Pressure.
 - (D) Choke Down Point.

If choice C is selected set score to 1.

3. Which of the following statements correctly describes force?
- (A) Force is a scalar quantity.
 - (B) Force is work in a unit of time.
 - (C) Force has magnitude and direction.
 - (D) Force is not a vector quantity.

If choice C is selected set score to 1.

4. Thermal energy is the only form of energy that can be added to or removed from a substance. How is thermal energy that is added to a substance stored?
- (A) In the form of internal energy.
 - (B) In the form of potential kinetic energy.
 - (C) In the form of mechanical energy.
 - (D) In the form of heat.

If choice A is selected set score to 1.

5. What is the term given to a process that occurs without a loss or gain of heat?

- (A) Adiabatic
- (B) Exothermic.
- (C) Endothermic.
- (D) Isothermal

If choice A is selected set score to 1.

6. Newton's Second Law of Motion states which of the following?

- (A) The acceleration of a body is directly proportional to the mass.
- (B) An unbalancing force on a body tends to produce an acceleration in the opposite direction of the force applied.
- (C) The acceleration of a body is inversely proportional to the applied force.
- (D) An unbalancing force on a body tends to produce an acceleration in the same direction of the force applied.

If choice D is selected set score to 1.

7. Which of the following statements concerning fluid flow is true?

- (A) If a fluid flowing through a tube reaches a constriction or narrowing of the tube, the velocity of the fluid flowing through the restriction decreases and the pressure increases.
- (B) If a fluid flowing through a tube reaches a constriction or narrowing of the tube, the velocity of the fluid flowing through the restriction increases and the pressure increases.
- (C) If a fluid flowing through a tube reaches a constriction or narrowing of the tube, the velocity of the fluid flowing through the restriction decreases and the pressure decreases.
- (D) If a fluid flowing through a tube reaches a constriction or narrowing of the tube, the velocity of the fluid flowing through the restriction increases and the pressure decreases.

If choice D is selected set score to 1.

8. Which of the following statements is true regarding centrifugal compressors?

- (A) The centrifugal compressor is frequently used on small, low power turbines.
- (B) The efficiency of a centrifugal compressor is greater than that of an axial compressor.
- (C) Centrifugal compressors are complicated in design and heavy.
- (D) The impeller of a centrifugal compressor has a radial inlet and axial discharge.

If choice A is selected set score to 1.

9. Which of the following is the main advantage of a split-axial compressor case?

- (A) Stronger construction.
- (B) Simpler to disassemble.
- (C) Easier to repair and inspect.
- (D) Cheaper to manufacture.

If choice C is selected set score to 1.

10. An axial compressor basically consists of which of the following?

- (A) Rotating pistons and stationary liners.
- (B) A stationary impeller and a rotating diffuser.
- (C) A rotating impeller and a stationary diffuser.
- (D) Stationary vanes and rotating blades.

If choice D is selected set score to 1.

11. Two functions of the compressor stator vanes include which of the following?

- (A) Direct air flow to rotor blades at the correct angle and are shaped to maintain a constant velocity and produce a pressure increase.
- (B) Direct air flow to each rotor stage at the correct angle and deliver air to the combustor at the correct velocity and pressure.
- (C) Direct air flow to rotor blades at the correct angle and are shaped to cause a velocity increase and a pressure decrease.
- (D) Direct air flow to rotor blades at the correct angle and are shaped to produce a velocity increase and maintain a constant pressure.

If choice B is selected set score to 1.

12. What is the term used to describe the stationary vanes preceding the first stage of an axial compressor?

- (A) Variable inlet vanes.
- (B) First stage stator vanes.
- (C) Inlet guide vanes.
- (D) Variable stator vanes.

If choice C is selected set score to 1.

13. Which of the following statements is true concerning axial compressor disk-type rotors?

- (A) Rotor discs are held together by through bolts.
- (B) Rotor consists of rings that are flanged to fit one against the other.
- (C) Rotor is only suitable for low-speed compressors.
- (D) Rotor discs are shrunk fit onto a steel shaft.

If choice D is selected set score to 1.

14. Most GTE fuel nozzles have passages for all of the following EXCEPT _____.

- (A) primary fuel flow
- (B) cooling water
- (C) secondary fuel flow
- (D) compressed air

If choice B is selected set score to 1.

15. A centrifugal flow gas turbine uses what type of combustion chamber?

- (A) double-annular
- (B) can
- (C) can-annular
- (D) annular

If choice B is selected set score to 1.

16. How do the high-velocity high-temperature gases cause the gas turbine rotor to rotate?

- (A) By converting the high-velocity gas to low-velocity gas.
- (B) By increasing the velocity of the gases.
- (C) By creating a low-pressure area before the rotor.
- (D) By transferring velocity energy and thermal energy to the turbine blades.

If choice D is selected set score to 1.

17. What are the two principle functions of the turbine nozzle guide vanes?

- (A) Convert the potential energy of the hot gases into heat energy and direct the flow of gases to the turbine rotor blades.
- (B) Convert the heat energy of the hot gases into kinetic energy and direct the flow of gases to the turbine rotor blades.
- (C) Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the turbine rotor blades.
- (D) Convert the heat energy of the hot gases into potential energy and direct the flow of gases to the compressor rotor blades.

If choice B is selected set score to 1.

18. What method is utilized to allow turbine nozzle blades to withstand high inlet temperatures?

- (A) Laser cooling
- (B) Thermoelectric cooling
- (C) Water cooling
- (D) Air cooling

If choice D is selected set score to 1.

19. To keep the exit pressures relatively constant across a HP turbine blade, which type of construction is generally utilized?

- (A) Rateau.
- (B) Impulse-Reaction.
- (C) Impulse.
- (D) Curtis.

If choice B is selected set score to 1.

20. In a twin-spool turbine, secondary air is most essential for cooling in what section?

- (A) HP compressor.
- (B) LP compressor.
- (C) LP turbine.
- (D) HP turbine.

If choice D is selected set score to 1.

21. What is the purpose of the spring in a lip-type oil seal?

- (A) To seal against maximum fluid pressure
- (B) To prevent air from entering the sump
- (C) To remove burrs and dirt from the shaft
- (D) To keep the neoprene snugly fit around the shaft

If choice D is selected set score to 1.

