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AD 913117

Project Report

PA-229-1
(RSP)

C. R. Berndtson
R. H. French
D. E. Nessman

19595

17 March 1971

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Data Reduction Program Documentation
ALTAIR Tape Read Package

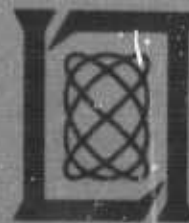
(Effective: April 1970)

Prepared for the Advanced Research Projects Agency,
the Department of the Army, and the Department of the Air Force
under Electronic Systems Division Contract F19628-70-C-0230 by

Lincoln Laboratory

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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6
DATA REDUCTION PROGRAM DOCUMENTATION
ALTAIR TAPE READ PACKAGE
(EFFECTIVE: APRIL 1970).

10 Charles
C. R. BERNDTSON,
Group 92

R. H. FRENCH
D. E. NESSMAN

Philco - Ford Corporation
Editors

12/26p.

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F19628-70-C-0230,
ARPA Order-600

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9 PROJECT REPORT, PA-229-1 (RSP)

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L. G. Hanson Field
Belford, Mass 01731

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The work reported in this document was performed at Lincoln Laboratory, a center for research operated by Massachusetts Institute of Technology. This work was sponsored by the Advanced Research Projects Agency of the Department of Defense (ARPA Order 600), the Department of the Army, and the Department of the Air Force under Air Force Contract F19628-70-C-0230.

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FOREWORD

This is the first report in the Data Reduction Program Documentation series. All reports will bear the document number PA-229 and will be distinguished by post-numerals -- the present report being PA-229-1.

The series will document in detail the programs used at Lincoln Laboratory in preparing the PRESS Operation and Data Summary (POD) Reports. Each POD is a presentation of data from a ballistic missile flight into the vicinity of the Kiernan Reentry Measurements Site (KREMS), situated on the island of Roi-Namur in the Kwajalein Atoll of the Marshall Islands. The data collected at KREMS is ~~shipped to Lincoln and there~~ validated, edited, and processed ^{and} ~~processed~~ ^A ~~processed~~ ^{cc} a selected subset of the data -- perhaps one-tenth to one percent of the whole -- is transcribed to computer formatted magnetic tapes and processed through a library of programmed algorithms to produce the information displayed, either graphically or in tabular form, in PODs, and subsequently used for interpretation and analysis.

It should be noted that, although KREMS possesses both radar and optical instrumentation, the emphasis in this report series is on the treatment of radar data. It should also be noted -- and in fact is to be stressed -- that an appreciation of the details of an algorithm must be based on an understanding

of the characteristics and idiosyncrasies of the radar which generated the data. It is not the purpose of this series to describe the ALTAIR, ALCOR, or T-1-DEX radars: descriptions are found in other references, either already published or in preparation. The reader is urged to familiarize himself with the instrument characteristics.

Within this series, each program will be documented as it is written for the Lincoln IBM 360/67 computer, and it is planned that each major program will constitute a separate report. To a certain extent, each report will be self-contained: abbreviations, symbols, minor subroutines, etc., will be repeated in each report even if common to a number of programs. However, a few subroutines are voluminous enough to warrant separate reports, and programs using these subroutines will cross-reference the appropriate report.

Although many of the programs produce, as output, graphical displays on a Stromberg-Carlson or Calcomp plotter, no attempt is made to document the control instructions for such devices, since the instructions are standardized and available elsewhere.

Each report will be dated according to the date of completion of the documentation. No implication is made that a program will not subsequently be modified, amended, or superseded: on the contrary, the history of radar data processing is one of continuous evolution of techniques, and it is unrealistic to assume that steady-state has been reached. The PA-229 series is being published for the convenience of interested parties, and Lincoln assumes no responsibility for the correctness of the information presented, nor for its currency.

The preparation of reports in this series is under the Editorship of Charles R. Berndtson of Lincoln, and of D. Nessmann and R. French of Philco-Ford Corporation. Inquiries, suggestions, corrections, criticisms, and requests for additional copies should be directed to C. R. Berndtson.

Finally, it will be observed that, in some cases, a report recognizes by name a principal contributor; in other cases, no name is given. Due to the intricate, evolutionary manner in which the programs came into being, the editors regret that it is in general impossible to give due credit to all -- mathematicians or radar analysts or programmers -- who contributed to the definition and writing of the programs.

The work reported in this document was performed at Lincoln Laboratory, a center for research operated by Massachusetts Institute of Technology. This work was sponsored by the Advanced Research Projects Agency of the Department of Defense (ARPA Order 600), the Department of the Army, and the Department of the Air Force under Air Force Contract F19628 -70 -C -0230.


Alan A. Grometstein

AAG:jb

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ALTAIR TAPE READ PACKAGE

The ALTAIR Tape Read Package retrieves data from the catalog and transcription tapes. It contains four IBM 360 assembler language subroutines which are called by the user's Fortran program.

