Operations Manual

UWM CSI - Vial Fill Test Bed
Connected Smart Manufacturing (CSM)
APT Manufacturing Solutions

September 16, 2020
Version 1.0

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1 Introduction

1.1 Scope and Purpose

UWM CSI Vial Filling Connected Smart Manufacturing (CSM) System

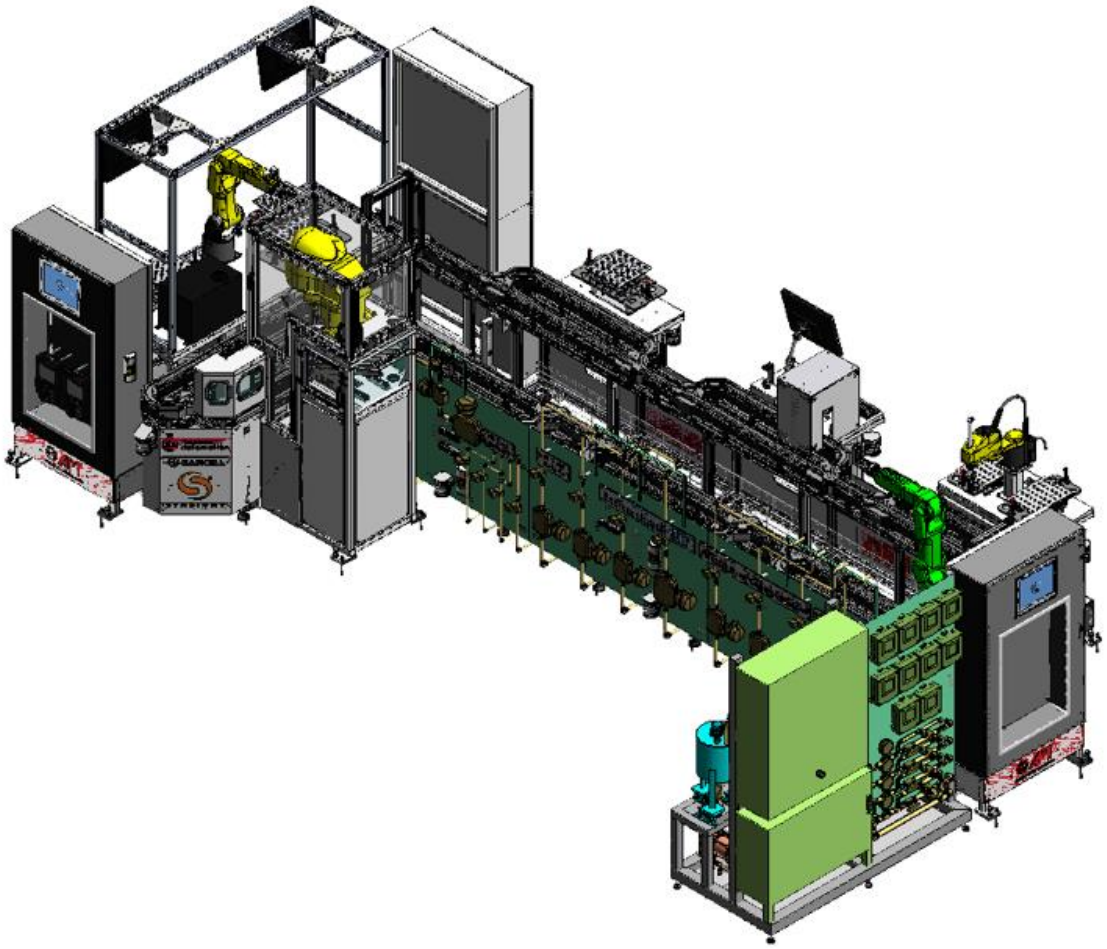

Figure 1-1 Vial Fill CSM System

The UWM CSI Vial Filling CSM System is an intelligent manufacturing system using the latest Industry 4.0 connected advanced manufacturing equipment and techniques to produce vials filled with varying product using a variety of filling methods and capturing process data that can be used for data analysis and system optimization.

The Vial Filling CSM System is a platform that university faculty and students will use for both education and research to further the advancement of a connected enterprise. The CAM components are integrated seamlessly within a fully integrated architecture and connected enterprise using cutting-edge smart-data devices at all layers.

1.2 Process Overview

The process overview detailed in this section describes in general how the Vial Filling Connected Smart Manufacturing system functions as a complete system processing component. Operational steps and slight variances in the process may differ from what is described here depending on the configuration parameters or using the stations in a dry cycle mode.

The Vial Filling CSM utilizes localized system configuration setting within the machine as well as process data requirements and parameters to determine how to process the product and which stations and inspections are required to complete the production job. When running under MES Production Center control, the process requirements and parameters are received from the MES system as to where and how to process and inspect the vials produced by the system.

1.2.1 Station1 – Load / Unload

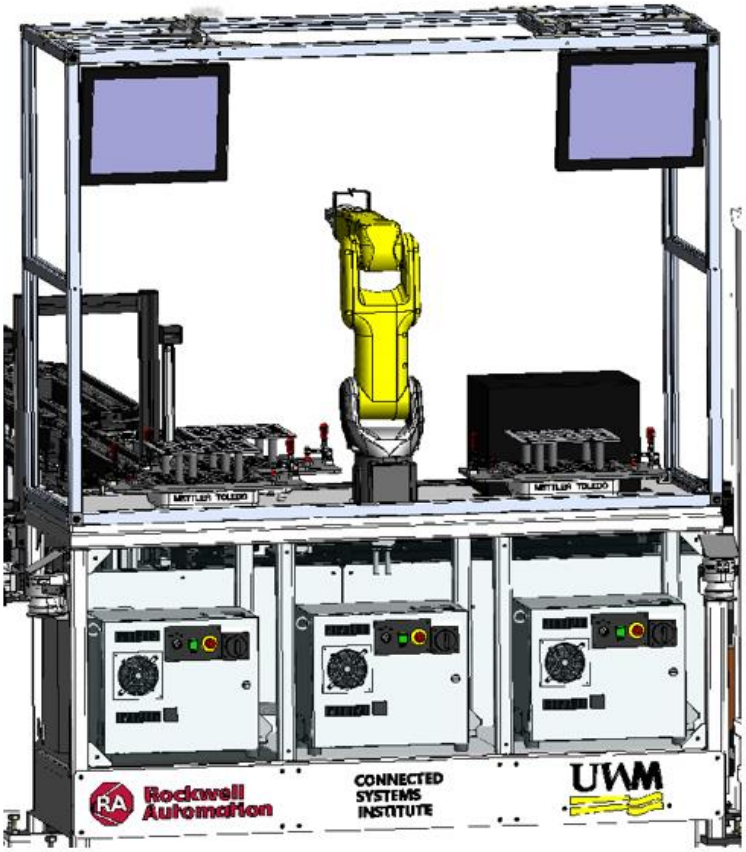

Figure 1-2 Station1 Load / Unload

Station1 is the start of system; Vial Inspect / Load Station. Empty vials are loaded to the system on an array template that sits atop a scale to determine empty vial weight. Once an order is received to process through the MES Production Center, the next available empty vial is retrieved by the FANUC LRMate 200iD 7L robot and then processed through a vision

inspection process as determined by the system configuration. The vial inspection consists of: inspecting the vials for damage or cleanliness by rotating the vial 360 degrees across three different sections of the vial; scanning and associating the vial's 2d bar code data to the scheduled production job. Once the vial inspection process has been completed, the vial is either loaded to the MagneMotion transport system or rejected to the reject parts tray.

Once a good vial is placed to the MagneMotion transport carrier, the production process parameters for that particular vial are loaded into the system's part tracking and traceability logic. These parameters are used and production data is updated as the vial is processed through the system.

Station 1 also received all finished product and stores them to one of two separate array templates. One array template for finished products that has met all process data and inspection criteria and are considered "Good Parts". The other array template for finished products that have failed to meet all process data parameters and inspection criteria and are considered "Bad Parts".

1.2.2 Station2 – Dry Fill

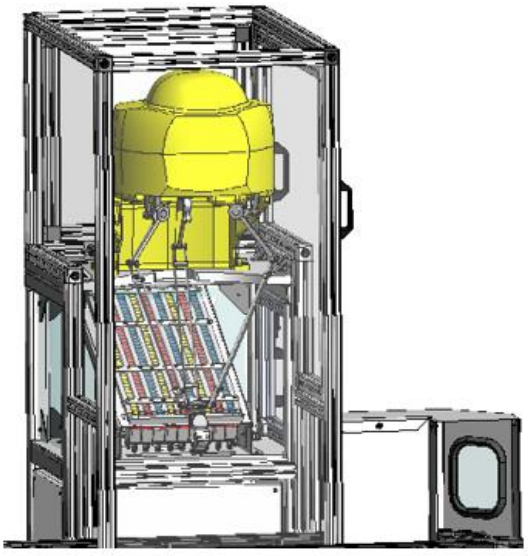

Figure 1-3 Station2 Dry Fill

The Dry Fill station consists of a gravity tray loaded with product of three varying-colored cubes. Each lane of product contains a color sensor to determine the appropriate color product is loaded into each channel. An M1iA robot is used to pick the colored product according to the process parameters.

An empty vial will arrive at this station on the MagneMotion transport system from the load station. The robot will receive the process parameters from the system's part tracking and traceability logic and picks the appropriate quantity in the appropriate order and places them to the vial at the station. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.3 Station3 – Wet Fill (Single Nozzle Sequential)

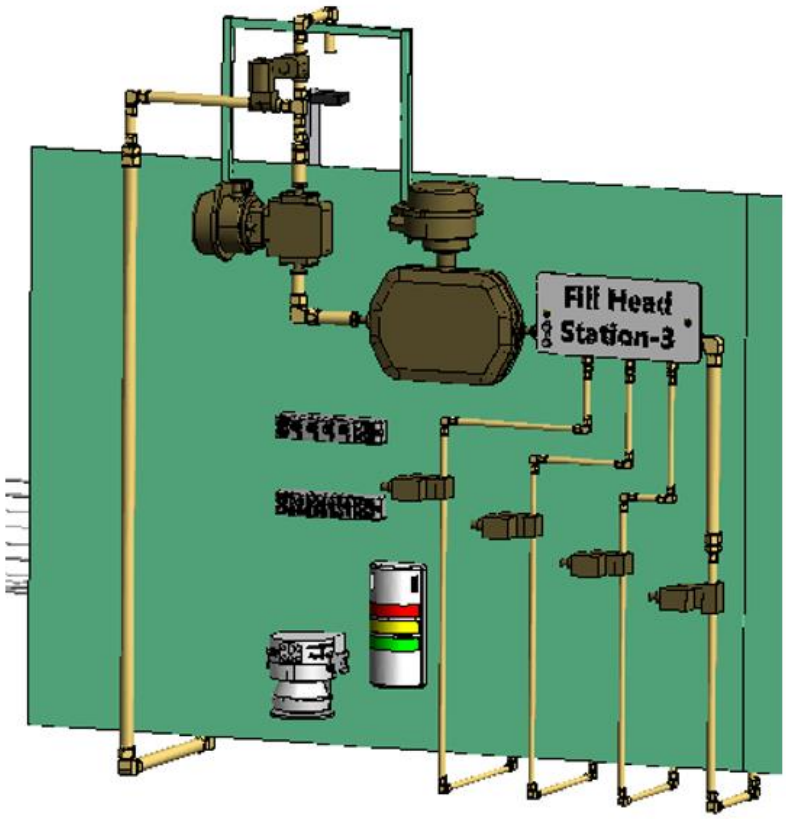

Figure 1-4 Wet Fill Single (Sequential)

The first Wet Fill station consists of a single nozzle used to dispense specified quantities of four different fluids sequentially into the vial located at the station on the MagneMotion carrier. The liquid fill parameters and resulting data are passed between the system PLC and the fluid delivery system PLC.

A vial will arrive at this station on the MagneMotion transport system from the load station or previous processing station. The station will receive the process parameters from the system's part tracking and traceability logic and dispenses the appropriate liquid in the appropriate order into the vial located at the station. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.4 Station4 – Wet Fill (Single Nozzle Mixed)

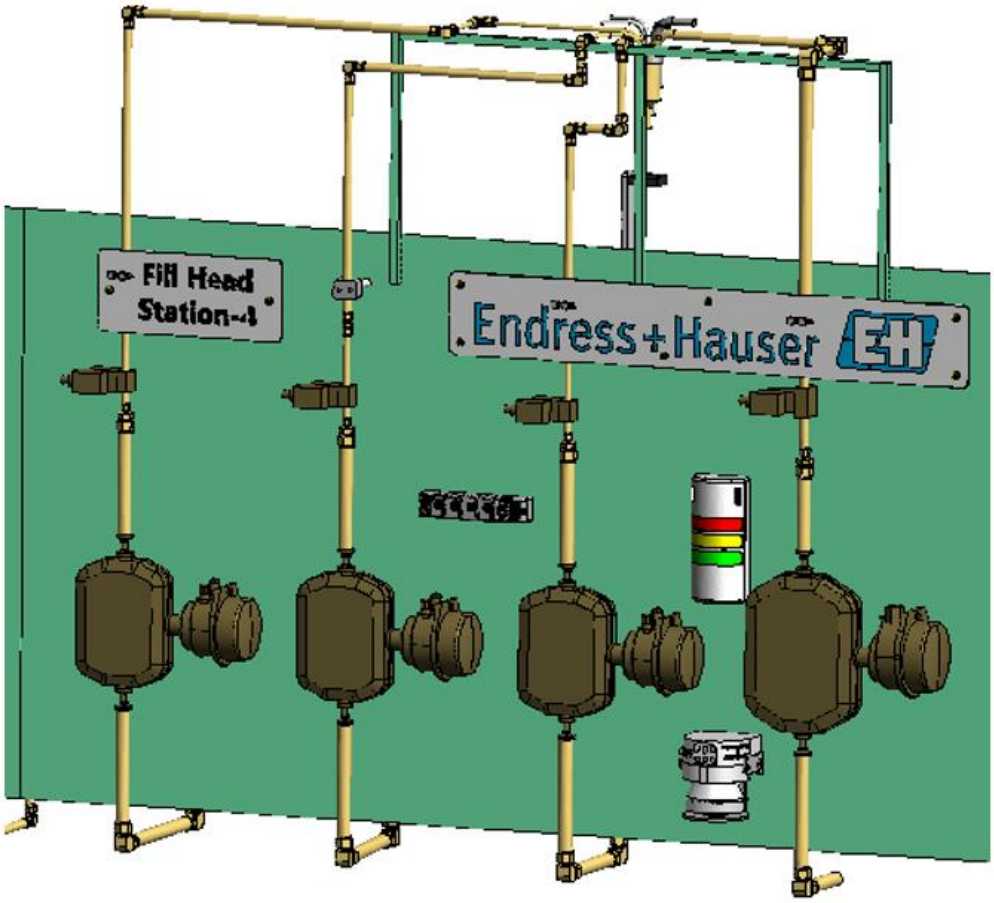

Figure 1-5 Wet Fill Single (Mixed)

The Second Wet Fill station consists of a single nozzle used to dispense specified quantities of four different fluids simultaneously into the vial located at the station on the MagneMotion carrier. The liquid fill parameters and resulting data are passed between the system PLC and the fluid delivery system PLC.