22. What type of starter is commonly used on smaller gas turbine engines?

- (A) Air turbine
- (B) Electric
- (C) Pneumatic
- (D) Hydraulic

If choice B is selected set score to 1.

23. Which of the following components removes the oil from the transfer gearbox?

- (A) Duplex filter assembly
- (B) Lube oil storage and conditioning assembly
- (C) Air/Oil separator
- (D) Lube and scavenge pump

If choice D is selected set score to 1.

24. What is the most common type of spark igniter used on a gas turbine engine?

- (A) Suppression gap
- (B) Resistive gap
- (C) Delayed gap
- (D) Annular gap

If choice D is selected set score to 1.

25. How is the lube oil supplied to each bearing in a gas turbine engine controlled?

- (A) Regulating valve.
- (B) Flow divider.
- (C) Calibrated orifice.
- (D) Lube oil pump.

If choice C is selected set score to 1.

26. The electrostatic vent fog precipitator removes oil mist from which of the following areas?

- (A) Synchronous self-shifting clutch
- (B) Gas turbine engine
- (C) Main reduction gear
- (D) Lube oil storage tank

If choice C is selected set score to 1.

27. As shown in the illustration, what is the purpose of pressurizing the main bearing lube oil sumps on a typical marine gas turbine? Illustration GT-0023

- (A) Assists in cooling the lube oil.
- (B) Provides uniform lube oil distribution around the bearing.
- (C) Increases lube oil penetration.
- (D) Minimizes oil leakage from the rotor shaft.

If choice D is selected set score to 1.

28. The main lubrication system utilized by the gas turbine engine shown in the illustration is what type? Illustration GT-0017

- (A) Oil mist recovery sump
- (B) Common drain sump
- (C) Dry sump
- (D) Wet sump

If choice C is selected set score to 1.

29. The bleed air surge relief valve differs from a normal relief valve in which of the following ways?

- (A) Opens completely at a specified lift pressure and closes immediately as soon as the pressure begins to drop.
- (B) Opens completely at a specified lift pressure and remains open until the pressure drops to a specified preset pressure.
- (C) Gradually opens at a specified lift pressure and closes immediately as soon as the pressure begins to drop.
- (D) Gradually opens at a specified lift pressure and remains open until the pressure drops to a specified preset pressure.

If choice B is selected set score to 1.

30. Assuming at least a 500 rpm for the input shaft speed from the power turbine, as shown in the illustration, the synchronous self-shifting (SSS) clutch used on marine gas turbine main propulsion gears, requires which of the following inputs or conditions to make engagement possible? Illustration GT-0018

- (A) Availability of low-pressure air to provide control air pressure for engagement.
- (B) Availability of high-pressure air to provide clutch air inflation pressure.
- (C) When the input shaft speed from the power turbine falls below the output shaft speed.
- (D) When the input shaft speed from the power turbine rises to the output shaft speed.

If choice D is selected set score to 1.

31. What feature is commonly used on articulated reduction gear arrangements for the correction of misalignment between the 1st reduction gear and the 2nd reduction pinions?

- (A) Torsion pads.
- (B) Quill shafts.
- (C) Fixed block pads.
- (D) Locked train shims.

If choice B is selected set score to 1.

32. What is the purpose of the Controllable-Pitch Propeller (CPP) hydraulic oil power system?

- (A) Supplies high-pressure oil for both propeller blade actuation and stern tube sealing.
- (B) Supplies low-pressure oil for propeller blade actuation and control oil for propeller pitch control.
- (C) Supplies low-pressure oil for both pitch control and stern tube sealing.
- (D) Supplies high-pressure oil for blade actuation and control oil for propeller pitch control.

If choice D is selected set score to 1.

33. During an auto-start sequence on the marine gas turbine control console shown in the illustration, what would be the correct order of events required to occur after the start sequence begins?
Illustration GT-0016

- (A) NGG reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.
- (B) Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, NGG reaches idle RPM.
- (C) Power turbine reaches ignition RPM, gas temperature greater than 400 degrees F, power turbine reaches idle RPM.
- (D) NGG reaches idle RPM, power turbine reaches ignition RPM, gas temperature greater than 400 degrees F.

If choice A is selected set score to 1.

34. Which of the following is the principle that a magnetic speed sensor/pickup operates on?

- (A) Vibration caused by shaft rotation can determine the speed of rotation.
- (B) Force is the product of mass and acceleration.
- (C) Voltage is produced when a ferrous material moves through a magnetic field.
- (D) Variations in the earth's magnetic field are caused by ferrous materials.

If choice C is selected set score to 1.

35. Which of the following is NOT a gas turbine auto shutdown parameter?

- (A) High exhaust gas temperature.
- (B) High compressor discharge pressure.
- (C) Module enclosure fire.
- (D) Power turbine over speed.

If choice B is selected set score to 1.

36. Compressor characteristics are normally summarized in the form of which of the following?

- (A) Compressor map.
- (B) Straight line graph.
- (C) Spread sheet.
- (D) Venn diagram.

If choice A is selected set score to 1.

37. All clock positions, engine references, and enclosure references apply to viewing the gas turbine engine shown in the illustration, from which of the following locations? Illustration GT-0017

- (A) Left side of the power turbine to the right side.
- (B) Intake end, looking toward the exhaust end.
- (C) Rear (exhaust end), looking toward the intake end.
- (D) Right side of the compressor to the left side.

If choice C is selected set score to 1.

38. Routine water washing of the gas turbine compressor shown in the illustration, is usually performed while operating under which of the following conditions? Illustration GT-0017

- (A) At 25% power.
- (B) At 75% power.
- (C) At 100% power.
- (D) With the starter motor drive.

If choice D is selected set score to 1.

39. When conducting a borescope inspection, you must be aware of all of the following factors EXCEPT which?

- (A) The limitations of your equipment.
- (B) The inspection areas and ports.
- (C) The internal reference points.
- (D) The engineer's experience.

If choice D is selected set score to 1.

40. Which of the following wrenches should NOT be used while working on a gas turbine?

- (A) Adjustable wrench.
- (B) Box wrench.
- (C) Flare nut wrench.
- (D) Crowfoot wrench.

