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Program Documentation

ARC Program Documentation

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For

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1.0 Introduction

The ARC (Altimeter Residual Computation) computer program was developed at the Wallops Flight Center, Wallops Island, Virignia, by Jim McMillan for Wolf Research and Development Group. The program acts as the final altimeter preprocessor before the data is reformatted for external users. It calculates all parameters necessary for the computation of the altimeter observation residuals and the sea surface height.

2.0 ARC Input Files

The following pages contain a description of all of the ARC input files. The user supplied data control cards will be described in Section 4.

2.1 GEODYN RV Tape

The GEODYN RV tape is a binary, unformatted, 800 BPI, standard label tape which supplies ARC with the satellite latitude, longitude, and height above the reference ellipsoid at fixed time intervals for interpolation. The tape format is given in Table 2-1. It should be noted that the only quantities on the tape which are used by ARC are DAY, SATLAT, SATLON, and SATHGT. ARC reads the GEODYN RV tape from file code 1.

IMPORTANT: The ARC program is designed to interpolate the RV tape and cannot perform extrapolation. Therefore, the RV tape must contain at least NORDER/2 records of data prior to the first observation and after the last observation to be processed, where NORDER is defined as the interpolation order (see Section 4.2.2).

2.2 Geoid Permanent File

The Marsh-Vincent geoid is supplied to the ARC computer program by means of a random disk permanent file with a

constant record size of 133 words. The data is valid only for latitudes greater than -66° and less than +66°. If an attempt is made to evaluate the geoid outside of these limits, the message "SATELLITE LATITUDE = __IS OUTSIDE RANGE OF GEOID - STOP," and the program will terminate. The data has been written on the disk in a one-degree latitude by one-degree longitude grid. Each disk record consists of a vector of all of the geoid values for a given longitude. ARC evaluates the geoid by linear interpolation at one-second intervals when computing observation residuals. The value of the geoid written on the output tape is evaluated at the time of the smoothed observation. ARC reads the geoid permanent file from file code 2.

2.3 Data Tape

The ARC input data tape, which is normally supplied as an output of the GAP computer program, is a binary, unformatted, 800 BPI, standard label tape which supplies ARC with the altimeter data to be processed. The formats for the header record and the low and high data rate data records are given in Tables 2-2 to 2-4. It should be noted that the only quantities on the tape which are used by ARC are MJDATE, FODAY, SMOALT, NWORDS, FRAMTI, DOY, YEAR, and CALT (or ALT). Arc reads the data tape from file code 29.

Word	Variable Name	Type	Description
1-2	DAY	D	Days from Jan 0.0 of the reference year.
3	IYMD	I	Date in YYMMDD.
4	IHM	I	Hours and minutes in HHMM.
5	SEC	R	Seconds.
6-7	POSVEL	D	Inertial position and velocity.
18-19	SATLAT	D	Satellite latitude in degrees.
20-21	SATLON	D	Satellite longitude in degrees.
22-23	SATHGT	D	Satellite altitude in meters.

TABLE 2.1. The GEODYN-RV Format

ALTIMETER TIMING HEADER RECORD

PARAMETER	N1	DT11	DT21	N2	DT12	DT22
DATE	1	YYMMDD	0	1	0	0
ALT	0	0	0	320	-155591680	1024051200
CALT	20	-53186560	1024051200	32	-53186560	1024051200
AS	20	256012800	1024051200	64	204810240	512025600
ARS1	1	2916561920	0	1	4145423360	0
ARS2	1	3018967040	0	1	4247828480	0
ARS3	1	3121372160	0	1	4657440960	0
ARS4	1	3223777280	0	1	4759054080	0
ARS5	1	3326182400	0	1	5169474560	0
ARS6	1	3428587520	0	1	5271079680	0
ARS7	1	3530992640	0	1	5681500160	0
ARS8	1	3633397760	0	1	5783905280	0
ARS9	1	3940613120	0	1	6193525760	0
ARS10	1	4043018240	0	1	6295930880	0
ARS11	1	4145423360	0	1	6705551360	0
ARS12	1	4247828480	0	1	6807956480	0
ARS13	1	4350233600	0	1	7217576960	0
ARS14	1	4452638720	0	1	7319982080	0
ARS15	1	4555043840	0	1	7729602560	0
ARS16	1	4657448960	0	1	7832007680	0
RSE M2	20	254028800	1024051200	320	-155591680	1024051200
RSE M3	20	254028800	1024051200	320	-53186560	1024051200
RAGC	20	766054400	1024051200	32	766054400	1024051200
IPG	20	-155591680	1024051200	320	-53186560	1024051200
RTP	4	-53186560	5120256000	8	456839040	4096204800
ANG	4	151623680	5120256000	8	254028800	4096204800
ARG	4	254028800	5120256000	8	1278080000	4096204800
APG	4	356433920	5120256000	8	2302131200	4096204800
ANSG	4	458839040	5120256000	8	3326182400	4096204800
RCT	1	17253279720	0	1	26674549760	0
RTT	1	17458086960	0	1	27186575360	0
RRT	1	17662894200	0	1	27698600960	0
GTT	1	17867709440	0	1	28210626560	0
ITT	1	18277329920	0	1	28722652160	0
WST	1	18482140160	0	1	29234677760	0
IFTA	1	2506941440	0	1	3633397760	0
RSA	1	2199726080	0	1	2711751680	0
VTA	1	2609346560	0	1	3735802680	0
RMI	1	13976314880	0	1	21963914240	0
SSHITE	20	-53186560	1024051200	320	*	*
IRS1	0	0	0	320	-53186560	1024051200
IRS2	0	0	0	320	-53186560	1024051200
IRS3	0	0	0	320	-53186560	1024051200
IRS4	0	0	0	320	-53186560	1024051200

Table 2.2 Data Tape Header Record

IRS5	0	0	0	320	-53186560	1024n5120	
IRS6	0	0	0	320	-53186560	1024n5120	
IRS7	0	0	0	320	-53186560	1024n5120	
IRS8	0	0	0	320	-53186560	1024n5120	
IRS9	0	0	0	320	-53186560	1024n5120	
IRS10	0	0	0	320	-53186560	1024n5120	
IRS11	0	0	0	320	-53186560	1024n5120	
IRS12	0	0	0	320	-53186560	1024n5120	
IRS13	0	0	0	320	-53186560	1024n5120	
IRS14	0	0	0	320	-53186560	1024n5120	
IRS15	0	0	0	320	-53186560	1024n5120	
IRS16	0	0	0	320	-53186560	1024n5120	
AW1	0	0	0	1	16331632640		0
AW2	0	0	0	1	16331632640		0
AW3	0	0	0	1	16331632640		0
AW4	0	0	0	1	16331632640		0
AW5	0	0	0	1	16331632640		0
AW6	0	0	0	1	16331632640		0
AW7	0	0	0	1	16331632640		0
AW8	0	0	0	1	16331632640		0
AW9	0	0	0	1	16331632640		0
AW10	0	0	0	1	16331632640		0
AW11	0	0	0	1	16331632640		0
AW12	0	0	0	1	16331632640		0
AW13	0	0	0	1	16331632640		0
AW14	0	0	0	1	16331632640		0
AW15	0	0	0	1	16331632640		0
AW16	0	0	0	1	16331632640		0
SAW1	0	0	0	1	16331632640		0
SAW2	0	0	0	1	16331632640		0
SAW3	0	0	0	1	16331632640		0
SAW4	0	0	0	1	16331632640		0
SAW5	0	0	0	1	16331632640		0
SAW6	0	0	0	1	16331632640		0
SAW7	0	0	0	1	16331632640		0
SAW8	0	0	0	1	16331632640		0
SAW9	0	0	0	1	16331632640		0
SAW10	0	0	0	1	16331632640		0
SAW11	0	0	0	1	16331632640		0
SAW12	0	0	0	1	16331632640		0
SAW13	0	0	0	1	16331632640		0
SAW14	0	0	0	1	16331632640		0
SAW15	0	0	0	1	16331632640		0
SAW16	0	0	0	1	16331632640		0

Table 2.2 (con't.)

RACCHI	1	1585295360	0	1	1687700480	0	
AVRAGC	1	1100656640	0	1	1715087360	0	
ALT	0	0	0	320	-137401680	1024051200	
CALT	20	-495819600	1024051200	32	-495819600	1024051200	
SPARE	0	0	0	0	0	0	
SPARE	0	0	0	0	0	0	
DSAD	4	-1843292160	5120256000	4	-1418310912	8[924096000	
ASAD1	1	645824268	0	1	933006646	0	
ASAD2	1	666305312	0	1	984207206	0	
ASAD3	1	707267360	0	1	1039411766	0	
XPAD	1	1352419616	0	1	2120906030	0	
YPAD	1	1372900646	0	1	2172108590	0	
ZPAD	1	1393381664	0	1	2223311150	0	
BPV2	1	922318112	0	1	1455272750	0	
CCBT	1	1700597024	0	1	2632931630	0	
CCSS	4	621151040	5120256000	4	2030128	8[924096000	
CCRR	4	723556160	5120256000	4	2050982520	8[924096000	
NCBT	1	1741559072	0	1	2684134190	0	
NCSS	4	928366400	5120256000	4	4099084928	8[924096000	
NCRR	4	1030771520	5120256000	4	6147187328	8[924096000	

Table 2.2 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
1	1	SATID	SATELLITE ID (NNPPPQQ)	
2	1	MTYPE	MEASUREMENT TYPE (40=LONG,41=SHORT)	
3	1	TSIND	TIME SYSTEM INDICATOR (NM)	
4	1	STNUMB	STATION NUMBER (0)	
5	1	PREPIN	PREPROCESSING INDICATORS (FORMAT ID)	
6	1	MJDATE	MODIFIED JULIAN DATE OF SMOOTH ALTITUDE	
7 - 8	1	FODAY	TIME TAG FOR SMOALT & SMOSSH	
9 - 10	1	SMOALT	SMOOTH ALTITUDE	MTRS
11	1	LAT	SATELLITE LATITUDE	DEG
12	1	LONG	SATELLITE LONGITUDE	DEG
13	1	ASIGMA	ALTITUDE MEASUREMENT STANDARD DEVIATION	MTRS
14	1	NWORDS	RECORD SIZE	
15	1	TREF	TROPOSPHERIC REFRACTION CORRECTION	MTRS
16	1	IREF	IONOSPHERIC REFRACTION CORRECTION	MTRS
17	1	GHITE	GEOID HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
18	1	THITE	TIDE HEIGHT ABOVE MEAN SEA LEVEL	MTRS
19 - 20	1	FRAMTI	FRAME TIME OF DAY	SEC
21	1	DOY	DAY OF YEAR	
22	1	YEAR	YEAR	
23 - 42	20	CALT	CUMULATIVE ALTITUDE	MTRS
43 - 62	20	SATHT	SATELLITE HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
63	1	CSIGH	CALCULATED STANDARD DEVIATION OF SATELLITE HEIGHT	MTRS
64 - 83	20	AS	ALTIMETER STATUS	N/A
84	1	ARS1	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 1	V
85	1	ARS2	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 2	V
86	1	ARS3	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 3	V
87	1	ARS4	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 4	V
88	1	ARS5	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 5	V
89	1	ARS6	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 6	V
90	1	ARS7	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 7	V
91	1	ARS8	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 8	V
92	1	ARS9	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 9	V

