

Control Techniques “SP” Spindle Drive Setup

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Overview:

- This document will walk you through the setup of a Control Techniques SP Spindle Drive.

Prerequisites:

- CT-USB cable to connect from console to CT Drive(optional). Set up can be completed using the keypad.
<http://www.galco.com/buy/Control-Techniques/CT-USB-CABLE>
- USB flash drive containing the CT Soft software version **CTSoft_V01_15_04**.
<http://www.emersonindustrial.com/en-US/controltechniques/downloads/userguidesandsoftware/Pages/softwaretools.aspx>
- USB flash drive containing default configuration file if you have one (optional). Parameters can also be entered manually.

1.0 - CT Soft Software install:

1. Before you begin make sure to check that all wiring on the drive is completed and correct.
2. Plug in USB cable to console and to the drive. If not using cable and CT Soft software go to page 13 Section 2.0.

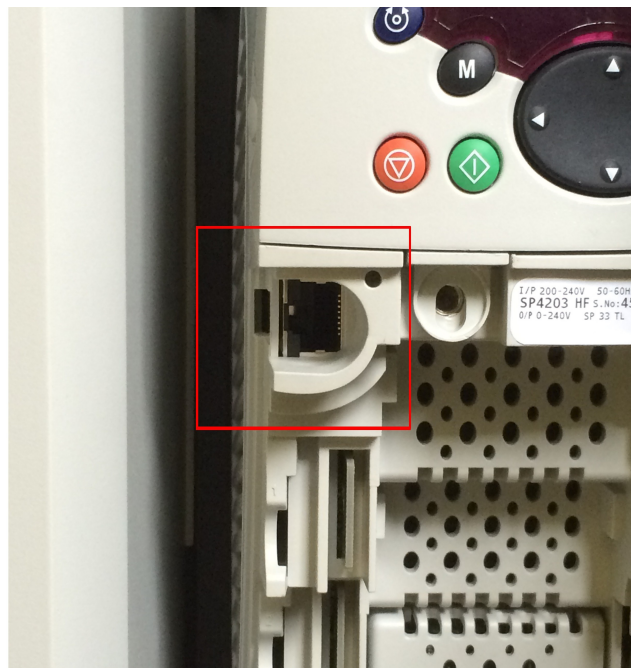


Figure 1

3. Plug in USB flash drive with the **CTSoft_V01_15_04** software.
4. Open CT Soft file folder and double click **CTSoft_V01_15_04.exe** and follow install prompts.

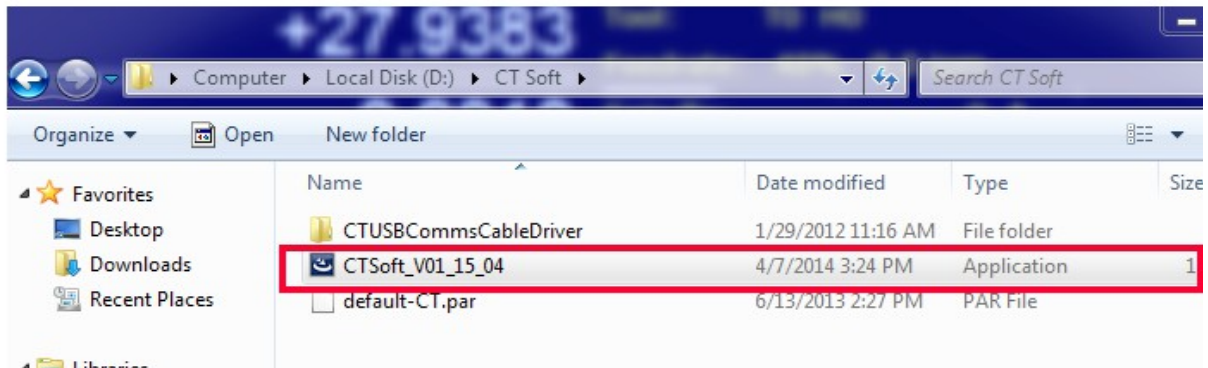


Figure 2

5. Once install is complete you must now check the driver at the control panel.
6. Open Control panel change view to small icons and select device manager.

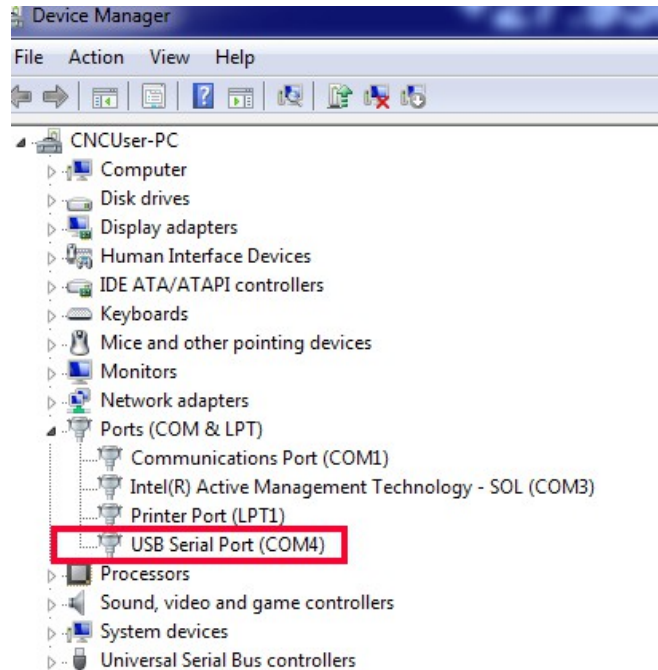


Figure 3

7. In device manager under Ports there will be a USB Serial Port with a COM number in parenthesis. Note the COM number as it will be used later in the setup process.
8. Also if the driver files did not install correctly you will need to manually install the driver files.

1.1 - Run CT Soft:

