

quick reference
guide for
datapoint
processors
and peripherals

**A summary of assembly
and machine language instructions**

SECOND EDITION

DATAPOINT CORPORATION



The Leader in Dispersed Data Processing™

REFERENCE GUIDE CONVENTIONS

The following conventions are adhered to throughout this guide.

1. All numbers not subscripted are assumed to be decimal unless noted in a table or chart
2. A "\$" appearing anywhere in this text other than character charts, shall denote an unused or unassigned item.
3. All items of information are generated for those model codes with which they are listed and can not be assumed to apply to any models not listed.

This guide is designed to aid the programmer and system analyst in using Datapoint equipment.

Under no circumstances is this guide to be used as a reference in the establishment of specifications or performance criteria. The appropriate product specification, reference manual, or software user's guide should be consulted for that purpose.

Suggestions and additions will be gratefully accepted. Write the Software Support Group, 9725 Datapoint Drive, San Antonio, Texas 78284.

DEVICE ADDRESS ASSIGNMENTS

| DEVICE | BINARY | OCTAL |
|-------------------------------------|---------------|--------------|
| Asynchronous Communications Adaptor | 11010010 | 322 |
| Cassette Deck | 11110000 | 360 |
| 9402 - DSREMOTE #2 | 11110100 | 350 |
| 9402 - DSREMOTE #3 | 11100100 | 344 |
| 9402 - DSREMOTE #4 | 11100010 | 342 |
| 9402 - DSREMOTE #5 | 11011000 | 330 |
| 9402 - DSREMOTE #6 | 11010100 | 324 |
| 9481 - Multifunction | 11010001 | 321 |
| Communications Adaptor #1 | | |
| 9481 - Multifunction | 11001100 | 314 |
| Communications Adaptor #2 | | |
| 9481 - Multifunction | 11001010 | 312 |
| Communication Adaptor #3 | | |
| 9481 - Multifunction | 11001001 | 311 |
| Communications Adaptor #4 | | |
| Local Printer #1 | 11000011 | 303 |
| Local Printer #2 | 11000101 | 305 |
| Local Printer #3 | 11000110 | 306 |
| Local Printer #4 | 10111000 | 270 |
| Magnetic Tape | 10110100 | 264 |
| Magnetic Tape | 10110010 | 262 |
| Magnetic Tape | 10110001 | 261 |
| Magnetic Tape | 10101100 | 254 |
| Magnetic Tape | 10101010 | 252 |
| Magnetic Tape | 10101001 | 251 |
| 9404 Synchronous Combox #2 | 10100110 | 246 |
| 9404 Synchronous Combox #1 | 10100101 | 245 |
| 9404 Synchronous Combox #3 | 10100011 | 243 |
| Reserved | 10011100 | 234 |
| Reserved | 10011010 | 232 |
| Reserved | 10011001 | 231 |
| 9420 Parallel Interface | 10010110 | 226 |
| 9420 Parallel Interface | 10010101 | 225 |
| 9420 Parallel Interface | 10010011 | 226 |
| 9420 Parallel Interface | 10001110 | 216 |
| 9420 Parallel Interface | 10001101 | 215 |
| 9420 Parallel Interface | 10001011 | 213 |
| Card Reader | 10000111 | 207 |
| Cartridge Disk | 01111000 | 170 |
| Cartridge Disk | 01110100 | 164 |
| Cartridge Disk | 01110010 | 162 |
| Cartridge Disk | 01110001 | 161 |
| 9402 - DSREMOTE #7 | 01101100 | 154 |
| 9402 - DSREMOTE #8 | 01101010 | 152 |
| 9462 - Multi Port Adaptor #1 | 01101001 | 151 |
| 9402 - DSREMOTE #9 | 01100110 | 146 |
| 9402 - DSREMOTE #10 | 01100101 | 145 |
| 9402 - DSREMOTE #11 | 01100011 | 143 |
| Servo Printer | 01011100 | 134 |
| Servo Printer | 01011010 | 132 |
| Servo Printer | 01011001 | 131 |
| Mass Storage Disk | 01010110 | 126 |
| Mass Storage Disk | 01010101 | 125 |
| Mass Storage Disk | 01010011 | 123 |
| Mass Storage Disk | 01001110 | 116 |
| Mass Storage Disk | 01001101 | 115 |
| Mass Storage Disk | 01001011 | 113 |
| Mass Storage Disk | 01000111 | 107 |
| Diskette | 00111100 | 074 |
| Diskette | 00111010 | 072 |
| Diskette | 00111001 | 071 |

DEVICE ADDRESS ASSIGNMENTS
(continued)

| DEVICE | BINARY | OCTAL |
|------------------------------|----------|-------|
| 9402 - DSREMOTE #12 | 00110110 | 066 |
| 9402 - DSREMOTE #13 | 00110101 | 065 |
| 9402 - DSREMOTE #14 | 00110011 | 063 |
| 9402 - DSREMOTE #15 | 00101110 | 056 |
| 9462 - Milti Port Adaptor #2 | 00101101 | 055 |
| 9402 - DSREMOTE #16 | 00101011 | 053 |
| Unassigned | 00100111 | 047 |
| Unassigned | 00011110 | 036 |
| Unassigned | 00011101 | 035 |
| Unassigned | 00011011 | 033 |
| Unassigned | 00010111 | 027 |
| Unassigned | 00001111 | 017 |

EXTERNAL COMMANDS

COMMAND WORD - EX (EXPRESSION)

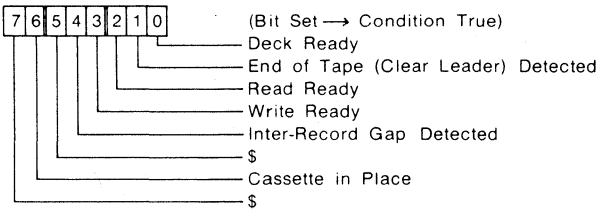
| ALL DEVICES | | | |
|---------------------|----------------|------------------------|---------------------|
| EXPRESSION | COMMAND NUMBER | OPERATION CODE (OCTAL) | COMMAND FUNCTION |
| ADR | 1 | 121 | Address Device |
| STATUS | 2 | 123 | Sense Status |
| DATA | 3 | 125 | Sense Data |
| WRITE | 4 | 127 | Write Strobe |
| COM1 | 5 | 131 | Command 1 |
| COM2 | 6 | 133 | Command 2 |
| COM3 | 7 | 135 | Command 3 |
| COM4 | 8 | 137 | Command 4 |
| \$ | 9 | 141 | \$ |
| \$ | 10 | 143 | \$ |
| \$ | 11 | 145 | \$ |
| \$ | 12 | 147 | \$ |
| BEEP | 13 | 151 | Beep |
| CLICK | 14 | 153 | Click |
| CASSETTE TAPE DECKS | | | |
| EXPRESSION | COMMAND NUMBER | OPERATION CODE (OCTAL) | COMMAND FUNCTION |
| DECK1 | 15 | 155 | Select Rear Deck |
| DECK2 | 16 | 157 | Select Front Deck |
| RBK | 17 | 161 | Read Block |
| WBK | 18 | 163 | Write Block |
| \$ | 19 | 165 | \$ |
| BSP | 20 | 167 | Backspace One Block |
| SF | 21 | 171 | Slew Forward |
| SB | 22 | 173 | Slew Backward |
| REWIND | 23 | 175 | Rewind Tape |
| STOP | 24 | 177 | Stop Tape |

NOTE: These device commands are in reference to ANSI cassette decks.

EXTERNAL COMMANDS

CASSETTE TAPE DECKS

STATUS WORD - EX STATUS



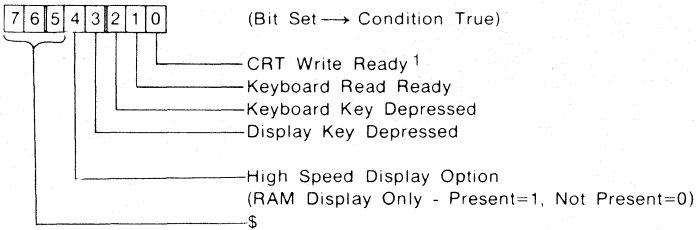
TAPE UNIT PHYSICAL SPECIFICATIONS (ANSI DECKS)

| | |
|--------------------------|------------------------------|
| Density | 47 characters/inch |
| Speed | 7.5 inches/second |
| Recording Rate | 350 character/second |
| Capacity | 115,000 characters (Typical) |
| Start/Stop Time | |
| (Inter-Record Gap) | 305 msec. |
| Start/Stop Distance | |
| (Inter-Record Gap) | 2.2 inches |
| Rewind Speed | 90 inches/second |
| Rewind Time (maximum) | 40 seconds |
| Characters Transfer Time | 2.8 msec. |

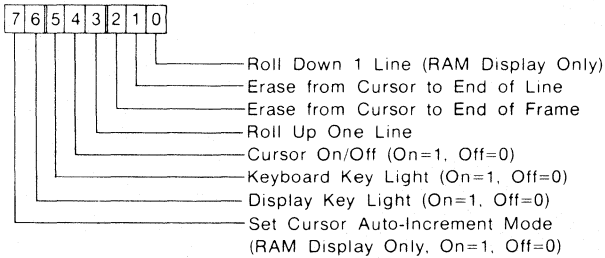
EXTERNAL COMMANDS

CRT/KEYBOARD

STATUS WORD - EX STATUS



CONTROL WORD - EX COM1



CONTROL WORD - EX COM2

Horizontal Cursor Position
(Decimal 0-79, 0-177₈, Starting at left of screen)

CONTROL WORD - EX COM3

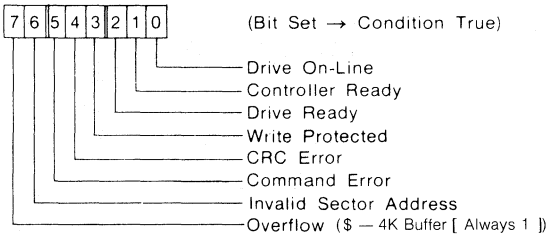
Vertical Cursor Position
(Decimal 0-11, 0-13₈, Starting at top of screen)

NOTE 1: CRT "Write Ready" is valid only if cursor is positioned to a valid screen position.

