Voltage and Resistance Tests

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Motor Voltage Test

WHEN MAKING THESE CHECKS, BE VERY CAREFUL NOT TO SHORT THE PINS TOGETHER OR TO GROUND! IT ONLY TAKES A MOMENTARY SHORT TO DAMAGE A DRIVER CHIP.

The voltage test will allow you to confirm that your controller is supplying the correct voltages to the stepper motors. Erroneous readings indicate a driver chip or driver board failure. You will be measuring the voltage between certain pins of the DB25 connector on the back of your controller. Figure 1 (below) shows the layout of the DB25 connector on your controller. *Note: If you are using a remote board you will need to perform the voltage tests on the remote driver board rather than on your controller.*

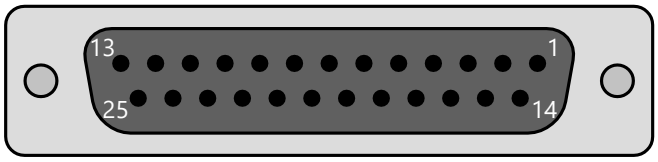

Figure 1: Female DB25 connector pin layout

Motor Voltage Test Procedure

Motor Voltage Table				
Pin Pair	Antenna Element	Driver Chip	Expected Voltage (idle)[1]	Expected Voltage (tuning)[2]
1-2	Driven	U5	~1-5VDC	~24-35VAC
3-4			~1-5VDC	~24-35VAC
5-6	Director 1 or 80m Coil	U6	~1-5VDC	~24-35VAC
7-8			~1-5VDC	~24-35VAC
9-10	Reflector	U7	~1-5VDC	~24-35VAC
11-12			~1-5VDC	~24-35VAC
14-15	Director 2	U8	~1-5VDC	~24-35VAC
16-17			~1-5VDC	~24-35VAC
18-19	Director 3	U9	~1-5VDC	~24-35VAC
20-21			~1-5VDC	~24-35VAC

Table 1: Expected motor voltages

Step 1: Begin by disconnecting power from your controller and then removing the DB25 connector from the back.

[1] Your voltage will vary depending on if you are using an SDA or Fluidmotion controller and whether the control cable is connected.
[2] Your voltage will vary depending on which power supply you are using.

Step 2: Reconnect power and turn the controller on.

Step 3: Using a multimeter, measure the voltage between the pins indicated in table 1, column 1. *Be sure to measure DC voltage during this step rather than AC!* You should be seeing around 5VDC. You only need to measure the voltages that correspond to the elements on your antenna. For example: if you have a 3-element antenna, measure the pin pairs associated with the Driven, Director 1, and Reflector elements.

Step 4: Now, tune the antenna and, while it is tuning, measure the voltage on the pins again. *This time be sure to measure AC voltage!*

Step 5: Retract the elements. Turn off the controller and disconnect power.

Step 6: Plug the DB25 cable back into the controller.

Conclusion

If you have significantly different values at any point in the test process, you can be reasonably certain that you have a damaged driver chip for that element. Be aware that in some cases, we have seen driver chips partially damaged, causing them to work part of the time. This can be confusing in the test process.

Relay Voltage Test

Relay Voltage Test Procedure

Some SteppIR antennas contain relays to change active elements. If you own an antenna with relays you should perform the relay voltage test to ensure that they are working properly. Erroneous readings indicate a fault with the relay board in your controller. Use the table below corresponding to your antenna to check the voltage on the indicated pin pairs in the indicated bands and modes. *Make sure that you are testing DC voltage!*

The " - " symbol in the charts below indicate that you should find zero voltage on the pin pair in that band and mode but you only really need to test the voltage where you see a 0VDC or 33VDC in the chart.

DB11						
Pin Pair	Relay	Direction	SDA 100		OptimizIR	
			6 - 17m	20m	6 - 17m	20m
13-23	R2	NORM	-	33VDC	-	33VDC
		180	-	0VDC	-	0VDC
		BI	-	33VDC	-	0VDC
13-24	R3	NORM	-	0VDC	-	0VDC
		180	-	33VDC	-	33VDC
		BI	-	0VDC	-	33VDC

DB18								
Pin Pair	Relay	Direction	SDA 100			OptimizIR		
			6 - 20m	30m	40m	6 - 20m	30m	40m
13-23	R2	NORM	-	33VDC	33VDC	-	0VDC	33VDC
		180	-	33VDC	0VDC	-	33VDC	0VDC
		BI	-	33VDC	33VDC	-	33VDC	33VDC
13-24	R3	NORM	-	0VDC	0VDC	-	33VDC	0VDC
		180	-	0VDC	33VDC	-	0VDC	33VDC
		BI	-	0VDC	0VDC	-	0VDC	0VDC

