

GLITCH WORKS 32K MIXED MEMORY
FOR GLITCHBUS
GW-GLITCHBUS-32KMEM1
USER'S MANUAL AND ASSEMBLY GUIDE

Revision 1, 2020-11-21

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1 Introduction

The Glitch Works 32K Mixed Memory Board (GW-GLITCHBUS-32KMEM1) interfaces 8K x 8 JEDEC pinout memory devices to the Glitchbus. Address and data buses are fully buffered. It has been tested with the following devices:

- 6264 type static RAM
- FM16W08 Ferroelectric RAM (FeRAM)
- 2764 type EPROM
- 28C64B type EEPROM
- 8K x 8 NVRAM with RTC (GW-48T08-1, MK48T08, etc.)
- Battery-backed NVRAM (GW-1225-1, GW-1213B-1 in 8K mode, DS1225, etc.)

The 32K Mixed Memory Board provides flexible address jumpering options. Any memory socket may be assigned to any 8K segment of memory. It is possible to have a single socket appear at multiple segments. Sockets which are not jumpered in will be disabled – the board will not respond to any memory requests for which a socket has not been jumpered, allowing holes in memory.

This board does not support paged or banked memory, and while it does support EPROM/EEPROM, it does not support relocation or switch-out.

2 Configuration

The 32K Mixed Memory Board has a single jumper area for configuring memory socket addressing. Jumper block J1 connects to the socket chip selects of U1 - U4. Jumper block J2 connects to the output of the address segment decoder. All positions are labeled in the silkscreen of the board.

To assign a socket to an address, jumper from the socket position on J1 to the desired address segment on J2. Jumper wire should be solid core of approximately 24 AWG (approximately 50 mm). Solid core telephone wire, CAT5 Ethernet cable, or cut component leads work well.

3 Assembly

The 32K Mixed Memory Board is designed to be easy to assemble for anyone with moderate soldering ability. It is a relatively simple board and will typically require between one-half and two hours of assembly time, depending on the skill of the assembler. The following tools will be required:

- Soldering iron, 20-40 W recommended, grounded tip
- Solder, 63/37 leaded solder recommended, Kester “44 Core” or similar
- Diagonal cutters or flush cutters
- Solder braid, solder sucker, or desoldering station, in the event errors are made
- Needle-nose pliers for bending component leads
- 1/4 and 1/8 W resistor lead forms (optional)

This manual does not cover basic soldering technique. If you are new to soldering, we recommend the Adafruit soldering guide and plenty of practice on a piece of protoboard before beginning assembly of this kit. The Adafruit guide can be found at:

<https://learn.adafruit.com/adafruit-guide-excellent-soldering>

3.1 Assembling the 32K Mixed Memory Board

If you purchased a full Glitch Works parts kit, we recommend completing all assembly sections, since extra features can be disabled as needed. If supplying your own parts, you may choose which sections to complete based on the functionality required.

Note that pin 1 is designated with a square pad for all ICs, resistor packs, switches, and most connectors. Pin 1 is toward the top of the board, as seen from the front, for all ICs, switch packs, and radial electrolytic capacitors. The component (front) side of the board is the side which contains the white silkscreen legend. It is recommended to install components from shortest to tallest, which makes assembly without an assembly vise or jig easier, assuming the board is flipped over and soldered with the component side resting on a table top.

Some jumper headers and connector headers are press-fit and may require a bit of force or gentle wiggling to install. This is normal and helps keep the headers in place when the board is flipped over for soldering.

3.2 Assembly Checklist

Note: if you do not have jumper wire for configuration, save cut resistor leads for this purpose.

- Verify parts list against kit contents or builder-provided parts
- Consult the assembly drawing for component locations and values
- Bend all 0.01 μF bypass capacitors (yellow axial bead) – position 2 on a 1/8 W lead form
- Install all 0.01 μF capacitors in positions marked C in assembly diagram
- Bend four 4.7 k Ω resistors and install in their marked locations – position 1 on a 1/4 W lead form
- Install non-socketed DIP ICs at their marked locations. Do not install U1, U2, U3, or U4
- Install 28-pin sockets at U1, U2, U3, and U4
- Install 4-pin socket strip at J1
- Install 8-pin socket strip at J2
- Install 33 μF 35 V capacitor at C11, bend leads with needle-nose pliers
- Install Glitchbus expansion connector

Once soldering assembly is complete, insert chosen memory devices in their sockets.

4 Initial Checkout and Testing

Once the 32K Mixed Memory Board is assembled, configure it as described in the “Configuration” section, starting on Page 2. We recommend beginning with a single 8K memory device installed, if possible. Ensure that memory on the 32K Mixed Memory Board does not conflict with other memory in your Glitchbus system – if there is a conflict, some Glitchbus SBCs or CPU boards will ignore it, while others will experience bus contention.