<u>Subroutine</u>	<u>Entry</u>
BREADS	BREADS BREAD REW
HDRR	HDRR NAMET
FORM	FORM
GETS	GET IGET

Appendices A-D present program listings of these subroutines.

The user's program calls a Fortran subroutine (CHEAD for the catalog tape and THEAD for the transcription tape) which in turn calls the ALTAIR Tape Read Package through the above entries. Entry BREADS is called to define the buffer areas and various flag and parameter locations used in the reading process. BREADS also opens the file and causes the first record of an ALTAIR tape to be read. The data from the first record is not available to the user, however, until the reading call BREAD is given. The BREAD call moves the data from the first record into an area where it is available to the Fortran user and also initiates the reading of the second record.

Entry HDRR is called to gain access to Tape Header Record FMHDRD which is the first record of a catalog or transcription tape. The remaining format and calibration records at the front of the tape are now read by successive BREAD calls.

Each of these records is interrogated by Entry NAMET which checks to see if the record should be stored in core. Entry FORM is called to store and unpack selected calibration and format records in a convenient form for later use by the GETS subroutine. Once a data record is reached, control will return to the main processing program from CHEAD or THEAD.

As successive data records are read into memory by the BREAD call, particular data items may be acquired by means of the entries GET (floating point number) and IGET (binary integer). A detailed description of the use and function of these subroutines is provided at the front of each subroutine listing.

COMMON SYMBOLS AND ABBREVIATIONS

(The units given for certain quantities are the units commonly used for those quantities, unless otherwise noted.)

ADT	ALCOR Data Tape
Alt	Altitude (km)
APS	Average Pulse Shape
ARS	ALTAIR Recording System
Avg	Average, Averaging
Az	Azimuth (deg)
CADJ	Adjusted Calibration Constant (db)
C-band	ALCOR frequency, 5664 MHz (NP) and 5667 MHz (WB)
El	Elevation (deg)
EOF	End of File
GMT	Greenwich Mean Time
h	Hours
Hz	Hertz
in	Inches
LC	Left Circular Polarization
min	Minutes
NB	Narrow Band
NRTPOD	Non-real Time Precision Orbit Determination Program
POD	Project PRESS Operation and Data Summary Report
Phase	Presented in deg
PRF	Pulse Repetition Frequency (pps)
PRI	Pulse Repetition Interval (s)
pps	Pulses per second
pts	Points

\dot{R}	Range (km)
\ddot{R}	Range Rate (km/s)
rad	Radians
RC	Right Circular Polarization
RCS	Radar Cross Section (dbsm)
s	Seconds
SD_w	Standard Deviation of Wake Velocity
T	Time
TAL	Time After Launch (s)
UHF	ALTAIR Frequency; 415 MHz
V	Velocity
V_d	Doppler Velocity
V_w	Mean Wake Velocity
VHF	ALTAIR Frequency; 155.5 MHz
WB	Wide Band
θ	Total Off-axis Angle (deg)
λ	Wavelength
*	Denotes Multiplication

