Single ROM Prototyping Board (SRBP) Instructions

Version 3.0

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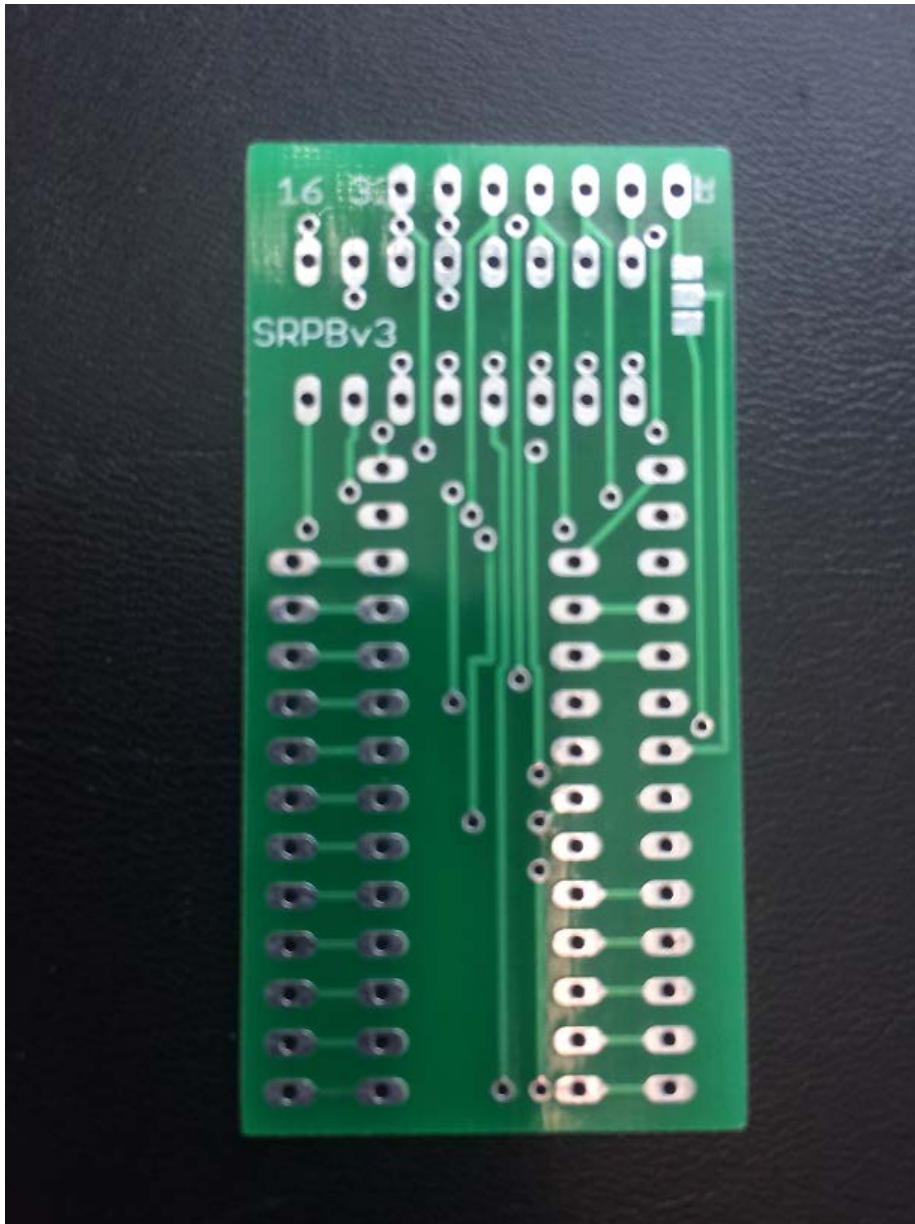
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Summary

The Single ROM Prototyping Board (SRBP) was designed to allow the quick "prototyping" of single Read Only Memory (ROM) replacements or to serve as a general purpose, single ROM solution when pre-fabricated *plug and play* type solutions do not already exist for a specific function or video arcade game.

Said another way, the SRPB is an adapter that allows you to quickly and easily convert old boards that contain lots of ROMs, such as those used with video arcade games, to use a single ROM.

