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DOE/SF/10539-15
(STMPO-565)

HELIOSTAT CONTROLLER
SOFTWARE SOURCE LISTING

Version A11-Barstow
Oct 22, 1980

Martin Marietta

PDOC - 024

1 *-----*

2 * 22-OCT-80*

3 * HELIOSTAT CONTROLLER *

4 * *

5 * FEPROM VERSION A11-BARSTOW D.A. POWELL *

6 *-----*

7 * *

8 * *

9 * INTERRUPT VECTORS *

10 * *

11 * *

12 FFF0 ORG \$FFF0

13 FFF0 F8FF FDB SCIO SCI INTERRUPT VECTOR

14 FFF2 F800 FDB INITZ TIMER OVERFLOW VECTOR

15 FFF4 F86D FDB SYSCLK TIMER OUTPUT COMPARE VECTOR

16 FFF6 F800 FDB INITZ TIMER INPUT CAPTURE VECTOR

17 FFF8 F800 FDB INITZ 68A21 IRQ..DISABLED

18 FFFA F800 FDB INITZ SOFTWARE INTERRUPT HANDLER

19 FFFC F800 FDB INITZ NON MASKABLE INTERRUPT VECTOR

20 FFFE F800 FDB INITZ POWER ON RESTART VECTOR

21 *

23	*	-----*
24	*	REVISIONS *
25	*	-----*
26	*	
27	*	A04...ORIGINAL RELEASE
28	*	A05...STACK AREA INCREASED TO ALLOW FOR 29-AUG-79
29	*	POSSIBLE 1 BYTE OVERFLOW
30	*	A06...COMPLETE REDESIGN OF A05 SYSTEM 01-NOV-79
31	*	WITH HI-SPEED COMM AND NEW ENCODER
32	*	SCHEME
33	*	A07...SOFTWARE *4 ENCODER SCHEME 19-NOV-79
34	*	A08...A07 WITH 4 CORRIDORS 13-FEB-80
35	*	
36	*	A09...A08 WITH FRAMING ERROR FIX AND 3.5 02-SEP-80
37	*	SECOND MOTOR COAST DELAY
38	*	A10...A09 WITH STOW ON LOSS OF COMM (IEA) 02-SEP-80
39	*	A11...MOTOR MEMORY BUFFER ADDITION 22-OCT-80
40	*	AND PIA OUTPUT REGISTER FIX
41	*	A12...A11 WITH STOW ON LOSS OF COMM (IEA) 22-OCT-80

43		*	-----*
44		*	SPECIAL REGISTERS...RESERVED LOCATIONS \$00-\$1F *
45		*	-----*
46		*	
47	0000	DDR1	EQU \$00 DATA DIRECTION REGISTER PORT1
48	0002	PORT1	EQU \$02 I/O PORT #1
49	0001	DDR2	EQU \$01 DATA DIRECTION REGISTER PORT2
50	0003	PORT2	EQU \$03 I/O PORT #2
51		*	
52	0008	TCSR	EQU \$08 TIMER CONTROL AND STATUS
53	0009	COUNTH	EQU \$09 COUNTER HI BITS
54	000A	COUNTL	EQU \$0A COUNTER LO BITS
55	000B	OCHI	EQU \$0B OUTPUT COMPARE REGISTER HI
56	000C	OCLO	EQU \$0C OUTPUT COMPARE REGISTER LO
57	000D	ICHI	EQU \$0D INPUT CAPTURE REGISTER HI
58	000E	ICLO	EQU \$0E INPUT CAPTURE REGISTER LO
59		*	
60	0010	SCIRM	EQU \$10 SERIAL COMM RATE AND MODE
61	0011	SCICS	EQU \$11 SERIAL COMM CONTROL AND STATUS
62	0012	SCIRX	EQU \$12 SERIAL COMM RECEIVER REGISTER
63	0013	SCITX	EQU \$13 SERIAL COMM TRANSMITTER REG
64		*	
65	0014	ROMRAM	EQU \$14 EPROM AND RAM CONTROL

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67 *-----*
68 * PERIPHERIAL INTERFACE ADAPTER...$5000-$5003 *
69 *-----*
70 5000 PIADDA EQU $5000 DATA DIRECTION REGISTER A SIDE
71 5000 PIAIOA EQU $5000 INPUT/OUTPUT REGISTER A SIDE
72 5002 PIACSA EQU $5002 CONTROL AND STATUS REGISTER A
73 *
74 5001 PIADDB EQU $5001 DATA DIRECTION REGISTER B SIDE
75 5001 PIAIOB EQU $5001 INPUT/OUTPUT REGISTER B SIDE
76 5003 PIACSB EQU $5003 CONTROL AND STATUS REGISTER B
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78 *-----*
79 * SYSTEM STACK AND ACTIVATION ENABLE BYTE *
80 *-----*
81 0080 ORG $80
82 0080 0022 RAM RMB 34 STACK AREA
83 0042 0001 STACK RMB 1 START OF STACK
84 *-----*
85 00A3 0001 ENABLE RMB 1 ENABLE BYTE *
86 * *
87 * ** ACTIVATION ENABLE BYTE ** *
88 * *
89 * DURING 'CLOCK TIME' INDIVIDUAL BITS OF THIS *
90 * BYTE ARE TESTED TO DETERMINE IF ACTIVATION *
91 * OF THE CORRESPONDING ACTION ROUTINE IS REQ'D. *
92 * *
93 * BIT 0 NEW SUN SYNC QUEUED *
94 * BIT 1 MESSAGE LENGTH TIMER CHECK *
95 * BIT 2 COMMUNICATIONS LOSS TIMER CHECK *
96 * BIT 3 STATUS RESPONSE ENABLE *
97 * BIT 4 INITIALIZE (OR RESTART) *
98 * BIT 5 SPARE *
99 * BIT 6 CONTROL ALGORITHM ENABLE *
100 * BIT 7 MOTOR CONTROL ENABLE *
101 *-----*
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103 *-----*
104 *      SYSTEM OPERATING VARIABLES      *
105 *-----*
106 00A4 0001 TRXOK   RMB      1      WHEN 0..TIME TO XMIT
107 00A5 0001 SLOSS   RMB      1      WHEN 0..MESSAGE TIMEOUT
108 00A6 0002 CLOSS   RMB      2      WHEN 0..COMM LOSS HAS OCCURED
109 00A8 0002 NEXVEC  RMB      2      POINTER TO NEXT VECTOR..SCIO
110 00AA 0002 IOVEC   RMB      2      POINTER TO CURRENT VECTOR
111 00AC 0001 BYTECT  RMB      1      BYTE COUNTER FOR SCIO SERVICER
112 00AD 0001 CHARS   RMB      1      COUNTER FOR TOTAL CHARS IN/OUT
113 00AE 0001 CKSM    RMB      1      CHECK SUM ACCUMULATOR
114 00AF 0001 MASK    RMB      1      MY ADDR BIT IN A BIT MASK
115 00B0 0001 MCOUNT RMB      1      2.50 MSEC MOTOR COUNTER
116 00B1 0002 ACOUNT  RMB      2      AZ MOTOR ACTIVATION FLAG
117 00B3 0002 ECOUNT  RMB      2      EL MOTOR ACTIVATION FLAG
118 00B5 0001 MOTWD   RMB      1      MOTOR ACTION REQUEST BITS
119 00B6 0001 MCODE   RMB      1      HOLDS AZ OR EL CODE FOR POINT
120 00B7 0001 ADDR    RMB      1      ADDRESS OF HELIOSTAT
121 00B8 0001 MSAVE  RMB      1      TEMP AREA FOR MOTOR WORD
122 00B9 0001 FREEZE  RMB      1      SAYS HOLD CURRENT STATUS
123 00BA 0001 SYNC    RMB      1      SYNCs CALC ROUTINE WITH SUN
124 *-----*
125 *      THE FOLLOWING MUST BE IN SEQUENTIAL MEMORY-AZIMUTH      *
126 *-----*
127 00BR 0001 OLDAZ   RMB      1      OLD 2-BIT AZIMUTH VALUE
128 00BC 0002 ASTUCK  RMB      2      COUNTER FOR STUCK GIMBAL
129 00BE 0002 AZABS   RMB      2      ABSOLUTE AZIMUTH ENCODER
130 00C0 0002 AZBAZ   RMB      2      AZIMUTH ENCODER BIAS VALUE
131 00C2 0001 FRZAZ   RMB      1      FLAGS INDEX MARK ENCOUNTER
132 00C3 0001 AZNC    RMB      1      AZ NO-COMPARE BITS
133 00C4 0001 AZCP    RMB      1      AZ COMPARE BITS
134 *-----*
135 *      THE FOLLOWING MUST BE IN SEQUENTIAL MEMORY-ELEVATION      *
136 *-----*
137 00C5 0001 OLDEL   RMB      1      OLD 2-BIT ELEVATION VALUE
138 00C6 0002 FSTUCK  RMB      2      COUNTER FOR STUCK GIMBAL
139 00C8 0002 ELABS   RMB      2      ABSOLUTE ELEVATION ENCODER
140 00CA 0002 ELRAZ   RMB      2      ELEVATION ENCODER BIAS
141 00CC 0001 FRZEL   RMB      1      FLAGS INDEX MARK ENCOUNTER
142 00CD 0001 ELNC    RMB      1      EL NO-COMPARE BITS
143 00CF 0001 ELCP    RMB      1      EL COMPARE BITS
144 *

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146 *-----*
147 *          VARIABLES USED BY CALC FOR POSITION CALCULATION          *
148 *-----*
149 00CF 0004  TARGETX  RMB      4
150 00D3 0004  TARGETY  RMB      4          LATEST TARGET VECTOR
151 00D7 0004  TARGETZ  RMB      4
152 *
153 00DB 0004  TX0      RMB      4          WORKING TARGET VECTOR
154 00DF 0004  TY0      RMB      4
155 00E3 0004  TZ0      RMB      4
156 *
157 00E7 0001  Y0      RMB      1  LS    CORDIC-Y
158 00E8 0001  Y1      RMB      1
159 00E9 0001  Y2      RMB      1
160 00EA 0001  Y3      RMB      1  MS
161      00E7  MQ0      EQU      Y0  LS    QUOTIENT
162      00E8  MQ1      EQU      Y1
163      00E9  MQ2      EQU      Y2
164      00EA  MQ3      EQU      Y3  MS
165 *
166 00EB 0001  AC20     RMB      1  LS    MATH ACCUM.
167 00EC 0001  AC21     RMB      1
168 00ED 0001  AC22     RMB      1
169 00EE 0001  AC23     RMB      1  MS
170 *
171 00EF 0001  X0      RMB      1  LS    CORDIC-X
172 00F0 0001  X1      RMB      1
173 00F1 0001  X2      RMB      1
174 00F2 0001  X3      RMB      1  MS
175      00EF  AC0      EQU      X0  LS    DIVIDEND
176      00F0  AC1      EQU      X1
177      00F1  AC2      EQU      X2
178      00F2  AC3      EQU      X3  MS
179 *
180 00F3 0001  AC10     RMB      1  LS    G.P.ACCUM.
181 00F4 0001  AC11     RMB      1
182 00F5 0001  AC12     RMB      1
183 00F6 0001  AC13     RMB      1  MS
184      00F3  OP0      EQU      AC10  LS    DIVISOR
185      00F4  OP1      EQU      AC11
186      00F5  OP2      EQU      AC12
187      00F6  OP3      EQU      AC13  MS
188 *
189 00F7 0001  TH0      RMB      1  LS    CORDIC-THETA
190 00F8 0001  TH1      RMB      1
191 00F9 0001  TH2      RMB      1
192 00FA 0001  TH3      RMB      1  MS
193 *
194      00FB  DVC      EQU      *    DIVIDE ITER. CTR.
195 00FB 0001  LC       RMB      1    CORDIC ITER. CTR.

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196

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197 00FC 0002 AZ

RMB 2 CALC'D AZ/EL

98 00FE 0002 EL

RMB 2

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200 *-----*
201 *          EXTERNAL RAM MEMORY          *
202 *-----*
203 2000          ORG          $2000
204 *
205 2000 0003    SUNX      RMB      3          SUN VECTOR      X
206 2003 0003    SUNY      RMB      3          Y
207 2006 0003    SUNZ      RMB      3          Z
208 2012          ORG          $2012
209 *-----*
210 *          INCOMING COMMAND BUFFER      *
211 *-----*
212 2012 0001    CMDT      RMB      1          COMMAND TYPE AND/OR ADDRESS
213 2013 0009    CMDS      RMB      9          SUN VECTOR
214 201C 0004    CMDW1M    RMB      4          WIRE WALK 1 MASK
215 2020 0009    CMDW1V    RMB      9          WIRE WALK 1 VECTOR
216 2029 0004    CMDW2M    RMB      4          WIRE WALK 2 MASK
217 202D 0009    CMDW2V    RMB      9          WIRE WALK 2 VECTOR
218 2036 0004    CMDW3M    RMB      4          WIRE WALK 3 MASK
219 203A 0009    CMDW3V    RMB      9          WIRE WALK 3 VECTOR
220 2043 0004    CMDW4M    RMB      4          WIRE WALK 4 MASK
221 2047 0009    CMDW4V    RMB      9          WIRE WALK 4 VECTOR
222 2050 0004    CMD       RMB      4          BEAM POINT OR..
223 2054 0004          RMB      4          ..AZEL OR..
224 2058 0009    VECTOR    RMB      9          INITIALIZATION
225 *-----*
226 *          RESPONSE BUFFER...CURRENT STATUS      *
227 *-----*
228 2061 0001    HEADER    RMB      1          RESPONSE BUFFER
229 2062 0002    STATUS    RMB      2          STATUS BITS
230 2064 0002    AZPOS     RMB      2          CURRENT AZ POSITION
231 2066 0002    ELPOS     RMB      2          CURRENT EL POSITION
232 2068 0002    AZBZ      RMB      2          AZ BIAS
233 206A 0002    ELBZ      RMB      2          EL BIAS
234 *
235 206C 0003    HELIX     RMB      3          HELIOSTAT VECTOR X
236 206F 0003    HELIY     RMB      3          Y
237 2072 0003    HELIZ     RMB      3          Z
238 *
239 2075 0002    CMDAZ     RMB      2          COMMANDED AZ
240 2077 0002    CMDEL     RMB      2          COMMANDED EL

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242 *-----*
243 * POWER ON OR RESTART ROUTINE *
244 *-----*
245 * SETS UP SYSTEM OPERATING PARAMETERS, *
246 * SYSTEM STATUS TABLES AND I/O PORT *
247 * CONFIGURATION. *
248 *-----*
249 * PERMITS ACTIVATION OF SERIAL I/O AND *
250 * HC INITIALIZATION ROUTINES..ALSO ENABLES *
251 * WATCH-DOG TIMER *
252 *-----*
253 F800 ORG SF800
254 F800 8E 00A2 TNITZ LDS #STACK INITIALIZE STACK
255 F803 CC 6000 LDD #$6000 MAKE PORT1 3MSB OUTPUTS..
256 F806 00 00 STD DDR1 ..PORT 2 INPUTS
257 F808 86 40 LDA A #$40 RESET WATCHDOG...
258 F80A 97 02 STA A PORT1 ...PUT IN RECEIVE MODE
259 *
260 F80C C6 04 LDA B #$04 SELECT A SIDE OUTPUT REG
261 F80E F7 5002 STA B PIACSA ...OF PIA
262 F811 86 FF LDA A #$FF SET MOTORS OFF..DE-ENERG
263 F813 B7 5000 STA A PIAIOA ..STATE IN OUT REG
264 F816 97 B8 STA A MSAVE ..AND MOTOR WORD
265 F818 7F 5002 CLR PIACSA SELECT DDR A SIDE
266 F81B B7 5000 STA A PIADDA MAKE A SIDE OUTPUTS
267 F81E 17 TRA SELECT DATA REGS
268 F81F FD 5002 STD PIACSA FOR BOTH A & B
269 F822 4C INC A A WAS $04..NOW $05
270 F823 97 10 STA A SCIRM SET UP RATE AND MODE OF SCI
271 F825 53 COM B B WAS $04..NOW $FB
272 F826 D7 11 STA B SCICS ENABLE RCVR AND TXMR
273 *
274 * DETERMINE BIT POSITION IN MASK
275 *
276 F828 D6 02 LDA B PORT1
277 F82A C4 1F AND B #$1F
278 F82C 07 B7 STA B ADDR SAVE ADDRESS
279 F82E F7 2061 STA B HEADER
280 F831 C4 07 AND B #$07 GET JUST 3 BITS
281 F833 4F CLR A
282 F834 0D SEC
283 F835 46 GETADR ROR A
284 F836 5A DEC B
285 F837 2A FC RPL GETADR
286 F839 97 AF STA A MASK
287 F83B BD FC22 JSR WU SET UP FOR RECEIVE
288 *

