RTE Driver DVA 47 For HP 92900A Real Time Applications Terminal Subsystem

Programming and Operating Manual

HEWLETT hp PACKARD

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Changed pages are identified by a change number adjacent to the page number. Changed information is indicated by a vertical line in the outer margin of the page. Original pages do not include a change number and are indicated as change number 0 on this page. Insert latest changed pages and destroy superseded pages.

Change 0 (Original) . . . . . SEPT 76

TABLE OF CONTENTS

TABLES

SECTION I

GENERAL INFORMATION

1 - 1 GENERAL DESCRIPTION

1 - 2 This manual contains information and procedures that allow the user to write application programs using FORTRAN, ALGOL or ASSEMBLY language programs and RTE Driver 47. Section III provides information required when configuring Driver DVA 47 into a Real-Time Executive (RTE) Operating System. The Driver is entered through a FORTRAN, ALGOL, or Assembly language call to control:
- Data transmission to and from 3070A terminals
- The Hewlett-Packard Interface Bus (HPIB) attached to each 3070A terminal
- Data transmission to and from any station (ie instrument, calculator) attached to terminal's HPIB's.

RTE Driver DVA 47 may control simultaneously up to 57-n terminals which may be distributed between n (up to 8) serial links and up to 13 stations attached to each terminal thru its HPIB.

1 - 3 OPERATING ENVIRONMENT

1 - 4 The operating environment for this software must be a HP2100/HP21MX Series Computer, an RTE Operating System, (REV. D or newer) one 92900A Terminals Subsystem and up to seven additional 40280A Serial Link Interface Kits. For hardware details refer to the 92900A Operating and Service Manual (Part no. 92900 - 90001), to the 3070A Operating and Service Manual (Part no. 03070 - 90001) and to the 40280A operating and Service Manual (Part no. 40280 - 90001).

1 - 5 COMPONENTS

1 - 6 The following components are included with DVA 47 :
a) This manual
b) Driver DVA 47 binary tape, HP Part no. 92900 - 16002 (RTE-II), HP Part no. 92900 - 16003 (RTE-III).

1 - 7 SYSTEM DESCRIPTION

1 - 8 CAREFULLY READ THIS SECTION IF YOU ARE NOT FAMILIAR WITH THE 3070A TERMINAL AND THE HEWLETT-PACKARD INTERFACE BUS (HPIB) AND YOU WANT TO USE THE EXTENDED FEATURES OF THIS DRIVER. (Refer to HP 3070A Terminal Operating and Service Manual HP Part no. 03070 - 90001) for detailed information.

1 - 9 DEFINITIONS

1 - 10 The Communication Module has two main functions :

- It transforms information coming from the computer (in bit serial form) according to a defined protocol into standard HPIB information. Hence, it acts as a SYSTEM CONTROLLER for the HP-IB, under remote control of the computer.

- It transforms information coming from the HP-IB (in HP-IB form) into bit serial form according to the defined protocol if the listener function has been addressed.
Note: In transparent mode of operation (see 2-6) care must be taken to address the listener function of the communication module if data or control information on the terminal's HP-IB is to go back to the computer.

1 - 11 HP-IB GLOSSARY

1 - 12 TALKER : A talker function provides a device with the capability to send device dependent data (over the HP-IB) to other devices. This capability exists only when the talker function is addressed to talk via a TALK ADDRESS (TLK) command (see table 2-7). Only one talker at a time can be active on the HP-IB.

1 - 13 LISTENER : A listener function provides a device with the capability to receive device dependent data (over the HP-IB) from other devices. This capability exists only when the listener function is addressed to listen via a LISTEN ADDRESS (LSN) command (see table 2-7). All stations able to listen may do so simultaneously on the HP-IB if they are addressed to listen.

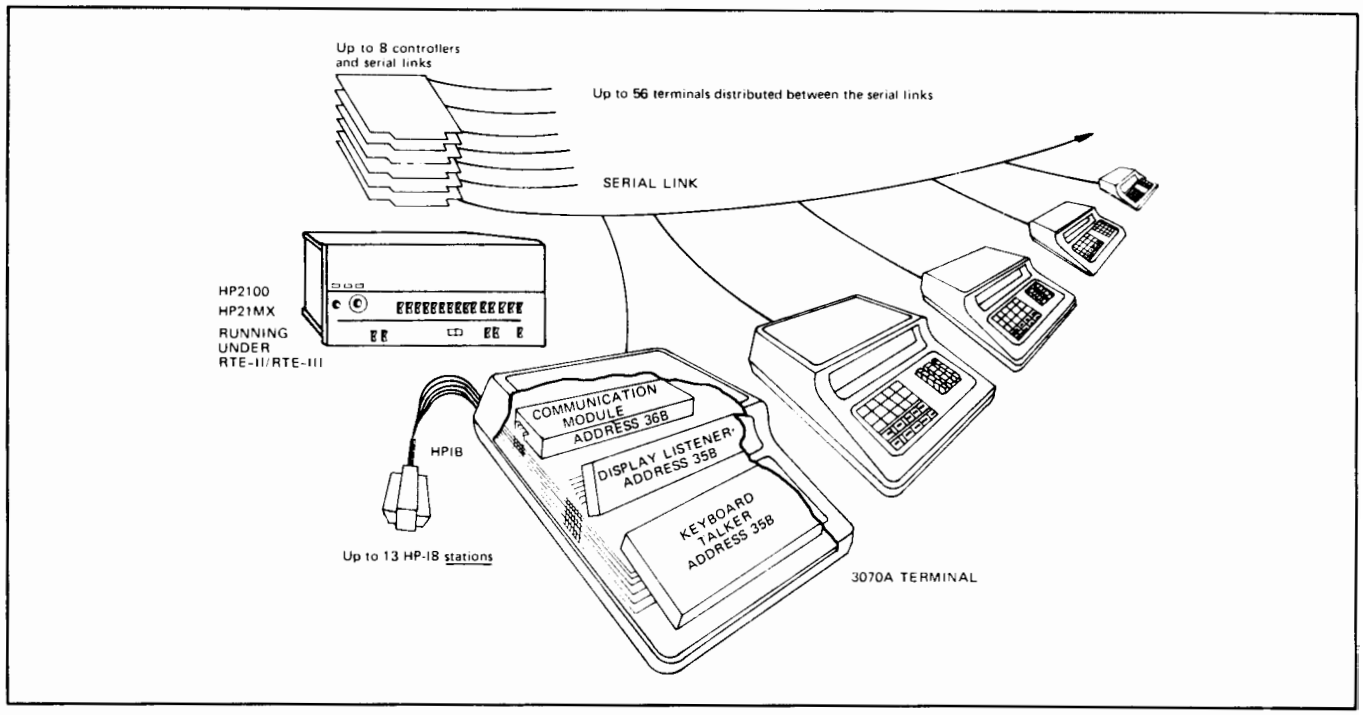


Figure 1-1

1 - 14 The HP 3070A data terminal Keyboard, Display sections and Communication Module section are considered as three HP-IB stations. The addresses are normally :

Keyboard	Talker	$35_{(8)}$	(Factory wired)
Display +lights	Listener	$35_{(8)}$	(Factory wired)
Communication Module	Listener	$36_{(8)}$	(Always set to $36_{(8)}$)

Addresses of the Keyboard-Display +lights section may be changed by the user (see HP 3070A Operating and Service Manual HP Part no. 03070 - 90001).

1 - 15 HP-IB CONTROL LINES

1 - 16 Five HP-IB lines are used to manage an orderly flow of information across the interface :

1 - 17 ATN (attention) is used to specify how data on the data lines are to be interpreted. If ATN is true, data is an HP-IB command byte, otherwise it is a data byte.

1 - 18 IFC (Interface Clear) is used to place the HP-IB interface system, portions of which are contained in all interconnected devices, in a known quiescent state.

1 - 19 REN (Remote Enable) is used to place instruments in a remote control mode thus disabling the front panel settings.

1 - 20 EOI (End or Identify) is used to indicate the end of a multiple byte transfer sequence.

1 - 21 SRQ (Service Request) is used by a device to indicate the need for attention and to request an interruption of the current sequence of events.

The 3070A terminal keyboard generates SRQ when the upper left special function key is being depressed (see HP 3070 Operating and Service Manual HP Part no. 03070 - 90001).

1 - 22 3070A KEYBOARD SPECIAL FUNCTION KEYS AND PROMPTING LIGHT CODE.

Refer to the HP 3070A Operating and Service Manual (HP Part no. 03070 - 90001).

SECTION II

APPLICATION INFORMATION

2 - 1 GENERAL

2 - 2 This section details the calls to the driver and describes any results of the hardware/software marriage where the hardware may influence software techniques.

2 - 3 CALLING SEQUENCES

2 - 4 The 3070A Real Time Applications terminals and their associated HP-IB stations are operated in the Real-Time Executive System through FORTRAN, ALGOL and Assembly language programs calling DVA 47. The Driver causes the units to respond to the Read, Write and Control calls as described in Tables 2-1 to 2-5.

2 - 5 NORMAL MODE of operation allows use of the HP 3070A as a simple numeric input/output device (without knowledge of the HP-IB) and **only requires utilization of these requests listed in table 2-6.** See APPENDIX A for normal mode programming example.

2 - 6 TRANSPARENT MODE of operation allows full control of terminal's HP-IB. The terminal itself is then considered as a set of HP-IB stations (see paragraph 1-14). See APPENDIX B for transparent mode programming example.

