



R6500 SOFTWARE PREPARATION SYSTEM (SPS) DEVELOPMENT CONFIGURATIONS

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INTRODUCTION

The R6500 Software Preparation System (SPS) is a low cost software development system for the R6500 family. Designers of microcomputer systems will find the SPS an ideal tool for evaluating the performance and programming ease of the new CMOS R65C02 CPU. Instruction sets of all the other microcomputers or microprocessors in the R6500, R65C00, R6500/* family are a subset of the CMOS CPU's instructions. In a fully expanded configuration, the R6500 Software Preparation System provides development capabilities equal to systems costing several times as much.

The basis of the SPS low cost development system is the extended firmware kit for the AIM 65 microcomputer. The AIM 65 provides the keyboard, printer, display and the I/O interfaces as well as the CPU and memory. RM 65 microcomputer modules and optional SPS for firmware may be used to add CRT, floppy disk, PROM programming and more memory.

For software, assembly language programming for the three variations of the 6500 instruction set is supported. The higher level languages (BASIC, FORTH, or Pascal) are supported in the R6500 Software Preparation System under the restriction that no assembler language development be done concurrently.

The SPS low cost development system is described in four possible configurations. Depending on user needs and requirements for a development system, you may select any one of these configurations or a variation of any one of them. Configuration 1 is highly recommended because of its fully expanded capabilities. However, the other three configurations can also be used to meet your software development needs.

Regardless of which configuration the user selects, a conversion kit of parts is needed. The parts kit (SPS-100) consists of an R65C02 CPU and four ROMs, all which plug in appropriate sockets on the AIM 65 microcomputer. In support of this kit, two other ROMs are available for expansion options for the CRT module (SPS-110) and for the PROM Programmer module (SPS-120).

FEATURES

- R65C02 CPU permits execution of all R6500 family instruction subsets, e.g.:
 - R6502 CPU family
 - R6500/1 microcomputer
 - R6500/11 microcomputer family
 - R6500/41 microcomputer family
 - R65C02 CMOS CPU family

- Symbolic trace during single step operation or breakpoints including extended instructions
- Symbolic disassembly compatible with Assembler format
- Mnemonic entry (single line assembly)
- New SPS functions with expanded user linkage
 - U-key handler and functions
 - User input handler and functions
 - User output handler and functions
- Symbolic Assembler
 - 80-column output format
 - Symbol table listing
 - Symbol cross reference listing
 - Object code generation with offset
 - Error messages (text)
- Symbolic Disassembler
 - User specified output device
- Assembler compatible output
- Improved single step trace (includes symbolic disassembly)
- Centronics Parallel Interface Driver for printer outputs
- Re-entry to independent text buffers
- User assignable vectors for I/O device handler allow use with customer provided peripheral expansion
- R6500 SPS firmware works automatically with Rockwell recommended expanded configurations

REFERENCE DOCUMENTS

The following documents contain information regarding set-up and operation of the R6500 SPS.

Order No.	Title
2167	R6500 Software Preparation System (SPS) User's Manual
209	AIM 65 Microcomputer User's Guide
RM04	RM65-7104E Adapter/Buffer Module Data Sheet
RM09	RM65-7008E 8-Slot Card Cage Data Sheet
808	RM65-3132E RM65 32K Dynamic RAM Module User's Manual
820	RM65-2901E PROM Programmer Module User's Manual
814	RM65-5102 CRT Module User's Manual
802	RM65-5101 Floppy Disk Controller Module User's Manual
269	AIM 65 PROM Programmer and CO-ED Module User's Manual



CONFIGURATION 1

Configuration 1 (reference SPS illustration Figure 1) is for the user needing a fully expanded AIM 65 microcomputer for a low cost development system. The expansion options will greatly ease your development efforts in generating code for the R6500 family devices. The RAM available to the user is 32k and the PROM Programmer is able to program industry standard 2k-, 4k-, 8k- and 16k-byte EPROMs and 2k-byte EEPROMs. The mass storage device is 5¼-inch floppies for faster access time of multiple files. The CRT is recommended rather than a 20-column display for the user to trace single stepped instructions. The 80-column printer will provide a fully expanded hard copy of the program.