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290 *-----*
291 *   SET SYSTEM OPERATING PARAMETERS AND STATUS INIT   *
292 *-----*
293 F83E 86 10  SETUP  LDA A    #$10    SET ACTIVATION ENABLE FOR...
294 F840 97 A3          STA A    ENABLE    ...HC SYSTEM INIT REQUEST
295 F842 CC 9080       LDD     #$9080   SET NOCOMP-COMP BITS
296 F845 DD C3        STD     AZNC     FOR AZ VARIABLES
297 F847 04           LSRD          PUT #$4840 THERE
298 F848 DD CD        STD     ELNC     FOR EL VARIABLES
299 F84A 4F           CLR A          SET COUNT OF 40..
300 F84B 97 C2       STA A    FRZAZ   CLEAR FREEZE FLAGS
301 F84D 97 CC       STA A    FRZEL
302 F84F 97 B9       STA A    FREEZE
303 F851 97 B5       STA A    MOTWD   SET 1.5 SEC DELAYS ON
304 F853 DD B1       STD     ACOUNT ..INTO MOTOR POWER
305 F855 DD B3       STD     ECOUNT  ..COUNTERS
306 F857 5F         CLR B
307 F858 FD 2062     STD     STATUS  CLEARS STATUS BUFFER
308 *
309 F85B 86 08       LDA A    #$08    ALLOW TIMER OUTPUT..
310 F85D 97 08       STA A    TCSR    ...COMPARE TO INTERRUPT
311 F85F 0E         CLI          LET INTERRUPTS HAPPEN
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313 *-----*
314 *          BACKGROUND PROGRAMS          *
315 *
316 *          INITIALIZATION ENABLE AND VERIFY LOOP
317 *          CONTROL ALGORITHM ENABLE AND ACTIVATION
318 *
319 *
320 *-----*
321 F860 96 A3  WAITI  LDA A    ENABLE  LOOP TILL INITIALIZED
322 F862 84 10          AND A    #910   RECEIVED INIT COMMAND..
323 F864 26 FA          BNE     WAITI  ..RESETS INIT BIT
324 *
325 F866 96 BA  WAITC  LDA A    SYNC    LOOP TILL SUN COMES IN
326 F868 27 FC          BEQ     WAITC  TO START CORDIC
327 F86A 7E FD33      JMP     CALC   IF REQ'D DO THE CONTROL..
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329 *-----*
330 * ENTER HERE ON TIMER OUTPUT COMPARE INTERRUPT *
331 * THIS SHOULD OCCUR APPROX EVERY 500 USEC *
332 * *
333 * APPROX WORST CASE TIME FROM ENTRY TO EXIT=300USEC *
334 *-----*
335 *
336 *
337 F86D 96 08 SYSCLK LDA A TCSR CLEAR TIMER INTERRUPT
338 F86F DC 09 LD0 COUNTH READ COUNTER
339 F871 C3 0250 ADDD #250 ADD OFFSET
340 F874 D0 08 STD OCHI MAKE NEW COMPARE VALUE
341 * LD0 #023A SET UP FOR 500 USEC..
342 * STX OCHI ..INTERVALS
343 * STX COUNTH RESET COUNTER TO FFF8
344 *
345 F876 96 02 HITDOG LDA A PORT1 GET PORT1 STATUS
346 F878 84 DF AND A #DF RESET WATCHDOG BIT
347 F87A 97 02 STA A PORT1 RESET WATCHDOG TIMER
348 F87C 8A 20 ORA A #20 SET WATCHDOG BIT
349 F87E 97 02 STA A PORT1 LET IT FLY AGAIN
350 *
351 F880 96 A3 START LDA A ENABLE GET ENABLE BYTE
352 F882 36 PSH A STACK A FOR LATER
353 *
354 F883 84 08 STATQ AND A #08 WAS STATUS REQUESTED
355 F885 27 1B BEQ SIOTIM NO..CHECK SERIAL I/O TIMEOUT
356 *
357 F887 96 A4 LDA A TRXOK IS IT MY TURN TO TRANSMIT YET
358 F889 27 05 BEQ SNDR0Q IF TRXOK=0 THEN ITS TIME..DOIT
359 F88B 7A 00A4 DEC TRXOK IF NOT..BUT ENABLED DEC
360 F88E 20 12 BRA SIOTIM CHECK TIMEOUT
361 F890 96 A3 SNDR0Q LDA A ENABLE GET ENABLE STATUS
362 F892 84 F7 AND A #F7 KEEP ALL BUT THIS ENABLED...
363 F894 97 A3 STA A ENABLE ...IF PREVIOUSLY ENABLED
364 F896 86 0E LDA A #0E SET TRANSMIT INTERRUPT ENABLE
365 F898 97 11 STA A SCICS ..DISABLE RECEIVER INTERRUPT
366 F89A 7F 00AC CLR BYTECT
367 F89D CE FCC9 LD0 #SCIOT LOAD VECTOR FOR XMIT
368 F8A0 DF AA STX IOVEC
369 *
370 F8A2 32 SIOTIM PHL A GET ENABLE STATUS
371 F8A3 36 PSH A PUT IT BACK
372 F8A4 84 02 AND A #02 DOES SCI TIME-OUT NEED CHECKING
373 F8A6 27 4D BEQ CTIME NO..CHECK COMM LOSS
374 *
375 F8A8 7A 00A5 DEC SLOSS COUNTDOWN SYNC TIME..
376 F8AB 26 48 BNE CTIME ..COUNTER CHECK FOR TIMEOUT
377 F8AD 96 A3 LDA A ENABLE GET ENABLE STATUS
378 F8AF 84 FD AND A #FD

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379	F8B1	97 A3		STA A	ENABLE	
380	F8B3	96 02		LDA A	PORT1	LOOK AT XMIT ENABLE LINE
381	F8B5	84 40		AND A	#\$40	IS IT LOW??
382	F8B7	27 15		BEQ	TXDSA	YES..IN XMIT ENABLE MODE
383	F8B9	96 A3		LDA A	ENABLE	SEE IF NEW COMMAND IS IN..
384	F8BB	85 01		BIT A	#\$01	..AND CKSM OK
385	F8BD	26 06		BNE	STRDEC	YES..DECODE COMMAND
386	F8BF	85 08		HIT A	#\$08	NO COMMAND..SEE IF POLL
387	F8C1	27 08		BEQ	TXDSA	NO POLL..RESYNC THYSELF
388	F8C3	20 30		BRA	CTIME	ITS A POLL..DO NOTHING
389	F8C5	84 FE	STRDEC	AND A	#\$FF	DISABLE ACTIVATION
390	F8C7	97 A3		STA A	ENABLE	
391	F8C9	8D F92C		JSR	DECODE	DO WHAT IT SAY..
392	F8CC	20 46		BRA	MOTOR	..RESPONSE SET UP ALREADY
393			*			
394	F8CE	96 02	TXDSA	LDA A	PORT1	GET PORT1 STATUS
395	F8D0	8A 40		ORA A	#\$40	SET RECEIVE MODE...
396	F8D2	97 02		STA A	PORT1	..FOR XMITTERS AND RCVRS
397	F8D4	DE 11		LDX	SCICS	CLEAR SCI INPUT BUFFER
398	F8D6	8D FC22		JSR	WJ	
399	F8D9	86 2061		LDA A	HEADER	GET CURRENT STATUS
400	F8DC	84 E0		AND A	#\$E0	STRIP OF TYPE
401	F8DE	81 A0		CMP A	#\$A0	WAS IT STATUS RESP??
402	F8E0	26 08		BNE	TXCRP	NO..COMMAND RESPONSE
403	F8E2	CC 007F		LDD	#\$007F	
404	F8E5	F4 2063		AND B	STATUS+1	CLEAR STATUS
405	F8E8	FD 2062		STD	STATUS	
406	F8EB	97 B9		STA A	FREEZE	CLEAR FREEZE
407	F8ED	96 11	TXCRP	LDA A	SCICS	
408	F8EF	84 FB		AND A	#\$FB	RESET XMIT INT ENABLE
409	F8F1	8A 18		ORA A	#\$18	ENABLE RECEIVER
410	F8F3	97 11		STA A	SCICS	NOW READY AGAIN
411			*			
412	F8F5	32	CTIME	PUL A		GET OLD ENABLE STATUS
413	F8F6	36		PSH A		PUT IT BACK FOR NEXT GUY
414	F8F7	84 04		AND A	#\$04	SHALL WE CHECK FOR COMM..
415	F8F9	27 19		BEQ	MOTOR	...LOSS...NO
416	F8FB	DE A6		LDX	CLOSS	YES..DEC TIMER
417	F8FD	09		DEX		COUNT DOWN TIMER..AT ZERO?
418	F8FE	DF A6		STX	CLOSS	LOAD NEW VALUE
419	F900	26 12		BNE	MOTOR	NO.GET ENCODER DATA,IF TIME
420	F902	DC BE		LDD	AZARS	GET CURRENT POSITION
421	F904	FD 2075		STD	CMDAZ	AND STAY THERE
422	F907	DC C8		LDD	ELARS	
423	F909	FD 2077		STD	CMDEL	
424	F90C	86 1C		LDA A	#\$1C	SAY LOST COMM
425	F90E	87 2063		STA A	STATUS+1	
426	F911	8D FC22		JSR	WJ	
427			*			
428	F914	32	MOTOR	PUL A		GET ENABLE..LAST TIME

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429	F915	4D		TST	A		IS MOTOR ROUTINE ACTIVE?
430	F916	2A	08	BPL		SCEXIT	NO..RETURN TO BACKGROUND
431	F918	7A	0080	DEC		MCOUNT	
432	F918	26	03	BNE		SCEXIT	
433	F91D	7E	FA36	JMP		POINT	
434	F920	38		SCEXIT		RTI	
435				*			
436	F921	06	R7	MASKOK	LDA	B	ADDR
437	F923	57		ASR	B		DETERMINE BIT POSITION
438	F924	57		ASR	B		IN 32 BIT MASK
439	F925	57		ASR	B		
440	F926	3A		ARX			POINT TO RIGHT BYTE
441	F927	A6	00	LDA	A	0,X	
442	F929	94	AF	AND	A	MASK	CHECK IF IN MASK
443	F92B	39		RTS			


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445 *-----*
446 *
447 *          DECODE..DETERMINES TYPE OF COMMAND AND MOVES *
448 *          VECTORS ETC..TO APPROPRIATE MEMORY BUFFERS *
449 *
450 *
451 *-----*
452 F92C CE 2000 DECODE  LDX      #SUNX      GET SUN ADDRESS
453 F92F A6 13  UPSUN   LDA  A      19,X      STORE
454 F931 A7 00          STA  A      0,X      NEW
455 F933 08          INX                      SUN
456 F934 8C 2009          CPX      #SUNX+9
457 F937 26 F6          BNE      UPSUN
458 F939 CE 1A90          LDX      #6800      SUN IS IN..SET UP FOR..
459 F93C DF A6          STX      CLOSS    ..ANOTHER 3.4 SECONDS
460 F93E 7C 00BA          INC      SYNC      ALLOW CALC TO GO
461 *-----*
462 *          DETERMINE IF WE SHOULD BE WALKING A WIRE *
463 *-----*
464 F941 CE 201C CKWW1   LDX      #CMDW1M   GET WIRE WALK MASK 1
465 F944 8D DB          BSR      MASKOK   ARE WE IN MASK
466 F946 27 05          BEQ      CKWW2    NO..CHECK 2
467 F948 CE 201F          LDX      #CMDW1V-1
468 F94B 20 39          BRA      UPTARG   UPDATE TARGET VECTOR
469 F94D CE 2029 CKWW2   LDX      #CMDW2M   GET WIRE WALK MASK 2
470 F950 8D CF          BSR      MASKOK
471 F952 27 05          BEQ      CKWW3    NO..CHECK 3
472 F954 CE 202C          LDX      #CMDW2V-1 UPDATE TARGET VECTOR
473 F957 20 2D          BRA      UPTARG
474 F959 CE 2036 CKWW3   LDX      #CMDW3M   GET WIRE WALK MASK 3
475 F95C 8D C3          BSR      MASKOK
476 F95E 27 05          BEQ      CKWW4    NO..CHECK 4
477 F960 CE 2039          LDX      #CMDW3V-1 UPDATE TARGET VECTOR
478 F963 20 21          BRA      UPTARG
479 F965 CE 2043 CKWW4   LDX      #CMDW4M   GET WIRE WALK MASK 4
480 F968 8D B7          BSR      MASKOK
481 F96A 27 05          BEQ      NEWDAT   NO..NO WIREWALKS
482 F96C CE 2046          LDX      #CMDW4V-1 UPDATE TARGET VECTOR
483 F96F 20 15          BRA      UPTARG

```

```

485 *-----*
486 *   DETERMINE IF COMMAND IS A BEAMPOINT   *
487 *-----*
488 F971 B6 2012 NEWDAT   LDA A       CMDT
489 F974 84 E0           AND A       #$E0
490 F976 81 20           CMP A       #$20       IS IT BEAM POINT?
491 F978 26 56           BNE         CKINIT
492 F97A CE 2050         LDX         #CMD       GET MASK
493 F97D 8D A2           BSR         MASKOK
494 F97F 27 2F           BEQ         NORVSP
495 F981 CE 2057         LDX         #VECTOR-1   GET ADDR OF TARGET
496 F984 8D 34           BSR         SETTT       SET NEW CMD IN STATUS
497 *-----*
498 *   TRANSFER NEW TARGET VECTOR INTO CALC'S BUFFER   *
499 *-----*
500 F986 8D 23   UPTARG   BSR         PASSIT   ARE WE INITIALIZED??
501 F988 26 26           BNE         NORVSP   IF NOT..NO CMD RESP
502 F98A EC 00           LDD         0,X       GET 'X' VECTOR
503 F98C 4F           CLR A
504 F98D DD CF           STD         TARGTX   GIVE IT TO CALC
505 F98F EC 02           LDD         2,X
506 F991 DD D1           STD         TARGTX+2
507 F993 EC 03           LDD         3,X       GET 'Y' VECTOR
508 F995 4F           CLR A
509 F996 DD D3           STD         TARGTY   GIVE IT TO CALC
510 F998 EC 05           LDD         5,X
511 F99A DD D5           STD         TARGTY+2
512 F99C EC 06           LDD         6,X       GET 'Z' VECTOR
513 F99E 4F           CLR A
514 F99F DD D7           STD         TARGTZ   GIVE IT TO CALC
515 F9A1 EC 08           LDD         8,X
516 F9A3 DD D9           STD         TARGTZ+2
517 F9A5 96 A3   DECODE   LDA A       ENABLE
518 F9A7 8A 44           ORA A       #$44       SET CALC ENA AND CLOSS TIMER
519 F9A9 20 0C           BRA         RSVPE

```

```
521 *-----*
522 * PASSIT CHECKS FOR INITIALIZED STATE OF HC *
523 *-----*
524 F9AB 96 A3 PASSIT LDA A ENABLE
525 F9AD 84 10 AND A #S10
526 F9AF 39 RTS
527 *-----*
528 * NORVSV DISABLES COMMAND RESPONSE *
529 *-----*
530 F9B0 BD FC22 NORVSV JSR WU
531 F9B3 96 A3 LDA A ENABLF
532 F9B5 84 F7 AND A #SF7 DISABLE REPLY
533 F9B7 97 A3 RSVPE STA A ENABLF
534 F9B9 39 RTS
535 *-----*
536 * SETTT SETS NEW HC COMMAND STATUS *
537 *-----*
538 F9BA B6 2012 SETTT LDA A CMDT GET MODE
539 F9BD 84 1F AND A #S1F BITS
540 F9BF 48 ASL A
541 F9C0 48 ASL A
542 F9C1 F6 2063 STTT1 LDA B STATUS+1 CLEAR
543 F9C4 C4 80 AND B #S80 OLD
544 F9C6 F7 2063 STA B STATUS+1 STATUS
545 F9C9 BA 2063 ORA A STATUS+1
546 F9CC B7 2063 STA A STATUS+1
547 F9CF 39 RTS
```

549

550

551

552 F9D0 4D

553 F9D1 26 40

554 F9D3 F6 2012

555 F9D6 C4 1F

556 F9D8 01 87

557 F9DA 26 D4

558 F9DC 96 A3

559 F9DE 84 EF

560 F9E0 97 A3

561 F9E2 CE 2050

562 F9E5 A6 00

563 F9E7 A7 14

564 F9E9 08

565 F9EA 8C 2061

566 F9ED 26 F6

567 F9EF CE 2064

568 F9F2 EC 00

569 F9F4 DD BE

570 F9F6 ED 11

571 F9F8 EC 02

572 F9FA DD C8

573 F9FC ED 13

574 F9FE EC 04

575

576 FA00 C1 FF

577 FA02 27 0C

578

579 FA04 DD C0

580 FA06 EC 06

581 FA08 DD CA

582 FA0A 86 18

583 FA0C 8D B3

584 FA0E 20 1F

585

586 FA10 0F

587 FA11 20 FD

CKINIT

TST A

BNE

UPAZEL

LDA B

CMDT

AND B

#\$1F

CMP B

ADDR

BNE

NORSVP

LDA A

ENABLE

GET ENABLE STATUS

AND A

#\$EF

SAY WERE ENABLED

STA A

ENARLE

LDX

#CMD

ADDRESS TO START OVERLAY

UPINIT

LDA A

0,X

GET DATA FROM CMD BUFF

STA A

20,X

PUT AWAY DATA

INX

POINT TO NEXT

CPX

#CMD+17

BNE

UPINIT

DO TILL DONE

LDX

#AZPOS

LDD

0,X

AZPOS

STD

AZABS

STD

\$11,X

CMDAZ

LDD

2,X

ELPOS

STD

ELABS

STD

\$13,X

CMDEL

LDD

4,X

AZ BIAS

*

CMP B

#\$FF

IF \$FF..RESTART

BEQ

DEATH

VIA WATCHDOG

*

STD

A7BAZ

LDD

6,X

EL BIAS

STD

ELBAZ

LDA A

#\$18

SET INITIALIZED BIT

BSR

STTT1

IN STATUS WORD

BRA

DSACLC

DISABLE CALC UPDATE

*

SFI

THIS TESTS THE WATCH-DOG

BRA

DEATH

...TIMER

```
589 *-----*
590 *   DETERMINE IF COMMAND IS AZ/EL POINTING   *
591 *-----*
592 FA13 8D 96  HPAZEL  BSR      PASSIT
593 FA15 26 99          RNF      NORSVP
594 FA17 CE 2050          LDX      #CMD
595 FA1A 8D F921          JSR      MASKOK
596 FA1D 27 91          BEQ      NORSVP
597 FA1F CE 2050          LDX      #CMD
598 FA22 A6 04  UPAE    LDA  A    4,X
599 FA24 A7 25          STA  A    37,X
600 FA26 08          INX
601 FA27 8C 2054          CPX      #CMD+4
602 FA2A 26 F6          BNE      UPAE
603 FA2C 8D 8C          BSR      SETT
604 FA2E 96 A3  DSACLC  LDA  A    ENABLE
605 FA30 84 BF          AND  A    #SBF      DISABLE CALC
606 FA32 8A 84          ORA  A    #84      ENABLE MOTORS AND COMM TIME
607 FA34 20 81          BRA      RSVPE
```

```

609 *-----*
610 *
611 * POINT,,READS ENCODERS, BUILDS DATA WORDS *
612 * AND ACTIVATES MOTORS BASED ON COMPARISON *
613 * OF COMMANDED (OR CALCULATED) AND ACTUAL *
614 * POSITIONS *
615 *
616 *-----*
617 *
618 FA36 86 05 POINT LDA A #5 5*500USEC=2.5MSEC
619 FA38 97 B0 STA A MCOUNT
620 FA3A 0E CLI ENABLE INTERRUPTS
621 FA3B 20 49 BRA READE READ ENCODERS
622 FA3D CE FA76 POINT1 LDX #AZVAR
623 FA40 8D FB64 JSR AZMOTR BUILD AZ MOTOR WORD
624 FA43 DC 91 LDD ACOUNT ANY DELAYS FOR ACTV.??
625 FA45 83 0001 SUBD #1 COUNT IT
626 FA48 26 03 BNE CKELM IF SO FORGET AZIMUTH
627 FA4A RD FRA9 JSR POWER IF NOT POWER AZ MOTOR
628 FA4D DD B1 CKELM STD ACOUNT
629 FA4F CE FA7E LDX #ELVAR
630 FA52 BD FB6B JSR ELMOTR BUILD EL MOTOR WORD
631 FA55 DC B3 LDD ECOUNT ANY EL DELAYS
632 FA57 83 0001 SUBD #1 COUNT IT
633 FA5A 26 03 BNE PTRTN IF SO..EXIT
634 FA5C RD FRA9 JSR POWER IF NOT POWER EL MOTOR
635 FA5F DD B3 PTRTN STD ECOUNT
636 FA61 0F SET DISABLE INTERRUPTS
637 FA62 B6 2062 LDA A STATUS GET MOTOR WORD
638 FA65 D6 B5 LDA B MOTWD
639 FA67 53 COM B
640 FA68 C4 06 AND B #$06 ARE HIGH SPEEDS OFF
641 FA6A 27 04 BEQ NEAR YES...WE'RE CLOSE
642 FA6C 84 DF AND A #$DF HIGH SPEED STILL ON
643 FA6E 20 02 BRA NFIN
644 FA70 8A 20 NEAR ORA A #$20 SET PROXIMITY BIT
645 FA72 P7 2062 NFIN STA A STATUS
646 FA75 3B RTI RETURN FROM SYSCLK
647 *
648 *
649 FA76 DF AZVAR FCB $DF,$20,$F5,$02,$08,$0A,$80,$7F
FA77 20
FA78 F5
FA79 02
FA7A 08
FA7B 0A
FA7C 80
FA7D 7F
650 FA7E BF ELVAR FCB $BF,$40,$EB,$04,$10,$14,$01,$FE
FA7F 40

```

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FA80 EB

FA81 04

FA82 10

FA83 14

FA84 01

FA85 FE

