



Systems Reference Library

IBM 1401/1460 Instruction and Timing Summary

This publication is a summary of instructions and timings for the 1401 and 1460 systems. Listed for each instruction is: instruction name, operation code, mnemonic, operands, d-character, word marks required, address registers after operation, remarks and timings.

This material is printed on one side only so that it can be arranged for a ready reference to assist programmers, or it can be placed in a 3-ring binder for 8 1/2" x 11" pages.

This publication, Form A24-6447-0, obsoletes Form X24-6447 and Form X24-6532. The information contained in these two publications is incorporated in this publication.

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SYMBOL AND ABBREVIATION KEY

| | |
|----------------|---|
| A | A-Address of the instruction. |
| A _p | The previous setting of the A-address register . |
| B | B-address of the instruction . |
| B _p | The previous setting of the B-address register . |
| BI | Address of the next instruction if a branch occurs. |
| dbb | The d-character and blank in the units and tens position . |
| F _M | Forms movement times . |
| GM | Group Mark . |
| GM-WM | Group-Mark with a Word-Mark . |
| I/O | Timing for input or output cycle . |
| IRG | Inter-record gap . |
| LA | The number of characters in the A-field. |
| LB | The number of characters in the B-field. |
| L _I | Length of instruction . |
| L _F | Length of field . |
| L _S | Number of characters per sector . |
| L _W | Length of A- or B-field, whichever is shorter . |
| LX | Number of characters to be cleared . |
| N | System processing cycle time (.0115 ms for 1401; .006 ms for 1460). |
| NSI | Address of the Next Sequential Instruction . |
| SC | Sector Count . |
| T | If indexing is installed . |
| T _F | The number of characters in A-field to be translated . |
| T _M | Tape movement Times . |
| WM | Word Mark . |
| * | Instruction cannot be chained . |
| . | The d-character must appear in the operand . |
| + | If indexing is installed . |
| Σ | Number of fields included in the operation . |
| Ns | Number of Sectors . |

IBM 1401/1460 INSTRUCTION AND TIMING SUMMARY

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--------------------------------|------------------|------------|----------|-------------------|-----|---------|--|-----------------------------------|------------------|--|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| ARITHMETIC INSTRUCTIONS | | | | | | | | | | |
| Add (One Field) | A | A | <u>A</u> | xxx | | | A-L _A | A-L _A | A-L _A | Blanks are treated as zeros. Unsigned field treated as positive. 1401: T = .0115 (L _I +3+2L _A) ms 1460: T = .006 (L _I +1+2L _A) ms |
| Add (Two Fields) | A | A | <u>A</u> | xxx | xxx | | B-L _B (Req'd in A if shorter than B) | A-L _W | B-L _B | Blanks are treated as zeros. Unsigned field treated as positive. 1401 No Recomplement Cycles: T = .0115 (L _I +3+L _A +L _B) ms 1401 Recomplement Cycle: T = .0115 (L _I +3+L _A +4L _B) ms 1460 No Recomplement Cycle: T = .006 (L _I +1+L _A +L _B) ms 1460 Complement Cycle: T = .006 (L _I +1+L _A +3L _B) ms 1460 Complement with Multiply-Divide: T = .006 (L _I +1+L _A +2L _B) ms |
| Subtract (One Field) | S | S | <u>S</u> | xxx | | | A-L _A | A-L _A | A-L _A | Unsigned field treated as positive. 1401: T = .0115 (L _I +3+2L _A) ms 1460: T = .006 (L _I +1+2L _A) ms |
| Subtract (Two Fields) | S | S | <u>S</u> | xxx | xxx | | B-L _B (Req'd in A if shorter than B) | A-L _W | B-L _B | Unsigned field treated as positive. 1401 No Recomplement Cycle: T = .0115 (L _I +3+L _A +L _B) ms 1401 Recomplement Cycle: T = .0115 (L _I +3+L _A +4L _B) ms 1460 No Recomplement Cycle: T = .006 (L _I +1+L _A +L _B) ms 1460 Complement Cycle: T = .006 (L _I +1+L _A +3L _B) ms 1460 Complement with Multiply-Divide: T = .006 (L _I +1+L _A +2L _B) ms |
| Zero and Add (One Field) | ZA | ZA | <u>?</u> | xxx | | | A-L _A | A-L _A | A-L _A | Zones are stripped, except over units position. T = N (L _I +1+2L _A) ms |
| Zero and Add (Two Fields) | ZA | ZA | <u>?</u> | xxx | xxx | | B-L _B (Req'd in A if shorter than B) | A-L _W | B-L _B | Zeros are stripped, except for units position. T = N (L _I +1+L _A +L _B) ms |
| Zero and Subtract (One Field) | ZS | ZS | <u>!</u> | xxx | | | A-L _A | A-L _A | A-L _A | A-field sign changes T = N (L _I +1+2L _A) ms |
| Zero and Subtract (Two Fields) | ZS | ZS | <u>!</u> | xxx | xxx | | B-L _B (Req'd in A if shorter than B) | A-L _W | B-L _B | T = N (L _I +1+L _A +L _B) ms |
| LOGIC INSTRUCTIONS | | | | | | | | | | |
| Branch (Unconditional) * | B | B | <u>B</u> | xxx | | | Adjacent to 1-Address | BI | Blank or (NSI) | Branch (without indexing): T = N (L _I +1) ms Branch (with indexing): T = N (L _I +2) ms |
| | | | <u>B</u> | | | | | <i>A_p</i> | <i>B-1</i> | |

* Indicates the instruction cannot be chained.

