

\* NAME: AB16-12T3 DOC 70181010000 REV F

PAGE

0001  
0002  
0003  
0004  
0005  
0006  
0007  
0008  
0009  
0010  
0011  
0012  
0013  
0014  
0015  
0016  
0017  
0018  
0019  
0020  
0021  
0022  
0023

\* NAME: AB16-12T3 DOC 70181010000 REV F  
\*  
\* DESCRIPTION: STANDARD REAL TIME CLOCK TEST  
\* CPU CLOCK CALIBRATION AID  
\*  
\*  
\* REVISION HISTORY

REV	DATE	
F	JAN 73	(AB16-12T3)
E	JUN 72	(AB16-12T3)
L	JAN 72	(AB16-12T3)
C	MAY 71	(016-12T3)
B	DEC 69	(016-RTC2)
A	NOT RELEASED	(316-RTC1)

APPROVED REVISION	
REV	.....F.....
ECO NO	Not Available.
DATE	10th May 1973.

\* COPYRIGHT 1973 BY HONEYWELL INFORMATION SYSTEMS INC.  
\*  
\*\*\*\*\*

EJCT

0001  
0002  
0003  
0004  
0005  
0006  
0007  
0008  
0009  
0010  
0011  
0012  
0013  
0014  
0015  
0016  
0017  
0018  
0019  
0020  
0021  
0022  
0023

\* NAME: AB16-12T3 DOC 70181010000 REV F

PAGE 2

0024  
0025  
0026  
0027  
0028  
0029  
0030  
0031  
0032  
0033  
0034  
0035  
0036  
0037  
0038  
0039  
0040  
0041  
0042  
0043  
0044  
0045  
0046  
0047  
0048  
0049  
0050  
0051  
0052  
0053  
0054  
0055  
0056  
0057  
0058  
0059  
0060

\* DISTRIBUTION

\* THIS PROGRAM IS INTENDED TO BE DISTRIBUTED IN A BINARY (SELF-LOADING) FORM. IT MUST BE LINKED DURING THE ORIGINAL LOAD WITH A 3/5/716 FORTRAN MATH LIBRARY.

\* IF A HARDWARE LIBRARY IS (INCORRECTLY) USED THE LINKED PROGRAM WILL NOT BE TRANSPORTABLE TO ALL 316/516/716 COMPUTERS.

\* STORAGE

\* THIS IS A STAND-ALONE PROGRAM WHICH USES ALL OF MEMORY UP TO 32K.

\* TIMING

\* CALIBRATION OF THE CPU CLOCK REQUIRES ONE MINUTE AS TIMED BY A SWEEP SECOND-HAND ON A WATCH OR CLOCK. THE OPERATOR IS EXPECTED TO TIME THE OPERATION TO 0.2 SECONDS (0.3 %).

\* BASIC TESTS TAKE ABOUT TWO MINUTES FOR A 60 HZ CLOCK.

\* IF THE TIME-OF-DAY IS RUN FOR ONE HOUR THEN 30 SECONDS IS ABOUT 1 PERCENT. TWELVE HOURS OPERATION GIVES 0.1 PERCENT ACCURACY INDICATION FOR 30 SECONDS VARIATION IN THE TIME PRINTING STARTS.

\* USE

\* LOAD, SET THE SENSE SWITCHES, START AT \*1000 AND OBSERVE THE CORRECT CP TYPE INDICATED ON THE ASR. ENTER THE PARAMETERS AS INDICATED BELOW.

\* ANSWER THE QUESTION \*Y\* TO START A CPU OPERATION (CLOCK) TIME CALIBRATION OR \*N\* TO RUN THE RTC TESTS.

0024  
0025  
0026  
0027  
0028  
0029  
0030  
0031  
0032  
0033  
0034  
0035  
0036  
0037  
0038  
0039  
0040  
0041  
0042  
0043  
0044  
0045  
0046  
0047  
0048  
0049  
0050  
0051  
0052  
0053  
0054  
0055  
0056  
0057  
0058  
0059  
0060

0061  
0062  
0063  
0064  
0065  
0066  
0067

\*  
\* SWITCH:  
\* 1-SET TO LOOP ON ELAPSED TIME ROUTINE  
\* 2-SET TO LOOP ON ERROR  
\* 3-SET TO FORCE OUTPUT OF STABILITY DISTRIBUTION DATA  
\* 4-SET TO BYPASS (OR END) THE TIME-OF-DAY OPERATION  
\*  
EJCT

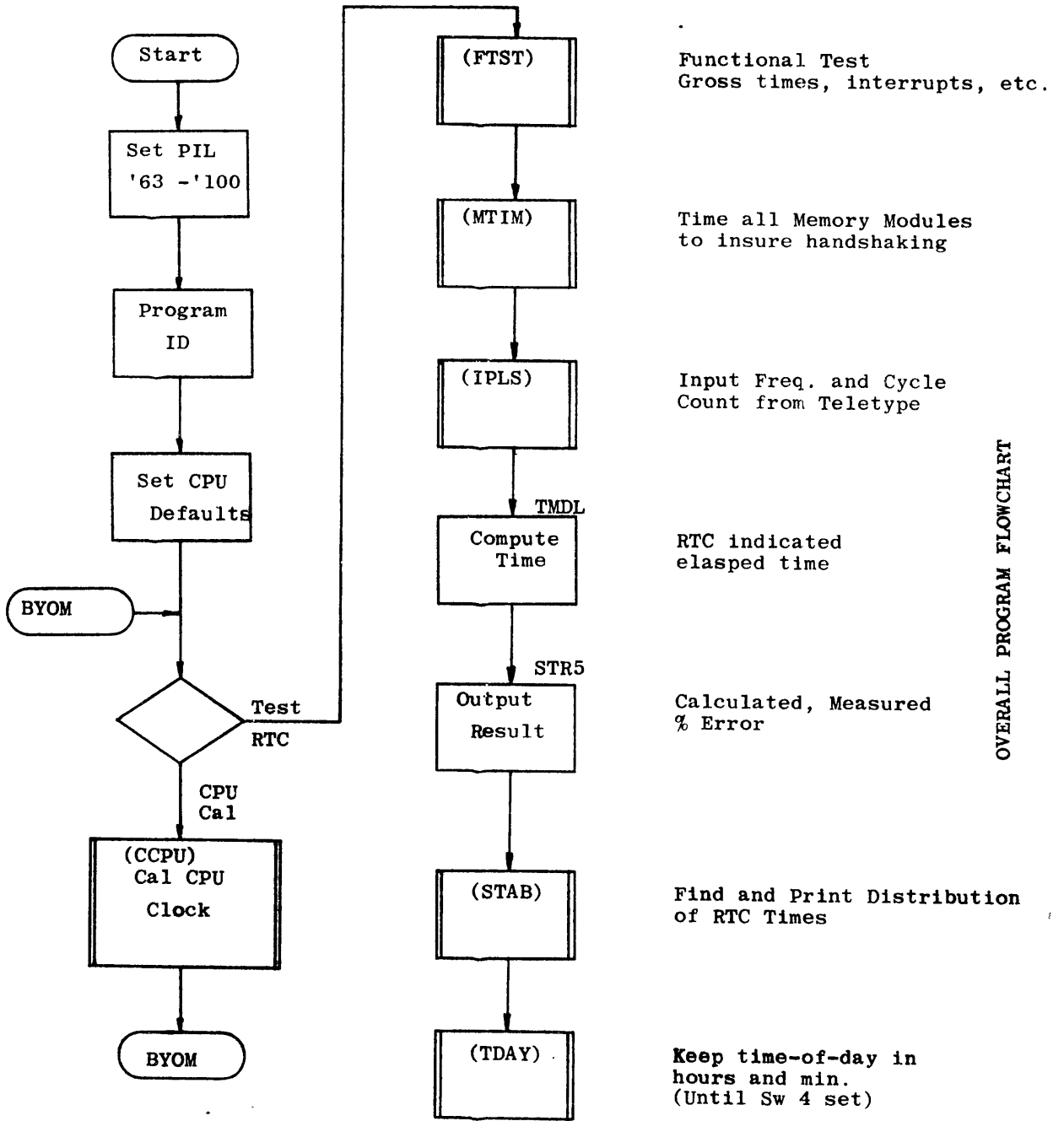
0061  
0062  
0063  
0064  
0065  
0066  
0067

0068  
0069  
0070  
0071  
0072  
0073  
0074  
0075  
0076  
0077  
0078  
0079  
0080  
0081  
0082  
0083  
0084  
0085  
0086  
0087  
0088  
0089  
0090  
0091  
0092  
0093  
0094  
0095  
0096  
0097  
0098  
0099  
0100  
0101  
0102  
0103  
0104

\*  
\* PARAMETER INPUT:  
\* NOM NS G: XXXX 400 TO 1600 NANOSECOND NOMINAL CPU TIME  
\* (775, 960, OR 1600 DEFAULT)  
\* FREQ G: XXXX 50 TO 1000 HZ (60 DEFAULT)  
\* SAMPLE G: XXXX 1 TO 1000 CLOCK CYCLES (1000 DEFAULT)  
\* HOUR G: XX 0 TO 23 INITIAL VALUES FOR TIME-OF-DAY  
\* MINUTE G: XX 0 TO 59 CLOCK (00:00 DEFAULT)  
\*  
\* THE INPUT MAY BE TERMINATED WITH A CR OR  
\* A PERIOD. THE TERMINATOR ALONE WILL USE THE  
\* DEFAULT OR PREVIOUS VALUE. ANY UNACCEPTABLE  
\* VALUE WILL CAUSE THE REQUEST FOR BOTH  
\* PARAMETERS TO BE REPEATED. VALID PARAMETERS  
\* ARE ACKNOWLEDGED WITH A CR/LF.  
\* THE PARAMETERS MUST BE CHOSEN SUCH THAT 1000 TIMES  
\* THE SAMPLE DIVIDED BY THE FREQUENCY IS LESS THAN  
\* 16768. THE MEASURED RESULT MUST ALSO BE UNDER 16768  
\* TO AVOID 'R1' AND 'DZ' ERRORS.  
\*  
\* TIMING CPU CLOCK TIME:  
\* USE THE SWEEP SECOND HAND OF A CLOCK OR WATCH AND NOTE THE  
\* TIME THE CYR OR PERIOD IS GIVEN AT THE END OF THE NOMINAL  
\* NANOSECOND INPUT. ON THE ONE MINUTE MARK HIT THE START  
\* BUTTON TO CAUSE AN INTERRUPT. WITH A LITTLE PRACTICE THE  
\* RESULT SHOULD BE CONSISTANT AND ACCURATE TO 0.3%.  
\*  
\* OUTPUT DATA - CPU OPERATION TIME  
\*  
\* THE OUTPUT MESSAGE GIVES THE TIME IN NANoseconds OF ONE  
\* GENERIC NO OPERATION AND THE PERCENT DEVIATION FROM THE  
\* NOMINAL TIME. DEPENDING UPON THE MEMORY TYPE THE TIME MAY  
\* BE ONE CYCLE OF THE MEMORY OR ONE CYCLE OF THE CPU.  
\*  
\* TO CALIBRATE A 'SCOPE START THE PROCESS, BUT DO NOT PUSH  
\* THE START BUTTON. THE LOOP WILL RUN FOREVER.

0068  
0069  
0070  
0071  
0072  
0073  
0074  
0075  
0076  
0077  
0078  
0079  
0080  
0081  
0082  
0083  
0084  
0085  
0086  
0087  
0088  
0089  
0090  
0091  
0092  
0093  
0094  
0095  
0096  
0097  
0098  
0099  
0100  
0101  
0102  
0103  
0104

\* OVERALL PROGRAM FLOWCHART  
EJCT



OVERALL PROGRAM FLOWCHART



0105	*		0105
0106	*		0106
0107	*		0107
0108	*		0108
0109	*	* OUTPUT DATA - ERRORS	0109
0110	*		0110
0111	*	ON DETECTION OF CERTAIN ANTICIPATED ERRORS, AN	0111
0112	*	ERROR MESSAGE WILL BE SENT TO THE ASK WHICH WILL	0112
0113	*	INDICATE THE ERROR THAT HAS OCCURRED.	0113
0114	*		0114
0115	*	ER1 - INTERRUPT NOT RTC	0115
0116	*		0116
0117	*	ER3 - INTERRUPT NOT RESET	0117
0118	*		0118
0119	*	ER4 - NO INTERRUPT RECEIVED IN 22 MILLISECONDS	0119
0120	*		0120
0121	*	ER5 - OCP *220 DID NOT RESET INTERRUPT	0121
0122	*		0122
0123	*	ER6 - INTERRUPT RECEIVED WITH MASK RESET	0123
0124	*		0124
0125	*	ER7 - LOCATION *61 NOT INCREMENTING	0125
0126	*		0126
0127	*	ER8 - MEMORY POINTED TO BY (X) RUNNING TOO FAST	0127
0128	*		0128
0129	*	ER9 - MEMORY POINTED TO BY (X) RUNNING TOO SLOW	0129
0130	*		0130
0131	*	ERROR MESSAGES (TWO LETTERS) ARE POSSIBLE FROM THE FORTRAN	0131
0132	*	LIBRARY, HOWEVER THEY SHOULD NOT APPEAR IF THE CORRECT	0132
0133	*	LIBRARY WAS LOADED.	0133
0134	*		0134
0135	*		0135
0136	*	* OUTPUT DATA - STABILITY TEST	0136
0137	*		0137
0138	*	THE STABILITY TEST DETERMINES A VALUE FOR AN RTC CYCLE	0138
0139	*	MEASURED IN UNITS OF EIGHT CP CYCLES AND AVERAGED OVER A	0139
0140	*	4096 CYCLE PERIOD. ONE THOUSAND SAMPLES OF ONE RTC	0140
0141	*	CYCLE EACH ARE TAKEN AND A RECORD OF EACH DEVIATION	0141

0142	*	FROM THE AVERAGE IS KEPT. THE AVERAGE AND THE	0142
0143	*	TALLY OF DEVIATIONS (FREQUENCY DISTRIBUTION) ARE LISTED	0143
0144	*	IF THE RESULTS ARE NOT ACCEPTABLE OR FORCED (SWITCH 3)	0144
0145	*	FOR USE BY THE USER SYSTEMS ANALYST. THE DISTRIBUTION	0145
0146	*	SHOWS THE EFFECT OF JITTER ON THE RTC AND THE CP CLOCK.	0146
0147	*		0147
0148	*	A *REJECT* MAY RESULT FROM NON-ZERO COUNTS IN THE ENDS OF	0148
0149	*	THE TABLE OR A WIDTH OF MORE THAN:	0149
0150	*	4 IF AVERAGE LESS THAN 667	0150
0151	*	0.5 % IF AVERAGE 667 TO 1333	0151
0152	*	8 IF AVERAGE GREATER THAN 1333	0152
0153	*		0153
0154	*		0154
0155	*	* OUTPUT DATA - ELAPSED TIME MEASUREMENT	0155
0156	*		0156
0157	*	THE TEST OPERATOR INPUTS THE INTENDED REAL RATE OF THE RTC	0157
0158	*	IN HERTZ AND A SAMPLE SIZE IN CYCLES. THE OUTPUT	0158
0159	*	IS THE MEASURED TIME FOR THE SAMPLE, WITH RESPECT	0159
0160	*	TO THE CP CLOCK, AND THE CALCULATED TIME FOR HIS	0160
0161	*	COMPARISON. THE MEASURED TIME IS COMPARED TO THE CALCULATED	0161
0162	*	TIME AND THE PER CENT DEVIATION (TO 0.1%) IS TYPED. IF	0162
0163	*	THE DEVIATION IS GREATER THAN 7.0% A WARNING MESSAGE	0163
0164	*	IS ALSO TYPED.	0164
0165	*		0165
0166	*	THE CPU TIME USED IS THE VALUE OBTAINED IN THE *CPU	0166
0167	*	OPERATION TIME* IF IT HAS BEEN RUN, OR THE DEFAULT VALUE	0167
0168	*	FOR THE CPU TYPE (800, 960 OR 1600 NANUSEC).	0168
0169	*		0169
0170	*	CLOCKS OUTSIDE THE RANGE OF 50 TO 1000 HZ MAY BE TESTED	0170
0171	*	BY USING AN APPROPRIATE MULTIPLIER.	0171
0172	*		0172
0173	*		0173
0174	*	* OUTPUT DATA - MEMORY MODULE TIMING	0174
0175	*		0175
0176	*	THE TIMING TEST DETERMINES THE TIME FOR ONE RTC CYCLE	0176
0177	*	AS MEASURED BY A LOOP IN THE FIRST 4K. THE LOOP IS 1RS CTR	0177
0178	*	AND JMP *-1. THE SAME LOOP IS THEN RUN IN EACH 4K MODULE	0178

\* NAME: AB16-12T3 DOC 70181010000 REV F

PAGE

0179	*	FOUND TO BE PRESENT. THE RESULTING COUNT IS COMPARED TO	0179
0180	*	THE FIRST. THE ALLOWED MARGIN IS 12.5%. THE MEMORY SIZE	0180
0181	*	FOUND IS TYPED ON THE TELETYPE.	0181
0182	*		0182
0183	*		0183
0184	*	OUTPUT DATA - TIME-OF-DAY	0184
0185	*		0185
0186	*	EVERY MINUTE THE CURRENT TIME IS TYPED STARTING FROM THE	0186
0187	*	HOURS AND MINUTES TYPED IN. THE OPERATOR IS EXPECTED TO USE	0187
0188	*	A WALL CLOCK WITH A SECOND HAND AND ALLOW THE TEST TO RUN	0188
0189	*	FOR AT LEAST SEVERAL HOURS. EXTRA OR MISSING INTERRUPTS (ONE	0189
0190	*	PER MINUTE NORMAL) CAUSE A HALT. THE TELETYPE MAY BE TURNED	0190
0191	*	OFF WHILE THE TEST IS RUNNING.	0191
0192	*		0192
0193	*	TO END THE TEST SET SENSE SWITCH FOUR.	0193
0194	*		0194
0195	*		0195
0196	*	*****	0196
0197		EJCT	0197

\* NAME: AB16-12T3 DOC 70181010000 REV F

PAGE

0198	*	OVERALL PROGRAM FLOWCHART	0198
0199		EJCT	0199

0200			CF5		0200
0201			CRG	*1000	0201
0202			*		0202
0203	01000	101000	NOP		0203
0204	01001	0 02 00570	LDA	PIFK	0204
0205	01002	74 0120	SMK	*120	0205
0206	01003	101000	NOP		0206
0207			*		0207
0208	01004	0 10 02552	JST	LFCK	0208
0209	01005	0 10 02574	JST	OPCC	0209
0210	01006	0 003335	LAC	MES9	0210
0211	01007	100000	NCP	SKP	0211
0212	01010	0 01 01123	JMP	BYCF	0212
0213			*		0213
0214	01011	0 02 00636	LDA	=60	0214
0215	01012	0 04 00544	STA	DCFS	0215
0216	01013	0 02 00717	LDA	=600	0216
0217	01014	0 04 00545	STA	DIAC	0217
0218	01015	0 02 01607	LDA	IR31	0218
0219	01016	0 04 01602	STA	IR5X	0219
0220			*		0220
0221	01017	0 10 02574	JST	OPCC	0221
0222	01020	0 003346	LAC	MES1	0222
0223			*		0223
0224	01021	0 02 00716	LDA	=A	0224
0225	01022	0 04 01120	STA	CPFA	0225
0226	01023	140040	CRA		0226
0227	01024	0 04 00574	STA	TEMP	0227
0228	01025	34 0004	SKS	4	0228
0229	01026	100000	SKP		0229
0230	01027	0 01 01033	JMP	**4	0230
0231	01030	0 12 00574	IRS	TEMP	0231
0232	01031	0 01 01025	JMP	*-4	0232
0233	01032	000000	HLT		0233
0234			*		0234
0235	01033	140040	CRA		0235
0236	01034	0 12 00001	IRS	1	0236

