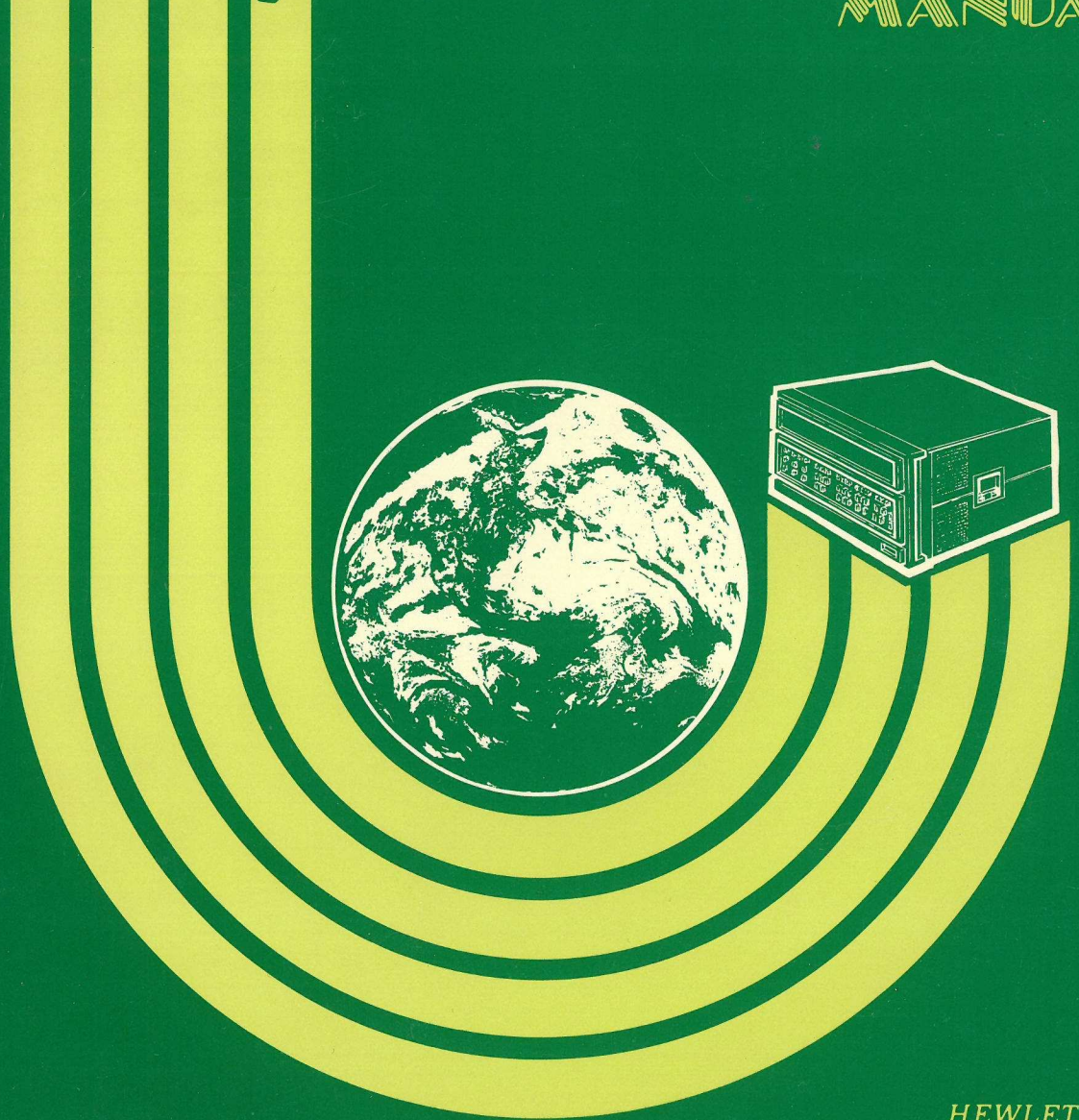
DISTRIBUTED SYSTEM SCE/11 SATELLITE COMMUNICATION EXECUTIVE

PROGRAMMING & OPERATING MANUAL



HEWLETT hp PACKARD

Copyright © 1974

HEWLETT-PACKARD COMPANY

Sunnyvale, California

First Edition

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system (e.g., in memory, disc or core) or be transmitted by any means, electronic, mechanical, photocopy, recording or otherwise, without prior written permission from the publisher.

