3.11.2.7 zz Command

Command format: zz n <enter>

The zz command results in an immediate action being taken by the radar system or the display of the current operational parameters. When using the zz commands, it may be necessary to enter additional parameters with some commands. The allowable zz command n values and additional parameter entries (if necessary) are shown in Table XVI.

3.11.2.8 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.

3.11.2.9 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.

3.11.2.10 DL Command

Command format: DL <enter>

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

3.11.2.11 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)

Table XV. ANT Command Bit Position Descriptions .

Hex Digit	Bit Position	Function	Description
1	1	Display antenna position data	Display the antenna position data for the type of operation selected (azimuth, elevation, both)
	2	Display antenna temperature data	Display the current antenna temperature (in Fahrenheit unless hex digit 3, bit 8 is selected).
	4	Display antenna status byte	Display the binary contents of the status byte received from the antenna.
	8	Display antenna fault byte	Display the contents of the fault status byte received from the antenna.
2	1	Display antenna index byte	Display a count of the number of antenna status messages received over a given period. This number should remain consistent unless there are communication problems between the antenna and TAC.
	2	Scroll the display	Perform a carriage return/line feed on the display each time a command is sent to the antenna.
	4	Enable display of azimuth information	Enables the output of azimuth information. If neither this nor the elevation enable are selected, the command will not function.
	8	Enable display of elevation information	Enables the output of elevation information. If neither this nor the azimuth enable are selected, the command will not function.
3	4, 2, 1	These bits are interpreted as a unit.	Valid entries are (in position 4, 2, 1 order): 100 = display position data in raw form 010 = display position data in gray scale 001 = display position data in degrees 000 = display position data in binary *All combinations not shown will result in a binary output.*
	8	Display temperature in Celsius	Display all temperature information in Celsius.
4	1	Display antenna velocity	Display the numeric value of the velocity of the antenna in the type of operation selected (azimuth, elevation, both)
	2	Display antenna commands	This will display antenna commands being sent by the TAC.
Note: Hex Digit 4, bit positions 4 & 8 are unused and will be ignored if entered.			

Table XVI. zz Command Entry Values .

n Value	Definition
blank	Display a list of the allowable zz n values.
0	Azimuth acceleration test
1	Display transmitter status
2	Display transmitter temperature
3	Place transmitter in operational Mode 0
4	Place transmitter in operational Mode 1
5	Place transmitter in operational Mode 2
6	Display transmitter data
7	unused
8	Display RVP-6 noise sample
9	unused
10 n1	Enter the value of n1 as the elevation pause counter value
11	Display RVP-6 current operating parameters
12 n1	Enter the value of n1 as the azimuth pause counter value
13	Halt RVP-6 processing
14	unused
15	unused
16	unused
17	Enable Windows control
18	Save antenna data to file
19	unused
20	unused
21	Display a hexadecimal dump of the last 368 bytes received from the RVP-6 (full screen)
22	Display RVP-6 current operating parameters

3.11.2.12 DTS Command

Command format: DTS <enter>

The DTS command will display the current tasks.

3.11.2.13 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.

3.11.2.14 LOG Command

Command format: LOG <enter>

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

3.11.2.15 EM Command

Command format: EM addr <enter>

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

3.11.2.16 ERA Command

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

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

3.11.2.17 FLAG Command

Command format: FLAG [value] <enter>

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

3.11.2.18 H Command

Command format: H <enter>

The H command displays the information shown in Figure 20.

3.11.2.19 HEAP Command

Command format: HEAP <enter>

3.11.2.20 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.

3.11.2.21 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.

3.11.2.22 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.

3.11.2.23 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.

3.11.2.24 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.

3.11.2.25 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.

3.11.2.26 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).

3.11.2.27 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).

3.11.2.28 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).

3.11.2.29 SFRS Command

Command format: SFRS <enter>

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

3.11.2.30 STATUS Command

Command format: STATUS <enter>

The STATUS command displays the current status of the radar antenna.

3.11.2.31 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.

3.12 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)
- starting and stopping acceleration rates
- radiation power level
- the scan type
- any desired diagnostic routines to be run

The software running in the operator's console also monitors the reported elevation of the radar dish. If the reported elevation is lower than 10° below the horizon, the operator's console will not issue a command to radiate.

3.13 Communications Protocol

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

Table XVII. Communication Types.

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

3.13.1 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 22)

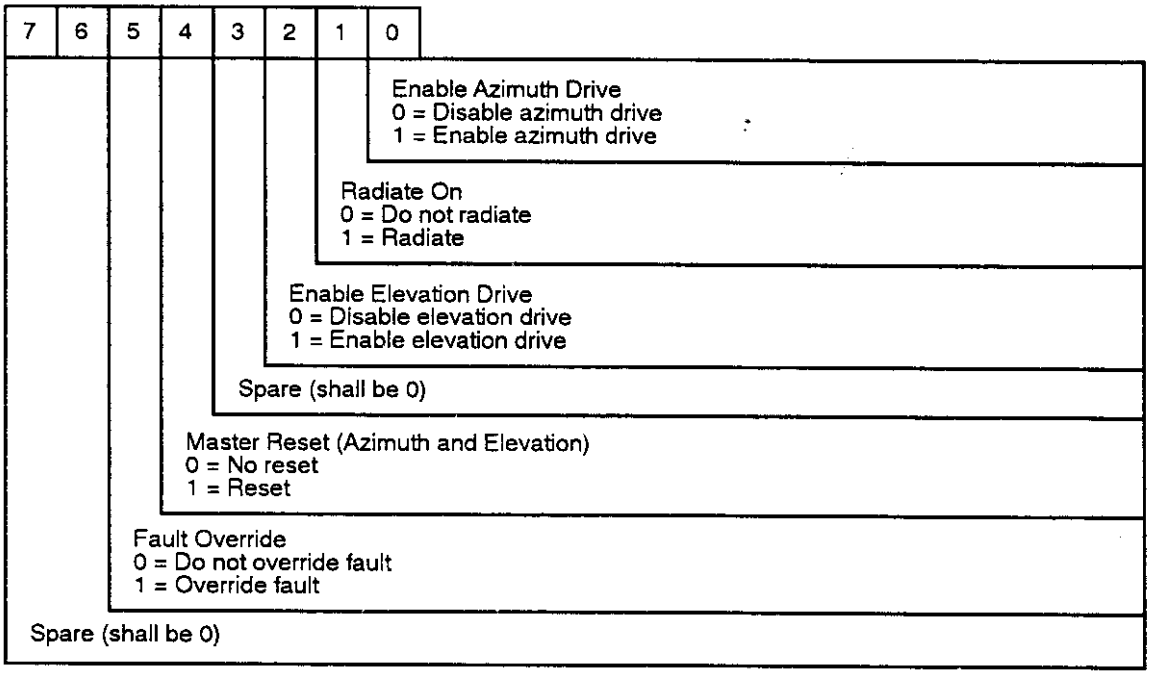

Figure 22. TAC to Antenna Command Word.