Table 2.3 Data Tape (Low Data Rate)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
93	1	ARS10	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.10	V
94	1	ARS11	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.11	V
95	1	ARS12	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.12	V
96	1	ARS13	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.13	V
97	1	ARS14	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.14	V
98	1	ARS15	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.15	V
99	1	ARS16	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.16	V
100 - 119	20	RSE	RANGE SERVO ERROR	CM
120 - 139	20	RAGC	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
140 - 159	20	IPG	INSTANTANEOUS PLATEAU GATE POWER	V
160 - 163	4	RTP	RADAR ALTIMETER TRANSMITTER OUTPUT POWER	DDBM
164 - 167	4	ANG	RADAR ALTIMETER AVERAGE NOISE GATE	V
168 - 171	4	ARG	RADAR ALTIMETER AVERAGE RAMP GATE	V
172 - 175	4	APG	RADAR ALTIMETER AVERAGE PLATEAU GATE	V
176 - 179	4	AASG	RADAR ALTIMETER AVERAGE ATTITUDE/SPECULAR GATE	V
180	1	BCT	RADAR ALTIMETER BIT/CAL TEMPERATURE	DC
181	1	RTT	RADAR ALTIMETER TRANSMITTER TEMPERATURE	DC
182	1	RRT	RADAR ALTIMETER RECEIVER TEMPERATURE	DC
183	1	GTT	RADAR ALTIMETER GLOBAL TRACKER TEMPERATURE	DC
184	1	ITT	RADAR ALTIMETER INTENSIVE TRACKER TEMPERATURE	DC
185	1	WST	RADAR ALTIMETER WAVEFORM SAMPLER TEMPERATURE	DC
186	1	IFTA	RADAR ALTIMETER IF TEST SIGNAL AMPLITUDE	V
187	1	RSA	RADAR ALTIMETER REFERENCE SIGNAL AMPLITUDE	V
188	1	VTA	RADAR ALTIMETER VIDEO TEST SIGNAL AMPLITUDE	V
189	1	RMI	RADAR ALTIMETER RECEIVER MIXER CURRENT	MV
190 - 209	20	SSHITE	SEA SURFACE HEIGHT	MTRS
210	1	RAGCHI	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE (HIGH)	DDBM
211	1	RAGCAV	RADAR ALTIMETER AVERAGE AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
212	1	H 1/3	H 1/3	CM
213 - 222	10	SPARE	SPARE	
223	1	SMOSSH	SMOOTH SEA SURFACE HEIGHT	MTRS

Table 2.3 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
224 - 227	4	DSAD	DIGITAL SOLAR ATTITUDE DETECTOR	N/A
228	1	ASAD1	ANALOG SOLAR ATTITUDE DETECTOR NO.1	V
229	1	ASAD2	ANALOG SOLAR ATTITUDE DETECTOR NO.2	V
230	1	ASAD3	ANALOG SOLAR ATTITUDE DETECTOR NO.3	V
231	1	XMAG	X-AXIS MAGNETOMETER	V
232	1	YMAG	Y-AXIS MAGNETOMETER	V
233	1	ZMAG	Z-AXIS MAGNETOMETER	V
234	1	EBV2	EXPERIMENT BUS NO.2 VOLTAGE	V
235 - 238	4	CCSS	COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
239 - 242	4	CCRR	COHERENT C-BAND PULSE REPETITION FREQUENCY	V
243	1	CCBT	COHERENT C-BAND BASE PLATE TEMPERATURE	DC
244 - 247	4	NCSS	NON-COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
248 - 251	4	NCRR	NON-COHERENT C-BAND PULSE REPETITION FREQUENCY	V
252	1	NCBT	NON-COHERENT C-BAND BASE PLATE TEMPERATURE	DC

Table 2.3 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
1	1	SATID	SATELLITE ID (NNPPPQQ)	
2	1	MTYPE	MEASUREMENT TYPE (40=LONG,41=SHORT)	
3	1	TSIND	TIME SYSTEM INDICATOR (NM)	
4	1	STNUMB	STATION NUMBER (0)	
5	1	PREPIN	PREPROCESSING INDICATORS (FORMAT ID)	
6	1	MJDATE	MODIFIED JULIAN DATE OF SMOOTH ALTITUDE	
7 - 8	1	FODAY	TIME TAG FOR SMOALT & SMOOSH	
9 - 10	1	SMOALT	SMOOTH ALTITUDE	MTRS
11	1	LAT	SATELLITE LATITUDE	DEG
12	1	LONG	SATELLITE LONGITUDE	DEG
13	1	ASIGMA	ALTITUDE MEASUREMENT STANDARD DEVIATION	MTRS
14	1	NWORDS	RECORD SIZE	
15	1	TREF	TROPOSPHERIC REFRACTION CORRECTION	MTRS
16	1	IREF	IONOSPHERIC REFRACTION CORRECTION	MTRS
17	1	GHITE	GEOID HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
18	1	THITE	TIDE HEIGHT ABOVE MEAN SEA LEVEL	MTRS
19 - 20	1	FRAMTI	FRAME TIME OF DAY	SEC
21	1	DOY	DAY OF YEAR	
22	1	YEAR	YEAR	
23 - 342	320	ALT	INSTANTANEOUS ALTITUDE (MODE 3)/CALT (MODE2)	MTRS
343 - 662	320	SATHT	SATELLITE HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
663	1	CSIGH	CALCULATED STANDARD DEVIATION OF SATELLITE HEIGHT	MTRS
664 - 727	64	AS	ALTIMETER STATUS	N/A
728	1	ARS1	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 1	V
729	1	ARS2	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 2	V
730	1	ARS3	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 3	V
731	1	ARS4	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 4	V
732	1	ARS5	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 5	V
733	1	ARS6	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 6	V
734	1	ARS7	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 7	V
735	1	ARS8	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 8	V
736	1	ARS9	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 9	V

Table 2.4 Data Tape (High Data Rate)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
737	1	ARS10	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.10	V
738	1	ARS11	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.11	V
739	1	ARS12	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.12	V
740	1	ARS13	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.13	V
741	1	ARS14	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.14	V
742	1	ARS15	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.15	V
743	1	ARS16	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.16	V
744 - 1063	320	RSE	RANGE SERVO ERROR	CM
1064 - 1095	32	RAGC	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
1096 - 1415	320	IPG	INSTANTANEOUS PLATEAU GATE POWER (MODE 3)	V
1416 - 1423	8	RTP	RADAR ALTIMETER TRANSMITTER OUTPUT POWER	DDBM
1424 - 1431	8	ANG	RADAR ALTIMETER AVERAGE NOISE GATE	V
1432 - 1439	8	ARG	RADAR ALTIMETER AVERAGE RAMP GATE	V
1440 - 1447	8	APG	RADAR ALTIMETER AVERAGE PLATEAU GATE	V
1448 - 1455	8	AASG	RADAR ALTIMETER AVERAGE ATTITUDE/SPECULAR GATE	V
1456	1	BCT	RADAR ALTIMETER BIT/CAL TEMPERATURE	DC
1457	1	RTT	RADAR ALTIMETER TRANSMITTER TEMPERATURE	DC
1458	1	RRT	RADAR ALTIMETER RECEIVER TEMPERATURE	DC
1459	1	GTT	RADAR ALTIMETER GLOBAL TRACKER TEMPERATURE	DC
1460	1	ITT	RADAR ALTIMETER INTENSIVE TRACKER TEMPERATURE	DC
1461	1	WST	RADAR ALTIMETER WAVEFORM SAMPLER TEMPERATURE	DC
1462	1	IFTA	RADAR ALTIMETER IF TEST SIGNAL AMPLITUDE	V
1463	1	RSA	RADAR ALTIMETER REFERENCE SIGNAL AMPLITUDE	V
1464	1	VTA	RADAR ALTIMETER VIDEO TEST SIGNAL AMPLITUDE	V
1465	1	RMI	RADAR ALTIMETER RECEIVER MIXER CURRENT	MV
1466 - 1785	320	SSHITE	SEA SURFACE HEIGHT	MTRS
1786 - 2105	320	IRS1	INSTANTANEOUS RETURN SAMPLE NO.1 (MODE 2)	V
2106 - 2425	320	IRS2	INSTANTANEOUS RETURN SAMPLE NO.2	V

Table 2.4 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
2426 - 2745	320	IRS3	INSTANTANEOUS RETURN SAMPLE NO.3 (MODE 2)	V
2746 - 3065	320	IRS4	INSTANTANEOUS RETURN SAMPLE NO.4	V
3066 - 3385	320	IRS5	INSTANTANEOUS RETURN SAMPLE NO.5 (MODE 2)	V
3386 - 3705	320	IRS6	INSTANTANEOUS RETURN SAMPLE NO.6	V
3706 - 4025	320	IRS7	INSTANTANEOUS RETURN SAMPLE NO.7 (MODE 2)	V
4026 - 4345	320	IRS8	INSTANTANEOUS RETURN SAMPLE NO.8	V
4346 - 4665	320	IRS9	INSTANTANEOUS RETURN SAMPLE NO.9 (MODE 2)	V
4666 - 4985	320	IRS10	INSTANTANEOUS RETURN SAMPLE NO.10	V
4986 - 5305	320	IRS11	INSTANTANEOUS RETURN SAMPLE NO.11 (MODE 2)	V
5306 - 5625	320	IRS12	INSTANTANEOUS RETURN SAMPLE NO.12	V
5626 - 5945	320	IRS13	INSTANTANEOUS RETURN SAMPLE NO.13 (MODE 2)	V
5946 - 6265	320	IRS14	INSTANTANEOUS RETURN SAMPLE NO.14	V
6266 - 6585	320	IRS15	INSTANTANEOUS RETURN SAMPLE NO.15 (MODE 2)	V
6586 - 6905	320	IRS16	INSTANTANEOUS RETURN SAMPLE NO.16	V
6906	1	AW1	CALCULATED AVERAGE WAVEFORM NO.1	V
6907	1	AW2	CALCULATED AVERAGE WAVEFORM NO.2	V
6908	1	AW3	CALCULATED AVERAGE WAVEFORM NO.3	V
6909	1	AW4	CALCULATED AVERAGE WAVEFORM NO.4	V
6910	1	AW5	CALCULATED AVERAGE WAVEFORM NO.5	V
6911	1	AW6	CALCULATED AVERAGE WAVEFORM NO.6	V
6912	1	AW7	CALCULATED AVERAGE WAVEFORM NO.7	V
6913	1	AW8	CALCULATED AVERAGE WAVEFORM NO.8	V
6914	1	AW9	CALCULATED AVERAGE WAVEFORM NO.9	V
6915	1	AW10	CALCULATED AVERAGE WAVEFORM NO.10	V
6916	1	AW11	CALCULATED AVERAGE WAVEFORM NO.11	V
6917	1	AW12	CALCUALTED AVERAGE WAVEFORM NO.12	V
6918	1	AW13	CALCULATED AVERAGE WAVEFORM NO.13	V
6919	1	AW14	CALCULATED AVERAGE WAVEFORM NO.14	V
6920	1	AW15	CALCULATED AVERAGE WAVEFORM NO.15	V
6921	1	AW16	CALCULATED AVERAGE WAVEFORM NO.16	V
6922	1	SAW1	CALCULATED SIGMA AVERAGE WAVEFORM NO.1	V
6923	1	SAW2	CALCULATED SIGMA AVERAGE WAVEFORM NO.2	V
6924	1	SAW3	CALCULATED SIGMA AVERAGE WAVEFORM NO.3	V
6925	1	SAW4	CALCULATED SIGMA AVERAGE WAVEFORM NO.4	V
6926	1	SAW5	CALCULATED SIGMA AVERAGE WAVEFORM NO.5	V
6927	1	SAW6	CALCULATED SIGMA AVERAGE WAVEFORM NO.6	V
6928	1	SAW7	CALCULATED SIGMA AVERAGE WAVEFORM NO.7	V

