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DTN Kavouras
WEATHER SERVICES

Maintenance Manual

Publication Number 06060016

Section 1: About this Manual

1.1 Overview

This manual is provided for preventive and corrective maintenance. The drawings, prints, and schematics necessary for the troubleshooting and repair of the doppler radar system are included in the Drawings and Prints Manual.

1.2 Audience

This manual is intended for individuals with a technical interest in the workings of the Triton Doppler Radar system.

1.3 Contents

Table of Contents: This is the table of contents for this manual. There are no sectional tables of contents.

Safety: This shows examples of the danger, warning, and caution labels used throughout the entire group of applicable manuals for this radar system.

System Operation: This is an operational overview of the radar system components.

Preventive Maintenance: This is a listing of necessary maintenance that needs to be performed periodically to ensure proper operation of the radar system.

Corrective Maintenance: This is detailed repair and adjustments for proper operation of the replaced or repaired parts.

Appendix A: This is a listing of the maintenance terminal display screens.

1.4 Acronyms and Abbreviations

AC	Alternating Current
ACK	Acknowledge
ACU	Azimuth Control Unit
AGC	Automatic Gain Control
AM	Amplitude Modulation
AP	Anomalous Propagation
AZEL	Azimuth/Elevation
CCOR	Clutter Correction
CDA	Clean Dry Air
CPR	Cardio Pulmonary Resuscitation
dB	decibels
dBm	decibels relative to 1 millivolt
dBT	decibel threshold
dBz	decibels of Z
DIP	Dual In-line Package
DVIP	Digital Volume Integrated Precipitation
ECU	Elevation Control Unit
EMI	Electromagnetic Interference
ESDS	Electrostatic Discharge Sensitive
GHz	Gigahertz (Billion Hertz)
Hz	Hertz
I	In-Phase
IF	Intermediate Frequency
kHz	Kilohertz (Thousand Hertz)
km	kilometers
kph	kilometers per hour
kW	kilowatts
LED	Light Emitting Diode
LNA	Low Noise Amplifier
m/s	Meters per Second
MDS	Minimum Discernible Signal
MHz	Megahertz (Million Hertz)
mph	Miles per Hour
MUX	Multiplexer
NAK	Not Acknowledge
OV	Overvoltage
PM	Pulse Width Modulation
PRF	Pulse Repetition Frequency
PROM	Programmable Read Only Memory
psi	Pounds per Square Inch
psig	Pounds per Square Inch, Gauged

PW	Pulse Width
Q	Quadrature
RAM	Random Access Memory
RCU	Receiver Control Unit
RF	Radio Frequency
RFI	Radio Frequency Interference
Rmax	Maximum range of a target, based on current PRF
ROM	Read Only Memory
SNR	Signal to Noise Ratio
SQI	Signal Quality Index
STC	Sensitivity Time Control
TAC	Transceiver Antenna Controller
TCU	Transmitter Control Unit
TWT	Traveling Wave Tube
UV	Undervoltage
VAC	Volts Alternating Current
VDC	Volts Direct Current
VSWR	Voltage Standing Wave Ratio
WSP	Weather Signal Power
Z	Number of precipitation particles in the radar volume

1.5 List of Applicable Documents

Dehydrator Manual
Motor Generator Manual
Radome Manual
RVP-6 User's Manual
Drawings and Prints Manual

Section 2: Safety

2.1 Levels of Warnings

Danger

Denotes an extreme hazard which would result in high probability of death and severe damage to the equipment. Signs identified by the word DANGER are used sparingly and only for those situations presenting the most serious hazards.

Warning

Denotes a hazard which presents a lesser degree of risk of injury or death and damage to the equipment than that identified by the word danger.

Caution

Denotes safety instructions or unsafe practices associated with events which could lead to personal injury. Signs denoted by the word CAUTION are often located near control areas to remind people of unsafe practices associated with controls. The use of the word CAUTION is also associated with potential minor personal injuries or discomfort. Minor cuts, abrasions, slipping, tripping, uncomfortable heat sources, noise and vibrations are examples associated with caution signs.

Besides personal injury, the word CAUTION will also be associated with actions that may lead to damaged equipment or facilities if instructions are not followed correctly.

Note:

Contains instructions or practices associated with maintaining dependable and safe operation of the equipment. A NOTE often highlights specific actions or steps that must be followed to avoid damage to the equipment or its functionality.

2.2 Electrical Hazards

During normal operations, radar systems generate dangerous voltages. Personnel working on or near this equipment must be aware of the types of dangers and the proper methods for avoiding injury.

The radar antenna is designed to allow it to emit microwave energy only when it is pointed in an area 10° below the surface of the horizon or anywhere above that point. Due to the curvature of the earth, the antenna beam will not come in contact with personnel within the range that is harmful to people or animals. If the antenna stops moving in azimuth and elevation for a minimum of 30 seconds, the radar will stop emitting microwave energy.

Personnel must stay off of the radar tower while the radar is in operation.

Periodically, technicians may be required to work on or near energized circuits. It is important that guidelines specified in this manual are followed carefully to avoid injury. If the input power supply fails to meet the operational parameters specified for this equipment, damage to the equipment may result.

When it becomes necessary to work on a de-energized electrical circuit inside the equipment, the following precautions must be taken:

- Operate the input power switch to the OFF position and install a WARNING tag on the switch notifying personnel that this switch is not to be operated without the knowledge and permission of the person whose name appears on the tag.
- Remove any fuses for this piece of equipment and carry them with you to prevent them from being installed.

2.2.1 ESDS To Equipment

The circuit boards used for the radar system are electrostatic discharge sensitive (ESDS). When handling a circuit board, observe the proper ESDS handling procedures to avoid damage to the components on the circuit board. At a very minimum, always touch an exposed metal surface prior to touching a circuit board.

2.2.2 Shock To Personnel

High voltages are present in this equipment. Touching electrical components while the equipment is running or immediately after turning off the power, could expose the individual to potential injury from electrical shock. ALWAYS assume that an electrical circuit is energized unless you have taken precautions to remove the source of power.

2.2.3 Microwave To Personnel

Working on or near an antenna that is emitting RF energy can result in death. NEVER allow the antenna to transmit RF energy while personnel are on or near it. If personnel are required to work near the antenna, place it under manual control.

2.3 Mechanical Hazards

The antenna and the pedestal directly below it contain moving parts. NEVER place your hands on or near any of the moving parts unless the antenna is under manual control.

When working near moving parts, ensure that the following conditions are met:

- Never wear jewelry or loose-fitting clothing.
- Always assume that the machinery could move at any time.

- If it is necessary to work on moveable parts, operate the input power switch for the equipment to OFF and install a WARNING tag on the switch notifying personnel that this switch is not to be operated without the knowledge and permission of the person whose name appears on the tag.
- Remove any fuses for this piece of equipment and carry them with you to prevent them from being installed.

2.4 Emergency Shutdown Procedures

At some point in time, it may become necessary for you to quickly stop the operation of a portion or all of this system. Familiarize yourself with the locations of all control switches.

2.5 First Aid and CPR Training Requirements

Personnel performing maintenance of this equipment should be trained in the administering of first aid and Cardio Pulmonary Resuscitation (CPR). Personnel should contact company representatives to obtain training prior to performing any maintenance on this system.

2.6 Summary of Safety Warnings

The following safety warnings appear in this manual. Become familiar with them and what they mean.

Operation of the radar system while working in this area could result in exposure to microwave energy.

Place the ACU LOCAL/REMOTE switch in the LOCAL position while working in this area.

This unit contains moving parts.

Do not touch exposed parts unless the unit is removed from the AUTO mode of operation.

This unit contains moving parts.

Do not touch movable parts with power applied to the antenna assembly.

Removal of the bolts from the bearings on the dish support arms will allow the dish to move from its designated position.

The bolts can be loosened to allow minor dish support arm movement, but complete bolt removal should only be performed on one bearing at a time.

Operation of the radar system while working in this area could result in exposure to microwave energy.

Power down the system while working in this area.

Operation of the radar system while deformations exist in the wave guide will result in hot spots in the wave guide and probable exposure to microwave energy.

Replace segments of wave guide which have even minor deformations of the interior surfaces prior to operating this equipment.

The location of this unit is dangerous for one person to attempt removal.

Removal should be performed by at least two people.

This unit weighs in excess of 100 pounds.

Lifting should be performed by at least two people.

The slide units are easily damaged if misaligned.

When installing the slide assemblies on the chassis into the slide assemblies in the rack, three people will be required. Two people need to lift and hold the chassis, and one person needs to guide the slide assemblies together.

The slide units are easily damaged if misaligned.

When installing the slide assemblies on the chassis into the slide assemblies in the rack, two people will be required. One person needs to lift and hold the chassis, and one person needs to guide the slide assemblies together.

The circulator is susceptible to damage from iron and magnetic fields.

Do not position any source of iron or a magnetic field within 4 inches of the circulator.

Loosening the elevation drive belt can allow the radar dish to rotate to its point of gravitational equilibrium.

When loosening the drive belt adjustment, keep all items clear of the drive gear and drive belt until the dish has stopped moving.

The weight and position of this chassis can cause injury if removal is attempted by one person.

Lifting should be performed by at least two people.

Tightening flange bolts improperly can result in damage to the flanges or rubber gaskets.

Read and follow the procedure for tightening wave guide flanges.

The TR limiter contains an isotope that is a hazardous material.

Discard in an approved manner.

Section 3: System Operation

3.1 Specifications

Table I. System Specifications .

Feature	Characteristic
Radar Range	Reflectivity - 1 to 400 km
Mean Radial Velocity and Spectrum Width - 1 to 230 km	
Transmitter:	
Transmit Frequency Range	5.6 and 5.62 GHz
Peak Power Output	7500 Watts
Average Power Output	112 Watts
Pulsewidths	0.125-20 μsec
Range Sample Interval	125 meters
Pulse Repetition Frequency	Variable, 160-2000
Waveform Types	Continuous, stagger
Antenna/Pedestal	
Antenna Type	C-band offset-feed half-parabolic dish
Antenna Size	4.3 meter O.D.
Beamwidth	1° pencil beam
Polarization	Linear horizontal
Pedestal Type	Yoke
Azimuth Coverage	360° continuous
Azimuth Rate (maximum)	±24°/sec (4 RPM)
Elevation Coverage	Operational: 360° continuous
Receiver/Processor	
Receiver Operating Band	20 MHz
RF Reference RF Test Source	- Sample of RF reference incrementable in 0.25 dB increments over receiver dynamic range - programmable phase modulation
Receiver Channel Types (2)	Linear Output I/Q Log Output

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Table I. System Specifications (continued).

Feature	Characteristic
Dynamic Range	105 dB
Receiver Noise Figure	3 dB
Signal Processor Type	RVP-6
Clutter Filter	Yes
Clutter Cancellation/Suppression	50 dB
Status and Control Processor	
Processor (TAC)	One general purpose digital computer with 32-bit architecture
Processor Memory	Semiconductor Memory
Ports	
Fiber optic	Four at 19.2 Kb — 4 Mb/sec
RS-232 Peripheral	Two (maintenance terminal & dehydrator)
Operating System	Proprietary, multi-tasking
Weights	
Empty Rack	277 pounds (126 kg)
Dehydrator	25 pounds (11 kg)
Transmitter	
with modulator oil	310 pounds (140 kg)
modulator without oil	72 pounds (32 kg)
TAC	85 pounds (38 kg)
Receiver	120 pounds (54 kg)
Motor Generator (3KVA)	290 pounds (132 kg)
Antenna	4.3 meter
Pedestal, without electronics	1787 pounds (810 kg)
ACU	33 pounds (15 kg)
Transformer	38 pounds (17 kg)
Wave guide	41 pounds (18 kg)
Mounting hardware	16 pounds (7 kg)
Reflector dish	550 pounds (249 kg)

3.2 System Overview

3.2.1 System Under Operator Control

During normal operation, the system requires the following events to occur, in the order listed, to obtain reliable information.

a. The operator console sends the TAC a control message.
b. The TAC evaluates the control message and determines the necessary actions to be taken by the various sections of the radar system.
c. The TAC sends azimuth and elevation data to the antenna.
d. The TAC sends the transmitter a command to radiate.
e. The TAC sends the receiver a command to receive.
f. The antenna, transmitter, receiver, and dehydrator send status messages to the TAC.
g. The receiver sends return data to the TAC.
h. The TAC combines all received information, reformats it and sends data and status information to the operator's console.

3.2.2 System Under Technician Control

3.2.2.1 Using Maintenance Terminal

a. Technician enters exclusive use of the radar system by logging into the maintenance console by typing: LOCAL <enter>
b. The maintenance terminal sends the TAC a control message.
c. The TAC evaluates the control message and determines the necessary actions to be taken by the various sections of the radar system.
d. The TAC sends azimuth and elevation data to the antenna.
e. The TAC sends the transmitter a command to radiate.
f. The TAC sends the receiver a command to receive.
g. The antenna, transmitter, receiver, and dehydrator send status messages to the TAC.
h. The receiver sends return data to the TAC.
i. The TAC combines all received information, reformats it and sends data and status information to the maintenance terminal.
j. Technician returns control of the TAC from the maintenance terminal by typing: WIN <enter>

3.2.2.2 Using SCAMP

For SCAMP procedures, refer to the SCAMP manual.

3.3 System Start-up

This section describes the technical operations performed by the entire system. This section can be used in conjunction with the maintenance sections in determining where a problem

exists in this system. When applying power to the system, certain pieces of equipment need to be turned on in a specific order due to interactions between them or because of a warm-up period.

Figure 1 shows a simplified block diagram of the radar system and the lines of communication.

The following list shows the order in which the system should be powered up.

- Motor generator

NOTE:

Allow a minimum of 30 seconds for the motor generator to achieve full operational output before applying power at any other assembly.

- Radar rack power switches
- Dehydrator
- Antenna pedestal
- Maintenance terminal (if installed)
- Transmitter
- TAC

NOTE:

During the 10-15 minute warm-up period of the system, verify that all fans are operating.

3.4 Motor Generator

The motor generator must be operated for at least 30 seconds prior to attempting to apply power to any of the other assemblies of the radar system so that the motor generator can achieve operational speed and the voltage level reaches its steady-state output level.

The motor generator has a start-up in-rush surge current of 22.5 amperes per phase. The normal operating current is 13.5 amperes per phase.

The output voltage of the generator shall be within the range specified in Table II. The output power distribution is shown in Figure 2.

Table II. Generator Output Voltage Levels.

Measurement	Voltage
Any phase referenced to ground	120 +10% VAC
Phase to phase	208 +10% VAC

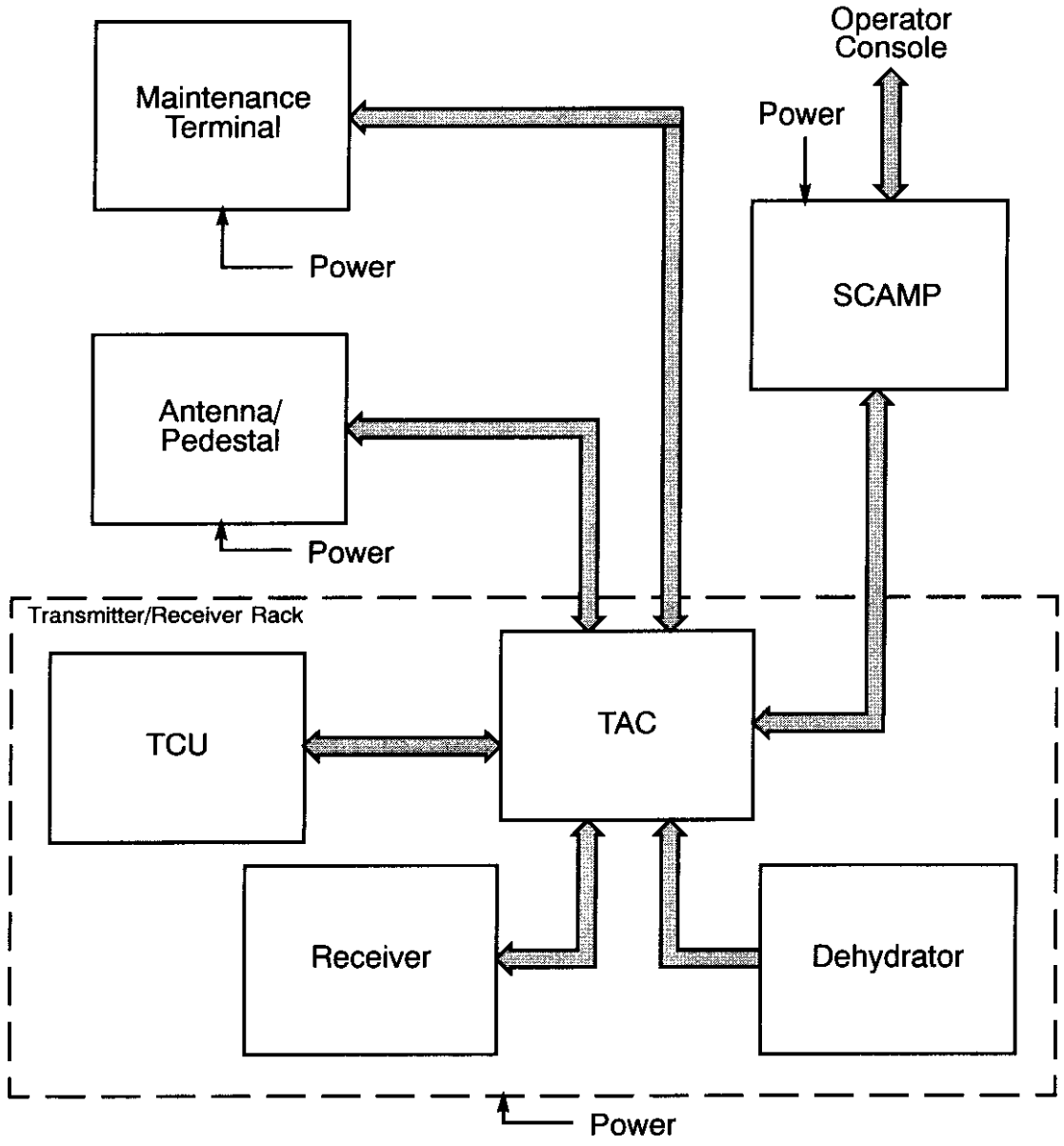

Figure 1. Simplified Functional Flow Block Diagram.

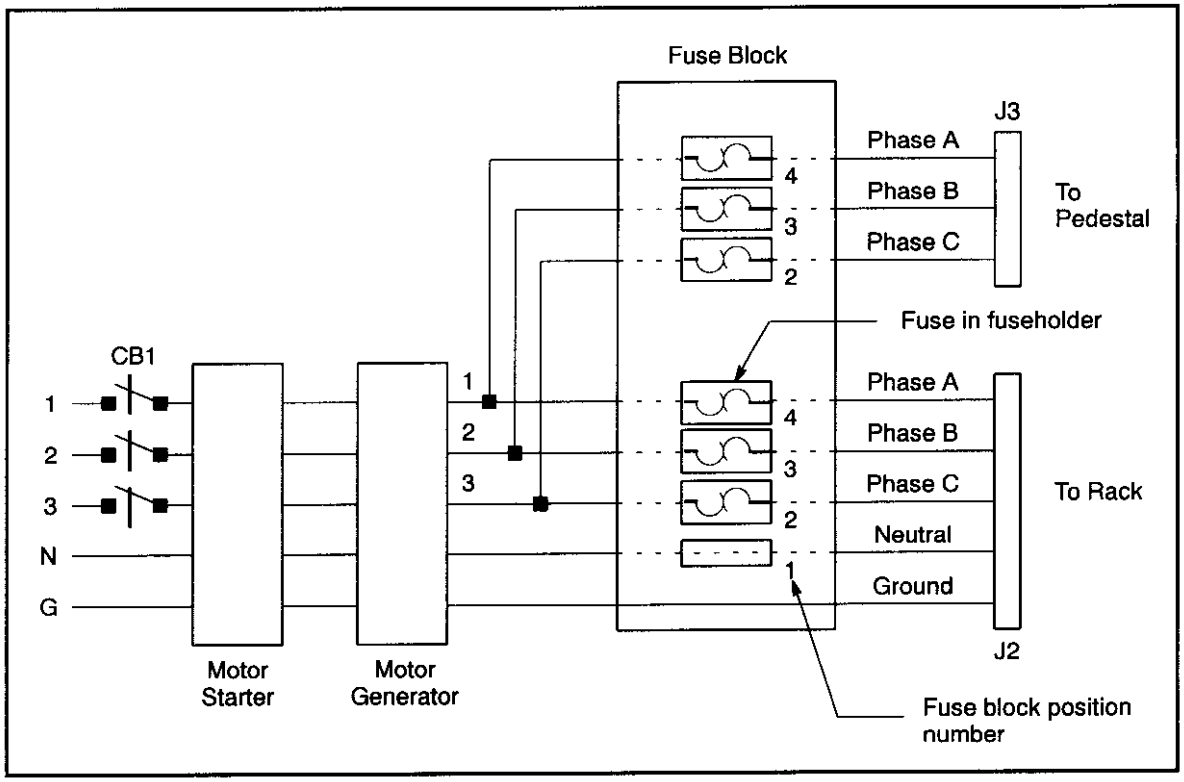

Figure 2. Generator Output.

3.5 Antenna/Pedestal

The antenna/pedestal provides the means of emitting high-power signals in a specific direction and collecting the low-power return signals. The antenna operates under the direction provided by the operator. The antenna can rotate in a 360° movement in both the azimuth and elevation planes.

The pedestal contains the azimuth control unit (ACU). The ACU power supply provides power for use by the antenna/pedestal and the ACU. The ACU interprets incoming command signals and generates the outgoing data. The pedestal contains the motor and position encoder for antenna azimuth operation.

The antenna yoke contains the elevation control unit (ECU), the elevation drive motor, an elevation position encoder, a proximity sensor for the antenna reflector dish, and a smoke detector.

3.5.1 ACU

Under the direction of control messages from the TAC, the ACU provides the necessary position information to the azimuth and elevation controller. The motor controller sends the position information to the drive motors.

The ACU contains an azimuth/elevation (AZEL) control board with switches for manually controlling the antenna dish azimuth and elevation, cooling fans, and communication interface.

Table III shows the switches and indicators on the AZEL control board.

Table III. AZEL Control Circuit Board Switches and Indicators.

Switch	Position (Color)	Description
PROC FAIL (CR1)	Red	The on-board processor has failed.
ANT RCV CAR (CR2)	Green	
+5 OK (CR3)	Green	
+12 OK (CR4)	Green	
+36 OK (CR5)	Green	
S1	ON/Off	
Position 1		Off = Boot debug monitor ON = Boot controller (normal)
Position 2		Off = Encoder installed ON = Use proximity sensor
Position 3		Off = Step/direction signal (not inverted) ON = Step/direction signal (inverted)
Position 4		Off = Board being used in ACU ON = Board being used in ECU
Position 5		Unused if switch position 2 = off; otherwise, Off = Proximity input disabled ON = Priximity input enabled (normal)
Position 6		Unused
Position 7		Unused
Position 8		Off = Use stored parameters (normal) ON = Use default parameters
LED1/LED2	B7-B0	B7 = unused B6 = unused B5 = unused B4 = unused B3 lit = volume scan B2 lit = go to position (ACU); elevate to position (ECU) B1 lit = sector scan (ACU); RHI scan (ECU) B0 lit = idle
LED3/LED4	B7 - B0	B7 lit = watchdog timer B6 = unused B5 = unused B4 = unused B3 = unused B2 = unused B1 lit = ECU input B0 lit = TAC input (ACU); ACU input (ECU)

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Table III. AZEL Control Circuit Board Switches and Indicators.

Switch	Position (Color)	Description
RESET	Momentary	Reset the board to the default condition
CW	Momentary	Rotate the antenna azimuth in a clockwise direction (when viewed from above)
CCW	Momentary	Rotate the antenna azimuth in a counterclockwise direction (when viewed from above)
UP	Momentary	Reflector moves clockwise (when viewed from elevation drive side of antenna)
DOWN	Momentary	Reflector moves counterclockwise (when viewed from elevation drive side of antenna)
LOCAL/ REMOTE	LOCAL	Enable the momentary pushbuttons for antenna movement
	REMOTE	Antenna movement controlled by the operator control station

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3.5.2 Azimuth Antenna Drive Assembly

The azimuth antenna drive assembly is responsible for rotating the antenna and providing accurate position data to the ACU. This assembly is comprised of the drive motor, the primary and secondary gearboxes, the drive gears, and the position encoder.

3.5.2.1 Drive Motor

The drive motor receives a DC voltage supply from the ACU. The voltage supply is regulated by the control module mounted in the ACU. The control module activates the various motor windings so that the position of the motor is moved to the desired position in the rotation quickly or slowly.

The drive motor receives a 3∅, variable voltage supply from the ACU. The voltage supply is varied so that the speed of the antenna can start slowly and increase to the desired operating speed, or to allow it to slow to a stop when no further rotation is required.

3.5.2.2 Primary and Secondary Gearboxes

The primary and secondary gearboxes provide a 150:1 gear reduction from the drive motor to the drive gears.

3.5.2.3 Drive Gears

The drive gears are designed to operate with a toothed drive belt to ensure that no position data errors occur due to belt slippage.

3.5.2.4 Position Encoder

The position encoder returns a position reading to the ACU. The position reported is not the true position of the antenna. The true position of the antenna is calculated in the TAC, based on the actual reported position from the encoder and an offset value that was entered at the TAC when the encoder was installed.

3.5.3 Antenna Yoke

3.5.3.1 ECU

Under the direction of control messages from the ACU, the ECU provides the necessary position information to the elevation controls. The ECU sends a status message to the ACU more frequently than every 8 ms during normal operation.

The ECU contains an elevation AZEL control board, power supplies, and cooling fans.

3.5.4 Elevation Antenna Drive Assembly

3.5.4.1 Elevation Antenna Drive Assembly

The elevation antenna drive assembly is responsible for rotating the reflector dish and providing accurate position data to the ECU. This assembly is comprised of the drive motor, the gearbox, the drive gears, the position encoder, and the proximity sensor.

3.5.4.1.1 Drive Motor

The drive motor receives a 3∅, variable voltage supply from the ECU. The voltage supply is varied so that the speed of the antenna can start slowly and increase to the desired operating speed, or to allow it to slow to a stop when no further rotation is required.

The drive motor receives a stepped DC voltage supply from the ACU. The voltage supply is stepped by the control module mounted in the ACU. The control module activates the various motor windings so that the position of the motor is moved to the desired position in the rotation quickly or slowly.

3.5.4.1.2 ECU Gearbox

The gearbox provides a 150:1 gear reduction from the drive motor to the drive gears.

3.5.4.1.3 Drive Gears

The drive gears are designed to operate with a toothed drive belt to ensure that no position data errors occur due to belt slippage.

3.5.4.1.4 Position Encoder

The position encoder returns a position reading to the ECU. The position reported is not the true position of the antenna. The true position of the antenna is calculated in the

TAC, based on the actual reported position from the encoder and an offset value that was entered at the TAC when the encoder was installed.

3.5.4.2 Proximity Sensor

The proximity sensor provides a signal to the ECU indicating whether it is safe for the radar to emit a signal without exposing personnel in the immediate area to RF energy. The reflector dish elevation position with relationship to the proximity sensor is determined by adjustment of a collar mounted on the elevation drive gear.

3.5.4.3 Smoke Detector

The smoke detector monitors for smoke within the radome.

3.6 Rack

The rack provides power and cooling for several units of the radar system. The rack provides electromagnetic interference (EMI) and radio frequency interference (RFI) shielding and security for the equipment and isolation from the operational personnel. The units mounted in the rack are slide mounted to allow for access to all sides of each chassis.

The rack provides power and cooling for several units of the radar system. The rack provides shielding and security for the equipment and isolation from the operational personnel. Several units mounted in the rack are slide mounted to allow for access to all sides of each chassis.

The vertical mounting in the rack allows the operational components to occupy a small amount of floor space. The chassis layout within the rack is as shown in Figure 3.

3.6.1 Dehydrator

The dehydrator removes moisture in the wave guide in order to reduce the attenuation of the RF signal. The moisture is removed by forcing the air for the wave guide through one of two drying canisters in the dehydrator. When the canister in use reaches a predetermined number of hours of use, or a percent of total saturation, the dehydrator switches to the alternate canister and recharges the used canister.

The dehydrator maintains a positive pressure of 2.2 - 3.0 psi of dry air within the wave guide while operating no more than 50% of the available time (50% duty cycle) to maintain that pressure. A self-resetting pressure relief valve is attached to the dehydrator output for protection from over-pressurization of the wave guide.

The dehydrator contains a status readout on the face of the unit. The readout shows the psig in the wave guide and any warnings or alarms. For additional information about the dehydrator, refer to dehydrator manual, Model ADH-2COM.

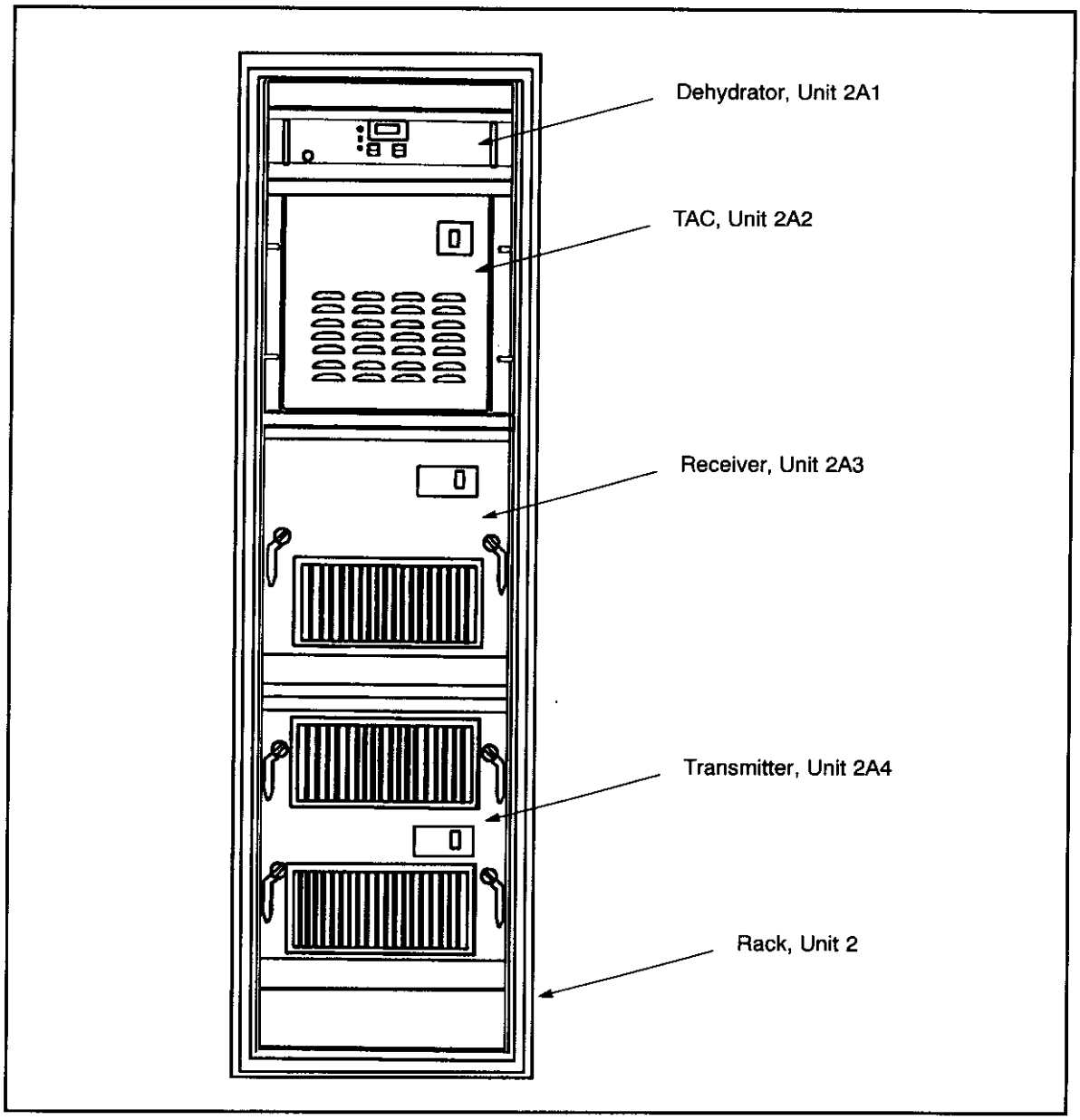

Figure 3. Rack Front View.

3.6.2 TAC

The TAC provides the timing signals for PRF and pulse width of the radar signals and performs the processing of the returned radar signals.

Fiber optic circuit boards are provided for communication lines to the antenna, transmitter, receiver, and operator's console. An optional RS232 serial communication interface is also available. A serial communication circuit board is provided for the communication lines to the maintenance terminal and the dehydrator. A 3-1/2 inch disk drive is provided for the loading of software into the KPB 961 processor.

Figure 4 shows the block diagram of data flow with the TAC and the other system components. For the format of the communication strings, refer to the Communication Protocol paragraphs. Figure 5 shows a cut-away view of the TAC.

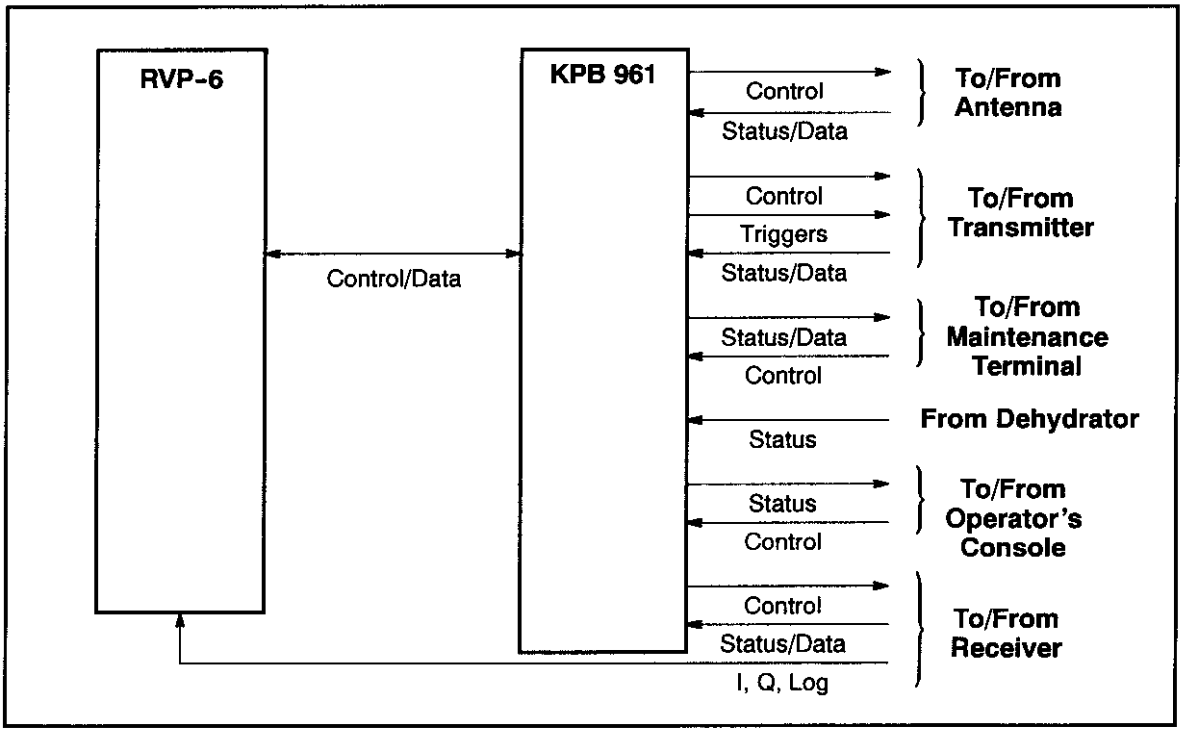

Figure 4. TAC Flow Block Diagram.

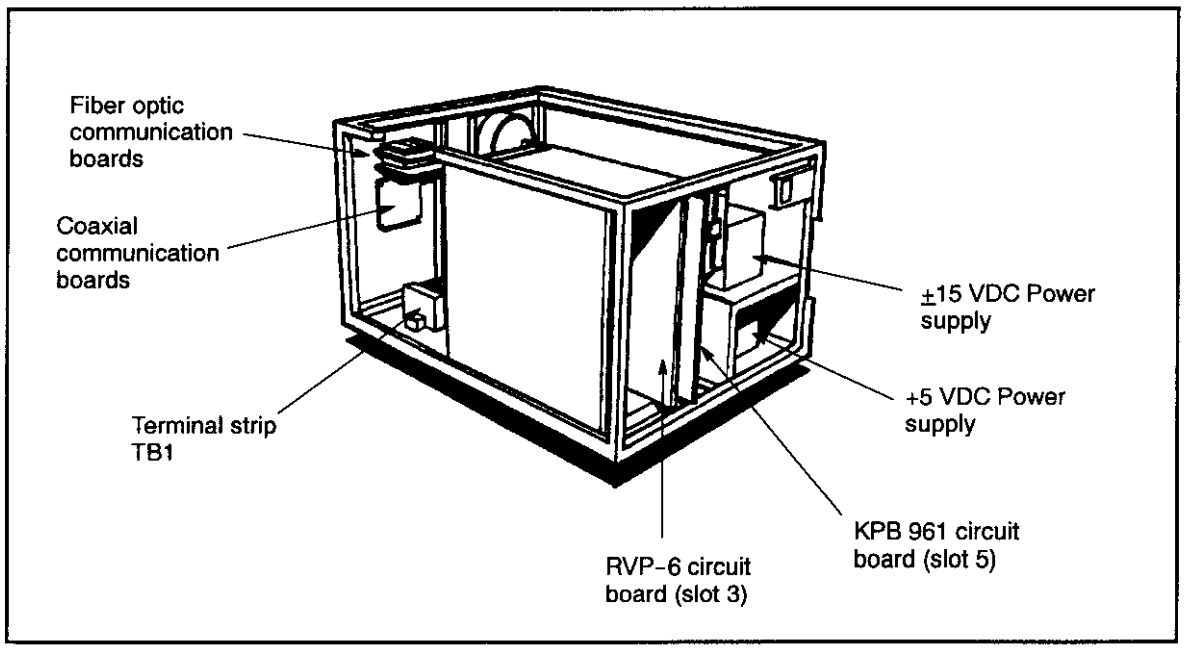

Figure 5. TAC Cut-away View.

3.6.2.1 Power Supplies

The TAC contains two power supplies, one for +5 ±5% VDC, and one for ±15 ±10% VDC.

3.6.2.2 RVP-6

The RVP-6 takes the raw video information from the receiver, applies the clutter filtering to the range bins, digitizes and processes weather data, and transmits it to the KPB 961 processor. For an in-depth explanation of RVP-6 functions, refer to the RVP manual.

The RVP-6 indicators and adjustments are specified in Table IV.

Table IV. RVP-6 Indicators and Adjustments.

Component	Label	Description
LED (green)	none	Not used
LED (red)	none	Not used
Potentiometers	STC Gain	For these settings, refer to the RVP-6 manual
	STC Offset	
	I Offset	
	I Gain	
	Q Offset	
	Q Gain	
	Log Offset	
	Log Gain	

3.6.2.2.1 Range Bins

The RVP-6 contains the range bins where returned signal data is stored. The range bin storage amount is dependent on the selected display range. For short ranges, each range bin will contain signal return for the shortest horizontal distance. As the display range increases, the horizontal distance contained in each range bin increases.

3.6.2.2.2 Clutter Filters

The RVP-6 contains the clutter filters. The clutter filters are adjustable values that remove data for non-moving objects. The clutter filter values range from 0 (no suppression) to 7 (maximum suppression).

The amount of area being examined varies according to the display range selected. For a 32 km range, each range bin contains the return for a distance of125 meters. For a 512 km range, each range bin contains the return for a distance of1 km. Refer to Table V for the exact lengths of area covered by each range bin. By setting each range

bin with a separate filter, it is possible to filter out areas of ground clutter from each range bin. Since different areas contain different amounts of clutter, is necessary to set each bin for the proper amount of filtering.

When setting clutter filters, it is necessary to examine trade-offs for the amount of area that the clutter is returned for. For example, if the area surrounding the antenna contains many ground clutter objects for a distance of 1 km, it would be necessary to select the #7 filter to remove the return from the corrected reflectivity display. If the area beyond 1 km has very few ground clutter objects, it may only be necessary to use a #2 or #3 clutter filter for that area.

The amount of clutter rejection necessary for a given range can also depend on the selected PRF that the radar is operating at. Due to these considerations, it may be necessary to change the clutter filter settings for the selected range if the PRF is changed. Due to the amount of time necessary to perform these adjustments, it is highly desirable that once the desired settings of the filters and the operating PRF have been achieved, these settings be set as the operational norm.

Table V. Range Bin Sizes

Display Range	Range Bin Length
32 km	125 m
64 km	125 m
128 km	250 m
256 km	500 m
320 km	625 m
512 km	1 km

3.6.2.3 KPB 961 Processor

The processor receives control messages from the operator's console or maintenance terminal and creates the necessary control messages to be sent to the other parts of the radar system.

This processor contains all of the trigger logic necessary to generate the timing signals for the transmitter. These timing signals can control the PRF and the pulse width of the RF signal emitted by the transmitter.

The processor monitors the status messages returned from all of the parts of the radar system and creates an all-inclusive status message to send to the operator's console. The digitized video data from the RVP-6 is also included with the status message.

The processor contains LEDs for a variety of uses. The carrier LEDs show activity at the fiber optic receivers. All other indicators and switches located on the processor board are shown in Table VI.

The KPB 961 circuit board jumpers are specified in Table VII.

Table VI. KPB 961 Processor Switches and Indicators

Switch/Indicator	Label	Description
DIP switch S1	0-7	NOTE: The circuit board is labeled 0-7. The switch is labeled 1-8. The settings in this column are shown by the board markings. The switch On position means the switch is moved toward the circuit board.
Boot control	0 & 1	0 / 1 / Boot from Off / Off / Flash memory (preferred default) On / Off / 5 1/4" floppy Off / On / 3 1/2" floppy (alternate default) On / On / maintenance terminal
DRAM size	2 & 3	2 / 3 / Size Off / Off / 4 MB (default) On / Off / 8 MB Off / On / 12 MB On / On / 16 MB
Control source (power on)	4	Off = maintenance terminal control during boot (obtained by typing LOCAL on maintenance terminal) On = Windows program control during boot (obtained by typing WIN on maintenance terminal) (default)
DRAM test type	5	Off = full DRAM test (default) On = quick DRAM test
Processor fail control	6	Off = processor halts and prints error message on maintenance terminal for any processor fault On = Processor reboots on any processor fault (default)
DRAM test conditions	7	Off = do not test DRAM if RAM disk valid (default) On = unconditional DRAM test
DIP switch S3 (dual processor address select)	8-1	Not used
LED (red)	FAIL	lit = The processor board is unable to read the processor ROM
RESET pushbutton	RESET	Causes the processor board to perform a reset to the default condition.
LED (red)	TRIGGER FAULT	lit = Trigger duty cycle greater than 1.5%

Table VI. KPB 961 Processor Switches and Indicators (continued)

LED (green)	DCD3A	Not used
LED (green)	DCD3B	Not used
LED (green)	TCU	lit = Fiber connected to the TCU. A complete communications path exists.
LED (green)	RCU	lit = Fiber connected to the RCU. A complete communications path exists.
LED (green)	AZEL	Not used
LED (green)	DCD1A	lit = Fiber connected to the ACU. A complete communications path exists.
LED (green)	DCD0B	Not used
LED (green)	I7	lit = Fiber connected to the Triton. A complete communications path exists.
LED (red)	OV	lit = Power supply output in an overvoltage condition
LED (green)	DC OK	lit = Power supply output levels within limits
LED (red)	UV	lit = Power supply output in an undervoltage condition

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Table VII. KPB 961 Jumper Locations

Jumper	Position	Jumper	Position
JP1	A	JP11	none
JP2	A	JP12	B
JP3	B	JP13	none
JP4	A	JP14	none
JP5	A	JP15	none
JP6	A	JP16	none
JP7	none	JP17	A
JP8	none	JP18	A
JP9	none	JP19	B
JP10	none	JP20	B

3.6.3 Receiver

The receiver accepts raw return signals from the antenna and separates them into various components for use by the processing functions of the radar. The receiver simplified flow block diagram is shown in Figure 6. Figure 7 shows the receiver cut-away diagram.

