

JET PROPULSION LABORATORY California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103

$$K \times f_T - f_R + f_B = \text{Doppler counter}$$

$$K \times f_T - f_R + f_B - D_1 = \text{Pseudo-residual}$$

$k = 240/221 @ S, 880/221 @ X$

10 April 1978

Refer to: 314.3-ASL:jh

Voyager Radio Science Team Members

Subject: Radio Science Closed Loop Data Interface Agreement

The tape containing the closed loop data delivered to the Voyager Radio Scientists by the Radio Science Data Team, will be the Archive Tracking Data File (ATDF). The ATDF is an 800 bpi, unlabeled, fielddata and binary magnetic tape. For non-JPL users, the ATDF will be a 9 track tape (7 track for JPL users). Seven track ATDF will be made for non-JPL users if requested. The attached memo 900-770, "Multi-mission Track Software Subsystem, Tracking Intermediate Data Record (IDR) Processor/Orbit Data Editor (ODE) Interface" will serve as the defining closed loop data interface specification between the Voyager Radio Science Team Members and the Radio Science Data Team. The ATDF tape structure is summarized and the formation of the data blocks are described on pages 4 and 5 respectively in the attached memo. Please sign the attached signature sheet (if this format is agreeable to you) and return it to me before May 1, 1978.

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*HOW GET?*

*(213) 354-6714*

*- 7790 SECTION 314*

*WHAT RECEIVE FREQ?*

*BOTTOM PG. 16?*

*ASSUMES THAT TAPE PROVIDES DOPPLER COUNTS*



VOYAGER RADIO SCIENCE CLOSED LOOP DATA  
INTERFACE AGREEMENT SIGNATURE PAGE

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900-770

TITLE: MULTI-MISSION TRACKING SOFTWARE SUBSYSTEM, TRACKING  
INTERMEDIATE DATA RECORD PROCESSOR/ORBIT DATA EDITOR  
INTERFACE

Original Issue Date: January 20, 1977

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APPROVAL

C. J. Vegas  
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Navigation Systems Section

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ABSTRACT

MEDIUM: Magnetic Tape

SPECIFICATIONS: 7-Track, 800 BPI, unlabeled, fielddata and binary

GENERATING PROGRAM: Intermediate Data Record Selection, Translation,  
Revision, Intercalation, and Processing Programs  
for Engineering Radio Metric Data (IDR-STRIPPER)

USING PROGRAM: Orbit Data Editor (ODE)

PURPOSE: Define the interface for passing Archive Tracking Data Files  
(ATDF's) to the ODE program for multi-project use or other  
users/user programs.



INTERFACE DESCRIPTION CHANGE HISTORY

Original Issue Date: January 20, 1977 Latest Revision Date: May 19, 1977

TITLE: MULTI-MISSION TRACKING SOFTWARE SUBSYSTEM, TRACKING  
INTERMEDIATE DATA RECORD PROCESSOR/ORBIT DATA EDITOR  
INTERFACE

<u>Issue/Revision</u>	<u>Date</u>	<u>Pages Changed</u>
Original	January 20, 1977	Original issue of pages 1-17
Revision 1	May 19, 1977	All



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Voyager Radio Science  
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Date: 16 Feb 78

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Programmer

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A. APPLICABLE DOCUMENTS

900-771 IDR-STRIPPER Programmer's Manual

B. APPLICABLE INTERFACE DESCRIPTIONS

None

C. FUNCTIONAL DESCRIPTION

1. Purpose

The purpose of this interface is to provide users with tracking data received by the Deep Space Network (DSN).

