

HEWLETT  PACKARD

OPERATING AND SERVICE MANUAL

12602A

COMPUTER INTERFACE KIT for OPTICAL MARK READER



Note

This manual should be retained with volume three of the computer documentation.

HP Computer Museum
www.hpmuseum.net

For research and education purposes only.

UPDATING SUPPLEMENT 15 OCT 1969

MANUAL IDENTIFICATION

Manual Serial Prefixed: N/A
Manual Printed: AUG 1969
Manual Part Number: 12602-9001

SUPPLEMENT DESCRIPTION

The purpose of this supplement is to correct manual errors (Errata) and to adapt the manual to instruments containing production improvements made subsequent to the printing of the manual. Enter the new information (or the Change Number, if more convenient) into the appropriate places in the manual, identified at left.

INSTRUMENT CHANGES

Prefix-Serial	Changes

ASSEMBLY CHANGES

Ref Des	Description	HP Part No.	Rev	Changes

CHANGE

DESCRIPTION

- | | |
|---|--|
| 1 | Paragraph 3-8, step '1': Change switch register setting from 044003 to 050003. |
|---|--|



CHANGE

DESCRIPTION

2

Replace figure 3-1 in the manual with the following figure 3-1.

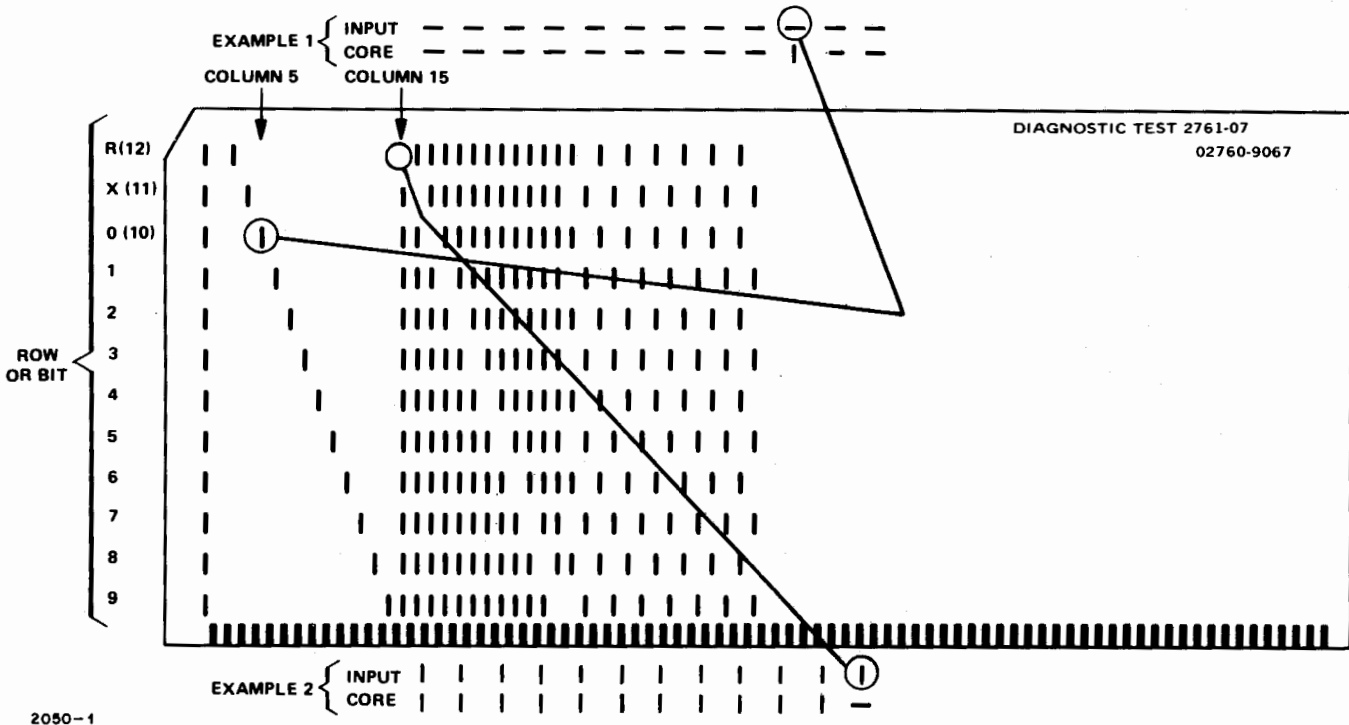


Figure 3-1. Data Input Test Errors

TABLE OF CONTENTS

Section	Page	Section	Page
I		III	
GENERAL INFORMATION		MAINTENANCE	
1-1. Introduction	1-1	3-1. Introduction	3-1
1-3. General Description	1-1	3-3. Diagnostics	3-1
1-7. Identification	1-1	3-5. Flag and Interrupt Circuitry Test	3-1
II		3-7. Data Input Test	3-1
INSTALLATION AND PROGRAMMING		3-9. Interpreting Data Errors	3-2
2-1. Introduction	2-1	3-12. Diagnostic Program Listing	3-2
2-3. Unpacking and Inspection	2-1		
2-5. Installation	2-1	IV	
2-8. Programming	2-1	REPLACEABLE PARTS	
2-10. Assembly Language	2-1	4-1. Introduction	4-1
2-15. FORTRAN	2-2	4-3. Ordering Information	4-1
2-18. ALGOL	2-2		
2-21. BASIC	2-2		

LIST OF ILLUSTRATIONS

Figure	Title	Page
3-1.	Data Input Test Errors	3-2

LIST OF TABLES

Table	Title	Page	Table	Title	Page
2-1.	Interconnecting Cable Connector Pin Functions	2-1	4-2.	List of Reference Designations and Abbreviations	4-2
4-1.	Replaceable Parts	4-1	4-3.	Code List of Manufacturers	4-3

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

1-2. This operating and service manual covers general information, installation, programming, and maintenance instructions for the Hewlett-Packard 12602A Interface Kit.

1-3. GENERAL DESCRIPTION.

1-4. The HP 12602A Interface Kit provides the necessary equipment to enable using the HP 2761A-07 Optical Mark Reader with an HP 2114, HP 2115, or HP 2116 Computer. The kit consists of the following items:

- a. 16-bit duplex register card (part no. 12554-60023).
- b. Interconnecting cable (part no. 12602-6002).
- c. Basic control system driver tape (HP 20027A).
- d. System input/output driver tapes for computers with 4K, 8K, or 16K memories (HP 20520B, HP 20521B, and HP 20522A, respectively).
- e. Optical mark reader binary diagnostic tape (HP 20347B).
- f. Ten test cards (part no. 02760-9067).
- g. 24-pin printed circuit card test connector (part no. 1251-0332).
- h. 16-bit duplex register card diagnostic tape (HP 20416C).
- i. Operating and Service Manual for the HP 12602A Interface Kit (part no. 12602-9001).
- j. Operating and Service Manual for the HP 12554A Interface Kit (part no. 12554-90021).

Note

Diagnostic test tape revisions are indicated by a change in the model number suffix letter. Required changes to the diagnostic operating procedures are reflected in updating supplements attached to this manual.

1-5. The interface kit is designed to permit transfer of data in the 12-bit parallel mode between the reader and the computer. The 16-bit duplex register card in the kit is a single-address input/output (I/O) card and uses positive-in/positive-out logic. Refer to the attached manual for the HP 12554A Interface Kit for a detailed theory of operation, logic diagram, and replaceable parts list for the 16-bit duplex register card.

1-6. The following information is transferred from the reader to the I/O interface card:

- | | |
|--------------------|---------------------------------|
| a. Bits 0 thru 11: | Data |
| b. Bits 12 and 13: | Status conditions of the reader |
| c. Bit 14: | Extended card-in-gate signal |
| d. Bit 15: | Card-in-gate signal |
| e. Flag: | Data status |

1-7. IDENTIFICATION.

1-8. Printed-circuit card revisions are identified by a letter and a date code stamped on the card. The letter code identifies the version of the etched trace pattern on the unloaded card. The date code refers to the electrical characteristics of the loaded card. If the date code stamped on the printed-circuit card does not agree with the date code shown on the schematic diagram in the HP 12554A Interface Kit manual for the positive-in/positive-out duplex register card, there are differences between your card and the card described in that manual. These differences are described in change sheets and manual supplements available at the nearest HP Sales and Service Office.

SECTION II

INSTALLATION AND PROGRAMMING

2-1. INTRODUCTION.

2-2. This section provides information on unpacking, inspection, installation, and programming for the HP 12602A Interface Kit.

2-3. UNPACKING AND INSPECTION.

2-4. If the shipping carton is damaged upon receipt, request that the carrier's agent be present when the kit is unpacked. Inspect the kit for damage (cracks, broken parts, etc.). If the kit is damaged or fails to meet specifications, notify the carrier and the nearest Hewlett-Packard Sales and Service Office immediately. (Sales and Service Offices are listed at the back of this manual.) Retain the shipping container and the packing material for the carrier's inspection. The Hewlett-Packard Sales and Service Office will arrange for the repair or replacement of the damaged kit without waiting for any claims against the carrier to be settled.

2-5. INSTALLATION.

2-6. To install the interface kit, proceed as follows:

- a. If computer is running a program, press HALT switch.
- b. Turn power off at computer and HP 2761-07 Optical Mark Reader.
- c. Open computer and plug 16-bit duplex register card into a slot in card cage. Make certain that all higher priority slots have either another I/O card or a priority jumper card installed.
- d. Connect 48-pin connector on interconnecting cable to installed card. Pass other end of cable out of rear of computer.
- e. Close computer and connect free end of interconnecting cable to connector on rear of reader.

2-7. Table 2-1 contains a list of pin assignments for the interconnecting cable. Pin assignments for both the 25-pin male connector that connects to the reader and the 48-pin printed-circuit card connector that connects to the interface card are listed.

2-8. PROGRAMMING.

2-9. The computer may be programmed in assembly language, BASIC, FORTRAN, and ALGOL. All necessary software required for programming the computer is supplied as part of the interface kit computer-software

package. Two types of drivers are included in the software supplied. The system input/output (SIO) driver tape permits reading without interrupt control; the basic control system (BCS) driver tape is for input under interrupt control. The general format for the four programming languages is shown in the following paragraphs.

Note

Hollerith coded card data is converted to ASCII characters by driver software in all cases.



Table 2-1. Interconnecting Cable Connector Pin Functions

CARD READER CONNECTOR PIN	INTERFACE CARD CONNECTOR PIN	FUNCTION
1	1	Data output row R (12)
2	2	Data output row X (11)
3	3	Data output row 0 (10)
4	4	Data output row 1
5	5	Data output row 2
6	6	Data output row 3
7	7	Data output row 4
8	8	Data output row 5
9	9	Data output row 6
10	10	Data output row 7
11	11	Data output row 8
12	12	Data output row 9
13	16	Card-in-gate
14	-	Test
15	-	Test
16	13	Feed status
17	BB	Ground
19	B	Clear-to-send
20	A	+ Feed control
21	14	Hopper/stacker status
22	15	End-of-card status
23	23	Flag
24	24	Ground
25	BB	Ground
All others	All others	Not used

2-10. ASSEMBLY LANGUAGE.

2-11. USING THE SIO DRIVER. When using the SIO driver for assembly language programming, the calling sequence is for input without interrupt control. The general format is as follows:

<u>Operation</u>	<u>Operand</u>
LDA	Buffer length. (Use positive number for characters and negative number for words.)
LDB	Buffer address
JSB	101B,I

2-12. The following is an example of a typical program calling sequence using the SIO driver. The program will read 40 hollerith characters into 20 consecutive memory locations beginning at the address contained in TBLE.

<u>Operation</u>	<u>Operand</u>
LDA	LNPTH
LDB	TBLE
JSB	101B,I
:	:
:	:
LNPTH DEC	40

2-13. USING THE BSC DRIVER. When using the BCS driver for assembly language programming, the calling sequence is for programs that require data input under interrupt control. The general format is as follows:

<u>Operation</u>	<u>Operand</u>
JSB	.IOC.
OCT	Function (Read hollerith = 10005 and read binary = 10105, assuming reader is unit 5.)
JMP	Reject address
DEF	Buffer address
DEC	Buffer length (Use negative number for characters and positive number for words.)

2-14. The following is an example of a typical program calling sequence using the BCS driver. The program will read 40 hollerith characters into 20 consecutive memory locations beginning at TBLE. If the I/O request is rejected, the program will go to REJ.

<u>Operation</u>	<u>Operand</u>
JSB	.IOC.
OCT	10005
JMP	REJ
DEF	TBLE
DEC	-40

2-15. FORTRAN.

2-16. When programming in FORTRAN, the following format is used for the calling sequence:

<u>Operation</u>	<u>Operand</u>
READ	(unit, format) list (This form is used for hollerith records.)
READ	(unit) list (This form is used for binary records.)

2-17. The following is a typical program example in FORTRAN for reading values for variables A1, A2, A3, and A4 assuming that the reader is unit 5.

<u>Operation</u>	<u>Operand</u>
READ	(5,101) A1, A2, A3, A4
101 FORMAT	(4F10.3)

2-18. ALGOL.

2-19. When programming in ALGOL, the following format is used for the calling sequence:

<u>Operation</u>	<u>Operand</u>
READ	(unit, format, list) (This form is used for hollerith records.)
READ	(unit, list) (This form is used for binary records.)

2-20. The following is a typical program example in ALGOL for reading values for variables A1, A2, A3, and A4 assuming that the reader is unit 5.

<u>Operation</u>	<u>Operand</u>
FORMAT P1	(4F10.3)
READ	(5, P1, A1, A2, A3, A4)

2-21. BASIC.

2-22. The standard Hewlett-Packard BASIC language interpreter can be specially configured to use the SIO driver with computers having 8K or larger memories. Instructions for doing this are contained in appendix B of the HP BASIC Language Reference Manual (part no. 02116-9077). When so configured, the SIO driver can be accessed in a BASIC program through a statement of the following form:

CALL (<driver number>,<parameter list>)

2-23. The HP 20115B BASIC Educational System Program is specially configured to use the BASIC marked card (part no. 02760-9051) with the HP 12602A Interface Kit. In this case, BASIC programs are read in directly and the calling statement is not required.

SECTION III MAINTENANCE

3-1. INTRODUCTION.

3-2. This section contains instructions and data for conducting diagnostic tests for the HP 12602A Interface Kit and the HP 2761A-07 Optical Mark Reader.

3-3. DIAGNOSTICS.

3-4. The following paragraphs provide diagnostic test procedures to verify that the reader and interface card are operating properly in conjunction with the computer. The diagnostic tests are given in two parts: (1) a basic test of flag and interrupt circuitry, and (2) a data input test to ensure accuracy of data transfer. Following the diagnostic tests is a complete tabular listing of the diagnostic program. The following items are required to run the diagnostic tests:

a. System input/output (SIO) driver tape for 4K, 8K, or 16K buffered teleprinter as required (HP 20322A, HP 20323A, or HP 20330B, respectively).

b. Optical mark reader binary diagnostic tape (HP 20347B). *20899 - 60001 REV B*

c. Ten test cards (part no. 02760-9067).