0237	01035	101000	NOP		0237
0238	01036	101040	SNZ		0238
0239	01037	0 01 01055	JMP	OLD	0239
0240			*		0240
0241			*		0241
0242	01040	0 02 00715	LDA	=-315	0242
0243	01041	0 04 00543	STA	DCUN	0243
0244	01042	0 02 00714	LDA	=*26	0244
0245	01043	0 04 00565	STA	MUCL	0245
0246	01044	0 02 00713	LDA	=800	0246
0247	01045	0 04 00572	STA	RENS	0247
0248	01046	0 04 00550	STA	EXNS	0248
0249	01047	0 02 01610	LDA	IRS2	0249
0250	01050	0 04 01602	STA	IR5X	0250
0251	01051	0 02 00712	LDA	=7	0251
0252	01052	0 04 00602	STA	TYPE	0252
0253	01053	0 02 00711	LDA	=A 7	0253
0254	01054	0 01 01106	JMP	ALL	0254
0255			*		0255
0256	01055	0 02 00574	ULD	LDA	0256
0257	01056	0 11 00710	CAS	TEMP	0257
0258	01057	0 01 01074	JMP	DDP5	0258
0259	01060	101000	NOP		0259
0260			*		0260
0261	01061	0 02 00707	LDA	=-155	0261
0262	01062	0 04 00543	STA	DCUN	0262
0263	01063	0 02 00706	LDA	=16	0263
0264	01064	0 04 00565	STA	MUCL	0264
0265	01065	0 02 00705	LDA	=1600	0265
0266	01066	0 04 00572	STA	RENS	0266
0267	01067	0 04 00550	STA	EXNS	0267
0268	01070	0 02 00704	LDA	=3	0268
0269	01071	0 04 00602	STA	TYPE	0269
0270	01072	0 02 00703	LDA	=A 3	0270
0271	01073	0 01 01106	JMP	ALL	0271
0272			*		0272
0273	01074	0 02 00702	DDP5	LDA	0273

0274	01075	0 04 00543	STA	DCCN	SET DELAY CONSTANT	0274
0275	01076	0 02 00701	LDA	=4		0275
0276	01077	0 04 00565	STA	MUCL		0276
0277	01100	0 02 00700	LDA	=960	DEFAULT CLOCK NS	0277
0278	01101	0 04 00572	STA	RENS		0278
0279	01102	0 04 00550	STA	EXNS		0279
0280	01103	0 02 00677	LDA	=5	FIVE FOR 516 IN TYPE	0280
0281	01104	0 04 00692	STA	TYPE		0281
0282	01105	0 02 00676	LDA	=A 5		0282
0283			*			0283
0284	01106	101000	ALL	NOP	ROOM FOR PATCH	0284
0285	01107	0 04 01116	STA	CPM+3	FORM A MESSAGE AND	0285
0286	01110	0 10 02574	JST	OPCC	TYPE THE CP IC	0286
0287	01111	0 001113	LAC	**2		0287
0288	01112	0 01 01123	JMP	BYCM		0288
0289	01113	120303	CFM	BCI	5, CP IS**16	0289
	01114	150240				
	01115	144723				
	01116	125252				
	01117	150666				
0290	01120	125252	CPMA	BCI	1,**	0290
0291	01121	106612		CCT	106612*0	0291
	01122	000000				
0292			*			0292
0293	01123	101000	BYCM	NOP		0293
0294	01124	0 02 00675	LDA	=*101000	NOP INSTRUCTION TO BYPASS	0294
0295	01125	0 04 01007	STA	NOP	THE ABOVE CODE ON RESTART	0295
0296	01126	101000	NOP		ROOM FOR PATCH	0296
0297			*			0297
0298	01127	0 10 02574	JST	OPCC	ASK IF CPU CAL OR RTC TEST	0298
0299	01130	0 003732	LAC	ME5G		0299
0300	01131	0 10 02611	JST	1PCC	INPUT ONE CHARACTER	0300
0301	01132	000000	B52	1	STORED HERE	0301
0302	01133	0 02 01132	LDA	*-1		0302
0303	01134	0 11 00674	CAS	=*331	Y	0303
0304	01135	100000	SKP			0304
0305	01136	0 01 03014	JMP	CCPL	Y SAYS YES - CAL THE CPU CLOCK	0305

0306	01137	0 11 00673	CAS	=*316	N	0306
0307	01140	100000	SKP			0307
0308	01141	100000	SKP		N SAYS DO THE RTC TESTS	0308
0309	01142	0 01 01123	JMP	BYCM	INPUT WAS NOT GOOD	0309
0310	01143	0 10 02552	JST	LFCK	ACK GOOD INPUT	0310
0311			*			0311
0312			*		REGULAR RTC TESTS FOLLOW	0312
0313			*			0313
0314	01144	101000	NOP		ROOM FOR PATCH	0314
0315	01145	0 10 01377	JST	FT5T	OO FUNCTION TEST	0315
0316	01146	101000	NOP		ROOM FOR PATCH	0316
0317	01147	0 10 03142	JST	MTIM	MEMORY MODULE TIMING TEST	0317
0318	01150	101000	NOP			0318
0319	01151	0 10 02075	STR2	JST	IPLS	INPUT PARAMETERS
0320	01152	101000	STR3	NOP		0320
0321	01153	14 0220	CCP	*220	STOP CLOCK IF ON	0321
0322	01154	0 02 00672	LDA	=-1	SET CLOCK TO ONE COUNT	0322
0323	01155	0 04 00061	STA	*61		0323
0324	01156	0 02 02026	LDA	INTC	AND ALL RUPT LOCATIONS TO	0324
0325	01157	0 10 02056	JST	SIL	RETURN TO INTI	0325
0326	01160	0 02 00545	LDA	DIIC		0326
0327	01161	140407	TCA		SET UP NEGATIVE VALUE FOR	0327
0328	01162	0 04 00531	STA	CIRX	IRS LOOP	0328
0329	01163	0 02 02030	LDA	RE11	RUPT RETURN GOES TO	0329
0330	01164	0 04 02027	STA	RE1L	STR4	0330
0331	01165	0 02 00671	LDA	=1	SET MASK FOR	0331
0332	01166	74 0020	SMK	*20	RUPT ON SYNCH	0332
0333	01167	14 0020	CCP	*20	AND START CLOCK	0333
0334	01170	000401	ENB		ALLOW RUPT	0334
0335	01171	0 02 00714	LDA	=22	MILLISEC BEFORE ERROR TIMEOUT	0335
0336	01172	0 10 02206	JST	DLYL	TIMOUT	0336
0337			*			0337
0338	01173	001001	INH		OH-OH AN ERROR	0338
0339	01174	101000	NOP		ON TIME-OUT	0339
0340	01175	0 10 02541	JST	ERPO		0340
0341	01176	0 003601	UAC	MER4	NO RUPT IN 22 MILLISEC	0341
0342	01177	101000	NOP			0342



```

0343 01200 100010 SR2
0344 01201 0 01 01152 JMP STR3 TRY AGAIN (LOOP ON ERROR) 0343
0345 01202 000000 HLT 0344
0346 01203 0 01 01123 JMP BYCM GO TO PROGRAM START 0345
0347 * 0346
0348 01204 101000 STR4 NOP 0347
0349 01205 0 02 02031 LDA RET2 HERE VIA INT1 AND RET1 0348
0350 01206 0 04 02027 STA RETU POINT NEXT RETURN TO STR5 0349
0351 01207 0 02 00531 LDA C1RX 0350
0352 01210 0 04 00061 STA *61 0351
0353 01211 140040 CRA 0352
0354 01212 000201 IAB 0353
0355 01213 140040 CRA 0354
0356 * 0355
0357 01214 001001 TMDL INH 0356
0358 01215 000201 IAB 0357
0359 01216 141206 AOA 0358
0360 01217 140100 SSP 0359
0361 01220 000401 ENB 0360
0362 01221 000201 IAB 0361
0363 01222 141216 ACA 0362
0364 01223 0 01 01214 JMP TMDL ON INTERRUPT GO VIA INT1 TO STR5 BELOW 0363
0365 * 0364
0366 * 0365
0367 * 0366
0368 * 0367
0369 * 0368
0370 01224 101000 STR5 NOP 0369
0371 01225 14 0220 UCP *220 ROOM FOR PATCH 0370
0372 01226 0 04 00541 STA CNTC TURN OFF CLOCK 0371
0373 01227 000201 IAB HIGH ORDER 0372
0374 01230 0 04 00540 STA CNTB LOW ORDER 0373
0375 01231 101000 NOP ROOM FOR PATCH 0374
0376 * 0375
0377 * 0376
0378 * 0377
0379 * 0378
* PRINT THE MEASURED TIME FROM LOOP, THE CALCULATED TIME (FROM
* LINC AND DCPS) AND THE PER-CENT VARIATION BETWEEN THEM. 0379

```

```

0380 * REAL IA,K1,K2,RMEA,TEMP,K3,RCAL,K4,K5 0380
0381 * INTEGER CNTB,CNTC,RENS,DINC,DCPS,PC 0381
0382 * TA=(FLOAT(CNTC)*32767.)/FLOAT(CNTB) 0382
0383 * 0383
0384 01232 0 10 00000 CALL FLCAT 0384
0385 01233 0 000540 DAC CNTB 0385
0386 01234 0 10 00000 CALL H$22 0386
0387 01235 0 000611 DAC TA 0387
0388 01236 0 10 00000 CALL FLCAT 0388
0389 01237 0 000541 DAC CNTC 0389
0390 01240 0 10 00000 CALL M$22 0390
0391 01241 0 000613 DAC K1 32767. 0391
0392 01242 0 10 00000 CALL A$22 0392
0393 01243 0 000611 DAC TA 0393
0394 01244 0 10 00000 CALL H$22 0394
0395 01245 0 000611 DAC TA 0395
0396 * 0396
0397 * RMEA=TA*RENS/125000. 0397
0398 * 0398
0399 01246 0 02 00572 LDA RENS 0399
0400 01247 0 10 00000 CALL C$12 0400
0401 01250 0 10 00000 CALL M$22 0401
0402 01251 0 000611 DAC TA 0402
0403 01252 0 10 00000 CALL D$22 0403
0404 01253 0 000615 DAC K2 125000. 0404
0405 01254 0 10 00000 CALL H$22 0405
0406 01255 0 000607 DAC RMEA 0406
0407 * 0407
0408 * IMEA=IFIX(RMEA) 0408
0409 * 0409
0410 01256 0 10 00000 CALL IFIX 0410
0411 01257 0 000607 DAC RMEA 0411
0412 01260 0 04 00562 STA IMEA 0412
0413 * 0413
0414 * RCAL=(FLOAT(DINC)/FLOAT(DCPS))*1000. 0414
0415 * 0415
0416 01261 0 10 00000 CALL FLCAT 0416

```



0491			*					0491
0492	01363	101000	STR6	NOP				0492
0493	01364	0 10 01517	JST	STAB		STABILITY (JITIE-) TEST		0493
0494			*					0494
0495	01365	101000		NOP				0495
0496	01366	100020		SR1				0496
0497	01367	0 01 01152	JMP	STR3		REPEAT ELAPSED AND STAB IF		0497
0498	01370	101000		NOP		SW 1 IS SET		0498
0499	01371	101002		SS4				0499
0500	01372	0 10 02624	JST	TDAY		GO TO TIME-OF-DAY IF SWITCH 4 IS RESET		0500
0501	01373	0 10 02574	JST	OPCO		ELSE TYPE 'DONE' MESSAGE		0501
0502	01374	0 003376	LAC	MES4		AND HALT		0502
0503	01375	000000		HLT				0503
0504	01376	0 01 01123	JMP	LYCM		ON RESTART DO ALL		0504
0505			*					0505
0506			*	FUNCTION	TEST			0506
0507			*					0507
0508	01377	0 000000	FIST	LAC	**			0508
0509	01400	101000		NOP				0509
0510	01401	14 0220	CCP	*220		TRY TO STOP CLOCK IF RUNNING		0510
0511	01402	0 02 00672	LDA	=-1		THEN SET CLOCK TO ONE COUNT		0511
0512	01403	0 04 00061	STA	*61				0512
0513	01404	0 02 02032	LDA	RET3		DAC FTS3 FOR RUPT RETURN		0513
0514	01405	0 10 02056	JST	SIL		DIRECTLY TO CODE BELOW		0514
0515			*			SIL DOES STA IN *63 THRU *77		0515
0516	01406	0 02 00671	LDA	=1		BIT 16 IS MASK		0516
0517	01407	74 0020	SMK	*20		SET IT		0517
0518	01410	14 0020	CCP	*20		TURN ON CLOCK IF IT WILL		0518
0519	01411	0 02 00714	LDA	=22		RUN, THEN WAIT UP TO		0519
0520	01412	000401	ENB			22 MILLISEC FOR IT TO TICK		0520
0521	01413	0 10 02206	JST	DLYL				0521
0522			*					0522
0523	01414	001001	INH			OH-OH NO CLOCK TICK IN		0523
0524	01415	14 0220	CCP	*220		22 MILLISEC		0524
0525	01416	0 003601	LAC	MER4				0525
0526	01417	100010	SR2					0526
0527	01420	0 01 01400	JMP	FIST+1				0527

0528	01421	0 01 01151	JMP	STR2		RETURN		0528
0529			*					0529
0530	01422	0 00 00000	FIS3	FZE				0530
0531	01423	14 0220	CCP	*220				0531
0532	01424	0 02 00665	LDA	=100				0532
0533	01425	0 10 02206	JST	DLYL		100 MILLISEC DELAY		0533
0534	01426	0 02 00061	LDA	*61		TEST LOCATION		0534
0535	01427	101040	SR2			OF CLOCK MEMORY INCREMENT		0535
0536	01430	0 01 01436	JMP	FTS4				0536
0537	01431	001001	INH					0537
0538	01432	0 10 02541	JST	ERPC		PRINTOUT ERROR MESSAGE		0538
0539	01433	0 003604	LAC	MER5				0539
0540	01434	100010	SR2					0540
0541	01435	0 01 01400	JMP	FTST+1		REPEAT ERROR		0541
0542			*					0542
0543	01436	140040	FIS4	CRA		RESET		0543
0544	01437	74 0020	SMK	*20		DEVICE MASK		0544
0545	01440	0 02 02033	LDA	RET4		SETUP ERROR		0545
0546	01441	0 10 02056	JST	SIL		SIL DOES STA IN *63 THRU *77		0546
0547	01442	0 02 00672	FIS2	LDA	=-1			0547
0548	01443	0 04 00061	STA	*61				0548
0549	01444	14 0020	CCP	*20				0549
0550	01445	000401	ENB					0550
0551	01446	0 02 00714	LDA	=22				0551
0552	01447	0 10 02206	JST	DLYL		22 MILLISEC DELAY		0552
0553	01450	001001	INH					0553
0554	01451	0 02 00061	LDA	*61		TEST IF		0554
0555	01452	0 11 00672	CAS	=-1		CLOCK IS		0555
0556	01453	0 01 01455	JMP	*+2		RUNNING		0556
0557	01454	0 01 01466	JMP	FTS5				0557
0558	01455	14 0220	CCP	*220				0558
0559	01456	-0 01 01377	JMP*	FTST		RETURN		0559
0560			*					0560
0561	01457	0 00 00000	FIS1	FZE		ERROR INTERRUPTS HERE		0561
0562	01460	001001	INH					0562
0563	01461	0 10 02541	JST	ERPC		PRINTOUT ERROR MESSAGE		0563
0564	01462	0 003607	LAC	MER6				0564

0565	01463	100010	SR2			0565
0566	01464	0 01 01436	JMP	FTS4	REPEAT	0566
0567	01465	0 01 01436	JMP	FTS1-1		0567
0568			*			0568
0569	01466	001001	FIS5 INH			0569
0570	01467	0 10 02541	JST	ERPC	PRINTOUT ERROR MESSAGE	0570
0571	01470	0 003612	LAC	MER7		0571
0572	01471	100010	SR2			0572
0573	01472	0 01 01436	JMP	FTS4	REPEAT	0573
0574	01473	0 01 01436	JMP	FTS1-1		0574
0575			*			0575
0576			*			0576
0577			*			0577
0578	01474	0 000000	SR2 DAC	**	SR2 INTO BUCKETS	0578
0579	01475	0 15 00573	STX	SAVE		0579
0580	01476	0 35 00664	LDX	=0		0580
0581	01477	0 07 00500	SUB	AVG		0581
0582	01500	0405 76	ARS	2	SCALE RESULT BY 4	0582
0583	01501	0 11 00603	CAS	=-10		0583
0584	01502	101000	NOP			0584
0585	01503	0 01 01506	JMP	**3		0585
0586	01504	0 12 00501	IRS	BUCK		0586
0587	01505	0 01 01515	JMP	OUTH		0587
0588	01506	0 11 00646	CAS	=10		0588
0589	01507	0 01 01514	JMP	**5		0589
0590	01510	101000	NOP			0590
0591	01511	0 04 00000	STA	**		0591
0592	01512	1 12 00514	IRS	BUCK+11,1		0592
0593	01513	100000	SKP			0593
0594	01514	0 12 00527	IRS	BUCK+22		0594
0595	01515	0 35 00573	OUTH LDX	SAVE		0595
0596	01516	-0 01 01474	JMP*	SR2		0596
0597			*			0597
0598			*	STABILITY (JITTER) TEST		0598
0599			*			0599
0600	01517	0 000000	STAB DAC	**		0600
0601	01520	0 10 02552	JST	LFCR		0601

0602	01521	0 10 02552	JST	LFCR		0602
0603	01522	0 10 02574	JST	OPCC	TYPE 'STABILITY TEST'	0603
0604	01523	0 003623	LAC	STNE		0604
0605	01524	000011	LXA		INSURE NORMAL MODE	0605
0606	01525	0 01 01526	JMP	**1	FOR INDEXING TO FOLLOW	0606
0607	01526	0 35 00662	LDX	=-23	CLEAR THE RESULT TABLE	0607
0608	01527	140040	CRA			0608
0609	01530	1 04 00530	STA	BUCK+23,1		0609
0610	01531	0 12 00000	IRS	**		0610
0611	01532	0 01 01530	JMP	**2		0611
0612	01533	0 02 00671	LDA	=1		0612
0613	01534	0 04 00500	STA	AVC	ACCOUNTS FOR RTC BREAKS	0613
0614	01535	14 0220	CCP	*220	CLEAR ANY CLOCK ACTION	0614
0615	01536	0 02 02040	LDA	RETY		0615
0616	01537	0 10 02056	JST	SIL	SIL DOES STA *63 THRU *77	0616
0617	01540	000401	ENB		ALLOW ANY OLD PI RUPT	0617
0618	01541	101000	NOP		REQUEST TO FLUSH THRU	0618
0619	01542	101000	NOP			0619
0620	01543	001001	INH			0620
0621	01544	100000	SKP		IF NO RUPT THEN SKIP OVER DAC	0621
0622			*			0622
0623	01545	0 000000	STAC DAC	**	PI RUPT IS CLEARED	0623
0624			*			0624
0625	01546	0 02 00672	LDA	=-1	SET TO SYNC ON NEXT	0625
0626	01547	0 04 00061	STA	*61	CLOCK CYCLE	0626
0627	01550	0 02 02036	LDA	RETY	SET RUPT HANDLER TO	0627
0628	01551	0 04 02027	STA	RETC	RETURN TO STAD	0628
0629	01552	0 02 02026	LDA	INTC	SET INTERRUPT LOCATIONS	0629
0630	01553	0 10 02056	JST	SIL	*63 THRU *77 TO RUPT HANDLER	0630
0631	01554	14 0020	CCP	*20	TURN ON CLOCK	0631
0632	01555	0 02 00671	LDA	=1	SET MASK BIT ON	0632
0633	01556	74 0020	SMK	*20		0633
0634	01557	0 02 00714	LDA	=22	AND ENABLE BREAKS WITH	0634
0635	01560	000401	ENB		A WAIT LOOP OF 22 MILLISEC	0635
0636	01561	0 10 02206	JST	DLYL		0636
0637			*			0637
0638	01562	001001	INH		OH-OH NO RUPT IN 22	0638

