



BCS MARK SENSE DRIVER D.15 (12602B KIT)  
(REV. A)

BINARY TAPE	20819-60001
SOURCE TAPE	20819-80001
SOURCE LISTING	20819-90001

## ASMB,R,E,L,T,C

0001  
 D.15 R 000000  
 I.15 R 000002  
 IVERR X 000001  
 DRAC1 X 000002  
 DRAC2 X 000003  
 OUT1 R 000012  
 OUT2 R 000013  
 CLREQ R 000016  
 M.01 R 000024  
 M.03 R 000037  
 M.40 R 000043  
 M.45 R 000046  
 M.20 R 000050  
 LIB.1 R 000072  
 OK R 000103  
 M.30 R 000115  
 M.A R 000117  
 M.80 R 000120  
 M.5P R 000121  
 M.50 R 000123  
 GETUN R 000125  
 STCR1 R 000161  
 BLARY R 000172  
 EXIT R 000201  
 CH2 R 000216  
 BUSY R 000223  
 NODMA R 000226  
 SAVCH R 000230  
 SDNA R 000233  
 DHA.1 R 000255  
 DHA.2 R 000256  
 DHA.3 R 000262  
 DHA.4 R 000263  
 DHA.5 R 000265  
 EXIT1 R 000270  
 H.60 R 000275  
 M.61 R 000277  
 DHA.7 R 000300  
 M.70 R 000315  
 STDAT R 000326  
 PICKF R 000335  
 J.1 R 000336  
 ECC R 000343  
 EOCDB R 000345  
 ECC1 R 000352  
 L.3 R 000363  
 L.1 R 000366  
 FAKT R 000371  
 L.2 R 000401  
 NEXT R 000402  
 M.80 R 000464  
 BIN R 000502  
 TRANS R 000505  
 H.92 R 000507  
 J.2 R 000510



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H.85	R	000513
PACK	R	000523
CASE3	R	000536
INC1	R	000542
INC2	R	000546
CASE0	R	000551
CASE1	R	000554
CASE2	R	000565
WHICH	R	000577
STATR	R	000606
CONFIG	R	000614
NXT	R	000616
RVRSE	R	000631
CLBNA	R	000643
DIA.6	R	000647
A		000600
B		000601
CR		000603
SAVEA	R	000655
SAVEB	R	000656
SAVAX	R	000657
SAVBX	R	000660
SAVEX	R	000661
SAVXX	R	000662
BUF	R	000663
IFLAG	R	000664
CCT	R	000665
EFLAG	R	000666
TEST	R	000667
CHARS	R	000670
ACTCH	R	000671
D2	R	000672
D3	R	000673
D4	R	000674
D6	R	000675
D7	R	000676
D60	R	000677
CRCNT	R	000700
M17	R	000701
M77	R	000702
DMASK	R	000703
SMASK	R	000704
M377	R	000705
M4000	R	000706
MST	R	000707
DMST	R	000710
M4	R	000711
M6	R	000712
M6	R	000713
M9	R	000714
M12	R	000715
M60	R	000716
F5	R	000717
P64	R	000720
P000	R	000721
QUEST	R	000722

EOCCL R 000723  
M3 R 000724  
FMASK R 000725  
CASCI R 000726  
CBINP R 000727  
CSINC R 000730  
SOTCH R 000731  
SMTCH R 000732  
TYPE R 000733  
NOOL R 000734  
CASE R 000735  
HOLD R 000736  
UTBC R 000737  
BUFIN R 000740  
BUFAD R 000741  
BUFFER R 000742  
PFERR R 001062  
HPERR R 001063  
NRERR R 001064  
BLANK R 001065  
CHAN R 001066  
CODNA R 001067  
DPA R 001070  
TABLE R 001071  
\*\* NO ERRORS\*

0001  
0002 00020  
0003  
0004

ASMR,R,B,L,T,C  
NAM D.15  
ENT D.15.1.15  
EXT IGERR,DMAC1,DMAC2

0007\* THIS MODULE OF THE HP-2116 BASIC CONTROL SYSTEM SOFTWARE IS \*  
 0008\* DESIGNED TO OPERATE THE CARD READER. \*

0010\* THE FUNCTION OF THIS DRIVER IS TO INITIATE, CONTINUE, AND \*  
 0011\* COMPLETE A CARD READER OPERATION REQUESTED THRU INPUT/OUTPUT \*  
 0012\* CONTROL. THIS DRIVER PROCESSES - \*

0014\* (1) CLEAR REQUEST - 0000 FUNCTION  
 0015\* (2) READ ASCII - 0100 AND  
 0016\* (3) PACKET BINARY - 0103 SUR-  
 0017\* (4) COLUMN IMAGES - 0101 FUNCTION

0019\* THE .IOC. CALLING SEQUENCE -

0021\* JSB .IOC.  
 0022\* UOI <FUNCTION><UNIT REFERENCE>  
 0023\* \*ERROR RETURN\*  
 0024\* DEF BUFFER  
 0025\* \*COUNT\*

