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INVESTIGATION OF MICROPULSATION ACTIVITY. 1. MAGAF SYSTEM ADDIT--ETC(U)

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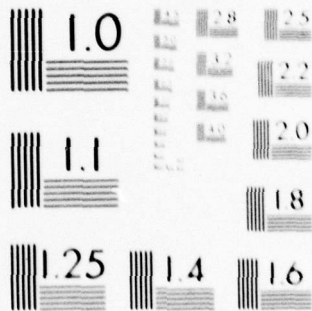
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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LEVEL

III

12

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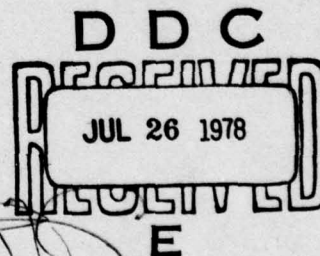
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INVESTIGATION OF MICROPULSATION ACTIVITY
1. MAGAF SYSTEM ADDITIONS
2. DATA ANALYSIS

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Systems Additions to the MAGAF data processing system are described herein. In the area of data analysis, a program written to generate magnetograms from the MAGAF Network data is described and sample magnetograms are shown.		

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I. MAGAF SYSTEM ADDITIONS

A.

SUBROUTINES \$UNPK AND \$REPK

SUBROUTINES \$UNPK AND \$REPK HAVE BEEN WRITTEN RESPECTIVELY TO UNPACK A DATA FRAME FROM RECEIVED DATA ORDER TO INSTRUMENT ORDER (DEFINED IN A PREVIOUS REPORT) AND TO REPACK THE DATA INTO RECEIVED DATA ORDER. SUBROUTINE REPACK IS USED PRIMARILY TO OBTAIN DUMPS FOR HARDWARE DIAGNOSTIC PURPOSES.

A PERMUTATION TABLE (\$CYCST THRU Ø\$CYCND) WHICH DEFINES THE PARTICULAR PERMUTATION FOR THIS PURPOSE HAS BEEN ADDED TO THE IN CORE SYSTEM.

USAGE: DIMENSION IA(245), IB(245)

CALL \$UNPK(IA,IB)

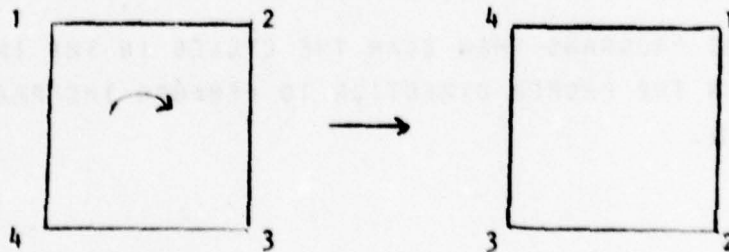
CALL \$REPK(IA,IB)

RESTRICTION: IA AND IB MUST BE DISJOINT OR IDENTICAL.

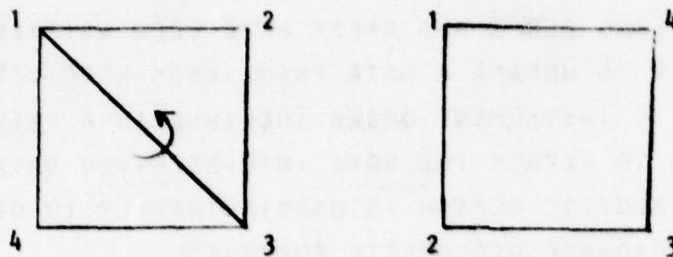
BECAUSE THE METHOD USED IS GENERALLY APPLICABLE TO ANY PERMUTATION AND ITS INVERSE, A BRIEF DISCUSSION OF METHOD AND A FLOW CHART OF THE PROCEDURE WILL BE GIVEN.

THEORY:

ANY PERMUTATION CAN BE REPRESENTED AS A PRODUCT OF DISJOINT CYCLES, WHERE A CYCLE IS MERELY A TRACING OF ELEMENTS WHICH PERMUTE INTO EACH OTHER. (SEE ANY TEXT ON MODERN ALGEBRA). FOR EXAMPLE, USING PERMUTATIONS OF A SQUARE, ROTATION THROUGH 90°:



CAN BE REPRESENTED AS (1,2,3,4) i.e. 1 GOES TO 2
GOES TO 3 GOES TO 4 GOES TO 1 AND REFLECTION ABOUT
A DIAGONAL



CAN BE REPRESENTED AS (1) (3) (2,4).

THE ADVANTAGE OF THIS REPRESENTATION IS THAT THE
INVERSE PERMUTATION IS IMPLICITLY DEFINED BY THE PER-
MUTATION ITSELF - READ THE CYCLES BACKWARDS.

METHOD:

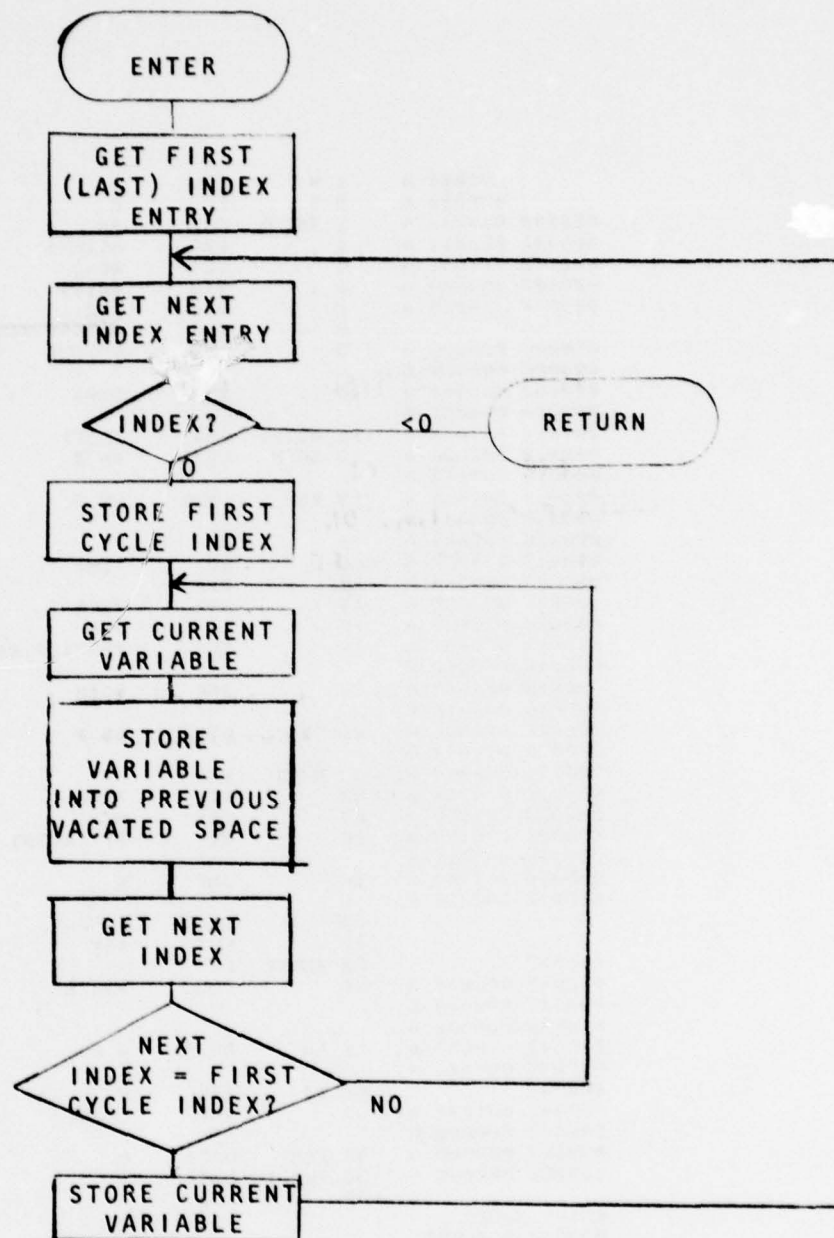
AN INDEX TABLE IS PREPARED WITH NEGATIVE TERMI-
NATORS AT BOTH ENDS CONTAINING THE CYCLES AUGMENTED
BY THE START INDEX OF EACH CYCLE.

FOR EXAMPLE THE TABLES FOR THE ROTATION AND
REFLECTION WOULD BE:

ROTATION	REFLECTION
-1	-1
1	1
2	1
3	3
4	3
1	2
-1	4
	2
	-1

THE PROGRAMS THEN SCAN THE CYCLES IN THE INDEX
TABLE IN THE PROPER DIRECTION TO PERFORM THE PER-
MUTATION.

FLOW CHART:



000001	A	1	X	EQU	1	
000002	A	2	B	EQU	2	
000000	014042	A	3	SETUP	LDA	AA
000001	054011	A	4		STA	AGIN+1
000002	014041	A	5		LDA	AA+1
000003	054024	A	6		STA	BB1+1
000004	054010	A	7		STA	BB2+1
			8	EXT	\$CYCST, \$CYCND	
000005	006030	A	9	LDXI	\$CYCND	
000006	000000	E				(\$CYCST FOR \$REPK)
000007	001000	A	10	JMP	DXR1	
000010	000031	R				
000011	064036	A	11	AGIN1	STB	TEMP1
000012	006030	A	12	AGIN	LDX	AA, B
000013	000043	R				
000014	006056	A	13	BB2	STAE	BB, B
000015	000044	R				
000016	005041	A	14	TXA		
000017	034027	A	15	LDX	TEMP	(1XR FOR \$REPK)
000020	005344	A	16	DXR		
000021	074025	A	17	STX	TEMP	
000022	025000	A	18	LDB	0, X	
000023	006627	A	19	SRE	TEMP1, 7, 020	
000024	000050	R				
000025	001000	A	20	JMP	AGIN	
000026	000012	R				
000027	006056	A	21	BB1	STAE	BB, B
000030	000044	R				(1XR FOR \$REPK)
000031	005344	A	22	DXR1	DXR	
000032	074014	A	23	STX	TEMP	
000033	025000	A	24	LDB	0, X	
000034	006477	A	25	BT	077, AGIN1	BTB0
000035	000011	R				
000036	001000	A	26	JMP	1	
000037	000026	R				(\$REPK FOR \$REPK)
			27	NAME	\$UNPK	
			28	EXT	\$SE	(\$REPK FOR \$REPK)
000037			29	\$UNPK	BES	0
000040	002000	A	30	CALL	\$SE, 2	
000041	000000	E				
000042	000002	A				
000043	000000	A	31	AA	DATA	0, 0
000044	000000	A	32	BB	BES	0
000045	001000	A	33	JMP	SETUP	
000046	000000	R				
000047	000000	A	34	TEMP	DATA	0
000050	000000	A	35	TEMP1	DATA	0
			36	END		

