

USDA ARS Cotton Ginning Research Unit

Stoneville, MS

Micro Gin Controls with PLC and HMI Supplemental Information

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Micro Gin Controls with Programmable Logic Controllers (PLC) and Human Machine Interface (HMI)

Appendix

Contents:

- 1 Installation
- 2 Motors
- 3 Inputs and Outputs (I/O)
- 4 PLC and HMI

1 – Installation:

- a) The USDA ARS micro gin facility is a research laboratory. As such, the facility must remain functional to the degree possible to meet various research requirements. Contractor will be required to perform installation of supplied equipment and associated materials in such manner as to minimize the down time of the micro gin research facility.
- b) Contractor is responsible for providing 120 and 240 volt single-phase from existing 45 kVa transformer at east end of building 26 as required for new configuration.

2 – Motors:

- a) All motors provided by USDA ARS. All are either on-hand or new.
- b) Table 1 is a listing of all motors associated with the new micro gin configuration.
- c) Table 2 indicates which motors require starters vs. variable frequency drives.
- d) Motor starting sequence is listed in Table 1.

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Table 1

Mtr	Machine	Mtr HP	Mtr RPM	Mtr FLA	NP Mtr V
1	Seed Blower	5	3490	6.8	440
2	Battery Condenser	2	1770	2.8	460
3	Mote Condenser	2	1770	2.8	460
4	#1 Lint Cleaner	5	1740	6.5	460
5	#2 Lint Cleaner	7.5	1750	9.4	460
6	#3 Lint Cleaner	7.5	1765	8.9	460
7	#1 Lint Cleaner Feed Works	2	1770	2.8	460
8	#3 Lint Cleaner Feed Works	3	1765	4.11	460
9	Lint Cleaner Exhaust Fan	10	1770	13.5	460
10	Mote Fan	7.5	3491	9.3	460
11	Gin Stand Brush	2	1760	3.5	460
12	Gin Stand Mote Wiper	0.5	1725	1	460
13	Gin Stand Saw	25	1760	32	460
14	Gin Stand Agitator	3	1760	4.2	460
15	Extractor Feeder Extracting Section	2	1760	3.5	460
16	Extractor Feeder Cylinder Cleaner Section	2	1760	3.5	460
17	Extractor Feeder Feed Rollers	0.5	1735	0.8	460
18	Conveyor Distributor	0.75	1700	1.31	460
19	Inclined Conveyor	1	3505	1.5	460
20	Gin Separator & Vacuum Feeder	3	1750	3.2	440
21	Gin Separator Fan A & B	10	1710	13.4	460
22	Impact Cylinder Cleaner	5	1745	6.4	460
23	Impact Cylinder Cleaner Separator	2	1740	3.2	440
24	TrashMaster Cylinder Cleaner	10	1750	12.4	460
25	TrashMaster Cylinder Cleaner Separator	2	1740	3.2	440
26	Stick Machine	10	1750	12.4	460
27	Stick Machine Separator	2	1740	3.2	440
28	Inclined Cylinder Cleaner	10	1750	12.4	460
29	Inclined Cylinder Cleaner Separator	2	1740	3.2	440
30	Horizontal Cylinder Cleaner Trash Vacuum (Future)	2	1770	2.8	460
31	Horizontal Cylinder Cleaner Trash Conveyor (Future)	1	1770	1.5	460
32	Horizontal Cylinder Cleaner (Future)	10	1750	12.4	460
33	Impact Cylinder Cleaner Separator Fan	10	1710	13.4	460
34	TrashMaster Cylinder Cleaner Separator Fan	10	1710	13.4	460
35	Stick Machine Separator Fan	10	1710	13.4	460

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36	Inclined Cylinder Cleaner Separator Fan	10	1710	13.4	460
37	Tower Drier 1B Separator	2	1740	3.2	440
38	Tower Drier 2B Separator	2	1740	3.2	440
39	Tower Drier 1B Burner Fan	10	1710	13.4	460
40	Tower Drier #2B Hot Air Pull Fan	30	1765	37	440
41	Tower Drier 1A Separator	2	1740	3.2	440
42	Tower Drier 2A Separator	2	1740	3.2	440
43	Tower Drier 1A Burner Fan	10	1710	13.4	460
44	Tower Drier #2A Hot Air Pull Fan	30	1775	35.8	440
45	Feed Control Bottom Vacuum Feeder	3	1740	3.83	460
46	Feed Control Separator and Top Vacuum Feeder	3	1740	3.83	460
47	Unloading Fan	30	1770	38	460
48	Feed Control Drive	0.5	1760	0.86	460