2 - 7 RECORD FORMATS

Note : When input/output terms are used it refers to the computers action with respect to the terminal.

2 - 8 NORMAL MODE ASCII INPUT

2 - 9 Normal Mode ASCII input is a string of characters terminated by :

a) A Line Feed (LF) code (not stored in the user buffer)
b) A Special Function Key (SFK) code (see 1-22) if previously selected as an input terminator (not stored in the user buffer).
c) Detection of the HP-IB Service Request line being true if previously selected as an input terminator.

Note: If more characters than requested are input they are lost, any SFK enabled as terminators are disabled and the only valid terminators are Line Feed or Service Request (if enabled).

Example : Given the following code

```
CALL EXEC (3, LU)              Clear Terminal
CALL EXEC (3, 1200B + LU, 5)   Enable SFK 5
CALL EXEC (3, 1400B + LU)      Set normal mode
CALL EXEC (1, LU, IDATA, -3)   Read Data
```

- A string of 2 characters or less followed by SFK5 will complete the read.
- A string of 3 characters or more followed by SFK5 will not complete the read (only a Line Feed will complete the read in this case).

2 - 10 TRANSPARENT MODE ASCII INPUT

2 - 11 Transparent ASCII input is a string of characters terminated by :

a) Same conditions as in Normal Mode ASCII input.
b) An HP-IB command (HP-IB Attention line true) in which case the command byte is the last byte stored in the user buffer.
c) Input of the requested number of bytes.

2 - 12 Non alphanumeric keys or codes are processed as follows :

DELETE (Rubout)	:	Deletes current record (on ASCII input only).
SPECIAL FUNCTION KEYS	:	Considered as ASCII data if not enabled as terminators.
SERVICE REQUEST KEY	:	Ignored if not enabled as terminator.

2 - 13 ASCII OUTPUT

2 - 14 ASCII output is a string of characters, the number of which is designated by the buffer length parameter in the request. The string is terminated by a Line Feed (supplied by the driver).

2 - 15 A buffer length of zero causes only a Line Feed to be transmitted.

2 - 16 NORMAL MODE BINARY INPUT

2 - 17 Normal Mode Binary input is a string of characters terminated by :

a) Input of the requested number of characters.
b) Detection of the Hewlett-Packard Interface Bus End or Identify (EOI) line being true.

2 - 18 TRANSPARENT MODE BINARY INPUT

2 - 19 Transparent binary input is a string of characters terminated by :

a) Same conditions as in Normal Mode Binary Input.
b) An HP-IB command (HP-IB Attention line true) in which case the command byte is the last byte stored in the user buffer.

2 - 20 BINARY OUTPUT

2 - 21 Binary output is a string of characters, the number of which is designated by the buffer length parameter in the request.
The HP-IB End or Identify (EOI) line is set true when outputting the last character of the string.

2 - 22 SPECIAL WRITE REQUEST

2 - 23 SERIAL POLL REQUEST

2 - 24 This special Write Request is used to identify an HPIB station which has set the Service Request Line true during a previous request.

2 - 25 The user buffer, IBUFR, must contain the addresses of the stations to be polled (in any order).

```
IBUFR     OCT AI                          Ai are addresses of
              .          0 ≤ Ai ≤ 35₈     stations on the HPIB
              .
              .
          OCT An
```

The user buffer length, IBUFL, in words, indicates the number of stations to be polled.

2 - 26 The first answering station causes the request to complete :

- That station's Service Request line is reset,
- The status word (EQT 5 bit 7-0) is updated :
  (STATION ADDRESS) Bit 4-0 : answering station address (37_8 if no answer)
  (SRQ) Bit 7 : indicates if other stations are still requesting service.

2 - 27 In order to clear the bit 7 indication in the status word as many serial poll requests as the number of requesting stations must be issued.

2 - 28 The HP 3070A keyboard is an HP-IB station (see HP 3070A Operating and Service Manual HP Part no. 03070 - 90001) which sets its Service Request line true when the Service Request key is pushed. The standard keyboard address is 35_8. A serial Poll request on station 35_8 will indicate if the key has been depressed or not.

```
Example : IBUFR = 35B
          ILU = Logical Unit Number of the terminal
          CALL EXEC (2, 2000 B + ILU, IBUFR, 1)
          CALL EXEC (13, ILU, IEQT5)
```

Upon return, content of IEQT5 indicates if the Service Request key has been used (bits 4-0 = 35_8) or not (bits 4-0 = 37_8) and if the HPIB Service Request line (SRQ) is still true or false (bits 7 = 1 or 0).
Note: Never Poll the communication module (station 36) as this would cause the program to go permanently into I/O suspension.

2 - 29 WRITE COMMAND BYTES REQUEST

2 - 30 This special write request allows the user to send HP-IB commands to control the HP-IB directly.

2 - 31 The buffer IBUFR must be constructed by the user and may include any mixture of available HP-IB commands (see table 2-7).
Each command is an 8-bit byte allowing two commands to appear in a single buffer word.

NOTE Care must be taken to configure the communication module of the 3070A during a WRITE command Request if a subsequent Transparent READ is to be executed. If it is not configured as a listener, the information being sent by a talker on the HP-IB will not be transfered back down the serial link to the computer.

Example : Configure station 21_8 and 27_8 as listeners
Configure station 20_8 as the talker
Read data sent by station 20_8 (ASCII string, LF) into IDATA.

```
IBUFR (1) = 2H? > Unlisten - Station 36 Listener
IBUFR (2) = 2H17 Station 21 Listener - Station 27 Listener.
IBUFR (3) = 2 HP  Station 20 talker
ILU = Logical Unit # of terminal
CALL EXEC (3, 1300B +ILU)              Set transparent mode
CALL EXEC (2, 2100B +ILU, IBUFR, -5)   Send HPIB commands
CALL EXEC (1, ILU, IDATA, ILEN)        Read data
```

2 - 32 **CONTROL FUNCTIONS**

2 - 33 Bits 10 through 6 define the control word function code used in CONTROL Requests.

2 - 34 CLEAR TERMINAL Function code = 0

a) Terminal display is erased, all initiator lights are cleared.
b) The special READ termination conditions are reset to their default value (ENTER key).
c) The next talker address (see paragraph 2-38) is reset to its default value (keyboard).
d) All stations active on the HP-IB are disabled (IFC sent on HP-IB).
e) The DCL (Universal Device Clear) code is sent to the HP-IB which causes all responding devices to return to a predetermined state.
f) All stations are returned to local control (Remote Disable).

2 - 35 ISSUE END OR IDENTIFY Function code = 1

a) Causes the End or Identify (EOI) HP-IB line to be set true allowing the End of Record indication to be observed by all responding devices.

2 - 36 REMOTE ENABLE Function code = 2

a) Forces responding HP-IB stations associated with the addressed terminal into the "Remote Control State"
b) After execution of this control function, any ensuing information sent to the associated HP-IB will contain the REN line true (Remote Enable) until a REMOTE DISABLE command is executed.

2 - 37 REMOTE DISABLE Function code = 3

a) All HP-IB stations associated with the terminal will revert back to local control.

2 - 38 SET NEXT TALKER ADDRESS Function code = 4
The addressed station will become a talker on the HP-IB when the next Normal mode READ call is executed. This call does not send any information on the HP-IB. It merely updates talker address in EQT 12 (Previous talker address will be overwritten).

2 - 39 CHECK FOR SRQ Function code = 7
The state of the SRQ line on the associated HP-IB is recorded in bit 7 of EQT 5 (status word).

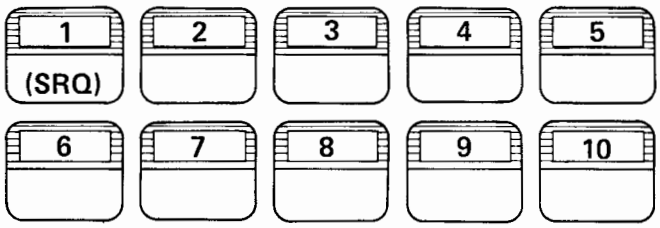
2 - 40 WAIT FOR SRQ Function code = 10_8
If a class I/O request, it does not complete until the Service Request line on the addressed terminal HP-IB becomes true. If a standard request, the user program is placed in I/O suspend until the Service Request line on the addressed terminal HP-IB becomes true. When it does, status word (EQT 5) bit 7 is set; the call is completed and user program is scheduled for execution.

2 - 41 GET STATUS BYTE Function code = 11_8

a) Gets 8 bits of hardware status (STB) from the relevant station attached to the addressed terminal HP-IB.
b) A serial Poll is executed on the defined station, the Status byte is then stored in status word (EQT5) bit 7-0 and call is completed.
Note: Do not attempt to get a status byte from a non-responding station (i.e. communication module). This will cause the program to go permanently into I/O suspension.

2 - 42 SELECT INPUT TERMINATOR Function code = 12_8
Used to dynamically define one or more Special Function key codes and/or the Service Request line detection as input terminators to an ASCII Read Request. A positive key number enables the function key, a negative number disables it.

Special function keys are identified by numbers as follows :



2 - 43 SET TRANSPARENT MODE Function code = 13_8
This call places the driver in the transparent mode of operation for the addressed terminal.

2 - 44 SET NORMAL MODE Function code = 14_8
This call places the driver in the normal mode of operation for the addressed terminal (Default mode).

