

Rockwell Automation

VITAL METALS PROCESS PLANT

PROCESS CONTROL SYSTEM

RIO CABINET 2 - 870-RIO-020

RA PROJECT: P2CA500039

DATE	BY	APPROVAL
10/02/23	GM	DESIGN REVIEW
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RIO CABINET 2 - 870-RIO-020
TITLE SHEET

Drawn by: GM | Date: 16/09/22

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
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DRAWING STANDARDS:

SYMBOLS:

- ↳ REFERS TO NOTE GIVEN BELOW
- ▲ LOW POWER CONTACT
- ↻ ARROW INDICATES FUNCTION INCREASE (ALWAYS CLOCKWISE)

4) **DANGER** - THIS EQUIPMENT MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION. TO AVOID ELECTRIC SHOCK, DISCONNECT.

5) **CAUTION** - NEVER REMOVE OR INSERT ANY MODULE OR CARD WHILE THE POWER IS ON.

- 9) REMOVE JUMPER IF ADDITIONAL INTERLOCK IS ADDED.
- 13) SEPARATELY MOUNTED, SUPPLIED BY OTHERS

14) SEPARATELY MOUNTED, SUPPLIED BY ROCKWELL AUTOMATION

32) MOTOR STABILIZING FIELD, S1 AND S2, IS NOT REQUIRED FOR NORMAL OPERATION. TAPE S1 AND S2 SEPARATELY AND DO NOT USE.

33) DRIVE MOTOR CONNECTIONS AS SHOWN ARE FOR INDICATED ROTATION FACING COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE A1 AND A2 CONNECTIONS IN MOTOR CONDUIT BOX.

34) TACHOMETER LEADS MUST BE CONNECTED TO GIVE THE INDICATED POLARITY.

35) IF OPPOSITE ROTATION IS DESIRED, CHANGE POLARITY OF THE COSINE SIGNAL BY INTERCHANGING THE COSINE INPUT LEADS.

36) USE TWISTED TWO - CONDUCTOR CABLE. THIS CABLE MUST BE IN A SEPARATE SIGNAL CONDUIT. IT CANNOT BE RUN WITH OTHER CONDUCTORS OR CABLES. USE RELIANCE PART NUMBER 417900-76EAD OR EQUIVALENT. REFER TO FIELD INSTALLATION AND WIRING TABLE ON NEXT SHEET FOR WIRE SPECIFICATIONS.

38) SIGNAL WIRE CABLES WITH THIS NOTE NUMBER CAN BE IN THE SAME SIGNAL CONDUIT. THEY CANNOT BE RUN WITH NON-SIGNAL WIRES. REFER TO FIELD INSTALLATION AND WIRING TABLE ON NEXT SHEET FOR WIRE SPECIFICATIONS.

38-1) REFER TO NOTE 38. THE NUMBER FOLLOWING THE NOTE 38 IDENTIFIES THE CABLES THAT MAY BE GROUPED TOGETHER IN THE SAME SIGNAL CONDUIT. FOR EXAMPLE, CABLES REFERENCED WITH NOTE 38-1 CANNOT BE RUN IN THE SAME SIGNAL CONDUIT WITH NOTE 38-2 CABLES.

40) COAXIAL CABLES WITH THIS NOTE CAN BE IN THE SAME SEPARATE SIGNAL CONDUIT. THEY CANNOT BE RUN WITH OTHER CONDUCTORS OR CABLES. FOR RECOMMENDED CABLE TYPE, REFER TO PRODUCT'S NETWORK MANUAL.

CABLE P/N	CONNECTOR P/N	TERMINATOR 75 OHM
TYPE (BELDEN P/N)	(AMPHENOL P/N)	RELIANCE P/N 707204-20A
RG59 417900-148A (9259)	405504-74A (31-212-1005)	AMPHENOL P/N 46650-75
RG11 417900-149A (8238)	612293-B (6775)	

41) **DANGER** - DO NOT OPEN DISCONNECT SWITCH WHILE THE MOTOR IS ENERGIZED.

47) RESOLVER WIRES: LOW LEVEL SIGNAL WIRING. MUST BE RUN IN SEPARATE SIGNAL CONDUIT OR TRAY.

BELDEN P/N	NO. OF TWISTED PAIRS	AWG #	RECOMMENDED MAXIMUM DIST. FOR EACH RESOLVER TYPE
			a) X1 a) X2 a) X5
b) 9730	3	24	1000 FT. 1000 FT. 600 FT.

- a) DISTANCES BEYOND THOSE RECOMMENDED MAY REQUIRE ADDITIONAL TUNING. USE RELIANCE CUSTOM PANEL 0-58801
- b) MAY ONLY BE RUN IN CONDUIT, PER NEC
- c) NOTE: CONNECT CABLE SHIELD TO GROUND AT CABINET ONLY

48) FIBER-OPTIC CABLES WITH THIS NOTE MAY BE RUN WITH ANY LEVEL 1 SIGNAL WIRING. IF NECESSARY THESE CABLES MAY BE RUN WITH ANY LEVEL WIRING. SEE INSTALLATION MANUAL FOR RESTRICTIONS.

52) REFER TO TRANSFORMER NAMEPLATE FOR CONNECTIONS OF PRIMARY LEADS.

53) **DANGER** - TRANSFORMER IS CONNECTED TO LINE VOLTAGE EVEN WHEN THE A-C DISCONNECT IS OPEN.

99) USER SUPPLIED PROTECTION MUST INCLUDE A DISCONNECTING DEVICE ON THE PRIMARY SIDE OF THE TRANSFORMER. PRIMARY AND SECONDARY WIRE PROTECTION FOR THE ISOLATION TRANSFORMER MUST BE PROVIDED PER NEC.

- D) MOUNTED ON DOOR.
- H) MOUNTED ON CABINET HOOD
- R) MOUNTED ON CONTROL HOUSE ROOF
- T) MOUNTED ON CABINET TRIM
- E) EXISTING EQUIPMENT

USE EXAMP. LOCATION CODES	DESCRIPTION
REM_NS	REMOTE MOUNTED - NOT SUPPLIED BY ROCKWELL AUTOMATION.
REM_S	REMOTE MOUNTED - SUPPLIED BY ROCKWELL AUTOMATION.
REM	REMOTE MOUNTED.
OS_2	MTD. ON OPERATORS STATION No. 2
PB_3	MTD. ON PUSHBUTTON STATION No. 3

GENERAL NOTES:

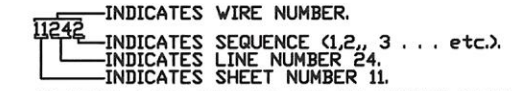
1. FOR FURTHER DRIVE INFORMATION ON INSTRUCTION MANUALS, SEE RESPECTIVE SCHEMATIC SECTIONS.
2. - BUILDING GROUND TO BE GROUNDED BY CUSTOMER.
- SYSTEM ZERO POTENTIAL NODE
- POWER EQUIPMENT GROUND
- PANEL (CHASSIS) GROUND
3. THE INTERNAL WIRING SELECTED MEETS OR EXCEEDS NEC, UL, AND CSA. INTERNAL POWER AND CONTROL WIRE HAS INSULATION RATED AT 105°C OR HIGHER.
4. * - INDICATES COMPONENTS SUPPLIED BY OTHERS.
5. INDICATES FIELD INSTALLED WIRES AS WELL AS THE WIRING LEVEL. WHEN ACCOMPANIED WITH THE DESIGNATION (FWC) THE WIRES/CABLE ARE PRE-SUPPLIED AT THE SOURCE CONNECTION BY ROCKWELL FOR CUSTOMER INSTALLATION AT SITE. (FWC) INDICATES FURNISHED WITH CABINET.

6. - INDICATES OUTGOING TERMINAL.
- INDICATES TERMINAL ON ELECTRONIC ASSEMBLY PRINTED CIRCUIT BOARD (IEA) ETC.
- INDICATES RELAY OR CONTACTOR WITH SUPPRESSOR.

7. COIL AND CONTACT CROSS REFERENCING - NUMBERS ADJACENT TO COIL AND UNDER CONTACT INDICATE SHEET AND LINE NUMBERS.
 - INDICATES SHEET NO. 101.
 - INDICATES LINE NO. 03.
 - NO - INDICATES NORMALLY OPEN CONTACTS
 - NC - INDICATES NORMALLY CLOSED CONTACTS

- OFF-PAGE CROSS REFERENCING - NUMBERS ADJACENT TO SOURCE AND DESTINATION SYMBOLS INDICATE SHEET AND LINE NUMBERS.
- FROM 1-24 1-24 - INDICATES LINE NO. 24.
 - TO 1-24 1-24 - INDICATES SHEET NO. 1.

8. WIRE # GENERATION



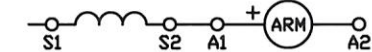
INTERNAL WIRE NUMBERS MAY BE 'FIXED' WITH A LINE AND SEQUENCE, BUT MAY SCHEMATICALLY SHOW A PREFIX.

9. TYPICAL DUAL VOLTAGE MOTOR FIELD CONNECTIONS ARE SHOWN BELOW. CONSULT THE MOTOR MANUFACTURER'S INSTRUCTIONS FOR CORRECT CONNECTIONS.

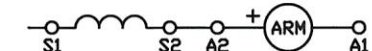


10. DC MOTOR ROTATION - CONSULT THE MOTOR MANUFACTURER'S INSTRUCTIONS FOR CORRECT CONNECTIONS.
 - FOR CCW ROTATION FACING COMMUTATOR END: A1 IS POSITIVE, F1 IS POSITIVE
 - FOR CW ROTATION FACING COMMUTATOR END: A2 IS POSITIVE, F1 IS POSITIVE

FOR CCW ROTATION WITH SERIES FIELD:



FOR CW ROTATION WITH SERIES FIELD:



FOR CCW ROTATION WITHOUT SERIES FIELD:



FOR CW ROTATION WITHOUT SERIES FIELD:



11. AC MOTOR ROTATION - CONSULT THE MOTOR MANUFACTURER'S INSTRUCTIONS FOR CORRECT CONNECTIONS.
 - FOR CW ROTATION VIEWED FROM MOTOR SHAFT: INVERTER OUTPUT U2 TO T1 (EUROPEAN MARKING U1), V2 TO T2 (EUROPEAN MARKING V1), W2 TO T3 (EUROPEAN MARKING W1)
 - FOR CCW ROTATION VIEWED FROM MOTOR SHAFT: INVERTER OUTPUT U2 TO T1 (EUROPEAN MARKING U1), V2 TO T3 (EUROPEAN MARKING V1), W2 TO T2 (EUROPEAN MARKING W1)

NOTE: NOT ALL AC MOTOR SUPPLIERS COMPLY WITH THE ABOVE CONVENTIONS.



COMBINATION MOTOR CONTROLLER WITH MOTOR CIRCUIT PROTECTOR

DANGER: To maintain overcurrent, short circuit and ground fault protection, the manufacturer's instructions for selecting current elements and setting the instantaneous-trip circuit breaker must be followed.

AVERTISSEMENT: Pour assurer une protection continue contre les surintensités, les court-circuits et une mise à la terre accidentelle, il est essentiel de choisir les éléments thermiques et de régler le disjoncteur à déclenchement instantané selon la notice technique du fabricant.

Determine motor full load current and motor design type identifier from motor nameplate.

For Design B, C and D motors adjust motor circuit protector to operate at a current setting between ten (10) and thirteen (13) times the full load current. For Design E and N motors adjust motor circuit protector to operate at a current setting between thirteen (13) and seventeen (17) times the full load current. NOTE: Motor circuit protector is set at minimum current setting when shipped from factory.

DANGER: Tripping of the instantaneous-trip circuit breaker is an indication that a fault current has been interrupted. Current carrying components of the magnetic motor controller should be examined and replaced if damaged, to provide continued protection against a risk of fire or electric shock. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced. (Refer to NEMA Standards Publication No. ICS 22 titled "Maintenance of Motor Controllers After a Fault Condition" also published as NEMA Standard Publication No. ICS 2, Part ICS 2-302.)

AVERTISSEMENT: L'ouverture du disjoncteur à déclenchement instantané indique qu'un courant de défaut a été interrompu. Les composants conducteurs de la commande magnétique du moteur doivent être inspectés et remplacés s'ils ont subi des dommages, afin d'assurer une protection continue contre le risque d'incendie et de choc électrique. En cas de défaillance de l'élément thermique d'un relais de surcharge, celui-ci doit être remplacé dans sa totalité.

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FIELD INSTALLATION AND WIRING

CATEGORY	WIRING LEVEL	SUB-GROUP	SIGNAL DEFINITION	SIGNAL EXAMPLES	CABLE TYPE	MINIMUM SPACING IN INCHES BETWEEN LEVELS (STEEL CONDUIT/TRAY)					SPACING NOTES
						4S	4	3	3S	2	
POWER (SEE NOTE 2-C FOR SPACING BELOW)	④	S	AC POWER (> 600VAC)	2.3KV 3 PHASE AC LINES	PER CEC AND LOCAL CODES	SEE NOTE 7	SEE NOTE 7	SEE NOTE 7	SEE NOTE 7	SEE NOTE 7	1 2 5
			AC POWER (< 600VAC)	480V 3 PHASE AC LINES	PER CEC AND LOCAL CODES	SEE NOTE 7	0	3/6	3/12	3/9	
			DC POWER	DC MOTOR ARMATURE	PER CEC AND LOCAL CODES						
			DC POWER	REGULATED DC MOTOR FIELD	PER CEC AND LOCAL CODES						
CONTROL (300V MAX OR 20 AMPS)	③		115VAC/VDC LOGIC	RELAY LOGIC, PLC I/O	PER CEC AND LOCAL CODES	SEE NOTE 7	3/6	0	3/9	1/3	
			115VAC POWER	POWER SUPPLIES, INSTRUMENTS	PER CEC AND LOCAL CODES						
		S	24VAC/VDC LOGIC	PLC I/O	PER CEC AND LOCAL CODES						
MEDIUM LEVEL SIGNAL (PROCESS)	②		ANALOG SIGNALS DC SUPPLIES	REF/FEEDBACK SIGNAL, 5 TO 24VDC SUPPLIES	SHIELDED CABLE BELDEN 8770, 9418	SEE NOTE 7	3/12	3/9	0	1/1	
			DIGITAL (LOW SPEED)	TTL							
		S	DIGITAL (HIGH SPEED)	RESOLVER, ENCODER/COUNTER I/O, PULSE TACH FEEDBACK	SHIELDED CABLE BELDEN 9730, 9773, 9892 (SEE USER MANUAL)						
		SHLD	ANALOG SIGNALS	REF/FEEDBACK SIGNALS	SHIELDED CABLE, TWISTED CONDUCTORS BELDEN 8760, 9729						
LOW LEVEL SIGNAL (COMM.)	①		SERIAL COMMUNICATION	RS232, 422 TO TERMINALS, PRINTERS	SHIELDED CABLE RS232-BELDEN 8770,8760 RS422-BELDEN 9729,9730	SEE NOTE 7	3/9	1/3	1/1	0	
		S	PLC SERIAL COMMUNICATION (> 20K BAUD)	PLC REMOTE I/O, PLC DATA HIGHWAY	TWINAXIAL CABLE BELDEN 9463 R-A 1770-CD						
		C	PLC SERIAL COMMUNICATION (> 5MB)	CONTROL NET	RG-6 QUAD SHIELD, COAX CABLE; A-B 1786-RG6 BELDEN 3092A						
		D	CAN COMMUNICATION	DEVICE - NET DRIVE - DRIVE	R-A 1485C-P1-C						
		E	ETHERNET		DEPENDS ON INSTALLATION						
		F	PLC SERIAL COMMUNICATION (> 5MB)	CONTROL-NET	FIBER OPTIC						N/A

GENERAL NOTES:

- STEEL CONDUIT IS RECOMMENDED FOR LEVELS 1 AND 2. FOR AC MOTOR CABLES, SEE NOTE 5. ALL CONDUITS CONNECTED TO THE CABINETS SHOULD BE PROPERLY SEALED TO MINIMIZE AIR OR WATER ENTRY INTO THE CABINETS. IF ALUMINUM CONDUIT IS USED, A. IT REQUIRES THE SAME MINIMUM SPACING IS USED AS THAT SHOWN FOR CABLE TRAYS. OR B. INDIVIDUAL STEEL JACKETED (STEEL MESH) CABLES ARE TO BE USED IF THE CONDUIT SPACINGS NEED BE THE SAME AS STEEL CONDUIT.
- SPACING SHOWN BETWEEN LEVELS IS THE MINIMUM REQUIRED FOR PARALLEL RUNS ≤ 400 FEET. GREATER SPACINGS SHOULD BE USED WHERE POSSIBLE.
- SHIELDS FOR SHIELDED CABLES MUST BE CONNECTED AT ONE END ONLY. THE OTHER END SHOULD BE CUT BACK AND INSULATED. SHIELDS FOR CABLES FROM A CABINET TO AN EXTERNAL DEVICE MUST BE CONNECTED AT CABINET END. SHIELDS FOR CABLES FROM ONE CABINET TO ANOTHER MUST BE CONNECTED AT THE SOURCE END CABINET. SPLICING OF SHIELDED CABLES, IF ABSOLUTELY NECESSARY, SHOULD BE DONE SUCH THAT SHIELDS REMAIN CONTINUOUS AND INSULATED FROM GROUND.

- NO. 16 AWG WIRE IS THE MINIMUM RECOMMENDED SIZE FOR CONTROL (LEVEL 3). POWER WIRE IS SELECTED BY LOAD, USING 75 DEG C WIRE RATING (LEVELS 4 AND 4S).
- ARMORED CABLE WITH A PVC OUTER JACKET IS REQUIRED TO PROVIDE THE NECESSARY ELECTRICAL SHIELDING FOR AC MOTOR CABLES CONNECTED TO A PWM INVERTER. RECOMMENDATIONS:
METALLIC ARMOR:
BEST PERFORMANCE: SHIELDED BELDEN CABLE PER TABLE BELOW, OR CONTINUOUS CORRUGATED ALUMINUM INTERLOCKED ALUMINUM, OR INTERLOCKED STEEL
ACCEPTABLE PERFORMANCE: PHASE CONDUCTORS - 3 GROUND CONDUCTORS - 3
CONDUCTORS:
BEST PERFORMANCE: PHASE CONDUCTORS - 3 GROUND CONDUCTORS - 1
ACCEPTABLE PERFORMANCE: PHASE CONDUCTORS - 3 GROUND CONDUCTORS - 1

THE CABLE CONNECTOR SELECTED MUST PROVIDE A GOOD ELECTRICAL CONNECTION BETWEEN THE ARMOR AND THE PE GROUND PLANE AT EACH END OF THE CABLE.
SHIELDED CABLE RECOMMENDATIONS:

BELDEN	29500	#16 AWG
BELDEN	29501	#14 AWG
BELDEN	29502	#12 AWG
BELDEN	29503	#10 AWG
BELDEN	29504	#8 AWG
BELDEN	29505	#6 AWG
BELDEN	29506	#4 AWG
BELDEN	29507	#2 AWG

DESCRIPTION - 4 CONDUCTOR TINNED COPPER, XLPE INSULATION, 600VRMS MAX, SPECIFICALLY DESIGNED FOR IGBT DRIVE APPLICATIONS. THE SHIELD SHOULD BE CONNECTED TO THE PE GROUND PLANE

- SEE A-B PUBLICATION AG2.2 FOR ADDITIONAL CONTROLNET COAX CABLE RECOMMENDATIONS.

SPACING NOTES:

- BOTH OUTGOING & RETURN CURRENT CARRYING CONDUCTORS ARE TO BE PULLED IN THE SAME CONDUIT OR LAYERED ADJACENT IN CABLE TRAY.
- ROUTE CABLES OF THE FOLLOWING LEVELS AS INDICATED:
A. LEVELS MUST BE RUN IN SEPARATE CONDUITS OR TRAYS.
B. INTERMIXING OF LEVELS IS NOT ALLOWED.
C. SPECIAL LEVELS 4S AND 3S MAY EXIST THAT REQUIRE SPECIFIC WIRES TO BE GROUPED FOR SPECIAL HANDLING.
D. LEVELS 1 AND 2 MAY HAVE THEIR RESPECTIVE CIRCUITS (WITHIN A GIVEN LEVEL) PULLED IN THE SAME CONDUIT OR LAYERED ADJACENT IN THE SAME CABLE TRAY.

NOTE: FOR LEVELS 3 AND 4, THE AMPACITY RATINGS OF CONDUCTORS IN A BUNDLE MAY NOT EXCEED THE DERATING GUIDELINES OF CEC TABLE 57

NOTE: THE RESPECTIVE CIRCUITS IN A GIVEN BUNDLE MAY EXPERIENCE SOME AMOUNT OF EMI COUPLING. SOME CIRCUIT APPLICATIONS MAY DICTATE SEPARATE SPACING.

- CONDUCTORS OF LEVELS 1 AND 2 MUST BE SHIELDED WHERE INDICATED PER THE RECOMMENDATIONS OR EQUIVALENT.
- IN CABLE TRAYS, STEEL SEPARATORS ARE ADVISABLE BETWEEN THE LEVELS.
- IF CONDUIT IS USED IT IS REQUIRED THAT IT BE CONTINUOUS AND COMPOSED OF MAGNETIC STEEL. (SEE GENERAL NOTE 1 ABOVE)
- FOR FURTHER INFORMATION ON SPACING OF PLC COMMUNICATION CABLES TO LEVEL 4, SEE R-A PLC INSTALLATION MANUAL.
- PER CEC SECTION 12, CONDUCTORS OF CIRCUITS RATED OVER 600V ARE NOT ALLOWED TO OCCUPY THE SAME CABLE, TRAY, OR CONDUIT. IT IS ACCEPTABLE FOR A TRAY TO HAVE A METAL BARRIER FOR SEPARATION.

COIL AND SOLENOID SUPPRESSION:

BEFORE UTILIZING THE CONTROL CIRCUIT POWER AVAILABLE FOR OPERATION OF CUSTOMER SUPPLIED DEVICES, THE COILS OR SOLENOIDS OF SUCH DEVICES MUST BE SUPPRESSED. THE EXTERNAL CONTROL CIRCUIT WIRING MUST BE RUN IN A SEPARATE CONDUIT THAT DOES NOT HAVE VARIABLE SIGNAL VOLTAGES OR POWER CIRCUIT VOLTAGES PRESENT. ELECTRICAL TRANSIENTS MAY CAUSE OCCASIONAL DRIVE MALFUNCTIONING.

EXAMPLE: SPACING RELATIONSHIP BETWEEN 480VAC INCOMING LEADS
a. 480VAC LEADS ARE LEVEL 4.
b. 24VDC LEADS ARE LEVEL 3.
c. FOR SEPARATE STEEL CONDUITS, THE CONDUITS ARE TO BE 3 INCHES APART.
d. IN A CABLE TRAY THE TWO GROUPS OF LEADS ARE TO BE 6 INCHES APART.

SHIELDED CABLES RECOMMENDATIONS:

BELDEN 8770	18 AWG	- 3 CONDUCTOR SHIELDED
BELDEN 8760	18 AWG	- 2 CONDUCTOR SHIELDED
BELDEN 9418	18 AWG	- 4 CONDUCTOR SHIELDED
BELDEN 9728	24 AWG	- 4 SHIELDED PAIRS (8 COND.)
BELDEN 9729	24 AWG	- 2 SHIELDED PAIRS (4 COND.)
BELDEN 9730	24 AWG	- 3 SHIELDED PAIRS (6 COND.)
BELDEN 9892	22 AWG	- 3 SHIELDED PAIRS (6 COND.)
BELDEN 9773	18 AWG	- 3 SHIELDED PAIRS (6 COND.)
BELDEN 9463	75 OHM	- TWINAXIAL (2 COND.)

FIELD WIRING INSIDE ROCKWELL ENCLOSURE:

- CONNECTIONS WILL BE ONLY TO TERMINALS PROVIDED.
- WIRE LENGTH FROM ENTRY POINT TO TERMINAL BOARD TO BE AS SHORT AS POSSIBLE.
- SIGNAL WIRE MUST NOT BE LACED OR RUN WITH NON-SIGNAL WIRE AFTER ENTRY INTO THE ENCLOSURE.
- INCOMING WIRE MUST NOT BE ROUTED IN WIRE CHANNELS OR THROUGH AREAS OF POWER AND CONTROL COMPONENTS AND WIRING.
- USE LASHING BARS WHEN PROVIDED FOR CUSTOMER CONVENIENCE.

FIELD INSTALLATION GROUNDING GUIDELINES

- FOR DRIVES INSTALLATION, REFER TO 'WIRING AND GROUNDING GUIDELINES', PUBLICATION DRIVES-IN001
- FOR PLC AND I/O INSTALLATION, REFER TO 'INDUSTRIAL AUTOMATION WIRING AND GROUNDING GUIDELINES', PUBLICATION 1770-4.1
- CEC SECTION 10, GROUNDING AND BONDING
- LOCAL CODE REQUIREMENTS

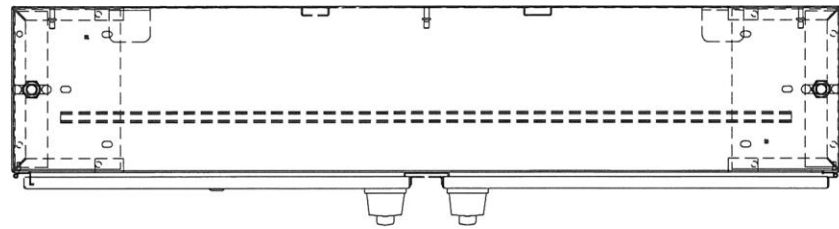
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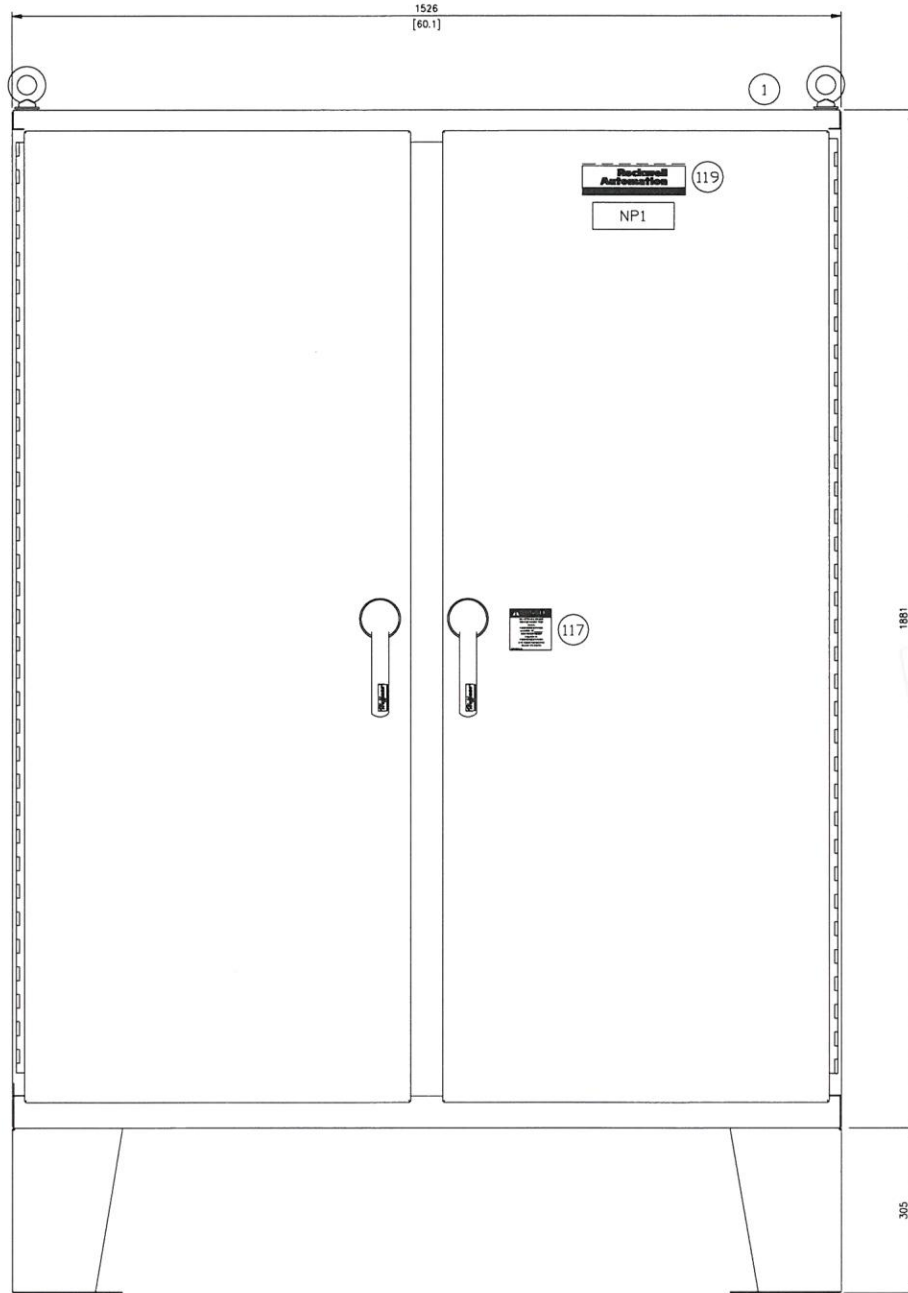
Rockwell Automation	
VITAL METALS PROCESS PLANT RID CABINET 2 - 870-RID-020 WIRE CLASSIFICATION	
Sheet	03 of 53 Next Sh 05
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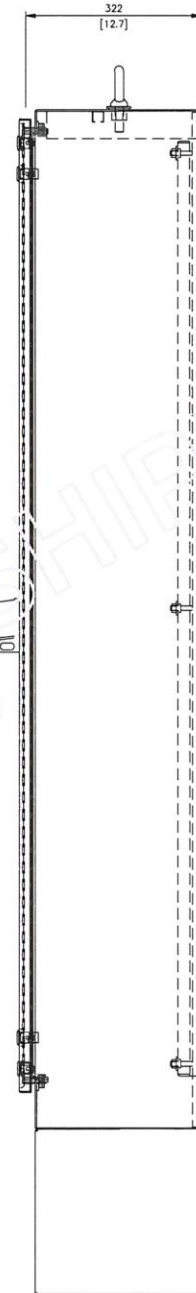




TOP VIEW
N.T.S.