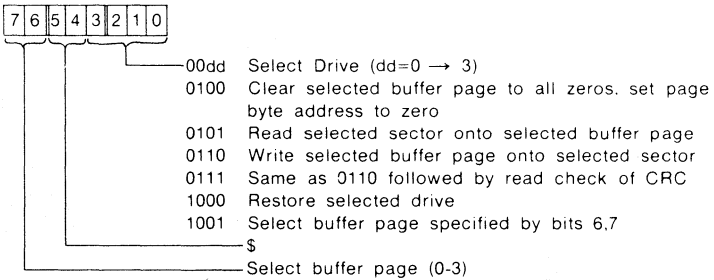
EXTERNAL COMMANDS

9350 DISK CONTROLLER/DRIVE

STATUS WORD - EX STATUS



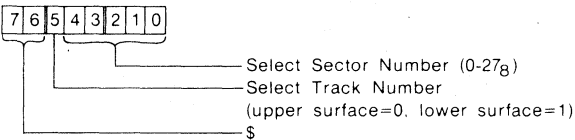
CONTROL WORD - EX COM1



CONTROL WORD - EX COM2

Select Cylinder Number (0-312_g)

CONTROL WORD - EX COM3



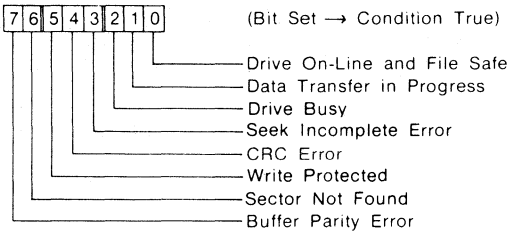
CONTROL WORD - EX COM4

Select Buffer Page Byte Address (0-256)

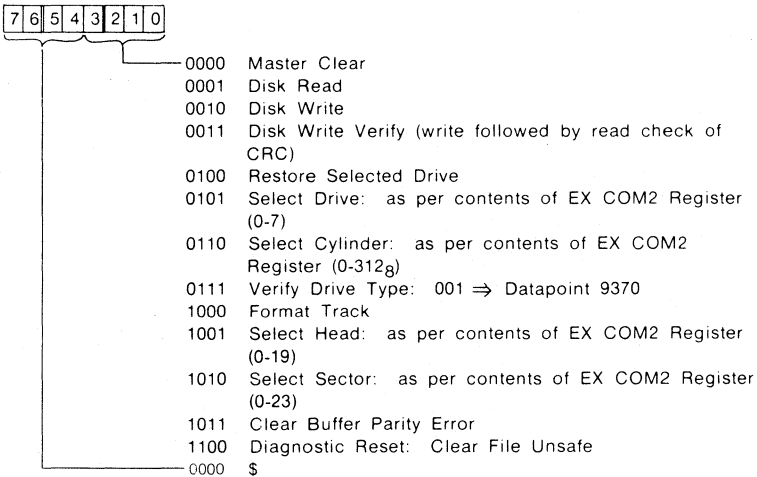
EXTERNAL COMMANDS

9370 DISK CONTROLLER/DRIVE

STATUS WORD - EX STATUS



CONTROL WORD - EX COM1



CONTROL WORD - EX COM2

Selects drive, cylinder, sector and head in conjunction with proper EX COM1 command

CONTROL WORD - EX COM3

Select buffer page (0-15)

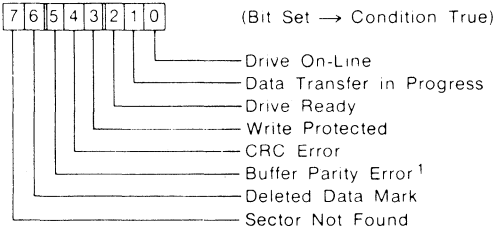
CONTROL WORD - EX COM4

Select buffer page byte address

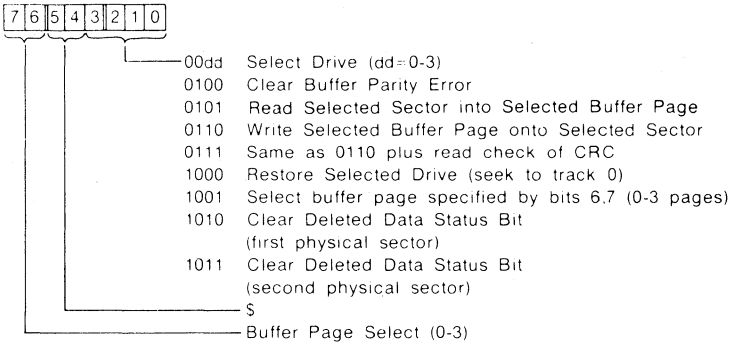
EXTERNAL COMMANDS

9380 DISK CONTROLLER/DRIVE

STATUS WORD - EX STATUS



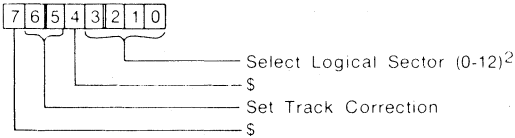
CONTROL WORD - EX COM1



CONTROL WORD - EX COM2

Select Track and Seek (0-76)

CONTROL WORD - EX COM3



CONTROL WORD - EX COM4

Select Buffer Page Byte Address (0-256)

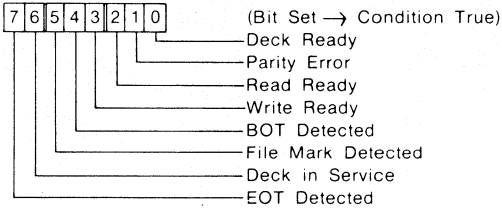
NOTE 1: Buffer memory parity will be in error on power-up until buffer is written in.

NOTE 2: The 9380 contains two physical sectors for each logical sector

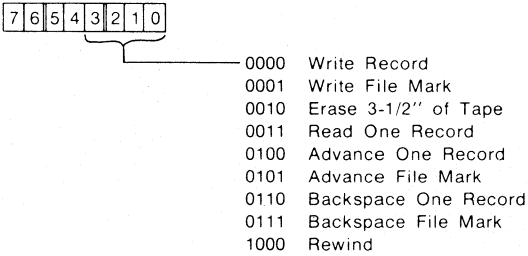
EXTERNAL COMMANDS

7 AND 9 TRACK TAPE TRANSPORTS (9550, 9551)

STATUS WORD - EX STATUS



CONTROL WORD - EX COM1



CONTROL WORD - EX COM2

Write Buffer Content on Tape

CONTROL WORD - EX COM3

Clear Buffer

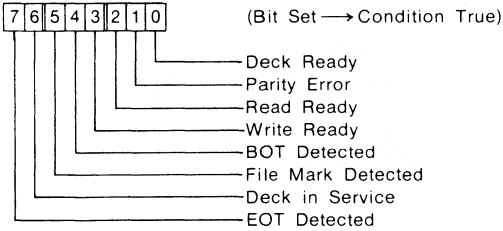
CONTROL WORD - EX COM4

\$

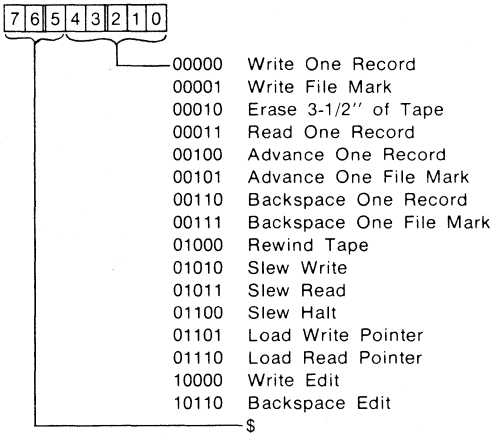
EXTERNAL COMMANDS

1600 BPI MAGNETIC TAPE SYSTEM (9580)

STATUS WORD - EX STATUS



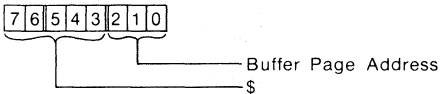
CONTROL WORD - EX COM1



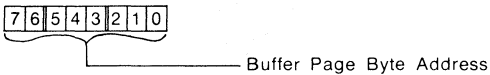
CONTROL WORD - EX COM2
Write Buffer Contents on Tape

CONTROL WORD - EX COM3
Clear Buffer

CONTROL WORD - EX COM4 (First Output)



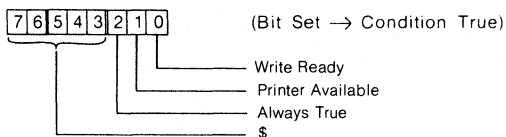
CONTROL WORD - EX COM4 (Second Output)



EXTERNAL COMMANDS

PRINTERS (9242, 9260, 9280, 9291, 9292) LOCAL PRINTERS (OTHER THAN SERVO PRINTERS)

STATUS WORD - EX STATUS



CHARACTER TRANSMISSION - EX WRITE

See - "Character Transmission and Translation Table"

Printer Control Codes¹

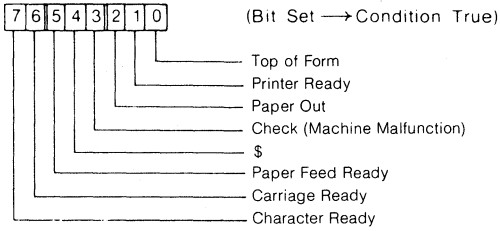
- 012₈ Line Feed
- 013₈ Vertical Tab (Centronics only)
- 014₈ Form Feed
- 015₈ Carriage Return
- 016₈ Elongated Print (Centronics only)

NOTE 1: Printer Control Codes are in addition to printing the buffer (i.e. data followed by a 014 will print the buffer and form feed).

