# SET-UP INSTRUCTIONS

## FOR THE

# HHP-16K



## HAND HELD PRODUCTS, INC.

# HHP-16K LIMITED WARRANTY

The HHP-16K is guaranteed for thirty (30) days from the date of shipment. Should a EPROM box prove to be defective within thirty (30) days, return the unit to us (at your expense) and we will replace any defective unit with a new one. Should any part of your HHP-16K malfunction after the above mentioned time, you may call Hand Held Products, Inc. (704) 541-1380 for an estimate of costs for repair or replacement, a return authorization number and shipping instructions.

THE FOREGOING LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE.

The material contained in the HHP-16K Set-Up Instructions is supplied for the convenience of HHP-16K owners and is supplied without representation or warranty of any kind. In any event, the liability of Hand Held Products, Inc. or its marketing agents for damages, regardless of the form of action, shall not exceed the charges paid by you for the HHP-16K, and by your acceptance of the HHP-16K you specifically agree that neither Hand Held Products, Inc. or its marketing agents shall be liable to you for any loss incurred while using the HHP-16K, or for any claim or demand against you by any other person arriving out of use of the HHP-16K. In no event will Hand Held Products, Inc. or its marketing agents be liable to you or any other party for consequential damages even if you have advised us of the possibility of such damages.

## INTRODUCTION

To set-up the HHP-16K for operation with your HP-41C/CV requires the setting of eight switches on two DIP sockets and the insertion of two or three pre-programmed EPROMs.  This will be accomplished as you follow the steps presented below.  The first step is to briefly review the address structure of the HP-41C/CV calculator.

## BACKGROUND

The ROM address structure for the HP-41C/CV is divided into 16 blocks of 4k bytes.  Each ROM address block in the HP-41C/CV has a unique number from 0 to 15.  Table I defines each address block along with key facts for each 4K space which may/will impact your decisions during set-up.  Note that 0 through 4 are not available for EPROM memory storage; in fact, 0 through 3 are not even scanned for XROMs by the HP-41C/CV and useage of 4 will most generally cause a problem (unless the diagnostic ROM is being executed).

### TABLE I

| 4 K ROM BLOCK ADDRESS | HP-41 FUNCTION | SPECIAL COMMENTS FOR EPROM USE | EPROM BASE ADDRESS 1 2 3 4 |
|---|---|---|---|
| 0 | System ROM 0 | Cannot use EPROMs | |
| 1 | System ROM 1 | Cannot use EPROMs | |
| 2 | System ROM 2 | Cannot use EPROMs | |
| 3 | Unavailable/unused | Cannot use EPROMs | |
| 4 | Diagnostic ROM | Under special conditions | 0 1 0 0 |
| 5 | Timer | EPROMs ok if no timer | 0 1 0 1 |
| 6 | Both Printers | Under special conditions | 0 1 1 0 |
| 7 | HP-IL | ERPOMs ok if no HP-IL | 0 1 1 1 |
| 8 | Port 1 (Lower 4k) | EPROMs ok | 1 0 0 0 |
| 9 | Port 1 (Upper 4k) | EPROMs ok | 1 0 0 1 |
| 10 | Port 2 (Lower 4k) | EPROMs ok | 1 0 1 0 |
| 11 | Port 2 (Upper 4k) | EPROMs ok | 1 0 1 1 |
| 12 | Port 3 (Lower 4k) | EPROMs ok | 1 1 0 0 |
| 13 | Port 3 (Upper 4k) | EPROMs ok | 1 1 0 1 |
| 14 | Port 4 (lower 4k) | Card Reader or EPROMs | 1 1 1 0 |
| 15 | Port 4 (Upper 4k) | EPROMs ok | 1 1 1 1 |

With this overview of the address structure and device address assignments for the HP-41C/CV, it is possible to develop a EPROM base address for your particular needs.  For example, if you only have a printer connected, then 5, 6, 8, 9, . . . 14, 15 are all available for your use but not the 7 address block.  Do not be confused by the physical Port 1, 2, 3 or 4 used to plug in a device, such as the printer.  We are thinking about assigned ROM address spaces for specific devices not physical ports.  Keep in mind that only the printer, HP-IL and timer are NOT port addressed while all

application ROMs and the wand are port addressed (that is they take on the ROM address space of the port they are plugged into). A final point; do not confuse RAM address space (quads, extended memory, etc.) with ROM address space. They are completely separate and do not occupy the same "space". Relax, it's all easy going from here on out!

