CORN PROCESSING SYSTEM

Sequence of Operation for CompactLogix 5380

1. SYSTEM OVERVIEW

The system consists of **4 Material Groups** separated by **3 Pneumatic Gates**. Material flows forward, but control logic operates in reverse (pull system) - triggered by Receiver's START button.

Material Flow Diagram

[GROUP 1] → GATE 1 → [GROUP 2] → GATE 2 → [GROUP 3] → GATE 3 → [GROUP 4]

Feeder Tray → Sheller/Conveyor/Aspirator → VMEK → Seed Treater R12

(Material_Gate) → (Aspirator_Hooper_Gate) → (R12_Hopper_Gate)

⚠ **CRITICAL:** Only ONE material per group at any time. Groups must be EMPTY before receiving new material.

2. GROUP DEFINITIONS

Group	Location	Equipment	Exit Gate
1	Feeder Tray	Bandeja + Barcode Scanner	**Material_Gate**
2	Shelling + Transfer	AEC Sheller → Air Conveyor → Aspirator → Aspirator Hopper	**Aspirator_Hooper_Gate**
3	VMEK Processing	VMEK (Color Sorter + Counter) → R12 Hopper	**R12_Hopper_Gate**
4	Seed Treatment	Seed Treater R12 → Envelope	— *(Final)*

3. CONTROL LOGIC (PULL SYSTEM)

The Receiver operator controls the system with the **START button**. When pressed, system checks conditions from Group 4 backwards to Group 1.

START Button - ENABLED when:

- Group 4 (Seed Treater) = EMPTY
- R12_Ready = TRUE
- R12_Envelop_Present_Sensor = TRUE
- Compressed_Air = TRUE
- No active faults

Cascade Sequence (on START)

1. **Open R12_Hopper_Gate:** Transfer Group 3 → 4
2. **When Group 3 empty:** Open Aspirator_Hooper_Gate, transfer Group 2 → 3
3. **When Group 2 empty:** Open Material_Gate + Air_Conveyor + Aspirator_Gate
4. **Group 1 empty:** Loader can load new material

4. GATE CONTROL CONDITIONS

Gate	Open Conditions	Close Conditions
Material_Gate *(Group 1→2)*	• Group 2 = EMPTY • Material in Group 1 • Compressed_Air = TRUE	• AEC_Material_Sensor = FALSE (no material for 3 sec)

Gate	Open Conditions	Close Conditions
Aspirator_Hooper_Gate *(Group 2→3)*	• Group 3 = EMPTY • VMEK = READY (OPC) • Material in Group 2 • Compressed_Air = TRUE	• Aspirator_Hopper_Sensor = FALSE (no material for 3 sec)
R12_Hopper_Gate *(Group 3→4)*	• Group 4 = EMPTY • R12_Ready = TRUE • R12_Envelop_Present = TRUE • START button pressed • Compressed_Air = TRUE	• R12_Hopper_Sensor = FALSE (no material for 3 sec)

Air Conveyor & Aspirator Gate (Synchronized)

Air_Conveyor and **Aspirator_Gate** operate together - both ON when material transfers through Group 2, both OFF when complete.

5. PLC I/O MAPPING

Hardware: CompactLogix 5380 (192.168.101.96)

Slot 1: Digital Inputs (5069-IB16)

IN	Tag Name	Address
0	AEC_Sheller_ON	Local:1:I.Pt00.Data
1	Compressed_Air	Local:1:I.Pt01.Data
2	Dust_Colletor_ON	Local:1:I.Pt02.Data
3	Seed_Treater_R12_Running	Local:1:I.Pt03.Data
4	Material_Gate_Open_Pos	Local:1:I.Pt04.Data
5	Material_Gate_Close_Pos	Local:1:I.Pt05.Data
7	AEC_Material_Sensor	Local:1:I.Pt07.Data
8	Aspiration_Gate_Open	Local:1:I.Pt08.Data
9	Aspiration_Gate_Close	Local:1:I.Pt09.Data
10	Aspirator_Hopper_Sensor	Local:1:I.Pt10.Data
11	R12_Hopper_Sensor	Local:1:I.Pt11.Data
12	R12_Gate_Open_Pos	Local:1:I.Pt12.Data
13	R12_Gate_Close_Pos	Local:1:I.Pt13.Data
14	R12_Ready	Local:1:I.Pt14.Data
15	R12_Envelop_Present_Sensor	Local:1:I.Pt15.Data

Slot 2: Digital Inputs (5069-IB16)

IN	Tag Name	Address
0	Aspirator_Hooper_Gate_Close_Pos	Local:2:I.Pt00.Data
1	Aspirator_Hooper_Gate_Open_Pos	Local:2:I.Pt01.Data
2-15	*SPARE*	Local:2:I.Pt02-15.Data

Slot 3: Digital Outputs (5069-OB16)

OUT	Tag Name	Address
0	AEC_Sheller_Run_Command	Local:3:O.Pt00.Data
1	AEC_Sheller_Stop_Command	Local:3:O.Pt01.Data
2	R12_Permit	Local:3:O.Pt02.Data
3	Material_Gate_Open	Local:3:O.Pt03.Data
4	Air_Conveyor	Local:3:O.Pt04.Data
5	Aspirator_Hopper_Gate	Local:3:O.Pt05.Data
6	Aspirator_Gate	Local:3:O.Pt06.Data
7	R12_Hopper_Gate	Local:3:O.Pt07.Data

Ethernet Devices

IP Address	Equipment
192.168.101.96	PLC (CompactLogix 5380)
192.168.101.102	PanelView 1 (Loader HMI)
192.168.101.103	PanelView 2 (Receiver HMI)
192.168.101.104	Printer (Zebra Label)
192.168.101.105	VMEK (OPC UA)
192.168.101.106	R12 Seed Treater
192.168.101.100	Edge Gateway Optix

6. EMERGENCY STOP

System stops when:

- Compressed_Air = FALSE
- Dust_Colletor_ON = FALSE
- OPC connection lost to VMEK

- Manual E-STOP pressed

Actions:

- All gates HOLD current position
- Disable START button
- Display fault on HMI
- Require supervisor override to restart