

MICROPROGRAM LISTING

30115A

NINE-TRACK (NRZI-PE) MAGNETIC TAPE SUBSYSTEM

(FOR THE HP 3000 COMPUTER SYSTEM)

Printed-Circuit Assembly

30215-60006, Series: A-1401

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* LISTING DATED 23 OCT 1973
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*
* CONSTANTS USED FOR TIMING CONTROL IN THE MAG. TAPE CONTROLLER
*
*****
**** **DATA XFER TIMING DELAYS**
T1 EQU #75 1 CHARACTER TIME(L)
T22 EQU #215 2.2 CHARACTER GATE FOR READING(L)
T4 EQU 1 4 CHARACTER SPACING FOR CRCC & LRCC(H)
T62 EQU #306 6.2 CHARACTER TIME(L)-SHOULD BE DOUBLED
T8 EQU 2 8 CHARACTER SPACING FOR FILE MARK(4)
T12 EQU 3 12 CHARACTER SPACING FOR BACKSPACING(H)
**** **START/STOP DELAYS OF CAPSTAN**
TCOST EQU #356 COAST DELAY FOR 103 USEC.
TSTRT EQU #113 START DELAY FOR .2 INCH(H)
TWSTR EQU #133 START DELAY FOR WRITE
TSTOP EQU #113 STOP DELAY FOR .2 INCH(H)
TIRG EQU #113 (START*STOP) COAST I/R DELAY FOR .4 INCH
(H)
**** **DELAYS RELATING TO R/W HEADS**
T145 EQU #35 MIN. & MAX. HEAD SPACING(H)
T155 EQU #37 DELAY AT FULL SPEED(H)
T15 EQU #74 NOM. HEAD SPACING DELAY AT HALF SPEED(H)
TS155 EQU #152 (MAX. HEAD + START) COAST DELAY(H)
TGAP EQU #372 DELAY FOR 1.25 INCH-(1/3 OF GAP) (H)
****
FM EQU #23 FILE/MARK CODE FOR 800 BPI
*****
*
* COMMAND CODES FOR THE CONTROLLER
*
*****
SEL EQU 0 SELECT THE UNIT
RDR EQU #6 READ RECORD
RDC EQU #16 READ RECORD WITH CRCC(800 BPI ONLY)
FSR EQU #7 FORWARD SPACE RECORD
FSF EQU #17 FORWARD SPACE FILE
WRR EQU #4 WRITE RECORD
WRZ EQU #14 WRITE RECORD WITH 0 PARITY(800 BPI ONLY)
WFM EQU #15 WRITE FILE-MARK
GAP EQU #5 WRITE A GAP
BSR EQU #12 BACK-SPACE RECORD
BSF EQU #13 BACK SPACE FILE
REW EQU #10 REWIND THE TAPE UNIT
RST EQU #11 REWIND & RESET
RDREV EQU #2 READ-REV. SUB GROUP
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SKIP

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- NOTES:
1. FILE-MARK AND TAPE MARK ARE SYNONYMOUS.
 2. CLEAR AND RESET ARE SYNONYMOUS.
 3. RO:R5 REFER TO CONTROLLER PROCESSOR REGISTERS RGO:RG5.
 4. SEE TEXT FOR COMPLETE COPY OF CODING SHEET.

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*
*           REFERENCE CODING SHEET FOR THE CONTROLLER PROCESSOR
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*****
* OP * 0 1 * 2 3 4 * 5 6 7 * 8 9 10 * 11 12 13 * 14 15 16 * 17 18 19*
*****
*IOC * 0 0 * 0 1 0 *DFC*U/L *   DEST/SOURCE *   *FWO*I/O*REG SELECT*
*ADD * 0 1 * 0 0 1 *DFC*U/L * CTM 000 * R2B 00* RL1 001 *FWO* CTA 00 *
*AND * 1 1 * 1 1 0 *   *   * R5M 001 * R1B 01* RR1 010 *   * W5A 01 *
*IOR * 1 1 * 0 1 1 *   *   * R4M 010 * R0B 10* RL4 011 *   * W4A 10 *
*XOR * 1 1 * 0 0 1 *   *   * R3M 011 * R3B 11* PASS 100 *   * W3A 11 * SPFC
*SUR * 0 0 * 1 1 0 *   *   * R2M 100 *   * SL1 101 *   *   *
*CMA * 1 0 * 0 0 0 *   *   * R1M 101 *   * SR1 110 *   *   *
*CMH * 1 0 * 1 0 1 *   *   * R0M 110 *   * SL4 111 *   *   *
*PSA * 1 1 * 1 1 1 *   *   * EXM 111 *   *   *   *
*PSR * 1 1 * 0 1 0 *   *   *   *   *   *   *
*****
*ADI * 0 0 * 0 0 1 *DFC*U/L *   *   *
*ANI * 1 0 * 1 1 0 *   *   *   *   * IMMEDIATE
*IOI * 1 0 * 0 1 1 *   *   *   *   * OPERAND
*XOI * 1 0 * 0 0 1 *   *   *   *   * (ONES COMPLEMENT)
*PSI * 1 0 * 1 1 1 *   *   *   *   *
*****
*OTI * 0 0 * 1 1 1 *DFC*U/L *   DESTINATION *   IMMEDIATE OPERAND
*****
*JMP * 0 0 * 0 0 0 *DFC* * * *   BRANCH ADDRESS
*JMX * 1 0 * 0 1 0 *   * * * *
*JMZ * 0 0 * 0 1 1 *   *RCS* *
*JSZ * 1 0 * 1 0 0 *   *RCS* *
*CAL * 0 1 * 1 1 0 *   * * * *
*CAX * 0 1 * 1 1 1 *   * * * *
*CMZ * 0 0 * 1 0 1 *   *RCS* *
*CXZ * 0 1 * 0 1 1 *   *RCS* *
*JOV * 1 1 * 0 0 0 *   *RCS* *
*RMN * 0 0 * 1 0 0 *   *RCS* *
*RXN * 0 1 * 1 0 0 *   *RCS* *
*RTN * 0 1 * 1 0 1 *   * * * *
*JXZ * 0 1 * 0 1 0 *   *RCS* *
*****
*RFS * 1 1 * 1 0 1 *DEC* FLAG *   BRANCH
*JFS * 1 1 * 1 0 0 *   * SELECT *   ADDRESS
*****
* RCS = 0, REVERSE CONDITION SENSE
* I/O = 0, OUTPUT
* FWO = 0, BYTE OPERATION
* DEC = 0, DECREMENT COUNTER
* U/L = 0, LOWER HALF
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SKP

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*****  
*  
*   CONTROLLER PROCESSOR SIGNALS(CONNECTOR J2)  
*  
*****  
*  
* 1  GND      GROUND  
* 2  GND      GROUND  
* 48 RAR11    ROM ADDRESS BIT 11(LSH)  
* 47 RAR10    ROM ADDRESS BIT 10  
* 46 RAR9     ROM ADDRESS BIT 9  
* 45 RAR8     ROM ADDRESS BIT 8  
* 44 RAR7     ROM ADDRESS BIT 7  
* 43 RAR6     ROM ADDRESS BIT 6  
* 42 RAR5     ROM ADDRESS BIT 5  
* 41 RAR4     ROM ADDRESS BIT 4  
* 40 RAR3     ROM ADDRESS BIT 3  
* 39 RAR2     ROM ADDRESS BIT 2  
* 38 RAR1     ROM ADDRESS BIT 1  
* 37 RAR0     ROM ADDRESS BIT 0(MSB)  
* 33 ROM19    ROM OUTPUT BIT 19(LSB)  
* 31 ROM18    ROM OUTPUT BIT 18  
* 29 ROM17    ROM OUTPUT BIT 17  
* 27 ROM16    ROM OUTPUT BIT 16  
* 25 ROM15    ROM OUTPUT BIT 15  
* 23 ROM14    ROM OUTPUT BIT 14  
* 21 ROM13    ROM OUTPUT BIT 13  
* 19 ROM12    ROM OUTPUT BIT 12  
* 17 ROM11    ROM OUTPUT BIT 11  
* 15 ROM10    ROM OUTPUT BIT 10  
* 13 ROM9     ROM OUTPUT BIT 9  
* 11 ROM8     ROM OUTPUT BIT 8  
* 9  ROM7     ROM OUTPUT BIT 7  
* 7  ROM6     ROM OUTPUT BIT 6  
* 5  ROM5     ROM OUTPUT BIT 5  
* 3  ROM4     ROM OUTPUT BIT 4  
* 34 ROM3     ROM OUTPUT BIT 3  
* 32 ROM2     ROM OUTPUT BIT 2  
* 30 ROM1     ROM OUTPUT BIT 1  
* 28 ROM0     ROM OUTPUT BIT 0(MSB)  
* 36 ENB      ROM ENABLE  
* 49 GND      GROUND  
* 50 GND      GROUND  
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SKIP
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154 *****
155 *
156 *      CONTROLLER PROCESSOR SIGNALS (CONNECTOR J3)
157 *
158 *****
159 *
160 * 47 M0      MIO BUS HIT 0 (MSB)
161 * 45 M1      MIO BUS HIT 1
162 * 43 M2      MIO BUS HIT 2
163 * 41 M3      MIO BUS HIT 3
164 * 42 M4      MIO BUS HIT 4
165 * 44 M5      MIO BUS HIT 5
166 * 46 M6      MIO BUS HIT 6
167 * 48 M7      MIO BUS HIT 7
168 * 40 M8      MIO BUS HIT 8
169 * 38 M9      MIO BUS HIT 9
170 * 36 M10     MIO BUS HIT 10
171 * 34 M11     MIO BUS HIT 11
172 * 31 M12     MIO BUS HIT 12
173 * 33 M13     MIO BUS HIT 13
174 * 35 M14     MIO BUS HIT 14
175 * 37 M15     MIO BUS HIT 15 (LSB)
176 * 8  IS      INPUT STROBE
177 * 10 LOS     LOWER OUTPUT STROBE
178 * 7  UOS     UPPER OUTPUT STROBE
179 * 18 ROR7    DESTINATION BIT 7 (MSB)
180 * 6  ROR9    DESTINATION BIT 9
181 * 20 ROR10   DESTINATION BIT 10
182 * 15 ROR8    DESTINATION BIT 8
183 * 17 ROR11   DESTINATION BIT 11 (LSB)
184 * 1  GND     GROUND
185 * 2  CLR     CLEAR RAR TO 0
186 * 3  T0      CLOCK PHASE 0
187 * 4  T3      CLOCK PHASE 3
188 * 5  T2      CLOCK PHASE 2
189 * 39 T1      CLOCK PHASE 1
190 * 32 EXT SEL EXTERNAL SELECT
191 * 49 RUN     FROM MAINTENANCE PANEL
192 * 50 GND     GROUND
193 *
194 *****
195 SKP

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*****  
*  
*      DEVICE CABLE CONNECTIONS (CONNECTOR J1)  
*  
*****  
*      J1      VERT. RD. C/S      NAME OF SIGNAL  
*      (SIG/GND)  
*  
*****  
* 33/27 L/10      WRITE DATA 0-WD0(MSB)  
* 34/27 M/11      WRITE DATA 1-WD1  
* 39/27 N/12      WRITE DATA 2-WD2  
* 40/27 P/13      WRITE DATA 3-WD3  
* 37/28 R/14      WRITE DATA 4-WD4  
* 38/28 S/15      WRITE DATA 5-WD5  
* 35/28 T/16      WRITE DATA 6-WD6  
* 36/28 U/17      WRITE DATA 7-WD7(LSB)  
* 10/28 K/9       WRITE DATA PARITY-WDP  
* 11/28 F/6       WRITE STATUS-SW  
* 30/27 J/8       WRITE CLOCK-WC  
* 22/27 H/7       WRITE PESET-WPS  
* 47/50          L/10      READ DATA 0-RD0(MSB)  
* 48/50          M/11      READ DATA 1-RD1  
* 45/50          N/12      READ DATA 2-RD2  
* 46/50          P/13      READ DATA 3-RD3  
* 43/49          R/14      READ DATA 4-RD4  
* 44/49          S/15      READ DATA 5-RD5  
* 41/49          T/16      READ DATA 6-RD6  
* 42/49          U/17      READ DATA 7-RD7(LSB)  
* 9/25           K/9       READ DATA PARITY-RDP  
* 8/23           J/8       READ CLOCK-RC  
* 7/23           BB/24     END OF BLOCK-EOB  
* 12/26          V/18     800/1600 BPI STATUS-SD16  
* 31/26          X/20     MULTIPLE TRACK IN ERROR-MTE  
* 32/26          Y/21     TAPE MARK-TM  
* 2/26           Z/22     SINGLE TRACK IN ERROR-STE  
* 29/26          AA/23    IDENTIFICATION BURST-IOB  
* 3/23           P/13     SELECT UNIT 0-CS0  
* 4/23           N/12     SELECT UNIT 1-CS1  
* 5/24           M/11     SELECT UNIT 2-CS2  
* 6/24           L/10     SELECT UNIT 3-CS3  
* 13/23          B/2      LOAD POINT(BOT)-SLP  
* 16/23          D/4      END OF TAPE(EOT)-SET  
* 14/24          E/5      READY-SR  
* 15/24          F/6      FILE PROTECT-SFP  
* 17/24          T/16     FORWARD-CF  
* 21/24          R/14     REWIND-CRW  
* 18/25          U/17     REVERSE-CR  
* 20/25          S/15     OFF LINE-CL  
* 19/25          W/19     SFT WRITE-WSW  
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*  
*      SKP  
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*****
*
*           DESTINATION CODES FOR OUTPUT FUNCTIONS
*
*****
*
*   D00      7970                      RD. CLK. F/F
*   D01      STATUS                    IS NOT CHANGED
*   D02      XFACE                      IN D00,D01 & D02
*   D03      WRITE REGISTER
*   D04      7970 + RESET RD. CLK.F/F
*   D05      STATUS + RESET RD. CLK. F/F
*   D06      XFACE + RESET RD. CLK. F/F
*   D07      DATA-IN REGISTER
*   D1X      RESET CMD. ENB. F/F        X IS ANY OCTAL DIGIT-
*   D2X      SET SERV. REQ. F/F        THESE 3 PERFORM ANY OF
*   D3X      SET SERV. REQ. & RST. CMD. ENB. F/F  ABOVE + D1X,D2X & D3X
*
*****
*
*           SOURCE CODES FOR INPUT FUNCTIONS
*
*****
*
*   D20+24   UNIT NO.
*   D11+15   LOW BYTE OF DATA-OUT
*   D21+25   HIGH BYTE OF DATA-OUT
*   D31+35   FULL WORD OF DATA-OUT
*   D12+16   8-BITS OF READ DATA (RD0 THRU RD7)
*   D22+D26  8-BITS OF STATUS
*   D32+36   RD. DATA & STATUS
*
*****
*
*           NAMES OF THE EXTERNAL FLAGS ARE AS FOLLOWS
*
*****
*
*   29 F00    FLAG0
*   30 F01    FLAG1
*   27 F02    FLAG2
*   28 F03    LOAD POINT(BOT)
*   25 F04    800/1600 BPI(800=0)
*   26 F05    WRITE STATUS
*   23 F06    RD/WRT PARITY(REV. SENSE FOR WRITE PARITY)
*   24 F07    END OF BLOCK F/F(USED IN 1600 BPI ONLY)
*   9  F10    READ CLOCK
*   22 F11    TAPE ERROR(REV. SENSE)
*   12 F12    OUT-XFER
*   21 F13    READY STATUS
*   11 F14    DATA F/F
*   14 F15    INTERRUPT CONDITION
*   13 F16    IN-XFER
*   16 F17    CMD. ENR.(REV. SENSE)
*
*****
*
*           S*P