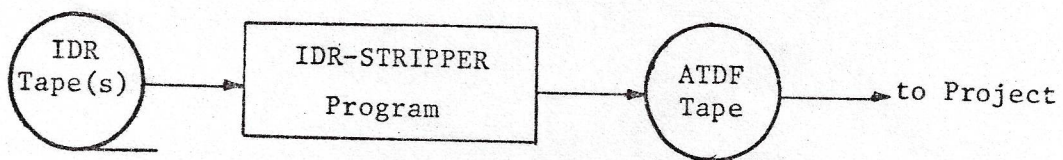
2. Description

The DSN transfers tracking data to the Univac 1108 via IDR tapes. The IDR tapes are processed to generate ATDF tapes. All data on any one ATDF tape pertains to only one spacecraft. The ATDF tape is comprised of a single data file consisting of both S and X band doppler, range, DRVID, angles, pseudo-residuals, programmed frequency, and radio metric validation data. The IDR-STRIPPER program will provide ATDF tapes to the ODE arranged as follows:

- a) File Identification Logical Record (1 record only)
- b) Pass Summary Logical Records (time ordered)
- c) Transmitter Logical Records (time ordered)
- d) Tracking Data Logical Records (time ordered)
- e) Hardware End-of-File Mark

D. FUNCTIONAL BLOCK DIAGRAM

A functional block diagram showing the generation of the ATDF tape is given below.





## E. DATA FORMAT

### 1. ATDF Tape Description

Each ATDF tape block (physical record) is 1792 36-bit words in length. Each block consists of 28 64-word (2304-bit) logical records. Tables 1 through 4 give detailed, bit-oriented descriptions of the ATDF logical records.

Note that several items of data are shown to be two's complement and may be positive, zero, or negative. The leftmost bit of these data items indicates the sign (0 means positive, 1 means negative). The sign bit for most items has been left-extended to fill another item of information (for always positive items these bits are shown to be all zeroes, otherwise they may be all zeroes or all ones). The user may extract the data item alone and sign-extend manually, or may use any portion of the Sign Bits field combined with the data field to get a signed integer which fills his computer's word size. For example, a 22 Sign Bits/14-bit Data Item pair can be taken as a 20-bit item to be ignored plus a 16-bit Data Item, or as a 4-bit item to be ignored plus a 32-bit Data Item, or as a 36-bit Data Item, etc. This is always true whether the Sign Bits field is all zeroes or all ones.

For computers such as the Univac 1108 which use one's complement for negative numbers, the ATDF two's complement numbers can be converted by subtracting one if the first bit of the data item is one (do not check for number less than 0 since a -0 (all one bits) is not recognized as negative, but must be converted).



Table 1. ATDF FILE IDENTIFICATION LOGICAL RECORD FORMAT

ADJUST FOR BITS 0-31

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
1	1-31	31	1	Sign Bits (all zeroes)
2	32-36	5		Word Count for ODE = 8
3	37-65	29	2	Sign Bits (all zeroes)
4	66-72	7		Record Type = 10
5	73-78	6	3	'T' = 031 <sub>8</sub> - 25
6	79-84	6		'R' = 027 <sub>8</sub> - 23
7	85-90	6		'A' = 006 <sub>8</sub> - 6
8	91-96	6		'C' = 010 <sub>8</sub> - 8
9	97-102	6		'K' = 020 <sub>8</sub> - 16
10	103-108	6		'I' = 016 <sub>8</sub> - 14
11	109-114	6	4	'N' = 023 <sub>8</sub> - 19
12	115-120	6		'G' = 014 <sub>8</sub> - 12
13	121-126	6		' ' = 005 <sub>8</sub> - 5
14	127-132	6		'D' = 011 <sub>8</sub> - 9
15	133-138	6		'A' = 006 <sub>8</sub> - 6
16	139-144	6		'T' = 031 <sub>8</sub> - 25
17	145-150	6	5	'A' = 006 <sub>8</sub> - 6
18	151-156	6		' ' = 005 <sub>8</sub> - 5
19	157-162	6		'F' = 013 <sub>8</sub> - 11
20	163-168	6		'I' = 016 <sub>8</sub> - 14
21	169-174	6		'L' = 021 <sub>8</sub> - 17
22	175-180	6		'E' = 012 <sub>8</sub> - 10
23	181-186	6	6	' ' = 005 <sub>8</sub> - 5
24	187-192	6		'I' = 016 <sub>8</sub> - 14
25	193-198	6		'D' = 011 <sub>8</sub> - 9
26	199-204	6		'R' = 027 <sub>8</sub> - 23
27	205-210	6		' ' = 005 <sub>8</sub> - 5
28	211-216	6		' ' = 005 <sub>8</sub> - 5
29	217-245	29	7	Sign Bits (all zeroes)
30	246-252	7		Spacecraft ID Number
31	253-256	4	8	Sign Bits (all zeroes)
32	257-264	8		Last 2 Digits of Year
33	265-280	16		Day-of-Year
34	281-288	8		Hour
35	289-292	4	9	Sign Bits (all zeroes)
36	293-300	8		Minute
37	301-308	8		Second
38	309-324	16		0
39-83	325-2304	1980	10-64	Not Used (all zeroes)