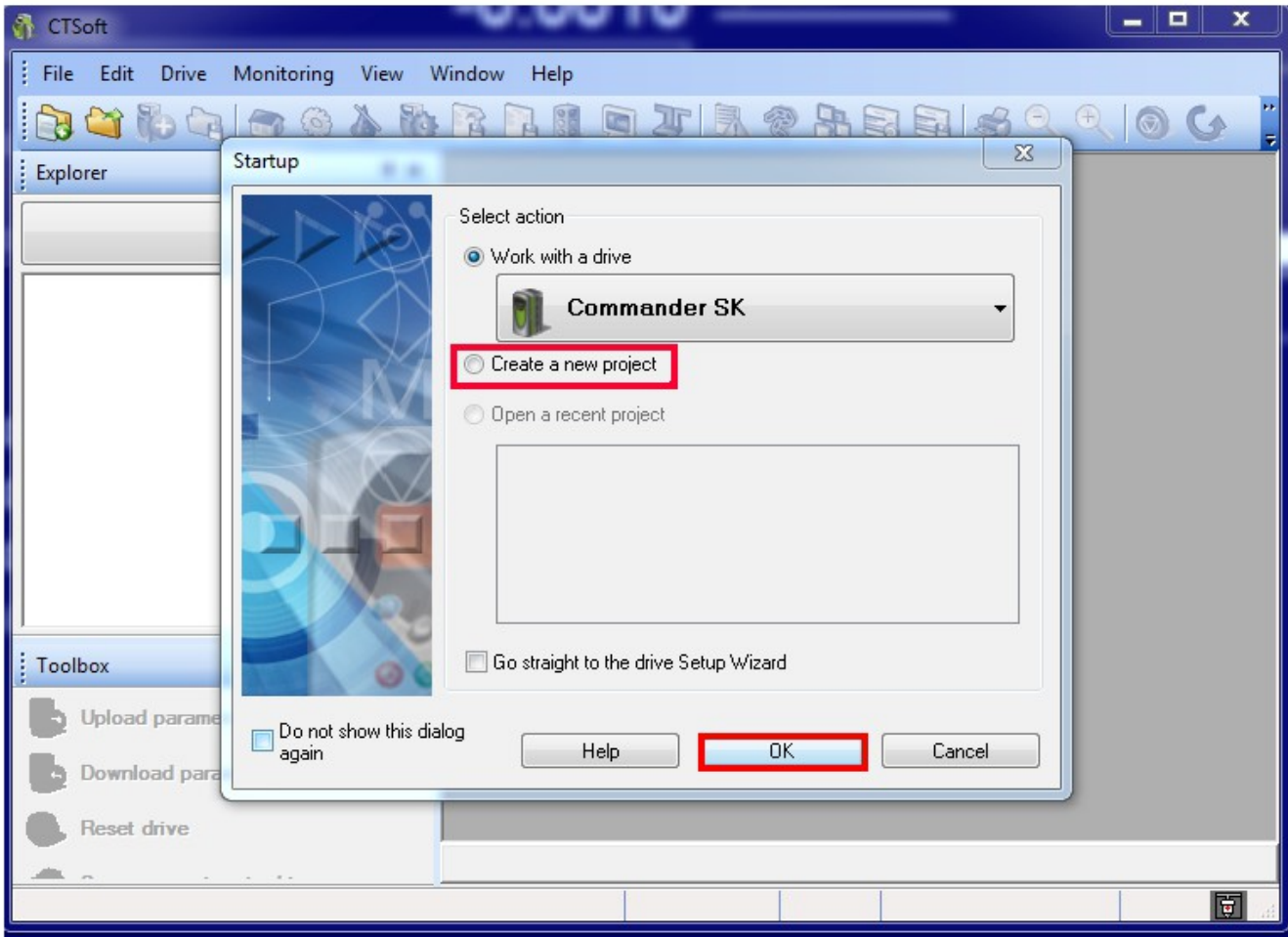


Figure 4

1. Open the start menu and run CT Soft
2. Select create new project for first time setup and select OK.

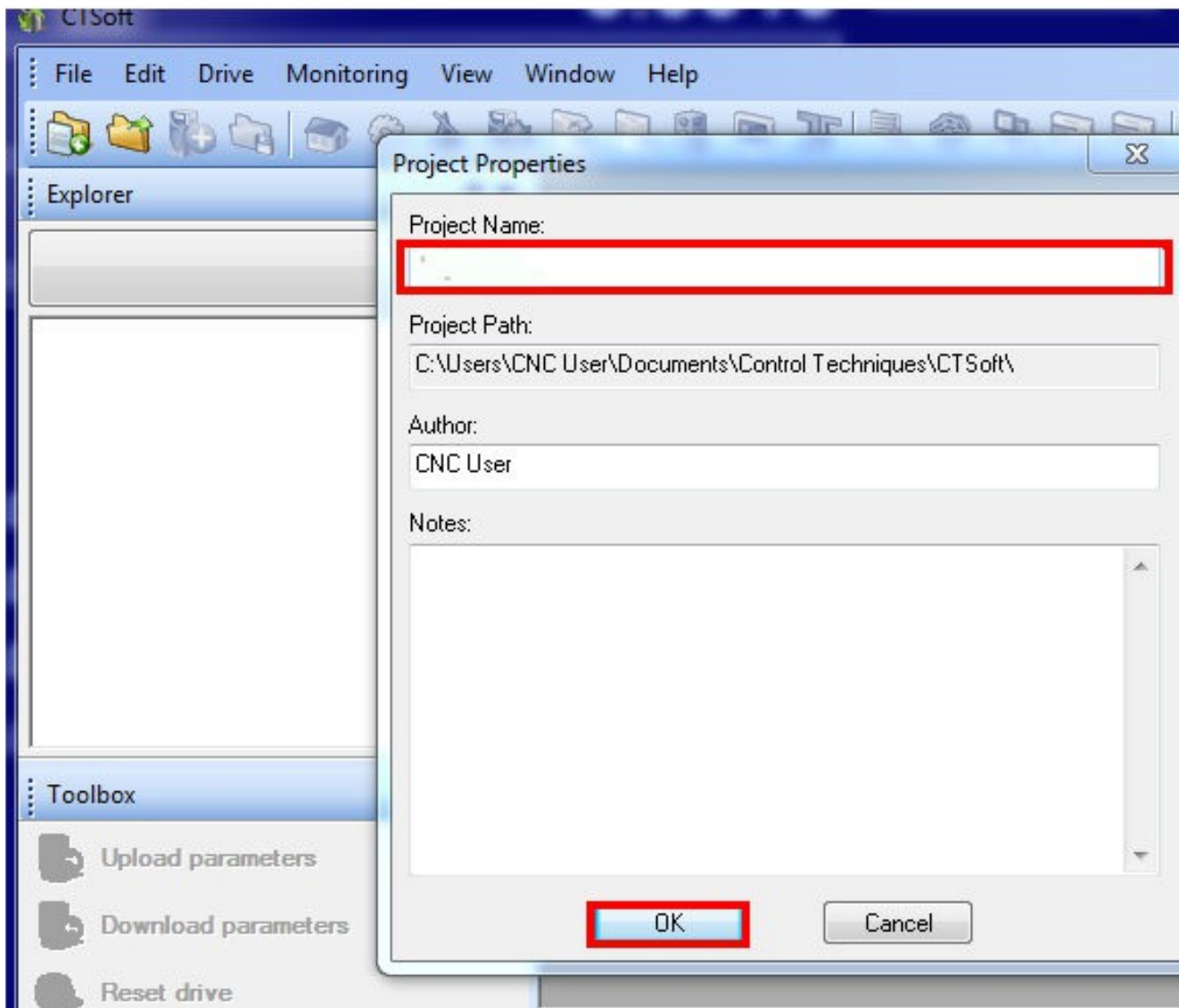


Figure 5

3. In project properties define the project name as the serial number of the control and select OK

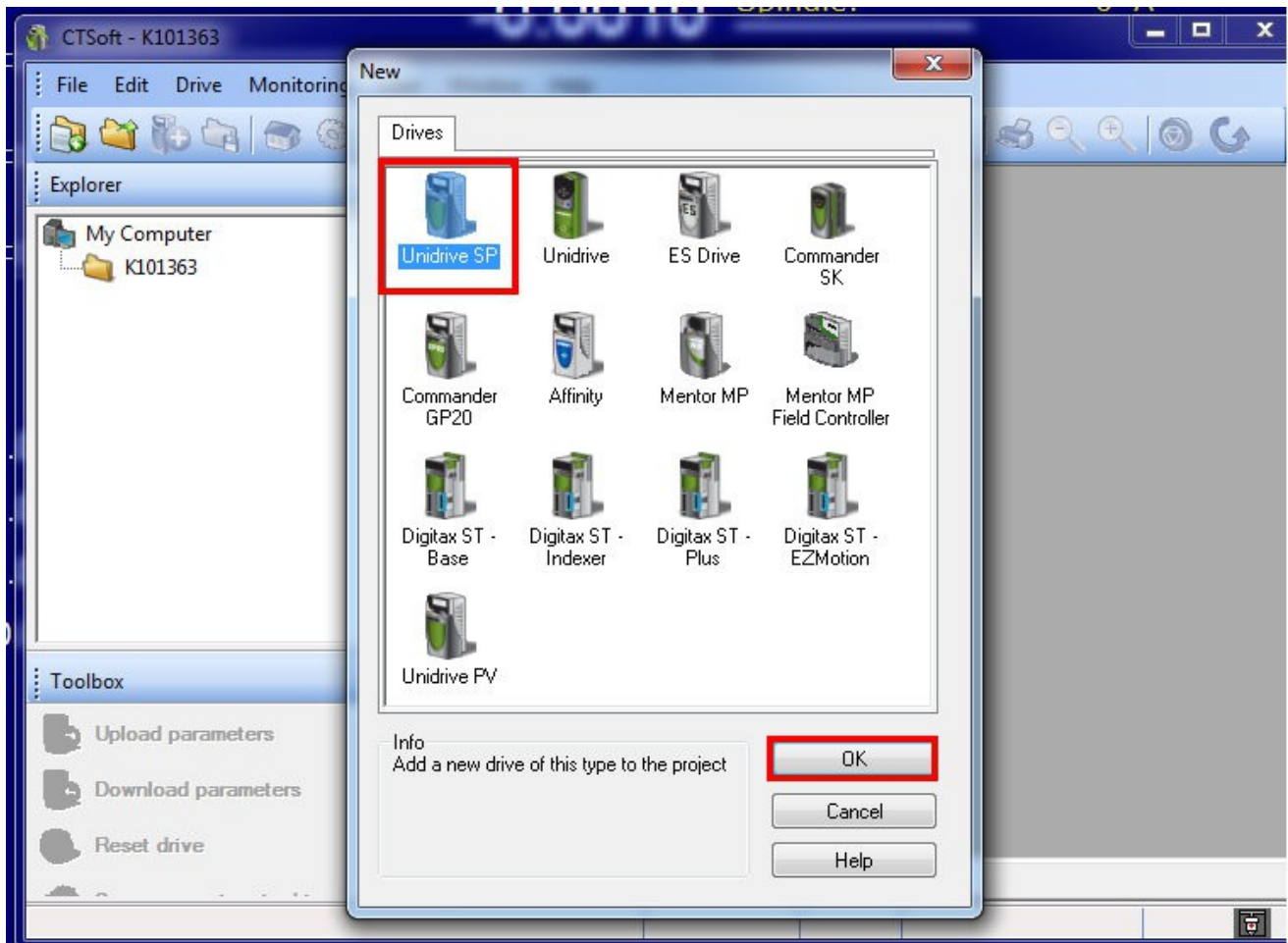


Figure 6

4. Select Unidrive SP and click OK.

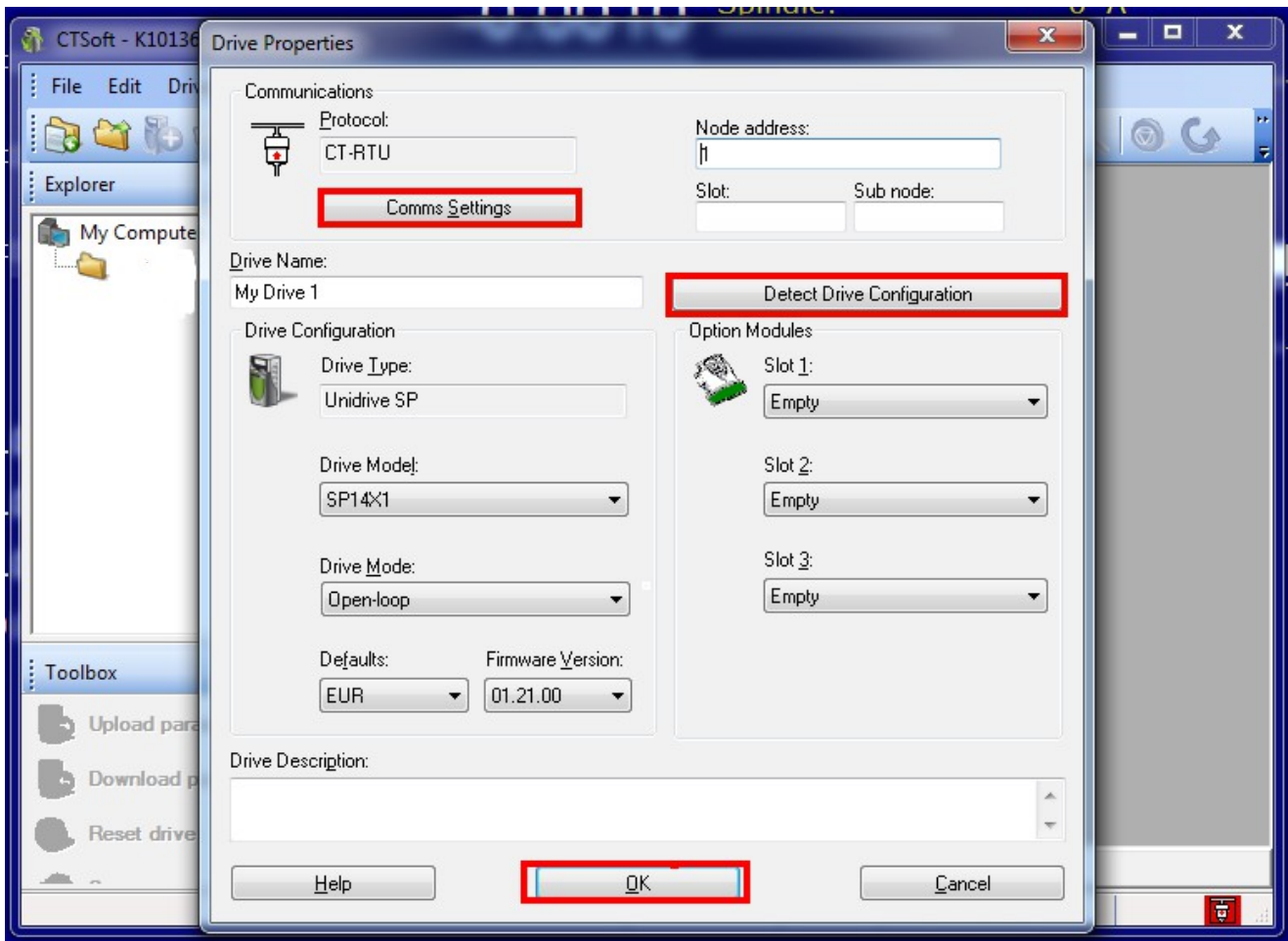


Figure 7

5. In Drive Properties window click Detect Drive Configuration.
6. If communication error pops up click ok then click on Comms Settings.

