



PLC Input and Output Diagnostic App Users Guide

CNC Software version: CNC12 v4.82+

Models: Acorn, AcornSix

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What is the PLC Diagnostic App?

A tool to observe CNC controller Inputs and Outputs. A tool to manually activate/invert/deactivate CNC controller Inputs and Outputs. Commonly used to debug any type of switches, relays, contactors, ATC's etc connected to the CNC controller.

With the CNC12 PLC Diagnostic App you can:

- Observe the state of any input or output live while the machine is running.
- 'Turn on' or 'Turn off' any input or output by clicking on it or using the keyboard live while the machine is running.
- Invert an input live while the machine is running.

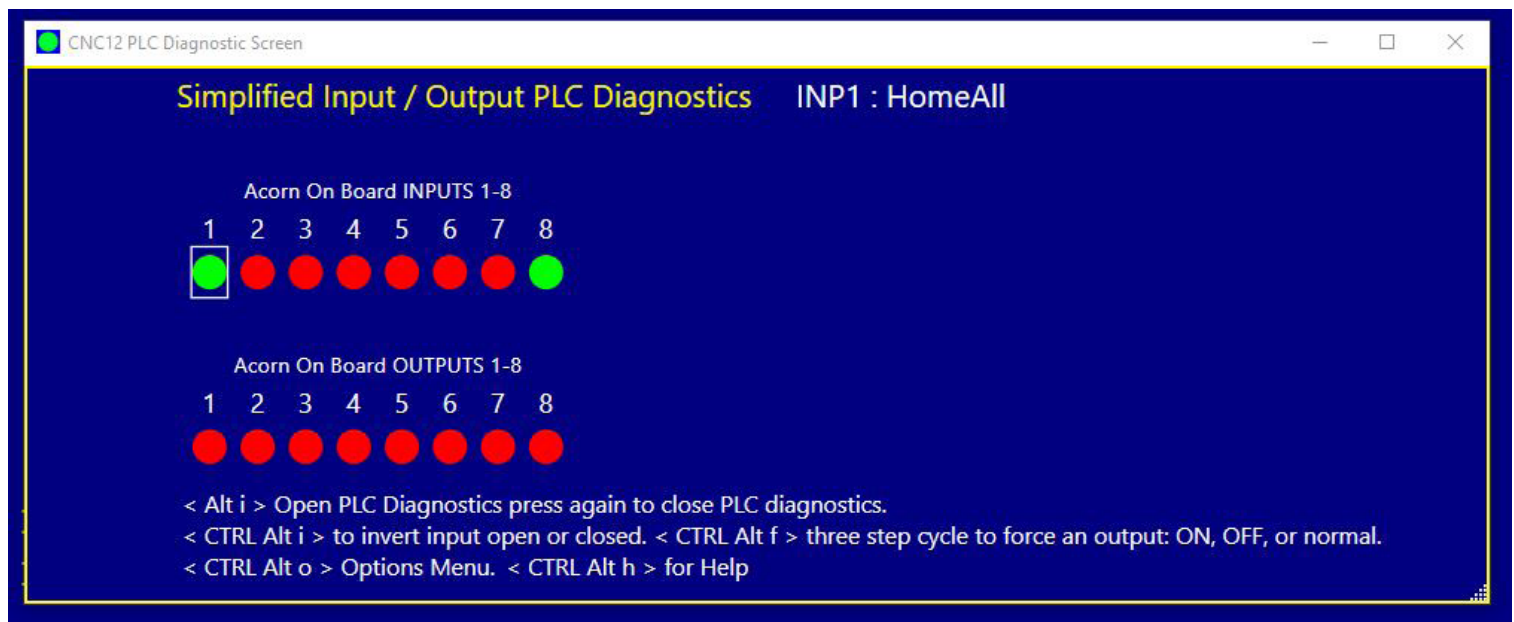
PLC App introduction video.

<https://youtu.be/FGgJ56p4M5Y>

Using the CNC12 PLC Diagnostic app.

From the main screen of CNC12,

Start the PLC diagnostic screen by pressing the keys <ALT> and <i> at the same time.

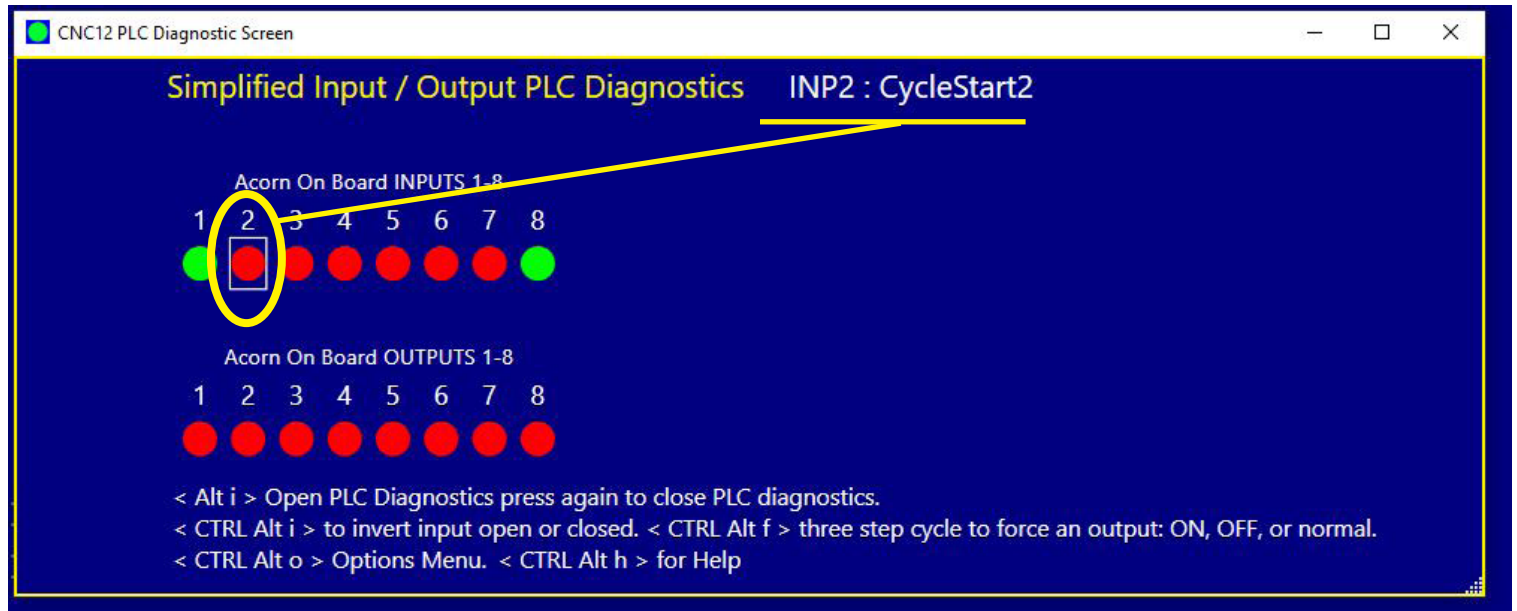


To exit from the Input and Output screen, press the keys <ALT> and <i> again at the same time.

