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TRAINING FOR MARINERS

Ship Radar Endorsement

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A circuit card in a RADAR system has just been replaced with a spare card. You notice the voltage level at point E in Fig. 8F12 is negative 4.75 volts when the inputs are all at 5 volts. The problem is:
The 50 K resistor has been mistakenly replaced with a 25 K resistor.

Illustrations: 8F12

In the circuit contained in Fig. 8F12, there are 5 volts present at points B and C, and there are zero volts present at points A and D. What is the voltage at point E?
-1.5 Volts.

Illustrations: 8F12

With regard to the comparator shown in Fig. 8C11, the input is a sinusoid. Nominal high level output of the comparator is 4.5 volts. Choose the most correct statement regarding the input and output.
The leading edge of the output waveform occurs 180 degrees after positive zero crossing of the input waveform.

Illustrations: 8C11

The nominal output high of the comparator shown in Fig. 8C11 is 4.5 volts. Choose the most correct statement which describes the trip points _____.
Upper trip point is +1.285 volts. Lower trip point is -1.285 volts.

Illustrations: 8C11

The circuit shown in Fig. 8C10 is the output of a switching power supply. Measuring from the junction of CR6, CR7 and L1 to ground with an oscilloscope, what waveform would you expect to see?
Pulsating DC much higher than line frequency.

Illustrations: 8C10

The diagram in Fig. 8C9 shows a simplified RADAR mixer circuit using a crystal diode as the first detector. What is the output of the circuit when no echoes are being received?
No output is developed.

Illustrations: 8C9

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

Illustrations: 8A3

What component of a RADAR receiver is represented by block 49 in Fig. 8A1?
Crystal detector (the mixer).

Illustrations: 8A1

What component of a RADAR receiver is represented by block 46 in Fig. 8A1?
The TR box.

Illustrations: 8A1

What component of a RADAR receiver is represented by block 48 in Fig. 8A1?
Klystron (local oscillator).

Illustrations: 8A1

What component of a RADAR receiver is represented by block 47 in Fig. 8A1?
The RF Attenuator.

Illustrations: 8A1

What component is block 50 in Fig. 8A1?
Discriminator.

Illustrations: 8A1

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?
D-type Flip-Flop, 3-State, Inverting.

Illustrations: 8A8

The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system _____.
The Memory and I/O communicate with peripherals.

Illustrations: 8A2

The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system _____.
The ALU executes arithmetic manipulations.

Illustrations: 8A2

The block diagram of a typical RADAR system microprocessor is shown in Fig. 8A2. Choose the most correct statement regarding this system _____.
Address pointers are contained in the general registers.

Illustrations: 8A2

What is the correct value of RS in Fig. 8A7, if the voltage across the LED is 1.9 Volts with 5 Volts applied and If max equals 40 milliamps?
77 ohms.

Illustrations: 8A7

In the circuit shown in Fig. 8A6, which of the following is true?
With either A or B low, Q1 is saturated and Q2 is off.

Illustrations: 8A6

If more light strikes the photodiode in Fig. 8A5, there will be:
More diode current.

Illustrations: 8A5

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?
Pin 5 high, Pin 9 high.

Illustrations: 8A4

At the operating frequency of 3000 MHz, what is the distance between the waveguide and the receiver in Diagram EL8T?
5 cm.

Illustrations: EL8T

At the operating frequency of 3000 MHz, what is the distance between the waveguide and the ATR spark gap in Diagram EL8T?
2.5 cm.

Illustrations: EL8T

What is the correct value of Rs in Diagram EL8S, if the voltage across the LED is 1.9 Volts with 5 Volts applied and If max equals 40 milliamps?
75 ohms.

Illustrations: EL8S

If more light strikes the photodiode in Diagram EL8R, there will be:
More diode current.

Illustrations: EL8R

With reference to the schematic shown in Diagram EL8Q, choose the most correct statement _____.
The filament of V201 carries dangerous voltages.

Illustrations: EL8Q

In this Line-Driver/Coax/Line-receiver circuit shown in Diagram EL8P, what component is represented by the blank box?
51 ohm resistor.

Illustrations: EL8P

The block diagram of a typical radar system microprocessor is shown in Diagram EL8O. Choose the most correct statement regarding this system _____.
Address pointers are contained in the general registers.

Illustrations: EL8O

The block diagram of a typical radar system microprocessor is shown in Diagram EL8O. Choose the most correct statement regarding this system _____.
The ALU executes arithmetic manipulations.

Illustrations: EL8O

The block diagram of a typical radar system microprocessor is shown in Diagram EL8O. Choose the most correct statement regarding this system _____.
The Memory and I/O communicate with peripherals.

Illustrations: EL8O

In the circuit shown in Diagram EL8N, which of the following is true?
With either A or B low, Q1 is saturated and Q2 is off.

Illustrations: EL8N

Choose the selection from the truth table which is correct for the circuit shown in Diagram EL8M.
0 1 1 1.

Illustrations: EL8M

In the circuit shown in Diagram EL8L, 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?
Pin 5 high, Pin 9 high.

Illustrations: EL8L

In the circuit shown in Diagram EL8K, what will be the output of the circuit?
ABC + BC

Illustrations: EL8K

With regard to the comparator shown in Diagram EL8J, the input is a sinusoid. Nominal high level output of the comparator is 4.5 volts. Choose the most correct statement regarding the input and output.
The leading edge of the output waveform occurs 180 degrees after positive zero crossing of the input waveform.

Illustrations: EL8J

The nominal output high of the comparator shown in Diagram EL8J is 4.5 volts. Choose the most correct statement which describes the trip points _____.
Upper trip point is 750 microVolts. Lower trip point is approximately 0 Volts.

Illustrations: EL8J

The circuit shown in Diagram EL8I is the output of a switching power supply. Measuring from the junction of CR6 and L1 to AGND with an oscilloscope, what waveform would you expect to see?
Pulsating DC much higher than line frequency.

Illustrations: EL8I

In the circuit shown in Diagram EL8H, the diode current is limited by:
R38.

Illustrations: EL8H

The diagram in Diagram EL8G shows a simplified radar mixer circuit using a crystal diode as the first detector. What is the output of the circuit when no echoes are being received?
No output is developed.

Illustrations: EL8G

The two sinewaves in the Diagram EL8F are being applied to the vertical and horizontal CRT deflection plates as shown. The display on the CRT screen will be:
A circle.

Illustrations: EL8F

The circuit shown in Diagram EL8E is being used as a time base generator for a CRT. How can this circuit be changed to produce the desired waveform shown?
Increase the resistance of R2.

Illustrations: EL8E

It is desired to modify the circuit in Diagram EL8E to produce trapezoidal sweep voltages for an electromagnetic CRT. This can be accomplished by:
Connecting a resistor between C3 and ground.

Illustrations: EL8E

What does the schematic in Diagram EL8D represent?
An STC circuit.

Illustrations: EL8D

A circuit card in a radar system has just been replaced with a spare card. You notice the voltage level at point E in Diagram EL8C is negative 4.75 volts when the inputs are all at 5 volts. The problem is:
The 50 K resistor has been mistakenly replaced with a 25 K resistor.

Illustrations: EL8C

In the circuit contained in Diagram EL8C, there are five volts present at points B and C, and there is zero volts present at points A and D. What is the voltage at point E?
-1.5 Volts.

Illustrations: EL8C

You are troubleshooting a component on a printed circuit board in a RADAR system while referencing the following Truth Table in Diagram EL8B. What kind of integrated circuit is the component?
D-Type Flip-Flop, 3-State, Inverting.

Illustrations: EL8B

What component of a radar receiver is represented by block 46 in Diagram EL8A?
The TR box.

Illustrations: EL8A

What component of a radar receiver is represented by block 47 in Diagram EL8A?
The RF Attenuator.

Illustrations: EL8A

What component of a radar receiver is represented by block 48 in Diagram El8A?
The Klystron.

Illustrations: EL8A

What component of a radar receiver is represented by block 49 in Diagram EL8A?
The Crystal Detector.

Illustrations: EL8A

What component is block 50 in Diagram EL8A?
The Discriminator.

Illustrations: EL8A

On an "A" scope presentation, range markers are displayed at 200 microsecond intervals. A target pulse appears exactly half-way between the third and fourth range marks. The range marks are being developed using a ringing oscillator. The operating frequency of the ringing oscillator must be _____.
5,000 Hz.
See REF2566

An artificial transmission line is used for:
Determining the shape and duration of pulses.

What radar circuit determines the pulse repetition rate (PRR)?
The timer (synchronizer circuit).

The microwave energy developed by the radar transmitter and radiated into space:
Travels through space "line of sight" only.

Which of the following is the most practical means of increasing the range of a ship radar installation?
Increase transmitter power, increase pulse width, and increase the time between transmitted pulses.

In older radar sets, how far from the waveguides are the spark gaps located?
One quarter wavelength.

Video amplifiers in pulse radar receivers must have a broad bandwidth because:
Weak pulses must be amplified.

The SSR subsystem of an Airport Surveillance Radar System uses:
Coded response information from aircraft transponders.