ENTRY NAMES

000037 R \$UNPK

EXTERNAL NAMES

000006 E \$CYCND 000000 E \$CYCST 000041 E \$SE

SYMBOLS

000006 E \$CYCND 000000 E \$CYCST 000041 E \$SE 000037 R \$UNPK

000043 R AA 000012 R AGIN 000011 R AGIN1 000002 A B

000044 R BB 000027 R BB1 000014 R BB2 000031 R DXR1

000000 R SETUP 000017 R TEMP 000050 R TEMP1 000001 A X

0 ERRORS ASSEMBLY COMPLETE

	1		
	2		
	3	NAME	SCVCST, SCVCND
000000 177777 A	4	SCVCST DATA	-1
	5	NLIS	
	6	DATA	0, 4, 16, 64, 55, 24, 92, 179, 189, 3, 13, 51, 8, 32, 140
000001 000000 A			
000002 000004 A			
000003 000020 A			
000004 000100 A			
000005 000067 A			
000006 000030 A			
000007 000134 A			
000010 000263 A			
000011 000275 A			
000012 000003 A			
000013 000015 A			
000014 000063 A			
000015 000010 A			
000016 000040 A			
000017 000214 A			
000020 000256 A	7	DATA	174, 78, 125, 117, 69, 74, 93, 182, 212, 215, 218, 221, 224, 227, 95
000021 000116 A			
000022 000175 A			
000023 000165 A			
000024 000105 A			
000025 000112 A			
000026 000135 A			
000027 000266 A			
000030 000324 A			
000031 000327 A			
000032 000332 A			
000033 000335 A			
000034 000340 A			
000035 000343 A			
000036 000137 A			
000037 000300 A	8	DATA	192, 60, 43, 181, 209, 108, 34, 146, 196, 152, 38, 162, 39, 165, 113
000040 000074 A			
000041 000053 A			
000042 000265 A			
000043 000321 A			
000044 000154 A			
000045 000042 A			
000046 000222 A			
000047 000304 A			
000050 000230 A			
000051 000046 A			
000052 000242 A			
000053 000047 A			
000054 000245 A			
000055 000160 A			
000056 000062 A	9	DATA	50, 5, 23, 89, 166, 131, 139, 167, 150, 0
000057 000005 A			
000060 000027 A			

000061	000131	A		
000062	000246	A		
000063	000203	A		
000064	000213	A		
000065	000247	A		
000066	000226	A		
000067	000000	A		
000070	000001	A	10	DATA 1, 7, 29, 127, 123, 91, 176, 132, 140, 180, 206, 105, 25, 115, 63
000071	000007	A		
000072	000035	A		
000073	000177	A		
000074	000173	A		
000075	000133	A		
000076	000260	A		
000077	000204	A		
000100	000216	A		
000101	000264	A		
000102	000316	A		
000103	000151	A		
000104	000031	A		
000105	000163	H		
000106	000077	A		
000107	000064	A	11	DATA 52, 11, 45, 191, 41, 175, 113, 53, 14, 54, 17, 67, 63, 71, 34
000110	000013	A		
000111	000055	A		
000112	000277	A		
000113	000051	A		
000114	000257	H		
000115	000161	A		
000116	000065	A		
000117	000016	H		
000120	000066	A		
000121	000021	A		
000122	000103	H		
000123	000104	A		
000124	000107	A		
000125	000124	H		
000126	000223	A	12	DATA 147, 199, 98, 201, 100, 6, 26, 113, 72, 87, 160, 1
000127	000307	H		
000130	000142	A		
000131	000311	A		
000132	000144	A		
000133	000006	A		
000134	000032	A		
000135	000166	A		
000136	000110	A		
000137	000127	A		
000140	000240	A		
000141	000001	A		
000142	000002	A	13	DATA 2, 10, 42, 178, 170, 2
000143	000012	H		
000144	000052	A		
000145	000262	A		

000146	000252	A			
000147	000002	A			
000150	000011	A	14	DATA	9, 35, 153, 57, 30, 134, 143, 202, 101, 9
000151	000043	A			
000152	000231	A			
000153	000071	A			
000154	000036	A			
000155	000206	A			
000156	000224	A			
000157	000312	A			
000160	000145	A			
000161	000011	A			
000162	000014	A	15	DATA	12, 48, 200, 99, 204, 103, 15, 61, 46, 194, 114, 56, 27, 121, 85
000163	000060	A			
000164	000310	A			
000165	000143	A			
000166	000314	A			
000167	000147	A			
000170	000017	A			
000171	000075	A			
000172	000056	A			
000173	000302	A			
000174	000162	A			
000175	000070	A			
000176	000033	A			
000177	000171	A			
000200	000125	A			
000201	000232	A	16	DATA	154, 76, 119, 75, 116, 66, 65, 62, 49, 203, 102, 12
000202	000114	A			
000203	000167	A			
000204	000113	A			
000205	000164	A			
000206	000102	A			
000207	000101	A			
000210	000076	A			
000211	000061	A			
000212	000313	A			
000213	000146	A			
000214	000014	A			
000215	000022	A	17	DATA	18, 70, 81, 138, 164, 77, 122, 88, 163, 58, 33, 143, 183, 207, 106
000216	000106	A			
000217	000121	A			
000220	000212	A			
000221	000244	A			
000222	000115	A			
000223	000172	A			
000224	000130	A			
000225	000243	A			
000226	000072	A			
000227	000041	A			
000230	000217	A			
000231	000267	A			
000232	000317	A			

000233	000152	A			
000234	000034	A	18	DATA	38, 124, 94, 185, 213, 216, 219, 222, 225, 228, 96, 195, 133, 145, 193
000235	000174	A			
000236	000136	A			
000237	000271	A			
000240	000325	A			
000241	000330	A			
000242	000333	A			
000243	000336	A			
000244	000341	A			
000245	000344	A			
000246	000140	A			
000247	000303	A			
000250	000205	A			
000251	000221	A			
000252	000301	A			
000253	000117	A	19	DATA	79, 128, 126, 120, 82, 141, 177, 151, 19, 73, 90, 173, 59, 36, 156
000254	000200	A			
000255	000176	A			
000256	000170	A			
000257	000122	A			
000260	000215	A			
000261	000261	A			
000262	000227	A			
000263	000023	A			
000264	000111	A			
000265	000132	A			
000266	000255	A			
000267	000073	A			
000270	000044	A			
000271	000234	A			
000272	000202	A	20	DATA	130, 136, 158, 168, 169, 188, 214, 217, 220, 223, 226, 229, 97, 193, 19
000273	000210	A			
000274	000236	A			
000275	000250	A			
000276	000251	A			
000277	000274	A			
000300	000326	A			
000301	000331	A			
000302	000334	A			
000303	000337	A			
000304	000342	A			
000305	000345	A			
000306	000141	A			
000307	000306	A			
000310	000276	A			
000311	000026	A	21	DATA	22, 86, 157, 149, 205, 104, 18
000312	000126	A			
000313	000235	A			
000314	000225	A			
000315	000315	A			
000316	000150	A			
000317	000022	A			

000320 000024 A	22	DATA	20, 80, 135, 155, 111, 47, 197, 171, 21, 83, 144, 196, 208, 107, 31
000321 000120 A			
000322 000207 A			
000323 000233 A			
000324 000157 A			
000325 000057 A			
000326 000305 A			
000327 000253 A			
000330 000025 A			
000331 000123 A			
000332 000220 A			
000333 000272 A			
000334 000320 A			
000335 000153 A			
000336 000037 A			
000337 000211 A	23	DATA	137, 161, 20
000340 000241 A			
000341 000024 A			
000342 000045 A	24	DATA	37, 159, 187, 211, 110, 44, 184, 210, 109, 37
000343 000237 A			
000344 000273 A			
000345 000323 A			
000346 000156 A			
000347 000054 A			
000350 000270 A			
000351 000322 A			
000352 000155 A			
000353 000045 A			
000354 000050 A	25	DATA	40, 172, 40
000355 000254 A			
000356 000050 A			
000357 000201 A	26	DATA	129, 129
000360 000201 A			
000361 000346 A	27	DATA	230, 230
000362 000346 A			
000363 000347 A	28	DATA	231, 231
000364 000347 A			
000365 000350 A	29	DATA	232, 232
000366 000350 A			
000367 000351 A	30	DATA	233, 233
000370 000351 A			
000371 000352 A	31	DATA	234, 234
000372 000352 A			
000373 000353 A	32	DATA	235, 235
000374 000353 A			
000375 000354 A	33	DATA	236, 236
000376 000354 A			
000377 000355 A	34	DATA	237, 237
000400 000355 A			
000401 000356 A	35	DATA	238, 238
000402 000356 A			
000403 000357 A	36	DATA	239, 239
000404 000357 A			
000405 000360 A	37	DATA	240, 240
000406 000360 A			
000407 000361 A	38	DATA	241, 241
000410 000361 A			
000411 000362 A	39	DATA	242, 242
000412 000362 A			
000413 000363 A	40	DATA	243, 243
000414 000363 A			
000415 000364 A	41	DATA	244, 244
000416 000364 A			
	42	LIST	
000417 177777 A	43	SCYCND DATA	-1
	44	END	

ENTRY NAMES

000417 R SCYCND 000000 R SCYCST

EXTERNAL NAMES

SYMBOLS

000417 R SCYCND 000000 R SCYCST

0 ERRORS ASSEMBLY COMPLETE

B.

DATA STORAGE AND RETRIEVAL SUBROUTINES

THE DATA STORAGE AND RETRIEVAL SUBROUTINES ARE DESIGNED TO FACILITATE THE STORAGE AND RETRIEVAL OF TIME SERIES DATA WITHOUT REQUIRING INORDINATE AMOUNTS OF CORE. THERE ARE SIX SUBROUTINES, EACH OF WHICH WILL BE DESCRIBED.

ROUTINE: OP\$N

CALLING SEQUENCE: CALL OP\$N (BUFFER,NVAR)

BUFFER - FLOATING POINT ARRAY OF DIMENSION AT
LEAST 60*NVAR (120*NVAR FOR FIXED POINT)

NVAR - NUMBER OF VARIABLES

OP\$N - MUST BE CALLED BEFORE ANY OTHER ROUTINES TO
OPEN THE DISKFILE (PLOTFL ON UNTIL 30) AND
SETUP FOR OTHER ROUTINES

ROUTINE: ADDCMP (ADD COMPONENT)

CALLING SEQUENCE: CALL ADDCMP(A,I)

A - VARIABLE TO BE ADDED

I - INDEX OF VARIABLE SNNAR

ROUTINE: RETRIV

CALLING SEQUENCE: CALL RETRIV(VECT,I)

VECT - VECTOR WHICH IS TO BE RETURNED

I - INDEX OF VARIABLE

ROUTINE: CLO\$E

CALLING SEQUENCE: CALL CLO\$E

CLOSES DISKFILE AND UPDATES IT. REOPENS IT
FOR LATER USE

NOTE: FOR PROPER PROGRAM FUNCTIONING, ADDCMP MUST
HAVE BEEN CALLED THE SAME NUMBER OF TIMES
FOR EACH INDEX, AND THAT NUMBER MUST BE A
MULTIPLE OF 60.

