

Included with free with all Acorn CNC software are pre-programmed safety inputs and CNC machine tool logic. These safety functions available in the Acorn Wizard are provided as a convenience for the DIY user and are typical for use with milling machines, lathes and routers. It is the users/integrator's responsibility to both install and test for proper operation before placing the machine tool in service, if you disagree please return the Acorn CNC control kit for a full refund.

There are two main methods for setting up safety devices on the Acorn equipped CNC machine tool.

- 1.) Make use of the pre-programmed safety device inputs and logic (Two methods are supported outlined below)
- 2.) Customize the CNC control machine tool PLC program to meet your requirements (unlimited customization is possible, door switches, light curtains, hand and foot switches and many other types of safety devices are supported with Centroid PLC logic, its up to you to configure the PLC logic to meet the machine tool safety requirements)

1.) Using the Acorn Wizard to setup safety devices. The Acorn Wizard is used to define which inputs and outputs are used for safety devices and the integrator chooses which type of typical safety logic to employ.

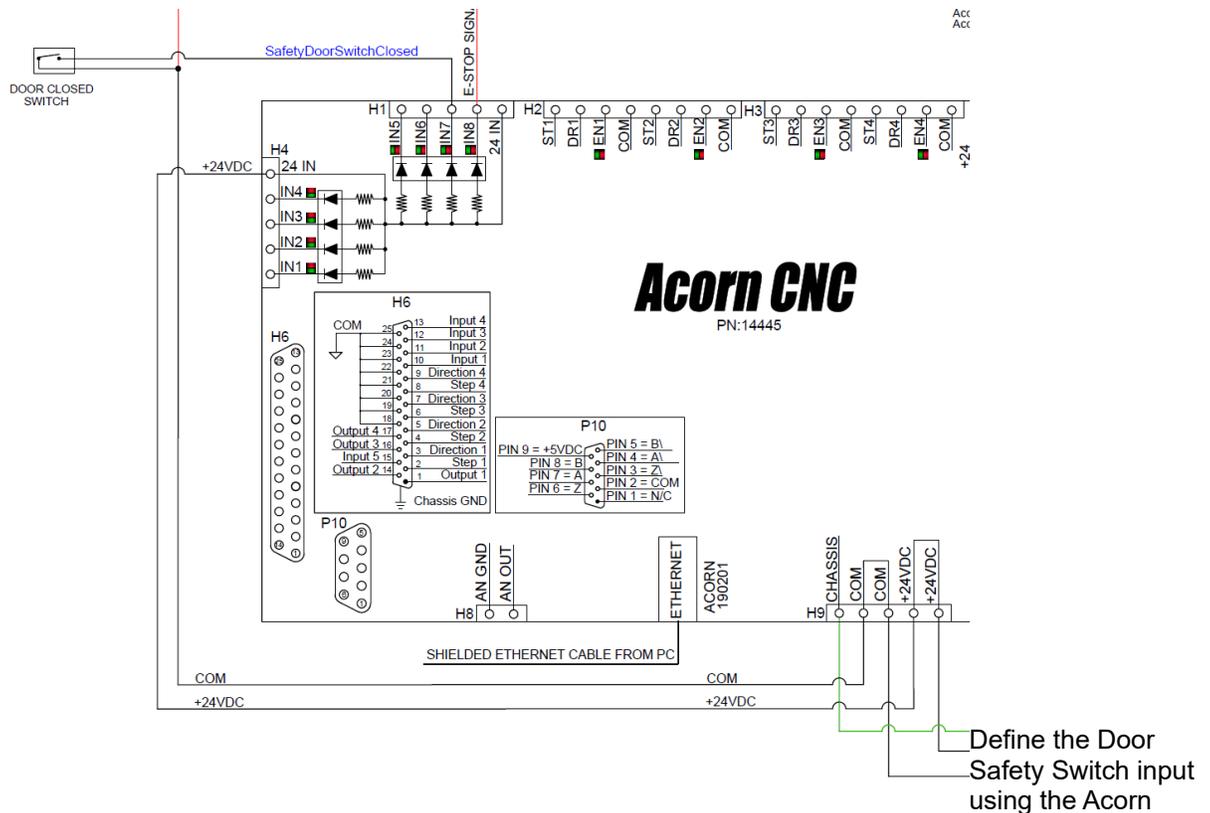
There are two pre-programmed methods to setup a door safety switch using the Acorn Wizard.

