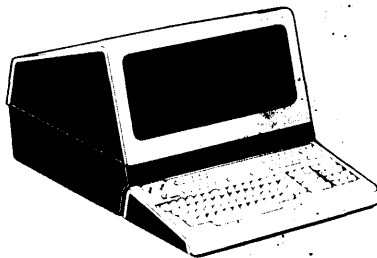HP 13255

TECHNICAL INFORMATION PACKAGE

Manual Part No. 13255-91000

REVISED

AUG-9-82

DATA TERMINAL
TECHNICAL INFORMATION

HEWLETT *hp* PACKARD

```
===============================================================================
|                                                                             |
|                                PREFACE                                      |
|                                                                             |
===============================================================================
```

This manual contains engineering design and application information for
the HP 264XX Data Terminal product line integral modules.

The first printing of this manual reflects the PCA date codes currently
being manufactured and as indicated on the applicable parts list.
Earlier versions of the PCA's are not described or referenced. Date
codes also appear in the upper left hand corner of each component
location diagram near the HP logo. Date codes appear in the following
format:

A-1620-42

The "A" field is incremented when changes to artwork occur. The next
field "16" reflects the year, and the "20" indicates the calendar week
in which the last change to the PCA occurred. The "42" indicates the
manufacturing division. It should be noted that some PCA's show "22"
as the manufacturing division.

The manual will be revised, when necessary, to incorporate new product
information or to reflect extensive changes. Updated versions of the
manual are available upon request through normal purchasing channels.

Additional information for the product line can be found in the manual
supplied with the product. Microcode information is contained in the
following documents:

HP PART NO.	DESCRIPTION
13255-90001	2640B Operating System Microcode Listing
13255-90003	2645A Operating System Microcode
13255-90004	2648A Operating System Microcode

HP 13255

TECHNICAL INFORMATION PACKAGE

Manual Part No. 13255-91000

REVISED

AUG-9-82

NOTE: This document is part of the 264XX DATA TERMINAL product
        series Technical Information Package (HP 13255).

===
| |
| PREFACE |
| |
===

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         ====================   =======================================
            13255-90001   2640B Operating System Microcode Listing
            13255-90003   2645A Operating System Microcode
            13255-90004   2648A Operating System Microcode

===
| |
| HOW TO USE THIS MANUAL |
| |
===

ORGANIZATION.

The manual is organized into functional modular sections.   Each module
represents one or more PCA's required to perform the module function.
A table cross referencing PCA's to modules as well as a table cross
referencing modules with applicable products are included in this
section.   Each module section is presented in accordance with a format
described as follows:

1.0   INTRODUCTION.

This section describes the major functional properties of the module.
It   includes   key   performance   specifications   and   properties
distinguishing this module from other similar modules.

2.0   OPERATING PARAMETERS.

This section contains various tables relating to physical parameters
including reliability and environmental information, power supply, and
clock requirements. Additional tables are included (where applicable)
to aid in software and firmware discussions.

Table 1.0 Physical Parameters

| |
| The PCA's and additional assemblies required for module |
| operation are listed by part number. Size and weight are |
| indicated where applicable. |
| |

Table 2.0 Reliability and Environmental Information

The specific environmental capabilities of each 264XX product
are as stated in the specification section of the Product Data
Sheets.

Hewlett-Packard Class B testing is defined as follows:
"CLASS B (Industrial and Commercial Environment). Light
industrial manufacturing or commerical environment suitable
for occupancy by operating personnel on a full time basis
without benefit of air conditioning or other protective
measures. Environment may involve moderately high and low
temperatures; humidity variations; and occassional minor
vibration. Individual Data Systems Products will be designed
to meet the requirements of this classification to assure
minimum costs and complexity when they are incorporated in
system cabinet configurations."

"Type tested at product level" implies that environmental
qualification has been performed with the module included in
an appropriate product.

"Failure Rate" is defined as the percentage of units expected
to fail every 1000 hours of operation under typical operating
conditions. Failure rate for a composite product may be
derived by adding individual module failure rates.

Table 3.0 Power Supply and Clock Requirements

Indicates the measured power supply and clock requirements for
the module total at +/-5% unless otherwise noted. Composite
product power requirements may be derived by adding individual
module power requirements. Total power available is listed in
the Power Supply module sections.