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31E
31F
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31R
31G
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32F
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33E
33F
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33R
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34R
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*****
*
* THE FOLLOWING ARE IMMEDIATE OPERAND/REGISTER BIT
* DEFINITIONS USED WITH OTI/IOC OP-CODES. CHECK
* DESTINATION/SOURCE CODE FIELD(PREVIOUS PAGE)
* & DETERMINE WHAT BIT CONFIGURATION IS USED.
*
*****
* MIO BUS BITS
*****
* 0 * 1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 * 9 * 10 * 11 * 12 * 13 * 14 * 15 *
*****
* -7970- (OUTPUT) (UPH) * (LWH)
*****
* RST * * SET*SET * * SET*SET *RST * *RST * SET* SET* RST* SET* SET* SET*
* DATA* * * WRT*WRT * * * REW*OFF *REW * * *FWD * FWD* REV* WRT* WRT*EVEN* ODD*
* F/F* * STB*RST * * *LINE*%0.L* *REV * * * * * *
*****
* -STATUS- (OUTPUT) (UPH) * (LWH)
*****
* RST * * * *SET *SET *SET *SET *EVEN* ODD* SET*TAPE*TIM-*TAPE* SET* CLR*
* DATA* * * * *UNIT*UNIT*UNIT*UNIT*BYTE*BYTE* EOF*EWR-* ING*RUN-*REJ *STA *
* F/F* * * *0,2 *0,1 *1,3 *2,3 * CNT* CNT* * OR*FRR *AWAY* ECT* TUS*
*****
* -XFACE- (OUTPUT) (UPH) * (LWH)
*****
* RST*SET* SET* RST* SET* RST* CLR* CLK* RST* SET* RST* SET* SUP* ENR* SET* SET*
* DATA*UNT* F0 * F0 * DEV*UNIT* BUS* INT* F2 * F2 * F1 * F1 * PAR* PAR* OUT* IN *
* F/F*INT* * * END* INT*LOGC* F/F* * * * * BIT* BIT*MODE*MODE*
*****
* -STATUS/RD DATA- (INPUT) (UPH) * (LWH)
*****
* ID * TP*TAPE* INT* SIO*FILE* * * R * R * R * R * K * R * K * K *
* BUR*MRK* ERR*PEND* OK *PROT* * * * D * D * D * D * D * D * D * D *
* -ST * * -OR*-ING* * * * * 0* 1* 2* 3* 4* 5* 6* 7*
*****
* -UNIT NO.- (INPUT, HIGH BYTE ONLY)
*****
* UNIT*UNIT*UNIT*UNIT* SFI* SEL* SEL* SEL*
* --- *---* * *UNIT*UNIT*UNIT*UNIT*
* MSB *LSB* MSB* LSB* 0,2* 0,1* 1,3* 2,3*
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SKIP
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357 0000 00 111 110 100 110 001 100
358 0001 11 001 110 001 110 011 111
359 0002 00 111 110 001 000 010 110
360 0003 10 111 111 101 100 000 000
361 0004 10 111 110 001 110 110 100
362 0005 00 111 000 000 001 000 001
363 0006 01 010 001 000 000 000 110
364 0007 00 111 100 011 010 100 101
365 0010 00 111 110 000 010 000 001
366 0011 00 111 110 001 000 010 100
367 0012 00 000 111 001 011 001 100
368 0013 10 111 101 011 111 001 100
369 0014 10 111 110 011 101 110 111
370 0015 10 111 100 011 101 110 111
371 0016 00 010 111 000 010 011 010
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380 0017 11 100 111 100 011 000 011
381 0020 11 100 110 100 011 000 011
382 0021 11 100 111 110 000 110 010
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388 0022 11 111 110 101 101 111 011
389 0023 11 111 110 101 101 111 011
390 0024 11 111 110 101 101 111 011
391 0025 00 010 110 000 110 000 010
392 0026 00 111 100 100 110 000 001
393 0027 00 010 111 100 110 011 011
394 0030 11 010 101 101 110 001 111
395 0031 00 011 101 000 000 011 101
396 0032 00 010 111 000 010 001 100
397 0033 00 010 111 000 110 000 100
398 0034 00 000 111 000 000 000 111
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*****
*
* POWER ON, I/O RESET OR RESET FROM THE MAINTENANCE
* PANEL FORCES THE CONTROLLER AT THE ADDRESS 0 (START).
*
*****
START OTI UPH D11 #163 RST DATA & CMD ENB F/F-SELECT UNIT #0
XOR CTM K3B R3A REGISTER & THE COUNTER
OTI UPH D02 #351 RST. F0,RUS-LOGIC & UNIT INT F/F
PSI UPH ROM #377 R0(0:7):=ALL ONFS
WAIT PSI UPH CTM TSTOP CNTR := STOP DELAY
OTI LWH D00 #276 DEC RESET FWD. REV. & SET ODD PARITY MODE
JXZ RCS * DEC TIME OUT THE COUNTER
CONT OTI LWH D06 #132 RST. F1,F2:ENABLE PARITY & IN-MODE
OTI UPH D00 #176 RST DATA F/F, REWIND & OFF-LINE
OTI UPH D02 #353 RESET F0 & UNIT INT. F/F
JMP PTCH1 GOTO PTCH1 TO LOOK FOR END INTERRUPT
CONT1 PSI LWH R1M #63 0011001100110011
PSI UPH R5M #210 R5:=(SELECT THIS UNIT NOW)
PSI LWH R5M #210 1000100010001000
IOC INP R4I D20 GET PRESENT UNIT NO. IN R4
*****
*
* HERE THE CONTROLLER WAITS FOR A 'CONTROL-ORDER' FROM THE MULTIPLEXOR.
* IF NO CONTROL COMES, IT GOES TO 'SCAN' TO LOOK FOR THE LATEST
* DRIVE-READY STATUS, THE CURRENT SELECTED UNIT INFORMATION
* IS STORED IN THE REGISTER R4.
*
*****
MAIN JFS F16 REJECT REJECT IF IN-XFER
JFS F12 REJECT OR OUT-XFER = 1
JFS F17 SCAN GOTO SCAN IF NO CONTROL ORDER
*****
*
* ENTRY AT 'BEGIN' ONLY IF A CONTROL ORDER IS ISSUED FIRST
*
*****
BEGIN PSA R4M R4A RL4 ROTATE R4 LEFT BY 4
PSA R4M R4A RL4 ADJUST PROPER CODE FOR
PSA R4M R4A RL4 LAST UNIT SELECTED AND
IOC OUT UPH R4I D01 OUTPUT TO SELECT IT
BEG2 OTI LWH D11 #176 RST. STATUS, CMD. ENH. & BYTE CNT.
IOC INP R3I D31 GET COMMAND WORD IN R3
PSB LWH ROM R3B PASS LOW HALF OF R3 IN R0
JMZ RCS DECOD GOTO DECOD IF NOT A SELECT COMMAND
IOC INP UPH R2I D20 SELECT THE PROPER
IOC OUT UPH R2I D21 UNIT & SET SERV. REQ.
JMP CONT GOTO CONT
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SKP

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406 0035 11 100 110 110 000 011 111
407 0036 00 000 111 000 011 000 011
408 0037 10 110 101 111 100 001 111
409 0040 00 011 101 000 011 000 011
410 0041 10 110 101 001 111 111 001
411 0042 10 001 101 110 011 111 001
412 0043 00 011 111 000 010 111 100
413 0044 10 001 101 110 011 111 011
414 0045 00 011 111 000 011 001 101
415 0046 10 110 101 111 111 110 111
416 0047 00 011 111 000 011 000 011
417 0050 10 001 101 110 011 111 101
418 0051 00 011 111 000 010 100 001
419 0052 11 100 101 010 000 101 100
420 0053 00 000 111 000 000 101 101
421 0054 01 110 111 000 001 000 100
422 0055 00 111 111 000 000 000 100
423 0056 10 110 101 111 111 111 110
424 0057 00 011 111 000 000 000 111
425 0060 00 111 110 000 000 000 010
426 0061 00 000 111 000 000 000 111
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435 0062 00 010 111 001 010 001 011
436 0063 00 000 111 001 011 010 111
437 0064 00 011 101 000 000 001 111
438 0065 00 010 110 000 110 000 101
439 0066 10 111 100 001 111 101 111
440 0067 11 010 111 010 100 111 111
441 0070 11 111 110 011 100 110 111
442 0071 01 010 001 000 000 111 001
443 0072 11 100 110 110 000 111 111
444 0073 11 110 111 111 010 000 111
445 0074 00 011 111 000 000 001 111
446 0075 11 001 111 101 010 000 111
447 0076 00 000 111 000 000 001 111
448 0077 11 110 111 111 010 000 111
449 0100 00 011 101 000 000 001 111
450 0101 11 001 111 101 010 000 111
451 0102 00 111 110 001 001 000 000
452 0103 00 000 111 000 011 000 111
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* THE GIVEN COMMAND IS DECODED HERE TO LOOK FOR WHICH SUBGROUP IT BELONGS TO.
*
*****
DECODE JFS F13 **2 REJECT THE COMMAND IF
JMP REJECT TAPE UNIT IS NOT READY
ANI LWH R3B #360 LOOK FOR ILLEGAL BITS IN R3
JMZ RCS REJECT REJECT THE COMMAND IF ILLEGAL BITS IN R3
ANI LWH R2M R3B RDP MASK OFF SUB-GROUP CMD. CODE IN R2
XOI LWH R2B RDR GOTO RDFWD IF READ
JMZ RDFWD FORWARD COMMAND
XOI LWH R2B WRR GOTO WRFWO IF
JMZ WRFWO WRITE COMMAND
ANI LWH R3B #10 GOTO REJECT IF COMMAND IS
JMZ REJECT ANY OF THREE REMAINING ILLEGAL CODES
XOI LWH R2B RDRFV GOTO RDBKD IF READ
XOI RDBKD REVERSE TYPE COMMAND
JFS F05 **2 SKIP NEXT IF WRT. STATUS=1
JMP **2 SKIP NEXT INSTRUCTION
CAL GOFWD SUB. CALL TO AVOID NOISE IN GAP
OTI UPH D20 #373 SET REWIND & SERV. REQ
ANI LWH R3B #1 LOOK FOR REW OR RST
JMZ CONT GOTO CONT IF 'REW' COMMAND
OTI UPH D00 #375 SET OFF-LINE F/F & GOTO
JMP CONT CONT IF 'RST' COMMAND
*****
*
* 'SCAN' CONTINUOUSLY SELECTS A UNIT & LOOKS FOR ITS READY STATUS. THIS IS
* DONE ONLY IF CONTROLLER IS IN IDLE STATE(NO SIO GOING ON). UNIT INT-
* -ERRUPT F/F IS SET WHEN A UNIT * PREVIOUSLY 'NOT-READY' BECOMES
* READY. AN INTERRUPT IS GENERATED TO TELL THE CPU ABOUT IT.
*
*****
SCAN IOC INP R3I D22 UPH GET STATUS BYTE IN R3
JMP PTCH2 GOTO PATCH THE PROGRAM
JMZ RCS MAIN GOTO MAIN IF ALREADY IN SIO ROUTINE
SCAN0 IOC OUT UPH R1I D01 SELECT UNIT FROM R1
PSI LWH CTM #20 PRESET CNTR TO 16 CYCLE DELAY
PSB R1M R1B RL1 R1 & R5 ARE ROTATED
PSA R5M R5A RL1 LEFT BY ONE BIT
JXZ RCS DEC * TIME OUT THE COUNTER
JFS F13 READY GOTO READY IF F13=1
AND UPH R0B R5A WAS THIS UNIT READY BEFORE ?
JMZ MAIN NOT RDY BEFORE; NOT RDY NOW-GOTO MAIN
XOR UPH R0M R0B R5A RDY BEFORE; NOT RDY NOW-MODIFY R0
JMP MAIN GOTO MAIN
READY AND UPH R0B R5A WAS THIS UNIT READY BEFORE ?
JMZ RCS MAIN RDY BEFORE; RDY NOW-GOTO MAIN
XOR UPH R0M R0B R5A NOT RDY BEFORE; RDY NOW-INT. CASE
OTI UPH D02 #277 SET UNIT INTERRUPT F/F
JMP INT2 GOTO INT2
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SKIP