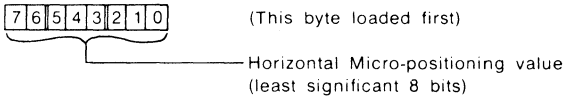
EXTERNAL COMMANDS

SERVO PRINTER (9250)

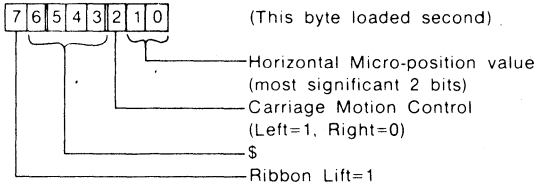
STATUS WORD - EX STATUS



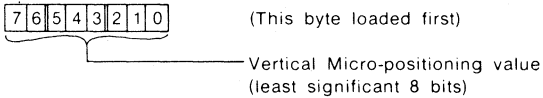
CONTROL WORD - EX WRITE (Used in conjunction with EX COM3)



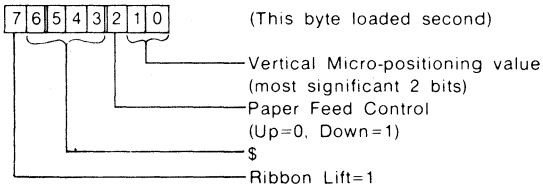
CONTROL WORD - EX COM1 (Used in conjunction with EX COM3)



CONTROL WORD - EX WRITE (Used in conjunction with EX COM4)



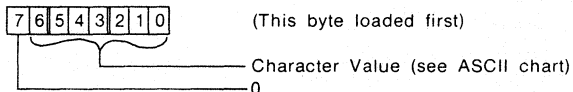
CONTROL WORD - EX COM1 (Used in conjunction with EX COM4)



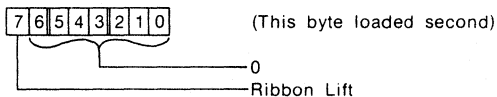
EXTERNAL COMMANDS

SERVO PRINTER 9250 (Cont.)

CONTROL WORD - EX WRITE (Used in conjunction with EX COM2)



CONTROL WORD - EX COM1 (used in conjunction with EX COM2)



CONTROL WORD - EX COM2

Generates Print Strobe

(Used in conjunction with EX WRITE and EX COM1)

CONTROL WORD - EX COM3

Generates Carriage Motion Strobe

(Used in conjunction with EX WRITE and EX COM1)

CONTROL WORD - EX COM4

Generates Paper Feed Strobe

(Used in conjunction with EX WRITE and EX COM1)

CONTROL WORD - EX DATA

Generates Form Feed Command

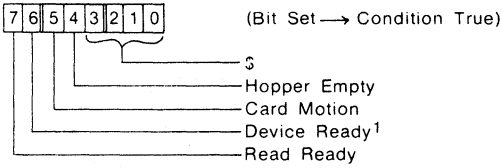
CONTROL WORD - EX STATUS

Generates "RESTORE" Command

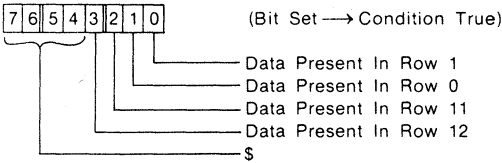
EXTERNAL COMMANDS

CARD READER (9504)

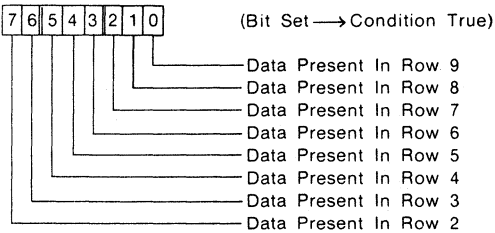
STATUS WORD - EX STATUS (FIRST INPUT)



STATUS WORD - EX STATUS (SECOND INPUT)



DATA WORD - EX DATA



CONTROL WORD - EX COM1

\$

CONTROL WORD - EX COM2

Card Feed Command

CONTROL WORD - EX COM3

Motor 'ON' Command

CONTROL WORD - EX COM4

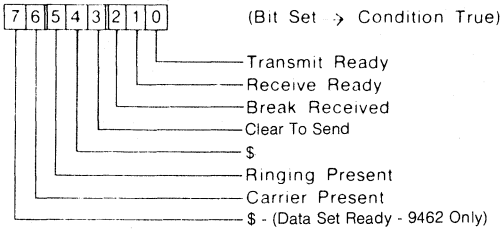
Motor 'OFF' Command

NOTE 1: Setting of this bit may be delayed as much as 10 seconds.

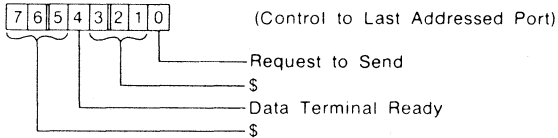
EXTERNAL COMMANDS

MULTIPLE PORT COMMUNICATIONS ADAPTOR (9460) (9462)

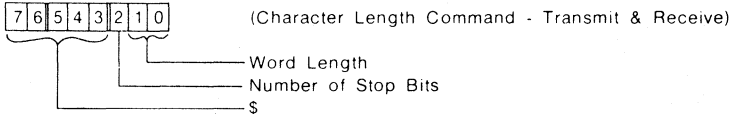
STATUS WORD¹ - EX STATUS



CONTROL WORD - EX COM1



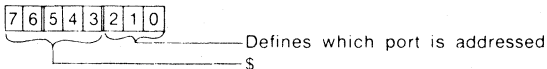
CONTROL WORD - EX COM2



TRANSMIT AND RECEIVE CHARACTER FORMATS

| CONTROL BIT POSITIONS | START BITS | INFORMATION BITS | STOP BITS | CODE BIT POSITIONS |
|-----------------------|------------|------------------|-----------|--------------------|
| 2 1 0 - OCTAL | | | | 7 6 5 4 3 2 1 0 |
| 000 - 0 | 1 | 5 | 1 | XXX54321 |
| 001 - 1 | 1 | 6 | 1 | XX654321 |
| 010 - 2 | 1 | 7 | 1 | X7654321 |
| 011 - 3 | 1 | 8 | 1 | 87654321 |
| 100 - 4 | 1 | 5 | 2 | XXX54321 |
| 101 - 5 | 1 | 6 | 2 | XX654321 |
| 110 - 6 | 1 | 7 | 2 | X7654321 |
| 111 - 7 | 1 | 8 | 2 | 87654321 |

CONTROL WORD - EX COM3



CONTROL WORD - EX COM4

\$

CONTROL WORD - EX WRITE

Transfers character in A-register to the currently selected port for transmission.

NOTE1: Until a port is selected, the STATUS word is a logical OR value of the status of all eight ports.

EXTERNAL COMMANDS

ASYNCHRONOUS COMMUNICATIONS ADAPTORS

STATUS WORD - EX STATUS (Bit Set → Condition True)

| Status Word Bits | Model Number | | | | |
|------------------|------------------------------|--------------------------|--------------------------|------|---------------------------|
| | 9400 | 9401 | 9402 | 9403 | 9410 |
| 0 | Transmit Ready | Same | Same | Same | Present Next Digit |
| 1 | Receive Ready | Same | Same | Same | Data Line Occupied |
| 2 | Break Received | Same | Same | Same | Distant Station Connected |
| 3 | Clear to Send (CB) | Same | Same | \$ | Abandon Call |
| 4 | Reverse Carrier Present (SB) | \$ | Same | \$ | Power Indication |
| 5 | Ringing Present (CE) | Same | Same | \$ | Standby Indicator |
| 6 | Main Carrier Present (CF) | Carrier Present (CAR) | Same | \$ | \$ |
| 7 | \$ | Data Coupler Ready (DCR) | Data Coupler Ready (DCR) | \$ | \$ |

EXTERNAL COMMANDS

ASYNCHRONOUS COMMUNICATIONS ADAPTORS (Cont.)

CONTROL WORD - EX COM1

Model Number

| EX COM1 Word Bits | 9400 | 9401 | 9402 | 9403 | 9410 |
|----------------------|------------------------------|--------------------------------------|-------------------------|------|------------------------------------|
| 0 | Request to Send | Same | Same | \$ | Data Terminal Ready |
| 1 | Invert Received Data Line | Same | Same | Same | Request to Send Mn. Channel |
| 2 | Supervisory Channel On | \$ | Same | \$ | Sig. Rate Sel./Transmit Freq. Sel. |
| 3 | Invert Transmitted Data Line | Same | Same | Same | Select Stand-By |
| 4 | Data Terminal Ready | Off-Hook | Off-Hook | \$ | Receiver Cut-off Main Channel |
| 5 | \$ | \$ | Send 2025 Hz | \$ | Return to Non-Data Mode |
| 6 | \$ | Originate=1 ¹ Answer=0 | Originate=1 Answer=0 | \$ | Request to Send Rev. Channel |
| 7 | \$ | Send Dial Pulses | Send Dial Pulses | \$ | Receiver Cut-Off Rev. Channel |

CONTROL WORD - EX COM2 (1st Execution)

Receive Time Base - least significant byte (see charts)

CONTROL WORD - EX COM2 (2nd Execution)

Receive Time Base - most significant byte (see charts)

CONTROL WORD - EX COM3 (1st Execution)

Transmit Time Base - least significant byte (see charts)

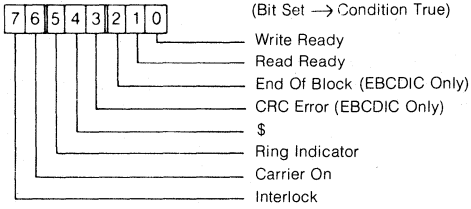
CONTROL WORD - EX COM3 (2nd Execution)

Transmit Time Base - most significant byte (see charts)

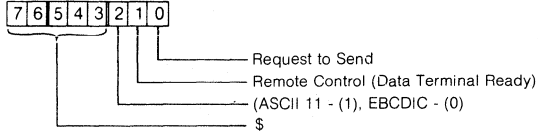
NOTE1: 2025 Hz is used for transmission if this bit is 0.