DEC EDCD  
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 X  
 Y  
 Z

64 - 36 BIT WORD = 72 - 32 BIT WORDS

ISSUE 1



Table 2. ATDF **FASS SUMMARY** LOGICAL RECORDS FORMAT

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
1	1-31	31	1	Sign Bits (all zeroes)
2	32-36	5		Word Count for ODE = 26
3	37-65	29	2	Sign Bits (all zeroes)
4	66-72	7		Record Type = 20
5	73-76	4	3	Sign Bits (all zeroes)
6	77-84	8		Last 2 Digits of Year
7	85-100	16		Day-of-Year
8	101-108	8		Hour
9	109-112	4	4	Sign Bits (all zeroes)
10	113-120	8		Minute
11	121-128	8		Second
12	129-144	16		0
13	145-148	4	5	Sign Bits (all zeroes)
14	149-156	8		Spacecraft ID Number
15	157-164	8		Network ID 2 = DSN 3 = MSFN 4 = ETR 5 = GTS
16	165-172	8		Station Number
17	173-180	8		Receiver Type 1 = S-Band 2 = X-Band
18	181-184	4	6	Sign Bits (all zeroes)
19	185-192	8		Last 2 Digits of Year
20	193-208	16		Day-of-Year
21	209-216	8		Hour
22	217-220	4	7	Sign Bits (all zeroes)
23	221-228	8		Minute
24	229-236	8		Second
25	237-252	16		0
26	253-256	4	8	Sign Bits (all zeroes)
27	257-272	16		Pass ID Number
28	273-288	16		1-Way Total Doppler Points
29	289-292	4	9	Sign Bits (all zeroes)
30	293-308	16		1-Way Good Doppler Points
31	309-324	16		1-Way Doppler Normalized Percentage
32	325-328	4	10	Sign Bits (all zeroes)
33	329-344	16		2-Way Total Doppler Points
34	345-360	16		2-Way Good Doppler Points
35	361-364	4	11	Sign Bits (all zeroes)
36	365-380	16		2-Way Doppler Normalized Percentage
37	381-396	16		3-Way Total Doppler Points
38	397-400	4	12	Sign Bits (all zeroes)
39	401-416	16		3-Way Good Doppler Points
40	417-432	16		3-Way Doppler Normalized Percentage
41	433-436	4	13	Sign Bits (all zeroes)
42	437-452	16		3-Way Coherent Total Doppler Points
43	453-468	16		3-Way Coherent Good Doppler Points

Time of First Data Point

Time of Last Data Point



Table 2. ATDF PASS SUMMARY LOGICAL RECORDS FORMAT (cont'd) ?

