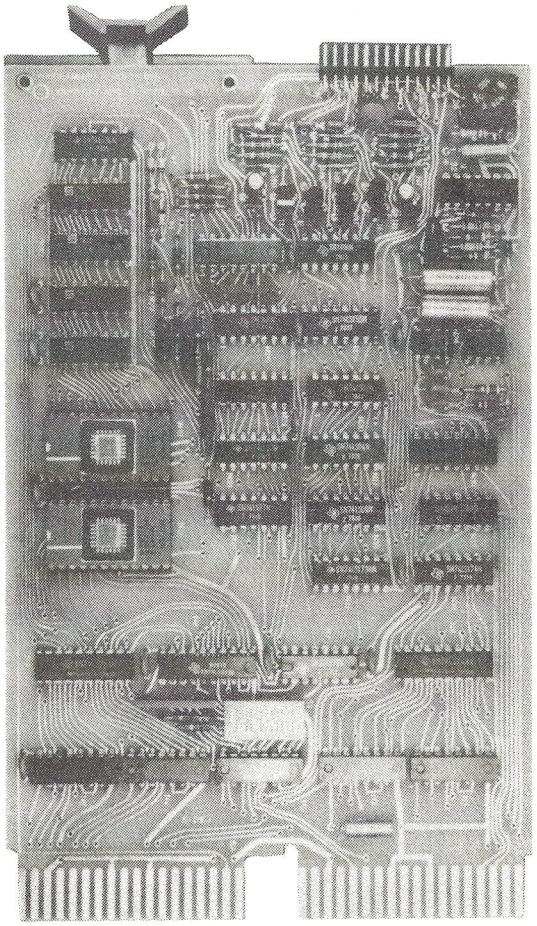
UV EPROM-PROGRAMMER FOR LSI-11



FEATURES

- "In machine programming" for more efficient and virtually error free loading of EPROMs.
- Programming is straightforward using console ODT commands or running as a subroutine under program control.
- Designed to load EPROMs of the type 2708, 2716, 2532.
- Contains its own PROM and RAM memory for storage and execution of its programming routines.
- Contains numerous auxiliary programs to facilitate EPROM loading and checking.
- Selectable address space of resident memory by means of DIP-switches.
- Possible operation beyond 32k address space.
- No special power is required. Only the normal +5VDC and +12VDC operating voltages present on the LSI-11 backplane are required.
- Completely compatible with LSI-11 Bus protocol.
- Can be installed in any option location in LSI-11, LSI-11/2, LSI-11/23 and PDP-11/03 systems.

DESCRIPTION

The VMP11-A module is a LSI-11 hardware option that greatly simplifies loading of EPROM circuits. It allows the user to perform "in machine programming" of any portion of an EPROM either under program control or by using simple console ODT commands. Data of any system memory area can be directly written (loaded) into a specified EPROM area. The EPROMs may be loaded location after location or in blocks less than their actual size. Numerous auxiliary programs facilitate EPROM loading and checking.

The VMP11-A consists of a single "double height" (two sets of blackplane pins) module (printed circuit board) that plugs into any standard LSI-11 backplane. The module contains its own PROM and RAM memory (2048 words of address space) required for storage and execution of its programming routines.

Switches allow selection of VMP11-A resident memory address space. The 2k (256 words of RAM and 1792 words of PROM) contiguous resident memory can be located in any 2k bank of the system in the Ø...32k range or in the 124...128k range if applicable.

A built in converter supplies the necessary programming voltage for EPROMs.

The programmer is designed to load EPROMs of the type 2708, 2716 and 2532 in conjunction which such LSI-11 memory options like the VME11-A, VMC11-A or VMC11-B UV EPROM memory modules.

If permanently installed in a system with the appropriate EPROM memory option the VMP11-A programmer may be used to generate nonvolatile data records of system events etc. under program control.

OPERATION

The user initiates the desired action by setting an appropriate command word with the related arguments (addresses etc.) and starting the operation at a predetermined address. The system responds with an appropriate message at the end of a task or after the occurrence of errors.

The VMP11-A programmer, which is using the systems CPU, automatically saves all General Registers contents including the Stack Pointers. It does not access any memory locations except its own and the locations specified by the user in a command.

List of commands:

SA = Start Address
EA = End Address

WRITE — The contents of the source data block specified by SA and EA is written (loaded or programmed) into the EPROM portion specified by its SA. The WRITE-command is automatically followed by a COMPARE-command.

COMPARE — The contents of the source data block specified by SA and EA is compared against the contents of the EPROM portion specified by its SA. The contents of any location which do not match are listed on the console terminal with their appropriate addresses.

OPERATION continued

LIST — The contents of the data block specified by SA and EA are listed on the console terminal.

ERASED — The contents of the data clock specified by SA and EA are checked for erasure. Any locations which are not properly erased are listed on the console terminal.

MOVE — The contents of the source data block specified by SA and EA are written into the RAM portion specified by its SA.

LOAD — Data available in Absolute Loader Format from specified input device is loaded into RAM memory.

DUMP — The contents of the source data block specified by SA and EA is dumped in Absolute Loader Format to the specified output device.

TEST — All data bits of all locations of the EPROM data block specified by SA and EA are loaded and checked thereafter. The test pattern is run twice, first as true data, secondly as inverted data, therefore loading all bits.

FILL — The contens of the RAM block specified by SA and EA are set to a preselected pattern.

Command Modifiers:

INVERSION — Any command except LIST, DUMP, LOAD or TEST may be operated with inverse data bits, if so specified in the command word.

DISPLACEMENT — By appropriately setting these two bits, an EPROM module with an address space beyond 0...32k (feasible with VMC11-A or VMC11-B module) may for instance get loaded from a RAM area residing within the boundaries of the first 32k.

Affected by DISPLACEMENT are the commands WRITE, COMPARE, LIST, ERASED, MOVED, TEST.

MODE — The variations are

- ODT-Mode
- SUBROUTINE-Mode
- Printout to Console
- Printout Inhibit
- Printout to Specified Device

INSTALLATION

The VMP11-A module can be installed in any LSI-11 bus-structured backplane. It only requires one option location and it is not dependent on position (device priority) along the bus. Hence, the module can be installed in any option location in single and multiple backplane systems. The module requires no special power; all operating power (+5V and +12V) is supplied by the normal power present on the backplane.

The appropriate UV EPROM module (like the VME11-A, VMC11-A or VMC11-B modules) is also installed in the LSI-11 backplane; an additional cable connection to the programmer module is to be made. Note that all commands except WRITE, ERASED and TEST may be run without the cable connection.

SPECIFICATION

Electrical

System Power

Standby

+5V	±5%	0,7	A typ.	(0,9 A max.)
+12V	±5%	0,01	A typ.	(0,02 A max.)

Operating (Programming)

+5V	±5%	0,7	A typ.	(0,9 A max.)
+12V	±5%	0,55	A typ.	(0,7 A max.)

Environmental

Operating Temperature

0°C to 55°C with a relative humidity of 10% to 95% (no condensation), with an adequate airflow across the module. When operating at the maximum temperature (55°C), air flow must maintain the inlet to outlet air temperature rise across the module to 7°C maximum.