Use the mouse (or arrow keys) to select an input and a white thin line box appears around the virtual LED and the assigned PLC Input function name for that input is displayed.

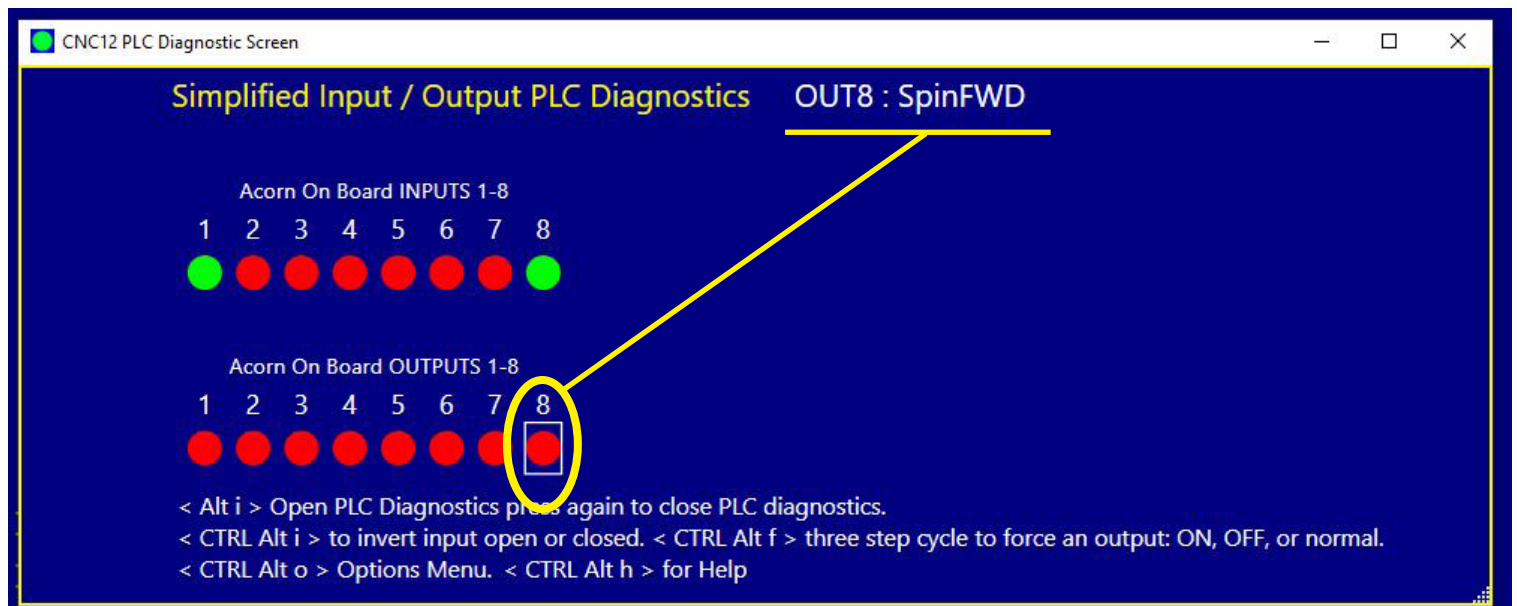
In the example below an external hard CycleStart button input has been assigned to input #2 which is named CycleStart2.

The cursor represented by a square white box is around virtual LED for Input #2 and the name of input #2 PLC function assignment appears.



Use the mouse to select an output and a white thin line box appears around the virtual LED and the assigned PLC Input function name for that input is displayed.

In the example below Output relay 8 has been assigned Spindle Forward PLC function named SpindFWD



The PLC function assignment to the input and outputs are made with the CNC control setup Wizard.

Below is the Wizard PLC function input definitions setup menu for some of the examples we are using in this document

Router CNC Control Configuration Wizard

Primary System

- Axis Drive Type
- Input Definitions**
- Output Definitions

Axis

- Configuration
- Homing and Travel
- Axes Pairing
- Advanced

Spindle

- Spindle #1
- Rigid Tapping
- PWM Setup

Touch Devices

- Probe
- Tool Touch Off

Control Peripheral

- Input Devices
- Wireless MPG

DB25 Connector

- Mapping

ATC

Input Type: Router

Axis1DriveOk

Axis2DriveOk

Axis3DriveOk

Axis4DriveOk

CycleCancel2

DriveOk

FirstAxisHomeLimitOk

FirstAxisHomeOk

FirstAxisMinusLimitOk

FirstAxisPlusLimitOk

FourthAxisHomeLimitOk

FourthAxisHomeOk

FourthAxisMinusLimitOk

FourthAxisPlusLimitOk

LimitAll

LubeOk

PressureLowMessage

PressureLowStop

RPM Sensor

SafetyDoorLockConfirmed

SafetyDoorSwitchClosed

SecondAxisHomeLimitOk

SecondAxisHomeOk

SecondAxisMinusLimitOk

SecondAxisPlusLimitOk

Acorn Integrated Inputs 1-8

NC NO

1 IN1

2 IN2

3 IN3

4 IN4

5 IN5

6 IN6

7 IN7

8 IN8

HomeAll

CycleStart2

FeedHold2

ToolCheck2

ProbeDetect

ProbeTripped

EStopOk

Click and Drag an Input function definition from list to the Input number Definition box to assign a function to an input.

Click the Input number circle to toggle the input state from NC to NO. Note: Probe Input states are determined in the Probe setup menus.

