

# BIPOLAR PROM ADAPTER READ THIS SHEET FIRST!

The BIPOLAR PROM ADAPTER (#ABIP) must be used with caution. The addendum which accompanies the adapter describes the precautions which must be followed for the successful use of the system. If the precautions are not followed the programming unit, the adapter or both may be damaged. Please review the following list:

1. **NEVER** install the adapter with AC power applied to the programming unit.
2. The adapter requires power from the programming unit ACCESSORY CONNECTOR. Connect the two wires (orange) to +5 and (yellow) to +35. The wires have push-on connectors. **NEVER** attach or remove the wires with AC power applied to the programming unit.
3. The 24 pin socket on the adapter is located at the corner. When you insert a device into the socket be sure that downward pressure does not cause the adapter to tilt down and disconnect from the programming unit socket. If this occurs remove power from the programming unit and reinstall the adapter.
4. Bipolar proms smaller than 24 pins are always inserted fully left justified in the 24 pin socket. The notch on the prom faces the red dot on the socket.

## ABOUT BIPOLAR PROMS

This paragraph discusses reoccurring issues which are specific to bipolar proms. Please be sure that you understand the following items:

1. Bipolar proms cannot be erased. The information is stored in an array of small fuses inside the part. An unblown (intact or unprogrammed) fuse will read as a 00. A blown (programmed) fuse will read as a 01. Once a fuse is blown that bit in the memory array of the part is permanently set.
2. There are two configurations of bipolar prom; 4 bit and 8 bit. The EPROM+ software reads and programs **ALL** bipolar proms as 8 bit parts. If you are working with a 4 bit part, such as an 82S129 or 74S287 there will be 4 bits which will always read as 01 because they **DON'T EXIST**. If you read a new, unprogrammed, 8 bit part into the buffer and examine the contents with the editor (Command 5) you will see 00, 00, 00, 00, 00, 00, 00, 00 in the first 8 locations. If you read an unprogrammed 4 bit part you will see 00, 00, 00, 00, 01, 01, 01, 01 in the first 8 locations. This is because the last four 01s represent the bits not physically in the part. If you read with no prom installed in the adapter you will see 01, 01, 01, 01, 01, 01, 01, 01 as no bits exist because no device is in the socket. Try it and see.
3. The EPROM+ system cannot perform a blank check on a 4 bit prom because four of the bits always appear to be programmed. When you instruct the system to program a part it will respond that the device is not erased and ask if a new device is installed. Respond with "N". When the system prompts with OVERRIDE? respond with "Y"es and the programming process will begin.

## HOW TO TELL IF YOUR 4 BIT PART IS BLANK (UNPROGRAMMED)

1. From the MAIN SCREEN select the BUFFER EDITOR (Command 5). Type the following:  
F0<space>7FF<space>F0<enter>. Note that <space> is the space bar and <enter> is the ENTER key. The editor screen will display all F0. Press "#" then "+". This converts the F0 bytes into bits. The editor screen will now appear exactly as a blank (unprogrammed) 4 bit bipolar prom. Press "ESC" to exit the editor.
2. Install your 4 bit bipolar prom into the adapter. Select Command 8 (compare device with buffer) and respond with "Y"es to perform the compare. If the prom is blank the system will indicate 0 errors. If there are any errors the part is defective or has already been programmed. **NOTE:** Many electronic distributors will not test their bipolar proms before shipment. If parts have been returned to the distributor as defective, they may have been programmed by the previous customer. **BE AWARE** that just because a part is in a tube or appears to be new that the only way to truly tell is via the above procedure.

## USING THE CONFIGURABLE BIPOLAR PROM SOCKET ADAPTER

The BIPOLAR PROM socket adapter allows the Andromeda Research programming system to read and program various manufacturers bipolar proms such as the Signetics 82SXXX and National 74SXXX families. The prom is read and programmed in a manner somewhat different from traditional EPROM devices. Since these chips require that only one bit be programmed at a time, the programming system uses one byte in the programming system buffer for each bit in the prom. This means that eight bytes in the programming systems buffer represent one byte in the prom. See below.

Byte 0 (57 HEX) in the PROM looks like (0 1 0 1 0 1 1 1 Binary)

In the programming systems buffer the same byte is represented as:  
0000-01 0001-01 0002-01 0003-00 0004-01 0005-00 0006-01 0007-00 (these are hex values)

**IMPORTANT:** Note that only the least significant bit of each buffer byte is used. With this arrangement, the system buffer requires 8 times the actual number bytes that the prom contains. This representation of prom data is called **BIT** format. Note that there is a command in the buffer editor (the # **COMMAND**) which allows you to convert the contents of the first 2048 bytes of the buffer from bit format to byte and from byte to bit. This command is very useful and was created specifically for use with bipolar proms. It is fully described in the system manual.