0639	01563	14 0220	CCP	*220	MILLISEC	0639
0640	01564	0 10 02541	JST	ERPO	PRINTOUT ERROR MESSAGE	0640
0641	01565	0 003601	DAC	MER4		0641
0642	01566	000000	HLT			0642
0643	01567	0 01 01123	JMP	BYCM	BACK TO START	0643
0644			*			0644
0645			*		INTERUPT GETS HERE VIA ROUTINE INT1 AND LOCATION RETU	0645
0646			*			0646
0647	01570	0 02 02037	STAD	LDA	RETB	0647
0648	01571	0 04 02027		STA	RETC	0648
0649	01572	0 02 00661		LDA	=-4096	0649
0650	01573	0 04 00061		STA	*61	0650
0651	01574	14 0020		CCP	*20	0651
0652	01575	000401		ENB		0652
0653	01576	0 02 00660		LDA	=-2041	0653
0654	01577	100000		SKP		0654
0655			*		2048 ADJUSTED FOR THE RUPT PROCESS	0655
0656	01600	0 02 00657		LDA	=-2046	0656
0657			*		2048 ADJUSTED FOR CYCLES USED IN SETUP	0657
0658	01601	0 04 00601		STA	TLY	0658
0659			*			0659
0660	01602	0 12 00601	IRSX	IRS	TLY	0660
0661	01603	0 01 01602		JMP	*-1	0661
0662			*		4 CP CYCLES PER COUNT IN TLY	0662
0663	01604	0 12 00500		IRS	AVG	0663
0664	01605	0 01 01600		JMP	*-5	0664
0665			*		ONE COUNT IN AVG PER 2048 X 4 = 8192 CP CYCLES	0665
0666	01606	000000		HLT		0666
0667			*			0667
0668	01607	0 12 00601	IRST	IRS	TLY	0668
0669	01610	0 12 00001	IRSZ	IRS	1	0669
0670			*		FOR 3 OR 516	0670
0671			*		FOR 716 (REQ'D FOR PARITY TIMES)	0671
0672			*			0672
0673			*		AT TIME OF INTERRUPT LOCATION AVG CONTAINS THE COUNT OF (8192 CP CLOCK CYCLES) PER 4096 RTC CYCLES.	0673
0674	01611	0 35 00656	STAE	LDA	=-1000	0674
0675	01612	0 10 02050	STOZ	JST	AFIS	0675

0676	01613	0 02 02034		LDA	RETB	0676
0677	01614	0 04 02027		STA	RETC	0677
0678	01615	0 10 02003		JST	EIRC	0678
0679	01616	0 02 00714		LDA	=22	0679
0680	01617	0 10 02206		JST	DLYL	0680
0681			*		DELAY UP TO 22 MILLISEC FOR RUPT	0681
0682	01620	001001		INH		0682
0683	01621	14 0220		CCP	*220	0683
0684	01622	0 10 02541		JST	ERPO	0684
0685	01623	0 003601		DAC	MER4	0685
0686	01624	000000		HLT		0686
0687	01625	0 01 01123		JMP	BYCM	0687
0688			*		BACK TO START	0688
0689	01626	0 02 02035	STAF	LDA	RETB	0689
0690	01627	0 04 02027		STA	RETC	0690
0691	01630	0 02 00672		LDA	=-1	0691
0692	01631	0 04 00061		STA	*61	0692
0693	01632	000401		ENB		0693
0694	01633	0 02 00565		LDA	MUCL	0694
0695			*		MAKE UP CYCLES LOST IN GETTING HERE	0695
0696	01634	141206		AGA		0696
0697	01635	0 01 01634		JMP	*-1	0697
0698			*			0698
0699			*		AT TIME OF INTERRUPT A-REGISTER CONTAINS ONE HALF	0699
0700			*		THE NUMBER OF CP CYCLES FOR THIS RTC CYCLE.	0700
0701			*			0701
0702	01636	0 10 01474	STAG	JST	SOFT	0702
0703	01637	0 12 00000		IRS	**	0703
0704	01640	0 01 01612		JMP	STCZ	0704
0705			*			0705
0706			*		IRS SKIPS AFTER 1000 SAMPLES. GO TO PRINT DISTRIBUTION.	0706
0707			*			0707
0708	01641	101000		NOP		0708
0709	01642	14 0220		CCP	*220	0709
0710	01643	0 10 02552		JST	LFGR	0710
0711	01644	0 10 01721		JST	TDIS	0711
0712	01645	0 02 00000		LDA	0	0712
					SEE IF RESULT IS GOOD OR BAL ZERO SAYS GOOD	

0713	01646	100004	SR3			0713
0714	01647	0 02 00671	LDA	=1		0714
0715	01650	101040	SNZ		NON-ZERO SAYS BAD OR FORCED	0715
0716	01651	-0 01 01517	JMP*	STAB	IT WAS GOOD - DO NOT PRINT DISTRIBUTION	0716
0717						0717
0718	01652	0 10 02552	JST	LFCK		0718
0719	01653	0 10 02574	JST	OPCG		0719
0720	01654	0 003635	DAC	STMF	TELL WHAT TEST IS ABOUT	0720
0721	01655	0 02 00500	LDA	AVG	GET AVERAGE	0721
0722	01656	0405 76	ARS	2	SCALE RESULT BY 4	0722
0723	01657	0 10 02222	JST	BUCC	CONVERT TO ASCII DECIMAL	0723
0724	01660	0 04 00574	STA	TEMP	SAVE FIRST TWO CHARACTERS	0724
0725	01661	000201	IAB			0725
0726	01662	0 04 00575	STA	TEMP+1	AND SECOND TWO	0726
0727	01663	140040	CRA			0727
0728	01664	0 04 00576	STA	TEMP+2	MESSAGE TERMINATOR	0728
0729	01665	0 10 02574	JST	OPCG	WRITE MESSAGE	0729
0730	01666	0 000574	LAC	TEMP		0730
0731	01667	0 10 02552	JST	LFCK	FORMAT IT	0731
0732						0732
0733	01670	0 02 00655	LDA	=-69	LABELS ARE 3 WORDS LONG	0733
0734	01671	0 04 00554	STA	HOLD		0734
0735	01672	0 02 00662	LDA	=-23	AND THERE ARE 23 OF THEM	0735
0736	01673	0 04 00555	STA	HOLD+1		0736
0737	01674	0 02 00716	LDA	=A	PUT IN LEADING SPACE	0737
0738	01675	0 04 00574	STA	TEMP	BEFORE THE DECIMAL NUMBER	0738
0739	01676	0 10 02552	SPTW JST	LFCK		0739
0740	01677	0 35 00554	LDX	HOLL		0740
0741	01700	0 10 02574	JST	OPCG		0741
0742	01701	1 004123	LAC	ME01+69+1		0742
0743	01702	0 02 00554	LDA	HOLL		0743
0744	01703	0 06 00704	ADD	=3		0744
0745	01704	0 04 00554	STA	HOLD		0745
0746	01705	0 35 00555	LDX	HOLL+1		0746
0747	01706	1 02 00530	LDA	BUCK+23+1		0747
0748	01707	0 10 04123	JST	V\$CD	OCTAL TO DECIMAL ASCII	0748
0749	01710	-0 000577	DAC*	TEMP+3	WITH ZERO SUPPRESS	0749

0750	01711	140040	CRA		MESSAGE TERMINATOR	0750
0751	01712	0 04 00600	STA	TEMP+4		0751
0752	01713	0 10 02574	JST	OPCG		0752
0753	01714	0 000574	LAC	TEMP		0753
0754	01715	0 12 00555	IRS	HOLL+1		0754
0755	01716	0 01 01676	JMP	SPTW	TYPE NEXT COUNT	0755
0756						0756
0757	01717	0 10 01721	JST	TDIS	TEST RESULT	0757
0758	01720	-0 01 01517	JMP*	STAB	END - OF - STABILITY	0758
0759						0759
0760			*		TEST DISTRIBUTION WIDTH AND OVERFLOW	0760
0761			*			0761
0762	01721	0 000000	TDIS DAC	**		0762
0763	01722	0 02 00501	LDA	BUCK	IF ANY IN END SLOTS THEN	0763
0764	01723	0 06 00527	ADD	BUCK+22	REJECT RIGHT NOW	0764
0765	01724	101040	SNZ			0765
0766	01725	0 01 01732	JMP	STAH	SO FAR ITS GOOD	0766
0767						0767
0768	01726	0 10 02574	JST	OPCG	'REJECT OUT OF RANGE'	0768
0769	01727	0 003470	LAC	MESA		0769
0770	01730	0 35 00671	LDX	=1	MARK X REG AS BAD TEST	0770
0771	01731	-0 01 01721	JMP*	TDIS	AND RETURN	0771
0772			*			0772
0773	01732	0 04 00574	STAH STA	TEMP	CLEAR A LOCATION	0773
0774	01733	0 04 00000	STA	0	AND THE X REG	0774
0775	01734	0 12 00000	IRS	0	BUMP IT	0775
0776	01735	1 06 00501	ADD	BUCK+1	AND TEST AHEAD FOR FIRST NON-ZERO VALUE	0776
0777	01736	101040	SNZ			0777
0778	01737	0 01 01734	JMP	**3	NOT FOUND YET	0778
0779			*			0779
0780	01740	0 12 00574	STAI IRS	TEMP	ADD ONE TO COUNT OF WIDTH	0780
0781	01741	0 12 00000	IRS	0	AND X REG	0781
0782	01742	0 11 00625	CAS	=1000	SEE IF ALL COUNTED	0782
0783	01743	000000	HLT		WHOOPS - TOO MANY	0783
0784	01744	0 01 01747	JMP	**3	YES - ALL DONE	0784
0785	01745	1 06 00501	ADD	BUCK+1	NO - ADD NEXT BUCKETS COUNT	0785
0786	01746	0 01 01740	JMP	STAI	AND GO BACK	0786

```

0787
0788 01747 0 02 00500 * LDA AVG NOW TEMP HAS WIDTH OF DISTRIBUTION 0787
0789 01750 0405 76 AKS 2 0788
0790 01751 000201 IAB FORM DOUBLE PRECISION INTEGER OF SCALEL 0790
0791 01752 140040 CRA VALUE OF AVERAGE 0791
0792 01753 0 10 02426 JST DIV TAKE 6 % OF IT (6/1000 = 1/167) 0792
0793 01754 0 000654 DAC =167 0793
0794 01755 000000 FLT ROUND UP 0794
0795 01756 0411 77 LLS 1 0795
0796 01757 141206 AUA 0796
0797 01760 0401 77 LRS 1 0797
0798 01761 0 11 00701 CAS =4 MAKE SURE VALUE IS BETWEEN 4 AND 8 0798
0799 01762 101000 NOP 0799
0800 01763 100000 SKP 0800
0801 01764 0 02 00701 LDA =4 0801
0802 01765 0 11 00653 CAS =8 0802
0803 01766 0 02 00653 LDA =8 0803
0804 01767 101000 NOP 0804
0805 0805 0805
0806 01770 0 11 00574 * CAS TEMP COMPARE TO PREVIOUSLY FOUND WIDTH OF 0806
0807 01771 101000 NOP DISTRIBUTION 0807
0808 01772 0 01 01777 JMP STAJ GOOD 0808
0809 0809 *
0810 01773 0 10 02574 JST OPCC *REJECT AS TOO WIDE* 0810
0811 01774 0 003505 DAC MESB 0811
0812 01775 0 35 00671 LDA =1 MARK X REG AS BAD 0812
0813 01776 -0 01 01721 JMP* TDIS AND RETURN 0813
0814 0814 *
0815 01777 0 10 02574 STAJ JST OPCC TYPE *RESULT IS GOOD* 0815
0816 02000 0 004004 DAC MESX 0816
0817 02001 0 35 00664 LDX =0 SHOW GOOD RESULT IN X REG 0817
0818 02002 -0 01 01721 JMP* TDIS AND RETURN 0818
0819 0819 *
0820 * ENABLE INTERRUPTS AND START REAL TIME CLOCK 0820
0821 * 0821
0822 02003 0 000000 EIRC DAC ** SUBROUTINE ENTRY 0822
0823 02004 0 02 00671 LDA =1 0823
    
```

```

0824 02005 74 0020 SMK *20 MASK 0824
0825 02006 14 0020 CCP *20 ENABLE CLOCK 0825
0826 02007 000401 ENB ENABLE INTERRUPT 0826
0827 02010 -0 01 02003 JMP* EIRC RETURN 0827
0828 0828 *
0829 * INTERRUPT SERVICE ROUTINE 0829
0830 0830 *
0831 02011 0 000000 INT1 DAC ** 0831
0832 02012 000011 DXA GET BACK TO NORMAL MODE 0832
0833 02013 34 0020 SKS *20 TEST FOR RTC INTERRUPT 0833
0834 02014 0 01 02017 JMP **3 0834
0835 02015 0 10 02541 JST ERPO PRINTOUT ERROR MESSAGE 0835
0836 02016 0 003573 DAC MER1 0836
0837 02017 14 0020 CCP *20 RESET RTC INTERRUPT 0837
0838 02020 34 0020 SKS *20 0838
0839 02021 0 01 02023 JMP **2 0839
0840 02022 0 01 02025 JMP **3 0840
0841 02023 0 10 02541 JST ERPO PRINTOUT ERROR MESSAGE 0841
0842 02024 0 003576 DAC MER3 0842
0843 02025 -0 01 02027 JMP* RETU RETURN 0843
0844 0844 *
0845 02026 0 002011 INTO DAC INT1 POINTS TO RUPT HANDLER 0845
0846 02027 0 000000 RETU DAC ** 0846
0847 0847 *
0848 02030 0 001204 RET1 DAC STR4 0848
0849 02031 0 001224 RET2 DAC STR5 0849
0850 02032 0 001422 RET3 DAC FTS3 0850
0851 02033 0 001457 RET4 DAC FTS1 0851
0852 02034 0 001626 RET5 DAC STAF 0852
0853 02035 0 001636 RET6 DAC STAG 0853
0854 02036 0 001570 RET7 DAC STAD 0854
0855 02037 0 001611 RET8 DAC STAE 0855
0856 02040 0 001545 RET9 DAC STAC 0856
0857 02041 0 002641 RETA DAC TDB TIME-OF-DAY PI FLUSH TO TDB 0857
0858 02042 0 002732 RETB DAC TDC TIME-OF-DAY NORMAL RUPT TC INT1 0858
0859 02043 0 003023 RETC DAC CCN CPU CAL FLUSH PI 0859
0860 02044 0 003060 RETD DAC CCJ CPU CAL NORMAL END (PUSH START BUTTON) 0860
    
```

0861	02045	0	003157	RLTE	DAC	MTIA	MEM TIMING PI FLUSH RUPT TO MTIA	0861
0862	02046	0	003177	RETF	DAC	MTIB	MEM TIMING RUPT FOR FIRST 4K	0862
0863	02047	0	003264	RETEG	DAC	MTIC	MEM TIMING RUPT FOR REMAINING MODULES	0863
0864				*				0864
0865				*			ADJUST FOR FIRST INTERRUPT--SKEW	0865
0866				*				0866
0867	02050	0	000000	AFIS	DAC	**	SUBROUTINE ENTRY	0867
0868	02051	0	02 00672	LDA		=-1	SETUP FOR	0868
0869	02052	0	04 00001	STA		'61	ONE INTERRUPT	0869
0870	02053	0	02 02026	LDA		INTC		0870
0871	02054	0	10 02056	JST		SIL	SET RUPT LOCATIONS '63 THRU '77	0871
0872	02055	-0	01 02050	JMP*		AFIS	RETURN	0872
0873				*				0873
0874				*			SET INTERRUPT LOCATIONS '63 THRU '77 WITH A REG	0874
0875				*				0875
0876	02056	0	000000	SIL	DAC	**		0876
0877	02057	0	04 00063	STA		'63		0877
0878	02060	0	04 00064	STA		'64		0878
0879	02061	0	04 00065	STA		'65		0879
0880	02062	0	04 00066	STA		'66		0880
0881	02063	0	04 00067	STA		'67		0881
0882	02064	0	04 00070	STA		'70		0882
0883	02065	0	04 00071	STA		'71		0883
0884	02066	0	04 00072	STA		'72		0884
0885	02067	0	04 00073	STA		'73		0885
0886	02070	0	04 00074	STA		'74		0886
0887	02071	0	04 00075	STA		'75		0887
0888	02072	0	04 00076	STA		'76		0888
0889	02073	0	04 00077	STA		'77	TALK ABOUT DULL CODE -	0889
0890	02074	-0	01 02056	JMP*		SIL	- WOW	0890
0891				*				0891
0892				*			INPUT NEW PARAMETERS	0892
0893				*				0893
0894	02075	0	000000	IPLS	DAC	**		0894
0895	02076	0	10 02574	JST		OPCO	ASK FOR FREQ	0895
0896	02077	0	003360	LAC		MES2		0896
0897	02100	0	10 02140	JST		PACK	GET PACKED WORD (OR SKIP 3)	0897

0898	02101	0	02 00566	LDA		NEWL		0898
0899	02102	0	10 02257	JST		DCG	PACKED DEC TO BINARY	0899
0900	02103	0	04 00544	STA		DCPS		0900
0901	02104	0	02 00544	LDA		DCPS	FETCH IT BACK	0901
0902	02105	0	11 00652	CAS		=50	AND CHECK TO LOWER LIMIT	0902
0903	02106		101000	NOP				0903
0904	02107		100000	SKP			GOOD SO FAR	0904
0905	02110	0	01 02115	JMP		IPLT	TOO SMALL	0905
0906				*				0906
0907	02111	0	11 00625	CAS		=1000	TRY HIGH LIMIT	0907
0908	02112	0	01 02115	JMP		IPLT	TOO BIG	0908
0909	02113		101000	NOP				0909
0910	02114	0	01 02120	JMP		IPLU	GOOD ON FREQ	0910
0911				*				0911
0912	02115	0	10 02574	IPLT	JST	OPCO	TYPE ERROR MESSAGE	0912
0913	02116	0	003460	DAC		MES6	ABOUT PARAMETER LIMITS	0913
0914	02117	0	01 02076	JMP		IPLS+1	AND REPEAT REQUEST	0914
0915				*				0915
0916	02120	0	10 02574	IPLU	JST	OPCO	ASK FOR SAMPLE SIZE IN CYCLES	0916
0917	02121	0	003367	DAC		MES3		0917
0918	02122	0	10 02140	JST		PACK	GET PACKED WORD (OR SKIP 3)	0918
0919	02123	0	02 00566	LDA		NEWL		0919
0920	02124	0	10 02257	JST		DCG	PACKED DECIMAL TO BINARY	0920
0921	02125	0	04 00545	STA		DINC		0921
0922	02126	0	02 00545	LDA		DINC	FETCH IT BACK	0922
0923	02127	0	11 00671	CAS		=1	COMPARE TO LOWER LIMIT	0923
0924	02130		101000	NOP				0924
0925	02131		100000	SKP				0925
0926	02132	0	01 02115	JMP		IPLT	TOO SMALL	0926
0927				*				0927
0928	02133	0	11 00625	CAS		=1000	TRY HIGH LIMIT	0928
0929	02134	0	01 02115	JMP		IPLT	TOO BIG	0929
0930	02135		101000	NOP			OK	0930
0931	02136	0	10 02552	JST		LFCK	ACKNOWLEDGE OPERATOR	0931
0932	02137	-0	01 02075	JMP*		IPLS	RETURN	0932
0933				*				0933
0934				*			STRIP ASCII AND PACK BCD - FOUR CHARACTER/WORD	0934



