Key Topic 97: INMARSAT Communications Systems-2

3-97P1 What is the best description for the INMARSAT-C system?

A. *It provides slow speed telex and voice service.*
B. It is a store-and-forward system that provides routine and distress communications.
C. It is a real-time telex system.
D. It provides world-wide coverage.

3-97P2 The INMARSAT mini-M system is a:

A. Marine SONAR system.
B. Marine global satellite system.
C. Marine depth finder.
D. Satellite system utilizing spot beams to provide for small craft communications.

3-97P3 What statement best describes the INMARSAT-B services?

A. Voice at 16 kbps, Fax at 14.4 kbps and high-speed Data at 64/54.
B. Store and forward high speed data at 36/48 kbps.
C. Voice at 3 kHz, Fax at 9.6 kbps and Data at 4.8 kbps.
D. Service is available only in areas served by highly directional spot beam antennas.

3-97P4 Which INMARSAT systems offer High Speed Data at 64/54 kbps?

A. C.
B. B and C.
C. Mini-M.
D. B, M4 and Fleet.

3-97P5 When INMARSAT-B and INMARSAT-C terminals are compared:

A. INMARSAT-C antennas are small and omni-directional, while INMARSAT-B antennas are larger and directional.

B. INMARSAT-B antennas are bulkier but omni-directional, while INMARSAT-C antennas are smaller and parabolic, for aiming at the satellite.

C. INMARSAT-B antennas are parabolic and smaller for higher gain, while INMARSAT-C antennas are larger but omni-directional.

D. INMARSAT-C antennas are smaller but omni-directional, while INMARSAT-B antennas are parabolic for lower gain.

3-97P6 What services are provided by the INMARSAT-M service?

A. Data and Fax at 4.8 kbps plus e-mail.
B. Voice at 3 kHz, Fax at 9.6 kbps and Data at 4.8 kbps.
C. Voice at 6.2 kbps, Data at 2.4 kbps, Fax at 2.4 kbps and e-mail.
D. Data at 4.8 kbps and Fax at 9.6 kbps plus e-mail.

Answer Key: 3-97P1: B 3-97P2: D 3-97P3: A 3-97P4: D 3-97P5: A 3-97P6: C

Key Topic 98: GPS

3-98P1 Global Positioning Service (GPS) satellite orbiting altitude is:
- A. *4,686 miles.*
- B. 24,184 miles.
- C. 12,554 miles.
- D. 247 miles.

3-98P2 The GPS transmitted frequencies are:
- A. 1626.5 MHz and 1644.5 MHz.
- B. 1227.6 MHz and 1575.4 MHz.
- C. 2245.4 and 2635.4 MHz.
- D. 946.2 MHz and 1226.6 MHz.

3-98P3 How many GPS satellites are normally in operation?
- A. 8
- B. 18
- C. 24
- D. 36

3-98P4 What best describes the GPS Satellites orbits?
- A. They are in six orbital planes equally spaced and inclined about 55 degrees to the equator.
- B. They are in four orbital planes spaced 90 degrees in a polar orbit.
- C. They are in a geosynchronous orbit equally spaced around the equator.
- D. They are in eight orbital planes at an altitude of approximately 1,000 miles.

3-98P5 How many satellites must be received to provide complete position and time?
- A. 1
- B. 2
- C. 3
- D. 4

3-98P6 What is DGPS?
- A. Digital Ground Position System.
- B. A system to provide additional correction factors to improve position accuracy.
- C. Correction signals transmitted by satellite.
- D. A system for providing altitude corrections for aircraft.

Answer Key: 3-98P1: C 3-98P2: B 3-98P3: C 3-98P4: A 3-98P5: D 3-98P6: B

Key Topic 99: Radiation Exposure

3-99Q1 Compliance with MPE, or Maximum Permissible Exposure to RF levels (as defined in FCC Part 1, OET Bulletin 65) for "controlled" environments, are averaged over _____ minutes, while "uncontrolled" RF environments are averaged over _____ minutes.

A. 6, 30.
B. 30, 6.
C. 1, 15.
D. 15, 1.

3-99Q2 Sites having multiple transmitting antennas must include antennas with more than _____% of the maximum permissible power density exposure limit when evaluating RF site exposure.

A. Any
B. 5
C. 1
D. 12.5

3-99Q3 RF exposure from portable radio transceivers may be harmful to the eyes because:

A. Magnetic fields blur vision.
B. RF heating polarizes the eye lens.
C. The magnetic field may attract metal particles to the eye.
D. RF heating may cause cataracts.

3-99Q4 At what aggregate power level is an MPE (Maximum Permissible Exposure) study required?

A. 1000 Watts ERP.
B. 500 Watts ERP.
C. 100 Watts ERP.
D. Not required.

3-99Q5 Why must you never look directly into a fiber optic cable?

A. High power light waves can burn the skin surrounding the eye.
B. An active fiber signal may burn the retina and infra-red light cannot be seen.
C. The end is easy to break.
D. The signal is red and you can see it.

3-99Q6 If the MPE (Maximum Permissible Exposure) power is present, how often must the personnel accessing the affected area be trained and certified?

A. Weekly.
B. Monthly.
C. Yearly.
D. Not at all.

Answer Key: 3-99Q1: A 3-99Q2: B 3-99Q3: D 3-99Q4: A 3-99Q5: B 3-99Q6: C

Key Topic 100: Safety Steps

3-100Q1 What device can protect a transmitting station from a direct lightning hit?

A. Lightning protector.
B. Grounded cabinet.
C. Short lead in.
D. There is no device to protect a station from a direct hit from lightning.

3-100Q2 What is the purpose of not putting sharp corners on the ground leads within a building?

A. No reason.
B. It is easier to install.
C. Lightning will jump off of the ground lead because it is not able to make sharp bends.
D. Ground leads should always be made to look good in an installation, including the use of sharp bends in the corners.

3-100Q3 Should you use a power drill without eye protection?

A. Yes.
B. No.
C. It's okay as long as you keep your face away from the drill bit.
D. Only in an extreme emergency.

3-100Q4 What class of fire is one that is caused by an electrical short circuit and what is the preferred substance used to extinguish that type of fire?

