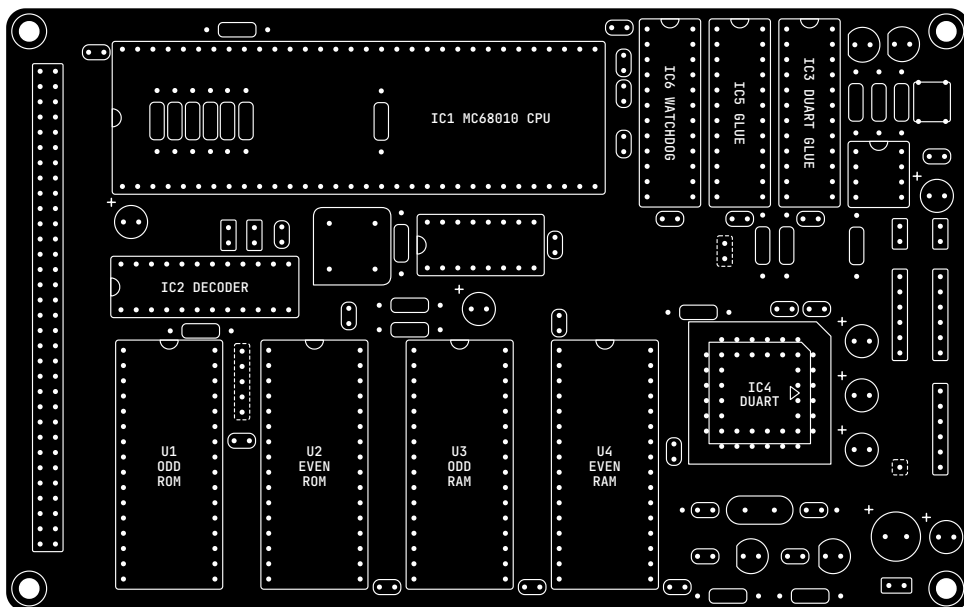


THROUGH-HOLE KIT · BUILD GUIDE

roscos_m68k

Classic v2

A Motorola 68010 computer on a single board, built by you from a bare PCB to a boot message. Five soldering stages, lowest parts first, then power-up.



MC68010

CPU AT 10 MHZ

1 MB + 1 MB

RAM + FLASH ROM

2 × UART

PLUS SPI / SD

160 × 100 mm

572 SOLDER JOINTS

Before you solder		2	4	LEDs, headers, electrolytics	6
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roscos_m68k is open-source hardware by Ross Bamford and contributors (roscos-m68k.com), released under the CERN Open Hardware Licence. Kit and guide by SolderDemon.



READ FIRST

Before you solder

Tick the kit off against the packing list, then build in the order of this guide. Low parts go first, so the board always lies flat while you solder.

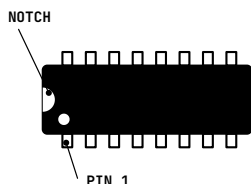
WHICH WAY ROUND

Every map shows the component side with the long expansion header **J3 on the left**. Keep your board that way and “left”, “right” and “up” in this guide always match what you see.

YOU NEED

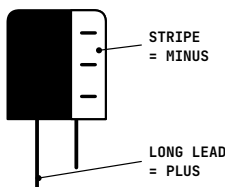
Temperature-controlled iron with a fine tip, solder 0.6–1 mm, flush cutters, small pliers, multimeter, masking tape. For repairs: flux and solder wick.

THREE PARTS THAT CAN GO IN BACKWARDS

**Chips and sockets**

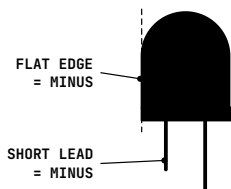
The notch marks the pin 1 end. Match it to the notch printed on the board.

Here: every notch points left or up.

**Electrolytic caps**

The long lead goes in the hole marked +. The stripe faces away from it.

