

TB152 (Rev1) - Inverter Control

Closing a switch between the inverter inputs for spin forward or reverse through an E-stop contactor to input common on the inverter will turn it on CW or CCW. Opening the switch will turn the inverter off.

The inverter controls the speed of the spindle motor by varying the frequency to the spindle motor. The maximum speed of the motor is determined by the Maximum frequency set in the inverter. The inverter will output this frequency when it receives a 10vdc signal from the analog out of the control. Most inverters are linear so that an analog signal of 2.5vdc will cause the inverter to output $\frac{1}{4}$ of the maximum frequency to the spindle motor, 5vdc = $\frac{1}{2}$ of the maximum frequency, 7.5vdc = $\frac{3}{4}$ of the maximum frequency. (See Example 1)

Example 1

If the maximum frequency of the inverter is set to 100Hz the following will apply.

Voltage	0v	.5v	1v	1.5v	2v	2.5v	3v	3.5v	4v	4.5v	5v
Frequency	0hz	5hz	10hz	15hz	20hz	25hz	30hz	35hz	40hz	45hz	50hz
Voltage	5.5v	6v	6.5v	7v	7.5v	8v	8.5v	9v	9.5v	10v	
Frequency	55hz	60hz	65hz	70hz	75hz	80hz	85hz	90hz	95hz	100hz	

There is a switch on the inverter that will open or close if the inverter faults out. This is connected to an input on the PLC in the control.

There is also a Reset output for the control to reset the inverter after it faults out. The RESET output turns on whenever the control receives a fault signal and an E-stop signal at the same time.

SPINDLE SPEED CONTROL

With the control in AUTO spindle mode.

No matter what number is entered for the Maximum spindle speed on the setup screen the analog output will be 10vdc when the control is commanded to spin at the maximum speed entered in setup and the Spindle Speed Override is set to 100%. If the control is commanded to spin at half of the maximum spindle speed the analog output will be 5vdc. (See Example 2)

Example 2

If 5000 rpm is entered for the maximum spindle speed the voltage of the analog out will be the following when the control is commanded to the following speeds with the override set to 100%.

SPEED	0	250	500	750	1000	1250	1500	1750	2000	2250	2500
VDC	0V	.5v	1v	1.5	2v	2.5	3v	3.5v	4v	4.5v	5v
SPEED	2750	3000	3250	3500	3750	4000	4250	4500	4750	5000	

VDC	5.5v	6v	6.5v	7v	7.5v	8v	8.5v	9v	9.5v	10v	
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In MANUAL spindle mode with a UNI-CONSOLE

No matter what number is entered for the Maximum spindle speed on the setup screen the analog output will be 5vdc when the spindle is turned on with the Spindle Speed Override set to 100%. For each push of the override buttons up or down the analog out will change by + or -.5v. (See Example 3)