If choice A is selected set score to 1.

41. If the lube oil scavenge temperature exceeds 300 degrees Fahrenheit on the gas turbine engine shown in the illustration, and reducing power does NOT bring the temperature within limits, the operator should do which of the following? Illustration GT-0017

- (A) Monitor the temperature while continuing to operate.
- (B) Shutdown the engine and troubleshoot.
- (C) Continue to reduce power on the engine.
- (D) Continue to operate at the reduced power level.

If choice B is selected set score to 1.

42. Compressor surge is caused by which of the following factors?

- (A) Low ambient air temperature.
- (B) Interrupted air flow.
- (C) Increased demand for secondary air.
- (D) Maximum fuel pressure.

If choice B is selected set score to 1.

43. On a vessel equipped with marine propulsion gas turbines, the operator's initial response to a high vibration alarm should be which of the following?

- (A) Wait for the harmonic vibration to dampen out.
- (B) Switch to the secondary channel to confirm the alarm.
- (C) Change out the vibration transducer.
- (D) Reduce the engine speed.

If choice D is selected set score to 1.

44. What is the primary purpose of the diffuser and distributor on the GE LM2500 gas turbine?

- (A) To provide uniform air flow to the combustor
- (B) To provide even temperature distribution at the compressor
- (C) To provide uniform air flow to the turbine
- (D) To provide uniform air flow to the compressor

If choice A is selected set score to 1.

45. Where are the carbon dioxide nozzles located in the GE LM2500 gas turbine enclosure?

- (A) Above the compressor.
- (B) Above and below the combustor section.
- (C) On the cross beam under the compressor front frame.
- (D) On either side of the power turbine.

If choice C is selected set score to 1.

46. Which of the following components prevent(s) objects smaller than 1/4 inch from entering the GE LM2500 gas turbine?

- (A) Demister pads
- (B) FOD screens
- (C) Inlet louvers
- (D) Centerbody

If choice B is selected set score to 1.

47. Marine GTE fuel oil systems, as shown in the illustration, require fuel oil shutdown valves to be _____ . Illustration GT-0021

- (A) manually operated from MPCMS
- (B) piped in series
- (C) piped in parallel
- (D) piped in series-parallel

If choice B is selected set score to 1.

48. For the GE LM2500 gas turbine engine shown in the illustration, the HP turbine 1st stage nozzle vanes are cooled by which of the following? Illustration GT-0020

- (A) 8th stage compressor air.
- (B) 9th stage compressor air.
- (C) 13th stage compressor air.
- (D) 16th stage compressor air.

If choice D is selected set score to 1.

49. For the GE LM2500 gas turbine shown in the illustration, the 9th stage bleed air is used for which of the following? Illustration GT-0017

- (A) Sump pressurization and cooling.
- (B) Power turbine cooling.
- (C) High-pressure turbine second stage nozzle cooling.
- (D) Compressor balance piston cavity pressurization.

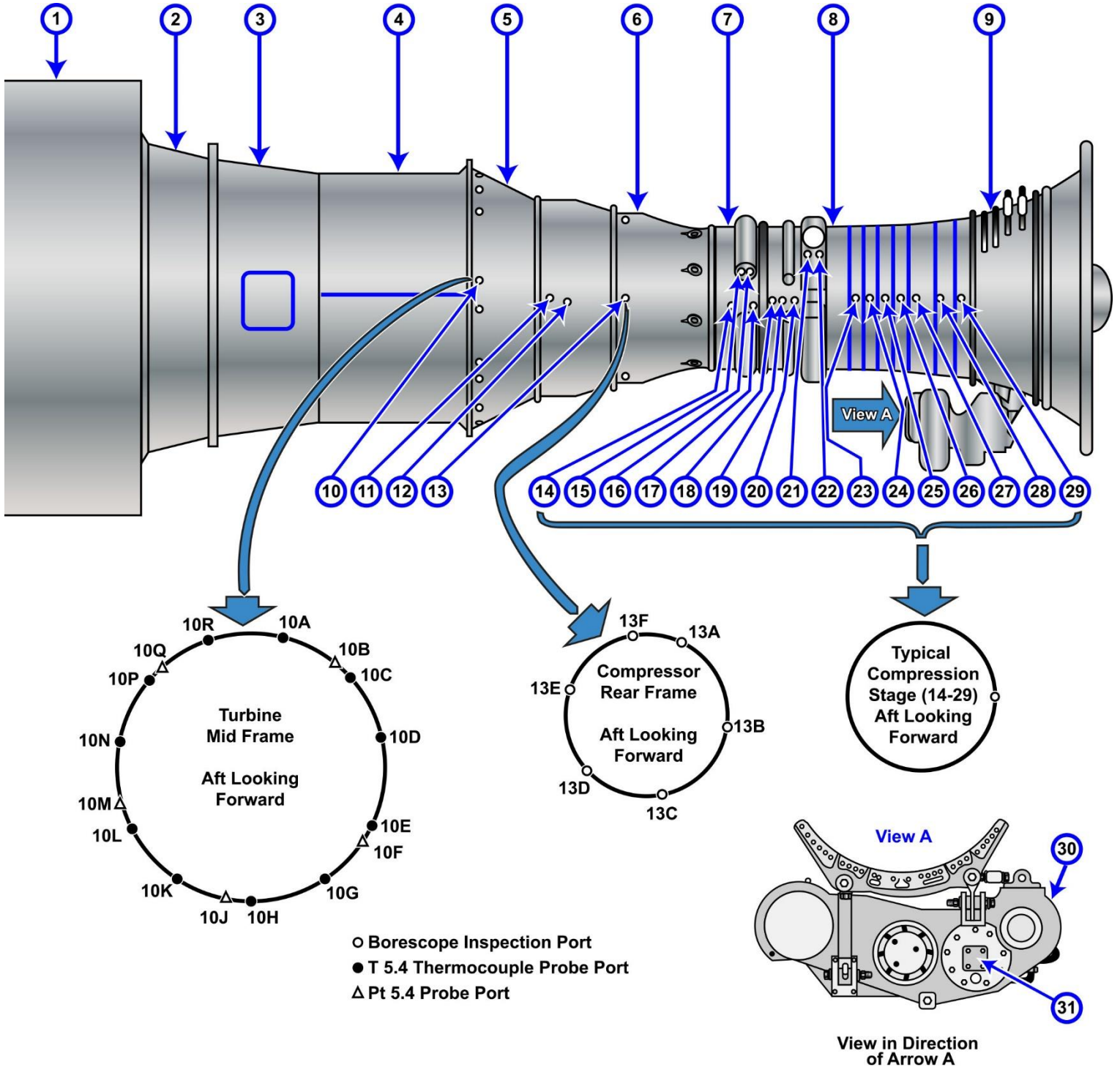
If choice B is selected set score to 1.

