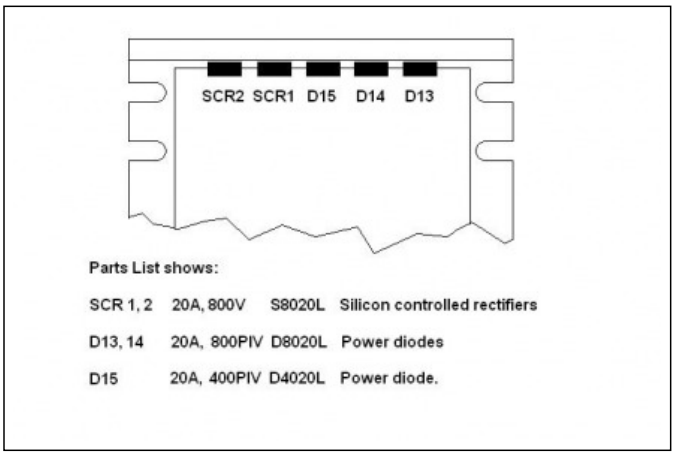
The Warco WM180 Lathe - Modifications (/)

A FEW NOTES ON THE SPEED CONTROL BOARDS USED IN THE WM180, FITTED TO MY DORE WESTBURY MILLING MACHINE AND USED IN "REAL BULL" MINI-LATHES.

The speed control board in my lathe bears a sticker saying it was made by Best Controls in Taiwan, I think it is a clone of an old version of the KBIC-240 board from KB Electronics in the US which I fitted to my Dore Westbury milling machine (http://andysmachines.weebly.com/dore-westbury-mill.html). Modern KB boards have many surface mount components, whereas the Best Controls version uses traditional components with leads.

If a complete new board is required, I'm sure a KBIC-240 would be a good replacement for the Best Controls version in my lathe. The KB Electronics website gives a list of UK distributors - specify England, rather than UK, when searching. Prices seem to vary (in August 2010) between £65 and £75, depending on the supplier you choose.

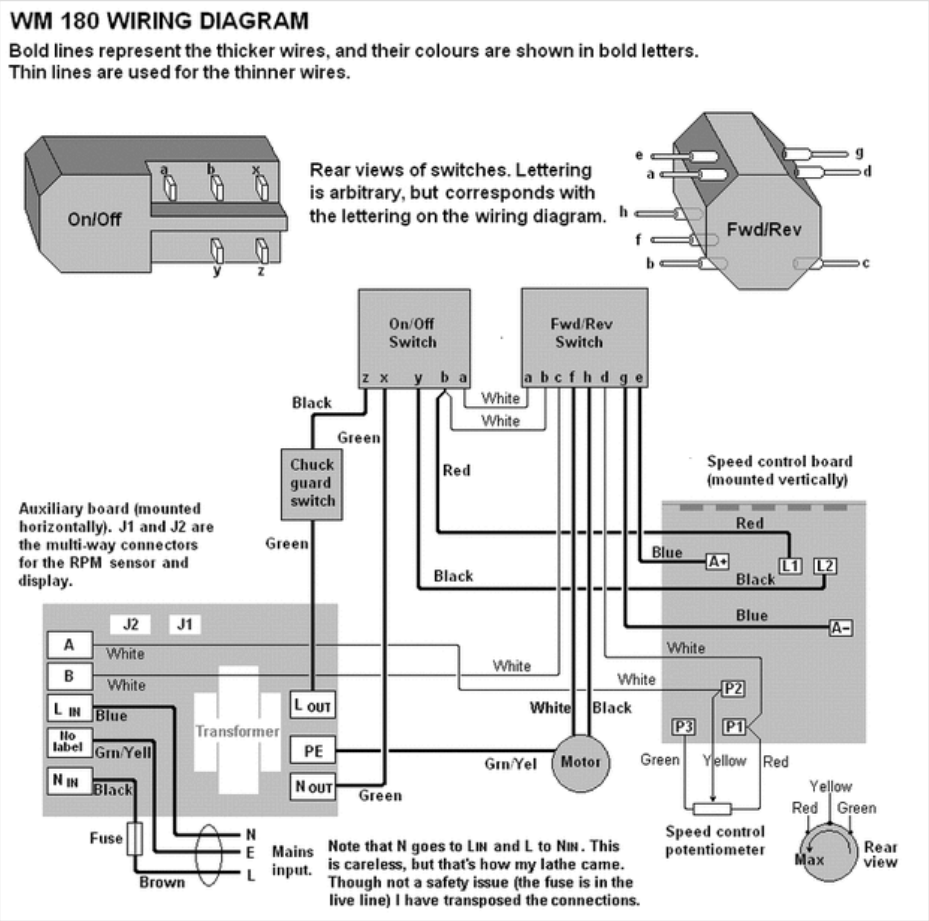
But it may not be necessary to pay out around £70 for a complete new board . The usual parts to fail on these controllers seem to be the SCRs and power diodes bolted to the upstand at one end of the heatsink. The manual which came with my KBIC controller in late 2009 contained a full (but out of date; it does not relate to the modern board with surface mount components) circuit diagram, components list and parts placement diagram. The manual on KB's website http://www.kbelectronics.com/manuals/kbic_manual.pdf (http://www.kbelectronics.com/manuals/kbic_manual.pdf) no longer contains a circuit diagram; they seem to have decided to make DIY repairs difficult. However, see the update further down this page.