A. FE28.
B. FE29.
C. FE30.
D. FE31.

3-100Q5 Do shorted-stub lightning protectors work at all frequencies?

A. Yes.
B. No, the short also kills the radio signals.
C. No, the short enhances the radio signal at the tuned band.
D. No, only at the tuned frequency band.

3-100Q6 What is a GFI electrical socket used for?

A. To prevent electrical shock by sensing ground path current and shutting the circuit down.
B. As a gold plated socket.
C. To prevent children from sticking objects in the socket.
D. To increase the current capacity of the socket.

Answer Key: 3-100Q1: D 3-100Q2: C 3-100Q3: B 3-100Q4: C 3-100Q5: D 3-100Q6: A

End of Proposed 2009 FCC Commercial Element 3 Question Pool

Subelement A – RADAR Principles – 10 Key Topics – 10 Exam Questions – 8 Drawings

Key Topic 1 – Marine RADAR Systems

8-1A1 Choose the most correct statement containing the parameters which control the size of the target echo.

A. Transmitted power, antenna effective area, transmit and receive losses, RADAR cross section of the target, range to target.

B. Height of antenna, power radiated, size of target, receiver gain, pulse width.

C. Power radiated, antenna gain, size of target, shape of target, pulse width, receiver gain.

D. Magnetron gain, antenna gain, size of target, range to target, wave-guide loss.

8-1A2 Which of the following has NO effect on the maximum range capability?

A. Carrier frequency.

B. Recovery time.

C. Pulse repetition frequency.

D. Receiver sensitivity.

8-1A3 What type of transmitter power is measured over a period of time?

A. Average.

B. Peak.

C. Reciprocal.

D. Return.

8-1A4 What RADAR component controls timing throughout the system?

A. Power supply.

B. Indicator.

C. Synchronizer.

D. Receiver.

8-1A5 Which of the following components allows the use of a single antenna for both transmitting and receiving?

A. Mixer.

B. Duplexer.

C. Synchronizer.

D. Modulator.

8-1A6 The sweep frequency of a RADAR indicator is determined by what parameter?

A. Carrier frequency.

B. Pulse width.

C. Duty cycle.

D. Pulse repetition frequency.

Answer Key: 8-1A1: A 8-1A2: B 8-1A3: A 8-1A4: C 8-1A5: B 8-1A6: D

Key Topic 2 – Distance and Time

8-2A1 A radio wave will travel a distance of three nautical miles in:
- A. 6.17 microseconds.
- B. 37.0 microseconds.
- C. 22.76 microseconds.
- D. 18.51 microseconds.

8-2A2 One RADAR mile is how many microseconds?
- A. 6.2
- B. 528.0
- C. 12.34
- D. 0.186

8-2A3 RADAR range is measured by the constant:
- A. 150 meters per microsecond.
- B. 150 yards per microsecond.
- C. 300 yards per microsecond.
- D. 18.6 miles per microsecond.

8-2A4 If a target is 5 miles away, how long does it take for the RADAR echo to be received back at the antenna?
- A. 51.4 microseconds.
- B. 123 microseconds.
- C. 30.75 microseconds.
- D. 61.7 microseconds.

8-2A5 How long would it take for a RADAR pulse to travel to a target 10 nautical miles away and return to the RADAR receiver?
- A. 12.34 microseconds.
- B. 1.234 microseconds.
- C. 123.4 microseconds.
- D. 10 microseconds.

8-2A6 What is the distance in nautical miles to a target if it takes 308.5 microseconds for the RADAR pulse to travel from the RADAR antenna to the target and back.
- A. 12.5 nautical miles.
- B. 25 nautical miles.
- C. 50 nautical miles.
- D. 2.5 nautical miles.

Answer Key: 8-2A1: D 8-2A2: C 8-2A3: A 8-2A4: D 8-2A5: C 8-2A6: B

Key Topic 3 – Frequency and Wavelength

8-3A1 Frequencies generally used for marine RADAR are in the ___ part of the radio spectrum.
- A. UHF
- B. EHF
- C. SHF
- D. VHF

8-3A2 Practical RADAR operation requires the use of microwave frequencies so that:
- A. Stronger target echoes will be produced.
- B. Ground clutter interference will be minimized.
- C. Interference to other communication systems will be eliminated.
- D. Antennas will be more efficient for both transmitting and receiving.

8-3A3 An S-band RADAR operates in which frequency band?
- A. 1 - 2 GHz.
- B. 4 - 8 GHz.
- C. 8 - 12 GHz.
- D. 2 - 4 GHz.

8-3A4 A RADAR operating at a frequency of 3 GHz has a wavelength of approximately:
- A. 1 centimeter.
- B. 10 centimeters.
- C. 3 centimeters.
- D. 30 centimeters.

8-3A5 The major advantage of an S-band RADAR over an X-band RADAR is:
- A. It is less affected by weather conditions.
- B. It has greater bearing resolution.
- C. It is mechanically less complex.
- D. It has greater power output.

8-3A6 An X band RADAR operates in which frequency band?
- A. 1 - 2 GHz.
- B. 2 - 4 GHz.
- C. 4 - 8 GHz.
- D. 8 - 12 GHz.

Answer Key: 8-3A1: C 8-3A2: A 8-3A3: D 8-3A4: B 8-3A5: A 8-3A6: D

Key Topic 4 – Power, Pulse Width, PRR

8-4A1 A pulse RADAR has a pulse repetition frequency (PRF) of 400 Hz, a pulse width of 1 microsecond, and a peak power of 100 kilowatts. The average power of the RADAR transmitter is:

A. 25 watts.
B. 40 watts.
C. 250 watts.
D. 400 watts.

8-4A2 A shipboard RADAR transmitter has a pulse repetition frequency (PRF) of 1,000 Hz, a pulse width of 0.5 microseconds, peak power of 150 KW, and a minimum range of 75 meters. Its duty cycle is:

A. 0.5
B. 0.05
C. 0.005
D. 0.0005

8-4A3 A pulse RADAR transmits a 0.5 microsecond RF pulse with a peak power of 100 kilowatts every 1600 microseconds. This RADAR has:

A. An average power of 31.25 watts.
B. A PRF of 3,200.
C. A maximum range of 480 kilometers.
D. A duty cycle of 3.125 percent.