A vial will arrive at this station on the MagneMotion transport system from the load station or previous processing station. The station will receive the process parameters from the system's part tracking and traceability logic and dispenses the appropriate liquid in into the vial located at the station. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.5 Station5 – Wet Fill (Individual)

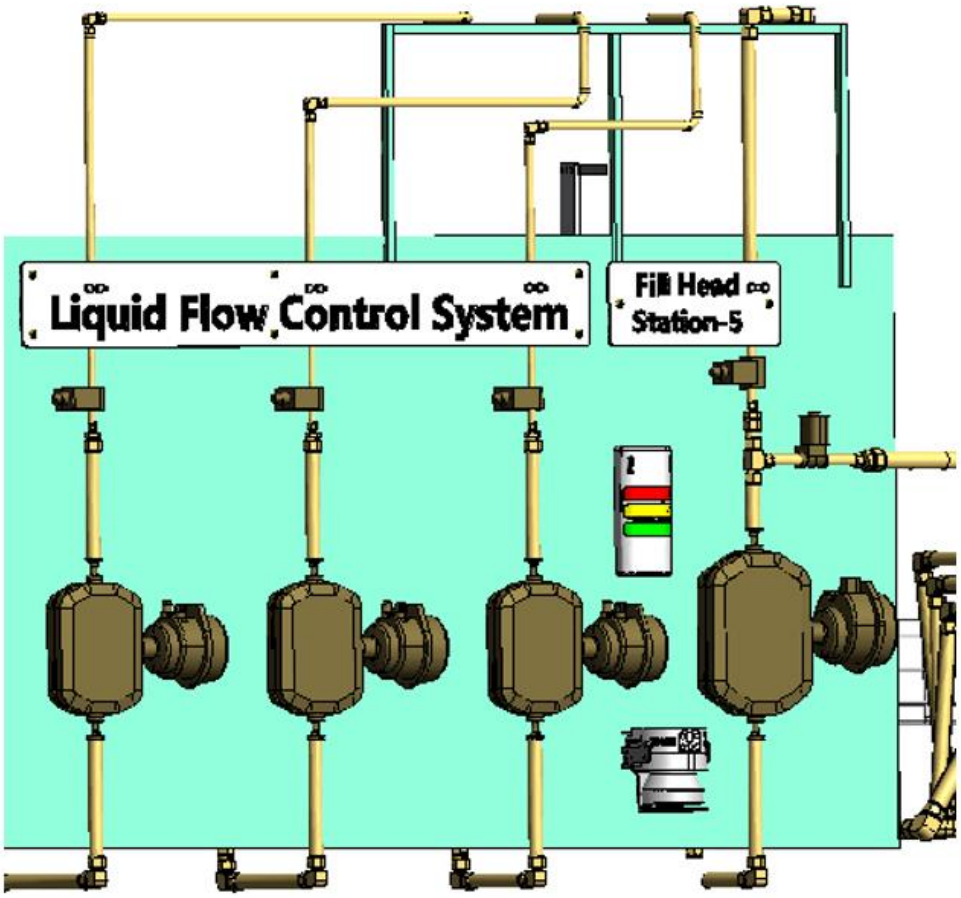

Figure 1-6 Wet Fill Individual (Seuqential)

The third Wet Fill station consists of four separate nozzles used to dispense specified quantities of four different fluids sequentially into the vial located at the station on the MagneMotion carrier. The liquid fill parameters and resulting data are passed between the system PLC and the fluid delivery system PLC.

A vial will arrive at this station on the MagneMotion transport system from the load station or previous processing station. The station will receive the process parameters from the system's part tracking and traceability logic and dispenses the appropriate liquid in the appropriate order into the vial located at the station. This process will repeat through the three other station nozzle positions. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.6 Station6 – Capping

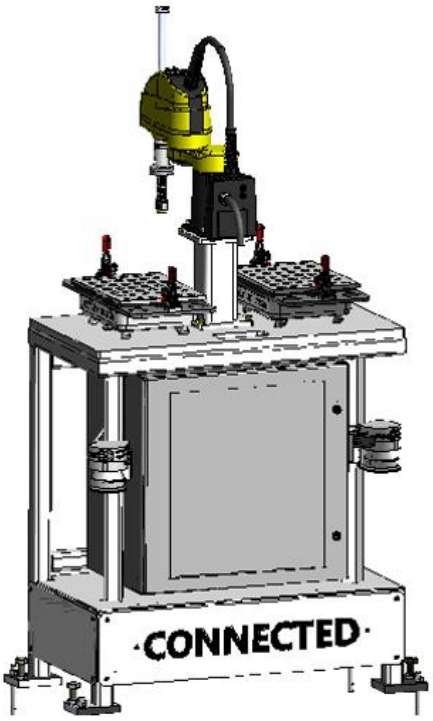

Figure 1-7 Capping Station

The capping station places caps onto the vials as determined by the process parameters for that vial. Caps are loaded to the system onto two array templates that sits atop a scale to determine cap weight. An SR3iA SCARA robot is used to pick the next available cap and place it to the vial loaded on the MagneMotion transport carrier. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.7 Station7 – Vision Inspection

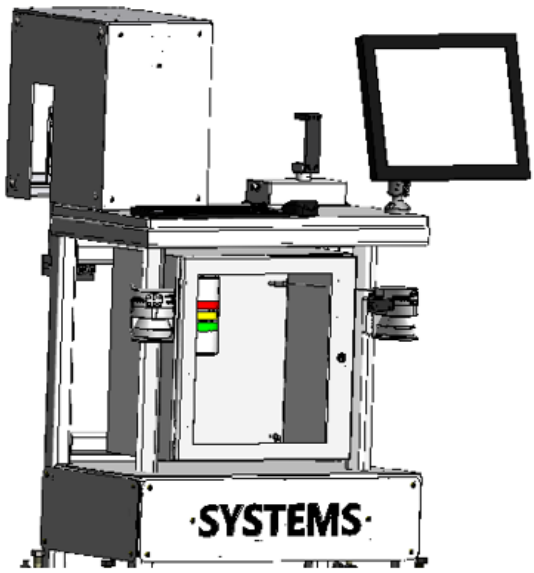

Figure 1-8 Vision Inspection Station

The vision inspection station is used to verify the contents of each vial that it inspects. Depending on the product that is to be inspected, the vision system loads one of two inspection programs. For liquid fill vials, the camera program evaluates the vial and returns RGB values (Red / Greed / Blue) of the inspection area. The resultant data is compared against MES provided process parameters to determine that the vial has the correct or incorrect color. For vials with dry fill contents, the vision system loads an inspection program that retrieved the RGB values for the seven different dry fill positions and compares them to the system's dry fill color setup parameters. The station determines if the vial is loaded with the correct color of dry fill cubes and that they are in the correct order as defined by the MES provided process parameters for that particular vial. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station.

1.2.8 Station8 – Weigh Check

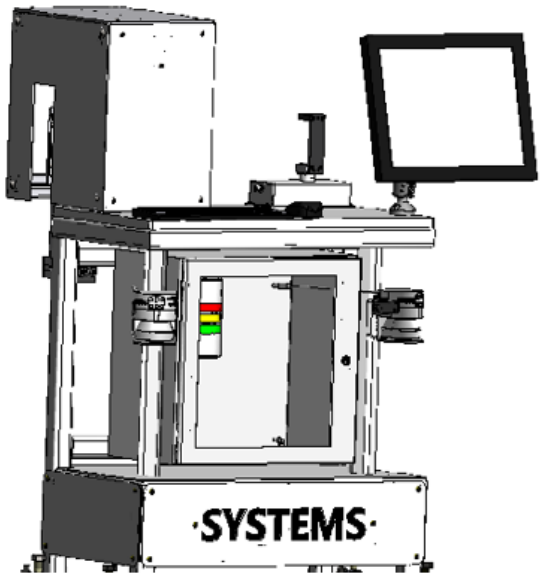

Figure 1-9 Weight Check Station

The weight check station is used to verify weight of the contents of each vial that it inspects against MES provided process parameters. Once a vial arrives at the station on a MagneMotion carrier, the Cr7 Robot retrieves the vial from the MagneMotion carrier and places it to the precision weigh scale. After a brief settling period, the station record the weight and compares the results to the MES parameters to determine to pass or fail the vial. Once completed, the CR7 robot picks the vial from the scale and places it back to the MagneMotion carrier. Upon completion, the station updates the system's part tracking and traceability database and then sends the vehicle on to the next processing station. and send it to the next processing station.

1.2.9 Station9 – Inspect / Repair

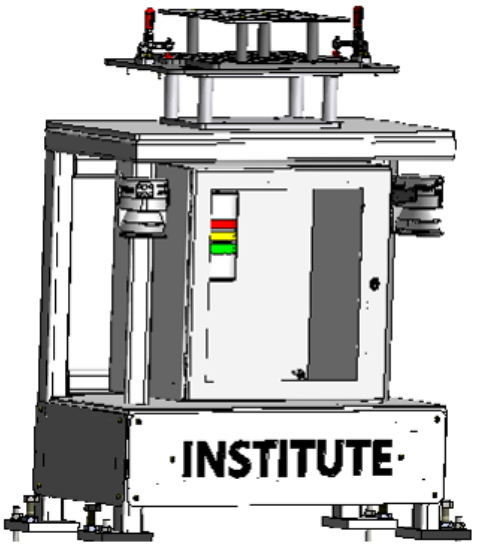

Figure 1-10 Inspect and Repair Station

The intent of the inspect and repair station is for product to be staged for inspection and possible repair by operating personnel. The demonstration program provided with the cell send vials whose process parameters were slightly outside the required specifications to the inspect and repair station. This station is designed for the end-user to develop their own processing and repair criteria and utilize it according to their processes.

Once a vial arrives at the station on a MagneMotion carrier, the Cr7 Robot retrieves the vial from the MagneMotion carrier and places it to the vial array.

1.2.10 MagneMotion Independent Cart Transport System

Figure 1-11 MagneMotion

The MagneMotion Independent Cart Transport system utilizes linear motor technology and magnetic carriers to transport vials throughout the CSI vial filling cell. The system is configured with 17 Nodes (locating positions) on 23 paths. Transport carriers flow through the system stopping at the required process stations or using bypass paths to continue moving throughout the system.

The MagneMotion node controller receives commands from the system's process PLC and in turn monitors and controls the direct motion of the independent cart trafficking, positioning and motion profiles. The system is designed for the end-user to build upon the basic programming provided and take advantage of the technology to develop and test varying delivery system configurations.

2 Safety

2.1 Follow Safety Instructions

Carefully read all safety messages in this manual and on the machine safety signs as depicted in Figure 2.1.

Keep safety signs in good condition. Replace missing or damaged safety signs.

Learn how to operate the machine and how to use controls properly. Do **NOT** let anyone operate the machine without instruction.

Keep the machine in proper working condition. Unauthorized modifications to the machine may impair its function and/or safety and affect the machine's life.

Figure 2-1 Follow Safety Instructions

Whenever encountering the caution symbol in the manual (Fig. 2.2). Carefully read the message text that accompanies the symbol. This caution symbol signals that failure to follow the accompanying message can lead to injury or death to personnel or damage to the

Figure 2-2 Caution Symbol

2.2 Residual Risks

The assembly cell is provided with fixed guarding along with a category 3 performance level d rated safety system. The safety system is meant to prevent the operator from coming into contact with any hazards. However, those hazards still exist. Those hazards are:

- Electrical shock hazard from the cabinet(s) and cable routing
- Pinch point crush hazard from robot(s) and mechanical motion
- Pinch points and trapping hazards from transport system
- Strobing lights from vision systems
- Sharp edges of machines parts
- Chemical / fluid exposure to liquid filling system
- Magnetic hazard from independent cart system
- Wet or slippery surfaces from liquid filling fluid.

2.3 Foreseeable Misuse

- This equipment is not for use within a residential area

- This equipment is designed for indoor use only
- This equipment is not designed for use within a potentially explosive environment
- This equipment is not designed for underground use
- Equipment is designed for educational use only simulating an assembly line with automation and robotics. Do not process any other material apart from that which the machine is designed to process
- Ensure that the correct LOTO is in place prior to any cleaning, repair or maintenance routines
- This equipment is not designed for use with personnel climbing over, on, or into the robot or conveyor and processing stations or maintenance area without following proper control of hazardous energy procedures.

2.4 Safety Precautions

The precautions outlined in this section are not intended to cover all hazards that may exist in a school or on this machine. Usage of safety equipment without common sense will not prevent accidents, nor will it reduce the severity of those accidents which do occur. It requires the constant attention of all personnel within the vicinity of this or any manufacturing operation to maintain a safe operation and work environment. A school and its equipment are only as safe as its faculty and students are safety conscious. Properly trained faculty and students, plus a well-maintained machine will contribute as much toward the overall safety program as any number of mechanical guards and safety devices.

1. Study the operating instructions thoroughly before attempting to install, operate, or maintain this machine.
2. Do **NOT** operate this machine unless all guards are in place and all safety devices are functioning properly. Check all devices before starting this machine.
3. Avoid wearing loose-fitting clothing and jewelry while working on or near moving components.
4. Never leave a running machine unattended. Shut down the machine before leaving the work area.
5. Keep the work area clean and free of grease, oil, water, or obstacles that could cause you to slip or trip and fall.
6. Always perform the safety lockout procedures listed on a LOTO Developed by the end user before performing any maintenance on this machine.

Never alter, by-pass, or otherwise deter the operation of any safety guard or other safety devices on this machine.

2.5 Robot Protective Safety Boundaries, Joint Limits, Force Monitoring

Each Fanuc Robot utilizing Advanced DCS is equipped with motion limiting features as an additional measure to protect personnel. Joint limitations and safety boundaries have been programmed specifically for the work envelope and function of each robot. Any modification to these safety features shall only be performed by qualified personnel and shall require the complete validation and certification of the system safety performance to be completed, then approved of by the end user safety engineer.

Joint limits restrict the individual robot axis to a pre-specified range of motion. Figure 2.3 depicts an example the allowable joint limitations and safety boundaries for the robot.

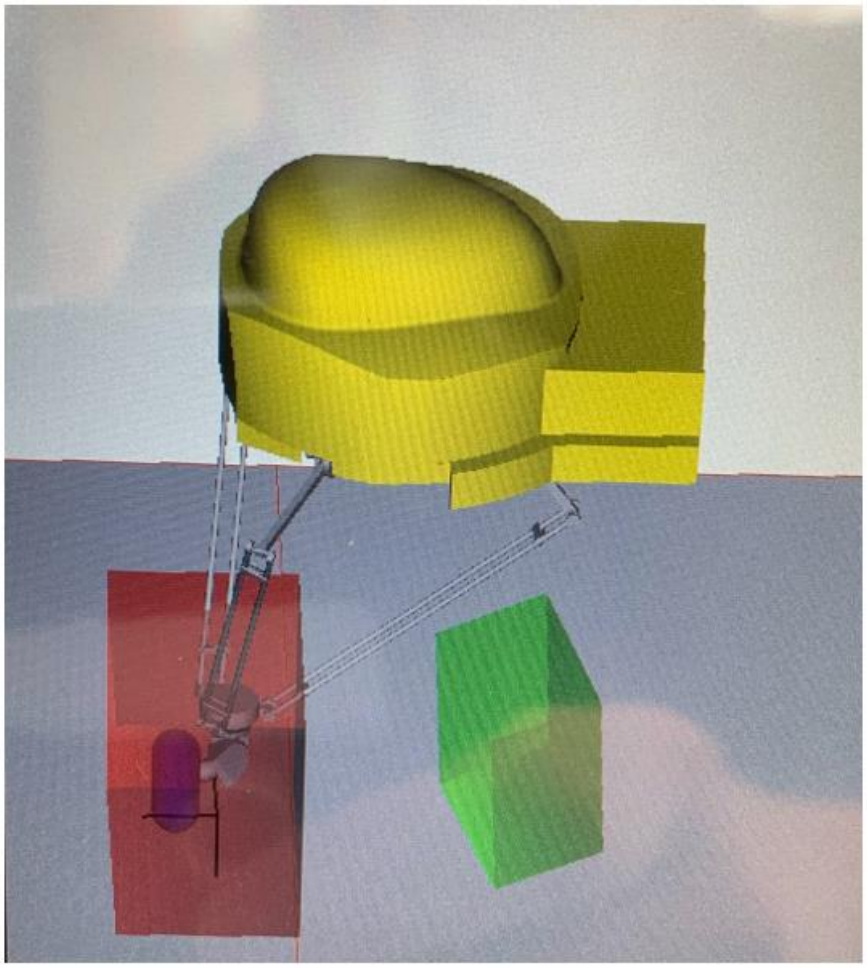

Figure 2-3 DCS Protective Zones

2.6 Robot Teach / Manual Mode

QUALIFIED INDIVIDUAL IS REQUIRED
FOR THE FOLLOWING PROCEDURE

Always use extreme caution while performing this procedure. Only a single person should ever be within the hazard area at any given time.

The machine is equipped with a teach mode to allow for robot adjustment through the use of the teach pendant while personnel are within the robot work envelope. It is beyond the scope of this operations manual to setup and teach the robot. This manual is not intended to replace the robot manufacturer's training or equipment manuals. Please refer to the manufacture's documentation and training for detailed procedures for working with and configuring the robot.

Figure 2-4 Teach Pendant / Teach Mode

2.7 Safety System

The Vial Fill Test Bed is equipped with a dedicated Allen Bradley L8 series GuardLogix programmable safety controller to monitor and control the safety of the entire system through control reliable means. The safety system for the cell consists of four dual channel emergency-stop push button with reset functionality, nine dual channel area scanners with warning and stop zones, two dual channel light curtains, a single dual channel solenoid locking door interlock, and four Fanuc robot controller with advanced DCS functionality and ethernet safety. The Fanuc robots are connected as a child to the system safety controller (e.g., an assembly cell emergency stop will emergency stop the robot). Activations of the robot controller and pendant emergency stop will also stop the assembly cell.

Figure 2-5 – System Safety Controller

2.8 Emergency Stop Circuit

The system is equipped with dual channel emergency stop push buttons. Upon activation, all hazardous electrical outputs are disabled by the monitoring safety controller and the robots are issued a stop category zero (emergency stop).

