

## K SERIES MODULES

Another very important variety of "off-the-shelf" modules is the K series module. These are used in, but not limited to control applications. The number of applications using these modules runs into the hundreds. Representative applications include:

- Computer Based Data Acquisition
- Computer Based Control Systems
- Multiprocessor Systems
- Industrial Data Acquisition and Control
- Analog-to-Digital Conversion and Multiplexer Subsystems
- Digital Input and Output Subsystems
- Gas Chromatography Systems
- N/C Tape Preparation Systems

The combination of the M and K series modules using the "building block" approach with "off-the-shelf" modules is an ideal method of interfacing to the PDP-8/E processor for control applications. For more information and detailed examples, the reader should acquire a free copy of DEC's Control Handbook containing more than 200 pages of instructive material in the field of industrial control.

# appendix

## SPARE PARTS LIST

### PDP8E CUSTOMER RECOMMENDED SPARES

| Option SP8-EA Kit (First Level) (4K) |                         | Option SP8-EC Kit (First Level) (8K) |                         |
|--------------------------------------|-------------------------|--------------------------------------|-------------------------|
| DEC PART NO.                         | DESCRIPTION             | DEC PART NO.                         | DESCRIPTION             |
| M8300                                | Major Register          | M8300                                | Major Register          |
| M8310                                | Register Control        | M8310                                | Register Control        |
| M8330                                | Timing Module           | M8330                                | Timing Module           |
| G104                                 | Sense/Inhibit Module    | G111                                 | Sense/Inhibit Module    |
| G227                                 | X/Y Driver Module       | G233                                 | X/Y Driver Module       |
| 12-05941                             | Slide Switch            | 12-05941                             | Slide Switch            |
| 12-05375                             | Slide Switch, Momentary | 12-05375                             | Slide Switch, Momentary |
| 12-5849-13                           | Handle, Terra Cotta     | 12-5849-13                           | Handle, Terra Cotta     |
| 12-5849-12                           | Handle, Amber           | 12-5849-12                           | Handle, Amber           |
| 12-9219                              | Indicator Bulb          | 12-9219                              | Indicator Bulb          |
| 70-06994                             | Key Switch Assy.        | 70-06994                             | Key Switch Assy.        |
| 54-9264                              | Power Supply Module     | 54-9264                              | Power Supply Module     |
| 54-9262                              | Power Supply Module     | 54-9262                              | Power Supply Module     |
| SP8-EA KIT                           |                         | SP8-EC KIT                           |                         |
| Option SP8-EB (Second Level) (4K)    |                         | Option SP8-ED (Second Level) (8K)    |                         |
| 10-00004                             | Capacitor               | 10-00004                             | Capacitor               |
| 10-00016                             | Capacitor               | 10-00016                             | Capacitor               |
| 10-00024                             | Capacitor               | 10-00024                             | Capacitor               |
| 10-00067                             | Capacitor               | 10-00067                             | Capacitor               |
| 10-00076                             | Capacitor               | 10-00076                             | Capacitor               |
| 10-01610                             | Capacitor               | 10-01610                             | Capacitor               |
| 10-03053                             | Capacitor               | 10-03053                             | Capacitor               |
| 10-05306                             | Capacitor               | 10-05306                             | Capacitor               |
| 10-09678                             | Capacitor               | 10-09678                             | Capacitor               |
| 11-00113                             | Diode D662              | 11-00113                             | Diode D662              |
| 11-00114                             | Diode IN644             | 11-00114                             | Diode IN644             |
| 11-05314                             | 1N645                   | 11-05314                             | 1N645                   |
| 11-09977                             | 1N749A                  | 11-09977                             | 1N749A                  |
| 11-09979                             | 1N1185A                 | 11-09979                             | 1N1185A                 |
| 11-10006                             | 1N1201A                 | 11-10006                             | 1N1201A                 |
| 11-10181-0                           | Thyrector               | 11-10181-0                           | Thyrector               |
| 11-10182-0                           | 1N4721                  | 11-10182-0                           | 1N4721                  |
| 11-10183-0                           | SCR (h724)              | 11-10183-0                           | SCR (h724)              |
| 11-10625                             | Diode Light             | 11-10625                             | Diode Light             |
| 12-05375                             | Switch Rocker           | 12-05375                             | Switch Rocker           |
| 12-09403-01                          | Fan                     | 12-09403-01                          | Fan                     |
| 12-10072                             | Terminal                | 12-10072                             | Terminal                |
| 12-10073                             | Connector Socket        | 12-10073                             | Connector Socket        |
| 12-10198-0                           | Relay KVP               | 12-10198-0                           | Relay KVP               |
| 12-10199-0                           | Thermal Relay           | 12-10199-0                           | Thermal Relay           |
| 12-10626                             | Switch Slide            | 12-10626                             | Switch Slide            |
| 12-10627                             | Switch                  | 12-10627                             | Switch                  |
| 13-00204                             | Resistor                | 13-00204                             | Resistor                |
| 13-00229                             | Resistor                | 13-00229                             | Resistor                |
| 13-00293                             | Resistor                | 13-00293                             | Resistor                |
| 13-00317                             | Resistor                | 13-00317                             | Resistor                |
| 13-00391                             | Resistor                | 13-00391                             | Resistor                |
| 13-00432                             | Resistor                | 13-00432                             | Resistor                |
| 13-00439                             | Resistor                | 13-00439                             | Resistor                |

PDP8-E OPTION SP8-EB, SP8-ED (SECOND LEVEL) CONT.

| DEC PART NO. | DESCRIPTION   | DEC PART NO. | DESCRIPTION   |
|--------------|---------------|--------------|---------------|
| 13-00481     | Resistor      | 13-00481     | Resistor      |
| 13-00496     | Resistor      | 13-00496     | Resistor      |
| 13-01420     | Resistor      | 13-01420     | Resistor      |
| 13-02871     | Resistor      | 13-02871     | Resistor      |
| 13-02941     | Resistor      | 13-02941     | Resistor      |
| 13-02955     | Resistor      | 13-02955     | Resistor      |
| 13-02956     | Resistor      | 13-02956     | Resistor      |
| 13-04833     | Resistor      | 13-04833     | Resistor      |
| 13-04855     | Resistor      | 13-04855     | Resistor      |
| 13-04868     | Resistor      | 13-04868     | Resistor      |
| 13-05128     | Resistor      | 13-05128     | Resistor      |
| 13-05252     | Resistor      | 13-05252     | Resistor      |
| 13-09143-6   | Potentiometer | 13-09143-6   | Potentiometer |
| 13-09143-8   | Potentiometer | 13-09143-8   | Potentiometer |
| 13-10032     | Resistor      | 13-10032     | Resistor      |
| 13-10071     | Resistor      | 12-10071     | Resistor      |
| 13-10170     | Thermister    | 13-10170     | Thermister    |
| 15-01742     | Transistor    | 15-01742     | Transistor    |
| 15-03100     | Transistor    | 15-03100     | Transistor    |
| 15-03409-01  | MPS6534B      | 15-03409-01  | MPS6534B      |
| 15-05321     | 2N4258        | 15-05321     | 2N4258        |
| 15-05819     | 2N3055 Case   | 15-05819     | 2N3055 Case   |
| 15-09338     | 2N1613        | 15-09338     | 2N1613        |
| 15-09632     | DEC 2007      | 15-09632     | DEC 2007      |
| 15-09649     | 2N3762        | 15-09649     | 2N3762        |
| 15-10015     | DEC 4008      | 15-11102     | DEC 4011      |
| 15-01051     | 2N3054        | 15-10151     | 2N3054        |
| 16-09478     | Transformer   | 16-09478     | Transformer   |
| 16-09651     | Transformer   | 16-09651     | Transformer   |
| 16-09996     | Transformer   | 16-09996     | Transformer   |
| 18-09880     | Crystal       | 18-09880     | Crystal       |
| 18-09880-01  | Crystal       | 18-09880-01  | Crystal       |
| 19-05521     | DEC 1540      | 19-05521     | DEC 1540      |
| 19-05547     | DEC 7474      | 19-05547     | DEC 7474      |
| 19-05575-00  | DEC 7400      | 19-05575-00  | DEC 7400      |
| 19-05579     | DEC 7440      | 19-05579     | DEC 7440      |
| 19-05586     | DEC 74H40     | 19-05586     | DEC 74H40     |
| 19-09004     | DEC 7402      | 19-09004     | DEC 7402      |
| 19-09055     | DEC 7495      | 19-09055     | DEC 7495      |
| 19-09056     | DEC 74H00     | 19-09056     | DEC 74H00     |
| 19-09057     | DEC 74H10     | 19-09057     | DEC 74H10     |
| 19-09267     | DEC 74H11     | 19-09267     | DEC 74H11     |
| 19-09373     | DEC ML-9601   | 19-09373     | DEC ML-9601   |
| 19-09594     | DEC 82513-930 | 19-09594     | DEC 82513-930 |
| 19-09667     | DEC 74H74     | 19-09667     | DEC 74H74     |
| 19-09686     | DEC 7404      | 19-09686     | DEC 7404      |
| 19-09854     | DEC 8251-1    | 19-10046     | DEC 7442-1    |
| 19-09867     | DEC 4007      | 19-09867     | DEC 4007      |
| 19-09927     | DEC 74H87     | 19-09927     | DEC 74H87     |
| 19-09928     | DEC 7416      | 19-09928     | DEC 7416      |
| 19-09929     | DEC 7417      | 19-09929     | DEC 7417      |
| 19-09930     | DEC 7405      | 19-09930     | DEC 7405      |
| 19-09931     | DEC 74H04     | 19-09931     | DEC 74H04     |
| 19-09932     | DEC 7483      | 19-09932     | DEC 7483      |
| 19-09934     | DEC 8266      | 19-09934     | DEC 8266      |
| 19-09935     | DEC 8235      | 19-09935     | DEC 8235      |
| 19-09936     | DEC 74151     | 19-09936     | DEC 74151     |
| 19-09937     | DEC 74153     | 19-09937     | DEC 74153     |
| 19-09955     | DEC 7412      | 19-09955     | DEC 7412      |

PDP8E CUSTOMER RECOMMENDED SPARES  
OPTION SP8-EB, SP8-ED (SECOND LEVEL) CONT.

| DEC PART NO. | DESCRIPTION     | DEC PART NO. | DESCRIPTION      |
|--------------|-----------------|--------------|------------------|
| 19-09971     | DEC 6380A       | 19-09971     | DEC 6380A        |
| 19-09972     | DEC 6314        | 19-09972     | DEC 6314         |
| 19-09973     | DEC 97401       | 19-09973     | DEC 97401        |
| 19-09981     | UA723C Volt Reg | 19-09981     | UA723C Volt Reg. |
| 19-10010     | DEC FSA2501     | 19-10010     | DEC FSA2501      |
| 19-10011     | DEC 7486        | 19-10011     | DEC 7486         |
| 19-10391     | DEC 5314        | 19-10391     | DEC 5314         |
| 19-10392     | DEC 5380        | 19-01392     | DEC 5380         |
| 19-10394     | DEC 5384        | 19-01394     | DEC 5384         |
| 19-10624     | DEC 74L54       | 19-10624     | DEC 74L54        |
| 90-07208     | Fuse            | 19-10973     | R-C Network      |
| 90-08386-0   | Fuse            | 90-07208     | Fuse             |
| 90-08387-0   | Fuse            | 90-08386-0   | Fuse             |
| 90-08388-0   | Fuse            | 90-08387-0   | Fuse             |
| 90-08389-0   | Fuse            | 90-08388-0   | Fuse             |
| 90-08390-0   | Fuse            | 90-08389-0   | Fuse             |
| 12-10089     | Socket          | 90-08390-0   | Fuse             |
| 12-10090     | Housing         | 12-10089     | Socket           |
|              |                 | 12-10090     | Housing          |
|              | SP8-ED KIT      |              | SP8-EB KIT       |

PDP8M CUSTOMER RECOMMENDED SPARES

| OPTION SP8-MA KIT (FIRST LEVEL) (4K) | OPTION SP8-MC KIT (FIRST LEVEL) (8K) |             |                          |
|--------------------------------------|--------------------------------------|-------------|--------------------------|
| M8300                                | Major Registers Module               | M8300       | Major Registers Module   |
| M8310                                | Registers Control Module             | M8310       | Registers Control Module |
| M8330                                | Timing Module                        | M8330       | Timing Module            |
| G104                                 | Sense/Inhibit Module                 | G111        | Sense/Inhibit Module     |
| G227                                 | X/Y Drive Module                     | G233        | X/Y Drive Module         |
| 11-10625                             | Light Emitting Diode                 | 11-10625    | Light Emitting Diode     |
| 12-10626                             | Slide Switch                         | 12-10626    | Slide Switch             |
| 12-05375                             | Slide Switch, Momentary              | 12-05375    | Slide Switch, Momentary  |
| 12-05849-06                          | Handle, Russett Orange               | 12-05849-06 | Handle, Russett Orange   |
| 12-05849-13                          | Handle, Terra Cotta                  | 12-05849-13 | Handle, Terra Cotta      |
| 54-09728                             | Regulator Board Assy.                | 54-09728    | Regulator Board Assy.    |
|                                      | SP8-MA KIT                           |             | SP8-MC KIT               |

PDP8F CUSTOMER RECOMMENDED SPARES

| OPTION SP8-FA KIT (FIRST LEVEL) (4K) | OPTION SP8-FC KIT (FIRST LEVEL) (8K) |            |                          |
|--------------------------------------|--------------------------------------|------------|--------------------------|
| M8300                                | Major Registers Module               | M8300      | Major Registers Module   |
| M8310                                | Registers Control Module             | M8310      | Registers Control Module |
| M8330                                | Timing Module                        | M8330      | Timing Module            |
| G104                                 | Sense/Inhibit Module                 | G111       | Sense/Inhibit Module     |
| G227                                 | X/Y Drive Module                     | G233       | X/Y Drive Module         |
| 11-10625                             | Light Emitting Diode                 | 11-10625   | Light Emitting Diode     |
| 12-10626                             | Slide Switch                         | 12-10626   | Slide Switch             |
| 12-05375                             | Slide Switch, Momentary              | 12-05375   | Slide Switch, Momentary  |
| 12-5849-12                           | Handle, Amber                        | 12-5849-12 | Handle, Amber            |
| 12-5849-13                           | Handle, Terra Cotta                  | 12-5849-13 | Handle, Terra Cotta      |
| 54-09728                             | Regulator Board Assy.                | 54-09728   | Regulator Board Assy.    |
|                                      | SP8-FA KIT                           |            | SP8-FC KIT               |

**PDP8F—PDP8M CUSTOMER RECOMMENDED SPARES**  
**OPTION SP8-MB, SP8-MD (SECOND LEVEL)**  
**OPTION SP8-FB, SP8-FD (SECOND LEVEL)**

| DEC PART NO. | DESCRIPTION              | DEC PART NO. | DESCRIPTION        |
|--------------|--------------------------|--------------|--------------------|
| 10-00004     | Capacitor                | 15-10196     | 2N5302             |
| 10-00016     | Capacitor                | 15-10706     | GPS—A55 or MPS—A55 |
| 10-03053     | Capacitor                | 15-10765     | TRIAC MAC 11-3     |
| 10-05306     | Capacitor                | 15-11102     | DEC 4011           |
| 10-09678     | Capacitor                | 16-09478     | Transformer        |
| 11-10324     | Solid State Lamp         | 16-09651     | Transformer        |
| 11-10714     | 12A Diode Bridge NSS3514 | 16-09996     | Transformer        |
| 12-09355     | Switch, Micro            | 18-09880     | Crystal            |
| 12-05033     | Fan Boxer                | 18-09880-01  | Crystal            |
| 12-10043     | Switch, Miniature Rotary | 19-05521     | DEC 1540           |
| 12-10073     | Connector, 40 Terminal   | 19-05547     | DEC 7474           |
| 12-10627     | Rotary Switch            | 19-05586     | DEC 74H40          |
| 12-10790     | Switch, DPST N.O         | 19-09004     | DEC 7402           |
| 12-10824     | Thermostat               | 19-09055     | DEC 7495           |
| 12-10830-5   | Circuit breaker 5 AMP    | 19-09056     | DEC 74H00          |
| 12-10830-7   | Circuit Breaker, 7 AMP   | 19-09057     | DEC 74H10          |
| 13-00229     | Resistor                 | 19-09267     | DEC 74H11          |
| 13-00317     | Resistor                 | 19-09373     | DEC ML-9601        |
| 13-00439     | Resistor                 | 19-09594     | DEC 82513-930      |
| 13-01420     | Resistor                 | 19-09667     | DEC 74H74          |
| 13-02871     | Resistor                 | 19-09686     | DEC 7404           |
| 13-02941     | Resistor                 | 19-09705     | DEC 8881           |
| 13-02955     | Resistor                 | 19-09867     | DEC 4007           |
| 13-02956     | Resistor                 | 19-09927     | DEC 74H87          |
| 13-03156     | Resistor                 | 19-09928     | DEC 7416           |
| 13-04833     | Resistor                 | 19-09929     | DEC 7417           |
| 13-04855     | Resistor                 | 19-09930     | DEC 7405           |
| 13-04868     | Resistor                 | 19-09931     | DEC 74H04          |
| 13-05128     | Resistor                 | 19-09932     | DEC 7483           |
| 13-05252     | Resistor                 | 19-09934     | DEC 8266           |
| 13-05872     | Resistor                 | 19-09935     | DEC 8235           |
| 13-10032     | Resistor                 | 19-09936     | DEC 74151          |
| 13-10071     | Resistor                 | 19-09937     | DEC 74153          |
| 13-10709     | Resistor                 | 19-09955     | DEC 7412           |
| 15-03409-01  | MPS6534B or 2N3133       | 19-09971     | DEC 6380A          |
| 15-05321     | 2N4258                   | 19-09972     | DEC 6314A          |
| 15-09338     | MPS6531 or 2N1613        | 19-09973     | DEC 97401          |
| 15-09632     | DEC 2007                 | 19-10010     | DEC FSA2501        |
| 15-09649     | 2N3762                   | 19-10011     | DEC 7486           |
| 19-09594     | DEC 8251                 | 19-10046     | DEC 7442-1         |
| 15-10015     | DEC 4008                 | 19-10973     | R-C Network        |
| 15-10151     | RCA 40372 (2N3054)       | 90-7221      | Fuse               |
|              |                          | 90-07226     | Fuse               |
|              |                          | 90-08389     | Fuse               |

SP8-MB KIT, SP8-FB KIT  
 SP8-MD, SP8-FD KIT

**CUSTOMER RECOMMENDED ASR-33 SPARES**  
**OPTION LT33-B TELETYPE**

| DEC PART NO. | DESCRIPTION      |
|--------------|------------------|
| 29-11424     | Circuit Board    |
| 29-11495     | Tape Sprocket    |
| 29-11443     | Lever Universal  |
| 29-11144     | Fuse             |
| 29-11367     | Brush (Distrib.) |
| 29-11412     | Drive Gear       |
| 29-11417     | Driven Gear      |
| 29-11411     | Belt             |
| 29-11376     | Shaft            |
| 29-11375     | Bearings         |
| 29-11374     | Bearings         |
| 29-17473     | Ribbon           |

LT33-B KIT

**CR8-E/CM8-E RECOMMENDED SPARE PARTS**  
**(FIRST LEVEL)**

| DEC PART NUMBER | DESCRIPTION |
|-----------------|-------------|
| 19-9971         | IC DEC 6380 |
| 19-9705         | IC DEC 8881 |
| 19-9704         | IC DEC 314  |
| 19-9373         | IC DEC 9601 |
| 19-9686         | IC DEC 7404 |
| 19-9594         | IC DEC 8251 |
| 19-9050         | IC DEC 7475 |
| 19-9004         | IC DEC 7402 |
| 19-5580         | IC DEC 7450 |
| 19-5579         | IC DEC 7440 |
| 19-5577         | IC DEC 7420 |
| 19-5576         | IC DEC 7410 |
| 19-5575         | IC DEC 7400 |
| 19-5547         | IC DEC 7474 |

SP8-CR KIT

**CR8-E/CM8-E RECOMMENDED SPARE PARTS**  
**(SECOND LEVEL)**

| DEC PART NO. | DESCRIPTION                          |
|--------------|--------------------------------------|
| 16-5528      | Delay line, 30 ns                    |
| 10-0025      | Capacitor, 560 pF, 100V, 5% DM       |
| 10-0016      | Capacitor, 100 pF, 100V, 5% DM       |
| 10-0067      | Capacitor, 6.8 μF, 35V, 20% S. TANT. |
| 10-1610      | Capacitor, 0.01 μF, 100V, 20% DISK   |
| 70-7252      | Cable, Card Reader Interface         |

SP8-CS KIT

**OPTION LT33-ST TOOL KIT**

| DEC PART NO. | DESCRIPTION        |
|--------------|--------------------|
| 29-12521     | 8 oz. Scale        |
| 29-12522     | 32 oz. Scale       |
| 29-12602     | 64 oz. Scale       |
| 29-12520     | Set of gauges      |
| 29-12523     | Offset screwdriver |
| 29-12524     | Offset screwdriver |
| 29-12525     | 8 Crochet hook     |
| 29-12526     | 12 Crochet hook    |
| 29-12527     | Spring hook push   |
| 29-12528     | Spring hook pull   |
| 29-12529     | Screw holder       |
| 29-11418     | Handwheel adap     |
| 29-12540     | Handwheel          |
| 29-12553     | Contact adjustment |
| 29-12554     | Gauge              |
| 29-12555     | Gauge              |
| 29-12556     | Bending tool       |
| 29-11498     | Gauge              |
| 29-12558     | Extractor          |
| 29-12559     | Tweezer            |
| 29-12560     | Tommy Wrench       |
| 29-12561     | Tommy Wrench       |
| 29-12562     | Key lever remover  |

LT33-ST KIT

**DB8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION  |
|--------------|--------------|
| 19-05547     | IC DEC 7474  |
| 19-05575     | IC DEC 7400  |
| 19-05579     | IC DEC 7440  |
| 19-09486     | IC DEC 384   |
| 19-09594     | IC DEC 8251  |
| 19-09686     | IC DEC 7404  |
| 19-09973     | IC DEC 97401 |
| 19-09971     | IC DEC 6380  |
| 19-09972     | IC DEC 6314  |