A basic sample-and-hold circuit contains:
An analog switch, a capacitor, amplifiers and input and output buffers.

Oscillations in a klystron local oscillator tube are maintained by:
Bunches of electrons passing the cavity grids.

How do you eliminate stationary objects such as trees, buildings, bridges, etc., from the PPI presentation?
Use a discriminator as a second detector.

Sea clutter on the radar scope cannot be effectively reduced using front panel controls. What circuit would you suspect is faulty?
The Sensitivity Time Control (STC} circuit.

A defective crystal in the AFC section will cause:
Bright flashing pie sections on the PPI.

What is a typical forward bias voltage across an LED when it is emitting light?
1.7 volts.

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.
25 nautical miles.

A radar operating at a frequency of 3.5 GHz has a wavelength of approximately:
8.6 centimeters.

A Continuous Wave radar is frequency modulated with a 100 Hz sine wave. At the output of the receiver phase detector, a phase delay of 18 degrees is measured. This indicates a target range of:
75 kilometers.

A circulator provides what function in the RF section of a radar system?
It replaces the TR cell and functions as a duplexer.

Why should long horizontal runs of waveguide be avoided?
To prevent accumulation of condensation.

Which of the following has NO effect on the maximum range capability?
Recovery time.

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.
25 nautical miles.

Short range RADARs would most likely transmit:
Narrow pulses at a fast rate.

Which of the following is not a method of analog-to-digital conversion?
Dynamic-range conversion.

Which of the following is not part of the transmitting system?
Klystron.

The shape and duration of the high-voltage pulse delivered to the magnetron is established by:
An artificial delay line.

The triggering section is also known as the:
Synchronizer.

In a RADAR receiver, the RF power amplifier:
Does not exist.

A logarithmic IF amplifier is preferable to a linear IF amplifier in a RADAR receiver because it:
Has a greater dynamic range.

The STC circuit:
Decreases sea return on the PPI scope.

Noise can _____.
Mask small targets.

How many deflection coils are driven by the sweep amplifier?
2

The purpose of the variable range marker is to:
Provide an accurate means of determining the range of a moving target.

What is the primary purpose of display system memory?
Eliminate fluctuating targets such as sea return.

Bearing resolution is:
The ability to distinguish two adjacent targets of equal distance.

On a basic synchro system, the angular information is carried on the:
Stator lines.

At microwave frequencies, waveguides are used instead of conventional coaxial transmission lines because:
They have considerably less loss.

It is reported that the RADAR is not receiving small targets. The most likely causes are:
Magnetron, IF amplifier, or receiver tuning.

RADAR interference to a communications receiver is eliminated by:
Properly grounding, bonding, and shielding all units.

To install and maintain a radar unit, you must have:
A General Radiotelephone Operator License (GROL) with a Radar Endorsement or a GMDSS Radio Maintainer License (GMDSS/M) with a Radar Endorsement.

What device is located between the magnetron and the mixer and prevents received signals from entering the magnetron?
The ATR Box.

Range markers are determined by:
The timer.

In comparing the overall operation of a pulse radar and a CW radar, it is determined that:
The pulse radar provides more accurate long-range and short-range measurements.

A shipboard radar uses a PFN driving a magnetron cathode through a step up transformer. This results in which type of modulation?
Pulse modulation.

The echo box is used for:
Testing and tuning of the radar unit by providing artificial targets.

To minimize video display saturation caused by RF energy from external sources, such as jamming, a receiver might employ:
FTC circuits.

What is the transmit frequency of an aircraft transponder?
1.09 GHz.

Which of the following is not a method of analog to digital conversion?
Dynamic-range conversion.

The STC circuit:
Decreases sea return on the PPI scope.

The radar service person should take the following precautions to ensure that the magnet of the magnetron is not weakened:
Keep metal tools away from the magnet.
Do not subject it to excessive heat.
Do not subject it to shocks or blows.
All of these.

When monitoring the gate voltage of a power MOSFET in the switching power supply of a modern radar, you would expect to see the gate voltage change from "low" to "high" by how much?
Greater than 2 Volts.

Before testing a radar transmitter, it would be a good idea to:
Make sure there are no explosives or flammable cargo being loaded.

Laser light is produced by:
Stimulated emission.

If the PRF is 2500 Hz, what is the PRI?
400 microseconds.

A radar transmitting at 6 GHz has a wavelength of:
5 cm.

A Continuous Wave radar is frequency modulated with a 100 Hz sine wave. At the output of the receiver phase detector, a phase delay of 36 degrees is measured. This indicates a target range of:
150 kilometers.

Why is coaxial cable often used for S-band installations instead of a waveguide:
Losses can be kept reasonable at S-band frequencies and the installation cost is lower.

Loss of distant targets during and immediately after wet weather indicates:
A leak in waveguide or rotary joint.

What type of transmitter power is measured over a period of time?
Average.

Frequencies generally used for marine RADAR are in the ___ part of the radio spectrum.
SHF

For a range of 30 nautical miles, the RADAR pulse repetition frequency should be:
2.7 kHz or less.

When comparing TTL and CMOS logic families, which of the following is true:
At higher operating frequencies, CMOS circuits consume almost as much power as TTL circuits.

High voltage is applied to what element of the magnetron?
The cathode.

Pulse-forming networks are usually composed of the following:
Series inductors and shunt capacitors.

Operation of any RADAR system begins in the:
Triggering section.

The high-gain IF amplifiers in a RADAR receiver may amplify a 2 microvolt input signal to an output level of 2 volts. This amount of amplification represents a gain of:
120 db.

Sea return is:
The reflection of RADAR signals from nearby waves.

The purpose of the discriminator circuit in a RADAR set is to:
Generate a corrective voltage for controlling the frequency of the klystron local oscillator.

The main purpose of the sweep generator is to provide:
The drive signal to the sweep amplifier.

How is the variable range marker usually adjusted for accuracy?
The minimum and maximum ranges are aligned with the matching fixed range ring.

The ship's speed indication on the ARPA display can be set manually, but does not change with changes in the vessel's speed. What other indication would point to a related equipment failure?
"LOG OUT" is displayed on the ARPA indicator.

The output of an RC integrator, when driven by a square wave with a period of much less than one time constant is a:
Triangle wave.

What is the most common type of antenna position indicating device used in modern RADARs?
Resolvers.

When you examine the RADAR you notice that there is no target video in the center of the CRT. The blank spot gets smaller in diameter as you increase the range scale. What operator front panel control could be misadjusted?
Sensitivity Time Control (STC).

A high magnetron current indicates a/an:
Defective external magnetic field.

Why should long horizontal runs of waveguide be avoided?
To prevent accumulation of condensation.

Who may replace fuses and receiving-type tubes and circuits in a radar unit?
A holder of a General Radiotelephone Operator License with a Radar Endorsement.

The ATR box:
Prevents the received signal from entering the transmitter.

The timer circuit:
Determines the pulse repetition rate (PRR).
Determines range markers.
Provides blanking and unblanking signals for the CRT.
All of these.

The characteristic of the magnetron output pulse that relates to accurate range measurement is its:
Rise time.

In a solid-state radar modulator, the duration of the transmitted pulse is determined by:
The pulse forming network.

The heading flash is a momentary intensification of the sweep line on the PPI presentation. Its function is to:
Inform the operator of the dead-ahead position on the PPI scope.

A magnetron has a cathode-anode potential of 20 kilovolts. Electrons emitted by the cathode:
Sustain oscillation by their cycloidal paths.

What is the receive frequency of an aircraft transponder?
1030 MHz.

Some hand shaking signals you might find on a EIA-232-D interface are:
RTS and CTS.

In a radar receiver, the RF power amplifier:
Does not exist.

While making repairs or adjustments to radar units:
Discharge all high-voltage capacitors to ground.

Prior to making "power-on" measurements on a switching power supply, you should be familiar with the supply because of the following:
If it does not use a line isolation transformer you may destroy the supply with grounded test equipment.

How can a CRT be damaged?
By leaving a stationary high-intensity image on the screen.

What is the primary purpose of an optical coupler?
To provide voltage isolation.

If the pulse repetition frequency (PRF) is 2000 Hz, what is the pulse repetition interval (PRI)?
0.0005 seconds.

How long is a half wavelength at 5400 MHz?
2.7 cm.

A Continuous Wave radar is frequency modulated with a 25 Hz sine wave. At the output of the receiver phase detector, a phase delay of 18 degrees is measured. This indicates a target range of:
300 kilometers.

Radar antenna direction must be sent to the display in all ARPA's or radar systems. How is this accomplished?
3-phase synchros.
2-phase resolvers.
Optical encoders.
Any of these.

A right angle bend in an X-band waveguide must have a radius greater than:
Two inches.

What RADAR component controls timing throughout the system?
Synchronizer.

Practical RADAR operation requires the use of microwave frequencies so that:
Stronger target echoes will be produced.

For a range of 10 nautical miles, the RADAR pulse repetition frequency (PRF) should be:
Approximately 8.1 kHz or less.