FRONT VIEW
N.T.S.

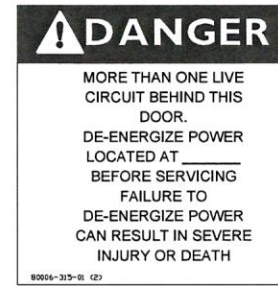


RIGHT SIDE VIEW
N.T.S.

ITEM	QTY	CATALOG	DESC1	MFG
1	1	A74H6012LP3PT	TYPE 4, TWO-DOOR FLOOR MOUNT ENCLOSURE 74"(H)x60"(W)x14"(D)	HOFFMAN
117	2	80006-315-01	WARNING LABEL	RA
118	1	80120-367-02	DATA NAMEPLATE	RA
119	1	30104-362-01	RA MONOGRAM NAMEPLATE, POLYCARBONATE, 7.5"x2.13", VELVET	RA

DATA NAMEPLATE	
CAT NO	PROCESS PLANT
RIO CABINET 2	
870-RIO-020	
ORDER NO	ENCLOSURE TYPE 4
SERIAL NO P2CA500039-0003	FACILITY
WORKING SH P2CA500039-0003 SH 10-17	
NORMAL DUTY OVS IP	HEAVY DUTY OVS IP
VOLTS PH	AMPS
INPUT	
OUTPUT	
AUXILIARY INPUT POWER	
VOLTS 120	PH 1
SHORT CIRCUIT CURRENT RMS SYMMETRICAL 10 KA	AMPS 2-15
480 VOLTS MAXIMUM	HZ 60
Rockwell Automation	
MADE IN CANADA	

80120-367-02 LABEL (INSIDE)



DANGER LABEL
OUTSIDE AND INSIDE
80006-315-01



NP1 - CABINET FRONT DOOR NAMEPLATE
BLACK TEXT ON WHITE LAMICIDID
TEXT SIZE: 10MM

NOTES:

1. FIELD CABLES BOTTOM ENTRY. POWER FEED BOTTOM ENTRY.

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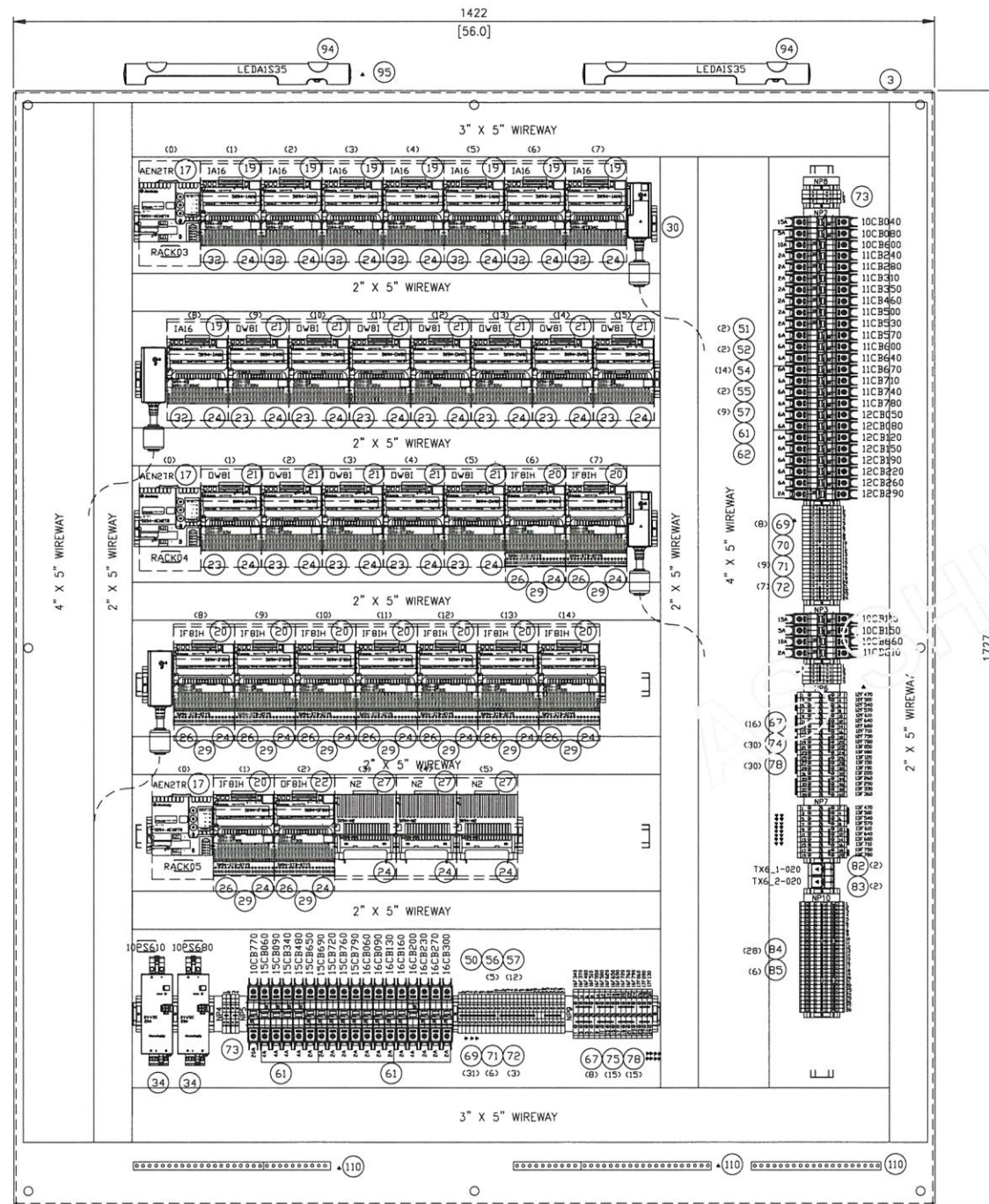
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VITAL METALS PROCESS PLANT
RIO CABINET 2 - 870-RIO-020
CABINET LAYOUT
Drawn by: GM Date: 02/02/22



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MOUNTING PANEL LAYOUT
N.T.S

LOAD	VA/W	QTY	BACKPLANE CONSUMPTION W	24V CONSUMPTION W		120V UPS CONSUMPTION W		BTU/hr	BTU/hr-TOT
				NOMINAL	MAXIMUM				
5094-AEN2TR	45.00	3		27.0				21.1	63.3
5094-IA16	29	8	9.0					11.9	95.2
5094-DW8I		12	12.2					11.94	143.3
5094-IF8IH	8.40	10	5.3	84.0				11.94	119.4
5094-DF8IH	19.20	1	0.5	19.2				12.6	12.6
			SUM1	27.0					
1606-XLE480ERZ	480	2			144	493.4		45.7	91.5
1489-MICXXX		47						6.8	320.8
FIELD POWER		1			180	900		30.7	30.7
		TOTAL		130.2	324.0	1393.4		BTU/hr->	876.8
								Watt->	256.9

NAMEPLATE SCHEDULE					
ITEM	QTY.		DESCRIPTION	PLATE SIZE	TEXT SIZE
NP1	1	LINE 1 LINE 2 LINE 3	PROCESS PLANT RIO CABINET 2 870-RIO-020	190 X 65	10 MM
NP2	1	LINE 1 LINE 2	TB1 120VAC	1492-GM35	AS REQ.
NP3	1	LINE 1 LINE 2	TB2 120VAC-UPS	1492-GM35	AS REQ.
NP4	1	LINE 1 LINE 2	TB3 24VDC	1492-GM35	AS REQ.
NP5	1	LINE 1 LINE 2	TB4 24VDC	1492-GM35	AS REQ.
NP6	1	LINE 1 LINE 2	TB5 120VAC	1492-GM35	AS REQ.
NP7	1	LINE 1 LINE 2	TB6 120VAC-UPS	1492-GM35	AS REQ.
NP8	1	LINE 1	LTB	1492-GM35	AS REQ.
NP9	1	LINE 1 LINE 2	TB7 24VDC	1492-GM35	AS REQ.
NP10	1	LINE 1	TB8	1492-GM35	AS REQ.

NAMEPLATES: STANDARD RA, AS PER LAYOUT AND WIRING DIAGRAMS.

NOTES:

- FIELD CABLES: BOTTOM ENTRY.
- COMPONENT GROUNDING AS PER VENDOR SPECIFICATION.
- AUXILIARY LED LIGHT TERMINALS: INSTALLED LOCATION BY PANEL SHOP.
- 120VAC AND 24VDC WIRING TO BE SEPARATED.
- SEE SH.7 FOR PANEL BOM.
- EQUIPMENT NAMEPLATES: (10 X 30)MM LAMICOID DR STICKER - TEXT AS SHOWN ON LAYOUT.

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Rockwell Automation Canada Ltd.
 Number: C080
 Permission to Certify held by:
 Discipline: Sr. Reg. No. 5506
 Automation
[Signature]



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VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 MOUNTING PANEL LAYOUT
 Drawn by: GM Date: 10/01/22

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Sheet 06 of 53 Next Sh 07
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ITEM	QTY	CATALOG	DESC2	DESC3	MFG
3	1	A72P60	MOUNTING PANEL, STEEL, WHITE, 68"(H) X 56"(W)		HOFFMAN
17	3	5094-AEN2TR	5094 ETHERNET/IP RJ45 (2) ADAPTER		RA
19	8	5094-IA16	5094 DIGITAL 16 INPUT, 120VAC		RA
20	10	5094-IF8IH	5094 ISOLATED ANALOG 8 INPUT, HART		RA
21	12	5094-DW8I	5094 RELAY 8 OUTPUT ISOLATED		RA
22	1	5094-DF8IH	5094 ISOLATE ANALOG 8 OUTPUT, HART		RA
23	12	5094-RTB3W	5094 RTB RELAY SCREW		RA
24	34	5094-MB	5094 MOUNTING BASE		RA
26	11	5094-RTB3I	5094 RTB ISOLATED SCREW		RA
27	3	5094-N2	5094 FILLER MODULE		RA
29	3	5094-STB-QTY5	5094 SHIELD RTB SCREW PACK OF 5		RA
30	2	5094-CE30	5094 INTER-CONNECT CABLE 3 METER		RA
32	8	5094-RTB3AC	5094 RTB AC SCREW		RA
34	2	1606-XLE480ERZ	20A POWER SUPPLY, 24-28V DC, 480W, 100-240V AC INPUT		RA
42	2	1585J-M8CBJM-1	ETHERNET CABLE, 8 CONDUCT., STRAIGHT MALE, RJ45,	TEAL PVC SHIELDED, 100BASE-TX, 100 MB/S, 1M	RA
43	1	1585J-M8CBJM-1M5	ETHERNET CABLE, 8 CONDUCT., STRAIGHT MALE, RJ45	TEAL PVC SHIELDED, 100BASE-TX, 100 MB/S, 1.5M	RA
44	1	1585J-M8CBJM-2M5	ETHERNET CABLE, 8 CONDUCT., STRAIGHT MALE, RJ45	TEAL PVC SHIELDED, 100BASE-TX, 100 MB/S, 2.5M	RA
50	1	1489-MIC200	CIRCUIT BREAKER, 1 POLE, 20A, 277VAC, 48VDC, 5-10IN		RA
51	2	1489-MIC150	CIRCUIT BREAKER, 1 POLE, 15A, 277VAC, 48VDC, 5-10IN		RA
52	2	1489-MIC100	CIRCUIT BREAKER, 1 POLE, 10A, 277VAC, 48VDC, 5-10IN		RA
54	14	1489-MIC060	CIRCUIT BREAKER, 1 POLE, 6A, 277VAC, 48VDC, 5-10IN		RA
55	2	1489-MIC050	CIRCUIT BREAKER, 1 POLE, 5A, 277VAC, 48VDC, 5-10IN		RA
56	5	1489-MIC040	CIRCUIT BREAKER, 1 POLE, 4A, 277VAC, 48VDC, 5-10IN		RA
57	21	1489-MIC020	CIRCUIT BREAKER, 1 POLE, 2A, 277VAC, 48VDC, 5-10IN		RA
61	3	1489-AMCL112	12 PINS, 12 CIRCUIT BREAKERS - 1 PHASE BUS BAR		RA
62	1	1489-AMCL118	18 PINS, 18 CIRCUIT BREAKERS - 1 PHASE BUS BAR		RA
67	24	1492-SJ8A-4	INSULATED SIDE JUMPER, 8 MM CENTER TO CENTER, 4 POLE, BLK		RA
69	63	1492-J4	TERMINAL BLOCK, BUL 1492-J, GRAY, 600 VAC/DC, 35A, 22-10AWG		RA
70	7	1492-CJJ6-10	CENTER JUMPER, SCREW TYPE, 10-POLE		RA
71	23	1492-EAJ35	1492 TERMINAL BLOCK ACCESSORIES END ANCHOR		RA
72	9	1492-GM35	1492 TERMINAL BLOCK ACCESSORIES GROUP MARKER CARRIER		RA
73	2	1492-EBJ16	END BARRIER, GRAY, J16/J35 OR PART, PLATE FOR J3/J4/J6/J10		RA
74	30	1492-JD3FB120	TWO-LEVEL FUSED TERMINAL BLOCK, 5-20MM, #22-#12	LED INDICATOR, 60-150V AC/DC	RA
75	15	1492-JD3FB24	TWO-LEVEL FUSED TERMINAL BLOCK, 5-20MM, #22-#12	LED INDICATION, 10-36V DC	RA
78	45	GDC-2A	5X20MM, 2A SLOW ACTING FUSE		EATON
79	2	1492-MR6X8	SNAP-IN LINKED MARKER CARD, 6 MM X 6 MM, NO TEXT, 120 MARKERS,		RA
80	2	1492-MR6X12	SNAP-IN LINKED MARKER CARD, 6 MM X 12 MM, NO TEXT, 120 MARKERS		RA
82	2	CADINIIG	MINI-CDM 1-PORT DIN RAIL MOUNTING ADAPTER, GRAY		PANDUIT
83	2	CJS688TGY	MINI-CDM CAT 6 ETHERNET MODULE FOR THE CADINIIG ADAPTER		PANDUIT
84	28	1492-JD4	1492-J IEC TERMINAL BLOCK, TWO-CIRCUIT FEED-THROUGH BLOCK,	4 MM (# 26 AWG - # 10 AWG), STANDARD FEEDTHROUGH, GRAY	RA
85	6	1492-CJLJ6-10	PLUG-IN CENTER JUMPER, 6 MM CENTER TO CENTER, 10 POLE		RA
94	2	LEDA1S35	LED CABINET LIGHT 90-260 VAC, 5W		HOFFMAN
95	1	LEDA10E	LED LIGHT EXTENSION CABLE, VAC, 39.37' (1000MM), #16AWG		HOFFMAN
97	1	ALFSWD	DDDR SWITCH ASSEMBLY		HOFFMAN
98	1	LDSWITCH72	PANELITE DDOR SWITCH CABLE, 72' (1.83M)		HOFFMAN
109	1	N-87	GROUND BAR, 6-14AWG, 34.5' (876MM)		ILSCO
110	40	E-153	1/4"-28X7/16", GROUND BAR LUG		ILSCO
111					
116	5		NAMEPLATE (10x30)MM WHITE LAMICOID OR STICKER		PANEL SHOP
120	7	199-DR1	35MM DIN RAIL, 1M		RA
121	9M	F2X5LG6	PANDUCT NARROW SLOT DUCT, LT GRAY, PVC, 5.1"x2.25", PK6		PANDUIT
122	2.4M	F3X5LG6	PANDUCT NARROW SLOT DUCT, LT GRAY, PVC, 5.1"x3.25", PK6		PANDUIT
123	3.2M	F4X5LG6	PANDUCT NARROW SLOT DUCT, LT GRAY, PVC, 5.1"x4.25", PK6		PANDUIT
124	9M	C2LG6	PANDUCT C2LG6 FLUSH COVER, LT GRAY, PVC, 0.35"x2.25", PK6		PANDUIT
125	2.4M	C3LG6	PANDUCT C3LG6 FLUSH COVER, LT GRAY, PVC, 0.35"x3.25", PK6		PANDUIT
126	3.2M	C4LG6	PANDUCT C4LG6 FLUSH COVER, LT GRAY, PVC, 0.35"x4.25", PK6		PANDUIT
127					
128					

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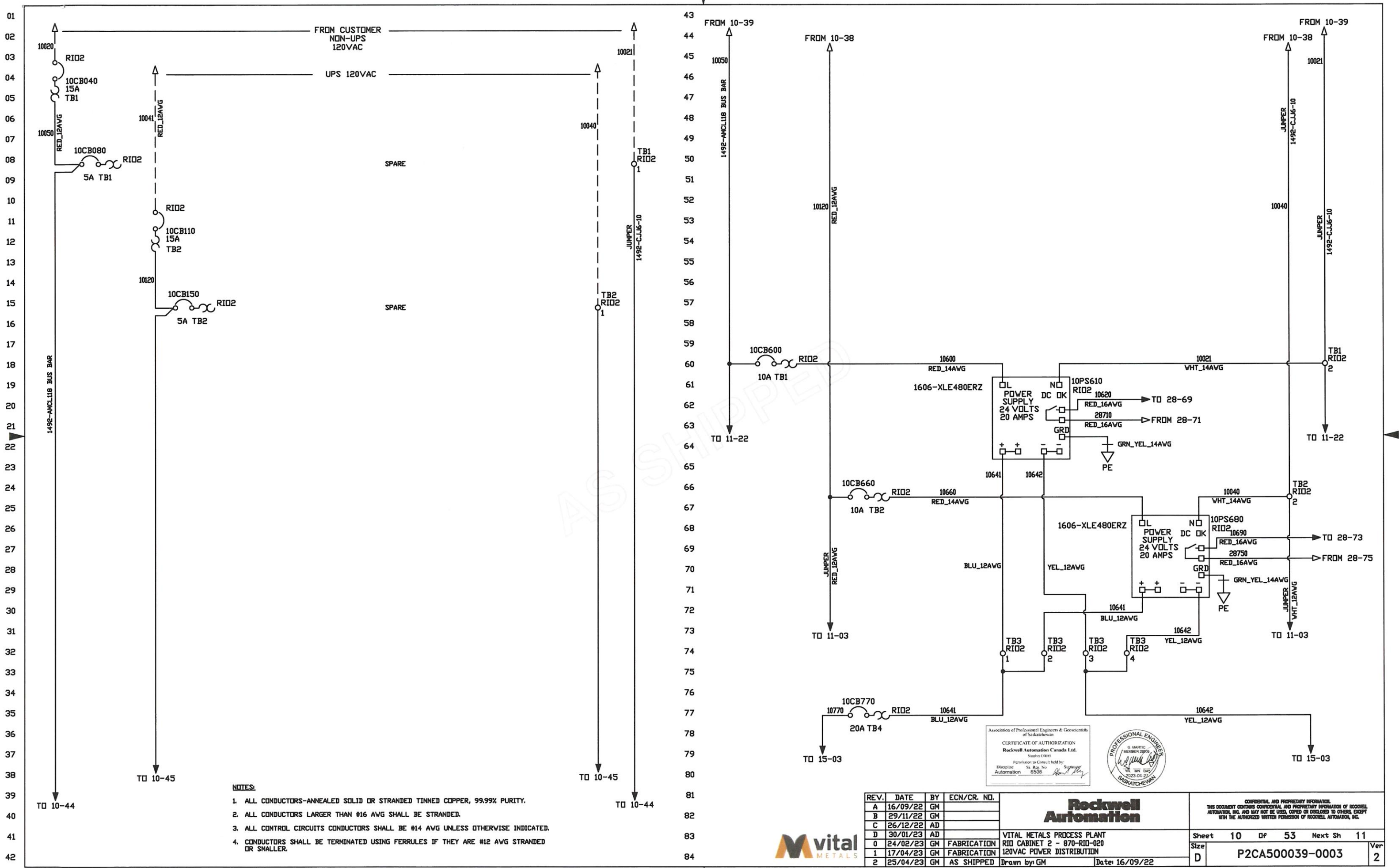
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RIO CABINET 2 - 870-RIO-020
PANEL BILL OF MATERIALS
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 3. ALL CONTROL CIRCUITS CONDUCTORS SHALL BE #14 AWG UNLESS OTHERWISE INDICATED.
 4. CONDUCTORS SHALL BE TERMINATED USING FERRULES IF THEY ARE #12 AWG STRANDED OR SMALLER.

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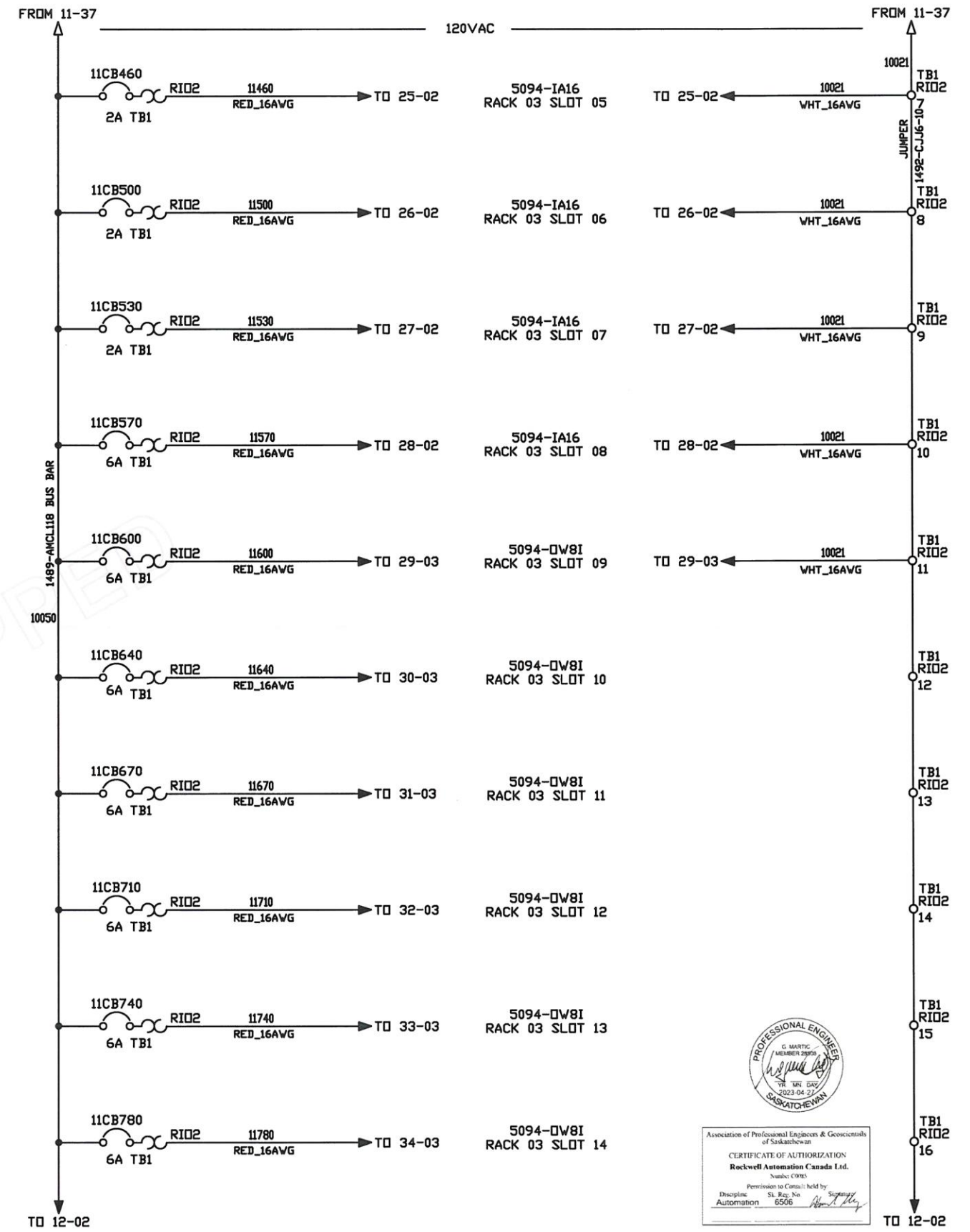
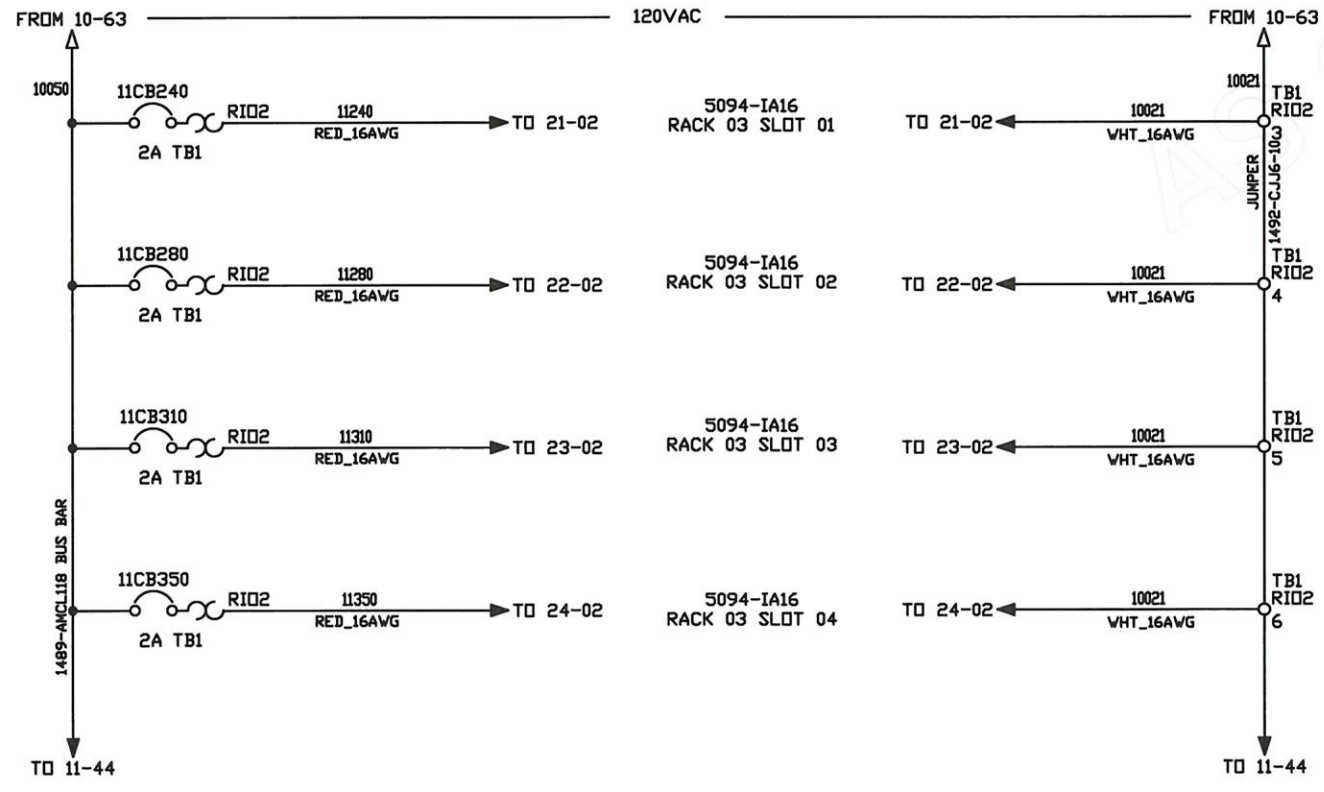
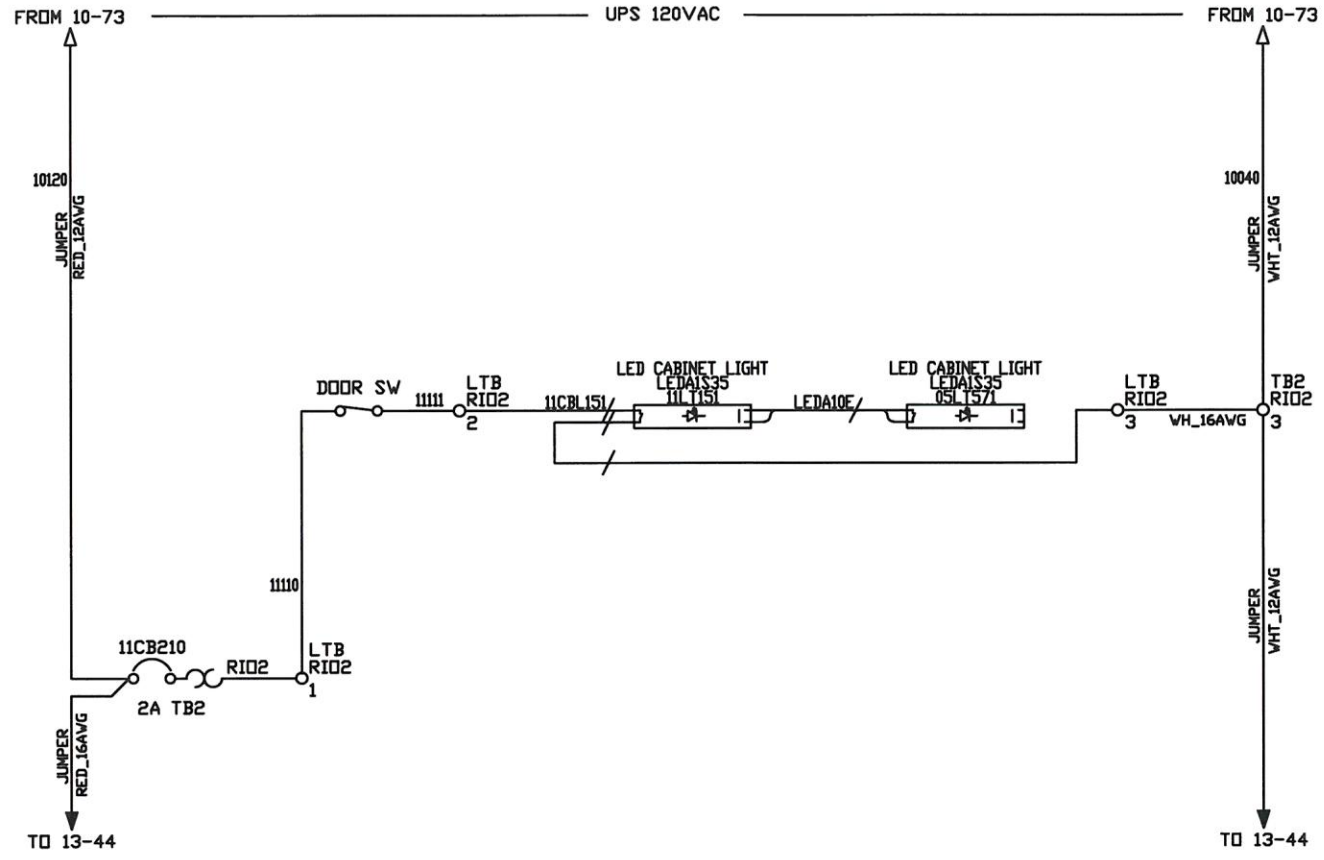
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 VITAL METALS PROCESS PLANT
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 120VAC POWER DISTRIBUTION
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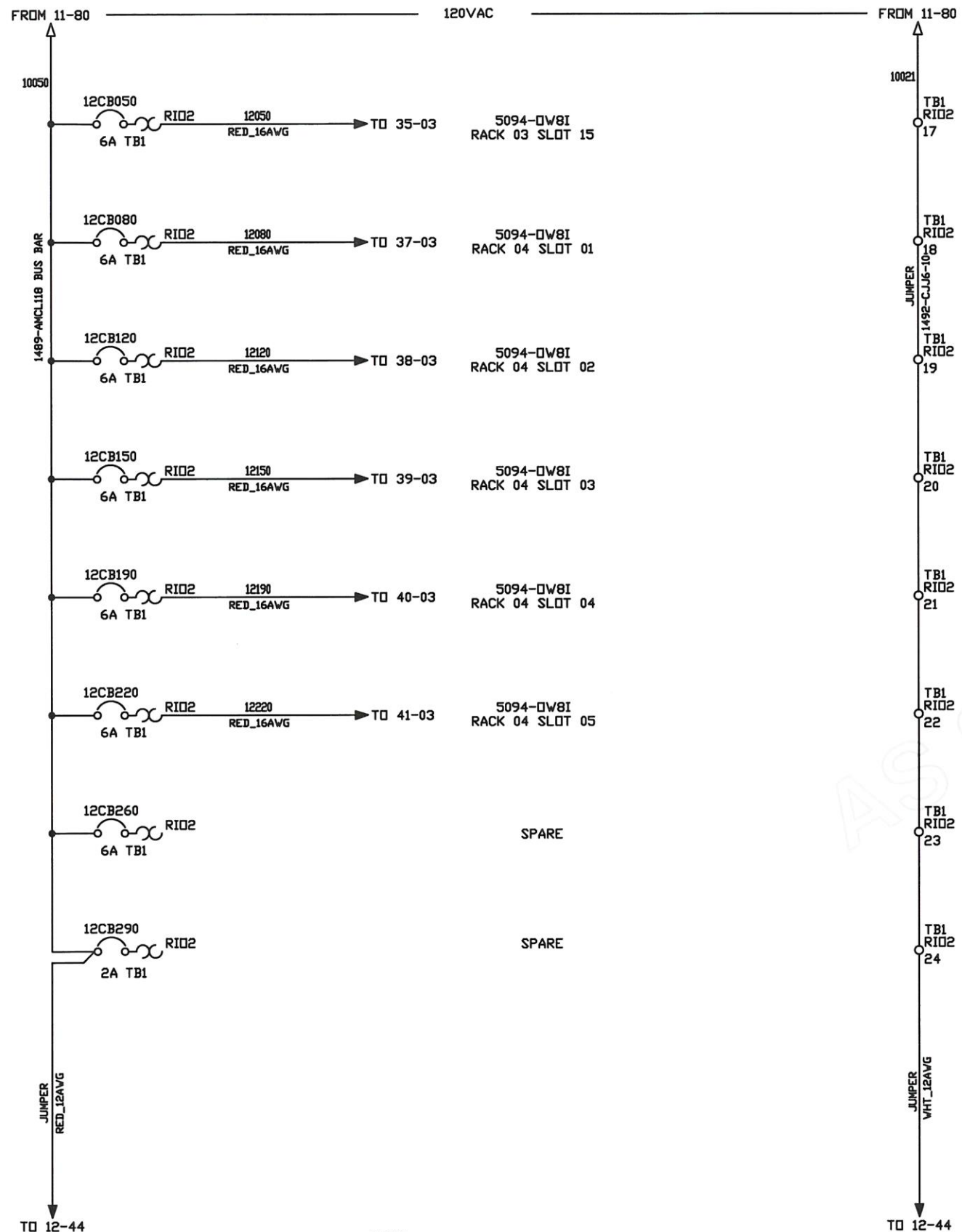
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VITAL METALS PROCESS PLANT
RIO CABINET 2 - 870-RIO-020
120VAC POWER DISTRIBUTION

