

I-STATION 3000 CONTROL SYSTEM
INDEX K-SERIES CAPSULE FILLER



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REVISION 1.01

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I. INTRODUCTION

- a. The purpose of this document is to describe the operation of the *I-Station 3000 Control System* and its associated support equipment. In this installation, the operator uses the *I-Station 3000 Control System* to control and monitor the operations of an Index K Series Capsule Filler.

II. OVERVIEW OF TERMS

a. PROGRAMMABLE LOGIC CONTROLLER (PLC)

- The Proface AGP 3500 PLC is a computer designed specifically for process control that uses the Ladder Logic programming language. It continually monitors process conditions via analog and digital inputs from field instrumentation and performs adjustments to the process with analog and digital outputs by using interlock logic, sequence logic, PID control and alarm checking. The PLC for this system will be an Proface AGP 3500 with I/O modules.

b. ANALOG & DIGITAL INPUTS / OUTPUTS (I/O)

- The term I/O will refer to the *I-Station's* PLC I/O modules. The input points on the modules translate electrical signals from field instrumentation into the appropriate PLC signals. The output points on the modules translate PLC commands into electrical signals appropriate to control field instrumentation.

c. OPERATOR INTERFACE TERMINAL (OIT)

- The OIT is the local control station used for primary operation of the Index K Series Capsule Filler. For this system, the OIT will consist of a Proface AGP 3500 system with an integrated PLC and Remote IO. The Proface AGP 3500 system has a touch screen to allow the User to push directly on the attached 10.4-inch color display to enter process information or confirmation of actions.

d. *I-Station* CONTROL SYSTEM

- Whenever the term *I-Station* is used in this document, it refers to the *I-Station 3000* control system as a whole. This includes the following:
 - The PLC
 - Analog & Digital I/O
 - The OIT
 - Capsule Filler
- The *I-Station 3000* performs the interlock checking required for safe operation of the Index Capsule Filler. All functions are User-initiated through the OIT for the appropriate equipment.

e. User

- The term User shall refer to the person entering commands or actions on the Proface AGP 3500 System through the integral Touch Screen. To operate the system, the User can 'press' a button or object shown on the screen by pressing on that area of the screen with a finger.

f. HMI (Human Machine Interface) OPERATOR INTERFACE

- The HMI Operator Interface is the primary User interface for controlling the operation of the Index Capsule Filler. The HMI for the *I-Station 3000* Control System is a Proface AGP 3500 Color display terminal. The operation of each component is described below.

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g. MAIN POWER DISCONNECT

The main power disconnect is a large knob located on the right side of the electrical enclosure. To supply power to the machine, rotate the knob 90 degrees clockwise from 'O' to 'I'. To remove power from the machine at any time, rotate the knob 90 degrees counter-clockwise from 'O' to 'I'. Read all electrical requirements and safety warnings before supplying power to the machine. Observe all safety warnings always and use proper safety equipment when appropriate.



CAUTION: After Turning off the Main Power wait 30 seconds to allow the Drives to Power Down before turning the Main Power back on. Failure to do so may damage the Drive and cause Faults.

III. TITLE SCREEN

The Title Screen is displayed after the initial startup of the HMI, as well as after the 'Log Out' button has been pressed. To advance to the next screen press the 'Log In' button.



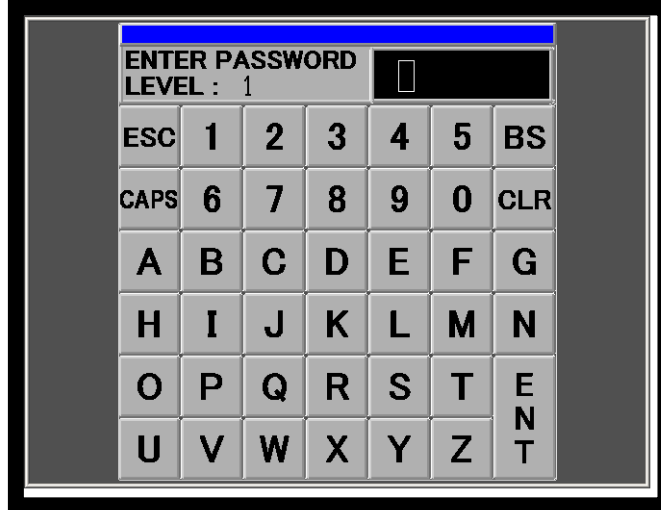
IV. USER LOGIN SCREEN

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The User Login Screen is used for logging into and out of the control system. The User logs in as follows:

- The User starts the login process by pressing the 'LOGIN' icon.
- The Keyboard Entry Screen will appear after the Log In button has been pressed.



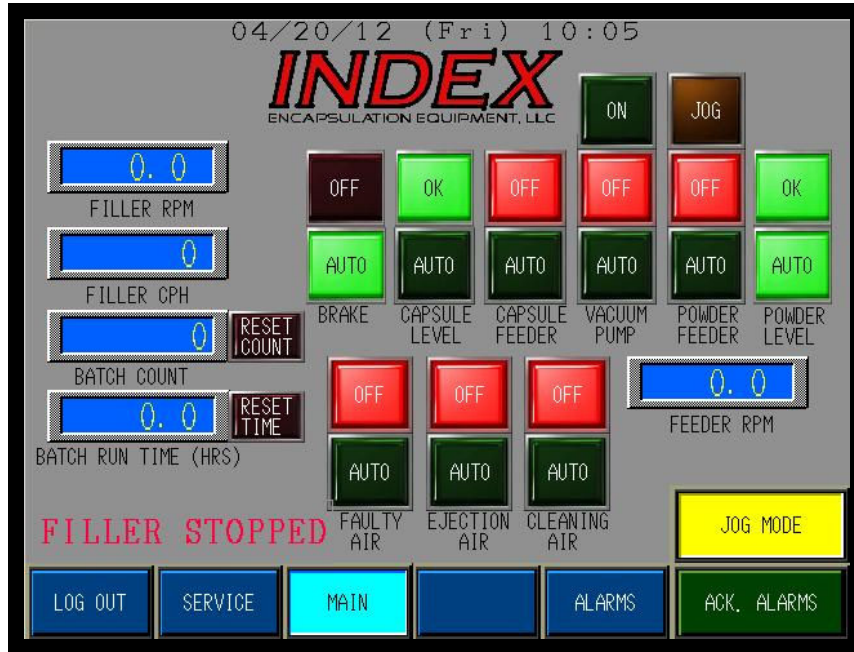
- The User enters their PASSWORD and presses the ENT function key. The USER LOGIN screen appears on the display again.
- If the Password is present in the database, then he/she will be granted access to the control system at the User level assigned to them.
- The User logs out of the control system by pressing the LOG OUT function key.
- Each User can be assigned to one of three levels of access to the system and can be configured by a User of the appropriate level. The levels configured are Operator, Maintenance, and Factory.
 1. **Operator Level:** Access to Operation and Alarm Screens
 2. **Maintenance Level:** Access to Operation, Alarm, and Service Screens
 3. **Factory Level:** Access to Operation, Alarm, Service and Factory Screens

CAUTION: Always turn the machine by hand prior to jogging or running the machine, especially after making adjustments or changing parts and tooling. Failure to do so can result in damage and a machine crash.