3.13.2 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 23
Word 3: Position (lower 6 bits) see Figure 24
Word 4: Position (upper 6 bits) see Figure 24
Word 5: Temperature see Figure 25
Word 6: Time Stamp see Figure 26
Word 7: Faults see Figure 27

Word 8: Azimuth Start of Command (all 1s)
Word 9: Status see Figure 23
Word 10: Position (lower 6 bits) see Figure 24
Word 11: Position (upper 6 bits) see Figure 24
Word 12: Temperature see Figure 25
Word 13: Time Stamp see Figure 26
Word 14: Faults see Figure 27

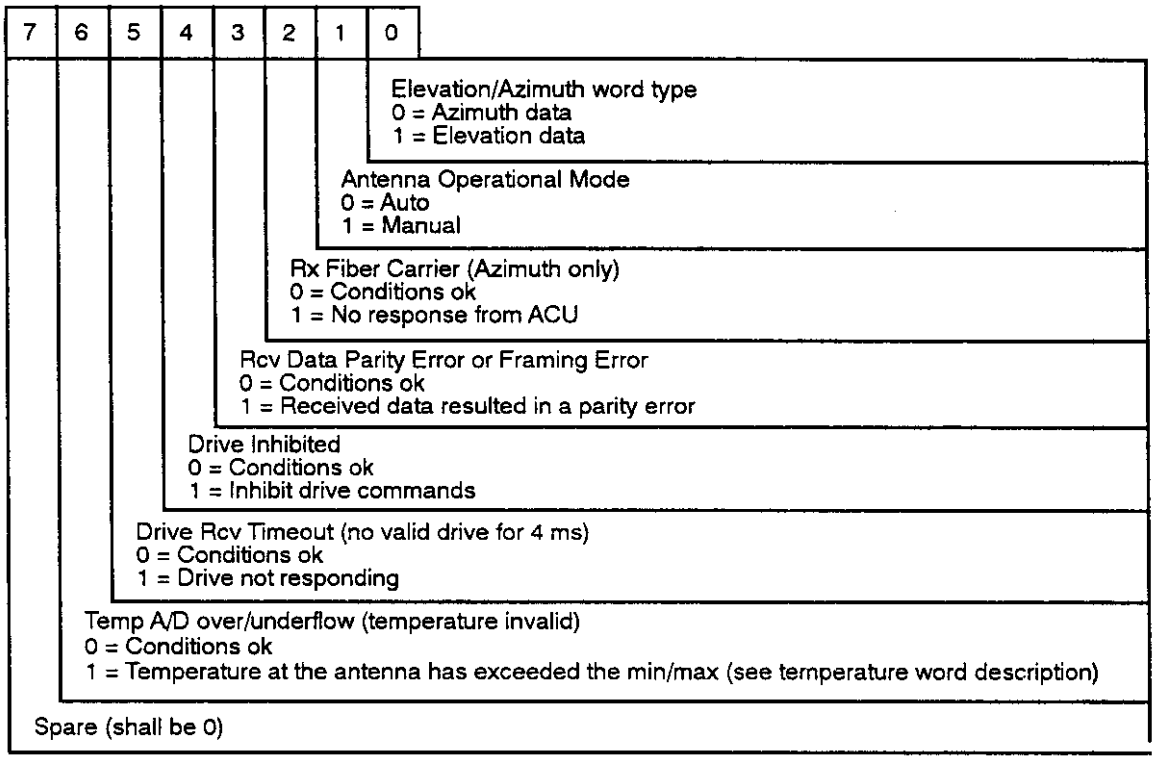

Figure 23. Elevation & Azimuth Status Words.

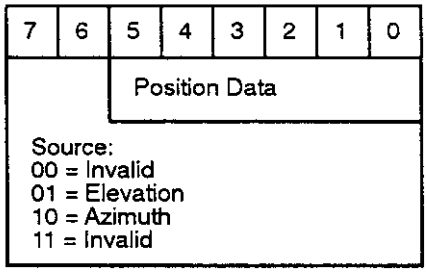

Figure 24. Elevation & Azimuth Position Word (Words 3 & 4 or 10 & 11).

7	6	5	4	3	2	1	0
64	32	16	8	4	2	1	0.5

Temperature is calculated by adding the numeric value of each bit value (as shown above) and adding that value to the base temperature of -25 degrees C.

NOTE: If only bit 6 were set to a 1, the temperature indicated would be 7 degrees C.

Figure 25. Elevation & Azimuth Temperature Word (Word 5 or 12).

7	6	5	4	3	2	1	0

Binary counter (incremented by one every 2 ms)

Figure 26. Elevation & Azimuth Time Stamp Word (Word 6 or 13).

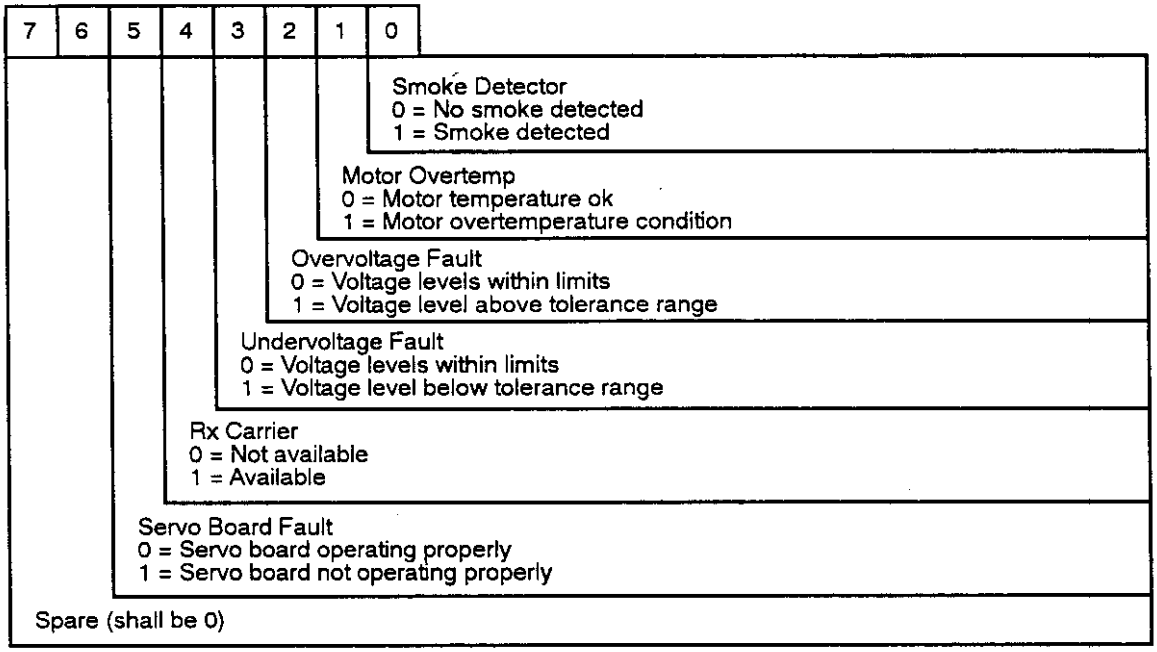

Figure 27. Elevation & Azimuth Fault Word (Word 7 or 14).

