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0066 * NOTE: WHEN USING AN ASR-33, MOMENTARILY PRESS THE START 0066
0067 * SWITCH ON THE READER AFTER PRESSING THE COMPUTER START 0067
0068 * BUTTON. WHEN USING AN ASR-35, SET THE MODE SWITCH 0068
0069 * TO KT, PRESS THE CONTROL KEY (CTRL) AND THE Q KEY 0069
0070 * SIMULTANEOUSLY, PRESS THE COMPUTER START BUTTON, AND 0070
0071 * SET THE READER SWITCH TO RUN. 0071
0072 * THE PROGRAM WILL SELF-LOAD FROM THIS POINT 0072
0073 * TO THE CORE AREA FROM WHICH IT WAS PUNCHED. 0073
0074 * 0074
0075 * RELOCATABLE FORMAT 0075
0076 * 1) LOAD THE PROGRAM AS ANY OTHER RELOCATABLE PROGRAM 0076
0077 * 2) TO OUTPUT A PAL MODE TAPE, USE INSTRUCTIONS BELOW, 0077
0078 * USING LOAD POINT FOR FIRST ADDRESS, AND LOAD POINT 0078
0079 * PLUS '577 AS LAST ADDRESS. 0079
0080 * 0080
0081 * 0081
0082 * TO USE PROGRAM: 0082
0083 * 1) MASTER CLEAR 0083
0084 * 2) SET PROGRAM COUNTER TO XX000 WHERE XY IS THE SECTOR 0084
0085 * INTO WHICH PAL-AP HAS BEEN LOADED. 0085
0086 * 3) ENTER THE OUTPUT DEVICE CODE INTO THE A-REGISTER. IF 0086
0087 * THE ASR-33 IS TO BE USED, SET BIT 1 OF THE A-REGISTER 0087
0088 * AND TURN ON THE PUNCH. IF THE ASR-35 IS TO BE USED, 0088
0089 * SET BIT 2 OF THE A-REGISTER. IF THE HIGH SPEED 0089
0090 * PUNCH IS TO BE USED, LEAVE THE A-REGISTER CLEARED. 0090
0091 * 4) PRESS START AND THE PROGRAM WILL HALT. 0091
0092 * 5) ENTER INTO THE A-REGISTER THE FIRST ADDRESS OF THE PROGRAM 0092
0093 * BEING PUNCHED. 0093
0094 * 6) PRESS START AND THE PROGRAM WILL HALT. 0094
0095 * 7) ENTER INTO THE A-REGISTER THE LAST ADDRESS OF THE 0095
0096 * PROGRAM BEING PUNCHED. 0096
0097 * 8) PRESS START AND THE SELECTED OUTPUT DEVICE WILL BEGIN 0097
0098 * PUNCHING TAPE. 0098
0099 * 9) UPON COMPLETION OF THE PUNCH, IF ANOTHER TAPE IS TO BE 0099
0100 * PUNCHED ON THE SAME DEVICE, CONTINUE FROM STEP 5. 0100
0101 * 0101
0102 * 0102

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0103 * TO GENERATE LOAD AND GO TAPES: 0103
0104 * SYSTEM BOOTSTRAP TAPES MAY BE PUNCHED BY CHANGING THREE 0104
0105 * LOCATIONS OF PAL-AP. ADDRESSING IS GIVEN IN OCTAL RELATIVE 0105
0106 * TO THE FIRST LOCATION OF PAL-AP (IT MUST BE THE FIRST 0106
0107 * LOCATION OF A SECTOR). LOCATIONS '613 AND '616 ARE BOTH 0107
0108 * "JMP '632" INSTRUCTIONS, AND SHOULD BE CHANGED TO 0108
0109 * "JMP* '632" INSTRUCTIONS - I.E. CHANGE FROM JUMP TO JUMP 0109
0110 * INDIRECT. LOCATION '632 SHOULD BE CHANGED FROM "OCT 12" TO 0110
0111 * "DAC PTR", WHERE PTR IS THE ABSOLUTE ADDRESS FOR 0111
0112 * EXECUTION AFTER LOADING THE PAPER TAPE BOOT. 0112
0113 * 0113
0114 * 0114
0115 * METHOD 0115
0116 * 0116
0117 * PAL-AP IS MADE UP OF TWO SECTIONS. THE PUNCH SECTION (INCLUDING 0117
0118 * THE BOOTSTRAP) OCCUPIES XX000-XX577. THE LOADER SECTION (READ IN 0118
0119 * BY THE BOOTSTRAP) OCCUPIES XX600-XX777. IN ADDITION TO THESE 0119
0120 * THE BOOTSTRAP SECTION WILL LOAD INTO LOCATIONS '20 THROUGH '57, 0120
0121 * AND WILL BE IN 8-8 FORMAT. 0121
0122 * 0122
