SI-TEX®

MODEL T-100

MARINE RADAR

INSTALLATION-OPERATION MANUAL

JUNE 1985

INTENTIONALLY OMITTED PAGES

II,VIII,12,16

WARNING

High Voltage Hazard

Due to the presence of high voltages within the display and transmit/receive unit of this radar system, ship's power should be disconnected from the display unit before attempting any maintenance. Coming in contact with these high voltages can be fatal. Also, note that some portions of the CRT high voltage circuits can retain a high voltage charge even after removal of ship's power.

Radiation Hazard

Care should be taken to avoid possible harmful effects (particularly to the eyes) of radiation from radar transmissions. To avoid harmful radiation, the display OPERATE switch should be turned to the STANDBY or OFF position when working on the transmit/receive unit. Under no circumstances should you look directly into the antenna from a distance of less than 2 feet when the radar is in operation.

For a permanent record, please record your T-100 serial number and purchase information here:

SERIAL NO. _____

DATE PURCHASED _____

DATE INSTALLED _____

DEALER'S NAME _____

LOCATION _____

_____

_____

T-100 SPECIFICATIONS

1. General

1) Maximum range:	16 nautical miles
2) Minimum range:	Better than 75 ft. on 1/4 nm range
3) Range scale:	

Range	Range Ring Interval
1/4 nm	4 @ 1/16
1/2	4 @ 1/8
1	4 @ 1/4
2	4 @ 1/2
4	4 @ 1
8	4 @ 2
16	4 @ 4

4) Range discrimination:	Better than 72 ft.
5) Range ring accuracy:	Better than ± 2.5% or maximum range of the scale in use, or 22m, whichever is the greater.
6) Bearing accuracy:	Better than ± 0.5 degree
7) Cathode-ray tube:	9 inch tube, super dark, green, nonglare Effective diameter 5 inches
8) Environmental conditions:	
Scanner Unit	Temperature -15 degree C to +50 degree C Humidity up to 95% at 35 degree C Wind velocity 51.4 m/s as relative
Display Unit	Temperature -10 degree C to +50 degree C Humidity up to 95% at 35 degree C
9) Power requirements:	11-40VDC, Current 6A @ 12VDC 3A @ 24VDC 2A @ 32VDC

2. Display Unit

1) Dimensions:	Width: 13.4 inches (W/bracket and knobs) Depth: 12.5 inches Height: 9.4 inches W/bracket
2) Mounting:	Table, overhead or bulkhead
3) Weight:	Approx. 7.5 kg, 16.5 lbs.

4) Bearing synchronizing system:	Motor encoder
5) Tuning:	Manual
6) Bearing scale:	360 degree electronically graduated at intervals of 5 degree on the CRT display
7) EBL (Electronic Bearing Line)	Standard Feature
8) VRM (Variable Range Marker)	Standard Feature
9) Operating Controls	POWER (OFF-SB-ON), TUNE, STC, GAIN, FTC, BRILL, RANGE

. Scanner Unit

1) Dimensions:	Diameter of radome - below 24.2 inches Height - Below 13.5 inches
2) Weight:	Approx. 9.5kg, 20.9 lbs.
3) Polarization:	Horizontal
4) Beamwidth:	Horizontal 5 degree Vertical 25 degree
5) Sidelobes:	Better than -21dB
6) Rotation:	24 RPM
7) Transmitter frequency:	9410 $\pm$ 30MHz
8) Peak power output:	3kW
9) Magnetron:	9M302
10) Pulse Length/PRF:	0.08uS/820Hz (0.25-2nm) 0.5/820Hz
11) Modulator:	Solid-state modulator
12) Duplexer:	Circulator
13) Crystal Protector:	Diode limiter
14) IF Amplifier	Center freq. 60 MHz $\pm$ 5MHz Bandwidth 6MHz $\pm$ 1MHz

CONTENTS

ILLUSTRATIONS

GENERAL DESCRIPTION

A highly efficient solid state marine radar system particularly suited for use as a primary radar on workboats, tugboats, harbor craft, fishing vessels and pleasure craft. The Type 100 radar was designed for exceptional reliability and operating performance with relatively low power drain. The complete system consists of a display unit with automatic voltage regulator, antenna and transceiver unit with slotted waveguide antenna.

The system is divided into two main units:

1. Display unit (with automatic voltage regulator).

2. Antenna or T/R unit (antenna and transceiver unit).

1. Display Unit

The display unit has a 9" CRT in a compact housing that can be mounted in an overhead, bulkhead or table top configuration. The main controls are conveniently located on the front panel with EBL (Electronic Bearing Line) and VRM (Variable Range Marker) as standard features.

2. Antenna (T/R) Unit

The T/R unit is comprised of the antenna and transceiver which are housed in the radome. The construction is light and compact to provide for ease of installation and maintenance, yet strong to survive the harshest environment.

3. Equipment Supplied

1.	Antenna Unit (MRT-119)	1 ea.
2.	Display Unit (MRD-47)	1 ea.
3.	Accessories	
	a. Sun Visor (MD-30015)	1 ea.
	b. Installation-Operation Manual	1 ea.
4.	Spare Parts Kit	
	a. Fuse - 5A	2 ea.
	b. Fuse - 3A	2 ea.
5.	Installation Kit	
	a. Bolt (Hex Head) B10 X 40mm (with plane washer, spring washer and nut)	4 sets
	b. Wood screw M8 X 50mm	5 ea.
	c. Quick disconnect clips (1700382)	20 ea.

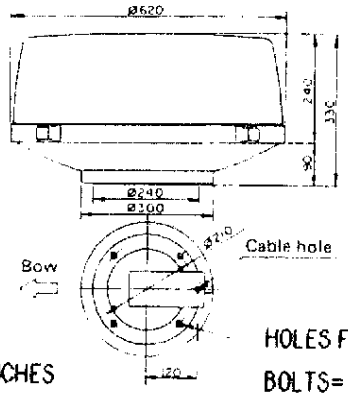
6. Cable with Connector 8 meters

7. Power Cable 1.8 meters

Outline and dimensions

a. Antenna unit

CONVERTED
ANTENNA DIMENSIONS
620MM=24.2 INCHES
240MM= 9.4 INCHES
90MM= 3.5 INCHES
330MM=12.9 INCHES
300MM=11.7 INCHES
210MM= 8.2 INCHES
120MM= 4.7 INCHES

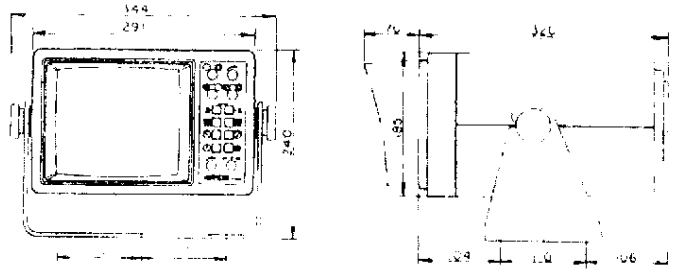


MAXIMUM MOUNTING PLATE THICKNESS=9/16 INCHES

HOLES FOR MOUNTING
BOLTS=10MM (0.4 INCHES)

b. Display unit

CONVERTED
DISPLAY UNIT DIMENSIONS
344MM=13.4 INCHES
290MM=11.3 INCHES
240MM= 9.4 INCHES
110MM= 4.3 INCHES
500MM=19.5 INCHES
185MM= 7.2 INCHES
70MM= 2.7 INCHES
104MM= 4.0 INCHES
106MM= 4.1 INCHES
320MM=12.5 INCHES
420MM=16.4 INCHES



Mounting dimensions

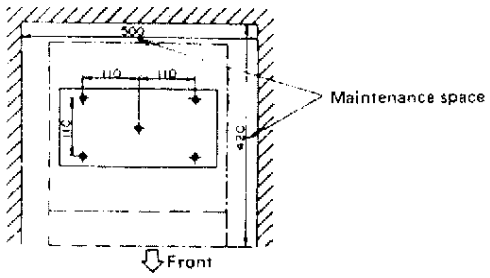


Figure 1. The dimensions given are in millimeters.
To convert to inches multiply by .039.