APPENDIX A
SUBROUTINE BREADS PROGRAM LISTING

```

***EREADS          DOUPLE BUFFERED READ FOR FORTRAN          BRE00010
*
*   THIS SUBROUTINE PROVIDES A DOUBLE BUFFERED READ CAPABILITY FOR BRE00020
*   FORTRAN READING OF UNFORMATTED BINARY TAPES.          BRE00030
*
*   TO UTILIZE THIS ROUTINE TWO CALLS, BREADS AND BRFAL, ARE BRE00040
*   NECESSARY. EREADS DEFINES THE BUFFER AREAS AND VARIOUS FLAG AND BRE00050
*   PARAMETER LOCATIONS USED IN THE READING PROCESS. BREADS ALSO OPENS BRE00060
*   THE FILE AND CAUSES THE FIRST RECORD OF AN ALTAIR TAPE TO BE READ. BRE00070
*   THE DATA FROM THE FIRST RECORD IS NOT AVAILABLE TO THE USER HOWEVER, BRE00080
*   UNTIL THE READING CALL BREAD IS GIVEN. THE BREAD CALL MOVES THE DATA BRE00090
*   FROM THE FIRST RECORD INTO AN AREA WHERE IT IS MADE AVAILABLE TO THE BRE00100
*   FORTRAN USER AND ALSO INITIATES THE READING OF THE SECOND RECORD. BRE00110
*   SUCCEEDING RECORDS ARE NOW READ BY THE BREAD CALL. BRE00120
*
*   CALLING SEQUENCES          BRE00130
*
*   CALL BREADS(LN,IBUF1,IBUF2,MAX,IPL,INDX,LEN,IPLG,IADD) BRE00140
*
*   WHERE LN IS NOT APPLICABLE TO OS. DUMMY PARAMETER. BRE00150
*   IBUF1 IS THE BEGINNING OF THE FIRST BUFFER. BRE00160
*   IBUF2 IS THE BEGINNING OF THE SECOND BUFFER. BRE00170
*   MAX IS THE MAXIMUM RECORD LENGTH TO BE READ. BRE00180
*   IPL IS A FILE COUNTER LOCATION WHICH IS INCREMENTED BY ONE BRE00190
*   FOR EACH END OF FILE MARK DETECTED. BRE00200
*   INDX IS SET TO EITHER 1 OR 2 AND DEFINES WHICH BUFFER WAS BRE00210
*   USED TO READ A RECORD. BRE00220
*   LEN IS SET TO GIVE THE ACTUAL RECORD LENGTH READ. BRE00230
*   IPLG IS A FLAG LOCATION USED TO STORE PARITY AND END OF FILE BRE00240
*   INDICATORS. 1 = NORMAL READ, 2 = PARITY ERROR, AND BRE00250
*   3 = EOF. BRE00260
*   IADD IS SET TO THE ACTUAL ADDRESS OF THE READ BUFFER USED FOR BRE00270
*   READING. BRE00280
*
*   CALL BRFAL(LN)          BRE00290
*
*   THIS COMPLETES THE READING OF A RECORD FROM THE SPECIFIED TAPE BRE00300
*   AND INITIATES THE READ OF THE NEXT RECORD. THIS CALL ALSO SETS THE BRE00310
*   THE FILE COUNT, INDEX VALUE, LENGTH, FLAG AND BUFFER ADDRESS TO THE BRE00320
*   PROPER VALUES FOR THE READ JUST COMPLETED. BRE00330
*
*   CALL REW(LN)          BRE00340
*
*   REWINDS THE TAPE.          BRE00350
*
*   VERSION 02/19/70          BRE00360
*
*   MACRO          BRE00370
&N          SSAVA &GR,&SA          BRE00380
&N          BALR &GR,0          BRE00390
          USING *,&GR          BRE00400
          LR 12,13          BRE00410
          LA 13,&SA          BRE00420
          ST 12,4(0,13)          BRE00430
          ST 13,8(0,12)          BRE00440
          BRE00450
          BRE00460
          BRE00470
          BRE00480
          BRE00490
          BRE00500
          BRE00510
          BRE00520
          BRE00530
          BRE00540
          BRE00550

```

	DROP	15	BRE00560
	MEND		BRE00570
	ENTRY	BREAD	BRE00580
	ENTRY	REW	BRE00590
	ENTRY	BREADS	BRE00600
	USING	*,15	BRE00610
BREADS	STM	14,12,12(13)	BRE00620
	LR	12,13	BRE00630
	LA	13,SAVE	BRE00640
	ST	12,4(0,13)	BRE00650
	ST	13,8(0,12)	BRE00660
	ST	1,SAVEP	BRE00670
	MVI	CC,X'00'	BRE00680
	MVI	TAPCE,X'FF'	BRE00690
	LM	2,10,0(1)	BRE00700
	L	2,0(0,2)	BRE00710
	ST	2,UNIT	BRE00720
	ST	1,ABUF1	BRE00730
	ST	3,CURBF	BRE00740
	ST	4,ABUF2	BRE00750
	L	5,0(0,5)	BRE00760
	ST	5,LENGTH	BRE00770
	ST	6,IPL	BRE00780
	SR	5,5	BRE00790
	ST	5,0(0,6)	BRE00800
	ST	7,INDX	BRE00810
	ST	8,LEN	BRE00820
	ST	9,IPLG	BRE00830
	N	10,CON1	BRE00840
	ST	10,IADD	BRE00850
	L	8,CURBF	BRE00860
	USING	IHADCB,5	BRE00870
	LA	5,RDCB	BRE00880
	TM	CCBOPFLGS,X'10'	BRE00890
	BNO	BREAD2	BRE00900
	MVI	SHOW,X'70'	BRE00910
	B	BREAD1	BRE00920
BREAD2	LR	9,15	BRE00930
	CLOSE	(RDCB,REREAD)	BRE00940
	LR	15,9	BRE00950
	OPEN	RDCB	BRE00960
	LR	15,9	BRE00970
	OI	CCBIFLGS,X'0C'	BRE00980
BREAD3	MVI	KERR,X'00'	BRE00990
	MVI	SHOW,X'01'	BRE01000
	MVI	CC,X'FF'	BRE01010
	B	PRFAD1	BRE01020
	USING	*,15	BRE01030
REFW.	STM	14,12,12(13)	BRE01040
	LR	12,13	BRE01050
	LA	13,SAVE	BRE01060
	ST	12,4(0,13)	BRE01070
	ST	13,8(0,12)	BRE01080
	LR	9,15	BRE01090
	CLOSE	(RDCB,REREAD)	BRE01100