### INSTALLING AND CONNECTING THE ADAPTER - (*AC POWER PACK MUST NOT BE PLUGGED IN!*)

**IMPORTANT WARNING:** The adapter has 28 pins and must be inserted like a 28 pin device (justified to the left as you face the programming unit). Reference the illustration on the programming unit overlay. **If you install the adapter incorrectly, the adapter or the programming unit may be damaged.**

Install the adapter into the programming unit by lifting the handle on the programming unit socket to about 45 degrees and then inserting the pins on the adapter into the open socket pins. The adapter must be flat against the socket of the programming unit. Release the handle to lock the adapter in place. Note that the red dot on the adapter socket should be facing the same direction as the red dot on the programming unit socket.

Connect the wire (marked +5) on the adapter to the ACCESSORY CONNECTOR pin marked +5.

Connect the wire (marked Vpp UNREG or +35) to the ACCESSORY CONNECTOR pin marked +35.

With the adapter installed and connected, connect the power pack to the AC outlet. Start the control program (PEP). The program should identify the programming unit and assign the I/O PORT. You may now proceed.

To read a programmed prom, install it into the 24 pin ZIF socket (left justify devices smaller than 24 pins) and use Command 3 to read it into the system.

Once this is done, remove the original chip and insert a blank prom into the ZIF socket. Select Command 2 and instruct the programming system to program the device beginning at address 0 and ending with the device maximum size. (**Note:** You can find the device size by pressing the "S" command from the main menu or type **ALL** in place of the ending address). Note that the system will inform you that the device is not erased. This is normal for this type of chip. Answer "N" to the question "New device installed?" and "Y" to the "Override?" question. The system will begin programming the chip. After the programming process is complete the system will verify that the device programmed correctly. If everything operated properly, the chip in the adapter is an exact duplicate of the chip which was read into the system.

You may save a copy of the information in the original chip by using Command A and specifying a buffer range of 0 to the device size.

To remove the adapter from the system, disconnect the power-pack from the wall outlet, then disconnect the wires from the adapter to the programming unit and then remove the adapter.

### PROGRAMMING ERRORS

A bipolar prom is programmed by applying a high voltage pulse to a specific bit in the device. This pulse physically causes a microscopic fuse to "BLOW" which sets the bit to a logic 1. Occasionally there will be fuses inside the device which do not blow the first time the device is programmed. If this occurs, you will see the system make up to five attempts (passes) to properly program the device. If after five attempts the part cannot be programmed, the system assumes the part is defective.

## READING AND PROGRAMMING OTHER BIPOLAR PROMS

This adapter will also read various pin compatible bipolar proms however it will only program the 82S and 74S types. (NOTE: The part number printed on the device must be 82SXXX or 74SXXX or the device will not program.) If you have a device that cannot be programmed using the adapter, you may read the device and then program the contents into an 82S or 74S pin compatible substitute.

**NOTE:** Manufacturers of bipolar proms may change their device programming requirements. If you encounter a situation where a supported device will not program correctly, try a different device from a different manufacturer.

## CONFIGURING THE ADAPTER

The BIPOLAR PROM adapter is user configurable using a 48 pin JUMPER BLOCK next to the 24 pin device socket. The JUMPER BLOCK allows the device socket pins to be routed to any adapter signal pin. The different types of bipolar proms have device inputs and outputs on different pins. The JUMPER BLOCK allows the adapter to be configured to connect the current adapter programming signal to the corresponding bipolar prom pin.