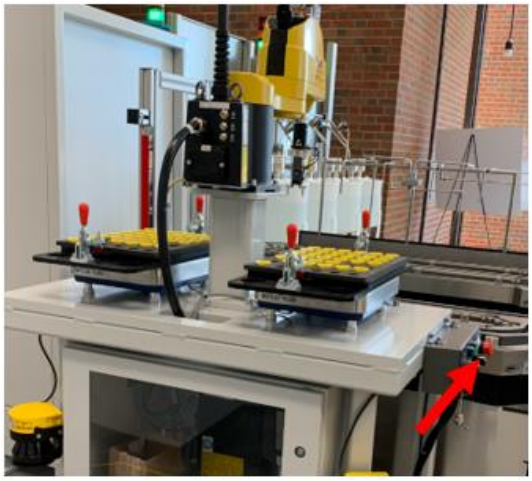

Figure 2-10 SR3iA E-Stop

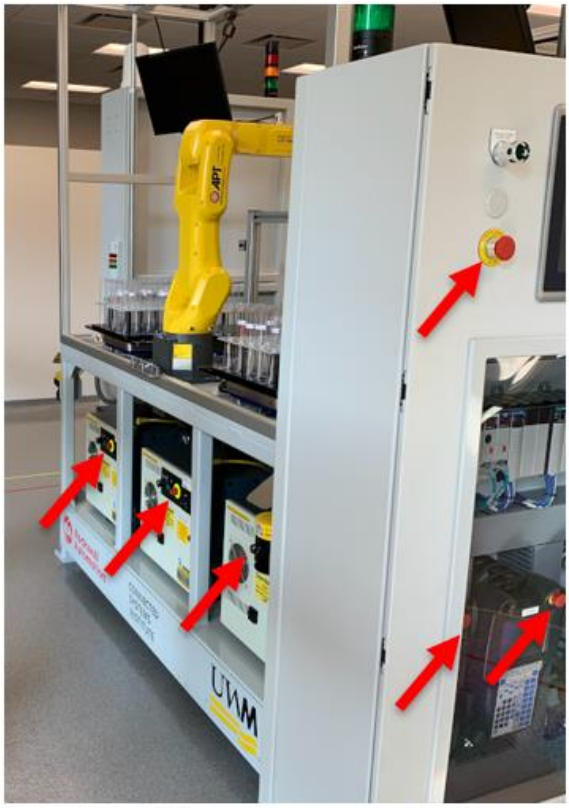

Figure 2-6 Robot E-Stops

Figure 2-9 Process Panel E-Stop

Figure 2-8 Robot & Power Panel E-Stop

Figure 2-7 Safety Panel E-Stop

2.9 Area Scanner

The area in front of each station is protected by an array of safety area scanner that has both a warning and stop zone.

When an obstruction is detected within the warning zone (depicted in yellow) the scanner sends dual signals to the safety PLC which in turns signals the robot controller initiating slow-down mode of the robot via CIP safety over ethernet protocols.

When an obstruction is detected within the protective stop zone (depicted in red), the area scanner and safety system controller initiate a safe stop of the machine and robot. When the areas scanner stop is activated, all hazardous electrical outputs are disabled, and the robot initiates zero speed and position monitoring preventing the robot from autonomous cycling. Robot I/O controlled through the robot controller are not affected by the area scanner stop.

Figure 2-11 Area Scanners

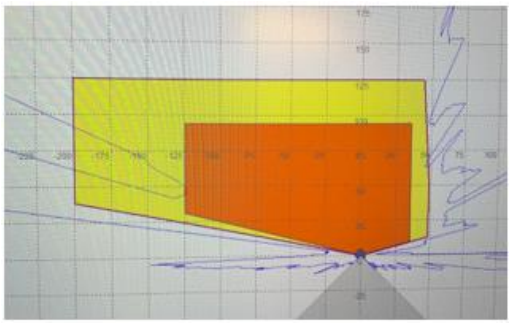

Figure 2-12 Area Scanner Zones

Figure 2-13 Area Scanner Zones

QUALIFIED INDIVIDUAL IS REQUIRED
FOR THE FOLLOWING PROCEDURE

Only qualified personnel should setup or modify the protective fields of the safety area scanner. Full functionality check and validation of the safety system shall be completed upon any modification the system setup and area scanner protective fields.

The area scanner protective fields have been set to the proper location and distance corresponding to the system layout and stop time distance calculated for the system robot speed at time of shipping. At time of shipping, robots have been restricted to a maximum override speed through the advanced DCS functions of the robot controller while in the slow zone. It is not recommended to modify the maximum speed as it will adversely affect the stop time distance and zone layout of the area scanners.

The Vial Fill Cell stations have integrated the safety area scanners as its primary mode of protection of perimeter guarding. To aide is the openness and ease of use for training, the system has incorporated an automatic reset functionality once the area scanner protection zones have been cleared of obstruction. This is accomplished by the Safety PLC monitoring and sending the slow down and stop signals to the system. While this feature is incorporated into the system, the end users should not rely solely on this feature and shall ensure good safety practices are in place when working and training on the system.

2.10 Light Curtains

The CR7 Rail Robot incorporates a seventh axis which is NOT collaborative in nature. In conjunction with the system area scanners, two sets of dual channel light curtains are used to prevent the rail from moving while the safety system is impeded. The combination of light curtains and area scanners allow the robot to function as long as no objects are detected within the safety detection zones. The Light curtains only become relevant to the safety function if the area scanners detect an obstruction and can be thought of as a secondary safety system or alternate safety system.

Figure 2-14 Light Curtains Receivers

Figure 2-15 Light Curtain Transmitters

3 Mode Status

The following modes are available on the individual stations. A brief description of each mode is provided for general information.

3.1 Control Power ON/OFF

Primarily a hard-wired interface that allows controls functions to be turned on and off. Alternately, an HMI based interface that allows for controls functions to be turned on and off. No Motions (Auto or Manual) shall occur if control power is not in an on state.

3.2 Manual Mode

Station motions are only allowed through manual interaction. Any fault condition shall place station into this mode of operation.

3.3 Auto Mode

Station is ready for automatic operation, but auto sequence is not started or processing. No manual functions can be performed.

3.4 Auto Cycle

Station's Auto Sequence is processing and repeating under normal conditions

3.4.1 Cycle Starting

Delay in auto cycle sequence start as needed based on application.

3.4.2 Cycle Stopping

Current Auto Cycle sequence continues until completed; Once completed station then drops out of Auto Cycle but remains in Auto Mode.

3.5 Dry Cycle

Emulation of Auto Cycle generally without parts or pallets. Simulates or ignores input sensors and inspection conditions to allow Auto Sequence to function. Primarily used for maintenance or troubleshooting.

3.6 Faulted

System has experienced a fault condition. Any fault condition shall drop the station out of automatic operation and place it into Manual Mode.

3.7 Idle

Station is in Auto Mode and Auto Cycle with the Cycle Started but is idle due to waiting on parts or operator input to continue processing the Auto Sequence.

Additional application specific modes may be added as needed. Any addition of mode types shall be approved during the design review process.

4 System Reset Types

The following four reset types are available on the individual stations. A brief description of each reset function is provided below for general information. Certain reset types may also include reset functions provided by other reset types.

4.1 Safety Reset

Used to reset the safety system of the machine when safety devices require a manual reset. This reset shall be of the trailing edge type. All safety devices must be physically ok to reset for the safety reset to complete.

4.2 Robot Reset

Used to reset the robot fault via UI[5]. Robot fault is cleared, servo power is turned on, but the paused program will not resume.

4.3 Reset

Used as a general system reset. Primarily thought of as a retry of the system state when the system fault occurred. After a general reset the system should start back up on its current process step and continue once placed back into auto mode and the cycle is started. In general, no manipulation of parts or machine functions should be needed when using the general reset function. However, there may be unique situation which may require intervention to have the system resume operations once restarted. System faults along with external device faults are cleared. The general system reset shall also invoke the Safety Reset and Robot Reset as applicable.

4.4 Master Reset

The Master Reset is the same functionality general system reset with the addition of resetting all sequence routines back to their initial starting points. This type of reset is used when the machine is to begin back at an initial configuration upon being placed back into auto cycle. This initial state a Master Reset induces requires that all parts and pallets be removed or put back to starting position.

5 Visual Indicators

5.1 Stack Light Indicators

The following are the status indicator definitions as provided with the default system programs.

Figure 5-1 Stack Light

5.1.1 Red – Flashing

System Faulted

5.1.2 Amber – Flashing

Attention Required

5.1.3 Green – Solid

System in Auto Mode and Running Auto Cycle

5.1.4 Green – Flashing

Cycle Stopping – Waiting Completion of Current Cycle to Stop Auto Cycling

5.2 Area Scanner Indicators

The following are the status indicator definitions which indicate the status of area scanner(s) for each cell station.

Figure 5-2 Area Scanner Indicator

5.2.1 Green

Area Scanner(s) Warning and Stop Zone(s)s are Cleared.

5.2.2 Yellow

Area Scanner(s) Warning Zone(s) Detect an Obstruction.

5.2.3 Red

Area Scanner(s) Stop Zone(s) Detect and Obstruction.

6 HMI General Information

6.1 Splash Screen

The splash screen is by default the initial screen the system displays on startup. Touching anywhere on the screen shall navigate to the main operations screen. Splash screen images may vary based on the application.

Figure 6-1 Splash Screen

6.2 Navigation Screens

Tabs configured through global objects located at the top of every screen are used for general navigation through the HMI program. The exception to this requirement is the startup splash screens and small pop-up screens. While the content of a few of the tabs may change based on applications specifics; the System, Operation, and Production Tabs are universal to all projects. Tabs may be added or removed based on the application.

Figure 6-2 Navigation Screens

6.3 General Information Indicators

General information used by the application is to be located at the bottom of HMI application screens. Examples of this are: system date and time; robot indicators and alarms.

Figure 6-3 General Information Indicators

6.4 System Screens

System screens are used for general machine setup and utilitarian operations. A majority of the functions available on the systems should screen more than likely should have security privileges associated with them. If the Security levels are not met, those functions should be not visible. Examples of system functions on the System HMI screens are: VFD frequency setup; Recipe Management System, Inspection Limits, IO Tests, Login, and Security Settings, Global Startup and Stopping Commands

Vial Fill System specific system screens and their uses shall be described in further detail in later section of this manual.

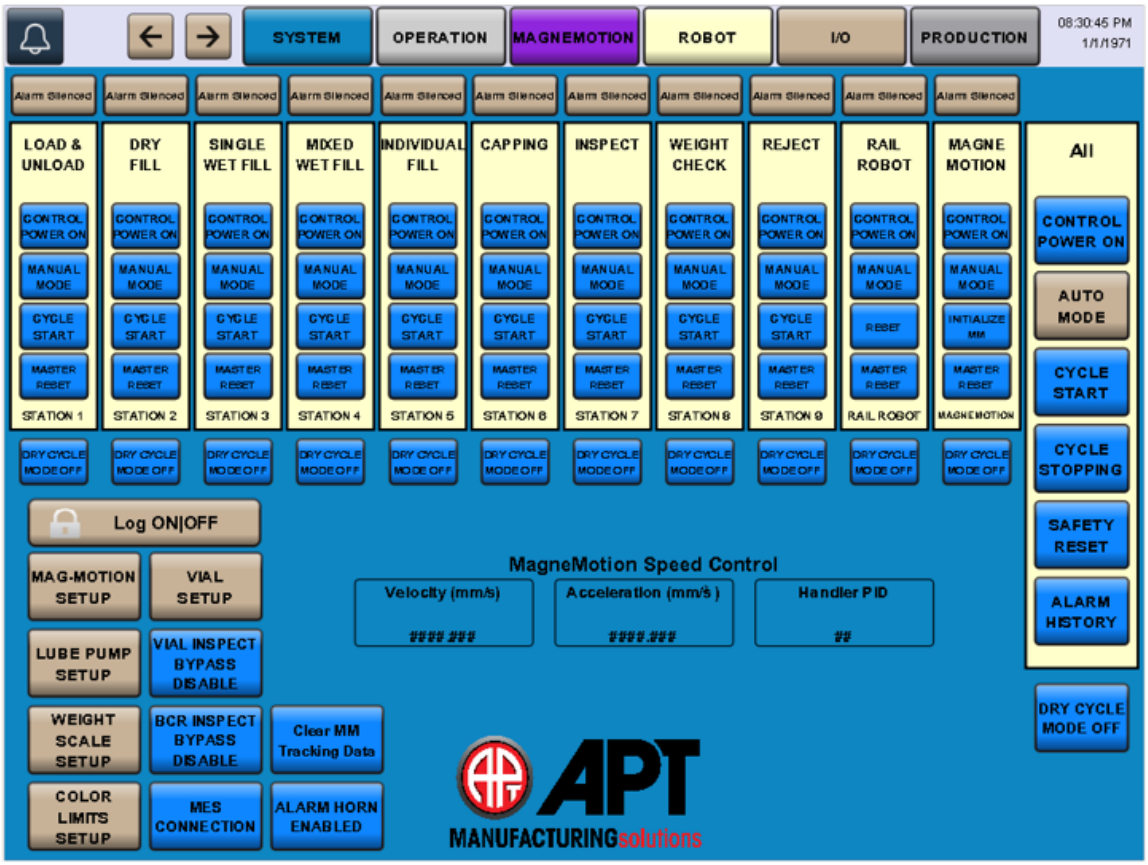

Figure 6-4 System Screen Example

6.5 Operation Screens

Operation screens are used for general machine operation and functionality. Use of 3d model images are used wherever possible to aid with the intuitiveness and ease of use. Sensor indicators are located as close to the actual position of the input device as represented on the 3d image. In addition, the following are incorporated into the operations screen:

- Mode operators for machine control (Global Functions)
- Additional operation screen navigation
- Local messages to display current operational sequence step number and description
- Fault banner on top of the screen indicating current active alarms
- Manual functions and indicator of the function
    - E.g. Button, Output State, Sensor Input of manual function

Vial Fill System specific operation screens and their uses shall be described in further detail in later section of this manual.

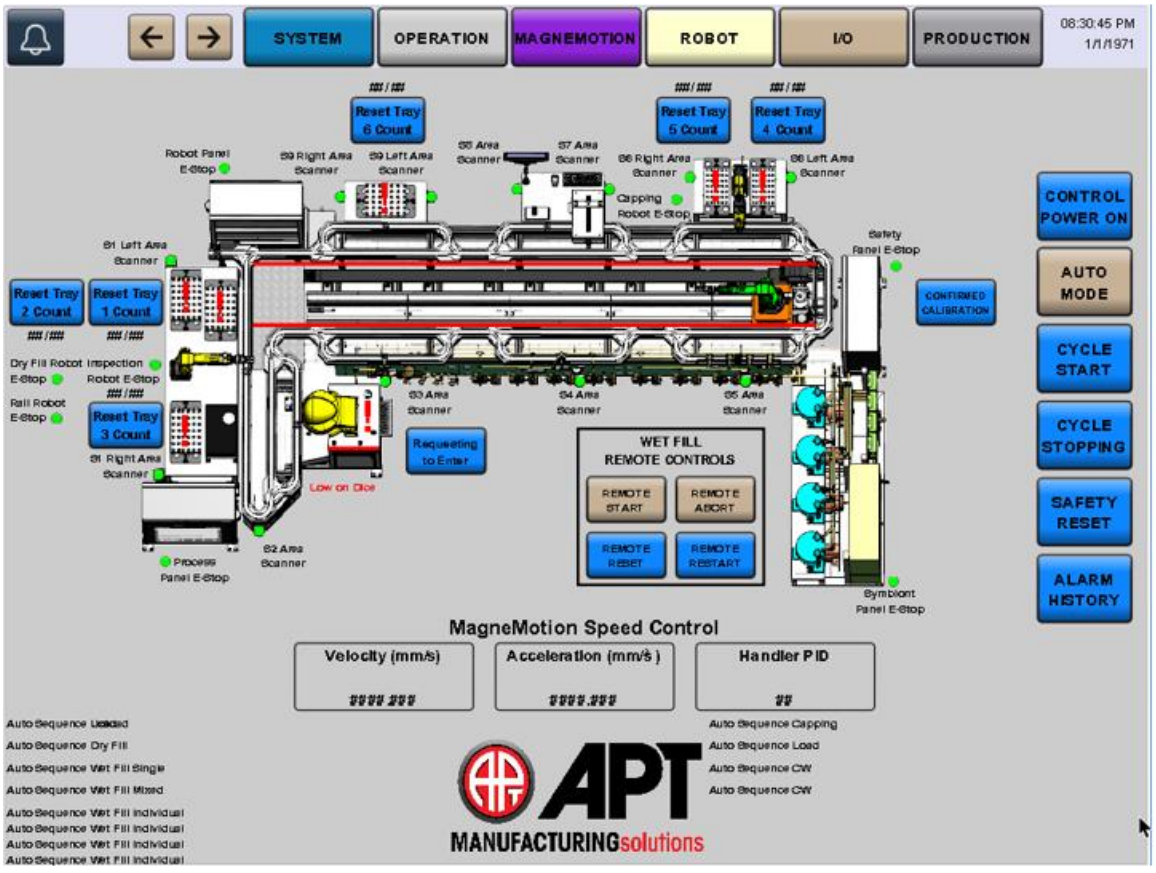

Figure 6-5 Operation Screen Example

6.6 Robot Screens

Robot screens are used to view and manipulate the robot functions, I/O, and parameters. Manual control of the robot shall also be located on these screens. This includes pick, place, and go to operations along with manual control of the robot controlled I/O functions such as gripper open and close.