0027\* WHERE COUNT IS  
 0028\* (1) POSITIVE FOR WORD COUNT  
 0029\* (2) NEGATIVE FOR CHARACTER COUNT

0031\* THIS ROUTINE READS HOLLERITH CARDS AND CONVERTS TO ASCII  
 0032\* IF AN ILLEGAL CHARACTER IS DETECTED A ? IS INSERTED AND  
 0033\* AT THE READ COMPLETION THE TRANSMISSION ERROR BIT WILL BE SET

0035\* STATUS RETURNED TO THE EQT IS AS FOLLOWS  
 0036\* BIT FURPCSE  
 0037\* 5 HOPPER EMPTY/STACKER FULL  
 0038\* 4 PICK FAIL  
 0039\* 1 ILLEGAL CHARACTER

0041\* \*\*\*\*\* INITIATOR SECTION \*\*\*\*\*

0043	00000	070000	D.15	KOP	
0044	00001	072655R		STA SAVEA	SAVE EQT ENTRY ADDRESS
0045	00002	076656R		STB SAVEB	SAVE REQUEST WORD 2 ADDRESS
0046	00003	150001		LDA B,I	GET WORD 2 OF REQUEST
0047	00004	012704R		ARI SMASK	ISOLATE FUNCTION.
0048	00005	002923		SZA,RSS	SKIP IF NOT ZERO.
0049	00006	020016R		JMP CLREQ	CLEAR REQUEST.
0050	00007	001222		KAL,RAL	CHECK FOR
0051	00010	002021		SSA,RSS	WRITE REQUEST.
0052	00011	020043R		JMP F.40	CHECK IF DRIVER BUSY.
0053	00012	062674R	0U11	LDA D4	SET A=4.
0054	00013	007400	0U12	CCE	SET R=FWA OF
0055	00014	046656R		ADB SAVEB	CALLING SEQUENCE.
0056	00015	020001X		JMP IOERR	ERROR EXIT.



0058	00016	162655R	CLFEN	LDA	SAVEA,I	GET WORD 1 OF EOT ENTRY.
0059	00017	012702R		AND	M77	ISOLATE CHANNEL NUMBER.
0060	00020	064000		LDB	A	STORE IN B-REGISTER.
0061	00021	003400		CCA		CONFIGURE
0062	00022	010614R		JSE	CNFIG	CLEAR REQUEST
0063	00023	000624R		DEF	M.01	INSTRUCTION.
0064	00024	107700	M.01	CLC	000,C	CLEAR REQUEST.
0065	00025	036655R		ISZ	SAVEA	WORD 2 OF EOT.
0066	00026	062707R		LDA	RST	ZERO OUT STATUS
0067	00027	112655R		AND	SAVEA,I	AND AVAILABILITY.
0068	00030	172655R		STA	SAVEA,I	UPDATE WORD 2 OF EOT.
0069	00031	030655R		ISZ	SAVEA	WORD 3 OF EOT.
0070	00032	002400		CLA		ZERO OUT
0071	00033	172655R		STA	SAVEA,I	TRANSMISSION LOG.
0072	00034	057066R		CPE	CHAN	IF CLEAR IS FOR BUSY CHANNEL
0073	00035	002001		RSS		THEN CLEAR DRIVER AND DMA.
0074	00036	120000R		JMP	D.15,I	RETURN TO .IOC.
0075	00037	072664R	M.03	STA	IFLAG	CLEAR DRIVER BUSY FLAG.
0076	00040	016643R		JSE	CLDMA	CLEAR DMA, IF USED.
0077	00041	073070R		STA	DMA	RESET DMA FLAG.
0078	00042	120000R		JMP	D.15,I	RETURN TO .IOC.



## 0050\* CHECK FOR VALID READ REQUEST

0062	00243	065664R	M.20	LDB IFLAG	CHECK DRIVER BUSY FLAG.
0063	00244	080083		SIZE, KSS	
0064	00245	020050R		JMP M.20	NOT BUSY, CONTINUE.
0065	00246	065756R	M.25	LDB M4000	BUSY OR INOPERABLE, SET B=100000
0066	00247	020115R		JMP M.35	SET A=1 AND EXIT.

0067\*

0068\* SET DMA FLAG, CHANNEL NO. CONFIGURE I/O INSTR.

0069\*

0090	00250	162655R	M.20	LDA SAVEA, I	GET WORD 1 OF EQT.
0091	00251	030400		CLB	SET DMA
0092	00252	002020		SSA	NON-ZERO IF
0093	00253	006004		INB	DMA IS
0094	00254	077073R		STB IMA	TO BE USED.
0095	00255	012702R		AND M77	ISOLATE CHANNEL.
0096	00256	073066R		STA CHAN	SAVE.
0097	00257	062712R		LDA M5	CONFIGURE
0098	00258	067065R		LDB CHAN	I/O
0099	00259	016514R		JSE CNFIG	INSTRUCTIONS
0100	00260	000072R		LEF LIB.1	.
0101	00261	000277R		LEF M.61	.
0102	00262	000275R		LEF M.60	.
0103	00263	000315R		LEF M.70	.
0104	00264	000507R		LEF M.82	.
0105	00265	062655R		LDA SAVEA	EQT ENTRY ADDRESS.
0106	00266	002004		INA	INC. TO WORD #2 OF ENTRY
0107	00267	072662R		STA SAVXX	AND SAVE.