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Below is the Wizard PLC function Output definitions setup menu for some of the examples we are using in this document

Router CNC Control Configuration Wizard

Primary System

- Axis Drive Type
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- ATC Setup

Preferences

- CNC Control

Output Type: Router

Axis2BrakeRelease

Axis4BrakeRelease

ChargePump

DriveResetOut

G540SpinFwdOff

G540SpinRevOff

GreenLight

LaserAlignActivate

LaserEnable

LaserReset

LubePump

NoFaultOut

OrientSpindle

PopUpPins

PWM Output

PWMSelect

RedLight

RouterDustCollection

RouterVacuumHoldDown

SafetyDoorLockOpen

SpindleBrakeRelease

SpindleCoolingFan

SpinREV

TurnClampOn

UnclampTool

VFDDirection

VFDEnable

VFDResetOut

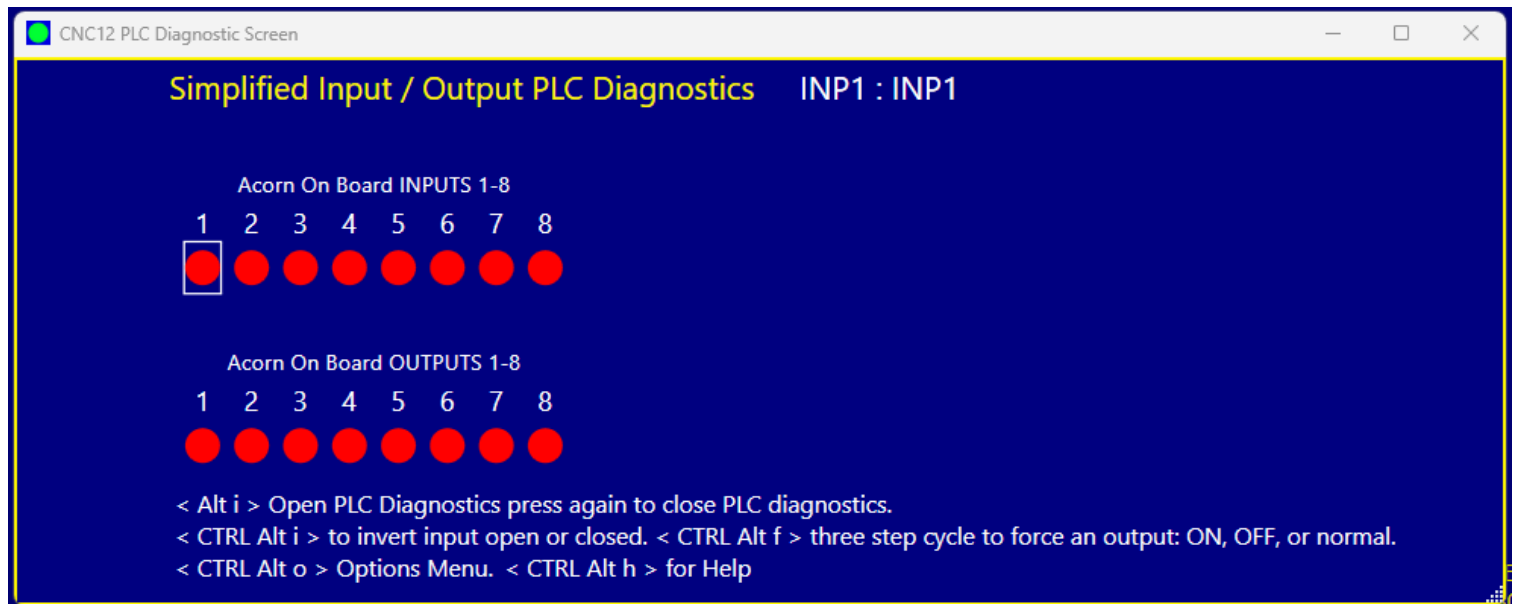
WorkLight

Acorn Integrated Outputs 1-8

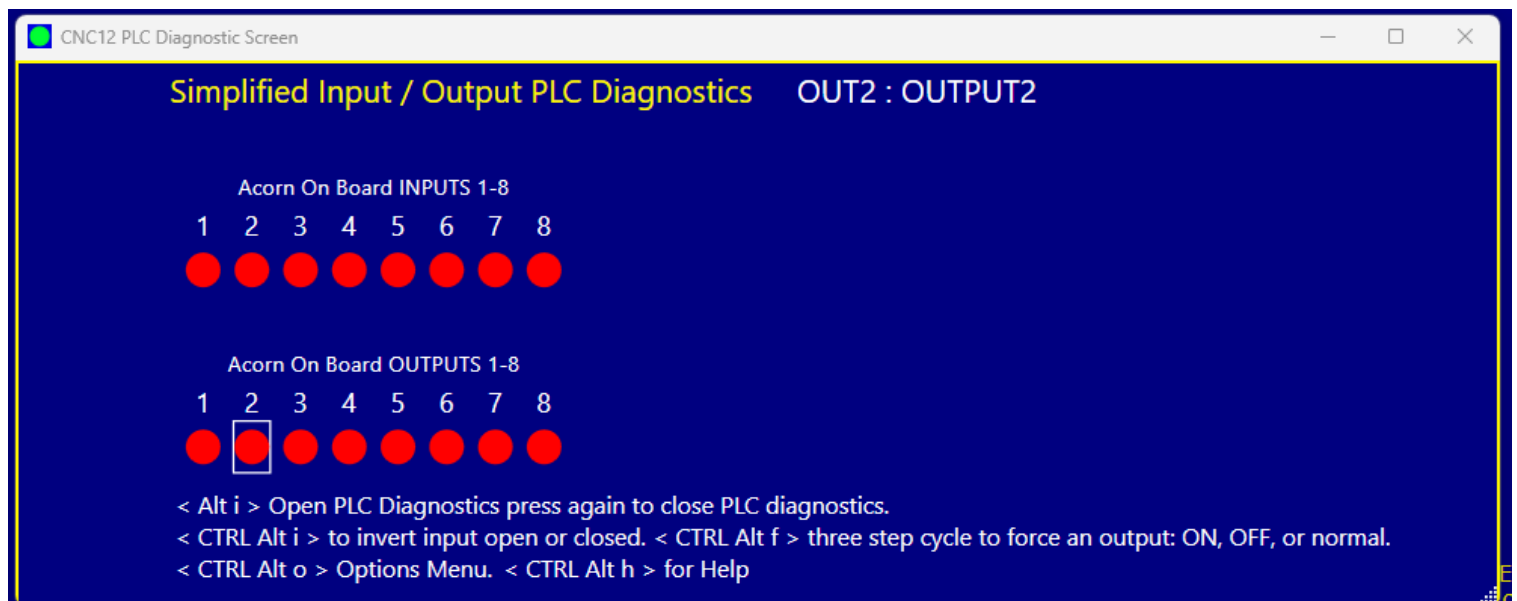
		Definition
1	OUT1	OUTPUT1
2	OUT2	OUTPUT2
3	OUT3	OUTPUT3
4	OUT4	OUTPUT4
5	OUT5	OUTPUT5
6	OUT6	DustFootActivate
7	OUT7	Axis3BrakeRelease
8	OUT8	SpinFWD

Click and Drag an Output function definition from list to the Output number Definition box to assign a function to an output

If no PLC assignment has been made in the Wizard for a particular input or output they appear simply as INP1:INP1



Or OUT2: OUTPUT2, etc.