DB18E								
Pin Pair	Relay	Direction	SDA 100			OptimizIR		
			6 - 20m	30m	40m	6 - 20m	30m	40m
13-23	R2	NORM	-	0VDC	33VDC	-	0VDC	33VDC
		180	-	0VDC	0VDC	-	0VDC	0VDC
		BI	-	33VDC	33VDC	-	0VDC	33VDC
13-24	R3	NORM	-	0VDC	0VDC	-	0VDC	0VDC
		180	-	0VDC	33VDC	-	0VDC	33VDC
		BI	-	0VDC	0VDC	-	0VDC	0VDC

DB36 w/80m Dipole				
Pin Pair	Relay	Mode	Band	
			6 - 40m	60/80m
13-22	R1	NORM	-	33VDC
		180	-	-
		BI	-	-

DB42 w/80m Dipole						
Pin Pair	Relay	Mode	Band			
			6m	10 - 20m	30/40m	60/80m
13-22	R1	NORM	-	-	-	33VDC
		180	-	-	-	-
		BI	-	-	-	-
13-23	R2	NORM	33VDC	33VDC	-	-
		180	33VDC	0VDC	-	-
		BI	33VDC	33VDC	-	-
13-24	R3	NORM	-	-	33VDC	-
		180	-	-	33VDC	-
		BI	-	-	33VDC	-

Resistance Test (Antenna Wiring Test)

The resistance test will allow you to check the state of your stepper motors and wiring. Erroneous readings indicate faulty wiring or damaged stepper motors.

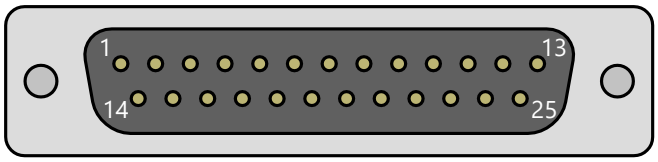

Figure 2: Male DB25 connector pin layout

Resistance Test Procedure

Resistance Table		
Pin Pair	*Antenna Element*	*Expected Resistance*
1-2	Driven	~ 20 Ohms
3-4		~ 20 Ohms
5-6	Director 1	~ 20 Ohms
7-8		~ 20 Ohms
9-10	Reflector	~ 20 Ohms
11-12		~ 20 Ohms
14-15	Director 2	~ 20 Ohms
16-17		~ 20 Ohms
18-19	Director 3	~ 20 Ohms
20-21		~ 20 Ohms
13-23	Relay 2	~ 280 or ~ 720 Ohms
13-24	Relay 3	~ 280 or ~ 720 Ohms

Table 2: Expected control cable resistances

The control cable uses 4 wires per motor (one motor in each element housing). Each motor has two wires for each of its two motor windings. This test assumes the antenna is connected to one end of the control cable and the measurements are taken at the 25-pin connector that mates to the controller. You need an ohmmeter capable of measuring 15 – 35 ohms with reasonable resolution or at least one that you can tell the difference between a dead short and 15 ohms.

Step 1: Remove the 25-pin DSUB control cable connector from the controller.

Step 2: Hold it so you are looking at the pins with them pointing at you. Orient the connector so the row with 13 pins is on top, now the upper left-hand pin is pin 1. See figure 2 (above) for reference.

Step 3: Measure the resistance between the pin pairs indicated. You only need to measure the resistance of wires that correspond to the elements on your antenna. For example: if you have a 3-element antenna, measure the pin pairs associated with the Driven, Director 1, and Reflector elements. You should read between about 18 ohms to 30 ohms depending on cable length between the pins listed below. (100' is about 23 ohms)

Step 4: Next make sure there is an open circuit between the following pins. (Any reading < 100 K ohms is bad)

- Connector case to any pin
- pin 1 to any pin except pin 2
- pin 3 to any pin except pin 4
- pin 5 to any pin except pin 6
- pin 7 to any pin except pin 8
- pin 9 to any pin except pin 10
- pin 11 to any pin except pin 12
- pin 14 to any pin except pin 15
- pin 16 to any pin except pin 17
- pin 13 is NOT used

Conclusion

If your antenna passes this test it does not mean it is wired correctly. You could have swapped two elements or even wired the whole thing backwards (started at the wrong end of the terminal strip) and it will still measure correctly because each connector pair has a motor winding connected to it, but it is the wrong one. This test just takes you to the next step of trying to determine if the antenna is wired correctly and then finally determining if the elements are physically moving. This is an open loop system and the controller has no way of knowing if the elements are really moving when commanded to.