PROGRAMMING AND OPERATING MANUAL

DISTRIBUTED SYSTEM
SCE/1
SATELLITE COMMUNICATION EXECUTIVE

1 DECEMBER 1974

PRINTED IN U.S.A.
Part No. 91700-93003

Microfiche No. 91700-93004

AMD SYSTEM WARRANTY

All Hewlett-Packard electronic measuring systems are warranted to be free from defects in material and workmanship for a period of 90 days. HP will repair or replace, at its option, without charge, any parts which prove to be defective during the warranty period. Warranty service will be performed on-site at the customer's facility in the United States, Canada, Western Europe, and near other designated HP service facilities, except for locations which are inaccessible or not regularly served by suitable public transportation. On-site 90 day systems warranty on all HP instruments is in lieu of the one year return-to-HP warranty described in the individual instrument manuals. No other warranty is expressed or implied. HP is not liable for consequential damages.

PRODUCT SAFETY
STATEMENT OF POLICY

AUTOMATIC MEASUREMENT DIVISION
HEWLETT-PACKARD CO.

The Automatic Measurement Division (AMD) of Hewlett-Packard Company shall comply with safety standards published by the International Electrotechnical Commission (IEC) to the fullest extent possible. Compliance with these standards is occasionally limited by the appropriateness of existing IEC Publications to particular conditions found in system and subsystem units and certain special applications thereof. To minimize hazards which may occur as a result of insufficient standards, AMD does supplement IEC requirements with certain nationally recognized United States Safety Standards. These standards principally are, but shall not be limited to, the National Electric Code (NFPA-1971) and Underwriters Laboratories.

Complex computer-based system and subsystem units utilizing both active and passive electronic equipment are presumed to contain reasonable hazards that cannot be further moderated at a cost compatible with user needs. Where such hazards may exist, the safety and health of AMD's customers and employees shall be protected to the fullest extent possible. This protection may take the form of, but not be limited to properly placed **WARNINGS** *and* **USER INSTRUCTIONS**.

Unsafe materials, products or conditions resulting from buyer requirements, when these are not considered as an integral part of the standard AMD products, shall be the sole responsibility of the buyer. This would include, but not be limited to, cables or connector accessories supplied at buyer request and intended to be used to interface that standard AMD product with other materials and products, or under conditions not controlled by AMD.

AMD maintains an active safety program to assure compliance with product safety standards to the fullest extent possible. This program includes, but is not limited to, safety inspections using AMD procedures A5951-0532-5 and A5951-0533-5.

For further information or assistance on safety matters, contact your AMD Contracts Administrator.

Protective devices may be required in some applications involving distributed system cabling. Consult with your local authorities on the proper installation of Class 2 (communication, remote control, signal) circuits, prior to deployment.

SECTION I
GENERAL DESCRIPTION

INTRODUCTION

This manual describes the SCE/1 Satellite Communication Executive. SCE/1 resides in the last sixty-four words (protected area) of core, and replaces the paper-tape BBL normally supplied with an HP computer.

SOFTWARE

SCE/1 is supplied as a single paper tape (P/N 29037-60001) which contains both the 64-word SCE/1 and a program for configuring and installing SCE/1 in 4K, 8K, 12K, 16K, 24K, and 32K (memory size) computers.

HARDWARE

The minimum hardware required by SCE/1 consists of:

HP 2100 computer with 4K of core
A paper tape reader or Teletype
HP 12665 Computer Serial Interface Kit
or
HP 12773 Computer Modem Interface Kit

PROGRAM DESCRIPTION

SCE/1 is normally resident in the protected area of satellite computers and is used to load programs from the central computer disc into satellite memory. Since SCE/1 resides in the protected memory of the satellite (last 64-words), complete core loads may be accomplished without overlaying the communications executive.