2 - 45 SET TIME OUT Function code = 22_8
When non zero, a time-out will occur after the selected time if the initiated READ or WRITE request has not been completed.

2 - 46 **STATUS INFORMATION**

2 - 47 The status information is maintained in word 5 of each terminal Equipment Table (bit 7-0) and may be returned to the user program thru a status request.

2 - 48 The status information may take different formats upon completion of driver requests.

2 - 49 READ REQUEST COMPLETION

EQT 5	8	7	6	5	4	3	2	1	0
		SRQ	REN	ATN	EOI	EOR			

2 - 50 EOR indicates which terminator caused the READ to complete.

EOR = 0 ASCII Read completed on LF or Binary Read completed on EOI or Buffer Full.
EOR = n ($1 \leqslant n \leqslant 10$) ASCII Read completed on Special Function Key n.
($n = 1$ indicates completion on SRQ key).
EOR = 15 Transparent mode ASCII Read completed on Buffer Full.
Note: EOR = 1 to 10 will occur only if SELECT INPUT TERMINATOR control EXEC calls have been previously issued.

2 - 51 ATN indicates state of HP-IB ATN (Attention) line.
= 1 if a Transparent Mode Read completed on ATN (HP-IB command detected).

2 - 52 REN indicates state of HP-IB REN (remote Enable) line.
= 1 if REN true.

2 - 53 SRQ indicates state of HP-IB SRQ (service Request) line.
= 1 if SRQ true (at least one station on the HP-IB of the addressed terminal is requesting service).
SRQ status indication is meaningless on completion of Transparent Read Request (unless EOR = 1).

2 - 54 EOI indicates state of HP-IB EOI (End or Identify) line.
= 1 if EOI has been detected true during the READ request.

2 - 55 WRITE REQUESTS COMPLETION

EQT 5	8	7	6	5	4	3	2	1	0
		SRQ	REN						

SRQ and REN have same meaning as above (see 2-52 and 2-53).
SRQ status indication is meaningless on completion of Transparent Write Requests and Write Command bytes request.

2 - 56 SERIAL POLL REQUEST COMPLETION

8	7	6	5	4	3	2	1	0
	SRQ	REN		STATION ADDRESS				

STATION ADDRESS is the address of the first station answering the Serial Poll request. If no station answered, STATION ADDRESS is set equal to 37_8.

SRQ and REN have same meaning as above (see 2-52 and 2-53).

2 - 57 GET STATUS BYTE REQUEST COMPLETION

7	6	5	4	3	2	1	0
DI08	DI07	DI06	DI05	DI04	DI03	DI02	DI01

Where DI08 - DI01 = Hardware status byte (STB) of the relevant station.

2 - 58 CHECK FOR SRQ / WAIT FOR SRQ REQUEST COMPLETION

EQT 5	8	7	6	5	4	3	2	1	0
		SRQ							

SRQ has same meaning as above (see 2-53)

2 - 59 INFORMATION ON ERROR COMPLETION

2 - 60 In both NORMAL and TRANSPARENT mode the following information is returned to the user provided the requests are standard requests (not class I/O) and for unbuffered terminals.

A - Reg = Status word (EQT 5)
B - Reg = 100000_8

2 - 61 When an error condition is detected the status word (EQT 5) is updated

EQT 5

8	7	6	5	4	3	2	1	0
						ERR		

ERR = 1 Time-out occured
ERR = 2 Hardware failure
- Power OFF on terminal
- Terminal disconnected
- Terminal physical address is set wrong or duplicata address
- Serial link is bad
- Hardware failure on terminal.

ERR = 2 is only detectable upon completion of a CLEAR TERMINAL control exec call. A good practice is to start a program by clearing all terminals before beginning any other operation.
ERR = 3 Hardware failure on the controller.
ERR = Maximum number of controllers already active for this driver or bad system configuration.
ERR = 5 Illegal Control Request.

2 - 62 The RTE system is notified of completion in error in all cases in NORMAL Mode and in case of fatal errors in TRANSPARENT Mode.

The following messages are issued :

ERR = 1 I/O ERR TO EQT # (Normal Mode)
ERR = 2 I/O ERR PE EQT # (Normal Mode)
ERR = 3/4 I/O ERR NR EQT # (Normal/transparent Modes).

TABLE 2-1 HP 3070A READ CALLS (DVA 47)

Assembly Language	Where
EXT EXEC . . . JSB EXEC DEF * +5 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL < return point > . Class Request EXT EXEC . . . JSB EXEC DEF return point DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL DEF IPRM1 DEF IPRM2 DEF ICLAS < return point > See RTE manual (HP Part No. 92001 - 93001) for definition of IPRM1, IPRM2, ICLAS	ICODE = Function code 1 = Read Request 17 = Class Read Request. ICNWD = Control Word Bit 0 thru 5 } = Logical Unit Number Bit 6 = Data Transfer Mode 0 = ASCII 1 = binary Bit 8 = (used only in NORMAL mode) 1 = Causes talker station input to be printed on terminal display as received. (The display is configured as a listener by this call). On subsequent read requests, regardless of the value of bit 8, the input will be echoed on the terminal display until a CLEAR TERMINAL control exec call is executed or an UNLISTEN HP-IB command is sent. IBUFR = Buffer location IBUFL = Buffer length + number = words - number = characters NORMAL Mode READ : The talker is as defined by the latest SET NEXT TALKER ADDRESS Control EXEC call. Default value is 3070A - Terminal keyboard. TRANSPARENT Mode READ : The talker is as configured by the user with a WRITE COMMAND BYTES request.
FORTRAN	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL)
FORTRAN (Class)	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL, IPRM1, IPRM2, ICLAS).

TABLE 2-2 HP 3070A WRITE CALLS (DVA 47)

Assembly Language	Where
EXT EXEC . . . JSB EXEC DEF * +5 DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL < return point > . . Class Request EXT EXEC . . . JSB EXEC DEF return point DEF ICODE DEF ICNWD DEF IBUFR DEF IBUFL DEF IPRM1 DEF IPRM2 DEF ICLAS < return point > See RTE manual (HP Part No. 92001 - 93001) for definition of IPRM1, IPRM2, ICLAS	ICODE = Function code 2 = Write Request 18 = Class WRITE Request ICNWD = Control Word Bit 0 Thru 5 = Logical Unit Number Bit 6 = Data Transfer Mode 0 = ASCII 1 = binary Bit 10 = Standard / Special functions 0 = Standard Write functions 1 = Special Write functions If Bit 6 = 0 Serial Poll Request (see 2-23) If Bit 6 = 1 Write Command Bytes Request (see 2-29) IBUFR = Buffer location IBUFL = Buffer length +number = words - number = characters NORMAL Mode WRITE : Listeners are the 3070A terminal display and all currently addressed listeners. TRANSPARENT Mode WRITE : Listeners are as configured by the user with a WRITE COMMAND BYTES request.
FORTRAN	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL)
FORTRAN (Class)	CALL EXEC (ICODE, ICNWD, IBUFR, IBUFL, IPRM1, IPRM2, ICLAS)

TABLE 2-3 SUMMARY OF AVAILABLE READ / WRITE REQUESTS CONTROL WORDS (CONWD)

Conwd	Request	Mode	Data	End of Record	Turn Display on	HPIB Command bytes generated
0000 L U	READ	NORMAL	ASCII	LF, SFK	NO	LSN 36, TLK*, UNT
0004 L U	READ	NORMAL	ASCII	LF, SFK	YES	LSN 35, LSN 36, TLK*, UNT
0001 L U	READ	NORMAL	BINARY	EOI, Buffer Full	NO	LSN 36, TLK*, UNT
0005 L U	READ	NORMAL	BINARY	EOI, Buffer Full	YES	LSN 35, LSN 36, TLK*, UNT
0000 L U	READ	TRANSPARENT	ASCII	LF, ATN, Buffer Full	NO	–
0001 L U	READ	TRANSPARENT	BINARY	EOI, ATN, Buffer Full	NO	–
0000 L U	WRITE	NORMAL	ASCII	LF	YES	LSN 35, UNT
0001 L U	WRITE	NORMAL	BINARY	EOI	YES	LSN 35, UNT
0000 L U	WRITE	TRANSPARENT	ASCII	LF	NO	–
0001 L U	WRITE	TRANSPARENT	BINARY	EOI	NO	–
0020 L U	SERIAL POLL	NORMAL OR TRANSPARENT	N/A	N/A	N/A	UNL, UNT, LSN 36, SPE, TLKx, TLKy, ... , UNT, SPD
0021 L U	WRITE COMMAND BYTES	NORMAL OR TRANSPARENT	HPIB COMMAND BYTES	BYTE COUNT EXHAUSTED	N/A	User defined sequence

* Next talker address
x, y, Addresses of stations serially polled
LSN aa Listen Address
TLK aa Talk Address
UNL, UNT Unlisten, Untalk

SPE, SPD Serial Poll Enable, Serial Poll Disable
EOI End or Identify line
ATN Attention line
LF Line Feed
SFK Special Function Key

TABLE 2-4 HP 3070A CONTROL CALLS (DVA 47)