50. The six borescope ports located in the compressor rear frame casing of the marine propulsion gas turbine shown, can be used to inspect all EXCEPT which of the following components? Illustration GT-0006

- (A) 14th stage compressor blades.
- (B) 1st stage turbine nozzle
- (C) Combustor.
- (D) Fuel nozzles.

If choice A is selected set score to 1.

GT-0006



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NAVEDTRA 14111

GT-0016

FUEL OIL

PUMP B FAULT	PUMP A FAULT	HEADER TEMP HI/LO
TANK B TEMP HI/LO	TANK A TEMP HI/LO	HEADER PRESS HI
		HEATER TEMP HI
SUCTION STR Δ P HI	DRAIN TANK LEVEL HI	FILTER WATER HI
		FILTER Δ P HI

TK B SUCT VALVE OPEN	TK A SUCT VALVE OPEN	
TK B RECIRC VALVE OPEN	TK A RECIRC VALVE OPEN	
TK B SUCT VALVE CL	TK A SUCT VALVE CL	FILTER A BLOCKED
TK B RECIRC VALVE CL	TK A RECIRC VALVE CL	FILTER B BLOCKED

HEADER

TEMP	PRESS
180 160 140 120 100 80 60 40 20 0	180 160 140 120 100 80 60 40 20 0

SERVICE TANK VALVES

B OPEN	A OPEN
B CLOSE	A CLOSE

PUMP

B FAST	A FAST
B SLOW	A SLOW
B STOP	A STOP

EMERG TRIP

B	A
---	---

PUMP MODE

MANUAL

B LEAD A LEAD

CONTROL TRANSFER

REMOTE LOCAL

GTM B

FUEL TEMP LO	LUBO LEVEL HI	LUBO COOLER OUT TEMP HI	COOLING AIR OUT TEMP HI	
FUEL FILTER BLOCKED	LUBO SCAV FILTER BLK	LUBO SUPPLY FILTER BLK	CLUTCH FAIL TO DISENGAGE	CLUTCH FAIL TO ENGAGE
				FIRE DETECTOR FAIL
	NO. 1 FUEL VALVE OPEN	TACH NO. 1 LOSS	STARTER CUTOUT	BLEED AIR VALVE OPEN
	NO. 2 FUEL VALVE OPEN	TACH NO. 2 LOSS	WATER WASH HEATER ON	

WATER WASH

TANK EMPTY

WASH ON OFF

HEATER ON OFF

OUT OF SERVICE

NORMAL

START COUNTER

■■■■

GTM TIMER

HOURS

■■■■

MANUAL START

VENT DAMPER OPEN	COOLING FAN ON	BLEED VALVE OPEN	STARTER AIR ON	IGNITER ON	MAIN FUEL VALVE OPEN
VENT DAMPER CLOSE	COOLING FAN OFF	BLEED VALVE CLOSE			MAIL FUEL VALVE CLOSE
FUEL LOW TEMP OVRD	FUEL PURGE ON	CLUTCH ENGAGE	CLUTCH DISENGAGE	BRAKE ON	BRAKE OFF
COMPUTER TEST ON					
PASS					
PT OVSP TRIP RESET	VIB ANALYZER TEST ON				

MAIN FUEL VALVE CHECK SWITCH

NO. 1 NO. 2

CONTROL TRANSFER

ENABLE INHIBIT

SPEED

GG	PT
12 11 10 9 8 7 6 5 4 3 2 1 0	5 4 3 2 1 0

PT INLET

TEMP	PRESS
20 18 16 14 12 10 8 6 4 2 0	75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0