The operator specifies the program stored on the central disc that is to be down-loaded by setting a 5-digit octal number into the satellite switch register (*nnnnn*). The Central Communication Executive (CCE) receives this number, converts it to its ASCII equivalent, prefixes the five digits with the letter 'P', and uses the six characters thus synthesized (P*nnnnn*) as the name of the file to down-load.

SECTION II
PROGRAM OPERATION

INTRODUCTION

SCE/1 is an absolute Assembly Language program. It is installed in the protected area of the satellite computer via the switch register or read in from paper tape via a BBL.

SWITCH REGISTER INSTALLATION

SCE/1 can be loaded via the front panel switch register. The octal listing of SCE/1 in Table 2-1 is provided for this purpose. The HP 2100 Front Panel Procedures Guide in the Software Operating Procedures Manual describes the load procedure.

The switch register can also be used to restore SCE/1 if it is destroyed during system operation. The operator replaces symbolic items in Table 2-1 with values appropriate to the configuration.

Table 2-1. SCE/1 Octal Listing

A	B: 0	1	2	3	4	5	6	7
0*m*7700:	1077*cc*	1035*cc*	1025*cc*	067774	017741	067732	017741	007104
0*m*7710:	017741	005323	106401	017741	017753	017753	017753	006021
0*m*7720:	027765	017753	000000	077775	017753	077776	106601	047777
0*m*7730:	017753	002041	177776	037776	067776	037775	027727	017753
0*m*7740:	027714	000000	1066*cc*	1023*cc*	027743	1025*cc*	053772	127741
0*m*7750:	053773	027742	027770	000000	1023*cc*	027754	1065*cc*	1035*cc*
0*m*7760:	002020	002300	063772	1026*cc*	127753	017753	006021	002040
0*m*7770:	102011	102077	170360	007417	170017	000000	000000	1*z*0100

Legend: A + B = Memory Address
m = 0 for 4K, 1 for 8K, 2 for 12K, 3 for 16K, 5 for 24K, 7 for 32K memory
cc = select code of Serial Interface card at satellite
z = 7 for 4K, 6 for 8K, 5 for 12K, 4 for 16K, 2 for 24K, 0 for 32K memory

PAPER TAPE INSTALLATION

SCE/1 is contained in a paper tape (P/N 29037-60001). The same paper tape contains a second program which configures the SCE/1 instructions for the select code of the satellite's Serial Interface Card, constructs the memory-protect constant (core-size dependant) for SCE/1, and then moves a copy of the configured SCE/1 into the protected area of the computer.

The procedure outlined below may be used to install SCE/1 in 4K, 8K, 12K, 16K, 24K, and 32K memory computers.

a. The SCE/1 Configurator/Installer paper tape (P/N 29037-60001) is loaded via the BBL or the program is down-loaded from central via an existing SCE/1 or SCE/2.

NOTE

If neither a BBL nor an SCE/1 or SCE/2 is available, the operator must install SCE/1 via the switch register as shown in Table 2-1.

b. The satellite switch register is set as follows:

Switches:	Set to:
5-0	Select Code of satellite Serial Interface card
14-12	0 for 4K CPU
	1 for 8K CPU
	2 for 12K CPU
	3 for 16K CPU
	5 for 24K CPU
	7 for 32K CPU

NOTE

All other switches *must* be set to 0.

c. The starting address (2_8) is loaded.
d. The Loader is enabled, preset, and run.
e. Halt 77B indicates successful installation.

Halt 22B indicates an invalid switch register setting:

- select codes less than 10B
- invalid CPU size indicated with switches 14-12
- extraneous switches

If Halt 22B is encountered, the switch register should be corrected and the procedure restarted from b.