All I/O and interface signals should be displayed on the robot screens to aide in maintenance and troubleshooting efforts. This includes but not limited to digital I/O, Universal I/O, and Group I/O.

As with all manual functions, actions that may cause damage to the equipment or product should be interlocked through the PLC program or not allowed to be selected via the HMI. Modification of the HMI operator though "visibility" options is the preferred method.

Vial Fill System specific robot screens and their uses shall be described in further detail in later section of this manual.

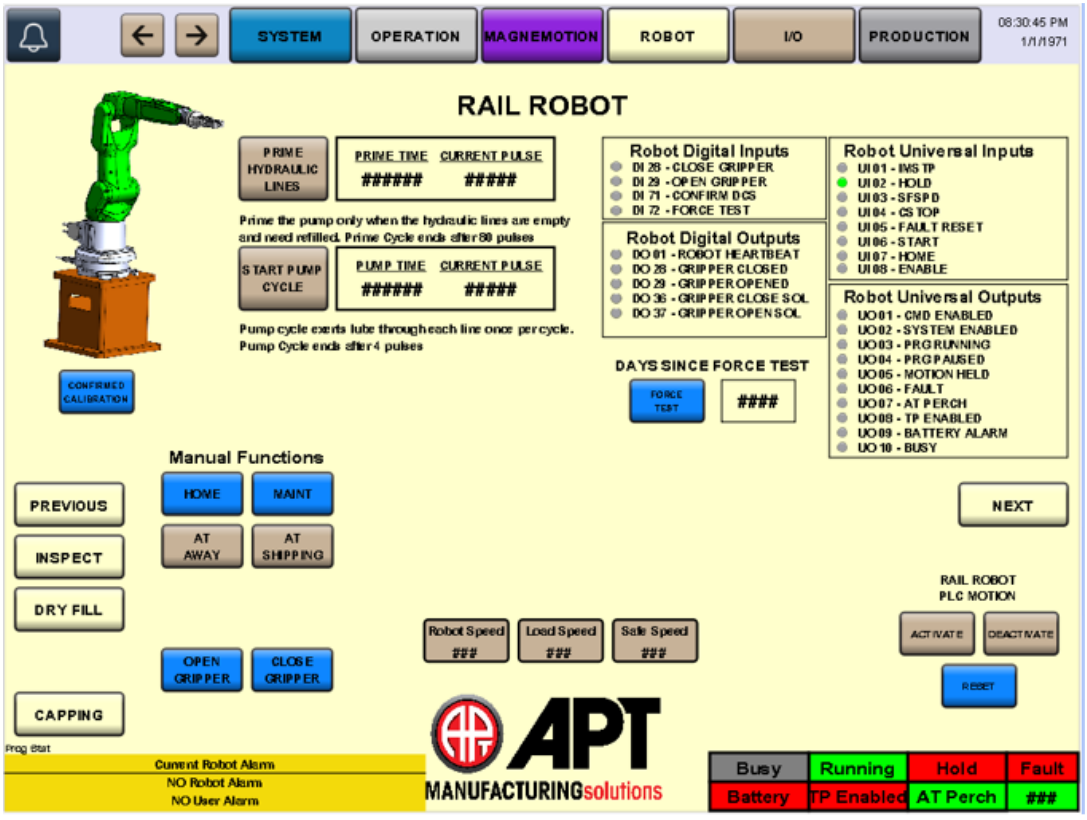

Figure 6-6 Robot Screen Example

6.7 I/O Screens

I/O screens include all I/O integrated into the system to aide in maintenance and troubleshooting efforts. Should faceplate pop-up screens be used, they shall be called from an I/O main screen.

Vial Fill System specific I/O screens and their uses shall be described in further detail in later section of this manual.

Figure 6-7 I/O Screen Example

6.8 Production Data Screen

Production data screens display the relevant information collected from the machine. A number of data points are automatically collected within the program provided.

Vial Fill System specific production screens and their uses shall be described in further detail in later section of this manual.

Figure 6-8 Production Data Screen Example

6.9 MagneMotion Screen

MagneMotion screens are used to view and manipulate the MagneMotion transport system's functions, I/O, and parameters.

Vial Fill System specific MagneMotion screens and their uses shall be described in further detail in later section of this manual.

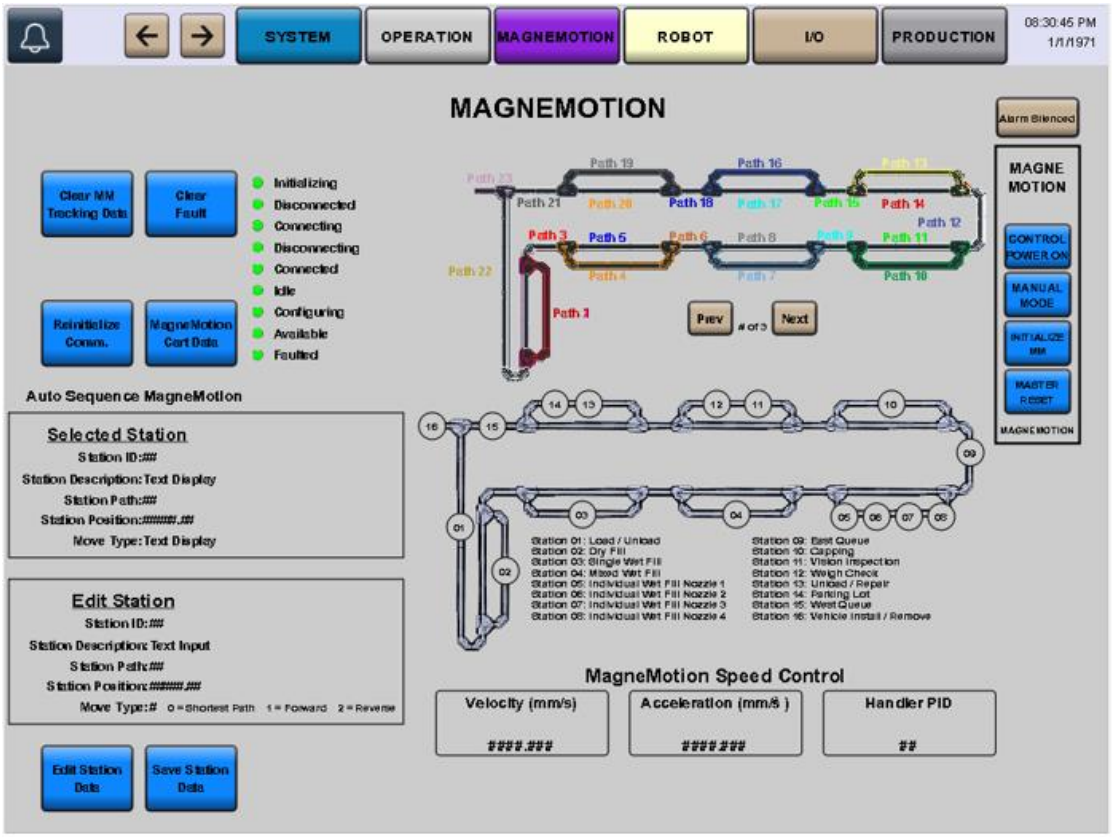

Figure 6-9 MagneMotion Screen Example

7 HMI Security

Typical application and HMI Security shall utilize the built-in security features of the HMI. Only applications that need to interface with plant systems for security authorizations shall use PLC based security functionality.

Unless otherwise provided by the customer at the time of Purchase Order and Project Kick-Off meeting, the following security levels and passwords have been used.

Security:

User	Password
APT	801
SUP	see
MAINT	fix
ENG	idea

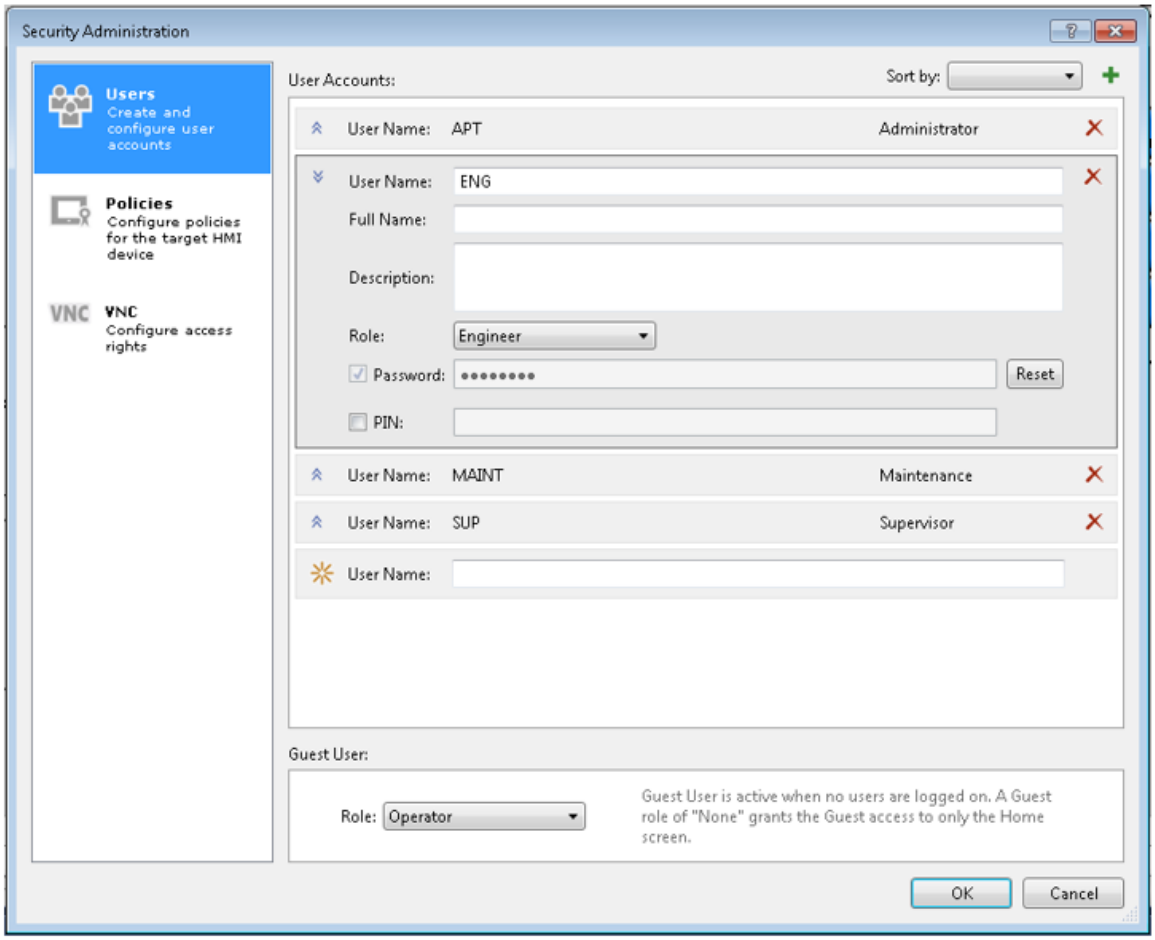

Figure 7-1 HMI Security Administration

8 Passwords

APT makes all efforts to use the default passwords provided with the hardware. However, it is common for the hardware manufacture to require changing of the default passwords. Unless otherwise provided by the customer at the time of Purchase Order and Project Kick-Off meeting, the following passwords shall be used.

Standard Password:	APTmfg801
Password Requiring Special Character:	APTmfg801!
Numeric Only Password:	801
Numeric and Special Character:	801!
Studio 5000 VNC Password:	APTmfg

**HMI equipment with VNC server installed will be configured with read and control access set to the numeric password listed in the table above. VNC hardware requiring special characters will use the numeric and special character password listed in the table above.

9 Vial Fill Machine Setup

9.1 Station Setup

This section provides a brief description of how to navigate and configure the stations through the HMI system setup screens. Some setup configurations are only accessible under security accounts.

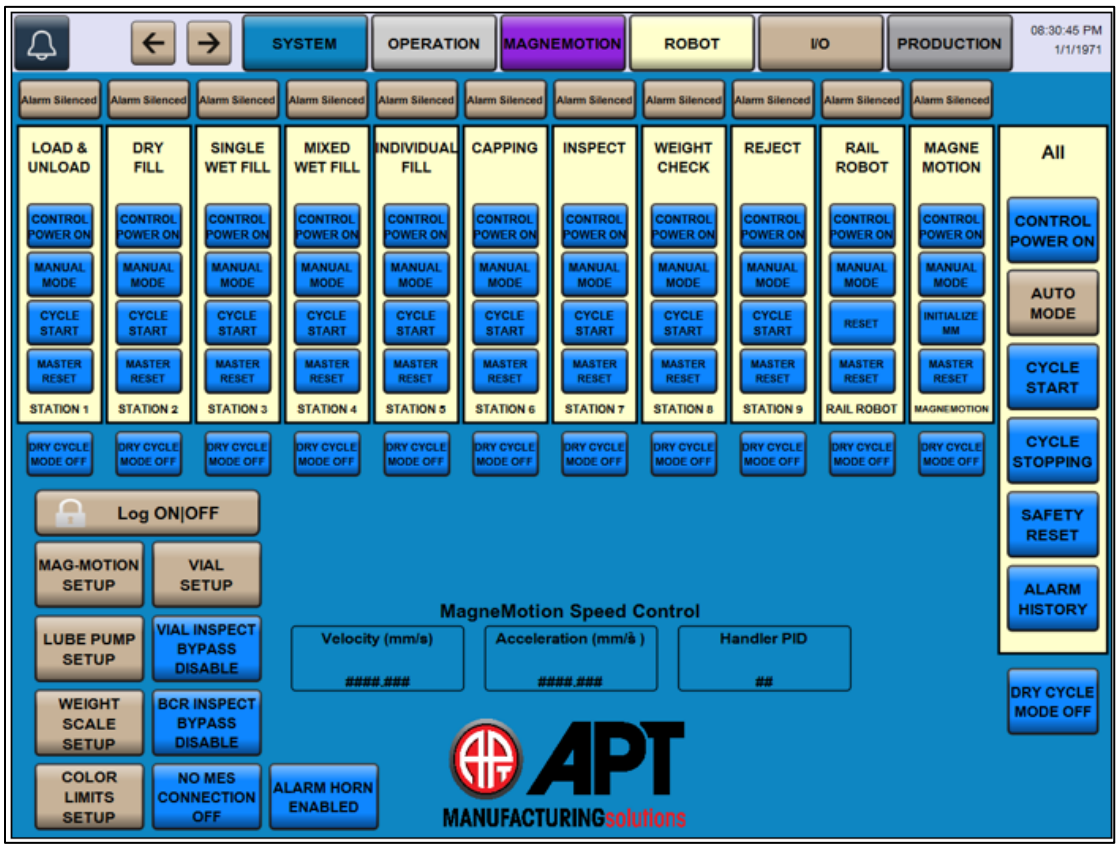

Figure 9-1 System Setup Main Screen

9.1.1 Login / Logout

The system login screen is where different security accounts can be entered or exited to access different functions of the HMI. The display shows the current user logged in. By selecting the login button, a pop-up will allow for entry of a user and password. Selecting the logout button, the system will log out to the “Default” user security profile. User accounts and passwords are only editable via the View Designer Application development software.

Figure 9-2 Login Screen PopUp

9.1.2 Dry Cycle Mode

When Dry Cycle Mode On is selected, the station will emulate an auto sequence once the system is started ignoring part presence indicators. For Dry Cycle to function, no parts can be in the system. Each time the system is started up in Dry Cycle mode, the Dry Cycle count is reset.