	LR	15,9	BRE01110
	MVI	IPL+3,X'00'	BRE01120
	MVI	EOFCTR+3,X'01'	BRE01130
	MVI	CC,X'00'	BRE01140
	L	13,SAVE+4	BRE01150
	RETURN	(14,12),RC=0	BRE01160
	USING	*,15	BRE01170
BREAD	STM	14,12,12(13)	BRE01180
	LR	12,13	BRE01190
	LA	13,SAVE	BRE01200
	ST	12,4(0,13)	BRE01210
	ST	13,8(0,12)	BRE01220
BREAD1	BALR	11,0	BRE01230
	USING	*,11	BRE01240
FILBUF	L	8,CURBF	BRE01250
	LA	7,5	BRE01260
	ST	7,CTR	BRE01270
	TM	SHOW,X'70'	BRE01280
	BO	CK	BRE01290
	TM	SHOW,X'01'	BRE01300
	BO	RDAH	BRE01310
	TM	CC,X'FF'	BRE01320
	BO	CK	BRE01330
RD	MVI	KERR,X'00'	BRE01340
	READ	BRDCB,SP,RCCB,ABUFA,X'2000'	BRE01350
	MVI	SHOW,X'02'	BRE01360
	TM	CC,X'FF'	BRE01370
	BO	RETURN	BRE01380
	TM	TAPCE,X'FF'	BRE01390
	BNO	RDAH	BRE01400
CK	CHECK	ERDCB	BRE01410
	TM	SHOW,X'70'	BRE01420
	BNO	NEXT	BRE01430
BBS	BSP	RDCB	BRE01440
	MVI	KERR,X'00'	BRE01450
	MVI	SHOW,X'01'	BRE01460
	MVI	CC,X'FF'	BRE01470
	B	FILBUF	BRE01480
NEXT	MVI	SHOW,X'03'	BRE01490
	TM	KERR,X'FF'	BRE01500
	BO	ERROR	BRE01510
	BAL	14,MOVE	BRE01520
RDAH	LA	8,1	BRE01530
	L	7,IPLG	BRE01540
	ST	8,0(0,7)	BRE01550
	SR	7,7	BRE01560
	L	8,CURBF	BRE01570
	LH	7,2(0,8)	BRE01580
	L	8,LEN	BRE01590
	ST	7,0(0,8)	BRE01600
	EAL	5,SWITCH	BRE01610
	MVI	TAPCE,X'00'	BRE01620
	MVI	CC,X'FF'	BRE01630
	L	8,CURBF	BRE01640
	LA	7,5	BRE01650

	ST	7,CTR	BRE01660
	B	RD	BRE01670
RETURN	L	13,SAVE+4	BRE01680
	MVI	SHOW,X'04'	BRE01690
	LM	14,12,12(13)	BRE01700
		RETURN RC=0	BRE01710
SWITCH	L	8,CURBF	BRE01720
	L	6,INDX	BRE01730
	L	7,IADD	BRE01740
	ST	8,0(0,7)	BRE01750
	S	8,ABUF1	BRE01760
	BZ	BB	BRE01770
	L	8,ABUF1	BRE01780
	LA	9,2	BRE01790
	B	SSWA	BRE01800
BH	L	8,ABUF2	BRE01810
	LA	9,1	BRE01820
SSWA	ST	8,CURBF	BRE01830
	ST	9,0(0,6)	BRE01840
	BR	5	BRE01850
RDCB	CCB	DSORG=PS,MACRF=RC,DEVD=TA,DEN=2,TRTCH=C,REC=M=U, BLKSIZE=8132,BUPNO=2,EODAD=EOF,SYNAD=TPSYN,DDNAME=RALT7,X	YPRE01860
		BFTER=S	BRE01870
TPSYN	MVI	KERR,X'FF'	BRE01880
	BF	14	BRE01890
EOF	LA	8,3	BRE01900
	L	7,IPLG	BRE01910
	ST	8,0(0,7)	BRE01920
	L	8,EOFCTR	BRE01930
	A	8,CNE	BRE01940
	ST	8,EOFCTR	BRE01950
	L	7,IPL	BRE01960
	ST	8,0(0,7)	BRE01970
	MVI	TAPCE,X'00'	BRE01980
	MVI	CC,X'FF'	BRE01990
	B	RD	BRE02000
ERROR	L	7,CTR	BRE02010
	BCT	7,*+4	BRE02020
	ST	7,CTR	BRE02030
	MVI	CC,X'00'	BRE02040
	MVI	TAPCE,X'FF'	BRE02050
	LTR	7,7	BRE02060
	BNZ	BSP	BRE02070
	MVI	TAPCE,X'00'	BRE02080
	LA	7,2	BRE02090
	L	8,IPLG	BRE02100
	ST	7,0(0,8)	BRE02110
	MVI	CC,X'FF'	BRE02120
	B	RD	BRE02130
BSP	B	RDCB	BRE02140
	B	RD	BRE02150
MOVE	L	2,CURBF	BRE02160
	L	9,LENGTH	BRE02170
	AR	9,2	BRE02180
	LA	8,4	BRE02190
			BRE02200