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463 0104 10 111 110 001 110 010 101 GOFWD PSI UPH CTM TS155 CNTR:=.155 INCH + START DELAY
464 0105 00 111 100 000 000 100 000 OTI LWH D00 #337 SET FWD F/F
465 0106 01 010 001 000 001 000 110 JXZ RCS DEC * TIME OUT THE COUNTER
466 0107 10 111 110 001 110 110 100 PSI UPH CTM TSTOP CNTR:=STOP DELAY
467 0110 00 111 000 000 001 001 000 OTI LWH D00 DEC #267 RST. FWD.-REV. F/F &WRITE F/F
468 0111 01 010 001 000 001 001 001 JXZ RCS DEC * TIME OUT THE COUNTER
469 0112 01 101 111 111 111 111 111 RTN SUBROUTINE RETURN
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480 0113 10 111 111 011 111 101 111 BLANK PSI UPH R1M #20 R1:=-240(IN UPPER HALF)
481 0114 10 111 110 001 100 000 101 TIMER PSI UPH CTM TGAP CNTR:=TIMER FOR 1.25" OF TAPE
482 0115 11 100 010 000 001 010 110 JFS F10 DEC NBLK GOTO NBLK IF RD. CLK.=1
483 0116 11 100 001 000 001 010 000 JFS F04 DEC **2 NO SKIP IF 800 RPI
484 0117 00 000 011 000 001 010 001 JMP **2 DEC SKIP NEXT INSTRUCTION
485 0120 11 100 001 110 001 010 111 JFS F07 DEC NB16 GOTO NB16 IF EOB=1
486 0121 01 010 001 000 001 001 101 JXZ RCS DEC *-4 WAIT FOR CNTR TO TIME OUT
487 0122 00 001 111 010 111 111 110 ANI UPH R1M R1B 1 R1:=R1+1
488 0123 00 011 101 000 001 001 100 JMZ RCS TIMER STAY IN LOOP TILL TIMER NON-ZERO
489 0124 00 111 100 000 100 000 100 OTI LWH D01 #373 SET TAPE RUNAWAY BIT
490 0125 00 000 111 000 011 000 100 JMP INTER GOTO INTER
491 0126 00 111 110 011 000 100 000 NBLK OTI UPH D06 #337 SET F0 TO INDICATE I RD. CLK.
492 0127 11 001 110 001 110 011 111 NB16 XOR CTM R3B R3A ZERO OUT THE COUNTER
493 0130 11 001 111 001 110 011 111 XOR R2M R3B R3A ZERO OUT R2 (CRC REGISTER)
494 0131 01 101 111 111 111 111 111 RTN SUBROUTINE RETURN
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501 0132 10 111 110 001 100 000 101 WGAP PSI UPH CTM TGAP PRESET CNTR. WITH 1.25 IN. TIMER
502 0133 01 000 111 111 111 111 111 NOP TIME OUT THREE
503 0134 01 000 111 111 111 111 111 NOP TIMES THE VALUE
504 0135 01 010 001 000 001 011 011 JXZ RCS DEC **2 OF THE COUNTER
505 0136 11 100 110 000 001 100 000 JFS F10 **2 SKIP NEXT IF RD CLK = 1
506 0137 00 000 111 000 001 100 001 JMP **2 DONE-RETURN
507 0140 00 111 100 010 100 010 000 OTI LWH D05 #357 SET TAPE-ERROR & RST RD CLK-NOISE IN GAP
508 0141 01 101 111 111 111 111 111 RTN RETURN
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518 0142 11 100 011 000 001 100 100 WRCHK JFS F14 DEC **2 SKIP NEXT IF DATA F/F=1
519 0143 00 111 000 000 100 001 000 OTI LWH DEC D01 #36/ SET TIMING ERROR IF DATA F/F = 0
520 0144 00 111 010 001 010 100 000 OTI UPH DEC D02 #137 RST DATA F/F & SET F0
521 0145 00 010 011 100 110 011 001 INC IMP DEC D31 R5I GET DATA OUT WORD IN R5
522 0146 11 100 010 100 001 101 001 JFS F12 DEC **3 SKIP 2 IF OUT-XFER=1
523 0147 00 111 010 001 000 010 000 OTI UPH DEC D02 #357 RST F0 INDICATING OUT-XFER = 0
524 0150 01 101 011 111 111 111 111 RTN DEC SUBROUTINE RETURN
525 0151 00 111 001 000 000 000 000 OTI LWH DEC D20 #37/ SET SERV. REQ. TO GET NEXT WORD
526 0152 01 101 011 111 111 111 111 RTN DEC SUBROUTINE RETURN
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532 0153 11 100 100 010 001 110 001 FSR0 JFS F01 FMCHK GOTO FMCHK IF F1=1(POSSIBLE FILE-MARK)
533 0154 00 111 110 011 000 010 000 AGAIN OTI UPH D06 #357 RESET F0 & RD. CLK.
534 0155 10 111 110 001 111 111 101 PSI UPH CTM T8 CNTR:=8 CHAR. DELAY
535 0156 11 100 010 000 001 111 111 JFS F10 DEC DROP ERROR CASE IF RD. CLK. COMES
536 0157 01 010 001 000 001 101 110 JXZ RCS DEC *-1 IN BEFORE COUNTER GOES TO 0
537 0160 00 000 111 000 011 110 101 JMP FRDF GOTO FRDF TO CONTINUE NEXT RECORD
538 0161 10 111 110 001 111 111 110 FMCHK PSI UPH CTM T4 CNTR:=4 CHARA. DELAY
539 0162 11 100 010 000 001 111 111 JFS F10 DEC DROP ERROR CASE IF ANY RD. CLK. COMES
540 0163 01 010 001 000 001 110 010 JXZ RCS DEC *-1 IN BEFORE COUNTER GOES TO ZERO
541 0164 10 111 110 001 111 111 110 PSI UPH CTM T4 CNTR:=T4.0
542 0165 11 100 010 000 001 111 000 JFS F10 DEC **3 LOOK FOR A RD. CLK.
543 0166 01 010 001 000 001 110 101 JXZ RCS DEC *-1 BEFORE COUNTER=0
544 0167 00 000 111 000 011 110 101 JMP FRDF NOISE: GOTO FRDF TO READ NEXT RECORD
545 0170 01 110 111 000 111 111 000 CAL FMPAR SUB. CALL TO LOOK FOR FILE-MARK
546 0171 10 111 100 001 100 000 000 PSI LWH CTM #377 CNTR:=4 CHAR. DELAY
547 0172 00 111 100 010 000 000 000 OTI LWH D04 #377 RESET RD. CLK. F/F
548 0173 01 010 001 000 001 111 011 JXZ RCS DEC * TIME OUT THE COUNTER
549 0174 11 100 110 000 001 111 111 JFS F10 DROP GOTO DROP IF RD. CLK.=1
550 0175 00 111 100 000 110 100 000 FM816 OTI LWH D01 #137 SET EOF STATUS
551 0176 11 100 100 010 010 000 010 JFS F01 ODEND TERMINATE IF F1=1 (FILE-MARK CONFIRMED)
552 0177 00 111 100 000 100 010 000 DROP OTI LWH D01 #357 SET TAPE ERROR STATUS
553 0200 00 000 111 000 010 000 010 JMP ODEND GOTO ODEND
554 0201 00 111 100 000 110 100 000 FILE OTI LWH D01 #137 SET EOF STATUS
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560 0202 00 111 100 011 010 100 000 ODEND OTI LWH D06 #137 RST. F1,F2 & RD. CLK.
561 0203 00 111 110 101 010 010 000 OTI UPH D12 #157 RESET F0, DATA F/F & EOB FLAG
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569 0204 11 100 111 010 011 000 100 STOP JFS F15 INTER GOTO INTER IF INTERRUPT FLAG=1
570 0205 11 001 110 001 110 011 111 XOR CTM R3B R3A ZERO OUT THE COUNTER
571 0206 00 000 111 001 011 110 001 JMP PATCH GOTO PATCH TO LOOK FOR END INTERRUPT
572 0207 11 100 111 100 010 001 001 JFS F16 **2 SKIP NEXT IF IN-XFER=1
573 0210 00 000 111 000 010 001 011 JMP **3 SKIP 2 INSTRUCTIONS
574 0211 00 111 110 001 000 001 000 OTI UPH D02 #367 SET DEVICE-END
575 0212 00 000 111 000 010 001 100 JMP **2 & SKIP NEXT INSTR.
576 0213 00 111 111 000 000 000 000 OTI UPH D20 #377 SET SERV. REQ.
577 0214 01 010 001 000 010 001 100 JXZ RCS * DEC TIME OUT THE CNTR.
578 0215 11 100 111 110 000 000 100 STOP1 JFS F17 WAIT GOTO WAIT IF NO CONTROL ORDER
579 0216 00 010 111 100 110 011 011 INC INP R3I D31 GET COMMAND WORD IN R3
580 0217 10 110 100 001 111 110 000 ANI LWH CTM R3B #17 MASK OFF COMMAND CODES IN CNTR
581 0220 11 001 101 001 010 000 011 XOR LWH R2M R0B CTA R2 := R0 XOR R3
582 0221 11 111 101 101 110 001 111 PSA LWH ROM R3A R0(LOWER):=R3(NEW COMMAND)
583 0222 10 110 101 110 011 111 001 ANI LWH R2B #6 GO TO WAIT IF NEW CMD. IS
584 0223 00 011 101 000 000 000 100 JNZ RCS WAIT OF DIFFERENT SUB-GROUP
585 0224 00 000 111 000 000 010 110 JMP BFG2 GOTO BEG2
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591 0225 10 111 110 001 111 111 101 FSRF PSI UPH CTM T8 CNTR:=T8.0
592 0226 00 111 010 011 000 010 000 OTI UPH DEC D06 #357 RESET F0 & RD. CLK.
593 0227 00 111 000 100 110 000 000 OTI LWH DEC D11 #177 MST. EOH & SET EVEN BYTE CNT.
594 0230 01 010 001 000 010 011 000 JXZ RCS DEC * TIME OUT THE COUNTER
595 0231 10 001 101 111 011 110 000 XNI LWH R0B FSF GOTO AGAIN IF CMD.
596 0232 00 011 111 000 001 101 100 JNZ AGAIN IS FSF - ELSE
597 0233 00 000 111 000 010 000 010 JMP ODEND GOTO ODEND
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604 0234 11 100 100 010 010 000 001 RBDEC JFS F01 FILE GOTO FILE IF F1=1
605 0235 10 001 101 111 011 110 101 XNI LWH R0B BSR GOTO ODEND
606 0236 00 011 111 000 010 000 010 JNZ ODEND IF CMD IS HSK
607 0237 00 111 110 001 000 010 000 OTI UPH D02 #357 RESET F0
608 0240 00 000 111 000 010 101 010 JMP BSRF GOTO BSRF TO CONTINUE BSRF COMMAND
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619 0241 11 100 100 110 010 110 000 RDBKD JFS F03 BSRF2 GOTO BSRF2 IF TAPE AT LOAD POINT
620 0242 11 100 101 010 010 100 101 JFS F05 **3 SKIP 2 IF WRITE STATUS=1
621 0243 10 111 110 001 110 110 100 PSI UPH CTM TSTRT PRESET COUNTER WITH TAPE
622 0244 00 000 111 000 010 101 000 JMP MERGE START DELAY & GOTO MERGE
623 0245 01 110 111 000 001 000 100 CAL GOFWD SUB. CALL TO AVOID NOISE IN GAP
624 0246 00 111 110 001 000 100 000 OTI UPH D02 #337 SET F0 TO REMEMBER WRT. STATUS WAS 1
625 0247 10 111 110 001 110 010 101 PSI UPH CTM TS155 CNTR:=.155" + START DELAY
626 0250 00 111 000 110 000 010 000 MERGE OTI LWH DEC D14 #357 SET REV.,RST. RD. CLK. &EOR F/F
627 0251 01 010 001 000 010 101 000 JXZ RCS DEC *-1 TIME OUT THE COUNTER
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634 0252 11 100 100 110 010 110 000 BSRF JFS F03 BSRF2 GOTO BSRF2 IF BOT=1
635 0253 11 100 110 000 010 110 010 JFS F10 BACK GOTO BACK IF RD. CLK.=1
636 0254 11 100 101 000 010 101 110 JFS F04 **2 SKIP NEXT IF 1600 BPI
637 0255 00 000 111 000 010 101 010 JMP BSRF GO BACK TO BSRF
638 0256 11 100 101 111 000 000 110 JFS F07 FM16 GOTO FM16 IF EOB FLAG=1
639 0257 00 000 111 000 010 101 010 JMP BSRF GO BACK IN LOOP
640 0260 00 111 101 000 000 000 000 BSRF2 OTI LWH D20 #377 SET SERV.REQ. & GOTO
641 0261 00 000 111 000 000 000 100 JMP WAIT WAIT FOR NEW COMMAND
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647 0262 11 100 101 001 000 010 100 BACK JFS F04 BCKRD GOTO BCKRD IF 1600 BPI
648 0263 01 110 111 000 111 111 000 CAL FMPAR SUB. CALL TO LOOK FOR FM CHARACTER
649 0264 10 111 100 001 101 110 010 PSI LWH CTM T22 PRESET THE CNTR
650 0265 10 111 110 001 111 111 110 PSI UPH CTM T4 WITH T6.2 DELAY
651 0266 11 100 010 000 101 001 011 JFS F10 DEC NOFM GOTO NOFM IF RD. CLK.
652 0267 01 010 001 000 010 110 110 JXZ RCS DEC *-1 CAME BEFORE CNTR = 0
653 0270 10 111 110 001 111 111 110 PSI UPH CTM T4 PRESET CNTR WITH T4
654 0271 11 100 010 000 101 000 111 JFS F10 DEC BCK1 GOTO BCK1 IF RD. CLK.
655 0272 01 010 001 000 010 111 001 JXZ RCS DEC *-1 CAME BEFORE CNTR = 0
656 0273 00 000 111 000 010 101 010 JMP BSRF NOISE CHARACTER-GOTO BSRF
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66 *
661 * 'RDFWD' IS THE ENTRY FOR READ FWD. CMDS. - RDR, RDC, FSR OR FSF. *
662 *
663 *****
664 0274 10 111 110 001 110 110 100 RDFWD PSI UPH CTM TSTRT CNTR:=START DELAY
665 0275 10 110 101 111 011 111 110 ANI LWH R0B 1 LOOK FOR SUBGROUP OF READ
666 0276 00 011 101 000 011 101 101 JMZ RCS FSRFO FSR-FSF GROUP-GOTO FSR50
667 0277 00 111 101 001 010 100 001 RDR1 OTI LWH D22 #136 RST. F1,F2 & SET SERV. REQ.& IN MODE
668 0340 11 100 111 100 011 101 110 JFS F16 RDGO GOTO RDGO IF IN-XFER=1
669 0301 11 100 110 100 011 000 011 JFS F12 REJECT REJECT IF OUT-XFER OR
670 0302 11 100 111 110 011 000 000 JFS F17 *-2 CMD=1-OTHERWISE STAY IN LOOP
671 *****
672 *
673 * 'REJECT' - ENTRY ONLY WHEN A 'COMMAND-REJECT' CONDITION HAS OCCURRED. *
674 *
675 *****
676 0303 00 111 100 000 100 000 010 REJECT OTI LWH D01 #375 SET REJECT BIT OF STATUS
677 *****
678 *
679 * 'INTER' - ENTRY ONLY IF AN INTERRUPT CONDITION IS DETECTED AT THE *
680 * END OF CURRENT COMMAND OR IN IDLE STATE OF THE *
681 * CONTROLLER. THE POSSIBLE INTERRUPT CONDITIONS *
682 * ARE:1. UNIT READY INTERRUPT 2. TRANSFER ERROR *
683 * 3. CMD. REJECT 4. BLANK TAPE 5. TIMING *
684 * ERROR & 6. TAPE FRROR. *
685 *
686 *
687 *****
688 0304 10 111 110 001 110 110 100 INTER PSI UPH CTM TSTOP PRESET CNTR. WITH TAPE STOP DELAY
689 0305 00 111 000 100 001 000 000 OTI LWH D10 #277 DEC RESET FWD,REV. & CMD. ENH.
690 0306 01 010 001 000 011 000 110 JXZ RCS * DEC TIME OUT THE CNTR.
691 0307 00 111 110 001 000 000 011 INT2 OTI UPH D02 #374 CLUCK INTERRUPT & CLR. RUS LOGIC
692 0310 00 010 111 001 010 001 011 INC IMP R3I D22 UPH GET STATUS BYTE IN UPPER R3
693 0311 10 110 111 111 111 101 111 ANI UPH R3B #20 IS INT. FLAG=1?
694 0312 00 011 101 000 011 001 000 JMZ RCS *-2 YES, KEEP LOOKING AT THIS BIT
695 0313 00 111 110 001 000 000 100 OTI UPH D02 #373 RESET UNIT INT. F/F
696 0314 00 000 111 000 000 000 100 JMP WAIT NO. GO TO WAIT
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704 0315 00 010 111 001 010 001 011
705 0316 10 110 111 111 111 111 011
706 0317 00 011 101 000 011 000 011
707 0320 00 111 100 011 010 100 010
708 0321 11 100 100 110 011 010 011
709 0322 00 111 100 001 000 010 000
710 0323 10 110 101 111 011 111 110
711 0324 00 011 101 000 011 011 111
712 0325 00 111 111 001 000 010 000
713 0326 11 100 101 000 011 011 010
714 0327 10 001 101 111 011 111 011
715 0330 00 011 111 000 011 011 010
716 0331 00 111 100 001 000 001 000
717 0332 11 100 110 100 011 011 110
718 0333 11 100 111 100 011 000 011
719 0334 11 100 111 110 011 011 010
720 0335 00 000 111 000 011 000 011
721 0336 00 111 101 000 000 000 000
722 0337 10 111 110 001 110 100 100
723 0340 00 111 000 010 000 100 100
724 0341 01 010 001 000 011 100 000
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732 0342 11 100 101 001 001 100 101
733 0343 11 100 100 010 011 100 101
734 0344 01 110 111 000 001 011 010
735 0345 00 111 100 011 000 100 000
736 0346 10 110 101 111 011 111 110
737 0347 00 011 101 000 111 000 110
738 0350 11 001 111 011 110 011 111
739 0351 11 001 111 001 110 011 111
740 0352 11 010 110 101 010 001 111
741 0353 10 111 100 001 111 000 010
742 0354 00 000 011 000 101 011 011
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*****
*
*   ENTRY FOR WRITE COMMAND - ANY ONE OF WRR, WRZ, WFM OR GAP
*
*****
WRFWD  INC  INP  R3I  D22  UPH          GET 7970 STATUS IN R3
      ANI  UPH  R3B  #4              REJECT THE COMMAND IF
      JMZ  RCS  REJECT              TAPE REEL IS PROTECTED
      OTI  LWH  D06  #135           RESET F1,F2,RD, CLK. & SET OUT MODE
      JFS  F03  **2                SKIP NEXT IF TAPE AT LOAD POINT
      OTI  LWH  D02  #357           SET F1 (ROT = 0)
      ANI  LWH  R0B  1              GOTO WJOIN IF
      JMZ  RCS  WJOIN              CMD IS WFM-GAP
      OTI  UPH  D22  #357           SET SERV. REQ. & RST. F0
      JFS  F04  **4                SKIP 3 IF 1600 RPI
      XOI  LWH  R0B  WRR           LOOK FOR WRZ COMMAND
      JMZ  **2                      SKIP NEXT IF WRR COMMAND
      OTI  LWH  D02  #367           WRZ CMD; DISABLE PARITY TRACK
      JFS  F12  **4                SKIP 3 IF OUT-XFER=1
      JFS  F16  REJECT             REJECT THE COMMAND IF
      JFS  F17  **2                CONTROL ORDER OR IN-XFER
      JMP  REJECT                  COMES BEFORE OUT-XFER
      OTI  LWH  D20  #377           SET SERV. REQ.
WJOIN  PSI  UPH  CTM  TWSTP        PRESET COUNTER WITH START DELAY
      OTI  LWH  DEC  D04  #33J     SET FWD., WRITE & RST. RD, CLK.
      JYZ  RCS  DEC  *-1           TIME OUT THE COUNTER
*****
*
*   AT THIS POINT TAPE IS UP TO SPED & READY TO DO WRITE OPERATIONS.
*   IF F0=1 THEN TAPE STARTED AT ROT. WRITE A 3.75" GAP FIRST.
*   IF F2=1 THEN COMMAND IS WFM OR GAP, OTHERWISE WRK OR WRZ.
*
*****
WRREC  JFS  F04  WR16             GOTO WR16 IF 1600 RPI
      JFS  F01  **2              WRITE A GAP IF
      CAL  WGAP                  TAPE WAS AT BOT
      OTI  LWH  D06  #337        RESET RD CLK & F1
      ANI  LWH  R0B  1          GOTO GPFM IF
      JMZ  RCS  GPFM            CMD IS WFM-GAP
      XOR  R1M  R3B  R3A        ZERO OUT R1(WRITE CRC CHARACTER)
      XOR  R2M  R3B  R3A        ZERO OUT R2(READ CRC CHARACTER)
      PSI  UPH  R4M  R0B        STORE HISTORY OF UNITS IN R4
      PSI  LWH  CTM  T1         CNTR:=1 CHAK. DELAY
      JMP  DEC  WLOOP           GOTO WLOOP
*****
      SKP