0123 * 0123
0124 * ANY PAL MODE PROGRAM HAS THE FOLLOWING OVERALL STRUCTURE: 0124
0125 * 1) PAL-AP FIRST PUNCHES ITS LOADER SECTION IN 8-8 0125
0126 * FORMAT FOLLOWED BY TWELVE INCHES OF LEADER. 0126
0127 * 2) NEXT THE DESIRED PROGRAM IS PUNCHED IN PAL FORMAT WHICH 0127
0128 * IS "RECOGNIZED" BY THE LOADER. 0128
0129 * THE LOADER ON THE FRONT OF THE TAPE WILL LOAD ITSELF AND 0129
0130 * THEN WILL LOAD THE PAL-FORMAT PROGRAM. 0130
0131 * 0131
0132 * 0132
0133 * DATA IS PUNCHED IN BLOCKS OF 50 WORDS EACH. SALIENT 0133
0134 * CHARACTERISTICS OF THE BLOCK STRUCTURE AREA ARE AS FOLLOWS: 0134
0135 * 1) A START OF MESSAGE CHARACTER (OCTAL 201) IS 0135
0136 * PUNCHED AT THE BEGINNING OF EACH BLOCK. 0136
0137 * 2) FOLLOWING THIS, THE ADDRESS OF THE FIRST MEMORY 0137
0138 * LOCATION IS PUNCHED. 0138
0139 * 3) EACH BLOCK IS ENDED BY: 0139

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0140 \* A) A CHECKSUM. THIS CONSISTS OF A WORD WHICH 0140  
0141 \* IS THE EXCLUSIVE OR OF ALL WORDS PUNCHED 0141  
0142 \* PLUS A WORD COUNT AND A BLOCK COUNT. 0142  
0143 \* (THE FIRST BLOCK IS ZERO AND EACH ONE THERE- 0143  
0144 \* AFTER IS INCREMENTED BY ONE.) THE 0144  
0145 \* CHECKSUM IS ROTATED RIGHT ONE BIT EACH 0145  
0146 \* TIME ANOTHER WORD IS ADDED TO IT. 0146  
0147 \* B) AT END OF MESSAGE CHARACTER (OCTAL 223). 0147  
0148 \* THE EOM IS FOLLOWED BY A RUBOUT CHARACTER (OCTAL 377) 0148  
0149 \* 4) SIX FRAMES OF LEADER ARE PUNCHED BETWEEN BLOCKS 0149  
0150 \* AND TWELVE INCHES OF LEADER ARE PUNCHED 0150  
0151 \* AT THE BEGINNING AND END OF THE PROGRAM. 0151  
0152 \* THE FORMAT OF THE PUNCHED WORDS IS AS FOLLOWS: 0152  
0153 \* 1) NON-ZERO WORDS ARE PUNCHED IN "INVISIBLE CODE". 0153  
0154 \* EACH 16-BIT WORD IS WRITTEN AS A FOUR-BIT AND 0154  
0155 \* TWO SIX-BIT CHARACTERS ON TAPE. THE FOUR-BIT 0155  
0156 \* CHARACTER REPRESENTS THE HIGH-ORDER FOUR 0156  
0157 \* BITS OF THE WORD. EACH SIX-BIT CHARACTER 0157  
0158 \* HAS THE HIGH-ORDER BIT IN CHANNEL EIGHT AND THE 0158  
0159 \* FIVE LOW-ORDER BITS IN CHANNELS FIVE THROUGH 0159  
0160 \* ONE. ORDINARILLY, NOTHING IS WRITTEN IN CHANNELS 0160  
0161 \* EIGHT THROUGH FIVE OF THE FOUR-BIT CHARACTER 0161  
0162 \* OR IN CHANNELS SIX AND SEVEN OF THE SIX-BIT 0162  
0163 \* CHARACTERS. 0163  
0164 \* 2) EIGHT CHARACTERS CAUSE SPECIAL ACTION BY THE ASR. 0164  
0165 \* THESE ARE 023 AND 223 (X-OFF), 021 AND 221 (X-ON), 012 0165  
0166 \* AND 212 (LINE FEED), 005 AND 205 (WRD). THESE ARE 0166  
0167 \* TRANSLATED INTO 177 AND 377, 176 AND 376, 175 AND 0167  
0168 \* 375, 174 AND 374, RESPECTIVELY. IN THE CASE OF EACH OF 0168  
0169 \* THESE CHARACTERS, CHANNELS SIX AND SEVEN ARE PUNCHED. 0169  
0170 \* 3) WHEN ONE OR MORE CONSECUTIVE ZERO WORDS ARE 0170  
0171 \* ENCOUNTERED IN MEMORY, THEY ARE REPRESENTED BY 0171  
0172 \* ONE PUNCHED WORD. THIS CONSISTS OF THE TWO'S COMPLEMENT 0172  
0173 \* OF THE NUMBER OF CONSECUTIVE ZERO WORDS ENCOUNTERED. IN 0173  