8-4A4 If a RADAR transmitter has a pulse repetition frequency (PRF) of 900 Hz, a pulse width of 0.5 microseconds and a peak power of 15 kilowatts, what is its average power output?

A. 15 kilowatts.
B. 13.5 watts.
C. 6.75 watts.
D. 166.67 watts.

8-4A5 What is the average power if the RADAR set has a PRF of 1000 Hz, a pulse width of 1 microsecond, and a peak power rating of 100 kilowatts?

A. 10 watts.
B. 100 watts.
C. 1,000 watts.
D. None of these.

8-4A6 8L37 (C) (250) A search RADAR has a pulse width of 1.0 microsecond, a pulse repetition frequency (PRF) of 900 Hz, and an average power of 18 watts. The unit's peak power is:

A. 200 kilowatts.
B. 180 kilowatts.
C. 20 kilowatts.
D. 2 kilowatts.

Answer Key: 8-4A1: B 8-4A2: D 8-4A3: A 8-4A4: C 8-4A5: B 8-4A6: C

Key Topic 5 – Range, Pulse Width, PRF

8-5A1 For a range of 5 nautical miles, the RADAR pulse repetition frequency should be:
A. 16.2 Hz or more.
B. 16.2 MHz or less.
C. 1.62 kHz or more.
D. 16.2 kHz or less.

8-5A2 For a range of 100 nautical miles, the RADAR pulse repetition frequency should be:
A. 8.1 kHz or less.
B. 810 Hz or less.
C. 8.1 kHz or more.
D. 81 kHz or more.

8-5A3 The minimum range of a RADAR is determined by:
A. The frequency of the RADAR transmitter.
B. The pulse repetition rate.
C. The transmitted pulse width.
D. The pulse repetition frequency.

8-5A4 Short range RADARs would most likely transmit:
A. Narrow pulses at a fast rate.
B. Narrow pulses at a slow rate.
C. Wide pulses at a fast rate.
D. Wide pulses at a slow rate.

8-5A5 For a range of 30 nautical miles, the RADAR pulse repetition frequency should be:
A. 0.27 kHz or less.
B. 2.7 kHz or less.
C. 27 kHz or more.
D. 2.7 Hz or more.

8-5A6 For a range of 10 nautical miles, the RADAR pulse repetition frequency (PRF) should be:
A. Approximately 8.1 kHz or less.
B. 900 Hz.
C. 18.1 kHz or more.
D. 120.3 microseconds.

Answer Key: 8-5A1: D 8-5A2: B 8-5A3: C 8-5A4: A 8-5A5: B 8-5A6: A

Key Topic 6: Pulse Width - Pulse Repetition Rates

8-6A1 *If the PRF is 2500 Hz, what is the PRI?*
- A. 40 microseconds.
- B. 400 microseconds.
- C. 250 microseconds.
- D. 800 microseconds.

8-6A2 If the pulse repetition frequency (PRF) is 2000 Hz, what is the pulse repetition interval (PRI)?
- A. 0.05 seconds.
- B. 0.005 seconds.
- C. 0.0005 seconds.
- D. 0.00005 seconds.

8-6A3 The pulse repetition rate (PRR) refers to:
- A. The reciprocal of the duty cycle.
- B. The pulse rate of the local oscillator tube.
- C. The pulse rate of the klystron.
- D. The pulse rate of the magnetron.

8-6A4 If the RADAR unit has a pulse repetition frequency (PRF) of 2000 Hz and a pulse width of 0.05 microseconds, what is the duty cycle?
- A. 0.0001
- B. 0.0005
- C. 0.05
- D. 0.001

8-6A5 Small targets are best detected by:
- A. Short pulses transmitted at a fast rate.
- B. Using J band frequencies.
- C. Using a long pulse width with high output power.
- D. All of these answers are correct.

8-6A6 What is the relationship between pulse repetition rate and pulse width?
- A. Higher PRR with wider pulse width.
- B. The pulse repetition rate does not change with the pulse width.
- C. The pulse width does not change with the pulse repetition rate.
- D. Lower PRR with wider pulse width.

Answer Key: 8-6A1: B 8-6A2: C 8-6A3: D 8-6A4: A 8-6A5: C 8-6A6: D

Key Topic 7 – Components-1

8-7A1 What component of a RADAR receiver is represented by block 46 in Fig. 8A1?

A. The ATR box.
B. The TR box.
C. The RF Attenuator.
D. The Crystal Detector.

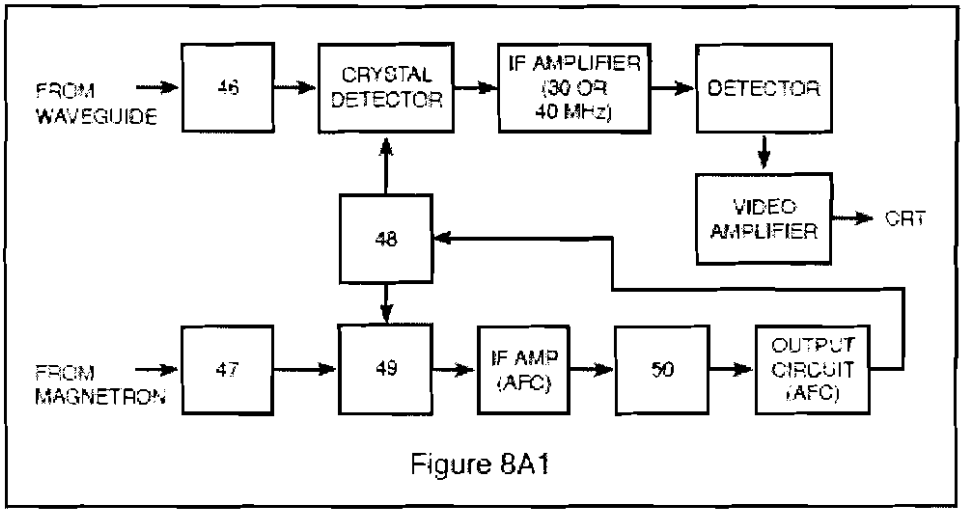

Figure 8A1

8-7A2 A basic sample-and-hold circuit contains:

A. An analog switch and an amplifier.
B. An analog switch, a capacitor, and an amplifier.
C. An analog multiplexer and a capacitor.
D. An analog switch, a capacitor, amplifiers and input and output buffers.