SP8-DB KIT

**SPARE MODULES**

| Module Part No. | Used In Option Number | Description  |
|-----------------|-----------------------|--|
| A231            | AD8-E                 | A/D Converter                                      |
| AB41            | AD8-E                 | A/D Converter                                      |
| A232            | AM8-E                 | 8-Channel Mux                                      |
| MB43            | CR8-F (CM8-E)         | Card Reader<br>Optical Mark Card Reader            |
| M8326           | DB8-E                 | Interprocessor Buffer                              |
| M882            | DK8-EA                | Real-Time Clock (Line)                             |
| M883            | DK8-EC                | Real-Time Clock (Crystal)                          |
| M860            | DK8-EP                | Real-Time Clock (Programmable)                     |
| M518            | DK8-EP                | Real-Time Clock (Programmable)                     |
| M7104           | RK8-E                 | DECpack Control                                    |
| M7105           | RK8-E                 | DECpack Control                                    |
| M7106           | RK8-E                 | DECpack Control                                    |
| M839            | DP8-E                 | Synchronous Modem                                  |
| M866            | DP8-E                 | Synchronous Modem                                  |
| M863            | DR8-E                 | 12-Channel Buffered I/O                            |
| M8350           | KA8-E                 | Positive I/O Bus                                   |
| M8360           | KD8-E                 | Data Break Interface                               |
| M884            | KG8-E                 | Redundancy Check                                   |
| M8340           | KE8-E                 | Extended Arithmetic Element                        |
| M8341           | KE8-E                 | Extended Arithmetic Element                        |
| M849            | KK8-E                 | RFI Shield   |
| M8300           | KK8-E                 | Major Registers                                    |
| M8310           | KK8-E                 | Major Registers Control                            |
| M8320           | KK8-E                 | Bus Loads  |
| M8330           | KK8-E                 | Timing Generator                                   |
| M8335           | VT8-E                 | DEC Display Control                                |
| M8336           | VT8-E                 | DEC Display Control                                |
| M8337           | VT8-E                 | DEC Display Control                                |
| M8342           | LS8-E                 | Line Printer                                       |
| M8650           | KL8-E                 | Teletype Control                                   |
| M8650 YA        | KL8-EX                | Asynchronous Interface (EIA Levels)                |
| M8652 YC        | KL8-F                 | Asynchronous Interface (Double Buffered)           |
| M8653           | KL8-M                 | Modem Control                                      |
| M848            | KP8-E                 | Power Fail & Auto Restart                          |
| M8329           | LC8-E                 | DECwriter Control                                  |
| M841            | LE8-E                 | Line Printer Control                               |
| M847            | MI8-E                 | Bootstrap Loader                                   |
| G104            | MM8-E                 | Sense Inhibit                                      |
| G111            | MM8-EJ                | Sense Inhibit 8K                                   |
| G227            | MM8-E                 | X-Y Drivers 4K                                     |
| G233            | MM8-EJ                | X-Y Drivers 8K                                     |
| H220            | MM8-E                 | Memory Stack (4K)                                  |
| H212            | MM8-EJ                | Memory Stack (8K)                                  |
| G105            | MP8-E                 | Sense Inhibit                                      |
| M880            | MR8-EA                | 256 ROM  |
| M840            | PC8-E                 | Reader, Punch Control                              |
| M868            | TD8-EH (TD8-EM)       | OMNIBUS DECtape Control<br>OMNIBUS DECtape Control |
| M8321           | TM8-E                 | MAGtape Control                                    |
| M8322           | TM8-E                 | MAGtape Control                                    |
| M8323           | TM8-E                 | MAGtape Control                                    |
| M8327           | TM8-E                 | MAGtape Control                                    |
| M869            | VC8-E                 | Display Generator                                  |
| M885            | VC8-E                 | Display Generator                                  |
| H724(a)         | P.S.                  | Power Supply (PDP8E)                               |
| M935            | OMNIBUS Connector     | Connector Module                                   |
| M842            | XY8-E                 | XY Plotter Control                                 |

**KG8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                             |
|--------------|---|
| 19-09704     | IC DEC 314                              |
| 19-09485     | IC DEC 380                              |
| 19-05575     | IC DEC 7400                             |
| 19-09004     | IC DEC 7402                             |
| 19-09686     | IC DEC 7404                             |
| 19-05576     | IC DEC 7410                             |
| 19-05580     | IC DEC 7450                             |
| 19-05547     | IC DEC 7474                             |
| 19-10011     | IC DEC 7486                             |
| 19-09594     | IC DEC 8251                             |
| 19-09615     | IC DEC 8271                             |
| 19-09705     | IC DEC 8881                             |
| 19-10035     | IC DEC 74197                            |
| 10-00016     | Capacitor, 100 pF, 100V, 5%             |
| 10-01610     | Capacitor, 0.01 $\mu$ F, 100V, 20% DISC |
| 10-00027     | Capacitor, 820 pF, 100V, 5%             |
| 13-00293     | Resistor, 330 $\Omega$ , 1/4W, 10%      |
| 13-01401     | Resistor, 750 $\Omega$ , 1/4W, 5%       |
| 13-00271     | Resistor, 220 $\Omega$ , 1/4W, 5%       |

**SP8-KG KIT**

**KM8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                     |
|--------------|---------------------------------|
| 19-05575     | IC DEC 7400                     |
| 19-09705     | IC DEC 8881                     |
| 19-09615     | IC DEC 8271                     |
| 19-09935     | IC DEC 8235                     |
| 19-09934     | IC DEC 8266                     |
| 19-09594     | IC DEC 8251                     |
| 19-09667     | IC DEC 74H74                    |
| 19-05547     | IC DEC 7474                     |
| 19-05577     | IC DEC 7420                     |
| 19-05576     | IC DEC 7410                     |
| 19-09686     | IC DEC 7404                     |
| 19-09056     | IC DEC 74H00                    |
| 19-09486     | IC DEC 354A                     |
| 19-09972     | IC DEC 6314A                    |
| 13-00365     | Resistor 1K, 1/4W, 5%           |
| 10-01610     | Capacitor 0.01 MF DISK, 20%     |
| 10-05306     | Capacitor 6.8 $\mu$ F, 35V, 10% |

**SP8-KM KIT**

**KP8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION           |
|--------------|-----------------------|
| 11-09991     | Diode, AZ1-1/4M, 6.8V |
| 11-00114     | Diode, D664           |
| 11-05275     | Diode, D672           |
| 15-03100     | Transistor, 3009B     |
| 15-03409-01  | Transistor, DEC 6534B |
| 19-05547     | IC DEC 7474           |
| 19-05575     | IC DEC 7400           |
| 19-05576     | IC DEC 7410           |
| 19-09004     | IC DEC 7402           |
| 19-09050     | IC DEC 7475           |
| 19-09373     | IC DEC 9601           |
| 19-09486     | IC DEC 384            |
| 19-09705     | IC DEC 8881           |
| 19-09971     | IC DEC 6380           |
| 19-09972     | IC DEC 6314           |

**SP8-KD KIT**

**LC8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                             |
|--------------|---|
| 19-10394     | IC DEC 5384                             |
| 19-10392     | IC DEC 5380                             |
| 19-10391     | IC DEC 5314                             |
| 19-10046     | IC DEC 7442                             |
| 19-9929      | IC DEC 7417                             |
| 19-9973      | IC DEC 97401                            |
| 19-9686      | IC DEC 7404                             |
| 19-9056      | IC DEC 74H00                            |
| 19-9004      | IC DEC 7402                             |
| 19-5580      | IC DEC 7450                             |
| 19-5579      | IC DEC 7440                             |
| 19-5575      | IC DEC 7400                             |
| 19-5547      | IC DEC 7474                             |
| 10-1610      | Capacitor, 0.01 $\mu$ F, 100V, 20% Disk |
| 10-0067      | Capacitor, 6.8 $\mu$ F, 35V, 20% Tant   |
| 10-0024      | Capacitor, 47 pF, 100V, 5% DISK         |
| 70-8417      | Signal Cable                            |

**SP8-LC KIT**

**M18-E (M847) RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                   |
|--------------|-------------------------------|
| 19-10436     | IC DEC 74123                  |
| 19-09004     | IC DEC 7402                   |
| 19-05547     | IC DEC 7474                   |
| 19-09935     | IC DEC 8235                   |
| 19-10041     | IC DEC 74164                  |
| 19-05575     | IC DEC 7400                   |
| 19-09705     | IC DEC 8881                   |
| 19-09686     | IC DEC 7404                   |
| 19-09485     | IC DEC 380                    |
| 19-09486     | IC DEC 384                    |
| 15-03100     | Transistor, DEC 3009B         |
| 11-00114     | Diode, D664                   |
| 13-01423     | Resistor 6.8K, 1/4W, 5%       |
| 10-00006     | Cap., 0.01 $\mu$ F, 100V, 20% |

**SP8-MI KIT**

**DK8-EA/DK8-EC—(M882/M883) RECOMMENDED SPART PARTS(FIRST LEVEL)**

| DEC PART NO. | DESCRIPTION |
|--------------|-------------|
| 19-9705      | DEC 8881    |
| 19-9704      | DEC 314     |
| 19-9485      | DEC 380     |
| 19-9051      | DEC 7490    |
| 19-9050      | DEC 7475    |
| 19-9004      | DEC 7402    |
| 19-5589      | DEC 7470    |
| 19-5576      | DEC 7410    |
| 19-5575      | DEC 7400    |
| 19-5547      | DEC 7474    |
| 19-9486      | DEC 384     |
|              | SP8-DK KIT  |

**DK8-EA/DK8-EC—(M882/M883) RECOMMENDED SPARE PARTS (SECOND LEVEL)**

| DEC PART NO. | DESCRIPTION                        |
|--------------|------------------------------------|
| 18-9880      | Crystal (M883 only)                |
| 16-9651      | Pulse Transformer (M883 only)      |
| 10-9678      | Capacitor 0.047 $\mu$ F, 16-15 20% |
| 10-1610      | Capacitor 0.01 $\mu$ F, 100V, 20%  |
| 10-0016      | Capacitor 100 pF, 100V, 5%         |
| 10-0014      | Capacitor 68 pF, 100V, 5%          |
| 10-0011      | Capacitor 47 pF, 100V, 5%          |
| 10-0006      | Capacitor 10 pF, 100V, 5%          |
| 10-1765      | Capacitor 0.005 $\mu$ F            |
|              | SP8-DL KIT                         |

**KA8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION               |
|--------------|---------------------------|
| 15-03100     | Transistor, DEC 3009B     |
| 19-09705     | IC DEC 8881               |
| 19-10010     | IC DEC 2501               |
| 19-09971     | IC DEC 6380               |
| 19-09921     | IC DEC 7417               |
| 19-09928     | IC DEC 7416               |
| 19-09686     | IC DEC 7404               |
| 19-09373     | IC DEC 9601 (M835 only)   |
| 19-09486     | IC DEC 384                |
| 19-09004     | IC DEC 7402               |
| 19-05578     | IC DEC 7430               |
| 19-05577     | IC DEC 7420               |
| 10-05576     | IC DEC 7410               |
| 19-05575     | IC DEC 7400               |
| 19-05547     | IC DEC 7474               |
| 11-00114     | Diode D664                |
| 11-00113     | Diode D662                |
| BC0BJ-10     | Cable, 10 ft.             |
| 19-10436     | IC DEC 74123 (M8350 only) |
|              | SP8-KA KIT                |

**KD8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                       |
|--------------|-----------------------------------|
| 10-01610     | Capacitor 0.01 $\mu$ F, 100V, 20% |
| 11-00113     | Diode D662                        |
| 19-05575     | IC DEC 7400                       |
| 19-05579     | IC DEC 7440                       |
| 19-09004     | IC DEC 7402                       |
| 19-09057     | IC DEC 74H10                      |
| 19-09267     | IC DEC 74H11                      |
| 19-09971     | IC DEC 6380                       |
| 19-09486     | IC DEC 384                        |
| 19-09615     | IC DEC 8217                       |
| 19-09667     | IC DEC 74H74                      |
| 19-09686     | IC DEC 7404                       |
| 19-09972     | IC DEC 6314                       |
| 19-09973     | IC DEC 97401                      |
| 19-09928     | IC DEC 7416                       |
| 19-09934     | IC DEC 8266                       |
| 19-09955     | IC DEC 7412                       |
| 19-10010     | IC DEC 2501                       |
|              | SP8-KD KIT                        |

**KE8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION                       |
|--------------|-----------------------------------|
| 19-05585     | IC DEC 7476                       |
| 19-05576     | IC DEC 7410                       |
| 19-09955     | IC DEC 7412                       |
| 19-10018     | IC DEC 74193                      |
| 19-09934     | IC DEC 8266                       |
| 19-09267     | IC DEC 74H11                      |
| 19-05635     | IC DEC 74H20                      |
| 19-05586     | IC DEC 74H40                      |
| 19-09486     | IC DEC 384                        |
| 19-09004     | IC DEC 7402                       |
| 19-09667     | IC DEC 74H74                      |
| 19-09059     | IC DEC 74H30                      |
| 19-09973     | IC DEC 97401                      |
| 19-09485     | IC DEC 380                        |
| 23-001A1     | IC Encoded ROM (Drives ROM 11-18) |
| 23-002A1     | IC Encoded ROM (Drives ROM 21-28) |
| 19-09930     | IC DEC 7405                       |
| 19-09705     | IC DEC 8881                       |
| 19-05575     | IC DEC 7400                       |
| 19-09686     | IC DEC 7404                       |
| 19-09062     | IC DEC 74H53                      |
| 19-10011     | IC DEC 7486                       |
| 19-09935     | IC DEC 8235                       |
| 13-00295     | Resistor 330 $\Omega$ 1/4W, 5%    |
| 13-00365     | Resistor 1K 1/4W, 5%              |
| 13-00317     | Resistor 470 $\Omega$ 1/4W, 10%   |
| 10-000067    | Capacitor 6.8 $\mu$ F, 5V, 20%    |
|              | Solid Tantalum                    |
| 10-01610     | Capacitor 0.01 $\mu$ F, 100V, 20% |
|              | Ceramic Disk                      |
|              | SP8-KE KIT                        |

**RECOMMENDED MR8-E SPARE PARTS**

| DEC PART NO. | DESCRIPTION          |
|--------------|----------------------|
| 15-05321     | Transistor DEC 4258  |
| 15-03100     | Transistor DEC 3009B |
| 11-00114     | Diode D664           |
| 19-10047     | IC DEC 74145         |
| 19-10046     | IC DEC 7442          |
| 19-09705     | IC DEC 8881          |
| 19-09688     | IC DEC 846           |
| 19-09667     | IC DEC 74H74         |
| 19-09486     | IC DEC 384           |
| 19-09971     | IC DEC 6380          |
| 19-09267     | IC DEC 74H11         |
| 19-09056     | IC DEC 7402          |
| 19-05576     | IC DEC 7410          |
| 19-05575     | IC DEC 7400          |
|              | SP8-MR KIT           |

**RECOMMENDED MP8-E SPARE PARTS**

| DEC PART NO. | DESCRIPTION          |
|--------------|----------------------|
| 15-02155     | Transistor DEC 1008  |
| 15-01881     | Transistor DEC 2219  |
| 15-03100     | Transistor DEC 3009B |
| 15-10062     | Transistor DEC 3734  |
| 15-09649     | Transistor DEC 3762  |
| 15-10015     | Transistor DEC 4008  |
| 15-0532      | Transistor DEC 4258  |
| 15-03409-01  | Transistor DEC 6534B |
| 19-05575     | IC DEC 7400          |
| 19-05590     | IC DEC 7401          |
| 19-09004     | IC DEC 7402          |
| 19-09686     | IC DEC 7404          |
| 19-05580     | IC DEC 7450          |
| 19-05547     | IC DEC 7474          |
| 19-10724     | IC DEC 74180         |
| 19-09056     | IC DEC 74H00         |
| 19-09057     | IC DEC 74H10         |
| 19-09267     | IC DEC 74H11         |
| 19-05586     | IC DEC 74H40         |
| 19-09967     | IC DEC 74H74         |
| 19-09704     | IC DEC 314           |
| 19-09485     | IC DEC 380           |
| 19-09486     | IC DEC 384           |
| 19-09594     | IC DEC 8251          |
| 19-09705     | IC DEC 8881          |
|              | SP8-MQ               |

**TD8-E RECOMMENDED SPARE PARTS (SECOND LEVEL)**

| DEC PART NO. | DESCRIPTION         |
|--------------|---------------------|
| 19-09004     | IC DEC 7402         |
| 19-05590     | IC DEC 7401         |
| 19-05578     | IC DEC 7430         |
| 19-05576     | IC DEC 7410         |
| 19-05575     | IC DEC 7400         |
| 19-05547     | IC DEC 7474         |
| 15-09338     | Transistor DEC 6351 |
| 11-00114     | Diode, D664         |
| 11-00113     | Diode, D662         |
|              | SP8-TE KIT          |

**RECOMMENDED MP8-E SPARE PARTS (SECOND LEVEL)**

| DEC PART NO. | DESCRIPTION                   |
|--------------|-------------------------------|
| 12-10043     | Rotary Switch                 |
| 16-09651     | Transformer 8010              |
| 16-09996     | Transformer 6501              |
| 16-09478     | Transformer 1775              |
| 16-09559     | Delay Line, 100ns             |
| 13-10032     | Resistor, 16.9 ohm, 6W, 1%    |
| 13-02858     | Resistor, 100 ohm, 1/8W, 1%   |
| 13-02956     | Resistor, 196 ohm, 1/8W, 1%   |
| 13-05114     | Resistor, 348 ohm, 1/8W, 1%   |
| 13-02955     | Resistor, 750 ohm, 1/8W, 1%   |
| 13-03114     | Resistor, 1K ohm, 1/8W, 1%    |
| 13-02871     | Resistor, 1.21K ohm, 1/8W, 1% |
| 13-04833     | Resistor, 1.96K ohm, 1/8W, 1% |
| 13-04856     | Resistor, 4.64K ohm, 1/8W, 1% |
| 13-04885     | Resistor, 9.09K ohm, 1/8W, 1% |
| 13-02941     | Resistor, 14.7K ohm, 1/8W, 1% |
| 13-03156     | Resistor, 34.8K ohm, 1/8W, 1% |
| 13-05128     | Resistor, 56.2K ohm, 1/8W, 1% |
| 13-05252     | Resistor, 68.1K ohm 1/8W, 1%  |
| 13-10071     | Thermistor, 1K, 1%            |
| 11-05275     | Diode D672                    |
| 11-00114     | Diode D664                    |
| 11-09991     | Zener Diode 1/4M6, 8AZ1       |
| 19-10010     | Diode Pack DEC 2501           |
|              | SP8-MP KIT                    |

**TD8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION  |
|--------------|--------------|
| 19-10436     | IC 74123     |
| 19-09935     | IC 8235      |
| 19-09931     | IC DEC 74H04 |
| 19-09929     | IC DEC 7417  |
| 19-09712     | IC DEC 8242  |
| 19-09705     | IC DEC 8881  |
| 19-10391     | IC DEC 5314  |
| 19-09686     | IC DEC 7404  |
| 19-09615     | IC DEC 8271  |
| 19-09594     | IC DEC 8251  |
| 19-10394     | IC DEC 5384  |
| 19-10392     | IC DEC 5380  |
| 19-09054     | IC DEC 7493  |
| 19-09050     | IC DEC 7475  |
|              | SP8-TD KIT   |

**XY8-E RECOMMENDED SPARE PARTS**

| DEC PART NO. | DESCRIPTION             |
|--------------|-------------------------|
| 15-03409-1   | Transistor DEC 6534B    |
| 15-03100     | Transistor DEC 3009B    |
| 19-09705     | IC DEC 8881             |
| 19-09704     | IC DEC 314              |
| 19-09686     | IC DEC 7404             |
| 19-09594     | IC DEC 8251             |
| 19-09373     | IC DEC 9601             |
| 19-09485     | IC DEC 380              |
| 19-05577     | IC DEC 7420             |
| 19-05576     | IC DEC 7410             |
| 19-05575     | IC DEC 7400             |
| 19-05547     | IC DEC 7474             |
| 13-000391    | Resistor 1.5K, 1/4W, 5% |
|              | SP8-XY KIT              |

# LOGIC CIRCUITS

## INTRODUCTION

The digital logic circuits in this chapter are used to interface I/O devices to the computer using Digital Equipment Corporation FLIP CHIP Modules. Logic handbooks published by DEC describe hundreds of FLIP CHIP Modules with their component circuits, associated accessories, hardware, power supplies, and mounting panels. The designer should study the logic handbooks carefully before beginning on interface design for a special I/O device.

The basic logic circuits used for interfacing to the computer are: AND, OR, NAND, NOR, Flip-Flop, Single-Shot, Schmitt Trigger, Inverter, Amplifier, and Bus Driver. A brief discussion of these circuits and their logic symbology follows.

The symbology employed with the PDP-8 family of computers and M-series modules is similar to MIL-STD-806B. This chapter describes DEC symbology with definitions of logic functions, graphic representations of the functions, and examples of their application. A Table of Combinations is also shown.

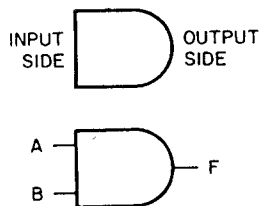
## LOGIC SYMBOLS

The following description of logic symbols contains truth tables that show graph representations of the logic functions. In the truth tables, the letter H stands for HIGH (+ 3V), and the letter L stands for LOW (0V). Examples of DEC symbology are shown along with figures and truth tables.

### State Indicator

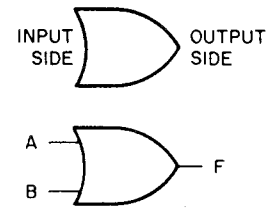
The presence of the small circular symbol at the input(s) of a function indicates that an L input signal activates the function. The absence of this small circle indicates that an H input signal activates the function. Similarly, a small circle at the output of a function indicates that the output terminal of the activated function is relatively low, and the absence of the circle indicates that the output is relatively high.

#### STATE INDICATOR ABSENT



| INPUT |   | OUTPUT |
|-------|---|--------|
| A     | B | F      |
| L     | L | L      |
| L     | H | L      |
| H     | L | L      |
| H     | H | H      |

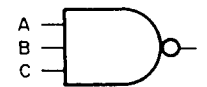
Symbol, AND Function



| INPUT |   | OUTPUT |
|-------|---|--------|
| A     | B | F      |
| L     | L | L      |
| L     | H | H      |
| H     | L | H      |
| H     | H | H      |

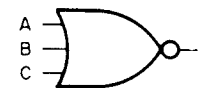
Symbol, OR Function

#### STATE INDICATOR PRESENT



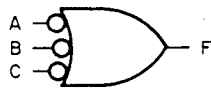
| INPUT |   |   | OUTPUT |
|-------|---|---|--------|
| A     | B | C | F      |
| L     | L | L | H      |
| L     | L | H | H      |
| L     | H | L | H      |
| L     | H | H | H      |
| H     | L | L | H      |
| H     | L | H | H      |
| H     | H | L | H      |
| H     | H | H | L      |

Symbol, NAND Function



| INPUT |   |   | OUTPUT |
|-------|---|---|--------|
| A     | B | C | F      |
| L     | L | L | H      |
| L     | L | H | L      |
| L     | H | L | L      |
| L     | H | H | L      |
| H     | L | L | L      |
| H     | L | H | L      |
| H     | H | L | L      |
| H     | H | H | L      |

Symbol, NOR Function

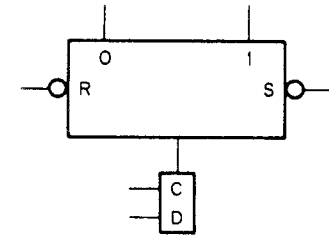


| INPUT |   |   | OUTPUT |
|-------|---|---|--------|
| A     | B | C | F      |
| L     | L | L | H      |
| L     | L | H | H      |
| L     | H | L | H      |
| L     | H | H | H      |
| H     | L | L | H      |
| H     | L | H | H      |
| H     | H | L | H      |
| H     | H | H | L      |

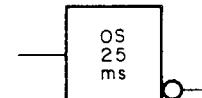
Symbol, NOR Function

Table of Combinations

| AND | OR | A | B | F |
|-----|----|---|---|---|
|     |    | H | H | H |
|     |    | H | L | L |
|     |    | L | H | L |
|     |    | L | L | L |
|     |    | H | H | L |
|     |    | H | L | L |
|     |    | L | H | L |
|     |    | L | L | H |
|     |    | H | H | H |
|     |    | H | L | H |
|     |    | L | H | H |
|     |    | L | L | H |

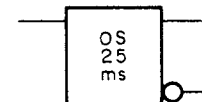


Symbol, Flip-Flop Function



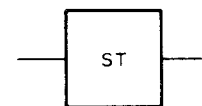
ONE OUTPUT

(OR)



TWO OUTPUT

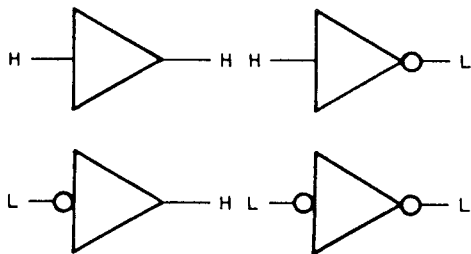
Symbol, One-Shot Function



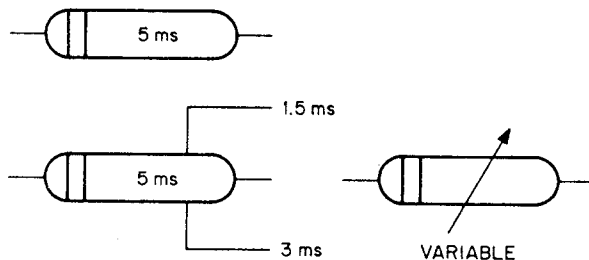
Symbol, Schmitt Trigger Function



Symbol, General Logic



Symbol, Amplifier



Symbol, Time Delay Function

Digital Equipment Corporation offers an extensive training program to every organization that purchases or presently owns a DEC computer. Our training objective is to familiarize the user with the hardware and software associated with his computer system.