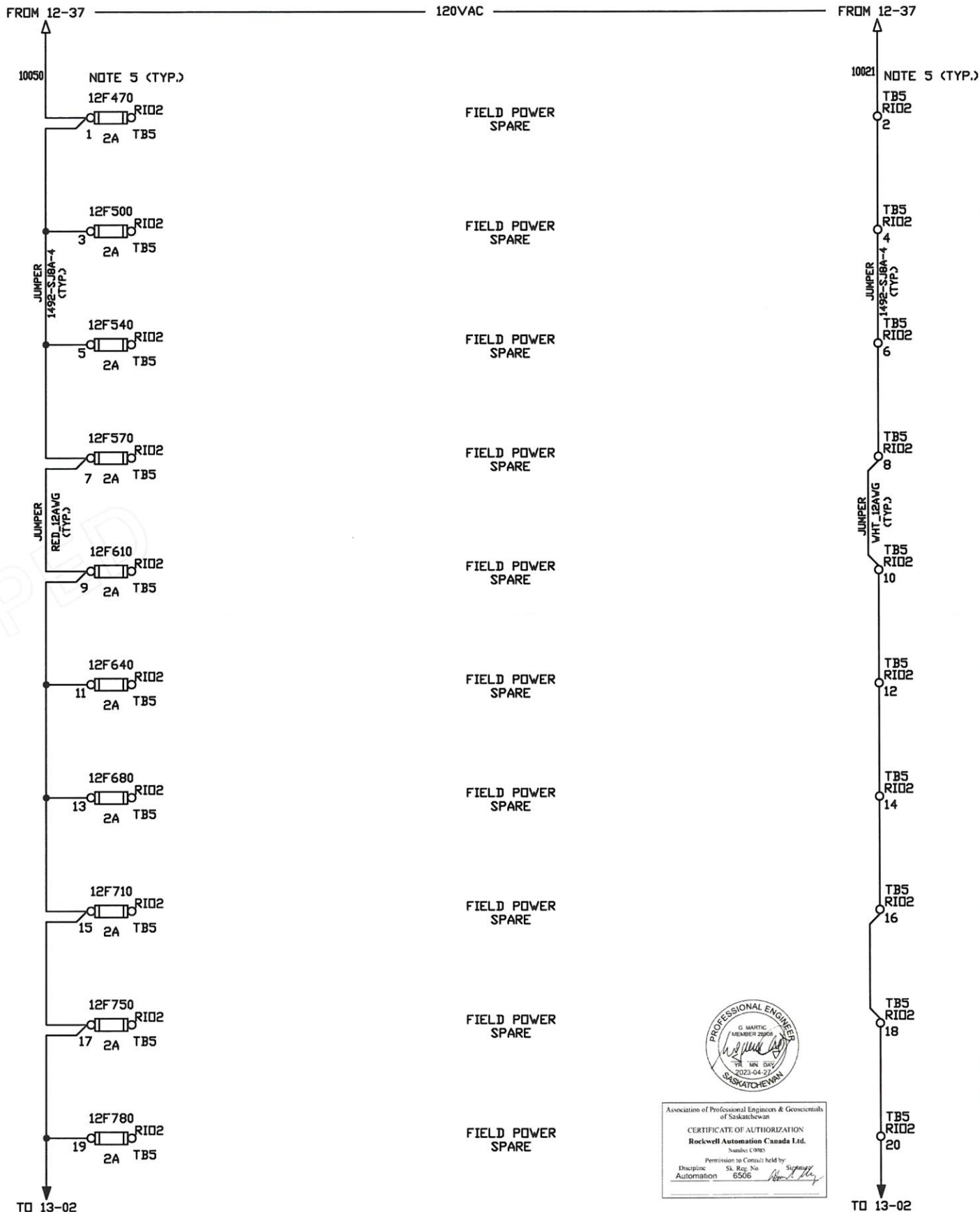
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 2. ALL CONDUCTORS LARGER THAN #16 AWG SHALL BE STRANDED.
 3. ALL CONTROL CIRCUITS CONDUCTORS SHALL BE #14 AWG UNLESS OTHERWISE INDICATED.
 4. CONDUCTORS SHALL BE TERMINATED USING FERRULES IF THEY ARE #12 AWG STRANDED OR SMALLER.
 5. TWO-CIRCUIT FUSED TERMINAL.

DATE	BY	APPROVAL
10/02/23	GM	DESIGN REVIEW
24/02/23	GM	FOR MANUFACTURING
25/04/23	GM	AS SHIPPED
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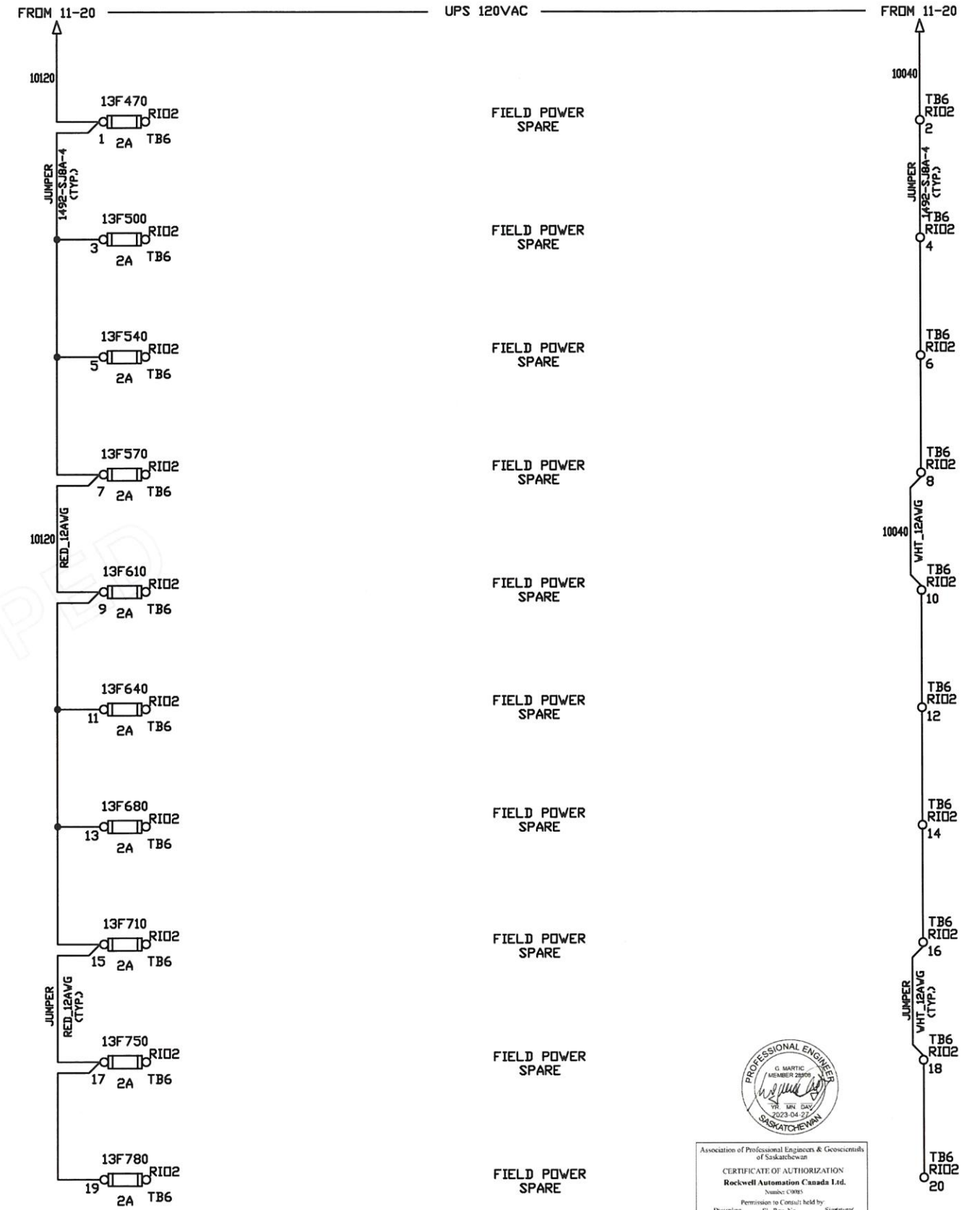
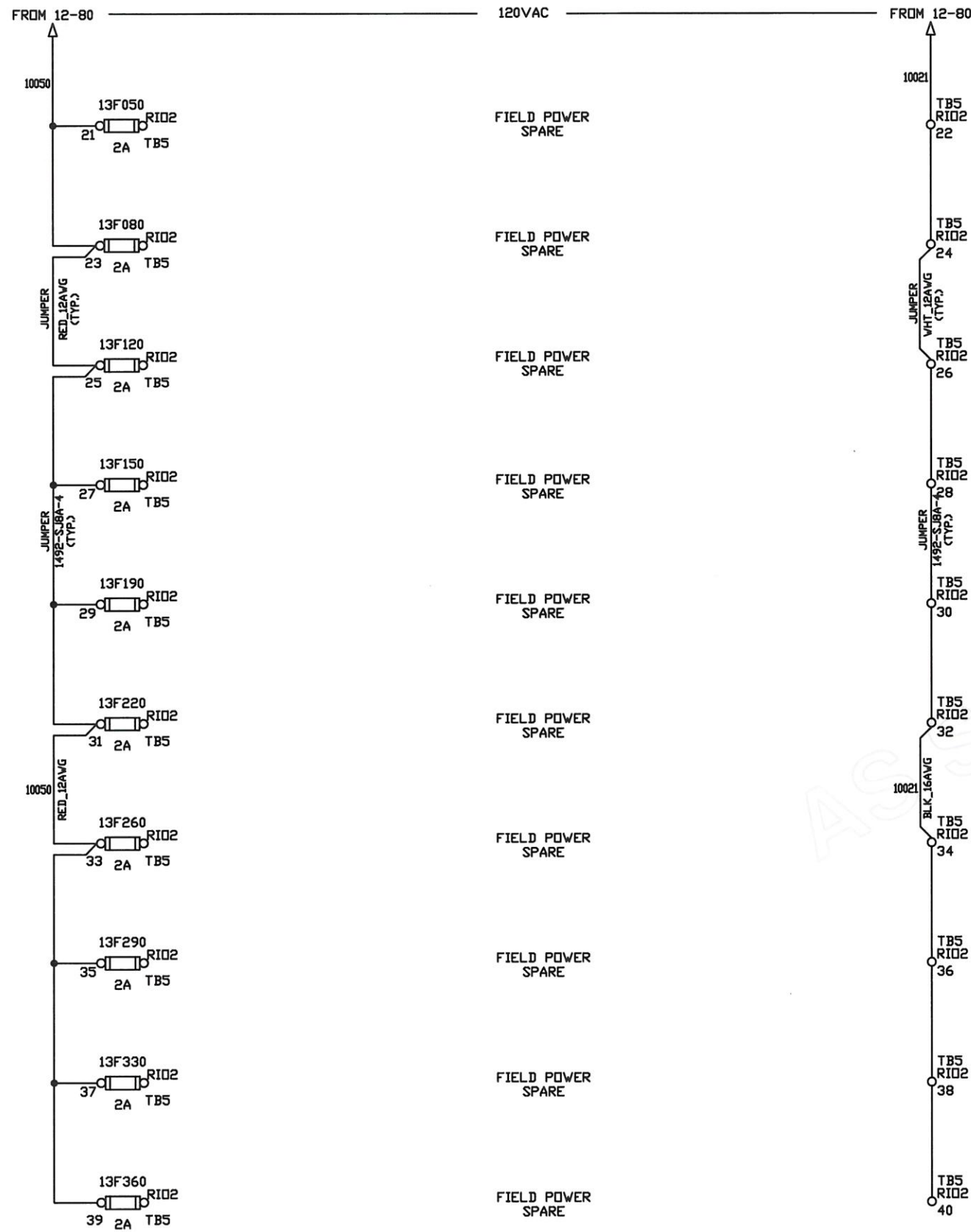
VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 120VAC POWER DISTRIBUTION

Drawn by: GM Date: 16/09/22



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Sheet 12 of 53 Next Sh 13
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 Number: C0985
 Permission to Consult held by
 Discipline: Automation
 St. Reg. No. 6566

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1	17/04/23	GM	FABRICATION
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 120VAC POWER DISTRIBUTION
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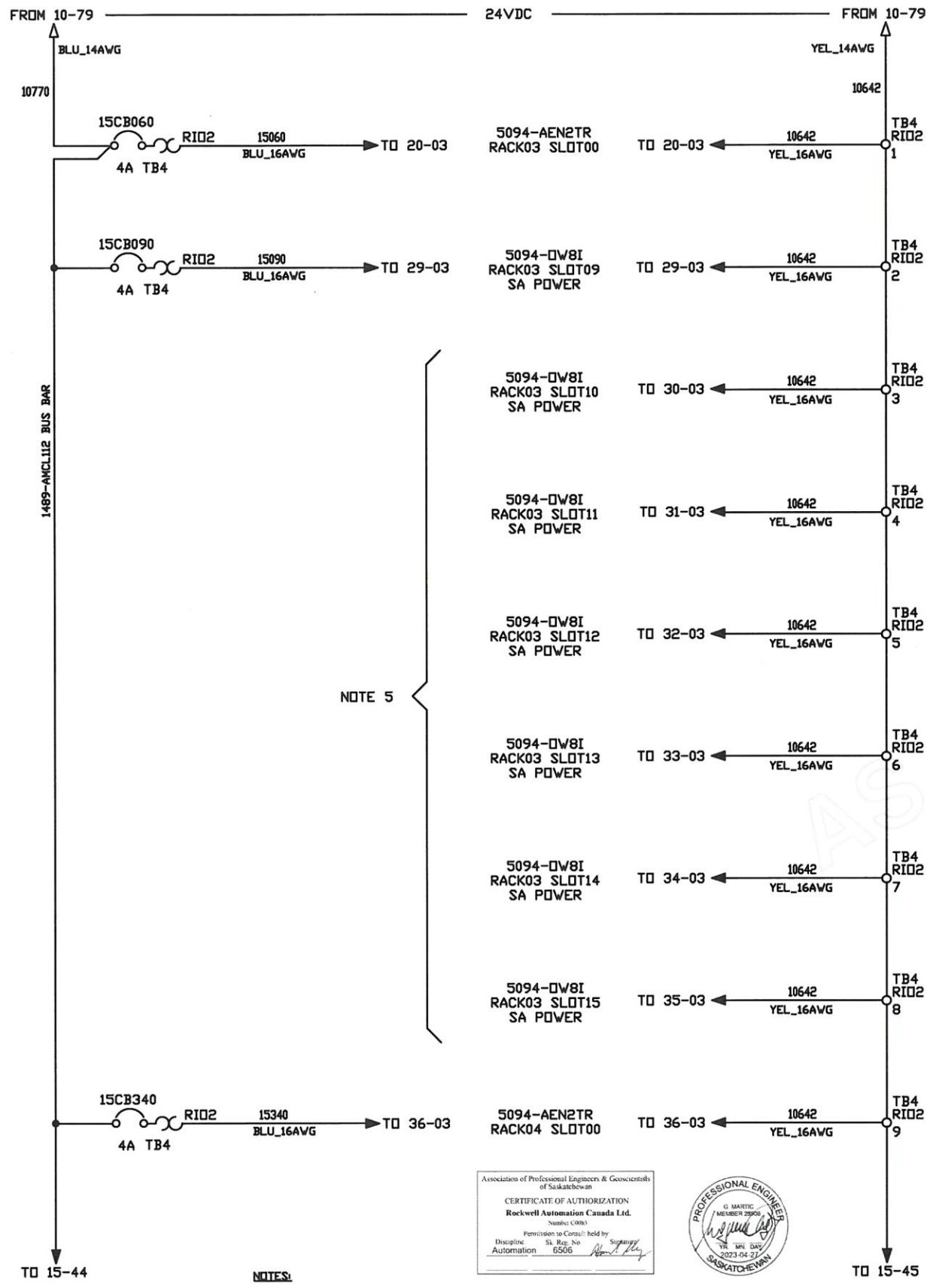
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Association of Professional Engineers & Geoscientists
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Name: C985
Permission to Consult held by:
Discipline: Automation St. Reg. No. 6506
Signature: [Signature] The Reg. Date: 2023-04-27



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Sheet	14	of	53	Next Sh	15	
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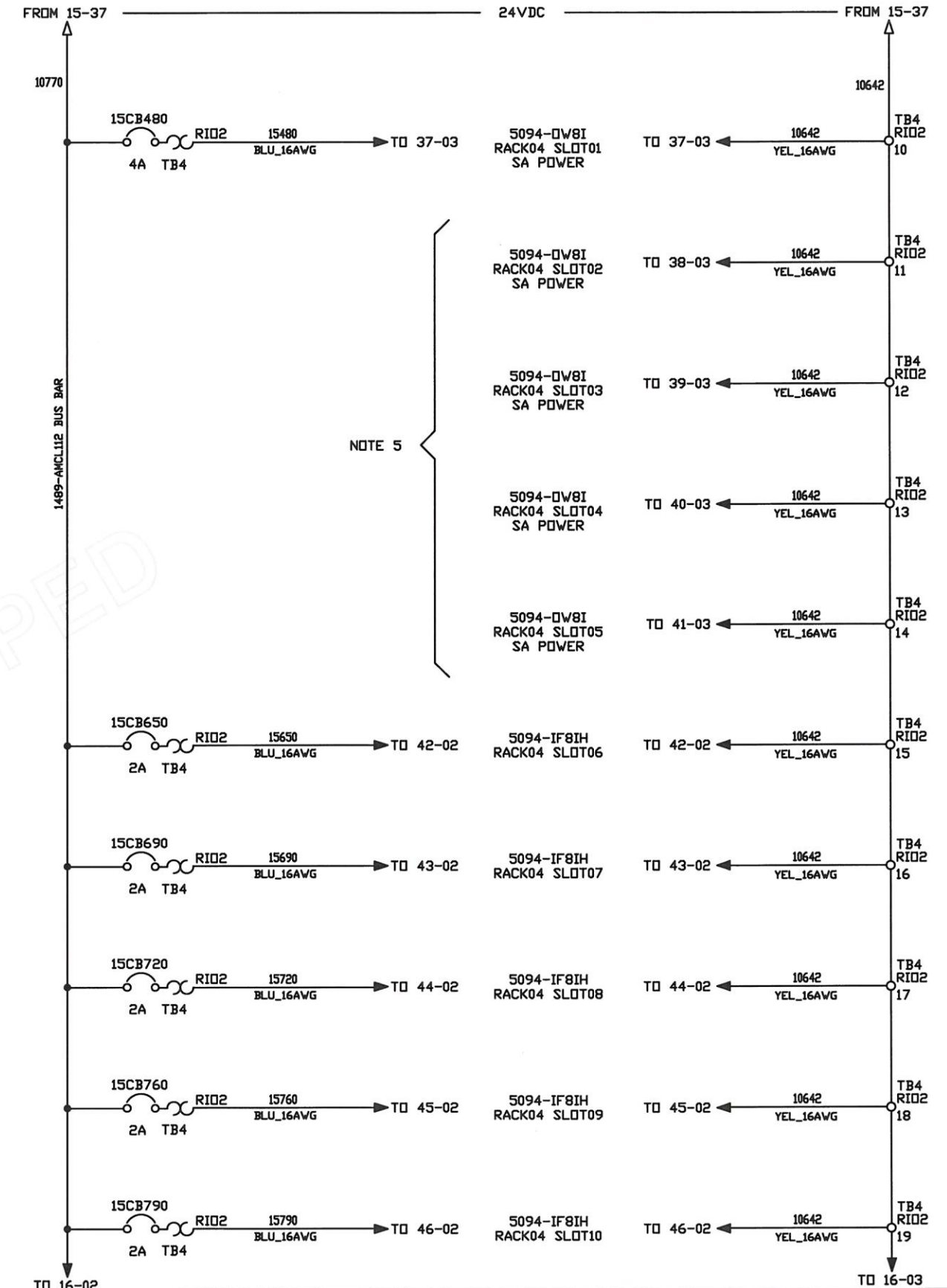
NOTE 5

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 "Saskatchewan"
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 Discipline: Automation 6506
 St. Reg. No. 2023 04 21
 Signature: [Signature]



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 2. ALL CONDUCTORS LARGER THAN #16 AWG SHALL BE STRANDED.
 3. ALL CONTROL CIRCUITS CONDUCTORS SHALL BE #14 AWG UNLESS OTHERWISE INDICATED.
 4. CONDUCTORS SHALL BE TERMINATED USING FERRULES IF THEY ARE #12 AWG STRANDED OR SMALLER.
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DATE	BY	APPROVAL
10/02/23	GM	DESIGN REVIEW
24/02/23	GM	FOR MANUFACTURING
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NOTE 5