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V. OPERATIONS SCREEN 1



The Operation Screens allow the user to control and monitor the Capsule Filler.

a. Main Motor Drive

- The Main Motor is controlled by the START, STOP, and JOG push buttons (pictured below) on the HMI panel.

b. "JOG MODE" / "AUTO MODE"

- When in the Auto Mode setting, the machine will run at the 'Filler RPM' speed. The button will turn Green in the Auto Mode. Press the START push button to run the machine.
- When in the Jog Mode setting, the machine will run at the 'Jog RPM' speed which can be adjusted on the service screen. The button will turn yellow in the Jog Mode. Press the JOG push button to jog the machine.



STOP
START
JOG

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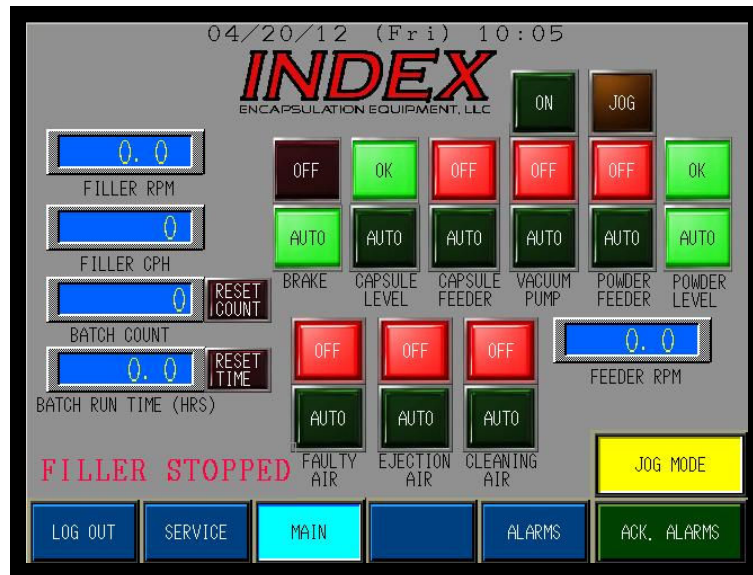
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- c. **FILLER RPM**
 - Displays the machine rate in (Main Shaft) Revolution Per Minute (RPM).
 - When the Filler RPM display box is touched a keypad will appear. To change the speed, enter the desired speed in the keypad and press the ENT icon.
- d. **FILLER CPH**
 - Displays the theoretical number of Capsules Per Hour filled and ejected by the capsule filler. The theoretical capsules per hour is determined by multiplying the revolutions per minute by the number of capsules per segment and multiplying that number by 60 (minutes).
- e. **BATCH COUNT**
 - Displays the theoretical number of capsuled filled and ejected during the batch.
 - The Batch Count can be reset by pressing and holding the 'Reset Count' Button for 6 seconds.
- f. **BATCH RUN TIME**
 - Displays the amount of hours the machine has been in the run mode during the current batch.
- g. **BRAKE**
 - **AUTO:** When the Brake is in Auto Mode, the AUTO button above 'BRAKE' will change color from dark green to bright green. In Auto mode, the brake will automatically engage when the machine is operated.
 - **OFF:** When the Brake is Off, the OFF button will change color from dark red to bright red. When the brake is off, the brake is disengaged to allow the drive to spin freely. This allows the User to spin the drive by hand.

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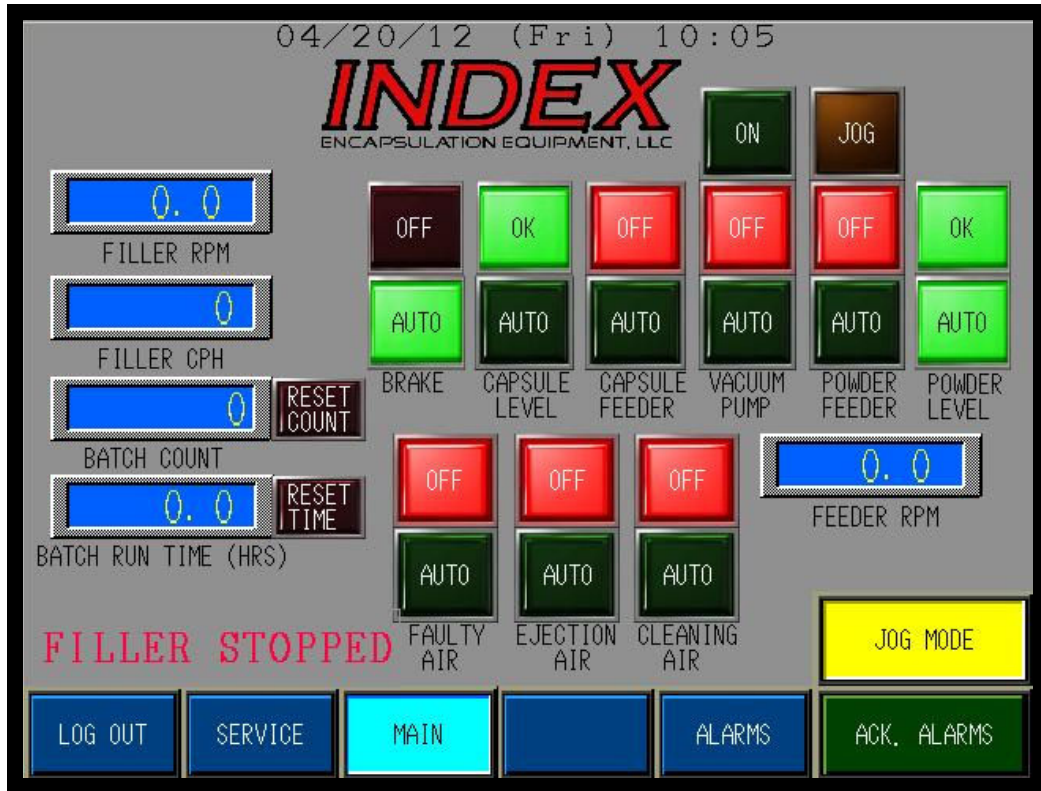
h. CAPSULE LEVEL

- When the Capsule Level Mode is set to Auto, the 'AUTO' button color will change from dark green to bright green. The Capsule Level Status, which is above the AUTO button, will switch from 'OK' (green icon) to 'LOW' (yellow icon) immediately after the Capsule Hopper Sensor (pictured below) stops sensing capsules. After the "CAPSULE LEVEL EMPTY" time (which is set on Service Screen 2) has passed, the status will change from 'LOW' to 'EMPTY' (red icon). In the Auto mode, when the status changes from LOW to EMPTY the "CAPSULE HOPPER EMPTY" alarm will trigger. The alarm will stop the machine so that the user can fill the Capsule Hopper, changing the status from 'EMPTY' (red) to 'OK' (green.)



