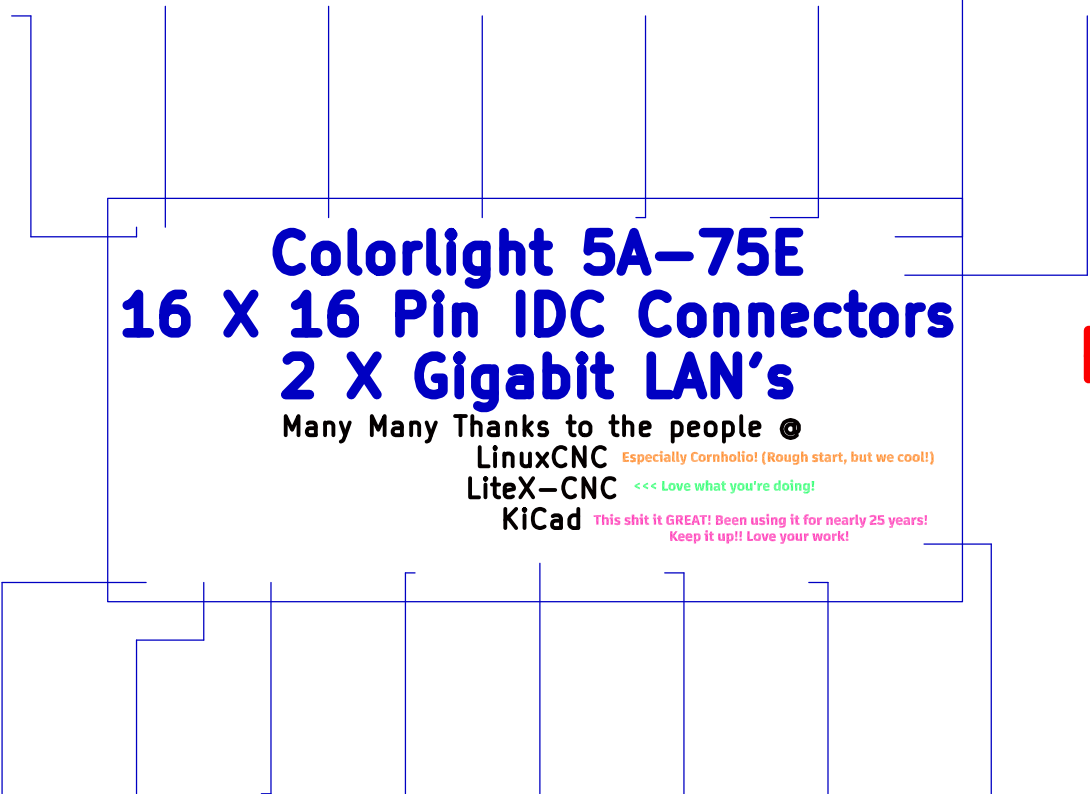


File: J1 BOARD.kicad\_sch File: J2 BOARD.kicad\_sch File: J3 BOARD.kicad\_sch File: J4 BOARD.kicad\_sch File: J5 BOARD.kicad\_sch File: J6 BOARD.kicad\_sch File: J7 BOARD.kicad\_sch File: J8 BOARD.kicad\_sch



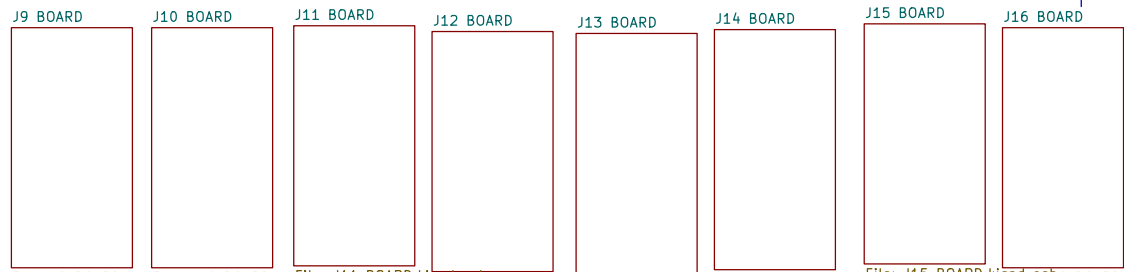
# Colorlight 5A-75E 16 X 16 Pin IDC Connectors 2 X Gigabit LAN's

Many Many Thanks to the people ☺  
**LinuxCNC** Especially Cornholio! (Rough start, but we cool!)  
**LiteX-CNC** <<< Love what you're doing!  
**KiCad** This shit it GREAT! Been using it for nearly 25 years!  
 Keep it up!! Love your work!

**ROUGH  
DRAFT  
DO NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 4:>
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:>
  - 2:>
  - 3:>
  - 5:>
  - 6:>
  - 7:>
- J11:
- 1:>
  - 2:>
  - 3:>
  - 5:>
  - 6:>
  - 7:>
- J12:
- 1:>
  - 2:>
  - 3:>
  - 5:>
  - 6:>
  - 7:>
- J13:
- 1:>
  - 2:>
  - 3:>
  - 5:>
  - 6:>
  - 7:>
- J14:
- 1:>
  - 2:>
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPIN IS DOWN
  - 2:< THC + LIMIT
  - 3:< THC TOUCH
  - 5:< THC UP
  - 6:< THC DOWN
  - 7:< START CYCLE
- > = OUTPUT  
 < = INPUT  
 ATC = AUTO TOOL CHANGER  
 MS = MAIN SPINDLE



File: J9 BOARD.kicad\_sch File: J10 BOARD.kicad\_sch File: J11 BOARD.kicad\_sch File: J12 BOARD.kicad\_sch File: J13 BOARD.kicad\_sch File: J14 BOARD.kicad\_sch File: J15 BOARD.kicad\_sch File: J16 BOARD.kicad\_sch

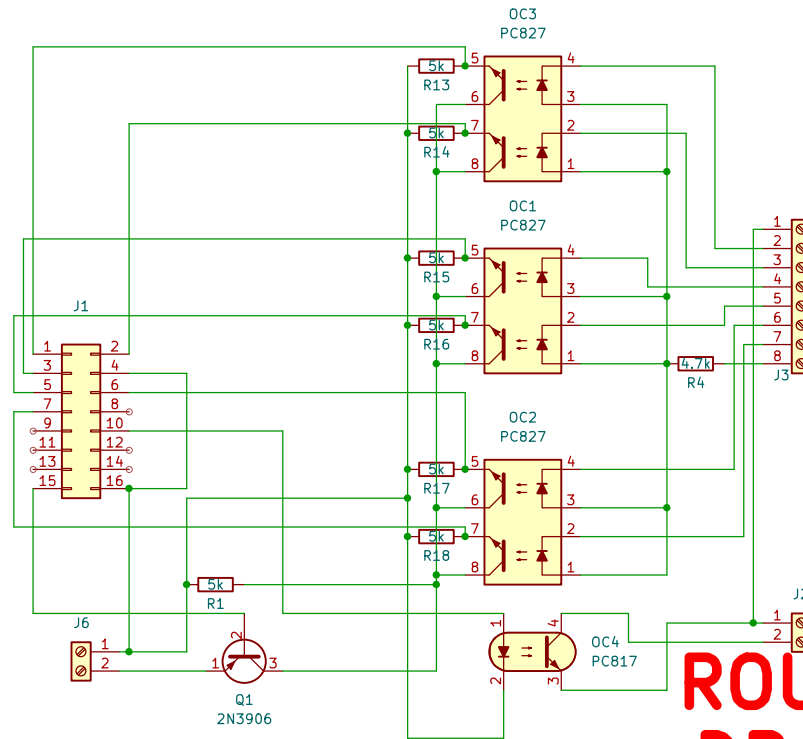
Sheet: /	
File: Motion Control.kicad_sch	
<b>Title:</b>	
Size: A4	Date:
KiCad E.D.A. 8.0.0	Rev:
	Id: 1/17