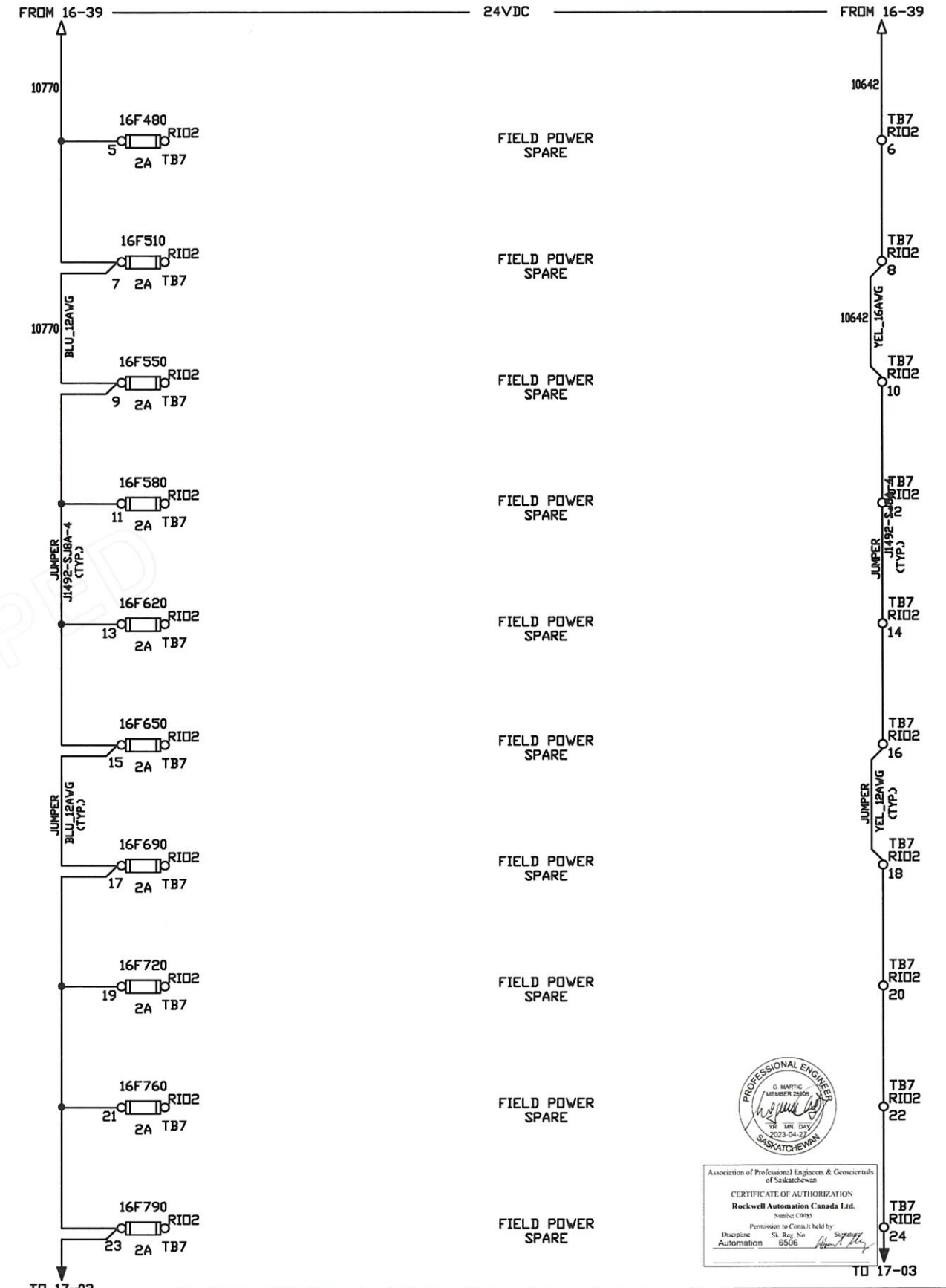
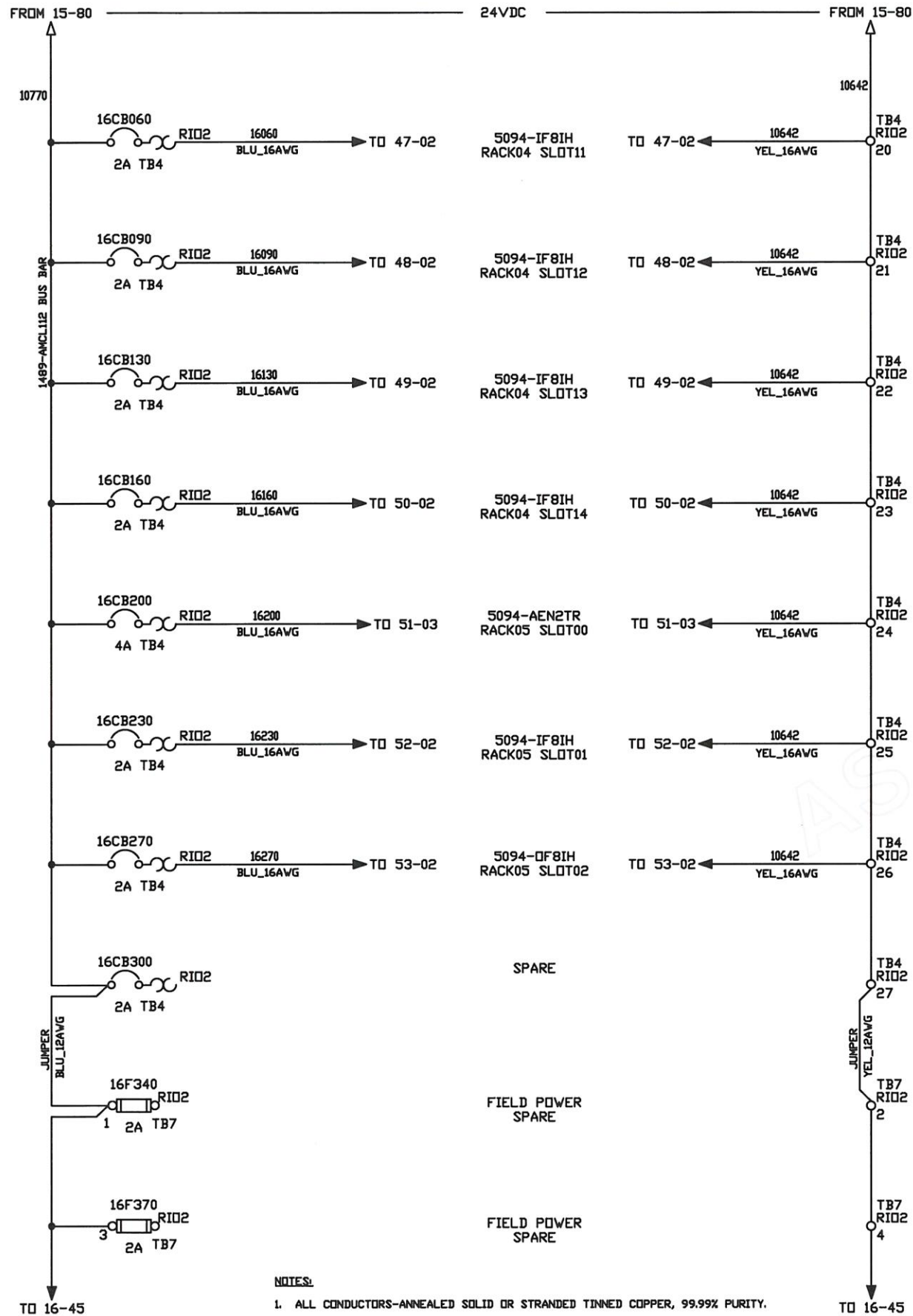
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 VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 24VDC POWER DISTRIBUTION
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2	25/04/23	GM	AS SHIPPED

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VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 24VDC POWER DISTRIBUTION

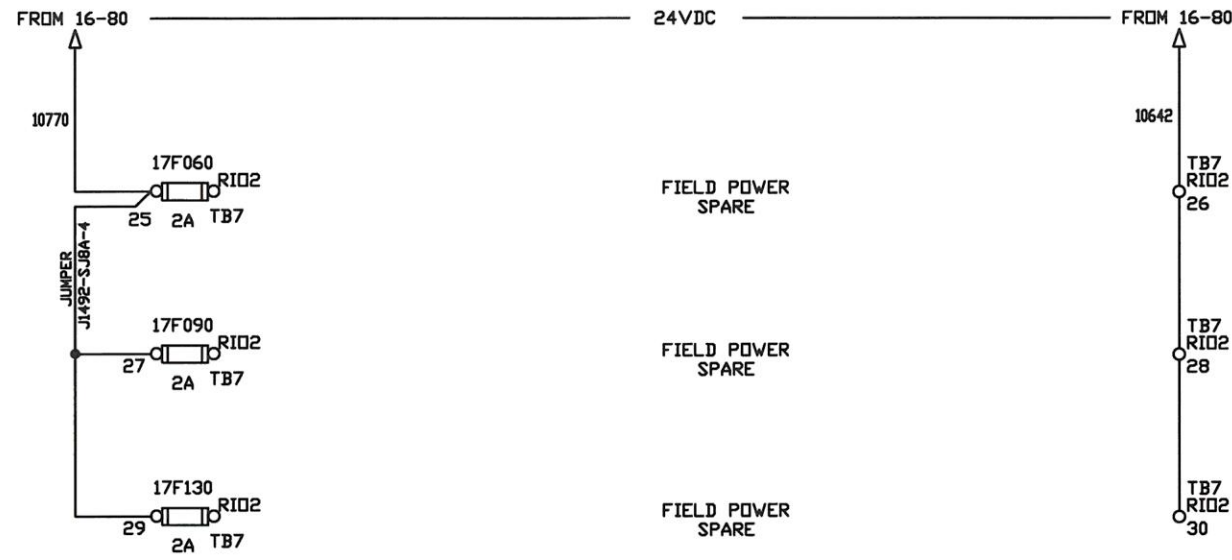
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Rockwell Automation

VITAL METALS PROCESS PLANT
RIO CABINET 2 - 870-RIO-020
24VDC POWER DISTRIBUTION

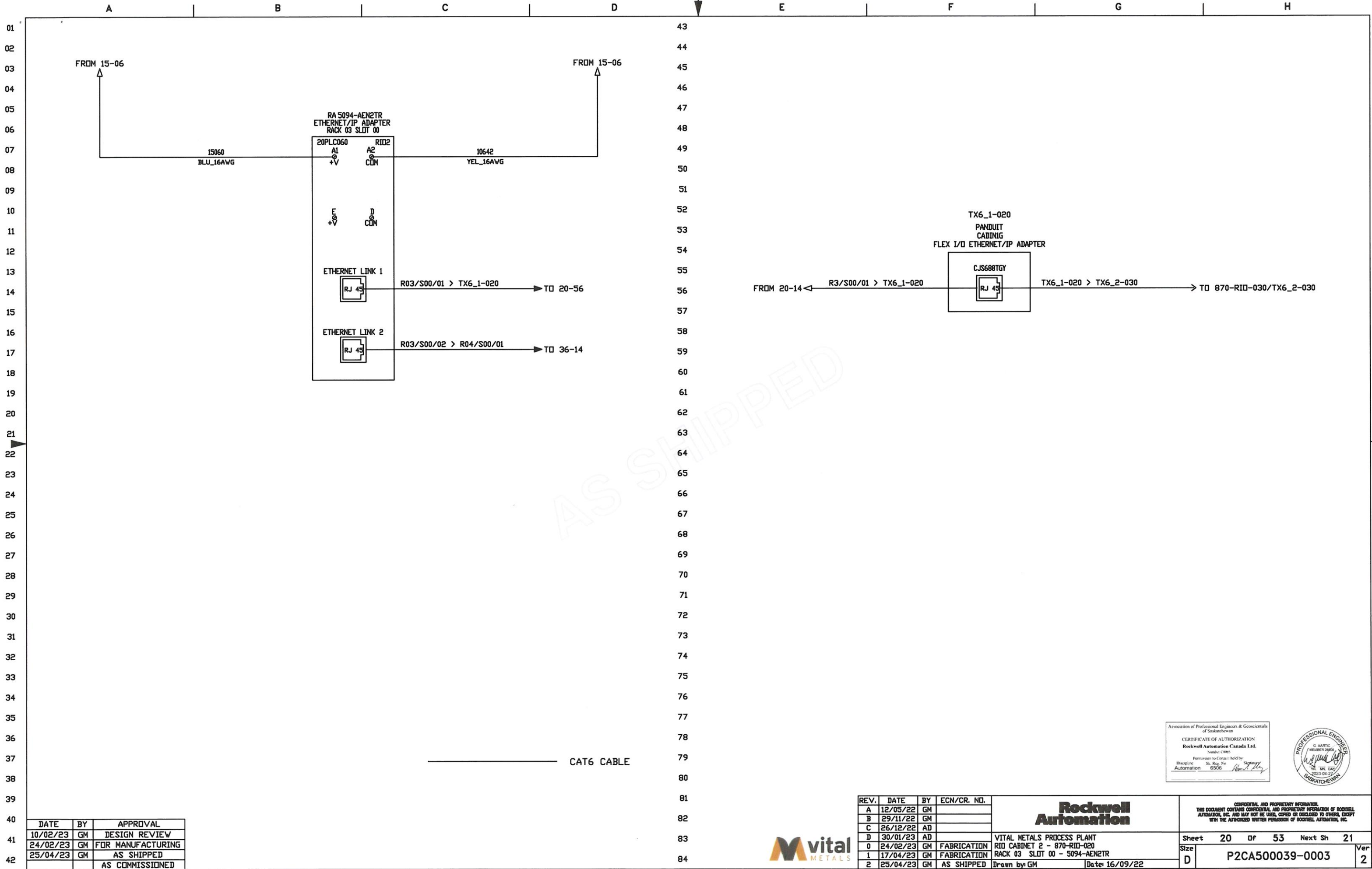
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10/02/23	GM	DESIGN REVIEW
24/02/23	GM	FOR MANUFACTURING
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RIO CABINET 2 - 870-RIO-020
RACK 03 SLOT 00 - 5094-AEN2TR

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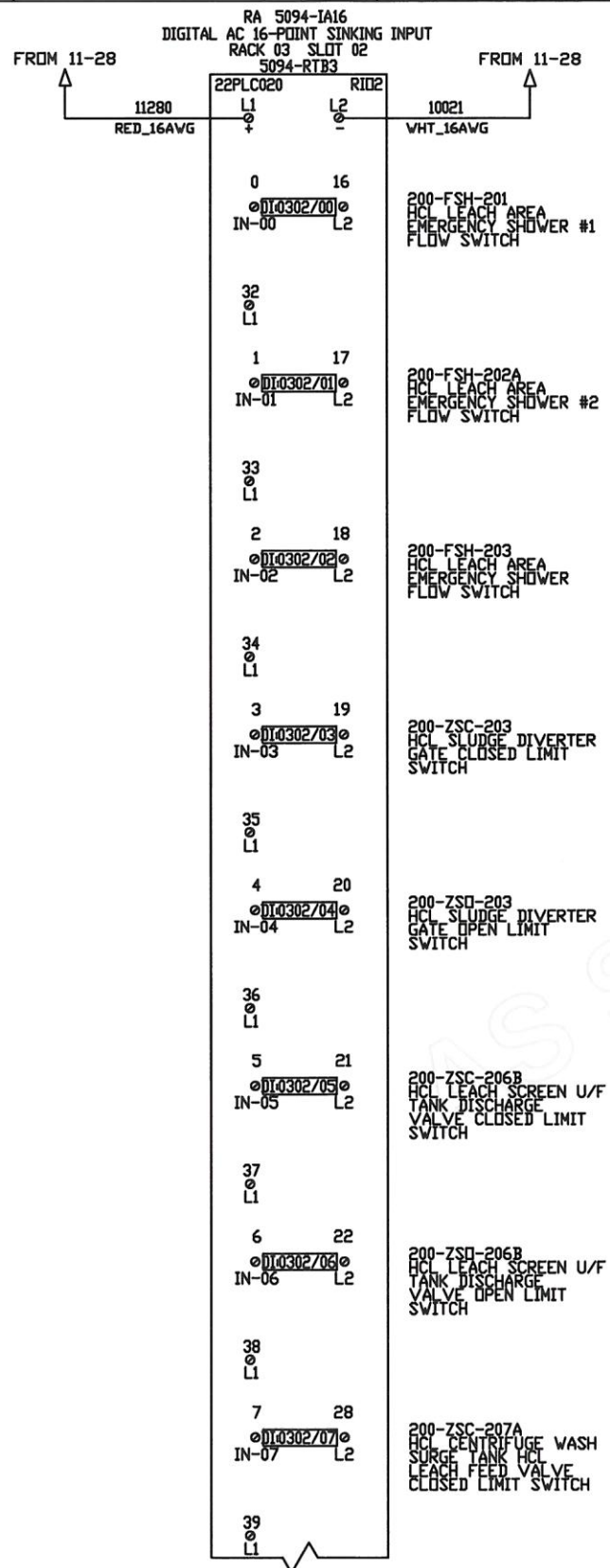
Sheet 21 of 53 Next Sh 22

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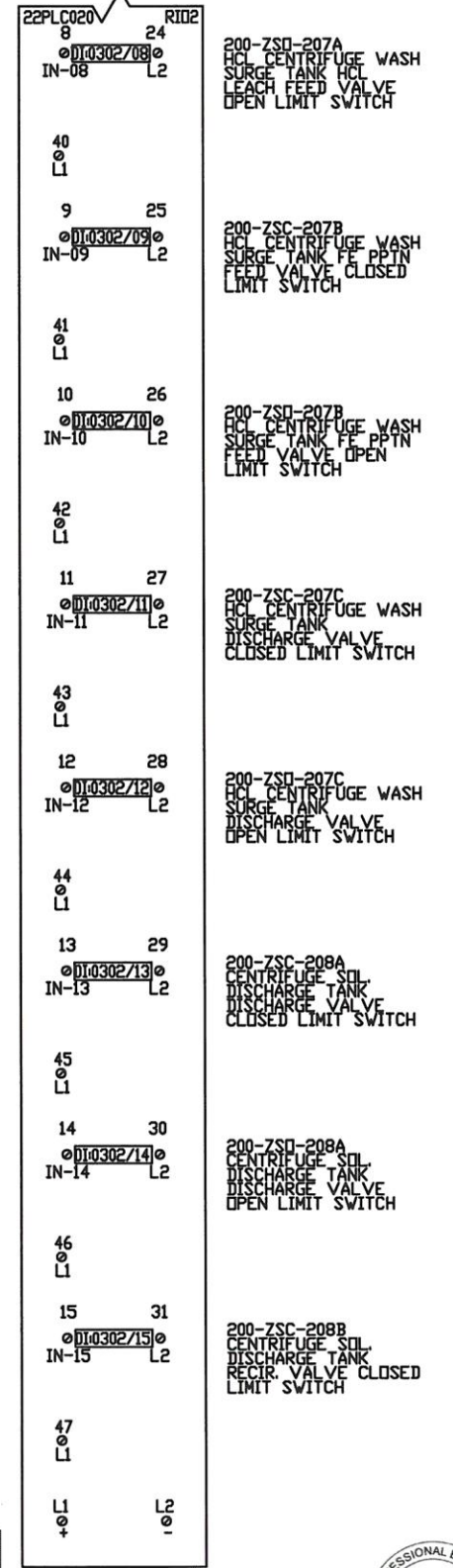
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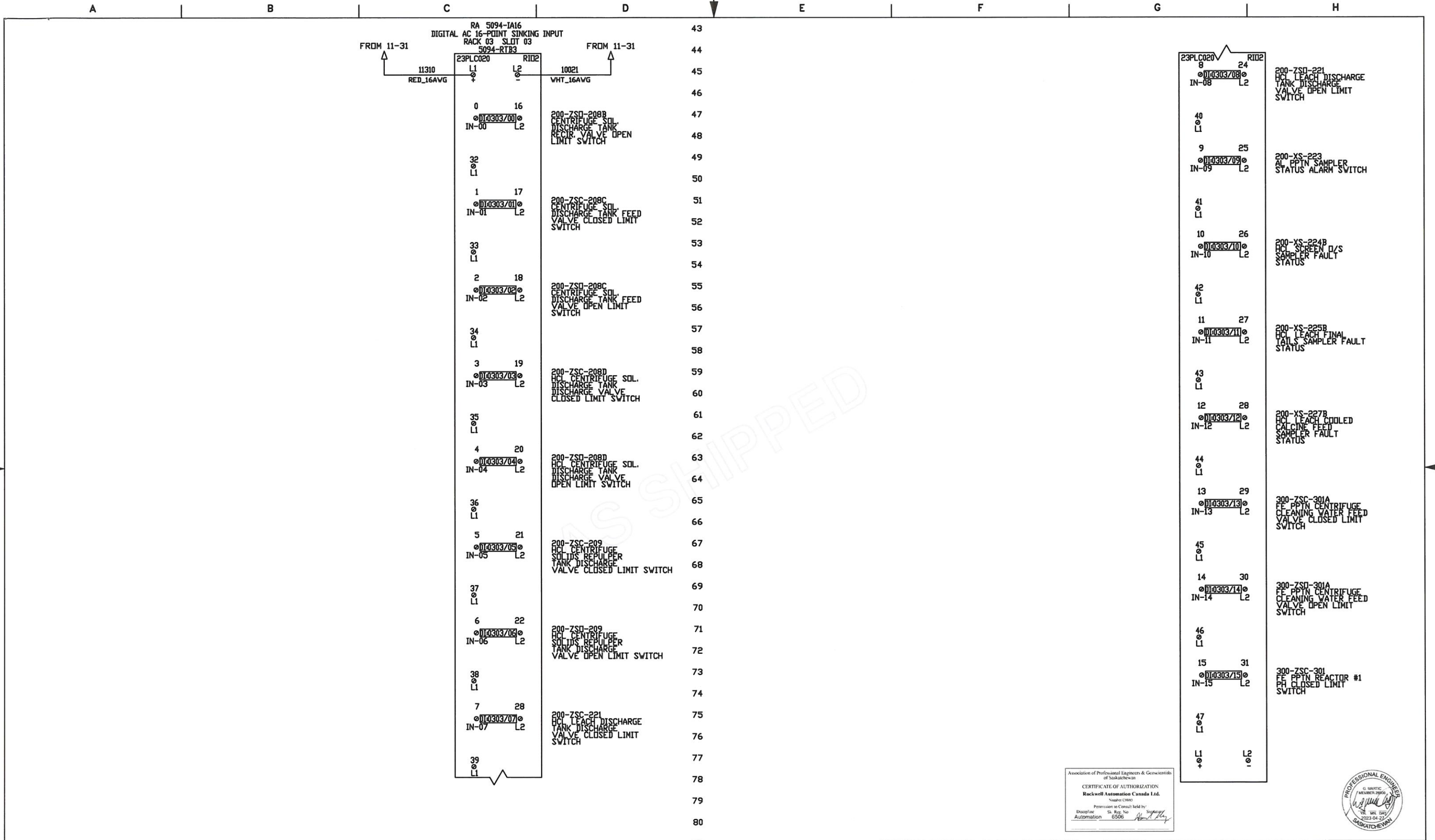
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Date: 2023-04-27
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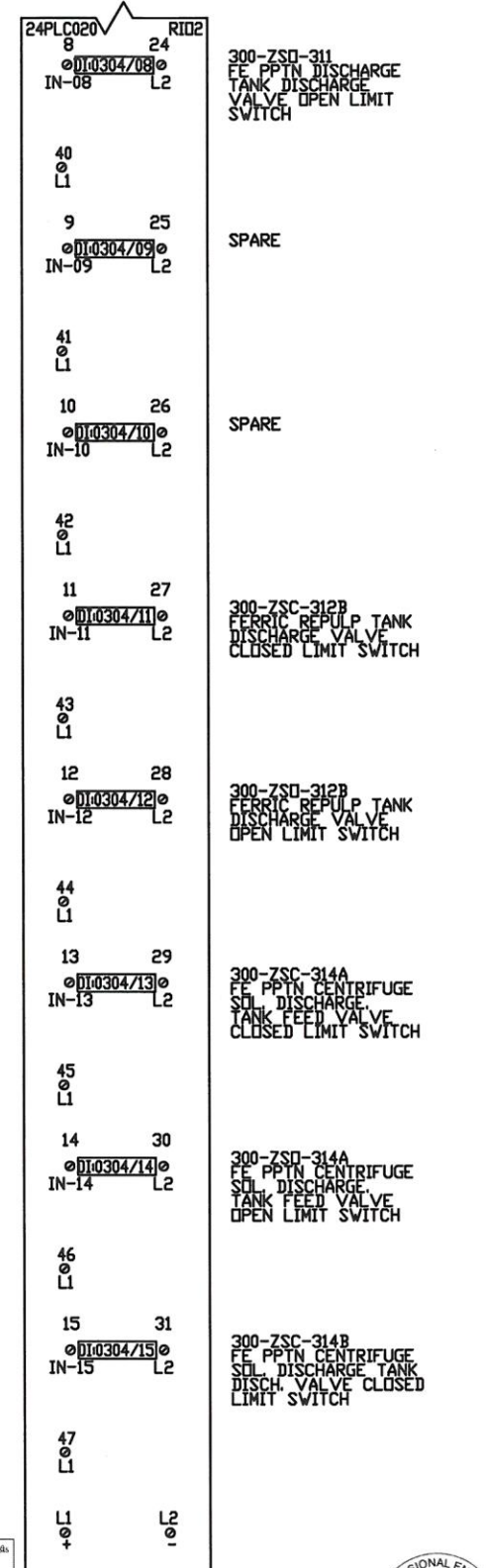
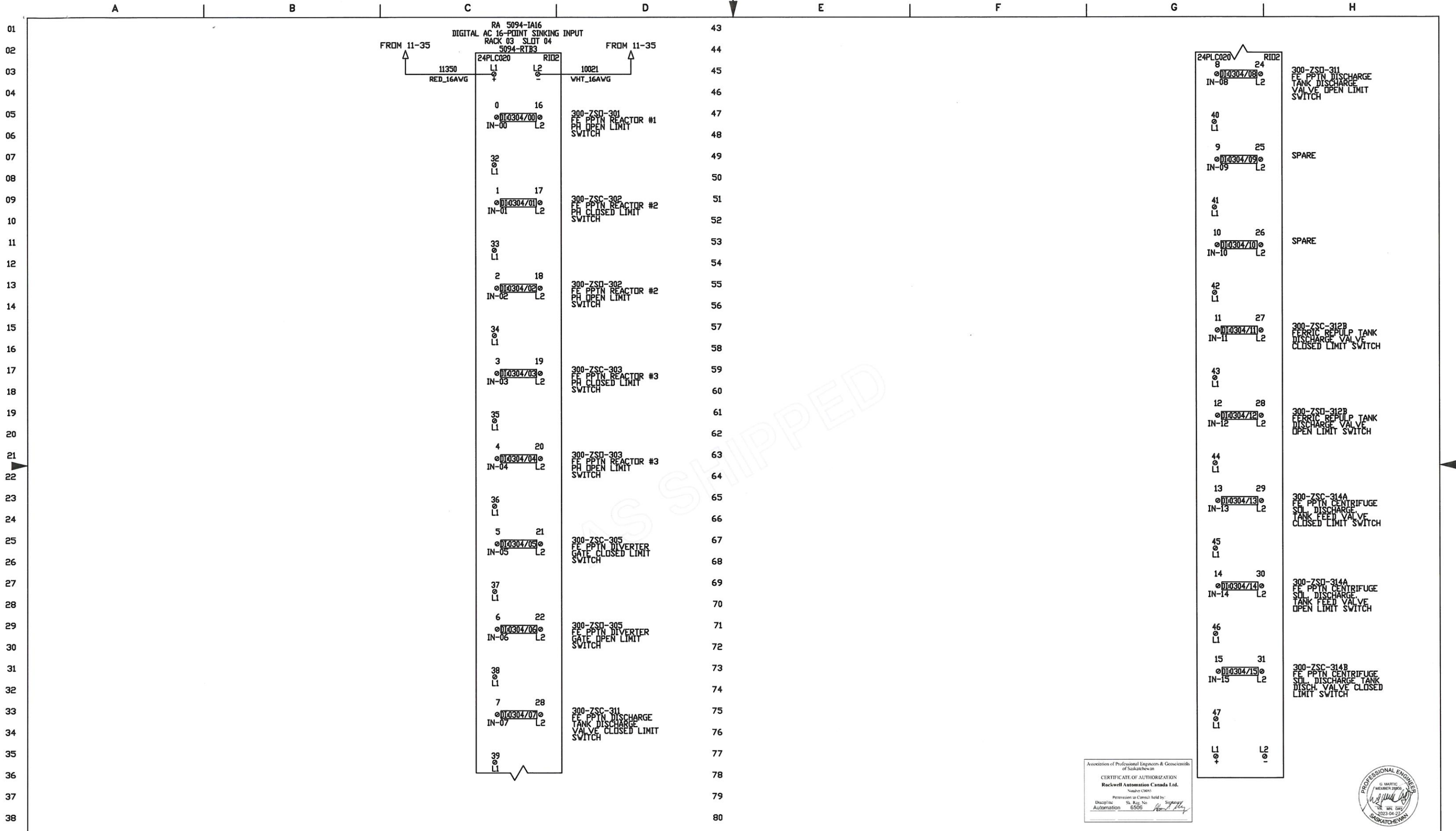
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24/02/23	GM	FOR MANUFACTURING
25/04/23	GM	AS SHIPPED
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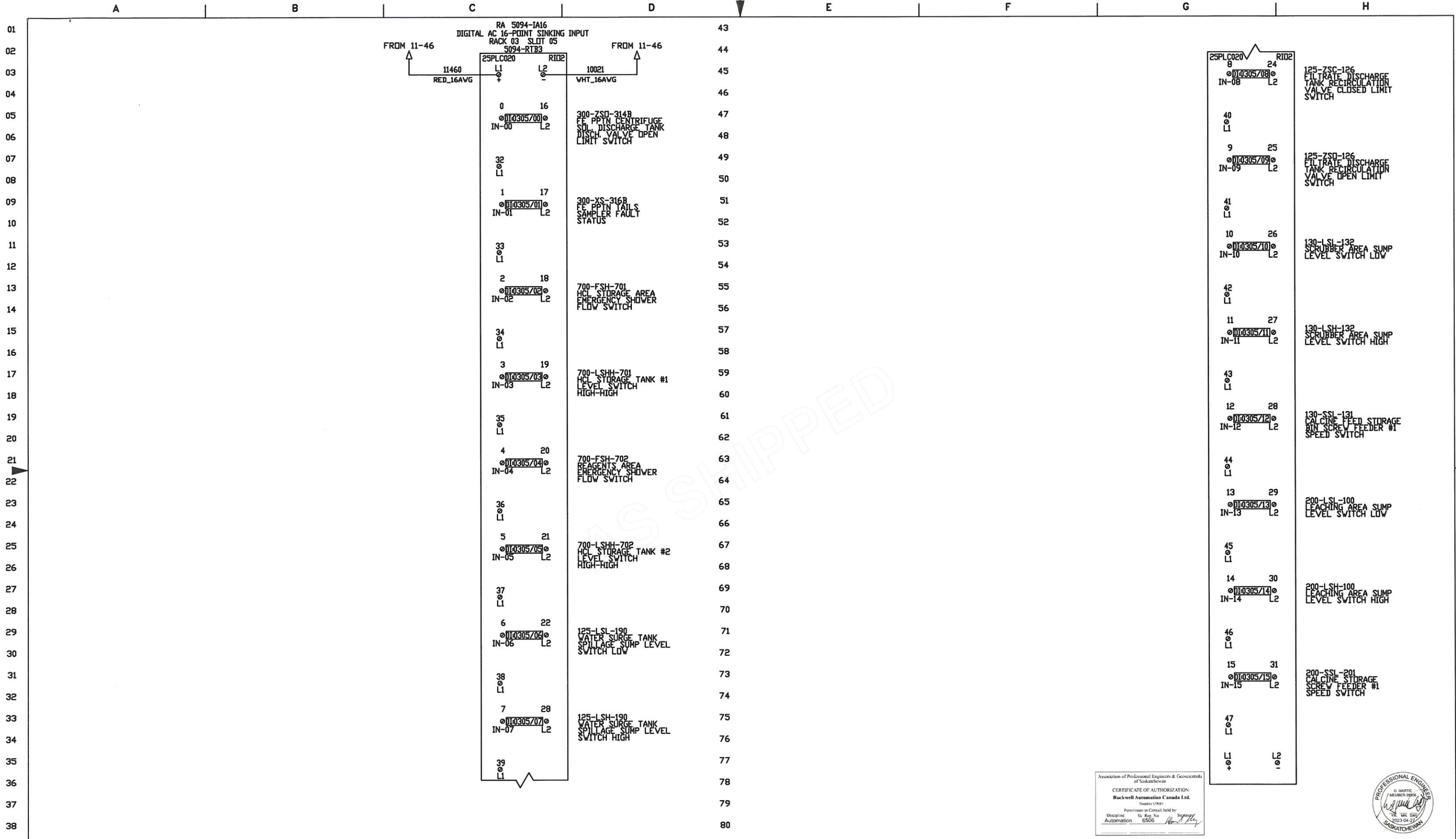
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 Discipline: Automation St. Reg. No. 5506 Signature: [Signature]
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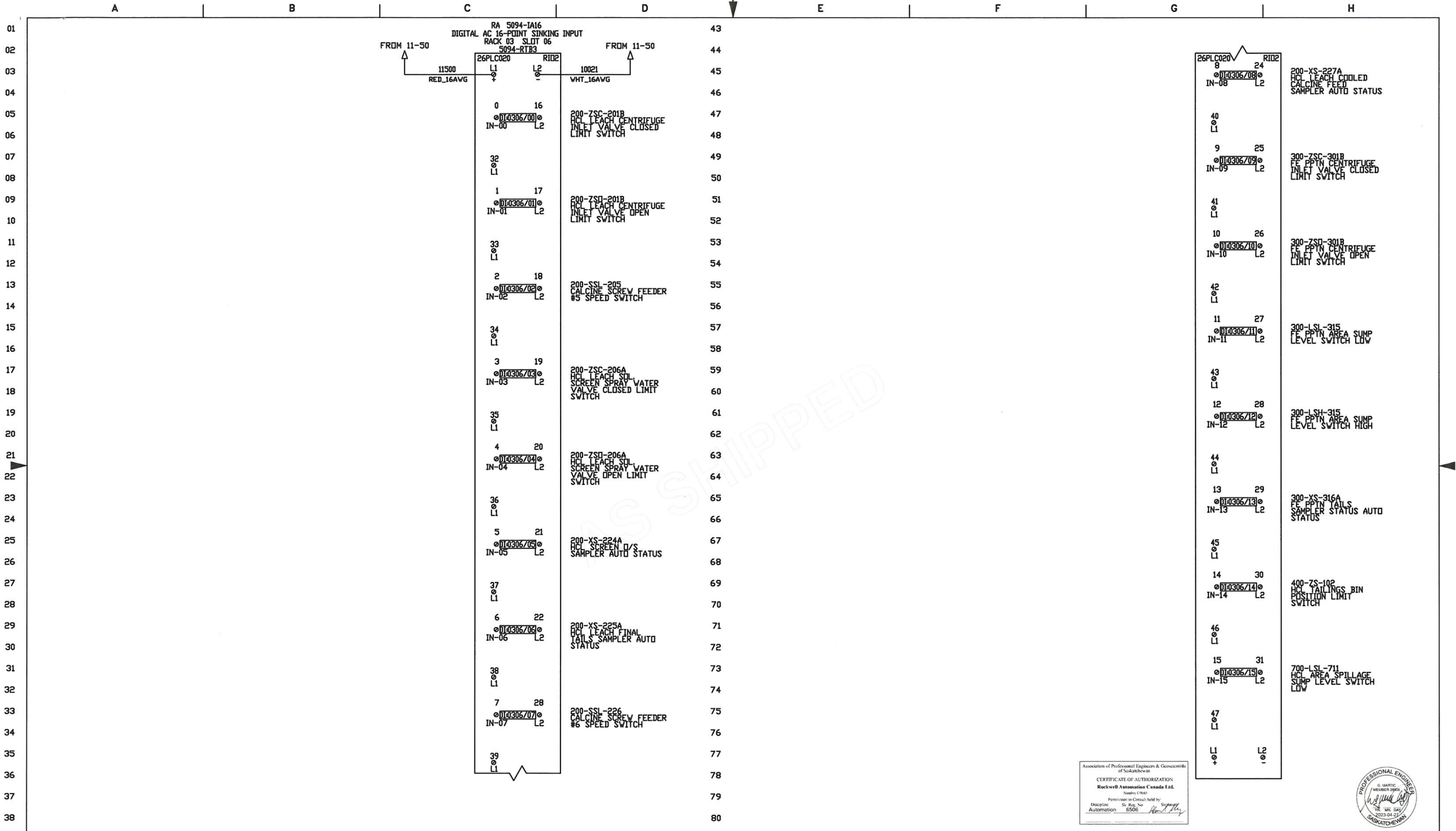
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 Discipline: Automation
 No. Reg. No. 6506
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2	25/04/23	GM	AS SHIPPED		