0108\*

0109\* CHECK CARD READER STATUS

0110\*

0111	00272	103500	LIE.1	LIA CR,C	LOAD STATUS.
0112	00273	001723		ALF,RAR	
0113	00274	002020		SSA	IS BIT 12 ON?
0114	00275	025103R		JMF OK	YES, CARD READER OK.
0115	00276	067063R		LDB HPERK	BIT 13=0, HOPPER EMPTY.
0116	00277	000014		SLA	
0117	00278	067064R		LDB NKERR	BIT 13=1, NOT READY.
0118	00279	016506R		JSE STATR	UPDATE STATUS IN EQT.
0119	00280	025046R		JMF M.45	ERROR RETURN.
0120	00281	000400	OK	CLB	SET B=0.
0121	00282	016506R		JSE STATR	CLEAR STATUS.

0122\*

0123\* .....IMPORTANT.....

0124\* ASCII - SWITCH=0, TYPE=NON 0.

0125\* PACKED - SWITCH=NON 0, TYPE=0.

0126\* COL. IM. - SWITCH=NON 0, TYPE=NON 0.

0127\*

0128	00285	162656R		LDA SAVEB, I	WORD 2 OF REQUEST.
0129	00286	012725R		AND FMASK	ISOLATE FUNCTION/SUB-FUNCTION.
0130	00287	052727R		CPA CBINP	FUNCTION/SUB-FUNCTION.
0131	00288	020121R		JMF M.PP	PACKED BINARY.
0132	00289	052730R		CPA CBINC	FUNCTION/SUB-FUNCTION.
0133	00290	020120R		JMP M.BC	COL. IMAGE BINARY.
0134	00291	052726R		CPA CASCI	FUNCTION/SUB-FUNCTION.
0135	00292	020117R		JMF M.A	ASCII.



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0136* ILLEGAL REQUEST, B-REG. = 0 AT THIS POINT.
0137 00115 002404 M.30 CLA,INA SET A TO NON-ZERO
0138 00116 120000R JMP D.15,I EXIT-ILLEGAL REQUEST OR BUSY.
0139 00117 002400 M.A CLA ASCII, SET A=0
0140 00120 007400 M.EC CCB SET R NON 0.
0141 00121 072732R M.EP STA SWITCH ASCII/BINARY SWITCH.
0142 00122 070733R STB TYPE PACKED/COL. IMAGE SWITCH.

0144* INITIALIZE FLAGS AND COUNTERS.

0146 00123 030655R M.EC ISZ SAVEA INC. TO EQT WORD 2.
0147 00124 002400 CLA
0148 00125 072670R GETUM STA CHARS SET UP BUFFERS.
0149 00126 072666R STA EFLAG
0150 00127 072671R STA ACTCH
0151 00130 072735R STA CASE INITIALIZE CASE
0152 00131 072736R STA HOLD
0153 00132 072734R STA NCOL
0154 00133 030656R ISZ SAVEB INCREMENT TO WORD 3-REJECT-
0155 00134 030656R ISZ SAVEB INCREMENT TO WORD 4-BUFFER ADD-
0156 00135 060741R LDB BUFAD SET INTERNAL BUFFER COUNTER
0157 00136 006004 INE TO WORD 1 OF THE
0158 00137 070740R STB BUFIN INTERNAL BUFFER.
0159 00140 060656R LDB SAVEB WORD 4 OF REQUEST.
0160 00141 164001 LDB B,I FOLLOW INDIRECT ADDRESSING
0161 00142 005275 RBL,CLE,SLB,ERB UNTIL BUFFER ADDRESS
0162 00143 020141R JMP *-2 IS FOUND.
0163 00144 030656R ISZ SAVEB INCREMENT TO WORD 5.
0164 00145 162656R LDA SAVEB,I BUFFER LENGTH.
0165 00146 002321 SSA,RSS ELIMINATE LARGE, POSITIVE
0166 00147 012705R ANI M377 BUFFER LENGTHS.
0167 00150 072700R STA CWCNT CHAR/WORD COUNT FLAG.
0168 00151 010577R JSB WHICH ASCII OR BINARY?
0169 00152 020172R JMP BINARY BINARY.
0170 00153 000200 RBL ASCII. DOUBLE BUF. ADR. FOR CHAR
0171 00154 070663R STB BUF STORE CHAR. ADDRESS.
0172 00155 002020 SSA + IF WORDS. MAKE CHARACTERS.
0173 00156 020161R JMP STOR1 - CHARACTERS.
0174 00157 001200 RAL CONVERT WORDS TO CHARACTERS.
0175 00160 003004 CMA,INA MAKE NEGATIVE.
0176 00161 072665R STOR1 STA CCT STORE CHAR. COUNT(-).
0177 00162 002002 SZA 0 CHAR. REQUESTED, GET OUT.
0178 00163 020201R JMP EXIT BYPASS BINARY LOGIC.
0179 00164 000400 CLE SET AVAIL. AND STATUS TO 0
0180 00165 010606R JSB STATA IN EQT.
0181 00166 002400 CLA SET A=0 FOR OP. COMPLETE.
0182 00167 030662R ISZ SAVXX INC. TO TRANS. LOG.
0183 00170 172662R STA SAVXX,I ZERO OUT TRANS. LOG.
0184 00171 120000R JMP D.15,I RETURN TO .IOC.
0185 00172 070663R BINARY STB BUF USER BUF. ADR.
0186 00173 002021 SSA,RSS - IF CHARACTERS. MAKE WORDS.
0187 00174 020177R JMP ++3 + WORDS.
0188 00175 001120 ARS DIV. BY 2 TO MAKE WORDS.
0189 00176 002001 RSS SKIP IF NEG.
0190 00177 003204 CMA,INA MAKE NEG. IF +.

