Emco Compact 5 CNC Lathe
Installing the WELturn controller circuit board

Safety First:

1) ensure the lathe is totally disconnected from the mains electricity supply before beginning work.
2) use a voltmeter to see if there is a voltage across the three large capacitors on the right, see Fig 1. If there is, discharge them though a 1K0 resistor: do not short circuit them.

Before you being work, please read ALL the instructions below so that you have a clear picture of what has to be done. The conversion is not difficult to do. It is a matter of taking great care to make the right connections.

The photographs show the conversion of a lathe with a video pcb and manual tool change. Some lathes do not have a video pcb. Other lathes have a video pcb and an auto tool change pcb. These variations are covered in these notes.

1) Slacken the screws retaining the back cover (no need to remove them).
2) Lift off the cover and place it out of the way.
3) Identify the items labelled in Fig 1.

Some pcb sockets will need to be disconnected. Prepare NOW a reliable scheme for putting their pcb plug numbers on them and showing which way round they go.

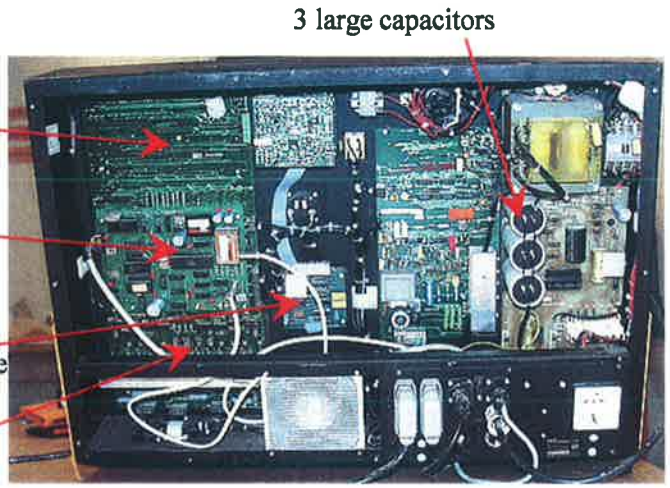

Fig 1 Inside the case

4) If you have a video pcb, refer to Fig 2
Unplug the three light coloured cables.
5a) Either, if you never intend to restore the lathe to its original condition, cut the cables at their furthest ends from the video pcb and remove them.
5b) Or, unplug the cables from the video pcb and coil them into a polythene bag. Seal the bag. Stow the bag in the bottom of the lathe case, on the right hand side. Take care not to obstruct the cooling fan, foul a heat sink or mains terminals.
6) Remove the four socket screws retaining the video pcb.
7) Remove the video pcb. Fig 3 shows the result.