9404 - SYNCHRONOUS COMMUNICATIONS ADAPTOR

STATUS WORD - EX STATUS



CONTROL WORD - EX COM1



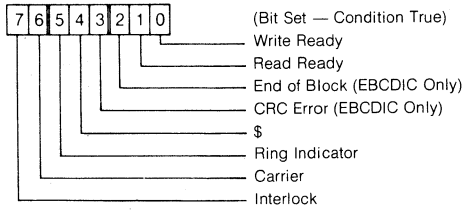
CONTROL WORD - EX COM2
Write Single 'DLE' ('DLE' Character
Loaded In The A-Register) - ENCDIC Only)

CONTROL WORD - EX COM3
New SYNC

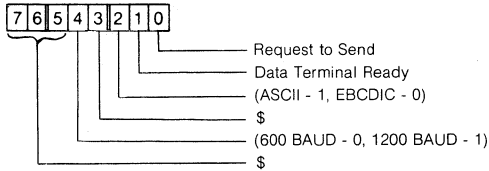
CONTROL WORD / EX COM4
\$

9405 - SYNCHRONOUS COMMUNICATIONS ADAPTOR
(9405 with 712 Clock Option)

STATUS WORD - EX STATUS



CONTROL WORD - EX COM1



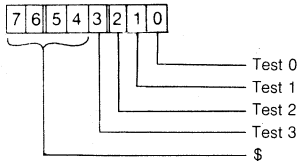
CONTROL WORD - EX COM2

Write Single 'DLE' (DLE) Character
 Loaded In The A-Register - EBDIC Only

CONTROLWORD - EX COM3

New Sync

CONTROL WORD - EX COM4



NOTE 1: The toggle switch on the 9405 board
 must be flipped for 600/1200 BAUD operation.

2200 MACHINE INSTRUCTIONS
(ASSEMBLER 4, DOSASM5, SNAP/1, SNAP/2)

| FUNCTION (Mnemonic Code) | OPERATION (OP) Code Expressed in Octal | DESCRIPTION (Definition of Function) | TIMING (in usec) * |
|--------------------------------|---|---|--------------------------|
| Lr _d (exp) | 0n _d 6,vvv | Load Immediate | 3.2 |
| Lr _d f _s | 3n _d n _s | Load | 3.2 ¹ |
| AD (exp) | 004,vvv | Add Immediate | 4.8 |
| ADr _s | 20n _s | Add | 3.2 ¹ |
| AC (exp) | 014,vvv | Add with Carry Immediate | 4.8 |
| ACr _s | 21n _s | Add with Carry | 3.2 ¹ |
| SU (exp) | 024,vvv | Subtract Immediate | 4.8 |
| SUr _s | 22n _s | Subtract | 3.2 ¹ |
| SB (exp) | 034,vvv | Subtract with Borrow Immediate | 4.8 |
| SBr _s | 23n _s | Subtract with Borrow | 3.2 ¹ |
| ND (exp) | 044,vvv | And Immediate | 4.8 |
| NDr _s | 24n _s | And | 3.2 ¹ |
| OR (exp) | 064,vvv | Or Immediate | 4.8 |
| ORr _s | 26n _s | Or | 3.2 ¹ |
| XR (exp) | 054,vvv | Exclusive - Or Immediate | 4.8 |
| XRr _s | 25n _s | Exclusive - Or | 3.2 ¹ |
| CP (exp) | 074,vvv | Compare Immediate | 4.8 |
| CPr _s | 27n _s | Compare | 3.2 ¹ |
| SRC | 012 | Shift Right Circular | 3.2 |
| SLC | 002 | Shift Left Circular | 3.2 |
| JMP (adr) | 104,lsb,msb | Unconditional Jump | 6.4 |
| JTc (adr) | 1p0,lsb,msb | Jump on True Flag | 4.8 ² |
| JFc (adr) | 1m0,lsb,msb | Jump on False Flag | 4.8 ² |
| CALL (adr) | 106,lsb,msb | Unconditional Call | 6.4 |
| CTc (adr) | 1p2,lsb,msb | Call on True Flag | 4.8 ² |
| CFc (adr) | 1m2,lsb,msb | Call on False Flag | 4.8 ² |
| RET | 007 | Unconditional Return | 3.2 |
| RTc | 0p3 | Return on True Flag | 1.6 ² |
| RFc | 0m3 | Return on False Flag | 1.6 ² |
| BETA* | 020 | Register and F/F Mode Swap | 3.2 |
| ALPHA* | 030 | Register and F/F Mode Swap | 3.2 |
| PUSH* | 070 | Address onto Stack | 3.2 |
| POP* | 060 | Address from Stack | 4.8 |
| DI* | 040 | Disable Interrupt | 3.2 |
| EI* | 050 | Enable Interrupt | 3.2 |
| NOP | 300 | No Operation | 3.2 |
| HALT | 377 | Halt | -- |
| INPUT | 101 | Input | 9.6 |
| EX | See Tables | External Command (see external command tables) | 9.6 |

r_s =source register
r_d =destination register
(exp)=one-byte expression
(adr)=two-byte address
c=condition flag
n_d,n_s=register reference
number
vvv=expression value
lsb=least significant byte
of address

msb=most significant byte
of address
*Version II 2200 only
1. add 1.6 usec if
memory reference
2. add 1.6 usec if transfer
occurs
p,m=condition code reference

REGISTER REFERENCE TABLE

| r | n |
|----|---|
| A | 0 |
| B | 1 |
| C | 2 |
| D | 3 |
| E | 4 |
| H | 5 |
| L | 6 |
| *X | 7 |
| M | 7 |

M=memory reference,
memory location specified
by HL*(or currently
selected register pair)

*5500 only

CONDITION (Flip-Flop) CODE REFERENCE TABLE

| c | m | p |
|---------------------------------|---|---|
| C (Carry) | 0 | 4 |
| Z (Zero) | 1 | 5 |
| S (Sign) | 2 | 6 |
| P (Parity) (true=odd parity) | 3 | 7 |

REGISTER CODES (5500 ONLY)

| r | [r] (register select opcode) | [pr] (reg. sel. for paged instructions) |
|---|---------------------------------|--|
| A | no code (implicit) | 105 |
| B | 111 | 114 |
| C | 062 | 124 |
| D | 113 | 134 |
| E | 174 | 144 |
| H | 115 | 154 |
| L | 176 | 164 |
| X | 117 | no code (cannot be used) |

REGISTER PAIR CODES (5500 ONLY)

| rp | [rp] - register pair select code |
|----|----------------------------------|
| HL | 176 (implicit) |
| BC | 062 |
| DE | 174 |
| XA | 022 |

**5500 MACHINE INSTRUCTIONS
(SNAP/1, SNAP/2)**

(1 of 4)

| FUNCTION (Mnemonic Code) | OPERATION (OP) Code Expressed in Octal | DESCRIPTION (Definition of Function) | TIMING (in usec) * |
|--------------------------------|---|---|--------------------------|
| Lr _d (exp) | 0n _d 6,vvv | Load Immediate | 2.0 |
| Lr _d f _s | 3n _d n _s | Load | 1.2 (2.6) |
| AD (exp) | 004,vvv | Add Immediate | 2.0 |
| ADr _s | 20n _s | Add | 1.4 (2.6) |
| AC (exp) | 014,vvv | Add with Carry Immediate | 2.0 |
| ACr _s | 21n _s | Add with Carry | 1.4 (2.6) |
| SU (exp) | 024,vvv | Subtract Immediate | 2.0 |
| SUr _s | 22n _s | Subtract | 1.4 (2.6) |
| SB (exp) | 034,vvv | Subtract with Borrow Immediate | 2.0 |
| SBr _s | 23n _s | Subtract with Borrow | 1.4 (2.6) |
| ND (exp) | 044,vvv | And Immediate | 2.0 |
| NDr _s | 24n _s | And | 1.4 (2.6) |
| OR (exp) | 064,vvv | Or Immediate | 2.0 |
| ORr _s | 26n _s | Or | 1.4 (2.6) |
| XR (exp) | 054,vvv | Exclusive - Or Immediate | 2.0 |
| XRr _s | 25n _s | Exclusive - Or | 1.4 (2.6) |
| CP (exp) | 074,vvv | Compare Immediate | 1.8 |
| CPr _s | 27n _s | Compare | 1.2 (2.4) |
| SRC | 012 | Shift Right Circular | 1.4 |
| SLC | 002 | Shift Left Circular | 1.4 |
| JMP (adr) | 104,lsb,msb | Unconditional Jump | 2.8 |
| JTc (adr) | 1p0,lsb,msb | Jump on True Flag | 1.4 (3.0) |
| JFc (adr) | 1m0,lsb,msb | Jump on False Flag | 1.4 (3.0) |
| CALL (adr) | 106,lsb,msb | Unconditional Call | 3.0 |
| CTc (adr) | 1p2,lsb,msb | Call on True Flag | 1.6 (3.2) |
| CFc (adr) | 1m2,lsb,msb | Call on False Flag | 1.6 (3.2) |
| RET | 007 | Unconditional Return | 1.8 |
| RTc | 0p3 | Return on True Flag | 1.0 (1.8) |
| RFc | 0m3 | Return on False Flag | 1.0 (1.8) |
| BETA | 020 | Register and F/F Mode Swap | 1.2 |
| ALPHA | 030 | Register and F/F Mode Swap | 1.0 |
| PUSH | 070 | Address onto Stack | 2.0 |
| POP | 060 | Address from Stack | 2.2 |
| DI | 040 | Disable Interrupt | 1.2 |
| EI | 050 | Enable Interrupt | 1.0 |
| NOP | 300 | No Operation | 1.2 |
| HALT | 377 | Halt | -- |
| INPUT | 101 | Input | 5.0 |
| EX | See tables | External Command (see external command tables) | 9.2 |

r_d=source register

r_s=destination register

(exp)=one-byte expression

(adr)=two-byte address

c=condition flag

n_d,n_s=register reference number

vvv=expression value

lsb=least significant byte
of address

msb=most significant byte
of address

*value in parenthesis is for
instruction making a memory
reference or causing a transfer.