Note

Diagnostic test tape revisions are indicated by a change in the model number suffix letter. Required changes to the diagnostic operating procedures are reflected in updating supplements attached to this manual.

3-5. FLAG AND INTERRUPT CIRCUITRY TEST.

3-6. To check the flag and interrupt circuitry of the interface card, proceed as follows:

a. Load reader binary diagnostic tape (HP 20347) into computer.

b. Load SIO driver tape (HP 20322A, HP 20323A, or HP 20330B) into computer. Set switch register to 000002 and press LOAD ADDRESS switch. Load switch register with select code of teleprinter interface card and press RUN switch. Computer should halt at address 102077. (Address should appear in M-register.)

c. Set switch register to 002000 and press LOAD ADDRESS switch. Then press RUN switch. Teleprinter should request remaining information. Type select code of reader interface card and press RETURN and LINE FEED keys on teleprinter.

d. Set computer switch register to 000003.

e. Press RUN switch. The teleprinter should type BEGIN BASIC TEST END BASIC TEST, BEGIN DATA INPUT TEST END DATA INPUT TEST.

3-7. DATA INPUT TEST.

3-8. The data input test should follow the flag and interrupt circuitry test in the preceding paragraphs. After completing the test in paragraph 3-5, proceed as follows:

a. Set computer switch register to 000007.

b. Press STOP switch on reader.

c. Press RUN switch on computer. Teleprinter should type NOT READY. If NO FLAG UNIT ON is typed, check control card in reader.

d. Place weight in reader without cards.

e. Momentarily press READY switch on reader. READY lamp should light momentarily. If READY lamp does not light, check lamp and control card in reader.

f. Press RUN switch on computer. Teleprinter should type HOPPER EMPTY/STACKER FULL. If an incorrect diagnostic is typed, check hopper switch or control card in reader.

g. Place diagnostic card deck (02760-9067) in reader and press READY switch on reader.

h. While holding cards from feeding into reader, press RUN switch on computer. Teleprinter should type NO CARD FEED. If abnormal result is obtained, check the following:

(1) If reader did not attempt to feed cards, check reader control card.

(2) If teleprinter typed NO FLAG UNIT ON, check reader control card.

(3) If teleprinter typed a series of blanks for data, check card-in-gate signal.

i. Set computer switch register to 040003.

j. Place test card deck in reader hopper with weight.

k. Press READY switch on reader and then press RUN switch on computer. The teleprinter should print out DATA OK for each card in the reader hopper. If an error occurs, refer to paragraph 3-9.

1. On computer, set switch register to 044003. Reader should now read remaining cards at approximately 210 cards-per-minute.

3-9. INTERPRETING DATA ERRORS.

3-10. During the data input test, the first 40 columns of data on each test card are compared to corresponding data in computer memory. If the data on the test card and the data in memory are the same, the teleprinter types out DATA OK for each card. If there is an error, the teleprinter types out the memory core data and the input data of the column where the error occurred for comparison. For example, the following may be typed by the teleprinter:

```
INPUT -----
CORE ----- 1 --
```

An examination of the test card (figure 3-1) indicates that column 5 of the test card is the column that corresponds to the core printout on the teleprinter. Each column where an error occurs is printed across the page with bit 9 on the left

and bit R (12) on the right. Note that column 5 on the test card is all blanks except for bit 0. Since the input data shows all blanks for column 5, including bit 0, an error is indicated in column 5, bit 0. As a second example:

```
INPUT 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
CORE 1 1 1 1 1 1 1 1 1 1 1 1 1 1 --
```

The second example indicates an error in column 15, bit R (12). When an error occurs, circle the error on the test card to identify the channel involved and to provide a troubleshooting aid.

3-11. If a special listing of a particular card is desired, place switch register to 144003. The teleprinter will then type a binary list of the card image.

3-12. DIAGNOSTIC PROGRAM LISTING.

3-13. The following is a complete listing of the reader diagnostic program.

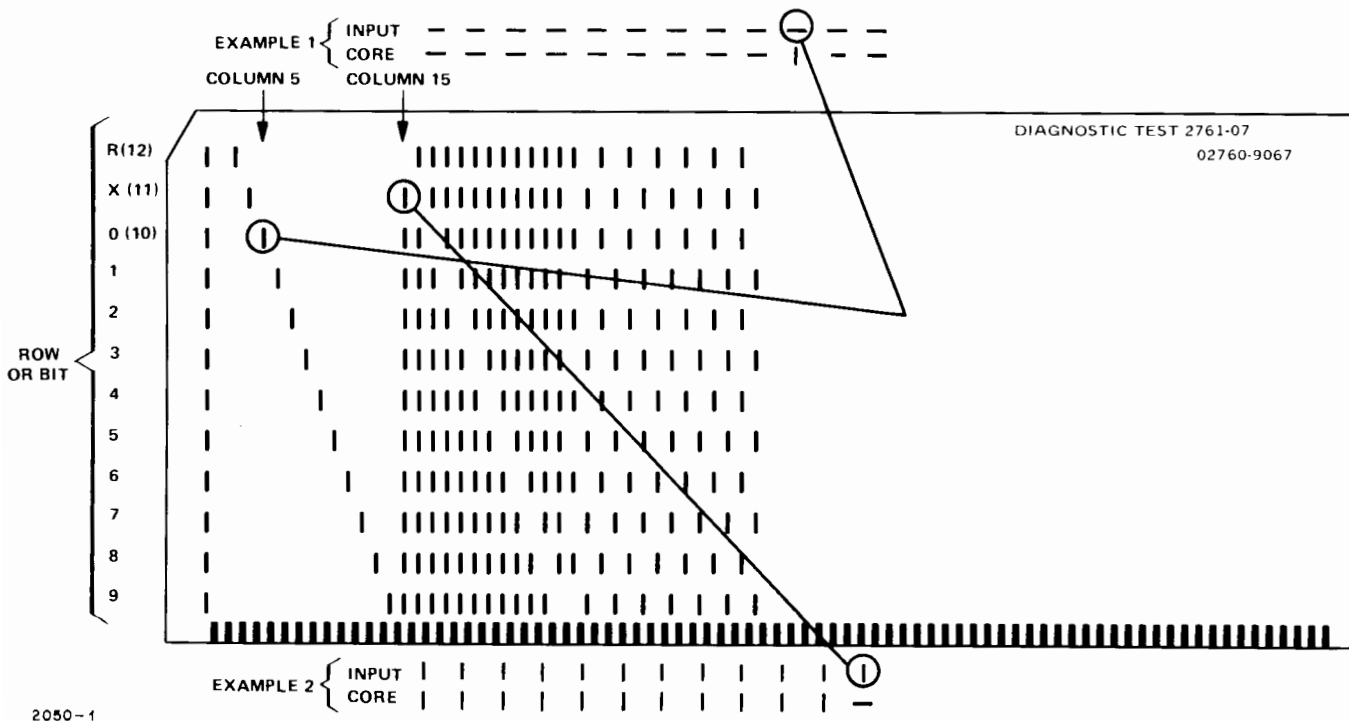


Figure 3-1. Data Input Test Errors

MARK SENSE CARD READER
DIAGNOSTIC

BINARY TAPE - HP20347B
SOURCE TAPE - HP20560B
SOURCE LISTING HP20347BL

PAGE 0001

0001		ASMB,A.B.L,T	JUNE 10, 1969
Z	003405		
AS1	000111		
AS2	000112		
AS3	000113		
AS5	000114		
AT	003202		
BIN	000126		
BOX	000127		
BS1	000130		
BS2	000131		
BTR	002257		
C1	000132		
DIT	002427		
DPS	002556		
E1	000143		
E10	000152		
E11	000153		
E2	000144		
E3	000145		
E4	000146		
E5	000147		
E6	000150		
E7	000151		
EOL	002153		
ERR	002372		
HI	000165		
HIS	000166		
IN	003141		
INC	002600		
INK	003070		
M67	000200		
MAX	000170		
ML1	000245		
ML2	000255		
ML4	000265		
ML5	000277		
ML6	000311		
ML7	000326		
ML8	000342		
ML9	000346		
OFF	003026		
ON	003112		
OUT	003055		
P1	002006		
P2	002022		
P4	002072		
P5	002117		
P7	002143		
P8	002334		
P9	002356		
RL1	000706		
STD	000631		
T3	000205		
UP	002743		
ZIG	003211		
.2NUM	002407		

PAGE 0002

ADDR	000110
ADIN	002202
ALLON	003161
ALOFF	003075
ASCI	000115
AUX1	000116
AUX2	000117
AUX3	000120
BIT0	000121
BIT1	000122
BIT2	000123
BIT3	000124
BIT4	000125
CLCC1	002477
CLF1	002261
CLF2	002314
COLCT	000133
COLNO	000134
DATA	003264
DATAD	003263
DEC10	000136
DEC11	000137
DEC12	000140
DEC9	000135
DELAY	000141
DOWN	002710
ELEV	003135
ELEVN	003051
ERBUF	000142
ERCTR	000155
ERPRT	002641
FEED	000156
FORT1	000157
FOUR	000160
HDASH	000161
HERE	002437
HONE	000163
IBAD	002426
INCLU	002252
INCR	003000
INQU	003154
IUFF	000167
JOIN	002634
LDASH	000162
LIA1	002500
LIST	003166
LONE	000164
MAD1	000215
MAD10	000347
MAD12	000364
MAD13	000405
MAD14	000420
MAD15	000427
MAD16	000446
MAD17	000454
MAD18	000465
MAD19	000501



PAGE 0003

MAD2	000246
MAD20	000515
MAD21	000524
MAD22	000534
MAD23	000543
MAD25	000553
MAD26	000563
MAD27	000566
MAD28	000576
MAD29	000607
MAD4	000256
MAD5	000266
MAD6	000300
MAD7	000312
MAD8	000327
MAD9	000343
MES1	000216
MES10	000350
MES12	000365
MES13	000406
MES14	000421
MES15	000430
MES16	000447
MES17	000455
MES18	000466
MES19	000502
MES2	000247
MES20	000516
MES21	000525
MES22	000535
MES23	000544
MES25	000554
MES26	000564
MES27	000567
MES28	000577
MES4	000257
MES5	000267
MES6	000301
MES7	000313
MES8	000330
MES9	000344
MIN1	000171
MIN12	000174
MIN2	000172
MIN40	000175
MIN6	000173
MIN80	000176
MIN82	000177
ML10	000363
ML12	000404
ML13	000417
ML14	000426
ML15	000445
ML16	000453
ML17	000464
ML18	000500
ML19	000514

PAGE 0004

ML20	000523
ML21	000533
ML22	000542
ML23	000552
ML25	000562
ML26	000565
ML27	000575
ML28	000605
ML29	000606
MODE	002164
MSK1	000201
MSK2	000202
OFFST	003017
DNST	003102
OTA1	002456
GTA2	002470
OTA3	002476
PRNT	002617
RAD1	000704
REP1	000705
ROW/2	000203
SENST	003255
SFC1	002301
SFC2	002310
SFC3	002321
SFC4	002463
SFS1	002275
SFS2	002305
SFS3	002315
SPOT	002475
STA1	002060
STAT	002522
STC3	002327
STCC1	002455
STDAD	000630
STF1	002304
STF2	002330
STF4	002346
STRIP	000204
TEMP0	000210
TEMP1	000211
TEMP2	000212
TENER	000213
THAT	002666
THERE	002431
TICK	000206
TNPAC	002611
TOCK	000207
TRYS	000214
TWEL	003130
TWELV	003044
WHERE	002570
ZERO	003245
** NO ERRORS*	

PAGE 0006 #01

```

0058*
0059*
0060*   STARTING ADDRESS DIAGNOSTIC PROGRAM = 2000B
0061*
0062*
0063*
0064*   SWITCH SETTINGS FOR PROGRAM CONTROL
0065*   *****
0066*   *
0067*   * BIT0 = 1   PERFORM BASIC TEST           *
0068*   * BIT1 = 1   PERFORM DATA INPUT TEST    *
0069*   * BIT2 = 1   TERMINATE AT END OF TEST    *
0070*   * BIT3 = 1   SUPPRESS SUPERFLUOUS MESSAGES *
0071*   * BIT12 = 1  SUPPRESS DATA OK MESSAGE   *
0072*   * BIT13 = 1  SPECIAL LIST (LINES 41 & 42) *
0073*   *           USE WITH BIT15 = 1 ONLY      *
0074*   * BIT14 = 1  DO ANOTHER CARD (DATA INPUT) *
0075*   * BIT15 = 1  LIST DATA INPUT            *
0076*   *
0077*   *****
0078*
0079*
0080*   HALTS AND ERRORS
0081*   *****
0082*   *
0083*   * E 01 = FLAG SET AFTER CLEAR FLAG       *
0084*   * E 02 = FLAG NOT CLEAR AFTER CLEAR FLAG *
0085*   * E 03 = FLAG NOT SET AFTER SET FLAG     *
0086*   * E 04 = FLAG SET AFTER CLEAR FLAG      *
0087*   * E 05 = FLAG SET AFTER CLEAR FLAG      *
0088*   * E 06 = FLAG NOT CLEAR AFTER CLEAR FLAG *
0089*   * E 07 = FAILURE TO INTERRUPT - THIS BOARD *
0090*   *           (MAYBE NO IRQ)               *
0091*   * E 10 = ERROR - NO IAK                  *
0092*   * E 11 = " - NO CRS                      *
0093*   *
0094*   * HLT0 = HALT AT BEGINNING OF PROGRAM    *
0095*   * HLT1 = WAIT FOR PROGRAM INPUT          *
0096*   * HLT2 = WAIT FOR LOADING                *
0097*   *
0098*   * HLT50 = ERROR - NOT READY TO READ     *
0099*   * HLT51 = ERROR - HOPPER EMPTY/STACKER FULL *
0100*   * HLT52 = ERROR - CARD DID NOT FEED     *
0101*   * HLT53 = ERROR - EXCESSIVE CLOCK MARKS  *
0102*   *
0103*   *****
0104*
0105*
0106*
0107*
0108*
0109*
0110*
0111*
0112*
0113*
0114*