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748 0355 00 111 100 001 001 000 001 FSRF0 OTI LWH D02 #27A SET F2 & IN-MODE
749 0356 00 111 100 110 000 101 000 RDGO OTI LWH D14 #327 RST. EOH, RD. CLK. & SET FWD
750 0357 01 010 001 000 011 101 111 JXZ RCS * DEC TIME OUT THE COUNTER
751 0360 11 100 100 110 011 110 010 JFS F03 **2 SKIP NEXT IF BOT STATUS=1
752 0361 00 000 111 000 011 110 101 JMP **4 SKIP 3 INSTRUCTIONS
753 0362 10 111 110 001 100 000 101 PSI UPH CTM TGAP CNTR:=1.25" DELAY
754 0363 11 100 100 110 011 110 011 JFS F03 * STAY HERE UNTIL BOT STATUS=0
755 0364 01 010 001 000 011 110 100 JXZ RCS DEC * TIME OUT 1.25" DELAY
756 0365 00 111 100 011 000 100 000 FRDF OTI LWH D06 #337 RST. RD. CLK. & F1
757 0366 01 110 111 000 001 001 011 CAL BLANK SUBROUTINE CALL TO BLANK
758 0367 11 100 101 001 000 011 111 JFS F04 FS16 GOTO FS16 IF 1600 HPI
759 0370 01 110 111 000 111 111 000 CAL FMPAR SUB. CALL TO SET F1 IF FM BYTE
760 0371 10 111 100 001 101 110 010 PSI LWH CTM T22 CNTR:=2.2 CHAR. DELAY
761 0372 11 100 000 100 100 000 001 JFS F02 DEC LOOP1 GOTO LOOP1 IF F2 = 1
762 0373 10 111 100 001 101 110 010 LOOPR PSI LWH CTM T22 PRESET COUNTER WITH T2.2
763 0374 00 111 000 010 101 000 000 OTI LWH DEC D05 #277 SET ODD BYTE COUNT & RST. RD. CLK.
764 0375 01 110 011 000 111 010 001 CAL DEC RBYTF SUB. CALL TO PROCESS 1 BYTE
765 0376 11 111 010 101 101 111 111 PSA R4M DEC R3A RL4 MOVE THE LOWER BYTE
766 0377 11 111 010 101 101 111 011 PSA R4M DEC R4A RL4 IN R3 INTO UPPER R4
767 0400 11 001 000 101 110 001 111 XOR LWH DEC R4M R3B R3A ZERO OUT LOW HALF OF W4
768 0401 11 100 010 000 100 000 100 LOOP1 JFS F10 DEC **3 GOTO ODDOR IF
769 0402 01 010 001 000 100 000 001 JXZ RCS DEC *-1 CNTR = 0 BEFORE
770 0403 00 000 111 000 100 011 101 JMP ODDOR A READ CLOCK COMES
771 0404 00 111 100 010 110 000 000 OTI LWH D05 #177 RST. RD. CLK. & SET EVEN BYTE CNT.
772 0405 00 111 100 001 000 100 000 OTI LWH D02 #337 RESET F1
773 0406 10 111 100 001 101 110 010 PSI CTM LWH T22 PRESET COUNTER WITH T2.2
774 0407 11 100 000 100 100 001 001 JFS **2 DEC F02 SKIP NEXT IF F2=1
775 0410 00 000 011 000 100 001 100 JMP **4 DEC SKIP NEXT 3 INSTRUCTIONS
776 0411 00 111 010 001 000 010 000 OTI UPH DEC D02 #357 RESET F0
777 0412 10 110 001 111 011 111 110 ANI LWH DEC ROB 1 GOTO LOOP1 IF
778 0413 00 011 001 000 100 000 001 JMZ RCS DEC LOOP1 CMD IS FSR-FSF
779 0414 01 110 011 000 111 010 001 CAL DEC RBYTF PROCESS THE BYTE
780 0415 11 100 000 100 100 011 010 JFS F02 DEC NEXT1 GOTO NEXT1 IF F2=1
781 0416 00 010 010 011 110 000 010 IOC OUT DEC UPH R4I D07 OUTPUT THE I-BYTE TO DATA-IN REG.
782 0417 00 010 000 011 110 000 011 IOC OUT DEC LWH R3I D07 OUTPUT THE BYTE IN DATA-IN REG.
783 0420 11 100 000 000 100 010 010 JFS **2 DEC F00 SKIP NEXT IF F0=1
784 0421 00 000 011 000 100 010 100 JMP **3 DEC SKIP 2 INSTRUCTIONS
785 0422 00 111 010 001 000 010 000 OTI UPH DEC D02 #357 RESET F0 (I WORD)
786 0423 00 000 011 000 100 011 001 JMP NFXT DEC GOTO NEXT
787 0424 11 100 011 000 100 010 110 JFS **2 DEC F14 SKIP NEXT IF DATA F/F=1
788 0425 00 111 000 000 100 001 000 OTI LWH DEC D01 #367 SET TIMING ERROR STATUS
789 0426 11 100 011 100 100 011 001 JFS F16 DEC NEXT GOTO NEXT IF IN-XFER=1
790 0427 00 111 000 001 001 000 000 OTI LWH DEC D02 #277 SET F2 TO INDICATE WC<REC. LENGTH
791 0430 00 000 011 000 100 011 010 JMP DEC NEXT1 GOTO NEXT1
792 0431 00 111 011 001 010 000 000 NEXT OTI UPH DEC D22 #177 RST. DATA F/F & SET SERV. REQ.
793 0432 11 100 010 000 011 111 011 NEXT1 JFS F10 DEC LOOPR STAY IN LOOP TILL
794 0433 01 010 001 000 100 011 010 JXZ RCS DEC *-1 ALL RD CLKS ARE DONE
795 0434 00 000 111 000 100 101 001 JMP EVENOR GOTO EVENOR
796
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802
*****
* F0=1 IF EXACTLY ONE CHARACTER READ FROM TAPE *
* F1=1 IF THE CHARACTER READ LOOKS PART OF FILE-MARK(OCTAL 23) *
* F2=1 IF THE COMMAND IS FSR OR FSF - OR IN RDR, RDC *
* COMMAND, THE WORD COUNT < RECORD LENGTH *
*****
SKP