3.13.3 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 (0x30 for mode 0, 0x31 for mode 1, 0x32 for mode 2)
2. Maximum allowable transient fault strikes byte

3. Current strike count byte
4. Current fault conditions (five bytes). Refer to Table XVIII for meanings.

Table XVIII. Transmitter Request Status Words 4-8.

Word	Bit Meanings (1= fault exists, 0= no fault)							
	7	6	5	4	3	2	1	0
4	Spare (shall be 0)	Spare (shall be 0)	Helix Current Fault	Leakage Current Fault	Tail-Biter Voltage Fault	Current Timing Fault	Cathode Current Fault	Cathode Voltage Fault
5	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
6	-15 VDC Power Supply Fault	Tail-Biter Reset Current Fault	+15 VDC Power Supply Fault	Spare (shall be 0)	Switch Driver Voltage Fault	+5 VDC Power Supply Fault	Spare (shall be 0)	Switch Reset Current Fault
7	Door Interlock Fault	Flow Switch Fault	Fan Interlock Fault	Pump Interlock Fault	Catastrophic Fault Indicator	Elevation Radiate Inhibit	Antenna Comm Fault	TCU Comm Fault
8	TWT Temperature Fault (ADC 7)	Analog Fault (ADC 6)	Analog Fault (ADC 5)	Hot Box Temp Fault (ADC 4)	Temperature Fault (ADC 3)	Temperature Fault (ADC 2)	Temperature Fault (ADC 1)	Temperature Fault (ADC 0)

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.

- The operating temperatures (four bytes)
- The modulator temperature byte
- The A/D value (two bytes)
- The TWT temperature

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

The transmitter responds by entering the standby mode. In the standby 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 mode. In the warm-up 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.

The transmitter responds by entering the transmit mode. In the transmit mode, power is applied for all transmitter functions.

f. The TAC sends a Reset command (0xFF) is sent to transmitter.

The transmitter responds by ceasing any current operations and returning to the conditions defined as the reset state.

3.13.4 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.

3.13.5 TAC to Operator Console

The TAC sends a 1600 bit command string to the Operator console. The contents of the command string are as shown in Figure 28.

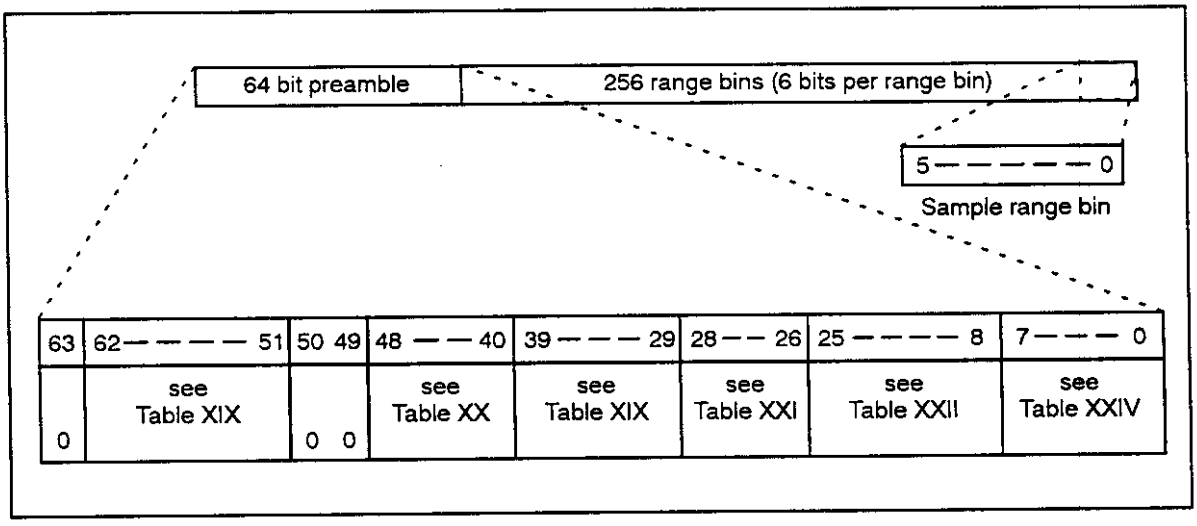

Figure 28. TAC to Operator Console Command String.

Table XIX. Azimuth and Elevation Angles from the TAC to the Operator Console.

Azimuth	
Bit	**Value**
62	180°
61	90°
60	45°
59	22.5°
58	11.25°
57	5.625°
56	2.8125°
55	1.40625°
54	0.703125°
53	0.3515625°
52	0.17578125°
51	0.087890625°

Elevation	
Bit	**Value**
39	90°
38	45°
37	22.5°
36	11.25°
35	5.625°
34	2.8125°
33	1.40625°
32	0.703125°
31	0.3515625°
30	0.17578125°
29	0.087890625°

Table XX. Radar Operational Range Values.

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

Table XXI. TAC Mode Selection.

Bit			Mode
28	27	26	
0	0	0	Standby
0	0	1	Corrected Reflectivity
0	1	0	Uncorrected Reflectivity
0	1	1	Test
1	0	0	Velocity (no unfolding)
1	0	1	Velocity (2X unfolding)
1	1	0	Velocity (3X unfolding)
1	1	1	Spectral Width

Table XXII. Radar System Status.

Bit	Meaning
25	RVP-6 communication failure
24	Antenna azimuth communication failure
23	Antenna elevation communication failure
22	TCU communication failure
21	RCU communication failure
20 - 9	Transmitter and antenna status bits (see Table XXIII)
8	Transmitter/antenna (see Table XXIII) 0 = transmitter 1= antenna

Table XXIII. Transmitter and Antenna Status Bits 20–8.