```

PAGE 0007 #01

```

0115*
0116*   CONSTANT STORAGE AREA
0117*
0118   00100           ORG 100B
0119   00100 024110     JMP 110B
0120   00105           ORG 105B
0121   00105 003405     DEF Z
0122   00110           ORG 110B
0123*
0124   00110 000000     ADDR  OCT 0           ADDRESS STORAGE
0125   00111 000000     AS1   OCT 0
0126   00112 000000     AS2   OCT 0
0127   00113 000000     AS3   OCT 0
0128   00114 000000     AS5   OCT 0
0129   00115 030060     ASCI  OCT 030060
0130   00116 000000     AUX1  OCT 0
0131   00117 000000     AUX2  OCT 0
0132   00120 000000     AUX3  OCT 0
0133   00121 000000     BIT0  OCT 0
0134   00122 000000     BIT1  OCT 0
0135   00123 000000     BIT2  OCT 0
0136   00124 000000     BIT3  OCT 0
0137   00125 000000     BIT4  OCT 0
0138   00126 000000     BIN   OCT 0
0139   00127 000000     BOX   OCT 0
0140   00130 000000     BS1   OCT 0
0141   00131 000000     BS2   OCT 0
0142   00132 000060     C1    OCT 60
0143   00133 000000     COLCT OCT 0
0144   00134 000000     COLNO OCT 0
0145   00135 000011     DEC9  DEC 9
0146   00136 000012     DEC10 DEC 10
0147   00137 030461     DEC11 OCT 030461
0148   00140 030462     DEC12 OCT 030462
0149   00141 000000     DELAY OCT 0
0150   00142 000143     ERBUF DEF **+1           ERROR BUFFER
0151   00143 000000     E1    OCT 0           SFS TRUE AFTER CLF
0152   00144 000000     E2    OCT 0           SFC FALSE AFTER CLF
0153   00145 000000     E3    OCT 0           SFS FALSE AFTER STF
0154   00146 000000     E4    OCT 0           SFC TRUE AFTER STF
0155   00147 000000     E5    OCT 0           SFS TRUE AFTER CLF
0156   00150 000000     E6    OCT 0           SFC FALSE AFTER CLF
0157   00151 000000     E7    OCT 0           FAILURE TO INTERRUPT
0158   00152 000000     E10   OCT 0           NO IAK
0159   00153 000000     E11   OCT 0           NO CRS
0160   00154 177777           OCT 177777           ERROR BUFFER TERMINATION
0161   00155 000000     ERCTR OCT 0
0162   00156 000001     FEED  OCT 000001
0163   00157 000050     FORT1 DEC 40
0164   00160 000004     FOUR  OCT 4
0165   00161 026400     HDASH OCT 026400
0166   00162 000055     LDASH OCT 55
0167   00163 030400     HONE  OCT 030400
0168   00164 000061     LONE  OCT 61
0169   00165 102010     HI    HLT 100
0170   00166 070010     HIS   STA 100
0171   00167 103100     IOFF  CLF 0

```

PAGE 0006 #01

0172	00170	177777	MAX	OCT	177777
0173	00171	177777	MIN1	DEC	-1
0174	00172	177776	MIN2	DEC	-2
0175	00173	177772	MIN6	DEC	-6
0176	00174	177764	MIN12	DEC	-12
0177	00175	177730	MIN40	DEC	-40
0178	00176	177660	MIN80	DEC	-80
0179	00177	177656	MIN82	DEC	-82
0180	00200	177711	M67	OCT	177711
0181	00201	000170	MSK1	OCT	170
0182	00202	000007	MSK2	OCT	7
0183	00203	000000	ROW/2	OCT	0
0184	00204	007777	STRIP	OCT	007777
0185	00205	177775	T3	DEC	-3
0186	00206	000000	TICK	OCT	0
0187	00207	000000	TOCK	OCT	0
0188	00210	000000	TEMP0	OCT	0
0189	00211	000000	TEMP1	OCT	0
0190	00212	000000	TEMP2	OCT	0
0191	00213	000000	TENER	OCT	0
0192	00214	000000	TRYS	OCT	000000
0193*					
0194	00215	000216	MAD1	DEF	**+1
0195	00216	050101	MES1	ASC	23,PARALLEL OUTPUT OPTICAL MARK READER DIA
	00217	051101			
	00220	046114			
	00221	042514			
	00222	020117			
	00223	052524			
	00224	050125			
	00225	052040			
	00226	047520			
	00227	052111			
	00230	041501			
	00231	046040			
	00232	046501			
	00233	051113			
	00234	020122			
	00235	042501			
	00236	042105			
	00237	051040			
	00240	042111			
	00241	040507			
	00242	047117			
	00243	051524			
	00244	044503			
0196	00245	000056	ML1	DEC	46
0197*					
0198	00246	000247	MAD2	DEF	**+1
0199	00247	044457	MES2	ASC	6,I/O CHANNEL?
	00250	047440			
	00251	041510			
	00252	040516			
	00253	047105			
	00254	046077			
0200	00255	000014	ML2	DEC	12
0201*					

PAGE 0009 #01

```

0202 00256 000257 MAD4 DEF **1
0203 00257 051505 MES4 ASC 6,SET SW, REG.
      00260 052040
      00261 051527
      00262 027040
      00263 051105
      00264 043456
0204 00265 000714 ML4 DEC 12
0205*
0206 00266 000267 MAD5 DEF **1
0207 00267 041105 MES5 ASC 8,BEGIN BASIC TEST
      00270 043511
      00271 047040
      00272 041101
      00273 051511
      00274 041440
      00275 052105
      00276 051524
0208 00277 000020 ML5 DEC 16
0209*
0210 00300 000301 MAD6 DEF **1
0211 00301 042516 MES6 ASC 8,END BASIC TEST
      00302 042040
      00303 041101
      00304 051511
      00305 041440
      00306 052105
      00307 051524
      00310 020040
0212 00311 000020 ML6 DEC 16
0213*
0214 00312 000313 MAD7 DEF **1
0215 00313 041105 MES7 ASC 11,BEGIN DATA INPUT TEST
      00314 043511
      00315 047040
      00316 042101
      00317 052101
      00320 020111
      00321 047120
      00322 052524
      00323 020124
      00324 042523
      00325 052040
0216 00326 000026 ML7 DEC 22
0217*
0218 00327 000330 MAD8 DEF **1
0219 00330 042516 MES8 ASC 10,END DATA INPUT TEST
      00331 042040
      00332 042101
      00333 052101
      00334 020111
      00335 047120
      00336 052524
      00337 020124
      00340 042523
      00341 052040
0220 00342 000024 ML8 DEC 20

```

PAGE 0010 #01

```

0221*
0222 00343 000344 MAD9 DEF **1
0223 00344 042440 MES9 ASC 1,E
0224 00345 000000 OCT 0
0225 00346 000004 ML9 DEC 4
0226*
0227 00347 000350 MAD10 DEF **1
0228 00350 052105 MES10 ASC 11,TFRMINATE PRESENT TEST
      00351 051115
      00352 044516
      00353 040524
      00354 042440
      00355 050122
      00356 042523
      00357 042516
      00360 052040
      00361 052105
      00362 051524
0229 00363 000026 ML10 DEC 22
0230*
0231 00364 000365 MAD12 DEF **1
0232 00365 046117 MES12 ASC 15,LOAD CARD/S - PUSH READY - RUN
      00366 040504
      00367 020103
      00370 040522
      00371 042057
      00372 051440
      00373 026440
      00374 050125
      00375 051510
      00376 020122
      00377 042501
      00400 042131
      00401 020055
      00402 020122
      00403 052516
0233 00404 000036 ML12 DEC 30
0234*
0235 00405 000406 MAD13 DEF **1
0236 00406 047117 MES13 ASC 9,NO FLAG - UNIT ON?
      00407 020106
      00410 046101
      00411 043440
      00412 026440
      00413 052516
      00414 044524
      00415 020117
      00416 047077
0237 00417 000022 ML13 DEC 18
0238*
0239 00420 000421 MAD14 DEF **1
0240 00421 047117 MES14 ASC 5,NOT READY!
      00422 052040
      00423 051105
      00424 040504
      00425 054441
0241 00426 000012 ML14 DEC 10

```


PAGE 0011 #01

```

0242*
0243 00427 000430 MAD15 DEF **1
0244 00430 044117 MES15 ASC 13,HOPPER EMPTY/STACKER FULL
      00431 050120
      00432 042522
      00433 020105
      00434 046520
      00435 052131
      00436 027523
      00437 052101
      00440 041513
      00441 042522
      00442 020106
      00443 052514
      00444 046040
0245 00445 000032 ML15 DEC 26
0246*
0247 00446 000447 MAD16 DEF **1
0248 00447 042101 MES16 ASC 4,DATA OK
      00450 052101
      00451 020117
      00452 045440
0249 00453 000010 ML16 DEC 8
0250*
0251 00454 000455 MAD17 DEF **1
0252 00455 026455 MES17 ASC 7,-- WORD ERRORS
      00456 020127
      00457 047522
      00460 042040
      00461 042522
      00462 051117
      00463 051123
0253 00464 000016 ML17 DEC 14
0254*
0255 00465 000466 MAD18 DEF **1
0256 00466 044516 MES18 ASC 10,INPUT = -----
      00467 050125
      00470 052040
      00471 036440
      00472 026455
      00473 026455
      00474 026455
      00475 020040
      00476 020040
      00477 020040
0257 00500 000024 ML18 DEC 20
0258*
0259 00501 000502 MAD19 DEF **1
0260 00502 041517 MES19 ASC 10,CURE =
      00503 051105
      00504 020075
      00505 020040
      00506 020040
      00507 020040
      00510 020040
      00511 020040
      00512 020040

```

PAGE 0012 #01

```

00513 020040
0261 00514 000024 ML19 DEC 20
0262*
0263 00515 000516 MAD20 DEF **1
0264 00516 051117 MES20 ASC 5,ROW- -OFF
      00517 053455
      00520 020040
      00521 026517
      00522 043106
0265 00523 000012 ML20 DEC 10
0266*
0267 00524 000525 MAD21 DEF **1
0268 00525 040514 MES21 ASC 6,ALI ROWS OFF
      00526 046040
      00527 051117
      00530 053523
      00531 020117
      00532 043106
0269 00533 000014 ML21 DEC 12
0270*
0271 00534 000535 MAD22 DEF **1
0272 00535 051117 MES22 ASC 5,ROW- -ON-
      00536 053455
      00537 020040
      00540 026517
      00541 047055
0273 00542 000012 ML22 DEC 10
0274*
0275 00543 000544 MAD23 DEF **1
0276 00544 040514 MES23 ASC 6,ALI ROWS ON
      00545 046040
      00546 051117
      00547 053523
      00550 020117
      00551 047040
0277 00552 000014 ML23 DEC 12
0278*
0279 00553 000554 MAD25 DEF **1
0280 00554 020040 MES25 ASC 6,
      00555 020040
      00556 020040
      00557 020040
      00560 020040
      00561 020040
0281 00562 000014 ML25 DEC 12
0282*
0283 00563 000564 MAD26 DEF **1
0284 00564 057460 MES26 ASC 1,+0
0285 00565 000002 ML26 DEC 2
0286*
0287 00566 000567 MAD27 DEF **1
0288 00567 047117 MES27 ASC 6,NO CARD FEED
      00570 020103
      00571 040522
      00572 042040
      00573 043105
      00574 042504

```



PAGE 0013 #01

0289	00575	000014	ML27	DEC	12
0290*					
0291	00576	000577	MAL28	DEF	**+1
0292	00577	026502	MES28	ASC	6,-BINARY LIST
	00600	044516			
	00601	040522			
	00602	054440			
	00603	046111			
	00604	051524			
0293	00605	000014	ML28	DEC	12
0294*					
0295	00606	000037	ML29	DEC	31
0296	00607	000610	MAL29	DEF	**+1
0297	00610	042530		ASC	16,EXCESSIVE NUMBER OF CLOCK MARKS
	00611	041505			
	00612	051523			
	00613	044526			
	00614	042440			
	00615	047125			
	00616	046502			
	00617	042522			
	00620	020117			
	00621	043740			
	00622	041514			
	00623	047503			
	00624	045440			
	00625	046501			
	00626	051113			
	00627	051440			
0298*					
0299*					
0300	00630	000000	STEAD	OCT	0
0301	00631	000632	STE	DEF	**+1
0302	00632	177760		OCT	177760
0303	00633	000000		OCT	0
0304	00634	000020		OCT	000020
0305	00635	000040		OCT	000040
0306	00636	000100		OCT	000100
0307	00637	000200		OCT	000200
0308	00640	000400		OCT	000400
0309	00641	001000		OCT	001000
0310	00642	002000		OCT	002000
0311	00643	004000		OCT	004000
0312	00644	010000		OCT	010000
0313	00645	020000		OCT	020000
0314	00646	040000		OCT	040000
0315	00647	100000		OCT	100000
0316	00650	177740		OCT	177740
0317	00651	177720		OCT	177720
0318	00652	177560		OCT	177560
0319	00653	177560		OCT	177560
0320	00654	177360		OCT	177360
0321	00655	176760		OCT	176760
0322	00656	175760		OCT	175760
0323	00657	173760		OCT	173760
0324	00660	167760		OCT	167760
0325	00661	157760		OCT	157760

PAGE 0014 #01

0326	00662	137760		OCT	137760	
0327	00663	077760		OCT	077760	
0328	00664	052520		OCT	052520	
0329	00665	125240		OCT	125240	
0330	00666	052520		OCT	052520	
0331	00667	125240		OCT	125240	
0332	00670	052520		OCT	052520	
0333	00671	125240		OCT	125240	
0334	00672	052520		OCT	052520	
0335	00673	125240		OCT	125240	
0336	00674	052520		OCT	052520	
0337	00675	125240		OCT	125240	
0338	00676	052520		OCT	052520	
0339	00677	125240		OCT	125240	
0340	00700	052520		OCT	052520	
0341	00701	125240		OCT	125240	
0342	00702	177760		OCT	177760	
0343	00703	000000		OCT	0	
0344*						
0345	00704	000705	RAD1	DEF	++1	
0346	00705	000000	REP1	OCT	0	
0347	00706	000002	RL1	OCT	2	
0348*						
0349*						
0350*						
0351*	MAIN PROGRAM					
0352*						
0353*						
0354	02000			ORG	2000H	
0355	02000	107700		CLC	0,C	INTERRUPT SYSTEM OFF
0356	02001	016153		JSR	EOL	LINE FEED
0357	02002	060245		LDA	ML1	PRINT
0358	02003	064215		LDR	RAD1	FIRST
0359	02004	114102		JSR	102B.I	MESSAGE
0360	02005	026011		JMP	++4	
0361	02006	062010	P1	LDA	++2	HALT AT
0362	02007	066010		LDR	++1	BEGINNING
0363	02010	102000		HLT	0	OF PROGRAM
0364	02011	064200		LDR	M67	PREPARE
0365	02012	060156		LEA	HIS	TRAP
0366	02013	072015		STA	++2	FOR
0367	02014	060165		LDA	HI	ILLEGAL
0368	02015	070010		STA	10R	INTERRUPT
0369	02016	036015		ISZ	*-1	FROM
0370	02017	002004		INA		ANY
0371	02020	006006		INR	,SZ8	DEVICE
0372	02021	026015		JMP	*-4	
0373	02022	016153	P2	JSR	EOL	LINE FEED
0374	02023	060255		LDA	ML2	PRINT
0375	02024	064246		LDR	MAD2	SECOND
0376	02025	114102		JSR	102B.I	MESSAGE
0377	02026	060706		LDA	RL1	RECEIVE
0378	02027	064704		LDR	RAD1	FIRST
0379	02030	114104		JSR	104B.I	REPLY
0380	02031	060705		LDA	REP1	CHECK FIRST CHARACTER
0381	02032	010201		AND	MSK1	FOR VALIDITY
0382	02033	050132		CPA	C1	VALID?