RESTORE PAPER-TAPE BBL WITH SCE/1

Occasionally it is necessary to restore the paper tape BBL in the satellite computer. The following procedure can be used. This procedure assumes:

a. The appropriate BBL for the satellite is stored under a file name in P*nnnnn* format at central.
b. The SCE/1 Configurator/Installer is also stored at central under a file name in P*nnnnn* format.
c. A configured SCE/1 is currently in the satellites protected area.

To restore the BBL a copy of the SCE/1 configurator/Installer is down-loaded from central and used to configure SCE/1, this configured version of SCE/1 is then used to down-load the BBL from central.

The SCE/1 Configurator/Installer maintains a copy of the configured SCE/1 starting at location 3700_8 (in the second page of computer memory); using this copy of SCE/1 allows the operator to down-load the BBL for a 4K computer. To load the BBL into a 4K computer:

a. Set the switch register to the program number (P*nnnnn*) of the SCE/1 Configurator/Installer, and perform the down-load with the existing SCE/1.
b. Configure the newly down-loaded SCE/1 Configurator/Installer, as described under the Paper Tape Installation procedure.
c. Clear location 3777B to zero. This disables the memory protect check in SCE/1, allowing it to load a program itself.
d. Set the switch register to the program number (P*nnnnn*) of the desired BBL.
e. Load Address 3700_8
f. Enable the satellite loader and Run.

SECTION III
APPLICATION PROGRAMS

STORAGE REQUIREMENTS

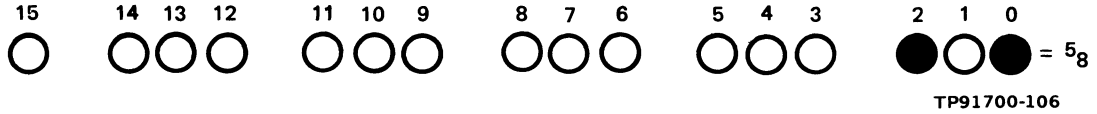
The SCE/1 load procedure requires that a program file be stored on the central disc. The program must be in absolute format and stored in a file with the required name format. The file name must be in the form: P*nnnnn*,where *nnnnn* is the ASCII equivalent of the octal number entered at the satellite switch register as described in the load procedure.

LOAD PROCEDURE

After SCE/1 has been installed,absolute program files containing the SCE/3, SCE/4, or SCE/5 operating systems can be down-loaded into an satellite with the following procedure.

a. CCE is activated at the central computer as described in the Central Communications Executive Manual.

b. The octal value of the required program file is set in bits 14-0 of the switch register. For example, if P00005 is down-loaded, the switch register setting is:



c. The starting address of SCE/1 is set to 0*m*7700 (see Table 2-1).

d. The loader is enabled; preset and run.

e. When the computer halts, it contains one of two values:

102011 -Data Transmission Error. For recovery, confirm the program file is on disc and retry from step b.
102077 -Successful Transmission.

f. If no transmission errors occur, the down-loaded program can be executed from its starting address as if it were loaded from the satellite paper tape reader.