INSTALLATION

1. Unpacking

As you unpack the Type 100 radar, inspect the contents to verify that the equipment listed in section one "Equipment Supplied" is there. Remove all items from the shipping container and check for physical damage.

2. Antenna (T/R) Unit Inspection

After unpacking, loosen the four (4) bolts that fasten the radar dome to the base. Inspect the internal parts for physical damage. There should be no loose plugs or connectors within the T/R unit nor should there be any loose nuts, bolts or screws.

3. Display Unit Inspection

After the T/R unit inspection, remove the 6 screws securing the top cover (one each side, 4 on upper rear panel). Check for loose parts and make sure the main circuit PCBs have not been jarred loose or have come partially unplugged. Once the inspection is completed, install the cover to prepare for installation.

4. Installation of the Display Unit

a. Select a convenient location that allows easy access for maintenance and adjustment. Also of prime importance is visibility. The mounting bracket provided, allows the unit to be mounted in an overhead, bulkhead or table top configuration.

b. Place the unit in a location protected from rain and sea water.

- NOTE -

Water damage is excluded from the provisions of the warranty.

c. Avoid placing the radar display close to other radio equipment. Also, it must be at least 2 feet from a magnetic compass.

d. Use the mounting bracket to mark the holes to be drilled for the mounting bracket screws. Once the bracket is installed, the display unit can be attached to the mounting bracket with the supplied mounting knobs. Then the tilt of the display unit can be adjusted for maximum visibility.

e. Connect the power cable to ship's power, paying close attention to polarity. The red wire at the end of the cable is tied to the (+) or positive side of the ship's power. The blue wire at the end of the cable is tied to the (-) or negative side. The power cable shielding, which looks like an uninsulated wire at the end of the power cable, should be connected to ship's ground to help eliminate or prevent R.F. interference from riding in on the power cable.

The power cable can be plugged into the unit only one way, so care must be taken not to force the power plug into the socket. The power cable shielding at the plug end should be connected to the ground post next to the power plug on the rear panel of the display unit. Do not connect the power until all wiring is completed.

5. Antenna (T/R) Unit Installation

a. Select a location as free of surrounding obstacles as possible. However, if installing near an obstruction cannot be avoided, place the T/R unit on the bow side of the obstacle. Also, it should be installed as close to the center line of the vessel as possible.

b. The T/R unit should be installed in as high a location as possible. Higher locations increase the range of the radar, keeping in mind that higher locations also look over nearby objects. The T/R unit height and range table will help you choose the best height when the installation is flexible.

c. Once the location is selected, the cable between the display unit and T/R unit should be run. Remember, the plug end is attached to the display unit. Route the cable up to the T/R unit location. Then prepare the mounting location by drilling four holes to allow for attaching the T/R unit to the mounting location using the 4 hex head B10 X 40mm bolts. Feed the free cable end into the large hole on the bottom of the T/R unit prior to fastening the antenna unit to it's location. Then secure the T/R unit in it's mounting location. When inserting the cable thru the base of the T/R unit, the binding (found on the inside of the T/R unit near the antenna drive motor) and rubber packing must be removed first.

   The installer should be aware that on the top of the dome and in the base of the T/R unit are triangles ▲ or arrows indicating the front of the unit so that the heading line can be pointed at the bow of the vessel.

d. After the base of the T/R unit is installed, the cable must be prepared. First, insert the cable thru the rubber packing (mentioned in the previous paragraphs). Next, remove approximately 8 inches of the outside cable sheath from the end. Then cut off 7 inches of the braided shield surrounding the bundle of wiring. Spread out the remaining shielding

   then insert the wire bundle thru the binding plate. Resecure the binding plate to the T/R unit clamping the spread out braided shield between the binding plate and T/R unit chassis. This will assure a proper grounding of the cable shield to prevent the radiation of R.F. interference signals.

e. Separate the wire and cable ends in the wire bundle. The one coaxial cable should have 1.25 inches of the sheath removed and the shield should be separated from the center lead. Next, remove 1/4 inch of insulation from the end of the coaxial center lead and all of the remaining wires in the wire bundle. Using a crimping tool, attach the quick disconnect clips to the coaxial center lead and shield and all the wires in the bundle. Once the quick disconnect clips are installed, use the following table and the connector label inside the T/R unit to determine which tab to insert the clips onto. If not installed properly damage can result to the T/R and Display units.

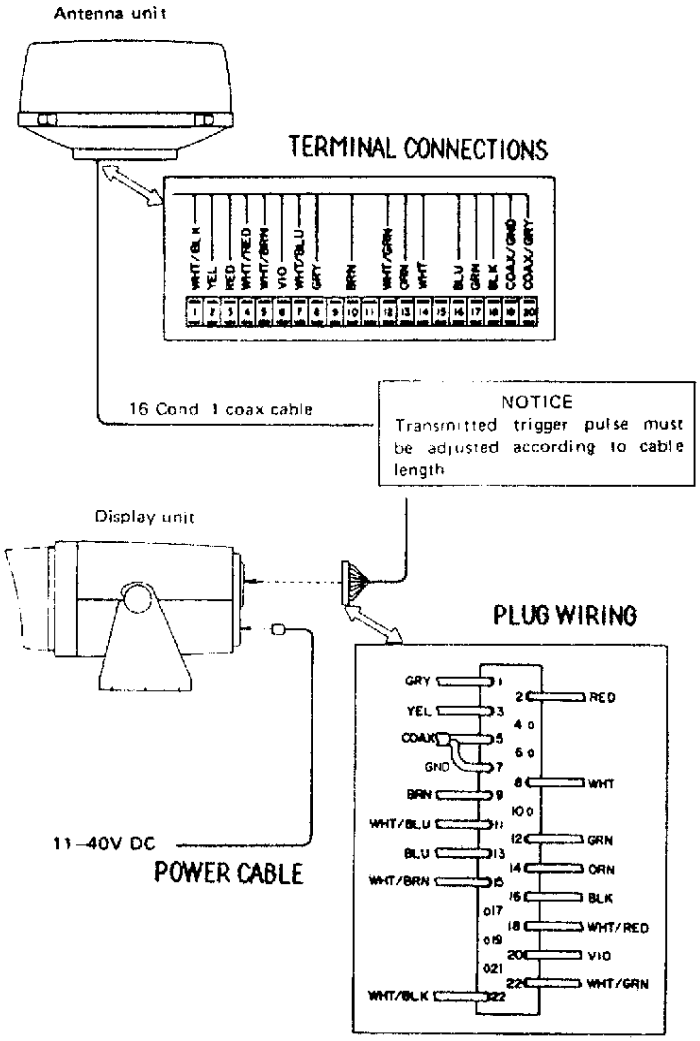


Figure 2. Cable Interconnection diagram.
See Appendix A.