PAGE 0015 #01

0383	02034	026036		JMP **2	YES
0384	02035	026022		JMP P2	NO
0385	02036	060705		LDA REP1	CHECK SECOND
0386	02037	001727		ALF,ALF	CHARACTER
0387	02040	010201		AND MSK1	FOR VALIDITY
0388	02041	050132		CPA C1	VALID?
0389	02042	026044		JMP **2	YES
0390	02043	026022		JMP P2	NO
0391	02044	002400		CLA	GENERATE
0392	02045	060705		LDA REP1	TEST
0393	02046	010202		AND MSK2	BOARD
0394	02047	070110		STA ADDR	ADDRESS
0395	02050	060705		LDA REP1	
0396	02051	001727		ALF,ALF	
0397	02052	010202		AND MSK2	
0398	02053	001721		ALF,ARS	
0399	02054	030110		IOR ADDR	
0400	02055	070110		STA ADDR	ADDRESS COMPLETE
0401	02056	016202		ISB ADIN	
0402	02057	062426		LDA IBAD	ILLEGAL INTERRUPT
0403	02060	070000	STA1	STA 0	TRAP
0404	02061	016153		JSH EOL	
0405	02062	060265		LDA ML4	SET SW, REG.
0406	02063	064256		LDB MAD4	OPTION
0407	02064	114102		JSH 102B.I	MESSAGE
0408	02065	062467		LDA **2	HALT TO
0409	02066	066067		LDB **1	LOAD SWITCH
0410	02067	102001		HLT 1	REGISTER
0411	02070	016153		JSH EOL	LINE FEED
0412	02071	000000		NOP	
0413	02072	016164	P4	JSH MODE	CHECK SW. REG.
0414	02073	060121		LDA BIT0	PERFORM
0415	02074	002011		SLA,RSS	BASIC TEST?
0416	02075	026117		JMP P5	NO.
0417	02076	060124		LDA BIT3	SUPPRESS
0418	02077	000010		SLA	MESSAGES
0419	02100	026106		JMP **6	YES.
0420	02101	000000		NOP	
0421	02102	060277		LDA ML5	PRINT FIRST
0422	02103	064266		LDB MAD5	BASIC TEST
0423	02104	114102		JSH 102B.I	MESSAGE
0424	02105	000000		NOP	
0425	02106	010257		JSH BTR	PERFORM BASIC TEST
0426	02107	060124		LDA BIT3	SUPPRESS
0427	02110	000010		SLA	MESSAGES
0428	02111	026117		JMP **6	YES.
0429	02112	000000		NOP	
0430	02113	060311		LDA ML6	PRINT SECOND
0431	02114	064300		LDB MAD6	BASIC TEST
0432	02115	114102		JSH 102B.I	MESSAGE
0433	02116	016153		JSH EOL	LINE FEED
0434	02117	060122	P5	LDA BIT1	PERFORM DATA
0435	02120	002411		SLA,RSS	INPUT TEST?
0436	02121	026143		JMP P7	NO
0437	02122	060124		LDA BIT3	SUPPRESS
0438	02123	000010		SLA	MESSAGES
0439	02124	026132		JMP **6	YES.

PAGE 0016 #01

```

0440 02125 000000      NOP
0441 02126 060326      LDA ML7          PRINT FIRST DATA
0442 02127 064312      LDH MAD7        INPUT TEST
0443 02130 114102      JSB 102B.I      MESSAGE
0444 02131 000000      NOP
0445 02132 016427      JSB BIT        PERFORM DATA INPUT TEST1
0446 02133 060124      LDA BIT3       SUPPRESS
0447 02134 000010      SLA            MESSAGES
0448 02135 026143      JMP **+6       YES.
0449 02136 000000      NOP
0450 02137 060342      LDA ML8        PRINT SECOND DATA
0451 02140 064327      LDH MAD8       INPUT TEST
0452 02141 114102      JSB 102B.I    MESSAGE
0453 02142 016153      JSB EOL
0454 02143 060123      LDA BIT2       TERMINATE
0455 02144 002011      SLA,RSS        PRESENT TEST?
0456 02145 026072      JMP P4         NO.
0457 02146 060363      LDA ML10       PRINT
0458 02147 064347      LDH MAD10      TERMINATE
0459 02150 114102      JSB 102B.I    MESSAGE
0460 02151 016153      JSB EOL        LINE FEED
0461 02152 026006      JMP P1
0462*
0463*LINE FEED, CARRIAGE RETURN
0464*
0465 02153 000000      EOL  NOP       ENTER SUBROUTINE
0466 02154 070111      STA AS1       STORE
0467 02155 074130      STB BS1       A & B
0468 02156 002400      CLA          LINE
0469 02157 006400      CLH          FEED
0470 02160 114102      JSB 102B.I
0471 02161 060111      LDA AS1       RESTORE
0472 02162 064130      LDH BS1       A & B
0473 02163 126153      JMP EOL,1     EXIT SUBROUTINE
0474*
0475*MODE SUBROUTINE
0476*
0477 02164 000000      MODE  NOP      ENTER SUBROUTINE
0478 02165 070112      STA AS2       STORE "A"
0479 02166 102501      LIA 1         EACH BIT
0480 02167 070121      STA BIT0      FROM THE
0481 02170 001300      RAR          SWITCH REGISTER
0482 02171 070122      STA BIT1     IS ROTATED
0483 02172 001300      RAR          INTO THE
0484 02173 070123      STA BIT2     LEAST SIGNIFICANT
0485 02174 001300      RAR          POSITION AND
0486 02175 070124      STA BIT3     STORED IN THE
0487 02176 001300      RAR          LOCATION BEARING
0488 02177 070125      STA BIT4     IT'S NAME
0489 02200 060112      LDA AS2       RESTORE A
0490 02201 126164      JMP MODE.1    EXIT SUBROUTINE
0491*
0492*ADDRESS INCLUSION ROUTINE
0493*
0494 02202 000000      ADIN  NOP      ENTER ROUTINE
0495 02203 107700      CLC 0,C      INTERRUPT SYSTEM OFF
0496 02204 016252      JSB INCLU    CONFIGURE STC,C XX

```

PAGE 0017 #01

0497	02205	103700		STC 0,C	
0498	02206	072455		STA STCC1	
0499	02207	016252		JSB INCLU	SAME FOR CLC,C XX
0500	02210	107700		CLC 0,C	
0501	02211	072477		STA CLCC1	
0502	02212	016252		JSB INCLU	SAME FOR SFS XX
0503	02213	102300		SFS 0	
0504	02214	072275		STA SFS1	
0505	02215	072305		STA SFS2	
0506	02216	072315		STA SFS3	
0507	02217	016252		JSB INCLU	SAME FOR SFC XX
0508	02220	102200		SFC 0	
0509	02221	072301		STA SFC1	
0510	02222	072310		STA SFC2	
0511	02223	072321		STA SFC3	
0512	02224	072463		STA SFC4	
0513	02225	016252		JSB INCLU	SAME FOR CLF XX
0514	02226	103100		CLF 0	
0515	02227	072261		STA CLF1	
0516	02230	072314		STA CLF2	
0517	02231	016252		JSB INCLU	SAME FOR STF XX
0518	02232	102100		STF 0	
0519	02233	072304		STA STF1	
0520	02234	072330		STA STF2	
0521	02235	072346		STA STF4	
0522	02236	016252		JSB INCLU	SAME FOR STC XX
0523	02237	102700		STC 0	
0524	02240	072327		STA STC3	
0525	02241	016252		JSB INCLU	SAME FOR OTA XX
0526	02242	102600		OTA 0	
0527	02243	072456		STA OTA1	
0528	02244	072470		STA OTA2	
0529	02245	072476		STA OTA3	
0530	02246	016252		JSB INCLU	SAME FOR LIA XX
0531	02247	102500		LIA 0	
0532	02250	072500		STA LIA1	
0533	02251	126202		JMP ADIN-1	EXIT ROUTINE
0534*					
0535*	INCLUSION SUBROUTINE				
0536*					
0537	02252	000000	INCLU	NOP	ENTER SUBROUTINE
0538	02253	162252		LDA INCLU,I	PUT ADDRESS
0539	02254	030110		IOR ADDR	INTO INSTRUCTION
0540	02255	036252		ISZ INCLU	EXIT
0541	02256	126252		JMP INCLU,I	SUBROUTINE
0542*					
0543*					
0544*	BASIC TEST ROUTINE				
0545*					
0546*					
0547	02257	000000	BTR	NOP	ENTER ROUTINE
0548	02260	107700		CLC 0,C	
0549	02261	103100	CLF1	CLF 0	
0550	02262	006400		CLB	INITIALIZE
0551	02263	074143		STB E1	ERROR
0552	02264	074144		STB E2	BUFFER
0553	02265	074145		STB E3	

PAGE 0018 #01

0554	02266	074146		STB E4	
0555	02267	074147		STB E5	
0556	02270	074150		STB E6	
0557	02271	074151		STB E7	
0558	02272	074152		STB E10	
0559	02273	074153		STB E11	
0560	02274	006004		INH	
0561	02275	102300	SFS1	SFS 0	FLAG SET?
0562	02276	026300		JMP ++2	NO.
0563	02277	074143		STB E1	YES. ERROR 1
0564	02300	006004		INH	INCREMENT ERROR CODE
0565	02301	102200	SFC1	SFC 0	FLAG CLEAR?
0566	02302	074144		STB E2	NO. ERROR 2
0567	02303	006004		INH	YES.
0568	02304	102100	STF1	STF 0	SET FLAG
0569	02305	102300	SFS2	SFS 0	FLAG SET?
0570	02306	074145		STB E3	NO. ERROR 3
0571	02307	006004		INH	YES.
0572	02310	102200	SFC2	SFC 0	FLAG CLEAR?
0573	02311	026313		JMP ++2	NO.
0574	02312	074146		STB E4	YES. ERROR 4
0575	02313	006004		INH	
0576	02314	103100	CLF2	CLF 0	CLEAR FLAG
0577	02315	102300	SFS3	SFS 0	FLAG SET?
0578	02316	026320		JMP ++2	NO.
0579	02317	074147		STB E5	YES. ERROR 5
0580	02320	006004		INH	
0581	02321	102200	SFC3	SFC 0	FLAG CLEAR?
0582	02322	074150		STB E6	NO. ERROR 6
0583	02323	006004		INH	YES.
0584	02324	060167		LDA IOFF	
0585	02325	170110		STA ADDR.1	
0586	02326	062426		LDA IBAD	
0587	02327	102700	STC3	STC 0	
0588	02330	102100	STF2	STF 0	SET FLAG
0589	02331	102100		STF 0	INTERRUPT SYSTEM ON
0590	02332	000000		NOP	
0591	02333	000000		NOP	
0592	02334	102200	P8	SFC 0	INTERRUPT OFF?
0593	02335	074151		STB E7	NO! ERROR 7
0594	02336	006004		INH	
0595	02337	102100		STF 0	INTERRUPT ON
0596	02340	000000		NOP	
0597	02341	000000		NOP	
0598	02342	102300		SFS 0	INTERRUPT?
0599	02343	074152		STB E10	NO IAK - ERROR 10
0600	02344	006004		INH	
0601	02345	106700		CLC 0	GIVE CRS
0602	02346	102100	STF4	STF 0	
0603	02347	102100		STF 0	INTERRUPT ON
0604	02350	000000		NOP	
0605	02351	000000		NOP	
0606	02352	102300		SFS 0	INTERRUPT?
0607	02353	074153		STB E11	NO! NO CRS
0608	02354	107700		CLC 0,C	INTERRUPT SYSTEM OFF
0609	02355	060142		LDA ERBUF	CHECK ERROR BUFFER
0610	02356	164000	P9	LDB 0,I	

PAGE 0019 #01

```

0611 02357 006003      SZH,RSS      ERROR?
0612 02360 026367      JMP **7      NO.
0613 02361 006007      INH,SZB,KSS  END OF ERROR BUFFER?
0614 02362 026371      JMP **7      YES.
0615 02363 164700      LDH 0,I      NO.
0616 02364 070114      STA AS5      PRINT
0617 02365 016372      JSH ERR      OUT
0618 02366 060114      LDA AS5      ERROR
0619 02367 002004      INA          CODE
0620 02370 026356      JMP P9
0621 02371 126257      JMP BTR,I    EXIT ROUTINE
0622*
0623*BASIC TEST ERROR PRINTOUT SUBROUTINE
0624*
0625 02372 000000      ERK  NOP      ENTER SUBROUTINE
0626 02373 074131      STB BS2      STORE B
0627 02374 060121      LDA BIT0
0628 02375 030010      SLA
0629 02376 126372      JMP ERR,I
0630 02377 060001      LDA 1
0631 02400 016407      JSH .2NUM    PACK 2 NUMBERS
0632 02401 074345      STB MES9+1
0633 02402 060346      LDA ML9      PRINT OUT
0634 02403 064343      LDH MAD9      ERROR
0635 02404 114102      JSH 102B.I  MESSAGE
0636 02405 064131      LDH BS2      RESTORE B
0637 02406 126372      JMP ERR,I    EXIT SUBROUTINE
0638*
0639*PACK TWO ASCII NUMBERS SUBROUTINE
0640*
0641 02407 000000      .2NUM NOP      ENTER SUBROUTINE
0642 02410 070113      STA AS3      STORE A
0643 02411 001323      WAR,RAR      FORMAT
0644 02412 001300      RAR          FIRST
0645 02413 010202      AND MSK2     NUMBER
0646 02414 030132      ICR C1
0647 02415 001727      ALF,ALF
0648 02416 070001      STA 1        STORE IT
0649 02417 060113      LDA AS3      FORMAT
0650 02420 010202      AND MSK2     SECOND
0651 02421 030132      IOW C1       NUMBER
0652 02422 030001      IOR 1        PACK THEM
0653 02423 070001      STA 1        INTO B
0654 02424 060113      LDA AS3      RESTORE A
0655 02425 126407      JMP .2NUM,I  EXIT SUBROUTINE
0656 02426 026334      IBAD JMP P8
0657*
0658*
0659* DATA INPUT TEST ROUTINE
0660*
0661*
0662 02427 000000      DIT  NOP      ENTER ROUTINE
0663 02430 107700      CLC 0,C      INTERRUPT SYSTEM OFF
0664 02431 060404      THERE LDA ML12  OUTPUT
0665 02432 064364      LDH MAD12    INSTRUCTION
0666 02433 114102      JSH 102B.I  MESSAGE
0667 02434 102002      HLT 2        WAIT FOR SERVICE