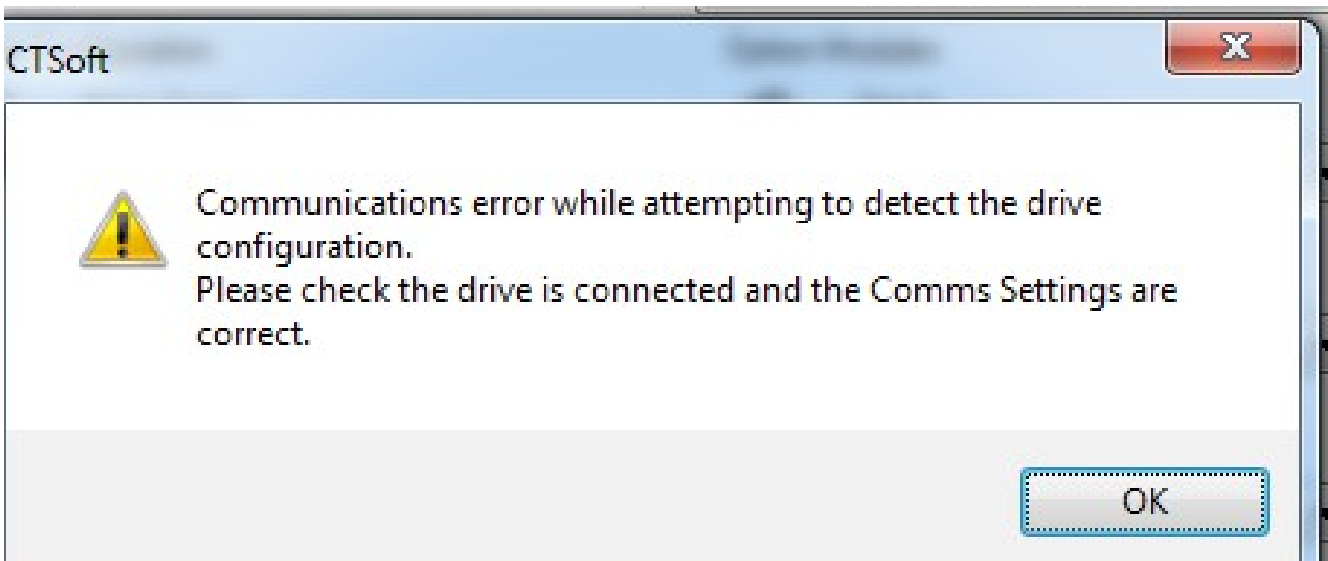


Figure 8

7. In Comms Settings window ensure protocol is set to **CT-RTU** and change the hardware setting to the Comm USB Serial Port noted earlier on page 2 step 7.

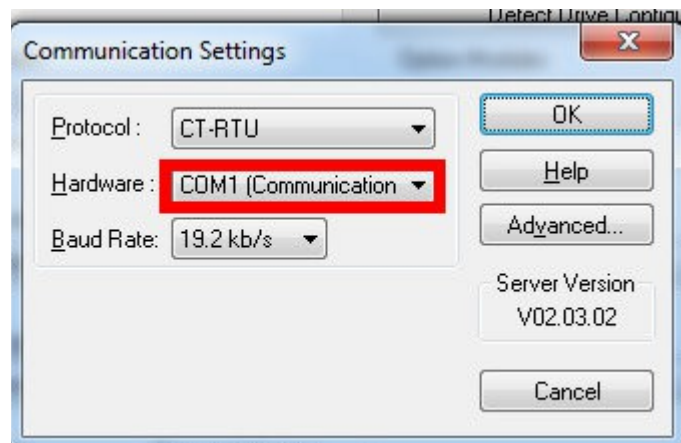


Figure 9

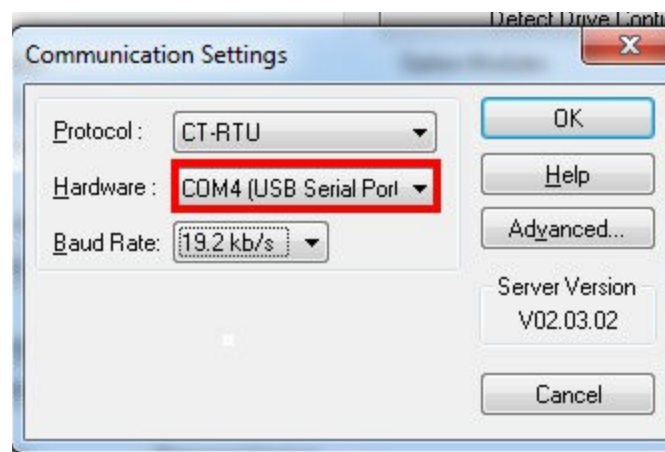


Figure 10

8. Click OK and click Detect Drive Configuration again.
Box should appear saying that the settings were successfully read from selected drive. Click OK.
9. Select drive menu and select online. [Figure 11](#)