Door Safety Method 1: Simple switch on the door or guard of a machine tool that triggers when door is opened. This uses a single input and triggers the door safety switch PLC logic.

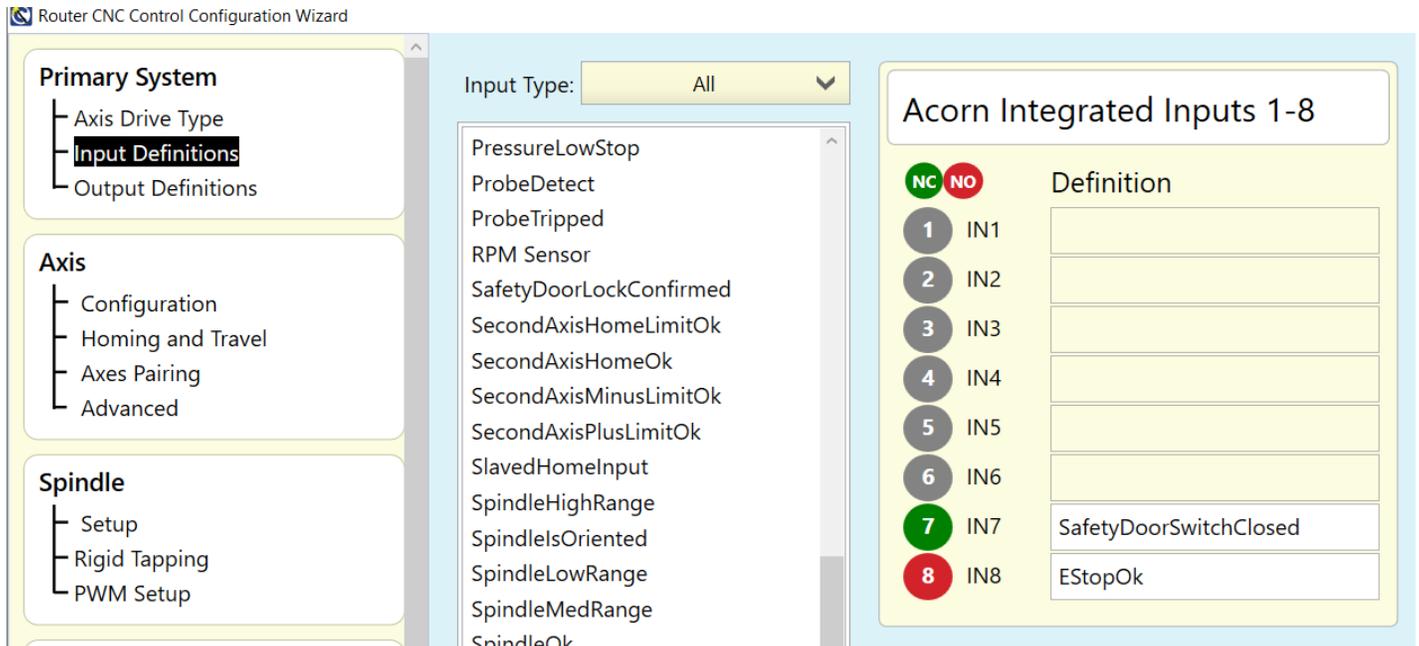
Door Safety Method 2: Use a combination door safety switch and interlock (won't allow door to open when machine is in operation) such as this unit. <https://www.msdirect.com/product/details/49794548>

Door Safety Method 1: Installation of a simple door safety switch and activation of Door Safety Logic.

Wire the switch according to Acorn schematic #S190918 and use the Wizard Input menu to define that input location. Note: any unused input on the Acorn or the Ether1616 can be used wire the switch according to the schematics.



Wizard Input menu.



Test the switch action by observing the Input(s) and forcing the output ON using the CNC12 PLC diagnostic screen. More information on how to use the PLC diagnostic menu inside of CNC12 is here. https://www.centroidcnc.com/centroid_diy/downloads/acorn_documentation/cnc12_PLC_diagnostic_screen.pdf

Choose the safety logic desired. Set parameter #985 to choose which type of safety logic for CNC12 to employ in conjunction with the door safety switch, see chart below that describes the logic. In CNC12 navigate to the CNC control parameters menu. F1 setup, F3 config (enter password 137), F3 Parameters, navigate to P985 and choose a value of 1 or 2 according to the chart on page 5.