Table 2.4 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
6929	1	SAW8	CALCULATED SIGMA AVERAGE WAVEFORM NO.8	V
6930	1	SAW9	CALCULATED SIGMA AVERAGE WAVEFORM NO.9	V
6931	1	SAW10	CALCULATED SIGMA AVERAGE WAVEFORM NO.10	V
6932	1	SAW11	CALCULATED SIGMA AVERAGE WAVEFORM NO.11	V
6933	1	SAW12	CALCULATED SIGMA AVERAGE WAVEFORM NO.12	V
6934	1	SAW13	CALCULATED SIGMA AVERAGE WAVEFORM NO.13	V
6935	1	SAW14	CALCULATED SIGMA AVERAGE WAVEFORM NO.14	V
6936	1	SAW15	CALCULATED SIGMA AVERAGE WAVEFORM NO.15	V
6937	1	SAW16	CALCULATED SIGMA AVERAGE WAVEFORM NO.16	V
6938	1	RAGCHI	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE (HIGH)	DDBM
6939	1	RAGCAV	RADAR ALTIMETER AVERAGE AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
6940	1	H_1/3	H 1/3	CM
6941 - 6957	17	SPARE	SPARE	
6958	1	SMOSSH	SMOOTH SEA SURFACE HEIGHT	MTRS
6959 - 6962	1	DSAD	DIGITAL SOLAR ATTITUDE DETECTOR	N/A
6963	1	ASAD1	ANALOG SOLAR ATTITUDE DETECTOR NO.1	V
6964	1	ASAD2	ANALOG SOLAR ATTITUDE DETECTOR NO.2	V
6965	1	ASAD3	ANALOG SOLAR ATTITUDE DETECTOR NO.3	V
6966	1	XMAG	X-AXIS MAGNETOMETER	V
6967	1	YMAG	Y-AXIS MAGNETOMETER	V
6968	1	ZMAG	Z-AXIS MAGNETOMETER	V
6969	1	EBV2	EXPERIMENT BUS NO. 2 VOLTAGE	V
6970 - 6973	4	CCSS	COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
6974 - 6977	4	CCRR	COHERENT C-BAND PULSE REPETITION FREQUENCY	V
6978	1	CCBT	COHERENT C-BAND BASE PLATE TEMPERATURE	DC
6979 - 6982	4	NCSS	NON-COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
6983 - 6986	4	NCRR	NON-COHERENT C-BAND PULSE REPETITION FREQUENCY	V
6987	1	NCBT	NON-COHERENT C-BAND BASE PLATE TEMPERATURE	DC

Table 2.4 (con't.)

3.0 ARC Output Files

The following pages contain a description of all of the ARC output files except scratch disk files and SYSOUT files.

3.1 Plot Tape

The plot tape generated by ARC is a non-standard label, 556 BPI, "pen instruction" CalComp plot tape with a buffer size of 1024 words, suitable for mounting on the WFC CalComp 763 plotter. The tape is not normally generated but can be created by the appropriate data control card (see Section 4.2.4). ARC writes the plot tape file code 3.

IMPORTANT: Since ARC generates one frame of plot (16 inches) for every minute of data, it is usually not desirable to request that the tape be plotted until it is known which minutes are of interest. Therefore, the program outputs a minute by minute summary of the block numbers of the plot tape. The user can then request any segment of the tape which he needs to have plotted by merely noting the block numbers on the computer request form and checking PLOT.

3.2 Output Tape

The ARC output data tape, which is normally used as the input to the CALTOR computer program, is a binary,

unformatted, 800 BPI, standard label tape. The formats for the header record and the low and high data rate data records are given in Tables 3-1 to 3-3. The parameters which ARC changes when writing the output tape are PREPIN, LAT, LON, ABIAS, TREF, GHITE, THITE, SATHT, CSIGH, SSHITE, and SMOSSH. ARC writes the output data tape on file code 4.

ALTIMETER TIMING HEADER RECORD

PARAMETER	N1	DT11	DT21	N2	DT12	DT22
DATE	2	YYMMDD	0	1	0	0
ALT	0	0	0	320	-155591680	1024051200
CALT	20	-53186560	1024051200	32	-53186560	1024051200
AS	20	256012800	1024051200	64	204810240	512025600
ARS1	1	2916561920	0	1	4145423360	0
ARS2	1	3018967040	0	1	4247828480	0
ARS3	1	3121372160	0	1	4657448960	0
ARS4	1	3223777280	0	1	4759854080	0
ARS5	1	3326182400	0	1	5169474560	0
ARS6	1	3428587520	0	1	5271879680	0
ARS7	1	3530992640	0	1	5681500160	0
ARS8	1	3633397760	0	1	5783905280	0
ARS9	1	3940613120	0	1	6193525760	0
ARS10	1	4043018240	0	1	6295930880	0
ARS11	1	4145423360	0	1	6705551360	0
ARS12	1	4247828480	0	1	6807956480	0
ARS13	1	4350233600	0	1	7217576960	0
ARS14	1	4452638720	0	1	7319982080	0
ARS15	1	4555043840	0	1	7729602560	0
ARS16	1	4657448960	0	1	7832007680	0
RSE M2	20	254028800	1024051200	320	-155591680	1024051200
RSE M3	20	254028800	1024051200	320	-53186560	1024051200
RAGC	20	766054400	1024051200	32	766054400	1024051200
IPC	20	-155591680	1024051200	320	-53186560	1024051200
RTP	4	-53186560	5120256000	8	458839040	4096204800
ANG	4	151623680	5120256000	8	254028800	4096204800
ARG	4	254028800	5120256000	8	1278080000	4096204800
APG	4	356433920	5120256000	8	2302131200	4096204800
AASG	4	458839040	5120256000	8	3326182400	4096204800
BCT	1	17253278720	0	1	26674549760	0
RTT	1	17458068960	0	1	27186575360	0
RRT	1	17662899200	0	1	27698600960	0
GTT	1	17867709440	0	1	28210626560	0
ITT	1	18277329920	0	1	28722652160	0
WST	1	18482140160	0	1	29234677760	0
IFTA	1	2506941440	0	1	3633397760	0
RSA	1	2199726080	0	1	2711751680	0
VTA	1	2609346560	0	1	3735802880	0
RMI	1	13976314880	0	1	21963914240	0
SSWITE	20	-53186560	1024051200	320	*	*
IRS1	0	0	0	320	-53186560	1024051200
IRS2	0	0	0	320	-53186560	1024051200
IRS3	0	0	0	320	-53186560	1024051200
IRS4	0	0	0	320	-53186560	1024051200

Table 3.1 Data Tape Header Record

IRS5	0	0	0	320	-53186560	1024005120
IRS6	0	0	0	320	-53186560	1024005120
IRS7	0	0	0	320	-53186560	1024005120
IRS8	0	0	0	320	-53186560	1024005120
IRS9	0	0	0	320	-53186560	1024005120
IRS10	0	0	0	320	-53186560	1024005120
IRS11	0	0	0	320	-53186560	1024005120
IRS12	0	0	0	320	-53186560	1024005120
IRS13	0	0	0	320	-53186560	1024005120
IRS14	0	0	0	320	-53186560	1024005120
IRS15	0	0	0	320	-53186560	1024005120
IRS16	0	0	0	320	-53186560	1024005120
AW1	0	0	0	1	16331632640	0
AW2	0	0	0	1	16331632640	0
AW3	0	0	0	1	16331632640	0
AW4	0	0	0	1	16331632640	0
AW5	0	0	0	1	16331632640	0
AW6	0	0	0	1	16331632640	0
AW7	0	0	0	1	16331632640	0
AW8	0	0	0	1	16331632640	0
AW9	0	0	0	1	16331632640	0
AW10	0	0	0	1	16331632640	0
AW11	0	0	0	1	16331632640	0
AW12	0	0	0	1	16331632640	0
AW13	0	0	0	1	16331632640	0
AW14	0	0	0	1	16331632640	0
AW15	0	0	0	1	16331632640	0
AW16	0	0	0	1	16331632640	0
SAW1	0	0	0	1	16331632640	0
SAW2	0	0	0	1	16331632640	0
SAW3	0	0	0	1	16331632640	0
SAW4	0	0	0	1	16331632640	0
SAW5	0	0	0	1	16331632640	0
SAW6	0	0	0	1	16331632640	0
SAW7	0	0	0	1	16331632640	0
SAW8	0	0	0	1	16331632640	0
SAW9	0	0	0	1	16331632640	0
SAW10	0	0	0	1	16331632640	0
SAW11	0	0	0	1	16331632640	0
SAW12	0	0	0	1	16331632640	0
SAW13	0	0	0	1	16331632640	0
SAW14	0	0	0	1	16331632640	0
SAW15	0	0	0	1	16331632640	0
SAW16	0	0	0	1	16331632640	0

Table 3.1 (con't.)