0174 \* ORDER TO DISTINGUISH THESE Z-COUNT WORDS, CHANNEL EIGHT 0174  
0175 \* OF THE HIGH-ORDER (FOUR-BIT) CHARACTER IS PUNCHED 0175  
0176 \* 0176

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0177 \* 0177  
0178 \* 0178  
0179 \* 0179  
0180 \* NOTE: THE WORD COUNT CONSISTS OF THE TOTAL NUMBER OF 0180  
0181 \* WORDS ENCOUNTERED WHILE PUNCHING A BLOCK, INCLUDING ALL 0181  
0182 \* ZERO WORDS. 0182  
0183 \* 0183  
0184 \* 0184  
0185 \* \*\*\*\*\* 0185  
0186 \* REL 0186  
0187 \* EXP ENTER EXTENDED MODE 0187  
0188 \* LOAD A WITH DEVICE CODE 0188  
0189 \* ENABL EXTENDED ADDRESSING 0189  
0190 \* SAVE DEVICE CODE 0190  
0191 \* 0191  
0192 \* ENTER FIRST ADDRESS 0192  
0193 \* SAVE IT 0193  
0194 \* 0194  
0195 \* ENTER LAST ADDRESS 0195  
0196 \* SAVE IT 0196  
0197 \* PICKUP DEVICE CODE 0197  
0198 \* IS ASP-33 IN USE 0198  
0199 \* NO. 0199  
0200 \* 0200  
0201 \* STA P01 0201  
0202 \* STA P02 0202  
0203 \* SCCR LDA EASR 0203  
0204 \* STA EPNC 0204  
0205 \* LDA PASP 0205  
0206 \* SOTA STA TRON+2 REPLACE OTA '2 WITH OTA '4. 0206  
0207 \* STA TRON+5 SET OTA'S 0207  
0208 \* STA RGPL+5 SET OTA'S 0208  
0209 \* STA XDF+2 SET OTA'S 0209  
0210 \* STA XDF+5 SET OTA'S 0210  
0211 \* STA LLDP+1 SET OTA'S 0211  
0212 \* STA MK+1 SET OTA'S 0212  
0213 \* STA P+2 SET OTA'S 0213

0214	00031	0 04 00117	STA	ORUB+1		0214
0215	00032	0 01 00052	JMP	CONT		021
0216	00032	0416 77	TF35 ALR	1	TEST FOR ASR-35	021
0217	00034	101400	SMI		IS ASR-35 IN USE	0217
0218	00035	0 01 00043	JMP	HISP	NO.	0218
0219	00036	0 02 00473	LDA	=*222		0219
0220	00037	0 04 00461	STA	PON	INITIALIZE PJNCH	0220
0221	00040	0 02 00472	LDA	=*377	AND RJBOU CODES	0221
0222	00041	0 04 00462	STA	RUB		0222
0223	00042	0 01 00016	JMP	SOCP		0223
0224	00043	140040	HISP CRA		HIGH SPEED PJNCH IN USE	0224
0225	00044	0 04 00461	STA	PON		0225
0226	00045	0 04 00462	STA	RUB		0226
0227	00046	0 02 00431	LDA	ERRP	OCP *2	0227
0228	00047	0 04 00056	STA	EPNC		0228
0229	00050	0 02 00432	LDA	PPRP	OTA *2	0229
0230	00051	0 01 00021	JMP	SOTA	STORE IT AWAY	0230
0231	00052	140040	CONT CRA			0231
0232	00053	0 04 00446	STA	BLCT	BLOCK COUNT	0232
0233	00054	0 04 00450	STA	ZCNT	AND ZCOUNT	0233
0234	00055	0 04 00443	STA	Z		0234
0235	00056	14 0002	EPNC OCP	*2	ENABLE PUNCH	0235
0236	00057	0 10 00410	JST	TPON	TURN PJNCH ON	0236
0237	00060	0 01 00077	JMP	LDR	GO TO PUNCH LEADER	0237
0238	00061	0 000000	LEAD DAC	**	ROUTINE TO PJNCH 12 INCHES OF LEADER	0238
0239	00062	0 02 00436	LDA	N120	SET INDEX FOR 120 FRAMES	0239
0240	00063	0 04 00453	STA	NDX	AND GO TO	0240
0241	00064	0 01 00070	JMP	**4	PUNCH	0241
0242	00065	0 000000	PNC DAC	**		0242
0243	00066	0 02 00065	LDA	PNC	STORE RETURN ADDRESS	0243
0244	00067	0 04 00061	STA	LEAD	IN LEAD	0244
0245	00070	140040	LLGP CRA		LEADER LOOP	0245
0246	00071	74 0002	OTA	*2	OUTPUT LEADER	0246
0247	00072	0 01 00071	JMP	*-1		0247
0248	00073	0 12 00453	IRS	NDX		0248
0249	00074	0 01 00070	JMP	*-4		0249
0250	00075	0 04 00447	STA	WDCT		0250

0251	00076	-0 01 00061	JMP*	LEAD	RETURN	0251
