

Data Collection System

Training Seminar

RF Systems

Microcom Design, Inc.

March/April 2019





Training Agenda

- General
 - Welcome and Introductions
 - Agenda Review
- Overview
 - DCS System
 - Data Collection Platform Basics
 - DCP Certification Standards
 - Direct Readout Ground Station (DAMS-NT System)
- DAMS-NT Hardware and Software
 - Dual Pilot Control Module (DPCM)
 - DPCM Utility
 - DAMS-NT DigiTrak Cage and Cards
 - DAMS-NT Server and Client Overview
 - Demodulator Configuration
 - Message/Demodulator Monitoring
 - Key Setup Information - Preferences

DCS Training Day 2 Agenda



- Other DCS Components
 - DAMS-NT DigiRIT Receiver and Software
 - Pilot/Test Transmitter (P/T Tx)
 - GOES DCS Signal Analyzer (GDSA)



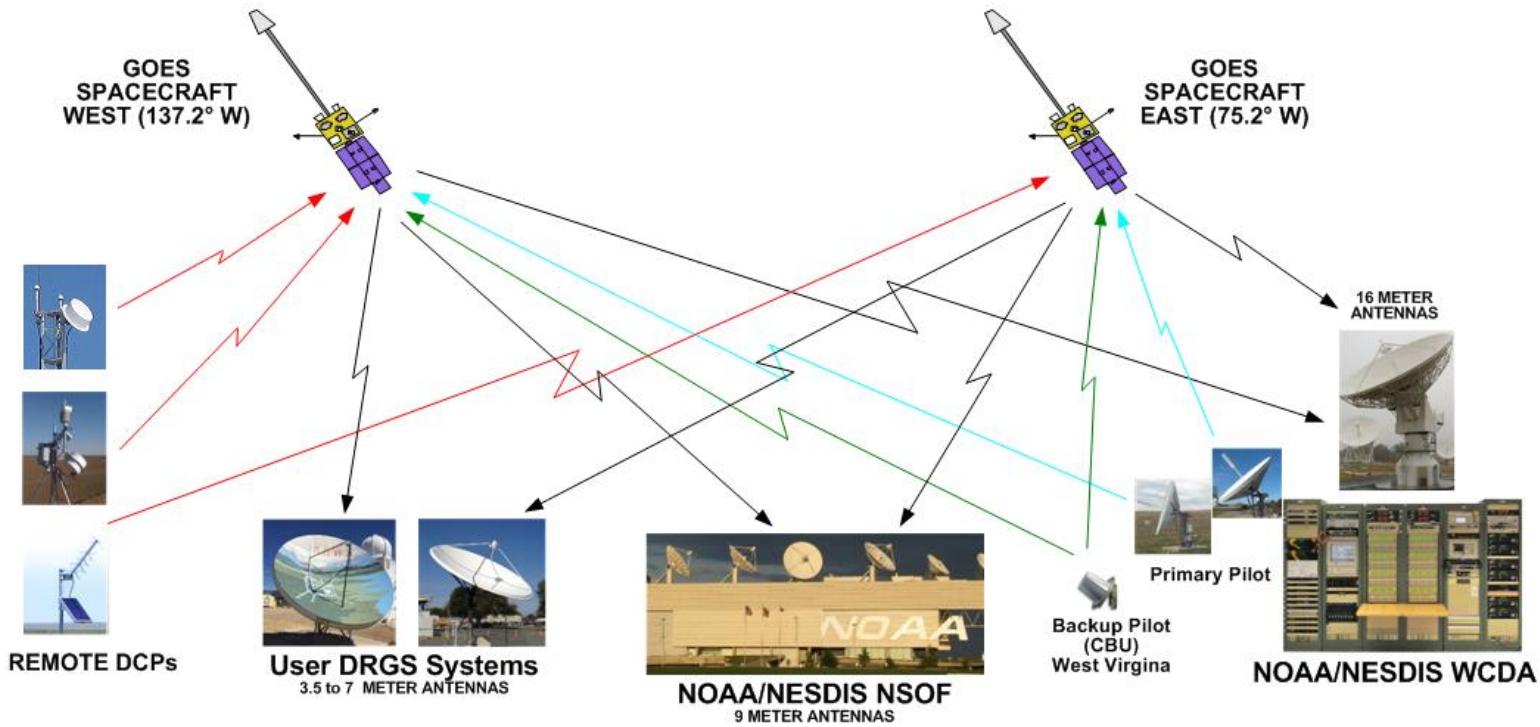
GOES DCS System Overview

GOES DCS: What is It?



- Data Relay System used for Collecting Environmental Data from Ground Based Sensors/Transmitters via Satellites to Receiving Stations.
 - NOAA = National Oceanic and Atmospheric Administration
 - NESDIS = National Environmental Satellite, Data, and Information Service
 - GOES = Geostationary Operational Environmental Satellite
- Carried on board all NOAA GOES Satellites since the 1970's.
 - GOES-1 (aka GOES-A) was launched in October 1975.
 - GOES-16 (aka GOES-R) was launched in November 2016, and became operational in December 2017.
 - GOES-17 (aka GOES-S) was launched in March 2018, and became operational in November 2018.
- Critical System used by a variety of US Government Agencies, State Agencies, Foreign Governments, and even Private Industry for Environmental and Meteorological Monitoring, Prediction and Warnings.

GOES DCS: Satellite Coverage

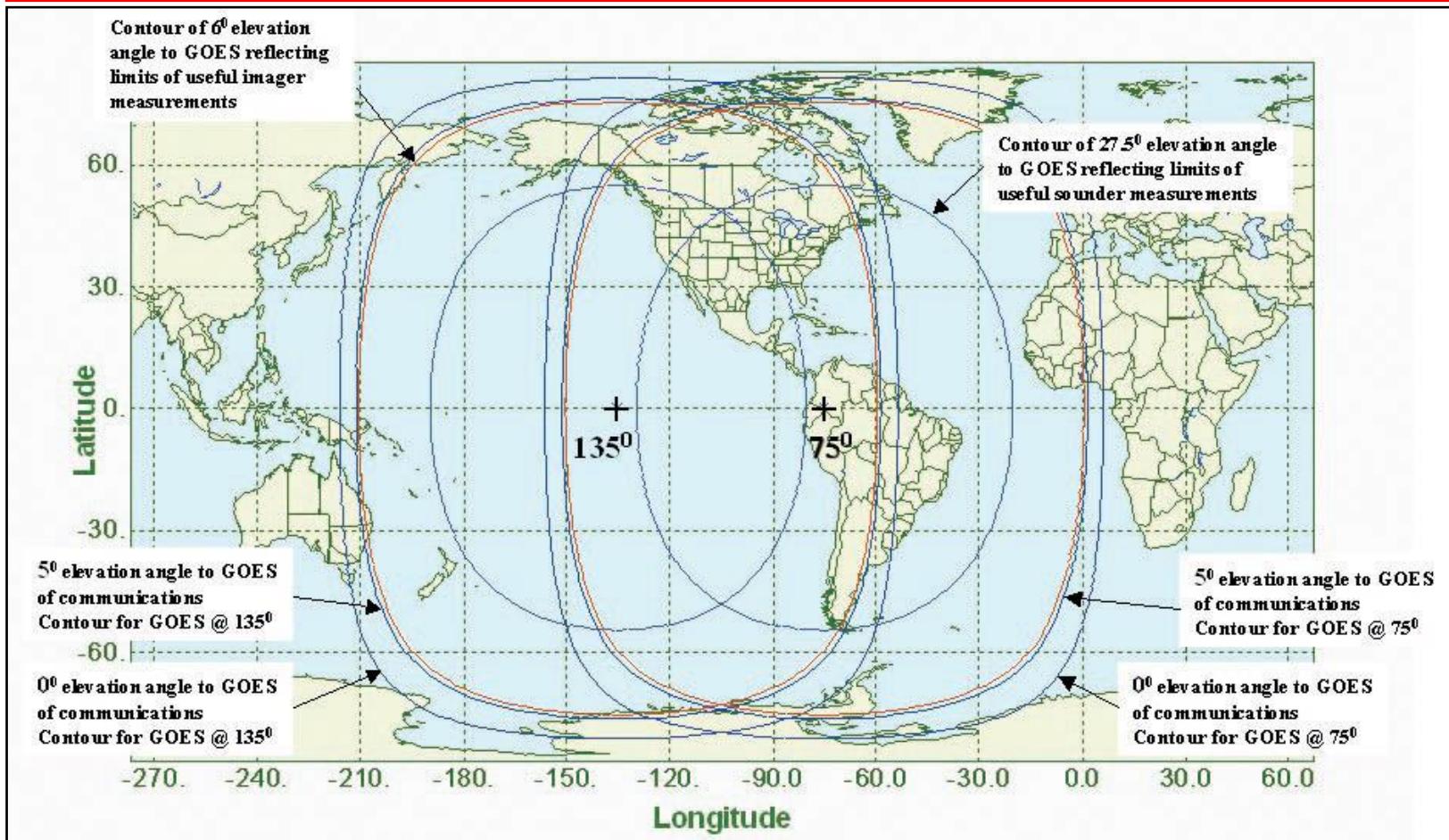


- Geostationary Satellites: GOES East @ 75.2° W and GOES West @ 137.2° W
- WCDA – Primary Receive Site NSOF – Alternate Receive Site
- DCPs Uplink at UHF (~402 MHz) & Downlink is L Band (~1680 MHz)
- Primary Pilot: Uplink = 401.85 MHz Downlink = 1679.85 MHz
- Backup Pilot: Uplink = 401.70 MHz Downlink = 1679.70 MHz

- Operational Satellites:
 - GOES East at 75.2° W
 - GOES West at 137.2° W
- Major NOAA Receive Sites:
 - Wallops Command and Data Acquisition Station (WCDAS)
 - NOAA's Satellite Operations Facility (NSOF)
- RF Communication:
 - DCP Uplink: UHF ~ 401.7 to 402.1 MHz
 - DCS Downlink: L Band ~ 1679.7 to 1680.1 MHz
 - Communication links not significantly affected by weather.
- Dual Pilot Beacon Tones:
 - Primary Pilot: 401.850 MHz – Uplink at WCDA – Directional antennas
 - Backup Pilot: 401.700 MHz – Uplink at WBU/CBU – Single antenna
- User Direct Readout Ground Stations
 - Provide independent, reliable, and redundant reception.

- FDMA: Frequency Division Multiple Access
 - Each DCP is assigned a specific number channel.
 - Channels are shared by multiple DCPs and/or Users.
- TDMA: Time Division Multiple Access
 - On a given channel, each DCP is assigned a specific time window.
 - Time windows are typically 5-15 seconds.
- Power Sharing
 - All active DCP signals are received at the satellite, translated in frequency, and retransmitted as a composite signal to the Direct Readout Ground Stations (DRGS).
 - The composite signal's downlink power is held constant, i.e. each active DCP shares a portion of the total power.
- GOES DCS Pilots
 - Provide an Amplitude and Frequency reference for all DCPs.
 - Critical to system operation. No Pilot \Rightarrow No DCS.
 - Pilots have special frequency (channel) and share downlink power.

GOES DCS: Satellite Coverage



GOES West: 137.2° W

GOES East: 75.2° W

GOES DCS: Users



➤ Flood Monitoring

- United States Geological Survey Water Resources Division
- U.S. Army Corps of Engineers
- NOAA National Weather Service River Forecast Offices



➤ Fire Monitoring

- U.S. Forest Service
- National Interagency Fire Center
- Canadian and State Fire Agencies

➤ Land Management

- Bureau of Land Management

GOES DCS: Users



- Geologic Event Monitoring
 - United States Geological Survey Geologic Division
 - Earthquake Monitoring
 - Volcano Monitoring
 - Earth's Magnetic Field Monitoring
 - Natural Resources of Canadian Geomagnetic Laboratory
- Tsunami Warning
 - NOAA/NWS/Tsunami Center
 - Chilean Tsunami Center



- Resource Management
 - International, National, State, and Local Water Resource Managers
 - Hydromet Service Facilities
 - Agricultural Concerns
 - Power Companies
 - Navigation and Homeland Security
 - NOAA National Ocean Survey
- Meteorological Users
 - U.S. National Weather Service
 - International Canada, Central America, South America, Mexico, Pacific Islands, Caribbean Basin
- Long Term Environmental Monitoring
 - US Geological Survey
 - NOAA National Climate Data Center
 - NOAA Data Buoy Center

GOES DCS: How Critical is It?



- IRAWS 5 station burned over during the Buzzard Fire in New Mexico (2018).
- No fire fighters lost their lives because they were able to evacuate in time thanks to the DCS messages from this and other stations.

GOES DCS: By the Numbers



According to the DADDS Databases There Are ...

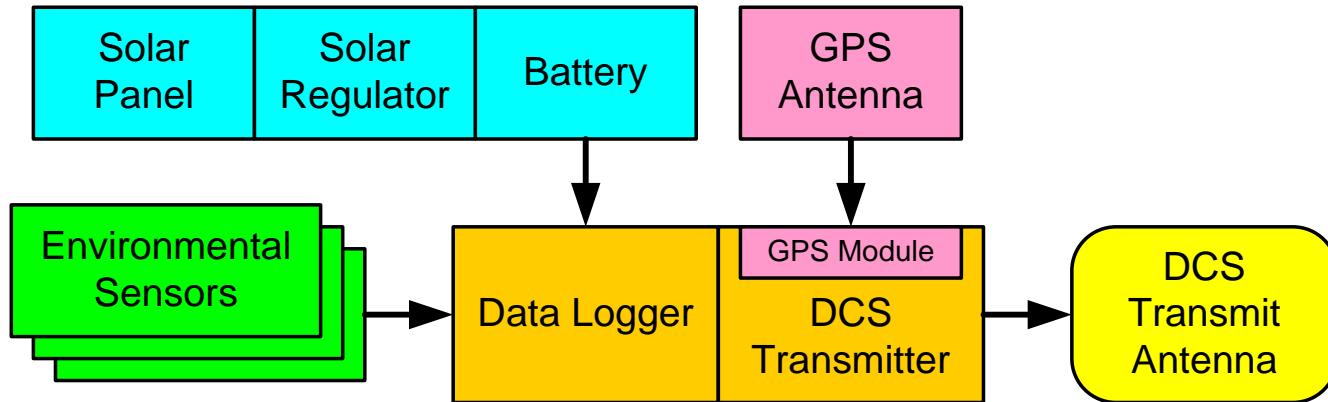
- Over 650 Different Group (Agencies) Using the DCS.
- Over 2000 Registered Users
- Over 40,000 Platform Assignments
 - Nearly 29,000 Active Platforms
- Over 850,000 Messages Received per Day
 - Over 25.5 Million Messages per Month
 - over to 310 Billion Messages Annually
- Of the Total Messages Received by WCDA, NSOF, and EDDN
 - WCDA Typically Receives 99.90% to 99.95%
 - NSOF Typically Receives 99.85% to 99.90%
 - EDDN Typically Receives 99.80% to 99.85%



Data Collection Platform Basics

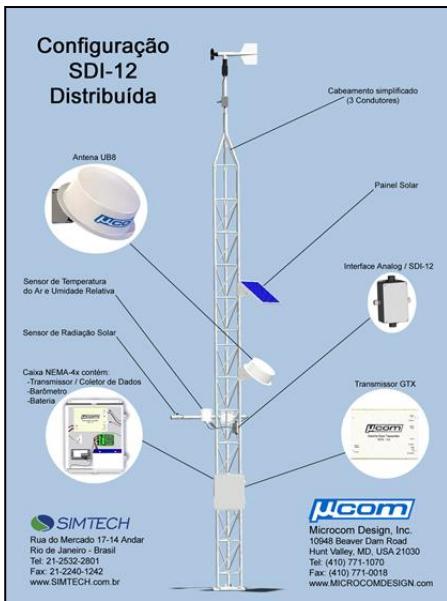
- While NOAA/NESDIS is responsible for the GOES satellites and the primary DCS receive sites (WCDA and NSOF), DCS users provide, operate and maintain the DCPs.
- DCPs are available from multiple vendors:
 - Sutron/Ott
 - Forest Technology Systems (FTS)
 - Xylem/Design Analysis
 - Signal Engineering/Vaisala
 - Campbell Scientific
 - Microcom Design Inc./Microcom Environmental
- DCPs come in a wide variety of configurations:
 - HydroMet Systems – water level and rainfall monitoring
 - AgriMet Systems – agriculture monitoring (e.g. evapotranspiration)
 - Full Met Systems – meteorological monitoring (e.g. air temperature, relative humidity, barometric pressure, wind speed & direction, etc.)
 - RWIS Systems – road weather information monitoring (e.g. wind, road temperature)

DCPs: Generic Block Diagram



- Power system generally consists of a Solar Panel, Solar Regulator, and 12 Volt Battery.
- Timing system generally consists of a GPS Antenna and an integral GPS module.
- One or more external Environmental Sensors are read periodically by the Data Logger.
- Data Logger and DCS Transmitter are often integrated into one unit.
- DCS Transmitter generates RF signal and send it to DCS Transmit Antenna.
- DCS Transmit Antenna is generally a directional antenna that focuses signal towards the GOES satellite (East or West) – the amount of focus is known as antenna gain.

DCPs: Microcom Examples



- Microcom GTX-2.0
 - Data Logger and Transmitter
- Microcom XPress
 - Integrated Data Collection Platform
 - GTX-2.0 Datalogger and Transmitter
 - Battery Pack and Solar Charger
 - GOES Transmit Antenna
 - GPS Antenna
 - Uses external 5 Watt Solar Panel
- Microcom Met Tower System
 - GTX-2.0 and battery in NEMA enclosure at base.
 - External solar panel, GPS antenna, and DCS transmit antenna.



DCPs: Microcom Pictorial Examples



- Most DCPs Transmit on a Self-Timed Schedule
 - NESDIS assigns channel and time slot (aka window).
 - Typical Self-Timed transmissions occur hourly; users would like to work toward 15-minute intervals.
 - Special case platforms have 6-minute (NOS PORTS) or 5-minute (Tsunami) intervals.
 - Time windows are typically 5-15 seconds (150-450 bytes).
 - Requires accurate time syncing; typically using GPS.
 - Scheduling and time syncing avoids message collision.
- Many DCPs Also Transmit Random Messages
 - In response to some environmental event.
 - Once triggered, a DCP will transmit a short message (< 3 seconds) several (3-5) times over a pseudo-random interval (5 minutes).
 - Numerous platforms share a common random channel so there is a potential for message collision.
 - Short messages, pseudo-random scheduling, and multiple reports help to ensure data gets received.

DCPs: Message Structure



Carrier 0.50s 0.25s	Clock (Symbol) 3 bits (1-0-1)	Frame Sync 15 bits	GOES ID (Hex) 4 bytes	Flag Word 1 byte	DCP Data Max: 32,000 bits @ 300; 128,000 bits @ 1200 Typ: 50-200 bytes @ 300; 500-1000 bytes @ 1200	EOT (ASCII 0x04) 1 byte	Encoder Flush 2/4 bytes
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- Carrier:
 - 0.500 ± 0.005 seconds for 300 bps
 - 0.250 ± 0.005 seconds for 1200 bps
- Clock (aka Symbol):
 - 3 BPSK transitions or bits for both 300 & 1200 bps
- Frame Sync Sequence (FSS):
 - 15 BPSK symbols (bits) for message alignment
- After FSS, remainder of message is transmitted in 8PSK
 - GOES ID – Provided by NESDIS
 - GOES ID is a 31-bit Bose-Chaudhuri-Hocquenghem (BCH) encoded address with a zero included as the 32nd LSB.
 - Allows 2-bit error correction if errors in received ID.
 - Flag Word (Byte) – Coded as an ASCII character.
 - Identifies message type – ASCII, Pseudo-Binary, or Binary (future).
 - One bit flags time update since last transmission.
 - DCP Data – User specific data in user specific format.
 - EOT and Flush – termination of message.

- Pure ASCII
 - Allowed, but discouraged by NESDIS.
 - More readable format at the expense of longer transmission times.
- Pseudo-Binary
 - Encodes six bits of information in each character.
 - Byte format: **P₀ 1 B₅ B₄ B₃ B₂ B₁ B₀** (**P₀** Odd Parity).
 - Results in Hex values from 40H to 7FH, which equate to ASCII characters @, A, B, ... ~, DEL. DEL is only non-printable char.
 - To make printable: ? (3FH) can be used for DEL (7FH).
 - Multiple characters used to represent 12, 18, 24 bit resolution.
 - Uses scaling and offset to limit range of values.
- Binary
 - Format and structure has yet to be determined.
 - Various manufacturer proposals under consideration by DCS community.
 - Proposals include simple compression (compaction) schemes to facilitate IT transparency and minimize transition effort.

GOES DCS: Pseudo-Binary Example



Slot	Chan	Baud	AddrCorr	AddrOrig	Carrier Time	Frame Time	End Time	Msg Time(S)	Len	BER	GDP	PHN	SNR
3	207E	300	5741B2F6	5741B2F6	12/065 17:55:44.495	12/065 17:55:45.094	12/065 17:55:46.030	1.535	28	0E-9	99.2	2.42	24.1
3	207E	300	5741A180	5741A180	12/065 17:55:34.719	12/065 17:55:35.323	12/065 17:55:35.807	1.088	11	0E-9	100.0	2.64	23.2
3	207E	300	5741941A	5741941A	12/065 17:55:24.719	12/065 17:55:25.322	12/065 17:55:25.806	1.087	11	0E-9	100.0	1.99	25.8
▶	207E	300	5741B2F6	5741B2F6	12/065 17:55:44.495	12/065 17:55:45.094	12/065 17:55:46.030	1.535	28	0E-9	99.2	2.42	24.1
3	207E	300	5741A180	5741A180	12/065 17:55:34.719	12/065 17:55:35.323	12/065 17:55:35.807	1.088	11	0E-9	100.0	2.64	23.2
3	207E	300	5741941A	5741941A	12/065 17:55:24.719	12/065 17:55:25.322	12/065 17:55:25.806	1.087	11	0E-9	100.0	1.99	25.8

DCP MSG DATA DAPS1/DDS DAMS-NT DECODED HEX-ASCII APPLY VIEW FULL MSG HIDE STATS

boA1?CeeeB^@IHzDEIxUjCeeBKeP

Slot	Chan	Baud	AddrCorr	AddrOrig	Carrier Time	Frame Time	End Time	Msg Time(S)	Len	BER	GDP	PHN	SNR
3	207E	300	5741E28A	5741E28A	12/065 17:56:14.744	12/065 17:56:15.325	12/065 17:56:15.808	1.064	11	0E-9	100.0	2.05	23.0
3	207E	300	5741D710	5741D710	12/065 17:56:04.728	12/065 17:56:05.324	12/065 17:56:05.807	1.079	11	0E-9	100.0	1.49	30.7
3	207E	300	5741C466	5741C466	12/065 17:55:44.745	12/065 17:55:55.323	12/065 17:55:55.807	1.062	11	0E-9	100.0	2.00	25.7
▶	207E	300	5741B2F6	5741B2F6	12/065 17:55:44.495	12/065 17:55:45.094	12/065 17:55:46.030	1.535	28	0E-9	99.2	2.42	24.1
3	207E	300	5741A180	5741A180	12/065 17:55:34.719	12/065 17:55:35.323	12/065 17:55:35.807	1.088	11	0E-9	100.0	2.64	23.2
3	207E	300	5741941A	5741941A	12/065 17:55:24.719	12/065 17:55:25.322	12/065 17:55:25.806	1.087	11	0E-9	100.0	1.99	25.8

DCP MSG DATA DAPS1/DDS DAMS-NT DECODED HEX-ASCII APPLY VIEW FULL MSG HIDE STATS

Isagen Display Decode File

Station: Canal Fuga Calderas

Platform ID: 5741B2F6

Transmit Date: 03/05/2012

Transmit Time: 17:55:45

Tx Batt Volts: 13.7

Tx Forward Power: 10.8

Tx Reverse Power: -6.1

Local Data Hour: 12:00

Rainfall: 0.0

Water Level: 1.58

Wind Speed: 0.9

Wind Direction: 57.0

Temperature: 26.1

Rel Humidity: 63.2

Baro Pressure: 887.1

Evaporation: 0.020

Solar Radiation: 451.0



Microcom XPress Show and Tell



DCP Certification Standards

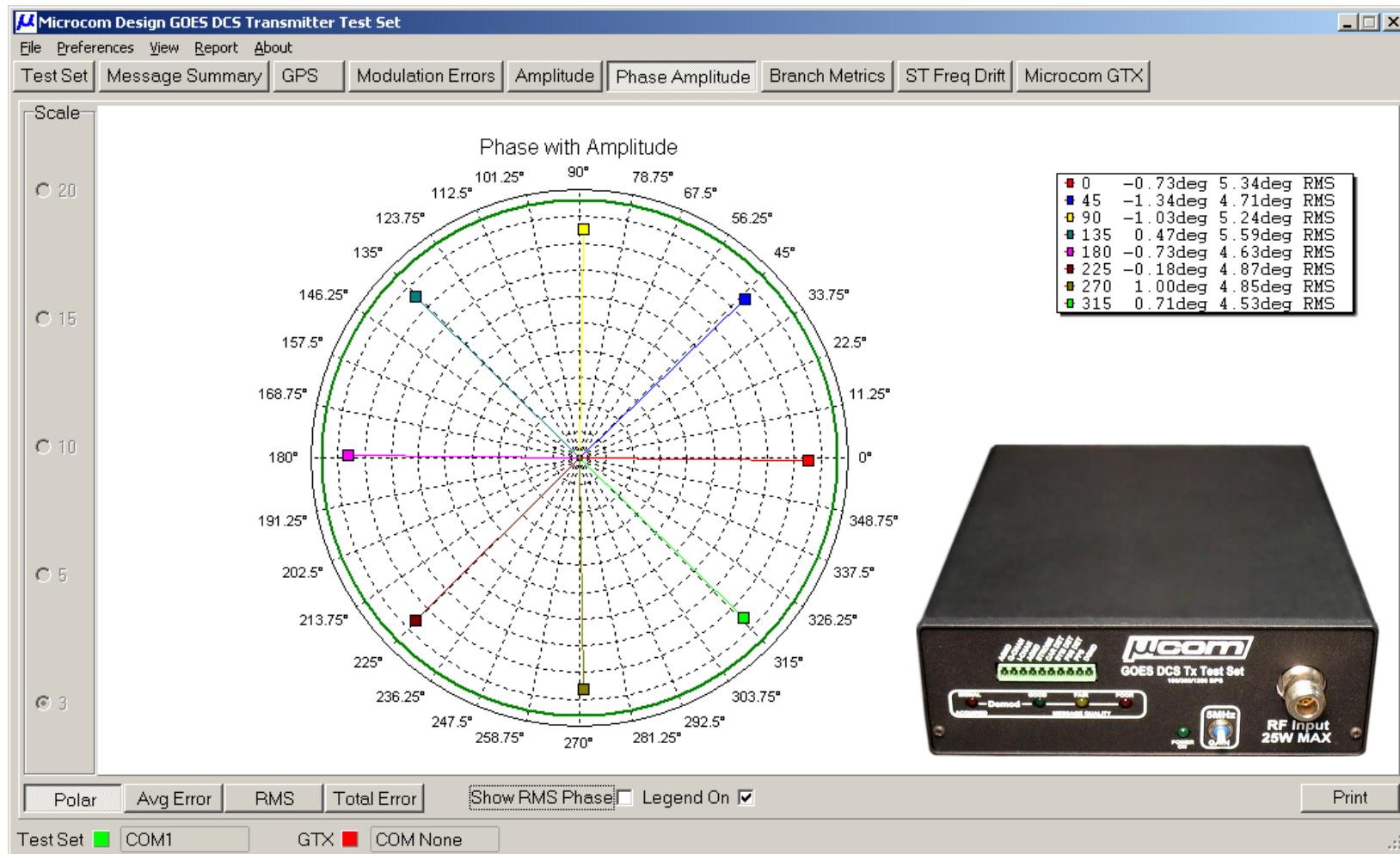
100 bps versus CS1 versus CS2



- Original DCPs utilized 100 bps Binary Phase Shift Keying
 - Replaced by HDR in early part of this century.
 - Still a few platforms out there using legacy 100 bps format.
- Certification Standard Version 1 – March 2000.
 - First High Data Rate Standard (HDR) – 300 bps & 1200 bps.
 - Soon after adoption, NOAA and Users began the transition away from 100 bps transmissions, which was to have been completed in 2013.
 - Effectively specified Bessel filtering.
 - Utilized the original 100 bps channels for 300 bps.
 - Defined new channels for 1200 bps – the “A” channels.
- Certification Standard Version 2 – June 2009
 - Second High Data Rate Standard – 300 bps & 1200 bps.
 - Transition to CS2 has already begun; expected to continue until the next decade.
 - Specifies use of Root Raised Cosine (RRC) filter.
 - Retains existing 300 bps channel centers. Doubles 300 bps channels by inserting new channel in between existing channel centers.
 - Defines new channels for 1200 bps. Eliminates “A” channels and places 1200 channels on same centers as 300 bps channels.
 - Lowered transmit powers for DCPs.

- Since its inception, the DCS has utilized Phase Modulation
 - GOES DCS Transmitters use Phase Modulation, as opposed to Amplitude Modulation (AM) or Frequency Modulation (FM).
 - Modulation ⇒ Variation of one or more properties of a periodic waveform, called the carrier signal.
 - The modulation of the carrier signal is what is used to convey the desired information; e.g. voice, music, text, or digital data.
- What Is Phase?
 - Phase is measured in Degrees ⇒ Think of Points around a Circle
 - Original 100 bps transmitters utilized Binary Phase Shift Keying (BPSK) – after carrier portion, signal varied between one of two phase states.
 - HDR (300 & 1200) transmitters utilize 8PSK – after FSS portion signal transitions between one of Eight Phase Symbols to convey message information (0° , 45° , 90° , 135° , 180° , 225° , 270° , 315°).

8PSK Modulation – A Pictorial View

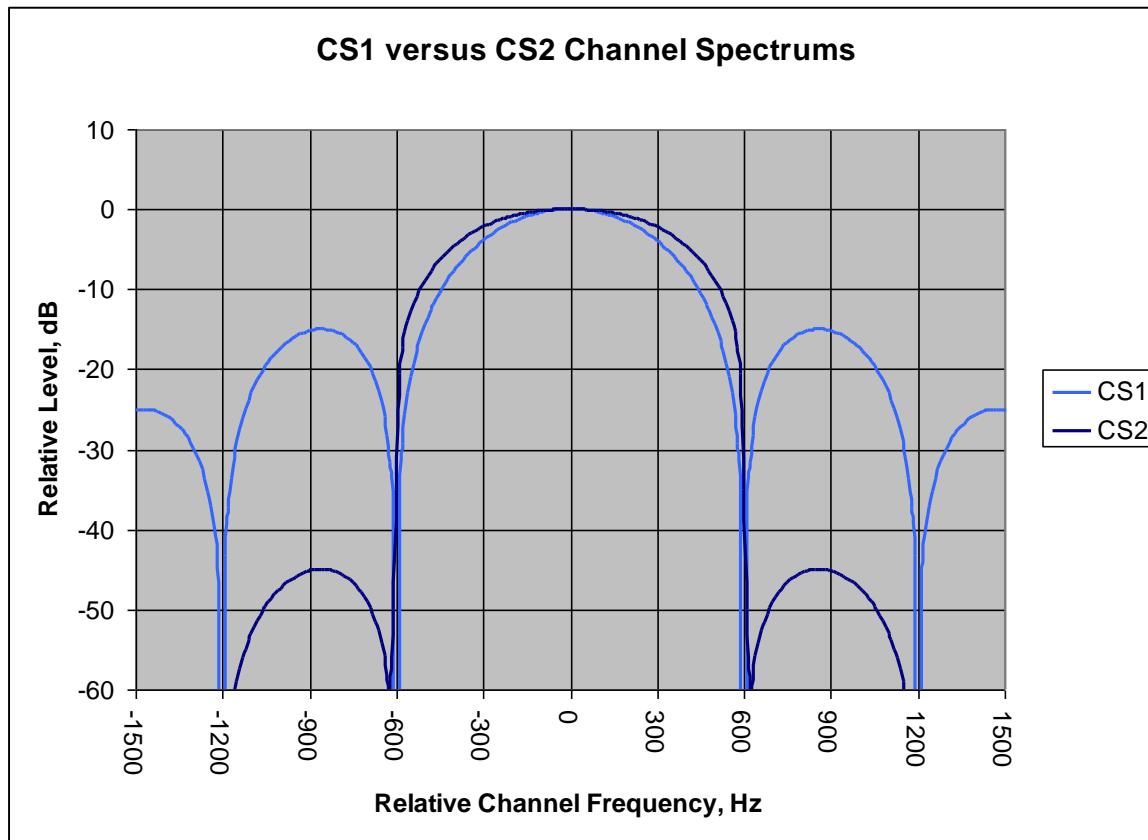


CS1 versus CS2: By the Numbers



Specification	CS1	CS2
Total 300 bps Channel Capacity	266	532
Domestic 300 bps Channel Capacity	220	440
Total 1200 bps Channel Capacity	133	177
Domestic 1200 bps Channel Capacity	110	145
Total Frequency Bandwidth	400 kHz	400 kHz
Domestic Frequency Bandwidth	330 kHz	330 kHz
Basic Channel Bandwidth	1500 Hz	750 Hz
100 bps Bandwidth	1500 Hz	N/A
300 bps Bandwidth	1500 Hz	750 Hz
1200 bps Bandwidth	3000 Hz	2250 Hz
Tx Allowed Uncertainty	±425 Hz	±125 Hz
Tx Frequency Stability	±1 ppm	±0.3 ppm
Demodulator Acquisition	±500 Hz	±150 Hz
300 bps Uplink Power (EIRP)	48 dBm	39 dBm
1200 bps Uplink Power (EIRP)	51 dBm	45 dBm

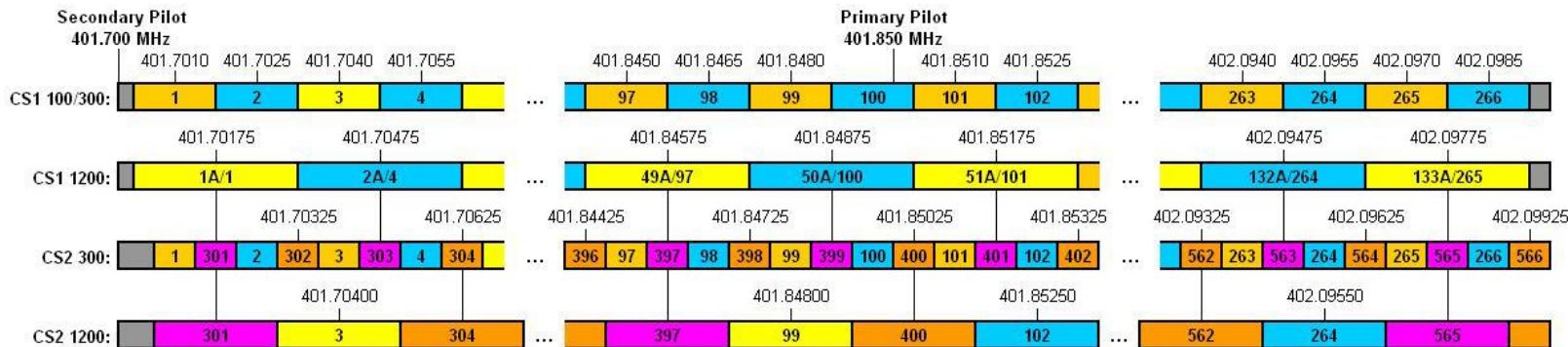
CS1 versus CS2: Spectrums



CS1 – Bessel CS2 - RRC

RRC significantly reduces sidelobes

CS1 versus CS2: Channel Maps



➤ CS1 Channel Mapping:

- A total of 266 100/300 bps channels spaced 1500 Hz apart.
- A total of 133 1200 bps channels spaced 3000 Hz apart.
 - Channels centered between two 300 bps channels.
 - Since DAPS could not handle "A" designation, convention was to reference to 300 bps channel maintaining odd/even alternation: 1A/1, 2A/4, ... 49A/97, 50A/100, ... 132A/264, 133A/265.

➤ CS2 Channel Mapping:

- A total of 532 300 bps channels spaced 750 Hz apart.
 - Legacy channel centers and number designations preserved.
 - New channels located between legacy channels, numbered 301-566 (i.e. channel numbers 267-300 are not used).
- A total of 177 1200 bps channels spaced 2250 Hz apart.
 - Channel centers aligned with 300 bps channels and same channel number designation utilized.



Direct Readout Ground Station DAMS-NT Overview

- Provides ***direct*** reception of DCS messages via DCPR transponder on GOES satellites.
- Satellite acts essentially as a “bent pipe”.
 - What is sent up from the remote DCPs, is effectively just sent back down.
 - DCPR transponder simply performs a frequency translation from UHF to L Band.
- Only the GOES satellite is between the remote DCPs and a DRGS.

Comparison to Other DCS Systems



- DRGS Advantages
 - No latency.
 - Allows monitoring of system performance in addition to platforms.
 - Reliability; does not depend on rebroadcast system and reception is unaffected by weather fading.
- HRIT
 - L Band rebroadcast via GOES satellites.
 - Lower cost satellite reception with full channel coverage.
 - Smaller dish size (1.2M to 2.4M).
 - Latency is 20-25 seconds.
- DCS Data Service (DDS) – LRGS/OpenDCS
 - Internet based message ingest.
 - Low cost; minimal latency (3-5 seconds; with good broadband connection).
- DOMSAT
 - Ku Band rebroadcast subject to weather fading.
 - Slated to be terminated in May 2019.

➤ NOAA/NESDIS DRGS Sites

- Wallops Command and Data Acquisition Station (WCDAS); Wallops Island, Virginia.
- NOAA's Satellite Operations Facility (NSOF); Suitland, Maryland.
- Both sites have complete East and West channel coverage with a total of 400 DCS demodulators at each site.

➤ U.S. Geological Survey (USGS)

- Emergency Data Distribution Network (EDDN)
- Located at the Earth Resources Observation and Science (EROS) Center in Sioux Falls, South Dakota
- Complete East and West channel coverage with a total of 320 DCS demodulators (160 East & 160 West).

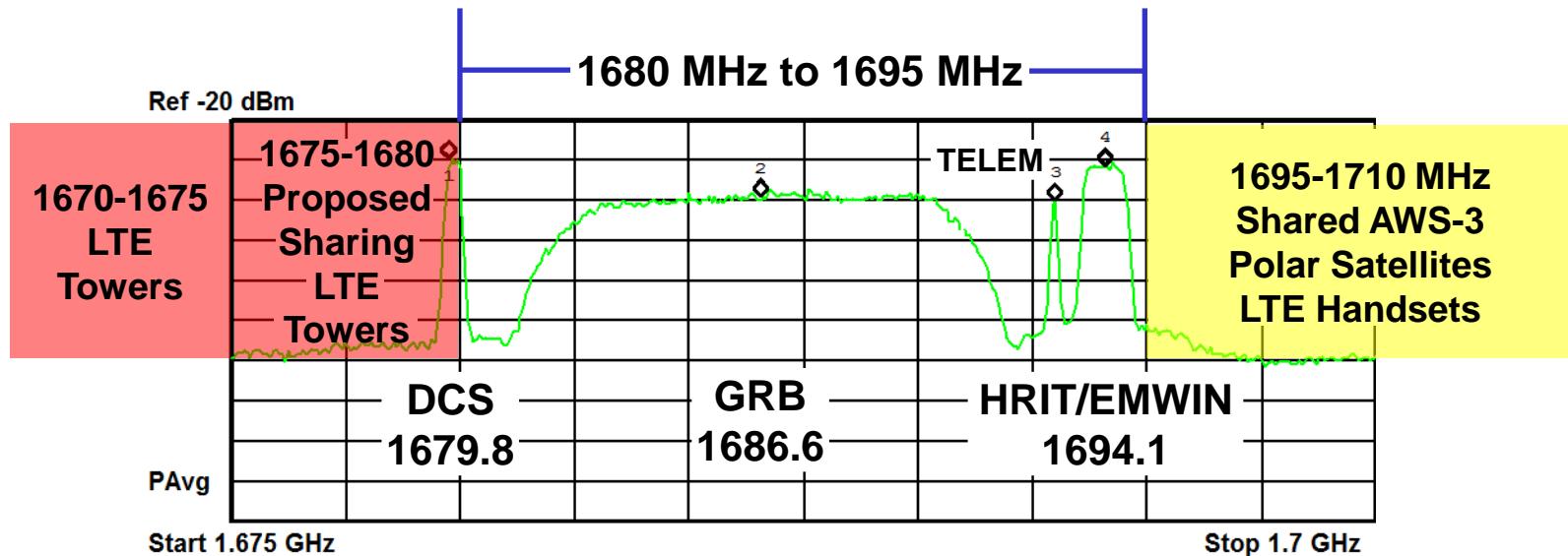
➤ Others

- National Interagency Fire Center (NIFC) – 80 Channels on West
- USACE Rock Island – 40 Channels on East and West each.
- Bureau of Reclamation – 80 Channels on West.