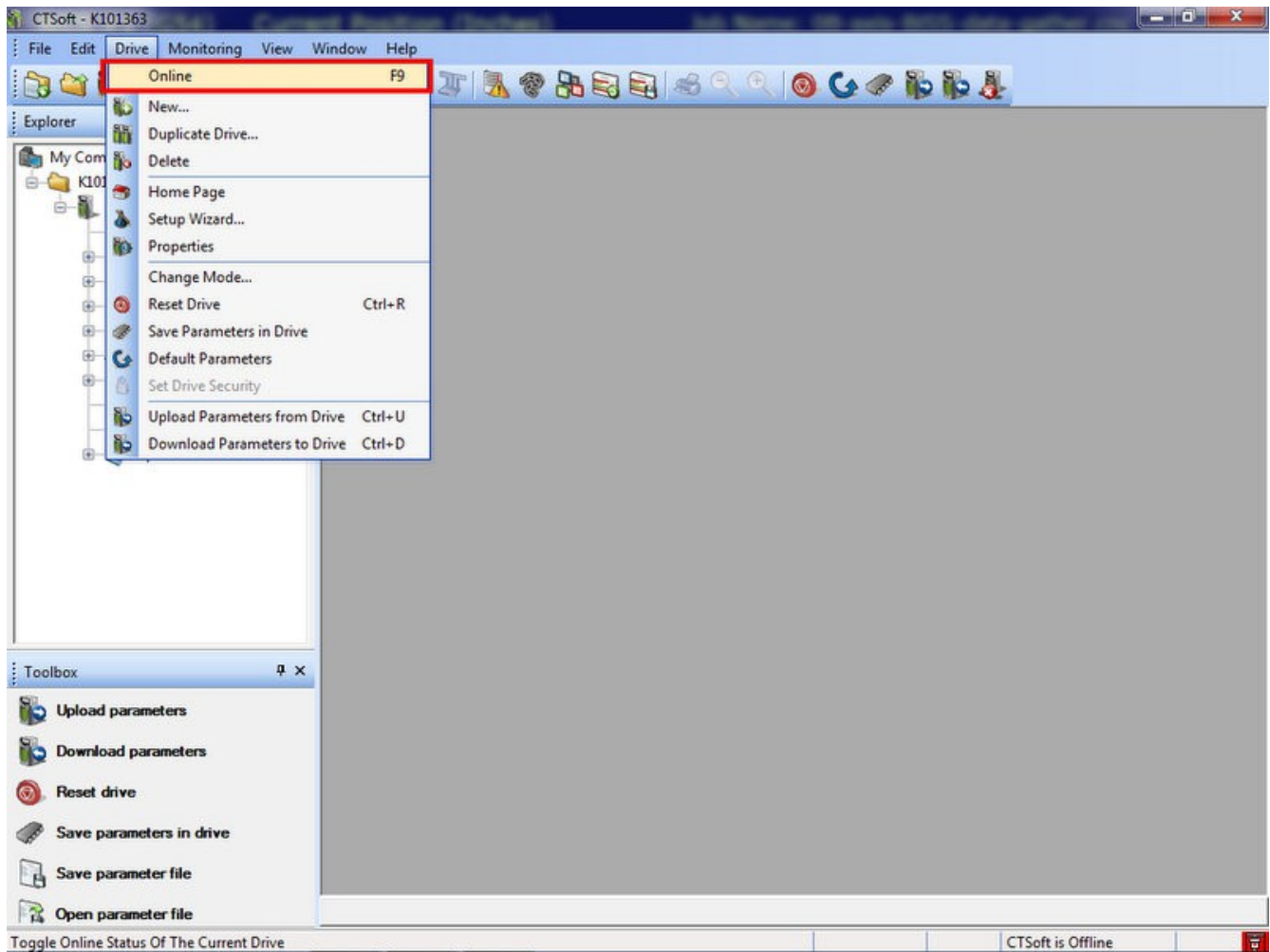


Figure 11

10. Check to see if the bottom right hand corner has changed from red to green and says that the drive is online. Note that it will say tripped next to it. See figure 12.
11. For next steps a mouse is recommended.
12. Select open parameter file if there is a default parameter file to load. In the case of Centroid first setup use **default-CT.par**
13. If you do not have a default parameter file you can change the parameters manually. The parameters to change and the values can be found on page 12 of this manual. See figure 15.
14. Window will pop up asking if you want to load file. Click yes.
15. Window will pop up asking if you want to download parameters to drive now. Click yes.

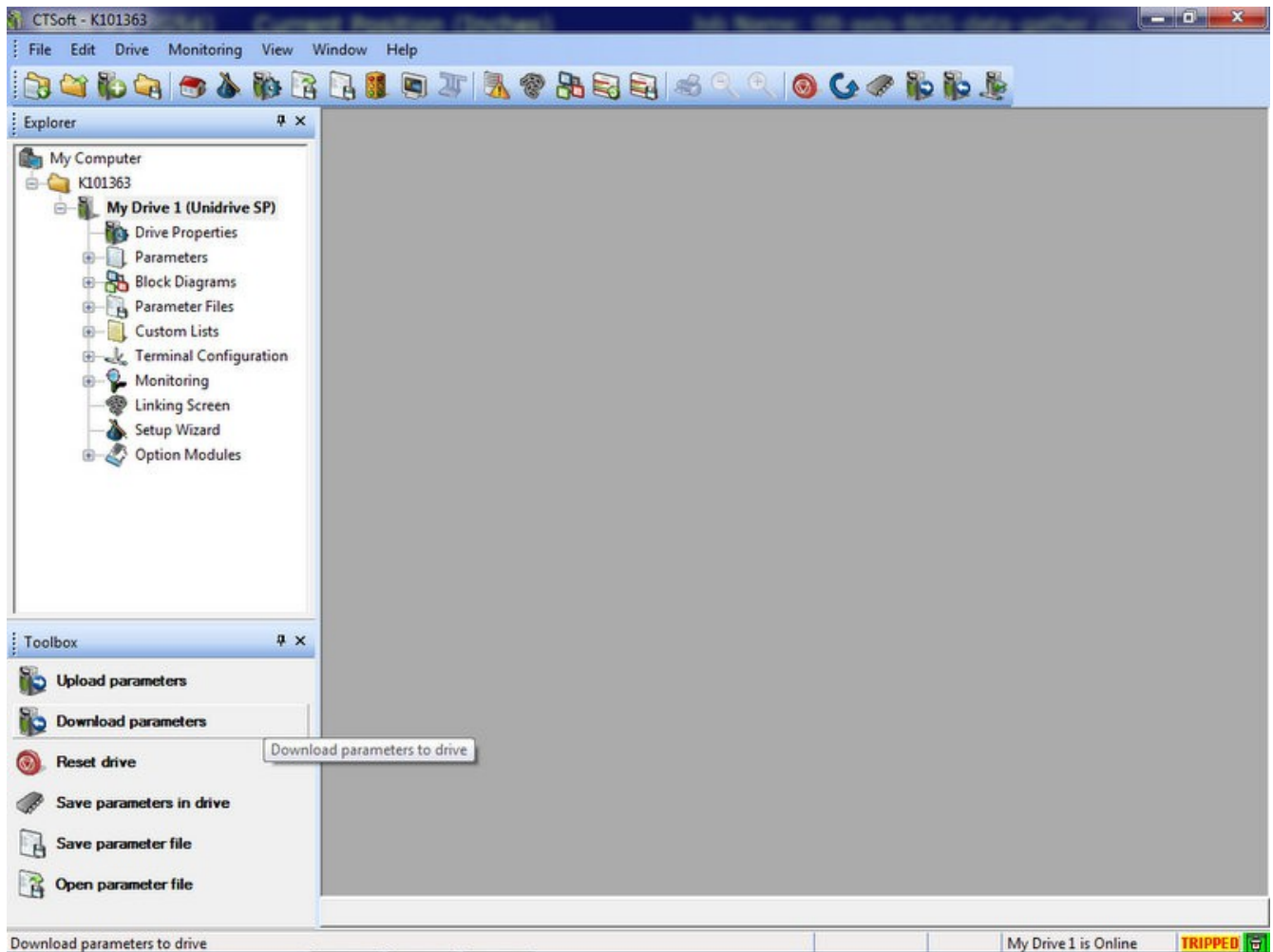


Figure 12

16. Once the parameters are downloaded to the drive. Select no when asked if you want to reset the drive. The green light at the bottom right of the screen will remain but the fault will have disappeared since the parameters are now set.
17. Click Save parameters to drive.
18. Now you will reset the drive by selecting Reset drive in the toolbox.