Tab #	Wire Color
1	White/Black
2	Yellow
3	Red
4	White/Red
5	White/Brown
6	Violet
7	White/Blue
8	Gray
9	No connection
10	Brown
11	No connection
12	White/Green
13	Orange
14	White
15	No connection
16	Blue
17	Green
18	Black
19	Coax/Ground (shield)
20	Coax/Gray

f. Before re-installing the radar dome, the heading line adjustment must be checked for proper alignment. To do this, go to the display unit and turn the OFF/SB/ON switch to SB (Standby) and allow the three minute timer to time out before turning the unit to ON. After time out, place the switch in the "ON" position and adjust the controls for a normal display. The vessel should be maneuvered so a known target is on a direct line with the center line of the vessel. Next, check to see if the target is on the ship's heading flash. If it is, then turn off the radar and re-install the radar dome. If it is not, estimate how many degrees of rotation the target lies to the right/left of the SHF. Turn the radar off and locate the SHF interrupter on the starboard side of the radar, just beneath the antenna, near the drive belt. The interrupter PCB is labeled T100-0200M1 and has two screws that should be loosened slightly. If the target is offset to the left of the SHF, move the interrupter forward. If the target is offset to the right of the SHF, move the interrupter back. The scale on the interrupter PCB is marked off in degrees. Maximum adjustment is ± 5 degrees. Once the SHF adjustment is complete, re-install the dome.

ADJUSTMENT

Although the radar when delivered has been adjusted at the factory for optimum performance, it may be necessary to make adjustments after installation in a case where the cable has been lengthened or made shorter. The main items that would need adjustment are:

1. Tune Meter
2. Trigger Delay
3. Threshold Level

These adjustments must be done by an FCC licensed technician.

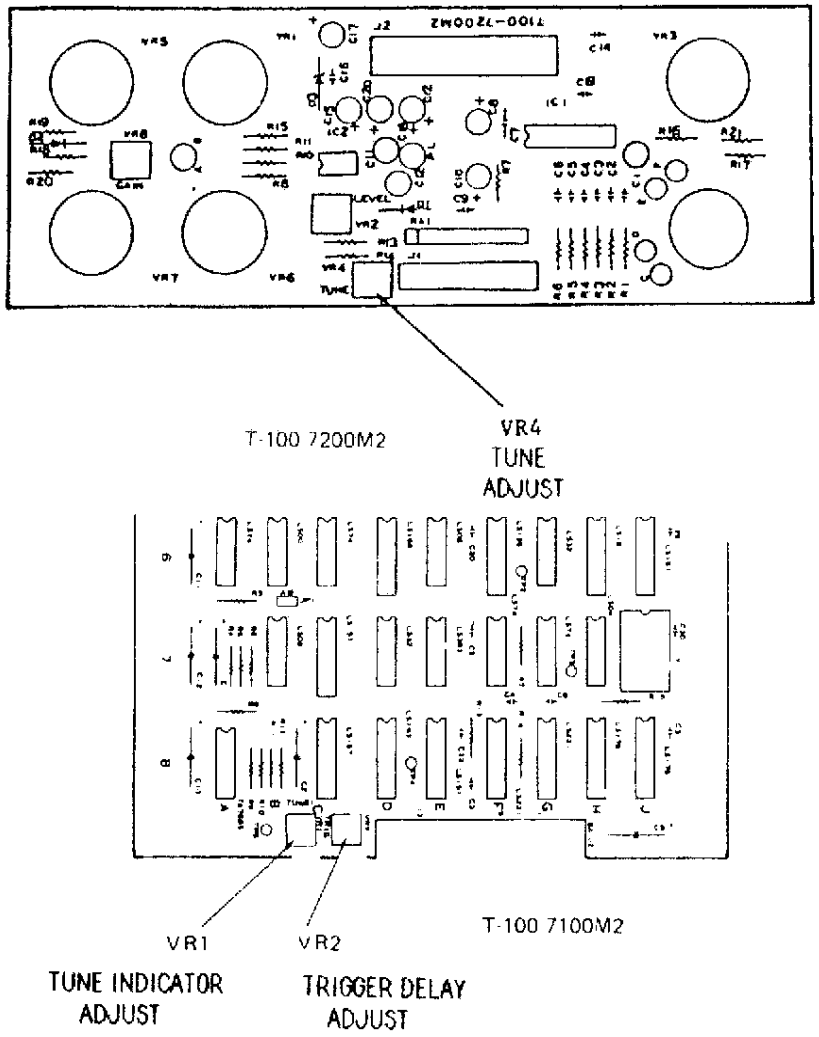


Figure 3. VR1, VR2 and VR4 PCB locations.

1. Tune Meter To adjust the tune meter, open the display unit case and locate PCB (Printed Circuit Board) T-100-7200M2. This is the circuit board directly behind the front control panel. Locate the potentiometer VR4. With the radar operating, do the following:

    a. Set the front panel tune control to center position.

    b. Set the range selector to 16 nautical miles.

    c. Adjust VR4 for the best target display.

    d. Locate VR1 on main circuit PCB labeled T-100-7100M2. This PCB is the one visible from the right side of the display. VR1 is at the control panel end of the circuit board.

    e. Adjust VR1 so that 4 bars are displayed on the CRT meter display in the lower right side of the CRT.

2. Trigger Delay Locate VR2 on PCB T-100-7100M2 (near previously located VR1)

    a. Set radar range to 1/4 nautical miles.

    b. Turn STC control fully counter clockwise.

    c. Adjust VR2 until the hole in the center spot just disappears.

3. Threshold Level Locate VR2 on the PCB labeled T-100-7200M2. This is the circuit board directly behind the front control panel. To make this adjustment, place the unit into operation and do the following:

    a. Set the gain control on the front panel fully clockwise.

    b. Set the STC control on the front panel fully counter clockwise.

    c. Set the range selector to 16 nautical miles.

    d. Adjust VR2 until some noise is displayed on the CRT.

    e. Set STC control fully clockwise. If VR2 is adjusted properly, the inner half of the scale arc should have no noise displayed.