Table 2

Mtr	Machine	Starter Size	New-On Hand	Starter Type	VFD
1	Seed Blower	0	New	DOL/Non-reversing	
2	Battery Condenser	0	New	480V/460V VFD	New
3	Mote Condenser	0	New	480V/460V VFD	New
4	#1 Lint Cleaner	0	New	480V/460V VFD	On Hand
5	#2 Lint Cleaner	1	New	480V/460V VFD	On Hand
6	#3 Lint Cleaner	1	New	480V/460V VFD	New
7	#1 Lint Cleaner Feed Works	0	New	480V/460V VFD	New
8	#3 Lint Cleaner Feed Works	0	New	480V/460V VFD	On Hand
9	Lint Cleaner Exhaust Fan	0	New	480V/460V VFD	New
10	Mote Fan	1	New	DOL/Non-reversing	
11	Gin Stand Brush	N/A	On Hand	480V/460V VFD	On Hand
12	Gin Stand Mote Wiper	N/A	On Hand	480V/460V VFD	On Hand
13	Gin Stand Saw	N/A	On Hand	480V/460V VFD	On Hand
14	Gin Stand Agitator	N/A	On Hand	480V/460V VFD	On Hand
15	Extractor Feeder Extracting Section	N/A	On Hand	480V/460V VFD	On Hand
16	Extractor Feeder Cylinder Cleaner Section	N/A	On Hand	480V/460V VFD	On Hand
17	Extractor Feeder Feed Rollers	N/A	On Hand	480V/460V VFD	On Hand

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18	Conveyor Distributor	00	New	480V/460V VFD	New
19	Inclined Conveyor	00	New	480V/460V VFD	New
20	Gin Separator & Vacuum Feeder	0	New	DOL/Non-reversing	
21	Gin Separator Fan A & B	1	New	DOL/Non-reversing	
22	Impact Cylinder Cleaner	0	New	DOL/Non-reversing	
23	Impact Cylinder Cleaner Separator	0	New	DOL/Non-reversing	
24	TrashMaster Cylinder Cleaner	1	New	DOL/Non-reversing	
25	TrashMaster Cylinder Cleaner Separator	0	New	DOL/Non-reversing	
26	Stick Machine	1	New	DOL/Non-reversing	
27	Stick Machine Separator	0	New	DOL/Non-reversing	
28	Inclined Cylinder Cleaner	1	New	DOL/Non-reversing	
29	Inclined Cylinder Cleaner Separator	0	New	DOL/Non-reversing	
30	Horizontal Cylinder Cleaner Trash Vacuum (Future)	0	Future	DOL/Non-reversing	
31	Horizontal Cylinder Cleaner Trash Conveyor (Future)	0	Future	DOL/Non-reversing	
32	Horizontal Cylinder Cleaner (Future)	1	Future	DOL/Non-reversing	
33	Impact Cylinder Cleaner Separator Fan	1	New	DOL/Non-reversing	
34	TrashMaster Cylinder Cleaner Separator Fan	1	New	DOL/Non-reversing	
35	Stick Machine Separator Fan	1	New	DOL/Non-reversing	
36	Inclined Cylinder Cleaner Separator Fan	1	New	DOL/Non-reversing	
37	Tower Drier 1B Separator	0	New	DOL/Non-reversing	
38	Tower Drier 2B Separator	0	New	DOL/Non-reversing	
39	Tower Drier 1B Burner Fan	1	New	DOL/Non-reversing	
40	Tower Drier #2B Hot Air Pull Fan	3	New	DOL/Non-reversing	
41	Tower Drier 1A Separator	0	New	DOL/Non-reversing	
42	Tower Drier 2A Separator	0	New	DOL/Non-reversing	
43	Tower Drier 1A Burner Fan	1	New	DOL/Non-reversing	
44	Tower Drier #2A Hot Air Pull Fan	3	New	DOL/Non-reversing	
45	Feed Control Bottom Vacuum Feeder	0	New	DOL/Non-reversing	
46	Feed Control Separator and Top Vacuum Feeder	0	New	DOL/Non-reversing	
47	Unloading Fan	3	New	DOL/Non-reversing	
48	Feed Control Drive	00	New	480V/460V VFD	New