Storage Temperature Range

-40°C to 85°C

Mechanical

Size

Height	13,2	cm	(5,2 in)
Length	22,8	cm	(8,9 in)
Width	1,27	cm	(0,5 in)

ORDERING INFORMATION

Part No.	Description
VMP11-AA	Programmer for UV EPROMs

VOGELSANG INFORMATIK
FL-9496 Balzers, Gagoz 863, Telefon 075 4 25 25

VMP11-A

UV EPROM-PROGRAMMER

USER'S MANUAL

P R E L I M I N A R Y

The material in this manual is for informational purposes and is subject to change without notice.

No responsibility is assumed for any errors which may appear in this manual.

VD010057

CONTENTS

1. INTRODUCTION

1.1 INTRODUCTION

The VMP11-A (Figure 1-1) is an LSI-11* hardware option that greatly simplifies loading of EPROM chips. It allows the user to perform "in machine programming" of any portion of an EPROM either under program control or by using simple console ODT commands. This manual contains user information, required for making effective use of the VMP11-A programmer option.

1.2 GENERAL DESCRIPTION (Figure 1-2)

The VMP11-A consists of a single "double height" (two sets of backplane pins) module (printed circuit board) that plugs into any standard LSI-11 backplane. The module contains its own PROM and RAM memory (2048 words of address space) required for storage and execution of its programming routines. A built in converter supplies the necessary programming voltage source for EPROMs. The programmer is designed to load EPROMs of the type 2708, 2716 and 2532 in conjunction which such LSI-11* memory options like the VME11-A or VMC11-A UV EPROM memory modules.

Besides using the VMP11-A programmer option for actual program loading of programs into EPROMs it may be used, if permanently installed, to generate nonvolatile data records of system events, system key data, gauge tables etc.

Features:

- o "In machine programming" of EPROMs.
- o Programming is straight forward using console ODT commands or running as a subroutine under program control.
- o Designed to load EPROMs of the type 2708, 2716, 2532.
- o Contains its own PROM and RAM memory for storage and execution of its programming routines.
- o Contains numerous auxiliary programs to facilitate EPROM loading and checking.
- o Selectable address space of resident memory by means of DIP-switches.
- o Possible operation beyond 32k address space.
- o No special power is required. Only the normal +5VDC and +12VDC operating voltages present on the LSI-11* backplane are required.
- o Completely compatible with LSI-11* Bus protocol.
- o Can be installed in any option location in LSI-11* and PDP-11/03* systems.