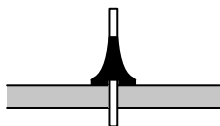
Here: every stripe faces right.

**LEDs**

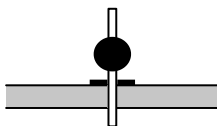
The flat edge of the body sits on the flat of the printed outline.

Here: every flat edge faces left.

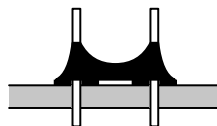
EVERY JOINT

**Good**

A small cone that wets both the pad and the lead.

**Bead on the Lead**

Solder never reached the pad. Add flux, reheat pad and lead together.

**Bridge**

Two pads joined. Draw the excess off with wick, then check the gap.

THE ROUTINE

- 1 Heat the pad and the lead together.
- 2 Feed solder into the joint, not onto the tip.
- 3 Take the solder away, then the iron. Hold still until it sets.
- 4 Trim the lead just above the cone.

STATIC

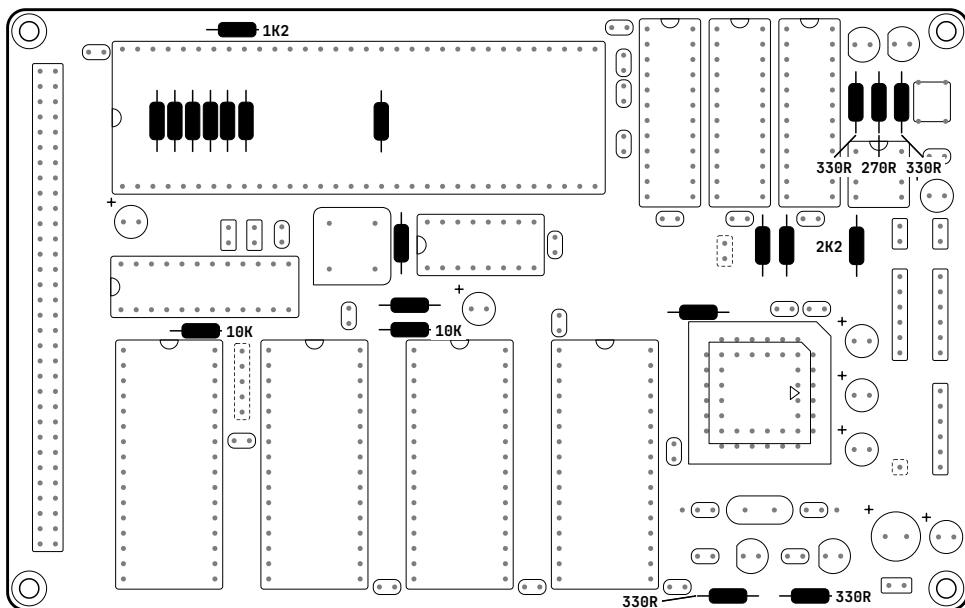
The chips are static-sensitive. Leave them in their packing until stage 5 and touch something grounded before you handle them.

1

STAGE 1

Resistors

21 PARTS

42 JOINTS

☒ FIT NOW ☐ ALREADY FITTED ☐ LATER

NO LABEL ON THE MAP = 4K7

VALUE	QTY	4 BANDS	5 BANDS	POSITIONS
☐ 4K7	12	yellow violet red	yellow violet black brown	R3 R7-R10 R12 R15-R18 R31 R32
☐ 330R	4	orange orange brown	orange orange black black	R1 R2 R13 R14
☐ 10K	2	brown black orange	brown black black red	R11 R19
☐ 1K2	1	brown red red	brown red black brown	R21
☐ 2K2	1	red red red	red red black brown	R27
☐ 270R	1	red violet brown	red violet black black	R28

HOW

- Resistors have no polarity. Bend both leads at the body, press the part flat on the board, solder, trim.
- Finish one value before you open the next bag.