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0191 00200 072665R STA COT STORE WORD COUNT(-).
0192*
0193* CAUTION: BE WARY OF THE E-REGISTER BETWEEN THIS
0194* POINT AND THE END OF THE INITIATOR.
0195*
0196 00201 067070R EXIT LDE DMA BYPASS DMA SET-UP
0197 00202 000103 CLE,SZB,RSS IF DMA NOT SPECIFIED
0198 00203 026270R JMP EXIT1 IN EGT.
0199* ANI SET E-REG TO ZERO.
0200*
0201* CHECK FOR AVAILAELE DMA CHANNEL.
0202*
0203 00204 103100 CLF 00 TURN OFF INTERRUPT SYSTEM.
0204 00205 060002X LDE DMAC1 GET DMA INDICATOR WORD.
0205 00206 000303 CCE,SZB,RSS IS DMA DEFINED?
0206 00207 026226R JMP NODMA NO, SPLIT.
0207 00210 000020 SSE YES, IS CH1 BUSY?
0208 00211 020216R JMP CH2 YES, TRY CH2.
0209 00212 074000 STB A SAVE CHANNEL #.
0210 00213 000225 RBL,ERR SET CH1
0211 00214 070002X STB DMAC1 BUSY.
0212 00215 026233R JMP SDMA
0213 00216 060003X CH2 LDE DMAC2 GET CH2 INDICATOR WORD.
0214 00217 000003 SZB,RSS IS DMAC2 DEFINED?
0215 00220 026223R JMP BUSY NO, REJECT REQUEST.
0216 00221 000021 SSE,RSS IS DMAC2 BUSY?
0217 00222 026230R JMP SAVCH NO, SAVE THIS CHANNEL.
0218 00223 000404 BUSY CLE,INB YES, SET DMA BUSY INDICATOR
0219 00224 102100 STF 00 TURN ON INTERRUPT SYSTEM.
0220 00225 020115R JMP M.30 AND REJECT.
0221 00226 062673R NOIMA LDA D3 SET A=3, B=FWA OF USER
0222 00227 020013R JMP OUT2 CALL AND EXIT.
0223 00230 074000 SAVCH STB A SAVE DMA CHANNEL NO.
0224 00231 000225 RBL,ERR SET DMAC2
0225 00232 070003X STB DMAC2 BUSY.
0226 00233 070070R SDMA STA DMA SAVE DMA CHANNEL NO.
0227 00234 102100 STF 00 TURN ON INTERRUPT SYSTEM.
0228*
0229* CONFIGURE DMA INSTRUCTIONS
0230*
0231 00235 067070R LDE DMA DMA CHANNEL NO.
0232 00236 062711R LDA M4 NO. OF INSTR. TO CONFIGURE.
0233 00237 010614R JSB CNFIG CONFIGURE FOR HIGHER CHANNEL.
0234 00240 000255R IEF DMA.1 .
0235 00241 000647R IEF DMA.6 .
0236 00242 000300R IEF DMA.7 .
0237 00243 001067R IEF CCEMA .
0238 00244 046711R AD2 M4 LOWER DMA CHANNEL.
0239 00245 062712R LDA M5 NO. OF INSTR. TO CONFIGURE.
0240 00246 010614R JSB CNFIG CONFIGURE FOR LOWER CHANNEL.
0241 00247 000256R IEF DMA.2 .
0242 00250 000262R IEF DMA.3 .
0243 00251 000263R IEF DMA.4 .
0244 00252 000265R IEF DMA.5 .
0245 00253 000345R IEF EOCDA .
0246*

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0247\* OUTPUT DMA CONTROL WORD 1.

0248\*

0249	00254	063066R	LDA	CHAN	ASSIGN DMA TO
0250	00255	102600	DMA.1	CTA 0B	PROPER CHANNEL.

0251\*

0252\* OUTPUT INTERNAL BUFFER ADDRESS.