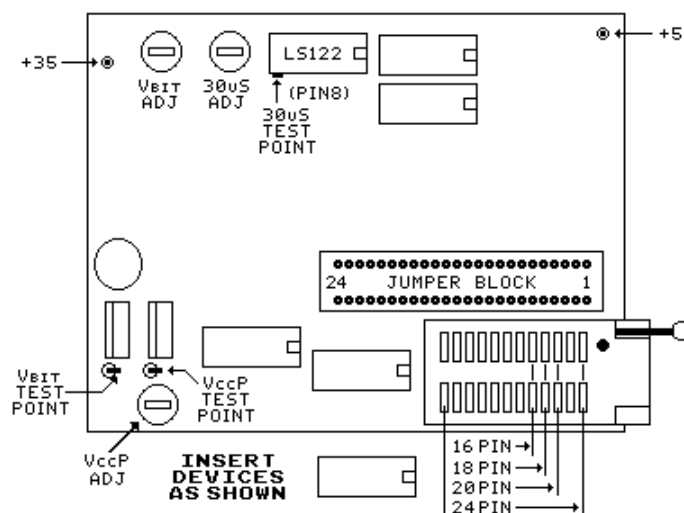
To configure the adapter for a specific bipolar prom, refer to the BIPOLAR PROM JUMPER BLOCK CONFIGURATIONS page. This page illustrates the JUMPER BLOCK connection arrangement for all supported devices. The adapter is shipped configured for the device type specified when the adapter was ordered. If no device was specified, the adapter is configured for the 32X8 prom. If you alter the configuration of the adapter, you may do so using 22 gauge solid wires or solder wires to removable DIP headers which are inserted into the JUMPER BLOCK.

The JUMPER BLOCK configurations on the configuration sheet illustrate the necessary interconnections. The column on the left shows the adapter programming signals. The column on the right are the connection points for the 24 pin device socket. Connect the signal designator in the left column to the corresponding (matching) pin designator on the right. This is all that is required to configure the adapter. Note that for 32X8 proms the configuration designators are directly adjacent to each other. Note that not all pins are used for all devices.

## ADJUSTING THE PROGRAMMING VOLTAGES (see figure below)

The adapter is initially set to program the 74S series of bipolar prom. This series of devices programs with Vbit and VccP set to 11.5 volts. Most of the 82S series of bipolar proms will also program at this voltage. Some of the older 82S family of proms required that Vbit be set to 18.0 volts and VccP be set to 8.7 volts. If you encounter an 82S device or series of 82S devices which do not program at all or only program partially, you may adjust the Vbit and VccP signal voltages. To adjust the voltages, install the adapter and apply power to the system. Connect the positive lead of a voltmeter to the tip of the 1.5K (brown, green, red, gold) resistor next to the 317 regulator which corresponds to the voltage you wish to change. Connect the negative lead to the GND pin on the ACCESSORY CONNECTOR. Turn the adjustment on the top of the corresponding 1 turn pot shown on the figure until the voltage reaches the desired level. Note that these voltage settings are not critical and can be +/- .2 volts.

## CONFIGURABLE BIPOLAR PROM ADAPTER



# BIPOLAR PROM JUMPER BLOCK CONFIGURATIONS

(TOP VIEW WITH 24 PIN ZIF SOCKET ON RIGHT)