The primary operating frequency of a reflex klystron is controlled by the:
Dimensions of the resonant cavity.

The characteristic of the magnetron output pulse that relates to accurate range measurement is its:
Rise time.

An artificial transmission line is used for:
Determining the shape and duration of pulses.

The timer circuit:
Determines the pulse repetition rate (PRR).
Determines range markers.
Provides blanking and unblanking signals for the CRT.
All of the above.

In the receive mode, frequency conversion is generally accomplished by a:
Crystal diode.

In a RADAR receiver AGC and IAGC can vary between:
20 and 40 db.

Sea clutter on the RADAR scope cannot be effectively reduced using front panel controls. What circuit would you suspect is faulty?
Sensitivity Time Control (STC) circuit.

The MTI circuit:
Is a filter, which blocks out stationary targets, allowing only moving targets to be detected.

The main purpose of the video amplifier is to provide:
Composite video to the cathode of the CRT.

The panel control for the variable range marker is normally a:
Variable resistor.

What does the term ARPA/CAS refer to?
The device which acquires and tracks targets that are displayed on the RADAR indicator's CRT.

How do you eliminate stationary objects such as trees, buildings, bridges, etc., from the PPI presentation?
Use a discriminator as a second detector.

Which of the following statements about antenna resolvers is correct?
The basic resolver contains a rotor winding and two stator windings that are 90 degrees apart.

Range rings on the PPI indicator are oval in shape. Which circuit would you suspect is faulty?
Sweep generation circuit.

Low or no mixer current could be caused by:
Local oscillator frequency misadjustment.
TR cell failure.
Mixer diode degradation.
All of the above.

Long horizontal sections of waveguides are not desirable because:
Moisture can accumulate in the waveguide.

Under what circumstances can an unlicensed person operate a radar set?
Only if the transmitter is a non-tuneable type and when the master of the ship designates him to operate it.

When a pulse radar is radiating, which elements in the TR box are energized?
Both the TR and ATR tubes.

Unblanking pulses are produced by the timer circuit. Where are they sent?
To the CRT.

Magnetrons may be frequency modulated by:
Varying the magnetron load impedance.

What device is used as a transmitter in a marine radar system?
A Magnetron.

The magnetron is:
A type of diode that requires an external magnetic field.

How many active elements are contained in a magnetron?
2

Choose the most correct statement with respect to component damage from electrostatic discharge:
ESD damage may cause immediate circuit failures, but may also cause failures much later at times when the radar set is critically needed.

In standard CMOS logic IC databooks, the parameter tTLH is considered to be:
Measured from the 10% to 90% points of the leading edge.

What is the average range of a ship's surface search radar unit?
40 miles.

While removing a CRT from its operating casing, it is a good idea to:
Wear gloves and goggles.

In a radar using digital video processing, a bright, wide ring appears at a fixed distance from the center of the display on all digital ranges. The transmitter is operating normally. What receiver circuit would you suspect is causing the problem?
Video storage RAM or shift register.

If a CRT is dropped:
It might implode, causing damage to workers and equipment.

The voltage drop across a LED rated at 1300 nm is:
1 volt.

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?
0.0001.

A Continuous Wave radar is frequency modulated with a 25 Hz sine wave. At the output of the receiver phase detector, a phase delay of 36 degrees is measured. This indicates a target range of:
600 kilometers.

A thick layer of rust and corrosion on the surface of the parabolic dish will have what effect?
Decrease in performance, especially for weak targets.

A rotary joint is used to:
Connect a stationary waveguide to the antenna array.

Which of the following components allows the use of a single antenna for both transmitting and receiving?
Duplexer.

An S-band RADAR operates in which frequency band?
2 - 4 GHz.

If the PRF is 2500 Hz, what is the PRI?
400 microseconds.

A Gunn diode oscillator takes advantage of what effect?
Negative resistance and bulk-effect.

What device is used as a transmitter in a marine RADAR system?
Magnetron.

The ferrite material in a circulator is used as a(an):
Phase shifter.

Pulse RADARs require precise timing for their operation. Which type circuit below might best be used to provide these accurate timing pulses?
Single-swing blocking oscillator.

An RF mixer has what purpose in a RADAR system?
Converts a low-level signal to a different frequency.

Which of the following statements is correct?
The video amplifier is located between the I.F. amplifier and the display system.

What circuit controls the suppression of sea clutter?
STC circuit.

Where is a RF attenuator used in a RADAR unit?
Between the magnetron and the AFC section of the receiver.

Timing circuits are used to provide what function?
Develop synchronizing pulses for the transmitter system.

An important component of the VRM system is the:
Shift register.

Which of the following would not be considered an input to the computer of a collision avoidance system?
Own ship's wind velocity from an anemometer.

Slotted waveguide arrays, when fed from one end exhibit:
Frequency scan.

An antenna synchro transmitter is composed of the following:
Two rotor and three stator windings.

What would be the most likely defective area when there is no target video in the center of the CRT and the blank spot gets smaller in diameter as your range scale is increased?
The TR (TRL) Cell.

If the magnetron is allowed to operate without the magnetic field in place:
It will quickly destroy itself from excessive current flow.

In a RADAR system, waveguides should be installed:
As straight as possible to reduce distortion.

What radar maintenance work may be done by unlicensed workers?
None.

In the AFC system, the discriminator compares the frequencies of the:
Magnetron and klystron.

Accurate range markers must be developed using very narrow pulses. A circuit that could be used to provide these high quality pulses for the CRT is a:
Blocking oscillator.

Some aircraft radars and avionics suites operate with a prime power line frequency of 400 Hz. What is the principle advantage of a higher line frequency?
The magnetic devices in a 400 Hz power supply such as transformers, chokes and filters are smaller and lighter in weight than those used in 60 Hz power supplies.

What device(s) could be used as the local oscillator in a radar receiver?
A Klystron and a Gunn Diode.

In a radar unit, the local oscillator is:
A klystron.

The shape and duration of the high voltage pulse delivered to the magnetron is established by:
An artificial delay line.

The display of a 2-D Airport Surveillance radar typically provides:
Range, azimuth, and SSR responses.

Which of the following would not be considered an input to the computer of a collision avoidance system?
Own ship's wind velocity from an anemometer.

The anode of a magnetron is normally maintained at ground potential:
For safety purposes.

In a marine radar set, a high VSWR is indicated at the magnetron output. The waveguide and rotary joint appear to be functioning properly. What component may be malfunctioning?
The waveguide array termination.

The raster scan radar display has missing video in a rectangular block on the screen. Where is the most likely problem area?
Memory area failure.

A high magnetron current indicates:
A defective external magnetic field.

Optical fibers used to carry radar signals are made of:
Glass coated with plastic.
Ultrapure glass.
Plastic.
All of these.

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:
0.0005.

A target pulse appears on the CRT 100 microseconds after the transmitted pulse. The target slant range is:
15 kilometers.

A shipboard acquisition or surface-search type of radar would have an antenna in the form of a:
Horizontal orange peel.

A typical shipboard radar antenna is a:
Slotted waveguide array.

The sweep frequency of a RADAR indicator is determined by what parameter?
Pulse repetition frequency.

A RADAR operating at a frequency of 3 GHz has a wavelength of approximately:
10 centimeters.

If the pulse repetition frequency (PRF) is 2000 Hz, what is the pulse repetition interval (PRI)?
0.0005 seconds.

Fine adjustments of a reflex klystron are accomplished by:
Varying the repeller voltage.

The magnetron is:
A type of diode that requires an external magnetic field.

In a circular resonant cavity with flat ends, the E-field and the H-field form with specific relationships. The:
E-lines are perpendicular to the end walls.

Unblanking pulses are produced by the timer circuit. Where are they sent?
CRT.

In a RADAR unit, the mixer uses a:
Silicon crystal or PIN diode.

Video amplifiers in pulse RADAR receivers must have a broad bandwidth because:
Weak pulses must be amplified.

The sensitivity time control (STC) circuit:
Decreases the sensitivity of the receiver for close objects.

The condition known as “glint” refers to a shifting of clutter with each RADAR pulse and can be caused by a:
Improperly functioning MTI filter.

The circuit that develops timing signals is called the:
Synchronizer.

Which of the following statements about the Variable Range Marker system is correct?
The VRM system develops a single adjustable range ring.

Which answer best describes a line on the display which indicates a target's position. The speed is shown by the length of the line and the course by the direction of the line.
Vector.

A typical shipboard RADAR antenna is a:
Slotted waveguide array.

RADAR antenna direction must be sent to the display in all ARPAs or RADAR systems. How is this accomplished?
3-phase synchros.
2-phase resolvers.
Optical encoders.
Any of the above.

While the vessel is docked the presentation of the pier is distorted near the center of the PPI with the pier appearing to bend in a concave fashion. This is a primary indication of what?
The waveguide compensation delay line needs adjusting.

Targets displayed on the RADAR display are not on the same bearing as their visual bearing. What should you first suspect?
Incorrect antenna position information.

What is the most important factor to consider in locating the antenna?
The antenna is in a location that is not shadowed by other structures.