0935			*						0935
0936	02140	0 000000	PACK	LAC	**				0936
0937	02141	140040		CRA					0937
0938	02142	0 04 00566		STA	NEwL				0938
0939	02143	0 04 00530		STA	CFLG				0939
0940	02144	0 10 02611	REST	JST	IPCC				0940
0941	02145	000000		BSZ	1				0941
0942	02146	0 02 02145		LDA	**1				0942
0943	02147	0 11 00667		CAS	=*256				0943
0944	02150	100000		SKP					0944
0945	02151	0 01 02173		JMP	RETN				0945
0946	02152	0 11 00651		CAS	=*215				0946
0947	02153	100000		SKP					0947
0948	02154	0 01 02173		JMP	RETN				0948
0949	02155	0 11 00650		CAS	=*271				0949
0950	02156	0 01 02202		JMP	REJT				0950
0951	02157	101000		NOP					0951
0952	02160	0 11 00647		CAS	=*260				0952
0953	02161	101000		NOP					0953
0954	02162	100000		SKP					0954
0955	02163	0 01 02202		JMP	REJT				0955
0956			*						0956
0957	02164	0 07 00647		SUB	=*260				0957
0958	02165	0 13 00566		IMA	NEwL				0958
0959	02166	0+14 74		LGL	4				0959
0960	02167	0 06 00566		ADD	NEwL				0960
0961	02170	0 04 00566		STA	NEwL				0961
0962	02171	0 12 00530		IRS	CFLG				0962
0963	02172	0 01 02144		JMP	REST				0963
0964			*						0964
0965	02173	0 02 00530	RETN	LDA	CFLG				0965
0966	02174	100040		SZE					0966
0967	02175	-0 01 02140		JMP*	PACK				0967
0968	02176	0 02 02140		LDA	PACK				0968
0969	02177	0 06 00704		ADD	=3				0969
0970	02200	0 04 02140		STA	PACK				0970
0971	02201	-0 01 02140		JMP*	PACK				0971

0972			*						0972
0973	02202	0 02 02140	REJT	LDA	PACK				0973
0974	02203	0 07 00704		SUB	=3				0974
0975	02204	0 04 02140		STA	PACK				0975
0976	02205	-0 01 02140		JMP*	PACK				0976
0977			*						0977
0978			*						0978
0979			*						0979
0980	02206	0 000000	DLYL	LAC	**				0980
0981	02207	140407		TCA					0981
0982	02210	0 04 00546		STA	DLYM				0982
0983	02211	0 01 02217		JMP	DLYB				0983
0984	02212	0 02 00543	DLYA	LDA	DCGN				0984
0985	02213	0 04 00547		STA	DLYN				0985
0986	02214	140040		CRA					0986
0987	02215	0 12 00547		IRS	DLYN				0987
0988	02216	0 01 02215		JMP	**1				0988
0989	02217	0 12 00546	DLYB	IRS	DLYM				0989
0990	02220	0 01 02212		JMP	DLYA				0990
0991	02221	-0 01 02206		JMP*	DLYL				0991
0992			*						0992
0993			*						0993
0994			*						0994
0995			*						0995
0996			*						0996
0997			*						0997
0998	02222	0 000000	BCDC	LAC	**				0998
0999	02223	0400 60		LRL	16				0999
1000	02224	0 10 02235		JST	BCDA				1000
1001	02225	0 04 02234		SJA	BCDR+1				1001
1002	02226	0 10 02235		JST	BCDA				1002
1003	02227	000201		IAB					1003
1004	02230	0 02 02234		LDA	BCDR+1				1004
1005	02231	000201		IAB					1005
1006	02232	-0 01 02222		JMP*	BCDC				1006
1007	02233			BCDR	BSS	2			1007
1008			*						1008

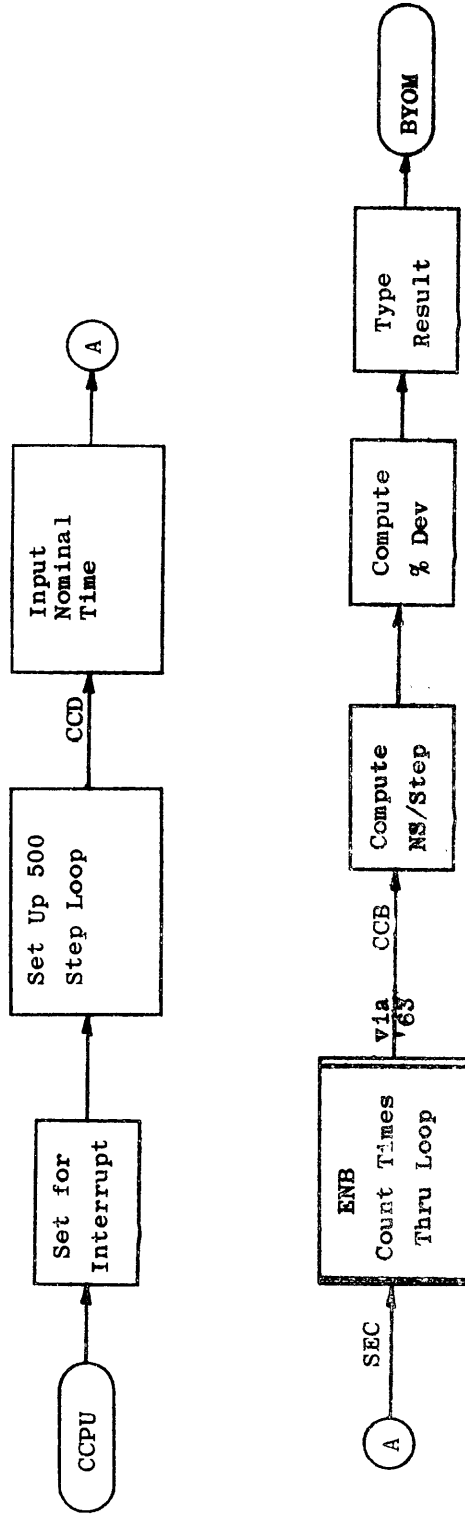
1009	02235	0 000000	BCDA	DAC	**		1009
1010	02236	140040		CRA			1010
1011	02237	0 04 02233	STA	BCDR		INITIALIZE	1011
1012	02240	0 10 02247	JST	DIVD	*	*	1012
1013	02241	0 04 02233	STA	BCDR		TWC	1013
1014	02242	0 10 02247	JST	DIVD		ASCII	1014
1015	02243	0415 70	ALS	8		PACK	1015
1016	02244	0 05 02233	ERA	BCDR	*	*	1016
1017	02245	0 04 02233	STA	BCDR	*	*	1017
1018	02246	-0 01 02235	JMP*	BCDA	*	*	1018
1019			*				1019
1020	02247	0 000000	DIVD	DAC	**		1020
1021	02250	140040		CRA			1021
1022	02251	0 10 02426	JST	DIV			1022
1023	02252	0 000646	DAC	=10	*		1023
1024	02253	000000	HLT			DIVIDE BY 10	1024
1025	02254	000201	IAB		*	*	1025
1026	02255	0 05 00647	ERA	=1000		AND ASCII PACK	1026
1027	02256	-0 01 02247	JMP*	DIVD	*	*	1027
1028			*				1028
1029			*				1029
1030			*				1030
1031			*				1031
1032			*				1032
1033	02257	0 000000	DCC	DAC	**		1033
1034	02260	0400 60	LRL	16		(B)=BCD	1034
1035	02261	0 10 02302	JST	DCCM			1035
1036	02262	001750	DEC	1000		X 1000	1036
1037	02263	0 04 02301	STA	DCCD			1037
1038	02264	0 10 02302	JST	DCCM			1038
1039	02265	000144	DEC	100		X 100	1039
1040	02266	0 06 02301	ADD	DCCD			1040
1041	02267	0 04 02301	STA	DCCD			1041
1042	02270	0 10 02302	JST	DCCM			1042
1043	02271	000012	DEC	10		X10	1043
1044	02272	0 06 02301	ADD	DCCD			1044
1045	02273	0 04 02301	STA	DCCD			1045

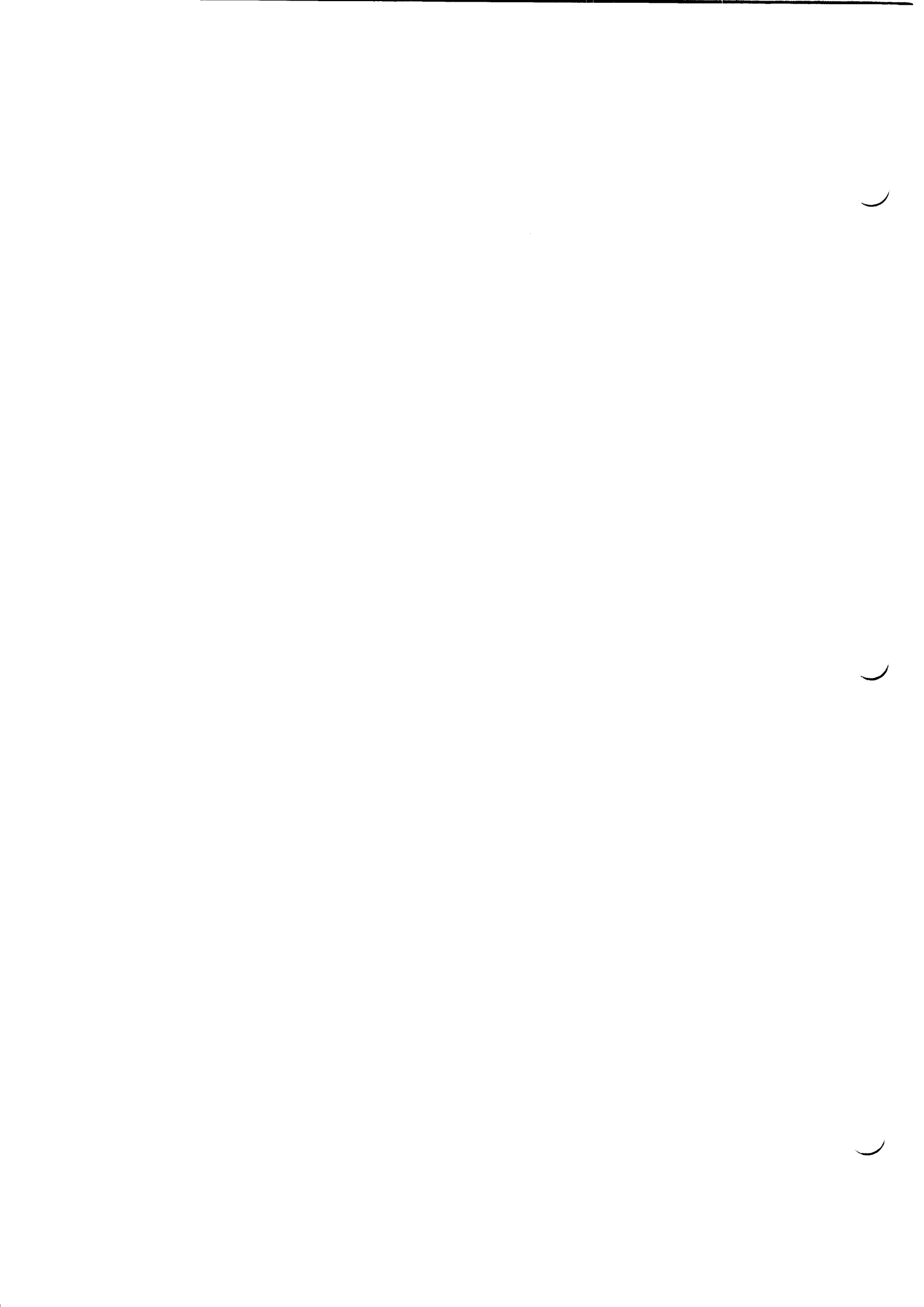
1046	02274	0 10 02302	JST	DCCM			1046
1047	02275	000001	DEC	1		X1	1047
1048	02276	0 06 02301	ADD	DCCD			1048
1049	02277	0 04 02301	STA	DCCD			1049
1050	02300	-0 01 02257	JMP*	DCC			1050
1051	02301	0 000000	DCCD	DAC	**		1051
1052			*				1052
1053	02302	0 000000	DCCM	DAC	**		1053
1054	02303	140040		CRA			1054
1055	02304	0410 74	LLL	4		MULTIPLICAND	1055
1056	02305	000201	IAB				1056
1057	02306	0 04 02316	STA	DCCS			1057
1058	02307	000201	IAB				1058
1059	02310	0 10 02317	JST	MPY			1059
1060	02311	-0 002302	DAC*	DCCM		MULTIPLIER	1060
1061	02312	0 02 02316	LDA	DCCS			1061
1062	02313	000201	IAB				1062
1063	02314	0 12 02302	IRS	DCCM			1063
1064	02315	-0 01 02302	JMP*	DCCM			1064
1065	02316	0 000000	DCCS	DAC	**		1065
1066			*				1066
1067			*				1067
1068			*				1068
1069	02317	-0 000000	MPY	DAC*	**		1069
1070	02320	101400	SMI			CHECK SIGN OF MULTIPLIER	1070
1071	02321	0 01 02333	JMP	MPYB		POSTIVE	1071
1072	02322	140407	ICA			NEGATIVE TWO'S COMPLEMENT	1072
1073	02323	000201	IAB			MULTIPLIER IN B REGISTER	1073
1074	02324	-0 02 02317	LDA*	MPY		LOAD MULTIPLICAND	1074
1075	02325	101400	SMI			CHECK SIGN	1075
1076	02326	0 01 02340	JMP	MPYC		POSTIVE	1076
1077	02327	140407	ICA			NEGATIVE TWO'S COMPLEMENT	1077
1078	02330	0 10 02355	MPYA	JST	MPYS	EXIT TO PERFORM MULTIPLICATION	1078
1079	02331	0 12 02317	IRS	MPY		INCREMENT FOR RETURN	1079
1080	02332	0 01 02420	MPAA	JMP	MEAT	EXIT	1080
1081	02333	000201	MPYB	IAB		PLACE MULTIPLIER IN B REG	1081
1082	02334	-0 02 02317	LDA*	MPY			1082

1442  
1443

\* CALIBRATE CPU CLOCK FLOWCHART  
EJCT

1442  
1443





1083	02335	101400	SMI		CHECK SIGN OF MULTIPLICAND	1083
1084	02336	0 01 02330	JMP	MPYA	MULTIPLICAND PLUS, GO TO MULTIPLY	1084
1085	02337	140407	TCA			1085
1086	02340	0 10 02355	MPYC JST	MPYS	NEGATIVE-2'S COMPLEMENT RESULT	1086
1087	02341	140200	KCB		RESET C BIT	1087
1088	02342	140401	CMA		ONE'S COMPLEMENT HI-ORDER	1088
1089	02343	000201	IAB			1089
1090	02344	140407	TCA		TWO'S COMPLEMENT LOW ORDER	1090
1091	02345	140407	TCA		TWO'S COMPLEMENT LOW ORDER	1091
1092	02346	101040	SNZ		IS RESULT ZERO	1092
1093	02347	140600	SCB		INSERT 1 FOR CARRY IN	1093
1094	02350	140100	SSP		RESET MSB TO ZERO	1094
1095	02351	000201	IAB		HI-ORDER TO A, LOW ORDER TO B	1095
1096	02352	141216	ACA			1096
1097	02353	0 12 02317	IRS	MPY	INCREMENT FOR RETURN	1097
1098	02354	0 01 02420	MPCC JMP	MEXT	EXIT	1098
1099			*			1099
1100			*		MULTIPLICATION SUBROUTINE FOR POSITIVE VALUES	1100
1101			*			1101
1102	02355	0 000000	MPYS DAC	**	ENTRANCE	1102
1103	02356	0 04 00535	STA	COMM	STORE MULTIPLICAND	1103
1104	02357	000201	IAB		MULTIPLIER IN A MULTIPLICAND IN B.	1104
1105	02360	0 04 00536	STA	COMM+1	STORE MULTIPLIER	1105
1106	02361	0 05 00535	ERA	COMM	.IF NEG. MINUS LARGEST NEGATIVE NUMBER	1106
1107	02362	100400	SPL		.IF ZERO NORMAL OR BOTH ARE LARGEST NEG NO.	1107
1108	02363	0 01 02412	JMP	MLNN	LARGEST NEG NO. IS PRESENT, MULTI. IN B	1108
1109	02364	000201	IAB		TEST MULTIPLICAND FOR LNN, IF NEG	1109
1110	02365	101400	SMI		BOTH OPERANDS ARE LNN OR FOR BOTH 1.00000.	1110
1111	02366	0 01 02370	JMP	**2		1111
1112	02367	0 01 02406	JMP	MPYN	RESULT WILL BE ZERO LNN*MLNN	1112
1113			*		IN A	1113
1114	02370	0 02 00536	LDA	COMM+1	NORMAL, MULTIPLY OPERANDS LOAD MULTIPLIER	1114
1115	02371	000201	IAB		MULTIPLIER IN B	1115
1116	02372	0 02 00645	MPYR LDA	=-15	LOAD COUNTER	1116
1117	02373	0 04 00536	STA	COMM+1	LOOP COUNTER	1117
1118	02374	140040	CRA		CLEAR A REGISTER	1118
1119	02375	0400 77	LRL	1	SHIFT TO RIGHT	1119