RAGCHI	1	15852953 60	0	1	16077004 80	0	
AVRAGC	1	11006566400	0	1	17150873600	0	
ALT	0	0	0	320	-137401680	1024051200	
CALT	20	-495819600	1024051200	32	-495819600	1024051200	
SPARE	0	0	0	0	0	0	
SPARE	0	0	0	0	0	0	
DSAD	4	-1843292160	5120256000	4	-1418310912	8192409600	
ASAD1	1	6458242560	0	1	9330066464	0	
ASAD2	1	6663053120	0	1	9842072064	0	
ASAD3	1	7072673600	0	1	10354117660	0	
XMAG	1	13524195160	0	1	21209060300	0	
YMAG	1	13729006400	0	1	21721085900	0	
ZMAG	1	13933816640	0	1	22233111500	0	
ERV2	1	9223181120	0	1	14552727500	0	
CCPT	1	17005970240	0	1	26329316 30	0	
CCSS	4	621151040	5120256000	4	2030120	8192409600	
CCPR	4	723556160	5120256000	4	2050982520	8192409600	
NCBT	1	17415590720	0	1	26841341900	0	
NCSS	4	926366400	5120256000	4	4099084928	8192409600	
NCRR	4	1030771520	5120256000	4	6147187328	8192409600	

Table 3.1 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
1	1	SATID	SATELLITE ID (NNPPPQQ)	
2	1	MTYPE	MEASUREMENT TYPE (40=LONG,41=SHORT)	
3	1	TSIND	TIME SYSTEM INDICATOR (NM)	
4	1	STNUMB	STATION NUMBER (0)	
5	1	PREPIN	PREPROCESSING INDICATORS (FORMAT ID)	
6	1	MJDATE	MODIFIED JULIAN DATE OF SMOOTH ALTITUDE	
7 - 8	1	FODAY	FRACTION OF DAY PAST MIDNIGHT	
9 - 10	1	SMOALT	SMOOTH ALTITUDE	MTRS
11	1	LAT	SATELLITE LATITUDE	DEG
12	1	LONG	SATELLITE LONGITUDE	DEG
13	1	ASIGMA	ALTITUDE MEASUREMENT STANDARD DEVIATION	MTRS
14	1	ABIAS	CALCULATED ALTITUDE BIAS	MTRS
15	1	TREF	TROPOSPHERIC REFRACTION CORRECTION	MTRS
16	1	IREF	IONOSPHERIC REFRACTION CORRECTION	MTRS
17	1	GHITE	GEOID HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
18	1	THITE	TIDE HEIGHT ABOVE MEAN SEA LEVEL	MTRS
19 - 20	1	FRAMTI	FRAME TIME OF DAY	SEC
21	1	DOY	DAY OF YEAR	
22	1	YEAR	YEAR	
23 - 42	20	CALT	CUMULATIVE ALTITUDE	MTRS
43 - 62	20	SATHT	SATELLITE HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
63	1	CSIGH	CALCULATED STANDARD DEVIATION OF SATELLITE HEIGHT	MTRS
64 - 83	20	AS	ALTIMETER STATUS	N/A
84	1	ARS1	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 1	V
85	1	ARS2	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 2	V
86	1	ARS3	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 3	V
87	1	ARS4	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 4	V
88	1	ARS5	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 5	V
89	1	ARS6	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 6	V
90	1	ARS7	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 7	V
91	1	ARS8	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 8	V
92	1	ARS9	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 9	V

Table 3.2 Data Tape (Low Data Rate)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
93	1	ARS10	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.10	V
94	1	ARS11	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.11	V
95	1	ARS12	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.12	V
96	1	ARS13	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.13	V
97	1	ARS14	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.14	V
98	1	ARS15	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.15	V
99	1	ARS16	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.16	V
100 - 119	20	RSE	RANGE SERVO ERROR	CM
120 - 139	20	RAGC	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
140 - 159	20	IPG	INSTANTANEOUS PLATEAU GATE POWER	V
160 - 163	4	RTP	RADAR ALTIMETER TRANSMITTER OUTPUT POWER	DDBM
164 - 167	4	ANG	RADAR ALTIMETER AVERAGE NOISE GATE	V
168 - 171	4	ARG	RADAR ALTIMETER AVERAGE RAMP GATE	V
172 - 175	4	APG	RADAR ALTIMETER AVERAGE PLATEAU GATE	V
176 - 179	4	AASG	RADAR ALTIMETER AVERAGE ATTITUDE/SPECULAR GATE	V
180	1	BCT	RADAR ALTIMETER BIT/CAL TEMPERATURE	DC
181	1	RTT	RADAR ALTIMETER TRANSMITTER TEMPERATURE	DC
182	1	RRT	RADAR ALTIMETER RECEIVER TEMPERATURE	DC
183	1	GTT	RADAR ALTIMETER GLOBAL TRACKER TEMPERATURE	DC
184	1	ITT	RADAR ALTIMETER INTENSIVE TRACKER TEMPERATURE	DC
185	1	WST	RADAR ALTIMETER WAVEFORM SAMPLER TEMPERATURE	DC
186	1	IFTA	RADAR ALTIMETER IF TEST SIGNAL AMPLITUDE	V
187	1	RSA	RADAR ALTIMETER REFERENCE SIGNAL AMPLITUDE	V
188	1	VTA	RADAR ALTIMETER VIDEO TEST SIGNAL AMPLITUDE	V
189	1	RMI	RADAR ALTIMETER RECEIVER MIXER CURRENT	MV
190 - 209	20	SSHITE	SEA SURFACE HEIGHT	MTRS
210	1	RAGCHI	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE (HIGH)	DDBM
211	1	RAGCAV	RADAR ALTIMETER AVERAGE AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
212	1	H 1/3	H 1/3	CM
213 - 222	10	SPARE	SPARE	
223	1	SMOSSH	SMOOTH SEA SURFACE HEIGHT	MTRS

Table 3.2 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
224 - 227	4	DSAD	DIGITAL SOLAR ATTITUDE DETECTOR	N/A
228	1	ASAD1	ANALOG SOLAR ATTITUDE DETECTOR NO.1	V
229	1	ASAD2	ANALOG SOLAR ATTITUDE DETECTOR NO.2	V
230	1	ASAD3	ANALOG SOLAR ATTITUDE DETECTOR NO.3	V
231	1	XMAG	X-AXIS MAGNETOMETER	V
232	1	YMAG	Y-AXIS MAGNETOMETER	V
233	1	ZMAG	Z-AXIS MAGNETOMETER	V
234	1	EBV2	EXPERIMENT BUS NO.2 VOLTAGE	V
235 - 238	4	CCSS	COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
239 - 242	4	CCRR	COHERENT C-BAND PULSE REPETITION FREQUENCY	V
243	1	CCBT	COHERENT C-BAND BASE PLATE TEMPERATURE	DC
244 - 247	4	NCSS	NON-COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
248 - 251	4	NCRR	NON-COHERENT C-BAND PULSE REPETITION FREQUENCY	V
252	1	NCBT	NON-COHERENT C-BAND BASE PLATE TEMPERATURE	DC

Table 3.2 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
1	1	SATID	SATELLITE ID (NNPPPQQ)	
2	1	MTYPE	MEASUREMENT TYPE (40=LONG,41=SHORT)	
3	1	TSIND	TIME SYSTEM INDICATOR (M2)	
4	1	STNUMB	STATION NUMBER (0)	
5	1	PREPIN	PREPROCESSING INDICATORS (FORMAT ID)	
6	1	MJDATE	MODIFIED JULIAN DATE OF SMOOTH ALTITUDE	
7 - 8	1	FODAY	FRACTION OF DAY PAST MIDNIGHT	
9 - 10	1	SMOALT	SMOOTH ALTITUDE	MTRS
11	1	LAT	SATELLITE LATITUDE	DEG
12	1	LONG	SATELLITE LONGITUDE	DEG
13	1	ASIGMA	ALTITUDE MEASUREMENT STANDARD DEVIATION	MTRS
14	1	ABIAS	CALCULATED ALTITUDE BIAS	MTRS
15	1	TREF	TROPOSPHERIC REFRACTION CORRECTION	MTRS
16	1	IREF	IONOSPHERIC REFRACTION CORRECTION	MTRS
17	1	GHITE	GEOID HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
18	1	THITE	TIDE HEIGHT ABOVE MEAN SEA LEVEL	MTRS
19 - 20	1	FRAMTI	FRAME TIME OF DAY	SEC
21	1	DOY	DAY OF YEAR	
22	1	YEAR	YEAR	
23 - 342	320	ALT	INSTANTANEOUS ALTITUDE (MODE 3)/CALT (MODE2)	MTRS
343 - 662	320	SATHT	SATELLITE HEIGHT ABOVE REFERENCE ELLIPSOID	MTRS
663	1	CSIGH	CALCULATED STANDARD DEVIATION OF SATELLITE HEIGHT	MTRS
664 - 727	64	AS	ALTIMETER STATUS	N/A
728	1	ARS1	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 1	V
729	1	ARS2	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 2	V
730	1	ARS3	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 3	V
731	1	ARS4	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 4	V
732	1	ARS5	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 5	V
733	1	ARS6	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 6	V
734	1	ARS7	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 7	V
735	1	ARS8	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 8	V
736	1	ARS9	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO. 9	V

Table 5.3 Data Tape (High Data Rate)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
737	1	ARS10	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.10	V
738	1	ARS11	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.11	V
739	1	ARS12	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.12	V
740	1	ARS13	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.13	V
741	1	ARS14	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.14	V
742	1	ARS15	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.15	V
743	1	ARS16	RADAR ALTIMETER AVERAGE RETURN SAMPLE NO.16	V
744 - 1063	320	RSE	RANGE SERVO ERROR	CM
1064 - 1095	32	RAGC	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
1096 - 1415	320	IPG	INSTANTANEOUS PLATEAU GATE POWER (MODE 3)	V
1416 - 1423	8	RTP	RADAR ALTIMETER TRANSMITTER OUTPUT POWER	DDBM
1424 - 1431	8	ANG	RADAR ALTIMETER AVERAGE NOISE GATE	V
1432 - 1439	8	ARG	RADAR ALTIMETER AVERAGE RAMP GATE	V
1440 - 1447	8	APG	RADAR ALTIMETER AVERAGE PLATEAU GATE	V
1448 - 1455	8	AASG	RADAR ALTIMETER AVERAGE ATTITUDE/SPECULAR GATE	V
1456	1	BCT	RADAR ALTIMETER BIT/CAL TEMPERATURE	DC
1457	1	RTT	RADAR ALTIMETER TRANSMITTER TEMPERATURE	DC
1458	1	RRT	RADAR ALTIMETER RECEIVER TEMPERATURE	DC
1459	1	GTT	RADAR ALTIMETER GLOBAL TRACKER TEMPERATURE	DC
1460	1	ITT	RADAR ALTIMETER INTENSIVE TRACKER TEMPERATURE	DC
1461	1	WST	RADAR ALTIMETER WAVEFORM SAMPLER TEMPERATURE	DC
1462	1	IFTA	RADAR ALTIMETER IF TEST SIGNAL AMPLITUDE	V
1463	1	RSA	RADAR ALTIMETER REFERENCE SIGNAL AMPLITUDE	V
1464	1	VTA	RADAR ALTIMETER VIDEO TEST SIGNAL AMPLITUDE	V
1465	1	RMI	RADAR ALTIMETER RECEIVER MIXER CURRENT	MV
1466 - 1785	320	SSHITE	SEA SURFACE HEIGHT	MTRS
1786 - 2105	320	IRS1	INSTANTANEOUS RETURN SAMPLE NO.1 (MODE 2)	V
2106 - 2425	320	IRS2	INSTANTANEOUS RETURN SAMPLE NO.2	V