Who is permitted to operate a ship radar unit?
The master of the ship, or anyone designated by the master.

The purpose of the discriminator circuit in a radar set is to:
Generate a corrective voltage for controlling the frequency of the klystron local oscillator.

What determines the maximum unambiguous range of a radar set?
The time between the transmitted pulses.

When a radar signal is sent to an object, the Doppler effect is:
Objects moving towards you reflect back a higher frequency.

The klystron local oscillator is constantly kept on frequency by:
The Automatic Frequency Control circuit.

What type of video output tube is used in most marine radar units?
A plan position indicator (PPI).

The pulse developed by the modulator may have an amplitude greater than the supply voltage. This is possible by:
Employing a resonant charging choke.

In a conventional PPI display, the electron beam is scanned:
From the center of the display to the outer edges and in a rotating pattern which follows the antenna position.

High voltage is applied to what element of the magnetron?
The cathode.

A keep-alive voltage is applied to:
The TR tube.

The VSWR of a microwave transmission line device might be measured using:
A dual directional coupler, a power meter, and a Network Analyzer.

The ship's speed indication on the ARPA display can be set manually, but does not change with changes in the vessel's speed. What other indication would point to a related equipment failure?
"LOG OUT" is displayed on the ARPA indicator.

If the TR box malfunctions:
The receiver might be damaged.

Light emissions from an LED are modulated by:
Current passing through the diode.

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:
40 watts.

If the operating radar frequency is 3000 MHz, what is the distance between the waveguide and the spark gaps in older radar units?
2.5 cm.

A gated LC oscillator, operating at 12.5 kHz, is being used to develop range markers. If each cycle is converted to a range mark, the range between markers will be:
12 kilometers.

To insert RF energy or extract RF energy from a waveguide, which of the following would not be used?
A coupling capacitance.

At microwave frequencies, waveguides are used instead of conventional coaxial transmission lines because:
They have considerably less loss.

The major advantage of an S-band RADAR over an X-band RADAR is:
It is less affected by weather conditions.

The pulse repetition rate (PRR) refers to:
The pulse rate of the magnetron.

Blocking oscillators operate on the formula of:
T = R x C.

A negative voltage is commonly applied to the magnetron cathode rather than a positive voltage to the magnetron anode because:
The anode can be operated at ground potential for safety reasons.

A ferrite circulator is most commonly used in what portion of a RADAR system?
The duplexer.

An advantage of resonant charging is that it:
Reduces the high-voltage power supply requirements.

In video amplifiers, compensation for the input and output stage capacitances must be accomplished to prevent distorting the video pulses. This compensation is normally accomplished by connecting:
An inductor in series with the input capacitance and an inductor in parallel with the output capacitance.

Prior to making “power-on” measurements on a switching power supply, you should be familiar with the supply because of the following:
If it does not use a line isolation transformer you may destroy the supply with grounded test equipment.

An ion discharge (TR) cell is used to:
Protect the receiver mixer during the transmit pulse.

Which of the following functions is not affected by the timing circuit?
Resolver output.

The purpose of the Electronic Bearing Line is to:
Measure the bearing of a specific target.

What is the purpose or function of the “Trial Mode” used in most ARPA equipment?
It is used to allow results of proposed maneuvers to be assessed.

Good bearing resolution largely depends upon:
A narrow antenna beam in the horizontal plane.

Waveguides can be constructed from:
Brass.
Aluminum.
Copper.
All of the above.

In a RADAR using digital video processing, a bright, wide ring appears at a fixed distance from the center of the display on all digital ranges. The transmitter is operating normally. What receiver circuit would you suspect is causing the problem?
Video storage RAM or shift register.

Loss of distant targets during and immediately after wet weather indicates:
A leak in waveguide or rotary joint.

Choose the most correct statement with respect to component damage from electrostatic discharge:
ESD damage may cause immediate circuit failures, but may also cause failures much later at times when the RADAR set is critically needed.

Where is a RF attenuator used in a radar unit?
Between the magnetron and the AFC section of the receiver.

The final stage of the sweep circuits of an electromagnetic CRT is usually a power amplifier. The reason for using a power amplifier rather than a voltage amplifier is:
To provide a relatively high output current to drive the deflection coils.

Airport wind shear radars depend upon:
The doppler effect to track rapid shifts in wind patterns.

What device(s) may act as the modulator of a radar system?
A thyratron and a silicon-controlled rectifier.

How are ranges changed so that range markers represent different distances?
By changing the oscillating frequency of the ringing oscillator.

To minimize video display saturation caused by RF energy from external sources, such as jamming, a receiver might employ:
FTC circuits.

What does the term ARPA/CAS refer to?
The device which acquires and tracks targets which are displayed on the radar indicator's CRT.

An ion discharge (TR) cell is used to:
Protect the receiver mixer during the transmit pulse.

How does a TWT amplify?
By transfer of energy from the signal to the electron beam.

Prior to removing, servicing or making measurements on any solid state circuit boards from the radar set, the operator should ensure that:
The proper work surfaces and ESD grounding straps are in place to prevent damage to the boards from electrostatic discharge.

The ship's heading flash on a gyro-stabilized indicator tracks in the opposite direction of the ship's turn. What would be the most likely cause?
Two of the phases of the gyrocompass signal to the indicator are reversed.

How would you prolong the life of a spark gap?
By periodically reversing the polarity.

The response time of a fiber optic system, (like those used to carry radar signal information), is:
The square root of the sum of the squares of the response times of its individual components.

A pulse radar transmits a 0.5 microsecond RF pulse with a peak power of 100 kilowatts every 1600 microseconds. This radar has:
An average power of 31.25 watts.

The wide dimension of a rectangular waveguide for a given frequency band is:
Approximately 1/2 wavelength.

On an "A" scope presentation, range markers are displayed at 200 microsecond intervals. A target pulse appears exactly half-way between the third and fourth range marks. The target slant range is _____.
105 kilometers.
See REF2566

Slotted waveguide arrays, when fed from one end exhibit:
Frequency scan.

Long horizontal sections of waveguides are not desirable because:
Moisture can accumulate in the waveguide.

An X band RADAR operates in which frequency band?
8 - 12 GHz.

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?
0.0001

The anode of a magnetron is normally maintained at ground potential:
For safety purposes.

A circulator provides what function in the RF section of a RADAR system?
It replaces the TR cell and functions as a duplexer.

The characteristics of a field-effect transistor (FET) used in a modern RADAR switching power supply can be compared as follows:
"On" state compares to a pure resistor. "Off" state compares to a mechanical relay.

In a RADAR unit, the mixer uses:
PIN diodes and silicon crystals.

Which of the following signals is not usually an input to the video amplifier?
Resolver.

A constant frequency switching power supply regulator with an input voltage of 165 volts DC, and a switching frequency of 20 kHz, has an "ON" time of 27 microseconds when supplying 1 ampere to its load. What is the output voltage across the load?
89.1 volts DC.

When the receiver employs an MTI circuit:
Only moving targets will be displayed.

The synchronizer primarily affects the following circuit or function:
Modulator.

The Electronic Bearing Line is:
A line from your own vessel to a specific target.

The ARPA term CPA refers to:
The closest point a ship or target will approach your own ship.

The center of the transmitted lobe from a slotted waveguide array is:
Several degrees offset from a line perpendicular to the antenna.

A microwave transmission line constructed of a center conductor suspended between parallel conductive ground planes is called:
Stripline.

The raster scan RADAR display has missing video in a rectangular block on the screen. Where is the most likely problem area?
Memory area failure.

In a marine RADAR set, a high VSWR is indicated at the magnetron output. The waveguide and rotary joint appear to be functioning properly. What component may be malfunctioning?
The waveguide array termination

Before testing a RADAR transmitter, it would be a good idea to:
Make sure there are no explosives or flammable cargo being loaded.

What frequency is the discriminator tuned to?
The 30 MHz or 60 MHz IF.

Using tuned circuits for selectivity, radar IF amplifier stages would normally be biased to operate:
Class A amplifiers.

Choose the most correct statement containing the parameters which control the size of the target echo _____.
Transmitted power, antenna effective area, transmit and receive losses, radar cross section of the target, range to target.

A circuit used to develop AFC voltage in a radar receiver is called the:
Discriminator.

Sea return is:
The reflection of radar signals from nearby waves.

An advantage of resonant charging is that it:
Reduces the high voltage power supply requirements.

The characteristics of a Field Effect Transistor (FET) used in a modern radar switching power supply can be compared as follows:
"On" state compares to a pure resistor. "Off" state compares to a mechanical relay.

In a radar unit, the mixer uses:
PIN diodes and silicon crysals.

A wavelength is equal to how many degrees of a sinewave?
360

Before removing either a primary or secondary airport surveillance radar from service for maintenance or repair, the operator must:
Notify Air Traffic Control.

While troubleshooting a memory problem in a raster scan radar, you discover that the "REFRESH" cycle is not operating correctly. What type of memory circuit are you working on?
DRAM.

If long-length transmission lines are not properly shielded and terminated:
Communications receiver interference might result.