CONFIGURATION 1 — PARTS LIST

Item	Rockwell Part Number	Description
1	A65-0500	AIM 65 with 4k RAM, an enclosure and power supply
2	SPS-100	R6500 Software Preparation Kit
3	SPS-200	Peripheral Connector Module
4	*	Parallel interface 80 column printer with cable
5	RM65-7104E	Adapter/Buffer Module for AIM 65
6	RM65-7008E	8 Slot Card Cage
7	*	Power Supply and cables for RM 65 Modules (+5V @ 8 A +12V @ 300 mA)
8	RM65-3132E	32k Dynamic RAM Module
9	RM65-2901E	PROM Programmer Module
10	SPS-120	PROM Programmer ROM
11	RM65-5102E	CRT Controller Module
12	SPS-110	SPS CRT ROM
13	SPS-210	CRT cable
14	*	CRT monitor
15	RM65-5101NE	Floppy Disk Controller Module
16	A65-090**	AIM 65 DOS 1.0 ROM
17	*	Floppy cable
18	*	Floppy disk drives (2 recommended)
19	*	Power supply for drives (typ. +5V and +12V) and cables

*User supplied items.
 **DOS is described in the FDC User's Manual (Document Order No. 802) except functions called from the U-key which are described in the SPS User's Manual (Document Order No. 2167).

INSTALLATION PROCEDURE

Installation steps for configuration 1 are as follows:

- 1) The AIM 65 (1) shown which includes the power supply and enclosure fully assembled can be replaced by any AIM 65 with 4k RAM plus a power supply and enclosure (typically A65-006). Install the SPS-100 Kit (2) into the AIM 65.
- 2) Attach the 80-column printer (4) and Peripheral Connector Module SPS-200 (3) to the AIM 65 Application connector (J1).
- 3) Connect the 8-Slot Card Cage (6) with the Power Supply (7). Install the Adapter/Buffer Module (5) into the card cage and attach to the AIM 65 Expansion connector (J3).
- 4) Set up the 32K DRAM module (8) for \$1000-\$7FFF, common-bank operation (for a factory-wired module, this is done by removing the shunt between pins 8 and 21 of the base address select header (Z24) and setting switches S1-2 to S1-4 OPEN). Install into the card cage.
- 5) Set up the PROM Programmer module (9) for \$9000-\$9FFF, common-bank operation and install the SPS-120 PROM ROM (10) into socket Z16 (set S1-1 to -4, -6, -7, -9, -10 OPEN, S1-5, -8 = CLOSED, E1 = C, E2 = B). Install into the card cage.
- 6) Set up the CRTC module (11) for \$D000-\$DFFF, common bank, 80-column operation and install the SPS-110 CRT ROM (12) into socket Z15. (Set S1-1, -3, -4 = CLOSED, S1-2, -5, -6 = OPEN, E1 = A, E2 = B, E3 = either.) Install into the card cage. Attach the SPS-210 CRT cable (13) between the CRT module and the CRT monitor (14).
- 7) Set up the FDC module (15) for \$8000-\$8FFF, common-bank, 5" operation and install the DOS V1.0 ROM (16) into socket Z10. (For a factory-configured module, S1-1, -2 = OPEN, S1-3, 4 = CLOSED, E1, E2, E3 = B, select headers JB1 and JB2, both have position 1-16 = SHUNT.) Install into the card cage. Attach the FDC cable (17) between the FDC module and the floppy disk drives (18).

CONFIGURATION 1 — MEMORY MAP

F000	DEBUG/MONITOR/] R6500 SPS ROMs
E000	UTILITIES ROM	
D000	CRTC ROM	
C000	ASSEMBLER/DISASSEMBLER] R6500 SPS ROMs
B000	MNEMONIC ENTRY ROM	
A000	AIM I/O	
9000	PROM PGMR. ROM	
8000	FDC AND DOS 1.0 ROM	
7000	USER RAM (30K BYTES)	
6000		
5000		
4000		
3000		
2000		
1000		
0800		
0000	SYSTEM RAM	

CONFIGURATION 2

Configuration 2 utilizes a cassette recorder instead of a floppy disk for mass storage. Cassette recorders offer a much lower cost form of mass storage but at a lower data transfer rate and with serial access of files. The amount of RAM in this configuration and the PROM programmer along with the R6500 Software Preparation kit provide the user with a powerful software development system.