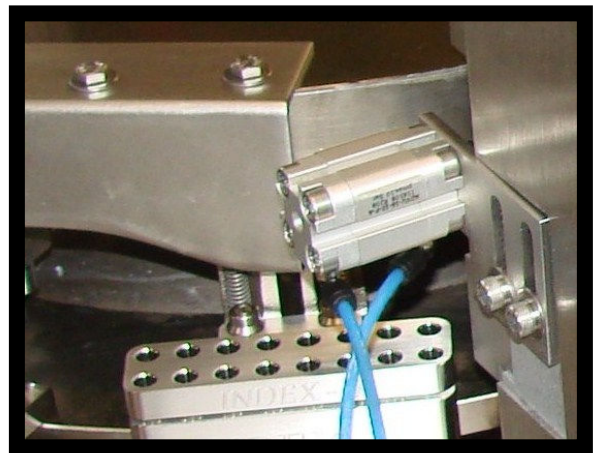
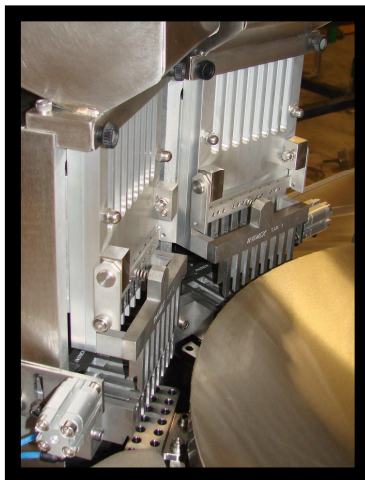
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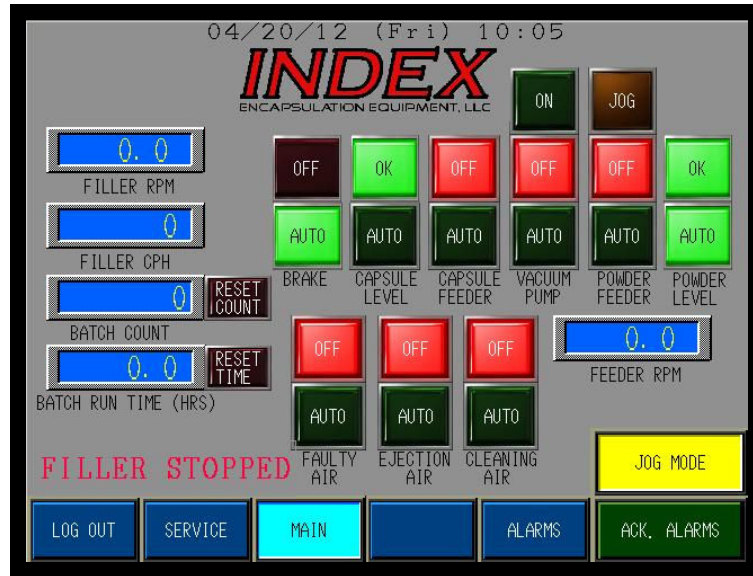
i. CAPSULE FEEDER

- **AUTO:** When the Capsule Feeder Mode is set to Auto, the color of the button will change from dark green to bright green. In Auto Mode, the Capsule Feed Air Cylinders (pictured below right) will automatically activate and allow the Magazines (pictured below left) to drop the capsules into the Orientation Blocks.
- **OFF:** When the Capsule Feeder Mode is set to Off, the color of the button will change from dark red to bright red. When in the Off Mode the Capsule Feed Air Cylinders will not activate, which allows the machine to operate without capsules.



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j. VACUUM PUMP

- **ON:** In the ON Mode, the ON button above 'VACUUM PUMP' will be bright green. In the On mode, the Vacuum Pump stays on, even after the machine has been stopped.
- **OFF:** In the OFF Mode, the OFF button above 'VACUUM PUMP' will be bright red. In the OFF Mode, the Vacuum Pump stays off, even after the machine has been started.
- **AUTO:** In the AUTO Mode, the AUTO button above 'VACUUM PUMP' will be bright green. In the AUTO Mode, when the machine is stopped, the Pump will automatically turn off after a prescribed amount of time, which can be adjusted via the "Vac Auto Off" setting on the Service Screen 2 on page 18.

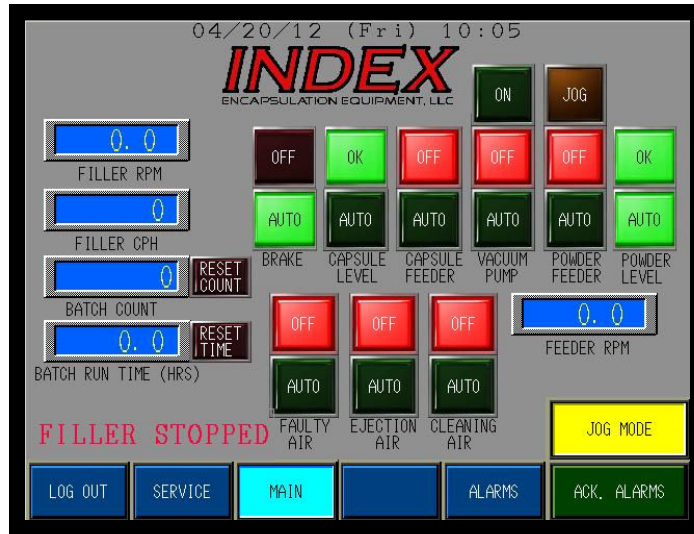
k. POWDER FEEDER

- **JOG:** When the JOG button above 'POWDER FEEDER' is pressed, the color will change to bright yellow. This button allows the operator to manually fill the Powder Bowl with powder by activating the Powder Motor and turning the Powder Auger.
- **OFF:** When the OFF button above 'POWDER FEEDER' is pressed, the color will change to bright red. When activated, the Powder Feeder will not feed powder into the Powder Bowl.
- **AUTO:** When the AUTO button above 'POWDER FEEDER' is pressed, the color will change to bright green. In Auto mode, the Powder Motor will automatically fill more powder into the Powder Bowl after the prescribed amount of time (set on Service Screen 2, pg. 17) has passed after the Powder Sensor (pictured below) has stopped sensing powder.



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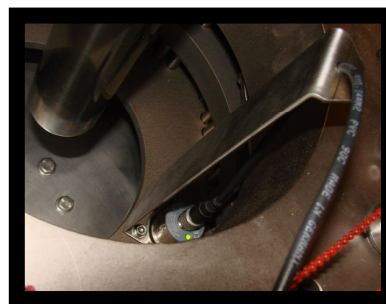


I. POWDER LEVEL

- When the Powder Level Mode is set to Auto, the AUTO button color will change from dark green to bright green. The Powder Level Status, which is the icon above the AUTO button, will switch from 'OK' (green) to 'LOW' (yellow) immediately after the Powder Bowl Sensor (pictured below) stops sensing powder.
- The LOW (yellow) status will trigger the Powder Motor to activate and fill the Powder Bowl with more powder after the 'POWDER FEED DELAY' (which is set on Service Screen 2) time has passed. The Powder Motor will over feed powder after the status has changed from LOW to OK for the set amount of time prescribed in the 'POWDER OVERFEED' setting, (Service Screen 2.)
- If the Powder Hopper is out of powder, the status will change from LOW (yellow) to EMPTY (red button) after the 'POWDER LEVEL EMPTY' (Service Screen 2) set time has passed. In the Auto mode, when the status changes from LOW to EMPTY the "POWDER HOPPER EMPTY" alarm will trigger. The alarm will stop the machine allowing the user to fill the Powder Hopper, changing the status from EMPTY to OK.