8-7A3 When comparing a TTL and a CMOS NAND gate:

A. Both have active pull-up characteristics.
B. Both have three output states.
C. Both have comparable input power sourcing.
D. Both employ Schmitt diodes for increased speed capabilities.

8-7A4 Silicon crystals:

A. Are very sensitive to static electric charges.
B. Should be wrapped in lead foil for storage.
C. Tolerate very low currents.
D. All of these.

8-7A5 Which is typical current for a silicon crystal used in a RADAR mixer or detector circuit?

A. 3 mA
B. 15 mA
C. 50 mA
D. 100 mA

8-7A6 What component of a RADAR receiver is represented by block 47 in Fig. 8A1?

A. The ATR box.
B. The TR box.
C. The RF Attenuator.
D. The Crystal Detector.

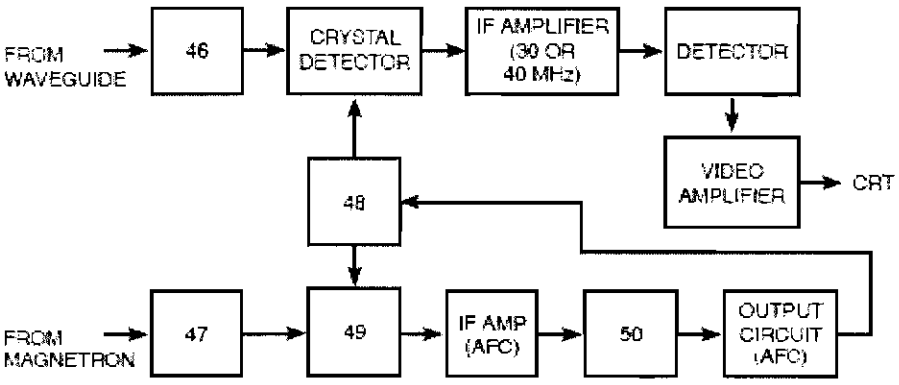

Figure 8A1

Answer Key: 8-7A1: B 8-7A2: D 8-7A3: A 8-7A4: D 8-7A5: A 8-7A6: C

Key Topic 8 – Components-2

8-8A1 The basic frequency determining element in a Gunn oscillator is:

A. The power supply voltage.
B. The type of semiconductor used.
C. The resonant cavity.
D. The loading of the oscillator by the mixer.

8-8A2 Which of the following is not a method of analog-to-digital conversion?

A. Delta-sigma conversion.
B. Dynamic-range conversion.
C. Switched-capacitor conversion.
D. Dual-slope integration.

8-8A3 When comparing TTL and CMOS logic families, which of the following is true:

A. CMOS logic requires a supply voltage of 5 volts ±20%, whereas TTL logic requires 5 volts ±5%.
B. Unused inputs should be tied high or low as necessary especially in the CMOS family.
C. At higher operating frequencies, CMOS circuits consume almost as much power as TTL circuits.
D. When a CMOS input is held low, it sources current into whatever it drives.

8-8A4 The primary operating frequency of a reflex klystron is controlled by the:

A. Dimensions of the resonant cavity.
B. Level of voltage on the control grid.
C. Voltage applied to the cavity grids.
D. Voltage applied to the repeller plate.

8-8A5 A Gunn diode oscillator takes advantage of what effect?

A. Negative resistance.
B. Avalanche transit time.
C. Bulk-effect.
D. Negative resistance and bulk-effect.

8-8A6 Fine adjustments of a reflex klystron are accomplished by:

A. Adjusting the flexible wall of the cavity.
B. Varying the repeller voltage.
C. Adjusting the AFC control system.
D. Varying the cavity grid potential.

Answer Key: 8-8A1: C 8-8A2: B 8-8A3: C 8-8A4: A 8-8A5: D 8-8A6: B

Key Topic 9 – Circuits-1

8-9A1 Blocking oscillators operate on the formula of:

A. T = R x C.
B. I = E/R.
C. By using the receiver's AGC.
D. None of the above are correct.

8-9A2 The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system.

A. The ALU is used for address decoding.
B. The Memory and I/O communicate with peripherals.
C. The control unit executes arithmetic manipulations.
D. The internal bus is used simultaneously by all units.