Example 3

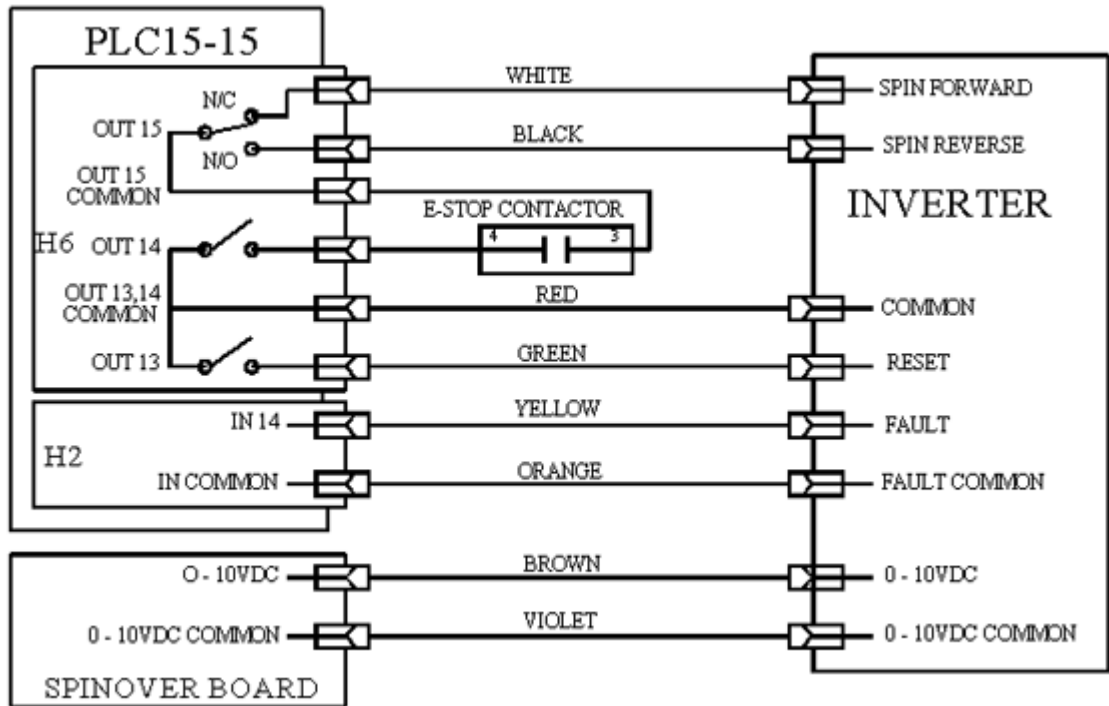
OFF	100%	-1	-2	-3	-4	-5	-6	-7	-8	-9
0v	5v	4.5v	4v	3.5v	3v	2.5v	2v	1.5v	1v	.5v
100%	+1	+2	+3	+4	+5	+6	+7	+8	+9	+10
5v	5.5v	6v	6.5v	7v	7.5v	8v	8.5v	9v	9.5v	10v

With an M39 pendant or an older console the Spindle Speed Override uses a potentiometer so that the voltage of the analog will be from 0vdc when the spindle is off to 10vdc when the spindle is on and the override is turned all the way up. When a Spinover board or a RTK2 is used for the analog out this voltage will be in 256 steps (.4v per step), With a PLCIO2, a SERVO3IO, or a SPIN232 the analog out voltage will be in 4096 steps (.002v per step).

SETTING UP THE CONTROL FOR MAXIMUM SPINDLE SPEED

To set up the control and inverter for the correct spindle speeds, follow these directions.

1. Enter in the desired maximum speed in the setup screen.
2. Then following the instructions in the inverter manual set the inverter maximum frequency to 120hz.
3. In MANUAL SPINDLE MODE turn the SPINDLE OVERRIDE all the way down.
4. Turn the spindle on CW and make sure it is turning the correct direction. If it is turning the wrong direction correct this by turning off power and swapping 2 legs of the 3phase between the inverter and the motor.
5. Repeat step 3 and 4.
6. Monitor the actual spindle speed with a tachometer and slowly increase the SPINDLE OVERRIDE until the correct spindle speed is reached. If the maximum speed cannot be reached turn the spindle off and restart at step 2 with a higher maximum frequency.
7. Write down the actual frequency that the inverter is outputting (from the control panel on the front inverter) and then turn off the spindle.
8. Then following the instructions in the inverter manual set the inverter maximum frequency to the frequency in step 7.
9. Go to AUTO SPINDLE MODE; With the OVERRIDE at 100%, in MDI start and run the spindle at the lowest rpm that the spindle will normally be operated at. Change the maximum frequency of the inverter so the actual spindle speed is within 1 rpm at this speed.
10. With a tachometer check the spindle speed across the full speed range.
11. It is more critical for the spindle speed to be exact at lower speeds and it is normal for the actual spindle speed to be correct at low speed and up to 50 rpm slower then the readout at the max rpm.
12. If there is a multi-range spindle see the operating manual for setting parameters 65-67.