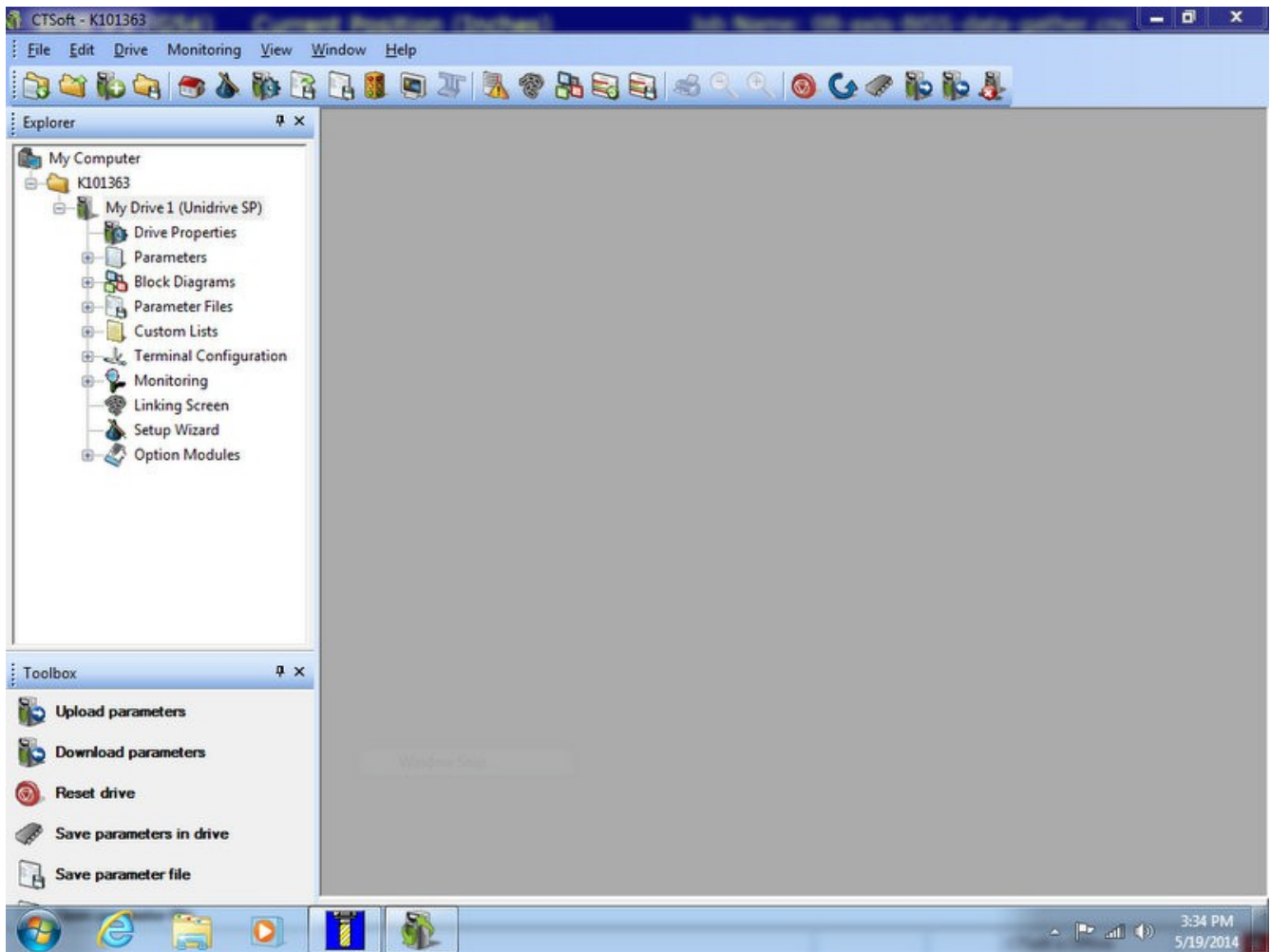


Figure 13

19. Now in the explorer section maximize the parameters section to see the loaded parameters. The ones highlighted in pink are the ones that have been changed from the default setting. Double check to make sure these are all set to the desired values outlined in figure 15. To change parameters you must double click the individual parameter menu groups to open them and make changes.

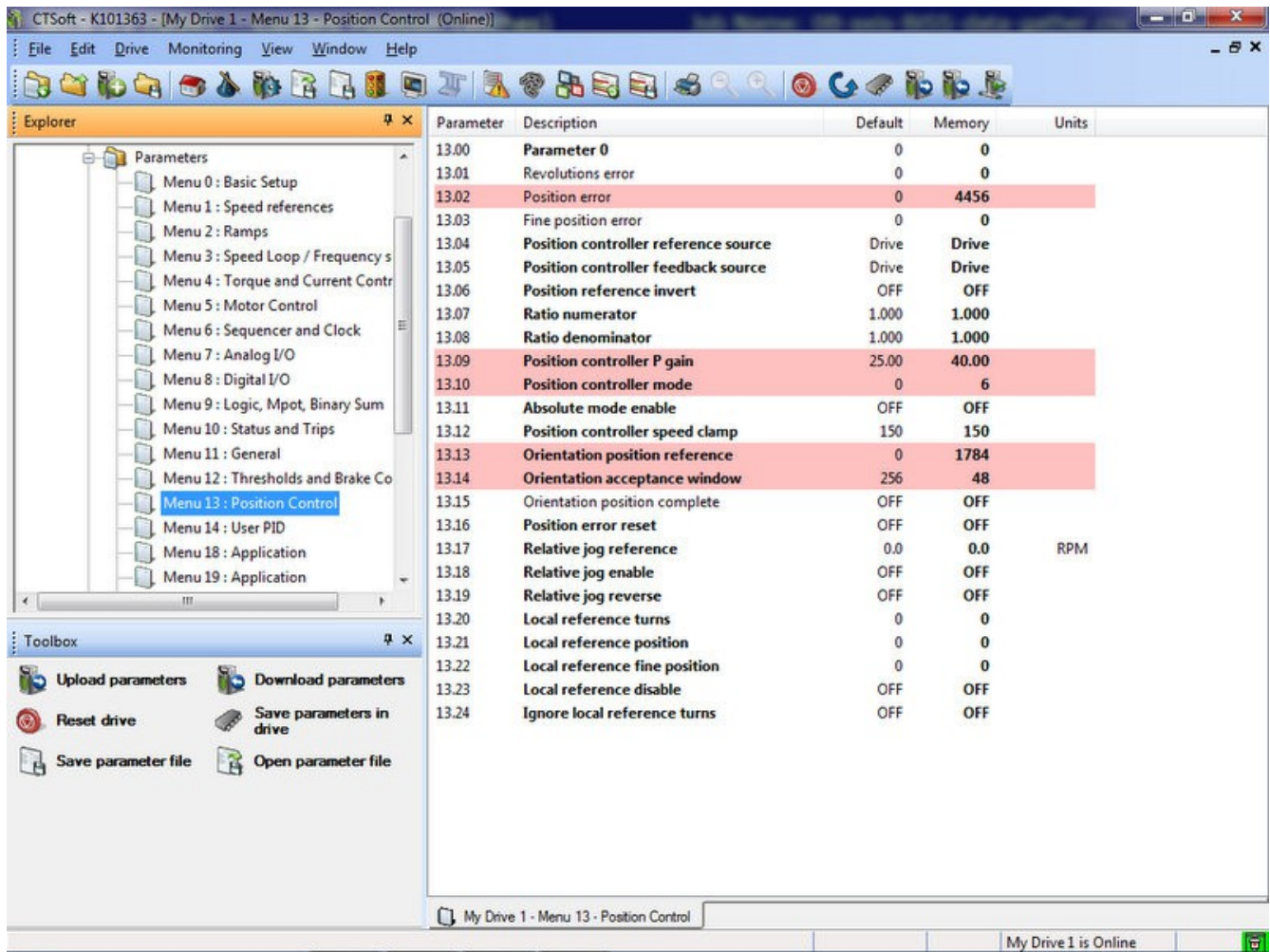


Figure 14 Parameters Menu

20. Finally we want to check to make sure we are getting spindle encoder feed back on the control.
21. To do this in the control software select **F1 Setup** then **F3 Config** then **F4 PID**. Manually turn the spindle slowly and watch on the screen that the ABS position for the spindle axis is changing while the spindle is moving.