1120	02376	100001	SRC		EXAMINE RIGHT MOST BIT	1120
1121	02377	0 06 00535	ADD	COMM	ADD MULTIPLICAND	1121
1122	02400	0 12 00536	IRS	COMM+1	CONTROL LOOP	1122
1123	02401	0 01 02375	JMP	**4	RECYCLE	1123
1124	02402	0400 77	LRL	1		1124
1125	02403	0414 77	LGL	1	PUT 0 IN SIGN ORDER OF A REGISTER	1125
1126	02404	0400 77	LRL	1	MOVE 0 TO SIGN OF B REGISTER	1126
1127	02405	-0 01 02355	JMP*	MPYS		1127
1128	02406	140040	MPYR CRA		RETURN ZERO RESULT	1128
1129	02407	000201	IAB		ZERO IN B	1129
1130	02410	0 02 00535	LDA	COMM	-1 IN A	1130
1131	02411	0 01 02331	JMP	MPYA+1	RESULT CANNOT BE REPRESENTED ABOUT WITH -1	1131
1132			*			1132
1133			*		MULTIPLY BY LARGEST NEGATIVE NUMBER	1133
1134			*		IF RESULT IS NEGATIVE AND THE	1134
1135			*		1. MULTIPLICAND IS LNN, RESULT IS THE TWO'S	1135
1136			*		COMPLEMENT OF THE MULTIPLIER	1136
1137			*		2. MULTIPLIER IS LNN, RESULT IS THE TWO'S	1137
1138			*		COMPLEMENT OF THE MULTIPLICAND	1138
1139			*		IF RESULT IS POSITIVE AND THE	1139
1140			*		1. MULTIPLICAND IS LNN, RESULT IS THE	1140
1141			*		MULTIPLIER	1141
1142			*		2. MULTIPLIER IS LNN, RESULT IS THE MULTIPLICAND	1142
1143			*			1143
1144	02412	140040	MLNN CRA		CLEAR B	1144
1145	02413	000201	IAB			1145
1146	02414	101400	SMI		CHECK MULTIPLICAND = MINUS LARGEST NEG. NO	1146
1147	02415	-0 01 02355	JMP*	MPYS	EXIT WITH MULTIPLICAND IN A MULTI. IS LNN	1147
1148	02416	0 02 00536	LDA	COMM+1	MULTIPLICAND IS LNN, LOAD MULTIPLIER IN A	1148
1149	02417	-0 01 02355	JMP*	MPYS	EXIT, MULTIPLICAND IS LNN	1149
1150	02420	0 04 00535	MEXT STA	COMM	SAVE RESULT EXIT ROUTINE	1150
1151	02421	0 02 02317	LDA	MPY	LOAD ENTRY	1151
1152	02422	0 03 00644	ANA	=*57777	GET RID OF INDIRECT BIT	1152
1153	02423	0 04 00536	STA	COMM+1	STORE RETURN	1153
1154	02424	0 02 00535	LDA	COMM	RESTORE RESULT	1154
1155	02425	-0 01 00536	JMP*	COMM+1	RETURN	1155
1156			*			1156

```

1157 * DIVIDE ROUTINE
1158 *
1159 02426 -0 000000 DIV DAC* **
1160 02427 101400 SMI
1161 02430 0 01 02464 JMP DIVE CHECK SIGN OF DIVIDEND
1162 02431 140200 RCB RESET C BIT
1163 02432 140401 CMA ONE'S COMPLEMENT HI-ORDER
1164 02433 000201 IAB
1165 02434 140407 TCA TWO'S COMPLEMENT LOW ORDER
1166 02435 101040 SNZ IF LOWER ORDER=0
1167 02436 140600 SCB MUST TWO'S COMPLEMENT HI-ORDER
1168 02437 140100 SSP SET B SIGN PLUS
1169 02440 000201 IAB
1170 02441 141216 ACA
1171 02442 101400 SMI IS NUMERATOR LARGEST NEGATIVE NUMBER
1172 02443 0 01 02445 JMP **2 NO CONTINUE, NORMAL
1173 02444 0 01 02462 JMP DIV2 ERROR EXIT ILLEGAL DIVIDE
1174 02445 0 04 00533 STA COME+1
1175 02446 -0 02 02426 LDA* DIV CHECK SIGN OF DIVISOR
1176 02447 101400 SMI
1177 02450 0 01 02471 JMP DIVC
1178 02451 140407 TCA TWO'S COMPLEMENT DIVISOR
1179 02452 101400 SMI TEST FOR LARGEST NEGATIVE NUMBER
1180 02453 0 01 02457 JMP DIVA DIVIDE DIVIDEND, DIVISOR SAME SIGN
1181 02454 0 02 00533 LDA COME+1 RESULT POSITIVE, LOAD NUMERATOR
1182 02455 000201 SWAP IAB
1183 02456 0 01 02460 JMP DIVX
1184 02457 0 10 02504 DIVA JST DIVS DIVIDE IF DIVISOR AND DIV SAME SIGN
1185 02460 0 12 02426 DIVX IRS DIV INCREMENT FOR NORMAL RETURN
1186 02461 000201 IAB QUOTIENT IN A REG, REMAINDER IN B
1187 02462 0 12 02426 DIVZ IRS DIV ERROR EXIT
1188 02463 0 01 02533 DEX JMP DEXT GO TO EXIT
1189 02464 0 04 00533 DIVB STA COME+1 STORE MOST SIGNIFICANT HALF OF DIVIDEND
1190 02465 -0 02 02426 LDA* DIV CHECK SIGN OF DIVISOR
1191 02466 101400 SMI COMPLEMENT ON NEGATIVE
1192 02467 0 01 02457 JMP DIVA DIVIDE OPERAND ARE OF SAME SIGN
1193 02470 140407 TCA TWO'S COMPLEMENT
    
```

```

1194 02471 101400 DIVC SMI CHECK DENOMINATOR FOR LARGEST NEGATIVE NO.
1195 02472 0 01 02476 JMP DIVN NOT LNN
1196 02473 0 02 00533 LDA COME+1 RESULT SIGN WILL BE NEGATIVE
1197 02474 000201 IAB RESULT IS NUMERATOR
1198 02475 0 01 02477 JMP **2 BY PASS DIVIDE COMPLEMENT RESULT
1199 02476 0 10 02504 DIVN JST DIVS DIVIDE
1200 *
1201 * RETURN HERE ON NEGATIVE RESULT
1202 *
1203 02477 000201 IAB COMPLEMENT QUOTIENT AND REMAINDER
1204 02500 140407 TCA
1205 02501 000201 IAB
1206 02502 140407 TCA
1207 02503 0 01 02460 JMP DIVX EXIT
1208 *
1209 * DIVIDE ROUTINE WITH HIGH ORDER DIVIDEND IN
1210 * COMMON +1, LOW ORDER DIVIDEND IN B REG AND
1211 * DIVISOR IN A REGISTER
1212 *
1213 02504 000000 DIVS FLT
1214 02505 0 04 00532 STA COME SAVE DIVISOR
1215 02506 0 02 00645 LDA ==15
1216 02507 0 04 00534 STA COME+2 LOOP COUNTER
1217 02510 0410 77 LLL 1 MOVE LOW ORDER LEFT 1
1218 02511 0 02 00533 LDA COME+1 LOAD HI ORDER
1219 02512 0 11 00532 CAS COME COMPARE DIVIDEND AND DIVISOR
1220 02513 0 01 02462 JMP DIVZ DIVIDEND GTR THAN OR
1221 02514 0 01 02462 JMP DIVZ EQUAL TO GO TO ERROR RETURN
1222 *
1223 * LOOP FOR DIVISION
1224 *
1225 02515 0412 77 DIVT LLR 1 MOVE DIVIDEND 1 POSITION TO LEFT
1226 02516 100400 SPL TEST SIGN POSITION FOR SPILL
1227 02517 0 01 02524 JMP DIVU MINUS SUBTRACT DIVIDEND IS GREATER
1228 02520 0 11 00532 CAS COME COMPARE DIVIDEND AND DIVISOR
1229 02521 0 01 02524 JMP DIVU IF GREATER SUBTRACT
1230 02522 0 01 02524 JMP DIVU EQUAL SUBTRACT
    
```



✓

✓

✓



1231	02523	0 01 02526	JMP	DIVH	INDEX AND LOOP	1231
1232	02524	0 07 00532	DIVC	SUB	COME	1232
1233	02525	140500		SSM	PUT-1-BIT IN QUOTIENT LOOP	1233
1234	02526	0 12 00534	DIVH	IRS	COME+2	1234
1235	02527	0 01 02515	JMP	DIVT	LOOP	1235
1236	02530	0412 77	LLR	1	LOOP	1236
1237	02531	0404 77	LGR	1	RESET SIGN BITS	1237
1238	02532	-0 01 02504	JMP*	DIVS		1238
1239	02533	0 04 00532	DEXT	STA	COME	1239
1240	02534	0 02 02426	LDA	DIV	SAVE RESULT EXIT ROUTINE	1240
1241	02535	0 03 00644	ANA	=*17777	LOAD ENTRY	1241
1242	02536	0 04 00533	STA	COME+1	GET RID OF INDIRECT BIT	1242
1243	02537	0 02 00532	LDA	COME	STORE RETURN	1243
1244	02540	-0 01 00533	JMP*	COME+1	RESTORE RESULT	1244
1245			*		RETURN	1245
1246			*			1246
1247			*			1247
1248	02541	0 00 00000	ERPC	PZE		1248
1249	02542	001001		INH		1249
1250	02543	0 10 02552	JST	LFCK		1250
1251	02544	-0 02 02541	LDA*	ERFC		1251
1252	02545	0 12 02541	IRS	ERFC		1252
1253	02546	0 04 02550	STA	ERFP		1253
1254	02547	0 10 02574	JST	OPCC		1254
1255	02550	0 000000	ERPP	DAC	**	1255
1256	02551	-0 01 02541	JMP*	ERFC	MESSAGE POINTER	1256
1257			*		RETURN	1257
1258			*			1258
1259			*		LINE FEED AND CARRIAGE RETURN	1259
1260	02552	0 000000	LFCK	DAC	**	1260
1261	02553	0 10 02556	JST	OPCW	OUTPUT LFCK	1261
1262	02554	106612	UCI	106612		1262
1263	02555	-0 01 02552	JMP*	LFCK	RETURN	1263
1264			*			1264
1265			*		OUTPUT TWO CHARACTERS	1265
1266			*			1266
1267	02556	0 000000	OPCW	DAC	**	1267

1268	02557	-0 02 02556	LDA*	OPCW	REACH BACK FOR DATA	1268	
1269	02560	0416 70	ALR	8		1269	
1270	02561	0 12 02556	IRS	OPCW	UPDATE RETURN	1270	
1271	02562	34 0104	SKS	*104	TEST BUSY	1271	
1272	02563	0 01 02562	JMP	*-1		1272	
1273	02564	14 0104	CCP	*104	SET IN OUTPUT MODE	1273	
1274	02565	74 0004	GTA	*4	OUTPUT IT	1274	
1275	02566	0 01 02565	JMP	*-1		1275	
1276	02567	0416 70	ALR	8		1276	
1277	02570	74 0004	GTA	*4		1277	
1278	02571	0 01 02570	JMP	*-1		1278	
1279	02572	140040	CRA			1279	
1280	02573	-0 01 02556	JMP*	OPCW	RETURN	1280	
1281			*			1281	
1282			*		OUTPUT CONTROL	1282	
1283			*			1283	
1284	02574	0 000000	OPCC	DAC	**	1284	
1285	02575	-0 02 02574	LDA*	OPCC	STARTING ADDRESS	1285	
1286	02576	0 04 02610	STA	PNTX	POINTER	1286	
1287	02577	0 12 02574	IRS	OPCC	UPDATE RETURN	1287	
1288	02600	-0 02 02610	OPNW	LDA*	PNTX	FETCH DATA FOR OUTPUT	1288
1289	02601	101040	SNZ		TEST FOR END OF DATA STRING	1289	
1290	02602	-0 01 02574	JMP*	OPCC	RETURN	1290	
1291	02603	0 04 02605	STA	**2	SETUP DATA FOR OUTPUT	1291	
1292	02604	0 10 02556	JST	OPCW	OUTPUT TWO CHARACTERS	1292	
1293	02605	0 000000	DAC	**		1293	
1294	02606	0 12 02610	IRS	PNTX	UPDATE POINTER	1294	
1295	02607	0 01 02600	JMP	OPNW		1295	
1296	02610	0 000000	PNTX	DAC	**	1296	
1297			*			1297	
1298			*		INPUT ONE CHARACTER	1298	
1299			*			1299	
1300	02611	0 000000	IPCC	DAC	**	1300	
1301	02612	34 0104	SKS	*104	TEST BUSY	1301	
1302	02613	0 01 02612	JMP	*-1		1302	
1303	02614	14 0004	CCP	*4	SET DEVICE IN THE INPUT MODE	1303	
1304	02615	34 1004	INA	*1004	INPUT ONE CHARACTER	1304	

1305	02616	0 01 02615	JMP	*-1		1305
1306	02617	0 03 00643	ANA	=*177	FORCE LEVEL 6 TO ALLOW	1306
1307	02620	0 05 00642	ERA	=*200	FUR KEYBOARDS WITH PARITY	1307
1308	02621	-0 04 02611	STA*	IPCC	STORE BACK	1308
1309	02622	0 12 02611	IRS	IPCC	UPDATE RETURN	1309
1310	02623	-0 01 02611	JMP*	IPCC	RETURN	1310
1311						1311
1312			*	TIME OF DAY TEST		1312
1313			*			1313
1314	02624	0 000000	TLAY	LAC	**	1314
1315	02625	14 0220	CCP	*220	TURN OFF ANYTHING THAT IS ON	1315
1316	02626	140040	CRA			1316
1317	02627	74 0020	SMK	*20		1317
1318	02630	0 04 00560	STA	HRS	SET TIME TO ZLRO	1318
1319	02631	0 04 00564	STA	MIN		1319
1320	02632	0 02 02041	LDA	RETA	DAC TDB	1320
1321	02633	0 10 02056	JST	SIL	SET LOCATIONS 63 THRU 77	1321
1322	02634	000401	END			1322
1323	02635	101000	NOP			1323
1324	02636	101000	NOP		ALLOW ANY HANGING PI RUPT	1324
1325	02637	001001	INH	SKP	TO COME THRU	1325
1326	02640	100000	SKP			1326
1327	02641	0 000000	TLB	DAC	**	1327
1328			*		PI RUPT COMES HERE	1328
1329	02642	0 02 02026	LDA	INIC	POINT DEDICATED LOCATIONS	1329
1330	02643	0 10 02056	JST	SIL	TO THE NORMAL RUPT HANDLER	1330
1331	02644	0 02 02042	LDA	RETB	POINT RUPT RETURN	1331
1332	02645	0 04 02027	STA	RETL	TO TDC	1332
1333			*			1333
1334	02646	0 10 02574	TLD	JST	GPCC	1334
1335	02647	0 003546	LAC	HRMS	ASK FOR HOURS	1335
1336	02650	0 10 02140	JST	PACK	INPUT PACKED WORD OR SKIP 3	1336
1337	02651	0 02 00566	LDA	NEWL	FETCH PACKED	1337
1338	02652	0 10 02257	JST	DCC	CONVERT TO BINARY	1338
1339	02653	0 04 00560	STA	HRS	STORE IT	1339
1340	02654	0 02 00560	LDA	HRS		1340
1341	02655	100400	SPL		CHECK FOR LIMITS OF 0 AND 23	1341

1342	02656	0 01 02646	JMP	TLD	TDC SMALL	1342	
1343	02657	0 11 00641	CAS	=23		1343	
1344	02660	0 01 02646	JMP	TLD	TDC BIG	1344	
1345	02661	101000	NOP			1345	
1346			*			1346	
1347	02662	0 10 02574	JST	OPCC	ASK FOR MINUTES	1347	
1348	02663	0 003556	LAC	HRMS		1348	
1349	02664	0 10 02140	JST	PACK	INPUT PACKED WORD OR SKIP 3	1349	
1350	02665	0 02 00566	LDA	NEWL	FETCH PACKED	1350	
1351	02666	0 10 02257	JST	DCC	CONVERT TO BINARY	1351	
1352	02667	0 04 00564	STA	MIN		1352	
1353	02670	0 02 00564	LDA	MIN	CHECK FOR MIN LIMITS OF 0 TO 59	1353	
1354	02671	100400	SPL			1354	
1355	02672	0 01 02646	JMP	TLD	TDC SMALL	1355	
1356	02673	0 11 00640	CAS	=59		1356	
1357	02674	0 01 02646	JMP	TLD	TDC BIG	1357	
1358	02675	101000	NOP			1358	
1359			*			1359	
1360	02676	0 10 02552	JST	LFGR	ACKNOWLEDGE GOOD VALUES	1360	
1361	02677	0 02 00544	LDA	DCPS		1361	
1362	02700	0 11 00637	CAS	=546	RESULT OF (60 * DCPS) MUST BE	1362	
1363	02701	0 01 02704	JMP	**3	LESS THAN 32767	1363	
1364	02702	101000	NOP		IF NOT THEN SCALE FREQUENCY UNTIL IT IS	1364	
1365	02703	0 01 02707	JMP	TDL	GOOD	1365	
1366			*			1366	
1367	02704	0 10 02574	JST	OPCC	TYPE	1367	
1368	02705	0 003523	LAC	MESF	*FREQ TOO HIGH*	1368	
1369	02706	0 01 01123	JMP	BYCM	AND GO BACK FOR NEW FREQ PARAM	1369	
1370			*			1370	
1371	02707	0 10 02317	TLE	JST	MPY	FREQ TIMES 60 SECONDS PER MINUTE	1371
1372	02710	0 000636	DAC	=60		1372	
1373	02711	000201	IAB		MAKE RESULT SINGLE PRECISION INTEGER	1373	
1374	02712	140407	ICA		NEG	1374	
1375	02713	0 04 00563	STA	MCNT	AND STORE FOR USE IN LOCATION *01	1375	
1376			*			1376	
1377	02714	0 02 00671	LDA	=1	SET CLOCK MASK	1377	
1378	02715	74 0020	SMK	*20		1378	

1379	02716	0 02 00503	LDA	MCNT	SET CLOCK	1379	
1380	02717	0 04 00061	STA	*61		1380	
1381	02720	14 0020	CCP	*20	CLEAR RUPT AND START CLOCK	1381	
1382	02721	000401	ENB		ASK FOR RUPT AT END	1382	
1383						1383	
1384	02722	100002	* TDF	SR4		1384	
1385	02723	-0 01 02624	JMP*	TDAY	RETURN IF SWITCH 4 IS SET	1385	
1386	02724	0 02 00061	LDA	*61	SHOW THE CLOCK VALUE	1386	
1387	02725	100040	SZE		ZERO IS AN ERROR	1387	
1388	02726	0 01 02722	JMP	TDF	GOOD - WAIT SOME MORE	1388	
1389						1389	
1390	02727	14 0220	CCP	*220	STOP CLOCK	1390	
1391	02730	000000	HLT			1391	
1392	02731	0 01 02730	JMP	*-1	VERY FATAL ERROR - NO RUPT CN GOING TO 0	1392	
1393						1393	
1394	02732	0 02 00061	* TDC	LDA	*61	RUPTS COME HERE VIA INT1 AND RETC	1394
1395	02733	101040	SNZ			1395	
1396	02734	0 01 02737	JMP	TDC		1396	
1397						1397	
1398	02735	000000	HLT			1398	
1399	02736	0 01 02735	* JMP	*-1	VERY FATAL ERROR - CLOCK HAS NOT GONE TO 0	1399	
1400						1400	
1401	02737	0 02 00563	TDC	LDA	MCNT	QUICK LIKE RESET THE CLOCK	1401
1402	02740	0 04 00061	STA	*61		1402	
1403	02741	14 0020	CCP	*20	AND RESTART IT	1403	
1404	02742	0 02 00564	LDA	MIN	GET THE MIN COUNT	1404	
1405	02743	141206	AUA		AND ADD TO IT	1405	
1406	02744	0 11 00636	CAS	=60		1406	
1407	02745	000000	HLT			1407	
1408	02746	100000	SKP			1408	
1409	02747	0 01 02752	JMP	**3	ON OVERFLOW RESET IT AND	1409	
1410	02750	0 12 00560	IRS	HR5	ADD TO HOURS	1410	
1411	02751	140040	CRA			1411	
1412	02752	0 04 00564	STA	MIN		1412	
1413	02753	0 10 04123	JST	V\$CD	CONVERT TO ASCII DECIMAL	1413	
1414	02754	-0 003571	LAC*	HRMN+4		1414	
1415	02755	0 02 03571	LDA	HRMN+4		1415	