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 Number 0760
 Permission to install held by
 Discipline: Automation St. Reg. No. 6506
 Signature: [Signature] Date: 16/09/22



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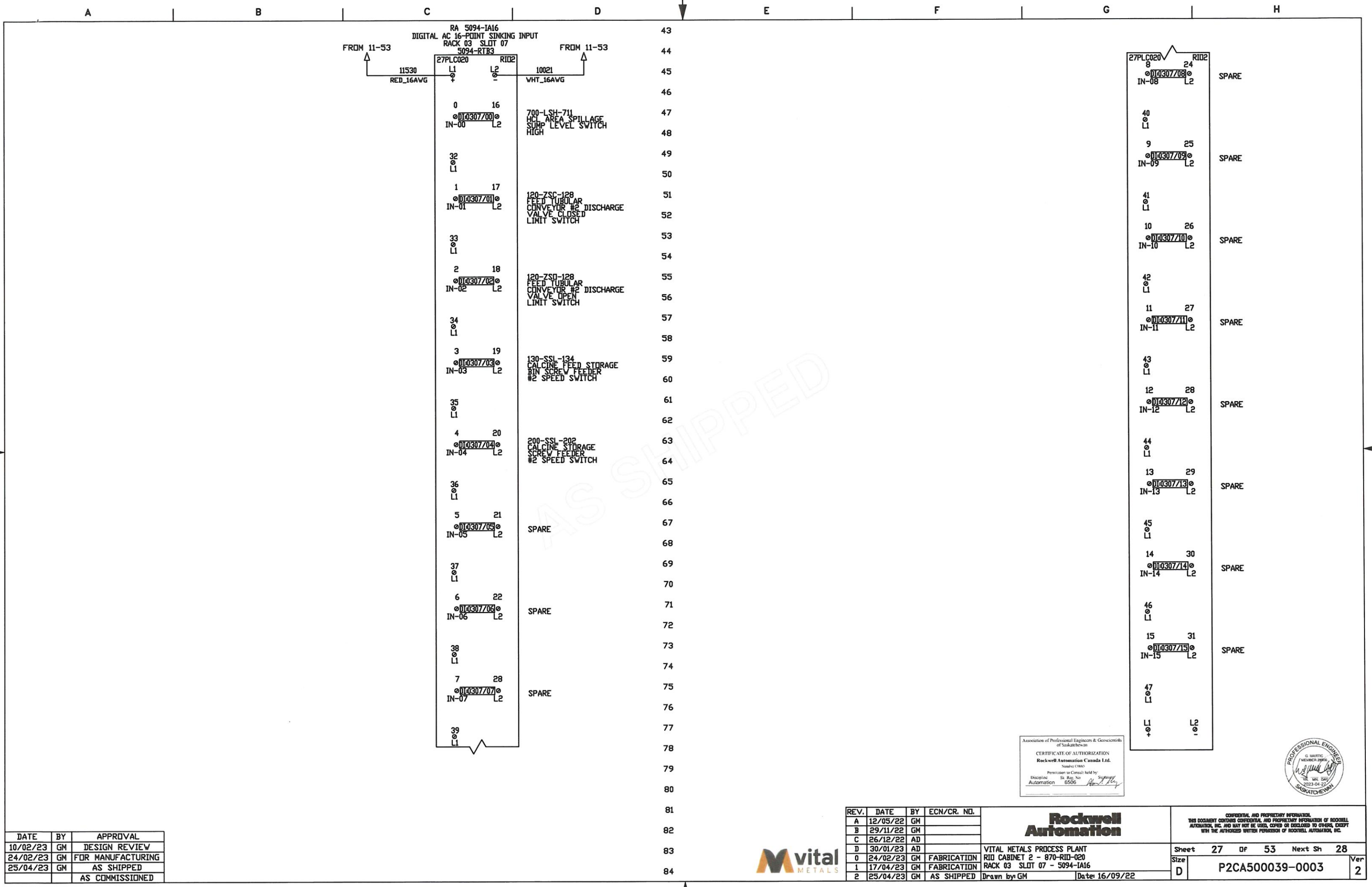
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2	25/04/23	GM	AS SHIPPED

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 VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
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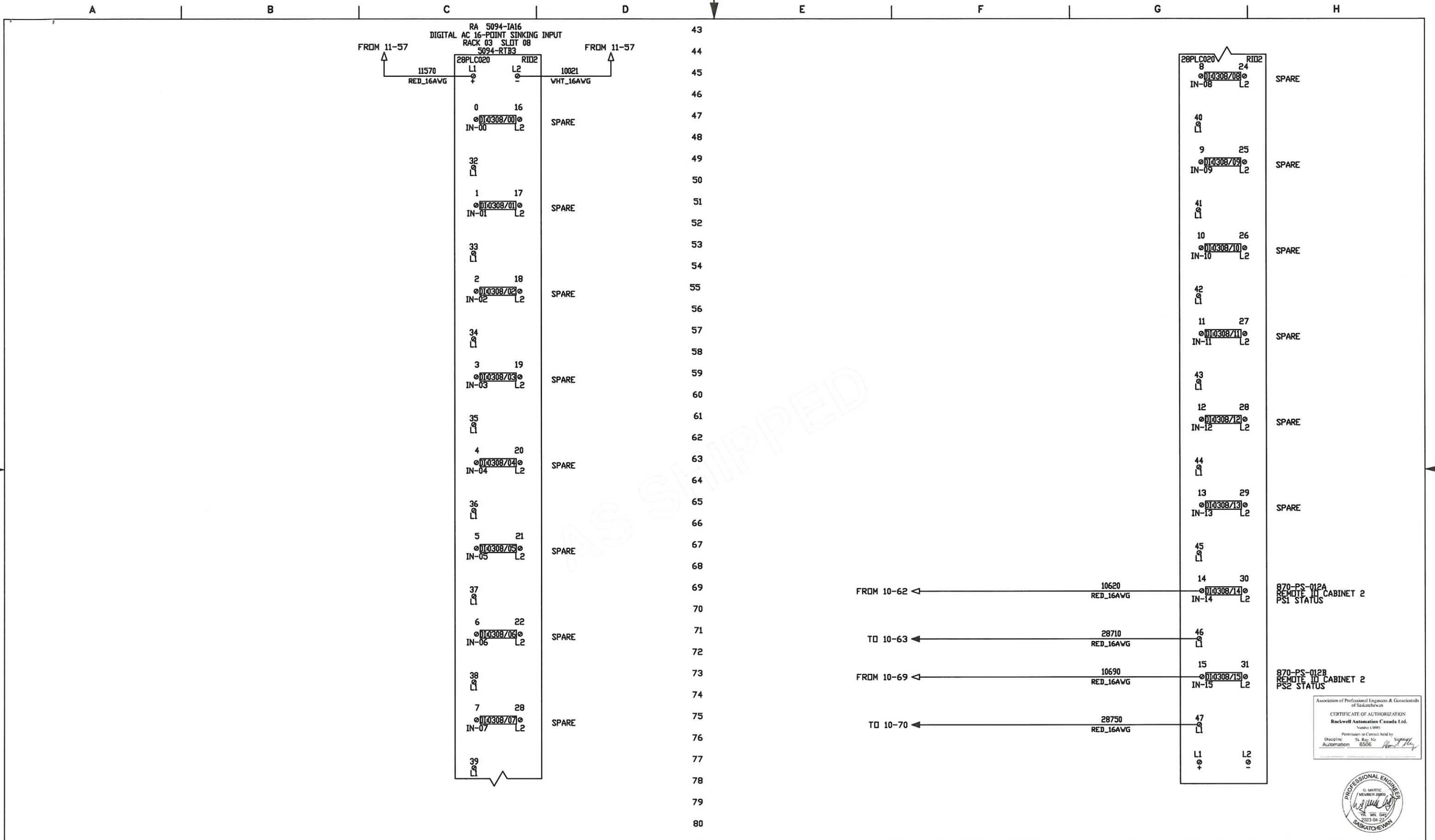
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VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 RACK 03 SLOT 07 - 5094-IA16
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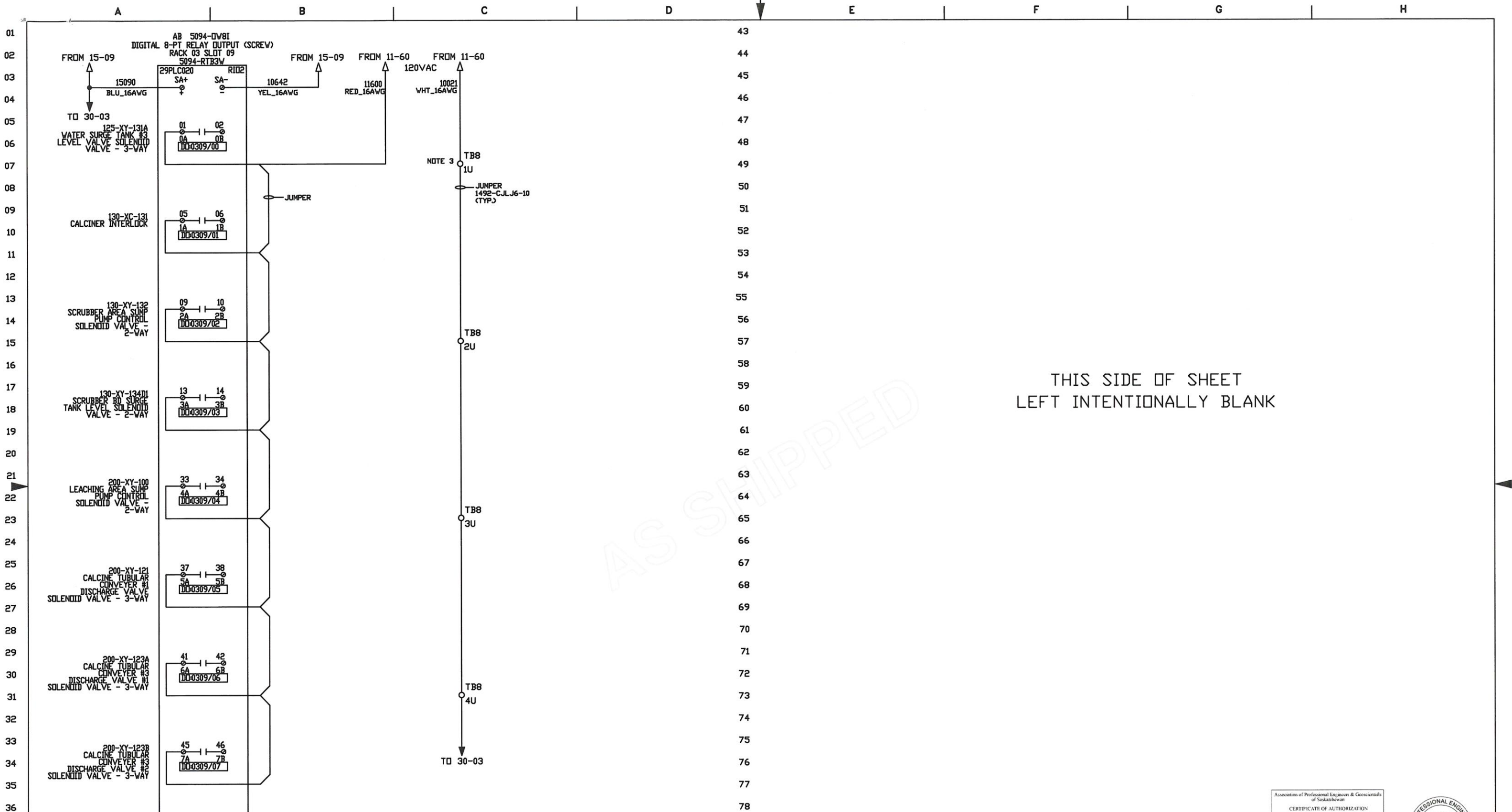
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 RID CABINET 2 - 870-RID-020
 RACK 03 SLOT 08 - 5094-IA16

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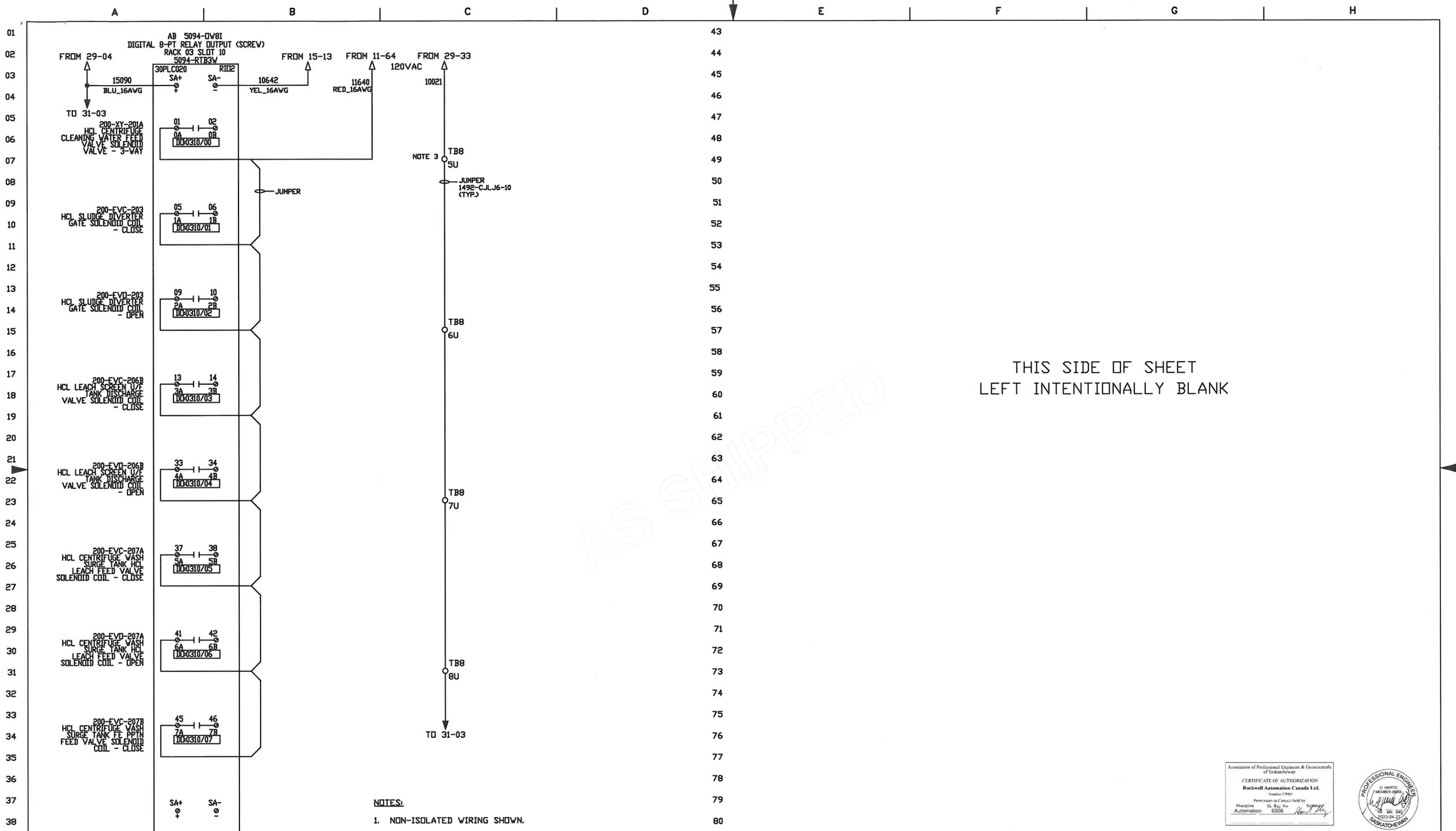
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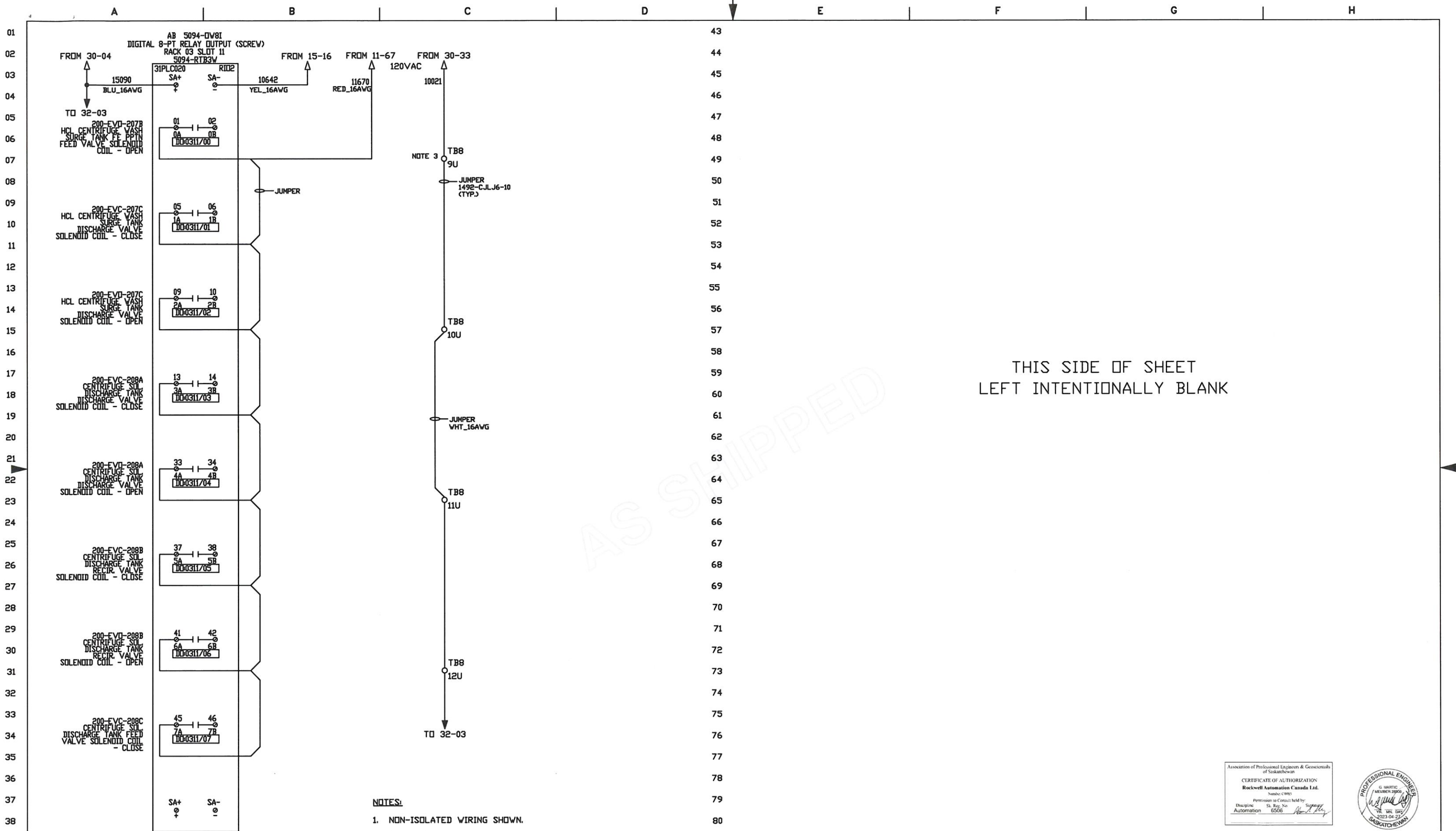
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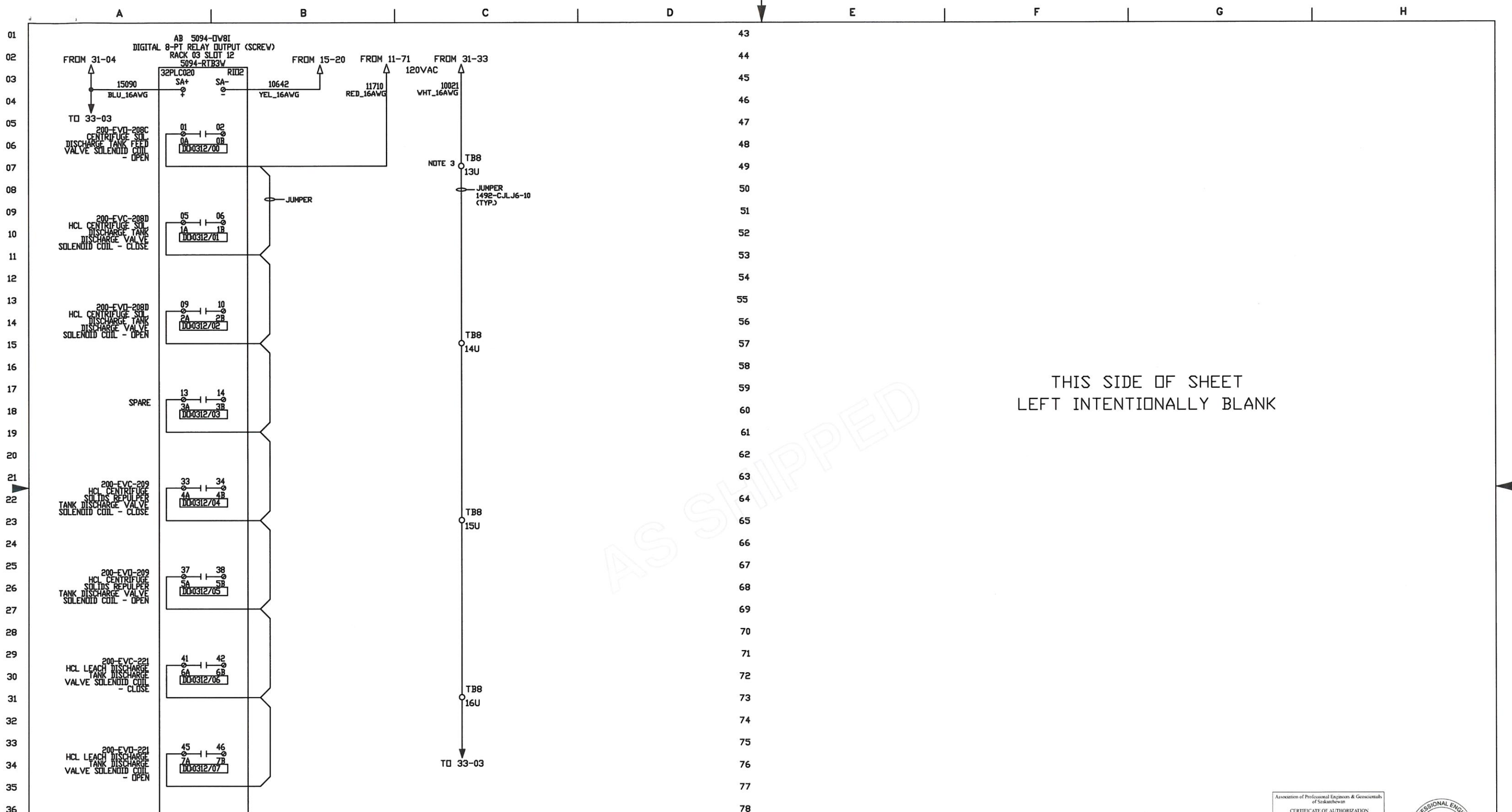
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VITAL METALS