Parameters

CT SP4203 and Cells Spindle HFS-170G Settings

Parameter	Description	Default	Memory	Units
1.06	Maximum reference clamp	1800	20000	RPM
2.04	Ramp mode select	Std	FASt	
2.11	Acceleration rate 1	2	0.3	s/1000 RPM
2.21	Deceleration rate 1	2	0.5	s/1000 RPM
3.23	Hard speed reference selector	OFF	On	
3.32	Drive encoder marker flag	OFF	On	
4.13	Current controller Kp gain	75	59	
4.14	Current controller Ki gain	1000	585	
5.06	Rated frequency	60	200	Hz
5.07	Motor rated current	80	72	A
5.08	Rated load rpm / rated speed	1770	5875	RPM
5.09	Rated voltage	230	220	V
5.1	Rated power factor	0.85	0.835	
5.11	Number of motor poles	Auto	4 pole	
5.17	Stator resistance (see user guide for scaling)	0	0.075	scaled Ohm
5.18	Maximum switching frequency	3	8	kHz
5.24	Transient inductance (sLs)	0	0.323	mH
5.25	Stator inductance (Ls)	0	3.51	mH
5.29	Motor saturation breakpoint 1	50	67	%
5.3	Motor saturation breakpoint 2	75	92	%
6.08	Hold zero speed	OFF	On	
7.15	T8 analog input 3 mode	th	Volt	
8.11	T24 digital I/O 1 invert	OFF	On	
8.13	T26 digital I/O 3 invert	OFF	On	
8.23	T26 digital I/O 3 source/destination	6.3	13.15	menu.param
8.24	T27 digital input 4 destination	6.32	6.3	menu.param
8.25	T28 digital input 5 destination	1.41	6.32	menu.param
8.33	T26 digital I/O 3 output select	OFF	On	
8.39	T28 & T29 digital input auto-selection disable	OFF	On	
10.3	Full power braking time	0.09	4	s
10.31	Full power braking period	3.3	5	s
11.44	Security status	L1	L2	
13.09	Position controller P gain	25	40	
13.1	Position controller mode	0	6	
13.13	Orientation position reference	0	1784	
13.14	Orientation acceptance window	256	48	

Figure 15

2.0 - Keypad Setup:

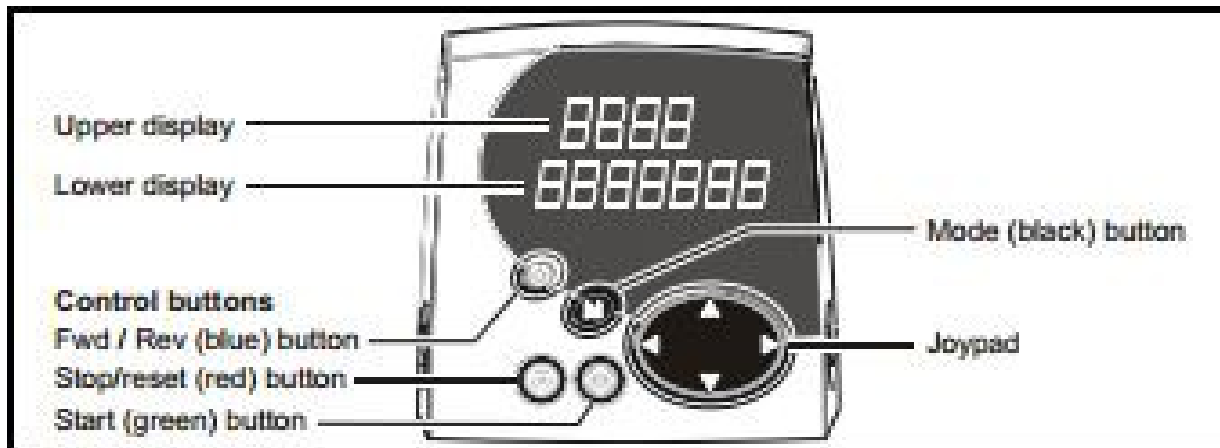


Figure 16 Keypad Layout

The Keypad consists of:

- Joypad – used to navigate the parameter structure and change parameter values.
- Mode Button – used to change between the display modes – parameter view, parameter edit, and status.
- Three Control Buttons – used to control the drive if keypad mode is selected.
- Two line LCD display.



Figure 17 LCD Readout upon initial start up

Keypad Setup:

1. To enter the menu screen press the black mode button (M). Once in the menu screen the upper display will be flashing. You can navigate through the various menus by pressing the left and right arrows on the joypad. To change to different parameters in a menu press the mode button again. The parameter value in the lower display will begin flashing then use the up and down arrows of the joypad to change the value. (Figure 19,20)

2. First the Operating Mode must be changed from Open Loop to Closed-Loop Vector. To do this press the mode then navigate to parameter 0.00 with the joypad and press the mode button again to edit parameter value. Change the value of 0.00 from 0 to 1254 for USA spec 60Hz AC supply frequency or 1253 for EUR spec 50Hz AC supply frequency using the joypad. **Note:** that you do not need to go from 0 to 1254 by pressing the up arrow 1254 times but can use the left to right arrows on the joypad to change each place. So to change a parameter from 0 to 1000 u can simply press the left arrow 3 times and the up arrow once to produce the value of 1000.
3. Press mode again so upper display is flashing and navigate to parameter 0.48 using the joypad. Press mode to change parameter from OPEn LP to CL VECt.
4. To complete the Operating Mode change press the red stop/reset button to complete this change. When reset there will be an audible click and ensure that parameter 0.00 has change back to a value of 0.
5. We need to change from level one to level 2 access to be able to change all parameters. To do this change parameter 0.49 from L1 to L2 and press mode button to save this change.
6. Using the parameters from Figure 15 navigate through the menus and change the parameters listed except for parameter except for parameter 8.25. Once all other parameters are changed go to paramter 0.00 and change from 0 to 1000. This is needed to save the advanced parameter changes. Now go to console and power off console and reset power to the machine and wait until CT Drive lights are off before turning power back on.
7. Once everything powers back up go back and change parameter 8.25. Also go back to parameter 0.00 and set to 1000 again. Repeat the process again to power off the system.



Figure 18 Readout in Normal Operating State

8. Once the system is powered back up the display should now read as shown in Figure 18. Which is the normal operating display.