Bit													Meaning
20	19	18	17	16	15	14	13	12	11	10	9	8	
0	0	0	0	X	X	X	X	X	X	X	X	0	Tx status word 1
0	0	0	1	X	X	X	X	X	X	X	X	0	Tx status word 2
0	0	1	0	X	X	X	X	X	X	X	X	0	Tx status word 3
0	0	1	1	X	X	X	X	X	X	X	X	0	Tx status word 4
0	1	0	0	X	X	X	X	X	X	X	X	0	Tx status word 5
0	1	0	1	X	X	X	X	X	X	X	X	0	Tx status word 6
0	1	1	0	X	X	X	X	X	X	X	X	0	Tx status word 7
0	1	1	1	X	X	X	X	X	X	X	X	0	Tx status word 8
1	0	0	0	X	X	X	X	X	X	X	X	0	Tx temperature word 1
1	0	0	1	X	X	X	X	X	X	X	X	0	Tx temperature word 2
1	0	1	0	X	X	X	X	X	X	X	X	0	Tx temperature word 3
1	0	1	1	X	X	X	X	X	X	X	X	0	Tx temperature word 4
1	1	0	0	X	X	X	X	X	X	X	X	0	Tx temperature word 5
1	1	0	1	X	X	X	X	X	X	X	X	0	Tx temperature word 6
1	1	1	0	X	X	X	X	X	X	X	X	0	Tx temperature word 7
1	1	1	1	X	X	X	X	X	X	X	X	0	Tx temperature word 8
0	0	0	0	X	X	X	X	X	X	X	X	1	Azimuth fault word
0	0	0	1	X	X	X	X	X	X	X	X	1	Azimuth status word
0	0	1	0	X	X	X	X	X	X	X	X	1	Azimuth temperature word
0	1	0	0	X	X	X	X	X	X	X	X	1	Elevation fault word
0	1	0	1	X	X	X	X	X	X	X	X	1	Elevation status word
0	1	1	0	X	X	X	X	X	X	X	X	1	Elevation temperature word

Table XXIV. TAC to Operator Console ACK/NAK.

Bit	Value
7	ACK/NAK 0 = NAK 1 = ACK
6 - 5	NAK type: 00 = Checksum error 01 = Data error 10 = Duty cycle invalid 11 = Receive time-out
4 - 0	Block identifier (same value as the receiver block ID)

3.13.6 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 29)

  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)

  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 29) 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 XXV. 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 XXV, 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 XXV for valid entries)
- Word 5: Data word 1

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

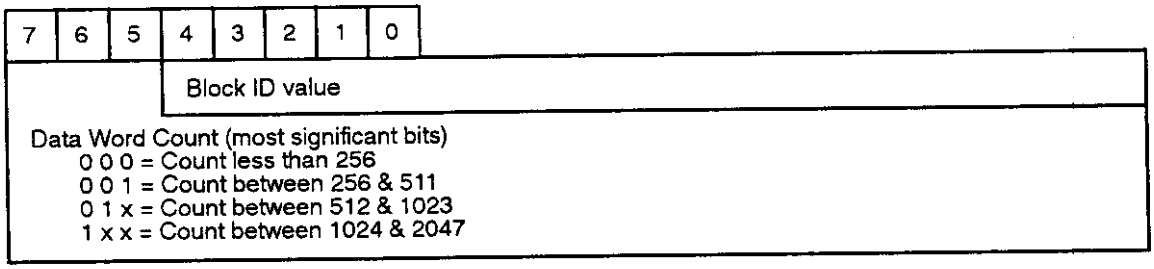

Figure 29. Operator Console to TAC Command (Word 2).

Table XXV. Command Type Number Identifier Values.

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
3	1	Mode	See Figure 30 for mode word bit meanings
9	2	Azimuth	See Table XXVI for data word descriptions
9	3	Elevation	See Table XXVII for data word descriptions
4	4	Range	See Table XX 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
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

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

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
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.
3	20	Three-lag Algo-rithm	Numeric value of 0x00 (two-lag) or 0x01 (three-lag). Either two- or three-lag algorithm will be se-lected.

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

Data Word Count (decimal)	Command		
	Type No.	Function	Notes
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.

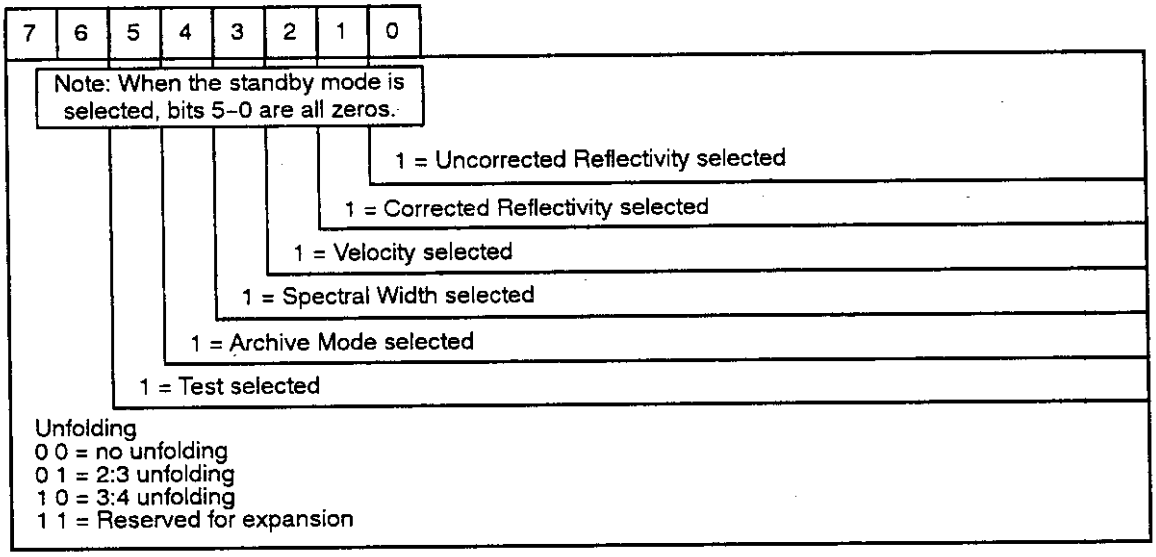

Figure 30. Mode Command Type Identifier Definition.

Table XXVI. 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 XXVII. 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.

3.13.7 Dehydrator to TAC

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

Section 4: Preventive Maintenance

Table XXVIII. Preventive Maintenance Schedule .

Period	Inspection	Reference Paragraph
Weekly	Clean ACU fan filters	4.1.4.1
	Clean 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 Triton i^7 exhaust fan operation	4.10
	Check rack front and heat exchanger filters	4.7.1
	Check heat exchanger functions	4.7.2
	Check rack exhaust fan operation	4.7.3
	Operate antenna and monitor for unusual noise	4.1.2.2, 4.1.3.2
	Verify operation of aircraft warning lights on radome	4.12
Monthly	Check elevation drive and encoder belts	4.1.3.1
	Check for azimuth gear box leaks	4.1.2.2
	Check for cooling system problems	4.7
	Verify operation of and voltage levels for:	
	TAC	4.6
	Receiver	4.5
	Transmitter	4.4
	Pedestal	4.1.4.2
	Verify dehydrator operation	4.3
Every two months	Check azimuth drive and encoder belts	4.1.2.1
	Check for elevation gearbox leaks	4.1.3.2
	Check dish support arm bearings	4.1.1.2
	Grease yoke spindle bearing	4.1.1.1
	Grease azimuth drive belt idler wheel	4.1.2.1
	Check oil level of the azimuth primary and secondary gearboxes	4.1.2.2
Every six months	Oil cooling pump bearings	4.7.4

Table XXVIII. Preventive Maintenance Schedule (continued).