APPENDIX A

SCE/1 SATELLITE COMMUNICATION EXECUTIVE

```
0052    00002                   ORG 2B
0053*
0054    00002   124003          JMP 3,I
0055    00003   000100          DEF START
0056    00004   102004          HLT 4B          POWER FAIL HALT
0057*
0058    00100                   ORG 100B
0059*
0060    00100   107700  START   CLC 0,C         TURN OFF EVERYTHING
0061    00101   102501          LIA 1
0062    00102   010165          AND B77         GET SELECT CODE
0063    00103   070162          STA CHN         SAVE SELECT CODE
0064    00104   010164          AND B7          VALIDATE
0065    00105   050162          CPA CHN
0066    00106   024153          JMP HLT22       INVALID SELECT CODE
0067    00107   102501          LIA 1
0068    00110   010166          AND MASK        CHECK FOR EXTRANEOUS SWITCHES
0069    00111   002002          SZA
0070    00112   024153          JMP HLT22       BAD SWITCH SETTINGS
0071    00113   102501          LIA 1
0072    00114   010167          AND G70         GET CPU SIZE
0073    00115   050170          CPA G40
0074    00116   024153          JMP HLT22       20K NO GOOD
0075    00117   050171          CPA G60
0076    00120   024153          JMP HLT22       28K NO GOOD
0077    00121   030172          IOR C77         FORM FWBBL
0078    00122   070173          STA FWBBL
0079    00123   003004          CMA, INA        NEGATE FOR MEM-PROTECT CONSTANT
0080    00124   170161          STA .MS,I
0081*
0082    00125   064174          LDB IOTAB       DEF TO I/O TABLES
0083    00126   074163          STB T2
0084    00127   164163  CNFG1   LDB T2,I       CONFIGURE THE I/O INSTRUCTIONS
0085    00130   006003          SZB,RSS
0086    00131   024143          JMP MOVE        FINISHED.
0087    00132   160001          LDA B,I
0088    00133   002021          SSA,RSS         SIMPLE I/O INSTRUCTION TEST
0089    00134   102063          HLT 63B         NOT I/O INSTRUCTION
0090    00135   020162          XOR CHN
0091    00136   010165          AND B77
0092    00137   120001          XOR B,I
0093    00140   170001          STA B,I         STORE CONFIGURED INSTRUCTION
0094    00141   034163          ISZ T2
0095    00142   024127          JMP CNFG1
```

SCE/1 SATELLITE COMMUNICATION EXECUTIVE (Continued)

```
0096*
0097    00143   064157  MOVE    LDB .GO
0098    00144   160001  MOVE1   LDA B,I
0099    00145   170173          STA FWBBL,I
0100    00146   034173          ISZ FWBBL
0101    00147   006004          INB
0102    00150   054160          CPB .ENDR       FINISHED ?
0103    00151   024155          JMP HLT77       YES.
0104    00152   024144          JMP MOVE1       NO. LOOP.
0105*
0106    00153   102022  HLT22   HLT 22B         INVALID SWITCH SETTINGS
0107    00154   002001          RSS
0108    00155   102077  HLT77   HLT 77B         INSTALLATION COMPLETED.
0109    00156   124003          JMP 3,I         RESTART
0110*
0111    00157   003700  .GO     DEF GO
0112    00160   004000  .ENDR   DEF ENDR
0113    00161   003777  .MS     DEF MS
0114    00162   000000  CHN     NOP
0115    00163   000000  T2      NOP
0116    00164   000007  B7      OCT 7
0117    00165   000077  B77     OCT 77
0118    00166   107700  MASK    OCT 107700
0119    00167   070000  G70     OCT 70000
0120    00170   040000  G40     OCT 40000
0121    00171   060000  G60     OCT 60000
0122    00172   007700  C77     OCT 7700
0123    00173   000000  FWBBL   NOP
0124*
0125    00174   000175  IOTAB   DEF *+1         DEF TO I/O TABLE
0126    00175   003700          DEF GO
0127    00176   003701          DEF GO+1
0128    00177   003702          DEF GO+2
0129    00200   003742          DEF OUT+1
0130    00201   003743          DEF OUT+2
0131    00202   003745          DEF OUT+4
0132    00203   003754          DEF IN+1
0133    00204   003756          DEF IN+3
0134    00205   003757          DEF IN+4
0135    00206   003763          DEF IN+8
0136    00207   000000          NOP             TERMINATES TABLE
0137*
```