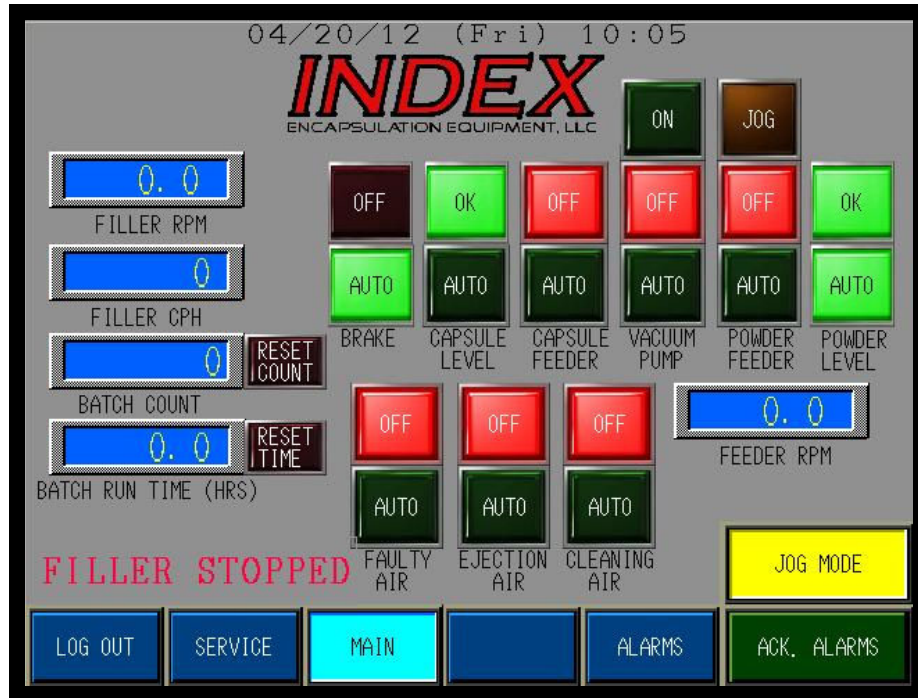
m. FEEDER RPM

- Displays the powder feeder rate in Revolution Per Minute (RPM).
- When the Feeder RPM display box is touched a keypad will appear. To change the speed, enter the desired speed in the keypad and press the ENT icon.



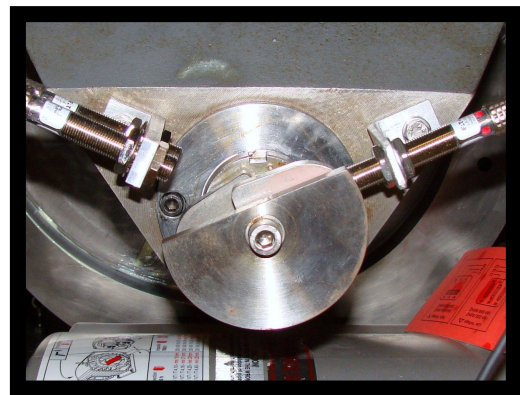
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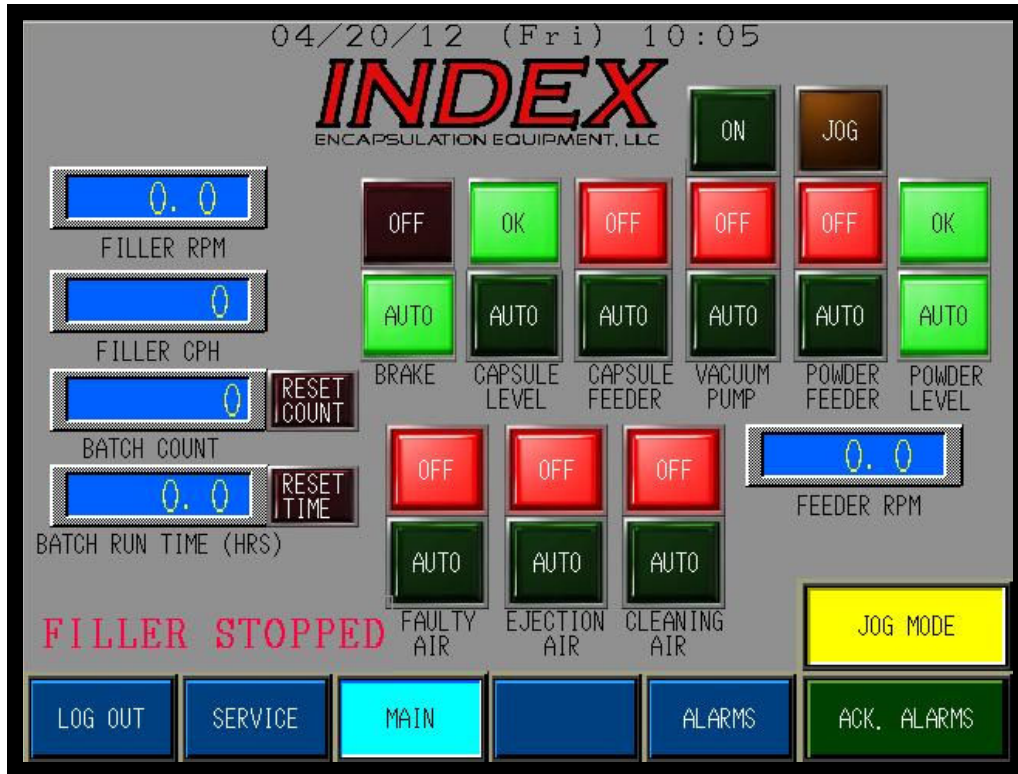
n. **AIR PRESSURE**

- The **FAULTY AIR** (Faulty Capsule Ejection Station), **EJECTION AIR** (Ejection Station), and **CLEANING AIR** (Cleaning Station) enable and disable the air pressure at the Faulty, Ejection, and Cleaning Stations.
- **AUTO**: When the Air Pressure solenoids are in Auto Mode, the AUTO icon will be bright green. The Auto Mode enables the air pressure to activate automatically. The air pressure is controlled by the respective solenoid valves in the Solenoid Bank (pictured below left). The timing of the air pressure can be adjusted by repositioning the small Segment Cam on the end of the main shaft (pictured below right.)
- **OFF**: When the OFF button is pressed, the color will change from dark red to bright red. This will disable the air pressure at the respective air pressure station.