1 PER PASS

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
44	469-472	4	14	Sign Bits (all zeroes)
45	473-488	16		3-Way Coherent Doppler Normalized Percentage
46	489-504	16	15	Range/DRVID Type (see Table 4)
47	505-508	4		Sign Bits (all zeroes)
48	509-524	16	16	Total Range Points Received
49	525-540	16		0
50	541-560	20	17	Sign Bits (all zeroes)
51	561-576	16		Total Records Received
52	577-580	4	18	Sign Bits (all zeroes)
53	581-596	16		Total DRVID Points Received
54	597-612	16	19	0
55	613-632	20		Sign Bits (all zeroes)
56	633-648	16	20	Type of Angles (see Table 4)
57	649-652	4		Sign Bits (all zeroes)
58	653-668	16	21	Total Angle Pairs
59	669-684	16		Total Good Angle Pairs
60	685-688	4	22	Sign Bits (all zeroes)
61	689-704	16		Angle Pairs Normalized Percentage
62	705-712	8	23	Sign Bits (all zeroes)
63	713-720	8		Split Pass ID Number
64	721-732	12	24	Sign Bits (all zeroes)
65	733-740	8		Last 2 Digits of Year
66	741-756	16	25	Day-of-Year
67	757-760	4		Sign Bits (all zeroes)
68	761-768	8	26	Hour
69	769-776	8		Minute
70	777-784	8	27	Sign Bits (all zeroes)
71	785-792	8		Second
72	793-820	28	28	Sign Bits (all zeroes)
73	821-828	8		Last 2 Digits of Year
74	829-832	4	29	Sign Bits (all zeroes)
75	833-848	16		Day-of-Year
76	849-856	8	30	Hour
77	857-864	8		Minute
78	865-876	12	31	Sign Bits (all zeroes)
79	877-884	8		Second
80	885-900	16	32	0
81	901-904	4		Sign Bits (all zeroes)
82	905-920	16	33	Total Doppler Points Received
83	921-936	16		Total Doppler Points Expected
84	937-940	4	34	Sign Bits (all zeroes)
85	941-956	16		Percentage of Doppler Points Received
86	957-972	16	35	Normalized Percentage of Doppler Points Received
87-123	973-2304	1332		28-64

ACQUISITION OF SIGNAL

AOS Time

LOSS OF SIGNAL

LOS Time



Table 3. ATDF TRANSMITTER LOGICAL RECORDS FORMAT

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
1	1-31	31	1	Sign Bits (all zeroes)
2	32-36	5		Word Count for ODE = 8
3	37-65	29	2	Sign Bits (all zeroes)
4	66-72	7		Record Type 30 = Spacecraft Transponder Record 31 = Station Transmitter Record
5	73-76	4	3	Sign Bits (all zeroes)
6	77-84	8		Last 2 Digits of Year
7	85-100	16		Day-of-Year
8	101-108	8		Hour
9	109-112	4	4	Sign Bits (all zeroes)
10	113-120	8		Minute
11	121-128	8		Second
12	129-144	16		0
13	145-148	4	5	Sign Bits (all zeroes)
14	149-156	8		Spacecraft ID Number
15	157-164	8		Network ID 2 = DSN 3 = MSFN 4 = ETR 5 = GTS
16	165-172	8		Station Number
17	173-180	8		Transmitter Type 0 = S-Band 1 = X-Band
18	181-184	4	6	Sign Bits (all zeroes)
19	185-192	8		Last 2 Digits of Year
20	193-208	16		Day-of-Year
21	209-216	8		Hour
22	217-220	4	7	Sign Bits (all zeroes)
23	221-228	8		Minute
24	229-236	8		Second
25	237-252	16		0
26	253-268	16	8	Sign Bits (all zeroes)
27	269-288	20		Transmitter Frequency - H/P*
28	289-304	16	9	Sign Bits (all zeroes)
29	305-324	20		Transmitter Frequency - L/P*
30-84	325-2304	1980	10-64	Not Used (all zeroes)