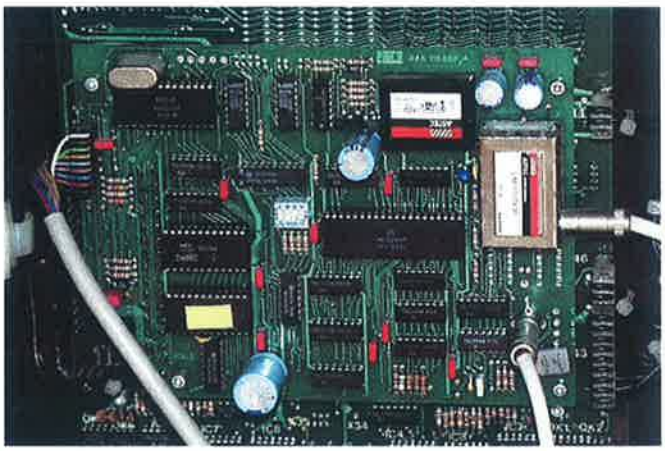
Fig 2 The video pcb

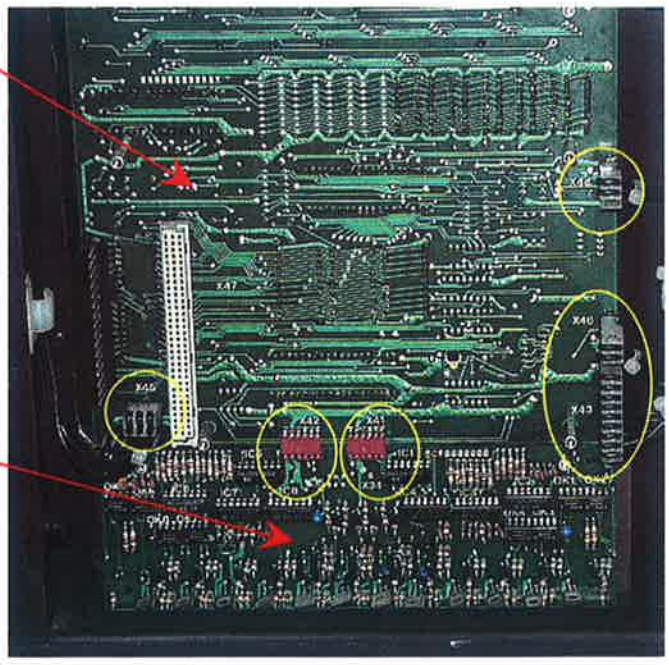

Fig 3 After removal of the video pcb

8) Refer to Fig 3. Remove connectors X43, X44, X45, X46 (ringed in yellow).
If you have an auto tool change pcb, remove connectors X48 and X49 as well (not shown ringed)..
9) On the front of the lathe case, remove the mm/min knob.
10) Remove the four pillars and socket screws which retain the processor pcb.
11) Carefully lift the processor pcb off connectors X34 and X35 (ringed in yellow).
12) Place the processor pcb aside. Fig 4 shows the result.

13) Refer to Fig 4. Identify connectors X34 and X35.
14) Very carefully, bend the six vertical pins on each connector forward through 90 degrees. Do this job a little at a time with suitable pliers. Use snipe nose pliers to support the short part of each pin which protrudes from the red plastic moulding so that the soldered connections to the pcb are not strained.
15) Fig 5 shows the result.
16) Reinstall the processor pcb. It no longer plugs into connectors X34 and X35. Secure the pcb with socket screws (do not re-use the four video pcb pillars or refit the video pcb - if there was one).
Replace the mm/min knob.
Reconnect wires and sockets to the correct processor pcb plugs.

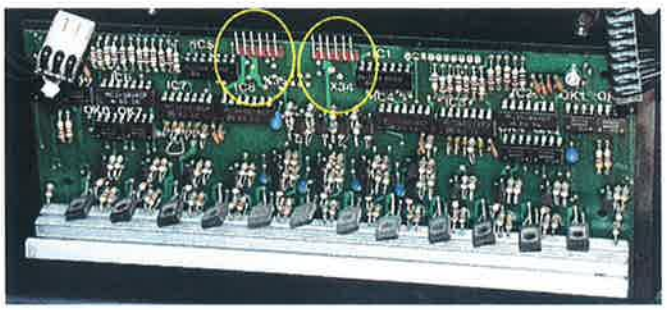

Fig 4 Connectors X34 & X35 before bending

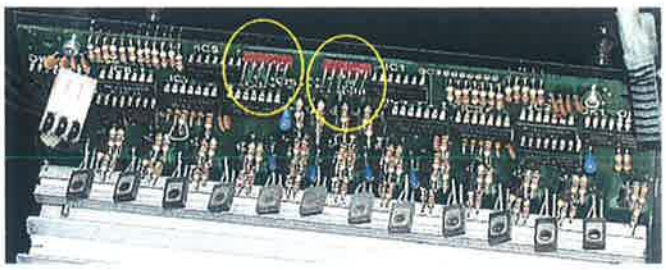

Fig 5 Connectors X34 & X35 after bending straight

17) In the narrow, tailstock, end of the lathe casing, cut a hole for the 9 way D socket to the dimensions shown in Fig 6, about 185mm from the top (further down than in the picture) See note below regarding hole punch hire.
. **Adjust the position according to the length of the two ribbon cables.**
Take great care to contain and collect all swarf and filings.
Orientate the hole carefully: the new controller pcb should be in the same plane as the existing pcbs in the lathe and its component side should face outwards. Fig 6 shows the hole when looking at the end of the lathe casing.