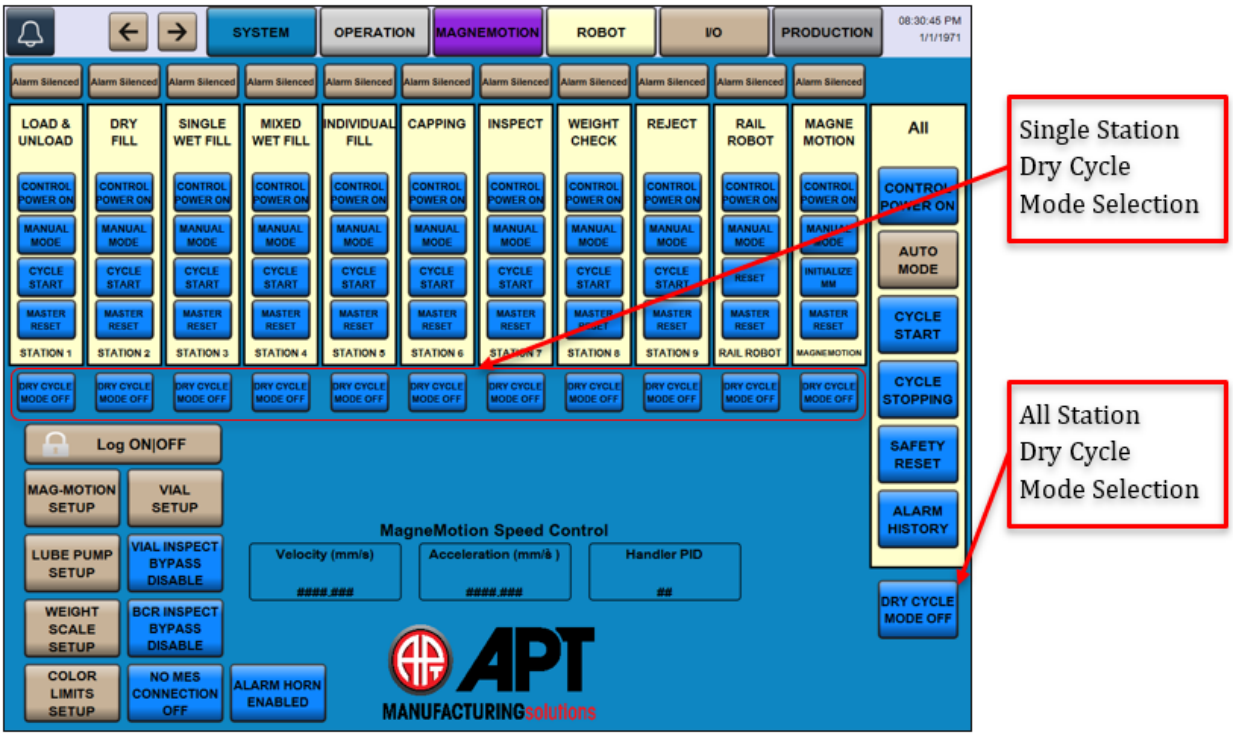

Figure 9-3 Dry Cycle Mode Selection

9.1.3 Robot Speeds

Robot general override speeds are linked and controlled by the system PLC and are configurable through the HMI robot screens. Three override speeds are available for modification.

The general robot speed sets the speed of the robot for all general movements.

The robot load speed configuration controls the speed of the robot while the robot has a part on the end of arm tool (EOAT).

The robot safe speed configuration controls the speed of the robot during safe move functions such as performing a safe home routine, or when an obstruction is detected in the area scanner warning zone.

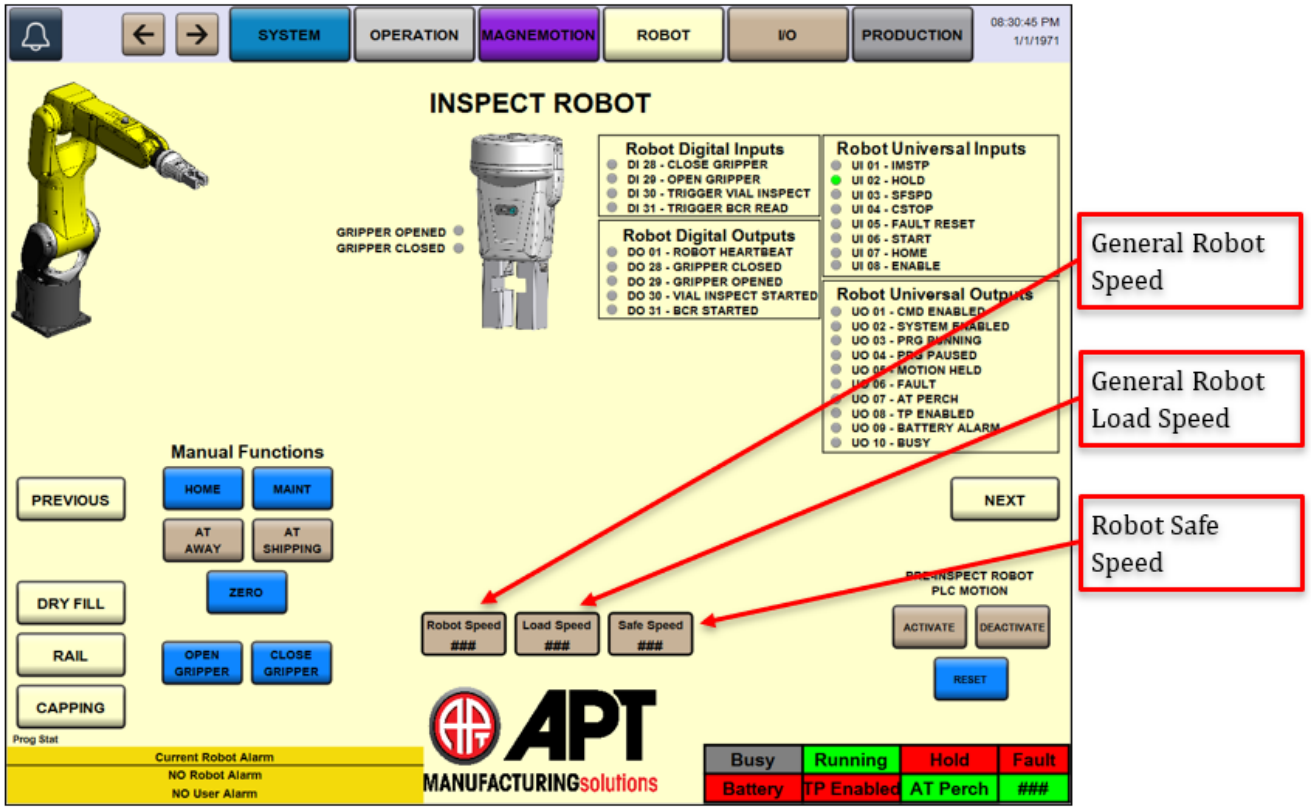

Figure 9-4 Robot Speed Configuration

9.1.4 Inspection Bypass

The vial inspect bypass will accept vials with pass conditions while enabled.

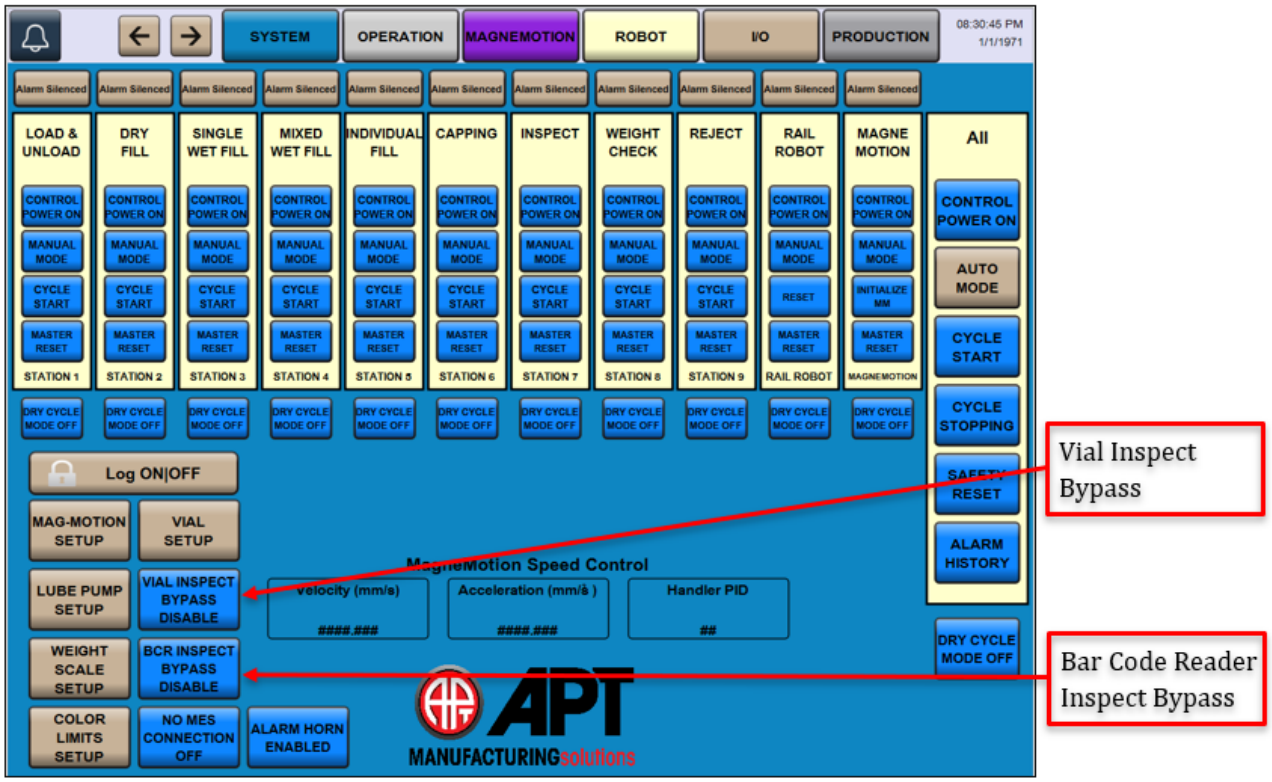

Figure 9-5 Stack Light Test Feature

9.1.5 No Mes Connection

Randomly populates process data into the production queue.

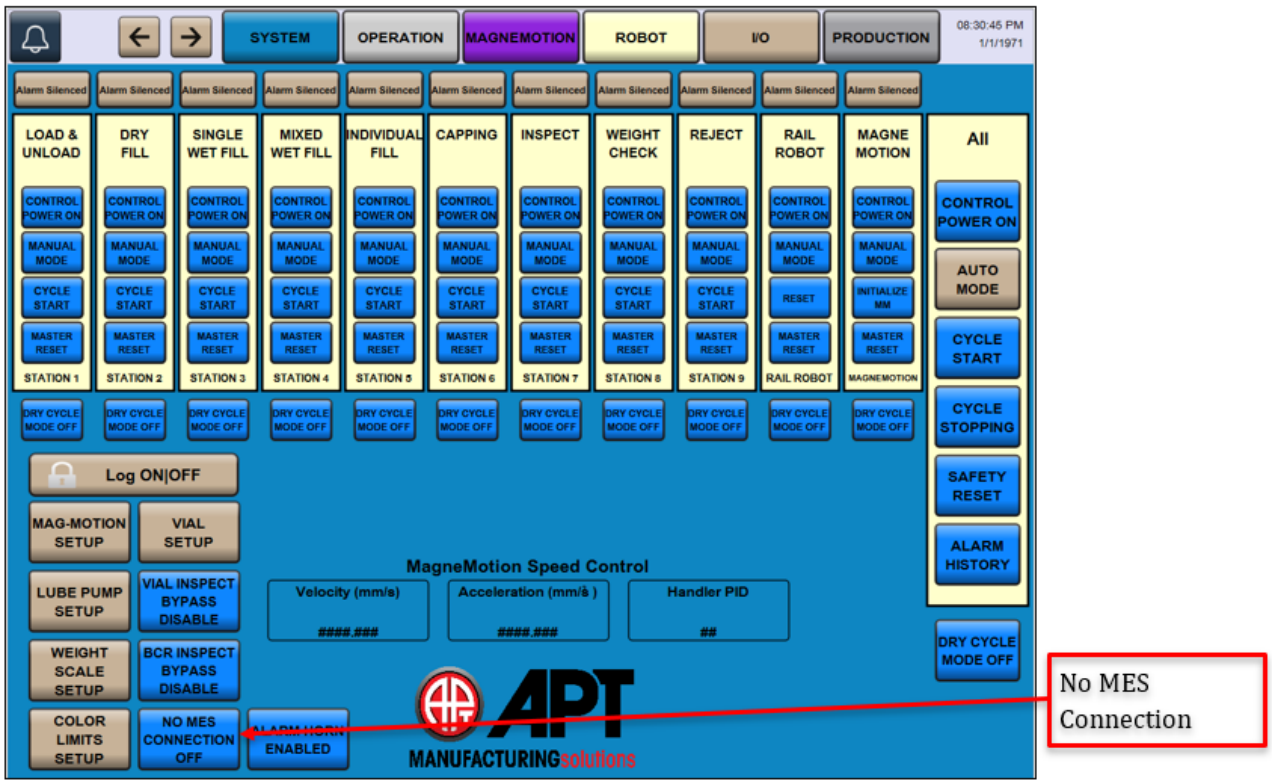

Figure 9-6 No MES Connection Setting

9.1.6 Alarm Horn

Disables the alarm from emitting noise when a system fault is triggered. Horn will still trigger when cycle starting the cell.

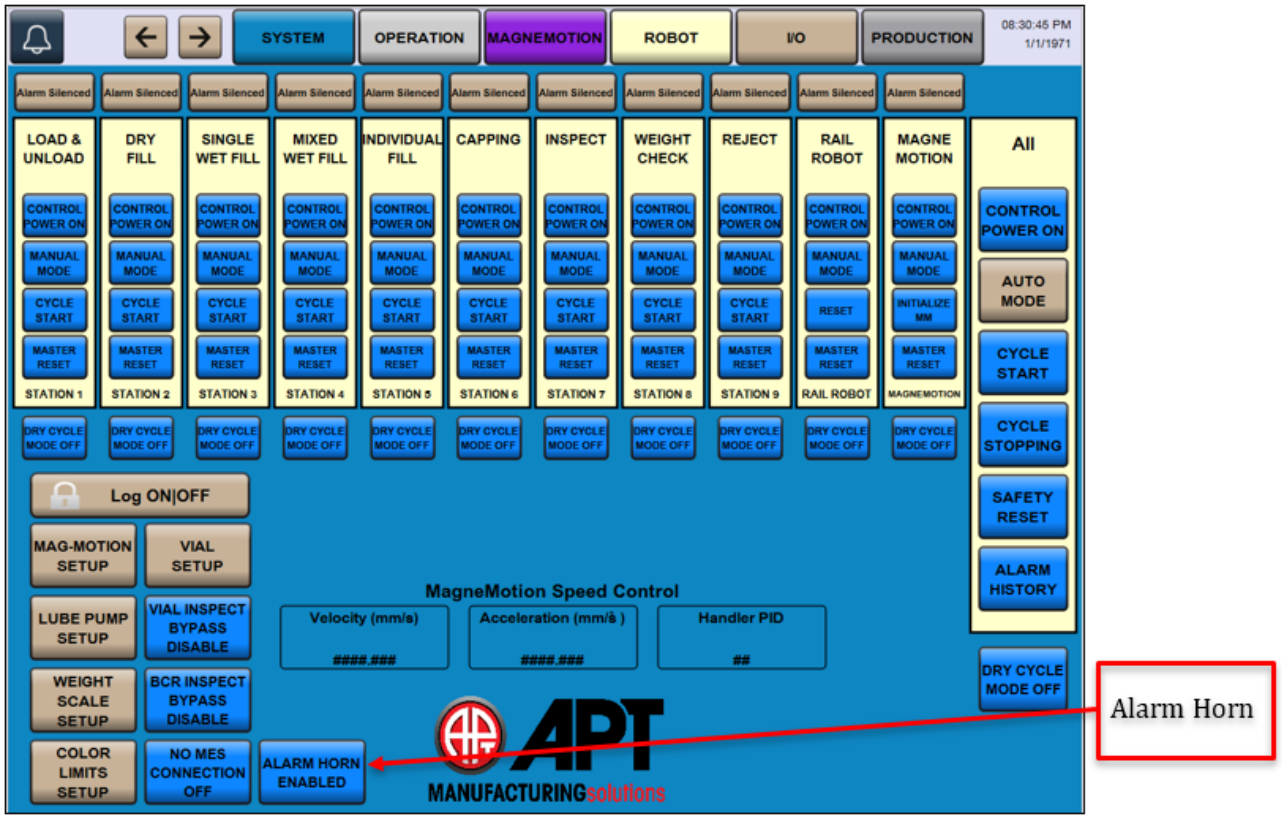

Figure 9-7 Alarm Horn Control

9.2 Sequence of Operations

PLC logic provided with the demonstration program uses sequence-based logic otherwise known as step logic. The following section details the sequence of operations for all stations in the logic. This information is also provided on the HMI as the station steps though its sequence.