EMERGENCY CONTROLS

EMERGENCY STOP

FIRE SYS DISABLED PUSH TO RESTORE

CO2 RELEASE INHIBIT

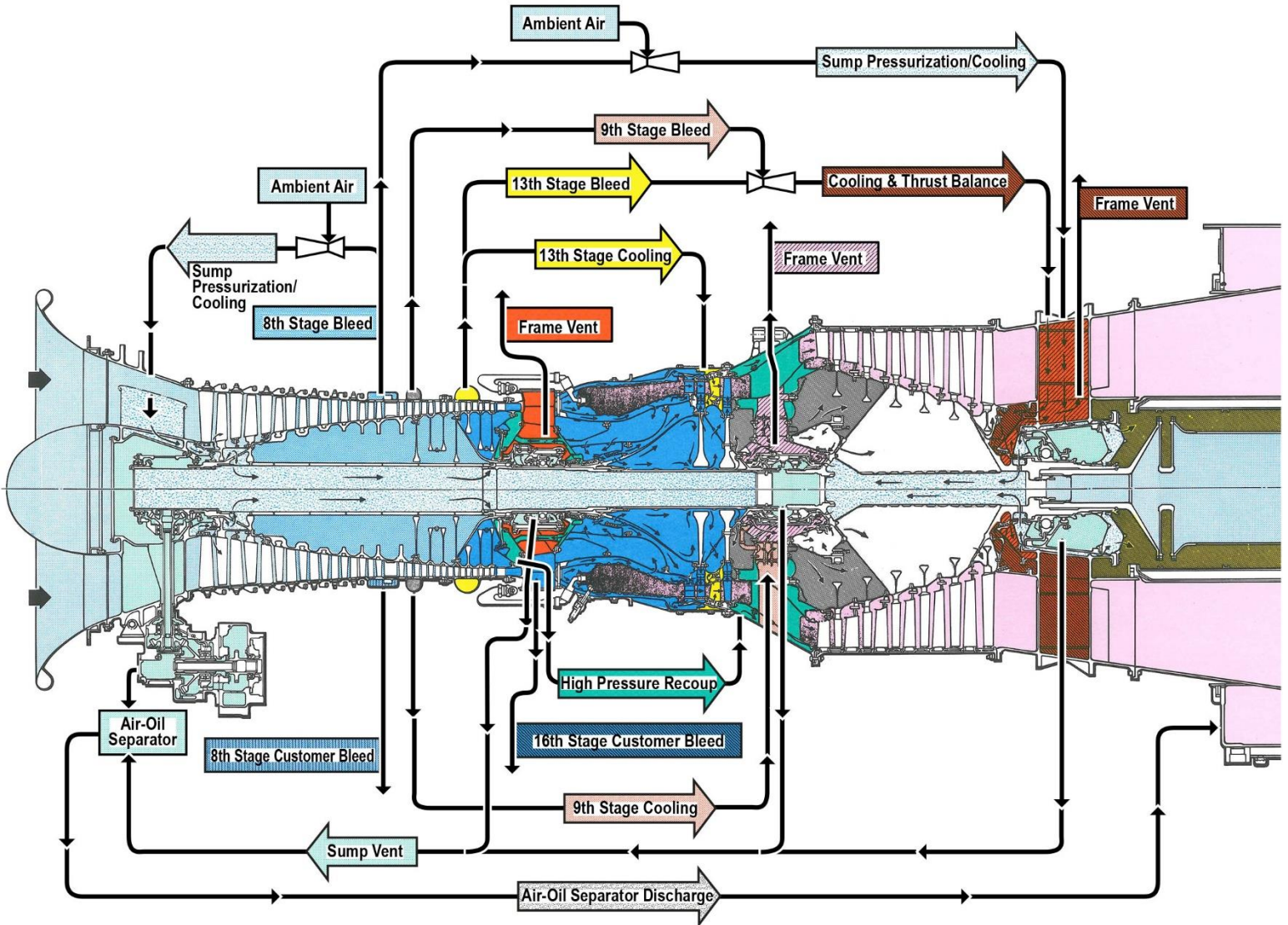
BATTLE OVRD ON

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GT-0017