Read the bands from the end where they are grouped. The last band, set apart, is the tolerance. Unsure? Measure it.

WATCH OUT

7 of the 4K7 resistors sit inside the IC1 outline: R7 R9 R10 R12 R15 R17 R18. The CPU socket covers them in stage 3, so they must be in, flat and trimmed first.

BEFORE STAGE 2 ☐ 21 resistors fitted, none left over ☐ Every lead trimmed

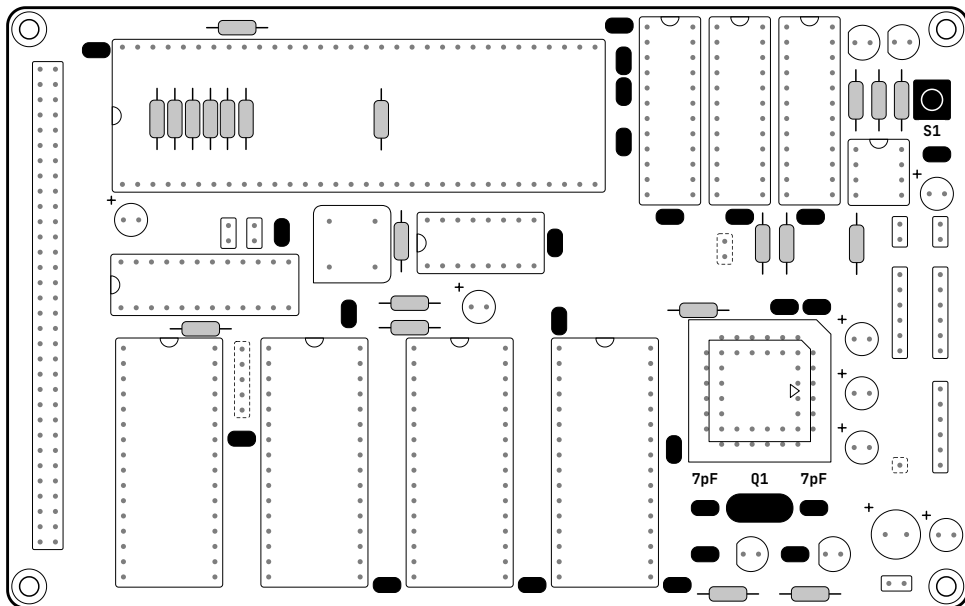
2

STAGE 2

Small capacitors, crystal

26 PARTS

54 JOINTS




NO LABEL ON THE MAP = 100nF

PART	QTY	MARKED	POSITIONS
 100nF ceramic	22	104	C3-C10 C12 C13 C20 C22-C32
 7pF ceramic	2	7	C1 C2, either side of the crystal
 3.6864 MHz crystal	1	3.6864	Q1
 Button	1		S1, top right corner

HOW

- Nothing in this stage has polarity. Either way round is correct.
- Seat each capacitor low on the board. Straighten leads that are wider than the holes with pliers first.
- Tape the crystal down and solder it quickly. If a joint will not take, let it cool and try again.
- The button only fits one way. Solder all four legs.

THREE HOLES

C1 C2 have three holes for two leads. One lead always goes in the hole nearest the crystal, the other in whichever remaining hole fits the lead spacing.