Professional full-time instructors regularly conduct classes at Digital's main training facility in Maynard, Massachusetts; Palo Alto, California; Reading, England; Paris, France; Munich, Germany; Scandinavia and Australia.

Early application for enrollment in the desired course is suggested, as class sizes are limited. DEC provides all training materials necessary for each class.

Software Courses — The software courses are familiarization courses, and as a general rule will give participants a working knowledge of the appropriate:

|                                  |                    |
|----------------------------------|--------------------|
| Machine Language Instruction Set | Assembler Programs |
| Programming Techniques           | Editor Programs    |
| Input/Output Programming         | Debugging Routines |

Hardware Courses — The hardware courses are familiarization courses, with the exception of Systems Maintenance Courses, and will give participants a working knowledge of the appropriate:

|   |
|---|
| Machine Language Instruction Set          |
| Logic Symbolology                         |
| Theory of Logic Operation of: Memory Unit |
| Central Processor Unit                    |
| I/O Section                               |

Systems Maintenance Courses — These courses are specially designed for the user who will maintain his own system or be involved with extensive interfacing, and who requires a good working knowledge of his system. The courses are patterned after those that DEC uses to train its own Field Service men, and will consist of lab time for on-the-job training.

The scheduled dates for DEC Training Courses at Maynard and Palo Alto will be listed in a separate document entitled "DIGITAL CUSTOMER TRAINING SCHEDULE" available from your local sales office, or the Training Departments.

To enroll in a scheduled course, use the enclosed registration form and mail it to the appropriate training facility, at Maynard, Massachusetts, or Palo Alto, California. A letter of confirmation will be sent to each registered student. In case of course cancellation, registered students will be notified during the week prior to the course's scheduled date. Digital Equipment Corporation, Training Department, 146 Main Street, Maynard, Massachusetts 01754. Telephone (617) 897-5111, Extension 2564, TWX 710-347-0212. Digital Equipment Corporation, Training Department, 560 San Antonio Road, Palo Alto, California 94306. Telephone (415) 326-5640, TWX 910-373-1266. Due to lack of adequate public transportation, a rental car is necessary when attending courses at either facility.

Digital can offer special training courses that will help solve the majority of your training problems. These courses can be tailored to your needs and your time schedule, and contain the information you desire your students to learn.

The cost to conduct a Special Course at your facility is the same as the on-site pricing for Standard Courses, plus any additional expenses necessary to prepare a course that we haven't taught before. If the course is conducted at one of our training facilities the cost is \$300 per student per week plus



Digital provides two types of training:

- Software Familiarization
- Hardware Familiarization

Both types of training assume that the individual has either a background in software or hardware fundamentals. For the individual desiring to get the utmost from his available training, or for the individual without the prerequisite background, the Introductory Programming Course will help provide the necessary foundation.

Introductory Programming Course – This course is designed to give the non-computer oriented person, or the individual with no machine language programming background, the fundamentals of computer arithmetic and machine language programming.

## SOFTWARE COURSE DESCRIPTIONS

### Introductory Programming Course

Course Length: one week

Course Cost: one training credit or \$300

Prerequisites: None

Description: The course gives non-computer oriented personnel the required programming background necessary to enter any of DEC's small computer software familiarization courses. The course consists of a description of: basic computer concepts, binary and octal numbering systems, computer arithmetic, problem solving, flow charting and programming techniques. Basic computer operation includes a description of a representative modified machine language instruction set, applicable programming techniques, use of computer operator console, and I/O programming fundamentals. Course consists of approximately 20% lab time.

### PDP-8 Family Software Course (Paper Tape)

Course Length: one week

Course Cost: one training credit or \$300

Prerequisites: Introductory Programming Course or equivalent background

Description: Course covers general operation of the PDP-8 Family computers paper tape system software to include PAL III Assembler, Symbolic Tape Editor, On-line Debugging Technique (ODT), and Floating Point package.

### PDP-8 Family Software Course (PS-8)

Course Length: one week

Course Cost: one training credit or \$300

Prerequisites: PDP-8 Family Software Course (Paper tape) or knowledge of the PDP-8 Family Paper Tape Software.

Description: This course covers the operation and familiarization of the 8K mass storage system including the operation of PS-8 editor, PAL 8 assembler, PS-8 Octal Debugging Technique (ODT), the SABR assembler, and user programming.

### PDP-8 Family Software Course (4K Monitor)

Course Cost: one training credit or \$300

Prerequisites: PDP-8 Family Software Course (Paper Tape) or knowledge of the PDP-8 Family Paper Tape Software

Description: Course covers general operation of 4K mass storage software including monitor PAL-D assembler Disk/DECtape editor, Disk/DECtape On-line Debugging Program (DDT-D), and Peripheral Interchange Program (PIP). Students will develop programs in the following areas: Disk/DECtape, extended memory, and monitor input/output.

### INDAC-8

Course Length: two weeks

Course Cost: two training credits or \$500

Prerequisites: Familiarity with FORTRAN, BASIC or similar procedural language helpful

Description: This course is designed to discuss

PDP-8 Family Computers – operation and programming to include the PDP-8 instruction set loader programs (RIM, BIN, HELP), assembler (PAL-3), and Symbolic Editor

4K Disk Monitor System – theory and operation to include the building of the monitor program.

### PDP-8/I-8/L or 8/e Hardware Familiarization Courses

Course Length: one week

Course Cost: one training credit or \$300

Prerequisites: Background in basic electronics, computer technology, and machine language programming.

Description: The course covers the instruction set, central processor including instruction and data flow, memory operation, instruction logic, program interrupt, data break (one and three cycle), and I/O hardware.

### PDP-8/I-8/L Systems Maintenance Course

Course Length: Three weeks

Course Cost: \$650. (training credits not applicable)

Prerequisites: Prior computer maintenance experience.

Description: The course covers systems description to include instruction set, logic operation of the central processor, power fail, extended memory, DF32-D, PC8/I high speed reader/punch unit, and DMO1. Maintenance is covered from theory of operation to actual troubleshooting on equipment. The course will utilize lab time for hands-on experience.

# LAB 8/e

## Hardware Course

Course Length: two weeks

Course Cost: two training credits or \$500

Prerequisites: PDP-8/e hardware course or equivalent experience.

Description: This course is designed to train the PDP-8/e oriented person the theory and operation and maintenance of the following: extended memory (MM8/E), high speed reader/punch (PC8/E), A-D/D-A concepts and logic (AD8-EA), multiplexor and preamp (AM8-EA-EC), display control (UC8/E), Display (UR-14), digital I/O (DR8-EA), and clock (DK8-EP). The course will utilize lab time for hands-on experience.

# PDP-8/e

## Systems Maintenance Course

Course Length: three weeks

Course Cost: \$650. (training credits not applicable)

Prerequisites: Prior computer maintenance experience

Description: This course covers systems description to include instruction set, logic operation of the central processor, power fail, extended memory, DF32-D, PC8-E high speed reader/punch unit, and M18-E bootstrap loader. Maintenance is covered from theory of operation to actual troubleshooting on equipment. The course will utilize lab time for hands-on experience.

# TC08-TU56

## Hardware Course

Course Length: one week

Course Cost: \$300. (training credits not applicable)

Prerequisites: PDP-8/1, 8/L, or 8/e Hardware course, Systems Maintenance Course or equivalent experience.

Description: The course covers systems description to include tape format and programming considerations, applicable IOT instructions, operation of the tape transport, logic operation of the control unit including read and write operations.

# ASCII CHARACTER SETS

## OCTAL

|                  |    | LAST DIGIT |     |           |          |              |              |              |              |
|------------------|----|------------|-----|-----------|----------|--------------|--------------|--------------|--------------|
|                  |    | 0          | 1   | 2         | 3        | 4            | 5            | 6            | 7            |
| FIRST TWO DIGITS | 00 | NULL       | ↑A  | ↑B        | ↑C       | ↑D           | ↑E           | ↑F           | ↑G           |
|                  | 01 | ↑H         | TAB | LINE FEED | VERT TAB | FORM FEED    | CAR. RET.    | ↑N           | ↑O           |
|                  | 02 | ↑P         | ↑Q  | ↑R        | ↑S       | ↑T           | ↑U           | ↑V           | ↑W           |
|                  | 03 | ↑X         | ↑Y  | ↑Z        | ALT MODE | CTRL SHIFT L | CTRL SHIFT M | CTRL SHIFT N | CTRL SHIFT O |
|                  | 04 | SPACE      |     | "         | #        | \$           | %            | &            | '            |
|                  | 05 | {          | }   | *         | +        | .            | -            | .            | /            |
|                  | 06 | 0          | 1   | 2         | 3        | 4            | 5            | 6            | 7            |
|                  | 07 | 8          | 9   | :         | ;        | <            | =            | >            | ?            |
|                  | 10 | Ⓐ          | Ⓐ   | Ⓑ         | Ⓒ        | Ⓓ            | Ⓔ            | Ⓕ            | Ⓖ            |
|                  | 11 | Ⓗ          | Ⓘ   | Ⓝ         | Ⓚ        | Ⓛ            | Ⓜ            | Ⓝ            | Ⓞ            |
|                  | 12 | Ⓟ          | Ⓠ   | Ⓡ         | Ⓢ        | Ⓣ            | Ⓤ            | Ⓥ            | Ⓦ            |
|                  | 13 | Ⓧ          | Ⓨ   | Ⓩ         | Ⓛ        | Ⓜ            | Ⓝ            | Ⓞ            | Ⓟ            |
|                  | 14 | .          | a   | b         | c        | d            | e            | f            | g            |
|                  | 15 | h          | i   | j         | k        | l            | m            | n            | o            |
|                  | 16 | p          | q   | r         | s        | t            | u            | v            | w            |
|                  | 17 | x          | y   | z         | {        |              | }            | ESCAPE       | DELETE       |

## DECIMAL

|                  |    | LAST DIGIT   |              |           |         |    |    |        |          |              |              |
|------------------|----|--------------|--------------|-----------|---------|----|----|--------|----------|--------------|--------------|
|                  |    | 0            | 1            | 2         | 3       | 4  | 5  | 6      | 7        | 8            | 9            |
| FIRST TWO DIGITS | 00 | NULL         | ↑A           | ↑B        | ↑C      | ↑D | ↑E | ↑F     | ↑G       | ↑H           | TAB          |
|                  | 01 | LINE FEED    | VERT TAB     | FORM FEED | CAR RET | ↑N | ↑O | ↑P     | ↑Q       | ↑R           | ↑S           |
|                  | 02 | ↑T           | ↑U           | ↑V        | ↑W      | ↑X | ↑Y | ↑Z     | ALT MODE | CTRL SHIFT L | CTRL SHIFT M |
|                  | 03 | CTRL SHIFT N | CTRL SHIFT O | SPACE     |         | "  | #  | \$     | %        | &            | '            |
|                  | 04 | {            | }            | *         | +       | .  | -  | .      | /        | 0            | 1            |
|                  | 05 | 2            | 3            | 4         | 5       | 6  | 7  | 8      | 9        | :            | ;            |
|                  | 06 | <            | =            | >         | ?       | Ⓐ  | Ⓑ  | Ⓒ      | Ⓓ        | Ⓔ            | Ⓕ            |
|                  | 07 | Ⓗ            | Ⓘ            | Ⓝ         | Ⓚ       | Ⓛ  | Ⓜ  | Ⓝ      | Ⓞ        | Ⓟ            | Ⓠ            |
|                  | 08 | Ⓟ            | Ⓠ            | Ⓡ         | Ⓢ       | Ⓣ  | Ⓤ  | Ⓥ      | Ⓦ        | Ⓧ            | Ⓨ            |
|                  | 09 | Ⓩ            | Ⓛ            | Ⓜ         | Ⓝ       | Ⓞ  | Ⓟ  | Ⓠ      | Ⓡ        | Ⓢ            | Ⓣ            |
|                  | 10 | d            | e            | f         | g       | h  | i  | j      | k        | l            | m            |
|                  | 11 | n            | o            | p         | q       | r  | s  | t      | u        | v            | w            |
|                  | 12 | x            | y            | z         | {       |    | }  | ESCAPE | DELETE   |              |              |

### Model 33 ASR/KSR Teletype Code (ASCII) in Binary Form

1 = HOLE PUNCHED = MARK  
0 = NO HOLE PUNCHED = SPACE

MOST SIGNIFICANT BIT  
LEAST SIGNIFICANT BIT  
8 7 6 5 4 3 2 1

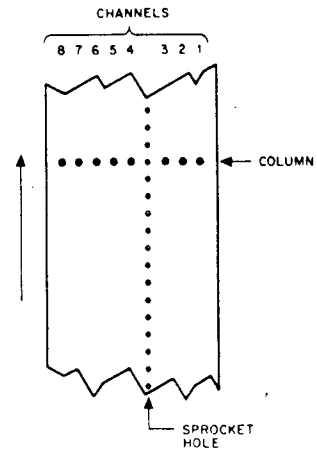
|  |    |       |                      |  |  |   |   |   |   |
|--|----|-------|----------------------|--|--|---|---|---|---|
|  |    |       |                      |  |  |   |   |   |   |
|  | @  | SPACE | NULL/IDLE            |  |  |   |   |   |   |
|  | A  | !     | START OF MESSAGE     |  |  | 0 | 0 | 0 | 0 |
|  | B  | "     | END OF ADDRESS       |  |  | 0 | 0 | 0 | 0 |
|  | C  | #     | END OF MESSAGE       |  |  | 0 | 0 | 0 | 1 |
|  | D  | \$    | END OF TRANSMISSION  |  |  | 0 | 0 | 1 | 0 |
|  | E  | %     | WHO ARE YOU          |  |  | 0 | 0 | 1 | 0 |
|  | F  | &     | ARE YOU              |  |  | 0 | 0 | 1 | 1 |
|  | G  | '     | BELL                 |  |  | 0 | 0 | 1 | 1 |
|  | H  | (     | FORMAT EFFECTOR      |  |  | 0 | 1 | 0 | 0 |
|  | I  | )     | HORIZONTAL TAB       |  |  | 0 | 1 | 0 | 0 |
|  | J  | *     | LINE FEED            |  |  | 0 | 1 | 0 | 1 |
|  | K  | +     | VERTICAL TAB         |  |  | 0 | 1 | 0 | 1 |
|  | L  | ,     | FORM FEED            |  |  | 0 | 1 | 1 | 0 |
|  | M  | -     | CARRIAGE RETURN      |  |  | 0 | 1 | 1 | 0 |
|  | N  | .     | SHIFT OUT            |  |  | 0 | 1 | 1 | 1 |
|  | O  | /     | SHIFT IN             |  |  | 0 | 1 | 1 | 1 |
|  | P  | 0     | DCO                  |  |  | 1 | 0 | 0 | 0 |
|  | Q  | 1     | READER ON            |  |  | 1 | 0 | 0 | 0 |
|  | R  | 2     | TAPE (AUX ON)        |  |  | 1 | 0 | 0 | 1 |
|  | S  | 3     | READER OFF           |  |  | 1 | 0 | 0 | 1 |
|  | T  | 4     | (AUX OFF)            |  |  | 1 | 0 | 1 | 0 |
|  | U  | 5     | ERROR                |  |  | 1 | 0 | 1 | 0 |
|  | V  | 6     | SYNCHRONOUS IDLE     |  |  | 1 | 0 | 1 | 1 |
|  | W  | 7     | LOGICAL END OF MEDIA |  |  | 1 | 0 | 1 | 1 |
|  | X  | 8     | S 0                  |  |  | 1 | 1 | 0 | 0 |
|  | Y  | 9     | S 1                  |  |  | 1 | 1 | 0 | 0 |
|  | Z  | :     | S 2                  |  |  | 1 | 1 | 0 | 1 |
|  | [  | ;     | S 3                  |  |  | 1 | 1 | 0 | 1 |
|  | <  | <     | S 4                  |  |  | 1 | 1 | 1 | 0 |
|  | =  | =     | S 5                  |  |  | 1 | 1 | 1 | 0 |
|  | >  | >     | S 6                  |  |  | 1 | 1 | 1 | 1 |
|  | ?< | ?<    | S 7                  |  |  | 1 | 1 | 1 | 1 |

|   |   |   |      |
|---|---|---|------|
| 1 | 0 | 0 | SAME |
| 1 | 0 | 1 | SAME |
| 1 | 1 | 0 | SAME |
| 1 | 1 | 1 | SAME |

### Paper Tape Formats

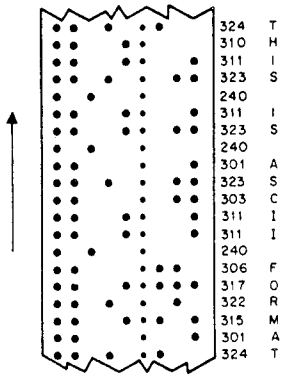
Manual use of the toggle switches on the operator console is a tedious and inefficient means of loading a program. This procedure is necessary in some instances, however, because the PDP-8/E computer must be programmed before any form of input to the memory unit is possible. For example, before any paper tape can be used to input information into the computer, the memory unit must have a stored program which will interpret the paper tape format for the computer. This loader program must be stored in memory with the console switches. A loader program consists of input instructions to accept information from the Teletype paper tape reader and instructions to store the incoming data in the proper memory locations.

Before the loader program can be written to accept information, the format in which the data is represented on the paper tape must be established. There are three basic paper tape formats commonly used in conjunction with PDP-8/E computer. The following paragraphs describe and illustrate these formats.



Data is recorded (punched) on paper tape by groups of holes arranged in a definite format along the length of the tape. The tape is divided into channels, which run the length of the tape, and into columns, which extend across the width of the tape, as shown in the adjacent diagram. The paper tape readers and punches used with PDP-8 family computers accept eight-channel paper tape.

\* Channel 8 is normally designated for parity check. The Teletype units used with the PDP-8/E computer do not generate parity, and Channel 8 is always punched.



### ASCII FORMAT

The USA Standard Code for Information Interchange (ASCII) format uses all eight channels\* of the paper tape to represent a single character (letter, number, or symbol) as shown in the diagram at left. The complete code is given in Appendix C.

## PERFORATED-TAPE LOADER SEQUENCES

### READIN MODE LOADER

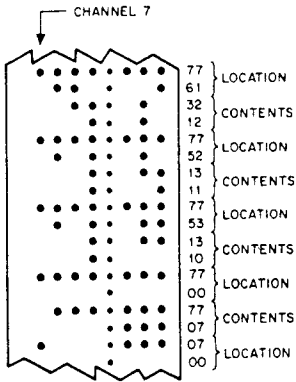
The readin mode (RIM) loader is a minimum length, basic perforated-tape reader program for the ASR33, it is initially stored in memory by manual use of the operator console keys and switches. The loader is permanently stored in 18 locations of page 37.

A perforated tape to be read by the RIM loader must be in RIM format:

| Tape Channel      | Format                                    |
|-------------------|---|
| 8 7 6 5 4 S 3 2 1 |   |
| 1 0 0 0 0 . 0 0 0 | Leader-trailer code                       |
| 0 1 A1 . A2       | Absolute address to contain next 4 digits |
| 0 0 A3 . A4       |   |
| 0 0 X1 . X2       | Content of previous 4-digit address       |
| 0 0 X3 . X4       |   |
| 0 1 A1 . A2       |   |
| 0 0 A3 . A4       | Address                                   |
| 0 0 X1 . X2       |   |
| 0 0 X3 . X4       | Content                                   |
| (Etc.)            | (Etc.)                                    |
| 1 0 0 0 0 . 0 0 0 | Leader-trailer code                       |

### RIM (READ IN MODE) FORMAT

RIM format tape uses adjacent columns to represent 12-bit binary information directly. Channels 1 through 6 are used to represent either address or information to be stored. A channel 7 punch indicates that the adjacent column and the following column are to be interpreted as an address specifying the location in which the information of the following two columns is to be stored. The tape leader and trailer for RIM format tape must be punched in channel 8 only (octal 200).



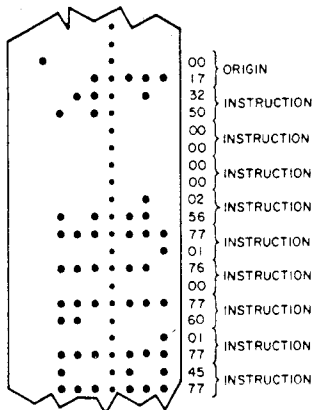
The RIM loader can only be used in conjunction with the ASR33 reader (not the high-speed perforated-tape reader). Because a tape in RIM format is, in effect, twice as long as it need be, it is suggested that the RIM loader be used only to read the binary loader when using the ASR33. (Note that PDP-8 diagnostic program tapes are in RIM format.)

The complete PDP-8/I RIM loader (SA = 7756) is as follows:

| Absolute Address | Octal Content | Tag  | Instruction I Z | Comments               |
|------------------|---------------|------|-----------------|------------------------|
| 7756,            | 6032          | BEG, | KCC             | /CLEAR AC AND FLAG     |
| 7757,            | 6031          |      | KSF             | /SKIP IF FLAG = 1      |
| 7760,            | 5357          |      | JMP .-1         | /LOOKING FOR CHARACTER |
| 7761,            | 6036          |      | KRB             | /READ BUFFER           |
| 7762,            | 7106          |      | CLL RTL         |                        |
| 7763,            | 7006          |      | RTL             | /CHANNEL 8 IN ACO      |
| 7764,            | 7510          |      | SPA             | /CHECKING FOR LEADER   |
| 7765,            | 5357          |      | JMP BEG+1       | /FOUND LEADER          |
| 7766,            | 7006          |      | RTL             | /OK, CHANNEL 7 IN LINK |
| 7767,            | 6031          |      | KSF             |                        |
| 7770,            | 5367          |      | JMP .-1         |                        |
| 7771,            | 6034          |      | KRS             | /READ, DO NOT CLEAR    |
| 7772,            | 7420          |      | SNL             | /CHECKING FOR ADDRESS  |
| 7773,            | 3776          |      | DCA I TEMP      | /STORE CONTENT         |
| 7774,            | 3376          |      | DCA TEMP        | /STORE ADDRESS         |

### BIN (BINARY FORMAT)

BIN format tape is similar to RIM format except that only the first address of consecutive locations is specified. An address is designated by a channel 7 punch and information following an address is stored in sequential locations after the designated address, until another location is specified as an origin. The tape leader/trailer for BIN format tape must be punched in channel 8 (octal 200) only.



```

7775, 5356      JMP BEG      /NEXT WORD
7776, 0         TEMP, 0       /TEMP STORAGE

```

Placing the RIM loader in core memory by way of the operator console keys and switches is accomplished as follows:

1. Set the starting address 7756 in the switch register (SR).
2. Press LOAD ADDRESS key.
3. Set the first instruction (6032) in the SR.
4. Press the DEPOSIT key.
5. Set the next instruction (6031) in the SR.
6. Press DEPOSIT key.
7. Repeat steps 5 and 6 until all 16 instructions have been deposited.