	LA	3,ABUFA	BRE02210
LOOP	MVC	0(224,2),0(3)	BRE02220
	MVC	224(224,2),224(3)	BRE02230
	MVC	448(224,2),448(3)	BRE02240
	MVC	672(224,2),672(3)	BRE02250
	MVC	896(224,2),896(3)	BRE02260
	MVC	1120(220,2),1120(3)	BRE02270
	MVC	1340(220,2),1340(3)	BRE02280
	MVC	1560(220,2),1560(3)	BRE02290
	MVC	1780(220,2),1780(3)	BRE02300
	MVC	2000(48,2),2000(3)	BRE02310
	A	3,T2048	BRE02320
	A	2,T2048	BRE02330
	CR	9,2	BRE02340
	ECCR	13,14	BRE02350
	BCT	8,LOOP	BRE02360
	BR	14	BRE02370
T2048	DC	F'2048'	BRE02380
CON1	DC	X'000FFFFF'	BRE02390
KERR	DC	X'00'	BRE02400
TAPCE	DC	X'00'	BRE02410
CC	DC	X'00'	BRE02420
SHOW	DC	X'0F'	BRE02430
EOFCTR	DC	F'1'	BRE02440
CTR	DC	F'0'	BRE02450
UNIT	DC	F'0'	BRE02460
SAVEP	DC	F'0'	BRE02470
CURBF	DC	F'0'	BRE02480
ABUF1	DC	F'0'	BRE02490
ABUF2	DC	F'0'	BRE02500
LENGTH	DC	F'0'	BRE02510
IPL	DC	F'0'	BRE02520
INDX	DC	F'0'	BRE02530
LEN	DC	F'0'	BRE02540
IPLG	DC	F'0'	BRE02550
IADD	DC	F'0'	BRE02560
SAVE	DC	18F'-1'	BRE02570
ONE	DC	F'1'	BRE02580
ABUFA	DS	2048F	BRE02590
	ICBD		BRE02600
	END		BRE02610

APPENDIX B
SUBROUTINE HDRR PROGRAM LISTING

HDRR RETRIEVES DATA FROM TAPE HEADER RECORD

THIS SUBROUTINE HAS TWO ENTRIES, HDRR AND NAMET. HDRR IS USED TO GAIN ACCESS TO TAPE HEADER RECORD FMHDRD WHICH APPEARS AS THE FIRST RECORD OF A RADAR, CATALOG, OR TRANSCRIPTION TAPE. NAMET IS USED TO CONVERT THE 4 CHARACTER BCD NAMES OF OTHER DATA BLOCK FORMATS TO EBCDIC. THIS PERMITS THE FORTRAN PROGRAM TO BYPASS THE STORAGE OF FORMAT TABLES NOT NEEDED BY THE PROGRAM.

* CALLING SEQUENCES

*
* CALL HDRR (IADD, ITYP, IDARR)

* WHERE IADD IS SET TO THE ACTUAL ADDRESS OF THE READ BUFFER USED FOR READING.

* ITYP INDICATES THE TYPE OF TAPE; INTEGER VARIABLE.

* WHERE:

- * 1 = CATALOG TAPE
- * 2 = TRANSCRIPTION TAPE
- * 5 = RADAR TAPE

* IDARR DATA TAPE IDENTIFICATION IN EBCDIC. DIMENSIONED EIGHT WORDS. CONTAINS CLASSIFIED INFORMATION SO SHOULD ONLY BE USED WITH DISCRETION.

* CALL NAMET (IADD, NAMED)

* WHERE IADD IS SET TO THE ACTUAL ADDRESS OF THE READ BUFFER USED FOR READING.

* NAMED IS THE 4 CHARACTER EBCDIC NAME OF THE FORMAT TABLE MOST RECENTLY PROCESSED BY THE READ ROUTINE.