```

PAGE 0020 #01

0668	02435	060205		LDA T3	
0669	02436	070214		STA TRYS	
0670	02437	002400	HERE	CLA	
0671	02440	070141		STA DELAY	
0672	02441	060175		LDA MIN80	GET THE BUFFER LENGTH
0673	02442	060177		LDA MIN80	
0674	02443	070133		STA COLCT	
0675	02444	070111		STA ASI	SAVE
0676	02445	067264		LDR DATA	GET THE BUFFER ADDRESS
0677	02446	002400		CLA	
0678	02447	170001		STA 1,I	CLEAR CORE
0679	02450	006004		INR	
0680	02451	034111		ISZ ASI	
0681	02452	026447		JMP *-3	
0682	02453	005400		CLR	
0683	02454	060156		LDA FEED	OUTPUT
0684	02455	103700	STCC1	STC 0,C	CARD FEED
0685	02456	102600	OTA1	OTA 0	COMMAND
0686	02457	060631		LDA STD	RESET STANDARD
0687	02460	070630		STA STDAN	PATTERN AND
0688	02461	063264		LDA DATA	DATA STORAGE
0689	02462	073263		STA DATAH	AREAS.
0690	02463	102200	SFC4	SFC 0	WAIT FOR FLAG
0691	02464	026475		JMP SPOT	OR TIMEOUT
0692	02465	034141		ISZ DELAY	
0693	02466	026463		JMP SFC4	
0694	02467	002400		CLA	TURN OFF
0695	02470	102600	OTA2	OTA 0	FEED
0696	02471	060417		LDA ML13	OUTPUT
0697	02472	064405		LDR MAD13	READER OFF
0698	02473	114102		JSR 102B.I	MESSAGE
0699	02474	026431		JMP THERE	TRY AGAIN!
0700	02475	002400	SPCT	CLA	TURN OFF
0701	02476	102600	OTA3	OTA 0	FEED
0702	02477	107700	CLCC1	CLC 0,C	
0703	02500	102500	LIA1	LIA 0	INPUT DATA
0704	02501	002021		SSA,RSS	SKIP IF CARD IN GATE
0705	02502	026522		JMP STAT	
0706	02503	010204		AND STRIP	DELETE STATUS BITS
0707	02504	001700		ALF	
0708	02505	173263		STA DATAH,I	STORE STRIPPED DATA
0709	02506	063263		LDA DATAH	
0710	02507	002004		INA	INCREMENT STORAGE ADDRESS
0711	02510	073263		STA DATAH	
0712	02511	002400		CLA	
0713	02512	070141		STA DELAY	
0714	02513	034133		ISZ COLCT	INCREMENT COLUMN COUNTER
0715	02514	026463		JMP SFC4	GET MORE DATA
0716	02515	060606		LDA ML29	
0717	02516	064607		LDR MAD20	
0718	02517	114102		JSR 102B.I	
0719	02520	102053		HLT 53R	
0720	02521	026437		JMP HERE	
0721	02522	000040	STAT	CLF	
0722	02523	001600		ELA	
0723	02524	002020		SSA	END OF CARD?
0724	02525	026556		JMP DPS	BEGIN DATA PRINTOUT



PAGE 0021 #01

0725	02526	001626	FLA,ELA	
0726	02527	002040	SEZ	HOPPER EMPTY/STACKER FULL?
0727	02530	026536	JMP **6	
0728	02531	060445	LDA ML15	OUTPUT
0729	02532	064427	LDB MAD15	EMPTY/FULL
0730	02533	114102	JSB 102B.I	MESSAGE
0731	02534	102051	HLT 51R	
0732	02535	026437	JMP HERE	
0733	02536	002020	SSA	C.R. READY?
0734	02537	026545	JMP **6	
0735	02540	060426	LDA ML14	OUTPUT
0736	02541	064420	LDB MAD14	NOT READY
0737	02542	114102	JSB 102B.I	MESSAGE!
0738	02543	102050	HLT 50B	
0739	02544	026437	JMP HERE	
0740	02545	034214	ISZ TRYS	
0741	02546	026437	JMP HERE	
0742	02547	060575	LDA ML27	OUTPUT
0743	02550	064566	LDB MAD27	NO FEED
0744	02551	114102	JSB 102B.I	MESSAGE
0745	02552	060205	LDA T3	
0746	02553	070214	STA TRYS	
0747	02554	102052	HLT 52B	
0748	02555	026437	JMP HERE	
0749	02556	106501	DPS LIB 1	CHECK FOR
0750	02557	006020	SSH	LIST OR ERROR ROUTINES
0751	02560	027166	JMP LIST	
0752	02561	002400	CLA	
0753	02562	070155	STA ERCTR	INITIALIZE
0754	02563	070213	STA TENER	COUNTERS AND
0755	02564	063264	LDA DATA	ADDRESSES
0756	02565	073263	STA DATAN	
0757	02566	060175	LDA MIN40	MINUS 40
0758	02567	070134	STA COLNO	
0759	02570	163263	WHERE LDA DATAN,I	
0760	02571	150630	CPA STDAN,I	
0761	02572	026600	JMP INC	DATA OK!
0762	02573	060155	LDA ERCTR	
0763	02574	002004	INA	
0764	02575	070155	STA ERCTR	
0765	02576	050136	CPA DEC10	
0766	02577	026611	JMP TNFAC	
0767	02600	063263	INC LDA DATAN	INCREMENT DATA
0768	02601	002004	INA	AND STANDARD
0769	02602	073263	STA DATAN	ADDRESSES
0770	02603	060630	LDA STDAN	
0771	02604	002004	INA	
0772	02605	070630	STA STDAN	
0773	02606	034134	ISZ COLNO	
0774	02607	026570	JMP WHERE	
0775	02610	026617	JMP PRNT	
0776	02611	060213	TNFAC LDA TENER	INCREMENT TENS
0777	02612	002004	INA	COUNTER AND
0778	02613	070213	STA TENER	CLEAR UNITS
0779	02614	002400	CLA	
0780	02615	070155	STA ERCTR	
0781	02616	026600	JMP INC	

PAGE 0022 #01

0782	02617	060155	PRNT	LDA ERCTR	
0783	02620	002002		SZA	
0784	02621	026641		JMP ERPRT	
0785	02622	060213		LDA TENEX	
0786	02623	002002		SZA	
0787	02624	026641		JMP ERPRT	
0788	02625	060001		LDA 1	
0789	02626	001700		ALF	
0790	02627	000010		SLA	
0791	02630	026634		JMP JOIN	
0792	02631	060453		LDA ML16	OUTPUT
0793	02632	064446		LDR MAD16	DATA GOOD
0794	02633	114102		JSR 102B.I	MESSAGE
0795	02634	102501	JOIN	LDA 1	
0796	02635	001600		ELA	
0797	02636	002020		SSA	DO ANOTHER CARD?
0798	02637	026437		JMP HERE	YES!
0799	02640	126427		JMP DIT, I	NO
0800	02641	060213	ERFRT	LDA TENEX	CONFIGURE
0801	02642	030115		IOR ASCI	ERROR NUMBER
0802	02643	001727		ALF, ALF	FOR PRINTOUT
0803	02644	030155		IOR ERCTR	
0804	02645	030115		IOR ASCI	
0805	02646	070455		STA MES17	
0806	02647	060464		LDA ML17	OUTPUT
0807	02650	064454		LDR MAD17	ERROR COUNT
0808	02651	114102		JSR 102B.I	MESSAGE
0809	02652	060175		LDA MIN40	INITIALIZE
0810	02653	070134		STA COLNO	COUNTERS
0811	02654	060171		LDA MIN1	AND DATA
0812	02655	070116		STA AUX1	STORAGE
0813	02656	060172		LDA MIN2	ADDRESSES
0814	02657	070117		STA AUX2	
0815	02660	002400		CLA	
0816	02661	070120		STA AUX3	
0817	02662	063264		LDA DATA	
0818	02663	073263		STA DATAN	
0819	02664	060631		LDA STD	
0820	02665	070630		STA STDAH	
0821	02666	163263	THAT	LDA DATAN, I	LOAD AND
0822	02667	164630		LDR STDAH, I	COMPARE
0823	02670	050001		CPA 1	DATA
0824	02671	027000		JMP INCR	
0825	02672	070211		STA TEMP1	
0826	02673	074212		STR TEMP2	
0827	02674	034116		ISZ AUX1	CHECK FOR
0828	02675	002001		RSS	FIRST
0829	02676	027017		JMP OFFST	OR
0830	02677	034117		ISZ AUX2	SECOND
0831	02700	002001		RSS	CHARACTERS
0832	02701	027102		JMP ONST	
0833	02702	060173		LDA MIN6	
0834	02703	070203		STA ROW/2	
0835	02704	060465		LDA MAD1A	
0836	02705	040160		ADA FOUR	
0837	02706	070206		STA TICK	
0838	02707	064211		LDR TEMP1	

PAGE 0023 #01

0839	02710	006020	DOWN	SSH	
0840	02711	026714		JMP **3	
0841	02712	060161		LDA HDASH	
0842	02713	026715		JMP **2	
0843	02714	060163		LDA HONE	
0844	02715	005200		RBL	
0845	02716	006020		SSH	
0846	02717	026722		JMP **3	
0847	02720	030162		IOR LDASH	
0848	02721	026723		JMP **2	
0849	02722	030164		IOR LONE	
0850	02723	170206		STA TICK-I	
0851	02724	060206		LDA TICK	
0852	02725	002004		INA	
0853	02726	070206		STA TICK	
0854	02727	005200		RBL	
0855	02730	034203		ISZ ROW/2	
0856	02731	026710		JMP DOWN	
0857	02732	060500		LDA ML18	PRINT
0858	02733	064465		LDB MAD18	INPUT
0859	02734	114102		JSH 102B-I	MESSAGE
0860	02735	060501		LDA MAD10	
0861	02736	040160		ADA FOUR	
0862	02737	070206		STA TICK	
0863	02740	060173		LDA MIN6	
0864	02741	070203		STA ROW/2	
0865	02742	064212		LDB TEMP2	
0866	02743	006020	UP	SSH	
0867	02744	026747		JMP **3	
0868	02745	060161		LDA HDASH	
0869	02746	026750		JMP **2	
0870	02747	060163		LDA HONE	
0871	02750	005200		RBL	
0872	02751	006020		SSH	
0873	02752	026755		JMP **3	
0874	02753	030162		IOR LDASH	
0875	02754	026756		JMP **2	
0876	02755	030164		IOR LONE	
0877	02756	170206		STA TICK-I	
0878	02757	060206		LDA TICK	
0879	02760	002004		INA	
0880	02761	070206		STA TICK	
0881	02762	005200		RBL	
0882	02763	034203		ISZ ROW/2	
0883	02764	026743		JMP UP	
0884	02765	060514		LDA ML19	PRINT
0885	02766	064501		LDB MAD10	CORE
0886	02767	114102		JSH 102B-I	MESSAGE
0887	02770	016153		JSH EOL	LINE FEED
0888	02771	034134		ISZ COLNO	
0889	02772	002001		RSS	
0890	02773	026634		JMP JOIN	
0891	02774	037263		ISZ DATA0	
0892	02775	034630		ISZ STDA0	
0893	02776	000000		NOP	
0894	02777	026666		JMP THAT	
0895	03000	060120	INCR	LDA AUX3	

PAGE 0024 #01

0896	03001	002002		SZA
0897	03002	026634		JMP JOIN
0898	03003	060116		LDA AUX1
0899	03004	002004		INA
0900	03005	070116		STA AUX1
0901	03006	034117		ISZ AUX2
0902	03007	000000		NOF
0903	03010	034134		ISZ COLNO
0904	03011	002001		RSS
0905	03012	026634		JMP JOIN
0906	03013	037263		ISZ DATA0
0907	03014	034630		ISZ STDA0
0908	03015	000000		NOF
0909	03016	026666		JMP THAT
0910	03017	064172	OFFST	LDH MIN2
0911	03020	060211		LDA TEMP1
0912	03021	002003		SZA,RSS
0913	03022	027075		JMP ALOFF
0914	03023	020212		XOR TEMP2
0915	03024	001323		RAR,RAR
0916	03025	001323		RAR,RAR
0917	03026	002011	OFF	SLA,RSS
0918	03027	027070		JMP INK
0919	03030	006021		SSH,RSS
0920	03031	027036		JMP **5
0921	03032	054172		CPH MIN2
0922	03033	027044		JMP TWELV
0923	03034	054171		CPH MIN1
0924	03035	027051		JMP ELEVN
0925	03036	070126		STA BIN
0926	03037	060115		LDA ASCI
0927	03040	030301		IOR 1
0928	03041	070520		STA MES20+2
0929	03042	074207		STR TOCK
0930	03043	027055		JMP OUT
0931	03044	074207	TWELV	STR TOCK
0932	03045	070126		STA BIN
0933	03046	064140		LDH DEC12
0934	03047	074520		STR MES20+2
0935	03050	027055		JMP OUT
0936	03051	074207	ELEVN	STR TOCK
0937	03052	070126		STA BIN
0938	03053	064137		LDH DEC11
0939	03054	074520		STR MES20+2
0940	03055	060523	OUT	LDA ML20
0941	03056	064515		LDH MAD20
0942	03057	114102		JSR 102B-I
0943	03060	034120		ISZ AUX3
0944	03061	064207		LDH TOCK
0945	03062	054135		CPH DEC9
0946	03063	027000		JMP INCR
0947	03064	000004		INR
0948	03065	060126		LDA BIN
0949	03066	001300		RAR
0950	03067	027026		JMP OFF
0951	03070	006004	INK	INR
0952	03071	001300		RAR

PAGE 0025 #01

0953	03072	054136		CPB DEC14
0954	03073	027000		JMP INCR
0955	03074	027026		JMP OFF
0956	03075	060533	ALCFF	LDA ML21
0957	03076	064524		LDB MAD21
0958	03077	114102		JSP 102B-I
0959	03100	034120		ISZ AUX3
0960	03101	027000		JMP INCR
0961	03102	064172	ONST	LDB MIN2
0962	03103	060211		LDA TEMP1
0963	03104	003000		CMA
0964	03105	002003		SZA,RSS
0965	03106	027161		JMP ALLON
0966	03107	020170		XOR MAX
0967	03110	001323		RAR,RAR
0968	03111	001323		RAR,RAR
0969	03112	002011	ON	SLA,RSS
0970	03113	027154		JMP INQU
0971	03114	006021		SSH,RSS
0972	03115	027122		JMP **5
0973	03116	054172		CPB MIN2
0974	03117	027130		JMP TWEL
0975	03120	054171		CPB MIN1
0976	03121	027135		JMP ELEV
0977	03122	070126		STA BIN
0978	03123	060115		LDA ASCI
0979	03124	030001		IOR 1
0980	03125	070537		STA MES22+2
0981	03126	074207		STB TOCK
0982	03127	027141		JMP IN
0983	03130	074207	TWEL	STB TOCK
0984	03131	070126		STA BIN
0985	03132	064140		LDR DEC12
0986	03133	074537		STB MES22+2
0987	03134	027141		JMP IN
0988	03135	074207	ELEV	STB TOCK
0989	03136	070126		STA BIN
0990	03137	064137		LDB DEC11
0991	03140	074537		STB MES22+2
0992	03141	060542	IN	LDA ML22
0993	03142	064534		LDB MAD22
0994	03143	114102		JSP 102B-I
0995	03144	034120		ISZ AUX3
0996	03145	064207		LDB TOCK
0997	03146	054135		CPB DEC9
0998	03147	027000		JMP INCR
0999	03150	006004		INH
1000	03151	060126		LDA BIN
1001	03152	001300		RAR
1002	03153	027112		JMP ON
1003	03154	006004	INGU	INH
1004	03155	001300		RAR
1005	03156	054136		CPB DEC14
1006	03157	027000		JMP INCR
1007	03160	027112		JMP ON
1008	03161	060552	ALLON	LDA ML23
1009	03162	064543		LDB MAD23