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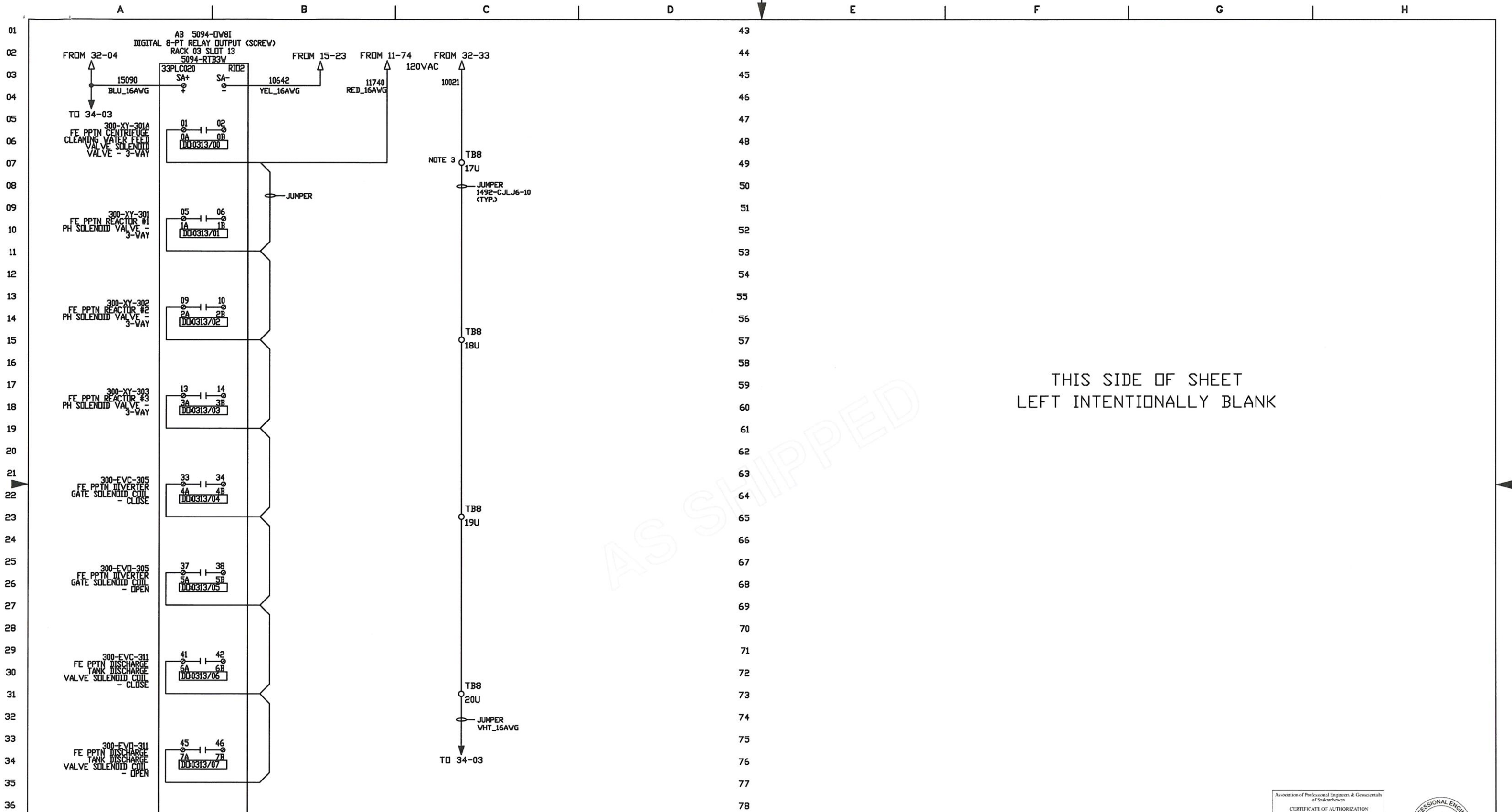
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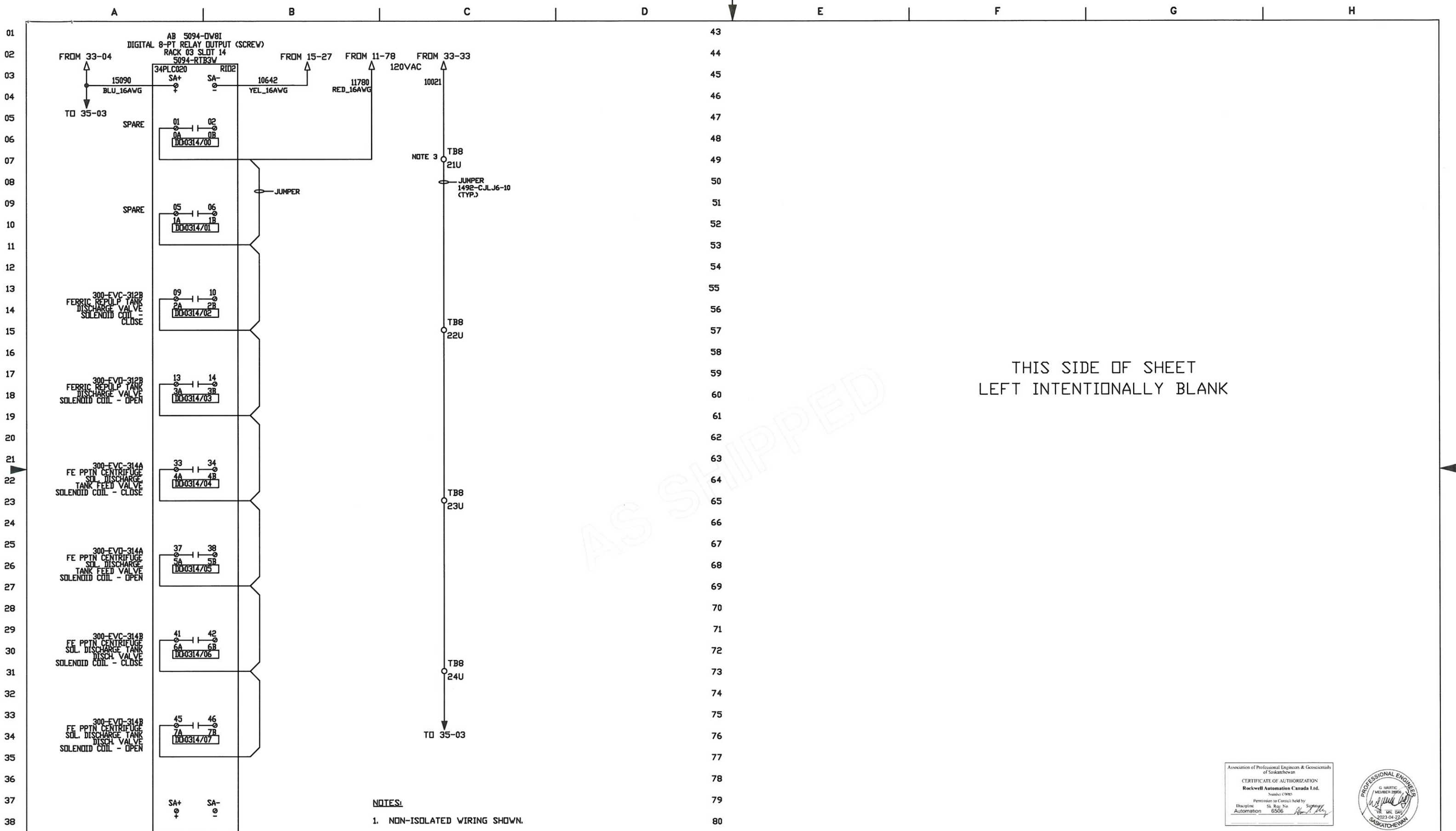
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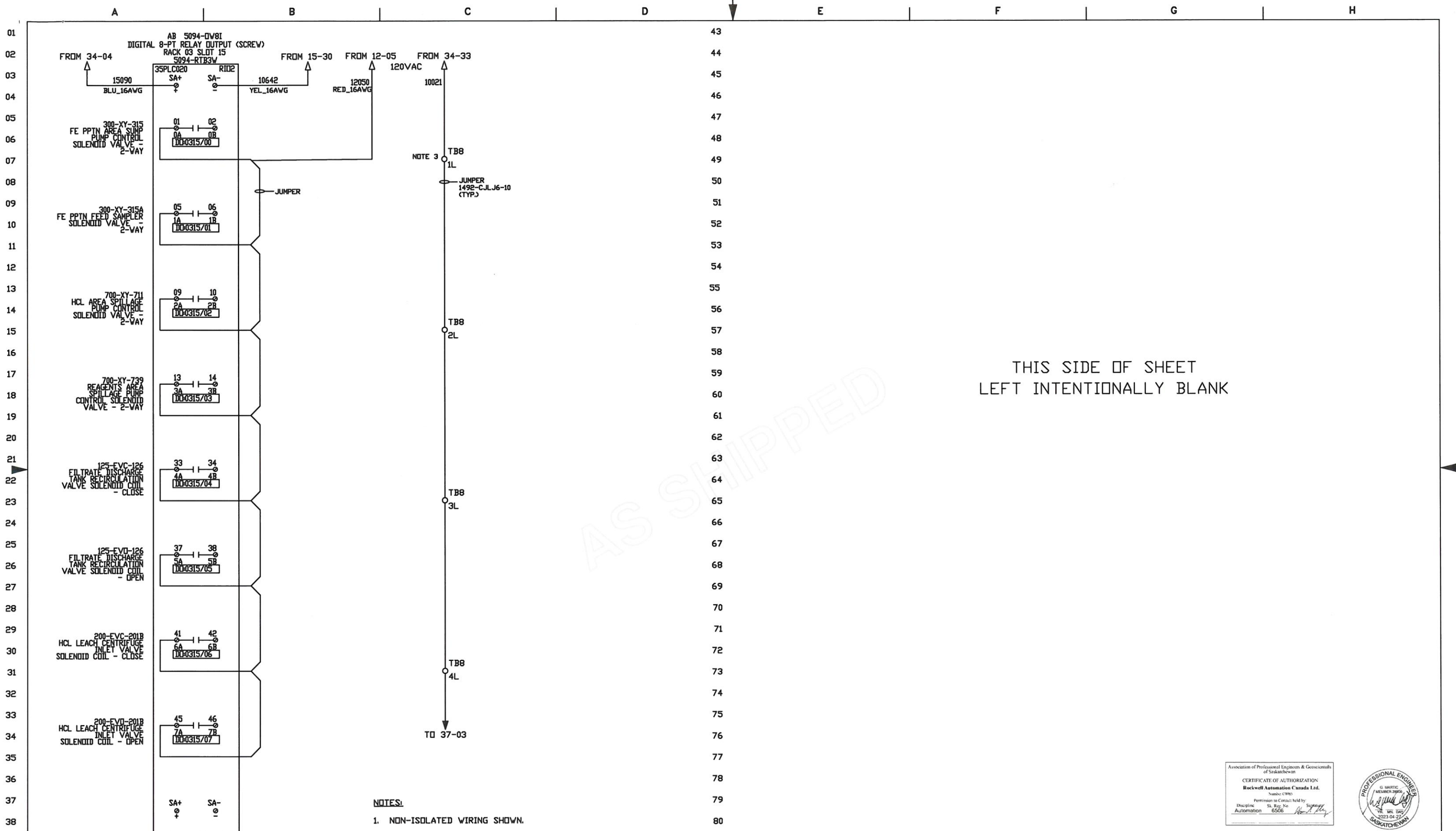
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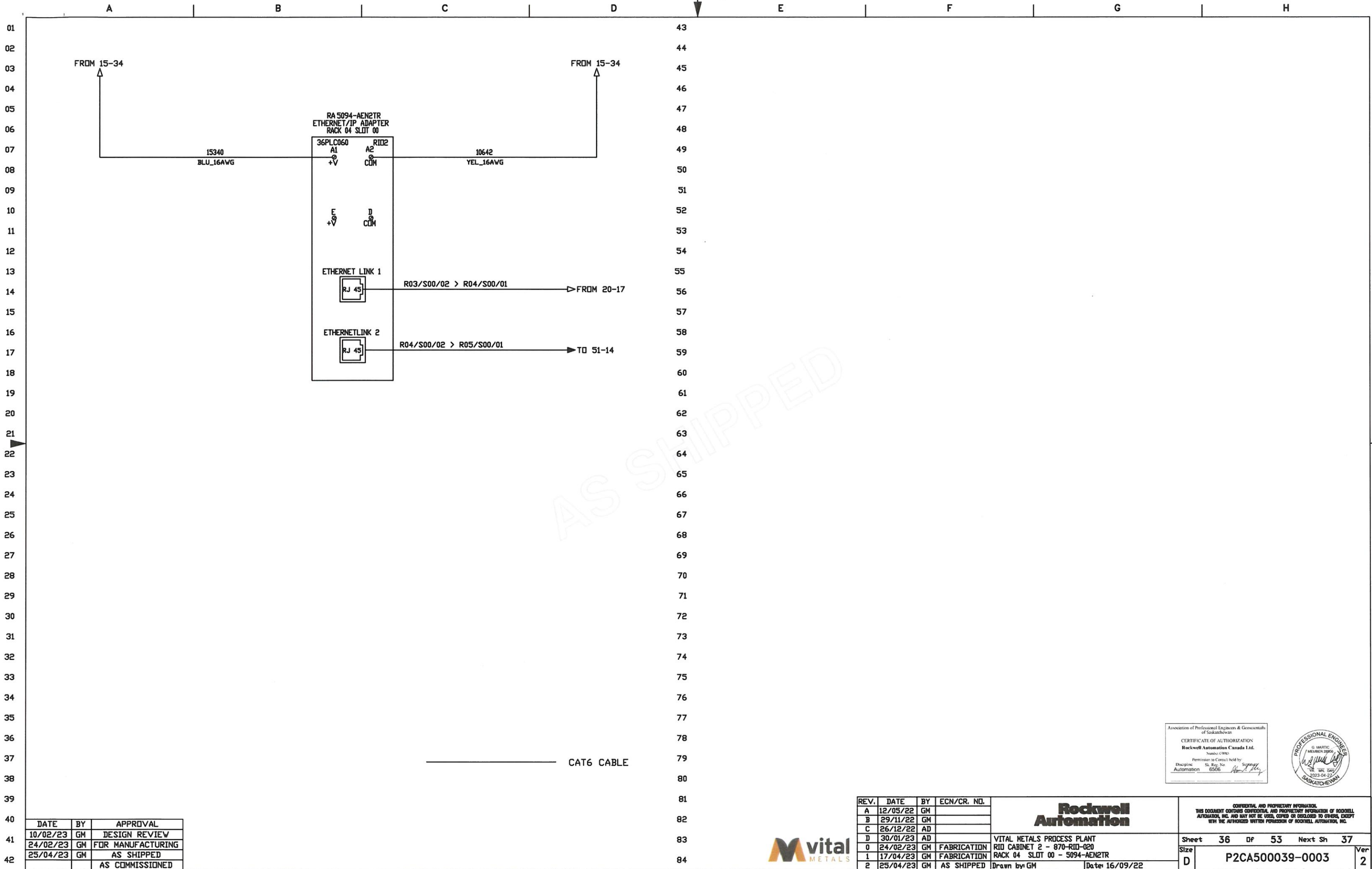
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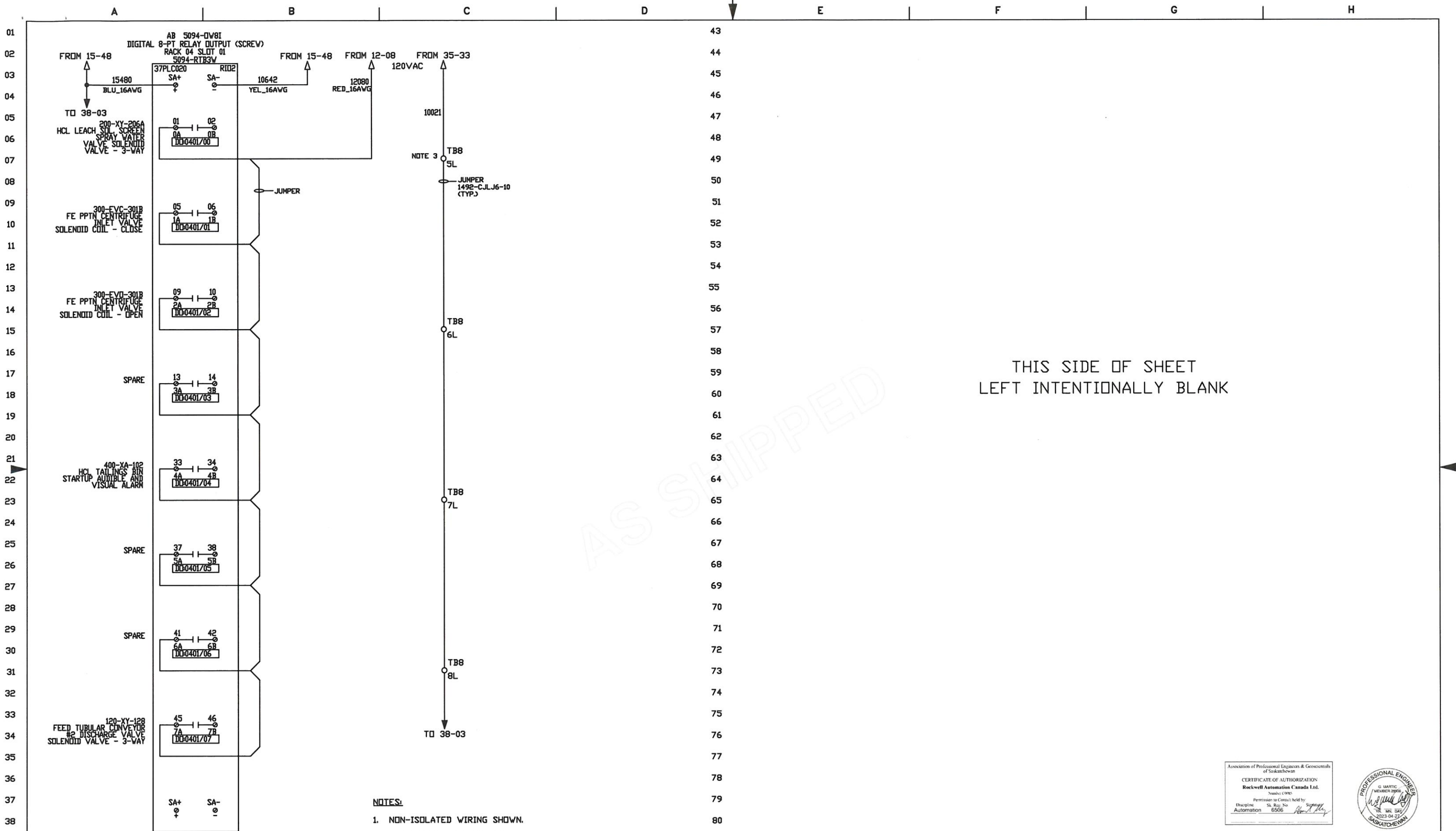
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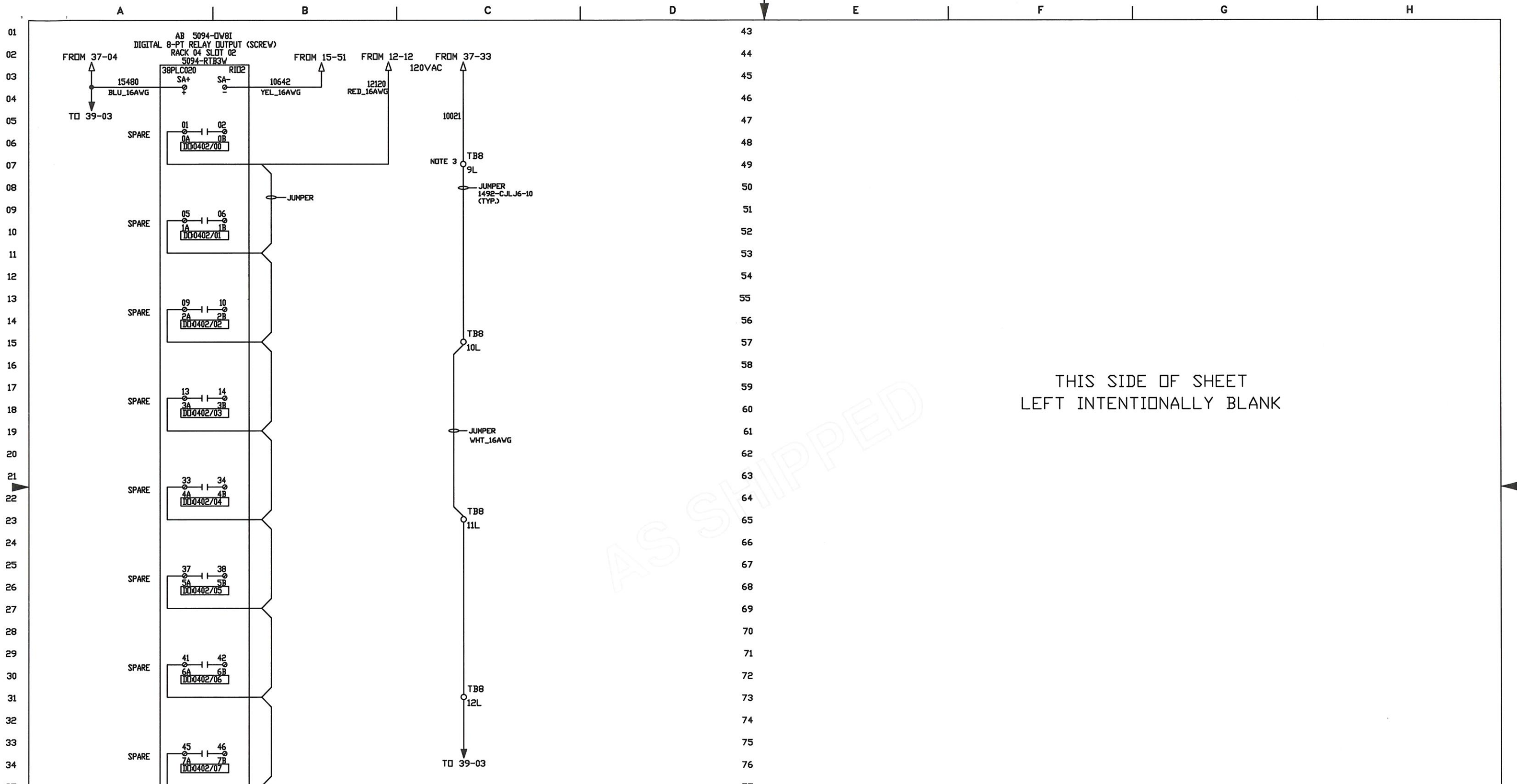
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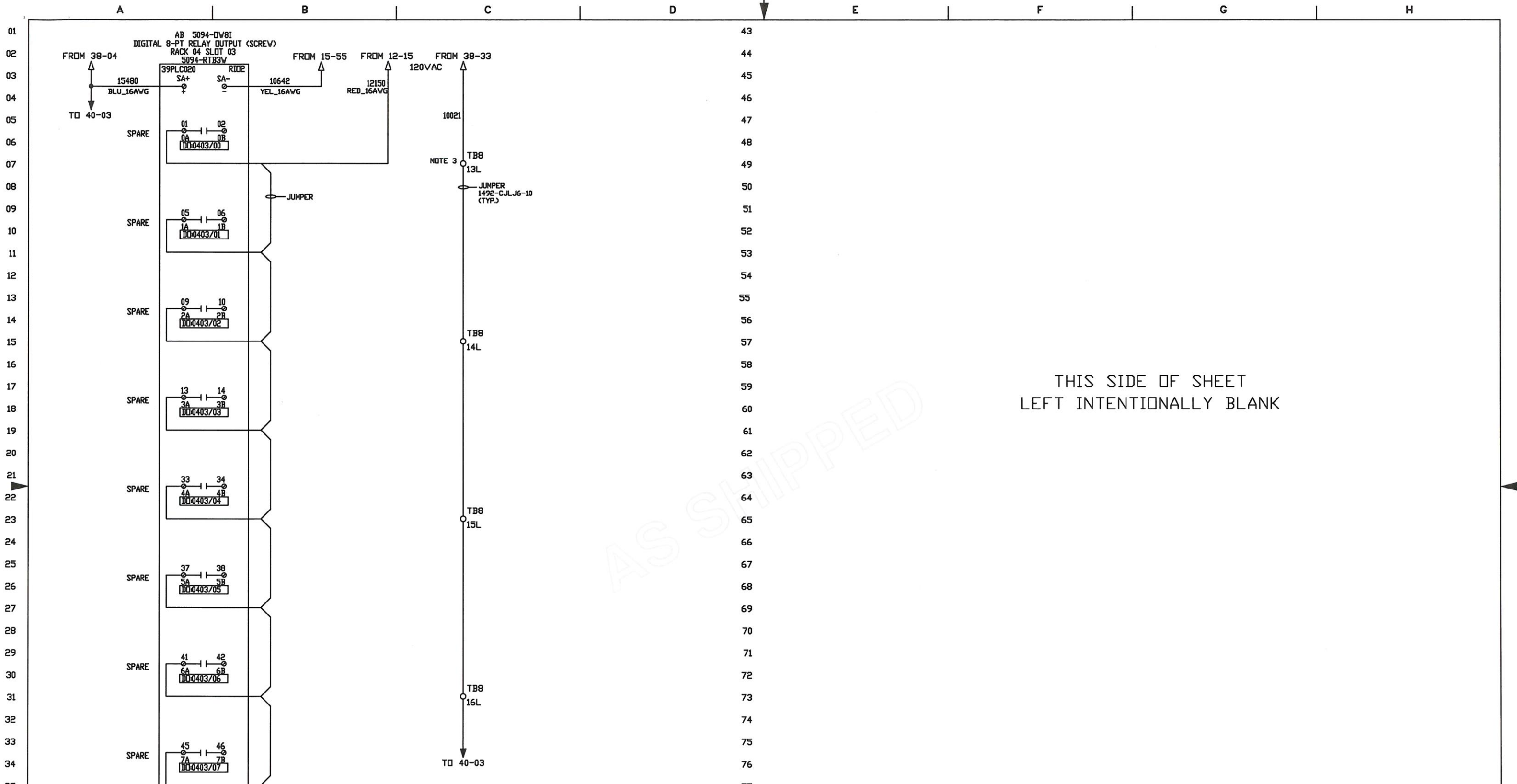
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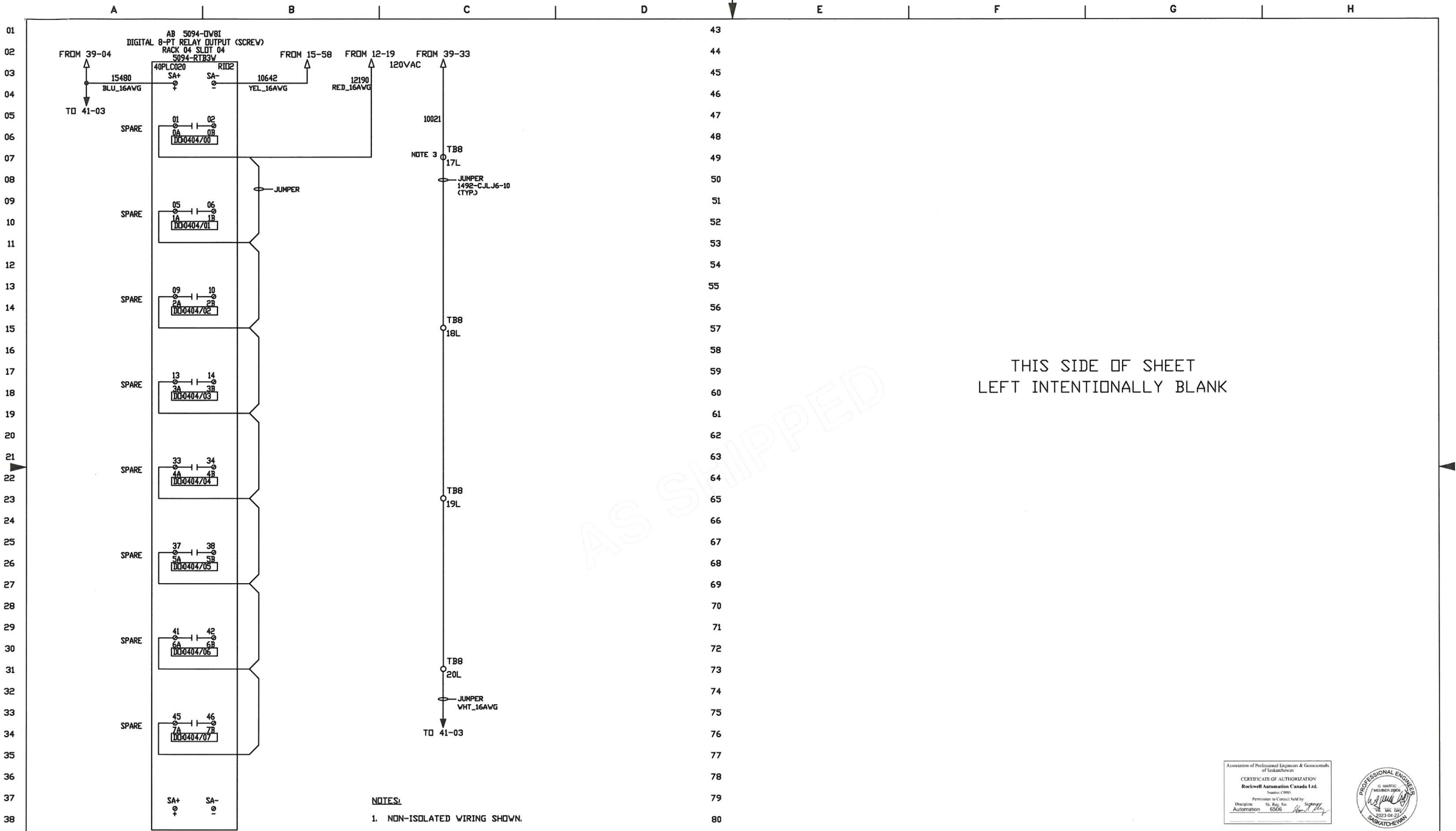
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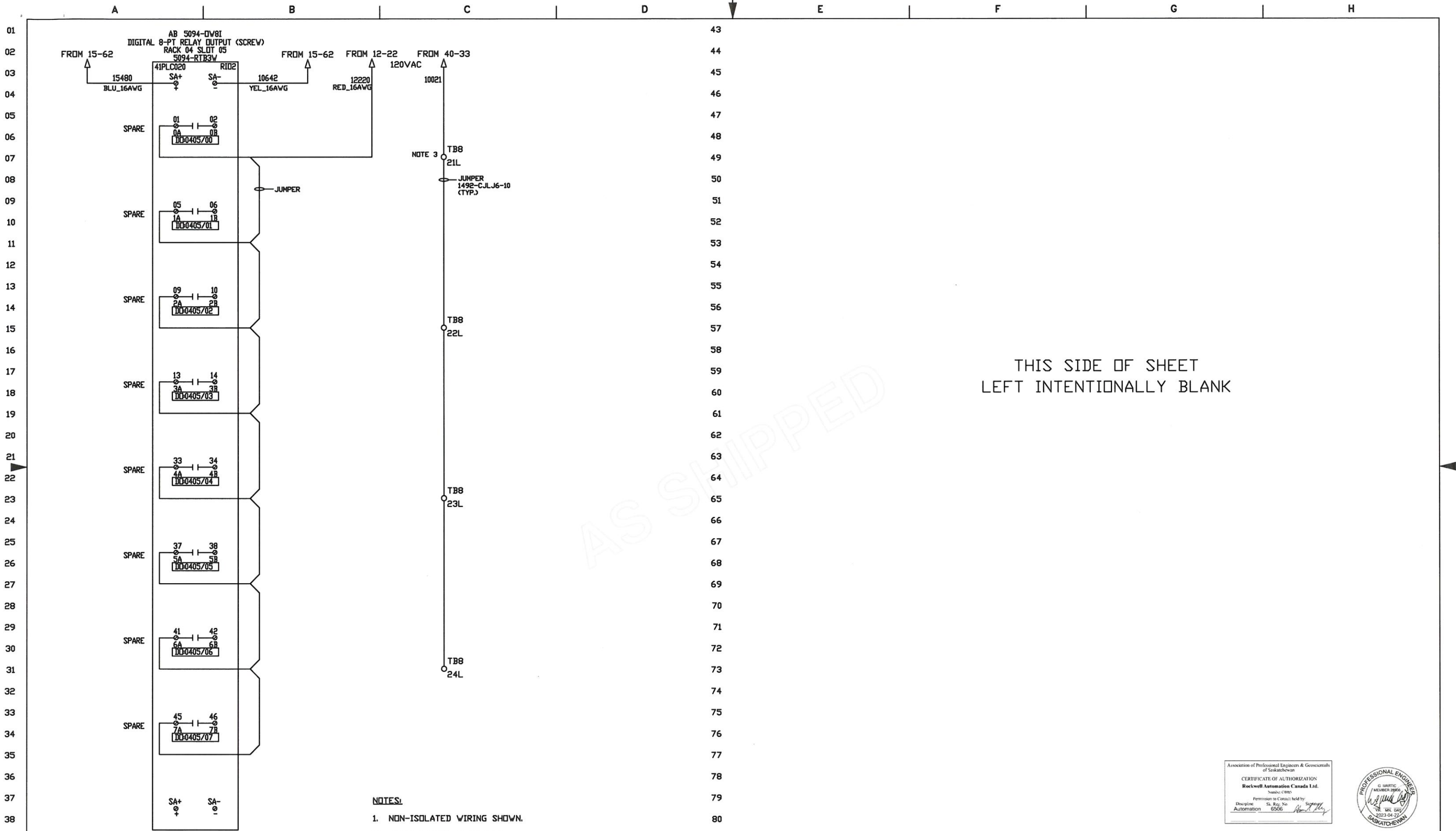
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1	17/04/23	GM	FABRICATION				
2	25/04/23	GM	AS SHIPPED				





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AS SHIPPED

- NOTES:**
- NON-ISOLATED WIRING SHOWN.
 - FIELD WIRING BY OTHERS.
 - TWO-CIRCUIT TERMINAL 1492-JD4, U/L - UPPER/LOWER.
 - FIELD NEUTRAL WIRING-USE DOUBLE FERULES FOR TWO WIRES.