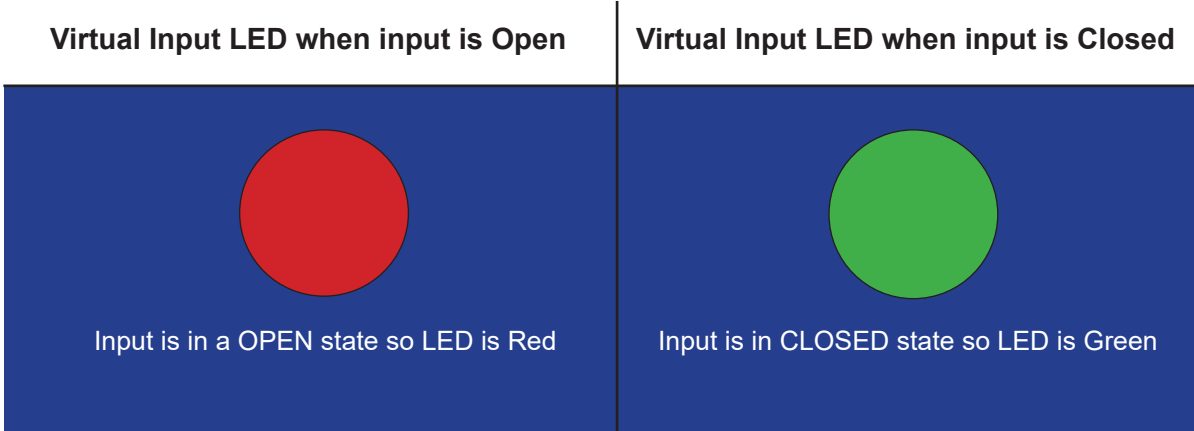
Even if an input or output is not assigned a PLC function they can still be observed manipulated with the PLC Diagnostic App.

Observing the Inputs and Outputs:

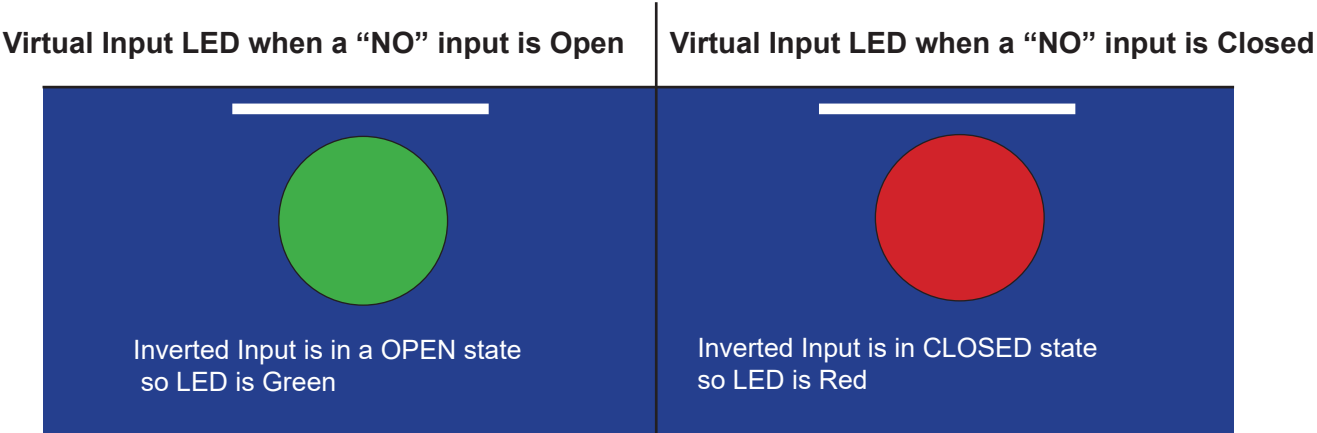
Input LED colors explained.

A red Virtual LED for an Input indicates that Input is “open”
A green Virtual LED for an Input indicates that Input is “closed”

When an input in the Wizard is set to NC (Normally Closed) the PLC diagnostic LED will appear Green when the input is made (aka closed), see below..



When an input in the Wizard is set to NO (Normally Open) the PLC diagnostic LED will be appear as below.
A white line above the Virtual LED indicates that particular input has been Inverted (set to Normally Open).

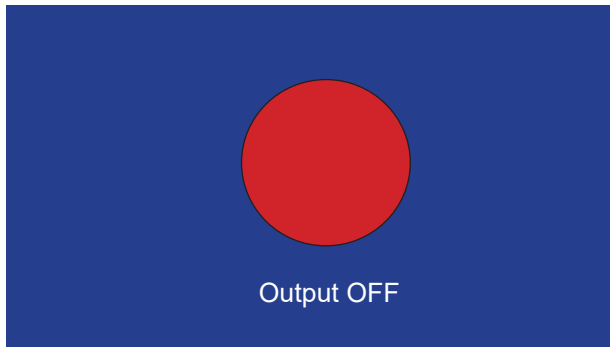


A green Virtual LED with a line above it is inverted and indicates that Input is “open”
A red Virtual LED with a line above it is inverted indicates that Input is “closed”

