

The Channel Interference Monitoring System

Summary and Purpose of Document

To provide a report on the operation of the GOES IDCS Automatic Monitoring System.

Action Requested: None

The Channel Interference Monitoring System

Abstract

As a member of the Coordination Group for Meteorological Satellites (CGMS), NOAA is tasked with managing the GOES frequency resources for the International Data Collection Service (IDCS). To efficiently utilize these resources requires that NOAA monitor and report interfering signals on unassigned international channels so that new services can be initiated on interference free channels. In January 1996, the Wallops Command and Data Acquisition Station (WCDAS) developed the IDCS Automatic Monitoring System (IDAMS) to provide interference monitoring. Although this system provided continuous, automatic frequency monitoring and reporting, the system was limited in its capabilities and reaction time. The IDAMS provided a “proof of concept” to build on. In May 1999, the WCDAS deployed an improved system, the Channel Interference Monitoring System (CIMS).

The CIMS provides continuous, automatic testing and reporting for both GOES East and West unassigned international channels. Its capabilities have also been expanded to provide scheduled testing of all GOES DCS channels, both International and Domestic. Along with statistical reporting of Radio Frequency Interference (RFI), the CIMS proves the capability to capture, archive and analyze a Spectrum Analyzer plot of all tested signals.

Action Requested: None

The IDCS Channel Interference Monitoring System

SYSTEM OPERATION

All controls and indicators for the CIMS are via computer keyboard and monitor, respectively. The predominant mode of system operation is the Automatic Mode, which provides continuous automatic RFI monitoring and data capture without operator intervention. A secondary mode is the Manual Mode whereby specific channel testing is time scheduled by the operator.

The Automatic Mode of Operation is defined as the mode whereby the system runs automatically, testing for and documenting instances of RFI on unassigned international channels. Under Labview, the operator generates a list of unassigned international channels as well as the DCS Pilot (Domestic channel 100). The Pilot is constantly monitored and by including this channel in the testing, a quality control check of the system is provided. The computer sets the Sutron Demodulator to a GOES East DCS international channel selected from this list and successively steps the demodulator through the following sweep ranges.

1. Sweep centered on channel-center, ± 500 Hz (channel center).
2. Sweep centered 500 Hz below channel-center, ± 500 Hz (channel-low).
3. Sweep centered 500 Hz above channel-center, ± 500 Hz (channel-high).

The demodulator, in this manner, can find a signal anywhere in the channel passband with an acquisition time of 0.5 seconds. During each sweep range the computer is continuously polling the demodulator for status; Locked or Unlocked. If the status reply is Unlocked, the computer sets the next sweep range and polls the demodulator again. This “sweep and poll” continues until all 3 sweep ranges on all unassigned channels have been tested. Spending about 7 seconds per channel searching before the next channel on the list is selected for testing. Once all of the GOES East DCS channels have been tested, the computer sets the coaxial switch to the GOES West DCS front end allowing the system to continue the same search on the West spacecraft. If at any time the poll status reply shows that the demodulator is Locked, this would indicate the presence of RFI. The computer would then command the Spectrum Analyzer to go to the frequency for that channel, set up all measurement parameters and take a 601 plot point “snapshot” of the interfering signal. This snapshot is retained on the hard drive for either printing or for display at a later time. The information is also retained in a database to allow statistical trending which can be displayed in report form.

The Manual Mode of Operation enables the operator to interactively perform testing on any GOES DCS International or Domestic channel, on either GOES East or West. The operator can manually build a schedule and pre-program the system to test any channel, up to a list of 10, at a operator specified time. One minute before the next operator scheduled test, the system will complete the channel it is current on, set up the system to the scheduled channel and spacecraft, and standby for signal acquisition. If the system detects demodulator Lock, then a snapshot is

taken of the Spectrum Analyzer plot and archived to the hard disk for later analysis. After the system has finished the Manual Mode scheduled task it returns to the Automatic Mode to continue it's primary task of monitoring the international channels for interference.