To load a tape in RIM format, place the tape in the reader, set the SR to the starting address 7756 of the RIM loader (not of the program being read), press the LOAD ADDRESS key, press the START key, and start the Teletype reader.

Refer to Digital Program Library document DEC-08-LRAA-D for additional information on the Readin Mode Loader program.

#### BINARY LOADER

The binary loader (BIN) is used to read machine language tapes (in binary format) produced by the program assembly language (PAL). A tape in binary format is about one-half the length of the comparable RIM format tape. It can, therefore, be read about twice as fast as a RIM tape and is, for this reason, the more desirable format to use with the 10 cps ASR33 reader or the Type PR8/1 High-Speed Perforated-Tape Reader.

The format of a binary tape is as follows:

LEADER: about 2 feet of leader-trailer codes.

BODY: characters representing the absolute, machine language program in easy-to-read binary (or octal) form. The section of tape may contain characters representing instructions (channel 8 and 7 not punched) or origin resettings (channel 8 not punched, channel 7 punched) and is concluded by 2 characters (channel 8 and 7 not punched) that represent a check sum for the entire section.

TRAILER: same as leader.

Operation of the BIN loader in no way depends upon or uses the RIM loader. To load a tape in BIN format place the tape in the reader, set the SR to 7777 (the starting address of the BIN loader), press the LOAD ADDRESS key, set SR switch 0 up for loading via the Teletype unit or down for loading via the high speed reader, then press the START key, and start the tape reader.

Refer to Digital Program Library document Digital-8-2-U [DEC-08-LBAA-D] for additional information on the Binary Loader program.

Example of the format of a binary tape:

| Tape Channel<br>8 7 6 5 4 S 3 2 1 | Memory<br>Location | Content | Comments            |
|-----------------------------------|--------------------|---------|---------------------|
| 1 0 0 0 0 . 0 0 0                 |                    |         | leader-trailer code |
| 0 1 0 0 0 . 0 1 0                 |                    |         |                     |
| 0 0 0 0 0 . 0 0 0                 |                    | 0200    |                     |
| 0 0 1 1 1 . 0 1 0                 |                    |         |                     |
| 0 0 0 0 0 . 0 0 0                 | 0200               | CLA     | origin-setting      |
| 0 0 0 0 1 . 0 1 0                 |                    |         |                     |
| 0 0 1 1 1 . 1 1 1                 | 0201               | TAD 277 |                     |
| 0 0 0 1 1 . 0 1 0                 |                    |         |                     |
| 0 0 1 1 1 . 1 1 0                 | 0202               | DCA 276 |                     |
| 0 0 1 1 1 . 1 0 0                 |                    |         |                     |
| 0 0 0 0 0 . 0 1 0                 | 0203               | HLT     |                     |
| 0 1 0 0 0 . 0 1 0                 |                    |         |                     |
| 0 0 1 1 1 . 1 1 1                 |                    | 0277    | origin-setting      |
| 0 0 0 0 0 . 0 0 0                 |                    |         |                     |
| 0 0 1 0 1 . 0 1 1                 | 0277               | 0053    |                     |
| 0 0 0 0 1 . 0 0 0                 |                    |         |                     |
| 0 0 0 0 0 . 1 1 1                 |                    | 1007    | sum check           |
| 1 0 0 0 0 . 0 0 0                 |                    |         | leader-trailer code |

After a BIN tape has been read in, one of the two following conditions exists:

- a. No checksum error: halt with AC = 0
- b. Checksum error: halt with AC = (completed checksum) — (tape checksum)

## CHARACTER CODES

| 8-bit<br>ASCII<br>Code | 6-bit<br>Code | DEC 029<br>Card<br>Code | DEC 026<br>Card<br>Code | Character<br>Representation | Remarks                     |
|------------------------|---------------|-------------------------|-------------------------|-----------------------------|-----------------------------|
| 240                    | 40            | .blank                  | blank                   |                             | space (non-printing)        |
| 241                    | 41            | 11-8-2                  | 12-8-7                  | !                           | exclamation point           |
| 242                    | 42            | 8-7                     | 0-8-5                   | "                           | quotation marks             |
| 243                    | 43            | 8-3                     | 0-8-6                   | #                           | number sign <sup>(10)</sup> |
| 244                    | 44            | 11-8-3                  | 11-8-3                  | \$                          | dollar sign                 |
| 245                    | 45            | 0-8-4                   | 0-8-7                   | %                           | percent                     |
| 246                    | 46            | 12                      | 11-8-7                  | &                           | ampersand                   |
| 247                    | 47            | 8-5                     | 3-6                     | '                           | apostrophe or acute accent  |
| 250                    | 50            | 12-8-5                  | 0-8-4                   | (                           | opening parenthesis         |
| 251                    | 51            | 11-8-5                  | 12-8-4 <sup>(11)</sup>  | )                           | closing parenthesis         |
| 252                    | 52            | 11-8-4                  | 11-8-4                  | *                           | asterisk                    |
| 253                    | 53            | 12-8-6                  | 12                      | +                           | plus                        |
| 254                    | 54            | 0-8-3                   | 0-8-3                   | ,                           | comma                       |
| 255                    | 55            | 11                      | 11                      | -                           | minus sign or hyphen        |
| 256                    | 56            | 12-8-3                  | 12-8-3                  | .                           | period or decimal point     |
| 257                    | 57            | 0-1                     | 0-1                     | /                           | slash                       |
| 260                    | 60            | 0                       | 0                       | 0                           |                             |
| 261                    | 61            | 1                       | 1                       | 1                           |                             |
| 262                    | 62            | 2                       | 2                       | 2                           |                             |
| 263                    | 63            | 3                       | 3                       | 3                           |                             |
| 264                    | 64            | 4                       | 4                       | 4                           |                             |
| 265                    | 65            | 5                       | 5                       | 5                           |                             |
| 266                    | 66            | 6                       | 6                       | 6                           |                             |
| 267                    | 67            | 7                       | 7                       | 7                           |                             |
| 270                    | 70            | 8                       | 8                       | 8                           |                             |
| 271                    | 71            | 9                       | 9                       | 9                           |                             |
| 272                    | 72            | 8-2                     | 11-8-2                  | :                           | colon                       |
| 273                    | 73            | 11-8-6                  | 0-8-2                   | ;                           | semicolon                   |
| 274                    | 74            | 12-8-4                  | 12-8-6                  | <                           | less than                   |
| 275                    | 75            | 8-6                     | 8-3                     | =                           | equals                      |
| 276                    | 76            | 0-8-6                   | 11-8-6                  | >                           | greater than                |
| 277                    | 77            | 0-8-7                   | 12-8-2                  | ?                           | question mark               |
| 300                    | 00            | 8-4                     | 8-4                     | @                           | at sign                     |
| 301                    | 01            | 12-1                    | 12-1                    | A                           |                             |
| 302                    | 02            | 12-2                    | 12-2                    | B                           |                             |
| 303                    | 03            | 12-3                    | 12-3                    | C                           |                             |
| 304                    | 04            | 12-4                    | 12-4                    | D                           |                             |
| 305                    | 05            | 12-5                    | 12-5                    | E                           |                             |
| 306                    | 06            | 12-6                    | 12-6                    | F                           |                             |
| 307                    | 07            | 12-7                    | 12-7                    | G                           |                             |

| 8-bit<br>ASCII<br>Code | 6-bit<br>Code | DEC 029<br>Card<br>Code | DEC 026<br>Card<br>Code | Character<br>Representation | Remarks                           |
|------------------------|---------------|-------------------------|-------------------------|-----------------------------|-----------------------------------|
| 310                    | 10            | 12-8                    | 12-8                    | H                           |                                   |
| 311                    | 11            | 12-9                    | 12-9                    | I                           |                                   |
| 312                    | 12            | 11-1                    | 11-1                    | J                           |                                   |
| 313                    | 13            | 11-2                    | 11-2                    | K                           |                                   |
| 314                    | 14            | 11-3                    | 11-3                    | L                           |                                   |
| 315                    | 15            | 11-4                    | 11-4                    | M                           |                                   |
| 316                    | 16            | 11-5                    | 11-5                    | N                           |                                   |
| 317                    | 17            | 11-6                    | 11-6                    | O                           |                                   |
| 320                    | 20            | 11-7                    | 11-7                    | P                           |                                   |
| 321                    | 21            | 11-8                    | 11-8                    | Q                           |                                   |
| 322                    | 22            | 11-9                    | 11-9                    | R                           |                                   |
| 323                    | 23            | 0-2                     | 0-2                     | S                           |                                   |
| 324                    | 24            | 0-3                     | 0-3                     | T                           |                                   |
| 325                    | 25            | 0-4                     | 0-4                     | U                           |                                   |
| 326                    | 26            | 0-5                     | 0-5                     | V                           |                                   |
| 327                    | 27            | 0-6                     | 0-6                     | W                           |                                   |
| 330                    | 30            | 0-7                     | 0-7                     | X                           |                                   |
| 331                    | 31            | 0-8                     | 0-8                     | Y                           |                                   |
| 332                    | 32            | 0-9                     | 0-9                     | Z                           |                                   |
| 333                    | 33            | 12-8-2 <sup>(5)</sup>   | 11-8-5                  | [                           | opening bracket, SHIFT/K          |
| 334                    | 34            | 11-8-7 <sup>(6)</sup>   | 8-7                     | \                           | backslash, SHIFT/L <sup>(8)</sup> |
| 335                    | 35            | 0-8-2                   | 12-8-5                  | ]                           | closing bracket, SHIFT/M          |
| 336                    | 36            | 12-8-7 <sup>(7)</sup>   | 8-5                     | ^                           | circumflex <sup>(2)</sup>         |
| 337                    | 37            | 0-8-5 <sup>(3)</sup>    | 8-2 <sup>(3)</sup>      | _                           | underline <sup>(4,9)</sup>        |

**Footnotes:**

- (1) On some DEC 026 Keyboards this character is graphically represented as 0.
- (2) On most DEC Teletypes circumflex is replaced by up-arrow (↑).
- (3) A card containing this code in column 1 with all remaining columns blank is an end-of-file card.
- (4) On most DEC Teletypes underline is replaced by backarrow (←).
- (5) On some 029 keyboards this character is graphically represented as a cent sign (¢).
- (6) On some 029 keyboards this character is graphically represented as logical NOT (¬).
- (7) On some 029 keyboards this character is graphically represented as vertical bar (|).
- (8) On some LP8 line printers, the character diamond (◊) is printed instead of backslash.
- (9) On some LP8 line printers, the character heart (♥) is printed instead of underline.
- (10) The number sign on some terminals is replaced by pound sign (£).

# LINE PRINTER CHARACTER CODES

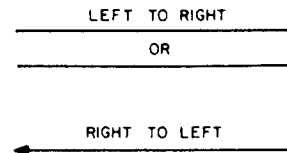
| LE8-E LINE PRINTER CODE |                        | Octal digit in AC 9-11 |    |   |    |    |   |     |  |
|-------------------------|------------------------|------------------------|----|---|----|----|---|-----|--|
| Octal                   | Octal digit in AC 9-11 |                        |    |   |    |    |   |     |  |
| digits in AC 5-8        | 0                      | 1                      | 2  | 3 | 4  | 5  | 6 | 7   |  |
| 00                      |                        |                        |    |   |    |    |   |     |  |
| 01                      |                        |                        | LF |   | FF | CR |   |     |  |
| 02                      |                        |                        |    |   |    |    |   |     |  |
| 03                      |                        |                        |    |   |    |    |   |     |  |
| 04                      | SP                     | !                      | "  | # | \$ | %  | & | '   |  |
| 05                      | (                      | )                      | *  | + | ,  | -  | . | /   |  |
| 06                      | 0                      | 1                      | 2  | 3 | 4  | 5  | 6 | 7   |  |
| 07                      | 8                      | 9                      | :  | ; | <  | =  | > | ?   |  |
| 10                      | @                      | A                      | B  | C | D  | E  | F | G   |  |
| 11                      | H                      | I                      | J  | K | L  | M  | N | O   |  |
| 12                      | P                      | Q                      | R  | S | T  | U  | V | W   |  |
| 13                      | X                      | Y                      | Z  | [ | \  | ]  | ^ | _   |  |
| 14                      | \                      | a                      | b  | c | d  | e  | f | g   |  |
| 15                      | h                      | i                      | j  | k | l  | m  | n | o   |  |
| 16                      | p                      | q                      | r  | s | t  | u  | v | w   |  |
| 17                      | x                      | y                      | z  | { |    | }  | ~ | DEL |  |

- Notes: 1. LF = Line Feed  
 FF = Form Feed  
 CR = Carriage Return  
 SP = Space
2. Characters below the heavy line are available only on 96-character printers.
3. On some early models of the LE8-E Line Printer, the \ (Code 134) is replaced by a ♦; and the ..... (Code 137) is replaced by a ♥.

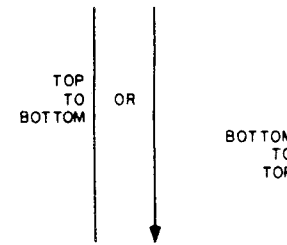
# Flowchart guide

The following is a partial list of flowchart symbols which can be used to diagram the logical flow of a program. The symbols may be made sufficiently large to include the pertinent information.

## REPRESENTATION OF FLOW



The direction of flow in a program is represented by lines drawn between symbols. These lines indicate the order in which the operations are to be performed. Normal direction of flow is from left to right and top to bottom. When the flow direction is not from left to right or top to bottom, arrowheads are placed on the reverse direction flowlines. Arrowheads may also be used on normal flow lines for increased clarity.



## TERMINAL



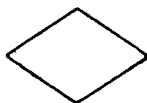
The oval symbol represents a terminal point in a program. It can be used to indicate a start, stop, or interrupt of program flow. The appropriate word is included within the symbol.

## PROCESSING



The rectangular symbol represents a processing function. The process which the symbol is used to represent could be an instruction or a group of instructions to carry out a given task. A brief description of the task to be performed is included within the symbol.

## DECISION



A diamond is used to indicate a point in a program where a choice must be made to determine the flow of the program from that point. A test condition is included within the symbol and the possible results of the test are used to label the respective flows from the symbol.

## PREDEFINED PROCESS



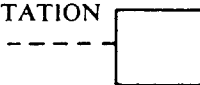
This symbol is used to represent an operation or group of operations not detailed in the flowchart. It is usually detailed in another flowchart. A subroutine is often represented in this manner.

## CONNECTOR



The circular symbol shown below represents an entry from or an exit to another part of the program flowchart. A number or a letter is enclosed to label the corresponding exits and entries. This symbol does not represent a program operation.

## ANNOTATION



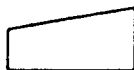
An addition of descriptive comments or explanatory notes for clarification is included within this symbol.

## INPUT/OUTPUT



This symbol is used in a flowchart to represent the input or output of information. This symbol may be used for all input/output functions, or symbols for specific types of input or output (such as those which follow) may be used.

## MANUAL INPUT



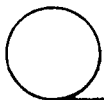
This symbol may be used to represent the manual input of information by means of on-line keyboards, switch settings, etc.

## PUNCHED TAPE



The input or output of information in which the medium is punched tape may be represented by this symbol.

## MAGNETIC TAPE



This symbol is used in a flowchart to represent magnetic tape input or output.

## PAPER TAPE LOADERS

### READ-IN MODE (RIM) LOADER

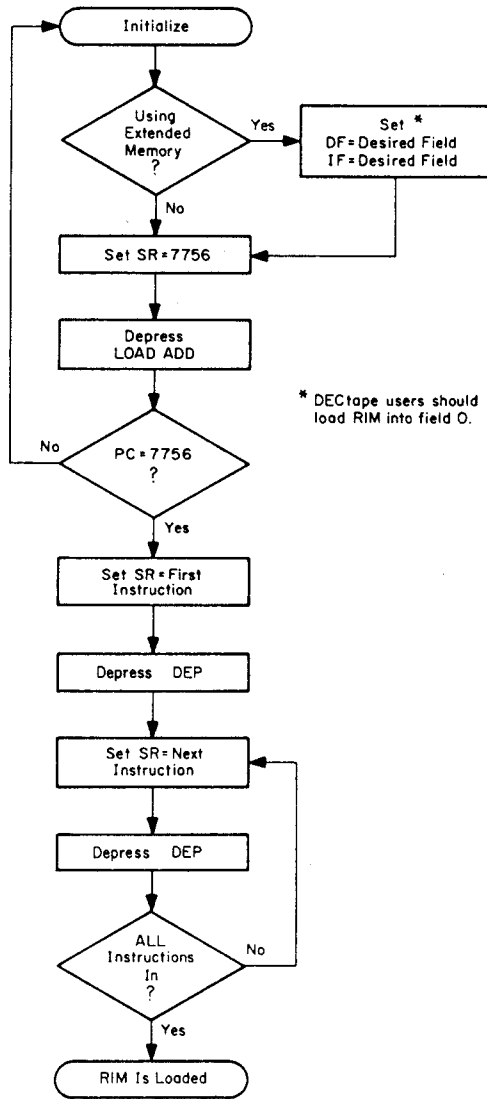
The RIM Loader is used to load programs punched on RIM format paper tape into core memory. It is stored in core memory locations 7756-7776 (21<sub>8</sub> locations), and started at location 7756. There are two versions of the RIM Loader, permitting either the high- or the low-speed reader to be used as an input device. The locations and corresponding instructions for both versions are listed below.

Table E1-1 RIM Loader Programs

| Location | INSTRUCTION      |                   |
|----------|------------------|-------------------|
|          | Low-Speed Reader | High-Speed Reader |
| 7756     | 6032             | 6014              |
| 7757     | 6031             | 6011              |
| 7760     | 5357             | 5357              |
| 7761     | 6036             | 6016              |
| 7762     | 7106             | 7106              |
| 7763     | 7006             | 7006              |
| 7764     | 7510             | 7510              |
| 7765     | 5357             | 5374              |
| 7766     | 7006             | 7006              |
| 7767     | 6031             | 6011              |
| 7770     | 5367             | 5367              |
| 7771     | 6034             | 6016              |
| 7772     | 7420             | 7420              |
| 7773     | 3776             | 3776              |
| 7774     | 3376             | 3376              |
| 7775     | 5356             | 5357              |

Note: Location 7776 is used for temporary storage.





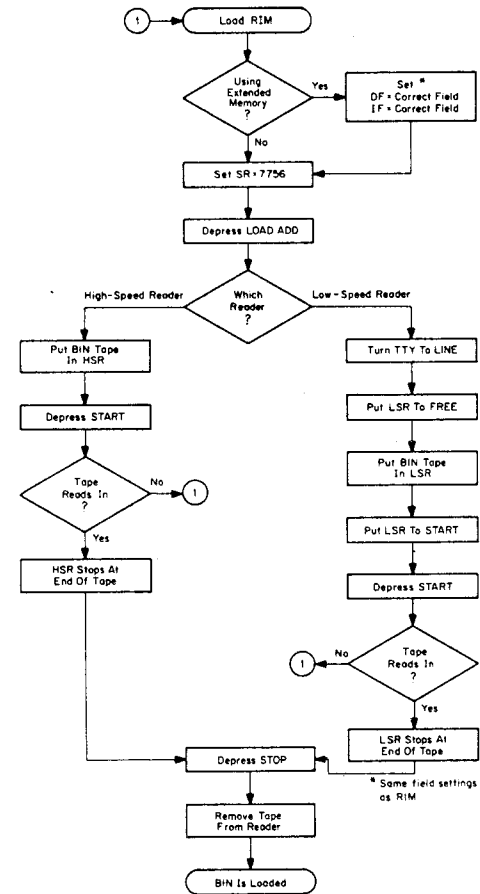
\* DECtape users should load RIM into field O.

Loading the RIM Loader

## BINARY (BIN) LOADER

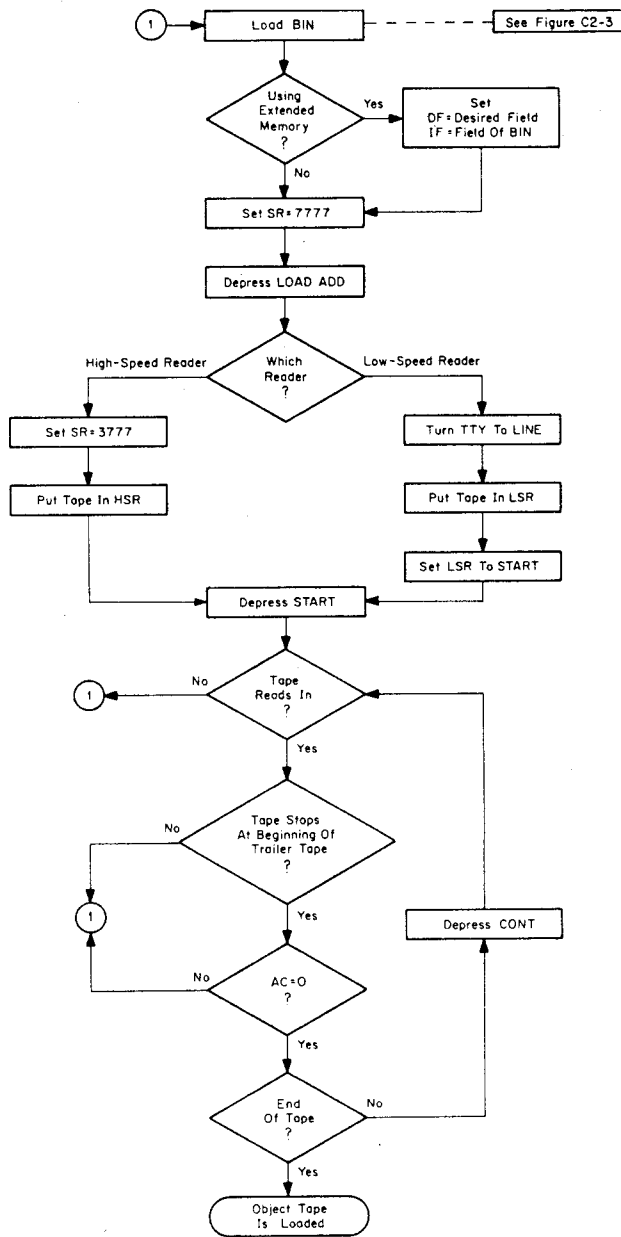
The BIN Loader is used to load programs punched on BIN format paper tape into core memory. It is stored in core memory locations 7625-7752 and 7777 (127<sub>8</sub> locations), and started at location 7777. The RIM Loader is usually used to load a RIM format tape of the BIN Loader.