0253\*

0254	00256	106700	DMA.2	CLC 0B	SET DMA TO ACCEPT BUFFER ADDRESS
0255	00257	062741R	LDA	BUFAD	GET INTERNAL BUFFER ADDRESS AND
0256	00258	002304	CCE,	INA	SET E=1 TO INDICATE DMA USED.
0257	00251	032706R	IDR	M4000	SET INPUT FLAG.
0258	00252	102600	DMA.3	CTA 0B	OUTPUT TO DMA.
0259	00253	102700	DMA.4	STC 0B	SET DMA TO ACCEPT WORD COUNT.
0260	00254	052716R	LDA	M80	SET TO -80 AND
0261	00255	102600	DMA.5	CTA 0B	OUTPUT TO DMA.
0262	00256	063067K	LDA	CCDMA	SET CLC IN DMA
0263	00257	173070R	STA	DMA,1	INTERRUPT LOCATION.
0264	00270	030664R	EXIT1	ISZ	IFLAG
0265	00271	060706R	LDE	M4000	SET DRIVER BUSY FLAG.
0266	00272	010606R	JSE	STATK	SET DEVICE BUSY
0267	00273	002440	CLA,	SEZ	IN EOT.
0268	00274	020277R	JMF	M,61	SET A=0. TURN ON DMA ONLY IF E=1
0269	00275	103700	M.00	STC	CR,C
0270	00276	120000R	JMP	D,15.1	START THE CARD READER.
0271	00277	103700	M.01	STC	CR,C
0272	00300	103700	DMA.7	STC	0B,C
0273	00301	120000R	JMP	D,15.1	RETURN TO .IOC.

## 0275\* \*\*\*\*\* CONTINUE SECTION \*\*\*\*\*

0277	00322	000000	1.15	KOP	ENTRY/EXIT.
0278	00323	103100		CLF 08	DISABLE THE INTERRUPT SYSTEM.
0279	00324	072657R		STA SAVAX	SAVE
0280	00325	075660R		STB SAVBX	A,
0281	00326	001520		ERA,ALS	B,
0282	00327	102201		SOC	E,
0283	00310	002004		INA	AND
0284	00311	072661R		STA SAVEX	OVERFLOW
0285	00312	016643R		JSE CLDMA	TURN OFF DMA IF USED.
0286	00313	005002		SZE	DMA USED?
0287	00314	102100		STF 08	YES, ENABLE INTERRUPT SYSTEM.
0288	00315	103500	M.70	LIA CR,C	READ CHAR. INTO A-REGISTER.
0289	00316	001210		RAL,SLA	BIT 15=1?
0290	00317	020326R		JMP STDAT	YES-GOOD DATA,STORE.
0291	00320	001232		RAL,SLA,RAL	BIT 14=1?
0292	00321	020343R		JMP EOC	YES-END OF CARD,EDIT DATA.
0293	00322	002020		SSA	BIT 12=1?
0294	00323	020335R		JMP PICKF	YES, PICK-FAIL.
0295	00324	067063R		LDB HPERR	NO, HOPPER EMPTY.
0296	00325	020336R		JMP J.1	FOLLOW ERROR CHAIN.



## 0298\* STORE CHARACTER IN INTERNAL BUFFER AREA.

0300	00326	006002	STAT	SZE	DMA USED?
0301	00327	020513R		JMP M.85	YES, GET OUT AND WAIT FOR E.O.C.
0302	00330	001300		RAR	RESTORE INPUT CHARACTER.
0303	00331	172740R		STA BUFIN,1	STORE COLUMN AS-IS.
0304	00332	036740R		ISZ BUFIN	INC. BUF.ADR.
0305	00333	030734R		ISZ NCOL	INC. COLUMN COUNTER.
0306	00334	020513R		JMP M.85	EXIT

## 0308\* PICK-FAIL AFTER 3 TRIES. SET ERROR IN EQT.

0310	00335	067062R	PICKF	LDB PFERR	LOAD PICK-FAIL CONSTANT.
0311	00336	010606R	J.1	JSE STATK	MERGE WITH EQT WORD 2.
0312	00337	002400		CLA	
0313	00310	036662R		ISZ SAVXX	WORD 3 OF EQT.
0314	00341	172662R		STA SAVXX,1	SET TRANS. LOG TO ZERO.
0315	00342	020510R		JMP J.2	EXIT..

## 0317\* HOPPER EMPTY/STACKER FULL. SET ERROR IN EQT.

0319	00343	006003	EOC	SZE,RSS	DMA USED?
0320	00344	020352R		JMP EOC1	NO, EDIT DATA.

0321\*

0322\* END OF CARD(DMA)-GET NCOL=# COLS ON CARD

0323\*

0324	00345	102500	ECCDM	LIA PB	LOAD DMA WORD COUNT.
0325	00346	002002		SZA	
0326	00347	032704R		IOR SMASK	SET BITS 14,15.
0327	00350	042677R		ADA DB0	SET NCOL TO # COLUMNS
0328	00351	072734R		STA NCOL	ON CARD.

0330\* END OF CARD-EDIT DATA INTO USER BUFFER.