What is the usual modulation method for fiber optic transmitters used to carry radar signal information?
Intensity modulation.

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?
6.75 watts.

A CW radar is operating on 1.5 GHz. If this radar uses rectangular waveguide, the wide dimension of the waveguide will measure:
10 cm.

A radar transmitter is operating on 2.5 GHz and the reflex klystron local oscillator, operating at 2.56 GHz, develops a 60 MHz IF. If the magnetron drifts higher in frequency, the AFC system must cause the klystron repeller plate to become:
More negative.

A microwave transmission line constructed of a center conductor suspended between parallel conductive ground planes is called:
Stripline.

How is the signal removed from a waveguide or magnetron?
With a thin wire called a J-Hook.

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:
40 watts.

Small targets are best detected by:
Using a long pulse width with high output power.

The phantastron circuit is capable of:
Developing a linear ramp voltage when triggered by an external source.

In a solid-state RADAR modulator, the duration of the transmitted pulse is determined by:
The pulse forming network.

A directional coupler has an attenuation of -30 db. A measurement of 100 milliwatts at the coupler indicates the power of the line is:
100 watts.

A pulse-width modulator in a switching power supply is used to:
Vary the duty cycle of the regulator switch to control the output voltage.

The error voltage from the discriminator is applied to the:
Repeller (reflector) of the klystron.

Which of the following signals are usually an input to the video amplifier?
Range.
Brilliance.
Contrast.
All of the above.

Modern liquid crystal displays have a pixel count of _____.
Greater than 200 pixels per inch.

The output from the synchronizer usually consists of a:
Pulse or square wave.

Which of the following inputs is required to indicate azimuth?
Gyro signals.

The display power supply provides the following:
5 volts DC for logic circuits and ± 12 volts DC for analog and sweep circuits.

How does antenna length affect the horizontal beamwidth of the transmitted signal?
The longer the antenna the narrower the horizontal beamwidth.

Waveguide theory is based upon:
The movement of an electromagnetic field.

On a vessel with two RADARs, one has a different range indication on a specific target than the other. How would you determine which RADAR is incorrect?
Check the sweep and timing circuits of both indicators for correct readings.

While making repairs or adjustments to RADAR units:
Discharge all high-voltage capacitors to ground.

The usual intermediate frequency of a shipboard radar unit is:
30 or 60 MHz.

The AFC system is used to:
Control the frequency of the klystron.

Frequencies generally used for marine radar are in the ___ part of the radio spectrum.
SHF.

The TR box:
Protects the receiver from the strong radar pulses and turns off the receiver when the transmitter is on.

The sensitivity-time control (STC} circuit:
Decreases the sensitivity of the receiver for close objects.

Pulse radars require precise timing for their operation. Which type circuit below might best be used to provide these accurate timing pulses?
A single-swing blocking oscillator.

Which of the following characteristics are true of a power MOSFET used in a radar switching supply?
High input impedance; failure mode can be gate punch-through.

An AFC system keeps the receiver tuned to the transmitted signal by varying the frequency of:
The local oscillator.

A raster scan radar display maintains the display presentation on the CRT face by the use of:
Video RAM.

Before ground testing of an aircraft radar, the operator should:
Ensure that the area in front of the antenna is clear of other maintenance personnel to avoid radiation hazards.

Small targets in an area of very heavy swell are frequently being lost and reacquired by a collision avoidance radar. Each time a target is acquired, the antenna rotates several times before the target's course and speed can be displayed. What is the most likely cause of the delay?
The CAS computations require several sweeps of the antenna.

If the rise time of a radar system's fiber optic signal transmitter is 1 nanosecond, what is its theoretical bandwidth?
350 MHz.

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?
100 watts.

Which of these conditions would require a waveguide with the smallest physical dimensions?
A frequency of 5 GHz.

A radar magnetron develops a transmission frequency of 1250 MHz. To develop an IF of 60 MHz, the local oscillator must operate at:
1.31 GHz.

What device(s) might be used to allow electronic scanning in an array antenna?
PIN diode phase shifters.

What should be done to the interior surface of a waveguide in order to minimize signal loss?
Keep it as clean as possible.

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:
0.0005

What is the relationship between pulse repetition rate and pulse width?
Lower PRR with wider pulse width.

The modulation frequency of most RADAR systems is between:
60 and 500 Hz.

What is the purpose or function of the RADAR duplexer/circulator?
An electronic switch that allows the use of one antenna for both transmission and reception.

In a fixed-frequency switching power supply, the pulse width of the switching circuit will increase when:
The load impedance decreases.

In a RADAR unit, the local oscillator is a:
Klystron.

The video (second) detector in a pulse modulated RADAR system would most likely use a/an:
Diode detector.

Voltages used in CRT anode circuits are in what range of value?
10-50 kV.

The sweep drive is initiated by what circuit?
Synchronizer.

Bearing information from the gyro is used to provide the following:
Vessel's own heading.

The display power supply provides the following:
5 volts DC for logic circuits.
± 12 volts DC for analog and sweep circuits.
17kV DC for the CRT HV anode.
All of the above.

What is the most common type of RADAR antenna used aboard commercial maritime vessels?
Slotted waveguide array.

A waveguide is used at RADAR microwave frequencies because:
It has lower transmission losses than other feedline types.

A defective crystal in the AFC section will cause:
Bright flashing pie sections on the PPI.

An increase in the deflection on the magnetron current meter could likely be caused by:
A decrease of the magnetic field strength.

While removing a CRT from its operating casing, it is a good idea to:
Wear gloves and goggles.

The error voltage from the discriminator is applied to:
The repeller (reflector) of the klystron.

The output of an AFC Discriminator is:
Zero volts if the IF is "on frequency".

The minimum range of a radar is determined by:
The transmitted pulse width.

A DC keep-alive potential:
Is applied to a TR tube to make it more sensitive and partially ionizes the gas in a TR tube, making it very sensitive to transmitter pulses.

The primary tube used in the STC circuit is:
A hydrogen thyratron.

Standard vacuum tubes are not used at radar frequencies because:
The inductance of the leads is excessive.

On a basic syncro system, the angular information is carried on:
The stator lines.

A Gunn diode oscillator takes advantage of what effect?
Negative resistance and bulk-effect.

In a raster-type display, the electron beam is scanned:
Horizontally and vertically across the CRT face.

The azimuth encoder of an airport surveillance radar appears to be malfunctioning. What must the operator do before performing maintenance on the unit?
The redundant unit is automatically switched into service and operates independently. You may remove and replace the malfunctioning unit without affecting normal operation.

An increase in the deflection on the magnetron current meter could likely be caused by:
A decrease of the magnetic field strength.

What circuit element receives the drive voltage in a radar system's fiber optic signal transmitter?
A transistor.

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:
20 kilowatts.

A shipboard raster scan radar has a CRT with the following characteristics: 70 pixels per character, 80 characters per line, 25 lines per screen and it scans 100 screens per second. What is the minimum required bandwidth for the electron beam control signal?
21 MHz.

The impedance total (Zo) of a transmission line can be calculated by Zo = ûL/C when inductance L and capacitance C are known. When a section of transmission line contains 250 microhenries of inductance and 1000 picofarads of capacitance, its impedance total (Zo) will be:
500 ohms.

The radome of an aircraft radar must be kept clean in order to prevent:
Loss of range performance.
Reflected power from affecting the transmitter.
Changes to the beam shape of the antenna which might reduce accuracy.
All of these.

The following is true concerning waveguides:
The magnetic field is strongest at the edges of the waveguide.

A pulse RADAR transmits a 0.5 microsecond RF pulse with a peak power of 100 kilowatts every 1600 microseconds. This RADAR has:
An average power of 31.25 watts.

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

The ATR box:
Prevents the received signal from entering the transmitter.

A major consideration for the use of a switching regulator power supply over a linear regulator is:
The overall efficiency of a switching regulator is much higher than a linear power supply.

The AFC system is used to:
Control the frequency of the klystron.

When monitoring the gate voltage of a power MOSFET in the switching power supply of a modern RADAR, you would expect to see the gate voltage change from “low” to “high” by how much?
Greater than 2 volts.

The purpose of the aquadag coating on the CRT is:
To protect the electrons from strong electric fields.
To act as a second anode.
To attract secondary emissions from the CRT screen.
All of the above.

Accurate range markers must be developed using very narrow pulses. A circuit that could be used to provide these high-quality pulses for the CRT is a:
Blocking oscillator.

Which of the following statements about “true bearing” is correct?
True North is at the top of the screen and the heading flasher indicates the vessel’s course.

In a display system power supply what is the purpose of the chopper?
It acts as an electronic switch between the raw DC output and the inverter.

The VSWR of a microwave transmission line device might be measured using:
A dual directional coupler, a power meter, and a network analyzer.

Waveguide theory is based on the principals of:
Skin effect and use of ¼ wave stubs.

The RADAR display has sectors of solid video (spoking). What would be the first thing to check?
For interference from nearby ships.

A thick layer of rust and corrosion on the surface of the parabolic dish will have what effect?
Decrease in performance, especially for weak targets.