```
652 *-----*
653 * PJA AND MOTOR WORD (MOTWD) CONFIGURATION *
654 *-----*
655 *
656 * BIT 0 = 0 1.5 SEC WAIT INACTIVE..ELEVATION *
657 * BIT 0 = 1 1.5 SEC WAIT ACTIVE..ELEVATION *
658 *
659 * BIT 1 = 0 TURN ON AZ HI SPEED *
660 * BIT 1 = 1 TURN OFF AZ HI SPEED *
661 *
662 * BIT 2 = 0 TURN ON EL HI SPEED *
663 * BIT 2 = 1 TURN OFF EL HI SPEED *
664 *
665 * BIT 3 = 0 TURN ON AZ LO SPEED *
666 * BIT 3 = 1 TURN OFF AZ LO SPEED *
667 *
668 * BIT 4 = 0 TURN ON EL LO SPEED *
669 * BIT 4 = 1 TURN OFF EL LO SPEED *
670 *
671 * BIT 5 = 0 AZ POS DIRECTION *
672 * BIT 5 = 1 AZ NEG DIRECTION *
673 *
674 * BIT 6 = 0 EL POS DIRECTION *
675 * BIT 6 = 1 EL NEG DIRECTION *
676 *
677 * BIT 7 = 0 1.5 SEC WAIT INACTIVE..AZIMUTH *
678 * BIT 7 = 1 1.5 SEC WAIT ACTIVE..AZIMUTH *
679 *
680 *-----*
```



```

682 *-----*
683 *
684 * READE.. THIS ROUTINE READS 4 BIT COUNTERS *
685 * AND UPDATES 'IN MEMORY' ABS ENCODERS. *
686 * THIS ROUTINE ALSO SETS 'ENCODER JUMPED' *
687 * STATUS BIT IF REQ'D AND FREEZES DATA IF *
688 * INDEX MARK IS ENCOUNTERED AND SETS STATUS *
689 * BITS ACCORDINGLY *
690 *-----*
691 FA86 F6 5001 READE LDA B PIAIOR GET ENCODER READINGS
692 FA89 F1 5001 CMP B PIAIOR DEBOUNCE
693 FA8C 26 F8 BNE READE
694 FA8E 37 PSH B SAVE FOR ELEVATION
695 *
696 *
697 FA8F CE 00B8 AZMUTH LDX #OLDA7 GET CONSTANT TABLE ADDR
698 FA92 8D 29 BSR CKIND CHECK MARK ENCOUNTERED
699 FA94 86 0A LDA A #$0A CONSTANT USED IN 'MOV'
700 FA96 8D 41 BSR RD1 UPDATE AZ COUNTER
701 FA98 7D 00B9 TST FREEZE DON'T UPDATE IF MARK..
702 FA9B 26 05 BNE ELEVTN ..WAS ENCOUNTERED
703 FA9D DC BE LDD AZABS IF NO FREEZE..UPDATE
704 FA9F FD 2064 STD AZPOS RETURN POSN
705 FAA2 33 ELEVTN PUL R GET READING FROM STACK
706 FAA3 57 ASR B SHIFT
707 FAA4 57 ASR B TO
708 FAA5 57 ASR B THE
709 FAA6 57 ASR B END
710 FAA7 CE 00C5 LDX #OLDEL GET CONSTANT TABLE ADDR
711 FAAA 8D 11 BSR CKIND CHECK MARK ENCOUNTERED
712 FAAC 86 14 LDA A #$14 CONSTANT USED IN 'MOV'
713 FAAE 8D 29 BSR RD1 UPDATE EL COUNTER
714 FAR0 7D 00B9 TST FREEZE DONT'T UPDATE IF MARK..
715 FAB3 26 05 BNE ENDRD
716 FAB5 DC C8 LDD ELABS GET ELEV POSN
717 FAB7 FD 2066 STD ELPOS UPDATE FOR RETURN
718 FABA 7E FA3D ENDRD JMP POINT1

```

```
720 *****
721 * DETERMINE IF A Z(FL)MARKS HAVE BEEN ENCOUNTERED *
722 *****
723 FABD 17          CKIND   TRA          TRANSFER READINGS
724 FARE 84 07          AND A    #S07        ARE BOTH A AND Z HI?
725 FAC0 81 05          CMP A    #S05        IF SO MARK REGION HERE
726 FAC2 26 14          RNE          NOIND       IF NOT FORGET IT
727 FAC4 84 03          AND A    #S03        HAVE WE MOVED??
728 FAC6 A8 00          FOR A    0,X          ..IF SO SET STATUS
729 FAC8 27 0E          BEQ          NOIND       ..IF NOT..DONT SET IT
730 FACA 86 2062        LDA A    STATUS
731 FADC AA 09          ORA A    9,X          SET APPRO ENCOUNTERED BIT
732 FACF 87 2062        STA A    STATUS
733 FAD2 86 01          LDA A    #01         SET FREEZE FLAG..
734 FAD4 97 B9          STA A    FREEZE      ..TO HOLD STATUS
735 FAD6 A7 07          STA A    7,X         INDICATE MARK ENCOUNTERED
736 FAD8 39          NOIND   RTS
737 *
```

```

739 *-----*
740 *
741 *      RD1...THIS ROUTINE UPDATES THE IN MEMORY
742 *      ENCODERS AND DOES COMPARE..NO-COMPARE
743 *
744 *-----*
745 FAD9 97 B6   RD1   STA A   MCODE
746 FADB C4 03   AND B   #S03   KEEP ONLY A & B DATA
747 FADD 37      PSH B      SAVE NEW TO UPDATE OLD
748 FADE E8 00   EOR B      0,X   HAS COUNT CHANGED??
749 FAE0 27 5C   BEQ       MOV    HASN'T MOVED..CHECK IT
750 FAE2 86 FF   LDA A      #SFF   IT MOVED..RESET STUCK
751 FAE4 A7 02   STA A      2,X
752 FAE6 A7 01   STA A      1,X   ..FOR NEXT CHECK
753 FAE8 C5 01   BIT B      #S01   DID A CHANGE??
754 FAEA 27 0D   BEQ       CKR    NO..MUST HAVE BEEN B
755 FAEC 32      PUL A      GET RESULT BACK
756 FAED 06      TAP       C CODES=RESULTS
757 FAEE 36      PSH A      RE-STACK RESULTS
758 FAEF 25 04   BCS       CKOVSA  IF A HI..SEE IF B HI
759 FAF1 28 11   BVC       DECX   A LO..IF B LO..DEC
760 FAF3 20 16   BRA       INCX   A LO..B HI..INCR
761 FAF5 29 0D   CKOVSA  BVS       DECX   A HI..IF B HI..DEC
762 FAF7 20 12   BRA       INCX   A HI..B LO..INCR
763 *
764 FAF9 32      CKR      PUL A
765 FAFA 06      TAP       OV AND CAR=RESULTS
766 FAFB 36      PSH A
767 FAFC 25 04   BCS       CKOVSB  IF A HI..SEE IF B HI
768 FAFE 28 08   BVC       INCX   A LO..IF B LO..INCR
769 FB00 20 02   BRA       DECX   A LO..B HI..DEC
770 FB02 29 07   CKOVSB  BVS       INCX   A HI..IF B HI..INCR
771 *
772 FB04 EC 03   DECX    LDD      3,X   GET ABS ENCODER VALUE
773 FB06 C3 FFFC ADDD     #-4   SUBTRACT 1..
774 FB09 20 05   BRA       ADDX     ..FROM RESULT
775 FB0B EC 03   INCX    LDD      3,X   GET ABS ENCODER VALUE
776 FB0D C3 0004 ADDD     #4   ADD 1 TO RESULT
777 FB10 ED 03   ADDX    STD      3,X
778 FB12 6D 07   TST      7,X   WAS MARK ENCOUNTERED??
779 FB14 27 24   BEQ      OLDNEW NO..UPDATE OLD RESULT
780 FB16 96 B6   LDA A      MCODE
781 FB18 81 0A   CMP A      #S0A   IS IT AZ TIME?
782 FB1A 26 07   BNE      XFL    NO ELEVATION
783 FB1C EC 03   LDD      3,X
784 FB1E FD 2064 STD      AZPOS   UPDATE AND HOLD
785 FB21 20 05   BRA      XSTAT
786 FB23 EC 03   XEL      LDD      3,X
787 FB25 FD 2066 STD      ELPOS
788 FB28 A3 05   XSTAT    SUBD     5,X   COMPARE WITH BIAS

```

last two bits are always 0

789	FB2A	27	0C		BEQ	CLRFRZ	IF THEY COMPARE..ALLS WELL
790	FB2C	B6	2062		LDA	A STATUS	IF NOT..
791	FB2F	AA	08		ORA	A 8,X	SET STATUS BIT TO NOTIFY
792	FB31	B7	2062		STA	A STATUS	..ALL WHO CARE AND..
793	FB34	EC	05		LDD	5,X	THEN MAKE IT RIGHT BY..
794	FB36	ED	03		STD	3,X	.PUTTING BIAS IN POSITION
795	FB38	6F	07	CLRFRZ	CLR	7,X	CLEAR FREEZE FLAG
796	FB3A	33		OLDNEW	PUL	B	GET BACK RESULT
797	FB3B	E7	00		STA	B 0,X	AND UPDATE OLD
798	FB3D	39			PTS		

799

*

800

*

IF EITHER MOTOR BIT IS ON, ALLOW 10.9 SECONDS

801

*

FOR COUNT TO CHANGE..IF IT DOESN'T, MOTOR

802

*

AND/OR ENCODER ARE FAULTY

803

804

805

806

807

808

809

810

811

812

813

814

815

816

817

818

819

820

821

822

*

MOV

NMOVE

LDA

COM

AND

BEQ

PSH

LDD

SUBD

STD

PUL

TST

BNE

TST

BNE

LDA

ORA

STA

INC

INC

BRA

MSAVE

MCODE

CLRFRZ

1,X

#15

1,X

PUL

1,X

CLRFRZ

2,X

CLRFRZ

STATUS

#\$02

STATUS

1,X

2,X

CLRFRZ

GET MOTOR STATUS

IS MOTOR TURNING

NO..FORGET IT

GET STUCK COUNTER

COUNT IT DOWN

IS COUNTER ZERO?

SET NOT MOVING BIT

RESET COUNTER TO

'FFFF'

```

824 *-----*
825 *
826 * AZMOTR..BUILDS AZIMUTH MOTOR WORD *
827 * THIS MOTOR WORD IS USED BY APOWER *
828 * TO ACTIVATE AZIMUTH MOTOR *
829 *
830 * ELMOTR..BUILDS ELEVATION MOTOR WORD *
831 * THIS MOTOR WORD IS USED BY EPOWER *
832 * TO ACTIVATE ELEVATION MOTOR *
833 *-----*
834 FB64 FC 2075 AZMOTR LDD CMDAZ GET COMMANDED POSITION
835 FB67 93 BE SUB D AZABS COMPARE WITH ACTUAL
836 FB69 20 05 BRA MOTR
837 FB68 FC 2077 ELMOTR LDD CMDEL
838 FB6F 93 08 SUB D ELABS
839 FB70 27 30 MOTR BEQ STOP
840 FB72 2B 0A RMI CCW IF RESULT NEG.,CCW
841 FB74 36 CW PSH A
842 FB75 96 B5 LDA A MOTWD GET MOTOR WORD
843 FB77 A4 00 AND A 0,X RESET DIR BIT 'DF-BF'
844 FB79 97 B5 STA A MOTWD
845 FB7B 32 PUL A
846 FB7C 20 0D BRA SPEED DETERMINE SPEED
847 FB7E 36 CCW PSH A
848 FB7F 96 B5 LDA A MOTWD
849 FB81 A4 01 ORA A 1,X SET DIR BIT '20-40'
850 FB83 97 B5 STA A MOTWD
851 FB85 32 PUL A
852 FB86 43 COM A
853 FB87 53 COM B
854 FB88 C3 0001 ADD D #S1 NEGATE RESULT
855 FB8B 4D SPEED TST A
856 FB8C 26 0C BNE HI
857 FB8E C1 20 CMP B #S20 REAL COUNT OF 8
858 FB90 24 08 BCC HI
859 FB92 96 B5 LO LDA A MOTWD
860 FB94 A4 02 AND A 2,X RESET SPEED BITS 'F5-EB'
861 FB96 A4 03 ORA A 3,X SET HI SPEED BIT '02-04'
862 FB9B 20 0C BRA MOTRET ALLOW LO SPEED
863 *
864 FB9A 96 B5 HI LDA A MOTWD
865 FB9C A4 02 AND A 2,X RESET SPEED BITS 'F5-EB'
866 FB9F A4 04 ORA A 4,X SET LO SPEED BIT '08-10'
867 FBA0 20 04 BRA MOTRET
868 *
869 FBA2 96 B5 STOP LDA A MOTWD
870 FBA4 A4 05 ORA A 5,X SET HI/LO BITS '0A-14'
871 FBA6 97 B5 MOTRET STA A MOTWD DISALLOW SPEEDS
872 FBAB 39 RTS

```

```

874 *-----*
875 *
876 *      POWER..DETERMINES IF SWITCHING DELAYS ARE *
877 *      REQUIRED AND CONTROLS MOTOR POWER ACTIVATION *
878 *      AND DIRECTION SWITCHING BY CONTROLLING VALUE *
879 *      IN ' COUNT' THEREBY CONTROLLING ENTRY *
880 *-----*
881 FBA9 96 B5  POWER  LDA A    MOTWD  GET MOTOR WORD
882 FBAB A4 01      AND A    1,X    CHECK DIR REQ  '20-40'
883 FBAD 06 B8      LDA B    MSAVE  GET ACTUAL MOTOR STATUS
884 FBAF E4 01      AND B    1,X    COMPARE DIR   '20-40'
885 FBB1 11          CBA      IF EQUAL DONT DELAY
886 FBB2 27 36      REQ      MOTSP  ..SET MOTOR SPEED
887 *
888 FBB4 96 B5  STOPI  LDA A    MOTWD  GET MOTOR STATUS
889 FBB6 A5 06      BIT A    6,X    IS WAIT ACTIVE '80-01'
890 FBB8 26 12      BNE      CHDIR  IF BIT HI ITS DONE
891 FBBA AA 06      ORA A    6,X    SET BIT   '80-01'
892 FBBC 97 B5      STA A    MOTWD
893 FBBE 96 B8  STOP2  LDA A    MSAVE  ..ALLOW MOTOR TO COAST
894 FBC0 AA 05      ORA A    5,X    ..AFTER THE   '0A-14'
895 FBC2 B7 5000    STA A    PIAIOA ..POWER GOES
896 FBC5 97 B8      STA A    MSAVE  ..NOW SAVE REAL STATUS
897 FBC7 CC 0578    LDD      #1400  1400*2.5MSEC=3.5 SEC
898 FBCA 20 32      BRA      PRET
899 *
900 FBCC D6 B8  CHDIR  LDA B    MSAVE  GET MOTOR STATUS
901 FBCE 53          COM B
902 FBCF E4 05      AND B    5,X    INVERT MOTOR BITS
903 FBD1 26 EB      BNE      STOP2  ARE MOTORS ON?? '0A-14'
904 FBD3 A4 07      AND A    7,X    WAIT AGAIN
905 FBD5 97 B5      STA A    MOTWD  RESET WAIT ACTIVE BIT
906 FBD7 D6 B8      LDA B    MSAVE  '7F-FE'
907 FBD9 A5 01      BIT A    1,X    GET MOTOR STATUS
908 FBDB 26 04      BNE      CCWA   GET REQU DIR   '20-40'
909 FBDD E4 00  CWA    AND B    0,X    IF BIT '0' GO CW
910 FBDF 20 02      BRA      DIREXT  RESET DIR BIT  'DF-BF'
911 *
912 FBE1 EA 01  CCWA   ORA B    1,X    SET DIR BIT   '20-40'
913 FBE3 F7 5000  DIREXT STA B    PIAIOA CHANGE DIRECTIONS
914 FBE6 D7 B8      STA B    MSAVE
915 FBE8 20 11      BRA      APOWRT  GET OUT
916 *
917 FBEA D6 B8  MOTSP  LDA B    MSAVE  GET MOTOR STATUS
918 FBEC E4 02      AND B    2,X    STRIP MOTOR BITS 'F5-EB'
919 FBEE D7 B8      STA B    MSAVE  SAVE STATUS MOMENTARILY
920 FBF0 D6 B5      LDA B    MOTWD  GET MOTOR STATUS
921 FBF2 E4 05      AND B    5,X    ONLY..   '0A-14'
922 FBF4 DA B8      ORA B    MSAVE  SET MOTOR SPEED
923 FBF6 F7 5000    STA B    PIAIOA AWAY WE GOOOOO!

```

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924 FBF9 D7 B8

STA B

MSAVE

SAVE REAL MOTOR STATUS

925 FBF8 CC 0028 APOVRT

LDD

#0040

40*2.5MSEC=100.0MSEC

926 FBF8 39

PRET

RTS