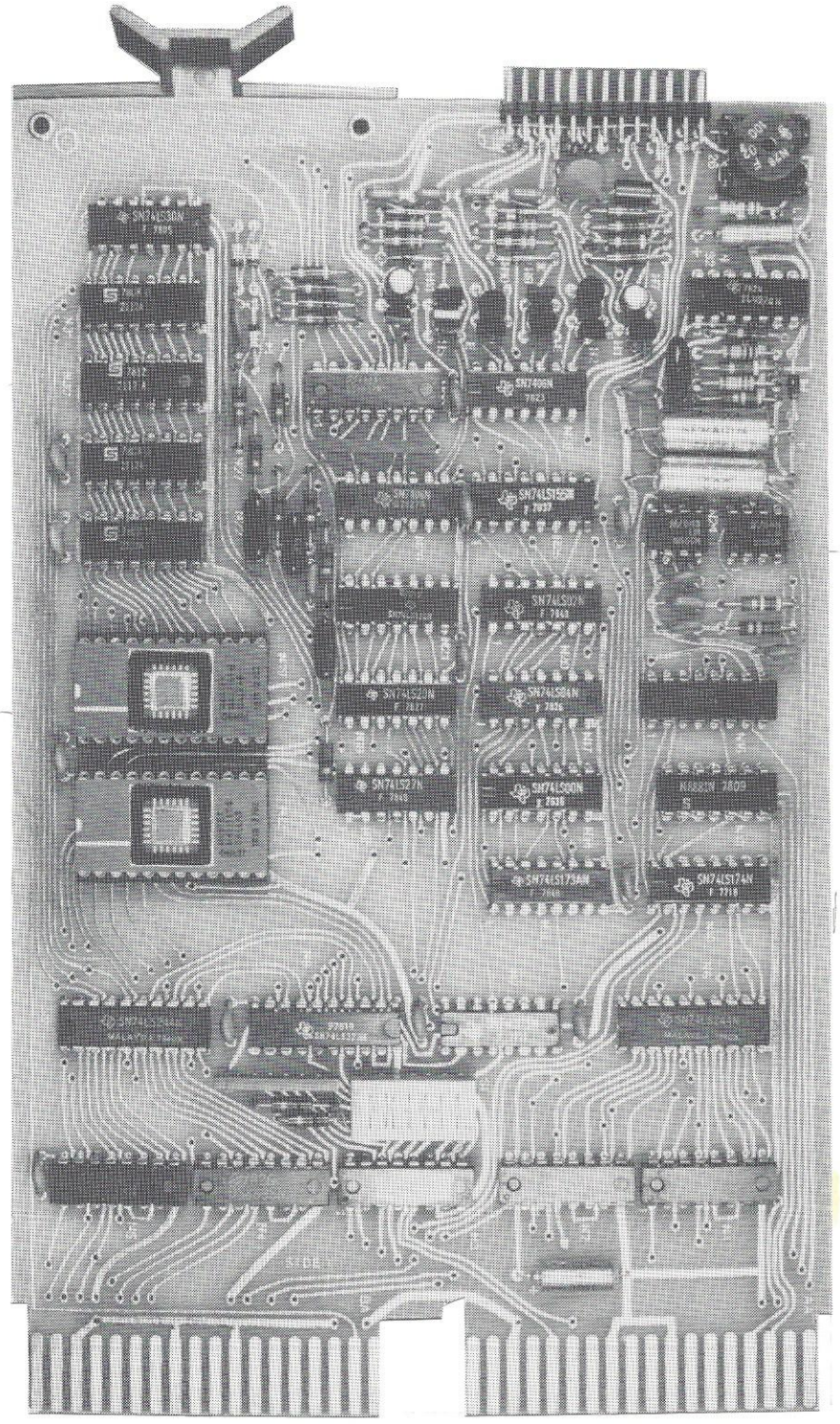


Figure 1 - 1 VMP11-A UV EPROM PROGRAMMER Module

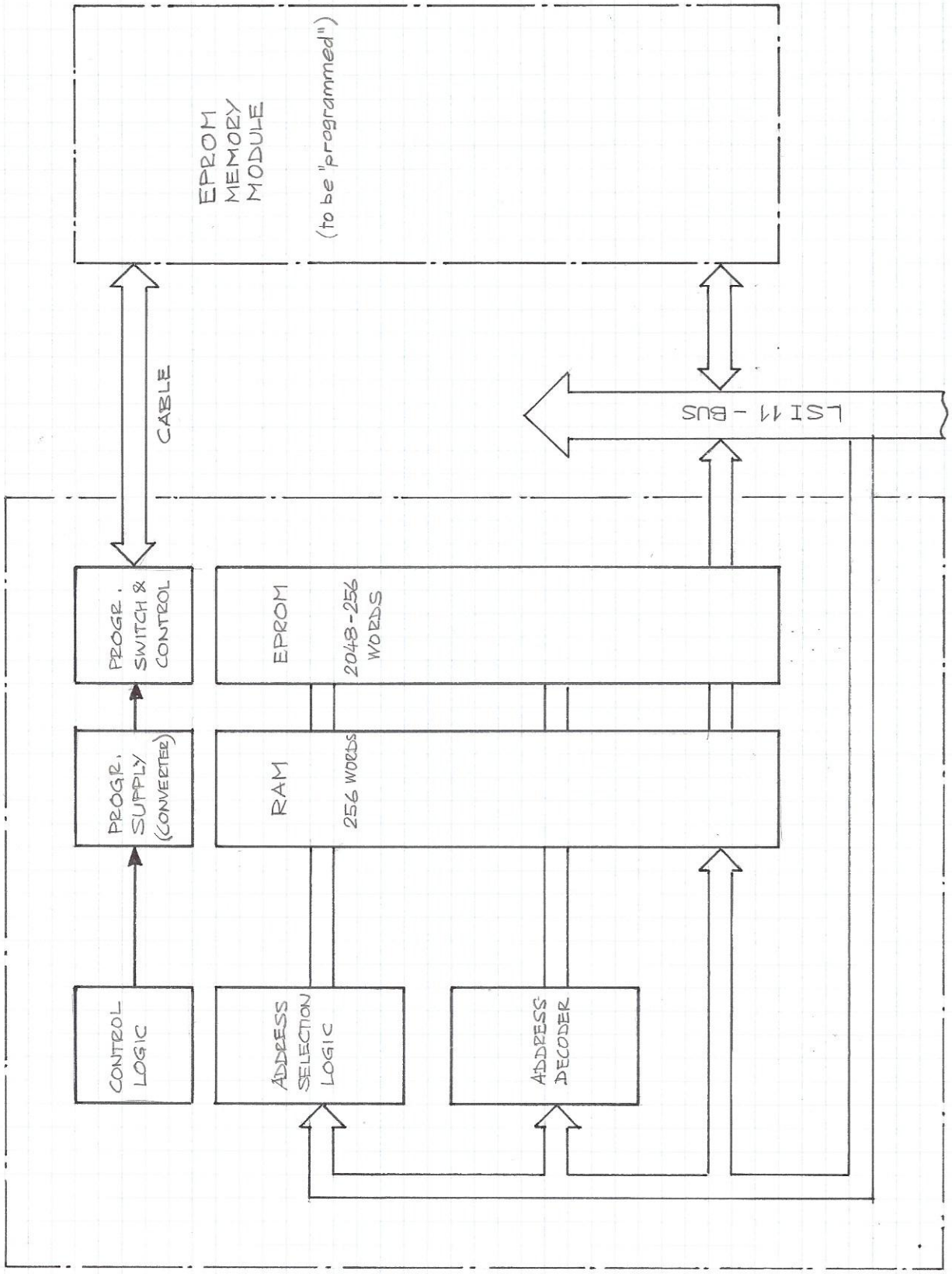


Figure 1-2 Block Diagram

1.3 SPECIFICATIONS

1.3.1 Electrical

System Power

Standby

+5V	± 5%	0,7 A typ.	(0,9 A max.)
+12V	± 5%	0,01 A typ.	(0,02A max.)

Operating (Programming)

+5V	± 5%	0,7 A typ.	(0,9 A max.)
+12V	± 5%	0,55 A typ.	(0,7 A max.)

1.3.2 Environmental

Operating Temperature

$0^{o}C$ to $55^{o}C$ with a relative humidity of 10% to 95% (no condensation), with an adequate airflow across the module. When operating at the maximum temperature ($55^{o}C$), air flow must maintain the inlet to outlet air temperature rise across the module to $7^{o}C$ maximum.

Storage Temperature Range

$-40^{o}C$ to $66^{o}C$.

1.3.3 Mechanical

Size

Height	13,2 cm	(5,2 in)
Length	22,8 cm	(8,9 in)
Width	1,27 cm	(0,5 in)

1.3.4 Backplane Pin Utilization

VMP11-AA backplane pin utilization is shown in Table 1-1.

1.3.4 Ordering Information

Part No.	Description
VMP11-AA	Programmer for UV EPROMs

Table 1-1 VMP11-A Backplane Pin Utilization

Module Side 1 (Component Side)		Module Side 2 (Solder Side)	
LSI-11 Bus Pin	Signal Mnemonic	LSI-11 Bus Pin	Signal Mnemonic
A1		A2	+5V
B1		B2	
C1	BAD16L	C2	GND
D1	BAD17L	D2	+12V
E1		E2	BDOUT L
F1		F2	BRPLY L
H1		H2	BDIN L
J1	GND	J2	BSYNC L
K1		K2	
L1		L2	
M1	GND	M2	BIAKI L
N1		N2	BIAKO L
P1		P2	BBS7 L
R1		R2	BDMGI L
S1		S2	BDMGO L
T1	GND	T2	BINIT L
U1		U2	BDAL0 L
V1		V2	BDAL1 L
BA1		BA2	+5V
BB1	BPOK H	BB2	
BC1		BC2	GND
BD1		BD2	
BE1		BE2	BDAL2 L
BF1		BF2	BDAL3 L
BH1		BH2	BDAL4 L
BJ1	GND	BJ2	BDAL5 L
BK1		BK2	BDAL6 L
BL1		BL2	BDAL7 L
BM1	GND	BM2	BDAL8 L
BN1		BN2	BDAL9 L
BP1		BP2	BDAL10 L
BR1		BR2	BDAL11 L
BS1		BS2	BDAL12 L
BT1	GND	BT2	BDAL13 L
BU1		BU2	BDAL14 L
BV1		BV2	BDAL15 L

2. INSTALLATION

2.1 GENERAL

This chapter contains the information required for configuring and installing the VMP11-A module in an LSI-11* system backplane. Configuring the module involves proper setting of switches that selects resident memory addresse space. Installation involves the proper connection to the system and the UV EPROM modules (VME11-A, VMC11-A) to be "loaded" with data. Detailed information is included in the following paragraphs.

2.2 CONFIGURING THE VMP11-A MODULE

Switch locations of the VMP11-A module are shown in Figure 2-1. Switches allow selection of VMP11-A resident memory address space. The 2K (256 words of RAM and 1792 words of PROM) contiguous resident memory of the VMP11-A can be located in any 2K bank of the system in the Ø...32K range and in the 124...128K range if applicable. The relationship between bus address bits and switch settings is shown in Figure 2-2. Set switches for a particular 2K bank as directed in Figure 2-2.

NOTE

The address space is to be selected such, that the 2K contiguous address space of the VMP11-A module does not interfer with any existing memory or peripheral addresses of the system.