CONFIGURATION 2 — PARTS LIST

Item	Rockwell Part Number	Description
1	A65-0500	AIM 65 with 4k RAM, an enclosure and power supply
2	SPS-100	R6500 Software Preparation Kit
3	SPS-200	Peripheral Connector Module
4	*	80-column printer and cables
5	RM65-7104E	Adapter Buffer for AIM 65
6	RM65-7008E	8-Slot Card Cage**
7	*	Power supply and cables for RM 65 modules (+5V @ 8 A, +12V @ 300 mA)
8	RM65-3132E	32k Dynamic RAM Module
9	RM65-2901E	PROM Programmer Module
10	SPS-120	PROM Programmer ROM
11	RM65-5102E	CRT Controller Module
12	SPS-110	SPS CRT ROM
13	SPS-210	CRT cable
14	*	CRT monitor
20	*	Cassette recorder and cables

*User supplied items
**Recommended configuration for ease of future expansion.

INSTALLATION PROCEDURE

Follow the steps described in Configuration 1 Installation Procedure except change the following steps for Configuration 2:

- 4) Set up the 32k DRAM (8) for \$1000-\$8FFF, common-bank operation (for factory configuration, all shunts installed in base address select header (Z24), S1-1 to -4 = OPEN). Install into the card cage.
- 7) Connect the cables from the cassette recorders (20) to the Peripheral Connector Module (3).

CONFIGURATION 2 — MEMORY MAP

F000	DEBUG/MONITOR/
E000	UTILITIES ROM
D000	CRTC RAM/ROM and I/O
C000	ASSEMBLER/DISASSEMBLER
B000	MNEMONIC ENTRY
A000	AIM I/O
9000	PROM PGMR ROM
8000	
7000	
6000	USER
5000	RAM
4000	(34.5K BYTES)
3000	
2000	
1000	
0600	
0000	SYSTEM RAM

CONFIGURATION 3

Configuration 3 removes both the floppy disk drives and the CRT monitor from Configuration 1, replacing the CRT with a dumb terminal and disk drive(s) with cassette recorder(s). If the user already owns a terminal, the extra expense of a CRT and controller may be avoided by using Configuration 3. If the dumb terminal has an RS-232-C interface, see the Rockwell Application Note Order No. 230 (Document #R6500N08) to interface the RS-232-C to the AIM 65. If the dumb terminal has a 20 mA current loop interface, consult the AIM 65 User's Guide (Section 9.2) for interface considerations. The Peripheral Connector Module SPS-200 (3) provides both serial interfaces.

CONFIGURATION 3 — PARTS LIST

Item	Rockwell Part Number	Description
1	A65-0500	AIM 65 with 4k RAM, an enclosure and power supply
2	SPS-100	R6500 Software Preparation Kit
3	SPS-200	Peripheral Connector Module
4	*	80-column printer and cable
5	RM65-7104E	Adapter/Buffer Module for AIM 65
6	RM65-7008E	8-Slot Card Cage**
7	*	Power supply and cables for RM 65 Modules (+5V @ 8 A, +12V @ 300 mA)
8	RM65-3132E	32k Dynamic RAM Module
9	RM65-2901E	PROM Programmer Module
10	SPS-120	PROM Programmer ROM
20	*	Cassette recorder and cables
21	*	Dumb terminal

*User supplied item.
**Recommended configuration for ease of future expansion.

INSTALLATION PROCEDURE

Follow the steps described in Configuration 1 Installation Procedure except change the following steps for Configuration 3:

- 4) same as Configuration 2 step 4
- 6) —delete step—
- 7) same as Configuration 2 step 7
- 8) Attach the dumb terminal (21) to the Peripheral Connector Module (3) and set the AIM 65 KB/TTY switch to TTY position.

NOTE: When using TTY mode for AIM 65, always press Delete or Return after a RESET to initialize sense baud rate.