This shows the location of the SCRs and power diodes, together with the component listings as per my out-dated manual, which covers six variants of the KBIC board. The components listed here are those specified for the KBIC-240, KBIC-240D and KBIC-240DS. The corresponding components in the KBIC–120, KBIC-125 and KBIC-225 have different ratings. Obviously, components should not be underrated for the job they are going to do, and the 2HP/1500W motor on my milling machine needs the 20A versions. My lathe motor is only 550W, and 10A versions (S8010L, D8010L, D4010L) would be perfectly adequate. Of course, it would do no harm to use overrated components, so on my milling machine I could use a D8020L (800PIV) for D15, rather than the D4020L (400PIV). The first digit in these component numbers represents their rated voltage (PIV in the case of the diodes). "4" represents 400v and "8" is 800v. The last two digits represent the rated amps, so "20" is 20A amps and "10" would be 10A. Those are momentary current ratings; the continuous ratings are only about 2/3 of those figures.

As to UK component suppliers, at the time of writing the parts shown in the diagram are available from Farnell. Someone more electronically savvy than me says the 2N6509 available in the UK from Cricklewood Electronics at low cost is rated at 800V 25A , so is a good replacement for SCR1 and SCR2. The part numbers shown in the diagram above seem to be used by the manufacturer Teccor, so Googling e,g. “Teccor S8020L” may be helpful. So may googling "Littelfuse" and the part number.

Returning to the control circuitry in my WM180 lathe, I have traced the jumble of wires connecting the various boards, switches etc and prepared the diagram below. I don’t know if all WM180s share the same layout and wire colours, and accept no responsibility for errors and omissions, but the diagram is shown in case it assists anyone. The incoming mains connections are shown as I found them, with Live going to “N in” and Neutral to “L in”. That didn’t present a danger here (the fuse was still in the Live line), but I have transposed them.



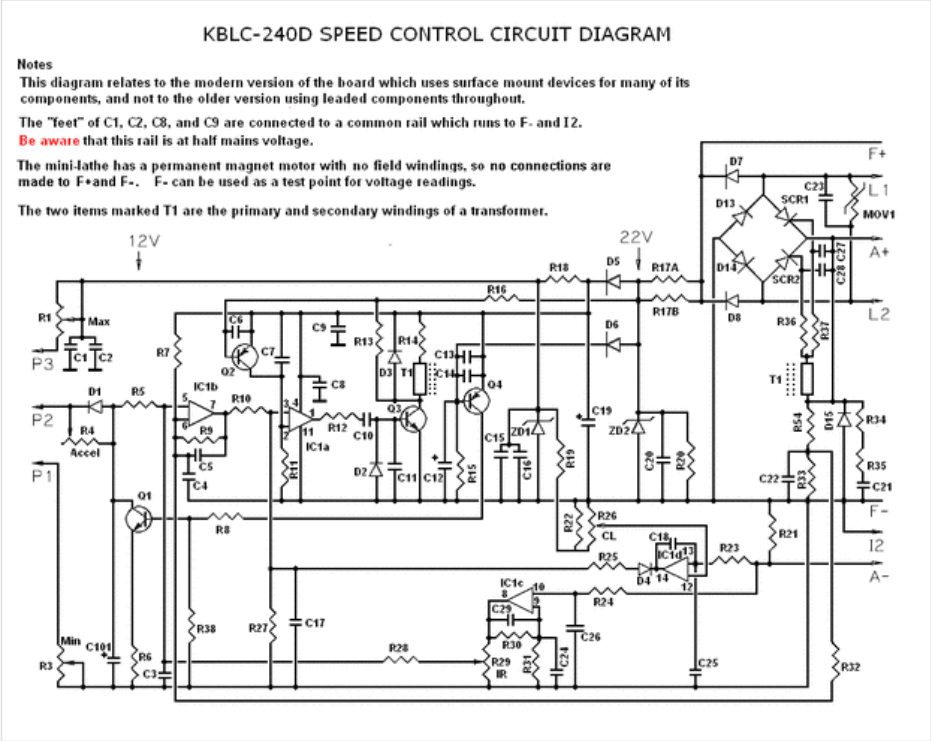
Incidentally, the Fwd/Rev switch is placed so that access to its terminals (which are screw, rather than push-on) is well-nigh impossible without removing it, and its fixings aren't immediately obvious. A thin blade will pop out the metallised label and expose the two screws beneath.