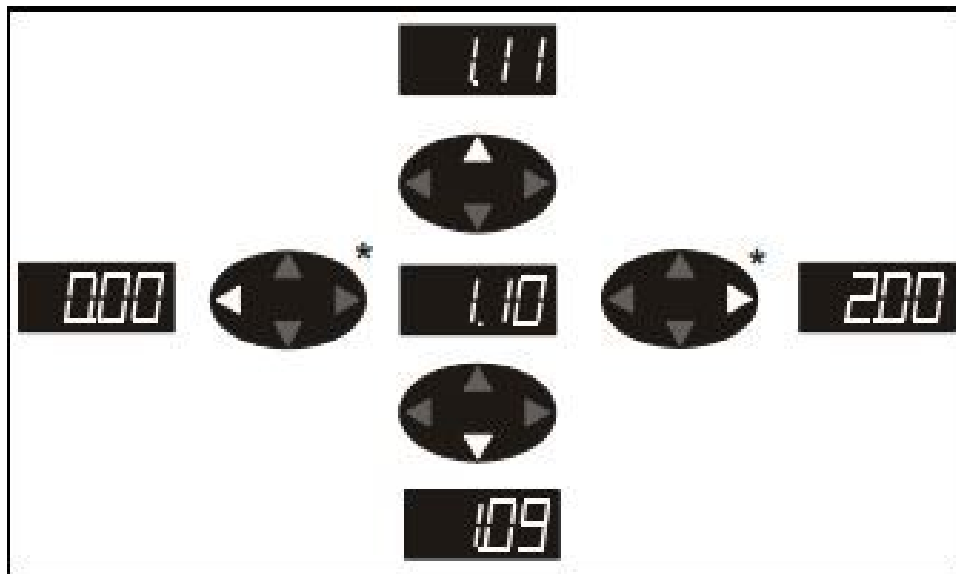


Figure 19

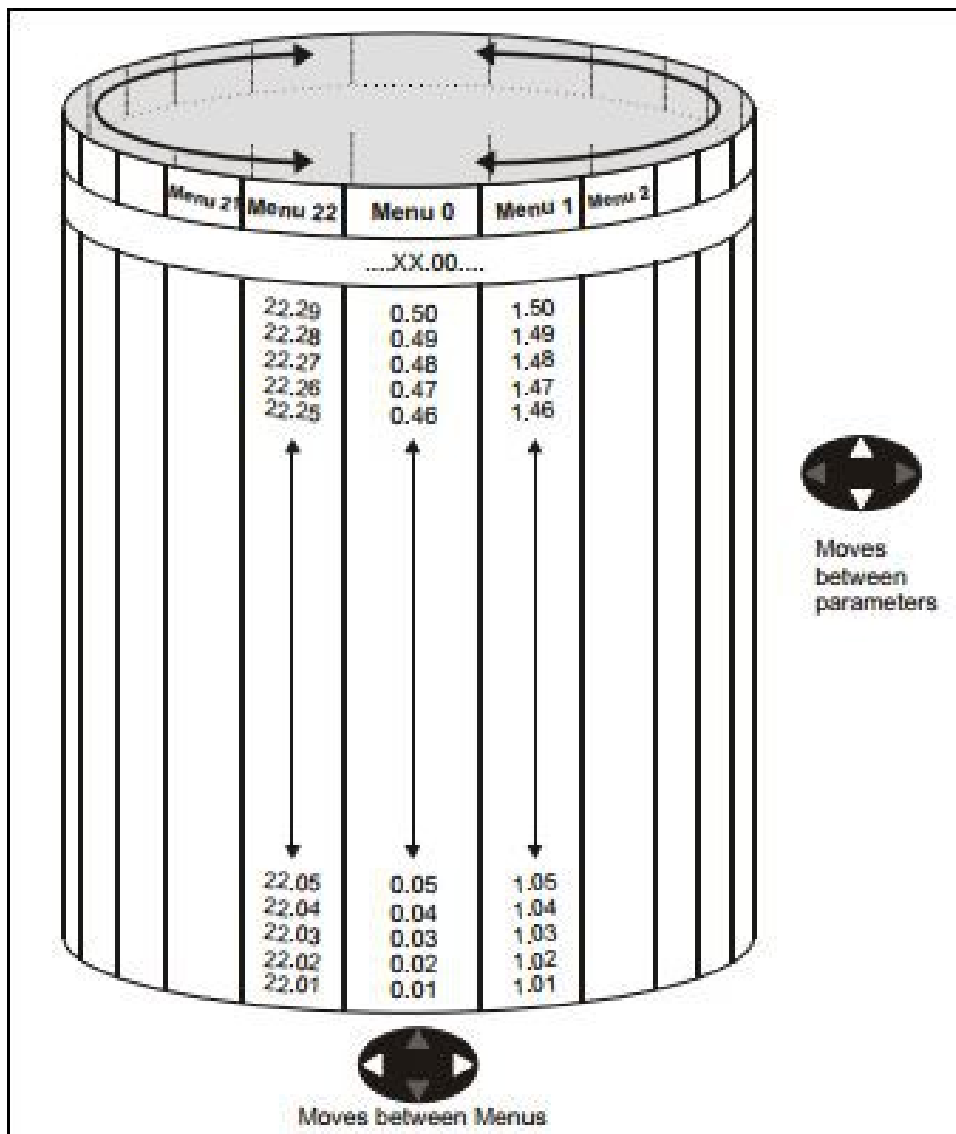


Figure 20

2.1 - Tuning:

1. To start the tuning process first set parameter 0.40 to 2 either using the CT Soft software by manually changing in parameters (Figure 14) and selecting apply or the key pad by pressing the mode button and navigating to 0.40 and changing to 2 ensuring to press mode again to save change.

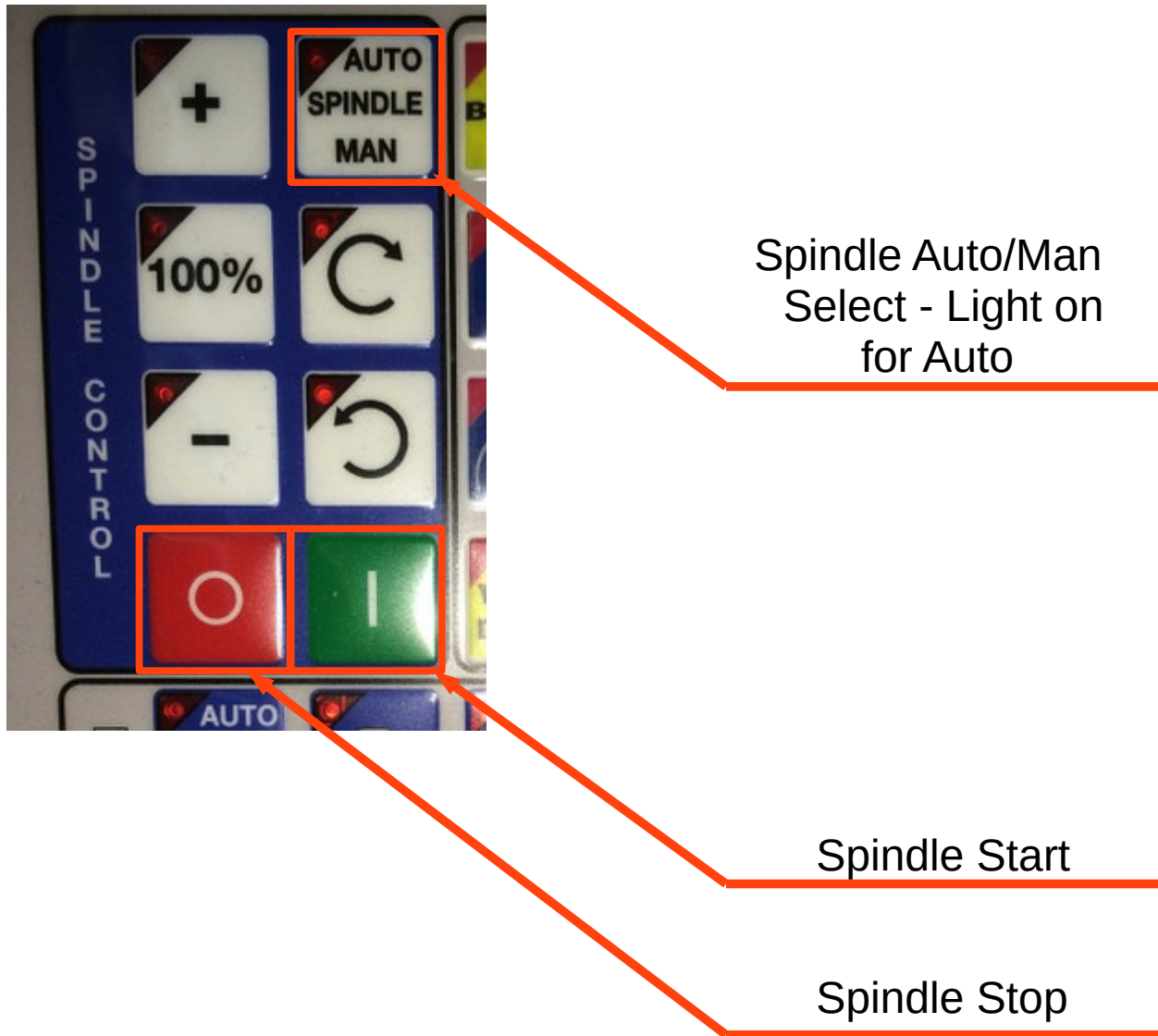


Figure 21

2. Next on the console put the spindle into manual mode using the spindle mode select button.
3. Press the green spindle start button to start the auto tune process.
4. The spindle will spin up to 4000rpm then stop and coast down to 0rpm. Do not stop spindle manually and make sure it is completely stopped.
5. Once the spindle is at 0rpm press the red spindle stop button and return the spindle to auto mode.
6. Finally save parameters in drive either using the CT Soft software or using the keypad to change 0.00 to 1000 and resetting the power.