32X8 PROMS (16 PIN)		256X4 PROMS (16 PIN)		512X4 PROMS (16 PIN)		512X8 PROMS (20 PIN)		256X8 PROMS (20 PIN)	
82523 825123 745188 745288		825126 825129 745287 745387		825130 825131 745570 745571		825146 825147 745472 745473		74LS471 82LS135	
VccP - 1	S20 1 - VccP	VccP - 1	S20 1 - VccP	VccP - 1	S20 1 - VccP	VccP - 1	S20 1 - A7	VccP - 1	S20 1 - A6
(+5) - 2	S4 2 -	(+5) - 2	S4 2 -	(+5) - 2	S4 2 -	(+5) - 2	S4 2 - A1	(+5) - 2	S4 2 - A1
B0 - 3	S5 3 - B0	B0 - 3	S5 3 - A6	B0 - 3	S5 3 - A6	B0 - 3	S5 3 - A2	B0 - 3	S5 3 - A2
B1 - 4	S6 4 - B1	B1 - 4	S6 4 - A5	B1 - 4	S6 4 - A5	B1 - 4	S6 4 - A3	B1 - 4	S6 4 - A3
B2 - 5	S7 5 - B2	B2 - 5	S7 5 - A4	B2 - 5	S7 5 - A4	B2 - 5	S7 5 - A4	B2 - 5	S7 5 - A4
B3 - 6	S8 6 - B3	B3 - 6	S8 6 - A3	B3 - 6	S8 6 - A3	B3 - 6	S8 6 - B0	B3 - 6	S8 6 - B0
B4 - 7	S9 7 - B4	B4 - 7	S9 7 - A0	B4 - 7	S9 7 - A0	B4 - 7	S9 7 - B1	B4 - 7	S9 7 - B1
B5 - 8	S10 8 - B5	B5 - 8	S10 8 - A1	B5 - 8	S10 8 - A1	B5 - 8	S10 8 - B2	B5 - 8	S10 8 - B2
B6 - 9	S11 9 - B6	B6 - 9	S11 9 - A2	B6 - 9	S11 9 - A2	B6 - 9	S11 9 - B3	B6 - 9	S11 9 - B3
B7 - 10	S13 10 - B7	B7 - 10	S13 10 - B3	B7 - 10	S13 10 - B3	B7 - 10	S13 10 - B4	B7 - 10	S13 10 - B4
GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11
GND - 12	S3 12 -	GND - 12	S3 12 -	GND - 12	S3 12 -	GND - 12	S3 12 - A0	GND - 12	S3 12 - A0
A9 - 13	S2 13 -	A9 - 13	S2 13 -	A9 - 13	S2 13 -	A9 - 13	S2 13 -	A9 - 13	S2 13 -
A6 - 14	S1 14 -	A6 - 14	S1 14 -	A6 - 14	S1 14 -	A6 - 14	S1 14 -	A6 - 14	S1 14 -
A5 - 15	S23 15 -	A5 - 15	S23 15 -	A5 - 15	S23 15 -	A5 - 15	S23 15 -	A5 - 15	S23 15 -
A8 - 16	S22 16 -	A8 - 16	S22 16 -	A8 - 16	S22 16 -	A8 - 16	S22 16 - VccP	A8 - 16	S22 16 - VccP
A7 - 17	S21 17 -	A7 - 17	S21 17 -	A7 - 17	S21 17 -	A7 - 17	S21 17 - A8	A7 - 17	S21 17 - A7
A4 - 18	S18 18 - A4	A4 - 18	S18 18 - GND	A4 - 18	S18 18 - A8	A4 - 18	S18 18 - A5	A4 - 18	S18 18 - GND
A3 - 19	S17 19 - A3	A3 - 19	S17 19 - CE	A3 - 19	S17 19 - CE	A3 - 19	S17 19 - CE	A3 - 19	S17 19 - CE
A2 - 20	S16 20 - A2	A2 - 20	S16 20 - B0	A2 - 20	S16 20 - B0	A2 - 20	S16 20 - B7	A2 - 20	S16 20 - B7
A1 - 21	S15 21 - A1	A1 - 21	S15 21 - B1	A1 - 21	S15 21 - B1	A1 - 21	S15 21 - B6	A1 - 21	S15 21 - B6
A0 - 22	S14 22 - A0	A0 - 22	S14 22 - B2	A0 - 22	S14 22 - B2	A0 - 22	S14 22 - B5	A0 - 22	S14 22 - B5
A10 - 23	S19 23 -	A10 - 23	S19 23 - A7	A10 - 23	S19 23 - A7	A10 - 23	S19 23 - A6	A10 - 23	S19 23 - A5
CE - 24	S19 24 - CE	CE - 24	S19 24 -	CE - 24	S19 24 -	CE - 24	S19 24 -	CE - 24	S19 24 -

