**PET 2332 Adapter Rev. 1**

**Module Description**

This is an adapter board for 27C64 to 27C512 EPROMs for 2332 sockets in PET/CBM machines, that make use of two chip select signals.

|  |  |
| --- | --- |
| **2332 Pin** | **Name** |
| 20 |  |
| 21 | CS2 |

Table 1: Chip selects

Pin 20 is an active low chip select, while Pin 21 is active high. In the CBM8032, is the “normal” chip select, while CS2 is connected to the signal, which switches off all ROMs (except the character ROM) while LOW. Hardware debugging with the diagnostic clip makes use of this feature. In the (dynamic) PET2001N boards, Pin 21 is permanently connected to +5V.

To implement this second chip select, the (active low enable) Pin 20 of the EPROM is utilized as a second chip select. A transistor and a pull-up resistor are used as an inverter for active high CS2 signal.

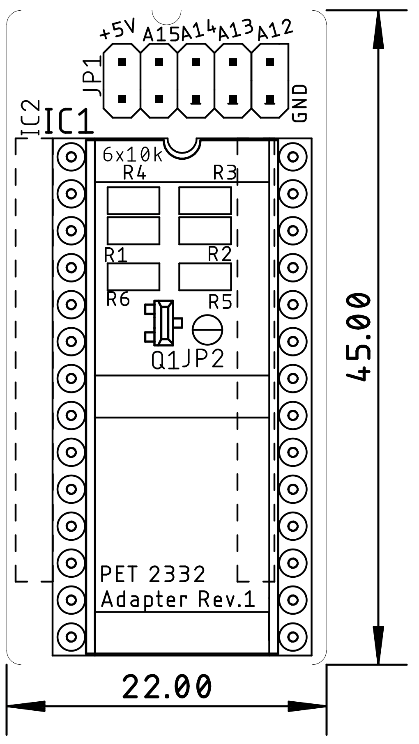


Figure 1: Dimensions of the PET 2332 Adapter

For a 27C512, up to 16 4k-memory banks can be selected. This is done at the pin header. For a fix setting, the pin header can stay not assembled, since the footprint is suitable for solder bridge configuration.

|  |  |  |  |
| --- | --- | --- | --- |
| **Signal** | **Pin** | **Pin** | **Signal** |
| A12 | 1 | 2 | GND |
| A13 | 3 | 4 | GND |
| A14 | 5 | 6 | GND |
| A15 | 7 | 8 | GND |
| +5V | 9 | 10 | n.c. |

Table 2: Jumper (JP1) for Bank Selection

The +5V pins are to provide supply voltage to a microcontroller, like the Arduino, in case it is desired to do an automatic bank switching in some way.

# Compatibility

**CBM80xx:** The adapter is compatible with all ROM sockets (UD6-UD12), except the Character ROM (UA3).

**CBM40xx**: The adapter is compatible with all ROM sockets (UD6-UD12), except the Character ROM (UA3).

The **CBM30xx** are PET2001N-16 or -32 (label in the back).

**PET2001N**: The adapter is compatible with all 4k ROM sockets (UD3-UD7 & UD9), except the Edit ROM (UD8) and the Character ROM (UF10).

# Bank Selection

The desired 4k memory bank is selected at JP1. For the pinout refer to Table 2. The jumper is installed (vertically) in a way, that it connects the address line with the GND potential.

| A15 | A14 | A13 | A12 | 4k Block | | Addr. Offset |
| --- | --- | --- | --- | --- | --- | --- |
| set | set | set | set | | #0 | 0x0000 |
| set | set | set | open | | #1 | 0x1000 |
| set | set | open | set | | #2 | 0x2000 |
| set | set | open | open | | #3 | 0x3000 |
| set | open | set | set | | #4 | 0x4000 |
| set | open | set | open | | #5 | 0x5000 |
| set | open | open | set | | #6 | 0x6000 |
| set | open | open | open | | #7 | 0x7000 |
| open | set | set | set | | #8 | 0x8000 |
| open | set | set | open | | #9 | 0x9000 |
| open | set | open | set | | #10 | 0xA000 |
| open | set | open | open | | #11 | 0xB000 |
| open | open | set | set | | #12 | 0xC000 |
| open | open | set | open | | #13 | 0xD000 |
| open | open | open | set | | #14 | 0xE000 |
| open | open | open | open | | #15 | 0xF000 |

Table 3: Selection of EPROM memory blocks

A set jumper corresponds to a LOW level (binary 0), an open jumper to a HIGH level. Do not confuse the PET memory address and the EPROM memory address. They have the address Bit A0 to A11 in common, but the rest is different. The selected memory bank appears in the address of the used socket.

# Compatibility of EPROMs

Although a 27C512 type EPROM is recommended, other types of EPROMs can be installed:

|  |  |  |
| --- | --- | --- |
| EPROM | Size | Capacity |
| 27C64 | 8k | 2x 4k option ROM |
| 27C128 | 16k | 4x 4k option ROM |
| 27C256 | 32k | 8x 4k option ROM |
| 27C512 | 64k | 16x 4k option ROM |

Table 4: Capacity of EPROM types

Those EPROMs are pin compatible, the jumpers, that have no function, due to the size, have to stay open.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EPROM | Size | A15 | A14 | A13 | A12 |
| 27C512 | 64kx8 | 🗹 | 🗹 | 🗹 | 🗹 |
| 27C256 | 32kx8 | open | 🗹 | 🗹 | 🗹 |
| 27C128 | 16kx8 | open | open | 🗹 | 🗹 |
| 27C64 | 8kx8 | open | open | open | 🗹 |

Table 5: Settings per EPROM type

🗹: The jumper can be open or closed, depending on the desired selection.