ROUTINE: CLOSE

CALLING SEQUENCE: CALL CLOSE

CLOSE DISK FILE AND UP DATE IT. REOPEN IT
FOR LATER USE.

NOTE: FOR PROPER PROGRAM FUNCTIONING, ADDCMP MUST HAVE
BEEN CALLED THE SAME NUMBER OF TIMES FOR EACH
INDEX AND THAT NUMBER MUST BE A MULTIPLE OF 60.

ROUTINE: OP\$N1, CLOS1

CALLING SEQUENCE: CALL (OP\$N1) (IFIRST, ILAST)
(CLOS1)

(OP\$N1 RETRIEVES) DATA BETWEEN IFIRST AND ILAST (FROM) DISK.
(CLOS1 STORES) (TO)

EXAMPLE: A TAPE EXISTS IN THE FOLLOWING CARD IMAGE FORMAT.

RECORD 1 - Alphabetic ID.

RECORD 2 - $n_1 - X_1 - X_{20}$ - OBSERVATIONS OF 20
VARIABLES (20F4.0) $n \leq 2401$

PROBLEM: TO STORE THE DATA MATRIX ON DISK, LATER
TO PRINT OUT THE DATA VARIABLE BY VARIABLE.

```

      DIMENSION ID(40) BUFFER(1200) X(20)
      COMMON /XXXX/ ID,N
      REWIND 21

      READ (21,100) ID
100  FORMAT (40A2)
      N=0

      CALL OP$N(BUFFER,20)
1  READ (21,101) X
101  FORMAT (20F40)

      IF (IOCHK(21)) 2,3,4
2  BACKSPACE 21
   GO TO 1

3  N=N+1
   DO 5 I=1, 20
5  CALL ADDCMP(X(I),1)

   GO TO 1
4  NADD=MOD(N,60)
   IF (NADD.EQ. 0) GO TO 99

DO 6 I=1,NADD
  DO 6 J=1,20
6  CALL ADDCMP(0.0,J)

99  CALL CLOS1(ID,ID(41))
     STOP
     END

     DIMENSION ID(41), VECT(2400)
     CALL OP$N(VECT,20)
     CALL OP$N1(ID,ID(41))

     N=ID(41)
     DO 1 I=1,20
1    CALL RETRIV (VECT,I)

1  WRITE (5,100) (ID(J),J=1,40), (VECT(J)2
1  WRITE (5,100) (ID(J), J=1,40), (VECT(J)J=1,N)
100  FORMAT(1H1,40A2/(1X,30F4.0))

     END
```

			1	NAME	OP\$N,CLOSE,RETRIV,ADDCMP,OP\$N
			2	EXT	\$SE
	000422 A		3 TWO	EQU	0422
	000001 A		4 X	EQU	1
	000002 A		5 B	EQU	2
000000	000000 A		6 OP\$N1	ENTR	
000001	002000 A		7	CALL	\$SE,2,0,0
000002	000000 E				
000003	000002 A				
000004	000000 A				
000005	000000 A				
000006	002000 A		8	CALL	SAVE
000007	000062 R				
000010	005001 A		9	TZA	
000011	006506 A		10	JSR	RDW,B
000012	000026 R				
000013	000000 A		11 CLOS1	ENTR	
000014	002000 A		12	CALL	\$SE,2,0,0
000015	000002 E				
000016	000002 A				
000017	000000 A				
000020	000000 A				
000021	002000 A		13	CALL	SAVE
000022	000062 R				
000023	005101 A		14	INCR	01
000024	006506 A		15	JSR	RDW,B
000025	000026 R				
000026	004250 A		16 RDW	LRLA	S
000027	124073 A		17	ADD	READ+3
000030	054021 A		18	STA	RDW1+3
000031	005101 A		19	INCR	01
000032	054304 A		20	STA	FCB+3
000033	005021 A		21	TBA	
000034	006140 A		22	SUBI	CLOS1-OP\$N1
000035	000013 A				
000036	005014 A		23	TAX	
000037	015000 A		24	LDA	0,X
000040	054027 A		25	STA	RETRN
000041	015004 A		26	LDA	4,X
000042	054272 A		27	STA	FCB+1
000043	005211 A		28	CPA	
000044	120422 A		29	ADD	TWO
000045	125005 A		30	ADD	5,X
000046	054265 A		31	STA	FCB
			32 RDW1	READ	FCB,30
000047	006505 A				
000050	000000 E				
000051	100000 A				
000052	000036 A				
000053	000134 R				
000054	000000 A				
000055	000000 A				
000056	014267 A		33	LDA	D120

000057	054254	A	34	STA	FCB
000060	001000	A	35	JMP	RETRN+1
000061	000071	R			
000062	000000	A	36	SAVE	ENTR
000063	054012	A	37	STA	STA
000064	064012	A	38	STB	STB
000065	074012	A	39	STX	STX
000066	001000	A	40	RETU*	SAVE
000067	100062	R			
000070	000000	A	41	RETRN	ENTR
000071	014004	A	42	LDA	STA
000072	024004	A	43	LDB	STB
000073	034004	A	44	LDX	STX
000074	001000	A	45	RETU*	RETRN
000075	100070	R			
000076	000000	A	46	STA	DATA 0
000077	000000	A	47	STB	DATA 0,0
000100	000000	A			
000100			48	STX	BES 0
			49	*	
			50	*	
000101	002000	A	51	RETR1	CALL SAVE
000102	000062	R			
000103	014045	A	52	LDA	WHERE
000104	054230	A	53	STA	FCB+1
			54	OPEN	FCB, 30
000105	006505	A			
000106	000050	E			
000107	100000	A			
000110	003036	A			
000111	000334	R			
000112	000000	A			
000113	000000	A			
000114	006017	A	55	LDAEX	ICM1
000115	100152	P			
000116	005111	A	56	IAR	
000117	054217	A	57	STA	FCB+3
			58	READ	READ FCB, 30
000120	006505	A			
000121	000106	E			
000122	100000	A			
000123	000036	A			
000124	000334	R			
000125	000000	A			
000126	000000	A			
000127	014205	A	59	LDA	FCB+1
000130	124215	A	60	ADD	D120
000131	054203	A	61	STA	FCB+1
000132	014204	A	62	LDA	FCB+3
000133	124175	A	63	ADD	HCOMP
000134	054202	A	64	STA	FCB+3
000135	124203	A	65	ADD	FCB+5
000136	144201	A	66	SUB	FCB+4

000137	005311	A	67	DAR	
000140	001004	A	68	JAN	READ
000141	000120	R			
000142	002000	A	69	CALL	RETRN
000143	000070	R			
000144	001000	A	70	JMP	*
000145	000144	R			
000145			71	RETRIV	BES 0
000146	002000	A	72	CALL	%SE,2
000147	000015	E			
000150	000002	A			
000151	000000	A	73	WHERE	DATA 0
000152	000000	A	74	ICM1	DATA 0
000153	001000	A	75	JMP	RETR1
000154	000101	R			
			76	*	
			77	*	
000155	002000	A	78	ADDCM1	CALL SAVE
000156	000062	R			
000157	006027	A	79	LDBEX	ICOMP
000160	100220	R			
000161	005322	A	80	DBR	
000162	064035	A	81	STB	ICOMP
000163	006216	A	82	LDAE	STPCMP,B,0200
000164	000427	R			
000165	054147	A	83	STA	FCB11
000166	006328	A	84	ADDE	NCMPS,B,0200
000167	000377	R			
000170	005014	A	85	TAX	
000171	024025	A	86	LDB	A
000172	016000	A	87	LDA	0,B
000173	055000	A	88	STA	0,X
000174	016001	A	89	LDA	1,B
000175	055001	A	90	STA	1,X
000176	024021	A	91	LDB	ICOMP
000177	006216	A	92	LDAE	NCMPS,B,0200
000200	000377	R			
000201	120422	A	93	ADD	TWO
000202	005014	A	94	TAX	
000203	144142	A	95	SUB	D120
000204	001010	A	96	JAZ	WRITE
000205	000223	R			
000206	006276	A	97	RET1	STXE NCMPS,B,0200
000207	000377	R			
000210	002000	A	98	CALL	RETRN
000211	000070	R			
000212	001000	A	99	JMP	*
000213	000212	R			
000213			100	ADDCMP	BES 0
000214	002000	A	101	CALL	%SE,2
000215	000147	E			
000216	000002	A			
000217	000000	A	102	A	DATA 0

000220	000000	A	103	ICOMP	DATA	0
000221	001000	A	104		JMP	ADDCM1
000222	000155	R				
000223	006216	A	105	WRITE	LDNE	RECNO, B, 0200
000224	000347	R				
000225	054111	A	106		STA	FCB+3
000226	124102	A	107		ADD	NOOMP
000227	006256	A	108		STOE	RECNO, B, 0200
000230	000347	R				
			109		WRITE	FCB, 30
000231	006505	A				
000232	000121	E				
000233	100000	A				
000234	000436	A				
000235	000334	R				
000236	000000	A				
000237	000000	A				
000240	005004	A	110		TX	
000241	001000	A	111		JMP	RET1
000242	000206	R				
			112	*		
			113	*		
000243	000000	A	114	CLOSE	ENTR	
000244	002000	A	115		CALL	SAVE
000245	000062	R				
000246	014100	A	116		LDA	RECNO
000247	054067	A	117		STA	FCB+3
			118		CLOSE	FCB, 30, , 1
000250	006505	A				
000251	000232	E				
000252	100000	A				
000253	013436	A				
000254	000334	R				
000255	000000	A				
000256	000000	A				
000257	002000	A	119		CALL	RETRN
000260	000070	R				
000261	001000	A	120		RETU*	CLOSE
000262	100243	R				
			121	*		
			122	*		
000263	002000	A	123	OPN1	CALL	SAVE
000264	000062	R				
000265	006037	A	124		LDXE*	NOOMP
000266	100331	R				
000267	074041	A	125		STX	NOOMP
000270	005040	A	126		TXB	
000271	014036	A	127		LDA	WORK
000272	164053	A	128		MUL	D120
000273	005021	A	129		TBA	
000274	005021	A	130		TBA	
000275	005002	A	131		TXB	
000276	144047	A	132	NXT1	SUB	D120