unchanged from prev. ACE

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------|-------------------|-----|---------|------------|-----------------------------------|----------------------|--|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Branch if Arithmetic* | B | BAV | <u>B</u> | xxx | | Z | | BI | dbb, Blank, (or NSI) | No Branch 1 T = N (L ₁ +1) ms |
| Branch if Carriage Channel #9* | B | BC9 | <u>B</u> | xxx | | 9 | | BI | dbb, Blank, (or NSI) | Branch (without indexing): T = N (L ₁ +1) ms |
| Branch if Carriage Channel #12* | B | BCV | <u>B</u> | xxx | | @ | | BI | dbb, Blank, (or NSI) | Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Character Equal | B | BCE | <u>B</u> | xxx | xxx | x | | BI | B-1, Blank, (or NSI) | |
| Branch if Either a Word Mark, or No Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | 3 | | BI | B-1, Blank, (or NSI) | |
| Branch if Either a Word Mark, or 12-Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | C | | BI | B-1, Blank, (or NSI) | No Branch: T = N (L ₁ +2) ms |
| Branch if Either a Word Mark, or 11-Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | L | | BI | B-1, Blank, (or NSI) | Branch (without indexing): T = N (L ₁ +2) ms |
| Branch if Either a Word Mark, or Zero Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | T | | BI | B-1, Blank, (or NSI) | Branch (with indexing): T = N (L ₁ +3) ms |
| Branch if No Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | 2 | | BI | B-1, Blank, (or NSI) | |
| Branch if Printer Error (I/O Check Stop Switch Off)* | B | BIN* | <u>B</u> | xxx | | ≠ | | BI | dbb, Blank, (or NSI) | No Branch: T = N (L ₁ +1) ms |
| Branch if Processing Check (Check Stop Switch Off)* | B | BIN* | <u>B</u> | xxx | | % | | BI | dbb, Blank, (or NSI) | Branch (without indexing): T = N (L ₁ +1) ms |
| Branch if Punch Error (I/O Check Stop Off)* | B | BIN* | <u>B</u> | xxx | | ! | | BI | dbb, Blank, (or NSI) | Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Reader Error (I/O Check Stop Switch Off)* | B | BIN* | <u>B</u> | xxx | | / | | BI | dbb, Blank, (or NSI) | No Branch: T = N (L ₁ +1) ms |
| Branch if Unconditional* | B | B | <u>B</u> | xxx | | blank | | BI | dbb, Blank, (or NSI) | Branch (without indexing): T = N (L ₁ +1) ms |
| Branch if Unequal Compare* | B | BU | <u>B</u> | xxx | | / | | BI | dbb, Blank, (or NSI) | Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Word Mark | BWZ | BWZ* | <u>V</u> | xxx | xxx | 1 | | BI | B-1, Blank, (or NSI) | |
| Branch if Zero-Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | S | | BI | B-1, Blank, (or NSI) | No Branch: T = N (L ₁ +2) ms |
| Branch if 11-Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | K | | BI | B-1, Blank, (or NSI) | Branch (without indexing): T = N (L ₁ +2) ms |
| Branch if 12-Zone | BWZ | BWZ* | <u>V</u> | xxx | xxx | B | | BI | B-1, Blank, (or NSI) | Branch (with indexing): T = N (L ₁ +3) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------|-------------------|-----|---------|----------------|-----------------------------------|--------------------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Compare | C | C | <u>C</u> | xxx | xxx | | A- and B-field | A-L _W | B-L _W | First word mark encountered ends operation. Unequal compare results if B-field is longer than A-field. T = N (L _I +1+2L _W) ms |
| DATA-MOVING INSTRUCTIONS | | | | | | | | | | |
| Load Characters to A Word Mark (One Field) | LCA | MLCWA | <u>L</u> | xxx | | | A-field | A-L _A | B _p -L _A | A-field word mark ends operation. B-field word marks cleared from positions worked on. T = N (L _I +1+2L _A) ms |
| Load Characters to A Word Mark (Two Fields) | LCA | MLCWA | <u>L</u> | xxx | xxx | | A-field | A-L _A | B-L _A | A-field word mark ends operation. B-field word marks are cleared. T = N (L _I +1+2L _A) ms |
| Move Characters and Edit * | MCE | MCE | <u>E</u> | xxx | xxx | | A- and B-field | A-address minus A-field length | B-L _B | Will be location of special control zero plus 1 with zero suppression. |
| Move Characters and Suppress Zeros * | MCS | MCS | <u>Z</u> | xxx | xxx | | A-field | A-L _A | B+1 | A-field word mark ends operation. T = N (L _I +1+3L _A) ms |
| Move Characters to A or B Word Mark (One Field) | MCW | MLC | <u>M</u> | xxx | | | A-field | A-L _W | B _p -L _W | T = N (L _I +1+2L _W) ms |
| Move Characters to A or B Word Mark (Two Fields) | MCW | MLC | <u>M</u> | xxx | xxx | | A- or B-field | A-L _W | B-L _W | First word mark encountered ends operation. T = N (L _I +1+2L _W) ms |
| Move Numeric | MN | MLMS | <u>D</u> | xxx | xxx | | | A-1 | B-1 | Numeric bits of A moved to B. B zone bits are retained. T = N (L _I +3) ms |
| Move Zone | MZ | MLZS | <u>Y</u> | xxx | xxx | | | A-1 | B-1 | Zone bits of A moved to B. B numeric bits are retained. T = N (L _I +3) ms |
| MISCELLANEOUS INSTRUCTIONS | | | | | | | | | | |
| Clear Storage | CS | CS | <u>1</u> | xxx | | | | A | X00-1 | T = N (L _I +1+L _X) ms |
| Clear Storage and Branch | CS | CS | <u>1</u> | xxx | xxx | | | BI | Blank or (NSI) | Branch (without indexing): T = N (L _I +L _X) ms Branch (with indexing): T = N (L _I +1+L _X) ms |
| Clear Word Marks (One Address) | CW | CW | <u>1</u> | xxx | | | | A-1 | A-1 | Word mark is cleared from the A-address. Data is undisturbed. T = N (L _I +3) ms |
| Clear Word Mark (Two Addresses) | CW | CW | <u>1</u> | xxx | xxx | | | A-1 | B-1 | Word marks are cleared from the A- and B-address. Data is undisturbed. T = N (L _I +3) ms |
| Halt* | H | H | <u>.</u> | | | | | A _p | B _p | Press key to resume operation. T = N (L _I +1) ms |
| Halt and Branch* | H | H | <u>.</u> | xxx | | | | BI | Blanks or (NSI) | Branch (without indexing): T = N (L _I +1) ms Branch (with indexing): T = N (L _I +2) ms |

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| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|------------|----------|-------------------|-----|------------------------|------------|-----------------------------------|----------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| No Operation* | NOP | NOP | <u>N</u> | | | | | A _p | B _p | Program resumes at next op code with a word mark. T = N (L ₁ +1) ms |
| Set Word Mark (One Address) | SW | SW | <u>1</u> | xxx | | | | A-1 | A-1 | Sets word mark in the A-address. Data is undisturbed. T = N (L ₁ +3) ms |
| Set Word Mark (Two Addresses) | SW | SW | <u>1</u> | xxx | xxx | | | A-1 | B-1 | Sets word mark in A- and B-address. Data is undisturbed. T = N (L ₁ +3) ms |
| IBM 1402 CARD READ-PUNCH INSTRUCTIONS | | | | | | | | | | |
| Branch if Last Card Switch On (Sense Switch A)* | B | BLC | <u>B</u> | xxx | | A | | BI | dbb, Blank, (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Punch Card (and Branch)* | P | P | <u>4</u> | (xxx) | | | | Ap(BI) | 181 | T = N (L ₁ +1) ms + I/O Punch cycle - 240 ms |
| Read and Punch (and Branch)* | RP | RP | <u>5</u> | (xxx) | | | | Ap(BI) | 081 or 181 | Normally the B-address register is at 181 unless punching is completed first. T = N (L ₁ +1) ms + I/O Read and punch cycle - 240 ms |
| Read Card (and Branch)* | R | R | <u>1</u> | (xxx) | | | | Ap(BI) | 081 | T = N (L ₁ +1) ms + I/O Read cycle - 75 ms |
| Select Stacker-Pocket* 1 2 4 8 | SS | SS (SSB) | <u>K</u> | (xxx) | | 1 [2] [4] [8] | | dbb(BI) | dbb, (Blank or NSI) | T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Read-Punch Feed (and Branch)* | P | RF | <u>4</u> | (xxx) | | R | | dbb(BI) | 181, (Blank or NSI) | T = N (L ₁ +1) ms + 37 ms Punch start time + 184 ms punch time. |
| Read-Punch Feed, Write (and Branch)* | WP | WRF | <u>6</u> | (xxx) | | R | | dbb(BI) | 181, (Blank or NSI) | T = N (L ₁ +1) ms + 308 ms (see publications for more detail) |
| IBM 1403 PRINTER INSTRUCTIONS | | | | | | | | | | |
| Control Carriage - After Print 1 [2 or 3] Space(s) (and Branch)* | CC | CC* (CCB) | <u>F</u> | (xxx) | | / S or T | | dbb(BI) | dbb, (Blank or NSI) | T = N (L ₁ +1) ms + F _M time |
| Control Carriage - Immediate Skip to Channel 1 2 - 12 (and Branch)* | CC | CC* (CCB) | <u>F</u> | (xxx) | | 1 #, @ | | dbb(BI) | dbb, (Blank or NSI) | T = N (L ₁ +1) ms + F _M time |
| Control Carriage - Immediate Space, 1 2 or 3 Space(s) (and Branch)* | CC | CC* (CCB) | <u>F</u> | (xxx) | | J K or L | | dbb(BI) | dbb, (Blank or NSI) | T = N (L ₁ +1) ms + F _M time |
| Control Carriage - Skip After Print to Channel 1 [2 - 12] (and Branch)* | CC | CC* (CCB) | <u>F</u> | (xxx) | | A B-1, ?, .. | | dbb(BI) | dbb, (Blank or NSI) | T = N (L ₁ +1) ms + F _M time |