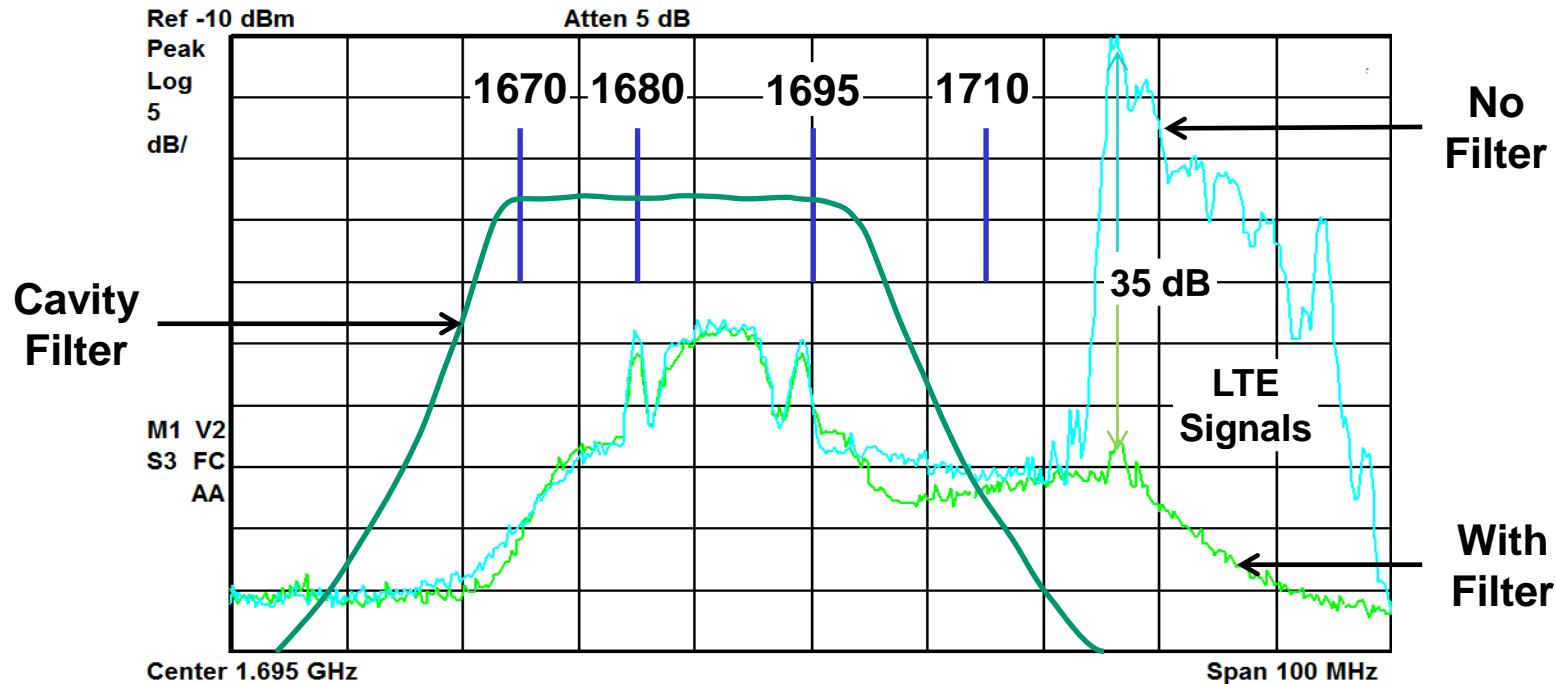
GOES L-Band Spectrum



- L-Band Downlink Signals:
 - Data Collection System (DCS, aka DCPR): 1679.7-1681.1 MHz, Linear Pol
 - GOES Rebroadcast (GRB): 1681.15-1692.05 MHz, Dual CP
 - Telemetry: 1683.0 MHz, 80 kHz BW, BPSK, RHC
 - High Rate Information Transmission (HRIT): 1693.4-1694.6 MHz, Lin Pol
- Interference Concerns:
 - 1695-1710 MHz, LTE Handsets, Sold as part of AWS-3, Sharing with Polar Sats
 - 1670-1680 MHz, LTE Towers, (1675-1680 MHz still being studied)

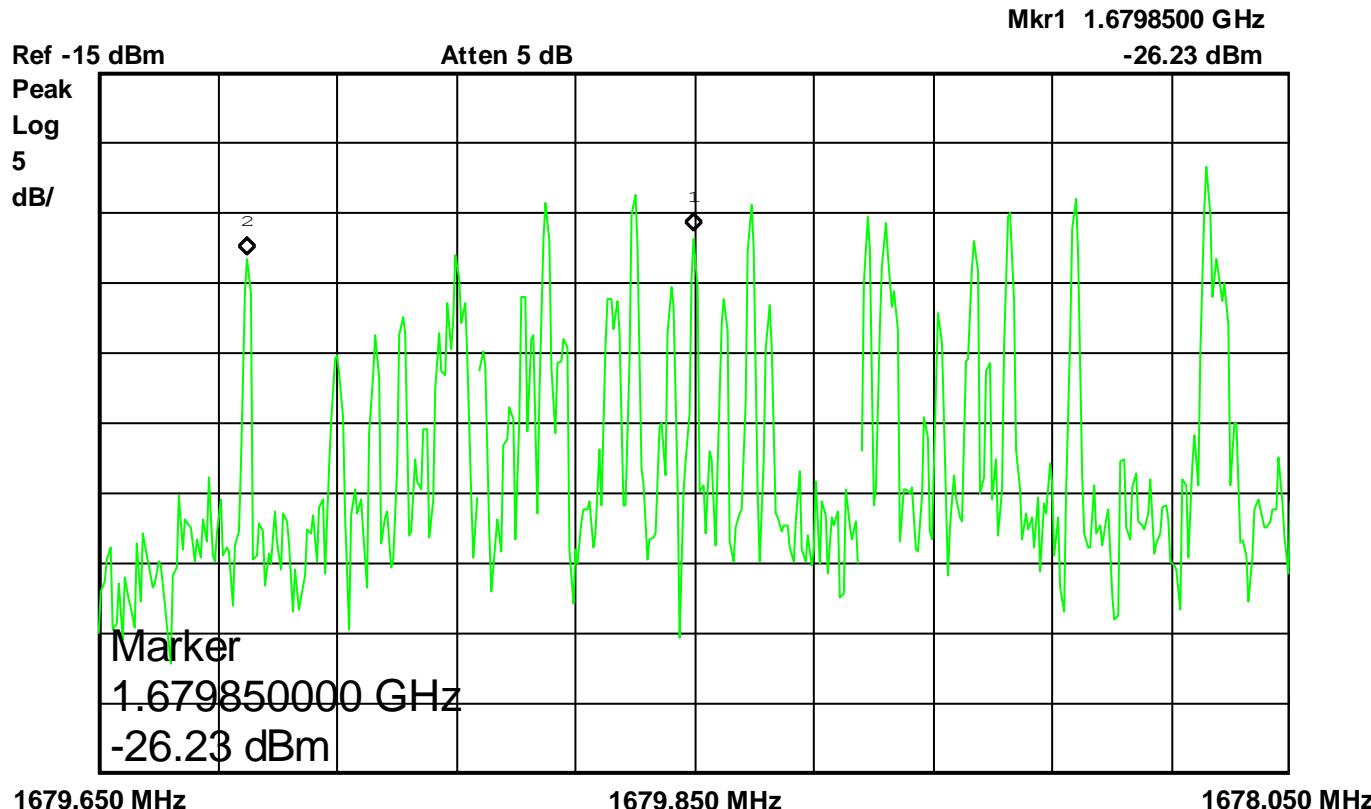


LTE Signals Above 1720 MHz



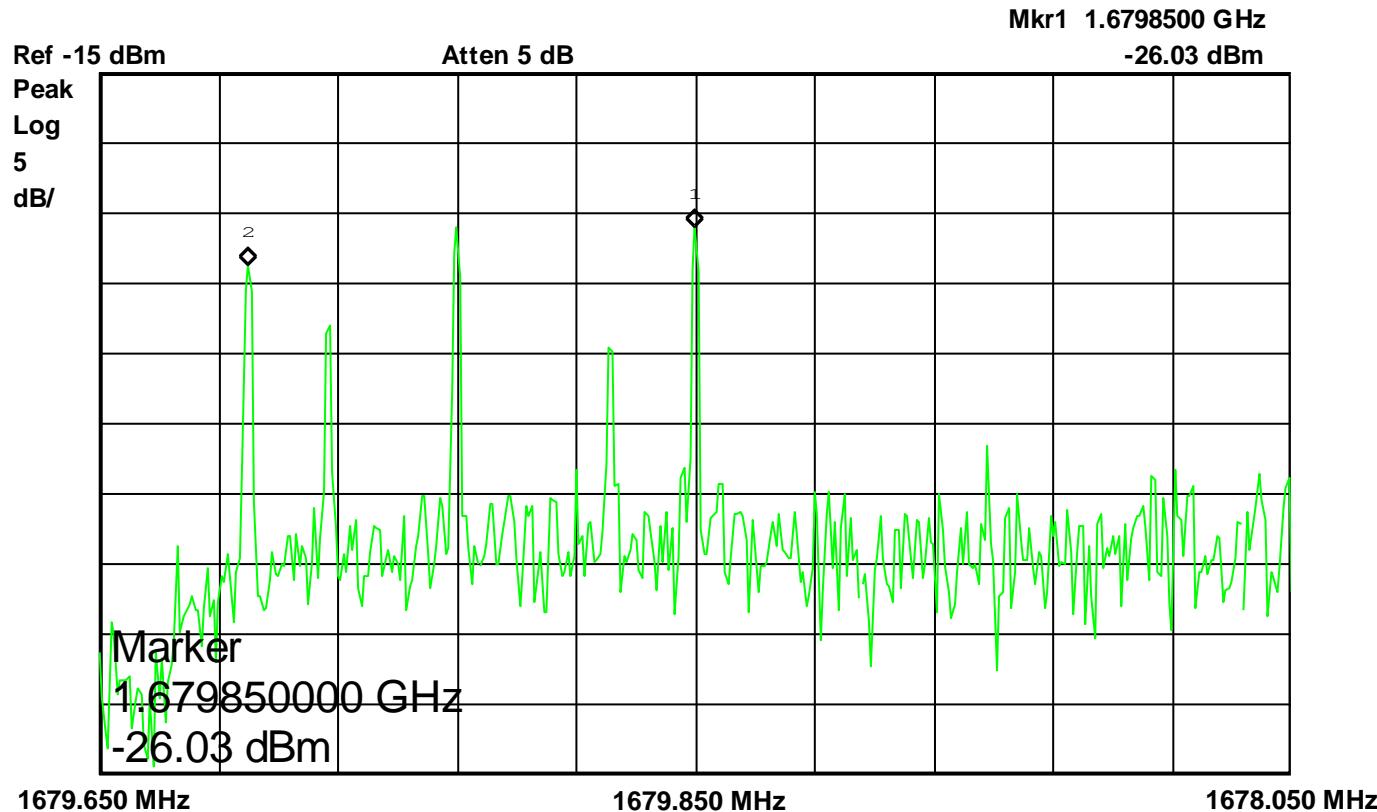
- Microcom can already see adjacent band signals above 1720 MHz.
 - Short burst LTE signals can only be captured using spectrum analyzer in "Max Hold" mode and allowing capture to run for several minutes.
- Readily filtered with external cavity filter between Feed and LNA/BDC.
- Significant improvement provided, but may not be good enough for AWS-3 (1695-1710 MHz) and/or proposed use of 1675-1680 MHz.

GOES DCS Spectrum – Heavily Loaded



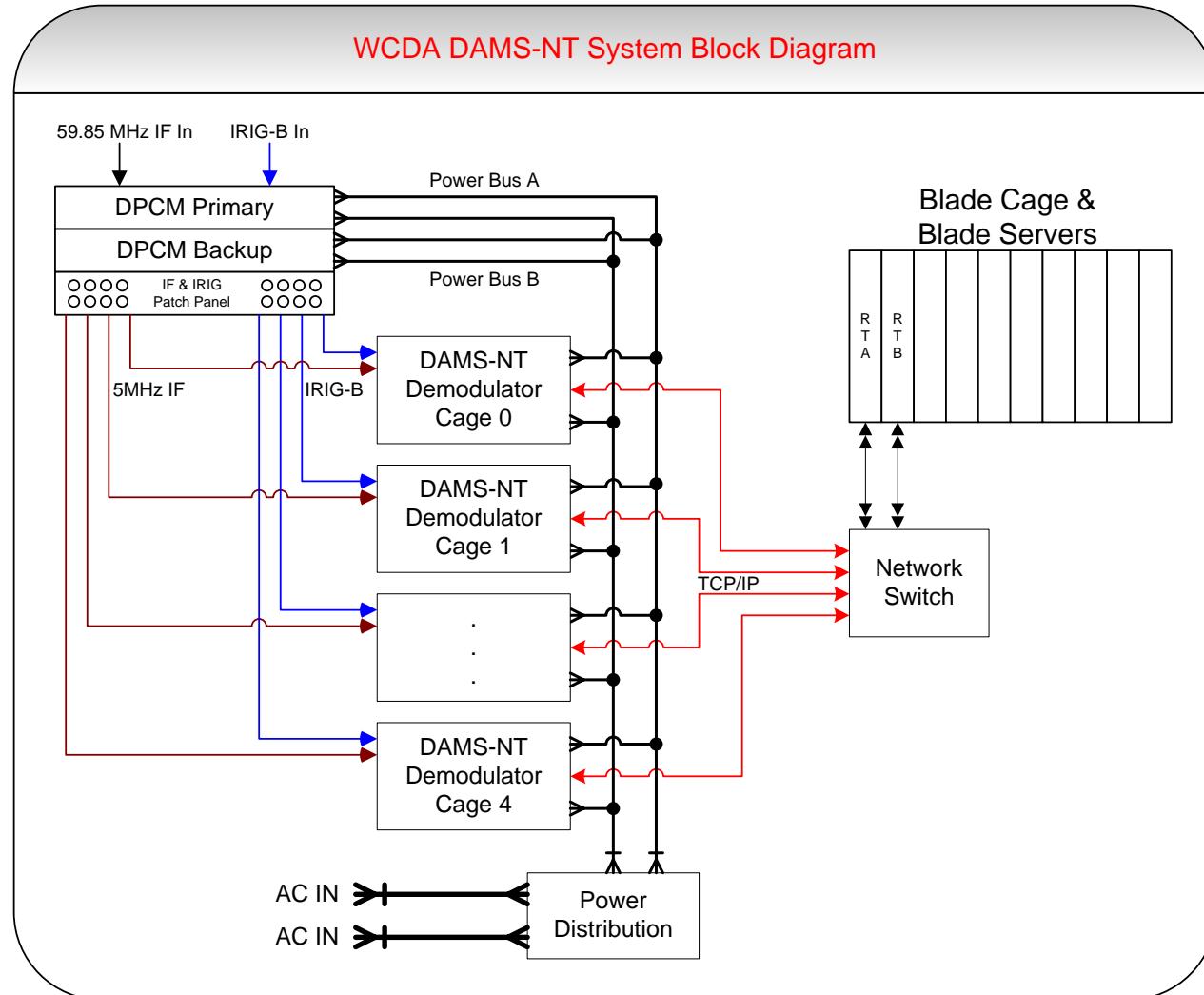
- DCS Spectrum encompasses ~330 kHz, and consists of over 400 channels.
- DRGS must be able to simultaneously monitor all of the channels of interest.
- Sometimes the DCS is heavily loaded as in spectrum above.

GOES DCS Spectrum – Lightly Loaded



- And, sometimes the DCS it is lightly loaded as in spectrum above.
- Pilots are always present.
- Satellite downlink power is held constant regardless of the number of active platforms, which results in *received* Pilot levels varying significantly.

DAMS-NT DRGS: Block Diagram



- A key aspect of the DAMS-NT system connectivity is that there is not a direct physical cable connection from the DPCMs or the DAMS-NT Cages.
- The determination of the Primary and Backup DPCMs, and the Cage ordering (0-4) is a logical mapping determined by their IP Addresses and how the DAMS-NT Servers are setup.
- If either of the DPCMs or any of the NIC-MUX units in the DAMS-NT Cages are changed, then the DAMS-NT Server setup must also be altered accordingly.

DAMS-NT & DADDS: A Brief History



- 2002: Microcom *DigiTrak* DRGS Designed
- 2002-2003: NOAA Wallops 300 bps HDR DSP Upgrades
- May 2003: DAMS-NT Contract Award
- Nov 2003: Original DAMS-NT System Deployment
- Mar 2005: DAMS-NT Interfaced to DAPS
- Sep 2006: DADDS Contract Award
- Sep 2006: DAMS-NT RI-COE Auto 100/300 Upgrade
- Mar 2007: DADDS Deployed at WCDA
- Nov 2007: NSOF DADDS/DAMS-NT Install
- Feb 2008: USGS EDDN @ EROS Brought Online (DPCM)
- Apr 2008: DAMS-NT WCDA Auto 100/300 Upgrade
- Nov 2008: DPCMs Installed at WCDA and NSOF
- Mar 2009: DAMS-NT Robustness Updates (Dual Server)
- Jun 2009: Release of Certification Standard 2
- Sep 2009: DADDS Takes over for DAPS
- Jan 2010: DAPS Retired and Dismantled

DAMS-NT & DADDS: A Brief History



- May 2010: Preliminary Update to Demods for CS2
- May 2010: Deployment of P/T Tx Units
- Oct 2011: CS1/CS2 Auto Detect Implemented
- Jun 2012: P/T Tx OCXO Update
- Aug 2012: DAMS-NT Fully Updated for CS2
- May 2013: HDR Transition Complete (most 100 bps DCPs retired).
- May 2014: DPCMs Updated for GOES-R Operation
- Apr 2015: NIC-MUXes Updated
- Dec 2015: P/T Tx Combiners replace RF Transfer Switch
- Dec 2015: Pilot Antenna Adjustment – Motorization of Spare
- Jun 2016: DADDS Assumes LRIT Distribution
- Mar 2017: GOES-R DCPR Testing Complete
- Dec 2017: GOES-16 Operational – DADDS disseminates HRIT
- Jun 2018: DAMS-NT DigiRITs installed at WCDA
- Dec 2018: GOES-17 Operational at 137.2° West
- Mar 2019: DADDS Server Refresh Complete



DRGS Hardware Components

Dual Pilot Control Module

Receiving Equipment - DPCM



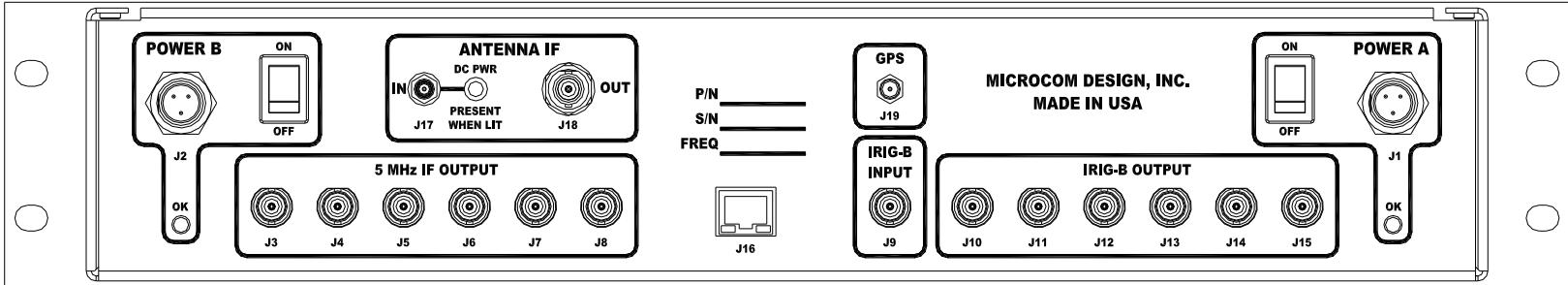
- GOES DCS Pilots
 - Provide an Amplitude and Frequency reference for DRGS.
 - Critical to system operation. No Pilot \Rightarrow No DCS.
 - Dual Pilots (Primary & Backup) provide redundancy and reliability.
- Dual Pilot Control Module
 - Inputs composite IF spectrum from the Front End
 - Can provide required DC Power to the Front End
 - Locates and Locks to both Pilots in IF spectrum.
 - One Pilot is used to provide both frequency and amplitude control.
 - If Lock on the Active Pilot is lost, DPCM switches over to other Pilot.
 - Down converts the Front End IF to 5 MHz IF for demodulators.
 - Provides Timing Outputs – Station Time Input and/or Integral GPS Module.

DPCM Details



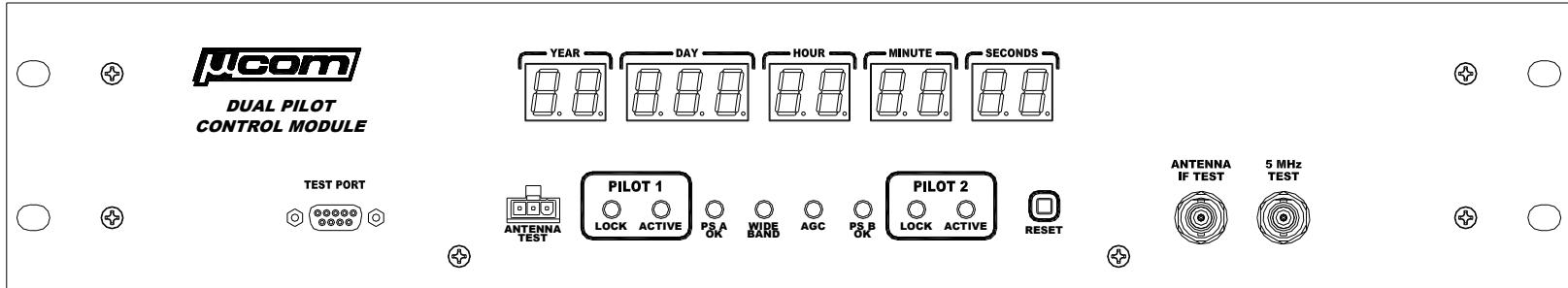
- Inputs Composite DCS IF Spectrum RFDS tunable via software from 50-90 MHz.
- Locates and Locks to Both Pilots in IF Spectrum.
 - Primary Pilot: 59.85 MHz
 - Backup Pilot: 59.70 MHz
- One Pilot is used to provide Frequency (Phase) and AGC feedback – designated the Active Pilot.
- DAMS-NT application provides option to give to the Primary Pilot.
- Backup Pilot provides additional performance and monitoring information.
- If Lock on the Active Pilot is lost, DPCM automatically switches over to the Backup Pilot.
- Down converts the Front-End IF to a 5 MHz IF to be fed into DAMS-NT Cages.
 - Down conversion references to Primary Pilot.
 - Primary Pilot: 5.000000 MHz
 - Backup Pilot: 4.850000 MHz
- Provides IRIG-B Timing Outputs for DAMS-NT Cages.

DPCM: Rear Panel View



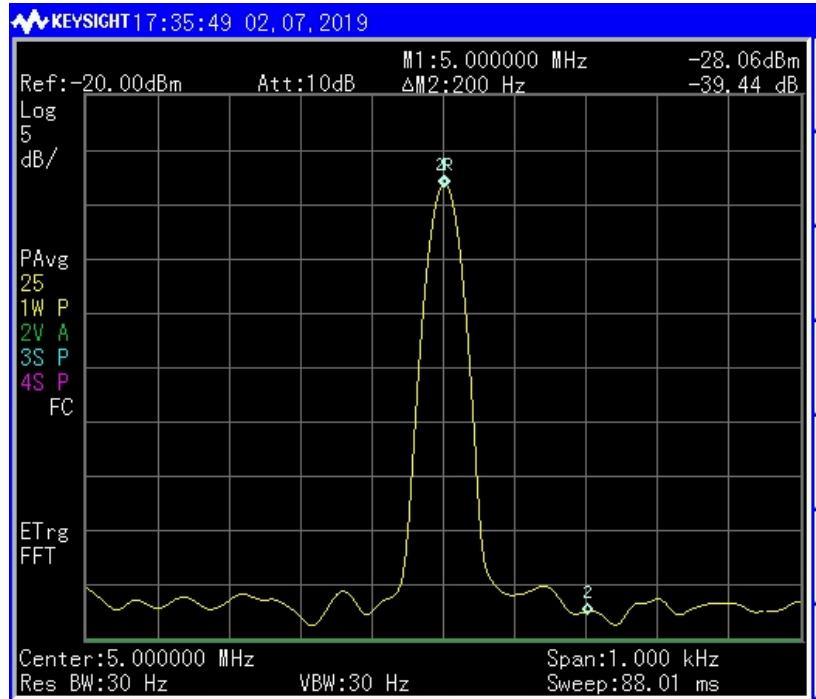
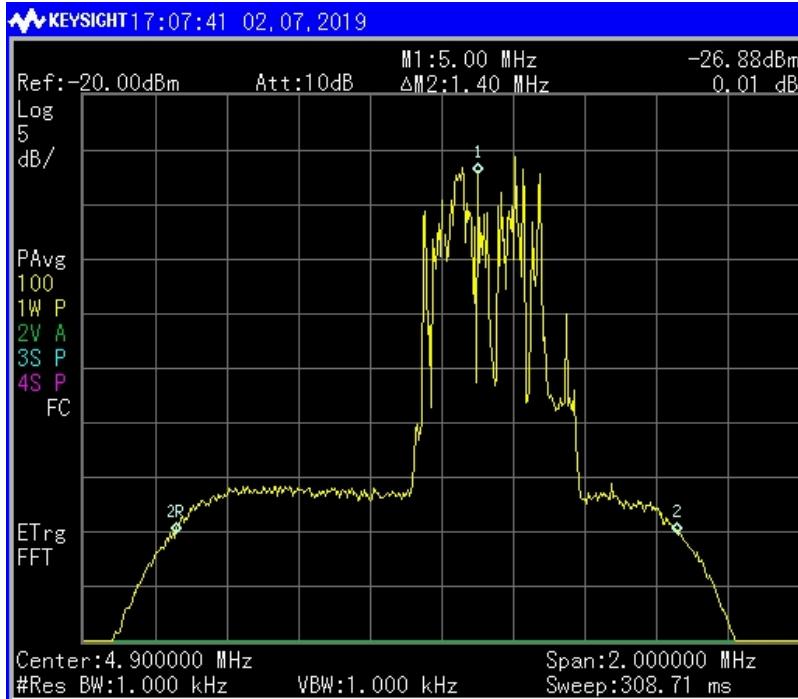
- Two Circular, 1/4 - Turn Locking connectors for Redundant Power Supplies (A and B)
- On/Off Switches and Status LED for both Power Supplies
- Antenna IF Input and Buffered Output
- LED to indicate Front-End DC Power
- GPS Antenna Input and/or IRIG-B Time Code Input
- Six Buffered 5 MHz IF Outputs
- Six Buffered IRIG-B Outputs
- RJ-11 TCP/IP Network Connection

DPCM: Front Panel View



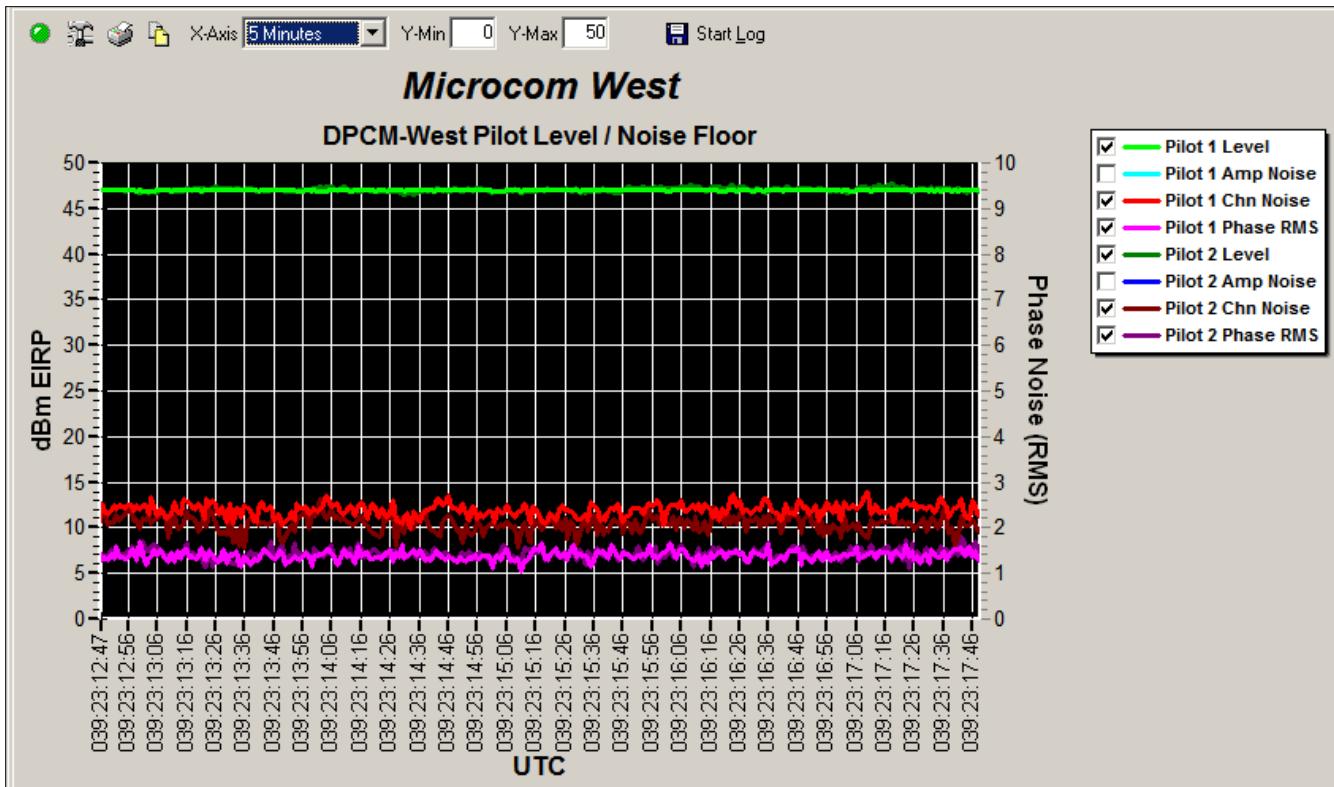
- Eight Status LEDs for Quick Visual Feedback.
 - Pilot 1 and 2 Lock and Active status.
 - Status of redundant power supplies.
 - Status of input signal level.
 - Status of Pilot AGC function.
- UTC Time Display of IRIG-B
- RS-232 Test Port for local monitoring and diagnostics.
- Antenna IF and 5 MHz Test Connectors.

DPCM: Typical 5 MHz Test Spectrums



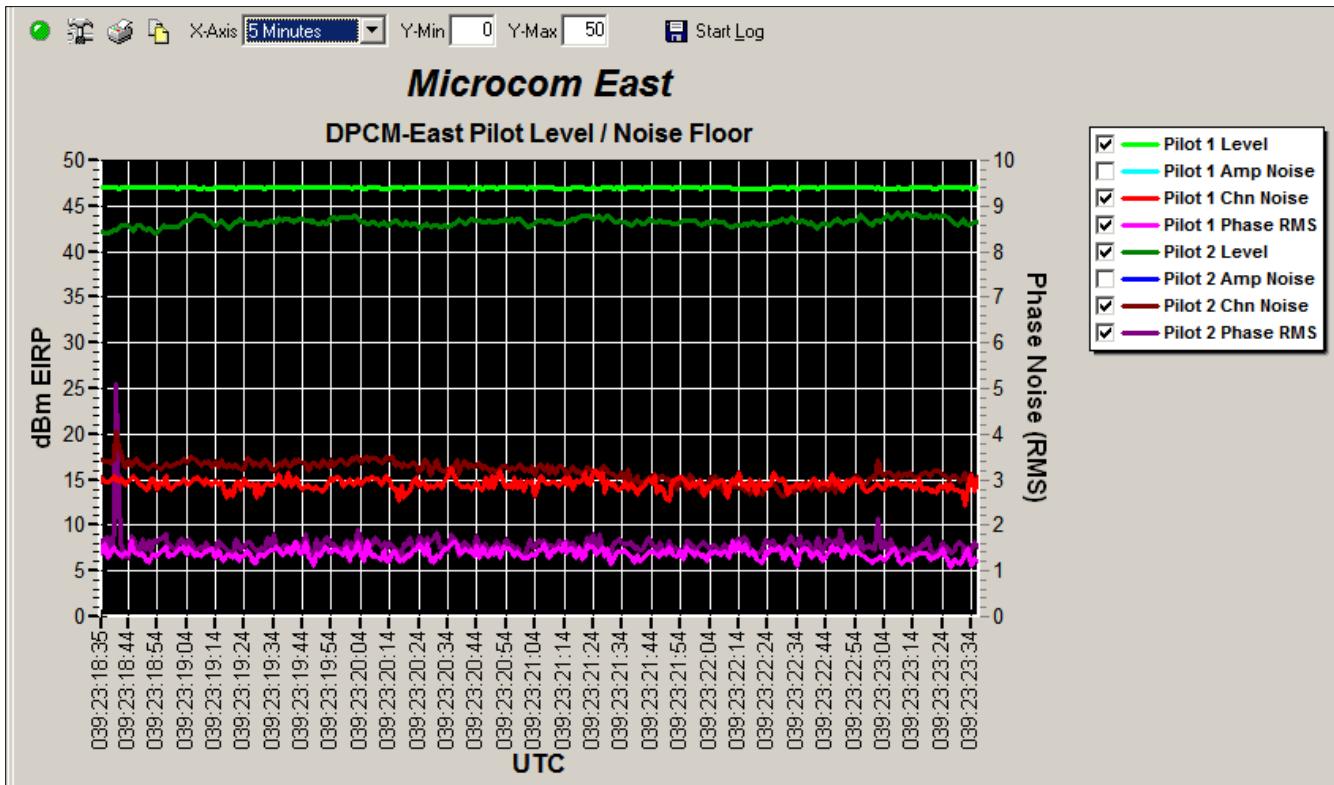
- DCS Spectrum filtered through SAW filter with ~1.4 MHz 3dB bandwidth.
 - Slightly off center to get in flattest part of passband, and ...
 - To give a bit more rejection to the GRB, which is only about 1 MHz away.
- Primary Pilot typically 35-40 dB SNR in 30 Hz RBW.
 - Good check of the performance of the system.

DPCM: Pilot Level/Noise Floor



- Tracked Pilot (typ Primary) should always be stable at 47 dBm EIRP due to AGC.
- Channel Noise should typically be between 10 and 15 dBm EIRP.
- Phase Noise should be between 1.0 and 1.5 degrees RMS for WCDA and NSOF.
- West typically lower than East since not as heavily loaded.

DPCM: Pilot Level/Noise Floor



- Backup Pilot will vary in level between East and West due to single antenna.
- Backup Pilot presently uplinked from a broad beamwidth antenna.
 - Currently at WBU, planned to be moved to CBU in next few months.
 - Long term goal is to replace with parabolic dish uplinks.

- Active Pilot always assumed to be at specified ***Uplink*** power.
 - DPCM will AGC (Automatic Gain Control) IF output to maintain Active Pilot at factory determined reference level: 47 dBm EIRP = -28 dBm.
 - NOAA actively works to maintain Pilot levels at nominal 47 dBm EIRP (Equivalent Isotropic Radiated Power).
 - Nature of system makes it impossible to make *absolute* signal level measurements; can only measure signal strength *relative* to Active Pilot.
 - Primary Pilot (Pilot 1) is most reliable reference due to narrow beam parabolic transmit antenna configuration.
- Channel Noise:
 - Energy in equivalent bandwidth 500 Hz offset from Pilot.
 - Also measured in dBm EIRP.
 - Expect 10-15 dBm EIRP \Rightarrow \sim 40 dB Signal-to-Noise Ratio (SNR).
- Phase Noise:
 - Measure in degrees RMS.
 - One of the best indicators of performance.
 - Expect 1.0-1.5 degrees RMS; System limit is \sim 1.0 degrees RMS.

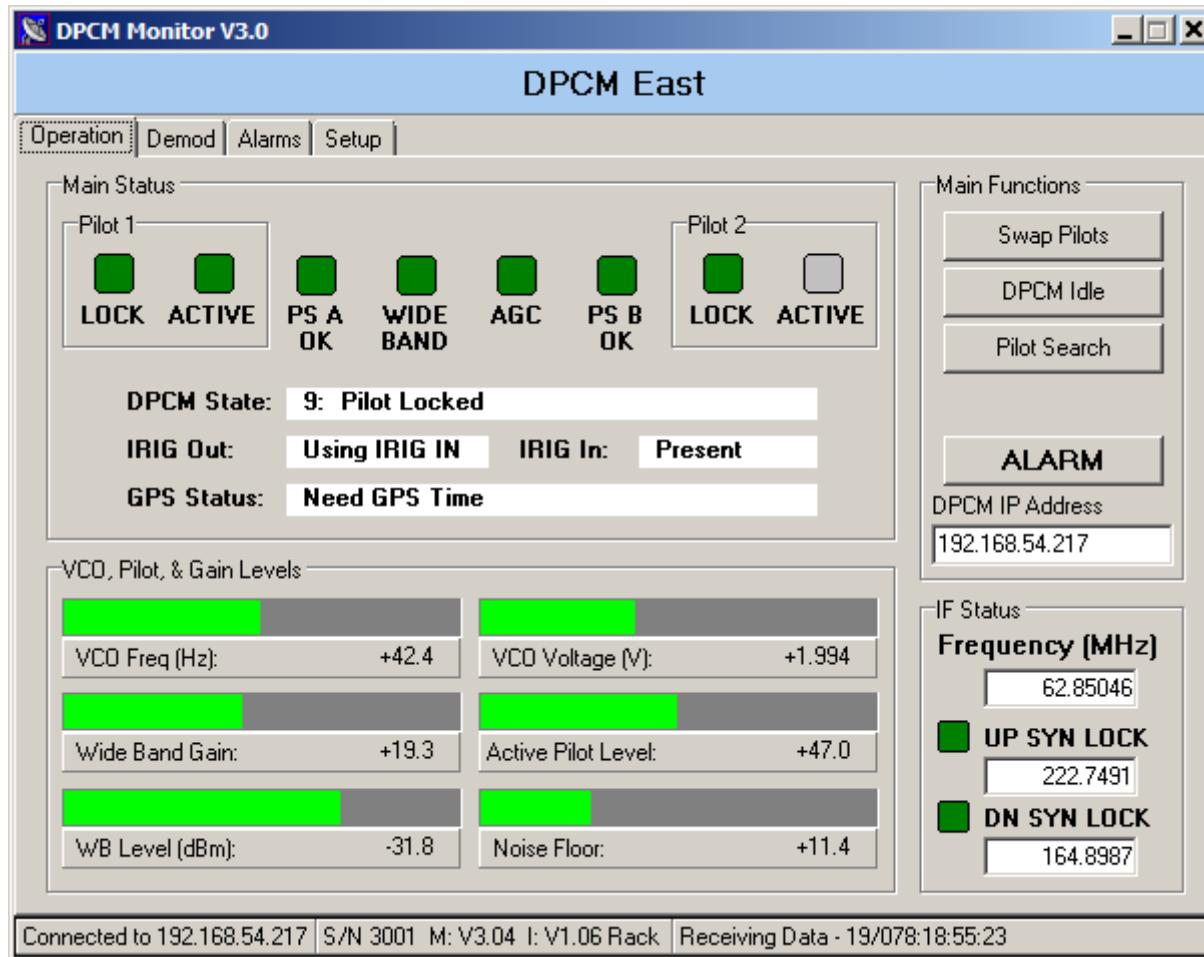


DRGS Software Components

DPCM Utility

- DAMS-NT Utility software used for monitoring and control of an individual DPCM.
- Four instances running on Process Monitor.
 - East Primary and Backup and West Primary and Backup
 - Colored coded title bar used to help identify instances.
- DPCM Utility has four tabbed pages:
 - Operation: Basic status and control.
 - Demod: Detailed status of both DigiTrak demodulators.
 - Alarm: Alarm status and configuration.
 - Setup: IF, Pilot, and Search algorithm Setup.
- Status panel at the bottom of the window provides:
 - TCP/IP connection status.
 - Unit Version and S/N.
 - Informational messages.

DPCM Utility: Operation Tab View

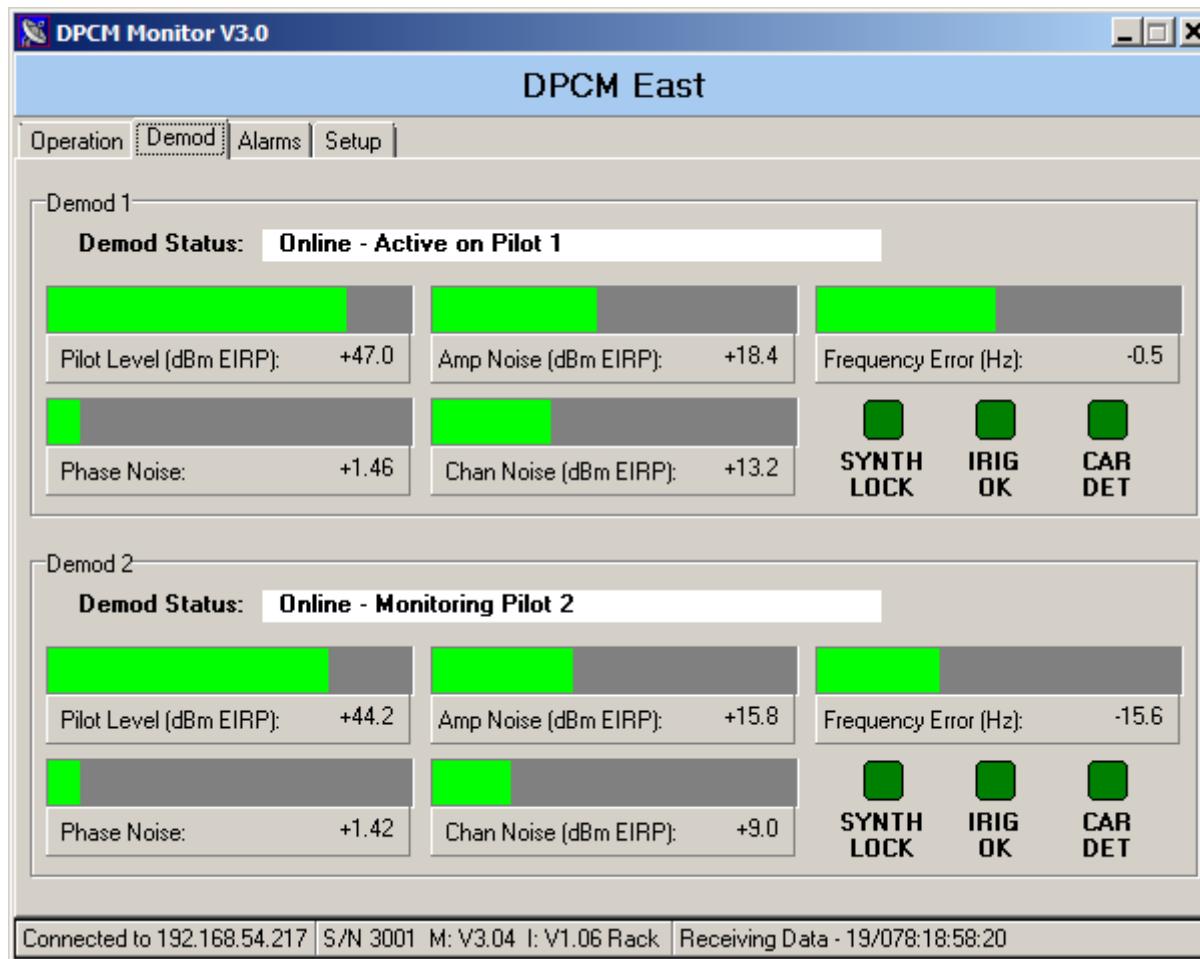


DPCM Utility: Operation Tab Description



- Eight Status indicators parrot the DPCM's front panel LEDs
- DPCM State: Reports a variety of states as the DPCM locates and validates the Telemetry carrier, and then proceeds to locate and validate the Pilot.
- VCO feedback voltage and equivalent frequency offset of the VCO.
- Pilot Gain & Levels group.
 - Show current Wide Band Gain (from 0 to 42 dB)
 - Optimum is around 21 dB, but 10-30 is good.
 - Will continuously vary due to satellite loading.,
 - Wide Band Signal Input Level (WB Level) in dBm
 - Optimum level is around -35 dBm.
 - Operational range is from -60 dBm to -20 dBm.
 - Active Pilot Level in dBm EIRP
 - Estimated Noise Floor level relative to the Pilot Level (also in dBm EIRP).
- Main Function Controls:
 - Swap Pilots : switch which Pilot is the Active Pilot
 - DPCM Idle : Enter the Idle mode (disables operation).
 - Pilot Search : Start or re-start the Pilot Search sequence.
 - ALARM indicator and acknowledge button.
 - DPCM IP Address edit box.
- IF Status: current IF frequency setting of the Synthesizer
- SYN LOCK: Whether or not the Up & Down Synthesizers are locked and stable.

DPCM Utility: Demod Tab View

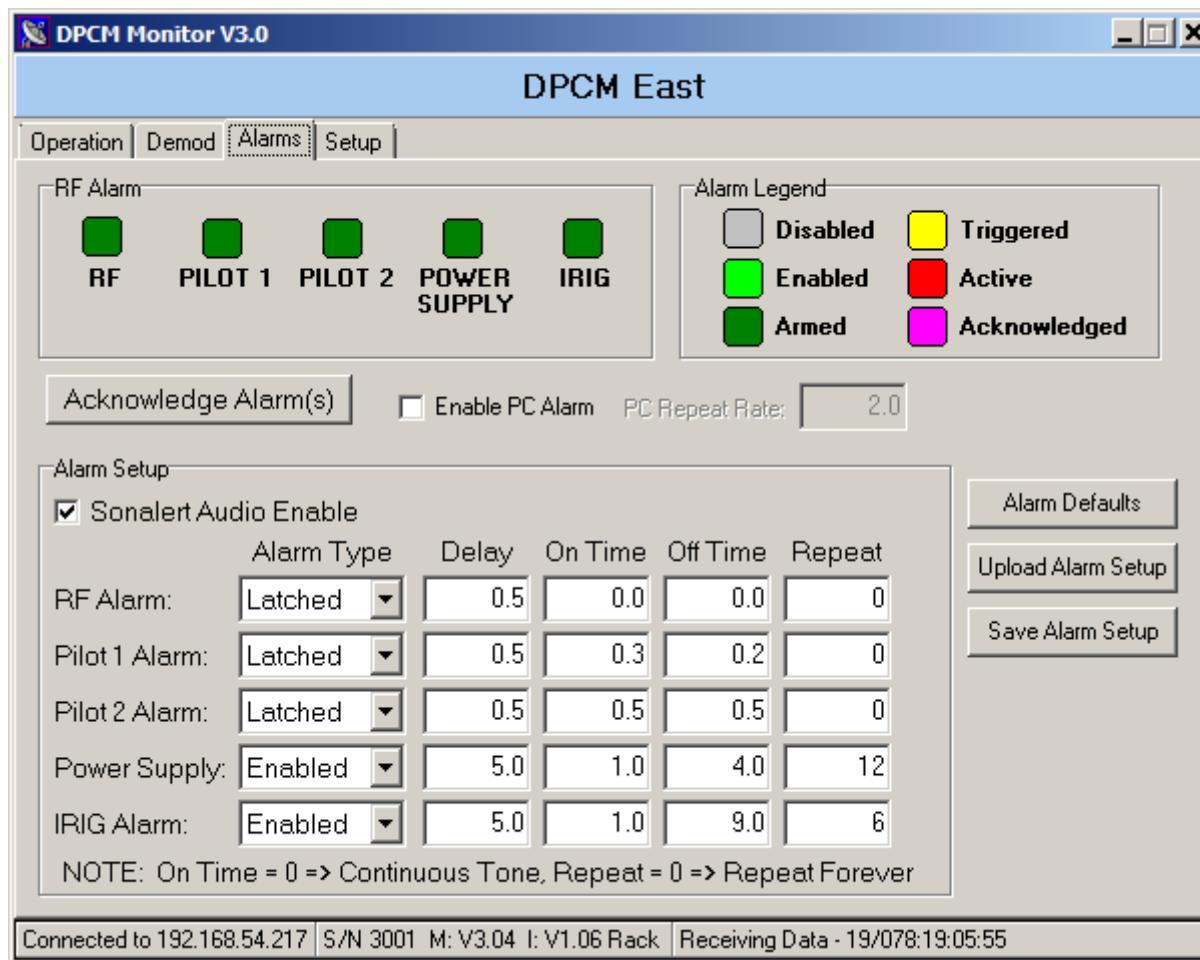


DPCM Utility: Demod Tab Description



- Shows two identical groups of visual indications providing status of the two *DigiTrak* demodulators utilized in the DPCM.
- Demod Status
- Pilot Level - in dBm EIRP
- Noise Measurements:
 - Amplitude Noise : estimate of the noise floor computed from the standard deviation of the variation in signal strength of the Pilot over a one second interval
 - Phase Noise : phase RMS of the Pilot carrier in degrees
 - Channel Noise : estimate of the noise floor by computing and average the power over an equivalent bandwidth used to monitor and track the Pilot, but offset from the Pilot by 500 Hz
- Frequency Error : the measured frequency offset of the Pilot.
- Status indicators
 - Synthesizer Lock
 - IRIG-B Ok
 - Pilot Carrier Detect

DPCM Utility: Alarms Tab View

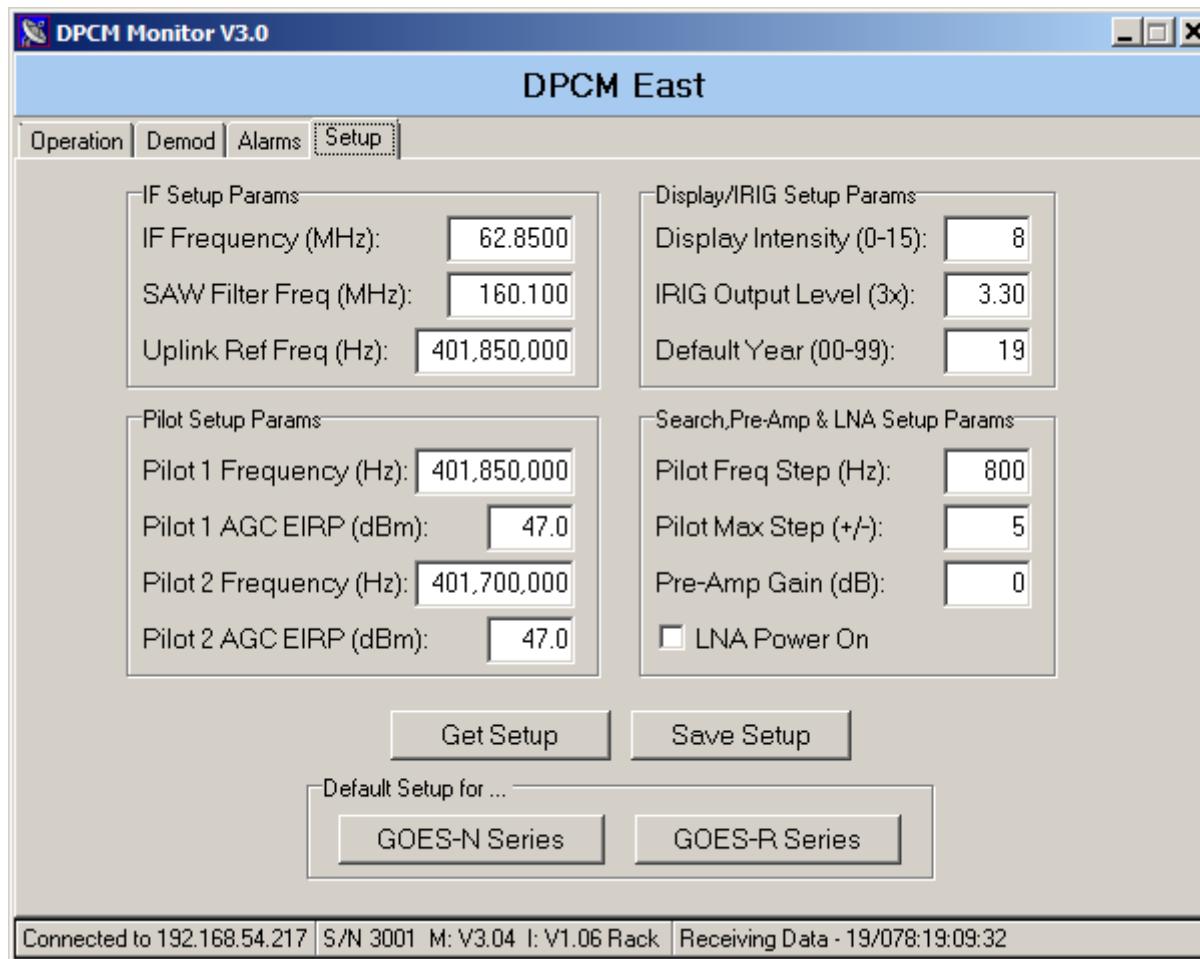


DPCM Utility: Alarms Tab Description



- Alarm Status
 - RF Alarm: Loss of input RF as indicated by wideband level.
 - Pilot 1 Alarm: DPCM not locked to Pilot 1.
 - Pilot 2 Alarm: DPCM not locked to Pilot 2.
 - Power Supply: One of the power two supplies has an error.
 - IRIG Alarm: IRIG Out not active since no time source.
- Alarm Acknowledgement button silences alarm.
- Enable PC Alarm only available in DPCM Utility.
- Alarm Setup
 - Sonalert Alarm Enable: Enables/disable front panel alarm Sonalert.
 - Alarms Configuration:
 - Alarms can Disabled, Enabled, and Latched (must be acknowledged).
 - Time Delay before activation – avoids alarm on brief outage.
 - On, Off, and Repeat setting determine the Sonalert tone sequence so each alarm can have a distinct audible indication.
- Alarm Setup Default, Upload and Save buttons on right.