Transmitter  
On Time

Transmitter  
Off Time

\* H/P = high part = variable /  $10^4$

L/P = low part = (variable modulo  $10^4$ ) x  $10^3$

double precision variable = (H/P) x  $10^4$  + (L/P) /  $10^3$



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
1	1-31	31	1	Sign Bits (all zeroes)
2	32-36	5		Word Count for ODE = 18
3	37-65	29	2	Sign Bits (all zeroes)
4	66-72	7		Record Type 90 = Low Rate Data 91 = High Rate Data
5	73-76	4	3	Sign Bits (all zeroes)
6	77-84	8		Last 2 Digits of Year
7	85-100	16		Day-of-Year
8	101-108	8		Hour
9	109-112	4	4	Sign Bits (all zeroes)
10	113-120	8		Minute
11	121-128	8		Second
12	129-144	16		0
13	145-148	4	5	Sign Bits (all zeroes)
14	149-156	8		Spacecraft ID Number
15	157-164	8		Network ID 2 = DSN 3 = MSFN 4 = ETR 5 = GTS
16	165-172	8		Station Number
17	173-180	8		Receiver Type 1 = S-Band 2 = X-Band
18	181-184	4	6	Sign Bits (zeroes or ones)
19	185-192	8		Ground Mode 0 = No Doppler, No Range, No DRVID 1 = One-Way Doppler 2 = Two-Way Doppler 3 = Three-Way Doppler 4 = Three-Way Coherent Doppler 5 = One-Way, No Doppler 6 = Two-Way, No Doppler 7 = Three-Way, No Doppler 8 = Three-Way Coherent, No Doppler
20	193-200	8		Range Type 0 = No Ranging Data 6 = PLOP (Planetary Operational Discrete Spectrum) 7 = PLOP2 (Planetary Operational Continuous Spectrum) 8 = MU2 (Planetary R&D Discrete Spectrum)
21	201-208	8		Angle Type 0 = No Angles 1 = Azimuth/Elevation 2 = Hour Angle/Declination 3 = X30/Y30 4 = X85/Y85



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
22	209-216	8		DRVID Type 0 = No DRVID Data 6 = PLOP 7 = PLOP2 8 = MU2
23	217-220	4	7	Sign Bits (all zeroes)
24	221	1		Doppler Good/Bad Indicator 0 = Good 1 = Bad
25	222	1		Doppler Data Tolerance 0 = In Tolerance 1 = Out of Tolerance
26	223	1		0
27	224-227	4		Bias (two's complement)
28	228	1		Range Acquisition Toggle
29	229	1		Angle Good/Bad Indicator 0 = Good 1 = Bad
30	230-232	3		Range Data Field Identifier (RDFI) 0 = No Ranging Data Present if Item 20 $\leq$ 0 0 = Range-at- $T_0$ if Item 20 $>$ 0 1 = Round Trip Light Time, $T_1$ 2 = $T_2, T_3$ 3 = Correlation Voltages 4 = $T_0$ , Carrier Suppression 5 = Range (Not at $T_0$ )
31	233	1		Transmitter Frequency Tolerance 0 = In Tolerance 1 = Out of Tolerance
32	234	1		FTS Standard Indicator 0 = In Lock 1 = Out of Lock
33	235	1	Synthesizer Indicator 0 = In Lock 1 = Out of Lock	
34	236	1	Receiver Loop Lock Indicator 0 = In Lock 1 = Out of Lock	
35	237	1	Transmitter/Exciter No. 1 On/Off 0 = On 1 = Off	
36	238	1	Transmitter/Exciter No. 2 On/Off 0 = On 1 = Off	
37	239	1	Receiver Block Identifier 0 = Block III 1 = Block IV	



