K Software Module Configurations

K.1 Overview

The HP 82982A Software Plug-in Module for the Portable PLUS provides a means for integrating additional ROM-based software into the computer system. This module has a storage capacity of 1.5M-bytes and supports up to twelve "ROM-disc" software packages.

The configuration of the module can be modified to accept a variety of combinations of ROMs and EPROMs. The ROM/EPROM Module is shipped from the factory configured to accept 6 pairs of ROMs. These ROMs can be a variety of sizes, as long as they meet the pin-out and performance requirements described in a following section. They can be matched pairs (allowing the possibility for executing code directly out of ROM/EPROM) or a pair can be two independent applications, each formatted as a stand-alone directory of files.

The configuration of the module can be modified by re-positioning one or more of the six jumpers wires mounted between the ROM/EPROM sockets. The positioning of these jumpers for all possible configurations is described in table K-1.

Two, four, or six of the ROM-socket pairs can be configured to accept 32Kx8 EPROMs instead of ROMs. These banks can be treated independently (as if they were ROMs) or the jumpers can be configured to allow 4 pairs of EPROMs to be cascaded, allowing them to be mapped into the entire 256K-bytes of memory space allocated for a ROM bank. This feature allows emulation of two 128K-byte ROMs using eight 32K-byte EPROMs (or potentially eight 32K-byte ROMs). The remaining two socket pairs always operate as independent banks.

Table K-1. Wire Jumper Connections for ROMs/EPROMs

Configuration	Wire Jumper Connections XW1	XW2	XW3	XW4	XW5	XW6
Small Group:						
Banks 0 and 1 = Independent ROM Pairs	A	-	-	-	-	-
= Independent EPROM Pairs	B	-	-	-	-	-
Large Group:						
Banks 4, 5, 6, 7 = Independent ROM Pairs	-	A	A	A	A	A
= Independent EPROM Pairs	-	B	-	A	A	A
Bank 7* = Up to 4 cascaded pairs of 32Kx8 ROMs	-	A	B	B	B	B
= Up to 4 cascaded pairs of 32Kx8 EPROMs	-	B	B	B	B	B

Notes: A "-" in a particular column means that the jumper associated with that column does not affect the bank configuration described on the left of the row.

Banks 2 and 3 are not present in this module.

The factory configuration is for all independent ROM pairs (all jumpers in position A).

* When the jumpers are configured for cascaded pairs of 32K-byte ROMs/EPROMs, the ROMs/EPROMs must be installed in the order 5-6-7-4 (that is, sockets 5H, 6H, 7H, 4H become bank 7H, and sockets 5L, 6L, 7L, 4L become bank 7L). Banks 4, 5, and 6 are not present in this configuration.

K.2 Plug-In ROMs and EPROMS

ROMs (or EPROMs) that are to be installed in the HP 82982A Software Drawer must meet certain specifications to ensure proper system operation. These specifications are listed in table K-2.

Table K-2. Plug-In ROM Specifications

Paremeter	Specification
Physical:	
IC package	ROM: 128K x 8 through 8K x 8 EPROM: 32K x 8 Jedec 28-pin dual in-line
Operating temperature	0° to 55°C (32° to 131°F)
Storage temperature	-25° to 55°C (-13° to 131°F)
Electrical:	
Access time (CS* to data valid)	363 ns max. (150 pF load)
Output enable time (OE* to data valid)	363 ns max. (150 pF load)
Data hold time	0 ns min.
Deselect time (CS* high)	90 ns min.
Cycle time	935 ns
Address setup time (address valid to CS*)	0 ns min.
Output capacitance (data lines)	15 pF max.
Output capacitance (address lines)	10 pF max.
Power supply voltage	5 Vdc ± 5%
Operating current	50 mA max.
Stand-by current	1 mA max.

Figure K-1 illustrates the pin configuration for ROMs and EPROMs used in the software drawer. A jumper in the drawer determines the connection for pin 1 based on whether the IC is a ROM or an EPROM.

Figure K-1. Pin Configuration for Plug-In ROM

++	1	28	Vcc
A12	2	27	A14
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	A16/OE*
A2	8	21	A10
A1	9	20	CS*
A0	10	19	D7
D0	11	18	D6
D1	12	17	D5
D2	13	16	D4
GND	14	15	D3

++ Set by jumper
ROM: A15
EPROM: Vpp

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Key: CS* = Chip Select (asserted low)
OE* = Output Enable (asserted low)
VPP = EPROM secondary supply voltage (operating: 5 volts)

Note: The numbering scheme used for the address signals shown on this diagram and used by integrated circuit manufacturers is offset by one in relation to the signal names shown on the schematic diagram of the ROM module. The pin labeled A0 in this diagram is connected to signal MA1 on the schematic diagram, A1 to MA2, etc.