0252	00077	0 10 00061	LDR JST	LEAD	GO TO PUNCH 12 INCHES OF LEADER	0252
0253	00100	0 02 00471	LDA	=*52	GET FIRST RETURN FOR CHAR SUBROUTINE	0253
0254	00101	0 04 00731	STA	CHAR		0254
0255	00102	0 04 00704	STA	SWCH	INITIALIZE TO PRISTINE CONDITION	0255
0256	00103	0 04 00715	STA	WORD	INITIALIZE TO PRISTINE CONDITION	0256
0257	00104	0 02 00434	LDA	NBL1	LENGTH OF FIRST LEVEL ROOT (NEG)	0257
0258	00105	0 04 00453	STA	NDX	FIRST	0258
0259	00106	0 02 00440	LDA	LOAD	BLOCK	0259
0260	00107	0 04 00401	STA	PN88	OF	0260
0261	00110	0 10 00400	JST	PN	PUNCH BL1	0261
0262	00111	0 12 00401	IRS	PN88	OMIT THE OCP OF BL2	0262
0263	00112	0 12 00401	IRS	PN88	OMIT THE INA OF BL2	0263
0264	00113	0 02 00437	LDA	NBL2	LENGTH OF SECOND LEVEL ROOT (NEG)	0264
0265	00114	0 04 00453	STA	NDX	BLOCK	0265
0266	00115	0 10 00400	JST	PN	PUNCH SECOND LEVEL ROOT	0266
0267	00116	0 02 00472	ORUB LDA	=*377		0267
0268	00117	74 0002	OTA	*2		0268
0269	00120	0 01 00117	JMP	*-1		0269
0270	00121	0 10 00410	JST	TPON		0270
0271	00122	0 10 00061	JST	LEAD	TURN PJNCH ON, PUNCH LEADER	0271
0272	00123	0 01 00125	JMP	RGBL+1		0272
0273			*			0273
0274			*		BEGIN PUNCHING BLOCK OF CHARACTERS	0274
0275			*			0275
0276	00124	0 10 00410	RGBL JST	TPON		0276
0277	00125	0 02 00433	LDA	N6	BEGIN BLOCK. SET INDEX FOR	0277
0278	00126	0 04 00453	STA	NDX	SIX FRAMES OF LEADER	0278
0279	00127	0 10 00065	JST	PNC	AND PJNCH	0279
0280	00130	0 02 00441	LDA	SOM	LOAD START-OF-MESSAGE	02
0281	00131	74 0002	OTA	*2	PUNCH	0281
0282	00132	0 01 00131	JMP	*-1	(DELAY IF PUNCH NOT READY)	0282
0283	00133	0 02 00435	LDA	N5C	INITIALIZE	0283
0284	00134	0 04 00451	STA	P1CT	PUNCH COUNT	0284
0285	00135	0 02 00446	LDA	BLCT	INITIALIZE CHECKSUM	0285
0286	00136	0 04 00452	STA	CKSM	WITH BLOCKCOUNT	0286
0287	00137	0 12 00446	IRS	BLCT	AND INCREMENT BLOCKCOUNT	0287

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0288	00140	0 02 00444	LDA	FADD	LOAD FIRST ADDRESS OF BLOCK	0288
0289	00141	0 07 00470	SUB	=1		0289
0290	00142	0 10 00277	JST	LOOP	AND PUNCH IT.	0290
0291	00143	0 02 00443	LDA	Z		0291
0292	00144	0 04 00450	STA	ZCNT		0292
0293	00145	0 02 00455	LDA	SAVE		0293
0294	00146	0 01 00150	JMP	**2		0294
0295	00147	0 12 00444	MOVE	IRS	INCREMENT FIRST ADDRESS	0295
0296	00150	0 12 00447	IRS	WDCT	AND WORD COUNT	0296
0297	00151	0 05 00452	ERA	CKSM	UPDATE CHECKSUM WITH	0297
0298	00152	0406 77	ARR	1		0298
0299	00153	0 04 00452	STA	CKSM	CHARACTER JUST PUNCHED	0299
0300	00154	0 12 00451	IRS	PNCT	INCREMENT PUNCHCOUNT	0300
0301	00155	0 01 00157	JMP	**2	50 WORDS NOT YET PUNCHED	0301
0302	00156	0 01 00226	JMP	ENBL	50 WORDS PUNCHED-END BLOCK	0302
0303	00157	0 10 00207	JST	DECD	CHECK IF ZCOUNT ZERO	0303
0304	00160	0 01 00221	JMP	GO	NO PUNCH STORED WORD	0304
0305	00161	-0 02 00444	LDA*	FADD	YES, LOAD NEXT WORD FROM MEMORY	0305
0306	00162	100040	SZE		IS IT ZERO	0306
0307	00163	0 01 00201	JMP	NZZZ	NO	0307
0308	00164	0 12 00450	IRS	ZCNT	YES, INCREMENT ZCOUNT	0308
0309	00165	0 12 00447	IRS	WDCT	AND WORDCOUNT	0309
0310	00166	0 12 00444	IRS	FADD	AND FIRST ADDRESS	0310