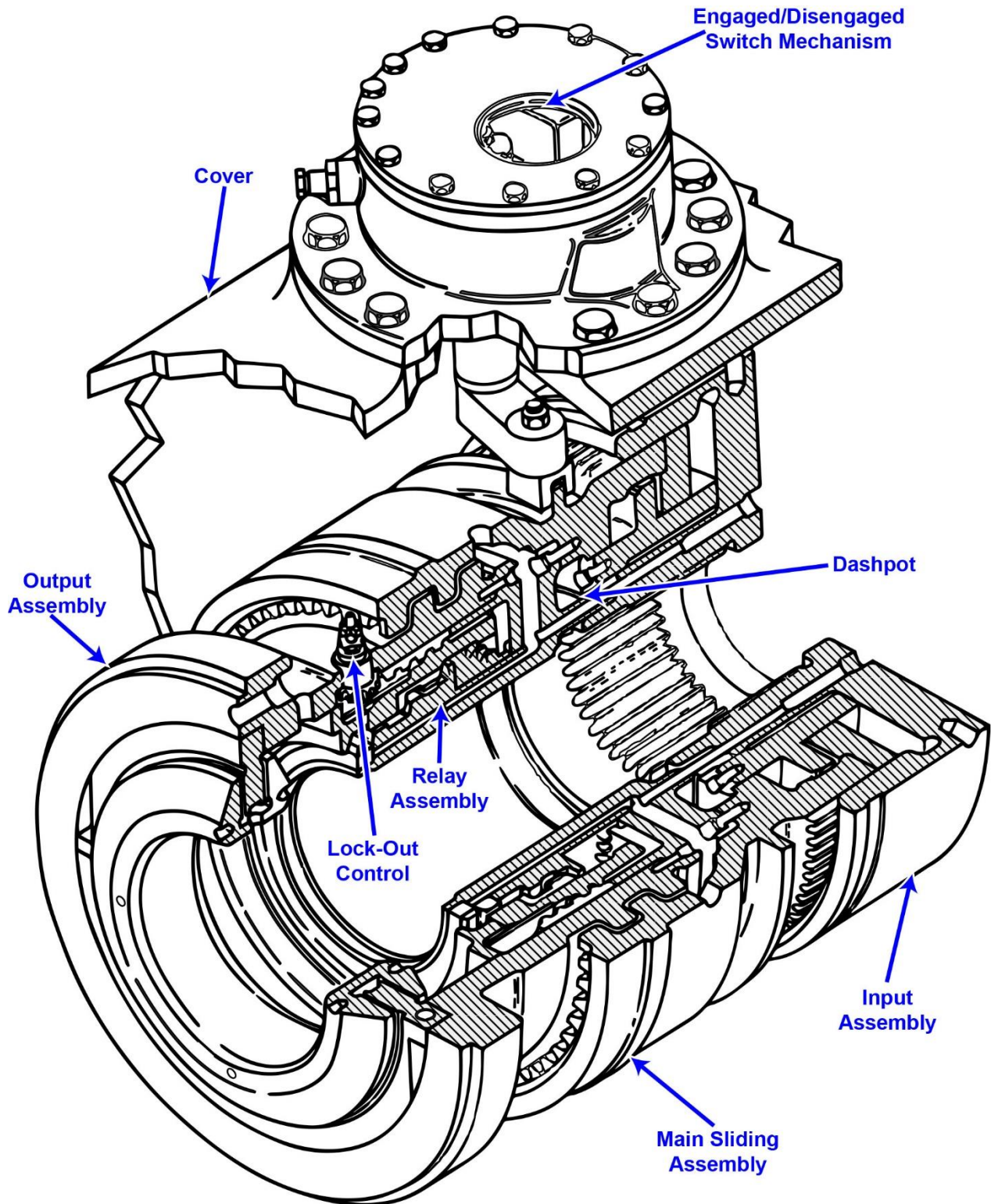


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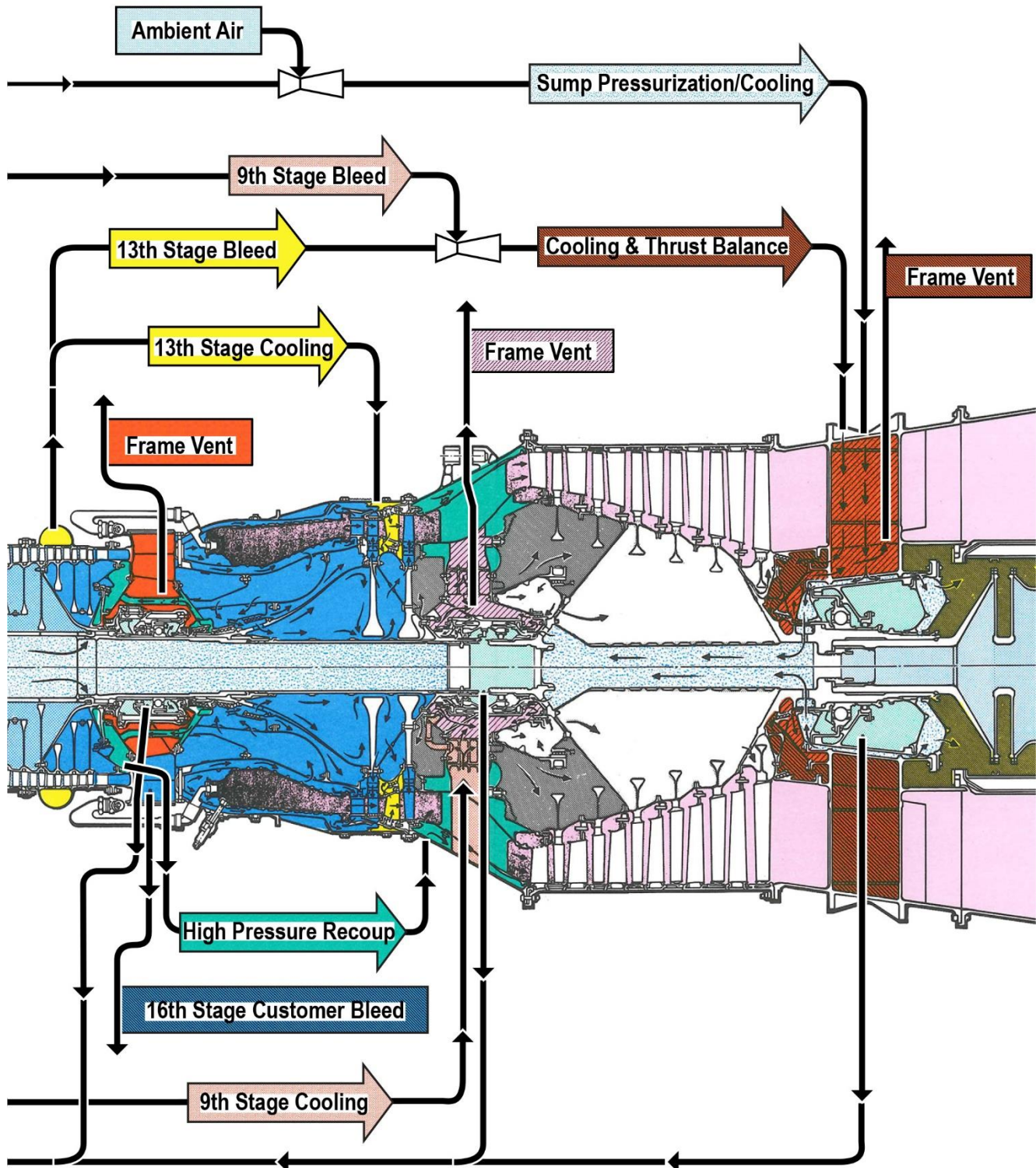
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GT-0018