000277	006255	A	133	STAE	STRCMP-1,X,0200
000300	000426	R			
000301	006275	A	134	STXE	RECNO-1,X,0200
000302	000346	R			
000303	006245	A	135	INRE	RECNO-1,X,0200
000304	000346	R			
000305	006265	A	136	STRE	NCHPS-1,X,0200
000306	000376	R			
000307	005344	A	137	DXR	
000310	001646	A	138	JXNZ	NXT1
000311	000276	R			
			139	OPEN	FCB,30
000312	006505	A			
000313	000251	E			
000314	100000	A			
000315	003036	A			
000316	000334	R			
000317	000000	A			
000320	000000	A			
000321	002000	A	140	CALL	RETRN
000322	000070	R			
000323	001000	A	141	JMP	*
000324	000323	R			
000324			142	OP\$N	BES 0
000325	002000	A	143	CALL	#SE,2
000326	000215	E			
000327	000002	A			
000330	000000	A	144	WORK	DATA 0
000331	000000	A	145	NCOMP	DATA 0
000332	001000	A	146	JMP	OPN1
000333	000263	R			
			147	FCB	FCB 120,*0,, 'PL', 'OT', 'FL'
000334	000170	A			
000335	000334	R			
000336	000000	A			
000337	000000	A			
000340	000000	A			
000341	000000	A			
000342	000000	A			
000343	150314	A			
000344	147724	A			
000345	143314	A			
000346	000170	A	148	D120	DATA 120
000347			149	RECNO	BSS 24
000377			150	NCHPS	BSS 24
000427			151	STRCMP	BSS 24
			152	END	

ENTRY NAMES

000213 R ADDCMP 000013 R CLO#1 000243 R CLOSE 000324 R OP\$N
000000 R OP#H1 000145 R RETRIV

EXTERNAL NAMES

000326 E #SE 000313 E V#IOC

SYMBOLS

000326 E \$SE	000217 R A	000155 R ADDCM1	000213 R ADDCMP
000002 A B	000013 R CLOS1	000243 R CLOS1	000346 R D120
000334 R FCB	000152 R ICM1	000220 R ICOMP	000317 R NCMP5
000331 R HCOMP	000276 R NXT1	000324 R OPIN	000000 R OPIN1
000263 R OPN1	000026 R RDW	000047 R RDW1	000120 R READ
000347 R RECNO	000206 R RET1	000101 R RETR1	000145 R RETRIV
000070 R RETRN	000062 R SAVE	000076 R STA	000077 R STB
000427 R STRCMP	000100 R STX	000422 A TWO	000313 E VBIOT
000151 R WHERE	000330 R WORK	000223 R WRITE	000001 A X

0 ERRORS ASSEMBLY COMPLETE

C.

TEKTRONIX PLOTTING ROUTINES

A SERIES OF PLOTTING ROUTINES HAS BEEN ADDED TO THE SYSTEM TO ENABLE PLOT FILES IN VARIAN DATAPLOT FORMAT TO BE OUTPUT TO THE TEKTRONIX 4014. THESE ROUTINES SCALE A STATOS PLOT SO THAT ONE INCH ON THE STATOS EQUALS ONE INCH ON CRT, NOT ON THE HARDCOPY. THESE ROUTINES ARE TRANSPARENT TO THE USER, WITH THE FOLLOWING EXCEPTIONS:

- 1) CARE SHOULD BE USED WITH NEGATIVE ORIGINS (in inches)
- 2) PRINTS BEYOND THE SCREEN LIMITS END UP AT THE RIGHT HAND AND TOP LIMITS OF THE SCREEN
- 3) ALL CHARACTERS ARE PLOTTED AT THE CURRENT CHARACTER SIZE (see TEKFNC below) AND UPRIGHT-ORIENTATION
- 4) SPECIAL CHARACTERS HAVE NOT BEEN IMPLEMENTED
- 5) MINIMIZATION OF STATOS SORT AND PLOT TIMES MAY INCREASE TEKTRONIX PLOT TIMES

IN ADDITION, A SUBROUTINE TEKFNC HAS BEEN WRITTEN TO ENABLE THE USER ACCESS TO TEKTRONIX FUNCTIONS.

USAGE:

TO OUTPUT TO THE TEKTRONIX, ADD THE FOLLOWING SUBROUTINES TO ANY DATAPLOT PROGRAM:

```
SUBROUTINE DPSORT
CALL CRTPLT
RETURN
END
SUBROUTINE DPLOT
RETURN
END
```

TO USE TEKTRONIX FUNCTIONS:

CALL TEKFN(1)

1-----	FUNCTION
1-----	LARGEST CHARACTERS
2-----	2ND LARGEST CHARACTERS
3-----	3RD " "
4-----	4TH "(SMALLEST) CHARACTERS
5-----	SOLID VECTORS
6-----	DOTTED VECTORS
7-----	DOT-DASHED VECTORS
8-----	SHORT-DASHED VECTORS
9-----	LONG-DASHED VECTORS

		1	NAME	CRTPLT, I\$BLD1
		2	EXT	\$SE
	000001 A	3 X	EQU	1
	000002 A	4 B	EQU	2
	000423 A	5 FOUR	EQU	0423
000000	000000 A	6 CRTPLT	ENTR	
		7	REM	FCB, 8
000001	006505 A			
000002	000000 E			
000003	100000 A			
000004	001410 A			
000005	000133 R			
000006	000000 A			
000007	000000 A			
		8	EXT	I\$PLT
000010	006017 A	9	LDRE	I\$PLT
000011	000000 E			
000012	001016 A	10	JANZ	AGAIN
000013	000023 R			
		11	READ	DOB1, 2, , 1
000014	006505 A			
000015	000002 E			
000016	100000 A			
000017	010002 A			
000020	000145 R			
000021	000000 A			
000022	000000 A			
		12 AGAIN	READ	FCB, 8
000023	006505 A			
000024	000015 E			
000025	100000 A			
000026	000010 A			
000027	000133 R			
000030	000000 A			
000031	000000 A			
000032	014101 A	13	LDA	FCB+1
000033	054005 A	14	STA	CALSEQ
000034	006020 A	15	LDBI	30
000035	000036 A			
000036	005322 A	16 DBR	DBR	
		17	EXT	CONVRT
000037	002000 A	18	CALL	CONVRT, 0
000040	000000 E			
000041	000000 A			
000041		19 CALSEQ	BES	0
000042	006017 A	20	LDRE*	CALSEQ
000043	100041 R			
000044	006140 A	21	SUBI	32700
000045	077674 A			
000046	001002 A	22	JAP	CLSOT
000047	000061 R			
000050	006017 A	23	LDRE	CALSEQ
000051	000041 R			

000052	120423	A	24	ADD	FOUR
000053	006057	A	25	STAE	CALSEQ
000054	000041	R			
000055	001026	A	26	JBNZ	DBR
000056	000036	R			
000057	001000	A	27	JNP	AGAIN
000060	000023	R			
000061	014050	A	28	CLSOT	LDA DCBFN
000062	002016	A	29	JANZM	BUFOUT
000063	000121	R			
000064	001000	A	30	RETU*	CRTPLT
000065	100000	R			
000066	000000	A	31	I\$BLD1	ENTR
000067	002000	A	32	CALL	\$SE,1
000070	000000	E			
000071	000001	A			
000072	000000	A	33	ICAR	DATA 0
000073	054016	A	34	STA	LDA+1
000074	064017	A	35	STB	LDB+1
000075	074020	A	36	STX	LDX+1
000076	006017	A	37	LDAE*	ICAR
000077	100072	R			
000100	034031	A	38	LDX	DCBFN
000101	044030	A	39	INP	DCBFN
000102	006255	A	40	STAE	0BUF,X,0200
000103	000340	R			
000104	005144	A	41	IXP	
000105	005041	A	42	TNA	
000106	144024	A	43	SUB	FCR
000107	002010	A	44	JAZM	BUFOUT
000110	000121	R			
000111	006010	A	45	LDA	LDAI
000112	000000	A			
000113	006020	A	46	LDB	LDBI
000114	000000	A			
000115	006030	A	47	LDX	LDXI
000116	000000	A			
000117	001000	A	48	RETU*	I\$BLD1
000120	100066	R			
			49	EXT	OUTK2
000121	000000	A	50	BUFOUT	ENTR
000122	002000	A	51	CALL	OUTK2,0BUF,DCBFN
000123	000000	E			
000124	000340	R			
000125	000132	R			
000126	005001	A	52	TNA	
000127	054002	A	53	STA	DCBFN
000130	001000	A	54	RETU*	BUFOUT
000131	100121	R			
			55	*	
000132	000000	A	56	DCBFN	DATA 0
000133	000170	A	57	FCR	FCR 120,IBUF,1

000134 000150 R
 000135 000400 A
 000136 000000 A
 000137 000000 A
 000140 000000 A
 000141 000000 A
 000142 000000 A
 000143 000000 A
 000144 000000 A

58 DCB1 DCB 30,IBUF

000145 000006 A
 000146 000150 R
 000147 000000 A
 000150
 000340

59 IBUF BSS 120
 60 OBUF BSS 120
 61 END

ENTRY NAMES

000000 R CRTPLT 000066 R I\$BLD1

EXTERNAL NAMES

000070 E \$SE 000040 E CONVRT 000011 E I\$PLT 000123 E OUTK2
 000024 E V\$IOO

SYMBOLS

000070 E \$SE 000023 R AGAIN 000002 A B 000121 R BUFOUT
 000041 R CALSEQ 000061 R CLSOT 000040 E CONVRT 000000 R CRTPLT
 000036 R DBP 000145 R DCB1 000132 R DCBEN 000133 R FCB
 000423 A FOUR 000066 R I\$BLD1 000011 E I\$PLT 000150 R IBUF
 000072 R ICAP 000111 R LDA 000113 R LDB 000115 R LDX
 000340 R OBUF 000123 E OUTK2 000075 R STX 000024 E V\$IOO
 000001 A X

0 ERRORS ASSEMBLY COMPLETE

```

1      SUBROUTINE CONVRT(INBLK)
2      DIMENSION INBLK(2,2)
3      DATA IGS/0/
4      DATA MAX,LX,LY,IHIY,IHIX/29700,4*-1/
5      IF(INBLK(1,1).LT.0) GO TO 99
6      IF(INBLK(1,1).GT.32700)GO TO 98
7      IL=1
8      IU=2
9      IF(INBLK(1,2).EQ.32764) IU=1
10     IOUT=0
11     DO 3 I=IL,IU
12     NX=MAX-INBLK(1,I)
13     IF(NX.LT.0)NX=0
14     IF(NX.GT.1430)NX=1430
15     NX=1#RST(NX)
16     IF(LX.NE.NX)IOUT=1
17     LX=NX
18     IHIY=32+ISHIFT(NX,5,3)
19     LOX=64+IAND(NX,31)
20     NY=INBLK(2,I)
21     IF(NY.GT.1089)NY=1089
22     NY=1#RST(NY)
23     IF(LY.NE.NY)IOUT=1
24     LY=NY
25     IHIY=32+ISHIFT(NY,5,3)
26     LOY=96+IAND(NY,31)
27     IF(I.EQ.2)GO TO 50
28     IF(IOUT.EQ.1)IGS=0
29     IF(IGS.EQ.0)CALL 1#BLD1(29)
30     IF(IGS+IOUT.EQ.0)GO TO 5
31     IF(IOUT.EQ.0)GO TO 55
32 56    IF(IHIY.NE.KHIY)CALL 1#BLD1(IHIY)
33     IF(LOY.NE.KLOY.OR.IHIX.NE.KHIX)CALL 1#BLD1(LOY)
34     IF(KHIX.NE.IHIX)CALL 1#BLD1(IHIX)
35 5    CALL 1#BLD1(LOX)
36 55    KHIX=IHIX
37     KLOY=LOY
38     KHIY=IHIY
39 3    IOUT=1
40     IGS=1
41     IF(INBLK(1,2).NE.32764)RETURN
42     CALL 1#BLD1(31)
43     CALL 1#BLD1(INBLK(2,2))
44     IGS=0
45     RETURN
46 99    CALL 1#BLD1(27)
47     CALL 1#BLD1(INBLK(2,2))
48     RETURN
49 98    IGS=0
50     LX=-1
51     LY=-1
52     KHIY=-1
53     KHIX=-1
54     RETURN
55     END

