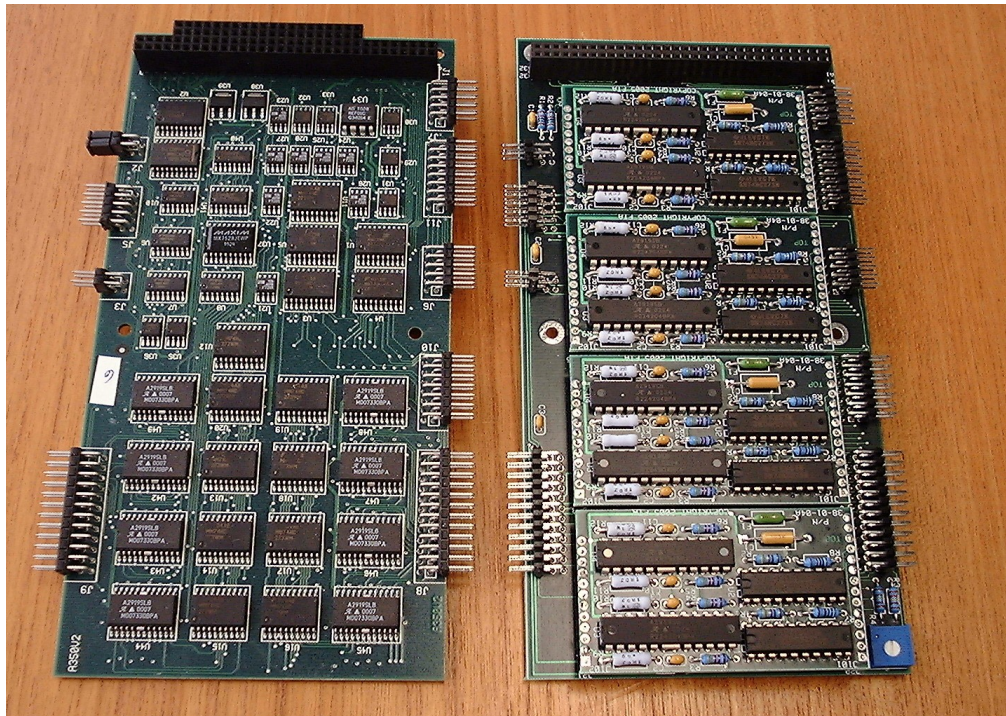


PC/104 Stepper Driver Validation

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This document will help you debug stepper driver problems on an FTA2000. Stepper motors are driven from PC/104 I/O boards stacked over a MicroSys 386 single board computer. The lower board in the stack drives the carousel and specimen stage – all axes except the six tip Z's and the focus and zoom motors which are driven by the upper board. If your problem concerns the carousel or specimen stage, you will have to remove the upper board in the stack to gain access to the lower board.

The stepper drivers are always Allegro A2919's, but both surface mount and thru-hole versions are used and these have different pinouts. The photo below shows both board types.



Board on left is surface mount (SMT) and board on right is thru-hole technology.

Both boards have the same external pinout. When you remove or install a board on the stack, you must be extra careful that the pins go into the lower socket correctly and are in the correct receptacles. You must be extra careful when you pull a board off the stack to do it slowly and with both hands in such a fashion that it comes straight up and *does not come off one end first and bend the pins*.

Similarly when you reinstall the edge connectors, you must be extra careful that the pins line up correctly and are not shifted over a position. *You will destroy the board stack if the connectors are plugged back together in a "shifted" fashion.*

Always

- use a flashlight so you can see that the connectors are aligned correctly
- have a second person check your work before applying power!

The principal test is to perform an ohmmeter check to see if the wiring is connected all the way through the motor windings. You do this with power off. The correct resistance for a tip Z motor winding is 10 ohms and the others will vary from 10 to 30 ohms for each of the two windings in a motor.

If the ohmmeter indicates correct continuity through the motor, then any problem is on the printed circuit board.

If the ohmmeter reading is either open or short (0 ohms), you must determine whether the interconnecting wiring is at fault or whether the motor itself is. This will require removing the top cap on the carousel. See the photos in

<http://www.firsttenangstroms.com/pdfdocs/FTA2000ValveSetup.pdf>

and also the general information in

<http://www.firsttenangstroms.com/pdfdocs/FTA2000CarouselSetup.pdf>

The wiring to each motor is color coded so you can go to each motor and check continuity by carefully making a small slit in the insulation and then performing an ohmmeter check at the motor.

Before you check a motor that you are having trouble with, check a good motor so you know your method and technique is correct. In the following table, windings "A" should have 10 to 30 ohms between them and similarly for windings "B".