## EXAMINING THE HHP-16K

Each HHP-16K is shipped with the four screws loosely inserted into the base of the unit. Remove these screws and top cover. Next look at the layout of the components and compare this with Figure 1. Notice that there are two DIP socket switches on the HHP-16K. The four address DIP switches are numbered 1 through 4 and correspond to the settings shown in Table I. The four configuration DIP switches are also numbered 1 through 4 and will be discussed later.

## SETTING THE ADDRESS DIP SWITCHES

The HHP-16K allocates continuous 4K blocks from the base address specified with the ROM address DIP switches. This means that if you have a 16K EPROM library, all four of the 4K ROM images will reside in a series starting with the base address and continuing for three additional 4K blocks. Therefore, when you select your base address (ok), keep in mind Table II below:
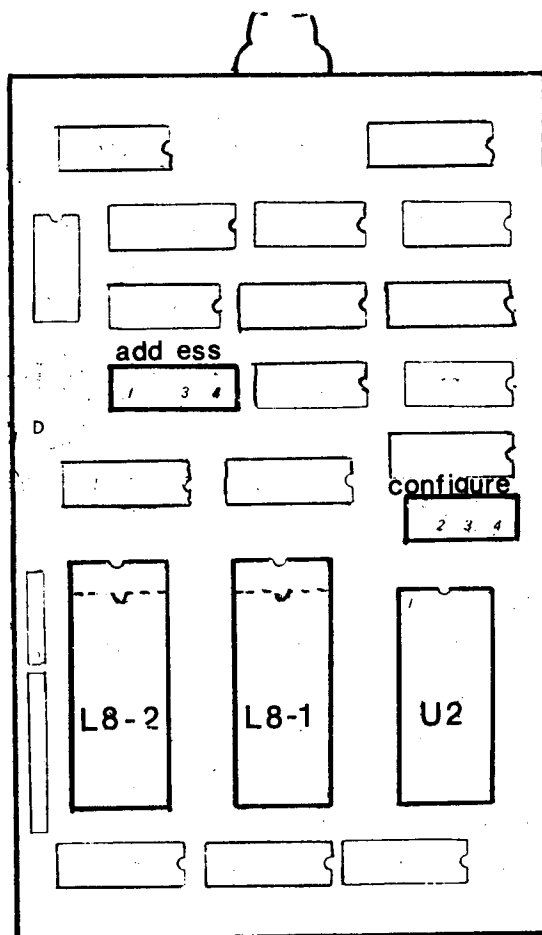


FIGURE 1

( Continued)

TABLE II

| 4K BASE ADDRESS | 4K EPROMs | 8K EPROMs | 16K EPROMs | SPECIAL NOTES |
|---|---|---|---|---|
| 4 | ok | ok | ok | ( Special Cases) |
| 5 | ok | -no-↑ | -no-↑ | (If No Timer) |
| 6 | ok | ok | -no-↑ | (If No HP-IL/Prt) |
| 7 | ok | -no-↑ | -no-↑ | (If No Printer) |
| 8 | ok | ok | ok | |
| 9 | ok | -no-↑ | -no-↑ | |
| 10 | ok | ok | -no-↑ | |
| 11 | ok | -no-↑ | -no-↑ | |
| 12 | ok | ok | ok | |
| 13 | ok | -no-↑ | -no-↑ | |
| 14 | ok | ok | -no-↑ | (If No Card Reader) |
| 15 | ok | -no-↑ | -no-↑ | |

From the above table you see that any 4K base EPROM address greater than 3 may be selected, even numbered base addresses must be selected for 8K EPROM libraries and for 16K you have only three choices (4, 8 or 12).

Try this test cases. Set up an 8K EPROM base address using Port 2 address blocks. This means you will use 10 and 11 which is set in the address DIP as 1 0 1 0 (where up is 1 and down is 0). Note that "up" refers to set-ting of a switch toward the connector cable and "down" refers to setting of a switch toward the large sockets. Move the switches in the address DIP (up-down-up-down).

Now set up your actual EPROM base address: Keep in mind that no setting of any of the switches (address or configuration) can damage the HP-41C/CV or HHP-16K though some invalid combinations may cause the 41C/CV to lock up until the batteries are removed. The next step is to set the configura-tion DIP switches.

SETTING THE CONFIGURATION DIP SWITCHES

These four switches tell the HHP-16K the size of your EPROM library and type of EPROMs you have used. It is easiest to do this by following the detailed steps below:

    A.  If you have a 4K library, set switches 1 and 2 off (down),
    B.  If you have a 8K library, set switch 1 on and 2 off,
    C.  If you have a 16K library, set switches 1 and 2 on (up).

Now you are going to tell the HHP-16K the type of EPROMs being used in the sockets.  Refer tc Figure 1 for L8 and U2 sockets.