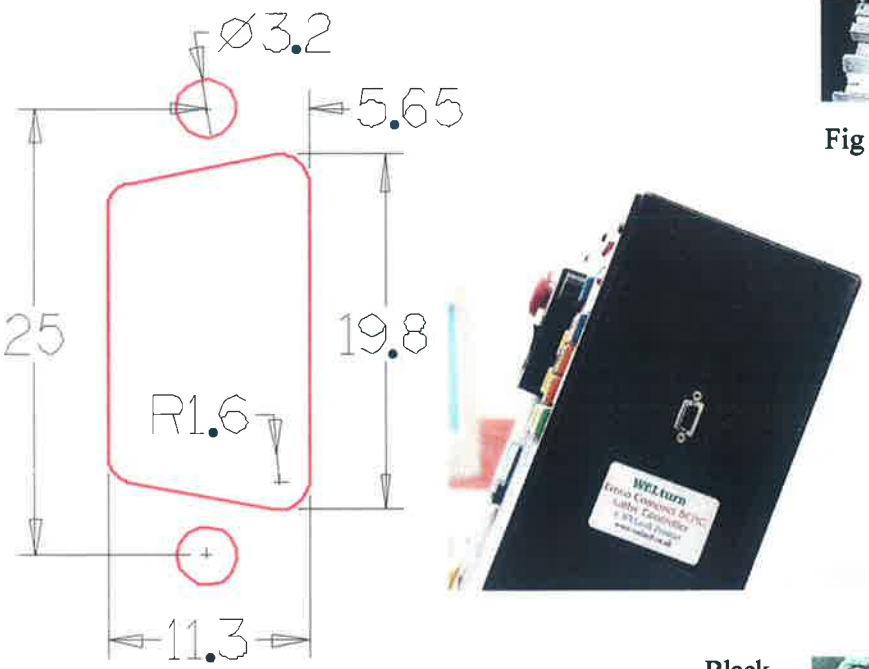

Fig 6 Dimensions & position of hole for 9 way serial socket

18) Secure the WELturn controller pcb to the lathe casing with the two hex head screws in the 9 pin serial socket.
19) Refer to Fig 7 and note the wires from connectors X44 and X46. Remove cable ties to free sufficient wire to fit Scotchlok splicers as shown.
20) Scotchloks are insulation displacement connectors. Therefore, do not strip the ends of the black, red, blue and brown wires from the WELturn controller pcb. Trim the length of these wires as necessary.
21) Take great care to correctly splice the black, red, blue and brown wires from the WELturn controller pcb to the existing wires as shown in Fig 7.

Double check you have got it right!

If you have not used Scotchlok splicers before, do a trial run with some scrap wire to get the hang of them. You can buy them in DIY and motoring stores.

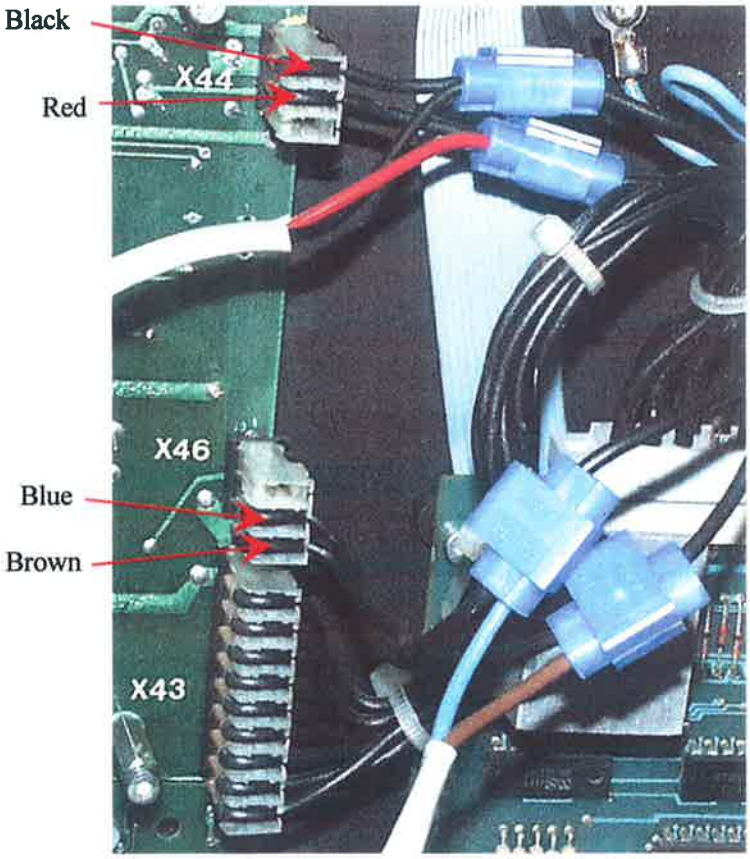

Fig 7 Splicing the new controller's wires

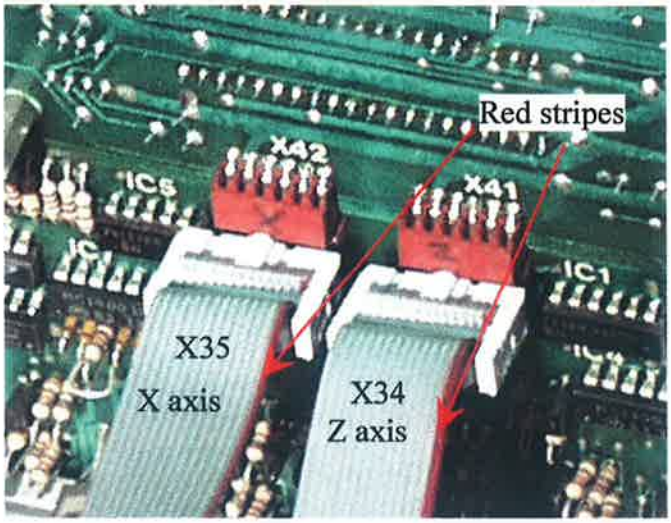

Fig 8 Attaching the WELturn controller ribbon cables

22) Refer to Fig 8. On the stepper motor driver pcb, connector X34 is for the Z axis motor and connector X35 is for the X axis motor.