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
38	240-242	3		Source Designation 1 = DSIF HS 5 = MSFN HS 6 = ETR 7 = GTS
39	243-244	2		0
40	245	1		Doppler Extractor 0 = On Counter 1 1 = On Counter 2
41	246-247	2		Antenna Pointing Status 0 = Auto 1 = Non Auto
42	248	1		0
43	249	1		Mutual Station Data Type 0 = Real Data 1 = Test Data
44	250	1		Doppler Bias Indicator 0 = Biased 1 = Unbiased
45	251	1		SDR Recall Flag for PS-RD 0 = Not SDR Recall Data 1 = SDR Recall Data
46	252	1		No Process Flag 0 = Process Record and Pass 1 = Do Not Process Record but Pass
47	253-257	5	8	Sign Bits (all zeroes)
48	258-288	31		Sample Time (x 100)
49	289-304	16	9	Sign Bits (all zeroes)
50	305-324	20		Doppler Count - H/P
51	325-340	16	10	Sign Bits (all zeroes)
52	341-360	20		Doppler Count - L/P
53	361-376	16	11	Sign Bits (zeroes or ones)
54	377-396	20		Range Data Field - Part 1 0 if Item 20 $\leq$ 0; Otherwise Item 30 = 0. Range-at- $T_0$ - H/P 1. Round Trip Light Time 2. $T_2$ Integration Time Constant 3. Ref. Voltage (two's complement) 4. $T_0$ Time Tag 5. Range (not at $T_0$ ) - H/P
55	397-412	16	12	Sign Bits (zeroes or ones)
56	413-432	20		Range Data Field - Part 2 0 if Item 20 $\leq$ 0; Otherwise Item 30 = 0. Range-at- $T_0$ - L/P 1. $T_1$ Integration Time Constant 2. $T_3$ Integration Time Constant 3. Quad. Voltage (two's complement) 4. Carrier Suppression (two's comp.) 5. Range (not at $T_0$ ) - L/P

*20 to 32*

*HOW FROM*

*DIFF PG. 13*



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
57	433-436	4	13	Sign Bits (all zeroes)
58	437-452	16		Number of Ranging Components
59	453-460	8		Split Pass ID Number
60	461-468	8		Line Number
61	469-472	4	14	Sign Bits (all zeroes)
62	473-480	8		Doppler Weight Factor
63	481-488	8		Range Weight Factor
64	489-504	16		Pass ID Number
65	505-508	4	15	Sign Bits (all zeroes)
66	509-524	16		Doppler Multiplier
67	525-540	16		DRVID Power/Noise Ratio (two's comp. x 10)
68	541-559	19	16	Sign Bits (all zeroes)
69	560-576	17		Azimuth/Hour Angle/X30/X85 (x 1000)
70	577-595	19	17	Sign Bits (all zeroes)
71	596-612	17		Elevation/Declination/Y30/Y85 (x 1000)
72	613-617	5	18	Sign Bits (all zeroes)
73	618-648	31		VCO Reference Frequency (x 10) (240/221) / 10
74	649-664	16	19	Sign Bits (zeroes or ones)
75	665-684	20		DRVID (two's complement x 100)
76	685-700	16	20	Sign Bits (all zeroes)
77	700-720	20		No. 2 H/R Doppler Count - H/P
78	721-736	16	21	Sign Bits (all zeroes)
79	737-756	20		No. 2 H/R Doppler Count - L/P
80	757-772	16	22	Sign Bits (all zeroes)
81	773-792	20		No. 3 H/R Doppler Count - H/P
82	793-808	16	23	Sign Bits (all zeroes)
83	809-828	20		No. 3 H/R Doppler Count - L/P
84	829-844	16	24	Sign Bits (all zeroes)
85	845-864	20		No. 4 H/R Doppler Count - H/P
86	865-880	16	25	Sign Bits (all zeroes)
87	881-900	20		No. 4 H/R Doppler Count - L/P
88	901-916	16	26	Sign Bits (all zeroes)
89	917-936	20		No. 5 H/R Doppler Count - H/P
90	937-952	16	27	Sign Bits (all zeroes)
91	953-972	20		No. 5 H/R Doppler Count - L/P
92	973-988	16	28	Sign Bits (all zeroes)
93	989-1008	20		No. 6 H/R Doppler Count - H/P
94	1009-1024	16	29	Sign Bits (all zeroes)
95	1025-1044	20		No. 6 H/R Doppler Count - L/P
96	1045-1060	16	30	Sign Bits (all zeroes)
97	1061-1080	20		No. 7 H/R Doppler Count - H/P
98	1081-1096	16	31	Sign Bits (all zeroes)
99	1097-1116	20		No. 7 H/R Doppler Count - L/P
100	1117-1132	16	32	Sign Bits (all zeroes)
101	1133-1152	20		No. 8 H/R Doppler Count - H/P
102	1153-1168	16	33	Sign Bits (all zeroes)
103	1169-1188	20		No. 8 H/R Doppler Count - L/P
104	1189-1204	16	34	Sign Bits (all zeroes)
105	1205-1224	20		No. 9 H/R Doppler Count - H/P