3 – Inputs and Outputs (I/O):

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- a) Discrete Inputs - 230
- b) Discrete Outputs - 130
- c) Analog Inputs – 26
- d) Analog Outputs – 20
- e) Contractor to provide 20-25% spare I/O capacity.

4 – PLC and HMI:

- a) PLC and HMI(s) to be mounted in stand-alone console with plinth.
- b) Console to be of NEMA 4 steel construction, similar to Hammond Manufacturing Series 2CLC (source, data sheet tENH-142, www.automationdirect.com).
- c) Actual dimensions of console to be determined by size and physical layout of PLC, number and dimensions of HMIs and associated electrical controls and devices.
- d) Console top panel to include minimum three (3) hardwired devices, one red-lighted Emergency Stop PB, one key- lock On/Off switch and one green-lighted Manual Re-Set PB.
- e) The following exemplifies acceptable PLC manufacturers. Substitutions are acceptable but must be pre-approved by client.
 - 1) Schneider M340
 - 2) Allen Bradley COMPACTLOGIX 5380
 - 3) Siemens SIMATIC S7-1500
 - 4) Omron NX1P2
 - 5) Automation Direct BRX
- f) There is no preference for supply of HMI(s). HMI(s) must meet U.S. Government requirements for source. Unit(s) shall be of the size and resolution to clearly display fifty (50) motor start/stop stations in one screen. For example 25" panel at minimum Full HD 1920 x 1080 resolution.

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Supplier to determine minimum number of HMI units necessary to satisfy client requirements.

5 – Starters:

a) The following is the accepted list of non-reversing NEMA 1 type with electronic starter manufacturers, not in any order of preference. Substitutions are acceptable but must be pre-approved by client.