DPCM Utility: Setup Tab View



- IF Setup Parameters:
 - Expected IF Frequency of Pilot 1 – Front End dependant.
 - SAW Filter Freq – Factory set to 160.100 MHz
 - Uplink Ref Freq – 5 MHz IF referenced to transmit frequency
 - Default is the Primary Pilot at 401,850,000 Hz.
 - Even if the Primary Pilot frequency is changed, this parameter should not change.
- Display/IRIG Setup Params
 - Time display brightness setting.
 - IRIG time signal peak voltage level.
 - Default year; only used if time provided from legacy (old) IRIG-B input.
- Pilot Setup Parameters
 - Uplink frequencies and amplitudes for both Pilots.
 - There has been some discussion of changing these in the future.
- Search, Pre-Amp & LNA Params
 - Search – When locating Pilots, DPCM will search from the center out in multiple steps.
 - Pilot Freq Step – size of each step in Hertz.
 - Pilot Max Step – how many positive and negative steps to make from center
 - Default values of 800 Hz and 5 provide ± 4500 Hz total search range.
 - Acquisition range at each step is a 1000 Hz so default of 800 Hz provides some overlap.

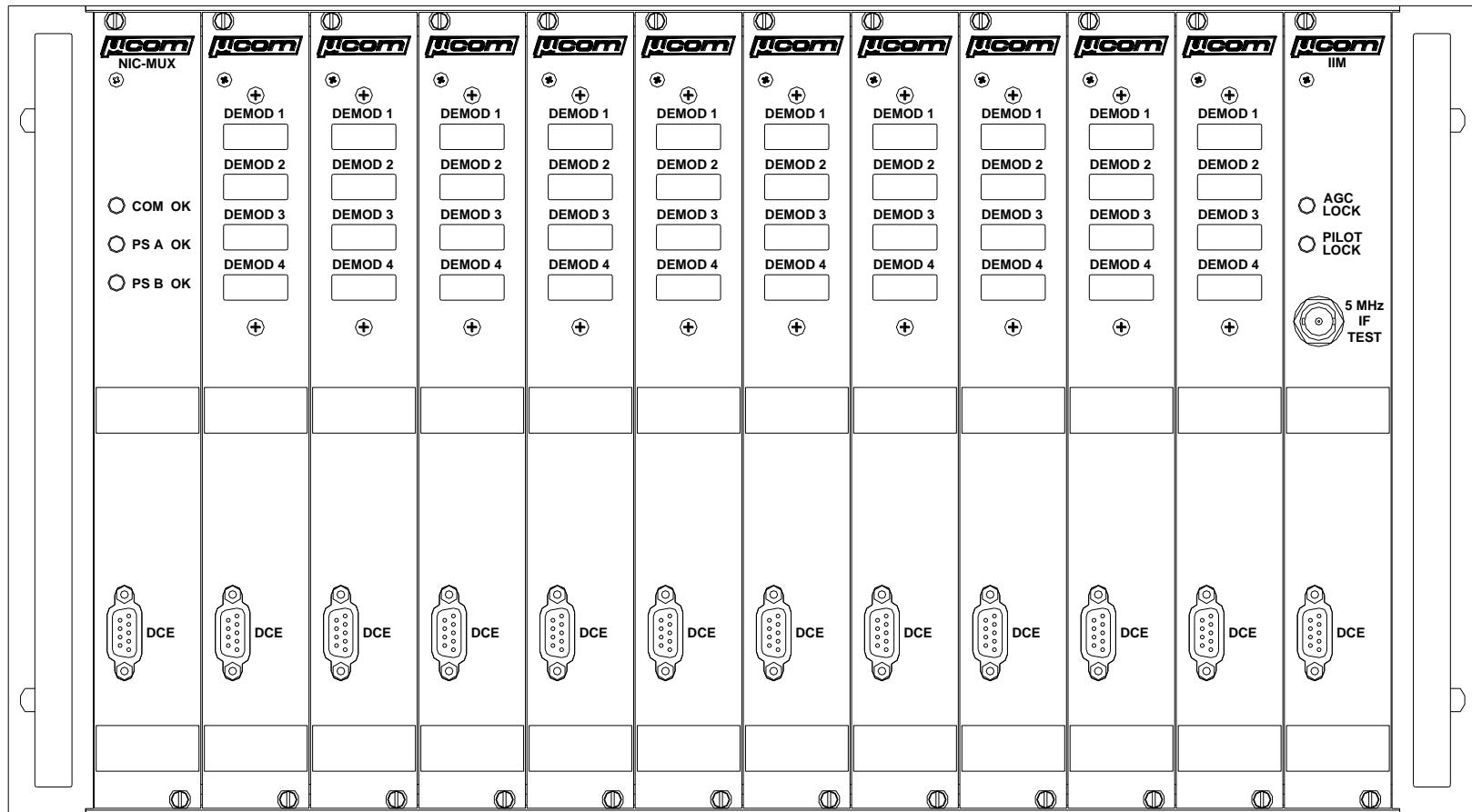
- Search, Pre-Amp & LNA Params (continued)
 - Pre-Amp Gain – provides manual adjustment of preamplifier gain to adjust for input signal level variations from site-to-site.
 - ± 15 dB adjustment range
 - Lower input levels (< -45 dBm) will typically require positive gain.
 - Higher input levels (> -30 dBm) will typically require attenuation or negative gain.
 - Goal is to get Wideband Gain near center of operation.
 - LNA Power On – allows enabling/disabling DC to Front-End (LNA/BDC).
 - Should never be checked for both NOAA sites.
 - Confirmation prompts are requested when enabling power for safety.
 - **NOTE: NOAA DPCMs have been hardware modified to prevent LNA DC power.**
- Quick Default Setup Buttons
 - Simplify adjusting IF Frequency for specific series of GOES Satellites.
 - Essentially obsolete as of GOES-17 going online.
- **IMPORTANT NOTES:**
 - **After changing and saving settings any frequency settings, a new Pilot search must be initiated from the Operation tab to force the DPCM to use the new settings.**
 - **Pre-Amp Gain can be adjusted without requiring a new Pilot Search, but adjustments should be limited to 5 dB changes to avoid causing DPCM to lose Pilot lock.**



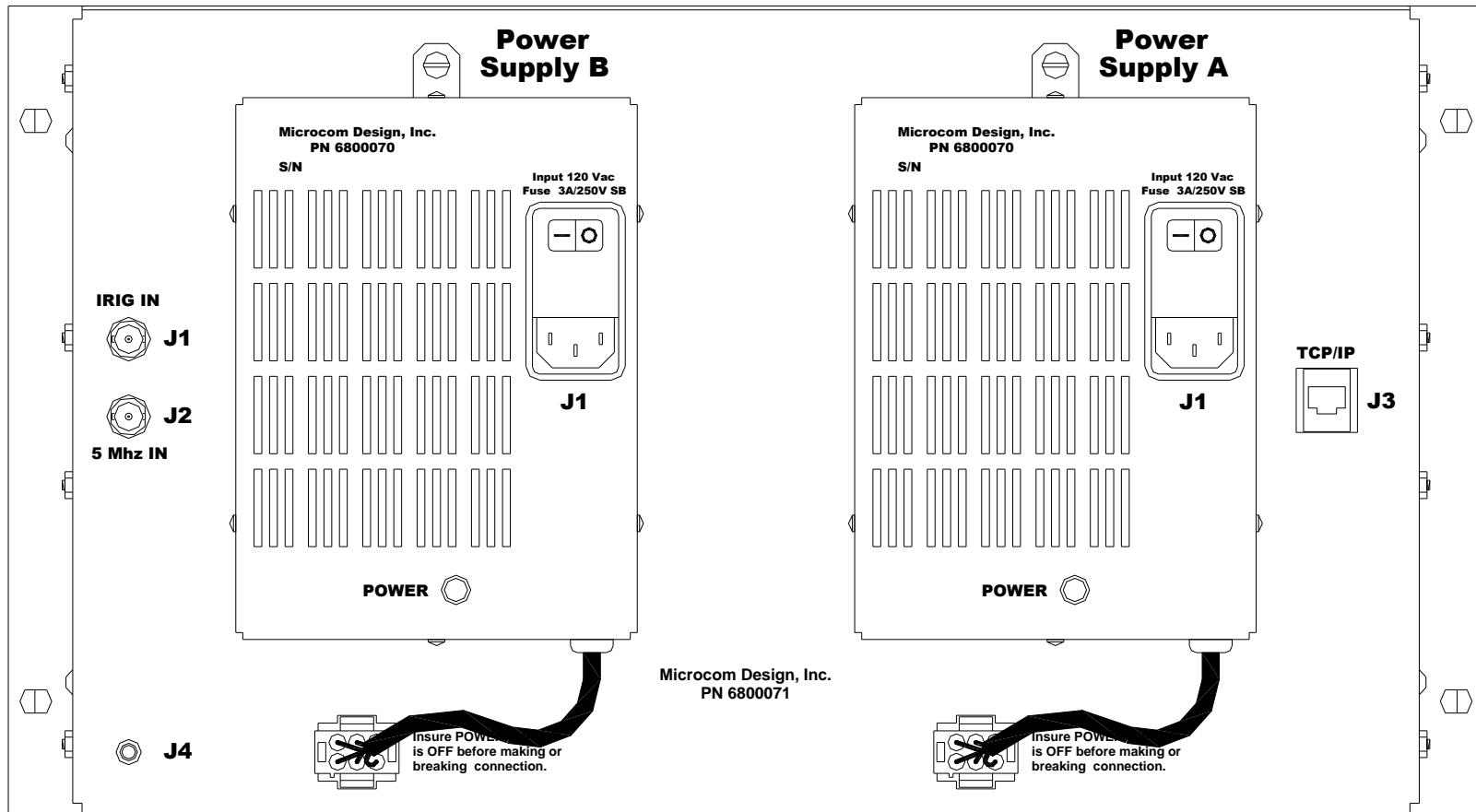
DRGS Hardware Components

DAMS-NT DigiTrak Cage

DAMS-NT Cage: Front View



DAMS-NT Cage: Rear View



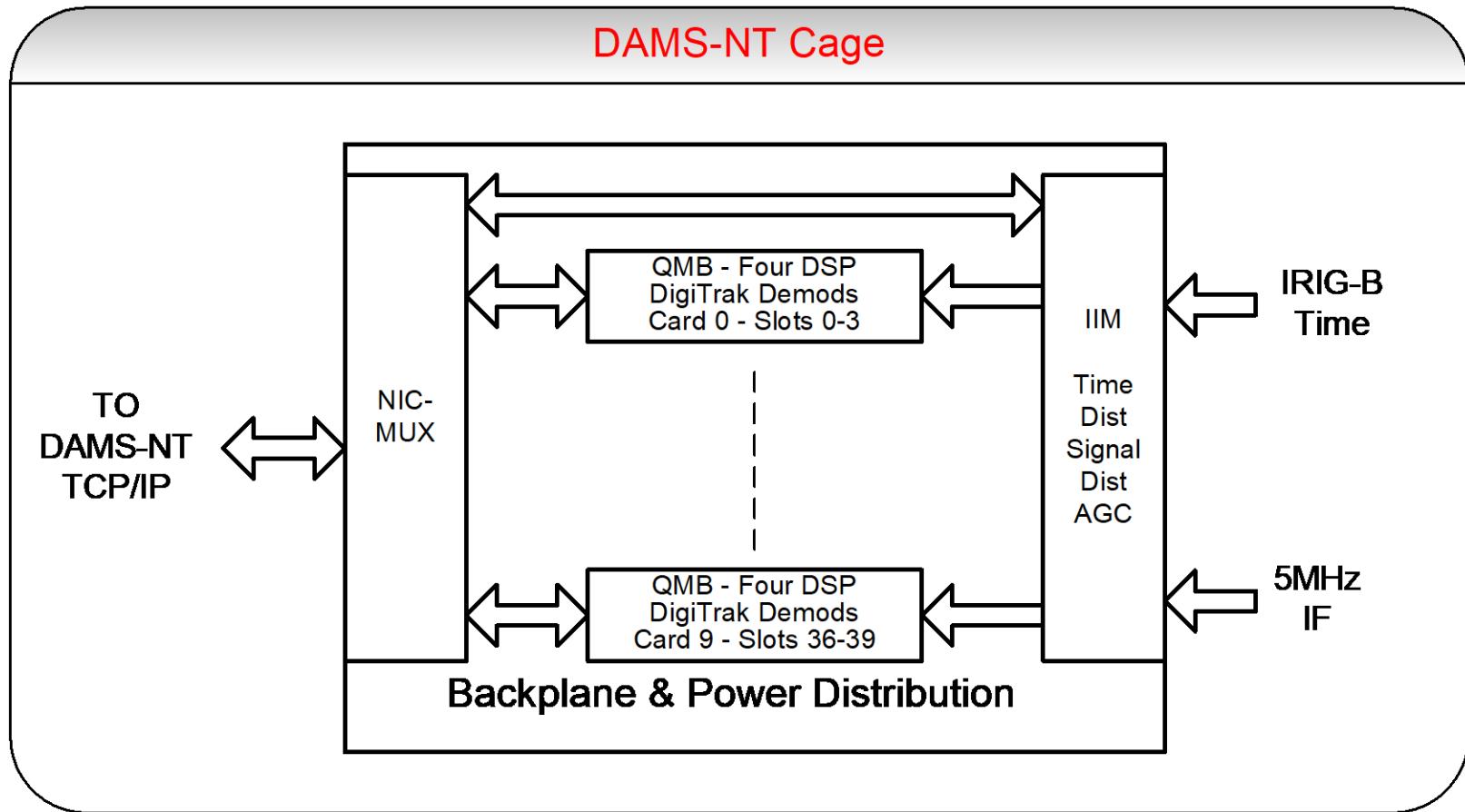
DAMS-NT Cage: Key Features



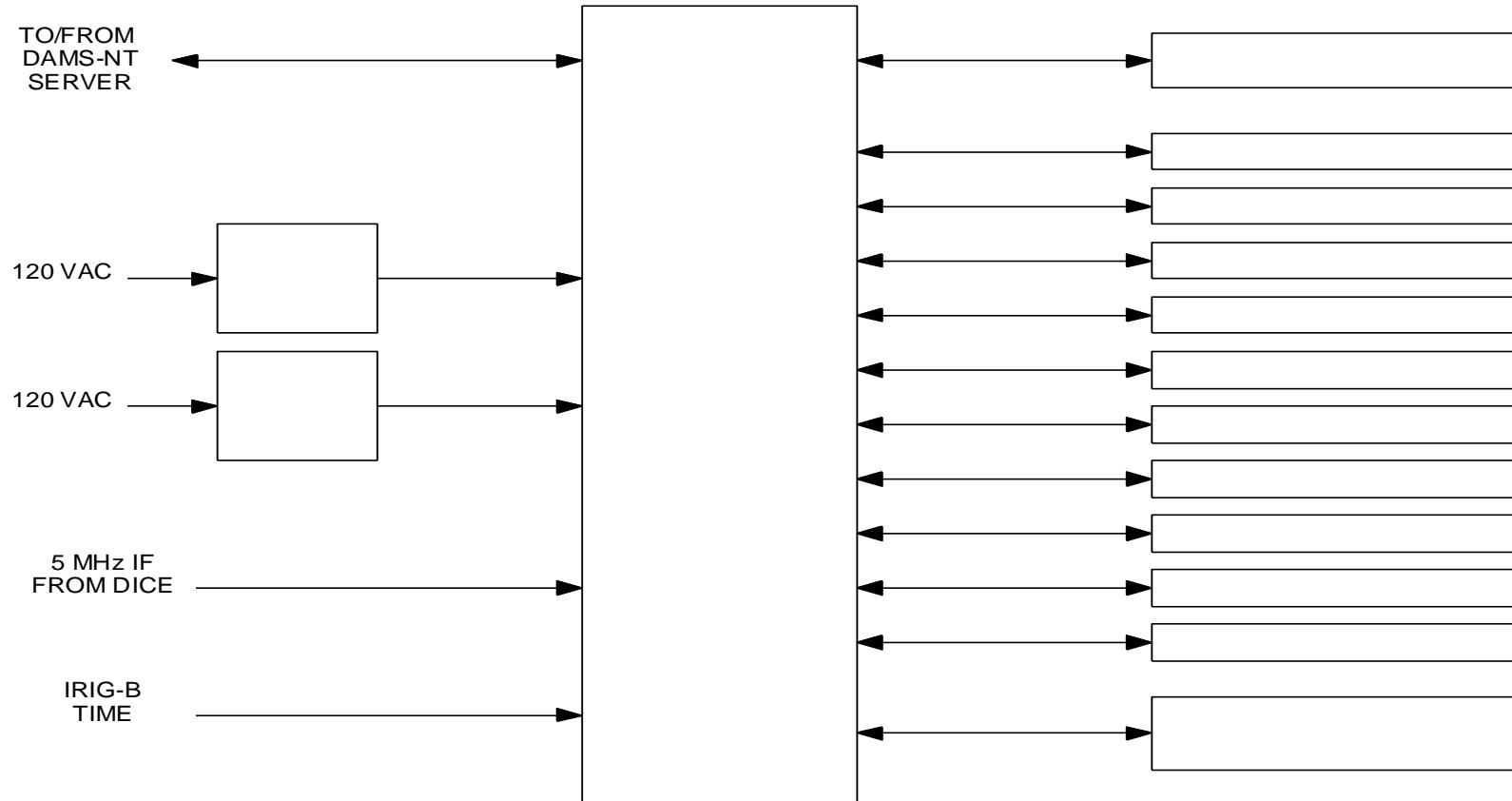
- Consists of Twelve Hot-Swappable Plug-In Cards
 - NIC-MUX on Left and IIM on Right
 - Ten Quad Motherboard (QMB) Demod Cards in Center
- NIC-MUX Provides Common Interface Point
 - **When swapping NIC-MUX need to verify Port Security is not enabled (check with IT department before installing new NIC-MUX).**
 - **Also have to reconfigure both DAMS-NT instances for new IP address.**
- IIM Accepts Composite IF and Distributes to Demodulators
 - IIM Can work off either Pilot 1 or Pilot 2
 - Auto Failover if Active Pilot is Lost
- Each QMB Provides 4-Char Alpha LED Display for Each Demod
- Each QMB Card May Contain Up to 4 Demodulators
 - 40 Demodulators Per Chassis
 - Not BAUD Specific – Operate 100, 300, 1200 bps, or Auto 100/300
 - Demods now support CS1, CS2 and Dual CS1/CS2 Modes
- Easy To Replace Redundant Power Supplies
 - Two Identical Power Supplies Mounted on Rear
 - Single Supply can Power the Cage ⇒ Hot Replacement
- IRIG-B Time Input
 - Demods Time Stamp GOES Messages to the Millisecond

- No External Mechanical Operator Adjustments
 - All Calibration Operations are Software Calibrations
 - Only regular (annual) calibration required is to calibrate the demods to the Pilot (frequency and amplitude).
- Tightly Matched IF Distribution
 - IF Signal paths within 0.1 dB across entire suite of demodulators.
 - IF Filtering within 0.5 dB across entire GOES DCS Spectrum
- Fast Data Throughput
 - Backplane Communications @ 19.2K bps
 - External Communications via 10/100 MBit TCP/IP
- All Component Firmware is In-Application-Programmable
 - Entire system can be re-programmed from DAMS-NT Server

DAMS-NT Cage: Overview



DAMS-NT Cage: Block Diagram



- Composite 5 MHz IF and IRIG-B provided to each DAMS-NT Cage at the IIM unit.
- IIM buffers and redistributes 5 MHz IF and IRIG-B to each of the ten Quad Motherboards (QMB) within the chassis.
- Each QMB buffers and redistributes 5 MHz IF and IRIG-B to each of the four *DigiTrak* DSP Demods.
- Each Demodulator can receive and demodulate on any single channel at any GOES DCS BAUD rate, including Auto 100/300.
- Each demodulator can operate in CS1, CS2 or Dual CS1/CS2 Mode.

- Each *DigiTrak* DSP Demodulator outputs message data, quality information, and time stamps via low-level RS-232 serial data path to Quad Motherboard Microcontroller.
- Each Quad Motherboard buffers serial data from demodulators, packetizes the data, and transmits it via independent RS-232 serial paths to NIC-MUX.
- NIC-MUX collects message and status data from each of the ten Quad Motherboards and the IIM.
- The NIC-MUX buffers the data, formats it into TCP/IP packets, and forwards the packets to DAMS-NT Server.
 - DCP packets sent upon completion of the GOES message.
 - Status packets sent on fixed report interval.

DAMS-NT Cage: Input Interface Module



- Uses *DigiTrak* DSP to provide Pilot Lock.
- Pilot Level monitored to provide AGC; ensures DCP signal strengths measured relative to constant pilot.
- Front Panel RS-232 Port allows for local monitoring of Pilot Status.
- NIC-MUX RS-232 Port provides diagnostic and status to DAMS-NT Server.
- Default is to use Primary Pilot.
- Locks to and switches over to Backup in the event the Primary Pilot is not Present.

DAMS-NT Cage: Quad Mother Board



- Each *DigiTrak* DSP Demodulator operates independently.
- Each demodulator has own IRIG-B input for time stamping.
- Not necessary to have all four demodulators installed.
- Display module contains four alphanumeric LED displays; one for each demodulator.
- Displays provide local message status (similar information is also provided in DAMS-NT Server GUI screen).
- Front Panel RS-232 Port provides local test and diagnostics.

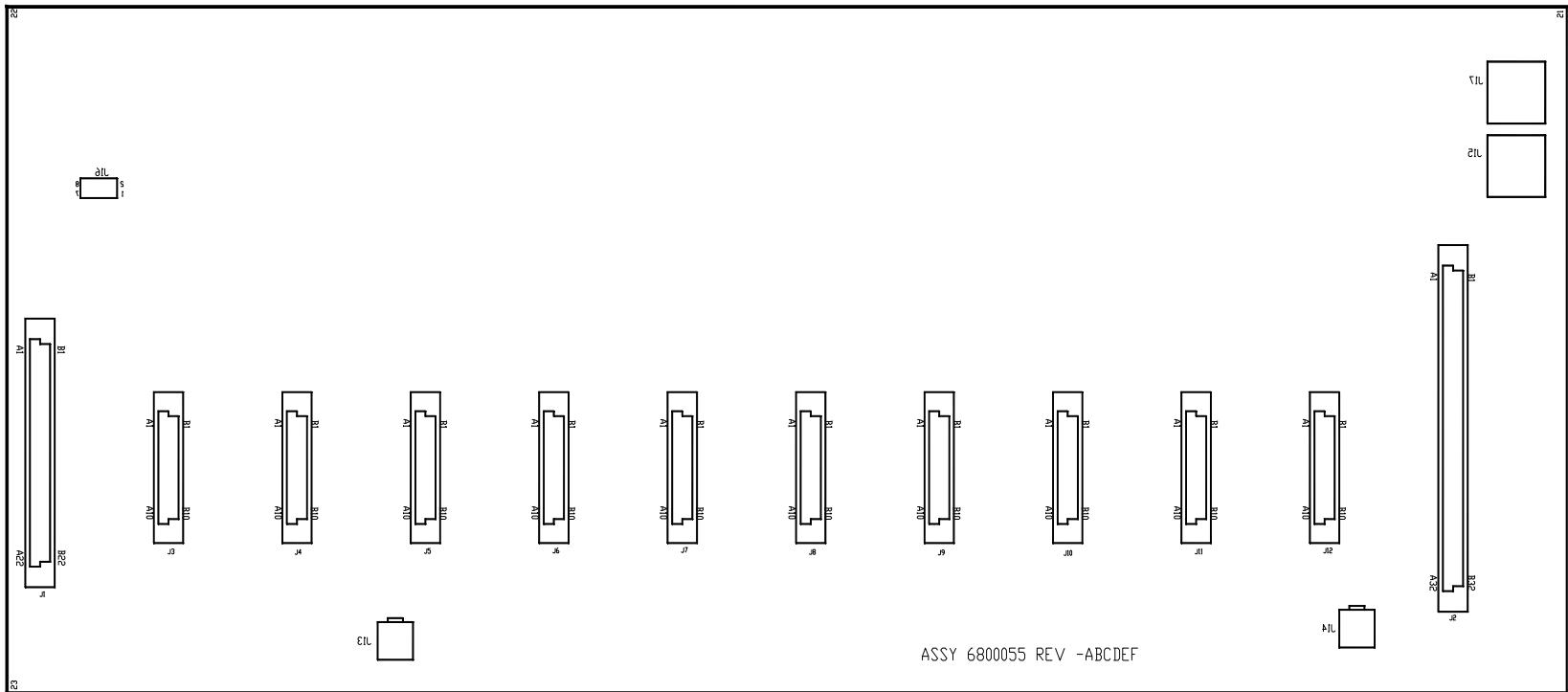
DAMS-NT Cage: *DigiTrak* DSP Demod



- Digital Signal Processing to demodulate GOES DCP messages.
- Supports all GOES data rates – 100, 300, 1200 and Auto 100/300 detection.
- CS1, CS2, and Dual CS1/CS2 Modes.
- Full GOES DCS channel coverage, including new CS2 channels (301-566).
- Frequency Acquisition Range is customizable. Added for CS2, but can also prove useful for diagnostics.
- Message reception time stamped to 1 millisecond
- External hardware to provide intermediate IF mix-down and anti-aliasing filtering.
- Final mix and baseband filtering in DSP firmware.
 - Has allowed CS2 support without requiring any hardware modifications.

- Utilizes two Texas Instruments ARM Processor with custom firmware.
- Separate embedded serial-to-Ethernet module to provide network communications.
- Front Panel RS-232 Port provides ANSI Terminal to DOS Machine.
- COM LED provides feedback of connection to DAMS-NT Server(s).
- Provides local Power Supply status via front panel LEDs.
- Supports Dual DAMS-NT Server for Redundancy

DAMS-NT Cage: Backplane Layout



ASSY 6800055 REV -ABCDEF

- IIM, Quad Motherboard, and NIC-MUX use distinct connectors to prevent erroneous installation.

- Design allows swapping one power supply while cage operates off the other.
- Supplies are diode or'd together at each assembly using a 1 diode/3 diode summing node.
- Supplies A and B alternate pins on backplane to ensure supplies share the total load.
 - NIC-MUX uses A as primary/B as Backup; 1ST QMB uses B as primary/A as Backup; 2ND A/B; 3RD B/A; ...; 10TH A/B; IIM B/A.
- Each supply is mounted using "L" shaped tabs inserted into slots on back panel; single thumb lock screw facilitates quick replacement.
- Each supply has independent Line Filter/Fuse/On/Off Switch and Output Power indicator.
- Detachable power cord at line filter facilitates removal of AC power during replacement.



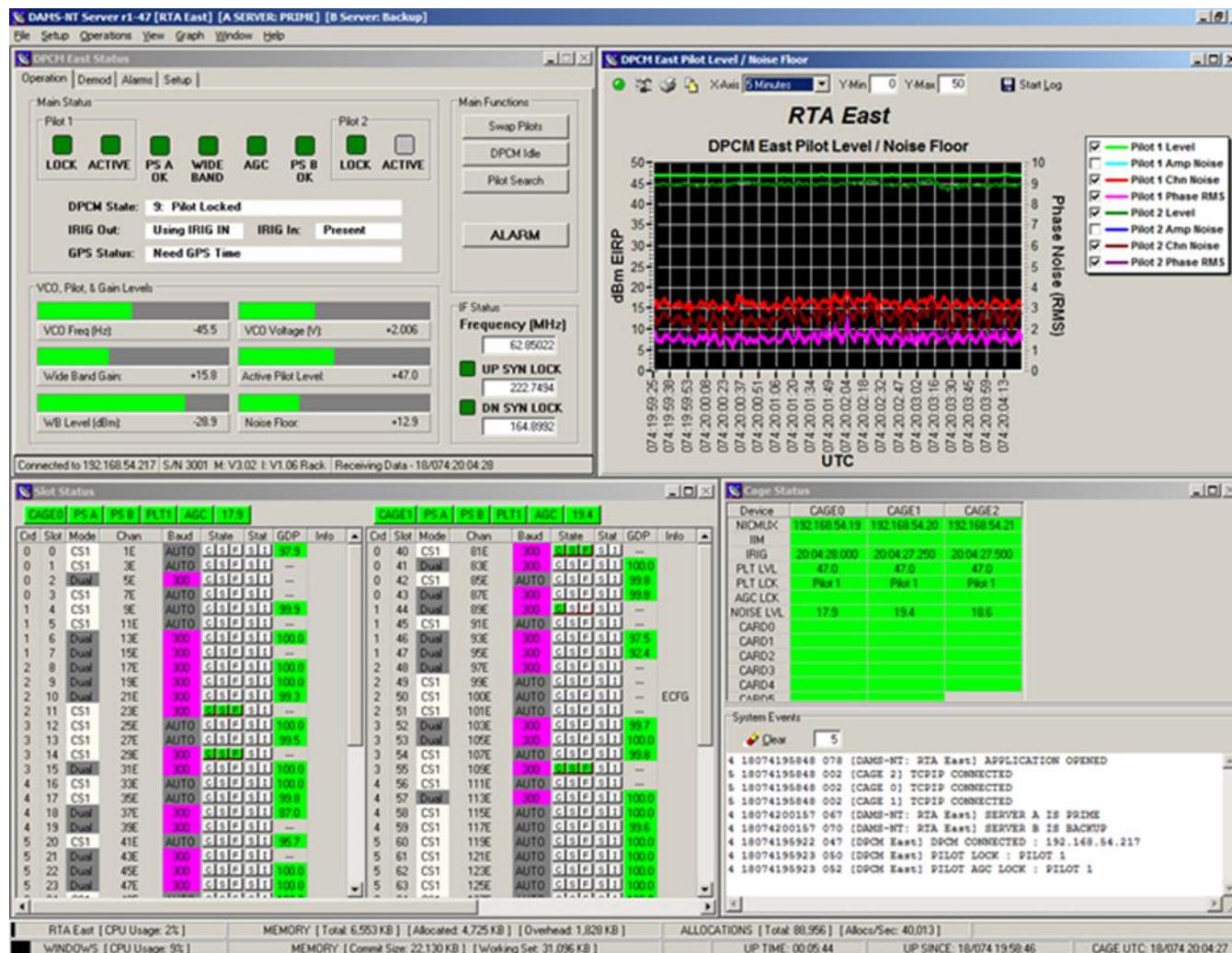
DRGS Software Components

DAMS-NT Server and Client

- DAMS-NT Server:
 - Two instances running on both Real-Time A and B servers (RTA and RTB); one instance for East and another for West.
 - Connects to DAMS-NT Cage(s) and ingests DCS message data and quality statistics from demodulators.
 - Disseminates message information to network connected clients (DADDS, DAMS-NT Client, LRGS, OpenDCS).
 - Provided redundancy and failover features:
 - Dual DAMS-NT Server configuration; Prime/Backup operation.
 - Preferred Pilot for DPCM and Cages.
 - Auto transfer of channel configuration from failed demod to a spare, or even from a failed cage to another cage.
 - Like DADDS, DAMS-NT Server applications run under AlwaysUp interface to ensure automatic start on boot (pseudo Service).
- DAMS-NT Client:
 - Installed on Process Monitors in Quiet Room.
 - Allows monitoring and limited control of DAMS-NT Servers.
 - Does not provide configuration capability of DAMS-NT Servers.

- DCS Data Acquisition and Monitoring System (New Technology)
- DAMS-NT Server and Client Provide:
 - Real-time monitoring of:
 - Message reception quality.
 - DCS Pilot status.
 - DPCM hardware status.
 - DAMS-NT Cage status.
 - System events.
 - Similar graphical user interfaces (GUI)
- DAMS-NT Client provides convenient way to monitor and control DAMS-NT Servers that are operating under AlwaysUp.
 - AlwaysUp interface was added to meet Windows and IT Security requirements that force login before applications can be started.
 - Update to Windows Server 2016 OS as part of DADDS refresh complicated AlwaysUp user interface.
 - DAMS-NT Client will become more important for normal operations.

DAMS-NT Server: Application



DAMS-NT Server: Main Status Windows



- The DAMS-NT Server has four main status windows.
- These screens which cannot be closed (only minimized).
- Slot Status:
 - Detailed information about each cage, and
 - All demodulators, also called slots.
- Cage Status:
 - General information about the health of each cage.
 - Provides historical Event log.
- Socket Status:
 - Status of DAMS-NT Server sockets.
 - Shows connected Clients and there statistics.
- DPCM Status:
 - Monitoring and Control of the DPCM itself.
 - Live Status information on both Pilots.

DAMS-NT Server: Slot Status



- Real-Time Status of the DAMS-NT QMBs and Demodulators.
- Activity and Faults are Updated Continuously.
- Color-coded ...
 - Fault Indicators
 - Operating (Certification) Mode, Data Rate Assignments
 - Received DCS Data Rate, Message Status Indicators, Last Message Data Quality

Slot Status

CAGE0	PS A	PS B	PLT1	AGC	18.1
0	0	CS2	1E	300	C S F S I
0	1	Dual	3E	300	C S F S I
0	2	Dual	5E	300	C S F S I
0	3	CS1	7E	AUTO	C S F S I
1	4	CS1	9E	AUTO	C S F S I
1	5	CS1	11E	AUTO	C S F S I
1	6	Dual	13E	300	C S F S I
1	7	Dual	15E	300	C S F S I
2	8	Dual	17E	300	C S F S I
2	9	Dual	19E	300	C S F S I
2	10	Dual	21E	300	C S F S I
2	11	CS1	23E	AUTO	C S F S I
3	12	CS1	25E	AUTO	C S F S I
3	13	CS1	27E	AUTO	C S F S I
3	14	Dual	29E	300	C S F S I
3	15	Dual	31E	300	C S F S I
4	16	CS1	33E	AUTO	C S F S I
4	17	CS1	35E	AUTO	C S F S I
4	18	Dual	37E	300	C S F S I
4	19	Dual	39E	300	C S F S I
5	20	CS1	41E	AUTO	C S F S I
5	21	Dual	43E	300	C S F S I
5	22	Dual	45E	300	C S F S I
5	23	Dual	47E	300	C S F S I
6	24	CS1	49E	AUTO	C S F S I
6	25	CS1	51E	AUTO	C S F S I
6	26	Dual	53E	300	C S F S I
6	27	Dual	55E	300	C S F S I
7	28	CS1	57E	300	C S F S I
7	29	Dual	59E	300	C S F S I
7	30	CS1	61E	AUTO	C S F S I
7	31	CS1	63E	AUTO	C S F S I
8	32	CS1	65E	300	C S F S I
8	33	Dual	67E	300	C S F S I
8	34	CS1	69E	AUTO	C S F S I
8	35	CS1	71E	AUTO	C S F S I
8	36	Dual	73E	300	C S F S I
9	37	CS1	75E	AUTO	C S F S I
9	38	CS1	77E	AUTO	C S F S I
9	39	CS1	79E	AUTO	C S F S I

CAGE1	PS A	PS B	PLT1	AGC	18.2
0	40	CS1	81E	300	C S F S I
0	41	Dual	83E	300	C S F S I
0	42	CS1	85E	AUTO	C S F S I
0	43	Dual	87E	300	C S F S I
1	44	Dual	89E	300	C S F S I
1	45	CS1	91E	AUTO	C S F S I
1	46	Dual	93E	300	C S F S I
1	47	CS2	95E	300	C S F S I
2	48	Dual	97E	300	C S F S I
2	49	CS1	99E	AUTO	C S F S I
2	50	CS1	100E	AUTO	C S F S I
2	51	CS1	101E	AUTO	C S F S I
3	52	Dual	103E	300	C S F S I
3	53	Dual	105E	300	C S F S I
3	54	CS1	107E	AUTO	C S F S I
3	55	CS1	109E	AUTO	C S F S I
4	56	CS1	111E	AUTO	C S F S I
4	57	Dual	113E	300	C S F S I
4	58	CS1	115E	AUTO	C S F S I
4	59	CS1	117E	AUTO	C S F S I
5	60	CS1	119E	AUTO	C S F S I
5	61	CS1	121E	AUTO	C S F S I
5	62	CS1	123E	AUTO	C S F S I
5	63	CS1	125E	AUTO	C S F S I
6	64	CS1	127E	AUTO	C S F S I
6	65	CS1	129E	AUTO	C S F S I
6	66	CS1	131E	AUTO	C S F S I
6	67	CS1	133E	AUTO	C S F S I
7	68	CS1	135E	AUTO	C S F S I
7	69	Dual	137E	300	C S F S I
7	70	Dual	139E	300	C S F S I
7	71	Dual	141E	300	C S F S I
8	72	Dual	143E	300	C S F S I
8	73	Dual	145E	300	C S F S I
8	74	Dual	147E	300	C S F S I
8	75	Dual	149E	300	C S F S I
9	76	Dual	151E	300	C S F S I
9	77	CS1	153E	AUTO	C S F S I
9	78	Dual	155E	300	C S F S I
9	79	Dual	157E	300	C S F S I

March/April 2019

Microcom Design, Inc.

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DAMS-NT Server: Fault Examples



CAGE2		PS A	PS B	PLT	AGC	17.0		
Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info
0	80	Dual	161E	300	C S F	S I	100.0	
0	81	Dual	163E	300	C S F	S I	100.0	
0	82	Dual	165E	300	C S F	S I	100.0	
0	83	CS1	167E	300	C S F	S I	...	
1	84	Dual	169E	300	C S F	S I	99.8	
1	85	Dual	171E	300	C S F	S I	100.0	
1	86	Dual	173E	300	C S F	S I	99.6	
1	87	Dual	175E	300	C S F	S I	99.3	
2	88	CS1	177E	300	C S F	S I	...	
2	89	CS1	181E/91A	1200	C S F	S I	100.0	
2	90	CS1	185E/93A	1200	C S F	S I	99.8	
2	91	CS1	189E/95A	1200	C S F	S I	...	
3	92	CS1	193E/97A	1200	C S F	S I	81.9	
3	93	CS1	197E/99A	1200	C S F	S I	...	
3	94	Dual	195E	300	C S F	S I	100.0	
3	95	Dual	201E	300	C S F	S I	99.8	
4	96	CS1	203E	AUTO	---	---	---	COMM
4	97	CS1	205E	300	C S F	S I	...	
4	98	Dual	207E	300	C S F	S I	98.9	
4	99	Dual	209E	300	C S F	S I	100.0	
5	100	CS1	213E/107A	1200	C S F	S I	99.2	
5	101	CS1	215E	300	C S F	S I	...	
5	102	CS1	216E	AUTO	C S F	S I	60.0	
5	103	Dual	217E	300	C S F	S I	100.0	

- Detected faults (red) or warnings (yellow) may apply to an individual demod ...
 - Slot 96: Demodulator Comm Error
 - Slot 99: IRIG Warning
- Cage indicator will be red whenever there is a fault anywhere in the cage.
- Red indications for Poor Message Quality are not a "Fault" with the Cage.

Slot Status								
CAGED		PS A	PS B	PLT	AGC	16.3	GDP	Info
Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info
0	0	CS1	1E	AUTO	---	---	---	---
0	1	CS1	3E	100	---	---	---	---
0	2	CS1	5E	AUTO	---	---	---	---
0	3	Dual	7E	300	---	---	---	---
1	4	CS1	9E	100	C S F	S I	100.0	
1	5	CS1	11E	100	C S F	S I	100.0	
1	6	CS1	13E	AUTO	C S F	S I	100.0	
1	7	CS1	15E	AUTO	C S F	S I	100.0	

- Or they may apply to an entire DAMS-NT Card or the entire Cage.
 - QMB 0: Lost Communications
 - Power Supply B Down

DAMS-NT Server: Slot Status Details



Slot Status									
CAGE0		PS A	PS B	PLT1	AGC	19.2			
Crd	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	
0	0	CS2	1E	300	C S F S I	...			
0	1	Dual	3E	300	C S F S I	...			
0	2	Dual	5E	300	C S F S I	...			
0	3	CS1	7E	AUTO	C S F S I	...			
1	4	CS1	9E	AUTO	C S F S I	...			
1	5	CS1	11E	AUTO	C S F S I	...			
1	6	Dual	13E	300	C S F S I	...			
1	7	Dual	15E	300	C S F S I	96.6			
2	8	Dual	17E	300	C S F S I	94.1			
2	9	CS2	19E	300	C S F S I	...			
2	10	Dual	21E	300	C S F S I	...			
2	11	CS1	23E	AUTO	C S F S I	99.7			
3	12	CS1	25E	AUTO	C S F S I	99.7			
3	13	CS1	27E	AUTO	C S F S I	98.6			
3	14	Dual	29E	300	C S F S I	...			
3	15	Dual	31E	300	C S F S I	99.5			

CAGE1									
CAGE1		PS A	PS B	PLT1	AGC	19.8			
Crd	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	
0	40	CS1	81E	300	C S F S I	...			
0	41	CS2	83E	300	C S F S I	...			
0	42	CS1	85E	AUTO	C S F S I	...			
0	43	Dual	87E	300	C S F S I	...			
1	44	Dual	89E	300	C S F S I	97.8			
1	45	CS1	91E	AUTO	C S F S I	...			
1	46	Dual	93E	300	C S F S I	...			
1	47	Dual	95E	300	C S F S I	96.8			
2	48	Dual	97E	300	C S F S I	...			
2	49	CS1	99E	AUTO	C S F S I	...			
2	50	CS1	100E	AUTO	C S F S I	...	ECFG		
2	51	CS1	101E	AUTO	C S F S I	...			
3	52	Dual	103E	300	C S F S I	99.1			
3	53	Dual	105E	300	C S F S I	96.7			
3	54	CS1	107E	AUTO	C S F S I	97.7			
3	55	CS1	109E	AUTO	C S F S I	98.3			

CAGE2									
CAGE2		PS A	PS B	PLT1	AGC	20.5			
Crd	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	
0	80	Dual	159E	300	C S F S I	100.0			
0	81	Dual	161E	300	C S F S I	99.5			
0	82	Dual	163E	300	C S F S I	82.8			
0	83	Dual	165E	300	C S F S I	87.5			
1	84	CS1	167E	AUTO	C S F S I	98.2			
1	85	Dual	169E	300	C S F S I	99.8			
1	86	CS1	171E	300	C S F S I	...			
1	87	Dual	173E	300	C S F S I	98.4			
2	88	CS1	175E	AUTO	C S F S I	99.0			
2	89	CS1	177E	300	C S F S I	...			
2	90	Dual	181E/91A	1200	C S F S I	100.0			
2	91	CS1	185E/93A	1200	C S F S I	93.5			
3	92	CS1	189E/95A	1200	C S F S I	...			
3	93	Dual	193E/97A	1200	C S F S I	100.0			
3	94	Dual	195E	300	C S F S I	...	ECFG		
3	95	CS1	197E/99A	1200	C S F S I	...			