Table 4.0 Jumper (Switch) Definitions

```
---------------------------------------------------------------------
|                                                                   |
|    The PCA designation is indicated and a brief description is     |
|    provided for interpretation of jumper (in/out) or switch        |
|    (open/closed) positions.                                        |
|                                                                   |
---------------------------------------------------------------------
```

Table 5.0 Connector Information

```
---------------------------------------------------------------------
|                                                                   |
|    Lists all connectors and pin numbers used by the module.        |
|    Signal names and a brief description are given.  Specific       |
|    PCA's are referenced in the table title (when necessary) to     |
|    avoid confusion.  Bars are used over signal names indicating    |
|                           _____                                 |
|    negative true logic ($\overline{XXXXX\ XXX}$) functions.        |
|                                                                   |
---------------------------------------------------------------------
```

Table 6.0 Module Bus Pin Assignments

```
---------------------------------------------------------------------
|                                                                   |
|                                                                   |
|    Defines the functional controls or responses of the module as   |
|    invoked through the module address and data lines.  A table is  |
|    included for each module address understood by the module.      |
|                                                                   |
|                                                                   |
---------------------------------------------------------------------
```

3.0   FUNCTIONAL DESCRIPTION.

This section describes the general overall functional operation of the
module and references the module block diagram. Each block on the
block diagram is described in a general functional manner relating what
the block does and why.   A detailed description relating how the
functions are performed, from the schematic diagram perspective,
follows:

4.0   MISCELLANEOUS.

Additional miscellaneous information relating to the module or its
operation is included here (when applicable).

Each module section is appended with support drawings and diagrams as
follows:

        Block Diagram - Ilustrates the overall module function.

        Schematic Diagram - All PCA schematics pertaining to the
                            module are included.

        Timing Diagrams - Included (when applicable) to support
                          module usage.

        Component Location Diagrams - Locates position of components
                                      on PCA by reference designator.
                                      Indicates date code of the PCA
                                      at time of manual printing.

        Miscellaneous Support Drawings - Included (when applicable)
                                         to support module usage.

MISC. (cont.)   Parts Lists - A listing by assembly of replaceable parts.
                                The PCA parts lists reflect the currently
                                manufactured PCA's as indicated by the date
                                codes.

PCA ASSEMBLY TO MODULE   MODULE TO PCA ASSEMBLY
CROSS-REFERENCE   CROSS-REFERENCE

ASSY NUMBER	MODULE NUMBER	MODULE NUMBER	ASSY NUMBER
02640-60002	13255-91245	13255-91000	INTRODUCTION
02640-60007	13255-91007	13255-91007	02640-60007,-60149
02640-60008	13255-91008	13255-91008	02640-60008
02640-60018	13255-91018	13255-91018	02640-60018
02640-60024	13255-91024	13255-91024	02640-60024
02640-60031	13255-91031	13255-91031	02640-60031
02640-60032	13255-91032	13255-91032	02640-60032
02640-60053	13255-91053	13255-91053	02640-60053
02640-60063	13255-91063	13255-91063	02640-60063
02640-60065	13255-91065	13255-91065	02640-60065
02640-60069	13255-91069	13255-91069	02640-60069
02640-60082	13255-91082	13255-91082	02640-60082
02640-60086	13255-91086		
02640-60088	13255-91112	13255-91095	02640-60095
02640-60095	13255-91095	13255-91106	02640-60106
02640-60106	13255-91106	13255-91107	02640-60107
02640-60107	13255-91107	13255-91112	02640-60088,-60112
02640-60112	13255-91112	13255-91119	02640-60119
02640-60119	13255-91119	13255-91124	02640-60124
02640-60124	13255-91124	13255-91125	02640-60125
02640-60125	13255-91125	13255-91126	02640-60126
02640-60126	13255-91126	13255-91128	02640-60128
02640-60128	13255-91128	13255-91137	02640-60137
02640-60137	13255-91137	13255-91143	02640-60143
02640-60143	13255-91143	13255-91144	02640-90144
02640-60144	13255-91144	13255-91146	02640-60146
02640-60146	13255-91146	13255-91150	02640-60150
02640-60149	13255-91007	13255-91171	02640-60171
02640-60150	13255-91150	13255-91192	02640-60192
02640-60153	13255-91245	13255-91203	02640-60169,-60202,-60203
02640-60171	13255-91171	13255-91256	02640-60256
02640-60192	13255-91192	13255-91221	02640-60221,-60216
02640-60169	13255-91203	13255-91245	02640-60245,-60244,-60002
02640-60202	13255-91203	13255-91246	02640-60246
02640-60203	13255-91203	13255-91223	02640-60223
02640-60256	13255-91256	13255-91239	02640-60239
02640-60221	13255-91221	13255-91243	02640-60243
02640-60216	13255-91221	13255-91249	02640-60249
02640-60245	13255-91245	13255-91252	02640-60252
02640-60246	13255-91246		
02640-60223	13255-91223		
02640-60239	13255-91239		
02640-60243	13255-91243		
02640-60249	13255-91249		
02640-60250	13255-91250		
02640-60252	13255-91252		
02640-60267	13255-91267		