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*****
*
*   IF CMD. IS FSR OR FSF THEN ODDEOR IS
*   ENTERED AFTER THE END OF RECORD.
*   IF CMD. IS RDR, RDC THEN ODDEOR IS
*   ENTERED ONLY IF ODD NUMBER OF
*   CHARACTERS ARE FOUND IN THE
*   RECORD BLOCK.
*
*****
813 0435 11 100 100 000 001 101 011 ODDEOR JFS F00 FSR0          GOTO FSK0 IF F0=1
814 0436 00 010 110 011 110 010 010   INC OUT R4I D07      OUTPUT THE FULL WORD TO DATA-IN REG.
815 0437 11 100 100 100 100 100 001   JFS F02 **2        SKIP NEXT IF F2=1
816 0440 00 000 111 000 100 100 110   JMP LREQ           GOTO LRFQ
817 0441 10 110 101 111 011 111 110   ANI LWH R0B 1      GOTO FSRF IF
818 0442 00 011 101 000 010 010 101   JNZ RCS FSRF      FSP-FSF CMD.
819 0443 00 111 100 000 110 000 000   OTI LWH D01 #177   SET EVEN BYTE CNT.
820 0444 00 111 100 001 000 010 000   OTI LWH D02 #357   SET F1 TO INDICATE ODD# OF BYTES
821 0445 00 000 111 000 100 101 001   JMP EVENOR        GOTO EVENOR
822 0446 11 100 111 000 100 101 000   LREQ JFS F14 **2    SKIP NEXT IF DATA F/F=1
823 0447 00 111 100 000 100 001 000   OTI LWH D01 #367   SET TIMING ERROR STATUS
824 0450 00 111 111 011 010 000 000   OTI UPH D26 #177   RST RD.CLK.& DATA F/F;SET SERV.REQ.
825 0451 10 111 100 001 100 000 000   EVENOR PSI LWH CTM #377 CNTR:=4 CHAR. DELAY
826 0452 11 100 010 000 100 101 111   JFS F10 DEC YCRC  GOTO YCRC IF RD. CLK.=1
827 0453 01 010 001 000 100 101 010   JXZ RCS DEC *-1    BEFORE COUNTER = 0
828 0454 11 001 110 111 110 011 111   XAR R3M R3B R3A   R3:=0(INNULL CRC CHARACTER)
829 0455 01 110 111 000 111 011 001   CAL CRITE         SUB. CALL TO PROCESS RD. CRCC
830 0456 00 000 111 000 100 110 001   JMP CRCHK        GOTO CRCHK
831 0457 01 110 111 000 111 010 101   YCRC CAL RRITE    SUB. CALL TO PROCESS CRCC
832 0460 00 111 100 010 000 000 000   OTI LWH D04 #377   RESET RD. CLK. F/F
833 0461 10 111 100 001 101 110 010   CRCHK PSI LWH CTM T22 PRESET CNTR. WITH
834 0462 10 111 110 001 111 111 110   PSI UPH CTM T4    6.7 CHAR. DELAY
835 0463 00 010 110 011 110 010 011   INC OUT R3I D07   OUTPUT THE CRCC IN DATA-IN REG.
836 0464 01 110 111 000 111 100 001   CAL CRCCCH       SUB. CALL TO VERIFY CRCC
837 0465 11 100 100 100 100 110 111   JFS F02 **2      SKIP NEXT IF F2=1
838 0466 00 000 111 000 100 111 001   JMP **3          SKIP 2 INSTRUCTIONS
839 0467 00 111 100 001 010 000 000   OTI LWH D02 #177  RESET F2
840 0470 00 000 111 000 101 000 001   JMP CHLRC        GOTO CHLRC
841 0471 11 100 111 000 100 111 011   JFS F14 **2      SKIP NEXT IF DATA-F/F=1
842 0472 00 111 100 000 100 001 000   OTI LWH D01 #367  SET TIMING ERROR STATUS
843 0473 00 111 110 001 010 000 000   OTI UPH D02 #177  RESET DATA F/F
844 0474 11 100 111 100 100 111 110   JFS **2 F16      SKIP NEXT IF IN-XFER=1
845 0475 00 000 111 000 101 000 001   JMP CHLRC        GOTO CHLRC
846 0476 10 001 101 111 011 110 001   XOI LWH R0B RDC   IF CMD. IS NOT RDC
847 0477 00 011 101 000 101 000 001   JNZ RCS CHLRC    THEN GOTO CHLRC
848 0500 00 111 101 001 001 000 000   OTI LWH D22 #277  SET SERV. REQ. TO SEND CRCC & SET F2
849 0501 01 010 001 000 101 000 001   CHLRC JXZ RCS DEC * TIME OUT THE COUNTER
850 0502 11 100 100 100 101 000 100   JFS F02 **2      SKIP NEXT IF F2=1
851 0503 00 000 111 000 010 000 010   JMP ODEND        GOTO ODEND
852 0504 11 100 111 000 010 000 010   JFS F14 ODEND     GOTO ODEND IF DATA F/F=1
853 0505 00 111 100 000 100 001 000   OTI LWH D01 #367  SET TIMING ERROR STATUS
854 0506 00 000 111 000 010 000 010   JMP ODEND        GOTO ODEND
*****
SKP

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857 *****
858 *
859 * AT THE ENTRY OF BCK1 IT IS LIKELY THAT FILE-MARK IS FOUND *
86 *
861 *****
862 0507 11 100 100 010 101 001 001 BCK1 JFS F01 **2 SKIP NEXT IF F1=1
863 0510 00 000 111 000 101 001 011 JMP NOFM GOTO NOFM
864 0511 01 110 111 000 111 111 000 CAL FMPAR SUB. CALL TO LOOK FOR FM CHARACTER
865 0512 11 100 100 010 101 010 011 JFS F01 CHGAP GOTO CHGAP IF F1=1
866 *****
867 *
868 * AT THE ENTRY OF NOFM FILE-MARK IS RULED OUT *
869 *
87 *****
871 0513 11 001 110 001 110 011 111 NOFM XOR CTM R3B R3A ZERO OUT THE COUNTER
872 0514 10 111 110 001 111 111 110 PSI UPH CTM T4 CNTR:=4 CHARACTER DELAY
873 0515 00 111 000 011 000 100 000 OTI LWH DEC D06 #337 RST. RD. CLK. & F1
874 0516 01 010 001 000 101 001 110 JXZ RCS DEC * TIME OUT THE COUNTER
875 0517 00 111 100 011 000 000 000 OTI LWH D06 #377 RESET RD. CLK.
876 0520 10 111 100 001 101 110 010 PSI LWH CTM T22 CNTR:=2.2 CHARACTER DELAY
877 0521 11 100 010 000 101 001 111 JFS F10 DEC *-2 GO BACK 2 IF RD. CLK.
878 0522 01 010 001 000 101 010 001 JXZ RCS DEC *-1 CAME BEFORE COUNTER = 0
879 0523 11 001 110 001 110 011 111 CHGAP XOR CTM R3B R3A ZERO OUT THE COUNTER
880 0524 10 111 110 001 111 100 010 PSI UPH CTM T145 CNTR:=.145" DELAY
881 0525 11 100 010 000 101 011 000 JFS F10 DEC **3 SKIP 2 IF RD. CLK.
882 0526 01 010 001 000 101 010 101 JXZ RCS DEC *-1 CAME BEFORE CNTR = 0
883 0527 00 000 111 000 010 011 100 JMP RBDEC GOTO RBDEC TO SEPARATE BSR-BSF CMD.
884 0530 00 111 100 011 000 100 000 OTI LWH D06 #337 RESET RD. CLK. & F1
885 0531 11 100 100 000 101 010 011 JFS F00 CHGAP GOTO CHGAP IF F0=1(WRT. STATUS WAS 1)
886 0532 00 000 111 000 101 010 101 JMP *-5 GO BACK 5 INSTRUCTIONS
887 *****
888 *
889 * F0=1 IF THE WRITE STATUS WAS 1 BEFORE BACKSPACE STARTED *
89 * F1=1 IF THE CHARACTER READ LOOKS PART OF FILE-MARK(OCTAL 23) *
891 * F2 IS NOT USED IN THE BSR OR BSF COMMAND *
892 *
893 *****
894 SKP

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89E
89A
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89A
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9.0
9.1
9.2
*****
*
*          F0=1 AS LONG AS OUT-XFER=1 (DATA WORDS STILL COMING)
*          F1=1 IF ATLEAST ONE READ CLOCK HAS COME
*          F2=1 IF ATLEAST ONE READ CLOCK IS FOUND
*          WITHIN TWO CHARACTER SPACING
*
*****
903 0533 01 110 011 000 001 100 010 WLOOP CAL DEC WRCHK SUB. CALL TO ASK FOR DATA WORD
904 0534 10 111 011 101 100 001 001 PSI UPH DEC ROM #366 R0(0:7)=-10
905 0535 11 100 010 000 101 100 001 WLP1 JFS F10 DEC **4 SKIP 3 IF RD. CLK.=1
906 0536 00 001 011 101 011 111 110 ANI UPH DEC ROM R0B 1 INCREMENT R0
907 0537 11 000 001 000 101 011 101 JCV RCS DEC WLP1 GOTO WLP1 IF NO-OVERFLOW
908 0540 00 000 011 000 101 100 101 JMP **5 DEC SKIP 4 INSTRUCTIONS
909 0541 01 110 011 000 111 010 001 CAL DEC RBYTE SUB. CALL TO COMPUTE RD. CRCC & LKCC
910 0542 00 111 000 001 001 010 010 OTI LWH DEC D02 #25b SET F1,F2 & OUT MODE
911 0543 00 001 011 101 011 111 010 ANI UPH DEC ROM R0B #5 UPDATE R0 BY 5
912 0544 11 000 001 000 101 011 101 JCV RCS DEC WLP1 GOTO WLP1 IF NO-OVERFLOW
913 0545 00 010 010 001 110 000 001 INC OUT DEC UPH R5I D03 OUTPUT THE WRITE BYTE
914 0546 11 111 010 111 101 110 111 PSA R3M DEC R5A RL4 SWOP UPPER & LOWER
915 0547 11 111 010 111 101 111 111 PSA R3M DEC R3A RL4 HALVES OF R5 IN R3
916 0550 01 110 011 000 111 100 111 CAL DEC WRCRC SUB. CALL TO COMPUTE WRITE CRCC
917 0551 01 010 001 000 101 101 001 JXZ RCS DEC * TIME OUT THE COUNTER
918 0552 00 111 110 000 000 100 000 OTI UPH D00 #337 SET WRITE STROKE
919 0553 10 111 100 001 111 000 010 PSI LWH CTM T1 CNTR:=1 CHAR. DELAY
920 0554 10 111 011 101 100 001 100 PSI UPH DEC ROM #36J R0(0:7)=-1J
921 0555 11 100 010 000 101 110 001 WLP2 JFS F10 DEC **4 SKIP 3 IF RD. CLK.=1
922 0556 00 001 011 101 011 111 110 ANI UPH DEC ROM R0B 1 INCREMENT R0 BY 1
923 0557 11 000 001 000 101 101 101 JCV RCS DEC WLP2 GOTO WLP2 IF NO-OVERFLOW
924 0560 00 000 011 000 101 110 101 JMP **5 DEC SKIP 4 INSTRUCTIONS
925 0561 01 110 011 000 111 010 001 CAL DEC RBYTE SUB. CALL TO COMPUTE RD. CRCC & LKCC
926 0562 00 111 000 001 001 010 010 OTI LWH DEC D02 #25b SET F1,F2 & OUT MODE
927 0563 00 001 011 101 011 111 010 ANI UPH DEC ROM R0B #5 UPDATE R0 BY 5
928 0564 11 000 001 000 101 101 101 JCV RCS DEC WLP2 GOTO WLP2 IF NO-OVERFLOW
929 0565 11 111 010 111 101 110 111 PSA R3M DEC R5A RL4 SWOP UPPER & LOWER
930 0566 11 111 010 111 101 111 111 PSA R3M DEC R3A RL4 BYTES OF R5 IN R3
931 0567 00 010 010 001 110 000 011 INC OUT DEC UPH R3I D03 OUTPUT WRT. BYTE
932 0570 11 111 010 111 110 010 111 PSA R3M DEC R5A PASS R5 IN R3
933 0571 01 110 011 000 111 100 111 CAL DEC WRCRC SUB. CALL TO COMPUTE WRT. CRCC
934 0572 01 010 001 000 101 111 010 JXZ RCS DEC * TIME OUT THE COUNTER
935 0573 00 111 110 000 000 100 000 OTI UPH D00 #337 SET WRITE STROKE
936 0574 10 111 100 001 111 000 010 PSI LWH CTM T1 CNTR:=1 CHAR. DELAY
937 0575 01 110 011 000 111 110 010 CAL DEC ODDW1 SUB. CALL TO FIND OUT CHAR. DROPOUT
938 0576 11 100 000 000 101 011 011 JFS F00 DEC WLOOP GOTO WLOOP IF F0=1
939 0577 11 111 111 101 110 001 011 PSA UPH ROM R4A MAKE R0 BACK TO WHAT IT WAS
940 0600 10 011 101 101 001 111 111 INI LWH ROM R0B #200 SET BIT 8 IN R0 TO INDICATE CRCC BYTE
941 0601 10 001 001 010 100 101 000 XOI LWH DEC R1M R1B #327 UPDATE CRC CHARACTER
942 0602 11 010 010 110 101 111 111 PSB R3M DEC R1B RL4 OUTPUT
943 0603 11 111 010 111 101 111 111 PSA R3M DEC R3A RL4 CRC
944 0604 00 010 010 001 110 000 011 INC OUT DEC UPH R3I D03 CHARACTER
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SxP