Assembly Language	Where
EXT EXEC . . JSB EXEC DEF *+3, or 4 DEF ICODE DEF ICNWD DEF IPARM <. return point > . Class Request EXT EXEC . . . JSB EXEC DEF return point DEF ICODE DEF ICNWD DEF IPARM DEF ICLAS < return point > . . .	ICODE = Request Code 3 = Control Request 19 = Class CONTROL Request ICNWD = Control Word Bit 0 Thru 5 } Logical Unit Number Bit 6 Thru 10 } Function code 00= Clear Terminal (see 2-34) 01= Issue end or identify (see 2-358) 02= Remote Enable (see 2-36) 03= Remote Disable (see 2-37) 04= Set next talker address (see 2-38) IPARM is the address of the station on the HPIB which will be the next talker ($0 \leq IPARM \leq 35$) 07= Check for Service Request (see 2-39) 10= Wait for Service Request (see 2-40) 11= Get Status Byte (see 2-41). IPARM is the address of the station of which to obtain status byte ($0 \leq IPARM \leq 358$) 12= Select input terminator (see 2-42) IPARM defines which special function key (including service request key) will be used to complete subsequent ASCII read requests ($-10 \leq IPARM \leq 10$) 13= Set Transparent Mode (see 2-43) 14= Set Normal Mode (see 2-44) 22= Set time-out (see 2-45) IPARM is set as the new time out interval. IPARM = Optional parameter ICLAS = Class number (if ICODE = 19)
FORTRAN	CALL EXEC (ICODE, ICNWD, IPARM)
FORTRAN (Class)	CALL EXEC (ICODE, ICNWD, IPARM, ICLAS)

TABLE 2-5 SUMMARY OF AVAILABLE CONTROL FUNCTIONS

CONWD	FUNCTION	OPTIONAL PARAMETER	HPIB COMMAND BYTES OR ACTION
0000 L U	Clear Terminal	–	REN, IFC, $\overline{\text{IFC}}$, DCL
0001 L U	Issue end of Identify	–	EOI, $\overline{\text{EOI}}$
0002 L U	Remote Enable	–	REN
0003 L U	Remote Disable	–	$\overline{\text{REN}}$
0004 L U	Set Next Talker Address	Next talker Address	–
0007 L U	Check for Service Request	–	UNT
0010 L U	Wait for Service Request	–	UNT
0011 L U	Get Status Byte	Station address	UNL, UNT, LSN36, SPE TLK(IPARM), UNT, SPD
0012 L U	Select Input Terminator	Special function key number	
0013 L U	Set Transparent Mode	–	–
0014 L U	Set Normal Mode	–	–
0022 L U	Set Time-out	New time-out Value	

NOTE : Control Requests have the same meaning whether in NORMAL or TRANSPARENT Mode

IFC ..... Set IFC line true
$\overline{\text{IFC}}$ ..... Set IFC line false
EOI ..... Set EOI line true
$\overline{\text{EOI}}$ ..... Set EOI line false
DCL ..... Device Clear command
REN ..... Set REN line true
$\overline{\text{REN}}$ ..... Set REN line false

TABLE 2-6 SIMPLIFIED DESCRIPTION OF REQUESTS NECESSARY FOR USE OF THE 3070A AS A NUMERIC INPUT/OUTPUT DATA TERMINAL

REQUEST	CONWD	DATA	END OF RECORD	TURN ON DISPLAY
READ	0000 L U	ASCII	LF, SFK	NO
READ	0004 L U	ASCII	LF, SFK	YES
READ	0001 L U	BINARY	Buffer Full	NO
READ	0005 L U	BINARY	Buffer Full	YES
WRITE	0000 L U	ASCII	LF	YES
WRITE	0001 L U	BINARY	Last character output	YES
CLEAR TERMINAL	0000 L U	See para 2-34		
SELECT INPUT TERMINAT.	0012 L U	See para 2-42		
WAIT FOR SERVICE REQUEST	0010 L U	See para 2-40 - Allows the user to place its program in I/O suspend until a special key (called the Service Request Key) is depressed.		
GET STATUS BYTE	0011 L U	See para. 2-41. Allows the user to clear the Service Request indications.		
SERIAL POLL WRITE	0020 L U	See para 2-23 - Allows the user to clear the Service Request indication.		

TABLE 2-7 AVAILABLE HP-IB COMMANDS

COMMAND	ACRONYM	COMMAND BYTE 7 6 5 4 3 2 1 0	BYTE POSITION	
			LEFT	RIGHT
Talk Address	TLK	X 1 0 T T T T T	040000 ⋮ 057000	000100 ⋮ 000136
Listen Address	LSN	X 0 1 L L L L L	020000 ⋮ 037000	000040 ⋮ 000076
Untalk	UNT	X 1 0 1 1 1 1 1	057400	000137
Unlisten	UNL	X 0 1 1 1 1 1 1	037400	000077
Go to local	GTL	X 0 0 0 0 0 0 1	000400	000001
Local lock-out	LLO	X 0 0 1 0 0 0 1	010400	000021
Device Clear	DCL	X 0 0 1 0 1 0 0	012000	000024
Selected Device Clear	SDC	X 0 0 0 0 1 0 0	002000	000004
Group Execute Trigger	GET	X 0 0 0 1 0 0 0	004000	000010
Take Control	TCT	X 0 0 0 1 0 0 1	004400	000011
Secondary Address	MSA	X 1 1 S S S S S	060000 ⋮ 077000	000140 ⋮ 000176
Serial Poll Enable	SPE	X 0 0 1 1 0 0 0	014000	000030
Serial Poll Disable	SPD	X 0 0 1 1 0 0 1	014400	000031

NOTE: Do not use parallel polling with the HP 92900 Subsystem.

SECTION III

CONFIGURATION INFORMATION

3 - 1 GENERAL

3 - 2 This section provides configuration information for Driver DVA 47 and is intented to augment the data provided in the Real-Time Executive Software System Programming and Operating Manual. (HP Part No. 92001-93001)

3 - 3 REAL-TIME GENERATION

3 - 4 The driver is loaded into the RTE System during system generation (as a core resident driver) as described in the appropriate RTE Software Manual. At this time, the following items must be supplied by the operator to configure the HP 3070A Terminals into the system being generated.

Note: The RTE system generated must be compatible with all date codes greater than or equal to 1604.

3 - 5 PROGRAM INPUT PHASE

3 - 6 Driver DVA 47 must be loaded during this phase.

3 - 7 TABLE GENERATION PHASE

3 - 8 In this phase, the following entries must be made :

a) An equipment table entry for each HP 40280A controller followed by an EQT entry for each 3070A terminal attached to this controller's serial link.THE ORDER OF EQT ENTRY FOR A GIVEN CONTROLLER MUST REFLECT PHYSICAL ADDRESSES OF TERMINALS ON THE ASSOCIATED SERIAL LINK.(See HP 3070A Operating and Service Manual).

if SC1 is the select code of controller 1
SC2 is the select code of controller 2
t, is the time-out parameter (if needed).

```
* EQUIPMENT TABLE ENTRY
SC1, DVA 47            EQT for controller 1 (dummy EQT entry)
SC1, DVA 47, T = t     EQT for terminal 1 of serial link 1
.
.
.
SC1, DVA 47, T = t     EQT for terminal n of serial link 1
SC2, DVA 47            EQT for controller 2 (dummy EQT entry)
SC2, DVA 47, T = t     EQT for terminal 1 of serial link 2.
.
.
.
.
```

b) A device Reference Table entry for each 3070A Terminal.

```
* DEVICE REFERENCE TABLE
xx = EQT # ?
m
.
.
.
.
```

Where xx is a logical unit number. Response "m" is the corresponding EQT number.
No logical unit number should reference the dummy EQT entries.

c) An Interrupt Table entry for each HP 40280A Serial Link Controller.

```
* INTERRUPT TABLE
SC1, EQT, d1   d1 and d2 are the EQT numbers of the dummy EQT's associated with each controller.
SC2, EQT, d2
```

APPENDIX A

NORMAL MODE OF OPERATION

```
0001  FTN4,L
0002        PROGRAM NORMA
0003        DIMENSION IREG(2),IB(5)
0004        EQUIVALENCE  (REG,IREG(1)),(IREG(1),AREG),(IREG(2),BREG)
0005        CALL RMPAR(IB)
0006        LU=IB(1)
0007  C
0008  C----SET NORMAL MODE
0009  C
0010        CALL EXEC(3,14000B+LU)
0011  C
0012  C----CLEAR TERMINAL & CHECK FOR WORKING STATE
0013  C
0014        REG=EXEC(3,LU)
0015        IF(BREG .LT. 0) GOTO 400
0016  C
0017  C----SWITCH LIGHT "1" ON
0018  C
0019        WRITE(LU)1418
0020  C
0021  C----ENABLE SRQ(SFK1) AND SFK5 AS READ TERMINATORS
0022  C
0023        CALL EXEC(3,12000B+LU,1)
0024        CALL EXEC(3,12000B+LU,5)
0025  C
0026  C----READ DATA
0027  C
0028   50   READ(LU,*)A
0029        CALL EXEC(13,LU,ISTAT)
0030        ISTAT=IAND(ISTAT,3)
0031        IF(ISTAT .EQ. 0) GOTO 100
0032        IF(ISTAT .EQ. 1) GOTO 200
0033        IF(ISTAT .EQ. 2) GOTO 300
0034  C
0035  C----COMPLETION ON ENTER KEY:STORE DATA ON MAG TAPE
0036  C
0037   100  WRITE(8)A
0038        GOTO 50
0039  C
0040  C----COMPLETION ON SRQ(REQUEST FOR SERVICE)KEY:CLEAR SRQ INDICATION
0041  C----AND READ AGAIN
0042  C
0043   200  CALL EXEC(3,11000B+LU,358)
0044        GOTO 50
0045  C
0046  C----HARDWARE FAILURE OR NOT READY :TERMINATE PROGRAM
0047  C
0048   400  WRITE(1,500)
0049   500  FORMAT("HARDWARE FAILURE")
0050        GOTO 350
0051  C
0052  C----COMPLETION ON SFK5 :WRITE EOF,REWIND TAPE &TERMINATE
0053  C
0054   300  ENDFILE 8
0055        REWIND 8
0056        CALL EXEC(3,LU)
```