```

0 ERRORS COMPILATION COMPLETE
/PFILE,PI,,CRTPLT
/DASMR,B

		1	NAME	I\$RAST
		2	EXT	\$SE
000000	000000	3	I\$RAST ENTR	
000001	002000	4	CALL	\$SE
000002	000000			
000003	000001	5	DATA	1
000004	000000	6	NX DATA	0
000005	004014	7	STB	STB
000006	006027	8	LDBE*	NX
000007	100004			
000010	006010	9	LDRI	715
000011	001313			
000012	006160	10	MULI	1023
000013	001277			
000014	006170	11	DIVI	1430
000015	002626			
000016	005021	12	TBA	
000017	024002	13	LDB	STB
000020	001000	14	RETU*	I\$RAST
000021	100000			
000022	005000	15	STB NOP	
		16	END	

ENTRY NAMES

000000 R I\$RAST

EXTERNAL NAMES

000002 E \$SE

SYMBOLS

000002 E \$SE 000000 R I\$RAST 000004 R NX

000022 R STB

0 ERRORS ASSEMBLY COMPLETE

		1	NAME	TEKFNC
		2	EXT	\$SE, V\$DPVE, V\$DPIV
000002 A		3 B	EQU	2
000000 000000 A		4 TEKFNC	ENTR	
000001 002000 A		5	CALL	\$SE, 1
000002 000000 E				
000003 000001 A				
000004 000000 A		6 IFUNC	DATA	0
000005 054027 A		7	STA	STA
000006 064030 A		8	STB	STB
000007 006027 A		9	LDBEX	IFUNC
000010 100004 R				
000011 005322 A	10		DBR	
000012 005021 A	11		TBA	
000013 001004 A	12		JAN	RET
000014 000034 R				
000015 144035 A	13		SUB	MAX
000016 001002 A	14		JAP	RET
000017 000034 R				
000020 006216 A	15		LDAE	TABLE, B, 0200
000021 000042 R				
000022 006020 A	16		LDBI	V\$DPVE
000023 000000 E				
000024 056003 A	17		STA	3, B
000025 006010 A	18		LDAI	077774
000026 077774 A				
000027 050002 A	19		STA	2, B
000030 005301 A	20		DECR	01
000031 056000 A	21		STA	0, B
000032 002000 A	22		CALL	V\$DPIV
000033 000000 E				
000034 006010 A	23 RET		LDAI	0
000035 000000 A				
000035	24 STA		RES	0
000036 006020 A	25		LDBI	0
000037 000000 A				
000037	26 STB		BES	0
000040 001000 A	27		RETUX	TEKFNC
000041 100000 R				
000042 000070 A	28 TABLE		DATA	56, 57, 58, 59, 96, 97, 98, 99, 100
000043 000071 A				
000044 000072 A				
000045 000073 A				
000046 000140 A				
000047 000141 A				
000050 000142 A				
000051 000143 A				
000052 000144 A				
000053 000011 A	29 MAX		DATA	9
	30		END	

ENTRY NAMES

000000 R TEKFNC

EXTERNAL NAMES

000002 E \$SE 000033 E V\$DPIV 000023 E V\$DPVE

SYMBOLS

000002 E \$SE 000002 A B 000004 P IFUNC 000053 R MAX
 000034 R RET 000035 R STA 000037 R STB 000042 R TABLE
 000000 R TEKFNC 000033 E V\$DPIV 000023 E V\$DPVE

0 ERRORS ASSEMBLY COMPLETE

II. DATA ANALYSIS

A program to produce magnetograms from the AFGL Magnetometer Network data was written. The program is to be run on the Varian computer and the magnetograms are hard copies of a Cathod Ray Tube (CRT) display.

The program is run by typing in on the CRT keyboard /LOAD, DEMO

The program DEMO then prompts the programmer
ENTER START HOUR OR 99 FOR BOT.

93 FOR CURRENT TAPE POSITION, 97 FOR DISK DATA

If you want to begin the magnetogram at a particular hour enter that hour as hh. If the magnetogram is to begin at the beginning of the TAPE (BOT) enter 99, if it is to begin from the current position of the tape enter 93. If the magnetogram is to be made from data already on disk enter 97.

ENTER START TIME FOR GRAPH IF DIFFERENT

The magnetograms should begin on the hour, but if the data to be plotted do not begin on the hour, enter a starting hour. For example say the data begin at 17:37, the programmer may enter 17 as the starting hour of the magnetogram. otherwise enter RETURN

ENTER START DAY IF DIFFERENT FROM CURRENT TAPE DAY

If the tape is positioned on day 213 for example and you want a magnetogram beginning on day 214 then enter 214. Otherwise enter RETURN.

ENTER NUMBER OF HOURS AND NUMBER OF PERIODS IF NOT 1 (HHPP)

Enter the length of the magnetograms in hours and the desired number of magnetograms. If you want seven eight hour magnetograms enter 0708. If only eight hour magnetogram is wanted enter 08.

AUTO HARD COPY (Y,N)?

If you want hard copies of the magnetograms produced automatically enter Y, if not enter N.

INDIVIDUAL PLOTS, OVERLAY PLOT, OR BOTH (I,O,B)?

If you want an individual plot of each station and no overlay

enter 1, if you want an overlay and no individual plots
enter 0. If you want both enter 8.

DEMO is a highly automated program. Once all the entries have been made all that is required of the programmer is that he change the tapes if the magnetogram requires more than one tape and that he terminate the program. The program is terminated by simply entering a / RETURN.

An example of the prompting sequence and the resulting magnetograms is shown in Figures 3 thru 9. These are the plots of X, Y, and Z components of the seven network stations, in order: MA, FL, MI, WI, SD, CA, WA. Figure 10 is a composite of all seven stations.

Figures 1 and 2 are plots of LINCHK for the selected date of the magnetograms, and give an overall view (for that date) of the quality of operation of the network for each station.

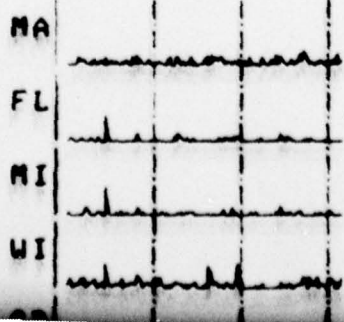
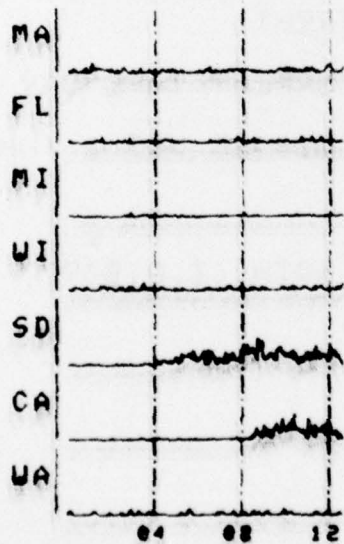
To use LINCHK

Load the tape of interest and type on the CRT
keyboard /LOAD,LINCHK

ENTER START HOUR OR 99 FOR BOT,
93 FOR CURRENT TAPE POSITION, 97 FOR DISK DATA
08
ENTER START TIME FOR GRAPH IF DIFFERENT
ENTER START DAY IF DIFFERENT FROM CURRENT TAPE DAY
155
ENTER NUMBER OF HOURS AND # OF PERIODS IF NOT 1 (HHPP)
12
AUTO HARD COPY (Y,N)?
Y
INDIVIDUAL PLOTS, OVERLAY PLOT, OR BOTH (I,O,B)?
B

8048/00:04 TO 8048/12:46

FILE 2



8048/00:04 TO 8048/12:46

FILE 2

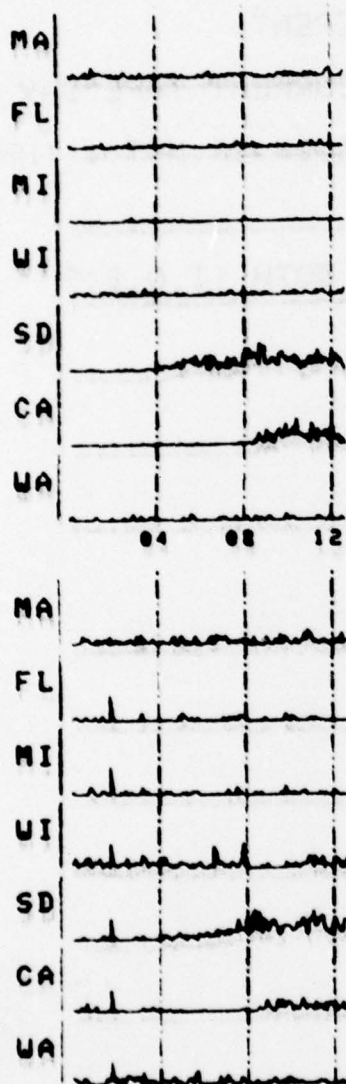


Figure 1.