PAGE 0026 #01

1010	03163	114102		JSH 102B.I	
1011	03164	034120		ISZ AUX3	
1012	03165	027000		JMP INCR	
1013	03166	016153	LIST	JSH EOL	
1014	03167	102501		LIA 1	GET SW. REG.
1015	03170	001626		FLA,ELA	
1016	03171	002020		SSA	DO SPECIAL LIST??
1017	03172	027255		JMP SENST	YES!!
1018	03173	060605		LDA ML28	
1019	03174	064576		LDR MAD28	
1020	03175	114102		JSH 102B.I	
1021	03176	063264		LDA DATA	
1022	03177	073263		STA DATA	
1023	03200	060176		LDA MIN80	
1024	03201	070206		STA TICK	
1025	03202	060173	AT	LDA MIN6	
1026	03203	070203		STA ROW/2	
1027	03204	060553		LDA MAD25	
1028	03205	070127		STA BOX	
1029	03206	167263		LDR DATA,,I	
1030	03207	006003		SZP,RSS	
1031	03210	027245		JMP ZERO	
1032	03211	006020	ZIG	SSR	
1033	03212	027215		JMP **3	
1034	03213	060161		LDA HDASH	
1035	03214	027216		JMP **2	
1036	03215	060163		LDA HONE	
1037	03216	005200		RBL	
1038	03217	006020		SSR	
1039	03220	027223		JMP **3	
1040	03221	030162		IOR LDASH	
1041	03222	027224		JMP **2	
1042	03223	030164		IOR LONE	
1043	03224	170127		STA BOX, I	
1044	03225	060127		LDA BOX	
1045	03226	002004		INA	
1046	03227	070127		STA BOX	
1047	03230	034203		ISZ ROW/2	
1048	03231	002001		RSS	
1049	03232	027235		JMP **3	
1050	03233	005200		RBL	
1051	03234	027211		JMP ZIG	
1052	03235	060562		LDA ML25	
1053	03236	064553		LDR MAD25	
1054	03237	114102		JSH 102B.I	
1055	03240	037263		ISZ DATA	
1056	03241	000000		NOP	
1057	03242	034206		ISZ TICK	
1058	03243	027202		JMP AT	
1059	03244	026634		JMP JOIN	
1060	03245	060565	ZERO	LDA ML26	
1061	03246	064563		LDR MAD26	
1062	03247	114102		JSH 102B.I	
1063	03250	037263		ISZ DATA	
1064	03251	000000		NOP	
1065	03252	034206		ISZ TICK	
1066	03253	027202		JMP AT	

PAGE 0027 #01

```
1067 03254 026634      JMP JOIN
1068 03255 063264  SENST LDA DATA
1069 03256 040167      ADA FORT1
1070 03257 073263      STA DATAH
1071 03260 060172      LDA MIN2
1072 03261 070206      STA TICK
1073 03262 027202      JMP AT
1074*
1075 03263 000000  DATAD OCT 0
1076 03264 003265  DATA DEF **1
1077 03265 000000      HSS 80
1078*
1079*
1080*
1081 03405      Z      EQU *
1082      FNE
** NO ERRORS*
```

SECTION IV REPLACEABLE PARTS

4-1. INTRODUCTION.

4-2. This section contains information for ordering replacement parts for the HP 12602A Interface Kit. Table 4-1 lists the replaceable parts for the interface kit and includes the following information for each part:

- a. Hewlett-Packard part number.
- b. Description of the part. (Refer to table 4-2 for an explanation of abbreviations used in the DESCRIPTION column.)
- c. Typical manufacturer of the part as a five-digit code. (Refer to table 4-3 for a listing of the manufacturers that correspond to the codes.)

d. Manufacturer's part number.

e. Total quantity of each part used in the interface kit.

4-3. ORDERING INFORMATION.

4-4. To order replacement parts, address order or inquiry to the local Hewlett-Packard Sales and Service Office. (Refer to list at the end of this manual for addresses.) Specify the following information for each part ordered:

- a. Hewlett-Packard stock number for each part.
- b. Description of each part.
- c. Circuit reference designation (if applicable).

Table 4-1. Replaceable Parts



HP PART NO.	DESCRIPTION	MFR	MFR PART NO.	TQ
12554-60023	16-Bit Duplex Register Card (See HP 12554A Interface Kit Manual for complete parts listing of the 16-Bit Duplex Register Card)	28480	12554-60023	1
12602-6002	Interconnecting Cable Consisting of:	28480	12602-6002	1
1251-0063	Connector Male Subminiature Type D: 25 Contact	71468	M-25P	1
1251-0335	Connector: 48 Contact PC	28480	1251-0335	1
8120-0808	Cable: Unshielded	28480	8120-0808	10 ft
1251-0332	Connector: 24 Contact PC	28480	1251-0332	1

Table 4-2. List of Reference Designations and Abbreviations

REFERENCE DESIGNATIONS		
A = assembly	J = receptacle connector	TB = terminal board
B = motor	K = relay	TP = test point
BT = battery	L = inductor	U = integrated circuit
C = capacitor	M = meter	V = vacuum tube, neon bulb, photocell, etc.
CP = coupler	MC = microcircuit	VR = voltage regulator
CR = diode	P = plug connector	W = cable, jumper
DL = delay line	Q = transistor	X = socket
DS = device signaling (lamp)	R = resistor	Y = crystal
E = misc hardware	RT = thermistor	Z = tuned cavity, network
F = fuse	S = switch	
FL = filter	T = transformer	
ABBREVIATIONS		
A = amperes	IMPG = impregnated	P/O = part of
AC = alternating current	IN. = inch, inches	POLY = polystyrene
AFC = automatic frequency control	INCD = incandescent	PORC = porcelain
ALUM = aluminum	INCL = include(s)	POS = position(s)
AL-ELECT = aluminum electrolytic	INS = insulation(ed)	POT = potentiometer
ASSY = assembly	INT = internal	PP = peak-to-peak
BFO = beat frequency oscillator	I/O = input/output	PT = point
BE CU = beryllium copper	K = kilo = 1000	PWV = peak working voltage
BH = binder head	LH = left hand	R = resistor
BP = bandpass	LIN = linear taper	RECT = rectifier
BRS = brass	LK WASH = lock washer	RF = radio frequency
BWO = backward wave oscillator	LOG = logarithmic taper	RH = round head or right hand
C = capacitor	LPF = low pass filter	RMO = rack mount only
CCW = counterclockwise	M = milli = 10 ⁻³	RMS = root-mean square
CER = ceramic	MEG = mega = 10 ⁶	RWV = reverse working voltage
CMO = cabinet mount only	MET FLM = metal film	S-B = slow-blow
COEF = coefficient	MET OX = metal oxide	SCR = screw
COM = common	MFR = manufacturer	SE = selenium
COMP = composition	MHz = megahertz	SECT = section(s)
COMPL = complete	MINAT = miniature	SEMICON = semiconductor
CONN = connector	MOM = momentary	SI = silicon
CP = cadmium plate	MTG = mounting	SIL = silver
CRT = cathode-ray tube	MY = Mylar	SL = slide
CTL = capacitor-transistor logic	N = nano (10 ⁻⁹)	SPDT = single-pole, double-throw
CW = clockwise	N/C = normally closed	SPG = spring
DC = direct current	NE = neon	SPL = special
DEPC = deposited carbon	NI PL = nickel plate	SPST = single-pole, single-throw
DPDT = double-pole, double-throw	NO. = number	SR = split ring
DPST = double-pole, single-throw	N/O = normally open	SST = stainless steel
DR = drive	NPN = negative-positive-negative	STL = steel
ELECT = electrolytic	NPO = negative positive zero (zero temperature coefficient)	TA = tantalum
ENCAP = encapsulated	NRFR = not recommended for field replacement	TD = time delay
EXT = external	NSR = not separately replaceable	TGL = toggle
F = farads	OBD = order by description	THD = thread
FH = flat head	OD = outer diameter	TI = titanium
FIL H = fillister head	OH = oval head	TOL = tolerance
FXD = fixed	OX = oxide	TRIM = trimmer
G = giga (10 ⁹)	P = peak	TTL = transistor-transistor logic
GE = germanium	PC = printed circuit	TWT = traveling wave tube
GL = glass	PF = picofarads = 10 ⁻¹² farads	U (μ) = micro = 10 ⁻⁶
GND/GRD = ground(ed)	PH = Phillips head	VAR = variable
H = henries	PH BRZ = phosphor bronze	VDCW = direct current working volts
HDW = hardware	PHL = Phillips	W/ = with
HEX = hexagonal	PIV = peak inverse voltage	W = watts
HG = mercury	PNP = positive-negative-positive	WIV = working inverse voltage
HR = hour(s)		WW = wirewound
HZ = hertz		W/O = without
ID = inner diameter		
IF = intermediate frequency		