Motor	Board "0"=lower "1"=upper	Winding	Edge Connector	Wire Color	Surface Mount IC	Thru hole IC
Specimen stage radial	0, device 0	A	J9 pin 1 J9 pin 2	Green Blue	U42 pin 17 U42 pin 14	U26 pin 1 U26 pin 21
		B	J9 pin 3 J9 pin 4	Black Red	U42 pin 20 U42 pin 23	U26 pin 2 U26 pin 5
Specimen stage theta	0, device 1	A	J9 pin 5 J9 pin 6	Green Blue	U43 pin 17 U43 pin 14	U27 pin 1 U27 pin 21
		B	J9 pin 7 J9 pin 8	Black Red	U43 pin 20 U43 pin 23	U27 pin 2 U27 pin 5
Specimen stage Z	0, device 2	A	J9 pin 9 J9 pin 10	Green Blue	U44 pin 17 U44 pin 14	U28 pin 1 U28 pin 21
		B	J9 pin 11 J9 pin 12	Black Red	U44 pin 20 U44 pin 23	U28 pin 2 U28 pin 5
Stage tilt	0, device 3	A	J8 pin 1 J8 pin 2	Green Blue	U45 pin 17 U45 pin 14	U29 pin 1 U29 pin 21
		B	J8 pin 3 J8 pin 4	Black Red	U45 pin 20 U45 pin 23	U29 pin 2 U29 pin 5
Carousel rotation	0, device 4	A	J8 pin 5 J8 pin 6	Green Blue	U46 pin 17 U46 pin 14	U30 pin 1 U30 pin 21
		B	J8 pin 7 J8 pin 8	Black Red	U46 pin 20 U46 pin 23	U30 pin 2 U30 pin 5
Lee pump	0, device 5	A	J8 pin 9 J8 pin 10	Green Blue	U47 pin 17 U47 pin 14	U31 pin 1 U31 pin 21
		B	J8 pin 11 J8 pin 12	Black Red	U47 pin 20 U47 pin 23	U31 pin 2 U31 pin 5
Hamilton distribution valve	0, device 6	A	J10 pin 3 J10 pin 4	Green Blue	U48 pin 17 U48 pin 14	U32 pin 1 U32 pin 21
		B	J10 pin 5 J10 pin 6	Black Red	U48 pin 20 U48 pin 23	U32 pin 2 U32 pin 5
Tip changer	0, device 7	A	J10 pin 7 J10 pin 8	Green Blue	U49 pin 17 U49 pin 14	U33 pin 1 U33 pin 21
		B	J10 pin 9 J10 pin 10	Black Red	U49 pin 20 U49 pin 23	U33 pin 2 U33 pin 5
Tip 1 Z	1, device 0	A	J9 pin 1 J9 pin 2	Green Blue	U42 pin 17 U42 pin 14	U26 pin 1 U26 pin 21
		B	J9 pin 3 J9 pin 4	Black Red	U42 pin 20 U42 pin 23	U26 pin 2 U26 pin 5

Tip 2 Z	1, device 1	A	J9 pin 5 J9 pin 6	Green Blue	U43 pin 17 U43 pin 14	U27 pin 1 U27 pin 21
		B	J9 pin 7 J9 pin 8	Black Red	U43 pin 20 U43 pin 23	U27 pin 2 U27 pin 5
Tip 3 Z	1, device 2	A	J9 pin 9 J9 pin 10	Green Blue	U44 pin 17 U44 pin 14	U28 pin 1 U28 pin 21
		B	J9 pin 11 J9 pin 12	Black Red	U44 pin 20 U44 pin 23	U28 pin 2 U28 pin 5
Tip 4 Z	1, device 3	A	J8 pin 1 J8 pin 2	Green Blue	U45 pin 17 U45 pin 14	U29 pin 1 U29 pin 21
		B	J8 pin 3 J8 pin 4	Black Red	U45 pin 20 U45 pin 23	U29 pin 2 U29 pin 5
Tip 5 Z	1, device 4	A	J8 pin 5 J8 pin 6	Green Blue	U46 pin 17 U46 pin 14	U30 pin 1 U30 pin 21
		B	J8 pin 7 J8 pin 8	Black Red	U46 pin 20 U46 pin 23	U30 pin 2 U30 pin 5
Tip 6 Z	1, device 5	A	J8 pin 9 J8 pin 10	Green Blue	U47 pin 17 U47 pin 14	U31 pin 1 U31 pin 21
		B	J8 pin 11 J8 pin 12	Black Red	U47 pin 20 U47 pin 23	U31 pin 2 U31 pin 5
Focus	1, device 6	A	J10 pin 3 J10 pin 4	Green Blue	U48 pin 17 U48 pin 14	U32 pin 1 U32 pin 21
		B	J10 pin 5 J10 pin 6	Black Red	U48 pin 20 U48 pin 23	U32 pin 2 U32 pin 5
Zoom	1, device 7	A	J10 pin 7 J10 pin 8	Green Blue	U49 pin 17 U49 pin 14	U33 pin 1 U33 pin 21
		B	J10 pin 9 J10 pin 10	Black Red	U49 pin 20 U49 pin 23	U33 pin 2 U33 pin 5

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