1416	02756	141140	ICL			1416	
1417	02757	0 11 00635	CAS	=*240		1417	
1418	02760	0 01 02766	JMP	TDF		1418	
1419	02761	100000	SKP		CHANGE BLANK TO LEADING ZERO	1419	
1420	02762	0 01 02766	JMP	TDF		1420	
1421						1421	
1422	02763	0 02 03571	LDA	HRMN+4		1422	
1423	02764	0 05 00634	LRA	=*10000	INVERT BIT FOUR	1423	
1424	02765	0 04 03571	STA	HRMN+4		1424	
1425						1425	
1426	02766	0 02 00633	* TLH	LDA	=A :	PUT COLON BETWEEN	1426
1427	02767	0 04 03570	STA	HRMN+3	HOURS AND MINS	1427	
1428	02770	0 02 00560	LDA	HR5		1428	
1429	02771	0 11 00632	CAS	=24	IF HOURS OVERFLOWED	1429	
1430	02772	000000	HLT		THEN CLEAR TO ZERO	1430	
1431	02773	140040	CRA			1431	
1432	02774	0 04 00560	STA	HR5		1432	
1433	02775	0 10 04123	JST	V\$CD	CONVERT TO DECIMAL	1433	
1434	02776	0 003570	LAC	HRMN+3		1434	
1435	02777	0 02 03567	LDA	HRMN+2		1435	
1436	03000	141050	CAL			1436	
1437	03001	0 11 00631	CAS	=*241	CHANGE LEADING BLANK	1437	
1438	03002	101000	NOP		TO LEADING ZERO	1438	
1439	03003	0 01 03006	JMP	**3		1439	
1440	03004	0 02 00670	LDA	=A 0		1440	
1441	03005	0 04 03567	STA	HRMN+2		1441	
1442						1442	
1443	03006	0 10 02552	* JST	LFCK		1443	
1444	03007	0 10 02574	JST	OPCC	TYPE THE TIME	1444	
1445	03010	0 003567	LAC	HRMN+2		1445	
1446	03011	101000	NOP		ROOM FOR PATCH	1446	
1447	03012	101000	NOP			1447	
1448	03013	0 01 02721	JMP	TDF-1	WAIT FOR RUPT	1448	
1449			EJCT			1449	

1450  
1451

\* CALIBRATE CPU CLOCK FLOWCHART  
EJCT

1450  
1451

1452	*						1452
1453	*						1453
1454	*						1454
1455		0 02 02043	CCPU	LDA	RETC	ALLOW ANY PENDING	1455
1456		0 10 02056		JST	SIL	RUPT TO FLUSH THRU TO	1456
1457		000401		ENB		CCA	1457
1458		101000		NOP			1458
1459		101000		NOP			1459
1460		03021		INH			1460
1461		100000		SKP		IF NO RUPT SKIP THE DAC	1461
1462		0 000000	CCA	DAC	**	PI RUPT COMES HERE	1462
1463	*						1463
1464		0 02 02044		LDA	RETD	SET FOR START BUTTON RUPT	1464
1465		0 04 00063		STA	*63	TO CCB	1465
1466	*						1466
1467		0 02 00630		LDA	=*5007	FIRST NOP GOES HERE	1467
1468		0 04 00574		STA	TEMP		1468
1469		0 35 00627		LDX	==492	500-(7*1) NOP'S	1469
1470		0 02 00675		LDA	=*101000	NOP	1470
1471		-0 04 00574		STA*	TEMP		1471
1472		0 12 00574		IRS	TEMP	FILL NOP'S INTO SECTOR 5 FOR	1472
1473		0 12 00000		IRS	0	492 LOCATIONS TO GIVE TOTAL	1473
1474		0 01 03032		JMP	*-3	OF 500 LOCATIONS USED IN LOCP	1474
1475	*						1475
1476		0 10 02574	CCU	JST	OPCO	ASK FOR EXPECTED NANUSEC	1476
1477		0 003747		DAC	MESH		1477
1478		0 10 02140		JST	PACK	INPUT UP TO 4 DEC DIGITS	1478
1479		0 02 00566		LDA	NEWL	OR SKIP NEXT 3 LOCATIONS	1479
1480		0 10 02257		JST	DCC		1480
1481		0 04 00550		STA	EXINS		1481
1482		0 02 00550		LDA	EXINS	NOW TEST THE EXPECTED	1482
1483		0 11 00705		CAS	=1000	TO LIMITS OF 400 AND 1000	1483
1484		0 01 03036		JMP	CCU	TOO BIG	1484
1485		101000		NOP			1485
1486		0 11 00626		CAS	=400	OPERATOR THINKS TEST STARTED	1486
1487		101000		NOP		WITH HIS CAR RET OR PERIOD	1487
1488		100000		SKP			1488

1489	03053	0 01 03036	JMP	CCU	TOO SMALL	1489
1490			*			1490
1491	03054	140040	CRA			1491
1492	03055	000201	IAB			1492
1493	03056	140040	CRA			1493
1494	03057	0 01 05000	JMP	SECB	GO TO WAIT FOR RUPT	1494
1495			*			1495
1496	03060	0 000000	CCB	DAC	**	1496
1497	03061	0401 74	LRS	4	HERE AFTER ONE MIN	1497
1498	03062	100040	SZE		NOW HAVE DOUBLE PREC COUNT	1498
1499	03063	000000	HLI		IN RANGE 60,000 TO 300,000	1499
1500			*		*** STILL OUT OF RANGE	1500
1501	03064	000201	IAB		NOW IN RANGE 3700 TO 19,000	1501
1502	03065	0 04 00571	STA	RECT	REAL COUNT	1502
1503			*			1503
1504	03066	0 02 00553	LDA	FCR+1	DIV COUNT INIT	1504
1505	03067	000201	IAB		7,500,000 FOR NANoseconds	1505
1506	03070	0 02 00552	LDA	FCR		1506
1507	03071	0 10 02426	JST	DIV		1507
1508	03072	0 000571	LAC	RECT	EXPECT RESULT TO BE	1508
1509	03073	000000	HLI		IN RANGE 400 TO 1600 APX	1509
1510			*			1510
1511	03074	0411 77	LLS	1	NOW ROUND UP	1511
1512	03075	100001	SRC		TEST OF OVERFLOW	1512
1513	03076	000000	HLI		*** OUT OF RANGE	1513
1514	03077	141206	AQA		ADD TRIAL	1514
1515	03100	0401 77	LRS	1	AND MOVE BACK	1515
1516			*			1516
1517	03101	0 04 00572	STA	RENS	NOW A HAS REAL NANUSEC	1517
1518	03102	0 10 04123	JST	V\$CD	GET IT READY TO TYPE	1518
1519	03103	0 003764	LAC	MESJ+6	AS INTEGER	1519
1520			*			1520
1521	03104	0 02 00572	LDA	RENS	NOW TAKE DIFFERENCE	1521
1522	03105	0 07 00550	SUB	EXRS		1522
1523	03106	100400	SPL		MAKE IT POSITIVE	1523
1524	03107	140407	TCA			1524
1525	03110	0 10 02317	JST	MPY	AND MULTIPLY IT BY 1000	1525

1526	03111	0 00025	DAC	=1000	FOR TENTHS OF PER-CENT	1526
1527			*			1527
1528	03112	0 10 02426	JST	DIV	DIV BY EXPECTED VALUE	1528
1529	03113	0 000550	DAC	LXNS		1529
1530	03114	000000	HLI			1530
1531			*			1531
1532	03115	0411 77	LLS	1	ROUND UP	1532
1533	03116	141206	AQA			1533
1534	03117	0401 77	LRS	1		1534
1535			*			1535
1536	03120	0 04 00574	STA	TEMP	TENTHS OF PER-CENT IN A REG	1536
1537	03121	0 10 04123	JST	V\$CD	PUT IT INTO MESSAGE	1537
1538	03122	-0 003771	DAC*	MESJ+3		1538
1539	03123	0 02 03771	LDA	MESJ+3		1539
1540	03124	141240	ICR		MOVE RIGHT MOST DIGIT	1540
1541	03125	0 05 00635	ERA	=*240	TO RIGHT ONE PLACE	1541
1542	03126	0 04 03772	STA	MESJ+4		1542
1543	03127	0 02 03771	LDA	MESJ+3		1543
1544	03130	141140	ICL		IF SECOND DIGIT (UNITS) IS	1544
1545	03131	0 11 00635	CAS	=*240	BLANK THEN FORCE IT TO	1545
1546	03132	100000	SKP		A ZERO	1546
1547	03133	0 06 00706	ADD	=*20		1547
1548	03134	141240	ICR		PUT IT BACK TO LEFT	1548
1549	03135	0 05 00667	ERA	=*256	AND STICK IN A DEC POINT	1549
1550	03136	0 04 03771	STA	MESJ+3		1550
1551			*			1551
1552	03137	0 10 02574	JST	OPCC	TYPE THE RESULTING TWO	1552
1553	03140	0 003756	LAC	MESI	FIGURES	1553
1554	03141	0 01 01123	JMP	BYCM	AND GO TO RESTART POINT	1554
1555			EJCT			1555

1556  
1557

\* MEMORY MODULE TIMING FLOWCHART  
EJCT

1556  
1557

1558  
1559  
1560

\*  
\* CHECK CYCLE TIME FOR EACH 4K SECTION OF MEMORY (CP TO 32K)  
\*  
1561 03142 0 000000 MTIM LAC \*\*  
1562 03143 001001 INH  
1563 03144 000013 EXA  
1564 03145 14 0220 UCP \*220  
1565 03146 0 02 02045 LDA RETE  
1566 03147 0 10 02056 JST SIL  
1567 03150 0 02 00671 LDA =1  
1568 03151 74 0020 SMK \*20  
1569 03152 000401 ENB  
1570 03153 101000 NOP  
1571 03154 101000 NOP  
1572 03155 001001 INH  
1573 03156 100000 SKP

1558  
1559  
1560  
1561  
1562  
1563  
1564  
1565  
1566  
1567  
1568  
1569  
1570  
1571  
1572  
1573

1574  
1575 03157 0 000000  
1576 03160 0 02 02046  
1577 03161 0 10 02056  
1578 03162 140040  
1579 03163 0 04 00542  
1580 03164 0 02 00624  
1581 03165 0 04 00061  
1582 03166 14 0020  
1583 03167 0 02 00061  
1584 03170 0 11 00624  
1585 03171 100000  
1586 03172 0 01 03167

\*  
\* M1IA LAC \*\*  
LDA RETF  
JST SIL  
CRA  
STA CTR  
LDA =-2  
STA \*61  
CCP \*20  
LDA \*61  
CAS =-2  
SKP  
JMP \*-3  
\*  
\* ENB  
IR5 CTR  
JMP \*-1  
HLT  
\*  
\* M1IB LAC \*\*  
CCP \*220

1574  
1575  
1576  
1577  
1578  
1579  
1580  
1581  
1582  
1583  
1584  
1585  
1586  
1587

1588 03173 000401  
1589 03174 0 12 00542  
1590 03175 0 01 03174  
1591 03176 000000  
1592  
1593 03177 0 000000  
1594 03200 14 0220

\*  
\* ENB  
IR5 CTR  
JMP \*-1  
HLT  
\*  
\* M1IB LAC \*\*  
CCP \*220

1588  
1589  
1590  
1591  
1592  
1593  
1594

1595	03201	0 02 00542	LDA	CTR	FETCH VALUE = APX VALUE AT 60 HERTZ	1595
1596	03202	100400	SPL		716=*12000, 516=*10000, 316=*5000	1596
1597	03203	000000	HLT		IT COUNTED TOO FAR	1597
1598	03204	0+05 75	ARS	J	TAKE ONE EIGHTH	1598
1599	03205	141216	ACA		ROUND UP	1599
1600	03206	0 13 00542	IMA	CTR		1600
1601	03207	0 06 00542	ADD	CTR	NOW A REG IS CTR+12.5%	1601
1602	03210	141206	AOA		MAKE A LITTLE OVER	1602
1603	03211	0 04 00556	STA	HLIM	SAVE AS LIMIT	1603
1604	03212	0 07 00542	SUB	CTR		1604
1605	03213	0 07 00542	SUB	CTR		1605
1606	03214	0 07 00623	SUB	=2	NOW CTR=12.5%	1606
1607	03215	0 04 00557	STA	LLIM	SAVE AS LOW LIMIT	1607
1608						1608
1609	03216	0 02 02047	LDA	RETC	SET FOR RUPT TO MTIC FROM MCLLL	1609
1610	03217	0 10 02056	JST	SIL	UNDER TEST	1610
1611	03220	140040	CRA			1611
1612	03221	0 04 00574	STA	TEFP	START WITH ADDRESS OF ZERO	1612
1613						1613
1614	03222	0 02 00574	MIIC LDA	TEMP		1614
1615	03223	0 06 00634	ADD	=*10000	BUMP TO FIRST LOCATION IN NEXT 4K MODULE	1615
1616	03224	100001	SR2			1616
1617	03225	0 01 03321	JMP	MTIP	WENT OVER 32K - THEREFORE ALL DONE	1617
1618	03226	0 04 00574	STA	TEMP		1618
1619	03227	0 35 00664	LDA	=0	PUT KNOW VALUE IN X REG	1619
1620	03230	0 02 00671	LDA	=1	GET ANOTHER VALUE	1620
1621	03231	-0 13 00574	IMA*	TEMP	STORE IT	1621
1622	03232	0 15 00575	STX	TEMP+1	SAVE THE X REG	1622
1623	03233	-0 13 00574	IMA*	TEMP	TRY TO GET IT BACK	1623
1624	03234	0 11 00671	CAS	=1		1624
1625	03235	0 01 03316	JMP	MTIR	MUST HAVE GONE BY END OF MEMORY	1625
1626	03236	100000	SKP		GOT IT BACK	1626
1627	03237	0 01 03316	JMP	MTIR		1627
1628						1628
1629	03240	0 02 00575	LDA	TEMP+1	LOOK FOR WRAPAROUND	1629
1630	03241	100040	SZ2			1630
1631	03242	0 01 03316	JMP	MTIR	HAD WRAPAROUND	1631

1632						1632
1633	03243	0 35 00574	MIIC LDA	TEMP	IF MEMORY THERE PUT ADDRESS IN INDEX	1633
1634	03244	0 02 00603	LDA	IRS	MUVE UP LOOP OF:	1634
1635	03245	1 04 00000	STA	0+1		1635
1636	03246	0 02 00604	LDA	JMP	LOC 0 IRS 3 BUMP COUNT EVERY FOUR CYCLES	1636
1637	03247	1 04 00001	STA	1+1	1 JMP *-1	1637
1638	03250	140040	CRA		2 HLT OVERFLOW ERROR	1638
1639	03251	1 04 00002	STA	2+1	3 BSZ 1 COUNT APPEARS HERE	1639
1640	03252	1 04 00003	STA	3+1		1640
1641						1641
1642	03253	0 02 00624	LDA	=-2	NOW GET BACK IN SYNC	1642
1643	03254	0 04 00061	STA	*61	WITH CLOCK TOCK	1643
1644	03255	14 0020	CCP	*20		1644
1645	03256	0 02 00061	LDA	*61		1645
1646	03257	0 11 00624	CAS	=-2	HAS IT TOCKED	1646
1647	03260	100000	SKP			1647
1648	03261	0 01 03256	JMP	*-3	NOT YET	1648
1649						1649
1650	03262	000401	ENB		YES - GO TO RUN LOOP	1650
1651	03263	1 01 00000	JMP	0+1	IN THE MODULE UNDER TEST	1651
1652						1652
1653	03264	0 000000	MIIC LAC	**	INTERRUPT BRINGS CONTROL BACK HERE	1653
1654	03265	14 0220	CCP	*220	CLEAR RUPT AND TURN CLOCK OFF	1654
1655	03266	1 02 00003	LDA	3+1	FETCH THE COUNT	1655
1656	03267	0 11 00556	CAS	HLIM	COMPARE TO HIGH LIMIT	1656
1657	03270	0 01 03273	JMP	**3	TOO LARGE	1657
1658	03271	101000	RUP			1658
1659	03272	0 01 03302	JMP	MTID	GOOD	1659
1660						1660
1661	03273	0 10 02541	JST	ERPO	MEMORY APPEARS TO BE RUNNING TOO FAST	1661
1662	03274	0 003615	LAC	MERO		1662
1663	03275	101000	RUP			1663
1664	03276	0 35 00574	LDA	TEFP	(X) POINTS TO MEMORY UNDER TEST	1664
1665	03277	100010	SR2			1665
1666	03300	0 01 03243	JMP	MTIE	LOOP ON ERROR	1666
1667	03301	000000	HLT			1667
1668						1668

\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 51

1669	03302	1 02 00003	MTID LDA	3*1	FETCH THE COUNT	1669
1670	03303	0 11 00557	CAS	LLIM	COMPARE TO LOWER LIMIT	1670
1671	03304	101000	NOP			1671
1672	03305	0 01 03222	JMP	MTIO	GOOD - GO TO NEXT MODULE	1672
1673			*			1673
1674	03306	0 10 02541	JST	ERPO	MEMORY APPEARS TO BE RUNNING TOO SLOW	1674
1675	03307	0 003620	DAC	MER9		1675
1676	03310	101000	NOP			1676
1677	03311	0 35 00574	LDX	TEMP	(X) POINTS TO MEMORY UNDER TEST	1677
1678	03312	100010	SR2			1678
1679	03313	0 01 03243	JMP	MTIE	LOOP ON ERROR	1679
1680	03314	000000	HLT			1680
1681	03315	0 01 03222	JMP	MTIO	GO ON TO NEXT MODULE	1681
1682			*			1682
1683	03316	0 02 00574	MIIR LDA	TEMP	HERE IF MEMORY NOT PRESENT	1683
1684	03317	0 07 00634	SUB	=*10000		1684
1685	03320	0 04 00574	STA	TEMP	BRING TEMP BACK TO LAST GOOD VALUE	1685
1686	03321	0 02 00574	MTIP LDA	TEMP	HERE ON PASSING 32K	1686
1687	03322	0405 06	ARS	10		1687
1688	03323	0 06 00701	ADD	=4		1688
1689	03324	0 10 04123	JST	V\$CD	CONVERT TO DECIMAL	1689
1690	03325	-0 000577	LAC*	TEMP+3		1690
1691	03326	0 02 00577	LDA	TEMP+3		1691
1692	03327	0 02 00577	LDA	TEMP+3	GET TWO CHARACTERS	1692
1693	03330	0 04 04001	STA	MESK+4	STICK INTO MESSAGE	1693
1694	03331	0 10 02574	JST	OPCG	TYPE	1694
1695	03332	0 003775	DAC	MESK	*MEM SZ XXX*	1695
1696	03333	101000	NOP		FOR PATCH ROOM	1696
1697	03334	-0 01 03142	JMP*	MTIM	ALL DONE	1697
1698			*			1698
1699			*	MESSAGE AREA		1699
1700			*			1700
1701	03335	106612	MES9 CCT	106612		1701
1702	03336	106612	CCT	106612		1702
1703	03337	140702	BCI	6*AB16-12T3		1703
	03340	130666				
	03341	126661				