If a CRT is dropped:
It might implode, causing damage to workers and equipment.

How may the frequency of the klystron be varied?
Small changes can be made by adjusting the repeller voltage and large changes can be made by adjusting the size of the resonant cavity.

The primary operating frequency of a reflex klystron is controlled by the:
Dimensions of the resonant cavity.

An S band radar operates in which frequency band?
2-4 GHz.

What determines the minimum range of a radar set?
The transmitted pulse width and the T/R cell recovery time.

In a radar unit, the mixer uses:
A silicon crystal or PIN diode.

Transit time might be defined as the time required for:
Electrons to travel from cathode to anode.

In a fixed-frequency switching power supply, the pulse width of the switching circuit will increase when:
The load impedance decreases.

The basic frequency determining element in a Gunn oscillator is:
The resonant cavity.

The position of the PPI scope sweep must indicate the position of the antenna. The sweep and antenna positions are frequently kept in synchronism by the use of:
Synchro systems.

It is reported that the radar is not receiving small targets. The most likely causes are:
Magnetron, IF amplifier, or receiver tuning.

An increase in magnetron current which coincides with a decrease in power output is an indication of what?
The external magnet weakening.

What is the special advantage of using plenum fiber optic cables to carry radar signal information aboard maritime vessels?
They meet stringent fire codes for running through wire-ways.

For a range of 10 nautical miles, the radar pulse repetition frequency (PRF) should be:
Approximately 8.1 kHz or less.

A shipboard raster scan radar has a CRT with the following characteristics: 70 pixels per character, 80 characters per line, 25 lines per screen and it scans 60 screens per second. What is the minimum required bandwidth for the electron beam control signal?
12.6 MHZ.

A certain length of transmission line has a characteristic impedance of 72 ohms. If the line is cut at its center, each half of the transmission line will have a Zo of:
72 ohms.

A ferrite circulator is most commonly used in what portion of a radar system?
The duplexer.

The polarization of the radiated electromagnetic energy through a waveguide is determined by:
The E field alone.

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?
6.75 watts.

A basic sample-and-hold circuit contains:
An analog switch, a capacitor, amplifiers and input and output buffers.

Choose the most correct statement:
The filament of the magnetron carries dangerous voltages.

In a pulse modulated magnetron what device determines the shape and width of the pulse?
Pulse Forming Network.

When a pulse RADAR is radiating, which elements in the TR box are energized?
Both the TR and ATR tubes.

Which of the following characteristics are true of a power MOSFET used in a RADAR switching supply?
High input impedance; failure mode can be gate punch-through.

What device(s) could be used as the local oscillator in a RADAR receiver?
Klystron and a Gunn Diode

A circuit used to develop AFC voltage in a RADAR receiver is called the:
Discriminator.

LCD patterns are formed when:
Current passes through the crystal causing them to align.

Range markers are determined by:
The timer.

A true bearing presentation appears as follows:
North is at the top of the display and the ship's heading flasher indicates the vessel's course.

In a display system power supply, what is the purpose of the inverter?
Produces the pulsed DC input voltage to the power transformer.

The impedance total (ZO) of a transmission line can be calculated by ZO = $\sqrt{L/C}$ when L and C are known. When a section of transmission line contains 250 microhenries of L and 1000 picofarads of C, its impedance total (ZO) will be:
500 ohms.

How is the signal removed from a waveguide or magnetron?
With a thin wire called a J-Hook.

The echo box is used for:
Testing and tuning of the RADAR unit by providing artificial targets.

Prior to removing, servicing or making measurements on any solid state circuit boards from the RADAR set, the operator should ensure that:
The proper work surfaces and ESD grounding straps are in place to prevent damage to the boards from electrostatic discharge.

The minimum range of a RADAR is primarily determined by?
The pulse width and TR (TRL) cell recovery time

Fine adjustments of a reflex klystron are accomplished by:
Varying the repeller voltage.

Electrons provide regeneration to oscillating cavities when they are:
Decelerating.

An X band radar operates in which frequency band?
8-12 GHz.

The ARPA term CPA refers to:
The closest point a ship or target will approach your own ship.

Why is hydrogen gas used in thyratron tubes?
It ionizes and deionizes quickly.
See REF011

A CW radar may be used to determine the rate of travel of a target and whether it is moving toward or away from the radar position. To make this determination:
The principles of doppler effect are employed.

The output of an RC integrator, when driven by a square wave with a period of much less than one time constant is?
A Triangle wave.

A logarithmic IF amplifier is preferable to a linear IF amplifier in a radar receiver because:
It has a greater dynamic range.

What is the main difference between an analog and a digital receiver?
The presence of decision circuitry to distinguish between "on" and "off" signal levels.

The radar display has sectors of solid video (spoking). What would be the first thing to check?
For interference from nearby ships.

Low or no mixer current could be caused by:
All of these.

Which of the following is not a type of multiplexing used in radar receiver signal transmitters sent through optical fibers?
Space-division multiplexing, with pulses transmitted at different positions in the fiber.

For a range of 30 nautical miles, the radar pulse repetition frequency should be:
2.7 kHz or less.

A shipboard raster scan radar has a CRT with the following characteristics: 100 pixels per character, 100 characters per line, 30 lines per screen and it scans 60 screens per second. What is the minimum required bandwidth for the electron beam control signal?
26.5 MHz.

A basic constant frequency switching power supply regulator with an input voltage of 165 volts DC, and a switching frequency of 20 kHz, has an "ON" time of 27 microseconds when supplying 1 ampere to its load. What is the output voltage across the load?
89.1 volts DC.

Choose the most correct statement:
For a given antenna, as frequency increases, beamwidth decreases.

Which of these transmission line statements is not true?
Standing waves travel down the line.

A radio wave will travel a distance of three nautical miles in:
18.51 microseconds.

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?
100 watts.

When comparing a TTL and a CMOS NAND gate:
Both have active pull-up characteristics.

The magnetron is used to:
Generate the output signal at the proper operating frequency.

What device(s) may act as the modulator of a RADAR system?
Thyratron or a silicon-controlled rectifier (SCR).

The TR box:
Protects the receiver from the strong RADAR pulses and mutes the receiver when the transmitter is on.

Which of the following statements is true?
The front end of the receiver does not provide any amplification to the RADAR signal.

The klystron local oscillator is constantly kept on frequency by:
The Automatic Frequency Control circuit.

In the AFC system, the discriminator compares the frequencies of the:
Magnetron and klystron.

One of the best methods of reducing noise in a RADAR receiver is?
Isolation.

In a raster-type display, the electron beam is scanned:
Horizontally and vertically across the CRT face.

A gated LC oscillator, operating at 27 kHz, is being used to develop range markers. If each cycle is converted to a range mark, the range between markers will be:
3 nautical miles.

In a digitized RADAR, the 360 degree sweep is divided into how many digitized segments?
4096

What would be a common switching frequency for a display system power supply?
18 kHz

If long-length transmission lines are not properly shielded and terminated:
Communications receiver interference might result.

A rotary joint is used to:
Connect a stationary waveguide to the antenna array.

If the TR tube malfunctions:
The receiver might be damaged.

What should be done to the interior surface of a waveguide in order to minimize signal loss?
Keep it as clean as possible.

An RF mixer has what purpose in a radar system?
It converts a low-level signal to a different frequency.

The pulse repetition rate (PRR) refers to:
The pulse rate of the magnetron.

Power losses in cavity resonators are very low because:
Conducting surfaces are large.

The major advantage of an S-band radar over an X-band radar is:
It is less affected by weather conditions.

What is the purpose or function of the "Trial Mode" used in most ARPA equipment?
It is used to allow results of proposed maneuvers to be assessed.

In video amplifiers, compensation for the input and output stage capacitances must be accomplished to prevent distorting the video pulses. This compensation is normally accomplished by:
Connecting an inductor in series with the input capacitance and an inductor in parallel with the output capacitance.

A CW radar is being frequency modulated with a low frequency sine wave to provide range measurements. To develop a range indication, the receiver would most likely use a:
Phase comparator, tuned to the modulating frequency.

A pulse width modulator in a switching power supply is used to:
Vary the duty cycle of the regulator switch to control the output voltage.

Silicon crystals:
Are very sensitive to static electric charges.
Should be wrapped in lead foil for storage.
Tolerate very low currents.
All of these.

The purpose of the aquadag coating on the CRT is:
To protect the electrons from strong electric fields.
To act as a second anode.
To attract secondary emissions from the CRT screen.
All of these.

When replacing components of a radar transmitter, what safety precautions should be taken?
All of these.

Silicon crystals are used in radar mixer and detector stages. Using an ohmmeter, how might a crystal be checked to determine if it is functional?
Its resistance should be low in one direction and high in the opposite direction.

A radio wave will travel a distance of three nautical miles in:
18.51 microseconds.

For a range of 5 nautical miles, the radar pulse repetition frequency should be:
16.2 kHz or less.

A shipboard raster scan radar has a CRT with the following characteristics: 100 pixels per character, 100 characters per line, 60 lines per screen and it scans 100 screens per second. What is the minimum required bandwidth for the electron beam control signal?
90 MHz.