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| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|--------------|--------------------------|-------------------|-----|---------|-------------|-----------------------------------|-------------------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Write and Punch (and Branch)* | WP | WP | <u>6</u> | (xxx) | | | | A _p (BI) | 181 | T = N (L ₁ +1) ms + I/O (see publication for more detail) |
| Write and Read (and Branch)* | WR | WR | <u>3</u> | (xxx) | | | | A _p (BI) | 081 | T = N (L ₁ +1) ms + I/O (see publication for more detail) |
| Write Line (and Branch)* | W | W | <u>2</u> | (xxx) | | | | A _p (BI) | 335 or 333 (print storage) | T = N (L ₁ +1) ms + I/O (see publication for more detail) |
| Write, Read, and Punch (and Branch)* | WRP | WRP | <u>7</u> | (xxx) | | | | A _p (BI) | 181 or 081 | T = N (L ₁ +1) ms + I/O (see publication for more detail) |
| Write Word Marks (and Branch)* | W | WM | <u>2</u> | (xxx) | | | | dbb(BI) | 335 or 333 (print storage) | T = N (L ₁ +1) ms + I/O (see publication for more detail) |
| IBM 1403 SELECTIVE TAPE LISTING (SPECIAL FEATURE) INSTRUCTION | | | | | | | | | | |
| Space Tape 1 [2 - 8] One Space | CC | CC* | <u>F</u> | | | | A B - H | dbb | dbb | T = N (L ₁ +1) ms + F _M time |
| IBM 1460 MULTIPLE PRINTER INSTRUCTION | | | | | | | | | | |
| Printer Pre-Select Printer 1 [2 or 3] | CU | CU* | <u>V</u> | | | | 1 2 or 3 | dbb | dbb | T = .006 (L ₁ +1) ms |
| IBM 1447 CONSOLE INSTRUCTION | | | | | | | | | | |
| Read From Console Printer (With Word Marks) | MU (LU) | MU* (LU)* | <u>M</u> (<u>L</u>) | %TO | xxx | R | | %30 | B+L _B +1 | GMWM needed to right of last message character. T = N (L ₁ +1) ms + operator keying time |
| Write On Console Printer (With Word) | MU (LU) | MU* (LU)* | <u>M</u> (<u>L</u>) | %TO | xxx | W | | %30 | B+L _B +1 | T = N (L ₁ +1) ms + 68 L _B ms + 800 (number of carrier return operations -1) ms |
| IBM 1406 STORAGE UNIT INSTRUCTION | | | | | | | | | | |
| Modify Address (One Address) | MA | MA | <u>#</u> - | xxx | | | | A-3 | A-1 or A-3 | Carry from hundreds to units position required: T = N (L ₁ +9) ms No carry required: T = N (L ₁ +8) ms |
| Modify Address (Two Addresses) | MA | MA | <u>#</u> - | xxx | xxx | | | A-3 | B-1 or B-3 | Carry from hundreds to units position required: T = N (L ₁ +9) ms No carry required: T = N (L ₁ +8) ms |
| IBM 1301 DISK STORAGE INSTRUCTIONS (1460) | | | | | | | | | | |
| Branch if Access Busy | B | BIN | <u>B</u> | xxx | | \ | | | | |
| Branch if Access Inoperable | B | BIN | <u>B</u> | xxx | | N | | | | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------------------|-------------------|-----|---------|-------------------------------|------------------------------------|--|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Branch if Any Disk Condition | B | BIN | <u>B</u> | xxx | | Y | | | | No Branch $T = .006 (L_1+1)$ ms Branch (without indexing): $T = .006 (L_1+1)$ ms Branch (with indexing): $T = .006 (L_1+2)$ ms |
| Branch if Disk Error | B | BIN | <u>B</u> | xxx | | V | BI | dbb, Blank, or (NSI) | | |
| Branch if Unequal-Address Compare | B | BIN | <u>B</u> | xxx | | X | | | | |
| Branch if Wrong Length Record | B | BIN | <u>B</u> | xxx | | W | | | | |
| Seek Disk | MU LU | SD | <u>M</u> <u>L</u> | %FO | xxx | R/W | B+6 | B+7 | Seeks specified cylinder $T = .006 (L_1+7)$ ms + access time | |
| Read Disk Sector(s) | MU | RD | <u>M</u> | %F1 | xxx | R | B+6 | B+11+N ₅ L ₅ | Complete when SC = 000 $T = .006 (L_1+1)$ ms + 1.7 N ₅ + disk rotation | |
| Read Disk Sector(s) with Word Marks | LU | RDW | <u>L</u> | %F1 | xxx | R | B+6 | B+11+N ₅ L ₅ | | |
| Read Disk Track Sectors with Addresses | MU | RDT | <u>M</u> | %F6 | xxx | R | B+9 | B+11+2120 | Reads 2120 characters with sector addresses $T = .006 (L_1+1)$ ms + 33.3 ms + disk rotation | |
| Read Disk Track Sectors with Addresses and Word Marks | LU | RDTW | <u>L</u> | %F6 | xxx | R | B+9 | B+11+1920 | Reads 1920 Characters with Sector Addresses $T = .006 (L_1+1)$ ms + 33.3 ms + disk rotation | |
| Read Disk with Sector Count Overlay | MU | RDCO | <u>M</u> | %F5 | xxx | R | B+6 | B+8+N ₅ L ₅ | Multiple-sector-count field in first-record read determines number of sectors read $T = .006 (L_1+1)$ ms + 1.7 N ₅ + disk rotation | |
| Read Disk with Sector Count Overlay with Word Marks | LU | RDCOW | <u>L</u> | %F5 | xxx | R | | | | |
| Write Disk Check | MU | WDC | <u>M</u> | %F3 | xxx | W | Depends on Previous Operation | | Data in specified core-storage area compared with data written on disk. | |
| Write Disk Check with Word Marks | LU | WDCW | <u>L</u> | %F3 | xxx | W | Depends on Previous Operation | | Data in specified core-storage area compared with data written on disk. $T = .006 (L_1+1)$ ms + 1.7 N ₅ + disk rotation. | |
| Write Disk Sector(s) | MU | WD | <u>M</u> | %F1 | xxx | W | B+6 | B+11+N ₅ L ₅ | Complete when SC = 000 $T = .006 (L_1+1)$ ms + 1.7 N ₅ + disk rotation | |
| Write Disk Sector(s) with Word Marks | LU | WDW | <u>L</u> | %F1 | xxx | W | | | | |
| Write Disk Track Sectors with Addresses | MU | WDT | <u>M</u> | %F6 | xxx | W | B+9 | B+11+2120 | Writes 2120 characters and sector addresses $T = .006 (L_1+1)$ ms + 33.3 ms + disk rotation | |
| Write Disk Track Sectors with Addresses and Word Marks | LU | WDTW | <u>L</u> | %F6 | xxx | W | B+9 | B+11+1920 | Writes 1920 characters and sector addresses $T = .006 (L_1+1)$ ms + 33.3 ms + disk rotation | |
| Write Disk with Sector Count Overlay | MU | WDCO | <u>M</u> | %F5 | xxx | W | B+6 | B+8+N ₅ L ₅ | Multiple-sector-count field, minus one, is written as first 3 characters of first sector | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|------------|----------------------|-------------------|-----|---------|------------|-----------------------------------|------------------------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Write Disk with Sector Count Overlay with Word Marks | LU | WDCOW | <u>L</u> | %F5 | xxx | W | | | | $T = .006 (L_1+1) \text{ ms} + 1.7 N_5 + \text{disk rotation}$ |
| IBM 1311 DISK STORAGE DRIVE INSTRUCTIONS | | | | | | | | | | |
| Branch if Access Busy | B | BIN | <u>B</u> | xxx | | | | | | No Branch $T = N (L_1+1) \text{ ms}$ |
| Branch if Access Inoperable | B | BIN | <u>B</u> | xxx | | N | | | | Branch (without indexing) $T = N (L_1+1) \text{ ms}$ |
| Branch if Any Disk Condition | B | BIN | <u>B</u> | xxx | | Y | | | | Branch (with indexing) $T = N (L_1+2) \text{ ms}$ |
| Branch if Disk Error | B | BIN | <u>B</u> | xxx | | V | | BI | dbb, Blank, or (NSI) | |
| Branch if Unequal Address Compare | B | BIN | <u>B</u> | xxx | | X | | | | |
| Branch if Wrong Length Record | B | BIN | <u>B</u> | xxx | | W | | | | |
| Seek Disk | MU LU | SD | <u>M</u> <u>L</u> | %F0 | xxx | R/W | | B+6 | B+7 | Seeks specified cylinder $T = N (L_1+7) \text{ ms} + \text{access time}$ |
| Read Disk Sector(s) | MU | RD | <u>M</u> | %F1 | xxx | R | | -B+6 | B+11+N ₅ L ₅ | Complete when SC = 000 |
| Read Disk Sector(s) with Word Marks | LU | RDW | <u>L</u> | %F1 | xxx | R | | B+6 | B+11+N ₅ L ₅ | $T = N (L_1+1) \text{ ms} + 2 N_5 + \text{disk rotation}$ |
| Read Disk Track Sectors with Addresses | MU | RDT | <u>M</u> | %F6 | xxx | R | | B+9 | B+11+2120 | Reads 2120 characters with sector addresses $T = N (L_1+1) \text{ ms} + \text{disk rotation}$ |
| Read Disk Track Sectors with Addresses and Word Marks | LU | RDTW | <u>L</u> | %F6 | xxx | R | | B+9 | B+11+1920 | Reads 1920 characters with sector addresses $T = N (L_1+1) \text{ ms} + \text{disk rotation}$ |
| Read Disk with Sector Count Overlay | MU | RDCO | <u>M</u> | %F5 | xxx | R | | B+6 | B+8+N ₅ L ₅ | Multiple-sector-count field in first record read determines number of sectors read $T = N (L_1+1) \text{ ms} + 2 N_5 + \text{disk rotation}$ |
| Read Disk with Sector Count Overlay with Word Marks | LU | RDCOW | <u>L</u> | %F5 | xxx | R | | B+6 | B+8+N ₅ L ₅ | Multiple-sector-count field in first record read determines number of sectors read $T = N (L_1+1) \text{ ms} + 2 N_5 + \text{disk rotation}$ |
