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DOCUMENT 152-83

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IRIG STANDARD FOR DISTRIBUTING INTERRANGE
VECTOR ACQUISITION DATA

AD-A433647



DATA REDUCTION AND COMPUTING GROUP
RANGE COMMANDERS COUNCIL

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September 1983

Prepared by

Data Reduction and Computing Group
Range Commanders Council

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PURPOSE

This document defines a standard procedure for distributing interrange vector acquisition data to remote tracking instruments.

APPLICATION

The standard procedures set forth herein are recommended, where applicable, for interchange of acquisition data among the National and Service Ranges and other ranges associated with the Range Commanders Council.

LIMITATIONS

This standard does not apply to the distribution of raw radar data.

STANDARD REFERENCES AND PROCEDURES

1. The IRIG WGS-72 Convention, described in a subsequent paragraph, is used as the reference spheroid for acquisition data.
2. The Global Coordinate System. Vector acquisition data are referred to as an earth-fixed, non-inertial, geocentric, right-handed, cartesian coordinate system. Orientation of system axes is:
 - a. System origin is at the geocenter.
 - b. Positive E-axis extends from origin through Greenwich meridian at the equator.
 - c. Positive F-axis extends from origin through 90°E meridian at the equator.
 - d. Positive G-axis extends from origin through the North Pole.
3. Teletype Message Format. The IRIG Interrange Vector Teletype Format in figure 1 is used for transmitting nominal pre-launch, in-flight, no-data, and simulated acquisition messages. Full details associated with each field of the format are shown in figure 2.

FIGURE 1

IRIG INTERRANGE VECTOR TELETYPE FORMAT

IRSTAAAAA

N00000 MM DD PPPP B

SEEEEEEEEEE CC SFFFFFFFFF CC SGGGGGGGGG CC

SÈÈÈÈÈÈÈÈ CC SËËËËËËË CC SĜĜĜĜĜĜĜ CC HHMMSSS CC

IRED

KEY: IRST	= Start of message code
A	= Range address
N	= Data type
O	= Operation number
M	= Month of year, Five in first digit, if pre-launch data
D	= Day of month, Five in first digit, if pre-launch data
P	= Orbit number
B	= Body number
S	= Sign of data
E F G È É Ę	= Coordinate and velocity data, geocentric, meters, meters/seconds
C	= Checksum of preceding characters
H	= Hours, Greenwich or T-time
M	= Minutes, Greenwich or T-time
S	= Seconds, Greenwich or T-time
IRED	= End of message code

FIGURE 2
 DETAILS OF IRIG VECTOR TELETYPE FORMAT

Line No.	Character No.	Character	Note	Description
				Carriage Return (Precedes Line 1)
				Carriage Return (Precedes Line 1)
				Line Feed (Precedes Line 1)
				Line Feed (Precedes Line 1)
				Letter Shift (Precedes Line 1)
1	1	I		Always the same
	2	R		Always the same
	3	S		Always the same
	4	T		Always the same
	5	A	1	Range Address
	6	A	1	Range Address
	7	A	1	Range Address
	8	A	1	Range Address
	9	A	1	Range Address
10				Carriage Return
11				Carriage Return
12				Line Feed

13 Line Feed
 14 Figure Shift

2	1	N		Indicates data type 1 = Nominal, 2 = Inflight, 3 = Powered flight, 4 = Simulated
	2	0	2	Indicates test number
	3	0	2	Indicates test number
	4	0	2	Indicates test number
	5	0	2	Indicates test number
	6	0	2	Indicates test number
	7			Single space
	8	M		Indicates month of year (tens)
	9	M		Indicates month of year (units)
	10			Single space
	11	D		Day of month (tens)
	12	D		Day of month (units)
	13			Single space
	14	P	3	Indicates rev number (thousands)
	15	P	3	Indicates rev number (hundreds)
	16	P	3	Indicates rev number (tens)
	17	P	3	Indicates rev number (units)
	18			Single space
	19	B	4	Indicates body number (units)
	20			Carriage return
	21			Carriage return
	22			Line feed

23 Line feed
24 Figure shift

3	1	S	Indicates sign of E data - = Negative & = Positive
	2	E	5 Most Significant Digit (MSD) of E parameter
	3	E	
	4	E	
	5	E	
	6	E	
	7	E	
	8	E	
	9	E	
	10	E	
	11	E	Least Significant Digit (LSD) of E parameter
	12		Single space
	13	C	6 Checksum for E parameter (tens)
	14	C	6 Checksum for E parameter (units)
	15		Single space
	16	S	Indicates sign of data - = Negative & = Positive
	17	F	5 MSD of F parameter
	18	F	
	19	F	
	20	F	
	21	F	

22	F		
23	F		
24	F		
25	F		
26	F		LSD of F parameter
27			Single space
28	C	6	Checksum for F parameter (tens)
29	C	6	Checksum for F parameter (units)
30			Single space
31	S		Indicates sign of G data - = Negative & = Positive
32	G	5	MSD of G parameter
33	G		
34	G		
35	G		
36	G		
37	G		
38	G		
39	G		
40	G		
41	G		LSD of G parameter
42			Single space
43	C	6	Checksum for G parameter (tens)
44	C	6	Checksum for G parameter (units)
45			Carriage return
46			Carriage return

47 Line feed
 48 Line feed
 49 Figure shift

4	1	S	Indicates sign of \dot{E} data	- = Negative & = Positive
	2	\dot{E}	7	MSD of \dot{E} parameter
	3	\dot{E}		
	4	\dot{E}		
	5	\dot{E}		
	6	\dot{E}		
	7	\dot{E}		(tenths)
	8	\dot{E}		LSD of \dot{E} parameter (hundredths)
	9			Single space
	10	C	6	Checksum for \dot{E} parameter (tens)
	11	C	6	Checksum for \dot{E} parameter (units)
	12			Single space
	13	S	Indicates sign of \dot{F} data	- = Negative & = Positive
	14	\dot{F}	7	MSD of \dot{F} parameter (velocity)
	15	\dot{F}		
	16	\dot{F}		
	17	\dot{F}		
	18	\dot{F}		
	19	\dot{F}		(tenths)
	20	\dot{F}		LSD of \dot{F} parameter (hundredths)