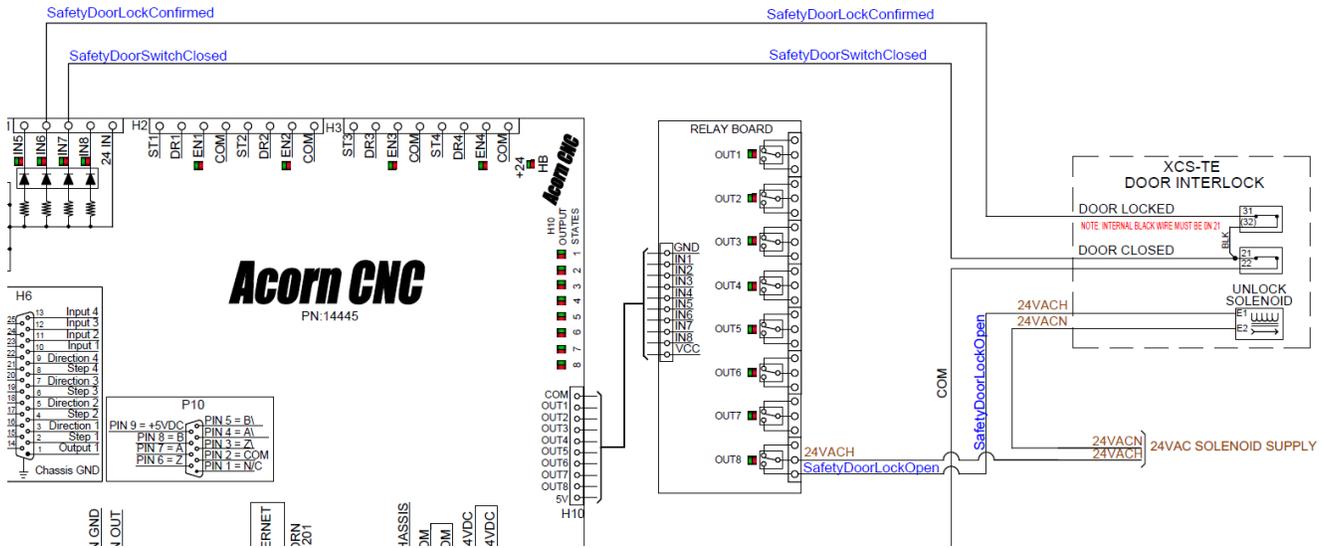
| Machine Parameters P900 - P999 | | | | | | | | | |
|--------------------------------|----------|-----|--------|-----|--------|-----|---------|-----|-----------|
| 900 | 0.0000 | 920 | 0.0000 | 940 | 0.0000 | 960 | 96.0000 | 980 | 0.0000 |
| 901 | 0.0000 | 921 | 0.0000 | 941 | 0.0000 | 961 | 0.0000 | 981 | 0.0000 |
| 902 | 0.0000 | 922 | 0.0000 | 942 | 0.0000 | 962 | 0.0000 | 982 | 0.0000 |
| 903 | 0.0000 | 923 | 0.0000 | 943 | 0.0000 | 963 | 0.0000 | 983 | 0.0000 |
| 904 | 0.0000 | 924 | 0.0000 | 944 | 0.0000 | 964 | 0.0000 | 984 | 0.0000 |
| 905 | 0.0000 | 925 | 0.0000 | 945 | 0.0000 | 965 | 0.0000 | 985 | 1.0000 |
| 906 | 0.0000 | 926 | 0.0000 | 946 | 0.0000 | 966 | 0.0000 | 986 | 0.0000 |
| 907 | 0.0000 | 927 | 0.0000 | 947 | 0.0000 | 967 | 0.0000 | 987 | 0.0000 |
| 908 | 0.0000 | 928 | 0.0000 | 948 | 0.0000 | 968 | 12.0000 | 988 | 0.0000 |
| 909 | 0.0000 | 929 | 0.0000 | 949 | 0.0000 | 969 | 0.0000 | 989 | 0.0000 |
| 910 | 0.0000 | 930 | 0.0000 | 950 | 0.0000 | 970 | 0.0000 | 990 | 0.0000 |
| 911 | 128.0000 | 931 | 0.0000 | 951 | 0.0000 | 971 | 0.0000 | 991 | 1000.0000 |
| 912 | 0.0000 | 932 | 0.0000 | 952 | 0.0000 | 972 | 0.0000 | 992 | 3000.0000 |
| 913 | 0.0000 | 933 | 0.0000 | 953 | 0.0000 | 973 | 0.0000 | 993 | 3000.0000 |
| 914 | 0.0000 | 934 | 0.0000 | 954 | 0.0000 | 974 | 0.0000 | 994 | 3000.0000 |
| 915 | 0.0000 | 935 | 0.0000 | 955 | 0.0000 | 975 | 0.0000 | 995 | 0.0000 |
| 916 | 0.0000 | 936 | 0.0000 | 956 | 0.0000 | 976 | 0.0000 | 996 | 0.0000 |
| 917 | 0.0000 | 937 | 0.0000 | 957 | 0.0000 | 977 | 0.0000 | 997 | 0.0000 |
| 918 | 0.0000 | 938 | 0.0000 | 958 | 0.0000 | 978 | 0.0000 | 998 | 0.0000 |
| 919 | 0.0000 | 939 | 0.0000 | 959 | 0.0000 | 979 | 0.0000 | 999 | 0.0000 |