When the BIN Loader is used to load a binary tape, caution must be exercised to ensure that the tape is started with binary leader code (code 200) under the read station. If the tape is started before this code, the contents of core memory may be lost.



\* Same field settings as RIM

Loading the BIN Loader



Loading A Binary Tape Using BIN

# MATHEMATICAL TABLES

## POWERS OF TWO

| $2^n$               | $n$ | $2^{-n}$   |
|---------------------|-----|--|
| 1                   | 0   | 1.0  |
| 2                   | 1   | 0.5  |
| 4                   | 2   | 0.25   |
| 8                   | 3   | 0.125  |
| 16                  | 4   | 0.0625   |
| 32                  | 5   | 0.03125  |
| 64                  | 6   | 0.015625   |
| 128                 | 7   | 0.0078125  |
| 256                 | 8   | 0.00390625   |
| 512                 | 9   | 0.001953125  |
| 1024                | 10  | 0.0009765625   |
| 2048                | 11  | 0.00048828125  |
| 4096                | 12  | 0.000244140625   |
| 8192                | 13  | 0.0001220703125  |
| 16384               | 14  | 0.00006103515625   |
| 32768               | 15  | 0.000030517578125  |
| 65536               | 16  | 0.0000152587890625   |
| 131072              | 17  | 0.00000762939453125  |
| 262144              | 18  | 0.000003814697265625   |
| 524288              | 19  | 0.0000019073486328125  |
| 1048576             | 20  | 0.00000095367431640625   |
| 2097152             | 21  | 0.000000476837158203125  |
| 4194304             | 22  | 0.0000002384185791015625                                       |
| 8388608             | 23  | 0.00000011920928955078125                                      |
| 16777216            | 24  | 0.000000059604644775390625                                     |
| 33554432            | 25  | 0.0000000298023223876953125                                    |
| 67108864            | 26  | 0.00000001490116119384765625                                   |
| 134217728           | 27  | 0.000000007450580596923808125                                  |
| 268435456           | 28  | 0.0000000037252902984619140625                                 |
| 536870912           | 29  | 0.00000000186264514523095703125                                |
| 1073741824          | 30  | 0.000000000931322574615378125                                  |
| 2147483648          | 31  | 0.000000000465661287307392578125                               |
| 4294967296          | 32  | 0.0000000002328306436538692890625                              |
| 8589934592          | 33  | 0.00000000011641532182693481453125                             |
| 17179869184         | 34  | 0.0000000000582076609134674072265625                           |
| 34359738368         | 35  | 0.00000000002910383045673370361308125                          |
| 68719476736         | 36  | 0.000000000014551915228366851806640625                         |
| 137438953472        | 37  | 0.0000000000072759576141834259033203125                        |
| 274877906944        | 38  | 0.0000000000036378780709171295166015625                        |
| 549755813888        | 39  | 0.00000000000181898940354586475830078125                       |
| 1099511627776       | 40  | 0.0000000000009094947017729282379150390625                     |
| 2199023255552       | 41  | 0.00000000000045474735088646411895751953125                    |
| 4398046511104       | 42  | 0.00000000000022737367544323205947875965625                    |
| 8796093022208       | 43  | 0.000000000000113686837216160297393798828125                   |
| 17592186044416      | 44  | 0.00000000000005684341886080801486948994140625                 |
| 35184372088832      | 45  | 0.000000000000028421709430404007434844970703125                |
| 70368744177664      | 46  | 0.0000000000000142108547152020037174224853515625               |
| 140737488355328     | 47  | 0.00000000000000710542735760100185871124267578125              |
| 281474976710656     | 48  | 0.00000000000000355271367880050092935562137890625              |
| 562949953421312     | 49  | 0.0000000000000017763568394002504646778106689453125            |
| 1125899906842624    | 50  | 0.00000000000000088817841970012523233890533447265625           |
| 2251799813985248    | 51  | 0.000000000000000444089209850062616169452667236328125          |
| 4503599627970496    | 52  | 0.00000000000000022204460492503130808472633681640625           |
| 9007199254740992    | 53  | 0.0000000000000001110223024625156540423616683458203125         |
| 18014398509481984   | 54  | 0.0000000000000000555111512312578220217151341704015625         |
| 36028797018963968   | 55  | 0.00000000000000002775557561562891351059079170852078125        |
| 72057594037927936   | 56  | 0.0000000000000000138778780781445675521539585426025390625      |
| 144115188075855872  | 57  | 0.000000000000000006938893903907228377647927126953125          |
| 288230376151711744  | 58  | 0.000000000000000003469446951953614888238489635650634765625    |
| 576460752303423488  | 59  | 0.00000000000000000173472347597680709441192448178253173828125  |
| 1152921504606846976 | 60  | 0.000000000000000000867361737988403547205962240891265869140625 |

# SCALES OF NOTATION

## 2<sup>x</sup> IN DECIMAL

| x     | 2 <sup>x</sup>      | x    | 2 <sup>x</sup>      | x   | 2 <sup>x</sup>      |
|-------|---------------------|------|---------------------|-----|---------------------|
| 0.001 | 1.00069 33874 62581 | 0.01 | 1.00695 55500 56719 | 0.1 | 1.07177 34625 36293 |
| 0.002 | 1.00138 72557 11335 | 0.02 | 1.01395 94797 90029 | 0.2 | 1.14869 83549 97035 |
| 0.003 | 1.00208 16050 79633 | 0.03 | 1.02101 21257 07193 | 0.3 | 1.23114 44133 44916 |
| 0.004 | 1.00277 64359 01078 | 0.04 | 1.02811 38266 56067 | 0.4 | 1.31950 79107 72894 |
| 0.005 | 1.00347 17485 09503 | 0.05 | 1.03526 49238 41377 | 0.5 | 1.41421 35623 73095 |
| 0.006 | 1.00416 78432 38973 | 0.06 | 1.04246 57608 41121 | 0.6 | 1.51571 65665 10398 |
| 0.007 | 1.00486 38204 23785 | 0.07 | 1.04971 66836 23067 | 0.7 | 1.62450 47927 12471 |
| 0.008 | 1.00556 05803 98468 | 0.08 | 1.05701 80405 61380 | 0.8 | 1.74110 11265 92248 |
| 0.009 | 1.00625 78234 97782 | 0.09 | 1.06437 01824 53360 | 0.9 | 1.86606 59830 73615 |

## 10<sup>±n</sup> IN OCTAL

| 10 <sup>n</sup> | n | 10 <sup>-n</sup>             | 10 <sup>n</sup>            | n  | 10 <sup>-n</sup>             |
|-----------------|---|------------------------------|----------------------------|----|------------------------------|
| 1               | 0 | 1.000 000 000 000 000 000 00 | 112 402 762 000            | 10 | 0.000 000 000 006 676 337 66 |
| 12              | 1 | 0.063 146 314 631 463 146 31 | 1 351 035 564 000          | 11 | 0.000 000 000 000 537 657 77 |
| 144             | 2 | 0.005 075 341 217 270 243 66 | 16 432 451 210 000         | 12 | 0.000 000 000 000 043 136 32 |
| 1 750           | 3 | 0.000 406 111 564 570 651 77 | 221 411 634 520 000        | 13 | 0.000 000 000 000 003 411 35 |
| 23 420          | 4 | 0.000 032 155 613 530 704 15 | 2 657 142 036 440 000      | 14 | 0.000 000 000 000 000 264 11 |
| 303 240         | 5 | 0.000 002 476 132 610 706 64 | 34 327 724 461 500 000     | 15 | 0.000 000 000 000 000 022 01 |
| 3 641 100       | 6 | 0.000 000 206 157 364 055 37 | 434 157 115 760 200 000    | 16 | 0.000 000 000 000 000 001 63 |
| 46 113 200      | 7 | 0.000 000 015 327 745 152 75 | 5 432 127 413 542 400 000  | 17 | 0.000 000 000 000 000 000 14 |
| 575 360 400     | 8 | 0.000 000 001 257 143 561 06 | 67 405 553 164 731 000 000 | 18 | 0.000 000 000 000 000 000 01 |
| 346 545 000     | 9 | 0.000 000 000 104 560 276 41 |                            |    |                              |

## n log<sub>10</sub> 2, n log<sub>2</sub> 10 IN DECIMAL

| n | n log <sub>10</sub> 2 | n log <sub>2</sub> 10 | n  | n log <sub>10</sub> 2 | n log <sub>2</sub> 10 |
|---|-----------------------|-----------------------|----|-----------------------|-----------------------|
| 1 | 0.30102 99957         | 3.32192 80949         | 6  | 1.80617 99740         | 19.93156 85693        |
| 2 | 0.60205 99913         | 6.64385 61898         | 7  | 2.10720 99696         | 23.25349 65642        |
| 3 | 0.90308 99870         | 9.96578 42847         | 8  | 2.40823 99653         | 26.57542 47591        |
| 4 | 1.20411 99827         | 13.28771 23795        | 9  | 2.70926 99610         | 29.89735 28540        |
| 5 | 1.50514 99783         | 16.60964 04744        | 10 | 3.01029 99566         | 33.21928 09489        |

## ADDITION AND MULTIPLICATION TABLES

| Addition                                   |    |    |    |    |    |    |    | Multiplication   |    |    |    |    |    |    |  |
|--|----|----|----|----|----|----|----|--|----|----|----|----|----|----|--|
| Binary Scale                               |    |    |    |    |    |    |    | Octal Scale  |    |    |    |    |    |    |  |
| $0 + 1 = 1$<br>$1 + 0 = 1$<br>$1 + 1 = 10$ |    |    |    |    |    |    |    | $0 \times 1 = 0$<br>$1 \times 0 = 0$<br>$1 \times 1 = 1$ |    |    |    |    |    |    |  |
| 0  | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 1  | 02 | 03 | 04 | 05 | 06 | 07 |  |
| 1  | 02 | 03 | 04 | 05 | 06 | 07 | 10 | 2  | 04 | 06 | 10 | 12 | 14 | 16 |  |
| 2  | 03 | 04 | 05 | 06 | 07 | 10 | 11 | 3  | 06 | 11 | 14 | 17 | 22 | 25 |  |
| 3  | 04 | 05 | 06 | 07 | 10 | 11 | 12 | 4  | 10 | 14 | 20 | 24 | 30 | 34 |  |
| 4  | 05 | 06 | 07 | 10 | 11 | 12 | 13 | 5  | 12 | 17 | 24 | 31 | 36 | 43 |  |
| 5  | 06 | 07 | 10 | 11 | 12 | 13 | 14 | 6  | 14 | 22 | 30 | 36 | 44 | 52 |  |
| 6  | 07 | 10 | 11 | 12 | 13 | 14 | 15 | 7  | 16 | 25 | 34 | 43 | 52 | 61 |  |
| 7  | 10 | 11 | 12 | 13 | 14 | 15 | 16 |  |    |    |    |    |    |    |  |

## MATHEMATICAL CONSTANTS IN OCTAL SCALE

|                        |            |                       |            |                            |            |
|------------------------|------------|-----------------------|------------|----------------------------|------------|
| $\pi = 3.11037$        | $552421_8$ | $e = 2.55760$         | $521305_8$ | $\gamma = 0.44742$         | $147707_8$ |
| $r^{-1} = 0.24276$     | $301556_8$ | $e^{-1} = 0.27426$    | $530661_8$ | $\ln \gamma = -0.43127$    | $233602_8$ |
| $\sqrt{\pi} = 1.61337$ | $611067_8$ | $\sqrt{e} = 1.51411$  | $230704_8$ | $\log_2 \gamma = -0.62573$ | $030645_8$ |
| $\ln \pi = 1.11206$    | $404435_8$ | $\log_2 e = 0.33626$  | $754251_8$ | $\sqrt{2} = 1.32404$       | $746320_8$ |
| $\log_2 \pi = 1.51544$ | $163223_8$ | $\log_2 e = 1.34252$  | $166245_8$ | $\ln 2 = 0.54271$          | $027760_8$ |
| $\sqrt{10} = 3.12305$  | $407267_8$ | $\log_2 10 = 3.24464$ | $741136_8$ | $\ln 10 = 2.23273$         | $067355_8$ |

## Octal-Decimal Conversion

The following table gives the multiples of the powers of 8. To convert a number from octal to decimal using the table, add the decimal number opposite the digit value for each digit position. To convert 40277<sub>8</sub> to decimal, the following numbers are obtained from the table and added.

| Position | Digit | Table entry |
|----------|-------|-------------|
| 5        | 4     | 16384       |
| 4        | 0     | 0           |
| 3        | 2     | 128         |
| 2        | 7     | 56          |
| 1        | 7     | 7           |

$$16575_{10} = 40277_8$$

This process is reversed to convert a number from decimal to octal. Subtract out the largest table entry which allows a positive remainder, then take the column number (position coefficient) of the table entry as the Nth digit of the result, where N is the row number (digit position) of the table entry. Continue this process, operating on the remainder from each step in the next step, until all digits of the result have been found. For example, to convert 23365<sub>10</sub> to an equivalent octal number:

$$\begin{array}{r}
 23365 \\
 -20480 = 5 \times 8^4 \\
 \hline
 2885 \\
 -2560 = 5 \times 8^3 \\
 \hline
 325 \\
 -320 = 5 \times 8^2 \\
 \hline
 5 \\
 -0 = 0 \times 8^1 \\
 \hline
 5 \\
 -5 = 5 \times 8^0 \\
 \hline
 0
 \end{array}$$

$55505_8 = 23365_{10}$

| Octal Digit Position/<br>8 <sup>n</sup> | Position Coefficients<br>(Multipliers) |        |        |        |         |         |         |         |
|---|--|--------|--------|--------|---------|---------|---------|---------|
|   | 0                                      | 1      | 2      | 3      | 4       | 5       | 6       | 7       |
| 1st (8 <sup>0</sup> )                   | 0                                      | 1      | 2      | 3      | 4       | 5       | 6       | 7       |
| 2nd (8 <sup>1</sup> )                   | 0                                      | 8      | 16     | 24     | 32      | 40      | 48      | 56      |
| 3rd (8 <sup>2</sup> )                   | 0                                      | 64     | 128    | 192    | 256     | 320     | 384     | 448     |
| 4th (8 <sup>3</sup> )                   | 0                                      | 512    | 1,024  | 1,536  | 2,048   | 2,560   | 3,072   | 3,584   |
| 5th (8 <sup>4</sup> )                   | 0                                      | 4,096  | 8,192  | 12,288 | 16,384  | 20,480  | 24,576  | 28,672  |
| 6th (8 <sup>5</sup> )                   | 0                                      | 32,768 | 65,536 | 98,304 | 131,072 | 163,840 | 196,608 | 229,376 |

Octal-Decimal Integer Conversion Table

|   |   | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |      |      | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|---|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 0000<br>to<br>0777<br>(Octal)             | 0000<br>to<br>0511<br>(Decimal)           | 0000 | 0000 | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0400 | 0256 | 0257 | 0258 | 0259 | 0260 | 0261 | 0262 | 0263 |
|   |   | 0010 | 0008 | 0009 | 0010 | 0011 | 0012 | 0013 | 0014 | 0015 | 0410 | 0264 | 0265 | 0266 | 0267 | 0268 | 0269 | 0270 | 0271 |
|   |   | 0020 | 0016 | 0017 | 0018 | 0019 | 0020 | 0021 | 0022 | 0023 | 0420 | 0272 | 0273 | 0274 | 0275 | 0276 | 0277 | 0278 | 0279 |
|   |   | 0030 | 0024 | 0025 | 0026 | 0027 | 0028 | 0029 | 0030 | 0031 | 0430 | 0280 | 0281 | 0282 | 0283 | 0284 | 0285 | 0286 | 0287 |
|   |   | 0040 | 0032 | 0033 | 0034 | 0035 | 0036 | 0037 | 0038 | 0039 | 0440 | 0288 | 0289 | 0290 | 0291 | 0292 | 0293 | 0294 | 0295 |
|   |   | 0050 | 0040 | 0041 | 0042 | 0043 | 0044 | 0045 | 0046 | 0047 | 0450 | 0296 | 0297 | 0298 | 0299 | 0300 | 0301 | 0302 | 0303 |
|   |   | 0060 | 0048 | 0049 | 0050 | 0051 | 0052 | 0053 | 0054 | 0055 | 0460 | 0304 | 0305 | 0306 | 0307 | 0308 | 0309 | 0310 | 0311 |
|   |   | 0070 | 0056 | 0057 | 0058 | 0059 | 0060 | 0061 | 0062 | 0063 | 0470 | 0312 | 0313 | 0314 | 0315 | 0316 | 0317 | 0318 | 0319 |
| Octal<br>10000<br>to<br>4096<br>(Decimal) | Octal<br>10000<br>to<br>4096<br>(Decimal) | 0100 | 0064 | 0065 | 0066 | 0067 | 0068 | 0069 | 0070 | 0071 | 0500 | 0320 | 0321 | 0322 | 0323 | 0324 | 0325 | 0326 | 0327 |
|   |   | 0110 | 0072 | 0073 | 0074 | 0075 | 0076 | 0077 | 0078 | 0079 | 0510 | 0328 | 0329 | 0330 | 0331 | 0332 | 0333 | 0334 | 0335 |
|   |   | 0120 | 0080 | 0081 | 0082 | 0083 | 0084 | 0085 | 0086 | 0087 | 0520 | 0336 | 0337 | 0338 | 0339 | 0340 | 0341 | 0342 | 0343 |
|   |   | 0130 | 0088 | 0089 | 0090 | 0091 | 0092 | 0093 | 0094 | 0095 | 0530 | 0344 | 0345 | 0346 | 0347 | 0348 | 0349 | 0350 | 0351 |
|   |   | 0140 | 0096 | 0097 | 0098 | 0099 | 0100 | 0101 | 0102 | 0103 | 0540 | 0352 | 0353 | 0354 | 0355 | 0356 | 0357 | 0358 | 0359 |
|   |   | 0150 | 0104 | 0105 | 0106 | 0107 | 0108 | 0109 | 0110 | 0111 | 0550 | 0360 | 0361 | 0362 | 0363 | 0364 | 0365 | 0366 | 0367 |
|   |   | 0160 | 0112 | 0113 | 0114 | 0115 | 0116 | 0117 | 0118 | 0119 | 0560 | 0368 | 0369 | 0370 | 0371 | 0372 | 0373 | 0374 | 0375 |
|   |   | 0170 | 0120 | 0121 | 0122 | 0123 | 0124 | 0125 | 0126 | 0127 | 0570 | 0376 | 0377 | 0378 | 0379 | 0380 | 0381 | 0382 | 0383 |
| 0200<br>to<br>0777<br>(Octal)             | 0200<br>to<br>0777<br>(Octal)             | 0200 | 0128 | 0129 | 0130 | 0131 | 0132 | 0133 | 0134 | 0135 | 0600 | 0384 | 0385 | 0386 | 0387 | 0388 | 0389 | 0390 | 0391 |
|   |   | 0210 | 0136 | 0137 | 0138 | 0139 | 0140 | 0141 | 0142 | 0143 | 0610 | 0392 | 0393 | 0394 | 0395 | 0396 | 0397 | 0398 | 0399 |
|   |   | 0220 | 0144 | 0145 | 0146 | 0147 | 0148 | 0149 | 0150 | 0151 | 0620 | 0400 | 0401 | 0402 | 0403 | 0404 | 0405 | 0406 | 0407 |
|   |   | 0230 | 0152 | 0153 | 0154 | 0155 | 0156 | 0157 | 0158 | 0159 | 0630 | 0408 | 0409 | 0410 | 0411 | 0412 | 0413 | 0414 | 0415 |
|   |   | 0240 | 0160 | 0161 | 0162 | 0163 | 0164 | 0165 | 0166 | 0167 | 0640 | 0416 | 0417 | 0418 | 0419 | 0420 | 0421 | 0422 | 0423 |
|   |   | 0250 | 0168 | 0169 | 0170 | 0171 | 0172 | 0173 | 0174 | 0175 | 0650 | 0424 | 0425 | 0426 | 0427 | 0428 | 0429 | 0430 | 0431 |
|   |   | 0260 | 0176 | 0177 | 0178 | 0179 | 0180 | 0181 | 0182 | 0183 | 0660 | 0432 | 0433 | 0434 | 0435 | 0436 | 0437 | 0438 | 0439 |
|   |   | 0270 | 0184 | 0185 | 0186 | 0187 | 0188 | 0189 | 0190 | 0191 | 0670 | 0440 | 0441 | 0442 | 0443 | 0444 | 0445 | 0446 | 0447 |
| 0300<br>to<br>0777<br>(Octal)             | 0300<br>to<br>0777<br>(Octal)             | 0300 | 0192 | 0193 | 0194 | 0195 | 0196 | 0197 | 0198 | 0199 | 0700 | 0448 | 0449 | 0450 | 0451 | 0452 | 0453 | 0454 | 0455 |
|   |   | 0310 | 0200 | 0201 | 0202 | 0203 | 0204 | 0205 | 0206 | 0207 | 0710 | 0456 | 0457 | 0458 | 0459 | 0460 | 0461 | 0462 | 0463 |
|   |   | 0320 | 0208 | 0209 | 0210 | 0211 | 0212 | 0213 | 0214 | 0215 | 0720 | 0464 | 0465 | 0466 | 0467 | 0468 | 0469 | 0470 | 0471 |
|   |   | 0330 | 0216 | 0217 | 0218 | 0219 | 0220 | 0221 | 0222 | 0223 | 0730 | 0472 | 0473 | 0474 | 0475 | 0476 | 0477 | 0478 | 0479 |
|   |   | 0340 | 0224 | 0225 | 0226 | 0227 | 0228 | 0229 | 0230 | 0231 | 0740 | 0480 | 0481 | 0482 | 0483 | 0484 | 0485 | 0486 | 0487 |
|   |   | 0350 | 0232 | 0233 | 0234 | 0235 | 0236 | 0237 | 0238 | 0239 | 0750 | 0488 | 0489 | 0490 | 0491 | 0492 | 0493 | 0494 | 0495 |
|   |   | 0360 | 0240 | 0241 | 0242 | 0243 | 0244 | 0245 | 0246 | 0247 | 0760 | 0496 | 0497 | 0498 | 0499 | 0500 | 0501 | 0502 | 0503 |
|   |   | 0370 | 0248 | 0249 | 0250 | 0251 | 0252 | 0253 | 0254 | 0255 | 0770 | 0504 | 0505 | 0506 | 0507 | 0508 | 0509 | 0510 | 0511 |
| 1000<br>to<br>1777<br>(Octal)             | 0512<br>to<br>1023<br>(Decimal)           | 1000 | 0512 | 0513 | 0514 | 0515 | 0516 | 0517 | 0518 | 0519 | 1400 | 0768 | 0769 | 0770 | 0771 | 0772 | 0773 | 0774 | 0775 |
|   |   | 1010 | 0520 | 0521 | 0522 | 0523 | 0524 | 0525 | 0526 | 0527 | 1410 | 0776 | 0777 | 0778 | 0779 | 0780 | 0781 | 0782 | 0783 |
|   |   | 1020 | 0528 | 0529 | 0530 | 0531 | 0532 | 0533 | 0534 | 0535 | 1420 | 0784 | 0785 | 0786 | 0787 | 0788 | 0789 | 0790 | 0791 |
|   |   | 1030 | 0536 | 0537 | 0538 | 0539 | 0540 | 0541 | 0542 | 0543 | 1430 | 0792 | 0793 | 0794 | 0795 | 0796 | 0797 | 0798 | 0799 |
|   |   | 1040 | 0544 | 0545 | 0546 | 0547 | 0548 | 0549 | 0550 | 0551 | 1440 | 0800 | 0801 | 0802 | 0803 | 0804 | 0805 | 0806 | 0807 |
|   |   | 1050 | 0552 | 0553 | 0554 | 0555 | 0556 | 0557 | 0558 | 0559 | 1450 | 0808 | 0809 | 0810 | 0811 | 0812 | 0813 | 0814 | 0815 |
|   |   | 1060 | 0560 | 0561 | 0562 | 0563 | 0564 | 0565 | 0566 | 0567 | 1460 | 0816 | 0817 | 0818 | 0819 | 0820 | 0821 | 0822 | 0823 |
|   |   | 1070 | 0568 | 0569 | 0570 | 0571 | 0572 | 0573 | 0574 | 0575 | 1470 | 0824 | 0825 | 0826 | 0827 | 0828 | 0829 | 0830 | 0831 |
| 1100<br>to<br>1777<br>(Octal)             | 0512<br>to<br>1023<br>(Decimal)           | 1100 | 0576 | 0577 | 0578 | 0579 | 0580 | 0581 | 0582 | 0583 | 1500 | 0832 | 0833 | 0834 | 0835 | 0836 | 0837 | 0838 | 0839 |
|   |   | 1110 | 0584 | 0585 | 0586 | 0587 | 0588 | 0589 | 0590 | 0591 | 1510 | 0840 | 0841 | 0842 | 0843 | 0844 | 0845 | 0846 | 0847 |
|   |   | 1120 | 0592 | 0593 | 0594 | 0595 | 0596 | 0597 | 0598 | 0599 | 1520 | 0848 | 0849 | 0850 | 0851 | 0852 | 0853 | 0854 | 0855 |
|   |   | 1130 | 0600 | 0601 | 0602 | 0603 | 0604 | 0605 | 0606 | 0607 | 1530 | 0856 | 0857 | 0858 | 0859 | 0860 | 0861 | 0862 | 0863 |
|   |   | 1140 | 0608 | 0609 | 0610 | 0611 | 0612 | 0613 | 0614 | 0615 | 1540 | 0864 | 0865 | 0866 | 0867 | 0868 | 0869 | 0870 | 0871 |
|   |   | 1150 | 0616 | 0617 | 0618 | 0619 | 0620 | 0621 | 0622 | 0623 | 1550 | 0872 | 0873 | 0874 | 0875 | 0876 | 0877 | 0878 | 0879 |
|   |   | 1160 | 0624 | 0625 | 0626 | 0627 | 0628 | 0629 | 0630 | 0631 | 1560 | 0880 | 0881 | 0882 | 0883 | 0884 | 0885 | 0886 | 0887 |
|   |   | 1170 | 0632 | 0633 | 0634 | 0635 | 0636 | 0637 | 0638 | 0639 | 1570 | 0888 | 0889 | 0890 | 0891 | 0892 | 0893 | 0894 | 0895 |
| 1200<br>to<br>1777<br>(Octal)             | 0512<br>to<br>1023<br>(Decimal)           | 1200 | 0640 | 0641 | 0642 | 0643 | 0644 | 0645 | 0646 | 0647 | 1600 | 0896 | 0897 | 0898 | 0899 | 0900 | 0901 | 0902 | 0903 |
|   |   | 1210 | 0648 | 0649 | 0650 | 0651 | 0652 | 0653 | 0654 | 0655 | 1610 | 0904 | 0905 | 0906 | 0907 | 0908 | 0909 | 0910 | 0911 |
|   |   | 1220 | 0656 | 0657 | 0658 | 0659 | 0660 | 0661 | 0662 | 0663 | 1620 | 0912 | 0913 | 0914 | 0915 | 0916 | 0917 | 0918 | 0919 |
|   |   | 1230 | 0664 | 0665 | 0666 | 0667 | 0668 | 0669 | 0670 | 0671 | 1630 | 0920 | 0921 | 0922 | 0923 | 0924 | 0925 | 0926 | 0927 |
|   |   | 1240 | 0672 | 0673 | 0674 | 0675 | 0676 | 0677 | 0678 | 0679 | 1640 | 0928 | 0929 | 0930 | 0931 | 0932 | 0933 | 0934 | 0935 |
|   |   | 1250 | 0680 | 0681 | 0682 | 0683 | 0684 | 0685 | 0686 | 0687 | 1650 | 0936 | 0937 | 0938 | 0939 | 0940 | 0941 | 0942 | 0943 |
|   |   | 1260 | 0688 | 0689 | 0690 | 0691 | 0692 | 0693 | 0694 | 0695 | 1660 | 0944 | 0945 | 0946 | 0947 | 0948 | 0949 | 0950 | 0951 |
|   |   | 1270 | 0696 | 0697 | 0698 | 0699 | 0700 | 0701 | 0702 | 0703 | 1670 | 0952 | 0953 | 0954 | 0955 | 0956 | 0957 | 0958 | 0959 |
| 1300<br>to<br>1777<br>(Octal)             | 0512<br>to<br>1023<br>(Decimal)           | 1300 | 0704 | 0705 | 0706 | 0707 | 0708 | 0709 | 0710 | 0711 | 1700 | 0960 | 0961 | 0962 | 0963 | 0964 | 0965 | 0966 | 0967 |
|   |   | 1310 | 0712 | 0713 | 0714 | 0715 | 0716 | 0717 | 0718 | 0719 | 1710 | 0968 | 0969 | 0970 | 0971 | 0972 | 0973 | 0974 | 0975 |
|   |   | 1320 | 0720 | 0721 | 0722 | 0723 | 0724 | 0725 | 0726 | 0727 | 1720 | 0976 | 0977 | 0978 | 0979 | 0980 | 0981 | 0982 | 0983 |
|   |   | 1330 | 0728 | 0729 | 0730 | 0731 | 0732 | 0733 | 0734 | 0735 | 1730 | 0984 | 0985 | 0986 | 0987 | 0988 | 0989 | 0990 | 0991 |
|   |   | 1340 | 0736 | 0737 | 0738 | 0739 | 0740 | 0741 | 0742 | 0743 | 1740 | 0992 | 0993 | 0994 | 0995 | 0996 | 0997 | 0998 | 0999 |
|   |   | 1350 | 0744 | 0745 | 0746 | 0747 | 0748 | 0749 | 0750 | 0751 | 1750 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 |
|   |   | 1360 | 0752 | 0753 | 0754 | 0755 | 0756 | 0757 | 0758 | 0759 | 1760 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 |
|   |   | 1370 | 0760 | 0761 | 0762 | 0763 | 0764 | 0765 | 0766 | 0767 | 1770 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 |