| Write Disk Check | MU | WDC | <u>M</u> | %F3 | xxx | W | | Depends on Previous Operation | | Data in specified core-storage area compared with data written on disk $T = N (L_1+1) \text{ ms} + 2 N_5 + \text{disk rotation}$ |
| Write Disk Check with Word Marks | LU | WDCW | <u>L</u> | %F3 | xxx | W | | Depends on Previous Operation | | Data in specified core-storage area compared with data written on disk $T = N (L_1+1) \text{ ms} + 2 N_5 + \text{disk rotation}$ |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------|-------------------|-----|---------|------------|-----------------------------------|------------------------------------|--|
| | SPS | Auto-coder | | A/1- | B- | | | A | B | |
| Write Disk Sector(s) | MU | WD | <u>M</u> | %F1 | xxx | W | | B+6 | B+11+N _S L _S | Complete when SC = 000 T = N (L ₁ +1) ms + 2 N _S + disk rotation |
| Write Disk Sector(s) with Word Marks | LU | WDW | <u>L</u> | %F1 | xxx | W | | | | |
| Write Disk Track Sectors with Addresses | MU | WDT | <u>M</u> | %F6 | xxx | W | | B+9 | B+11+2120 | Writes 2120 characters and sector addresses T = N (L ₁ +1) ms + 42 ms + disk rotation |
| Write Disk Track Sectors with Addresses and Word Marks | LU | WDTW | <u>L</u> | %F6 | xxx | W | | B+9 | B+11+1920 | Writes 1920 characters and sector addresses T = N (L ₁ +1) ms + 42 ms + disk rotation |
| Write Disk with Sector Count Overlay | MU | WDCO | <u>M</u> | %F5 | xxx | W | | B+6 | B+8+N _S L _S | Multiple-sector-count field minus one written as first 3 characters of first sector. T = N (L ₁ +1) ms + 2 N _S + disk rotation |
| Write Disk with Sector Count Overlay with Word Marks | LU | WDCOW | <u>L</u> | %F5 | xxx | W | | | | |
| IBM 1311 SPECIAL FEATURE SCAN DISK | | | | | | | | | | |
| Scan Disk Equal | MU | SDE | <u>M</u> | %F8 | xxx | W | | B+6 | B+11+L _F | Records must be in sector format test. Result with appropriate Branch instruction GMWM must be set at right of search argument. Search argument must be less than one sector. T = .0115 (L ₁ +1) ms + 2 N _S + disk rotation |
| Scan Disk Equal with Word Marks | LU | SDEW | <u>L</u> | %F8 | xxx | W | | B+6 | B+11+L _F | |
| Scan Disk High or Equal | MU | SDH | <u>M</u> | %F9 | xxx | W | | B+6 | B+11+L _F | |
| Scan Disk High or Equal with Word Marks | LU | SDHWC | <u>L</u> | %F9 | xxx | W | | B+6 | B+11+L _F | |
| Scan Disk Low or Equal | MU | SDL | <u>M</u> | %F7 | xxx | W | | B+6 | B+11+L _F | |
| Scan Disk Low or Equal with Word Marks | LU | SDLW | <u>L</u> | %F7 | xxx | W | | B+6 | B+11+L _F | |
| IBM 1311 SPECIAL FEATURE TRACK RECORD | | | | | | | | | | |
| Read Disk-Track Record | MU | RDTR | <u>M</u> | %F2 | xxx | R | | B+6 | B+11+2980 | Reads 2980 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| Read Disk-Track Record with Addresses | MU | RDTA | <u>M</u> | %F@ | xxx | R | | B+9 | B+11+2986 | Reads 2986 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| Read Disk-Track Record with Addresses and Word Marks | LU | RDTAW | <u>L</u> | %F@ | xxx | R | | B+9 | B+11+2688 | Reads 2688 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| Read Disk-Track Record with Word Marks | LU | RDTRW | <u>L</u> | %F2 | xxx | R | | B+6 | B+11+2682 | Reads 2682 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|-------------|----------------------|-------------------|-----|---------|------------|-----------------------------------|---------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Write Disk-Track Record | MU | WDTR | <u>M</u> | %F2 | xxx | W | | B+6 | B+11+2980 | Writes 2980 characters T = .0115 (L ₁ +1) + 40 ms + disk rotation |
| Write Disk-Track Record with Addresses | MU | WDTA | <u>M</u> | %F@ | xxx | W | | B+9 | B+11+2986 | Writes 2986 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| Write Disk-Track Record with Addresses and Word Marks | LU | WDTAW | <u>L</u> | %F@ | xxx | W | | B+9 | B+11+2688 | Writes 2688 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| Write Disk-Track Record with Word Marks | LU | WDTRW | <u>L</u> | %F2 | xxx | W | | B+6 | B+11+2682 | Writes 2682 characters T = .0115 (L ₁ +1) ms + 40 ms + disk rotation |
| IBM 1405 DISK STORAGE INSTRUCTIONS | | | | | | | | | | |
| Branch if Access Inoperable | B | BIN | <u>B</u> | xxx | | N | | BI | dbb, Blank or (NSI) | No Branch: T = .0115 (L ₁ +1) ms Branch (without indexing): T = .0115 (L ₁ +1) ms Branch (with indexing): T = .0115 (L ₁ +2) ms |
| Branch if any Disk Unit Error Condition | B | BIN | <u>B</u> | xxx | | Y | | | | |
| Branch if Read-or-Write-Parity Check or Read Back Check Error | B | BIN | <u>B</u> | xxx | | V | | | | |
| Branch if Unequal-Address Compare | B | BIN | <u>B</u> | xxx | | X | | | | |
| Branch if Wrong-Length Record | B | BIN | <u>B</u> | xxx | | W | | | | |
| Read Disk Full-Track | MU | RDT | <u>M</u> | %Fn | bbb | R | | | B+1010 | |
| Read Disk Full-Track with Word Marks | LU | RDTW | <u>L</u> | %Fn | bbb | R | | B+1 | B+890 | T = .0115 (L ₁ +9) ms + 50 ms + disk rotation |
| Read Disk Single Record | MU | RD | <u>M</u> | %Fn | bbb | R | | | B+210 | T = .0115 (L ₁ +9) ms + 10 ms + disk rotation |
| Read Disk Single Record with Word Marks | MU | RDW | <u>L</u> | %Fn | bbb | R | | | B+186 | |
| Seek Disk | MU or LU | SD | <u>M</u> or <u>L</u> | %F0 | bbb | R | | | B+8 | T = .0115 (L ₁ +9) ms + access time |
| Write Disk Check | MU or LU | WDC or WDCW | <u>M</u> or <u>L</u> | %F3 | bbb | W | | | B+210 or B+1010 | T = .0115 (L ₁ +9) ms + 50 ms |
| Write Disk Full-Track | MU | WDT | <u>M</u> | %Fn | bbb | W | | | B+1010 | T = .0115 (L ₁ +9) ms + 50 ms + disk rotation |
| Write Disk Full-Track with Word Marks | LU | WDTW | <u>L</u> | %Fn | bbb | W | | | B+890 | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|-----------------------|-------------------|-----|---------|------------|-----------------------------------|-----------------------|--|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Write Disk Single Record | MU | WD | <u>M</u> | %Fn | bbb | W | | | B+210 | T = .0115 (L ₁ +9) ms + 10 ms + disk rotation |
| Write Disk Single-Record with Word Marks | LU | WDW | <u>L</u> | %Fn | bbb | W | B+1 | | B+186 | |
| IBM 729 AND 7330 MAGNETIC TAPE UNIT INSTRUCTIONS | | | | | | | | | | |
| Backspace Tape Record* | CU | BSP | <u>U</u> | %Un | | B | | %4n | dbb | Backspace one tape record T = N (L ₁ +1) ms + T _M |
| Branch if End of Reel* | B | BEF | <u>B</u> | xxx | | K | | BI | dbb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms |
| Branch if Tape Error* | B | BER | <u>B</u> | xxx | | L | | BI | dbb, Blank (or NSI) | Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Diagnostic Read* | - | - | <u>U</u> | %Bn | | A | | %2n | dbb | Tape advances to next IRG without transmitting data T = N (L ₁ +1) ms + T _M |
| Read Tape (with word marks)* | MU (LU) | RT (RTW) | <u>M</u> (<u>L</u>) | %Un | xxx | R | | %4n | GM+1 | IRG on tape or GMWM in core storage stops operation. GM is inserted in storage after last character read from tape. (Word separator characters are translated to WM in core storage.) T = N (L ₁ +1) ms + T _M |
| Rewind Tape (and Unload)* | CU | RWD (RWV) | <u>U</u> | %Un | | R | | %4n | dbb | |
| Rewind Tape (and Unload)* | CU | RWD (RWV) | <u>U</u> | %Un | | (U) | | %4n | dbb | T = N (L ₁ +1) ms (see publication for more detail) |
| Skip and Blank Tape* | CU | SKP | <u>U</u> | %Un | | E | | %4n | dbb | T = N (L ₁ +1) ms (see publication for more detail) |
| Write Tape (with word marks)* | MU | WT | <u>M</u> | %Un | xxx | W | | %4n | GM+1 | GMWM in core storage stops operation (WM in core storage written on tape as a word separator character.) T = N (L ₁ +1) ms + T _M |
| Write Tape Mark | CU | WTM | <u>U</u> | %Un | | M | | %4n | dbb | T = N (L ₁ +1) ms + T _M |
| IBM 1011 PAPER TAPE READER INSTRUCTIONS | | | | | | | | | | |
| Branch if Input/Output Indicator On* | B | BIN | <u>B</u> | xxx | | 1 | | BI | dbb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms |
| Branch if Paper Tape Reader Ready* | B | BIN | <u>B</u> | xxx | | 2 | | BI | dbb, Blank (or NSI) | Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Read from Paper Tape (with word marks) | | | <u>M</u> (<u>L</u>) | %PI | xxx | R | | %71 | B+ message length + 1 | T = N (L ₁ +1) ms + record transmission time |