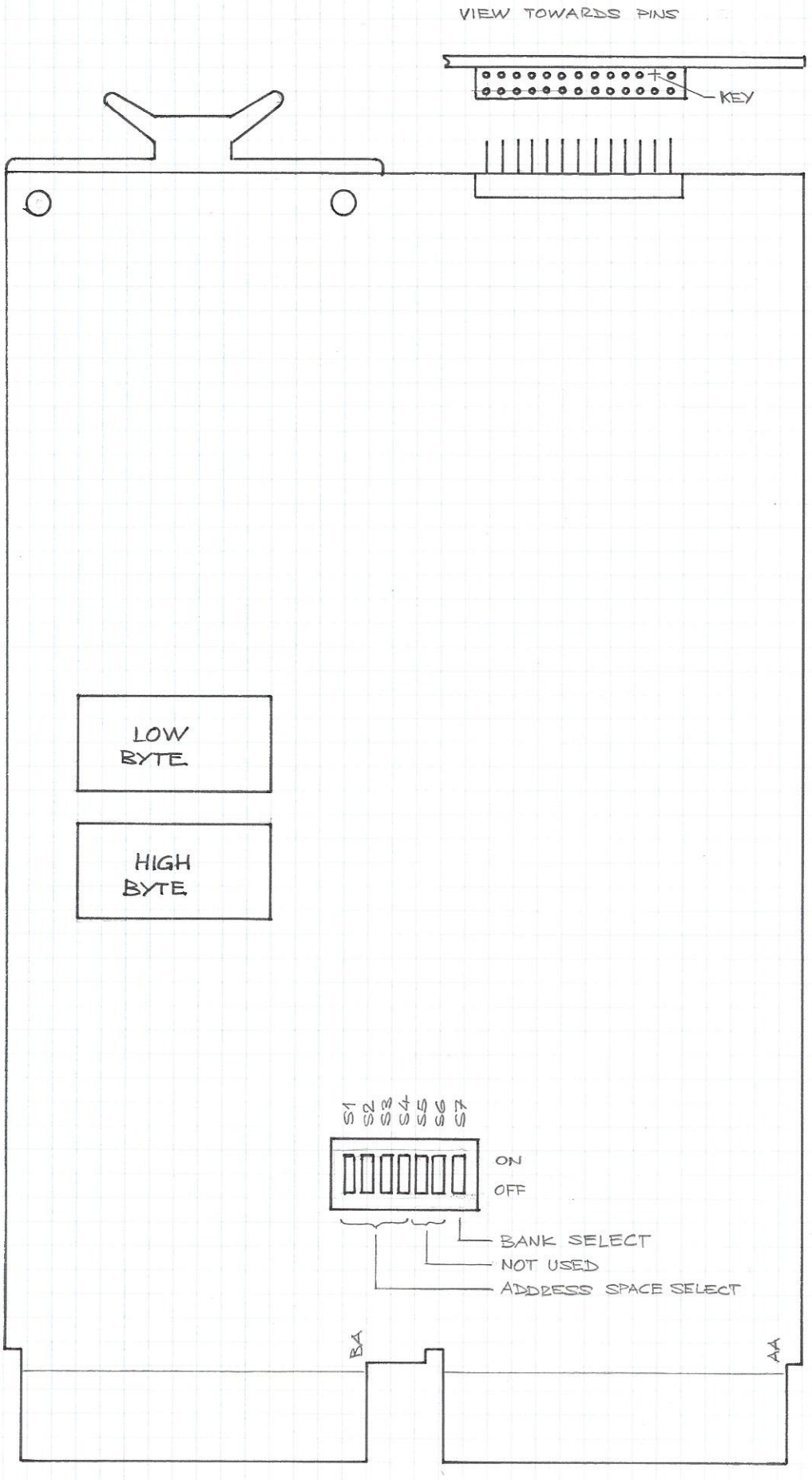
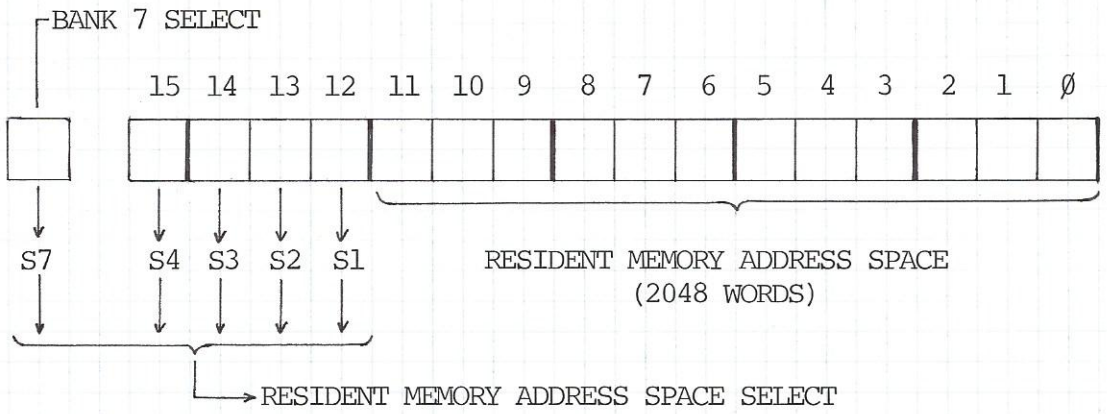


Figure 2-1 Switch, Connector and Socket Locations



ADDRESS RANGE OCTAL	DECIMAL	SWITCH SETTING S7	S4	S3	S2	S1
000000 - 007776	0 - 2k	O	O	O	O	O
010000 - 017776	2 - 4k	O	O	O	O	C
020000 - 027776	4 - 6k	O	O	O	C	O
030000 - 037776	6 - 8k	O	O	O	C	C
040000 - 047776	8 - 10k	O	O	C	O	O
050000 - 057776	10 - 12k	O	O	C	O	C
060000 - 067776	12 - 14k	O	O	C	C	O
070000 - 077776	14 - 16k	O	O	C	C	C
100000 - 107776	16 - 18k	O	C	O	O	O
110000 - 117776	18 - 20k	O	C	O	O	C
120000 - 127776	20 - 22k	O	C	O	C	O
130000 - 137776	22 - 24k	O	C	O	C	C
140000 - 147776	24 - 26k	O	C	C	O	O
150000 - 157776	26 - 28k	O	C	C	0	C
160000 - 167776	28 - 30k	*)	C	C	C	O
170000 - 177776	30 - 32k	*)	C	C	C	C
760000 - 767776	124 - 126k	C	C	C	C	O
770000 - 777776	126 - 128k	C	C	C	C	C

O = OPEN
C = CLOSED

*) O FOR CPU WITH 128k ADDRESS SPACE

C FOR CPU WITH 32k ADDRESS SPACE

Figure 2-2 VMP11-A Addressing

2.3 INSTALLING THE VMP11-A MODULE

2.3.1 Backplane Installation

The VMP11-A module can be installed in any LSI-11* bus-structured backplane. It only requires one option location and it is not dependent on position (device priority) along the bus. Hence, the module can be installed in any option location in single and multiple backplane systems. The module requires no special power; all operating power (+5V and +12V) is supplied by the normal power present on the backplane.