```

928 *
929 *
930 * VECTOR HERE WHEN SCI INTERRUPT HAPPENS
931 *
932 *
933 FBFF DE AA SCIO LDX IOVEC CONTAINS SCIOT VECTOR..
934 FC01 6E 00 JMP 0,X ..IF TRANSMIT INTERRUPT
935 * IS EXPECTED..
936 * CONTAINS SCIOR VECTOR..
937 * ..IF RECEIVE INTERRUPT
938 * IS EXPECTED
939 *
940 * ENTER HERE ON FIRST BYTE OF INCOMING MESSAGE
941 *
942 *
943 FC03 96 A3 SCIOR LDA A ENABLE GET ENABLE RYTE
944 FC05 84 FD AND A #$FD RESET SYNC TIMER
945 FC07 97 A3 STA A ENABLE
946 FC09 96 11 LDA A SCICS GET SCI STATUS
947 FC0B 84 44 AND A #$44 ISOLATE ERROR BITS
948 FC0D 26 10 RME SETWU IF ERROR OCCUR..QUIT
949 FC0F 7C 00AD INC CHARS COUNT MESSAGE BYTES
950 FC12 D6 12 LDA B SCIRX GET INCOMING BYTE
951 FC14 17 TRA SAVE IT
952 FC15 DB AE ADD B CKSM CHECKSUM BYTE
953 FC17 D7 AE STA B CKSM
954 FC19 DE A8 LDX NEXVEC GET ADDR OF SERVICE RT
955 FC1B D6 AC LDA B BYTECT
956 FC1D 6E 00 JMP 0,X JUMP TO SERVICE ROUTINE
957 *
958 * SETS HARDWARE RECEIVER DISABLE TILL MSG GONE
959 *
960 FC1F 8D 01 SETWU BSR WU SET WAKE UP
961 FC21 3B RTI
962 *
963 FC22 96 11 WU LDA A SCICS GET SCI STATUS BYTE
964 FC24 8A 01 ORA A #$01 SET WAKE-UP BIT
965 FC26 97 11 STA A SCICS DISABLE RECEIVER
966 FC28 4F CLR A
967 FC29 97 AD STA A CHARS CLEAR MESSAGE COUNTER
968 FC2B 97 AE STA A CKSM CLEAR CHECKSUM BYTE
969 FC2D 97 AC STA A BYTECT CLEAR BYTE COUNTER
970 FC2F 96 12 LDA A SCIRX CLEAR RX BUFFER
971 FC31 CE FC3C LDX #GETCMD SET UP AGAIN FOR...
972 FC34 DF A8 STX NEXVEC ..START OF NEW MSG
973 FC36 CE FC03 LDX #SCIOR GET ADDR OF INTERRUPT..
974 FC39 DF AA STX IOVEC ..HANDLER AND STORE
975 FC3B 39 RTS RTI TO BACKGROUND
976 *
977 *

```


978	*						
979	*						
980	*						
981	FC3C	B7	2012	GETCMD	STA A	CMDT	PUT AWAY BYTE
982	FC3F	16			TAR		SAVE TYPE
983	FC40	84	E0		AND A	#\$E0	ISOLATE TYPE
984	*						
985	FC42	81	A0	GCMD5	CMP A	#\$A0	STATUS RESPONSE?
986	FC44	27	D9		REQ	SETWU	
987	*						
988	FC46	81	80	GCMD4	CMP A	#\$80	STATUS POLL
989	FC48	26	0E		BNE	GCMD1	
990	FC4A	17		TOHFC	TBA		YES..IS IT MINE??
991	FC4B	84	1F		AND A	#\$1F	ISOLATE ADDRESS
992	FC4D	91	B7		CMP A	ADDR	GET REAL ADDRESS
993	FC4F	26	CE		BNE	SETWU	NO..IGNORE THEN??
994	FC51	CE	FC8A		LDX	#VERIFY	YES..ENABLE CHECKSUM
995	FC54	DF	AB		STX	NEXVEC	
996	FC56	20	13		BRA	STRSYN	START SYNC TIMER
997	*						
998	FC58	81	20	GCMD1	CMP A	#\$20	IS IT A BEAMER??
999	FC5A	27	07		REQ	STRSUN	
1000	FC5C	81	60	GCMD3	CMP A	#\$60	IS IT ABS AZ/EL??
1001	FC5E	27	03		REQ	STRSUN	
1002	FC60	4D		GCMD0	TST A	#0	IS IT INIT TIME??
1003	FC61	26	BC	CMDOUT	BNE	SETWU	NO..ABOUT DONE THEN
1004	*						
1005	FC63	7F	00AC	STRSUN	CLR	BYTECT	CLEAR BYTE COUNTER
1006	FC66	CE	FC76		LDX	#GETDAT	POINT TO DATA COLLECTOR
1007	FC69	DF	AB		STX	NEXVEC	
1008	*						
1009	FC6B	86	04	STRSYN	LDA A	#\$04	SET UP FOR 2.0 MSEC DELAY
1010	FC6D	97	A5	STRSY1	STA A	SLOSS	
1011	FC6F	96	A3		LDA A	ENABLE	
1012	FC71	8A	02		ORA A	#\$02	ENABLE TIMER TO COUNT
1013	FC73	97	A3		STA A	ENABLE	
1014	FC75	3B			RTI		RETURN IT IS
1015	*						
1016	*						
1017	*						LOADS DATA INTO INPUT BUFFER
1018	*						
1019	*						
1020	FC76	CE	2013	GETDAT	LDX	#CMDS	POINT TO MSG BUFFER
1021	FC79	3A		FMSGIB	ABX		ADD BYTECOUNT TO X
1022	FC7A	A7	00		STA A	0,X	TO OFFSET
1023	FC7C	7C	00AC		INC	BYTECT	
1024	FC7F	C1	4D		CMP B	#77	GOT ALL DATA??
1025	FC81	26	E8		BNE	STRSYN	NO..START TIMER AGAIN
1026	FC83	CE	FC8A		LDX	#VERIFY	YES..POINT TO VERIFY
1027	FC86	DF	AB		STX	NEXVEC	

1028	FC88	20	E1					
1029				*				
1030				*	VERIFYS DATA IS CORRECT			
1031				*	AND CALCULATES RESPONSE PERIOD			
1032				*				
1033	FC8A	96	AE	VERIFY	LDA A	CKSM		
1034	FC8C	26	D3		RNE	CMDOUT	BAD COMMAND..RESET	
1035				*				
1036	FC8E	F6	2061	CALCTX	LDA B	HEADER		
1037	FC91	C4	1F		AND B	#\$1F	STRIP OFF OLD	
1038	FC93	86	2012		LDA A	CMDT	GET COMMAND TYPE	
1039	FC96	84	E0		AND A	#\$E0	ISOLATE TYPE	
1040	FC98	81	80		CMP A	#\$80	IS IT POLL??	
1041	FC9A	26	0A		RNE	CALTX1	NO..MUST BE RESP	
1042	FC9C	CA	A0	NOCALC	ORA B	#\$A0	SAY POLL RESP	
1043	FC9E	86	07		LDA A	#7		
1044	FCA0	97	AD	NOC	STA A	CHARS		
1045	FCA2	86	06		LDA A	#6	ALLOW HFC TO LINE SWAP	
1046	FCA4	20	16		BRA	ENARSP		
1047	FCA6	96	A3	CALTX1	LDA A	ENABLE		
1048	FCA8	8A	01		ORA A	#\$01	SAY NEW SUN IS IN	
1049	FCAA	97	A3		STA A	ENABLE		
1050	FCAC	86	01		LDA A	#1		
1051	FCAE	97	AD		STA A	CHARS		
1052	FCB0	CA	C0		ORA B	#\$C0	SAY CMD RESP	
1053	FCB2	96	B7		LDA A	ADDR	GET REAL ADDRESS	
1054	FCB4	97	A4		STA A	TRXOK	SAVE IT	
1055	FCB6	48			ASL A		MULTIPLY BY	
1056	FCB7	98	A4		ADD A	TRXOK	3 AND	
1057	FCB9	88	05		ADD A	#\$5	...ADD 5	
1058	FCBB	48			ASL A		GET # OF 500USEC	
1059	FCBC	97	A4	ENARSP	STA A	TRXOK	INTERVALS	
1060	FCBE	96	A3		LDA A	ENABLE		
1061	FCC0	8A	08		ORA A	#\$08	ENABLE RESPONSE	
1062	FCC2	97	A3		STA A	ENABLE		
1063	FCC4	F7	2061		STA B	HEADER		
1064	FCC7	20	A2	VERFIN	BRA	STRSYN	START TIMER..LAST TIME	
1065				*				
1066				*				

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1068 *-----*
1069 *   ENTER HERE ON TRANSMITTER INTERRUPT   *
1070 *-----*
1071 FCC9 96 11   SCIOT   LDA A   SCICS   CLEAR INT FLAG
1072 FCC8 96 02   LDA A   PORT1   GET PORT STATUS
1073 FCCD 84 BF   AND A   #SFB    ENABLE XMITTER
1074 FCCF 97 02   STA A   PORT1
1075 FCD1 96 AD   LDA A   CHARS   IF 0 SEND CKSM
1076 FCD3 27 17   REQ     SNCKS   IF NOT OUTPUT
1077 FCD5 CE 2061 NORMAL LDX   #HEADER GET ADDR RESP BUFF
1078 FCD8 06 AC   BINX   LDA B   BYTECT  GET POINTER
1079 FCDA 3A     ABX
1080 FCDB E6 00   LDA B   0,X    GET DATA BYTE
1081 FCDD 96 AE   LDA A   CKSM
1082 FCDF 18     ABA     UPDATE CKSM
1083 FCE0 97 AE   STA A   CKSM
1084 FCE2 D7 13   STA B   SCITX  SEND THE BYTE OUT
1085 FCE4 7A 00AD DEC   CHARS   ADD IN CKSM
1086 FCE7 7C 00AC INC   BYTECT  POINT TO NEXT ONE
1087 FCEA 20 DB   BRA   VERFIN  GET OUT
1088 FCEC 96 AC   SNCKS  LDA A   BYTECT  WAS IT A CMD RESP??
1089 FCEE 81 01   CMP A   #1
1090 FCF0 26 04   BNE   OKCKSM YES,,FORGET CKSM
1091 FCF2 86 03   LDA A   #S03
1092 FCF4 20 07   BRA   NOCKSM
1093 FCF6 D6 AE   OKCKSM LDA B   CKSM
1094 FCF8 50     NEG B
1095 FCF9 D7 13   STA B   SCITX
1096 FCFB 86 06   LDA A   #S06
1097 FCFD D6 11   NOCKSM LDA B   SCICS   DISABLE TX INTERRUPT
1098 FCFF C4 FB   AND B   #SFB
1099 FD01 D7 11   STA B   SCICS
1100 FD03 7E FC6D SCTRTI JMP    STRSY1

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1102 *-----*

1103 * 4-BYTE MOVE ROUTINES USER BY CALC *

1104 *-----*

1105			*				
1106	FD06	EC	00	PVLX	LDD	0,X	LOAD X
1107	FD08	DD	E7		STD	X0	
1108	FD0A	EC	02		LDD	2,X	'F5-EB'
1109	FD0C	DD	F1		STD	X2	
1110	FD0E	39			RTS		
1111				*			
1112	FD0F	EC	00	PVLY	LDD	0,X	LOAD Y
1113	FD11	DD	E7		STD	Y0	
1114	FD13	EC	02		LDD	2,X	
1115	FD15	DD	E9		STD	Y2	
1116	FD17	39			RTS		
1117				*			
1118	FD18	EC	00	PVLA1	LDD	0,X	LOAD AC1
1119	FD1A	DD	F3		STD	AC10	
1120	FD1C	EC	02		LDD	2,X	
1121	FD1E	DD	F5		STD	AC12	
1122	FD20	39			RTS		
1123				*			
1124	FD21	EC	00	PVLA2	LDD	0,X	LOAD AC2
1125	FD23	DD	EB		STD	AC20	
1126	FD25	EC	02		LDD	2,X	
1127	FD27	DD	ED		STD	AC22	
1128	FD29	39			RTS		
1129				*			
1130	FD2A	DC	E7	PVSY	LDD	Y0	STORE Y
1131	FD2C	ED	00		STD	0,X	
1132	FD2E	DC	E9		LDD	Y2	
1133	FD30	ED	02	PVX	STD	2,X	
1134	FD32	39			RTS		

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7

PVLX^{PVX}, PVLY, PVLA1, PVLA2, PVSY

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1136 *-----*
1137 *
1138 *      CALC..UTILIZES CORDIC ALGORITHM TO CALCULATE
1139 *      AZIMUTH AND ELEVATION IF POINTING OR WIREWALK
1140 *      COMMAND IS RECEIVED
1141 *
1142 *-----*
1143 FD33  CALC      EQU      *
1144 *-----*
1145 *      TRANSFER LATEST TARGET TO WORKING TARGET
1146 *-----*
1147 FD33 CE 00CF      LDX      #TARGTX  GET ADDR OF LATEST
1148 FD36 A6 00      TXFER    LDA A      0,X
1149 FD38 A7 0C      STA A      12,X
1150 FD3A 08          INX
1151 FD3B 8C 00DB      CPX      #TARGTX+12
1152 FD3E 26 F6      RNE      TXFER
1153 *-----*
1154 *      CALCULATE REAL TARGET VECTOR
1155 *-----*
1156 FD40 CE 2071      LDX      #HELIZ-1  ***  BZ=TZ-HZ
1157 FD43 8D CA      BSR      PVLY
1158 FD45 4F          CLR A
1159 FD46 97 E7      STA A      Y0
1160 FD48 CE 00E3      LDX      #T70
1161 FD4B 8D FF2B      JSR      SUB
1162 *
1163 FD4E CE 00DB      LDX      #TX0      ***  BX=TX-HX
1164 FD51 8D BC      BSR      PVLY
1165 FD53 CE 206B      LDX      #HELIX-1
1166 FD56 8D C9      BSR      PVLA2
1167 FD58 4F          CLR A
1168 FD59 97 ER      STA A      AC20
1169 FD5B CE 00E7      LDX      #Y0
1170 FD5E 8D FF2B      JSR      SUB
1171 FD61 CE 00DB      LDX      #TX0
1172 FD64 8D C4      BSR      PVSX
1173 *
1174 FD66 CE 00DF      LDX      #TY0      ***  BY=TY-HY
1175 FD69 8D FD06      JSR      PVLX
1176 FD6C CE 206E      LDX      #HELIY-1
1177 FD6F 8D A7      BSR      PVLAI
1178 FD71 4F          CLR A
1179 FD72 97 F3      STA A      AC10
1180 FD74 CE 00EF      LDX      #X0
1181 FD77 8D FF2B      JSR      SUB
1182 FD7A CE 00DF      LDX      #TY0
1183 FD7D DC EF      PVSX      LDD      X0      STORE X
1184 FD7F ED 00      STD      0,X
1185 FD81 DC F1      LDD      X2

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1186 FD83 ED 02
1187 *

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STD 2,X

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1189 *-----*
1190 *          NORMALIZE TARGET VECTOR          *
1191 *-----*
1192 FD85 8D FE57      JSR      CORDIC      K * SQRT( BX**2 + BY**2 )
1193 FD88 CE FFEC      LDX      #K0          DIVIDE BY K
1194 FD8B 8D FD18      JSR      PVLA1
1195 FD8E 86 1F        LDA      A          #31
1196 FD90 97 FB        STA      A          DVC
1197 FD92 8D FF43      JSR      DIVIDE
1198 FD95 CE 00E3      LDX      #TZO
1199 FD98 8D FD06      JSR      PVLX
1200 FD9B 8D FE57      JSR      CORDIC      K * SQRT( BX**2 + BY**2 + BZ**
1201 FD9E CE FFEC      LDX      #K0          DIVIDE BY K
1202 FDA1 8D FD18      JSR      PVLA1      RESULT = MAGNITUDE R
1203 FDA4 86 21        LDA      A          #33
1204 FDA6 97 FB        STA      A          DVC
1205 FDA8 8D FF43      JSR      DIVIDE
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1207 *-----*
1208 *   ADD NORMALIZED VECTORS,,OBTAIN BEAM POINTING VECTOR   *
1209 *-----*
1210 FDAB CE 00E7      LDY      #Y0      NORMALIZE BZ
1211 FDAE BD FD18      JSR      PVL A1
1212 FDB1 CE 00E3      LDY      #TZ0
1213 FDB4 BD 20        BSR      DIVD1
1214 FDB6 CE 2005      LDY      #SUN7-1      ADD NORMALIZED SUN VECTOR
1215 FDB9 BD 33        BSR      ADDD1      BZ+SZ
1216 FDBB CE 00E3      LDY      #TZ0      STORE IN TZ
1217 FDBF BD FD2A      JSR      PVS Y
1218 FDC1 CE 00DF      LDY      #TY0      NORMALIZE BY
1219 FDC4 BD 10        BSR      DIVD1
1220 FDC6 CE 2002      LDY      #SIUN7-1      ADD NORMALIZED SUN VECTOR
1221 FDC9 BD 23        BSR      ADDD1      BY+SY
1222 FDCB CE 00DF      LDY      #TY0
1223 FDCE BD FD2A      JSR      PVS Y
1224 FDD1 CE 00DB      LDY      #TX0      NORMALIZE BX
1225 FDD4 BD 00        BSR      DIVD1
1226 FDD6 CE 1FFF      LDY      #SIUNX-1      ADD NORMALIZED SUN VECTOR
1227 FDD9 BD 13        BSR      ADDD1
1228 FDDB CE 00DF      LDY      #TY0      LOAD VY IN Y
1229 FDEE BD FD06      JSR      PVL X
1230 FDE1 BD 18        BRA      CALC1
1231 *
1232 *
1233 *
1234 FDE3 BD FD06 DIVD1 JSR      PVL X
1235 FDE6 BD 1F        LDA A      #31
1236 FDE8 BD FB        STA A      DVC
1237 FDEA BD FF43      JSR      DIVIDE
1238 FDED BD 39        RTS
1239 *
1240 FDEE BD FD21 ADDD1 JSR      PVLA2
1241 FDF1 BD 4F        CLR A
1242 FDF2 BD EB        STA A      AC20
1243 FDF4 CE 00E7      LDY      #Y0
1244 FDF7 BD FF10      JSR      ADD
1245 FDEA BD 39        RTS
1246 FDFB BD 5A      CALC1      BSR      CORDIC      CALCULATE AZIMUTH ANGLE

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1248 *-----*
1249 *                PERFORM +OR- 270 DEGREE CALC                *
1250 *-----*
1251 FDFD 96 FA          LDA A      TH3
1252 FDFF D6 F9          LDA B      TH2
1253 FE01 00 FC          STD         AZ          CALC-AZ
1254 FE03 93 BE          SUB D      AZABS        CURRENT AZ POSN.
1255 FE05 2A 01          BPL         **3
1256 FE07 43            COM A          ABS.VAL.DIFF.HI-BYTE
1257 FE08 81 40          CMP A      #$40
1258 FE0A 2D 0F          BLT         AZOK        BRIF DIFF.LT.180 DEGREES
1259 FE0C 96 FC          LDA A      AZ
1260 FE0E 2A 01          BPL         **3
1261 FE10 43            COM A          ABS.VAL.CALCAZ.HI-BYTE
1262 FE11 81 20          CMP A      #$20
1263 FE13 2D 06          BLT         AZOK        BRIF CANNOT GEN ANOTHER
1264 FE15 96 FC          LDA A      AZ
1265 FE17 88 80          ADD A      #$80        AZ +OR- 360 DEGREES
1266 FE19 97 FC          STA A      AZ
1267      FE18      AZOK EQU         *
1268 FE18 CE FFEC        LDX         #K0          DIVIDE VECTOR BY K
1269 FE1E 9D FD18        JSR         PVLAI
1270 FE21 86 1F          LDA A      #31
1271 FE23 97 FB          STA A      DVC
1272 FE25 BD FF43        JSR         DIVIDE
1273 FE28 CE 00E3        LDX         #TZO          CALCULATE ELEVATION ANGLE
1274 FE2B BD FD06        JSR         PVLX
1275 FE2E 8D 27          BSR         CORDIC
1276 FE30 96 FA          LDA A      TH3
1277 FE32 D6 F9          LDA B      TH2
1278 FE34 00 FE          STD         EL
1279 *-----*
1280 *                DETERMINE IF CALC IS STILL REQUIRED                *
1281 *-----*
1282 FE36 B6 2063        LDA A      STATUS+1    HAVE WE LOST COMM??
1283 FE39 81 1C          CMP A      #SIC        IF SO..DONT POST RESULTS
1284 FE3B 27 14          BEQ         ENDCLC     ...AND GET OUT
1285 FE3D 96 A3          LDA A      ENABLE      GET ENABLE STATUS
1286 FE3F 84 40          AND A      #$40        IS CALC UPDATE ALLOWED??
1287 FE41 27 0E          BEQ         ENDCLC     IF NOT..BUG OUT
1288 FE43 DC FC          LDD         AZ          IF SO..PASS RESULT
1289 FE45 C4 FC          AND B      #$FC        STRIP OFF 2 LS BITS
1290 FE47 FD 2075        STD         CMDAZ      ..TO MOTOR
1291 FE4A DC FE          LDD         EL          DO THE SAME WITH ELEVATION
1292 FE4C C4 FC          AND B      #$FC        STRIP OFF 2 LS BITS
1293 FE4E FD 2077        STD         CMDEL
1294 FE51 7F 00BA ENDCLC CLR         SYNC
1295 FE54 7E F866        JMP         WAITC      BACK TO CALC WAIT

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1297 *-----*
1298 *          CORDIC ARCTAN CALCULATION ROUTINE          *
1299 *-----*
1300 *
1301 FE57 4F          CORDIC      CLR A          CLEAR THETA
1302 FE58 97 F7          STA A          TH0
1303 FE5A 97 F8          STA A          TH1
1304 FE5C 97 F9          STA A          TH2
1305 FE5E 96 F2          LDA A          X3          X NEGATIVE?
1306 FE60 28 0C          BMI          CORXM
1307 FE62 86 20          CORYN      LDA A          #S20          NO, THETA=90
1308 FE64 97 FA          STA A          TH3
1309 FE66 CE 00E7        LDY          #Y0          Y=-Y
1310 FE69 8D FF02        JSR          TWOC
1311 FE6C 20 0A          BRA          CORIN      TO INITIALIZE
1312 FE6E 86 E0          CORXM      LDA A          #SE0          YES, THETA =-90
1313 FE70 97 FA          STA A          TH3
1314 FE72 CE 00EF        LDY          #X0          X=-X
1315 FE75 8D FF02        JSR          TWOC
1316 FE78 7F 00FB        CORIN      CLR          LC
1317 *
1318 FE7B CE 00EB        CORLP      LDY          #AC20          PUT X IN Y ACCUMULATOR
1319 FE7E C6 04          LDA B          #4
1320          FE80          CORAX      EQU          *
1321 FE80 A6 04          LDA A          4,X
1322 FE82 A7 00          STA A          0,X
1323 FE84 08          INX
1324 FE85 5A          DEC B
1325 FE86 26 FA          RNF          CORAX
1326 FE88 CE 00E7        LDY          #Y0          PUT Y IN X ACCUMULATOR
1327 FE8B C6 04          LDA B          #4
1328          FE8D          CORAY      EQU          *
1329 FE8D A6 00          LDA A          0,X
1330 FE8F A7 0C          STA A          5C,X
1331 FE91 08          INY
1332 FE92 5A          DEC B
1333 FE93 26 FA          RNF          CORAY
1334 FE95 CE 00F3        LDY          #AC10          GET SHIFT COUNT
1335 FE98 06 FA          LDA B          LC
1336 FE9A 27 09          BEQ          CORXX      SHIFT COUNT=0?
1337 FE9C 8D 72          BSR          SR          NO, SHIFT X ACCU RIGHT
1338 FE9E CE 00EB        LDY          #AC20          GET SHIFT COUNT
1339 FEA1 06 FA          LDA B          LC
1340 FEA3 8D 6B          BSR          SR          SHIFT Y ACCU RIGHT
1341          FEA5          CORXX      EQU          *          CALCULATE NEW X
1342 FEA5 CE 00EF        LDY          #X0
1343 FEA8 96 EA          LDA A          Y3          Y LT 0?
1344 FEA A 28 04          BMI          CORXS
1345 FEAC 8D 6F          BSR          ADD          NO, ADD ACCUX TO X
1346 FEAE 20 02          BRA          CORTH

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COO	13:12	JAN 27, '84	MMC	M6801/M6803	MPU	ASSEMBLER	PAGE	42
1347	FEB0	8D 79	CORXS	BSR	SUB	YES, SUBTRACT ACCUX FROM X		
1348	FEB2		CORTH	EQU	*	CALCULATE NEW THETA		
1349	FEB2	CE FF98		LDX	#ALPHA			
1350	FEB5	D6 FB		LDA B	LC	DETERMINE OPERAND ADDRESS		
1351	FEB7	C1 0D		CMP B	#13	SHORT CONSTANTS??		
1352	FEB9	2D 05		BLT	LONG			
1353	FEB8	CE FFB2		LDX	#ALPHA2			
1354	FEBE	20 01		BRA	SHORT			
1355	FEC0	58	LONG	ASL B				
1356	FEC1	58	SHORT	ASL B				
1357	FEC2	3A		ARX				
1358	FEC3	8D FD18		JSR	PVLA1	LOAD OPERAND INTO AC1		
1359	FEC6	D6 FB		LDA B	LC	GET ITER COUNT		
1360	FEC8	C1 0D		CMP B	#13	POINTING TO SHORTS??		
1361	FECA	2D 04		BLT	NOCLMS	NO..DONT CLR MS BITS		
1362	FECC	4F		CLR A		YES..CLEAR MS BITS		
1363	FECD	5F		CLR B				
1364	FECE	DD F5		STD	AC12			
1365	FED0	CE 00F3	NOCLMS	LDX	#AC10			
1366	FED3	96 EA		LDA A	Y3			
1367	FED5	2A 02		BPL	CORTA	Y LT 0?		
1368	FED7	8D 29		BSR	TWOC	YES, NEGATE OPERAND		
1369	FED9	CE 00F3	CORTA	LDX	#AC10			
1370	FEDC	8D 3F		BSR	ADD	ADD OPERAND TO THETA		
1371	FEDE	CE 00F3		LDX	#AC10	PUT RESULT IN THETA		
1372	FEE1	EC 00		LDD	0,X			
1373	FEE3	ED 04		STD	4,X			
1374	FEE5	EC 02		LDD	2,X			
1375	FEE7	ED 06		STD	6,X			
1376	FEE9		CORYY	EQU	*	CALCULATE NEW Y		
1377	FEE9	CE 00E7		LDX	#Y0			
1378	FEEC	96 EA		LDA A	Y3			
1379	FEED	2A 04		BPL	CORYS	Y GT 0?		
1380	FEF0	8D 2B		BSR	ADD	NO, ADD ACCUY TO Y		
1381	FEF2	20 02		BRA	CORNX			
1382	FEF4	8D 35	CORYS	BSR	SUB	YES, SUBTRACT ACCUY FROM Y		
1383	FEF6	D6 FB	CORNX	LDA B	LC			
1384	FEF8	5C		INC B				
1385	FEF9	C1 1D		CMP B	#S1D			
1386	FEFB	27 12		BEQ	PTSX	RETURN..SAVE A BYTE		
1387	FEFD	D7 FB		STA B	LC			
1388	FEFF	7E FE7B	CORTE	JMP	CORLP	DO IT AGAIN		