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0332 00352 102100 EOC1 STF 08 ENABLE INTERRUPT SYSTEM.
0333 00353 066741R LDE BUFAJ SET INTERNAL BUFFER COUNTER
0334 00354 070740R STE BUFIN TO WORD "0".
0335 00355 062733R LDA TYPE PACKED/COL. IMAGE SWITCH.
0336 00356 002003 SZA, RSS PACKED BINARY?
0337 00357 020371R JMP PAKT YES.
0338* AT THIS POINT, MODE IS EITHER ASCII
0339* OR COLUMN IMAGE BINARY.
0340 00360 062665R L.1 LDA CCT NO. CHRS/WDS REQUESTED.
0341 00361 042734R ADA NCOL ADD NO. COLS. ON CARD.
0342 00362 002020 SSA ABS(CCT) GTR NCOL?
0343 00363 020306R JMP L.1 YES, USE NCOL.
0344 00364 062665R LDA CCT NO, USE CCT.
0345 00365 020401R JMP L.2
0346 00366 062734R L.1 LDA NCOL USE NCOL.
0347 00367 000304 CMA, INA MAKE NEGATIVE.
0348 00370 020401R JMP L.2 STORE IN CCT.
0349 00371 000004 PAKT IN8 LOAD WORD 1 OF
0350 00372 160001 LDA B, I INTERNAL BUFFER.
0351 00373 010031R JSB RVRSE REVERSE DATA BITS.
0352 00374 001323 RAR, RAR ISOLATE RECORD
0353 00375 001323 RAR, RAR LENGTH, BITS 11-4
0354 00376 012705R ANI M377 OF COL. 1, AND STORE.
0355 00377 072734R STA NCOL IN NCOL. (NOT USED FOR PACKED)
0356 00400 020360R JMP L.3 FIND MINIMUM.
0357 00401 072665R L.2 STA CCT STORE MINIMUM COUNT.

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0359\* RETURN POINT TO PICK UP NEXT COLUMN.

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0361 00402 030740R NEXT ISZ BUFIN INCREMENT TO NEXT COLUMN.
0362 00403 062665R LDA CCT CHECK IF DESIRED NO. OF CHARS.
0363 00404 002003 SZA, RSS OR WORDS HAVE BEEN PROCESSED.
0364 00405 020464R JMP M.80 YES, EXIT.
0365 00406 162740R LDA BUFIN, I PICK UP NEXT COLUMN.
0366 00407 012703R ANI DMASK MASK OUT STATUS BITS.
0367 00410 010077R JSB WHICH BINARY OR ASCII?
0368 00411 020523R JMP PACK BINARY
0369 00412 030670R ISZ CHARS INCR CHAR PROCESSED COUNT
0370 00413 060714R LDE M9 INITIALIZE NO. OF BITS TO
0371 00414 070667R STE TEST EXAMINE
0372 00415 060670R LDE CHARS SET ACTCH<CHARS ONLY IF THIS
0373 00416 002002 SZA IS A NON-ZERO CHARACTER
0374 00417 070671R STE ACTCH

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0376\* TEST BITS A(2-0). THEY MUST BE 4,2,1,0. CONVERT TO 4,2,6,0

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0378 00420 000010 SLA
0379 00421 042717R ADA P5
0380 00422 001723 ALF, RAR MULT BY 8 GIVING 32,16,48,0
0381 00423 064000 LDE A STORE IN B.
0382 00424 000200 RBL PUT ROW 9 INTO BIT 15
0383 00425 012721R ANI P63B MASK OFF NON FIELD BITS IN A

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0385* * A IS USED TO ACCUMULATE THE TOTAL THE FIELD ROWS
0386* * CONTRIBUTE 0,16,32, OR 48. ROWS 1-9 CONTRIBUTE 1-9.
0387* ALL LEGAL COMBINATIONS ARE FROM 0-63

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0389	00426	003000	CMA	ACTUALLY A IS NEG-1, SO RESULT
0393*				IS IN (-64,-1)
0391	00427	005210	RBL,SLB	ROTATE AND TEST NEXT ROW
0392	00430	042667R	ADA TEST	ADD ITS VALUE IF SET
0393	00431	030667R	ISZ TEST	TEST FOR FINISHED
0394	00432	026427R	JMP *-3	NOT YET
0395	00433	042720R	ADA P64	NOW PUT IN INTERVAL (0,63)
0396	00434	002021	SSA,RSS	TEST FOR LEGAL CHARACTER
0397	00435	020440R	JMP *+3	LEGAL
0398	00436	030666R	ISZ EFLAG	ILLEGAL SO SET ERROR FLAG
0399	00437	062722R	LDA QUEST	USE ? IF ILLEGAL
0400	00440	000065	CLE,ERA	POSITION FOR TABLE LOOKUP
0401	00441	043371R	ADA TABLE	ADD IN-TABLE POINTER
0402	00442	160000	LDA 0,I	LOAD WORD CONTAINING DESIRED CHA
0403	00443	002241	SEZ,RSS	ROTATE IF
0404	00444	001727	ALF,ALF	NECESSARY
0405	00445	012705R	ANI M377	MASK OFF CHARACTER
0405	00446	060663R	LDE BUF	GET BUFFER ADDRESS POSITION
0407	00447	004365	CLE,ERR	
0408	00450	002041	SEZ,RSS	IF E=0,
0409	00451	001737	ALF,SLA,ALF	ROTATE CHAR TO HIGH PART
0410	00452	130001	IOR B,I	OTHERWISE, IOR
0411	00453	170001	STA B,I	AND STORE
0412	00454	030663R	ISZ BUF	INDEX BUFFER POINTER
0413	00455	030665R	ISZ CCT	INCREMENT CHAR PROCESS COUNT
0414	00456	020402R	JMP NEXT	PICK UP NEXT COLUMN
0415*	ALL CHARACTERS PROCESSED AT THIS POINT			
0416	00457	002040	SEZ	ODD NO. OF CHARACTERS?
0417	00460	020464R	JMP M,80	NO, EXIT.
0418	00461	060665R	LDA BLANK	YES, BLANK
0419	00462	130001	IOR B,I	RIGHT HALF
0420	00463	170001	STA B,I	OF LAST WORD.
0421*				
0422*	END OF CARD STATUS CHECK			
0424*	SET STATUS IN EQ1.			
0425	00464	000400	M,80 CLE	SET STATUS=0.
0426	00465	062666R	LDA EFLAG	ILLEGAL CHAR.FLAG.
0427	00466	002002	SZA	ANY?
0428	00467	060672R	LDE D2	YES, SET BAD CHAR. BIT.
0429	00470	016006R	JSE STATR	UPDATE STATUS IN EQ1.
0430*	SET TRANSMISSION LOG IN EQ1.			
0431	00471	060700R	LDE CWCNT	CHAR. OR WORD CNT. FLAG.
0432	00472	062671R	LDA ACTCH	NO. CHAR/WORDS TRANSMITTED.
0433	00473	010577R	JSE WHICH	BINARY?
0434	00474	020502R	JMP BIN	YES, JUMP.
0435	00475	000320	SSE	CHARACTERS REQUESTED?
0436	00476	020505R	JMP TRANS	YES, STORE IN TRANS. LOG.
0437	00477	002004	INA	NO, ROUND UP ON NO. OF
0438	00500	001100	ARS	WORDS TRANSFERRED.
0439	00501	020505R	JMP TRANS	STORE IN TRANS. LOG.
0440	00502	042706R	BIN ADA M4000	SET BIT 15 FOR BINARY
0441	00503	000020	SSE	CHARACTERS REQUESTED?
0442	00504	001000	ALS	YES, MULT NO.WDS.BY 2.
0443	00505	030662R	TRANS ISZ SAVXX	WORD 3 OF EQ1.
0444	00506	172662R	STA SAVXX,I	UPDATE TRANS LOG.