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o. NAVIGATION

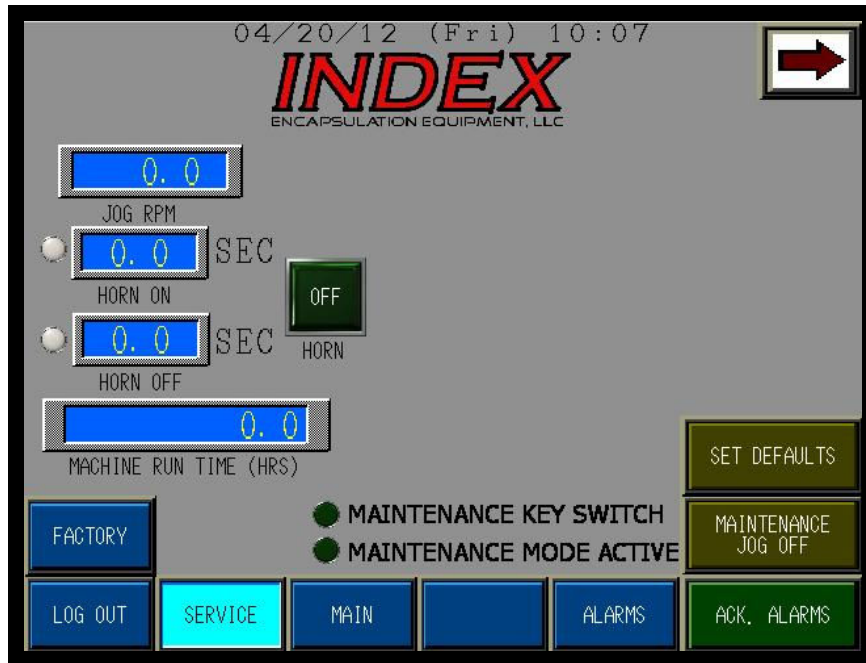
- **LOG OUT:** Pressing the LOG OUT button will navigate the user to the LOG IN screen.
- **SERVICE :** Pressing the SERVICE button will navigate the user to Service Screen 1. The Service screens require a password for users with proper training.
- **MAIN:** The Operation Screen is the Main screen. When on the Operation Screen, the MAIN button will be a bright blue as shown in the screen above.
- **ALARMS:** Pressing the ALARMS button will navigate the user to Alarm Screen 1.
- **ACK. ALARMS:** Pressing the ACK. ALARMS button will acknowledge the alarms without navigating away from the Operation Screen 1.

CAUTION: Only Users with the proper training in servicing the INDEX Capsule Filler should modify the settings on these screens. Possible damage to the equipment or personal injury could occur!

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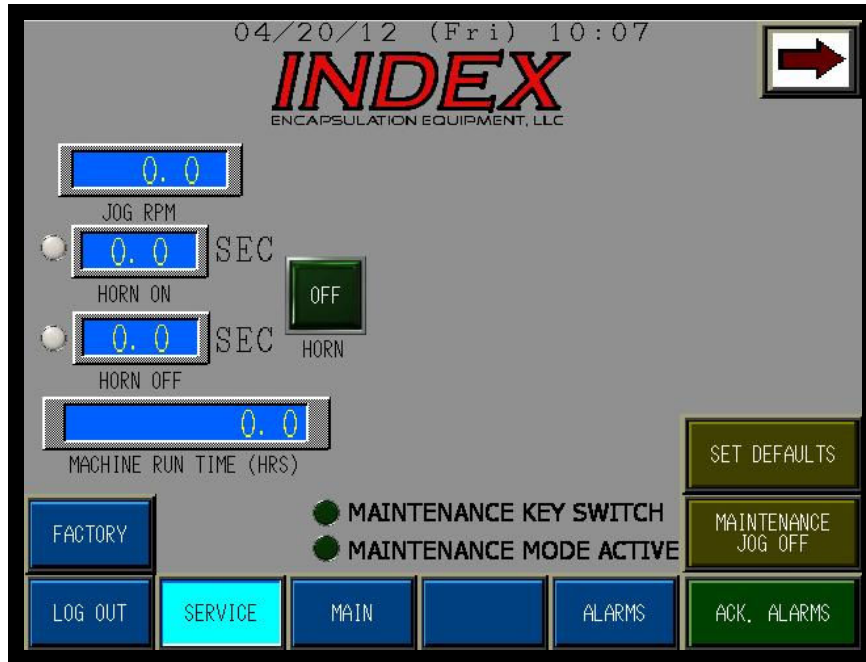
VI. SERVICE SCREEN 1



- a. **SERVICE SCREEN SETTINGS**
 - The service screen settings allow the User to view and modify several parameters that are used during the operation of the Capsule Filler. These parameters can be modified by touching the blue icon settings, entering the new value and pressing the ENT key.
- b. **JOG RPM**
 - The speed setting for jog in Revolutions Per Minute.
- c. **HORN ON**
 - The amount of time the Horn sounds for during an alarm.
- d. **HORN OFF**
 - The amount of time between Horns during an alarm.
- e. **HORN**
 - Press the HORN icon to turn the alarm horn (pictured left) ON (bright green) or OFF (dark green.)
- f. **MACHINE RUN TIME (HRS)**
 - The amount of time the machine has operated in the run mode.

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g. SET DEFAULTS

- Pressing and holding the SET DEFAULTS icon for 6 seconds will adjust all of the settings back to the original factory settings.

h. MAINTENANCE KEY SWITCH

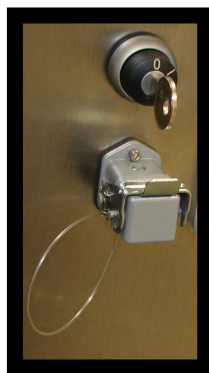
- The light to the left of 'MAINTENANCE KEY SWITCH' will turn green when the Maintenance Key Switch (pictured below) is turned from '0' to '1'.

i. MAINTENANCE MODE ACTIVE

- The light to the left of 'MAINTENANCE MODE ACTIVE' will turn green when the Maintenance Key is turned to the '1' position and the Jokab Two Hand Jog Controller is plugged in.

j. MAINTENANCE JOG (OFF/ON)

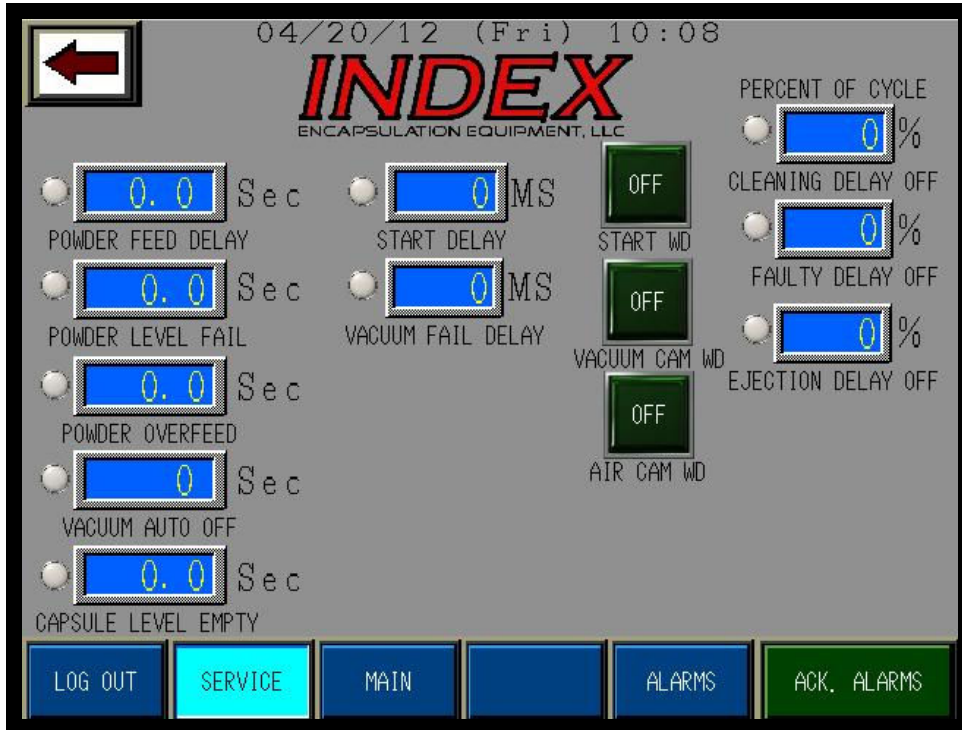
- When the maintenance key (pictured below left) is turned, Maintenance Jog allows qualified personnel to jog the Index Capsule Filler with the doors open using the two hand remote jog controller (pictured below right). The controller requires two hands to operate to prevent the user from placing their hand inside the moving machine and preventing injury. The Maintenance Mode Jog will be disabled unless the key is turned and the controller is plugged in.