8048 12:46 TO 8050/03:27 FILE 1

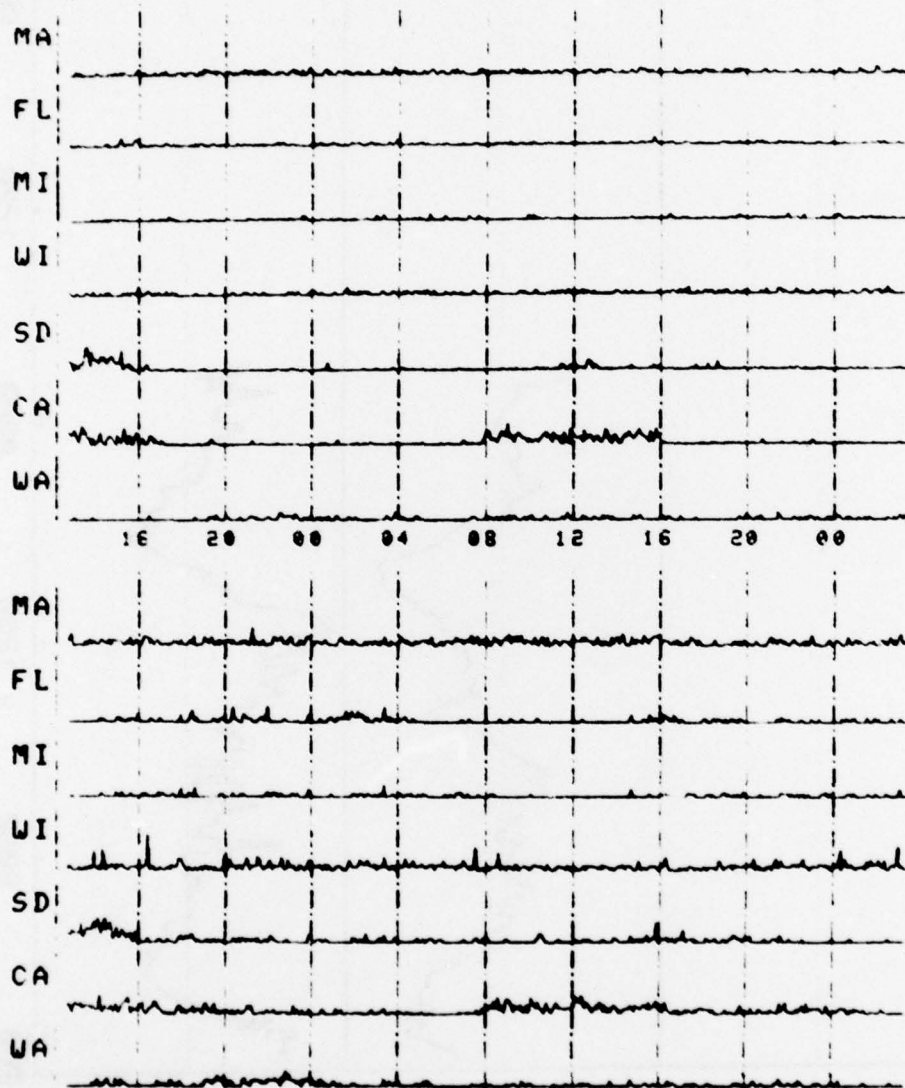


Figure 2.

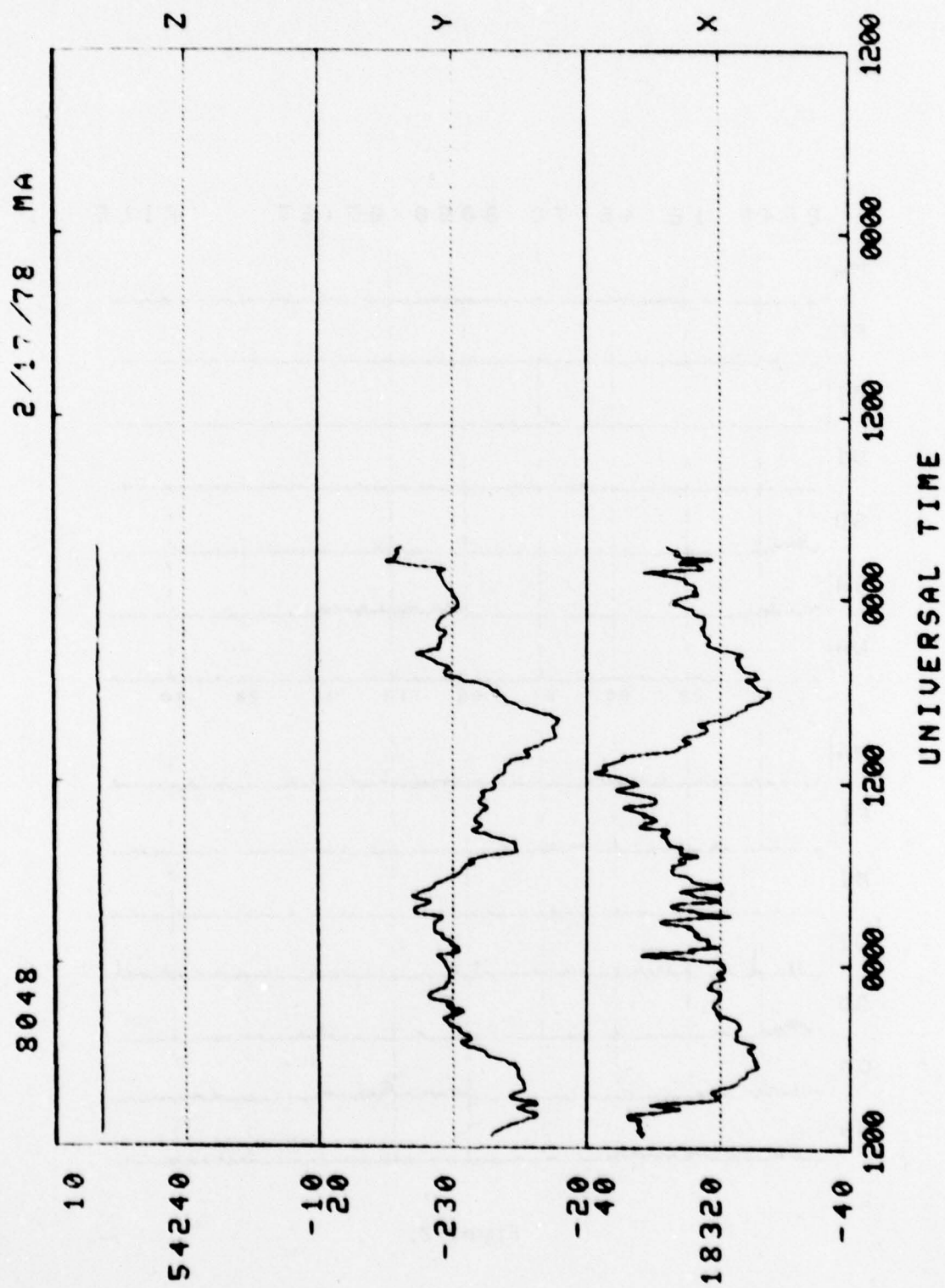


Figure 3.

2/17/78 FL

8048

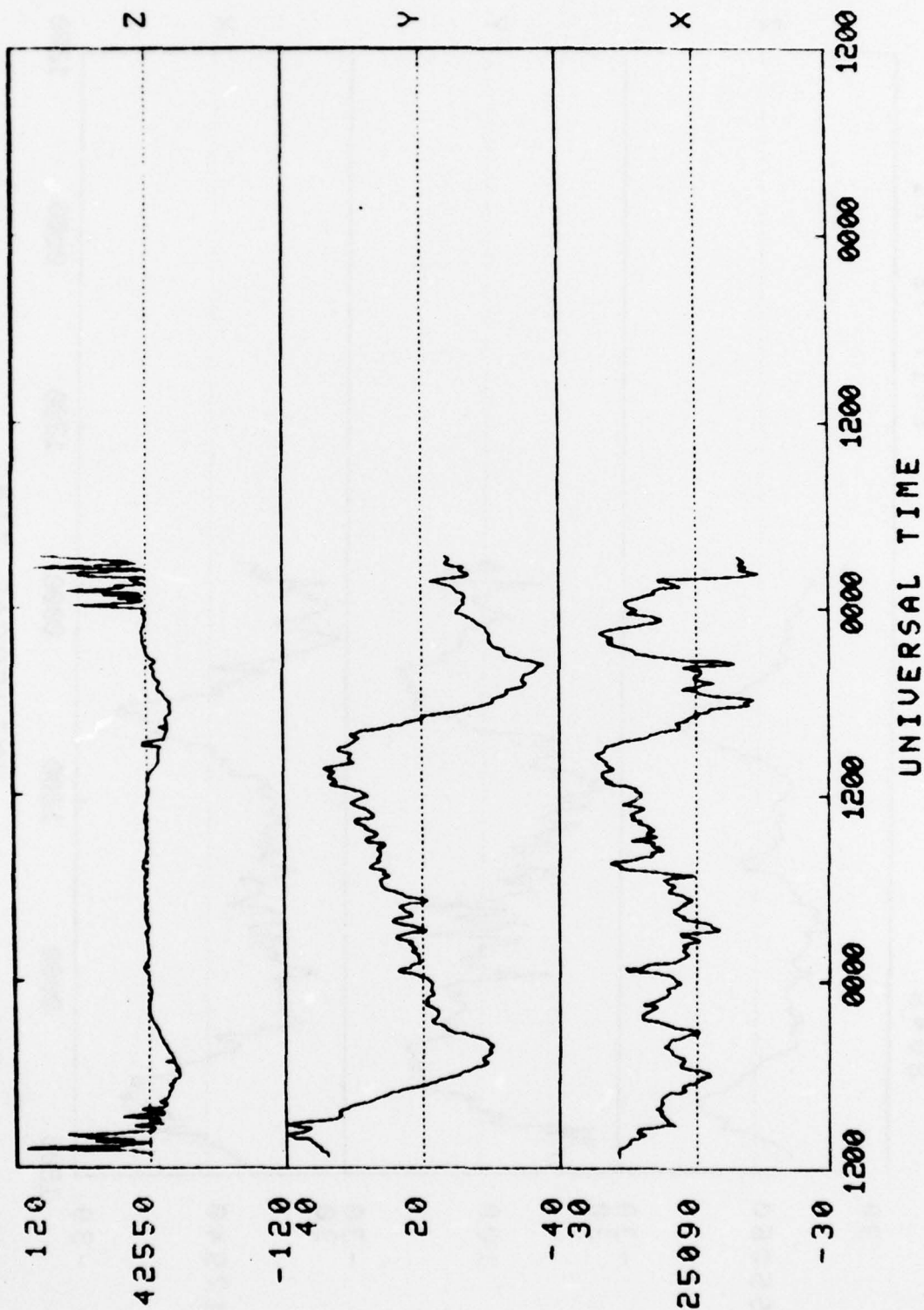


Figure 4.