A directional coupler has an attenuation of -30 db. A measurement of 100 microwatts at the coupler indicates the power of the line is:
100 watts.

Proportionally, a very narrow beamwidth for a radar antenna indicates:
Proportionally higher frequencies are being transmitted and received.

Standing waves on a transmission line may be an indication that:
Some of the energy is not absorbed by the load.

One RADAR mile is how many microseconds?
12.34

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:
20 kilowatts.

Silicon crystals:
Are very sensitive to static electric charges.
Should be wrapped in lead foil for storage.
Tolerate very low currents.
All of these.

The purpose of the modulator is to:
Provide high voltage pulses of the proper shape and width to the magnetron.

The purpose of a modulator in the transmitter section of a RADAR is to:
Provide the correct waveform to the transmitter.

What device is located between the magnetron and the mixer and prevents received signals from entering the magnetron?
The ATR tube.

Logarithmic receivers:
Can't be saturated.

How may the frequency of the klystron be varied?
Small changes can be made by adjusting the repeller voltage and large changes can be made by adjusting the size of the resonant cavity.

An AFC system keeps the receiver tuned to the transmitted signal by varying the frequency of the:
Local oscillator.

The primary cause of noise in a RADAR receiver can be attributed to:
Thermal noise caused by RADAR receiver components.

Select the statement, which is most correct regarding a raster scan display _____.
Raster scanning is controlled by clock pulses and requires an address bus.

What would be the frequency of a range ring marker oscillator generating range rings at 10 nautical miles intervals?
8 kHz

While troubleshooting a memory problem in a raster scan RADAR, you discover that the "REFRESH" cycle is not operating correctly. What type of memory circuit are you working on?
DRAM

What display system power supply output would use a tripler circuit?
The HV supply for the CRT anode.

A certain length of transmission line has a characteristic impedance of 72 ohms. If the line is cut at its center, each half of the transmission line will have a ZO of:
72 ohms.

Resistive losses in a waveguide are very small because:
The inner surface of the waveguide is large.

The indicated distance from your own vessel to a lighthouse is found to be in error. What circuit would you suspect?
Range ring oscillator.

Which of the following is the most useful instrument for RADAR servicing?
Oscilloscope.

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:
SCR's and Thyratrons.

The timer circuit:
Determines the pulse repetition rate (PRR).
Determines range markers.
Provides blanking and unblanking signals for the CRT.
All of these.

In a circular resonant cavity with flat ends, the E-field and the H-field form with specific relationships. The:
E-lines are perpendicular to the end walls.

A major consideration for the use of a switching regulator power supply over a linear regulator is:
The overall efficiency of a switching regulator is much higher than a linear power supply.

On most ARPA equipment, this is a line on the PPI display which indicates a target's position. The speed of the target is shown by the length of the line. The course of the target is shown by the direction of the line. This statement best describes a/an _____.
Vector.

The video (second) detector in a pulse modulated RADAR system would most likely use a/an:
Diode detector.

To obtain an indication of target movement using the doppler principle, a CW radar receiver would most likely employ a:
Discriminator, tuned to the IF.

In video amplifiers, compensation for the input and output stage capacitances must be accomplished to prevent distorting the video pulses. This compensation is normally accomplished by:
Connecting an inductor in series with the input capacitance and an inductor in parallel with the output capacitance.

The TWT (traveling wave tube) is:
A microwave amplifier tube.

When you examine the RADAR you notice that there is no target video in the center of the CRT. The blank spot gets smaller in diameter as you increase the range scale. What operator front panel control could be misadjusted?
Sensitivity Time Control (STC}.

Targets displayed on the radar display are not on the same bearing as their visual bearing. What should you first suspect?
Incorrect antenna position information.

In a radar unit, if the crystal mixer becomes defective, replace the:
The crystal and the TR tube.

One radar mile is how many microseconds?
12.34.

For a range of 100 nautical miles, the radar pulse repetition frequency should be:
810 Hz or less.

Radar range is measured by the constant:
150 meters per microsecond.

The high gain IF amplifiers in a radar receiver may amplify a 2 microvolt input signal to an output level of 2 volts. This amount of amplification represents a gain of:
120 db.

Marine radar is dependent upon antenna beamwidth for:
Bearing resolution.

What is the purpose or function of the RADAR duplexer/circulator?
An electronic switch that allows the use of one antenna for both transmission and reception.

RADAR range is measured by the constant:
150 meters per microsecond.

For a range of 5 nautical miles, the RADAR pulse repetition frequency should be:
16.2 kHz or less.

Which is typical current for a silicon crystal used in a RADAR mixer or detector circuit?
3 mA

Which of the following statements about most modern RADAR transmitter power supplies is false?
High voltage supplies may produce voltages in excess of 5,000 volts AC.

The pulse developed by the modulator may have an amplitude greater than the supply voltage. This is possible by:
Employing a resonant charging choke.

A keep-alive voltage is applied to:
The TR tube.

RADAR receivers are similar to:
Microwave receivers.

Overcoupling in a RADAR receiver will cause?
Oscillations.

A RADAR transmitter is operating on 3.0 GHz and the reflex klystron local oscillator, operating at 3.060 GHz, develops a 60 MHz IF. If the magnetron drifts higher in frequency, the AFC system must cause the klystron repeller plate to become:
More negative.

Noise can appear on the LCD as _____.
Erratic video and sharp changes in intensity.

What are the usual input signals to the video amplifier?
Low level video.
Fixed range rings.
Variable range rings.
All of the above.

What is the distance between range markers if the controlling oscillator is operating at 20 kHz?
4 nautical miles.

The term DRAM stands for:
Dynamic random access memory.

The heading flash is a momentary intensification of the sweep line on the PPI presentation. Its function is to:
Inform the operator of the dead-ahead position on the PPI scope.

Standing waves on a transmission line may be an indication that:
Some of the energy is not absorbed by the load.

A right-angle bend in an X-band waveguide must have a radius greater than:
Two inches.

Silicon crystals are used in RADAR mixer and detector stages. Using an ohmmeter, how might a crystal be checked to determine if it is functional?
Its resistance should be low in one direction and high in the opposite direction.

A non-magnetic screwdriver should always be used when replacing what component?
Magnetron.

Energy travels down a section of transmission line at a rate of T=ûLC. If a section of line has 100 microhenries of inductance and 1,000 picofarads of capacitance, how long will it take the leading edge of a pulse to travel the length of the line?
316 nanoseconds.
See REF2564

Good bearing resolution largely depends upon:
A narrow antenna beam in the horizontal plane.

On what frequency is radar expected to cause interference?
On most any communications frequency.

Practical radar operation requires the use of microwave frequencies so that:
Stronger target echoes will be produced.

The major advantage of digitally processing a radar signal is:
Enhancement of weak target returns.

Raster-scan displays are frequently used in the newer and the more sophisticated radars. These displays are most like those found in:
Television sets.

In the receive mode, frequency conversion is generally accomplished by a:
Crystal diode.

A negative voltage is commonly applied to the magnetron cathode rather than a positive voltage to the magnetron anode because:
The anode can be operated at ground potential for safety reasons.

When comparing TTL and CMOS logic families, which of the following is true:
At higher operating frequencies, CMOS circuits consume almost as much power as TTL circuits.

The input signal to a TWT is inserted at:
The cathode end of the helix.

When you examine the RADAR you notice that there is no target video in the center of the CRT. The blank spot gets smaller in diameter as you increase the range scale. If all of the front panel controls are properly adjusted, what would be the most probable faulty circuit?
The TR (TRL) Cell.

Range rings on the PPI indicator are oval in shape. Which circuit would you suspect is faulty?
Sweep generation circuit.

Radar interference on a communications receiver appears as:
A steady tone.

If a target is 5 miles away, how long does it take for the radar echo to be received back at the antenna?
61.7 microseconds.

U.S. Regulations limit exposure to microwave energy to a power density of 5 mW/centimeters squared. What is the average energy density transmitted by a radar across a one square foot surface area with the following pulse parameters: 1000 pulses per second, 55 kilowatts peak power, and a 3 microsecond pulse width? (Assume all the RF is focused on the 1 square foot surface).
178 miliwatts/centimeters squared.

A Continuous Wave radar is frequency modulated with a 50 Hz sine wave. At the output of the receiver phase detector, a phase delay of 18 degrees is measured. This indicates a target range of:
150 kilometers.

Given a square wave with a frequency of 1,000 hertz to be converted to trigger pulses by an RC network, which combination of R and C will provide the sharpest pulses?
R = 51 kilohms, C = 0.001 microfarad.

The ferrite material in a circulator is used as a(an):
Phase shifter.

Resistive losses in a waveguide are very small because:
The inner surface of the waveguide is large.

If a target is 5 miles away, how long does it take for the RADAR echo to be received back at the antenna?
61.7 microseconds.

For a range of 100 nautical miles, the RADAR pulse repetition frequency should be:
810 Hz or less.

The purpose of the Pulse Forming Network is to:
Produce a pulse of the correct width.