RECWR  
REF  
FREQ

10 PER SEC  
DATA  
1/10th SEC  
RATE



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
106	1225-1240	16	35	Sign Bits (all zeroes)
107	1241-1260	20		No. 9 H/R Doppler Count - L/P
108	1261-1276	16	36	Sign Bits (all zeroes)
109	1277-1296	20		No. 10 H/R Doppler Count - H/P
110	1297-1312	16	37	Sign Bits (all zeroes)
111	1313-1332	20		No. 10 H/R Doppler Count - L/P
112	1333-1337	5	38	Sign Bits (zeroes or ones)
113	1338-1368	31		Doppler Residual (two's comp. x 1000)
114	1369-1376	8	39	Sign Bits (zeroes or ones)
115	1377-1404	28		Range Residual (two's comp. x 100)
116	1405-1422	18	40	Azimuth/Hour Angle/X30/X85 Residual (two's complement x 1000)
117	1423-1440	18		Elevation/Declination/Y30/Y85 Residual (two's complement x 1000)
118	1441-1443	3	41	TRK-2-14 Data Flag 0 = TRK-2-14 Data Present -1 = No TRK-2-14 Data Present
119	1444-1446	3		Angles Mode 0 = Auto Track 1 = Manual Aided 2 = Computer Right Ascension/Declination 3 = Drive Tape 4 = Sidereal
120	1447-1448	2		Angles Conscan Mode 0 = Conscan Off 1 = Conscan Auto 2 = Conscan Manual
121	1449	1		Azimuth/Hour Angle/X30/X85 Residual Tolerance 0 = In Tolerance 1 = Out of Tolerance
122	1450	1		Elevation/Declination/Y30/Y85 Residual Tolerance 0 = In Tolerance 1 = Out of Tolerance
123	1451-1453	3		Doppler Channel Number
124	1454	1		Frequency Standard Reference 0 = Backup 1 = Prime
125	1455-1458	4		Doppler Receiver Reference
126	1459-1460	2		Exciter VCO Reference 0 = Short 1 = Synthesizer 2 = Not Available
127	1461	1		DTK Software Configuration 0 = Good 1 = Bad
128	1462	1		DTK Hardware 0 = No Fail 1 = Fail



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
129	1463	1		Doppler Residual Tolerance 0 = In Tolerance 1 = Out of Tolerance
130	1464	1		Doppler Noise Tolerance 0 = In Tolerance 1 = Out of Tolerance
131	1465	1		Total Doppler Slipped Cycles Tolerance 0 = In Tolerance 1 = Out of Tolerance
132	1466-1468	3		Reference Channel for Differential Doppler Phase
133	1469-1476	8		Doppler Figure of Merit (two's comp. x 10)
134	1477-1494	18	42	Slipped Cycles During Count (two's comp.)
135	1495-1512	18		Total Slipped Cycles During Count
136	1513-1530	18	43	Doppler Noise (x 1000)
137	1531-1548	18		Recv'd Signal Strength (two's comp. x 10)
138	1549-1553	5	44	Sign Bits (zeroes or ones)
139	1554-1584	31		Diff. Doppler Phase (two's comp. x 1000)
140	1585	1	45	Range Modulation On/Off 0 = On 1 = Off
141	1586	1		Prime Range Channel 0 = S-Band 1 = X-Band
142	1587	1		Pipelining On/Off 0 = On 1 = Off
143	1588	1		Chopper Frequency On/Off 0 = On 1 = Off
144	1589	1		Carrier Suppression Units 0 = Volts 1 = dB
145	1590	1		Range Validity 0 = Good 1 = Bad
146	1591	1		Range Calibration Tolerance 0 = In Tolerance 1 = Out of Tolerance
147	1592	1		Range Configuration Indicator 0 = Same 1 = Different
148	1593	1		Range Power/Noise Ratio Tolerance 0 = In Tolerance 1 = Out of Tolerance
149	1594	1		Range Residual Tolerance 0 = In Tolerance 1 = Out of Tolerance