Note

It is generally possible to use a ROM/EPROM with secondary "Chip Select*" (asserted low) lines in the positions of "No Connect" pins which are otherwise used as address lines by larger memory components. Mirror images are not required by the system and these address lines will be driven low when accessing these ROMs/EPROMs.

K.3 Detailed Description

K.3.1 ROM/EPROM Organization Options

A software package can be stored in a variety of configurations depending on its size, whether or not code is to be executed directly out of ROM/EPROM, and whether the package is to be stored in ROM or EPROM. The typical storage configurations of a single software package are described in the following table.

Memory sizes shown in table K-3 refer to the number of bytes of storage in the ROM/EPROM (memory components organized to have 8-bit parallel access). These memory sizes are rounded up to correspond to the size of typically-used parts. The abbreviations "*hb*" and "*fb*" refer to "Half-Bank" and "Full-Bank", respectively. These terms are described in the text following the table. Note that only 32K-byte EPROMs can be used in this module (any size ROM can be used).

Table K-3. ROM/EPROM Organization Options

Software Package Size	Typical Storage Options: ROM	EPROM
32K	1 *hb* 32K ROM	1 *hb* 32K EPROM
33K-64K	1 *hb* 128K ROM	2 *fb* or *hb* 32K EPROMs
65K-128K	1 *hb* 128K ROM	3-4 *hb* 32K EPROMs
129K-256K	2 *fb* 128K ROMs	5-8 *fb* 32K EPROMs
257K+	Software package must be partitioned into 2 or more *pseudo-independent* packages, each <= 256K in size.	

The term "pseudo-indendent" refers to the fact that each package must independently support the firmware-interface requirements of the Portable PLUS system, yet firmware support is provided to allow the code from one partitioned section of a package to "call" code from another section (refer to chapter 9).

A ROM "bank" refers to a section of ROM-based memory which can be mapped into a 256K-byte memory space of the Portable PLUS system. Only one bank can be mapped into the system at a time. The terms "Half-Bank" and "Full-Bank" refer to the memory organization of sequential bytes of a file stored in ROM disc. A selected ROM "bank"

can be either empty, it can contain a "full-bank", or it can be composed of 1 or 2 "half-banks". The following is a description of these two forms of the Portable PLUS ROM disc memory organization. (Generally, references to a "ROM" can be interpreted to refer to either a ROM or an EPROM.)

The architecture of the Portable PLUS uses a 16-bit parallel data bus. The typical memory organization for this type of data bus would utilize two 8-bit wide memory storage components for each section of memory, one component being selected on the even addresses and the other component on the odd addresses. Thus sequential bytes of a file stored in such a memory organization would be contained in alternate memory storage components.

ROM-based software packages using this form of memory organization are referred to as "full-bank" ROMs. Full-bank ROMs always come in pairs, with one ROM designated to go in a "Low-Byte" socket (even addresses) and the other to go in the adjacent "High-Byte" socket (odd addresses). Because this form of memory organization is consistent with the architecture of the CPU, this is the only form of ROM-based software which has the option of executing directly out of ROM. For further details about executing code directly out of ROM, refer to chapter 9.

When a ROM-based software package is organized as a "half-bank" ROM, sequential bytes in the files of the package are stored sequentially within the ROM memory component itself. Since this form of organization is inconsistent with the architecture of the CPU, the firmware of the Portable PLUS must re-align the bytes of any of these files when transferring data from a data file to a requesting process or when downloading an executable file into system memory before executing it. Since half-bank ROMs are not directly executable and since the firmware can handle these files at either even or odd addresses, a half-bank ROM can be placed in either a "High-Byte" or "Low-Byte" socket. The adjacent socket can either be empty or it can contain another half-bank software package.

K.3.2 Jumper and Socket Labeling

The Portable PLUS Software Module provides 12 sockets for either ROMs or EPROMs. Since the use of EPROMs generally involves different circuitry than for ROMs, the Software Module has 6 wire jumpers which can be used to re-configure the hardware for the various modes of operation.

The Software Module comes configured from the factory for use with ROMs only. When the plug-in module is used in this mode, the only circuit board labels needed to install ROMs are the 6 large "L"s and 6 "H"s located on each socket of the Software

Module circuit board. The ROMs of full-bank software packages will be labeled with either an "H" or an "L", corresponding to the label on the socket in which those ROMs are to be installed. The only other requirement is that the two ROMs of a full-bank ROM pair must be installed in adjacent sockets. The ROMs of half-bank software packages will not be labeled with either an "L" or an "H"; these can be placed in any available socket.