PRODUCT/MODULE CROSS-REFERENCE

CODE: A=Accessory   O=Option   S=Standard   K=Service Kit

Module Number	Module Nomenclature	40 B	40 N	40 S	41 A	45 A	45 K	45 N	45 R	45 S	13290 B	48 A	49 A	49 B	49 C
13255-91007	4K Prom	-	-	-	-	-	-	-	-	-	-	-	A	-	-
13255-91008	Processor 8008-1	S	S	S	-	-	-	-	-	-	-	-	-	-	-
13255-91018	Keyboard	S	S	S	S	S	S	S	S	S	S	S	O	S	S
13255-91024	Display Expansion	A	A	A	S	A	S	A	S	A	A	A	A	A	A
13255-91031	Duplex Register	A	A	A	A	A	A	A	A	A	A	A	A	A	A
13255-91032	Cartridge Tape	-	-	-	O	O	O	O	O	O	S	O	O	O	O
13255-91053	Prom Character	A	A	A	A	A	A	A	A	A	A	A	A	A	A
13255-91063	Display Test	K	K	K	K	K	K	K	K	K	K	K	K	K	K
13255-91065	4K Memory	A	A	A	SA	SA	SA	SA	SA	SA	-	A	A	SA	-
13255-91069	Simplified Keyboard	-	-	-	-	-	-	-	-	-	-	-	O	-	-
13255-91082	CTU Test	-	-	-	K	K	K	K	K	K	K	K	K	K	K
13255-91086	Async Data Comm	S	S	S	S	S	S	S	S	S	S	S	A	S	S
13255-91095	Sweep Board	S	S	S	S	S	S	S	S	S	S	S	S	S	S
13255-91106	Async Multipoint	-	-	-	A	A	A	A	A	A	A	A	A	A	A
13255-91107	Sync Multipoint	-	-	-	A	A	A	A	A	A	A	A	A	A	A
13255-91112	Display Control	S	S	S	S	S	S	S	S	S	S	S	S	S	S
13255-91119	Comp Video IF	A	A	A	A	A	A	A	A	A	A	A	A	A	A
13255-91246	Extended Keyboard IF	S	S	S	S	S	S	S	S	S	S	S	O	S	S
13255-91124	Extended DMA	-	-	-	S	S	S	S	S	S	S	S	S	S	S
13255-91125	Graphics Controller	-	-	-	-	-	-	-	-	-	-	S	O	-	S
13255-91126	Graphic Memory	-	-	-	-	-	-	-	-	-	-	S	O	-	S