# J1 Board 6 Digital Inputs + 1 Drive Enable

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:> X + LIMIT
- 2:< X - LIMIT
- 3:< X HOME
- 5:< Y + LIMIT
- 6:< Y - LIMIT
- 7:< Y HOME
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< X+ LIMIT
- 3:< X- LIMIT
- 4:< X HOME
- 5:< Y+ LIMIT
- 6:< Y- LIMIT
- 7:< Y HOME
- 8:< +24 VOLT

- 1:> GND
- 2:> DRIVE ENABLE

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

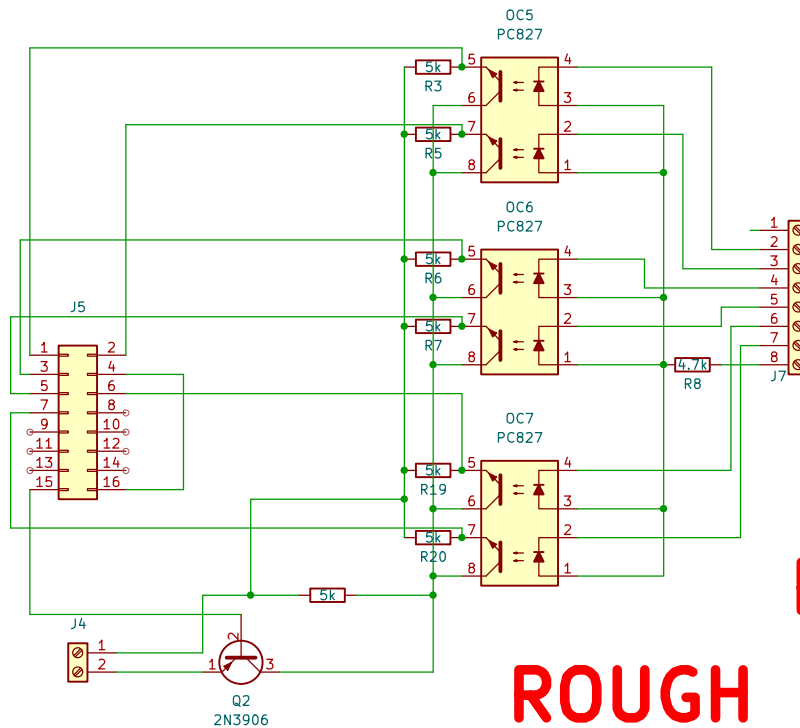
- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:  
1:< X + LIMIT  
2:< X - LIMIT  
3:< X HOME  
5:< Y + LIMIT  
6:< Y - LIMIT  
7:< Y HOME
- J2:  
1:< Z + LIMIT  
2:< Z - LIMIT  
3:< Z HOME  
5:< PROBE  
6:< TOOL RELEASE  
7:< SPINDLE RPM
- J3:  
1:< Enc1A X  
2:< Enc1B X  
3:< Enc2A Y  
5:< Enc2B Y  
6:< Enc3A Z  
7:< Enc3B Z
- J4:  
1:< Enc4A  
2:< Enc4B  
3:< Enc5A  
5:< Enc5B  
6:< Enc6A  
7:< Enc6B
- J5:  
1:> SPINDLE SELECT  
2:> ATC TOOL CLAMP  
3:> ATC TOOL LIFTER  
5:> ATC LIFTER CLAMP  
6:> ATC SHUTTER  
7:> ATC DRAWER
- J6:  
1:PWM> X  
2:PWM> Y  
3:PWM> Z  
5:PWM> SPINDLE  
6:PWM>  
7:PWM>
- J7:  
1:STEP1> THC  
2:DIR1> THC  
3:STEP2>  
5:DIR2>  
6:STEP3>  
7:DIR3>
- J8:  
1:STEP4>  
2:DIR4>  
3:STEP5>  
5:DIR5>  
6:STEP6>  
7:DIR6>

- J9:  
1:> MS CAVITY CLEANER  
2:> MS CUT CLEANER  
3:> THC TORCH ENABLE  
5:> SPINDLE FWD  
6:> SPINDLE REV  
7:> DRIVE RESET
- J10:  
1:> OP1  
2:> OP2  
3:> OP3  
5:> OP4  
6:> OP5  
7:> OP6
- J11:  
1:> OP7  
2:> OP8  
3:> OP9  
5:> OP10  
6:< IP1  
7:< IP2
- J12:  
1:< IP3  
2:< IP4  
3:< IP5  
5:< IP6  
6:< IP7  
7:< IP8
- J13:  
1:< IP9  
2:< IP10  
3:< IP11  
5:< IP12  
6:< IP13  
7:< IP14
- J14:  
1:< IP15  
2:< IP16  
3:< EMERGENCY STOP  
5:< RESET DRIVES  
6:< ATC CLAMP IS OPEN  
7:< ATC CLAMP IS CLOSED
- J15:  
1:< ATC LIFTER IS UP  
2:< ATC LIFTER IS DOWN  
3:< ATC TOOL IN CAVITY  
5:< MAIN SPINDLE IS UP  
6:< MAIN SPINDLE IS DOWN  
7:< AUX SPINDLE IS UP
- J16:  
1:< AUX SPINDLE IS DOWN  
2:< THC LIMIT +  
3:< THC TOUCH  
5:< THC TORCH VOLTS  
6:< START CYCLE  
7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J2 Board 6 Digital Inputs

- 1:< Z + LIMIT
- 2:< Z - LIMIT
- 3:< Z HOME
- 5:< PROBE
- 6:< TOOL RELEASE
- 7:< SPINDLE TACH
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:> OE

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< Z+ LIMIT
- 3:< Z- LIMIT
- 4:< Z HOME
- 5:< PROBE
- 6:< TOOL RELEASE
- 7:< SPINDLE TACH
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground

- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME

- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM

- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z

- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B

- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER

- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>

- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>

- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET

- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6

- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2

- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8

- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14

- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED

- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP

- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<

> = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J2 BOARD/  
File: J2\_BOARD.kicad\_sch

**Title:**

Size: A4 Date:

KiCad E.D.A. 8.0.0

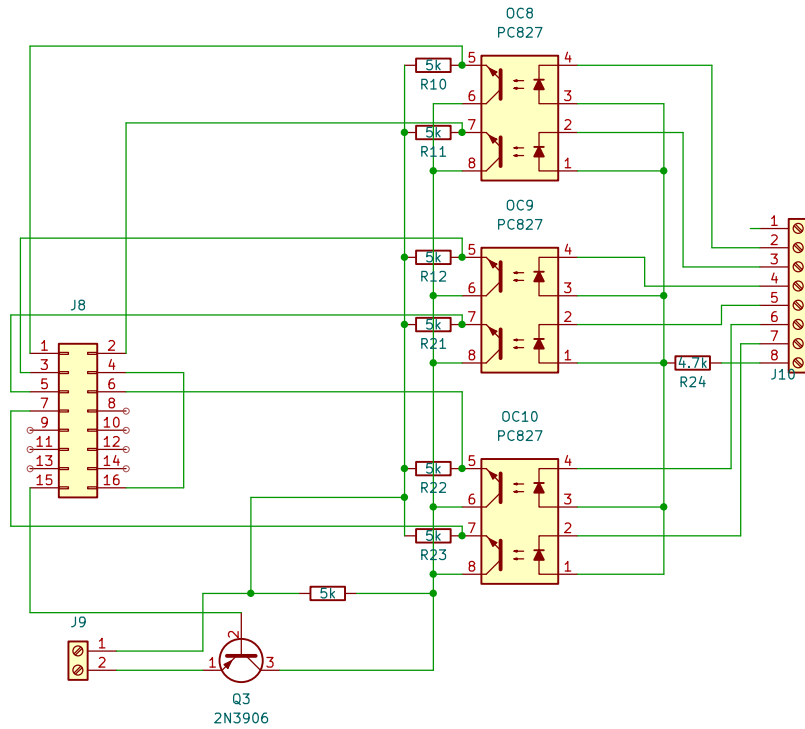
**Rev:**

Id: 3/17

# J3 Board 6 Digital Inputs

- 1:< Enc1A X
- 2:< Enc1B X
- 3:< Enc2A Y
- 5:< Enc2B Y
- 6:< Enc3A Z
- 7:< Enc3B Z
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE

- 1:> GND
- 2:> +5V



**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 1:> OP1
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 1:> OP2
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
  - 1:> OP3
  - 2:> OP4
  - 3:> OP5
  - 5:> OP6
  - 6:> OP7
  - 7:> OP8
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
  - 1:> OP9
  - 2:> OP10
  - 3:> OP11
  - 5:> OP12
  - 6:> OP13
  - 7:> OP14
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
  - 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
  - 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
  - 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>
- J8:
- 1:< GND
  - 2:< +5V
- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:> IP1
  - 7:> IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J3 BOARD/  
File: J3\_BOARD.kicad\_sch

Title:

Size: A4  
KiCad E.D.A. 8.0.0

Date:

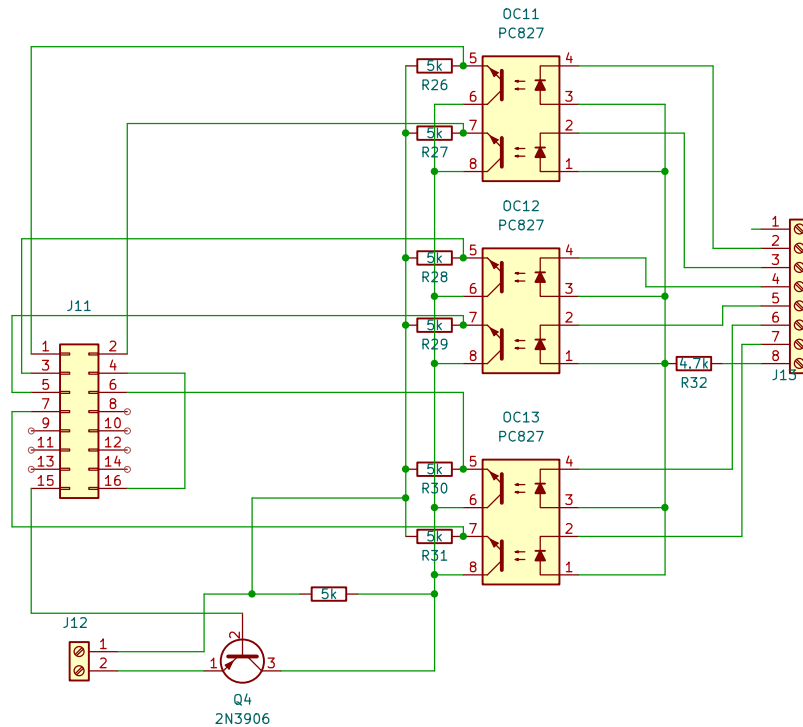
Rev:

Id: 4/17

# J4 Board 6 Digital Inputs

- 1:< Enc4A
- 2:< Enc4B
- 3:< Enc5A
- 5:< Enc5B
- 6:< Enc6A
- 7:< Enc6B
- 8:> Watchdog
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:>

- 1:> GND
- 2:> +5V



**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

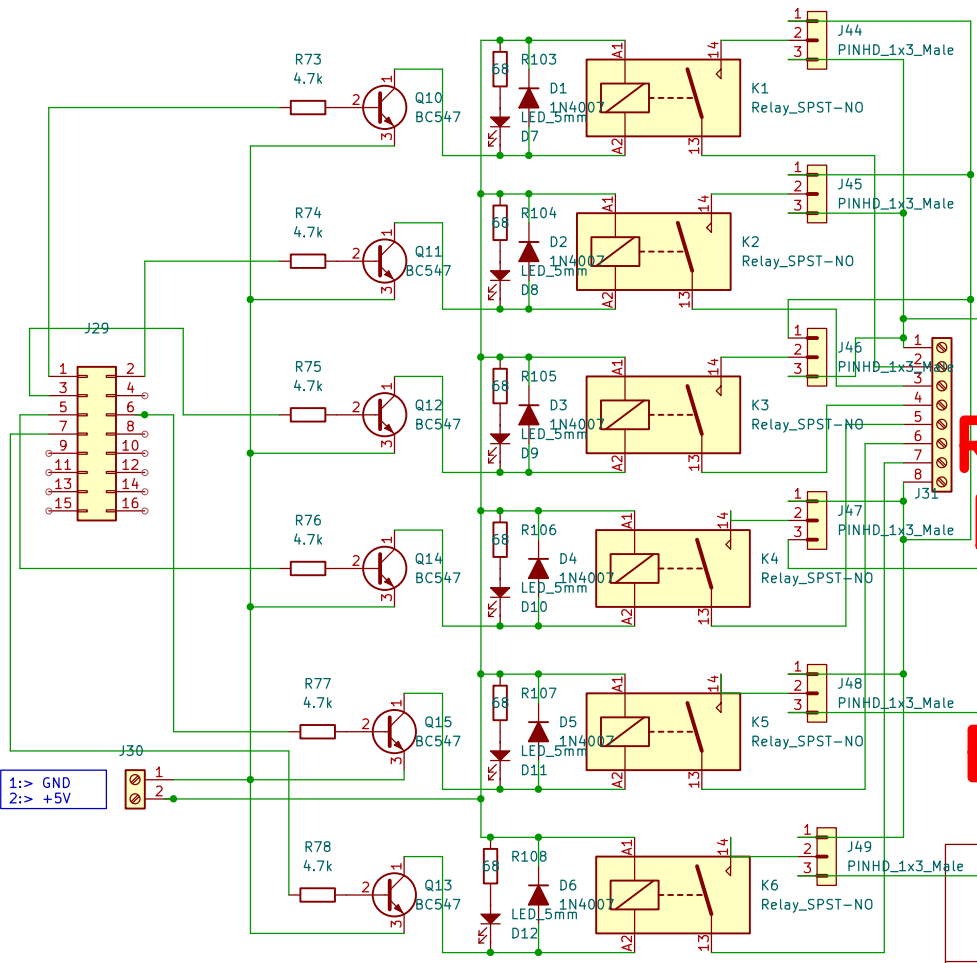
- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:> IP1
  - 7:> IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J5 Board 6 Relay Outputs (Selectable +24 or Gnd Out)

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:> SPINDLE SELECT
- 2:> ATC TOOL CLAMP
- 3:> ATC TOOL LIFTER
- 5:> ATC LIFTER CLAMP
- 6:> ATC SHUTTER
- 7:> ATC DRAWER
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE



- 1:< GND
- 2:> SPINDLE SELECT
- 3:> ATC TOOL CLAMP
- 4:> ATC TOOL LIFTER
- 5:> ATC SHUTTER
- 6:> ATC DRAWER
- 7:> +5V

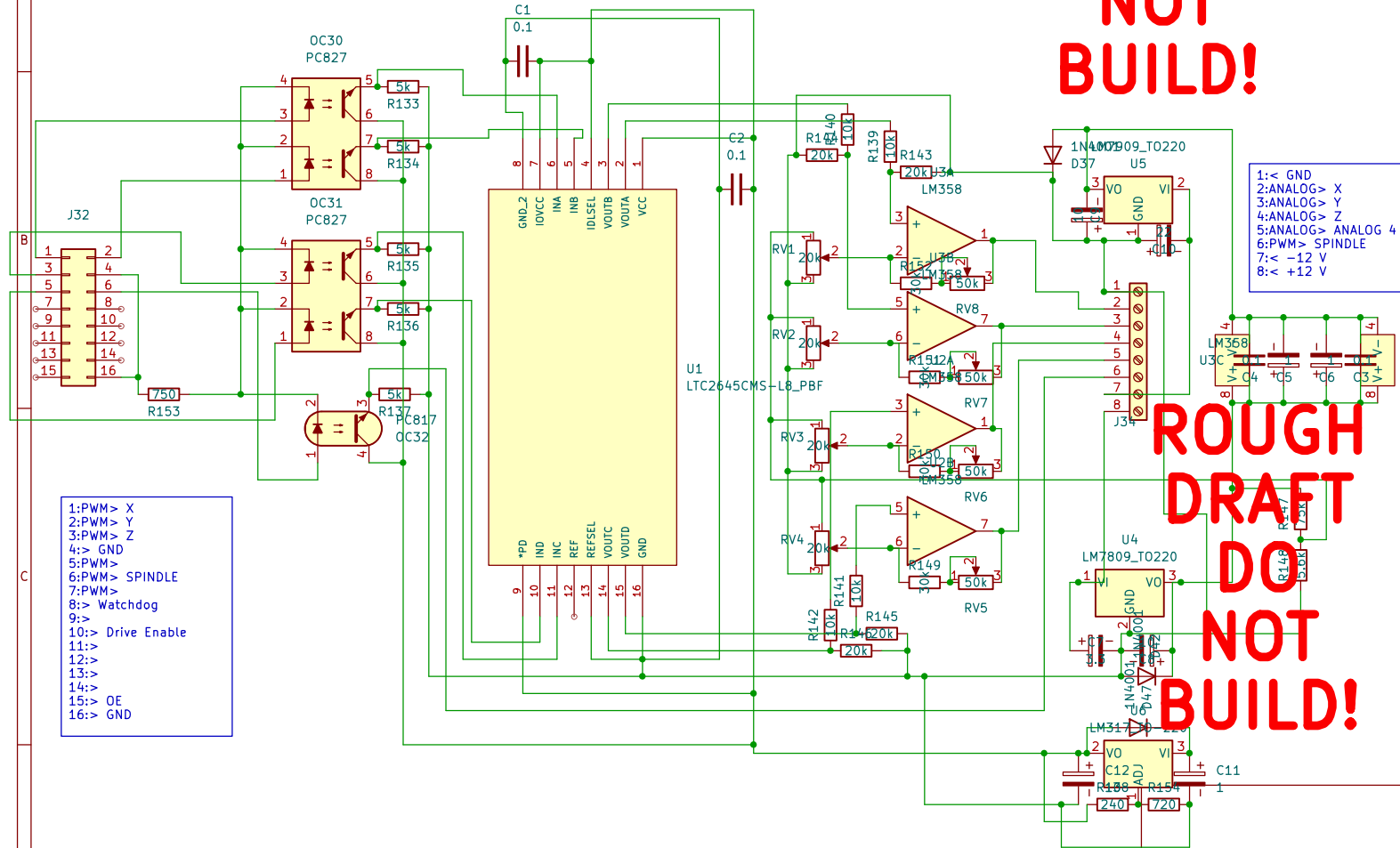
**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J6 Board 4 Analog Outs $\pm 6V$ (For Yasakawa Drives) 1 PWM Out

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**



- 1: PWM > X
- 2: PWM > Y
- 3: PWM > Z
- 4: > GND
- 5: PWM >
- 6: PWM > SPINDLE
- 7: PWM >
- 8: > Watchdog
- 9: >
- 10: > Drive Enable
- 11: >
- 12: >
- 13: >
- 14: >
- 15: > OE
- 16: > GND

- 1: < GND
- 2: ANALOG > X
- 3: ANALOG > Y
- 4: ANALOG > Z
- 5: ANALOG > ANALOG 4
- 6: PWM > SPINDLE
- 7: < -12 V
- 8: < +12 V

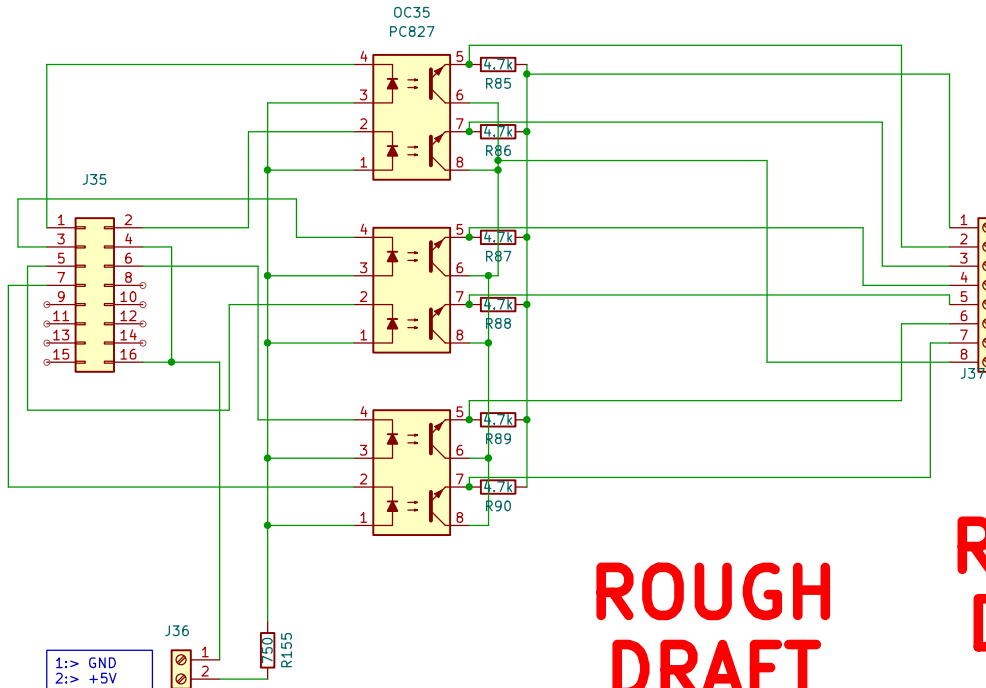
**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4: > Ground
  - 8: > Watchdog
  - 9: >
  - 10: > Drive Enable
  - 11: >
  - 12: >
  - 13: >
  - 14: >
  - 15: > OE (+3.3V)
  - 16: > Ground
- J1:
- 1: < X + LIMIT
  - 2: < X - LIMIT
  - 3: < X HOME
  - 5: < Y + LIMIT
  - 6: < Y - LIMIT
  - 7: < Y HOME
- J2:
- 1: < Z + LIMIT
  - 2: < Z - LIMIT
  - 3: < Z HOME
  - 5: < PROBE
  - 6: < TOOL RELEASE
  - 7: < SPINDLE RPM
- J3:
- 1: < Enc1A X
  - 2: < Enc1B X
  - 3: < Enc2A Y
  - 4: < Enc2B Y
  - 5: < Enc3A Z
  - 6: < Enc3B Z
  - 7: < Enc3C Z
- J4:
- 1: < Enc4A
  - 2: < Enc4B
  - 3: < Enc5A
  - 4: < Enc5B
  - 5: < Enc6A
  - 6: < Enc6B
- J5:
- 1: > SPINDLE SELECT
  - 2: > ATC TOOL CLAMP
  - 3: > ATC TOOL LIFTER
  - 5: > ATC LIFTER CLAMP
  - 6: > ATC SHUTTER
  - 7: > ATC DRAWER
- J6:
- 1: PWM > X
  - 2: PWM > Y
  - 3: PWM > Z
  - 5: PWM > SPINDLE
  - 6: PWM >
  - 7: PWM >
- J7:
- 1: STEP1 > THC
  - 2: DIR1 > THC
  - 3: STEP2 >
  - 5: DIR2 >
  - 6: STEP3 >
  - 7: DIR3 >
- J8:
- 1: STEP4 >
  - 2: DIR4 >
  - 3: STEP5 >
  - 5: DIR5 >
  - 6: STEP6 >
  - 7: DIR6 >

- J9:
- 1: > MS CAVITY CLEANER
  - 2: > MS CUT CLEANER
  - 3: > THC TORCH ENABLE
  - 5: > SPINDLE FWD
  - 6: > SPINDLE REV
  - 7: > DRIVE RESET
- J10:
- 1: > OP1
  - 2: > OP2
  - 3: > OP3
  - 5: > OP4
  - 6: > OP5
  - 7: > OP6
- J11:
- 1: > OP7
  - 2: > OP8
  - 3: > OP9
  - 5: > OP10
  - 6: < IP1
  - 7: < IP2
- J12:
- 1: < IP3
  - 2: < IP4
  - 3: < IP5
  - 6: < IP7
  - 7: < IP8
- J13:
- 1: < IP9
  - 2: < IP10
  - 3: < IP11
  - 5: < IP12
  - 6: < IP13
  - 7: < IP14
- J14:
- 1: < IP15
  - 2: < IP16
  - 3: < EMERGENCY STOP
  - 5: < RESET DRIVES
  - 6: < ATC CLAMP IS OPEN
  - 7: < ATC CLAMP IS CLOSED
- J15:
- 1: < ATC LIFTER IS UP
  - 2: < ATC LIFTER IS DOWN
  - 3: < ATC TOOL IN CAVITY
  - 5: < MAIN SPINDLE IS UP
  - 6: < MAIN SPINDLE IS DOWN
  - 7: < AUX SPINDLE IS UP
- J16:
- 1: < AUX SPINDLE IS DOWN
  - 2: < THC LIMIT +
  - 3: < THC TOUCH
  - 5: < THC TORCH VOLTS
  - 6: < START CYCLE
  - 7: <
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J7 Board 3 Step/Dir Outs