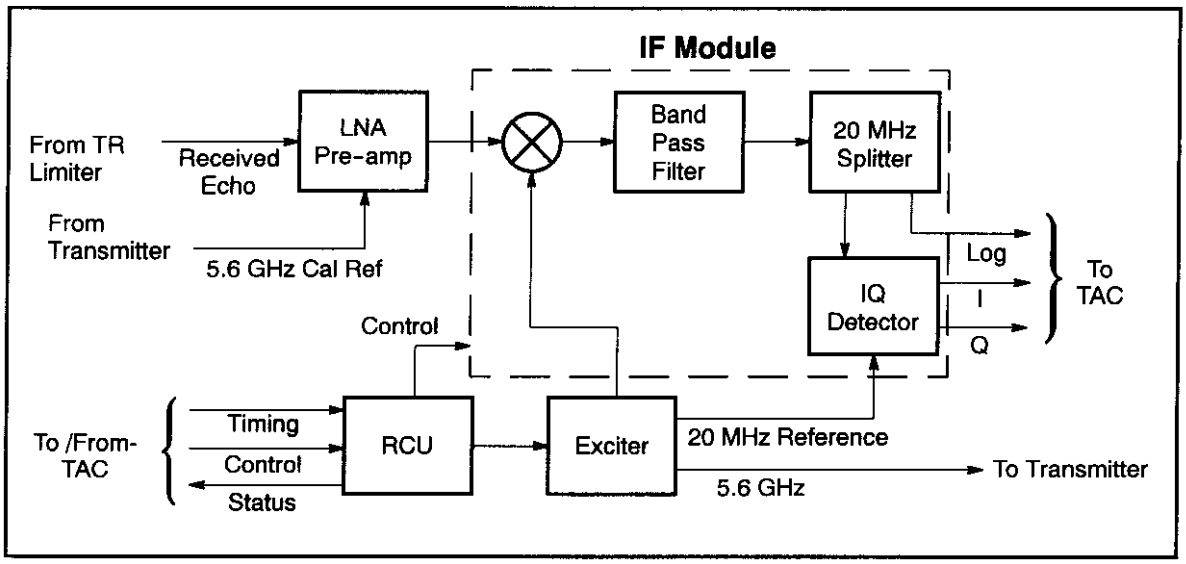

Figure 6. Receiver Simplified Flow Block Diagram

3.6.3.1 Power Supplies

The receiver contains four power supplies. They are the +5 ±5% VDC, ±15 ±10% VDC, +7 ±5% VDC,and +17 ±10% VDC.

3.6.3.2 RCU

The RCU provides the control functions for the receiver. The receiver receives its direction through the command message from the TAC. It provides status and fault status messages, along with radar data in the form of In-phase (I), quadrature (Q), and Log, to the TAC. The RCU provides timing signals to the transmitter and internal controls to the receiver.

The RCU LEDs are described in Table VIII. The RCU jumpers are described in Table IX.

Table VIII. RCU LED Functions

LED (color)	Label	Description
CR1 - CR8 (red)	LED0 - LED7	Not used
CR13 (green)	+5 VOLTS	lit = +5 VDC power supply within normal output limits
CR15 (green)	none	lit = Processor speed 8 MHz extinguished = Processor speed 4 MHz
CR16 (green)	+15 VOLTS	lit = +15 VDC power supply within normal output limits

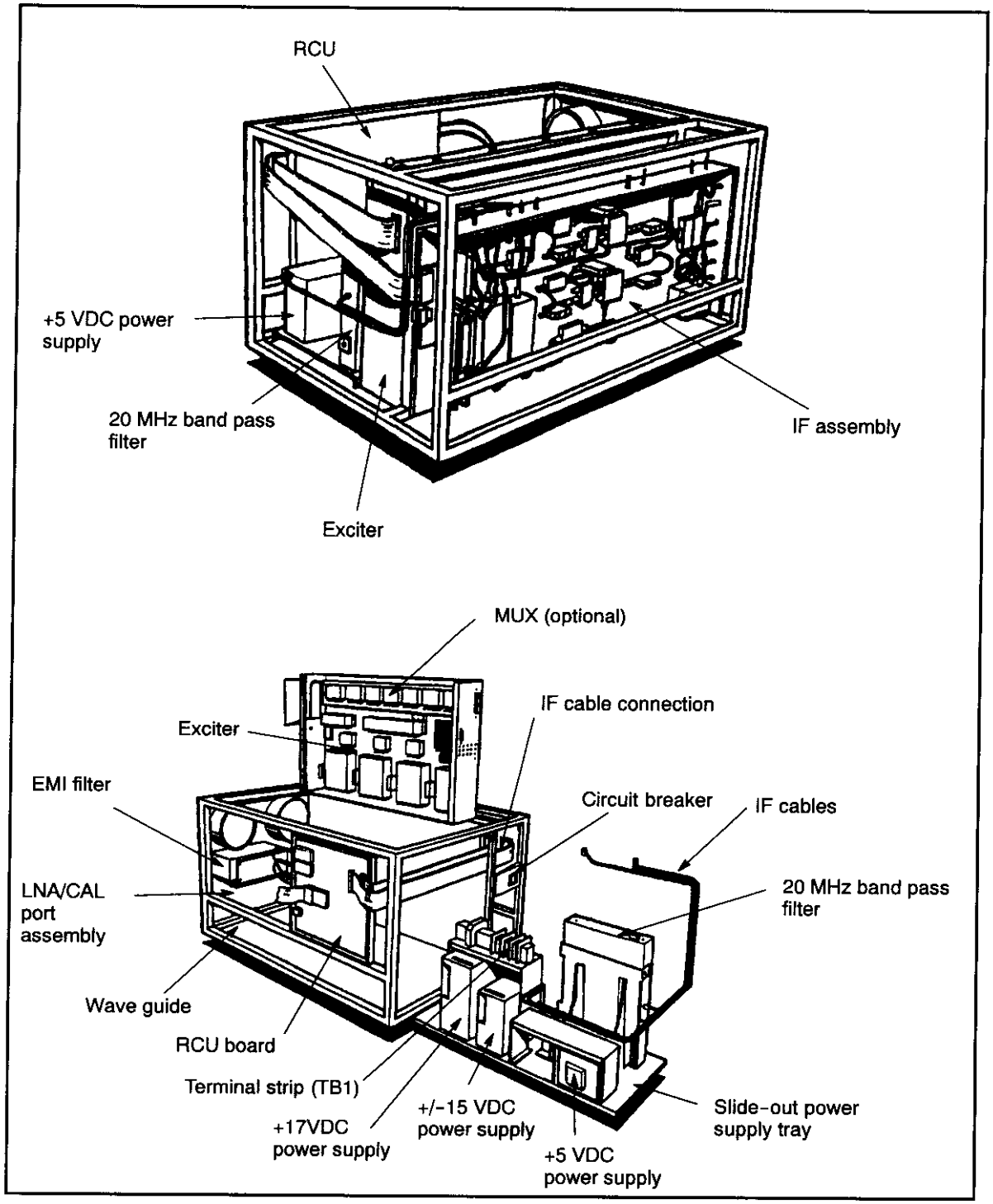

Figure 7. Receiver Cut-away View

Table VIII. RCU LED Functions

CR17 (green)	+28 VOLTS	lit = +28 VDC power supply within normal output limits
CR18 (green)	-15 VOLTS	lit = -15 VDC power supply within normal output limits
CR19 (green)	+12 VOLTS	lit = +12 VDC power supply within normal output limits
CR20 (green)	-12 VOLTS	lit = -12 VDC power supply within normal output limits
CR21 (green)	none	lit = Receiver signal quality ok extinguished = receiver signal quality bad
CR22 (green)	none	lit = signal frequency locked at 5.62 GHz
CR23 (green)	none	lit = signal frequency locked at 5.67 GHz
CR24 (green)	none	lit = signal frequency locked at 5.6 GHz
CR25 (green)	none	lit = signal frequency locked at 5.65 GHz

Table IX. RCU Jumpers

Jumper	Pins Jumpered	Function
JP1	no jumper	Not a valid operational condition
	1-2	2K PROM installed in socket U2
	2-3	8K PROM installed in socket U2
JP2	no jumper	Not a valid operational condition
	1-2	2K PROM installed in socket U2
	2-3	8K PROM installed in socket U2
JP3	no jumper	Not a valid operational condition
	1-2	2K PROM installed in socket U3
	2-3	8K PROM installed in socket U3
JP4	no jumper	Not used, do not install a jumper
JP5	no jumper	Not used, do not install a jumper
JP6	no jumper	600 ms watchdog timeout
	1-2	150 ms watchdog timeout
	2-3	1.2 second watchdog timeout
JP7	no jumper	Reset RCU if +5 VDC supply drops below +4.5 VDC
	1-2	Reset RCU if +5 VDC supply drops below +4.75 VDC
JP8	no jumper	Not a valid operational condition
	1-2	Disable watchdog timer
	2-3	Enable watchdog timer
JP9 - JP15	no jumper	Not used, do not install a jumper
JP16	no jumper	Normal operation
	1-2	Test mode
JP18	no jumper	Not a valid operational condition
	1-2	2K RAM installed in socket U5
	2-3	8K RAM installed in socket U5
JP19	no jumper	4 MHz
	1-2	8 MHz
JP20	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 3
	2-3	+5 Volt pullup for relay driver 3

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Table IX. RCU Jumpers (continued)

Jumper	Pins Jumpered	Function
JP22	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 6
	2-3	+5 Volt pullup for relay driver 6
JP23	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 5
	2-3	+5 Volt pullup for relay driver 5
JP24	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 4
	2-3	+5 Volt pullup for relay driver 4
JP25	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 0
	2-3	+5 Volt pullup for relay driver 0
JP26	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 1
	2-3	+5 Volt pullup for relay driver 1
JP27	no jumper	No pullup of relay
	1-2	+15 Volt pullup for relay driver 2
	2-3	+5 Volt pullup for relay driver 2
JP28	no jumper	Normal condition
	1-2	Not used
	2-3	Not used
JP29	no jumper	Normal condition
	1-2	Not used
	2-3	Not used
JP30	no jumper	Normal condition
	1-2	Not used
	2-3	Not used

3.6.3.3 LNA Preamplifier

Input signals to the LNA preamplifier must be limited externally by the TR limiter to provide a maximum power level of +20 dBm to prevent damage to the receiver.

The LNA provides amplification to the returned radar signal. The low level of the returned signal is amplified by an approximate factor of 10^5.

3.6.3.4 IF Module

The IF module provides noise filtering and separation of the returned signal into the Log, I, and Q signals for transmission to the TAC. As the returned signal is fed into the IF module, it is combined with a 20 MHz reference signal to provide frequency shift of a known signal.

3.6.3.5 Exciter

The exciter provides the 5.62 GHz local oscillator frequency for the IF module, a 20 MHz reference signal for the IQ detector, and the 5.6 GHz frequency to the transmitter.

3.6.4 Transmitter

The transmitter simplified flow block diagram is shown in Figure 8. Figure 9 shows the transmitter cut-away view.

3.6.4.1 Power Supplies

The transmitter contains three power supplies, ±15 ±10% VDC, +5 ±5% VDC, and the B+high voltage power supply.

3.6.4.2 TCU

The TCU provides the control functions for the transmitter. The transmitter receives its direction through the command message from the TAC. It provides status messages to the TAC. The TCU performs fault monitoring at all times and the fault status is sent to the TAC.

The TCU switch settings are shown in Table X. The TCU LEDs are described in Table XI. The TCU jumpers are described in Table XII.

Table X. TCU Switch Settings

Switch	Setting	Description
U15	9	16-position switch
U16	5	16-position switch
U17	4	16-position switch
U18	B	16-position switch
U19	4	16-position switch
U37	As required	16-position switch — Used to set pulse width of pulse generated by SW1. Values are: 0 = no pulse, 1 (1 µs) to F (15 µs)
S1		Both slides must be at the same setting. off position = Normal operation ON position = TCU in single pulse mode. See SW1 for description.
SW1	—	Each time the button is pushed, a single pulse is transmitted (only functional when both switches on S1 are in the ON position).
SW2	—	Each time the button is pushed, the TCU is reset to the initial conditions.

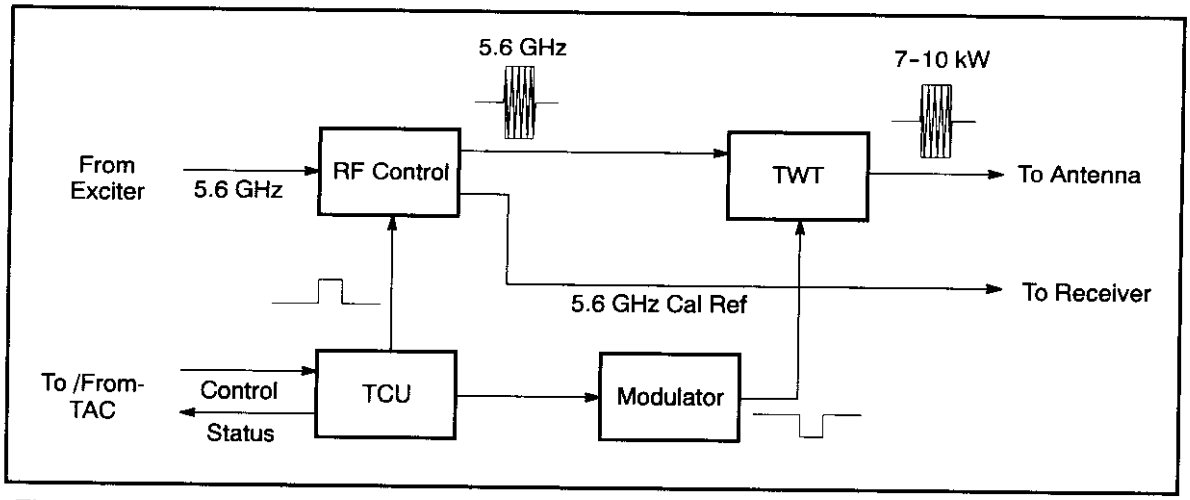

Figure 8. Transmitter Simplified Flow Block Diagram.

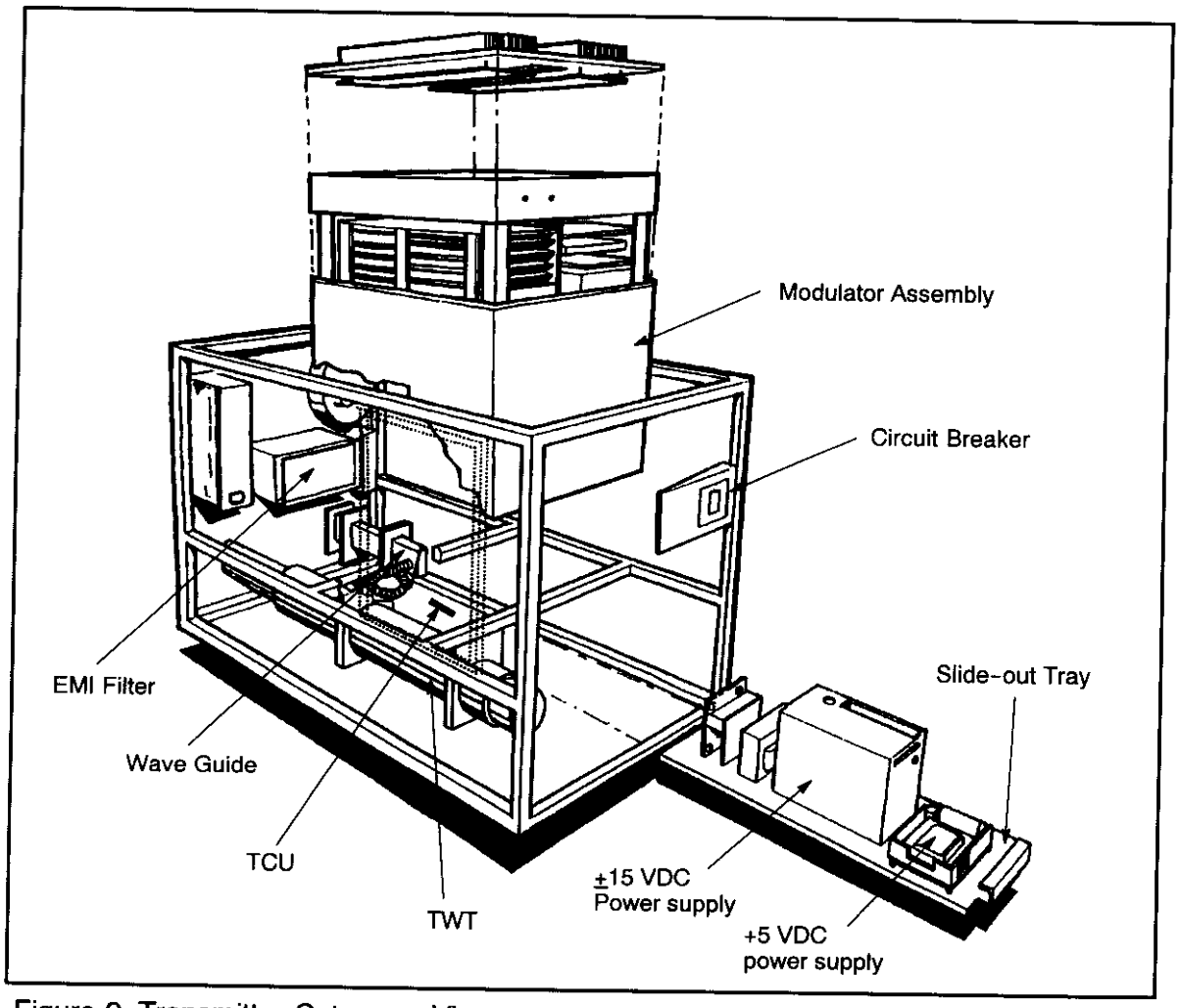

Figure 9. Transmitter Cut-away View.

Table XI. TCU LED Functions

LED (color)	Label	Description
CR11 (green)	none	lit = antenna fiber optic carrier present
CR14 (red)	FOC_ILK	N/A
CR15 (red)	KLY_ILK	N/A
CR16 (red)	PRI_FLOW	lit = glycol coolant flow is too low
CR17 (red)	none	N/A
CR18 (red)	LEVEL	N/A
CR19 (red)	none	N/A
CR20 (red)	none	N/A
CR21 (red)	WG_POS FLT	N/A
CR22 (red)	SYS_TFLT	lit = a transient fault has occurred - this will be cleared after approximately 30 seconds. If three transient faults occur within a short period of time, this indicator will light and shut down the radar.
CR23 (red)	SYS_CFLT	lit = a critical fault has occurred that will result in the system being shut down
CR24 (red)	FIL_CRD_ILK	N/A
CR25 (red)	none	TWT coolant temp: lit = overtemperature
CR27 (red)	none	N/A
CR28 (red)	none	Chassis air temperature: lit = overtemperature
CR29 (red)	none	N/A
CR30 (red)	none	N/A
CR31 (red)	AUX FLOW	N/A
CR32 (red)	none	N/A
CR33 (red)	PMP & FAN INTERLOCK	N/A
CR34 (red)	AUX PMP INTERLOCK	N/A
CR35 (red)	RADIATE	lit = the system is radiating
CR36 (red)	RADIATE INTLK_OK	
CR37 (red)	AIRFLOW	N/A
CR38 (red)	DOOR	N/A
CR39 (red)	INTERRUPT	blinking = the processor on the TCU is accepting interrupts
CR41 (red)	none	N/A
CR42 (red)	CCURL	lit = TWT cathode current below the expected level
CR43 (red)	CCURH	lit = TWT cathode current above the expected level

Table XI. TCU LED Functions (continued)

LED (color)	Label	Description
CR44 (red)	none	N/A
CR45 (red)	CVOLH	N/A
CR46 (red)	CVOLL	lit = TWT sever current fault
CR47 (red)	LK_CUR	N/A
CR48 (red)	BTV	N/A
CR49 (red)	ARC	N/A
CR52 (red)	FCUR	lit = filament supply overcurrent condition
CR53 (red)	HVOC	lit = the current into the modulator high voltage power supply is above the maximum limit
CR54 (red)	FPWR	lit = the forward power is low
CR55 (red)	MD	N/A
CR56 (red)	MAG	N/A
CR57 (red)	PW	lit = pulse width exceeds the allowable limit (≈25 μs)
CR58 (red)	VSWR	lit = reflected power level exceeds allowable limits
CR60 (red)	SWDRV_VL	lit = switch drive voltage for the modulator switches is below low limit
CR61 (red)	SWDRV_VH	lit = switch drive voltage for the modulator switches is above high limit
CR62 (red)	M15L	lit = negative 15 VDC level is below the minimum allowable level
CR63 (red)	M15H	lit = negative 15 VDC level is above the maximum allowable level
CR64 (red)	P15L	lit = positive 15 VDC level is below the minimum allowable level
CR65 (red)	P15H	lit = positive 15 VDC level is above the maximum allowable level
CR66 (red)	P5H	lit = positive 5 VDC level is above the maximum allowable level
CR67 (red)	HVL	lit = the -15 kV level is below (more negative) than the allowable level
CR68 (red)	HVH	lit = the -15 kV level is above (more positive) than the allowable level
CR69 (red)	24VL	N/A
CR70 (red)	24VH	N/A
CR71 (red)	BTRST_C	lit = no reset current to the modulator biter
CR72 (red)	SWRST_C	lit = no reset current to the modulator switches
CR73 (red)	P5L	lit = the positive 5 VDC level is below the minimum allowable limit

Table XI. TCU LED Functions (continued)

LED (color)	Label	Description
CR77 (red)	HIGH VOLTAGE ON	lit = the TCU has sent the command to turn the high voltage supply on, but does not mean voltage level is within limits
CR78 (red)	FOCUS MAG-NET ON	N/A
CR79 (red)	FILIMENTS ON	N/A
CR80 (red)	PUMP	lit = primary cooling pump is operating
CR81 (red)	AUX_PUMP	N/A
CR82 (red)	WG_TST	N/A
CR83 (red)	DC_LD	N/A
CR84 (red)	AC_LD	N/A

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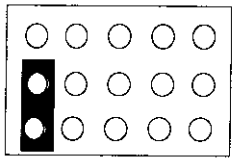
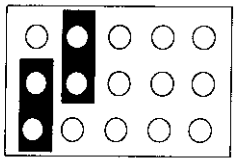
3.6.4.3 TWT

For normal operation, the transmitter requires a 10-12 minute warm-up period before the transmission of any high-power energy. During the warm-up period, the modulator provides the filament voltage necessary to heat the internal components of the TWT for optimum life expectancy of the TWT. A fault condition will prevent the transmitter from producing any output from the TWT.

3.6.4.4 Modulator

The modulator provides pulsed high voltage to the TWT, where it is amplified, and then sent to the antenna. The transmitter amplifies the 5.6 GHz RF signal from the exciter in the receiver to a typical power level of 7-10 kilowatts (kW).

Table XII. TCU Jumpers

Jumper	Pins Jumpered	Function
H1 and H2	H1  Column Number 1 2 3 4 5 H2 	H1 is used to set the VSWR (reflected power) sampling time. The indicated setting results in the measurement of the reflected power 20 ns after the rising edge of the RF gate signal until the falling edge of the RF gate signal. H2 is used to set the forward power sampling delay time. The indicated setting results in the measurement of the forward power 20 ns after the falling edge of the RF gate signal. The delay times increase by 20 ns for each column (from left to right, yielding a jumpered delay range of 20–100 ns).
JP1	no jumper	Not used
	jumper	Not used
JP2	no jumper	Not used
	jumper	Not used
JP3	no jumper	Do not use this setting
	left-center	Do not use this setting
	center-right	RS-232 clock source
JP5	no jumper	Do not use this setting
	top-center	4 MHz CPU clock
	center-bottom	8 MHz CPU clock
JP6	no jumper	Watchdog time out = 1.2 seconds
	left-center	Not used
	center-right	Not used
JP7	no jumper	Processor reset at supply $\leq$ 4.5 V
	jumper	Processor reset at supply $\leq$ 4.75 V
JP8	no jumper	Do not use this setting
	top-center	WDT source = A/D_CE
	center-bottom	WDT source = 2 MHz clock (for factory test only)
JP9	no jumper	Not used
	top-center	Not used
	center-bottom	Not used

3.6.5 Wave Guide

The wave guide is the path of the transmitted RF energy from the transmitter to the antenna and returned signal of detected objects from the antenna to the receiver. To best achieve this, all obstructions within the wave guide must be removed. Obstructions are things such as dust, air-borne moisture, deformities in wave guide segments, or even an improperly adjusted Voltage Standing Wave Ratio (VSWR).

To prevent the introduction of contaminants within the wave guide during times when installation or maintenance are being performed, it is mandatory that all openings on wave guide segments have covers installed.

To reduce any internal attenuation caused by moisture within the wave guide, the wave guide is pressurized and moisture removed by the dehydrator. The pressure within the wave guide will cause some leakage at connection joints. This is normal to allow air movement from the dehydrator to the antenna within the wave guide. However, excessive leakage is an indication of a problem.

A bend or kink in a wave guide segment, or any damage that results in even a minor deformity within the wave guide, is sufficient to be a source of a problem. The deformity on the inner surface of the wave guide will result in an excessive amount of RF energy striking the deformity. The damage to the wave guide could then result in the release of RF energy.

The VSWR is a voltage representation of the RF energy being reflected to the receiver from the previously transmitted pulse. The amount of returned energy depends on loss within the wave guide. The measurement is performed at the port on the circulator. A pad and a crystal are installed on this port. The pad reduces the RF energy to the crystal by a predetermined value to prevent damage to the crystal. The crystal converts the RF energy into a DC voltage (measured in millivolts) that is supplied to the TCU for monitoring. If this voltage is higher than the expected maximum level, a transient fault is generated. If ten contiguous transient faults are generated, a catastrophic fault is generated and the radar will shut down. Each time a transient or catastrophic fault is caused, the VSWR indicator on the TCU will light and a fault message will appear on the operator's console. If a transient fault is detected at one time and the fault is not detected the next time it is checked, the indicator and fault message will be cleared.

The primary method of adjusting the strength of the reflected RF energy is performed by the stub tuner. The stub tuner alters the impedance of the wave guide. The setting of the stub tuner is not intended to result in a setting of exact equilibrium of the returned RF energy in relation to the transmitted RF energy.

The crystal output monitoring is performed at a given time after the positive-going edge of the RF Gate signal. The time delay is adjustable with the use of the jumper positions on H1 and H2 of the TCU.

The rack contains some major components used in conjunction with the wave guide. These are:

- Circulator
- Stub tuner
- Dehydrator pressure port
- Power sampler
- Reflected power sampler
- TR limiter

3.6.5.1 Circulator

The circulator is susceptible to damage from iron or magnetic fields.

Do not position any iron or source of magnetic field within 4 inches of the circulator.

When a returned signal is received at the antenna, the energy returns through the wave guide, and the circulator directs this low-power energy to the receiver.

3.6.5.2 Stub Tuner

The stub tuner is for adjustment of the impedance of the wave guide. When sections of the wave guide are taken apart or adjusted, it may be necessary to re-adjust the stub tuner.

3.6.5.3 Forward Power Sampler

The forward power sampler measures the energy being emitted by the transmitter. The information about the energy is sent to the TCU as either a pass or fail condition.

3.6.5.4 Reflected Power Sampler

The reflected power sampler measures the energy being returned to the receiver. The information about the returned energy is sent to the TCU as either a pass or fail condition.

3.6.5.5 TR Limiter

The TR limiter provides isolation for the receiver to protect it from the high-power energy being emitted by the transmitter. This isolation is necessary because the receiver senses energy levels significantly lower than the levels of the energy from the transmitter.

The TR limiter provides a 20 dBm limit on the signal level sent to the LNA. The TR limiter is tuned for the primary operational frequency of the radar.

3.7 Maintenance Terminal

The maintenance terminal provides the technician a means of causing the system to operate in a known condition for a defined period of time. It can also be used as an aid in locating and repairing abnormal conditions within the system.

NOTE:

The maintenance terminal is provided for use by only experienced personnel that understand the operation of the radar. Improper settings from the maintenance terminal can render the radar system inoperable for use by personnel at the operator's console or may cause damage to the antenna assembly.

Appendix A shows the various maintenance screens and provides descriptions of their entries.

3.7.1 Terminal Access

To utilize the maintenance terminal, perform the following:

a. If not currently running, operate the maintenance panel power switch to the on position.

NOTE:

If the desired command is known, you may ignore the following steps and proceed directly with the desired functions.

b. At the > prompt, type H <enter>

NOTE:

If entering the maintenance screens, it is recommended that you place the system under maintenance terminal local control to prevent values from being changed by the operator console.

c. Observe that the command listing screen is displayed. For sample screens that are accessed by the MAINT command, and their definitions, refer to Appendix A.

3.7.2 Terminal Commands

The command listing displayed on the maintenance terminal is a condensed version that doesn't show all information about each command. These paragraphs provide greater detail for the commands with expanded capabilities. Figure 10 shows the contents of the main menu screen for the maintenance terminal.

```
WIN                                 - Windows Control
LOCAL                               - Console Control
zz                                  - DEBUG STUFF
BP                                  - Break Point Control
COPY [d:][path]old [d:][path]new    - Copy file(s)
DIR [d:][file] [/B,/C,/S,/P]        - DIRectory display
DL                                  - Disable Log
DTCL task_id                        - Display Task Call List
DTS                                 - Display Task Statistics
DUMP [d:][path]name {/D|/F}         - Display file as HEX
LOG                                 - Enable Log
EM addr                             - Examine and change memory
ERA [d:][path]file(s)               - ERAse file(s)
FLAG [value]                        - Display/Set display flags
H                                   - THIS DISPLAY
HEAP                                - HEAP display
MAINT                               - Maintenance Mode
ML                                  - Module List Display
ORD1 addr length                    - display memory as 8 bit
ORD2 addr length                    - display memory as 16 bit
ORD4 addr length                    - display memory as 32 bit
REN [d:]{path]old [d:][path]new     - Rename/Move files/directories
SET1 addr length value              - set memory as 8 bit
SET2 addr length value              - set memory as 16 bit
SET4 addr length value              - set memory as 32 bit
SFRS                                - Display Special Function Registers
TCB task_id                         - Display Task Control Block
TCU n                               - Initiate a TCU function

For more information on a command enter the command followed by ?.
i.e. 'CD ?'.
Square brackets [] represent optional parameters.
Arrow Left and Arrow right - cursor position.
Arrow Up and Arrow Down - next and previous line.
Backspace - cursor left and erase.
Del and Esc - erase current Line.
>>
```

Figure 10. Maintenance Terminal Command Help Listing.

3.7.2.1 WIN Command

Command format: WIN <enter>

The WIN command returns the system control to the Windows operating system and the programs that are currently loaded.

3.7.2.2 LOCAL Command

Command format: LOCAL <enter>

The LOCAL command places the radar system under exclusive control of the maintenance terminal. Any commands issued by the programs running on the Windows computer will be ignored until the WIN command is issued.

3.7.2.3 zz Command

NOTE:

This command is for use only by Kavouras employees familiar with factory-level knowledge of the radar operation. DO NOT attempt to discover the uses of this command. Incorrect command format can cause damage to the radar.

3.7.2.4 COPY Command

Command format: COPY [d:][path]old [d:][path]new <enter>

The COPY command needs the location and name of the source (old) file, followed by the location for the destination (new) file.

3.7.2.5 DIR Command

Command format: DIR [d:][path][file] [/B, /C, /S, /P] <enter>

The DIR command without the slash (/) options will list the presence/absence of the specified file or directory.

/B will display the specified file/directory size in bytes.
/C will display the specified file/directory size in clusters.
/S will display the specified file/directory size in sectors.
/P will pause when the screen becomes full.

/B, /C, and /S can not be used together.

3.7.2.6 DL Command

Command format: DL <enter>

The DL command disables the Log function. This disables the display of Ingest and command/status.

3.7.2.7 DTCL Command

Command format: DTCL task_id <enter>

The DTCL command allows the viewing of the contents of the specified task call list.

The available task call lists are defined by the DTS command.

The task_id parameter can be entered in any of the following formats:

Binary:	0(b | B) (0 . . 1)
Octal:	0(o | O) (0 . . 7) or 0(0 . . 7)
Decimal:	(1 . . 9) (0 . . 9)
Hex:	0(x | X) (0 . . 9, A . . F)

3.7.2.8 DTS Command

Command format: DTS <enter>

The DTS command will display the current tasks.

3.7.2.9 DUMP Command

Command format: DUMP [d:][path]name [/D, /F] <enter>

The DUMP command displays the contents of a file (/F) or directory (/D) specified in hexadecimal format.

3.7.2.10 LOG Command

Command format: LOG <enter>

The LOG command enables the LOG function. While enabled, the LOG function stores the received LOG data.

3.7.2.11 EM Command

Command format: EM addr <enter>

The EM command performs an inspect and change function on the memory address (addr) specified.

3.7.2.12 ERA Command

Command format: ERA [d:][path]file(s) <enter>

The ERA command will erase the files (or directories) specified.

3.7.2.13 FLAG Command

Command format: FLAG [value] <enter>

The flag command will enter flag states specified by the value entry.

3.7.2.14 H Command

Command format: H <enter>

The H command displays the information shown in Figure 10.

3.7.2.15 HEAP Command

Command format: HEAP <enter>

3.7.2.16 MAINT Command

Command format: MAINT <enter>

NOTE:

Prior to using this command, it is advisable to place the maintenance terminal in exclusive control of the radar by using the LOCAL command.

The MAINT command causes the maintenance terminal to enter the maintenance screens shown in Appendix A. These screens allow for detailed functional direction of the radar.

3.7.2.17 ML Command

Command format: ML <enter>

The ML command displays the contents of the module list.

NOTE:

Use of the ORD1 or ORD2 commands can cause damage to the radar if incorrect values are used.

3.7.2.18 ORD1 Command

Command format: ORD1 addr length <enter>

The ORD1 command displays the memory contents starting with address (addr) and displaying for (length) number of addresses in 1 byte increments.

3.7.2.19 ORD2 Command

Command format: ORD2 addr length <enter>

The ORD2 command displays the memory contents starting with address (addr) and displaying for (length) number of addresses in 2 byte (1 word) increments.

3.7.2.20 ORD4 Command

Command format: ORD4 addr length <enter>

The ORD4 command displays the memory contents starting with address (addr) and displaying for (length) number of addresses in 4 byte (double-length word) increments.

3.7.2.21 REN Command

Command format: REN [d:][path]old [path]new <enter>

The REN command allows for renaming and existing (old) file with a new name. By specifying the drive and path parameters and using the same file name, it is possible to move the file from one location to another.

3.7.2.22 SET1 Command

Command format: SET1 addr length value <enter>

The SET1 command enters a binary value (8 bits) at the address (addr) and for the specified number of addresses (length).

3.7.2.23 SET2 Command

Command format: SET2 addr length value <enter>

The SET2 command enters a binary value (16 bits) at the address (addr) and for the specified number of addresses (length).

3.7.2.24 SET4 Command

Command format: SET4 addr length value <enter>

The SET4 command enters a binary value (32 bits) at the address (addr) and for the specified number of addresses (length).

3.7.2.25 SFRS Command

Command format: SFRS <enter>

The SFRS command displays the contents of the special function registers.

3.7.2.26 TCB Command

Command format: TCB task_id <enter>

The TCB command will display the task control block for the location specified by the task_id.

3.7.2.27 TCU Command

Command format: TCU n <enter>

The TCU command will cause the radar to perform the function specified by n. The n field is defined in Table XIII.

Table XIII. TCU Command Entry Values

n Value	Definition
blank	Display a list of the allowable TCU n values.
S	Display the TCU status on the maintenance terminal
T	Display temperatures on the maintenance terminal
0	Place the transmitter in OFF mode
1	Place the transmitter in warm-up/standby mode
2	Place the transmitter in radiate mode (if transmitter not in standby prior to this command, the transmitter will go through the warm-up and then enter the radiate mode)
O	Override antenna faults until the TCU is reset
P	Display transmitter status and temperatures on the maintenance terminal
*	Reset the TCU

3.8 Operator's Console

The operator's console provides the TAC with the operating parameters selected by the operator. These operating parameters contain information concerning the following items:

- speed of antenna rotation (both azimuth and elevation)
- radiation power level
- the scan type
- any desired diagnostic routines to be run

3.9 Communications Protocol

The communications occur between major assemblies using serial data exchange. Each interface and its communication are as specified in Table XIV.

Table XIV. Communication Types

Assemblies		Cable Type	Data Rate	Data Type
From	To			
TAC	Transmitter	fiber optic	9600 bps	Synchronous
Transmitter	TAC	fiber optic	19.2 K bps	Synchronous
			19.2 K bps	
			19.2 K bps	
TAC	Maintenance terminal	coaxial	19.2 K bps	Asynchronous
Maintenance terminal	TAC	coaxial	19.2 K bps	Asynchronous
Dehydrator	TAC	coaxial	19.2 K bps	Asynchronous
TAC	Antenna	fiber optic	250 K bps	Synchronous
Antenna	TAC	fiber optic	250 K bps	Synchronous
TAC	Operator's console	fiber optic	4 MB	Synchronous
Operator's console	TAC	fiber optic	1 MB	Synchronous

3.9.1 TAC to Antenna (Uplink Data)

Uplink data is provided from the TAC to the radar antenna assembly to provide positioning information for the antenna dish. Also sent to the antenna assembly is a command word with instructions concerning whether to radiate, reset certain conditions, and how to handle any existing fault conditions.

The uplink data format consists of four serial data words, sent in ascending bit order (0–7). The first serial data word is the Start of Command word

- Word 1: Start of Command (all 1s)

NOTE:

The drive command voltages are represented by a digital value ranging from 0x01 through 0xFE. If the most significant bit (MSB) equals zero (value = 0x01 - 0x7F) the drive voltage represents antenna backward movement (top to bottom for elevation or counterclockwise for azimuth). If the most significant bit (MSB) equals one (value = 0x80 - 0xFE) the drive voltage represents antenna forward movement (bottom to top for elevation or clockwise for azimuth).

- Word 2: Azimuth Drive Command Voltage (0x01 to 0xFE)

- Word 3: Elevation Drive Command Voltage (0x01 to 0xFE)
- Word 4: Command (see Figure 11)

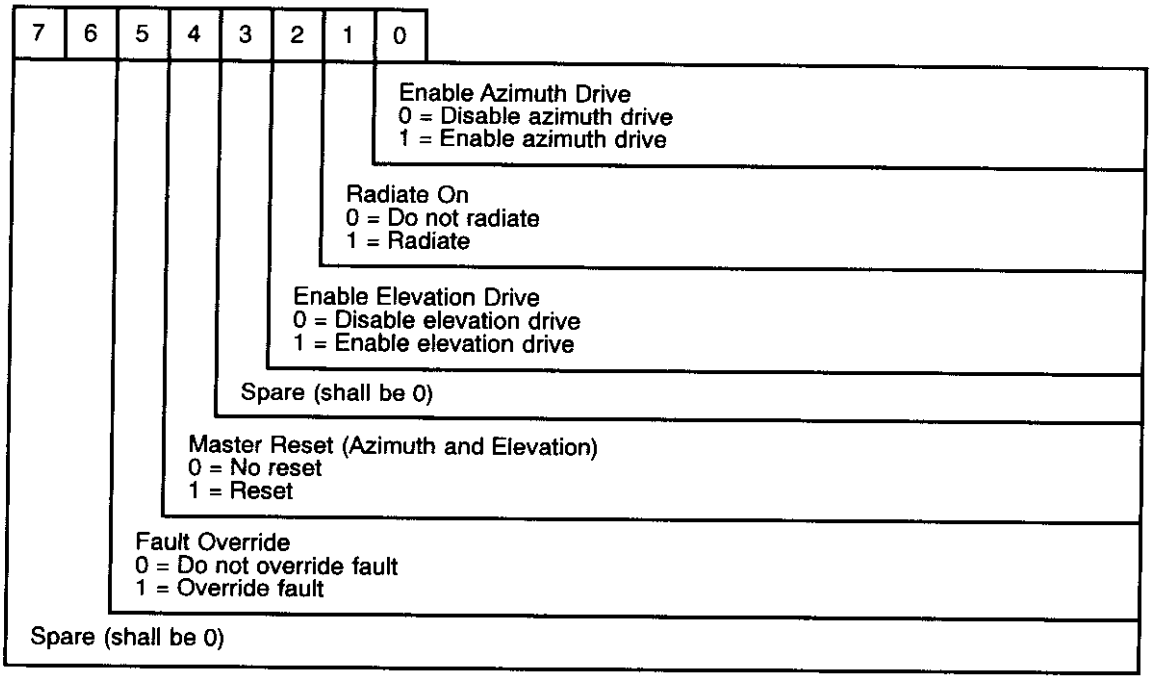


Figure 11. TAC to Antenna Command Word

3.9.2 Antenna to TAC (Downlink Data)

Downlink data is collected from the antenna assembly by the TAC to obtain position data and signal return data from the antenna dish. Also included is various other words with the current operating conditions at the antenna assembly.

The downlink data format consists of 14 serial data words, sent in ascending bit order (0-7). The first serial data word is the Start of Command word.