0311	00167	0 12 00451	IRS	PNCT	EUMP WORD COUNT	0311
0312	00170	0 01 00213	JMP	CKLA	CHECK FOR LAST ADDRESS	0312
0313	00171	0 02 00450	LDA	ZCNT	GO TERMINATE BLOCK	0313
0314	00172	0 10 00277	JST	LOOP	PUNCH NO. OF ZERO WORDS	0314
0315	00173	0 05 00452	ERA	CKSM	CALCULATE NEW CKSM	0315
0316	00174	0406 77	ARR	1	*	0316
0317	00175	0 04 00452	STA	CKSM	SAVE IT	0317
0318	00176	140040	CRA		RESET ZCOUNT	0318
0319	00177	0 04 00450	STA	ZCNT	DO IT	0319
0320	00200	0 01 00226	JMP	ENBL	GO FINISH BLOCK	0320
0321	00201	0 04 00454	NZZZ	STA	WORD NOT ZERO, STORE IT	0321
0322	00202	0 02 00450	LDA	ZCNT	CHECK ZCOUNT	0322
0323	00203	101040	SNZ		IS IT ZERO	0323
0324	00204	0 01 00223	JMP	GO+2		0324

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0325	00205	0 10 00277	JST	LOOP	NO, TAKE ZCOUNT. PUNCH,	0325	
0326	00206	0 01 00151	JMP	MOVE+2	RETURN	0326	
0327	00207	0 000000	DECD	DAC	**	0327	
0328	00210	0 02 00450	LDA	ZCNT	DECISION SUBROUTINE	0328	
0329	00211	101040	SNZ		CHECK ZCOUNT	0329	
0330	00212	0 12 00207	IRS	DFCD	IS IT ZERO	0330	
0331	00213	0 02 00444	CKLA	LDA	YES, INCREMENT RETURN ADDRESS	0331	
0332	00214	0 07 00470	SUB	=1	NO, CHECK	0332	
0333	00215	0 05 00445	ERA	LADD	LAST	0333	
0334	00216	100040	SZE		ADDRESS	0334	
0335	00217	-0 01 00207	JMP*	DECD	NOT REACHED. RETURN	0335	
0336	00220	0 01 00243	JMP	CHEK	LAST ADDRESS REACHED, CHECK ZCOUNT	0336	
0337	00221	140040	GO	CRA	RESTORE	0337	
0338	00222	0 04 00450	STA	ZCNT	ZCOUNT TO ZERO	0338	
0339	00223	0 02 00454	LDA	WD	TAKE STORED WORD	0339	
0340	00224	0 10 00277	JST	LOOP	AND PUNCH IT	0340	
0341	00225	0 01 00147	JMP	MOVE	AND CONTINUE.	0341	
0342			*			0342	
0343			*		END BLOCK	0343	
0344			*			0344	
0345	00226	0 02 00450	ENBL	LDA	ZCNT	0345	
0346	00227	0 04 00443	STA	Z		0346	
0347	00230	140040	CRA			0347	
0348	00231	0 04 00450	STA	ZCNT		0348	
0349	00232	0 02 00447	LDA	WDCT		0349	
0350	00233	0 05 00452	ERA	CKSM	WITH CHECKSUM	0350	
0351	00234	0 10 00277	JST	LOOP	AND PUNCH	0351	
0352	00235	0 10 00267	JST	XOF	PUNCH XOFF	0352	
0353	00236	0 01 00124	JMP	5GBL	BEGIN NEW BLOCK	0353	
0354	00237	0 10 00277	ZNZ	JST	LOOP	ZCOUNT NOT ZERO, PUNCH IT.	0354
0355	00240	0 05 00452	ERA	CKSM	UPDATE	0355	
0356	00241	0406 77	ARR	1		0356	
0357	00242	0 04 00452	STA	CKSM	CHECKSUM	0357	
0358	00243	140040	CRA			0358	
0359	00244	0 04 00450	STA	ZCNT		0359	
0360	00245	0 02 00447	LDA	WDCT	LOAD WORD COUNT AND	0360	
0361	00246	0 05 00452	ERA	CKSM	ERA IT WITH CHECKSUM	0361	

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0362	00247	0 10 00277	JST	LOOP	FUNCH CHECKSUM	0362
0363	00250	0 10 00267	JST	XOF	PUNCH TWO XOF'S	0363
0364	00251	0 10 00410	JST	TRON	TURN PUNCH ON	0364
0365	00252	0 10 00267	JST	XOF	SECOND XOF	0365
0366	00253	0 10 00410	JST	TRON		0366
0367	00254	0 10 00061	JST	LEAD	TURN PUNCH ON, PUNCH LEADER	0367
0368	00255	0 02 00460	LDA	CODE	PICKUP OUTPUT DEVICE	0368
0369	00256	0416 77	ALP	1	CHECK IF ASR-35	0369
0370	00257	101400	SMI		*	0370
0371	00260	100000	SKP		EITHER B3 OR H/S	0371