- 1:STEP1> THC
- 2:DIR1> THC
- 3:STEP2>
- 5:DIR2>
- 6:STEP3>
- 7:DIR3>
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE



- 1:> GND
- 2:> +5V

- 1:< GND
- 2:STEP1> THC
- 3:DIR1> THC
- 4:STEP2>
- 5:DIR2>
- 6:STEP3>
- 7:DIR3>
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J7 BOARD/  
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Title:

Size: A4 Date:

KiCad E.D.A. 8.0.0

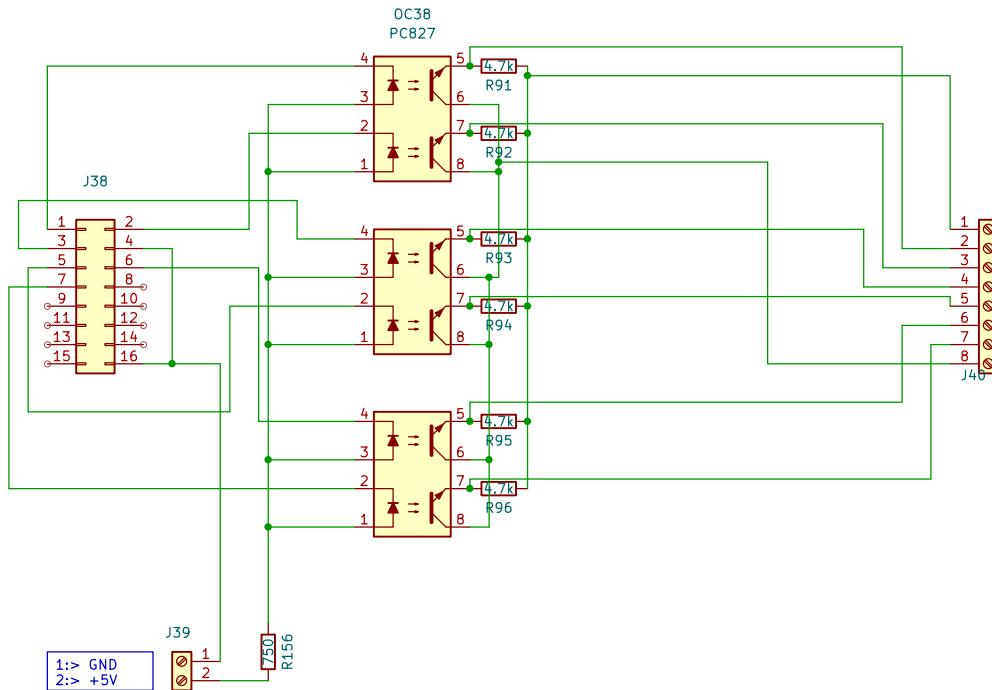
Rev:

Id: 8/17



# J8 Board 3 Step/Dir Outs

- 1:STEP4>
- 2:DIR4>
- 3:STEP5>
- 5:DIR5>
- 6:STEP6>
- 7:DIR6>
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE



- 1:> GND
- 2:> +5V

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:< GND
- 2:STEP4>
- 3:DIR4>
- 4:STEP5>
- 5:DIR5>
- 6:STEP6>
- 7:DIR6>
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

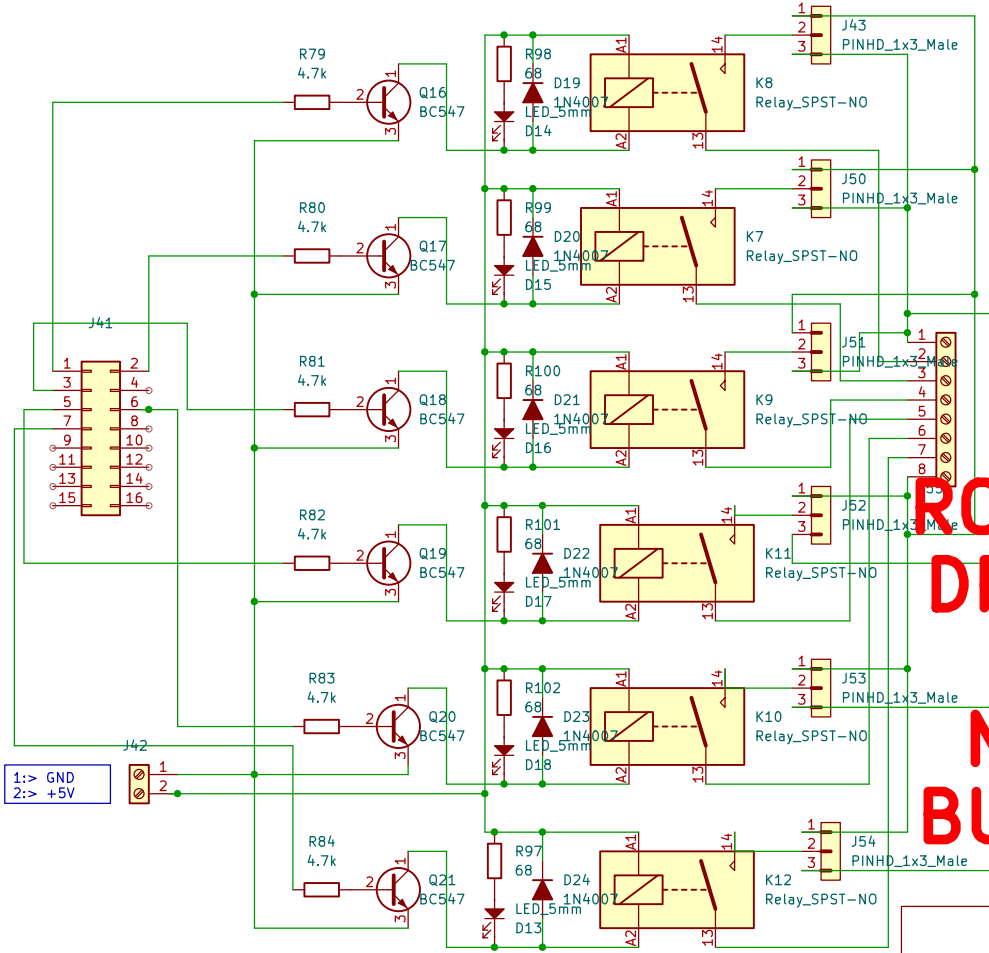
- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J9 Board 6 Relay Outputs (Selectable +24 or Gnd Out)

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:> MS CAVITY CLEANER
- 2:> MS CUT CLEANER
- 3:> THC TORCH ENABLE
- 5:> SPINDLE FWD
- 6:> SPINDLE REV
- 7:> DRIVE RESET
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE



- 1:> GND
- 2:> +5V

- 1:< GND
- 2:> MS CAVITY CLEANER
- 3:> MS CUT CLEANER
- 4:> THC TORCH ENABLE
- 5:> SPINDLE FWD
- 6:> SPINDLE REV
- 7:> DRIVE RESET
- 8:> +5VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