Word 1: Elevation Start of Command (all 1s)
Word 2: Status see Figure 12
Word 3: Position (lower 6 bits) see Figure 13
Word 4: Position (upper 6 bits) see Figure 13
Word 5: Temperature see Figure 14
Word 6: Time Stamp see Figure 15
Word 7: Faults see Figure 16
Word 8: Azimuth Start of Command (all 1s)
Word 9: Status see Figure 12
Word 10: Position (lower 6 bits) see Figure 13
Word 11: Position (upper 6 bits) see Figure 13
Word 12: Temperature see Figure 14

Word 13: Time Stamp see Figure 15
Word 14: Faults see Figure 16

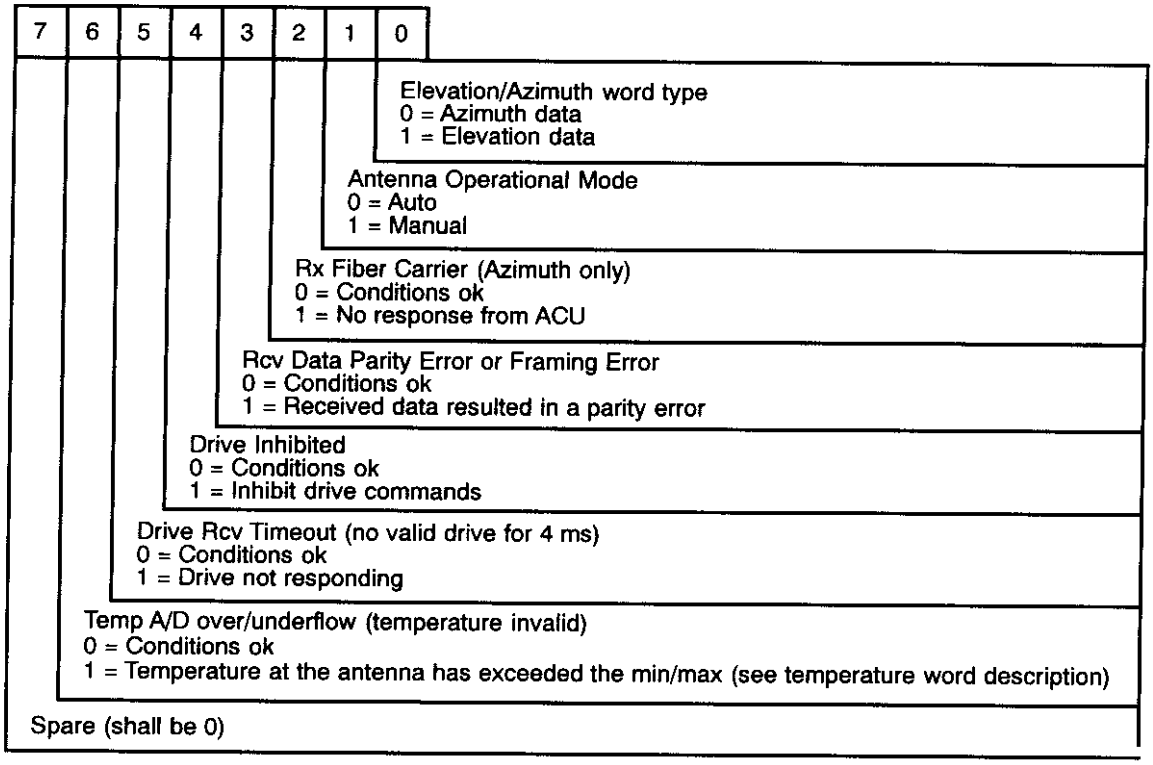


Figure 12. Elevation & Azimuth Status Words

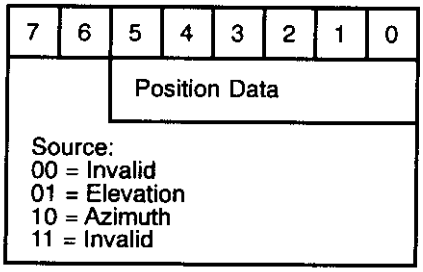


Figure 13. Elevation & Azimuth Position Word (Words 3 & 4 or 10 & 11)

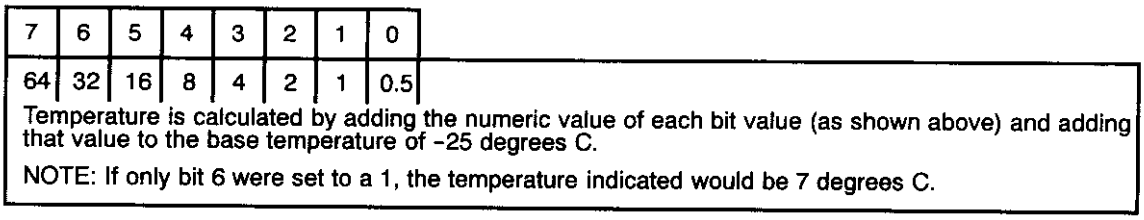


Figure 14. Elevation & Azimuth Temperature Word (Word 5 or 12)

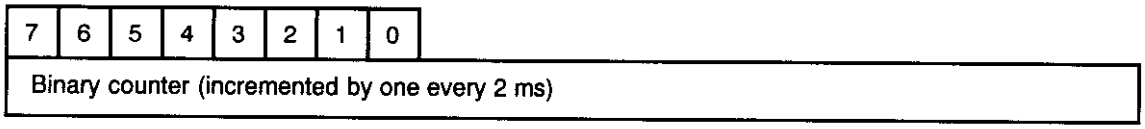


Figure 15. Elevation & Azimuth Time Stamp Word (Word 6 or 13)

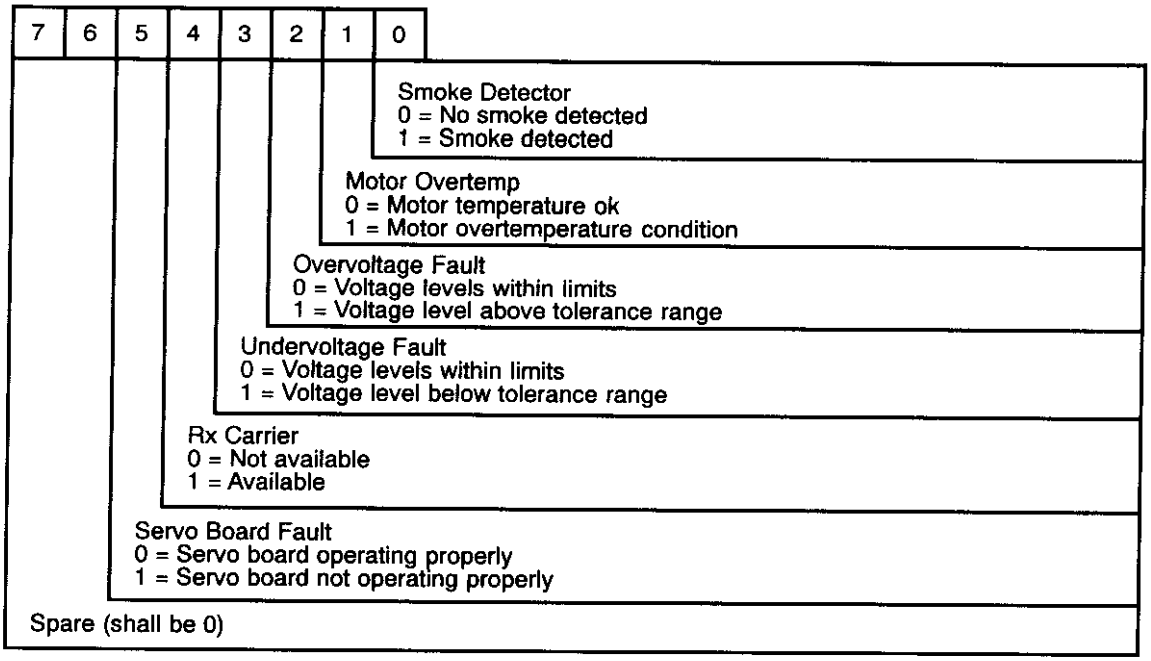


Figure 16. Elevation & Azimuth Fault Word (Word 7 or 14)

3.9.3 TAC to Transmitter and Transmitter to TAC

The following steps contain the possible TAC to transmitter commands and the transmitter actions as a result of those commands.

a. The TAC sends a Request Status command (0x53) to the transmitter.

The transmitter responds with:

1. Current mode byte (0x41 for antenna, 0x42 for AC Load, 0x43 for DC Load, 0x44 for Dummy Load)
2. Current state byte (0x30 for off mode, 0x31 for standby mode, 0x32 for radiate mode)
3. Current strike count byte
4. Current fault conditions (eight bytes). Refer to Table XV for meanings.

Table XV. Transmitter Request Status Words 3-10

Word	Bit Meanings (1= fault exists, 0= no fault)							
	7	6	5	4	3	2	1	0
3	Spare (shall be 0)	Spare (shall be 0)	Sever Voltage Low	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Cathode Current Low	Cathode Current High
4	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Pulse Width Too Wide	Forward Power Fault	VSWR Fault	Filament Transformer Overcurrent	High-Voltage Transformer Overcurrent
5	+5 Supply Low Fault	+5 Supply High Fault	-15 Supply Low Fault	-15 Supply High Fault	+15 Supply Low Fault	+15 Supply High Fault	HV Switch Drive Power Supply Low	HV Switch Drive Power Supply High
6	Biter Drive Voltage Low	Spare (shall be 0)	Biter Reset Current Fault	Sw Reset Current Fault	Spare (shall be 0)	Spare (shall be 0)	High Voltage Low Fault	High Voltage High Fault
7	Primary Flow Loop Fault	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)
8	Catastrophic Fault	Antenna Comm Fault	TAC Comm Fault	Spare (shall be 0)	Pump and Fan Interlock	Radiate OK	Spare (shall be 0)	Spare (shall be 0)
9	Temperature Fault (ADC 7)	Temperature Fault (ADC 6)	Temperature Fault (ADC 5)	Temperature Fault (ADC 4)	Temperature Fault (ADC 3)	Temperature Fault (ADC 2)	Temperature Fault (ADC 1)	Temperature Fault (ADC 0)
10	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Spare (shall be 0)	Radiate mode (bit positions) 2 1 0 0 0 0 Transmitter Off 0 0 1 Transmitter warming up 0 1 0 Transmitter in standby (due to antenna fault during transmit) 0 1 1 Transmitter in standby (normal) 1 0 0 Transmitter radiating 1 0 1 illegal 1 1 0 illegal 1 1 1 illegal		

b. The TAC sends a Request Temperature command (0x54) to the transmitter.

The transmitter responds with:

NOTE:

For the temperature of the first five bytes sent to the TAC, the numeric value (0-255) can be converted to degrees Celsius by using the following formula:

Temperature (°C) = (value/4) + 10.

- Word 0 - Chassis air temperature
- Word 1 - TWT temperature
- Word 2 - Modulator temperature
- Word 3 - Spare
- Word 4 - Spare
- Word 5 - Spare
- Word 6 - Spare
- Word 7 - Spare

c. The TAC sends a Change to mode 0 command (0x30) to the transmitter.

The transmitter responds by entering the off mode. In the off mode, the TCU remains on, but the supply power is removed from the filament, pump, high voltage, and transmitter cooling fans.

NOTE:

If entering the warm-up mode or transmit mode from the standby mode, the filament warm-up period for the TWT will need to occur. While this is occurring, the transmitter will not be able to transmit a signal to the antenna.

d. The TAC sends a Change to mode 1 command (0x31) to the transmitter.

The transmitter receives a change to mode 1 command. It responds by entering the warm-up/standby mode. In the warm-up/standby mode, the TCU remains on, along with the TWT filament, pump, and fans. The high voltage is off.

e. The TAC sends a Change to mode 2 command (0x32) to the transmitter.

f. The TAC sends a Change to normal mode command (0x41) to the transmitter.

The transmitter generates RF energy with the TWT and sends this energy through the wave guide to the antenna.

g. The TAC sends a Test mode 1 command (0x42) to the transmitter.

This command is currently not available.

h. The TAC sends a Test mode 2 command (0x43) to the transmitter.

This command is currently not available.

i. The TAC sends a Test mode 3 command (0x44) to the transmitter.

This command is currently not available.

j. The TAC sends an Antenna fault override command (0x4F) to the TCU.

The TCU will ignore antenna faults to allow testing without valid antenna input.

3.9.4 TAC to Receiver and Receiver to TAC

The following steps contain the possible TAC to receiver commands and the receiver actions as a result of those commands.

a. The TAC sends a Request Status command to the receiver.

The receiver responds with:

- ID byte (0x00 = Status, 0x01 = ACK/NAK, 0x02 = Sample Data)
- Status information

b. The TAC sends a Load New STC Curve Table command (514 bytes) to the receiver. The 514-byte command is comprised of:

- 1-byte command ID (0x15)

- 512 bytes of data
- 1-byte checksum

The receiver accepts the data, performs a checksum on the received data, and if the checksum is correct sends an ACK. If the checksum is incorrect, the receiver sends an NAK.

c. The TAC sends a Load Attenuator Table command (514 bytes) to the receiver. The 514-byte command is comprised of:

- 1-byte command ID (0x11)
- 512 bytes of data (256 16-bit words, sent low byte, high byte).
- 1-byte checksum

The receiver accepts the data, performs a checksum on the received data, and if the checksum is correct sends an ACK. If the checksum is incorrect, the receiver sends an NAK.

d. The TAC sends a Load Phase Shifter Table command (258 bytes) to the receiver. The 258-byte command is comprised of:

- 1-byte command ID (0x12)
- 256 bytes of data
- 1-byte checksum

The receiver accepts the data, performs a checksum on the received data, and if the checksum is correct sends an ACK. If the checksum is incorrect, the receiver sends an NAK.

e. The TAC sends a Load Bandwidth Register command (2 bytes) to the receiver. The 2-byte command is comprised of:

- 1-byte command ID (0x13)
- 1 byte of data

The receiver accepts the data and sends an ACK.

f. The TAC sends a Load Bandwidth Gain Register command (2 bytes) to the receiver. The 2-byte command is comprised of:

- 1-byte command ID (0x14)
- 1 byte of data

The receiver accepts the data and sends an ACK.

g. A Reset command (0xFF) is sent to receiver:

The receiver accepts the data and resets to the default conditions.

3.9.5 TAC to Operator Console

The TAC sends a command string to the Operator console. The contents of the command string are as shown in Figure 17. The status information portion is explained in Figure 17.

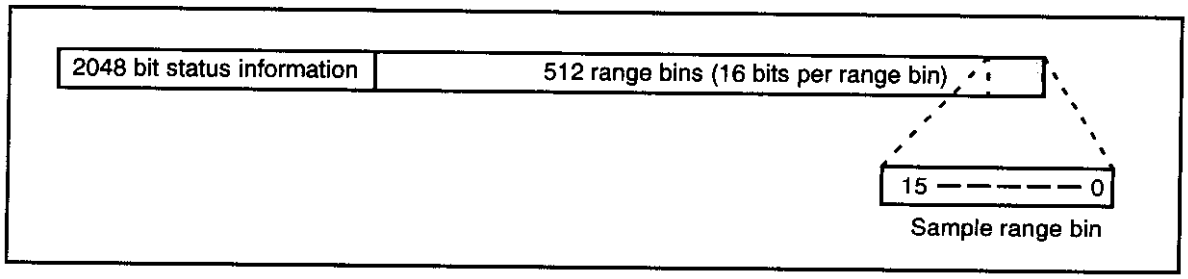


Figure 17. TAC to Operator Console Command String.

Table XVI. TAC to Operator Status Information.

Byte	Description	Byte	Description	Byte	Description
0, 1	Ack/Nak (see Table XVII)	54, 55	RVP status 2 (see Table XXV)	220	SQI
2, 3	Start range	56, 57	Comm status (see Table XXIV)	221	Frequency
4, 5	End range (see Table XVIII)	58-137	Character data	222	Bandwidth
6, 7	Azimuth angle (see Table XX)	138, 139	Current pulse width (see Table XXVI)	223	Sample size
8, 9	Elevation angle (see Table XX)	140, 141	Current PRF (see Table XXVII)	224, 225	Discretes (see Table XXIX)
10-13	Mode (see Table XXIII)	142	Antenna mode (see Table XXVIII)	226	RVP command echo
14-25	Transmitter status	143	Threshold seq count	227	unused
26-33	Transmitter temps	144-159	Reflectivity thresholds	228-231	Receiver status
34-39	unused	160-175	Velocity thresholds	232-236	Dehydrator status
40	Azimuth status (see Table XIX)	176-191	Width thresholds	237	unused
41	Azimuth fault (see Table XXI)	192-198	Azimuth command	238, 239	Data mode
42	Azimuth temp	199-205	Elevation command	240, 241	Number of range bins (see Table XXX)
43	Elevation status (see Table XXII)	206, 207	UZ flag	242, 243	Lenm
44	Elevation fault (see Table XXI)	208, 209	CZ flag	244, 245	Lensd
45	Elevation temp	210, 211	V flag	246	Volume scan info (see Table XXXI)
46, 47	Log noise	212, 213	W flag	247-249	unused
48, 49	I dc offset	214, 215	CCOR	250, 251	Number of SCSI bytes
50, 51	Q dc offset	216, 217	WSP	252, 253	Sequence number
52, 53	RVP status 1 (see Table XXV)	218, 219	LOG	254, 255	Synchronization characters (0xAA55)

Table XVI Notes:

Bytes 2 & 3 — These bytes are currently used as an internal counter

Bytes 42 & 45 — These bytes contain the antenna temperature in Celsius. The value is determined using the following formula:
(°F/2) - 25 = °C

Byte 143 — This byte is used as a counter. The value is incremented each time a new set of threshold values are output.

Bytes 144-159 — These bytes contain 16 reflectivity thresholds. The first byte (144) is always a value of zero and should be ignored.

Bytes 160-175	These bytes contain 16 reflectivity thresholds. The first byte (160) is always a value of one and should be ignored.
Bytes 176-191	These bytes contain 16 spectral widths. The first byte (176) is always a value of two and should be ignored.
Bytes 192-198	These bytes echo the contents of the last received azimuth control block.
Bytes 199-205	These bytes echo the contents of the last received elevation control block.
Bytes 206 & 207	These bytes echo the contents of the last received uncorrected reflectivity threshold control flags.
Bytes 208 & 209	These bytes echo the contents of the last received corrected reflectivity threshold control flags.
Bytes 210 & 211	These bytes echo the contents of the last received velocity threshold control flags.
Bytes 212 & 213	These bytes echo the contents of the last received spectral width threshold control flags.
Bytes 214 & 215	These bytes echo the contents of the last received CCOR threshold.
Bytes 216 & 217	These bytes echo the contents of the last received WSP threshold.
Bytes 218 & 219	These bytes echo the contents of the last received Log noise threshold.
Byte 220	This byte echoes the contents of the last received SQI threshold.
Byte 221	This byte echoes the last received transmitter frequency command. Currently, this is the selected transmitter frequency.
Byte 222	This byte contains the current receiver bandwidth.
Byte 223	This byte echoes the contents of the last received sample size command.
Byte 226	This byte echoes the contents of the command that caused the current SCSI data.
Bytes 242 & 243	These bytes contain the RVP-6 log-exponential noise mean. This value is used for calibration.
Bytes 244 & 245	These bytes contain the RVP-6 log-exponential noise standard deviation. This value is used for calibration.
Byte 246	During volume scanning, bit 0 is set once every 1° of azimuth scan. At the end of each elevation angle within the volume, bit 1 will be set until the next elevation angle is reached. Bits 1 and 2 will be set at the end of the volume scan. Bit 1 will be cleared when the elevation reaches the lowest elevation angle in the volume scan. Bit 2 will remain set until the next volume scan is begun.
Bytes 250 & 251	These bytes contain the quantity of bytes of RVP-6 data that are being sent. The maximum allowable number of RVP-6 data bytes that can be

sent in one string is limited to 2048. If a greater number of RVP-6 data bytes are to be sent, they will be broken down into groups of 2048 and sent with subsequent status information strings.

Bytes 252 & 253 These bytes form a 16-bit incremental counter. The count is incremented each time a data block is received by the TAC.

Table XVII. ACK/NAK Description.

Byte	Bit	Description
1	15-11 10 9 8	unused Data not valid for command received Not enough data received for specified command Duty-cycle error
0	7	ACK/NAK (0=NAK, 1=ACK)
	6 & 5	NAK type: (ignored if bit 7=1) 00=Checksum error 01=Data error 10=Synchronization error 11=Receive time-out
	4-0	Block identifier (echo of receiver block ID)

Table XVIII. Radar Ending Range Values.

Byte	Bit	Value
5	15-10 9 8	unused 512 km 256 km
4	7 6 5 4 3 2 1 0	128 km 64 km 32 km 16 km 8 km 4 km 2 km 1 km

Table XIX. Azimuth Status.

Byte	Bit	Description
40	7 6 5 4 3 2 1 0	unused 1 = temperature in overtemp/undertemp condition 1 = no valid drive for 4 ms 1 = azimuth drive inhibited 1 = data parity or framing error 1 = receiver fiber carrier present 1 = ACU under manual control 1 = Elevation status word, 0 = azimuth status word

Table XX. Azimuth and Elevation Angles.

Azimuth			Elevation		
Byte	**Bit**	**Value**	**Byte**	**Bit**	**Value**
7	15	180°	9	15	unused
	14	90°		14	90°
	13	45°		13	45°
	12	22.5°		12	22.5°
	11	11.25°		11	11.25°
	10	5.625°		10	5.625°
	9	2.8125°		9	2.8125°
	8	1.40625°		8	1.40625°
6	7	0.703125°	8	7	0.703125°
	6	0.3515625°		6	0.3515625°
	5	0.17578125°		5	0.17578125°
	4	0.087890625°		4	0.087890625°
	3	0.0439453125°		3	0.0439453125°
	2	0.02197265625°		2	0.02197265625°
	1	0.010986328125°		1	0.010986328125°
	0	0.0054931640625°		0	0.0054931640625°
For elevation, 0° = straight up, 90° = boresight, and 180° = straight down.					

Table XXI. Azimuth/Elevation Faults.

Byte	Bit	Description
41	7	unused
(Az)	6	unused
44	5	1 = Servo circuit board fault
(El)	4	1 = No receiver carrier on the fiber optic cable
	3	1 = Undervoltage fault
	2	1 = Overvoltage fault
	1	1 = Antenna drive motor overtemp
	0	1 = Smoke detected

Table XXII. Elevation Status.

Byte	Bit	Description
43	7	unused
	6	1 = temperature in overtemp/undertemp condition
	5	1 = no valid drive for 4 ms
	4	1 = azimuth drive inhibited
	3	1 = data parity or framing error
	2	unused
	1	1 = ECU under manual control
	0	1 = Elevation status word, 0 = azimuth status word

Table XXIII. Mode Description.

Byte	Bit	Description
13	31-24	unused
12	23-16	unused
11	15	RVP data status (0=no data, 1=data)
	14 & 13	Unfolding 00=no unfolding 01=2:3 unfolding 10=3:4 unfolding 11=4:5 unfolding
	12	Test mode (1=test mode, 0=normal operation)
	11	Uncorrected reflectivity (1=uncorrected, 0=corrected)
	10	Corrected reflectivity (1=corrected, 0=uncorrected)
	9	Spectral width (1=Spectral width display enabled, 0= not enabled)
	8	Velocity (1= Velocity display enabled, 0=not enabled)
10	7	Raw I data
	6	Raw Q data
	5	Raw Log data
	4	Error data
	3 - 0	Number of data bits: (1-16) 0000 = 16 bits 0001 = 1 bit . . . 1111 = 15 bits

Table XXIV. Communication Status.

Byte	Bit	Description
57	15-8	unused
56	7-5	unused
	4	RCU communication failure
	3	RVP-6 communication failure
	2	Antenna azimuth communication failure
	1	Antenna elevation communication failure
	0	TCU communication failure

Table XXV. RVP Status

Byte	Bit	Description
55	31-26	unused
	25	DSP supports 16-bit floating point time series
	24	DSP has full IAGC hardware and firmware configuration
54	23	Angle ray sync (1=dynamic, 0=begin on sync angles)
	22	Angle sync is not interruptible
	21	Angle sync is enabled
	20	Angle sync axis (1=elevation, 0=azimuth)
	19	Angle sync input (1=BCD, 0=binary)
	18	PWINFO command (1=disabled, 0=enabled)
	17	Error in loading the trigger angle table (see RVP manual LSYNC command)
	16	No trigger, or longer than 6.8 ms since last trigger
53	15	unused
	14	Error in the Exponential-LOG portion of the last SNOISE command
	13-10	unused
	9	Error in last Load Range Mask (LRMSK) command. This generally means too many range bins were selected.
	8	unused
52	7	Insufficient time to compute noise offsets during SNOISE
	6	Command received while waiting for output FIFO space. The command was processed but some of the data was lost (zeroed).
	5	Buffer overflow during time series mode
	4	reserved for expansion
	3	PRF varied by more than 10 μs from beginning to end of a processing interval
	2	No trigger during PROC command
	1	Trigger too fast during noise measurement (some of the noise sample bins were positioned past the trigger range)
	0	No trigger during noise measurement

sheet 1 of 1

Table XXVI. Current Pulse Width.

Byte	Bit	Description
139	15-8	unused
138	7	16 μs
	6	8 μs
	5	4 μs
	4	2 μs
	3	1 μs
	2	500 ns
	1	250 ns
	0	125 ns

Table XXVII. Current PRF (in Hz).

Byte	Bit	Description
141	15-12	unused
	11	2048
	10	1024
	9	512
	8	256
140	7	128
	6	64
	5	32
	4	16
	3	8
	2	4
	1	2
	0	1

Table XXVIII. Antenna Mode.

Byte	Bit	Description
142	7-6	unused
	5-4	Azimuth mode: 00 = Stop/seek 01 = Scan 10 = Sector scan 11 = reserved
	3-2	Elevation mode: 00 = Stop/seek 01 = Sector scan (RHI) 10 = Volume scan 11 = reserved
	1	Elevation scan direction (1=up, 0=down)
	0	Azimuth movement direction (1=clockwise, 0=counterclockwise)

Table XXIX. Discretes.

Byte	Bit	Description
225	15-8	unused
224	7-5	unused
	4	Doppler speckle filter (0=disabled, 1=enabled)
	3	Log speckle filter (0=disabled, 1=enabled)
	2	3-lag algorithm (0=disabled, 1=enabled)
	1	Clutter microsuppression (0=disabled, 1=enabled)
	0	AGC (0=disabled, 1=enabled)

Table XXX. Number of Range Bins.

Byte	Bit	Value
241	15-9	unused
	8	256
240	7	128
	6	64
	5	32
	4	16
	3	8
	2	4
	1	2
	0	1

Table XXXI. Volume Scan.

Byte	Bit	Description
246	7-3	unused
	2	Volume scan (0=not completed, 1=completed)
	1	Elevation angle (0=not at end, 1=at end)
	0	Volume data (0=do not save, 1=save)

3.9.6 Operator Console to TAC

Communication between the operator console and the TAC are based on RS-232 serial format. The data format for the command from the operator console to the TAC is as follows:

- Word 1: Start of Command (0x01)
- Word 2: Block ID and the 3 most significant bits for the data word count (see Figure 18)

  The block ID value is an incremental counter ranging from 0x01 to 0x1F. The block ID is used as a reference number between the operator console and the TAC that ensures that a response from the TAC is associated with the appropriate command from the operator console.

- Word 3: Data word count (lowest 8 bits)

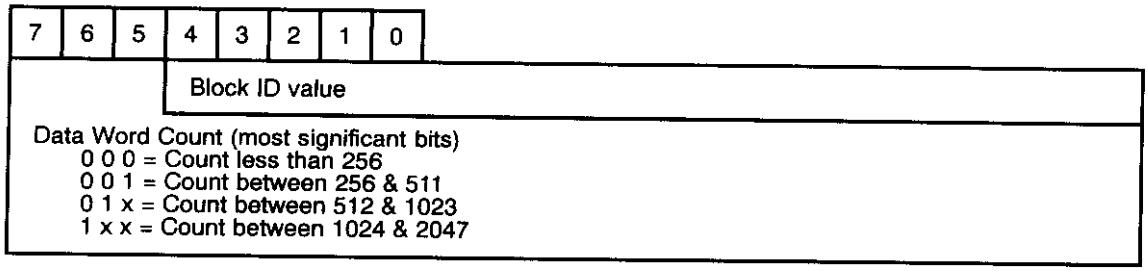


Figure 18. Operator Console to TAC Command (Word 2).

The data word count has a maximum value of 255 (0xFF). To obtain values greater than 255, the upper 3 bits of word 2 (see Figure 18) are used as an extension of this word.

The data word count value is the number of words that follow this word. The number of words that follow the data word count word is as specified in Table XXXII. Most commands will contain word 4 (command type number identifier) and word n+1 (checksum). If a word count of 4 is listed in Table XXXII, the data word count word would be followed by a command type number identifier word, two data words, and a checksum word.

The Inquiry (command type number 255) is followed by only a command type identifier word, thus the value of 1.

- Word 4: Command type number identifier (see Table XXXII for valid entries)
- Word 5: Data word 1

  .
  .
  .
- Word n: Data word n
- Word n+1: Checksum

Table XXXII. Command Type Number Identifier Values.

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
3	1	Mode	See Figure 19 for mode word bit meanings
9	2	Azimuth	See Table XXXIII for data word descriptions
9	3	Elevation	See Table XXXIV for data word descriptions
4	4	Range	See Table XVIII for values of the data words
variable, 66 max.	5	Threshold Levels	Up to 64 separate threshold levels may be defined. The values for each data word are as follows: **Reflectivity**: Numeric value in the range of 0 to 255 0 = no signal 1 = -31.5 dBz 2 = -31 dBz ↓ ↓ 64 = 0 dBz ↓ ↓ 255 = 95.5 dBz **Velocity**: Numeric value in the range of 0 to 255 0 = no velocity data signal available 1 = maximum velocity toward the radar ($-V_u$) ↓ ↓ 128 = no movement ↓ ↓ 255 = maximum velocity away from the radar ($+V_u$) **Spectral Width**: Numeric value in the range of 0 to 255 0 = no spectral width data available 1-255 = n Where: n/256 * V_u = m/s m/s = meters per second V_u = unambiguous velocity

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Table XXXII. Command Type Number Identifier Values. (continued)

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
3	6	Unfolding	Numeric value (1, 2, or 3) 1 = no PRF stagger 2 = 2:3 PRF stagger (multiply V_u by 2) 3 = 3:4 PRF stagger (multiply V_u by 3)
514 or 1026	7	Clutter Filters	This feature is currently unused
4	8	PRT (pulse repetition timing)	Numeric value between 0x0A6A - 0xC350 Values that are outside the allowable range will result in the use of the minimum value (if less than the minimum value) or the maximum value (if greater than the maximum value).
4	9	Pulse Width	Numeric value between 0x01 - 0xA0 Values greater than 0xA0 will be interpreted as 0xA0. A pulse width of 0x00 will result in the radar entering the standby mode.
4	10	Sample Size	Numeric value between 0x04 - 0xFF Values less than 0x04 will be interpreted as 0x04.
4	11	CCOR	See the RVP-6 manual for a description of this operation.
4	12	SQI Threshold	See the RVP-6 manual for a description of this operation.
4	13	WSP Threshold	See the RVP-6 manual for a description of this operation.
4	14	UZ Thresholding Flag	See the RVP-6 manual for a description of these flags.
4	15	CZ Thresholding Flag	
4	16	Velo Threshold-ing Flag	
4	17	Width Threshold-ing Flag	
3	18	AGC Enable	Numeric value of 0x00 (select STC) or 0x01 (select AGC). Default value is 0x01.
3	19	Clutter Microsup-pression	Numeric value of 0x00 (before range averag-ing) or 0x01 (after range averaging). The clutter microsuppression will be per-formed in one of these two states.

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Table XXXII. Command Type Number Identifier Values. (continued)

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
3	20	Three-lag Algorithm	Numeric value of 0x00 (two-lag) or 0x01 (three-lag). Either two- or three-lag algorithm will be selected.
3	21	Log Speckle Filter	Numeric value of 0x00 (disable) or 0x01 (enable) the speckle filter for the Log signal.
3	22	Doppler Speckle Filter	Numeric value of 0x00 (disable) or 0x01 (enable) the speckles (single-point returns) on the doppler data channels.
3	64	Calibration Mode	Select the calibration mode of operation.
3	65	Set IF Attenuator	Set the IF attenuator to the specified value.
514	66	Set Test Attenuators	Set the test attenuator to the specified value.
1	255	Inquiry	Request for current status of the TAC.

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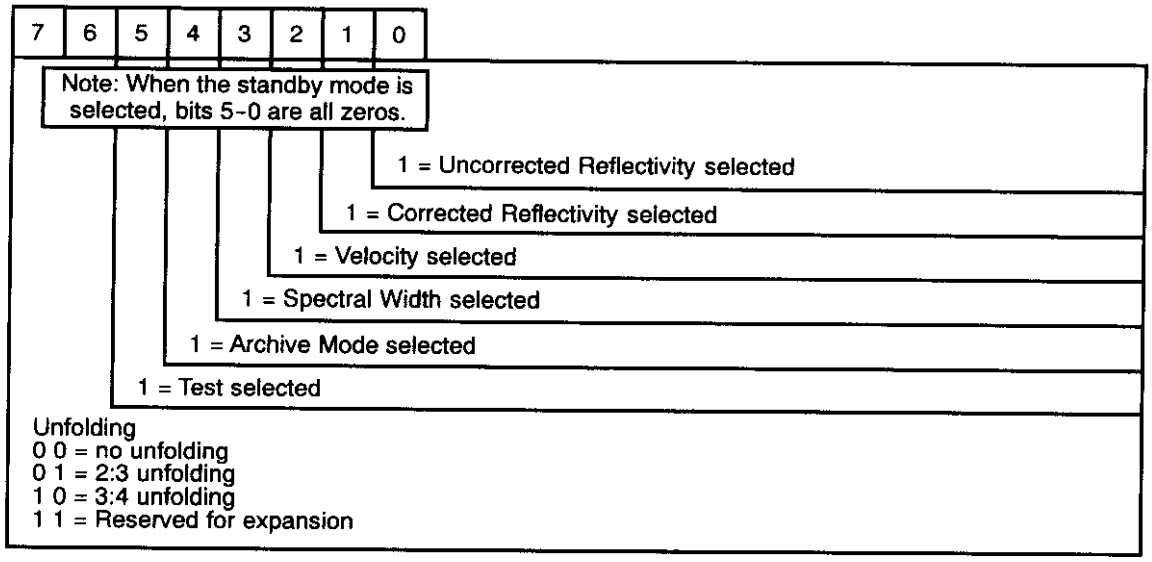

Figure 19. Mode Command Type Identifier Definition.

Table XXXIII. Azimuth Data Words.

Data Word	Content 7	6	5	4	3	2	1	0	Description
1	0	0	0	0	0	0	0	0	**Goto**. Move the antenna to the position specified in data words 2 & 3
	0	0	0	0	0	0	0	1	**Scan**. Rotate the antenna in the direction specified in data word 7 at the speed specified in data word 6
	0	0	0	0	0	0	1	0	**Sector scan**. Rotate the antenna back and forth in a width defined by data words 4 & 5. The width will be centered on the angle specified in data words 2 & 3. The antenna speed will be specified in data word 6.
	0	0	0	0	0	0	1	1	**Volume scan**. Except that this function shall repeat until the elevation area specified by an elevation command, this function is the same as the sector scan shown above.
	0	0	0	0	0	1	0	0	**Stop antenna**. Disengage all drive voltages from the antenna.
	0	0	0	0	0	1	0	1	**Open loop**. Drive antenna in the specified direction without any regulation to maintain a specific speed.
2	x	x	x	x	x	x	x	x	**Center angle**. Lower 8 bits of a 16-bit value.
3	x	x	x	x	x	x	x	x	**Center angle**. Upper 8 bits of a 16-bit value. LSB = 0.0054931640625 °
4	x	x	x	x	x	x	x	x	**Sector width**. Lower 8 bits of a 16-bit value.
5	x	x	x	x	x	x	x	x	**Sector width**. Upper 8 bits of a 16-bit value. LSB = 0.0054931640625 °
6	x	x	x	x	x	x	x	x	**Speed**. Rotation speed (in degrees/second)
7	0	0	0	0	0	0	0	n	**Rotation direction**. Direction (when viewed from above) of rotation. n = 0: Clockwise n = 1: Counterclockwise

Table XXXIV. Elevation Data Words.

Data Word	Content 7	6	5	4	3	2	1	0	Description
1	0	0	0	0	0	0	0	0	**Goto**. Move the antenna to the position specified in data words 2 & 3
	0	0	0	0	0	0	0	1	**Scan**. Rotate the antenna in the direction specified in data word 7 at the speed specified in data word 6
	0	0	0	0	0	0	1	0	**Sector scan**. Rotate the antenna back and forth in a width defined by data words 4 & 5. The width will be centered on the angle specified in data words 2 & 3. The antenna speed will be specified in data word 6.
	0	0	0	0	0	0	1	1	**Volume scan**. Except that this function shall repeat until the elevation area specified by an elevation command, this function is the same as the sector scan shown above.
	0	0	0	0	0	1	0	0	**Stop antenna**. Disengage all drive voltages from the antenna.
	0	0	0	0	0	1	0	1	**Open loop**. Drive antenna in the specified direction without any regulation to maintain a specific speed.
2	x	x	x	x	x	x	x	x	**Bottom angle**. Lower 8 bits of a 16-bit value. The bottom angle is the lowest vertical position for a Range-Height-Indicator (RHI) or volume scan.
3	x	x	x	x	x	x	x	x	**Bottom angle**. Upper 8 bits of a 16-bit value. LSB = 0.0054931640625 °
4	x	x	x	x	x	x	x	x	**Top angle**. Lower 8 bits of a 16-bit value. The top angle is the highest vertical position for an RHI or volume scan.
5	x	x	x	x	x	x	x	x	**Top angle**. Upper 8 bits of a 16-bit value. LSB = 0.0054931640625 °
6	x	x	x	x	x	x	x	x	**Speed**. Rotation speed (in degrees/second)
7	x	x	x	x	x	x	x	x	**Step size**. Size (in $\frac{1}{8}$°) of elevation angle shift for each sweep during a volume scan.

3.9.7 TAC to Dehydrator and Dehydrator to TAC

The TAC sends a full system status request (0x31). The command is sent to the dehydrator at address 0x30. If the dehydrator address has been modified on the dehydrator communication circuit board has been changed, no communication will occur.

The dehydrator sends a status word to the TAC. The format is as specified in the dehydrator manual.

Section 4: Preventive Maintenance

Table XXXV. Preventive Maintenance Schedule .

Period	Inspection	Reference Paragraph
At installation of the radar	Monitor the dehydrator operating parameters	4.3
	Check for corrosion on wave guides	4.2
	Verify conditions of earth ground cables	4.11
	Inspect and tighten mounting hardware	—
Weekly	Operate antenna and monitor for unusual noise	4.1.2.2, 4.1.3.2
	Check ACU fan filters	4.1.4.1
	Check ECU fan filters	4.1.3.3
	Check transmitter exhaust fan operation	4.4
	Check receiver exhaust fan operation	4.5
	Check TAC exhaust fan operation	4.6
	Check rack front and heat exchanger filters	4.7.1
	Check rack filters	4.7.1
	Check heat exchanger functions	4.7.2
	Check rack exhaust fan operation	4.7.3
Monthly	Verify dehydrator operation	4.3
	Check for elevation gearbox leaks	4.1.3.2
	Check for cooling system problems	4.7
	Measure the 20 MHz log video noise level	4.5
	Verify operation of and voltage levels for:	
	TAC	4.6
	Receiver	4.5
	Transmitter	4.4
	Pedestal	4.1.4.2
	Check for azimuth gear box leaks	4.1.2.2
	Examine heat exchanger cooling fins for debris	4.7.2
Every two months	Check azimuth drive and encoder belts	4.1.2.1
	Check dish support arm bearings	4.1.1.2
	Grease yoke spindle bearing	4.1.1.1
	Check oil level of the azimuth primary and secondary gearboxes	4.1.2.2
	Grease azimuth primary and secondary gearbox shaft bearings	4.1.2.2
	Check elevation drive and encoder belts	4.1.3.1

Table XXXV. Preventive Maintenance Schedule (continued).

Period	Inspection	Reference Paragraph
Every six months	Oil cooling pump bearings	4.7.4
	Check dehydrator pump air inlet filter	4.3
Annually	Check for corrosion on wave guides	4.2
	Verify generator cleaning of housing	4.9
	Verify conditions of earth ground cables	4.11
Periodically	Clean cabinets and perform unspecified maintenance.	4.8, 4.10
	Inspect and tighten mounting hardware at time of installation and during maintenance operations.	—
	Check the azimuth drive belt	4.1.2

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4.1 Antenna

4.1.1 Yoke Assembly

4.1.1.1 Yoke Spindle Bearing

Every two months, inspect the yoke spindle bearing and add grease. For adding the grease, refer to the **Yoke Spindle Bearing Lubrication** procedure in Section 5.

4.1.1.2 Antenna Dish Support Arm Bearings

4.1.1.2.1 Sealed Bearing (Wave Guide Arm of Antenna Dish)

Every two months, inspect the bearing located on the dish support arm with the wave guide passing through it. If there is any grease leaking from the bearing, contact your Kavouras representative.

4.1.1.2.2 Elevation Control Arm Bearings

Every two months, inspect the elevation control arm bearings and add grease. For adding the grease, refer to the **Elevation Control Arm Bearing Lubrication** procedure in Section 5.

4.1.2 Azimuth Control

4.1.2.1 Azimuth Drive Belt

Every two months, perform the following:

a. Inspect the azimuth drive and encoder belts for signs of fraying, cracking, or excessive wear.

NOTE:

If any of these wear conditions exist, and the determination is made to replace the belt, retain the worn belt as an emergency replacement in case the new belt becomes unusable.

b. Inspect the azimuth drive belt for correct tension by determining the amount of deflection on the side of the belt. If the azimuth drive belt requires the tension to be adjusted, perform the **Azimuth Drive Belt** adjustment procedure in Section 5.

c. Inspect the encoder drive belt for correct tension by determining the amount of deflection on the side of the belt. High tension is not required, there should not by any obvious slack in the belt.

4.1.2.2 Azimuth Drive Gearbox

Weekly, listen for any unusual noises while manually operating the antenna.

Weekly, inspect for leakage of oil. If there is leakage, contact your Kavouras representative.

Every two months, verify the proper oil level in the gearbox by performing the **Azimuth Primary Gearbox Oil Level** and **Azimuth Secondary Gearbox Oil Level** procedures in Section 5.

Every two months, grease the shaft bearings on the primary and secondary gearboxes by performing the **Azimuth Primary Gearbox Bearing Lubrication** and **Azimuth Secondary Gearbox Bearing Lubrication** procedures in Section 5.

4.1.3 Elevation Control

4.1.3.1 Elevation Drive Belt

Every two months, perform the following:

a. Inspect the elevation drive and encoder belts for signs of fraying, cracking, or excessive wear.

b. Inspect the elevation drive belt for correct tension by determining the amount of deflection on the side of the belt. The method for measuring belt deflection is shown in Figure 20.

4.1.3.2 Elevation Drive Gearbox

Weekly, listen for any unusual noises while manually operating the antenna.

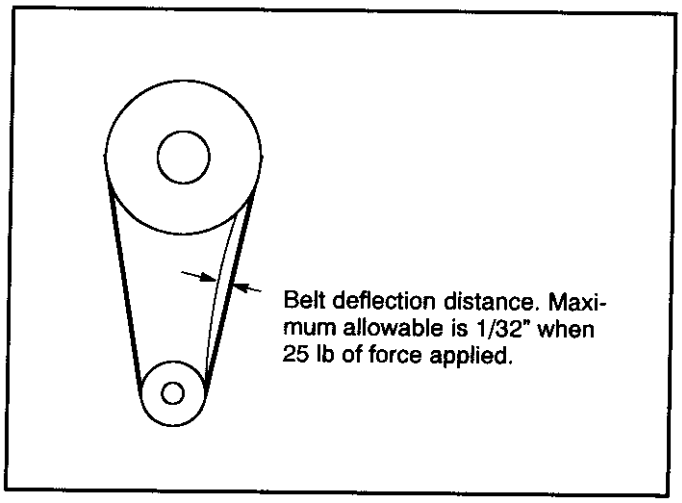

Figure 20. Elevation Drive Belt Deflection.

Monthly, inspect for leakage of grease. If there is leakage, contact your Kavouras representative.

4.1.3.3 Elevation Control Unit

Weekly, check the fan filters, If installed, and clean as needed in warm soapy water. Allow filters to air dry; then install them. If replacement filters are required, we recommend the use of Kavouras part number 10530305.

4.1.4 Pedestal

4.1.4.1 Azimuth Control Unit

Weekly, check the fan filters and clean as needed in warm soapy water. Allow filters to air dry; then install them. If replacement filters are required, we recommend the use of Kavouras part number 10530305.

4.1.4.2 300 VDC Power Supply

Monthly, verify that the output level for the power supply is between 250 and 300 volts DC.

Weekly, check the fan filter and clean as needed.

4.2 Wave Guides

Annually, inspect the wave guides for signs of corrosion. The typical locations for corrosion are the connecting hardware and the joints of wave guide sections where dissimilar metals meet. If corrosion is present, clean or replace the corroded parts.

4.3 Dehydrator

At time of installation of the radar and daily for the first two weeks of operation, monitor the dehydrator operational parameters by performing the **Dehydrator Checkout** procedure in Section 5.

Monthly, verify dehydrator operational parameters by performing the **Dehydrator Checkout** procedure in Section 5.

Every six months, examine the air inlet filter on the air pump. This filter (part number 10530105) will need to be replaced every two years or more often if the dehydrator is operated for extended periods at a high duty cycle.

4.4 Transmitter

Monthly, verify the proper power output level of the transmitter by looking at the CURRENT STATUS screen of the maintenance terminal. If the output of the transmitter is low the CURRENT STATUS screen will provide notification of the situation.

Weekly, verify proper operation of the two exhaust fans.

4.5 Receiver

Weekly, verify proper operation of the two exhaust fans.

Monthly, measure noise level of the 20 MHz log video by performing the **Log Video Noise Level** procedure in Section 5.

4.6 TAC

Weekly, verify proper operation of the two exhaust fans.

Monthly, verify the status of TAC by checking the CURRENT STATUS screen.

Monthly, perform the **TAC Power Supply Voltage Checkout** and **TAC Power Supply Voltage Adjustment** procedures in Section 5.

4.7 Rack Cooling

4.7.1 Air Filters

Weekly, perform the following:

a. Check the filters in the rack front door and clean as needed in warm soapy water. Allow filters to air dry; apply a light misting of oil; then install them. If replacement

filters are required, we recommend the use of DTN Kavouras part number 11040920.

b. Check the heat exchanger air filter on the rear door and clean as needed in warm soapy water. Allow filter to air dry; apply a light misting of oil; then install it. If a replacement filter is required, we recommend the use of DTN Kavouras part number 11040945.

4.7.2 Heat Exchanger

Weekly, verify proper operation of the exhaust fan(s) on the heat exchanger.

Weekly, check the fluid level in the fluid reservoir. If the level has gone down, check for leaks and the reason for the loss of fluid. After the source of any leaks is located and repaired, replenish the fluid reservoir.

Monthly, and as necessary, vacuum out the heat exchanger cooling fins.

Verify that the pump located under the transmitter is functioning properly by operating the PUMP switch on the inside of the rear rack door to the LOCAL position. The pump should run continuously in this position. Return the PUMP switch to the REMOTE position and close the rear rack door.

Check to see if all four fans located at the bottom of the heat exchanger box are operating properly.

Weekly, check for leaks at all hose connections.

4.7.3 Rack Cooling Fans

Weekly, verify that the exhaust fan(s) mounted at the top of the rear rack door are operating properly.

4.7.4 Cooling Pump

Monthly, listen for any unusual noises from the cooling pump.