0445	00507	100700	M.82	CLC	W	TURN OFF CHANNEL.
0446	00510	002400	J.2	CLA		
0447	00511	072664R		STA	IFLAG	RESET READY FLAG
0448	00512	073070R		STA	DMA	RESET DMA FLAG.
0449	00513	062661R	M.85	LDA	SAVEX	RESTORE
0450	00514	103101		CLC		E
0451	00515	000036		SLA,ELA		OVERFLOW
0452	00516	102101		STC		A
0453	00517	052657R		LDA	SAVAX	AND
0454	00520	060660R		LDB	SAVBX	B
0455	00521	102100		STP	0R	TURN ON INTERRUPT SYSTEM.
0456	00522	120302R		JMP	1.15.I	AND EXIT.
0457*						
0458*	ROUTINE FOR PACKING 4 COLUMNS OF BINARY DATA INTO 3 16-BIT WORDS.					
0459*						
0460	00523	010631R	PACK	JSE	RVRSE	REVERSE DATA BITS.
0461	00524	060733R		LDB	TYPE	PACKED/COL.IMAGE SWITCH.
0462	00525	006002		SZB		COLUMN IMAGES?
0463	00526	026536R		JMP	CASE3	YES, PUT RIGHT IN USER BUFFER.
0464	00527	060735R		LDB	CASE	LOAD CASE (0,1,2 OR 3).
0465	00530	007007		CMB,INB,SZB,RSS		
0466	00531	020551R		JMP	CASE0	JUMP
0467	00532	000007		INB,SZB,RSS		TO
0468	00533	026554R		JMP	CASE1	THE
0469	00534	000007		INB,SZB,RSS		APPROPRIATE
0470	00535	026565R		JMP	CASE2	CASE.
0471	00536	007400	CASE3	CCB		
0472	00537	070735R		STB	CASE	RESET CASE TO -1.
0473	00540	032736R		IOR	HOLD	MERGE DATA.
0474	00541	172663R		STA	BUF,I	STORE FULL WORD IN BUFFER.
0475	00542	030663R	INC1	ISZ	BUF	INC.USER BUFFER ADDRESS
0476	00543	036565R		ISZ	CCT	INC.NO.WORDS TRANSFERRED.
0477	00544	000000		NOP		
0478	00545	036671R		ISZ	ACTCH	BLANKS NOT IGNORED IN BINARY
0479	00546	030735R	INC2	ISZ	CASE	INC.CASE NO.
0480	00547	000000		NOP		
0481	00550	020402R		JMP	NEXT	PCK UP NEXT COLUMN.
0482	00551	001700	CASE0	ALF		MOVE 12 BITS TO HIGH ORDER.
0483	00552	072736R		STA	HOLD	SAVE
0484	00553	026546R		JMP	INC2	INC. CASE ONLY.
0485	00554	001727	CASE1	ALF,ALF		MOVE BITS 11-8 TO LOW ORDER.
0486	00555	064000		LDB	A	SAVE.
0487	00556	012701R		AND	M17	ISOLATE 4 LOW BITS.
0488	00557	032736R		IOR	HOLD	MERGE DATA.
0489	00560	172663R		STA	BUF,I	STORE FULL WORD IN BUFFER.
0490	00561	060001		LDA	B	RELOAD ROTATED COLUMN.
0491	00562	012725R		AND	FMASK	ISOLATE 8 HIGH BITS.
0492	00563	072736R		STA	HOLD	SAVE
0493	00564	020542R		JMP	INC1	INCREMENT COUNTERS.
0494	00565	001727	CASE2	ALF,ALF		MOVE BITS 11-4
0495	00566	001700		ALF		TO LOW ORDER.
0496	00567	064000		LDB	A	SAVE
0497	00570	012705R		AND	M377	ISOLATE 8 LOW BITS
0498	00571	032736R		IOR	HOLD	MERGE DATA.
0499	00572	172663R		STA	BUF,I	STORE FULL WORD IN BUFFER.
0500	00573	060001		LDA	B	RELOAD ROTATED COLUMN.





