Multimeter Clock — three-meter HOURS / MINUTES / SECONDS build

Bill of materials · abbtech (Alan Parekh, Hacked Gadgets, 2010): PIC16F628A controller on perfboard driving three 0.5 mA meters

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

Every part for the collected Multimeter Clock, in the order of the article's parts list (Volumes 6, 9 and 10): the controller on a 2 × 3 in perfboard, the 9–12 V supply and the three meters. The enclosure (layered MDF, Volume 6 §6.5) and the dial faces (Volume 8) are not listed. Part numbers are examples that meet the specification. The 4.7 kΩ meter resistors suit 0.5 mA meters; for any other full-scale current, resize them (Volume 4) before building. The whole clock runs at 9–12 V: no shock hazard.

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** The original list does not say enough, or the rating is marginal; the safer value is given.

Conflict The parts list and the circuit 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**	PIC	**PIC16F628A, pre-programmed** 18-pin DIP; timebase, counting, calibration (Vol 5)	PIC16F628A-I/P	PIC16F628 (the article's part; Microchip lists it not recommended for new designs)	Kit seller (pre-programmed) Digi-Key www.digikey.com Mouser www.mouser.com	**Same**	A blank chip needs a PIC programmer and the firmware.
☐ ☐ ☐	**1**	PIC socket	**18-pin chip socket** DIP, 0.300 in				**Same**	
☐ ☐ ☐	**1**	Board	**Perfboard, 2 × 3 in**				**Same**	
☐ ☐ ☐	**1**	DC in	**2-position terminal block** 9–12 V DC input				**Same**	
☐ ☐ ☐	**5**	Supply + meter channels	**Diode, listed as "1N4401"** Reverse-polarity protection and per-meter clamp	1N4001	Any 1N400x	Digi-Key Mouser	**Conflict**	There is no 1N4401 diode (2N4401 is a transistor); almost certainly a typo for 1N4001 (Vol 9).
☐ ☐ ☐	**1**	Input filter	**100 µF capacitor, 25 V** Listed as 12 V; sits on the 9–12 V input ahead of the regulator				**Spec**	A 12 V rating has no margin on a 12 V adapter.
☐ ☐ ☐	**1**	5 V rail filter	**47 µF capacitor, 10 V or more** Listed as 5 V; on the regulated 5 V rail				**Spec**	A 5 V rating has no margin on a 5 V rail.
☐ ☐ ☐	**1**	PIC decoupling	**0.01 µF ceramic capacitor**				**Same**	
☐ ☐ ☐	**2**	Crystal load	**22 pF ceramic capacitor** One per OSC pin				**Same**	
☐ ☐ ☐	**1**	Regulator	**LM7805 5 V regulator** TO-220	LM7805 / L7805CV		Digi-Key Mouser	**Same**	
☐ ☐ ☐	**1**	Crystal	**20 MHz crystal** HC-49				**Same**	

ORD	HAVE	FIT	QTY	REF. DES.	PART / SPECIFICATION	PART NUMBER	ALTERNATES / SUBSTITUTES	WHERE TO BUY	TAG	NOTES
☐	☐	☐	**4**	3 meter channels + MCLR pull-up	**4.7 kΩ resistor, 1/4 W** Sized for 0.5 mA meters				Same	
☐	☐	☐	**1**	Status LED	**1 kΩ resistor, 1/4 W**				Same	
☐	☐	☐	**3**	H, M, S / calibration	**Tactile button**				Same	
☐	☐	☐	**2**	Scale-adjust + config	**0.1 in pin header, 2-position**				Same	
☐	☐	☐	**2**	For the headers	**0.1 in shorting jumper**				Same	
☐	☐	☐	**1**	Status	**Blue LED** Steady at power-up, 1 s on / 1 s off running				Same	
Supply and meters										
☐	☐	☐	**1**	Power	**9–12 V DC wall adapter** Regulated preferred				Same	
☐	☐	☐	**3**	HOURS / MINUTES / SECONDS	**Analog multimeter or panel meter, 0.5 mA DC range** Moving-coil; anything up to a few mA works if the resistors are resized		Bare microammeter/milliammeter movements (Vol 3)	eBay Surplus sellers	Spec	Re-face with time dials (Vol 8); calibrate each (Vol 6 §6.6).

Orders

VENDOR	ORDER NO.	DATE	TOTAL	RECEIVED	LINES / NOTES

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

Notes