9.2.1 Station 1 Load Auto Sequence

Station 1 Step 10: Pick Empty Vial from Tray 3
Station 1 Step 20: Waiting for Vial to be Picked from Tray 3
Station 1 Step 30: Inspect Vial Position 1
Station 1 Step 40: Waiting for Vial Inspection Position 1 to Complete
Station 1 Step 50: Checking Position 1 Inspection Results
Station 1 Step 60: Inspect Vial Position 2
Station 1 Step 70: Waiting for Vial Inspection Position 2 to Complete
Station 1 Step 80: Checking Position 2 Inspection Results
Station 1 Step 90: Inspect Vial Position 3
Station 1 Step 100: Waiting for Vial Inspection Position 3 to Complete
Station 1 Step 110: Checking Position 3 Inspection Results
Station 1 Step 115: Checking for BCR Bypass
Station 1 Step 120: Inspect Vial Bar Code Reader
Station 1 Step 130: Waiting for Vial Bar Code Reader to Complete
Station 1 Step 140: Checking Bar Code Reader Results
Station 1 Step 150: Merge Current Vial Data with Scheduler Data
Station 1 Step 160: Wait for MagneMotion Vehicle Present
Station 1 Step 170: Load Vial to MagneMotion
Station 1 Step 180: Waiting for Vial to be Loaded onto MagneMotion
Station 1 Step 190: Transfer Vial Data to MagneMotion Vehicle
Station 1 Step 200: Updating Production Data / End of Cycle
Station 1 Step 300: Load Vial to Tray 1 Reject
Station 1 Step 310: Waiting for Vial to be Loaded to Reject Tray
Station 1 Step 320: Transferring Vial Data from Robot to Reject Tray

9.2.2 Station 1 Unload Auto Sequence

Station 1 Step 10: Pick Vial from MagneMotion
Station 1 Step 20: Waiting for Vial to be Picked from MagneMotion
Station 1 Step 30: Transfer Part Tracking Data to Robot
Station 1 Step 40: Evaluating Tracking Data
Station 1 Step 50: Place Bad Vial to Reject Tray (Tray 1)
Station 1 Step 60: Waiting for Vial to be Placed to Reject Tray (Tray 1)
Station 1 Step 70: Transfer Part Tracking Data to Reject Tray (Tray 1)
Station 1 Step 80: Increment Reject Tray Count
Station 1 Step 90: Place Good Vial to Finished Tray (Tray 2)
Station 1 Step 100: Waiting for Vial to be Placed to Finished Tray (Tray 2)
Station 1 Step 110: Transfer Part Tracking Data to Finished Tray (Tray 2)
Station 1 Step 120: Update Production Data / End of Cycle

9.2.3 Station 2 Auto Sequence

Station 2 Step 10: Sending Process Data to Robot
Station 2 Step 20: Trigger Dry Fill Robot to Run
Station 2 Step 30: Waiting for Robot to Run (PNS 100)
Station 2 Step 40: Waiting for Robot Program to Finish (PNS 100)
Station 2 Step 50: Update Tracking Data
Station 2 Step 60: Updating Production Data / End of Cycle

9.2.4 M1iA Robot PNS Sequence of Operations

Step 00: Waiting for Sequence Start
Step 10: Set PNS Program Number
Step 20: Strobe PNS and Wait for Acknowledgement
Step 30: Send Production Start
Step 40: Wait for Robot to Run

9.2.5 Station 3 Auto Sequence

Station 3 Step 10: Sending Required Data to Symbiont
Station 3 Step 20: Triggering WetFill
Station 3 Step 30: Waiting for WetFill to Complete Process
Station 3 Step 40: Spare
Station 3 Step 50: Updating Tracking Data
Station 3 Step 60: Updating Production Data / End of Cycle

9.2.6 Station 4 Auto Sequence

Station 4 Step 10: Sending Required Data to Symbiont
Station 4 Step 20: Triggering Mixed WetFill
Station 4 Step 30: Waiting for Mixed WetFill to Complete Process
Station 4 Step 40: Spare
Station 4 Step 50: Updating Tracking Data

9.2.7 Station 5 Auto Sequence

9.2.7.1 Wet Fill Individual A Auto Sequence

Station 5 Wetfill A Step 10: Sending Required Data to Symbiont
Station 5 Wetfill A Step 20: Triggering WetFill
Station 5 Wetfill A Step 30: Waiting for WetFill to Complete Process
Station 5 Wetfill A Step 40: Waiting for Robot Program to Finish (PNS 100)
Station 5 Wetfill A Step 50: Updating Tracking Data
Station 5 Wetfill A Step 60: Updating Production Data / End of Cycle

9.2.7.2 Wet Fill Individual B Auto Sequence

Station 5 Wetfill B Step 10: Sending Required Data to Symbiont
Station 5 Wetfill B Step 20: Triggering WetFill
Station 5 Wetfill B Step 30: Waiting for WetFill to Complete Process
Station 5 Wetfill B Step 40: Waiting for Robot Program to Finish (PNS 100)
Station 5 Wetfill B Step 50: Updating Tracking Data
Station 5 Wetfill B Step 60: Updating Production Data / End of Cycle

9.2.7.3 Wet Fill Individual C Auto Sequence

Station 5 Wetfill C Step 10: Sending Required Data to Symbiont
Station 5 Wetfill C Step 20: Triggering WetFill
Station 5 Wetfill C Step 30: Waiting for WetFill to Complete Process
Station 5 Wetfill C Step 40: Waiting for Robot Program to Finish (PNS 100)
Station 5 Wetfill C Step 50: Updating Tracking Data
Station 5 Wetfill C Step 60: Updating Production Data / End of Cycle

9.2.7.4 Wet Fill Individual D Auto Sequence

Station 5 Wetfill D Step 10: Sending Required Data to Symbiont
Station 5 Wetfill D Step 20: Triggering WetFill
Station 5 Wetfill D Step 30: Waiting for WetFill to Complete Process
Station 5 Wetfill D Step 40: Waiting for Robot Program to Finish (PNS 100)
Station 5 Wetfill D Step 50: Updating Tracking Data
Station 5 Wetfill D Step 60: Updating Production Data / End of Cycle

9.2.8 Station 6 Auto Sequence

Station 6 Step 10: Pick Vial Cap
Station 6 Step 20: Waiting for Robot to Pick Vial Cap
Station 6 Step 30: Place Cap onto Vial
Station 6 Step 40: Waiting for Cap to be Placed on Vial
Station 6 Step 50: Transfer Vial Data to MagneMotion
Station 6 Step 60: Updating Production Data / End of Cycle

9.2.9 Station 7 Auto Sequence

Station 7 Step 00: Waiting for Load Request
Station 7 Step 10: Sending Required Process Data to Camera
Station 7 Step 20: Triggering Vision Inspect
Station 7 Step 30: Waiting for Inspect to Complete
Station 7 Step 40: Evaluating Inspect Results
Station 7 Step 50: Updating Tracking Data
Station 7 Step 60: Updating Production Data / End of Cycle

9.2.10 Station 8 Auto Sequence

Station 8 Step 10: Waiting for Rail Robot to be Available
Station 8 Step 20: Pick Vial From MagneMotion
Station 8 Step 30: Waiting for Robot to Pick Vial From MagneMotion
Station 8 Step 40: Transferring Vial Data to Robot
Station 8 Step 50: Place Vial to Check Weight
Station 8 Step 60: Waiting for Vial to be Placed in Check Weigh Station
Station 8 Step 70: Transferring Vial Data to Check Weigh Station
Station 8 Step 80: Evaluating Vial Weight
Station 8 Step 90: Waiting for Rail Robot to be Available
Station 8 Step 100: Pick Vial from CW
Station 8 Step 110: Waiting for Vial to be Picked from CW
Station 8 Step 120: Transfer Vial Data to Robot
Station 8 Step 130: Place Vial to MagneMotion
Station 8 Step 140: Waiting for Vial to be Placed into MagneMotion Cart
Station 8 Step 150: Transferring Vial Data to MagneMotion Cart
Station 8 Step 160: Production Data / End of Cycle

9.2.11 Station 9 Auto Sequence

Station 9 Step 10: Waiting for Rail Robot to be Available
Station 9 Step 20: Picking Vial From MagneMotion
Station 9 Step 30: Waiting for Robot to Pick Vial From MagneMotion
Station 9 Step 40: Transferring Vial Data to Robot
Station 9 Step 50: Place Vial to Reject Tray
Station 9 Step 60: Waiting for Vial to be Placed in Reject Tray
Station 9 Step 70: Transferring Vial Data to Reject Tray
Station 9 Step 80: Updating Tray Count
Station 9 Step 90: Production Data / End of Cycle

9.3 Mode Selection / Station Reset

Mode selection is accomplished through operators on the station HMI. The operators will be display different values and control based on the current state of the machine. Depress the operator to toggle between the modes.

1. Auto / Manual Mode
2. Cycle Start / Reset
3. Cycle Stop / Master Reset
4. Safety Reset

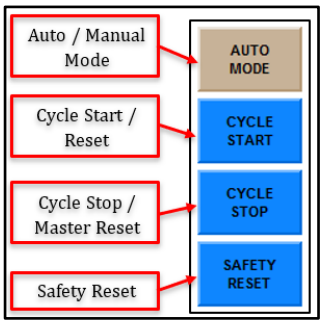

Figure 9-8 Mode Operators

The station has three types of reset functionality:

1. Reset – Resets current faults conditions, send the robot to its safe home position, and readies the station to resume operation from where it left off at the time of fault or disruption. Best thought of as a "resume or retry" operation. Once the Station is placed back into Auto Mode and Cycle Start, the system resumes its previous sequence step.
2. Master Reset – Resets current faults conditions, send the robot to its safe home position, resets the stations sequence of operation back to 0 (starting step number), and readies the station to begin operations as if not parts are in that station. This reset functionality is best thought of as a "give up and start over". Parts or Pallets may need to be removed from the station or robot in the event a Master Reset is induced.
3. Safety Reset – Resets the safety controller and enables the systems hazardous functions controlled by the safety system. This reset is identical to depressing the reset push button on the station electrical enclosure.

Station reset is accomplished through operators on the station HMI. Depress the appropriate operator based on the need to reset the station.

9.4 Manual Functions

While the station is in Manual Mode, the operator may manually manipulate motions for the station through operators on the HMI. Manual operators may only be visible or function while in manual mode. Manual operators that are displayed while in Auto mode provide an indication of their status only.

Improper movement of motions manually may result in damage to product, pallets, conveyor systems or station components.

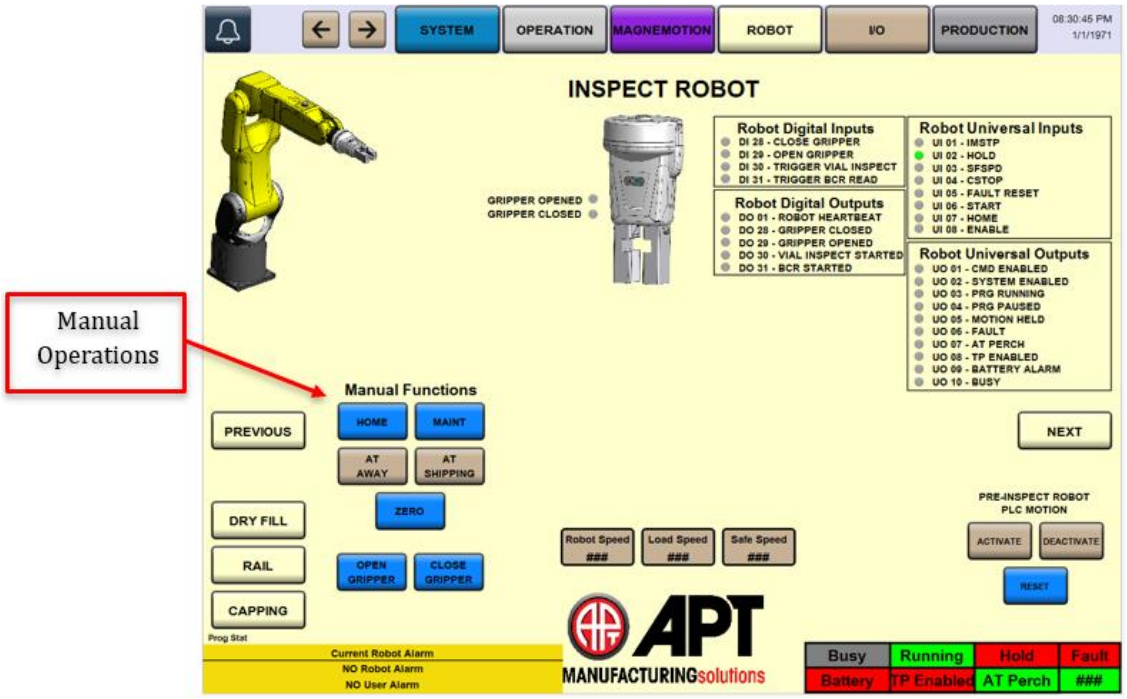

Figure 9-9 Manual Mode Operators

9.5 Automatic Operation

Automatic operation continually cycles through the sequence of operations defined in section 9.3. To enter automatic operation from initial startup: system control power must be on; the station must be clear of any fault conditions (Reset); Station sequence of operation should be on Step 0 (Master Reset); Place the station in Auto Mode by depressing the "Manual Mode" HMI operator; once in Auto Mode, depress the Cycle Start HMI Operator after holding it for 5 seconds. The station will now begin Automatic Operation.

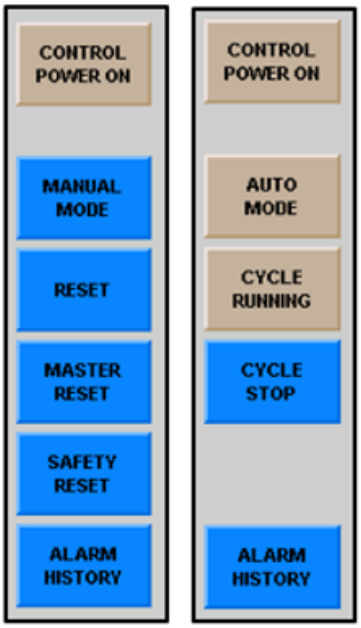

Figure 9-10 Startup & Shutdown Operators

To safely shut down the station at the end of a cycle, depress the cycle stop HMI operator. The station will continue processing through its current sequence of operations and once that cycle is complete the station will take itself out of Auto Cycle but stay in Auto Mode.

In the even a fault condition occurs during automatic operation, the station will display the appropriate fault message and place itself in manual mode with the cycle stopped. Once the fault condition is resolved, the operator should attempt to retry the operation by the following sequence of HMI interface: Reset; Auto Mode, Cycle Start. The station will resume its previous sequence of operation.

9.6 HMI Screens & Operations

9.6.1 System Screen

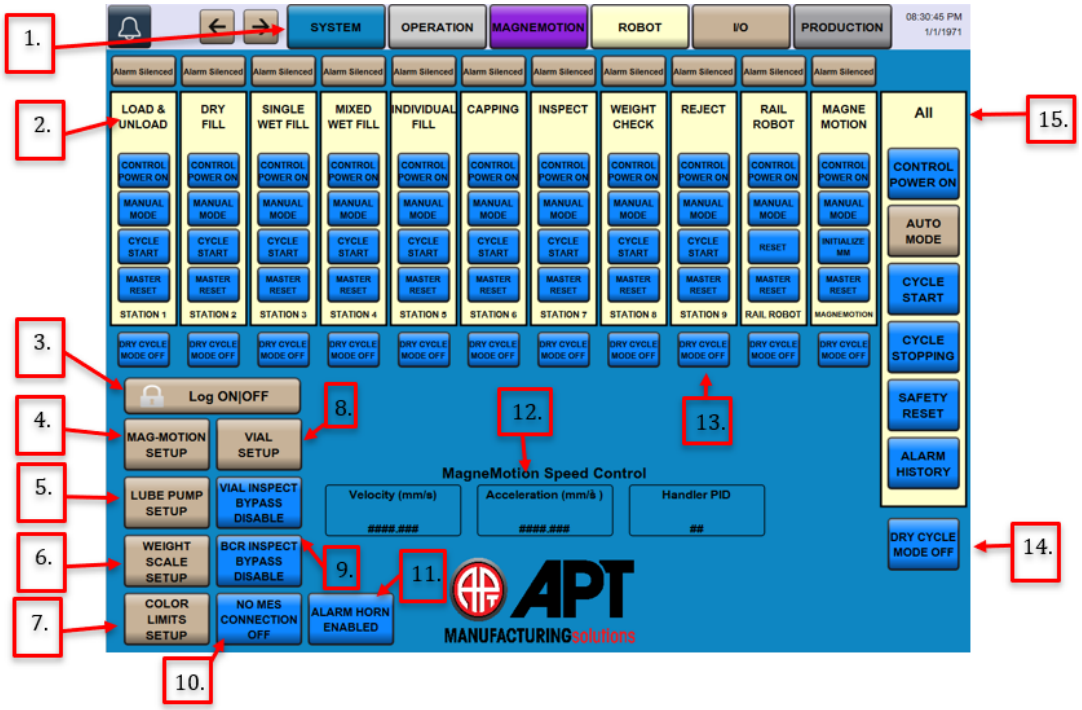

Figure 9-11 System Main Screen

1) Screen Navigation Tabs – Used to navigate to different functions of the HMI.
2) Individual Station Modes – Touch Text to navigate to the station operation screen
3) Login / Logout button
4) Navigate to MagneMotion Setup Screen
5) Navigate to Lube Pump Setup Screen
6) Navigate to Weight Scale Setup Screen
7) Navigate to Color Limits Setup Screen
8) Navigate to Vial Setup Screen
9) Inspect Bypasses – Determines whether the BCR and Vial Inspects are enabled
10) Toggle MES Connection – Determines whether Process Data is randomly generated
11) Toggle Alarm Horn
12) MagneMotion Speed Controls
13) Toggle Individual Dry Cycle Mode
14) Toggle All Dry Cycle Mode
15) All Station Mode Operators