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GT-0020

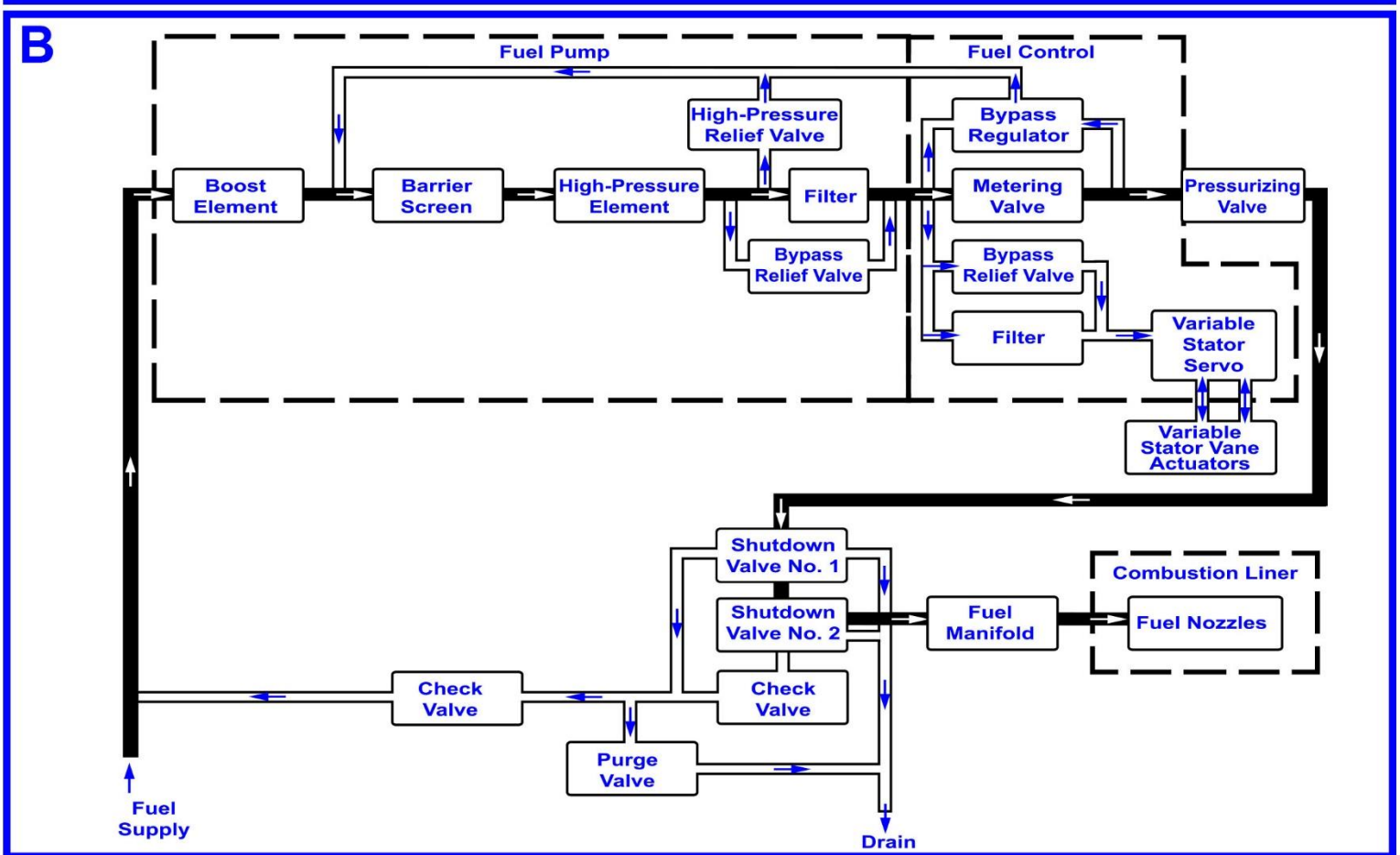
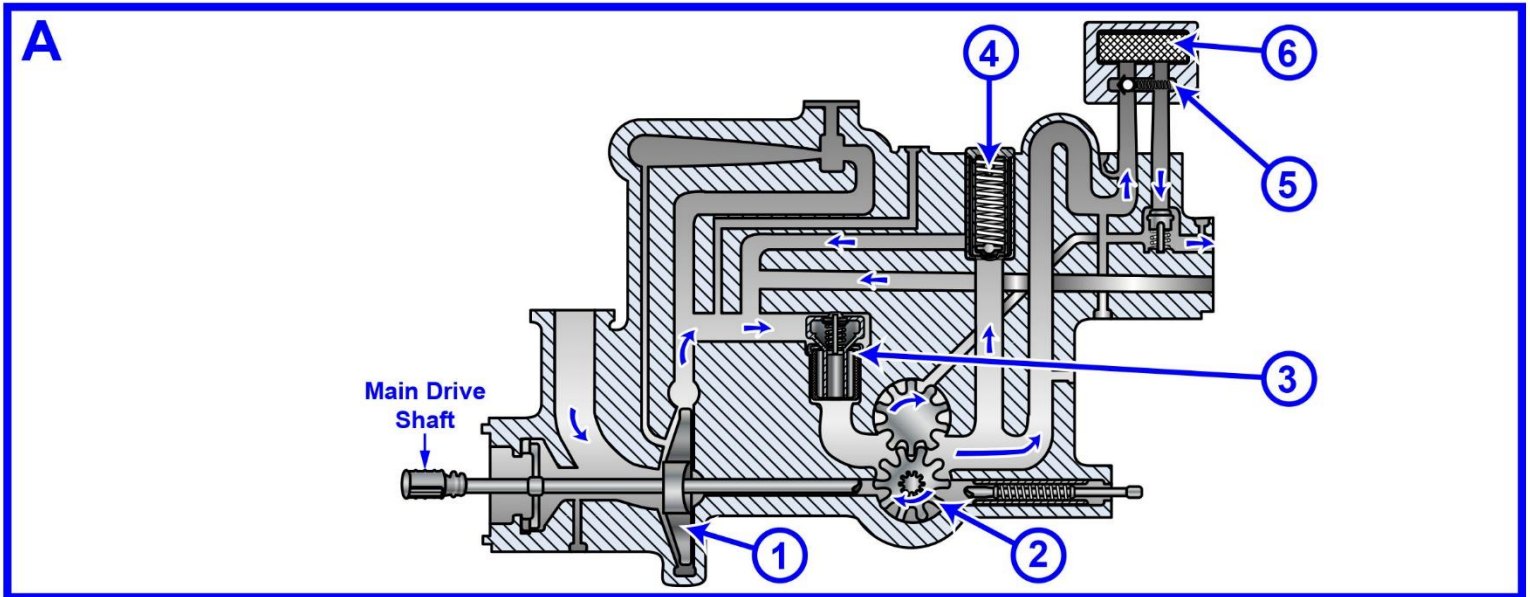