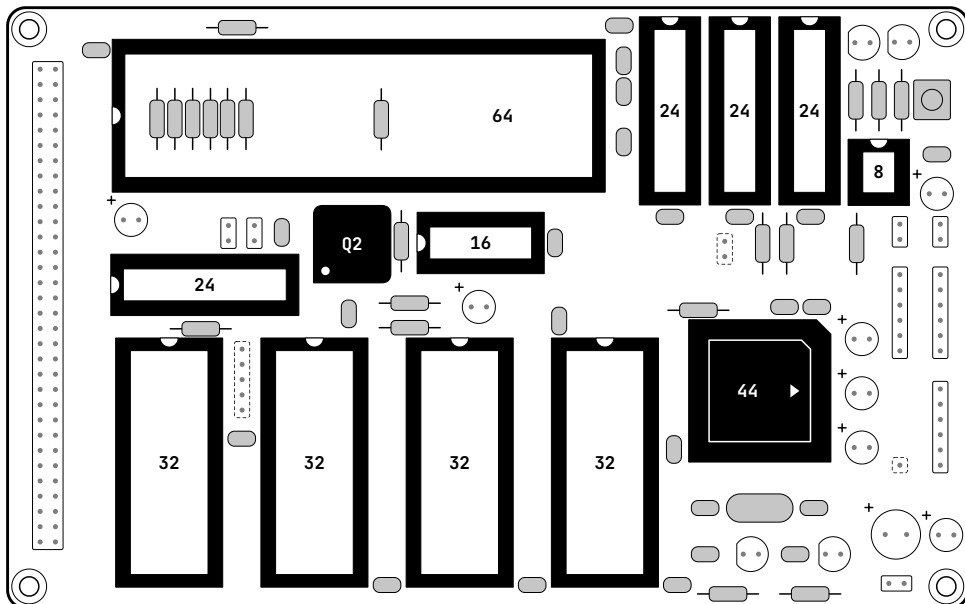
BEFORE STAGE 3  24 capacitors fitted  Crystal flat on the board  Button seated

3

STAGE 3

Sockets and oscillator

13 PARTS

360 JOINTS

☒ FIT NOW ☐ ALREADY FITTED ☐ LATER

NUMBER = PIN COUNT

PART	QTY	POSITIONS	WHICH WAY
☐ 64-pin socket	1	IC1	notch left
☐ 32-pin socket	4	U1-U4	notch up
☐ 24-pin socket	4	IC2 IC3 IC5 IC6	IC2: notch left; IC3 IC5 IC6: notch up
☐ 16-pin socket	1	IC7	notch left
☐ 8-pin socket	1	IC15	notch up
☐ 44-pin PLCC socket	1	IC4	cut corner top right
☐ 10 MHz oscillator	1	Q2	sharp corner bottom left; soldered, no socket

HOW

- Drop the socket in, notch over the printed notch. Solder two opposite corner pins.
- Look from the side. Not flat, or notch wrong? Reheat a corner and fix it now.
- Solder the remaining pins. It is easy to skip one in a long row.

NO CHIPS YET

The sockets stay empty until stage 5.

The oscillator is a metal can with one sharp corner: that is pin 1, usually marked with a dot.