Every six months, oil the pump bearings by performing the **Cooling Pump Bearing Lubrication** procedure in Section 5.

4.8 Maintenance Terminal

As needed, blow the dust out of the keyboard, wipe off screen, and clean any filters.

4.9 Motor Generator

Annually, clean windings with compressed air. Please refer to the "NOBRUSH" Frequency Converter manual for cleaning instructions.

4.10 Display Screens

As needed, blow the dust out of the keyboards, wipe off screens, and clean any filters.

4.11 Structure Maintenance

Weekly, create a condition that will cause the aircraft warning lights mounted on the radome to turn on. Verify proper operation.

Annually, check the connections for all earth ground cables to verify no corrosion is present. If corrosion is present, correct the problem.

Section 5: Corrective Maintenance

5.1 Tools, Test Equipment and Supplies

5.1.1 Standard Tools

Table XXXVI. Standard Tools List .

Item	Nomenclature	Description	Mfr/Part Number
1	Bottle, spray	Filter oil	—
2	Covers, protective, wave guide	Wave guide opening covers	Kav 11081031
3	Desoldering bulb	Plastic tip, removable	—
4	Flashlight	—	—
5	Glasses, safety	—	—
6	Gun, grease, with nozzle extension	—	—
7	Mirror, inspection	—	—
8	Nut driver set, hex	3/16", 1/4", 5/16", 11/32", 3/8", 7/16", 1/2"	
9	Oiler, flexible nozzle	SAE 20 oil	—
10	Pliers set	4" & 6" diagonal cutters, 4" & 6" needle nose, 6" & 8" slip joint, 10" arc joint, 7" straight jaw, 7" curved jaw locking	
11	Screwdriver set, alignment non-metallic	—	—
12	Screwdriver set, flat-tip	1/8"x4", 3/16"x4", 1/4"x4", 1/4"x6", 5/16"x8", 3/8"x12"	—
13	Screwdriver set, phillips-tip	#1x3", #2x4", #2x8", #3x6"	—
14	Socket set, combination, metric	15mm, 17mm, 19mm	—
15	Thermometer, (°F)	—	—
16	Wrench, torque	5-75 ft lb	—
17	Wrench set, allen	—	—

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Table XXXVI. Standard Tools List (continued).

Item	Nomenclature	Description	Mfr/Part Number
18	Wrench set, combination	1/4", 5/16", 11/32", 3/8", 7/16", 1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", 15/16", 1", 1-1/8", 1-1/4"	—
19	Wrench set, combination metric	6 through 27 mm (22 pieces, 12 pt. sockets)	—
20	Wrench set, hex-key long	.050", 1/16", 3/32", 1/8", 5/32", 3/16", 1/4", 5/16", 3/8"	—
21	Wrench set, hex-key, long, metric	1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12 mm	—
22	Wrench set, socket 3/8" drive	5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 12 pt. sockets; 3" & 6" extension bars; quick release ratchet, 3/8" to 1/4" adapter	—
23	Wrench set, socket 1/2" drive	7/16", 1/2", 9/16", 5/8", 11/16", 3/4", 13/16", 7/8", 15/16", 1", 1-1/8", 1-1/4", 12 pt. sockets; 3", 6", & 10" extension bars; quick release ratchet, 1/2" to 3/8" adapter	—

5.1.2 Test Equipment

Table XXXVII. Standard Test Equipment List.

Item	Nomenclature	Description	Mfr/Part Number
1	Cable, test, coaxial, BNC male connectors, 6-foot	—	—
2	Cable, test coaxial 8-foot BNC male-to-BNC male (qty 2)	—	—
3	Cable, test coaxial 8-foot, SMA male-to-SMA male	—	—
4	Calculator, scientific	—	—
5	Cord, fiberoptic patch	—	—
6	Cup, dip, 16 & 20 pin	—	—
7	Detector, crystal	HP23 B option 003, HP 423B or equivalent	—
8	Dip clip, 16 pin	—	—
9	High voltage probe	—	—
10	Leads, test, multimeter	Fluke/TL70 (included with model 87 multimeter) or equivalent	—
11	Leads, test, multimeter	Fluke/Y8134/YU8140	—
12	Meter, power	HP436A or equivalent	—
13	Multimeter, digital	Fluke/model 87, Fluke/ model 8060A or equivalent	—
14	Radio, 2-way communications (qty 2)	—	—
15	Spectrum analyzer	HP8563A or equivalent	—
16	Termination, 50 ohms, SMA male	HP908A (N-Type) or equivalent	—
17	Thermometer, Fahrenheit	—	—
18	Watch, stop	—	—

5.1.3 Consumable Items

Table XXXVIII. Consumables/Expendables List.

Item	Nomenclature	Description	Mfr/Part Number
1	Brush, paint	1/4" with soft bristles	—
2	Brush, acid	1/4" with stiff bristles	—
3	Caulk (radome)	white	—
4	Circuit breaker	TAC, Receiver	Kav 91001515
5	Circuit breaker	Transmitter	Kav 91001510
6	Coolant	Automotive coolant	—
7	Filter, air, re-usable, metal mesh	ACU/ECU fans	Kav 10530305
8	Filter, air, re-usable, metal mesh	Rack front door	Kav 11040920
9	Fuses	Fan & Pump controls	MDL 7/250V
10	Gaskets, wave guide	72C 1/2 Gasket	Kav 91001035
11	Gaskets, wave guide, conductive	1/2 Gasket	Kav 91001039 SPEC
12	Gloves, rubber (4 pair)	—	—
13	Grease, bearing	Dow Corning Molykote 44	—
14	Markers, lead	—	—
15	Oil, dielectric	Exxon Univolt N61 Inhibited Transformer Oil ASTM-D-3487 Type II IEC 296 Class II A BS 148:1984 Class II A Product Code: 331831 Formula: 01831	—
16	Oil, gear box	Mobil Oil Corp. SHC 629 (or equivalent)	—
17	Oil, light (filter coating)	mineral or equivalent	—
18	Signs, warning	DANGER HIGH VOLTAGE	—
19	Tags, safety	Equipment off — DO NOT ENERGIZE	—
20	Tubing, heat shrink	Assorted sizes	—
21	Wraps, tie	Assorted sizes	—

5.2 Radome

Refer to the Radome manual that was provided by the radome manufacturer. The manual covers installation, repair and maintenance required.

Operation of the radar system while working in this area could result in exposure to microwave energy.

Ensure that the radar is in the OFF mode when working in this area.

5.3 Antenna

5.3.1 Yoke Assembly

5.3.1.1 Dish Support Arm Bearings

The dish support arm bearings will require the use of a crane to lift the dish assembly. If bearing replacement is required, contact your Kavouras representative.

5.3.1.2 Elevation Encoder

The encoder is not repairable. Replace it and send the defective encoder to Kavouras.

- **Removal**

a. At the ACU, operate the power switch to the OFF (down) position.

b. On the encoder mounting bracket, loosen the cap screws that mount the bracket to the yoke and slide the encoder assembly forward to release tension on the encoder drive belt.

NOTE:

The encoder is easily damaged. When handling the encoder assembly take care not to drop or strike the encoder with any object.

c. Loosen the flex coupling where the encoder shaft enters the flex coupling.

d. Remove the cap screws that hold the encoder to the bracket.

e. Remove the encoder from the bracket.

f. Disconnect the cable by rotating the plug lock ring a 1/4 turn counterclockwise. Secure the cable so that is does not fall.

- **Installation**

a. Insert the encoder into the mounting bracket, inserting the shaft into the flex coupling.

b. Using four cap screws, mount the encoder on the vertical mounting plate and tighten to 15 ft lb.

c. Tighten the flex coupling screw to 10 ft lb.

d. Attach the cable to the encoder and ensure the plug lock ring is turned 1/4 turn clockwise.

NOTE:

Overtightening the encoder drive belt can stretch the belt or cause it to skip a tooth on the gears. Tighten the belt so that a slight give exists when pressed.

e. Ensure that the encoder drive belt is aligned on the drive wheels and slide the mounting bracket to tighten the drive belt.

f. Tighten the mounting bracket cap screws to 25 ft lb.

g. Perform the *Elevation Offset Adjustment* procedure.

h. At the ACU, operate the power switch to the ON (up) position.

i. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.3 Elevation Encoder Drive Belt

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Loosen the encoder mounting bracket and slide it towards the dish drive shaft.

d. Perform the **Elevation Upper Gear** removal procedure.

NOTE:

The encoder is easily damaged. When handling the encoder assembly take care not to drop or strike the encoder with any object.

e. Loosen the flex coupling where the encoder shaft enters the flex coupling.

f. Remove the cap screws that hold the encoder to the bracket.

g. Remove the encoder from the bracket.

Removal of the bolts from the bearings on the dish support arms will allow the dish to move from its designated position.

The bolts can be loosened to allow minor dish support arm movement, but complete bolt removal should only be performed on one bearing at a time.

h. Loosen, but do not remove, the bolts holding the two shaft support bearings.

NOTE:

Two people will be required for the next step.

i. Using a lever, lift the support arm and slide a 1/4 inch spacer under the inner bearing housing. Lower the bearing onto the spacer.

j. Remove the bolts from the outer bearing.

k. Using the gap under the outer bearing, remove the old encoder drive belt.

- **Installation:**

a. Slip the new encoder belt around the shaft and the first shaft support bearing.

b. Insert the encoder into the mounting bracket, inserting the shaft into the flex coupling.

c. Using four cap screws, mount the encoder on the vertical mounting plate and tighten to 15 ft lb.

d. Tighten the flex coupling screw to 10 ft lb.

NOTE:

Two people will be required for the next step.

e. Using a lever, lift the support arm and remove the spacer from under the inner bearing housing. Lower the support arm.

f. Replace the outer bearing bolts and tighten all bearing bolts to 25 ft lb.

NOTE:

Overtightening the encoder drive belt can stretch the belt or cause it to skip a tooth on the gears. Tighten the belt so that a slight give exists when pressed.

g. Ensure that the encoder drive belt is aligned on the drive wheels and slide the encoder mounting bracket to tighten the drive belt.

h. Tighten the mounting bracket cap screws to 25 ft lb.

i. Perform the **Elevation Upper Gear** installation procedure.

j. At the ACU, operate the power switch to the ON (up) position.

k. Perform the ***Elevation Offset Adjustment*** procedure.

l. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.4 Elevation Drive Belt

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

Loosening the elevation drive belt can allow the radar dish to rotate to its point of gravitational equilibrium.

When loosening the drive belt adjustment, keep all items clear of the drive gear and drive belt until the dish has stopped moving.

c. Slightly loosen the bolts on the elevation drive belt tension adjustment bracket (refer to Figure 21).

d. Using the adjustment screw, loosen the belt tension so the elevation drive belt can be removed.

e. Remove the elevation drive belt.

- **Installation:**

a. Install the new elevation drive belt on the drive gears.

b. Using the adjustment screw on the drive belt adjustment bracket, increase the belt tension to achieve a maximum deflection of 1/32 inch at 25 pounds of pressure, as shown in Figure 22.

c. Tighten the drive belt adjustment bracket bolts to 25 ft lb.

d. At the ACU, operate the power switch to the ON (up) position.

e. Perform the *Elevation Offset Adjustment* procedure.

f. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.5 Elevation Motor

NOTE:

When disconnecting the cables from the motor, secure the cables to ensure that they do not fall into the hole in the yoke arm.

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Slightly loosen the bolts on the elevation drive belt tension adjustment bracket.

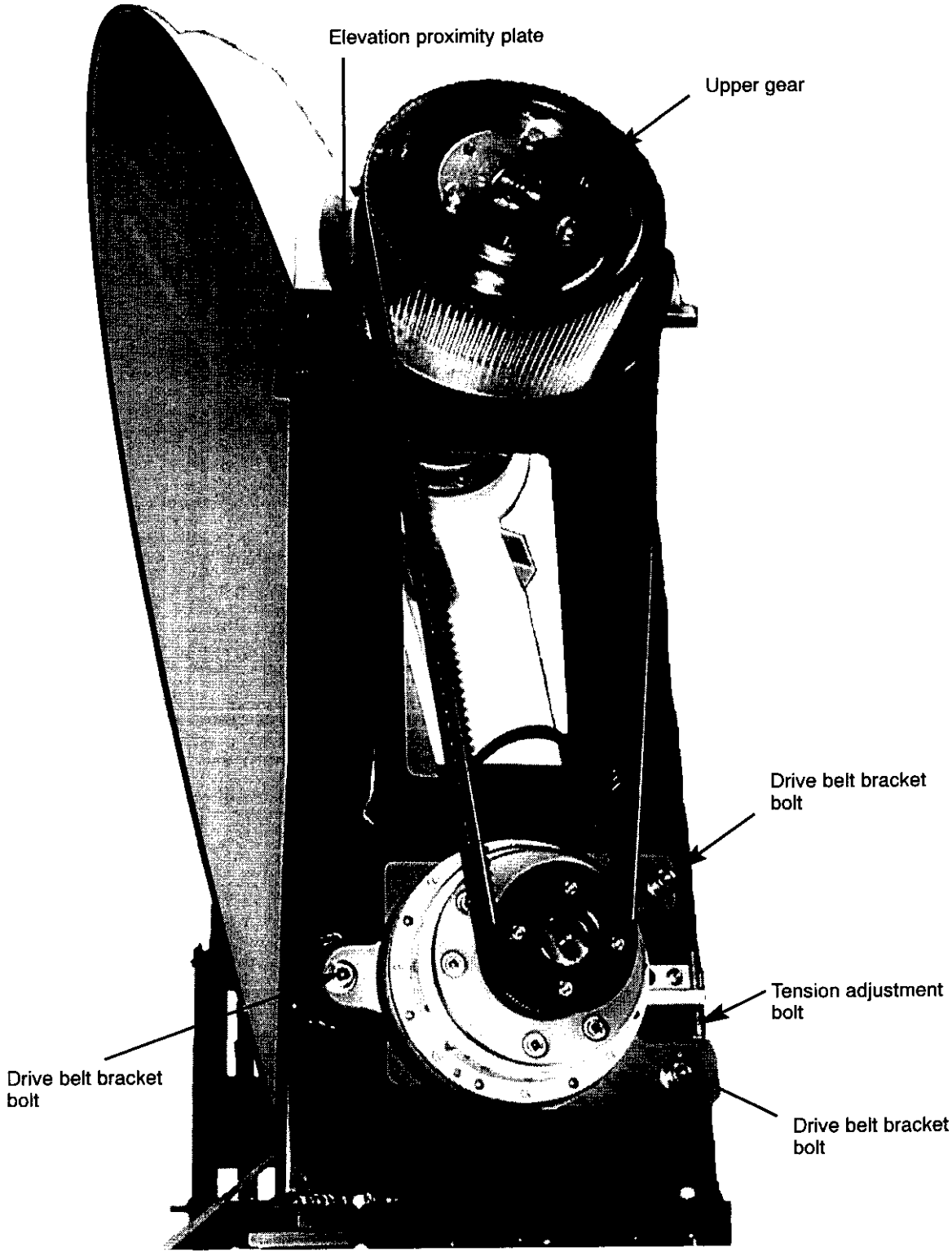


Figure 21. Elevation Drive Arm

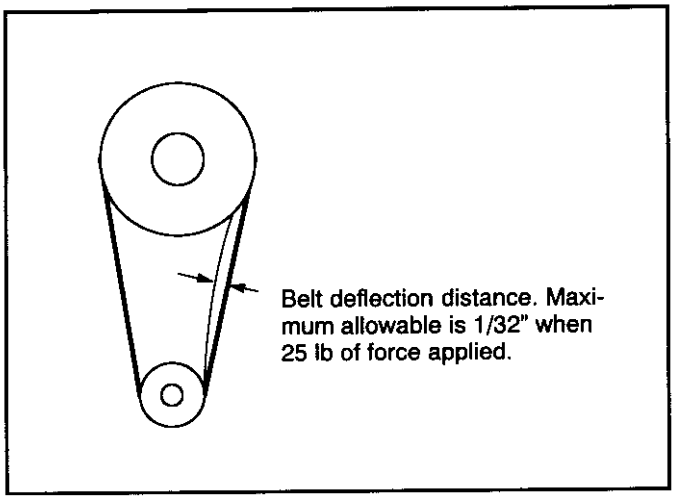


Figure 22. Elevation Drive Belt Deflection.

Loosening the elevation drive belt can allow the radar dish to rotate to its point of gravitational equilibrium.

When loosening the drive belt adjustment, keep all items clear of the drive gear and drive belt until the dish has stopped moving.

d. Using the adjustment screw, loosen the belt tension so the elevation drive belt can be removed.

e. Remove the elevation drive belt.

f. Remove the cables from the motor and secure them so they do not fall into the yoke arm.

g. While supporting the motor, remove the cap screws holding the motor.

h. Remove the motor.

- **Installation:**

a. With the motor positioned so that the cable jacks are facing the same direction as the old motor, install and tighten the motor cap screws to 25 ft lb.

b. Attach each of the cables to the motor and ensure the plug lock ring is turned 1/4 turn clockwise.

c. Replace the drive belt.

d. Using the adjustment screw on the drive belt adjustment bracket, increase the belt tension to achieve a maximum deflection of 1/32 inch at 25 pounds of pressure.

e. Tighten the drive belt adjustment bracket bolts to 25 ft lb.

f. At the ACU, operate the power switch to the ON (up) position.

g. Perform the *Elevation Offset Adjustment* procedure.

h. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.6 Elevation Upper Gear

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Slightly loosen the bolts on the elevation drive belt tension adjustment bracket.

Loosening the elevation drive belt can allow the radar dish to rotate to its point of gravitational equilibrium.

When loosening the drive belt adjustment, keep all items clear of the drive gear and drive belt until the dish has stopped moving.

d. Using the adjustment screw, loosen the belt tension so the elevation drive belt can be removed.

e. Remove the elevation drive belt.

f. Remove the three bolts on the smaller inner hub of the gear.

g. Insert the same three bolts into the three threaded holes on the hub, turning each bolt by hand until they can be turned no farther.

h. Using a wrench, tighten one of the bolts 1/2 turn.

i. Moving to the next bolt, repeat the previous step.

j. Repeat steps h and i until the hub can be removed from the larger gear.

k. Remove the key from the keyway of the larger gear.

l. Remove the large gear.

m. Remove the three bolts from the threaded hub holes and retain them for use in the original holes.

- **Installation:**

a. Place the large gear on the shaft with the opening for the inner hub facing out.

b. Insert the key in the keyway.

c. Place the inner hub in the large gear.

d. Align the unthreaded hub holes with the corresponding threaded holes on the large gear. Tighten the hub bolts finger tight.

e. Using a wrench, tighten one hub bolt 1/2 turn.

f. Moving to the next bolt, repeat the previous step.

g. Repeat steps e and f until the hub bolts have been tightened to 25 ft lb.

h. Replace the drive belt.

i. Using the adjustment screw on the drive belt adjustment bracket, increase the belt tension to achieve a maximum deflection of 1/32 inch at 25 pounds of pressure.

j. Tighten the drive belt adjustment bracket bolts to 25 ft lb.

k. At the ACU, operate the power switch to the ON (up) position.

l. Perform the *Elevation Offset Adjustment* procedure.

m. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.7 Elevation Offset Adjustment

a. If not already, place the maintenance terminal in exclusive control of the TAC.

b. Using the ACU ELEV REV/FWD switch, move the radar dish until the feed horn of the dish is level.

c. At the maintenance terminal, change the elevation offset to indicate an elevation of 0°.

d. At the ACU, operate the LOCAL/REMOTE switch to REMOTE.

e. At the maintenance terminal, move the antenna as necessary to locate a predetermined reference point at a given azimuth and elevation.

f. Modify the elevation offset to indicate the actual elevation.

g. Release the maintenance terminal from exclusive control of the TAC.

5.3.1.8 Elevation Rotary Joint

The rotary joint is not repairable. If defective, it must be replaced.

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

c. Disassemble the wave guide flange at the bottom of the 90° bend, saving the rubber gaskets and shim for re-use. Refer to Figure 23 for locations of components.

d. Disassemble the top flange of the 90° bend wave guide, saving gasket for re-use.

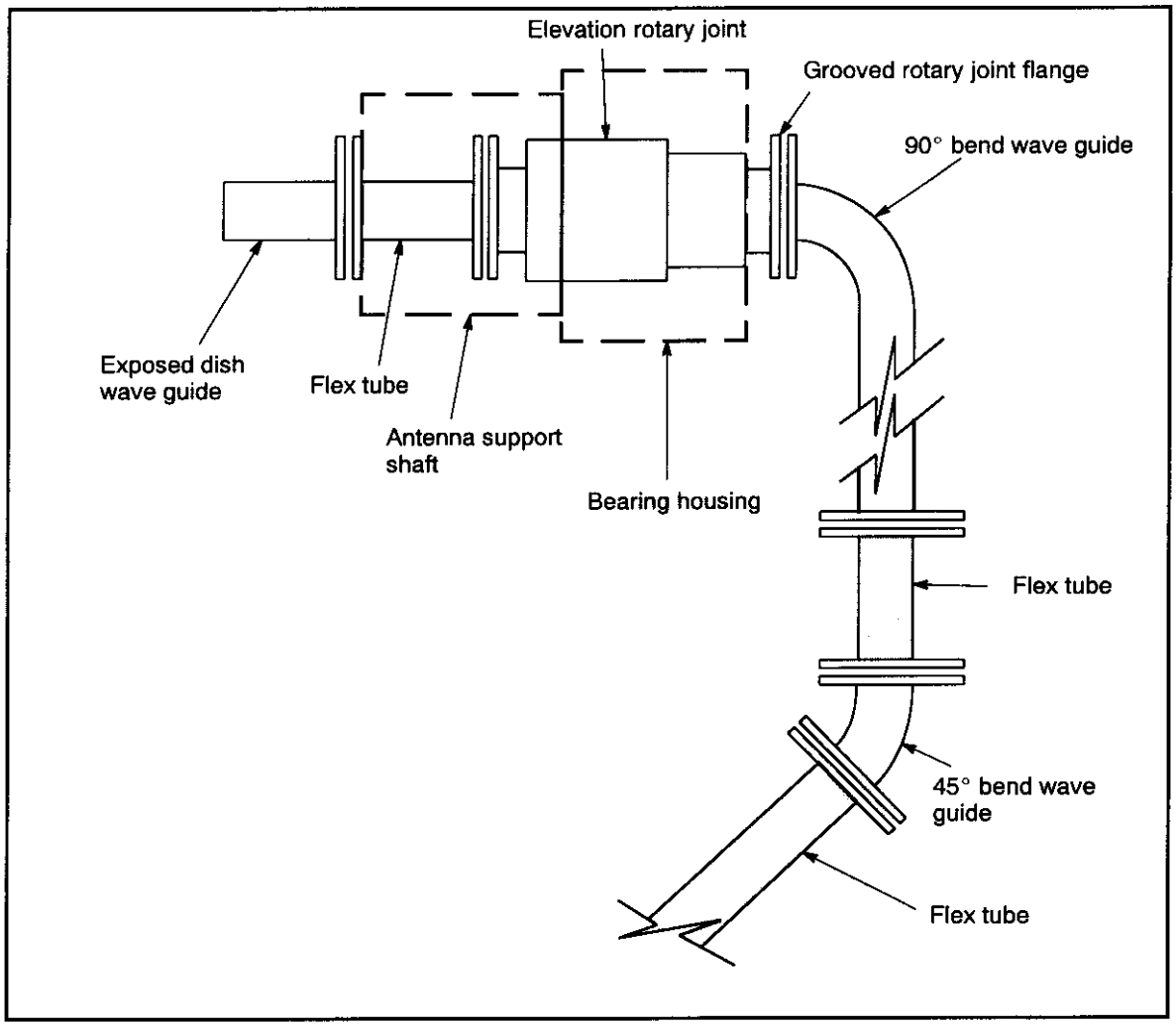


Figure 23. Elevation Wave Guide Rotary Joint.

e. Disassemble the wave guide flange located between the dish and the flex guide segment that passes through the antenna support shaft.

f. Retract the four rotary joint alignment bolts. The alignment bolts enter the collar on the outside edge of the main bearing assembly. The four bolts are directed toward the center axis of the rotary joint.

g. Pull the rotary joint, collar assembly and wave guide assembly out of the main bearing assembly.

h. Remove the flexible wave guide segment and shim from the rotary joint, noting which end has the groove for the rubber gasket.

- **Installation:**

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave

guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide. If contaminants exist, refer to the wave guide paragraphs for instructions on cleaning.

NOTE:

When tightening wave guides, verify that the gasket is properly positioned with the flat surface in the groove of the flange. Perform the bolt torque in steps to reduce the possibility of damaging the gaskets or flanges.

a. Install the flexible wave guide segment and shim removed from the old rotary joint on the new rotary joint. Tighten the flange bolts in an alternating cross-over pattern to 80 inch lb.

b. Insert the rotary joint and flexible wave guide through the main bearing assembly.

c. Loosely assemble the flange where the antenna dish wave guide and the flexible wave guide join.

d. Tighten the flange bolts between the flexible wave guide and the antenna dish wave guide to 80 inch lb.

e. Align the rotary joint:

1. Obtain the following items:
   - Dial indicator, accurate to 0.001 inch, with magnetic base and adjustable arms
   - Flat iron, 1-1/2 inch wide, 1/4 inch thick, 12-18 inches long
   - Clamp
2. Using the clamp, attach the flat iron to the wave guide riser as shown in Figure 24.

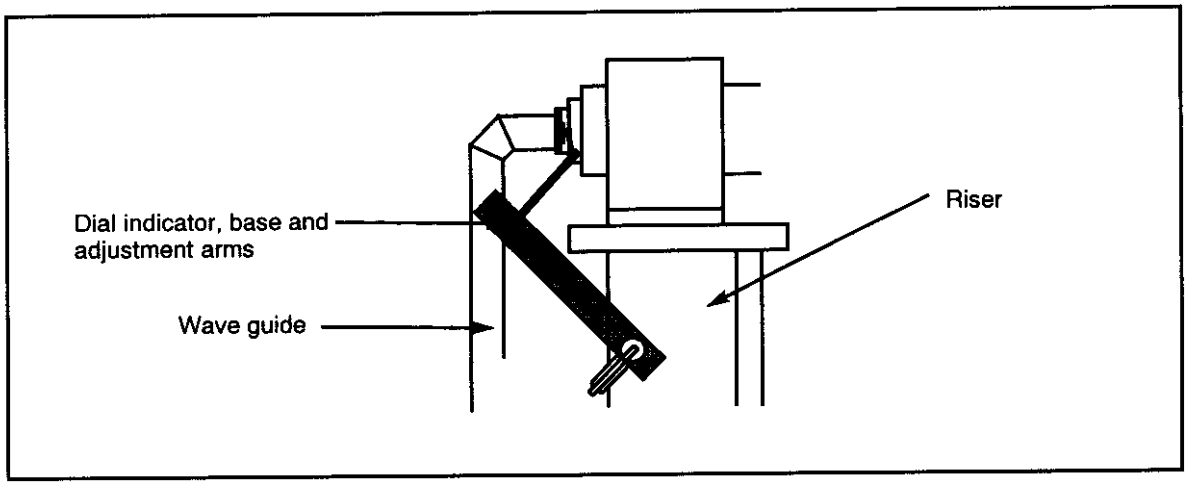


Figure 24. Elevation Rotary Joint Flat Iron Attachment

NOTE:

The collar on the outside of the rotary joint has holes for joining the two halves of the collar. When using the dial indicator, if the feeler portion drops into one of these holes, permanent damage to the dial indicator will result. For this reason, it is advisable to install a feeler that extends beyond the surface being measured.

3. Attach a feeler to the dial indicator that allows the dial indicator to be mounted at a 90° orientation to the rotary joint collar. Refer to Figure 25.

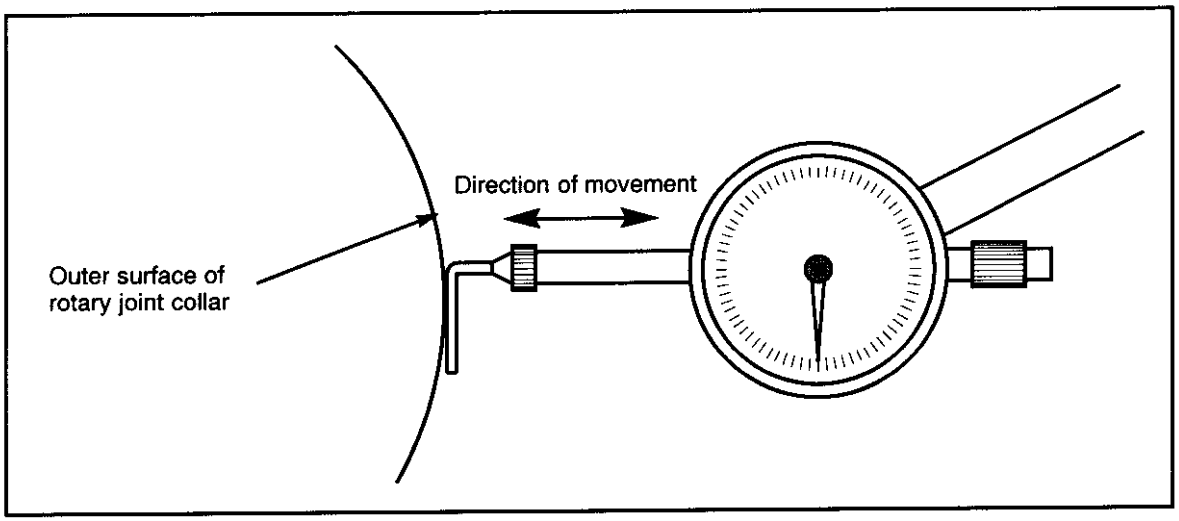


Figure 25. Dial Indicator Feeler Installation

4. Attach the base of the dial indicator to the flat iron.

NOTE:

When properly positioned, the feeler plunger of the dial indicator should be partially moved toward the body of the dial indicator. This allows for the possibility that the point where the feeler is positioned on the collar is not the furthest point from the dial indicator.

5. Adjust the arms of the dial indicator to position the feeler on the outer surface of the rotary joint collar.
6. Observe the value indicated on the dial indicator.
7. While observing the gauge on the dial caliper to determine the nearest and farthest points from the dial caliper, have another person change the elevation in one direction so that the reflector makes a 360° revolution.
8. Record the values of the closest and farthest points measured during the antenna movement.

9. Subtract the smaller value from the larger value.
10. If the resulting value is less than 0.015, this procedure is complete. No further adjustment is required. If the value is greater than 0.015, proceed with the following steps.
11. Rotate the antenna until the location nearest to the collar is reached.
12. Loosen the collar adjustment setscrews on the opposite side of the reflector shaft to allow the collar to move one half the difference determined in step 9.
13. Tighten all setscrews for the rotary joint collar and repeat steps 7 through 10 until the variation is reduced to an acceptable amount.

NOTE:

The next step will require two people to prevent the possibility of damage to the rotary joint or to the flexible wave guide segment below the 90° bend wave guide segment.

f. Attach the 90° bend wave guide piece to the rotary joint and to the flexible wave guide. After verifying that the flanges are properly assembled, tighten the flange bolts to 80 inch lb.

g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

h. Perform the **VSWR Stub Tuner Calibration** procedure to compensate for any wave guide changes.

5.3.1.9 Yoke Wave Guide

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

c. Disassemble the wave guide flange at the bottom of the 90° bend, saving the rubber gaskets and shim for re-use. Refer to Figure 23 for locations of components.

d. Disassemble the top flange of the 90° bend wave guide, saving gasket for re-use.

e. Remove the access panel on the yoke arm to gain access to the wave guide.

f. Disconnect the wave guide at the lowest flange that will not put extra stress on a piece of flexible wave guide, saving hardware for re-use.

g. Loosen the yoke arm wave guide mounting brackets for the disconnected sections of wave guide and remove the wave guide segments from the yoke arm.

h. Replace the defective segments of wave guide, tightening bolts to 80 inch lb.

- **Installation:**

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide. If contaminants exist, refer to the wave guide paragraphs for instructions on cleaning.

a. Install the wave guide segments into the yoke arm mounting brackets and tighten brackets sufficiently to allow minor movement for alignment of flanges.

b. Tighten the flange bolts of the lowest segment, using an alternating cross-over pattern, to 80 inch lb.

NOTE:

The next step will require two people to prevent the possibility of damage to the rotary joint or to the flexible wave guide segment below the 90° bend wave guide segment.

c. Attach the 90° bend wave guide piece to the elevation rotary joint and to the flexible wave guide. After verifying that the flanges are properly assembled, tighten the flange bolts to 80 inch lb.

d. Tighten yoke arm mounting brackets to 25 ft lb.

e. Replace the yoke arm access panel and tighten the screws to 15 ft lb.

f. At the ACU, operate the power switch to the ON (up) position.

g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

h. Perform the **VSWR Stub Tuner Calibration** procedure to compensate for any wave guide changes.

5.3.1.10 Elevation Control Unit

5.3.1.10.1 Control Board

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Remove the antenna arm access cover from over the ECU.

d. Remove the circuit board connectors from the control board.

e. Remove the screws holding the control board to the back of the ECU and remove the control board

f. Verify that the positions of the jumpers on the new control board match those of the control board being replaced.

- **Installation:**

a. Verify that all jumpers are in the proper locations.

b. Using the screws, mount the replacement control board to the ECU.

c. Attach the circuit board connectors to the control board.

d. Install the antenna arm access cover over the ECU.

e. At the ACU, operate the power switch to the ON (up) position.

f. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.1.10.2 Fans and Fan Filters

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Remove the antenna arm access cover from over the ECU.

d. Disconnect the wiring to the fan.

e. Remove the fan mounting hardware.

f. Remove the fan, noting direction of air flow.

- **Installation:**

a. Verify the direction of air flow for the new fan and mount the fan and filter in the ECU.

b. Attach the fan mounting hardware and tighten to 15 ft lb.

c. Attach the fan wiring.

d. At the ACU, operate the power switch to the ON (up) position.

e. Verify that the fan is expelling air.

f. Install the antenna arm access cover over the ECU.

g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.2 Pedestal

Operation of the radar system while working in this area could result in exposure to microwave energy.

Ensure that the radar is in the OFF mode when working in this area.

5.3.2.1 Azimuth Motor

- **Removal**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. On the motor, disconnect the cables by rotating each plug lock ring 1/4 turn counterclockwise.

d. At the ACU, disconnect the motor cable.

e. Remove the four cap screws holding the gearbox motor shaft access cover (see Figure 26).

f. Using your fingers, turn the motor shaft collar so that the screw on the motor shaft collar is visible.

g. On the motor shaft collar, loosen the screw but do not completely remove it.

h. Remove the four cap screws holding the motor to the gearbox.

i. Lift the motor straight upward. Remove the shaft key from the motor or collar for use with the new motor.

j. Remove the shaft collar and key from the motor shaft.

- **Installation**

a. Install the shaft collar and align the keyway with the motor shaft keyway.

b. Insert the key in the keyway and torque the collar screw to 15 ft lb.

c. Insert the new motor so that the gearbox shaft keyway aligns with the keyway on the motor shaft collar.

d. Insert the shaft key into the keyway for the gearbox shaft and collar.

e. Install the four cap screws for the motor. Torque them to 25 ft lb.

f. Torque the gearbox shaft collar cap screw to 25 ft lb.

g. Install the gearbox motor shaft access cover and torque the cap screws to 15 ft lb.

h. Attach each of the cables to the motor and ensure the plug lock ring is turned 1/4 turn clockwise.

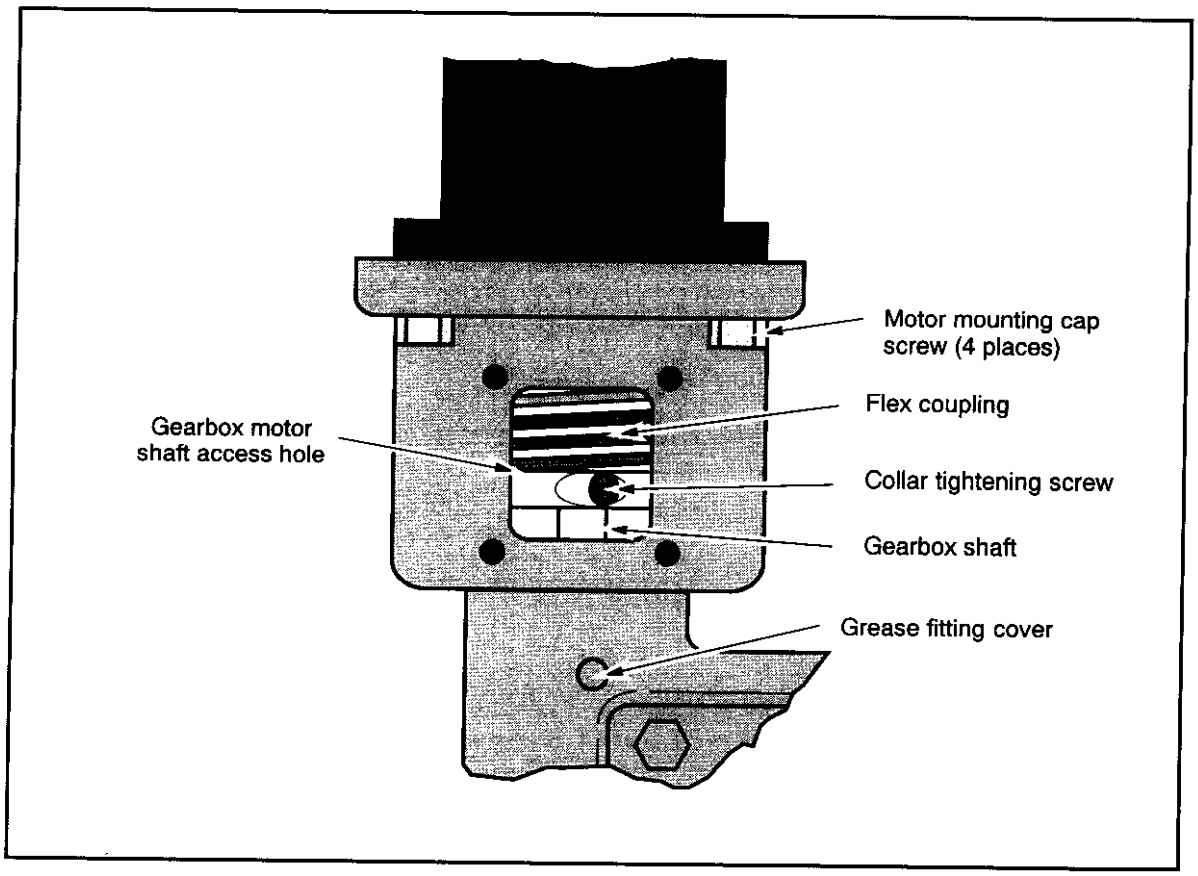


Figure 26. Azimuth Flex Coupling Access.

i. At the ACU, operate the power switch to the ON (up) position.

j. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

k. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.2 Azimuth Drive Belt Tensioner

This unit contains moving parts.

Do not touch movable parts with power applied to the antenna assembly.

- **Release drive belt tension:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Loosen the three bolts on the azimuth drive belt tension plate (see Figure 27).

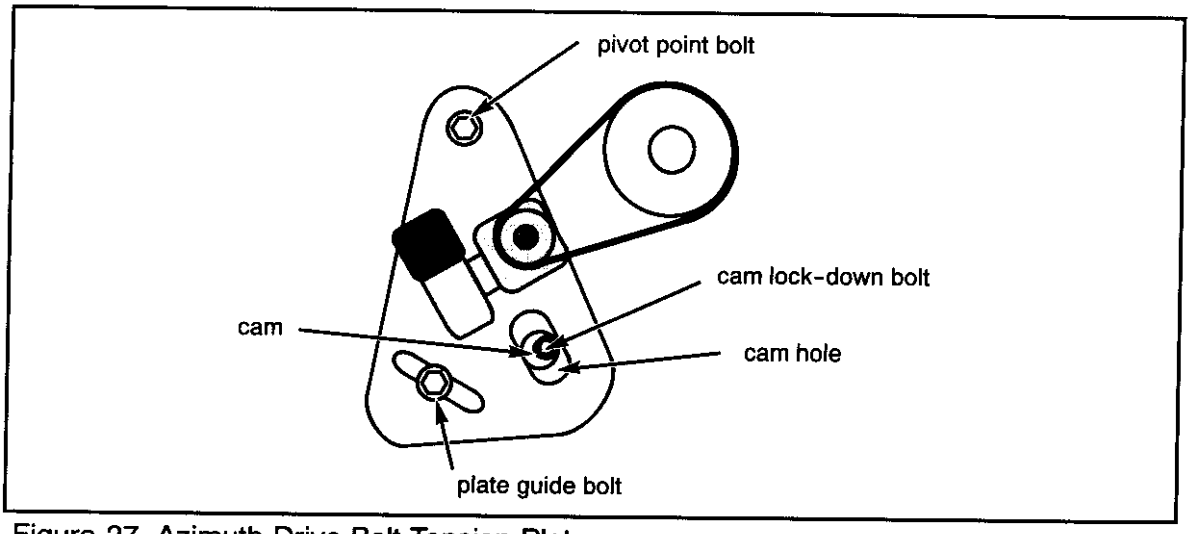


Figure 27. Azimuth Drive Belt Tension Plate.

d. If necessary, turn the cam to allow the tension plate to move toward the antenna drive gear.

- **Setting drive belt tension:**

a. Align the drive belt to the proper position on the drive gears.

b. Turn the cam to the position where the proper belt tightness is achieved.

c. While holding the cam in position, tighten the cam lock-down bolt so that the cam does not turn when pressure on the cam wrench is released.

d. Tighten all three hold-down bolts to 25 ft lb.

e. At the ACU, operate the power switch to the ON (up) position.

f. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.2.3 Azimuth Drive Belt

This unit contains moving parts.

Do not touch movable parts with power applied to the antenna assembly.

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Perform the **Azimuth Drive Belt Tensioner** release drive belt tension procedure.

d. Remove the screws and clips holding the replacement drive belt in position.

NOTE:

If the old belt is still intact, save it for emergency use by placing it in the location of the new belt and securing it with the provided hardware.

e. Release the new drive belt and re-attach the screws and clips to their original positions.

f. Place the new drive belt in position, and perform the **Azimuth Drive Belt Tensioner** installation procedures.

g. At the ACU, operate the power switch to the ON (up) position.

h. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

i. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.4 Azimuth Encoder

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. On the encoder, disconnect the cable by rotating the plug lock ring 1/4 turn counterclockwise.

d. On the encoder mounting bracket, loosen the cap screws that mount the bracket to the pedestal and slide the encoder assembly forward to release tension on the encoder drive belt.

NOTE:

The encoder is easily damaged. When handling the encoder assembly, take care not to drop the encoder or strike it with any object.

e. Loosen the flex coupling where the encoder shaft enters the flex coupling.

f. Remove the encoder assembly.

- **Installation:**

a. Insert the encoder shaft into the flex coupling.

b. Using four cap screws, mount the encoder to the mounting bracket and tighten screws to 15 ft lb.

c. Tighten the flex coupling screw to 10 ft lb.

NOTE:

When performing the next step, it is necessary to position the drive belt above the encoder drive gear because there will not

be room to position the belt once the encoder mounting bracket is in place.

d. Position the encoder mounting bracket on the pedestal and insert the three adjustment cap screws to keep the mounting bracket in place.

e. Attach the cable to the encoder and ensure the plug lock ring is turned 1/4 turn clockwise.

NOTE:

Overtightening the encoder drive belt can stretch the belt or cause it to skip a tooth on the gears. Tighten the belt so that a slight give exists when pressed.

f. Using your hands, pull the encoder mounting bracket as far as possible to achieve belt tightness. There should not be any obvious slack in the belt.

g. While holding the mounting bracket, tighten the cap screws to 25 ft lb.

h. At the ACU, operate the power switch to the ON (up) position.

i. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

j. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.5 Azimuth Encoder Drive Belt

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. If the belt is broken, remove all pieces of the old drive belt.

NOTE:

The replacement encoder drive belt is located at the lower portion of the pedestal, surrounding the waveguide and several cables.

d. Loosen the bolts that hold the encoder bracket assembly. Move the assembly away from the main drive gear so that the belt will pass between the encoder pulley and the main drive gear.

e. Position the encoder belt around the gears.