- Support for Up to 4 Cages
 - Numbered 0 - 3
 - 160 Channels Total
 - Cage Identified by TCP/IP Address
- Slot Status Information (Stat)
 - Mode, Channel, Baud
 - State: **C**arrier, **S**ymbol, **F**rame
 - Status: **S**ynthesizer & **I**RIG
- Last Message Quality (GDP)
 - Good Phase Percentage (Typical)
 - Phase Noise
 - Signal-to-Noise Ratio (SNR)
 - Bit-Error Rate (BER) Estimate
- Information (Info) – Error Details & Special Configuration (ECFG)

DAMS-NT Server: Cage Banks



Slot Status - Cage Bank 1												Slot Status - Cage Bank 2																
CAGE3						CAGE4						CAGE5						CAGE6										
Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info		
0	123	CS2	307E	300	C S F S I	...			0	160	CS2	381E	300	C S F S I	...			0	200	CS2	461E	300	C S F S I	...				
1	124	CS2	309E	300	C S F S I	...			0	161	CS2	383E	300	C S F S I	...			0	201	CS2	463E	300	C S F S I	...				
1	125	CS2	311E	300	C S F S I	...			0	162	CS2	385E	300	C S F S I	...			0	202	CS2	465E	300	C S F S I	...				
1	126	CS2	313E	300	C S F S I	...			0	163	CS2	387E	300	C S F S I	...			0	203	CS2	467E	300	C S F S I	...				
1	127	CS2	315E	300	C S F S I	...			1	164	CS2	389E	300	C S F S I	...			1	204	CS2	469E	300	C S F S I	...				
2	128	Slot Status - Cage Bank 0																										
2	129	CAGE0						CAGE1						CAGE2						CAGE3								
2	130	Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info	Cr	Slot	Mode	Chan	Baud	State	Stat	GDP	Info
2	131	0	0	CS1	1E	AUTO	C S F S I	...			0	40	CS1	81E	AUTO	C S F S I	100.0			0	80	Dual	161E	300	C S F S I	100.0		
3	132	0	1	CS1	3E	100	C S F S I	...			0	41	Dual	83E	300	C S F S I	100.0			0	81	Dual	163E	300	C S F S I	100.0		
3	133	0	2	CS1	5E	AUTO	C S F S I	100.0			0	42	CS1	85E	AUTO	C S F S I	100.0			0	82	CS1	165E	300	C S F S I	...		
3	134	0	3	Dual	7E	300	C S F S I	...			0	43	CS1	87E	AUTO	C S F S I	100.0			0	83	CS1	167E	300	C S F S I	...		
4	135	1	4	CS1	9E	100	C S F S I	100.0			1	44	CS1	89E	AUTO	C S F S I	100.0			1	84	Dual	169E	300	C S F S I	99.9		
4	136	1	5	CS1	11E	100	C S F S I	100.0			1	45	CS1	91E	AUTO	C S F S I	...			1	85	Dual	171E	300	C S F S I	100.0		
4	137	1	6	CS1	13E	AUTO	C S F S I	100.0			1	46	CS1	93E	AUTO	C S F S I	100.0			1	86	Dual	173E	300	C S F S I	65.1		
4	138	1	7	CS1	15E	AUTO	C S F S I	100.0			1	47	CS1	95E	300	C S F S I	...			1	87	CS1	175E	300	C S F S I	...		
5	139	2	8	CS1	17E	AUTO	C S F S I	100.0			2	48	CS1	97E	AUTO	C S F S I	...			2	88	Dual	177E	300	C S F S I	...		
5	140	2	9	CS1	19E	AUTO	C S F S I	100.0			2	49	CS1	99E	AUTO	C S F S I	...			2	89	CS1	181E/91A	1200	C S F S I	...		
5	141	2	10	CS1	21E	AUTO	C S F S I	...			2	50	CS1	101E	AUTO	C S F S I	...			2	90	CS1	185E/93A	1200	C S F S I	98.5		
5	142	2	11	CS1	23E	AUTO	C S F S I	...			2	51	CS1	103E	AUTO	C S F S I	99.7			2	91	CS1	189E/95A	1200	C S F S I	...		
6	143	3	12	CS1	25E	100	C S F S I	99.9			3	52	CS1	105E	300	C S F S I	...			3	92	CS1	193E/97A	1200	C S F S I	87.0		
6	144	3	13	CS1	27E	AUTO	C S F S I	99.8			3	53	CS1	107E	300	C S F S I	...			3	93	CS1	197E/99A	1200	C S F S I	...		
6	145	3	14	CS1	29E	AUTO	C S F S I	100.0			3	54	CS1	109E	AUTO	C S F S I	37.4			3	94	Dual	195E	300	C S F S I	97.4		
6	146	3	15	CS1	31E	AUTO	C S F S I	99.5			3	55	CS1	111E	AUTO	C S F S I	100.0			3	95	Dual	201E	300	C S F S I	98.5		
7	147	4	16	CS1	33E	AUTO	C S F S I	100.0			4	56	CS1	113E	300	C S F S I	...			4	96	...	...	...	...	...	...	...
7	148	4	17	CS1	35E	AUTO	C S F S I	100.0			4	57	CS1	115E	AUTO	C S F S I	100.0			4	97	...	...	...	...	...	...	...
7	149	4	18	CS1	37E	AUTO	C S F S I	...			4	58	CS1	117E	300	C S F S I	...			4	98	...	...	...	...	...	...	...

- DAMS-NT Server supports up to 8 Cages.
- For 5 or More Cages:
 - The Slot Status is split into two “Cage Bank” Screens.
 - Each screen will show half the DAMS-NT Cages.

DAMS-NT Server: Cage Status



Device	CAGE0	CAGE1	CAGE2	CAGE3
NICMUX	1009	1010	1012	1011
IIM				
IRIG	17:12:10.000	17:12:10.250	17:12:09.500	17:12:09.750
PLT LVL	47.0	0.0	46.9	46.9
PLT LCK	Pilot 1	UNLOCK	Pilot 1	Pilot 1
AGC LCK		UNLOCK		
NOISE LVL	14.8	0.0	16.9	16.8
CARD0	DOWN			
CARD1				
CARD2				
CARD3				
CARD4				
CARD5				
CARD6				
CARD7				
CARD8				
CARD9				

Device	CAGE0	CAGE1	CAGE2	CAGE3
NICMUX	1009	1010	1012	1011
IIM				
IRIG	17:14:43.000	17:14:43.250	17:14:43.500	17:14:42.750
PLT LVL	47.0	47.0	46.9	47.0
PLT LCK	Pilot 1	Pilot 1	Pilot 1	Pilot 1
AGC LCK				
NOISE LVL	17.4	15.8	16.7	16.1
CARD0				
CARD1				
CARD2				
CARD3				
CARD4				
CARD5				
CARD6				
CARD7				
CARD8				
CARD9				

System Events

Clear 4

2 12251171003 033 [RACK:DAMS-NT East][CAGE:0][CARD:0] COMM QMB DOWN
2 12251171010 029 [RACK:DAMS-NT East][CAGE:1] IIM PILOT UNLOCK
2 12251171010 030 [RACK:DAMS-NT East][CAGE:1] IIM AGC UNLOCK

2 12251171003 033 [RACK:DAMS-NT East][CAGE:0][CARD:0] COMM QMB DOWN
2 12251171010 029 [RACK:DAMS-NT East][CAGE:1] IIM PILOT UNLOCK
2 12251171010 030 [RACK:DAMS-NT East][CAGE:1] IIM AGC UNLOCK
4 12251171410 035 [RACK:DAMS-NT East][CAGE:0][CARD:0] COMM QMB UP
2 12251171414 031 [RACK:DAMS-NT East][CAGE:1] IIM PILOT LOCK
2 12251171420 032 [RACK:DAMS-NT East][CAGE:1] IIM AGC LOCK

- System Status for DAMS-NT Cages
- Top Section: Summary Status Grid with Faults Shown in Red
- Bottom Section: Fault/Event History
- Unlike Slot Status, Cage Status is not split into multiple windows when 5 or more cages in system; grid just continues to grow horizontally.

DAMS-NT Server: Socket Status



- Displays the status of the DAMS-NT Server Sockets:
 - Top Half of Screen: Listening Socket Ports and their Protocol.
 - Bottom Half of Screen: Connected Socket Clients.

The screenshot shows a Windows application window titled "Socket Status". The window has two main sections: "Sockets" and "Connected Sockets".

Sockets

Port/IP Address	Socket Type	Status	RX Bytes/Sec	TX Bytes/Sec
17010	DAMS-NT DCP	1	---	309
17014	DAMS-NT HIQ	1	---	672
17011	DAMS-NT Event	Listening	---	---
17015	DAMS-NT Stat/Cntrl	1	---	4,374
192.168.54.19	NIC-MUX 0	Connected	1,468	32
192.168.54.20	NIC-MUX 1	Connected	1,361	16
192.168.54.21	NIC-MUX 2	Connected	1,101	16

Connected Sockets

Local Port	Socket Type	Remote Port	Remote Addr	RX Cnt	TX Cnt	RX/TX Dcp
17010	DAMS-NT DCP	52717	192.168.54.242	---	176	---
17014	DAMS-NT HIQ	63393	192.168.54.242	---	1,643	---
17015	DAMS-NT Stat/Cntrl	52716	192.168.54.242	1	236	---
63396	NIC-MUX 0	4001	192.168.54.19	4,354	266	621
63395	NIC-MUX 1	4001	192.168.54.20	4,082	266	577
63397	NIC-MUX 2	4001	192.168.54.21	3,253	266	522

- DAMS-NT Server provides virtually identical status screen to DPCM Utility with following differences:
 - DAMS-NT Server does not support color coded title bar above DPCM status screen.
 - DPCM IP Address not shown on Operation tab.
 - DPCM IP Address definable in DAMS-NT Server Preferences on DPCM/IIM tab.
 - No PC Alarm controls on Alarm tab.

DAMS-NT Client: Application



DAMS-NT Client r1-47 [Client Demo]

File Client Window Help

[Server A] [RTA East] [A SERVER: PRIME] [B Server: Backup] [192.168.54.253][17015] Connected

DPCM 1 Slot Status | Cage Status | Event Log | Socket Status | Operation | Demod |

Main Status

Pilot 1	LOCK	ACTIVE	PS A	OK	WIDE	BAND	AGC	PS B	OK	Pilot 2	LOCK	ACTIVE
---------	------	--------	------	----	------	------	-----	------	----	---------	------	--------

DPCM State: 9: Pilot Locked

IRIG Out: Using IRIG IN IRIG In: Present

GPS Status: Need GPS Time

VCO, Pilot, & Gain Levels

VCO Freq (Hz):	-38.0	VCO Voltage (V):	+2.005
Wide Band Gain:	+20.9	Active Pilot Level:	+47.0
WB Level (dBm):	-31.7	Noise Floor:	+15.4

IF Status

Frequency (MHz): 62.85046

UP SYN LOCK 222.7491

DN SYN LOCK 164.8987

[Server B] [RTB East] [B SERVER: BACKUP] [A Server: Prime] [192.168.54.254][17015] Connected

DPCM 1 Slot Status | Cage Status | Event Log | Socket Status | Operation | Demod |

Main Status

Pilot 1	LOCK	ACTIVE	PS A	OK	WIDE	BAND	AGC	PS B	OK	Pilot 2	LOCK	ACTIVE
---------	------	--------	------	----	------	------	-----	------	----	---------	------	--------

DPCM State: 9: Pilot Locked

IRIG Out: Using IRIG IN IRIG In: Present

GPS Status: Need GPS Time

VCO, Pilot, & Gain Levels

VCO Freq (Hz):	-41.4	VCO Voltage (V):	+2.006
Wide Band Gain:	+20.9	Active Pilot Level:	+46.9
WB Level (dBm):	-31.7	Noise Floor:	+15.2

IF Status

Frequency (MHz): 62.85046

UP SYN LOCK 222.7491

DN SYN LOCK 164.8987

[HQ Test] [192.168.54.254][17014] Connected

DCP Data (ALL) | DCP Summary | ACTIVE

563 < < Row 1 of 563 > >

Slot	Mode	Chan	Baud	AddlCorr	AddlOrig	Carrier Time	Frame Time	End Time	Msg Dur	Len	BER	GDP	PHN	SNR	Pilot	Noise	Par	Bad	SS	FO	FS	SCID	MI	DO	ARM
63	CS1	125E	300	1785038A	1785038A	19/077 22:25:29.542	19/077 22:25:30.118	19/077 22:25:30.494	0.952	7	0E-9	100.0	1.38	29.0	46.9	22.7	0	0	43.7	-81.7	N	..	N	N	00
59	CS2	117E	300	386086C6	386086C6	19/077 22:25:20.742	19/077 22:25:21.308	19/077 22:25:29.631	8.889	305	0E-9	99.8	3.17	23.8	47.0	19.4	0	0	42.9	0.7	R	..	N	N	00
37	CS2	75E	300	472D6084	472D6084	19/077 22:25:25.282	19/077 22:25:25.874	19/077 22:25:29.504	4.222	127	0E-9	100.0	2.62	23.5	47.0	18.7	0	0	40.0	-0.2	R	..	N	N	00
40	CS2	81E	300	B55880EC	B55880EC	19/077 22:25:20.295	19/077 22:25:20.876	19/077 22:25:29.039	8.744	297	0E-9	89.0	5.22	17.8	47.0	19.4	0	0	32.8	1.7	R	..	N	N	00
7	CS2	15E	300	B5C1A07A	B5C1A07A	19/077 22:25:21.285	19/077 22:25:21.881	19/077 22:25:28.925	7.640	255	0E-9	100.0	2.05	28.0	47.0	19.1	0	0	43.0	1.6	R	..	N	N	00
103	CS1	215E	300	01032040	01032040	19/077 22:25:25.504	19/077 22:25:26.094	19/077 22:25:28.817	3.313	95	0E-9	100.0	1.79	30.1	47.0	18.3	0	0	48.8	-79.3	N	..	N	N	00
16	CS2	33E	300	C640E13E	C640E13E	19/077 22:25:21.152	19/077 22:25:21.749	19/077 22:25:28.740	7.588	255	0E-9	99.1	3.27	25.0	47.0	19.1	0	0	40.7	-7.9	R	..	N	N	00
25	CS2	51E	300	BE7097F6	BE7097F6	19/077 22:25:21.306	19/077 22:25:21.888	19/077 22:25:28.691	7.385	247	0E-9	100.0	2.19	26.9	47.0	19.1	0	0	42.7	-0.9	R	..	N	N	00
99	CS2	207E	300	7007A3CE	7007A3CE	19/077 22:25:21.606	19/077 22:25:22.188	19/077 22:25:28.698	7.092	237	0E-9	100.0	2.91	26.9	47.0	18.8	0	0	45.6	3.8	R	..	N	N	00
30	CS1	61E	300	B5674510	B5674510	19/077 22:25:22.093	19/077 22:25:22.093	19/077 22:25:28.363	6.871	228	0E-9	100.0	1.84	32.4	47.0	19.1	0	0	49.3	-18.1	N	..	N	N	00
35	CS1	71E	300	5037C56A	5037C56A	19/077 22:25:20.271	19/077 22:25:20.849	19/077 22:25:28.132	7.861	266	0E-9	100.0	1.82	31.5	46.9	21.5	0	0	48.0	1.1	N	..	N	N	00

DCP MSG DATA | DAPS/DDS | DAMS-NT | DECODED | HEX-ASCII | APPLY VIEW | FULL MSG |

BRTEZ

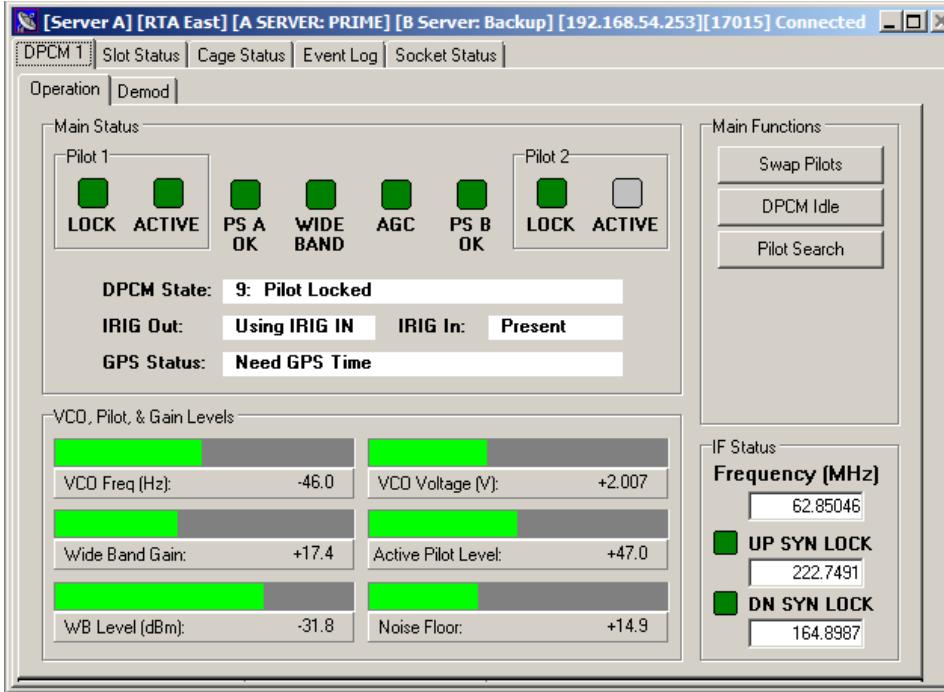
Client Demo [CPU Usage: 0%] | MEMORY [Total: 25,755 KB] [Allocated: 24,352 KB] [Overhead: 1,402 KB] | ALLOCATIONS [Total: 285,095] [Allocs/Sec: 10,397] | UP TIME: 00:15:55 | UP SINCE: 19/077 22:10:22 | PC UTC: 19/077 22:26:17 ::

WINDOWS [CPU Usage: 0%] | MEMORY [Commit Size: 43,728 KB] [Working Set: 50,880 KB]

- GUI Based Application Built Off Same Code Base as the DAMS-NT Server.
 - Provides same “look” and “feel” as the DAMS-NT Server.
 - Specifically designed to connect to the DAMS-NT Server sockets.
 - Does not include direct interface to hardware components, but ...
 - Allows status monitoring and limited control of DAMS-NT Server via the Stat/Ctrl socket.
- One DAMS-NT Client can monitor multiple DAMS-NT Servers
 - In example screen shot on previous slide, the DAMS-NT Client is monitoring both DAMS-NT Server A and DAMS-NT Server B.
 - Each DAMS-NT Server appears in single window with tabbed pages analogous to main DAMS-NT Server status windows.
- Client can also be configured to monitor message/channel reception from on or more DAMS-NT Servers.

- Provides remote status and control of DAMS-NT Server.
- Collects main Server status screens into single tabbed window.
 - DPCM Status:
 - Basic Monitoring and Control of the DPCM.
 - Parrots the Operation and Demod tabs from the Server.
 - Slot Status:
 - Parrots status information on Cages and Demods (Slots).
 - Allows configuration changes to demods.
 - Cage Status:
 - Parrots cage status grid.
 - Allows IIM Pilot to be controlled.
 - Event Log
 - Separate memo view of the DAMS-NT Event Log.
 - Recalls last 100 Events on connect.
 - New Events added as they occur.
 - Server Status:
 - Parrots DAMS-NT Server sockets status.
 - Shows the sockets this Client is connected to.

DAMS-NT Client: Stat/Ctrl DPCM



- Limited to just Operation and Demod tabs.
- Operation and Demod tab pages are identical to DPCM status from DAMS-NT Server with exception of lack of ALARM button.
- If second DPCM present in system, a DPCM2 tab page will be shown between DPCM1 and Slot Status.

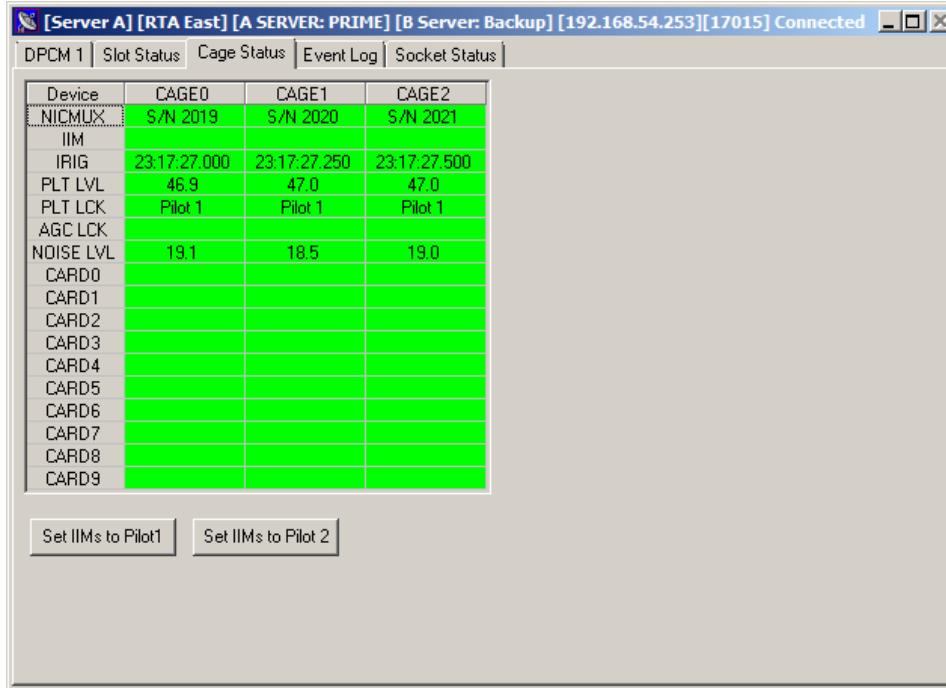
DAMS-NT Client: Stat/Ctrl Slot Status



Slot Status Summary							
		CAGE0 CAGE1 CAGE2					
		CAGE0 PS A PS B PLT1 AGC 18.9					
Crd	Slot	Mode	Chan	Baud	State	Stat	GDP
1	5	CS1	11E	AUTO	C S F S I	100.0	
1	6	CS1	13E	AUTO	C S F S I	100.0	
1	7	CS1	15E	AUTO	C S F S I	99.8	
2	8	CS1	17E	AUTO	C S F S I	100.0	
2	9	CS1	19E	300	D S F S I	...	
2	10	CS1	21E	AUTO	C S F S I	100.0	
2	11	CS1	23E	AUTO	C S F S I	99.8	
3	12	CS1	25E	300	D S F S I	...	
3	13	CS1	27E	AUTO	C S F S I	93.9	
3	14	CS1	29E	AUTO	C S F S I	...	
3	15	CS1	31E	AUTO	C S F S I	73.7	
4	16	CS1	33E	300	D S F S I	...	
4	17	CS1	35E	300	D S F S I	...	
4	18	CS1	37E	AUTO	C S F S I	100.0	
4	19	CS1	39E	AUTO	C S F S I	100.0	
5	20	CS1	41E	AUTO	---	---	...
5	21	CS1	43E	AUTO	C S F S I	99.8	
5	22	CS1	45E	AUTO	C S F S I	99.7	
5	23	CS1	47E	300	D S F S I	...	
6	24	CS1	49E	300	D S F S I	...	

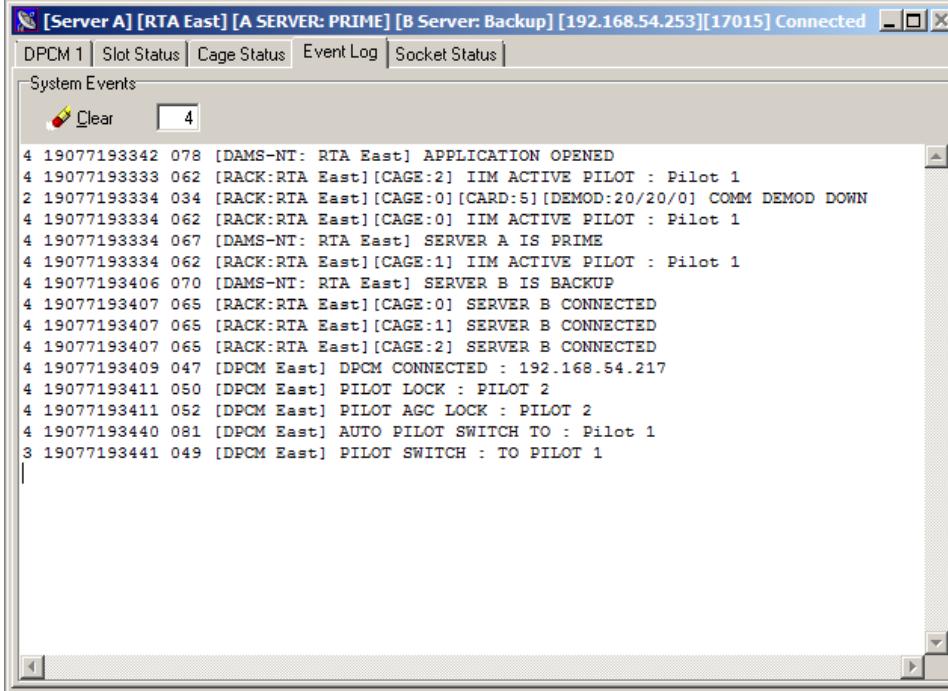
- Summary information provided on left for all cages.
- Slot Status by cage accessible via additional tabbed pages on right.
- Information in Slot Status grid identical to Server.
- Need to use slide bar or expand Client window to see Slot Status for all demods in a particular cage.

DAMS-NT Client: Stat/Ctrl Cage Status



- Cage Status information identical to equivalent grid in Server.
- Event information captured on separate tab.
- For Server in Prime mode, can also use Client Cage Status to set all IIMs to Pilot 1 or Pilot 2.
- For Server in Backup mode, the buttons are disabled.

DAMS-NT Client: Stat/Ctrl Event Log



- Client Event Log tab captures DAMS-NT Server Events.
- On Client launch/open, the last 100 Events are automatically extracted.
- Clearing the log at the Client only erases the Clients log; the Server's Event log is unaffected.

DAMS-NT Client: Stat/Ctrl Socket Status

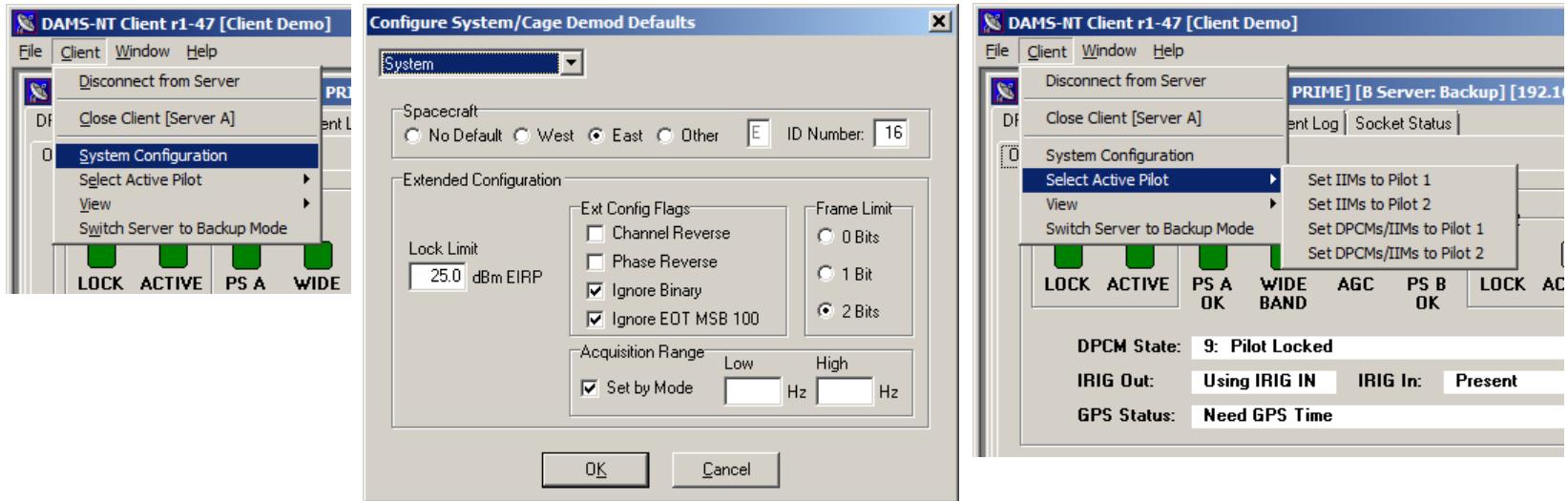


[Server A] [RTA East] [A SERVER: PRIME] [B Server: Backup] [192.168.54.253][17015] Connected				
DPCM 1 | Slot Status | Cage Status | Event Log | Socket Status				
Sockets				
Port/IP Address	Socket Type	Status	RX Bytes/Sec	TX Bytes/Sec
17010	DAMS-NT DCP	Listening	...	...
17014	DAMS-NT HIQ	2	...	6016
17011	DAMS-NT Event	Listening	...	...
17015	DAMS-NT Stat/Cntrl	1	...	5390
192.168.54.19	NIC-MUX 0	Connected	790	...
192.168.54.20	NIC-MUX 1	Connected	616	16
192.168.54.21	NIC-MUX 2	Connected	2026	32

Connected Sockets							
Local Port	Socket Type	Remote Port	Remote Addr	RX Cnt	TX Cnt	RX/TX Dcp	
17014	DAMS-NT HIQ	3999	192.168.████████	...	78353	...	
17014	DAMS-NT HIQ	51657	192.168.54.240	...	499	...	
17015	DAMS-NT Stat/Cntrl	51040	192.168.54.240	1	14800	...	
52403	NIC-MUX 0	4001	192.168.54.19	218126	14610	28288	
52404	NIC-MUX 1	4001	192.168.54.20	213816	14609	29119	
52405	NIC-MUX 2	4001	192.168.54.21	190797	14608	20955	

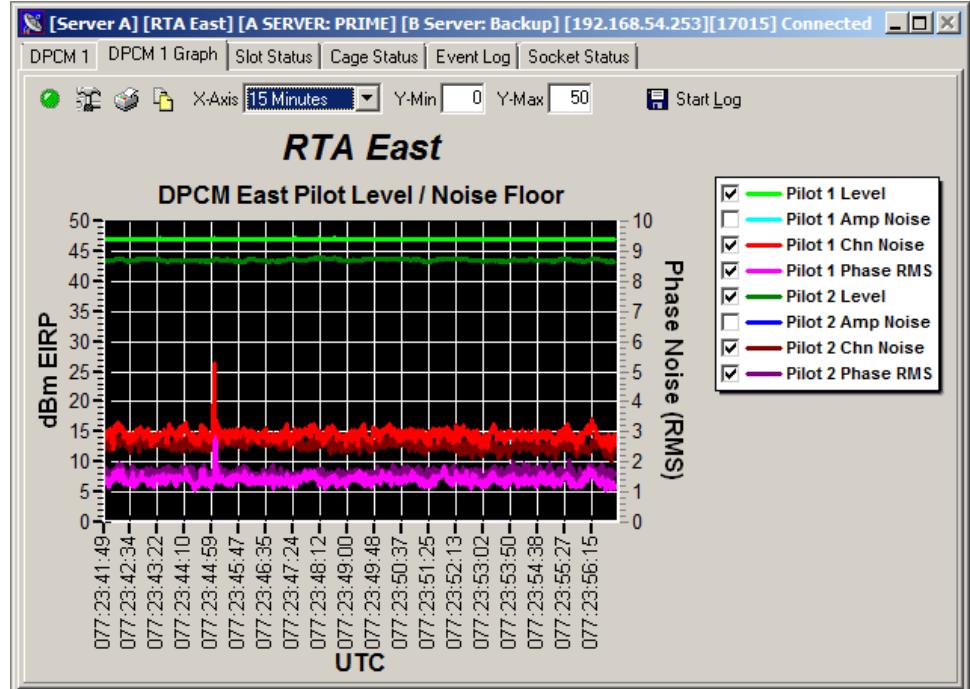
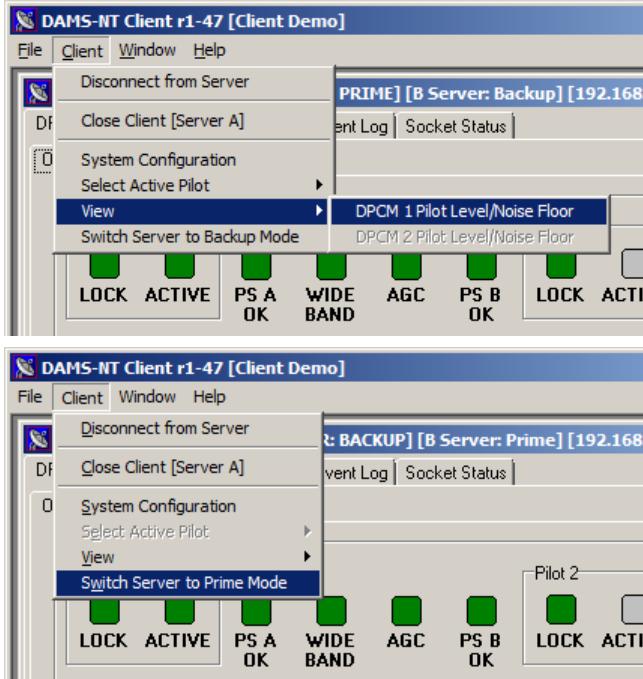
- Socket Status information identical to equivalent grid in Server.
- Any connected sockets from this DAMS-NT Client will also be indicated.
- In this example the DAMS-NT Client has a HIQ connection as well as a Stat/Ctrl connection.

DAMS-NT Client: Stat/Ctrl Client Menu



- System Configuration menu item allows access to dialog to configure default settings for demods.
 - Either by whole system or by individual cage.
 - Generally only set on initial install.
- Select Active Pilot menu item allows the active pilot for either the IIMs or the DPCM and IIMs to be selected.
 - First two sub items same function as on Cage Status tab.
 - DPCM Pilot can be individually set by using Swap Pilots button on DPCM Operation tab.

DAMS-NT Client: Stat/Ctrl Client Menu

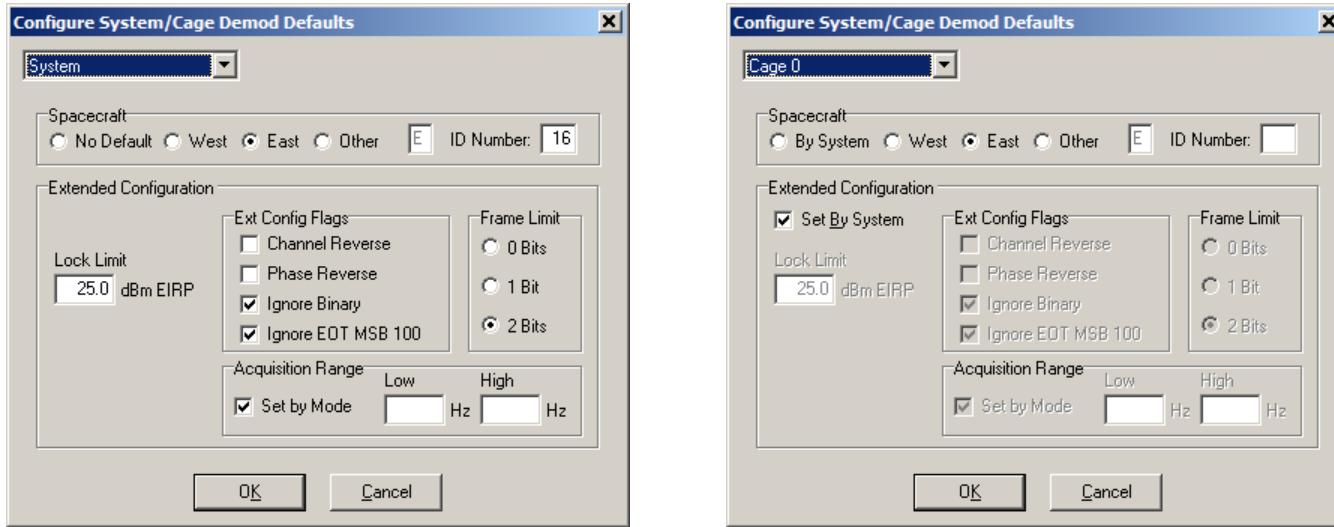


- View menu item used to launch Pilot Level/Noise Floor DPCM graph.
- Graph shown in new tab page.
- If second DPCM in system, its Pilot Level/Noise Floor graph can also be viewed.
- Last menu item allows Server to be switched between Prime and Backup operation. Note when in Backup mode, active pilot control is disabled.



DRGS Software Components Demodulator Configuration

DAMS-NT: System/Cage Setup

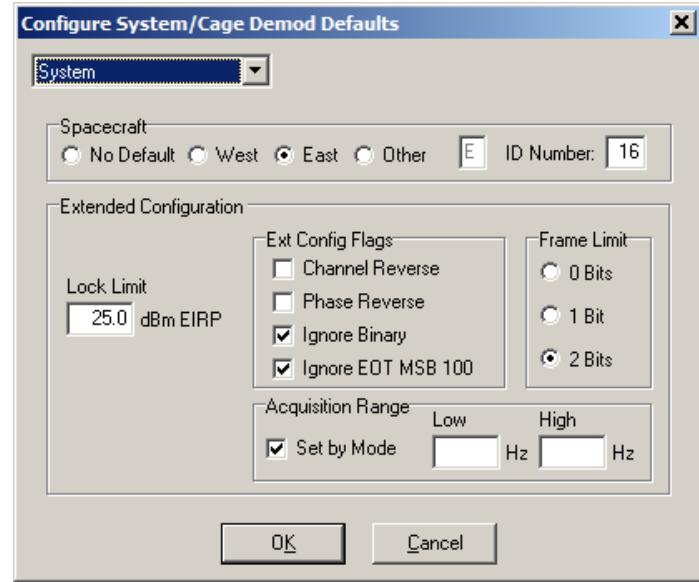


- Define Spacecraft for System and/or Cages
 - In future NOAA may no longer utilize Odd/Even East/West convention.
 - International channels may be monitored on both East and West.
 - What really determines Spacecraft is RF/IF path and where the dish points.
 - System can have “No Default”; Cage can be set to “By System”.
- Extended Configuration:
 - Define default settings for demods.
 - Facilitates global system changes, e.g. setting Lock Limit for all demods.
 - Cages can be defined individually or all at once.
 - Cages can have Extended Configuration “Set By System”.

DAMS-NT: Extended Configuration



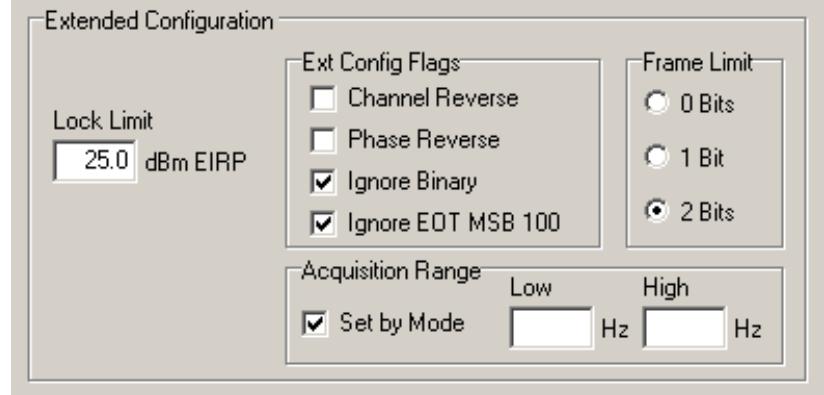
- Generally defined on System wide basis.
- Can be overridden on Cage (not common) or demod (for troubleshooting) basis.
- Options:
 - Lock Limit – level below which demods will not lock and attempt to receive messages.
 - Frame Limit – allowed bit errors in FSS.
 - Extended Config Flags – special demod configuration and message handling.
 - Acquisition Range – frequency range relative to channel center outside of which demod will not receive messages.
- If "Set By System" option checked, then Cage Extended Config comes from System.
- Similar option in demod configuration to get Extended Config from Cage.
 - Extended Configuration can flow down from System to Cage to Demods.
 - If parent (System or Cage) defaults change, demods will be automatically reconfigured.



DAMS-NT: Extended Config Defaults



- Lock Limit: 25.0 dBm EIRP
 - Determined by NOAA/NESDIS.
- Channel Reverse: Unchecked
 - Determined by IF spectrum.
 - Latest DPCM does not reverse channels in 5 MHz IF.
- Phase Reverse: Unchecked
 - Typically follows Channel Reverse.
- Ignore Binary: Checked
 - No Binary Specification Yet.
 - Early DCPs erroneously reported message was Binary when it was in fact ASCII.
- Ignore EOT MSB 100: Checked
 - To address some older 100 bps DCPs that had an issue.



- Frame Limit: 2 Bits
 - Determined by NOAA NESDIS
 - Has always been set to 2.
- Acquisition Range: "Set by Mode"
 - CS1: ± 500 Hz
 - CS1: ± 150 Hz
 - Dual: ± 500 Hz

DAMS-NT: Demodulator Configuration



- Can be accomplished from either the DAMS-NT Server or the DAMS-NT Client using popup menus in appropriate Slot Status grid.
- Move cursor over row for desired demo and right click on mouse.
- Click either the Configure Demod (Client) or Cage/Slot – Configure Demods (Server) menu item.
- Launches Configure Slot(s) dialog.
- Dialog will be initially populated with current configuration for slot.
- If Server is Backup, Configure Slot(s) dialog will be in “View Only” mode.

The screenshot displays two windows of the DAMS-NT software:

Left Window (Server A): A "Slot Status" window showing the "Slot Status Summary" for CAGE0, CAGE1, and CAGE2. It includes a table of active channels and a detailed table of demodulator configurations. A context menu is open over the detailed table, with the following options:

- Configure Demod
- All Demods Extd By Cage
- Cage - Configure Defaults
- Cage - All Demods Extd Cfg By Cage
- Cage - Sort Demods This Cage Only
- Cage - Insert Demod Channels
- Cage - Remove Demod Channels
- Clear Cage Messages

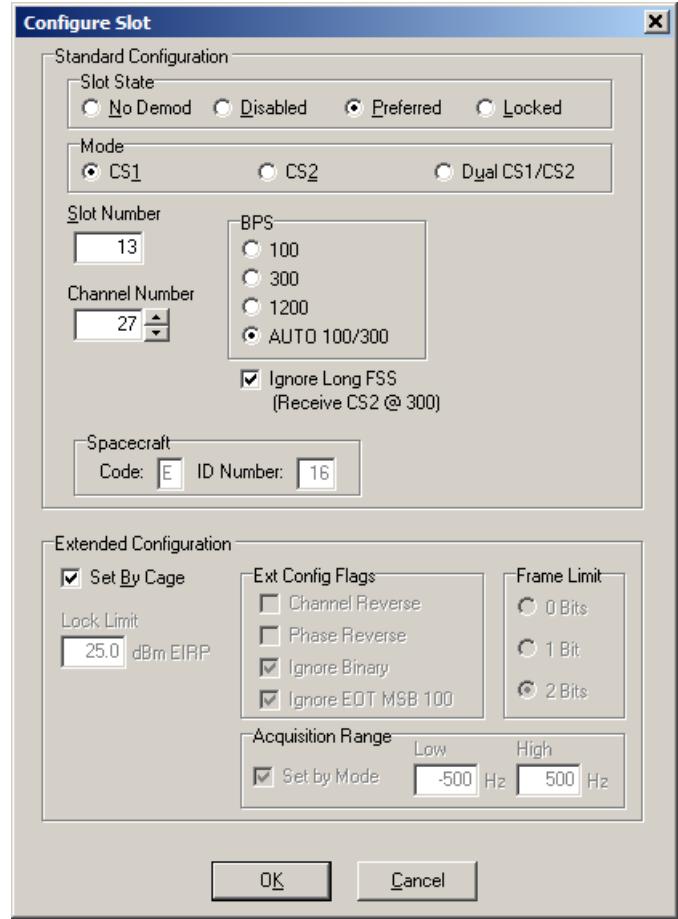
Right Window (Client): A "Slot Status" window showing a table of demodulator configurations for CAGE0. A context menu is open over the table, with the following options:

- Slot - History
- Cage/Slot - Configure Demod(s)
- Cage - Configure Defaults
- Cage - All Demods Extd Cfg By Cage
- Cage - Sort Demods This Cage Only
- Cage - Insert Demod Channels
- Cage - Remove Demod Channels
- Clear Cage Messages

DAMS-NT: Configure Slot Dialog



- Slot State:
 - No Demod ⇒ A demod is not physically present in this slot.
 - Disabled ⇒ A demod is present but will not be assigned to a channel.
 - Preferred ⇒ Assignment is preferred at this slot, but can be moved on failure or sort.
 - Locked ⇒ Assignment must stay at this slot.
 - Replaced “Slot Disabled” and “Slot Unused” checkboxes.
- Mode:
 - CS1, CS2 or Dual CS1/CS2
 - Changing the Mode will impact other controls.
- Spacecraft is not definable on demod basis. Setting is based on Cage.

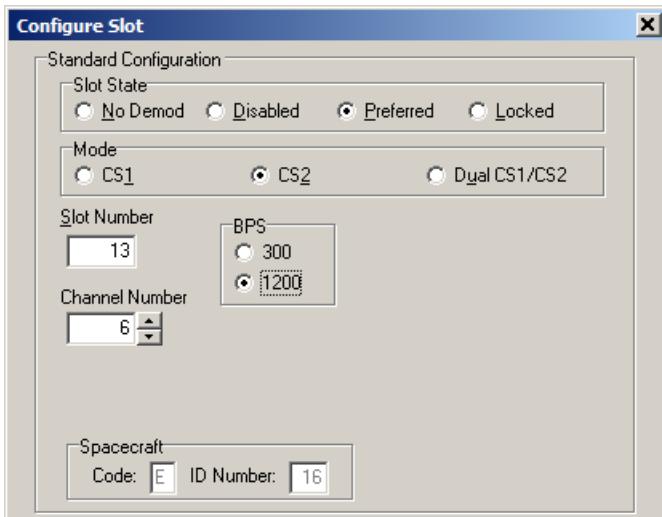
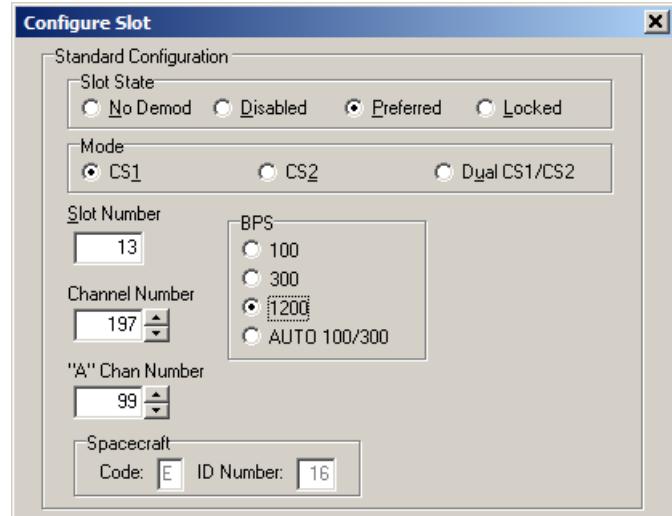


DAMS-NT: Configure CS1 vs. CS2



➤ CS1 Mode:

- Baud rates of 100, 300, 1200 and AUTO 100/300 still selectable.
- “Ignore Long FSS” only available in AUTO 100/300.
- 1200 BPS still provides “A Chan Number” control.
- Always uses Bessel filter.