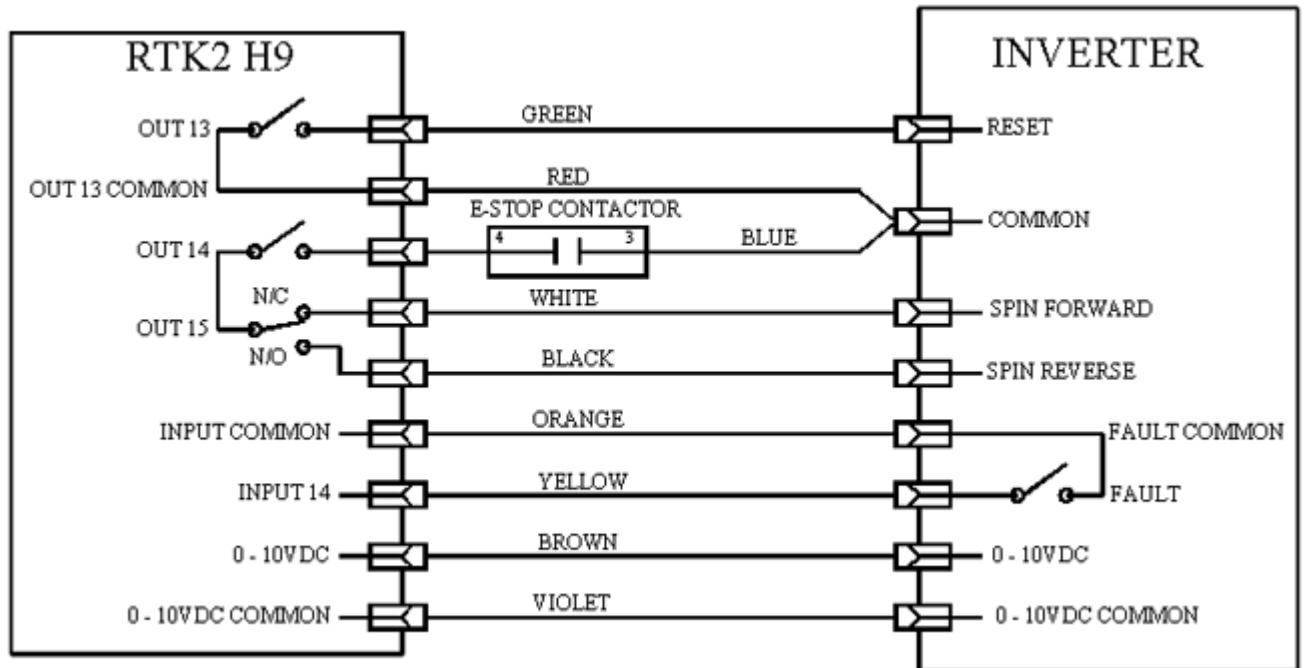


The PLC15-15 requires the addition of a SPINOVER board to produce the 0 – 10vdc. The SPINOVER output is an 8 BIT output that produces 0 – 10VDC in 256 Steps. Parameter 31 should be set to 0.

For use with a lathe or when more precise speed control is needed a SPIN232 board is used to provide the 0 to 10VDC instead of the SPINOVER board and parameter 31 is set to a 1 for COM port 1 or a 2 for COM port 2.

The fault input is power internally by 5vdc and is triggered by pulling it down to input common (5vdc common).

RTK2 INVERTER CONNECTION



The 0 –10VDC is an 8 BIT output that produces 0 – 10VDC in 256 Steps. Parameter 31 should be set to 0.

For use with a lathe or when more precise speed control is needed a SPIN232 board is used to provide the 0 to 10VDC instead of the RTK2 and parameter 31 is set to a 1 for COM port 1 or a 2 for COM port 2.

The fault input is power internally by 5vdc and is triggered by pulling it down to input common (5vdc common).

Document History

Rev1 Created on 2000-01-05 by #000