*
* VERSION 11/20/69

```

*
*      START  0
*      ENTRY  NAMET
*      ENTRY  HDRR
*      USING  *,15
HDRR  STM    14,12,12(13)
      LR     12,13
      LA     13,SAVE
      ST     12,4(0,13)
      ST     13,8(0,12)
      LM     2,4,0(1)
      L      2,0(0,2)
      L      6,8(0,2)
      ST     6,0(0,3)
      LA     3,3
      LR     5,4
      LA     9,SAVER
LOOPTW LM     6,8,12(2)
      STM    6,8,0(9)
      SRDL   6,2
      SIL    6,2
      SLDL   6,6
      SLL    6,2

```

```

SIDL 6,6
SIL 6,2
SLDL 6,6
ST 6,0(0,4)
LR 7,8
SR 6,6
SIL 7,8
SIDL 6,6
SLL 6,2
SIDL 6,6
SLL 6,2
SIDL 6,6
SIL 6,2
SLDL 6,6
ST 6,4(0,4)
A 4,=P'8'
A 2,=P'12'
A 9,=P'12'
BCT 3,LOOPW
TRNSLVN TR 0(24,5),TABLE
L 13,SAVE+4
LM 14,12,12(13)
RETURN RC=0
USING *,15
NAMEI STM 14,12,12(13)
LR 12,13
EALR 11,0
USING *,11
LA 13,SAVE
ST 12,4(0,13)
ST 13,8(0,12)
LM 4,5,0(1)
L 4,0(0,4)
LM 2,3,0(4)
N 2,=X'000000FF'
SRDL 2,2
SLL 2,2
SLDL 2,6
SLL 2,2
SLDL 2,6
SIL 2,2
SLDL 2,6
SI 2,0(0,5)
TR 0(4,5),TABLE
L 13,SAVE+4
LM 14,12,12(13)
RETURN RC=0
SAVE DC 18P'-1'
SAVEF DC 20P'15'
TABLE DC C'0123456789 ='
DC C'' /STUVWX'
DC C'YZ .) -JKL'
DC C'MNOPQR $* '
DC C'+ABCDEFGHI ,( '
END

```

APPENDIX C
SUBROUTINE FORM PROGRAM LISTING

```

***FCRM
*
* STORES DATA BLOCK FORMATS
*
* THIS SUBROUTINE STORES AND UNPACKS SELECTED DATA BLOCK FORMATS
* IN A CONVENIENT FORM FOR LATER USE BY THE GET/IGET FUNCTIONS.
*
* CALLING SEQUENCES
*
* CALL FORM (IADD, ITEM, IB, NAMED, NTEM, ARG6)
*
* WHERE IADD IS SET TO THE ACTUAL ADDRESS OF THE READ BUFFER USED
* FOR READING.
*
* ITEM IS THE FORMAT TAPE IMAGE. EACH ITEM IS STORED IN SIX
* HALFWORDS. ITEM MUST BE DIMENSIONED TO THE TOTAL NUMBER
* OF ITEMS STORED X 6.
*
* IB IS THE ITEM BASE INDEX.
*
* NAMED IS THE 4 CHARACTER EBCDIC NAME OF THE FORMAT TABLE
* MOST RECENTLY PROCESSED BY THE READ ROUTINE.
*
* NTEM IS THE NUMBER OF ITEMS IN THE MOST RECENTLY READ FORMAT
* TABLE.
*
* ARG6 IS AN ABNORMAL RETURN; STATEMENT LABEL. OCCURS WHEN A
* FORMAT TABLE HAS MORE THAN 700 ITEMS OR WHEN A FORMAT
* TABLE HAS 0 LENGTH.
*
* VERSION 10/27/69
*
*
* START 0
* ENTRY FORM SEARCH FORMAT TABLES
* USING *, 15
*
FORM B F5
DC XL1'05', CL5'FORM' ENTRY
F5 STM 2, 10, 28(13) SAVE FORTRAN REGISTERS USED
LM 5, 9, 0(1) LOAD INDEXES TO TABLES
*
* 5 IADD - TAPE I/O AREA
* 6 ITEM - FORMAT TAPE IMAGE
* 7 IB - ITEM BASE INDEXES
* 8 NAME - FORMAT NAMES
* 9 NTEM - NUMBER OF ITEMS/FORM
*
* ST 6, 0(7) BASE ADDRESS IN BYTES
* L 5, 0(5) LOAD ADDRESS
* MVC WD+1(3), 0(5) STANDARD WORD BOUNDARY
* NI WD, X'00'
* LH 4, WD+2
* SRL 4, 1 LOAD 2 BYTE LENGTH OF FORMAT
* S 4, =F'1' DIVIDE FORMAT LENGTH BY 2
* LR 10, 4 NUMBER OF ITEMS
* ST 4, 0(9) SAVE NO. OF ITEMS +1
* MVC WD+1(3), 3(5) STORE NTEM
* L 2, WD 24 BIT NAME
* LA 1, 4 LOAD BCD NAME
* SRDL 2, 6 4 BCD LETTERS
* SRL 3, 2 6 BCD BITS/BYTE
* BCT 1, F10 2 ZERO BITS/BYTE
* ST 3, 0(8) STORE NAME IN BCD
* TR 0(4, 8), TABLE TRANSLATE NAME INTO EBCDIC
* C 4, =F'0' TEST FOR ZERO TABLE LENGTH

