

Bill Of Materials for JH. 20-pole Phaser (PCB mount components listed only.)

Errors excepted, subject to modifications.

Quantity	Part name	Remarks
	Semiconductors	
11	CA3046 (or CA3086) Transistor Array	Option: You can use 20 transistor pairs like LM394 or SSM2210 to replace 10 of the CA3046 arrays. You still need 1 CA3086 (or CA3046) then. Please double check where the components will be placed; it's tricky!
5	TL072 Opamp	
1	OPA2134 Opamp	
1	LM317T Voltage Regulator	note orientation on board!
1	LM337T Voltage Regulator	note different orientation on board!
4	1N4001 Diode	
2	1N4148 Diode	
	Capacitors (Voltage rating 35V or higher)	
40	15nF 5mm or 7.5mm spacing	Wima MKS-2 or similar. 5% tolerance recommended but not mandatory.
6	47nF or 100nF SMD 0805	Bypass Caps on solder side. Voltage rating (35V or higher!) is important!
3	33pF Ceramic 2.5mm spacing	board grid is actually in inches – but I think 2.54mm components are sold as “2.5mm” – same for 5, 7.5, 10mm ...
2	10pF Ceramic 2.5mm spacing	
1	10nF Ceramic 2.5mm spacing	
4	2.2nF 5mm or 7.5mm spacing	5% tolerance recommended but not mandatory
1	10nF 5mm or 7.5mm spacing	
2	220nF 5mm or 7.5mm spacing	marked “u22” on board
1	470nF 5mm, 7.5mm, or 10mm spacing	
2	10uF Tantal Electrolytic 2.5mm spacing	near voltage regulators
2	470uF / 40V Electrolytic	the “big ones”
2	1uF Electrolytic	
1	10uF Electrolytic	
2	22uF Electrolytic	
1	15uF Electrolytic	22uF will do if you can't get 15uF
	Trim pots	
1	100 Ohm Piher 10mm trimpot	
2	50k Piher 10mm trimpot	Piher PT-10 horizontal mount
1	Multiturn Trimmer 10k (all pins in a row, 2.5mm spacing)	marked as 5k on board; but you'll need a 10k value together with a 1k Tempco resistor
	Tempco resistor + scaling resistor	
1	1k Tempco Resistor +3300ppm/K or similar Physical size not so important; long leads will be bent such that the Resistor sits on top of the neighbouring CA3086 (or 3046)	marked as TC 560 on board, but it's unlikely that you'll get a 560 Ohm Tempco resistor. (Two other component values adjusted to 1k Tempco accordingly.)

1	47k Metall film resistor 0.25W	marked as 27k on board; directly below Tempco Resistor
	5% 0.25W Carbon resistors	
3	22M (22 MegOhm)	Use two 10M in series if you can't get 22M
2	10 Ohm	
	1% 0.25W Metal Film Resistors	1k5 means 1.5 kOhm etc.
2	100 Ohm	
2	240 Ohm	
3	330 Ohm	
3	470 Ohm	
2	620 Ohm	
1	1k	
2	1k5	
6	2k7	
2	3k	
6	3k3	
2	5k6	one is mounted vertically
2	10k	don't mix up with 18k
1	12k	
4	18k	don't mix up with 10k
2	30k	
1	33k	
1	56k	
2	82k	
12	100k	
2	150k	
2	220k	
1	470k	
2	1M (1 MegOhm)	one is mounted vertically
	Board connectors	
	Of course you can solder the wires directly to the board, and then don't need any connectors! Here's what connectors I used:	
9	PSS 254/2G (2pin, 2.54mm spacing)	in Germany, you get them from www.reichelt.de
5	PSS 254/3G (3pin, 2.54mm spacing)	
2	PSS 254/5G (5pin, 2.54mm spacing)	