Door Interlock Mode Selection
 0 = Disabled
 1 = Slowjog while door open
 2 = System stop while door open

Navigation buttons: Prev. Table (F7), Next Table (F8), Save (F10)

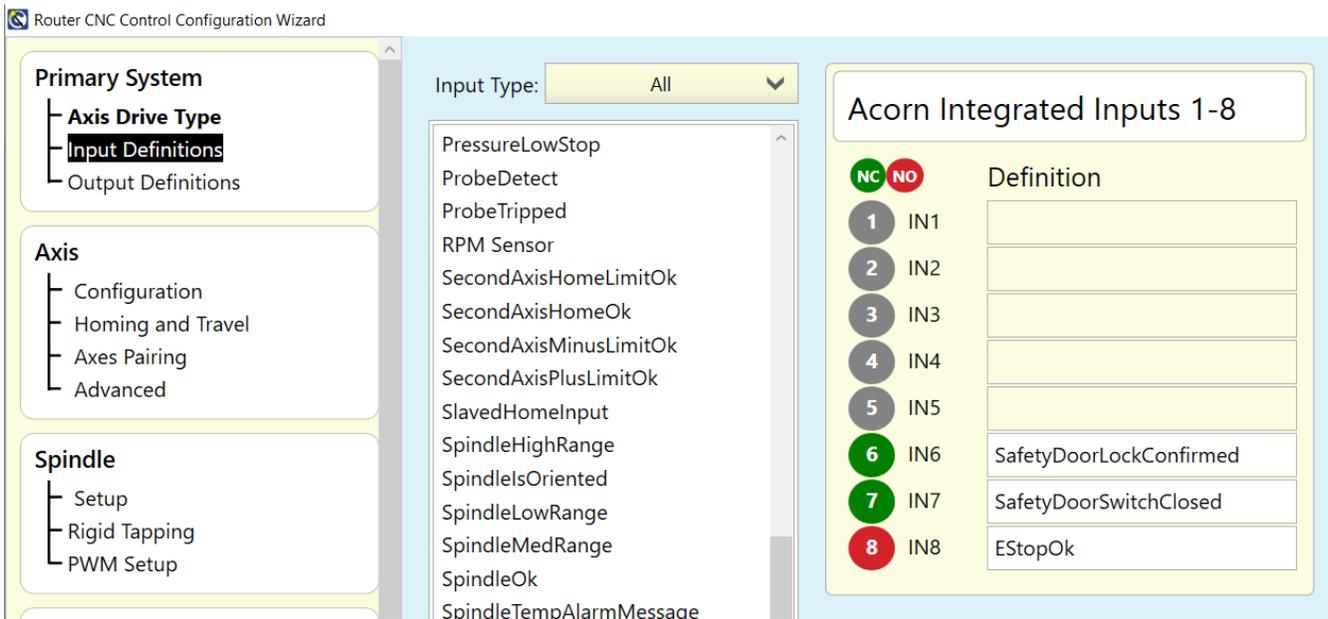
Door Safety Method 2: Install a combination door safety switch and door interlock such as the Telemecanique XASTE5312 , <https://www.msdirect.com/product/details/49794548>