Double-check all ICs for proper orientation, check all solder joints for cold joints or solder bridges. Install the 32K Mixed Memory Board in your Glitchbus stack or backplane. If the Glitchbus system used for check-out uses ROMFS or otherwise includes boot options, we recommend starting a ROM monitor first (ROM program switches set to 0 for Glitch Works SBCs).

Power on your Glitchbus system and press **RESET**. Once the monitor comes up, attempt to read memory locations on the 32K Mixed Memory Board. If you have installed writable memory in the 32K Mixed Memory Board, attempt memory writes and readback. Once basic function has been confirmed, we recommend running a memory test for several passes.

4.1 Troubleshooting

If your 32K Mixed Memory Board fails to come up, recheck all solder joints for cold joints, bridges, or missed pins – this is by far the most common problem we’ve observed during assembly workshops. Recheck configuration options. If using the 32K Mixed Memory Board with a Glitch Works SBC, make sure that the memory board is addressed for memory not otherwise available on the SBC.

4.2 Repair and Service

If you purchased an assembled 32K Mixed Memory Board from Glitch Works, LLC, your board is warranted to work on arrival. If you have assembled a kit that fails to work, you may return it to Glitch Works, LLC for evaluation, repair, and testing. For questions concerning returns or configuration, please visit <http://www.glitchwrks.com/> and click the “Contact” link.

Do note that while we will attempt to help those who have purchased used boards, there is no warranty extended.

5 Parts List

If you purchased a full Glitch Works parts kit, be sure it includes the following:

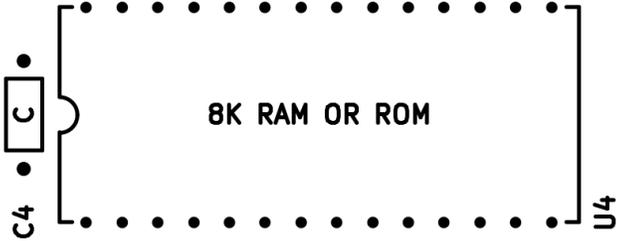
- 10x 0.01 μF axial ceramic capacitor (yellow bead)
- 1x 33 μF 35 V axial electrolytic capacitor
- 4x 4.7 $\text{k}\Omega$ 1/4 W resistor (see above note)
- 1x 74LS04 hex inverter
- 1x 74LS20 dual 4-input NAND gate
- 1x 74LS138 one-of-eight decoder
- 3x 74LS245 transceiver
- 4x 28-pin IC socket
- 1x 4-pin socket strip
- 1x 8-pin socket strip

Kits may also include a Glitchbus connector (stacking or right-angle) and/or 8K x 8 6264-type static RAM, if selected as a purchase option.

5.1 Substitutions

The following substitutions may be made if you have purchased a bare board and are supplying your own parts, or in a full Glitch Works parts kit:

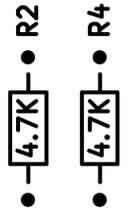
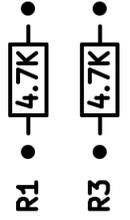
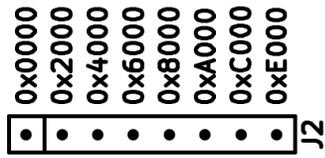
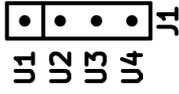
- Any compatible 7400 series family logic ICs may be used (for example, a 74LS04 in the parts list may be shipped as a 7404, 74S04, 74F04, 74LS04, 74ALS04, or 74HCT04)
- All 4.7 $\text{k}\Omega$ resistors on the 32K Mixed Memory Board are pull-up resistors, and may be any value from 2.2 $\text{k}\Omega$ to 10 $\text{k}\Omega$, even though they are indicated as 4.7 $\text{k}\Omega$ on the assembly drawing
- Resistors may be of varying precision and body type