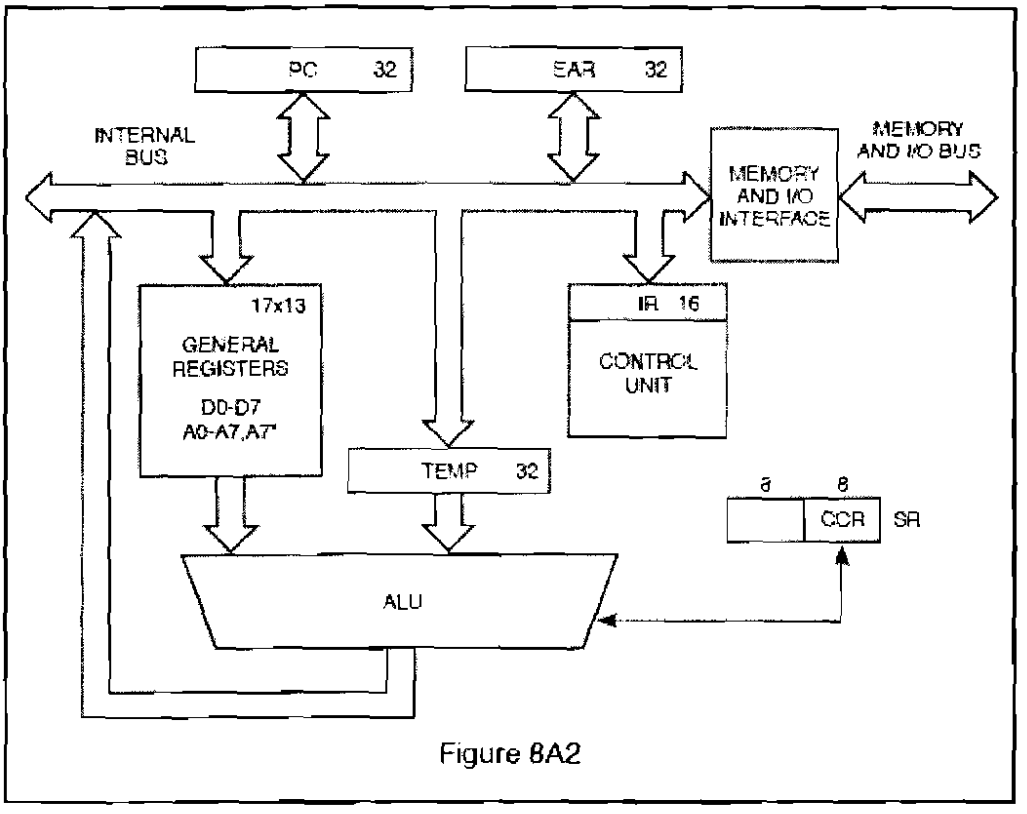

Figure 8A2

8-9A3 The phantastron circuit is capable of:

A. Stabilizing the magnetron.
B. Preventing saturation of the RADAR receiver.
C. Being used to control repeller voltage in the AFC system.
D. Developing a linear ramp voltage when triggered by an external source.

8-9A4 The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system.

A. *The ALU executes arithmetic manipulations.*
B. The ALU is used for address decoding.
C. General registers are used for arithmetic manipulations.
D. Address pointers are contained in the control unit.

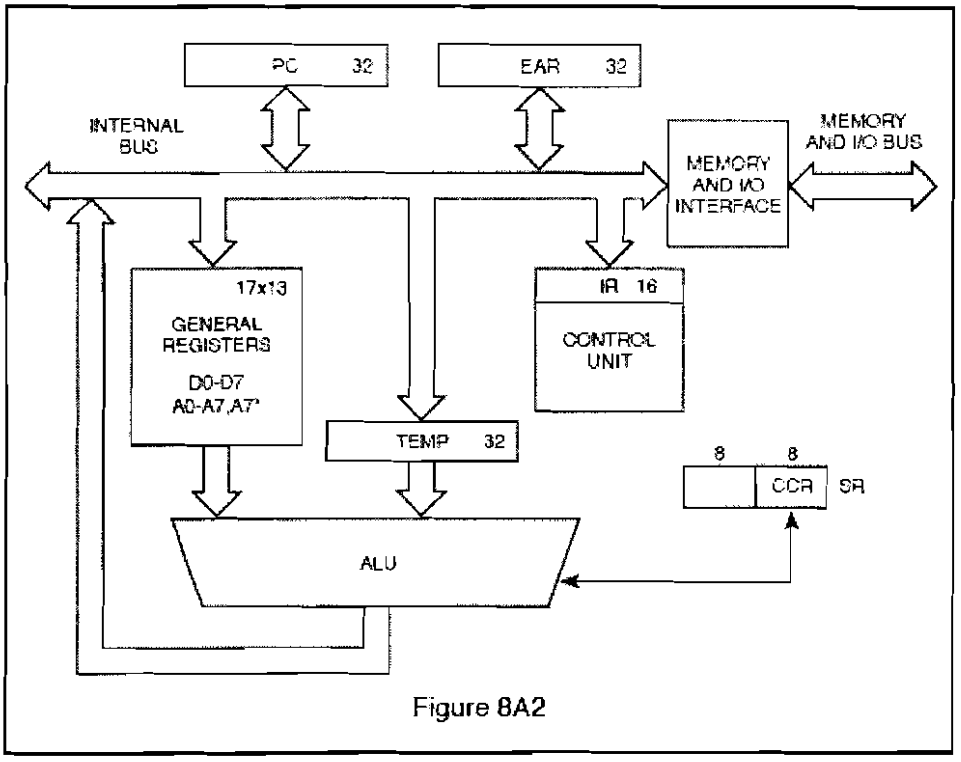

Figure 8A2

8-9A5 In the Line-Driver/Coax/Line-receiver circuit shown in Fig. 8A3, what component is represented by the blank box marked "X"?

A. 25-ohm resistor.
B. 51-ohm resistor.
C. 10-microhm inductor.
D. 20-microhm inductor.

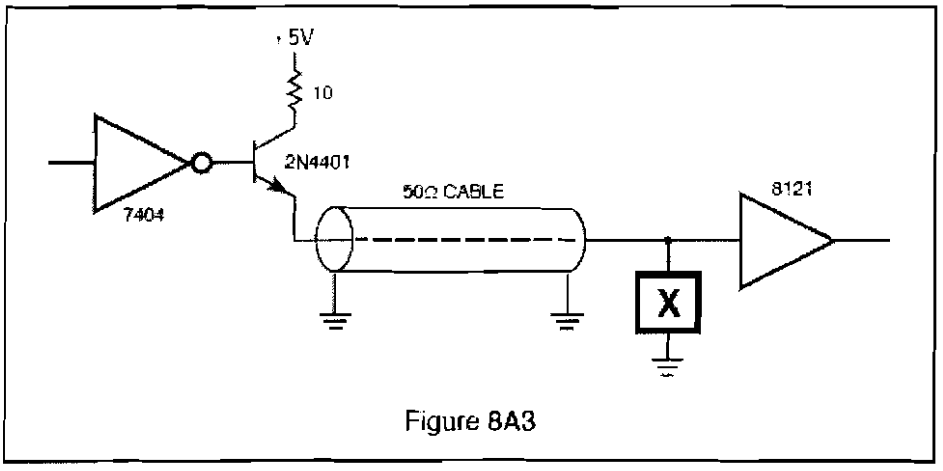

Figure 8A3

8-9A6 Choose the most correct statement:

A. *The magnetron anode is a low voltage circuit.*
B. The anode of the magnetron carries high voltage.
C. The filament of the magnetron carries dangerous voltages.
D. The magnetron filament is a low voltage circuit.