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953 0605 10 111 100 001 101 111 111
954 0606 10 111 011 011 100 100 111
955 0607 11 100 010 000 110 001 011
956 0610 00 001 011 010 111 111 110
957 0611 11 000 001 000 110 000 111
958 0612 00 000 011 000 110 001 111
959 0613 01 110 011 000 111 010 001
960 0614 00 111 000 001 001 010 010
961 0615 00 001 011 010 111 111 010
962 0616 11 000 001 000 110 000 111
963 0617 00 111 010 001 000 110 000
964 0620 01 010 001 000 110 010 000
965 0621 01 110 111 000 111 110 010
966 0622 10 110 101 111 001 111 111
967 0623 00 011 111 000 110 011 000
968 0624 11 100 100 000 110 000 101
969 0625 10 110 101 101 010 000 000
970 0626 00 111 110 000 000 100 000
971 0627 00 000 111 000 110 000 101
972 0630 11 100 100 000 110 000 101
973 0631 00 111 100 001 010 000 000
974 0632 00 111 110 000 000 010 000
975 0633 00 111 100 001 000 000 101
976 0634 11 100 100 010 110 110 100
977 0635 10 111 110 001 111 100 000
978 0636 11 100 010 000 110 100 001
979 0637 01 010 001 000 110 011 110
980 0640 00 000 111 000 001 111 111
981 0641 01 110 111 000 111 111 000
982 0642 01 110 111 000 111 010 001
983 0643 11 001 110 001 110 011 111
984 0644 11 100 100 100 110 100 110
985 0645 00 000 111 000 110 110 100
986 0646 11 100 100 010 110 101 000
987 0647 00 000 111 000 001 111 111
988 0650 10 111 110 001 111 111 101
989 0651 10 111 100 001 101 110 010
990 0652 11 100 010 000 110 101 101
991 0653 01 010 001 000 110 101 010
992 0654 00 000 111 000 001 111 111
993 0655 01 110 111 000 111 111 000
994 0656 11 100 100 010 110 110 000
995 0657 00 000 111 000 001 111 111
996 0660 10 111 110 001 111 111 101
997 0661 11 100 010 000 001 111 111
998 0662 01 010 001 000 110 110 001
999 0663 00 000 111 000 010 000 001

*****
*
*           IF F0=0 & R0(R:1)=1 THEN IT IS TIME TO WRITE CRCC
*           IF F0=0 & R0(R:1)=0 THEN IT IS TIME TO WRITE LRCC
*
*****
OTCRC PSI LWH CTM #200          CNTR:=2.0 CHAR. DELAY
PSI UPH DEC R1M #330          R1(0:7):=-40
OTC1 JFS F10 DEC **4          SKIP 3 IF RD. CLK.=1
ADI UPH DEC R1M R1B 1        INCREMENT R1
JOV RCS DEC OTC1            GOTO OTC1 IF NO-OVERFLOW
JMP **5 DEC                 SKIP 4 INSTRUCTIONS
CAL LWH DEC RBYTF           SUB. CALL TO COMPUTE RD. CRCC & LRCC
OTI LWH DEC D02 #255        SET F1,F2 & OUT MODE
ADI UPH DEC R1M R1B #5      UPDATE R1 BY 5
JOV RCS DEC OTC1            GOTO OTC1 IF NO-OVERFLOW
OTI UPH DEC D02 #317        TOGGLE F0
JXZ RCS DEC *               TIME OUT THE COUNTER
CAL ONDwl                   SUB. CALL TO DETECT CHARACTER DROPOUT
ANI LWH R0B #200            LOOK FOR BIT 8 OF R0
JMZ OTC2                    GOTO OTC2 IF R0(B)=0
JFS F00 OTCRC              GOTO OTCRC IF F0=1
ANI LWH R0M R0B #177        MAKE BIT 8 OF R0 = 0
OTI UPH D00 #337           SET WRITE STROBE (TO WRITE CRCC)
JMP OTCRC                  GOTO OTCRC
OTC2 JFS F00 OTCRC          GOTO OTCRC IF F0=1
OTI LWH D02 #177           RESET F2
LRCC OTI UPH D00 #357       SET WRITE RESET PULSE
OTI LWH D02 #372           ENABLE PARITY & SET IN-MODE
JFS F01 YESRD              GOTO YESRD IF F1=1
NORD PSI UPH CTM T155       CNTR:=.155" DELAY
JFS F10 DEC **3           SKIP 2 IF RD. CLK.=1
JXZ RCS DEC **1           BEFORE CNTR=0
JMP DROP                   CHAR. DROPOUT-GO TO DROP
CAL FMPAR                  SUB. CALL TO LOOK FOR FM BYTE
CAL RBYTE                  SUB. CALL TO COMPUTE RD. CRCC
XOR CTM R3B R3A           ZERO OUT THE COUNTER
JFS F02 **2               SKIP NEXT IF F2=1(WFM CMD.)
JAP YESRD                  GOTO YESRD
JFS F01 **2               SKIP NEXT IF F1=1
JAP DROP                   GOTO DROP
PSI UPH CTM T8            CNTR:=
PSI LWH CTM T22           10.2 CHAR. DELAY
JFS F10 DEC **3           SKIP 2 IF RD. CLK. = 1
JXZ RCS DEC **1           BEFORE CNTR=0
JMP DROP                   CHAR. DROPOUT CASE-GOTO DROP
CAL FMPAR                  SUB. CALL TO LOOK FOR FM BYTE
JFS F01 **2               SKIP NEXT IF F1=1
JMP DROP                   FM DOES NOT MATCH-GOTO DROP
PSI UPH CTM T8            CNTR:=8.0 CHAR. DELAY
JFS F10 DEC DROP          GOTO DROP IF RD. CLK.=1
JXZ RCS DEC **1           BEFORE CNTR=0
JMP FILE                   GOTO FILE(FM CONFIRMED)

*****
S*P

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1001

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1048 0664 10 111 100 001 101 110 010
1049 0665 11 100 010 000 110 111 000
1010 0666 01 010 001 000 110 110 101
1011 0667 00 000 111 000 110 111 010
1012 0670 01 110 111 000 111 010 001
1013 0671 00 000 111 000 110 110 100
1014 0672 10 111 100 001 100 000 000
1015 0673 11 100 010 000 110 111 110
1016 0674 01 010 001 000 110 111 011
1017 0675 00 000 111 000 001 111 111
1018 0676 01 110 111 000 111 010 001
1019 0677 10 111 100 001 101 110 010
1020 0700 11 100 010 000 001 111 111
1021 0701 01 010 001 000 111 000 000
1022 0702 01 110 111 000 111 100 001
1023 0703 10 111 110 001 111 111 110
1024 0704 01 010 001 000 111 000 100
1025 0705 00 000 111 000 010 000 010
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1031 0706 10 001 101 111 011 111 010
1032 0707 00 011 101 000 111 001 010
1033 0710 01 110 111 000 001 011 010
1034 0711 00 000 111 000 010 000 010
1035 0712 00 111 110 001 111 101 100
1036 0713 10 111 110 001 111 111 101
1037 0714 00 111 110 000 000 100 000
1038 0715 01 010 001 000 111 001 101
1039 0716 00 111 110 001 000 100 000
1040 0717 00 111 100 001 001 000 000
1041 0720 00 000 111 000 110 011 010
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*****
*
*   ENTRY AT YESRD ONLY IF A READ CLOCK IS ENCOUNTERED
*   DURING THE WRITING OF A DATA BLOCK
*
*****
YESRD PSI LWH CTM T22          CNTR:=2.2 CHAR. DELAY
      JFS F10 DEC **3          SKIP 2 IF RD. CLK.=1
      JXZ RCS DEC *-1          BEFORE CNTR = 0
      JMP **3                   SKIP 2 INSTRUCTIONS
      CAL RRYTE                 SUB. CALL TO COMPUTE RD. CRCC
      JMP YESRD                 GO BACK TO YESRD
      PSI LWH CTM #377          CNTR:=4.0 CHAR. DELAY
      JFS F10 DEC **3          SKIP 2 IF RD. CLK.=1
      JXZ RCS DEC *-1          BEFORE CNTR=0
      JMP DROP                  CRCC=0? GOTO DROP(CHAR. DROPOUT)
      CAL RRYTE                 SUB. CALL TO COMPUTE CRCC
      PSI LWH CTM T22          CNTR:=2.2 CHAR. DELAY
      JFS F10 DEC DROP          GOTO DROP IF RD. CLK.=1
      JXZ RCS DEC *-1          BEFORE CNTR. = 0
      CAL CRCC                  SUB. CALL TO VERIFY READ CRCC
      PSI UPH CTM T4           CNTR:=4 CHAR. DELAY
      JXZ RCS DEC *            TIME OUT THE COUNTER
      JMP ODEND                 GOTO ODEND
*****
*
*   ENTRY AT GPFM ONLY IF WFM OR GAP COMMAND
*
*****
GPFM XNI LWH ROB GAP          LOOK FOR GAP COMMAND
      JNZ RCS **3              SKIP 2 IF WFM COMMAND
      CAL WGAP                  WRITE A GAP OF 3.75 INCH
      JMP ODEND                 FO TO ODEND
      OTI UPH D03 FM           OUTPUT THE FILE-MARK CHARACTER
      PSI UPH CTM T8           PRESET THE CNTR WITH T8.0 DELAY
      OTI UPH D00 #337         SET WRITE STROBE
      JXZ RCS DEC *            TIME OUT THE COUNTER
      OTI UPH D02 #337         SET FO
      OTI LWH D02 #277         SET F2 TO INDICATE WFM CMD.
      JMP LRCQ                  GOTO LRCQ
*****
SKP

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1050 0721 00 111 000 001 000 000 001 RBYTE OTI LWH DEC D02 #376 SET IN-MODE F/F
1051 0722 00 111 000 010 000 000 000 OTI LWH DEC D04 #377 RESET RD. CLK. F/F
1052 0723 11 100 010 010 111 010 101 JFS F11 DEC **2 SKIP NEXT IF PARITY OKAY
1053 0724 00 111 000 000 100 010 000 OTI LWH DEC D01 #357 SET TAPE ERROR BIT
1054 0725 00 010 000 101 010 001 011 RBITE IQC INP DEC LWH R3I D12 GET READ BYTE IN R3
1055 0726 10 111 010 111 111 111 110 WBITE PSI UPH DEC R3M 1 R3(R):=1
1056 0727 11 100 001 100 111 011 001 JFS F06 DEC **2 SKIP NEXT IF READ PARITY = 1
1057 0730 11 001 010 111 110 001 111 XOR UPH DEC R3M R3B R3A ZERO OUT UPPER HALF OF R3
1058 0731 11 001 011 000 001 011 111 CBITE XOR R2M DEC R2B R3A RR1 CRCR:=(CRCR 'XOR' R3) ROTATED RT. 1
1059 0732 11 010 011 000 010 011 111 PSB R2M DEC R2B LOOK FOR SIGN OF R2
1060 0733 10 100 011 000 111 011 111 JSZ **4 DEC SKIP 3 IF SIGN = 0
1061 0734 10 111 011 001 111 111 110 PSI UPH DEC R2M 1 MODIFY CRCR-PIT SIGN IN BIT 7 OF R2
1062 0735 10 001 001 000 011 000 011 XOR LWH DEC R2M R2B #74 INVERT BITS 10-13 OF R2
1063 0736 01 101 011 111 111 111 111 RTN DEC SUBROUTINE RETURN
1064 0737 11 001 011 001 110 001 111 XOR UPH DEC R2M R3B R3A ZERO OUT UPPER HALF OF R2
1065 0740 00 000 011 000 111 011 110 JMP #-2 DEC GO BACK 2 INSTRUCTIONS
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1075 0741 10 001 101 000 000 101 000 CRCCH XORI LWH R2M R2B #327 UPDATE FINAL
1076 0742 10 001 111 000 011 111 110 XORI UPH R2M R2B #1 CRC CHARACTER
1077 0743 11 010 111 000 010 011 111 PSB R2M R2B R2 SHOULD BE 0 FOR GOOD DATA BLOCK
1078 0744 00 011 111 000 111 100 110 JMZ **2 SKIP NEXT IF CRCCH CHECKS OUT
1079 0745 00 111 100 000 100 010 000 OTI LWH D01 #357 SET TAPE ERROR BIT
1080 0746 01 101 111 111 111 111 111 KTN SUBROUTINE RETURN
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SKIP