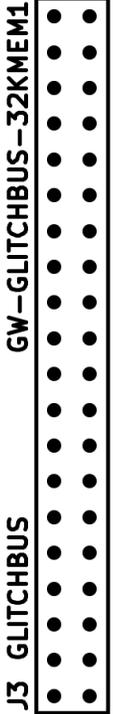
32K Memory Board for Glitchbus
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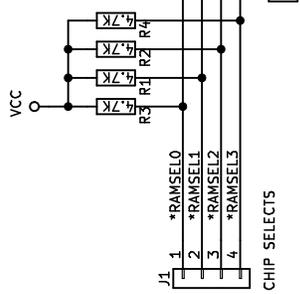
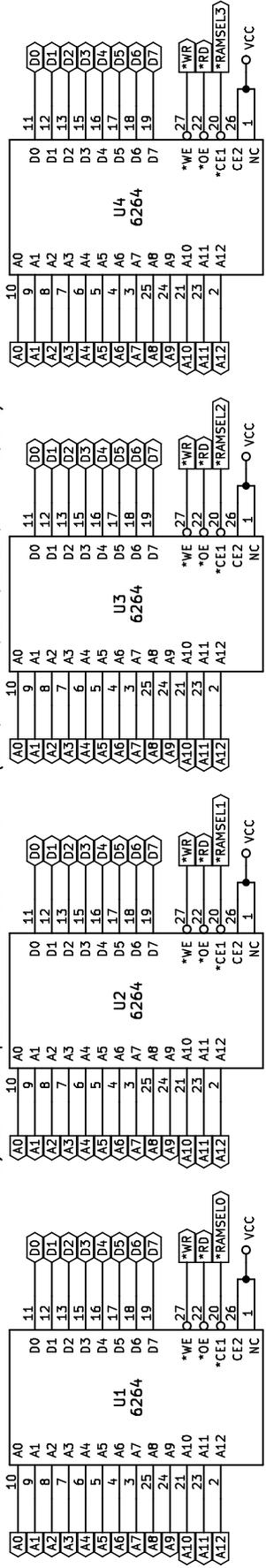
JUMPER J1 SELECTS TO J2 OUTPUTS
 UNCONNECTED SELECTS WILL BE DISABLED



J3 GLITCHBUS

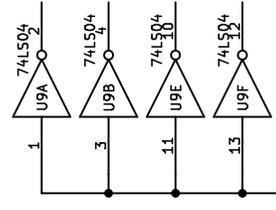


Memory ICs -- Compatible with JEDEC 8K x 8 Devices (6264, FM16W08, 2764, 28C64, MK48T08, etc.)

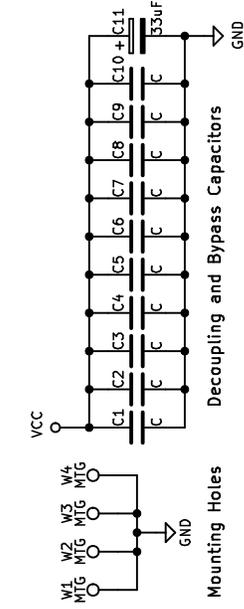
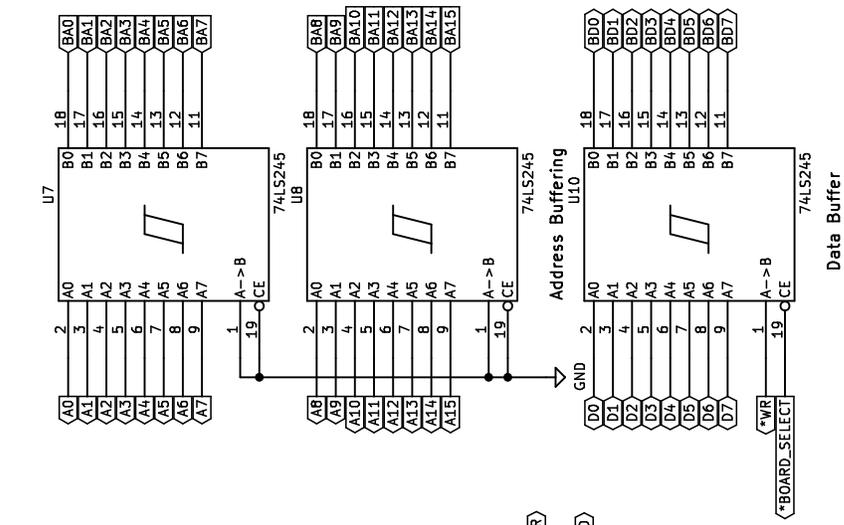


Memory Decode/Select Logic

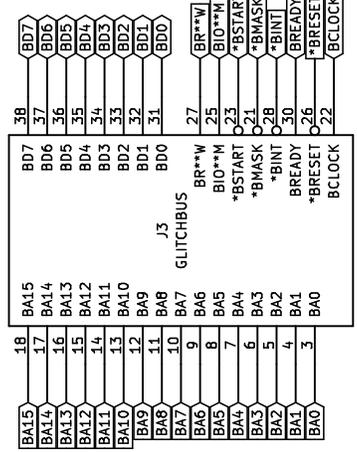
Jumper outputs from J2 to selects at J1. Unconnected segments will be disabled (board will not respond). Do not connect multiple segment outputs to a single select!



*RD Generator and *WR Buffer



Decoupling and Bypass Capacitors



Glitchbus Expansion Connector

GW-GLITCHBUS-32KMEM1
 J. Chapman
Glitch Works, LLC
 Sheet: /
 File: gw-glitchbus-32kmem1.sch
Title: 32K Mixed Memory Board
 Size: USLetter Date: 2020-11-21
 KiCad E.D.A. kicad 5.1.2

Rev: PROD 1
 Id: 1/1