APPENDIX B

TRANSPARENT MODE OF OPERATION

```
0001  FTN4,L
0002        PROGRAM TRANS
0003        DIMENSION IREG(2),IB(5)
0004        EQUIVALENCE (REG,IREG(1)),(IREG(1),AREG),(IREG(2),BREG)
0005        CALL RMPAR(IB)
0006        LU=IB(1)
0007  C
0008  C----SET TRANSPARENT MODE
0009  C
0010        CALL EXEC(3,13008+LU)
0011  C
0012  C----CLEAR TERMINAL &CHECK FOR WORKING STATE
0013  C
0014        REG=EXEC(3,LU)
0015        IF(BREG .LT. 0)GOTO 350
0016  C
0017  C----CONFIGURE DISPLAY AS A LISTENER (HP-IB ADDRESS IS 35B)
0018  C----CONFIGURE COMMUNICATION MODULE AS A LISTENER(HP-IB ADDRESS IS 36B)
0019  C
0020   50   IB(2)=2H=>
0021        CALL EXEC(2,21008+LU,IB(2),1)
0022  C
0023  C----SWITCH LIGHT "1" ON (MEANING:HOW MANY MEASURES ?)
0024  C
0025        WRITE(LU)141B
0026  C
0027  C----CONFIGURE KEYBOARD AS A TALKER (HP-IB ADDRESS IS 35B)
0028  C
0029        CALL EXEC(2,21008+LU,(1008+358)*256,-1)
0030  C
0031  C----ENABLE SRQ(SFK1) AND SFK5 AS READ TERMINATORS
0032  C
0033        CALL EXEC (3,12008+LU,1)
0034        CALL EXEC (3,12008+LU,5)
0035  C
0036  C----GET ANSWER FROM KEYBOARD
0037  C
0038        READ(LU,*)N
0039        CALL EXEC(13,LU,ISTAT)
0040        ISTAT=IAND(ISTAT,3)
0041        IF(ISTAT .EQ. 0) GOTO 70
0042        IF(ISTAT .EQ. 1) GOTO 300
0043        IF(ISTAT .EQ. 2) GOTO 400
0044        IF (ISTAT .GT. 2) GOTO 400
0045  C
0046  C----COMPLETION ON ENTER KEY:TAKE N READINGS FROM A 5302B COUNTER
0047  C
0048   70   TFREQ=0.
0049  C
0050  C----DISABLE SRQ AND SFK5 AS READ TERMINATORS
0051  C----DECONFIGURE TALKERS & LISTENERS
0052  C----CONFIGURE COUNTER AS A LISTENER (HP-IB ADDRESS IS 1 IN THIS EXAMPLE)
0053  C----TRIGGER THE COUNTER(SEND "I")
0054  C----UNLISTEN
0055  C----CONFIGURE COMMUNICATION MODULE AS A LISTENER (HP-IB ADDRESS IS 36B)
0056  C----CONFIGURE COUNTER AS A TALKER
0057  C----READ VALUE(A FREQUENCY IN THIS EXAMPLE)AND ACCUMULATE
0058  C
0059        DO 100 I=1,N
```

```
0060          CALL EXEC(3,LU)
0061          CALL EXEC(2,21008+LU,418*256,-1)
0062          IB(3)=2HI←
0063          REG=EXEC(2,LU,IB(3),1)
0064          IB(2)=2H?>
0065          IB(3)=2HA
0066          CALL EXEC(2,21008+LU,IB(2),-3)
0067          READ(LU,*)FREQ
0068          TFREQ=TFREQ+FREQ
0069   100    CONTINUE
0070    C
0071    C----COMPUTE AVERAGE FREQUENCY
0072    C
0073          FREQ=TFREQ/N
0074    C
0075    C----CONFIGURE DISPLAY AS A LISTENER,SWITCH LIGHT "2" ON,OUTPUT RESULT
0076    C
0077          CALL EXEC(2,21008+LU,(408+35B)*256,-1)
0078          WRITE(LU)143B
0079          WRITE(LU,200)FREQ
0080   200    FORMAT(F12.3)
0081          GOTO 50
0082    C
0083    C----COMPLETION ON SRQ(REQUEST FOR SERVICE) KEY:CLEAR SRQ  INDICATION
0084    C----AND READ AGAIN
0085    C
0086   300    CALL EXEC(3,11008+LU,35B)
0087          GOTO 50
0088    C
0089    C----HARDWARE FAILURE OR NOT READY:TERMINATE PROGRAM
0090    C
0091   350    WRITE(1,500)
0092   500    FORMAT ("HARDWARE FAILURE")
0093          GOTO 450
0094    C
0095    C----COMPLETION ON SFK5:TERMINATE PROGRAM
0096    C
0097   400    CALL EXEC(3,LU)
0098   450    END
```