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
150	1595	1		Pseudo DRVID Tolerance 0 = In Tolerance 1 = Out of Tolerance
151	1596	1		Differenced S-X Range Tolerance 0 = In Tolerance 1 = Out of Tolerance
152	1597-1600	4		Receiver Number
153	1601	1		Exciter Number 0 = Block III 1 = Block IV
154	1602-1603	2		Maser Number
155	1604-1605	2		Maser Type 0 = SPD 1 = XRO 2 = Non Standard 3 = Not Available
156	1606	1		Transmitter Power Indicator 0 = Low Power 1 = High Power
157	1607	1		Transmitter Power Units 0 = Volts 1 = KW
158	1608-1620	13		Transmitter Power Level (x 100)
159	1621-1640	20	46	Range Calibration (x 100)
160	1641-1656	16		Range Power/Noise Ratio (two's comp. x 10)
161	1657-1671	15	47	Sign Bits (zeroes or ones)
162	1672-1692	21		Avg. Doppler Residual (two's comp. x 1000)
163	1693-1700	8	48	Sign Bits (zeroes or ones)
164	1701-1728	28		Pseudo DRVID (two's complement x 100)
165	1729-1742	14	49	Sign Bits (zeroes or ones)
166	1743-1764	22		Differenced S-X Range (two's comp. x 100)
167	1765-1786	22	50	Z Correction (two's complement x 100)
168	1787-1800	14		Wave Form Distortion (two's comp. x 100)
169	1801-1814	14	51	Sign Bits (all zeroes)
170	1815-1833	19		DRVID Noise (x 100)
171	1834	1		DRVID Validity 0 = Good 1 = Bad
172	1835	1		DRVID Noise Tolerance 0 = In Tolerance 1 = Out of Tolerance
173	1836	1		DRVID Power/Noise Ratio Tolerance 0 = In Tolerance 1 = Out of Tolerance
174	1837-1844	8	52	Sign Bits (zeroes or ones)
175	1845-1872	28		Differenced S-X DRVID (two's comp. x 100)
176	1873-1876	4	53	Sign Bits (all zeroes)
177	1877	1		Exciter Number
178	1878-1908	31		Programmed Freq. Ramp (two's comp. x 10 <sup>6</sup> )

How  
START?



WORD IS  
ZERO  
FILLED



Table 4. ATDF TRACKING DATA LOGICAL RECORDS FORMAT (cont'd)

Item Number	Bit Number	Length (Bits)	U1108 Word	Description
179	1909-1924	16	54	Sign Bits (all zeroes)
180	1925-1944	20		Programmed Frequency - H/P
181	1945-1960	16	55	Sign Bits (all zeroes)
182	1961-1980	20		Programmed Frequency - L/P
183	1981-1998	18	56	High Rate Noise
184	1999-2016	18		Medium High Rate Noise
185	2017-2034	18	57	Medium Low Rate Noise
186	2035-2052	18		Low Rate Noise
187	2053-2065	13	58	Sign Bits (all zeroes)
188	2066	1		New Medium Low Rate Noise 0 = Yes 1 = No
189	2067	1		New Low Rate Noise 0 = Yes 1 = No
190	2068	1		Static Phase Error Units 0 = Volts 1 = Degrees
191	2069-2076	8	59	Figure of Merit (two's comp. x 10)
192	2077-2088	12		Static Phase Error (two's comp. x 10)
193	2089-2092	4		0
194	2093-2100	8		Prediction Set ID, 1st ASCII Character
195	2101-2108	8		Prediction Set ID, 2nd ASCII Character
196	2109-2116	8		Prediction Set ID, 3rd ASCII Character
197	2117-2124	8		Prediction Set ID, 4th ASCII Character
198-202	2125-2304	180	60-64	Not Used (all zeroes)