```

1390 *-----*
1391 *          MATH UTILITY SUBROUTINES          *
1392 *-----*
1393 *
1394      FF02      TWOC      EQU      *          NEGATES A FOUR BYTE WORD
1395 FF02 C6 04          LDA B      #4
1396 FF04 0C          CLC
1397 FF05 86 00      TWOCL      LDA A      #0
1398 FF07 A2 00          SRC A      0,X
1399 FF09 A7 00          STA A      0,X
1400 FF0B 08          INX
1401 FF0C 5A          DEC B
1402 FF0D 26 F6          BNE          TWOCL
1403 FF0F 39          RTSX      RTS

```

```

1405      FF10      SR          EQU      *          SHIFTS WORD AT LOCATION IN
1406 FF10 0C          CLC          X REGISTER RIGHT NUMBER OF
1407 FF11 67 03          ASR          3,X          BITS SPECIFIED IN B
1408 FF13 66 02          ROR          2,X          REGISTER
1409 FF15 66 01          ROR          1,X
1410 FF17 66 00          ROR          0,X
1411 FF19 5A          DEC B
1412 FF1A 26 F4          BNE          SR
1413 FF1C 39          RTS

```

```

1415      FF1D      ADD          EQU      *          ADDS TWO WORDS THAT ARE
1416 FF1D C6 04          LDA B      #4          IN CONSECUTIVE LOCATIONS
1417 FF1F 0C          CLC          THE RESULT IS LEFT IN THE
1418      FF20      ADDLP          EQU      *          LOWER ADDRESS WORD
1419 FF20 A6 00          LDA A      0,X
1420 FF22 A9 04          ADC A      4,X
1421 FF24 A7 00          STA A      0,X
1422 FF26 08          INX
1423 FF27 5A          DEC B
1424 FF28 26 F6          BNE          ADDLP
1425 FF2A 39          RTS

```

1427	FF2B	SUB	EQU	*	SUBTRACTS TWO WORDS IN
1428	FF2B	C6 04	LDA R	#4	THE INDEX REGISTER.
1429	FF2D	0C	CLC		THE RESULT IS LEFT IN THE
1430	FF2E	SUBLP	EQU	*	LOWER ADDRESS WORD
1431	FF2F	A6 00	LDA A	0,X	
1432	FF30	A2 04	SBC A	4,X	
1433	FF32	A7 00	STA A	0,X	
1434	FF34	08	INX		
1435	FF35	5A	DEC B		
1436	FF36	26 F6	BNE	SUBLP	
1437	FF38	39	RTS		

1439	FF39	SHL	EQU	*	LEFT SHIFT WORD ONE BIT
1440	FF39	C6 04	LDA B	#504	
1441	FF3B	0C	CLC		
1442	FF3C	SHLLP	EQU	*	
1443	FF3C	69 00	ROL	0,X	
1444	FF3E	08	INX		
1445	FF3F	5A	DEC B		
1446	FF40	26 FA	BNE	SHLLP	
1447	FF42	39	RTS		

```

1449 *-----*
1450 *          DIVISION ROUTINE - VERSION 1.0          *
1451 *          THIS ROUTINE DIVIDES TWO 32 BIT OPERANDS WHOSE *
1452 *          LOCATIONS ARE SEQUENTIAL IN LOCATIONS AC AND OP. *
1453 *          SUBROUTINES USED:                          *
1454 *          SHL - LEFT SHIFT CONTINUOUS WORD          *
1455 *          SUR - SUBTRACT WORDS                      *
1456 *          ADD - ADD WORDS                          *
1457 *          THE RESULT IS LEFT IN MQ                 *
1458 *          THE DIVIDE COUNT IS SET BY THE CALLING PROGRAM. *
1459 *          AND STORED IN DVC.                        *
1460 *-----*
1461 *
1462          FF43  DIVIDE  FNH          *
1463 FF43 4F          CLR A          CLEAR QUOTENT
1464 FF44 5F          CLR B
1465 FF45 DD E7      STD          MQ0
1466 FF47 DD E9      STD          MQ2
1467 *
1468 FF49 C6 40      LDA R          #$40      TEST FOR NEGATIVE OPERANDS
1469 FF4B D7 EB      STA B          AC20     CHANGE IF NEGATIVE AND
1470 FF4D 96 F2      DIVTA        LDA A          AC3      LOAD AC20 WITH APPROPREATE
1471 FF4F 2A 08      RPL          DIVTO     SIGN
1472 FF51 CE 00EF    LDX          #AC0
1473 FF54 8D AC      BSR          TWOC
1474 FF56 78 00EB    ASL          AC20
1475 FF59 96 F6      DIVTO        LDA A          OP3
1476 FF5B 2A 08      RPL          DIVST
1477 FF5D CE 00F3    LDX          #OP0
1478 FF60 8D A0      BSR          TWOC
1479 FF62 78 00EB    ASL          AC20
1480 *
1481 FF65 CE 00EF    DIVST        LDX          #AC0      START DIVISION
1482 FF68 8D C1      BSR          SUB        SUBTRACT OP FROM AC
1483 *
1484 FF6A CE 00E7    DIVLP        LDX          #MQ0     SHIFT QUOTENT LEFT ONE BIT
1485 FF6D 8D CA      BSR          SHL
1486 *
1487 FF6F CE 00EF    LDX          #AC0     SHIFT DIVIDEND LEFT ONE BIT
1488 FF72 8D C5      BSR          SHL
1489 *
1490 FF74 25 0D      BCS          DIVAD     DIVIDEND NEGATIVE BEFORE
1491 FF76 CE 00EF    LDX          #AC0     SHIFT?
1492 FF79 8D B0      BSR          SUB        NO, SUBTRACT
1493 FF7B 96 E7      LDA A          MQ0     SET BIT 1 OF QUOTENT
1494 FF7D 8A 01      ORA A          #$01
1495 FF7F 97 E7      STA A          MQ0
1496 FF81 20 05      BRA          DIVS
1497 *
1498 FF83 CE 00EF    DIVAD        LDX          #AC0     YES, ADD

```

1499 FF86 8D 95

BSR ADD

1500 *

1501 FF88 7A 00FB DIVS

DEC DVC NEXT ITERATION

1502 FF8B 26 DD

BNE DIVLP

1503 *

1504 FF8D 96 ER

LDA A AC20 CORRECT SIGN

1505 FF8F 2A 06

RPL DIVR

1506 FF91 CE 00E7

LDX #MQ0

1507 FF94 8D FF02

JSR TWOC

1508 *

1509 FF97 39 DIVR

RTS