APPENDIX B

SCE/1 BBL CODE

```
0139     03700                ORG 3700B        SITUATE FOR TRANSPORTABILITY
0140*
0141     00014          SDI   EQU 14B          SATELLITE COMPUTER CHANNEL.
0142*
0143     03700   107714 GO    CLC SDI,C
0144     03701   103514       LIA SDI,C
0145     03702   102514       LIA SDI
0146*
0147     03703   067774       LDB RC           OUTPUT 1-WORD PARMB
0148     03704   017741 M2    JSB OUT          PRECEEDED BY 3 OVERHEAD
0149     03705   067732       LDB MIN2         WORDS: RC, LENGTH, MODE.
0150     03706   017741       JSB OUT
0151     03707   007104       CMB,CLE,INB
0152     03710   017741       JSB OUT
0153     03711   005323       RBR,RBR          SET BIT 15.
0154     03712   106401       MIB 1            MERGE CONTENTS OF SW REGISTER.
0155     03713   017741       JSB OUT
0156*
0157     03714   017753 X     JSB IN           READ RC.
0158     03715   017753       JSB IN           READ REQUEST LENGTH.
0159     03716   017753       JSB IN           READ MODE.
0160     03717   006021       SSB,RSS          REQUEST ONLY?
0161     03720   027765       JMP END          YES (EOT).
0162     03721   017753       JSB IN           READ RECORD LENGTH.
0163     03722   000000       NOP              ADJUST ADDRESS SO MIN2=-2
0164     03723   077775       STB RL           SAVE.
0165     03724   017753       JSB IN           READ START ADDRESS.
0166     03725   077776       STB ADDR         SAVE.
0167     03726   106601       OTB 1            FLASH THE LIGHTS
0168     03727   047777 Y     ADB MS           SIMULATE PARITY ERROR IF BAD ADDR
0169     03730   017753       JSB IN           READ DATA WORD.
0170     03731   002041       SEZ,RSS          SKIP IF ADDR/PARITY ERROR.
0171     03732   177776 MIN2  STB ADDR,I       MOVE TO CORE ADDRESS.
0172     03733   037776       ISZ ADDR         INCR. CORE POINTER.
0173     03734   067776       LDB ADDR
0174     03735   037775       ISZ RL           LAST DATA WORD?
0175     03736   027727       JMP Y            NO.
0176     03737   017753       JSB IN           YES, READ CHECKSUM.
0177     03740   027714       JMP X
0178*
0179     03741   000000 OUT   NOP
0180     03742   106614       OTB SDI          OUTPUT WORD,
0181     03743   102314       SFS SDI          REPLY RECEIVED?
0182     03744   027743       JMP *-1          NO.
```

SCE/1 BBL CODE (Continued)

```
0183     03745   102514          LIA SDI          READ REPLY.
0184     03746   053772          CPA TNW          TNW?
0185     03747   127741          JMP OUT,I        YES.
0186     03750   053773          CPA RLW          RLW?
0187     03751   027742          JMP *-7          YES.
0188     03752   027770          JMP HLT11        NEITHER.
0189*
0190     03753   000000  IN      NOP
0191     03754   102314          SFS SDI          NEW WORD RECEIVED?
0192     03755   027754          JMP *-1          NO.
0193     03756   106514          LIB SDI          READ DATA WORD.
0194     03757   103514          LIA SDI,C        READ STATUS WORD.
0195     03760   002020          SSA              PARITY ERROR?
0196     03761   002300          CCE              YES, SET E-REGISTER.
0197     03762   063772          LDA TNW          ASK FOR NEXT WORD.
0198     03763   102614          OTA SDI
0199     03764   127753          JMP IN,I         RETURN.
0200*
0201     03765   017753  END     JSB IN           READ PROGL STATUS WORD.
0202     03766   006021          SSB,RSS          ERROR IF NEGATIVE.
0203     03767   002040          SEZ
0204     03770   102011  HLT11   HLT 11B          PARITY/ADDR ERROR HALT.
0205     03771   102077          HLT 77B
0206*
0207     03772   170360  TNW     OCT 170360       TRANSMIT NEXT WORD.
0208     03773   007417  RLW     OCT 007417       RE-TRANSMIT LAST WORD.
0209     03774   170017  RC      OCT 170017       REQUEST COMING.
0210     03775   000000  RL      NOP
0211     03776   000000  ADDR    NOP
0212     03777   000000  MS      NOP              NEGATIVE OF CORE SIZE.
0213*
0214     04000           ENDR    BSS 0
0215                             END
```

HEWLETT hp PACKARD

Part No. 91700-93003
Microfiche No. 91700-93004

PRINTED IN U.S.A.