```

	BNH	F45	
	C	4,=F'700'	10/27/69
	BNL	F45	TEST FOR TOO LONG
F15	LA	5,6(5)	NEXT ITEM
	MVC	WD+1(3),0(5)	
	L	4,WD	
	N	4,=X'007FFFFFF'	DROP 8 BIT
	SR	2,2	
	LF	3,4	
	D	2,=F'100000'	
	STH	3,0(6)	P
	M	2,=F'100000'	
	SR	4,3	
	SR	2,2	
	LF	3,4	
	D	2,=F'10000'	
	STH	3,2(6)	M
	M	2,=F'10000'	
	SR	4,3	
	STH	4,4(6)	RRRR
	SR	2,2	
	MVC	WD+1(3),3(5)	
	CH	2,2(6)	
	BNE	F35	MODE ZERO
	MVC	8(4,6),2(5)	360 FLOATING
	CH	2,0(6)	BYTE ADDRESS
	BNE	F40	
	L	7,WD	MANTISSA
	SLL	7,8	
	SR	9,9	
	CR	7,2	NEGATIVE
	DNL	F20	
	LA	9,1	
	SLL	7,1	DROP SIGN BIT
	SRL	7,1	
F20	SRL	7,8	
	TM	0(5),X'80'	
	BO	F25	
	TM	3(5),X'40'	
	BO	F25	
	O	7,=X'46000000'	INTEGER EXPONENT
	CH	2,4(6)	
	BE	F30	
F25	SLL	7,8	DROP EXPONENT
	SRL	7,8	
	IH	2,4(6)	
	SLL	2,23	
	SRA	2,23	
	AH	2,=X'0103'	
	SRDL	2,2	
	SRL	3,30	
	SLL	7,0(3)	
	SRL	7,2	
	SRDL	2,8	
	OR	7,3	

```

F30  SLL  9,31
      OR   7,9
      ST   7,8(6)
      R    F40
F35  L     4,WD
      LR   3,4
      D    2,=F'10000'
      STH  3,6(6)           XX
      M    2,=F'10000'
      SR   4,3
      SR   2,2
      LR   3,4
      D    2,=F'100'
      STH  3,8(6)           NN
      M    2,=F'100'
      SR   4,3
      STH  4,10(6)         BB
F40  LA    6,12(6)
      BCT  10,F15
      RETURN (2,10)
F45  RETURN (2,10),RC=4
WD   DC    F'0'

```

STANDARD WORD BOUNDRY
BCD TO EBCDIC TABLE

```

TABLE DC XL16'FOF1F2F3F4F5F6F7F8F9404040404040'
      DC XL16'4040E2E3E4E5E6E7E8E9404040404040'
      DC XL16'40D1D2D3D4D5D6D7D8D9404040404040'
      DC XL16'40C1C2C3C4C5C6C7C8C9404040404040'
      I TORG
      END

```


	MVC	WD(4),8(7)	FLOATING POINT WORD
	B	G122	
G20	TM	KEY,X'02'	TEST FOR FLOATING ANSWER
	BC	G30	
G25	RETURN	(2,11)	
G30	O	0,X'46000000'	EXPONENT
	ST	0,WD	
G32	SER	0,0	NORMALIZE
	AE	0,WD	GET
	B	G25	
G35	LH	3,4(7)	RRRR
	S	3,P'1'	
	CH	2,0(7)	TEST P
	BNE	G40	
	LR	1,3	MULTIPLY RRRR BY 3
	AR	3,1	
	AR	3,1	
G40	AR	8,3	DATA ADDRESS
	C	10,P'6'	TEST M
	BE	G135	224 FLOATING POINT
	BH	G120	360 FLOATING POINT
*			1 DATA
*			2 ZERO
*			4 IX
*			5 NN
*			6 BB
*			7 M
	LH	4,6(7)	
	CR	4,2	TEST IX
	BNE	G45	
	LA	4,1	IX=1
	LA	5,24	NN=24
	LA	6,24	BB=24
	F	G50	
G45	LH	5,8(7)	NN
	LH	6,10(7)	BB
*			LEFT ADJUST DATA
G50	SR	9,9	POSITION NUMBER
	MVC	WD(4),0(8)	DATA ON WORD BOUNDRY
	L	3,WD	LOAD DATA
	S	4,P'1'	
	SLL	3,0(4)	LEFT ADJUST DATA
	AR	10,10	MULTIPLY M BY 4
	AR	10,10	
	B	GG-4(10)	
GG	B	G55	M=1 POSITIVE
	B	G60	M=2 SIGN MAGNITUDE
	B	G60	M=3 SIGN MAGNITUDE
	B	G70	M=4 2'S COMPLEMENT
	B	G80	M=5 1'S COMPLEMENT
G55	SLL	2,0(5)	POSITIVE DATA
	B	G85	
G60	CR	3,2	TEST DATA
	BNL	G55	POSITIVE
	SLL	3,1	DROP SIGN BIT