PRODUCT/MODULE CROSS-REFERENCE

CODE: A=Accessory   O=Option   S=Standard   K=Service Kit

Module Number	Module Nomenclature	40 B	40 N	40 S	41 A	45 A	45 K	45 N	45 R	45 S	13290 B	48 A	49 A	49 B	49 C
13255-91128	HP-IB	-	-	-	-	-	-	-	-	-	-	-	A	-	-
13255-91137	CTU IF	-	-	-	O	O	O	O	O	O	S	O	O	O	O
13255-91143	GP Async Data Comm	A	A	A	A	A	A	A	A	A	A	A	A	A	A
13255-91144	Control Store	S	S	S	-	-	-	-	-	-	-	-	O	-	-
13255-91146	High Speed Par Part	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13255-91150	ROM (EA)	-	-	-	-	-	-	-	-	-	-	-	O	-	-
13255-91171	Universal Memory	-	-	-	A	A	A	A	A	A	S	S	A	A	S
13255-91192	Control Memory	-	-	-	S	S	S	S	S	S	S	S	O	S	S
13255-91203	Power Supply	S	S	S	S	S	S	S	S	S	S	S	S	S	S
13255-91256	Processor (8080)	-	-	-	S	S	S	S	S	S	S	S	S	S	S
13255-91221	32K B/S Cont Mem	-	-	-	-	-	-	-	-	-	S	-	-	-	-

ASSEMBLY/ROM/PRODUCT CROSS-REFERENCE

FIRMWARE ROMS

CAUTION! Firmware ROMs are MOS devices. Care must be
taken to avoid static discharge when handling.

HP PART # 1818-	40B	40N	40S	41A	45A	45K	45N	45R	45S	13298A	40B	49A	49B	49C	ROM DESCRIPTION	ASSY # 02640-	REF DES
0173	S	S	S												2640X Firmware	60144	2-4K
0174	S	S	S												2640X Firmware	60144	4-6K
0175	S	S	S												2640X Firmware	60144	6-8K
0201		S													2640N Firmware	60144	0-2K
0202			S												2640S Firmware	60144	0-2K
0259	S														2640B Firmware	60144	0-2K
0203						S						S	O		264X Orig. Main	60192	0-2K
0205												S	O		264X Orig. Main	60192	4-6K
0206				S	S	S	S		S			S	O	S	264X Orig. Main	60192	6-8K
0207					S		S		S			S	O	S	264X Orig. Main	60192	8-10K
0208				O	O	O	O	O	O			S	O	O	264X Orig.Dev.Sup.	60192	10-12K
0209				O	O	O	O	O	O			S	O	O	264X Orig.Dev.Sup.	60192	12-14K
0210				O	O	O	O		O			S	O	O	264X Orig.Dev.Sup.	60192	14-16K

```
                          1
                          3
                          2
        4 4 4 4 4 4 4 4 4 9 4 4 4
HP PART 0 0 0 1 5 5 5 5 5 8 0 9 9 9     ROM DESCRIPTION      ASSY #   REF
# 1818- B N S A A K N R S A B A B C                          02640-   DES
======= = = = = = = = = = = = = =       ==================   ======   ======
0211                        S O         264X Orig.Dev.Sup.   60192    16-18K
------- - - - - - - - - - - - - -
0212        S               S O S       2645 Keyboard        60192    18-20K
------- - - - - - - - - - - - - -
0213      S       S         S O         264X Orig.Pt.to Pt.  60192    20-22K
------- - - - - - - - - - - - - -
0273      S                             2641 Main Code       60192    8-10K
------- - - - - - - - - - - - - -
0274      O                             2641 Device Sup.     60192    16-18K
------- - - - - - - - - - - - - -
0275      S                             2641 Keyboard        60192    18-20K
------- - - - - - - - - - - - - -
0276      S                             2641 Main Code       60192    28-30K
------- - - - - - - - - - - - - -
0278                      O             264X Binary Loader   60192    0-2K
------- - - - - - - - - - - - - -
0287      S S   S     S     S O S       264X Original Main   60192    8-10K
------- - - - - - - - - - - - - -
0298                S                   2645R Main Code       60192   0-2K
------- - - - - - - - - - - - - -
0299                S                   2645R Main Code       60192   2-4K
------- - - - - - - - - - - - - -
0300                S                   2645R Main Code       60192   4-6K
------- - - - - - - - - - - - - -
0301                S                   2645R Main Code       60192   6-8K
------- - - - - - - - - - - - - -
0302                S                   2645R Main Code       60192   8-10K
------- - - - - - - - - - - - - -
0303                  O                 2645R Device Sup.     60192   14-16K
------- - - - - - - - - - - - - -
0304                   S                2645S Keyboard        60192   18-20K
------- - - - - - - - - - - - - -
0310                  O                 2645R Device Sup.     60192   16-18K
------- - - - - - - - - - - - - -
```