9.6.1.1 System Lube Pump Screen

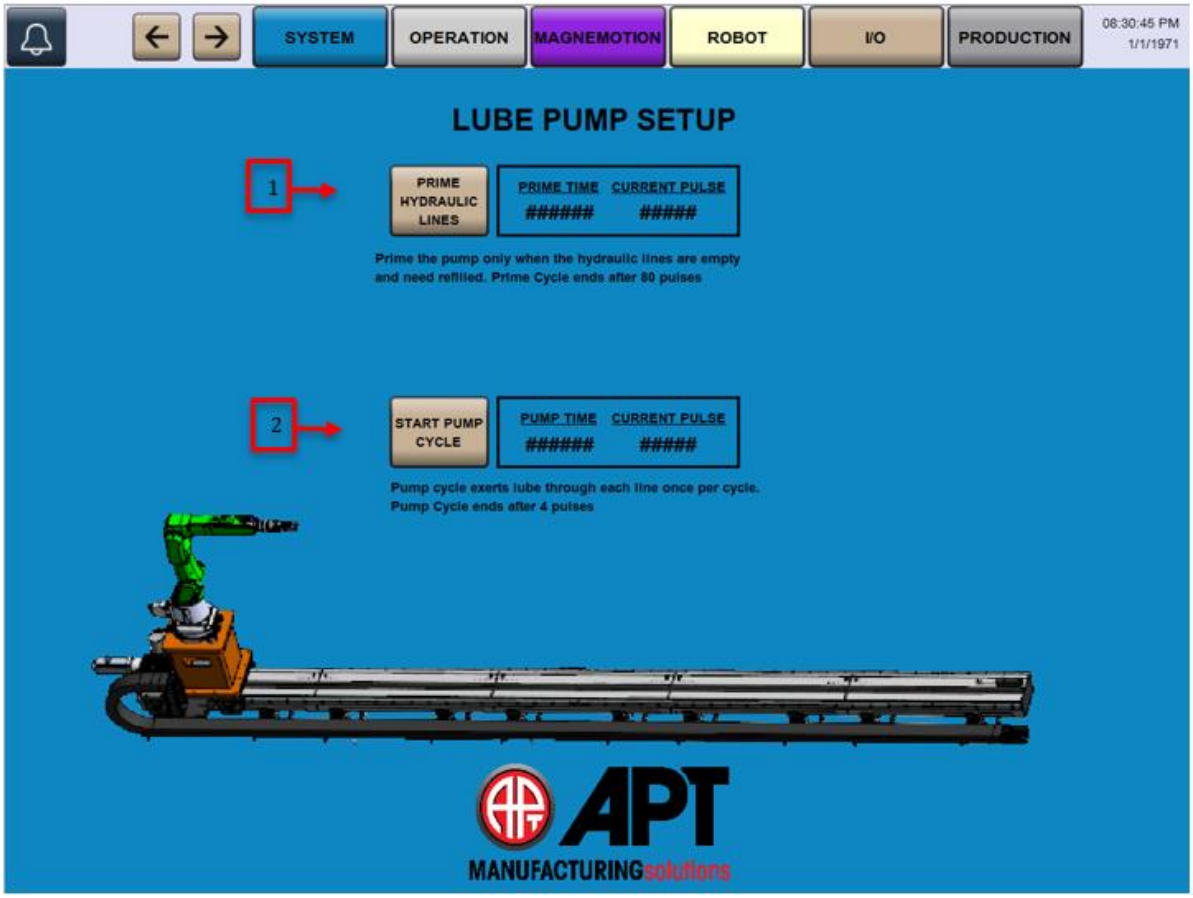

Figure 9-12 Lube Pump Screen

1) Prime Hydraulic Lines – Primes the Lube Lines
2) Start Pump Cycle – excretes one pump of Lube out of each line

9.6.1.2 Weight Scale Setup Screen

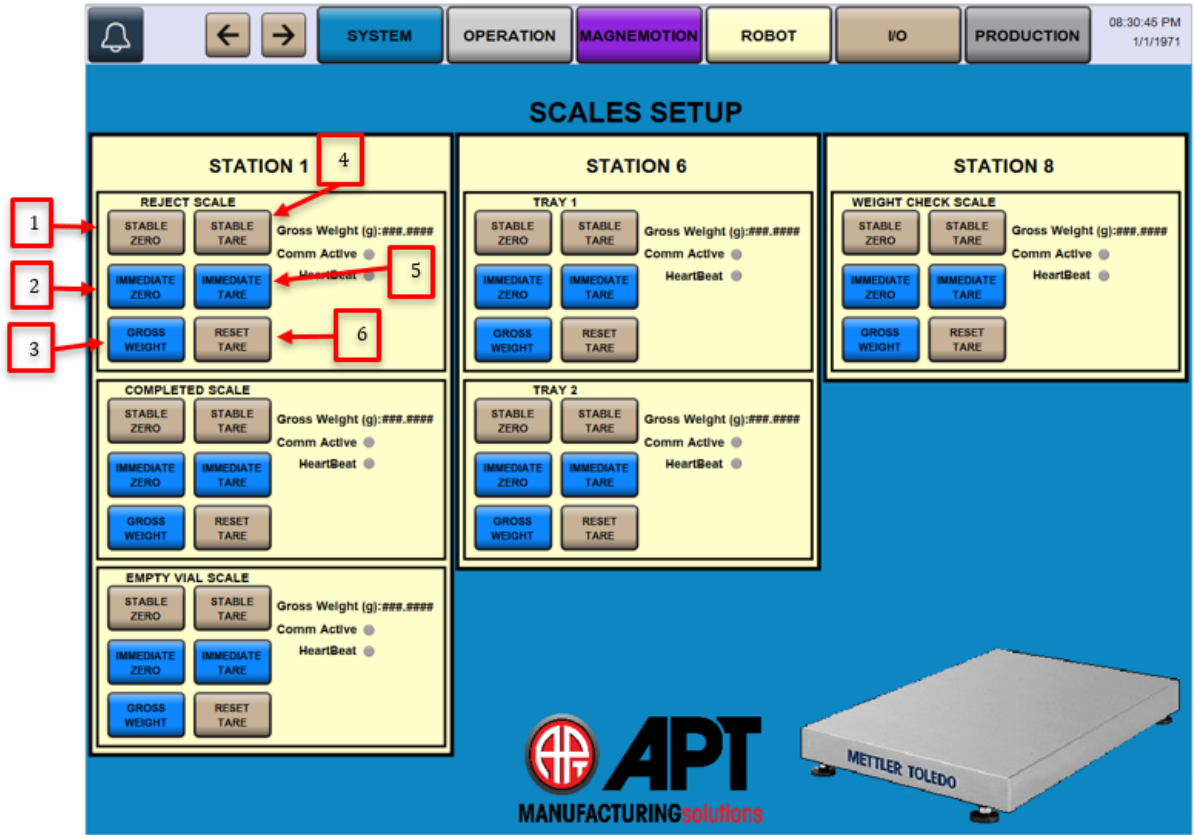

Figure 9-13 Weight Scale Setup

1) Stable Zero Scale
2) Immediate Zero Scale
3) Toggle Gross/Net Weight
4) Stable Tare
5) Immediate Tare
6) Reset Tare

9.6.1.3 Camera Dice Color Limits Setup Screen

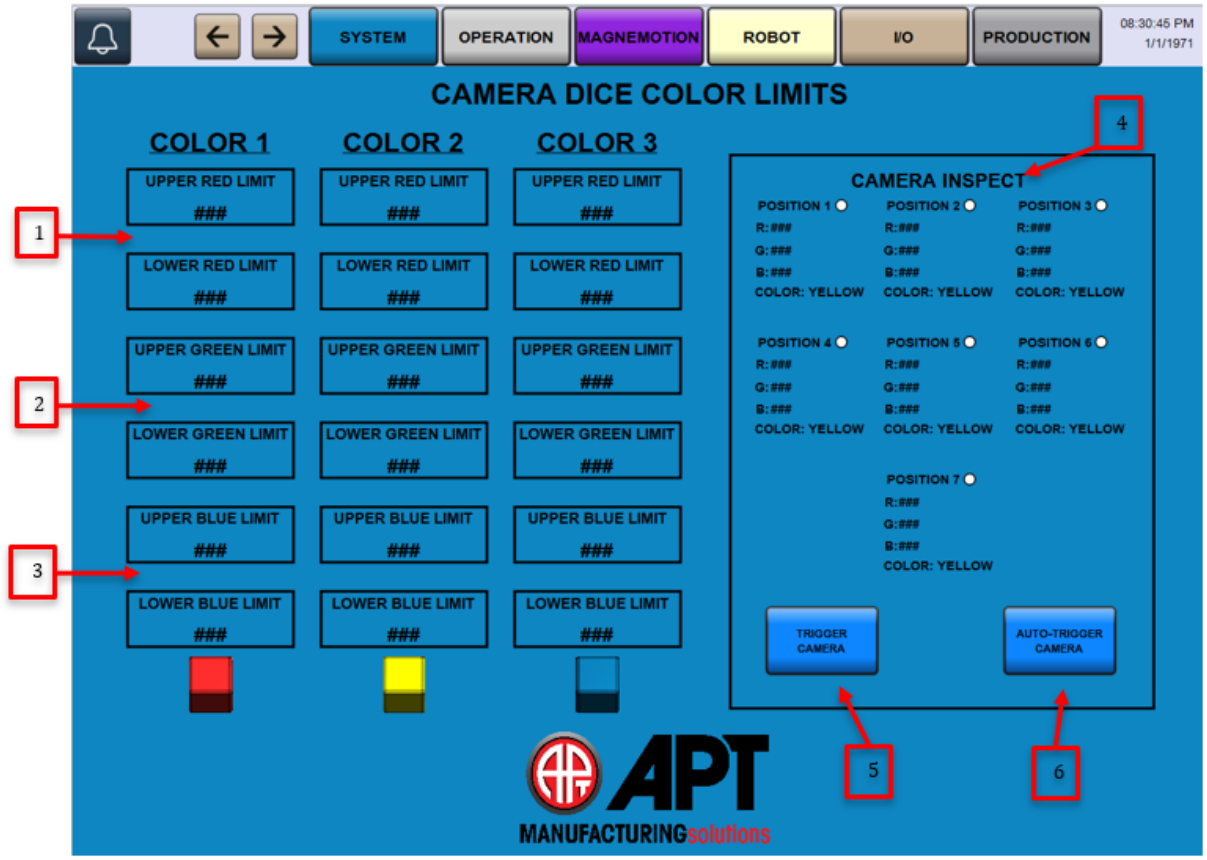

Figure 9-14 Stack Light Setup

1) Adjust Upper and Lower Red Limits
2) Adjust Upper and Lower Green Limits
3) Adjust Upper and Lower Blue Limits
4) Displays last triggered camera inspect
5) Trigger camera once
6) Trigger camera repeatedly

9.6.1.4 Camera Dice Color Limits Setup Screen

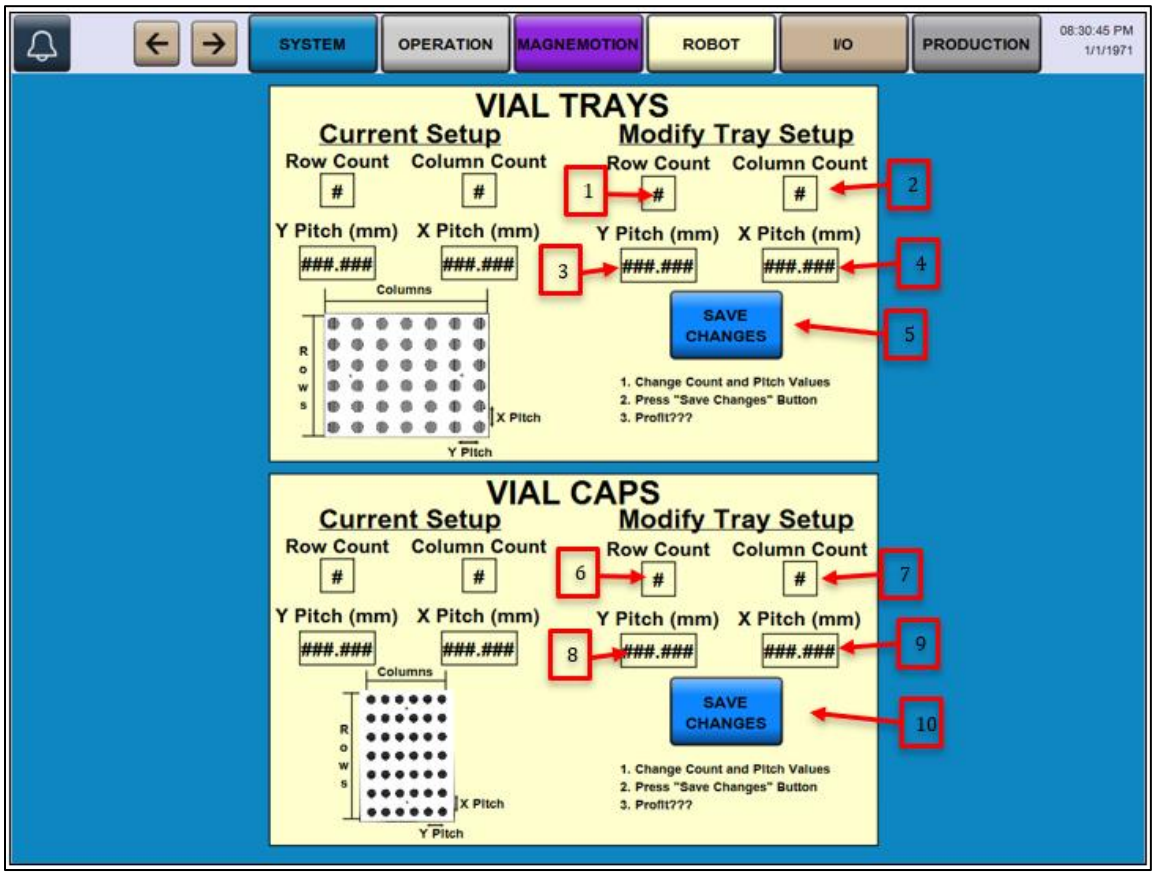

Figure 9-15 Stack Light Setup

1) Adjust Vial Tray Row Count
2) Adjust Vial Tray Column Count
3) Adjust Vial Tray Y Pitch
4) Adjust Vial Tray X Pitch
5) Save Vial Tray Changes
6) Adjust Cap Tray Row Count
7) Adjust Cap Tray Column Count
8) Adjust Cap Tray Y Pitch
9) Adjust Cap Tray X Pitch
10) Save Cap Tray Changes

9.6.2 Operations Screen

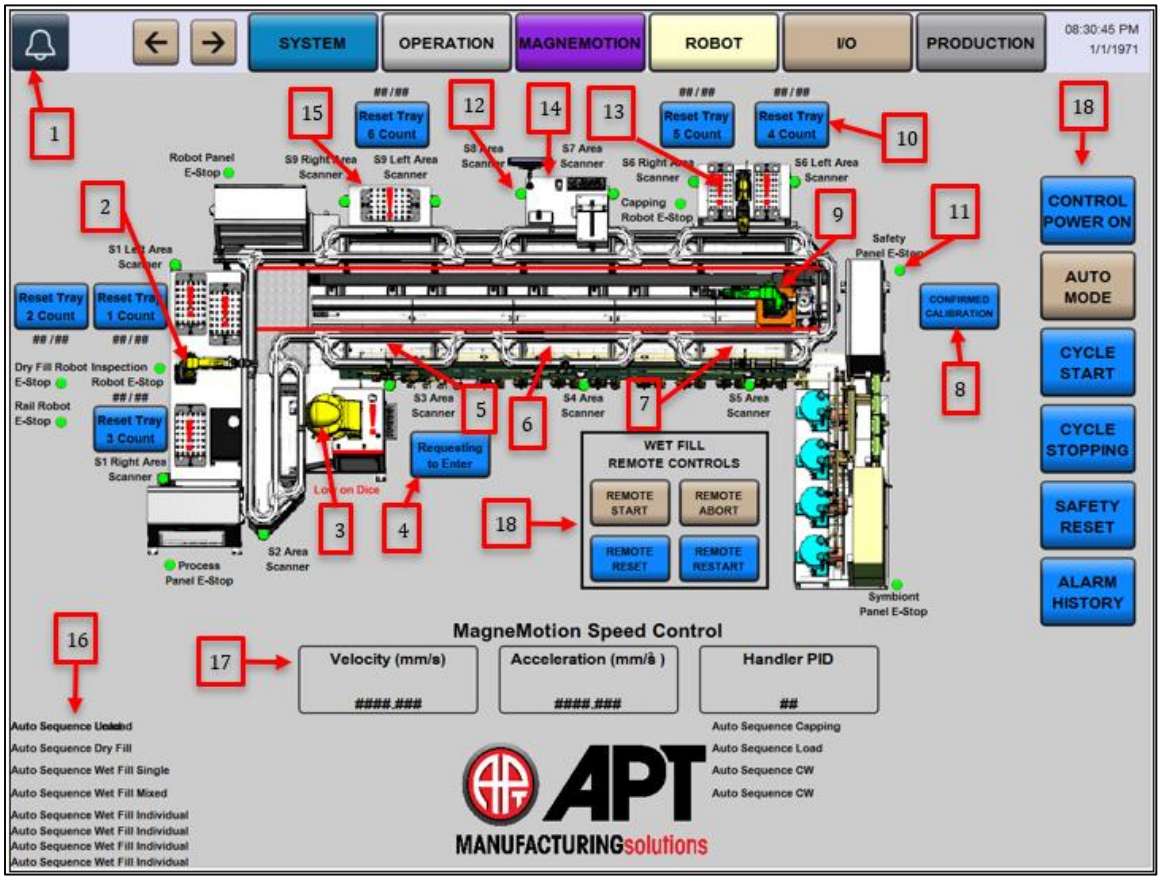

Figure 9-16 Main Operation Screen

1) Display of Current System Fault
2) Navigate to Station 1 Operation Screen
3) Navigate to Station 2 Operation Screen
4) Request to Enter Dice Cell
5) Navigate to Station 3 Operation Screen
6) Navigate to Station 4 Operation Screen
7) Navigate to Station 5 Operation Screen
8) Confirm Collaborative Robot Calibration
9) Navigate to Rail Robot Operation Screen
10) Reset Tray Count
11) Emergency Stop Status
12) Area Scanner Status (Green-Clear; Yellow-Warning Zone; Red-Stop Zone)
13) Navigate to Station 6 Operation Screen
14) Navigate to Station 7 & 8 Operation Screen
15) Navigate to Station 9 Operation Screen
16) Auto Sequence Display and Description for every Station
17) MangeMotion Speed Controls
18) Remote WetFill Controls
19) All Stations Mode Operators