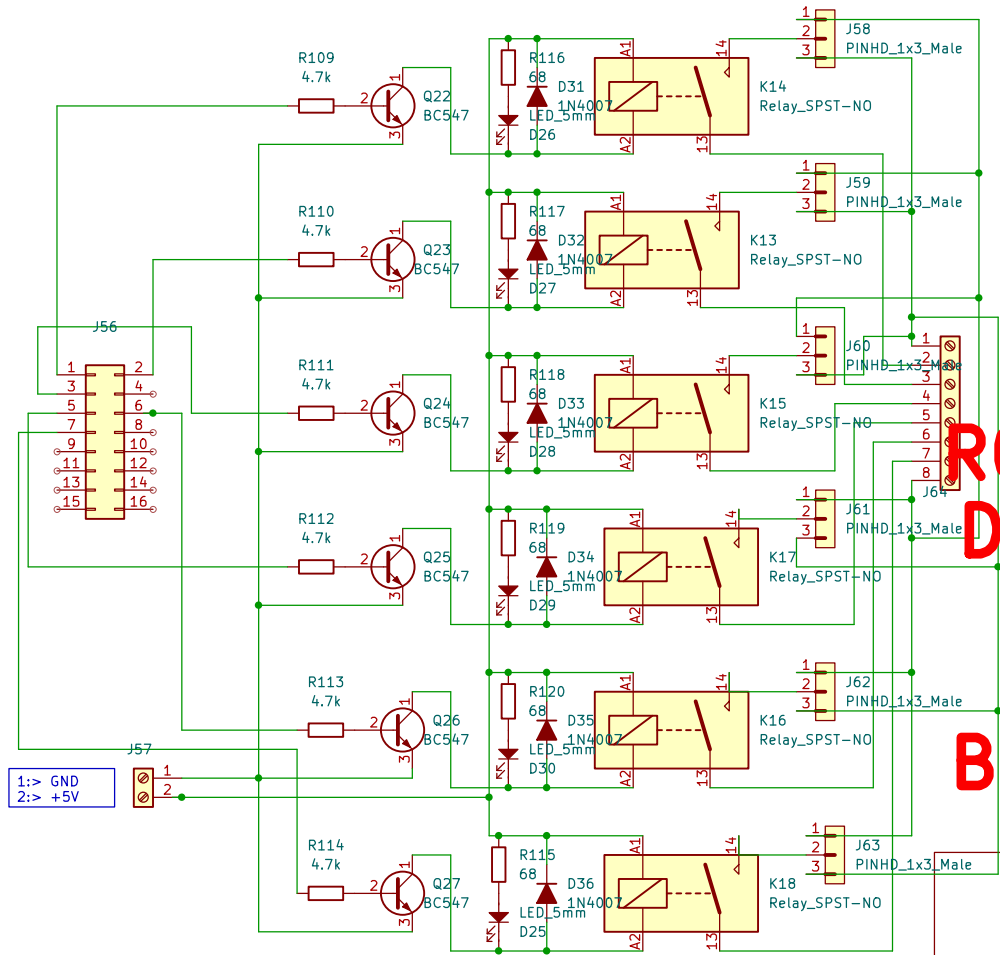
- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

# J10 Board 6 Relay Outputs (Selectable +24 or Gnd Out)

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:> OP1
- 2:> OP2
- 3:> OP3
- 5:> OP4
- 6:> OP5
- 7:> OP6
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:>



- 1:> GND
- 2:> +5V

- 1:< GND
- 2:> OP1
- 3:> OP2
- 4:> OP3
- 5:< GND
- 6:> OP4
- 7:> OP5
- 8:< +24 VOLT

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 7:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J10 BOARD/  
File: J10 BOARD.kicad\_sch

<b>Title:</b>	
Size: A4	Date:
KiCad E.D.A. 8.0.0	Rev:
	Id: 11/17

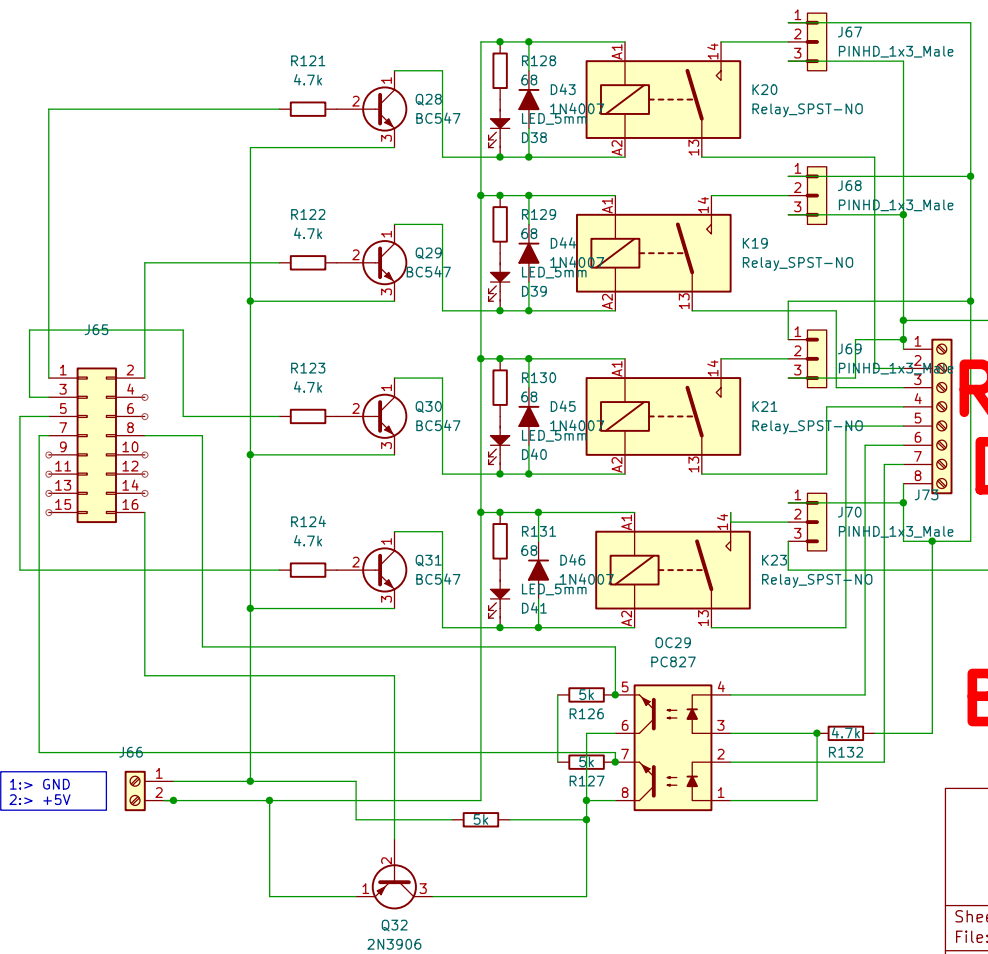
# J11 Board

## 4 Relay Outputs

## 2 Digital Inputs

(Selectable +24 or Gnd Out)

- 1:> OP7
- 2:> OP8
- 3:> OP9
- 5:> OP10
- 6:< IP1
- 7:< IP2
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:>



**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:> X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J11 BOARD/  
File: J11 BOARD.kicad\_sch

<b>Title:</b>		<b>Rev:</b>	
Size: A4	Date:		
KiCad E.D.A. 8.0.0		Id: 12/17	

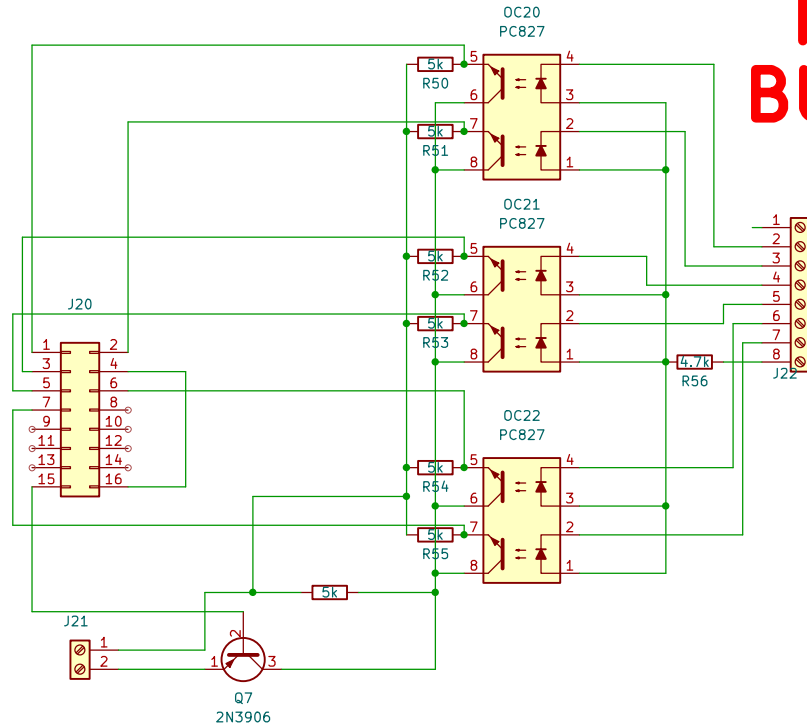
# J12 Board 6 Digital Inputs

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:< IP3
- 2:< IP4
- 3:< IP5
- 5:< IP6
- 6:< IP7
- 7:< IP8
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:>