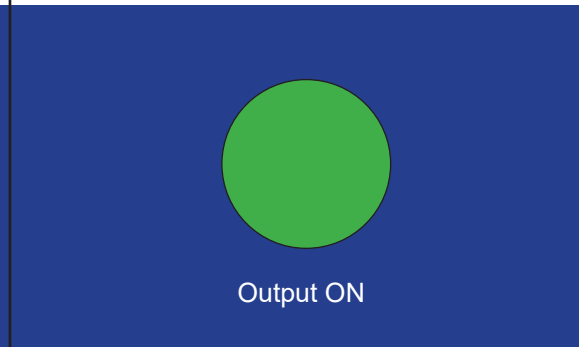
Note: Whenever possible use a NC type switch or sensor for CNC applications

Observing Outputs

Virtual Output LED when output is not active



Virtual Output LED when output is energized



Manually interacting with Input and Outputs

Inverting Inputs

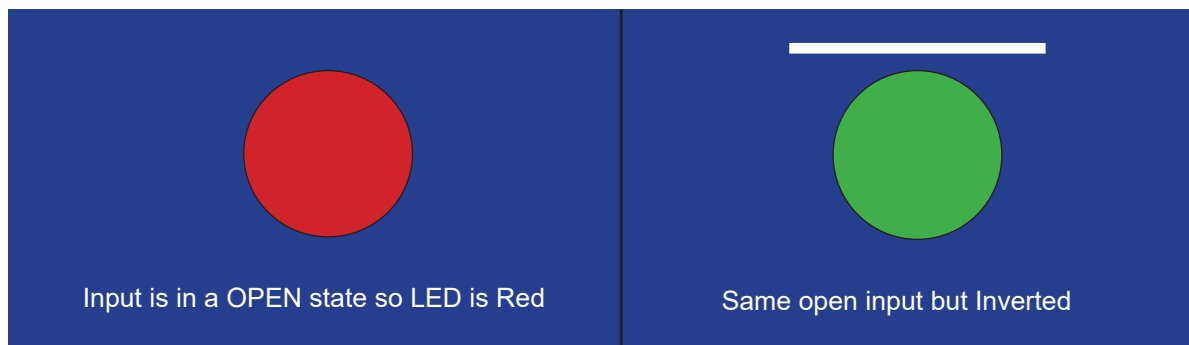
A useful tool in the PLC diagnostic screen to employ while testing and setting things up is the ability to manually “invert” an input directly and immediately. Move the mouse (or use the arrow keys) to the input number to invert, and press <CTRL>, <ALT> and <i> at the same time. Press <CTRL>, <ALT> and <i> again at the same time to cycle the input from inverted state to not inverted. A mouse double click can also be used to invert or un-invert an input.

See this in action in the PLC Diagnostic App Video: <https://youtu.be/FGgJ56p4M5Y>

A white line will appear above an input that has been inverted either manually or by the Wizard. Any input can be manually inverted whether it has been assigned a PLC function or not.

Manually inverting an input is useful when first setting up a CNC control. For instance, when an input is configured in the Wizard but is not actually wired up to the CNC control, the integrator can use the mouse or the hot keys <CTRL ALT i> to invert that input so the control thinks the input is wired up and is in its happy state therefore “bypassing” this function or think of it as tricking the PLC into thinking the switch or sensor is connected and activated.

This tool can also be used if the switch or sensor is wired up and you wish to defeat it or exercise the PLC logic without actuating the physical switch to simulate switch activation.



Inverting an input in this manner is commonly used as a debug tool when initially configuring inputs however, the Wizard will set the input inversions properly depending on the NC (normally open) or NO (normally closed) selection made for that particular input. Be sure to return the input to its previous state when the input has been properly wired and configured with the Wizard for normal operation.

Manually interacting with Outputs

Another useful tool in the PLC Diagnostic App to use while testing and setting things up is ability to manually activate or deactivate an output.

Any output can be manually activated or deactivated whether it has been assigned a PLC function or not.

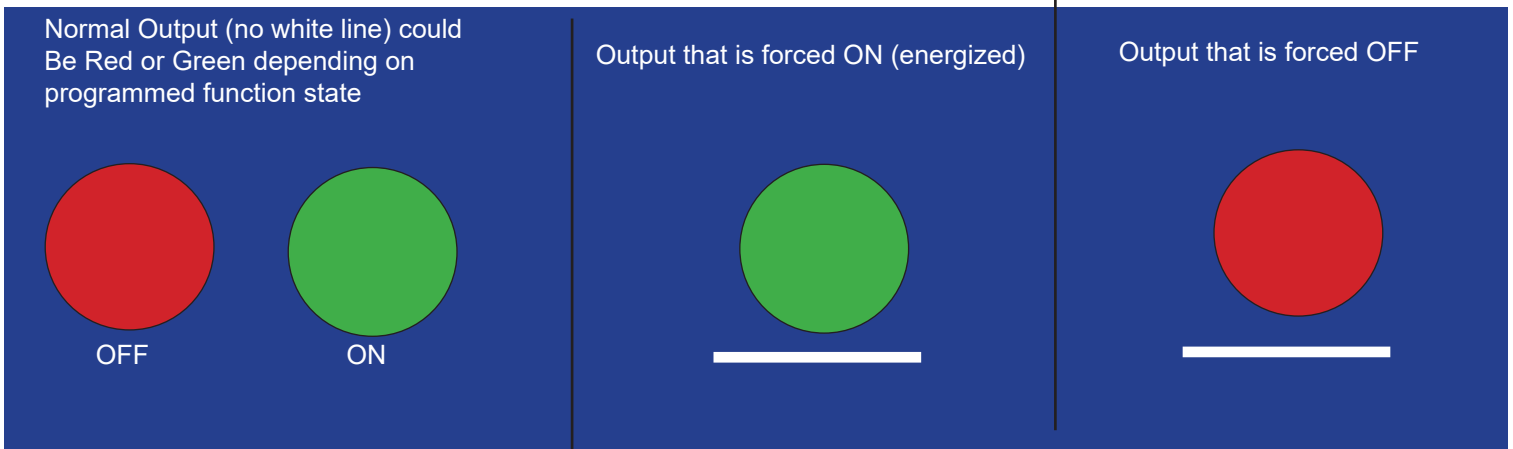
Warning: Be careful, if there is high power equipment connected to the CNC control that equipment will be activated when using the PLC Diagnostic App to manually energize an output.

Move the cursor to the output number to activate, and double click or press <CTRL>, <ALT> and <f> at the same time and the output activates.

