DSS 13 Antenna Monitor System

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A monitor system is being developed for the 26-meter antenna at DSS 13 so that unattended station operation can proceed safely. The antenna has been successfully operating unattended since July 1978. This article documents the part of the monitor system that is currently in use. A later article will be issued which will document the full monitor system.

I. Introduction

The part of the monitor system that is currently functioning at DSS 13 checks system pressures, accumulator pressures, differential pressures, wind velocity, power supplies, fluid temperatures and fluid levels. These system measurements are sent to the antenna controller from a data sampler that interrogates the transducers. The antenna controller decides and takes appropriate action. Some measurements are checked continuously and some measurements are checked as a function of antenna state.

II. Continuous Tests

A. 5-Second Tests

(1) The data sampler
If it is not functioning, the antenna is shut down and the problem is logged.

(2) The wind tower power supply
If it is not functioning, the antenna is shut down and the problem is logged.

(3) Fluid level
If it is greater than 23 cm or less than 11 cm, the antenna is shut down and the problem is logged.

(4) The 2 control room power supplies
If either is not functioning, a warning is logged.

(5) The fluid temperature
If the fluid temperature is too high, the antenna is stowed and the problem is logged.

(6) The lube oil pressure switch
If the system is not pressurized, this test is ignored. If the system is pressurized and the lube oil pressure switch is off, the system is shut down and the problem is logged.

B. 10-Second Tests

(1) Wind velocity and gusts
If the wind velocity exceeds 20 m/s or gusts exceed 25 m/s, the antenna is stowed and the problem is logged.

(2) Wind direction
Wind direction is displayed.

III. Electronics On, Pumps Off

A. Disable Monitor Circuit

If it is off, the antenna is shut down. The monitor system determines which of two conditions caused the problem: loss of the Hydro-Mech 28 v power supply or disable button, and logs the problem.

B. Accumulator Pressures

If any pressure is not within the specified range, the antenna is shut down and the problem is logged.

(1) Azimuth low speed
5.5×10^6 -- 8.3×10^6 N/m^2

(2) Azimuth high speed #1
6.9×10^6 – 9.3×10^6 N/m^2

(3) Azimuth high speed #2
6.9×10^6 – 9.3×10^6 N/m^2

(4) Elevation System #1
8.3×10^6 – 10.3×10^6 N/m^2

(5) Elevation System #2
8.3×10^6 – 10.3×10^6 N/m^2

C. Brakes

If any brake is off, the antenna is shut down and the problem is logged.

IV. Pumps On, Low Speed, No Drive

A. Accumulator Pressures

If any pressure is not within the specified range, the antenna is shut down and the problem is logged.

(1) Azimuth low speed
8.3×10^6 – 13.1×10^6 N/m^2

(2) Azimuth high speed #1
6.9×10^6 – 9.3×10^6 N/m^2

(3) Azimuth high speed #2
6.9×10^6 – 9.3×10^6 N/m^2

(4) Elevation system #1
8.3×10^6 – 21.7×10^6 N/m^2

(5) Elevation system #2
8.3×10^6 – 21.7×10^6 N/m^2

(6) Elevation low speed
12.4×10^6 – 20.0×10^6 N/m^2

B. Brakes

If any brake is off, the antenna is shut down and the problem is logged.

V. Pumps On, High Speed, No Drive

A. Accumulator Pressures

If any pressure is not within the specified range, the antenna is shut down and the problem is logged.

(1) Azimuth low speed
5.5×10^6 – 8.3×10^6 N/m^2

(2) Azimuth high speed #1
8.3×10^6 – 15.5×10^6 N/m^2

(3) Azimuth high speed #2
8.3×10^6 – 15.5×10^6 N/m^2

(4) Elevation high speed
18.6×10^6 – 21.4×10^6 N/m^2

(5) Elevation system #1
18.6×10^6 – 21.4×10^6 N/m^2

(6) Elevation system #2
18.6×10^6 – 21.4×10^6 N/m^2

B. Brakes

If any brake is off, the antenna is shut down and the problem is logged.

VI. Low Speed Drive

A. Differential Pressures

If any pressure exceeds the specified limits for longer than 20 seconds, the antenna is shut down and the problem is logged.

(1) Azimuth low speed
5.5×10^6 N/m^2

(2) Elevation low speed
3.8×10^6 N/m^2

B. Brakes

If any brake is set, the drive command voltage is set to zero, the antenna is shut down and the problem is logged.

VII. High Speed Drive

A. Differential Pressures

If any pressure exceeds the specified limits for longer than 20 seconds, the antenna is shut down and the problem is logged.

(1) Azimuth high speed
13.8×10^6 N/m^2

(2) Elevation high speed
12.8×10^6 N/m^2

B. Brakes

If any brake is set, the drive command voltage is set to zero, the antenna is shut down and the problem is logged.

VIII. Comments

The monitor system has been functioning as planned. It has been used since July 1978. It has performed properly in high winds and has correctly reported all malfunctions that it was designed to identify.