Table 4-3. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
00000	U. S. A. Common	Any supplier of U. S.	05245	Components Corp.	Chicago, Ill.	09145	Tech. Ind. Inc. Atchm Elect.	Burbank, Calif.
00136	McCoy Electronics	Mount Holly Springs, Pa.	05277	Westinghouse Electric Corp.		09250	Electro Assemblies, Inc.	Chicago, Ill.
00213	Sage Electronics Corp.	Rocnester, N. Y.		Semi-Conductor Dept.	Youngwood, Pa.	09353	C & K Components Inc.	Newton, Mass.
00287	Cemco Inc.	Danielson, Conn.	05347	Ultronic, Inc.	San Mateo, Calif.	09569	Mallory Battery Co. of	
00334	Humidial	Colton, Calif.		Unicon Carbide Corp., Elect. Div.			Canada, Ltd.	Toronto, Ontario, Canada
00348	Microtron Co., Inc.	Valley Stream, N. Y.			New York, N. Y.	09922	Burncy Corp.	Norwalk, Conn.
00373	Garlock Inc.	Cherry Hill, N. J.	05574	Viking Ind. Inc.	Canoga Park, Calif.	10214	General Transistor Western Corp.	
00656	Aerovox Corp.	New Bedford, Mass.	05593	Icore Electro-Plastics Inc.	Sunnyvale, Calif.			Los Angeles, Calif.
00779	Amp. Inc.	Harrisburg, Pa.	05616	Cosmo Plastic		10411	Ti-Taf, Inc.	Berkeley, Calif.
00781	Aircraft Radio Corp.	Boonton, N. J.		(Radio Electrical Spec. Co.)	Cleveland, Ohio	10646	Carborundum Co.	Niagara Falls, N. Y.
00815	Northern Engineering Laboratories, Inc.	Burlington, Wis.	05624	Barber Colman Co.	Rockford, Ill.	11236	CTS of Berne, Inc.	Berne, Ind.
			05728	Tiffen Optical Co.		11237	Chicago Telephone of California, Inc.	
00853	Sangamo Electric Co., Pickens Div.	Pickens, S. C.			Roslyn Heights, Long Island, N. Y.			So. Pasadena, Calif.
00866	Goe Engineering Co.	City of Industry, Cal.	05729	Metro-Tel Corp.	Westbury, N. Y.	11242	Bay State Electronics Corp.	Waltham, Mass.
00891	Carl E. Holmes Corp.	Los Angeles, Calif.	05783	Stewart Engineering Co.	Santa Cruz, Calif.	11312	Tetedyne Inc., Microwave Div.	Palo Alto, Calif.
00929	Microlab Inc.	Livingston, N. J.	05820	Wakefield Engineering Inc.	Wakefield, Mass.	11314	National Seal	Downey, Calif.
01002	General Electric Co., Capacitor Dept.	Hudson Falls, N. Y.	06004	Bassick Co., Div. of Stewart Warner Corp.		11453	Precision Connector Corp.	Jamaica, N. Y.
					Bridgeport, Conn.	11534	Duncan Electronics Inc.	Costa Mesa, Calif.
01009	Alden Products Co.	Brockton, Mass.	06090	Raychem Corp.	Redwood City, Calif.	11711	General Instrument Corp., Semiconductor	
01121	Allen Bradley Co.	Milwaukee, Wis.	06175	Bausch and Lomb Optical Co.	Rochester, N. Y.		Div., Products Group	Newark, N. J.
01255	Litton Industries, Inc.	Beverly Hills, Calif.	06402	E. T. A. Products Co. of America	Chicago, Ill.	11717	Imperial Electronic, Inc.	Buena Park, Calif.
01281	TRW Semiconductors, Inc.	Lawndale, Calif.	06540	Anatom Electronic Hardware Co., Inc.		11870	Melabs, Inc.	Palo Alto, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.	Dallas, Texas			New Rochelle, N. Y.	12040	National Semiconductor	Danbury, Conn.
01349	The Alliance Mfg. Co.	Alliance, Ohio	06555	Beede Electrical Instrument Co., Inc.		12136	Philadelphia Handle Co.	Camden, N. J.
01589	Pacific Relays, Inc.	Van Nuys, Calif.			Penacook, N. H.	12361	Grove Mfg. Co., Inc.	Shady Grove, Pa.
01670	Gudebrod Bros. Silk Co.	New York, N. Y.	06666	General Devices Co., Inc.	Indianapolis, Ind.	12574	Gulton Ind. Inc. Data System Div.	Albuquerque, N. M.
01930	Amerock Corp.	Rockford, Ill.	06751	Components Inc., Ariz. Div.	Phoenix, Ariz.			
01961	Pulse Engineering Co.	Santa Clara, Calif.	06812	Torrington Mfg. Co., West Div.		12697	Clarostat Mfg. Co.	Dover, N. H.
02114	Ferroxcube Corp. of America	Saugerties, N. Y.			Van Nuys, Calif.	12728	Elmar Filter Corp.	W. Haven, Conn.
02116	Wheelock Signals, Inc.	Long Branch, N. J.	06980	Varian Assoc. Esmac Div.	San Carlos, Calif.	12859	Nippon Electric Co., Ltd.	Tokyo, Japan
02286	Cole Rubber and Plastics Inc.	Sunnyvale, Calif.	07088	Kelvin Electric Co.	Van Nuys, Calif.	12881	Metex Electronics Corp.	Clark, N. J.
02660	Amphenol-Borg Electronics Corp.	Broadview, Ill.	07126	Digitran Co.	Pasadena, Calif.	12930	Della Semiconductor Inc.	Newport Beach, Calif.
02735	Radio Corp. of America, Semiconductor and Materials Div.	Somerville, N. J.	07137	Transistor Electronics Corp.	Minneapolis, Minn.	12954	Dickson Electronics Corp.	Scottsdale, Arizona
02771	Vocaline Co. of America, Inc.	Old Saybrook, Conn.	07138	Westinghouse Electric Corp. Electronic Tube Div.	Elmira, N. Y.	13103	Thermolloy	Dallas, Texas
					New York, N. Y.	13396	Tetofunken (GmbH)	Hanover, Germany
02777	Hopkins Engineering Co.	San Fernando, Calif.	07149	Flincht Corp.		13835	Midland-Wright Div. of Pacific Industries, Inc.	Kansas City, Kansas
02875	Hudson Tool & Die Co.	Newark, N. J.	07233	Cinch-Graphix Co.	City of Industry, Calif.			
03508	G. E. Semiconductor Prod. Dept.	Syracuse, N. Y.	07256	Silicon Transistor Corp.	Carle Place, N. Y.	14099	Sem-Tech	Newbury Park, Calif.
03705	Apex Machine & Tool Co.	Dayton, Ohio	07261	Avnet Corp.	Culver City, Calif.	14193	Calif. Resistor Corp.	Santa Monica, Calif.
03797	Eldema Corp.	Compton, Calif.	07263	Fairchild Camera & Inst. Corp. Semiconductor Div.		14298	American Components, Inc.	Conshohocken, Pa.
03818	Parker Seal Co.	Los Angeles, Calif.			Mountain View, Calif.	14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.	West Palm Beach, Fla.
03877	Transiron Electric Corp.	Wakefield, Mass.	07322	Minnesota Rubber Co.	Minneapolis, Minn.	14493	Hewlett-Packard Company	Loveland, Colo.
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls, N. J.	07387	Birtcher Corp., The	Monterey Park, Calif.	14655	Cornell Dublier Electric Corp.	Newark, N. J.
03954	Singer Co., Drehl Div.		07397	Sylvania Elect. Prod. Inc., Mt. View Operations		14674	Corning Glass Works	Corning, N. Y.
					Mountain View, Calif.	14752	Electro Tube Inc.	San Gabriel, Calif.
04009	Arrow, Hair and Hegeman Elect. Co.	Hartford, Conn.	07700	Technical Wire Products Inc.	Cranford, N. J.	14960	Williams Mfg. Co.	San Jose, Calif.
			07829	Bodine Elect. Co.	Chicago, Ill.	15203	Webster Electronics Co.	New York, N. Y.
04013	Taurus Corp.	Lambertville, N. J.	07910	Continental Device Corp.	Hawthorne, Calif.	15287	Sronics Corp.	Northridge, Calif.
04062	Arco Electronic Inc.	Great Neck, N. Y.	07933	Raytheon Mfg. Co., Semiconductor Div.		15291	Adjustable Bushing Co.	N. Hollywood, Calif.
04222	Hi-Q Division of Aerovox	Myrtle Beach, S. C.			Mountain View, Calif.	15558	Micron Electronics	
04354	Precision Paper Tube Co.	Wheeling, Ill.	07980	Hewlett-Packard Co., Boonton Radio Div.				Garden City, Long Island, N. Y.
04404	Dymec Division of Hewlett-Packard Co.	Palo Alto, Calif.			Rockaway, N. J.	15566	Amprobe Inst. Corp.	Lynbrook, N. Y.
			08145	U. S. Engineering Co.	Los Angeles, Calif.	15631	Cabletronics	Costa Mesa, Calif.
04651	Sylvania Electric Products, Microwave Device Div.	Mountain View, Calif.	08289	Blinn, Delbert Co.	Pomona, Calif.	15772	Twentieth Century Coil Spring Co.	
			08358	Burgess Battery Co.				Santa Clara, Calif.
04673	Dakota Engr. Inc.	Culver City, Calif.			Niagara Falls, Ontario, Canada	15801	Fenwal Elect. Inc.	Framingham, Mass.
04713	Motorola, Inc., Semiconductor Prod. Div.	Phoenix, Arizona	08654	Bristol Co., The	Waterbury, Conn.	15818	Amelco Inc.	Mt. View, Calif.
			08717	Sloan Company	Sun Valley, Calif.	16037	Spruce Pine Mica Co.	Spruce Pine, N. C.
04732	Filtron Co., Inc. Western Div.		08718	ITT Cannon Electric Inc., Phoenix Div.		16179	Omni-Spectra Inc.	Farmington, Mich.
					Phoenix, Arizona	16352	Computer Diode Corp.	Lodi, N. J.
04773	Automatic Electric Co.	Northlake, Ill.	08727	National Radio Lab. Inc.	Paramus, N. J.	16585	Boots Aircraft Nut Corp.	Pasadena, Calif.
04796	Sequoia Wire Co.	Redwood City, Calif.	08792	CBS Electronics Semiconductor Operations. Div. of C. B. S. Inc.		16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.	Brooklyn, N. Y.
04811	Precision Coil Spring Co.	El Monte, Calif.						Kokoma, Ind.
04870	P. M. Motor Company	Westchester, Ill.	08806	General Electric Co. Miniat. Lamp Dept.		16758	Delco Radio Div. of G. M. Corp.	Canoga Park, Calif.
04919	Component Mfg. Service Co.				Loweil, Mass.	17109	Thermonetics Inc.	Mountain View, Calif.
			08984	Mel-Rain	Cleveland, Ohio	17474	Tranex Company	Mountain View, Calif.
			09026	Babcock Relays Div.	Indianapolis, Ind.	17554	Components Inc.	Biddeford, Me.
05006	Twentieth Century Plastics, Inc.	Los Angeles, Calif.	09134	Texas Capacitor Co.	Houston, Texas	17675	Hamlin Metal Products Corp.	Akron, Ohio
						17745	Angstromh Prec. Inc.	No. Hollywood, Calif.

Table 4-3. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
80486	All Star Products Inc.	Defiance, Ohio	86684	Radio Corp. of America, Electronic Comp. & Devices Div.	Harrison, N. J.	95566	Arnold Engineering Co.	Marengo, Ill.
80509	Avery Label Co.	Monrovia, Calif.	86928	Seastrom Mfg. Co.	Glendale, Calif.	95712	Dage Electric Co., Inc.	Franklin, Ind.
80583	Hammarlund Co., Inc.	Mars Hill, N. C.	87034	Marco Industries	Anaheim, Calif.	95984	Siemon Mfg. Co.	Wayne, Ill.
80640	Stevens, Arnold, Co., Inc.	Boston, Mass.	87216	Philco Corporation (Lansdale Division)	Lansdale, Pa.	95987	Weckesser Co.	Chicago, Ill.
80813	Dimco Gray Co.	Dayton, Ohio	87473	Western Fibrous Glass Products Co.	San Francisco, Calif.	96067	Microwave Assoc., West Inc.	Sunnyvale, Calif.
81030	International Instruments Inc.	Orange, Conn.	87664	Van Waters & Rogers Inc.	San Francisco, Calif.	96095	Hi-Q Div. of Aerovox Corp.	Olean, N.Y.
81073	Grayhill Co.	LaGrange, Ill.	87930	Tower Mfg. Corp.	Providence, R. I.	96256	Thordarson-Meissner Inc.	Mt. Carmel, Ill.
81095	Triad Transformer Corp.	Venice, Calif.	88140	Cutler-Hammer, Inc.	Lincoln, Ill.	96296	Solar Manufacturing Co.	Los Angeles, Calif.
81312	Winchester Elec. Div. Litton Ind., Inc.	Oakville, Conn.	88220	Gould-National Batteries, Inc.	St. Paul, Minn.	96306	Microswitch, Div. of Minn.-Honeywell	Freeport, Ill.
81349	Military Specification		88698	General Mills, Inc.	Buffalo, N.Y.	96330	Carlton Screw Co.	Chicago, Ill.
81483	International Rectifier Corp.	El Segundo, Calif.	89231	Graybar Electric Co.	Oakland, Calif.	96341	Microwave Associates, Inc.	Burlington, Mass.
81541	Airpax Electronics, Inc.	Cambridge, Maryland	89473	G. E. Distributing Corp.	Schenectady, N.Y.	96501	Excel Transformer Co.	Oakland, Calif.
81860	Barry Controls, Div. Barry Wright Corp.	Watertown, Mass.	89665	United Transformer Co.	Chicago, Ill.	96733	San Fernando Elect. Mfg. Co.	San Fernando, Calif.
82042	Carter Precision Electric Co.	Skokie, Ill.	90030	United Shoe Machinery Corp.	Beverly, Mass.	96881	Thomson Ind. Inc.	Long Is., N.Y.
82047	Sperfi Faraday Inc., Copper Hewitt Electric Div.	Hoboken, N.J.	90179	US Rubber Co., Consumer Ind. & Plastics Prod. Div.	Passaic, N.J.	97464	Industrial Retaining Ring Co.	Irvine, N.Y.
82116	Electric Regulator Corp.	Norwalk, Conn.	90970	Bearing Engineering Co.	San Francisco, Calif.	97539	Automatic & Precision Mfg.	Englewood, N.J.
82142	Jeffers Electronics Division of Speer Carbon Co.	Du Bois, Pa.	91146	ITT Cannon Elect. Inc., Salem Div.	Salem, Mass.	97979	Reon Resistor Corp.	Yonkers, N.Y.
82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.	Paramus, N.J.	91260	Connor Spring Mfg. Co.	San Francisco, Calif.	97983	Litton System Inc., Adler-Westrex Commun. Div.	New Rochelle, N.Y.
82209	Maguire Industries, Inc.	Greenwich, Conn.	91345	Miller Dial & Nameplate Co.	El Monte, Calif.	98141	R-Tronics, Inc.	Jamaica, N.Y.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division	Emporium, Pa.	91418	Radio Materials Co.	Chicago, Ill.	98159	Rubber Teck, Inc.	Gardena, Calif.
82376	Astion Corp.	East Newark, Harrison, N.J.	91506	Augal Inc.	Attleboro, Mass.	98220	Hewlett-Packard Co., Moseley Div.	Pasadena, Calif.
82389	Switchcraft, Inc.	Chicago, Ill.	91637	Dale Electronics, Inc.	Columbus, Nebr.	98278	Microdot, Inc.	So. Pasadena, Calif.
82647	Metals & Controls Inc. Spencer Products	Attleboro, Mass.	91662	Elco Corp.	Willow Grove, Pa.	98291	Sealectro Corp.	Mamaroneck, N.Y.
82768	Phillips-Advance Control Co.	Joliet, Ill.	91737	Greinar Mfg. Co., Inc.	Wakefield, Mass.	98376	Zero Mfg. Co.	Burbank, Calif.
82866	Research Products Corp.	Madison, Wis.	91827	K F Development Co.	Redwood City, Calif.	38410	Etc Inc.	Cleveland, Ohio
82877	Rotron Mfg. Co., Inc.	Woodstock, N.Y.	91886	Malco Mfg. Co., Inc.	Chicago, Ill.	98731	General Mills Inc., Electronics Div.	Minneapolis, Minn.
82893	Vector Electronic Co.	Glendale, Calif.	91929	Honeywell Inc., Micro Switch Div.	Freeport, Ill.	98734	Paeco Div. of Hewlett-Packard Co.	Palo Alto, Calif.
83014	Hartwell Corp.	Los Angeles, Calif.	91961	Nahm-Bros. Spring Co.	Oakland, Calif.	98821	North Hills Electronics, Inc.	Glen Cove, N.Y.
83058	Carr Fastener Co.	Cambridge, Mass.	92180	Tru-Connector Corp.	Peabody, Mass.	98978	International Electronic Research Corp.	Burbank, Calif.
83086	New Hampshire Ball Bearing, Inc.	Peterborough, N. H.	92367	Edgeel Optical Co. Inc.	Rochester, N.Y.	99109	Columbia Technical Corp.	New York, N.Y.
83125	General Instrument Corp., Capacitor Div.	Darlington, S. C.	92607	Tensolite Insulated Wire Co., Inc.	Tarrytown, N.Y.	99313	Varian Associates	Palo Alto, Calif.
83148	ITT Wire and Cable Div.	Los Angeles, Calif.	92702	IMC Magnetics Corp.	Westbury Long Island, N.Y.	99378	Altee Corp.	Winchester, Mass.
83186	Victory Eng. Corp.	Springfield, N.J.	92966	Hudson Lamp Co.	Kearney, N.J.	99515	Marshall Ind., Capacitor Div.	Monrovia, Calif.
83298	Beidix Corp., Red Bank Div.	Red Bank, N.J.	93332	Sylvania Electric Prod. Inc. Semiconductor Div.	Woburn, Mass.	99707	Control Switch Division, Controls Co. of America	El Segundo, Calif.
83315	Hubbell Corp.	Mundelein, Ill.	93369	Robbins & Myers Inc.	Palisades Park, N.J.	99800	Delevan Electronics Corp.	East Aurora, N.Y.
83324	Rosan Inc.	Newport Beach, Calif.	93410	Stemco Controls, Div. of Essex Wire Corp.	Mansfield, Ohio	99848	Wilco Corporation	Indianapolis, Ind.
83330	Smith, Herman H., Inc.	Brooklyn, N.Y.	93632	Waters Mfg. Co.	Culver City, Calif.	99928	Branson Corp.	Whippany, N.J.
83332	Tech Labs	Palisade's Park, N.J.	93929	G. V. Controls	Livingston, N.J.	99934	Renbrandt, Inc.	Boston, Mass.
83385	Central Screw Co.	Chicago, Ill.	94137	General Cable Corp.	Bayonne, N.J.	99942	Hoffman Electronics Corp. Semiconductor Div.	El Monte, Calif.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.	Brookfield, Mass.	94142	Phelps Dodge	Yonkers, N.Y.	99957	Technology Instrument Corp. of Calif.	Newbury Park, Calif.
83594	Burroughs Corp. Electronic Tube Div.	Plainfield, N.J.	94144	Raytheon Co., Comp. Div., Ind. Comp. Operations	Quincy, Mass.			
83740	Union Carbide Corp. Consumer Prod. Div.	New York, N.Y.	94148	Scientific Electronics Products, Inc.	Loveland, Colo.	THE FOLLOWING HP VENDORS HAVE NO NUMBER ASSIGNED IN THE LATEST SUPPLEMENT TO THE FEDERAL SUPPLY CODE FOR MANUFACTURERS HANDBOOK.		
83777	Model Eng. and Mfg., Inc.	Huntington, Ind.	94154	Wagner Elect. Corp., Tung-Sol Div.	Newark, N.J.			
83821	Lloyd Scruggs Co.	Festus, Mo.	94197	Curtiss-Wright Corp. Electronics Div.	East Paterson, N.J.			
83942	Aeronautical Inst. & Radio Co.	Lodi, N.J.	94222	South Chester Corp.	Chester, Pa.			
84171	Arco Electronics Inc.	Great Neck, N.Y.	94330	Wire Cloth Products, Inc.	Bellwood, Ill.	0000F	Malco Tool and Die	Los Angeles, Calif.
84396	A. J. Glesener Co., Inc.	San Francisco, Calif.	94375	Automatic Metal Products Co.	Brooklyn, N.Y.	0000Z	Willow Leather Products Corp.	Newark, N.J.
84411	TRW Capacitor Div.	Ogallala, Neb.	94682	Worcester Pressed Aluminum Corp.	Worcester, Mass.	000AB	ETA	England
84970	Sarkes Tarzian, Inc.	Bloomington, Ind.	94696	Magnecraft Electric Co.	Chicago, Ill.	000BB	Precision Instrument Components Co.	Van Nuys, Calif.
85454	Boonton Molding Company	Boonton, N.J.	95023	George A. Philbrick Researchers, Inc.	Boston, Mass.	000CS	Hewlett-Packard Co., Colorado Springs	Colorado Springs, Colorado
85471	A. B. Boyd Co.	San Francisco, Calif.	35236	Allies Products Corp.	Dania, Fla.	000MM	Rubber Eng. & Development	Hayward, Calif.
85474	R. M. Bracamonte & Co.	San Francisco, Calif.	95238	Continental Connector Corp.	Woodside, N.Y.	000NN	A "N" D Mfg. Co.	San Jose, Calif.
85660	Koried Koids, Inc.	Hamden, Conn.	95263	Leecraft Mfg. Co., Inc.	Long Island, N.Y.	000QQ	Cooltron	Oakland, Calif.
85911	Seamless Rubber Co.	Chicago, Ill.	95265	National Coil Co.	Sheridan, Wyo.	000WW	California Eastern Lab.	Burlington, Calif.
86174	Fahrer Bearing Co.	Los Angeles, Calif.	95275	Vitramon, Inc.	Bridgeport, Conn.	000YY	S. K. Smith Co.	Los Angeles, Calif.
86197	Clifton Precision Products Co., Inc.	Clifton Heights, Pa.	95348	Gordos Corp.	Bloomfield, N.J.			
86579	Precision Rubber Products Corp.	Dayton, Ohio	95354	Methode Mfg. Co.	Rolling Meadows, Ill.			