APPENDIX C

PROGRAM EXAMPLE

USING CLASS I/O REQUESTS

```
0001  FTN,L
0002  C
0003  C
0004  C         EXAMPLE PROGRAM USING CLASS I/O REQUESTS
0005  C
0006  C
0007  C THIS PROGRAM ALLOWS A NUMBER OF TERMINALS TO PERFORM SIMULTANEOUSLY
0008  C AN INCOMING INSPECTION TRANSACTION TO REPORT BAD PARTS RECEIVED.
0009  C
0010  C TO PERFORM A TRANSACTION THE USER SHOULD
0011  C      1=PRESS THE SRQ KEY TO START THE TRANSACTION
0012  C      2=ANSWER WITH A PART# (XXXXX=YYYYY) TO THE QUESTION "PART ?"
0013  C        (LIGHT # 1).          XXXXX,YYYYY ARE NUMERIC STRINGS(XXXXX#0)
0014  C      3=ENTER QUANTITY RECEIVED AS ANSWER TO THE QUESTION "RECEIVED QTY?"
0015  C        (LIGHT # 2).
0016  C      4=ENTER QUANTITY REJECTED AS ANSWER TO THE QUESTION "REJECTED QTY?"
0017  C        (LIGHT # 3).
0018  C      5=ENTER REJECT CAUSE AS ANSWER TO THE QUESTION "REJECT REASON?"
0019  C        (LIGHT # 4).
0020  C        REASONS FOR REJECT ARE GIVEN BY PRESSING SFK'S 2,3,4,5.
0021  C
0022  C
0023  C     TO START THIS PROGRAM  ISSUE A   ON,EXAMP,FIRST,LAST
0024  C                                      WITH FIRST : LOWEST TERMINAL LU#
0025  C                                           LAST  : HIGHEST TERMINAL LU #
0026  C
0027         PROGRAM EXAMP,3,60
0028  C
0029         DOUBLE PRECISION PUT,IQR(63),LIQR(63),IQ(63),IRSN(4,63),
0030        1IQD,IRS1,IRS2,IRS3,IRS4
0031         DIMENSION  IPAR(5),LU(57),IAB(2),IDUMB(3),INPT(7),
0032        1IDCB(144),INAM(3),IBUF(25),
0033        1LAST(63),IPN(6,63)
0034         EQUIVALENCE (IPAR(1),IFRST),
0035        1            (IPAR(2),LAST),
0036        2            (AB,IAB(1)),
0037        3            (IBUF(8),IQD),
0038        4            (IBUF(11),IRS1),
0039        5            (IBUF(14),IRS2),
0040        6            (IBUF(17),IRS3),
0041        7            (IBUF(20),IRS4)
0042  C
0043         DATA LMP1/60537B/,LMP15/76537B/,LMP2/61537B/,LMP3/62537B/,
0044        1LMP4/63537B/,
0045        1ISC/2HMH/,INAM/2HSA,2HVE,2H  /
0046         CALL RMPAR(IPAR)
0047  C
0048  C               GET AND SAVE LU # TO BE USED
0049  C
0050         DO 1 I=IFRST,LAST
0051         LU(I+1-IFRST)=I
0052  1      CONTINUE
0053  C
0054  C               OPEN DATA STORAGE FILE (NOT EXCLUSIVE)
0055  C
0056         CALL OPEN(IDCB,IER,INAM,1B,ISC,ICR)
0057  C
0058  C             SET NORMAL MODE;CLEAR TERMINAL;CLEAR SRQ IF ANY
0059  C             ENABLE SRQ DETECTION AS AN INPUT TERMINATION
```

```
0060  C             ISSUE A CLASS READ TO GET THE SRQ INDICATION
0061  C             (WAIT ON SRQ IS USELESS WITH CLASS I/O)
0062  C
0063        DO 2 I=1,LAST=IFRST+1
0064        CALL EXEC(3,LU(I)+1400B,0)
0065        CALL EXEC(3,LU(I)+0B,0)
0066        CALL EXEC(3,LU(I)+1100B,35B)
0067        CALL EXEC(3,LU(I)+1200B,1)
0068        CALL EXEC(17,LU(I),INPT,-1,LU(I),-1,ICL)
0069  2     CONTINUE
0070  C
0071  C    PREPARE BUFFER TO SWITCH LIGHTS OFF
0072  C
0073        IDUMB(1)=60142B
0074        IDUMB(2)=62146B
0075  C
0076  C-------------GET INPUT & CHECK---------------
0077  C
0078  200   AB=EXEC(21,ICL+20000B,INPT,-11,LUT,IP2,IP3)
0079  C
0080  C
0081  201   CALL EXEC(13,LUT,IQT5)
0082        ISRQ=IAND(IQT5,2008)
0083        ISFK=IAND(IQT5,17B)
0084  C
0085  C           IS IT THE BEGINNING OF A TRANSACTION ?
0086  C
0087        IF((ISRQ .EQ. 0).AND.(IP2 .EQ. -1)) GOTO 100
0088  C
0089  C           IS TRANSACTION TO BE RESTARTED AT THE BEGINNING ?
0090  C
0091        IF((ISRQ .EQ. 200B).OR.(IP2 .EQ. 0)) GOTO 1000
0092  C
0093  C                 SWITCH OFF ERROR LIGHT (LIGHT # 15)
0094  C
0095        IDUMB(3)=LMP15=400B
0096        CALL EXEC(2,LUT,IDUMB(3),1)
0097  C
0098  C                 CHECK FOR VALID INPUT IN PHASE 4
0099  C
0100        IF((IP2.EQ.4).AND.(ISFK.GT.1).AND.(IAB(2).EQ.0))GOTO 202
0101        IF(IP2.EQ.4) GOTO 109
0102  C
0103  C                 CHECK FOR VALID INPUT IN OTHER PHASES
0104  C
0105        IF((IP2.NE.4).AND.(ISFK.EQ.0).AND.(IAB(2).GT.0)) GOTO 202
0106        IF(IP2.LT.4) GOTO 109
0107  C
0108  C                 GO TO THE RELEVANT PHASE OF THE TRANSACTION
0109  C
0110  202   GOTO (2000,3000,4000,5000)IP2
0111  C
0112  C
0113  C
0114  C*****************RETURN POINTS FROM PHASES*****************
0115  C
0116  C
0117  C
0118  C               ISSUE A CLASS READ WITH ECHO ON DISPLAY
0119  C
```

```
0120  101    CALL EXEC(17,LUT+400B,INPT,-11,LUT,IP2,ICL)
0121         GOTO 200
0122  C
0123  C                ISSUE A CLASS READ WITHOUT ECHO
0124  C
0125  100    CALL EXEC(17,LUT,INPT,-1,LUT,-1,ICL)
0126         GOTO 200
0127  C
0128  C                SWITCH ON ERROR LIGHT (LIGHT#15) AND READ AGAIN
0129  C
0130  109    CALL EXEC(2,LUT,LMP15,1)
0131         GOTO 101
0132  C
0133  C              END OF TRANSACTION - SAVE DATA IN "SAVE" FILE
0134  C                 SET UP TERMINAL FOR NEXT TRANSACTION
0135  C
0136  C                 RECORD STRUCTURE IS
0137  C                 LU #                  1 @ WORD
0138  C                 PART #                6 WORDS
0139  C                 QTY RECEIVED          3 WORDS
0140  C                 QTY RJCT REASON 1     3 WORDS
0141  C                 QTY RJCT REASON 2     3 WORDS
0142  C                 QTY RJCT REASON 3     3 WORDS
0143  C                 QTY RJCT REASON 4     3 WORDS
0144  C
0145  102    IBUF(1)=LUT
0146         DO 9000 I=2,7
0147  9000   IBUF(I)=IPN(I-1,LUT)
0148         IQD=IQ(LUT)
0149         IRS1=IRSN(1,LUT)
0150         IRS2=IRSN(2,LUT)
0151         IRS3=IRSN(3,LUT)
0152         IRS4=IRSN(4,LUT)
0153         CALL WRITF(IDCB,IER,IBUF,23)
0154         CALL POST(IDCB,IER)
0155         GOTO 201
0156  C
0157  C
0158  C
0159  C----------PHASE # 1   IP2=0  OR SRQ DETECTED-------------------------
0160  C
0161  C             INITIALIZE/REINITIALIZE TRANSACTION
0162  C
0163  1000   CALL EXEC(3,LUT+1100B,35B)
0164  C
0165  C             CLEAR TERMINAL
0166  C
0167         CALL EXEC(3,LUT+0,0)
0168  C
0169  C            ENABLE SFK 1 TO 5
0170  C
0171         DO 1001 IK=1,5
0172         CALL EXEC(3,LUT+1200B,IK)
0173  1001   CONTINUE
0174  C
0175  C            SWITCH ON "PART #?" (LIGHT # 1)
0176  C
0177         CALL EXEC(2,LUT,LMP1,1)
0178  C
0179  C            INITIALIZE STORAGE AREA FOR THIS TERMINAL
0180  C
0181         IQ(LUT)=0
0182         IQR(LUT)=0
```

```
0183          LAST(LUT)=0
0184          LIQR(LUT)=0
0185          DO 1002 I=1,4
0186    1002  IRSN(I,LUT)=0
0187          DO 1003 I=1,6
0188    1003  IPN(I,LUT)=200408
0189    C
0190    C          SET IP2=2 TO GO TO PHASE 2
0191    C
0192          IP2=1
0193          GOTO 101
0194    C
0195    C
0196    C--------PHASE # 2    IP2=1--------------------------------------
0197    C
0198    C          CHECK ANSWER TO "PART#?"
0199    C
0200    C       CHECK FOR = IN INPUT STRING
0201    2000  IF(IAND(INPT(3),3778).NE.558) GOTO 109
0202    C       CHECK FOR XXXXX # 0
0203          CALL ASTIN(INPT,5,PUT)
0204          IF(PUT.LE.0.D0) GOTO 109
0205    C        CHECK FOR NUMERIC X & Y
0206          IF (INPT(4).LT.300608) GOTO 109
0207          IF (INPT(5).LT.300608) GOTO 109
0208          IF (IAND(INPT(6),177400B).LT.300008) GOTO 109
0209    C       P/N IS O.K
0210          DO 2001 I=1,6
0211          IPN(I,LUT)=INPT(I)
0212    2001  CONTINUE
0213    C
0214    C         SWITCH ON  "QTY RECEIVED?"  (LIGHT # 2)
0215    C
0216          IDUMB(3)=LMP2
0217          CALL EXEC(2,LUT,IDUMB,3)
0218    C
0219    C         SET IP2=2 TO GO TO PHASE 3
0220    C
0221          IP2=2
0222          GOTO 101
0223    C
0224    C
0225    C
0226    C--------PHASE # 3   IP2=2--------------------------------------------
0227    C
0228    C          CHECK ANSWER TO "QTY RECEIVED?"  MUST BE NUMERIC AND POSITIVE
0229    C
0230    3000  CALL ASTIN(INPT,IAB(2),PUT)
0231          IF(PUT.LT.0.D0) GOTO 109
0232          IQ(LUT)=PUT
0233    C
0234    C          SWITCH ON  "QTY REJECTED?"  (LIGHT # 3)
0235    C
0236          IDUMB(3)=LMP3
0237          CALL EXEC(2,LUT,IDUMB,3)
0238    C
0239    C          SET IP2=3 TO GO TO PHASE 4
0240    C
0241          IP2=3
0242          GOTO 101
0243    C
0244    C
0245    C
```

```
0246  C----------PHASE # 4   IP2=3----------------------------------------
0247  C
0248  C
0249  C           CHECK ANSWER TO  "QTY REJECTED?"
0250  C           IF NEGATIVE NUMBER :ERROR
0251  C           IF NULL            :TRANSACTION COMPLETE STORE DATA
0252  C           IF POSITIVE        :IF SUM OF REJECTED PARTS>QTY RECEIVED:ERRO
0253  C
0254  C
0255  4000  CALL ASTIN(INPT,IAB(2),PUT)
0256        IF(PUT) 109, 4001, 4002
0257  4001  IP2=0
0258        GOTO 102
0259  4002  IF(IQ(LUT)-(IQR(LUT)+PUT)) 109,4003,4004
0260  4003  LAST(LUT)=1
0261  4004  IQR(LUT)=IQR(LUT)+PUT
0262        LIQR(LUT)=PUT
0263  C
0264  C       SWITCH ON  "REJECT REASON?"  (LIGHT # 4)
0265  C
0266        IDUMB(3)=LMP4
0267        CALL EXEC(2,LUT,IDUMB,3)
0268  C
0269  C       SET IP2=4  TO GO TO PHASE 5
0270  C
0271        IP2=4
0272        GOTO 101
0273  C
0274  C
0275  C
0276  C--------PHASE # 5   IP2=4----------------------------------------
0277  C
0278  C
0279  C       CHECK ANSWER TO  "REJECT REASON?"
0280  C            IF REASON ALREADY GIVEN !              :ERROR
0281  C            IF SUM OF REJECTED QTY = QTY RECEIVED :END OF TRANSACTION
0282  C            IF ALL REASONS USED                    :END OF TRANSACTION
0283  C
0284  5000  IKY=ISFK=1
0285        IF(IRSN(IKY,LUT),NE,0) GOTO 109
0286        IRSN(IKY,LUT)=LIQR(LUT)
0287        IF (LAST(LUT),EQ,1) GOTO 5001
0288        IF(IRSN(1,LUT)*IRSN(2,LUT)*IRSN(3,LUT)*IRSN(4,LUT),NE,0) GOTO 5001
0289  C
0290  C       ASK FOR NEXT QUANTITY TO REJECT
0291  C
0292        IP2=3
0293        IDUMB(3)=LMP3
0294        CALL EXEC(2,LUT,IDUMB,3)
0295        GOTO 101
0296  C     END OF TRANSACTION
0297  5001  IP2=0
0298        GOTO 102
0299        END
0300  C
0301  C
0302  C
0303  C
0304        SUBROUTINE ASTIN(ASCII,TLOG,RES)
0305  C                     SUBROUTINE TO CONVERT AN ASCII-BUFFER INTO
0306  C                     DOUBLE PRECISION VALUE
0307  C     NOTE:IF TLOG <= 0 RESULT WILL BE '0'
0308  C
```

```
0309          DOUBLE PRECISION RES
0310          INTEGER ASCII(1),EXP,TLOG,ODD,LOOP
0311          RES=0.D0
0312          EXP=0
0313          IF(TLOG .LE. 0)GO TO 5
0314          IF(TLOG .NE. 1) GOTO 6
0315          I=1
0316          GOTO 7
0317     6    LOOP=TLOG/2
0318          ODD=TLOG-LOOP*2
0319          IF(ODD)2,2,1
0320    C
0321    C                     TLOG IS ODD DO FIRST CONVERSION
0322    C
0323    1     CHR=IAND(ASCII(LOOP+1),77400B)/256-60B
0324          IF(CHR .LT. 0. .OR. CHR .GT. 9.)GO TO 4
0325          RES=CHR
0326          EXP=EXP+1
0327    C
0328    C                     HERE TO DO THE REST OF THE ASCII BUFFER
0329    C
0330    2     DO 3 I=LOOP,1,-1
0331          CHR=IAND(ASCII(I),377B)-60B
0332          IF(CHR .LT. 0. .OR. CHR .GT. 9.) GO TO 4
0333          RES=DBLE(CHR)*10.D0**EXP+RES
0334          EXP=EXP+1
0335     7    CHL=(IAND(ASCII(I),77400B)/256)-60B
0336          IF(CHL .LT. 0. .OR. CHL .GT. 9.)GO TO 4
0337          RES=DBLE(CHL)*10.D0**EXP+RES
0338    3      EXP=EXP+1
0339    C
0340    C                     THAT'S IT!NOW SEE IF THIS IS A NEGATIVE NUMBER
0341    C
0342    4     IF(CHR .EQ. -3. .OR. CHL .EQ. -3.)RES=RES*(-1.)
0343    C
0344    C                     LET'S RETURN TO CALLER
0345    C
0346    5     RETURN
0347          END
```