0372	00261	0 10 00267	JST	XOF	STOP PUNCH ON ASR-35	0372
0373	00262	0 01 00371	JMP	DONE	GO WRAP UP	0373
0374	00263	0 02 00450	CHEK LDA	ZCNT	IS ZCOUNT ZERO	0374
0375	00264	100040	SZF			0375
0376	00265	0 01 00237	JMP	ZNZ	NO, PUNCH IT	0376
0377	00266	0 01 00245	JMP	ZNZ+6		0377
0378	00267	0 000000	XCF DAC	**	FUNCH XOFF ROUTINE	0378
0379	00270	0 02 00442	LDA	XOFF	LOAD XOFF	0379
0380	00271	74 0002	CTA	'2	PUNCH	0380
0381	00272	0 01 00271	JMP	*-1	(DELAY IF PUNCH NOT READY)	0381
0382	00273	0 02 00472	LDA	=*377		0382
0383	00274	74 0002	CTA	'2		0383
0384	00275	0 01 00274	JMP	*-1		0384
0385	00276	-0 01 00267	JMP*	XOF	RETURN	0385
0386	00277	0 000000	LOOP DAC	**	MAIN PUNCH LOOP	0386
0387	00300	0 10 00306	JST	TEST	IS WORD A ZCOUNT	0387
0388	00301	0 05 00467	ERA	=*100000	YES, PUT ONE IN HIGH ORDER BIT	0388
0389	00302	0 10 00331	JST	PNCH	PUNCH	0389
0390	00303	0 10 00331	JST	PNCH	THREE	0390
0391	00304	0 10 00331	JST	PNCH	CHARACTERS	0391
0392	00305	-0 01 00277	JMP*	LOOP	RETURN	0392
0393	00306	0 000000	TEST DAC	**		0393
0394	00307	0 04 00455	STA	SAVE	SAVE WORD	0394
0395	00310	0 02 00450	LDA	ZCNT		0395
0396	00311	101040	SNZ			0396
0397	00312	0 01 00317	JMP	*+5		0397
0398	00313	0 05 00466	ERA	=-1	TAKE TWO'S	0398

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0399	00314	0 06 00470	ADD	=1	COMPLEMENT	0399
0400	00315	0 04 00455	STA	SAVE	UPDATE SAVE	0400
0401	00316	0 01 00321	JMP	*+3	CONTINUE	0401
0402	00317	0 12 00306	IFS	TEST	ZCOUNT ZERO, CONTINUE	0402
0403	00320	0 02 00455	LDA	SAVE	REGAIN SAVE	0403
0404	00321	0406 76	APR	2	POSITION CHARACTER	0404
0405	00322	0 04 00455	STA	SAVE		0405
0406	00323	0 03 00445	ANA	=*36000	CLEAR TO CHARACTER	0406
0407	00324	-0 01 00306	JMP*	TEST	RETURN	0407
0408	00325	0404 66	HCB LGR	10	CHANGE HIGH-ORDER	0408
0409	00326	0 03 00464	ANA	=*37	BIT FROM CHANNEL 6	0409
0410	00327	0 05 00463	ERA	=*200	TO CHANNEL 8	0410
0411	00330	0 01 00335	JMP	*+5	AND GO TO PUNCH	0411
0412	00331	0 000000	PNCH DAC	**	PUNCH ROUTINE	0412
0413	00332	100400	SPL		CHECK FOR	0413
0414	00333	0 01 00325	JMP	HCB	HIGH ORDER BIT	0414
0415	00334	0404 66	LGR	10	POSITION CHARACTER	0415
0416	00335	0 04 00456	STA	SAVE	STORE IT	0416
0417	00336	0 03 00464	ANA	=*37	SET UP FOR TRANSLATION CHECK	0417
0418	00337	0 04 00457	STA	SAVE	STORE	0418
0419	00340	0 02 00420	LDA	ADC1	LOAD ADDRESS OF TABLE	0419
0420	00341	0 04 00421	STA	ADC2	SETUP FOR CHECK	0420
0421	00342	-0 02 00421	LDA*	ADC2	LOAD FROM TABLE	0421
0422	00343	101040	SNZ		CHECK FOR END OF TABLE	0422
0423	00344	0 01 00362	JMP	OK	DONE, NO TRANSLATION NEEDED	0423
0424	00345	0 03 00472	ANA	=*377	CLEAR 9 HIGH-ORDER BITS	0424
0425	00346	0 05 00457	ERA	SAVE	CHECK FOR	0425
0426	00347	101040	SNZ		MATCH	0426
0427	00350	0 01 00353	JMP	TRNS	YES, TRANSLATE	0427
0428	00351	0 12 00421	IFS	ADC2	NO, INCREMENT ADDRESS	0428
0429	00352	0 01 00342	JMP	*-8	AND RETURN	0429
0430	00353	0 02 00456	TRNS LDA	SAVE	PICK UP ORIGINAL CHARACTER	0430
0431	00354	0 03 00463	ANA	=*200	CLEAR ALL BUT BIT 8	0431
0432	00355	0 04 00456	STA	SAVE	SAVE BIT	0432