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< IP3
- 3:< IP4
- 4:< IP5
- 5:< IP6
- 6:< IP7
- 7:< IP8
- 8:< +24 VOLT

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

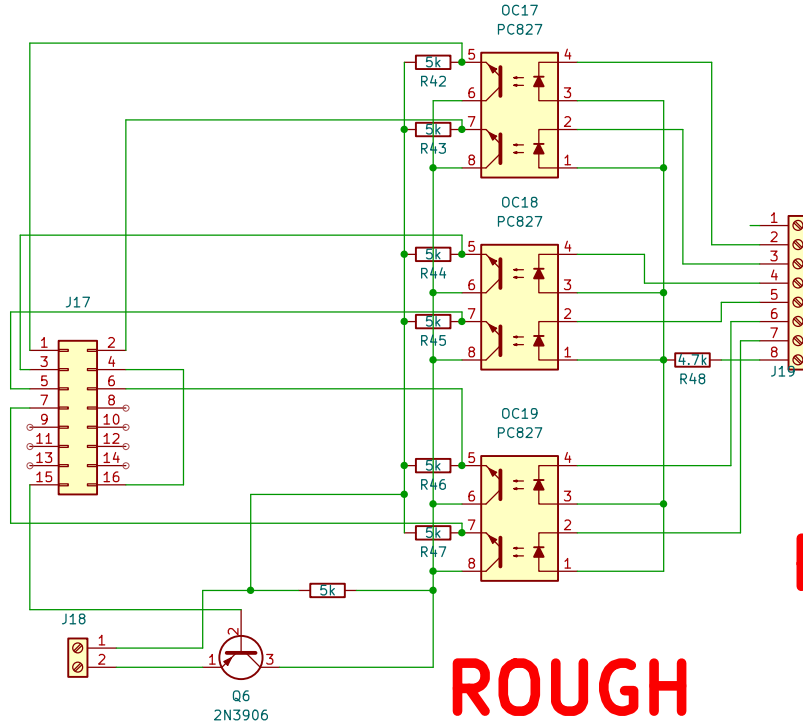
Sheet: /J12 BOARD/  
File: J12 BOARD.kicad\_sch

<b>Title:</b>		<b>Rev:</b>	
Size: A4	Date:		
KiCad E.D.A. 8.0.0		Id: 13/17	

# J13 Board 6 Digital Inputs

- 1:< IP9
- 2:< IP10
- 3:< IP11
- 5:< IP12
- 6:< IP13
- 7:< IP14
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< IP9
- 3:< IP10
- 4:< IP11
- 5:< IP12
- 6:< IP13
- 7:< IP14
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground

- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME

- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM

- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z

- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B

- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER

- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>

- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>

- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET

- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6

- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2

- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8

- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14

- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED

- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP

- J16:
- 1:< AUX SPINDLE IS DOWN
  - 2:< THC LIMIT +
  - 3:< THC TOUCH
  - 5:< THC TORCH VOLTS
  - 6:< START CYCLE
  - 7:<

> = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

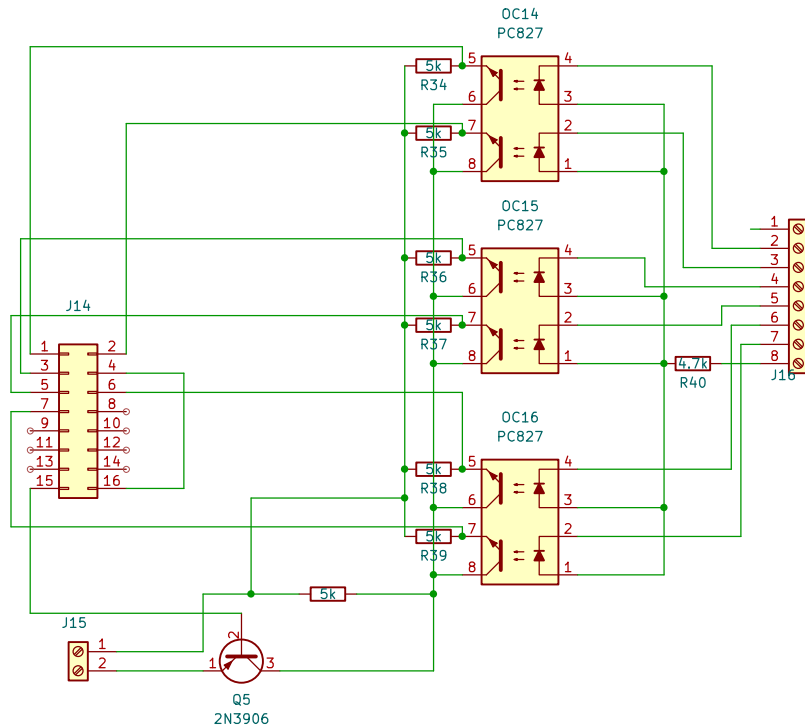
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File: J13 BOARD.kicad\_sch

<b>Title:</b>	
Size: A4	Date:
KiCad E.D.A. 8.0.0	Rev:
	Id: 14/17

# J14 Board 6 Digital Inputs

- 1:< IP15
- 2:< IP16
- 3:< E-STOP
- 5:< RESET DRIVES
- 6:< ATC CLAMP IS OPEN
- 7:< ATC CLAMP IS CLOSED
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:> OE
- 15:>

- 1:> GND
- 2:> +5V



**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- 1:< GND
- 2:< IP15
- 3:< IP16
- 4:< E-STOP
- 5:< RESET DRIVES
- 6:< ATC CLAMP IS OPEN
- 7:< ATC CLAMP IS OPEN
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 5:< IP5
  - 6:< IP6
  - 7:< IP7
  - 8:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPIN IS DOWN
  - 2:< THC + LIMIT
  - 3:< THC TOUCH
  - 5:< THC UP
  - 6:< THC DOWN
  - 7:< START CYCLE
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

Sheet: /J14 BOARD/  
File: J14 BOARD.kicad\_sch

Title:

Size: A4  
KiCad E.D.A. 8.0.0

Date:

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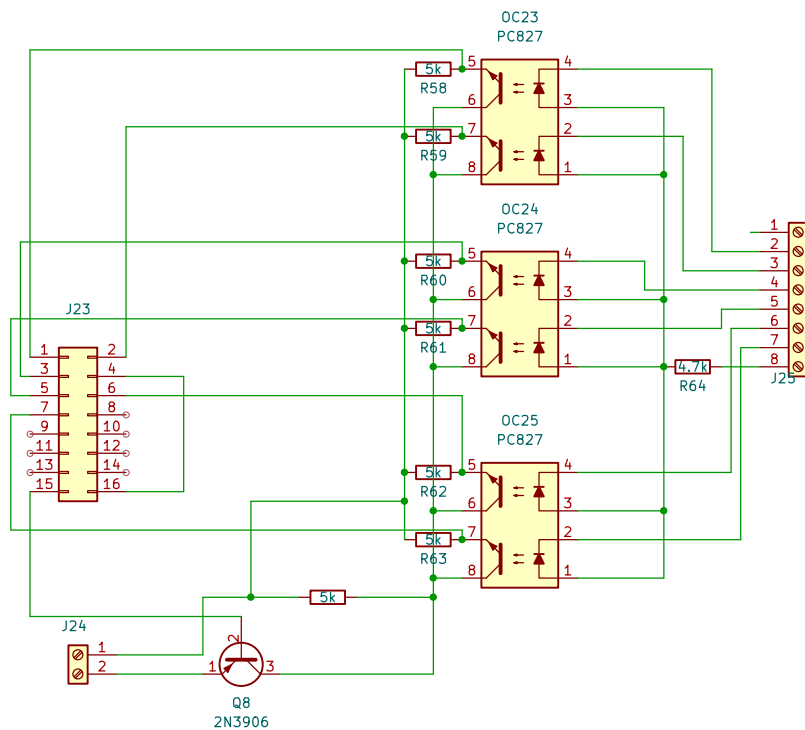
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# J15 Board 6 Digital Inputs