In case Vpp is located at a dedicated pin (pin 1), A15 has no effect anymore. A HIGH level is recommended, the corresponding jumper is open. The /PGM Pin should be set HIGH, this is accomplished by an open jumper for A14.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27C64 | | | | | | | | | | | |
|  | 27C128 | | | | | | | | | |  |
|  | 27C256 | | | | | | | |  |
|  | 27C512 | | | | | |  |
|  | SOCKET | | | |  |
| Vpp | Vpp | Vpp | A15 | 1 | A15 | VCC | 28 | VCC | VCC | VCC | VCC |
| A12 | A12 | A12 | A12 | 2 | A12 | A14 | 27 | A14 | A14 | /PGM | /PGM |
| A7 | A7 | A7 | A7 | 3 | A7 | A13 | 26 | A13 | A13 | A13 | n.c. |
| A6 | A6 | A6 | A6 | 4 | A6 | A8 | 25 | A8 | A8 | A8 | A8 |
| A5 | A5 | A5 | A5 | 5 | A5 | A9 | 24 | A9 | A9 | A9 | A9 |
| A4 | A4 | A4 | A4 | 6 | A4 | A11 | 23 | A11 | A11 | A11 | A11 |
| A3 | A3 | A3 | A3 | 7 | A3 | /OE | 22 | /G/Vpp | /G | /G | /G |
| A2 | A2 | A2 | A2 | 8 | A2 | A10 | 21 | A10 | A10 | A10 | A10 |
| A1 | A1 | A1 | A1 | 9 | A1 | GND | 20 | /E | /E | /E | /E |
| A0 | A0 | A0 | A0 | 10 | A0 | D7 | 19 | D7 | D7 | D7 | D7 |
| D0 | D0 | D0 | D0 | 11 | D0 | D6 | 18 | D6 | D6 | D6 | D6 |
| D1 | D1 | D1 | D1 | 12 | D1 | D5 | 17 | D5 | D5 | D5 | D5 |
| D2 | D2 | D2 | D2 | 13 | D2 | D4 | 16 | D4 | D4 | D4 | D4 |
| GND | GND | GND | GND | 14 | GND | D3 | 15 | D3 | D3 | D3 | D3 |

Table 6: EPROM pin compatibility

# Using parallel EEPROMs

There are ***parallel*** EPROMs, which fit into the EPROM sockets. They do not require erasing with a UV eraser, like EPROMs, but the price is higher.

Since they can be written, which is controlled by the signal, but the Super Expander II cartridge is lacking of this functionality, this signal has to be HIGH (inactive). The 28C256 has the A14 signal connected to Pin 1, which is A15 of the EEPROM socket. This is no problem, but it has to be kept in mind, that the jumper for A15 has effect on the bank select A14 of the EPROM.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 28C64 | | | | | | | |
|  | 28C256 | | | | | |  |
|  | SOCKET | | | |  |
| n.c. | 💣A14 | 1 | A15 | VCC | 28 | VCC | VCC |
| A12 | A12 | 2 | A12 | A14 | 27 | /WE | /WE |
| A7 | A7 | 3 | A7 | A13 | 26 | A13 | n.c |
| A6 | A6 | 4 | A6 | A8 | 25 | A8 | A8 |
| A5 | A5 | 5 | A5 | A9 | 24 | A9 | A9 |
| A4 | A4 | 6 | A4 | A11 | 23 | A11 | A11 |
| A3 | A3 | 7 | A3 | /OE | 22 | /G/Vpp | /OE |
| A2 | A2 | 8 | A2 | A10 | 21 | A10 | A10 |
| A1 | A1 | 9 | A1 | GND | 20 | /E | /CE |
| A0 | A0 | 10 | A0 | D7 | 19 | D7 | D7 |
| D0 | D0 | 11 | D0 | D6 | 18 | D6 | D6 |
| D1 | D1 | 12 | D1 | D5 | 17 | D5 | D5 |
| D2 | D2 | 13 | D2 | D4 | 16 | D4 | D4 |
| GND | GND | 14 | GND | D3 | 15 | D3 | D3 |

Table 7: EEPROM pin compatibility

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EEPROM | Size | A15 | A14 | A13 | A12 |
| 28C256 | 32kx8 | =A14 | OPEN | yes | yes |
| 28C64 | 8kx8 | OPEN | OPEN | OPEN | yes |

Table 8: Settings per EEPROM type

# Programming instructions

For instructions on setting up a complete multiple character ROM image, please refer to

<https://github.com/svenpetersen1965/C64-Kernal-Adapter-Switch-Long-Board/blob/master/Rev.%200/pdf/C64_KernalSw_8k_v0.pdf>

The description is about how to create a multiple Kernal ROM image, a multiple 2332 ROM image works pretty similar, except the size is only 4kB.

# Revision History

## Rev. 0

* Prototype, fully functional.

## Rev. 1

* Some experimental features removed.
* Rounded corners and a notch added to identify the orientation
* Fully functional