\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 52

	03342	131324				
	03343	131640				
	03344	120240				
1704	03345	000000	MES1	BSZ 1		1704
1705	03346	120240	BCI	1*		1705
1706	03347	130661	BCI	5*11 JAN 73		1706
	03350	120312				
	03351	140716				
	03352	120267				
	03353	131640				
1707	03354	151305	BCI	3*REV F		1707
	03355	153240				
	03356	143240				
1708	03357	000000	MES2	BSZ 1		1708
1709			*			1709
1710	03360	106612	MES2 CCT	106612*		1710
1711	03361	120240	BCI	3* FREQ		1711
	03362	143322				
	03363	142721				
1712	03364	120277	CCT	120277*135240*0		1712
	03365	135240				
	03366	000000				
1713			*			1713
1714	03367	106612	MES3 CCT	106612		1714
1715	03370	151701	BCI	3*SAMPLE		1715
	03371	146720				
	03372	146305				
1716	03373	120277	CCT	120277*135240*0		1716
	03374	135240				
	03375	000000				
1717			*			1717
1718	03376	106612	MES4 CCT	106612		1718
1719	03377	142317	BCI	2*DONE		1719
	03400	147305				
1720	03401	106612	CCT	106612*0		1720
	03402	000000				
1721			*			1721



\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 53

1722	03403	106612	MES5	CCT	106612		1722
1723	03404	146705		BCI	2,MEAS		1723
	03405	140723					
1724	03406	120252	OPME	BCI	7,*****	CALC	1724
	03407	125252					
	03410	125252					
	03411	125240					
	03412	120303					
	03413	140714					
	03414	141040					
1725	03415	120252	OPMA	BCI	11,*****	MILLISEC	1725
	03416	125252					
	03417	125252					
	03420	125252					
	03421	120240					
	03422	146711					
	03423	146314					
	03424	144723					
	03425	142703					
	03426	120240					
	03427	120240					
1726	03430	125252	PCMA	BCI	5,*****%		1726
	03431	125252					
	03432	125252					
	03433	125252					
	03434	122640					
1727	03435	000000		BSZ	1		1727
1728	03436	120240	MES6	BCI	2, OK		1728
	03437	147713					
1729	03440	000000		BSZ	1		1729
1730	03441	106612	MES7	CCT	106612		1730
1731	03442	151305		BCI	11,REJECT (OVER 7% LIMIT)		1731
	03443	145305					
	03444	141724					
	03445	120250					
	03446	147726					
	03447	142722					

\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 54

	03450	120267					
	03451	122640					
	03452	146311					
	03453	146711					
	03454	152251					
1732	03455	106612		CCT	106612,106612		1732
	03456	106612					
1733	03457	000000		BSZ	1		1733
1734	03460	106612	MES8	CCT	106612		1734
1735	03461	147725		BCI	6,CCT OF RANGE		1735
	03462	152240					
	03463	147706					
	03464	120322					
	03465	140716					
	03466	143705					
1736	03467	000000		BSZ	1		1736
1737	03470	120240	MESA	BCI	12, REJECT (OUT OF RANGE)		1737
	03471	151305					
	03472	145305					
	03473	141724					
	03474	120240					
	03475	124317					
	03476	152724					
	03477	120317					
	03500	143240					
	03501	151301					
	03502	147307					
	03503	142651					
1738	03504	000000		BSZ	1		1738
1739	03505	120240	MESB	BCI	13, REJECT (DIST TOO WIDE)		1739
	03506	151305					
	03507	145305					
	03510	141724					
	03511	120240					
	03512	124304					
	03513	144723					
	03514	152240					

03515	152317				
03516	147640				
03517	153711				
03520	142305				
03521	144640				
1740 03522	000000	BSZ	1		
1741 03523	106612	MESF CCT	106612		1740
1742 03524	143322	ECI	17,FREQ TOO HIGH (SCALE TO UNDER 547)		1741
03525	142721				1742
03526	120324				
03527	147717				
03530	120310				
03531	144707				
03532	144240				
03533	124323				
03534	141701				
03535	146305				
03536	120324				
03537	147640				
03540	152716				
03541	142305				
03542	151240				
03543	132664				
03544	133651				
1743 03545	000000	BSZ	1		
1744 03546	106612	HRMS CCT	106612,106612		1743
03547	106612				1744
1745 03550	120240	BCI	3, HOUR		1745
03551	144317				
03552	152722				
1746 03553	120277	CCT	12,277,135240,0		1746
03554	135240				
03555	000000				
1747 03556	106612	MINMS CCT	106612		1747
1748 03557	146711	BCI	3,MINUTE		1748
03560	147325				
03561	152305				

1749 03562	120277	CCT	120277,135240,0		1749
03563	135240				
03564	000000				
1750 03565	120240	HRMN BCI	5, ***:**		1750
03566	120240				
03567	125252				
03570	125272				
03571	125252				
1751 03572	000000	BSZ	1		1751
1752		*			1752
1753 03573	142722	MER1 BCI	2,ER1		1753
03574	130640				
1754 03575	000000	BSZ	1		1754
1755 03576	142722	MER3 BCI	2,ER3		1755
03577	131640				
1756 03600	000000	BSZ	1		1756
1757 03601	142722	MER4 BCI	2,ER4		1757
03602	132240				
1758 03603	000000	BSZ	1		1758
1759 03604	142722	MER5 BCI	2,ER5		1759
03605	132640				
1760 03606	000000	BSZ	1		1760
1761 03607	142722	MER6 BCI	2,ER6		1761
03610	133240				
1762 03611	000000	BSZ	1		1762
1763 03612	142722	MER7 BCI	2,ER7		1763
03613	133640				
1764 03614	000000	BSZ	1		1764
1765 03615	142722	MER8 BCI	2,ER8		1765
03616	134240				
1766 03617	000000	BSZ	1		1766
1767 03620	142722	MER9 BCI	2,ER9		1767
03621	134640				
1768 03622	000000	BSZ	1		1768
1769 03623	106612	SIME CCT	106612		1769
1770 03624	151724	BCI	7,STABILITY TEST		1770
03625	140702				

\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 57

03626	144714			
03627	144724			
03630	154640			
03631	152305			
03632	151724			
1771	03633	106612	CCT	
1772	03634	000000	BSZ	1
1773	03635	106612	CCT	106612
1774	03636	142311	BCI	24,DIST OF 1000 ONE RTC CYCLE SAMPLES FROM AVERAGE
	03637	151724		
	03640	120317		
	03641	143240		
	03642	130660		
	03643	130260		
	03644	120317		
	03645	147305		
	03646	120322		
	03647	152303		
	03650	120303		
	03651	154703		
	03652	146305		
	03653	120323		
	03654	140715		
	03655	150314		
	03656	142723		
	03657	120306		
	03660	151317		
	03661	146640		
	03662	140726		
	03663	142722		
	03664	140707		
	03665	142640		
1775	03666	106612	CCT	106612
1776	03667	147706	BCI	25,CF 4096 RTC CYCLES. THE AVERAGE (ARBITRARY UNITS)
	03670	120264		
	03671	150271		
	03672	133240		

\* NAME: AE16-12T3 DOC 70181010000 REV F

PAGE 58

03673	151324			
03674	141640			
03675	141731			
03676	141714			
03677	142723			
03700	127240			
03701	152310			
03702	142640			
03703	140726			
03704	142722			
03705	140707			
03706	142640			
03707	124301			
03710	151302			
03711	144724			
03712	151301			
03713	151331			
03714	120325			
03715	147311			
03716	152323			
03717	124640			
1777	03720	106612	CCT	106612
1778	03721	153701	BCI	8,9,AS FOUND TO BE
	03722	151640		
	03723	143317		
	03724	152716		
	03725	142240		
	03726	152317		
	03727	120302		
	03730	142640		
1779	03731	000000	BSZ	1
1780	03732	106612	CCT	106612
1781	03733	152311	BCI	9,TIME CPU (Y OR N)
	03734	146705		
	03735	120303		
	03736	150325		
	03737	120250		

03740	154640				
03741	147722				
03742	140316				
03743	144640				
1782	03744	137672	VFD	8, '277,8, '272	1782
1783	03745	120000	CCT	120000,0	1783
	03746	000000			
1784	03747	106612	MESH CCT	106612	1784
1785	03750	147317	BCI	3, KUM NS	1785
	03751	146640			
	03752	147323			
1786	03753	140277	CCT	120277,135240,0	1786
	03754	135240			
	03755	000000			
1787	03756	106612	MESI CCT	106612	1787
1788	03757	146705	BCI	7, PLAS***** NS	1788
	03760	140723			
	03761	125252			
	03762	125252			
	03763	125252			
	03764	125240			
	03765	147323			
1789	03766	120252	MESJ BCI	6, ***** %	1789
	03767	125252			
	03770	125252			
	03771	125252			
	03772	120240			
	03773	122640			
1790	03774	000000	CCT	0	1790
1791	03775	120315	MESK BCI	6, MEM IS **K	1791
	03776	142715			
	03777	120311			
	04000	151640			
	04001	125252			
	04002	145640			
1792	04003	000000	BSZ	1	1792
1793	04004	120240	MESX BCI	8, RESULT IS GOOD	1793

04005	151305				
04006	151725				
04007	146324				
04010	120311				
04011	151640				
04012	143717				
04013	147704				
1794	04014	106612	CCT	106612,0	1794
	04015	000000			
1795	04016	136255	ME01 BCI	2, <-10	1795
	04017	130660			
1796	04020	000000	BSZ	1	1796
1797	04021	120255	BCI	2, -10	1797
	04022	130660			
1798	04023	000000	BSZ	1	1798
1799	04024	120240	BCI	2, -9	1799
	04025	126671			
1800	04026	000000	BSZ	1	1800
1801	04027	120240	BCI	2, -8	1801
	04030	126670			
1802	04031	000000	BSZ	1	1802
1803	04032	120240	BCI	2, -7	1803
	04033	126667			
1804	04034	000000	BSZ	1	1804
1805	04035	120240	BCI	2, -6	1805
	04036	126666			
1806	04037	000000	BSZ	1	1806
1807	04040	120240	BCI	2, -5	1807
	04041	126665			
1808	04042	000000	BSZ	1	1808
1809	04043	120240	BCI	2, -4	1809
	04044	126664			
1810	04045	000000	BSZ	1	1810
1811	04046	120240	BCI	2, -3	1811
	04047	126663			
1812	04050	000000	BSZ	1	1812
1813	04051	120240	BCI	2, -2	1813

	04052	126662				
1814	04053	000000	BSZ	1		1814
1815	04054	120240	BCI	2,	-1	1815
	04055	126661				
1816	04056	000000	BSZ	1		1816
1817	04057	120240	BCI	2,	0	1817
	04060	120260				
1818	04061	000000	BSZ	1		1818
1819	04062	120240	BCI	2,	1	1819
	04063	120261				
1820	04064	000000	BSZ	1		1820
1821	04065	120240	BCI	2,	2	1821
	04066	120262				
1822	04067	000000	BSZ	1		1822
1823	04070	120240	BCI	2,	3	1823
	04071	120263				
1824	04072	000000	BSZ	1		1824
1825	04073	120240	BCI	2,	4	1825
	04074	120264				
1826	04075	000000	BSZ	1		1826
1827	04076	120240	BCI	2,	5	1827
	04077	120265				
1828	04100	000000	BSZ	1		1828
1829	04101	120240	BCI	2,	6	1829
	04102	120266				
1830	04103	000000	BSZ	1		1830
1831	04104	120240	BCI	2,	7	1831
	04105	120267				
1832	04106	000000	BSZ	1		1832
1833	04107	120240	BCI	2,	8	1833
	04110	120270				
1834	04111	000000	BSZ	1		1834
1835	04112	120240	BCI	2,	9	1835
	04113	120271				
1836	04114	000000	BSZ	1		1836
1837	04115	120240	BCI	2,	10	1837
	04116	130660				

1838	04117	000000	BSZ	1		1838
1839	04120	120276	BCI	2,	>10	1839
	04121	130660				
1840	04122	000000	BSZ	1		1840
1841			*			1841
1842			ORGA	ORG	*500	DROP TO BASE SECTOR
1843			*			1843
1844			*			1844
1845			*			1845
1846	00500	000000	AVG	BSZ	1	AVERAGE VALUE IN STABILITY TEST
1847	00501	000000	BUCK	BSZ	23	23 BUCKETS FOR STABILITY RESULTS
1848	00530	000000	CFLG	BSZ	1	CHARACTER FLAG
1849	00531	000000	CINX	BSZ	1	TEMP STORE FOR COUNT
1850	00532	000000	CCME	BSZ	3	TEMP STORE IN MULTIPLY
1851	00535	000000	CCMM	BSZ	3	TEMP STORE IN DIVIDE
1852	00540	000000	CNTB	BSZ	1	LOW
1853	00541	000000	CNTC	BSZ	1	AND HIGH COUNT
1854	00542	000000	CTR	BSZ	1	COUNTER IN MEMORY TIMING
1855	00543	000000	DCGN	BSZ	1	DELAY CONSTANT FOR IRS AND JMP LOOP
1856	00544	000000	DCPS	BSZ	1	CYCLES PER SEC
1857	00545	000000	DINC	BSZ	1	CYCLES IN ELAPSED TIME SAMPLE
1858	00546	000000	DLYM	BSZ	1	USE IN DELAY
1859	00547	000000	DLYN	BSZ	1	SOME NUMBER OF MILLISEC
1860	00550	001407	EANS	DEC	775	CLOCK CAL EXPECTED NANUSEC - 775 DEFAULT
1861	00552	000344	FCTR	DBP	7.5E6BB30	DOUBLE INTEGER 7,500,000
	00553	070340				
1862	00554	000000	HCLD	BSZ	2	TEMP STORE IN ACNT
1863	00556	000000	HLIM	BSZ	1	HIGH
1864	00557	000000	LLIM	BSZ	1	AND LOW LIMITS IN MEMORY TIMING
1865	00560	000000	HRS	BSZ	1	HOURS IN TIME-OF-DAY
1866	00561	000000	ICAL	BSZ	1	INTEGER CALC TIME
1867	00562	000000	IMEA	BSZ	1	INTEGER MEAS TIME
1868	00563	000000	MCNT	BSZ	1	NEG COUNT USED IN TIME-OF-DAY
1869	00564	000000	MIN	BSZ	1	MINUTES IN TIME-OF-DAY
1870	00565	000000	MUCL	BSZ	1	MAKE UP FOR CYCLES LOST IN STABILITY
1871	00566	000000	NEWL	BSZ	1	INPUT STORE
1872	00567	000000	PC	BSZ	1	PER CENT TIMES TEN

1873	00570	177760	PIMR	0CT	177760	MASK FOR 12 PI LINES	1873
1874	00571	000000	RECT	BSZ	1	CLOCK CAL REAL COUNT (A + B)/16	1874
1875	00572	000000	RENS	BSZ	1	CLOCK CAL REAL NANUSEC	1875
1876	00573	000000	SAVE	BSZ	1	TEMP STORE	1876
1877	00574	000000	TEMP	BSZ	5	TEMP STORE	1877
1878	00601	000000	TLY	BSZ	1	TALLY IN STABILITY TEST	1878
1879	00602	000000	TYPE	BSZ	1	TYPE 3,5,7 OR 6 (FOR 716L)	1879
1880			*				1880
1881	00603	0 12 00003	IRS	IRS	3	SECTOR BIT MUST BE SET IN BOTH INSTRUCTIONS	1881
1882	00604	0 01 00000	JMP	JMP	0	USED IN MEMORY TIMING LOOP	1882
1883			*				1883
1884	00605	000000	RCAL	BSZ	2	FORTRAN REAL VARIABLE STORAGE	1884
1885	00607	000000	RMEA	BSZ	2	AND CONSTANTS	1885
1886	00611	000000	TA	BSZ	2		1886
1887			*				1887
1888	00613	043777	K1	DEC	32767.		1888
	00614	177400					
1889	00615	044372	K2	DEC	125000.		1889
	00616	011000					
1890	00617	042575	K3	DEC	1000.		1890
	00620	000000					
1891	00621	035501	K4	DEC	0.0005		1891
	00622	104467					
1892			*				1892
1893			*				1893
1894			*				1894
1895	00623	000002		FIN			1895
	00624	177776					
	00625	001750					
	00626	000620					
	00627	177024					
	00630	005007					
	00631	000241					
	00632	000030					
	00633	120272					
	00634	010000					
	00635	000240					

00636	000074
00637	001042
00640	000073
00641	000027
00642	000200
00643	000177
00644	037777
00645	177761
00646	000012
00647	000260
00650	000271
00651	000215
00652	000062
00653	000010
00654	000247
00655	177673
00656	176030
00657	174002
00660	174007
00661	170000
00662	177751
00663	177766
00664	000000
00665	000144
00666	000106
00667	000256
00670	120260
00671	000001
00672	177777
00673	000316
00674	000331
00675	101000
00676	120265
00677	000005
00700	001700
00701	000004
00702	177373

00703 120263  
 00704 000003  
 00705 003100  
 00706 000020  
 00707 177545  
 00710 027174  
 00711 120267  
 00712 000007  
 00713 001440  
 00714 000026  
 00715 177307  
 00716 120240  
 00717 001130

1896			CRG	ORGA	BACK UP FOR V\$LIB	1896
1897			*			1897
1898			*			1898
1899			*			1899
1900	04123	0 000000	V\$OD	DAC **		1900
1901	04124	0 04 04256	STA	V\$C1	SIGNED OCTAL WORD	1901
1902	04125	0 04 04257	STA	V\$C2	WORKING STORAGE	1902
1903	04126	0 02 04264	LDA	=*-20		1903
1904	04127	0 04 04260	STA	V\$C3	SET FLAG =*-20	1904
1905	04130	-0 02 04123	LDA*	V\$GD	GET DCA OF THE DECIMAL FIELD	1905
1906	04131	0 04 04135	STA	**4		1906
1907	04132	0 12 04123	IRS	V\$OD	CALLING LOCATION PLUS TWO	1907
1908	04133	0 10 04273	JST	V\$S1	INITIALIZE SEVEN BYTE FIELD	1908
1909	04134	000007	DEC	7		1909
1910	04135	0 000000	DAC	**	DAC OF 7 BYTES	1910
1911	04136	0 02 04265	LDA	=*240		1911
1912	04137	0 10 04320	JST	V\$SB	PUT ONE LEADING SPACE	1912
1913	04140	000000	HLL			1913
1914	04141	0 02 04265	LDA	=*240		1914
1915	04142	0 10 04320	JST	V\$SB	PUT SECOND LEADING SPACE	1915
1916	04143	000000	HLL			1916
1917	04144	0 02 04247	LDA	V\$CX	FIELD POINTER	1917
1918	04145	0 04 04262	STA	V\$C5		1918