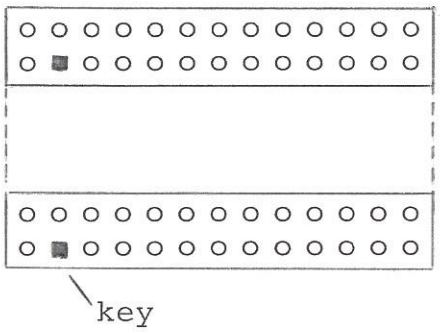
The appropriate UV EPROM module (like the VME11-A or VMC11-A modules) is also installed in the LSI-11* backplane; an additional cable connection to the programmer module is to be made. Note that all commands except WRITE, ERASED and TEST may be run without the cable connection.

2.3.2 Cable Connection to UV EPROM modules (VME11-A and VMC11-A)

Two cables are supplied with each VMP11-A programmer module:

- 26-pol for the VME11-A UV EPROM module
- 10-pol for the VMC11-A UV EPROM module.

The cables and etch connectors are appropriately keyed to prevent from erroneous connection (refer to Figure 2-3, 2-4).

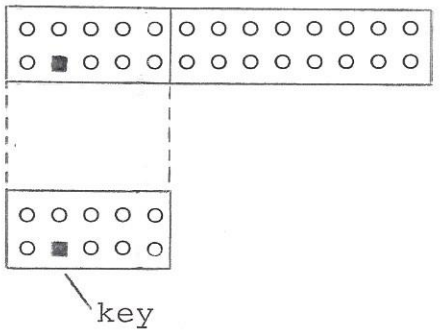


Programmer VMP11-A

cable 26-pol

UV EPROM VME11-A

Figure 2-3



Programmer VMP11-A

cable 10-pol

UV EPROM VMC11-A

Figure 2-4

NOTE

On some early shipments of the VMEll-A modules the keying of the edge connector is not implemented. The proper keying may be done by cutting the appropriate pin as indicated in Figure 2-5.

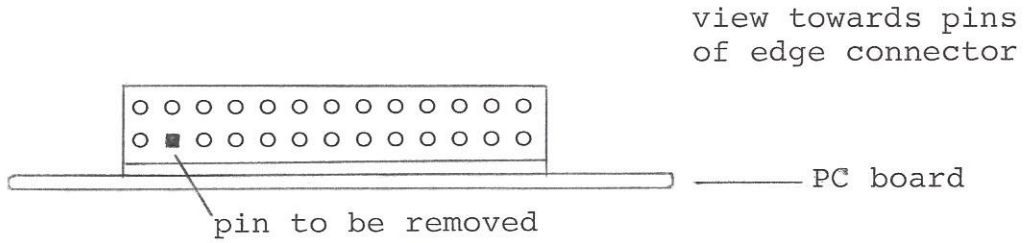


Figure 2-5

3. LOADING OF EPROMs

3.1 GENERAL

This chapter contains specific instructions for loading and erasing EPROMs. A detailed description gives the user the information required to operate the VMP11-A EPROM programmer in connection with such EPROM memory modules as the VME-11A or VMC11-A.

3.1.1 Loading EPROMs

Loading (or programming) EPROMs is the process where the binary information is stored in the EPROM locations. This is a process that must be carefully executed as directed by the appropriate EPROM manufacturer's instructions.

3.1.2 Data Word Format

Each EPROM word, when read by the LSI-11* processor, is read from two bytes (stored) in two separate EPROMs. Each byte is simultaneously addressed and produces its respective 8-bit portion of the 16-bit word that is read. Since the word format is contained in two 8-bit bytes (one byte in each EPROM), each EPROM is to be loaded with successive memory locations, but dedicated to one 8-bit byte.

The unprogrammed (or erased) EPROM contents are all "1's" (high state). Loading data into the EPROM introduces logic "Ø's" (low state). Following are the conventions for the VME11-AA, VME11-AB and VMC11-A EPROM memory modules:

The VME11-AA (standard) module assigns "Ø's" (high state) to the LSI-11* data bus with unprogrammed (or erased) EPROM contents.

The VME11-AB (optional) module assigns "1's" (low state) to the LSI-11* data bus with unprogrammed (or erased) EPROM contents.

The VMC11-A module assigns "1's" (low state) to the LSI-11* data bus with unprogrammed (or erased) EPROM contents.

3.1.3 Addressing

EPROM integrated circuits, when installed in the VME11-A and VMC11-A modules are addressed by high-active address bits.

The correspondence between LSI-11* bus lines and the address bus lines of the EPROMs is as follows:

BUS SIGNALS (BDAL):	1	2	3	4	5	6	7	8	9	10	11	12
EPROM PINS:	8	7	6	5	4	3	2	1	23	22	(19)	(18)

3.2 OPERATION

3.2.1 General

Operation is possible under program control or by using simple ODT commands. Data of any system memory area can be directly written (loaded) into a specified EPROM area. The EPROMs may be loaded location after location or in blocks less than its actual size. Numerous auxiliary programs facilitate EPROM loading and checking.

3.2.2 Commands

The general command format is outlined in Fig. 3-1.

A table of the commands with their appropriate arguments is shown in Fig. 3-2. A command is to be entered into location XXØØØØ and its arguments into the locations XXØØØ2, XXØØØ4, XXØØØ6, XXØØ1Ø (XX is defined by the appropriate switch setting for selection of resident address space, see Fig. 2-2).