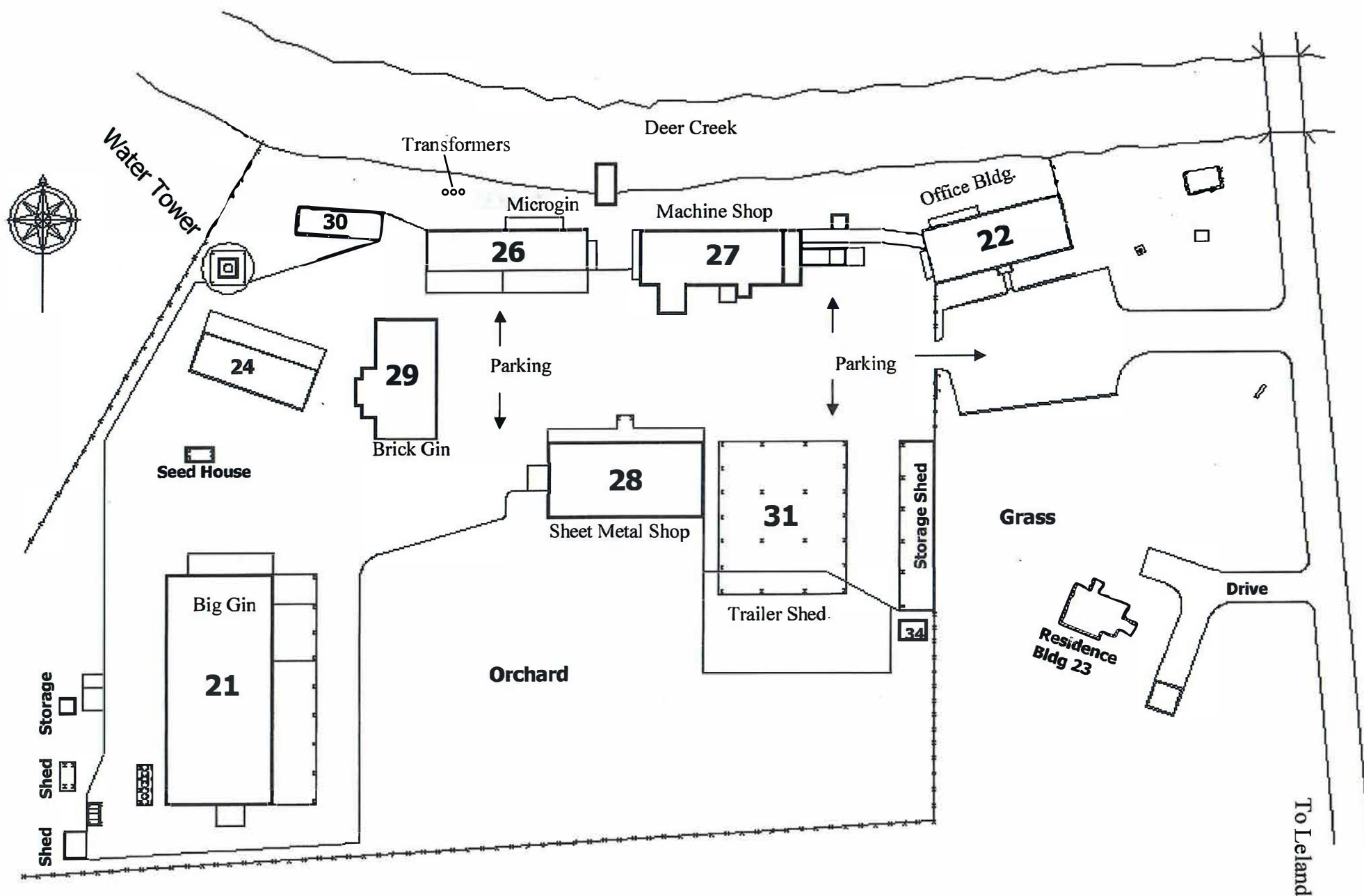
- 1) ABB Electrification U.S.
- 2) Schneider Electric
- 3) Eaton
- 4) Siemens
- 5) Rockwell Automation (Allen Bradley)
- 6) Mitsubishi Electric
- 7) Fuji Electric
- 8) General Electric

b) The following is the accepted list of Variable Frequency Drives in order of preference. Substitutions are acceptable but must be pre-approved by client.