DATE	BY	APPROVAL
10/02/23	GM	DESIGN REVIEW
24/02/23	GM	FOR MANUFACTURING
25/04/23	GM	AS SHIPPED
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 CERTIFICATE OF AUTHORIZATION
 Rockwell Automation Canada Ltd.
 Number: 0385
 Permission to Contact held by:
 Discipline: Automation, St. Reg. No. 8566, Signature: [Signature]

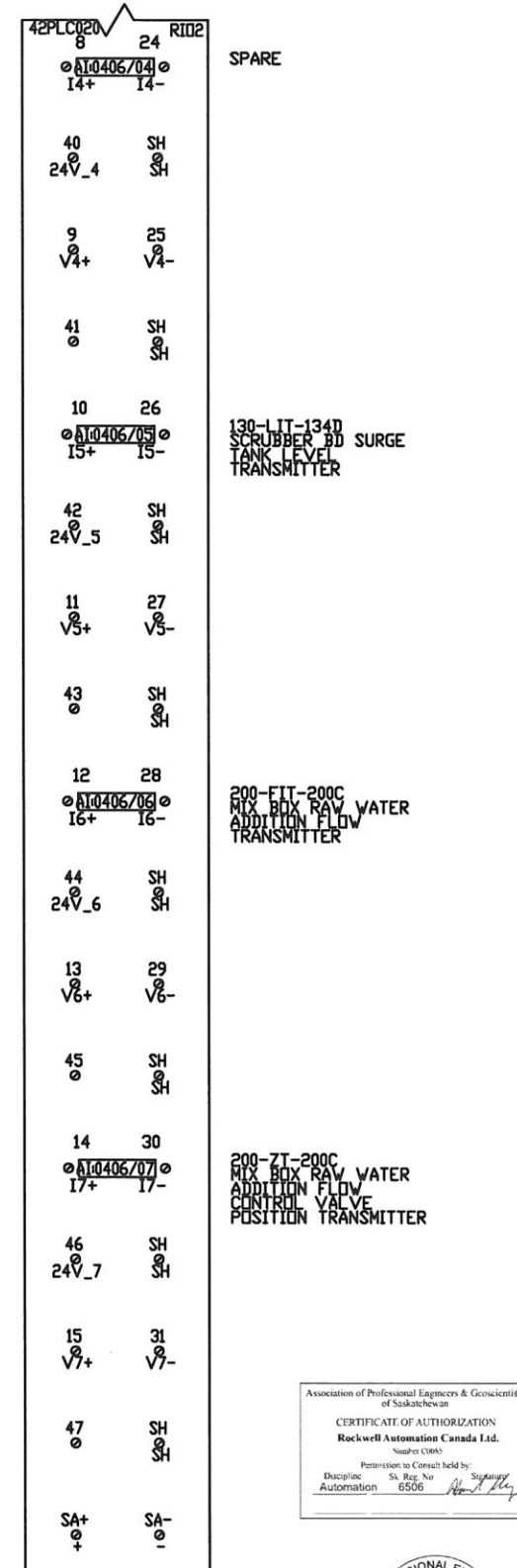
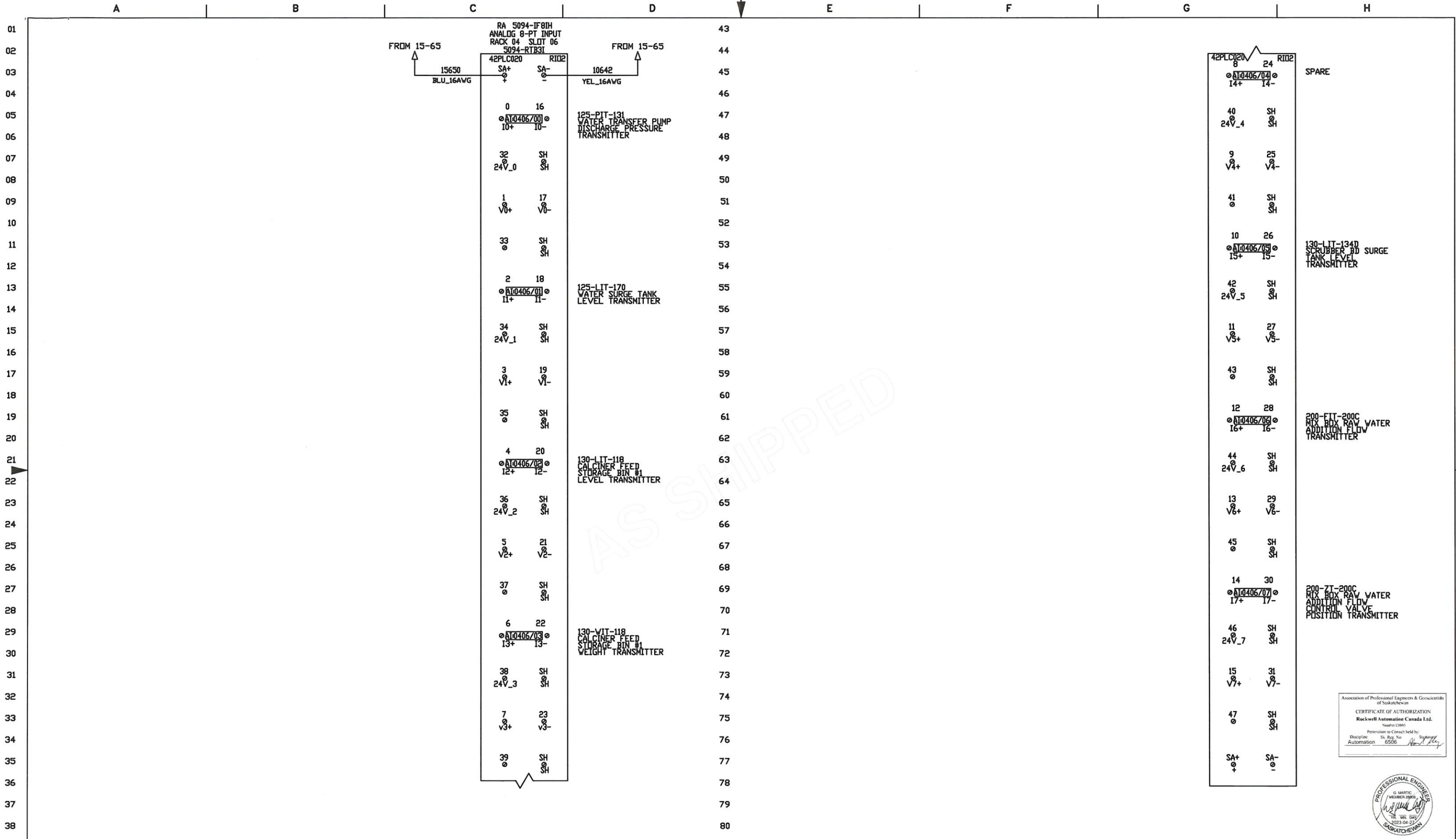


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VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 RACK 04 SLOT 05 - 5094-DV81
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Sheet	41	OF	53
Next Sh	42		
Size	D		Ver 2
P2CA500039-0003			



Association of Professional Engineers & Geoscientists of Saskatchewan
 CERTIFICATE OF AUTHORIZATION
 Rockwell Automation Canada Ltd.
 Number: 0385
 Permission to Consult held by:
 Discipline: Automation
 6506
 [Signature]



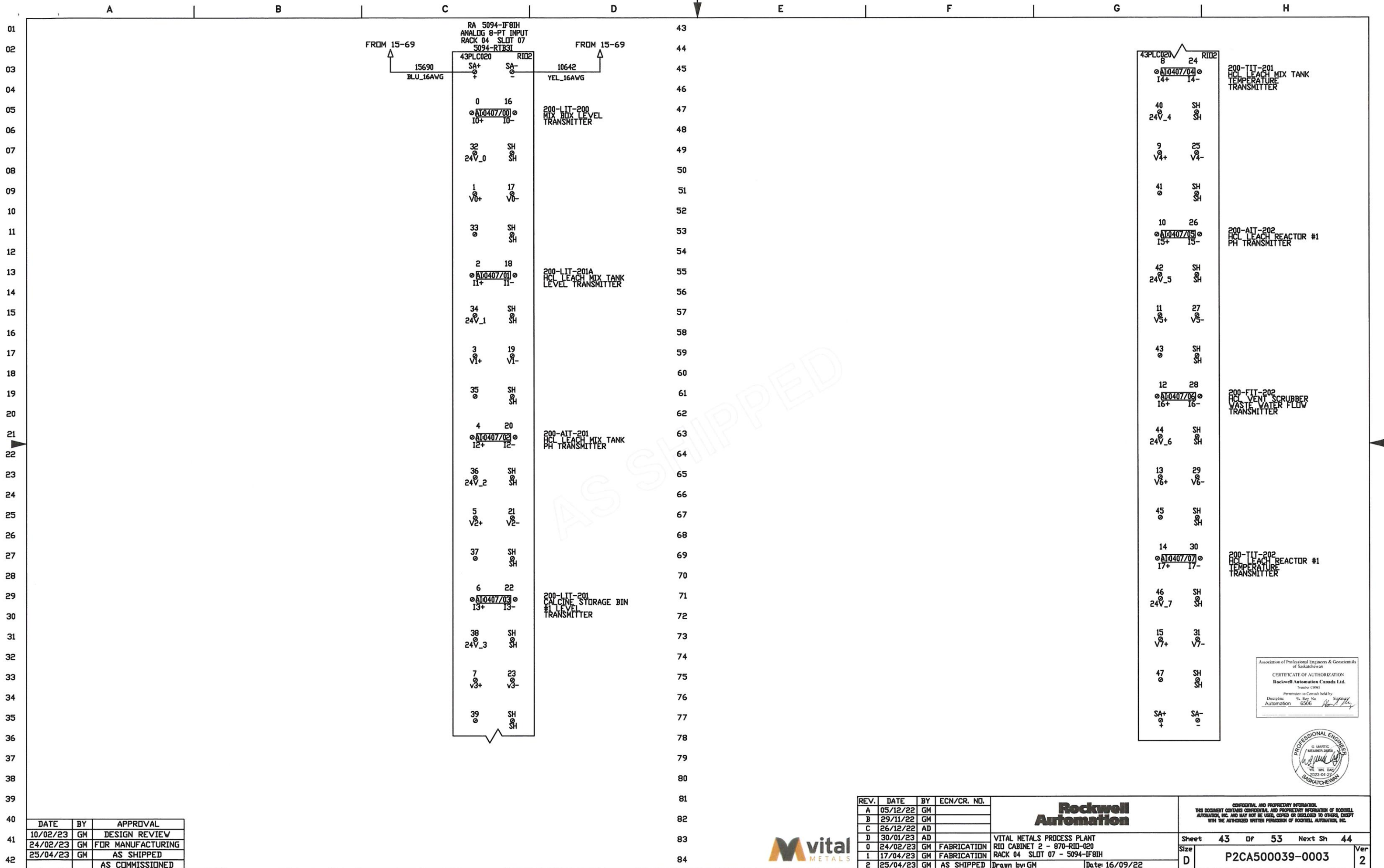
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24/02/23	GM	FOR MANUFACTURING
25/04/23	GM	AS SHIPPED
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REV.	DATE	BY	ECN/CR. NO.
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B	29/11/22	GM	
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1	17/04/23	GM	FABRICATION
2	25/04/23	GM	AS SHIPPED

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 VITAL METALS PROCESS PLANT
 RIO CABINET 2 - 870-RIO-020
 RACK 04 SLOT 06 - 5094-IF8IH
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10/02/23	GM	DESIGN REVIEW
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25/04/23	GM	AS SHIPPED
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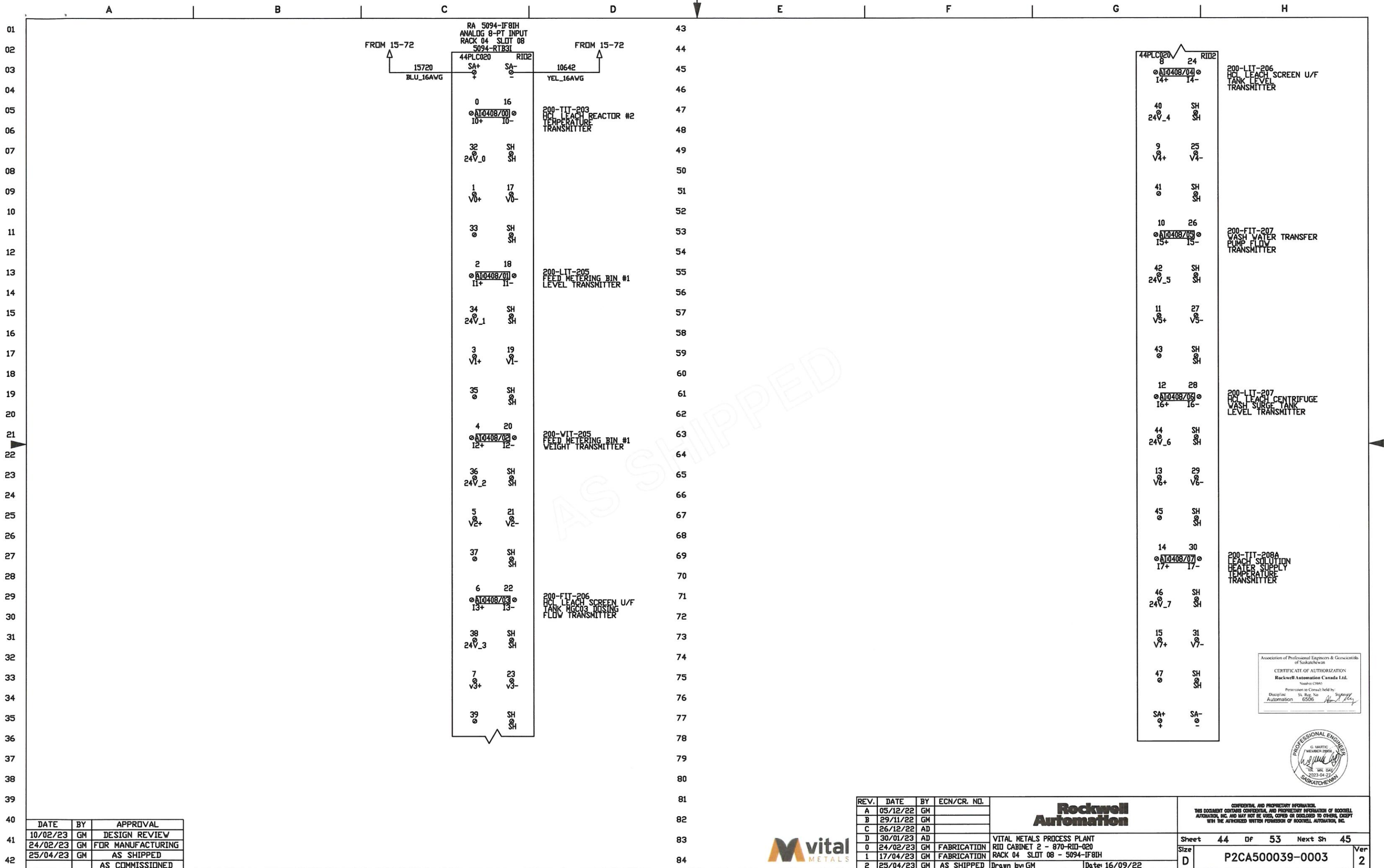
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 RACK 04 SLOT 07 - 5094-IF8IH
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 Size D P2CA500039-0003 Ver 2

Association of Professional Engineers & Geoscientists of Saskatchewan
 CERTIFICATE OF AUTHORIZATION
 Rockwell Automation Canada Ltd.
 Permission to Control held by:
 Descriptive: Automation 6506





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25/04/23	GM	AS SHIPPED
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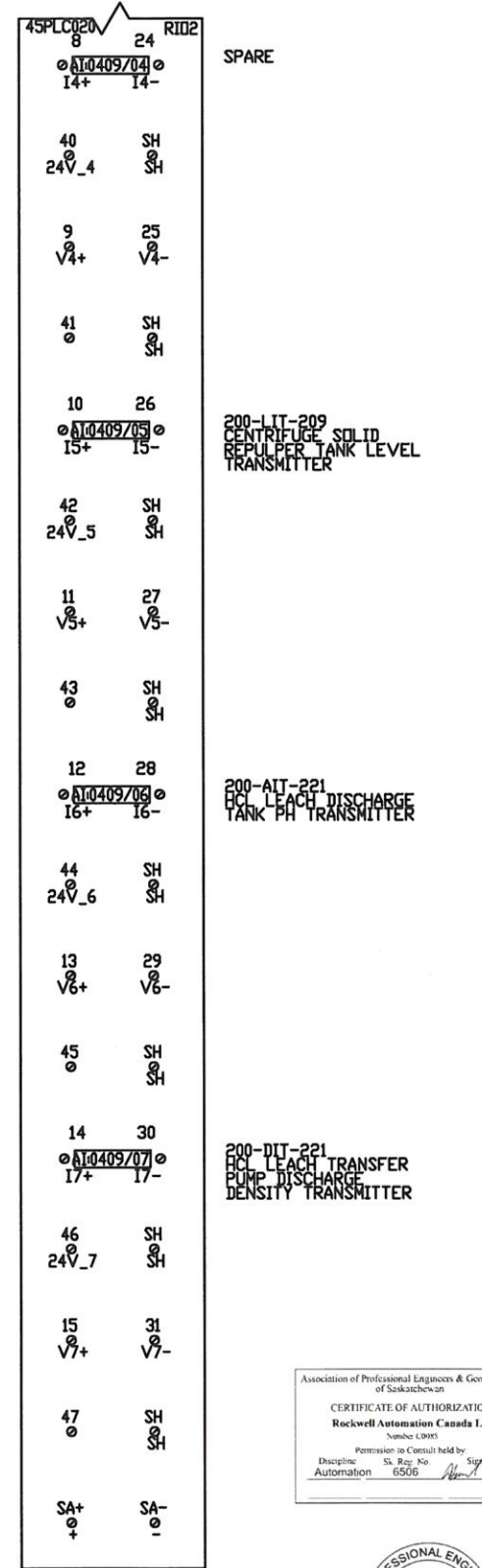
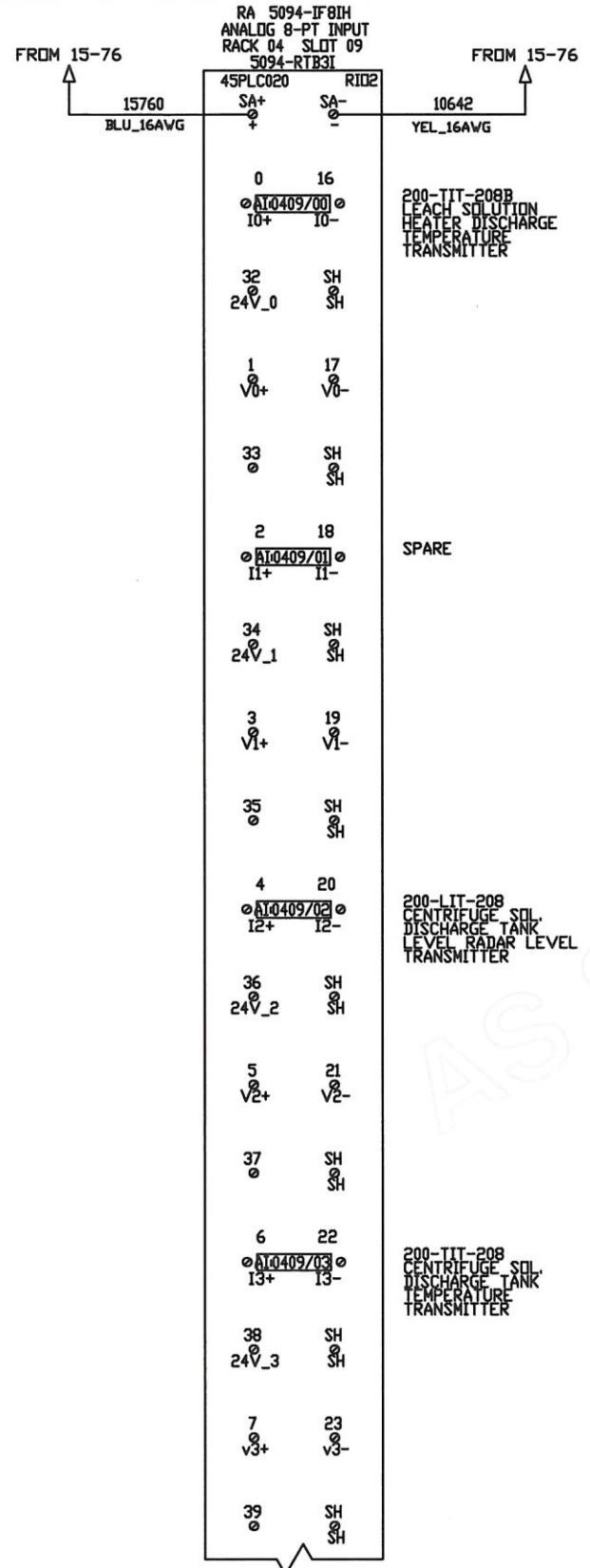


VITAL METALS PROCESS PLANT
RID CABINET 2 - 870-RID-020
RACK 04 SLOT 08 - 5094-IF8IH
Drawn by: GM Date: 16/09/22

Sheet 44 of 53 Next Sh 45
Size D P2CA500039-0003 Ver 2

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Rockwell Automation Canada Ltd.
Number: CMAAS
Permission to Consult held by:
Discipline: Automation
S.A. Reg. No. 6506
Signature: [Signature]





Association of Professional Engineers & Geoscientists
of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Rockwell Automation Canada Ltd.
Name: GM
Permission to Control held by
Discipline: Automation St. Reg. No. 6506 Signature: [Signature]
Date: 2023-04-22



DATE	BY	APPROVAL
10/02/23	GM	DESIGN REVIEW
24/02/23	GM	FOR MANUFACTURING
25/04/23	GM	AS SHIPPED
		AS COMMISSIONED

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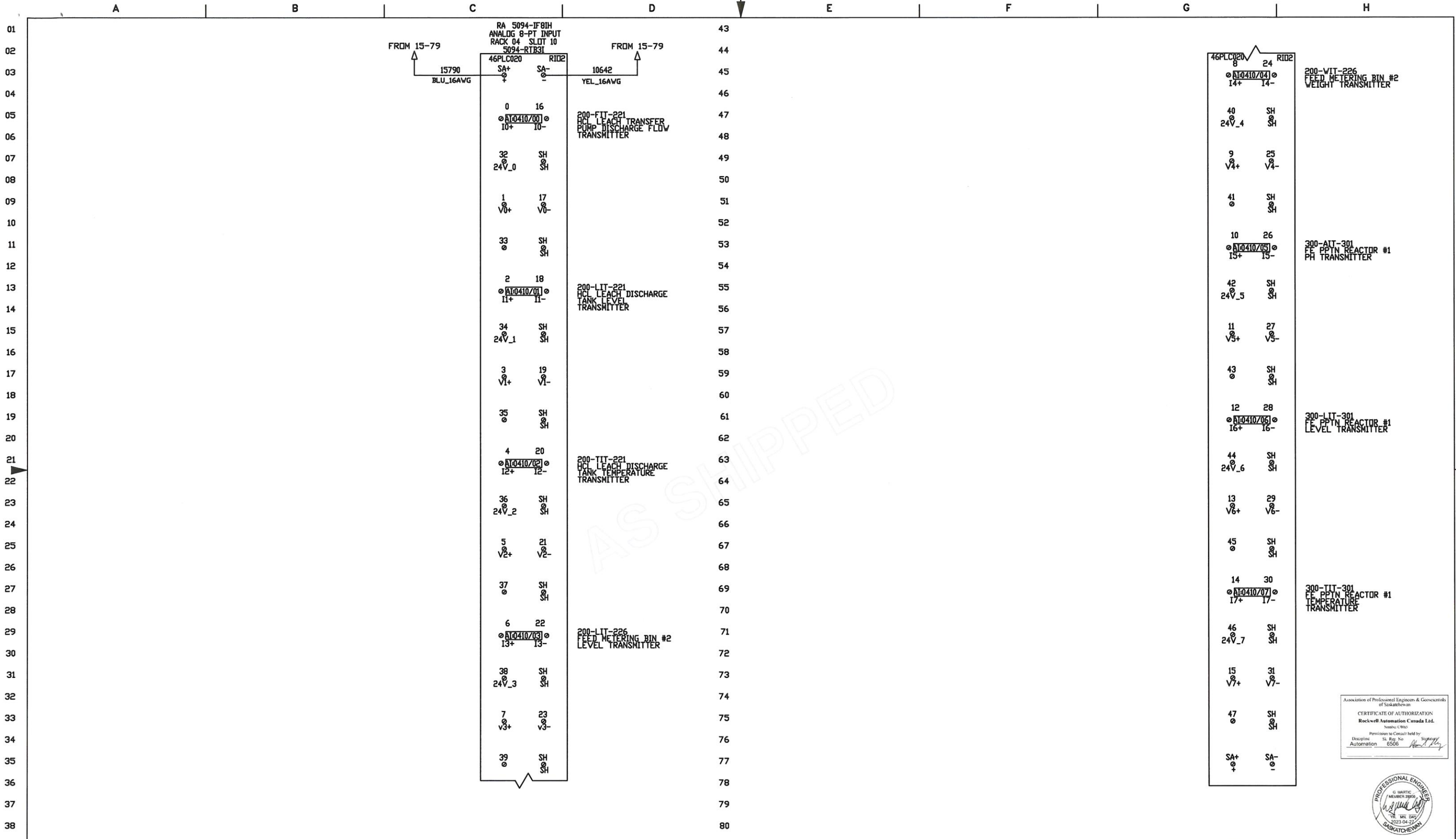
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RACK 04 SLOT 09 - 5094-IF8IH
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25/04/23	GM	AS SHIPPED
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1	17/04/23	GM	FABRICATION
2	25/04/23	GM	AS SHIPPED

