

Axis Drives

Gearshift

Lubrication and Tool Change

Spindle

AC Power Supply

Relays

		Contactors	Pole 1	Pole 2	Pole 3	Pole 4	Model ID	24V DC Coil Power W
K01	E Stop Chain 1	A1-A2	13-14				CA3KN40BD3	1.5
K02	E Stop Chain 2	A1-A2	13-14				CA3KN40BD3	1.5
K03	Axes Limit Switch E-Stop Chain	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K04	Acess Gate Limit Switches	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K05	Access Gate Over-ride	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K06	Enable Axes Drives T20	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K07	Run Axes Drives T5	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K08	Axes Retract	A1-A2	13-14	23-24			CA3KN40BD3	1.5
K09	E-Stop Safety Relay Output	A1-A2	13-14	23-24	33-34	43-44	CA3KN40BD3	1.5
K10	X Axis Brake Release	A1-A2	13-14				CA3KN40BD3	1.5
K11	Y Axis Brake Release	A1-A2	13-14				CA3KN40BD3	1.5
K12	Z Axis Brake Release	A1-A2	13-14				CA3KN40BD3	1.5
K13	Gearshift Motor M5 ON/OFF	A1-A2	13-14	21-22			CA3KN22BD3	1.5
K14	Gearshift Motor M6 ON/OFF	A1-A2	13-14	21-22			CA3KN22BD3	1.5
K15	Geashift Motor M7 ON/OFF	A1-A2	13-14	21-22			CA3KN22BD3	1.5
K16	Gearshift Motor Direction	A1-A2	13-14	21-22	31-32	43-44	CA3KN22BD3	1.5
K17	Vertical ToolHolder Release	A1-A2	13-14				CA3KN40BD3	1.5
K18	Horizontal Toolholder Release	A1-A2	13-14				CA3KN40BD3	1.5
K19	Spindle Lubrication	A1-A2	13-14				CA3KN40BD3	1.5
K22	Central Lubrication Motor Contactor	A1-A2	13-14				CA3KN40BD3	1.5
K20	Hydraulic System Motor VFD Run	A1-A2	13-14	23-24	33-34		CA3KN40BD3	1.5
K21	Tool Change	A1-A2	13-14				CA3KN40BD3	1.5
K23	X axis Drive MPCB Contactor 25A						LC1D25	
K24	Y Axis Drive MPCB Contactor 25A						LC1D25	
K25	Z Axis Drive MPCB Contactor 40A						LC1D40	
K26	Cabinet Fan Thermostat AC							
K27	Cabinet Fan Thermostat DC							
K28	Mist Coolant	A1-A2	13-14				CA3KN40BD3	1.5
K29	Flood Coolant	A1-A2	13-14				CA3KN40BD3	1.5

Q01	Isolation Switch 63A 3P	VCF3	
Q02	MCB 40A 3P D Curve	Acti9 iC60 A9F45340	Incoming Power L1, L2, L3
Q03	MCB 1P 10A D Curve	Acti9 iC60H Disbo A9F45110	X Axis Servo Aux
Q04	MCB 1P 10A D Curve	Acti9 iC60H Disbo A9F45110	Y Axis Servo Aux
Q05	MCB 1P 10A D Curve	Acti9 iC60H Disbo A9F45110	Z Axis Servo Aux
Q06	MCB 1P 32A D Curve	Acti9 iC60H Disbo A9F45132	X Axis Servo Power
Q07	MCB 1P 32A D Curve	Acti9 iC60H Disbo A9F45132	Y Axis Servo Power
Q08	MCB 1P 40A D Curve	Acti9 iC60H Disbo A9F45140	Z Axis Servo Power
Q09	MCB 1P 10A D Curve	Acti9 iC60H Disbo A9F45110	ATV320 VFD - Spindle
Q10	MCB 1P 10A D Curve	Acti9 iC60H Disbo A9F45110	ATV320 VFD - Hydraulic System
Q11	MCB 1P 6A D Curve	Acti9 iC60H Disbo A9F45106	Central Lubrication Pump
Q12	MCB 1P 1A D Curve	Acti9 iC60H Disbo A9F55101	Cabinet Fan
Q13	MCB 1P 4A C Curve	Acti9 iC60H Disbo A9F54104	Siemens 24V PSU 240W
Q14	MCB 1P 4A C Curve	Acti9 iC60H Disbo A9F54104	Siemens 12V PSU 144W
Q15	MCB 1P 2A C Curve	Acti9 iC60H Disbo A9F54101	Omron 5V PSU 30W
Q16	MCB 1P 6A C Curve	Acti9 iC60H Disbo A9F54106	Computer PC PSU
Q17	MCB 1P 6A C Curve	Acti9 iC60H Disbo A9F54106	Computer Monitor

Prefix	Device ID	Label
\$	1	X Axis
\$	2	Y Axis
\$	3	Z Axis
\$	4	Handwheel ON
\$	5	Jog 0.01 mm
\$	6	Pendant Release/Clamp Tool
\$	7	E-Stop 1
\$	8	E-Stop 2
\$	9	Activate
\$	10	Home
\$	11	Z - Jog
\$	12	Y+ Jog
\$	13	X+ Jog
\$	14	X- Jog
\$	15	Y- Jog
\$	16	Z+ Jog
\$	17	Axes Retract
\$	18	Rapid
\$	19	Spindle Direction
\$	20	Spindle ON
\$	21	Tool Change Vertical/Horizontal
\$	22	Tool Change
\$	23	Lube Cycle
\$	24	Cycle Start
\$	25	Cycle Stop
\$	26	Spindle Nominal RPM
\$	27	Spindle % Override
\$	28	FeedRate % Override
\$	29	
\$	30	
\$	31	Lube Pressure
\$	32	
\$	33	Hydraulic System Pressure
\$	34	
\$	35	
\$	36	Gearshift Ratio M5 Slow
\$	37	Gearshift Ratio M5 Medium
\$	38	Gearshift Ratio M5 Fast
\$	39	Gearshift Ratio M6 Slow
\$	40	Gearshift Ratio M6 Medium
\$	41	Gearshift Ratio M6 Fast
\$	42	Countershaft M7 Fast
\$	43	Countershaft M7 Slow
\$	44	Countershaft M7 Acknowledge
\$	45	- X Axis Limit Switch - reducing
\$	46	- X Axis Limit Switch - range end
\$	47	X Axis Limit Switch - E-Stop
\$	48	
\$	49	+X Axis Limit Switch - range end
\$	50	+X Axis Limit Switch - reducing
\$	51	- Y Axis Limit Switch - reducing
\$	52	- Y Axis Limit Switch - range end
\$	53	Y Axis Limit Switch - E-Stop
\$	54	
\$	55	+Y Axis Limit Switch - range end
\$	56	+Y Axis Limit Switch - reducing
\$	57	- Z Axis Limit Switch -reducing
\$	58	- Z Axis Limit Switch - range end
\$	59	-Z Axis Limit Switch - E-Stop
\$	60	+Z Axis Limit Switch - E-Stop
\$	61	+Z Axis Limit Switch - range end
\$	62	+Z Axis Limit Switch - reducing
\$	63	Access Gate Limit Switch 1
\$	64	Access Gate Limit Switch 2
\$	65	E-Stop 3

OEM Solenoid Valves

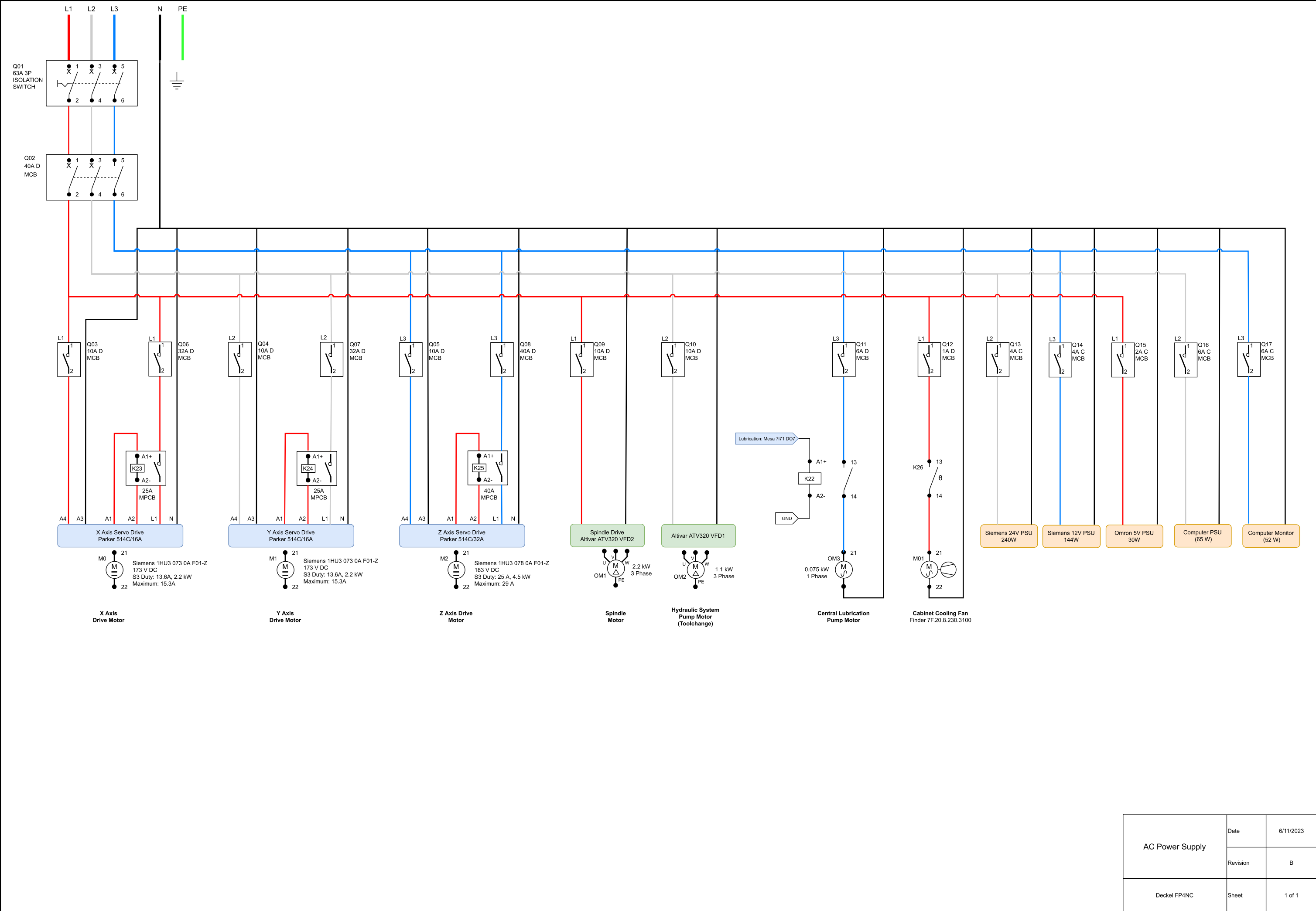
Y01		
Y02	X Axis Brake Release Solenoid	
Y03	Y Axis Brake Release Solenoid	
Y04	Z Axis Brake Release Solenoid	
Y05	Horizontal Drawbar Release Solenoid	
Y06	Vertical Drawbar Release Solenoid	
Y07	Mist Coolant Pneumatic Solenoid	
Y08		
Y09		
Y10	Spindle Lubrication Solenoid Valve	