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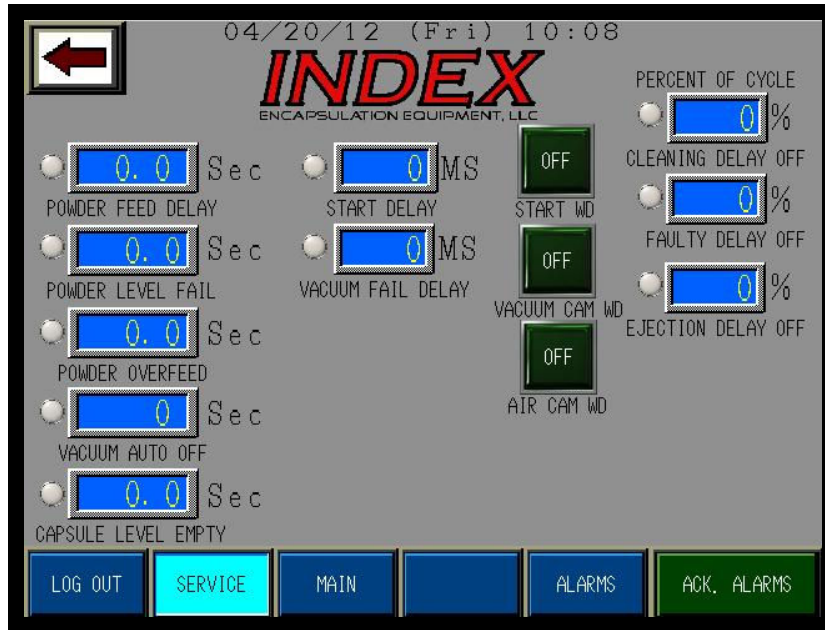
VII. SERVICE SCREEN 2



- a. **POWDER FEED DELAY**
 - The amount of time (0-99 seconds) between the Low Powder Level detection and the Powder Motor/Auger activating.
- b. **POWDER LEVEL EMPTY**
 - The amount of time (0-99 seconds) between the Low Powder Level detection and the 'Powder Hopper Empty' alarm triggering.
- c. **POWDER OVERFEED**
 - The amount of time (0-99 seconds) that Powder Motor remains on after the Powder Level has been satisfied.
- d. **VACUUM AUTO OFF**
 - The amount of time after the machine is stopped until the Vacuum Pump is automatically turned off.
- e. **CAPSULE LEVEL EMPTY**
 - The delay in time after the Capsule Level status changes from OK to LOW and the "Capsule Hopper Empty" alarm triggers, stopping the machine.

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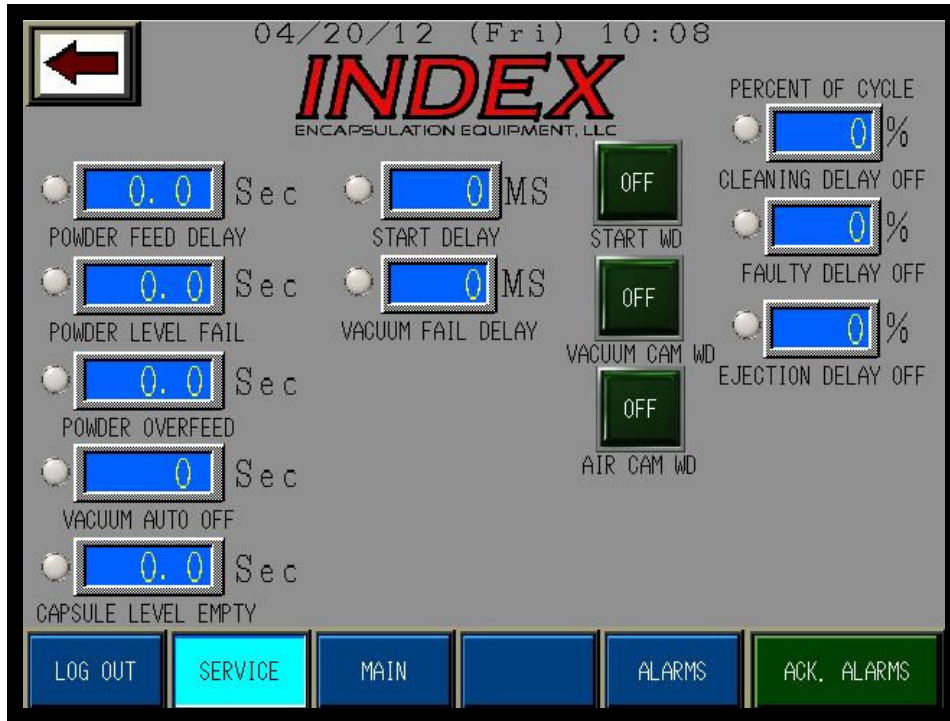
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- f. **START DELAY**
 - The amount of delay time after the start button is pressed and the main motor starts.
- g. **VACUUM FAIL DELAY**
 - The amount of time between the sensor not detecting vacuum pressure and the “Vacuum Level” alarm.
- h. **START WD**
 - When the Start Watch Dog is on, the ‘Filler Start Fail” alarm will sound and stop the machine if the Segment Cam (pictured below) is not detected by the sensor.
- i. **VACUUM CAM WD**
 - When the Vacuum Cam Watch Dog is on, the ‘Missing Vacuum Cam Input’ alarm will sound if the Vacuum Cam (pictured below) is not detected by the sensor. The Vacuum Cam is the large cam.
- j. **AIR CAM WD**
 - When the Segment Cam Watch Dog is on, the ‘Missing Segment Cam Input’ alarm will sound if the Segment Cam (pictured below) is not detected by the sensor.

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k. CLEANING DELAY OFF

- The percentage of time per cycle that the air at the Segment Cleaning Station will be off. If the amount is 0%, the air will discharge throughout the cycle. If the amount entered is 30%, the air will discharge for 30% of the cycle. By setting the amount at a percentage of the cycle, adjustments will not be required with changes in speed or the jog mode.

l. FAULTY DELAY OFF

- The percentage of time per cycle that the air at the Faulty Capsule Ejection Station will be off. If the amount is 0%, the air will discharge throughout the cycle. If the amount entered is 30%, the air will discharge for 30% of the cycle. By setting the amount at a percentage of the cycle, adjustments will not be required with changes in speed or the jog mode.

m. EJECTION DELAY OFF

- The percentage of time per cycle that the air at the Capsule Ejection Station will be off. If the amount is 0%, the air will discharge throughout the cycle. If the amount entered is 30%, the air will discharge for 30% of the cycle. By setting the amount at a percentage of the cycle, adjustments will not be required with changes in speed or the jog mode.