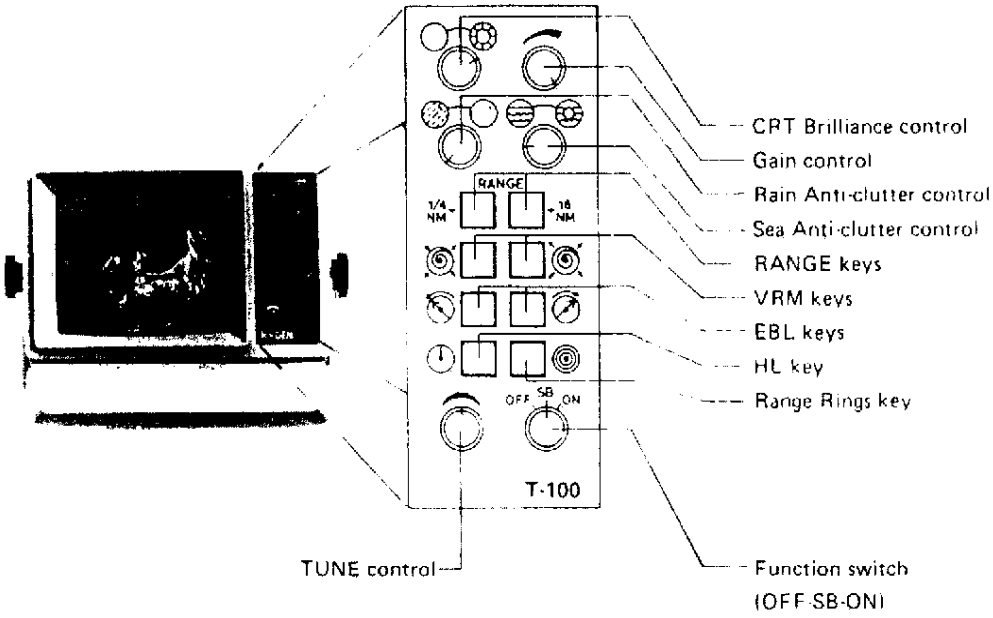
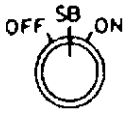


Figure 4. Control panel layout.

CONTROL FUNCTIONS



1. Function Switch (OFF-SB-ON)

This is the ON-OFF switch with a center position SB(Standby). The function of each position of the switch is as follows:

a. OFF - Removes power from the display and antenna units.

b. SB - Standby mode. Power is supplied to the antenna and display units. Preheating of the magnetron begins and lasts for 150 seconds. During magnetron preheat, the heading line is displayed. After the preheat time-out has been completed, the scale is then displayed on the CRT. While the function switch is in the SB position, the antenna is rotating, but not transmitting.

c. ON - Position for normal operation of the radar. If the function switch is placed in the ON position before the magnetron preheating is complete (150 seconds), the radar will not display the scale or transmit any microwave energy until the preheat process is complete.

2. Range Select Switch

Selects the desired operating range for the CRT display. Left side switch, when pressed, steps the ranges down and the right side switch steps thru the ranges, increasing the range displayed with each step. Maximum range is 16 nautical miles and the minimum range is 1/4 nuatical miles. The table below lists the ranges and gives the data for each range.

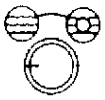
Range (NM)	Range Ring Interval (NM)	Number of Rings	Pulse Length (Microseconds)
1/4	1/16	4	0.08
1/2	1/8	4	0.08
1	1/4	4	0.08
2	1/2	4	0.08
4	1	4	0.5
8	2	4	0.5
16	4	4	0.5

3. Tune Control

Tunes the receiver circuit in the antenna unit for best target image.

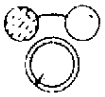
4. Gain Control

Controls the sensitivity of the radar receiver. Adjusted to acquire best target image with the least amount of noise.



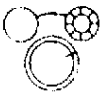
5. Sea Anti-Clutter Control - STC

Also known as the STC Control, this control is used to reduce sea clutter which could otherwise obscure close range targets in moderate to heavy seas.



6. Rain Anti-Clutter Control - FTC

Also known as the FTC Control, this control is used to improve target visibility in rain.



7. CRT Brilliance Control

Sets the overall brightness level of the CRT display.

8. H.L. (Heading Line) Switch

Removes the heading line from the CRT display while this switch is pressed.

9. Range Rings Switch

Turns the range rings on the CRT display on or off with each press of this switch.

10. EBL (Electronic Bearing Line) Switches

Pressing either EBL switch activates the Electronic Bearing Line. Pressing the left switch rotates the bearing line counter clockwise. Pressing the right EBL switch rotates the bearing line clockwise. The EBL information is displayed in the upper left corner of the CRT display.

11. VRM (Variable Range Marker) Switch

Pressing either VRM switch activates the VRM display on the CRT. Pressing the right VRM switch moves the VRM out from the center. Pressing the left VRM switch moves the marker circle in toward the center of the display. The VRM data is displayed in the upper left side of the CRT display.

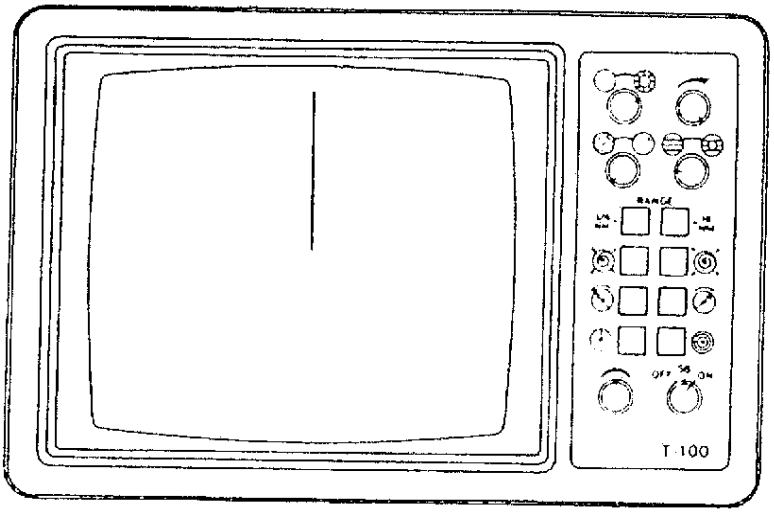


Figure 5. Radar CRT Display during Magnetron preheat time.

BASIC OPERATING PROCEDURES

Power On

a) Set the function switch to SB (standby). This starts the magnetron preheat timer. The preheat time lasts 150 seconds.

b) Set the following controls to the specified positions for power up.

CRT Brilliance	full clockwise
Gain	full counter-clockwise
Rain Anti-Clutter	off
Sea Anti-Clutter	off

During the magnetron preheat period, the CRT will only display the SHF (Ship's Heading Flash) line.

c) When the scale is displayed on the CRT, the preheat time is complete. Set the range to 4 nautical miles.

d) Turn the function switch from SB to the ON position.

e) Turn down the CRT brilliance control until the scale is just visible on the display.

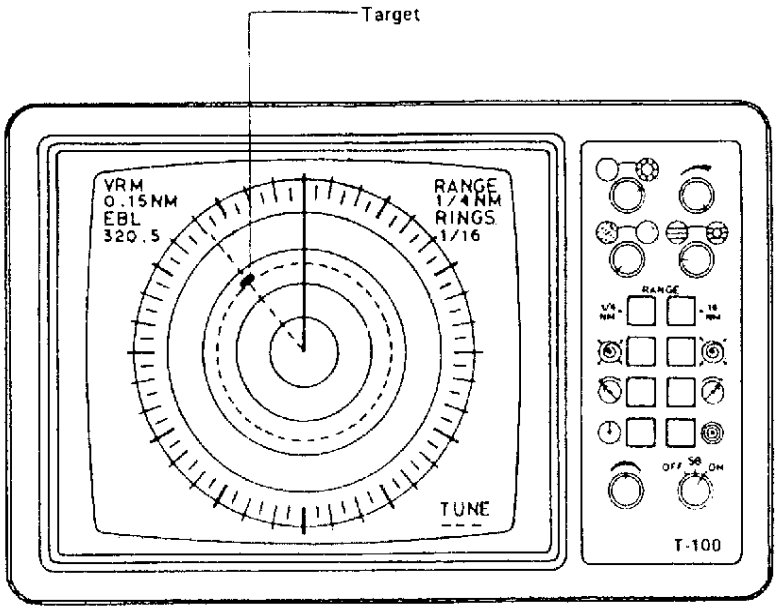


Figure 6. Active Radar CRTDisplay showing a target at .15 nautical miles.

f) Adjust the gain control up until a fine speckling of noise is visible on the CRT display.

g) Check the radar tuning by watching the tune indicator located on the lower right side of the CRT display. Slowly turn the tune control back and forth to locate the area that produces the most tuning bars. Then set the tune control to the center of this area.