UPDATE

In 2012, I have heard from a gentleman who owns a Real Bull mini-lathe fitted with a genuine KBLC-240D speed control board. That board is a variant of the KBIC-240 mentioned above. It is fitted with SCRs and power diodes of reduced current rating (the motor on the Real Bull is about 2/3 HP), has no indicator LEDs fitted and there are other minor differences, but it is essentially the same board as the KBIC-240D. So, in case it helps anyone:

KBLC-240D SPEED CONTROL AND AUXILIARY BOARDS
AS USED ON A "REAL BULL" MINI-LATHE. E&OE

By courtesy of Pat Darragh who traced the circuits, drew them and identified the components.



KBLC-240D SPEED CONTROL BOARD COMPONENTS

Components with their numbers printed on the PCB have the same numbers here. The remainder have been given numbers which may not accord with the maker's number scheme.

RESISTORS				CAPACITORS		SEMICONDUCTORS		
R1	10K	R20	10K	C1	0.01?	D1	1N4005	1A 600PIV
R2	4K7	R21	****	C2	0.01?	D2	1N4005	1A 600PIV
R3	2K5	R22	3K3	C3	0.01	D3	1N4005	1A 600PIV
R4	100K	R23	47K	C4	0.01	D4	1N4005	1A 600PIV
R5	10K	R24	47K	C5	0.1	D5	1N4005	1A 600PIV
R6	2R2	R25	10K	C6	0.01	D6	1N4005	1A 600PIV
R7	4M7	R26	10K	C7	0.1	D7	1N5399	1.5A 1000PIV
R8	22K	R27	1M5	C8	0.01	D8	1N5399	1.5A 1000PIV
R9	3M3	R28	100K	C9	0.01	D13	D8010L	10A 800PIV
R10	100K	R29	10K	C10	0.01	D14	D8010L	10A 800PIV
R11	47K	R30	2M2	C11	0.022	D15	D8010L	10A 400PIV
R12	4K7	R31	47K	C12	4.7mfd?	ZD1		12V 1W
R13	15K	R32	47K	C13	0.22?	ZD2		12V 1W
R14	47R	R33	3K9	C14	0.22?	SCR1	A69108	10A 800V?
R15	22K	R34	470R	C15	0.01?	SCR2	A69108	10A 800V?
R16	22K	R35	470R	C16	0.01?	IC1	LM324AD	
R17A	15K	R36	47R	C17	0.001	Q1	NPN	600mA 40V
R17B	100K	R37	47R	C18	0.033	Q2	PNP	600mA 40V
R18	1K5	R38	3K3	C19	100mfd	Q3	NPN	600mA 40V
R19	82K	R54	110K	C20	0.022	Q4	PNP	600mA 40V
				C21	0.1			
				C22	0.1			
				C23	0.047	**PULSE TRANSFORMER**		
				C24	0.01	T1	Toroidal pulse transformer	
				C25	0.047			
				C26	0.01			
				C27	0.01?			
				C28	0.01?	**VARISTOR**		
				C29	0.1	MOV1		
				C101	22mfd			

R2 is the speed control pot on the lathe's control panel.

**** R21 is the horsepower resistor to suit the HP of the motor. On a Real Bull mini-lathe, it is typically 0.1 ohms

There are a number of zero ohm resistors on the PCB which are not shown on the circuit diagram.

A redundant 4K7 resistor may be present on the PCB, between C18 and D4 to the right of IC1. The KBLC-240D board is a variant of the standard KBIC-240D which has a "CL" indicator LED driven by pin 18 of IC1, via the resistor. This LED is absent on the KBLC-240D.

Capacitor values marked "?" may not be correct

REAL BULL MINILATHE AUXILIARY CONTROL BOARD