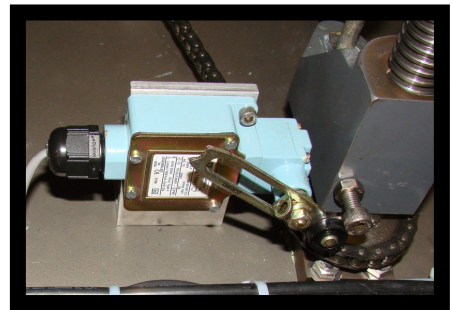
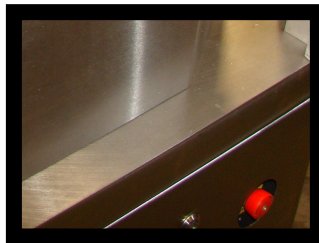
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VIII. **ALARM SCREEN 1** - **Green** is OK, **White** is LOW, **Red** is an ALARM.

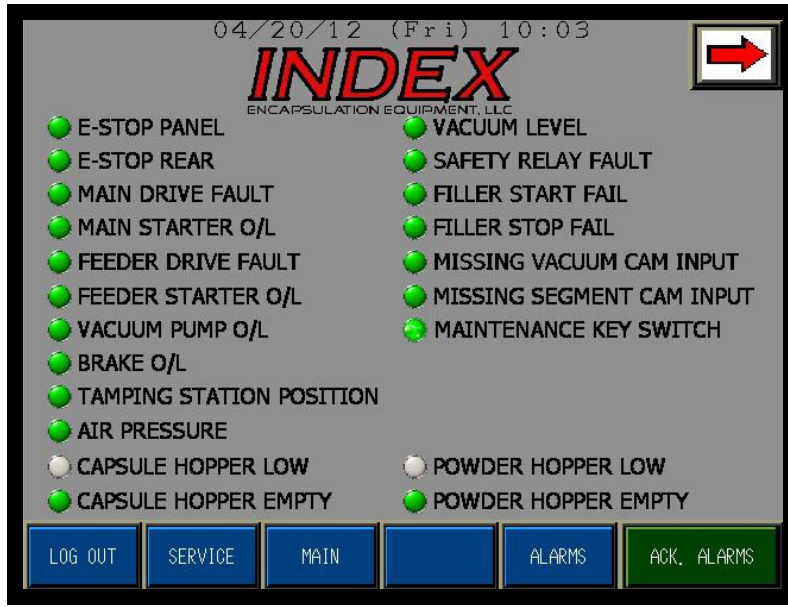


- a. **E-STOP PANEL**
 - The E-Stop on the HMI Touchscreen Enclosure (pictured bottom left) is pressed.
- b. **E-STOP REAR**
 - The E-Stop on the Lower Rear Door (pictured bottom middle) is pressed.
- c. **MAIN DRIVE FAULT**
 - The main drive has an alarm, or has lost power, check drive display and refer to drive manual, cycle power on drive to reset if the drive display has an alarm.
- d. **MAIN STARTER, FEEDER STARTER, VACUUM PUMP, and BRAKE O/L**
 - All of the Overload (O/L's) alarms are current overload circuit protection. The starter is either tripped or off. Check position of operator and reset.
- e. **TAMPING STATION POSITION**
 - The machine will not start if the Tamping Head is raised up or if the Tamping Head Sensor (pictured bottom right) is not sensing the Tamping Head Lift Screw. When this occurs, check the Tamping Head position and ensure that the Tamping Head is down and check the sensor connections.



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f. AIR PRESSURE

- Low or no air pressure being detected.
 - Turn on Air Pressure.
 - Check sensor and Air Pressure connections.

g. CAPSULE HOPPER LOW

- The Capsule Level status switched from OK to LOW because the Capsule Hopper Sensor (pictured bottom left) stopped sensing capsules.
 - Add Capsules.
 - Check sensor connection.

h. CAPSULE HOPPER EMPTY

- The CAPSULE LEVEL EMPTY delay time has passed since the Capsule Hopper Level status switched from OK to LOW.
 - Increase "Capsule Level Empty" time on Service Screen 2.

i. VACUUM LEVEL

- The vacuum level sensor (pictured bottom right) is sensing low or no vacuum pressure. Check: Sensor, Vacuum Connections, Pump Vanes & Filter.

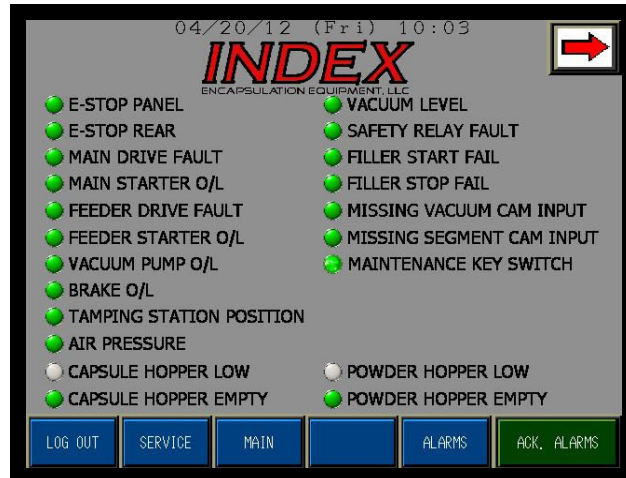
j. SAFETY RELAY FAULT

- The safety relay PLC is faulted.
- Cycle power and re-acknowledge the alarm.



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k. FILLER START FAIL

- When the START push button on the HMI enclosure is pressed, the Start Watchdog uses the Segment Cam Proximity Sensor (pictured left) to detect the Start Cam to ensure that the Main Shaft is turning. If the sensor does not detect the cam within the WATCHDOG % of the cycle (FACTORY SCREEN), the machine will stop and show 'FILLER START FAIL'.
- Check the Segment Cam position and the Sensor position and connections.

l. FILLER STOP FAIL

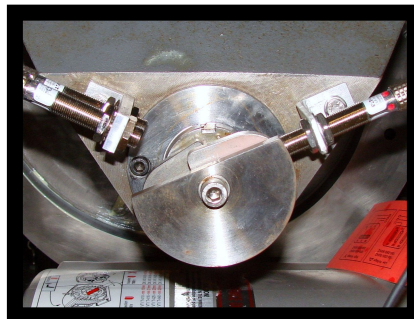
- When the STOP push button on the HMI enclosure is pushed, the machine does not stop until the Start Cam is detected by its proximity sensor. This enables the machine to stop in the correct position. If the sensor does not detect the cam within the WATCHDOG % of the cycle (which is set on the FACTORY SCREEN), the machine will stop and show 'FILLER STOP FAIL'.
- Check the Segment Cam position and the Sensor position and connections.

m. MISSING VACUUM CAM INPUT

- The Vacuum Cam Sensor is not sensing the large Vacuum Cam (pictured below).
- Check the Vacuum Cam position and the Sensor position and connections.

n. MISSING SEGMENT CAM INPUT

- The Segment Cam Sensor is not sensing the small Air Cam (pictured below).
- Check the Segment Cam position and the Sensor position and connections.