NOTE:

Overtightening the encoder drive belt can stretch the belt or cause it to skip a tooth on the gears. Tighten the belt so that a slight give exists when pressed.

f. Using your hands, pull the encoder mounting bracket as far as possible to achieve belt tightness. There should not be any obvious slack in the belt.

g. While holding the mounting bracket, tighten the cap screws to 25 ft lb.

h. At the ACU, operate the power switch to the ON (up) position.

i. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

j. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.6 Azimuth Offset Adjustment

a. If not already, place the maintenance terminal in exclusive control of the TAC.

b. At the ACU control board, place the LOCAL/REMOTE switch in the LOCAL position.

c. Using the CW/CCW switches, move the radar dish until the feed horn points true north.

d. At the maintenance terminal, change the azimuth offset to indicate an azimuth of 0°.

e. At the ACU control board, place the LOCAL/REMOTE switch in the REMOTE position.

f. Modify the azimuth offset to indicate the actual position.

g. Release the maintenance terminal from exclusive control of the TAC.

5.3.2.7 Azimuth Slip Ring

Refer to Figure 28 for locations of parts during this procedure.

- **Removal:**

NOTE:

These steps will require two people.

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. Disconnect the slip ring wiring, noting the locations of each wire removed.

d. Remove the four wave guide alignment bolts.

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

NOTE:

After removing the flange bolts at the flexible wave guide, note the orientation of the rubber gaskets and the shim between the wave guide flanges as they are removed.

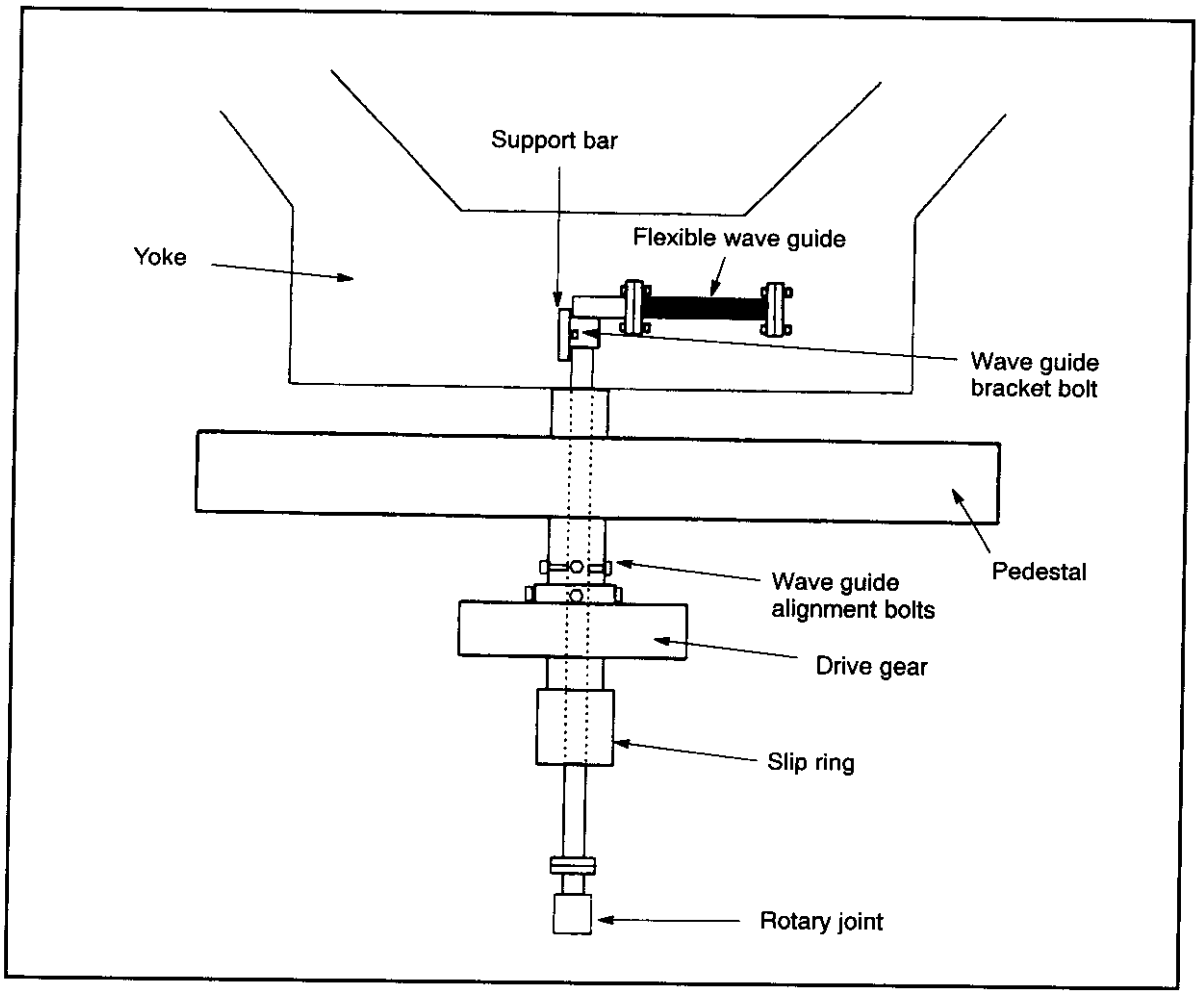


Figure 28. Side View of Rotating Wave Guide Assembly Through Antenna and Pedestal.

e. Remove the wave guide flange bolts for the joints above the rotary joint and at the flexible wave guide segment.

NOTE:

The next step will require one person to grasp the wave guide above the flange that joins with the rotary joint and lift up so that no downward pressure is exerted on the rotary joint. The other person will perform the next step.

f. Remove the bolts holding the wave guide bracket to the support bar. DO NOT remove the bolts holding the support bar to the yoke.

NOTE:

Several wires also pass through the shaft along side of the wave guide. Take care not to damage any of these wires.

g. Carefully lift the wave guide segment up through the shaft.

h. On the bracket for the alignment pin at the base of the slip ring, remove the two bolts holding the bracket to the pedestal and remove the bracket.

i. At the ECU, disconnect the three connectors for the slip ring wires.

j. Using one end of a string that is at least 2m long, tie the three slip ring wire connectors together.

NOTE:

Attach the other end of the string to something in the ECU to prevent it from falling down the shaft.

k. While supporting the slip ring assembly, disconnect the three screws at the top of the slip ring assembly and set the slip ring assembly on the pedestal.

l. Gently pull the slip ring wires and connectors from the shaft.

- **Installation:**

a. Attach the end of the string in the shaft to the wires and connectors of the new slip ring and carefully pull them into the ECU.

NOTE:

Be carefull not to pinch the wires in the shaft during the next step.

b. Insert the slip ring assembly into the shaft and tighten the screws to 15 ft lb.

c. Position the slip ring alignment bracket and tighten the bolts to 25 ft lb.

d. At the ECU, connect the wiring connectors from the slip ring.

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide. If contaminants exist, refer to the wave guide paragraphs for instructions on cleaning.

e. Carefully lower the wave guide through the shaft to a point where one person can support it slightly above the rotary joint.

f. Install the wave guide bracket around the wave guide in the yoke assembly and tighten the bolts enough to prevent the wave guide from moving.

g. Noting the orientation of when they were removed, insert the rubber gaskets and shims in the joints between all disconnected segments of wave guide and attach the hardware.

h. Using an alternating cross-over pattern for tightening the flange bolts, tighten the flange bolts to 80 inch lb.

i. Install the four wave guide alignment bolts and tighten each one until it barely touches the wave guide. Adjust each bolt so that it is finger tight against the wave guide. Tighten the lock nut on the alignment bolts that have them.

j. Tighten the wave guide bracket bolts to 25 ft lb.

k. Connect the external slip ring wiring.

l. At the ACU, operate the power switch to the ON (up) position.

m. Perform the **VSWR Stub Tuner Calibration** procedure to compensate for any wave guide changes.

n. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.2.8 Azimuth Rotary Joint

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. In the antenna yoke, loosen the bolts holding the wave guide bracket to the support bar. DO NOT remove the bolts holding the support bar to the yoke.

d. Remove the wave guide flange bolts for the flanges above and below the rotary joint.

NOTE:

Observe the location of the flange with the groove. The new rotary joint will need to be oriented the same way.

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

e. Use care not to damage the rubber gaskets and remove the rotary joint.

- **Installation:**

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide. If contaminants exist, refer to the wave guide paragraphs for instructions on cleaning.

a. Using rubber gaskets at each flange, install the rotary joint and tighten the flange bolts, using an alternating cross-over pattern, to 80 inch lb.

b. In the antenna yoke, tighten the bolts holding the wave guide bracket to the support bar to 25 ft lb.

c. Align the rotary joint:

1. Attach the magnetic base of the dial indicator on the underside of the center shelf.
2. Adjust the feeler for the dial indicator at a 90° angle against the outer edge of the body of the rotary joint (see Figure 25). Ensure that the dial indicator plunger is partially moved toward the main body of the dial indicator to allow movement toward or away from the main body.
3. While observing the gauge on the dial caliper to determine the nearest and farthest points from the dial caliper, have another person change the azimuth in one direction so that the reflector makes a 360° revolution.
4. Record the values of the closest and farthest points measured during the antenna movement.
5. Subtract the smaller value from the larger value.
6. If the resulting value is less than 0.015, this procedure is complete. No further adjustment is required. If the value is greater than 0.015, proceed with the following steps.
7. Rotate the antenna until the location nearest to the collar is reached.

Loosening the wrong bolts could result in movement of the drive gear.
Verify that the correct bolts are loosened.

8. Locate the four wave guide alignment bolts located above the azimuth drive gear.
9. Adjust the wave guide alignment bolts to move the rotary joint one half the distance determined in step 5.
10. Repeat steps 3 through 9 until an allowable movement value is reached.

d. At the ACU, operate the power switch to the ON (up) position.

e. Perform the **VSWR Stub Tuner Calibration** procedure to compensate for any wave guide changes.

f. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.2.9 Azimuth Control Unit

5.3.2.9.1 Control Board

- **Removal:**

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU:

   1. Operate the power switch to the OFF (down) position.

   2. Open the door.

c. Remove the circuit board connectors from the control board.

d. Verify that the positions of the jumpers on the new control board match those of the control board being replaced.

e. Remove the nuts holding the control board to the ACU and remove the control board.

- **Installation:**

a. Verify that all jumpers are in the correct positions.

a. Mount the replacement control board to the ACU and tighten the nuts.

b. Attach the circuit board connectors to the control board.

c. Close the door to the ACU.

d. At the ACU, operate the power switch to the ON (up) position.

e. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.2.9.2 Fans

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU:

   1. Operate the power switch to the OFF (down) position.

   2. Open the door.

c. Disconnect the wiring to the fan.

d. Remove the fan mounting hardware.

e. Remove the fan.

f. Verify the direction of air flow for the new fan and mount to provide air flow from inside the cabinet.

g. Attach the fan mounting hardware and tighten to 15 ft lb.

h. Attach the fan wiring.

i. Verify that the fan is expelling air.

j. At the ACU, operate the power switch to the ON (up) position.

k. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3 Lubricant Application

5.3.3.1 Azimuth Primary Gearbox Oil Level

For location of oil plugs, refer to Figure 29.

a. Ensure that the maintenance terminal has been placed in local control.
b. At the ACU, operate the power switch to the OFF (down) position.
c. Remove the oil level plug from the side of the gearbox.
d. Observe the level of the oil. If the oil level is below the lower lip of the oil level plug hole, perform the following. Otherwise, proceed to step f.
e. Remove the oil fill plug and add gear lubrication that complies with the specifications for Mobil Oil Corp. oil type SHC 629 (or equivalent) until it reaches the lower lip of the oil level plug hole.
f. Replace the oil fill and oil level plugs.
g. At the ACU, operate the power switch to the ON (up) position.
h. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.2 Azimuth Primary Gearbox Bearing Lubrication

For location of grease fitting, refer to Figure 29.

a. Ensure that the maintenance terminal has been placed in local control.
b. At the ACU, operate the power switch to the OFF (down) position.

NOTE:

Ensure that the grease gun expells grease when the handle is operated.

c. Place the grease gun fitting on the grease fitting.
d. Add two pumps of grease.
e. Wipe off any grease from the grease fitting.
f. At the ACU, operate the power switch to the ON (up) position.
g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.3 Azimuth Secondary Gearbox Oil Level

For location of oil plugs, refer to Figure 30.

a. Ensure that the maintenance terminal has been placed in local control.

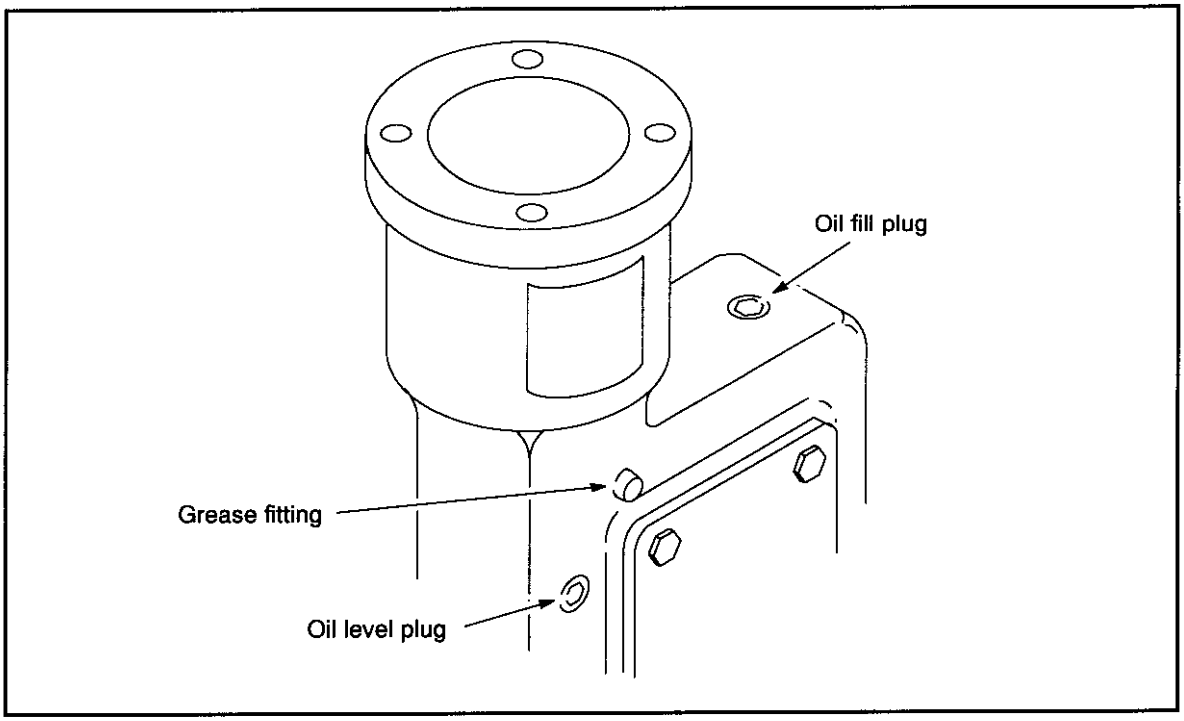


Figure 29. Azimuth Primary Gearbox Oil Plug and Bearing Lubrication Locations.

b. At the ACU, operate the power switch to the OFF (down) position.

NOTE:

The plug on the face of the gearbox with the four exposed threaded holes is not the oil level plug. The oil level plug is located on the primary gearbox side of the secondary gearbox.

c. Remove the oil level plug from the side of the gearbox.
d. Remove the oil fill plug and add gear lubrication that complies with the specifications for Mobil Oil Corp. oil type SHC 629 (or equivalent) until it reaches the lower lip of the oil level plug hole.
e. Replace the oil fill and oil level plugs.
f. At the ACU, operate the power switch to the ON (up) position.
g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.4 Azimuth Secondary Gearbox Bearing Lubrication

For location of grease fitting, refer to Figure 30

a. Ensure that the maintenance terminal has been placed in local control.
b. At the ACU, operate the power switch to the OFF (down) position.

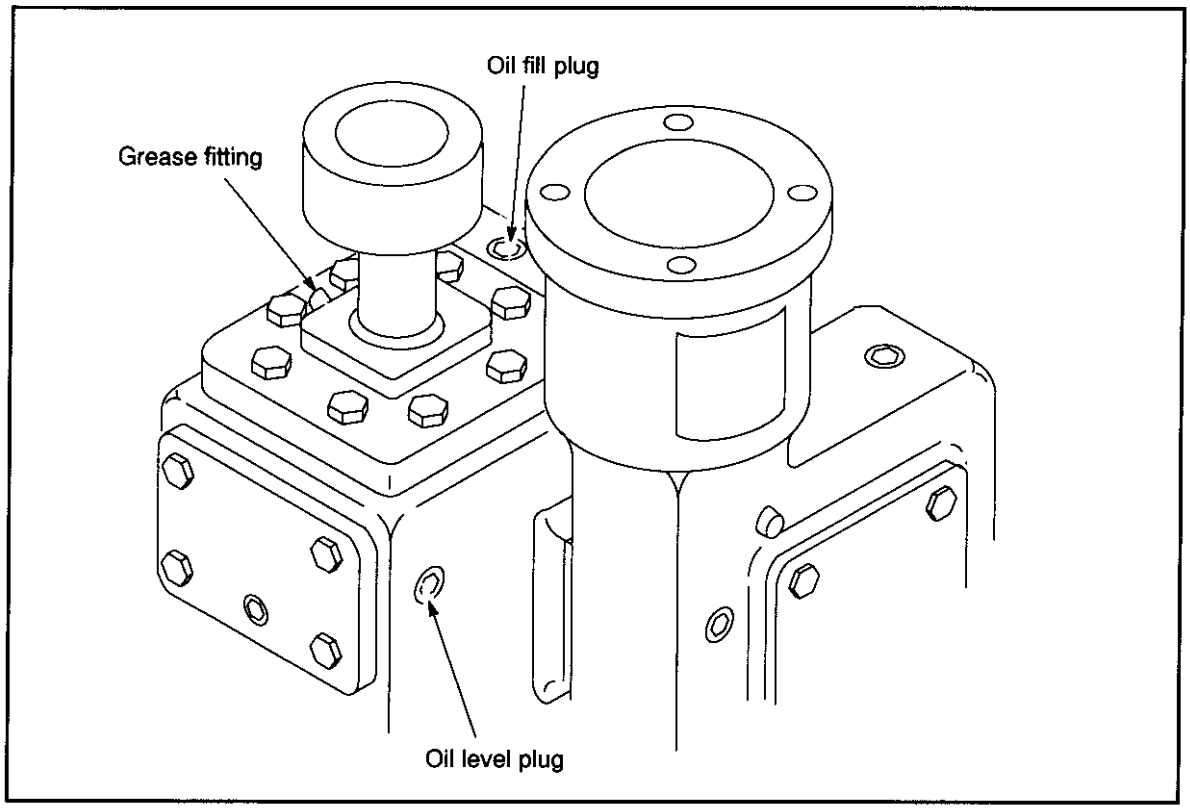


Figure 30. Azimuth Secondary Gearbox Oil Plugs and Lubraction Locations.

c. Place the grease gun fitting on the grease fitting.
d. Add grease until a slight amount of grease escapes from the bearing seal.
e. Wipe off any grease from the grease fitting and the bearing seal.
f. At the ACU, operate the power switch to the ON (up) position.
g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.5 Yoke Spindle Bearing Lubrication

a. Ensure that the maintenance terminal has been placed in local control.
b. At the ACU, operate the power switch to the OFF (down) position.
c. Place the grease gun fitting on the grease fitting located on the side of the yoke spindle bearing chamber on the pedestal.
d. Add grease until the 2 psi relief fitting next to the grease fitting allows grease to escape or the seal at the bottom of the bearing allows grease to escape.
e. Wipe any grease from the grease fitting and the lower seal area.
f. At the ACU, operate the power switch to the ON (up) position.
g. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.6 Elevation Control Arm Bearing Lubrication

a. Ensure that the maintenance terminal has been placed in local control.

b. At the ACU, operate the power switch to the OFF (down) position.

c. On the elevation drive motor arm of the yoke, place the grease gun on the grease fitting of one of the radar dish support arm bearings.

d. Add grease until a slight amount of grease escapes at one of the seals.

e. Wipe off any grease at the grease fitting and at the seals.

f. Repeat steps c through e for the other radar dish arm bearing.

g. At the ACU, operate the power switch to the ON (up) position.

h. At the maintenance terminal, type: WIN <Enter> (to put the radar back under operator control).

5.3.3.7 Cooling Pump Bearing Lubrication

a. At the operator's console, place the transmitter in the standby mode.

b. Remove the left panel of the rack.

c. On the cooling pump, locate the oil holes by observing an alignment arrow on the label attached to the body of the pump. Refer to Figure 31 for location of the oil holes.

d. Put two drops of SAE 20 motor oil in each of the oil holes of the pump motor.

e. Install the left panel of the rack.

f. At the operator's console, place the transmitter in the desired mode.

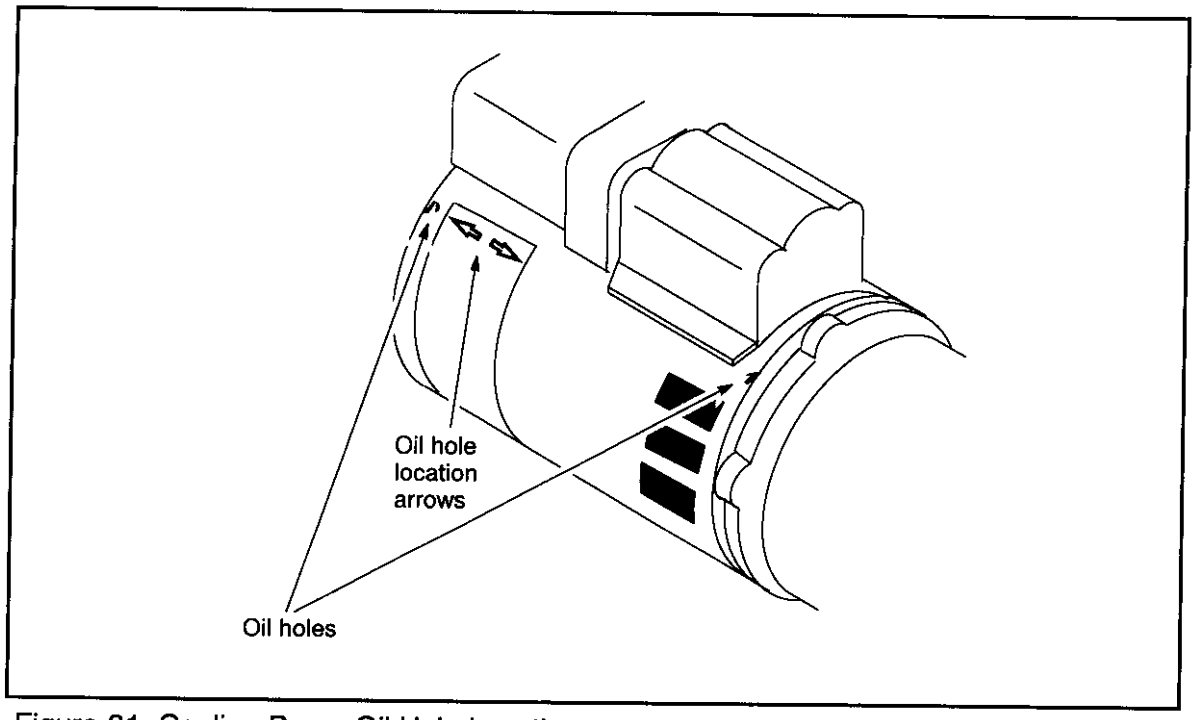


Figure 31. Cooling Pump Oil Hole Locations.

5.4 Wave Guides

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide.

Operation of the radar system while working in this area could result in exposure to microwave energy.

Power down the system while working in this area.

5.4.1 Wave Guide Visual Inspection

Each time a section of wave guide is installed, it should be visually inspected internally to verify that no contaminants have been introduced or to observe any minor deformations of the wave guide. Any segment of wave guide found to be contaminated must be cleaned prior to installation. Any deformations in a wave guide segment require the replacement of that segment.

Operation of the radar system while deformations exist in the wave guide will result in hot spots in the wave guide and probable exposure to microwave energy.

Replace segments of wave guide which have even minor deformations of the interior surfaces prior to operating this equipment.

5.4.2 Wave Guide Internal Cleaning

If it is necessary to clean the interior of a section of wave guide due to contamination, perform the following steps, depending on the type of contamination:

- **Dust or other dry particles:**

Using a source of clean dry air (CDA), blow the particles from the wave guide segment.

- **Liquids that evaporate:**

  Using a source of CDA, blow the particles from the wave guide segment.

- **Materials that leave a residue (oil, smoke, etc.)**

  Use a pressurized chemical spray (trichoroethane or similar) to remove the residue, followed by CDA to prevent dust or other air-borne particles from adhering to the wet surface.

5.4.3 Wave Guide Shim and Gasket Positioning

Replacing wave guide segments requires the installation of a rubber gasket in any joint between wave guide segments. Refer to the drawings and prints manual for the wave guide configuration.

Shims are used between wave guide flanges that are of dissimilar metals to prevent chemical reaction. When separating wave guide segments that have shims installed, it is important to note the location of the shims to ensure that they are properly installed when reassembling the segments.

Figure 32 shows flange and gasket positioning.

5.4.4 Wave Guide Flange Tightening Procedure

When replacing wave guide segments, it is necessary to orient the segment so that the flange with the groove is facing the proper direction. The groove is for the positioning of a

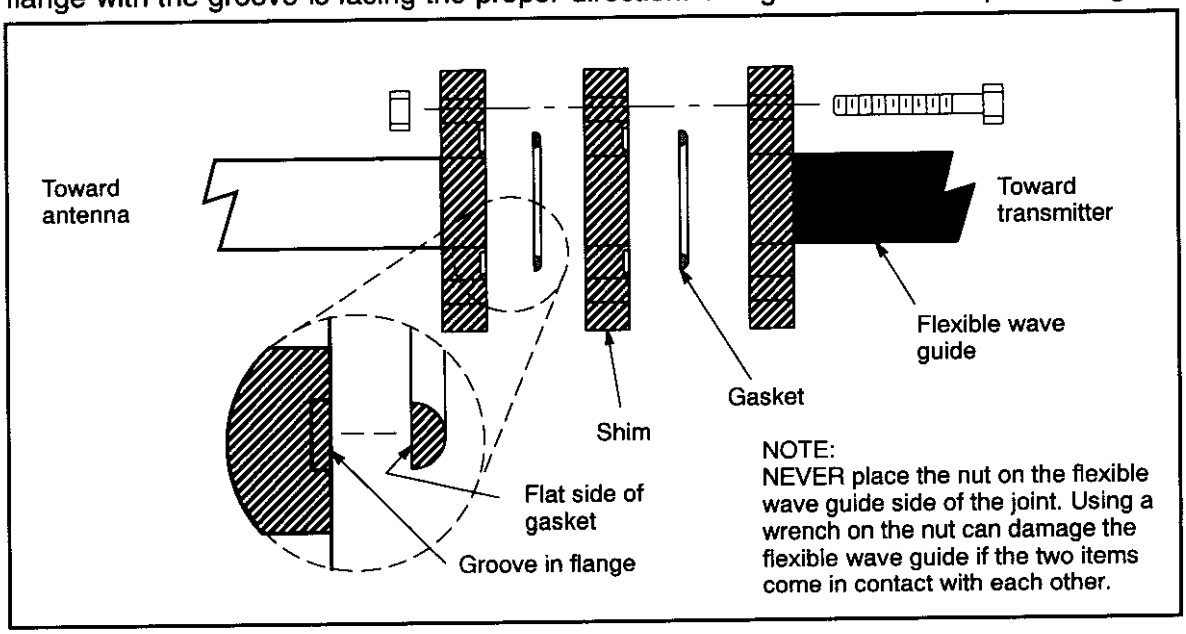


Figure 32. Flange and Gasket Positioning.

rubber gasket. If wave guide segments are placed in the wrong direction, a poor seal can be achieved, resulting in poor performance of the radar. As a rule, the flange with the groove should always be placed so that a signal traveling from the transmitter to the antenna will pass through the grooved flange end of the wave guide segment first.

Tightening flange bolts improperly can result in damage to the flanges or rubber gaskets.

Read and follow the procedure for tightening wave guide flanges.

To properly tighten the flange bolts, perform the following:

a. Install all hardware and tighten finger tight.

b. Using an alternating cross-over pattern, as shown in Figure 33, tighten each bolt until a torque of 80 inch lb is achieved.

5.4.5 VSWR Stub Tuner

5.4.5.1 VSWR Stub Tuner Replacement

- **Removal:**

a. At the maintenance terminal:

1. Obtain exclusive control of the radar.
2. Place the transmitter in the standby mode.

b. Remove the flange bolts from the bottom flange of the stub tuner.

c. Remove the flange bolts from the top flange of the stub tuner.

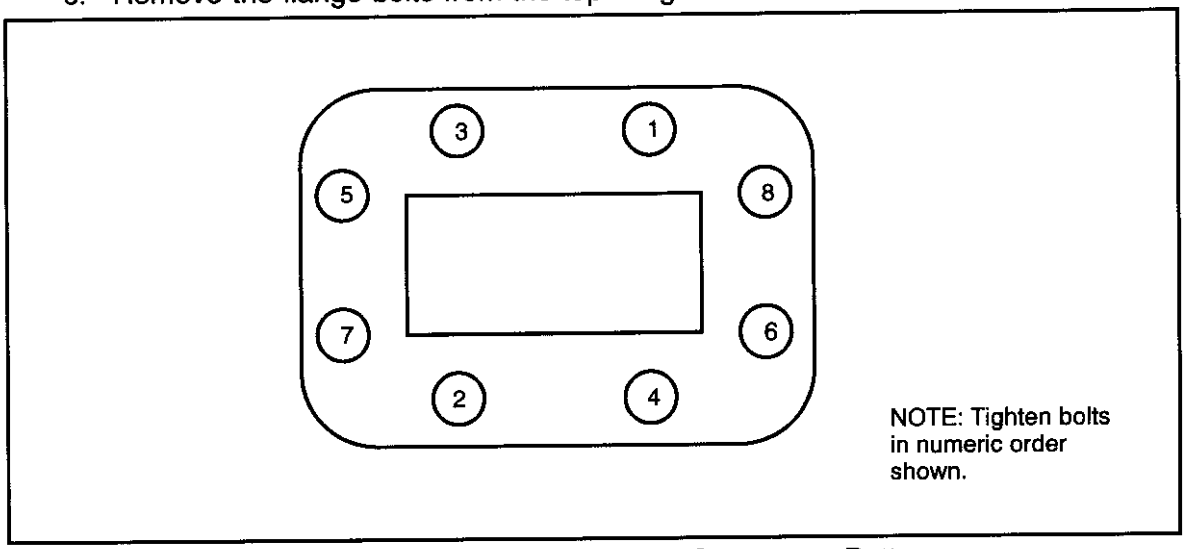


Figure 33. Wave Guide Bolt Tightening Alternating Cross-over Pattern.

d. While ensuring that none of the gaskets fall into the wave guide, carefully remove the air manifold, the shim below the air manifold, the stub tuner, and the shim below the stub tuner.

NOTE:

To prevent wave guide contamination, install wave guide protective covers in the exposed end of each wave guide segment.

- **Installation:**

NOTE:

When removing wave guide protective covers, use caution to prevent contamination of the interior of the exposed wave guide segment. Before installing each wave guide segment, perform a visual examination to verify that no contaminants exist within the wave guide. If contaminants exist, refer to the wave guide paragraphs for instructions on cleaning.

a. Assemble the stub tuner, shims, and air manifold, with the grooved flanges facing down, ensuring all gaskets are properly positioned.

b. Tighten all flange bolts, using an alternating cross-over pattern for each flange, to 80 inch lb.

c. Tighten the wave guide mounting bracket to 80 inch lb.

d. Perform the **VSWR Stub Tuner Calibration** procedure.

5.4.5.2 VSWR Stub Tuner Calibration

If the stub tuner is being installed for the first time, extend each of the adjustment rods so that they extend approximately three inches.

- **Test Equipment**
  - Oscilloscope with (2) test cables
- **Test Conditions**

NOTE:

The transmitter must be in the standby mode until instructed otherwise.

a. At the oscilloscope:

1. Set channel 1 to measure a pulse amplitude of 100 mv/div.
2. Attach a test cable from the transmitter J12 VSWR connector to oscilloscope channel 1.

b. At the operator's console:

1. Set the PRF to 160 (or the lowest available value).
2. Set the Pulse Width to 10 μs.

NOTE:

If the radar has been turned off, it will be necessary to go through the warm-up/standby modes before proceeding.

c. Place the radar in the transmit mode.

d. Observe the waveforms for channel one. The waveform should be a horizontal waveform as close as possible to the 0 mv amplitude (ignore signal ringing) as possible. Refer to Figure 34 and Figure 35 for waveform examples.

e. To adjust the stub tuner:

1. Loosen the lock nut on each adjustment rod.
2. Observe the oscilloscope and slide each adjustment arm in or out (in very small amounts of movement) until the waveform results in an amplitude of approximately 2-3 mv.
3. Tighten the lock nut on each adjustment rod.
4. On the oscilloscope, observe that the waveform is still properly adjusted. If not, repeat the adjustment procedure.

f. Remove the test cable from the transmitter and place the radar settings in the desired conditions.

The TR limiter contains an isotope that is a hazardous material.

If being replaced, discard the old TR limiter in an approved manner.

5.4.6 Forward Power Sampler

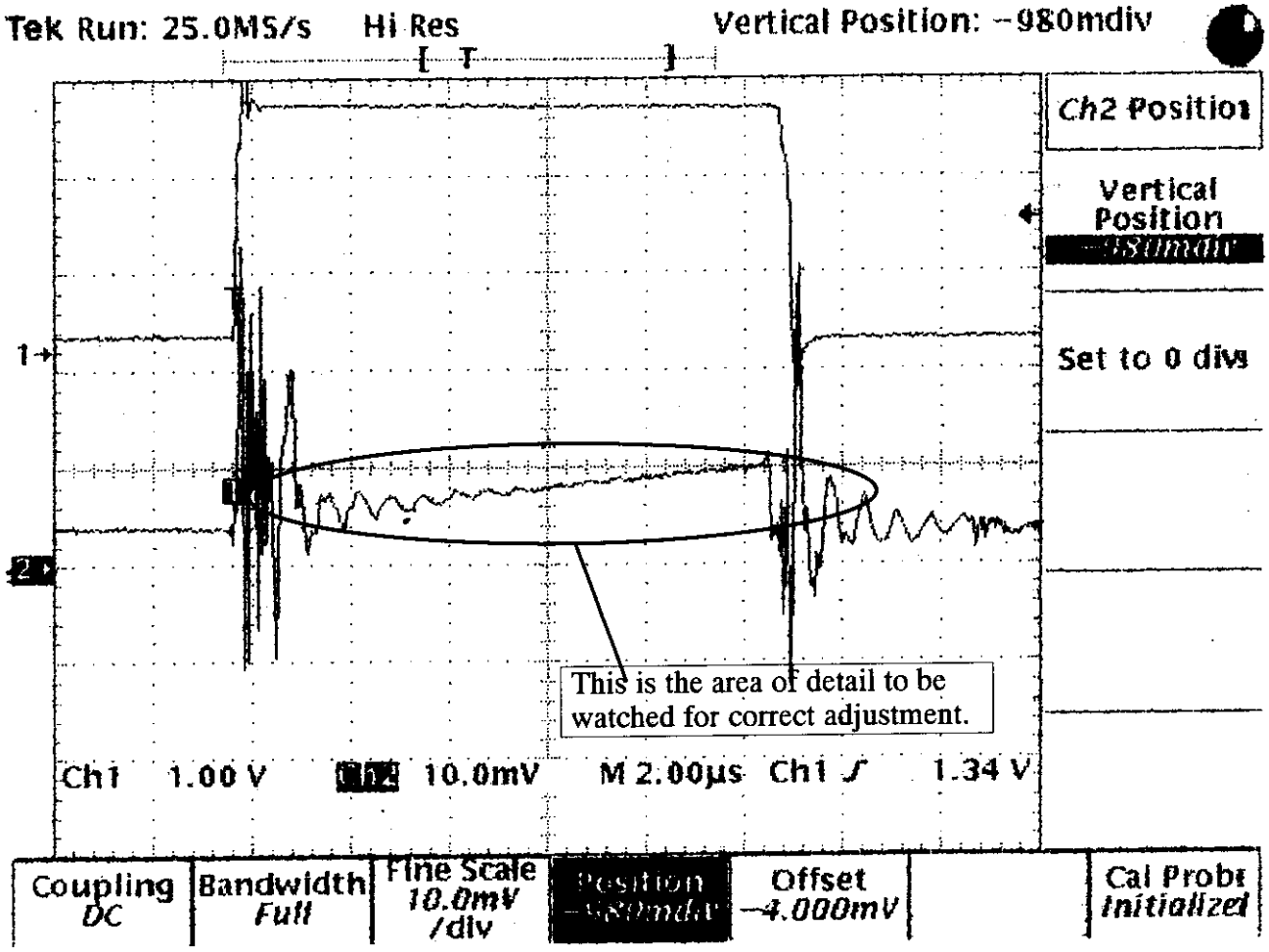
The forward power sampler must be removed with the circulator assembly.

5.4.7 Reflected Power Sampler

The reflected power sampler must be removed with the circulator.

5.4.8 TR Limiter

The TR limiter must be removed with the circulator assembly.



This is a sample waveform showing a VSWR that is close but not quite correctly adjusted.

Figure 34. VSWR Waveform With Improper Adjustment

5.5 Dehydrator

5.5.1 Chassis Replacement

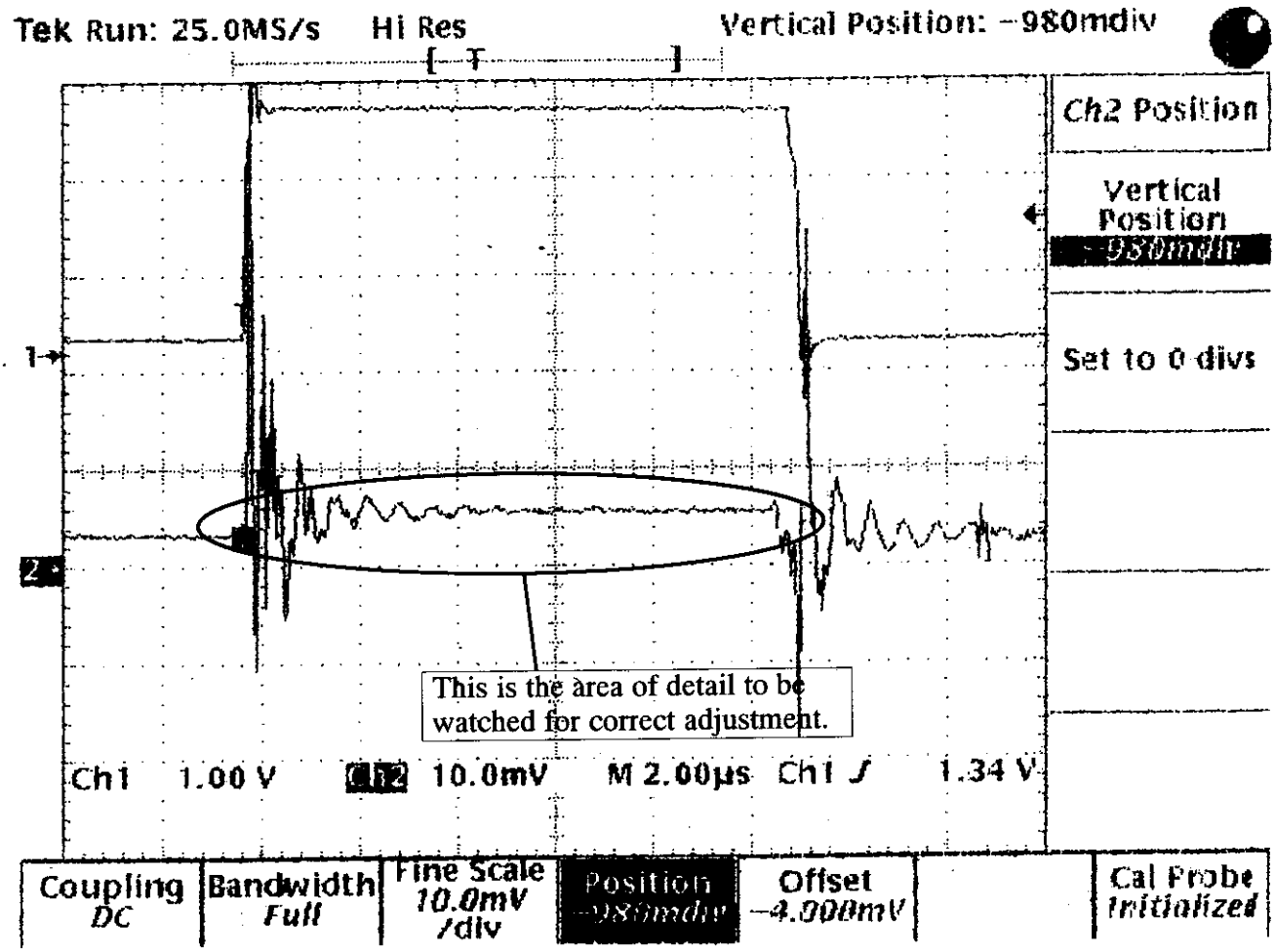
- **Removal:**

a. Open the front door of the rack.

b. Operate the dehydrator power switch to OFF.

c. Open the rear door of the rack.

d. Disconnect the cables from the dehydrator.



This is a sample waveform showing a VSWR that is adjusted properly.

Figure 35. VSWR Waveform With Proper Adjustment

NOTE:

Use care when removing the hose from the barbed fitting. Pulling too hard can break the barbed fitting from the dehydrator.

e. Disconnect the hose from the barbed fitting.

f. Unscrew the screws that hold the dehydrator faceplate to the rack and slide the dehydrator to the extended position.

The location of this unit is dangerous for one person to attempt removal.

Removal should be performed by at least two people.

g. One person must hold the dehydrator from below while a second person removes the four screws holding the slides to the dehydrator.

h. Remove slide assemblies from dehydrator.

- **Installation**

a. Install slide assemblies on replacement dehydrator.

b. Screw the screws that hold the dehydrator in the rack into the faceplate.

c. Connect all cables and the air hose.

d. Close the rear door of the rack.

e. Operate the dehydrator power switch to ON.

f. Close the front door of the rack.

g. At the operator's console, place the radar in the desired mode.

5.5.2 Pump Air Inlet Filter Replacement

a. Open the front door of the rack.

b. Remove the screws holding the dehydrator faceplate to the rack.

c. Pull the dehydrator to the extended position.

d. Operate the dehydrator power switch to the OFF position.

e. Remove the top cover of the dehydrator.

f. Locate the air inlet filter on the pump (refer to Figure 36).

g. Remove the filter.

h. Being careful not to overtighten, install the new filter.

i. Replace the top cover of the dehydrator.

j. Operate the dehydrator power switch to the ON position.

k. Return the dehydrator into the rack and attach the faceplate screws.

l. Close the rack door.

5.5.3 Dehydrator Checkout

NOTE:

The detailed information about each of the operational parameters checked in this procedure can be found in the dehydrator manual provided with your system.

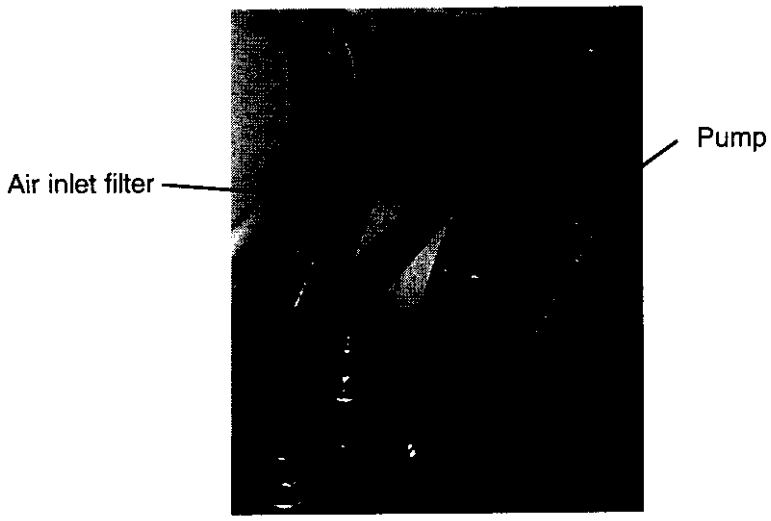


Figure 36. Dehydrator Pump Air Inlet Filter

At the dehydrator front panel, perform the following steps and record the values in the radar system log book.

a. Press the **Parameter Select** switch.
b. Observe the display and record the pressure (P) value.
c. Press the **Parameter Select** switch.
d. Observe the display and record the ambient temperature (A) value.
e. Press the **Parameter Select** switch.
f. Observe the display and record the absorption unit status (S) value.