```

1511 *-----*
1512 *          CORDIC ANGLE COEFFICIENTS FOR          *
1513 *          ARCTAN CALCULATION                      *
1514 *
1515 *          NOTE:  ALL SPECIFIED LS-BYTE FIRST --   *
1516 *          MS-BYTE LAST...                          *
1517 *
1518 *-----*
1519          FF98      ALPHA      EQU          *
1520 *
1521 FF98 00          FCB      $00,$00,$00,$10          $ 1000 0000      45DEG,
      FF99 00
      FF9A 00
      FF9B 10
1522 FF9C 8F          FCB      $8F,$02,$72,$09          $ 0972 028F
      FF9D 02
      FF9E 72
      FF9F 09
1523 FFA0 2E          FCB      $2E,$9C,$FD,$04          $ 04FD 9C2E
      FFA1 9C
      FFA2 FD
      FFA3 04
1524 FFA4 EA          FCB      $EA,$88,$88,$02          $ 0288 88EA
      FFA5 88
      FFA6 88
      FFA7 02
1525 FFA8 A2          FCB      $A2,$86,$45,$01          $ 0145 86A2
      FFA9 86
      FFAA 45
      FFAB 01
1526 FFAC F1          FCB      $F1,$EB,$A2,$00          $ 00A2 EBF1
      FFAD EB
      FFAE A2
      FFAF 00
1527          FFB2      ALPHA2      EQU          *+2
1528 FFB0 0F          FCB      $0F,$7B,$51,$00          $ 0051 7B0F
      FFB1 7B
      FFB2 51
      FFB3 00
1529 FFB4 2B          FCB      $2B,$BE,$2B,$00          $ 002B BE2B
      FFB5 BE
      FFB6 2B
      FFB7 00
1530 FFB8 2A          FCB      $2A,$5F,$14,$00          $ 0014 5F2A
      FFB9 5F
      FFBA 14
      FFBB 00
1531 FFBC 97          FCB      $97,$2F,$0A,$00          $ 000A 2F97
      FFBD 2F
      FFBE 0A

```


1532	FFBF 00 FFC0 CC FFC1 17 FFC2 05 FFC3 00	FCB	\$CC,\$17,\$05,\$00	\$ 0005 17CC
1533	FFC4 E6 FFC5 88 FFC6 02 FFC7 00	FCB	\$E6,\$88,\$02,\$00	\$ 0002 88E6
1534	FFC8 F3 FFC9 45 FFCA 01 FFCB 00	FCB	\$F3,\$45,\$01,\$00	\$ 0001 45F3
1535	FFCC FA FFCD A2	FCB	\$FA,\$A2	\$ 0000 A2FA
1536	FFCE 7D FFCF 51	FCB	\$7D,\$51	\$ 0000 517D
1537	FFD0 RE FFD1 28	FCB	\$8F,\$28	\$ 0000 28BE
1538	FFD2 5F FFD3 14	FCB	\$5F,\$14	\$ 0000 145F
1539	FFD4 30 FFD5 0A	FCB	\$30,\$0A	\$ 0000 0A30
1540	FFD6 18 FFD7 05	FCB	\$18,\$05	\$ 0000 0518
1541	FFD8 8C FFD9 02	FCB	\$8C,\$02	\$ 0000 028C
1542	FFDA 46 FFDB 01	FCB	\$46,\$01	\$ 0000 0146
1543	FFDC A3 FFDD 00	FCB	\$A3,\$00	\$ 0000 00A3
1544	FFDE 51 FFDF 00	FCB	\$51,\$00	\$ 0000 0051
1545	FFE0 29 FFE1 00	FCB	\$29,\$00	\$ 0000 0029
1546	FFE2 14 FFE3 00	FCB	\$14,\$00	\$ 0000 0014
1547	FFE4 0A FFE5 00	FCB	\$0A,\$00	\$ 0000 000A
1548	FFE6 05 FFE7 00	FCB	\$05,\$00	\$ 0000 0005
1549	FFE8 03 FFE9 00	FCB	\$03,\$00	\$ 0000 0003
1550	FFEA 01 FFEB 00	FCB	\$01,\$00	\$ 0000 0001
1551		*		
1552	FFEC E4 FFED 84 FFEE 64 FFEF 69	K0 FCB	\$E4,\$84,\$64,\$69	\$ 6964 84E4 K

*SYMBOL TABLE

ACCOUNT	00B1	AC0	00FF	AC1	00F0	AC10	00F3	AC11	00F4
AC12	00F5	AC13	00F6	AC2	00F1	AC20	00EB	AC21	00EC
AC22	00ED	AC23	00EE	AC3	00F2	ADD	FF1D	ADD01	FDEE
ADDLP	FF20	ADDR	00B7	ADDX	FB10	ALPHA	FF98	ALPHA2	FFB2
APOWRT	FBFB	ASTUCK	00BC	AZ	00FC	AZABS	00BE	AZBAZ	00C0
AZBZ	2068	AZCP	00C4	AZMOTR	FB64	AZMIJTH	FA8F	AZNC	00C3
AZOK	FE1B	AZPOS	2064	AZVAR	FA76	BINX	FCDB	BYTECT	00AC
CALCTX	FC8E	CALC1	FDFB	CALC	FD33	CALTX1	FCA6	CCW	FB7E
CCWA	FBE1	CHARS	00AD	CHDIR	FBCC	CKB	FAF9	CKELM	FA4D
CKIND	FABD	CKINIT	F9D0	CKOVSA	FAF5	CKOVSB	FB02	CKSM	00AE
CKWW1	F941	CKWW2	F94D	CKWW3	F959	CKWW4	F965	CLOSS	00A6
CLRFRZ	FB38	CMD	2050	CMDAZ	2075	CMDDEL	2077	CMDOUT	FC61
CMDS	2013	CMDT	2012	CMDW1M	201C	CMDW1V	2020	CMDW2M	2029
CMDW2V	202D	CMDW3M	2036	CMDW3V	203A	CMDW4M	2043	CMDW4V	2047
CORAX	FE80	CORAY	FE8D	CORNIC	FE57	CORIN	FE78	CORLP	FE7B
CORNX	FEF6	CORTA	FED9	CORTE	FEFF	CORTH	FEB2	CORXN	FE6E
CORXS	FE80	CORXY	FEA5	CORYN	FE62	CORYS	FEF4	CORYY	FEE9
COUNTH	0009	COUNTL	000A	CTIME	F8F5	CW	F874	CWA	FBDD
DDR1	0000	DDR2	0001	DEATH	FA10	DECODE	F92C	DECODEF	F9A5
DECX	FB04	DIREXT	FBE3	DIVAD	FF83	DIVD1	FDE3	DIVIDE	FF43
DIVLP	FF6A	DIVR	FF97	DIVST	FF65	DIVS	FF88	DIVTA	FF4D
DIVTO	FF59	DSACLC	FA2E	DVC	00FB	ECOUNT	00B3	EL	00FE
ELABS	00C8	ELBAZ	00CA	ELBZ	206A	ELCP	00CE	ELEVTVN	FAA2
ELMOTR	FB6B	ELNC	00CD	ELPOS	2066	ELVAR	FA7E	ENABLE	00A3
ENARSP	FCBC	ENDCLC	FES1	ENDRD	FABA	ESTUCK	00C6	FMSGIB	FC79
FREEZE	00B9	FR7A7	00C2	FRZEL	00CC	GCMDO	FC60	GCMO1	FC58
GCMO3	FC5C	GCMO4	FC46	GCMO5	FC42	GETAOR	F835	GETCMD	FC3C
GETDAT	FC76	HEADER	2061	HELIX	206C	HELIY	206F	HELIZ	2072
HI	FB9A	HITDOG	F876	ICHI	000D	ICLO	000E	INCX	FB08
INITZ	FB00	IDVEC	00AA	K0	FFEC	LC	00FB	LO	FB92
LONG	FEC0	MASKOK	F921	MASK	00AF	MCOOE	00B6	MCOUNT	00B0
MOTOR	F914	MOTRET	FBA6	MOTR	FB70	MOTSP	FBEA	MOTWD	00B5
MOV	FB3F	MO0	00E7	MO1	00E8	MO2	00E9	MO3	00FA
MSAVE	00B8	NEAR	FA70	NEWDAT	F971	NEXVEC	00A8	NFIN	FA72
NMOVE	FB56	NOC	FCA0	NOCALC	FC9C	NOCKSM	FCFD	NOCLMS	FED0
NOIND	FAD8	NORMAL	FCDS	NORSVP	F9B0	OCHI	000R	OCL0	000C
OKCKSM	FCF6	OLDAZ	00B8	OLDEL	00C5	OLDNEW	FB3A	OP0	00F3
OP1	00F4	OP2	00F5	OP3	00F6	PASSIT	F9AB	PIACSA	5002
PIACSB	5003	PIADDA	5000	PIADDR	5001	PIAIOA	5000	PIAIOR	5001
POINT	FA36	POINT1	FA3D	PORT1	0002	PORT2	0003	POWER	FBA9
PRET	FBFE	PTRTN	FA5F	PVLA1	FD18	PVLA2	FD21	PVLX	FD06
PVLY	FDOF	PVSX	FD7D	PVSY	FD2A	PVX	FD30	RAM	0080
RD1	FAD9	READE	FAB6	ROMRAM	0014	RSVPE	F9B7	RTSX	FF0F
SCEXIT	F920	SCICS	0011	SCIOR	FC03	SCIOT	FCC9	SCIO	FBFF
SCIRM	0010	SCIRX	0012	SCITX	0013	SCTRTI	FDD3	SETTT	F9BA

SETUP	F83E	SETWU	FC1F	SHL	FF39	SHLLP	FF3C	SHORT	FEC1
STOTIM	F8A2	SLOSS	00A5	SNDCKS	FCEC	SNDREQ	F890	SPEED	FB8B
STOPT	FF10	STACK	00A2	START	F880	STATQ	F883	STATUS	2062
STOPI	F8B4	STOP2	FB8E	STOP	FBA2	STRDEC	F8C5	STRSUN	FC63
STRSYN	FC6B	STRSY1	FC6D	STTT1	F9C1	SUB	FF2B	SUBLP	FF2E
SUNX	2000	SUNY	2003	SUNZ	2006	SYNC	00BA	SYSCLK	F86D
TARGETX	00CF	TARGETY	00D3	TARGETZ	00D7	TCSR	000A	TH0	00F7
TH1	00F8	TH2	00F9	TH3	00FA	TOHFC	FC4A	TRXOK	00A4
TWOCL	FF05	TWOC	FF02	TXCRP	F8E0	TXDSA	F8CE	TXFER	FD36
TX0	00DB	TY0	00DF	TZ0	00E3	UPAE	FA22	UPAZEL	FA13
UPINIT	F9E5	UPSUN	F92F	UPTARG	F986	VECTOR	2058	VERFIN	FCC7
VERIFY	FC8A	WAITC	FA66	WAITI	F860	WU	FC22	XEL	FB23
XSTAT	F828	X0	00EF	X1	00F0	X2	00F1	X3	00F2
Y0	00E7	Y1	00E8	Y2	00E9	Y3	00EA		

*NO UNDEFINED SYMBOLS

*NO ERROR LINES

REF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
116	ACOUNT	304 624 628
175	AC0	1472 1481 1487 1491 1498
176	AC1	
180	AC10	184 1119 1179 1334 1365 1369 1371
181	AC11	185
182	AC12	186 1121 1364
183	AC13	187
177	AC2	
166	AC20	1125 1168 1242 1318 1338 1469 1474 1479 1504
167	AC21	
168	AC22	1127
169	AC23	
178	AC3	1470
1415	ADD	1244 1345 1370 1380 1499
1240	ADD01	1215 1221 1227
1418	ADDLP	1424
120	ADDR	278 436 556 992 1053
777	ADDX	774
1519	ALPHA	1349
1527	ALPHA2	1353
925	APOVRT	915
128	ASTUCK	
197	AZ	1253 1259 1264 1266 1288

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
129	AZABS	420 569 703 835 1254
130	AZBAZ	579
232	AZBZ	
133	AZCP	
834	AZMOTR	623
697	AZMUTH	
132	AZNC	296
1267	AZOK	1258 1263
230	AZPOS	567 704 784
649	AZVAR	622
1078	RINX	
111	BYTECT	366 955 969 1005 1023 1078 1086 1088
1036	CALCTX	
1246	CALC1	1230
1143	CALC	327
1047	CALTX1	1041
847	CCW	840
912	CCWA	908
112	CHARS	949 967 1044 1051 1075 1085
900	CHDIR	890
764	CKB	754
628	CKELM	626
723	CKIND	698 711
552	CKINIT	491

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
761	CKOVSA	758
770	CKOVSB	767
113	CKSM	952 953 966 1033 1081 1083 1093
464	CKWW1	
469	CKWW2	466
474	CKWW3	471
479	CKWW4	476
108	CLOSS	416 418 459
795	CLRFRZ	789 806 813 815 821
222	CMD	492 561 565 594 597 601
239	CMDA7	421 834 1290
240	CMDL	423 837 1293
2003	CMDOUT	1034
213	CMD5	1020
212	CMDT	488 538 554 981 1038
214	CMDW1M	464
215	CMDW1V	467
216	CMDW2M	469
217	CMDW2V	472
218	CMDW3M	474
219	CMDW3V	477
220	CMDW4M	479
221	CMDW4V	482

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
1320	CORAX	1325
1328	CORAY	1333
1301	CORDIC	1192 1200 1246 1275
1316	CORIN	1311
1318	CORLP	1388
1383	CORNX	1381
1369	CORTA	1367
1388	CORTE	
1348	CORTH	1346
1312	CORXN	1306
1347	CORXS	1344
1341	CORXX	1336
1307	CORYN	
1382	CORYS	1379
1376	CORYY	
53	COUNTH	338
54	COUNTL	
412	CTIME	373 376 388
841	CW	
909	CWA	
47	DDR1	256
49	DDR2	
584	DEATH	577 587
452	DECODE	391

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
517	DECODE	
772	DECX	759 761 769
913	DIREXT	910
1498	DIVAD	1490
1234	DIVD1	1213 1219 1225
1462	DIVIDE	1197 1205 1237 1272
1484	DIVLP	1502
1509	DIVR	1505
1481	DIVST	1476
1501	DIVS	1496
1470	DIVTA	
1475	DIVTO	1471
604	DSACLC	584
194	DVC	1196 1204 1236 1271 1501
117	ECOUNT	305 631 635
198	FL	1278 1291
139	ELABS	422 572 716 838
140	ELBAZ	581
233	ELB7	
143	ELCP	
705	ELEVTN	702
837	ELMOTR	630
142	ELNC	298

REF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
231	ELPOS	717 787
650	ELVAR	629
85	ENABLE	294 321 351 361 363 377 379 383 390 517 524 531 533 558 560 604 943 945 1011 1013 1047 1049 1060 1062 1285
1059	FNARSP	1046
1294	ENDCLC	1284 1287
718	ENDRD	715
138	ESTUCK	
1021	FMSGIB	
122	FREFZE	302 406 701 714 734
131	FRZAZ	300
141	FRZFL	301
1002	GCMD0	
998	GCMD1	989
1000	GCMD3	
988	GCMD4	
985	GCMD5	
283	GETADR	285
981	GETCMD	971
1020	GETDAT	1006
228	HEADER	279 399 1036 1063 1077
235	HELIX	1165
236	HELIY	1176
237	HELIZ	1156

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
186	OP2	
187	OP3	1475
524	PASSIT	500 592
72	PIACSA	261 265 268
76	PIACSR	
70	PIADDA	266
74	PIADDR	
71	PIAIOA	263 895 913 923
75	PIAIOB	691 692
618	POINT	433
622	POINT1	718
48	PORT1	258 276 345 347 349 380 394 396 1072 1074
50	PORT2	
881	POWER	627 634
926	PREF	898
635	PTRTN	633
1118	PVLA1	1177 1194 1202 1211 1269 1358
1124	PVLA2	1166 1240
1106	PVLX	1175 1199 1229 1234 1274
1112	PVLY	1157 1164
1183	PVSX	
1130	PVSY	1172 1217 1223
1133	PVY	

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
82	RAM	
745	RD1	700 713
691	READE	621 693
65	ROMRAM	
533	RSVPE	519 607
1403	RTSX	1386
434	SCEXIT	430 432
61	SCICS	272 365 397 407 410 946 963 965 1071 1097 1099
943	SCIOR	973
1071	SCIOT	367
933	SCIO	13
60	SCIRM	270
62	SCIRX	950 970
63	SCITX	1084 1095
1100	SCRTTI	
538	SETTT	496 603
293	SETUP	
960	SETWU	948 986 993 1003
1439	SHL	1485 1488
1442	SHLLP	1446
1356	SHORT	1354
370	SIOTIM	355 360
107	SLOSS	375 1010

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
1088	SNOCKS	1076
361	SNDREQ	358
855	SPEED	846
1405	SR	1337 1340 1412
83	STACK	254
351	START	
354	STATQ	
229	STATUS	307 404 405 425 542 544 545 546 637 645 730 732 790 792 816 818 1282
888	STOPIT	
893	STOP2	903
869	STOP	839
389	STRDEC	385
1005	STRSUN	999 1001
1009	STRSYN	996 1025 1028 1064
1010	STRSY1	1100
542	STTT1	583
1427	SUB	1161 1170 1181 1347 1382 1482 1492
1430	SUBLP	1436
205	SUNX	452 456 1226
206	SUNY	1220
207	SUNZ	1214
123	SYNC	325 460 1294
337	SYSCLK	15

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
149	TARGETX	504 506 1147 1151
150	TARGETY	509 511
151	TARGETZ	514 516
52	TCSR	310 337
189	TH0	1302
190	TH1	1303
191	TH2	1252 1277 1304
192	TH3	1251 1276 1308 1313
990	TOHFC	
106	TRYOK	357 359 1054 1056 1059
1397	TWOCL	1402
1394	TWOC	1310 1315 1368 1473 1478 1507
407	TXCRP	402
394	TXDSA	382 387
1148	TXFER	1152
153	TX0	1163 1171 1224
154	TY0	1174 1182 1218 1222 1228
155	TZ0	1160 1198 1212 1216 1273
598	UPAE	602
592	UPAZEL	553
562	UPTNIT	566
453	UPSIN	457
500	UPTARG	468 473 478 483
224	VECTOR	495

DEF ON

LINE	SYMBOL	REFERENCED ON LINE(S)
1064	VERFIN	1087
1033	VERIFY	994 1026
325	WAITC	326 1295
321	WATTI	323
963	WII	287 398 426 530 960
786	XEL	782
788	XSTAT	785
171	X0	175 1107 1180 1183 1314 1342
172	X1	176
173	X2	177 1109 1185
174	X3	178 1305
157	Y0	161 1113 1130 1159 1169 1210 1243 1309 1326 1377
158	Y1	162
159	Y2	163 1115 1132
160	Y3	164 1343 1366 1378

3:15 JAN 27, '84 ID=0925

ELAPSED JOB TIME	00:02:28
PARTITION NUMBER	11
CHARGE UNITS	1567
TOTAL CPU TIME	1.9215
PROCESSOR EXECUTION TIME	.0021
PROCESSOR SERVICE TIME	.0010
USER EXECUTION TIME	1.8180
USER SERVICE TIME	.1004
CARDS: CARDS READ	6
PAGES: PROCESSOR PAGES	4
USER PAGES	64
CORE: PEAK CORE(PAGES)	29
PAGE MINUTES	65.2502
I/O: OPERATIONS	288
CALS	5708
FILE SPACE	
AVLBL RAD PERMANENT	500
AVLBL DISK PERMANENT	500
RESOURCES ALLOCATED	
CO= 64(PAGES)	

STOP *ASM COMPLETE*

GIN MARIETTA AEROSPACE

DENVER DIVISION
POST OFFICE BOX 179
DENVER, COLORADO 80201
TELEPHONE (303) 977-3000

January 30, 1984

Mr. Doug Elliott
DOE Site Office
Post Office Box 366
Daggett, CA 92327

Subject: Closeout Actions on Martin Marietta Contracts with DOE San Francisco Operations Office

Reference: Letter of December 06, 1983, S.D. Elliott, Jr. to M. Frohardt, Closeout of Contracts

In regard to the referenced letter, following is the status and actions in process to close out these items:

1. Contract Closeout Status

In regard to the closeout of cost type contracts DE-AC03-76ET20422, Central Receiver Test Facility, and DE-AC03-78ET21007, Collector System Phase I, we include the "Contractors Assignment of Refunds and Rebates" and "Contractors Release" with our final invoice package. The final invoices for these two contracts will be submitted upon completion of final settlement negotiations for our 1979 overhead and G&A rates which is currently in progress. In reference to the closeout of contract DE-AC03-80SF10539, Collector System Phase II, please see Attachment 1, the letter to Ms. Joann Littlehales dated January 23, 1984, for the current status.

2. Patent Clearance

The following documents are in the process of being cleared by our Patent office. When this transmittal is available, I will send a copy to you.

- MCR-78-1323, "10-MWe Solar Thermal Pilot Plant Conceptual Design Review"
- MCR-78-1330, "10-MWe Solar Thermal Pilot Plant Preliminary Design Review"
- MCR-79-1302, "10-MWe Solar Thermal Pilot Plant Final Design Review (2 Vols)"
- 40-0-500-4P, "10-MWe Solar Thermal Pilot Plant Phase II O&M Equipment"
- 40-0-500-6P, "10-MWe Solar Thermal Pilot Plant Phase II Planning"

Mr. Doug. Elliott
January 27, 1984
Page 2

The remainder of the documents have been previously cleared by the following letters, copies of which are included in Attachment 2.

Letters from Phillip DeArment to Roger Gaither:

DAC-83-417, dated May 24, 1983
80-Y-15555, dated July 28, 1980
DAC-82-389, dated May 3, 1982
Letter dated March 11, 1982
Letter dated November 10, 1982

3. Documents

You requested copies of some documents and drawings in the referenced letter. Copies of the following drawings and documents are being submitted under Attachment 3.


MCR-78-1330, "Preliminary Design Review Package"
MCR-79-1352B, "Quality Assurance Plan for 10-MWe Phase II
Collector"
MCR-80-1376, "Heliostat Stimulator Operators' Manual"
40M500-2S, "Foundation Requirements"
40M500-2M, "Canting Procedures"
40M500-1T, "Installation Instructions"
40M500-5P, "Acceptance Plan"
MCR-81-1715, "Collector System Integrated Acceptance Test Plan"
MCR-80-1361, "Collector System Functional Test Plan"
40M500 5132788, "Adapter Plate/Control Arm Heat Tool"
40M500 5132771, "Field Canting Tool"
Source Listing of Code for Heliostat Controller ROM or EPROM*
Source Listing of Code for Heliostat Field Controller ROM/EPROM

No drawing exists for 40E500 5132776, "Drive Unit Checkout Console" as this checkout console consisted of a stimulator to operate a production Drive Mechanism Assembly. Also MCR-78-1330 is the correct document number for the Preliminary Design Review Package rather than MCR-78-1325. MCR-78-1325 is the document number assigned to all the Monthly Progress Reports written during the Phase I contract.

Doug, I hope this will help in getting the documentation finalized. I will follow-up with the additional information identified. If you have any questions please call on me.

Sincerely yours,

MARTIN MARIETTA CORPORATION


Melvin W. Frohardt
Solar Programs

Enclosures

cc: H. Wroton
Sonia Jackson

U.S. DEPARTMENT OF ENERGY

memorandum

MAY 17 1984

DATE

PLY TO
ATTN OF

Doug Elliott, DOE/Barstow

SUBJECT Patent Clearance for Two Software Source Listings Developed by Martin Marietta Corporation for 10-MWe Pilot Plant Project under Contract DE-AC03-80SF10539

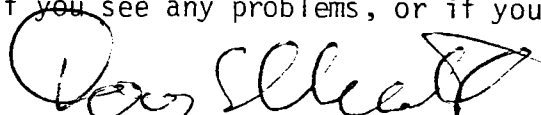
TO Roger Gaither, DOE/SAN (OPC)

Enclosed are two documents - software source listings for the Pilot Plant heliostat controllers (HC's) and heliostat field controllers (HFC's) - developed by Martin Marietta under their contract for fabrication of the Solar One collector subsystem:

<u>Primary Document No.</u>	<u>Secondary No.</u>	<u>Brief Title</u>
DOE/SF/10539-14	(STMP0-564)	"HFC Software Source Listing; Version A02"
DOE/SF/10539-15	(STMP0-565)	"HC Software Source Listing; Version A11..."

We would like to make these documents available through TIC and NTIS, and also to be able to provide copies to other parties interested in the Solar One control system (we have one such request in hand at present). Initially, MMC had shown some reluctance to make these programs available, and I had discussed with Taylor Belt the possibility of a formal request under contract GP "additional data" articles, and at the same time, I sent off a request for these listings to the MMC program manager, Mel Frohardt (Attch. 1). Taylor reviewed the contract, and pointed out to me that the SOW calls for provision of "program sources in machine-readable form", and that this should be adequate, since MMC had not indicated this material as reserved in any way. In any event, Mr. Frohardt did forward the requested listings in January (Attch. 2) without any reservation.

Since, however, we have a request from one of MMC's competitors in the solar field (ARCO), I would like to be sure we are "extra clean" before sending the listings to them or to TIC/NTIS (even though MMC has announced they are no longer in the solar business). You might wish, then, to check with Phil DeArment on this before clearing these documents. Please let me know if you see any problems, or if you need any further information



S. D. Elliott, Jr., Director,
DOE Solar One Project Office

Attchs.: 1) DOE ltr. 12/6/83
2) MMC ltr. 1/30/84

Encls.: 2 Source Listings, w/Forms 70/RA-426

cc: M. Lopez, DOE/SAN (FGS)
T. Belt, DOE/SAN (OPC)
W. D. Matheny, TIC Document Control
M. Soderstrum, Burns & McDonnell



DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327

Prime Contract No.
DE-AC03-80SF10539
Subcontract No.
(N/A)
Report No.
DOE/SF/10539-15 (STMPO-565)
Date of Report
October 1980
Name & Phone No. of DOE Technical Representative
S. D. Elliott, Jr. (619) 254-2672

- Document Title:
"HELIOSTAT CONTROLLER SOFTWARE SOURCE LISTING: Version All-Barstow"
- Type of Document: Technical Report, Conference Paper, Journal Article, Abstract or Summary,
 Copy of Oral Presentation, Other (please specify): _____
- In order to meet a publication schedule or submission deadline, patent clearance by _____ (routine) _____ would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

- I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:
 - Attention should be directed to pages _____ of this document.
 - This document describes matter relating to an invention:
 - Contractor Invention Docket No. _____
 - A disclosure of the invention was submitted to DOE on _____ (date)
 - A disclosure of the invention will be submitted shortly _____ (approximate date)
 - A waiver of DOE's patent rights to the contractor:
 has been granted, has been applied for; or will be applied for _____ (date)

5. This document is being submitted, but no review has been made ^{by me} of this document for possible inventive subject matter.

6. Remarks: Return clearance and review copy to Project Office at address above

Reviewing/Submitting Official: Name (Print/Type) S. D. Elliott, Jr., Director
Title DOE Solar One Project Office
Signature *S. D. Elliott* Date May 17, 1984

TO: INITIATOR OF REQUEST
FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

- No patent objection to above-identified release.
- Please defer release until advised by this office.

Signed _____ Date Mailed _____

STAMPED-50

U.S. DEPARTMENT OF ENERGY
memorandum

DATE **MAY 22 1984**

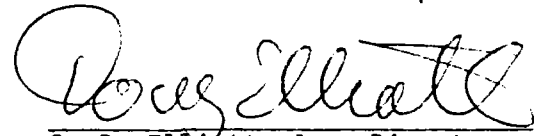
REPLY TO
ATTN OF Doug Elliott, DOE/Barstow