What is Included

There are two versions available:

- SRPB – Shipped as a fully assembled adaptor board, including the six pin jumper wires
- SRPB-EE – Shipped as a fully assembled SRPB, the six pin jumper wires, and a 27512 EEPROM (Electrically Erasable Programmable Read Only Memory)

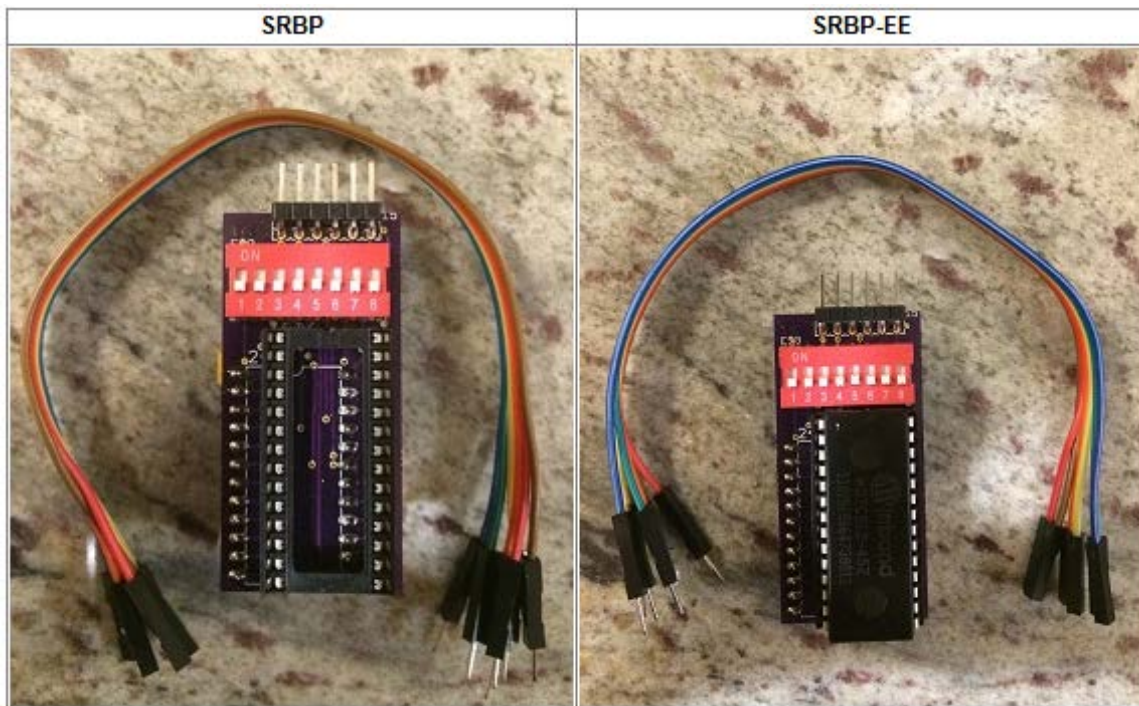   **Note: The included EEPROM is a Windbond W27C512-xx**

Figure 1 - The two types of SRPB available for sale

History

The computer hardware, sometimes referred to as a Printed Circuit Board (PCB) or "board", in many older video arcade games, such as Atari Asteroids, Missile Command, and Tempest, have numerous small, hard to find, and expensive parts known as ROMs (Read Only Memory). Maintaining or repairing these game boards can be difficult and time consuming, even for experienced repair persons. A few video arcade game enthusiasts have created kits containing customer adapter boards that allow specific game boards to use a single ROM, while others have provided instructions for physically *hacking* (altering) specific game boards to use a single ROM. Utilizing a single ROM often increases the reliability of the game board, can sometimes be used to fix non-working boards, and may assist in isolating ROM related issues with non-working boards.

As someone that repairs video arcade game boards for others, I wanted a fairly universal solution to either upgrade game boards permanently to use a single ROM or a way to simply bypass all the game ROMs to isolate ROM related issues. The SRBP is my solution to solve both problems.