5500 MACHINE INSTRUCTIONS
(SNAP/1, SNAP/2)

(2 of 4)

| FUNCTION (Mnemonic Code) | OPERATION (OP) Code Expressed in Octal | DESCRIPTION (Definition of Function) | TIMING (in usec) |
|-----------------------------------|---|--|---------------------|
| Lr _d M rp | [rp].3n _d 7 | Load register from memory, memory address in rp | 3.4 |
| LMr _s rp | [rp].37n _s | Load memory from register, memory address in rp | 3.4 |
| (op)r _s r _d | [r _d].[*] | Arithmetic or logical operation to other than A register | +1.0 |
| (op)r _d (exp) | [r _d].[*]vvv | Immediate arithmetic or logical operation to other than A register | +1.0 |
| SLCr _d | [r _d].002 | Shift left circular, other than A reg | 2.4 |
| SRCr _d | [r _d].012 | Shift right circular, other than A reg | 2.4 |
| SRE | 032 | Shift right extended | 1.4 |
| SREr _d | [r _d].032 | Shift right extended, other than A reg | 2.4 |
| INr _d | [r _d].101 | Input, to other than A register | 6.0 |
| EXr _s | [r _d].[ext] | External command, from other than A Reg (see external command tables for [ext]) | 10.2 |
| PIN | 103 | Input with parity testing | 5.4 |
| PINr _d | [r _d].103 | Input with parity testing, to other than A register | 6.4 |
| PUSH rp | [rp].070 | Address onto stack, from rp | 2.8 |
| PUSH (adr) | 051.lsb.msb | PUSH Immediate | 2.8 |
| POP rp | [rp].060 | Address from stack, into rp | 3.0 |
| BT | 021 | Block transfer | < 820 |
| BTR | 111.021 | Block transfer reverse | < 820 |
| BFAC | 011 | Binary field add with carry | < 50 |
| BFSB | 031 | Binary field subtract with borrow | < 50 |
| BCP | 041 | Block Compare | < 722 |
| DFAC | 111.041 | Decimal field add with carry | < 79 |
| DFSB | 062.041 | Decimal field subtract with borrow | < 70 |
| BFSL | 075 | Binary field shift left | < 39 |
| BFSR | 111.075 | Binary field shift right | < 37 |
| MIN | 061 | Multiple In, DMA - type command, I/O device to memory starting at HL | < 155 (8.4/byte) |
| MOUT | 071 | Multiple Out, DMA - type command, I/O device from memory starting at HL | < 161 (8.8/byte) |
| STKS | 065 | Stack Store, save stack in memory | < 40 |
| STKL | 111.065 | Stack Load, restore stack from memory | < 40 |
| REGS | 055 | Register Store, save registers in memory, descending from top-of-stack address | 13.2 |
| REGL | 111.055 | Register Load, restore registers from memory, descending from address in HL | 12.0 |

rp=register pair

[rp]=register pair select code

[r]=register select code

(op)=arithmetic or logical operator:
AD,AC,SU,SB,ND,OR,XR,CP

[*]=op code for (op) from page 1

TIMING NOTE:

+ prior to time indicates
time to be added to timing for
equivalent instruction from page 1

< prior to time indicates
maximum possible time. These
instructions are extremely complex;
check 5500 reference.

5500 MACHINE INSTRUCTIONS
(SNAP/1, SNAP/2)

(3 of 4)

| FUNCTION (Mnemonic Code) | OPERATION (OP) Code (Expressed in Octal) | DESCRIPTION (Definition of Function) | TIMING (in usec) |
|--|---|--|---------------------|
| CCS _d | [_d] .042 | Condition Code Save in _d , add _d to itself to restore conditions | 3.0 |
| Increment Register Pair Instructions | | | |
| INCP HL | 015 | HL by 1 | 2.8 |
| INCP HL.2 | 117.015 | HL by 2 | 3.8 |
| INCP HL.A | 017 | HL by contents of A | 3.0 |
| INCP BC | 062.015 | BC by 1 | 3.6 |
| INCP BC.2 | 113.015 | BC by 2 | 3.8 |
| INCP BC.A | 062.017 | BC by contents of A | 3.8 |
| INCP DE | 174.015 | DE by 1 | 3.6 |
| INCP DE.2 | 115.015 | DE by 2 | 3.8 |
| INCP DE.A | 174.017 | DE by contents of A | 3.8 |
| Decrement Register Pair Instructions | | | |
| DECP HL | 035 | HL by 1 | 2.8 |
| DECP HL.2 | 117.035 | HL by 2 | 3.8 |
| DECP HL.A | 037 | HL by contents of A | 3.0 |
| DECP BC | 062.035 | BC by 1 | 3.6 |
| DECP BC.2 | 113.035 | BC by 2 | 3.8 |
| DECP BC.A | 062.037 | BC by contents of A | 3.8 |
| DECP DE | 174.035 | DE by 1 | 3.6 |
| DECP DE.2 | 115.035 | DE by 2 | 3.8 |
| DECP DE.A | 174.037 | DE by contents of A | 3.8 |
| Double Load Instructions | | | |
| DL _{rp_d} . _{rp_s} | -- | load _{rp_d} from memory locations pointed to by _{rp_s} .lsb first | -- |
| DL DE.HL | 047 | | 3.4 |
| DL BC.HL | 111.047 | | 5.2 |
| DL BC.BC | 062.047 | | 4.6 |
| DL BC.DE | 113.047 | | 5.0 |
| DL DE.BC | 174.047 | | 4.6 |
| DL DE.DE | 115.047 | | 5.0 |
| DL HL.BC | 176.047 | | 4.6 |
| DL HL.DE | 117.047 | | 5.0 |
| DL HL.HL | 057 | | 4.0 |
| NOJ | 045 | NOP Jump, skip next two bytes | 1.4 |
| SC | 067 | System Call, call 0170025 | 1.8 |
| UR | 111.012 | User Return | 2.0 |
| STL | 077 | Sector Table Load | 27.4 |
| BP | 052 | Break Point, call 0170030 (DEBUG) | 1.8 |

_{r_d}=destination register
_{rp_d}=destination register pair
_{rp_s}=source register pair
lsb=least significant byte
[_{r_d}]=register select code

5500 MACHINE INSTRUCTIONS
(SNAP/1, SNAP/2)

(4 of 4)

| FUNCTION (Mnemonic Code) | OPERATION (OP) Code Expressed in Octal | DESCRIPTION (Definition of Function) | TIMING (in usec) |
|--------------------------------|---|---|---------------------|
| DS rp_s, rp_d | -- | Double Store Instructions store contents of rp_s into memory locations pointed to by rp_d , 1sb first | -- |
| DS DE,HL | 027 | | 3.4 |
| DS BC,HL | 111,027 | | 5.2 |
| DS BC,DE | 113,027 | | 5.0 |
| DS DE,BC | 174,027 | | 4.6 |
| DS HL,BC | 176,027 | | 4.6 |
| DS HL,DE | 117,027 | | 5.0 |
| PL $r_d(\text{exp})$ | [pr], 1sb | Paged Load, load r_d from memory location given by 1sb, msb in X | 3.0 |
| PS $r_s(\text{exp})$ | [pr+2], 1sb | Paged Store, store r_d into memory | 3.0 |
| DPL $rp,(\text{exp})$ | [r], [pr], 1sb | Double Paged Load, load rp from memory location and location + 1 ([r] is for first register of pair, [pr] for second) ($rp \neq XA$) | 4.8 |
| DPS $rp,(\text{exp})$ | [r], [pr+2], 1sb | Double Paged Store, store rp into memory (similar to DPL) | 4.8 |
| | | Index Instructions: index is a two-byte value in memory, X contains msb and (i) gives 1sb of location of the index. (dsp) is used to modify the value in the index. | |
| INCI (dsp),(i) | 005, 1sb, [i] | Increment Index by 1sb of (dsp) | 7.6 |
| DECI (dsp),(i) | 025, 1sb, [i] | Decrement Index by 1sb of (dsp) | 7.8 |
| INCI *(dsp),(i) | 111,005, 1sb, msb, [i] | Increment Index by msb, 1sb of (dsp) | 9.6 |
| DECI *(dsp),(i) | 111,025, 1sb, msb, [i] | Decrement Index by msb, 1sb of (dsp) | 9.8 |
| LFII $rp,(\text{dsp}), (i)$ | [rp], 005, 1sb, [i] | Load From Index Incremented, add 1sb of (dsp) to index value and save result in rp (does not modify value in index) | 7.4 |
| LFID $rp,(\text{dsp}), (i)$ | [rp], 025, 1sb, [i] | Load From Index Decrementated, subtract 1sb from index and save result in rp (does not modify value in index) | 7.6 |
| LFII $rp,*(\text{dsp}), (i)$ | [srp], 005, 1sb, msb, [i] | Load From Index Incrementated, same as LFII above, but using msb, 1sb of (dsp) | 8.4 |
| LFID $rp,*(\text{dsp}), (i)$ | [srp], 025, 1sb, msb, [i] | Load From Index Decrementated, same as LFID above, but using msb, 1sb of (dsp) | 8.6 |

[pr]=register select code for
paged instructions
(i)=expression for 1sb of index
address
(dsp)=expression for displacement
of index instructions
[i]=1sb value of (i)

[srp]=special register pair select
code for index instructions:
BC=113
DE=115
HL=117

LABELS

Labels consist only of alphanumeric characters and \$. A label must begin with an alpha character. Special terminating characters (not part of the label) indicate special qualities for the label.

| LABEL LENGTH (characters) | OVER-LENGTH LABEL ACTION | TERMINATING CHARACTER | CHARACTERISTIC ASSIGNED |
|------------------------------|------------------------------------|-----------------------|---|
| ASSEMBLER 4 | | | |
| 6 | uses first 6 characters | none | |
| DOSASM5 | | | |
| 6 | uses first 6 characters | * = | program entry point redefinition of label value |
| SNAP/1 | | | |
| 8 | uses first 7 and last 1 characters | * = | program entry point redefinition of label value |
| SNAP/2 | | | |
| 8 | uses first 7 and last 1 characters | * = : | program entry point redefinition external definition |

EXPRESSIONS

Numeric expressions use 16-bit two's complement values. If the instruction requires only one byte, the msb of the expression is discarded.

Expression evaluation is strictly left to right, all operators having equal precedence. SNAP/1 and SNAP/2 allow the use of parentheses to modify order of evaluation per normal algebraic convention.

Binary Operators

+ add
 - subtract
 * multiply
 / integer division*
 .AND. logical AND*
 .OR. logical OR*
 .XOR. logical exclusive-OR*

Unary Operators

< shift left number of places indicated by next value
 > shift right number of places indicated by next value
 - negation
 * set star flag

*Not available on ASSEMBLER 4

Strings can be included in all expressions. A string is delimited by apostrophes. The value of a character in a string is the ASCII value for the character with the parity bit (bit 7) always zero.

NOTE: only the DC directive allows strings more than one character long. For this case, one byte of code is generated for each character.