SUBJECT Archiving of DOE Contractor-Generated Software at National Energy Software Center
at Argonne National Laboratory

TO Duncan Tanner, SNLL Technical Manager

DOE Order 1360.4 requires that all software generated under DOE contracts, if of any potential value to other DOE contractors or to the general public, be filed ((as computer programs or summaries thereof) with the National Energy Software Center at ANL. Distribution is to be made via NESC, with the exception that in case of urgency, copies may be provided to DOE contractors concurrently with the NESC submission. I am following the latter course in responding to the request for the Martin Marietta Heliostat Controller and Heliostat Field Controller codes to ARCO, who is, in effect, a subcontractor to Pacific Gas & Electric under the Repowering Final Design Cooperative Agreement, but I would like to be sure that in the future we can let NESC take care of such distribution for us.

I would appreciate your assistance in identifying other Solar One software, or suitable summaries thereof (we certainly would not wish to incur the expense or effort, for example, involved in supplying the MDAC "Unit Development Folders" in toto) and in assembling it for transmittal to NESC for distribution on request to future inquirers. I will be "researching" the mechanisms for such transmittal with SAN's Technical Information Coordinator, Don Holz, ascertaining the formats and quantities involved, and setting up the process for those items that may not become available until after you and I leave the site this Fall. Your help in this activity will be greatly appreciated.



S. D. Elliott, Jr., Director,
DOE Solar One Project Office

cc: Mike Lopez, DOE/SAN (FGS)
Don Holz, DOE/SAN (ISEA)

ARCO Power Systems
7061 S. University Boulevard
Suite 307
Littleton, Colorado 80122
Telephone 303 798 1317



May 22, 1984

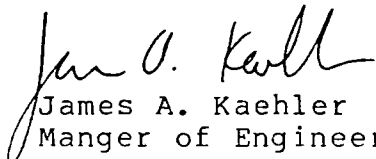
Dr. Doug Elliott, DOE Project Director
Department of Energy
Solar One Site Office
Post Office Box 366
Daggett, CA 92327

I understand from talking to Jim McDowell that the following documents are available:

HELIOSTAT CONTROLLER SOFTWARE SOURCE LISTING
HELIOSTAT FIELD CONTROLLER SOFTWARE SOURCE LISTING

I would appreciate any information you could forward on the above subjects.

Thank You,


James A. Kaehler
Manger of Engineering

JAK/dt

I WOULD LIKE TO OBTAIN A COPY OF:

- ① THE SOURCE LISTING OF THE CODE FOR THE HELIOSTAT CONTROLLER ROM OR EPROM
- ② SAME FOR THE HELIOSTAT FIELD CONTROLLER

PLEASE SEND TO:

ARCO POWER SYSTEMS
UNIT #307
7061 S. UNIVERSITY BLVD
LITTLETON, CO 80122

ATT: J. KAEHLER

THANKS

Jim Kaehler
11/17/83

CORDIC ALGORITHM



Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Reply to:

DOE Site Office
Post Office Box 366
Daggett, CA 92327

Mr. Melvin T. Frohardt
Martin Marietta Aerospace
Post Office Box 179
Denver, CO 80201

DEC 06 1983

Subj.: Closeout Actions on Martin Marietta Contracts with DOE San Francisco
Operations Office

Dear Mel:

Nearly six months ago, I requested your assistance in finalizing patent clearance on a number of the documents from the Collector Phase I and Phase II contracts which we wish to enter into the DOE Technical Information Center system. Thus far, I have not had any response to this request. We are about to issue the bibliography developed by Burns & McDonnell under the EPRI-funded "Lessons Learned and Project Documentation" study (I assume you have received a copy of Vol. 1, "Lessons Learned" - if not, let me know and I will send you one), and we and TIC anticipate a substantial number of requests for key documents, including yours.

In addition, SAN Contracts Closeout (Sonia Jackson) advises me that several of the final documents needed to complete closeout (and release final payment of withheld funds), ~~is~~ as yet lacking, not only on the above two contracts, but also on the old Preliminary Design contract. I would greatly appreciate your assistance (or your guidance as to who can assist us) in getting this wrapped up and off both of our desks. To recapitulate (adding the items needed by SAN) for the three contracts:

DE-AC03-76ET20422 (Old Contract -1110), Central Receiver System Prel. Design:

- o A "Final Invoice", to be submitted to Sonia Jackson, with copy to me;
- o "Contractors Assignment of Refunds and Rebates", to Sonia;
- o "Contractors Release", to Sonia;
- o "Contractor Request for Patent Clearance" (send to me, only), for:
 - MCR-77-161, "System Safety Design Criteria for Central Receiver...System",
 - MCR-77-162, "System Safety Program Requirements for Solar Thermal Systems".

(These were done under an extension to the Preliminary Design contract, and are valuable background documents.)

DE-AC03-78ET21007 Collector System, Phase I:

- o "Final Invoice", to Sonia, copy to me;
- o "Assignment of Funds and Rebates", to Sonia;

- o "Contractors Release", to Sonia;
- o "Contractor Request for Patent Clearance", to me, for:
 - MCR-78-1323, "10-MWe Solar Thermal Pilot Plant Conceptual Design Review";
 - MTR-78-1330, "10-MWe Solar Thermal Pilot Plant Preliminary Design Review";
 - MCR-79-1302, "10-MWe Solar Thermal Pilot Plant Final Design Review (2 Vols.)";
 - 40-0-500-4P, "10-MWe Solar Thermal Pilot Plant Phase II O&M Equipment";
 - 40-0-500-6P, "10-MWe Solar Thermal Pilot Plant Phase II Planning."

DE-AC03-80SF10539, Collector System Phase II

- o "Final Invoice", to Sonia, copy to me;
- o "Assignment of Funds and Rebates", to Sonia;
- o "Contractors Release", to Sonia;
- o "Contractor Request for Patent Clearance", to me, for:
 - MCR-79-1352B* "Quality Assurance Plan for 10-MWe Phase II Collector..";
 - MCR-80-1304, "10-MWe Solar Pilot Plant Collector Subsystem Safety Plan";
 - MCR-81-1331B, "Hazard Analysis for 10-MWe ...Pilot Plant";
 - 40-0-500-2P, "10-MWe ...Pilot Plant Phase II Mfg. Plan, Rev. 2";
 - MCR-80-1341A, "10-MWe Collector Sybsystem Software/Firmware Functional Req'ts.";
 - MCR-80-1362, "System Description Document, Collector Subsystem...";
 - MCR-80-1376* "Heliostat Stimulator Operators' Manual";
 - MCR-81-1708, "Operation Instructions, Heliostat Field Subsystem...";
 - MCR-81-1709A, "Maintenance Instructions, Heliostat Field Subsystem...";
 - MTR-81-1769, "...Collector Subsystem Functional Test Report";
 - MCR-81-1770, "Supplemental Spares Plan, Heliostat Field...";
 - MCR-80-1377A, "Software/Firmware Design Specifications...";
 - MCR-82-1701, "Control System Theory of Operation";
 - Drawing Set, as Identified in "Drawing Tree 400500 5132701";
 - Source Listing of Code for Heliostat Controller ROM or EPROM*
 - Source Listing of Code for Heliostat Field Controller ROM/EPROM*

Our files do not have current copies of the following other items identified in the Drawing Tree (400500 5132701):

Documents: 40M500-2S, "Foundation Req'ts.", 40M500-1T, "Installation Instructions", 40M500-2M, "Canting Procedures", 40M500-5P, "Acceptance Plan", MCR-80-1361, "Collector System Functional Test Plan", and MCR-81-1715, "Collector System Integrated Acceptance Test Plan."

 * Current copies of these four items are lacking from the Project files; your assistance in obtaining at least one copy of each will be most appreciated.

Drawings: 40X500 5132788, "Adapter Plate/Control Arm Heat Tool", 40X500 5132771, "Field Cantino Tool", and 40E500 5132776, "Drive Unit Checkout Console".

While these items are not carried in the current version of the Bibliography (none of the Plant as-built drawings have been entered as yet), many, if not all, of them may be expected to be of interest to the solar community. I would appreciate at least one copy of each, again with your release. To save you considerable effort in preparing the Patent Clearance Request forms (I am enclosing several copies of the form), you may combine many of the above by simply clearing the "Drawing Tree", with its contents.

If you need the other closeout forms cited above (your Contract Administration staff should have them in stock), please call Sonia Jackson at FTS 536-4179, or write her at:

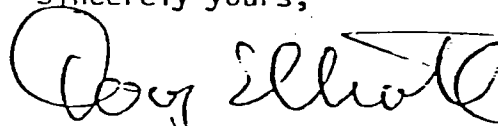
Ms. Sonia Jackson (CM)
Department of Energy
1333 Broadway
Oakland, CA 94612

Finally, since we are required to forward two clean, reproducible copies of each document to DOE/TIC, as well as needing one clean copy for our on-site archives, any "extras" you can turn up around your offices would be greatly appreciated; certainly, rather than throw anything of possible interest out, send it to me.

Mel, I know (believe me!) that this is all a significant amount of work, and I wish I didn't have to ask you (or your staff) to go through it, but it will be to our mutual benefit in the end to get these three contracts all cleaned up, and a comprehensive package of Project documentation (currently, over 550 documents, plus drawings) into the archives. If there is anything further I can do to assist you in this effort, please call on me.

Encl.: DOE Proj. Ofc. ltr. 6/25/83
Patent Clearance Req. Forms

Sincerely yours,



S. D. Elliott, Jr., Director,
DOE Project Office, Barstow

cc: H. C. Wroton, MMC
Sonia Jackson, DOE/SAN (CM)

PS: I keep running across references to a document I can't identify: MCR-78-1325; what was it?



DEPARTMENT OF ENERGY
SAN FRANCISCO OPERATIONS OFFICE

CONTRACTOR REQUEST FOR PATENT CLEARANCE
FOR RELEASE OF UNCLASSIFIED DOCUMENT

TO: Roger S. Gaither, Asst. Chief for Prosecution
Office of Patent Counsel/Livermore Office
P.O. Box 808, L-376
Livermore, California 94550

FROM: DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327

Prime Contract No.
DE-AC03-80SF10539
Subcontract No.
(N/A)
Report No.
DOE/SF/10539-15 (STMP0-565)
Date of Report
October 1980
Name & Phone No. of DOE Technical Representative
S. D. Elliott, Jr. (619) 254-2672

1. Document Title:

"HELIOSTAT CONTROLLER SOFTWARE SOURCE LISTING: Version A11-Barstow"

2. Type of Document: Technical Report, Conference Paper, Journal Article, Abstract or Summary,
 Copy of Oral Presentation, Other (please specify): _____

3. In order to meet a publication schedule or submission deadline, patent clearance by _____ (routine) would be desired.

SENDER IS TO CHECK BOX #4 OR #5 BELOW.

4. I have reviewed (or have had reviewed by technically knowledgeable personnel) this document for possible inventive subject matter (Subject Inventions) and that no inventions or discoveries (Subject Inventions) are deemed to be disclosed in this document except as stated below:

a. Attention should be directed to pages _____ of this document.

b. This document describes matter relating to an invention:

- i. Contractor Invention Docket No. _____
- ii. A disclosure of the invention was submitted to DOE on _____ (date)
- iii. A disclosure of the invention will be submitted shortly _____ (approximate date)
- iv. A waiver of DOE's patent rights to the contractor:
 has been granted, has been applied for; or will be applied for _____ (date)

5. This document is being submitted, but no review has been made ^{by me} of this document for possible inventive subject matter.

6. Remarks: Return clearance and review copy to Project Office at address above

Reviewing/Submitting Official: Name (Print/Type) S. D. Elliott, Jr., Director
Title DOE Solar One Project Office
Signature *S. D. Elliott* Date May 17, 1984

TO: INITIATOR OF REQUEST

FROM: ASSISTANT CHIEF FOR PROSECUTION
Office of Patent Counsel/Livermore Office

No patent objection to above-identified release.

Please defer release until advised by this office.

Signed *L. E. Cochran*

Date Mailed 5/25/84

S. D. Elliott

Lee
5/21/84

U.S. DEPARTMENT OF ENERGY

memorandum

DATE JUN 11 1984

TO S. D. Elliott, Jr., Director, DOE Solar One Project Office

SUBJECT Submission of Documents Prepared under Martin Marietta Corporation Contract DE-AC03-80SF10539 for TIC Processing

TO William D. Matheny, DOE/TIC Document Control

Enclosed are two copies of documents as indicated below for TIC processing, accompanied by DOE Form RA-426:


Primary Document No. Secondary No. Brief Title

DOE/SF/10539-15 (STMPO-565) "HC Software Source Listing: Version A11..."

Copies have been separately provided to DOE/SAN Office of Patent Counsel for Patent Clearance (Attch. 1), and to the National Energy Software Center (Attch. 2).

Encl.: 1 Document (2 copies) w/ Form RA-426

Attch.: 1. Ltr., Proj. Off./SAN/OPC 5/17/84
 2. Memo, Proj. Off./SAN/ISEA 6/11/84


S. D. Elliott, Jr., Director,
DOE Solar One Project Office

cc: R. Gaither, DOE/SAN (OPC)
 M. Lopez, DOE/SAN (FGS)
 D. Holz, DOE/SAN (ISEA)
 M. Soderstrum, Burns & McDonnell

DOE AND MAJOR CONTRACTOR RECOMMENDATIONS FOR
ANNOUNCEMENT AND DISTRIBUTION OF DOCUMENTS

See Instructions on Reverse Side

1. DOE Report No. DOE/SF/10539-15 (STMP0-565)	2. Contract No. DE-AC03-80SF10539	3. Subject Category No. UC-62
--	--------------------------------------	----------------------------------

4. Title
"HELIOSTAT CONTROLLER SOFTWARE SOURCE LISTING: Version A11 - Barstow"

5. Type of Document ("x" one)
 a. Scientific and technical report
 b. Conference paper: Title of conference _____

_____ Date of conference _____

Exact location of conference _____ Sponsoring organization _____

c. Other (specify planning, educational, impact, market, social, economic, thesis, translations, journal article manuscript, etc.)

6. Copies Transmitted ("x" one or more)
 a. Copies being transmitted for standard distribution by DOE-TIC.
 b. Copies being transmitted for special distribution per attached complete address list.
 c. Two completely legible, reproducible copies being transmitted to DOE-TIC. (Classified documents, see instructions)
 d. Twenty-seven copies being transmitted to DOE-TIC for TIC processing and NTIS sales.

7. Recommended Distribution ("x" one)
 a. Normal handling (after patent clearance): no restraints on distribution except as may be required by the security classification. Make available only
 b. To U.S. Government agencies and their contractors. c. within DOE and to DOE contractors.
 d. within DOE. e. to those listed in item 13 below.
 f. Other (Specify) Archive/issue on request

8. Recommended Announcement ("x" one)
 a. Normal procedure may be followed. b. Recommend the following announcement limitations:

9. Reason for Restrictions Recommended in 7 or 8 above.
 a. Preliminary information. b. Prepared primarily for internal use. c. Other (Explain)

10. Patent, Copyright and Proprietary Information
Does this information product disclose any new equipment, process or material? No Yes If so, identify page nos. _____
Has an invention disclosure been submitted to DOE covering any aspect of this information product? No Yes
If so, identify the DOE (or other) disclosure number and to whom the disclosure was submitted.
Are there any patent-related objections to the release of this information product? No Yes If so, state these objections.
Does this information product contain copyrighted material? No Yes
If so, identify the page number _____ and attach the license or other authority for the government to reproduce.
Does this information product contain proprietary information? No Yes If so, identify the page numbers _____
("x" one) a. DOE patent clearance has been granted by responsible DOE patent group.
 b. Document has been sent to responsible DOE patent group for clearance.

11. National Security Information (For classified document only; "x" one)
Document a. does b. does not contain national security information

12. Copy Reproduction and Distribution
Total number of copies reproduced 10 Number of copies distributed outside originating organization 5

13. Additional Information or Remarks (Continue on separate sheet, if necessary)

14. Submitted by (Name and Position) (Please print or type)
S. D. Elliott, Jr., Director, DOE Solar One Project Office

Organization
Post Office Box 366, Daggett, CA 92327 (619) 254-2672

Signature  Date MAY 17 1984

U.S. DEPARTMENT OF ENERGY

memorandum

DATE JUN 11 1984

RE TO S. D. Elliott, Jr., Director, DOE Solar One Project Office
ATTN OF

SUBJECT Transmittal of Two Software Source Code Listings Developed by Martin Marietta Corporation under Contract DE-AC03-80SF10539, for 10-MWe Solar Pilot Plant

TO Don Holz, Technical Information Officer, DOE/SAN (ISEA)
National Energy Software Center, ANL

Enclosed are copies of two software source code listings developed by MMC under Contract DE-AC03-80SF10539 for the collector (heliostat) subsystem at the 10-MWe Solar Thermal Central Receiver Pilot Plant ("Solar One"):

OSTI/TIC Doc. No. Title

DOE/SF/10539-14 "Heliostat Field Controller Software Source Listing: Version A02"


DOE/SF/10539-15 "Heliostat Controller Software Source Listing: Version A11-Barstow"

The first document is a listing of the software developed for programming of the sixty-four field control microprocessors used in the collector subsystem, each of which controls up to thirty-two individual heliostats. The second document provides the programming for the 1,818 individual heliostat microprocessors.

These documents have been released by SAN Office of Patent Counsel, and copies are being provided to the Office of Scientific and Technical Information, Oak Ridge, for archiving and announcement via TIC and NTIS. Copies are also being provided to ARCO Power Systems, Littleton, CO, for work under the Carissa Plains Repowering Project, for which they are a subcontractor on Contract DE-FC03-84SF11990.

SAN MD 1430.1 requires (Para. 6.b.(7),(c)) that under such circumstances a copy of the software in question shall be furnished to NESC, via the Technical Information Officer. The enclosed copies are provided for that purpose.

Encls.: 2 Software Source Listings


S. D. Elliott, Jr. (619) 254-2672

cc: M. Lopez, DOE/SAN (FGS)
W. Matheny, DOE/OSTI



Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Reply to:
DOE Solar One Project Office
Post Office Box 366
Daggett, CA 92327
(619) 254-2672

Mr. James A. Kaehler
Manager of Engineering
ARCO Power Systems, Suite 307
7061 South University Blvd.
Littleton, CO 80122

JUN 11 1984

Subj.: Transmittal of Solar One 10-MWe Pilot Plant HC and HFC Source Code Listings

Dear Jim:

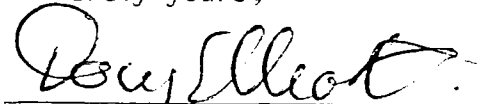
In response to your verbal request via the Sandia Technical Manager last winter, and your written inquiry of May 22, I am providing herewith copies of the MMC source code listings for the heliostat controllers and heliostat field controllers at Solar One. The delay in our response was occasioned by the necessity of obtaining hard-copy listings from MMC, and in entering them into the DOE documentation system. Copies are available to DOE contractors through the DOE Technical Information Center at Oak Ridge (and, for others, through NTIS), or from the National Energy Software Center at Argonne National Laboratory; rather than make you take the added time to go through these sources, I have had this extra set run for direct transmittal for your use on the Rockwell Carissa Plains project.

For further particulars on the programs themselves, I suggest you contact Duncan Tanner, the Sandia Technical Manager, at (619) 254-2971; please let me know if there is any way in which I can be of further assistance.

Encls.: 2 Software Source Code Listings

cc: Duncan Tanner, SNLL/Barstow

Sincerely yours,


S. D. Elliott, Jr., Director,
DOE Solar One Project Office

STMAO
-505

(1)

Fri 6 July 84

2810 TTC ← Margaret Dulley NESC re MARCH
≥ CFE software - probably to merge the
general dissemination - also, NESC makes