Potential Uses for the SRBP

1. As a single, generic adapter to convert a board, including game boards, to use a single ROM on a permanent basis.
2. As a troubleshooting tool to assist in the repair of boards, including game boards, by bypassing the existing ROMs and their sockets, without the need to cut traces or make other permanent modifications to the board.
3. As a quick and easy way of testing or prototyping changes to the software on ROMs, without the need to cut traces or make other permanent modifications to the board.
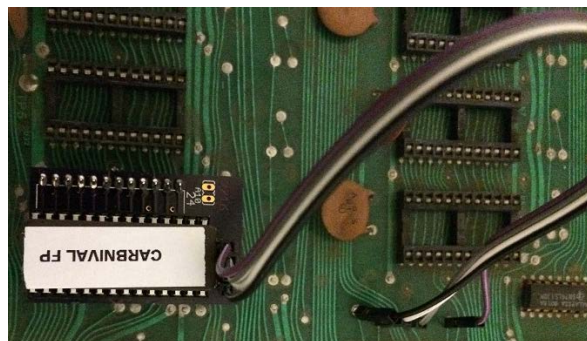

Figure 2 – Sega/Gremlin carnival game board with a prototype model SRBP installed (eliminated 16 2708 ROMs)

Features

- Allows users to easily prototype professional and sturdy Single ROM hacks using the existing sockets on a PCB main board
- Allows insertion into 2708, 2516, 2716, or 2732 sockets with NO permanent board modifications
- Consider the SRBP via DIP switches for 2708, 2516, 2716, or 2732 sockets
- Accept a cheap and easy to find 27512 or 27256 EPROM
- Provide external jumpers headers for address lines A10-A15

Types of ROM Sockets Supported

- 2708
- 2516
- 2716
- 2732

Caveats to Understand about the SRBP

The following are a few things to be aware of before buying and using the SRBP:

1. If your game board uses TMS2532 ROMs and sockets, the SRBP will not work without modification of the underlying game board, however many boards that use TMS2532s can be configured to use 2732s, refer to the board schematics or manual for that particular hardware.
2. The SRBP has the "chip enable and output enable" tied together and jumpered to pin 18 on the board socket, which on most board is GROUNDED (on), therefore it will only work on CPU boards that have a buffer chip that is enabled on ROM access. Luckily most boards that I have looked at (Atari mainly) use a separate buffer for the ROM address range so this is not a problem.
3. You must have the information on how to single ROM your board (recipes will be added as discovered) Mainly this is a tool to convert boards where that information already exists OR where you want to experiment yourself to try to design your own single ROM solutions. Almost all games should be able to use this board.
4. On games with separate game code, video code and Sound Code, the SRPB kit will not be able to replace all game, video, and sound ROMS, however you can use 1 SRPB for each section.

General Usage (short version)

- Remove the old ROMs from your board

- Program a new ROM image into a single 27256 or 27512 EPROM
- Insert the programmed ROM into the SRPB
- Place the SRPB into an open ROM socket on your board
- Set the SRBP jumpers as needed for your board
- Plug the header cables into the appropriate address lines on your board

General Usage (long version)

The SRBP can use a 27256 or 27512 series PROMs (Programmable Read Only Memory) to store all of the needed ROM software. The 27512 is ideal for use on most 1980's type video arcade game Central Processing Units (CPUs), such as the Z80 or 6502, because a 27512 holds enough data for the entire addressable memory range of these CPUs (IE. The biggest software program that CPU can understand). The SRBP can be installed in any socket on a board that is manufactured to use a 2708, 2516, 2716, or 2732 PROM.