NOTE:

If either the second or third display character for the absorption unit status is a "d", the absorption unit (center character is unit 1, the right character is unit 2) has failed and must be replaced. Refer to the dehydrator manual for obtaining a replacement absorption unit and the replacement procedure.

g. Press the **Parameter Select** switch.
h. Observe the display and record the duty cycle (d) value.
i. Press the **Parameter Select** switch.
j. Observe the display and record the flow rate (F) value.

5.6 Transceiver Antenna Control (TAC)

The TAC is slide mounted.

5.6.1 Chassis Replacement

- **Removal:**

a. At the operator's console, place the radar in the off mode.

b. Open the front door of the rack.

c. Operate the TAC power switch to OFF.

d. Disconnect all cables from the TAC.

e. Remove the four screws on the front panel that hold the chassis in the rack.

f. Pull the chassis to the extended position.

The weight and position of this chassis can cause injury if removal is attempted by one person.
Lifting should be performed by at least two people.

g. Press the slide release buttons and remove the chassis from the rack.

h. Remove the slides from the TAC.

- **Installation:**

a. Install the slides on the replacement TAC.

The slide units are easily damaged if misaligned.
When installing the slide assemblies on the chassis into the slide assemblies in the rack, three people will be required. Two people need to lift and hold the chassis, and one person needs to guide the slide assemblies together.

b. Insert slides into mating slide sections.

c. Close chassis. Fasten the TAC front panel to the rack.

d. Connect the cables. Use a 12 inch lb torque wrench to tighten the fiber optic cable connectors.

e. Close the rear door of the rack.

f. Operate the TAC power switch to ON.

g. Close the front door of the rack.

h. At the operator's console, place the radar in the desired mode.

5.6.2 Circuit Board Replacement

a. At the operator's console, turn off the transmitter.

b. Open the front door of the rack.

c. Operate the TAC power switch to OFF.

d. Loosen the four chassis mounting screws from the front of the TAC.

e. Remove the front cover of the TAC.

NOTE:

If removing the KPB 961 circuit board, disconnect the disk drive ribbon cable connector from the front edge of the circuit board prior to removing the circuit board.

f. Grasp the circuit board hold-down clips and simultaneously move them to disengage the circuit board from the connectors at the back of the card cage.

g. Slide the circuit board out of the card cage.

h. Insert the new circuit board into the card cage until it comes in contact with the connector at the back of the card cage.

i. Engage the circuit board into the card cage connector by simultaneously pressing both hold-downs toward the circuit board.

NOTE:

If replacing the KPB 961 circuit board, attach the disk drive ribbon cable connector to the circuit board.

j. Replace the TAC front cover and install the mounting screws.

k. Operate the TAC power switch to ON.

l. Close the front door of the rack.

m. At the operator's console, place the radar in the desired mode.

5.6.3 Card Cage Replacement

- **Removal:**

a. At the operator's console, turn off the transmitter.

b. Open the front door of the rack.

c. Operate the TAC power switch to OFF.

d. Loosen the four chassis mounting screws from the front of the TAC.

e. Open the TAC to the extended position.

f. Remove the top cover of the TAC.

g. Remove the front cover of the TAC.

h. Remove the four screws securing the top power supply and remove the supply.

i. Remove the power supply mounting plate.

j. Remove the four screws securing the bottom power supply and remove the supply.

NOTE:

Do not remove any connectors attached to the pins on the back of the circuit board connectors.

k. Disconnect the card cage cables connections at the other assemblies.

l. Remove the screws that attach the card cage to the side and bottom of the TAC.

m. Rotate the back of the card cage toward the center of the TAC until the edge of TB1 is clear of the hold-down bracket on the side of the TAC.

n. Lift the card cage out of the TAC.

- **Installation:**

a. Place the card cage in the TAC and place in position so that the lip of TB1 is under the hold-down bracket on the side of the TAC.

NOTE:

When installing screws, tighten to 25 ft lb.

b. Attach all mounting hardware for the sides and bottom of the card cage.

c. Connect all connectors from the card cage to their appropriate assemblies.

d. Attach the bottom power supply to the TAC and connect the connectors.

e. Attach the power supply mounting bracket to the TAC.

f. Attach the top power supply to the mounting bracket and connect the connectors.

g. Replace the top cover to the TAC.

h. Push the TAC into the rack and attach the mounting screws through the front of the TAC.

i. Operate the TAC power switch to ON.

j. Perform the *TAC Operation* procedure.

5.6.4 Disk Drive Replacement

- **Removal:**

a. Perform the *Card Cage Replacement* removal procedure.

b. Remove the disk drive cables from the back of the disk drive.

c. Remove the four screws that attach the disk drive mounting brackets to the side of the card cage and slide out the disk drive.

d. Remove the mounting brackets from the disk drive and retain for installation on the new disk drive.

- **Installation:**

NOTE:

When installing screws, tighten to 25 ft lb.

a. Attach the disk drive mounting brackets to the disk drive.

b. Attach the disk drive mounting brackets to the card cage.

c. Connect the disk drive cables.

d. Perform the *Card Cage Replacement* installation procedure.

e. Replace the top cover to the TAC.

5.6.5 Power Supply Replacement

- **Removal of the ±15 VDC power supply:**

a. At the operator's console, turn off the transmitter.

b. Open the front door of the rack.

a. Operate the TAC power switch to OFF.

b. Loosen the four chassis mounting screws from the front of the TAC.

c. Open the TAC to the extended position.

d. Remove the top cover of the TAC.

e. Remove the front cover of the TAC.

f. Disconnect the top power supply and remove from the mounting bracket.

NOTE:

If nothing is to be done with the +5 VDC power supply, proceed to the *Installation of the ±15 VDC power supply* steps.

- **Removal of the +5 VDC power supply:**

a. Perform the *removal of the ±15 VDC power supply* steps.

b. Remove the screws for the top power supply mounting bracket.

c. Disconnect the lower power supply and remove from the cabinet.

- **Installation of the +5 VDC power supply:**

NOTE:

When installing screws, tighten to 25 ft lb.

a. Attach the +5 VDC power supply to the cabinet and connect the connectors.

b. Replace the top power supply mounting bracket.

c. Perform the *installation of the ±15 VDC power supply* steps.

- **Installation of the ±15 VDC power supply:**

NOTE:

When installing screws, tighten to 25 ft lb.

a. Attach the top power supply to the mounting bracket and connect the connectors.

b. Replace the top cover to the TAC.

c. Push the TAC into the rack and attach the mounting screws through the front of the TAC.

d. Operate the TAC power switch to ON.

e. Perform the *TAC Operation* procedure.

5.6.6 TAC Operation

The TAC can be operated by the maintenance console for maintenance and troubleshooting, or by the operator's console for normal operation.

5.6.6.1 TAC Power Supply Voltage Checkout

To verify the voltage outputs from the TAC power supplies, perform the following:

a. Open the front door of the rack.

b. Remove the front cover of the TAC.

c. Observe the voltage level LEDs located near the lower edge of the circuit board (KPB 961) in slot 5. If either of the red LEDs are lit (OV or UV), the TAC voltages are out of tolerance. If the green LED is lit, the voltages are within tolerance.

d. If the voltages are within tolerance, replace the front cover to the TAC, there is no further action required.

e. Close the front door of the rack.

5.6.6.2 TAC Power Supply Voltage Adjustment

a. Operate the TAC power switch to OFF.

b. Loosen the four chassis mounting screws from the front of the TAC.

c. Open the TAC to the extended position.

d. Remove the top cover of the TAC.

e. Remove the front cover of the TAC.

f. Using the test points shown in Figure 37, connect a multimeter to the appropriate test points on the KPB 961 circuit board in slot 5 to measure the applicable output voltage.

g. Locate, using Figure 37, the position of the adjustment potentiometer for the desired power supply.

h. Operate the TAC power switch to ON.

NOTE:

The +15 VDC power supply supplies both + and - voltages from the same adjustment potentiometer. After adjusting, verify that both voltage levels are at an acceptable level. It may be necessary to increase or decrease one voltage level to achieve the desired voltage level for the other output voltage.

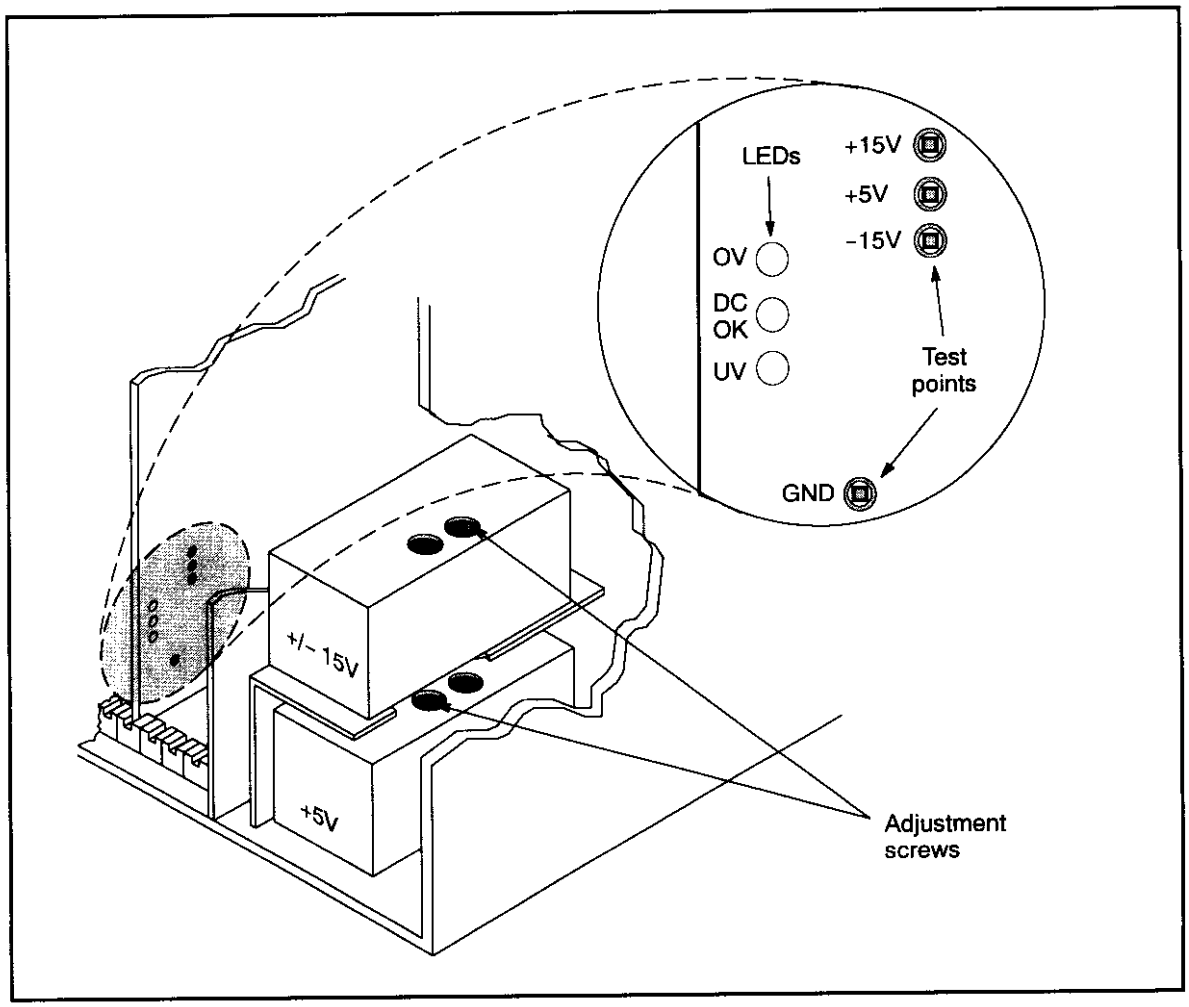


Figure 37. TAC Power Supply Adjustments.

i. While observing the meter reading, use the plastic screwdriver to adjust the potentiometer on the power supply.

j. When the desired voltage level is achieved, verify that the out-of-tolerance LED for the adjusted voltage has been extinguished.

k. Repeat steps i and j as necessary to adjust the other voltage levels.

l. Operate the TAC power switch to OFF.

m. Replace the top cover to the TAC.

n. Replace the TAC front cover and install the mounting screws.

o. Return the TAC to the closed position in the rack and tighten the hold-down screws.

p. Operate the TAC power switch to ON.

q. Close the front door of the rack.

5.6.7 Adjusting Clutter Filters

The clutter filters must be adjusted for operation of the radar at the time of installation and as necessary to accommodate changes in the operating PRF. To obtain the best results, this procedure should be performed on a day when very few air-borne particles are present in the air.

- **Preliminary conditions:**
  - The radar must be transmitting at the desired PRF
  - Uncorrected and corrected displays selected (in the case of single displays, select corrected video)
  - Range rings enabled
  - Desired display range selected
  - Maintenance terminal on the clutter filter screen for the desired range
  - Antenna elevation set between 0.0 and 0.2 degrees
  - Antenna speed set to a speed of approximately 6°/sec (1 RPM)
- **Selecting clutter filters**

a. Using the range rings and the range bin length shown in Table XXXIX, calculate the distance to the clutter return on the uncorrected video display.

b. On the maintenance terminal:

1. Select the clutter filter screen for the displayed radar range.
2. Using the distance represented in Table XXXIX, determine how many range bins are represented for the distance to the clutter. For example, if the clutter is 10 km distant from the radar, using the 32 km range, every eight range bins represent a distance of 1 km. Therefore, range bin 80 would represent a distance of 10 km.

Table XXXIX. Range Bin Sizes

Display Range	Range Bin Length
32 km	125 m
64 km	125 m
128 km	250 m
256 km	500 m
320 km	625 m
512 km	1 km

3. Set the clutter filter to a value of 4.
4. While observing the corrected radar display, allow the sweep to rotate to the area of the clutter return, and send the maintenance terminal change (press the S key).
5. If the clutter disappears, decrease the filter setting by one and send the data again. If the clutter appears, change back to the previous setting and send the change.

NOTE:

Using a #7 filter will probably remove any signal return, except for the most extreme precipitation. For this reason, it may be desirable to set the clutter filter to a value just below the level where the entire amount of ground clutter disappears. This determination is entirely at the discretion of the radar site operators.

6. If the clutter is still present, increase the filter number by one and send the new value. Repeat this step until the clutter disappears.

c. Repeat step b until all areas of ground clutter on the display have been filtered out, or the return levels optimized to show the desired return.

- **Saving settings**

a. When all settings for clutter filters have been made, press the Esc key and when prompted, save the settings to both (flash and disk).

b. Press the HOME key twice to exit the maintenance screens.

c. At the operator console, place the antenna speed to the desired setting and turn off range rings.

5.7 Receiver

The receiver is slide mounted.

5.7.1 Chassis Replacement

- **Removal:**

a. At the operator's console, turn the radar off.
b. Open the front door of the rack.
c. Operate the receiver power switch to OFF.

NOTE:

The latches on the left side of the chassis rotate in a different direction from the latches on the right side.

d. Rotate the chassis latches to unlatch the chassis.
e. Open the rear door of the rack.
f. Disconnect the cable that attaches the wave guide adapter to the LNA on the receiver rear panel.
g. Disconnect the cable that extends from the 3-way directional coupler attached to J10 at J8 of the transmitter.
h. Unscrew the two screws that attach the rear movement prevention bracket to the receiver.
i. Pull the chassis out as far as it will go.

This unit weighs in excess of 100 pounds.
Lifting should be performed by at least two people.

j. Press the slide release buttons and remove the chassis from slide.
k. Remove the slide assemblies from receiver and save for further use.

- **Installation:**

a. Install the slides on replacement receiver.

The slide units are easily damaged if misaligned.
When installing the slide assemblies on the chassis into the slide assemblies in the rack, three people will be required. Two people need to lift and hold the chassis, and one person needs to guide the slide assemblies together.

b. Insert the slides into the mating slide sections.
c. Ensuring that the jack number and the cable plug numbers match, connect all cabling. Use a 12 inch lb torque wrench for the cables mounted on J8-J10 & J16.

NOTE:

If the power supply output levels are to be adjusted at this time, proceed directly to the *Receiver Power Supplies* paragraph.

NOTE:

When pushing the receiver to the closed position, ensure that no cables are pinched.

d. Push the receiver all the way in.
e. Using the front panel latches, latch the receiver into the rack.
f. Connect the cable that attaches the wave guide adapter to the LNA on the receiver rear panel.
g. Attach the cable that extends from the 3-way directional coupler attached to J10 to J8 of the transmitter.
h. If the power supply voltages are to be performed, proceed to the *Receiver Power Supplies* adjustment procedures.
i. Close the rear door of the rack.
j. Operate the receiver power switch to ON.
k. Close the front door of the rack.

5.7.2 Receiver Power Supplies

5.7.2.1 Gaining Access to the Power Supplies

a. At the operator's console, place the radar in the standby mode.
b. Open the front door of the rack.
c. Operate the receiver power switch to OFF.

NOTE:

The latches on the left side of the chassis rotate in a different direction from the latches on the right side.

d. Rotate the chassis latches to unlatch the receiver.
e. Open the rear door of the rack.
f. Disconnect the rigid cable that connects the wave guide adapter to the LNA assembly.
g. Disconnect the cable that extends from the J10 3-way directional coupler at J8 of the transmitter.
h. Release the thumb screws attached to the bracket at the rear of the chassis that is attached to the frame.
i. Remove the frame attachment bracket screws at the rear of the chassis.
j. Pull the chassis out as far as it will go.
k. Remove the top, front, and left side covers of the chassis.

Operation of the RPU without the cooling fans operating can be done for the short period of time necessary for measuring voltages. It is not recommended that the RPU be operated for longer than 30 minutes without the fans operating.

NOTE:

Refer to Figure 38 for the location of the various voltages on the receiver terminal block.

5.7.2.2 +5 VDC Adjustment

NOTE:

Due to the locations of the terminals with relation to the power supply, it will be necessary for two people to perform this operation.

a. Measure the +5 VDC output between the +5V and GND connections on TB1.

b. If necessary to adjust the output level, use Figure 39 to locate the voltage adjustment potentiometer.

c. Using a non-conducting screwdriver, turn the adjustment potentiometer to achieve a +5 ± 5% VDC output level.

5.7.2.3 ±15 VDC Adjustment

a. Measure the ±15 VDC output between the +15V and GND & -15V and GND connections on TB1.

b. If necessary to adjust the output level, use Figure 40 to locate the voltage adjustment points.

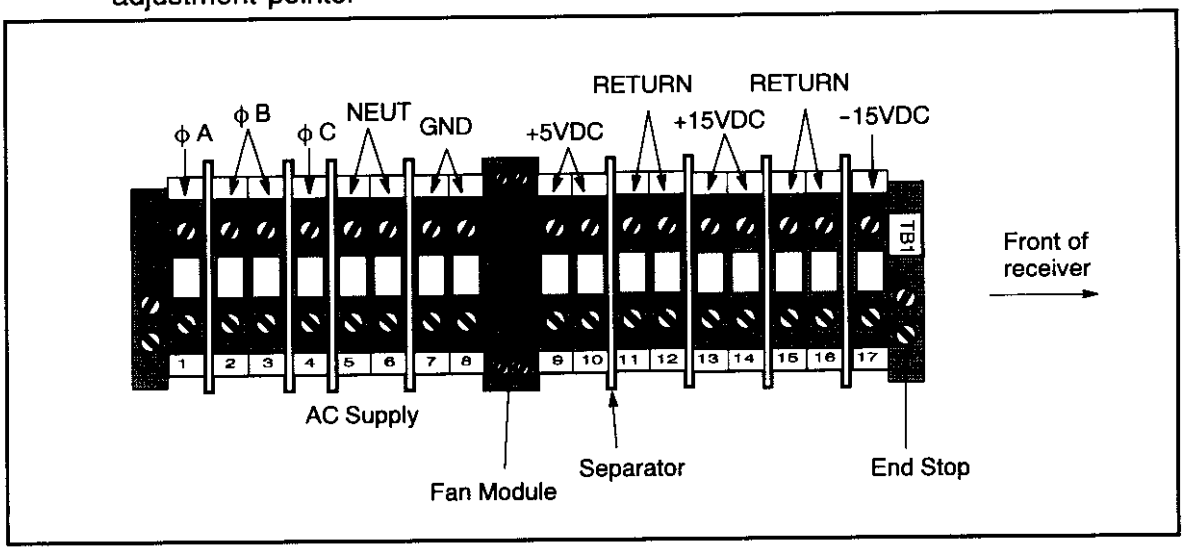


Figure 38. Receiver Power Terminal Block (TB1).

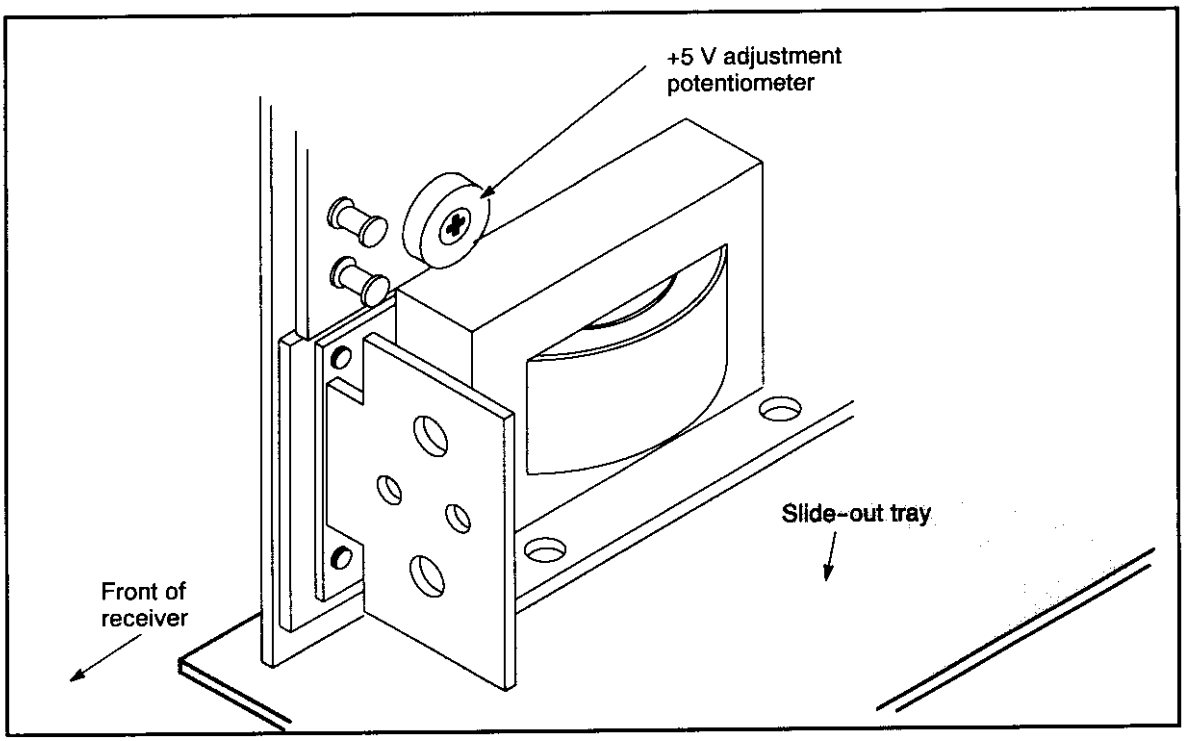


Figure 39. Location of the Receiver +5 VDC Adjustment.

NOTE:

The adjustment potentiometer adjusts the output levels of both the +15 and -15 VDC.

c. Using a non-conducting screwdriver, turn the adjustment potentiometer to achieve a ±15 ± 10% VDC output level.

5.7.3 Power Supply Replacement

a. If necessary, perform the **Gaining Access to the Power Supply** procedure.
b. Unscrew the two slide-out tray hold-down screws at the front of the power supply tray.
c. Disconnect any cabling and RF lines necessary to allow removal of the tray.
d. Lift the front edge of the tray and pull it out of the receiver.
e. Disconnect the connector to the power supply to be replaced.
f. Unscrew the mounting screws for the power supply and remove it.
g. Install the new power supply and tighten the mounting screws to 15 ft lb.
h. Reconnect the power supply connector.
i. Slide the tray back into the receiver, making sure to place the rear lip of the tray under the hold-down bracket at the rear of the receiver.

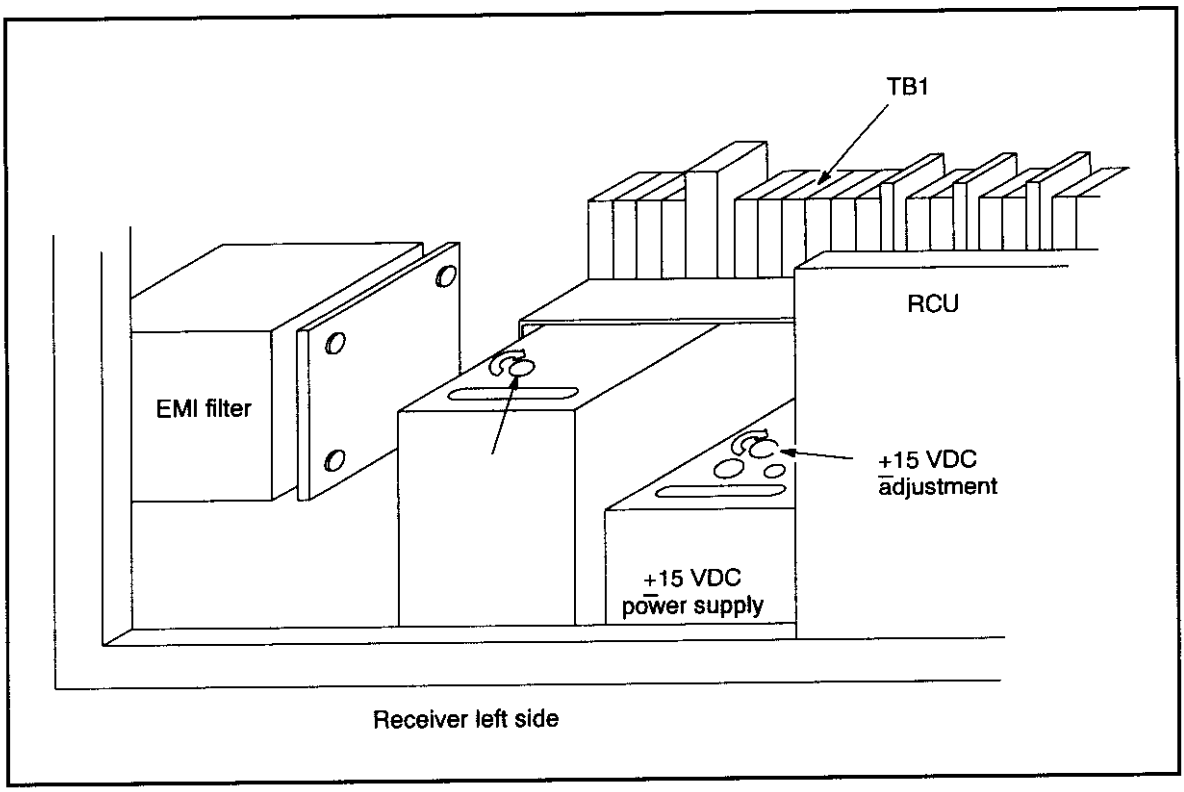


Figure 40. Receiver Power Supplies.

j. At the front of the tray, tighten the hold-down screws.

k. Connect all cabling and RF lines removed earlier.

l. Perform the voltage adjustment procedure for the replaced power supply.

5.7.4 Returning Receiver to Operational Position

a. Operate the receiver power switch to OFF.

b. Replace any chassis covers that have been removed.

NOTE:

When pushing the receiver to the closed position, ensure that no cables are pinched.

c. Push the chassis all the way in.

d. Using the front panel chassis latches, latch the chassis into the rack.

e. Attach the bracket at the back of the receiver that prevents the receiver from being pulled out.

f. Attach the bracket at the back of the RPU that prevents the chassis from being pulled out.

g. Attach the rigid cable that extends from the wave guide adapter to the LNA on the receiver rear panel.

h. Attach the cable that extends from the J10 3-way directional coupler to J8 of the transmitter.

i. Close the rear door of the rack.

j. Operate the receiver power switch to ON.

k. Close the front door of the rack.

l. At the operator's console, place the radar in the desired mode of operation.

5.8 Calibration and Alignment Procedures

5.8.1 IF Attenuator Operational Value

If not already in standby mode, place the radar in the standby mode to perform this procedure.

Tools and test equipment needed:

- Oscilloscope
- Digital voltmeter test cable with BNC connector
- BNC tee

a. At the receiver rear panel, install the BNC tee on J13 (20 MHz Log Video) and reconnect the cable to the tee.

b. Attach the oscilloscope to J13.

c. At the maintenance terminal, screen 15, set the first value to 65535 (full attenuation) and do the CTRL + W sequence to fill the remaining values with the 65535 value.

d. Press the S key (to send the change).

NOTE:

In the next step, if any pulses are visible, the receiver is detecting a signal from another source. If a pulse is detected, the meter can not be used for obtaining readings for any portion of this procedure because the meter will average the pulse level with the noise level, resulting in inaccurate data.

e. At the oscilloscope, observe the display. The display should contain only noise waveforms.

f. Disconnect the oscilloscope from J13.

g. Set the meter to measure a signal of 400 mV maximum.

h. Attach the meter to J13.

i. At the maintenance terminal, screen 3, set the IF attenuator to the first setting specified in Table XL.

j. Press the S key (to send the change).

k. At the meter, observe the measured noise level (in mV) and record the reading in the second column of the table in the line that corresponds with the IF attenuator setting.

l. Except that the IF attenuator setting shall be for the remaining settings from Table XL, repeat step i through step k until all settings have been used.

m. At the maintenance terminal, screen 15, set the Test Attenuator to 250 (62.5 dB).

n. Press the S key (to send the change).

o. Except that the readings will be recorded in the third column of Table XL, repeat steps i through l to obtain the Signal + Noise values.

p. Using the values recorded in Table XL, complete the entries for columns 4 and 5.

NOTE:

The values in column 5 are divided by a value of 27 because the Log Amplifier used in this system has a value of 27 mV/dB.

Table XL. IF Attenuator Settings

IF Attenuator Setting	Noise Level (in mV)	Signal + Noise (in mV)	Difference (mV) (column 3 minus column 2)	Value (dB) (column 4 divided by 27)
8				
10				
12				
14				
16				
18				
20				
22				
24				
26				

q. Refer to Table XL, column 5:

1. Locate the largest value.
2. Locate the column 5 entry that is 3 to 4 dB lower than the largest value.
3. Move left to the IF attenuator column to find the value that corresponds with the value located in the previous step.
4. At the maintenance terminal, screen 3, set the IF Attenuator to the value from column 1.

5. Press the S key (to send the change).

r. At the Operator Console, locate the screen that has the radar pulse width setting. Change the pulse width to a different value.

s. On the radar display, uncorrected reflectivity screen, observe that no excessive noise is displayed.

NOTE:

If the uncorrected reflectivity shows excessive noise, return to step q.4) and increase the IF Attenuator value by 1. Continue through step s to observe any effect the change has made.

t. Record the IF Attenuator setting in the system log book as "IF Attenuator Operational Value" (this will be needed in the receiver calibration)

u. Disconnect the meter from J13.

5.8.2 Log Video Noise Level

If not already in standby mode, place the radar in the standby mode to perform this procedure.

Tools and test equipment needed:

- Digital voltmeter test cable with BNC connector
- BNC tee

a. At the receiver rear panel, install the BNC tee on J13 (20 MHz Log Video) and reconnect the cable to the tee.

b. Set the meter to measure a signal of 400 mV maximum.

c. Attach the meter to J13.

d. At the operator's console, set the pulse width to 20 μs.

e. At the meter, observe the measured level (in mV) and record the reading in the radar system log book as "Log Video Measured Noise Level". Make sure to record the Pulse Width setting for each measurement.

f. Except that the pulse width setting shall be for each of the remaining values specified in Table XLI, repeat step d and step e for each remaining pulse width.

g. Disconnect the meter from J13 and if no further testing is to be performed, return the radar to the desired settings and operational mode.

Table XLI. Log Video Noise Level Pulse Width Measurement

Pulse Width Setting (in μs)	J13 Measured Level (in mVDC)
20	
10	

Table XLI. Log Video Noise Level Pulse Width Measurement

5	
2	
1	
0.5	

5.8.3 RVP-6 Potentiometer Adjustments

If not already in standby mode, place the radar in the standby mode to perform this procedure.

5.8.3.1 Log Gain and Log Offset Potentiometers

a. Open the front door of the rack.
b. On the receiver rear panel, connect the oscilloscope to J13.
c. At the maintenance terminal:
    1. Type: **MAINT** <Enter>
    2. Go to screen 3. Set the IF Attenuator to a value of 0.
    3. Press the S key (to send the change).
    4. Go to screen 15, set the Test Attenuator to a value of 0.
    5. Press the S key (to send the change).
d. On the oscilloscope, observe that the 20 MHz Log Video output is approximately 2.2 to 2.4 VDC.
e. Disconnect the oscilloscope from J13 and attach the cable removed for testing.
f. At the TAC, remove the front panel to allow access to the RVP-6 circuit board in the card cage.
g. On the RVP-6 circuit board, attach the oscilloscope test probe ground wire to the AGND test point and attach the test lead to the LPVID test point.
h. On the RVP-6 circuit board, locate the LOG GAIN and LOG OFFSET potentiometers.
i. While observing the oscilloscope display, adjust the LOG GAIN and LOG OFFSET potentiometers to obtain a signal level of 2.2 VDC.
j. At the maintenance terminal, screen 3, set the IF Attenuator to a value of 63 dB.
k. Press the S key (to send the change).
l. At the maintenance terminal, screen 15, set the Test Attenuator to a value of 65535 (127.5 dB).

m. Press the S key (to send the change).

NOTE:

When adjusting the LOG GAIN and LOG OFFSET to obtain the -2.2 VDC level, adjust each potentiometer equally to remove the variation.

n. While observing the oscilloscope display, adjust the LOG GAIN and LOG OFFSET potentiometers to obtain a signal level of -2.2 VDC.

o. At the maintenance terminal, screen 3, set the IF Attenuator to a value of 0.

p. Press the S key (to send the change).

q. At the maintenance terminal, screen 15, set the Test Attenuator to a value of 0.

r. Press the S key (to send the change).

NOTE:

When adjusting the LOG GAIN and LOG OFFSET to obtain the 2.2 VDC level, adjust each potentiometer equally to remove the variation.

s. While observing the oscilloscope display, adjust the LOG GAIN and LOG OFFSET potentiometers to obtain a signal level of 2.2 VDC.

t. Repeat steps i through s until the positive and negative voltage levels are correct.

5.8.3.2 Adjust the linear channel potentiometers:

a. At the maintenance terminal, screen 18 (AGC Curve Table), set the first value to 255 and do the CTRL + W sequence to fill the remaining values with the 255 value.

b. Press the S key (to send the change).

c. At the maintenance terminal, screen 3, set the AGC Enable to OFF; then ON.

d. Press the S key (to send the change).

e. At the maintenance terminal, screen 3, set the IF Attenuator to the value recorded in the system log book as "IF Attenuator Operational Value".

f. Press the S key (to send the change).

g. At the maintenance terminal, screen 17 (Phase Shift Table), press the U key to select an upward phase shift.

h. At the maintenance terminal, screen 14, set the Phase Trigger Rate to 2500.

i. Press the S key (to send the change).

j. On the RVP-6 circuit board, attach the oscilloscope test probe ground wire to the AGND test point and attach the test lead to the IPVID test point.

k. On the oscilloscope, observe a 4.4 V Peak-to-Peak signal (-2.2 to +2.2 V)

l. On the RVP-6 circuit board, locate the I GAIN and I OFFSET potentiometers.

NOTE:

In the next step, the I GAIN will be at or near the minimum adjustment setting. If the ±2.2 V level can not be achieved, adjust I GAIN to result in the greatest difference between the positive and negative levels.

m. While observing the oscilloscope display, adjust the I GAIN and I OFFSET potentiometers to obtain the desired signal.

n. On the RVP-6 circuit board, attach the oscilloscope test probe ground wire to the AGND test point and attach the test lead to the QPVID test point.

o. On the oscilloscope, observe a 4.4 V Peak-to-Peak signal (-2.2 to +2.2 V)

p. On the RVP-6 circuit board, locate the Q GAIN and Q OFFSET potentiometers.

NOTE:

In the next step, the Q GAIN will be at or near the minimum adjustment setting. If the ±2.2 V level can not be achieved, adjust Q GAIN to result in the greatest difference between the positive and negative levels.

q. While observing the oscilloscope display, adjust the Q GAIN and Q OFFSET potentiometers to obtain the desired signal.

r. On the RVP-6 circuit board, attach the oscilloscope channel 2 test probe ground wire to the AGND test point and attach the test lead to the IPVID test point.

NOTE:

It may be necessary to adjust the amplitude of the IPVID and QPVID signals. When observing the waveforms, they will be 90° out of phase.

s. On the oscilloscope, adjust the display to overlay the IPVID and QPVID waveforms.

t. Adjust, as necessary, the gain for the signal with the smallest Peak-to-Peak amplitude to the level of the larger.

u. At the maintenance terminal, screen 17 (Phase Shift Table), set the first value to 4 and do the CTRL + W sequence to fill the remaining values with the 4 value.

v. Press the S key (to send the change).

w. At the maintenance terminal, screen 15, set the first value to 65535 (full attenuation) and do the CTRL+W sequence to fill the remaining values with the 65535 value.

x. Press the S key (to send the change).

NOTE:

Refer to the maintenance manual for instructions on extending the various chassis to replace panels and covers and to return the chassis to the operational condition.

y. Disconnect all test equipment, replace all removed panels and covers, and return the radar to the operational condition.

5.8.4 Receiver Calibration

The receiver calibration is performed at the operator's console.

5.8.5 Receiver Operation

Three items can be checked on the receiver. LOG Amplifier Dynamic Range, Filter Band Width, and Receiver Sensitivity/(MDS).

LOG Amplifier Dynamic Range

a. Energize the radar system but DO NOT RADIATE throughout this test. The computer must command the transmitter's gated RF Drive for a CV (constant output) condition.

b. Insert a BNC (Tee) connector in the receiver rear output jack of the Log amplifier channel. Connect a 75 ohm coaxial cable between the Tee and the oscilloscope. Insert another BNC (Tee) connector at the oscilloscope and connect a millivolt multimeter to this Tee.

c. Command the transmitter gated RF Drive to an OFF condition from the computer.

d. Select the 40 kHz band pass filter mode from the computer.

e. Adjust the IF attenuator (bandwidth gain) for minimum DC output indicated on the oscilloscope or multimeter.

f. Verify the performance of the log amplifier compared to the appropriate Data Sheet by setting the CAL attenuator from the computer. Increase or decrease the attenuation value to obtain this data. The output value from the Log amplifier should be approximately 27 mV/division. The delta difference of the CAL attenuator should be 80 dB.

Filter Band Width

a. Observe the 20 MHz output at the Receiver rear test jack (three way splitter output).

b. Input the 20 MHz IF attenuator for zero attenuation from the computer.

5.8.6 Adjusting Clutter Filters

The clutter filters must be adjusted for operation of the radar at the time of installation and as necessary to accommodate changes in the operating PRF. To obtain the best results, this procedure should be performed on a day when very few air-borne particles are present in the air.

- **Preliminary conditions:**

- The radar must be transmitting at the desired PRF
- Uncorrected and corrected displays selected (in the case of single displays, select corrected video)
- Range rings enabled
- Desired display range selected
- Maintenance terminal on the clutter filter screen for the desired range
- Antenna elevation set between 0.0 and 0.2 degrees
- Antenna speed set to a speed of approximately 6°/sec (1 RPM)

- **Selecting clutter filters**

a. Using the range rings and the range bin length shown in Table XXXIX, calculate the distance to the clutter return on the uncorrected video display.

b. On the maintenance terminal:

1. Select the clutter filter screen for the displayed radar range.
2. Using the distance represented in Table XLII, determine how many range bins are represented for the distance to the clutter. For example, if the clutter is 10 km distant from the radar, using the 32 km range, every eight range bins represent a distance of 1 km. Therefore, range bin 80 would represent a distance of 10 km.

Table XLII. Range Bin Sizes

Display Range	Range Bin Length
32 km	125 m
64 km	125 m
128 km	250 m
256 km	500 m
320 km	625 m
512 km	1 km

3. Set the clutter filter to a value of 4.
4. While observing the corrected radar display, allow the sweep to rotate to the area of the clutter return, and send the maintenance terminal change (press the S key).
5. If the clutter disappears, decrease the filter setting by one and send the data again. If the clutter appears, change back to the previous setting and send the change.

NOTE:

Using a #7 filter will probably remove any signal return, except for the most extreme precipitation. For this reason, it may be desirable to set the clutter filter to a value just below the level where the entire amount of ground clutter disappears. This

determination is entirely at the discretion of the radar site operators.

6. If the clutter is still present, increase the filter number by one and send the new value. Repeat this step until the clutter disappears.

c. Repeat step b until all areas of ground clutter on the display have been filtered out, or the return levels optimized to show the desired return.

- **Saving settings**

a. When all settings for clutter filters have been made, press the Esc key and when prompted, save the settings to both (flash and disk).

b. Press the HOME key twice to exit the maintenance screens.

c. At the operator console, place the antenna speed to the desired setting and turn off range rings.

d. On the rear rack door, operate the FAN switch to LOCAL and verify that the fan operates.

e. On the rear rack door, operate the FAN switch to REMOTE.

f. Close the rear rack door.

5.9 Transmitter

The transmitter is slide mounted.

To remove any panel or cover from the transmitter, extend the chassis out the front door opening of the rack. To extend the chassis, place the radar in the standby or off mode so that the wave guide on the back of the transmitter chassis can be disconnected.

Due to the length of some cables attached to the rear of the transmitter chassis, and the need to connect the wave guide, it will be necessary to return the transmitter to the retracted position for operation.

5.9.1 Transmitter Chassis Extension to Maintenance Position

a. At the operator's console, place the radar in the standby mode.

b. Open the front door of the rack.

c. Open the rear door of the rack.

NOTE:

If the transmitter has been in the radiate mode for more than one hour, it will be necessary to keep the coolant flowing through the TWT and modulator. To do this, place the PUMP switch on the rear door in the LOCAL position.

d. Operate the transmitter power switch to OFF.

NOTE:

The latches on the left side of the chassis rotate in a different direction from the latches on the right side.

e. Rotate the chassis latches to unlatch the transmitter.

f. Remove the flange bolts from the lower flange of the 90° wave guide elbow attached to the transmitter.

g. Disconnect the cable that extends from the J10 3-way directional coupler at J8 of the transmitter.

h. Push the transmitter out part way and remove the rubber gasket from the wave guide, saving for later use.

i. Pull the chassis out as far as it will go.

5.9.2 Cover and Panel Removal or Installation

- **Removal:**

a. Perform the **Transmitter Chassis Extension To The Maintenance Position** procedure (see paragraph 5.9.1).

b. Remove the screws for the panel or cover to be removed.

c. Remove the cover or panel.

d. Perform the **Transmitter Chassis Operational Position** procedure (see paragraph 5.9.8).

- **Installation:**

a. Perform the **Transmitter Chassis Extension To The Maintenance Position** procedure (see paragraph 5.9.1).

b. Install the missing cover or panel.

c. Install the screws for the panel or cover being installed.

d. Perform the **Transmitter Chassis Operational Position** procedure (see paragraph 5.9.8).

5.9.3 Chassis Replacement

- **Removal:**

a. Perform the **Transmitter Chassis Extension To The Maintenance Position** procedure (see paragraph 5.9.1).

b. Disconnect all cables from the back of the transmitter.

c. Place a catch tray or absorbent material below the two coolant fittings to catch any fluid that may leak out.

d. Disconnect the two cooling tube connectors by pushing the gray button down and pulling the fitting out of the connector.

This unit weighs in excess of 100 pounds.

Lifting should be performed by at least two people.

e. Press the slide release buttons and remove the chassis from slide.

f. Remove the slide assemblies from transmitter and save for further use.

- **Installation:**

a. Install slide assemblies on the replacement transmitter.

The slide units are easily damaged if misaligned.