Period	Inspection	Reference Paragraph
Annually	Check for corrosion on wave guides	4.2
	Verify conditions of earth ground cables	4.12
	Verify generator cleaning of housing	4.9
Periodically	Clean cabinets and perform unspecified maintenance.	4.8, 4.11
	Inspect and tighten mounting hardware at time of installation and during maintenance operations.	—
	Each time the modulator cover is removed, inspect the oil for signs of discoloration and presence of contaminants.	—

4.1 Antenna

4.1.1 Yoke Assembly

4.1.1.1 Yoke Spindle Bearing

The yoke spindle bearing requires inspection and grease to be added every two months. 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)

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

4.1.1.2.2 Elevation Control Arm Bearings

The elevation control arm bearings require inspection and grease to be added every two months. 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

Perform the following steps every two months:

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 belt tension idler wheel for a build-up of wax from the azimuth drive belt. If a build-up is present, clean using a plastic scraper to scrape the surface of the belt tension idler wheel.

c. 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.

d. 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.

e. Grease the drive belt tension idler wheel by performing the *Azimuth Drive Belt Idler Wheel Bearing Lubrication* procedure in Section 5.

4.1.2.2 Azimuth Drive Gearbox

a. Inspect for leakage of oil every time the bearings are greased. If there is leakage, contact your Kavouras representative.

b. Verify that the proper oil level in the gearbox is maintained by performing the *Azimuth Primary Gearbox Oil Level* and *Azimuth Secondary Gearbox Oil Level* procedures in Section 5.

c. 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.

d. Listen for any unusual noises when manually operating the antenna.

4.1.3 Elevation Control

4.1.3.1 Elevation Drive Belt

Perform the following steps every two months:

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 31.

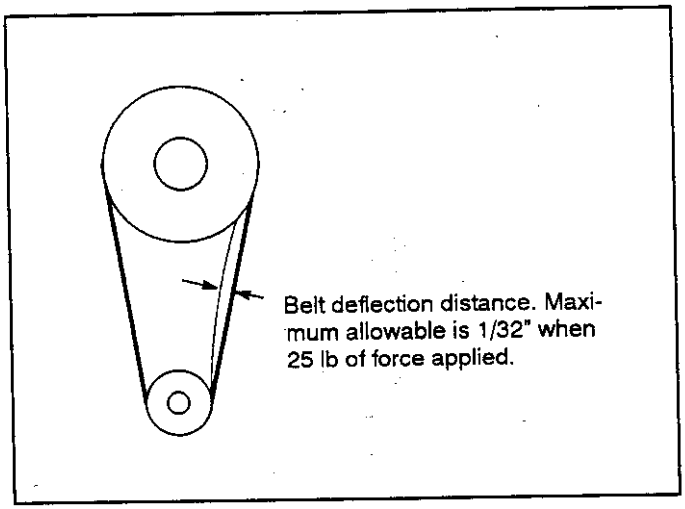

Figure 31. Elevation Drive Belt Deflection.

4.1.3.2 Elevation Drive Gearbox

a. Inspect for leakage of grease. If there is leakage, contact your Kavouras representative.

b. Listen for any unusual noises when manually operating the antenna.

4.1.3.3 Elevation Control Unit

If installed, check the fan filters weekly 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

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

a. Output level for the power supply should be between 250 and 300 volts DC.

b. The fan filter should be checked and cleaned weekly.

4.2 Wave Guides

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

The dehydrator readout is on the face of the unit so the front rack door will have to be opened to observe the LED readout. The readout will show the psig in the wave guide and any warnings or alarms. Check the air pump duty cycle every month for excessive running by pressing the PARAMETER SELECT button on the dehydrator. Go to parameter D, that is for monitoring the duty cycle of the air pump. Anything over a 50 % duty cycle is excessive and the system must be checked. Press the FAULT CODE SWITCH and note if the display is "00" or "--". These two screens indicate no faults are detected by the compressor fault logic. Refer to the factory supplied manual Model ADH-2COM.

4.4 Transmitter

a. 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 notify you of the situation.

b. Verify proper operation of the two exhaust fans weekly.

4.5 Receiver

Verify proper operation of the two exhaust fans weekly.

4.6 TAC

a. Verify proper operation of the two exhaust fans weekly.

b. Verify the status of TAC by checking the CURRENT STATUS screen.

c. 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

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 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 Kavouras part number 11040945.

4.7.2 Heat Exchanger

a. 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.

b. 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.

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

d. Check for leaks at all hose connections.

4.7.3 Fans

Verify that the six exhaust fans mounted at the top of the rear rack door are operating properly.

4.7.4 Cooling Pump

a. Oil the pump bearings by performing the *Cooling Pump Bearing Lubrication* procedure in Section 5.

b. Listen for any unusual noises from the cooling pump.

4.8 Maintenance Terminal

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

4.9 Motor Generator

Maintenance requirements are to keep the unit free of dirt and other accumulations. The windings should be cleaned with compressed air once a year. Please refer to the "NOBRUSH" Frequency Converter manual for cleaning instructions.

4.10 Triton i^7

Verify proper operation of the exhaust fans weekly.

4.11 Display Screens

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

4.12 Structure Maintenance

a. Create a condition that will cause the aircraft warning lights mounted on the radome turn on. Verify proper operation.

b. 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 XXIX. Standard Tools List .

Item	Nomenclature	Description	Mfr/Part Number
1	Bottle, spray	Filter oil	—
2	Covers, protective, wave guide	Wave guide opening covers	Kav
3	Desoldering bulb	Plastic tip, removable	—
4	Flashlight	—	—
5	Gauge set, feeler	—	—
6	Glasses, safety	—	—
7	Gun, grease, with nozzle extension	—	—
8	Hammer, dead blow	16 oz. ball peen	—
9	Mirror, inspection	—	—
10	Nut driver set, hex	3/16", 1/4", 5/16", 11/32", 3/8", 7/16", 1/2"	
11	Oiler, flexible nozzle	SAE 20 oil	—
12	Pliers, miniature, cutters	—	—
13	Pliers, snap ring	—	—
14	Pliers set	4" & 6" diagonal cutters, 4" & 6" needle nose, 6" & 8" slip joint, 10" arc joint, 7" straight jaw, 7" curved jaw locking	
15	Punch set, pin	1/16", 3/32", 1/8", 5/32", 3/16", 1/4"	—
16	Ratchet set	Phillips-tip head	—
17	Ratchet set	1/2" drive	—
18	Screwdriver set, alignment non-metallic	—	—

Table XXIX. Standard Tools List (continued).