Wire according to schematic #S15078 or #S15011 (Ehter1616 example) , just like Method 1 any free inputs and output can be employed. Just be sure to define them using the Wizard to match which ones you have them wire to.

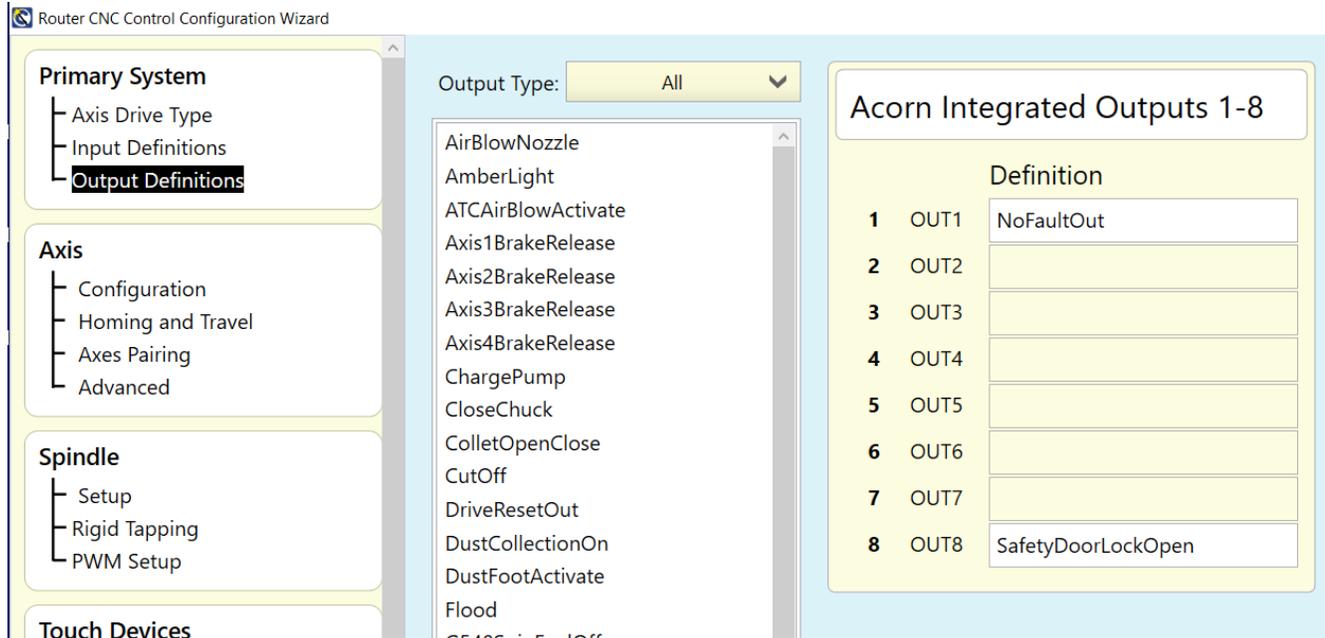


Define the inputs and outputs using the Acorn Wizard.

Input Definition.



Output definition



Test the switch action by observing the Input(s) and forcing the output ON using the CNC12 PLC diagnostic screen. More information on how to use the PLC diagnostic menu inside of CNC12 is here. https://www.centroidcnc.com/centroid_diy/downloads/acorn_documentation/cnc12_PLC_diagnostic_screen.pdf

Now that the switch(s) have been wired, configured and tested. Choose which style of safety logic required. In CNC12 navigate to the CNC control parameters menu. F1 setup, F3 config (enter password 137), F3 Parameters, navigate to P985 and choose a value of 1 or 2 according to the chart on page 5.