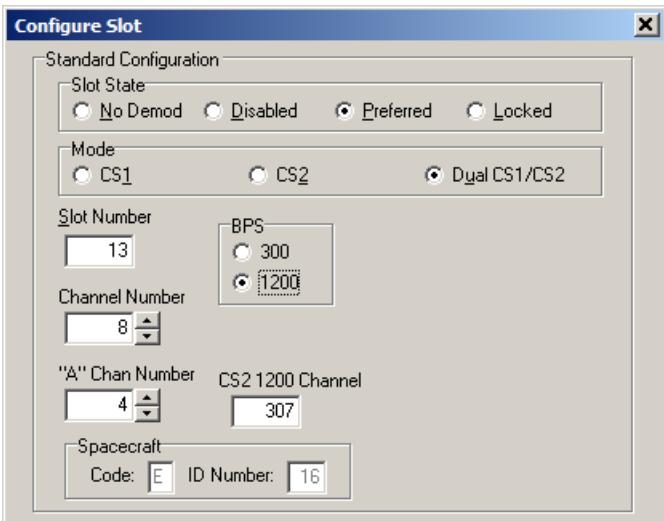
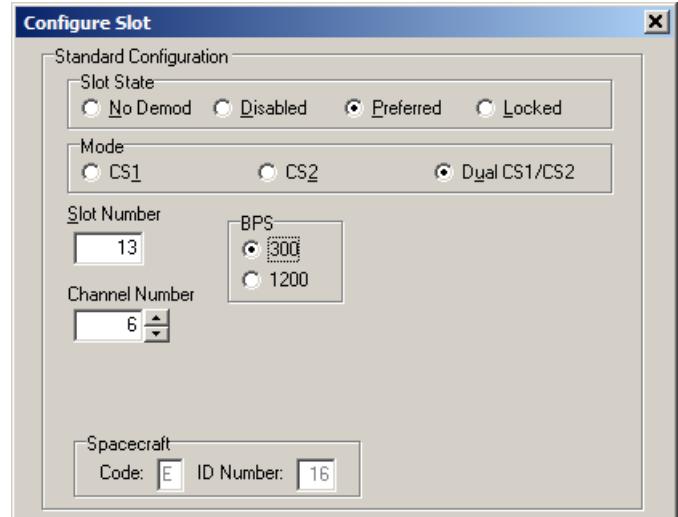
➤ CS2 Mode:

- Only Baud rates of 300 and 1200 allowed.
- Always uses RRC filter.
- 1200 BPS no longer uses “A” channel, but channel will be limited per CS2 specification.

DAMS-NT: Configure Dual Mode



- Dual CS1/CS2 Mode
 - Only 300 and 1200.
 - Will auto detect and apply correct filter based on FSS.
- Dual CS1/CS2 Mode @ 300 bps:
 - Channels limited to 1-266.

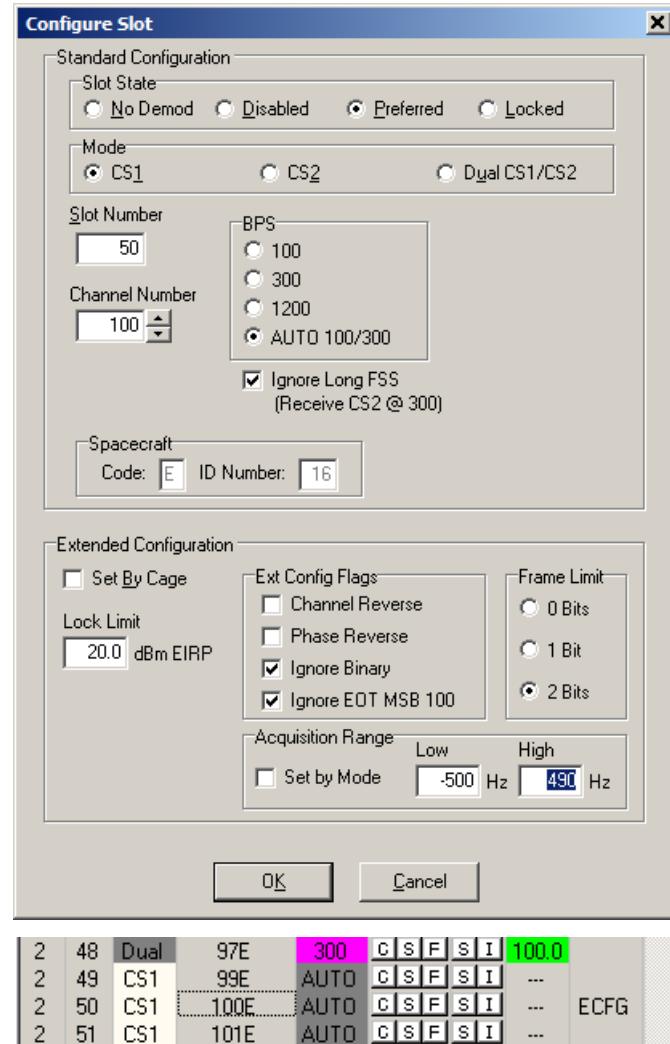
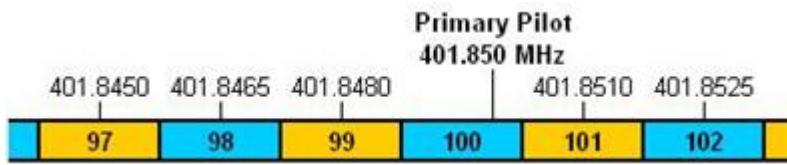


- Dual CS1/ CS2 Mode @ 1200 bps:
 - “A” and “CS2” Channels shown.
 - Both CS1 and CS2 channel centers must be aligned.
 - DASM-NT will not allow an invalid setting.
 - Should not be used too often.

DAMS-NT: Demod Extended Config



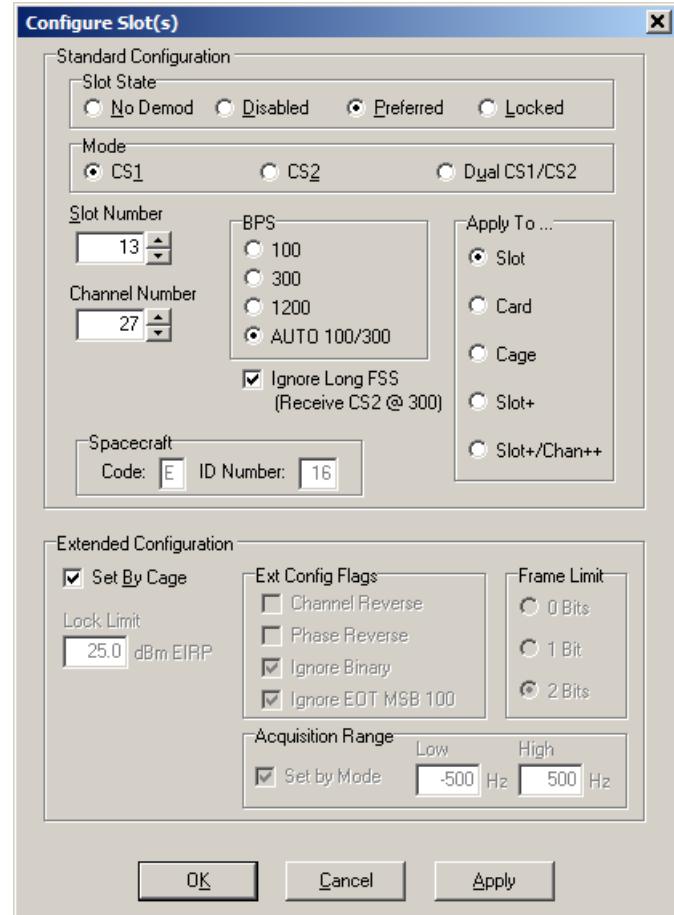
- First uncheck “Set By Cage” option.
- Lock Limit
 - Has been useful in past when interference present in channel (typically raised).
- Frame Limit and Ext Config Flags
 - Not really a reason to override.
- Acquisition Range
 - Could be useful to ignore interference or other signal at edge of channel.
 - Good use of a Custom Acquisition is to monitor for interference near Primary Pilot.
 - Primary Pilot: 401.8500 MHz
 - Channel 100: 401.8495 MHz
 - Primary Pilot right at the edge of Acquisition Range for Channel 100.
 - Typically tuning a demodulator to channel 100 results in a continuous Carrier Lock.



DAMS-NT: Configure Slot(s) Dialog



- Apply To... option in DAMS-NT Server allows multiple demods to configured.
 - Slot sets just the individual demod as in DAMS-NT Client.
 - Card sets all 4 demods on the QMB.
 - Cage sets all demods in the Cage.
 - Slot+ sets all demods from this slot to last demod in the Cage.
 - Slot+/Chan++ sets this demod to the channel specified and then all remaining demods in cage to same Mode and BPS, but increments channel by 2 for each subsequent slot.
- Apply To... options primarily useful for test and initial setup.
- Apply button useful for configuring multiple demods as it applies the requested change, but does not close the dialog.





DRGS Software Components

Message/Demodulator Monitoring

DAMS-NT Server: Slot History Screen



Slot History [All] 1,828 << Row 1 of 1000 >>

Slot	Mode	Chan	Baud	AddrCorr	AddrOrg	Carrier Time	Frame Time	End Time	Msg Time(S)	Len	BER	GDP	PHN	SNR	CgPilot	CgNois	Par	Bad	SS	FO	FS	MI	DO	ARM
32	C51	65E	300	3347A5A8	3347A5A8	12/251 20:41:48.288	12/251 20:41:48.873	12/251 20:41:51.143	2.855	78	0E-9	99.1	3.02	24.2	46.9	18.3	0	0	39.5	-20.5	N	N	N	00
59	C51	119E	300	3D0C75BA	3D0C75BA	12/251 20:41:49.539	12/251 20:41:50.127	12/251 20:41:50.664	1.125	13	0E-9	100.0	2.58	27.0	46.9	18.5	0	0	40.4	3.3	N	N	N	00
78	C51	125E	100	DDC177BE	DDC177BE	12/251 20:41:47.532	12/251 20:41:48.631	12/251 20:41:50.967	3.335	23	0E-9	100.0	2.46	26.9	47.0	16.9	0	0	41.1	9.4	B	N	N	00
70	C51	141E	300	CB162444	CB162444	12/251 20:41:40.381	12/251 20:41:40.977	12/251 20:41:50.367	9.986	345	0E-9	99.8	2.82	28.5	46.9	20.8	0	0	40.8	17.0	N	N	N	00
83	C51	167E	300	A687E500	A687E500	12/251 20:41:45.293	12/251 20:41:45.874	12/251 20:41:50.036	4.739	149	0E-9	100.0	2.03	28.8	47.0	17.3	0	0	43.8	-1.1	N	N	N	00
90	C51	185E/93A	1200	CD094690	CD094690	12/251 20:41:41.281	12/251 20:41:41.532	12/251 20:41:49.748	8.467	1225	0E-9	99.9	2.62	25.1	46.9	17.9	0	0	45.2	14.2	N	N	N	00
41	C51	83E	300	17B987F0	17B987F0	12/251 20:41:40.519	12/251 20:41:41.101	12/251 20:41:49.104	8.585	293	0E-9	96.6	4.05	21.9	46.9	20.8	0	0	35.5	-16.1	N	N	N	00
80	C51	161E	300	CE46A138	CE46A138	12/251 20:41:46.293	12/251 20:41:46.861	12/251 20:41:48.472	2.173	53	0E-9	94.0	4.18	19.9	47.0	16.4	0	0	33.9	-2.1	N	N	N	00
101	C51	215E	300	50313520	50313520	12/251 20:41:42.277	12/251 20:41:42.861	12/251 20:41:48.011	5.734	186	0E-9	100.0	1.90	30.6	47.0	17.3	0	0	45.0	-7.8	N	N	N	00
89	C51	181E/91A	1200	1170666C	1170666C	12/251 20:41:41.535	12/251 20:41:41.787	12/251 20:41:47.800	6.265	895	0E-9	100.0	2.35	25.2	47.0	17.3	0	0	44.8	-86.6	N	N	N	00
3	C51	7E	300	CE4C7602	CE4C7602	12/251 20:41:42.288	12/251 20:41:42.871	12/251 20:41:47.247	4.959	157	0E-9	98.8	3.85	22.7	47.0	17.8	0	0	35.7	0.7	N	N	N	00
53	C51	107E	300	17E618C6	17E618C6	12/251 20:41:40.517	12/251 20:41:41.112	12/251 20:41:47.276	6.759	224	0E-9	99.2	3.26	24.4	46.9	20.8	0	0	37.4	-55.7	N	N	N	00
74	C51	149E	300	DD8E541C	DD8E541C	12/251 20:41:43.381	12/251 20:41:43.949	12/251 20:41:47.179	3.798	114	0E-9	99.8	2.60	28.9	47.0	17.2	0	0	42.5	-79.4	N	N	N	00
85	C51	171E	300	BC63A18B	BC63A18B	12/251 20:41:40.291	12/251 20:41:40.873	12/251 20:41:47.009	6.713	223	0E-9	100.0	2.11	29.5	46.9	23.0	0	0	43.1	-4.6	N	N	N	00
17	C51	35E	300	DE141484	DE141484	12/251 20:41:40.532	12/251 20:41:41.116	12/251 20:41:46.719	6.187	203	0E-9	100.0	1.87	32.1	46.9	20.9	0	0	46.3	-63.8	N	N	N	00
82	C51	165E	300	DDA222FE	DDA222FE	12/251 20:41:43.283	12/251 20:41:43.870	12/251 20:41:46.567	3.284	94	0E-9	93.9	4.28	20.9	47.0	17.3	0	0	34.2	-1.2	N	N	N	00
76	C52	121E	300	5035468A	5035468A	12/251 20:41:45.127	12/251 20:41:45.715	12/251 20:41:46.465	1.338	19	0E-9	100.0	3.17	22.5	47.0	17.2	0	0	36.6	-9.0	R	N	N	00
24	C51	49E	300	CE1476E6	CE1476E6	12/251 20:41:43.540	12/251 20:41:44.122	12/251 20:41:45.726	2.196	53	0E-9	100.0	2.72	24.9	47.0	16.8	0	0	40.3	-4.5	N	N	N	00
43	C51	87E	300	1668C1C2	1668C1C2	12/251 20:41:40.507	12/251 20:41:41.107	12/251 20:41:45.511	5.004	158	0E-9	99.1	3.23	24.9	46.9	20.8	0	0	38.6	-20.6	N	N	N	00

DCP MSG DATA DAPS1/DDS DAMS-NT HEX-ASCII APPLY VIEW FULL MSG HIDE STATS

P90760331ky_@@@d0^@T!@x^@C@.exX3@HC?@P4Bc5Bz6^t9Iw<BL!@x^@C@.exY3@KCu@S<BG ■

STAT_EOM	00		
BAUD RATE	300		
FRAME CHAR	N		
FREQUENCY DEVIATION	-20.5	-20.3	
AVERAGE POWER	+39.5		
NOISE POWER	+15.3		
BIT ERROR RATE	0E-9		
SIGNAL/NOISE	+24.2		
GOOD PHASES	329	332	99.1
PHASE STATS 0 DEG (+60)	-0.09	2.94	
45 DEG (-60)	+0.08	3.59	
90 DEG	+0.26	3.08	
135 DEG	-0.57	3.02	
180 DEG	+0.05	2.96	
225 DEG	+0.63	3.01	
270 DEG	-0.51	2.93	
315 DEG	+0.02	2.66	
MOD INDEX/PHAS NOISE	-0.02	3.02	+0.63
MESSAGE CARRIER TIME	12/251 20:41:48.288		
MESSAGE SYNC TIME	12/251 20:41:48.756		
MESSAGE FRAME TIME	12/251 20:41:48.873		
MESSAGE END TIME	12/251 20:41:51.143		

DAMS-NT Client: HIQ Client Screen



DAMS-NT Client r1-47 [Client Demo] - [HIQ Demo] [192.168.54.253][17014] Connected

File Client Window Help

DCP Data (All) DCP Summary

ACTIVE 1,095 << Row 1 of 1095 >>

Slot	Mode	Chan	Baud	AddrCorr	AddrOrig	Carrier Time	Frame Time	End Time	Msg Dur	Len	BER	GDP	PHN	SNR	Pilot	Noise	Par	Bad	SS	FO	FS	SCID	MI	DQ	ARM
► 53	CS2	105E	300	17DBB2CA	17DBB2CA	19/078 17:40:22.291	19/078 17:40:22.865	19/078 17:40:29.001	6.710	221	0E-9	98.7	3.25	21.7	47.0	18.3	0	0	38.1	-0.5	R	16	N	N	00
30	CS2	61E	300	B56DA780	B56DA780	19/078 17:40:20.305	19/078 17:40:20.885	19/078 17:40:29.048	8.743	237	0E-9	99.9	2.42	24.7	46.8	22.7	0	0	41.5	-1.5	R	16	N	N	00
103	CS1	215E	300	01032040	01032040	19/078 17:40:25.519	19/078 17:40:26.107	19/078 17:40:28.830	3.311	95	0E-9	100.0	1.88	31.5	47.0	18.9	0	0	48.3	-7.9	N	16	N	N	00
15	CS1	31E	300	CE33753C	CE33753C	19/078 17:40:20.263	19/078 17:40:20.850	19/078 17:40:28.133	7.870	266	0E-9	100.0	1.71	36.1	46.8	22.7	0	0	49.7	-1.3	N	16	N	N	00
81	CS1	161E	300	CE466426	CE466426	19/078 17:40:26.263	19/078 17:40:26.847	19/078 17:40:27.731	1.462	26	0E-9	100.0	2.73	31.6	47.0	18.1	0	0	45.5	2.1	N	16	N	N	00
36	CS1	73E	300	CE166064	CE166064	19/078 17:40:25.529	19/078 17:40:26.106	19/078 17:40:27.842	2.313	58	0E-9	100.0	1.90	29.2	47.0	18.1	0	0	45.4	-14.3	N	16	N	N	00
32	CS1	65E	300	3346C284	3346C284	19/078 17:40:24.249	19/078 17:40:24.846	19/078 17:40:27.570	3.321	95	0E-9	100.0	2.21	24.0	47.0	18.1	0	0	42.4	12.5	N	16	N	N	00
100	CS2	209E	300	3372E712	3372E712	19/078 17:40:24.266	19/078 17:40:24.855	19/078 17:40:27.526	3.259	91	0E-9	99.2	2.95	24.0	47.0	18.4	0	0	40.6	4.2	R	16	N	N	00
61	CS2	121E	300	FD018C56	FD018C56	19/078 17:40:26.312	19/078 17:40:26.887	19/078 17:40:27.584	1.272	17	0E-9	100.0	1.94	27.2	47.0	17.9	0	0	42.3	-5.6	R	16	N	N	00
74	CS1	147E	300	335D750C	335D750C	19/078 17:40:25.267	19/078 17:40:25.852	19/078 17:40:27.455	2.188	53	0E-9	100.0	2.54	26.7	47.0	17.9	0	0	40.4	3.1	N	16	N	N	00
12	CS1	25E	300	CE6DD054	CE6DD054	19/078 17:40:21.497	19/078 17:40:22.087	19/078 17:40:27.531	6.034	197	0E-9	100.0	1.71	34.5	47.0	18.3	0	0	49.6	-89.9	N	16	N	N	00
70	CS2	139E	300	176CB3CA	176CB3CA	19/078 17:40:23.276	19/078 17:40:23.850	19/078 17:40:27.026	3.750	110	0E-9	99.8	2.66	22.9	46.9	18.2	0	0	38.3	0.1	R	16	N	N	00
96	CS1	201E	300	4750DF0	4750DF0	19/078 17:40:18.543	19/078 17:40:19.129	19/078 17:40:26.971	8.428	287	0E-9	100.0	2.15	31.6	46.9	22.5	0	0	46.5	-1.0	N	16	N	N	00
78	CS1	155E	300	DDBDC000	DDBDC000	19/078 17:40:22.288	19/078 17:40:22.849	19/078 17:40:27.012	4.724	149	0E-9	100.0	1.98	25.6	47.0	18.3	0	0	44.9	1.3	N	16	N	N	00
54	CS2	107E	300	177ED446	177ED446	19/078 17:40:23.255	19/078 17:40:23.847	19/078 17:40:26.891	3.636	105	0E-9	100.0	2.29	25.8	46.9	18.2	0	0	41.4	-0.6	R	16	N	N	00
44	CS2	89E	300	163D4486	163D4486	19/078 17:40:24.513	19/078 17:40:25.103	19/078 17:40:26.759	2.246	53	0E-9	100.0	2.78	28.2	47.0	17.7	0	0	44.2	-16.3	R	16	N	N	00
22	CS2	45E	300	386D5652	386D5652	19/078 17:40:23.150	19/078 17:40:23.752	19/078 17:40:26.849	3.699	109	0E-9	99.6	2.99	27.3	47.0	18.3	0	0	42.3	-15.2	R	16	N	N	00
33	CS2	67E	300	FAB3AAE8	FAB3AAE8	19/078 17:40:23.170	19/078 17:40:23.750	19/078 17:40:26.793	3.623	107	0E-9	99.1	3.03	26.0	47.0	18.3	0	0	41.5	8.2	R	16	N	N	00
39	CS1	79E	300	50327124	50327124	19/078 17:40:20.264	19/078 17:40:20.849	19/078 17:40:26.745	6.481	214	0E-9	99.9	2.45	27.3	46.8	22.7	0	0	43.1	2.0	N	16	N	N	00
80	CS1	159E	300	3366F6C0	3366F6C0	19/078 17:40:24.258	19/078 17:40:24.854	19/078 17:40:26.431	2.173	52	0E-9	100.0	1.79	31.8	47.0	18.4	0	0	45.7	-13.7	N	16	N	N	00
31	CS2	63E	300	3933E6B2	3933E6B2	19/078 17:40:23.969	19/078 17:40:24.550	19/078 17:40:26.446	2.477	64	0E-9	98.6	3.13	28.5	47.0	18.3	0	0	43.6	36.4	R	16	N	N	00
83	CS1	165E	300	DDA1A3E4	DDA1A3E4	19/078 17:40:23.282	19/078 17:40:23.850	19/078 17:40:26.333	3.051	86	0E-9	100.0	1.67	27.3	47.0	18.4	0	0	49.9	1.0	N	16	N	N	00
66	CS2	131E	300	DD4C00EE	DD4C00EE	19/078 17:40:25.279	19/078 17:40:25.867	19/078 17:40:26.431	1.152	12	0E-9	100.0	2.32	25.1	47.0	16.6	0	0	40.9	-2.3	R	16	N	N	00
72	CS1	143E	300	3B0071EA	3B0071EA	19/078 17:40:20.337	19/078 17:40:20.940	19/078 17:40:26.276	5.939	193	0E-9	100.0	1.75	36.3	46.9	19.8	0	0	49.6	28.1	N	16	N	N	00
13	CS1	27E	300	75C0F620	75C0F620	19/078 17:40:20.289	19/078 17:40:20.883	19/078 17:40:26.139	5.850	190	0E-9	100.0	2.52	27.7	46.8	22.7	0	0	40.6	-7.9	N	16	N	N	00
75	CS1	149E	300	DD8D5D056	DD8D5D056	19/078 17:40:23.274	19/078 17:40:23.856	19/078 17:40:26.099	2.825	77	0E-9	100.0	2.30	27.8	46.9	18.2	0	0	41.4	3.3	N	16	N	N	00
17	CS2	35E	300	DE1390A4	DE1390A4	19/078 17:40:23.916	19/078 17:40:24.490	19/078 17:40:26.014	2.098	50	0E-9	100.0	3.11	22.6	47.0	18.3	0	0	40.6	-3.6	R	16	N	N	00
86	CS2	171E	300	BC6327AC	BC6327AC	19/078 17:40:23.274	19/078 17:40:23.848	19/078 17:40:25.904	2.630	68	0E-9	100.0	2.12	25.4	47.0	18.4	0	0	39.9	0.5	R	16	N	N	00
8	CS2	176E	300	CE1502BC	CE1502BC	19/078 17:40:24.277	19/078 17:40:24.855	19/078 17:40:25.552	1.275	17	0E-9	98.9	2.57	25.7	47.0	17.9	0	0	39.4	1.2	R	16	N	N	00
26	CS1	53E	300	1726A232	1726A232	19/078 17:40:23.287	19/078 17:40:23.852	19/078 17:40:25.455	2.168	53	0E-9	100.0	1.66	25.6	47.0	18.3	0	0	48.0	1.4	N	16	N	N	00
55	CS2	109E	300	17750186	17750186	19/078 17:40:23.269	19/078 17:40:23.851	19/078 17:40:25.507	2.238	53	0E-9	100.0	2.37	25.4	46.9	18.2	0	0	41.7	1.0	R	16	N	N	00
104	CS1	217E	300	35416584	35416584	19/078 17:40:20.260	19/078 17:40:20.846	19/078 17:40:25.197	4.937	156	0E-9	99.7	2.44	29.2	46.9	22.5	0	0	45.2	5.8	N	16	N	N	00
11	CS1	23E	300	DE2CE6D6	DE2CE6D6	19/078 17:40:20.253	19/078 17:40:20.847	19/078 17:40:25.010	4.757	149	0E-9	100.0	1.89	31.8	46.8	22.7	0	0	45.1	-2.6	N	16	N	N	00

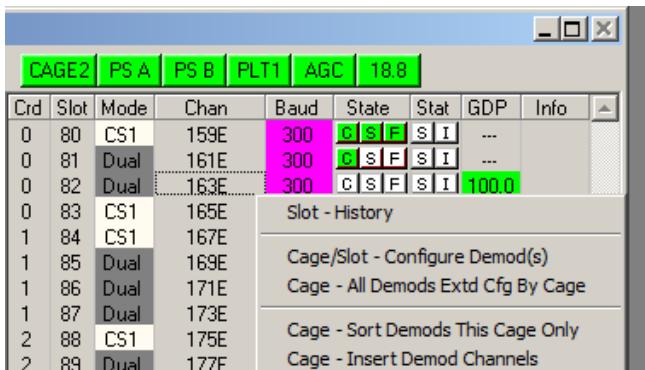
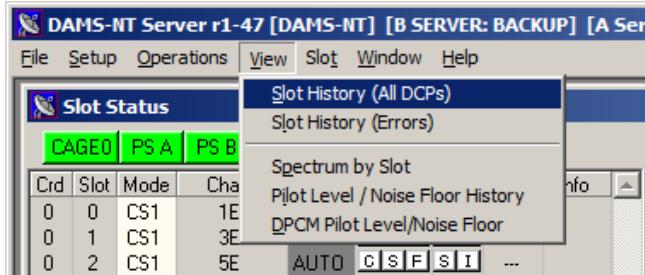
DCP MSG DATA DAPS/DDS DAMS-NT DECODED HEX-ASCII APPLY VIEW FULL MSG

^B\$TAsG`xZ`An@@D@g1`@kAsG`xZ`Ak@@M@h@`@hAsG`xZ`Au@@O@jV`@eAsG`xZ`Ag@@J@h@`@jAsP`xZ`AT@@G@gX`@vAsN`xZ`AQ@@E@gX`@sAsV`xZ`e_@G@hT`@EAAs^`xZ@@A@@F@hh`@As`xZ@AIC@G@hh`@Asf`xZ@AY@C@iP`@BRAsm`xZ@Aj@@D@iP`@B`@Asv`xZ@Ap@@E@jB`@B`@i

Client Demo [CPU Usage: 0%] MEMORY [Total: 16.187 KB] [Allocated: 15,426 KB] [Overhead: 760 KB] ALLOCATIONS [Total: 152,434] [Allocs/Sec: 8,780] UP TIME: 00:03:23 UP SINCE: 19/078 17:37:06 PC UTC: 19/078 17:40:30 ::

- Slot History and Client Message Screens Have Similar Format and Functionality, but there are differences.
 - GOES DCP Message List
 - Slot, Mode, Channel, BAUD
 - Address Original, Address Corrected
 - Start Time, Frame Time, End Time, Message Time (Duration)
 - Length (in Bytes), Data Quality (BER, GDPH, PHNS, SNR)
 - Cage Pilot Level, Cage Pilot Noise Floor
 - Parity Errors, Invalid (Bad) Chars, DAPS Stats
 - Signal Strength (SS), Frequency Offset (FO), Frame Sync Char (FS)
 - Modulation Index (MI), Data Quality Code (DQ), ARM Code
 - GOES DCP Message
 - ASCII, ASCII-HEX, STRIP PARITY
 - Extended *DigiTrak* Message Quality Statistics
 - Average Power, Frequency Deviation, Modulation Index/RMS Phase Noise, etc.
 - Message Time Stamps (Start, Symbol, Frame, End) to a millisecond resolution.
- Server Slot History windows can be launched for individual demods.
- Client message window can be filtered to a specific channel or a subset of channels.
- Monitoring message traffic can be useful for identifying system or demodulator performance issues – e.g. if all or a large number of messages are poor, could be an indication of a fault or interference.

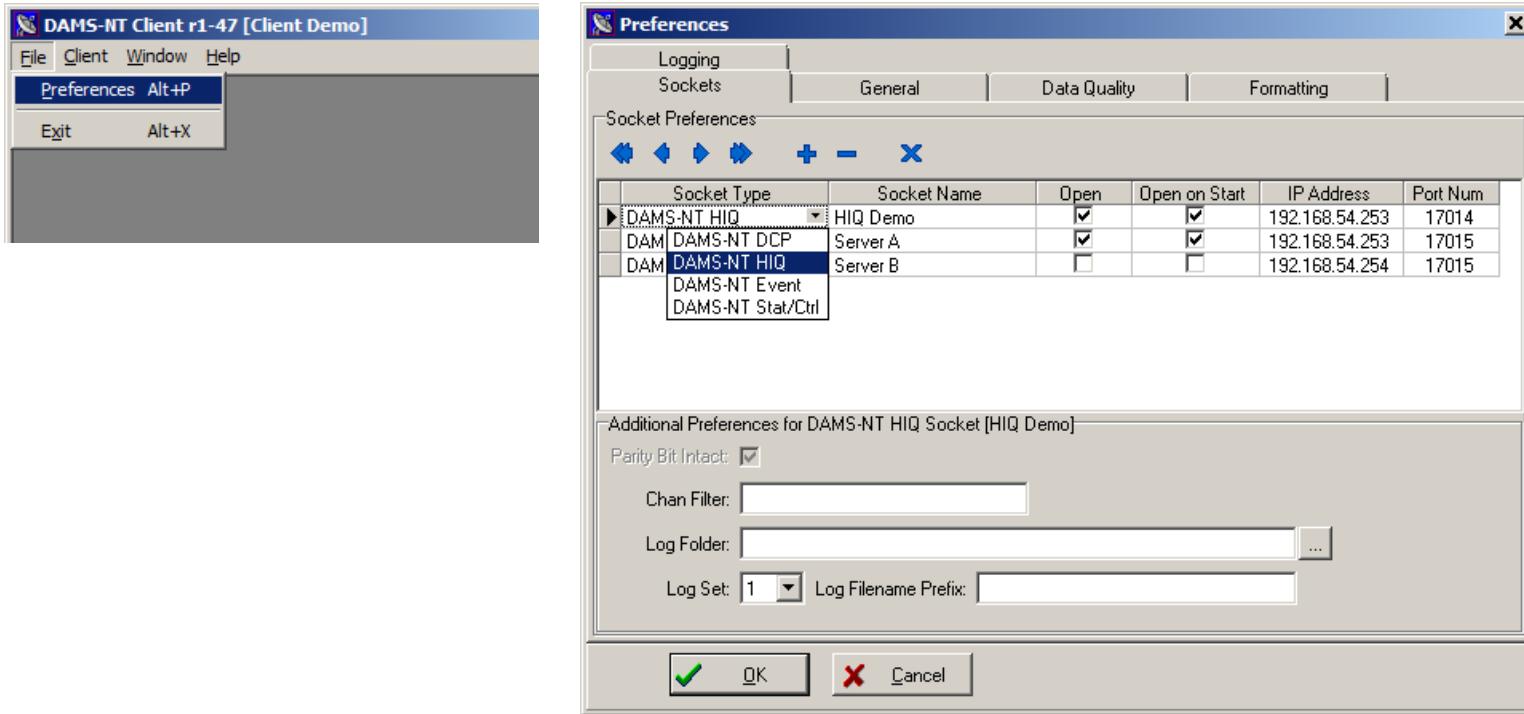
DAMS-NT Server: Slot History Windows



- Use View menu to access ...
 - “Slot History (All DCPs)” for all received messages.
 - “Slot History (Errors)” to see all messages with errors.
- Placing the cursor over a slot row in the Slot Status screen, right click the mouse and select “Slot – History”
- Can also be launched by simply double clicking mouse in grid row.

Slot	Mode	Chan	Baud	AddrCorr	AddrOrig	Carrier Time	Frame Time	End Time	Msg Dur	Len	BER	GDP	PHN	SNR	Pilot	Noise	Par	Bad	SS	FO	FS	MI	DO	ARM
82	CS1	163E	300	DD4D21E6	DD4D21E6	19/078 18:19:03.261	19/078 18:19:03.853	19/078 18:19:06.230	2.969	82	0E.9	100.0	1.73	34.5	47.0	19.0	0	0	49.7	0.6	N	N	N	00
82	C52	163E	300	DD4D147C	DD4D147C	19/078 18:18:50.853	19/078 18:18:58.189	7.935	266	0E.9	99.8	2.52	23.5	46.9	19.4	0	0	38.8	-0.3	R	N	N	00	
82	CS1	163E	300	DD4D070A	DD4D070A	19/078 18:18:42.512	19/078 18:18:43.108	19/078 18:18:46.125	3.613	106	0E.9	100.0	1.91	34.0	46.9	18.4	0	0	48.7	-46.1	N	N	N	00
82	CS1	163E	300	DD4CF574	DD4CF574	19/078 18:18:31.494	19/078 18:18:32.077	19/078 18:18:37.014	5.520	178	0E.9	100.0	1.70	34.0	47.0	19.1	0	0	48.8	-23.1	N	N	N	00
82	C52	163E	300	DD4CE602	DD4CE602	19/078 18:18:20.851	19/078 18:18:27.227	6.949	230	0E.9	100.0	2.23	24.5	46.9	21.4	0	0	39.4	-0.2	R	N	N	00	
82	CS1	163E	300	DD4CD398	DD4CD398	19/078 18:18:11.502	19/078 18:18:12.104	19/078 18:18:17.040	5.538	178	0E.9	99.3	3.19	24.0	47.0	19.1	0	0	38.5	-83.7	N	N	N	00
82	C52	163F	300	DD4C00FF	DD4C00FF	19/078 18:18:03.250	19/078 18:18:03.852	19/078 18:18:07.028	3.778	110	0E.9	99.8	2.29	25.0	47.0	18.1	0	0	39.5	0.8	R	N	N	00

DAMS-NT Client: Socket Preferences



- Use the Sockets tab in the Preferences dialog to set up the DAMS-NT HIQ socket.
- Server A is .253 and Server B is .254 on the DAMS-NT subnet.
- Port 17014 is for East and port 17024 is for West).
- Use Open to launch Client now; use Open on Start to launch with app.

DAMS-NT Client: Channel Filtering



- Use Channel Filter edit box above grid to specify channel(s) to filter on and then click filter speed button (flashlight).
- Use comma(s) and hyphen(s) to specify multiple channels to monitor.
 - Hyphen used to define range of channels (for example: 11-15 is equivalent to 11,12,13,14,15).



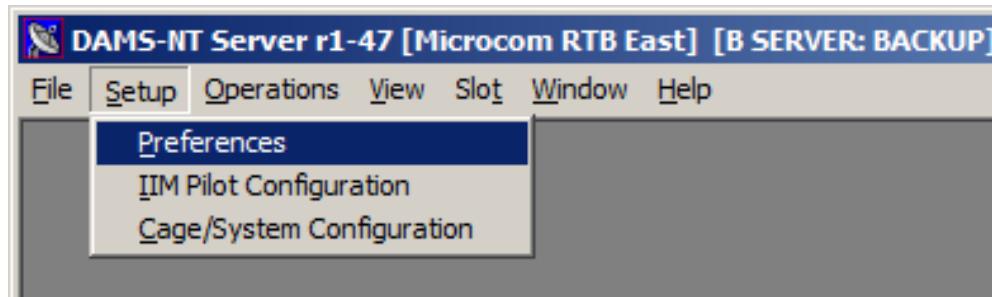
DRGS Software Components

Key Setup Information - Preferences

DAMS-NT Server: Preferences



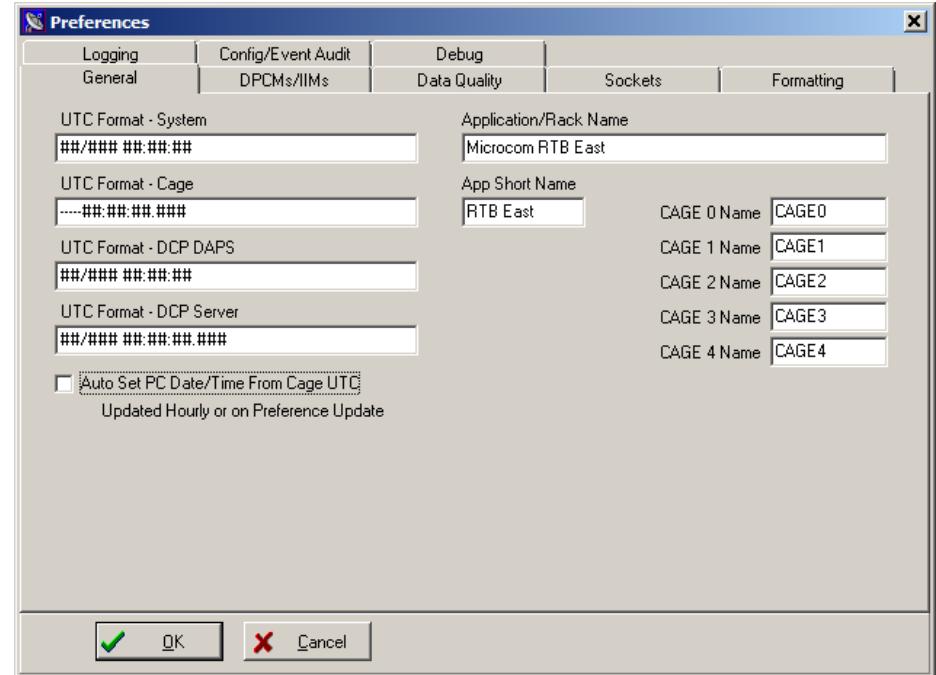
- Certain setups can presently only be done at DAMS-NT Server.
 - Need to access DAMS-NT Server Setup/Preferences menu.
 - Launches the DAMS-NT Preferences Dialog.
 - Options are grouped into seven distinct tabbed pages.



DAMS-NT Server: General Preferences



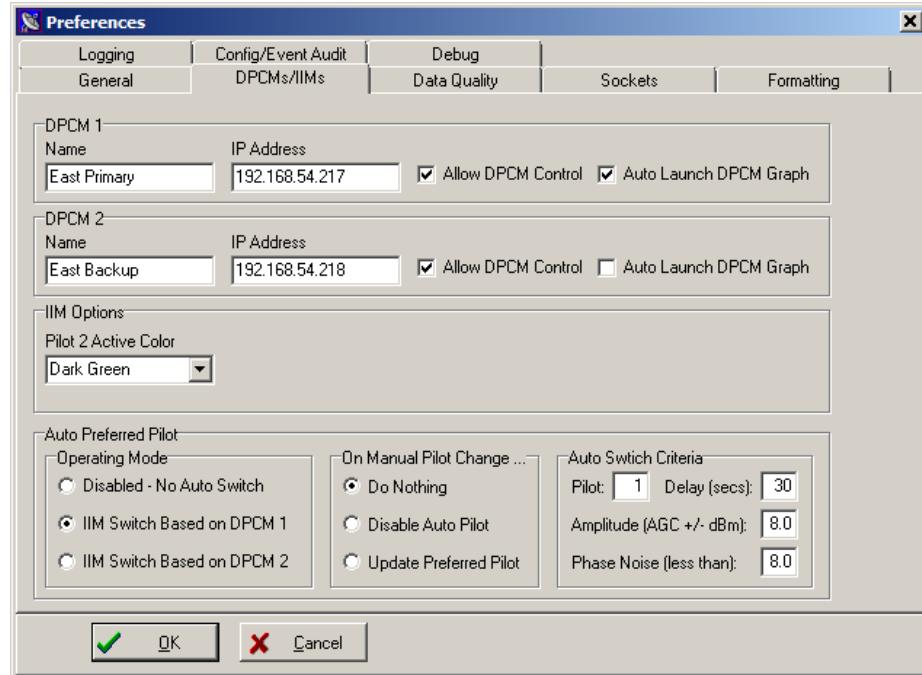
- Define Application/Rack Name
 - Appears in Title Bar
- Define App Short Name
 - For Windows Taskbar
- Define Unique Name for Each Cage
 - not commonly used
- UTC Time Formatting
- PC Date/Time Update
 - Should not be checked
 - Servers kept in time sync by NTP



DAMS-NT Server: DPCMs/IIMs Prefs



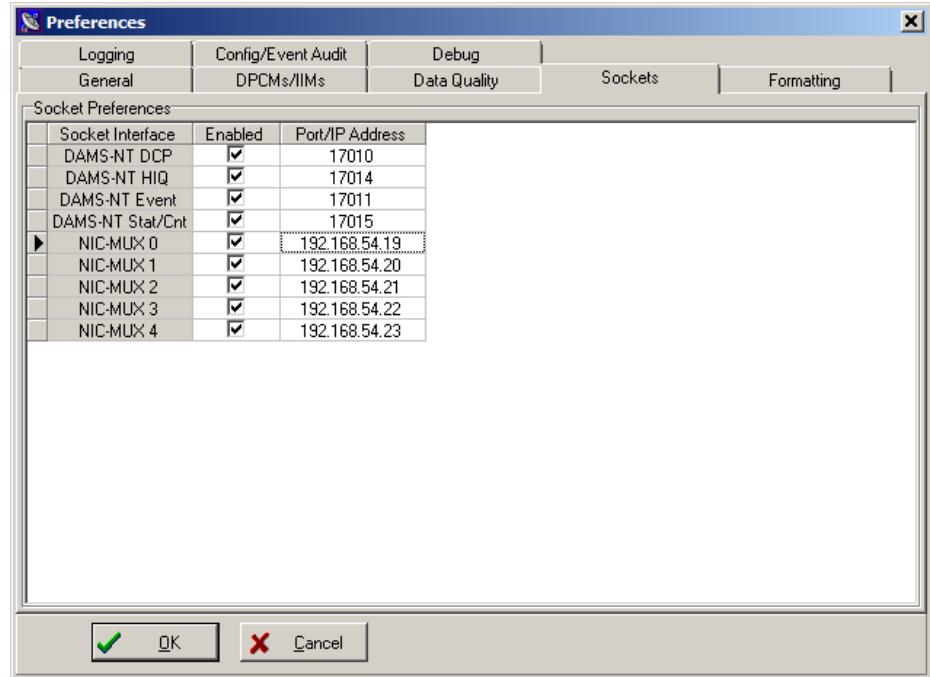
- Define DCPM Name
 - Status and Pilot Graphs
- Define DPCM IP Address
 - If DPCM is replaced, IP needs to be updated
- Allow DPCM Control
 - Typically is enabled
- Auto launch of DPCM Graph
 - Just a convenience
- Pilot 2 Active Color
 - To distinguish when IIMs operating on Backup Pilot
- Auto Preferred Pilot
 - Provides a mechanism to keep DPCMs and IIMs on Primary Pilot since it is typically better controlled due to separate East & West parabolic antennas.
 - Auto Switch Criteria intended to ensure switch back to Preferred Pilot doesn't happen too quickly and until Pilot is stable.



DAMS-NT Server: Socket Preferences



- Socket Configuration:
 - DAMS-NT Server Socket Port Numbers
 - NIC-MUX IP Addresses
- DAMS-NT Port Numbers
 - Typically set to Defaults
 - 1701x for East Ports
 - 1702x for West Ports
- NIC-MUX IP Addresses
 - First 3 octets determined by network configuration
 - Last octet is NIC-MUX last 2 digits of serial number
- NIC-MUX 0 through 4 settings logically determine Cage 0 through 4 mapping.
- If a NIC-MUX needs to be swapped ...
 - First confirm with IT department that Network Switch Port Security is not enabled.
 - Replace NIC-MUX and note new NIC-MUX Serial Number.
 - Access Setup/Preferences/Sockets and edit last octet accordingly.





Other DCS Components

DAMS-NT DigiRIT HRIT Receiver

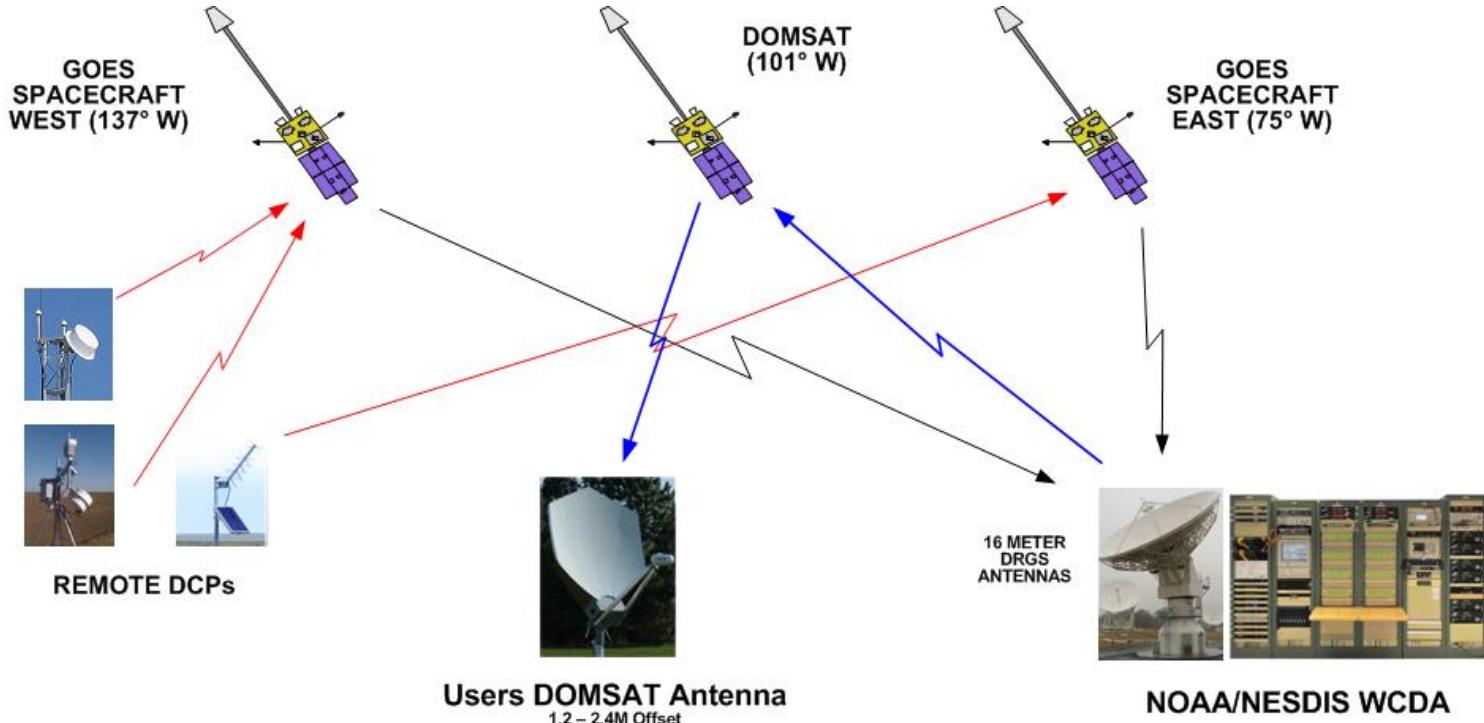
DOMSAT versus LRIT/HRIT Comparison



- Both are satellite rebroadcasts of all DCS messages received by NOAA.
- DOMSAT streams DCS messages, while LRIT/HRIT transfers files.
 - For efficiency, multiple DCS messages must be collected into files.
 - DOMSAT stream “dedicated” to DCS, LRIT/HRIT stream shares multiple NOAA products; DCS, EMWIN, Imagery.
- DOMSAT uses Domestic Satellite, LRIT/HRIT broadcast over GOES.
 - DOMSAT requires annual funding, LRIT/HRIT has no user recurring satellite usage costs.
 - DOMSAT has limited coverage outside of CONUS, LRIT/HRIT has hemispherical coverage.
 - DOMSAT primarily used for other data, GOES LRIT/HRIT dedicated to environmental usage.
- DOMSAT frequency in Ku band, while LRIT/HRIT in L band.
 - DOMSAT highly susceptible to weather fading, LRIT/HRIT far more robust.
 - DOMSAT service to be discontinued in May 2019.