When installing the slide assemblies on the chassis into the slide assemblies in the rack, three people will be required. Two people need to lift and hold the chassis, and one person needs to guide the slide assemblies together.

b. Insert the slides into the mating slide sections.

c. Push the transmitter part way in so that cooling tube connectors are not above any electrical parts.

d. Connect the two cooling tube connectors.

NOTE:

Ensure that the wave guide gasket is properly positioned and isn't damaged when pushing the transmitter to the operational position.

e. Push the transmitter all the way in.

f. Using the chassis front panel latches, latch the transmitter into the rack.

g. Install the wave guide bolts. Tighten to 80 inch lb using an alternating cross-over pattern.

h. Ensuring that the jack number and the cable plug numbers match, connect all cabling. Use a 12 in lb torque wrench for the cables mounted on J7-J11.

i. Attach the cable that extends from the 3-way directional coupler (receiver J10) at J8 of the transmitter.

j. Close the rear door of the rack.

k. Operate the transmitter power switch to ON.

l. Close the front door of the rack.

5.9.4 Transmitter Power Supplies

5.9.4.1 Gaining Access to the Power Supplies

a. At the maintenance terminal:

1. Place the radar system under exclusive control.
2. Place the radar in the standby mode.

a. Perform the **Transmitter Chassis Extension To The Maintenance Position** procedure (see paragraph 5.9.1).

b. Open the front door of the rack.

c. Operate the transmitter power switch to OFF.

NOTE:

The latches on the left side of the chassis rotate in a different direction from the latches on the right side.

d. Rotate the chassis latches to unlatch the transmitter.

e. Open the rear door of the rack.

f. Unbolt the flange of the 90° segment of the wave guide that attaches to the transmitter chassis.

g. Disconnect the cable that extends from the 3-way directional coupler attached to J10 of the receiver to J8 of the transmitter.

h. Push the transmitter out part way and remove the rubber gasket from the wave guide, saving for later use.

i. Pull the chassis out as far as it will go.

j. Remove the front and right side covers of the chassis.

NOTE:

Refer to Figure 41 for the location of the various voltages on the transmitter terminal block.

5.9.4.2 +5 VDC Adjustment

NOTE:

Due to the locations of the terminals with relation to the power supply, it will be necessary for two people to perform this operation.

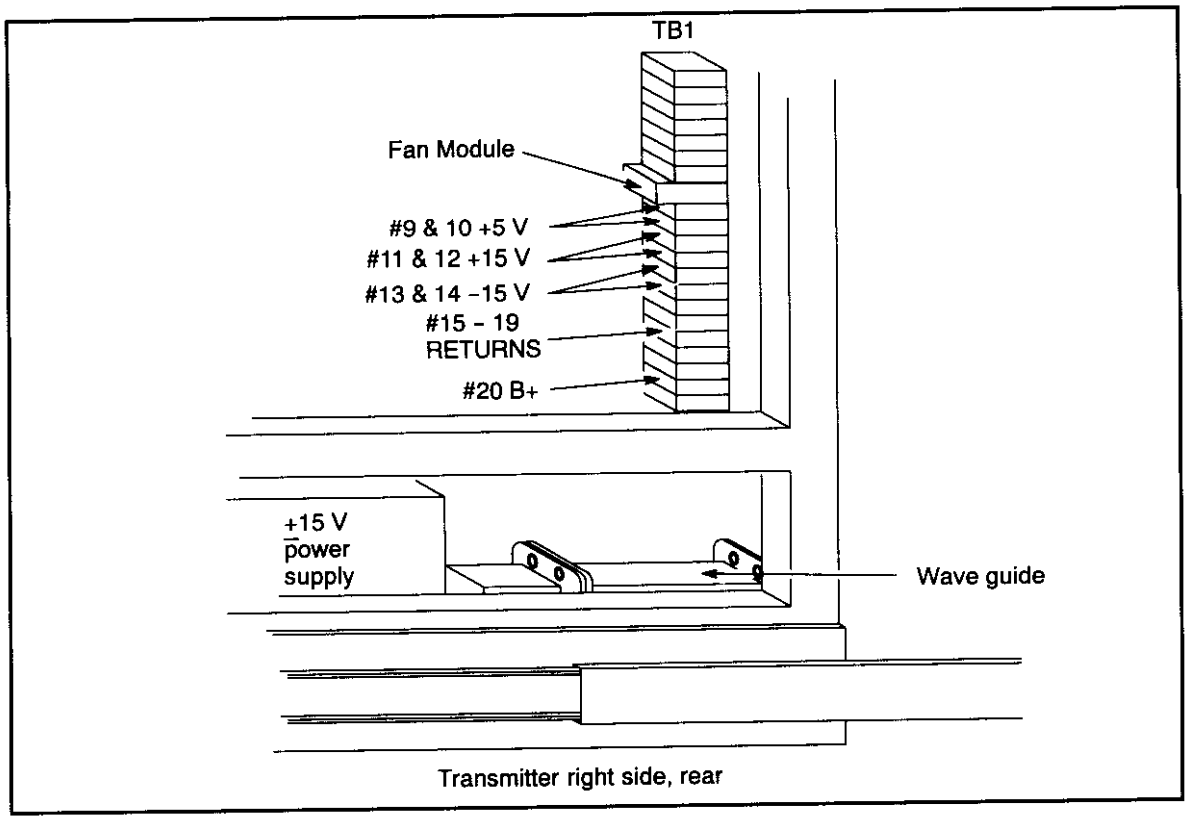


Figure 41. Transmitter Power Terminal Block (TB1).

a. Operate the transmitter power switch to ON.
b. Measure the +5 VDC output between the +5V and +5V RTN connections on TB1.
c. If necessary to adjust the output level, use Figure 42 to locate the voltage adjustment potentiometer.
d. Using a non-conducting screwdriver, turn the adjustment potentiometer to achieve a +5 ± 5% VDC output level.

5.9.4.3 ±15 VDC Adjustment

a. Operate the transmitter power switch to ON.
b. Measure the ±15 VDC output between the +15V and +15V RTN & -15V and -15V RTN connections on TB1.
c. If necessary to adjust the output level, use Figure 43 to locate the voltage adjustment points.

NOTE:

The adjustment potentiometer adjusts the output levels of both the +15 and -15 VDC.

d. Using a non-conducting screwdriver, turn the adjustment potentiometer to achieve a ±15 ± 10% VDC output level.

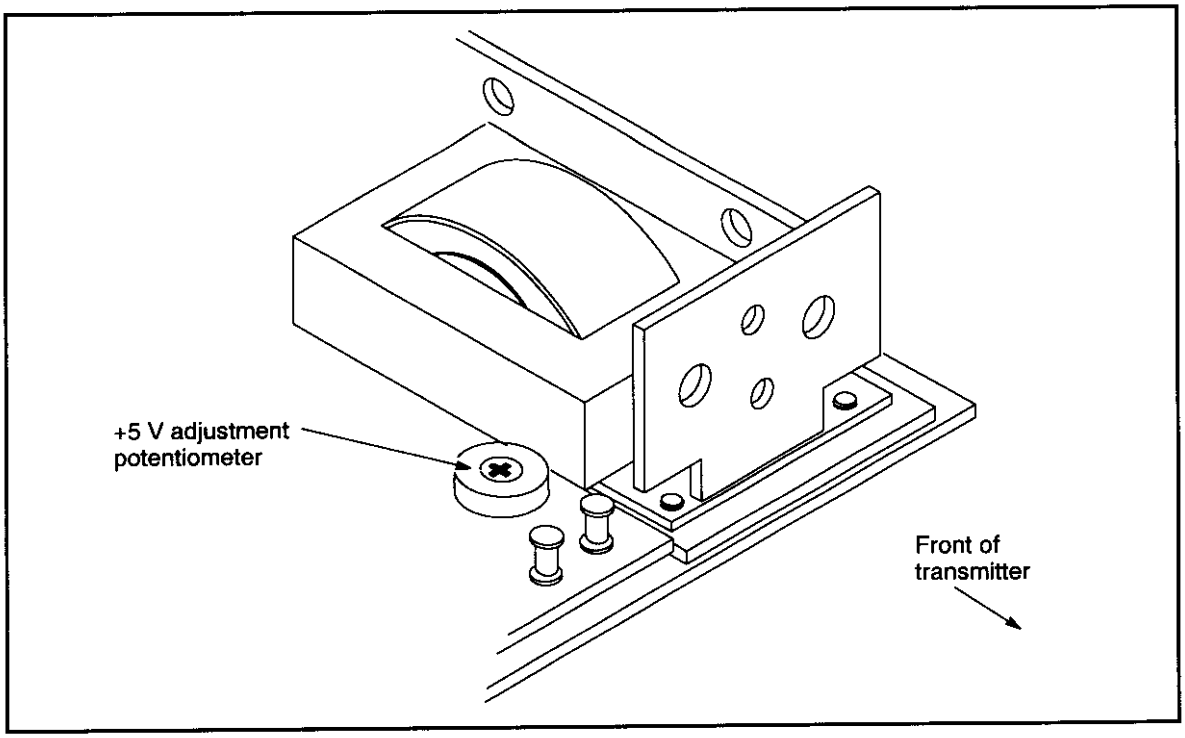


Figure 42. Location of the Transmitter +5 VDC Adjustment.

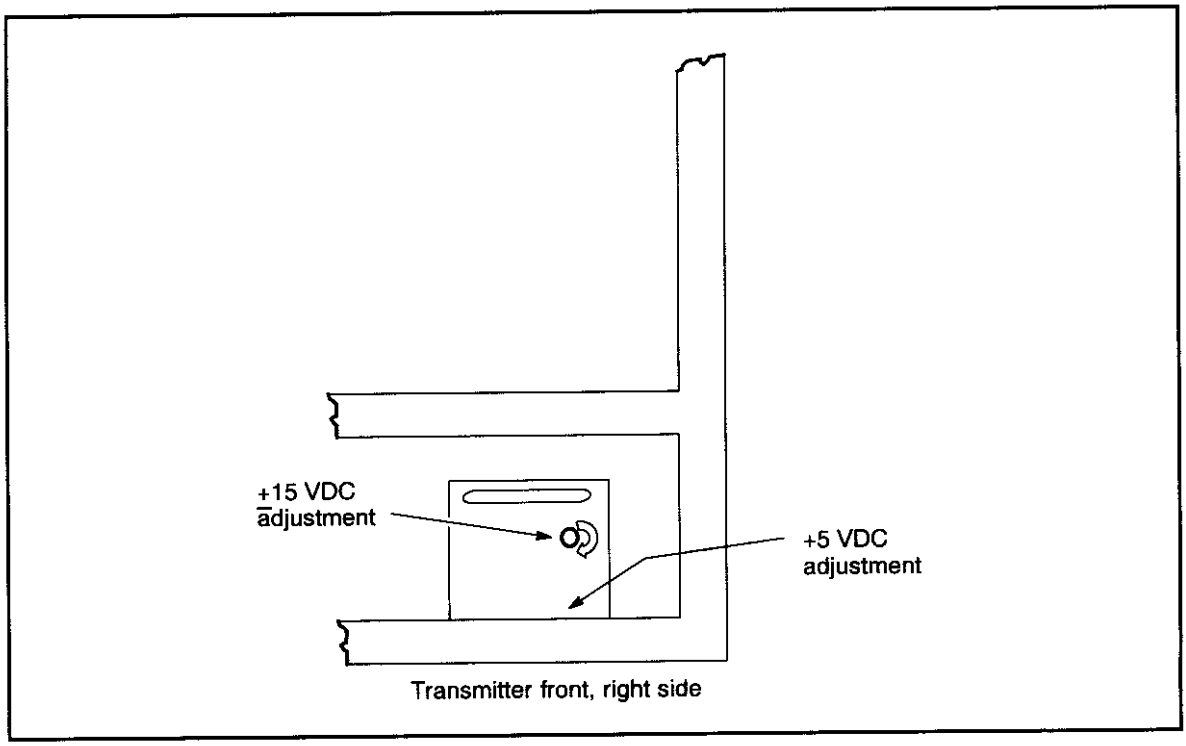


Figure 43. Transmitter ±15 VDC Power Supply.

5.9.5 Modulator Testing

5.9.5.1 Measuring Filament Current

To measure filament current the transmitter must be opened to gain access to various sections of the transmitter chassis. The measurement must be done with the transmitter on and in the standby mode.

- **Test equipment**
  - Digital voltmeter
  - Modulator high voltage test cable, separated at the center connections, resulting in two cables.
  - TWT data sheet for the installed TWT
- **Test conditions**

a. At the maintenance terminal or operator console, turn off the radar.

b. At the transmitter:

1. Turn off the power switch.
2. Remove the front panel.
3. At the modulator, disconnect the brown high voltage lead from J2.
4. Using the high voltage test cable pieces, attach one to the brown high voltage lead and the other to J2 of the modulator.

c. Configure the meter to read a value of at least 4 amps.

d. Using test leads with alligator clips, attach one lead to each of the free ends of the high voltage test cable pieces.

- **Measurement**

a. At the transmitter, turn on the power switch.

b. At the operator console or maintenance terminal, place the radar in the warm-up mode.

c. Observe the meter reading. The displayed value should be approximately ($\pm$0.2 amps) the heater current value from the TWT data sheet.

d. Observe that the yellow standby LED on the transmitter circuit breaker bracket is flashing (in warm-up mode).

e. After approximately 10 minutes, the yellow LED should become steadily lit (in standby mode).

f. Observe the meter value. Verify that the meter reading is the value specified on the TWT data sheet heater current field ($\pm$ 0.1 amps).

- **Returning the transmitter to the operational state.**

NOTE:

If additional tests will be performed, these steps can be omitted until all testing is complete.

a. At the operator console or maintenance terminal, turn off the radar.

b. At the transmitter:

1. Turn off the power switch.
2. Remove the test equipment and test cables.
3. Connect the brown high voltage lead to modulator J2.
4. Replace the front panel.
5. Turn on the power switch.

c. At the operator console, place the radar in the desired mode.

5.9.5.2 Programming the TCU for a Different TWT

NOTE:

If the installed TWT is a replacement, a **TCU Limits** data sheet must be generated prior to performing this procedure. The data sheet is generated by the procedure specified in the technical bulletin in the box with the replacement TWT. The measurements require operation of the radar and several pieces of test equipment.

When a TWT is changed, it is necessary to enter the parameters for the new TWT into the circuitry of the TCU.

- **Test equipment**

- WYSE terminal (or equivalent) with a four-pin communication cable attached to the modem connector of the terminal.

- **Test conditions**

a. At the transmitter, remove the left side panel.

b. At the TCU:

1. Locate J14.
2. Ensure the correct orientation of the connector and attach the WYSE terminal to J14.

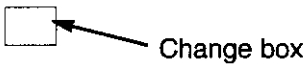
- **Measurement**

a. At the WYSE terminal:

1. Turn on the monitor.
2. Enable the CAPS LOCK function with the CAPS LOCK key.
3. Simultaneously press the SHIFT and SETUP keys.
4. Press the F4 key.

5. Set the following parameters:
   - COMM = FDX
   - MDM RC HSK = XON-XOFF/XPC
   - AUX RC HSK = XON-XOFF/XPC
   - XMT LIM = 35 CPS
   - MDM RC HSK LEVEL = 64
   - SEND ACK = OFF
   - ANSWERBACK MODE = OFF
   - MDM XMT HSK = XON-XOFF
   - AUX XMT HSK = XON-XOFF
6. Press the F5 key.
7. Set the following parameters:
   - MDM BAUD RATE = 9600
   - AUX BAUD RATE = 9600
   - HOST PORT = MODEM PORT
   - MDM DATA/PARITY = 7/ODD
   - AUX DATA/PARITY = 7/ODD
   - PRINTER ATTACHED = OFF
   - MDM STOP BITS = 1
   - AUX STOP BITS = 1
   - NULLS SUPPRESSED = ON
8. Press the F12 key.
9. Observe the following message:

```
SETUP                          SAVE?
(F1-F11: ....          )       (SPACE: TOGGLES) XXXXXX-XX
```



10. Use the spacebar to select the ALL change box content.
11. Press the F12 key.
12. Turn off and then back on, the monitor power.
13. Press the # key.
14. Refer to Table XLIII for the first parameter and enter the parameter number.
15. Observe the ENTER CMD ... prompt.

16. Enter the necessary information for the selected parameter.
17. Repeat steps 13 through 16 until all parameters specified in Table XLIII are entered.
18. Press the # key.
19. Press the R key.
20. Observe that the displayed values are correct.

Table XLIII. TWT Limits for TCU

Parameter	Entry
0	Sever limit
1	B32
2	Current lower limit
3	Current upper limit
4	dc divider lower limit
5	dc divider upper limit
6	forward power limit

NOTE: The limit values are found on the TWT data sheet in the system log book if the TWT was shipped with your system. If the installed TWT is a replacement, the procedure for creating a data sheet for that TWT was shipped with the TWT. All values are entered by the hexadecimal values on the TWT data sheet. ALWAYS verify that the data sheet is for the TWT that is installed in the transmitter.

b. At the TCU, install a jumper on JP2.
c. At the terminal:
    1. Press the # key.
    2. Press the W key.
    3. Observe the instructions on the screen.
d. When the instructions have stopped updating, turn off the transmitter power switch.
e. At the TCU, remove the jumper at JP2.
f. Operate the transmitter power switch to the ON position.
g. At the terminal:
    1. Press the # key.
    2. Press the R key.
    3. Verify that the contents were changed.
    4. Press the # key.
    5. Press the W key.
    6. Observe the value levels message.

NOTE:

For meter readings, use JP9 pin 1 as the ground reference point.

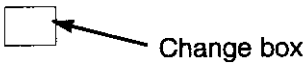
7. Using a meter, verify levels at the locations specified.

- **Returning the transmitter to the operational state.**

a. At the WYSE terminal:

1. Simultaneously press the SHIFT and SETUP keys.
2. Press the F5 key.
3. Set the following parameters:
   - MDM BAUD RATE = 19200
   - AUX BAUD RATE = 19200
   - HOST PORT = MODEM PORT
   - MDM DATA/PARITY = 8/NONE
   - AUX DATA/PARITY = 8/NONE
   - PRINTER ATTACHED = OFF
   - MDM STOP BITS = 1
   - AUX STOP BITS = 1
   - NULLS SUPPRESSED = ON
4. Press the F12 key.
5. Observe the following message:

```
SETUP                              SAVE?
(F1-F11: ....              )       (SPACE: TOGGLES) XXXXXX-XX
```



6. Use the spacebar to select the ALL change box content.
7. Press the F12 key.
8. Turn off and then back on, the monitor power.

b. At the operator console or maintenance terminal, turn off the radar.

c. At the transmitter:

1. Turn off the power switch.
2. Remove the test equipment and test cables.
3. Replace the panels.
4. Turn on the power switch.

d. At the operator console, place the radar in the desired mode.

5.9.5.3 Measuring TWT Sever Current

To measure TWT sever current the transmitter must be opened to gain access to the TCU. The measurement must be done with the transmitter turned on and transmitting and the wave guide connected to the antenna. Refer to the applicable paragraphs for the procedures for extending and retracting the transmitter.

- **Test equipment**
  - Oscilloscope set for DC coupled measurement
  - Coaxial test lead (six foot, RG58 or RG59) with BNC connectors
  - BNC Tee (if not already installed on TCU BNC1)
- **Test conditions**

a. At the maintenance terminal or operator console, place the radar in the standby mode.

NOTE:

It is possible on some racks to remove the side panel on the transmitter by removing the rack side panel.

b. Remove the left side panel on the rack.

c. At the transmitter:

1. Extend the transmitter to the maintenance position.
2. Remove the left side panel.
3. Retract the chassis and reconnect the transmitter cables and wave guide.

d. Remove the rack left side panel to gain access to the TCU.

e. If not already installed, install a BNC tee on TCU BNC1.

f. Connect the oscilloscope lead to TCU BNC1.

g. Set the oscilloscope to measure amplitude of 20mV/div.

h. At the maintenance terminal or operator console, place the radar in the transmit mode, with a PRF of 200 and a pulse width of 5 μs.

i. Adjust the oscilloscope horizontal time to display at least two complete waveforms (see Figure 44).

NOTE:

Ensure that the ground reference level for the waveform is the true ground level by disabling signal measurement and verifying that the scope ground level displayed is at the same location vertically as indicated by the waveform measurement.

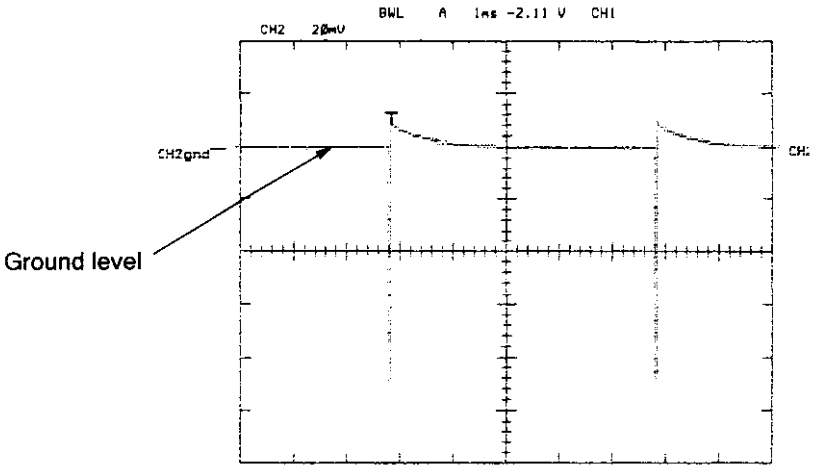


Figure 44. Sever Voltage Ground Level Positioning

j. Using the flattest portion of the top of the waveforms, position the top of the waveform on a horizontal line near the top of the display. This is the point of reference for measuring the voltage measurement.

k. Change the oscilloscope horizontal time to display a single waveform (refer to Figure 45).

l. Observe and record the vertical deflection (in mV) of the waveform.

m. At the maintenance terminal or operator console, place the radar in the standby mode.

n. Disconnect the cable attached to the tee on TCU BNC1.

o. Remove the oscilloscope test lead and tee from TCU BNC1.

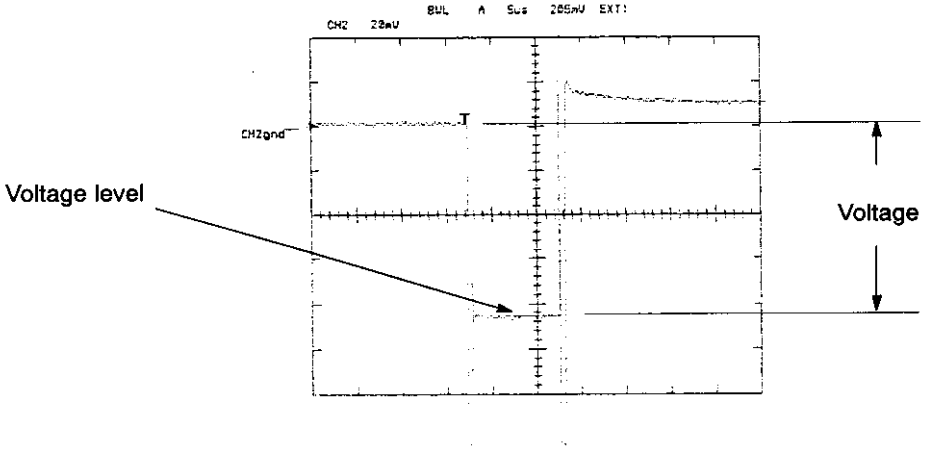


Figure 45. Sever Voltage Measurement

p. Using an multimeter and the system cable just disconnected from TCU BNC1, measure the resistance between the cable inner lead and connector body. The expected measurement is approximately 30 ohms.

q. Using the vertical deflection value measured in step l and the resistance value measured in step p, divide the voltage by the resistance to determine the sever current (in mA).

r. If the sever current is greater than 20 mA, contact Kavouras for additional assistance.

s. At the maintenance terminal or operator console, place the radar in the standby mode.

t. At the transmitter:

1. Extend the transmitter to the maintenance position.
2. Replace the left side panel.
3. Retract the chassis and reconnect the transmitter cables and wave guide.

u. Replace the left side panel of the rack.

v. At the maintenance terminal or operator console, place the radar in the desired mode.

5.9.5.4 Measuring Cathode Current

To measure cathode current the transmitter must be opened to gain access to various sections of the transmitter chassis. The measurement must be done with the transmitter turned on and the wave guide connected to the antenna. Refer to the applicable paragraphs for the procedures for extending and retracting the transmitter.

- **Test equipment**

  - Oscilloscope
  - BNC Tee (if not already installed on TCU BNC2)

- **Test conditions**

a. At the maintenance terminal or operator console, turn off the radar.

b. At the transmitter:

1. Turn off the power switch.
2. Extend the transmitter to the maintenance position.
3. Remove the left side panel.
4. Retract the chassis and reconnect the transmitter cables and wave guide.

c. Remove the rack left side panel to gain access to the TCU.

d. If not already installed, install a BNC tee on TCU BNC2.

e. Connect the oscilloscope lead to TCU BNC2.

f. Set the oscilloscope to measure amplitude of 1V/div.

g. On the TCU:

1. Locate the S1 slide switches. Place both S1 slide switches in the ON position. Normal operating mode has these in the off position.

NOTE:

U37 values equate to the pulse width of the signal. An 8 = 8 μs pulse, 9 = 9 μs pulse, and 10 = 10 μs pulse.

2. Locate switch U37. Set the switch for one setting in the range of 8 through 10.

- **Measurement**

a. At the transmitter, turn on the power switch.

b. At the maintenance terminal, place the radar in the warm-up mode (type: TCU 1 <Enter>).

c. Observe that the yellow standby LED on the transmitter circuit breaker bracket is flashing (in warm-up mode).

d. After approximately 10 minutes, the yellow LED should become steadily lit (in standby mode).

e. At the maintenance terminal, place the radar in the radiate mode (type: TCU 2 <Enter>).

f. At the TCU, observe the condition of the LEDs. Any LEDs other than those specified may indicate an error condition. The following LEDs are lit or flashing:

CR35 (lit)
CR39 (flashing)
CR77 (lit)
CR79 (lit)
CR80 (lit)

g. While observing the oscilloscope, press the TCU SW1 pushbutton to create a single RF pulse. Measure the amplitude of the signal on the oscilloscope.

h. On the TWT data sheet, locate the value for the Cathode Current. This value will be expressed in amperes.

NOTE:

The TCU converts the cathode current into a voltage for BNC2. A one volt level at BNC2 correlates to a one ampere value at the TWT.

i. Compare the reading of the pulse with the value on the data sheet. These values should be within $\pm$0.1 of each other.

j. If the cathode current is as specified in the TWT data sheet, proceed to step k, otherwise, it will be necessary to set the correct parameters:

1. At the UGR board mounted on the front or side of the modulator, locate the two slide switches S1 and S2. Record the current switch settings.

NOTE:

It will be necessary to press SW1 each time the switch settings are changed so that the resulting value can be observed on the oscilloscope.

2. The UGR slide switches are treated as a single setting. See Figure 46 for switch values. If the measured value is larger than the specified TWT data sheet value, decrease the value of the setting. If the measured value is smaller than the specified TWT data sheet value, increase the value of the setting.

k. Verify that no additional TCU LEDs are lit.

l. On the TCU, move the two slides on switch S1 to the OFF position.

- **Returning the transmitter to the operational state.**

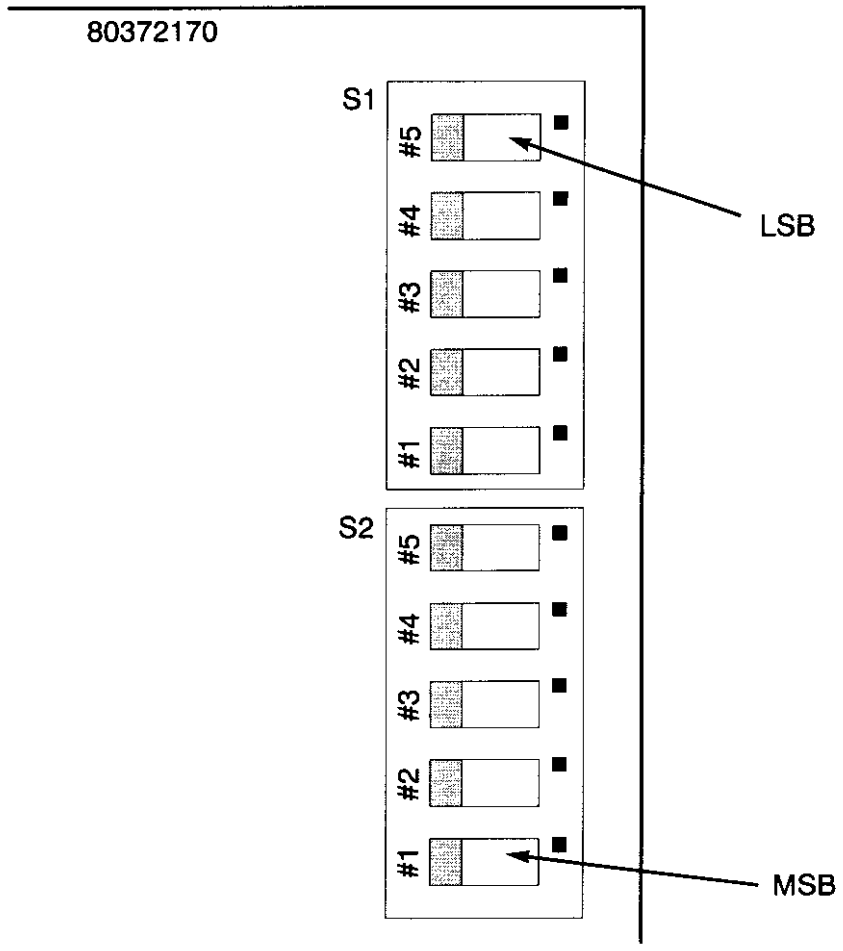


Figure 46. Cathode Current Setting Using UGR Switch Settings

NOTE:

If additional tests will be performed, these steps can be postponed until all testing is complete.

m. At the maintenance terminal, turn off the radar (type: TCU 0 <Enter>).

n. At the transmitter:

1. Turn off the power switch.
2. Remove the test equipment and test cables.
3. Extend the chassis to the maintenance position.
4. Replace the side panel.
5. Retract the chassis and reconnect the transmitter cables and wave guide.
6. Turn on the power switch.

o. Replace the rack side panel.

p. At the operator console, place the radar in the desired mode.

5.9.6 TWT Replacement

- **Removal:**

a. At the operator's console, place the transmitter in the off mode.

b. Open the front door of the rack.

c. Operate the power switch for each chassis to the OFF position.

NOTE:

The latches on the left side of the chassis rotate in a different direction from the latches on the right side.

d. Rotate the chassis latches to unlatch the transmitter.

e. Open the rear door of the rack.

f. Remove the flange bolts from the lower flange of the 90° wave guide elbow attached to the transmitter.

g. Disconnect the cable that extends from the J10 3-way directional coupler (receiver) at J8 of the transmitter.

h. Push the transmitter out part way and remove the rubber gasket from the wave guide, saving for later use.

i. Remove the transmitter front cover, top cover, and side covers.

j. Remove the connectors from the back of the modulator.

k. Disconnect the two TWT high voltage leads from the front of the modulator by unscrewing the connectors at the modulator.

l. Disconnect the modulator coolant hoses at the quick disconnect fittings at the bottom of the transmitter.

The weight and position of this assembly can cause injury if removal is attempted by one person.
Lifting should be performed by at least two people.

m. Remove the mounting screws at the base of the modulator and remove the modulator from the right side of the transmitter. Refer to Figure 47.

n. Disconnect the two RF connectors from the side of the TWT.

o. Disconnect the TWT ground cable.

p. Remove the four screws holding the TWT mounting blocks to the transmitter frame.

q. Using a locking-jaw pliers, pinch each coolant hose near the TWT to prevent coolant from leaking out when the hoses are disconnected.

r. Place absorbent material beneath the TWT coolant fittings.

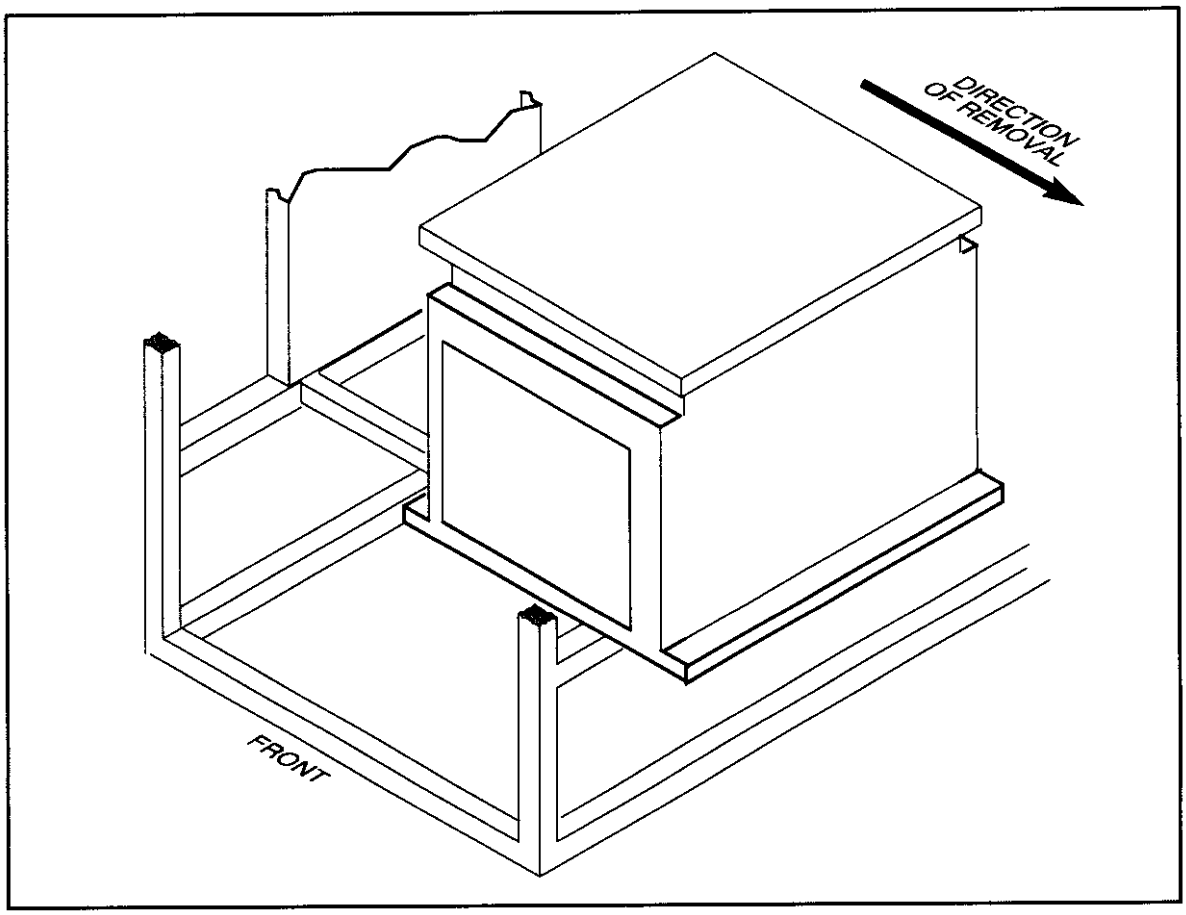


Figure 47. Modulator Removal.

NOTE:

Support the coolant fitting end of the TWT so that it remains higher than the other end of the TWT to prevent any remaining coolant from leaking into the transmitter.

s. Disconnect the coolant hoses from the TWT.

t. Remove the TWT.

- **Installation:**

a. Move the TWT mounting brackets to the new TWT so they are in the same position as the TWT they were removed from.

b. Connect the coolant hoses to the TWT.

c. Route the high voltage leads through the current doughnut at the front of the transmitter and attach them to the modulator.

d. Attach the TWT high voltage leads to the modulator (yellow to J1, brown to J2).

e. Loosely attach the TWT mounting blocks to the transmitter frame.

f. Moving the TWT as necessary to properly align the connectors, attach the RF connectors to the TWT.

g. Attach the TWT ground cable.

h. Connect the coolant hoses to the transmitter.

The weight and position of this assembly can cause injury if removal is attempted by one person.

Lifting should be performed by at least two people.

i. Install the modulator assembly and attach the mounting screws.

j. Attach the modulator coolant hoses to the fittings on the base of the transmitter.

k. Connect the connectors at the rear of the modulator.

l. While watching for leaks in the transmitter, operate the 50/60 Hz power switch to the ON position.

m. Perform the **Programming the TCU for a Different TWT** procedure.

n. Replace the top and side panels on the transmitter.

o. Replace the front panel on the transmitter.

p. Replace the rubber gasket in the wave guide flange.

q. With one person pushing the transmitter and another verifying that the wave guide rubber gasket remains in place, push the transmitter to the closed position.

r. Using the front panel latches, latch the transmitter into the rack.

s. Install the wave guide bolts. Tighten to 80 inch lb using an alternating cross-over pattern.

t. Attach the cable that extends from the J10 3-way directional coupler (receiver) to J8 of the transmitter.

u. Close the rear door to the rack.

5.9.7 Power Supply Replacement

a. If necessary, perform the **Gaining Access to the Power Supplies** procedure.

b. Unscrew the two slide-out tray hold-down screws at the front of the power supply tray.

c. Disconnect any cabling necessary to allow removal of the tray.

d. Lift the front edge of the tray and pull it out of the transmitter.

e. Disconnect the connector to the power supply to be replaced.

f. Unscrew the mounting screws for the power supply and remove it.

g. Install the new power supply and tighten the mounting screws to 15 ft lb.

h. Reconnect the power supply connector.

i. Slide the tray back into the transmitter, making sure to place the rear lip of the tray under the hold-down bracket at the rear of the receiver.

j. At the front of the tray, tighten the hold-down screws.

k. Connect all cabling removed earlier.

l. Perform the voltage adjustment procedure for the replaced power supply.

5.9.8 Transmitter Chassis Operational Position

a. Release the slide catches to allow chassis movement.

b. Ensure that the wave guide gasket is positioned properly.

NOTE:

When pushing the transmitter to the closed position, ensure that no hoses or cabling are pinched.

c. Push the transmitter all the way in.

d. Using the chassis front panel latches, latch the transmitter into the rack.

NOTE:

It is very important to use an alternating cross-over pattern when tightening wave guide flanges to avoid warping the flange, cracking the seam, and to avoid RF leakage.

e. Install the wave guide bolts. Tighten to 80 inch lb using an alternating cross-over pattern.

f. Attach the cable that extends from the J10 3-way directional coupler (receiver) to J8 of the transmitter.

g. Close the rear door of the rack.

h. Operate the transmitter power switch to ON.

i. Close the front door of the rack.

j. At the operator's console, place the radar in the desired mode of operation.

5.9.9 Forward Power Measurement and Adjustment

The RF forward power is regulated by the RF drive assembly located at the upper rear portion of the transmitter chassis. The power level is adjustable to achieve the optimum operating level for maximum output without damage to the TWT.

- **Test equipment:**

  To perform this procedure, an oscilloscope will be necessary.

- **Preparation:**

  Prior to performing this procedure, it is necessary that the left side panel of the transmitter and the left side panel of the rack (when viewed from the front of the rack) is removed. The radar will be unable to radiate while this procedure is being performed.

  In order to determine the dB output level of the RF drive assembly, it will be necessary to refer to the crystal curve chart for the crystal installed at the forward power sample port on the wave guide.

- **Measurement:**

a. At the operator's console, record the operating pulse width of the radar.

b. Except that the transmitter power switch should not be turned off, perform the **Transmitter Chassis Extension To The Maintenance Position** procedure.

c. Remove the screws for the rack left panel and the transmitter left panel.

d. Remove the panels.

e. Except that the transmitter shall be left in the standby mode, perform the **Transmitter Chassis Operational Position** procedure.

f. At the left side of the TCU, remove the connector attached to the forward power connector (may be identified as BNC 4 on some systems) install a BNC tee connector and re-attach the removed connector.

g. Attach the test lead from the oscilloscope to the other end of the BNC tee.

h. At the oscilloscope:

   1. Adjust the vertical deflection to measure a value $\geq$150mv.

2. Adjust the horizontal deflection to the pulse width recorded in step a.
3. The trigger source should be the measured signal.

i. At the operator's console, place the radar in the radiate mode.

j. At the oscilloscope, observe the waveform. It should appear similar to the waveform in Figure 48.

k. Using the crystal chart, determine the desired waveform amplitude by finding the value (in mv) that represents 8.5 dB.

l. If the measured power level is too low, perform the adjustment procedure. Otherwise, proceed to the **Test equipment removal** procedure.

- **Adjustment:**

Refer to Figure 49 for locations during the following steps.

a. Use a wrench to loosen the nut on the RF drive assembly adjustment screw.

b. While observing the oscilloscope display, turn the RF drive assembly adjustment screw counterclockwise to verify that the level is adjustable.

c. After verifying that the level changes, observe the oscilloscope display and turn the adjustment screw clockwise until the signal level reaches its maximum level. Note this voltage level. This is the saturation level of the TWT.

NOTE:

If the saturation level is lower than the value for 8.5 dB from the crystal chart, there may be a problem. Contact Kavouras for further instruction.

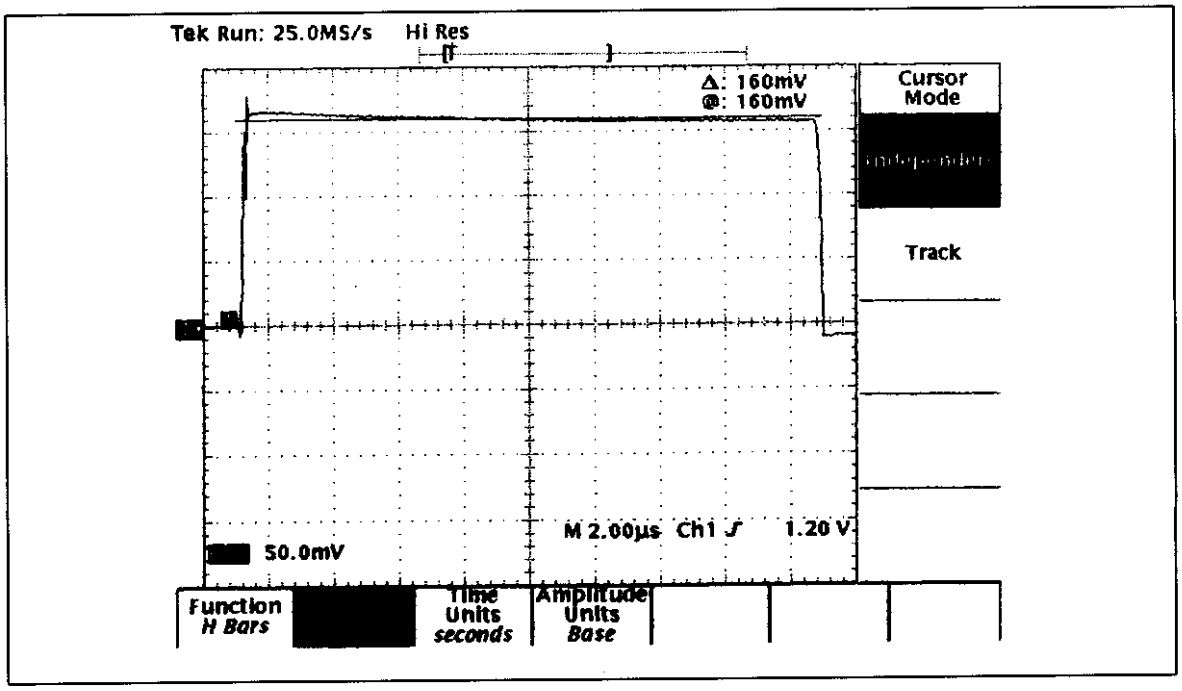


Figure 48. Forward Power Sample Waveform

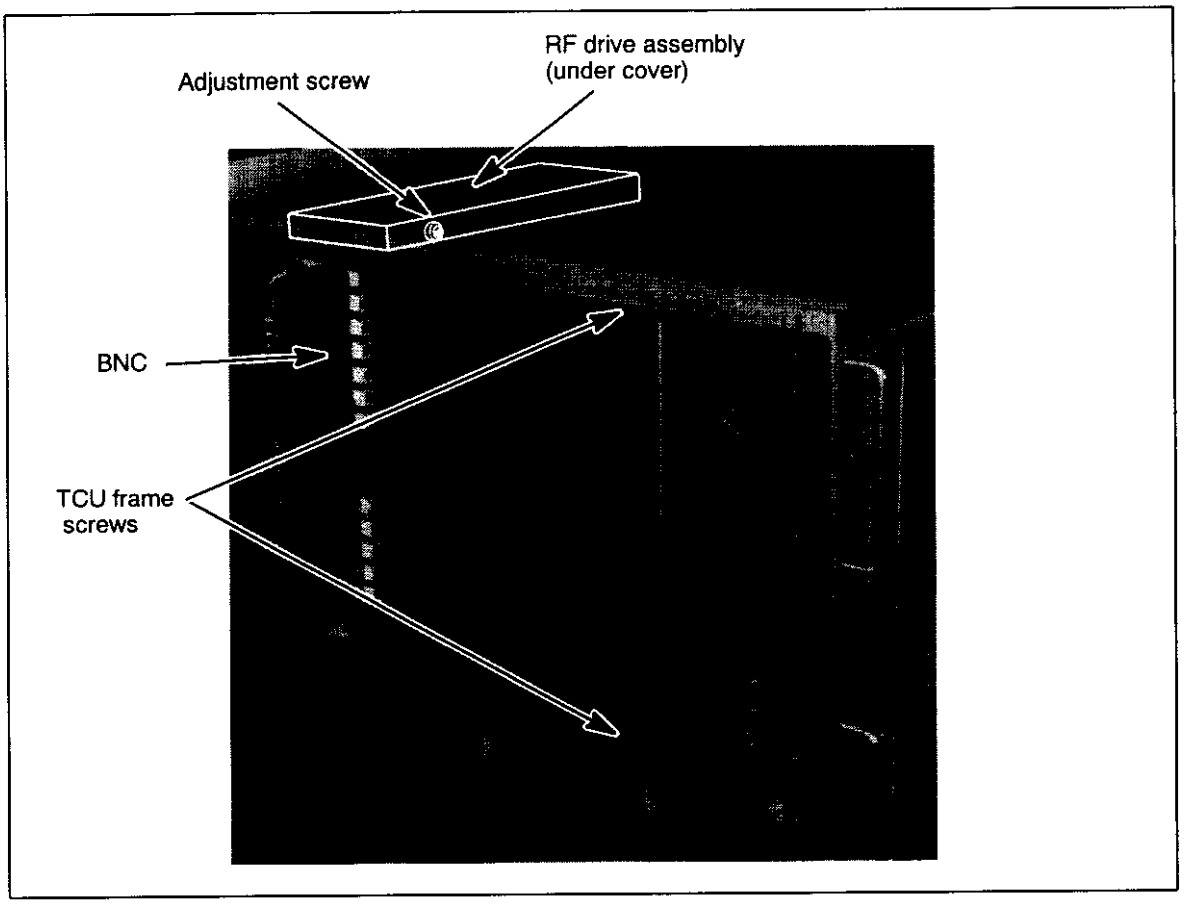


Figure 49. Transmitter TCU and RF Drive Assembly Locations

d. Using the crystal chart, determine the voltage level that represents a 0.5 to 1.0 dB level lower than the saturation level.

e. While observing the oscilloscope display, turn the adjustment screw counterclockwise until the value determined in step d is achieved, or until the value for 8.5 dB is reached (whichever is higher).

f. While holding the adjustment screw to prevent turning, tighten the nut on the adjustment screw.

g. Verify that the voltage level has not changed.

h. At the operator's console, place the radar in the standby mode.