21			Single space	
22	C	6	Checksum for \dot{F} parameter (tens)	
23	C	6	Checksum for \dot{F} parameter (units)	
24			Single space	
25	S		Indicates sign \dot{G} data	- = Negative & = Positive
26	\dot{G}	7	MSD of \dot{G} parameter	(velocity)
27	\dot{G}			
28	\dot{G}			
29	\dot{G}			
30	\dot{G}			
31	\dot{G}			(tenths)
32	\dot{G}		LSD of \dot{G} parameter	(hundredths)
33			Single space	
34	C		Checksum for \dot{G} parameter (tens)	
35	C		Checksum for \dot{G} parameter (units)	
36			Single space	
37	H	8	Tens of hours	
38	H		Units of hours	
39	M		Tens of minutes	
40	M		Units of minutes	
41	S		Tens of seconds	
42	S		Units of seconds	
43	S		Tenths of a second	
44			Single space	
45	C	5	Checksum for time word	(tens)
46	C	5	Checksum for time word	(units)

47			Carriage return
48			Carriage return
49			Line feed
50			Line feed
51			Letter shift

5	1	I	Always same
	2	R	Always same
	3	E	Always same
	4	D	Always same
	5	T	Always same
	6	R	Always same
	7	M	Always same
	8	E	Always same
	9		Carriage return
	10		Carriage return
	11		Line feed
	12		Line feed
	13		Figure shift

NOTE 1: Range Address

- a. To address a message to one of the following Range agencies, insert the appropriate letter code in character number 5:

E	AD, Eglin, AFB, FL
M	PMTC, Pt. Mugu, CA
W	WSMR, NM
A	WSMC, Vandenberg AFB, CA

P ESMC, Patrick AFB, FL
B AFSCF, Sunnyvale, CA
G GSFC, Greenbelt, MD
H JSC, Houston, TX
K Kwajalein Missile Range
D All DOD ranges
C All DOD and NASA ranges
S Range Instrumentation Ships

b. For multiple address, insert appropriate code letters in characters 5 through 9. Sequence of letters is not important.

c. Examples: (* indicates teletype spaces)

(1) W**** - To WMSR

(2) PWK** - To ESMC, WSMR, and KMR

(3) GDS** - To GSFC, all DOD ranges, all ships

(4) CS*** - To all DOD and NASA range agencies, and to all ships

(5) PAWEM - To ESMC, WSMC, WSMR, AD, and PMTC

NOTE 2: A four digit operation number would be placed in characters 3 through 6, three digit operation number in characters 4 through 6 (operation number is always placed to the right). Shuttle program will show 4 digit SIC number in place of test number.

NOTE 3: Rev is defined as a complete cycle around the Earth, starting and ending with the ascending node; number 0 begins at launch.

NOTE 4: These characters will generally be zero for programs consisting of a single orbiting body. Shuttle program shows VID here.

NOTE 5: Indicate Earth centered position in meters with the decimal implied after characters 11, 26, and 41. The coordinate system is non-inertial, right-hand cartesian with the positive E-axis extending from the geocenter through the prime meridian at the equator, the positive F-axis extending from the geocenter through the 90°E meridian at the equator, and the positive G-axis extending from the geocenter through the North Pole.

NOTE 6: Decimal addition of characters in parameters indicated; add 1 to checksum if sign of parameter is negative, i.e., -1234567890 = 46 where 46 is the checksum.

NOTE 7: Indicate earth fixed velocity in meters, non-inertial. The decimal is implied between characters 6 and 7, 18 and 19, and 30 and 31.

NOTE 8: This is the time of the point indicated by the vector and is in Zulu time. A decimal is implied between characters 42 and 43.

GENERAL NOTE: Zeroes will be inserted in all data characters not used or needed. SPACES ARE BLANK.

ACQUISITION EARTH MODEL

The IRIG WGS-72 Convention will be used as a reference spheroid for generating acquisition data. Constants for this spheroid are:

1. Coefficient of flattening [F]: 1:298.26
2. Equatorial radius [a]: 6,378,135 meters
also: 20,925,639 international feet
3. Eccentricity squared [$e^2 = F(2-F)$]: $.6694317778 \times 10^{-2}$
4. Polar radius [b = a(1-F)]: 6356750.52 meters
5. Conversion factor: 1 foot = 0.3048 meters

SUPPLEMENTARY

INFORMATION

ADDENDUM
Document 152-83
IRIG Standard for Distributing Interrange
Vector Acquisition Data

1. Replace para 1, page 1 under STANDARD REFERENCES AND PROCEDURES as follows:

"1. The IRIG WGS 84 Convention, described in a subsequent paragraph, is used as the reference spheroid for acquisition data."

2. On page 11, replace the ACQUISITION EARTH MODEL description as follows:

"The IRIG WGS 84 convention will be used as a reference spheroid for generating acquisition data. Constants for this spheroid are:

1. Coefficient of flattening [f]: 1/298.257223563
2. Semi-major Axis [a]: 6378137m
also: 20,925,646.33 International feet
3. Eccentricity squared [e = f(2-f)]: 0.00669437999013
4. Semi-minor Axis [b = a(1-f)]: 6356752.3142 meters
5. Conversion factor: 1 International foot = 0.3048 meters
(1 US Survey foot = 12/39.37 meters)"

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