

Lo-tech 2MB EMS Board

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The **Lo-tech 2MB EMS Board** is an 8-bit ISA expansion card providing up to 2MB of EMS for IBM compatible PCs. The small form factor makes the board suitable for the IBM Portable Computer 5155.

Revision History:

- R01 - Prototype. See Lo-tech 2MB EMS Board (prototype) Resources.
- R02 - First production release.



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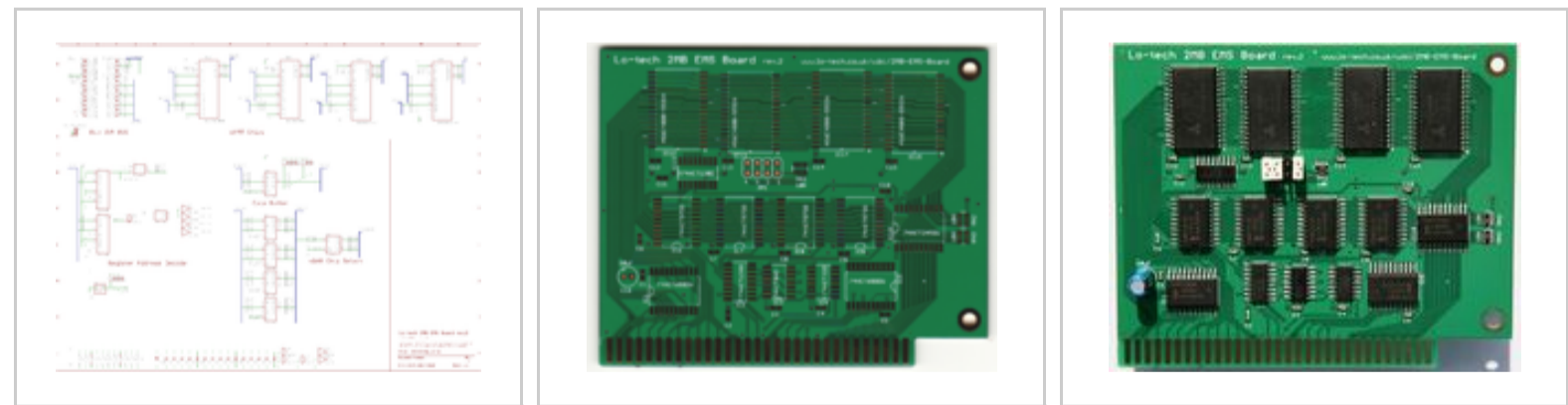
Technical Description

The **Lo-tech 2MB EMS Board** utilises up to four AS6C4008-55SIN 4Mb static RAM chips (<https://www.lo-tech.co.uk/downloads/1MB-RAM-Board/AS6C4008.pdf>) to provide up to 16Mb (=2MB) total RAM capacity, buffered via a 74ACT245 to ensure compatibility with TTL logic levels, on an 8-bit ISA expansion card. For applications that support EMS, this provides a way to install more than the 1MB total address capacity of the 8086 and 8088 processors.

Following the LIM EMS specification, physical RAM is divided into 16KB pages and addressed via a single 64KB window (the 'page frame') in the upper memory (http://en.wikipedia.org/wiki/Upper_memory_area) . The pages presented within the window are determined by the value set in four page registers, which are programmed through IO ports. A jumper block enables the page frame IO port base addresses to configured to match the system requirements.

For operation, the EMS board requires a LIM memory manager driver, LTEMME.EXE. This driver provides LIM 4 compatibility.

Design



- AS6C4008-55SIN 4Mb static RAM datasheet (<https://www.lo-tech.co.uk/downloads/1MB-RAM-Board/AS6C4008.pdf>)

Use of this design is provided subject to the **lo-tech.co.uk Terms and Conditions**.

Assembly

This PCB makes use of SMT components:

- SOIC chips have a pitch of 1.27mm
- 0603 package capacitors and resistors

Assembly requires flux and a temperature controlled soldering station.

Bill of Materials

Part	Value	Device	Package	Qty	Farnell	Mouser
C1..C15	0.1uF	X7R Ceramic Capacitor	0603	15	1414610	80-C0603C104K4R
C16	10uF	16V Electrolytic	E2-5	1	9451056	140-REA100M1CBK0511P
IC1, IC5	-	74HCT688DW	SOIC-20	2	1085321	771-HCT688D652
IC2	-	74HCT139D	SOIC-16	1	1085308	771-74HCT139D-T
IC3	-	74HCT04D	SOIC-14	1	1085299	595-SN74HCT04D
IC4	-	74HCT32D	SOIC-14	1	1201305	771-74HCT32D-T
IC6..IC9	-	74HCT573D	SOIC-20	4	1201309	771-74HCT573D
IC10	-	74HCT245DW	SOIC-20	1	1085315	771-74HCT245D
IC11	-	74HCT138D	SOIC-16	1	1201307	771-74HCT138D-T
IC12..IC15	-	AS6C4008-55SIN 4Mb SRAM	SOIC-32	4	1562901	913-AS6C4008-55SIN
JP1	-	PINHD-2X4	-	1	1593441	649-77313-101-08LF
RN1..RN3	10k	RESISTOR, ARRAY-4, 10K, 1206	1206	3	1770137	652-CAY16-103J4LF

Note: Only one SRAM chip is required to build a functioning board (populate SRAM chips in order from IC12).

ISA Bracket

Uses Lo-tech ISA Slot Bracket Type 3.

JP1: Board Configuration

The board is configured via four jumpers on the pin-header JP1 (O=open, C=closed, position 1 is furthest from IC11 (74LS138D)):

Page Frame Base Address		IO Port Base Address	
Value (1,2)	Base Address	Value (3,4)	Base Address
C,C	C000h	C,C	260-263h
O,C	D000h	O,C	264-267h
C,O	E000h	C,O	268-26Bh
O,O	(invalid)	O,O	26C-26Fh

The recommended configuration is E000h and 260h, being C,O,C,C.

See Also

- Lo-tech Memory Boards
- Lo-tech Memory Board FAQ
- Lo-tech PCB Shop (<https://www.lo-tech.co.uk/shop>)

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