Rockwell Automation

VITAL METALS PROCESS PLANT
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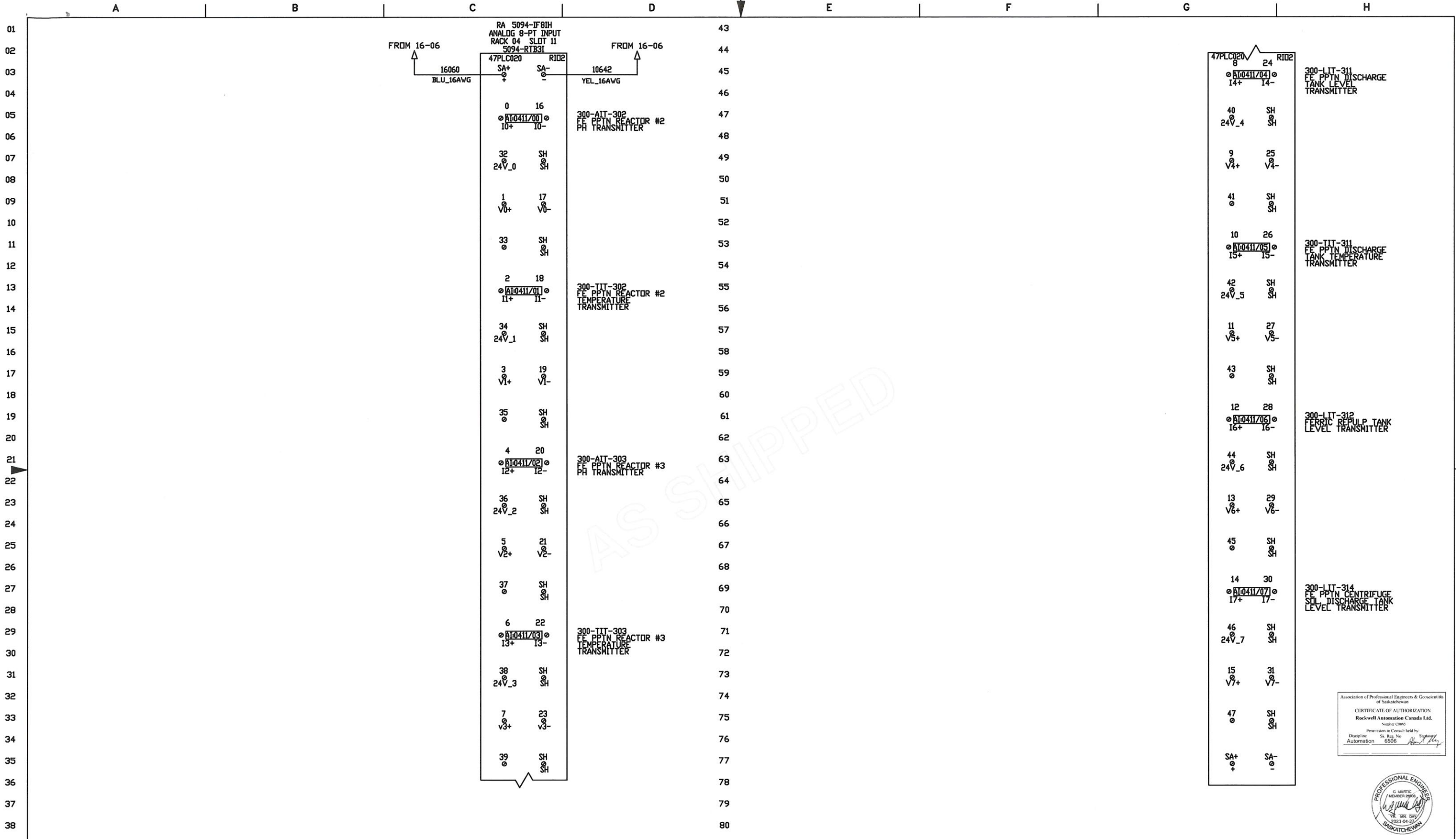
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Size D P2CA500039-0003 Ver 2

Association of Professional Engineers & Geoscientists of Saskatchewan
CERTIFICATE OF AUTHORIZATION
Rockwell Automation Canada Ltd.
Number: C9035
Permission to Control held by:
Description: St. Regis No. 6506
Automation: 6506





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25/04/23	GM	AS SHIPPED
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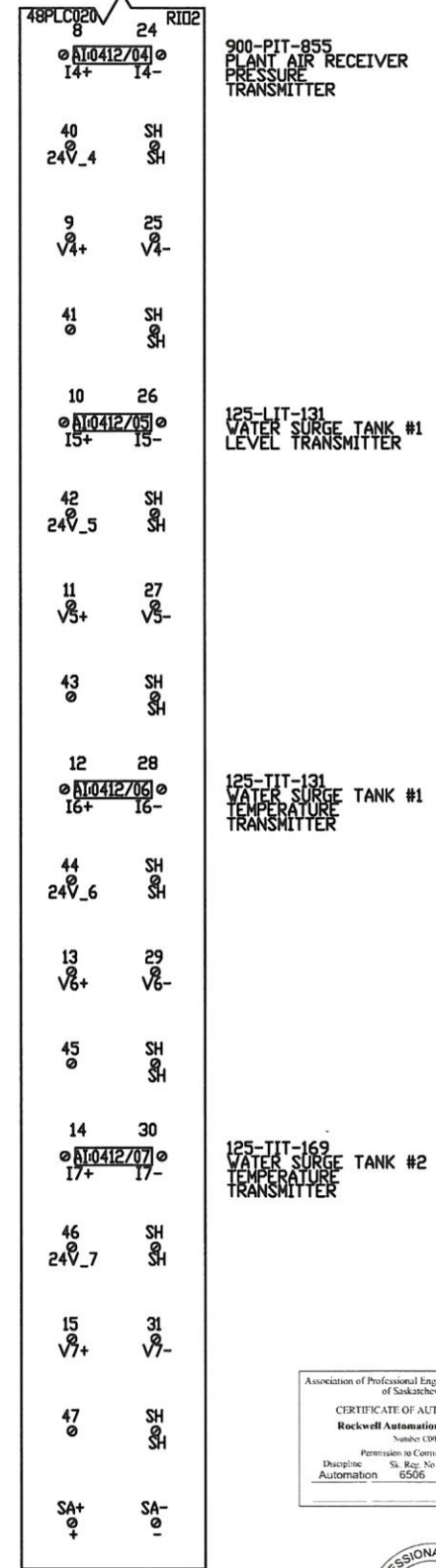
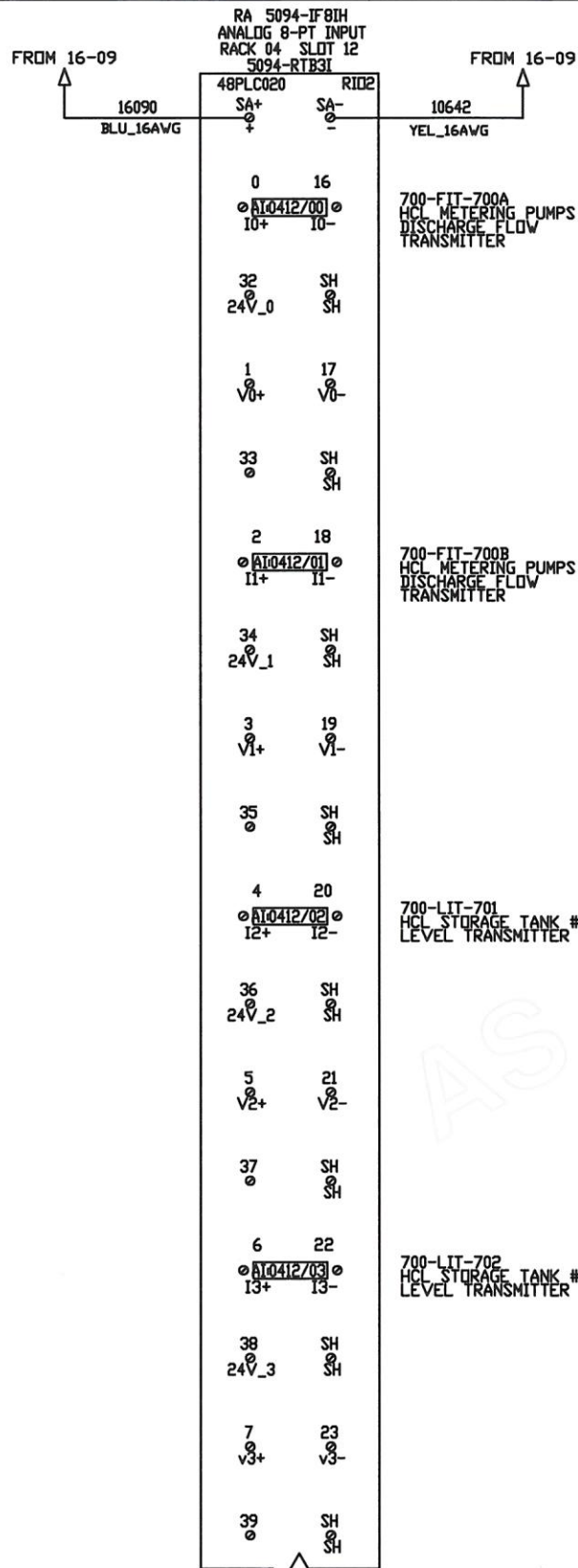
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 Size D P2CA500039-0003 Ver 2

Association of Professional Engineers & Geoscientists of Saskatchewan
 CERTIFICATE OF AUTHORIZATION
 Rockwell Automation Canada Ltd.
 Number: C2065
 Permission to Consult held by:
 Discipline: Automation St. Reg. No. 6506
 Signature: [Signature]





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 Rockwell Automation Canada Ltd.
 Number: C9185
 Permission to Commit held by:
 Discipline: Automation, 6506
 Signature: [Signature]
 Date: 2023-04-27



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25/04/23	GM	AS SHIPPED
		AS COMMISSIONED

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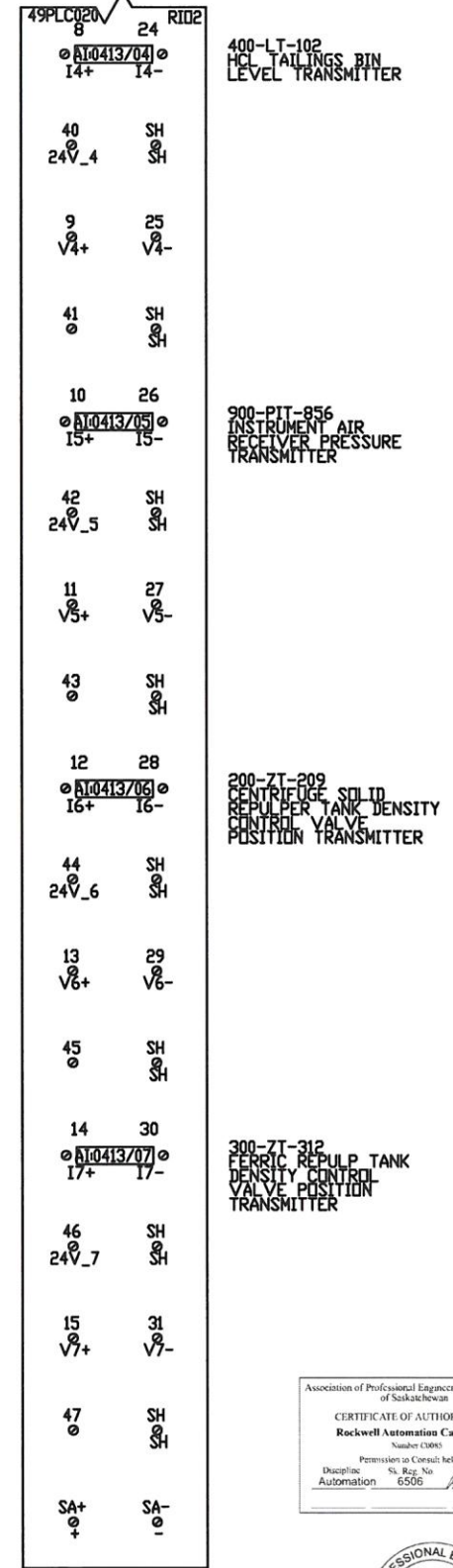
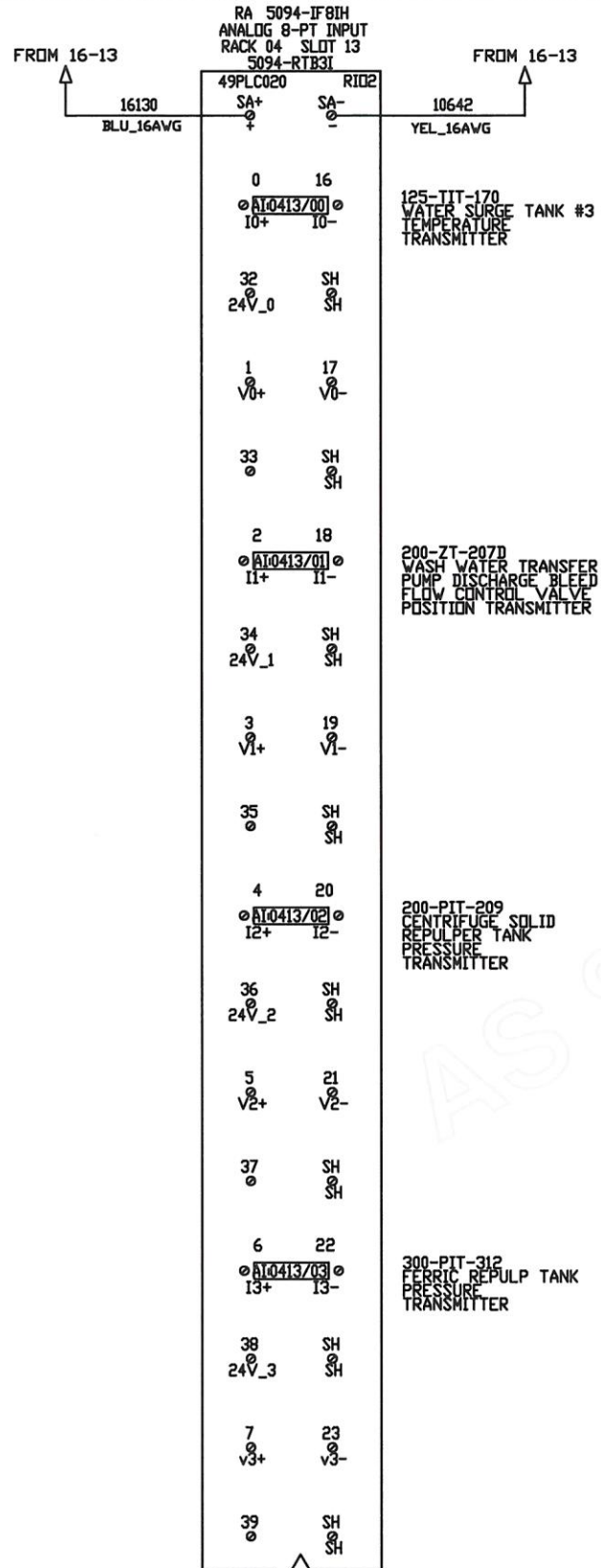
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 RID CABINET 2 - 870-RID-020
 RACK 04 SLOT 12 - 5094-IF81H
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CERTIFICATE OF AUTHORIZATION
Rockwell Automation Canada Ltd.
Number C3085
Permission to Consult held by:
Discipline: Automation
Ss. Reg. No. 6555
Date: 2023-04-27



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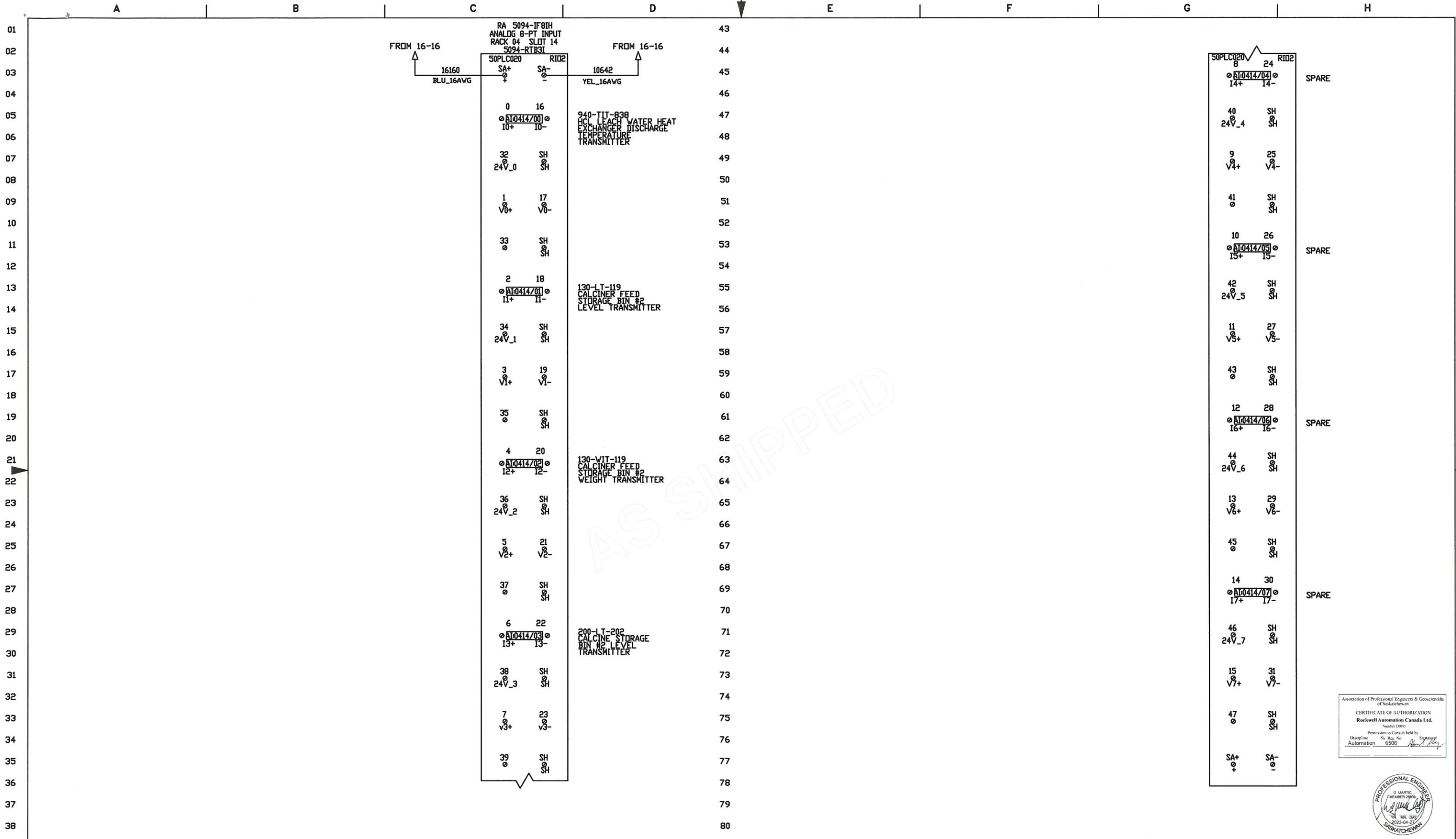
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RID CABINET 2 - 870-RID-020
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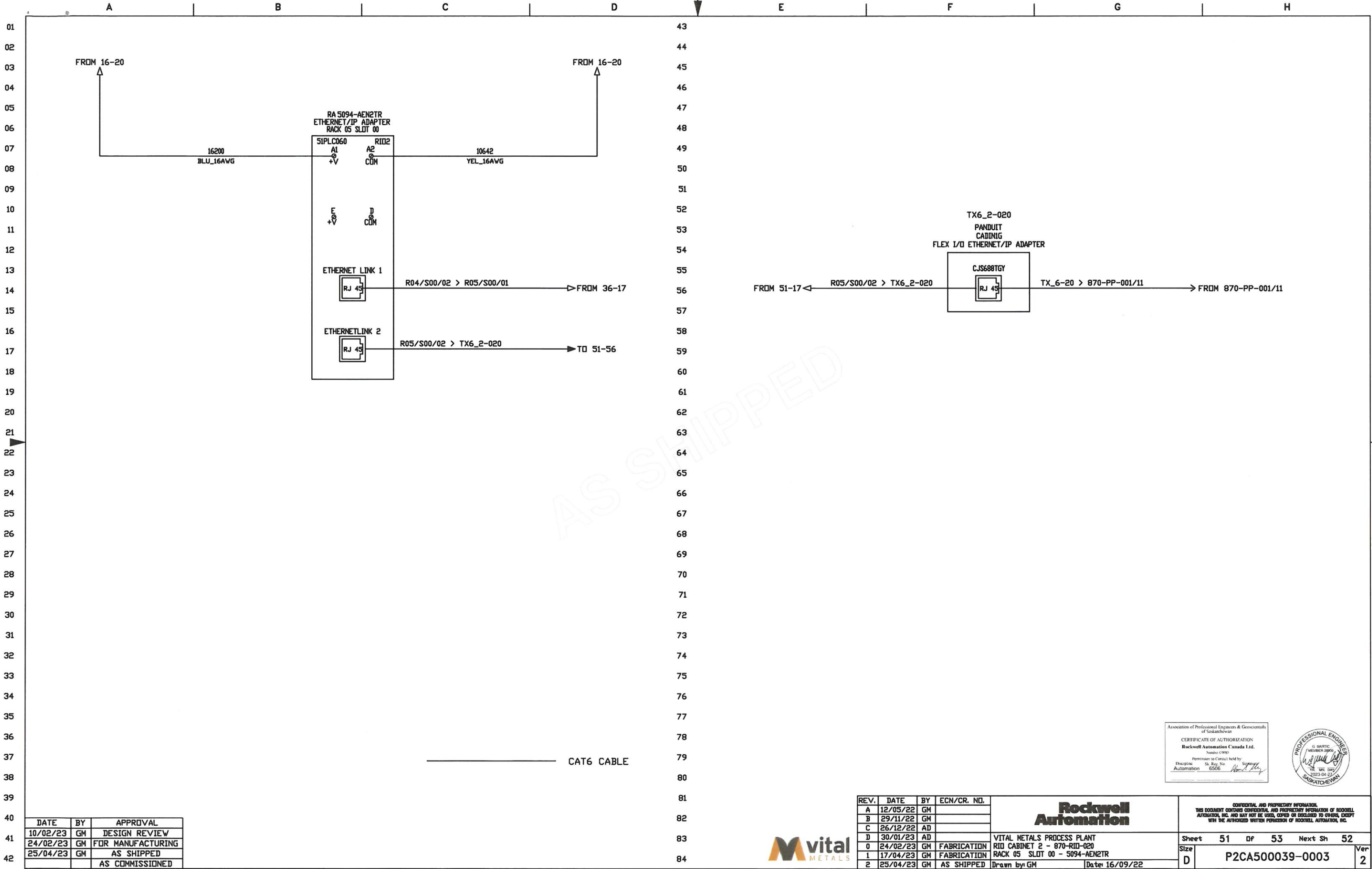
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24/02/23	GM	FOR MANUFACTURING
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				Drawn by: GM	Date: 16/09/22	Ver 2



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 Number 03003
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 Discipline: Automation
 6506





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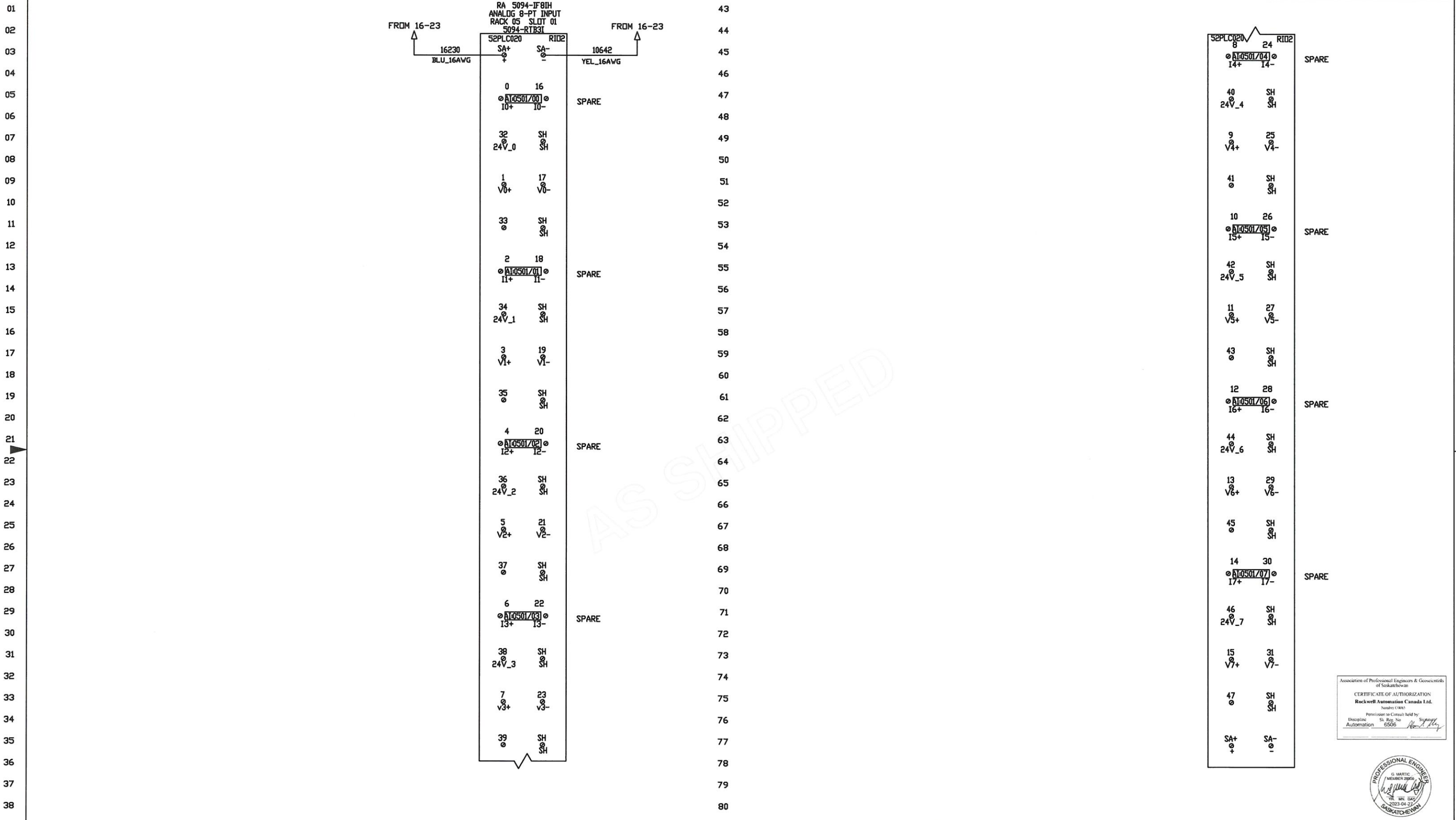
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 RACK 05 SLOT 00 - 5094-AEN2TR
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 Number: C095
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 Discipline: Automation St. Reg. No. 6506
 Signature: [Signature] Date: 2023-04-27



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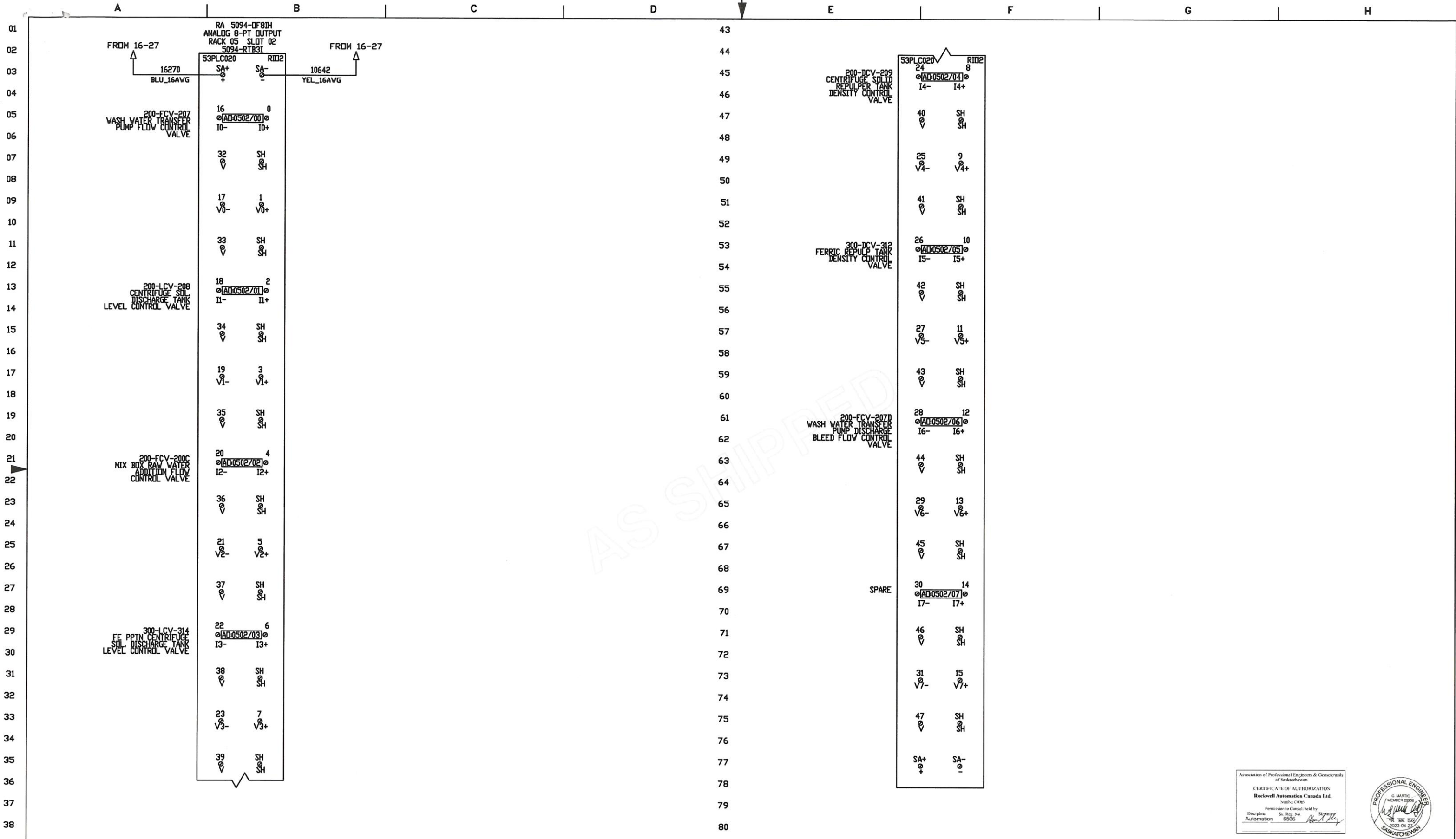
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				Drawn by: GM	Date: 16/09/22	Ver 2

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 Number: C/BA5
 Permitted to Consult held by:
 Discipline: Automation
 No. Reg. No. 5506
 Signature: [Signature]



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25/04/23	GM	AS SHIPPED
		AS COMMISSIONED

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2	25/04/23	GM	AS SHIPPED

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 Number: C9785
 Permitted to Control held by:
 Discipline: Automation St. Reg. No. 6506
 Signature: [Signature] YR. EXP. DATE: 2023-04-27
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