To use the SRPM you must read and understand the following steps:

1) Understanding the basics about the SRBP board
2) Obtain and program a valid, single ROM image to the 27256 or 27512 EPROM
3) Set DIP switches 1-4 based upon the socket the SRBP will be plugged into
4) Set DIP switches 3-8 based upon the size of the single, ROM image
5) Connect jumpers 3-8 to the game board, if necessary
6) Select the !Output Enable mode setting, and solder the solder pad jumper appropriately
7) Connect the !output enable jumper to the game board if necessary

Step 1:   Understanding the basics about the SRBP board

The first thing to understand about the SRBP is the locations of six (6) pins and eight (8) DIP switches. As shown in Figure 3, the six pins are inside the red circle and the eight DIP switches are inside the blue circle.
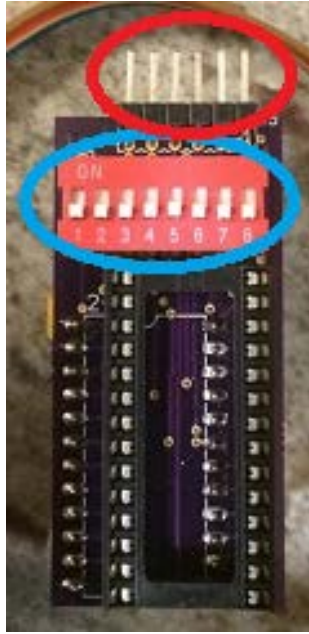
Figure 3 - The SRBP, the six pins, and the eight DIP switches

These pins connect the associated address lines (a10 – a15) on your chosen PROM, a 27256 or 27512, to the appropriate address lines and socket on the board you are installing the SRBP onto. Figure 3 shows these pins, their respective address lines, and the associated DIP switches.
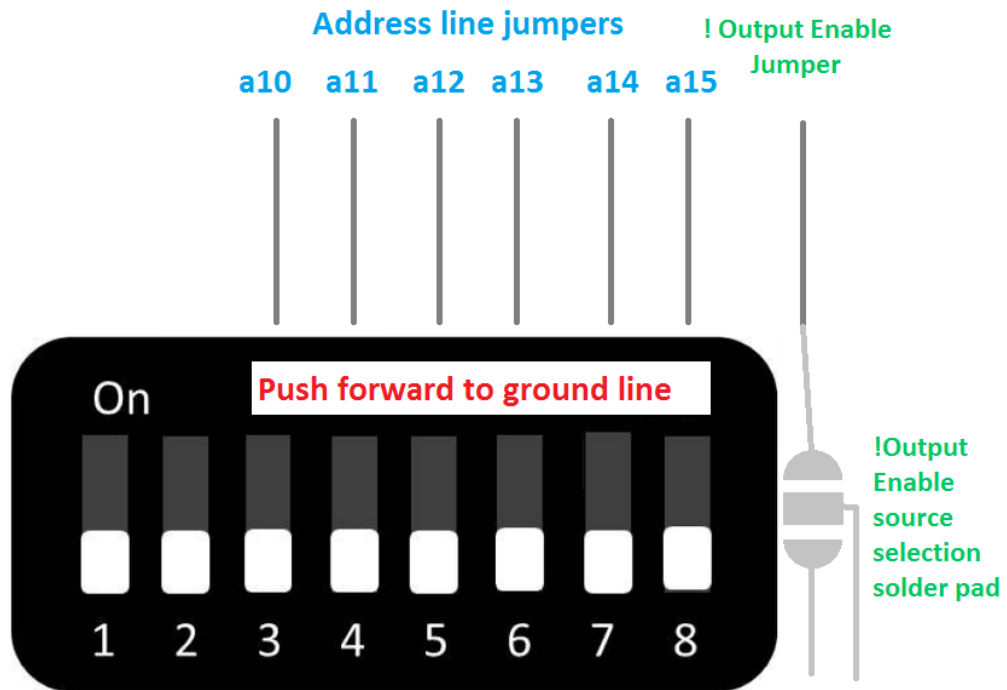

Figure 4 - Address line jumpers

As shown in Figure 3 and 4, there are eight DIP switches that serve multiple purposes.

DIP switches 1 and 2 match your chosen 27256 or 27512 PROM with the type of socket used on your board. Said another way, DIP switches 1 and 2, when turned on, match your chosen PROM's address lines, A10 and A11, to the appropriate address lines used in the socket on your board, where the SRBP will be plugged into. This allows you to natively use those address lines if they are provided by that socket, which is generally preferred for reasons this document will not cover.