2. Power Off

a) Set the function switch to:

SB - If the radar will be needed again, without having to wait for the preheat time to elapse.

OFF - If the radar will not be used for an extended period.

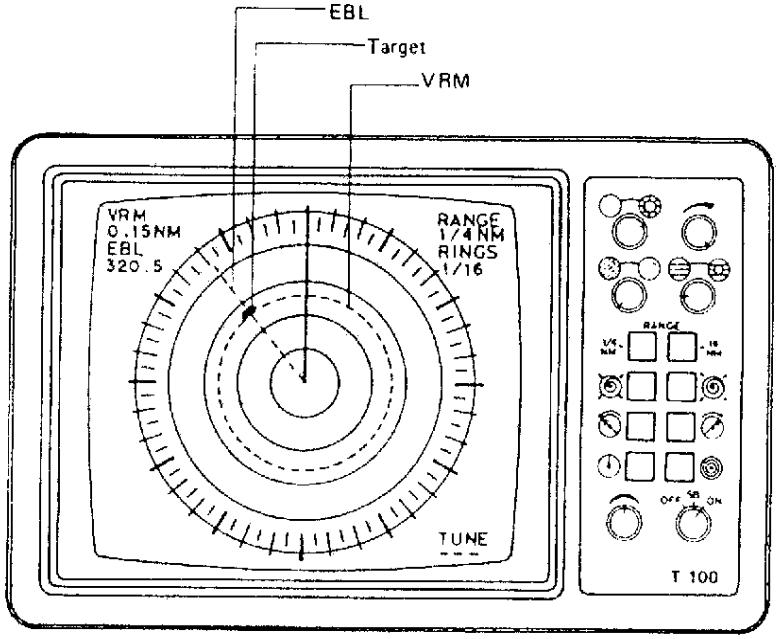


Figure 7. Radar display with VRM and EBL Data displayed in the upper left corner of the CRT.

RANGE AND BEARING MEASUREMENTS

1. Range Measurement

a) Select a range that displays the target to be measured.

b) To estimate the distance to a target, use the range rings provided on the display. The distance between the range rings is displayed in the upper right side of the CRT display labeled as RINGS.

c) For a more precise measurement, activate the VRM by pressing the right VRM switch. Do this until the VRM ring just touches the inside of the target.

d) Read the distance in nautical miles in the upper left corner of the CRT display.

2. Bearing Measurement

a) Activate the EBL line by pressing either EBL switch, continuing to press either switch until the electronic bearing line lies over the center of the target.

b) Read the bearing to the target displayed in the upper left corner of the CRT in degrees.

The following section gives general data that will help the radar user understand and interpret the images displayed on the radar CRT display.

1. Target Discrimination

Target discrimination is the ability to differentiate between targets and images on the radar CRT. This includes real and false images. The positional information of a target presented by the radar is affected and changed by many things. They are changes in location, weather and operating skill of the operator. A major consideration when interpreting a target is the size, shape and the material the target is made of. As the operator gains experience, he or she will become better at judging these bits of information correctly.

2. Bending of Radar Microwaves

The radio waves emitted by the radar are called microwaves. The transmitted radar microwaves are bent slightly as they travel along the earth's surface. This characteristic changes according to the atmospheric density of the air.

D (visible distance)= 2.22 ($\sqrt{h_1}$ + $\sqrt{h_2}$) miles

h_1: Antenna height (meters)

h_2: Target height (meters)

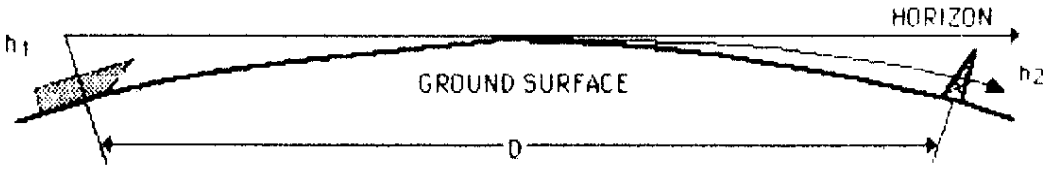


Figure 8. Transmission of Radar Microwaves.

This allows the radar to see approximately 6% further than by visual line of sight. All of this is relative to the antenna height and height of the target.

3. Super Refraction

From time to time, weather conditions can create an air duct that will conduct microwave transmissions for greater distances than would normally be attainable. This ducting of the radar microwave signal is called super refraction. Also, under certain weather conditions, the propagation of radar microwave signals can be reduced significantly. This is known as sub-refraction.

4. Reflection Intensity and Incident Angle

The intensity of reflected radar microwaves (target echoes) is related to the heights and density of the target. Also, the type material the target is made from and the shape of the target, affect the strength of the returning signal. Therefore, the reflected signal from a target that is high and large may not be as strong as expected. A low target can also return a signal that is as strong when its surface is perpendicular to the transmitted radar waves. The strength of the reflected radar microwaves are extremely reduced when the incident angle of the radar signal to the target is very small. For example, the signal reflected back from areas like a sand beach, a sandbar, a muddy sandbank and even a conical lighthouse are normally very weak and are not displayed as clear images. Therefore, these types of targets should not be used for the measurement of distance because of the error that they may introduce.

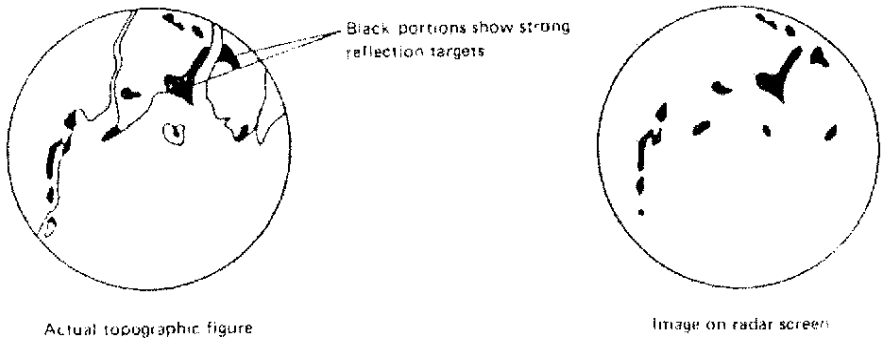


Figure 9. Example of Topography versus the Radar image.

It should be noted that areas such as beaches with small hills or mountains, appear as coastline having no depth, while a peninsula with a high mountain at the tip will present a radar image similar to that of an island.