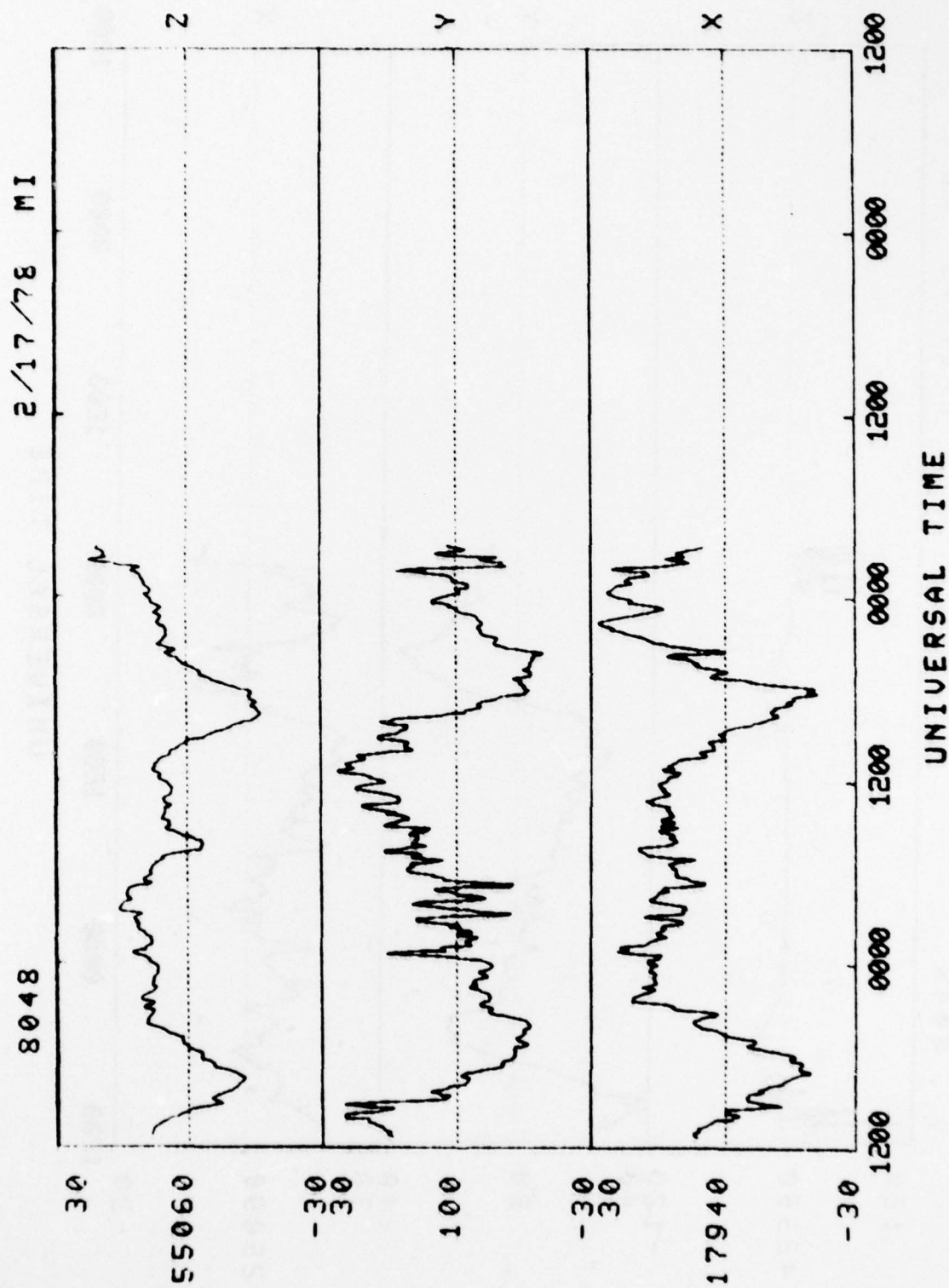


Figure 5.

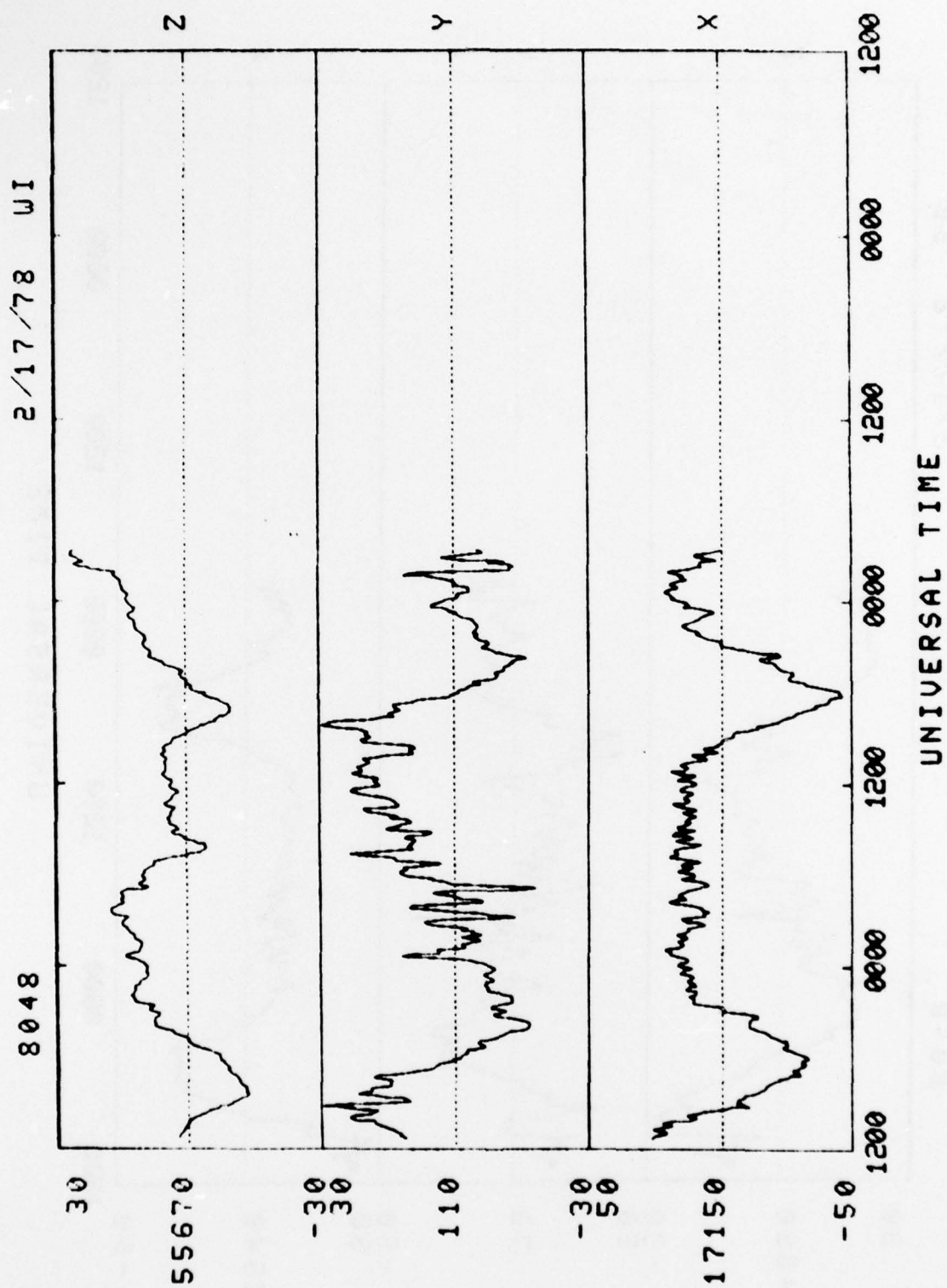


Figure 6.

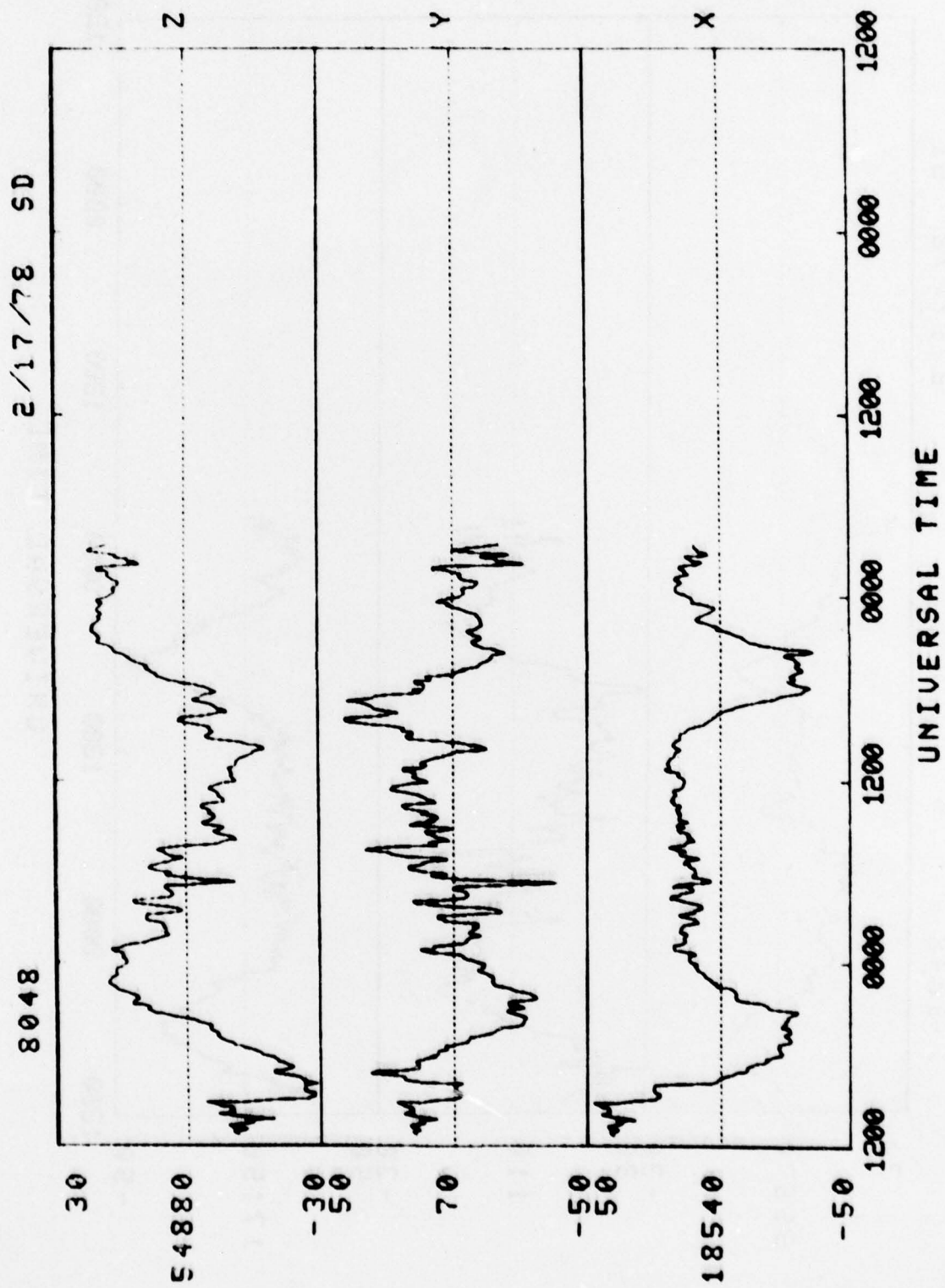


Figure 7.