APPENDIX D

HP-IB COMMAND BYTES

OCTAL AND ASCII EQUIVALENT

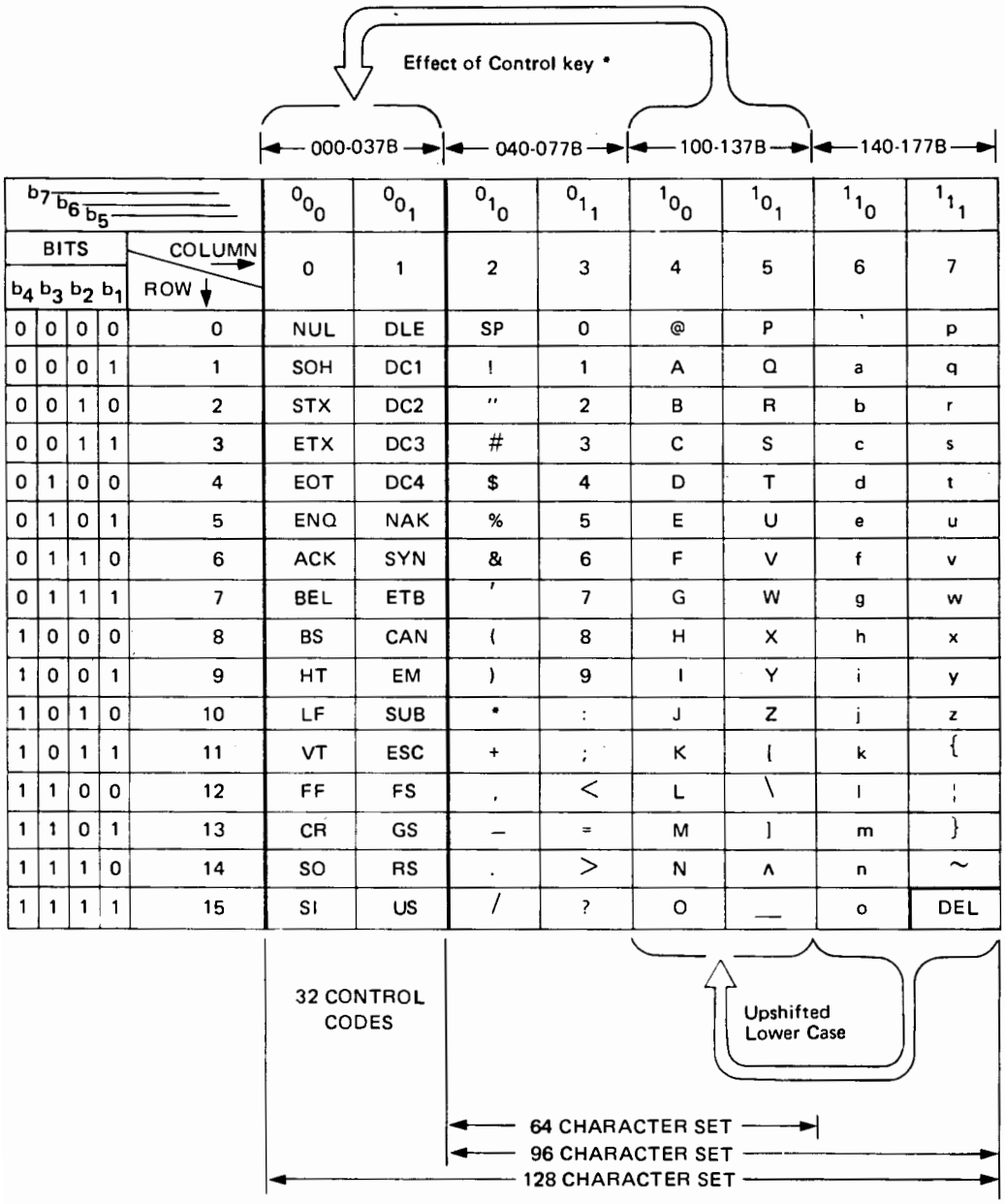
HPIB COMMAND BYTE	FIRST CHARAC. OCTAL EQUIVAL.	SECOND CHARAC. OCTAL EQUIVAL.	ASCII CHARAC. EQUIVAL.
SDC	002000	000004	EOT (End of transmission)
GET	004000	000010	BS (Backspace)
TCT	004400	000011	HT (Horizontal tabulation)
GTL	006000	000014	FF (Form Feed)
LLO	010400	000021	DC1 (Device control 1
DCL	012000	000024	DC4 (Device Control 4)
SPE	014000	000030	CAN (Cancel)
SPD	014400	000031	EM (End of medium)
TLK 0	040000	000100	@
TLK 1	040400	000101	A
TLK 2	041000	000102	B
TLK 3	041400	000103	C
TLK 4	042000	000104	D
TLK 5	042400	000105	E
TLK 6	043000	000106	F
TLK 7	043400	000107	G
TLK 10	044000	000110	H
TLK 11	044400	000111	I
TLK 12	045000	000112	J
TLK 13	045400	000113	K
TLK 14	046000	000114	L
TLK 15	046400	000115	M
TLK 16	047000	000116	N
TLK 17	047400	000117	O
TLK 20	050000	000120	P
TLK 21	050400	000121	Q
TLK 22	051000	000122	R
TLK 23	051400	000123	S
TLK 24	052000	000124	T
TLK 25	052400	000125	U
TLK 26	053000	000126	V
TLK 27	053400	000127	W
TLK 30	054000	000130	X
TLK 31	054400	000131	Y
TLK 32	055000	000132	Z
TLK 33	055400	000133	[
TLK 34	056000	000134	\
TLK 35	056400	000135	]
TLK 36	057000	000136	↑ up arrow
UNT	057400	000137	← back arrow
LSN 0	020000	000040	space
LSN 1	020400	000041	!
LSN 2	021000	000042	"
LSN 3	021400	000043	#
LSN 4	022000	000044	$
LSN 5	022400	000045	%
LSN 6	023000	000046	&