Table 3.3 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
2426 - 2745	320	IRS3	INSTANTANEOUS RETURN SAMPLE NO.3 (MODE 2)	V
2746 - 3065	320	IRS4	INSTANTANEOUS RETURN SAMPLE NO.4	V
3066 - 3385	320	IRS5	INSTANTANEOUS RETURN SAMPLE NO.5 (MODE 2)	V
3386 - 3705	320	IRS6	INSTANTANEOUS RETURN SAMPLE NO.6	V
3706 - 4025	320	IRS7	INSTANTANEOUS RETURN SAMPLE NO.7 (MODE 2)	V
4026 - 4345	320	IRS8	INSTANTANEOUS RETURN SAMPLE NO.8	V
4346 - 4665	320	IRS9	INSTANTANEOUS RETURN SAMPLE NO.9 (MODE 2)	V
4666 - 4985	320	IRS10	INSTANTANEOUS RETURN SAMPLE NO.10	V
4986 - 5305	320	IRS11	INSTANTANEOUS RETURN SAMPLE NO.11 (MODE 2)	V
5306 - 5625	320	IRS12	INSTANTANEOUS RETURN SAMPLE NO.12	V
5626 - 5945	320	IRS13	INSTANTANEOUS RETURN SAMPLE NO.13 (MODE 2)	V
5946 - 6265	320	IRS14	INSTANTANEOUS RETURN SAMPLE NO.14	V
6266 - 6585	320	IRS15	INSTANTANEOUS RETURN SAMPLE NO.15 (MODE 2)	V
6586 - 6905	320	IRS16	INSTANTANEOUS RETURN SAMPLE NO.16	V
6906	1	AW1	CALCULATED AVERAGE WAVEFORM NO.1	V
6907	1	AW2	CALCULATED AVERAGE WAVEFORM NO.2	V
6908	1	AW3	CALCULATED AVERAGE WAVEFORM NO.3	V
6909	1	AW4	CALCULATED AVERAGE WAVEFORM NO.4	V
6910	1	AW5	CALCULATED AVERAGE WAVEFORM NO.5	V
6911	1	AW6	CALCULATED AVERAGE WAVEFORM NO.6	V
6912	1	AW7	CALCULATED AVERAGE WAVEFORM NO.7	V
6913	1	AW8	CALCULATED AVERAGE WAVEFORM NO.8	V
6914	1	AW9	CALCULATED AVERAGE WAVEFORM NO.9	V
6915	1	AW10	CALCULATED AVERAGE WAVEFORM NO.10	V
6916	1	AW11	CALCULATED AVERAGE WAVEFORM NO.11	V
6917	1	AW12	CALCUALTED AVERAGE WAVEFORM NO.12	V
6918	1	AW13	CALCULATED AVERAGE WAVEFORM NO.13	V
6919	1	AW14	CALCULATED AVERAGE WAVEFORM NO.14	V
6920	1	AW15	CALCULATED AVERAGE WAVEFORM NO.15	V
6921	1	AW16	CALCULATED AVERAGE WAVEFORM NO.16	V
6922	1	SAW1	CALCULATED SIGMA AVERAGE WAVEFORM NO.1	V
6923	1	SAW2	CALCULATED SIGMA AVERAGE WAVEFORM NO.2	V
6924	1	SAW3	CALCULATED SIGMA AVERAGE WAVEFORM NO.3	V
6925	1	SAW4	CALCULATED SIGMA AVERAGE WAVEFORM NO.4	V
6926	1	SAW5	CALCULATED SIGMA AVERAGE WAVEFORM NO.5	V
6927	1	SAW6	CALCULATED SIGMA AVERAGE WAVEFORM NO.6	V
6928	1	SAW7	CALCULATED SIGMA AVERAGE WAVEFORM NO.7	V

Table 3.3 (con't.)

WORD LOCATION(S)	NUMBER SAMPLES	PARAMETER MNEMONIC	PARAMETER DESCRIPTION AND COMMENTS	UNIT
6929	1	SAW8	CALCULATED SIGMA AVERAGE WAVEFORM NO.8	V
6930	1	SAW9	CALCULATED SIGMA AVERAGE WAVEFORM NO.9	V
6931	1	SAW10	CALCULATED SIGMA AVERAGE WAVEFORM NO.10	V
6932	1	SAW11	CALCULATED SIGMA AVERAGE WAVEFORM NO.11	V
6933	1	SAW12	CALCULATED SIGMA AVERAGE WAVEFORM NO.12	V
6934	1	SAW13	CALCULATED SIGMA AVERAGE WAVEFORM NO.13	V
6935	1	SAW14	CALCULATED SIGMA AVERAGE WAVEFORM NO.14	V
6936	1	SAW15	CALCULATED SIGMA AVERAGE WAVEFORM NO.15	V
6937	1	SAW16	CALCULATED SIGMA AVERAGE WAVEFORM NO.16	V
6938	1	RAGCHI	RADAR ALTIMETER AUTOMATIC GAIN CONTROL VOLTAGE (HIGH)	DDBM
6939	1	RAGCAV	RADAR ALTIMETER AVERAGE AUTOMATIC GAIN CONTROL VOLTAGE	DDBM
6940	1	H 1/3	H 1/3	CM
6941 - 6957	17	SPARE	SPARE	
6958	1	SMOSSH	SMOOTH SEA SURFACE HEIGHT	MTRS
6959 - 6962	1	DSAD	DIGITAL SOLAR ATTITUDE DETECTOR	N/A
6963	1	ASAD1	ANALOG SOLAR ATTITUDE DETECTOR NO.1	V
6964	1	ASAD2	ANALOG SOLAR ATTITUDE DETECTOR NO.2	V
6965	1	ASAD3	ANALOG SOLAR ATTITUDE DETECTOR NO.3	V
6966	1	XMAG	X-AXIS MAGNETOMETER	V
6967	1	YMAG	Y-AXIS MAGNETOMETER	V
6968	1	ZMAG	Z-AXIS MAGNETOMETER	V
6969	1	EBV2	EXPERIMENT BUS NO. 2 VOLTAGE	V
6970 - 6973	4	CCSS	COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
6974 - 6977	4	CCRR	COHERENT C-BAND PULSE REPETITION FREQUENCY	V
6978	1	CCBT	COHERENT C-BAND BASE PLATE TEMPERATURE	DC
6979 - 6982	4	NCSS	NON-COHERENT C-BAND RECEIVED SIGNAL STRENGTH	V
6983 - 6986	4	NCRR	NON-COHERENT C-BAND PULSE REPETITION FREQUENCY	V
6987	1	NCBT	NON-COHERENT C-BAND BASE PLATE TEMPERATURE	DC

Table 3.3 (con't.)

4.0 Data Control Cards

The ARC computer program has been designed to operate without user supplied data cards whenever possible. However there may be some applications which require special execution directives. These directives are supplied to the program by means of the optional data control cards.

4.1 Mandatory Data Control Cards

4.1.1 Title Card

The first data control card encountered by the ARC program is considered as the run title and is printed on every page of output, on the run summary, on the printer plots, and on the CalComp plots. The title is alphanumeric, 80 characters long, and should be centered on the data card.

4.2 Optional Data Control Cards

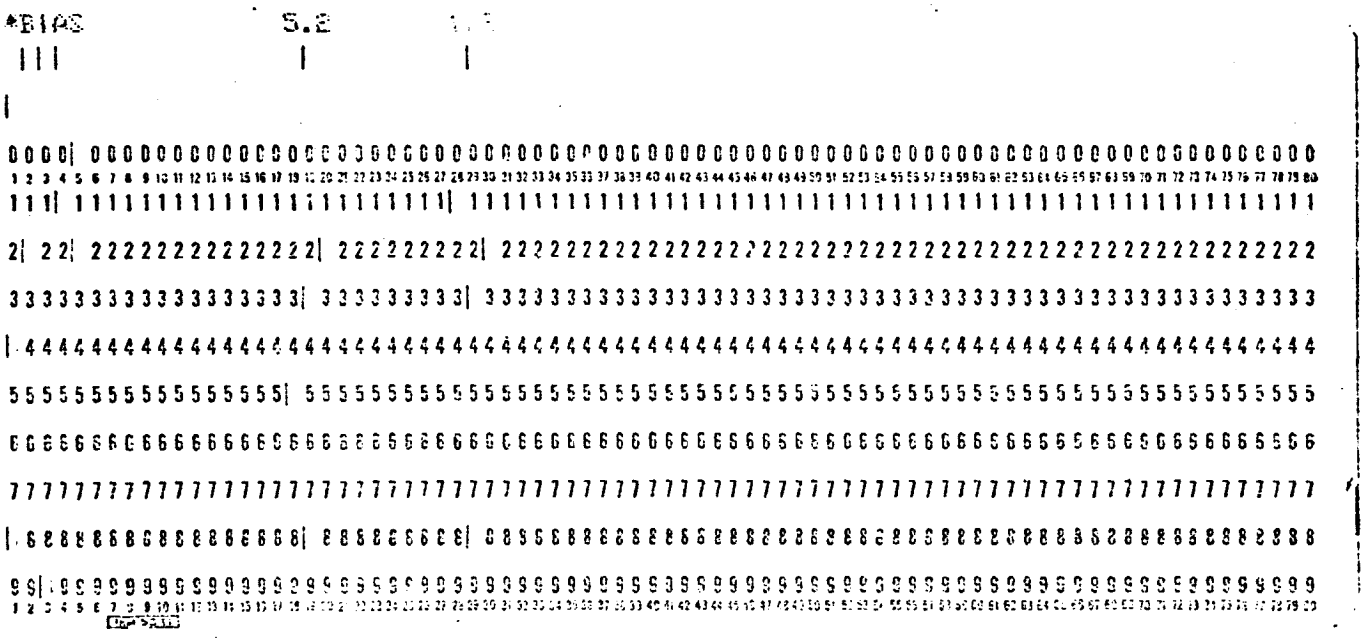
All optional data control cards are read according to the following format:

```
FORMAT (A5,I5,3F10.5,A40)
```

where the first field is the card identifier, the next four fields supply executive information, and the last field is an unused field which may contain comments, numbers, etc. If an optional data control card with an unrecognizable identifier is encountered, the program will terminate.

4.2.1 *BIAS Control Card

The *BIAS control card is used to supply the program with the value of the altimeter bias. If no card is present, the bias will be set to zero.

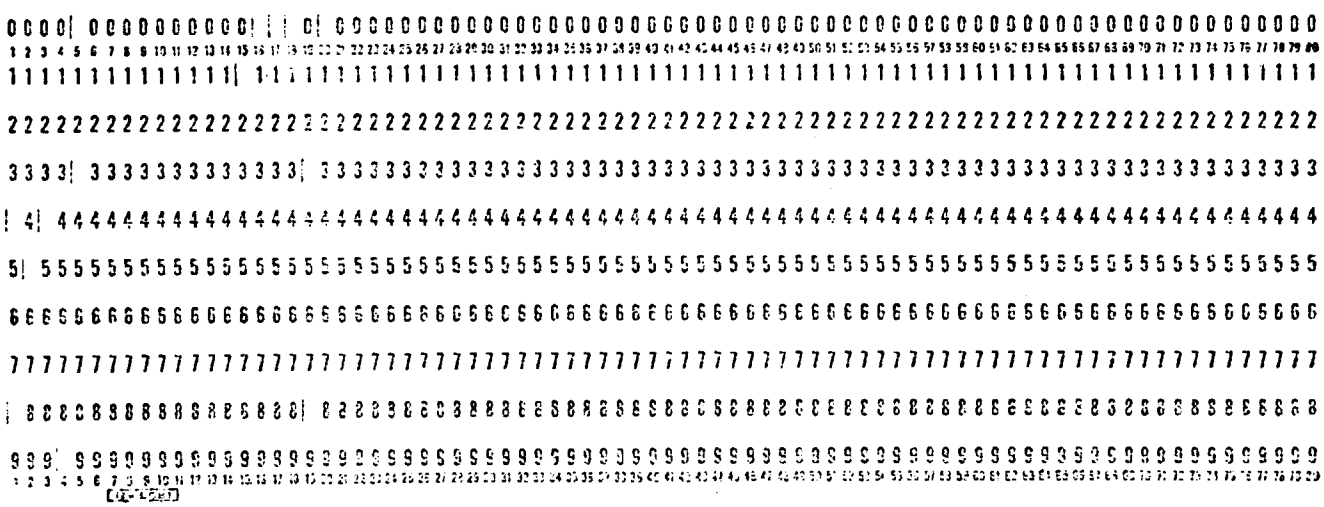


NAME	COLUMNS	FORMAT	DESCRIPTION
*BIAS	1-5	A5	
BIAS1	11-20	F10.5	global mode bias
BIAS2	21-30	F10.5	intensive mode bias

4.2.2 *EDIT Control Card

The *EDIT control card is used to supply the program with the editting criterion for the plotting of the altimeter residuals. It is necessary to edit out bad residuals since ARC scales its plots based upon the maximum and minimum values to be plotted. If no card is present, observation residuals greater than 50 meters in absolute value will be editted.