Answer Key: 8-9A1: A 8-9A2: B 8-9A3: D 8-9A4: A 8-9A5: B 8-9A6: C

8-10A1 In the circuit shown in Fig. 8A4, U5 pins 1 and 4 are high and both are in the reset state. Assume one *clock cycle occurs of Clk A followed by one cycle of Clk B. What are the output states of the two D-type flip* flops?

A. Pin 5 low, Pin 9 low.
B. Pin 5 high, Pin 9 low.
C. Pin 5 low, Pin 9 high.
D. Pin 5 high, Pin 9 high.

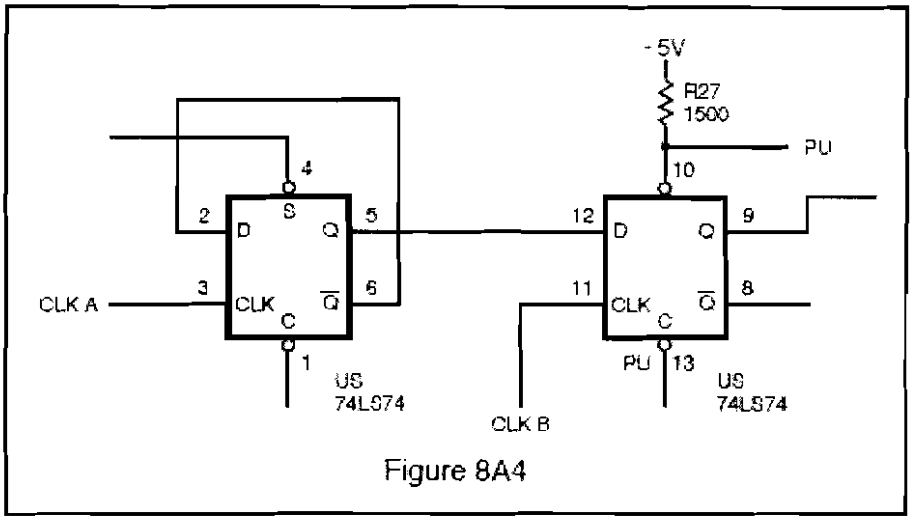

Figure 8A4

8-10A2 If more light strikes the photodiode in Fig. 8A5, there will be:

A. Less diode current.
B. No change in diode current.
C. More diode current.
D. There is wrong polarity on the diode.

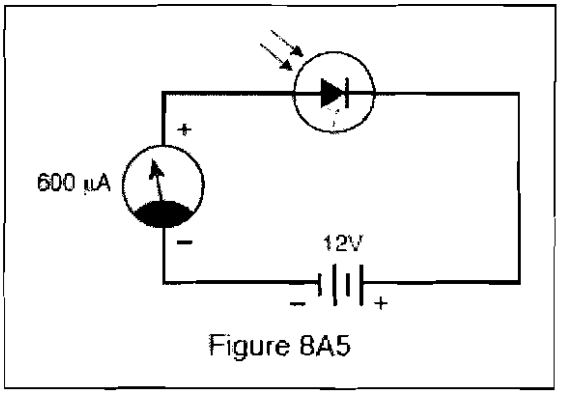

Figure 8A5

8-10A3 In the circuit shown in Fig. 8A6, which of the following is true?

A. With A and B high, Q_1 is saturated and Q_2 is off.
B. With either A or B low, Q_1 is saturated and Q_2 is off.
C. With A and B low, Q_2 is on and Q_4 is off.
D. With either A or B low, Q_1 is off and Q_2 is on.

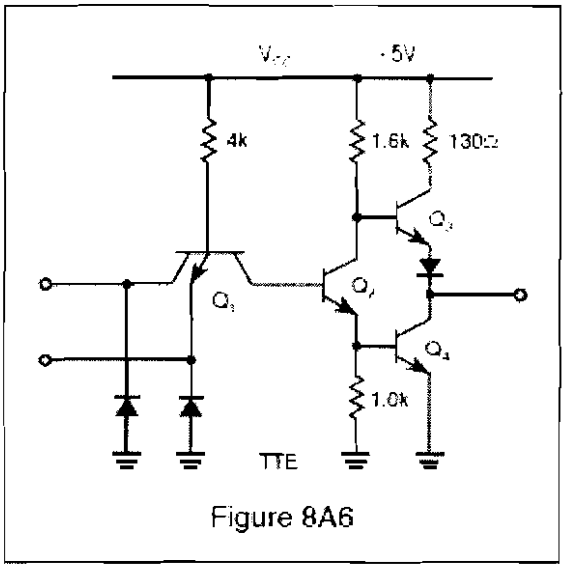

Figure 8A6

8-10A4 What is the correct value of R_S in Fig. 8A7, if the voltage across the LED is 1.9 Volts with 5 Volts applied and I_F max equals 40 milliamps?

A. 4,700 ohms.
B. 155 ohms.
C. 77 ohms.
D. 10,000 ohms.

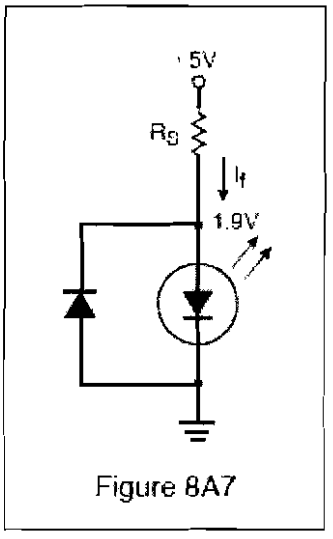

Figure 8A7

8-10A5 The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system.

A. The ALU is used for address decoding.
B. General registers are used for arithmetic manipulations.
C. The control unit executes arithmetic manipulations.
D. Address pointers are contained in the general registers.

