TIX clock, Build A — the gweeds DIY TiX

Bill of materials · Guido Seevens (Instructables, 2011): ATmega16 in BASCOM-AVR, BC548 rows and TD62304 column arrays scanning a 3 × 9 LED matrix, single-sided PCB

Revision: B **Date:** 2026-11-03 **Lines:** 19 **Source:** clocks.fubsypoly.com/tix/vol-6/

Every part in Volume 6's bill of materials for Build A (§6.3.1), grouped by function. Designators and values come from the designer's parts list and the Eagle schematic in tixclock.zip (board 'Colour Clock PCB Rev 2.3'). Two additions are marked derived: R5–R7, the row current-limit resistors the original lacks, and C4, a bypass capacitor at the AVR. Pin map and wiring: §6.3.2. Firmware: flash the designer's TIXCLOCK.HEX with avrdude after setting lfuse 0xE4, hfuse 0xD9 (§6.3.5). Solder the 27 LEDs and the wire links first: the AVR on the copper side covers some of their pads. Feed it regulated 5 V only. The case and the diffuser stack are in Volume 8.

Tick **Ord** when ordered, **Have** when it is in hand and checked against the part number, **Fit** when it is installed. Write the vendor, order number and price on the last page. Alternates for obsolete (EOL) parts are in **bold**.

Same A standard current part; buy it as listed. **EOL** Obsolete: buy the alternate given.

Spec Not in the original design, or the original value was wrong: the derived value is listed (§6.3.1 shows the arithmetic). **Conflict** The sources disagree; the resolution is given.

Choice An option the builder chooses.

ORD	HAVE	FIT	QTY	REF. DES.	PART / SPECIFICATION	PART NUMBER	ALTERNATES / SUBSTITUTES	WHERE TO BUY	TAG	NOTES
Controller										
☐	☐	☐	**1**	IC1	**ATmega16A-PU microcontroller + 40-pin DIP socket** 40-pin DIP; 8 MHz internal RC (lfuse 0xE4), JTAG off (hfuse 0xD9)	ATMEGA16A-PU	**Original ATmega16(L) is retired; the ATmega16A has the same pinout and signature, so the original HEX runs unchanged (-p m16).**	Digi-Key www.digikey.com/en/products/result?keywords=… Mouser www.mouser.com/c/?q=ATMEGA16A-PU	**EOL**	Connect AVCC (pin 30) to +5 V and pin 31 to GND; the schematic omits them.
☐	☐	☐	**1**	Q4	**32.768 kHz watch crystal** 2 × 6 mm cylinder, 12.5 pF; on TOSC1/TOSC2 (pins 28/29); no load caps	AB26TRB-32.768KHZ-T	Any 2 × 6 mm or 3 × 8 mm 32.768 kHz tuning-fork crystal	Mouser www.mouser.com/c/?q=AB26TRB-32.768KHZ-T Digi-Key www.digikey.com/en/products/result?keywords=…	**Same**	
☐	☐	☐	**4**	R1–R4	**Resistor 100 kΩ, ¼ W** R1–R3 button pull-downs (PB0, PB2, PB1); R4 RESET pull-up			Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=100k+1/4W+resistor	**Same**	
☐	☐	☐	**1**	C1	**Electrolytic capacitor 4.7 µF, 16 V** Radial, 2.5 mm lead pitch (original list: 10 V)			Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=4.7uF+16V+radial	**Same**	Mind the polarity.
☐	☐	☐	**2**	C2, C3	**Ceramic capacitor 100 nF** Bypass at IC2/IC3 pin 9; 2.5 or 5 mm pitch		The original's 10 pF, as drawn (ineffective as a bypass)	Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=100nF+50V+ceramic+radial	**Conflict**	Original list and schematic say 10 pF.