*EDIT 1000.0



NAME	COLUMNS	FORMAT	DESCRIPTION
*EDIT	1-5	A5	
REDIT	11-20	F10.5	observation residual editting criterion

4.2.3 *ORDR Control Card

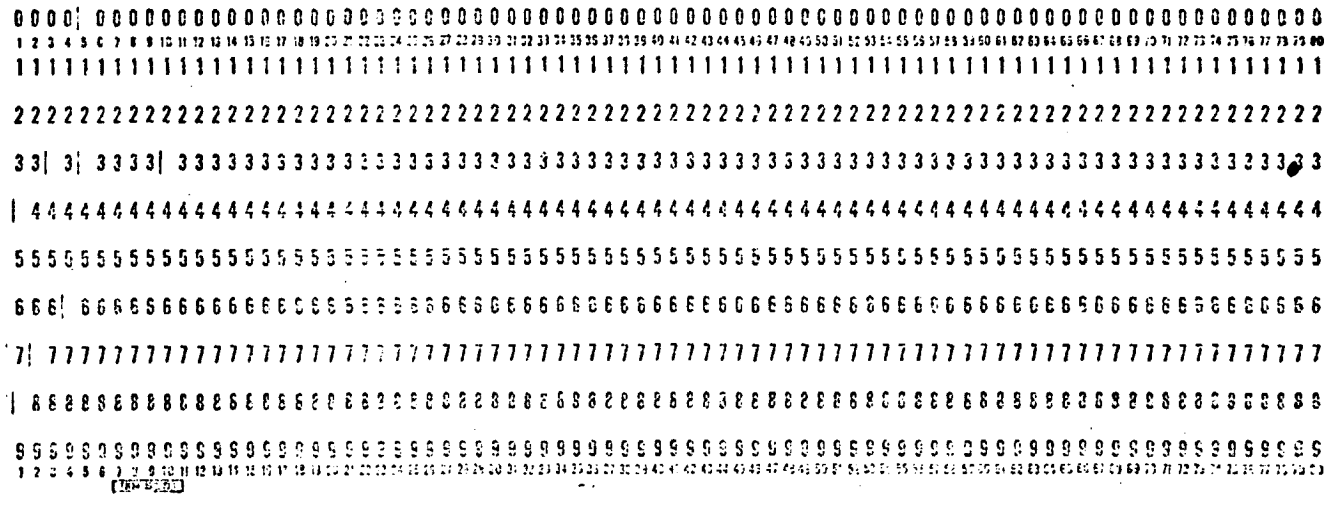
The *ORDR control card supplies the program with the RV tape interpolation order. The maximum acceptable value is 7 and the minimum acceptable value is 3. It should be noted that the interpolation order effects the number of records needed on the RV tape before the first observation and after the last observation (see Section 2.1). The order of the interpolation chosen should reflect the mesh size of the RV tape. If no card is present, the interpolation order will be set to 7. As of 2 September 1976, the spacing on RV tapes was 30 seconds for tapes generated at WFC and 60 seconds for tapes generated at NWL.

NAME	COLUMNS	FORMAT	DESCRIPTION
*ORDR	1-5	A5	
NORDER	6-10	I5	RV interpolation order

4.2.4 *PLOT Control Card

The *PLOT control card supplies the program with the plot option chosen by the user. If no card is present, the program will produce only printer plots for every minute of data. It should be noted that an output tape can be generated by the program when the user supplies a *PLOT control card.

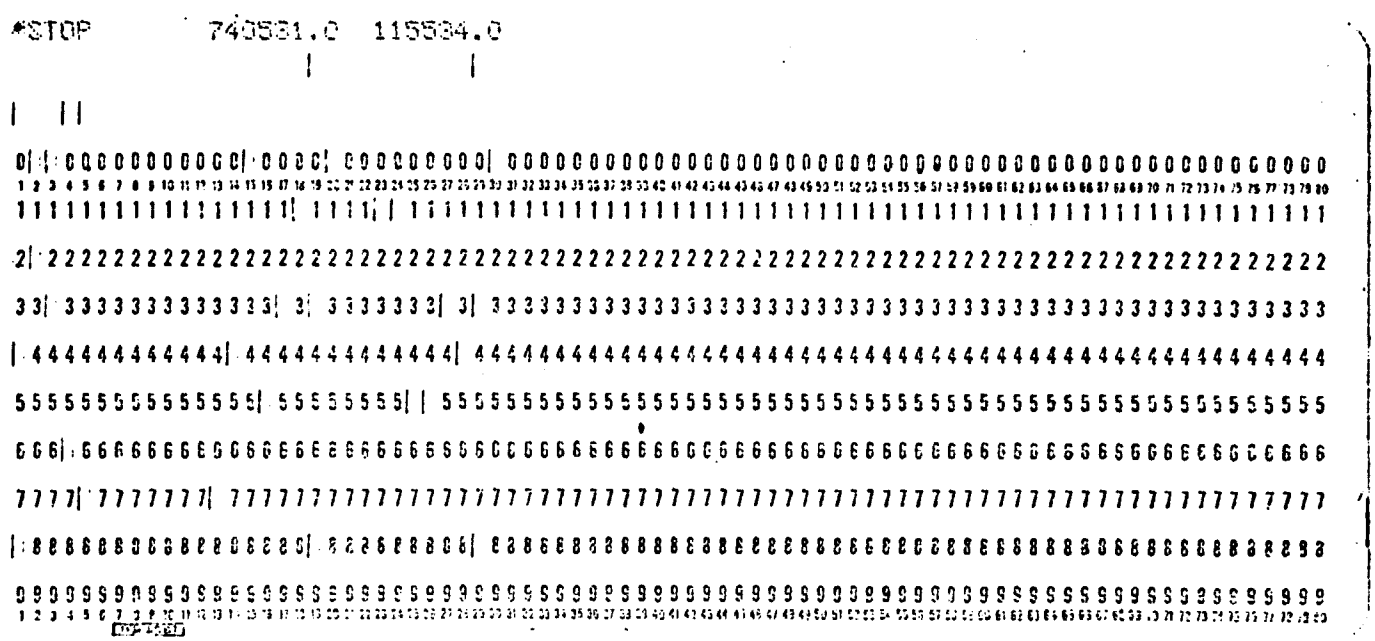
*PLOT 3



NAME	COLUMNS	FORMAT	DESCRIPTION
*PLOT	1-5	A5	
IPLT	6-10	I5	plot option 0 = no plots 1 = printer plots 2 = printer and CalComp plots 3 = printer and CalComp summary plots only

4.2.5 *STOP Control Card

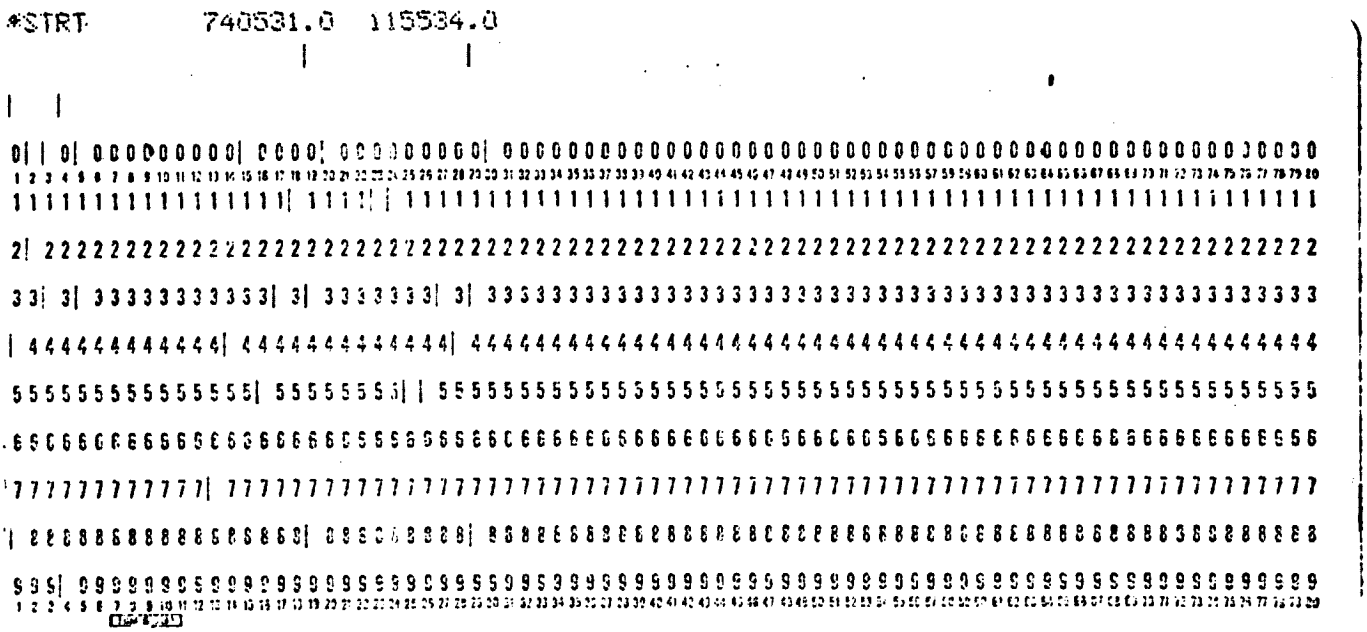
The *STOP control card is used to supply the program with the desired stop time. If no card is present, the program will terminate upon reaching an end of file on the observation tape.



NAME	COLUMNS	FORMAT	DESCRIPTION
*STOP	1-5	A5	
YMD	11-20	F10.5	YYMMDD. of stop time
HMS	21-30	F10.5	HHMMSS.SSS of stop time

4.2.6 *STRT Control Card

The *STRT control card is used to supply the program with the desired start time. If no card is present, the program will start with the first observation on the data tape.