The use of EPROMs on the Portable PLUS Software Module requires a more detailed inspection of the jumper and socket labeling on the Software Module circuit board. The 6 jumpers are labeled "XW1" through "XW6" with an "A" and a "B" on each end of each jumper socket. The "A" and "B" correspond to the two possible positions of the wire jumper installed in the jumper socket. Each of the 12 ROM sockets are labeled at the opposite end of the socket opposite from its nearest jumper. These small socket labels are single-digit numbers followed by either an "L" or an "H".

It is generally necessary to locate the labels just described in order to use the Software Module with EPROMs.

K.3.3 Jumpers and Socket Groups

There are two ways to use EPROMs in the Software Module. First, an EPROM can be used as if it were a 32K ROM. In this mode, an EPROM can be used for a 32K half-bank software package or 2 EPROMs can be used for a 64K full-bank package. The other mode of EPROM usage provides a means to emulate ROMs which are larger than 32K-bytes using multiple 32K-byte EPROMs.

To allow for the possibility of using both ROMs and EPROMs simultaneously, the configuration circuitry associated with selecting between ROM and EPROM usage controls two groups of ROM/EPROM sockets independently. Since the configuration of either one of the two groups has no effect on the operation of the other group, the configuration procedure for each group will be described separately.

K.3.4 Configuration of the Small Group

The "small group" of ROM sockets consists of those sockets with the following labels: "0L", "0H", "1L", "1H". These 4 sockets reside in the upper left-hand corner of the plug-in module (with the module connector facing towards you). Regardless of jumper settings, these four sockets are *always configured as two banks*, "bank 0" and "bank 1"--the bank number corresponds to the first digit of the socket labels.

This group is affected by only the jumper labeled "XW1". "XW1" selects whether this group is to be used with ROMs or EPROMs.

When the jumper is in the "A" position, the sockets of this group can be used with 32K-, 64K-, or 128K-byte ROMs.

When jumper "XW1" is in the "B" position, the sockets of this group can be used with 32K-byte EPROMs only. (32K-byte ROMs can be used if pin 1 is an active-high chip select or is not connected.) These EPROMs can contain a software package that is organized as either a 32K half-bank package or a 64K full-bank package.

This group cannot be used to emulate ROMs larger than 32K-bytes.

K.3.5 Configuration of the Large Group

The "large group" of ROM sockets consists of those sockets with the following labels: "4L", "4H", "5L", "5H", "6L", "6H", "7L", "7H". Six of these eight sockets reside in the right half of the Software Module, with the remaining two sockets residing in the lower left-hand corner of the plug-in module (with the plug-in oriented such that the connector is facing towards you). This group can be configured as four separate banks (banks 4 through 7) *or* as a single bank (bank 7), depending on the position of jumpers "XW3" through "XW6".

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Unlike the "small group" of sockets previously described, this group has three modes of operation. When jumpers "XW3", "XW4", "XW5", and "XW6" are all in position "A", jumper "XW2" controls this group in exactly the same way that "XW1" controls the small group (selecting either ROMs or EPROMs). When "XW2" is in position "A", sockets 4-7L,H can be used only with ROMs. When "XW2" is in position "B", sockets 4-7L,H can be used only with 32K EPROMs that are configured as 32K-byte half-bank singles or 64K-byte full-bank pairs (including combinations of these).

The remaining mode of operation is provided to allow 32K-byte EPROMs to be cascaded to emulate half-bank or full-bank software packages that are larger than 32K- or 64K-bytes, respectively. This mode is selected by positioning the six jumpers "XW2"-"XW6" all in the "B" position. *There is no valid configuration where jumpers "XW3"-"XW6" are not either all in position "A" or all in position "B".*

In this mode of operation the sockets labeled "5L", "6L", "7L", and "4L" are sequentially combined to form a single 128K-byte half-bank on the Low-byte data bus. Each socket can have a 32K-byte EPROM installed which comprises one-fourth of a 128K-byte half-bank. *The order of the sockets that comprise this half-bank is*

"5-6-7-4". The sockets "5H", "6H", "7H", and "4H" correspond to the High-byte half-bank and are organized in the same way as the Low-byte half-bank just described.

You can emulate 128K-byte ROMs using 32K-byte EPROMs. The EPROMs can be used in place of one or two 128K-byte half-bank software packages or one 256K-byte full-bank package. Four 32K-byte EPROMs are required for each 128K-byte ROM to be emulated. Fewer than four EPROMs can be used to emulate smaller ROMs or for 128K-byte ROMs having 32K-bytes of unused memory. The only requirements for this are that the EPROMs are installed in the proper order and that their software configuration accurately reflects the ROM-based software package being emulated.