DC Motors

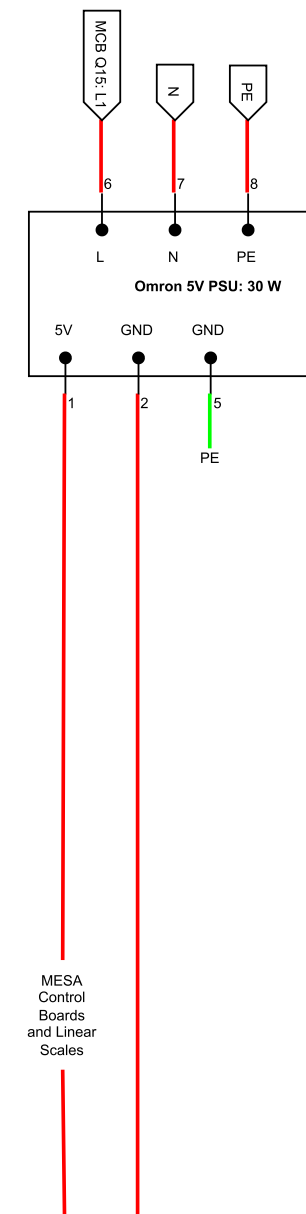
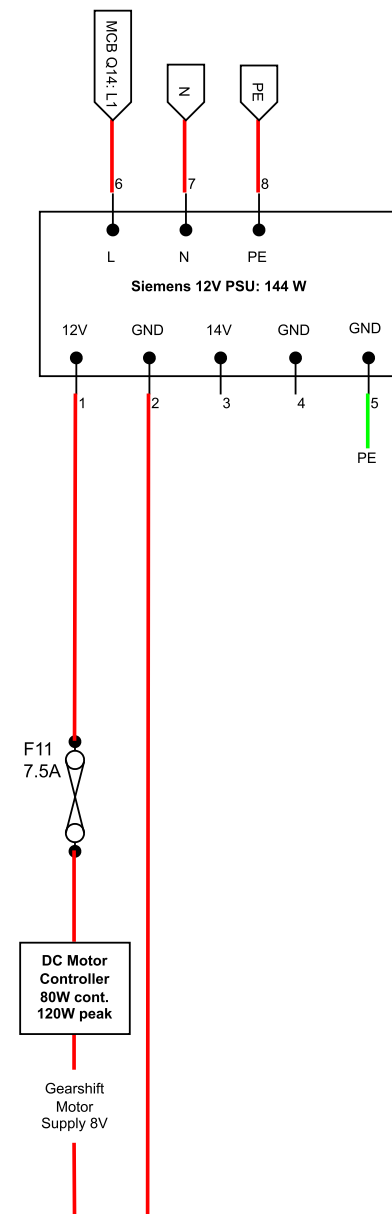
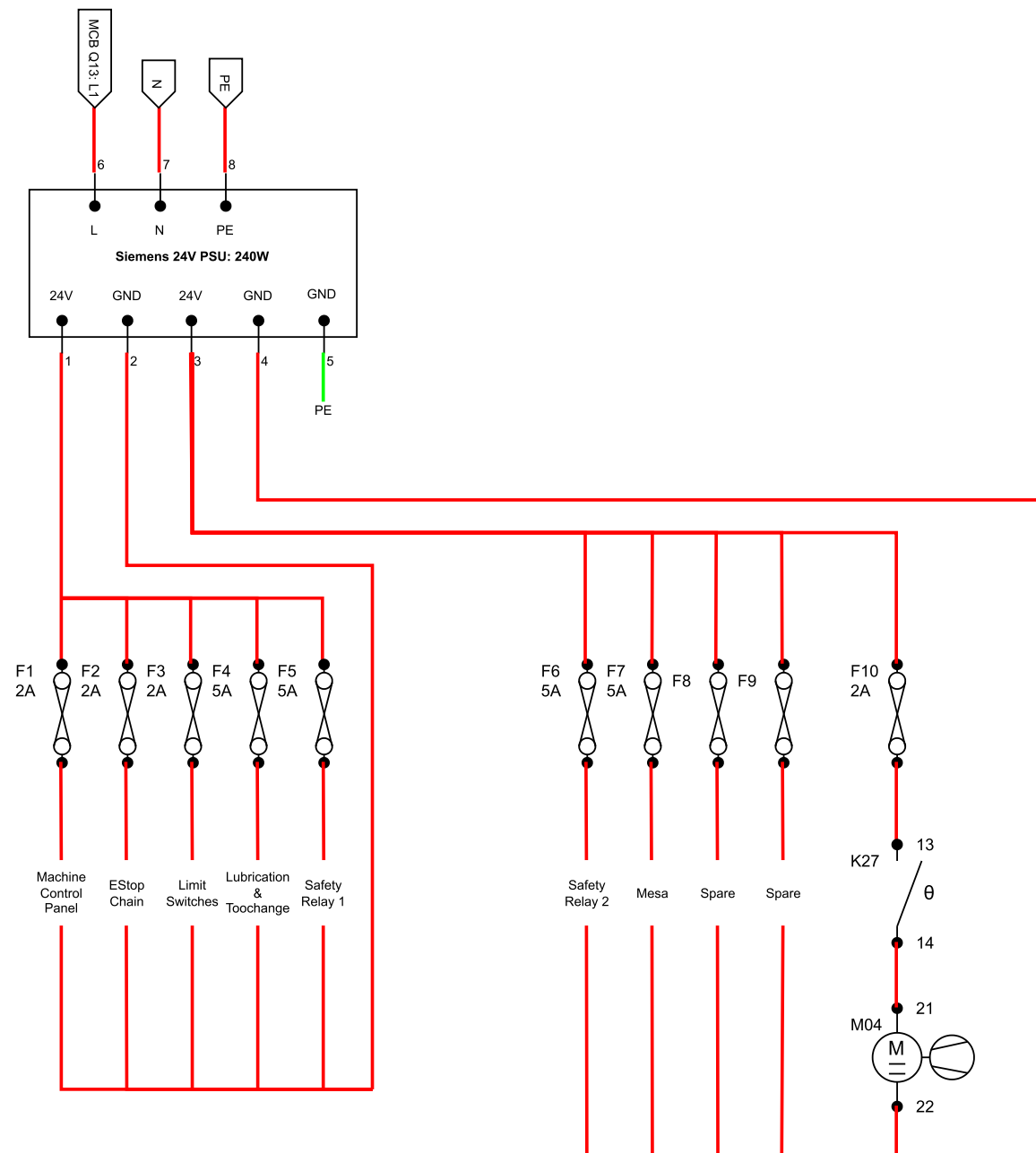
M1	X Axis Servo Motor
M2	Y Axis Servo Motor
M3	Z Axis Servo Motor
M4	Cabinet Cooling Fan
M5	Gear Shift Block 1
M6	Gear Shift Block 2
M7	Gear Shift Countershaft
M8	
M9	

AC Motors

OM1	Spindle Motor	230V 3 Phase	2.2 kW
OM2	Hydraulic System Motor	230V 3 Phase	1.1 kW
OM3	Lubrication Motor	230V Single Phase	0.075 kW
OM4	Cabinet Cooling Fan	230 V Single Phase	0.028 kW
OM5			
OM6			
OM7			
OM8			
OM9			

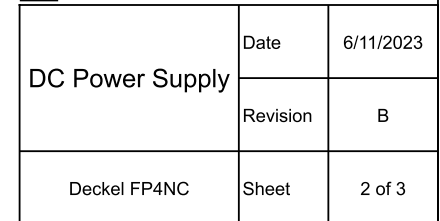


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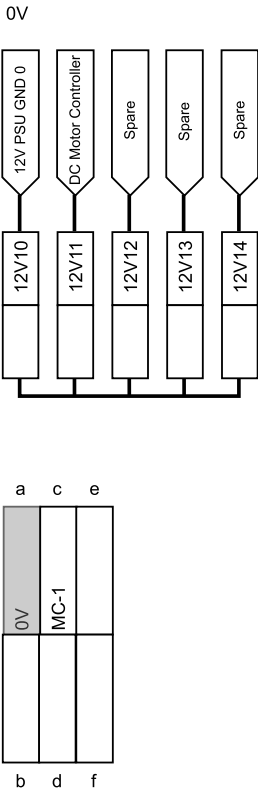
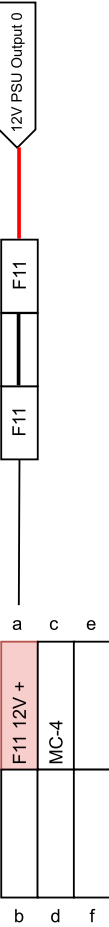


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5V+



12V PSU Power Distribution



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The diagram illustrates the electrical connections for the 2000 Series CNC Machine. It shows the following components and their connections:

- Access Gate Limit Switches:** Includes switches S63 and S64, connected to terminals 21 and 22. The output is connected to K04, which is then connected to A1+ and A2-.
- E-Stops:** Includes switches S07 and S08, connected to terminals 11, 12, 21, and 22. The output is connected to K01 and K02, which are then connected to A1+ and A2-.
- Axis E-Stop Limits:** Includes switches S47, S53, S59, and S60, connected to terminals 21 and 22. The output is connected to K03, which is then connected to A1+ and A2-.
- X Axis Brake Release:** Includes relay Y2, connected to terminals 23 and 24. The output is connected to 1-G3.
- Y Axis Brake Release:** Includes relay Y3, connected to terminals 33 and 34. The output is connected to 1-G5.
- Z Axis Brake Release:** Includes relay Y4, connected to terminals 43 and 44. The output is connected to 1-G7.

The diagram also shows various terminal blocks and switches, including F2-f, F2-d, F2-b, F3-e, F2-e, F2-c, F3-c, S63, S64, S07, S08, S47, S53, S59, S60, K04, K01, K02, K03, Y2, Y3, Y4, and 1-G3, 1-G5, 1-G7.

The diagram illustrates the electrical connections for the Mesa 7i70 DI 27 module. It features a 24V+ power supply and a GND connection. The module's terminals are connected to various components:

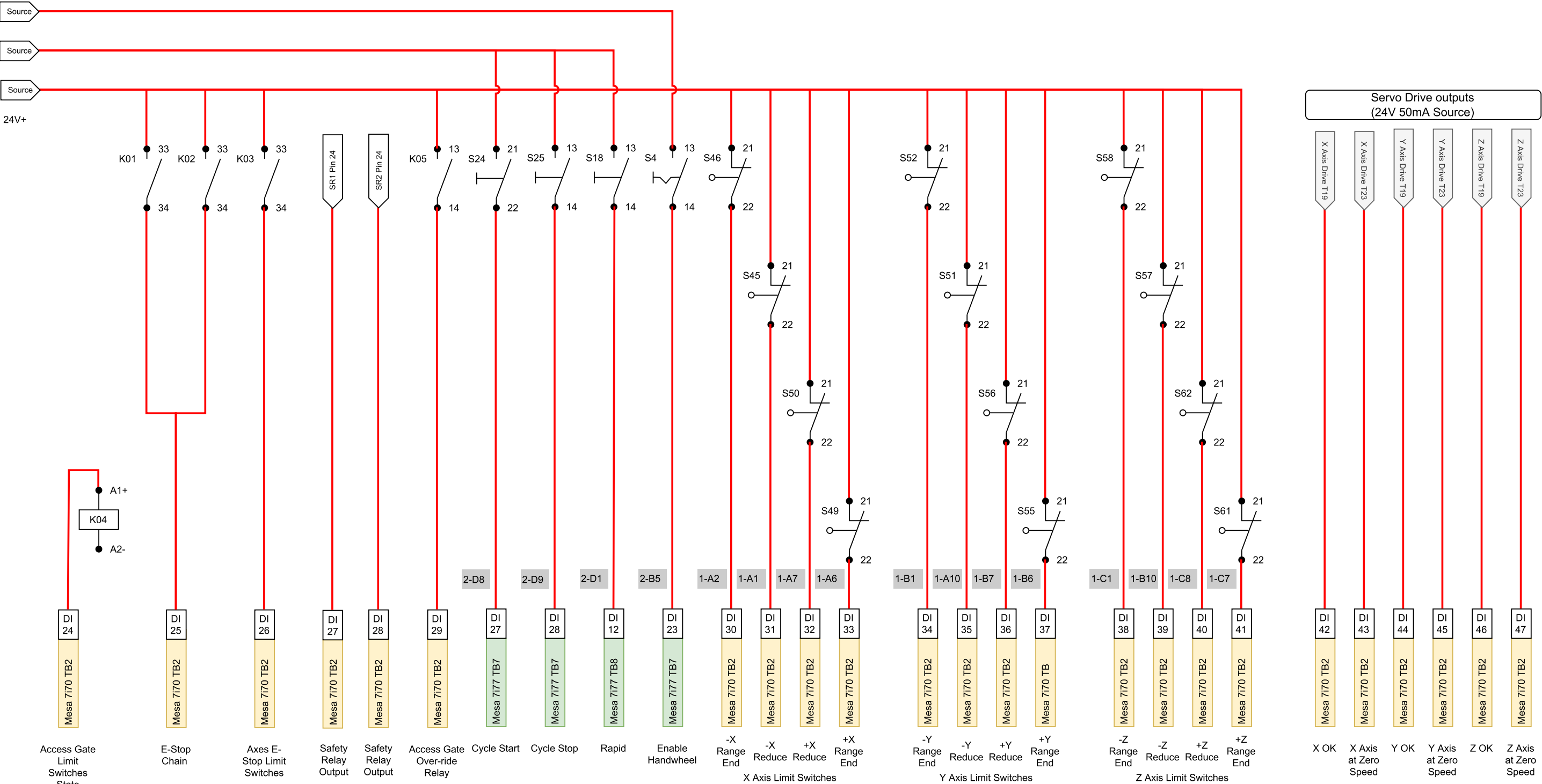
- Power Supply:** 24V+ and GND are connected to the top and bottom of the module.
- Relays:** K01, K02, K03, K04, K05, K08, and K09 are shown with their respective terminals (13, 14, 23, 24) connected to the module's output lines.
- Switches:** S09 is an activation switch monitored by the safety relay. S33, S34, and S39 are also shown.
- Safety Relay:** The XPS-AFL-1 Safety Relay is connected to the module's output lines (A1, A2, A1+, A2-).
- Other Components:** F5-e, F5-c, F5-b, and Mesa 7i70 DI 27 are labeled components.

The activation switch S09 is monitored by the Safety Relay. The activation switch is pressed and released to activate, and the safety relay output is triggered by the release of the activation switch provided the e-stop chain is OK, axes limits and access gate limits are OK - or over-ridden,

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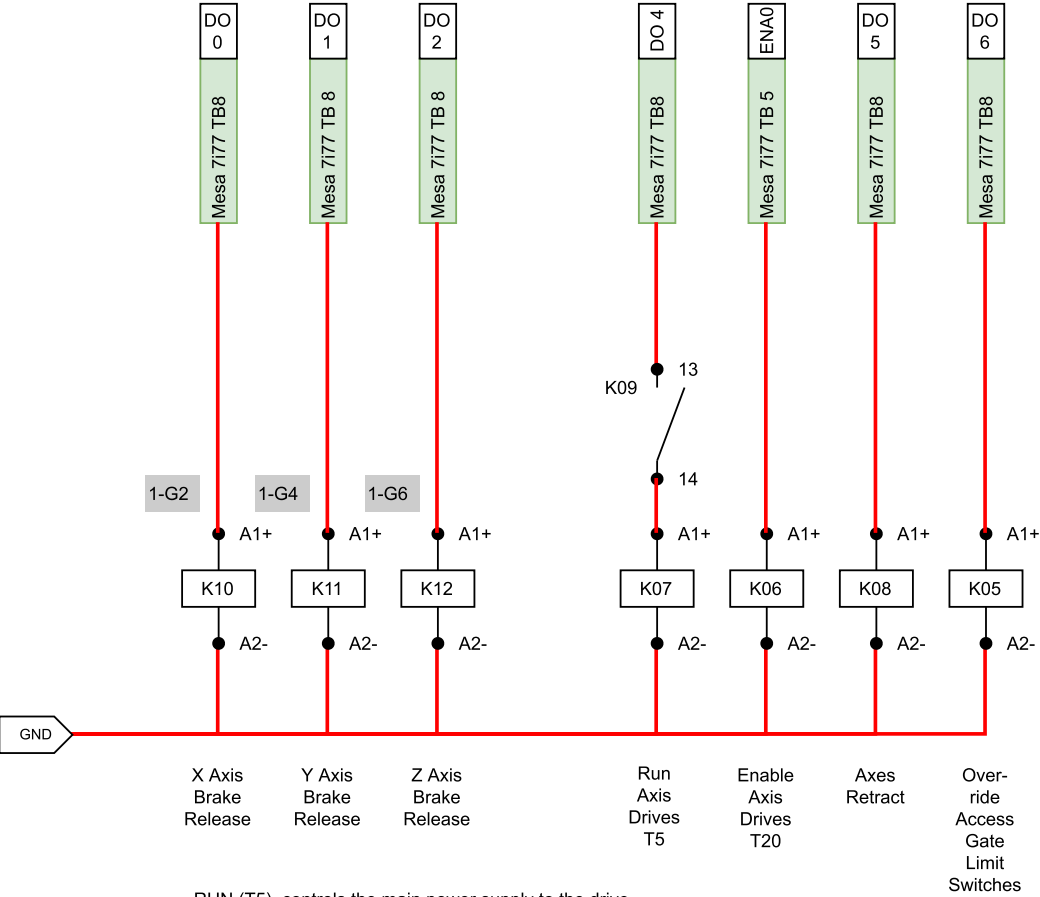
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Digital Inputs

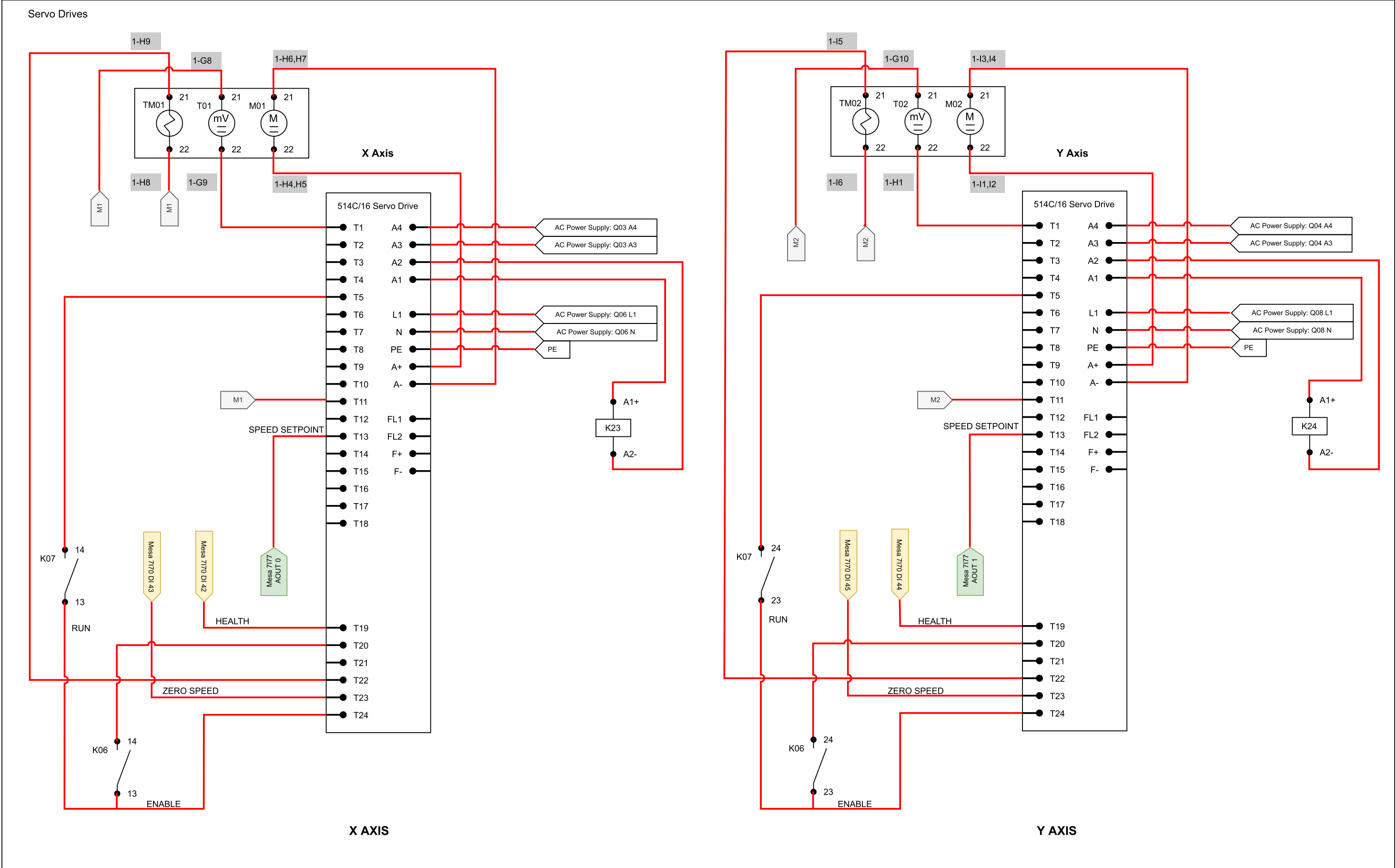


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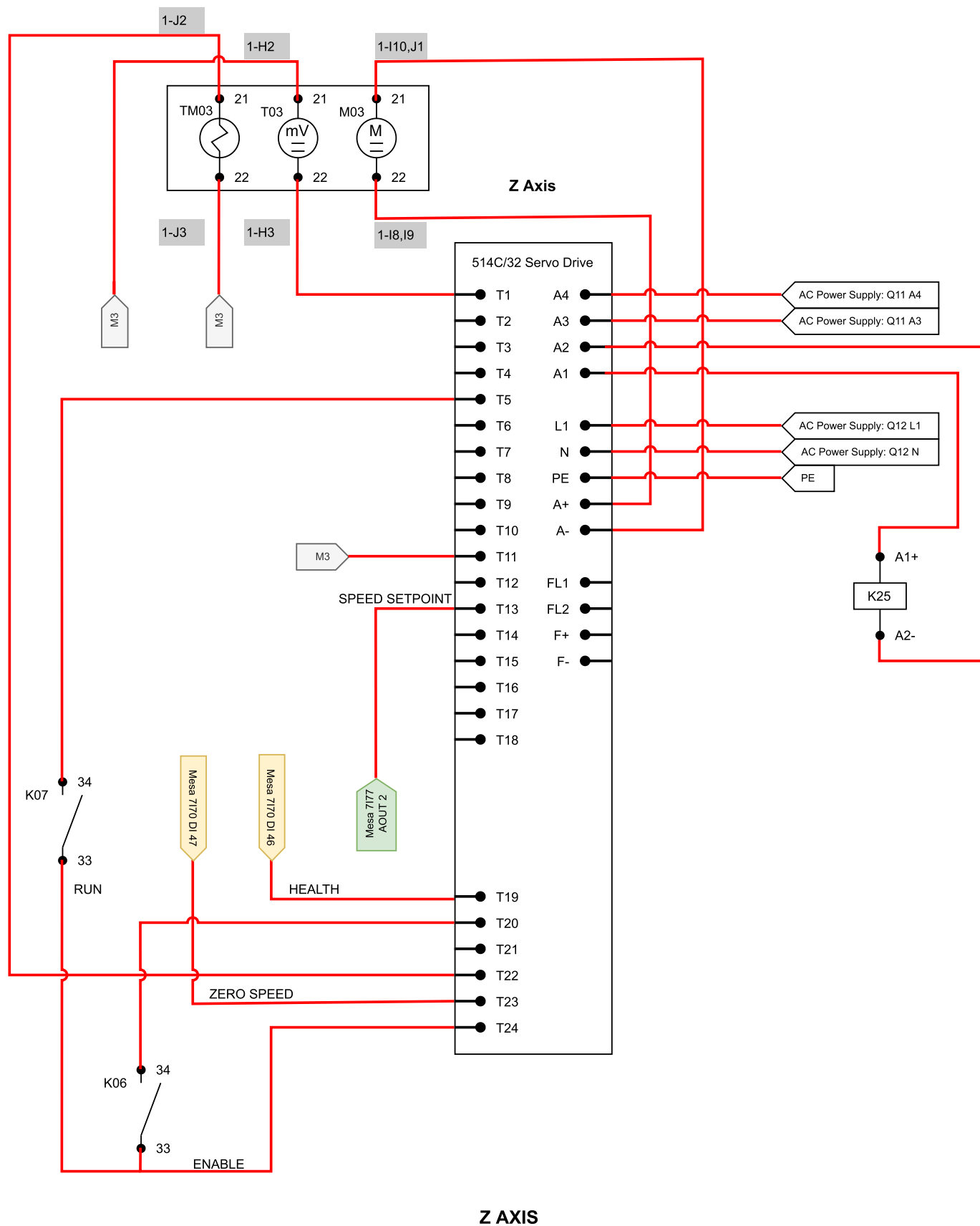
Digital Outputs



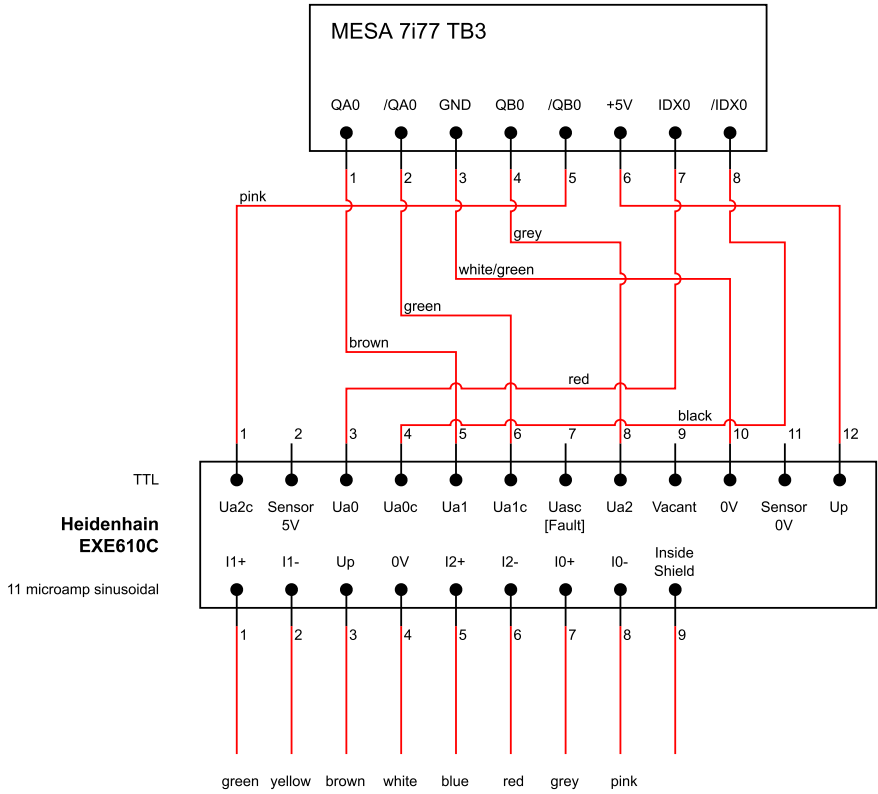
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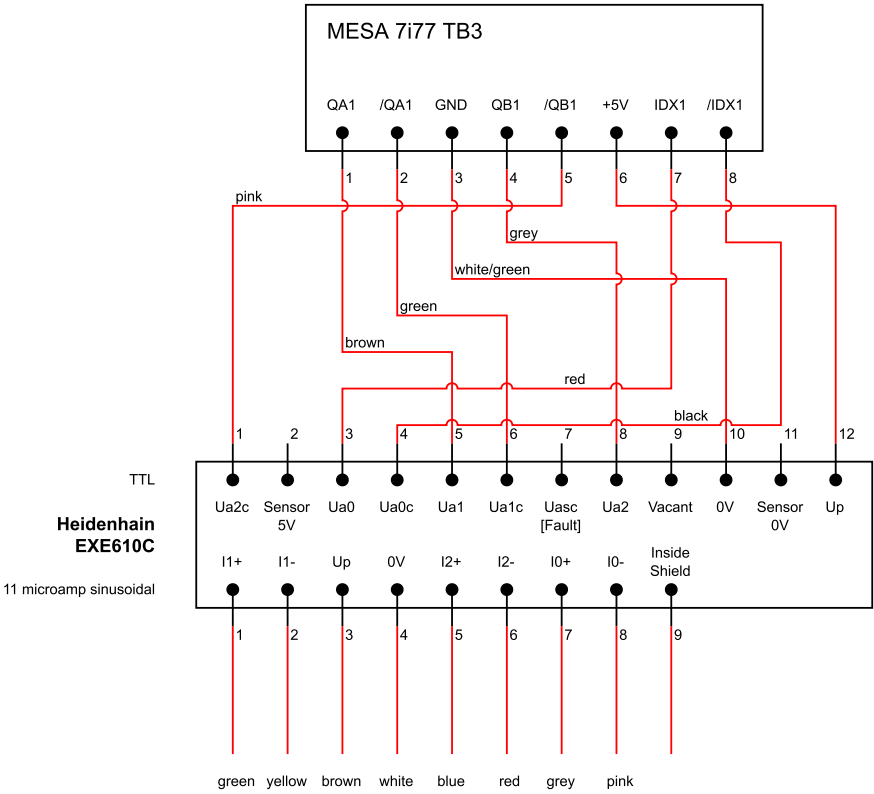
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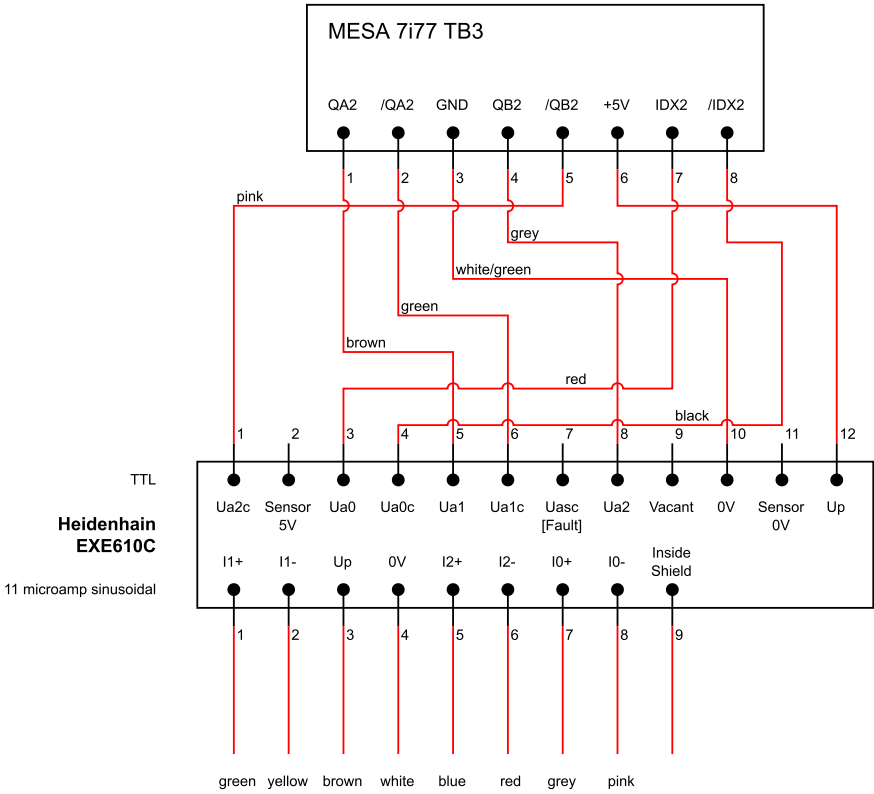
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X AXIS



Y AXIS



Z AXIS

EXE-Ausgangssignale TTL

Pinbelegung
12-polige Flanschdose (Stift) für TTL-Ausgangssignale
(Farbangaben gelten für HEIDENHAIN-Kabel)

Pin	1	2	3	4	5	6	7	8	9	10	11	12	/
Signal	U _{a2}	5 V Sensor *	U _{a0}	U _{a0}	U _{a1}	U _{a1}	U _{aS}	U _{a2}	/	0 V U _{tl} *	0 V Sensor *	5 V U _p *	/
Farbe	rosa	blau	rot	schwarz	braun	grün	violett	grau	/	weiß/ grün	weiß	braun/ grün	gelb
Color	pink	blue	red	black	brown	green	violet	gray		white/ green	white	brown/ green	yellow

*Die Sensorleitung ist intern mit der Versorgungsleitung verbunden

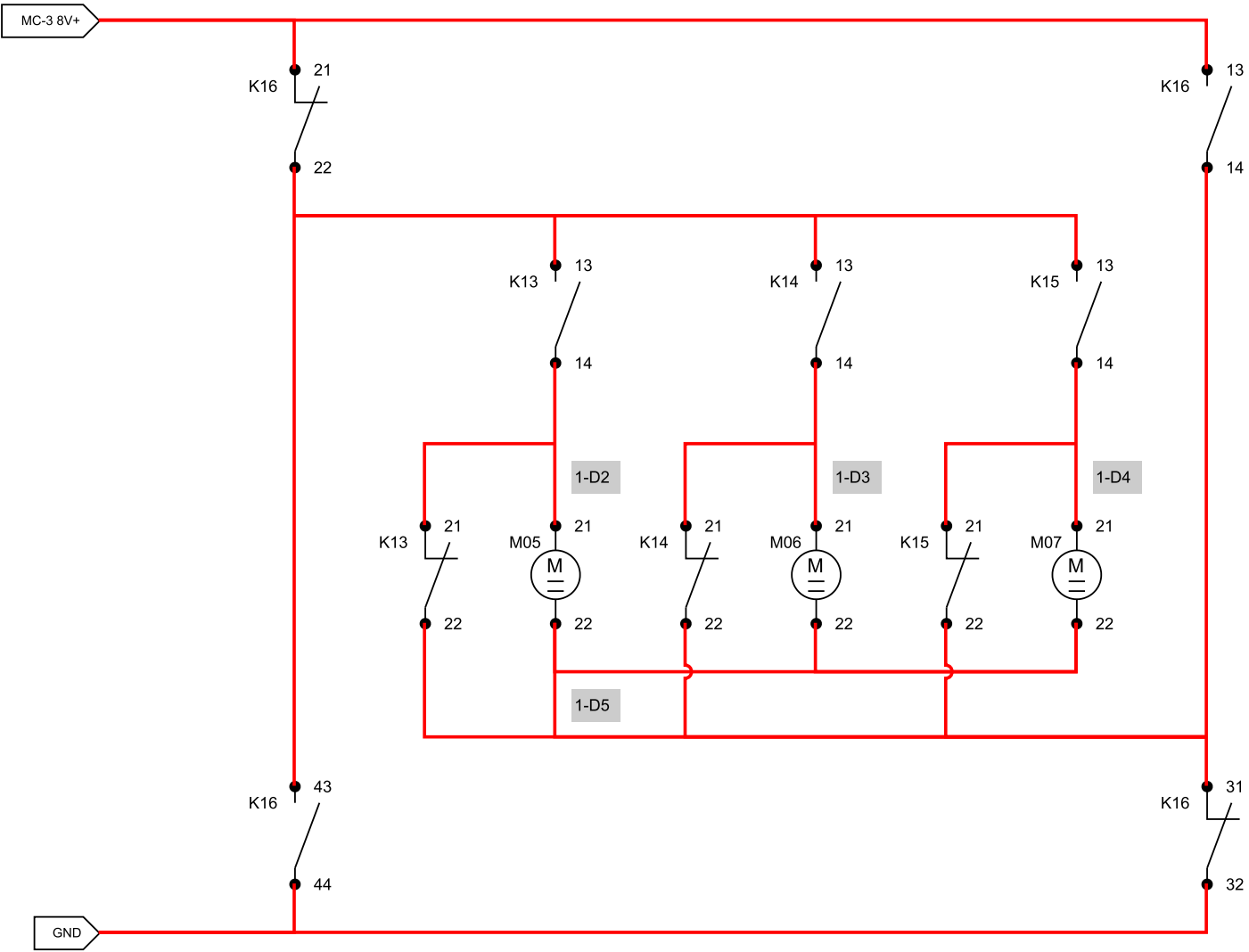
EXE Output Signals (TTL)

Pin layout
12-pin flange socket (male) for TTL output signals
(colors specified as they apply to HEIDENHAIN cable)

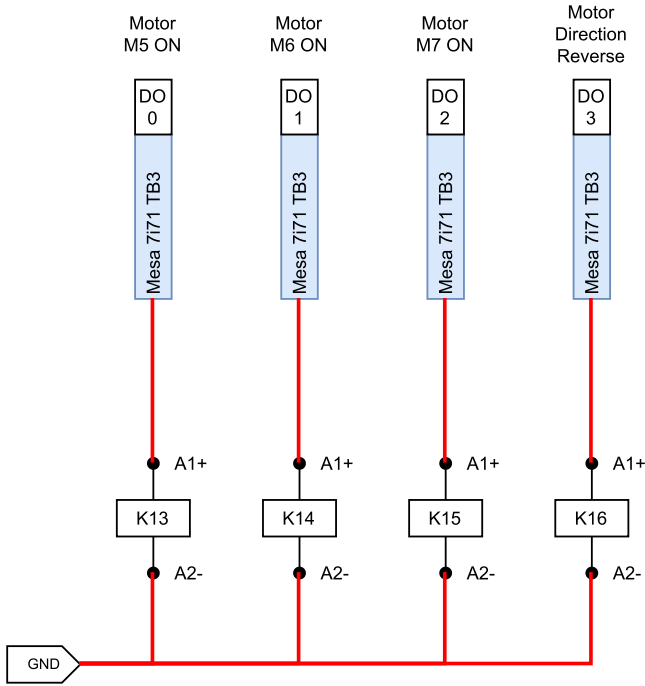
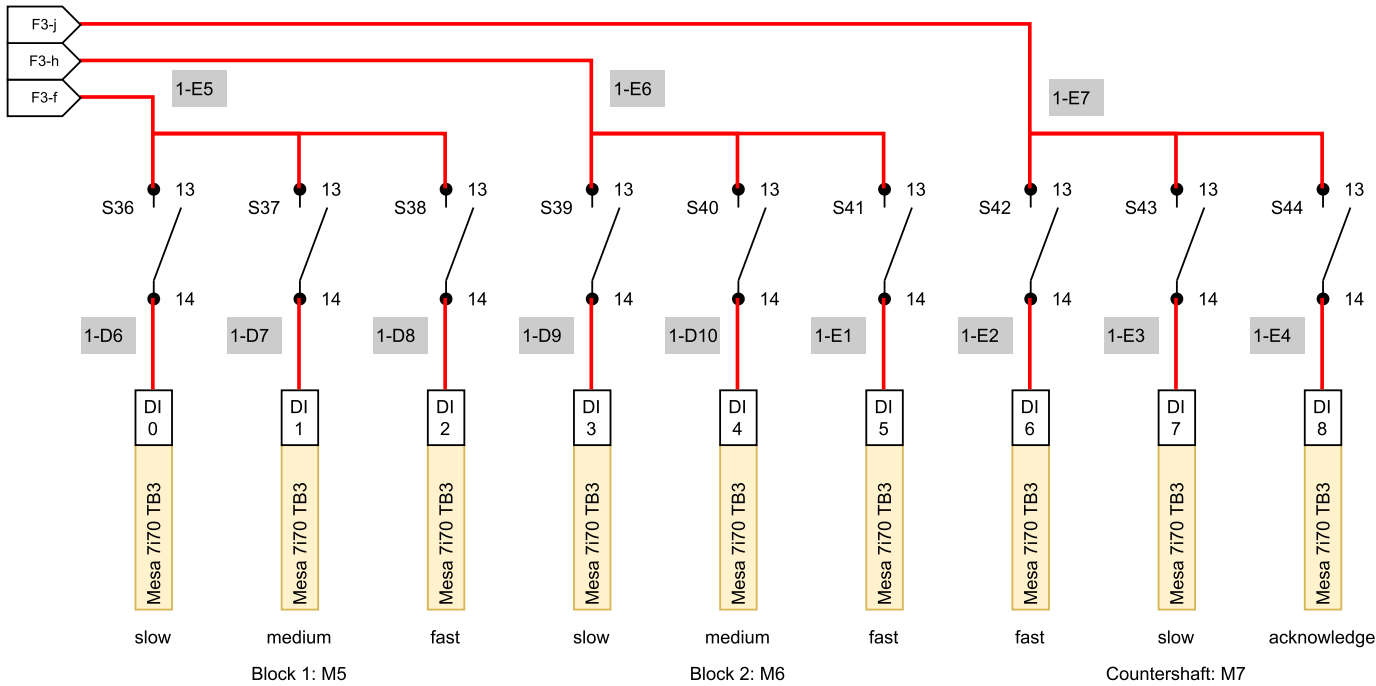
*The sensor line is connected internally to the supply line

Axis Encoders	Date	10/09/2023
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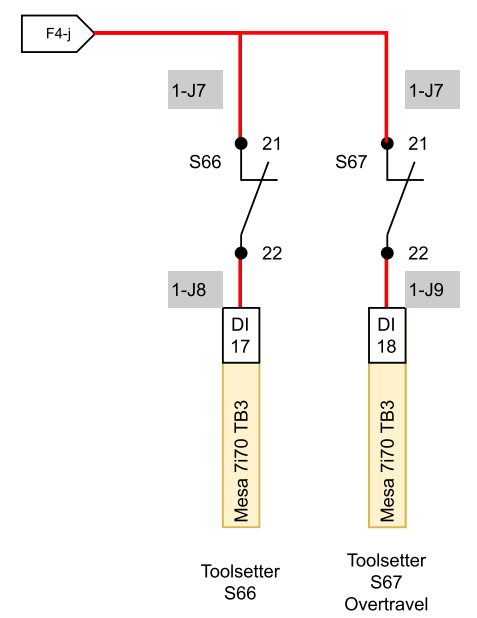
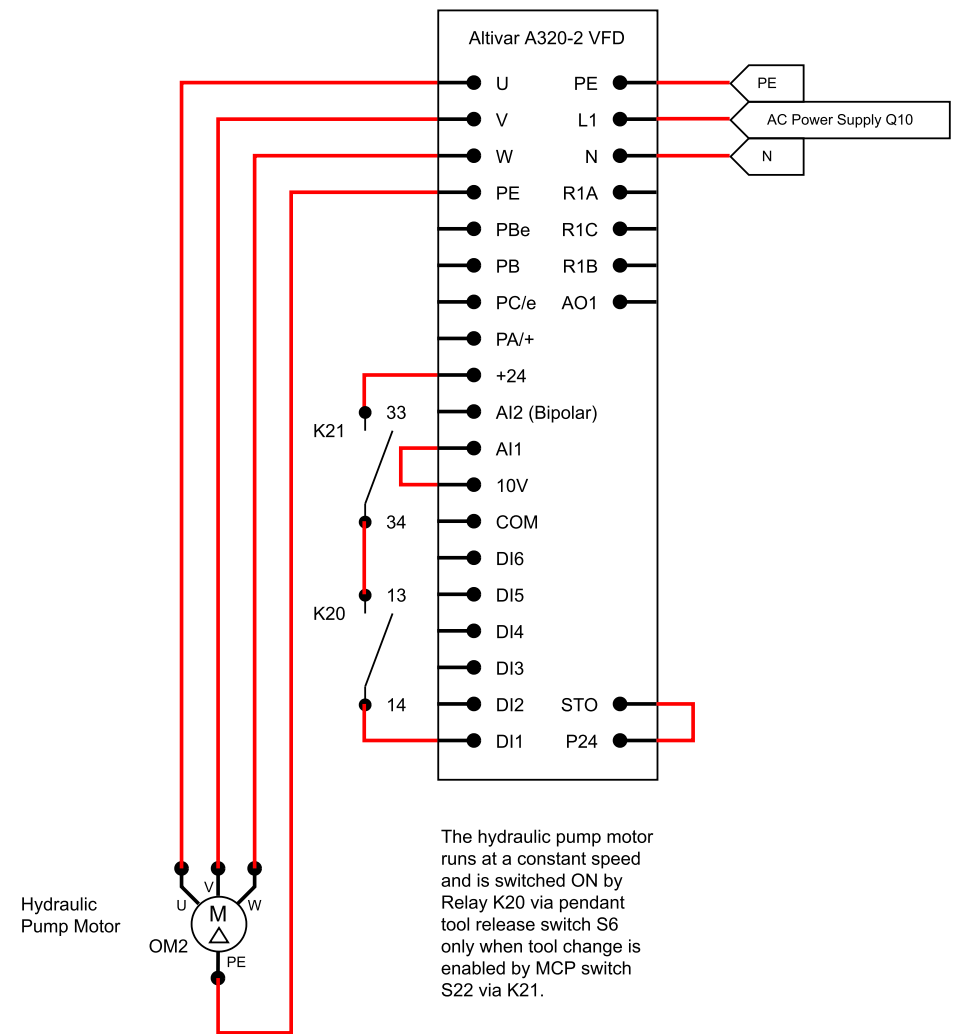
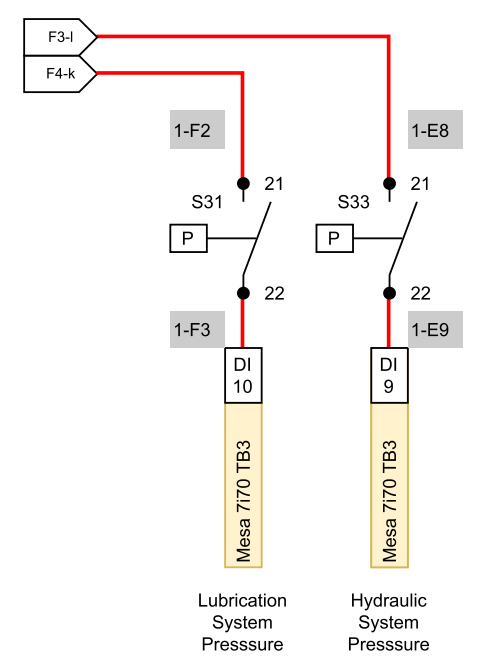
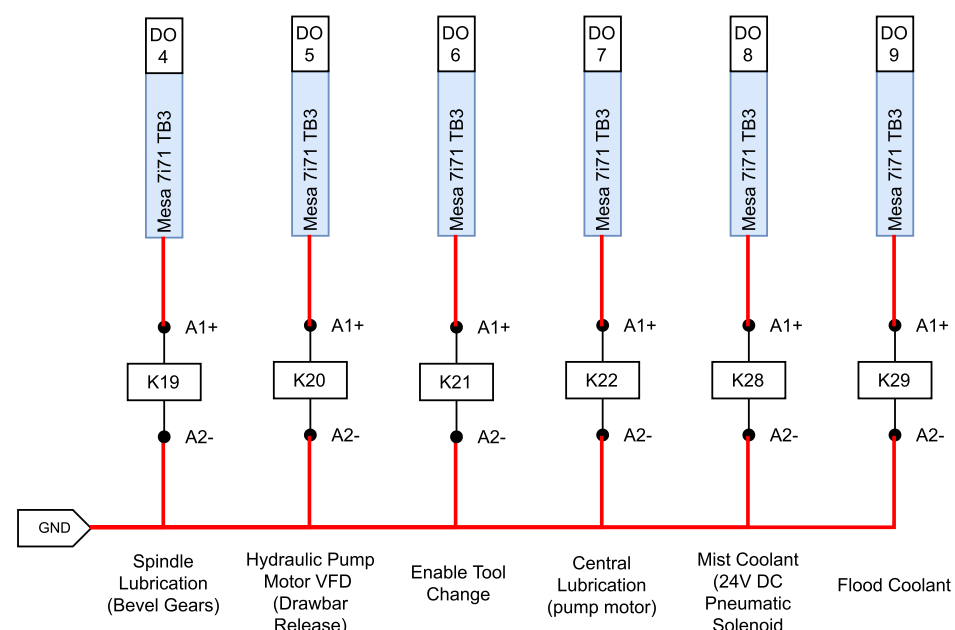
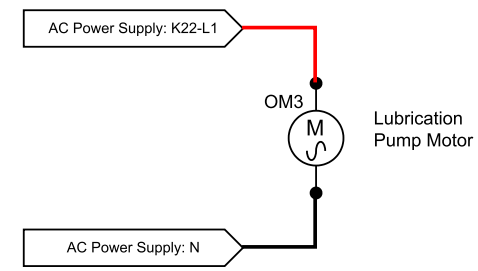
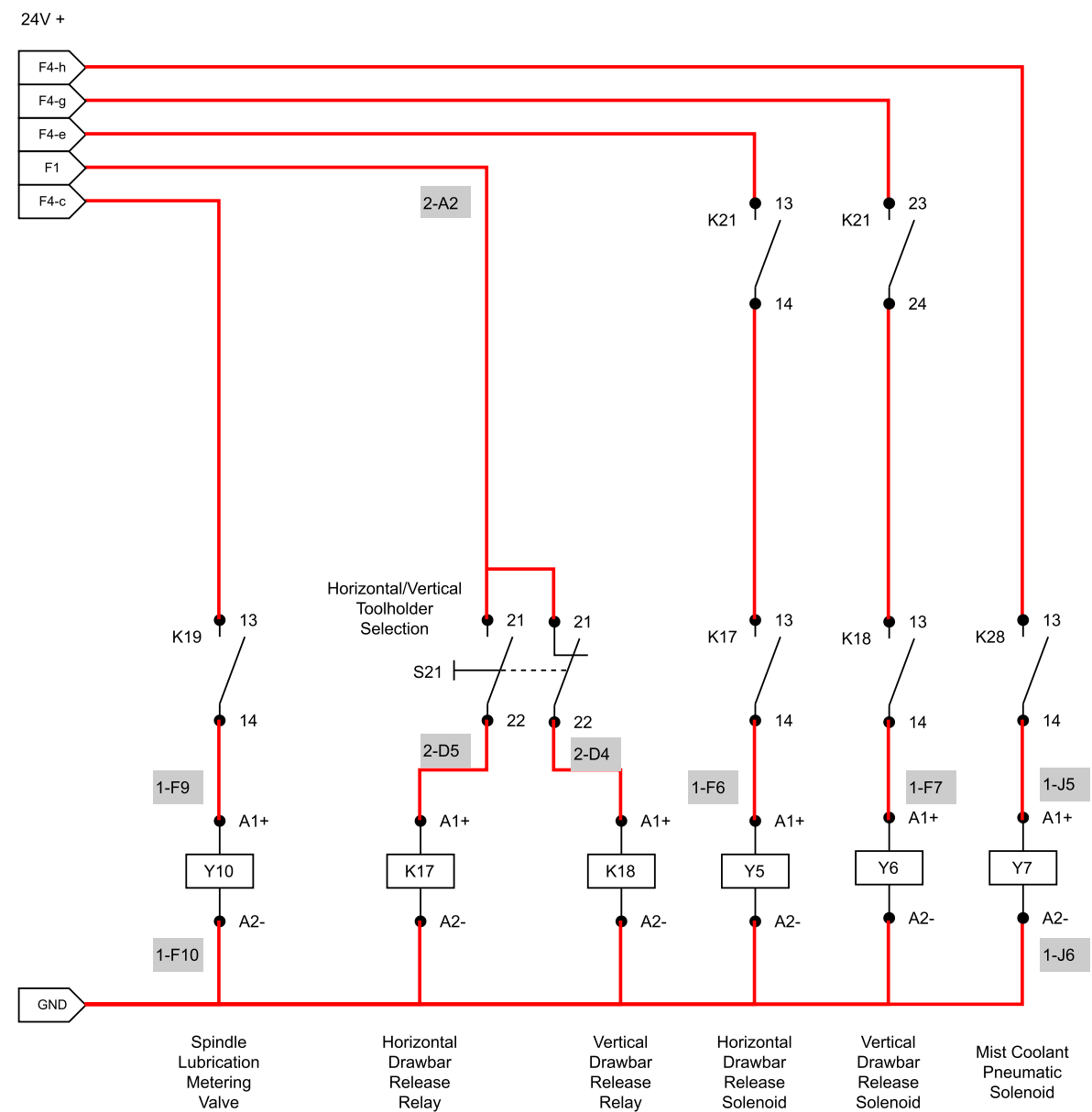
Spindle Control	Date	6/11//2023
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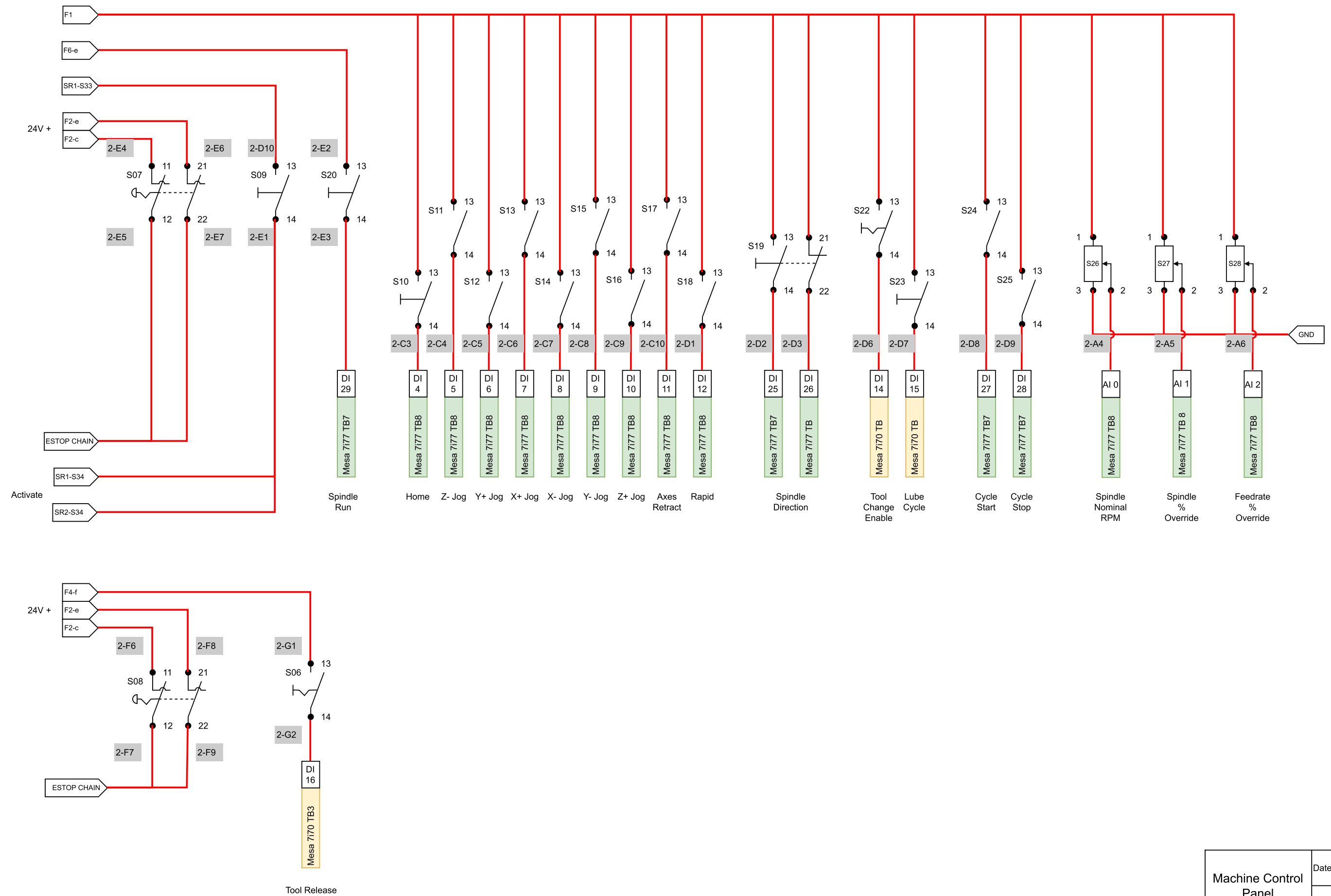
RPM	63	80	100	125	150	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	0
Switch																			
S36			x			x			x			x			x			x	
S37		x			x			x			x			x			x		
S38	x			x			x			x			x			x			
S39							x	x	x							x	x	x	
S40				x	x	x							x	x	x				
S41	x	x	x							x	x	x							
S42										x	x	x	x	x	x	x	x	x	
S43	x	x	x	x	x	x	x	x	x										
S44																			x



Gearshift	Date	6/11/2023
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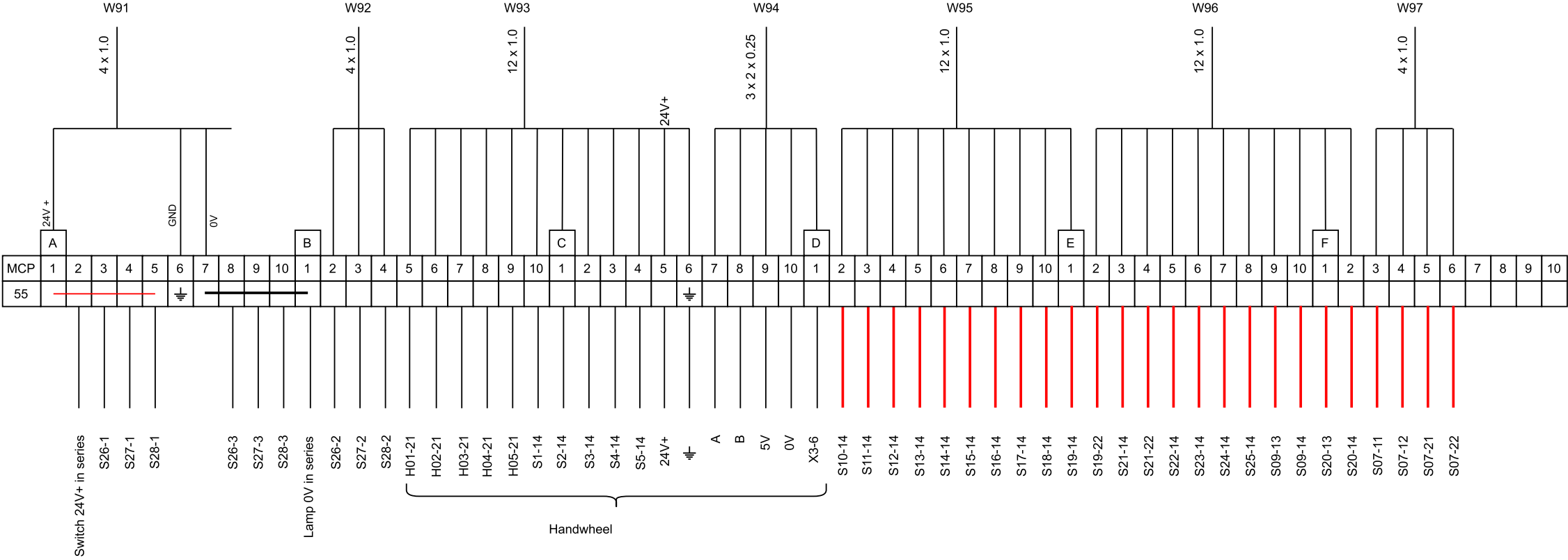


Lubrication and Toolchange	Date	25-01-2025
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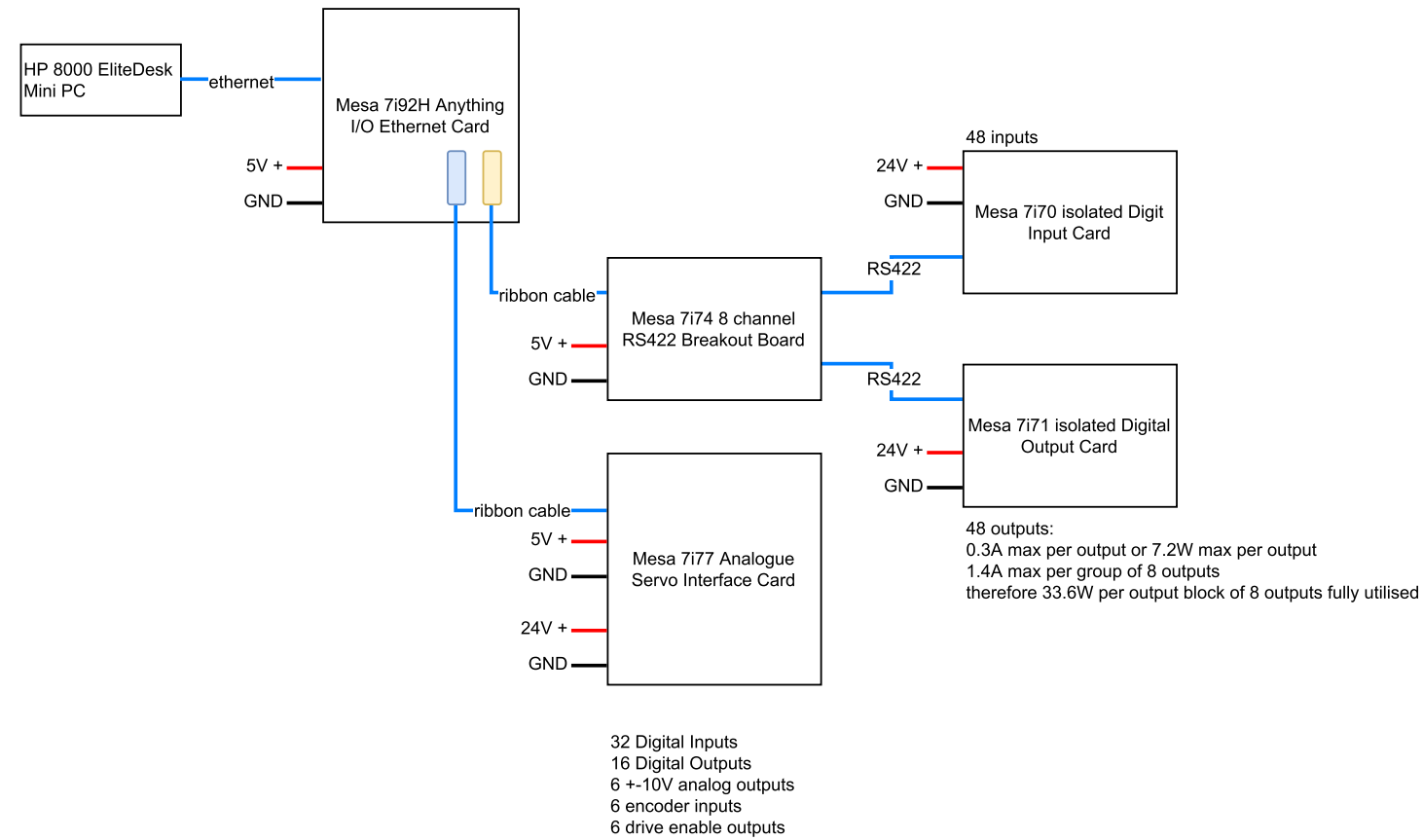
PENDANT


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MACHINE CONTROL PANEL

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TB1		
	1	2
		5V
	5V M1-c	5V L1-a

TB2	1	2	3	4	5	6	7	8
	VF							
	F7-c	x	x	x	x	x	x	24V COM

TB3		x							Y								Z							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	QA0	QA0	GND	QB0	QB0	+5V	IDX0	IDX0	QA0	QA0	GND	QB0	QB0	+5V	IDX0	IDX0	QA0	QA0	GND	QB0	QB0	+5V	IDX0	IDX0
	Brown	Green	White/Grn	Grey	Pink	Bn/Grn	Red	Black	Brown	Green	White/Grn	Grey	Pink	Bn/Grn	Red	Black	Brown	Green	White/Grn	Grey	Pink	Bn/Grn	Red	Black

TB4	1	2	3	4	5	6	7	8
	QA3	QA3	GND	QB3	QB3	+5V	IDX3	IDX3
		x	MPG GND		x	MPG +5V	x	x
			2C2			2C1		

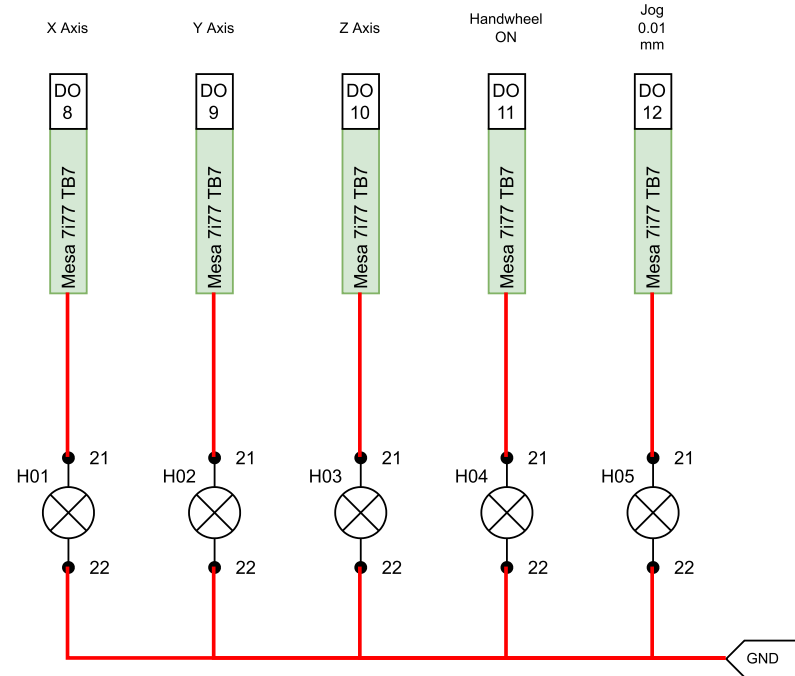
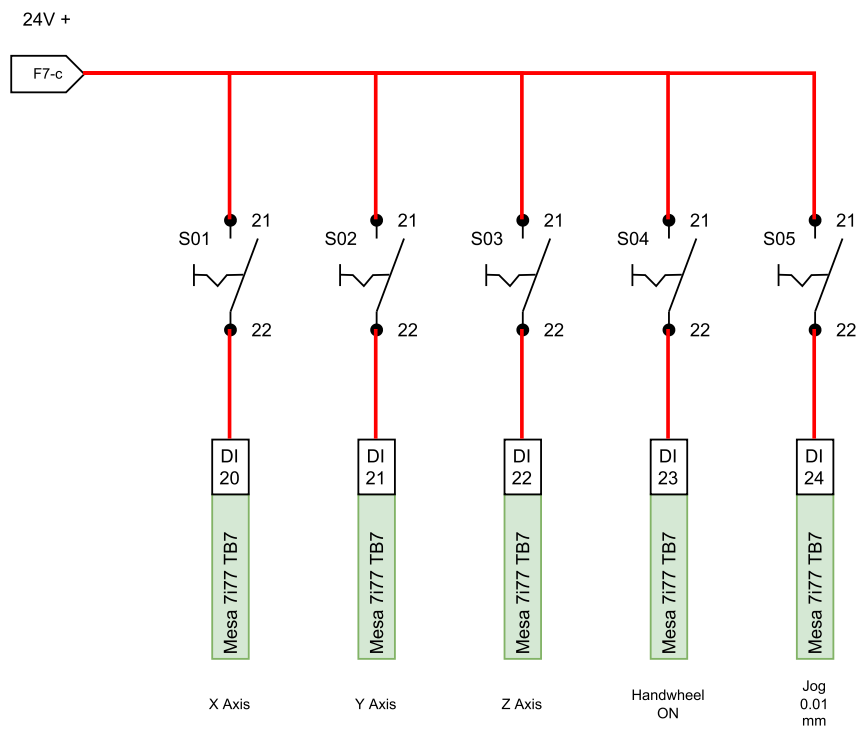
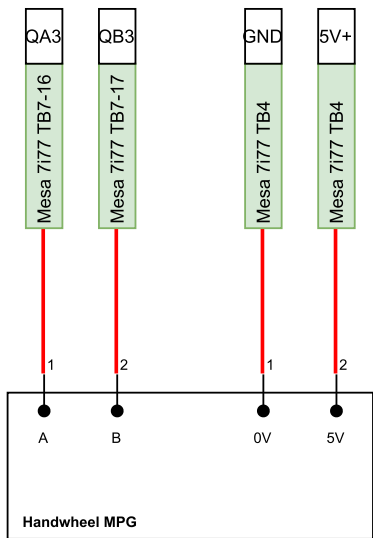
TB5	1	2	3	4	5	6	7	8	9	10	11	12
	ENAO-	ENAO+	GND	AOUT0			GND	AOUT1			GND	AOUT2
	TB8-DI15	F7-f	Shield	X-T13	x	x	x	Y-T13	x	x	x	Z-T13
	Shield		Core 1					Core 2				Core 3

4 core 0.5mm2

	23	24
	GND	AOUT5
		VFD1-A12

TB7		DI16	DI17	DI18	DI19	DI20	DI21	DI22	DI23	DI24	DI25	DI26	DI27	DI28	DI29	DI30	DI31	DO8	DO9	DO10	DO11	DO12	DO13	DO14	DO15
	2B9	Handwheel A	Handwheel B			H/Wheel X: S01	H/Wheel Y: S02	H/Wheel Z: S03	H/Wheel ON: S04	H/Wheel JOG : S05	Spindle CW: S19	Spindle CCW: S19	Cycle Start: S24	Cycle Stop: S25	Spindle Start: S20		Enable Drives Input	H/Wheel Lamp H01	H/Wheel Lamp H02	H/Wheel Lamp H03	H/Wheel Lamp H04	H/Wheel Lamp H05			Spindle Run
	2B10					2-B2	2-B3	2-B4	2-B5	2-B6	2-D2	2-D3	2-D8	2-D9	2-E3		2-A7	2-A8	2-A9	2-A10	2-B1				VFD2-DI1
		Handwheel in Software mode 3																							

TB8		DI0	DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8	DI9	DI10	DI11	DI12	DI13	DI14	DI15	DO0	DO1	DO2	DO3	DO4	DO5	DO6	DO7
	2-A4	Spindle Nom RPM: S26	Spindle % Override: S27	Feedrate % Override: S28	Spindle Actual Speed	Home: S10	Z- Jog: S11	Y+ Jog: S12	X+ Jog: S13	X- Jog: S14	Y- Jog: S15	Z+ Jog: S16	Axes Retract: S17	Rapid: S18				X Axis Brake	Y Axis Brake	Z Axis Brake	Spindle Jog	Run Drives - T5 via K09- K07 in series	Axes Retract	Gate Limit Switch Override	Enable Drives
	2-A5																	K10-A1	K11-A1	K12-A1	VFD2-DI2	K09-13	K08-A1	K05-A1	K06-A1



Handwheel	Date	6/11/2023
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