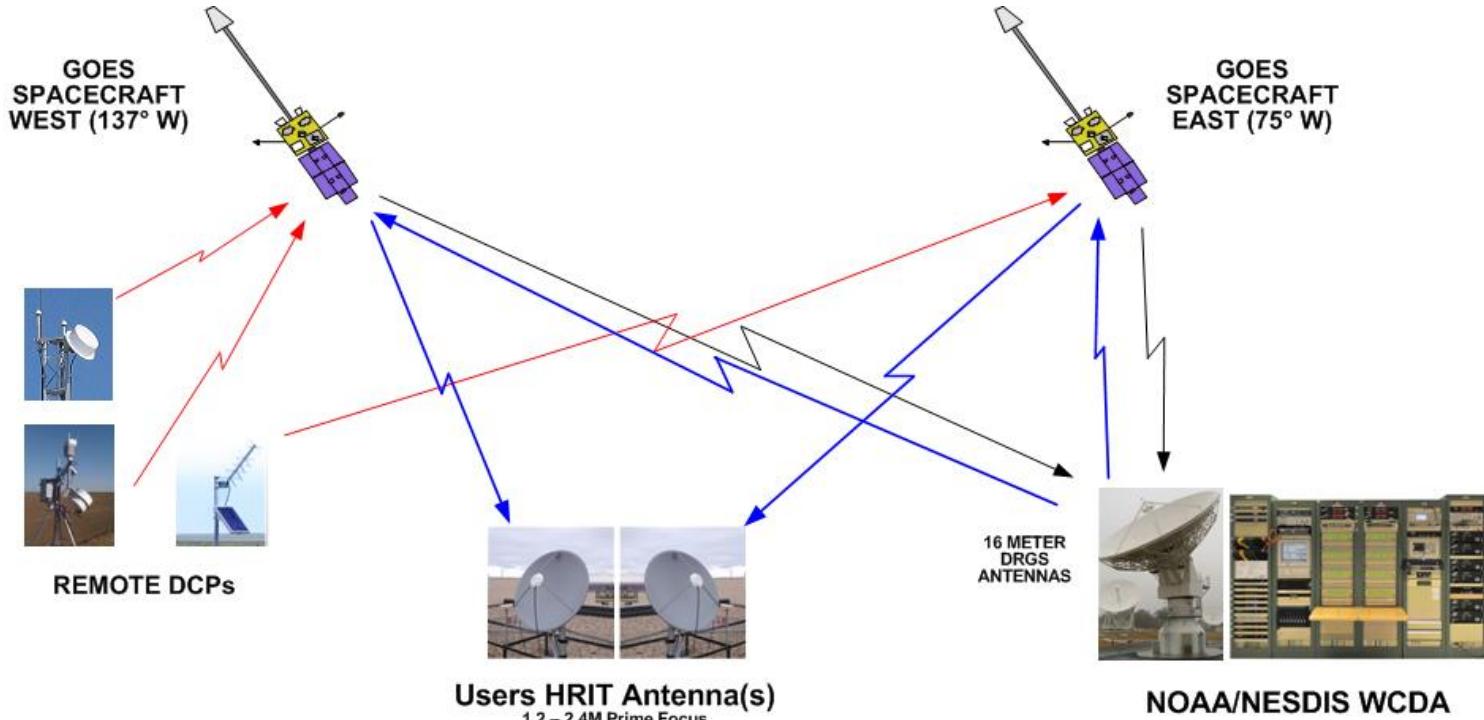
- HRIT is also known as HRIT/EMWIN
 - Emphasizes the use of HRIT for Emergency Managers Weather Information Network.
 - Previously EMWIN had a separate downlink from the satellite.
- Basic structure and information content remains the same:
 - Data packeting and forward error correction unchanged.
 - Virtual channel scheme unchanged.
 - Originally DCS file format/structure was unchanged.
 - New HRIT DCS File Format recently adopted and implemented.
- Operation changes:
 - Increases information data rate from 128 kbps to 405 kbps.
 - Downlink frequency changed slightly from 1691 to 1694.1 MHz.
 - Bandwidth increase from 400 kHz to 1.2 MHz to accommodate higher data rate.

DOMSAT Overview



- GOES West @ 137° W - DOMSAT @ 101° W - GOES East @ 75° W
 - Geostationary Orbits
- DCPS Uplink in UHF Band (~402 MHz)
- DCS Downlink in L Band (~1680 MHz)
- DOMSAT: Ku Band @ 11817.5 MHz

HRIT/EMWIN Overview



- GOES West @ 137° W - GOES East @ 75° W - Geostationary Orbits
- DCPs Uplink in UHF Band (~402 MHz)
- DCS Downlink in L Band (~1680 MHz)
- LRIT Downlink in L Band @ 1694.1 MHz – *FROM BOTH SATELLITES*
- NOTE: HRIT uses Prime Focus Dish versus Offset Antenna

- Downlink Frequency: 1694.1 MHz (L Band)
- Downlink Bandwidth 1.205 MHz
- Information Data Rate: 405 kbps (50.6 kBps)
- Forward Error Correction: Convolution and Block
 - Inner Code: Rate ½ Viterbi, Constraint Length 7
 - Outer Code: Reed Solomon (255,223) – 223 information bytes and 32 check bytes; can correct up to 16 bytes in error
- Data Files are Packetized and Framed
 - Frame: 1024 Bytes
 - 4-byte FSS, followed by four interleaved 255 byte RS blocks.
 - ~ 880 bytes of information in each frame.
 - Packets: Variable up to 8 kilobytes
 - Each Packet terminated in CRC-16.
 - Large Files require multiple packets.
 - First Packet contains HRIT Headers.

- Files can be sent on one of 63 Virtual Channels (VC)
 - Each Frame begins with a 6-byte sequence that defines the VC and includes a 3-byte Frame Counter.
 - Frame Sequence Counters are unique to VC.
- Each Virtual Channels has defined minimum and maximum data throughput rates to essentially set a priority scheme.
 - Smaller DCS files can be interspersed while a larger image file is being transmitted.
 - DCS legacy formatted files being transmitted on VC 31.
 - New DCS files being transmitted on VC 32.
- LRIT is a Continuous Transmission
 - A 64TH Virtual Channel (VC 63) is used for "Fill", i.e. when there is no data to send.
 - With coding overhead, actual transmission rate is 927 ksps (kbps)
$$405 = (927 / 2) * (223/255)$$

DigiRIT Receiver: Front Panel



- 2RU 19" Rack Mount Configuration.
 - Status, Setup and Test from Front Panel.
- Status
 - LCD provides operational summary status.
 - Red/Green LEDs for Signal Acquired and Client Connected status
- Setup
 - Simple two-button setup using LCD as feedback.
 - Requires very little setup, and should rarely need to be changed
- Test
 - RF monitoring connections.
 - Diagnostic troubleshooting serial port.

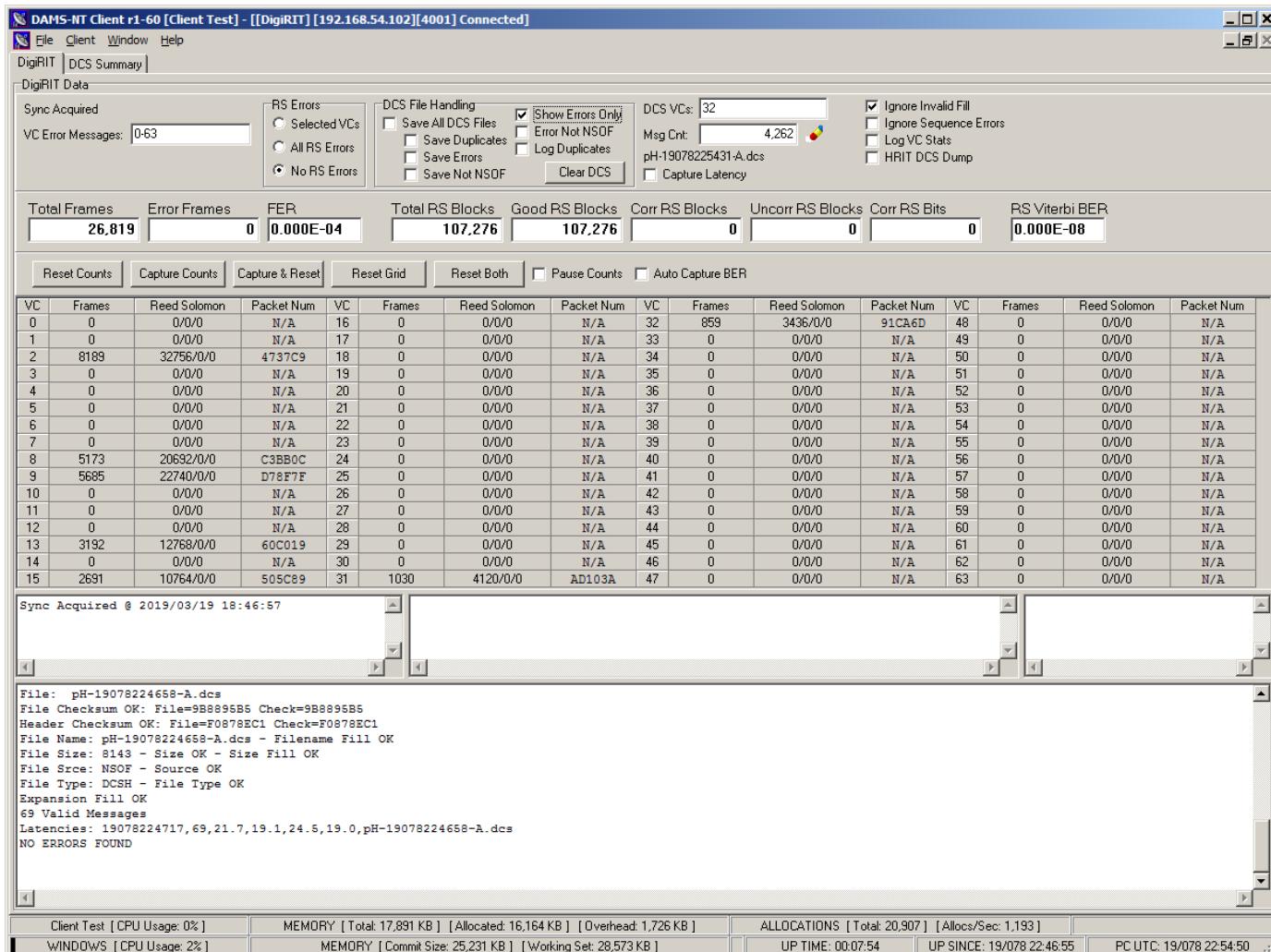
DigiRIT Receiver: Rear Panel



- Power
 - Standard 110/120 VAC Power Input
 - Power On/Off switch and visual indication.
- IF Connections
 - 140 MHz (± 14 MHz) Input – Typically used for standalone HRIT system.
 - 70 MHz (± 20 MHz) Input – Typically used when piggybacked of DRGS system; as in the case of NSOF and WCDA.
 - Input level range -80 to -20 dBm; above -40 dBm must use internal attenuator.
 - Optionally enable DC power to feed with visual indication.
 - Buffered outputs can feed other components.
- Network – Separate TCP/IP Connection for
 - DCS connection to acquire just DCS messages formatted in DAMS-NT protocol.
 - Raw LRIT/HRIT interface to receive entire stream of data.

- Two DigiRIT units deployed at both NSOF and WCDA.
 - One unit at each site monitoring GOES-East and the other monitoring GOES-West.
 - IF input for DigiRITs daisy chain from DPCMs.
 - HRIT IF Frequency: 74.1 MHz
- Primary purpose is to provide Data Quality Monitor (DQM) function similar to DOMSAT.
 - DADDS can ingest the DCS messages received by DigiRIT and compare to messages sent to PDA/HRIT.
 - Messages not received can be optionally retransmitted.
 - Unlike DOMSAT, HRIT DQM process can and must monitor to ingest streams; East and West.
- Presently two separate DCS file streams are being generated by DADDS; each stream accounts for ~3.5% of HRIT bandwidth.
 - Legacy format provided only minimal, DAPS style, quality statistics.
 - New format includes high resolution DAMS-NT quality statistics in a compressed format that actually reduces overhead by 41%.
 - New format also utilizes improved Abnormal Received Message (ARM) code approach, which will eliminate need to transmit Informational Messages.

DigiRIT: Special DAMS-NT Client



DigiRIT DAMS-NT Client: Overview

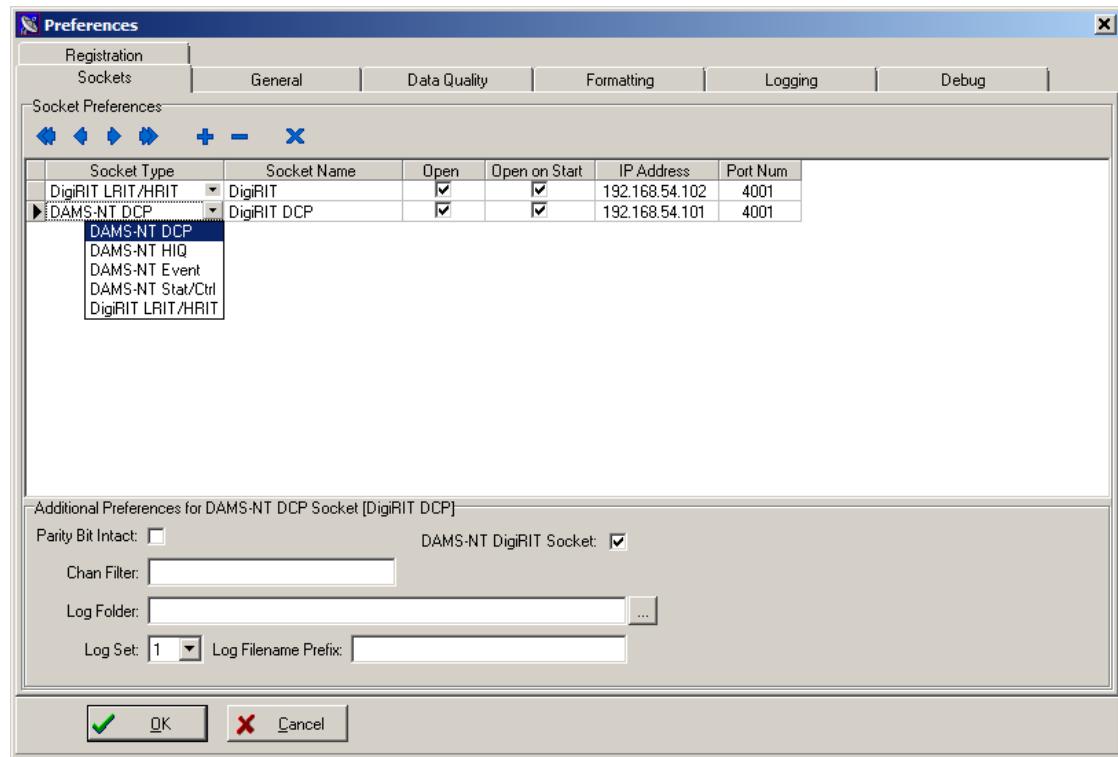


- Special version of DAMS-NT Client specifically developed for DigiRIT.
 - Originally written by Microcom as a means to test the DigiRIT when it was first being developed in 2012.
 - Was extended and used for validation of original DADDS LRIT dissemination process.
 - Was further extended and utilized extensively to assist PDA/HRIT contractor in addressing latency issues with initial implementation of HRIT DCS transmissions in 2017 and early 2018.
 - Was further extended in fall of 2018 to add Frame Error Rate and Bit Error statistics in support of HRIT interference testing.
 - Recently enhanced to support New HRIT DCS File Format.
- Installed on Process Monitor computer in Quiet Room when DigiRITs were installed in 2018, but has not been accessible due to login permissions issue, which was resolved as part of DADDS Refresh.
- Should be a useful monitoring and troubleshooting tool for HRIT DCS dissemination specifically, and HRIT in general.
- May want or require additional enhancements once WCDA Operators have had a chance to get familiar with application.
 - While it was written to test and monitor HRIT, and specifically DCS traffic, it was not written to satisfy any specific NOAA operational requirements.

DigiRIT Client: Socket Setup



- Since it was built off standard DAMS-NT Client, app includes all standard Client sockets.
- For DCS message reception, use DAMS-NT DCP socket type.
- For overall HRIT monitoring, use DigiRIT LRIT/HRIT socket type.
- DAMS-NT DCP Socket ingests DCS messages in DAMS-NT Protocol.
 - Includes special extensions for DigiRIT status monitoring.
 - Supports DAMS-NT Protocol extensions for enhanced HRIT file format.
- A single Client instance can interface to multiple DigiRITs.



DCP Socket: New DCS HRIT File Format



DAMS-NT Client r1-60 [Client Test] - [[DigiRIT DCP] [192.168.54.101][4001] Connected]

File Client Window Help

DCP Data (All) DigiRIT Status/DCP Summary

ACTIVE 51,594 << Row 1312 of 2500 >>

Slot	Mode	Chan	Baud	PlatformID	Carrier Time	End Time	Msg Dur	Len	Ingest Time	Latency	GDP	PHN	SS	FO	MI	DQ	FLG	ARM
32	CS1	31E	300	CE392412	19/079 17:40:50.292	19/079 17:40:54.713	4.421	137	19/079 17:41:07.913	13.200	100.0	1.74	46.8	-1.9	N	N	30	...
32	CS1	67E	300	8030C406	19/079 17:40:50.378	19/079 17:40:54.627	4.249	130	19/079 17:41:07.913	13.286	97.0	3.80	36.5	13.9	N	N	30	...
32	CS1	175E	300	4542D4DE	19/079 17:40:45.396	19/079 17:40:54.552	9.156	315	19/079 17:41:07.913	13.361	100.0	1.94	44.0	5.2	N	N	30	...
32	CS2	144W	300	43438394	19/079 17:40:49.598	19/079 17:40:54.323	4.725	149	19/079 17:41:07.913	13.590	100.0	1.38	45.0	-0.8	N	N	30	N.T.
32	CS1	164W	300	DD6792D4	19/079 17:40:50.304	19/079 17:40:54.115	3.811	114	19/079 17:41:07.913	13.798	100.0	1.78	46.5	-0.8	N	N	30	...
32	CS2	29E	300	170D008C	19/079 17:40:50.285	19/079 17:40:54.316	4.031	120	19/079 17:41:07.913	13.597	100.0	2.15	39.8	-2.1	N	N	30	...
32	CS2	73E	300	CE163018	19/079 17:40:51.934	19/079 17:40:54.300	2.366	58	19/079 17:41:07.788	13.488	97.0	3.58	38.4	1.0	N	N	30	...
32	CS2	157E	300	17E191F8	19/079 17:40:50.282	19/079 17:40:54.129	3.847	113	19/079 17:41:07.788	13.659	99.5	2.84	36.8	0.6	N	N	30	...
32	CS2	148W	300	3363341E	19/079 17:40:50.280	19/079 17:40:53.849	3.569	102	19/079 17:41:07.788	13.939	100.0	1.86	40.0	-0.8	N	N	30	...
32	CS1	147E	300	335DD5F4	19/079 17:40:50.274	19/079 17:40:53.967	3.693	109	19/079 17:41:07.788	13.821	100.0	1.93	44.5	17.5	N	N	30	...
32	...	161E	300	CE4642CA	19/079 17:38:45.000	19/079 17:38:50.000	...	...	19/079 17:41:07.788	...	...	...	...	...	...	...	...	M

DCP MSG DATA DAPS/DDS DAMS-NT HEX-ASCII APPLY VIEW FULL MSG

```
PC 10 #15 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 :PR 700 #1440 0.00 0.00 :WL 10 #15 1.92 1.86 1.93 1.89 1.91 1.90
1.94 1.90 :BL 13.21
```

Client Test [CPU Usage: 0%] MEMORY [Total: 20,774 KB] [Allocated: 18,820 KB] [Overhead: 1,954 KB] ALLOCATIONS [Total: 61,876] [Allocs/Sec: 968]

WINDOWS [CPU Usage: 0%] MEMORY [Commit Size: 30,547 KB] [Working Set: 35,635] UP TIME: 01:27:26 UP SINCE: 19/079 16:16:14 PC UTC: 19/079 17:43:40

- DAMS-NT DCP Socket similar to other DCS message ingest windows.
- Key distinctions include:
 - Message Ingest and Latency columns – HRIT latency is typically 10-20 seconds.
 - Reduced, but improved HRIT message statistics
 - ARM flag and Missed Message reporting.
 - Slot reports HRIT Virtual Channel (32 is new format, 31 is legacy format).

DCP Socket: Legacy File Comparison



DAMS-NT Client r1-60 [Client Test] - [[DigiRIT DCP] [192.168.54.101][4001] Connected]

File Client Window Help

DCP Data (ALL) DigiRIT Status/DCP Summary

ACTIVE 52,299 << Row 1 of 2500 >>

Slot	Mode	Chan	Baud	PlatformID	Carrier Time	End Time	Msg Dur	Len	Ingest Time	Latency	GDP	PHN	SS	FO	MI	DQ	FLG	ARM
31	...	113E	300	15DDC52C	19/079 17:50:50.509	19/079 17:50:58.446	7.937	270	19/079 17:51:12.070	13.624	...	...	51	+0	N	N	00	...
31	...	37E	300	51809748	19/079 17:50:50.701	19/079 17:50:58.371	7.670	258	19/079 17:51:11.072	12.701	...	...	37	+0	N	N	00	...
31	...	112W	300	F001E38A	19/079 17:50:52.626	19/079 17:50:58.708	6.082	198	19/079 17:51:11.072	12.364	...	...	35	+0	N	N	00	...
31	...	88W	300	CE942122	19/079 17:50:56.294	19/079 17:50:58.694	2.400	62	19/079 17:51:11.072	12.378	...	...	44	+0	N	N	00	...
31	...	72W	300	3351527C	19/079 17:50:54.291	19/079 17:50:57.652	3.361	96	19/079 17:51:11.072	13.420	...	...	43	+0	N	N	00	...
31	...	206W	300	BCC15C4C	19/079 17:50:56.314	19/079 17:50:57.741	1.427	25	19/079 17:51:11.072	13.331	...	...	34	+0	H	N	00	...
31	...	150W	300	3369F052	19/079 17:50:54.311	19/079 17:50:57.610	3.299	96	19/079 17:51:11.072	13.462	...	...	42	+0	N	N	00	...
31	...	148W	300	3361A488	19/079 17:50:54.303	19/079 17:50:57.468	3.165	89	19/079 17:51:11.072	13.604	...	...	43	+0	N	N	00	...
31	...	133E	300	16639452C	19/079 17:50:56.594	19/079 17:50:57.723	1.129	14	19/079 17:51:11.072	13.349	...	...	48	+0	N	N	00	...
31	...	159E	300	33660644	19/079 17:50:54.279	19/079 17:50:57.620	3.341	95	19/079 17:51:11.072	13.452	...	...	38	+0	N	N	00	...
31	...	153E	300	17F222E6	19/079 17:50:51.275	19/079 17:50:57.603	6.328	207	19/079 17:51:11.072	13.469	...	...	41	+0	N	N	00	...

DCP MSG DATA DAPS/DDS DAMS-NT HEX-ASCII APPLY VIEW FULL MSG

```
20/03/19 17:45 303 327 1.5 7.9 18.52 27 3.75 770 0 13.6 842
20/03/19 17:30 220 319 2.9 5.2 18.04 32 3.75 771 0 13.6 825
20/03/19 17:15 86 357 0.0 7.2 18.10 33 3.75 771 0 13.6 801
20/03/19 17:00 140 338 1.3 9.4 17.30 35 3.75 771 0 13.6 765
```

Client Test [CPU Usage: 0%] MEMORY [Total: 22,085 KB] [Allocated: 20,181 KB] [Overhead: 1,903 KB] ALLOCATIONS [Total: 77,371] [Allocs/Sec: 1,197]

WINDOWS [CPU Usage: 0%] MEMORY [Commit Size: 32,288 KB] [Working Set: 37,212] UP TIME: 01:35:00 UP SINCE: 19/079 16:16:14 PC UTC: 19/079 17:51:15

- Improved HRIT message statistics only available from new HRIT DCS files.
 - Good Phase (GDP) and Phase Noise (PHN) ARM flag not present.
 - Signal Strength to dB instead of 0.1 dB.
 - Frequency Offset reported in DAPS compressed format with 50 Hz resolution instead of to 0.1 Hz.
 - No ARM codes reported.

DCP Sckt: DigiRIT Status/DCP Summary



DAMS-NT Client r1-60 [Client Test] - [[DigiRIT DCP] [192.168.54.101][4001] Connected]

File Client Window Help

DCP Data (ALL) DigiRIT Status/DCP Summary

DigiRIT Status

Signal Strength	RS Score	Clients	Message Counter	State
-58.9 dBm	100%	1	0000881481	FS
Count Reset				

Serial No: 1001 Main Version: V1.14 Slave Version: V1.13

HRIT IF Frequency: 77.100 MHz Attenuation: 0 dB VC Mode: Static (32,63,63,63)

Message Summary

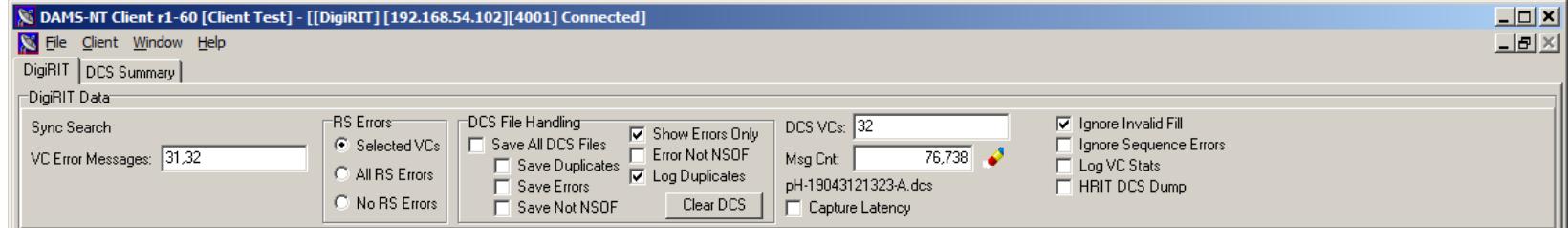
Info	UTC 19	UTC 18	UTC 17	UTC 16	UTC 15	UTC 14
Received (All/Errors/Missed)	30852/126/646	35383/120/685	35252/132/661	35228/114/672	35233/123/746	35049/135/752
In Filter (All/Errors/Missed)	30852/126/646	35383/120/685	35252/132/661	35228/114/672	35233/123/746	35049/135/752
Info	UTC 13	UTC 12	UTC 11	UTC 10	UTC 9	UTC 8
Received (All/Errors/Missed)	34634/122/688	35161/128/684	35001/119/713	35038/120/693	35057/105/684	34951/112/659
In Filter (All/Errors/Missed)	34634/122/688	35161/128/684	35001/119/713	35038/120/693	35057/105/684	34951/112/659
Info	UTC 7	UTC 6	UTC 5	UTC 4	UTC 3	UTC 2
Received (All/Errors/Missed)	35033/129/670	35126/109/633	34938/112/676	34976/108/658	35079/138/662	34972/150/683
In Filter (All/Errors/Missed)	35033/129/670	35126/109/633	34938/112/676	34976/108/658	35079/138/662	34972/150/683
Info	UTC 1	UTC 0	UTC 23	UTC 22	UTC 21	UTC 20
Received (All/Errors/Missed)	35087/144/671	35269/112/642	35032/104/709	35081/111/731	35124/108/705	35054/130/684
In Filter (All/Errors/Missed)	35087/144/671	35269/112/642	35032/104/709	35081/111/731	35124/108/705	35054/130/684
Info	DAY 80	DAY 79	DAY 78	DAY 77	DAY 76	DAY 75
Received (All/Errors/Missed)	697319/2458/13578	131/1/21	0/0/0	0/0/0	0/0/0	0/0/0
In Filter (All/Errors/Missed)	697319/2458/13578	131/1/21	0/0/0	0/0/0	0/0/0	0/0/0

Client Test [CPU Usage: 1%] MEMORY [Total: 19,595 KB] [Allocated: 17,814 KB] [Overhead: 1,780 KB] ALLOCATIONS [Total: 15,295] [Allocs/Sec: 3,773]

WINDOWS [CPU Usage: 0%] MEMORY [Commit Size: 31,498 KB] [Working Set: 33,820] UP TIME: 1 Day 00:40:28 UP SINCE: 19/079 19:11:06 PC UTC: 19/080 19:51:34

- DigiRIT Status parrots front panel status and other key information.
- Message Summary grid can be useful for identifying short term or daily outages.
 - Reports total, and messages with errors (e.g. parity), and missed.

DigiRIT Socket: Control Section



- Control Section provides numerous controls to tailor operation and monitoring:
 - Error Messages can be limited to only VCs of interest.
 - Reed Solomon (RS) Errors can be for selected or all VCs, or totally ignored.
 - DCS Files can be saved in variety of ways for additional analysis.
 - Long term latency information can be captured in files.
 - Special options for ignoring specific errors and capturing additional info.

DigiRIT Socket: FER/BER Section



Total Frames	Error Frames	FER	Total RS Blocks	Good RS Blocks	Corr RS Blocks	Uncorr RS Blocks	Corr RS Bits	RS Viterbi BER
392,245	6	1.530E-05	1,568,980	1,568,640	322	18	2,980	9.311E-07
<input type="button" value="Reset Counts"/>	<input type="button" value="Capture Counts"/>	<input type="button" value="Capture & Reset"/>	<input type="button" value="Reset Grid"/>	<input type="button" value="Reset Both"/>	<input type="checkbox"/> Pause Counts	<input type="checkbox"/> Auto Capture BER		

- FER/BER Top Section provides running HRIT performance statistics.
 - Frames: Total, Error (at least one uncorrectable RS block), and Frame Error Rate (FER)
 - RS Blocks: Total (4 per Frame), Good (no errors), Correctable, Uncorrectable, and total number of corrected bits by RS algorithm.
 - RS Viterbi Bit Error Rate (BER): Calculated from the number of bits the RS corrects.
- FER/BER Section provides several controls to clear, capture and control performance statistics and the VC Grid information.

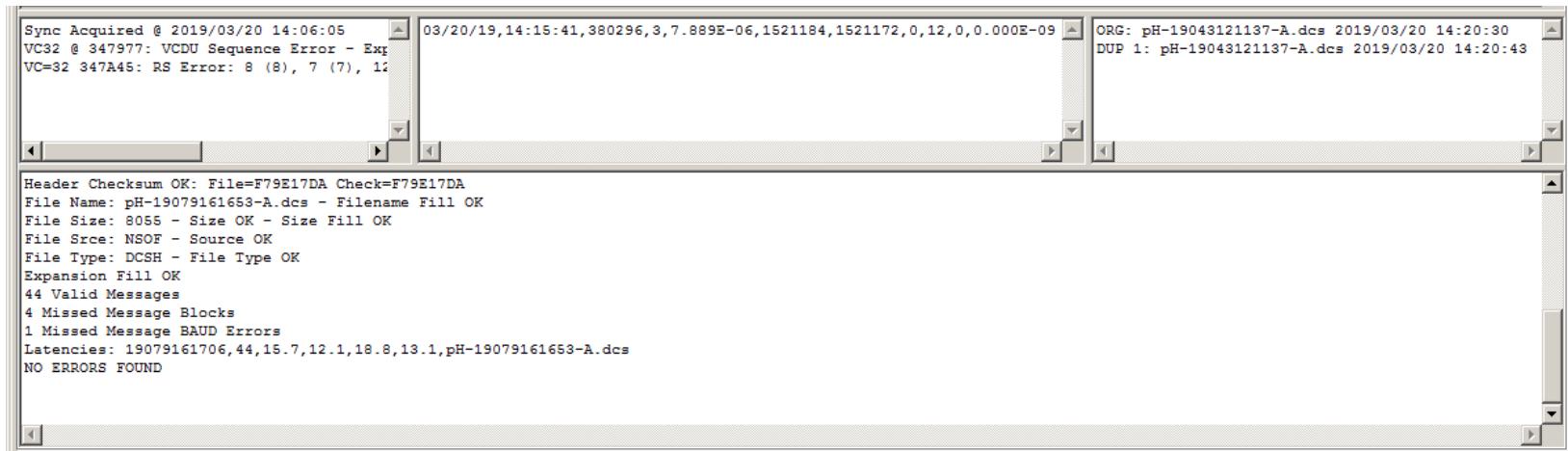
DigiRIT Socket: Virtual Channel Grid



VC	Frames	Reed Solomon	Packet Num	VC	Frames	Reed Solomon	Packet Num	VC	Frames	Reed Solomon	Packet Num	VC	Frames	Reed Solomon	Packet Num
0	4	16/0/0	000A85	16	0	0/0/0	N/A	32	16215	64540/319/1	347C5C	48	0	0/0/0	N/A
1	18006	72024/0/0	5EB0EA	17	5646	22584/0/0	37FDAE	33	0	0/0/0	N/A	49	0	0/0/0	N/A
2	62318	249272/0/0	4B0812	18	0	0/0/0	N/A	34	0	0/0/0	N/A	50	0	0/0/0	N/A
3	0	0/0/0	N/A	19	0	0/0/0	N/A	35	0	0/0/0	N/A	51	0	0/0/0	N/A
4	0	0/0/0	N/A	20	1557	6228/0/0	02E6FD	36	0	0/0/0	N/A	52	0	0/0/0	N/A
5	0	0/0/0	N/A	21	0	0/0/0	N/A	37	0	0/0/0	N/A	53	0	0/0/0	N/A
6	0	0/0/0	N/A	22	14227	56908/0/0	127A55	38	0	0/0/0	N/A	54	0	0/0/0	N/A
7	32788	131152/0/0	8A4C3F	23	7	28/0/0	00183B	39	0	0/0/0	N/A	55	0	0/0/0	N/A
8	19940	79760/0/0	0EC09A	24	156	624/0/0	05CD75	40	0	0/0/0	N/A	56	0	0/0/0	N/A
9	21678	86712/0/0	DAA1FC	25	0	0/0/0	N/A	41	0	0/0/0	N/A	57	0	0/0/0	N/A
10	0	0/0/0	N/A	26	0	0/0/0	N/A	42	0	0/0/0	N/A	58	0	0/0/0	N/A
11	0	0/0/0	N/A	27	0	0/0/0	N/A	43	0	0/0/0	N/A	59	0	0/0/0	N/A
12	0	0/0/0	N/A	28	0	0/0/0	N/A	44	0	0/0/0	N/A	60	0	0/0/0	N/A
13	28344	113376/0/0	65BBC2	29	0	0/0/0	N/A	45	0	0/0/0	N/A	61	0	0/0/0	N/A
14	35090	140360/0/0	5EE0C2	30	0	0/0/0	N/A	46	0	0/0/0	N/A	62	0	0/0/0	N/A
15	33944	135776/0/0	553D52	31	16747	66988/0/0	AFA167	47	0	0/0/0	N/A	63	85573	342292/0/0	FFFFCB

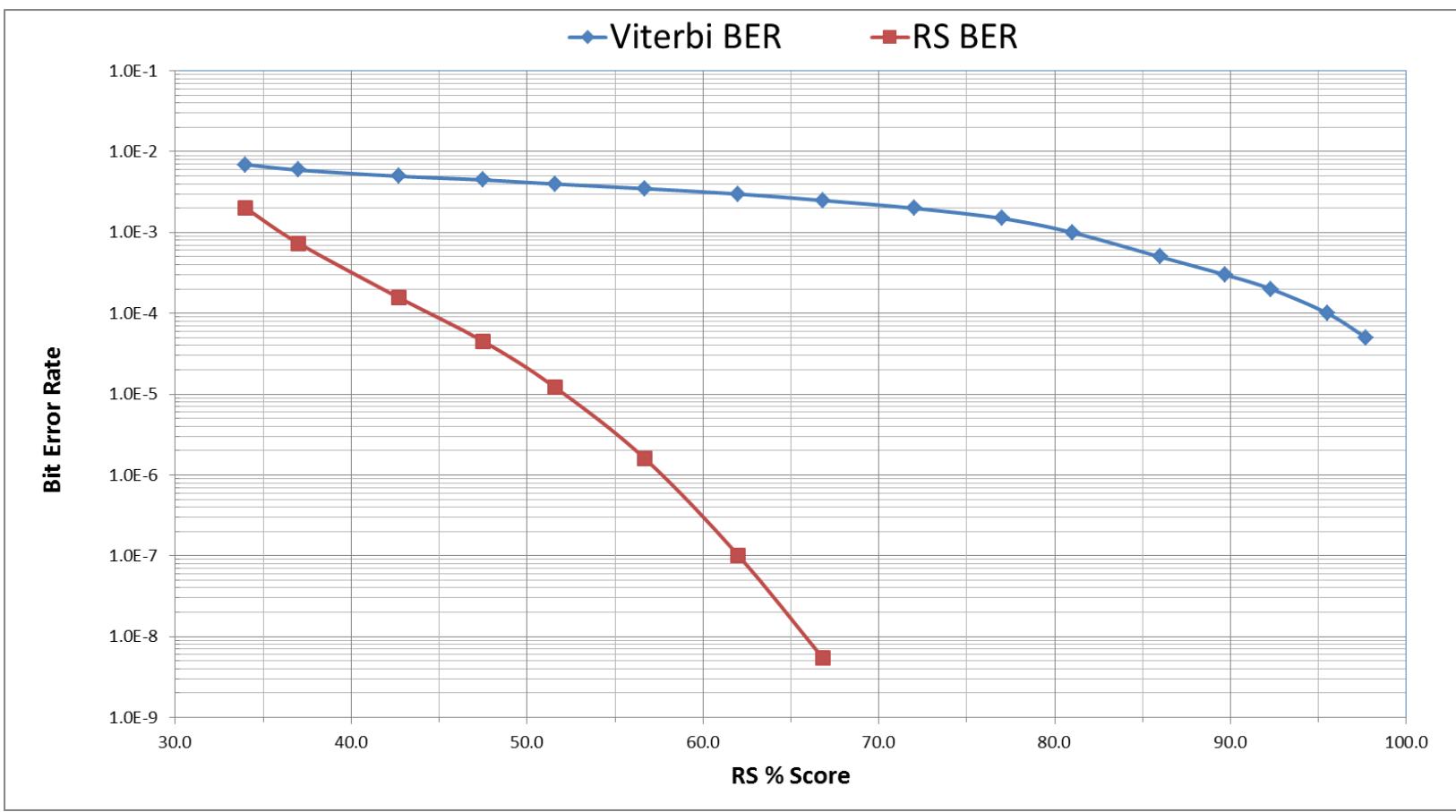
- Virtual Channel Grid summarizes statistics on each of the 64 virtual channels, including:
 - Total Number of Frames
 - Read Solomon Counts – Good/Corr/Uncorr
 - Current Packet/Frame sequence number.

DigiRIT Socket: Memos Section



- Memos Section provides four distinct memo fields (from top left):
 - HRIT Event/Error Log: Captures key HRIT events (e.g. Sync Acquired) and errors. Errors can be filtered using settings in Controls Section.
 - FER/BER and VC Log: Used to capture FER/BER statistics and VC summary.
 - DCS File Log: Will log the filenames of any DCS files received with errors and duplicate files received along with date/time stamp.
 - DCS File Summary Memo: Can show file summary results for all DCS files or only ones with detected errors.
- Memo sections can be easily resized as desired. Place cursor on vertical splitters between upper three memos or the horizontal splitter, and click and drag.

DigiRIT BER versus RS % Score



- Reed Solomon Percentage Score is reported in DigiRIT LCD.
- Graph indicates the above 80% should expect virtually no data errors.

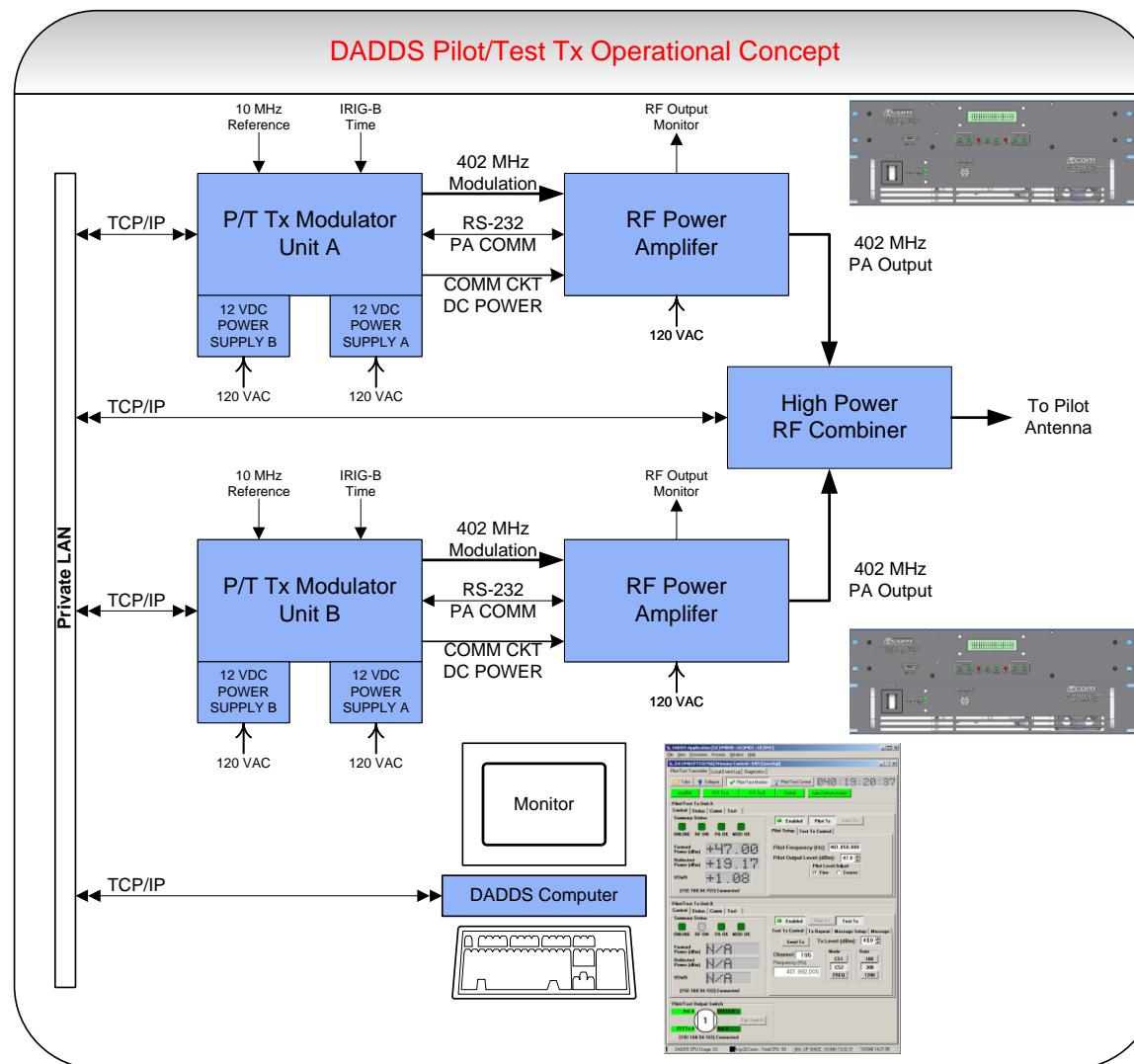


DigiRIT and DAMS-NT Client Demo



Other DCS Components Pilot/Test Transmitter

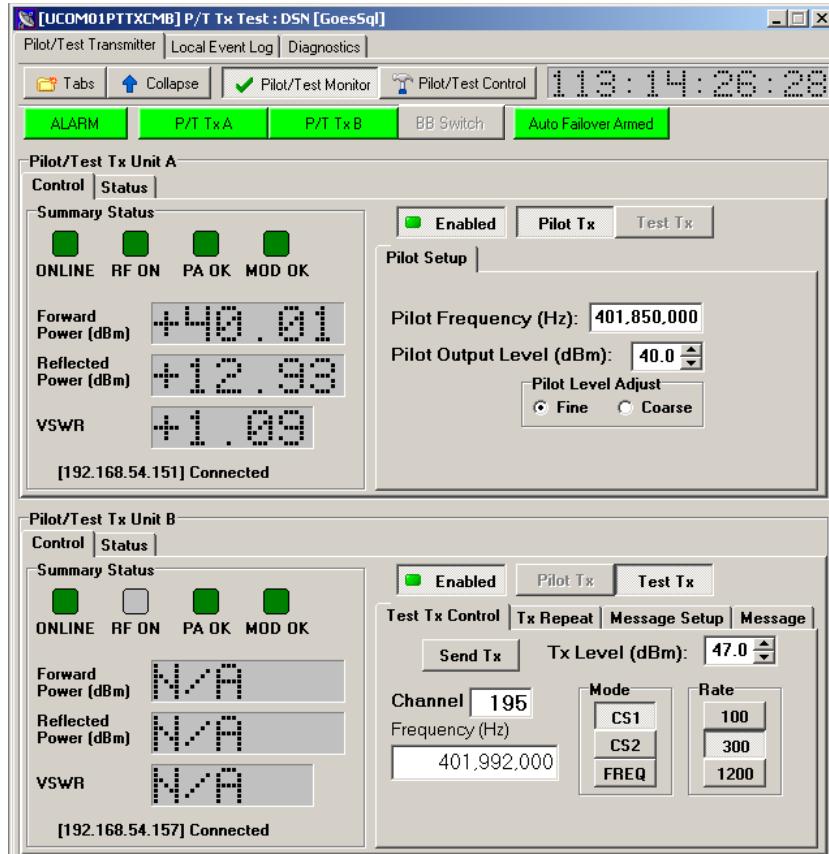
P/T TX: Typical System Block Diagram



- Segregate Control and Low Power RF (modulation) functions from High Power RF functions. Each P/T Tx Unit consists of ...
 - Pilot/Test Transmitter Control Module (a.k.a. Modulator) unit.
 - Pilot/Test Transmitter Power Amplifier (PA) unit.
 - Modulator and PA need to be paired, but are not a matched set.
- Pair Two P/T Tx Units to Create System
 - One P/T Tx to provide Pilot uplink (High Priority).
 - Second P/T Tx to be Test Transmitter (Low Priority).
- Second P/T Tx acts as Hot Backup to Pilot unit.
 - Originally used RF Transfer switch to direct individual RF Outputs to appropriate antennas under computer control.
 - In 2016, replaced RF Transfer switches with high power RF Combiners.
 - Provide for Pilot Auto Failover capability.
- Other Important Features:
 - Single DADDS instance can control multiple P/T Tx Systems.
 - Ability to have other DADDS instances monitor P/T Tx Systems (albeit with single point of control).
 - Front Panel backup operation.