Octal-Decimal Integer Conversion Table (continued)

|                               |                                 | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |      |      | 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|-------------------------------|---------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 2000<br>to<br>2777<br>(Octal) | 1024<br>to<br>1535<br>(Decimal) | 2000 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 2400 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 |
|                               |                                 | 2010 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 2410 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 |
|                               |                                 | 2020 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 2420 | 1296 | 1297 | 1298 | 1299 | 1300 |      |      |      |

Octal-Decimal Integer Conversion Table (continued)

4000 to 4777 (Octal) to 2048 to 2559 (Decimal)

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4000 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 |
| 4001 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 |
| 4002 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 |
| 4003 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 |
| 4004 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 |
| 4005 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 |
| 4006 | 2096 | 2097 | 2098 | 2099 | 2100 | 2101 | 2102 |
| 4007 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 | 2110 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4100 | 2112 | 2113 | 2114 | 2115 | 2116 | 2117 | 2118 |
| 4110 | 2120 | 2121 | 2122 | 2123 | 2124 | 2125 | 2126 |
| 4120 | 2128 | 2129 | 2130 | 2131 | 2132 | 2133 | 2134 |
| 4130 | 2136 | 2137 | 2138 | 2139 | 2140 | 2141 | 2142 |
| 4140 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 | 2150 |
| 4150 | 2152 | 2153 | 2154 | 2155 | 2156 | 2157 | 2158 |
| 4160 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 |
| 4170 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4200 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 |
| 4210 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 |
| 4220 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 |
| 4230 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 |
| 4240 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 |
| 4250 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 |
| 4260 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 |
| 4270 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4300 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 |
| 4310 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 |
| 4320 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 |
| 4330 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 |
| 4340 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 |
| 4350 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 |
| 4360 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 |
| 4370 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 |

5000 to 5777 (Octal) to 2560 to 3071 (Decimal)

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5000 | 2560 | 2561 | 2562 | 2563 | 2564 | 2565 | 2566 |
| 5010 | 2568 | 2569 | 2570 | 2571 | 2572 | 2573 | 2574 |
| 5020 | 2576 | 2577 | 2578 | 2579 | 2580 | 2581 | 2582 |
| 5030 | 2584 | 2585 | 2586 | 2587 | 2588 | 2589 | 2590 |
| 5040 | 2592 | 2593 | 2594 | 2595 | 2596 | 2597 | 2598 |
| 5050 | 2600 | 2601 | 2602 | 2603 | 2604 | 2605 | 2606 |
| 5060 | 2608 | 2609 | 2610 | 2611 | 2612 | 2613 | 2614 |
| 5070 | 2616 | 2617 | 2618 | 2619 | 2620 | 2621 | 2622 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5100 | 2624 | 2625 | 2626 | 2627 | 2628 | 2629 | 2630 |
| 5110 | 2632 | 2633 | 2634 | 2635 | 2636 | 2637 | 2638 |
| 5120 | 2640 | 2641 | 2642 | 2643 | 2644 | 2645 | 2646 |
| 5130 | 2648 | 2649 | 2650 | 2651 | 2652 | 2653 | 2654 |
| 5140 | 2656 | 2657 | 2658 | 2659 | 2660 | 2661 | 2662 |
| 5150 | 2664 | 2665 | 2666 | 2667 | 2668 | 2669 | 2670 |
| 5160 | 2672 | 2673 | 2674 | 2675 | 2676 | 2677 | 2678 |
| 5170 | 2680 | 2681 | 2682 | 2683 | 2684 | 2685 | 2686 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5200 | 2688 | 2689 | 2690 | 2691 | 2692 | 2693 | 2694 |
| 5210 | 2696 | 2697 | 2698 | 2699 | 2700 | 2701 | 2702 |
| 5220 | 2704 | 2705 | 2706 | 2707 | 2708 | 2709 | 2710 |
| 5230 | 2712 | 2713 | 2714 | 2715 | 2716 | 2717 | 2718 |
| 5240 | 2720 | 2721 | 2722 | 2723 | 2724 | 2725 | 2726 |
| 5250 | 2728 | 2729 | 2730 | 2731 | 2732 | 2733 | 2734 |
| 5260 | 2736 | 2737 | 2738 | 2739 | 2740 | 2741 | 2742 |
| 5270 | 2744 | 2745 | 2746 | 2747 | 2748 | 2749 | 2750 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5300 | 2752 | 2753 | 2754 | 2755 | 2756 | 2757 | 2758 |
| 5310 | 2760 | 2761 | 2762 | 2763 | 2764 | 2765 | 2766 |
| 5320 | 2768 | 2769 | 2770 | 2771 | 2772 | 2773 | 2774 |
| 5330 | 2776 | 2777 | 2778 | 2779 | 2780 | 2781 | 2782 |
| 5340 | 2784 | 2785 | 2786 | 2787 | 2788 | 2789 | 2790 |
| 5350 | 2792 | 2793 | 2794 | 2795 | 2796 | 2797 | 2798 |
| 5360 | 2800 | 2801 | 2802 | 2803 | 2804 | 2805 | 2806 |
| 5370 | 2808 | 2809 | 2810 | 2811 | 2812 | 2813 | 2814 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4400 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 |
| 4410 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 |
| 4420 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 |
| 4430 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 |
| 4440 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 |
| 4450 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 |
| 4460 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 |
| 4470 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4500 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 |
| 4510 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 |
| 4520 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 |
| 4530 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 |
| 4540 | 2400 | 2401 | 2402 | 2403 | 2404 | 2405 | 2406 |
| 4550 | 2408 | 2409 | 2410 | 2411 | 2412 | 2413 | 2414 |
| 4560 | 2416 | 2417 | 2418 | 2419 | 2420 | 2421 | 2422 |
| 4570 | 2424 | 2425 | 2426 | 2427 | 2428 | 2429 | 2430 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4600 | 2432 | 2433 | 2434 | 2435 | 2436 | 2437 | 2438 |
| 4610 | 2440 | 2441 | 2442 | 2443 | 2444 | 2445 | 2446 |
| 4620 | 2448 | 2449 | 2450 | 2451 | 2452 | 2453 | 2454 |
| 4630 | 2456 | 2457 | 2458 | 2459 | 2460 | 2461 | 2462 |
| 4640 | 2464 | 2465 | 2466 | 2467 | 2468 | 2469 | 2470 |
| 4650 | 2472 | 2473 | 2474 | 2475 | 2476 | 2477 | 2478 |
| 4660 | 2480 | 2481 | 2482 | 2483 | 2484 | 2485 | 2486 |
| 4670 | 2488 | 2489 | 2490 | 2491 | 2492 | 2493 | 2494 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 4700 | 2496 | 2497 | 2498 | 2499 | 2500 | 2501 | 2502 |
| 4710 | 2504 | 2505 | 2506 | 2507 | 2508 | 2509 | 2510 |
| 4720 | 2512 | 2513 | 2514 | 2515 | 2516 | 2517 | 2518 |
| 4730 | 2520 | 2521 | 2522 | 2523 | 2524 | 2525 | 2526 |
| 4740 | 2528 | 2529 | 2530 | 2531 | 2532 | 2533 | 2534 |
| 4750 | 2536 | 2537 | 2538 | 2539 | 2540 | 2541 | 2542 |
| 4760 | 2544 | 2545 | 2546 | 2547 | 2548 | 2549 | 2550 |
| 4770 | 2552 | 2553 | 2554 | 2555 | 2556 | 2557 | 2558 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5400 | 2816 | 2817 | 2818 | 2819 | 2820 | 2821 | 2822 |
| 5410 | 2824 | 2825 | 2826 | 2827 | 2828 | 2829 | 2830 |
| 5420 | 2832 | 2833 | 2834 | 2835 | 2836 | 2837 | 2838 |
| 5430 | 2840 | 2841 | 2842 | 2843 | 2844 | 2845 | 2846 |
| 5440 | 2848 | 2849 | 2850 | 2851 | 2852 | 2853 | 2854 |
| 5450 | 2856 | 2857 | 2858 | 2859 | 2860 | 2861 | 2862 |
| 5460 | 2864 | 2865 | 2866 | 2867 | 2868 | 2869 | 2870 |
| 5470 | 2872 | 2873 | 2874 | 2875 | 2876 | 2877 | 2878 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5500 | 2880 | 2881 | 2882 | 2883 | 2884 | 2885 | 2886 |
| 5510 | 2888 | 2889 | 2890 | 2891 | 2892 | 2893 | 2894 |
| 5520 | 2896 | 2897 | 2898 | 2899 | 2900 | 2901 | 2902 |
| 5530 | 2904 | 2905 | 2906 | 2907 | 2908 | 2909 | 2910 |
| 5540 | 2912 | 2913 | 2914 | 2915 | 2916 | 2917 | 2918 |
| 5550 | 2920 | 2921 | 2922 | 2923 | 2924 | 2925 | 2926 |
| 5560 | 2928 | 2929 | 2930 | 2931 | 2932 | 2933 | 2934 |
| 5570 | 2936 | 2937 | 2938 | 2939 | 2940 | 2941 | 2942 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5600 | 2944 | 2945 | 2946 | 2947 | 2948 | 2949 | 2950 |
| 5610 | 2952 | 2953 | 2954 | 2955 | 2956 | 2957 | 2958 |
| 5620 | 2960 | 2961 | 2962 | 2963 | 2964 | 2965 | 2966 |
| 5630 | 2968 | 2969 | 2970 | 2971 | 2972 | 2973 | 2974 |
| 5640 | 2976 | 2977 | 2978 | 2979 | 2980 | 2981 | 2982 |
| 5650 | 2984 | 2985 | 2986 | 2987 | 2988 | 2989 | 2990 |
| 5660 | 2992 | 2993 | 2994 | 2995 | 2996 | 2997 | 2998 |
| 5670 | 3000 | 3001 | 3002 | 3003 | 3004 | 3005 | 3006 |

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 5700 | 3008 | 3009 | 3010 | 3011 | 3012 | 3013 | 3014 |
| 5710 | 3016 | 3017 | 3018 | 3019 | 3020 | 3021 | 3022 |
| 5720 | 3024 | 3025 | 3026 | 3027 | 3028 | 3029 | 3030 |
| 5730 | 3032 | 3033 | 3034 | 3035 | 3036 | 3037 | 3038 |
| 5740 | 3040 | 3041 | 3042 | 3043 | 3044 | 3045 | 3046 |
| 5750 | 3048 | 3049 | 3050 | 3051 | 3052 | 3053 | 3054 |
| 5760 | 3056 | 3057 | 3058 | 3059 | 3060 | 3061 | 3062 |
| 5770 | 3064 | 3065 | 3066 | 3067 | 3068 | 3069 | 3070 |

Octal-Decimal Integer Conversion Table (continued)

6000 to 6777 (Octal)

3072 to 3583 (Decimal)

| 0    | 1    | 2    | 3    | 4    | 5    | 6    | 7    |
|------|------|------|------|------|------|------|------|
| 6000 | 3072 | 3073 | 3074 | 3075 | 3076 | 3077 | 3078 |
| 6010 | 3080 | 3081 | 3082 | 3083 | 3084 | 3085 | 3086 |
| 6020 | 3088 | 3089 | 3090 | 3091 | 3092 | 3093 | 3094 |
| 6030 | 3096 | 3097 | 3098 | 3099 | 3100 | 3101 | 3102 |
| 6040 | 3104 |      |      |      |      |      |      |

Octal-Decimal Fraction Conversion Table

| Octal | Decimal | Octal | Decimal | Octal | Decimal | Octal | Decimal |
|-------|---------|-------|---------|-------|---------|-------|---------|
| .000  | .000000 | .100  | .125000 | .200  | .250000 | .300  | .375000 |
| .001  | .001953 | .101  | .126953 | .201  | .251953 | .301  | .376953 |
| .002  | .003906 | .102  | .128906 | .202  | .253906 | .302  | .378906 |
| .003  | .005859 | .103  | .130859 | .203  | .255859 | .303  | .380859 |
| .004  | .007812 | .104  | .132812 | .204  | .257812 | .304  | .382812 |
| .005  | .009765 | .105  | .134765 | .205  | .259765 | .305  | .384765 |
| .006  | .011718 | .106  | .136718 | .206  | .261718 | .306  | .386718 |
| .007  | .013671 | .107  | .138671 | .207  | .263671 | .307  | .388671 |
| .010  | .015625 | .110  | .140625 | .210  | .265625 | .310  | .390625 |
| .011  | .017578 | .111  | .142578 | .211  | .267578 | .311  | .392578 |
| .012  | .019531 | .112  | .144531 | .212  | .269531 | .312  | .394531 |
| .013  | .021484 | .113  | .146484 | .213  | .271484 | .313  | .396484 |
| .014  | .023437 | .114  | .148437 | .214  | .273437 | .314  | .398437 |
| .015  | .025390 | .115  | .150390 | .215  | .275390 | .315  | .400390 |
| .016  | .027343 | .116  | .152343 | .216  | .277343 | .316  | .402343 |
| .017  | .029296 | .117  | .154296 | .217  | .279296 | .317  | .404296 |
| .020  | .031250 | .120  | .156250 | .220  | .281250 | .320  | .406250 |
| .021  | .033203 | .121  | .158203 | .221  | .283203 | .321  | .408203 |
| .022  | .035156 | .122  | .160156 | .222  | .285156 | .322  | .410156 |
| .023  | .037109 | .123  | .162109 | .223  | .287109 | .323  | .412109 |
| .024  | .039062 | .124  | .164062 | .224  | .289062 | .324  | .414062 |
| .025  | .041015 | .125  | .166015 | .225  | .291015 | .325  | .416015 |
| .026  | .042968 | .126  | .167968 | .226  | .292968 | .326  | .417968 |
| .027  | .044921 | .127  | .169921 | .227  | .294921 | .327  | .419921 |
| .030  | .046875 | .130  | .171875 | .230  | .296875 | .330  | .421875 |
| .031  | .048828 | .131  | .173828 | .231  | .298828 | .331  | .423828 |
| .032  | .050781 | .132  | .175781 | .232  | .300781 | .332  | .425781 |
| .033  | .052734 | .133  | .177734 | .233  | .302734 | .333  | .427734 |
| .034  | .054687 | .134  | .179687 | .234  | .304687 | .334  | .429687 |
| .035  | .056640 | .135  | .181640 | .235  | .306640 | .335  | .431640 |
| .036  | .058593 | .136  | .183593 | .236  | .308593 | .336  | .433593 |
| .037  | .060546 | .137  | .185546 | .237  | .310546 | .337  | .435546 |
| .040  | .062500 | .140  | .187500 | .240  | .312500 | .340  | .437500 |
| .041  | .064453 | .141  | .189453 | .241  | .314453 | .341  | .439453 |
| .042  | .066406 | .142  | .191406 | .242  | .316406 | .342  | .441406 |
| .043  | .068359 | .143  | .193359 | .243  | .318359 | .343  | .443359 |
| .044  | .070312 | .144  | .195312 | .244  | .320312 | .344  | .445312 |
| .045  | .072265 | .145  | .197265 | .245  | .322265 | .345  | .447265 |
| .046  | .074218 | .146  | .199218 | .246  | .324218 | .346  | .449218 |
| .047  | .076171 | .147  | .201171 | .247  | .326171 | .347  | .451171 |
| .050  | .078125 | .150  | .203125 | .250  | .328125 | .350  | .453125 |
| .051  | .080078 | .151  | .205078 | .251  | .330078 | .351  | .455078 |
| .052  | .082031 | .152  | .207031 | .252  | .332031 | .352  | .457031 |
| .053  | .083984 | .153  | .208984 | .253  | .333984 | .353  | .458984 |
| .054  | .085937 | .154  | .210937 | .254  | .335937 | .354  | .460937 |
| .055  | .087890 | .155  | .212890 | .255  | .337890 | .355  | .462890 |
| .056  | .089843 | .156  | .214843 | .256  | .339843 | .356  | .464843 |
| .057  | .091796 | .157  | .216796 | .257  | .341796 | .357  | .466796 |
| .060  | .093750 | .160  | .218750 | .260  | .343750 | .360  | .468750 |
| .061  | .095703 | .161  | .220703 | .261  | .345703 | .361  | .470703 |
| .062  | .097656 | .162  | .222656 | .262  | .347656 | .362  | .472656 |
| .063  | .099609 | .163  | .224609 | .263  | .349609 | .363  | .474609 |
| .064  | .101562 | .164  | .226562 | .264  | .351562 | .364  | .476562 |
| .065  | .103515 | .165  | .228515 | .265  | .353515 | .365  | .478515 |
| .066  | .105468 | .166  | .230468 | .266  | .355468 | .366  | .480468 |
| .067  | .107421 | .167  | .232421 | .267  | .357421 | .367  | .482421 |
| .070  | .109375 | .170  | .234375 | .270  | .359375 | .370  | .484375 |
| .071  | .111328 | .171  | .236328 | .271  | .361328 | .371  | .486328 |
| .072  | .113281 | .172  | .238281 | .272  | .363281 | .372  | .488281 |
| .073  | .115234 | .173  | .240234 | .273  | .365234 | .373  | .490234 |
| .074  | .117187 | .174  | .242187 | .274  | .367187 | .374  | .492187 |
| .075  | .119140 | .175  | .244140 | .275  | .369140 | .375  | .494140 |
| .076  | .121093 | .176  | .246093 | .276  | .371093 | .376  | .496093 |
| .077  | .123046 | .177  | .248046 | .277  | .373046 | .377  | .498046 |