Item	Nomenclature	Description	Mfr/Part Number
19	Screwdriver set, electronic thin blade	1/8"x3", 1/8"x6", 1/8"x8", 1/8" blade, 1/8"x4", 3/16"x4". 1/4"x4", 1/4"x6", 5/16"x8", 3/8"x12"	—
20	Screwdriver set, miniature	.055", .070", 1" flat-tip and phillips tip	—
21	Screwdriver set, flat-tip	1/8"x4", 3/16"x4", 1/4"x4", 1/4"x6", 5/16"x8", 3/8"x12"	—
22	Screwdriver set, phillips-tip	#1x3", #2x4", #2x8", #3x6"	—
23	Socket, adapter	1/2" to 3/4"	Snap-On/GLA 12A or equivalent
24	Socket set, 3/8" drive	—	—
25	Socket set, 1/2" drive	—	—
26	Socket set, 1/4" drive (standard)	—	—
27	Socket set, combination, metric	15mm, 17mm, 19mm	—
28	Spacer, 4mm	—	—
29	Thermometer, (°F)	—	—
30	Wrench, crescent small	—	—
31	Wrench, torque	5-75 ft lb	—
32	Wrench set, allen	—	—
33	Wrench set, adjustable	4", 8", 12", 18" length	—
34	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"	—
35	Wrench set, combination metric	6 through 27 mm (22 pieces, 12 pt. sockets)	—
36	Wrench set, hex-key long	.050", 1/16", 3/32", 1/8", 5/32", 3/16", 1/4", 5/16", 3/8"	—
37	Wrench set, hex-key, long, metric	1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12 mm	—

Table XXIX. Standard Tools List (continued).

Item	Nomenclature	Description	Mfr/Part Number
38	Wrench set, socket 1/4" drive	3/16", 7/32", 1/4", 9/32", 5/16", 11/32", 3/8", 7/16", 1/2", 12 pt. sockets; 3" & 6" extension bars; quick release ratchet	—
39	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	—
40	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 XXX. 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	—	—
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 XXXI. Consumables/Expendables List.

Item	Nomenclature	Description	Mfr/Part Number
1	Battery	1.5V, D-size	—
2	Brush, paint	1/4" with soft bristles	—
3	Brush, acid	1/4" with stiff bristles	—
4	Bucket, plastic	1 gallon	—
5	Caulk (radome)	white	—
6	Circuit breaker	TAC, Receiver	Kav 91001515
7	Circuit breaker	Transmitter	Kav 9100xxxx
8	Coolant	Automotive coolant	—
9	Filter, air, re-usable, metal mesh	ACU/ECU fans	Kav 10530305
10	Filter, air, re-usable, metal mesh	Heat exchanger	Kav 11040945
11	Filter, air, re-usable, metal mesh	Rack front door	Kav 11040920
12	Fuses	Fan & Pump controls	MDL 7/250V
13	Gaskets, wave guide	72C 1/2 Gasket	Kav 91001035
14	Gloves, rubber (4 pair)	—	—
15	Grease, bearing	Dow Corning Molykote 44	—
16	Markers, lead	—	—
17	Oil, dialectric	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	—
18	Oil, gear box	Mobil Oil Corp. SHC 629 (or equivalent)	—
19	Oil, light (filter coating)	mineral or equivalent	—
20	Pen, ball point	—	—
21	Printer, color	—	—
22	Signs, warning	DANGER HIGH VOLTAGE	—
23	Solder, rosin core	60/40	—
24	Swabs, lint-free	6"	—

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Table XXXI. Consumables/Expendables List.

Item	Nomenclature	Description	Mfr/Part Number
25	Tags, safety	Equipment off — DO NOT ENERGIZE	—
26	Tape, adhesive	Masking tape	—
27	Tubing, heat shrink	Assorted sizes	—
28	Towels, paper	—	—
29	Wire	Stranded, coaxial, RF	—
30	Wraps, tie	Assorted sizes	—

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5.2 Radome

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

WARNING

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

Place the ACU AUTO/MANUAL switch in the MANUAL position while 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. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

c. 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.

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

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

f. Remove the encoder from the bracket.

g. 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.

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. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

h. Perform the *Elevation Offset Adjustment* procedure.

5.3.1.3 Elevation Encoder Drive Belt

- **Removal:**

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

b. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

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

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

WARNING
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.

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

NOTE:

Two people will be required for the next step.

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

h. Remove the bolts from the outer bearing.

i. 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.

NOTE:

Two people will be required for the next step.

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

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

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

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

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

g. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

h. Perform the *Elevation Offset Adjustment* procedure.

5.3.1.4 Elevation Drive Belt

- **Removal:**

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

b. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

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

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

f. 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 32.

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

d. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

e. Perform the *Elevation Offset Adjustment* procedure.

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.

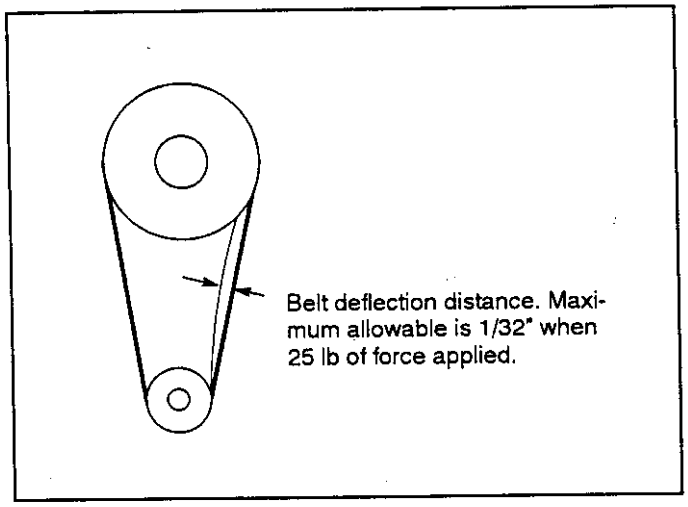

Figure 32. Elevation Drive Belt Deflection.

b. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

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

CAUTION

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.

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

f. Remove the elevation drive belt.

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

h. Remove the cap screws holding the motor.

i. Loosen the setscrew on the drive gear on the motor shaft.

j. Remove the drive gear and key from the motor shaft and retain for use on the new motor.

- **Installation:**

a. Install the drive gear and key removed from the old motor on the new motor and tighten the setscrew on the drive gear.

b. Align the motor drive gear with the mating part in the elevation drive gear assembly.

c. 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.

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

e. Replace the drive belt.

f. 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.

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

h. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

i. Perform the *Elevation Offset Adjustment* procedure.

5.3.1.6 Elevation Upper Gear

- **Removal:**

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

b. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

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

CAUTION
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.

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

f. Remove the elevation drive belt.

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

h. 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.

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

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

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

l. Remove the key from the key way of the larger gear.

m. Remove the large gear.

n. 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 key way.

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 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

l. Perform the *Elevation Offset Adjustment* procedure.

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 AUTO/MANUAL switch to AUTO.

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. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker 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.

d. Disassemble the wave guide flange at the bottom of the 90° bend, saving the rubber gaskets and shim for re-use. Refer to Figure 33 for locations of components.

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

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

g. 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.