3.2.2.1 Command Format

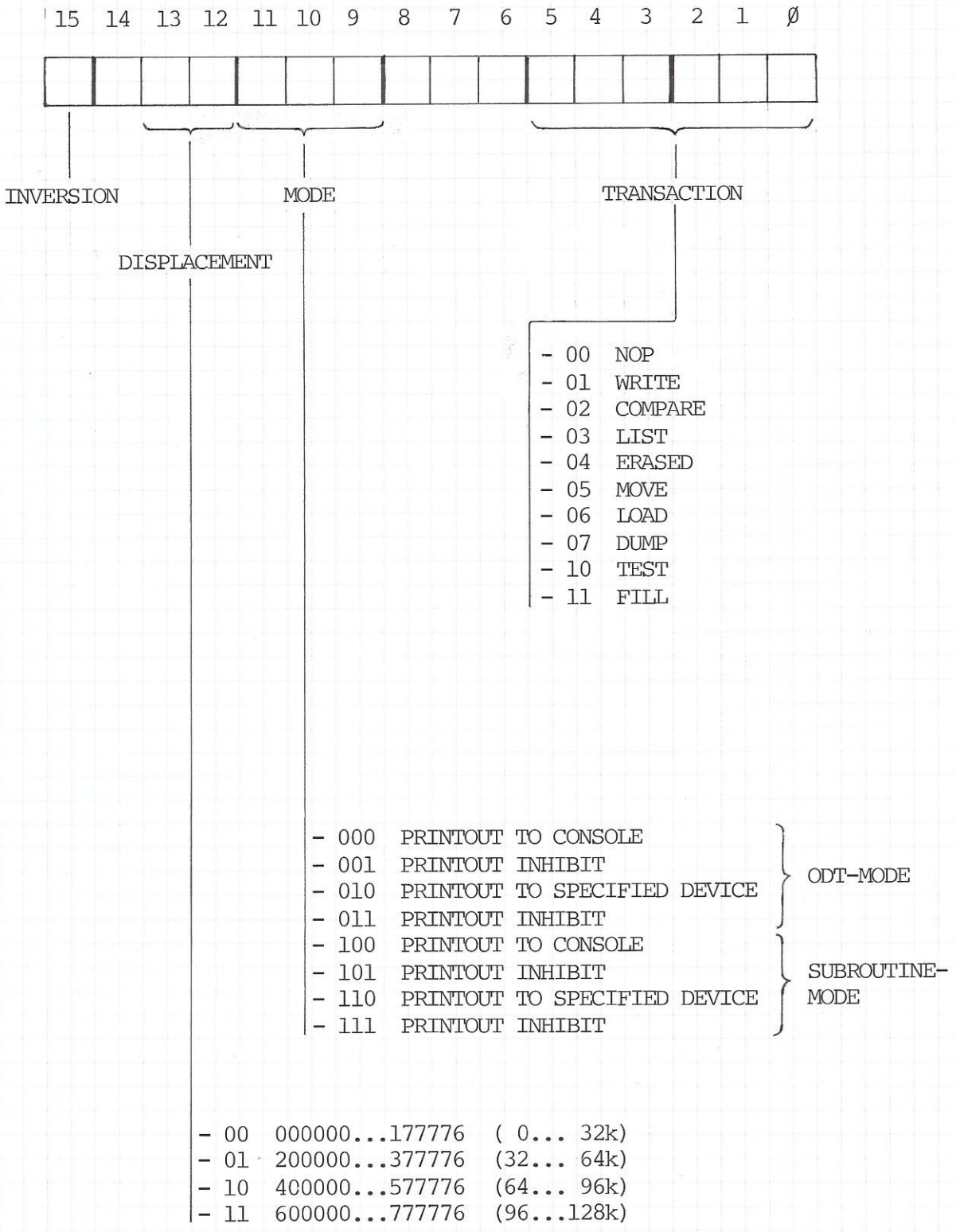


Figure 3-1

3.2.2.2 Command Table

SA = Start Address
EA = End Address

Transaction (XX0000, Bit 0...5)	Command Arguments				Return Arguments		
	Arg.1 (XX0002)	Arg.2 (XX0004)	Arg.3 (XX0006)	Arg.4 (XX0010)	Arg.5 (XX0012)	Arg.6 (XX0014)	Arg.7 (XX0016)
00 NOP	-	-	-	-	-	-	-
01 WRITE	SA SOURCE	EA SOURCE	SA EPROM	Device Address for Printout on Specified Output Device	First Error	Last Error	Error Count
02 COMPARE	SA SOURCE	EA SOURCE	SA EPROM		First Error	Last Error	Error Count
03 LIST	SA	EA	-		-	-	-
04 ERASED	SA EPROM	EA EPROM	-		First Error	Last Error	Error Count
05 MOVE	SA	EA	SA		-	-	-
06 LOAD	Device Adr. INPUT	Reloc.Load ADDRESS	-		-	-	-
07 DUMP	SA SOURCE	EA SOURCE	Device Adr. OUTPUT		-	-	-
10 TEST	SA EPROM	EA EPROM	Test Pattern		First Error	Last Error	Error Count
11 FILL	SA RAM	EA RAM	Fill Pattern		-	-	-

Figure 3-2

3.2.2.3 List of commands

NOP — No operation.

WRITE — The contents of the source data block specified by SA and EA is written (loaded or programmed) into the EPROM portion specified by its SA. The WRITE-command is automatically followed by a COMPARE-command. An error count is maintained in location XX0016. An indication of the address of the first error encountered is stored in XX0012 and the address of the last error is stored in XX0014.

COMPARE — The contents of the source data block specified by SA and EA is compared against the contents of the EPROM portion specified by its SA. The contents of any location which do not match are listed on the console terminal with their appropriate addresses. An error count is maintained in location XX0016. An indication of the address of the first error encountered is stored in XX0012 and the address of the last error is stored in XX0014.

LIST — The contents of the data block specified by SA and EA are listed on the console terminal.

ERASED — The contents of the data block specified by SA and EA is compared against "0" (against "1" if the INVERSION bit is set) in case of the VME11-A and against "1" in case of the VMC11-A (the INVERSION bit has no influence here). Any locations which are not properly erased are listed on the console terminal. An error count is maintained in location XX0016. An indication of the address of the first error encountered is stored in XX0012 and the address of the last error is stored in XX0014.

MOVE — The contents of the source data block specified by SA and EA is written into the RAM portion specified by its SA. Do not attempt to "move" into EPROM address space.

LOAD — Data available in Absolute Loader Format from specified input device (RCSR of input device: 177560 for console) is loaded into RAM memory. Normal loading (Argument 2 = 0) causes the program being loaded to load at an absolute address. Relocated loading (Argument 2 to specify load address) allows loading of certain programs into any specific area in memory, or to continue loading from where the loader left off on a previous load operation.

Setting of Argument 2:

0 = normal

1 = relocated-continue loading where left off.

nnnnn+1 = relocated-loading starts at nnnnn.

DUMP — The contents of the source data block specified by SA and EA is dumped in Absolute Loader Format to the specified output device (XCSR of output device: 177564 for console).

TEST — All data bits of all locations of the EPROM data block specified by SA and EA are loaded and checked thereafter. The test pattern (defined by argument 3) is run twice, first as true data, secondly as inverted data, therefore loading all bits. The defined pattern is alternately complemented for consecuitive locations. Default pattern (argument 3=0) is checkerboard pattern. The use of the INVERSION bit is similar as in the command ERASED.

FILL — The contents of the RAM-block specified by SA and EA are set to the pattern selected by argument 3. Setting of the INVERSION bit causes the preselected pattern to be inverted.

3.2.2.4 Command Modifiers

INVERSION — Any command except LIST, DUMP or TEST may be operated with inversed data bits, if so specified in the command word.

Normally the INVERSION is not to be used when programming 2708-, 2716 and 2532-type EPROMs for use in their appropriate modules like the VME11-AA and the VMC11-A. However the INVERSION may be necessary when programming EPROMs for use in alternate hardware. The INVERSION must be used when programming EPROMs on VME11-AB-modules.

DISPLACEMENT — By appropriately setting these two bits, an EPROM module with an address space beyond 0...32k (feasible with VMC11-A EPROM option) may for instance get loaded from a RAM area residing within the boundaries of the first 32k.

Affected by DISPLACEMENT are the commands WRITE, COMPARE, LIST, ERASED, MOVE, TEST.

Note: The use of this option is to be avoided in a system with memory management option activated, or when the RAM modules used are lacking the address decoding of the bus addresses 13...15, or with some early versions of the KD11-J, -R microprocessor boards which are lacking the appropriate bus termination.