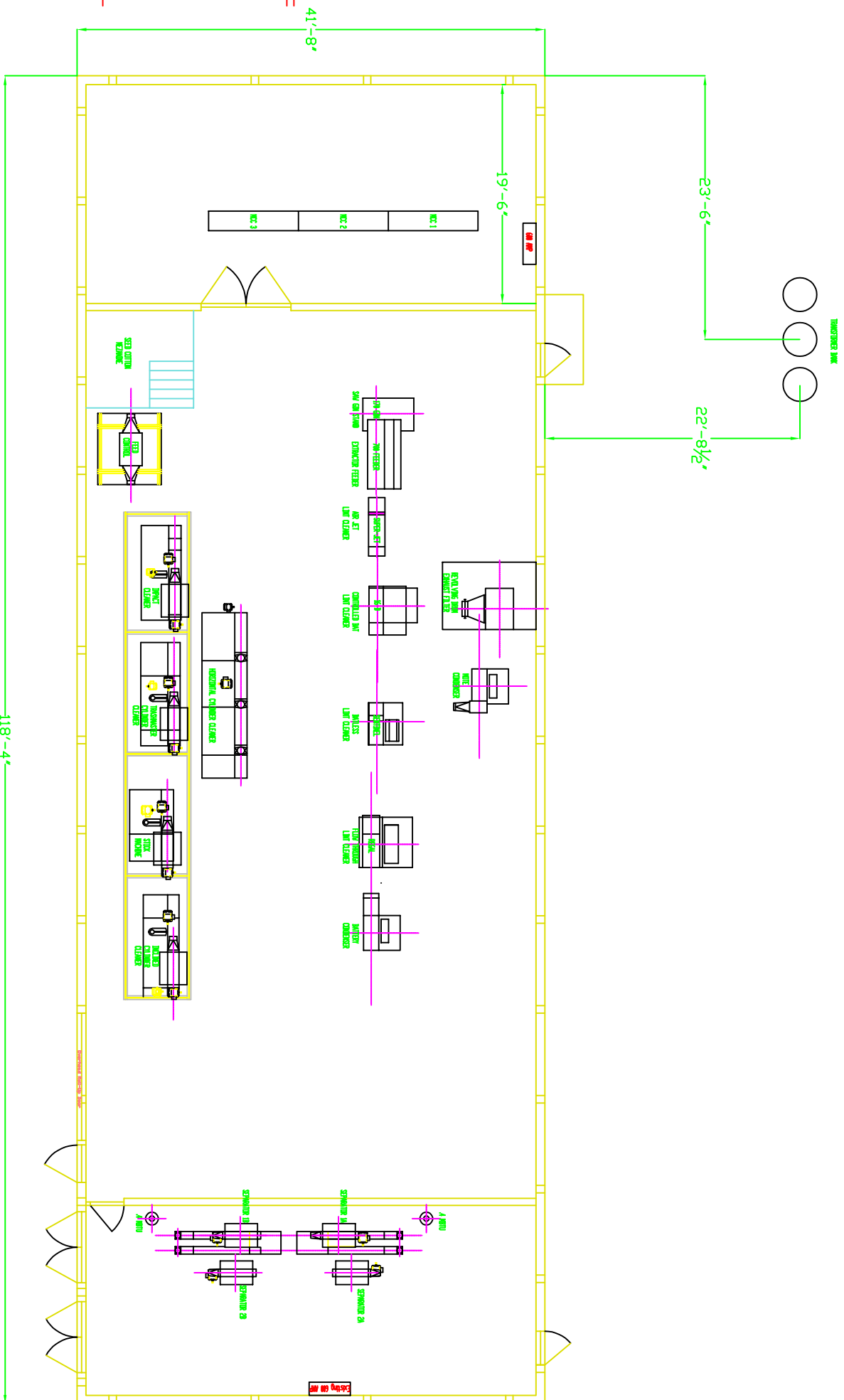
- 1) Schneider Altivar ATV340
- 2) Eaton Power XL DX1
- 3) Mitsubishi FR-A800