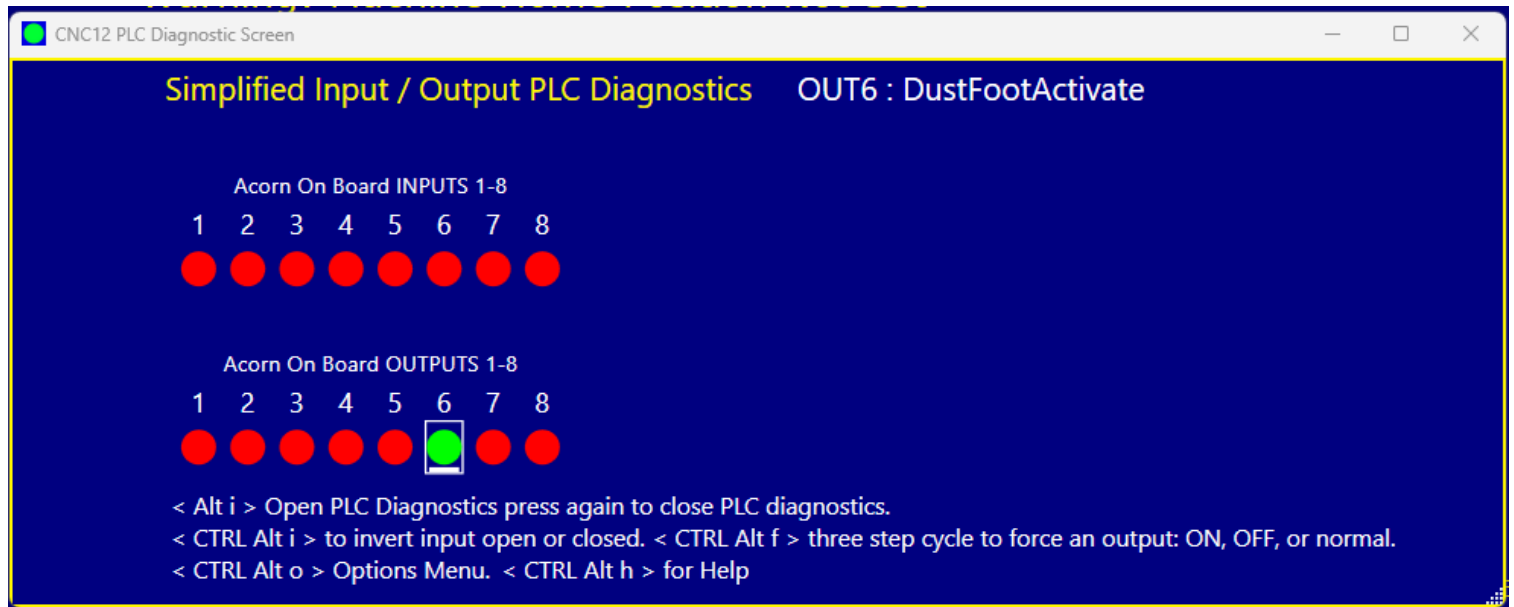
Press <CTRL>, <ALT> and <f> again at the same time and the output deactivates.

Press <CTRL>, <ALT> and <f> again at the same time and the output returns to the normal programmed state.

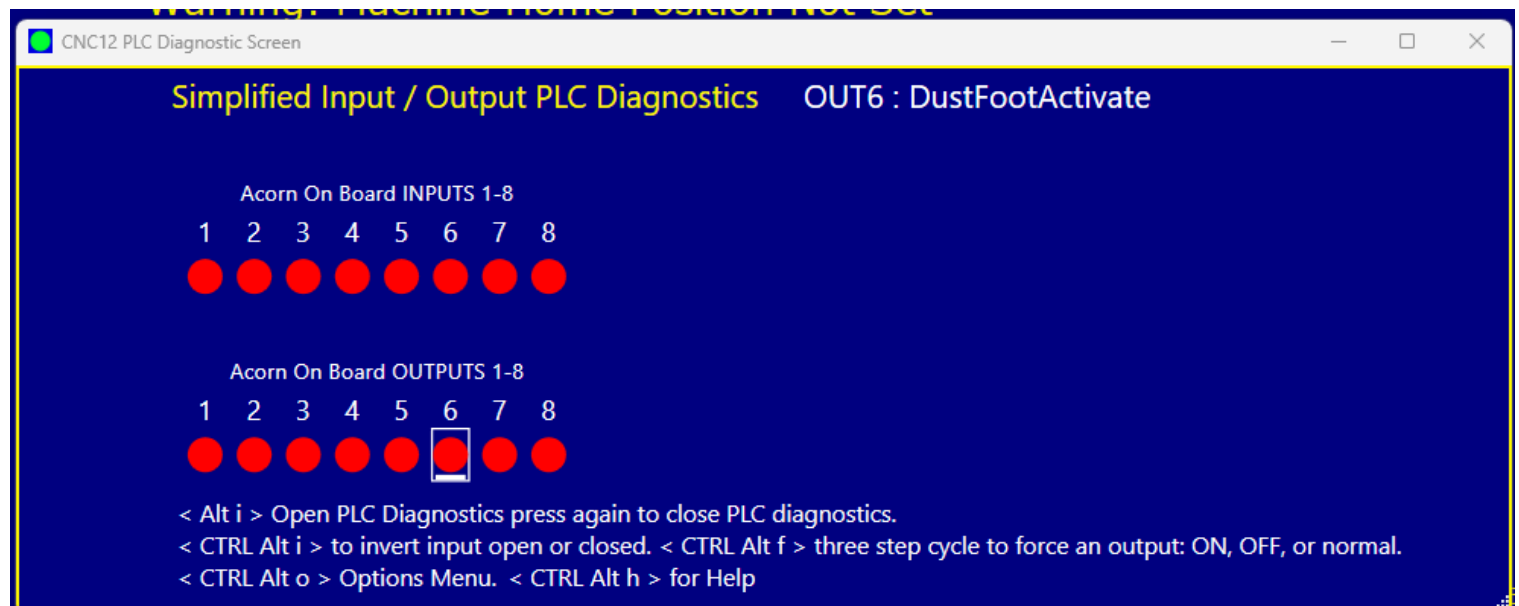
A white line will appear below an Output that has been manually manipulated.



For instance if it is desired to test an output that controls a Dust Foot attachment on a CNC router to see if the output has been wired properly to the corresponding air solenoid, move the cursor to the output number that has been assigned the Dust Foot function, in the case below Output 6, and double click or press <CTRL>, <ALT> and <f> at the same time and the output activates.