| IBM 1012 TAPE PUNCH INSTRUCTIONS | | | | | | | | | | |
| Backspace Tape (and Branch)* | SS | SS (SSB) | <u>K</u> | xxx | | A | | BI | dbb, Blank (or NSI+1) | Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|------------------------|-------------------|-----|---------|------------|-----------------------------------|----------------------|---|
| | SPS | Auto-coder | | A/1- | B- | | | A | B | |
| Branch if in Back-space Operation* | B | BIN* | <u>B</u> | xxx | | 1 | | BI | dbb, Blank, (or NSI) | |
| Branch if Tape Punch Ready* | B | BIN* | <u>B</u> | xxx | | 2 | | BI | dbb, Blank (or NSI) | |
| Branch if Tape Punch Not Ready to Accept Data* | B | BIN* | <u>B</u> | xxx | | 3 | | BI | dbb, Blank (or NSI) | No Branch: T = N (L _i +1) ms Branch (without indexing): T = N (L _i +1) ms Branch (with indexing): T = N (L _i +2) ms |
| Branch if Tape Punch is Not Ready to Read* | B | BIN* | <u>B</u> | xxx | | 4 | | BI | dbb, Blank (or NSI) | |
| Branch if Tape Punch Overextended* | B | BIN* | <u>B</u> | xxx | | 5 | | BI | dbb, Blank (or NSI) | |
| Branch if Supply Reel Low or Chad Box Full* | B | BIN* | <u>B</u> | xxx | | 6 | | BI | dbb, Blank (or NSI) | |
| Write On Tape Punch* | | | <u>M</u> | %P1 | xxx | W | | %71 | B+3 | T = N (L _i +1) ms + transmission time |
| Tape Punch Read Back Check* | | | <u>M</u> | %P1 | xxx | R | | %71 | B+3 | T = N (L _i +1) ms + transmission time |
| IBM 7340 HYPERTAPE DRIVE INSTRUCTIONS | | | | | | | | | | |
| Attention Response (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | B | | dbb(BI) | dbb, Blank (or NSI) | T = N (L _i +1) ms Branch (without indexing): T = N (L _i +1) ms Branch (with indexing): T = N (L _i +2) ms |
| Branch if Attention Indicator On* | B | BIN* | <u>B</u> | xxx | | 4 | | BI | dbb, Blank (or NSI) | |
| Branch if Normal End Indicator On* | B | BIN* | <u>B</u> | xxx | | 2 | | BI | dbb, Blank (or NSI) | No Branch: T = N (L _i +1) ms Branch (without indexing): T = N (L _i +1) ms Branch (with indexing): T = N (L _i +2) ms |
| Branch if Unusual End Indicator On* | B | BIN* | <u>B</u> | xxx | | 1 | | BI | dbb, Blank (or NSI) | |
| Branch if 7641 Busy Indicator On* | B | BIN* | <u>B</u> | xxx | | 3 | | BI | dbb, Blank (or NSI) | |
| Control Load Operation* | | | <u>L</u> | %11 | xxx | W | | %91 | B+4 | See Form A24-3069. |
| Control Move Operation* | | | <u>M</u> | %11 | xxx | W | | %91 | B+4 | See Form A24-3069. |
| End Response (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | E | | dbb(BI) | dbb, Blank (or NSI) | T = N (L _i +1) ms Branch (without indexing): T = N (L _i +1) ms Branch (with indexing): T = N (L _i +2) ms |
| Read Operation (with word marks)* | | | <u>M</u> <u>(L)</u> | %11 | xxx | R | | %91 | GM+1 | See Form A24-3069. |
| Sense Load Operation* | | | <u>L</u> | %11 | xxx | R | | %91 | B+8 | See Form A24-3069. |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|------------|--------------------------|-------------------|-----|---------|------------|-----------------------------------|---------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Sense Move Operation* | | | <u>M</u> | %I1 | xxx | R | | %91 | B+8 | See Form A24-3069. |
| Start Control (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | F | | dbb(BI) | dbb, Blank (or NSI) | T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Start Read* | CU | CU* | <u>U</u> | %I1 | | E | | %91 | dbb | See Form A24-3069. |
| Start Sense (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | G | | dbb(BI) | dbb, Blank (or NSI) | T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Start Write* | CU | CU* | <u>U</u> | %I1 | | D | | %91 | dbb | See Form A24-3069. |
| Write Op (with WM's) | | | <u>M</u> (<u>L</u>) | %I1 | xxx | W | | %91 | GM+1 | See Form A24-3069. |
| IBM 1009 INSTRUCTIONS | | | | | | | | | | |
| Branch if 1009 Run* | B | BIN* | <u>B</u> | xxx | | 1 | | BI | dbb, Blank (or NSI) | |
| Branch if End-of-Message Receive* | B | BIN* | <u>B</u> | xxx | | 5 | | BI | dbb, Blank (or NSI) | |
| Branch if End-of-Message Transmit* | B | BIN* | <u>B</u> | xxx | | 2 | | BI | dbb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Good Transmission* | B | BIN* | <u>B</u> | xxx | | 3 | | BI | dbb, Blank (or NSI) | |
| Branch if Receive Error* | B | BIN* | <u>B</u> | xxx | | 6 | | BI | dbb, Blank (or NSI) | |
| Branch if Transmission Error* | B | BIN* | <u>B</u> | xxx | | 4 | | BI | dbb, Blank (or NSI) | |
| Load Character from the Receiving 1009 | LU | LCA | <u>L</u> | %D1 | xxx | R | | T41 | B + 1 | T = N (L ₁ +3) ms if ws + dead time T = N (L ₁ +2) ms |
| Load Character to the Transmitting 1009 | LU | LCA | <u>L</u> | %D1 | xxx | W | | %41 | B + 1 | T = N (L ₁ +3) ms if ws + dead time T = N (L ₁ +2) ms |
| Move Character to the Receiving 1009 | MU | MCW | <u>M</u> | %D1 | xxx | R | | %41 | B + 1 | T = N (L ₁ +2) ms + dead time |
| Move Character to Transmitting 1009 | MU | MCW | <u>M</u> | %D1 | xxx | W | | T41 | B + 1 | T = N (L ₁ +2) ms + dead time |
| Set Ready to Receive* | CU | CU* | <u>U</u> | %D1 | | D | | %41 | d41 | T = N (L ₁ +1) ms |
| Start Transmission* | CU | CU* | <u>U</u> | %D1 | | E | | %41 | d41 | T = N (L ₁ +1) ms |
| Suppress 3-Second Alarm* | SS | SS* | <u>K</u> | | | A | | dpp | dpp | T = N (L ₁ +1) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------------------|-------------------|-----|---------|------------|-----------------------------------|------------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| IBM 1404 INSTRUCTIONS | | | | | | | | | | |
| Control Carriage-Eject and Immediate Skip to Channel 1* | CC | CC* | <u>F</u> | | | I | | dpp | dpp | Eject card at print station. T = .0115 (L ₁ +1) ms |
| Control Carriage-Eject and Skip to Channel 1 after next Print* | CC | CC* | <u>F</u> | | | A | | dpp | dpp | Eject card at print station after next print cycle. T = .0115 (L ₁ +1) ms |
| For other Control Carriage instructions, refer to the IBM 1403 Printer Instruction Section | | | | | | | | | | |
| Read Card from 1404 Printer | R | R | <u>1</u> | | | 0 | | Ap | 364 | T = .0115 (L ₁ +1) ms + I/O |
| Write and Read 1404 Printer | WR | WR | <u>3</u> | | | 0 | | Ap | 081 | T = .0115 (L ₁ +1) ms + I/O |
| Write Line | W | W | <u>2</u> | | | | | Ap | 332 | T = .0115 (L ₁ +1) ms + I/O |
| Read Compare 1404 Special Feature Instructions (Reference Text A24-3068) | | | | | | | | | | |
| Branch if Invalid Card Code Indicator On | B | BIN* | <u>B</u> | xxx | | 0 | | BI | dbi, Blank or (NSI) | No Branch: T = .0115 (L ₁ +1) ms Branch (without indexing): T = .0115 (L ₁ +1) ms Branch (with indexing): T = .0115 (L ₁ +2) ms |
| Compare | C | C | <u>C</u> | xxx | 363 | | | A-L _W | B-L _W | T = .0115 (L ₁ +1+L _A +L _B) ms |
| IBM 1407 CONSOLE INQUIRY INSTRUCTIONS | | | | | | | | | | |
| Branch if Inquiry Clear Indicator On | B | BIN* | <u>B</u> | xxx | | * | | BI | dbb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = .0115 (L ₁ +2) ms |
| Branch if Inquiry Request Indicator On | B | BIN* | <u>B</u> | xxx | | Q | | | | |
| Line Space | MU or LU | MU or LU | <u>M</u> or <u>L</u> | %TC | xxx | W | GM-WM in B | %30 | B + 1 | T = N (L ₁ +1) ms + space time |
| Read from Console Printer (with word marks) | MU LU | MU LU | <u>M</u> <u>L</u> | %TC | xxx | R | | %30 | B + Message Length + 1 | T = N (L ₁ +1) ms + operator keying time |
| Write on Console Printer (with word marks) | MU LU | MU LU | <u>M</u> <u>L</u> | %TC | xxx | W | | %30 | B + Message Length + 1 | T = N (L ₁ +1) ms + output typing time |
| IBM 1412 MAGNETIC CHARACTER READER, MODEL 1 INSTRUCTIONS | | | | | | | | | | |
| Branch if Magnetic Character Reader Account-Number Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 6 | | BI | dbb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Magnetic Character Reader Amount-Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 4 | | | | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|------------|----------|-------------------|-----|---------------|------------|-----------------------------------|---|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Branch if Magnetic Character Reader Document-Spacing Check Indicator On* | B | BIN* | <u>B</u> | xxx | | 8 | | | | No Branch: $T = N (L_1+1) \text{ ms}$ Branch (without indexing): $T = N (L_1+1) \text{ ms}$ Branch (with indexing): $T = N (L_1+2) \text{ ms}$ |