DIP switch 3-8 allow you to manually ground address lines a10 – a15 if your single ROM software does not need them. **If an address jumper line is used to tap into the board, the associated switch should be "OFF".**

WARNING: NEVER manually ground a line with the switch AND use the jumpers to tap into the board for the same address line.

Additionally, this SRBP ties !CS and !CS2 together and is set to pin #18 on the underlying socket. Almost always on a 24 pin EPROM game board socket this is manually tied to GROUND, meaning this chip will ALWAYS be enabled and outputting. This works great for games where the ROMs are isolated from the data bus via a buffer. However, if the underlying board does not buffer the ROM section output, then this will not work for your applications. The board can be modified to have the cable select pin selectively output. Contact atari@paladingrp.com for more information.

Step 2:   Obtain and program a valid single ROM image to the 27256 or 27512 EPROM.

Please refer to your EEPROM/EPROM/PROM programmer manual for instructions regarding how to perform the programming.

Note: Do not contact me regarding the needed ROM software. Instead, refer to legal outlets for more information regarding methods to obtain the desired ROM software.

Step 3:   Set DIP switches 1 and 4 based upon the socket the SRBP will be plugged into

Setting DIP switch 1 to **ON** will internally jumper a10 from the 27256 / 27512 PROM to pin 19 (a10) on the board socket. If your underlying socket is for a 2516, 2716, or a 2732 PROM, then this switch should be turned **ON**, switch #3 should be turned , **OFF** and jumper header a10 should **NOT** be connected to anything.

WARNING: NEVER allow DIP switch 1 to be on, while DIP switch 3 is ON or jumper

header A10 is used.

Setting DIP switch 2 to **ON** will internally jumper a11 from the 27256/27512 to pin #21 (a11) on the underlying socket. If your underlying chip is a 2732 this switch should be turned **ON** AND switch #4 should be turned **OFF**, and jumper header a11 should **NOT** be connected to anything.

WARNING: **NEVER allow DIP switch 2 to be on, while DIP switch 4 is ON or jumper header A11 is used.**

Below are charts that show switches 1-4 depending on different the type of board socket the SRBP is being plugged into:

Figure 5 - Settings for installing the SRBP in a 2708 ROM socket

Figure 6 - Settings for installing the SRBP in a 2516 or 2716 ROM socket
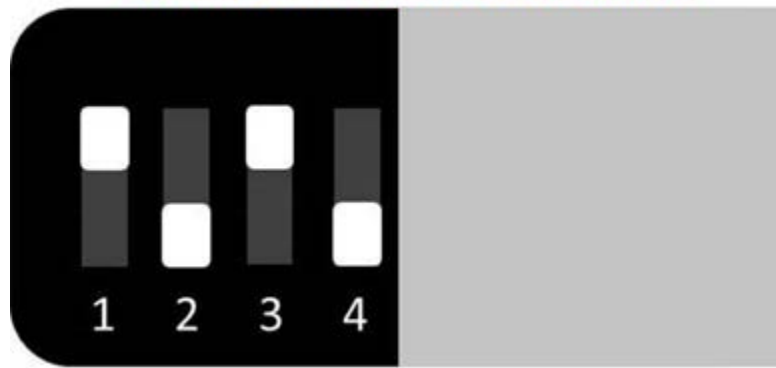
Installing the SRPB in a 2732 socket

Figure 7 - Settings for installing the SRBP in a 2732 ROM socket

Step 4: Set DIP switches 3-8 based upon the size of the single ROM image

The next step is to determine which address lines you will need to jumper to your board. For each address line you plan to jumper to your board, ensure the associated DIP switch position set is OFF. If you do not plan to jumper a specific line, then turn the associated DIP switch "ON", which will force that line to ground.

WARNING: NEVER jumper a line while having the associated jumper set to "ON".

In addition:

- If DIP switch 1 is "ON" then DIP switch 3 should be "OFF" AND A10 should NOT be jumpered to anything. The following image would be incorrect usage, and may damage your game board.