Double click again, or press <CTRL>, <ALT> and <f> at the same time and the output deactivates,

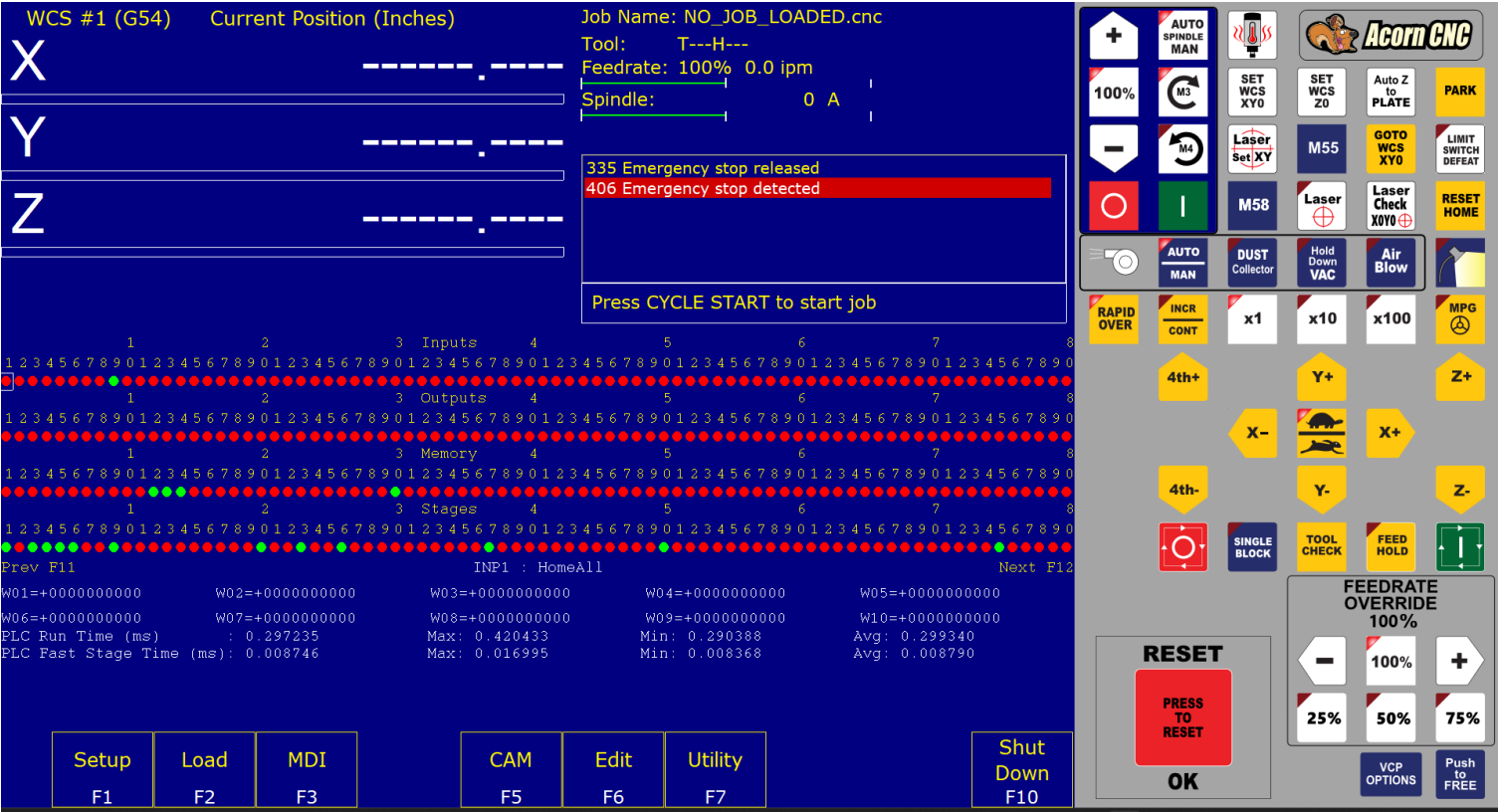


Press <CTRL>, <ALT> and <f> again at the same time and the output returns to the normal programmed state.

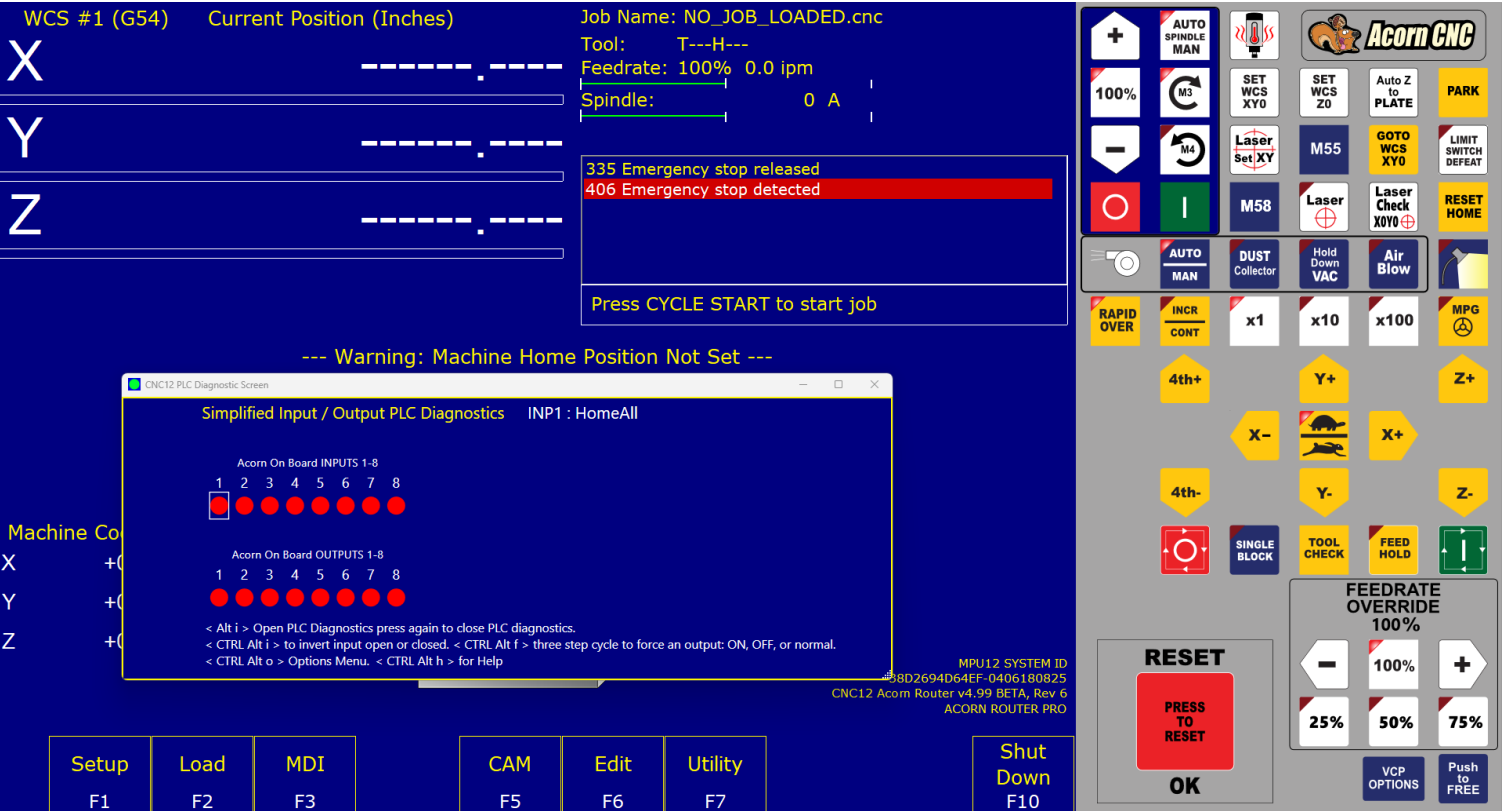
Be sure to return the output to its normal state (no white line) for normal CNC control operation.