0433	00356	-0 02 00421	LDA*	ADC2	PICK UP SUBROUTINE	0433
0434	00357	0404 76	LGR	8	CHARACTER	0434
0435	00360	0 05 00456	ERA	SAVE	OBTAIN CORRECT BIT 8	0435

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0436 00361 0 01 00363 JMP **2
0437 00362 0 02 00456 OK LDA SAVA PUNCH 0436
0438 00363 74 0002 OTA *2 NO TRANSLATION, GET CHARACTER 0437
0439 00364 0 01 00363 JMP *-1 PUNCH 0438
0440 00365 0 02 00456 LDA SAVE (DELAY IF PUNCH NOT READY) 0439
0441 00366 0416 72 ALR 6 POSITION WORD 0440
0442 00367 0 04 00455 STA SAVE FOR NEXT CHARACTER 0441
0443 00370 -0 01 00331 JMP* PNCH STORE CHARACTER 0442
0444 00371 14 0102 DONE OCP *102 AND RETURN 0443
0445 00372 0 01 00002 JMP BEGN RESTART IF DESIRED 0444
0446 00373 0 000000 P DAC ** 0445
0447 00374 0406 70 ARR 8 0446
0448 00375 74 0002 CTA *2 PUNCH 0447
0449 00376 0 01 00375 JMP *-1 0448
0450 00377 -0 01 00373 JMP* P 0449
0451 00400 0 00 00000 PN PZE ** 0450
0452 00401 0 00 00000 PN86 PZE ** 0451
0453 00402 0 10 00373 JST P PUNCH LOAD PROGRAM 0452
0454 00403 0 10 00373 JST P IN S-B FORMAT 0453
0455 00404 0 12 00401 IPS PN88 0454
0456 00405 0 12 00453 IPS NDX 0455
0457 00406 0 01 00401 JMP PN88 0456
0458 00407 -0 01 00400 JMP* PN 0457
0459 00410 0 000000 TPN DAC ** 0458
0460 00411 0 02 00461 LDA PON TURN PUNCH ON 0459
0461 00412 74 0002 OTA *2 OUTPUT *222 0460
0462 00413 0 01 00412 JMP *-1 IF AS2-35 IN USE. 0461
0463 00414 0 02 00462 LDA RUB OUTPUT *377 0462
0464 00415 74 0002 OTA *2 IF AS2-35 IN USE. 0463
0465 00416 0 01 00415 JMP *-1 0464
0466 00417 -0 01 00410 JMP* TPN ADDRESS OF C1 0465
0467 00420 0 000422 ADC1 DAC C1 0466
0468 00421 ADC2 BSS 1 0467
0469 * 0468
0470 * TRANSLATION TABLE. ILLEGAL CHARACTER (7 LOW ORDER BITS) 0469
0471 * IN RIGHT-HAND HALF AND SURSTITUTION CHARACTER (7 LOW ORDER BITS) 0470
0472 * IN LEFT-HAND HALF. 0471

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0473 *
0474 00422 077423 C1 OCT 77423,77021,76412,76005,0 0473
0475 00423 077021 0474
0476 00424 076412
0477 00425 076005
0478 00426 000000
0479 *
0480 00427 14 0104 EASR OCP *104 0475
0481 00430 74 0004 FASR OTA *4 0476
0482 00431 14 0002 EBRP OCP *2 0477
0483 00432 74 0002 PRRP OTA *2 0478
0484 00433 177772 N6 DEC -6 0479
0485 00434 0 177740 NBL1 DAC ST-BL2 NEGATIVE LENGTH OF FIRST LEVEL BOOT 0480
0486 00435 177716 N50 DEC -50 0481
0487 00436 177610 N120 DEC -120 0482
0488 00437 0 177604 NBL2 DAC WAIT-STPC-1 NEG LENGTH OF SECOND LEVEL BOOT 0483
0489 00440 0 02 00540 LOAD LDA ST STARTING ADDRESS 0484
0490 00441 000201 SOM OCT 201 0485
0491 00442 000223 YOFF OCT 223 0486
0492 00443 Z BSS 1 0487
0493 00444 FADD BSS 1 0488
0494 00445 LADD BSS 1 0489
0495 00446 FLCT BSS 1 0490
0496 00447 WDCI BSS 1 0491
0497 00450 ZCMT BSS 1 0492
0498 00451 PNCT BSS 1 0493
0499 00452 CKEN BSS 1 0494
0500 00453 ADX BSS 1 0495
0501 00454 XD BSS 1 0496
0502 00455 SAVE BSS 1 0497
0503 00456 SAVA BSS 1 0498
0504 00457 SAVE BSS 1 0499
0505 00460 CODE BSS 1 0500
0506 00461 000000 PCM BSS 1 0501
0507 00462 000000 FUF BSZ 1 0502