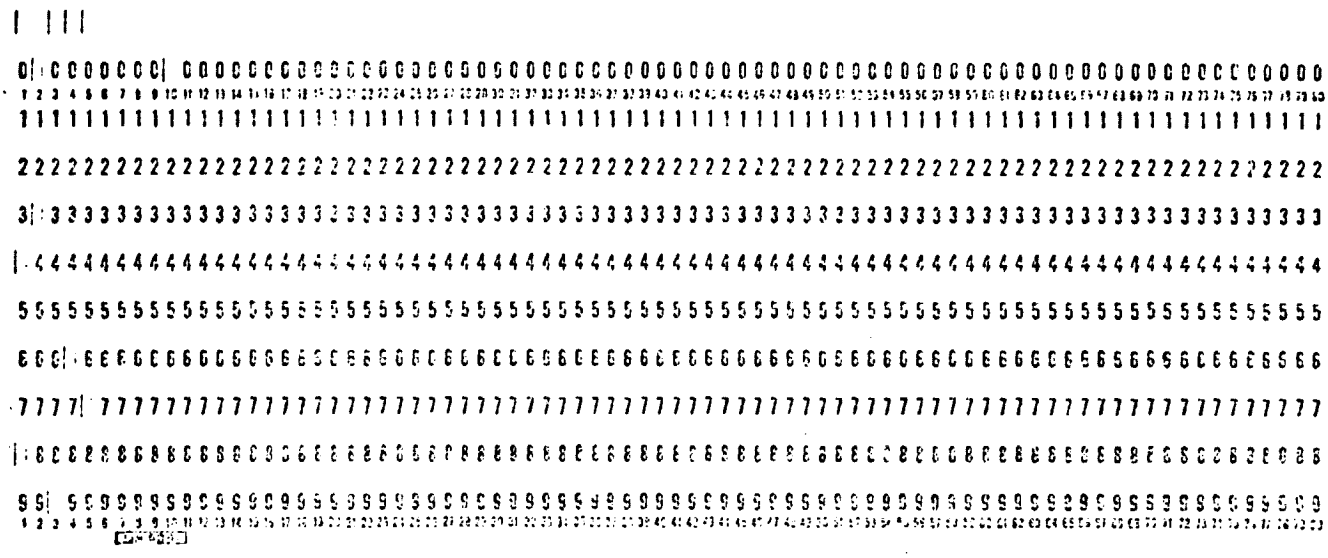


NAME	COLUMNS	FORMAT	DESCRIPTION
*STRT	1-5	A5	
YMD	11-20	F10.5	YYMMDD. of start time
HMS	21-30	F10.5	HHMMSS.SSS of start time

4.2.7 *TROP Control Card

The *TROP control card is used to supply the program with executive information for processing tropospheric refraction. If no card is present, each observation will be corrected for tropospheric refraction using a table of corrections based upon average met. data (see Section 5.1).

*TROP 0



NAME	COLUMNS	FORMAT	DESCRIPTION
*TROP	1-5	A5	
ITROP	6-10	I5	refraction identifier 0 = no refraction 1 = refraction with met data supplied
PRES	11-20	F10.5	pressure in mb.
TEMP	21-30	F10.5	temperature in °F
VAPR	31-40	F10.5	vapor pressure in mb.

4.2.8 *SKIP Control Card

The *SKIP control card is used to supply the program with the file number to be used on the RV tape (counting the tape label). If no card is present, the second file is used.

NAME	COLUMNS	FORMAT	DESCRIPTION
*SKIP	1-5	A5	
NFSKIP	6-10	I5	File number to be used for RV tape (counting the tape label)

4.2.9 *SIGH Control Card

The *SIGH control card is used to supply the program with the value of CSIGH, the calculated standard deviation of the satellite height in meters. If no card is present, a value of 10 meters is assumed.

*SIGH	1-5	A5	
CSIGH	11-20	F10.5	Calculated standard deviation of the satellite height

5.0 Mathematical Model

5.1 Tropospheric Refraction

Each observation processed by the ARC computer program is corrected for tropospheric refraction although the program does not alter the value of the observation on the data tape. The program makes use of the Saastamoinen tropospheric refraction model as presented in the "Wallops Island Tropospheric Refraction Study and Analysis", C.C. Goad, 1974, except that a constant elevation angle of 90° is used. The correction is given by:

$$dr = 0.002277\ [P + (0.05+1255.0/T)V]$$

where

P is the surface pressure in mb.,

T is the surface temperature in °K, and

V is the surface vapor pressure in mb.

The ARC program contains a table of corrections based upon average values of P, T, and V for each month of the year and in latitude increments of 5° from -70° to +65°. This table is linearly interpolated at one second intervals to obtain the tropospheric refraction correction for observation residuals and sea surface height. The tropospheric refraction correction written and the output tape is evaluated at the time (latitude) of the smoothed observation. The interpolation table is given in Table 5.1.

Table 5.1. Nominal Tropospheric Refraction Corrections

LATITUDE	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
-70	2.32	2.32	2.33	2.35	2.37	2.38	2.37	2.37	2.37	2.35	2.32	2.31
-65	2.33	2.33	2.34	2.35	2.38	2.38	2.40	2.41	2.38	2.35	2.35	2.32
-60	2.35	2.36	2.35	2.37	2.39	2.40	2.42	2.42	2.41	2.38	2.37	2.35
-55	2.38	2.38	2.36	2.39	2.41	2.43	2.46	2.46	2.45	2.42	2.40	2.39
-50	2.42	2.40	2.39	2.42	2.43	2.47	2.49	2.50	2.48	2.46	2.44	2.42
-45	2.44	2.43	2.42	2.45	2.46	2.49	2.53	2.53	2.51	2.50	2.47	2.45
-40	2.47	2.46	2.45	2.48	2.48	2.52	2.56	2.55	2.54	2.52	2.50	2.48
-35	2.49	2.48	2.48	2.50	2.51	2.54	2.56	2.57	2.56	2.54	2.52	2.51
-30	2.51	2.49	2.51	2.52	2.53	2.55	2.56	2.57	2.58	2.56	2.54	2.52
-25	2.52	2.50	2.52	2.53	2.53	2.56	2.56	2.57	2.58	2.57	2.56	2.53
-20	2.53	2.52	2.52	2.53	2.54	2.57	2.56	2.58	2.58	2.56	2.57	2.55
-15	2.55	2.52	2.54	2.54	2.54	2.58	2.57	2.58	2.58	2.57	2.58	2.55
-10	2.57	2.56	2.57	2.55	2.55	2.58	2.58	2.57	2.58	2.58	2.57	2.56
-5	2.57	2.57	2.57	2.57	2.58	2.57	2.56	2.56	2.55	2.56	2.56	2.56
0	2.56	2.57	2.57	2.58	2.57	2.56	2.55	2.53	2.54	2.55	2.56	2.56
5	2.56	2.56	2.57	2.58	2.58	2.58	2.55	2.54	2.54	2.57	2.56	2.56
10	2.57	2.58	2.57	2.58	2.57	2.57	2.55	2.55	2.54	2.55	2.56	2.56
15	2.57	2.58	2.57	2.57	2.55	2.55	2.53	2.55	2.53	2.53	2.54	2.56
20	2.56	2.57	2.57	2.54	2.53	2.52	2.51	2.51	2.50	2.50	2.52	2.53
25	2.51	2.53	2.55	2.51	2.50	2.49	2.48	2.48	2.47	2.47	2.48	2.50
30	2.48	2.50	2.50	2.47	2.46	2.46	2.45	2.44	2.44	2.45	2.45	2.47
35	2.44	2.46	2.45	2.43	2.42	2.42	2.41	2.41	2.42	2.42	2.42	2.44
40	2.40	2.41	2.40	2.40	2.38	2.38	2.37	2.37	2.39	2.39	2.39	2.40
45	2.36	2.37	2.36	2.36	2.35	2.34	2.34	2.34	2.35	2.35	2.35	2.35
50	2.32	2.33	2.33	2.32	2.31	2.31	2.31	2.31	2.32	2.32	2.31	2.32
55	2.30	2.30	2.30	2.29	2.28	2.28	2.28	2.28	2.29	2.30	2.29	2.30
60	2.29	2.28	2.28	2.27	2.27	2.27	2.26	2.26	2.26	2.26	2.27	2.29
65	2.28	2.27	2.26	2.25	2.26	2.26	2.26	2.25	2.25	2.25	2.26	2.28

5.2 Altitude Bias

Each altitude observation processed by the ARC computer program is corrected for bias while computing residuals, SSHITE etc. The value of the bias correction is constant and is zero unless supplied by the user (see Section 4.2.1). The program accepts separate bias values for the global and intensive modes.

5.3 Geoid

During the computation of the altimeter observation residual it is necessary to calculate the modeled height of the geoid. The ARC computer program uses the Marsh-Vincent geoid (see "Geophysical Surveys", 1974, pp. 481-511, D. Reidel Pub. Co., Dordrecht, Holland). The geoid height is evaluated by linearly interpolating a table of values given in one-degree latitude by one-degree longitude increments. The interpolation is performed every second for observation residuals and sea surface height. The value written on the output tape is evaluated at the time (latitude and longitude) of the smoothed observation.

5.4 Tide

During the computation of the altimeter observation residuals it is also necessary to calculate the modeled tide height. The ARC computer program uses the Hendershott tide model (see "Ocean Tides", M.C. Hendershott, EOS Trans., Febr. 1973) which is evaluated every second for residuals and sea surface heights. The value written on the output tape is evaluated at the time of the smoothed observation.

5.5 Ephemeris Interpolation

In order to calculate observation residuals and sea surface heights, and evaluate the geoid and tide heights, it is necessary to interpolate the satellite latitude, longitude, and height above the reference ellipsoid. The ARC computer program uses a fixed mesh, fixed order Lagrange interpolation scheme, where the order is supplied by the user (see Section 4.2.3) and can vary from 3 to 7 inclusive. The satellite latitude and longitude are evaluated every second. The values of latitude and longitude written on the output tape are evaluated at the time of the smoothed observation. The height above the reference ellipsoid is evaluated at every observation. The Lagrange interpolation scheme was chosen both because of its accuracy and simplicity (no difference tables are required and interpolation coefficients need only be computed once for a fixed mesh interpolation). However it should be noted that the interpolation routine is not capable of extrapolating the ephemeris data. Accordingly, the user should take care that several records of information are present on the ephemeris tape both before and after any possible observation (see Section 2.1).

5.6 Orbit Geometry

The geometry of the observation residuals, sea surface height, and associated parameters are given in Figure 5.1.

The computed observation residual is given by

$$y = O-C$$

where y is the observation residual, O is the corrected observation, and C is the computed observation. The corrected observation is given by

$$O = O' - dr + B$$

where O' is the actual observation, dr is the tropospheric refraction correction (see section 5.1), and B is the a priori altitude bias. The computed observation is given by

$$C = H - G - T$$

where H is the interpolated height above the reference ellipsoid (see section 5.5), G is the computed height of the geoid (see section 5.3), and T is the tide height (see section 5.4)

The computed sea surface height is given by

$$SSH = H - O$$

and the computed smoothed sea surface height is given by

$$SMOOSH = HS - SMOALT$$

where SMOALT is the smoothed observation and HS is the height above the reference ellipsoid evaluated at the same time as SMOALT.