ASSEMBLER PSEUDO-INSTRUCTIONS
called MACROS in ASSEMBLER 4 and DOSASM5

| ASSEMBLER 4, DOSASM5, SNAP/1, and SNAP/2 | | |
|--|--------------------------------------|-----------------------------------|
| INSTRUCTION | EXPANSION | CODE |
| HL (e) | LL lsb LH msb | 066 lsb 056 msb |
| DE (e) | LE lsb LD msb | 046 lsb 036 msb |
| BC (e) | LC lsb LB msb | 036 lsb 026 msb |
| MSr _s (e) | LL lsb | 066 lsb 37n _s |
| MSr _s *(e) | LMr _s LL lsb LH msb | 066 lsb 056 msb 37n _s |
| MLr _d (e) | LL lsb | 066 lsb 3n _d 7 |
| MLr _d *(e) | L _d M LL lsb LH msb | 066 lsb 056 msb 3n _d 7 |
| SRN (e) | L _d M RPT (e) | 012 012 ((e) times) |
| SLN (e) | SRC RPT (e) SLC | 002 002 ((e) times) |

r_s=source register
r_d=destination register
(e)=expression

lsb=low-order byte of expression value
msb=high-order byte of expression value
n=register reference number

ASSEMBLY ERROR FLAGS

| ASSEMBLER 4, DOSASM5, SNAP/1, and SNAP/2 | |
|--|--|
| D | Different definition of labels (pass 1 only, all but first occurrence ignored on pass 2) |
| I | Instruction mnemonic undefined |
| E | Expression or label error (unrecognizable character) |
| U | Undefined label (value of zero assigned) |
| DOSASM5, SNAP/1, SNAP/2 | |
| F | File error, inclusion limits exceeded or END found in included file |
| P | Programmer Produced, ERR instruction encountered |
| SNAP/2 | |
| > | Indicates external reference - not an error condition |
| O | Overflow on page sensitive PAB |

MACROS (SNAP/1 and SNAP/2 only)

Macro Definition (Prototype)

```
MACRO  
[label] name [symbol[(default)]] [,symbol[(default)]]...  
.  
code  
.  
MEND
```

Macro Call

```
[label] name [expression][ expression]...
```

The replacement of symbols by expressions is position-dependent. If no expression is given for a symbol, the default replaces the symbol; if no default is given, the symbol disappears from the expanded code.

Macro names follow the same syntax rules as labels.

[] above encloses optional fields.

Macro Directives

MIFnn Identical to IFnn directive, for use only in macro definitions
(MIFnn compares strings, rather than numeric values)

MXIF Identical to XIF directive, for use only in macro definitions

ASSEMBLER EXECUTION

ASSEMBLER 4

Run assembler from rear deck (LGO or CTOS tape). Source program as file #0 in front deck. Object file will be written as file #1 on front deck. A series of questions will allow selection of print and display options.

DOSASM5 and SNAP/1

Command line:

```
ASM <sourcefile> [ ,<objectfile> [ ,<entrypt> ] ] [ ;options ]
```

Options:

| | |
|-----------------------------|----------------------------------|
| D - display output | I - list INCLUDED lines |
| L - print output | G - list lines of generated code |
| X - print cross-reference | M - list macro expansion lines |
| F - list IF - skipped lines | (SNAP/1 only) |

SNAP/2

Command line:

```
SNAP <sourcefile> [<relocfile>] [:options]
```

Options: same as SNAP/1

SNAP/2 produces relocatable code. The LINK utility must be used to convert the relocatable code to absolute (executable) code.

CHARACTER TRANSMISSION AND TRANSLATION TABLE

| DEC | OCTAL | HEX | ASCII | EBCDIC | IBM BCD | Honeywell BCD | EBCDIC CARD CODE | BINARY |
|-----|-------|-----|-------|--------|---------|----------------------------|------------------|------------|
| 0 | 000 | 00 | NUL | NUL | | 0 | 12-0-1-8-9 | 00 000 000 |
| 1 | 001 | 01 | SOH | SOH | 1 | 1 | 12-1-9 | 00 000 001 |
| 2 | 002 | 02 | STX | STX | 2 | 2 | 12-2-9 | 00 000 010 |
| 3 | 003 | 03 | ETX | ETX | 3 | 3 | 12-3-9 | 00 000 011 |
| 4 | 004 | 04 | EOT | PF | 4 | 4 | 12-4-9 | 00 000 100 |
| 5 | 005 | 05 | ENQ | HT | 5 | 5 | 12-5-9 | 00 000 101 |
| 6 | 006 | 06 | ACK | LC | 6 | 6 | 12-6-9 | 00 000 110 |
| 7 | 007 | 07 | BEL | DEL | 7 | 7 | 12-7-9 | 00 000 111 |
| 8 | 010 | 08 | BS | | 8 | 8 | 12-8-9 | 00 001 000 |
| 9 | 011 | 09 | HT | RLF | 9 | 9 | 12-1-8-9 | 00 001 001 |
| 10 | 012 | 0A | LF | SMM | 0 | 1 | 12-2-8-9 | 00 001 010 |
| 11 | 013 | 0B | VT | VT | = | = | 12-3-8-9 | 00 001 011 |
| 12 | 014 | 0C | FF | FF | / | : | 12-4-8-9 | 00 001 100 |
| 13 | 015 | 0D | CR | CR | : | : | 12-5-8-9 | 00 001 101 |
| 14 | 016 | 0E | SO | SO | > | > | 12-6-8-9 | 00 001 110 |
| 15 | 017 | 0F | SI | SI | @ | & | 12-7-8-9 | 00 001 111 |
| 16 | 020 | 10 | DLE | DLE | Space | + | 12-11-1-8-9 | 00 010 000 |
| 17 | 021 | 11 | DC1 | DC1 | / | A | 11-1-9 | 00 010 001 |
| 18 | 022 | 12 | DC2 | DC2 | S | B | 12-2-9 | 00 010 010 |
| 19 | 023 | 13 | DC3 | TM/DC3 | T | C | 11-3-9 | 00 010 011 |
| 20 | 024 | 14 | DC4 | RES | U | D | 11-4-9 | 00 010 100 |
| 21 | 025 | 15 | NAK | NL | V | E | 11-5-9 | 00 010 101 |
| 22 | 026 | 16 | SYN | BS | W | F | 11-6-9 | 00 010 110 |
| 23 | 027 | 17 | ETB | IL | X | G | 11-7-9 | 00 010 111 |
| 24 | 030 | 18 | CAN | CAN | Y | H | 11-8-9 | 00 001 000 |
| 25 | 031 | 19 | EM | Em | Z | I | 11-1-8-9 | 00 011 001 |
| 26 | 032 | 1A | SUB | CC | = | : | 11-2-8-9 | 00 011 010 |
| 27 | 033 | 1B | ESC | CU1 | . | . | 11-3-8-9 | 00 011 011 |
| 28 | 034 | 1C | FS | IFS | (|) | 11-4-8-9 | 00 011 100 |
| 29 | 035 | 1D | GS | IGS | - | - | 11-5-8-9 | 00 011 101 |
| 30 | 036 | 1E | RS | IRS | % | % | 11-6-8-9 | 00 011 110 |
| 31 | 037 | 1F | US | IUS | // | ? % dirty lozenge | 11-7-8-9 | 00 011 111 |
| 32 | 040 | 20 | SPACE | DS | - | - | 11-0-1-8-9 | 00 100 000 |
| 33 | 041 | 21 | ! | SOS | J | J | 0-1-9 | 00 100 001 |
| 34 | 042 | 22 | " | FS | K | K | 0-2-9 | 00 100 010 |
| 35 | 043 | 23 | # | | L | L | 0-3-9 | 00 100 011 |
| 36 | 044 | 24 | \$ | BYP | M | M | 0-4-9 | 00 100 100 |
| 37 | 045 | 25 | % | LF | N | N | 0-5-9 | 00 100 101 |
| 38 | 046 | 26 | & | ETB | O | O | 0-6-9 | 00 100 110 |
| 39 | 047 | 27 | ' | ESC | P | P | 0-7-9 | 00 100 111 |
| 40 | 050 | 28 | (| | Q | Q | 0-8-9 | 00 101 000 |
| 41 | 051 | 29 |) | | R | R | 0-1-8-9 | 00 101 001 |
| 42 | 052 | 2A | * | SM | ! | # | 0-2-8-9 | 00 101 010 |
| 43 | 053 | 2B | + | CU2 | \$ | \$ | 0-3-8-9 | 00 101 011 |
| 44 | 054 | 2C | , | | * | * | 0-4-8-9 | 00 101 100 |
| 45 | 055 | 2D | - | ENQ | } | " | 0-5-8-9 | 00 101 101 |
| 46 | 056 | 2E | . | ACK | ; | = | 0-6-8-9 | 00 101 110 |
| 47 | 057 | 2F | / | BEL | ^ | ! | 0-7-8-9 | 00 101 111 |