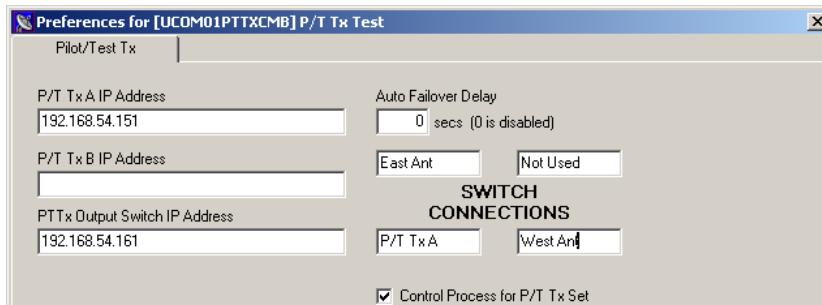
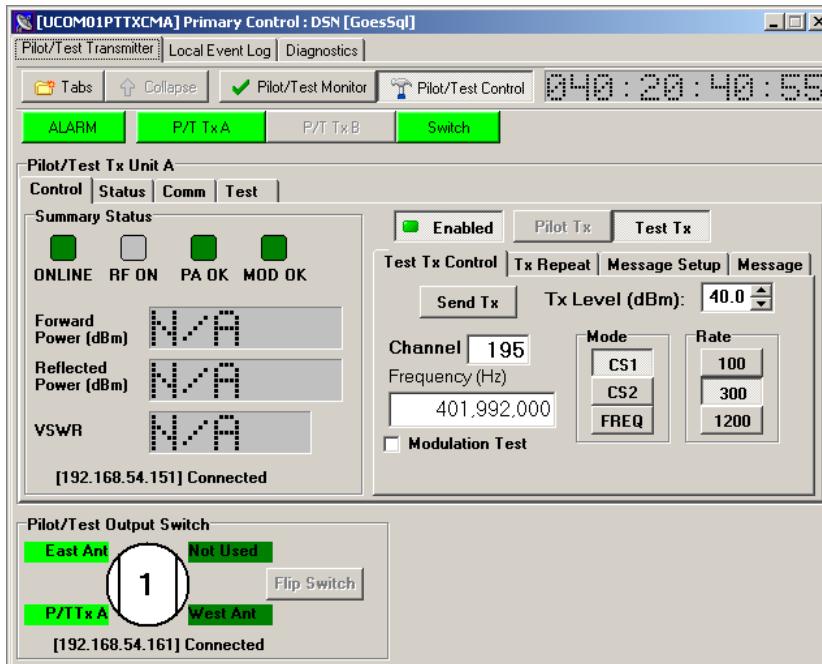
- New Modulator OCXO
 - Original OCXO began failing (drifting in frequency) about six months after original installation.
 - Almost, if not, all units experienced the failure.
 - Due poor response and lack of support from manufacturer, the decision was made redesign the P/T Tx to use new OCXO from different manufacturer.
 - Microcom developed and retrofitted all six units with a patch board with the new OCXO and some required additional circuitry.
 - New OCXO has shown improved stability and better performance than original device.
- Hardware changes led to additional software/firmware changes.
 - Additional OCXO fault detection.
 - Ability to operate P/T Tx without 10 MHz Station Reference.
 - P/T Tx will use Station Reference if present, but will not shutdown if lost, i.e. 10 MHz Fault downgraded from “Critical” to “Error” level.
- P/T Tx systems moved to 8M Shelter.
- Replaced RF Transfer switches with high power RF Combiners.

P/T TX: DADDS Operational GUI



- Summary Indicators and General Controls at Top
- Two Independent Pilot/Test Tx Graphical Sections:
 - Designated as A and B
 - Does not force which is Pilot and which is Test Tx.
 - Active and continuous status feedback.
- BB Switch button now disabled.

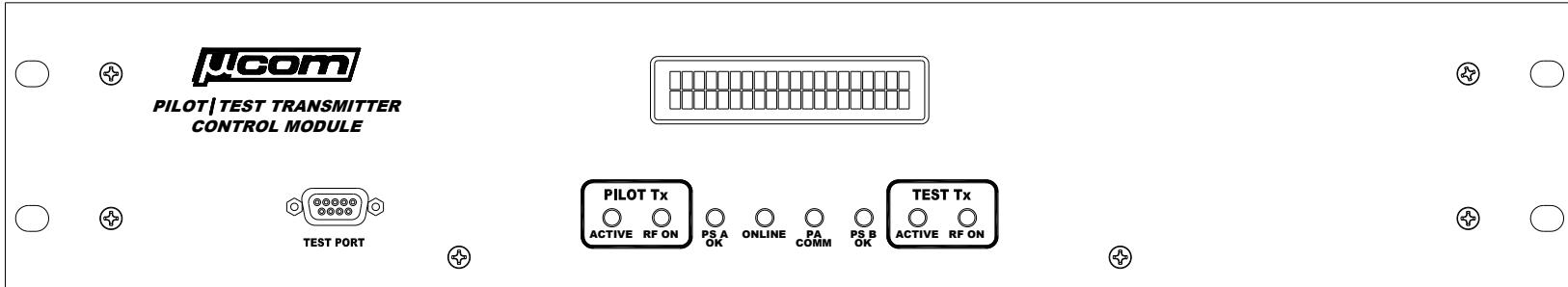
P/T Tx: Alternate Configuration GUI



- Design and implementation does not preclude alternate configurations.
- Graphical sections omitted if IP Address not defined.
- Example: Single unit used as test Transmitter only with independent East/West antennas.

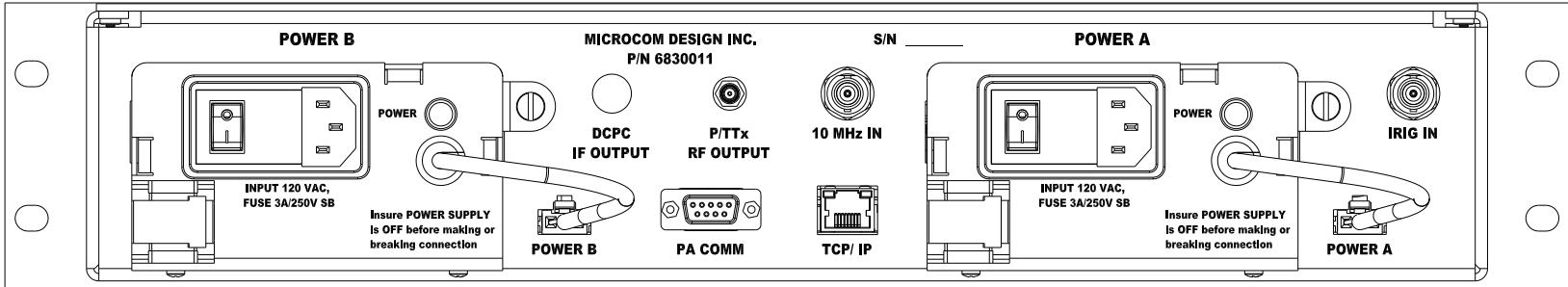
- DADDS Process Preferences used to define IP Addresses and Switch Connection labels.

P/T Tx: Modulator - Front Panel

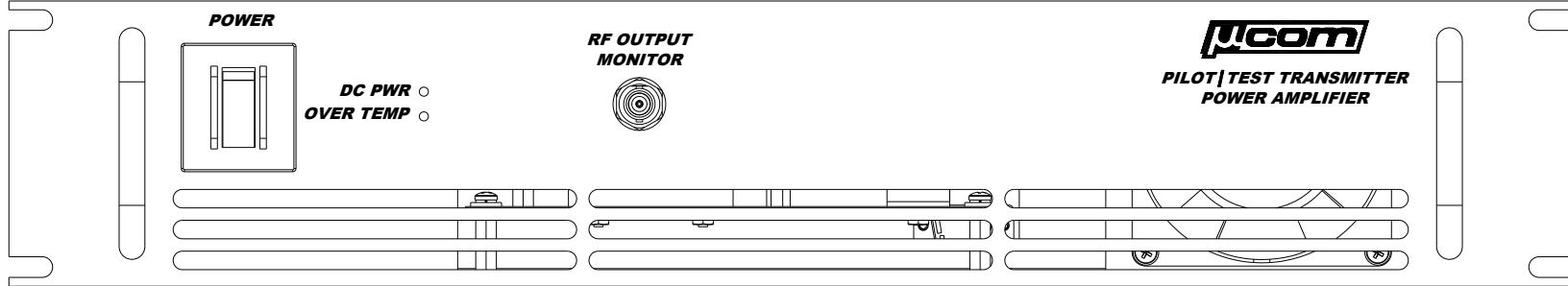


- Eight Status LEDs for Quick Visual Feedback.
 - Pilot Tx Mode Active and RF ON.
 - Test Tx Mode Active and RF ON.
 - Status of redundant power supplies.
 - Status of DADDS control (ONLINE).
 - Status of PA COMM.
- 2-Line by 20-Character LCD for status message information.
- RS-232 Test Port for local monitoring and diagnostics.

P/T TX: Modulator - Rear Panel

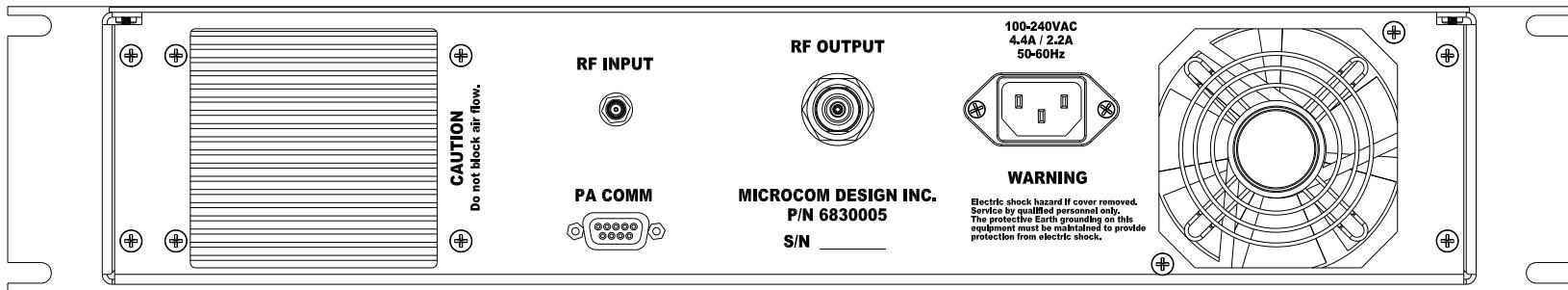


- Two Independent Redundant Power Supplies (A and B)
 - Each supply has independent Line Filter/Fuse/On/Off Switch and Output Power indicator.
 - "L" shaped tabs inserted into slots on back panel; single thumb lock screw facilitates quick replacement.
 - Similar to DAMS-NT supply, but lower power and wattage.
- PA Connections:
 - P/T Tx RF Output (SMA) – Low Power RF (~ 12 dBm maximum output).
 - PA COMM – Serial Communication, Power, and Control Lines.
- Station Connections:
 - IRIG-B Input – Auto detected level (1.0 to 10.0 Vpp)
 - 10 MHz Reference Input – Transformer Isolated (max 5.0 Vpp)
 - RJ-11 TCP/IP Network Connection – To DADDS



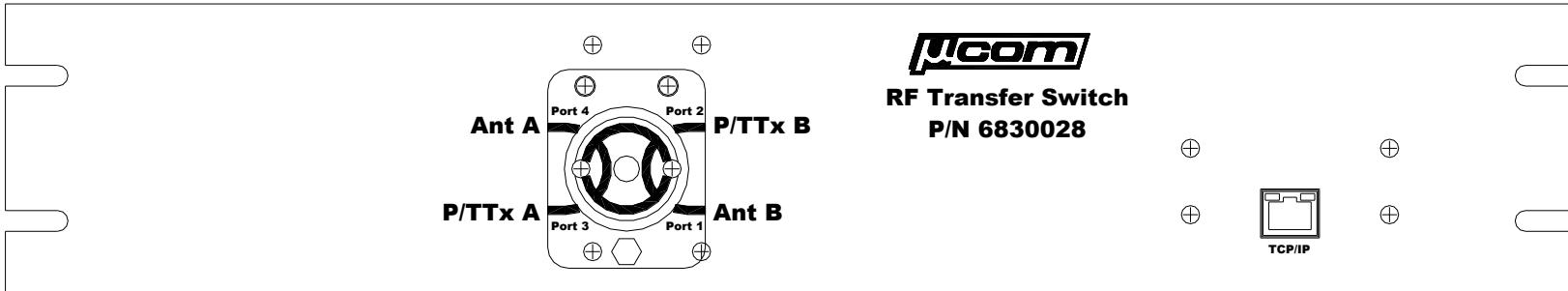
- 10 Amp Circuit Breaker with On/Off Switch
 - Serves as emergency cutoff.
- Two Status LEDs.
 - DC Power – Indicates main 30 VDC is on.
 - OVER TEMP Fault.
- RF Output Monitor port – approximately 40 dB below main RF output on rear panel.

P/T TX: PA - Rear Panel



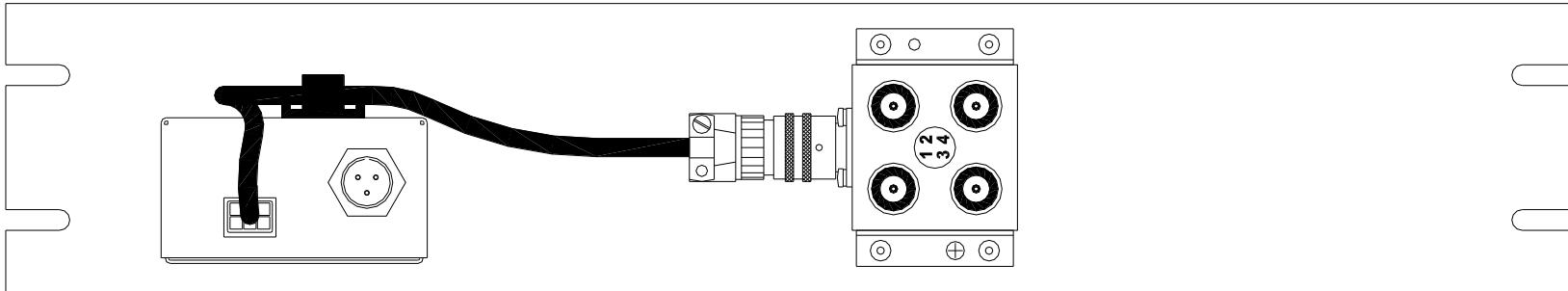
- RF Input Connector (SMA) for low power RF from Modulator.
- PA COMM – Serial Communication, Power, and Control Lines
 - Mating connection for DB9 M-F cable from Modulator.
- RF Output (N) – High Power RF, 100 Watts maximum.
 - PA output MUST be properly terminated into 50-ohm load capable of handling 100 Watts.
 - Failure to terminate output can damage PA.
- Standard Line Input connector with integral power line filter.
- Fan for Power Supply.
- Exhaust port for PA module's fan and heatsink.

P/T TX: RF Transfer Switch - Front Panel



- Off-the-Shelf 100 Watt Baseball Switch
 - Can be manually switched.
 - Clear plastic hinged cover to prevent inadvertent switch.
 - Panel/switch graphics visually represents connections.
- RJ-11 TCP/IP Network Connection – To DADDS.
 - Control module mounted on rear, but network connection on front.
- Designed to mount in rear of rack behind the two P/T Tx units it interfaces to.

P/T TX: RF Transfer Switch - Rear Panel



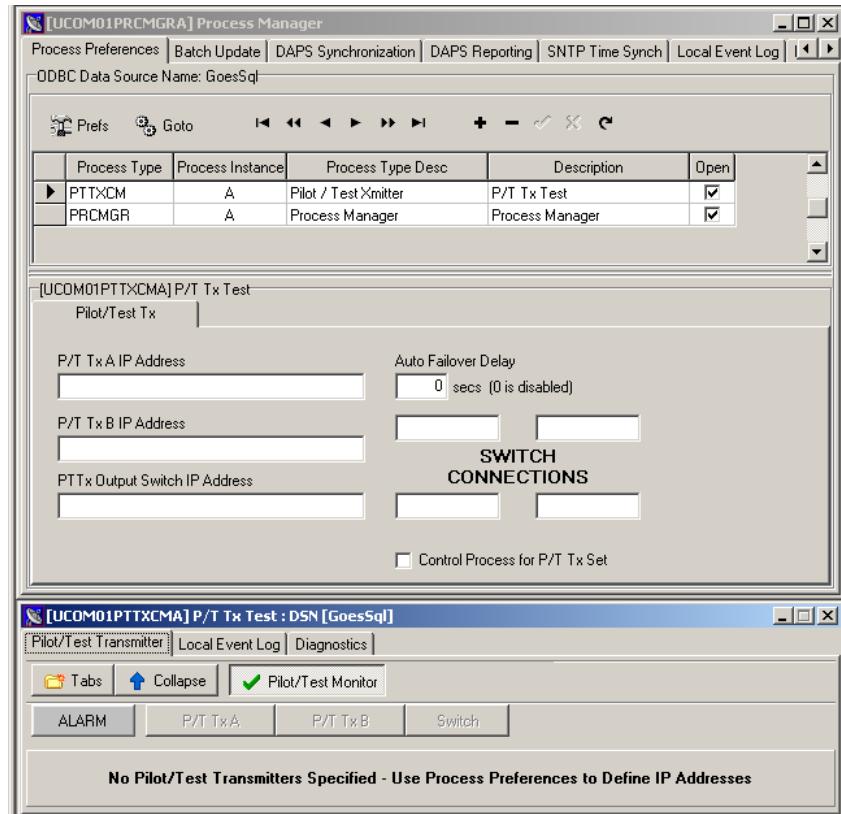
- Control Unit and Baseball Switch Mounted from Rear
 - Custom cable from Control Unit to Baseball Switch provided.
- Circular, 1/4 - Turn Locking connectors for Control Unit Power Supply.
 - Microcom +15 VDC Universal Supply provided with each unit.
 - Same supply as used in Microcom DPCM.
- Baseball Switch provides four N-type RF connectors labeled 1 thru 4.
 - Matches Ports 1 through 4 on front panel labeling.

- Modulator-to-PA Unit:
 - Low Power RF – 1' SMA to SMA cable provided.
 - PA Communications, Control, and DC Power – 1' DB9 M-F serial patch cable provided.
 - **NOTE: DO NOT CONNECT THESE DB9's TO A COMPUTER.**
- High Power RF: (PA-to-Switch-to-Antenna)
 - All N-type connections.
 - PA RF Outputs to Input side of Switch.
 - P/T Tx A is Port 3 and P/T Tx B is Port 2.
 - Outputs of Switch to Antenna (or Dummy Load).
 - Ant A is Port 4 and Ant B is Port 1.
 - Ensure all connections match A and B designation.
 - PA Outputs MUST be terminated – Switch is not a termination.
- Station Connections:
 - IRIG-B and 10 MHz Reference to Modulator (both are BNCs)
 - Three network connections:
 - P/T Tx A and P/T Tx B (at Modulator unit).
 - RF Transfer Switch.
 - 110 VAC Line Inputs.

P/T TX: Creating a PTTXCM Process



- Use DADDS Process Manager to create new PTTXCM Process.
- Recommend providing unique Description for each PTTXCM Process Instance – Description included in each window's title bar.
- Open new Process.
- New Process will not have any IP Addresses defined.
- Without IP Address, corresponding graphical section is not displayed.



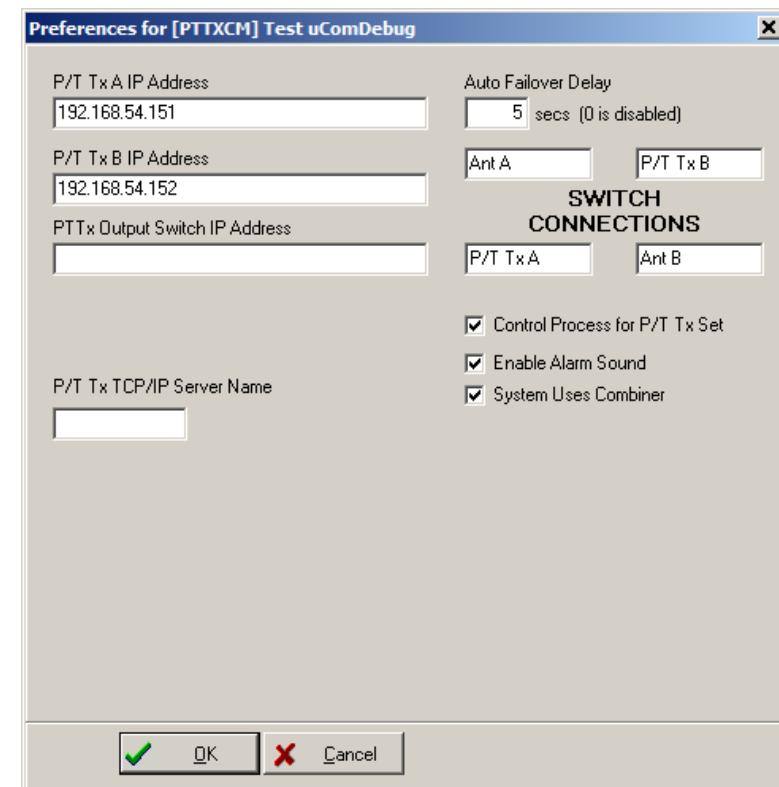
- Newly created PTTXCM Process

P/T TX: Setting up a PTTXCM Process

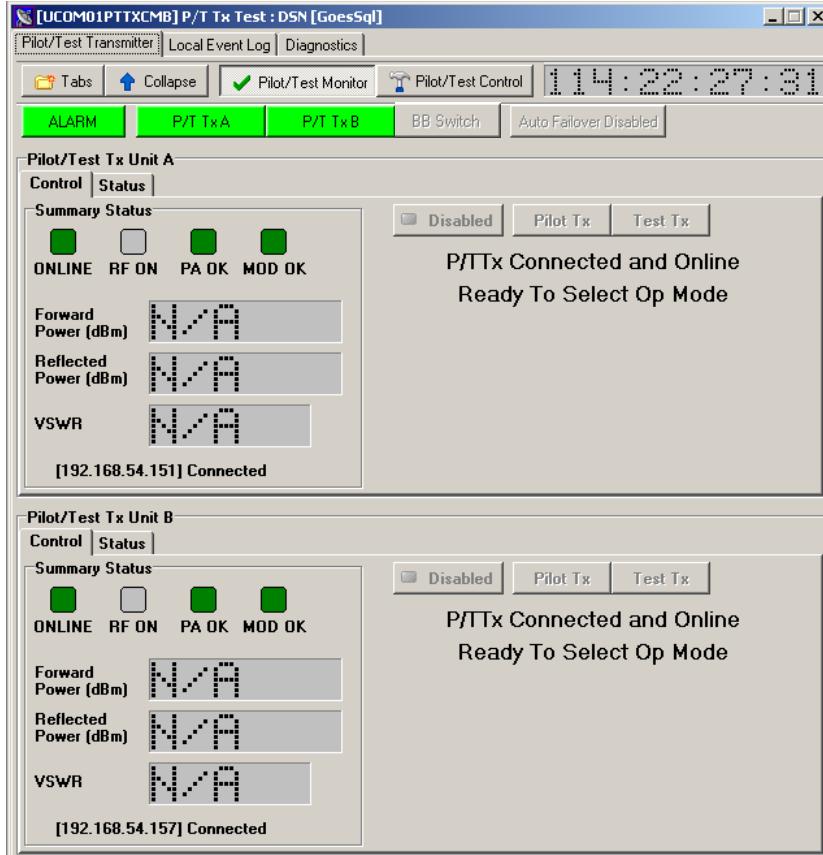


- Launch Process Preference dialog.
- For each hardware component, enter its IP Address.
 - Default IP Address for P/T Tx Unit is 192.168.54.15x (x = last digit of S/N).
 - Default IP Address for Switch is 192.168.54.16x (x = last digit of S/N); leave blank if not used.

- P/T Tx A IP Address ➔
- P/T Tx B IP Address ➔
- Switch IP Address (blank) ➔
- Check to take control ➔
- Check for Combiner ➔
- Can also modify switch connection labels.
- Set Auto Failover Delay to non-zero value to enable.
 - Combiner speeds up failover.

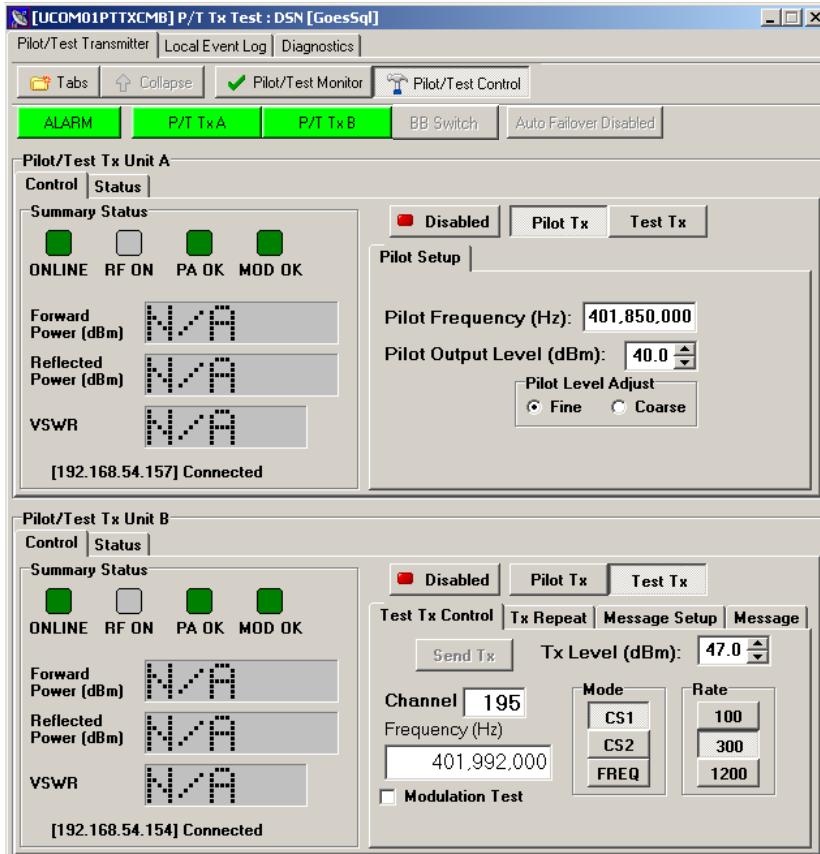


P/T TX: New PTTXCM Process



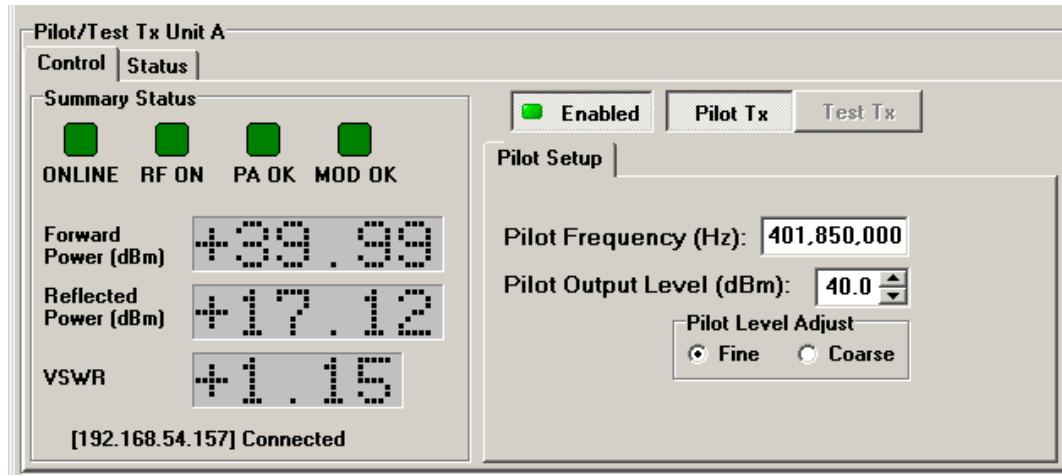
- Units connected and communicating.
- No faults present – all indicators are green.
- Auto Failover not enabled.
- Neither P/T Tx has operational mode defined.
- No RF being generated.
- No Switch in use.
- To define operational modes, first necessary to click "Pilot/Test Control" button.

P/T TX: Pilot/Test Control Mode



- Pilot Tx and Test Tx buttons enabled.
- Disabled button visible and enabled.
- P/T Tx A set for Pilot mode; Pilot controls visible.
- P/T Tx B set for Test Tx mode; Test Tx controls visible.
- No RF being generated.

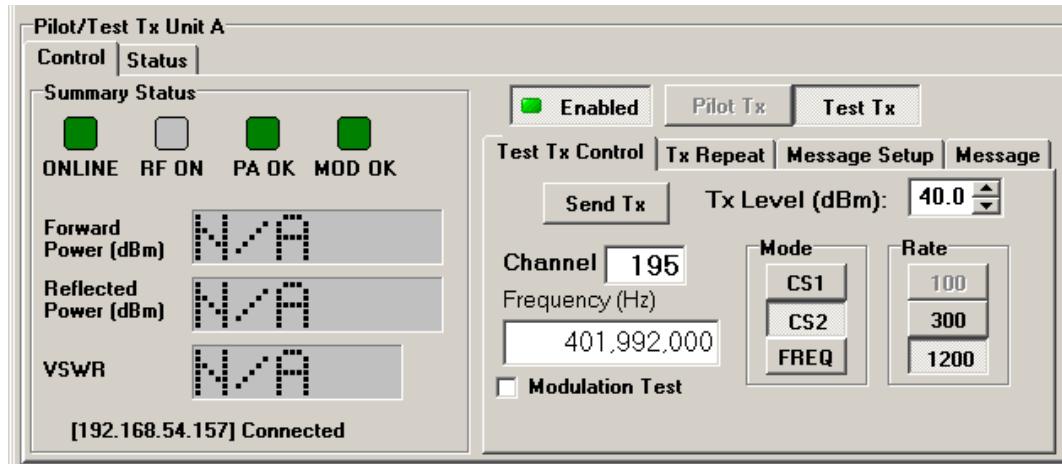
P/T TX: Pilot Mode Setup and Control



- Pilot Frequency:
 - Entered in Hertz – Primary = 401,850,000 Hz; Backup = 401,700,000 Hz.
 - Can only be entered/edited when unit is Disabled (not actively generating RF output).
- Pilot Output Level
 - Defined in dBm. Can be manually entered or ...
 - Up/Down arrow buttons allow Fine (0.1 dB) or Coarse (1 dB) adjustments
- Clicking “Disabled” button enables Pilot uplink.

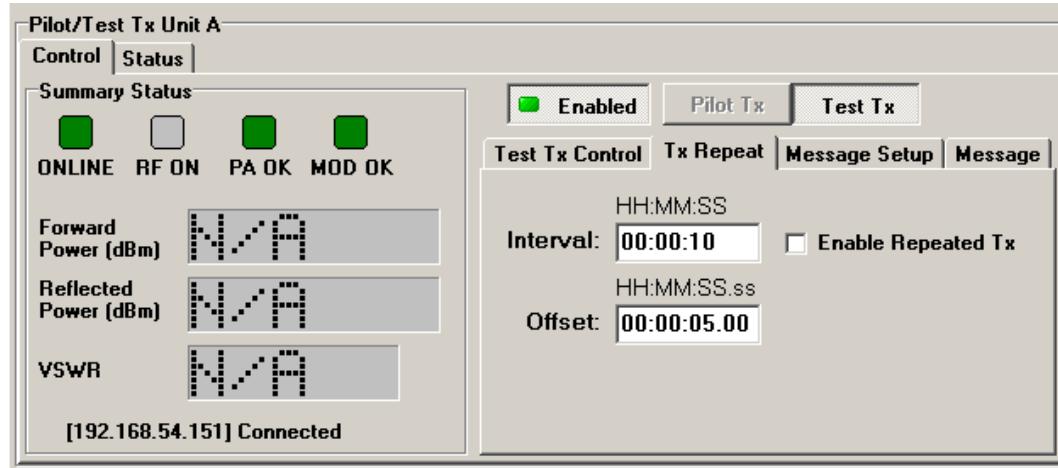
- Test Tx Control – Primary Control Page
 - Initiate a Test Transmission.
 - Setup key test transmission characteristics (channel, rate, etc.).
- Tx Repeat – Define repeated time synchronized transmissions.
- Message Setup – Basic message setup parameters defined.
 - GOES DCS ID
 - Certification specific parameters (e.g. preamble and interleaver).
- Message – Define, load, and save test messages to send.
- Msg Test Params – Special message parameters.
 - Generate intentional faults.
 - Vary key certification characteristics.
- Test Modulation – Enable/control continuous transmissions.
 - Modulated or un-modulated.

P/T TX: Test Tx Control Page



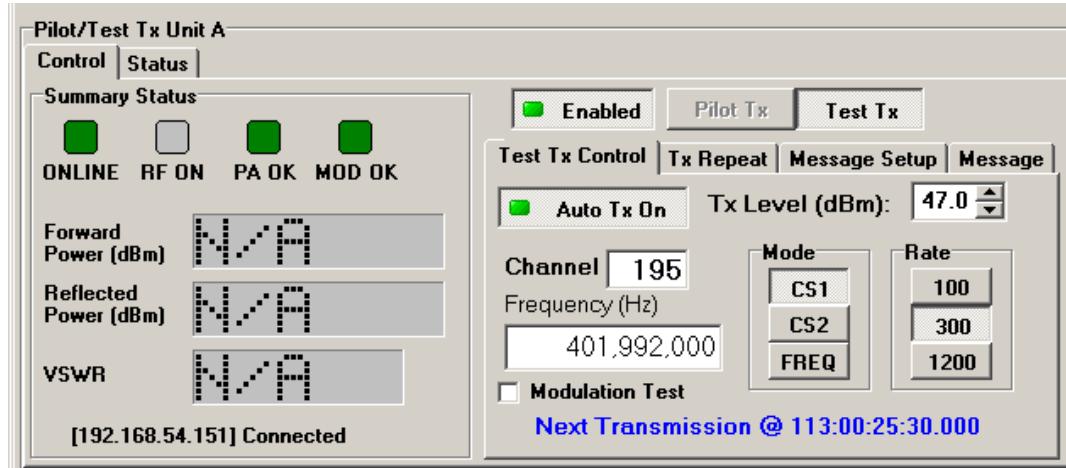
- Manually initiate a Test Transmission.
- Define Test Tx Power Level (in dBm).
- Define Channel or specify exact Frequency.
- Select Certification Mode:
 - CS1 (Certification Standard 1) – Bessel modulation and filtering.
 - CS2 (Certification Standard 2) – Root Raised Cosine modulation and filtering.
- Select Data Rate: 100, 300 or 1200 bps.
- Enable special “Modulation Test” mode.

P/T TX: Tx Repeat Page



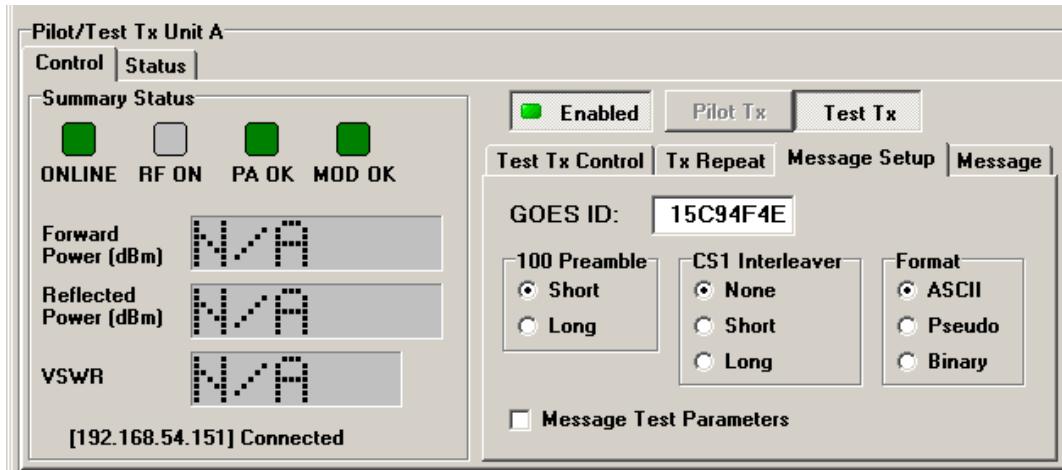
- Define Repeat Interval in HH:MM:SS
 - From 5 seconds (00:00:05) to 24 hours (24:00:00).
- Define Repeat Offset in HH:MM:SS.ss
 - Offset is the specific point in time within the interval when the test transmission will occur.
 - Offset must be strictly less than Interval.
- Enable Repeated Test Transmissions
 - Only enables this mode, does not start transmission sequence.

P/T TX: Tx Repeat Example



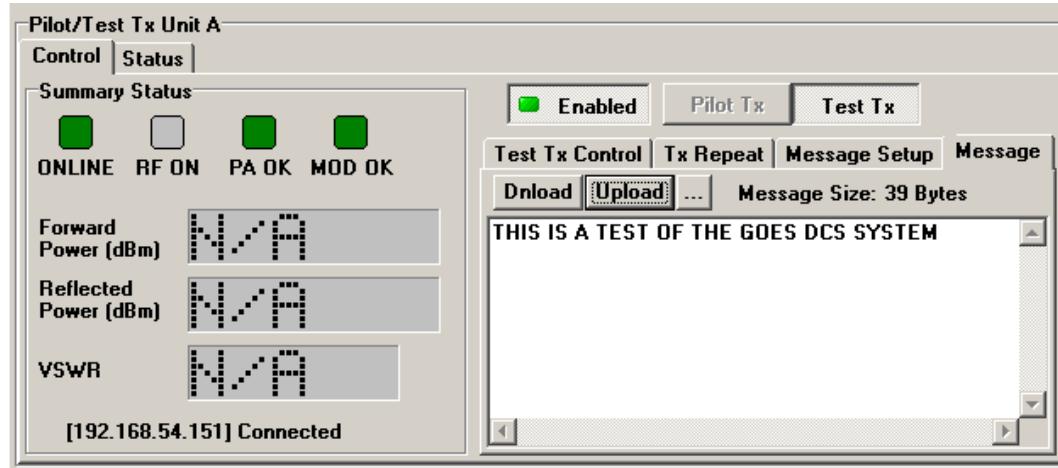
- Repeated Test Transmissions Enabled and Active ("Auto Tx On" button pressed).
- Repeat Example Definition:
 - Interval = 01:00:00
 - Offset = 00:25:30.00
- Next Transmission at "113:00:25:30.000"

P/T TX: Message Setup Page

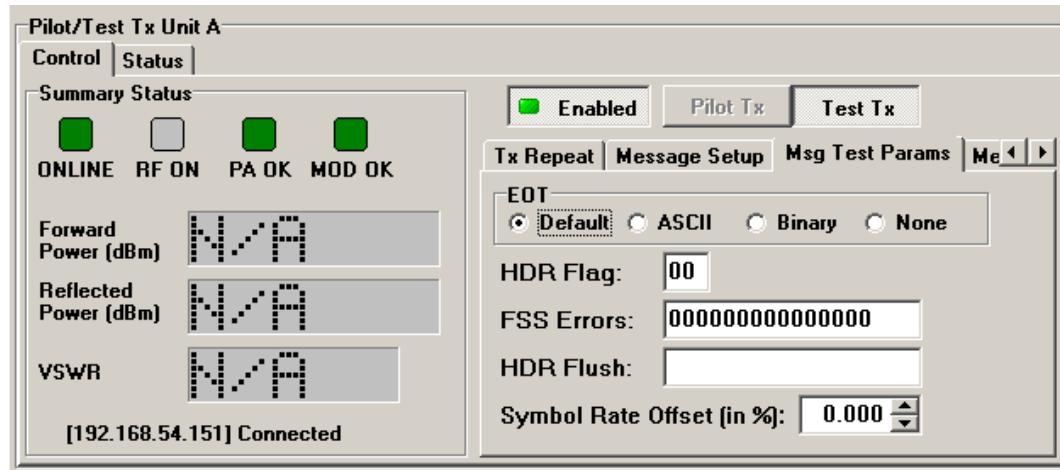


- Define 8-Character Hexadecimal GOES DCS ID
- Define 100 BPS Preamble
 - Short ⇒ 0.5 second carrier, 0.48 second clock.
 - Long ⇒ 5.0 second carrier, 2.5 second clock.
- Define CS1 Interleaver – None, Short, or Long
 - None in predominate use.
 - Interleavers removed from CS2.
- Define HDR Format – ASCII, Pseudo-Binary, or Binary
 - Only defines two bits in HDR Flag Word; first byte of HDR message.
- Enable Message Test Parameters page.

P/T TX: Message Page

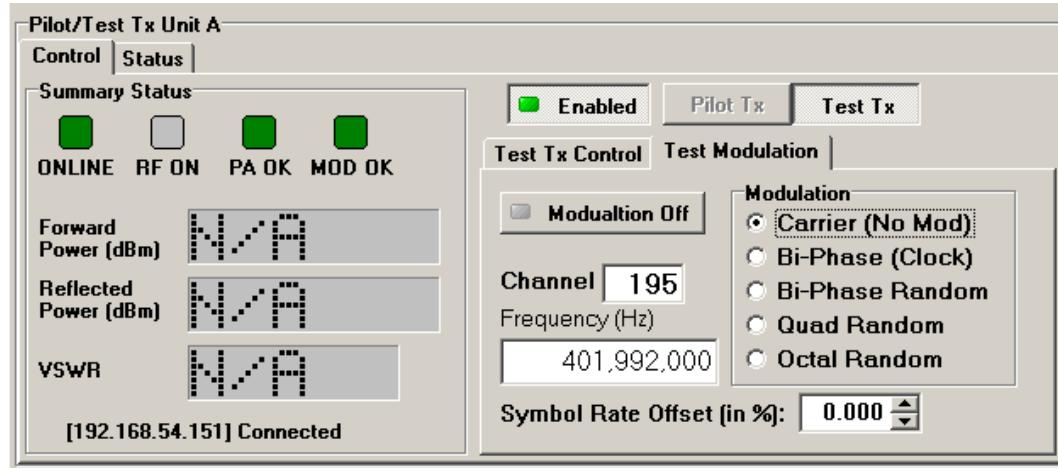


- Define ASCII Text Message to Send in Test Transmission
 - Can be from 1 to 16,384 characters.
- Messages must be explicitly downloaded ("Dnload") and uploaded ("Upload").
- Ellipsis button ("...") calls up a Popup Menu that allows ...
 - messages to be saved and loaded.
 - the "Default" message to be specified.
 - the edit memo to be cleared.
- "Message Size" indication in total bytes (including CR and LF chars).



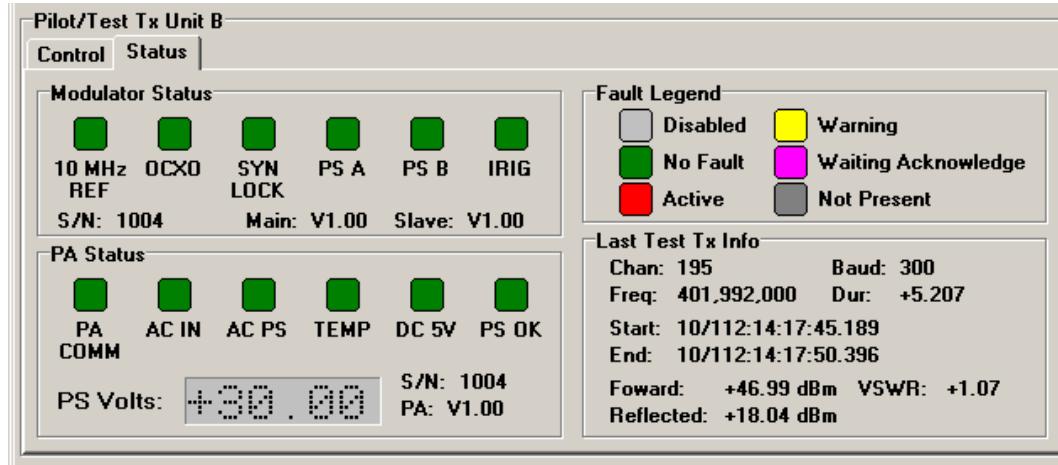
- Define or Override EOT (End of Transmission)
- Define HDR (High Data Rate) Flag Word if Non-Zero
- Specify FSS (Frame Sync Sequence) Errors
- Override and define HDR Flush Sequence (CS1 or CS2 only)
- Specify a Symbol Rate Offset in Percent (%)
- Only available in Control Mode when control on Message Setup page is checked. All return to defaults when hidden.