HP PART # 1818-	40B	40N	40S	41A	45A	45K	45N	45R	45S	132 98A	40B	49A	49B	49C	ROM DESCRIPTION	ASSY # 02640-	REF DES
0311								S							2645R Keyboard	60192	18-20K
0312								S							2645R Main Code	60192	28-30K
0324								S							2645R Main Code	60192	30-32K
0365						S									2645K Main Code	60192	0-2K
0366						S									2645K Main Code	60192	2-4K
0367						S									2645K Main Code	60192	4-6K
0368						S									2645K Main Code	60192	8-10K
0369						O									2645K Device Sup.	60192	16-18K
0370						S									2645K Keyboard	60192	18-20K
0371						S									2645K Pt. to Pt.	60192	20-22K
0401									S	O			S		2648 Original Main	60192	0-2K
0402									S	O			S		2648 Original Main	60192	2-4K
0403									S	O			S		2648 Original Main	60192	4-6K
0404										O					2648 Original Main	60192	6-8K
0405									S	O			S		2648 Original Main	60192	8-10K
0406									O	O			O		2648 Orig.Dev.Sup.	60192	10-12K
0407									O	O			O		2648 Orig.Dev.Sup.	60192	12-14K
0408									O	O			O		2648 Orig.Dev.Sup.	60192	14-16K
0409									O	O			O		2648 Orig.Dev.Sup.	60192	16-18K

```
                          1
                          3
                          2
        4 4 4 4 4 4 4 4 4 9 4 4 4
HP PART 0 0 0 1 5 5 5 5 5 8 0 9 9 9   ROM DESCRIPTION      ASSY #  REF
======= = = = = = = = = = = = = = =   ==================   ======  ======
 0410                 S   O   S       2648 Keyboard        60192   18-20K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0411                 S   O   S       2648 Orig.Pt.to Pt.  60192   20-22K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0412                 S   O   S       2648 Original Main   60192   24-26K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0413                 S   O   S       2648 Original Main   60192   26-28K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0414                 S   O   S       2648 Original Main   60192   28-30K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0415                 S   O   S       2648 Original Main   60192   30-32K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0416                 S   O   S       2648 Original Main   60192   38-40K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0417                 S   O   S       2648 Original Main   60192   40-42K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0418                 S   O   S       2648 Original Main   60192   42-44K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0419                 S   O   S       2648 Original Main   60192   44-46K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0420                 S   O   S       2648 Original Main   60192   46-48K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0426           O   O   O     O O     264X Cur.Dev.Sup.    60192   16-18K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0433           A   A   A A O         264X MntrModeMltpt   60192   20-22K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0434           A   A   A A O         264X Multipoint      60192   20-22K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0435           A   A   A A O         264X Multipoint      60192   22-24K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0437       S                         2645K Main Code      60192   28-30K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0446                 S   O   S       2648A Cur.MainCode   60192   6-8K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0448           S   S   S S O         264X Cur.Main Code   60192   4-6K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0512           S   S   S   O   S     264X Cur.Main Code   60192   0-2K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
 0513           S   S   S   O   S     264X Cur.Pt.to Pt.   60192   20-22K
------- - - - - - - - - - - - - - -   ------------------   ------  ------
```

```
                              1
                              3
                              2
            4 4 4 4 4 4 4 4 4 9 4 4 4
HP PART     0 0 0 1 5 5 5 5 5 8 0 9 9 9   ROM DESCRIPTION       ASSY #  REF
=======     = = = = = = = = = = = = = =   ==================    ======  =====
 0547                         S   O   S   2648 Org. Pt to Pt    60192   20-22K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0548                         S   O   S   2648 Org Main         60192   2-4K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0552                   S                 2645N Keyboard        60192   18-20K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0747                         S   O   S   2648 Org Main         60192   26-28K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0748                         S   O   S   2648 Org Main         60192   28-30K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0749                         S   O   S   2648 Org Main         60192   30-32K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
 0755                         S   O   S   2648 Org Main         60192   38-40K
 ------     - - - - - - - - - - - - - -   ------------------    ------  ------
```