| Branch if Magnetic Character Reader-Late Read Indicator On* | B | BIN* | B | xxx | | 1 | | | | |
| Branch if Magnetic Character Reader Read-Check Indicator On* | B | BIN* | <u>B</u> | xxx | | 3 | | | | |
| Branch if Magnetic Character Reader Read-not-ready Indicator On* | B | BIN* | <u>B</u> | xxx | | 2 | | | | |
| Branch if Magnetic Character Reader Transmit-Routing Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 7 | | | | |
| Disengage Magnetic Character Reader* | CU | CU | <u>U</u> | %S1 | | D | %21 | dbb | $T = N (L_1+1) \text{ ms}$ | |
| Engage Magnetic Character Reader* | CU | CU | <u>U</u> | %S1 | | E | %21 | dbb | $T = N (L_1+1) \text{ ms}$ | |
| Load from Magnetic Character Reader* | LU | LU | <u>L</u> | %S1 | xxx | R | %21 | B + Message Length + 1 | $T = N (L_1+1) \text{ ms} + \text{message length} + \text{document movement (see publication for more detail)}$ | |
| Move from Magnetic Character Reader* | MU | MU | M | %S1 | xxx | R | %21 | B + Message Length + 1 | | |
| Select Stacker-Pocket A [B, 0-9, Reject] (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | A [B, C-L, M] | dbb (BI) | dbb, Blank (or NSI) | No Branch: $T = N (L_1+1) \text{ ms}$ Branch (without indexing): $T = N (L_1+1) \text{ ms}$ Branch (with indexing): $T = N (L_1+2) \text{ ms}$ | |
| IBM 1418 AND 1428 OPTICAL READER INSTRUCTIONS | | | | | | | | | | |
| Branch if Character On-Line* | B | BIN* | <u>B</u> | xxx | | 6 | BI | dbb, Blank or (NSI) | | |
| Branch if Document End* | B | BIN* | <u>B</u> | xxx | | 5 | | | | |
| Branch if Document under Selected Read Station* | B | BIN* | <u>B</u> | xxx | | 3 | | | | |
| Branch if Empty Hopper and Transport* | B | BIN* | <u>B</u> | xxx | | 7 | | | | |
| Branch if Late-Read (or Late Reading Mode Change on 1428) Indicator On* | B | BIN* | <u>B</u> | xxx | | 1 | | | | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|-------------------|----------------------------------|-------------------|-----|---------------|------------|-----------------------------------|---|-----------------------|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Branch if Ready to Engage* | B | BIN* | <u>B</u> | xxx | | 2 | | | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms | |
| Branch if Ready to Read* | B | BIN* | <u>B</u> | xxx | | 8 | | | | |
| Control Unit-Disengage* | CU | CU* | <u>U</u> | %S2 | | D | %22 | dbb | T = N (L ₁ +1) ms | |
| Control Unit-Engage* | CU | CU* | <u>U</u> | %S2 | | E | %22 | dbb | T = N (L ₁ +1) ms | |
| Read In Move Mode* | MU | MU* | <u>M</u> | %S2 | xxx | R | %22 | B + 1 | T = N (L ₁ +1) ms + message length + document length + 1 (See publication for more detail) | |
| Reading Mode Determination- Alphabetic Set (1428 only)* | SS | SS* | <u>K</u> | | | C | dbb | dbb | T = N (L ₁ +1) ms | |
| Reading Mode Determination- Alphabetic Set (1428 only) | SS | SS* | <u>K</u> | | | E | dbb | dbb | T = N (L ₁ +1) ms | |
| Reading Mode Determination- Numeric Set (1428 only) | SS | SS* | <u>K</u> | | | F | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Second Read Station | SS | SS* | <u>K</u> | | | N | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket A [B, 0-9] (14-18)* | SS | SS* | <u>K</u> | | | A B, 09 | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket A (1428) | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | A D H | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket B (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | B D H | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket R (1428)* | SS | SS* | <u>K</u> | | | G | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket 0 (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | B H G | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket 1 (1428)* | SS | SS* | <u>K</u> | | | A | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket 2 (1428)* | SS | SS* | <u>K</u> | | | B | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket 3 (1428)* | SS SS | SS* SS* | <u>K</u> <u>K</u> | | | A G | dbb | dbb | T = N (L ₁ +1) ms | |
| Select Stacker-Pocket 4 (1428)* | SS | SS* | <u>K</u> | | | D | dbb | dbb | T = N (L ₁ +1) ms | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|-------------------|----------------------------------|-------------------|----|-------------|------------|-----------------------------------|-----|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Select Stacker-Pocket 5 (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | A D G | | dbb | dbb | T = N (L ₁ +1) ms |
| Select Stacker-Pocket 6 (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | B D G | | dbb | dbb | T = N (L ₁ +1) ms |
| Select Stacker-Pocket 7 (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | A B D | | dbb | dbb | T = N (L ₁ +1) ms |
| Select Stacker-Pocket 8 (1428)* | SS | SS* | <u>K</u> | | | H | | dbb | dbb | T = N (L ₁ +1) ms |
| Select Stacker-Pocket 9 (1428)* | SS SS SS | SS* SS* SS* | <u>K</u> <u>K</u> <u>K</u> | | | A H G | | dbb | dbb | T = N (L ₁ +1) ms |
| IBM 1418/1428 SPECIAL FEATURE INSTRUCTIONS | | | | | | | | | | |
| Read Station, Additional or Mark Reading Station | | | | | | | | | | |
| Select First Read Station* | SS | SS* | <u>K</u> | | | M | | dbb | dbb | T = N (L ₁ +1) ms |
| IBM 1419 MAGNETIC CHARACTER READER INSTRUCTIONS | | | | | | | | | | |
| Branch if Document-Spacing Error Indicator On* | B | BIN* | <u>B</u> | xxx | | 8 | | | | |
| Branch if Document to be Read Indicator On* | B | BIN* | <u>B</u> | xxx | | 1 | | | | |
| Branch if Document under Read Head (PDS 4) Indicator On* | B | BIN* | <u>B</u> | xxx | | 2 | | | | |
| Branch if Valid Account-Number Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 5 | BI | dbb, Blank (or NSI) | | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Valid Amount Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 4 | | | | |
| Branch if Valid Serial-Number Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 7 | | | | |
| Branch if Valid Transit-Number Field Indicator On* | B | BIN* | <u>B</u> | xxx | | 6 | | | | |
| Control Unit-Disengage* | CU | CU* | <u>U</u> | %S1 | | D | | %21 | dbb | T = N (L ₁ +1) ms |
| Control Unit-Engage* | CU | CU* | <u>U</u> | %S1 | | E | | %21 | dbb | T = N (L ₁ +1) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|---------------|----------|-------------------|-----|----------------------|------------|-----------------------------------|----------------------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Read from 1419 in Load Mode* | LCA | LU | <u>L</u> | %S1 | xxx | R | | %21 | B -- Mes- sage Length -- 1 | T = N (L ₁ +1) ms + message length + document length + 1 (see A24-3068 for more information) |
| Read from 1419 in Move Mode* | MC W | MU | <u>M</u> | %S1 | xxx | R | | %21 | B -- Mes- sage Length -- 1 | T = N (L ₁ +1) ms + message length + document length + 1 (see A24-3068 for more information) |
| Select Stacker - Pocket A [B, 0-9, Reject] (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | A B, C-L, M | | ddb (B1) | ddb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| IBM 1448 TRANSMISSION CONTROL UNIT INSTRUCTIONS | | | | | | | | | | |
| Branch if Early Warning Indicator On* | B | BIN* | <u>B</u> | xxx | | | | BI | ddb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if End of Block Indicator On* | B | BIN* | <u>B</u> | xxx | | | | BI | ddb, Blank (or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Disable Interrupt (and Branch) * | SS | SS (SSB)* | <u>K</u> | (xxx) | | | | ddb (B1) | Blank (NSI) | Branch (with indexing): T = N (L ₁ +2) ms |
| Enable Interrupt (and Branch) | SS | SS (SSB)* | <u>K</u> | (xxx) | | | | ddb (B1) | Blank (NSI) | |
| Scan* | | | <u>O</u> | xxx | | | | BI | BI | See A24-3068 for timing information. |
| IBM 1401/1460 SPECIAL FEATURE INSTRUCTIONS -- ADVANCED PROGRAMMING | | | | | | | | | | |