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1090 0747 11 001 010 111 110 001 111  WRCRC XOR UPH DEC R3M R3B R3A      ZERO OUT UPPER HALF OF R3
1091 0750 11 100 001 100 111 101 010    JFS F06 DEC **2                SKIP NEXT IF WRITE PARITY = 0
1092 0751 10 111 010 111 111 111 110    PSI UPH DEC R3M 1                APPEND PARITY IN BIT 7 OF R3
1093 0752 11 001 011 010 101 011 111    XOR R1M DEC R1B R3A RR1        CRCR:=(CRCR 'XOR' R3) ROTATED RT. 1
1094 0753 11 010 011 010 110 011 111    WRCR1 PSB R1M DEC R1B          LOOK FOR SIGN OF R1
1095 0754 10 100 011 000 111 110 000    JNZ **4 DEC                    SKIP 3 IF SIGN=0
1096 0755 10 111 011 011 111 111 110    PSI UPH DEC R1M 1              MODIFY CRCR-PUT SIGN IN BIT 7 OF R1
1097 0756 10 001 001 010 111 000 011    XOR LWH DEC R1M R1B #74       INVERT BITS 10-13 OF R1
1098 0757 01 101 011 111 111 111 111    RTN DEC                        SUBROUTINE RETURN
1099 0760 11 001 011 011 110 001 111    XOR UPH DEC R1M R3B R3A       ZERO OUT UPPER HALF OF R1
1100 0761 00 000 011 000 111 101 111    JMP *-2 DEC                    GO BACK 2 INSTRUCTIONS
1101
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1109 0762 11 100 000 010 111 110 100    ODDW1 JFS F01 DEC **2          SKIP NEXT IF 1-CHAR. FLAG=1
1110 0763 00 000 011 000 111 110 111    JMP **4 DEC                    NO CHARACTER YET-GO BACK
1111 0764 11 100 000 100 111 110 110    JFS F02 DEC **2                SKIP NEXT IF 11-CHAR. FLAG=1
1112 0765 00 000 011 001 011 111 100    JMP DEC PTCH3                   CHAR. DROPOUT CASE GOTO DROPPTCH3
1113 0766 00 111 000 001 010 000 000    OTI LWH DEC D02 #177          RESET F2 (11-CHAR. FLAG)
1114 0767 01 101 011 111 111 111 111    RTN DEC                        SUBROUTINE RETURN
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1123 0770 00 111 100 011 000 100 000    FMPAR OTI LWH D06 #337        RESET F1 & RD. CLK. F/F
1124 0771 00 010 100 101 010 001 011    IOC IMP LWH R31 D12          GET READ BYTE IN R3
1125 0772 11 100 101 100 111 111 110    JFS **4 F06                  RETURN IF PARITY = 1
1126 0773 10 001 101 111 111 101 100    XOR LWH R3B FM                SET F1 IF
1127 0774 00 011 101 000 111 111 110    JNZ RCS **2                  THE READ BYTE
1128 0775 00 111 100 001 000 010 000    OTI LWH D02 #357             IS A FILE MARK
1129 0776 00 111 100 000 100 000 001    OTI LWH D01 #376             RST STATUS IF NOISE ON TAPE
1130 0777 01 101 111 111 111 111 111    RTN DEC                        SUBROUTINE RETURN
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SVP

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1138 1000 00 111 100 101 000 100 000
1139 1001 00 010 111 001 010 001 011
1140 1002 10 110 111 111 110 111 111
1141 1003 00 011 101 001 000 000 101
1142 1004 00 111 100 001 000 010 000
1143 1005 01 101 111 111 111 111 111
1144
1145 1006 01 110 111 001 000 000 000
1146 1007 00 000 111 001 000 011 010
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1153 1010 00 010 111 001 010 001 011
1154 1011 10 110 111 111 111 011 111
1155 1012 00 011 101 001 000 001 100
1156 1013 00 111 100 000 100 010 000
1157 1014 01 101 111 111 111 111 111
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1160
1161
1162
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1164 1015 11 001 010 010 110 000 111
1165 1016 11 100 000 101 000 010 000
1166 1017 00 111 000 000 000 000 011
1167 1020 00 010 010 001 110 000 001
1168 1021 01 010 001 001 000 010 001
1169 1022 00 111 110 000 000 100 000
1170 1023 01 101 111 111 111 111 111
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1176 1024 11 100 101 111 000 011 001
1177 1025 11 100 110 001 000 010 111
1178 1026 00 000 111 001 000 010 100
1179 1027 00 111 100 011 000 000 000
1180 1030 00 000 111 001 000 010 100
1181 1031 00 111 100 001 000 100 000
1182 1032 11 001 110 001 110 011 111
1183 1033 10 111 110 001 111 100 010
1184 1034 00 111 000 100 000 000 000
1185 1035 01 010 001 001 000 011 101
1186 1036 00 000 111 000 010 011 100
1187
1188

*****
*
*           FMP16 SETS F1 IF FILE-MARK IS FOUND(1600 BPI).
*
*****
FMP16 OTI LWH D12 #337          RESET F1 & EOB FLAG
      IOC IMP R3I D22 UPH      GET STATUS BYTE IN R3
      ANI UPH R3B #100        LOOK FOR TAPE MARK BIT
      JNZ RCS **2            SKIP NEXT IF TAPE MARK HIT = 0
      OTI LWH D02 #357        SET F1 TO INDICATE TAPE MARK
      KTN                    SUBROUTINE RETURN
*****
FMP16 CAL FMP16                SUB. CALL TO LOOK FOR TAPE MARK
      JMP BCK2                GOTO BCK2
*****
*
*           SUBROUTINE ERR16 SETS TAPE ERROR F/F IF AN ERROR
*           IS DISCOVERED BY THE TAPE DRIVE(1600 BPI ONLY).
*
*****
ERR16 IOC IMP UPH R3I D22      GET STATUS BYTE IN R3
      ANI UPH R3B #40        LOOK FOR TAPE ERROR
      JNZ RCS **2            SKIP NEXT IF TAPE ERROR=0
      OTI LWH D01 #357        SET TAPE ERROR BIT OF STATUS
      RTN                    SUBROUTINE RETURN
*****
*
*           SUBROUTINES WRTP1 & WRTP3 ARE CALLED TO OUTPUT
*           THE WRITE BYTE & SET WRITE STROBE(1600 BPI)
*
*****
WRTP1 XOR UPH DEC R5M R5A R1B  R5(UPPER):=R5 'XOR' R1
WRTP2 JFS **2 DEC F02          SKIP NEXT IF F2=1(WFM)
WRTP3 OTI LWH DEC D00 #374     TOGGLE ODD/EVEN F/F
      IOC OUT DEC UPH R5I D03  OUTPUT THE BYTE FROM R5
      JXZ RCS DEC *           TIME OUT THE COUNTER
      OTI UPH D00 #337        SET WRITE STROBE
      KTN                    SUBROUTINE RETURN
*****
*
*           BCKRD IS THE READ REV. 1600 BPI ROUTINE(F0=1 IF WRT. STATUS WAS 1)
*
*****
BCKRD JFS F07 **5            SKIP 4 IF EOB=1
      JFS F10 **2            SKIP NEXT IF RD. CLK.=1
      JMP BCKRD              GOTO BCKRD
      OTI LWH D06 #377        RESET RD. CLK. F/F
      JMP BCKRD              GO BACK TO BCKRD
      OTI LWH D02 #337        RESET F1
BCK2  XOR CTM R3B R3A         ZERO OUT THE COUNTER
      PSI UPH CTM T145        CNTP:=.145 IN. DELAY
      OTI LWH DEC D10 #377    RESET EOB FLAG
      JXZ RCS DEC *           TIME OUT THE COUNTER
      JMP RBDEC              GOTO RBDEC
*****
SKP

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1190
1191
1192 1037 11 100 100 001 000 100 110
1193 1040 01 110 111 001 000 001 000
1194 1041 01 110 111 001 000 000 000
1195 1042 11 100 100 010 010 000 001
1196 1043 11 100 111 010 010 000 010
1197 1044 00 111 100 100 000 000 000
1198 1045 00 000 111 000 011 110 101
1199 1046 01 110 111 001 010 100 110
1200 1047 00 010 100 101 010 001 011
1201 1050 11 010 110 111 101 111 111
1202 1051 11 010 110 111 101 111 111
1203 1052 00 111 100 010 101 000 000
1204 1053 11 100 101 111 001 001 000
1205 1054 11 100 110 001 000 101 110
1206 1055 00 000 111 001 000 101 011
1207 1056 00 111 100 010 110 000 000
1208 1057 01 110 111 001 010 100 110
1209 1060 11 100 100 101 000 101 011
1210 1061 00 010 100 101 010 001 011
1211 1062 00 010 110 011 110 000 011
1212 1063 00 010 100 011 110 000 011
1213 1064 11 100 100 001 000 110 110
1214 1065 00 000 111 001 000 111 000
1215 1066 00 111 110 001 000 010 000
1216 1067 00 000 111 001 000 111 110
1217 1070 11 100 111 001 000 111 010
1218 1071 00 111 100 000 100 001 000
1219 1072 00 111 110 001 010 000 000
1220 1073 11 100 111 101 000 111 110
1221 1074 00 111 100 001 001 000 000
1222 1075 00 000 111 001 000 101 011
1223 1076 00 111 101 000 000 000 000
1224 1077 11 100 101 111 001 000 010
1225 1100 11 100 110 001 000 100 110
1226 1101 00 000 111 001 000 111 111
1227 1102 11 100 100 101 001 000 101
1228 1103 01 110 111 001 000 001 000
1229 1104 00 000 111 000 010 000 010
1230 1105 10 110 101 111 011 111 110
1231 1106 00 011 101 000 010 010 101
1232 1107 00 000 111 001 001 000 011
1233 1110 11 100 100 101 001 000 101
1234 1111 11 001 110 001 110 011 111
1235 1112 00 010 110 011 110 000 011
1236 1113 00 010 100 011 110 000 000
1237 1114 10 111 100 001 111 000 010
1238 1115 11 100 111 001 001 001 111
1239 1116 00 111 100 000 100 001 000
1240 1117 00 111 111 001 010 000 000
1241 1120 01 010 001 001 001 010 000
1242 1121 11 100 111 001 001 010 011
1243 1122 00 111 100 000 100 001 000
1244 1123 00 000 111 000 010 000 010
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*****
* FS16 IS THE 1600 HPI READ FWD. ENTRY(F0=1 FOR 1 CHARACTER READ)
*****
FS16 JFS F00 RD166 GOTO RD166 IF F0=1
CAL ERR16 SUB. CALL TO LOOK FOR TAPE ERROR
CAL FMP16 SUB. CALL TO LOOK FOR TAPE MARK
JFS F01 FILE GOTO FILE IF F1=1(FM CONFIRMED)
JFS F15 ODEND TERMINATE READ IF INTERRUPT CONDITION=1
OTI LWH D10 #377 RESET EOB F/F
JMP FRDF GOTO FRDF TO READ NEXT RECORD
RD166 CAL ERCHK CHECK PARITY OF THE READ BYTE
INC IMP LWH R3I D12 GET READ BYTE IN R3
PSB R3M R3B RL4 MOVF THE DATA BYTE FROM LOW
PSB R3M R3B RL4 HALF OF R3 TO UPPER HALF
OTI LWH D05 #277 SET ODD BYTE CNT & RST. RD. CLK.
LP16 JFS F07 RDND2 GOTO RDND2 IF EOB=1
JFS F10 **2 SKIP NEXT IF RD. CLK.=1
JMP LP16 GO BACK IN LOOP
OTI LWH D05 #177 SET EVEN BYTE CNT & RST. RD. CLK.
CAL ERCHK CHECK PARITY OF READ BYTE
JFS F02 LP16 GO BACK IN LOOP IF F2=1
INC IMP LWH R3I D12 GET READ BYTE IN R3
INC OUT UPH R3I D07 OUTPUT THE I-BYTE TO DATA-IN REG.
INC OUT LWH R3I D07 OUTPUT THE II DATA BYTE
JFS F00 **2 SKIP NEXT IF F0=1
JMP **3 SKIP 2 INSTRUCTIONS
OTI UPH D02 #357 RESET F0
JMP NXT16 GOTO NXT16
JFS F14 **2 SKIP NEXT IF DATA-F/F=1
OTI LWH D01 #367 SET TIMING ERROR STATUS
OTI UPH D02 #177 RESET DATA F/F
JFS F16 **3 SKIP 2 IF IN-XFFK = 1
OTI LWH D02 #277 SET F2 TO INDICATE WC<REC. LENGTH
JMP LP16 GOTO LP16
NXT16 OTI LWH D20 #377 SET SERV. REQ.
TERMT JFS F07 RDEND GOTO RDEND IF EOB FLAG=1
JFS F10 RD166 GOTO RD166 IF RD. CLK.=1
JMP TRMT OTHERWISE STAY IN LOOP
RDEND JFS F02 **3 SKIP 2 IF F2=1
CAL ERR16 SUB. CALL TO LOOK FOR TAPE ERROR
JMP ODEND GOTO ODEND
RDND1 ANI LWH R0B 1 GOTO FSRF IF
JNZ RCS FSRF FSR-FSF CMD.
JMP **4 ELSE GO BACK 4
RDND2 JFS F02 RDND1 GOTO RDND1 IF F2=1
XOR CTM R3B R3A ZERO OUT THE COUNTER
INC OUT UPH R3I D07 OUTPUT THE I-BYTE TO DATA-IN REG.
INC OUT LWH CTI D07 ZERO OUT THE LOWER DATA BYTE
PSI LWH CTM T1 CNTR:=1 WORD DELAY
JFS F14 **2 SKIP NEXT IF DATA-F/F=1
OTI LWH D01 #367 SET TIMING ERROR
OTI UPH D22 #177 SET SERV. REQ. & RST. DATA F/F
JXZ RCS DEC * TIME OUT THE COUNTER
JFS F14 **2 SKIP NEXT IF DATA F/F=1
OTI LWH D01 #367 SET TIMING ERROR
JMP ODEND GOTO ODEND
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SKP