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o. MAINTENANCE KEY SWITCH

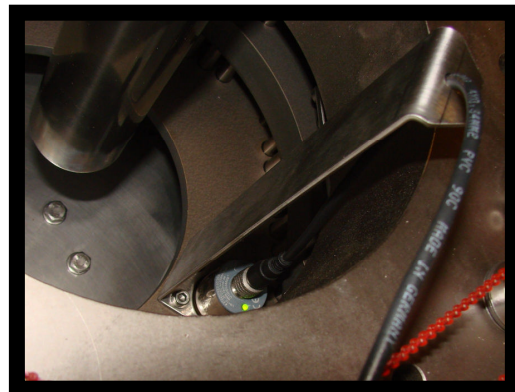
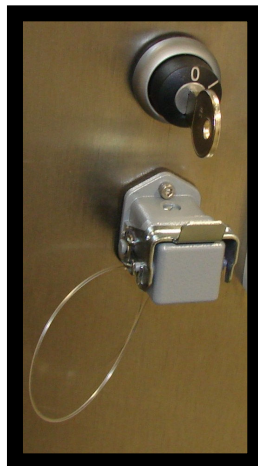
- The user attempted to go into the Maintenance Jog Mode without turning the Maintenance Key Switch (pictured below left.)

p. POWDER HOPPER LOW

- The Powder Level Sensor (pictured below right) has stopped detecting powder.
- In the Auto Mode, the Powder Motor will activate and feed more powder into the Powder Bowl.

q. POWDER HOPPER EMPTY

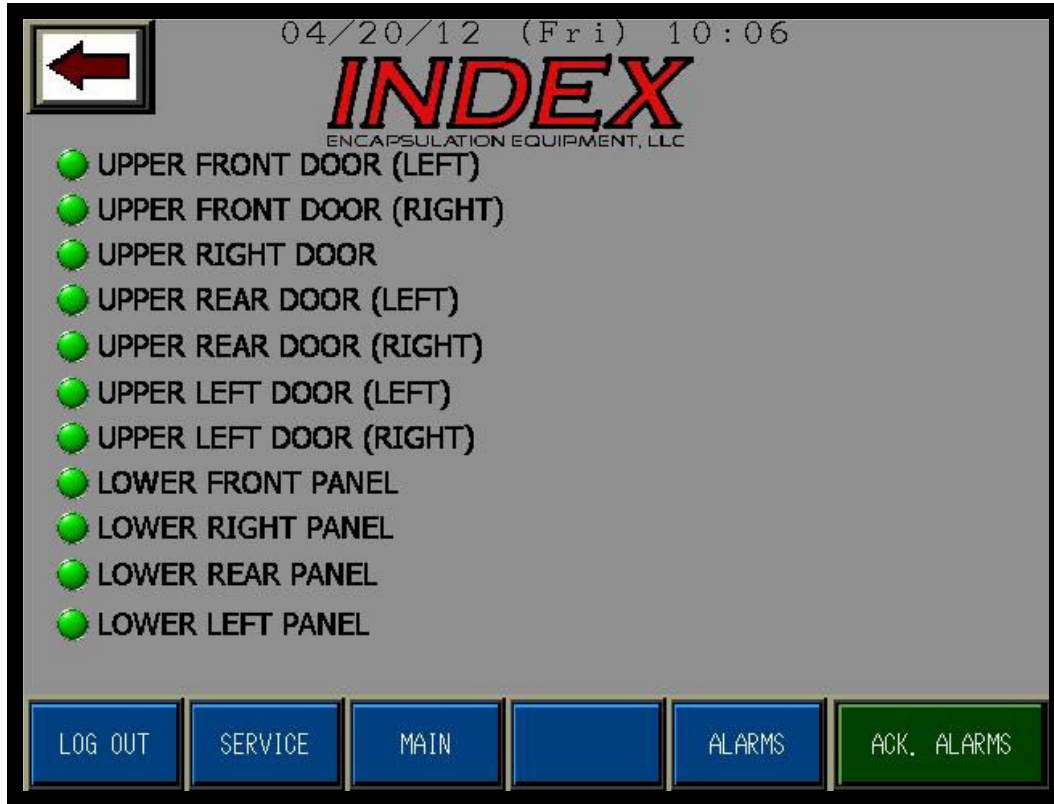
- The POWDER LEVEL EMPTY delay time has passed since the Powder Level status switched from OK to LOW.
- Increase "Powder Level Empty" time on Operation Screen 2.
- Check the Level Sensor connections.
- Increase the POWDER OVERFEED time.
- Add Powder to the Powder Hopper.



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IX. ALARM SCREEN 2 – ENCLOSURE DOORS



- The light to the left of the alarm description is **Green** when the doors are closed and **Red** when the doors are open.
- To disable the alarm, close the door and check the connections and positions of the Jokab RFID door switches (pictured below.)

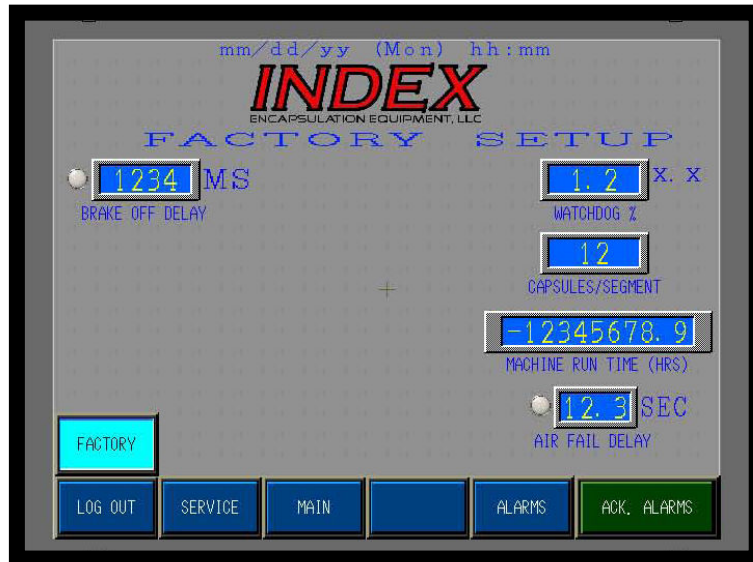


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X. FACTORY SCREEN

The Factory Settings are password protected and set prior to installation.



- a. **BRAKE OFF DELAY**
 - The amount of time between the stop button being pressed and the brake activating.
- b. **WATCHDOG %**
 - The percent of time during the cycle that the Vacuum, Segment, and Pellet Cam Sensors look for their respective Cams. If the sensors do not detect the cam, the respective alarms will trigger.
- c. **CAPSULES / SEGMENT**
 - Depending on the model of the capsule filler, the segments can hold either 12 or 16 capsules per segment.
- d. **MACHINE RUN TIME (HRS)**
 - The total amount of hours the machine has ran in the run mode.
- e. **AIR FAIL DELAY**
 - The amount of time between the machine being turned on without air pressure and the alarm sounding.

Please call Index at 267-387-3000 with any questions or comments.

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