0501	00574	012704R	AND SHASK	ISOLATE 4 HIGH BITS.
0502	00575	072736R	STA HOLD	SAVE.
0503	00576	020542R	JMP INCI	INCREMENT COUNTERS.

0505\*

0506\* DECISION ROUTINE TO TEST FOR BINARY OR ASCII INPUT.

0507\* NORMAL RETURN FOR BINARY, NORMAL+1 RETURN FOR ASCII.

0508\*

0509 00577 000000 WHICH NOP

0510 00600 070731R STB SCTCH SAVE B-REGISTER.

0511 00601 060732R LDB SWITCH LOAD ASCII/BINARY SWITCH

0512 00602 000003 SZB, RSS SKIP IF BINARY(NON-ZERO)

0513 00603 030577R ISZ WHICH INC. RETURN ADDRESS

0514 00604 060731R LDB SCTCH RESTORE B REGISTER.

0515 00605 120577R JMF WHICH, I RETURN.

0516\*

0517\* ROUTINE TO UPDATE WORD 2 IN EQT. B-REG. CONTAINS

0518\* AVAILABILITY(BITS 15,14) AND STATUS(BITS 7-0).

0519\* BITS 13-8 IN B-REG. MUST BE OFF.

0520\*

0521 00606 000000 STATR NOP

0522 00607 162662R LDA SAVXX, I LOAD WORD 2 FROM EQT.

0523 00610 012707R AND MST MASK OUT STATUS.

0524 00611 030001 IOR B MERGE NEW STATUS.

0525 00612 172662R STA SAVXX, I UPDATE.

0526 00613 120606R JMF STATR, I RETURN.

0527\*

0528\* ROUTINE TO SET SELECT CODES IN THE I/O INSTRUCTIONS

0529\* AT CALL TIME.

0530\*

0531 00614 000000 CNFIG NOP

0532 00615 072731R STA SCTCH NO. OF INSTR. TO CONFIGURE.

0533 00616 062614R NXT LDA CNFIG ADR. OF FIRST LIST ELEMENT.

0534 00617 032706R IOR M4000 SET INDIRECT BIT.

0535 00620 072606R STA STATR ADR. OF I/O INSTR.

0536 00621 062725R LDA FMASK MASK OUT OLD SELECT CODE

0537 00622 112606R AND STATR, I IN I/O INSTRUCTION.

0538 00623 030001 IOR B ADD NEW SELECT CODE.

0539 00624 172606R STA STATR, I STORE INSTRUCTION.

0540 00625 030614R ISZ CNFIG INC. TO NEXT LABEL.

0541 00626 030731R ISZ SCTCH INC. NO. OF INSTR. CONFIGURED.

0542 00627 026616R JMP NXT PICK UP NEXT INSTRUCTION.

0543 00630 120614R JMF CNFIG, I RETURN.

0544\*

0545\* ROUTINE TO REVERSE THE ORDER OF BITS 11-0 IN THE A-REGISTER.

0546\*

0547 00631 000000 RVFSE NOP

0548 00632 060715R LDB M12 -12(DEC).

0549 00633 070731R STB SCTCH # BITS TO BE REVERSED.

0550 00634 000400 CLB ZERO B-REG.

0551 00635 001503 ERA TRANSFER 1 BIT

0552 00636 005600 ELB FROM A TO B.

0553 00637 030731R ISZ SCTCH FINISHED?

0554 00640 020635R JMF \*-3 NO, MOVE ANOTHER BIT.

0555 00641 074000 STB A YES, RETURN DATA TO A-REG.

0556 00642 120631R JMF RVRSE, I AND RETURN.

0557\*

0558\* ROUTINE TO CLEAR DMA IF USED.

0559\*

0560 00643 000000 CLIMA NOP

0561	00644	067070R		LDE DMA	LOAD DMA CHANNEL NO.
0562	00645	000003		SZE,RSS	WAS DMA USED?
0563	00646	126643R		JMP CLDMA,I	NO, RETURN.
0564	00647	102120	DMA.6	STF #8	CLEAR DMA.
0565	00650	056675R		CPE D6	CH1 USED?
0566	00651	070002X		STB DMAC1	YES, CLEAR CH1 BUSY FLAG.
0567	00652	056676R		CPE D7	CH2 USED?
0568	00653	070003X		STB DMAC2	YES, CLEAR CH2 BUSY FLAG.
0569	00654	126643R		JMP CLDMA,I	RETURN.