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1252 1124 11 001 110 011 110 011 111 IDENT XOR R5M R3B R3A ZERO OUT R5
1253 1125 10 111 111 001 100 010 111 PSI R2M UPH #350 SET R2= TO 4"ID BURST COUNT
1254 1126 10 111 100 011 111 111 110 PSI R5M LWH #1 R5:=1
1255 1127 01 001 111 000 010 010 111 ADD R2M R2B R5A INCREMENT R2
1256 1130 10 111 100 001 111 100 101 PSI CTM LWH #32 PRESET THE COUNTER
1257 1131 01 110 011 001 000 001 111 CAL DEC WRTP3 SUBROUTINE CALL
1258 1132 01 001 111 000 010 010 111 ADD R2M R2B R5A R2:=R2+1
1259 1133 00 011 101 001 001 011 000 JNZ RCS **3 GO BACK IN LOOP IF R2 IS NON-ZERO
1260 1134 01 110 111 000 001 011 010 CAL WGAP CALL TO WGAP TO WRITE A GAP
1261 1135 11 100 101 111 001 011 111 JFS F07 **2 SKIP NEXT IF EOH DETECTED BY DRIVE
1262 1136 00 000 111 000 001 111 111 JMP DPOP NO EOB - ERROR CASE
1263 1137 01 110 111 001 000 001 000 CAL EPR16 SUB. CALL TO LOOK FOR TAPE ERROR
1264 1140 00 111 100 101 000 010 000 OTI LWH D12 #357 SET F1 & RESET EOH
1265 1141 00 010 111 001 010 001 011 IOC INP UPH R3I D22 GET 1600 STATUS IN R3
1266 1142 10 110 111 111 101 111 111 ANI UPH R3B #200 LOOK FOR ID-BURST STATUS
1267 1143 00 011 111 001 001 100 101 JNZ **2 ID-BURST CONFIRMED-SKIP NEXT INSTRUCTION
1268 1144 00 000 111 000 001 111 111 JMP DROP NO ID-BURST STATUS-ERROR CASE
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1273 1145 10 110 101 111 011 111 110 WR16 ANI LWH R0B 1 LOOK FOR SUBGROUP OF WRITE
1274 1146 00 011 111 001 001 101 000 JNZ **2 SKIP NEXT IF WRP CMD.
1275 1147 00 111 100 001 001 000 000 OTI LWH D02 #277 SET F2 TO INDICATE WFM OR GAP CMD.
1276 1150 11 100 100 011 001 101 010 JFS F01 **2 SKIP NEXT IF F1=1(NOT BOT)
1277 1151 00 000 111 001 001 010 100 JMP IDENT GOTO IDENT TO WRITE ID-BURST
1278 1152 00 111 100 000 000 000 001 OTI LWH D00 #376 SET ODD F/F
1279 1153 10 111 111 011 100 000 000 PSI R1M UPH #377 FILL UPPER BYTE OF R1 WITH ALL 1'S
1280 1154 00 111 100 001 000 100 000 OTI LWH D02 #337 RESET F1
1281 1155 10 111 111 001 101 001 111 PSI R2M UPH #260 R2:=R2-80
1282 1156 11 100 100 101 001 110 000 JFS F02 **2 SKIP NEXT INSTRUCTION IF F2=1
1283 1157 00 000 111 001 001 111 010 JMP WRT16 WRR CMD.-GOTO WR16 TO WRITE PREFAMBLE
1284 1160 10 001 101 111 011 111 010 XOI LWH R0B GAP LOOK FOR GAP COMMAND
1285 1161 00 011 101 001 001 110 111 JNZ RCS **6 SKIP 5 IF WFM COMMAND
1286 1162 01 110 111 000 001 011 010 CAL WGAP SUBROUTINE CALL TO WRITE 3.75" GAP
1287 1163 11 100 101 111 001 110 101 JFS F07 **2 SKIP NEXT IF EOH FLAG=1
1288 1164 00 000 111 000 010 000 010 JMP ODEND GOTO ODEND
1289 1165 01 110 111 001 000 001 000 CAL EPR16 SUB. CALL TO LOOK FOR TAPE ERROR
1290 1166 00 000 111 000 010 000 010 JMP ODEND GOTO ODEND
1291 1167 00 111 100 000 000 000 010 OTI LWH D00 #375 SET EVEN F/F
1292 1170 10 111 111 011 101 011 000 PSI R1M UPH #247 R1(UPPER):=FM CHARACTER
1293 1171 10 111 111 001 101 010 000 PSI R2M UPH #257 R2:=R2-81
1294 1172 11 010 110 010 110 001 111 WRT16 PSB R5M UPH R1B PASS UPPER BYTE OF R1 IN R5
1295 1173 10 111 100 001 111 110 101 LPFM PSI CTM LWH #12 PRESET THE COUNTER
1296 1174 01 110 011 001 000 001 101 LPFM1 CAL DEC WRTP1 SUBROUTINE CALL
1297 1175 00 001 111 000 011 111 110 ANI R2M UPH R2B #1 R2(UPPER):=R2+1
1298 1176 00 011 101 001 001 111 011 JNZ RCS LPFM GO IN LOOP IF R2 IS NON-ZERO
1299 1177 11 100 100 101 010 011 001 JFS F02 FIN16 GOTO FIN16 IF F2=1
1300 1200 10 111 100 001 111 100 110 PSI CTM LWH #31 PRESET THE COUNTER
1301 1201 11 100 000 001 010 011 001 BLK16 JFS F00 DEC FIN16 GOTO FIN16 IF F0=1(POSTAMBLE WRITTEN)
1302 1202 01 110 011 001 000 001 101 CAL DEC WRTP1 SUBROUTINE CALL
1303
1304
*****
SKP

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1310 1293 10 111 100 001 111 110 100
1311 1294 01 110 011 000 001 100 010
1312 1295 01 110 011 001 000 001 111
1313 1296 10 111 100 001 111 110 011
1314 1297 01 110 011 001 000 001 101
1315 1210 11 111 110 011 101 110 111
1316 1211 11 111 110 011 101 110 111
1317 1212 10 111 100 001 111 110 101
1318 1213 01 110 011 001 000 001 111
1319 1214 10 111 100 001 111 110 011
1320 1215 01 000 011 111 111 111 111
1321 1216 01 110 011 001 000 001 101
1322 1217 11 100 100 001 010 000 011
1323 1220 11 001 010 011 110 011 111
1324 1221 10 111 100 001 111 110 100
1325 1222 01 110 011 001 000 001 101
1326 1223 10 111 100 001 111 110 011
1327 1224 01 110 011 001 000 001 101
1328 1225 10 111 100 001 111 100 011
1329 1226 10 111 011 001 101 001 111
1330 1227 00 111 010 001 000 100 000
1331 1230 00 000 011 001 001 111 100
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1339 1231 00 111 100 000 000 000 001
1340 1232 11 100 100 101 010 011 101
1341 1233 10 111 110 001 111 001 100
1342 1234 00 000 011 001 010 011 110
1343 1235 10 111 110 001 111 011 100
1344 1236 11 100 001 111 010 100 001
1345 1237 01 010 001 001 010 011 110
1346 1240 00 000 111 000 001 111 111
1347 1241 11 100 100 101 010 100 100
1348 1242 01 110 111 001 000 001 000
1349 1243 00 000 111 000 010 000 010
1350 1244 01 110 111 001 000 000 000
1351 1245 00 000 111 000 001 111 101
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1355 1246 10 001 101 111 011 111 001
1356 1247 00 011 101 001 010 101 010
1357 1250 11 100 110 011 010 101 010
1358 1251 00 111 100 000 100 010 000
1359 1252 01 101 111 111 111 111 111
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*****
*          WLP16 IS THE LOOP-ENTRY POINT FOR WRITING THE          *
*          DATA-BLOCK. F0=1 AS LONG AS OUT-XFER=1.              *
*          (1600 HPI ONLY)                                        *
*****
WLP16 PSI CTM LWH #13          PRESET THE COUNTER
      CAL     DEC WRCHK        SUBROUTINE CALL TO WRCHK
      CAL     DEC WRTD3        SUBROUTINE CALL
      PSI CTM LWH #14          PRESET THE COUNTER
      CAL     DEC WRTD1        SUBROUTINE CALL
      PSA RSM R5A RL4         LEFT ROTATE R5
                              BY 8-BITS IN R5
      PSA RSM R5A RL4
      PSI CTM LWH #12          PRESET THE COUNTER
      CAL     DEC WRTD3        SUBROUTINE CALL
      PSI CTM LWH #14          PRESET THE COUNTER
      NOP     DEC              NO-OPERATION
      CAL     DEC WRTD1        SUBROUTINE CALL
      JFS F00 WLP16          GO IN THE WRITE LOOP IF F0=1
      XOR R5M DEC R3B R3A     ZERO OUT R5
      PSI CTM LWH #13          PRESET THE COUNTER
      CAL     DEC WRTD1        SUBROUTINE CALL
      PSI CTM LWH #14          PRESET THE COUNTER
      CAL     DEC WRTD1        SUBROUTINE CALL
      PSI CTM LWH #34         PRESET THE COUNTER
      PSI R2M DEC UPH #260    R2(UPPER)=-80
      OTI UPH DEC D02 #337    SET F0 TO INDICATE POSTAMBLE CASE
      JMP     DEC LPFM1        GOTO WRITE POSTAMBLE
*****
*          AN END OF BLOCK PULSE IS AWAITED AT FIN16 AFTER      *
*          WRITING OF DATA BLOCK OR FILE-MARK IS DONE.        *
*          TAPE ERROR OR FILE-MARK STATUS IS                    *
*          CHECKED TO ENSURE SUCCESSFUL                          *
*          WRITING(1600 HPI).                                    *
*****
FIN16 OTI LWH D00 #376        SET ODD F/F
      JFS F02 FM166          GOTO FM166 IF F2=1
      PSI UPH CTM #63        CNTR:=.155"+80 CHARACTER DELAY
      JMP **2 DEC            SKIP NEXT INSTRUCTION
FM166 PSI UPH CTM #43        CNTR:=.155" + 20 CHARACTER DELAY
      JFS F07 DEC **3        SKIP 2 IF EOB=1
      JXZ RCS DEC **1        STAY IN LOOP TILL CNTR. NON-ZERO
      JMP DROP              CHARACTER DROPOUT CASE
      JFS F02 **3           SKIP 2 IF WFM COMMAND
      CAL ERR16            SUB. CALL TO LOOK FOR TAPE ERROR
      JMP ODEND           GOTO ODEND
      CAL FMP16           SUB. CALL TO LOOK FOR TAPF MARK
      JMP FM816          GOTO FM816
*****
*          SUBROUTINE TO CHECK PARITY OF EACH BYTE IN RDR CMD.  *
*****
ERCHK XOI LWH R0B RDR        PERFORM PARITY CHECK ONLY
      JMZ RCS **3          IF THE COMMAND IS 'RDR'
      JFS F11 **2          SKIP NEXT IF PARITY OK
      OTI LWH D01 #357     SET TAPE ERROR F/F
      RTN                 SUBROUTINE RETURN
*****
SRP

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1367 1314 00 010 111 001 010 001 011
1368 1315 10 110 111 111 111 101 111
1369 1316 00 011 101 001 011 001 100
1370 1317 10 111 111 011 111 001 100
1371 1320 00 000 111 000 000 001 011
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1377 1327 00 010 111 001 010 001 011
1378 1330 10 110 111 111 111 110 111
1379 1331 00 011 101 000 000 001 111
1380 1332 00 010 111 001 010 001 011
1381 1333 10 110 111 111 111 101 111
1382 1334 00 011 101 001 011 011 010
1383 1335 00 000 111 000 000 110 101
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1389 1361 10 111 100 001 100 010 001
1390 1362 11 100 111 101 011 110 100
1391 1363 00 000 111 001 011 110 110
1392 1364 00 111 110 001 000 001 000
1393 1365 00 000 111 001 011 110 111
1394 1366 00 111 111 000 000 000 000
1395 1367 01 010 001 001 011 110 111
1396 1370 00 010 111 001 010 001 011
1397 1371 10 110 111 111 111 101 111
1398 1372 00 011 111 000 010 001 101
1399 1373 00 000 111 000 000 000 100
1400
1401 1374 11 111 111 101 110 011 011
1402 1375 00 000 111 000 001 111 111
1403

*****
*
*          OPG #1314
*
*****
PTCH1 IOC IMP R3I D22 UPH          GET STATUS BYTE IN UPPER R3
      ANI UPH R3B #20              IS INT. FLAG=1?
      JMZ RCS *-2                  YES, KEEP LOOKING AT THIS BIT
      PSI UPH R1M #63              R1:=(TRYING TO SELECT UNIT)
      JMP CONT1                    GOTO CONT1 TO CONTINUE WITH THE PROGRAM
*****
*
*          OPG #1327
*
*****
PTCH2 IOC IMP R3I D22 UPH          GET STATUS BYTE IN R3
      ANI UPH R3B #10              LOOK FOR SIO OK BIT
      JMZ RCS MAIN                 GOTO MAIN IF ALREADY IN SIO ROUTINE
      IOC IMP R3I D22 UPH          GET STATUS BYTE IN R3
      ANI UPH R3B #20              IS INT. FLAG=1?
      JMZ RCS *-2                  YES, KEEP LOOKING AT THIS BIT
      JMP SCAN0                    GO BACK TO SCAN0
*****
*
*          OPG #1361
*
*****
PATCH PSI LWH CTM TCOST          PRESET THE COUNTER WITH COAST DELAY
      JFS F16 *-2                  SKIP NEXT IF IN-XFER=1
      JMP *-3                       SKIP 2 INSTRUCTIONS
      OTI UPH D02 #367             SET DEVICE-END
      JMP *-2                       SKIP NEXT INSTRUCTION
      OTI UPH D20 #377             SET SERV. REQ.
      JXZ RCS DEC *                TIME OUT THE COUNTER
      IOC IMP R3I D22 UPH          GET STATUS BYTE IN UPPER R3
      ANI UPH R3B #20              IS INT. FLAG=1?
      JMZ STOP1                     NO, GOTO STOP1
      JMP WAIT                       INTERRUPT NOT YET PROCESSED, GOTO WAIT
*****
PTCH3 PSA R4A ROM                RESTORE R0 FROM R4
      JMP DROP
      END

```

ERRORS



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