ASSEMBLY/ROM/PRODUCT CROSS-REFERENCE

CHARACTER SET ROMS

FUNCTION	ASSY # 02640-	REF DES	HP PART # 1816-	40B	40N	40S	41A	45A	45K	45N	45R	13295S	40B	48A	49A
Upper Case Roman	60112	U310	0612	S	S	S	S						S	S	O
Lower Case Roman	60112	U28	0613	O			O	O	S				S	S	O
Upper Norwegian	60112	U310	0866	S					S						
Lower Norwegian	60112	U28	0867	O					S						
Upper Swedish	60112	U310	0864		S					S					
Lower Swedish	60112	U28	0865		O					O					
Math Set	60024	U29	0642	A	A	A	O	A	A	A	A		A	A	A
Line Set	60024	U39	0641	A	A	A	O	A	A	A	A		A	A	A
Large Char Set	60024	U49	0947	A	A	A	O	A	A	A	A		A	A	A
Upper APL	60024	U29	0984					S							
Lower APL	60024	U210	0985					S							
Overstrike APL	60024	U39	0986					S							
Upper Case Roman with Katakana	60112	U310	0743								S				
Katakana	60024	U29	0744								S				
Arabic	60024	U29	1013									S			
Arabic	60024	U210	1014									S			

MANUFACTURER'S CODE LIST

MFG #	MANUFACTURER NAME	ADDRESS
00000	U.S.A. COMMON	ANY SUPPLIER OF USA
0026W	WESTERN DIGITAL CORP	NEWPORT BEACH, CA 92663
0053S	SCHAAL BROS INC	BERTHOUD, CO 80513
01121	ALLEN-BRADLEY CO	MILWAUKEE, WI 53212
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS, TX 75231
01961	PULSE ENGINEERING INC	SAN DIEGO, CA 92111
02660	BUNKER RAMO CORP AMPHENOL CONN DIV	BROADVILLE, IL 60153
02735	RCA CORP SOLID STATE DIV	SOMMERVILLE, NJ 08876
03296	NYLON MOLDING CORP	SPRINGFIELD, NJ 07081
04009	ARROW-HART INC	HARTFORD, CT 06106
04426	ILLINOIS TOOL WORKS INC LICON DIV	CHICAGO, IL 60634
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX, AZ 85008
05216	PHOENIX TRANSFORMER CO	PHOENIX, AZ 85034
05820	WAKEFIELD ENGINEERING INC	WAKEFIELD, MA 01880
05972	LOCTITE CORP	NEWINGTON, CT 06111
06090	RAYCHEM CORP	MENLO PARK, CA 94025
06915	RICHO PLASTIC CO	CHICAGO, IL 60646
07263	FAIRCHILD SEMICONDUCTOR DIV	MOUNTAIN VIEW, CA 94040
08530	RELIANCE MICA CORP	BROOKLYN, NY 11232
09353	C AND K COMPONENTS INC	WATERTOWN, MA 02172
09922	BURNDY CORP	NORWALK, CT 06852
11236	CTS OF BERNE INC	BERNE, IN 46711
12954	DICKSON ELECTRONICS CORP	SCOTTSDALE, AZ 85252
13103	THERMALLOY CO	DALLAS, TX 75247
13862	ALASCO RUBBER & PLASTICS CORP	BURLINGAME, CA 94010
15818	TELEDYNE SEMICONDUCTOR	MOUNTAIN VIEW, CA 94040
16037	SPRUCE PINE MICA CO	SPRUCE PINE, NC 28777
16428	BELDEN CORP	RICHMOND, IN 47374
18324	SIGNETICS CORP	SUNNYVALE, CA 94086
19701	MEPCO/ELECTRA CORP	MINERAL WELLS, TX 76067
21109	ABLESTIK ADHESIVE CO INC	GARDENA, CA 90248
22526	BERG ELECTRONIC INC	CUMBERLAND, PA 17070
23875	M-TRON INDUSTRIES INC	YANKTON, SD 57078
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD, PA 16701
24931	SPECIALTY CONNECTOR CO INC	INDIANAPOLIS, IN 46227
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA, CA 95051
27264	MOLEX PRODUCTS CO	DOWNERS GROVE, IL 60515
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO, CA 94304
28984	COMPONENTS SPECIALTIES CORP	TEMPLE CITY, CA 91780
3G003	GENERAL ELECTRIC CO	PHILADELPHIA, PA 19101
3H674	NIPPON MINIATURE BEARINGS	CULVER CITY, CA 90230
31471	AMERICAN MICRO SYSTEMS INC	SANTA CLARA, CA 95051
32997	BOURNS INC TRIMPOT PROD DIV	RIVERSIDE, CA 92507
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE, CA 94086
34649	INTEL CORP	MOUNTAIN VIEW, CA 94040
5E440	STILLMAN RUBBER CO	ENGLEWOOD, NJ 07631
50783	PENN-TRAN CORP	BELLEFONTE, PA 16823