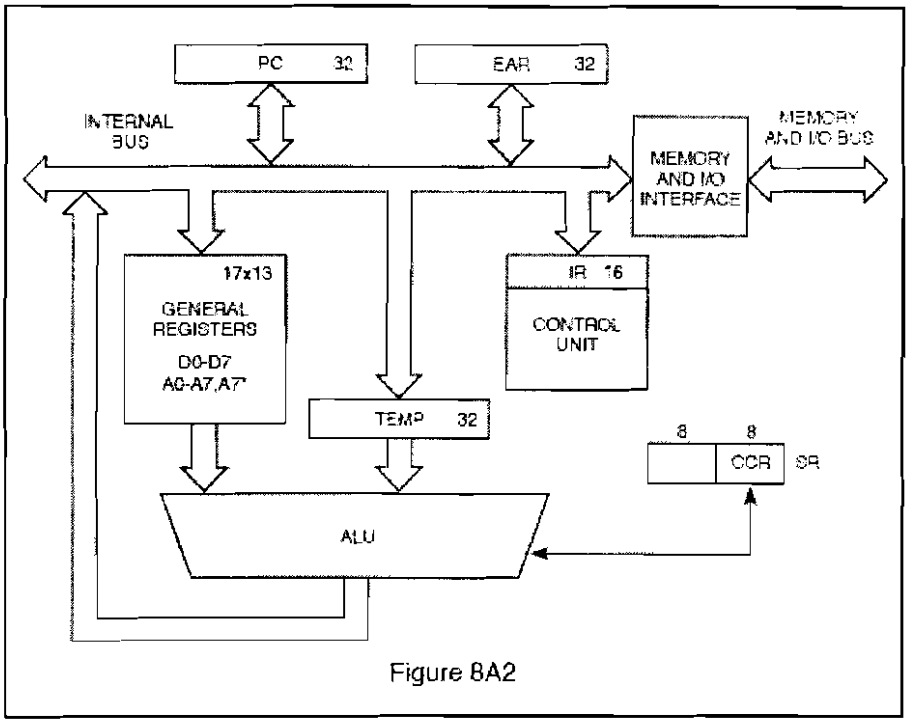

Figure 8A2

8-10A6 You are troubleshooting a component on a printed circuit board in a RADAR system while referencing the Truth Table in Fig. 8A8. What kind of integrated circuit is the component?

A. D-type Flip-Flop, 3-State, Inverting.
B. Q-type Flip-Flop, Non-Inverting.
C. Q-type Directional Shift Register, Dual.
D. D to Q Convertor, 2-State.

TRUTH TABLE

INPUTS			OUTPUT
$\overline{OE}$	CP	Dn	$\overline{On}$
L	⌐	H	L
L	⌐	L	H
L	L	X	No Change
H	X	X	Z

Note: X = Don't care
Z = High impedance state
⌐ = Low-to-High transition

Figure 8A8

Answer Key: 8-10A1: D 8-10A2: C 8-10A3: B 8-10A4: C 8-10A5: D 8-10A6: A

Key Topic 11 – Transmitting Systems

8-11B1 The magnetron is used to:
A. Generate the output signal at the proper operating frequency.
B. Determine the shape and width of the transmitted pulses.
C. Modulate the pulse signal.
D. Determine the pulse repetition rate.

8-11B2 The purpose of the modulator is to:
A. Transmit the high voltage pulses to the antenna.
B. Provide high voltage pulses of the proper shape and width to the magnetron.
C. Adjust the pulse repetition rate.
D. Tune the Magnetron to the proper frequency.

8-11B3 Which of the following statements about most modern RADAR transmitter power supplies is false?
A. High voltage supplies may produce voltages in excess of 5,000 volts AC.
B. There are usually separate low voltage and high voltage supplies.
C. Low voltage supplies use switching circuits to deliver multiple voltages.
D. Low voltage supplies may supply both AC and DC voltages.

8-11B4 The purpose of the Pulse Forming Network is to:
A. Act as a low pass filter.
B. Act as a high pass filter.
C. Produce a pulse of the correct width.
D. Regulate the pulse repetition rate.

8-11B5 The purpose of the Synchronizer is to:
A. Generate the modulating pulse to the magnetron.
B. Generate a timing signal that establishes the pulse repetition rate.
C. Insure that the TR tube conducts at the proper time.
D. Control the pulse width.

8-11B6 Which of the following is not part of the transmitting system?
A. Magnetron.
B. Modulator.
C. Pulse Forming Network.
D. Klystron.

Answer Key: 8-11B1: A 8-11B2: B 8-11B3: A 8-11B4: C 8-11B5: B 8-11B6: D

Key Topic 12 – Magnetrons

8-12B1 High voltage is applied to what element of the magnetron?
- A. *The waveguide.*
- B. The anode.
- C. The plate cap.
- D. The cathode.

8-12B2 The characteristic of the magnetron output pulse that relates to accurate range measurement is its:
- A. Amplitude.
- B. Decay time.
- C. Rise time.
- D. Duration.

8-12B3 What device is used as a transmitter in a marine RADAR system?
- A. Magnetron.
- B. Klystron.
- C. Beam-powered pentode.
- D. Thyratron.

8-12B4 The magnetron is:
- A. A type of diode that requires an internal magnetic field.
- B. A triode that requires an external magnetic field.
- C. Used as the local oscillator in the RADAR unit.
- D. A type of diode that requires an external magnetic field.

8-12B5 A negative voltage is commonly applied to the magnetron cathode rather than a positive voltage to the magnetron anode because:
- A. The cathode must be made neutral to force electrons into the drift area.
- B. A positive voltage would tend to nullify or weaken the magnetic field.
- C. The anode can be operated at ground potential for safety reasons.
- D. The cavities might not be shock-excited into oscillation by a positive voltage.

8-12B6 The anode of a magnetron is normally maintained at ground potential:
- A. Because it operates more efficiently that way.
- B. For safety purposes.
- C. Never. It must be highly positive to attract the electrons.
- D. Because greater peak-power ratings can be achieved.

Answer Key: 8-12B1: D 8-12B2: C 8-12B3: A 8-12B4: D 8-12B5: C 8-12B6: B

Key Topic 13 – Modulation

8-13B1 In a solid-state RADAR *modulator, the duration of the transmitted pulse is determined by:*

A. The thyratron.
B. The magnetron voltage.
C. The pulse forming network.
D. The trigger pulse.

8-13B2 The modulation frequency of most RADAR systems is between:

A. 60 and 500 Hz.
B. 3000 and 6000 Hz.
C. 1500 and 7500 Hz.
D. 1000 and 3000 Hz.

8-13B3 A shipboard RADAR uses a PFN driving a magnetron cathode through a step-up transformer. This results in which type of modulation?