2.2 - Orient Position:

1. To set orient position put a tool into the spindle. Position tool changer arm to align with notch in tool holder.
2. Open CT Soft software and enable drive online. Open parameters and select menu 13.
3. With your hand manually turn the tool to one side of the notch.
4. Set parameter 13.13 to 0 and select apply.
5. Note the value in parameter 13.02. Move the tool to the other side of the notch and note the value in 13.02 again.
6. Take both numbers added together and divide by two.
7. If the number you get is negative then put a the positive value of that number in parameter 13.13 and apply. Example if the value you get is -2500 the enter 2500 in parameter 13.13.
8. If the number you get is positive then take the 65535 minus the number and enter that into 13.13. Example if the value is 2500 then take $65535 - 2500 = 63035$, then enter 63035 in parameter 13.13 and hit apply.
9. Now when the tool is moved from side to side the value should be close to the same positive and negative. Example one side of notch will say -500 and the other side will say 500. this will orient the spindle in the center of the notch.
10. To set orient position using the control keypad repeat steps 1 through 3. Navigate to menu 13 and set parameter 13.13 to 0.
11. Now navigate to parameter 13.02 and move spindle to one side of notch and check value on LCD display. Move spindle to other side and record position.
12. Use those numbers to find the value needed in 13.13. Check now that the values in 13.02 are close to the same positive and negative.
13. Now go to parameter 0.00 and enter 1000. then shut down and restart control.
14. Return the tool changer to its normal position.
15. MDI command M19 and check spindle position appears correct.

CTSoft - K101363 - [My Drive 1 - Menu 13 - Position Control (Online)]

File Edit Drive Monitoring View Window Help

Parameters

- Menu 0 : Basic Setup
- Menu 1 : Speed references
- Menu 2 : Ramps
- Menu 3 : Speed Loop / Frequency s
- Menu 4 : Torque and Current Contr
- Menu 5 : Motor Control
- Menu 6 : Sequencer and Clock
- Menu 7 : Analog I/O
- Menu 8 : Digital I/O
- Menu 9 : Logic, Mpot, Binary Sum
- Menu 10 : Status and Trips
- Menu 11 : General
- Menu 12 : Thresholds and Brake Co
- Menu 13 : Position Control
- Menu 14 : User PID
- Menu 18 : Application
- Menu 19 : Application

Parameter	Description	Default	Memory	Units
13.00	Parameter 0	0	0	
13.01	Revolutions error	0	0	
13.02	Position error	0	184	
13.03	Fine position error	0	0	
13.04	Position controller reference source	Drive	Drive	
13.05	Position controller feedback source	Drive	Drive	
13.06	Position reference invert	OFF	OFF	
13.07	Ratio numerator	1.000	1.000	
13.08	Ratio denominator	1.000	1.000	
13.09	Position controller P gain	25.00	40.00	
13.10	Position controller mode	0	6	
13.11	Absolute mode enable	OFF	OFF	
13.12	Position controller speed clamp	150	150	
13.13	Orientation position reference	0	62712	
13.14	Orientation acceptance window	256	48	
13.15	Orientation position complete	OFF	OFF	
13.16	Position error reset	OFF	OFF	
13.17	Relative jog reference	0.0	0.0	RPM
13.18	Relative jog enable	OFF	OFF	
13.19	Relative jog reverse	OFF	OFF	
13.20	Local reference turns	0	0	
13.21	Local reference position	0	0	
13.22	Local reference fine position	0	0	
13.23	Local reference disable	OFF	OFF	
13.24	Ignore local reference turns	OFF	OFF	

Toolbox

- Upload parameters
- Download parameters
- Save parameters in

Figure 22

Edit Parameter

Orientation position reference

Parameter: 13.13

Range: 0 - 65535

Default: 0

62712

OK

Apply

Close

Parameter Help

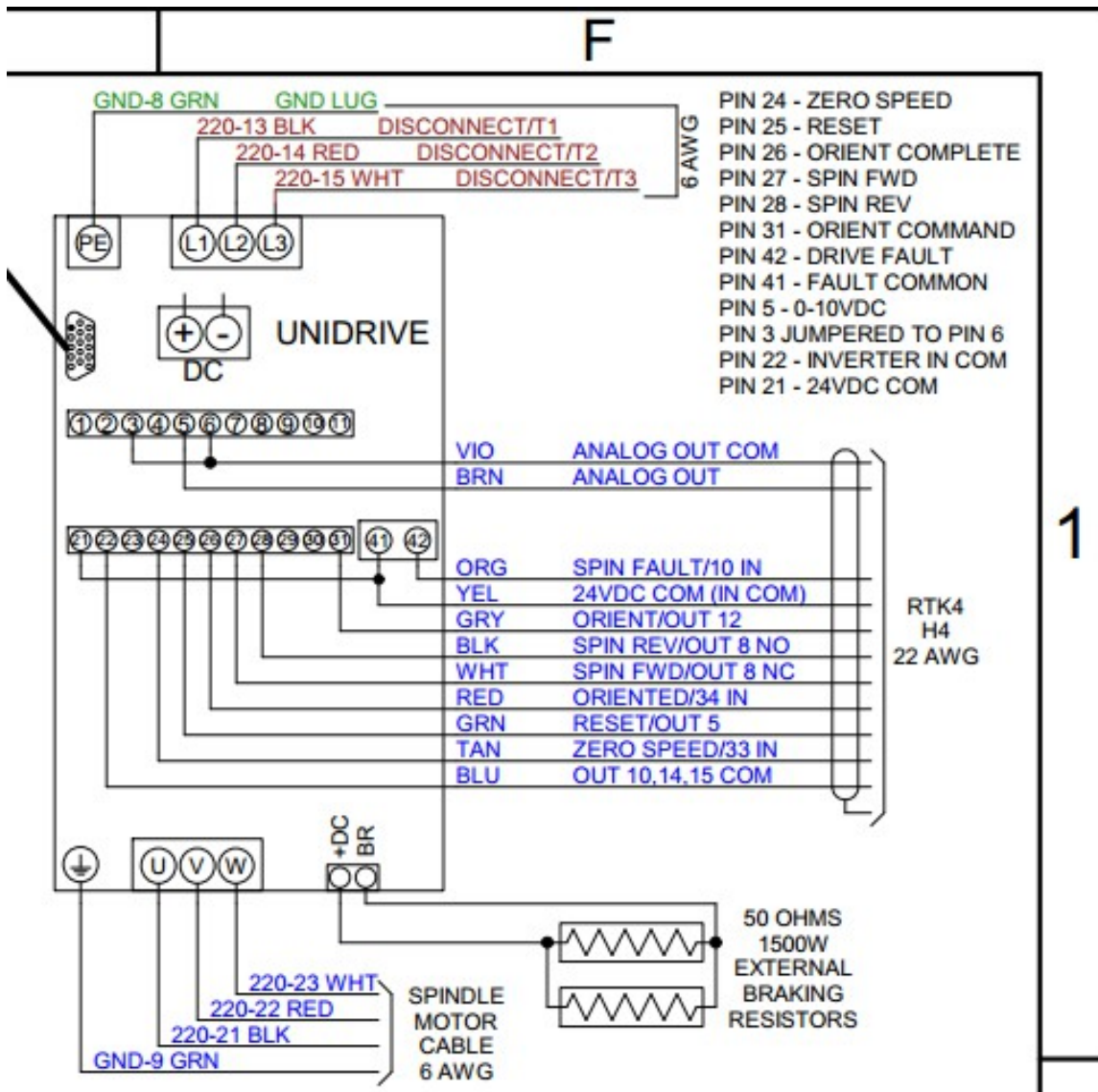
Help

Figure 23

3.0 - Control Techniques SP Drive Wiring:

- The following signals are wired up to the Cells Spindle Drive:

Terminal Number	Function	PLC Wiring
3,6	Analog Common	Spindle Analog Common
5	Analog Out	Spindle Analog Out
21,41	24VDC Common	24VDC Common
22	Output Common	Output Common
24	Zero Speed	Zero Speed Input
25	Reset	Spindle Reset Out
26	Orient Complete	Orient Complete Input
27	Spin Forward	Spindle Forward
28	Spin Reverse	Spindle Reverse
31	Hardware Enable	Orient Request Out
42	Drive Fault	Spindle Fault Input



Typical A560 CT Spindle wiring

3.1 - PLC Funtions:

- The following table is the outputs each mode of spindle operation.

Output	Spindle Off (M5/M20)	Spindle FWD (M3)	Spindle REV (M4)	Spindle Orient (M19)
Spindle FWD	OFF	ON	OFF	OFF
Spindle Reverse	OFF	OFF	ON	OFF
Request Orient	OFF	ON	ON	ON