There are two PLC diagnostic tools available with CNC12. The simplified and the original.

The Original looks like this and displays additional information compared to the simplified version.



The simplified PLC Diagnostic App looks like this and is the default selection for Acorn and AcornSix.



Controls for which one is the default application are found in the Acorn and AcornSix Wizard under “Preferences” , “CNC Control”

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- Axes Pairing
- Advanced

Spindle

- Spindle #1
- Rigid Tapping
- PWM Setup

Touch Devices

- Probe
- Tool Touch Off

Control Peripheral

- Input Devices
- Wireless MPG

DB25 Connector

- Mapping

ATC

- ATC Setup

Preferences

- CNC Control**
- VCP Preferences
- Wizard
- VCP Aux Keys

CNC Control Preferences

CNC12 Configuration Menu password	<input checked="" type="checkbox"/> Yes
Display Distance To Go	<input checked="" type="checkbox"/> Yes
Display Machine Coordinates	<input checked="" type="checkbox"/> Yes
Display DRO Decimal Precision	4
Display Active G&M Codes	No
Feedrate Override: Maximum percentage	100
Feedrate Override: Minimum percentage to invoke FEED HOLD	0
"Clean Filter" reminder message frequency in days. (default is OFF = 0)	0
Run Time Graphics on start up	<input checked="" type="checkbox"/> Yes
Remember Last G Code program after restart	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Allow CYCLE START in Run Menu and Graph Menu	<input checked="" type="checkbox"/> Yes
Display Keyboard Jogging Legend on Alt+J press	<input checked="" type="checkbox"/> Yes
Part G code Preview on Job Load	<input checked="" type="checkbox"/> Yes
PopupPins Deactivate on Cycle Start	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Disable Worklight on Startup	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Keyboard Jogging: Enter key = Cycle Start	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
USB/Keyboard Jogging active on CNC12 start up	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Enable Simple PLC Diagnostic as default	<input checked="" type="checkbox"/> Yes
Force Rehoming After Estop condition	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Which PLC Diagnostic tool to use can also be selected using Parameter 422 in the CNC configuration parameter menu.

P422 = 0 = use Simplified PLC Diagnostic App

P422 = 1 = use Advanced PLC Diagnostic menu

Machine Parameters P340 - P439											
340	0.0000	360	4000.0000	380	0.0000	400	1.0000	420	0.0000		
341	0.0000	361	4000.0000	381	54.0000	401	1.0000	421	0.0000		
342	0.0000	362	4000.0000	382	55.0000	402	0.0000	422	0.0000		
343	0.0000	363	4000.0000	383	0.0000	403	0.0000	423	0.0000		
344	0.0000	364	4000.0000	384	0.0000	404	0.0000	424	0.0000		
345	1.7500	365	250.0000	385	0.0000	405	0.0000	425	0.0000		
346	1.7500	366	2.0000	386	0.0000	406	0.0000	426	0.0000		
347	1.7500	367	2.0000	387	0.0000	407	0.0000	427	0.0000		
348	15.0000	368	0.0000	388	0.0000	408	0.0000	428	0.0000		
349	100.0000	369	75.0000	389	0.0000	409	0.0000	429	0.0000		
350	100.0000	370	0.0000	390	0.0000	410	1.0000	430	1.0000		
351	0.0000	371	0.0000	391	1000.0000	411	0.0000	431	0.0000		
352	100.0000	372	0.0000	392	0.0000	412	0.0000	432	0.0000		
353	400.0000	373	0.0000	393	0.1000	413	0.0000	433	0.0000		
354	0.0000	374	255.0000	394	0.1000	414	0.0000	434	0.0000		
355	100.0000	375	4000.0000	395	30.0000	415	0.0000	435	0.0000		
356	400.0000	376	1.0000	396	30.0000	416	3.0000	436	0.0000		
357	4000.0000	377	0.0000	397	0.2500	417	1.0000	437	0.0000		
358	4000.0000	378	0.0000	398	1.0000	418	0.0000	438	0.0000		
359	4000.0000	379	0.0000	399	0.5000	419	0.0000	439	0.0000		

Simplified PLC Diagnostics
0 = Simplified
1 = Advanced

Prev. Table F7 Next Table F8 Save F10

Acorn CNC

100% M3 M4 M5 M58 Laser Set XY0 Laser X0Y0

AUTO SPINDLE MAN DUST Collector Hold Down VAC Air Blow

RAPID OVER INCR CONT x1 x10 x100 MPG

4th+ Y+ Z+ X- X+ Y- Z-

4th- SINGLE BLOCK TOOL CHECK FEED HOLD

RESET PRESS TO RESET OK

FEEDRATE OVERRIDE 100% 25% 50% 75%

VCP OPTIONS Push to FREE