

Thoughts on a New HRIT DCS File Format

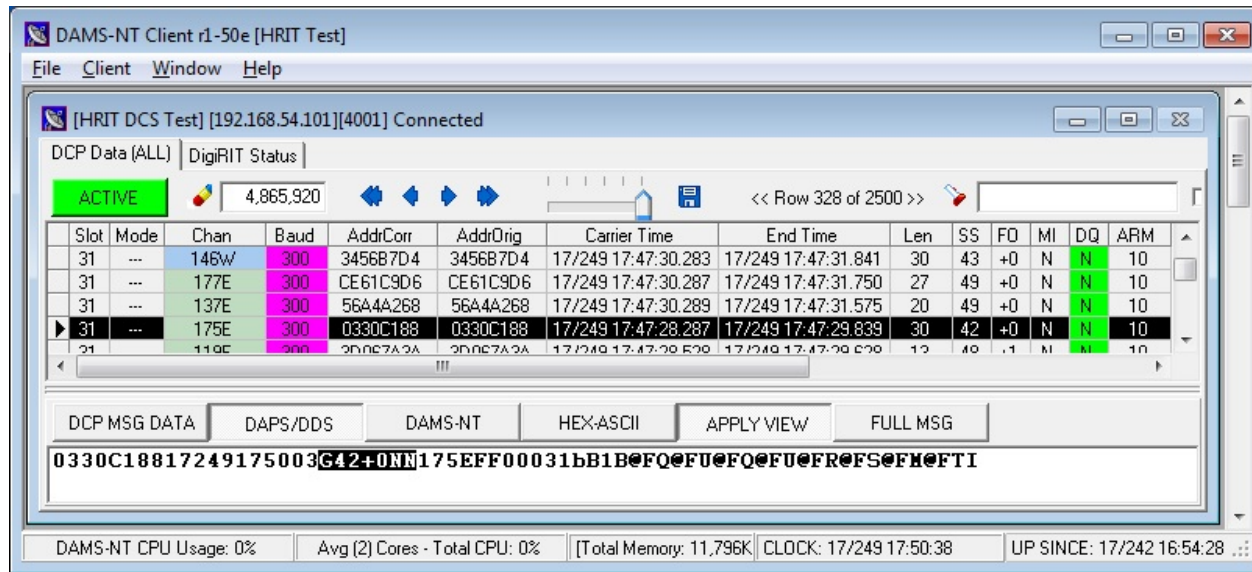
Presented by
Microcom Design, Inc.
September 2017



Existing LRIT DCS File Format

- **Originally developed in 2003-2005.**
 - Uses mix of ASCII and binary fields in the header.
 - Provides the DAPS error message statistics.
 - Was enhanced to provide the carrier start and message end times as a footer.
- **Major deficiency is DAPS frequency resolution.**
 - +/- 500 Hz with 50 Hz resolution.
 - Current CS2 transmitter limit is +/- 125 Hz
- **Other things that could be improved:**
 - Signal strength to 0.1 dB.
 - Phase noise measurements.
 - Utilizing more binary fields in message header.

Message Statistics – DADDS versus XRIT



The screenshot shows the DAMS-NT Client interface. The main window displays a table of DCP Data (ALL) with columns: Slot, Mode, Chan, Baud, AddrCorr, AddrOrig, Carrier Time, End Time, Len, SS, FD, MI, DQ, and ARM. The table is currently showing row 328 of 2500. The selected row (31) has the following data: Slot: 31, Mode: ---, Chan: 175E, Baud: 300, AddrCorr: 0330C188, AddrOrig: 0330C188, Carrier Time: 17/249 17:47:28.287, End Time: 17/249 17:47:28.839, Len: 30, SS: 42, FD: +0, MI: N, DQ: N, ARM: 10. Below the table, there are tabs for DCP MSG DATA, DAPS/DDS, DAMS-NT, HEX-ASCII, APPLY VIEW, and FULL MSG. The FULL MSG tab is selected, showing the message: 0330C18817249175003G42+0NN175EFF00031bB1B@FQ@FU@FQ@FU@FR@FS@FM@FTI. At the bottom of the window, there is a status bar showing: DAMS-NT CPU Usage: 0%, Avg (2) Cores - Total CPU: 0%, [Total Memory: 11,796K] CLOCK: 17/249 17:50:38, UP SINCE: 17/242 16:54:28.

Slot	Mode	Chan	Baud	AddrCorr	AddrOrig	Carrier Time	End Time	Len	SS	FD	MI	DQ	ARM
31	---	146W	300	3456B7D4	3456B7D4	17/249 17:47:30.283	17/249 17:47:31.841	30	43	+0	N	N	10
31	---	177E	300	CE61C9D6	CE61C9D6	17/249 17:47:30.287	17/249 17:47:31.750	27	49	+0	N	N	10
31	---	137E	300	56A4A268	56A4A268	17/249 17:47:30.289	17/249 17:47:31.575	20	49	+0	N	N	10
31	---	175E	300	0330C188	0330C188	17/249 17:47:28.287	17/249 17:47:28.839	30	42	+0	N	N	10
31	---	119E	300	2D0E7A2A	2D0E7A2A	17/249 17:47:29.529	17/249 17:47:29.629	12	49	+1	N	N	10

➤ DAPS Legacy Stats Still Used by LRIT/HRIT

G48+2NN

T

SS

±X

M

D

Type: G = Good ? = Parity Errors (ARM)

Signal Strength: dBm EIRP

Frequency: Sign & Digit (±F times 50 Hz)

Modulation Index (Phase): Normal, High, Low

Data Quality (Phase): Normal, Fair, Poor

➤ Carrier Start and End times with millisecond resolution supported.