MANUFACTURER'S CODE LIST

MFG #	MANUFACTURER NAME	ADDRESS
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56289	SPRAGUE ELECTRIC CO	NORTH ADAMS, MA 01247
59730	THOMAS & BETTS CO THE	ELIZABETH, NJ 07207
61957	USM CORP	BOSTON, MA 02107
70472	ASSOCIATED SPRING CORP	BRISTOL, CT 06010
71400	BUSSMAN MFG DIV OF MCGRAW-EDISON CO	ST LOUIS, MO 63017
71468	ITT CANNON ELECTRIC CO	SANTA ANA, CA 92702
71590	CENTRALAB ELEK DIV GLOBE-UNION INC	MILWAUKEE, WI 53201
71744	CHICAGO MINIATURE/DRAKE	CHICAGO, IL 60640
71785	TRW ELEK COMPONENTS CINCH DIV	ELK GROVE VILLAGE, IL 60007
72136	ELECTRO MOTIVE CORP SUB IEC	WILLIMANTIC, CT 06226
72619	DIALIGHT CORP SUB DIGITRONICS CORP	BROOKLYN, NY 11237
73138	BECKMAN INSTRUMENTS INC HELIPOT DIV	FULLERTON, CA 92634
73734	FEDERAL SCREW PRODUCTS CO	CHICAGO, IL 60618
74970	JOHNSON E F CO	WASECA, MN 56093
75042	TRW INC PHILADELPHIA DIV	PHILADELPHIA, PA 19108
75915	LITTELFUSE INC	DES PLAINES, IL 60016
76381	3M COMPANY	ST PAUL, MN 55101
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF	ELGIN, IL 60126
79136	WALDES-KOHINOOR INC	LONG ISLAND CITY, NY 11101
79963	ZIERICK MFG CO	MT KISCO, NY 10549
80120	SCHNITZER ALLOY PRODUCTS CO	ELIZABETH, NJ 07206
80126	PACIFIC ELECTRICORD CO	GARDENA, CA 90247
81073	GRAYHILL INC	LA GRANGE, IL 60525
81640	CONTROLS CO OF AMER CONT SWITCH DIV	FOLCROFT, PA 19032
83330	SMITH HERMAN H INC	BROOKLYN, NY 11207
84830	LEE SPRING CO	BROOKLYN, NY 11201
86928	SEASTROM MFG CO	GLENDALE, CA 91201
88245	LITTON PRECISION PROD INC USECO DIV	VAN NUYS, CA 91409
9D949	AMPHENOL SALES DIV OF BUNKER-RAMO	HAZELWOOD, MO 63042
90201	MALLORY CAPACITOR CO	INDIANAPOLIS, IN 46206
91506	AUGAT INC	ATTLEBORO, MA 02703
91637	DALE ELECTRONICS INC	COLUMBUS, NE 68601
92194	ALPHA WIRE CORP	ELIZABETH, NJ 07207
93907	CAMCAR SCREW & MFG CO	ROCKFORD, IL 61101
94222	SOUTHCO INC	LESTER, PA 19113
95712	BENDIX CORP THE MICROWAVE DEVICES	FRANKLIN, IN 46131
95987	WECKESSER CO INC	CHICAGO, IL 60641
96904	NATVAR CORP	WOODBRIDGE, NJ 07095
97464	INDUSTRIAL RETAINING RING CO	IRVINGTON, NJ 07111
98410	E T C INC	CLEVELAND, OHIO 44103
99800	AMER PRCN IND INC DELEVAN DIV	AURORA, NY 14052