| Move Characters to Record Mark or Group-Mark WM | MC M | MR CM | <u>P</u> | xxx | xxx | | | A+L _A | B+L _A | Standard on 1460 T = N (L ₁ +1+2 L _A) ms |
| Store A-address Register 1* | SAR | SAR | <u>Q</u> | xxx | | | | A-3 | A _p | Store contents of A-address register in A-address. T = N (L ₁ +1+2 L _A) ms |
| Store B-Address Register - One Address 1* | SBR | SBR | <u>H</u> | xxx | | | | A-3 | B _p | Store contents of B-address register in the A-address T = N (L ₁ +4) ms |
| Store B-Address Register - Two Addresses 1* | SBR | SBR | <u>H</u> | xxx | xxx | | | A-3 | B _p | T = N (L ₁ +7) ms |
| COLUMN BINARY | | | | | | | | | | |
| Bit Test 2 | | | | | | | | | | |
| Branch if Bit Equal* | BBE | BBE | <u>W</u> | xxx | xxx | x | | BI | B-1, Blank (or NSI) | No Branch: T = N (L ₁ +2) ms Branch (without indexing): T = N (L ₁ +2) ms Branch (with indexing): T = N (L ₁ +3) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|------------------------------------|------------------|------------|------------------------|-------------------|-----|---------|--|---------------------------------------|---------------------------------------|---|
| | SPS | Auto-coder | | A/1- | B- | | | A | B | |
| Move and Binary Code | MC W | MBC | <u>M</u> | xxx | xxx | B | | A-L _A | Address of preset WM in 400 area + 99 | T = N (L ₁ +1+2 L _B) ms |
| Move and Binary Decode | MC W | MBD | <u>M</u> | xxx | xxx | A | | Address of preset WM in 400 area + 99 | B-L _B | T = N (L ₁ +1+2 L _B) ms |
| Punch Column Binary (and Branch)* | P | PCB | <u>4</u> | (xxx) | | C | | dbb (BI) | 181 (Blank or NSI) | T = N (L ₁ +1) ms + I/O |
| Read Binary Tape* | MU | RTB | <u>M</u> | %Bn | xxx | R | | %2n | B + Message Length + 1 | T = N (L ₁ +1) ms + T _M |
| Read Column Binary (and Branch)* | R | RCB | <u>1</u> | (xxx) | | C | | dbb (BI) | 481 (Blank or NSI) | T = N (L ₁ +1) ms + I/O |
| Write Binary Tape* | MV | WTB | <u>M</u> | %Bn | xxx | W | | %2n | GM-WM+1 | T = N (L ₁ +1) ms + T _M |
| COMPRESSED TAPE | | | | | | | | | | |
| Move and Insert Zeros | M12 | M12 | <u>X</u> | xxx | xxx | | High-order position of expanded fields | Address of preset GM-WM | Last B-field WM-1 | GMWM to left of high order A-field position T = N (L ₁ +1+2 L _A + L _Z) ms |
| Read Compressed Tape* | MU | MU* | <u>M</u> | %Cn | xxx | R | | %3n | Address of inserted GM | IRG stops operation T = N (L ₁ +1) ms + T _M |
| DIRECT DATA CHANNEL | | | | | | | | | | |
| Branch if Data Transmission Ended* | B | BIN* | <u>B</u> | xxx | | 2 | | BI | dbb, Blank or NSI | |
| Branch if Read Request* | B | BIN* | <u>B</u> | xxx | | 3 | | BI | dbb, Blank or NSI | |
| Branch if System Stops* | B | BIN* | <u>B</u> | xxx | | 8 | | BI | dbb, Blank or NSI | |
| Branch if Transmission Error* | B | BIN* | <u>B</u> | xxx | | 1 | | BI | dbb, Blank or NSI | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Trying to Read* | B | BIN* | <u>B</u> | xxx | | 7 | | BI | dbb, Blank or NSI | |
| Branch if Trying to Write* | B | BIN* | <u>B</u> | xxx | | 6 | | BI | dbb, Blank or NSI | |
| Branch if Write Request* | B | BIN* | <u>B</u> | xxx | | 4 | | BI | dbb, Blank or NSI | |
| Read Data (with word marks)* | MU (LU) | MU (LU) | <u>M</u> <u>(L)</u> | %H1 | xxx | R | | %81 | B + Message Length + 1 | T = N (L ₁ +1) ms + transmission and start time. |
| Read Request* | SS | SS* | <u>K</u> | | | C | | dbb | dbb | T = N (L ₁ +1) ms |
| Reset* | SS | SS* | <u>K</u> | | | E | | dbb | dbb | T = N (L ₁ +1) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|------------|--------------|-------------------|-----|---------|-----------------|-----------------------------------|--|--|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Write Data (with word marks)* | MU (LU) | MU (LU) | <u>M</u> (L) | %H1 | xxx | W | | %B1 | B + Message Length + 1 | T = N (L ₁ +1) ms + transmission and start time |
| Write Request* | SS | SS* | <u>K</u> | | | D | | dbb | dbb | T = N (L ₁ +1) ms |
| HIGH-LOW-EQUAL COMPARE (standard on 1460) | | | | | | | | | | |
| Branch if Equal Compare - B=A* | B | BE | <u>B</u> | xxx | | S | | BI | dbb, Blank or NSI | No Branch: T = N (L ₁ +1) ms |
| Branch if High Compare - B < A* | B | BH | <u>B</u> | xxx | | U | | BI | dbb, Blank or NSI | Branch (without indexing): T = N (L ₁ +1) ms |
| Branch if Low Compare - B > A | B | BL | <u>B</u> | xxx | | T | | BI | dbb, Blank or NSI | Branch (with indexing): T = N (L ₁ +2) ms |
| MULTIPLY-DIVIDE | | | | | | | | | | |
| Divide* | D | D | <u>%</u> | xxx | xxx | | A-field | A minus division length | Tens position of quotient | Quotient developed in high-order positions of B-field |
| Multiply* | M | M | <u>@</u> | xxx | xxx | | A-field B-field | A minus multiplier length | B minus Product field length | Product developed in low-order positions of B-field |
| PROCESSING OVERLAP | | | | | | | | | | |
| Branch if Punch Busy* | B | BIN* | <u>B</u> | xxx | | H | | BI | dbb, Blank or NSI | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Reader Busy* | B | BIN* | <u>B</u> | xxx | | I | | BI | dbb, Blank or NSI | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Branch if Tape or Input-Output Busy* | B | BIN* | <u>B</u> | xxx | | J | | BI | dbb, [0-Address Register Contents +] Blank, or NSI | No Branch (without indexing): T = N (L ₁ +1) ms No Branch (with indexing): T = N (L ₁ +2) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms |
| Overlap Off (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | | | dbb (BI) | dbb (Blank or NSI) | T = N (L ₁ +1) ms |
| Overlap On (and Branch)* | SS | SS* (SSB)* | <u>K</u> | (xxx) | | | \$ | dbb (BI) | dbb (Blank or NSI) | T = N (L ₁ +1) ms |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|---|------------------|-------------|----------------------|-------------------|-----|----------|------------|-----------------------------------|--|-----------------------|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| Punch Card In Overlap Mode (and Branch)* | P | P | <u>4</u> | (xxx) | | | | <u>0-Add. Reg.</u> 181 | T = N (L ₁ +1) ms + I/O Branch (without indexing): T = N (L ₁ +1) ms + I/O Branch (with indexing): T = N (L ₁ +2) ms + I/O | |
| Read Card in Overlap Mode (and Branch)* | R | R | <u>1</u> | (xxx) | | | | <u>0-Add. Reg.</u> 081 | T = N (L ₁ +1) ms + I/O Branch (without indexing): T = N (L ₁ +1) ms + I/O Branch (with indexing): T = N (L ₁ +2) ms + I/O | |
| Read Tape In Overlap Mode (with word marks)* | MU (LU) | MU* (LU)* | <u>M</u> <u>L</u> | @Un | xxx | R | | <u>0-Add. Reg.</u> GM+1 | T = N (L ₁ +1) ms + T _M | |
| Reset Overlap (and Branch) | SS | SS* (SSB)* | <u>K</u> | (xxx) | | | dbb (B1) | dbb (Blank or NSI) | T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms | |
| Write Tape In Overlap (with word mark)* | MU (LU) | MU* (LU)* | <u>M</u> <u>L</u> | @Un | xxx | W | | <u>0-Add. Reg.</u> GM+1 | T = N (L ₁ +1) ms + T _M | |
| READ-PUNCH RELEASE | | | | | | | | | | |
| Start Punch Feed* | SPF | SPF | <u>9</u> | | | | Ap | Bp | T = N (L ₁ +1) ms | |
| Start Read Feed* | SRF | SRF | <u>8</u> | | | | Ap | Bp | T = N (L ₁ +1) ms | |
| SCAN DISK 1301 AND 1311 (1460) | | | | | | | | | | |
| Scan Disk Equal (with word marks)* | MU (LU) | SDE (SDEW) | <u>M</u> <u>L</u> | %F8 | xxx | W | B + 6 | B+11+L _F | Record must be in sector format. Test result with appropriate Branch instruction. GM-WM must be set to right of search argument L _F = 100 T = .006 (L ₁ +1) ms + 2 N _S + disk rotation | |
| Scan Disk High or Equal (with word marks)* | MU (LU) | SDH (SDHWC) | <u>M</u> <u>L</u> | %F9 | xxx | W | B + 6 | B+11+L _F | | |
| Scan Disk Low or Equal (with word marks)* | MU (LU) | SDL (SDLW) | <u>M</u> <u>L</u> | %F7 | xxx | W | B + 6 | B+11+L _F | | |
| SENSE SWITCHES (1401) | | | | | | | | | | |
| Branch if Sense Switch B C-G On* | B | BSS* | <u>B</u> | xxx | | B C-G | B1 | dbb (Blank or NSI) | No Branch: T = N (L ₁ +1) ms Branch (without indexing): T = N (L ₁ +1) ms Branch (with indexing): T = N (L ₁ +2) ms | |
| SPACE SUPPRESSION (1401-standard on 1460) | | | | | | | | | | |
| An Sd- character used with any one of the WRITE instructions prevents the automatic spacing operation after the print operation | | | | | | | | | | |