- If DIP switch 2 is "ON" then DIP switch 4 should be "OFF" AND A11 should NOT be jumpered to anything.The following image would be incorrect usage, and may damage your game board.
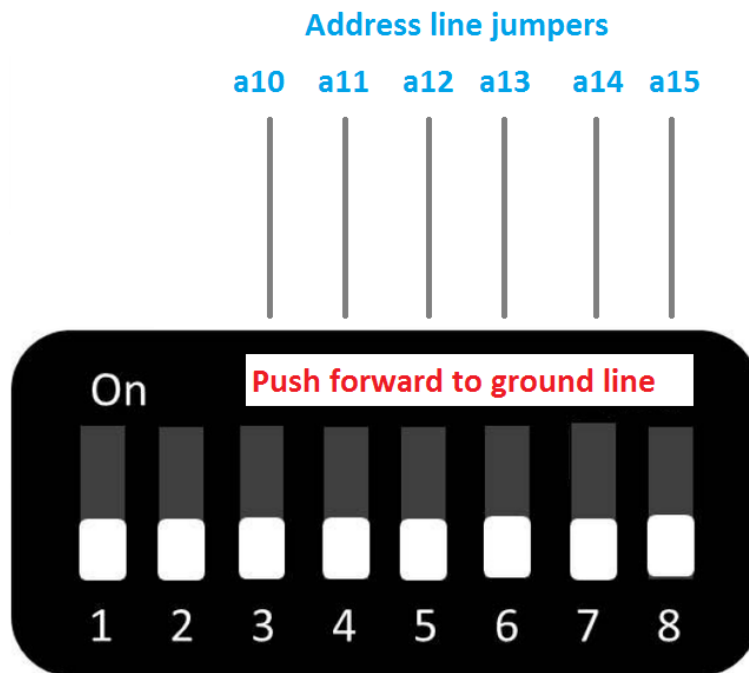
Address line jumpers

a10　a11　a12　a13　a14　a15

On

Push forward to ground line

1　2　3　4　5　6　7　8

Figure 8 - Address line jumpers

Step 5:　Connect jumpers 3-8 to the game board, if necessary

For any DIP switches 3 - 8 that is set to "OFF", ensure to jumper the respective address line jumper properly to the game board. For example:

Step 6: Select the !Output Enable mode setting, and solder the solder pad jumper appropriately

With the SRPB v3 we have added an additional customization option. The !Output Enabled selection pad and jumper. Previous versions of the SRBP had !OE tied to ground which means the EEPROM is ALWAYS outputting. This is the useful case for game were the ROMS are behind a buffer that isolates the ROM reads from the rest of the IO circuit and is commonly found on game boards. However some games do NOT buffer the ROMs and place the ROMS directly on the data BUS, on these board if the ROM was always outputting that would interfer with other non-ROM I/O such as RAM reads and writes.

Therefore on the SRBP version 3 board we provide a selection solder pad to configure the behavior. As such you MUST configure one of the two options below by default the SRBP board is set to neither, and will not work for ANY board until it is configured.

Using the chart below use a glob of solder to bridge either the top or the bottom semi-circle of the jumper solder pad to the middle rectangle of the jumper solder pad. Most boards you will probably want to use the image on the left ("Tied to GROUND, EEPROM is always outputting"). However if you wish to tie into a signal on the underlying board, solder the top semi-circle to the middle rectangle and proceed to step 7.