HPIB COMMAND BYTE	FIRST CHARAC. OCTAL EQUIVAL.	SECOND CHARAC. OCTAL EQUIVAL.	ASCII CHARAC. EQUIVAL.
LSN 7	023400	000047	'
LSN 10	024000	000050	(
LSN 11	024400	000051	)
LSN 12	025000	000052	*
LSN 13	025400	000053	+
LSN 14	026000	000054	,
LSN 15	026400	000055	-
LSN 16	027000	000056	.
LSN 17	027400	000057	/
LSN 20	030000	000060	0
LSN 21	030400	000061	1
LSN 22	031000	000062	2
LSN 23	031400	000063	3
LSN 24	032000	000064	4
LSN 25	032400	000065	5
LSN 26	033000	000066	6
LSN 27	033400	000067	7
LSN 30	034000	000070	8
LSN 31	034400	000071	9
LSN 32	035000	000072	:
LSN 33	035400	000073	;
LSN 34	036000	000074	<
LSN 35	036400	000075	=
LSN 36	037000	000076	>
UNL	037400	000077	?
MSA 0	060000	000140	`
MSA 1	060400	000141	a
MSA 2	061000	000142	b
MSA 3	061400	000143	c
MSA 4	062000	000144	d
MSA 5	062400	000145	e
MSA 6	063000	000146	f
MSA 7	063400	000147	g
MSA 10	064000	000150	h
MSA 11	064400	000151	i
MSA 12	065000	000152	j
MSA 13	065400	000153	k
MSA 14	066000	000154	l
MSA 15	066400	000155	m
MSA 16	067000	000156	n
MSA 17	067400	000157	o
MSA 20	070000	000160	p
MSA 21	070400	000161	q
MSA 22	071000	000162	r
MSA 23	071400	000163	s
MSA 24	072000	000164	t
MSA 25	072400	000165	u
MSA 26	073000	000166	v
MSA 27	072400	000167	w
MSA 30	074000	000170	x
MSA 31	074400	000171	y
MSA 32	075000	000172	z
MSA 33	075400	000173	{
MSA 34	076000	000174	|
MSA 35	076400	000175	}
MSA 36	077000	000176	~
MSA 37	077400	000177	DEL

APPENDIX E

HEWLETT-PACKARD CHARACTER SET

FOR COMPUTER SYSTEM



b_7 b_6 b_5					0_0	0_1	$0_1{}_0$	$0_1{}_1$	$1_0{}_0$	$1_0{}_1$	$1_1{}_0$	$1_1{}_1$
BITS				COLUMN →	0	1	2	3	4	5	6	7
b_4	b_3	b_2	b_1	ROW ↓								
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	¦
1	1	0	1	13	CR	GS	–	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

EXAMPLE: The representation for the character "K" (column 4, row 11) is.

	b_7	b_6	b_5	b_4	b_3	b_2	b_1
BINARY	1	0	0	1	0	1	1
OCTAL	1		1			3	

* Depressing the Control key while typing an upper case letter produces the corresponding control code on most terminals. For example, Control-H is a backspace.

HEWLETT-PACKARD CHARACTER SET FOR COMPUTER SYSTEMS

This table shows HP's implementation of ANS X3.4-1968 (USASCII) and ANS X3.32-1973. Some devices may substitute alternate characters from those shown in this chart (for example, Line Drawing Set or Scandanavian font). Consult the manual for your device.

The left and right byte columns show the octal patterns in a 16 bit word when the character occupies bits 8 to 14 (left byte) or 0 to 6 (right byte) and the rest of the bits are zero. To find the pattern of two characters in the same word, add the two values. For example, "AB" produces the octal pattern 040502. (The parity bits are zero in this chart.)

The octal values 0 through 37 and 177 are control codes. The octal values 40 through 176 are character codes.

Decimal Value	Octal Values		Mnemonic	Graphic[1]	Meaning
	Left Byte	Right Byte			
0	000000	000000	NUL	$^{N}_{U}$	Null
1	000400	000001	SOH	$^{S}_{H}$	Start of Heading
2	001000	000002	STX	$^{S}_{X}$	Start of Text
3	001400	000003	ETX	$^{E}_{X}$	End of Text
4	002000	000004	EOT	$^{E}_{T}$	End of Transmission
5	002400	000005	ENQ	$^{E}_{Q}$	Enquiry
6	003000	000006	ACK	$^{A}_{K}$	Acknowledge
7	003400	000007	BEL		Bell, Attention Signal
8	004000	000010	BS	$^{B}_{S}$	Backspace
9	004400	000011	HT	$^{H}_{T}$	Horizontal Tabulation
10	005000	000012	LF	$^{L}_{F}$	Line Feed
11	005400	000013	VT	$^{V}_{T}$	Vertical Tabulation
12	006000	000014	FF	$^{F}_{F}$	Form Feed
13	006400	000015	CR	$^{C}_{R}$	Carriage Return
14	007000	000016	SO	$^{S}_{O}$	Shift Out } Alternate
15	007400	000017	SI	$^{S}_{I}$	Shift In } Character Set
16	010000	000020	DLE	$^{D}_{L}$	Data Link Escape
17	010400	000021	DC1	D_1	Device Control 1 (X-ON)
18	011000	000022	DC2	D_2	Device Control 2 (TAPE)
19	011400	000023	DC3	D_3	Device Control 3 (X-OFF)
20	012000	000024	DC4	D_4	Device Control 4 ($\overline{\text{TAPE}}$)
21	012400	000025	NAK	$^{N}_{K}$	Negative Acknowledge
22	013000	000026	SYN	$^{S}_{Y}$	Synchronous Idle
23	013400	000027	ETB	$^{E}_{B}$	End of Transmission Block
24	014000	000030	CAN	$^{C}_{N}$	Cancel
25	014400	000031	EM	$^{E}_{M}$	End of Medium
26	015000	000032	SUB	$^{S}_{B}$	Substitute
27	015400	000033	ESC	$^{E}_{C}$	Escape[2]
28	016000	000034	FS	$^{F}_{S}$	File Separator
29	016400	000035	GS	$^{G}_{S}$	Group Separator
30	017000	000036	RS	$^{R}_{S}$	Record Separator
31	017400	000037	US	$^{U}_{S}$	Unit Separator
127	077400	000177	DEL	▩	Delete, Rubout[3]

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
32	020000	000040		Space, Blank
33	020400	000041	!	Exclamation Point
34	021000	000042	"	Quotation Mark
35	021400	000043	#	Number Sign, Pound Sign
36	022000	000044	$	Dollar Sign
37	022400	000045	%	Percent
38	023000	000046	&	Ampersand, And Sign
39	023400	000047	'	Apostrophe, Acute Accent
40	024000	000050	(	Left (opening) Parenthesis
41	024400	000051	)	Right (closing) Parenthesis
42	025000	000052	*	Asterisk, Star
43	025400	000053	+	Plus
44	026000	000054	,	Comma, Cedilla
45	026400	000055	-	Hyphen, Minus, Dash
46	027000	000056	.	Period, Decimal Point
47	027400	000057	/	Slash, Slant
48	030000	000060	0	} Digits, Numbers
49	030400	000061	1	
50	031000	000062	2	
51	031400	000063	3	
52	032000	000064	4	
53	032400	000065	5	
54	033000	000066	6	
55	033400	000067	7	
56	034000	000070	8	
57	034400	000071	9	
58	035000	000072	:	Colon
59	035400	000073	;	Semicolon
60	036000	000074	<	Less Than
61	036400	000075	=	Equals
62	037000	000076	>	Greater Than
63	037400	000077	?	Question Mark

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
64	040000	000100	@	Commercial At
65	040400	000101	A	
66	041000	000102	B	
67	041400	000103	C	
68	042000	000104	D	
69	042400	000105	E	
70	043000	000106	F	
71	043400	000107	G	
72	044000	000110	H	
73	044400	000111	I	
74	045000	000112	J	
75	045400	000113	K	
76	046000	000114	L	
77	046400	000115	M	
78	047000	000116	N	Upper Case Alphabet. Capital Letters
79	047400	000117	O	
80	050000	000120	P	
81	050400	000121	Q	
82	051000	000122	R	
83	051400	000123	S	
84	052000	000124	T	
85	052400	000125	U	
86	053000	000126	V	
87	053400	000127	W	
88	054000	000130	X	
89	054400	000131	Y	
90	055000	000132	Z	
91	055400	000133	[	Left (opening) Bracket
92	056000	000134	\	Backslash, Reverse Slant
93	056400	000135	]	Right (closing) Bracket
94	057000	000136	^ ↑	Caret, Circumflex, Up Arrow[4]
95	057400	000137	_ ←	Underline, Back Arrow[4]

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
96	060000	000140	`	Grave Accent[5]
97	060400	000141	a	
98	061000	000142	b	
99	061400	000143	c	
100	062000	000144	d	
101	062400	000145	e	
102	063000	000146	f	
103	063400	000147	g	
104	064000	000150	h	
105	064400	000151	i	
106	065000	000152	j	
107	065400	000153	k	
108	066000	000154	l	
109	066400	000155	m	
110	067000	000156	n	Lower Case Letters[5]
111	067400	000157	o	
112	070000	000160	p	
113	070400	000161	q	
114	071000	000162	r	
115	071400	000163	s	
116	072000	000164	t	
117	072400	000165	u	
118	073000	000166	v	
119	073400	000167	w	
120	074000	000170	x	
121	074400	000171	y	
122	075000	000172	z	
123	075400	000173	{	Left (opening) Brace[5]
124	076000	000174	|	Vertical Line[5]
125	076400	000175	}	Right (closing) Brace[5]
126	077000	000176	~	Tilde, Overline[5]

Notes:

[1]This is the standard display representation. The software and hardware in your system determine if the control code is displayed, executed, or ignored. Some devices display all control codes as ".", "@", or space.

[2]Escape is the first character of a special control sequence. For example, ESC followed by "J" clears the display on a 2640 terminal.

[3]Delete may be displayed as "__", "@", or space.

[4]Normally, the caret and underline are displayed. Some devices substitute the up arrow and back arrow.

[5]Some devices upshift lower case letters and symbols (` through ~) to the corresponding upper case character (@ through ^). For example, the left brace would be converted to a left bracket.

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