* Indicates the instruction cannot be chained.

| Instruction Name | Mnemonic Op Code | | Op Code | Address Registers | | d-Char. | WM's Req'd | Address Registers After Operation | | Remarks and/or Timing |
|--|------------------|--------------|-----------------------------------|-------------------|------------------------------|---------|------------|-----------------------------------|-----------------------|---|
| | SPS | Auto-coder | | A/I- | B- | | | A | B | |
| TRACK RECORD - 1301 (1460) | | | | | | | | | | |
| Read-Disk-Track Record (with word marks)* | MU (LU) | RDTR (RDTRW) | \overline{M} (\overline{L}) | %F2 | xxx | R | | B + 6 | B+11+2543 (B+11+2261) | T = .006 (L ₁ +1) ms + 33.3 ms + disk rotation |
| Read-Disk-Track Record with Address (and word marks)* | MU (LU) | RDTA (RDTAW) | \overline{M} (\overline{L}) | %F@ | xxx | R | | B + 9 | B+11+2549 (B+11+2267) | T = .006 (L ₁ +1) ms + 33.3 ms + disk rotation |
| Write-Disk-Track Record (with word marks)* | MU (LU) | WDTR (WDTRW) | \overline{M} (\overline{L}) | %F2 | xxx | W | | B + 6 | B+11+2543 (B+11+2261) | T = .006 (L ₁ +1) ms + 33.3 ms + disk rotation |
| Write-Disk-Track Record with Address (and word marks)* | MU (LU) | WDTA (WDTAW) | \overline{M} (\overline{L}) | %F@ | xxx | W | | B + 9 | B+11+2549 (B+11+2267) | T = .006 (L ₁ +1) ms + 33.3 ms + disk rotation |
| TRACK RECORD - 1311 (1460) | | | | | | | | | | |
| Read-Disk-Track Record (with word marks)* | MU (LU) | RDTR (RDTRW) | \overline{M} (\overline{L}) | %F2 | xxx | R | | B + 6 | B+11+2980 (B+11+2682) | T = .006 (L ₁ +1) ms + 40 ms + disk rotation |
| Read-Disk-Track Record with Address (and word marks)* | MU (LU) | RDTA (RDTAW) | \overline{M} (\overline{L}) | %F@ | xxx | R | | B + 9 | B+11+2986 (B+11+2688) | T = .006 (L ₁ +1) ms + 40 ms + disk rotation |
| Write-Disk-Track Record (with word marks)* | MU (LU) | WDTR (WDTRW) | \overline{M} (\overline{L}) | %F2 | xxx | W | | B + 6 | B+11+2980 (B+11+2682) | T = .006 (L ₁ +1) ms + 40 ms + disk rotation |
| Write-Disk-Track Record with Address (and word marks)* | MU (LU) | WDTA (WDTAW) | \overline{M} (\overline{L}) | %F@ | xxx | W | | B + 9 | B+11+2986 (B+11+2688) | T = .006 (L ₁ +1) ms + 40 ms + disk rotation |
| TRANSLATE (1460) | | | | | | | | | | |
| Load Record | | | \overline{P} | xxx | xxx | | | A+L _A | B+L _A | T = .006 (L ₁ +1+2 L _A) ms |
| Translate (with word marks)* | | | \overline{I} | xxx | x00 (even hundreds position) | | | | | T = .006 (L ₁ +2+3 T _F) ms |

* Indicates the instruction cannot be chained.

READER'S SURVEY FORM

IBM 1401/1460 Instruction and Timing Summary, Form A24-6447-0

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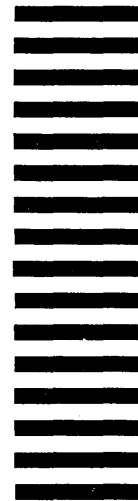
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