| Door open condition with CNC12 P985=1 | Action |
|--|---|
| While running g code program | Shuts off spindle, stops all motion enters into Feed Hold mode, issues message "Door Open, close the door and press Cycle Start to continue". When door closes new message. "Door Closed, press Cycle Start to continue" |
| While not running a g code program | Spindle will not turn on, issues message to close the door if user attempts to turn on the spindle in manual mode or auto mode. ""Door Open, close the door to Run the Spindle" |
| Starting a G code program, no automatic movement before door is closed | "Door Open, close the door and press Cycle Start to continue". When door closes new message. "Door Closed, press Cycle Start to continue" |
| Jogging. | Allows Slow Jogging, will not allow user to select Fast Jog. On vcp or mpg. Issues message "Door Open, slow jogging only" |
| When Method 2 is used. | When exiting from a program, or FeedHold with Spindle Stop then Door is unlocked after 3 seconds. Allowing the operator to open the Door. When door is closed and Program Starts, SafetyDoorLockOpen is turned off and checks for DoorLockConfirmed. Will Fault the system after 2 seconds of running if DoorLockConfirmed is not seen with the message "9087 Door Lock Fault!" |
| | |

| | |
|--|---|
| Door open condition with P985=2 | |
| While running g code program | Shuts off spindle, stops all motion enters into Estop condition, issues message "Door Open, close Door and cycle Reset to continue". When door closes new message. "Door Closed, cycle Reset to continue" |
| While not running a g code program | Spindle will not turn on, issues message to close the door if user attempts to turn on the spindle in manual mode or auto mode. ""Door Open, close door to run the Spindle" |
| Starting a G code program, no automatic movement before door is closed | If cycle start is pressed with door open. "Door Open, close Door and cycle Reset to continue" |
| Jogging. | Does not allow Jogging, will not allow user to Jog the machine on vcp or mpg. Issues message "Door Open, close door and cycle Reset to continue" |
| When Method 2 is used. | When exiting from a program, or FeedHold with Spindle Stop then Door is unlocked after 3 seconds. Allowing the operator to open the Door. When door is closed and Program Starts, SafetyDoorLockOpen is turned off and checks for DoorLockConfirmed. Will Fault the system after 2 seconds of running if DoorLockConfirmed is not seen with the message "9087 Door Lock Fault!" |
| | |
| Door open condition with P985=0 | Disables Safety Door Logic |
| | |

Custom Safety Device Configuration.

Centroid CNC controls can be installed on a wide variety automated equipment that require different safety devices and functionality of the CNC software. Centroid has made available the ability to accommodate an equally wide variety of safety devices and functionality. The provided Acorn pre-programmed safety functions available in the Acorn Wizard are provided as a convenience for the DIY user and are typical for use with milling machines, lathes and routers. However, it is the user/integrator's responsibility to install and configure the safety equipment and logic to meet safety requirements and routinely test the functionality and keep a log of such testing. The Centroid CNC system is very flexible and can be made to meet most any special requirements for safety. If the machine tool safety functionality is desired to be different than the standard pre programmed logic the integrator has several choices. 1.) Edit the machine PLC program to meet their requirements. (free video series, manual and examples are available on the website) 2.) have a 3rd party edit the machine PLC program to meet their requirements 3.) hire Centroid to create custom machine PLC program.

With all these options, a clear definition of the machine tool safety requirements is necessary.

Centroid's PLC programming language, tools, documentation and how to videos are provided for free and are available on the website, free tech support is also available through the use of the Centroid Tech Support forum. Here are some important links.

Centroid Tech Support Forum. <https://centroidcncforum.com/index.php>

All Acorn documentation (including this document, Acorn safety hook up schematics, PLC diagnostic menu user guide and much more.) <https://centroidcncforum.com/viewtopic.php?f=60&t=3397>

and for those that want to customize the safety features of their machine tool these free tools are available.

PLC programming manual https://www.centroidcnc.com/centroid_diy/centroid_manuals.html

PLC programming video series https://youtube.com/playlist?list=PLXhs2C5No0_gFS_RmKNo7hii2WKIedQIQ

PLC detective tool https://www.centroidcnc.com/downloads/centroid_PLC_detective_quickstart.pdf

Safety Switch PLC customization example. https://www.centroidcnc.com/dealersupport/tech_bulletins/uploads/314.pdf