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

i. 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

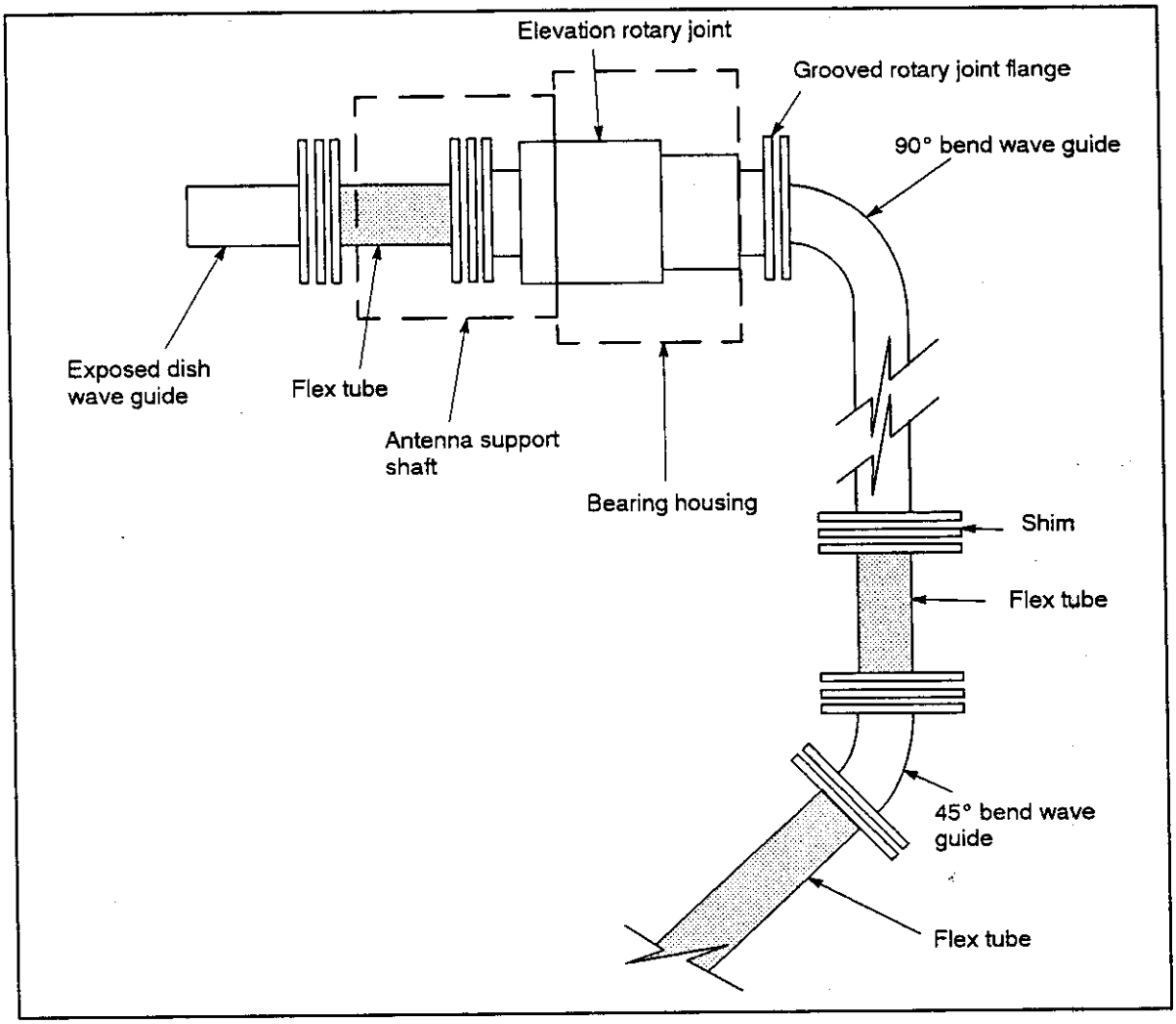

Figure 33. Elevation Wave Guide Rotary Joint.

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 25-40 ft 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.

d. Using the four adjustment screws in the bearing housing, align the rotary joint.

e. Tighten the flange bolts between the flexible wave guide and the antenna dish wave guide to 25-40 ft 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.

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 25-40 ft lb.

g. At the 300 VDC power supply:
   1. Operate the circuit breaker to the ON (up) position.
   2. Operate the ON/OFF switch to ON.

h. Operate the ACU AUTO/MANUAL switch to AUTO.

i. 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. Operate the ACU AUTO/MANUAL switch to MANUAL.

c. On the 300 VDC power supply:
   1. Operate the ON/OFF switch to OFF.
   2. Operate the circuit breaker 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.

d. Disassemble the wave guide flange at the bottom of the 90° bend, saving the rubber gaskets and shim for re-use. Refer to Figure 33 for locations of components.

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

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

g. 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.

h. 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.

i. Replace the defective segments of wave guide, tightening bolts to 25-40 ft 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 25-40 ft 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 25-40 ft 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 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

g. Operate the ACU AUTO/MANUAL switch to AUTO.

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 Servo Board

- **Removal:**

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

c. At the ECU, open the door for the box with 300 VDC indicator (right side box).

d. Remove the circuit board edge connectors from the servo board.

e. Verify that the positions of the jumpers on the new servo board match those of the servo board being replaced.

f. Remove the nuts holding the servo board mounting bracket to the back of the ECU and remove the servo board.

g. Verify that the replacement servo board has two stand-off lugs attached to the two screws on the edge of the servo board opposite to the mounting bracket.

h. If necessary, remove the mounting bracket from the old servo board and attach to the replacement servo board.

- **Installation:**

a. Mount the replacement servo board to the ECU and tighten the nuts to 15 ft lb.

b. Attach the circuit board edge connectors to the servo board.

c. Close the door to the ECU.

d. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

e. Operate the ACU AUTO/MANUAL switch to AUTO.

5.3.1.10.2 Control Board

- **Removal:**

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. On the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

c. At the ECU, open the door for the left side box.

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

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

f. Remove the nuts holding the control board to the back of the ECU and remove the control board.

- **Installation:**

a. Verify that the jumpers (JP1 & JP2) are in the correct positions.

b. Mount the replacement control board to the ECU and tighten the nuts to 15 ft lb.

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

d. Close the door to the ECU.

e. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.

2. Operate the ON/OFF switch to ON.

f. Operate the ACU AUTO/MANUAL switch to AUTO.

5.3.1.10.3 Fans

- **Removal:**

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. At the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

c. Disconnect the wiring to the fan.

d. Remove the fan mounting hardware.

e. Remove the fan.

- **Installation:**

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

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

c. Attach the fan wiring.

d. At the 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

e. Verify that the fan is expelling air.

f. Operate the ACU AUTO/MANUAL switch to AUTO.

5.3.2 Pedestal

WARNING
Operation of the radar system while working in this area could result in exposure to microwave energy.
Place the ACU AUTO/MANUAL switch in the MANUAL position while working in this area.

5.3.2.1 Azimuth Motor

- **Removal**

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. At the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

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

d. Remove the four cap screws holding the gearbox motor shaft access cover (see Figure 34).