5. Minimum Detectable Range

The minimum detectable range is determined by the antenna height, the dead angle of the transmitted radar microwaves and the transmitting pulse width. If a target is within the minimum detectable range, the radar signal will pass over the target and not be reflected and therefore will not produce an image on the CRT.

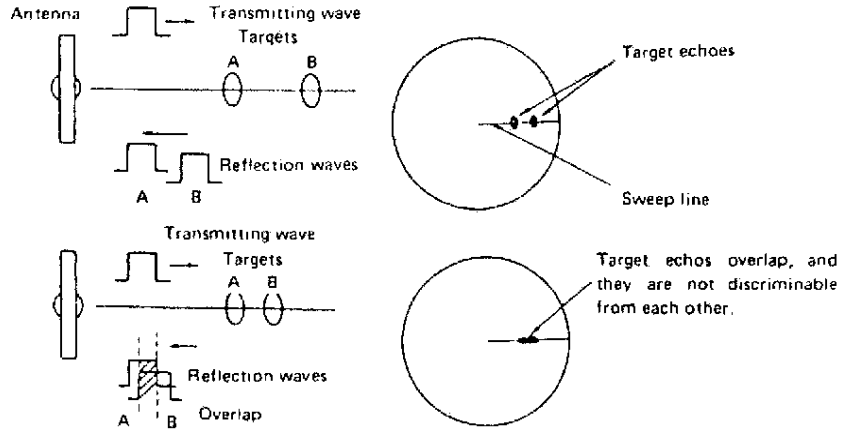


Figure 10. Range Resolution.

6. Range Resolution

The range resolution is the minimum distance between two images on the same bearing that will produce two separate images. This is determined by the pulse width of the transmitted signal.

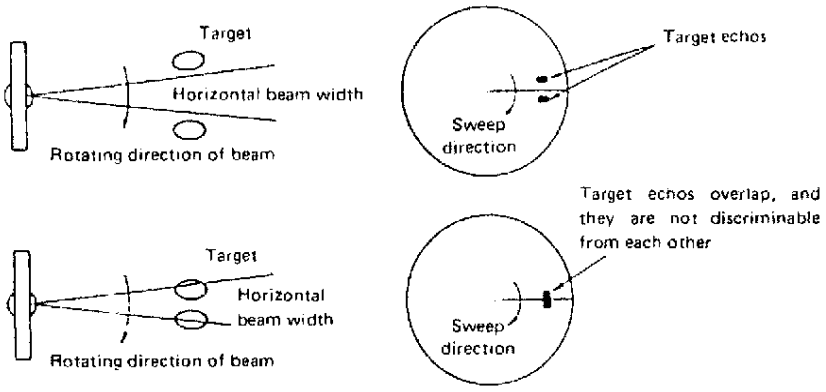


Figure 11. Bearing Resolution.

7. Bearing Resolution

Bearing resolution is the minimum bearing difference between two targets at the same range that will produce two separate images on the radar CRT display. This minimum bearing difference is determined by the radar antenna's horizontal beam width.

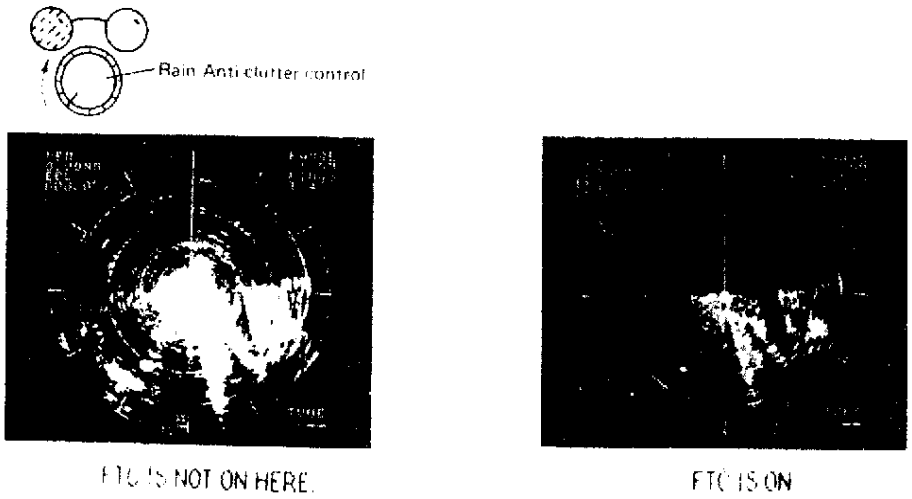


Figure 12. FTC Control Example.

8. The Effect of Rain, Snow, Fog and Clouds on Radar Images

The strength of the reflected signal from rain, snow, fog and clouds can be unexpectedly strong and usually appears as a foggy or cloudy image on the radar CRT display. The effects of these weather conditions can be reduced by using the FTC or Rain Anti-Clutter Control. The effect of the FTC control is increased by turning the control knob clockwise. It is important to remember that FTC does cause a slight reduction in sensitivity.

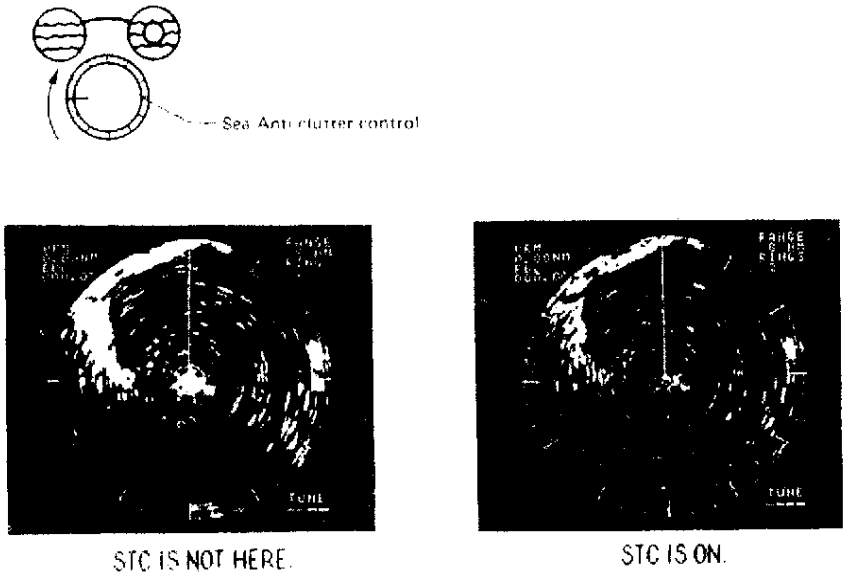


Figure 13. STC Control Example.

9. The Effect of Sea Clutter on Radar Images

Rough seas will produce images on the radar CRT display. This return is from the wave activity and is usually more noticeable on the lee side of the vessel. The amount of sea return is proportional to the height of the waves. However, almost all of this can be eliminated by using the STC or Sea Anti-Clutter Control. Turning the STC control clockwise increases the amount of STC. It is important not to use any more STC than is necessary.

10. Radar Interference

Radar units nearby, operating on the same frequency, will interfere with the radar CRT images. Interference from other radars is distinctive and easily identified by the lines produced on the CRT display. They can appear as straight line spoking, spirals or dotted lines that are straight or spiral. The pattern changes with each new sweep or rotation of the radar antenna.