MODE The variations are

- ODT-Mode
- SUBROUTINE-Mode
- Printout to Console
- Printout Inhibit
- Printout to Specified Device

In ODT-Mode the command word, the arguments and the program start are typed into the console using ODT command language. After execution of the entire command, the program halts.

In SUBROUTINE-Mode command word and arguments are passed by a user defined program. The programmer is startet by a JSR. After execution, it returns to the calling program via a RTS.

Messages and listings may be printed on the console or output to a device specified with its device address (XCSR), or printout may be suppressed alltogether.

3.2.3 Program Start

Programmer Start Address is XX1000, with both manual start in ODT-Mode and with start under program control in SUBROUTINE-Mode using a JSR PC instruction.

3.2.4 Execution of the loading

The actual loading (or programming) of the EPROM is straightforward to the user:

- Enter desired command into location XX0000.
- Enter arguments into locations XX0002, XX0004, XX0006, XX0010.
- Start programmer at start address XX1000 by means of ODT commands or under program control by a Jump to Subroutine (JSR PC). (XX is dependent on address assignement of VMP11-A programmer, refer to Fig. 2-2.)
- When console printout is enabled, termination is indicated by printout "DONE" and then the programmer either halts or returns to the main program (RTS PC).
- Check Return Arguments (error indications) if necessary.

Note that the VMP11-A programmer automatically saves all General Register contents. The Stack Pointer (R6) is also preserved. Furthermore it does not access any memory locations except its own and the locations specified by the user in a command.

3.3 ERASING EPROMs

The recommended erasure procedure for the EPROMs is exposure to shortwave ultraviolet light which has a wavelength of 2537 Angstroms (Å). The integrated dose (i.e., UV intensity X exposure time) for erasure should be a minimum of 15 W-sec/cm^2. The erasure time with this dosage is approximately 15 to 20 minutes using an ultraviolet lamp with a 12000 uW/cm^2 power rating. The EPROMs should be placed within 1 inch of the lamp tubes during erasure. Some lamps have a filter on their tubes which should be removed before erasure.

The erasure characteristics of the EPROMs are such that erasure begins to occur when exposed to light with wavelengths shorter than approximately 4000 Angstroms (Å). It should be noted that sunlight and certain types of fluorescent lamps have wavelengths in the 3000-4000Å range. Data show that constant exposure to room level fluorescent lighting could erase the typical EPROMs in approximately 3 years, while it would take approximately 1 week to cause erasure when exposed to direct sunlight. If an EPROM is to be exposed to these types of lighting conditions for extended periods of time, opaque labels should be placed over the EPROM window to prevent unintentional erasure.

3.4 EXAMPLES OF LOADING PROCEDURES

3.4.1 General

This section contains a sample loading session enabling the user to gain a quick understanding of how to use the VMP11-A programmer. Only part of the existing commands and available command modifiers are applied in this session. However the sample session is constructed such that the user will be adequately prepared to use the VMP11-A programmer.

3.4.2 System Configuration

The system used in this example consists of:

- LSI-11* CPU, LSI-11* bus, power supply.
- 4k-RAM, address space octal 0-17776.
- 4k UV EPROM module type VME11-AA with 2k of EPROM installed in address space octal 60000-67776 (the address space beyond 67776 is enabled but no EPROMs are installed).

- VMP11-A programmer with resident memory space set to octal 160000-167776.

- Console terminal with paper tape reader (device address: RCSR 177560).

- Output device (device address XCSR 177504).

3.4.3 Sample Loading Session

Step 1: ERASED-Command

```
@160000/XXXXXX 4          (LF)            ; command
160002/XXXXXX 60000       (LF)            ; SA EPROM
160004/XXXXXX 67776       (CR)            ; EA EPROM
@161000G                                  ; start
064000 000XXX                             ; 1st error
066002 000XXX                             ; 2nd error
066006 000XXX                                  |
066010 000XXX                                  |
                          (MANUAL HALT)   ; stop printout
016XXXX
@160012/64000             (LF)            ; check address of first error
160014/66010              (LF)            ; check address of last error
160016/4                  (CR)            ; check error count
                                          ; replace unerased EPROM
@160000/XXXXXX 1004       (LF)            ; command (with no error
160002/XXXXXX 60000       (LF)            ; SA EPROM          printout)
160004/XXXXXX 67776       (CR)            ; EA EPROM
@161000G                                  ; start
166600                                    ; program halt
@160016/0                 (CR)            ; error count = 0
@
```

The contents of the EPROM block starting at octal 60000 and ending at octal 67776 are checked for proper erasure. An error printout occurs which is interrupted by the operator after a few lines. The error pattern suggest that the Low Byte EPROM of the memory bank from 64000 to 67776 is not erased. The operator replaces the suspected EPROM and repeats the test with inhibited printout. After completion of the test the error count, checked from Return Argument 7 (location 160016), is found to be zero, indicating properly erased EPROMs.

Step 2: FILL-Command

```
@160000/XXXXXX 11       (LF)        ; command
160002/XXXXXX 30000     (LF)        ; SA RAM
160004/XXXXXX 33776     (LF)        ; EA RAM
160006/XXXXXX 0         (CR)        ; fill pattern
@161000G                            ; start
DONE                                ; done
166600                              ; program halt
@
```

The contents of the RAM block starting at octal 30000 and ending at octal 33776 is cleared. This preliminary step is useful to prevent undefined data from appearing in any gap of a subsequently loaded program.

Step 3: LOAD-Command

```
@160000/XXXXXX 6        (LF)        ; command
160002/XXXXXX 177560    (LF)        ; device addres: input
160004/XXXXXX 30001     (CR)        ; load address
@161000G                            ; start
160412                              ; program halt (loader)
@
```

The data in Relocatable Absolute Loader Format is loaded from the console device (RCSR 177560) into the RAM memory space beginning at octal location 30000.

Step 4: WRITE-Command (part 1)

```
@160000/XXXXXX 1        (LF)        ; command
160002/XXXXXX 0         (LF)        ; SA source
160004/XXXXXX 3776      (LF)        ; EA source
160006/XXXXXX 60000     (CR)        ; SA EPROM
@161000G                            ; start
DONE                                ; done
166600                              ; program halt
@
```

The contents of the source block starting at 0 and ending at octal 3776 are loaded into consecutive locations of the EPROM section starting at octal 60000. The absence of an error listing indicates a perfect "loading" of all EPROM locations.

Step 5: WRITE-Command (part 2)
showing error printout

```
@160000/XXXXXX 1          (LF)          ; command
160002/XXXXXX 30000       (LF)          ; SA source
160004/XXXXXX 34000       (LF)          ; EA source
160006/XXXXXX 64000       (CR)          ; SA EPROM
@161000G                                ; start
070000 000000 XXXXXX                    ; one error
DONE                                    ; done
166600                                  ; program halt
@
```

The contents of the source block starting at octal 30000 and ending at 34000 are loaded into consecutive locations of the EPROM section starting at octal 64000. The only error present is attributable to an incorrect block EA of the source (34000 instead of 33776), exeeding the memory space of the available EPROM by one location. Therefore, in spite of the error printout, the "loading" is correct.