- **Test equipment removal:**

a. Disconnect the TCU forward power cable from the BNC tee.

b. Remove the test cable and BNC tee.

c. Attach the forward power cable.

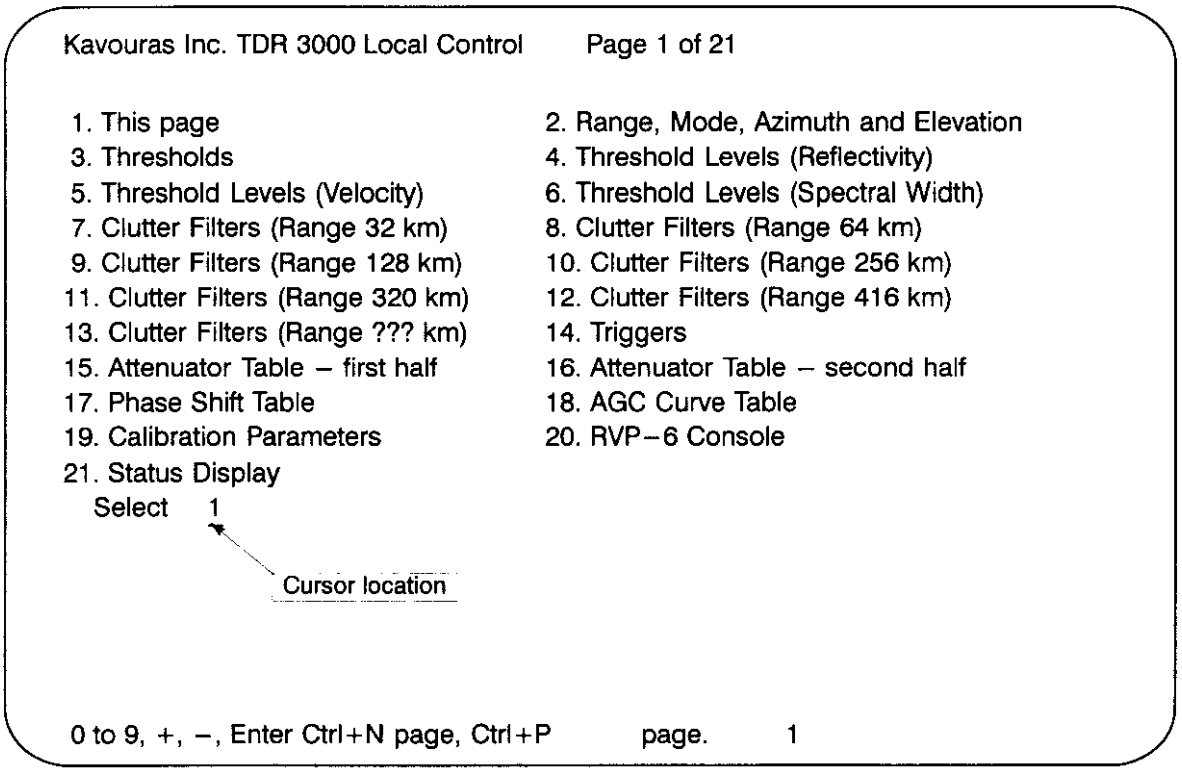
d. Disconnect the wave guide and if the cabinet has been moved, return to the original location.

e. Replace the transmitter top cover.

f. Perform the **Transmitter Chassis Operational Position** procedure.

Appendix A
Maintenance Terminal Display Screens

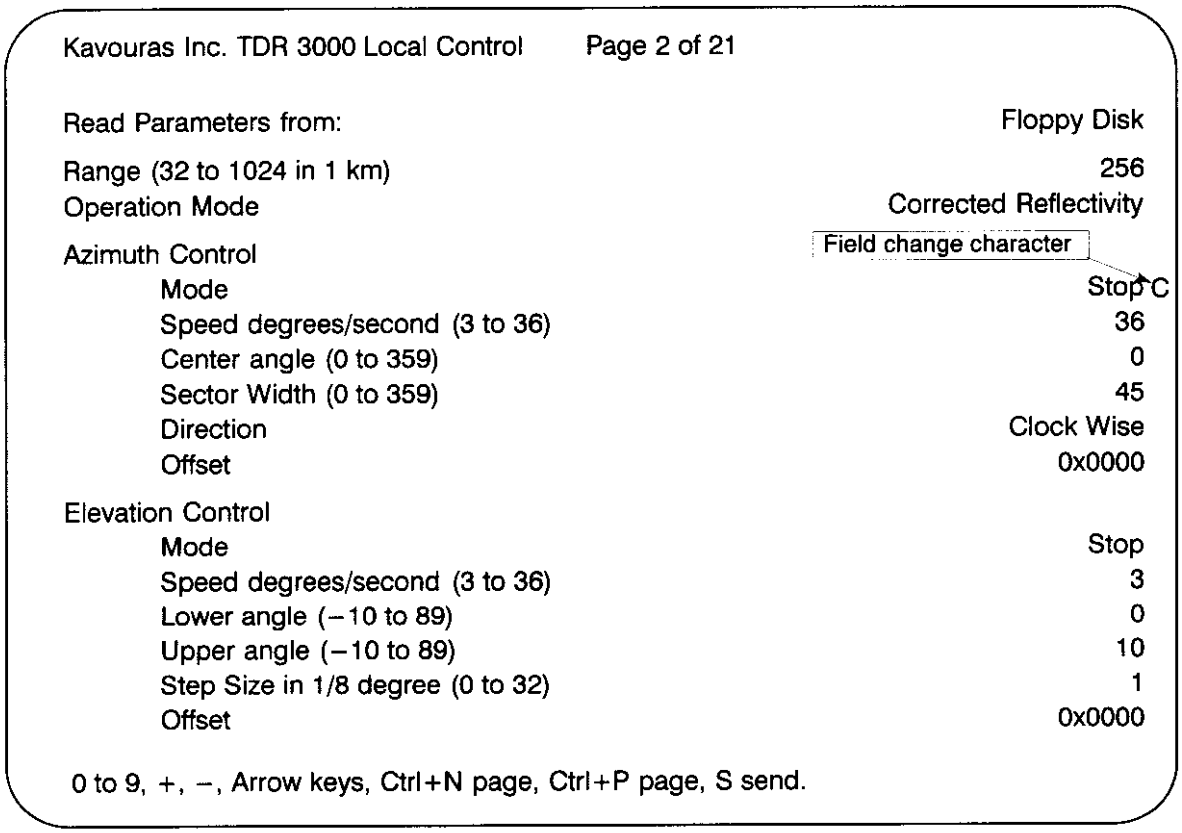
This appendix contains the screens available from the maintenance terminal and instructions pertaining to what the various entries mean. Each figure will represent a screen as it appears on the terminal.



Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next higher number
- - = the minus sign will move back the previous number
- Enter = accept the number currently displayed at the cursor position
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page

Figure A-1. Maintenance Terminal Screen 1 of 21.



NOTE:

The values shown in the figure are the default values for your system. Entries made to fields will not take effect until they are saved. When this screen is exited, any entries not saved will result in a prompt at the time of exiting as to whether to save the entries. For allowable entries for each of these fields, refer to Table A-1.

Where:

- A field change character of "C" indicates a field change made, but not yet saved.
- 0 to 9 = the allowable number entry keys (if in a numeric field)
- + = the plus sign will change to the next sequential value for the selected field
- − = the minus sign will change to the last sequential value for the selected field
- Arrow keys: & = move up one line; & = move down one line
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-2. Maintenance Terminal Screen 2 of 21.

Table A-1. Maintenance Terminal Screen 2 Definitions .

Entry	Value	Meaning
Range (32 to 1024 in 1km)	Numeric value in the range of 32 to 1024	The desired operational range of the radar
Operational Mode	Corrected Reflectivity	Refer to the RVP-6 manual for further information about these modes.
	Uncorrected Reflectivity	
	Test	
	Velocity	
	Spectral Width	
	Standby	
Azimuth Control:		
Mode	Stop	Stop antenna movement
	Scan	Perform a scan at the specified azimuth
	Sector Scan	Perform a sector scan with the selected azimuth and elevation center angles and widths specified
Speed degrees/second (3 to 36)	Numeric value in the range of 3 to 36	Number of degrees per second to rotate the antenna
Center angle (0 to 359)	Numeric value in the range of 0 to 359	This indicates the degree of azimuth to be used as the center of a sector scan.
Sector Width (0 to 359)	Numeric value in the range of 0 to 359	This indicates the width (in degrees) of a sector scan. One half of this number will occur on each side of the center angle value. A value of 0 will result in the antenna acting as though it received a stop mode command.
Direction	Clock Wise	This will cause the antenna (when viewed from above) to rotate in a clockwise direction.
	Counter Clock Wise	This will cause the antenna (when viewed from above) to rotate in a counter clockwise direction.
Offset	Hexadecimal value in the range of 0000 to 0xFFF	This value should not be changed unless maintenance has been performed on the antenna that resulted in the azimuth offset being in error.

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Table A-1. Maintenance Terminal Screen 2 Definitions (continued).

Entry	Value	Meaning
Elevation Control:		
Mode	Stop	Stop antenna movement
	Scan	Perform a scan at the specified elevation
	Sector Scan	Perform a sector scan with the selected azimuth and elevation center angles and widths specified
Speed degrees/second (3 to 36)	Numeric value in the range of 3 to 36	Speed of elevation in degrees per second
Lower angle (-10 to 89)	Numeric value in the range of -10 to 89	The bottom angle of elevation in a sector scan
Upper angle (-10 to 89)	Numeric value in the range of -10 to 89	The top angle of elevation in a sector scan
Step size in 1/8 degree (0 to 32)	Numeric value in the range of 0 to 32	Results in an elevation rise of between 0 and 4 degrees per elevation sweep. This parameter has no effect during sector scans.
Offset	Hexadecimal value in the range of 0000 to xFFF	This value should not be changed unless maintenance has been performed on the antenna that resulted in the elevation offset being in error.

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Pulse per second (125 to 3000)		500	0x3e80
20 MHz IF Band Width		2 MHz	
50 MHz IF Band Width		5 MHz	
IF Attenuator (0 to 63)		40	
Unfolding (1,2,3)		1	
Sample Size (4 to 255)		25	
Clutter Threshold (0 to −50 dB in 1/16 dB)		320	−20.0000 dB
Signal Quality Index Threshold (0 to 255)		128	
Weather Signal Power Threshold (0 to 1024 dB in 1/16 dB)		40	−5.0000 dB
Uncorrected Reflectivity Thresholding (0x0000 to 0xFFFF)		0xaaaa	
Corrected Reflectivity Thresholding (0x0000 to 0xFFFF)		0x8888	
Velocity Thresholding (0x0000 to 0xFFFF)		0xc0c0	
Width Thresholding (0x0000 to 0xFFFF)		0xc000	
AGC Enable		On	
Clutter Microsuppression		On	
Three lag algorithm		Off	
RVP−6 Processing	Disabled		

0 to 9, +, −, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. Entries made to fields will not take effect until they are saved. When this screen is exited, any entries not saved will result in a prompt at the time of exiting as to whether to save the entries. For allowable entries for each of these fields, refer to Table A-2.

Where:

- A field change character of "C" indicates a field change made, but not yet saved.
- 0 to 9 = the allowable number entry keys (will delete existing entry)
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Arrow keys: & = move up one line; & = move down one line
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-3. Maintenance Terminal Screen 3 of 21.

Table A-2. Maintenance Terminal Screen 3 Definitions .

Entry	Value	Meaning
Pulse per second (125 to 3000)	Numeric value in the range of 125 to 3000	The desired PRF. The lower the range (see Figure A-2), the higher the allowable PRF. Refer to Table A-3 for allowable PRFs versus selected ranges.
20 MHz Band Width	Off	No receiver band pass filter selected
	45 kHz	Use the 45 kHz receiver band pass filter
	80 kHz	Use the 80 kHz receiver band pass filter
	200 kHz	Use the 200 kHz receiver band pass filter
	500 kHz	Use the 500 kHz receiver band pass filter
	1 MHz	Use the 1 MHz receiver band pass filter
	2 MHz	Use the 2 MHz receiver band pass filter
50 MHz Band Width	Off	No receiver band pass filter selected
	5 MHz	Use the 5 MHz receiver band pass filter
	10 MHz	Use the 10 MHz receiver band pass filter
IF Attenuator (0 to 63)	Numeric value in the range of 0 to 63	Select a value for the IF attenuator (used to set the receiver noise threshold)
Unfolding (1, 2, 3)	1	No unfolding
	2	2x unfolding
	3	3x unfolding
Sample Size (4 to 255)	Numeric value in the range of 4 to 255	Number of transmitter pulses returned to the receiver to be averaged together to obtain a digital video data word for transmission to the Triton. This value should be determined by determining the operational mode of the radar and the PRF of the transmitter. The shorter the range and higher the PRF, the higher the sample size should be.
Clutter Threshold (0 to -50 dB in 1/16 dB)	Numeric value in the range of 0 to 50	CCOR threshold: refer to the CCOR threshold paragraph in section 3 for a definition of this entry.
Signal Quality Index Threshold (0 to 255)	Numeric value in the range of 0 to 255	SQI threshold: refer to the SQI threshold paragraph in section 3 for a definition of this entry.
Weather Signal Power Threshold (0 to 1024 dB in 1/16 dB)	Numeric value in the range of 0 to 16384	WSP threshold: refer to the WSP threshold paragraph in section 3 for a definition of this entry.

Table A-2. Maintenance Terminal Screen 3 Definitions (continued).

Entry	Value	Meaning
Uncorrected Reflectivity Thresholding (0x0000 to 0xFFFF)	Hexadecimal numeric value	See the RVP-6 Manual for a description of this entry.
Corrected Reflectivity Thresholding (0x0000 to 0xFFFF)	Hexadecimal numeric value	
Velocity Thresholding (0x0000 to 0xFFFF)	Hexadecimal numeric value	
Width Thresholding (0x0000 to 0xFFFF)	Hexadecimal numeric value	
AGC Enable	On	Use AGC control to linear amplifier.
	Off	Use STC curve to linear amplifier.
Clutter Microsuppression	On	Eliminate clutter bins prior to averaging when range averaging is used by the RVP-6.
	Off	Use clutter bins when range averaging is used by the RVP-6.
Three Leg algorithm	Off	Perform calculation of spectral width, as described in the RVP-6 manual using the two-leg auto-correlation estimate.
	On	Perform calculation of spectral width, as described in the RVP-6 manual. Use of this may cause the loss of some range bins due to the amount of time required to perform the calculations versus the distance of range being searched. Most range bin losses will occur at a high PRF with short ranges.
RVP-6 Processing	Disabled	Do not process video data with the RVP-6 processor. (Used during testing, when video returns are not important, or not desired.)
	Enabled	Process returned video using the RVP-6 processor.

Table A-3. PRF Selection by Range.

Range	Maximum PRF	Usable PRF	Maximum Pulse Width	Maximum Velocity
16 km (10 miles)	9362	3000	2 s	40.1 m/s
32 km (20 miles)	4681	3000	2 s	40.1 m/s
48 km (30 miles)	3120	3000	2 s	40.1 m/s
64 km (40 miles)	2340	2300	2.6 s	30.7 m/s
80 km (50 miles)	1872	1850	3.24 s	24.7m/s
96 km (60 miles)	1560	1500	4 s	20.8 m/s
112 km (70 miles)	1337	1300	4.6 s	17.4 m/s
128 km (80 miles)	1170	1100	5.45 s	14.7 m/s
144 km (90 miles)	1040	1000	6 s	13.4 m/s
160 km (100 miles)	936	900	6.66 s	12 m/s
176 km (110 miles)	851	750	8 s	10 m/s
192 km (120 miles)	780	750	8 s	10 m/s
208 km (130 miles)	720	500	12 s	6.7 m/s
224 km (140 miles)	668	500	12 s	6.7 m/s
240 km (150 miles)	624	500	12 s	6.7 m/s
256 km (160 miles)	585	500	12 s	6.7 m/s
272 km (170 miles)	550	500	12 s	6.7 m/s
288 km (180 miles)	511	500	12 s	6.7 m/s
304 km (190 miles)	492	400	15 s	5.3 m/s
320 km (200 miles)	468	400	15 s	5.3 m/s
336 km (210 miles)	445	400	15 s	5.3 m/s
352 km (220 miles)	425	400	15 s	5.3 m/s
368 km (230 miles)	407	400	15 s	5.3 m/s
384 km (240 miles)	350	350	17.14 s	4.7 m/s
400 km (250 miles)	374	350	17.14 s	4.7 m/s
416 km (260 miles)	360	350	17.14 s	4.7 m/s

Velocity conversion of m/s to MPH (KPH):

40.1 m/s = 90 (144) MPH	13.4 m/s = 30 (48) MPH
30.7 m/s = 69 (110) MPH	12 m/s = 27 (43) MPH
24.7 m/s = 55 (88) MPH	10 m/s = 22 (35) MPH
20.8 m/s = 47 (75) MPH	6.7 m/s = 14 (22) MPH
17.4 m/s = 39 (62) MPH	5.3 m/s = 11 (17) MPH
14.7 m/s = 33 (52) MPH	4.7 m/s = 10.5 (16) MPH

NOTE:

If increasing pulse width, change PRF followed by pulse width.
If decreasing pulse width, change pulse width followed by PRF.

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Threshold Levels (Reflectivity)

0	0	64	74	84	94	104	114	124	134	144
10	154	164	174	184	194	204	214	224	234	244
20	255	255	255	255	255	255	255	255	255	255
30	255	255	255	255	255	255	255	255	255	255
40	255	255	255	255	255	255	255	255	255	255
50	255	255	255	255	255	255	255	255	255	255
60	255	255	255	255						

Reflectivity 0 dBz

NOTE: Only positions 1-15 are used. All subsequent entries (16-64) are ignored.

0 to 9, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

This screen covers the displayed radar display screen colors. The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-4.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-4. Maintenance Terminal Screen 4 of 21.

Table A-4. Maintenance Terminal Screen 4 Definitions.

Entry	Value	Meaning
Fields 1-15	Numeric value in the range of 0 to 255 0 = no signal 1 = -31.5 dBz 2 = -31 dBz 64 = 0 dBz 255 = 95.5 dBz	The number represents the threshold at which the color bar on the side of display will change, indicating a greater number of particles present in the returned signal. Each number between 1 and 255 equals 0.5 dBz. Numbers between 1-63 equal negative dBz and 64-255 equal positive dBz. The default settings would result in a change in color for every 5 dBz increase.

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Threshold Levels (Velocity)

0	1	1	13	32	51	70	89	108	128	147
10	166	185	204	223	242	255	255	255	255	255
20	255	255	255	255	255	255	255	255	255	255
30	255	255	255	255	255	255	255	255	255	255
40	255	255	255	255	255	255	255	255	255	255
50	255	255	255	255	255	255	255	255	255	255
60	255	255	255	255						

Velocity −6.7 m/s

0 to 9, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-5.

Where:

- 0 to 9 = the allowable number entry keys; values entered will result in the display of the equivalent velocity in meters per second, which equate to the following wind speeds:

40.1 m/s = 90 MPH (144 KPH)	13.4 m/s = 30 MPH (48 KPH)
30.7 m/s = 69 MPH (110 KPH)	12 m/s = 27 MPH (43 KPH)
24.7 m/s = 55 MPH (88 KPH)	10 m/s = 22 MPH (35 KPH)
20.8 m/s = 47 MPH (75 KPH)	6.7 m/s = 14 MPH (22 KPH)
17.4 m/s = 39 MPH (62 KPH)	5.3 m/s = 11 MPH (17 KPH)
14.7 m/s = 33 MPH (52 KPH)	4.7 m/s = 10.5 MPH (16 KPH)

- + = the plus sign will move ahead to the next entry
- − = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-5. Maintenance Terminal Screen 5 of 21.

Table A-5. Maintenance Terminal Screen 5 Definitions.

Entry	Value	Meaning
Fields 1-64	Numeric value (0-255)	0 = no velocity data available 1 = maximum velocity toward the radar 128 = no movement 255 = maximum velocity away from the radar

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Threshold Levels (Spectral Width)

0	2	38	77	115	153	191	230	255	255	255
10	255	255	255	255	255	255	255	255	255	255
20	255	255	255	255	255	255	255	255	255	255
30	255	255	255	255	255	255	255	255	255	255
40	255	255	255	255	255	255	255	255	255	255
50	255	255	255	255	255	255	255	255	255	255
60	255	255	255	255						

Width 1.0 m/s

0 to 9, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-6.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-6. Maintenance Terminal Screen 6 of 21.

Table A-6. Maintenance Terminal Screen 6 Definitions.

Entry	Value	Meaning
All fields	Numeric value (0-255)	0 = no spectral width data available 1-255 = n Where: n/256 * Vu = m/s Vu = unambiguous velocity m/s = meters per second

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Clutter Filters (Range 32 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-7.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-7. Maintenance Terminal Screen 7 of 21.

Table A-7. Maintenance Terminal Screen 7 Definitions.

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range 64 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-8.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-8. Maintenance Terminal Screen 8 of 21.

Table A-8. Maintenance Terminal Screen 8 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range 128 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-9.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-9. Maintenance Terminal Screen 9 of 21.

Table A-9. Maintenance Terminal Screen 9 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range 256 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-10.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-10. Maintenance Terminal Screen 10 of 21.

Table A-10. Maintenance Terminal Screen 10 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range 320 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-11.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-11. Maintenance Terminal Screen 11 of 21.

Table A-11. Maintenance Terminal Screen 11 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range 416 km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-12.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-12. Maintenance Terminal Screen 12 of 21.

Table A-12. Maintenance Terminal Screen 12 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Clutter Filters (Range ??? km)

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
60	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
80	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
100	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
120	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
140	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
160	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
200	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
220	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
240	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				

This screen is used if a non-standard range is selected.

0 to 7, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-13.

Where:

- 0 to 7 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-13. Maintenance Terminal Screen 13 of 21.

Table A-13. Maintenance Terminal Screen 13 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-7)	0 = all pass filter selected (no clutter suppression) 1-7 = specific filters (see RVP-6 manual, appendix III, for filter characteristics)

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Pulse per second (125 to 3000)	500	0x3e80
Drive Pulse Width (0.5 to 20.0 us in 125 ns)	16	2.0000 s
RF Delay (0 to 32 us in 125 ns)	8	1.0000 s
System Delay	6	0.7500 s
STC start (0 to 127 in 125 ns)	80	1.5 km
STC end (0 to 2047 in 125 ns)	1100	20.6 km
Attenuator Trigger rate (0 to 65535)	64	
Phase Trigger Rate (0 to 65535)	0	
Trigger Enables (0 to 127)	0	

0x01 – Prf Enable (Master Enable)
0x02 – Phase Enable
0x04 – Drive Pulse Enable
0x08 – RF Drive Enable
0x10 – STC Trigger Enable
0x20 – Test Trigger Enable
0x40 – Internal prf Enable

0 to 9, +, –, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-14.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Arrow keys: & = move up one line; & = move down one line
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-14. Maintenance Terminal Screen 14 of 21.

Table A-14. Maintenance Terminal Screen 14 Definitions .

Entry	Value	Meaning
Pulse per second (125 to 3000)	Numeric value in the range of 125 to 3000	The desired PRF. The lower the range (see Figure A-2), the higher the allowable PRF. Refer to Table A-3 for allowable PRFs versus selected ranges.
Drive Pulse Width 0.5 to 20.0 (s in 125 ns)	Numeric value (4 to 160)	Multiply this value by 0.125 to yield the number of s.
RF Delay (0 to 32 s in 125 ns)	Numeric value (0-256)	Multiply this value by 0.125 to yield the number of s. This is the amount of time (in s) that the RF gate from the TAC will be delayed to allow the transmitter modulator output pulse to achieve a stable level before transmitting the RF pulse to the antenna.
System Delay	Numeric value NOTE: This value should be entered during the installation process. DO NOT change this value during other operations.	This is the amount of delay inherent in the modulator. The system delay corrects for this delay so that the actual RF pulse sent to the antenna is the width specified by the drive pulse width.
STC Start (0 to 127 in 125 ns)	Numeric value (0 to 1016)	Multiply this value by 0.125 to yield the number of s. NOTE: This field currently has no effect.
STC end (0 to 2047 in 125 ns)	Numeric value (0 to 16376)	Multiply this value by 0.125 to yield the number of s. NOTE: This field currently has no effect.
Phase Trigger Rate (0 to 65535)	Numeric value (0 to 65535)	This sets the rate at which the receiver steps through the Phase Shift table (see Figure A-17). This in turn determines the doppler shift.
Attenuator Trigger Rate (0 to 65535)	Numeric value (0 to 65535)	This sets the rate at which the receiver steps through the Attenuator table (see Figure A-15). This allows known values to be output at specified ranges on the display.
Trigger Enables (0 to 127)	Numeric value (0-127)	This number is the cumulative value of all selected enables. To determine the value, refer to the values of the triggers.

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Table A-14. Maintenance Terminal Screen 14 Definitions (continued).

Entry	Value	Meaning
0x01 - Prf Enable (Master Enable)	1	This trigger must be selected if any trigger other than the Phase Enable trigger is to be used.
0x02 - Phase Enable	2	This trigger is not affected by the enabling of the PRF Enable. If selected, this trigger will allow velocity measurement testing.
0x04 - Drive Pulse Enable	4	Enable the TAC to generate the drive pulse timing. This must be selected to allow the enabling of the RF gate.
0x08 - RF Drive Enable	8	Enable the TAC to send the RF drive pulse. If disabled, the RF gate remains at a continuous high signal level for calibration.
0x10 - STC Trigger Enable	16	This trigger currently has no effect.
0x20 - Test Trigger Enable	32	This trigger is used for stepping through the attenuator table. When disabled, only the first value from the attenuator table will be used.
0x40 - Internal prf Enable	64	Generate an internal PRF trigger when there is no RVP-6 installed.

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Attenuator Table – first half

0	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
10	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
20	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
30	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
40	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
50	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
60	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
70	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
80	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
90	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
100	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
110	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
120	65535	65535	65535	65535	65535	65535	65535	65535		

Attenuator 127.50

NOTE: These values should only be changed during calibration.

0 to 9, +, –, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the values to be entered for the normal operation of your system. For allowable entries for each of these fields during calibration, refer to Table A-15.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; = move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-15. Maintenance Terminal Screen 15 of 21.

Table A-15. Maintenance Terminal Screen 15 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-65535, which results in an attenuation value of 0-127.5 dB)	This value controls the attenuation values from the test attenuators (see Figure A-15 and Figure A-16). The values entered here are interpreted to obtain the settings for the two separate attenuators. To determine the attenuator values based on the numeric value entered, and a sample method of determining the attuenuation value, see below.

Attenuator #1								Attenuator #2								
32	16	8	4	2	1	.5	.25	32	16	8	4	2	1	.5	.25	Bit values by attenuator
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	Bit position by attenuator
Entries that would achieve an attenuation of 1 dB.																Value for table
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	259
0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	514
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	769
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1024
32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	Numeric value by bit position (added together to yield value for the numeric entry)

NOTE:

Table A-16 lists values to use to achieve a desired dB value. Other values may yield the same dB value, but these values are provided for ease of value computation.

Table A-16. Attenuator Settings

Attenuator Setting	Attenuation (dB)	Attenuator Setting	Attenuation (dB)	Attenuator Setting	Attenuation (dB)	Attenuator Setting	Attenuation (dB)
0	0	128	32	65281	64	65409	96
4	1	132	33	65285	65	65413	97
8	2	136	34	65289	66	65417	98
12	3	140	35	65293	67	65421	99
16	4	144	36	65297	68	65425	100
20	5	148	37	65301	69	65429	101
24	6	152	38	65305	70	65433	102
28	7	156	39	65309	71	65437	103
32	8	160	40	65313	72	65441	104
36	9	164	41	65317	73	65445	105
40	10	168	42	65321	74	65449	106
44	11	172	43	65325	75	65453	107
48	12	176	44	65329	76	65457	108
52	13	180	45	65333	77	65461	109
56	14	184	46	65337	78	65465	110
60	15	188	47	65341	79	65469	111
64	16	192	48	65345	80	65473	112
68	17	196	49	65349	81	65477	113
72	18	200	50	65353	82	65481	114
76	19	204	51	65357	83	65485	115
80	20	208	52	65361	84	65489	116
84	21	212	53	65365	85	65493	117
88	22	216	54	65369	86	65497	118
92	23	220	55	65373	87	65501	119
96	24	224	56	65377	88	65505	120
100	25	228	57	65381	89	65509	121
104	26	232	58	65385	90	65513	122
108	27	236	59	65389	91	65517	123
112	28	240	60	65393	92	65521	124
116	29	244	61	65397	93	65525	125
120	30	248	62	65401	94	65529	126
124	31	252	63	65405	95	65533	127

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Attenuator Table – second half

120									65535	65535
130	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
140	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
150	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
160	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
170	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
180	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
190	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
200	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
210	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
220	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
230	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
240	65535	65535	65535	65535	65535	65535	65535	65535	65535	65535
250	65535	65535	65535	65535	65535	65535				

Attenuator 127.50

NOTE: These values should only be changed during calibration.

0 to 9, +, –, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the values to be entered for the normal operation of your system. For allowable entries for each of these fields during calibration, refer to Table A-17.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-16. Maintenance Terminal Screen 16 of 21.

Table A-17. Maintenance Terminal Screen 16 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-65535, which results in an attenuation value of 0-127.5 dB)	This value controls the attenuation values from the test attenuators (see Figure A-15 and Figure A-16). The values entered here are interpreted to obtain the settings for the two separate attenuators. To determine the attenuator values based on the numeric value entered, and a sample method of determining the attuenuation value, see below.

Attenuator #1								Attenuator #2								
32	16	8	4	2	1	.5	.25	32	16	8	4	2	1	.5	.25	Bit values by attenuator
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	Bit position by attenuator
Entries that would achieve an attenuation of 1 dB.																Value for table
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	259
0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	514
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	769
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1024
32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1	Numeric value by bit position (added together to yield value for the numeric entry)

NOTE:

Table A-16 lists values to use to achieve a desired dB value. Other values may yield the same dB value, but these values are provided for ease of value computation.

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Phase Shift Table

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3
20	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7
40	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11
60	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
80	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3
100	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7
120	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11
140	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
160	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3
180	4	5	6	7	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7
200	8	9	10	11	12	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11
220	2	13	14	15	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
240	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				

NOTE: The given values represent the positional step within a digital sine wave. The sine wave changes in 22-1/2° increments.

0 to 9, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-18.

NOTE:

The phase trigger entered in screen 14 affects the step rate of these values. The faster the step rate, the greater the velocity.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-17. Maintenance Terminal Screen 17 of 21.

Table A-18. Maintenance Terminal Screen 17 Definitions

Entry	Value	Meaning
All fields	Numeric value (0-15)	This number represents the quantity of 22.5° phase shifts. The values for the phase shift are as follows: 0 = 0° 1 = 22.5° 2 = 45° 3 = 67.5° 4 = 90° 5 = 112.5° 6 = 135° 7 = 157.5° 8 = 180° 9 = 202.5° 10 = 225° 11 = 247.5° 12 = 270° 13 = 292.5° 14 = 315° 15 = 337.5°

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AGC Curve Table

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

NOTE: These values should only be changed during calibration.

0 to 9, +, −, Ctrl+W fill, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-19.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Ctrl+W = fill the remainder of the table with the cursor location value
- Arrow keys: = move up one line; = move down one line; = move left one field; move right one field
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-18. Maintenance Terminal Screen 18 of 21.

Table A-19. Maintenance Terminal Screen 18 Definitions

Entry	Value	Meaning
All fields	Numeric values (0-255)	Based on the AGC response curve for the radar. The value entered results in application of an AGC of 0 volts (no attenuation) to -4 volts (≈80 dB) to the I/Q amplifier to prevent clipping of the peaks of the I and Q waveforms. Clipping of the waveforms results in an incorrect phase shift measurement.

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Calibration Reflectivity (0 to −100 dB in 1/16 dB)	352	−22.0000 dB
Calibration Pulse Width (0 to 20 s in 1/2 s)	10	5.0000 s
Clutter Filter Stabilization Delay (0 to 255)	0	
Number of AGC Pulses Integrated (0 to 255)	8	
Enable Zero clutter Filters	Yes	
Log receiver noise threshold (0 to 16 dB in 1/16 dB)	8	0.5000 dB
Enable Pipelining	No	
Log Receiver Slope (0 to 65535)	1300	

0 to 9, +, −, Arrow keys, Ctrl+N page, Ctrl+P page, S send.

NOTE:

The values shown in the figure are the default values for your system. For allowable entries for each of these fields, refer to Table A-20.

Where:

- 0 to 9 = the allowable number entry keys
- + = the plus sign will move ahead to the next entry
- - = the minus sign will move back to the previous entry
- Arrow keys: & = move up one line; & = move down one line
- Ctrl+N = move to the next sequential page from the current page
- Ctrl+P = move to the last sequential page from the current page
- S send = accept the value currently displayed at the cursor position

Figure A-19. Maintenance Terminal Screen 19 of 21.

Table A-20. Maintenance Terminal Screen 19 Definitions

Entry	Value	Meaning
Calibration Reflectivity (0 to -100 dB in 1/16 dB)	Numeric value (0-1600)	Multiply the value by 0.0625 to obtain the actual reflectivity. (This value will be determined during calibration.)
Calibration Pulse Width (0 to 20 s in 1/2 s)	Numeric value (0-40)	Multiply the value by 0.5 to obtain the actual pulse width. (This value will be determined during calibration.)
Clutter Filter Stabilization Delay (0 to 255)	Numeric value (0-255)	Quantity of pulses to discard during dual PRF operation to account for clutter filter ringing. See the RVP-6 manual for clutter filter operation.
Number of AGC Pulses Integrated (0 to 255)	Numeric value (0-255)	Number of pulses averaged to determine the AGC value sent to the I/Q amplifier in the receiver.
Enable Zero clutter Filters	Yes	DO NOT change this setting.
Log receiver noise threshold (0 to 16 dB in 1/16 dB)	Numeric value (0-256)	Multiply the value by 0.0625 to obtain the actual threshold.
Enable Pipelining	No	DO NOT change this setting.
Log Receiver Slope (0 to 65535)	Numeric value (0-65535)	Determined during initial calibration. This value is based on the analog to digital value for the selected position on the slope curve.

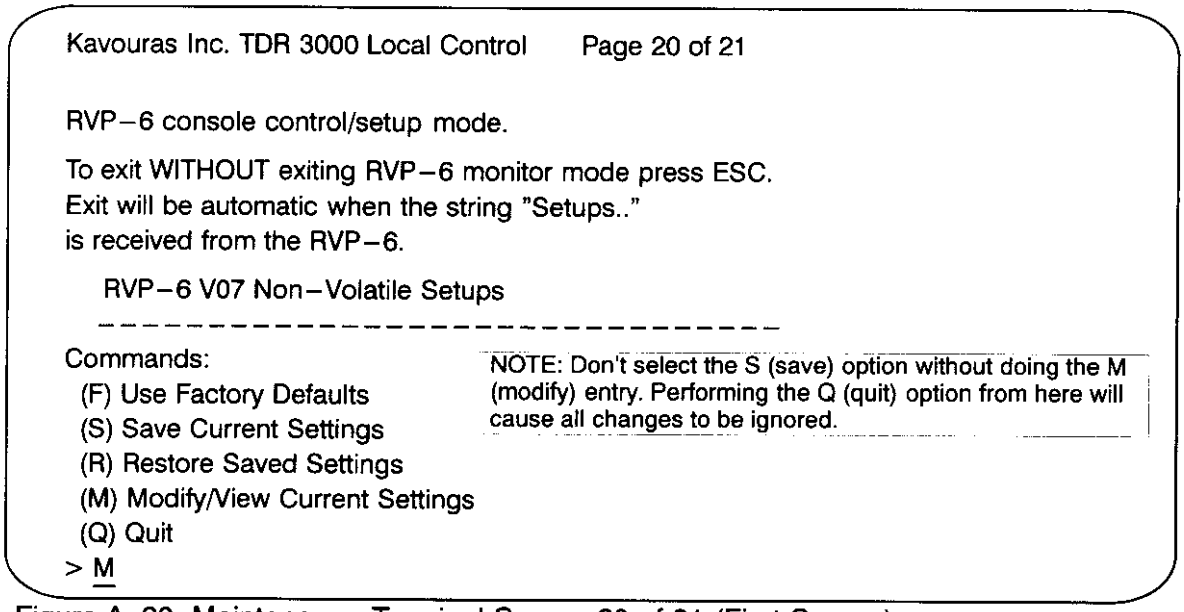

Figure A-20. Maintenance Terminal Screen 20 of 21 (First Screen).

```
Power-Up PRF: 500.00 Hz
Power-Up Pulse Width: 0
PreTrigger active on rising edge: YES
Delay from PreTrigger to range zero: 30.00 usec
STC delay to range zero: 2.00 usec
AGC anticipation of LOG Receiver: 0.00 usec
Trig 0: Start: -5.00  Width:  1.00  High:YES
Trig 1: Start: -4.00  Width:  1.00  High:YES
Trig 2: Start: -3.00  Width:  1.00  High:YES
Trig 3: Start: -2.00  Width:  1.00  High:YES
Trig 4: Start: -1.00  Width:  1.00  High:YES
Trig 5: Start:  0.00  Width:  1.00  High:YES
Fast polarization switching: NO
Switch point relative to range zero: 0.00 usec
Max PRF for Pulse Width 0: 2000.00 Hz.  Bits:1110
Max PRF for Pulse Width 1: 1000.00 Hz.  Bits:1101
Max PRF for Pulse Width 2:  800.00 Hz.  Bits:1011
Max PRF for Pulse Width 3:  500.00 Hz.  Bits:0111
PWINFO command enabled: YES
Default STC ranges  Min:4.00  Max:75.00
Default STC shape   Exp:3.00  Inv:NO
Acquisition clock: 14.3900 MHz
DSP clock (U34) :  40.0000 MHz
TTY secondary rate: 1200 Baud
Serial Interface rate: 9600 Baud
SCSI Bus ID: 4
Host Interface- 0:Parallel, 1:SCSI : 0
PipeLine- 0:Never, 1:User, 2:Always : 1
R2 Processing- 0:Never, 1:User, 2:Always : 1
Dynamic Angle Sync- 0:Never, 1:User, 2:Always : 1
Clutter MicroSupression- 0:Never, 1:User, 2:Always : 1
# of AUX Boards (-1:Dynamic): -1
# of bits in A/D converters: 12
RVP-5 Emulation: NO

> Q
Exiting Setups..
```

NOTE: This screen will only appear if the M entry is selected on the first screen.

These entries may vary from your system. For entry descriptions, refer to the RVP-6 manual.

The proper order to exit from this screen and save the entries is to select S (save), followed by Q (quit).

Figure A-21. Maintenance Terminal Screen 20 of 21 (Second Screen).

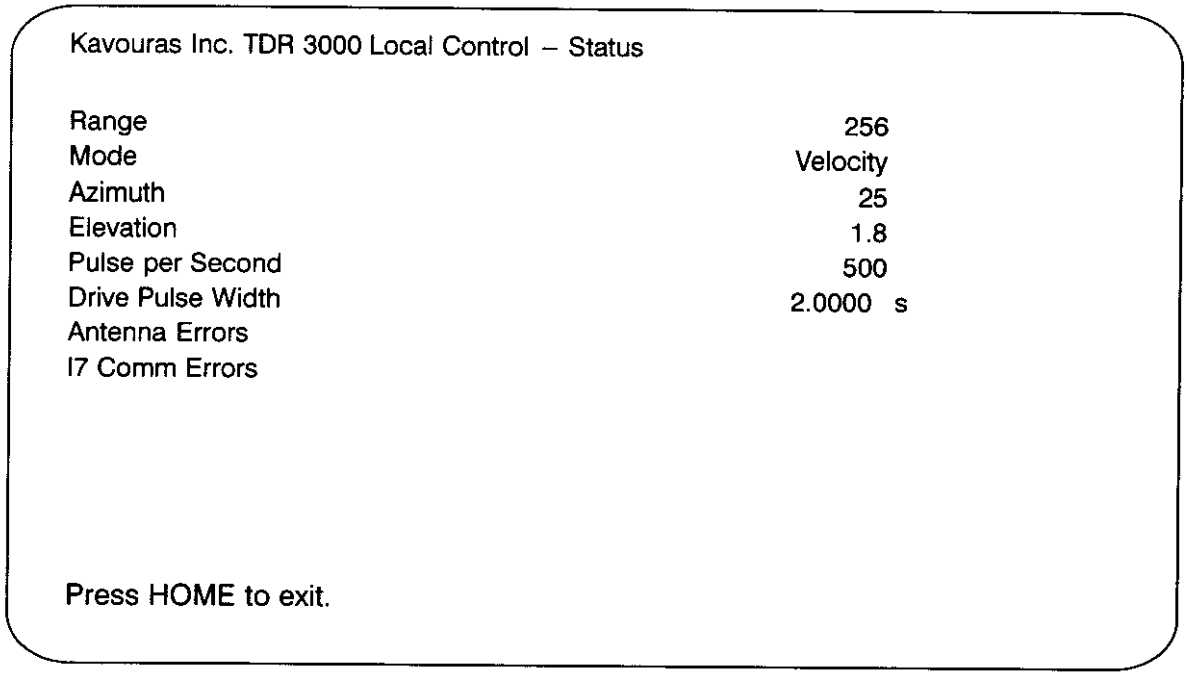

Figure A-22. Maintenance Terminal Screen 21 of 21.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

Y

Z