23) Connect the two ribbon cables as shown in Fig 8. *Note the positions of the red stripes on the ribbon cables.* The unused holes in the sockets on the ribbon cables have been blocked deliberately to avoid misconnection: do not unblock them.

There are no longer any connections to X41 and X42 on the original processor pcb.

24) **Connecting to the Auto Tool Change Turret PCB** (if installed)
Refer to Fig 9. On the turret pcb, locate connector X68 and the wires from terminals 3 and 6. Cut these wires about 60mm from the socket. Strip the ends of these short lengths of wire. Use screw terminal blocks to connect the white and yellow wires from the WELturn controller pcb, as shown.
Secure the unstripped ends of the cut wires in a terminal block and tuck it safely out of the way, Fig 10.

Fig 10 Secured, unstripped cut ends of wires which went to X68, 3 and 6

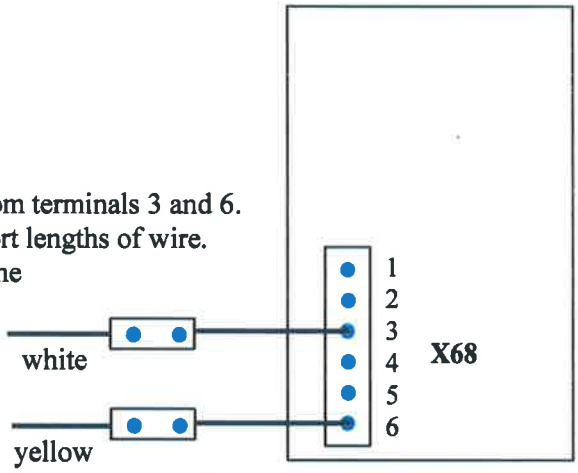

Fig 9 Auto Tool Change Turret pcb

25) Even though the old processor pcb is still "live" and the LEDs and seven segment code display still illuminate, the push buttons and mm/min knob have no effect or function in the new control system and should be ignored. You could fasten a cover over them if you wish.

26) Replace and secure the back cover of the lathe.

Optional Modifications

27) You can, if you wish, remove the cassette recorder and its pcb and also the Interface pcb, see Fig 11.

28) Remove the socket from connector X43 on the old processor pcb, see Fig 3.
The wires from this socket go to another socket which fits on to the interface pcb. This latter socket has two further wires attached to it (pins 4 and 5) which come from elsewhere in the system. Cut these two wires close to the socket. Insulate the ends of the wires securely and use a cable tie to attach them to a nearby cable loom.

29) Removal of the cassette deck leaves a hole in the front of the lathe case. Blank it off with suitable material.

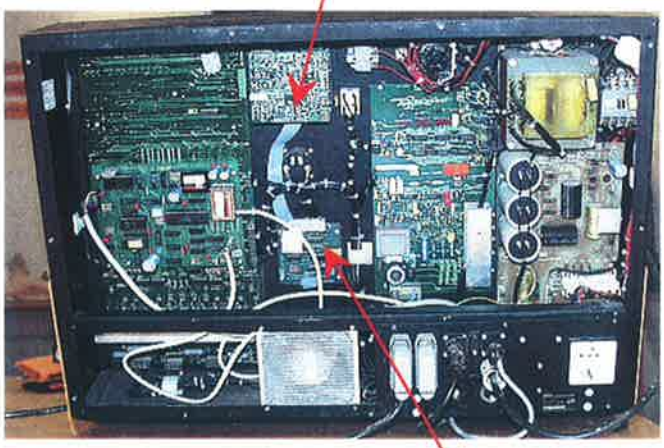

Fig 11

Serial Socket Hole Punch Hire (UK only)

RS Components Ltd sell a punch and die (RS stock number 548-300) which cuts a perfect D hole and has a template for accurate placing of the two fixing holes. But, it is very expensive, especially for one-off use. However, you can hire this punch and die from WELsoft for £5 plus £5 for Royal Mail Special Delivery, including insurance and packing.

A deposit equal to the current RS Component price inclusive of VAT (£105) will be required and the tool must be returned, complete and undamaged, by Royal Mail Special Delivery within ten days for refund of the deposit. £5 will be charged from the deposit for every day the tool is overdue.

Improvements

WELsoft welcome any suggestions for improving the clarity of these instructions: e-mail Peter Patient on peterpatient@btinternet.com

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