SYSTEM REPORTING

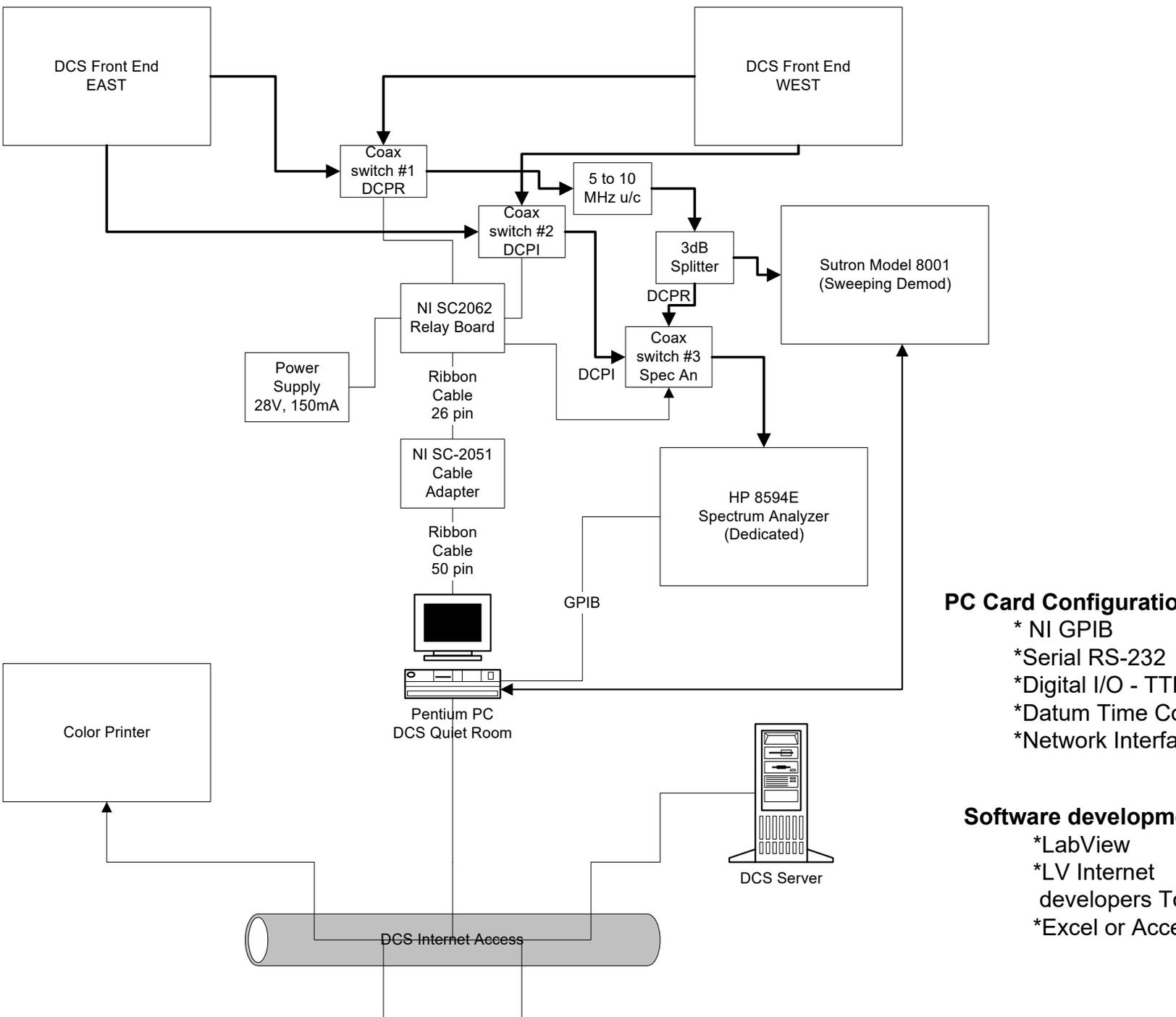
A statics log of all unassigned international channels that showed the presence of RFI is maintained in the form of an Excel spreadsheet to help in manipulating the data. A monthly report is generated (see Table 1) from this spreadsheet showing a running account of the percent time that any channel has interference when tested. For this reports purpose, the running account begins January 1 each year so that the monthly report shows statistics gathered up to that point in time each year. The report is generated in text format and is posted on the IDCS website each month at <http://dcs.noaa.gov/internat.htm>. The Spectrum Analyzer plots of channel RFI are also archived and can be printed out, along with the measurement parameters, for analysis.

CONCLUSION

With the deployment of the CIMS in May 1999, GOES IDCS is now able to provide a flexible, continuous, automated service in the monitoring of the international channels. Future enhancements to the system would concentrate on providing more in the way of exportable CIMS data including: System access through the Internet for "up to the minute reports" and RFI Spectrum Analyzer plots accessible through the Internet. Through better interference detection and monitoring, NOAA helps to ensure that new services offered through the GOES IDCS are as efficiently used as is possible.

Figure 1

CIMS CONFIGURATION



PC Card Configuration

- * NI GPIB
- * Serial RS-232
- * Digital I/O - TTL
- * Datum Time Co
- * Network Interfa

Software development

- * LabView
- * LV Internet developers T
- * Excel or Acc

Table 1

Channel #	Phase Locked	Times Tested	% Time Locked
202	3	29143	0.010294067
204	3	19790	0.015159171
206	4	19493	0.020520187
208	2	19947	0.01002657
210	1	19482	0.005132943
216	1	19938	0.005015548
218	0	19938	0 0
222	1	19932	0.005017058
238	0	19927	0 0
244	0	19922	0 0
246	0	19918	0 0
248	3	19914	0.015064779
250	2	19908	0.010046213
252	0	19902	0 0
254	0	19897	0 0
256	0	19891	0 0
258	2	19888	0.010056315
260	0	19884	0 0
264	2	19883	0.010058844
266	6866	19882	34.53374912
100	15014	15019	99.96670884