P/T TX: Modulation Test Page



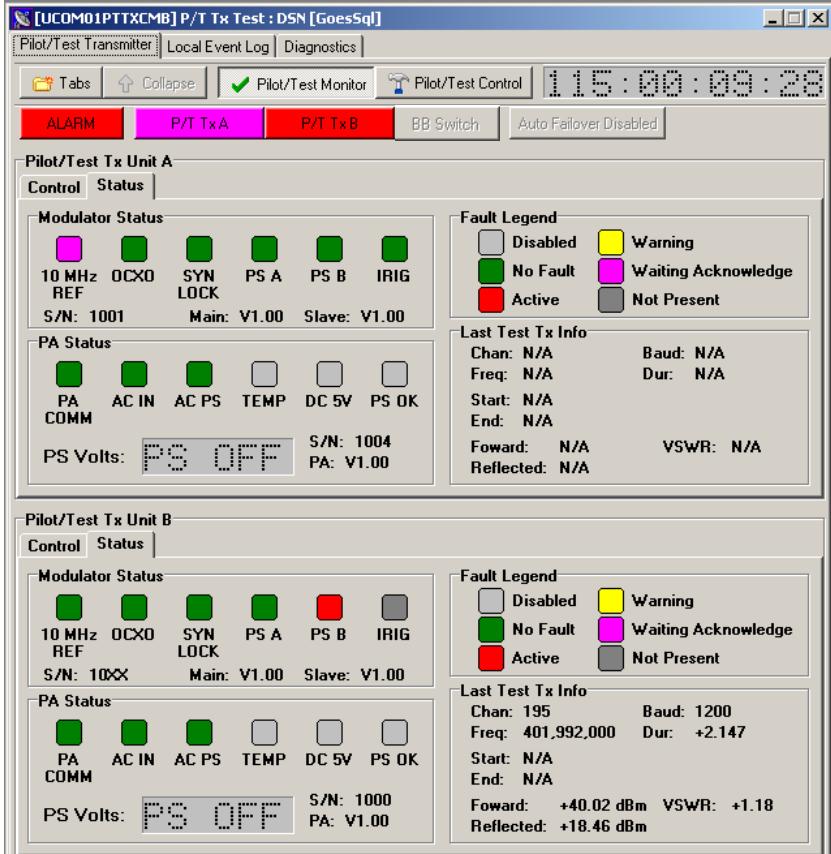
- Specify and initiate continuous test transmission.
 - As constant carrier (no modulation), or
 - One of four modulation types.
- Channel and Frequency controls same as on Test Tx Control page.
- Can specify a Symbol Rate Offset in Percent (%)
- Only available in Control Mode when checkbox on Test Tx Control page is checked. All other tab pages are hidden.
- Test Tx Control page still used to specify Level, Mode, and Rate.

P/T TX: Status Page



- Modulator Status – Health and Information on Modulator Unit.
 - Six status/fault indicators: 10 MHz Reference Input, OCXO, Synthesizer Lock, Power Supply A, Power Supply B, IRIG-B Input.
 - Serial Number and Microcontroller firmware versions.
- PA Status – Health and Information on PA Unit.
 - Six status/fault indicators: PA COMM, AC at Input, AC at Power Supply, Temperature, 5V DC for temp sensor, 30 VDC Power Supply.
 - Power Supply Voltage
 - Serial Number and Microcontroller firmware version.
- Fault Legend – Color code for fault indicators.
- Summary Information for most recent Test Transmission.

P/T TX: Fault Reporting



- ALARM indicator parrots highest level fault of System Status indicators.
- System Status indicators parrot highest level fault for associated unit.
- Individual unit (Modulator or PA) parrot status of highest level unit fault in MOD OK or PA OK on Control Page (not shown).
- P/T Tx A reporting 10 MHz REF fault waiting to be ack'd.
- P/T Tx B reporting Power Supply B fault.

P/T TX: Modulator Fault Summary



Fault	Fault Type	Fault Reporting Mechanism	Notes
MOD SLAVE	Critical	“SLAVE FAULT” reported in “Summary Status”.	All faults except “SYN LOCK”, “PS A”, and “PS B” disabled.
10 MHz REF	Error	Fault reported in “Modulator Status”.	Downgraded from Critical to Error Fault Type.
OCXO	Critical	Fault reported in “Modulator Status”.	Will typically also generate a “SYN LOCK” fault.
SYN LOCK	Critical	Fault reported in “Modulator Status”.	
PS A	Error	Fault reported in “Modulator Status”.	
PS B	Error	Fault reported in “Modulator Status”.	
IRIG	Warning	Fault reported in “Modulator Status”.	Fault will disable time scheduled transmissions.

P/T TX: Additional OCXO Faults



Fault	Fault Type	Fault Reporting Mechanism	Notes
OCXO Stabilize	Critical	OCXO indicator turns red and STABLE will be displayed beneath it.	OCXO could not be stabilized to 10 MHz reference on startup. Fault can only be cleared by re-cycling power.
OCXO DAC Warn	Warning	OCXO indicator turns yellow and DAC will be displayed beneath it.	OCXO DAC control value getting close to fault limit.
OCXO DAC Error	Critical	OCXO indicator turns red and DAC will be displayed beneath it.	OCXO DAC control value has exceeded fault limit.
OCXO Freq Warn	Warning	OCXO indicator turns yellow and FREQ will be displayed beneath it.	OCXO Automatic Frequency Control algorithm indicating frequency error near fault limit.
OCXO Freq Error	Critical	OCXO indicator turns red and FREQ will be displayed beneath it.	OCXO AFC algorithm indicating frequency error in excess of fault limit.

P/T TX: OCXO Diagnostics



- Available on Diagnostics Tab
- Reported for Both Units
- Provides AFC Mode and Low-Level Operational Parameters.
- Key values are “10 & 100 Sec Errors” and “DAC Base”.
- OCXO Operation Modes:
 - 10 MHz AFC In AFC holding 10 MHz (Typically when unit is idle).
 - Custom Freq AFC: In AFC OCXO pulled off 10 MHz to custom frequency.
 - AFC Fault: Another Fault has occurred that prevents AFC.
 - Warmup: In Warmup period.
 - Stabilize: In Stabilization period.
 - Stabilize Error: Stabilization Fault declared (Unit disabled).
- 10 & 100 Sec Error values determine frequency warning and error status.
 - OCXO Freq Warn Limit: +/- .25 ⇒ Output frequency off more than 10 Hz
 - OCXO Freq Error Limit: +/- .50 ⇒ Output frequency off more than 20 Hz
- The DAC Base value is the point where the OCXO should be exactly 10MHz.
 - Typical range: Between 1500 and 2500
 - OCXO DAC Warn Limits: Low=650 and High=3450
 - OCXO DAC Error Limits: Low=450 and High=3650

P/T Tx Diagnostics Unit A				
OCXO Status				
Mode	Index	Avg Count		
10 MHz AFC (2)	79	50		
Time	Count	Average	Target	Error
1 Sec	+00000			
10 Secs	+00000	+0.0000	+0.0000	+0.0000
100 Secs	+00000	+0.0003	+0.0000	+0.0003
	Actual	Base	Error	Expected
DAC	+1920	+1920	+000	+000

P/T TX: PA Fault Summary



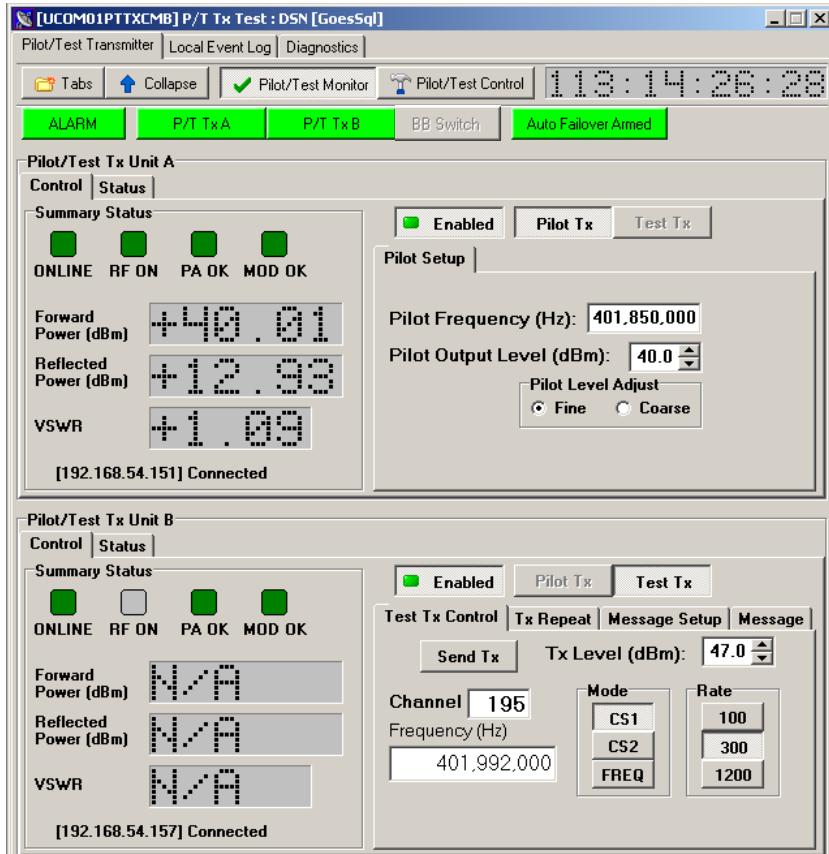
Fault	Fault Type	Fault Reporting Mechanism	Notes
PA COMM	Critical	“PA” Status”.	Disables “AC IN”, AC PS”, “TEMP”, “DC 5V, and “PS OK”.
AC IN	Critical	“PA” Status”.	Should also generate an “AC PS” fault.
AC PS	Critical	“PA” Status”.	Disables “TEMP”, “DC 5V, and “PS OK” faults.
TEMP	Critical	Fault reported in “PA” Status”.	
DC 5V	Critical	Fault reported in “PA” Status”.	May also generate a “TEMP” fault.
PS OK	Critical	Fault reported in “PA” Status”.	

P/T TX: System Fault Summary



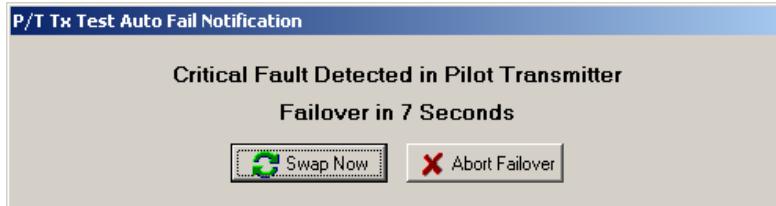
Fault	Fault Type	Fault Reporting Mechanism	Notes
VSWR Warning	Warning	VSWR value displayed in Yellow.	Occurs when $1.5 < \text{VSWR} < 3.5$
VSWR Error	Error	VSWR display will read "FAULT" in magenta.	Occurs when $\text{VSWR} > 3.5$. VSWR may display in Red.
PA Level	Error	Forward Power value displayed in Red.	Occurs when actual power not within 1 dB of target Level.
P/T Tx A Comm	Error	Unit Indicator Red.	All unit controls and status indications disabled.
P/T Tx B Comm	Error	Unit Indicator Red.	All unit controls and status indications disabled.
Switch Comm	Error	Unit Indicator Red.	"Flip Switch" button disabled and no position indication.

P/T TX: Pilot Auto Failover



- Auto Failover Armed – Requires:
 - One P/T Tx Unit enabled for Pilot operation.
 - Second P/T Tx Unit in idle or in Test Tx mode.
 - Second P/T Tx cannot have any active or non-ack'd critical faults.
 - Both P/T Tx units online and communicating.
 - RF Transfer Switch no longer necessary if Combiner in use.
 - Auto Failover Delay not zero.
- If last condition is met, but any other not, Auto Failover indicator will be yellow.
- If Auto Failover is zero, indicator will be grayed out and will read "Auto Failover Disabled".

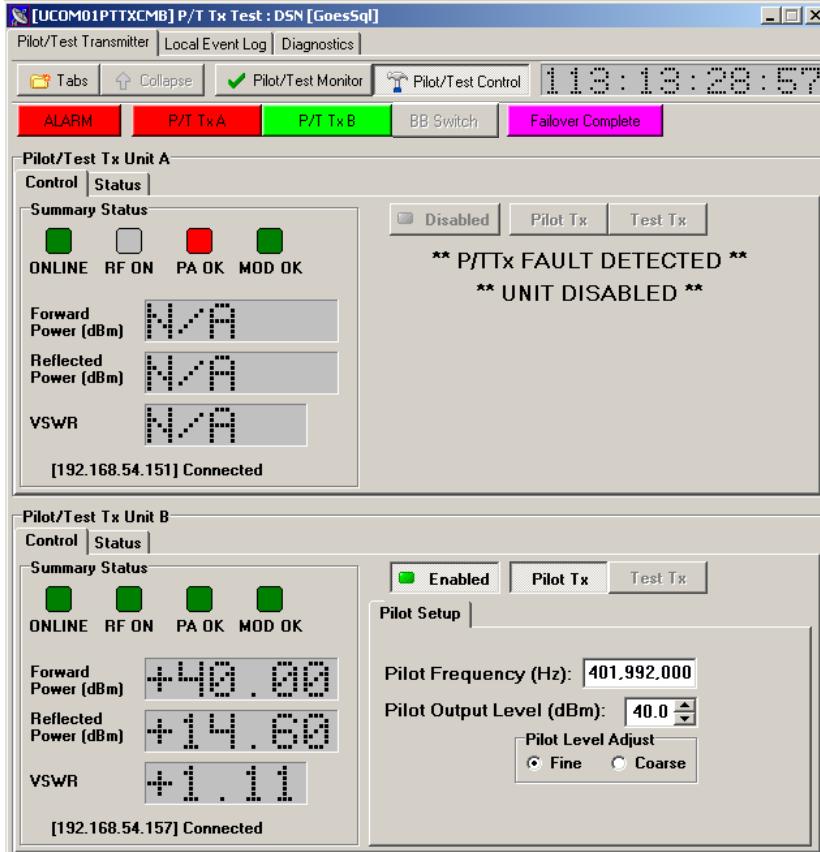
P/T TX: Pilot Auto Failover Sequence



- Pilot Settings (Level and Frequency) Captured
- Backup Unit Disabled
- If being used, Transfer Switch Flipped
- Captured Settings Sent to Backup Unit
- Pilot Enabled on Backup Unit



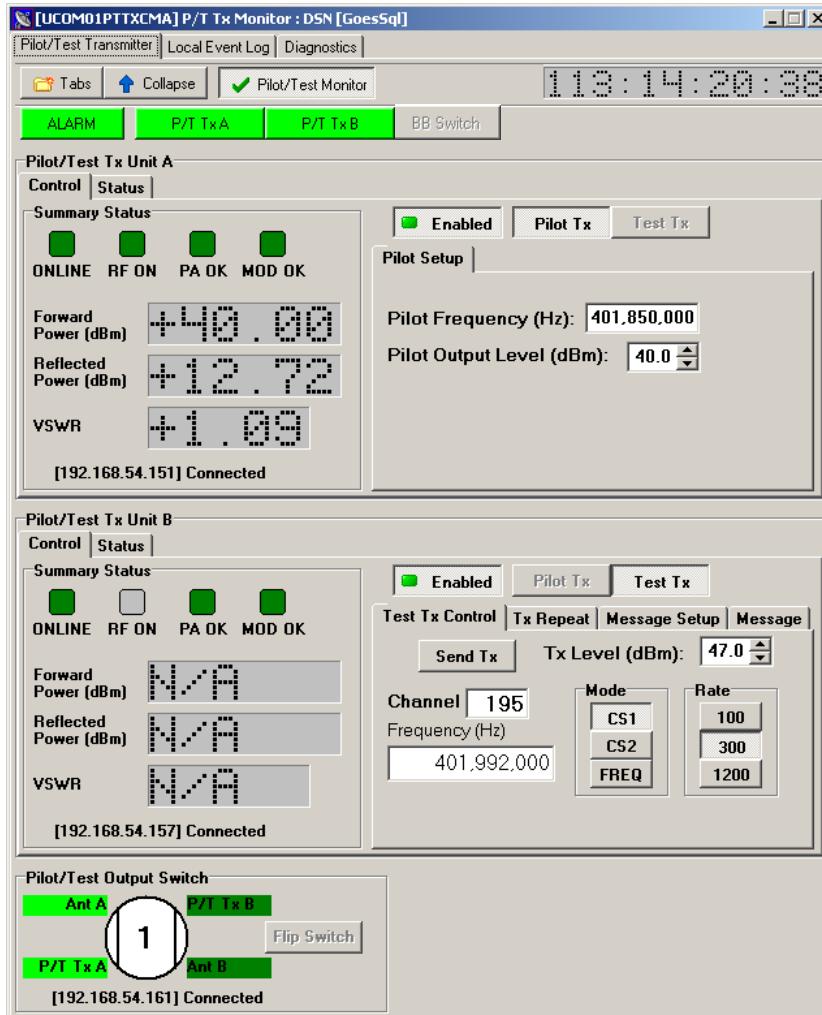
P/T TX: Pilot Auto Failover Complete



➤ Auto Failover Complete:

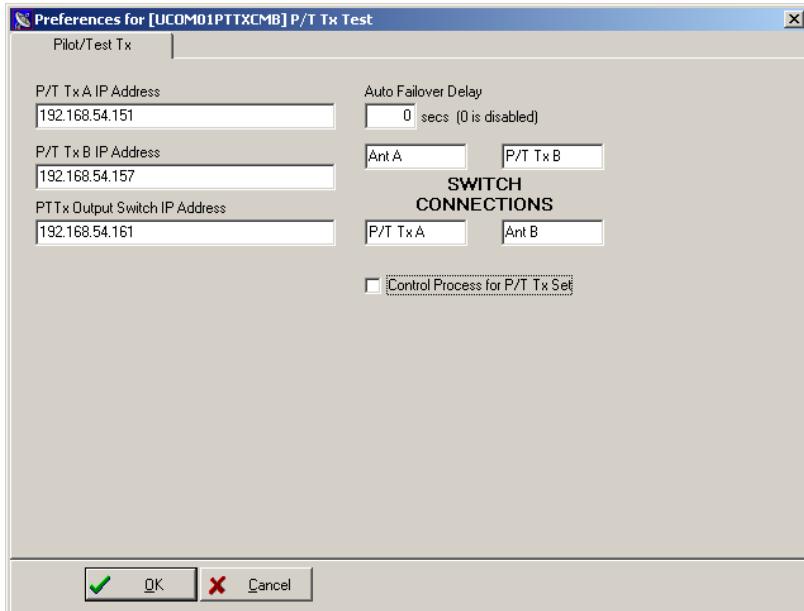
- Backup Unit operating as Pilot Uplink.
- Original Pilot Unit reporting fault in PA and is disabled – fault must have been critical.
- Auto Failover waiting to be acknowledged.

P/T TX: DADDS Monitor Process 1

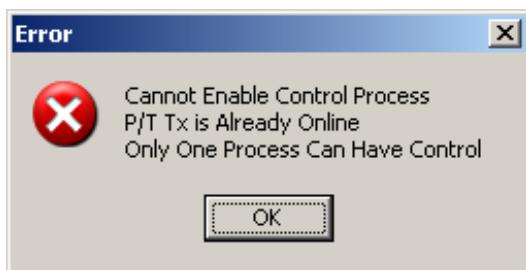


- P/T Tx System can connect to additional DADDS processes in Monitor only operation – Monitor Process.
- “Pilot/Test Control” button removed; DADDS only controls hidden (e.g. “Pilot Level Adjust”).
- Allows almost complete monitoring of all functional elements – anything hardware related.
- Cannot Monitor Auto Failover
 - Since Auto Failover is strictly a DADDS function.
 - However, faults and transition sequence will be apparent.
- Can only have one Control Process, but control can be “transferred”.
 - Current Control Process must relinquish control first.
 - Monitor Process can then assume control.

P/T TX: DADDS Monitor Process 2



- Defined by not checking “Control Process for P/T Tx Set”.
- To properly monitor, IP Addresses must be correctly defined.
- Switch Connection labels for visual match only.



- Attempting to define Monitor Process as Control Process when another process is in control will result in error dialog.

- Need to distinguish between Monitor *Process* versus Control *Process* and Monitor *Mode* and Control *Mode*.
- A Monitor Process can ONLY monitor the status of a P/T Tx system. It can never “control” any element of it.
- A Control Process can operate in one of two *Modes*, Monitor Mode or Control Mode.
 - Determined by whether the “Pilot/Test Monitor” or “Pilot/Test Control” button is depressed.
 - Monitor Mode does provide limited control, i.e. the ability to send test transmissions.
 - Control Mode provides complete control:
 - Can change Pilot settings.
 - Can send test messages with forced transmit error (e.g. no EOT).
 - Can enable test modulation.
 - Can change IP Addresses.

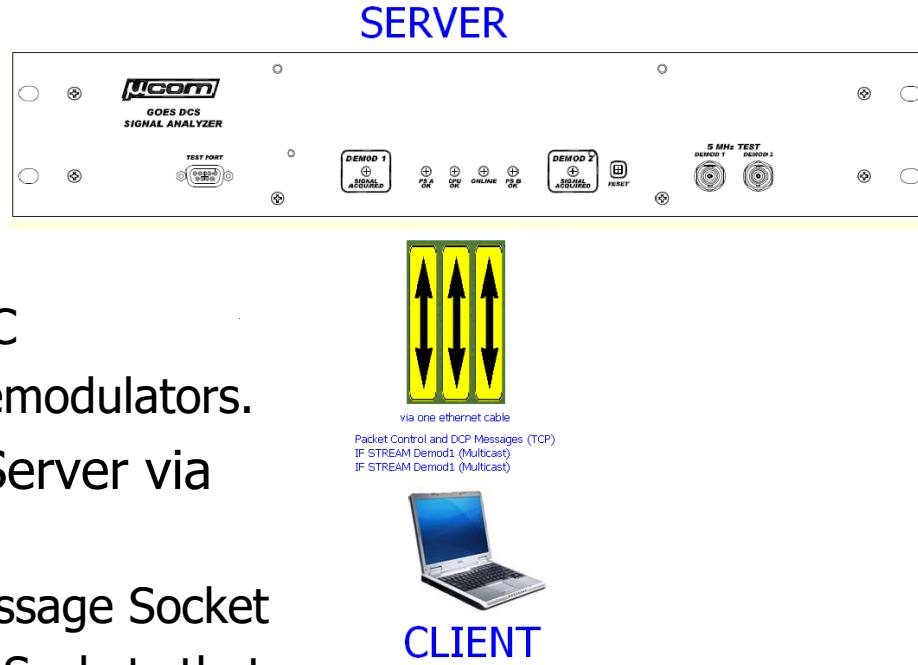


Other DCS Components GOES DCS Signal Analyzer

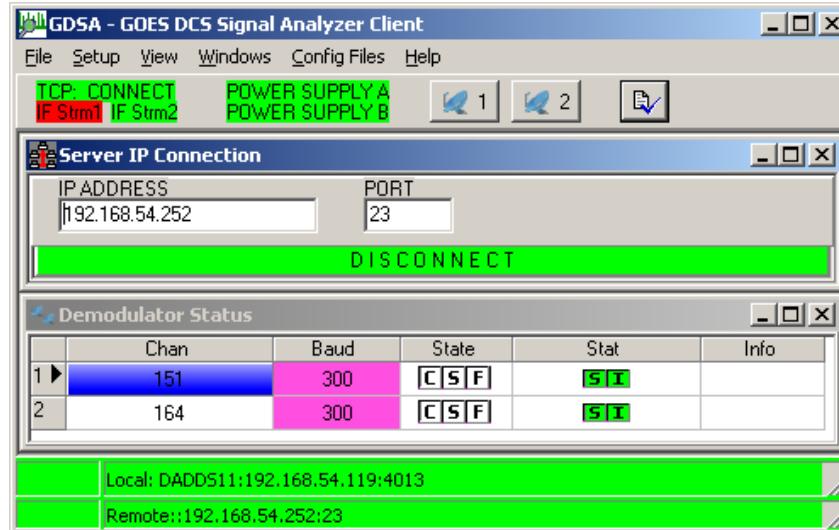
GDSA: Overview



- Two Main Components:
 - GDSA Server
 - GDSA Client Software
- GDSA Server Contains:
 - An Embedded Window PC
 - 2 customized *DigiTrak* demodulators.
- GDSA Client Connects to Server via three TCP/IP Sockets:
 - One Control and DCP Message Socket
 - Two Multicast Streaming Sockets that transmit the raw digitized IF signals.
- GDSA Client Software:
 - Allows displaying and capturing of the received DCS messages.
 - Display and analysis of the demods' IF signals being processed.
 - Complete control of the two *DigiTrak* demodulators.



GDSA: Client Main Window

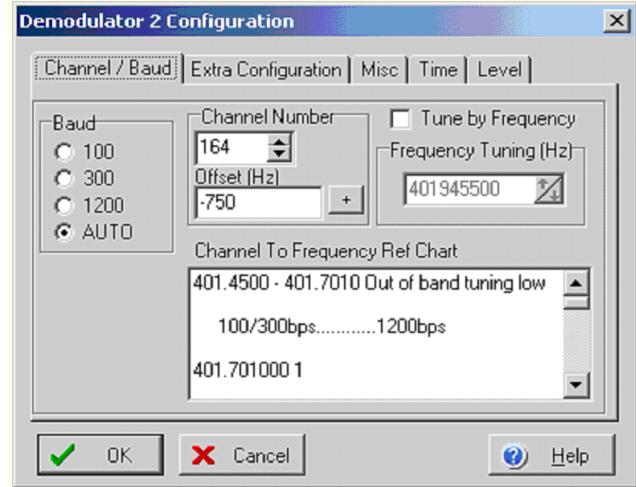


- TCP/IP Connection Status:
 - IF Streams 1 and 2 shown at top.
 - Control and DCS Message interface in "Server IP Connection" window.
- Server IP Connection Window Used To:
 - Define the GDSA Server IP Address and Port Number.
 - Manually connect to or disconnect from the GDSA Server.
- Optional Demodulator Status Window
 - Summarizes Channel and Baud.
 - Provides State and Status indications similar to the DAMS-NT Server.

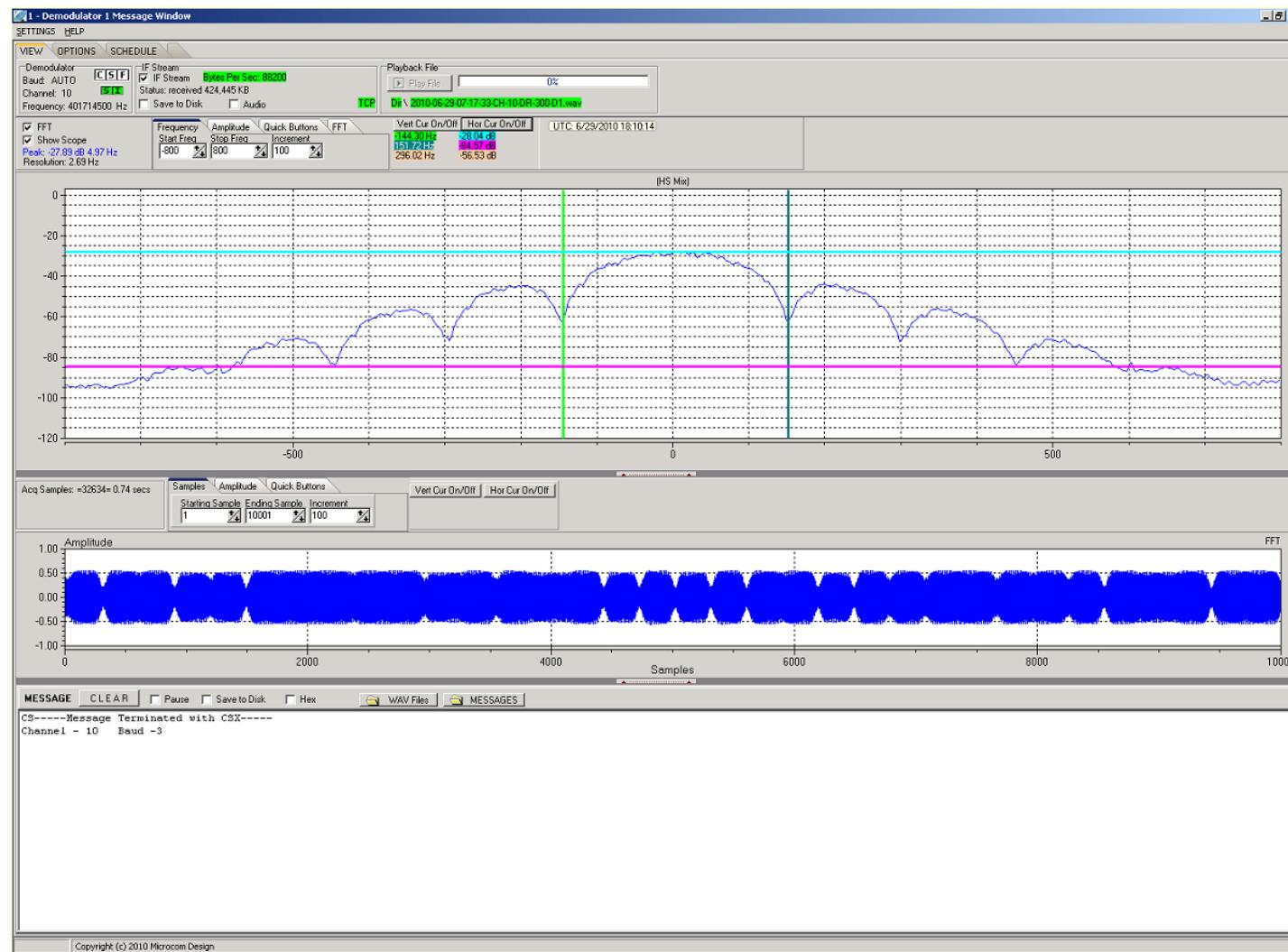
GDSA: Demodulator Configuration



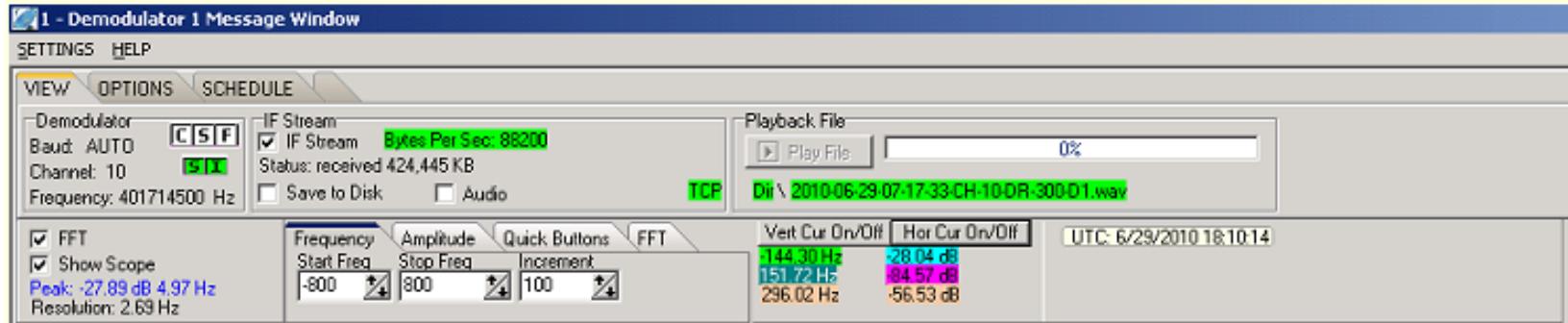
- Demodulators can be Independently Configured:
- Baud Rate
 - 100, 300, 1200 or Auto
- Tune by Channel or by Frequency.
 - CS1 Channels only, but
 - Can be set to any frequency within the GOES DCS band.
- Offset controls provide convenient method to tune to a frequency near a channel center:
 - Select Channel, enter Offset, and click '+' button.
 - Frequency will be calculated and posted to frequency entry field.
- Channel to Frequency Reference Chart can also be used to determine desired frequency.
- Additional tabbed pages provide access to demod's other configuration options.
- Can be accessed from Setup menu, via the Demodulator Status window, or by double clicking in the "Demodulator" group on the monitoring window.



GDSA: Main Monitoring Window

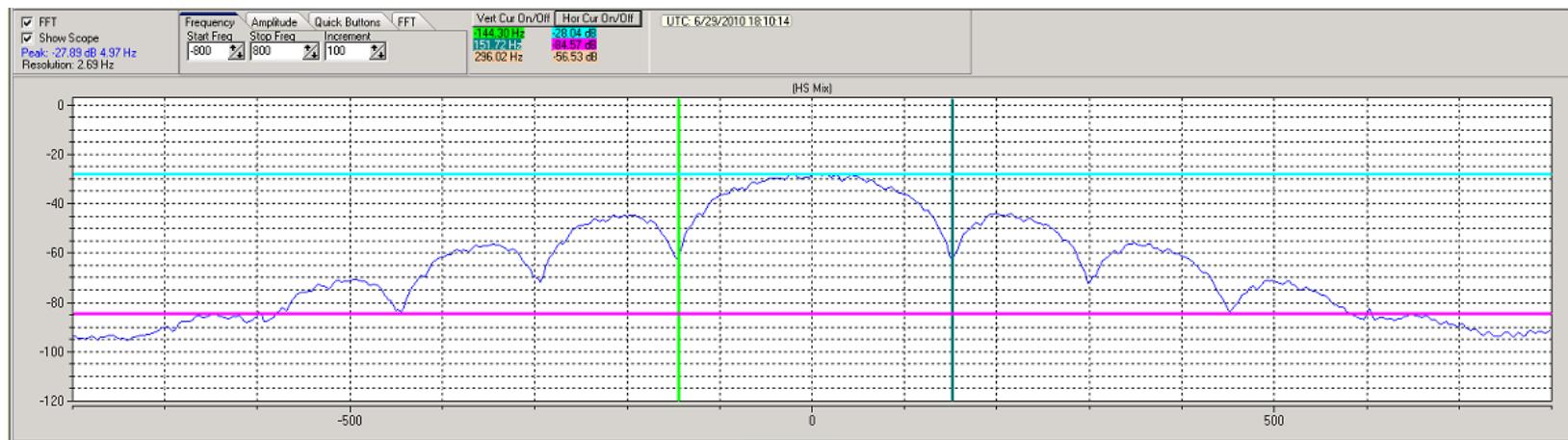


GDSA: Monitoring – View Controls



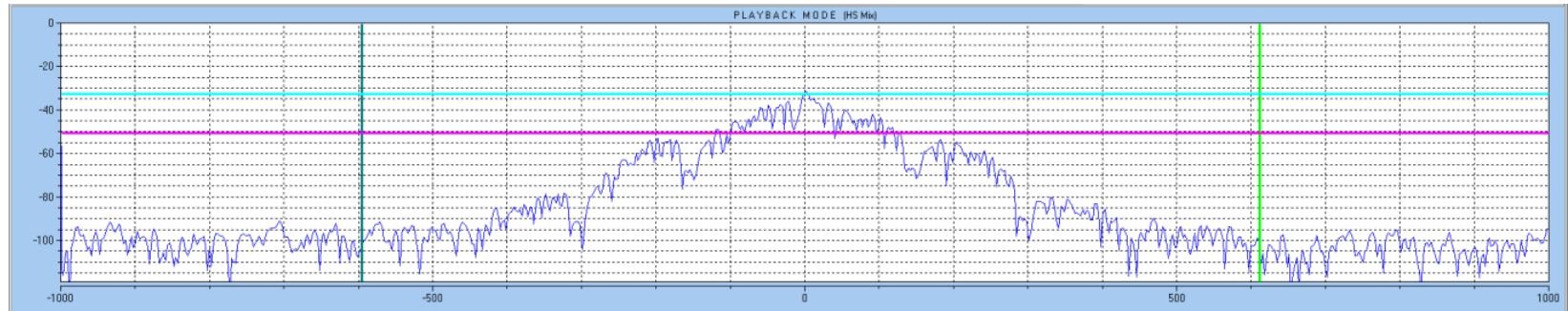
- Demodulator: Summarizes current configuration and status.
- IF Stream: Status and control; optionally to Save raw IF to Disk.
- Playback File: Provides ability to play back captured IF file for repetitive analysis.
- Sub-window view controls: Show and Hide FFT (spectrum) and Scope graphs.
- Spectrum graph control tabs (Frequency, Amplitude, Quick Buttons, and FFT) allow a variety of characteristics to be tailored to signal being analyzed.
- Spectrum cursor buttons and data aid in making spectral measurements.
- Current UTC date/time also displayed for convenience.

GDSA: Spectrum Graph



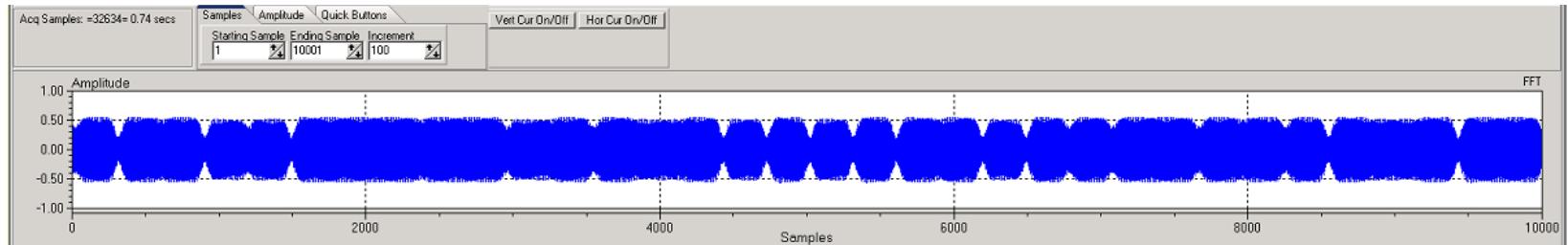
- Horizontal axis is in frequency.
- Vertical axis is the signal level in the IF in dBm (-28 dBm ~ 47 dBm EIRP).
- Cursors allow both frequency and amplitude measurements to be made.
- Controls allow specifying the frequency range to be graphed relative to the channel center.
 - Spectral range is approximately ± 4500 Hz from channel center (several 300 bps channels).
 - While the GDSA cannot graph the entire DCS spectrum, it can be tuned anywhere in it.
- Quick Buttons are tailored to the the purpose of the GDSA and provide quick setup for typical DCS channel analysis.
- The FFT algorithm, which converts the time domain signal into the frequency domain, can also be adjusted as needed.

GDSA: Spectrum Graph - Playback



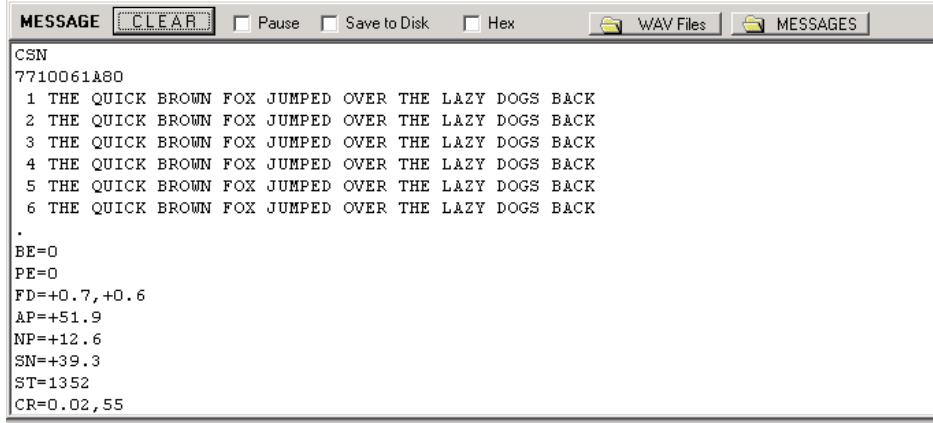
- Works just like in live mode, but ...
- Title notes that the GDSA is in “PLAYBACK MODE”.
- Background changes to light blue.

GDSA: Scope Graph



- Provides a time domain representation of the sampled IF.
- Can be useful for demonstrating the modulation envelope of a GOES DCS message.
- Doesn't allow any meaningful measurements or analysis to be made.
- Can be hidden to reclaim screen real estate for Spectrum graph.

GDSA: Message Section



MESSAGE Pause Save to Disk Hex

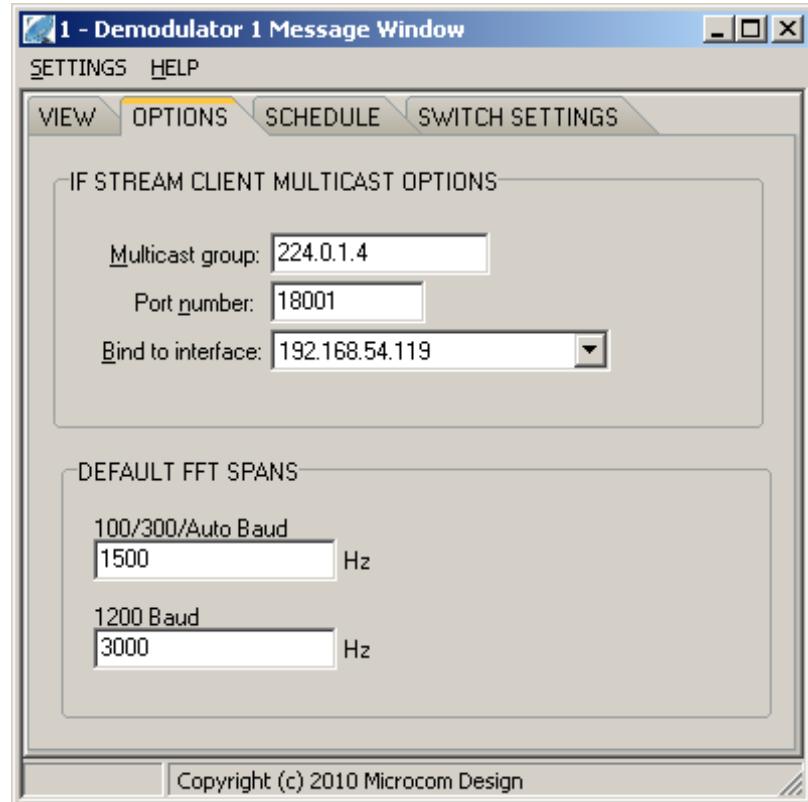
```
CSN
7710061A80
1 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
2 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
3 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
4 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
5 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
6 THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK
.
BE=0
PE=0
FD=+0.7,+0.6
AP=+51.9
NP=+12.6
SN=+39.3
ST=1352
CR=0.02,55
```

- Shows the received message data and message quality statistics as provided by the *DigitTrak* demodulator.
- Message Window can be Cleared and Paused as needed.
- Controls are provided to capture messages, view them in Hex, and quickly access saved message.
 - Filenames include the date and time the file was captured so they are unique and can be easily located.
- The Message section cannot be hidden, but window splitter controls allow the size to be adjusted to suit.

GDSA: Options Tab



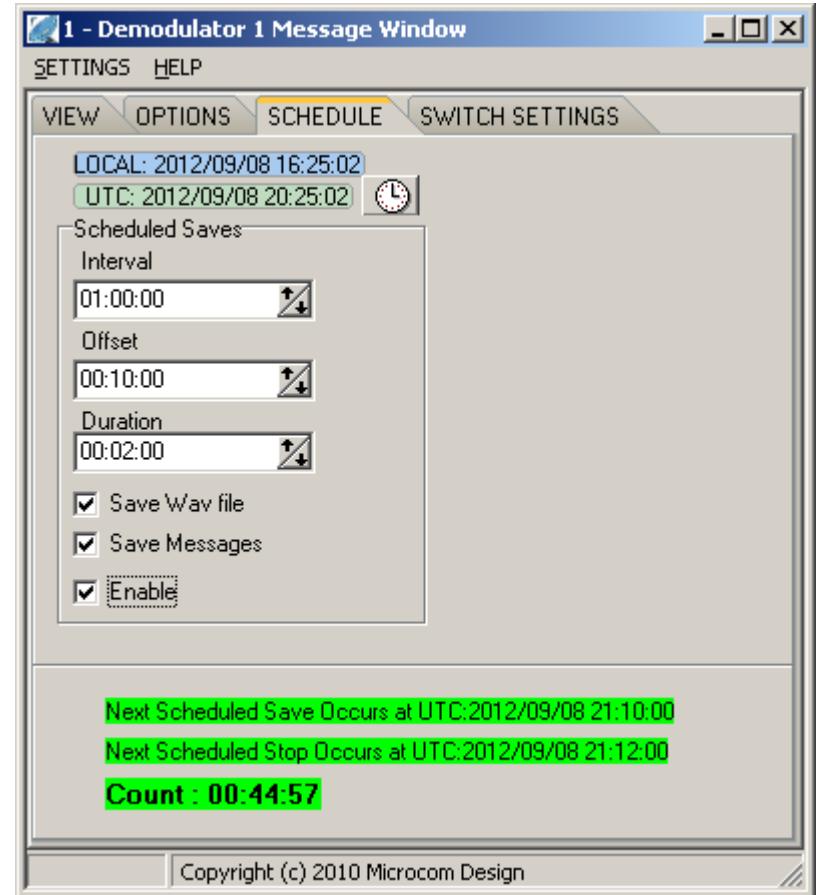
- IF Stream Configuration
 - Multicast Group
 - Port Number
 - Bind to Interface
 - Leave as set.
- Default Spectrum Spans
 - Used in Quick Button
 - 100/300: 1500 Hz
 - 1200: 3000 Hz



GDSA: Schedule Tab



- Local and UTC Time Shown
- Define Schedule for Record
 - Interval: How often
 - Offset: Where in window
 - Duration: How long
 - Example:
 - Every hour for 2 minutes beginning at 10 minutes past the top of the hour.
- Can Capture ...
 - Wav Files (IF)
 - DCS Message
- Checking “Enable” initiates.
- Schedule information provided once enabled.





**END OF DAY 2 TRAINING
“THANK YOU” FOR YOUR ATTENTION**