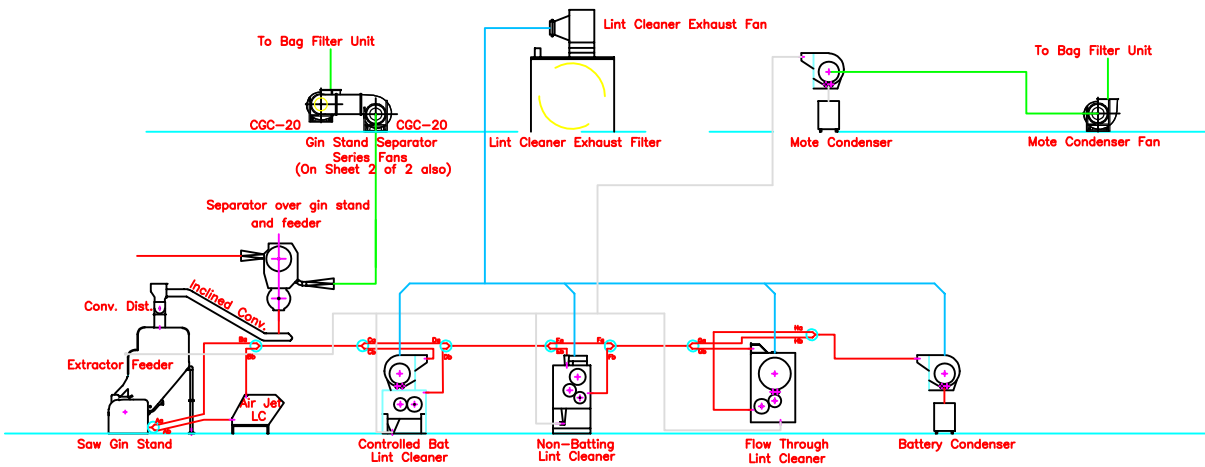
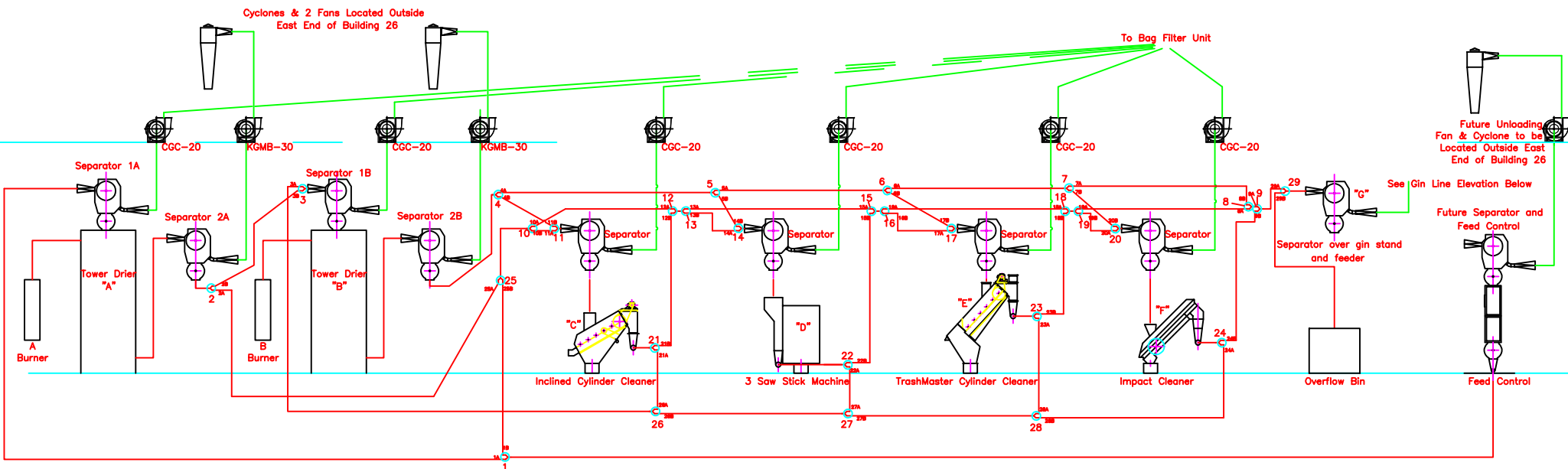
6- Time Frame and Delivery::

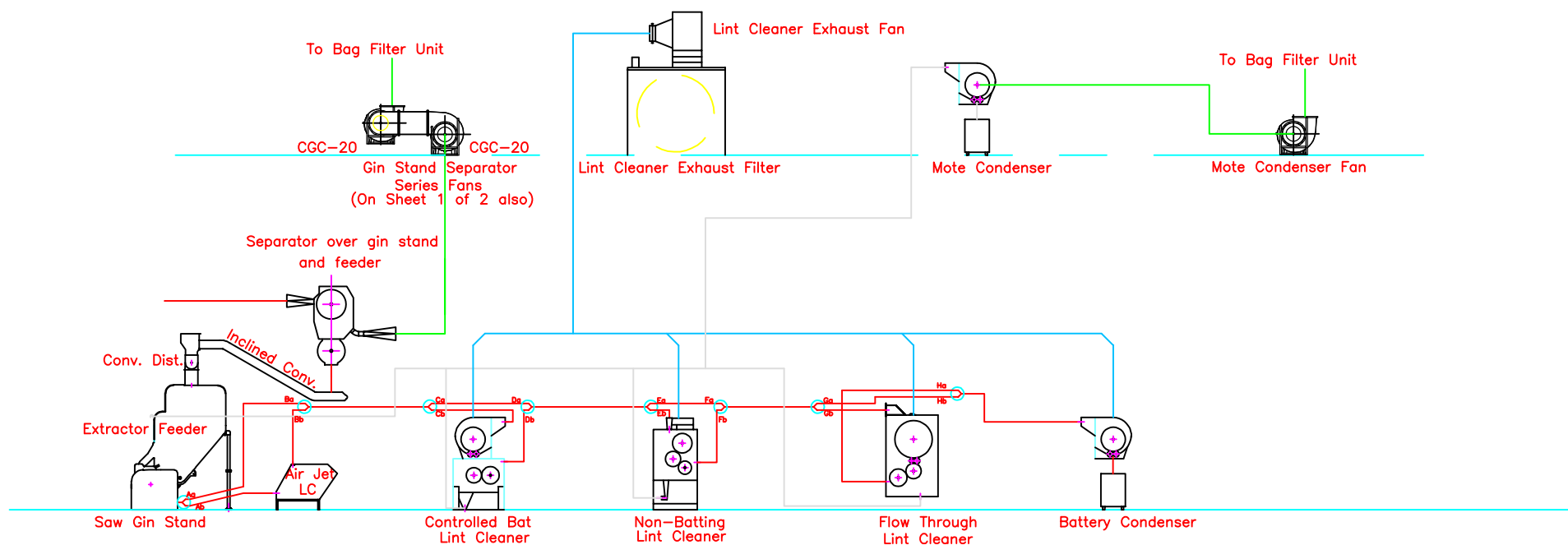
a) PLC and HMI delivery and installation complete by April 1, 2027.