512X8 PROMS (24 PIN)		1024X4 PROMS (18 PIN)		2048X4 PROMS (18 PIN)		1024X8 PROMS (24 PIN)		2048X8 PROMS (24 PIN)	
825140 825141 745474 745475		825136 825137 745572 745573		825184 825185		825180 825181 745478 745479		825190 825191	
VccP - 1	S20 1 - GND	VccP - 1	S20 1 - A7	VccP - 1	S20 1 - A7	VccP - 1	S20 1 - GND	VccP - 1	S20 1 - CE
(+5) - 2	S4 2 - A4	(+5) - 2	S4 2 - A6	(+5) - 2	S4 2 - A6	(+5) - 2	S4 2 - A4	(+5) - 2	S4 2 - A4
B0 - 3	S5 3 - A3	B0 - 3	S5 3 - A5	B0 - 3	S5 3 - A5	B0 - 3	S5 3 - A3	B0 - 3	S5 3 - A3
B1 - 4	S6 4 - A2	B1 - 4	S6 4 - A4	B1 - 4	S6 4 - A4	B1 - 4	S6 4 - A2	B1 - 4	S6 4 - A2
B2 - 5	S7 5 - A1	B2 - 5	S7 5 - A3	B2 - 5	S7 5 - A3	B2 - 5	S7 5 - A1	B2 - 5	S7 5 - A1
B3 - 6	S8 6 - A0	B3 - 6	S8 6 - A0	B3 - 6	S8 6 - A0	B3 - 6	S8 6 - A0	B3 - 6	S8 6 - A0
B4 - 7	S9 7 - B0	B4 - 7	S9 7 - A1	B4 - 7	S9 7 - A1	B4 - 7	S9 7 - B0	B4 - 7	S9 7 - B0
B5 - 8	S10 8 - B1	B5 - 8	S10 8 - A2	B5 - 8	S10 8 - A2	B5 - 8	S10 8 - B1	B5 - 8	S10 8 - B1
B6 - 9	S11 9 - B2	B6 - 9	S11 9 - GND	B6 - 9	S11 9 - A10	B6 - 9	S11 9 - B2	B6 - 9	S11 9 - B2
B7 - 10	S13 10 - B3	B7 - 10	S13 10 - CE	B7 - 10	S13 10 - CE	B7 - 10	S13 10 - B3	B7 - 10	S13 10 - B3
GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11	GND - 11	NC 11
GND - 12	S3 12 - A5	GND - 12	S3 12 -	GND - 12	S3 12 -	GND - 12	S3 12 - A5	GND - 12	S3 12 - A5
A9 - 13	S2 13 - A6	A9 - 13	S2 13 -	A9 - 13	S2 13 -	A9 - 13	S2 13 - A6	A9 - 13	S2 13 - A6
A6 - 14	S1 14 - A7	A6 - 14	S1 14 -	A6 - 14	S1 14 -	A6 - 14	S1 14 - A7	A6 - 14	S1 14 - A7
A5 - 15	S23 15 - A8	A5 - 15	S23 15 -	A5 - 15	S23 15 -	A5 - 15	S23 15 - A8	A5 - 15	S23 15 - A8
A8 - 16	S22 16 -	A8 - 16	S22 16 -	A8 - 16	S22 16 -	A8 - 16	S22 16 - A9	A8 - 16	S22 16 - A9
A7 - 17	S21 17 - CE	A7 - 17	S21 17 - VccP	A7 - 17	S21 17 - VccP	A7 - 17	S21 17 - CE	A7 - 17	S21 17 - A10
A4 - 18	S18 18 - (+5)	A4 - 18	S18 18 - A9	A4 - 18	S18 18 - A9	A4 - 18	S18 18 - (+5)	A4 - 18	S18 18 - (+5)
A3 - 19	S17 19 - B7	A3 - 19	S17 19 - B0	A3 - 19	S17 19 - B0	A3 - 19	S17 19 - B7	A3 - 19	S17 19 - B7
A2 - 20	S16 20 - B6	A2 - 20	S16 20 - B1	A2 - 20	S16 20 - B1	A2 - 20	S16 20 - B6	A2 - 20	S16 20 - B6
A1 - 21	S15 21 - B5	A1 - 21	S15 21 - B2	A1 - 21	S15 21 - B2	A1 - 21	S15 21 - B5	A1 - 21	S15 21 - B5
A0 - 22	S14 22 - B4	A0 - 22	S14 22 - B3	A0 - 22	S14 22 - B3	A0 - 22	S14 22 - B4	A0 - 22	S14 22 - B4
A10 - 23	S19 23 - (+5)	A10 - 23	S19 23 - A8	A10 - 23	S19 23 - A8	A10 - 23	S19 23 - (+5)	A10 - 23	S19 23 - (+5)
CE - 24	S19 24 -	CE - 24	S19 24 -	CE - 24	S19 24 -	CE - 24	S19 24 -	CE - 24	S19 24 -

## BIPOLAR PROM PIN CONFIGURATION INFORMATION

### 32X8 PROMS

**74S188**  
**74S288**  
**82S23**  
**82S123**

B0 - 1 S5 S20 16 - VccP  
B1 - 2 S6 S19 15 -  $\overline{CE}$   
B2 - 3 S7 S18 14 - A4  
B3 - 4 S8 S17 13 - A3  
B4 - 5 S9 S16 12 - A2  
B5 - 6 S10 S15 11 - A1  
B6 - 7 S11 S14 10 - A0  
GND - 8 S13 9 - B7

### 256X4 PROMS

**74S287**  
**74S387**  
**82S126**  
**82S129**

A6 - 1 S5 S20 16 - VccP  
A5 - 2 S6 S19 15 - A7  
A4 - 3 S7 S18 14 -  $\overline{CE2}$  (GND)  
A3 - 4 S8 S17 13 -  $\overline{CE1}$   
A0 - 5 S9 S16 12 - B0  
A1 - 6 S10 S15 11 - B1  
A2 - 7 S11 S14 10 - B2  
GND - 8 S13 9 - B3