Octal-Decimal Fraction Conversion Table (continued)

| Octal   | Decimal | Octal   | Decimal | Octal   | Decimal | Octal   | Decimal |
|---------|---------|---------|---------|---------|---------|---------|---------|
| .000000 | .000000 | .000100 | .000244 | .000200 | .000488 | .000300 | .000732 |
| .000001 | .000003 | .000101 | .000247 | .000201 | .000492 | .000301 | .000736 |
| .000002 | .000007 | .000102 | .000251 | .000202 | .000495 | .000302 | .000740 |
| .000003 | .000011 | .000103 | .000255 | .000203 | .000499 | .000303 | .000743 |
| .000004 | .000015 | .000104 | .000259 | .000204 | .000503 | .000304 | .000747 |
| .000005 | .000019 | .000105 | .000263 | .000205 | .000507 | .000305 | .000751 |
| .000006 | .000022 | .000106 | .000267 | .000206 | .000511 | .000306 | .000755 |
| .000007 | .000026 | .000107 | .000270 | .000207 | .000515 | .000307 | .000759 |
| .000010 | .000030 | .000110 | .000274 | .000210 | .000518 | .000310 | .000762 |
| .000011 | .000034 | .000111 | .000278 | .000211 | .000522 | .000311 | .000766 |
| .000012 | .000038 | .000112 | .000282 | .000212 | .000526 | .000312 | .000770 |
| .000013 | .000041 | .000113 | .000286 | .000213 | .000530 | .000313 | .000774 |
| .000014 | .000045 | .000114 | .000289 | .000214 | .000534 | .000314 | .000778 |
| .000015 | .000049 | .000115 | .000293 | .000215 | .000537 | .000315 | .000782 |
| .000016 | .000053 | .000116 | .000297 | .000216 | .000541 | .000316 | .000785 |
| .000017 | .000057 | .000117 | .000301 | .000217 | .000545 | .000317 | .000789 |
| .000020 | .000061 | .000120 | .000305 | .000220 | .000549 | .000320 | .000793 |
| .000021 | .000064 | .000121 | .000308 | .000221 | .000553 | .000321 | .000797 |
| .000022 | .000068 | .000122 | .000312 | .000222 | .000558 | .000322 | .000801 |
| .000023 | .000072 | .000123 | .000316 | .000223 | .000560 | .000323 | .000805 |
| .000024 | .000076 | .000124 | .000320 | .000224 | .000564 | .000324 | .000808 |
| .000025 | .000080 | .000125 | .000324 | .000225 | .000568 | .000325 | .000812 |
| .000026 | .000083 | .000126 | .000328 | .000226 | .000572 | .000326 | .000816 |
| .000027 | .000087 | .000127 | .000331 | .000227 | .000576 | .000327 | .000820 |
| .000030 | .000091 | .000130 | .000335 | .000230 | .000579 | .000330 | .000823 |
| .000031 | .000095 | .000131 | .000339 | .000231 | .000583 | .000331 | .000827 |
| .000032 | .000099 | .000132 | .000343 | .000232 | .000587 | .000332 | .000831 |
| .000033 | .000102 | .000133 | .000347 | .000233 | .000591 | .000333 | .000835 |
| .000034 | .000106 | .000134 | .000350 | .000234 | .000595 | .000334 | .000839 |
| .000035 | .000110 | .000135 | .000354 | .000235 | .000598 | .000335 | .000843 |
| .000036 | .000114 | .000136 | .000358 | .000236 | .000602 | .000336 | .000846 |
| .000037 | .000118 | .000137 | .000362 | .000237 | .000606 | .000337 | .000850 |
| .000040 | .000122 | .000140 | .000366 | .000240 | .000610 | .000340 | .000854 |
| .000041 | .000125 | .000141 | .000370 | .000241 | .000614 | .000341 | .000858 |
| .000042 | .000129 | .000142 | .000373 | .000242 | .000617 | .000342 | .000862 |
| .000043 | .000133 | .000143 | .000377 | .000243 | .000621 | .000343 | .000865 |
| .000044 | .000137 | .000144 | .000381 | .000244 | .000625 | .000344 | .000869 |
| .000045 | .000141 | .000145 | .000385 | .000245 | .000629 | .000345 | .000873 |
| .000046 | .000144 | .000146 | .000389 | .000246 | .000633 | .000346 | .000877 |
| .000047 | .000148 | .000147 | .000392 | .000247 | .000637 | .000347 | .000881 |
| .000050 | .000152 | .000150 | .000396 | .000250 | .000640 | .000350 | .000885 |
| .000051 | .000156 | .000151 | .000400 | .000251 | .000644 | .000351 | .000888 |
| .000052 | .000160 | .000152 | .000404 | .000252 | .000648 | .000352 | .000892 |
| .000053 | .000164 | .000153 | .000408 | .000253 | .000652 | .000353 | .000896 |
| .000054 | .000167 | .000154 | .000411 | .000254 | .000656 | .000354 | .000900 |
| .000055 | .000171 | .000155 | .000415 | .000255 | .000659 | .000355 | .000904 |
| .000056 | .000175 | .000156 | .000419 | .000256 | .000663 | .000356 | .000907 |
| .000057 | .000179 | .000157 | .000423 | .000257 | .000667 | .000357 | .000911 |
| .000060 | .000183 | .000160 | .000427 | .000260 | .000671 | .000360 | .000915 |
| .000061 | .000186 | .000161 | .000431 | .000261 | .000675 | .000361 | .000919 |
| .000062 | .000190 | .000162 | .000434 | .000262 | .000679 | .000362 | .000923 |
| .000063 | .000194 | .000163 | .000438 | .000263 | .000683 | .000363 | .000926 |
| .000064 | .000198 | .000164 | .000442 | .000264 | .000688 | .000364 | .000930 |
| .000065 | .000202 | .000165 | .000446 | .000265 | .000690 | .000365 | .000934 |
| .000066 | .000205 | .000166 | .000450 | .000266 | .000694 | .000366 | .000938 |
| .000067 | .000209 | .000167 | .000453 | .000267 | .000698 | .000367 | .000942 |
| .000070 | .000213 | .000170 | .000457 | .000270 | .000701 | .000370 | .000946 |
| .000071 | .000217 | .000171 | .000461 | .000271 | .000705 | .000371 | .000949 |
| .000072 | .000221 | .000172 | .000465 | .000272 | .000709 | .000372 | .000953 |
| .000073 | .000225 | .000173 | .000469 | .000273 | .000713 | .000373 | .000957 |
| .000074 | .000228 | .000174 | .000473 | .000274 | .000717 | .000374 | .000961 |
| .000075 | .000232 | .000175 | .000477 | .000275 | .000720 | .000375 | .000965 |
| .000076 | .000236 | .000176 | .000480 | .000276 | .000724 | .000376 | .000968 |
| .000077 | .000240 | .000177 | .000484 | .000277 | .000728 | .000377 | .000972 |

Octal-Decimal Fraction Conversion Table (continued)

| Octal   | Decimal | Octal   | Decimal | Octal   | Decimal | Octal   | Decimal |
|---------|---------|---------|---------|---------|---------|---------|---------|
| .000400 | .000976 | .000500 | .001220 | .000600 | .001464 | .000700 | .001708 |
| .000401 | .000980 | .000501 | .001224 | .000601 | .001468 | .000701 | .001712 |
| .000402 | .000984 | .000502 | .001228 | .000602 | .001472 | .000702 | .001716 |
| .000403 | .000988 | .000503 | .001232 | .000603 | .001476 | .000703 | .001720 |
| .000404 | .000991 | .000504 | .001235 | .000604 | .001480 | .000704 | .001724 |
| .000405 | .000995 | .000505 | .001239 | .000605 | .001483 | .000705 | .001728 |
| .000406 | .000999 | .000506 | .001243 | .000606 | .001487 | .000706 | .001731 |
| .000407 | .001003 | .000507 | .001247 | .000607 | .001491 | .000707 | .001735 |
| .000410 | .001007 | .000510 | .001251 | .000610 | .001495 | .000710 | .001739 |
| .000411 | .001010 | .000511 | .001255 | .000611 | .001499 | .000711 | .001743 |
| .000412 | .001014 | .000512 | .001258 | .000612 | .001502 | .000712 | .001747 |
| .000413 | .001018 | .000513 | .001262 | .000613 | .001506 | .000713 | .001750 |
| .000414 | .001022 | .000514 | .001266 | .000614 | .001510 | .000714 | .001754 |
| .000415 | .001026 | .000515 | .001270 | .000615 | .001514 | .000715 | .001758 |
| .000416 | .001029 | .000516 | .001274 | .000616 | .001518 | .000716 | .001762 |
| .000417 | .001033 | .000517 | .001277 | .000617 | .001522 | .000717 | .001766 |
| .000420 | .001037 | .000520 | .001281 | .000620 | .001525 | .000720 | .001770 |
| .000421 | .001041 | .000521 | .001285 | .000621 | .001529 | .000721 | .001773 |
| .000422 | .001045 | .000522 | .001289 | .000622 | .001533 | .000722 | .001777 |
| .000423 | .001049 | .000523 | .001293 | .000623 | .001537 | .000723 | .001781 |
| .000424 | .001052 | .000524 | .001296 | .000624 | .001541 | .000724 | .001785 |
| .000425 | .001056 | .000525 | .001300 | .000625 | .001544 | .000725 | .001789 |
| .000426 | .001060 | .000526 | .001304 | .000626 | .001548 | .000726 | .001792 |
| .000427 | .001064 | .000527 | .001308 | .000627 | .001552 | .000727 | .001796 |
| .000430 | .001069 | .000530 | .001312 | .000630 | .001556 | .000730 | .001800 |
| .000431 | .001071 | .000531 | .001316 | .000631 | .001560 | .000731 | .001804 |
| .000432 | .001075 | .000532 | .001319 | .000632 | .001564 | .000732 | .001808 |
| .000433 | .001079 | .000533 | .001323 | .000633 | .001567 | .000733 | .001811 |
| .000434 | .001083 | .000534 | .001327 | .000634 | .001571 | .000734 | .001815 |
| .000435 | .001087 | .000535 | .001331 | .000635 | .001575 | .000735 | .001819 |
| .000436 | .001091 | .000536 | .001335 | .000636 | .001579 | .000736 | .001823 |
| .000437 | .001094 | .000537 | .001338 | .000637 | .001583 | .000737 | .001827 |
| .000440 | .001098 | .000540 | .001342 | .000640 | .001586 | .000740 | .001831 |
| .000441 | .001102 | .000541 | .001346 | .000641 | .001590 | .000741 | .001834 |
| .000442 | .001106 | .000542 | .001350 | .000642 | .001594 | .000742 | .001838 |
| .000443 | .001110 | .000543 | .001354 | .000643 | .001598 | .000743 | .001842 |
| .000444 | .001113 | .000544 | .001358 | .000644 | .001602 | .000744 | .001846 |
| .000445 | .001117 | .000545 | .001361 | .000645 | .001605 | .000745 | .001850 |
| .000446 | .001121 | .000546 | .001365 | .000646 | .001609 | .000746 | .001853 |
| .000447 | .001125 | .000547 | .001369 | .000647 | .001613 | .000747 | .001857 |
| .000450 | .001129 | .000550 | .001373 | .000650 | .001617 | .000750 | .001861 |
| .000451 | .001132 | .000551 | .001377 | .000651 | .001621 | .000751 | .001865 |
| .000452 | .001136 | .000552 | .001380 | .000652 | .001625 | .000752 | .001869 |
| .000453 | .001140 | .000553 | .001384 | .000653 | .001628 | .000753 | .001873 |
| .000454 | .001144 | .000554 | .001388 | .000654 | .001632 | .000754 | .001876 |
| .000455 | .001148 | .000555 | .001392 | .000655 | .001636 | .000755 | .001880 |
| .000456 | .001152 | .000556 | .001396 | .000656 | .001640 | .000756 | .001884 |
| .000457 | .001155 | .000557 | .001399 | .000657 | .001644 | .000757 | .001888 |
| .000460 | .001159 | .000560 | .001403 | .000660 | .001647 | .000760 | .001892 |
| .000461 | .001163 | .000561 | .001407 | .000661 | .001651 | .000761 | .001895 |
| .000462 | .001167 | .000562 | .001411 | .000662 | .001655 | .000762 | .001899 |
| .000463 | .001171 | .000563 | .001415 | .000663 | .001659 | .000763 | .001903 |
| .000464 | .001174 | .000564 | .001419 | .000664 | .001663 | .000764 | .001907 |
| .000465 | .001178 | .000565 | .001422 | .000665 | .001667 | .000765 | .001911 |
| .000466 | .001182 | .000566 | .001426 | .000666 | .001670 | .000766 | .001914 |
| .000467 | .001186 | .000567 | .001430 | .000667 | .001674 | .000767 | .001918 |
| .000470 | .001190 | .000570 | .001434 | .000670 | .001678 | .000770 | .001922 |
| .000471 | .001194 | .000571 | .001438 | .000671 | .001682 | .000771 | .001926 |
| .000472 | .001197 | .000572 | .001441 | .000672 | .001686 | .000772 | .001930 |
| .000473 | .001201 | .000573 | .001445 | .000673 | .001689 | .000773 | .001934 |
| .000474 | .001205 | .000574 | .001449 | .000674 | .001693 | .000774 | .001937 |
| .000475 | .001209 | .000575 | .001453 | .000675 | .001697 | .000775 | .001941 |
| .000476 | .001213 | .000576 | .001457 | .000676 | .001701 | .000776 | .001945 |
| .000477 | .001216 | .000577 | .001461 | .000677 | .001705 | .000777 | .001949 |

Table 1-1 PDP-8/E Memory Reference Instructions  
(Refer to Chapter 3)

| Mnemonic Symbol | Octal Code | Indicators | Execution Times |                  |              |                              | Operation |
|-----------------|------------|------------|-----------------|------------------|--------------|------------------------------|-----------|
|                 |            |            | Direct Address  | Indirect Address | Auto-Indexed |                              |           |
| AND Y           | 0          | IR = 0,F,E | 2.6             | 3.8              | 4.0          | Logical AND between Y and AC |           |
| TAD Y           | 1          | IR = 1,F,E | 2.6             | 3.8              | 4.0          | Two's complement Add Y to AC |           |
| ISZ Y           | 2          | IR = 2,F,E | 2.6             | 3.8              | 4.0          | Increment Y and skip if zero |           |
| DCA Y           | 3          | IR = 3,F,E | 2.6             | 3.8              | 4.0          | Deposit at Y and clear AC    |           |
| JMS Y           | 4          | IR = 4,F,E | 2.6             | 3.8              | 4.0          | Jump to subroutine at Y      |           |
| JMP Y           | 5          | IR = 5,F   | 1.2             | 2.4              | 2.6          | Jump to Y                    |           |

Table 1-2 Loading Constants Into The Accumulator

| Mnemonic | Decimal Constant | Octal Code | Instructions Combined |
|----------|------------------|------------|-----------------------|
| NL0000 = | 0                | 7300       | CLA CLL               |
| NL0001 = | 1                | 7301       | CLA CLL IAC           |
| NL0002 = | 2                | 7305       | CLA CLL IAC RAL       |
|          |                  | (or)       |                       |
| NL0002 = | 2                | 7326       | CLA CLL CML RTL       |
| NL0003 = | 3                | 7325       | CLA CLL CML IAC RAL   |
| NL0004 = | 4                | 7307       | CLA CLL IAC RTL       |
| NL0006 = | 6                | 7327       | CLA CLL CML IAC RTL   |
| NL0100 = | 64               | 7203       | CLA IAC BSW           |
| NL2000 = | 1024             | 7332       | CLA CLL CML RTR       |
| NL3777 = | 2047             | 7350       | CLA CLL CMA RAR       |
| NL4000 = | -0               | 7330       | CLA CLL CML RAR       |
| NL5777 = | -1025            | 7352       | CLA CLL CMA RTR       |
| NL6000 = | -1024            | 7333       | CLA CLL CML IAC RTL   |
| NL7775 = | -3               | 7346       | CLA CLL CMA RTL       |
| NL7776 = | -2               | 7344       | CLA CLL CMA RAL       |
| NL7777 = | -1               | 7340       | CLA CLL CMA           |

**Table 1-3 Group 1 Operate Microinstructions**

| Mnemonic Symbol | Octal Code | Sequence | Operation   |
|-----------------|------------|----------|---|
| NOP             | 7000       | —        | No operation. Causes a 1.2 $\mu$ s program delay.   |
| IAC             | 7001       | 3        | Increment AC. The content of the AC is incremented by one in two's complement arithmetic.   |
| RAL             | 7004       | 4        | Rotate AC and L left. The content of the AC and the L are rotated left one place.           |
| RTL             | 7006       | 4        | Rotate two places to the left. Equivalent to two successive RAL operations.                 |
| RAR             | 7010       | 4        | Rotate AC and L right. The content of the AC and L are rotated right one place.             |
| RTR             | 7012       | 4        | Rotate two places to the right. Equivalent to two successive RAR operations.                |
| BSW             | 7002       | 4        | Byte swap.  |
| CML             | 7020       | 2        | Complement L.   |
| CMA             | 7040       | 2        | Complement AC. The content of the AC is set to the one's complement of its current content. |
| CIA             | 7041       | 2, 3     | Complement and increment accumulator. Used to form two's complement.                        |
| CLL             | 7100       | 1        | Clear L.  |
| CLL RAL         | 7104       | 1, 4     | Shift positive number one left.   |
| CLL RTL         | 7106       | 1, 4     | Clear link, rotate two left.  |
| CLL RAR         | 7110       | 1, 4     | Shift positive number one right.  |
| CLL RTR         | 7112       | 1, 4     | Clear link, rotate two right.   |
| STL             | 7120       | 1, 2     | Set link. The L is set to contain a binary 1.   |
| CLA             | 7200       | 1        | Clear AC. To be used alone or in OPR 1 combinations.  |
| CLA IAC         | 7201       | 1, 3     | Set AC = 1.   |
| GLK             | 7204       | 1, 4     | Get link. Transfer L into AC11.   |
| CLA CLL         | 7300       | 1        | Clear AC and L.   |
| STA             | 7240       | 2        | Set AC = 1. Each bit of the AC is set to contain a 1.                                       |

**Table 1-4 Group 2 Operate Microinstructions**

| Mnemonic Symbol | Octal Code | Sequence | Operation  |
|-----------------|------------|----------|--|
| HLT             | 7402       | 3        | Halt. Stops the program after completion of the cycle in process. If this instruction is combined with others in the OPR 2 group the other operations are completed before the end of the cycle. |
| OSR             | 7404       | 3        | OR with switch register. The OR function is performed between the content of the SR and the content of the AC, with the result left in the AC.   |
| SKP             | 7410       | 1        | Skip, unconditional. The next instruction is skipped.  |
| SNL             | 7420       | 1        | Skip if L $\neq$ 0.  |
| SZL             | 7430       | 1        | Skip if L = 0.   |
| SZA             | 7440       | 1        | Skip if AC = 0.  |
| SNA             | 7450       | 1        | Skip if AC $\neq$ 0.   |
| SZA SNL         | 7460       | 1        | Skip if AC = 0, or L $\neq$ 1, or both.  |
| SNA SZL         | 7470       | 1        | Skip if AC $\neq$ 0 and L = 0.   |
| SMA             | 7500       | 1        | Skip on minus AC. If the content of the AC is a negative number, the next instruction is skipped.  |
| SPA             | 7510       | 1        | Skip on positive AC. If the content of the AC is a positive number, including zero, the next instruction is skipped.   |
| SMA SNL         | 7520       | 1        | Skip if AC < 0, or L = 1, or both.   |
| SPA SZL         | 7530       | 1        | Skip if AC $\geq$ 0 and if L = 0.  |
| SMA SZA         | 7540       | 1        | Skip if AC $\leq$ 0.   |
| SPA SNA         | 7550       | 1        | Skip if AC > 0.  |
| CLA             | 7600       | 2        | Clear AC. To be used alone or in OPR 2 combinations.   |
| LAS             | 7604       | 1, 3     | Load AC with SR.   |
| SZA CLA         | 7640       | 1, 2     | Skip if AC = 0, then clear AC.   |
| SNA CLA         | 7650       | 1, 2     | Skip if AC $\neq$ 0, then clear AC.  |
| SMA CLA         | 7700       | 1, 2     | Skip if AC < 0, then clear AC.   |
| SPA CLA         | 7710       | 1, 2     | Skip if AC $\geq$ 0, then clear AC.  |



**Table 1-5 Group 3 Operate Microinstructions**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| NOP             | 7401       | No Operation   |
| MQL             | 7421       | Load Multiplier Quotient   |
| MQA             | 7501       | Multiplier Quotient OR into Accumulator                                |
| SWP             | 7521       | Swap Accumulator and Multiplier Quotient                               |
| CLA             | 7601       | Clear Accumulator  |
| CAM             | 7621       | Clear Accumulator and Multiplier Quotient (CLA MQL)                    |
| ACL             | 7701       | Clear Accumulator, Load Multiplier Quotient into Accumulator (CLA MQA) |
| CLA SWP         | 7721       | Load Multiplier Quotient into Accumulator, Clear Multiplier Quotient   |

**Table 1-6 Programmed Data Transfer Instructions**

| Mnemonic Symbol | Octal Code | Operation                          |
|-----------------|------------|------------------------------------|
| ION             | 6001       | Interrupt Turn On                  |
| IOF             | 6002       | Interrupt Turn Off                 |
| SKON            | 6000       | Skip if Interrupt On, IOF          |
| SRQ             | 6003       | Skip if Interrupt Request          |
| GTF             | 6004       | Get Flags                          |
| RTF             | 6005       | Restore Flag, ION                  |
| SGT             | 6006       | Skip if "Greater Than" Flag is Set |
| CAF             | 6007       | Clear All Flags                    |

**Table 1-7 KM8-E Memory Extension**

| Mnemonic Symbol | Octal Code | Operation   |
|-----------------|------------|---|
| GTF             | 6004       | Get Flags   |
| RFT             | 6005       | Restore Flags, ION                                    |
| CDF             | 62N1       | Change to Data Field N (N=0 to 7)                     |
| CIF             | 62N2       | Change to Instruction Field N (N=0 to 7)              |
| CDI             | 62N3       | Change Data Field, Change Instruction Field (CDF CIF) |
| RDF             | 6214       | Read Data Field                                       |
| RIF             | 6224       | Read Instruction Field                                |
| RIB             | 6234       | Read Interrupt Buffer                                 |
| RMF             | 6244       | Restore Memory Field                                  |