ORD	HAVE	FIT	QTY	REF. DES.	PART / SPECIFICATION	PART NUMBER	ALTERNATES / SUBSTITUTES	WHERE TO BUY	TAG	NOTES
☐	☐	☐	**1**	C4	**Ceramic capacitor 100 nF (derived)** Across IC1 pins 10–11, on the copper side			Tayda www.taydaelectronics.com/catalogsearch/resul…	**Spec**	
☐	☐	☐	**3**	S1–S3	**Tactile switch 6 × 6 mm, through-hole** S1 Set (PB1), S2 Up (PB2), S3 Down (PB0); each to +5 V	`Omron B3F-1000`	Any 6 × 6 mm 4-pin tactile switch; taller actuators (e.g. B3F-1020, -1050) to suit the case buttons	Digi-Key www.digikey.com/en/products/result?keywords=… Mouser www.mouser.com/c/?q=B3F-1000 Tayda www.taydaelectronics.com/catalogsearch/resul…	**Same**	
Matrix drivers one column on at a time; each row carries one LED										
☐	☐	☐	**2**	IC2, IC3	**7-channel LOW-active sink driver, DIP-16 + sockets** Input LOW = output on. Pin 8 GND, pin 9 VCC (+5 V, per the Toshiba datasheet). IC3 uses channels 1–2 only; leave pins 3–7 and 10–14 open	`TBD62304APG`	**TD62304AP / TD62304APG (original, EOL; new old stock) — use R5–R7 = 22 Ω with it. NOT ULN2003/TBD62003 (high-active).**	Mouser www.mouser.com/c/?q=TBD62304APG Digi-Key www.digikey.com/en/products/result?keywords=… Avnet www.avnet.com/americas/product/toshiba/tbd62…	**EOL**	A TD62304AP (new old stock) uses the same pin-out.
☐	☐	☐	**3**	Q1–Q3	**NPN transistor BC548B, TO-92** Row drivers: collector +5 V, base to PC0/PC1/PC2, emitter to row (via R5–R7)	`BC548B`	BC547B, BC549; 2N3904 works but its pinout is reversed (EBC)	Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=BC548B	**Same**	
☐	☐	☐	**3**	R5–R7	**Resistor 47 Ω, ¼ W (derived)** One per row, in the emitter lead. ≈23 mA (blue/green), ≈47 mA (red/orange) while lit, 1/9 duty		22 Ω with a TD62304AP. Or 27 per-LED resistors on stripboard: 100 Ω red/orange, 47 Ω blue/green	Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=47+ohm+1/4W+resistor	**Spec**	Not in the original, which has no LED resistors.
Display anodes to rows, cathodes to columns										
☐	☐	☐	**3**	LED1–LED3	**5 mm high-intensity LED, blue** Hours tens; column 1 (PA0)			Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=5mm+blue+LED	**Conflict**	Designer: blue/red/orange/green; rest of the dive: yellow/red/blue/green. Any four colours work.
☐	☐	☐	**9**	LED4–LED12	**5 mm high-intensity LED, red** Hours units; columns 2–4 (PA1–PA3)			Tayda www.taydaelectronics.com/catalogsearch/resul… Mouser www.mouser.com/c/?q=5mm+red+LED	**Same**	

ORD	HAVE	FIT	QTY	REF. DES.	PART / SPECIFICATION	PART NUMBER	ALTERNATES / SUBSTITUTES	WHERE TO BUY	TAG	NOTES
☐	☐	☐	**6**	LED13–LED18	**5 mm high-intensity LED, orange** Minutes tens; columns 5–6 (PA4–PA5)			Tayda www.taydaelectronics.com/catalogsearch/resul... Mouser www.mouser.com/c/?q=5mm+orange+LED	**Same**	
☐	☐	☐	**9**	LED19–LED27	**5 mm high-intensity LED, green** Minutes units; columns 7–9 (PA6, PA7, PC3)			Tayda www.taydaelectronics.com/catalogsearch/resul... Mouser www.mouser.com/c/?q=5mm+green+LED	**Same**	Sand the lenses for even light. Check polarity before soldering.

Board, power and tools

ORD	HAVE	FIT	QTY	REF. DES.	PART / SPECIFICATION	PART NUMBER	ALTERNATES / SUBSTITUTES	WHERE TO BUY	TAG	NOTES
☐	☐	☐	**1**	JP1	**2-pin 2.54 mm header + regulated 5 V supply** Pin 2 +5 V, pin 1 GND; ≥500 mA. No regulator on the board		USB charger via a USB breakout; 5 V barrel adapter	Tayda www.taydaelectronics.com/catalogsearch/resul...	**Choice**	
☐	☐	☐	**1**	JP2	**6-pin 2.54 mm single-row header** ISP, inline: 1 MOSI, 2 MISO, 3 SCK, 4 RESET, 5 +5 V, 6 GND			Tayda www.taydaelectronics.com/catalogsearch/resul...	**Same**	
☐	☐	☐	**1**	Board	**Single-sided PCB 228 × 85 mm, or stripboard** Eagle board 'Colour Clock PCB Rev 2.3' (tixclock.zip, pre-v6 binary: needs EAGLE)		Stripboard, as the designer's first prototype		**Choice**	
☐	☐	☐	**1**	Tool	**AVR ISP programmer + 6 jumper wires** For avrdude; wire to JP2's inline pinout	`USBasp`	AVRISP mkII, Atmel-ICE, Arduino as ISP		**Choice**	
☐	☐	☐	**—**	Display / case	**Reflector grid, tracing-paper diffuser, smoked acrylic window, case** See Volume 8				**Choice**	

Orders

VENDOR	ORDER NO.	DATE	TOTAL	RECEIVED	LINES / NOTES

Build total: _____ **Started:** _____ **First power-up:** _____

Notes