0508 00463 000200 FIN 0503
0509 00464 000037 0504

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0645	00725	0 12 00704	IFS	SWCH					
0646	00726	0 02 00021	LDA	*21					0645
0647	00727	0406 77	ARP	1					0646
0648	00730	-0 01 00715	JMP*	WORD					0647
0649	00731	0 000052	CHAR DAC	*52	FIRST TIME IN-RETURN VIA *52				0648
0650	00732	0 02 00022	LDA	*22					0649
0651	00733	0414 70	LCL	R					0650
0652	00734	100400	SPL						0651
0653	00735	0 12 00021	IFS	*21					0652
0654	00736	0414 77	LGL	1					0653
0655	00737	0 05 00764	ERA	=*174000					0654
0656	00740	101040	SNZ						0655
0657	00741	0 02 00763	LDA	=*171000					0656
0658	00742	0 05 00762	ERA	=*1000					0657
0659	00743	101040	SNZ						0658
0660	00744	0 02 00761	LDA	=*167000					0659
0661	00745	0 05 00770	ERA	L1					0660
0662	00746	101040	SNZ						0661
0663	00747	0 02 00771	LDA	L2					0662
0664	00750	0 05 00762	ERA	=*1000					0663
0665	00751	101040	SNZ						0664
0666	00752	0 02 00772	LDA	L3					0665
0667	00753	0 05 00773	ERA	L4					0666
0668	00754	0414 76	LGL	2					0667
0669	00755	0 05 00021	ERA	*21	IN ACC. READ NEXT,				0668
0670	00756	0416 72	ALP	6	EXIT ON STOP CODE,				0669
0671	00757	0 04 00021	STA	*21	OTHERWISE TRANSLATE				0670
0672	00760	0 01 00600	JMP	WAIT-2					0671
0673	00761	167000	FIN						0672
	00762	001000							0673
	00763	171000							
	00764	174000							
	00765	000002							
	00766	000221							
	00767	000022							
0674	00770	002000	L1	OCT	2000				0674

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0675	00771	154000	L2	OCT	154000				
0676	00772	157000	L3	OCT	157000				0675
0677	00773	176000	L4	OCT	176000				0676
0678	00774	000000	GCT	0					0677
0679	00775	000223	STPC	OCT	223				0678
0680			*		LOCATION	FUNCTION			0679
0681			*						0680
0682			*		20	CHECKSUM			0681
0683			*		21	ACCUMULATOR			0682
0684			*		22	CHARACTER BUFFER			0683
0685			*		24	BLOCK COUNT			0684
0686			*		25	WORD COUNT			0685
0687			END						0686
ADC1	000420	ADC2	000421	BEGN	000002	FGBL	000124		0687
BL2	000600	ELCT	000446	BUMP	000626	C1	000422		
CHAP	000731	CHEK	000263	CKLA	000213	CKSM	000452		
CCDE	000470	COMT	000052	DATA	000665	DFCD	000207		
EQNE	000371	EASR	000427	ERRP	000431	ENBL	000226		
ENDT	000632	EPNC	000056	ERRP	000630	FADD	000444		
GO	000221	HISP	000043	HOR	000325	L1	000770		
L2	000771	L3	000772	L4	000773	LADD	000445		
LDR	000077	LEAD	000361	LLDP	000070	LOAD	000440		
LGOP	000277	MOVE	000147	N120	000436	N50	000435		
N6	000433	NBL1	000434	NBL2	000437	NDX	000453		
NZZZ	000201	CK	000362	ORUE	000116	P	000373		
PASR	000430	PPPP	000432	PA	000400	PNBR	000401		
PNC	000065	PNCH	000331	PNCT	000451	PON	000461		
RUB	000442	SAVA	000456	SAVR	000457	SAVE	000455		
SCAN	000655	SOCP	000016	SCM	000441	SOTA	000021		
ST	000540	STPC	000775	STPT	000633	SWCH	000704		
TEST	000304	TF35	000033	TPON	000410	TENS	000353		
WAIT	000602	WD	000454	WDCT	000447	WORD	000715		
XCF	000267	XOFF	000442	Z	000443	ZCNT	000450		
ZNZ	000237								
0000 WARNING OR ERROR FLAGS									
DAP-16 MOD 2 REV. D 06-28-71									