Step 6: DUMP-Command

```
@160000/XXXXXX 7          (LF)          ; command
160002/XXXXXX 60000       (LF)          ; SA source
160004/XXXXXX 67776       (LF)          ; EA source
160006/XXXXXX 177504      (CR)          ; device address: output
@161000G                                ; start
160216                                  ; program halt (dump)
@
```

The full contents of the previously loaded EPROM memory space starting at octal 60000 and ending at octal 67776 is dumped to the specified output device (XCSR 177504).

3.4.4 Typical Printout Formats

Halt addresses:

- normal 166600
- loader 160412
- dump 160216

List printouts applicable for the commands LIST, ERASED, TEST

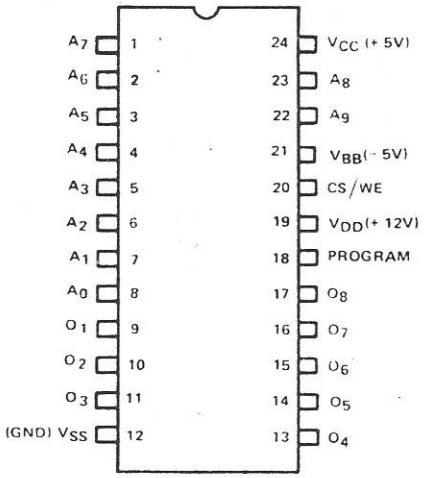
- first column: address
- second column: data

Error printouts applicable for the commands WRITE, COMPARE,

- first column: address
- second column effectiv data
- third column expected data

Programming Time

EPROM-type	Programming time of nominal	
	TEST	WRITE
2708	75 %	150 %
2716	100 %	100 %
2532	100 %	100 %



PIN NAMES

A_1 A_9	ADDRESS INPUTS
O_1 O_8	DATA OUTPUTS
CS/WE	CHIP SELECT/WRITE ENABLE INPUT

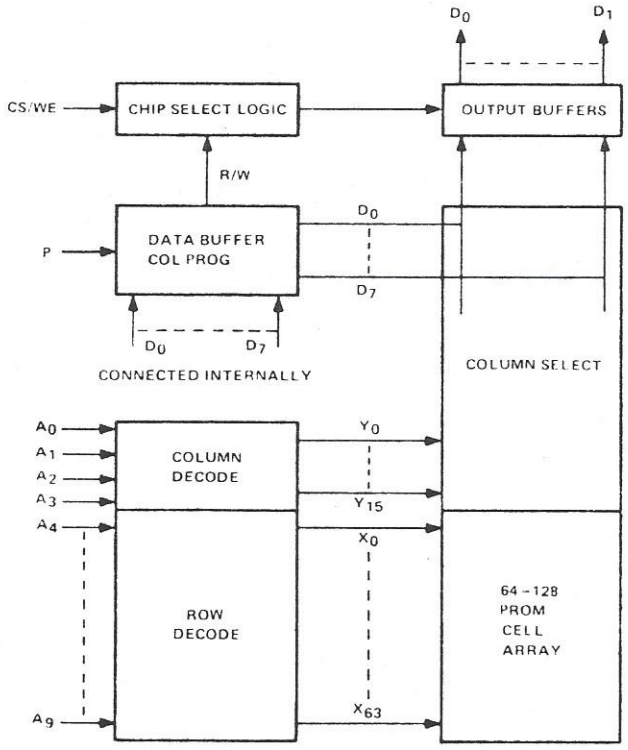
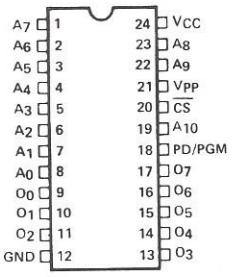


Figure A-2/1 2708-type EPROM

PIN CONFIGURATION



PIN NAMES

A_0–A_{10}	ADDRESSES
PD/PGM	POWER DOWN/PROGRAM
$\overline{CS}$	CHIP SELECT
O_0–O_7	OUTPUTS

MODE SELECTION

MODE \ PINS	PD/PGM (18)	$\overline{CS}$ (20)	V_{PP} (21)	V_{CC} (24)	OUTPUTS (9-11, 13-17)
Read	V_{IL}	V_{IL}	+5	+5	D_{OUT}
Deselect	Don't Care	V_{IH}	+5	+5	High Z
Power Down	V_{IH}	Don't Care	+5	+5	High Z
Program	Pulsed V_{IL} to V_{IH}	V_{IH}	+25	+5	D_{IN}
Program Verify	V_{IL}	V_{IL}	+25	+5	D_{OUT}
Program Inhibit	V_{IL}	V_{IH}	+25	+5	High Z

BLOCK DIAGRAM

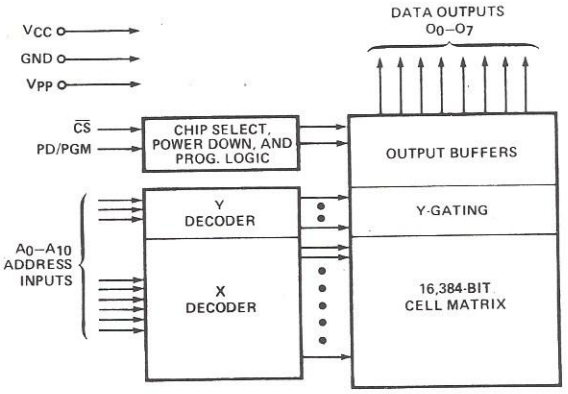
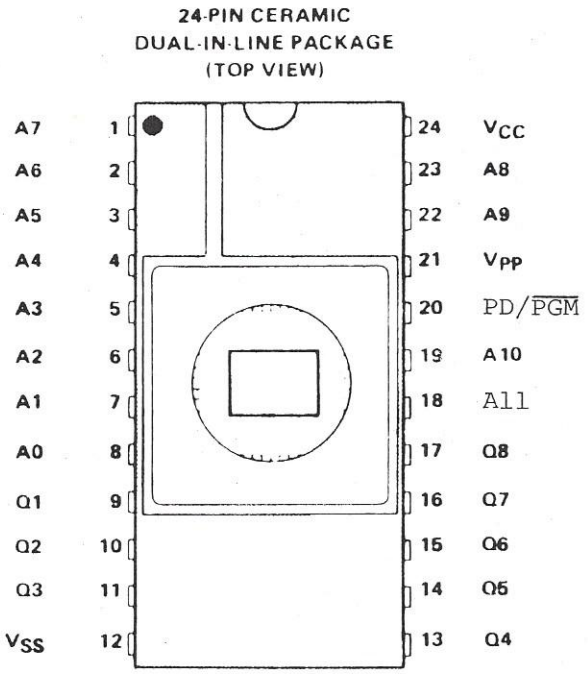


Figure A-2/2 2716-type EPROM



PIN NOMENCLATURE	
A(N)	Address Inputs
$\overline{CS}$	Chip Select
PD/PGM, PD/$\overline{PGM}$	Power Down/Program
O(N)	Input/Output
V_{CC}	+5 V Power Supply
V_{PP}	+25 V Power Supply
V_{SS}	0 V Ground

Figure A-2/3 2532-type EPROM