1919	04146	0 02 04266	LDA	=-4		1919
1920	04147	0 04 04261	STA	V\$C4	LEADING ZEROS SUPPRESS COUNT	1920
1921	04150	140040	CRA			1921
1922	04151	0 04 04255	STA	V\$CY	SET V\$UY=0	1922
1923	04152	0 02 04257	LDA	V\$C2	LOAD THE WORD	1923
1924	04153	100400	SPL			1924
1925	04154	0 01 04165	JMP	V\$CQ	IF NEGATIVE, CHANGE TO POSITIVE NUMBER	1925
1926			*			1926
1927	04155	140040	V\$CC	CRA	IF POSITIVE, PROCESS THE INTEGER	1927
1928	04156	0 04 04263	STA	V\$C6	ACCUMULATOR =0	1928
1929	04157	0 02 04257	LDA	V\$C2	LOAD THE OCTAL NUMBER	1929
1930	04160	-0 07 04262	V\$OP	SUB*	SUBTRACT CONVERSION FACTOR	1930
1931	04161	100400	SPL		IF POSITIVE, SKIP	1931
1932	04162	0 01 04171	JMP	V\$CK	IF NEG., TRANSFER ACCUM. TO BYTE-STRING	1932
1933	04163	0 12 04263	IRS	V\$C6	BUMP ACCUM. BY ONE	1933
1934	04164	0 01 04160	JMP	V\$CP	DO MORE CONVERSION	1934
1935			*			1935
1936	04165	0 05 04267	V\$CQ	ERA	CHANGE THE NEGATIVE INTEGER	1936
1937	04166	0 07 04267	SUB	=-1	TO A POSITIVE NUMBER	1937
1938	04167	0 04 04257	STA	V\$C2		1938
1939	04170	0 01 04155	JMP	V\$CC	GO TO PROCESS IT.	1939
1940			*			1940
1941	04171	-0 06 04262	V\$OR	ADD*	RESTORE LAST NUMBER	1941
1942	04172	0 04 04257	STA	V\$C2		1942
1943	04173	0 02 04263	LDA	V\$C6	GET ACCUMULATOR	1943
1944	04174	100040	SZE			1944
1945	04175	0 01 04243	JMP	V\$CW	IF NON-ZERO, GO AND SET FLAG=0	1945
1946	04176	0 02 04260	LDA	V\$C3	LOAD FLAG	1946
1947	04177	100040	SZE			1947
1948	04200	0 12 04255	IRS	V\$CY	NO. OF ZEROS ACTUALLY SUPPRESSED	1948
1949	04201	0 06 04270	V\$OT	ADD	FORM THE DECIMAL BYTE	1949
1950	04202	0 10 04320	JST	V\$SE	TRANSFER THE BYTE TO THE STRING	1950
1951	04203	000000	HLL			1951
1952	04204	0 12 04262	IRS	V\$C5	BUMP FIELD POINTER	1952
1953	04205	0 12 04261	IRS	V\$C4	BUMP ZERO SUPPRESS COUNTER	1953
1954	04206	0 01 04155	JMP	V\$CC		1954
1955	04207	140040	CRA			1955

1956	04210	0 04 04263	STA	V\$C6	CLEAR ACCUMULATOR	1956
1957	04211	0 02 04257	LDA	V\$C2	LOAD THE INTEGER	1957
1958	04212	-0 07 04262	V\$OU SUB*	V\$C5	SUBTRACT THE CONVERSION FACTOR	1958
1959	04213	100400	SPL			1959
1960	04214	0 01 04217	JMP	V\$CV	IF NEG., GO TO LAST DIGIT ROUTINE	1960
1961	04215	0 12 04263	IRS	V\$C6	BUMP ACCUM.	1961
1962	04216	0 01 04212	JMP	V\$CU		1962
1963						1963
1964	04217	0 02 04263	V\$OV LDA	V\$C6	LAST TIME ACCUM.	1964
1965	04220	0 06 04270	ADD	=*260	LAST DECIMAL BYTE	1965
1966	04221	0 10 04320	JST	V\$SB	TRANSFER LAST DIGIT TO BYTE STRING	1966
1967	04222	000000	HLT			1967
1968	04223	0 02 04256	LDA	V\$C1		1968
1969	04224	101400	SMI		TEST IF THE NO. WAS NEGATIVE	1969
1970	04225	-0 01 04123	JMP*	V\$CD	IF PLUS, THEN FINISHED.	1970
1971	04226	0 02 04135	LDA	V\$CD+10	MINUS SIGN ROUTINE	1971
1972	04227	0416 77	ALR	1	RIGHT-MOST BYTE	1972
1973	04230	0 07 04271	SUB	=5	SIXTH BYTE FROM RIGHT	1973
1974	04231	0 06 04255	ADD	V\$CY	BYTE FOR FLOATING MINUS SIGN	1974
1975	04232	0406 77	ARK	1	DCA OF WORD FOR MINUS SIGN	1975
1976	04233	0 04 04236	SJA	**3		1976
1977	04234	0 10 04273	JST	V\$SI		1977
1978	04235	000001	DEC	1		1978
1979	04236	0 000000	DAC	**		1979
1980	04237	0 02 04272	LDA	=*255	PUT MINUS SIGN	1980
1981	04240	0 10 04320	JST	V\$SB		1981
1982	04241	000000	HLT			1982
1983	04242	-0 01 04123	JMP*	V\$CD	RETURN	1983
1984						1984
1985	04243	140040	V\$UW CRA			1985
1986	04244	0 04 04260	STA	V\$C3	SET FLAG =0	1986
1987	04245	0 02 04263	LDA	V\$C6		1987
1988	04246	0 01 04201	JMP	V\$CT		1988
1989						1989
1990	04247	0 004250	V\$OX DAC	**1		1990
1991	04250	023420	DEC	10000	CONVERSION FACTORS	1991
1992	04251	001750	DEC	1000		1992

1993	04252	000144	LEC	100		1993
1994	04253	000012	DEC	10		1994
1995	04254	000001	DEC	1		1995
1996	04255	000000	V\$OY BSZ	1	NUMBER OF ZEROS ACTUALLY SUPPRESSED	1996
1997	04256	000000	V\$O1 BSZ	1	SIGNED OCTAL WORD	1997
1998	04257	000000	V\$O2 BSZ	1	WORKING STORAGE	1998
1999	04260	000000	V\$O3 BSZ	1	FLAG =-120 OR =0	1999
2000	04261	000000	V\$O4 BSZ	1	COUNTER FOR MAX. ZERO SUPPRESS	2000
2001	04262	000000	V\$O5 BSZ	1	FLD POINTER FOR CONVERSION FACTORS	2001
2002	04263	000000	V\$O6 BSZ	1	ACCUMULATOR	2002
2003			*			2003
2004	04264	177760	FIN			2004
	04265	000240				
	04266	177774				
	04267	177777				
	04270	000260				
	04271	000005				
	04272	000255				
2005			*			2005
2006	04273	0 000000	V\$SI DAC	**		2006
2007	04274	-0 02 04273	LDA*	V\$S1	GET LENGTH OF BYTE STRING	2007
2008	04275	100400	SPL		MUST BE A POSITIVE NUMBER	2008
2009	04276	000000	HLT		ERROR	2009
2010	04277	0 06 04410	ADD	--1		2010
2011	04300	101040	SNZ			2011
2012	04301	0 07 04410	SUB	--1		2012
2013	04302	0 05 04410	ERA	--1	ONE'S COMPLEMENT	2013
2014	04303	0 07 04410	SUB	--1	TWO'S COMPLEMENT	2014
2015	04304	0 04 04404	STA	V\$S5	STORE AT SHIFT COUNTER	2015
2016	04305	0 04 04406	STA	V\$S7	PERMA. STORE	2016
2017	04306	-0 02 04273	LDA*	V\$S1	GET THE BYTE COUNT	2017
2018	04307	0 05 04410	ERA	--1	ONE'S COMPLEMENT	2018
2019	04310	0 04 04407	STA	V\$S8	OVERFLOW COUNTER	2019
2020	04311	0 12 04273	IRS	V\$S1	CALLING LOCATION PLUS TWO	2020
2021	04312	-0 02 04273	LDA*	V\$S1	ADDRESS FOR RIGHT-END BYTE LOCATION	2021
2022	04313	0416 77	ALR	1	ABSOLUTE NO. FOR THE RIGHT-END BYTE	2022



2023	04314	0 06 04404	ADD	V\$S5	LEFT-END BYTE LOCATION NO.	2023
2024	04315	0 04 04402	STA	V\$S3		2024
2025	04316	0 12 04273	IRS	V\$S1	CALLING LOCATION PLUS THREE	2025
2026	04317	-0 01 04273	JMP*	V\$S1	RETURN	2026
2027			*			2027
2028	04320	0 000000	V\$SB DAC	**		2028
2029	04321	0 04 04405	STA	V\$S6	NEW BYTE TO BE MOVED IN	2029
2030	04322	0 02 04402	LDA	V\$S3	LEFT-MOST BYTE LOCATION	2030
2031	04323	0404 77	LGR	1	DIVIDE BY TWO FOR LEFT END WORD	2031
2032	04324	0 04 04400	STA	V\$S1	LEFT-MOST WORD	2032
2033	04325	0 07 04410	SUB	=-1		2033
2034	04326	0 04 04401	STA	V\$S2	WORD+1 ADDRESS	2034
2035	04327	0 02 04402	LDA	V\$S3		2035
2036	04330	0 03 04411	ANA	=1	STRIP ALL BUT THE LAST BIT (EVEN-ODD TEST)	2036
2037	04331	101040	SNZ		ODD, SKIP NEXT INSTRUCTION	2037
2038	04332	0 01 04356	JMP	V\$SE	GO TO EVEN ROUTINE	2038
2039			*			2039
2040	04333	-0 02 04400	V\$SF LDA*	V\$S1	GET THE FIRST WORD	2040
2041	04334	0 03 04412	ANA	=*177400	STRIP OFF RIGHT HALF	2041
2042	04335	0 04 04403	STA	V\$S4	TEMP. STORAGE	2042
2043	04336	-0 02 04401	LDA*	V\$S2	GET THE NEXT WORD	2043
2044	04337	0404 70	LGR	8	SHIFT RIGHT	2044
2045	04340	0 05 04403	ERA	V\$S4		2045
2046	04341	-0 04 04400	STA*	V\$S1	STORE AT FIRST LOCATION	2046
2047	04342	0 12 04400	IRS	V\$S1	INCREMENT V\$S1	2047
2048	04343	0 12 04401	IRS	V\$S2	INCREMENT V\$S2	2048
2049	04344	0 12 04404	IRS	V\$S5	TEST IF SHIFT COUNT IS ZERO	2049
2050	04345	0 01 04356	JMP	V\$SE	IF NOT, GO TO EVEN ROUTINE	2050
2051	04346	-0 02 04400	LDA*	V\$S1	YES, GET NEXT WORD	2051
2052	04347	0 03 04413	ANA	=*377	STRIP OFF LEFT HALF	2052
2053	04350	-0 04 04400	STA*	V\$S1	STORE IN PLACE	2053
2054	04351	0 02 04405	LDA	V\$S6	GET THE NEW BYTE	2054
2055	04352	0414 70	LGL	8	SHIFT LEFT	2055
2056	04353	-0 05 04400	ERA*	V\$S1		2056
2057	04354	-0 04 04400	STA*	V\$S1		2057
2058	04355	0 01 04367	JMP	V\$SA		2058
2059			*			2059

2060	04356	-0 02 04400	V\$SE LDA*	V\$S1	GET FIRST WORD	2060
2061	04357	0414 70	LGL	8	SHIFT LEFT	2061
2062	04360	-0 04 04400	STA*	V\$S1	STORE INDIRECTLY IN PLACE	2062
2063	04361	0 12 04404	IRS	V\$S5	TEST IF SHIFT COUNT IS ZERO	2063
2064	04362	0 01 04333	JMP	V\$SF	GO TO ODD ROUTINE	2064
2065	04363	0 02 04405	LDA	V\$S6	IF YES, GET THE NEW BYTE	2065
2066	04364	0 03 04413	ANA	=*377	STRIP OFF LEFT HALF	2066
2067	04365	-0 05 04400	ERA*	V\$S1		2067
2068	04366	-0 04 04400	STA*	V\$S1		2068
2069	04367	0 02 04406	V\$SA LDA	V\$S7		2069
2070	04370	0 04 04404	STA	V\$S5	RESTORE THE SHIFT COUNTER	2070
2071	04371	0 12 04407	IRS	V\$S8	IF V\$S8=0, GO TO OVERFLOW ROUTINE	2071
2072	04372	0 01 04376	JMP	**4	IF V\$S8 IS NOT ZERO, TAKE THE NORMAL RETURN	2072
2073	04373	0 02 04410	LDA	=-1	RE-INITIALIZE FOR OVERFLOW RETURN	2073
2074	04374	0 04 04407	STA	V\$S8	SET UP FOR NEXT OVERFLOW RETURN	2074
2075	04375	-0 01 04320	JMP*	V\$S8	OVERFLOW RETURN	2075
2076	04376	0 12 04320	IRS	V\$S8	CALLING LOCATION PLUS ONE	2076
2077	04377	-0 01 04320	JMP*	V\$S8	NORMAL RETURN	2077
2078			*			2078
2079	04400	0 000000	V\$S1 DAC	**	FIRST WORD	2079
2080	04401	0 000000	V\$S2 DAC	**	NEXT WORD	2080
2081	04402	000000	V\$S3 BSZ	1	LEFT-MOST BYTE ADDRESS	2081
2082	04403	000000	V\$S4 BSZ	1	TEMP STORAGE	2082
2083	04404	000000	V\$S5 BSZ	1	SHIFT COUNTER	2083
2084	04405	000000	V\$S6 BSZ	1	NEW BYTE	2084
2085	04406	000000	V\$S7 BSZ	1	PERMA. STORE FOR SHIFT COUNT	2085
2086	04407	000000	V\$S8 BSZ	1	OVERFLOW COUNTER	2086
2087			*			2087
2088	04410	177777	FIN			2088
	04411	000001				
	04412	177400				
	04413	000377				
2089			*			2089
2090			*			2090
2091			*			2091
2092			CRG	*5000		2092

```
2093 *
2094 * THE CODE GETS FILLED IN BY CLOCK CAL PROGRAM TO BECOME A LOOP
2095 * OF 500 GENERIC INSTRUCTIONS DRIVING A DOUBLE PRECISION INTEGER
2096 * COUNTER. THE LOOP IS BROKEN BY A START BUTTON INTERRUPT.
2097 *
2098 SEC5 INH
2099 05000 001001 IAB PUT LEAST HALF IN A REG
2100 05002 141206 AOA ADD ONE TO IT
2101 05003 140100 SSP FORCE BIT B1 TO BE RESET
2102 05004 000201 IAB PUT WORDS IN CORRECT DOUBLE FORM
2103 05005 141216 ACA ADD ANY CARRY FROM LEAST HALF
2104 05006 000401 ENB AND ROUNDED OUT WITH 492 NUP'S
2105 *
2106 CRG *5000+500-1 LOOP IS 500 LONG
2107 05763 0 01 05000 JMP SEC5
2108 *
2109 *
2110 END
```

AFIS	002050A	ALL	001106A	AVG	000500A	BCDA	002235A
BCCD	002222A	BCCR	002233A	BUCK	000501A	BYOM	001123A
CCA	003023A	CCB	003060A	CCD	003036A	CCPU	003014A
CFLG	000530A	CINX	000531A	CNTB	000540A	CNTC	000541A
CGME	000532A	CUMM	000535A	CPM	001113A	CPMA	001120A
CTR	000542A	CCU	002257A	DCOF	002302A	DCON	000543A
DCCS	002316A	DCUT	002301A	DCPS	000544A	DUPS	001074A
DEEX	002463A	DLAT	002533A	DINC	000545A	DIV	002426A
DIVA	002457A	LIVB	002464A	DIVC	002471A	DIVD	002247A
DIVH	002526A	DIVN	002476A	DIVS	002504A	DIVT	002515A
DIVU	002524A	DIVX	002460A	DIVZ	002462A	DLYA	002212A
DLYH	002217A	DLYL	002206A	DLYF	000546A	DLYN	000547A
LIRC	002003A	ERPO	002541A	ERPP	002550A	EXNS	000550A
FCTR	000552A	FTS1	001457A	FTS2	001442A	FIS3	001422A
FTS4	001436A	FTS5	001466A	FTST	001377A	HLIM	000556A
HULL	000554A	HRMN	003565A	HRMC	003546A	HRS	000560A
ICAL	000561A	IRHA	000562A	INT1	002011A	INTO	002026A
IPLS	002075A	IPLT	002115A	IPLU	002120A	IPOC	002611A

IKS	000603A	IRST	001607A	IRSX	001602A	IRSZ	001610A
JMP	000604A	K1	000613A	K2	000615A	K3	000617A
K4	000621A	LFLC	002552A	LLIF	000557A	MCNT	000563A
ME01	004016A	MER1	003573A	MER3	003576A	MER4	003601A
MER5	003604A	MER6	003607A	MER7	003612A	MER8	003615A
MER9	003620A	MES1	003346A	MES2	003360A	MES3	003367A
MES4	003376A	MES5	003403A	MES6	003436A	MES7	003441A
MES8	003460A	MES9	003335A	MESA	003470A	MESB	003505A
MESF	003523A	MESG	003732A	MESH	003747A	MESI	003756A
MESJ	003766A	MESK	003775A	MESX	004004A	MEXT	002420A
MJN	000564A	MLNN	002412A	MNMS	003556A	MPAA	002332A
MPCC	002354A	MPY	002317A	MPYA	002330A	MPYB	002333A
MPYC	002340A	MPYN	002406A	MPYR	002372A	MPYS	002355A
MTIA	003157A	MTIB	003177A	MTIC	003264A	MTID	003302A
MTIE	003243A	MTIM	003142A	MTIC	003222A	MTIP	003321A
MTIR	003316A	MUCL	000565A	NEWL	000566A	NUP	001007A
ULD	001055A	OPCU	002574A	CPMA	003415A	JPME	003406A
UPNW	002600A	OPCW	002556A	ORGA	004123A	OUTH	001515A
PACK	002140A	PC	000567A	PCMA	003430A	PIMK	000570A
PNTX	002610A	RCAL	000605A	RECT	000571A	REJT	002202A
RENS	000572A	KEST	002144A	RET1	002030A	RET2	002031A
RET3	002032A	KET4	002033A	RET5	002034A	RET6	002035A
RET7	002036A	RET8	002037A	RET9	002040A	RETA	002041A
RETB	002042A	RETC	002043A	RETU	002044A	RETE	002045A
RETF	002046A	REIG	002047A	RET:	002173A	RETO	002027A
RMEA	000607A	SAVE	000573A	SEC5	005000A	SIL	002056A
SURT	001474A	SPTW	001676A	STAB	001517A	SIAC	001545A
STAD	001570A	STAE	001611A	STAF	001626A	SIAG	001636A
STAH	001732A	STAI	001740A	STAJ	001777A	STME	003623A
STMF	003635A	STOZ	001612A	STR2	001151A	SIR3	001152A
STR4	001204A	STR5	001224A	STR6	001363A	SIR7	001361A
SWAP	002455A	TA	000611A	TDAY	002624A	TDB	002641A
TDC	002732A	TDD	002646A	TDE	002707A	TDF	002722A
TDG	002737A	TDB	002766A	TDIS	001721A	TEMP	000574A
TLY	000601A	TMDL	001214A	TYPE	000602A	V\$U1	004256A
V\$Q2	004257A	V\$U3	004260A	V\$Q4	004261A	V\$U5	004262A
V\$C6	004263A	V\$UD	004123A	V\$OC	004155A	V\$OP	004160A

\* NAME: A616-12T3 DOC 70181010000 REV F

PAGE 73

V\$CV	004165A	V\$OR	004171A	V\$OT	004201A	V\$OU	004212A
V\$CV	004217A	V\$OW	004243A	V\$OX	004247A	V\$OY	004255A
V\$S1	004400A	V\$S2	004401A	V\$S3	004402A	V\$S4	004403A
V\$S5	004404A	V\$S6	004405A	V\$S7	004406A	V\$S8	004407A
V\$SA	004307A	V\$SB	004320A	V\$SE	004356A	V\$SF	004333A
V\$S1	004273A						

0000 WARNING OR ERROR FLAGS  
DAP-16 MOD 2 REV. L 06-28-71