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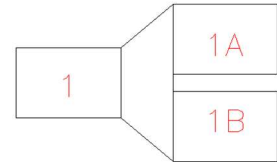






Micro Gin Pre-Cleaning Machine Selector Scheme

	ID	Machine
	A	1st Stage Tower Drier
	B	2nd Stage Tower Drier
	C	Inclined Cylinder Cleaner
	D	Stick Machine
	E	TrashMaster Cylinder Cleaner
	F	Impact Cleaner
	G	Overflow Separator



From/To refers to material flow direction

Valve Scheme			Valve Scheme
	ID	From	To
1	1	Feed Control	
2	1A		Inlet 1A Tower Drier Separator
3	1B		B side of valve 25
4	2	Discharge 1B Tower Drier Separator	
5	2A		A side of valve 25
6	2B		B side of valve 3
7	3		Inlet 1B Tower Drier Separator
8	3A	Outlet of valve 26	
9	3B	B side of valve 2	
10	4	Discharge 2B Tower Drier Separator	
11	4A		Inlet of valve 5
12	4B		B side of valve 11
13	5	A side of valve 4	
14	5A		Inlet of valve 6
15	5B		B side of valve 14
16	6	A side of valve 5	
17	6A		Inlet of valve 7
18	6B		B side of valve 17
19	7	A side of valve 6	
20	7A		B side of valve 8
21	7B		B side of valve 20
22	8		A side of valve 9
23	8A		A side of valve 19
24	8B	A side of valve 7	
25	9		Inlet of valve 29
26	9A	Outlet of valve 8	
27	9B	B side of valve 24	

		Valve Scheme	Valve Scheme
	ID	From	To
28	10	Outlet of valve 25	
29	10A		A side of valve 12
30	10B		A side of valve 11
31	11		Separator over Inclined Cylinder Cleaner C
32	11A	B side of valve 10	
33	11B	B side of valve 4	
34	12		Inlet of valve 13
35	12A	A side of valve 10	
36	12B	B side of valve 21	
37	13	Outlet of valve 12	
38	13A		A side of valve 15
39	13B		A side of valve 14
40	14		Separator over Stick Machine D
41	14A	B side of valve 13	
42	14B	B side of valve 5	
43	15		Inlet of valve 16
44	15A	A side of valve 13	
45	15B	B side of valve 22	
46	16	Outlet of valve 15	
47	16A		A side of valve 18
48	16B		A side of valve 17
49	17		Separator over TrashMaster E
50	17A	B side of valve 16	
51	17B	B side of valve 6	
52	18		Inlet of valve 19
53	18A	A side of valve 16	
54	18B	B side of valve 23	
55	19	Outlet of valve 18	
56	19A		A side of valve 8
57	19B		A side of valve 20
58	20		Separator over Impact Cleaner F
59	20A	B side of valve 19	
60	20B	B side of valve 7	
61	21	Discharge of Inclined Cylinder Cleaner C	
62	21A		A side of valve 26
63	21B		B side of valve 12
64	22	Discharge of Stick Machine D	
65	22A		A side of valve 27
66	22B		B side of valve 15