00015-47
Revised: April, 1969

From: FSC. Handbook Supplements

Table 4-3. Code List of Manufacturers (Continued)

Code No.	Manufacturer	Address	Code No.	Manufacturer	Address	Code No.	Manufacturer	Address
17870	McGraw-Edison Co.	Manchester, N. H.	62119	Universal Electric Co.	Owosso, Mich.	73899	JFD Electronics Corp.	Brooklyn, N. Y.
18042	Power Design Pacific Inc.	Palo Alto, Calif.	63743	Ward-Leonard Electric Co.	Mt. Vernon, N. Y.	73905	Jennings Radio Mfg. Corp.	San Jose, Calif.
18083	Clevite Corp., Semiconductor Div.	Palo Alto, Calif.	64959	Western Electric Co., Inc.	New York, N. Y.	73957	Groov-Pin Corp.	Ridgefield, N. J.
18324	Signetics Corp.	Sunnyvale, Calif.	65092	Weston Inst. Inc. Weston-Newark	Newark, N. J.	74276	Signalite Inc.	Neptune, N. J.
18476	Ty-Car Mfg. Co., Inc.	Holliston, Mass.	66295	Wrttek Mfg. Co.	Chicago, Ill.	74455	J. H. Winns, and Sons	Winchester, Mass.
18486	TRW Elect. Comp. Div.	Des Plaines, Ill.	66346	Minnesota Mining & Mfg. Co. Revere	Mincon Div. St. Paul, Minn.	74861	Industrial Condenser Corp.	Chicago, Ill.
18583	Curtis Instrument, Inc.	Mt. Kisco, N. Y.	70276	Allen Mfg. Co.	Hartford, Conn.	74868	R. F. Products Division of Amphenol-Borg Electronics Corp.	Danbury, Conn.
18612	Vishay Instruments Inc.	Malvern, Pa.	70309	Allied Control	New York, N. Y.	74970	E. F. Johnson Co.	Waseca, Minn.
18873	E. I. DuPont and Co., Inc.	Wilmington, Del.	70318	Allmetal Screw Product Co., Inc.	Garden City, N. Y.	75042	International Resistance Co.	Philadelphia, Pa.
18911	Durant Mfg. Co.	Milwaukee, Wis.	70417	Amplex. Div. of Chrysler Corp.	Chicago, Ill.	75253	Keystone Carbon Co., Inc.	St. Marys, Pa.
19315	The Bendix Corp., Navigation & Control Div.	Teterboro, N. J.	70485	Allantic India Rubber Works, Inc.	Chicago, Ill.	75378	CTS Knights Inc.	Sandwich, Ill.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.	West Orange, N. J.	70563	Amperite Co., Inc.	Union City, N. J.	75382	Kulka Electric Corporation	Mt. Vernon, N. Y.
19589	Concoa	Baldwin Park, Calif.	70674	AOC Products Inc.	Minneapolis, Minn.	75818	Lenz Electric Mfg. Co.	Chicago, Ill.
19644	LRC Electronics	Horseheads, N. Y.	70903	Belden Mfg. Co.	Chicago, Ill.	75915	Littlefuse, Inc.	Des Plaines, Ill.
19701	Electra Mfg. Co.	Independence, Kansas	70998	Bird Electronic Corp.	Cleveland, Ohio	76005	Lord Mfg. Co.	Eric, Pa.
20183	General Atomics Corp.	Philadelphia, Pa.	71002	Birnbach Radio Co.	New York, N. Y.	76210	C. W. Marwedel	San Francisco, Calif.
21226	Executone, Inc.	Long Island City, N. Y.	71034	Bliley Electric Co., Inc.	Erie, Pa.	76433	General Instrument Corp., Micamold Division	Newark, N. J.
21335	Fafnir Bearing Co., The	New Britain, Conn.	71041	Boston Gear Works Div. of Murray Co. of Texas	Quincy, Mass.	76487	James Millen Mfg. Co., Inc.	Malden, Mass.
21520	Fansteel Metallurgical Corp.	N. Chicago, Ill.	71218	Bud Radio, Inc.	Willoughby, Ohio	76493	J. W. Miller Co.	Los Angeles, Calif.
23042	Texscan Corp.	Indianapolis, Ind.	71279	Cambridge Thermionics Corp.	Cambridge, Mass.	76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.	San Leandro, Calif.
23783	British Radio Electronics Ltd.	Washington, D. C.	71286	Camloc Fastener Corp.	Paramus, N. J.	76545	Mueller Electric Co.	Cleveland, Ohio
24455	G. E. Lamp Division	Neia Park, Cleveland, Ohio	71313	Cardwell Condenser Corp.	Lindenhurst L. I., N. Y.	76703	National Union	Newark, N. J.
24655	General Radio Co.	West Concord, Mass.	71400	Bussmann Mfg. Div. of McGraw-Edison Co.	St. Louis, Mo.	76854	Oak Manufacturing Co.	Crystal Lake, Ill.
24681	Memcor Inc., Comp. Div.	Huntington, Ind.	71436	Chicago Condenser Corp.	Chicago, Ill.	77068	The Bendix Corp., Electrodynamics Div.	N. Hollywood, Calif.
24796	Parelo Inc.	San Juan Capistrano, Calif.	71447	Calif. Spring Co., Inc.	Pico-Rivera, Calif.	77075	Pacific Metals Co.	San Francisco, Calif.
26365	Gries Reproducer Corp.	New Rochelle, N. Y.	71450	CTS Corp.	Elkhart, Ind.	77221	Phanostran Instrument and Electronic Co.	South Pasadena, Calif.
26462	Gibbet File Co. of America, Inc.	Carlstadt, N. J.	71468	ITT Cannon Electric Inc.	Los Angeles, Calif.	77252	Philadelphia Steel and Wire Corp.	Philadelphia, Pa.
26851	Compac Hollister Co.	Hollister, Calif.	71471	Cinema, Div. Aerovox Corp.	Burbank, Calif.	77342	American Machine & Foundry Co. Potter & Brumfield Div.	Princeton, Ind.
26992	Hamilton Watch Co.	Lancaster, Pa.	71482	C. P. Clare & Co.	Chicago, Ill.	77630	TRW Electronic Components Div.	Camden, N. J.
27251	Specialities Mfg. Co., Inc.	Stratford, Conn.	71590	Centralab Div. of Globe Union Inc.	Milwaukee, Wis.	77638	General Instrument Corp., Rectifier Div.	Brooklyn, N. Y.
28480	Hewlett-Packard Co.	Palo Alto, Calif.	71616	Commercial Plastics Co.	Chicago, Ill.	77764	Resistance Products Co.	Harrisburg, Pa.
28520	Heyman Mfg. Co.	Kenilworth, N. J.	71700	Cornish Wire Co., The	New York, N. Y.	77969	Rubbercraft Corp. of Calif.	Torrance, Calif.
30817	Instrument Specialties Co., Inc.	Little Falls, N. J.	71707	Coto Coil Co., Inc.	Providence, R. I.	78189	Shakeproof Division of Illinois Tool Works	Eigin, Ill.
33173	G. E. Receiving Tube Dept.	Owensboro, Ky.	71744	Chicago Miniature Lamp Works	Chicago, Ill.	78277	Sigma	So. Braintree, Mass.
35434	Lectrohm Inc.	Chicago, Ill.	71785	Cinch Mfg. Co., Howard B. Jones Div.	Chicago, Ill.	78283	Signal Indicator Corp.	New York, N. Y.
36196	Stanwyck Coil Products Ltd.	Hawkesbury, Ontario, Canada	71984	Dow Corning Corp.	Midland, Mich.	78290	Struthers-Dunn Inc.	Pitman, N. J.
36287	Cunningham, W. H. & Hill, Ltd.	Toronto Ontario, Canada	72136	Electro Motive Mfg. Co., Inc.	Williamant, Conn.	78424	Speciality Leather Prod. Co.	Newark, N. J.
37942	P. R. Mallory & Co. Inc.	Indianapolis, Ind.	72619	Dialight Corp.	Brooklyn, N. Y.	78452	Thompson-Bremer & Co.	Chicago, Ill.
39543	Mechanical Industries Prod. Co.	Akron, Ohio	72656	Indiana General Corp., Electronics Div.	Keasby, N. J.	78471	Tilley Mfg. Co.	San Francisco, Calif.
40920	Miniature Precision Bearings, Inc.	Keene, N. H.	72699	General Instrument Corp., Cap. Div.	Newark, N. J.	78488	Stackpole Carbon Co.	St. Marys, Pa.
42190	Muter Co.	Chicago, Ill.	72765	Drake Mfg. Co.	Harwood Heights, Ill.	78493	Standard Thomson Corp.	Waltham, Mass.
43990	C. A. Norgren Co.	Englewood, Colo.	72825	Hugh H. Eby Inc.	Philadelphia, Pa.	78553	Tinnerman Products, Inc.	Cleveland, Ohio
44655	Ohmite Mfg. Co.	Skokie, Ill.	72928	Gudeman Co.	Chicago, Ill.	78790	Transformer Engineers	San Gabriel, Calif.
46384	Penn Eng. & Mfg. Corp.	Doylestown, Pa.	72962	Elastic Stop Nut Corp.	Union, N. J.	78947	Ucinite Co.	Newtonville, Mass.
47904	Polaroid Corp.	Cambridge, Mass.	72964	Robert M. Hadley Co.	Los Angeles, Calif.	79136	Waldes Kohinoor Inc.	Long Island City, N. Y.
48620	Precision Thermometer & Inst. Co.	Southampton, Pa.	72982	Ernie Technological Products, Inc.	Erie, Pa.	79142	Veeder Root, Inc.	Hartford, Conn.
49956	Microwave & Power Tube Div.	Waltham, Mass.	73061	Hansen Mfg. Co., Inc.	Princeton, Ind.	79251	Wenco Mfg. Co.	Chicago, Ill.
52090	Rowan Controller Co.	Westminster, Md.	73076	H. M. Harper Co.	Chicago, Ill.	79727	Continental-Wirt Electronics Corp.	Philadelphia, Pa.
52983	Sanborn Company	Waltham, Mass.	73138	Helipot Div. of Beckman Inst., Inc.	Fullerton, Calif.	79963	Zierick Mfg. Corp.	New Rochelle, N. Y.
54294	Shallcross Mfg. Co.	Selma, N. C.	73293	Hughes Products Division of Hughes Aircraft Co.	Newport Beach, Calif.	80031	Mecco Division of Sessions Clock Co.	Morristown, N. J.
55026	Simpson Electric Co.	Chicago, Ill.	73445	Amperelect Co.	Hicksville, L. I., N. Y.	80120	Schnitzer Alloy Products Co.	Elizabeth, N. J.
55933	Sonotone Corp.	Elmsford, N. Y.	73506	Bradley Semiconductor Corp.	New Haven, Conn.	80131	Electronic Industries Association. Any brand Tube meeting EIA Standards-Washington.	DC.
55938	Raytheon Co. Commercial Apparatus & Systems Div.	So. Norwalk, Conn.	73559	Carling Electric, Inc.	Hartford, Conn.	80207	Unimax Switch, Div. Maxon Electronics Corp.	Wallingford, Conn.
56137	Spaulding Fibre Co., Inc.	Tonawanda, N. Y.	73586	Circle F Mfg. Co.	Trenton, N. J.	80223	United Transformer Corp.	New York, N. Y.
56289	Sprague Electric Co.	North Adams, Mass.	73682	George K. Garrett Co., Div. MSL Industries Inc.	Philadelphia, Pa.	80248	Oxford Electric Corp.	Chicago, Ill.
59446	Telex Corp.	Tulsa, Okla.	73734	Federal Screw Products Inc.	Chicago, Ill.	80294	Bouts Inc.	Riverside, Calif.
59730	Thomas & Betts Co.	Elizabeth, N. J.	73743	Fischer Special Mfg. Co.	Cincinnati, Ohio	80411	Acro Div. of Robertshaw Controls Co.	Columbus, Ohio
60741	Triplitt Electrical Inst. Co.	Bluffton, Ohio	73793	General Industries Co., The	Elyria, Ohio			
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.	Pittsburgh, Pa.	73846	Goshen Stamping & Tool Co.	Goshen, Ind.			