| DEC | OCTAL | HEX | ASCII | EBDIC | IBM BCD | Honeywell BCD | EBCDIC CARD CODE | BINARY |
|-----|-------|-----|-------|-------|---------|----------------------------------|------------------|------------|
| 48 | 060 | 30 | 0 | | + | < | 12-11-0-1-8-9 | 00 110 000 |
| 49 | 061 | 31 | 1 | | A | / | 1-9 | 00 110 001 |
| 50 | 062 | 32 | 2 | SYN | B | S | 2-9 | 00 110 010 |
| 51 | 063 | 33 | 3 | | C | T | 3-9 | 00 110 011 |
| 52 | 064 | 34 | 4 | PN | D | U | 4-9 | 00 110 100 |
| 53 | 065 | 35 | 5 | RS | E | V | 5-9 | 00 110 101 |
| 54 | 066 | 36 | 6 | UC | F | W | 6-9 | 00 110 110 |
| 55 | 067 | 37 | 7 | EOT | G | X | 7-9 | 00 110 111 |
| 56 | 070 | 38 | 8 | | H | Y | 8-9 | 00 111 000 |
| 57 | 071 | 39 | 9 | | I | Z | 1-8-9 | 00 111 001 |
| 58 | 072 | 3A | : | | ? | @ | 2-8-9 | 00 111 010 |
| 59 | 073 | 3B | ; | CU3 | . | . | 3-8-9P | 00 111 011 |
| 60 | 074 | 3C | < | DC4 |) | CR | 4-8-9 | 00 111 100 |
| 61 | 075 | 3D | = | NAK | { | <small>clean lozenge</small> | 5-8-9 | 00 111 101 |
| 62 | 076 | 3E | > | | < | ¢ | 6-8-9 | 00 111 110 |
| 63 | 077 | 3F | ? | SUB | # | | 7-8-9 | 00 111 111 |
| 64 | 100 | 40 | @ | SPACE | | | NO PUNCHES | 01 000 000 |
| 65 | 101 | 41 | A | | | | 12-0-1-9 | 01 000 001 |
| 66 | 102 | 42 | B | | | | 12-0-2-9 | 01 000 010 |
| 67 | 103 | 43 | C | | | | 12-0-3-9 | 01 000 011 |
| 68 | 104 | 44 | D | | | | 12-0-4-9 | 01 000 100 |
| 69 | 105 | 45 | E | | | | 12-0-5-9 | 01 000 101 |
| 70 | 106 | 46 | F | | | | 12-0-7-9 | 01 000 110 |
| 71 | 107 | 47 | G | | | | 12-0-6-9 | 01 000 111 |
| 72 | 110 | 48 | H | | | | 12-0-8-9 | 01 001 000 |
| 73 | 111 | 49 | I | | | | 12-1-8 | 01 001 001 |
| 74 | 112 | 4A | J | ¢ | | | 12-2-8 | 01 001 010 |
| 75 | 113 | 4B | K | . | | | 12-3-8 | 01 001 011 |
| 76 | 114 | 4C | L | < | | | 12-4-8 | 01 001 100 |
| 77 | 115 | 4D | M | (| | | 12-5-8 | 01 001 101 |
| 78 | 116 | 4E | N | + | | | 12-6-8 | 01 001 110 |
| 79 | 117 | 4F | O | | | | 12-7-8 | 01 001 111 |
| 80 | 120 | 50 | P | & | | | 12 | 01 010 000 |
| 81 | 121 | 51 | Q | | | | 12-11-1-9 | 01 010 001 |
| 82 | 122 | 51 | R | | | | 12-11-2-9 | 01 010 010 |
| 83 | 123 | 53 | S | | | | 12-11-3-9 | 01 010 011 |
| 84 | 124 | 54 | T | | | | 12-11-4-9 | 01 010 100 |
| 85 | 125 | 55 | U | | | | 12-11-5-9 | 01 010 101 |
| 86 | 126 | 56 | V | | | | 12-11-6-9 | 01 010 110 |
| 87 | 127 | 57 | W | | | | 12-11-7-9 | 01 010 111 |
| 88 | 130 | 58 | X | | | | 12-11-8-9 | 01 011 000 |
| 89 | 131 | 59 | Y | | | | 11-1-8 | 01 011 001 |
| 90 | 132 | 5A | Z | ! | | | 11-2-8 | 01 011 010 |
| 91 | 133 | 5B | [| \$ | | | 11-3-8 | 01 011 011 |
| 92 | 134 | 5C |] | * | | | 11-4-8 | 01 011 100 |
| 93 | 135 | 5D | ^ |) | | | 11-5-8 | 01 011 101 |
| 94 | 136 | 5E | ^ | ; | | | 11-6-8 | 01 011 110 |
| 95 | 137 | 5F | _ | ~ | | | 11-7-8 | 01 011 111 |
| 96 | 140 | 60 | \ | - | | | 11 | 01 100 000 |
| 97 | 141 | 61 | a | / | | | 0-1 | 01 100 001 |
| 98 | 142 | 62 | b | | | | 11-0-2-9 | 01 100 010 |
| 99 | 143 | 63 | c | | | | 11-0-3-9 | 01 100 011 |
| 100 | 144 | 64 | d | | | | 11-0-4-9 | 01 100 100 |
| 101 | 145 | 65 | e | | | | 11-0-5-9 | 01 100 101 |
| 102 | 146 | 66 | f | | | | 11-0-6-9 | 01 100 110 |
| 103 | 147 | 67 | g | | | | 11-0-7-9 | 01 100 111 |

| DEC | OCTAL | HEX | ASCII | EBDIC | IBM Honeywell EBCDIC | | | BINARY |
|-----|-------|-----|-------|-------|----------------------|-----|-------------|------------|
| | | | | | BCD | BCD | CARD CODE | |
| 104 | 150 | 68 | h | | | | 11-0-8-9 | 01 101 000 |
| 105 | 151 | 69 | i | | | | 0-1-8 | 01 101 001 |
| 106 | 152 | 6A | j | | | | 12-11 | 01 101 010 |
| 107 | 153 | 6B | k | | | | 0-3-8 | 01 101 011 |
| 108 | 154 | 6C | l | % | | | 0-4-8 | 01 101 100 |
| 109 | 155 | 6D | m | - | | | 0-5-8 | 01 101 101 |
| 110 | 156 | 6E | n | > | | | 0-6-8 | 01 101 110 |
| 111 | 157 | 6F | o | ? | | | 0-7-8 | 01 101 111 |
| 112 | 160 | 70 | p | | | | 12-11-0 | 01 110 000 |
| 113 | 161 | 71 | q | | | | 12-11-0-1-9 | 01 110 001 |
| 114 | 162 | 72 | r | | | | 12-11-0-2-9 | 01 110 010 |
| 115 | 163 | 73 | s | | | | 12-11-0-3-9 | 01 110 011 |
| 116 | 164 | 74 | t | | | | 12-11-0-4-9 | 01 110 100 |
| 117 | 165 | 75 | u | | | | 12-11-0-5-9 | 01 110 101 |
| 118 | 166 | 76 | v | | | | 12-11-0-6-9 | 01 110 110 |
| 119 | 167 | 77 | w | | | | 12-11-0-7-9 | 01 110 111 |
| 120 | 170 | 78 | x | | | | 12-11-0-8-9 | 01 111 000 |
| 121 | 171 | 79 | y | \ | | | 1-8 | 01 111 001 |
| 122 | 172 | 7A | z | : | | | 2-8 | 01 111 010 |
| 123 | 173 | 7B | { | # | | | 3-8 | 01 111 011 |
| 124 | 174 | 7C | } | @ | | | 4-8 | 01 111 100 |
| 125 | 175 | 7D | ~ | ' | | | 5-8 | 01 111 101 |
| 126 | 176 | 7E | DEL | = | | | 6-8 | 01 111 110 |
| 127 | 177 | 7F | DEL | " | | | 7-8 | 01 111 111 |
| 128 | 200 | 80 | | | | | 12-0-1-8 | 10 000 000 |
| 129 | 201 | 81 | | a | | | 12-0-1 | 10 000 001 |
| 130 | 202 | 82 | | b | | | 12-0-2 | 10 000 010 |
| 131 | 203 | 83 | | c | | | 12-0-3 | 10 000 011 |
| 132 | 204 | 84 | | d | | | 12-0-4 | 10 000 100 |
| 133 | 205 | 85 | | e | | | 12-0-5 | 10 000 101 |
| 134 | 206 | 86 | | f | | | 12-0-6 | 10 000 110 |
| 135 | 207 | 87 | | g | | | 12-0-7 | 10 000 111 |
| 136 | 210 | 88 | | h | | | 12-0-8 | 10 001 000 |
| 137 | 211 | 89 | | i | | | 12-0-9 | 10 001 001 |
| 138 | 212 | 8A | | | | | 12-0-2-8 | 10 001 010 |
| 139 | 213 | 8B | | | | | 12-0-3-8 | 10 001 011 |
| 140 | 214 | 8C | | | | | 12-0-4-8 | 10 001 100 |
| 141 | 215 | 8D | | | | | 12-0-5-8 | 10 001 101 |
| 142 | 216 | 8E | | | | | 12-0-6-8 | 10 001 110 |
| 143 | 217 | 8F | | | | | 12-0-7-8 | 10 001 111 |
| 144 | 220 | 90 | | | | | 12-11-1-8 | 10 010 000 |
| 145 | 221 | 91 | | j | | | 12-11-1 | 10 010 001 |
| 146 | 222 | 92 | | k | | | 12-11-2 | 10 010 010 |
| 147 | 223 | 93 | | l | | | 12-11-3 | 10 010 011 |
| 148 | 224 | 94 | | m | | | 12-11-4 | 10 010 100 |
| 149 | 225 | 95 | | n | | | 12-11-5 | 10 010 101 |
| 150 | 226 | 96 | | o | | | 12-11-6 | 10 010 110 |
| 151 | 227 | 97 | | p | | | 12-11-7 | 10 010 111 |
| 152 | 230 | 98 | | q | | | 12-11-8 | 10 011 000 |
| 153 | 231 | 99 | | r | | | 12-11-9 | 10 011 001 |
| 154 | 232 | 9A | | | | | 12-11-2-8 | 10 011 010 |
| 155 | 233 | 9B | | | | | 12-11-3-8 | 10 011 011 |
| 156 | 234 | 9C | | | | | 12-11-4-8 | 10 011 100 |
| 157 | 235 | 9D | | | | | 12-11-5-8 | 10 011 101 |
| 158 | 236 | 9E | | | | | 12-11-6-8 | 10 011 110 |
| 159 | 237 | 9F | | | | | 12-11-7-8 | 10 011 111 |