11. False and Missing Images

There may be instances when there are images on the CRT display that have no corresponding vessel or target. Also, there may be times when a target may not be displayed on the radar display. Knowing the causes of these phenomena is instrumental in selecting a location for the radar T/R unit. A carefully selected T/R unit location can help avoid some of these problems.

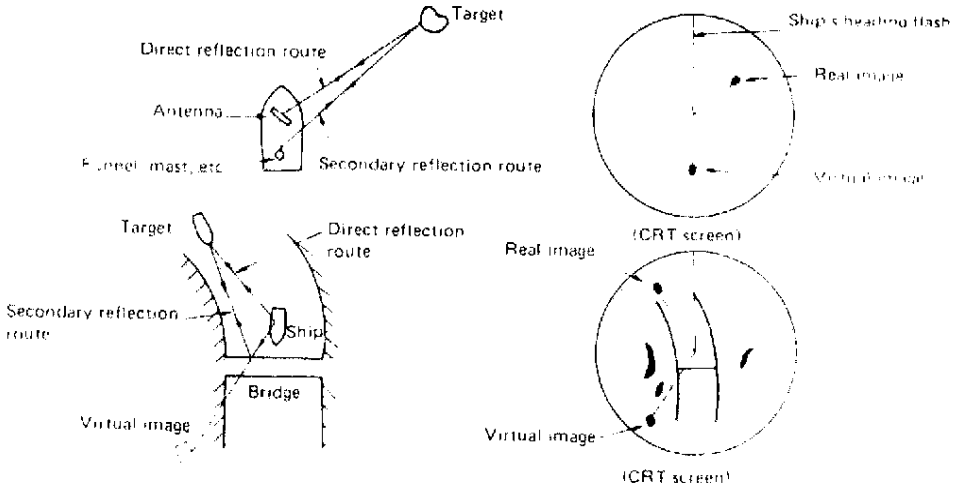


Figure 14. False Images.

12. False Images

A false image is the image of a target that is duplicated at a different bearing. This duplicate image may be the result of the T/R unit being installed near a mast, funnel or large structure on board the vessel that readily reflects the radar microwave transmissions. These false images will be at the same distance as the real image but will have a bearing that will lie in the directing of the ship board obstruction.

This type of false image can also be produced temporarily when the vessel is near an iron bridge or similar structure.

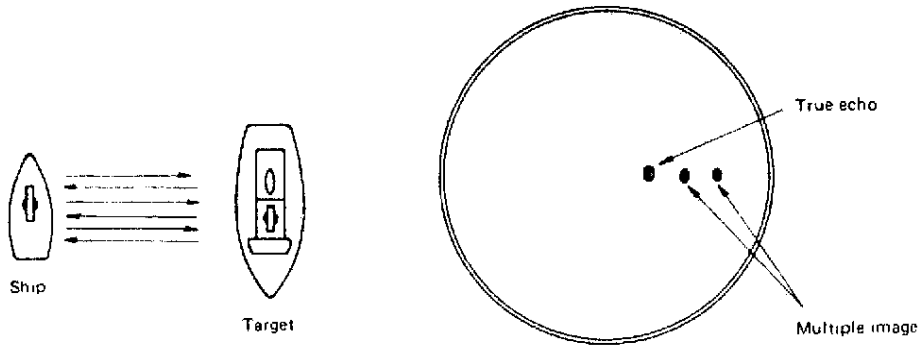


Figure 15. Multiple Images.

13. Multiple Images

A problem related to false images is multiple images. This is a temporary situation caused when two vessels pass close to each other. The radar signal may be reflected between the two ships more than once. This will produce more than one radar image of the target vessel at different distances. All images of that target vessel will lie on the same bearing with real image being the closest image of the target vessel. This phenomenon will disappear if the vessels move farther apart or the angle of one ship to the other changes. In any case, the true image is easily identified.

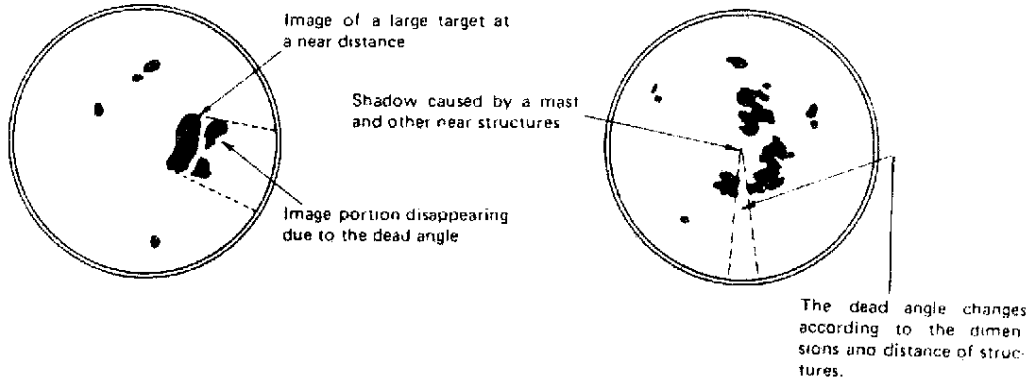


Figure 16. Shadow and Dead Angle.

14. Shadow or Dead Angle

This problem can and should be avoided by careful consideration of the T/R unit mounting location prior to installation.

Shadow or dead angle is that area in the radar CRT display that produces no targets or images as the result of the mounting of the T/R unit near a funnel, mast or other object that will obstruct radar microwave transmissions.

This causes a shadow, sometimes totally blocking out a particular section of the radar CRT display. This obstructed section is called the dead angle. Also, large targets can have a similar effect on the areas behind them.