**Table 1-8 KE8-E Extended Arithmetic Element**

| Mnemonic Symbol                      | Octal Code | Operation                     |
|--------------------------------------|------------|-------------------------------|
| <b>MODE CHANGING INSTRUCTIONS</b>    |            |                               |
| SWAB                                 | 7431       | Switch from Mode A to B       |
| SWBA                                 | 7447       | Switch from Mode B to A       |
| SKB                                  | 7471       | Skip if Mode B                |
| <b>STANDARD INSTRUCTIONS</b>         |            |                               |
| CAM                                  | 7621       | 0→ AC, 0→ MQ                  |
| MQA                                  | 7501       | MQ "OR"ed with AC→ AC         |
| ACL                                  | 7701       | MQ→ AC (MQA CLA)              |
| MQL                                  | 7421       | AC→ MQ, 0→ AC                 |
| SWP                                  | 7521       | AC→ MQ, MQ→ AC                |
| <b>MODE A INSTRUCTIONS</b>           |            |                               |
| SCA                                  | 7441       | Step Counter "OR" with AC     |
| SCA CLA                              | 7641       | Step Counter to AC            |
| SCL                                  | 7403       | Step Counter Load from Memory |
| MUY                                  | 7405       | Multiply                      |
| DVI                                  | 7407       | Divide                        |
| NMI                                  | 7411       | Normalize                     |
| SHL                                  | 7413       | Shift Left                    |
| ASR                                  | 7415       | Arithmetic Shift Right        |
| LSR                                  | 7417       | Logical Shift Right           |
| <b>MODE B INSTRUCTIONS</b>           |            |                               |
| ACS                                  | 7403       | AC to Step Count              |
| MUY                                  | 7405       | Multiply                      |
| DVI                                  | 7407       | Divide                        |
| NMI                                  | 7411       | Normalize                     |
| SHL                                  | 7413       | Shift Left                    |
| ASR                                  | 7415       | Arithmetic Shift Right        |
| LSR                                  | 7417       | Logical Shift Right           |
| <b>DOUBLE PRECISION INSTRUCTIONS</b> |            |                               |
| DAD                                  | 7443       | Double Precision Add          |
| DST                                  | 7445       | Double Precision Store        |
| DPIC                                 | 7573       | Double Precision Increment    |
| DCM                                  | 7575       | Double Precision Complement   |
| DPSZ                                 | 7451       | Double Precision Skip if Zero |

**Table 1-9 Teletype Keyboard/Reader**

| Mnemonic Symbol | Octal Code | Operation                                   |
|-----------------|------------|---|
| KCF             | 6030       | Clear Keyboard Flag                         |
| KSF             | 6031       | Skip on Keyboard Flag                       |
| KCC             | 6032       | Clear Keyboard Flag, and AC, Advance Reader |
| KRS             | 6034       | Read Keyboard Buffer Static                 |
| KIE             | 6035       | Set/Clear Interrupt Enable                  |
| KRB             | 6036       | Read Keyboard Buffer, Clear Flag            |

**Table 1-10 Teletype Teleprinter/Punch**

| Mnemonic Symbol | Octal Code | Operation                        |
|-----------------|------------|----------------------------------|
| TFL             | 6040       | Set Teleprinter Flag             |
| TSF             | 6041       | Skip on Teleprinter Flag         |
| TCF             | 6042       | Clear Teleprinter Flag           |
| TPC             | 6044       | Load Teleprinter and Print       |
| TSK             | 6045       | Skip on Printer or Keyboard Flag |
| TLS             | 6046       | Load Teleprinter Sequence        |

**Table 1-11 PR8-E Paper Tape Readers**

| Mnemonic Symbol | Octal Code | Operation                                      |
|-----------------|------------|--|
| RPE             | 6010       | Set Reader/Punch Interrupt Enable              |
| RSF             | 6011       | Skip on Reader Flag                            |
| RRB             | 6012       | Read Reader Buffer                             |
| RFC             | 6014       | Reader Fetch Character                         |
| RCC             | 6016       | Read Buffer and Fetch New Character (RRB, RFC) |
| PCE             | 6020       | Clear Reader/Punch Interrupt Enable            |

**Table 1-12 PP8-E Paper Tape Punch**

| Mnemonic Symbol | Octal Code | Operation                             |
|-----------------|------------|---------------------------------------|
| RPE             | 6010       | Set Reader/Punch Interrupt Enable     |
| PCE             | 6020       | Clear Reader/Punch Interrupt Enable   |
| PSF             | 6021       | Skip on Punch Flag                    |
| RCF             | 6022       | Clear Punch Flag                      |
| PPC             | 6024       | Load Punch Buffer and Punch Character |
| PLS             | 6026       | Load Punch Buffer Sequence            |

**Table 1-13 PC8-E Reader/Punch**

| Mnemonic Symbol | Octal Code | Operation                             |
|-----------------|------------|---------------------------------------|
| RPE             | 6010       | Set Reader/Punch Interrupt Enable     |
| RSF             | 6011       | Skip on Reader Flag                   |
| RRB             | 6012       | Read Reader Buffer                    |
| RFC             | 6014       | Reader Fetch Character                |
| RFC, RRB        | 6016       | Read Buffer and Fetch New Character   |
| PCE             | 6020       | Clear Reader/Punch Interrupt Enable   |
| PSF             | 6021       | Skip on Punch Flag                    |
| PCF             | 6022       | Clear Punch Flag                      |
| PPC             | 6024       | Load Punch Buffer and Punch Character |
| PLS             | 6026       | Load Punch Buffer Sequence            |

**Table 1-14 TC08-P DECTape Control**

| Mnemonic Symbol | Octal Code | Operation                        | Time ( $\mu$ s) |
|-----------------|------------|----------------------------------|-----------------|
| DTRA            | 6761       | Read Status Register A           | 2.6             |
| DTCA            | 6762       | Clear Status Register A          | 2.6             |
| DTXA            | 6764       | Load Status Register A           | 2.6             |
| DTLA            | 6766       | Clear and Load Status Register A | 3.6             |
| DTSF            | 6771       | Skip on Flag                     | 2.6             |
| DTRB            | 6772       | Read Status Register B           | 2.6             |
| DTXB            | 6774       | Load Status Register B           | 2.6             |

Address Locations: 7754 = Word Count  
7755 = Current Address

**Table 1-15 TC58 DECmagtape System**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| MTSF            | 6701       | Skip on Error Flag or Magnetic Tape Flag           |
| MTCR            | 6711       | Skip on Tape Control Ready                         |
| MTTR            | 6721       | Skip on Tape Transport Ready                       |
| MTAF            | 6712       | Clear Registers, Error Flag and Magnetic Tape Flag |
| MTRC            | 6724       | Inclusive OR Contents of Command Register          |
| MTCM            | 6714       | Inclusive OR Contents of AC                        |
| MTLC            | 6716       | Load Command Register                              |
| none            | 6704       | Inclusive OR Contents of Status Register           |
| MTRS            | 6706       | Read Status Register                               |
| MTGO            | 6722       | Mag Tape "GO"                                      |
| none            | 6702       | Clear AC   |

**Table 1-16 RK08-P Control and RK01 Disk Drive and Control**

| Mnemonic Symbol | Octal Code | Operation                               | Time ( $\mu$ s) |
|-----------------|------------|---|-----------------|
| DLDA            | 6731       | Load Disk Address<br>(Maintenance Only) | 2.6             |
| DLDC            | 6732       | Load Command Register                   | 2.6             |
| DLDR            | 6733       | Load Disk Address and Read              | 2.6             |
| DRDA            | 6734       | Read Disk Address                       | 2.6             |
| DLDW            | 6735       | Load Disk Address and Write             | 2.6             |
| DRDC            | 6736       | Read Disk Command Register              | 3.6             |
| DCHP            | 6737       | Load Disk Address and Check Parity      | 4.6             |
| DRDS            | 6741       | Read Disk Status Register               | 2.6             |
| DCLS            | 6742       | Clear Status Register                   | 2.6             |
| DMNT            | 6743       | Load Maintenance Register               | 3.6             |
| DSKD            | 6745       | Skip on Disk Done                       | 3.6             |
| DSKE            | 6747       | Skip on Disk Error                      | 4.6             |
| DCLA            | 6751       | Clear All                               | 2.6             |
| DRWC            | 6752       | Read Word Count Register                | 3.6             |
| DLWC            | 6753       | Load Word Count Register                | 3.6             |
| DLCA            | 6755       | Load Current Address Register           | 3.6             |
| DRCA            | 6757       | Read Current Address Register           | 4.6             |

**Table 1-17 DF32-D Disk File and Control**

| Mnemonic Symbol | Octal Code | Operation                            | Time ( $\mu$ s) |
|-----------------|------------|--------------------------------------|-----------------|
| DCMA            | 6601       | Clear Disk Address Register          | 2.6             |
| DMAR            | 6603       | Load Disk Address Register and Read  | 3.6             |
| DMAW            | 6605       | Load Disk Address Register and Write | 3.6             |
| DCEA            | 6611       | Clear Disk Extended Address          | 2.6             |
| DSAC            | 6612       | Skip on Address Confirmed Flag       | 2.6             |
| DEAL            | 6615       | Load Disk Extended Address           | 3.6             |
| DEAC            | 6616       | Read Disk Extended Address           | 3.6             |
| DFSE            | 6621       | Skip on Zero Error Flag              | 2.6             |
| DFSC            | 6622       | Skip on Data Completion Flag         | 2.6             |
| DMAC            | 6626       | Read Disk Memory Address Register    | 3.6             |

Address Locations: 7750 = Word Count  
7751 = Memory Address

**Table 1-18 RF08 Disk File**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| DCIM            | 6611       | Clear Disk Interrupt Enable and Core Memory Address Extension Register |
| DIML            | 6615       | Load Interrupt Enable and Memory Address Extension Register            |
| DIMA            | 6616       | Load Interrupt and Extended Memory Address                             |
| DFSE            | 6621       | Skip on Disc Error   |
| DISK            | 6623       | Skip Error or Completion Flag  |
| DCXA            | 6641       | Clear High Order Address Register                                      |
| DXAL            | 6643       | Clear and Load High Order Address Register                             |
| DXAC            | 6645       | Clear AC & Load DAR into AC  |
| DMMT            | 6646       | Initiate Maintenance Register  |

**Table 1-19 TM8-E/F Control**

| Mnemonic Symbol | Octal Code | Operation                       |
|-----------------|------------|---------------------------------|
| LWCR            | 6701       | Load Word Count Register        |
| CWCR            | 6702       | Clear Word Count Register       |
| LCAR            | 6703       | Load Current Address Register   |
| CCAR            | 6704       | Clear Current Address Register  |
| LCMR            | 6705       | Load Command Register           |
| LFGR            | 6706       | Load Function Register          |
| LDBR            | 6707       | Load Data Buffer Register       |
| RWCR            | 6711       | Read Word Count Register        |
| CLT             | 6712       | Clear Transport                 |
| RCAR            | 6713       | Read Current Address Register   |
| RMSR            | 6714       | Read Main Status Register       |
| RCMR            | 6715       | Read Command Register           |
| RFSR            | 6716       | Read Function Register & Status |
| RDBR            | 6717       | Read Data Buffer                |
| SKEF            | 6721       | Skip if Error Flag              |
| SKCB            | 6722       | Skip if Not Busing              |
| SKJD            | 6723       | Skip if Job Done                |
| SKTR            | 6724       | Skip if Tape Ready              |
| CLF             | 6725       | Clear Controller and Master     |

**Table 1-20 LE-8 Line Printer**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| PSKF            | 6661       | Skip on Character Flag   |
| PCLF            | 6662       | Clear the Character Flag                                       |
| PSKE            | 6663       | Skip on Error  |
| PSTB            | 6664       | Load Printer Buffer, Print on Full Buffer or Control Character |
| PSIE            | 6665       | Set Program Interrupt Flag                                     |
| PCLF, PSTB      | 6666       | Clear Line Printer Flag, Load Character, and Print             |
| PCIE            | 6667       | Clear Program Interrupt Flag                                   |

**Table 1-21 CR8-E Card Reader and Control or CM8-E Optical Mark Card Reader and Control**

| Mnemonic Symbol | Octal Code | Operation                            |
|-----------------|------------|--------------------------------------|
| RCSF            | 6631       | Skip on Data Ready                   |
| RCRA            | 6632       | Read Alphanumeric                    |
| RCRB            | 6634       | Read Binary                          |
| RCNO            | 6635       | Read Conditions Out to Card Reader   |
| RCRC            | 6636       | Read Compressed                      |
| RCNI            | 6637       | Read Condition In From Card Reader   |
| RCSD            | 6671       | Skip on Card Done Flag               |
| RCSE            | 6672       | Select Card Reader and Skip if Ready |
| RCRD            | 6674       | Clear Card Done Flag                 |
| RCSI            | 6675       | Skip If Interrupt Being Generated    |
| RCTF            | 6677       | Clear Transition Flags               |

**Table 1-22 XY8-E Incremental Plotter Control**

| Mnemonic Symbol | Octal Code | Operation                                     |
|-----------------|------------|---|
| PLCE            | 6500       | Clear Interrupt Enable                        |
| PLSF            | 6501       | Skip on Plotter Flag                          |
| PLCF            | 6502       | Clear Plotter Flag                            |
| PLPU            | 6503       | Pen Up  |
| PLLR            | 6504       | Load Direction Register, Set Flag             |
| PLPD            | 6505       | Pen Down                                      |
| PLCF, PLLR      | 6506       | Clear Flag, Load Direction Register, Set Flag |
| PLSE            | 6507       | Set Interrupt Enable                          |

**Table 1-23 VC8-E CRT Display Control**

| Mnemonic Symbol | Octal Code | Operation                                      |
|-----------------|------------|--|
| DILC            | 6050       | Clears Enables, Flags and Delays               |
| DICD            | 6051       | Clears Done Flag                               |
| DISD            | 6052       | Skip on Done Flag                              |
| DILX            | 6053       | Load X Register                                |
| DILY            | 6054       | Load Y Register                                |
| DIXY            | 6055       | Clear Done Flag; Intensify; Set Done Flag      |
| DILE            | 6056       | Transfers AC to Enable Register                |
| DIRE            | 6057       | Transfers Display Enable/Status Register to AC |

**Table 1-24 VW01 Writing Tablet**

| Mnemonic Symbol | Octal Code | Operation           |
|-----------------|------------|---------------------|
| WTSC            | 6054       | Set Tablet Controls |
| WTRX            | 6052       | Read X              |
| WTRS            | 6072       | Read Status         |
| WTSE            | 6074       | Select Tablet       |
| WTMN            | 6064       | Clear Set XY        |

**Table 1-25 DC02-F 8-Channel Multiple Teletype Control**

| Mnemonic Symbol | Octal Code | Operation                 |
|-----------------|------------|---------------------------|
| MTPF            | 6113       | Read Transmitter Flag     |
| MINT            | 6115       | Set Interrupt Flip-Flop   |
| MTON            | 6117       | Select Specified Station  |
| MTKF            | 6123       | Read Receiver Flag Status |
| MINS            | 6125       | Skip on Interrupt Request |
| MTRS            | 6127       | Read Station Status       |
| MKSF            | 6111       | Skip on Key Board Flag    |
| MKCC            | 6112       | Clear Receive Flag        |
| MKRS            | 6114       | Receive Operation         |
| NONE            | 6116       | Combined MKRS & MICCC     |
| MTSF            | 6121       | Skip on Transmitter Flag  |
| MTCF            | 6122       | Clear Transmitter Flag    |
| MTPC            | 6124       | Transmit Operation        |
| NONE            | 6126       | Combined MTCF & MTPC      |

**Table 1-26 BB08-P General Purpose Interface Unit**

| Mnemonic Symbol | Octal Code | Operation             | Time ( $\mu$ s) |
|-----------------|------------|-----------------------|-----------------|
| GTSF            | 6361       | Skip on Transmit Flag | 2.6             |
| GCTF            | 6362       | Clear Transmit Flag   | 2.6             |
|                 | 6564       | (User-Assigned)       | 2.6             |
| GRSF            | 6371       | Skip on Receive Flag  | 2.6             |
| GCRF            | 6372       | Clear Receive Flag    | 2.6             |
| GRDB            | 6374       | Read Device Buffer    | 2.6             |

**Table 1-27 Universal Digit Controller (UDC)**

| Mnemonic Symbol | Octal Code | Operation                       | Time ( $\mu$ s) |
|-----------------|------------|---------------------------------|-----------------|
| UDSS            | 6351       | Skip on Scan Not Busy           | 2.6             |
| UDSC            | 6353       | Start Interrupt Scan            | 3.6             |
| UDRA            | 6356       | Read Address and Generic Type   | 3.6             |
| UDLS            | 6357       | Load Previous Status            | 4.6             |
| UDSF            | 6361       | Skip on UDC Flag and Clear Flag | 2.6             |
| UDLA            | 6363       | Load Address                    | 3.6             |
| UDEI            | 6364       | Enable UDC Interrupt Flag       | 2.6             |
| UDDI            | 6365       | Disable UDC Interrupt Flag      | 3.6             |
| UDRD            | 6366       | Clear AC and Read Data          | 3.6             |
| UDLD            | 6367       | Load Data and Clear AC          | 4.6             |

**Table 1-28 DR8-EA 12-Channel Buffered Digital I/O**

| Mnemonic Symbol | Octal Code | Operation                       |
|-----------------|------------|---------------------------------|
| DBDI            | 65x0       | Disable Interrupt               |
| DBEI            | 65x1       | Enable Interrupt                |
| DBSK            | 65x2       | Skip on Done Flag               |
| DBCI            | 65x3       | Clear Selective Input Register  |
| DBRI            | 65x4       | Transfer Input to AC            |
| DBCO            | 65x5       | Clear Selective Output Register |
| DBSO            | 65x6       | Set Selective Output Register   |
| DBRO            | 65x7       | Transfer Output to AC           |

**Table 1-29 MP8E-Memory Parity**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| DPI             | 6100       | Disable Memory Parity Error Interrupt                          |
| SMP             | 6101       | Skip on No Memory Parity Error                                 |
| EPI             | 6103       | Enable Memory Parity Error Interrupt                           |
| CMP             | 6104       | Clear Memory Parity Error Flag                                 |
| SMP, CMP        | 6105       | Skip on No Memory Parity Error, Clear Memory Parity Error Flag |
| CEP             | 6106       | Check for Even Parity  |
| SPO             | 6107       | Skip on Memory Parity Option                                   |

**Table 1-30 Synchronous Modem Interface**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| SGTT            | 6405       | Transmit Go  |
| SGRR            | 6404       | Receive Go   |
| SSCD            | 6400       | Skip if Character Detected   |
| SCSD            | 6406       | Clear Sync Detect  |
| SSRO            | 6402       | Skip if Receive Word Count Overflow                                      |
| SCSI            | 6401       | Clear Synchronous Interface  |
| SRTA            | 6407       | Read Transfer Address Register   |
| SLCC            | 6412       | Load Control   |
| SSRG            | 6410       | Skip if Ring Flag  |
| SSCA            | 6411       | Skip if Carrier/AGC Flag   |
| SRS2            | 6414       | Read Status 2  |
| SRS1            | 6415       | Read Status 1  |
| SLFL            | 6413       | Load Field   |
| SSBE            | 6416       | Skip on Bus Error  |
| SRCD            | 6417       | Read Character Detected (if AC0=0)<br>Maintenance Instruction (if AC0=1) |
| SSTO            | 6403       | Skip if Transmit Word Count Overflows                                    |

| Break Address Locations: |                          | For additional interfaces: |                 |
|--------------------------|--------------------------|----------------------------|-----------------|
|                          |                          | Device Codes               | Break Locations |
| 7720                     |                          |                            |                 |
| 7721                     | Test Characters          | 42, 43                     | 7700-7710       |
| 7722                     |                          | 44, 45                     | 7660-7670       |
| 7723                     |                          | 46, 47                     | 7640-7650       |
| 7724                     | Receive Word Count       |                            |                 |
| 7725                     | Receive Current Address  |                            |                 |
| 7726                     | Not Used                 |                            |                 |
| 7727                     | Transmit Word Count      |                            |                 |
| 7730                     | Transmit Current Address |                            |                 |

**Table 1-31 Multicycle Data Break Locations**

| Assigned Locations | Date Break Device                              | Channel |
|--------------------|--|---------|
| 7640-7650          | DP8-EA/EB                                      | 4       |
| 7660-7670          | DP8-EA/EB                                      | 3       |
| 7700-7710          | DP8-EA/EB                                      | 2       |
| 7720-7730          | DP8-EA/EB                                      | 1       |
| 7750,7751          | DF32-D   |         |
| 7752,7753          | (Reserved for Industry Standard Magnetic Tape) |         |
| 7754,7755          | TC08-P   |         |

**Table 1-32 KM8-E Time-Share**

| Mnemonic Symbol | Octal Code | Operation              |
|-----------------|------------|------------------------|
| CINT            | 6204       | Clear User Interrupt   |
| SINT            | 6254       | Skip on User Interrupt |
| CUF             | 6264       | Clear User Flag        |
| SUF             | 6274       | Set User Flag          |

**Table 1-33 DK8-EP Programmable Real Time Clock**

| Mnemonic Symbol | Octal Code | Operation                          |
|-----------------|------------|------------------------------------|
| CLZE            | 6130       | Clear Clock Enable Register per AC |
| CLSK            | 6131       | Skip on Clock Interrupt            |
| CLOE            | 6132       | Set Clock Enable Register per AC   |
| CLAB            | 6133       | AC to Clock Buffer                 |
| CLEN            | 6134       | Load Clock Enable Register         |
| CLSA            | 6135       | Clock Status to AC                 |
| CLBA            | 6136       | Clock Buffer to AC                 |
| CLCA            | 6137       | Clock Counter to AC                |

**Table 1-34 DK8-EA Line Frequency Clock**

| Mnemonic Symbol | Octal Code | Operation                         |
|-----------------|------------|-----------------------------------|
| CLEI            | 6131       | Enable Interrupt                  |
| CLDI            | 6132       | Disable Interrupt                 |
| CLSK            | 6133       | Skip on Clock Flag and Clear Flag |

**Table 1-35 DK8-EC Crystal Clock**

| Mnemonic Symbol | Octal Code | Operation                         |
|-----------------|------------|-----------------------------------|
| CLEI            | 6131       | Enable Interrupt                  |
| CLDI            | 6132       | Disable Interrupt                 |
| CLSK            | 6133       | Skip on Clock Flag and Clear Flag |

**Table 1-36 KP8-E Power Fail Detect**

| Mnemonic Symbol | Octal Code | Operation         |
|-----------------|------------|-------------------|
| SPL             | 6102       | Skip on Power Low |

**Table 1-37 DP8-EP Redundancy Check Option**

| Mnemonic Symbol | Octal Code | Operation              |
|-----------------|------------|------------------------|
| RCTV            | 6110       | Test VRC and Skip      |
| RCRL            | 6111       | Read BCC Low           |
| RCRH            | 6112       | Read BCC High          |
| RCCV            | 6113       | Compute VRC            |
| RCGB            | 6114       | Generate BCC           |
| RCLC            | 6115       | Load Control           |
| RCCB            | 6116       | Clear BCC Accumulation |

**Table 1-38 DR8-E Interprocessor Buffer**

| Mnemonic Symbol | Octal Code | Operation  |
|-----------------|------------|--|
| DBRF            | 65x1       | Skip if the receive set to a 1   |
| DBRD            | 65x2       | Read incoming data into the AC, clear receive flag                       |
| DBTF            | 65x3       | Skip if the transmit flag is set to a 1                                  |
| DBTD            | 65x4       | Load the AC into the transmit buffer, transmit and set the transmit flag |
| DBEI            | 65x5       | Enable the Interrupt Request line  |
| DBDI            | 65x6       | Disable the Interrupt Request Line                                       |
| DBCD            | 65x7       | Clear done flag  |