A. Frequency modulation.
B. Amplitude modulation.
C. Continuous Wave (CW) modulation.
D. Pulse modulation.

8-13B4 In a pulse modulated magnetron what device determines the shape and width of the pulse?

A. Pulse Forming Network.
B. Thyratron.
C. LC parallel circuit.
D. Dimensions of the magnetron cavity.

8-13B5 What device(s) may act as the modulator of a RADAR system?

A. Magnetron.
B. Klystron.
C. Video amplifier.
D. Thyratron or a silicon-controlled rectifier (SCR).

8-13B6 The purpose of a modulator in the transmitter section of a RADAR is to:

A. Improve bearing resolution.
B. Provide the correct waveform to the transmitter.
C. Prevent sea return.
D. Control magnetron power output.

Answer Key: 8-13B1: C 8-13B2: A 8-13B3: D 8-13B4: A 8-13B5: D 8-13B6: B

Key Topic 14 – Pulse Forming Networks Modulation

8-14B1 The pulse developed by the modulator may have an amplitude greater than the supply voltage. This is *possible by:*

A. Using a voltage multiplier circuit.
B. Employing a resonant charging choke.
C. Discharging a capacitor through an inductor.
D. Discharging two capacitors in series and combining their charges.

8-14B2 Pulse transformers and pulse-forming networks are commonly used to shape the microwave energy burst RADAR transmitter. The switching devices most often used in such pulse-forming circuits are:

A. Power MOSFETS and Triacs.
B. Switching transistors.
C. Thyratrons and BJT's.
D. SCR's and Thyratrons.

8-14B3 The purpose of the pulse-forming network is to:

A. Determine the width of the modulating pulses.
B. Determine the pulse repetition rate.
C. Act as a high pass filter.
D. Act as a log pass filter.

8-14B4 The shape and duration of the high-voltage pulse delivered to the magnetron is established by:

A. An RC network in the keyer stage.
B. The duration of the modulator input trigger.
C. An artificial delay line.
D. The time required to saturate the pulse transformer.

8-14B5 Pulse-forming networks are usually composed of the following:

A. Series capacitors and shunt inductors.
B. Series inductors and shunt capacitors.
C. Resonant circuit with an inductor and capacitor.
D, None of the above.

8-14B6 An artificial transmission line is used for:

A. The transmission of RADAR pulses.
B. Testing the RADAR unit, when actual targets are not available.
C. Determining the shape and duration of pulses.
D. Testing the delay time for artificial targets.

Answer Key: 8-14B1: B 8-14B2: D 8-14B3: A 8-14B4: C 8-14B5: B 8-14B6: C

Key Topic 15 – TR - ATR - Circulators - Directional Couplers-1

8-15B1 The ferrite material in a circulator is used as a(an):
A. *Electric switch.*
B. Saturated reactor.
C. Loading element.
D. Phase shifter.

8-15B2 In a circular resonant cavity with flat ends, the E-field and the H-field form with specific relationships. The:
A. E-lines are parallel to the top and bottom walls.
B. E-lines are perpendicular to the end walls.
C. H-lines are perpendicular to the side walls.
D. H-lines are circular to the end walls.

8-15B3 A ferrite circulator is most commonly used in what portion of a RADAR system?
A. The antenna.
B. The modulator.
C. The duplexer.
D. The receiver.

8-15B4 A circulator provides what function in the RF section of a RADAR system?
A. It replaces the TR cell and functions as a duplexer.
B. It cools the magnetron by forcing a flow of circulating air.
C. It permits tests to be made to the thyristors while in use.
D. It transmits antenna position to the indicator during operation.

8-15B5 A directional coupler has an attenuation of -30 db. A measurement of 100 milliwatts at the coupler indicates the power of the line is:
A. 10 watts.
B. 100 watts.
C. 1,000 watts.
D. 10,000 watts.

8-15B6 What is the purpose or function of the RADAR duplexer/circulator?
A. An electronic switch that allows the use of one antenna for both transmission and reception.
B. A coupling device that is used in the transition from a rectangular waveguide to a cireular waveguide.
C. A modified length of waveguide used to sample a portion of the transmitted energy for testing purposes.
D. A dual section coupling device that allows the use of a magnetron as a transmitter.

Answer Key: 8-15B1: D 8-15B2: B 8-15B3: C 8-15B4: A 8-15B5: B 8-15B6: A

Key Topic 16 – TR - ATR - Circulators - Directional Couplers-2

8-16B1 The ATR box:
- A. Protects the receiver from strong RADAR signals.
- B. Prevents the received signal from entering the transmitter.
- C. Turns off the receiver when the transmitter is on.
- D. All of the above.

8-16B2 When a pulse RADAR is radiating, which elements in the TR box are energized?
- A. The TR tube only.
- B. The ATR tube only.
- C. Both the TR and ATR tubes.
- D. Neither the TR nor ATR tubes.

8-16B3 The TR box:
- A. Prevents the received signal from entering the transmitter.
- B. Protects the receiver from the strong RADAR pulses.
- C. Turns off the receiver when the transmitter is on.
- D. Protects the receiver from the strong RADAR pulses and mutes the receiver when the transmitter is on.

8-16B4 What device is located between the magnetron and the mixer and prevents received signals from entering the magnetron?
- A. The ATR tube.
- B. The TR tube.
- C. The RF Attenuator.
- D. A resonant cavity.

8-16B5 A keep-alive voltage is applied to:
- A. The crystal detector.
- B. The ATR tube.
- C. The TR tube.
- D. The magnetron.

8-16B6 A DC keep-alive potential:
- A. Is applied to a TR tube to make it more sensitive.
- B. Partially ionizes the gas in a TR tube, making it very sensitive to transmitter pulses.
- C. Fully ionizes the gas in a TR tube.
- D. Is applied to a TR tube to make it more sensitive and partially ionizes the gas in a TR tube.

Answer Key: 8-16B1: B 8-16B2: C 8-16B3: D 8-16B4: A 8-16B5: C 8-16B6: D