machine-readable data. Will just
summarize for now. Will send me the
changes on NESC ≥ copy of DUE circle.

✓
S 71400-523

National Energy Software Center

Argonne National Laboratory 9700 South Cass Avenue Argonne, Illinois 60439 312/972-7250

July 7, 1984

S. D. Elliott, Jr., Director
DOE Solar One Project Office
P. O. Box 366
Daggett, CA 92327

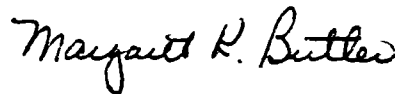
Dear Mr. Elliott:

I am enclosing copies of the Center's brochure and Installation Representative Guide as promised in our telephone conversation. I believe these will serve to introduce you to the NESC program. The copy of DOE Order 1360.4 which you requested is enclosed, also.

My first impression on receiving the microprocessor software source listings was that the software was designed for a unique application and would only be useful as a guide to others attempting to develop similar software for different applications. Consequently, they would only need the software in human-readable form. After our discussion, I am not sure. Perhaps the best way to let people know of the availability of the software would be through publication of an NESC Summary describing the application and noting the availability of the source listings. However, if the software is such that it would be useful to others in machine-readable form, we need to consider making it available in that form. How is the machine-readable software stored?

Please call me after you have looked over the enclosed material, and we can discuss the best way to handle this particular software.

Sincerely,



Margaret K. Butler

Enclosures:
As stated

2-2-83

SUBJECT: COMPUTER SOFTWARE SHARING

1. PURPOSE. To prescribe Departmental policies and procedures for the effective sharing of computer software developed by the Department of Energy (DOE) for scientific, technical, and technology related applications, so that the duplication of software development is minimized.
2. EXCLUSIONS. This Order excludes management information systems (MIS) covered by DOE 1330.1, operational systems, and operational proprietary software.
3. REFERENCES.
 - a. DOE 1330.1, ENERGY AND MANAGEMENT INFORMATION SYSTEMS REVIEW, COORDINATION, AND INTEGRATION, of 8-1-78, which establishes policy to ensure proper review and coordination of the development and modification of energy information systems and management information systems.
 - b. DOE 1340.1A, MANAGEMENT OF PUBLIC COMMUNICATIONS PUBLICATIONS, AND SCIENTIFIC, TECHNICAL, AND ENGINEERING PUBLICATIONS, of 8-25-82, which prescribes policies, standards, and procedures for effective management of DOE publications.
 - c. DOE 1360.1, ACQUISITION AND MANAGEMENT OF AUTOMATIC DATA PROCESSING EQUIPMENT AND RESOURCES, of 8-9-78, which establishes Departmental policies and procedures for the acquisition and management of automatic data processing (ADP) equipment and resources.
 - d. DOE 1360.2, COMPUTER SECURITY PROGRAM FOR UNCLASSIFIED COMPUTER SYSTEMS, of 3-9-79, which establishes Departmentwide policies and procedures for developing, implementing, and administering a program for safeguarding DOE computer systems and in particular DOE sensitive unclassified information.
 - e. DOE 1360.3, AUTOMATIC DATA PROCESSING AND DATA COMMUNICATIONS STANDARDS, of 3-27-79, which establishes Departmentwide policy for the development and implementation of Departmental ADP and data communications standards.
 - f. Federal Property Management Regulation, 41 CFR Subpart 101-36.16, Federal Software Exchange Program, of 6-78, which provides policy and procedures describing the Federal Software Exchange Program, the reporting of common-use ADP software to the Federal Software Exchange Center and subsequent use of this information for Governmentwide sharing.
 - g. Paperwork Reduction Act of 1980, Public Law 96-511, U.S.C. 101, which is an act to reduce paperwork and enhance the economy and efficiency of the Government and the private sector by improving Federal information policymaking, and for other purposes.

DISTRIBUTION:
All Departmental Elements
Federal Energy Regulatory Commission (info)

INITIATED BY:
Technical Information Center

- h. "U.S. Department of Energy National Energy Software Center Installation Representative Guide," of 9-79, ANL/NESC-1, which is an introduction and reference manual to the program and operating procedures of the National Energy Software Center, and is available from Argonne National Laboratory, 9700 South Cass Avenue, Argonne, IL 60439.

4. DEFINITIONS.

- a. Computer Software. Those computer programs and routines with scientific, technical, and technology related applications used to extend the capabilities of computers. Software includes independent subroutines, related groups of routines, single programs, and sets or systems of programs. Software normally provided by the computer manufacturer, as well as that nonmanufacturer supplied operational proprietary and operational system software necessary to ensure fundamental operability of the automated data processing equipment, are excluded.
- b. Common-Use Software. That portion of software which deals with problems common to many Agencies or components of the DOE, that would be useful to other Agencies or components of the DOE, and is written in such a way that minor variations in requirements can be accommodated without significant programming effort.
- c. Software Summary. A condensed description or abstract of a computer program or automated data system.
- d. Specialized Computer Software Center. Those DOE and DOE-contractor operations that collect, test, announce, and provide computer software in specialized subject areas (e.g., radiation shielding or nuclear data).

5. BACKGROUND.

- a. Computer programs are expensive to develop, test, and modify. Computer centers can benefit from being able to learn of and obtain software already developed.
- b. DOE organizations and contractors develop computer software that has value to others within DOE and to other Government Agencies, Government contractors, and to the private sector.
- c. DOE organizations and contractors can benefit from a central clearinghouse of information on computer software.
- d. The National Energy Software Center, a DOE contractor effort formerly known as the Argonne Code Center, has been established to effect computer software sharing by collecting, reviewing, testing, packaging, and distributing computer software programs developed by the Department of Energy and its contractors. The National Energy Software Center ensures, insofar as practicable, that the package contains all computer-readable elements and information necessary for use of the software by individuals, other than authors, in computer environments different from that in which the software was developed. No computer software that is classified for national security

2-2-83

reasons is processed by the National Energy Software Center. The National Energy Software Center provides a Departmental focal point for exchanges with the U.S. and foreign organizations and for Departmental participation in the Federal Software Exchange Program.

- e. Federal Property Management Regulation 41 CFR 101-36.16 establishes the Federal Software Exchange Program requiring software sharing within the Federal Government. DOE complies with this regulation through the operation of the National Energy Software Center collecting, processing, and distributing all DOE software, thus serving as one DOE contact point for the Federal Software Exchange Program and effecting efficiencies over the alternative of the Federal Software Exchange Program having to collect software from each DOE organization and contractor.
- f. The Technical Information Center provides funding and programmatic direction to the National Energy Software Center. Software is an information product similar to scientific and technical reports in that it has value beyond the purpose for which the software was originally prepared. The Technical Information Center provides central implementation of DOE policy for the control of technical information products including computer software.
- g. Specialized computer software centers have been formed to share software in specialized technical areas and are usually located in laboratories where research and development is proceeding and where there is close coordination between the specialized centers and research and development staff. These centers serve a function similar to that of the National Energy Software Center but in a limited, specialized technical area and are responsible for determining that their activities do not duplicate the activities of the National Energy Software Center. These centers are the Engineering Physics Information Center of the Oak Ridge National Laboratory and the National Nuclear Data Center of Brookhaven National Laboratory.

6. POLICIES. DOE shall:

- a. Promote the sharing and exchange of computer software among DOE organizations and contractors so that duplication of effort is minimized.
- b. Promote the sharing of DOE-developed computer software with other Government Agencies as required by FPMR 41 CFR 101-36.16.
- c. Establish a focal point which maintains a central clearinghouse of information on computer software for the sharing of software.

7. RESPONSIBILITIES.

- a. Director of Administration, develops policies for computer software sharing by DOE and its contractors.

b. Manager of Technical Information Center .

- (1) Provides funding and programmatic direction of the National Energy Software Center to achieve effective software sharing.
- (2) Develops procedures for collecting, announcing, and disseminating computer software developed or acquired by DOE and its contractors.
- (3) Integrates the announcement and dissemination functions of the National Energy Software Center into the Departmentwide technical information program conducted by the Technical Information Center.
- (4) Implements policy concerning foreign dissemination of computer software.

c. Contracting Officers ensure that computer software, when developed through DOE contracts and grants, becomes DOE property and is available to the National Energy Software Center.

d. Heads of Departmental Elements.

- (1) Ensure that procurement request packages contain provisions obtaining DOE rights to computer software developed at DOE expense and requiring use of the procedures in this Order.
- (2) Verify that specialized computer software centers coordinate their activities with the National Energy Software Center to minimize overlap of software offered and follow policy regarding computer software sharing and dissemination.

8. PROCEDURES AND REQUIREMENTS.

- a. Before developing new computer software, DOE organizations and contractors are encouraged to contact the National Energy Software Center directly or review descriptions to determine whether the required software already exists or is under development.
- b. DOE organizations and contractors shall provide the National Energy Software Center with the computer-readable and other package material for common-use software developed under Departmental sponsorship and released by the originator or believed by the originator to have value to other sites; procedures for this are given in the "National Energy Software Center Installation Representative Guide." Software summaries shall be supplied for DOE-sponsored software that has not been sent to the National Energy Software Center because of its preliminary status or its limited potential application.
- c. DOE organizations and contractors may provide computer software directly to other DOE organizations and contractors upon request provided that a copy is submitted to the National Energy Software Center at the same time it is submitted to the requester. Software will be provided to contractors under this provision only for use in performing contract functions.

2-2-83

- d. Dissemination outside the Department shall be through the National Energy Software Center or through the appropriate DOE-sponsored specialized computer software center. Requests from outside the Department for DOE-developed computer software shall be referred to the National Energy Software Center or to the appropriate DOE-sponsored specialized computer software center.
- e. DOE-sponsored specialized computer software centers shall keep the National Energy Software Center informed of any computer software that they disseminate.
- f. Before disseminating, transmitting, or using computer software, DOE organizations, National Energy Software Center, and other DOE computer software centers shall ascertain that such action is consistent with DOE's rights to the computer software. In cases where there are restrictions against further dissemination of software, appropriate agreements from recipients prohibiting such further dissemination shall be obtained.
- g. Requests for exceptions to these requirements shall be submitted to the Manager of Technical Information Center for approval after coordination with interested Headquarters organizations.



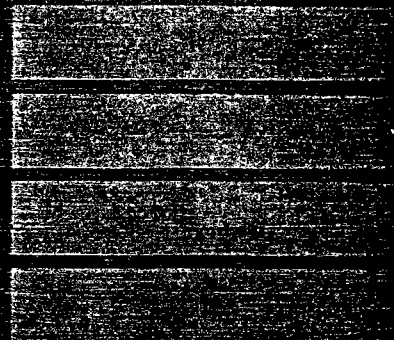
WILLIAM S. HEFFELFINGER
Director of Administration

DOE/TIC-11469 (Rev. 8)
(DEB3003194)

National Energy Software Center

operated for the
Technical Information Center
U.S. Department of Energy
Oak Ridge, Tennessee

by the
Argonne National Laboratory
Argonne, Illinois





ABOUT THE TECHNICAL INFORMATION CENTER

The Technical Information Center in Oak Ridge, Tennessee, has been the national center for scientific and technical information for the Department of Energy (DOE) and its predecessor agencies since 1946. In developing and managing DOE's technical information program, the Center places under bibliographic control not only DOE-originated information but also worldwide literature on scientific and technical advances in the energy field and announces the source and availability of this information. Whereas the literature of science is emphasized, coverage is extended to DOE programmatic, socioeconomic, environmental, legislative/regulatory, energy analysis, and policy-related areas. To accomplish this mission, the Center builds and maintains computerized energy-information data bases and disseminates this information via computerized retrieval systems and announcement publications such as abstracting journals, bibliographies, and update journals. Direct



UNITED STATES DEPARTMENT OF ENERGY

Donald Paul Hodel
Secretary

Martha O. Hesse
Assistant Secretary
Management and Administration

William S. Heffelfinger
Director of Administration

Joseph G. Coyne
Manager
Technical Information Center

access to the Center's most comprehensive data base, the Energy Data Base, is available to the public through commercial on-line bibliographic retrieval systems. The Energy Data Base and many of the Center's energy-related data bases are available to DOE offices and contractors and to other government agencies via DOE/RECON, the Department's on-line information retrieval system. The Center has developed and maintains systems to record and communicate energy-related research-in-progress information, to maintain a register of DOE public communications publications, to track research report deliverables from DOE contractors, and to test and make available DOE-funded computer software programs with scientific and management applications. The Center also maintains a full-scale publishing capability to serve special publication needs of the Department. To effectively manage DOE's technical information resources, the Center's program is one of continual development and evaluation of new information products, systems, and technologies.

NATIONAL ENERGY SOFTWARE CENTER

The National Energy Software Center (NESC) at Argonne National Laboratory is operated for the DOE Technical Information Center to effect the sharing of computer software for DOE offices and DOE contractors. NESC has four responsibilities: (1) operation of a software information and resource center for acquiring, processing, announcing, and distributing DOE-sponsored computer software and data compilations; (2) acquisition for DOE use through the exchange process, announcement, and distribution of energy-related software produced in foreign countries; (3) assistance to DOE computer facilities in identifying needed non-DOE software; and (4) management and control of the transfer of DOE-developed software to other government agencies, foreign organizations, and private sector U.S. commerce and industry in compliance with federal laws and regulations.

NESC is the successor to the Argonne Code Center established in 1960.

Prepared by the
Technical Information Center
U. S. Department of Energy

This booklet is available
free from the

U. S. Department of Energy
National Energy Software Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

and free (as Order No. DE83003194
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ANL/NESC-1 (Rev.)
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INSTALLATION REPRESENTATIVE GUIDE

May 1983
Date Published

Argonne National Laboratory
Argonne, Illinois

TECHNICAL INFORMATION CENTER
U. S. DEPARTMENT OF ENERGY

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This report is available as DE83008451 from the National Technical Information Service,
U. S. Department of Commerce, Springfield, Virginia 22161.

Price: Printed Copy A03
Microfiche A01



JT (L) 369/56

SEP 25 1984

Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Ms. Margaret K. Butler
National Energy Software Center
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

Solar One Project Office Recommendation Regarding "Heliostat Controller Software Listing" and "Heliostat Field Controller Software Listing", Contract DE-AC03-80SF10539

Dear Ms. Butler:

I am sorry it has taken so long to respond to your letter of July 7 regarding the two print-outs sent you via DOE/SAN in June. The material you sent was most informative about NESC's functions, about which we had heard very little previously.

Your suggestion about preparing an NESC Summary and obtaining machine-readable tapes is well-taken. In this case, however, it would appear that the software, being designed for a unique application (in the sense that another user would probably prefer to develop his own program), as you state you at first thought, is adequate in its present form. Frankly, the submission was made to comply with the requirement that NESC be provided with a copy of any software distributed outside the project. We had had one request for it, from a former employee of Martin Marietta subsequently involved in another project for DOE (which itself has since been terminated); he had adequate background to use the material as provided. Since that time, we have not had, nor do we expect, further requests for this material. In my opinion, therefore, it does not warrant the effort involved in preparing the Summary; nor, since the contract under which it was prepared is now in closeout, are we in a position to go back to MMC for a machine-readable copy. Finally, this Office is to be closed as of September 28, and there will be no-one remaining from DOE to oversee such activity. I therefore recommend that we simply leave things as they are.

Thank you once again for your help; I wish you and NESC success in your endeavors.

Sincerely yours,

S. D. Elliott, Jr., Director,
DOE Solar One Project Office

cc: M. Lopez, DOE/SAN (FGS)
D. Holz, DOE/SAN (ISEA)