### 512X4 PROMS

**74S570**  
**74S571**  
**82S130**  
**82S131**

A6 - 1 S5 S20 16 - VccP  
A5 - 2 S6 S19 15 - A7  
A4 - 3 S7 S18 14 - A8  
A3 - 4 S8 S17 13 -  $\overline{CE1}$   
A0 - 5 S9 S16 12 - B0  
A1 - 6 S10 S15 11 - B1  
A2 - 7 S11 S14 10 - B2  
GND - 8 S13 9 - B3

### 1024X4 PROMS

**74S572**  
**74S573**  
**82S136**  
**82S137**

A6 - 1 S4 S21 18 - VccP  
A5 - 2 S5 S20 17 - A7  
A4 - 3 S6 S19 16 - A8  
A3 - 4 S7 S18 15 - A9  
A0 - 5 S8 S17 14 - B0  
A1 - 6 S9 S16 13 - B1  
A2 - 7 S10 S15 12 - B2  
 $\overline{CE1}$  - 8 S11 S14 11 - B3  
GND - 9 S13 10 -  $\overline{CE2}$

### 2048X4 PROMS

**82S184**  
**82S185**

A6 - 1 S4 S21 18 - VccP  
A5 - 2 S5 S20 17 - A7  
A4 - 3 S6 S19 16 - A8  
A3 - 4 S7 S18 15 - A9  
A0 - 5 S8 S17 14 - B0  
A1 - 6 S9 S16 13 - B1  
A2 - 7 S10 S15 12 - B2  
A10 - 8 S11 S14 11 - B3  
GND - 9 S13 10 -  $\overline{CE}$

### 512X8 PROMS

**74S472**  
**74S473**  
**82S146**  
**82S147**

A0 - 1 S3 S22 20 - VccP  
A1 - 2 S4 S21 19 - A8  
A2 - 3 S5 S20 18 - A7  
A3 - 4 S6 S19 17 - A6  
A4 - 5 S7 S18 16 - A5  
B0 - 6 S8 S17 15 -  $\overline{CE}$   
B1 - 7 S9 S16 14 - B7  
B2 - 8 S10 S15 13 - B6  
B3 - 9 S11 S14 12 - B5  
GND - 10 S13 11 - B4

### 512X8 PROMS

**74S474**  
**74S475**  
**82S140**  
**82S141**

A7 - 1 S1 24 - VccP  
A6 - 2 S2 S23 23 - A8  
A5 - 3 S3 S22 22 - NC  
A4 - 4 S4 S21 21 -  $\overline{CE1}$   
A3 - 5 S5 S20 20 -  $\overline{CE2}$  (GND)  
A2 - 6 S6 S19 19 - CE3(+5)  
A1 - 7 S7 S18 18 - CE4(+5)  
A0 - 8 S8 S17 17 - B7  
B0 - 9 S9 S16 16 - B6  
B1 - 10 S10 S15 15 - B5  
B2 - 11 S11 S14 14 - B4  
GND - 12 S13 13 - B3

### 1024X8 PROMS

**74S478**  
**74S479**  
**82S180**  
**82S181**

A7 - 1 S1 24 - VccP  
A6 - 2 S2 S23 23 - A8  
A5 - 3 S3 S22 22 - A9  
A4 - 4 S4 S21 21 -  $\overline{CE1}$   
A3 - 5 S5 S20 20 -  $\overline{CE2}$  (GND)  
A2 - 6 S6 S19 19 - CE3(+5)  
A1 - 7 S7 S18 18 - CE4(+5)  
A0 - 8 S8 S17 17 - B7  
B0 - 9 S9 S16 16 - B6  
B1 - 10 S10 S15 15 - B5  
B2 - 11 S11 S14 14 - B4  
GND - 12 S13 13 - B3

### 2048X8 PROMS

**82S190**  
**82S191**

A7 - 1 S1 24 - VccP  
A6 - 2 S2 S23 23 - A8  
A5 - 3 S3 S22 22 - A9  
A4 - 4 S4 S21 21 - A10  
A3 - 5 S5 S20 20 -  $\overline{CE1}$   
A2 - 6 S6 S19 19 - CE2(+5)  
A1 - 7 S7 S18 18 - CE3(+5)  
A0 - 8 S8 S17 17 - B7  
B0 - 9 S9 S16 16 - B6  
B1 - 10 S10 S15 15 - B5  
B2 - 11 S11 S14 14 - B4  
GND - 12 S13 13 - B3