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GT-0021

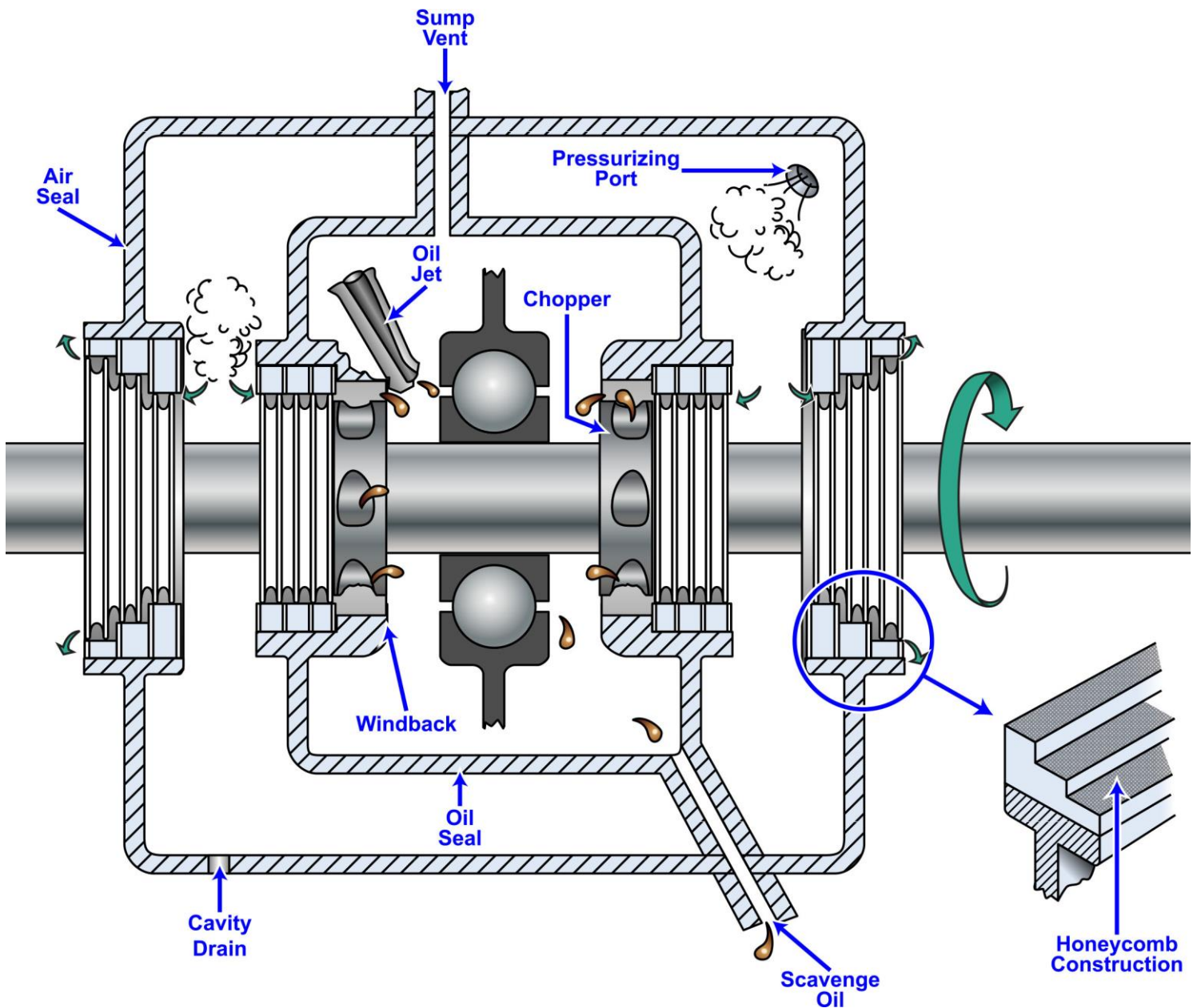


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GT-0023

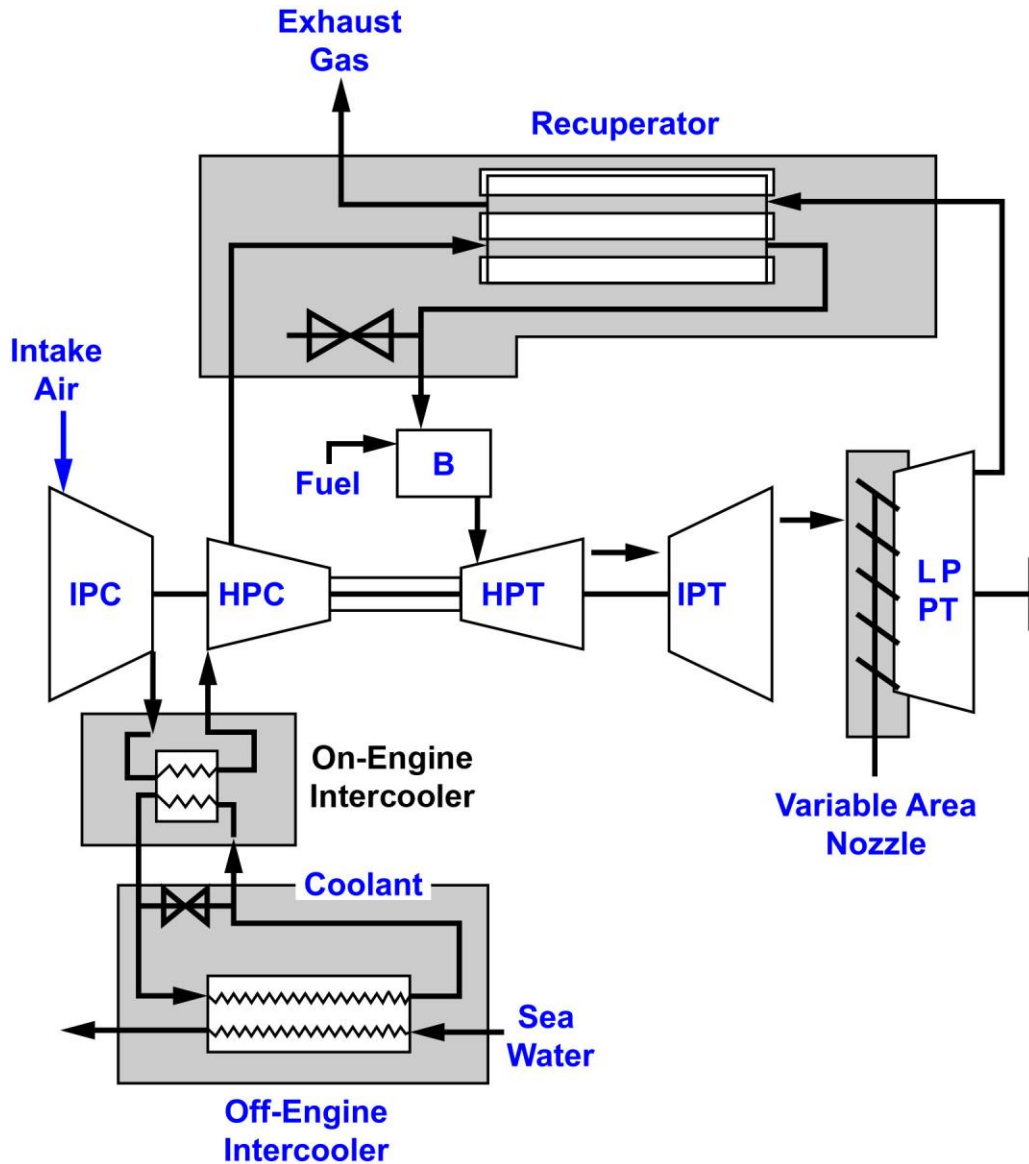


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GT-0026



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