    D.   If sockets L8 are 2732 (4K or 8K library); switch 3 off,
    E.   If sockets L8 are 2764 (8K or 16K library); switch 3 on,
         Note that one 2764 may be used for 8K or two 2732s.
    F.   If socket U2 is a 2716 (4K or 8K library); switch 4 off,
    G.   If socket U2 is a 2732 (16K library); switch 4 on (up).

For those noting that one additional switch setting for 1 and 2 is possible, the following may clear up this specialized situation.  By setting switch 1 off and 2 on, you tell the HHP-16K that you plan to use 8K with 2764 chips but only the half of each 2764 will actually contain data.  This may appear to "waste" valuable EPROM space but should you need to have two standard 4K ROM modules in ports 1 and 2 and also wish to use the upper 4K address spaces (9 & 11) for EPROM storage, then you have an alternative.  Set the EPROM address DIP to 9 (1 0 0 1)  and the configuration DIP to 0 1 1 1 to store 8K of EPROM in the upper port spaces not used while the ROM modules are in place.

CHANGING EPROMS

The HHP-16K uses zero insertion force (ZIF) sockets to ease the task of changing the Intel compatible 2716, 2732 and 2764 EPROMs.  To change an EPROM chip, simply lift the lever on the side of the ZIF socket.  You will notice that as you raise the lever, the pin holders separate in the socket.

The HP41C/CV has a ten bit data structure.  The HHP-16K keeps the lower eight bits in the L8-1 and/or L8-2 locations while the upper two bits are stored in the U2 location.  Socket U2 is a 24 pin ZIF with the number 1 pin in the upper left corner (See Figure 1).

It is a simple matter to set the EPROM chip into U2 and close down the lever to its locked position.  The L8 sockets have 28 pins to accommodate the 2764 chips when needed.  Again the number 1 pin is in the upper left corner.  Take care when inserting 2732 type chips to set the chip in the lower 24 pin area.

SUMMARY ON EPROMS AND DIP SWITCHES

To bring all of the above together in a simplified manner, let us assume that you wish to store an EPROM library of any size assuming that you use the Port 1 ROM address as the base.  Table III presents the four alternatives most commonly used.

TABLE III

| LIBRARY SIZE | U2 | SOCKET L8-1 | L8-2 | ADDRESS 1 2 3 4 | CONFIG. 1 2 3 4 |
|---|---|---|---|---|---|
| 4K | 2716 | 2732 | | 1 0 0 0 | 0 0 0 0 |
| 8K | 2716 | 2732 | 2732 | 1 0 0 0 | 1 0 0 0 |
| 8K | 2716 | 2764 | | 1 0 0 0 | 1 0 1 0 |
| 16K | 2732 | 2764 | 2764 | 1 0 0 0 | 1 1 1 1 |

For most user applications, the above four cases will satisfy the set-up requirements. In case you do not have any 2716 chips, you may substitute 2732 chips for U2 (wasting half their space) but keep the configuration DIP switches the same as for the 2716.

## CREATION OF EPROMS

Master EPROMs for an application may be created in any one of several ways. If the developer is using the Hewlett-Packard SDS-II custom ROM development system, HHP will provide a BURN program which is software compatible with the SDS-II system. You should contact Hand Held Products, Inc. for further information about this program.

A second alternative for EPROM creation is to copy the target programs to cards. Hand Held Products, Inc. will convert the magnetic cards to 4K ($50.00), 8K ($75.00), and 16K ($100.00) for master EPROMs on a first-in, first-out service basis. EPROM costs are invoiced at competitive rates. HHP will also duplicate master EPROMs for OEM applications upon request for a nominal fee.

A third alternative for EPROM creation is through the HHP-41DS micro development system. Utilizing the HP-41C/CV, HP-IL and a host CP/M micro computer with FORTRAN IV capability, the HHP-41DS enables OEMs to build, burn, duplicate and erase their 4K, 8K and 16K EPROM libraries in-house quickly and simply. Contact Hand Held Products, Inc. for further information.

## MAINTENANCE

Should you require hardware maintenance on the HHP-16K, refer to the warranty for instructions, then contact HHP by phone at (704)-541-1380 during normal business hours (8:30 a.m. - 5:00 p.m. EST) or write for further information not covered in the warranty.

## SUMMARY

The HHP-16K EPROM storage unit provides you with a flexible storage format for your application program library. Once set-up the HHP-16K should not require any further switch settings or attention. Powered by the HP-41C/CV, the HHP-16K is ready when you turn ON the HP-41C/CV. Good luck with your applications development!