BEFORE STAGE 4 ☐ 12 sockets flat, notches match the map ☐ No pin skipped

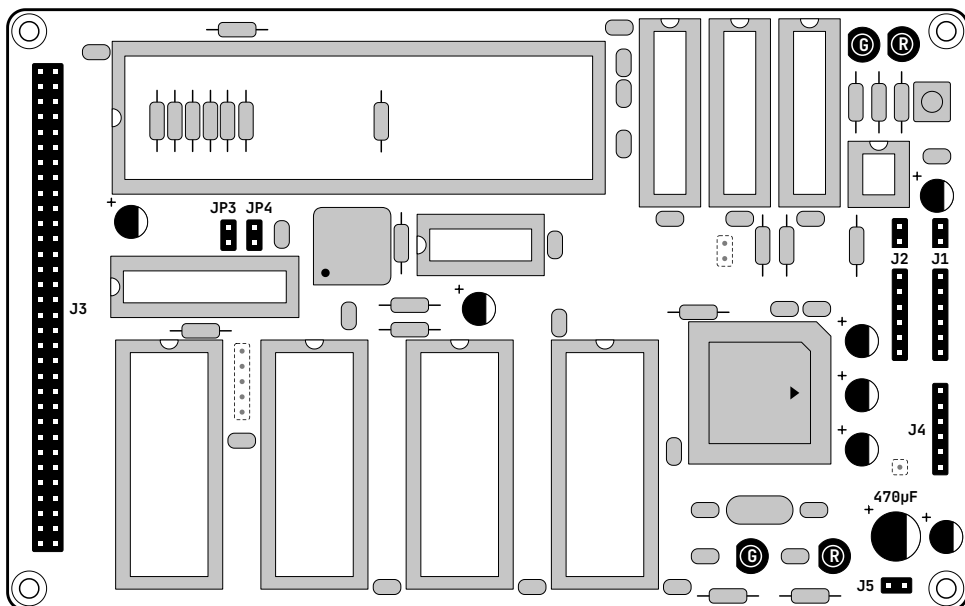
4

STAGE 4

LEDs, headers, electrolytics

21 PARTS

116 JOINTS



 FIT NOW  ALREADY FITTED  LATER G = GREEN, R = RED · NO LABEL = 100µF

PART	QTY	POSITIONS	WHICH WAY
☐ LED green	2	LED1 LED3	flat edge and short lead left
☐ LED red	2	LED2 LED4	flat edge and short lead left
☐ Header 2×32	1	J3	two 1×32 strips side by side, short pins into the board
☐ Header 1×6	3	J1 J2 J4	short pins into the board
☐ Header 1×2	5	J5 JP1-JP4	short pins into the board
☐ 100µF electrolytic	7	C11 C14-C19	long lead in + hole (left), stripe right
☐ 470µF electrolytic	1	C21	long lead in + hole (left), stripe right

HOW

- LEDs first. Solder one lead, check the LED stands straight, then the other.
- Headers next. Tack one pin, check the header is upright, then the rest.
- Electrolytics last, the 470µF at the very end. Push each one flat first.

POLARITY

A reversed electrolytic can burst. A reversed LED stays dark. Check each stripe and flat edge against the map before soldering.

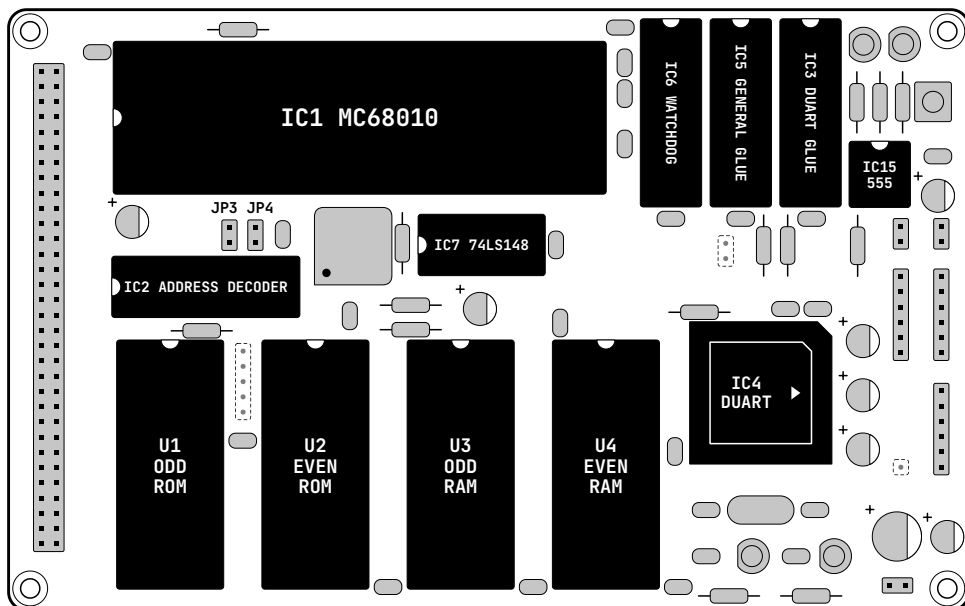
J6-J8 stay empty: no parts are supplied for them.