CONFIGURATION 3 — MEMORY MAP

F000	DEBUG/MONITOR/
E000	UTILITIES ROM
D000	FREE
C000	ASSEMBLER/DISASSEMBLER
B000	MNEMONIC ENTRY ROM
A000	AIM I/O
9000	PROM PROGRAMMER ROM
8000	USER RAM (34.5K BYTES)
7000	
6000	
5000	
4000	
3000	
2000	
1000	
0600	
0000	SYSTEM RAM

CONFIGURATION 4

Configuration 4 is intended for the user whose needs for a development system are very basic and whose budget is very limited. It is recommended that programs developed with Configuration 4 not exceed 500 bytes of object code. With this configuration, the user has 5k of RAM to develop his software, a cassette recorder to store his software, and a PROM programmer capable of programming 1k-, 2k- and 4k-byte PROMs.

CONFIGURATION 4 — PARTS LIST

Item	Rockwell Part Number	Description
1	A65-0500	AIM 65 with 4k RAM, an enclosure and power supply
2	SPS-100	R6500 Software Preparation Kit
3	SPS-200	Peripheral Connector Module
4	*	80-column printer
20	*	Cassette recorder and cables
21	*	Dumb terminal
22	A65-901**	PROM Programmer and Co-ed Module

*User supplied item.
 **The A65-901 PROM Programmer and COED Module is not an RM 65 module and cannot be used in Configurations 1, 2 or 3.

INSTALLATION PROCEDURE

NOTE: Configuration 4 does not allow for expansion and should be used only if the PROM Programmer and CO-ED Module is already available. Follow the installation steps as shown:

- 1) same as Configuration 1, step 1
- 2) same as Configuration 1, step 2
- 3) same as Configuration 2, step 3
- 4) same as Configuration 3, step 8 (including note)
- 5) Attach the PROM Programmer/CO-ED Module (22) to the AIM 65 Expansion connector (J3).

CONFIGURATION 4 — MEMORY MAP

F000	DEBUG/MONITOR/
E000	UTILITIES ROM
D000	FREE
C000	ASSEMBLER/DISASSEMBLER
B000	MNEMONIC ENTRY ROM
A000	AIM I/O
9000	PROM PROGRAMMER WITH COED ROM
8000	NOT AVAILABLE
7000	
6000	
5000	
4000	
3000	
2000	
13FF	
0600	USER RAM
0000	SYSTEM RAM/USER RAM

R6500 SOFTWARE PREPARATION SYSTEM ORDERING PARTS LIST

Item	Required for Configuration	Description	Part Number	Supplier
(1)	All	AIM 65 with enclosure and power supply	A65-0500	Rockwell
(2)	All	SPS ROM and R65C02 CPU kit	SPS-100	Rockwell
(3)	All	Peripheral Connector module	SPS-200	Rockwell
(4)	All	80-column printer and cable	—	
(5)	1,2,3	Adapter/Buffer Module for AIM 65	RM65-7104E	Rockwell
(6)	1,2,3	8-Slot Card Cage	RM65-7008E	Rockwell
(7)	1,2,3	Power supply for RM 65 Modules	—	
(8)	1,2,3	32k DRAM Module	RM65-3132E	Rockwell
(9)	1,2,3	PROM Programmer Module	RM65-2901E	Rockwell
(10)	1,2,3	SPS PROM ROM	SPS-120	Rockwell
(11)	1,2	CRTC Module	RM65-5102E	Rockwell
(12)	1,2	SPS CRTC ROM	SPS-110	Rockwell
(13)	1,2	CRT cable	SPS-210	Rockwell
(14)	1,2	CRT Monitor	—	
(15)	1	FDC Module	RM65-5101NE	Rockwell
(16)	1	DOS V1.0 ROM	A65-090	Rockwell
(17)	1	Floppy disk drives	—	
(18)	1	Floppy cable	—	
(19)	1	Power supply for floppy disk drives	—	
(20)	2,3,4	Cassette recorders, cables	—	
(21)	3,4	Dumb terminal	—	
(22)	4	PROM Programmer and COED Module	A65-901	Rockwell

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