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

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

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

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

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

- **Installation**

a. Install the shaft collar and align the key way with the motor shaft key way.

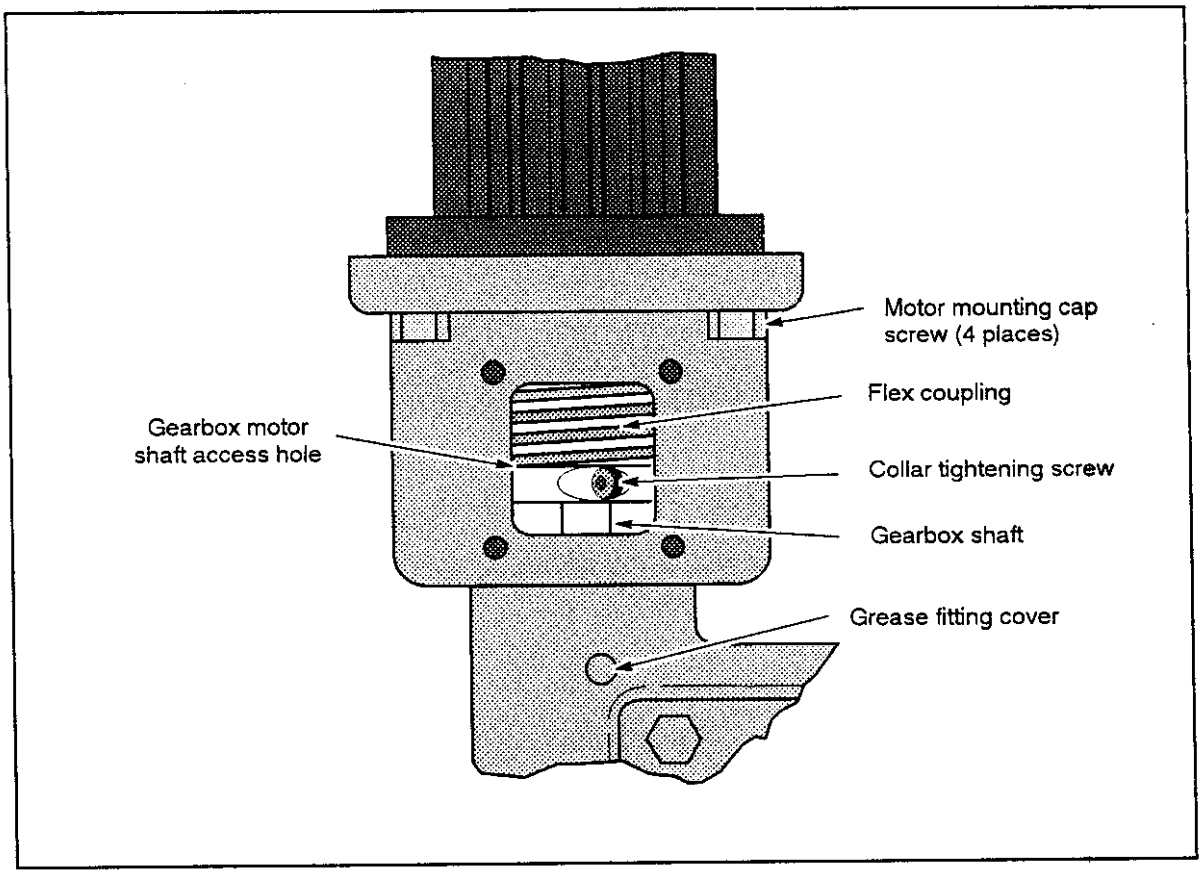

Figure 34. Azimuth Flex Coupling Access.

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

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

d. Insert the shaft key into the key way 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.

i. At the 300 VDC power supply:

   1. Operate the circuit breaker to the ON (up) position.
   2. Operate the ON/OFF switch to ON.

j. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.2 Azimuth Drive Belt Tensioner

WARNING
This unit contains moving parts.
Do not touch movable parts with power applied to the antenna assembly.

- **Release drive belt tension:**

a. Loosen the three bolts on the azimuth drive belt tension plate (see Figure 35).

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

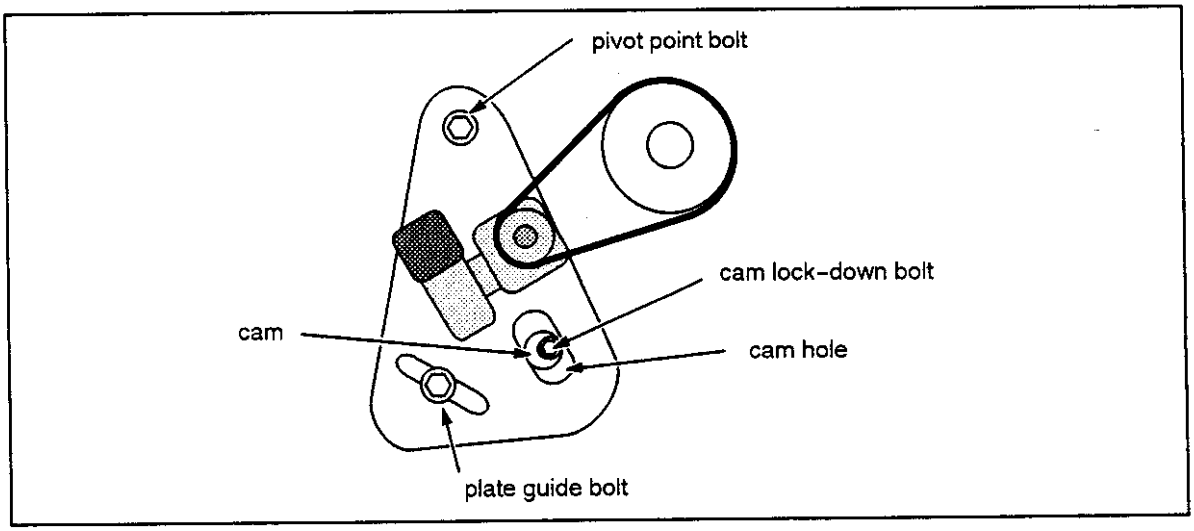

Figure 35. Azimuth Drive Belt Tension Plate.

- **Installation:**

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. Operate the ACU AUTO/MANUAL switch to AUTO.

5.3.2.3 Azimuth Drive Belt

WARNING
This unit contains moving parts.
Do not touch movable parts with power applied to the antenna assembly.

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. At the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker to the OFF (down) position.

NOTE:

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

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 300 VDC power supply:

1. Operate the circuit breaker to the ON (up) position.
2. Operate the ON/OFF switch to ON.

h. Perform the *Azimuth Offset Adjustment* procedure.

5.3.2.4 Azimuth Encoder

- **Removal:**

a. Operate the ACU AUTO/MANUAL switch to MANUAL.

b. At the 300 VDC power supply:

1. Operate the ON/OFF switch to OFF.
2. Operate the circuit breaker 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.

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 300 VDC power supply: