



Newburg, Missouri, USA
 573-368-7399
 machmotion.com

SALES ORDER No.: xxxxx

DRAWING No.: RPKM00-001

SUPPLY VOLTAGE: 240 VOLTS 60 Hz

PHASE:	-	3 PH (240V)
FULL LOAD AMPS:	-	35.0 AMPS
LARGEST LOAD:	-	18.3 AMPS
MAX SPINDLE MOTOR SIZE:	-	5 H.P.
MIN SUPPLY CIRCUIT CONDUCTOR:	-	39.5 AMPS
MAX SUPPLY CIRCUIT OCPD:	-	60 AMPS

SHORT CIRCUIT CURRENT RATING: 5 kA @ 240 VOLTS MAX

AMBIENT TEMPERATURE RATING: 41° TO 104° F (5° TO 40° C)

THIS EQUIPMENT DOES PROVIDE SUPPLY CIRCUIT OVERCURRENT PROTECTION.

NUMBER OF PAGES 23

COMPANY: MACHMOTION NEWBURG, MISSOURI, USA		DATE: 4/14/2020		CUSTOMER CUSTOMER LOCATION		ALL RIGHTS RESERVED		DRAWING NO: RPKM00-001		NAME: RAPIDPATH KNEE MILL		=	+		
DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	SUPPLIER NO: XXXXXX		TITLE PAGE / COVER SHEET		&	PREV PAGE: <<---	PAGE:
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CHANGE HISTORY

NR.	DATE (MM/DD/YYYY)	EDITOR	CHANGE SPECIFICATION	ID	PAGES
000	01/16/2020	JUSTIN R. WALZ	INITIAL RELEASE		ALL
001	04/14/2020	JUSTIN R. WALZ	UPDATED RELEASE		ALL
002	07/06/2020	JUSTIN R. WALZ	ADDED OPTION FOR 4TH AXIS		ALL
003					
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DESCRIPTION	NEMA SYMBOLS	IEC SYMBOLS	LETTER CODE TO IEC 617
NORMALLY OPEN CONTACTOR CONTACT	M	KM	KM - CONTACTOR
NORMALLY CLOSED CONTACTOR CONTACT	M	KM	KM - CONTACTOR
NORMALLY CLOSED AUXILIARY CONTACT	M	KM	KM - CONTACTOR
NORMALLY OPEN RELAY CONTACT	CR	KA	KA - RELAY
NORMALLY CLOSED RELAY CONTACT	CR	KA	KA - RELAY
NORMALLY OPEN DELAYED CLOSING CONTACT	T	KT	KT - TIME DELAY
NORMALLY CLOSED DELAYED OPENING CONTACT	T	KT	KT - TIME DELAY
NORMALLY OPEN DELAYED OPENING CONTACT	T	KT	KT - TIME DELAY
NORMALLY CLOSED DELAYED CLOSING CONTACT	T	KT	KT - TIME DELAY
NORMALLY OPEN PUSH BUTTON	PB	SB	SB - PUSH BUTTON
NORMALLY CLOSED PUSH BUTTON	PB	SB	SB - PUSH BUTTON
EMERGENCY STOP PUSH BUTTON	PB	SB	SB - PUSH BUTTON
NORMALLY OPEN LEVEL SWITCH	LVS	SL	SL - LEVEL SWITCH
NORMALLY OPEN PRESSURE SWITCH	PS	SP	SP - PRESSURE SWITCH
NORMALLY OPEN FLOW SWITCH	FS	SF	SF - FLOW SWITCH
NORMALLY OPEN TEMPERATURE SWITCH	TS	ST	ST - TEMPERATURE SWITCH
NORMALLY OPEN LIMIT SWITCH	LS	SQ	SQ - LIMIT SWITCH
NORMALLY CLOSED LIMIT SWITCH	LS	SQ	SQ - LIMIT SWITCH
PLUG	PLG	XP	XP - PLUG
SOCKET	PLG	XS	XS - SOCKET
PLUG AND SOCKET	PLG	XS	XS - PLUG AND SOCKET
CONTACTOR COIL	M	KM	KM - CONTACTOR
CONTROL RELAY COIL	CR	KA	KA - RELAY
SLOW OPERATING (ON DELAY) RELAY COIL	TR	KT	KT - TIMED RELAY
SLOW RELEASING (OFF DELAY) RELAY COIL	TR	KT	KT - TIMED RELAY
SOLENOID COIL	SOL	YV	YV - ELECTROMAGNETIC OPERATED VALVE
PROXIMITY SENSOR	PRX	SQ	SQ - PROXIMITY SWITCH

DESCRIPTION	NEMA SYMBOLS	IEC SYMBOLS	LETTER CODE TO IEC 617
PROXIMITY SENSOR	PRX	SQ	SQ - PHOTOEYE SWITCH
ISOLATOR/DISCONNECT SWITCH	KS	QS	QS - ISOLATOR/DISCONNECT DEVICE
FUSE	FU	FU	FU - FUSE
CIRCUIT BREAKER	CB	QF	QF - CIRCUIT BREAKER
WARNING HORN	HN	HA	HA - WARNING HORN
INDICATOR LAMP (PILOT LIGHT)	LT	HL	HL - INDICATOR LAMP
PUSH TO TEST INDICATOR LAMP (PILOT LIGHT)	LT	HL	HL - INDICATOR LAMP
FLUORESCENT LIGHT	LT	EL	EL - CABINET LIGHTING
SELECTOR SWITCH	SS	SA	SA - SELECTOR SWITCH
4 POSITION SELECTOR SWITCH	SS	SA	SA - SELECTOR SWITCH
MOTOR	MTR	M	M - MOTOR
ELECTROMAGNETIC BRAKE	BRK	YB	YB - ELECTROMAGNETIC BRAKE

- BQ - POSITION TRANSDUCER
- E - MISCELLANEOUS COMPONENTS
- EH - HEATING DEVICE
- FR - CURRENT PROTECTIVE DEVICE
- GS - SUPPLY DEVICE (POWER SUPPLY)
- HV - VENTILATOR
- XB - LINK
- XT - FUSED TERMINAL
- X1 - TERMINAL
- TA - CURRENT TRANSFORMER
- TC - CONTROL CIRCUIT TRANSFORMER
- TM - POWER TRANSFORMER
- TS - MAGNETIC STABILISER
- TV - VOLTAVE TRANSFORMER

WIRE COLOR CHART						
VOLTAGE	LINE SIDE OF MAIN DISCONNECT (ABOVE DISCONNECTING MEANS)		LOAD SIDE OF MAIN DISCONNECT (BELOW DISCONNECTING MEANS)		WIRES TO EXTERNAL ELECTRICAL ENCLOSURES (INTERLOCKING)	
	HOT CONDUCTOR	GROUNDING CURRENT CARRYING CONDUCTOR	HOT CONDUCTOR	GROUNDING CURRENT CARRYING CONDUCTOR	HOT CONDUCTOR	GROUNDING CURRENT CARRYING CONDUCTOR
241 - 575 VAC	BLACK / ORANGE TRACER/SLEEVE/TUBE		BLACK			
151 - 575 VDC			BLACK			
151 - 240 VAC			RED	WHITE		
0 - 150 VAC	ORANGE	WHITE/ ORANGE TRACER/SLEEVE/TUBE	RED	WHITE		
24 VDC (0 - 50)	BLUE / ORANGE TRACER/SLEEVE/TUBE	WHITE WITH BLUE TRACER & ORANGE TAPE	BLUE	WHITE/BLUE TRACER/SLEEVE/TUBE	ORANGE	ORANGE
GROUND	GREEN/ YELLOW TRACER					

WIRE COLOR CODE CHART	
WIRE COLOR	ABBREVIATION
BLACK	BK
BROWN	BN
RED	RD
ORANGE	OG
YELLOW	YE
GREEN	GN
BLUE	BU
VIOLET	VT
GRAY	GY
WHITE	WH
PINK	PK
GOLD	GD
TURQUOISE	TQ
SILVER	SR
GREEN WITH YELLOW TRACER	GNYE
BLACK WITH ORANGE TRACER	BKOG
BLUE WITH ORANGE TRACER	BUOG
WHITE WITH RED TRACER	WHRD
WHITE WITH ORANGE TRACER	WHOG
WHITE WITH BLUE TRACER	WHBU
WHITE WITH BLUE TRACER AND ORANGE TAPE (OR SHRINK TUBE)	WHBU+OG

CABLE SIZE CONVERSION TABLE		
METRIC	TO	AWG
0.5		20
0.75		18
1.0		16
1.5		14
2.5		12
4.0		10
6.0		8
10.0		6
16.0		4
25.0		2
35.0		1
50.0		0

NFPA 79 - 2015 EDITION	
Table 8.2.2.3 Minimum Size of Equipment Grounding Conductors and Bonding Jumpers	
Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of the Equipment (Not Exceeding Amperes)	Copper Conductor Size (AWG or kcmil)
10	16
15	14
20	12
30	10
40	10
60	10
100	8
200	6
300	4
400	3
500	2
600	1
800	1/0
1000	2/0
1200	3/0
1600	4/0
2000	250
2500	350
3000	400
4000	500
5000	700
6000	800

NFPA 79 - 2015 EDITION			
Table 12.5.1 Conductor Ampacity Based on Copper Conductors with 60°C (140°F), 75°C (167°F), 90°C (194°F) Insulation in an Ambient Temperature of 30°C (86°F)			
Conductor Size (AWG)	Ampacity		
	60°C (140°F)	75°C (167°F)	90°C (194°F)
30	-	0.5	0.5
28	-	0.8	0.8
26	-	1	1
24	2	2	2
22	3	3	3
20	5	5	5
18	7	7	14
16	10	10	18
14	20	20	25
12	25	25	30
10	30	35	40
8	40	50	55
6	55	65	75
4	70	85	95
3	85	100	110
2	95	115	130
1	110	130	150
1/0	125	150	170
2/0	145	175	195
3/0	165	200	225
4/0	195	230	260
250	215	255	290
300	240	285	320
350	260	310	350
400	280	335	380
500	320	380	430
600	355	420	475
700	385	460	520
750	400	475	535
800	410	490	555
900	435	520	585
1000	455	545	615

NFPA 79 - 2015 EDITION			
Table 12.5.5(a) Ambient Correction Factors			
For ambient temperatures other than 30°C (86°F), multiply the allowable ampacity by the appropriate factor shown below.			
Ambient Temperature (°C)	Correction Factor 60°C	Correction Factor 75°C	Correction Factor 90°C
21-25	1.08	1.05	1.04
26-30	1.00	1.00	1.00
31-35	0.91	0.94	0.96
36-40	0.82	0.88	0.91
40-45	0.71	0.82	0.87
46-50	0.58	0.75	0.82
51-55	0.41	0.67	0.76
56-60	-	0.58	0.71
61-70	-	0.33	0.58
71-80	-	-	0.41

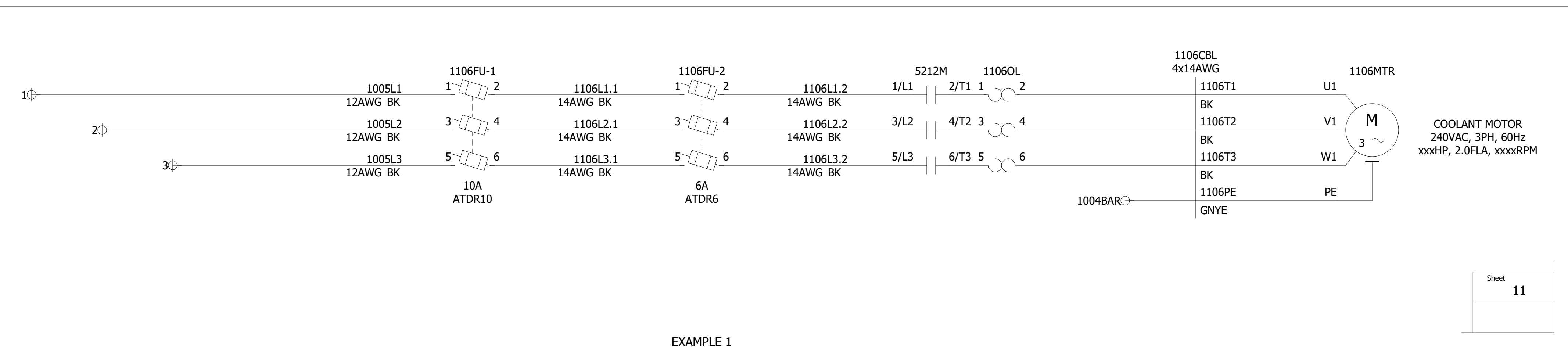
Notes:
(1) Wire types listed in 12.3.1 shall be permitted to be used at the ampacities listed in this table.
(2) The sources for the ampacities in this table are Table 310.15(B)(16) of NFPA 70.

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DESIGNER: JUSTIN R. WALZ	REVISION:	LOC:	FACTORY:	DEPT:	OP. NO:	STA. NO:	SUPPLIER NO: XXXXXX	WIRE INFORMATION	&	PREV PAGE: <<--- 05	
	APPROVER: -	-	-	-	-	-	MACH. NAME: RAPIDPATH KNEE MILL		#	NEXT PAGE: --->>> 07	

EXAMPLE 1

IF DEVICES / WIRES ARE CONNECTED TO 3 PHASE LINES

1. DEVICES ARE IDENTIFIED BY THE ALPHA SUFFIX ACCORDING TO NEMA/NFPA COMBINED WITH THE SHEET NUMBER AND LINE REFERENCE AT WHICH THE DEVICE IS POSITIONED.
2. IF TWO OR MORE DEVICES WITH THE SAME PREFIX EXIST ON THE SAME LINE REFERENCE, THEN DEVICES ARE SUFFIXED -1, -2, -3...
3. WIRE NUMBERS ARE CONSTRUCTED FROM THE SHEET AND LINE NUMBER ON WHICH THEY OCCUR, WITH THE THREE PHASE IDENTIFIER L1, L2, L3 (OR T1, T2, T3) DEPENDING ON TERMINATION TO END DEVICE.

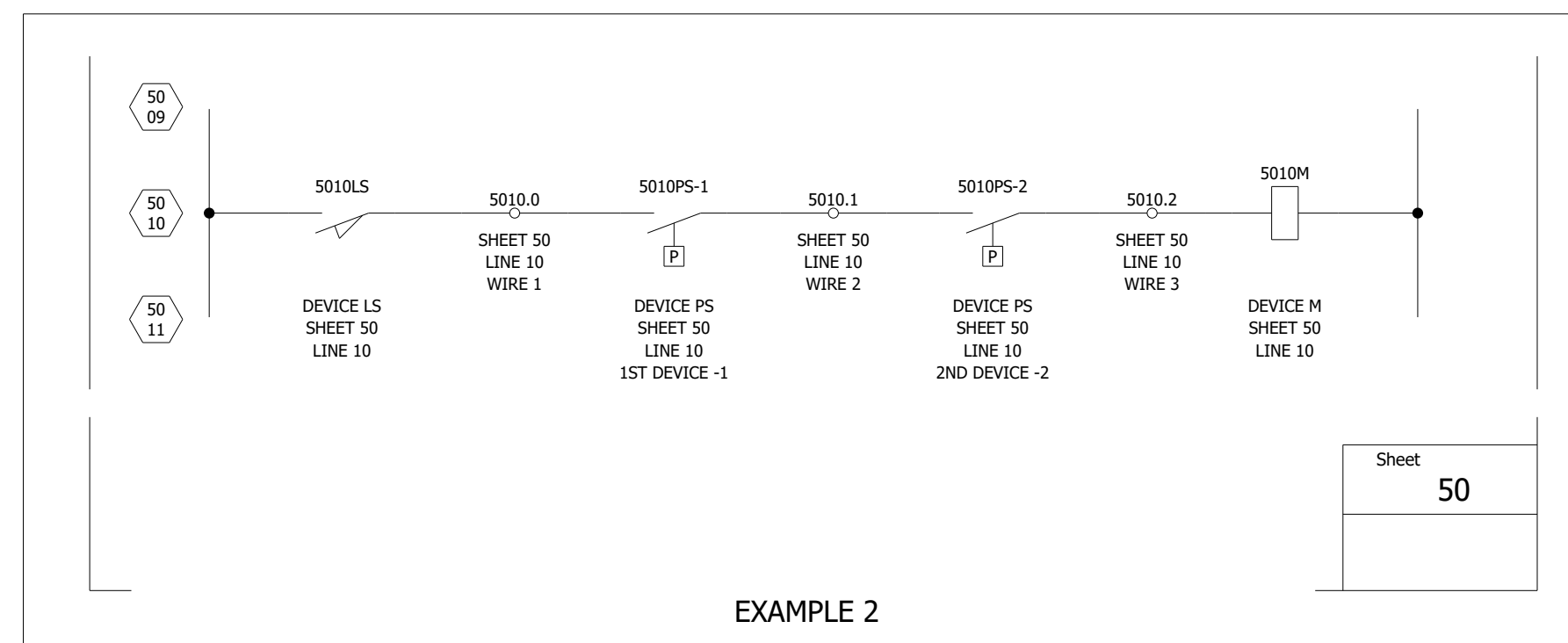


EXAMPLE 1

EXAMPLE 2

IF DEVICES / WIRES ARE NOT CONNECTED TO A PLC INPUT OR OUTPUT THEN:

1. DEVICES ARE IDENTIFIED BY THE ALPHA SUFFIX ACCORDING TO NEMA/NFPA COMBINED WITH THE SHEET NUMBER AND LINE REFERENCE AT WHICH THE DEVICE IS POSITIONED.
2. IF TWO OR MORE DEVICES WITH THE SAME PREFIX EXIST ON THE SAME LINE REFERENCE, THEN DEVICES ARE SUFFIXED -1, -2, -3...
3. WIRE NUMBERS ARE CONSTRUCTED FROM THE SHEET AND LINE NUMBER ON WHICH THEY OCCUR, WITH AN EXTRA DIGIT AFTER THIS RANGING FROM 1 TO 9 GOING FROM LEFT TO RIGHT.

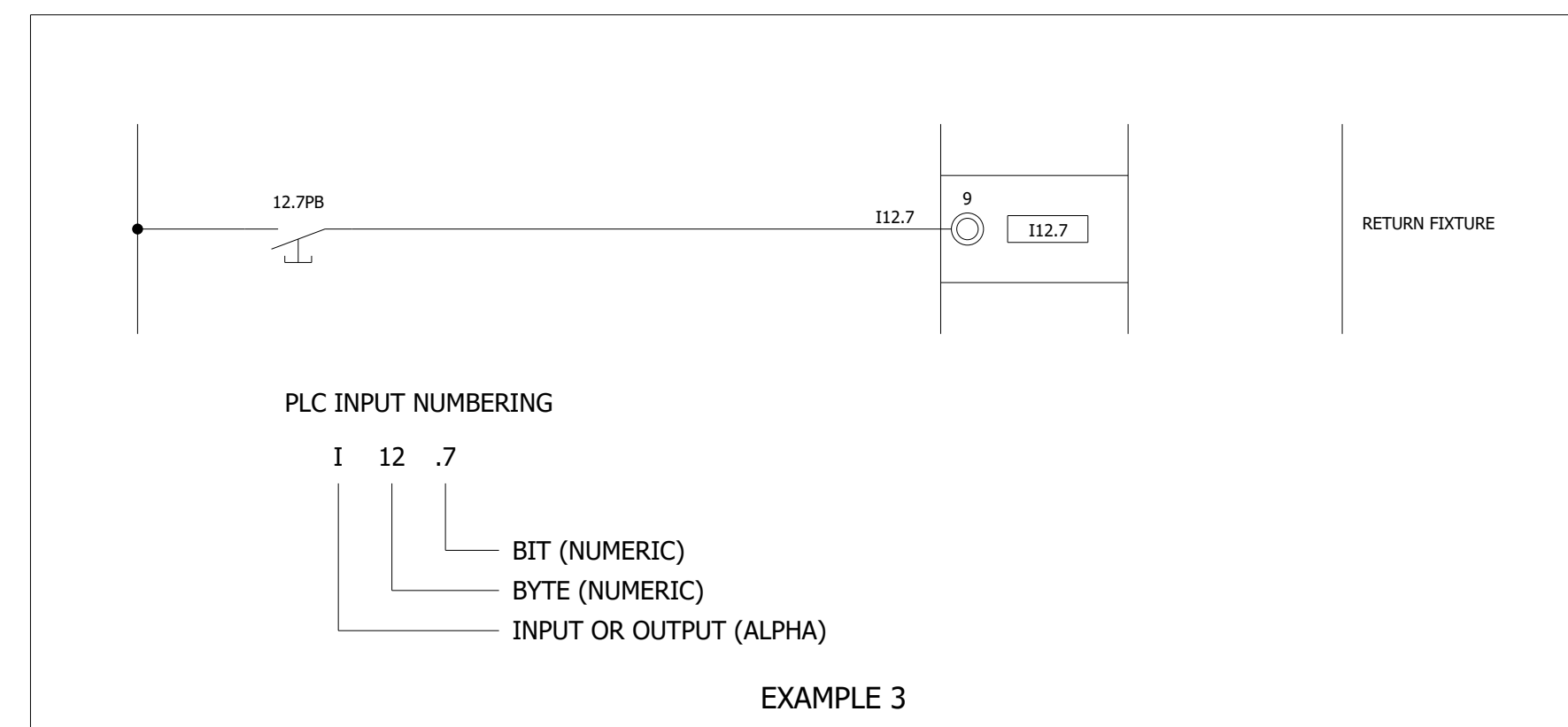


EXAMPLE 2

EXAMPLE 3

IF DEVICES / WIRES ARE CONNECTED TO A PLC INPUT OR OUTPUT THEN:

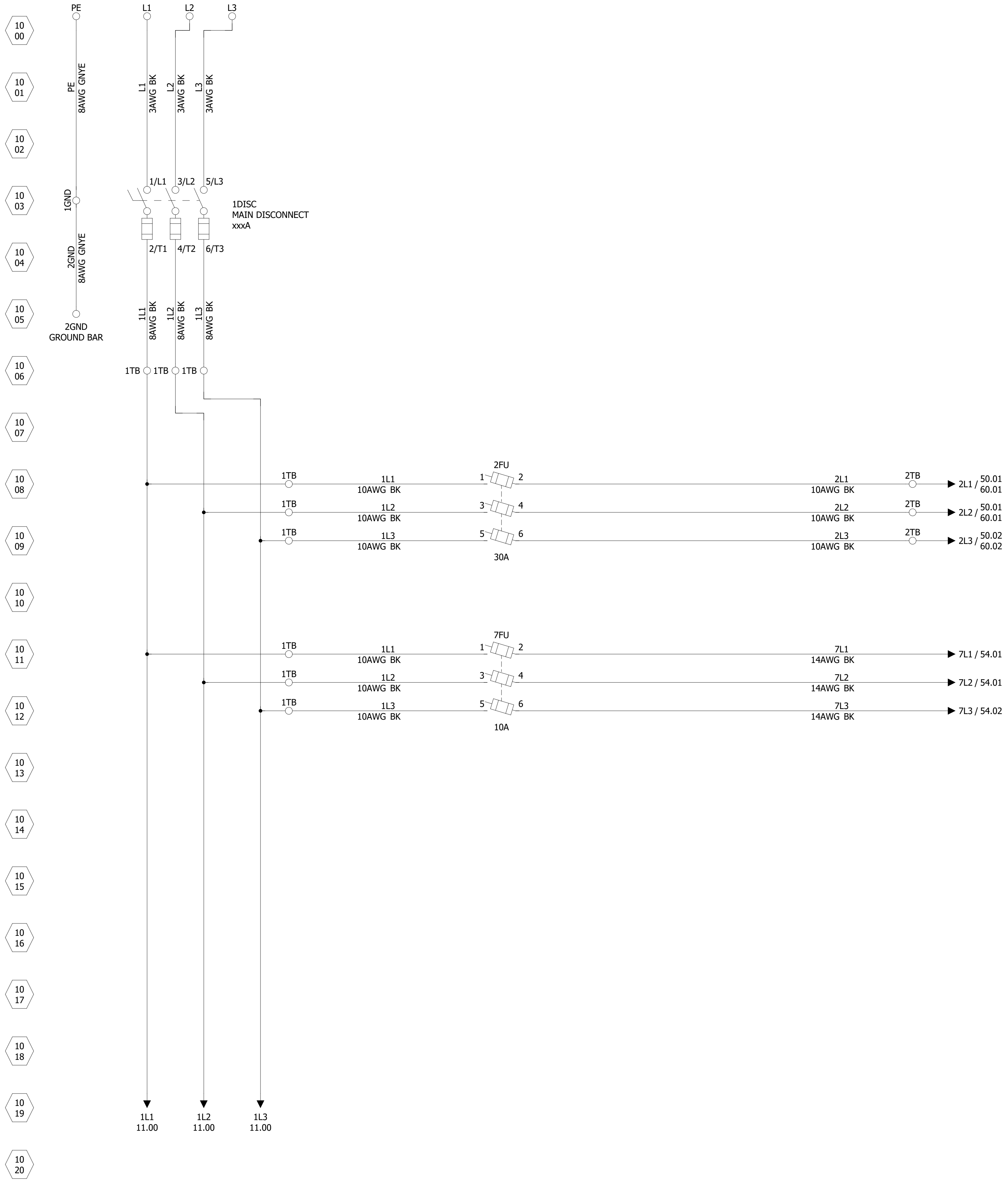
1. DEVICES ARE IDENTIFIED BY THE ALPHA SUFFIX ACCORDING TO NEMA/NFPA COMBINED WITH THE PLC ADDRESS TO WHICH IT IS CONNECTED. CONTACTS, AUX. CONTACTS FROM HARDWIRE DEVICES ARE IDENTIFIED BY THE DEVICE DESIGNATION WHERE THE DEVICE IS WIRED.
2. WIRES ARE NUMBERED USING THE FULL PLC I/O ADDRESS OF THE INPUT OR OUTPUT TO WHICH THEY ARE CONNECTED.



EXAMPLE 3

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CUSTOMER SUPPLIED 3 PHASE POWER
 INCOMING : 3 PHASE + GROUND / 240VAC / 60 Hz / xxx AMPS



POWER TO
 AXIS 1, 2 AND 3 DRIVE
 5000 DRV
 SPINDLE DRIVE
 6000 DRV

*** OPTIONAL AXIS ***
 POWER TO
 AXIS 4 DRIVE
 5400 DRV

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DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	SUPPLIER NO: XXXXXX		MAIN DISCONNECT - 3 PHASE POWER
									MACH. NAME: RAPIDPATH KNEE MILL		

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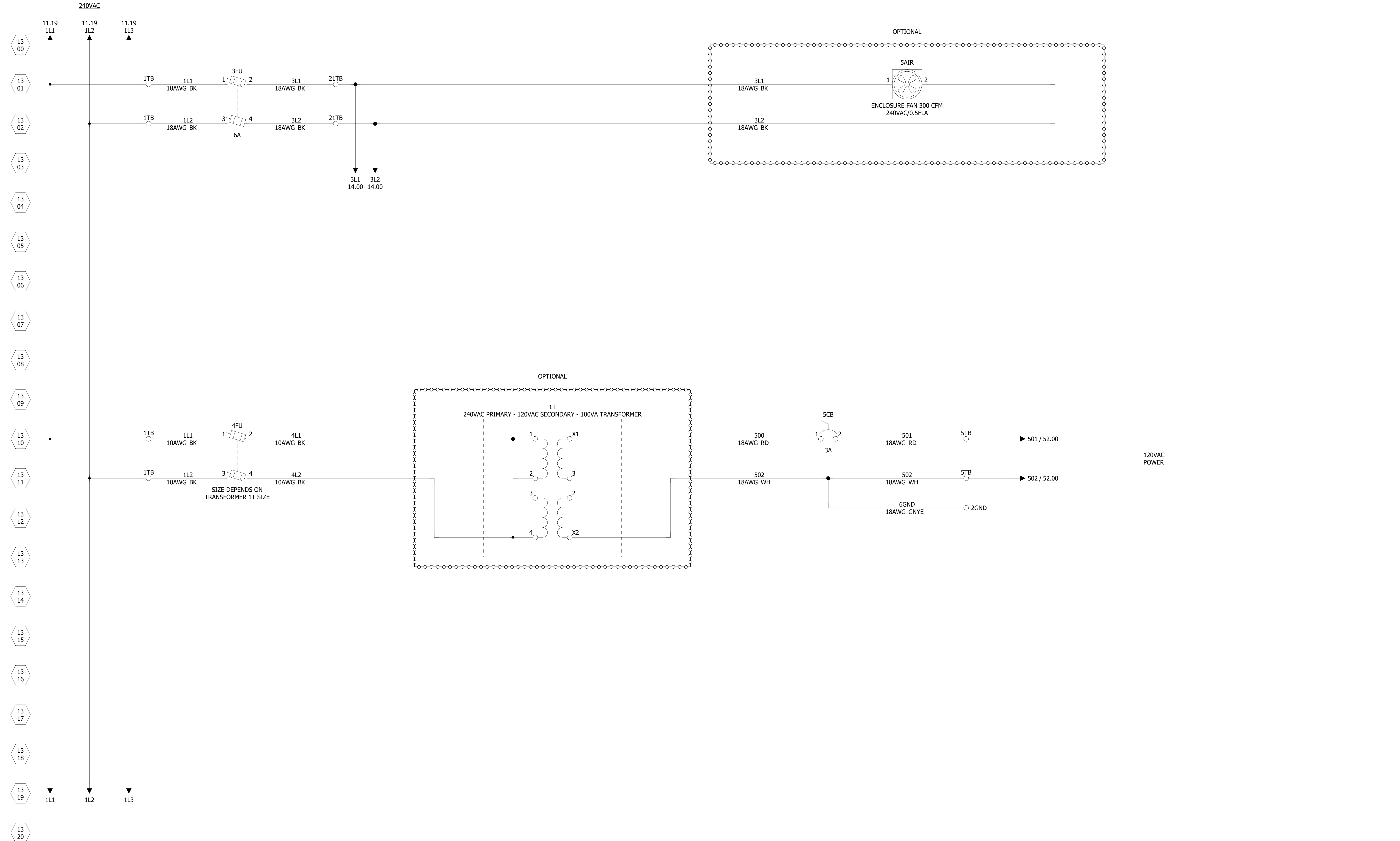
COMPANY:
MACHMOTION
NEWBURG, MISSOURI, USA

DATE:
4/14/2020
REVISION:

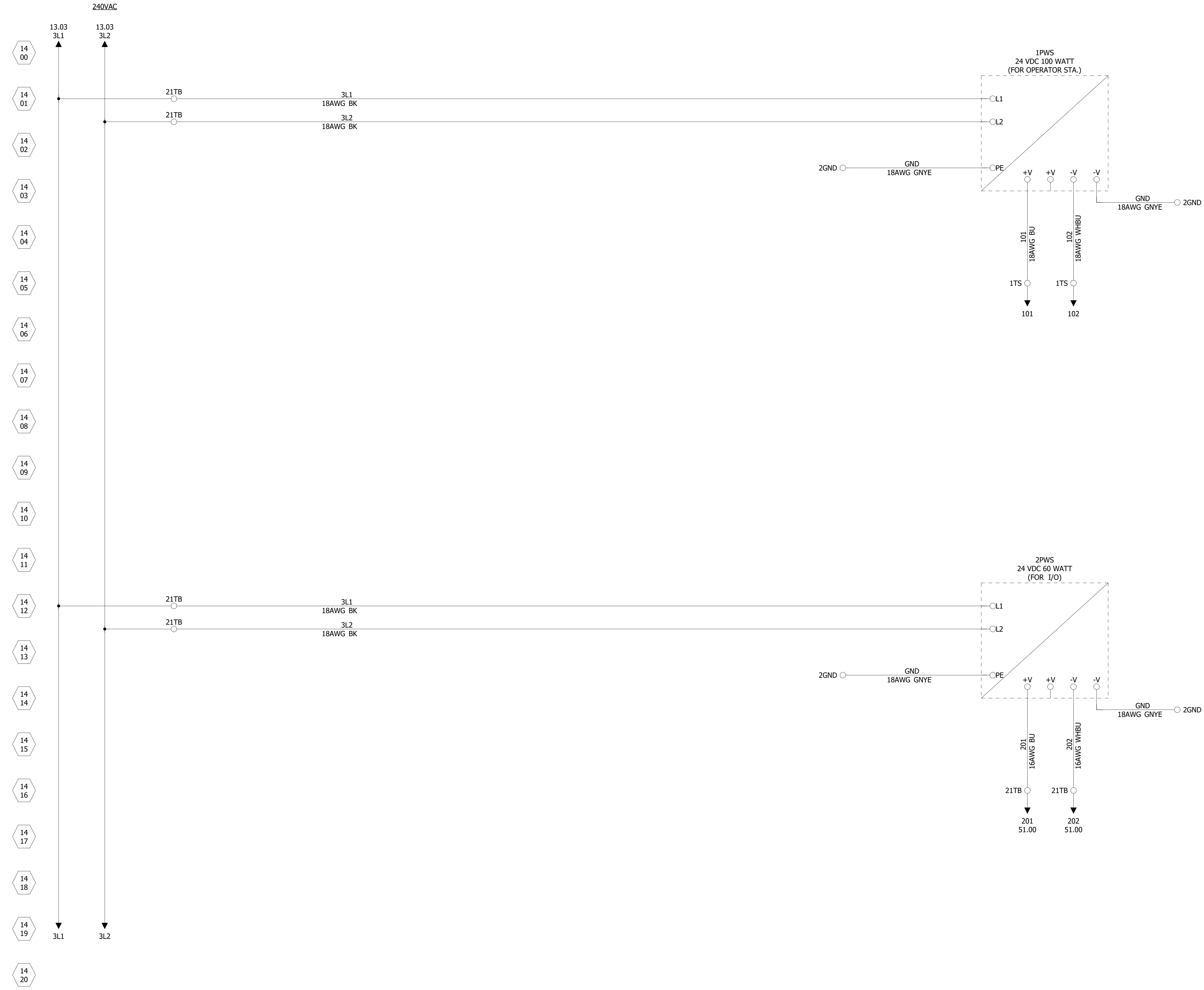
CUSTOMER
CUSTOMER LOCATION

ALL RIGHTS RESERVED
DRAWING NO:
RPKM00-001
SUPPLIER NO:
XXXXXX
MACH. NAME:
RAPIDPATH KNEE MILL
DRAWING NO:

NAME:
RAPIDPATH KNEE MILL
3 PHASE POWER - MOTORS



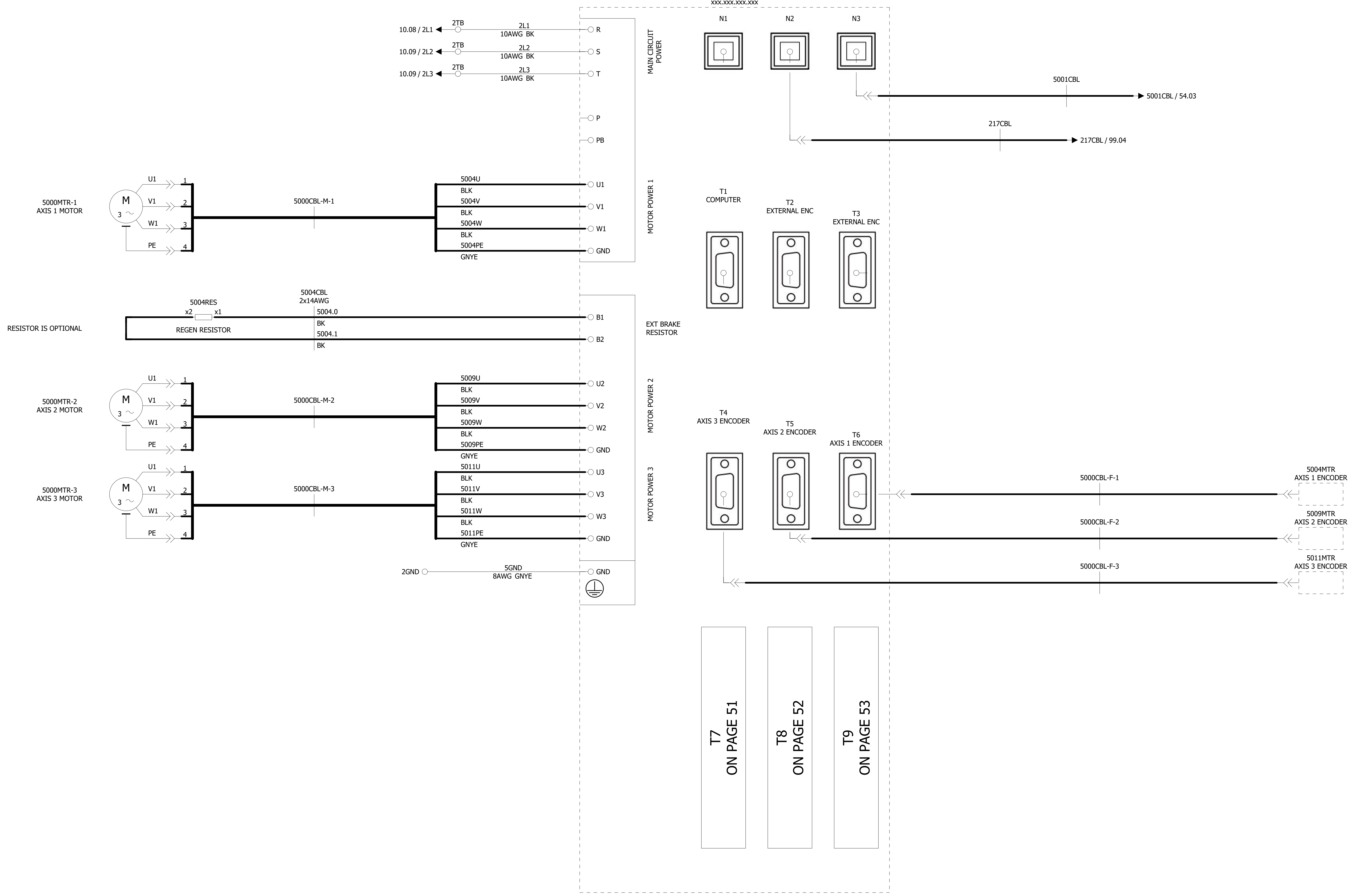
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DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	SUPPLIER NO: XXXXXX		FAN - TRANSFORMER		PREV PAGE: <<---		PAGE: 11	
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														50	

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CTB
AXIS 1, 2, 3 DRIVE



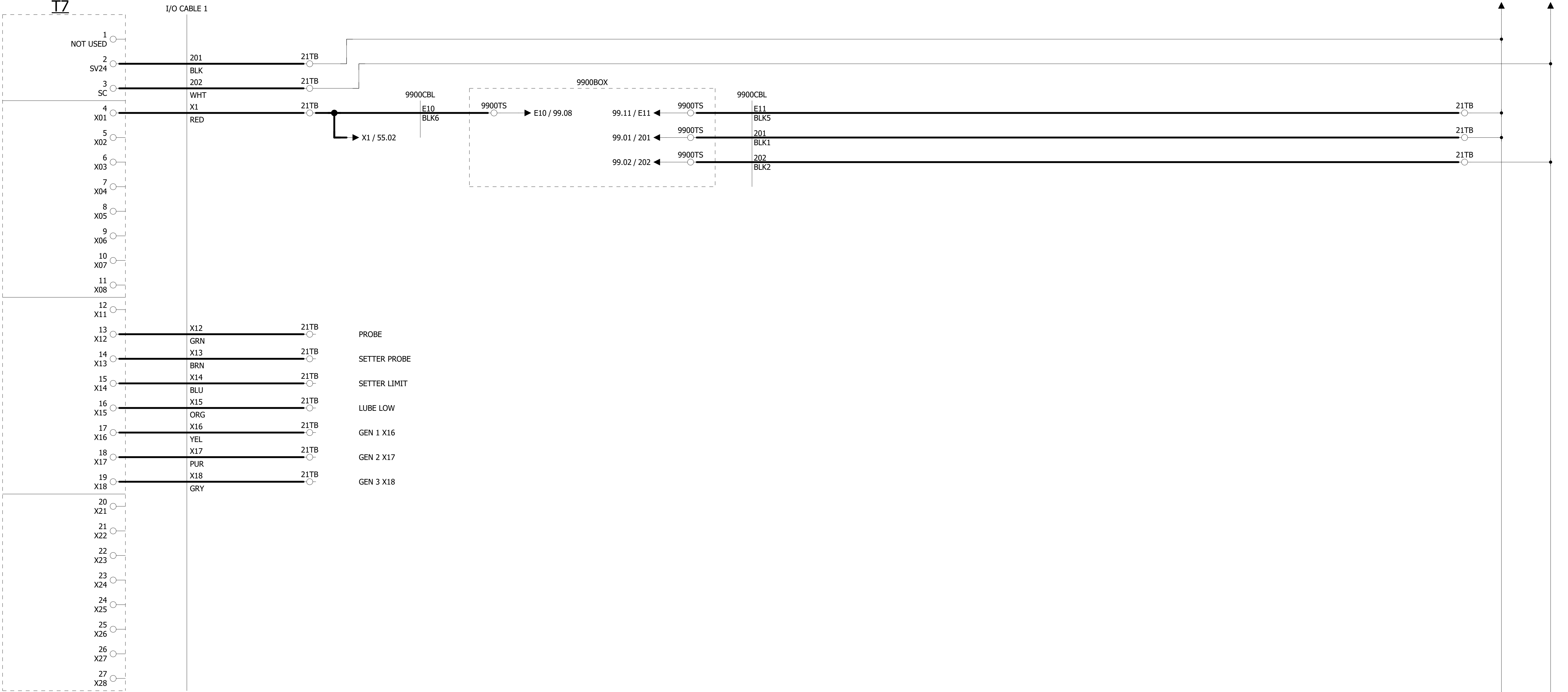
T7
ON PAGE 51

T8
ON PAGE 52

T9
ON PAGE 53

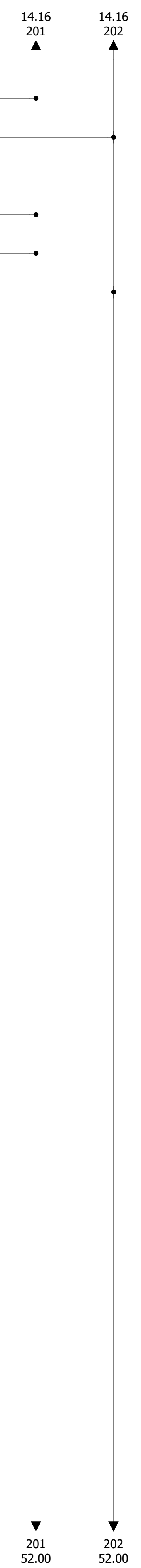
CTB
AXIS 1, 2, 3 DRIVE

- 51 00
- 51 01
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CONTROLLER INPUTS

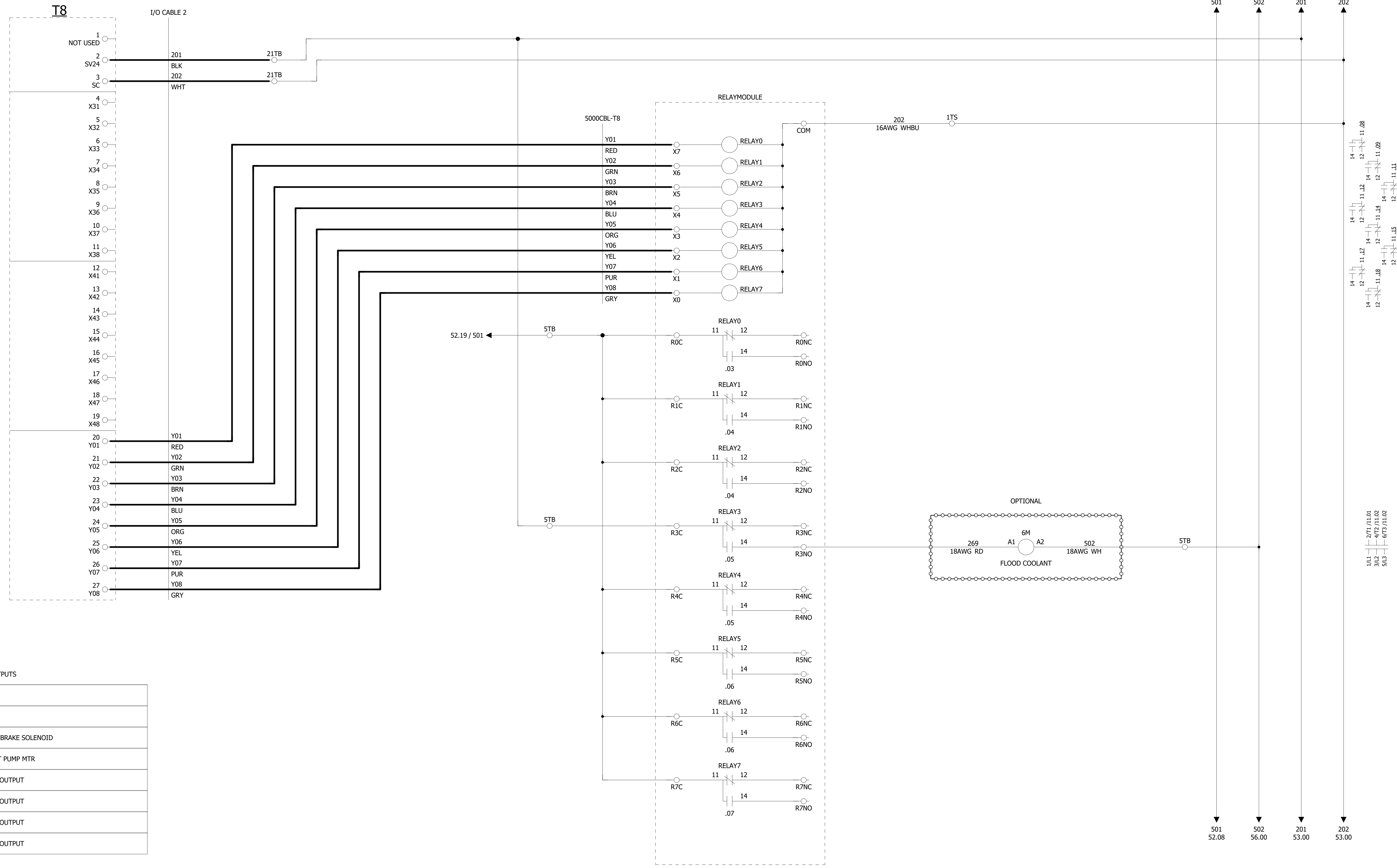
X01	E-STOP OKAY
X12	PROBE
X13	TOOL SETTER - PROBE
X14	TOOL SETTER - LIMIT
X15	LOW LUBE
X16	Z AXIS LIMITS
X17	UNUSED INPUT
X18	UNUSED INPUT



CTB
AXIS 1, 2, 3 DRIVE

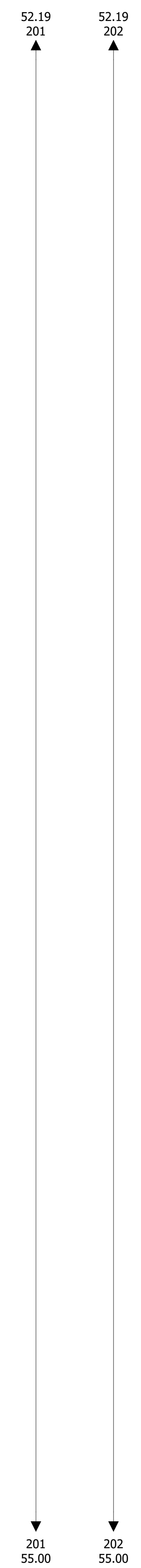
120VAC
13.10 501 13.11 502 51.19 201 51.19 202

- 52 00
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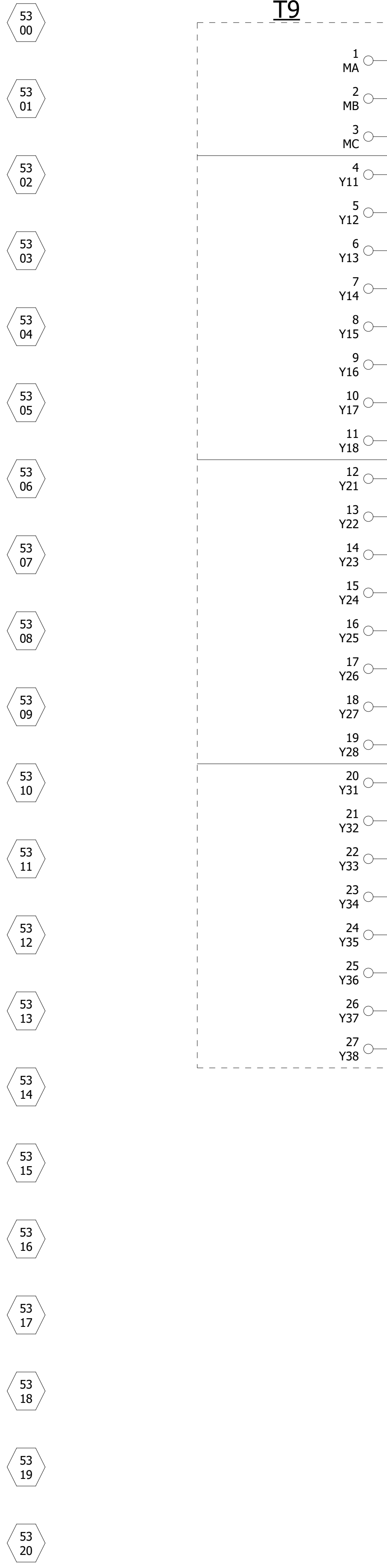
CONTROLLER OUTPUTS

Y01	MIST
Y02	LUBE
Y03	SPINDLE BRAKE SOLENOID
Y04	COOLANT PUMP MTR
Y05	UNUSED OUTPUT
Y06	UNUSED OUTPUT
Y07	UNUSED OUTPUT
Y08	UNUSED OUTPUT



CTB
AXIS 1, 2, 3 DRIVE

T9

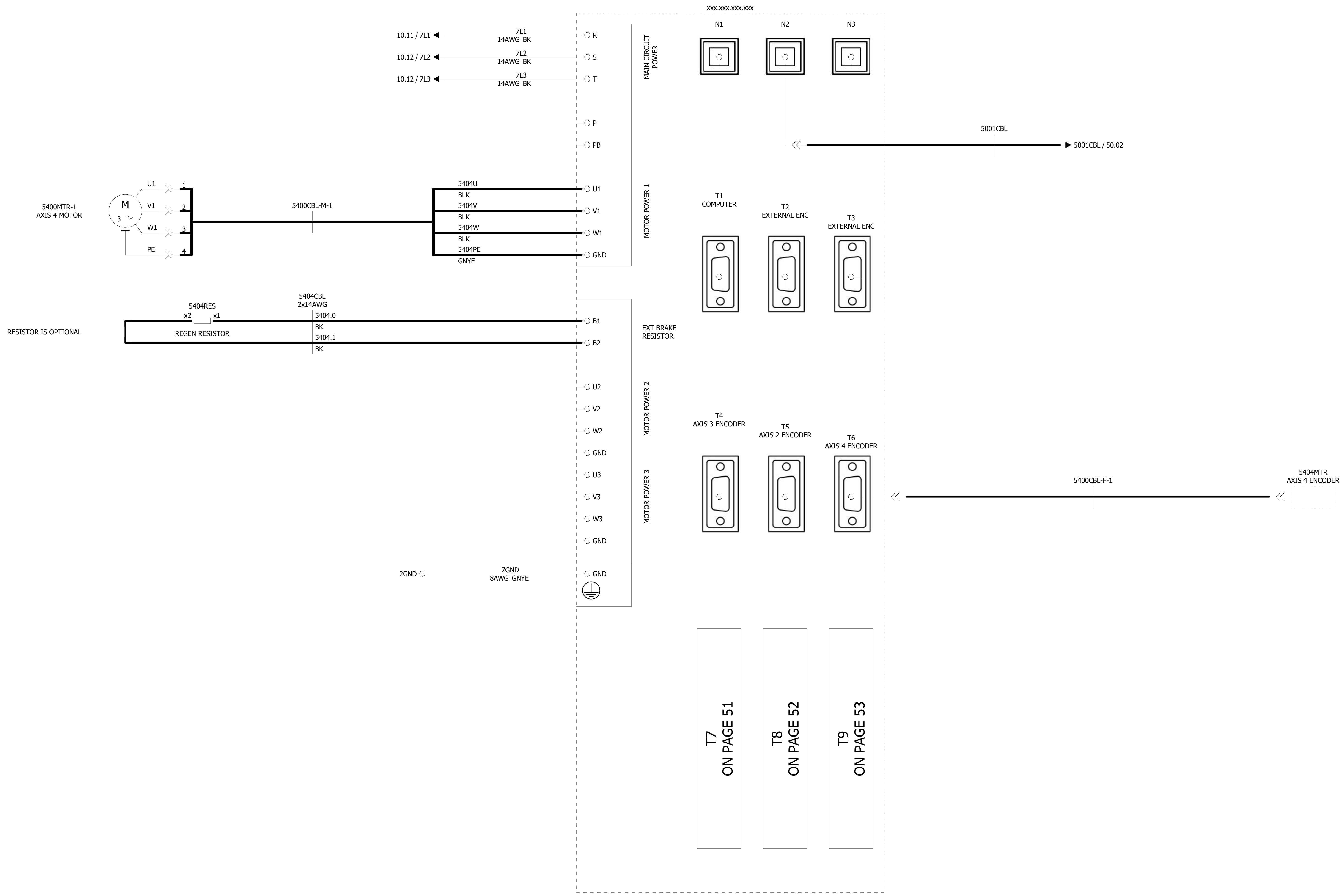


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CTB
AXIS 4 DRIVE

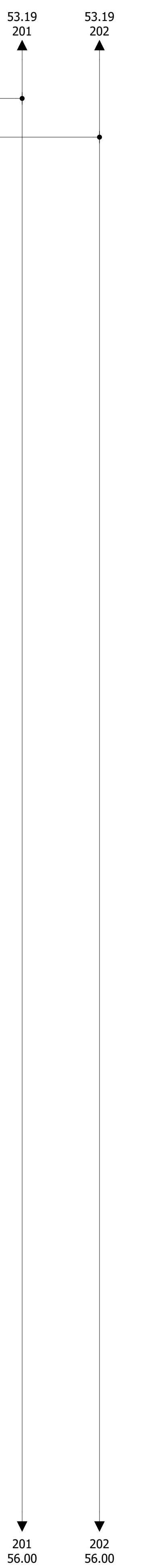
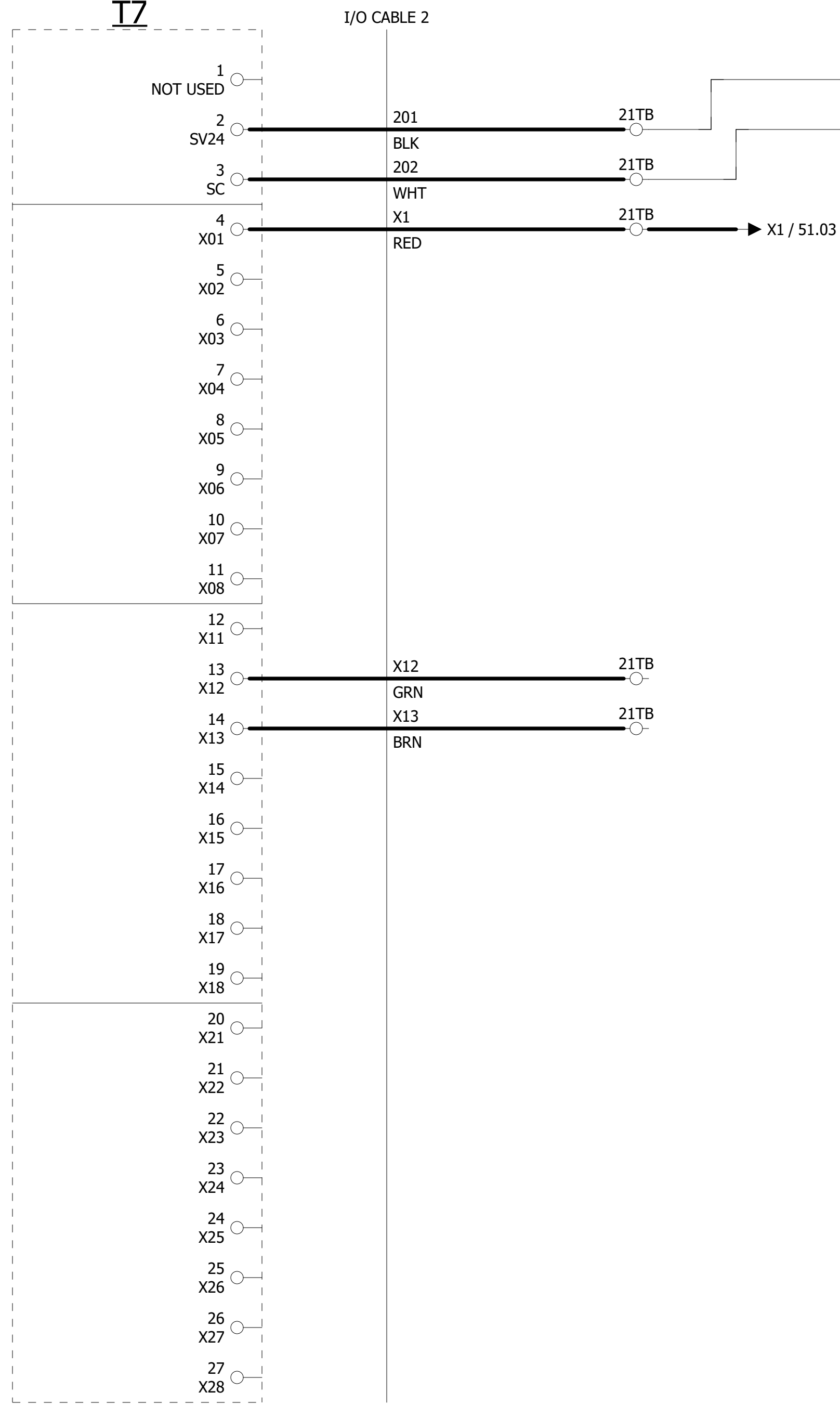
*** OPTIONAL AXIS ***

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 55 19
 55 20



CONTROLLER INPUTS

X01	E-STOP OKAY
X12	UNUSED INPUT
X13	UNUSED INPUT
X14	UNUSED INPUT
X15	UNUSED INPUT
X16	UNUSED INPUT
X17	UNUSED INPUT
X18	UNUSED INPUT

CTB
AXIS 4 DRIVE

T8

I/O CABLE 2

*** OPTIONAL AXIS ***

120VAC 24VDC

56
00

56
01

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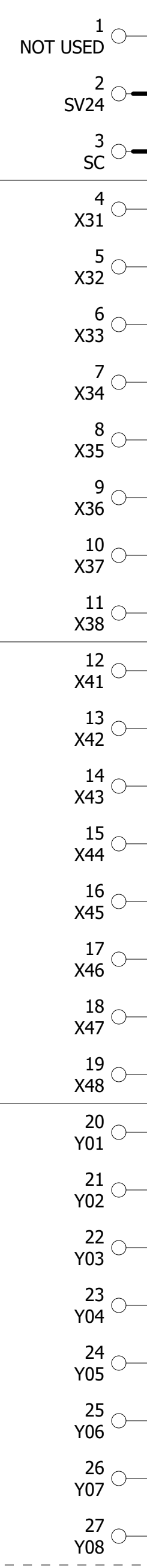
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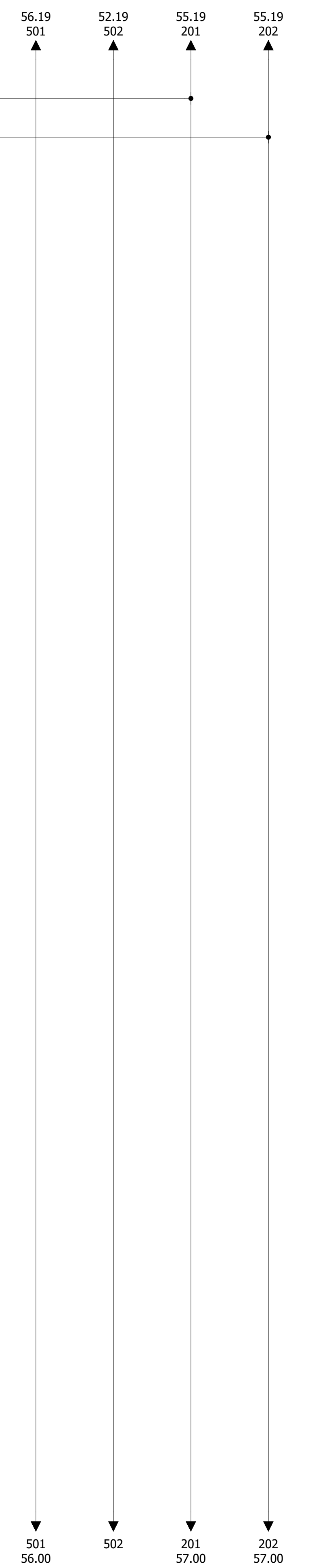
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CONTROLLER OUTPUTS

Y01	MIST
Y02	LUBE
Y03	SPINDLE BRAKE SOLENOID
Y04	COOLANT PUMP MTR
Y05	UNUSED OUTPUT
Y06	UNUSED OUTPUT
Y07	UNUSED OUTPUT
Y08	UNUSED OUTPUT



CTB
 AXIS 4 DRIVE

T9

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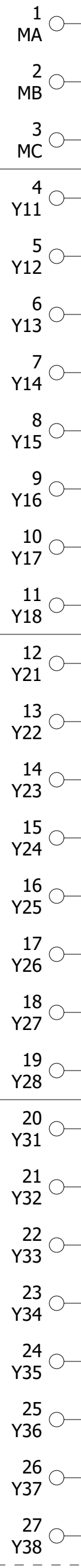
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*** OPTIONAL AXIS ***

24VDC

56.19
201

56.19
202

201
61.00

202
61.00

COMPANY: MACHMOTION NEWBURG, MISSOURI, USA		DATE: 4/14/2020		CUSTOMER CUSTOMER LOCATION		ALL RIGHTS RESERVED		DRAWING NO: RPKM00-001		NAME: RAPIDPATH KNEE MILL		=		+	
DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -		FACTORY: -		DEPT: -		OP. NO: -		STA. NO: -		PAGE: 56	
								MACH. NAME: RAPIDPATH KNEE MILL		DRAWING NO:		NEXT PAGE:---->>		60	

6000DRV
SPINDLE CONTROLLER

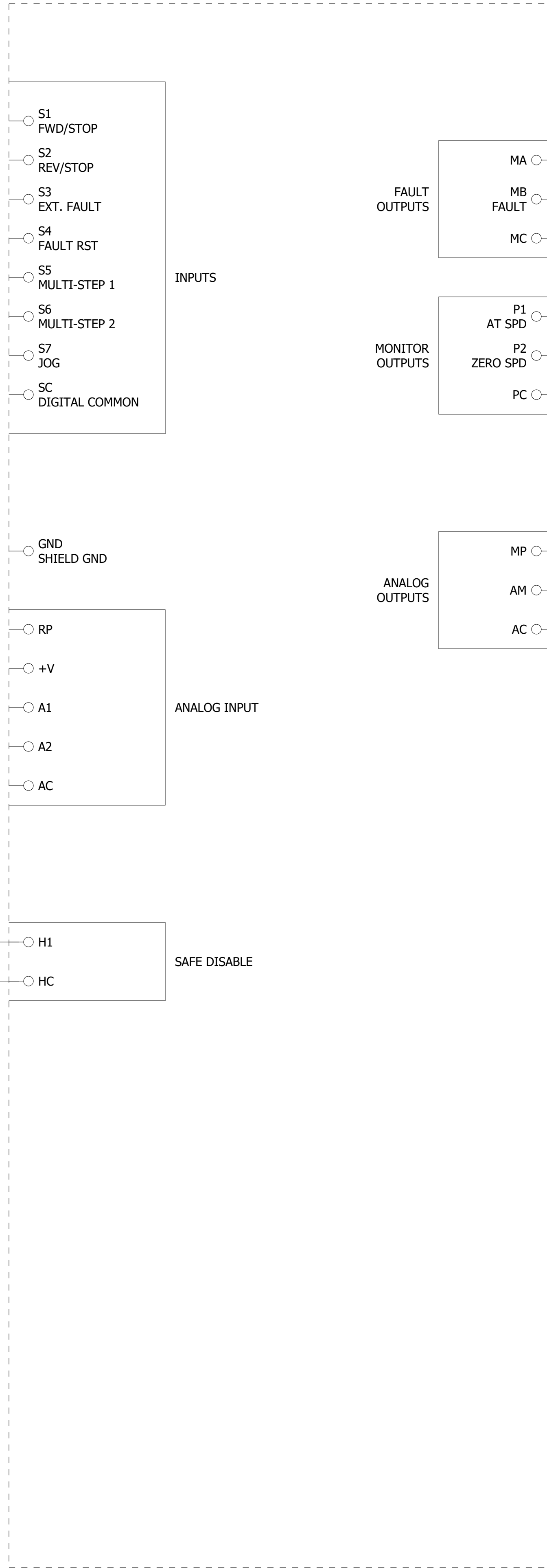
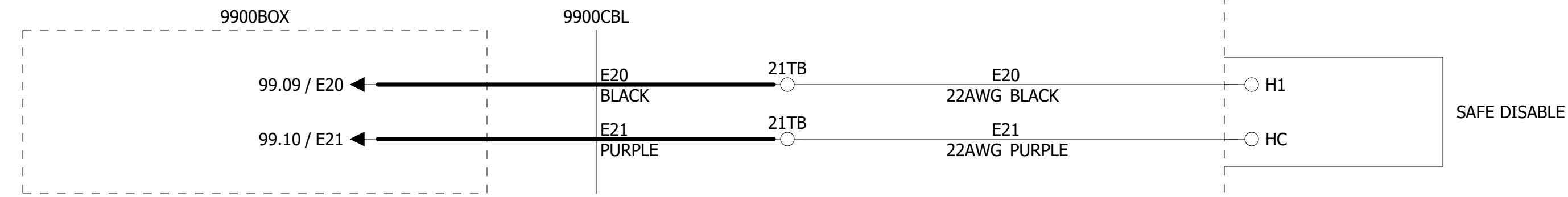
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57.19
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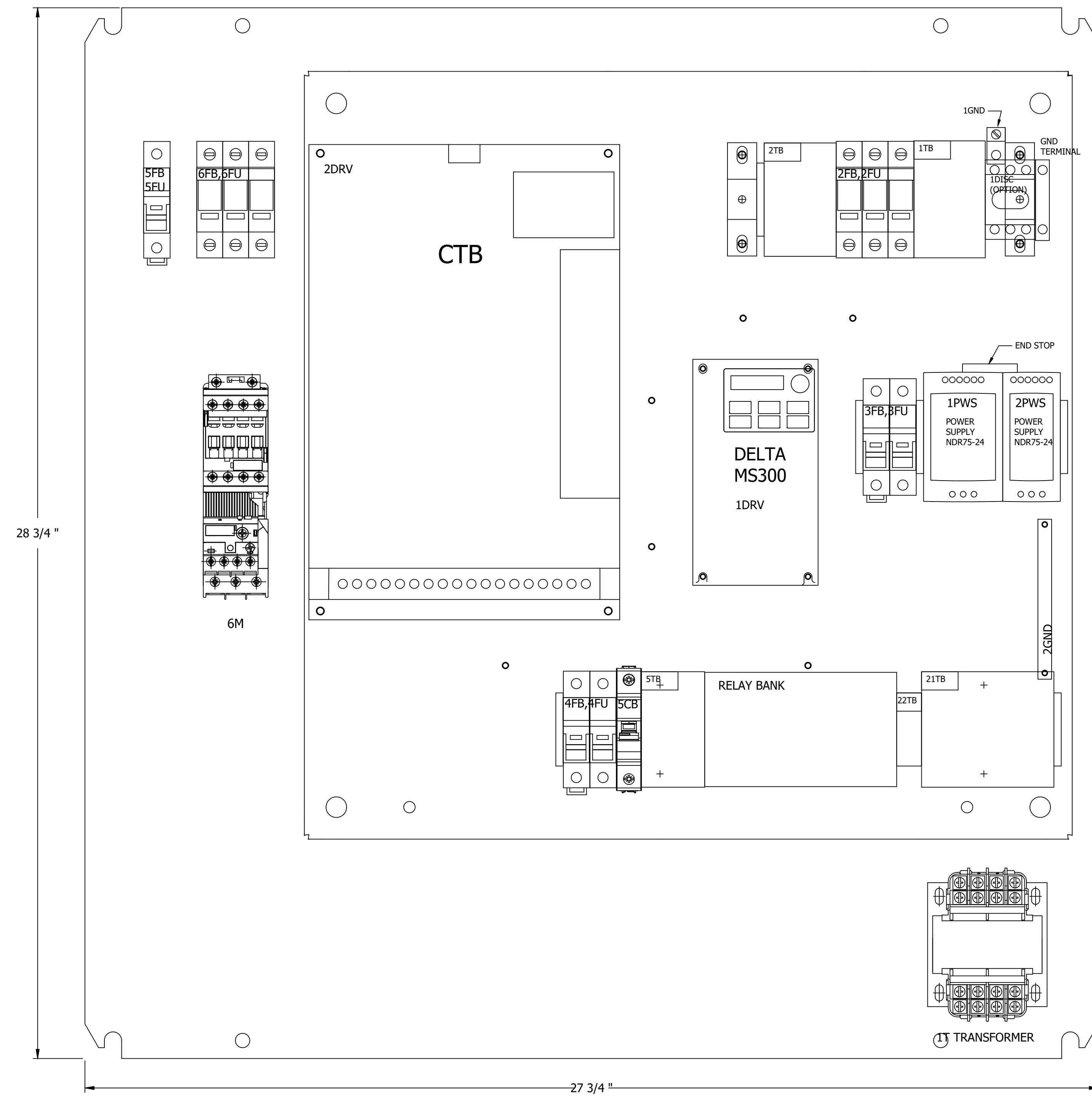
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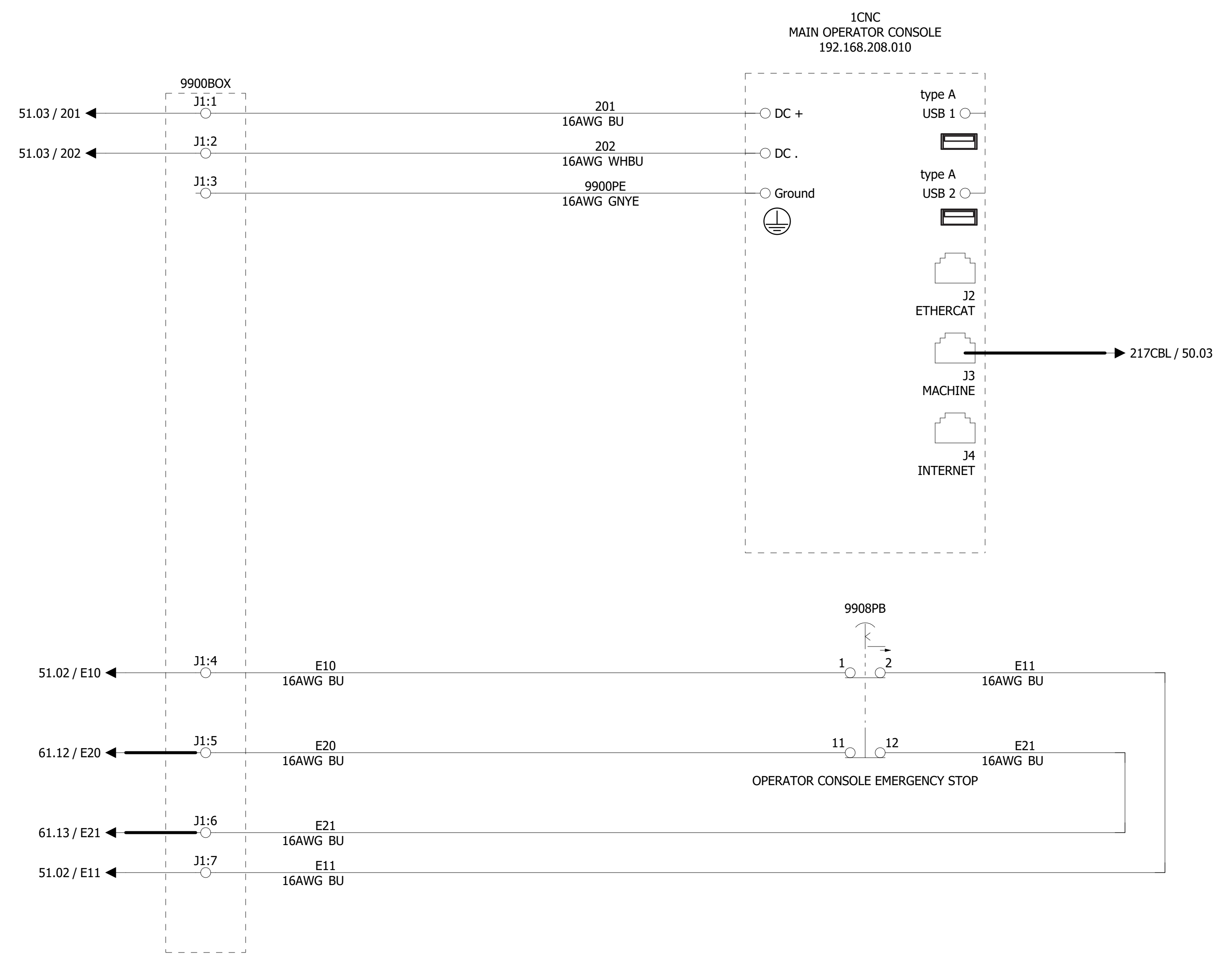


COMPANY: MACHMOTION NEWBURG, MISSOURI, USA	DATE: 4/14/2020 REVISION:	CUSTOMER CUSTOMER LOCATION	ALL RIGHTS RESERVED	DRAWING NO: RPKM00-001 SUPPLIER NO: XXXXXX	NAME: RAPIDPATH KNEE MILL 6000 DRV- SPINDLE DRIVE	=	+	PREV PAGE: <<---	PAGE:
DESIGNER: JUSTIN R. WALZ	APPROVER: -	LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	MACH. NAME: RAPIDPATH KNEE MILL	DRAWING NO:	&
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COMPANY: MACHMOTION NEWBURG, MISSOURI, USA		DATE: 4/14/2020		CUSTOMER CUSTOMER LOCATION		ALL RIGHTS RESERVED		DRAWING NO: RPKM00-001		NAME: RAPIDPATH KNEE MILL		=		+	
DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	SUPPLIER NO: XXXXXX	MAIN ELECTRICAL PANEL - BACKPLATE		PREV PAGE: <<---		PAGE: 61	
								MACH. NAME: RAPIDPATH KNEE MILL		DRAWING NO:		NEXT PAGE: ---->>		99	

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DESIGNER: JUSTIN R. WALZ	APPROVER: -	LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	MACH. NAME: RAPIDPATH KNEE MILL	DRAWING NO:	PREV PAGE: <<--- 96 NEXT PAGE: --->>	PAGE: 99
							#	133		

1TB
1L1
1L2
1L3

2TB
2L1
2L2
2L3
2L3

5TB
NEUT
GND
120V
120V
120V
NEUT
NEUT
NEUT

21TB
E10
E11
E20
E21
24V
24V
24V
0V
0V
0V
PROBE
SETTER PROBE
SETTER LIMIT
LUBE LOW
GEN1 X16
GEN2 X17
GEN3 X18

22TB
PC24V
PC0V
GND

COMPANY: MACHMOTION NEWBURG, MISSOURI, USA		DATE: 4/14/2020		CUSTOMER CUSTOMER LOCATION		ALL RIGHTS RESERVED		DRAWING NO: RPKM00-001		NAME: RAPIDPATH KNEE MILL		=	+		
DESIGNER: JUSTIN R. WALZ		APPROVER: -		LOC: -	FACTORY: -	DEPT: -	OP. NO: -	STA. NO: -	SUPPLIER NO: XXXXX		DRAWING NO:		PREV PAGE: <<--->		99
								MACH. NAME: RAPIDPATH KNEE MILL				NEXT PAGE: --->>			
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