!Output enable selection

Tied to GROUND
EEPROM is always
outputting

Tied to !OE selection
jumper. Use jumper to tap
into game PCB
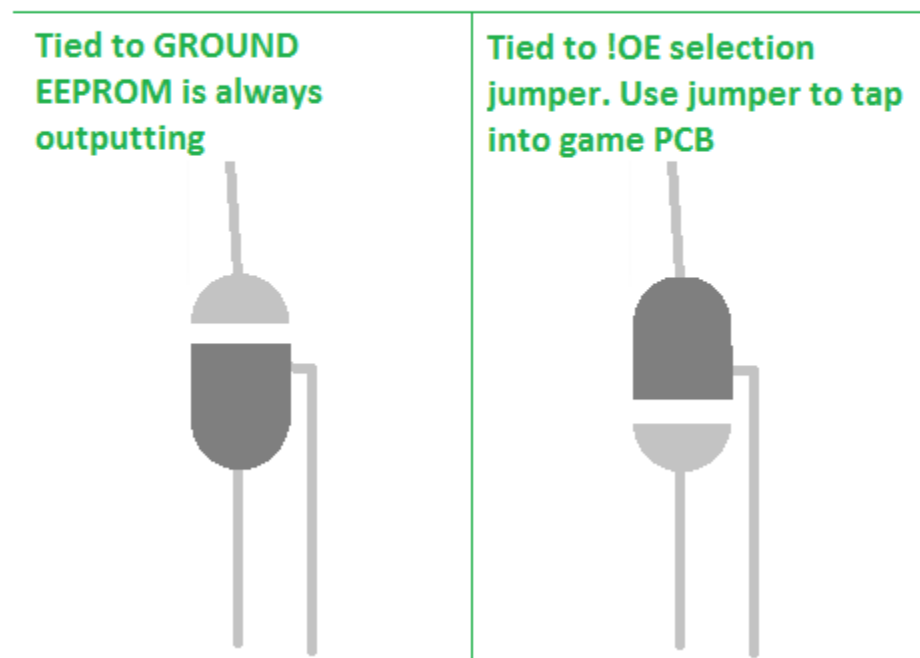
Step 7: Connect the output enabled jumper (if necessary)

Step 7 should be performed ONLY if you choose to tap into the underlying board for the !output enable signal. That is you should only perform step 7 if your jumper looks like the image on the right. DO NOT perform step 7 if your jumper selection settings look like the image on the left.

!Output enable selection

Tied to GROUND
EEPROM is always
outputting

Tied to !OE selection
jumper. Use jumper to tap
into game PCB
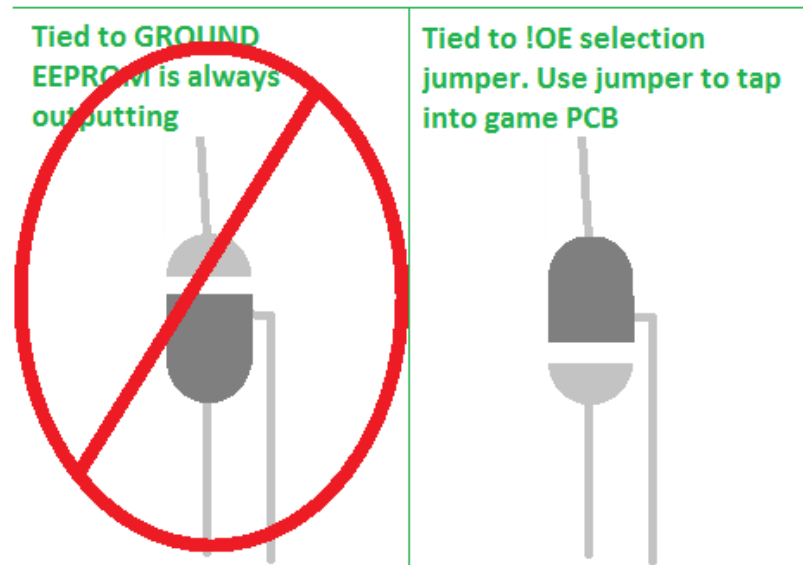
Now use the jumper header directly above the jumper selection wire to tap into whatever signal that you need on the underlaying game board. On many boards this will be labeld similar to "ROM" or "ROM READ" where the words have a line drawn over them.

Below is an example of the ROM selection signal from the Atari Centipede schematics.

$\overline{ROM}$

Commonly Asked Questions

Question: Can more than one SRBP be used on a single board?
Answer: Yes, at long as the SRBP are used to replace specific ROMs in specific areas of the board.

For example: The Atari Centipede video arcade game board uses two sets of ROMs. Once set is for the game software, while the other set is used to tell the game's video screen (monitor) what to display. One SRBP could be used to replace the game software ROMs, while a second could be used to replace the video screen ROMs.

Troubleshooting Steps

[currently empty]

Acknowledgements

Special thank you to many of the great KLOVers that have purchased and supported the board. Additional special thanks to KLOV user "*SCOTT C*" who greatly improved this instruction manual.