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:
SCR's and Thyratrons.

A DC keep-alive potential:
Is applied to a TR tube to make it more sensitive and partially ionizes the gas in a TR tube.

What section of the receiving system sends signals to the display system?
Video amplifier.

The usual intermediate frequency of a shipboard RADAR unit is:
30 or 60 MHz.

RADAR interference on a communications receiver appears as:
A steady tone.

Which of the following would not normally be an input to the video amplifier?
Resolver signal.

What would be the frequency of a range ring marker oscillator generating range rings at intervals of 0.25 nautical miles?
322 kHz

How does the dual memory function reduce sea clutter?
Successive sweeps are digitized and compared. Only signals appearing in both sweeps are displayed.

The major advantage of digitally processing a RADAR signal is:
Enhancement of weak target returns.

What precautions should be taken with horizontal waveguide runs?
They should be sloped slightly downwards at the elbow and a small drain hole drilled in the elbow.

To insert RF energy into or extract RF energy from a waveguide, which of the following would not be used?
Coupling capacitance.

In a RADAR unit, if the crystal mixer becomes defective, replace the:
The crystal and the TR tube.

What kind of display would indicate water in the waveguide?
Large circular rings near the center.

Which wavelengths are standard for attenuation measurements in fiber optic cable?
850 nm
1300 nm
1550 nm
All of these.
See REF2565

Bearing resolution is:
The ability to distinguish two adjacent targets of equal distance.

If the magnetron is allowed to operate without the magnetic field in place:
It will quickly destroy itself from excessive current flow.

Short range radars would most likely transmit:
Narrow pulses at a fast rate.

In order to ensure that a practical filter is able to remove undesired components from the output of an analog to digital convertor, the sampling frequency should be:
Greater than two times the highest component of the sampled frequency.

Voltages used in CRT anode-circuits are in what range of value?
10-50 kV.

When the receiver employs an MTI circuit:
Only moving targets will be displayed.

Solid state microwave amplifier devices operating at C-Band and above are typically made from:
Gallium Arsenide.

When comparing a TTL and a CMOS NAND gate:
Both have active pull-up characteristics.

Which is typical current for a silicon crystal used in a radar mixer or detector circuit?
3 mA.

While examining the shipboard radar sets, you notice on a particular indicator that the video representing the pier is distorted closest to the center of the PPI. (The video appears to bend in a concave fashion.) This is a primary indication of what?
The waveguide compensation delay line needs adjusting.

On a vessel with two radars, one has a different range indication on a specific target than the other. How would you determine which radar is incorrect?
Check the sweep and timing circuits of both indicators for correct readings.

Radar interference to a communications receiver is eliminated by:
Properly grounding, bonding, and shielding all units.

Visible light is measured between:
100 and 1000 nanometers.

How long would it take for a radar pulse to travel to a target 10 nautical miles away and return to the radar receiver?
123.4 microseconds.

You are asked to determine if it is safe for maintenance personnel to work immediately in front of the antenna of an air traffic control SSR while it is operating. The radar transmits at a frequency of 1030 MHz with a peak power of 3 KW, a pulse width of 2.0 microseconds and a pulse repetition rate (PRR) of 250 Hz with an antenna whose dimensions are 1.5 meters high and 8.54 meters wide. What is the average power density immediately in front of the antenna?
.012 miliwatts/centimeters squared.

A Continuous Wave radar is frequency modulated with a 50 Hz sine wave. At the output of the receiver phase detector, a phase delay of 36 degrees is measured. This indicates a target range of:
300 kilometers.

What is the most common type of radar antenna used aboard commercial maritime vessels?
Slotted array.

A waveguide is used at radar microwave frequencies because:
It has lower transmission losses than other feedline types.

Choose the most correct statement containing the parameters which control the size of the target echo _____.
Transmitted power, antenna effective area, transmit and receive losses, RADAR cross section of the target, range to target.

How long would it take for a RADAR pulse to travel to a target 10 nautical miles away and return to the RADAR receiver?
123.4 microseconds.

The minimum range of a RADAR is determined by:
The transmitted pulse width.

The basic frequency determining element in a Gunn oscillator is:
The resonant cavity.

The purpose of the Synchronizer is to:
Generate a timing signal that establishes the pulse repetition rate.

The purpose of the pulse-forming network is to:
Determine the width of the modulating pulses.

What RADAR circuit determines the pulse repetition rate (PRR)?
Timer (synchronizer circuit).

What is the main difference between an analog and a digital receiver?
The presence of decision circuitry to distinguish between “on” and “off” signal levels.

The I.F. Amplifier bandwidth is:
Wide for short ranges and narrow for long ranges.

The STC circuit is used to:
Decrease sea return on a RADAR receiver.

In a RADAR receiver the most common types of interference are?
Weather and sea return.

The purpose of the sweep amplifier is to:
Drive the CRT deflection coils.

The variable range marker signal is normally fed to the input of the:
Video amplifier.

How many sequential memory cells with target returns are required to display the target?
2

In order to ensure that a practical filter is able to remove undesired components from the output of an analog-to-digital converter, the sampling frequency should be:
Greater than two times the highest component of the sampled frequency.

The position of the PPI scope sweep must indicate the position of the antenna. The sweep and antenna positions are frequently kept in synchronization by the use of:
Synchro systems.

The following is true concerning waveguides:
The magnetic field is strongest at the edges of the waveguide.

An increase in magnetron current that coincides with a decrease in power output is an indication of what?
The external magnet weakening.

Why is coaxial cable often used for S-band installations instead of a waveguide?
Losses can be kept reasonable at S-band frequencies and the installation cost is lower.

REF011
Flammable liquids give off flammable vapors at or below a temperature of 80°F. Within this class, there are three grades, based on their Reid Vapor Pressure and flash point. All liquids that burn may be grouped into these five grades. It is apparent that flammable liquids are those that may be ignited at temperatures below 80°F whereas the combustible liquids must be heated to above 80°F before they will flash. Class IA flammable liquids have a flash point below 73 °F (22.8 °C) (the upper end of the common range of room temperature) and a boiling point below 100 °F Class IB flammable liquids have a flash point below 73 °F (22.8 °C) and a boiling point greater than or equal to 100 °F (37.8 °C) Class IC flammable liquids have a flash point greater than or equal to 73 °F (22.8 °C) and below 100 °F (37.8 °C) Class II combustible liquids have a flash point greater than or equal to 100 °F (37.8 °C) and below 140 °F (60 °C) Class IIIA combustible liquids have a flash point greater than or equal to 140 °F (60 °C) and below 200 °F (93.3 °C) Class IIIB combustible liquids have a flash point greater than or equal to 200 °F (93.3 °C) Grade A refers to a flammable liquid with Reid vapor pressure of 14 pounds per square inch absolute (psia) or more. Think of a Grade A cargo as a very volatile liquid that gives off lots of vapor even at relatively low temperatures...so much vapor, in fact, that the vapor can build up considerable measurable pressure inside a closed test container. Grade B refers to a flammable liquid with a Reid vapor pressure of more than 814 pounds (psia) but less than 14 pounds Grade C refers to a flammable liquid with a Reid vapor pressure of 814 pounds (psia) or less and a flash point of 80°F or below. Gasoline with a Reid vapor pressure of 7.4 pounds (psia) and a flash point of -40°F is an example of a grade C cargo. Since gasoline's primary hazard is its flammability it is a Subchapter D cargo rather than a Subchapter O cargo where properties other than or in addition to flammability are regulated. Grade D refers to a combustible liquid with a flash point above 80°F, but below 150°F. One example is Diesel oil that is either a Grade D or a Grade E liquid depending upon its flash point, which can vary between 110°F and 190°F. Grade E refers to a combustible liquid with a flash point of 150°F or above. "Bunker C," or heavy industrial fuel oil, is an example of a Grade E liquid. Liquefied flammable gas (LFG): Any flammable gas with a Reid Vapor Pressure (RVP) above 40 pounds and that has been changed from a gas to a liquid state. 46 CFR 30.10-39. Liquefied natural gas (LNG): C■ and C■ hydrocarbons that can be liquefied either by refrigeration or by pressurization at ambient temperatures. Reid Vapor Pressure is the pressure exerted by the vapor of a liquid as determined by laboratory tests in a Reid Apparatus at a standard temperature of 100°F, expressed in pounds per square inch (absolute) (psia) according to standards established by the American Society for Testing Materials (ASTM). It is now government policy to accept meaningful civilian standards, such as this ASTM standard, wherever possible rather than to develop and enforce separate government standards.

REF2564
A nanosecond (ns) is one billionth of a second (10-9 s).

REF2565
In physics, attenuation (in some contexts also called extinction) is the gradual loss in intensity of any kind of flu through a medium. For instance, sunlight is attenuated by dark glasses, and -rays are attenuated by lead. In electrical engineering and telecommunications, attenuation affects the propagation of waves and signals in electrical circuits, in optical fibers, as well as in air (radio waves).

REF2566
microsecond is an SI unit of time equal to one millionth (10-6) of a second. Its symbol is µs.