The computed altimeter geoid is given by

$$G' = SSH - T.$$

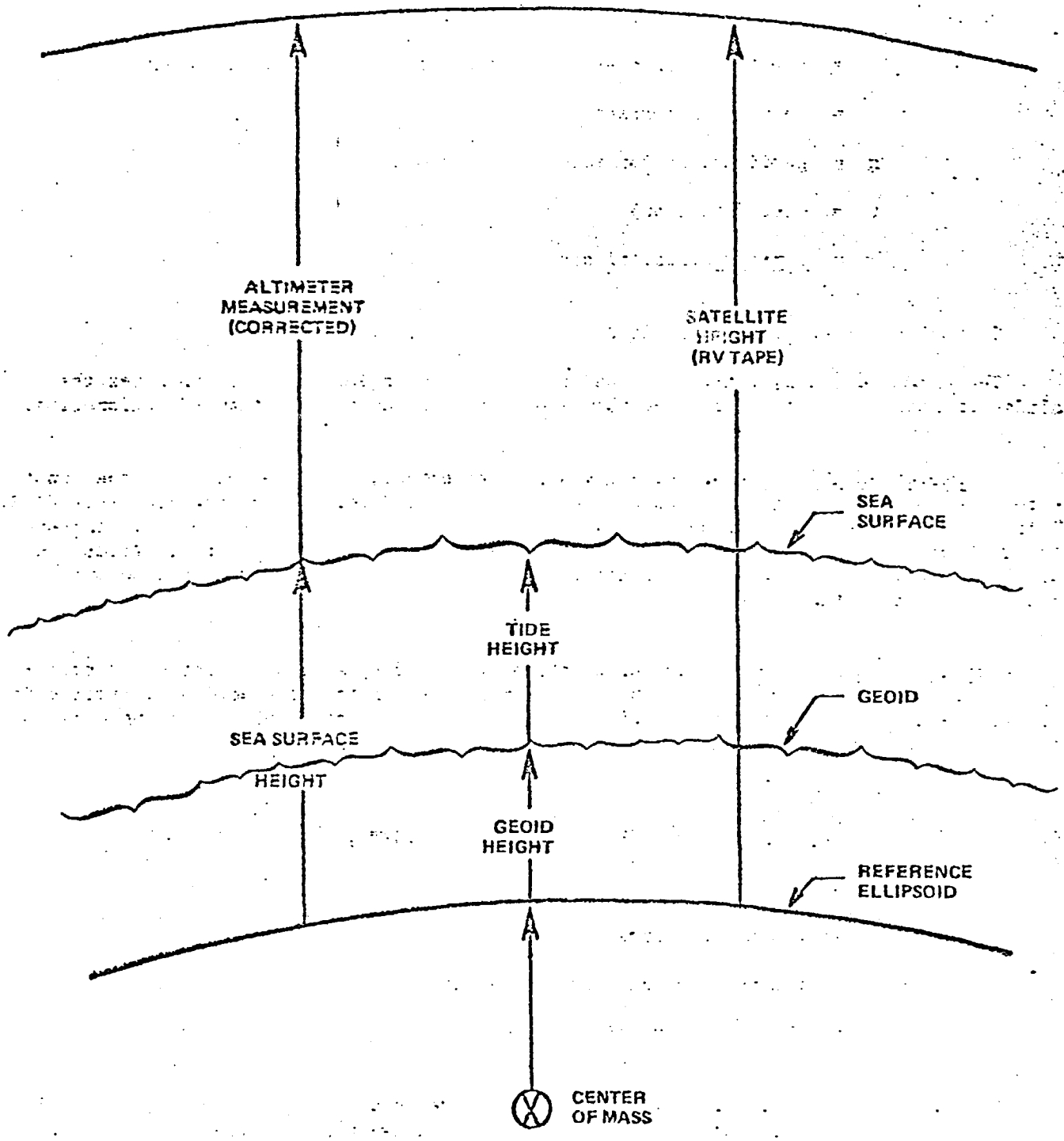


Figure 5.1. The ARC Observation Geometry

5.7 Timing

Each of the parameters computed by ARC and written and the output tape (i.e., LAT, LONG, TREF, GHITE, THITE, SATHT, SSHITE, and SMOSSH) has a time of evaluation. The LAT, LONG, TREF, GHITE, THITE, and SMOSSH variables are evaluated at the time of the smoothed observation (at FODAY). If FODAY is not available from the GAP input tape, it is computed by ARC and LAT, LONG, and SMOSSH are set to -8888.0. SATHT, SSHITE, CALT, ALT, and the observation residuals computed by ARC are time tagged by the following algorithm:

$$t_i = \text{FRAMTI} + \Delta t + (i-1)\delta t$$

where t_i is the time of the sample of SATHT, SSHITE, CALT, ALT, or the observation residual, Δt is the amount of time added to the frame time (FRAMTI) to obtain the time of the first sample, and δt is the amount of time elapsed between any two adjacent samples occurring in the same frame.

The ARC program computes corrected values of Δt and δt for CALT and ALT and places them in the timing and header record. The corrections made are for transit time, filter delay, and tracking loop delay (see Tables 5.2, 5.3, and 5.4).

TM Mode 1

$$T_{new} = -53\ 186\ 560 + 28\ 190\ 000 - 4.5\ (102\ 405\ 120 - 10\ 000\ 000$$

(T_{old}) (transit time) (filter delay) (tracking loop delay)

$$= -495\ 819\ 600 \text{ sec.} \times 10^{10}$$

Table 5.2

TM Mode 2

$$T_{new} = -53\ 186\ 560 + 28\ 190\ 000 - 4.5\ (102\ 405\ 120) - 10\ 000\ 000$$

(T_{old}) (transit time) (filter delay) (tracking loop delay)

$$= -495\ 819\ 600 \text{ sec.} \times 10^{10}$$

Table 5.3

TM Mode 3

$$T_{new} = -155\ 591\ 680 + 28\ 190\ 000 - 10\ 000\ 000$$

(T_{old}) (transit time) (tracking loop delay)

$$= -137\ 401\ 680 \text{ sec.} \times 10^{-10}$$

Table 5.4

PROGRAM MESSAGES

ARC

*** ARC NORMAL TERMINATION ***

INIT

DATA CARD NOT ACCEPTABLE - STOP

HEADER

GAP FLAG NOT SET

PROCS

*** NORMAL TERMINATION OF PROCESSING SECTION ***

UNRECOGNIZABLE FORMAT - RECORD SKIPPED

READER

*** EOF READ ON OBSERVATION TAPE ***

READRV

*** EOF READ GEODYN RV TAPE - STOP ***

*** GEODYN RV TAPE CANNOT BE BACKSPACED - STOP ***

TROP

LATITUDE OF _____ IS OUTSIDE TABLES

GEOID

SATELLITE LATITUDE = _____ IS OUTSIDE OF GEOID - STOP

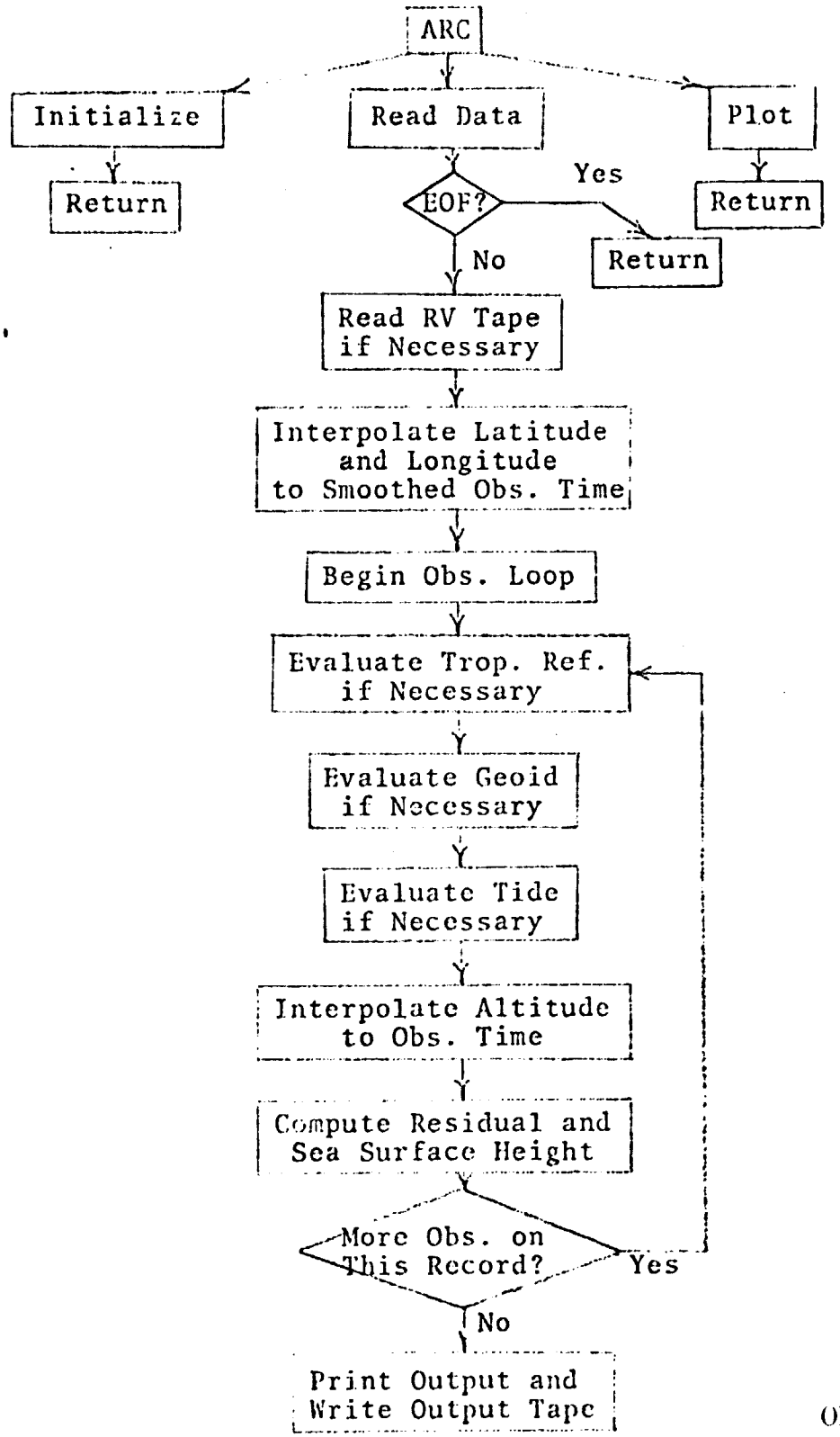
PLTSAU

DIMENSIONS IN PLTSAU INSUFFICIENT - STOP

PLOTR

NOTHING TO PLOT

6.0 Program Flowchart



7.0 Production Deck Setup

The production version of the ARC computer program can be executed by supplying the tape cards and the data control cards:

```
$       IDENT     112225,ARC
$       OPTION    FORTRAN,RELMEM
$       LOWLOAD
$       ENTRY     ......
        Binary decks  and LINK cards.
$       EXECUTE
$       LIMITS    50,31K,,10K
$       TAPE      01,X1D,,nnnn,,RV
$       TAPE      04,X4D,,,,ARC
$       TAPE      29,X9D,,mmmm,,GAP
$       FILE      03,D3R,20S
$       FILE      07,D7R,20S
$       SYSOUT    11
$       SYSOUT    12
$       USERID    PRODUCTION$PRODUCTION
$       PRMFL     02,R,R,PRODUCTION/GEOID
$       INCODE    IBMF
        (Title Card)
        (Optional Control Cards)
$       ENDJOB
***EOF
```