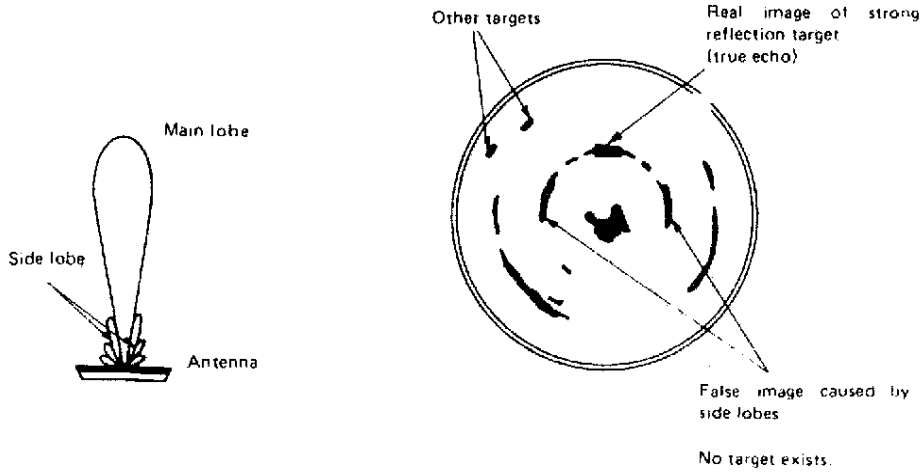


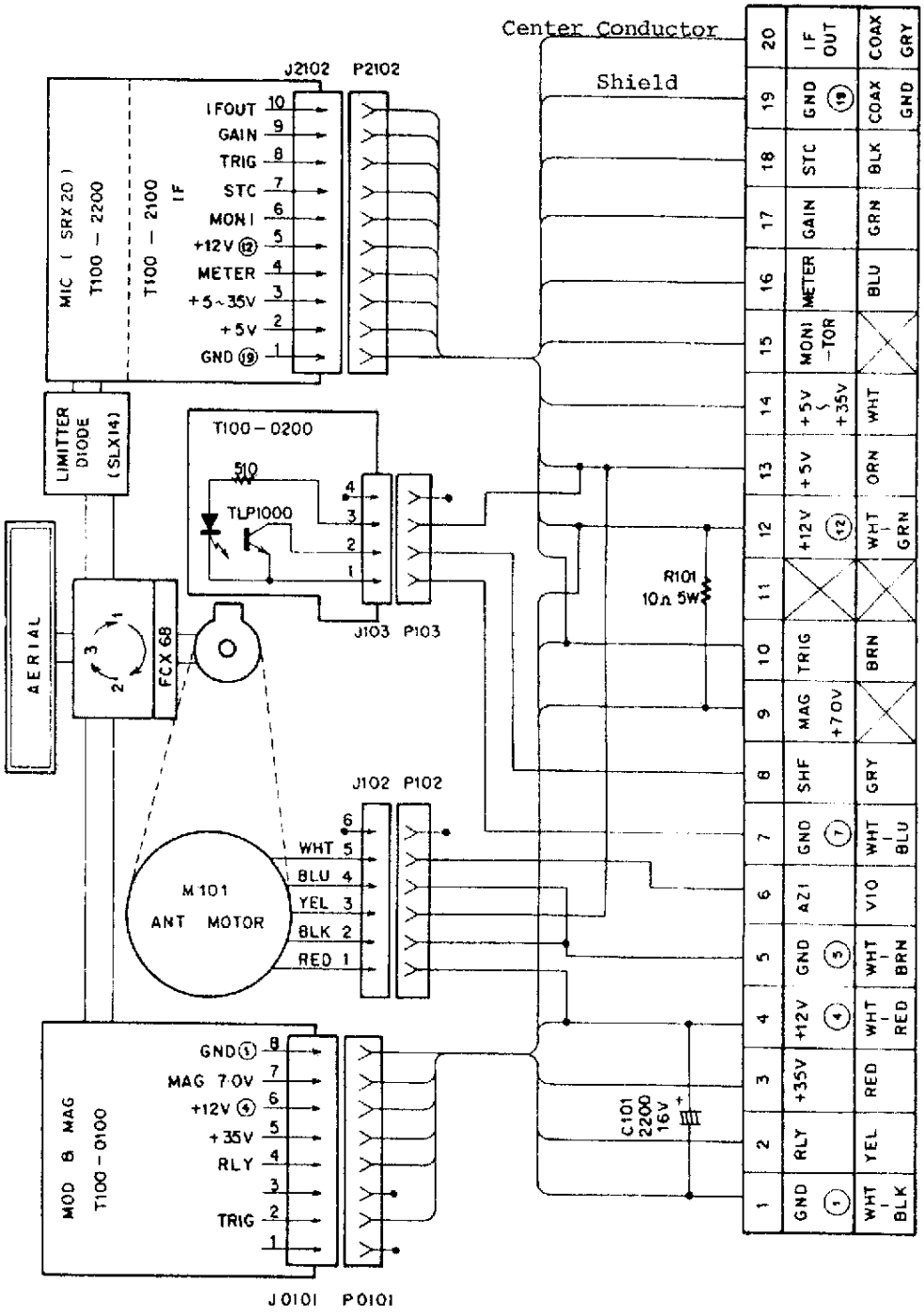
Figure 17. False Images caused by side lobes.

15. False Images Caused by Side Lobes

The signal transmitted by the radar antenna consists of a main lobe and additional side lobes. Normally, the output level of the signal produced by the side lobes is very low and has no effect on the radar CRT display. However, in some cases, when the target is nearby and produces a very strong return, false images can be produced from this side lobe signal. These false images appear as arcs or elongated targets that are curved. This can be eliminated by slightly reducing the sensitivity of the receiver or by using the STC or Sea Anti-Clutter Control.

APPENDIX A

Connection diagram of the Antenna unit DWG. NO. T100-J. E001



APPENDIX B

		Antenna Height Above Sea Level (Meters)				
		5	10	15	20	25
Target	0	4.96nm	7.02nm	8.59nm	9.93nm	11.10nm
Height	5	9.93nm	11.95nm	13.56nm	14.89nm	16.06nm
Above	10	11.98nm	14.04nm	15.62nm	16.95nm	18.12nm
Sea	15	13.56nm	15.62nm	17.20nm	18.53nm	19.69nm
Level	20	14.89nm	16.95nm	18.53nm	19.86nm	21.03nm
(Meters)	25	16.06nm	18.12nm	19.69nm	21.03nm	22.20nm
	30	17.12nm	19.17nm	20.75nm	22.09nm	23.26nm
	35	18.10nm	20.15nm	21.73nm	23.06nm	24.23nm
	40	19.00nm	21.06nm	22.64nm	23.97nm	25.14nm
	45	19.86nm	21.91nm	23.49nm	24.82nm	25.99nm
	50	20.66nm	22.72nm	24.29nm	25.62nm	26.80nm

GLOSSARY

Bearing - The direction to a target, generally expressed in degrees. If expressed as relative bearing, the measurement would be in degrees with the vessel's bow as 0 degrees. The bearing given in degrees magnetic would be in reference to the direction measured by a compass. Bearing in degrees true measures direction to an object or target with reference to correct geographic North and South. Only relative bearing is provided by this radar.

CRT - Cathode Ray Tube. Used to display radar images. Similar in theory and function to a television picture tube.

EBL - Electronic Bearing Line. Used to measure relative bearing to a target on the radar CRT display.

FTC - Fast Time Constant. Refers to the Rain Anti-Clutter Control which changes the time constant of the video input circuit in order to increase the visibility of a target in rain, fog, snow and clouds.

Gain - The level of amplification of a signal. In radar, the gain control controls the amount of amplification of the received, reflected signal.

Interference - Signals produced by outside sources received by the radar that produces undesirable display images.

Microwave - R.F. (Radio Frequency) signals of very short wave length. Usually wave lengths between 1 meter and 1 millimeter.

Radar - An acronym that stands for RAdio Detecting And Ranging.

Range - The distance to a target.

Refraction - The bending of microwave signals as they travel thru the atmosphere.

Resolution - The measure of a radar transceiver's and display's ability to differentiate between two targets at a minimum separation.

S.B. - Standy By. An operating mode that maintains power to the display and T/R unit, but there are no microwave transmissions.

S.H.F. - Ship's Heading Flash. Indicates to the radar operator the direction of the vessel's bow.

S.T.C. - Sensitivity Time Constant. Abbreviation for the control used to reduce sea clutter. This control reduces sensitivity of the receiver for close-in returns.

Transceiver - A transmitter and receiver built into one package.

T/R Unit - Abbreviation for the antenna, transmitter and receiver combination which is the portion of the radar system mounted on the outside of the vessel (on a mast, top of wheel house, etc.).

V.R.M. - Abbreviation for Variable Range Marker. An electronic circular curser that aids in estimating the range to a specific target.