## ROUGH DRAFT DO NOT BUILD!

- 1:< ATC LIFTER IS UP
- 2:< ATC LIFTER IS DOWN
- 3:< ATC TOOL IN CAVITY
- 5:< MAIN SPINDLE IS UP
- 6:< MAIN SPINDLE IS DOWN
- 7:< AUX SPINDLE IS UP
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< ATC LIFTER IS UP
- 3:< ATC LIFTER IS DOWN
- 4:< ATC TOOL IN CAVITY
- 5:< MAIN SPINDLE IS UP
- 6:< MAIN SPINDLE IS DOWN
- 7:< AUX SPINDLE IS UP
- 8:< +24 VOLT

## ROUGH DRAFT DO NOT BUILD!

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:> IP1
  - 7:> IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPIN IS DOWN
  - 2:< THC + LIMIT
  - 3:< THC TOUCH
  - 5:< THC UP
  - 6:< THC DOWN
  - 7:< START CYCLE
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
MS = MAIN SPINDLE

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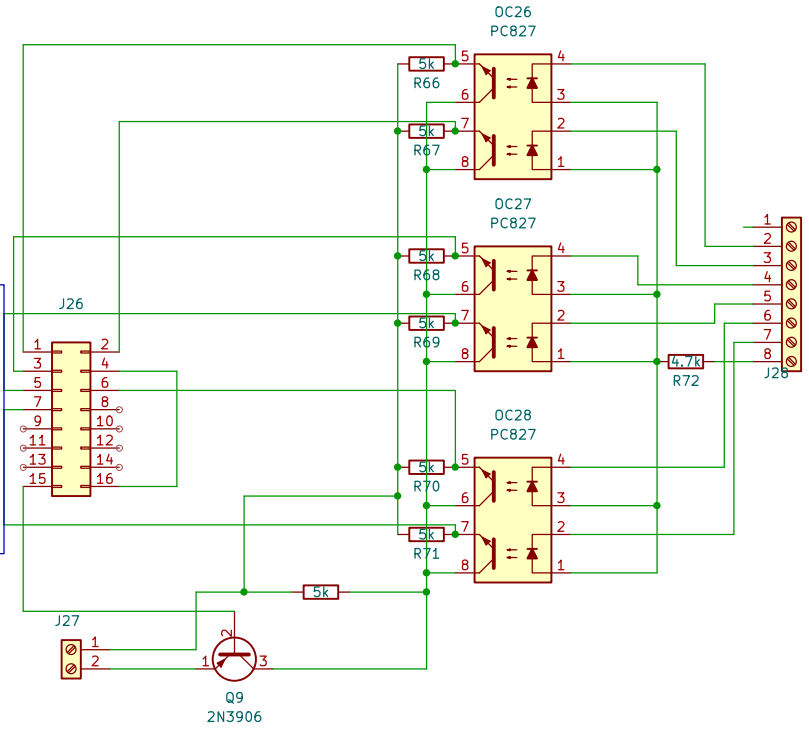
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# J16 Board 6 Digital Inputs

- 1:< AUX SPIN IS DOWN
- 2:< THC + LIMIT
- 3:< THC TOUCH
- 5:< THC UP
- 6:< THC DOWN
- 7:< START CYCLE
- 8:> Watchdog
- 9:>
- 10:> Drive Enable
- 11:>
- 12:>
- 13:>
- 14:>
- 15:> OE

- 1:> GND
- 2:> +5V



- 1:< GND
- 2:< AUX SPIN IS DOWN
- 3:< THC + LIMIT
- 4:< THC TOUCH
- 5:< THC UP
- 6:< THC DOWN
- 7:< START CYCLE
- 8:< +24 VOLT

**ROUGH  
DRAFT  
DO  
NOT  
BUILD!**

- Global Pins:  
(Available on all connectors)
- 4:> Ground
  - 8:> Watchdog
  - 9:>
  - 10:> Drive Enable
  - 11:>
  - 12:>
  - 13:>
  - 14:>
  - 15:> OE (+3.3V)
  - 16:> Ground
- J1:
- 1:< X + LIMIT
  - 2:< X - LIMIT
  - 3:< X HOME
  - 5:< Y + LIMIT
  - 6:< Y - LIMIT
  - 7:< Y HOME
- J2:
- 1:< Z + LIMIT
  - 2:< Z - LIMIT
  - 3:< Z HOME
  - 5:< PROBE
  - 6:< TOOL RELEASE
  - 7:< SPINDLE RPM
- J3:
- 1:< Enc1A X
  - 2:< Enc1B X
  - 3:< Enc2A Y
  - 5:< Enc2B Y
  - 6:< Enc3A Z
  - 7:< Enc3B Z
- J4:
- 1:< Enc4A
  - 2:< Enc4B
  - 3:< Enc5A
  - 5:< Enc5B
  - 6:< Enc6A
  - 7:< Enc6B
- J5:
- 1:> SPINDLE SELECT
  - 2:> ATC TOOL CLAMP
  - 3:> ATC TOOL LIFTER
  - 5:> ATC LIFTER CLAMP
  - 6:> ATC SHUTTER
  - 7:> ATC DRAWER
- J6:
- 1:PWM> X
  - 2:PWM> Y
  - 3:PWM> Z
  - 5:PWM> SPINDLE
  - 6:PWM>
  - 7:PWM>
- J7:
- 1:STEP1> THC
  - 2:DIR1> THC
  - 3:STEP2>
  - 5:DIR2>
  - 6:STEP3>
  - 7:DIR3>
- J8:
- 1:STEP4>
  - 2:DIR4>
  - 3:STEP5>
  - 5:DIR5>
  - 6:STEP6>
  - 7:DIR6>

- J9:
- 1:> MS CAVITY CLEANER
  - 2:> MS CUT CLEANER
  - 3:> THC TORCH ENABLE
  - 5:> SPINDLE FWD
  - 6:> SPINDLE REV
  - 7:> DRIVE RESET
- J10:
- 1:> OP1
  - 2:> OP2
  - 3:> OP3
  - 5:> OP4
  - 6:> OP5
  - 7:> OP6
- J11:
- 1:> OP7
  - 2:> OP8
  - 3:> OP9
  - 5:> OP10
  - 6:< IP1
  - 7:< IP2
- J12:
- 1:< IP3
  - 2:< IP4
  - 3:< IP5
  - 5:< IP6
  - 6:< IP7
  - 7:< IP8
- J13:
- 1:< IP9
  - 2:< IP10
  - 3:< IP11
  - 5:< IP12
  - 6:< IP13
  - 7:< IP14
- J14:
- 1:< IP15
  - 2:< IP16
  - 3:< EMERGENCY STOP
  - 5:< RESET DRIVES
  - 6:< ATC CLAMP IS OPEN
  - 7:< ATC CLAMP IS CLOSED
- J15:
- 1:< ATC LIFTER IS UP
  - 2:< ATC LIFTER IS DOWN
  - 3:< ATC TOOL IN CAVITY
  - 5:< MAIN SPINDLE IS UP
  - 6:< MAIN SPINDLE IS DOWN
  - 7:< AUX SPINDLE IS UP
- J16:
- 1:< AUX SPIN IS DOWN
  - 2:< THC + LIMIT
  - 3:< THC TOUCH
  - 5:< THC UP
  - 6:< THC DOWN
  - 7:< START CYCLE
- > = OUTPUT  
< = INPUT  
ATC = AUTO TOOL CHANGER  
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