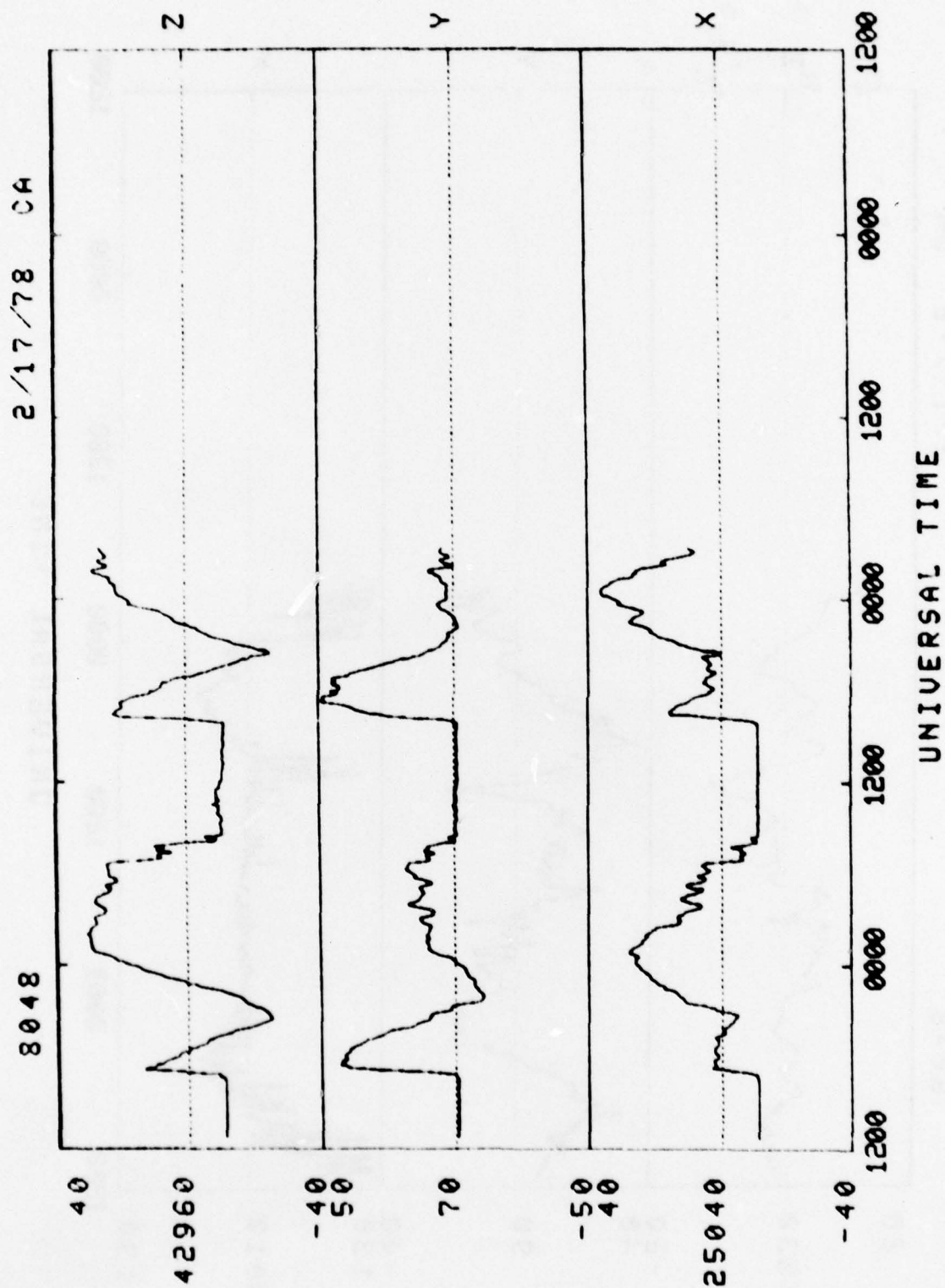


Figure 8.

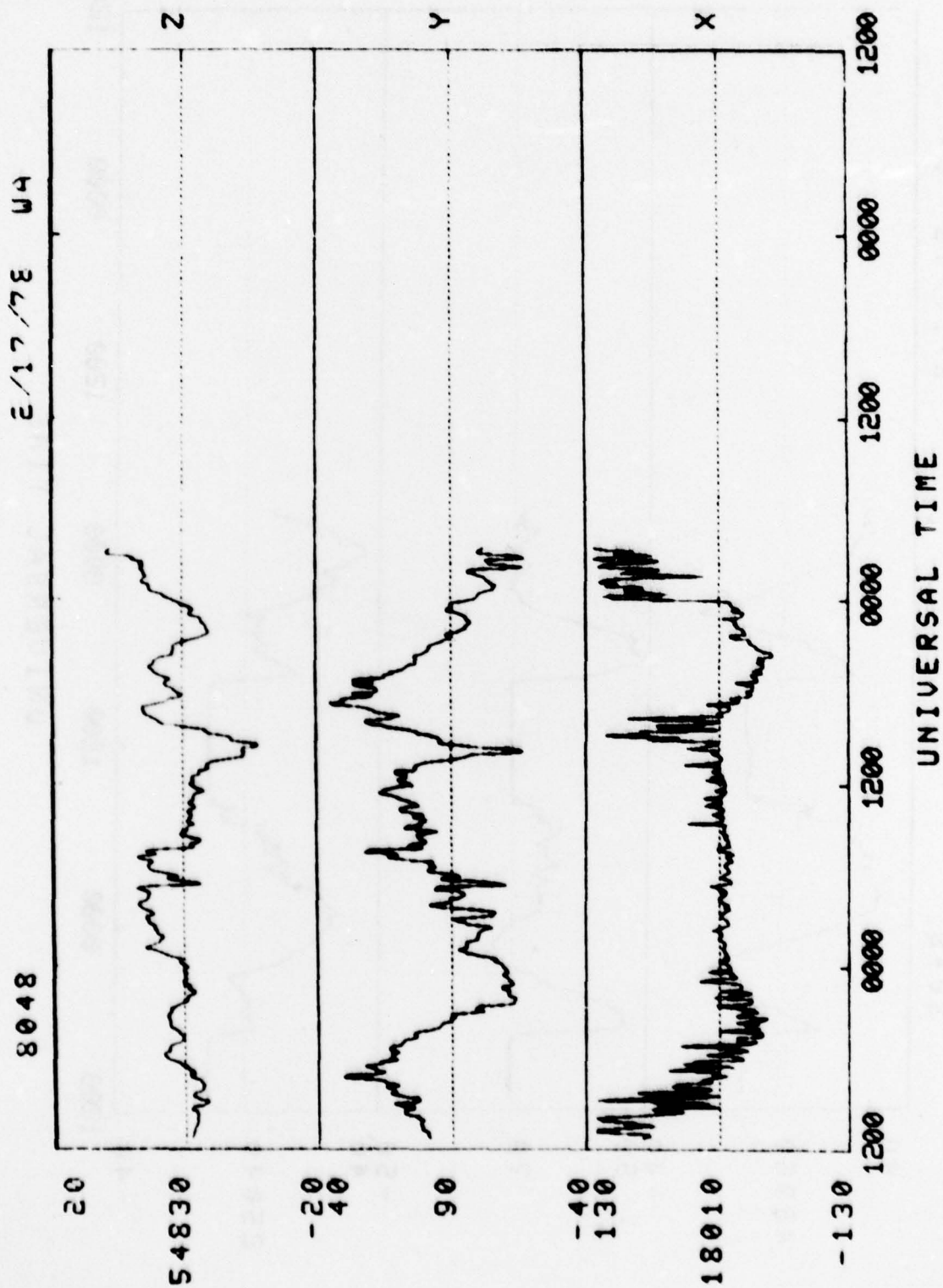


Figure 9.

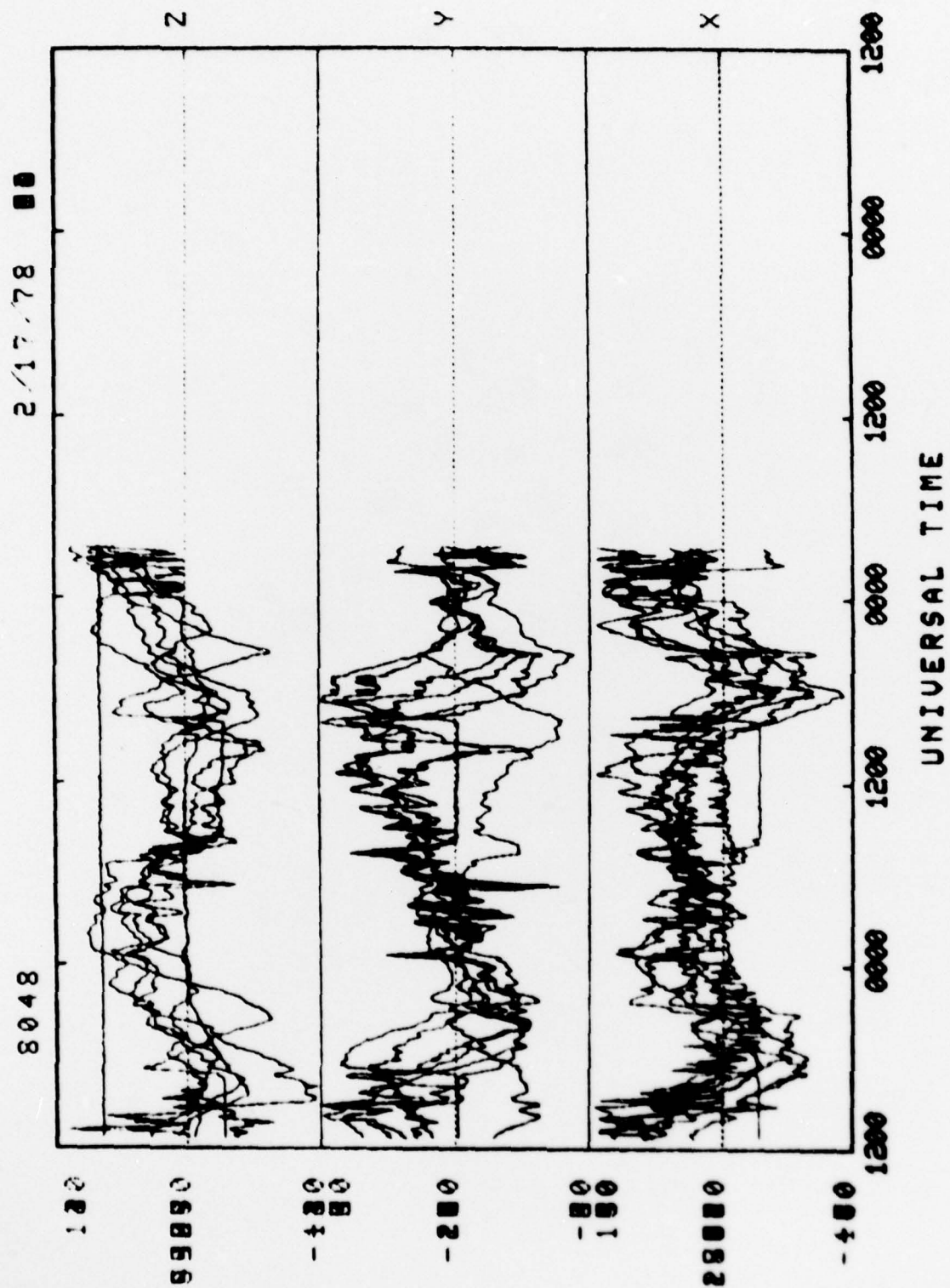


Figure 10.