Message Statistics – DADDs versus XRIT

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

NEED TO UPDATE YOUR SYSTEM USE AGREEMENT? [CLICK HERE TO BEGIN...](#) [PDT FILE](#) • [CDT FILE](#) • [REPORT A BUG](#) • **VERSION 1.93**

CHANNEL STATS | PROCESS STATS | **MESSAGES** | PLATFORMS | CHANNELS | RADIOS | GROUPS | DRO | SUAS | ARGOS | USERS | AUDITS

WELCOME, BRETT BETSILL

NETLISTS & VIEWS | DEFAULT VIEW | NETLISTS | FILTER | CLEAR | **EXPORT** | 100

	ADDRESS	GROUP	CHAN	BAUD	SIGNAL	NOISE	QUALITY	FREQ	CAR TIME	END TIME	MSG TIME	ARM	SCID	TYPE	LEN	MESSAGE DATA
▶	354305A6	HIGUOH	96	300	45.7	2.3	100.0	2.7	17/249 17:00:30.297	17/249 17:00:40.053	9.756	G	15	CS1	337	":PRS 1 #1 1627 1619 1618...
▶	334A564A	NOANOS	72	300	40.8	3.0	99.3	-6.1	17/249 17:00:36.307	17/249 17:00:39.950	3.643	G	15	CS2	106	"P87643141BIP@@@v0zaP8A...
▶	33685250	NOANOS	150	300	37.0	4.1	95.8	-2.3	17/249 17:00:36.290	17/249 17:00:39.840	3.550	G	15	CS2	102	"P94316471@@@B@@v0zaP%@g...
▶	33708700	NOANOS	209	300	33.1	6.8	79.8	1.4	17/249 17:00:36.287	17/249 17:00:39.487	3.200	G	13	CS2	89	"P99999231IEV@@@v0zaPI@...
▶	A1215AAA	UNIVNY	57	300	43.8	3.8	97.3	8.3	17/249 17:00:30.433	17/249 17:00:39.470	9.037	G	13	CS2	310	'@@AQ_K@@@ d d d d d d ...

PAGE 1 OF 5125286 | PAGE SIZE: 5 | 1 - 5 OF 25626426 MESSAGES

- **“Signal” Strength:** **dBm EIRP to 0.1 dB**
- **Phase “Noise”:** **in degrees RMS to 0.1°**
- **Message “Quality”:** **in percent to 0.1% (aka “Batting Average”)**
- **“Freq”uency:** **deviation from channel center to 0.1 Hz**





Initial Recommendation & Comparison

<i>Field Name</i>	<i>Bytes</i>	<i>Format</i>
Block Identifier	1	TBD
Message Block Length	2	Integer Unsigned
Sequence Number	3	Integer Unsigned
Message Flags/Baud	1	Bit Mapped
Message ARM Code	1	ASCII Char (G,?,M,T,W, etc.)
Corrected Address	4	Hexadecimal
Original Address	4	Hexadecimal
Carrier Start	7	BCD
Message End	7	BCD
Signal Strength X10	2	Integer Unsigned
Frequency Offset X10	2	Integer Signed
Phase Noise X100	2	Integer Unsigned
Good Phase X2	1	Integer Unsigned
Channel	2	Integer Unsigned
Spacecraft	1	ASCII Character (E,W)
Source Code	2	ASCII Characters
Message Data	Var	ASCII or Pseudo-Binary

<i>Field Name</i>	<i>Bytes</i>	<i>Format</i>
Delimiter	2	0x02 0x02
Message Flags	1	Bit Mapped
Message ID Code	1	ASCII
Corrected Address	8	ACSII Hex
Start (Frame) Time	11	ASCII Decimal (Second Rounded)
Msg ARM Code	1	ASCII Char (G,?,M,T,W, etc.)
Signal Strength	2	ASCII Decimal
Frequency Offset	2	ASCII Special
Modulation Index	1	ASCII Character (N,H,L)
Data Quality	1	ASCII Character (N,F,P)
Channel	3	ASCII Decimal
Spacecraft	1	ASCII Character (E,W)
Source Code	2	ASCII Characters
Message Length	5	ASCII Decimal
Message Data	Var	ASCII or Pseudo-Binary
Carrier Start	14	ASCII Decimal
Delimiter	1	ASCII Space (0x20)
Message End	14	ASCII Decimal

- **New: 42 bytes of overhead** **Old: 70 bytes of overhead**
- **Uses binary fields as much as possible.**
- **Block identifier and length will allow for future variations and/or new features (e.g. system messages).**





Transition Recommendations

- **Would be nice if both formats could be transmitted during a defined transition period.**
 - Easily supported by LRIT/HRIT file type designation in primary header.
 - Current DCS file type is 130 (0x82) ; simply need a new DCS file type for the new format.
 - Initial period (6 months) old format would have priority.
 - Second period (6 months) new format would have priority.
- **Bandwidth requirements:**
 - Presently DCS accounts for ~4% of the HRIT transmission.
 - Transmitting 2 streams would double bandwidth to 8%.
 - Fill accounts for 15-20% (but long periods of no fill occur).
- **Dual streams during transition still to be approved by NOAA.**



Next Steps

- **Feedback on this presentation.**
- **Microcom has been tasked with documenting new format for NOAA consideration and distribution.**
- **NOAA to follow up with STIWG members.**
- **Looking for input and feedback from HRIT receiver manufacturers on scope of updates.**
 - **Expect updates to be limited to software/firmware.**
- **Questions, Comments & Discussion**