| DEC | OCTAL | HEX | ASCII | EBDIC | IBM BCD | Honeywell BCD | EBCDIC CARD CODE | BINARY |
|-----|-------|-----|-------|-------|---------|---------------|------------------|------------|
| 160 | 240 | A0 | | | | | 11-0-1-8 | 10 100 000 |
| 161 | 241 | A1 | | ~ | | | 11-0-1 | 10 100 001 |
| 162 | 242 | A2 | | s | | | 11-0-2 | 10 100 010 |
| 163 | 243 | A3 | | t | | | 11-0-3 | 10 100 011 |
| 164 | 244 | A4 | | u | | | 11-0-4 | 10 100 100 |
| 165 | 245 | A5 | | v | | | 11-0-5 | 10 100 101 |
| 166 | 246 | A6 | | w | | | 11-0-6 | 10 100 110 |
| 167 | 247 | A7 | | x | | | 11-0-7 | 10 100 111 |
| 168 | 250 | A8 | | y | | | 11-0-8 | 10 101 000 |
| 169 | 251 | A9 | | z | | | 11-0-9 | 10 101 001 |
| 170 | 252 | AA | | | | | 11-0-2-8 | 10 101 010 |
| 171 | 253 | AB | | | | | 11-0-3-8 | 10 101 011 |
| 172 | 254 | AC | | | | | 11-0-4-8 | 10 101 100 |
| 173 | 255 | AD | | | | | 11-0-5-8 | 10 101 101 |
| 174 | 256 | AE | | | | | 11-0-6-8 | 10 101 110 |
| 175 | 257 | AF | | | | | 11-0-7-8 | 10 101 111 |
| 176 | 260 | B0 | | | | | 12-11-0-1-8 | 10 110 000 |
| 177 | 261 | B1 | | | | | 12-11-0-1 | 10 110 001 |
| 178 | 262 | B2 | | | | | 12-11-0-2 | 10 110 010 |
| 179 | 263 | B3 | | | | | 12-11-0-3 | 10 110 011 |
| 180 | 264 | B4 | | | | | 12-11-0-4 | 10 110 100 |
| 181 | 265 | B5 | | | | | 12-11-0-5 | 10 110 101 |
| 182 | 266 | B6 | | | | | 12-11-0-6 | 10 110 110 |
| 183 | 267 | B7 | | | | | 12-11-0-7 | 10 110 111 |
| 184 | 270 | B8 | | | | | 12-11-0-8 | 10 111 000 |
| 185 | 271 | B9 | | | | | 12-11-0-9 | 10 111 001 |
| 186 | 272 | BA | | | | | 12-11-0-2-8 | 10 111 010 |
| 187 | 273 | BB | | | | | 12-11-0-3-8 | 10 111 011 |
| 188 | 274 | BC | | | | | 12-11-0-4-8 | 10 111 100 |
| 189 | 275 | BD | | | | | 12-11-0-5-8 | 10 111 101 |
| 190 | 276 | BE | | | | | 12-11-0-6-8 | 10 111 110 |
| 191 | 277 | BF | | | | | 12-11-0-7-8 | 10 111 111 |
| 192 | 300 | C0 | | | | | 12-0 | 11 000 000 |
| 193 | 301 | C1 | | A | | | 12-1 | 11 000 001 |
| 194 | 302 | C2 | | B | | | 12-2 | 11 000 010 |
| 195 | 303 | C3 | | C | | | 12-3 | 11 000 011 |
| 196 | 304 | C4 | | D | | | 12-4 | 11 000 100 |
| 197 | 305 | C5 | | E | | | 12-5 | 11 000 101 |
| 198 | 306 | C6 | | F | | | 12-6 | 11 000 110 |
| 199 | 307 | C7 | | G | | | 12-7 | 11 000 111 |
| 200 | 310 | C8 | | H | | | 12-8 | 11 001 000 |
| 201 | 311 | C9 | | I | | | 12-9 | 11 001 001 |
| 202 | 312 | CA | | | | | 12-0-2-8-9 | 11 001 010 |
| 203 | 313 | CB | | | | | 12-0-3-8-9 | 11 001 011 |
| 204 | 314 | CC | | | | | 12-0-4-8-9 | 11 001 100 |
| 205 | 315 | CD | | | | | 12-0-5-8-9 | 11 001 101 |
| 206 | 316 | CE | | | | | 12-0-6-8-9 | 11 001 110 |
| 207 | 317 | CF | | | | | 12-0-7-8-9 | 11 001 111 |
| 208 | 320 | D0 | | | | | 11-0 | 11 010 000 |
| 209 | 321 | D1 | | J | | | 11-1 | 11 010 001 |
| 210 | 322 | D2 | | K | | | 11-2 | 11 010 010 |
| 211 | 323 | D3 | | L | | | 11-3 | 11 010 011 |
| 212 | 324 | D4 | | M | | | 11-4 | 11 010 100 |
| 213 | 325 | D5 | | N | | | 11-5 | 11 010 101 |
| 214 | 326 | D6 | | O | | | 11-6 | 11 010 110 |
| 215 | 327 | D7 | | P | | | 11-7 | 11 010 111 |

| DEC | OCTAL | HEX | ASCII | EBDIC | IBM Honeywell EBCDIC | | BINARY |
|-----|-------|-----|-------|-------|----------------------|---------------|------------|
| | | | | | BCD | BCD CARD CODE | |
| 216 | 330 | D8 | | Q | | 11-8 | 11 011 000 |
| 217 | 331 | D9 | | R | | 11-9 | 11 011 001 |
| 218 | 332 | DA | | | | 12-11-2-8-9 | 11 011 010 |
| 219 | 333 | DB | | | | 12-11-3-8-9 | 11 011 011 |
| 220 | 334 | DC | | | | 12-11-4-8-9 | 11 011 100 |
| 221 | 335 | DD | | | | 12-11-5-8-9 | 11 011 101 |
| 222 | 336 | DE | | | | 12-11-6-8-9 | 11 011 110 |
| 223 | 337 | DF | | | | 12-11-7-8-9 | 11 011 111 |
| 224 | 340 | E0 | | ◊ | | 0-2-8 | 11 100 000 |
| 225 | 341 | E1 | | | | 11-0-1-9 | 11 100 001 |
| 226 | 342 | E2 | | S | | 0-2 | 11 100 010 |
| 227 | 343 | E3 | | T | | 0-3 | 11 100 011 |
| 228 | 344 | E4 | | U | | 0-4 | 11 100 100 |
| 229 | 345 | E5 | | V | | 0-5 | 11 100 101 |
| 230 | 346 | E6 | | W | | 0-6 | 11 100 110 |
| 231 | 347 | E7 | | X | | 0-7 | 11 100 111 |
| 232 | 350 | E8 | | Y | | 0-8 | 11 101 000 |
| 233 | 351 | E9 | | Z | | 0-9 | 11 101 001 |
| 234 | 352 | EA | | | | 11-0-2-8-9 | 11 101 010 |
| 235 | 353 | EB | | | | 11-0-3-8-9 | 11 101 011 |
| 236 | 354 | EC | | | | 11-0-4-8-9 | 11 101 100 |
| 237 | 355 | ED | | | | 11-0-5-8-9 | 11 101 101 |
| 238 | 356 | EE | | | | 11-0-6-8-9 | 11 101 110 |
| 239 | 357 | EF | | | | 11-0-7-8-9 | 11 101 111 |
| 240 | 360 | F0 | | 0 | | 0 | 11 110 000 |
| 241 | 361 | F1 | | 1 | | 1 | 11 110 001 |
| 242 | 362 | F2 | | 2 | | 2 | 11 110 010 |
| 243 | 363 | F3 | | 3 | | 3 | 11 110 011 |
| 244 | 364 | F4 | | 4 | | 4 | 11 110 100 |
| 245 | 365 | F5 | | 5 | | 5 | 11 110 101 |
| 246 | 366 | F6 | | 6 | | 6 | 11 110 110 |
| 247 | 367 | F7 | | 7 | | 7 | 11 110 111 |
| 248 | 370 | F8 | | 8 | | 8 | 11 111 000 |
| 249 | 371 | F9 | | 9 | | 9 | 11 111 001 |
| 250 | 372 | FA | | | | 12-11-0-2-8-9 | 11 111 010 |
| 251 | 373 | FB | | | | 12-11-0-3-8-9 | 11 111 011 |
| 252 | 374 | FC | | | | 12-11-0-4-8-9 | 11 111 100 |
| 253 | 375 | FD | | | | 12-11-0-5-8-9 | 11 111 101 |
| 254 | 376 | FE | | | | 12-11-0-6-8-9 | 11 111 110 |
| 255 | 377 | FF | | | | 12-11-0-7-8-9 | 11 111 111 |

5500 ROM DEBUG COMMAND SUMMARY:

| | |
|------------|--|
| nnnA | Address the given or current I/O device. |
| (nnnnn)B | Set a breakpoint at the given or current address. |
| (nnnnn)C | Call the given or current address. |
| D | Decrement the current address. |
| E | Continue execution from a breakpoint. |
| (nnn)F | Fetch next data byte from the given or current device. |
| (nnn)G | Goto Data mode in the given or current device on 'E'. |
| I | Increment the current address. |
| (nnnnn)J | Jump to the given or current address. |
| 12345K | Set ASCII key in mode. |
| L | Link to the address pointed to by the current address. |
| (nnn) nnnM | Modify the contents of the current address. |
| nnnnnnP | Load the base register. |
| 12345Q | Load the sector table. |
| R | Switch Alpha/Beta mode flip-flop and display. |
| nnS | Display the specified stack item. |
| 12345T | Start the memory test. |
| U | Set User flag, then perform 'E' command. |
| nnnV | EX COM4 Device must be addressed for I/O commands. |
| nnnW | EX WRITE Status is displayed after command issue. |
| nnnX | EX COM1 'nnn' is the output byte. |
| nnnY | EX COM2 |
| nnnZ | EX COM3 |
| nnnX | Display register and pair (with modify option): |
| (nnn) nnnA | If input argument exceeds eight bits, |
| nnnb | the command modifies a register pair. |
| (nnn) nnnC | The LSB register specifies a pair: e.g. L for HL. |
| nnnd | The shift key must be depressed during command. |
| (nnn) nnnE | |
| nnnh | |
| (nnn) nnnI | |
| nnnf | Condition flags. |
| | Adding the number to itself will restore the flags. |
| nnnnnnENT | Set current address to 'nnnnnn'. |
| CAN | Cancel entry line. |
| BKSP | Backspace on entry line. |
| (nnn) nnn. | Modify and increment. |
| (nnn) nnn | Modify and increment using last non-null value. |
| # | Clear all (DEBUG set) breakpoints. |

ROM DEBUG DISPLAY FORMAT:

| | |
|---------|---|
| AAAAAA | CURADR (The current address in octal) |
| X NNN | ASCII, 8-bit octal C(CURADR) |
| MMMMMM | 16-bit (LSB, MSB) address formed at CURADR, CURADR +1 |
| nnnnnnn | Command entry position |

MODEL CODE NO. 60311

DATAPOINT CORPORATION



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