G65	SRL	3,1	
	LA	9,1	NEGATIVE NUMBER
	B	G55	
G70	CR	3,2	2'S COMPLEMENT
	BNL	G55	POSITIVE
G75	SR	2,3	MAKE POSITIVE
	LR	3,2	
	SR	2,2	
	B	G65	
G80	CR	3,2	1'S COMPLEMENT
	BNL	G55	POSITIVE
	SLDL	2,0(5)	
	LA	2,1(2)	CONVERT TO 2'S COMPLEMENT
	SRDL	2,0(5)	
	B	G75	
G85	TM	KEY,X'02'	TEST ENTRY
	BO	G100	FLOAT
	CR	5,6	TEST NN,BB
	BH	G90	NN>BB
	SR	6,5	BB-NN
	SLL	2,0(6)	
	B	G95	EXIT
G90	SR	5,6	NN-BB
	SRL	2,0(5)	
G95	LR	0,2	ANSWER
	SR	1,1	
	CR	9,1	TEST SIGN
	BE	G25	POSITIVE
	SR	1,2	MAKE NEGATIVE
	LR	0,1	
	B	G25	
G100	CR	6,5	TEST BB,NN
	BI	G110	BB<NN
	SR	6,5	BB-NN
	LR	1,6	
	N	1,=P'3'	
	SLL	2,0(1)	POWER OF 2
	SRL	8,2	POWER OF 16
	LA	6,70(6)	EXPONENT
G105	SLL	6,24	POSITION EXPONENT
	SLL	9,31	SIGN BIT
	OR	6,9	SIGN+EXPONENT
	OR	2,6	ANSWER
	ST	2,WD	
	LF	0,WD	
	B	G25	
G110	SR	5,6	NN-BB
	LF	1,5	
	SRL	5,2	POWER OF 16
	N	1,=P'3'	POWER OF 2
	SR	3,3	
	CR	1,3	ZERO POWER OF 2
	BE	G115	
	LA	5,1(5)	
	LA	3,4	

	SR	3,1	
	SLL	2,0(3)	
G115	LA	6,70	STANDARD EXPONENT
	SR	6,5	
	B	G105	
G120	MVC	WD(4),0(8)	360 FLOAT DATA
G122	TM	KEY,X'02'	
	BQ	G32	
	L	3,WD	LOAD DATA
	SR	2,2	
	SLDL	2,1	SIGN BIT
	LR	9,2	
	SR	2,2	
	SLDL	2,7	EXPONENT
	SRL	3,8	
	LA	1,70	
	CR	2,1	
	BL	G130	E<70
	SR	2,1	
	SLL	2,2	MULTIPLY BY 2
	SLL	3,0(2)	
G125	LR	0,3	
	SR	2,2	
	CR	2,9	
	BE	G25	
	SR	2,3	MAKE NEGATIVE
	LR	0,2	
	B	G25	
G130	SR	1,2	DROP BITS
	SLL	1,2	
	SRL	3,0(1)	
	B	G125	
G135	MVI	WD+7,X'00'	
	MVI	WD,X'00'	
	LA	2,0	
	MVC	WD+1(3),0(8)	
	LA	3,0	
	MVC	WD+4(3),3(8)	
	L	4,WD+4	
TESTMAN	LTR	5,4	
	SLL	4,1	
	BC	10,TSTEXP	
	MVI	MANFLG,X'80'	
TSTEXP	TM	WD+2,X'01'	
	BZ	POSEXP	
	MVI	EXPFLG,X'FF'	
	XI	WD+3,X'FF'	
	IC	3,WD+3	
	A	3,=P'1'	
	D	2,=P'4'	
	STC	2,SHIFT+3	
	BC	15,SHIFT	
POSEXP	IC	3,WD+3	
	D	2,=P'4'	
	C	2,=P'0'	

	BC	8,REMZERO
	LA	5,4
	SR	5,2
	STC	5,SHIPT+3
SHIFT	SRL	4,0
	BC	15,NEWEXP
REMZERO	S	3,=P'1'
NEWEXP	LA	5,65
	TM	EXPFPG,X'FF'
	BC	1,NEGEXP
	AR	5,3
	BC	15,STPLPT
NEGEXP	SR	5,3
	S	5,=P'1'
STPLPT	SRL	4,8
	ST	4,WD
	STC	5,WD
	OC	WD(1),MANFLG
	B	G122
EXPFPG	DC	X'00'
MANFIG	DC	X'00'
WD	DS	2F
KEY	DS	CL1
	LTORG	
	LYORG	
	END	