BEFORE STAGE 5 ☐ 4 LEDs: flat edges left ☐ 8 electrolytics: stripes right ☐ Headers upright

5

STAGE 5

Chips and jumpers

12 CHIPS
NO SOLDERING



NAMES AS PRINTED ON THE BOARD

FIRST, WITH THE SOCKETS STILL EMPTY

- 1 Check every joint with a magnifier: beads, bridges, skipped pins.
- 2 Multimeter on continuity across the two pins of J5. A brief chirp is the capacitors charging. A steady tone is a short: find it first.

THEN THE CHIPS

- 1 Press each row of legs gently against the bench until both rows are parallel.
- 2 Notch to notch, every leg in its hole, then press down evenly.
- 3 IC4: cut corner to cut corner (top right), then straight down until it sits level.

LOOK-ALIKES

The two ROMs look alike, and so do the four ATF22V10C, but each is programmed for one socket. Go by the label on the chip. The two RAM chips are interchangeable.

JUMPERS

Leave JP1–JP4 open for the first power-up. Park each cap on one pin.

- JP1 JP2 power the board from a serial adapter. Never both, never with a supply on J5.
- JP3 enables flash ROM writes.
- JP4 only for the original RAM expansion board.

BEFORE POWER

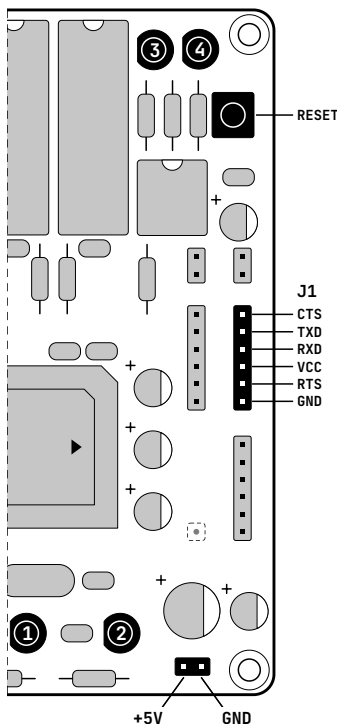
☐ Notches match the map

☐ No leg folded under

☐ JP1–JP4 open

LAST STEP

Power-up



- 1 Power.** 5 V DC, regulated, at least 500 mA, on J5: left pin +5 V, right pin GND, as printed on the board. Measure the supply before you connect it.
- 2 Serial.** A USB serial adapter set to 5 V on J1 (UART-A). The pins follow the usual 6-pin FTDI order, GND at the bottom. With loose wires: board TXD to adapter RXD, RXD to TXD, GND to GND.
- 3 Terminal.** 115200 baud, 8 data bits, no parity, 1 stop bit.
- 4 Switch on** and watch the LEDs.

NO PROTECTION

Reversed power leads or more than 5 V will destroy chips. There is no fuse and no regulator on the board.

A HEALTHY BOARD

LED4	RESET red	one blink at power-on, then off
LED3	RUN green	on, steady
LED2	I1 red	on briefly during start-up, then off
LED1	I0 green	blinks about once a second


SOMETHING ELSE HAPPENS? UNPLUG FIRST.

- **No LED at all:** measure 5 V across J5, then check the LED flat edges.
- **A chip gets hot:** it is in backwards or in the wrong socket.
- **RESET stays lit:** check IC15, IC5 and the stripe of C11.
- **RUN lit, no text:** swap TXD and RXD, check the baud rate, check you are on J1 and not J2.
- **I0 never blinks:** ODD and EVEN ROM swapped, a look-alike chip in the wrong socket, or a leg folded under.


STILL STUCK? WE WILL HELP.

Send clear photos of both sides of the board and tell us what the four LEDs do.

solderdemon.com/docs

t.me/solderdemon_official

solderdemon.official@gmail.com