9.6.2.1 Station 1 Operation Screen

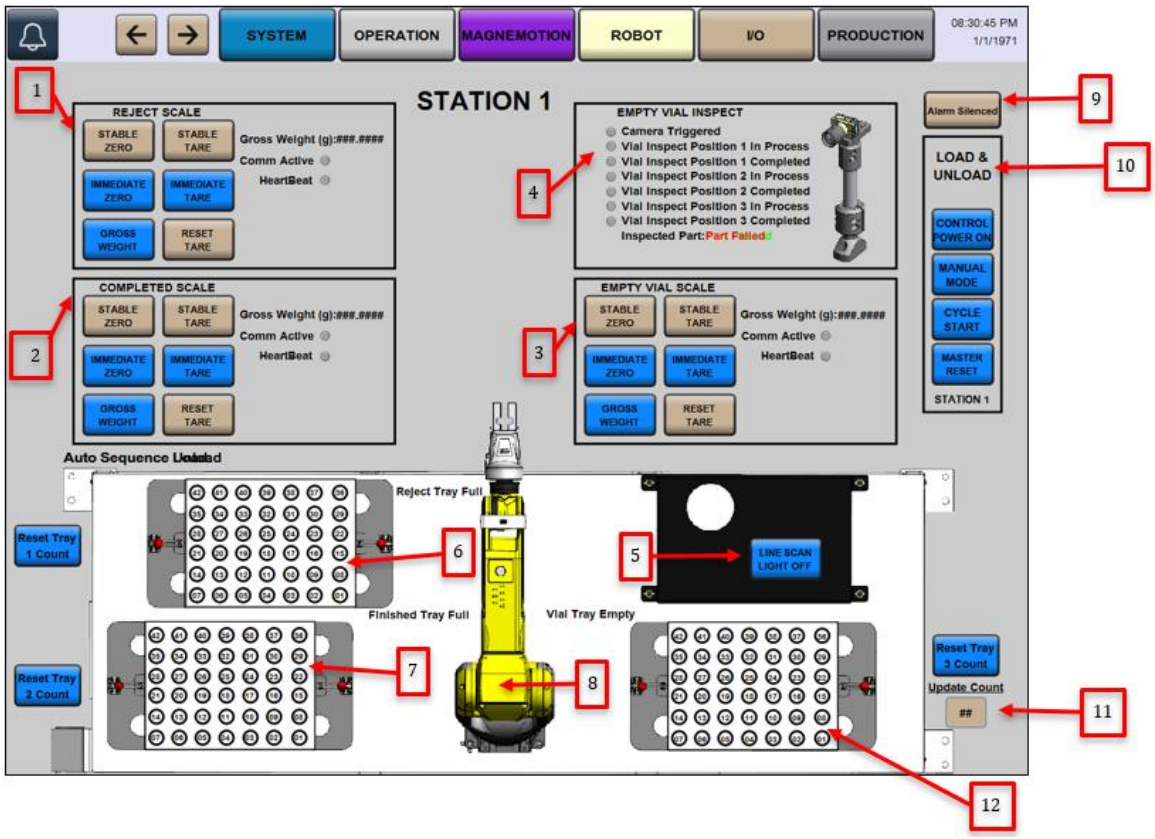

Figure 9-17 Station 1 Operation Screen

1) Tray 1 Scale
2) Tray 2 Scale
3) Tray 3 Scale
4) Current Vial Inspect
5) Toggle Line Scan Light
6) Navigate to Tray 1 Vial Inspect Operation Screen / Current Tray Count
7) Navigate to Tray 2 Vial Inspect Operation Screen / Current Tray Count
8) Navigate to LR-Mate Robot Screen
9) Station Alarm Silence
10) Station Mode Operators
11) Manually Update Tray Count
12) Empty Vial Tray Count

9.6.2.2 Station 2 Operation Screen

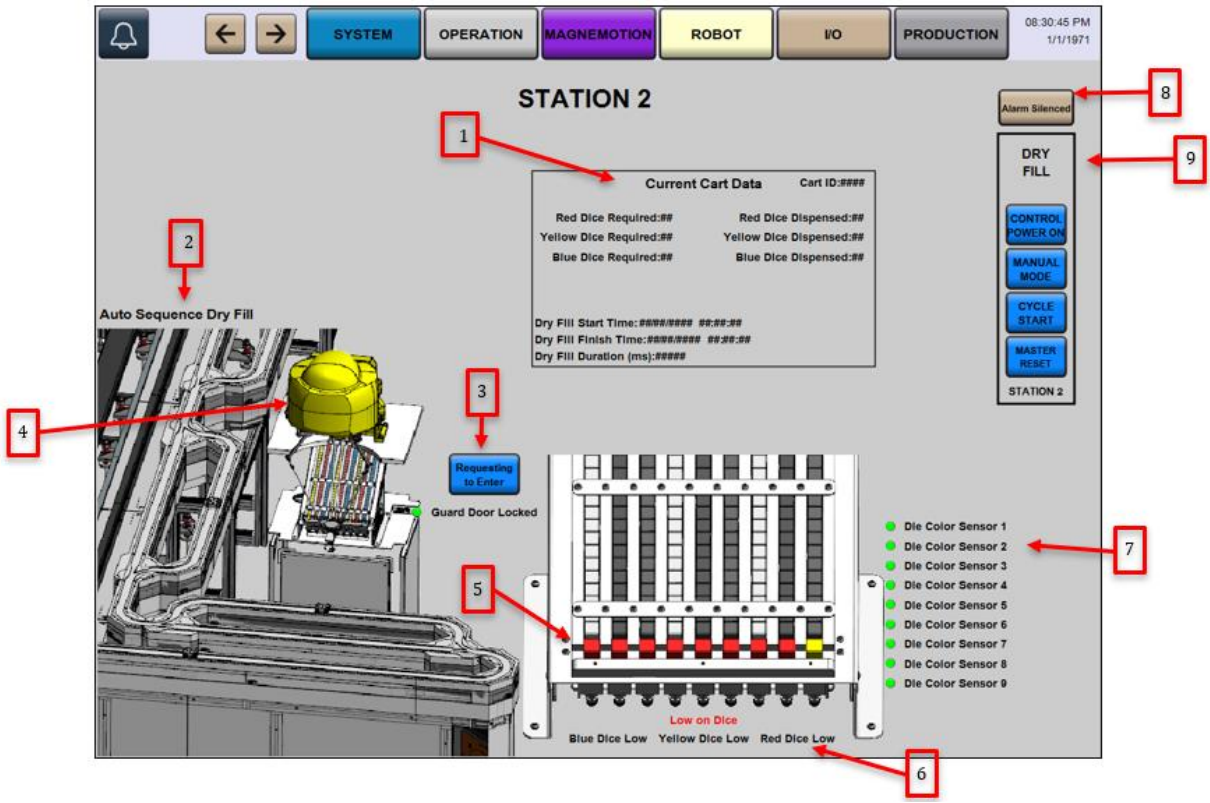

Figure 9-18 Station 2 Operation Screen

1) Station 2 Current Cart Data / Navigate to MagneMotion Information Screen
2) Station 2 Auto Sequence Steps
3) Request to Enter Dice Cell
4) Navigate to M1iA Robot Screen
5) Current Dice Color
6) Dice Tray Low on Dice Indicators
7) Die Sensor Indicators
8) Station Alarm Silence
9) Station Mode Operators

9.6.2.3 Station 3 Operation Screen

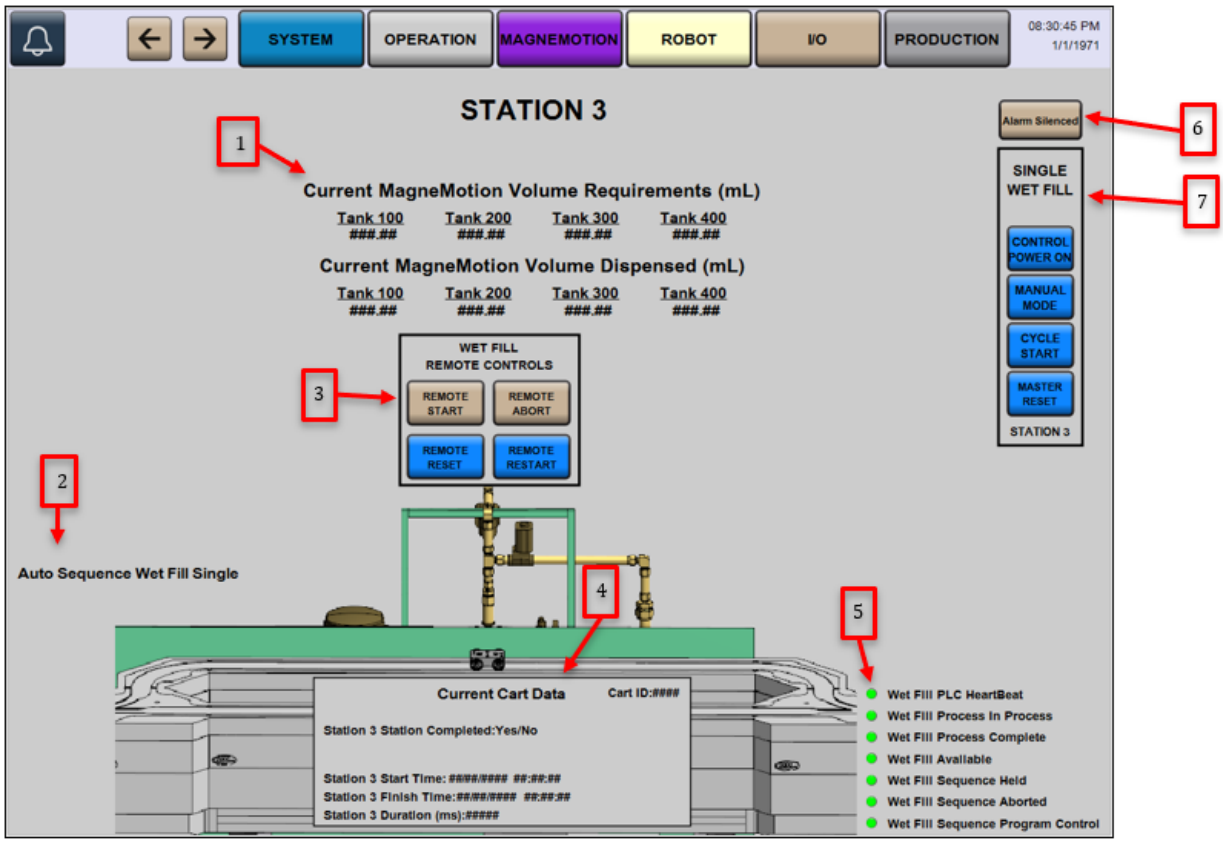

Figure 9-19 Station 3 Operation Screen

1) Station 3 Current Wetfill Volume Required / Dispensed values
2) Station 3 Auto Sequence Steps
3) Remote Wetfill Controls
4) Station 3 Current Cart Data / Navigate to MagneMotion Information Screen
5) Wetfill Station 3 Status Indicators
6) Station Alarm Silence
7) Station Mode Operators

9.6.2.4 Station 4 Operation Screen

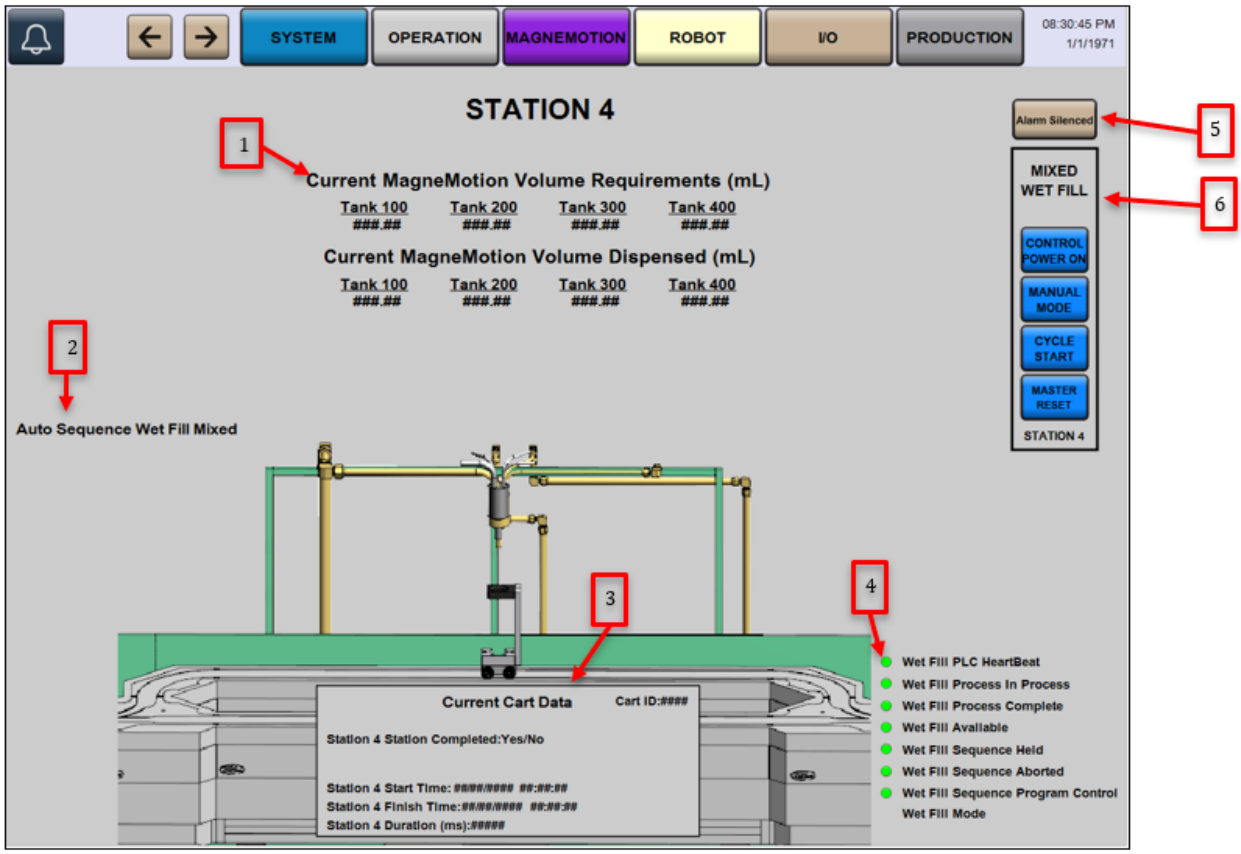

Figure 9-20 Station 4 Operation Screen

1) Station 4 Current Wetfill Volume Required / Dispensed values
2) Station 4 Auto Sequence Steps
3) Station 4 Current Cart Data / Navigate to MagneMotion Information Screen
4) Wetfill Station 4 Status Indicators
5) Station Alarm Silence
6) Station Mode Operators

9.6.2.5 Station 5 Operation Screen

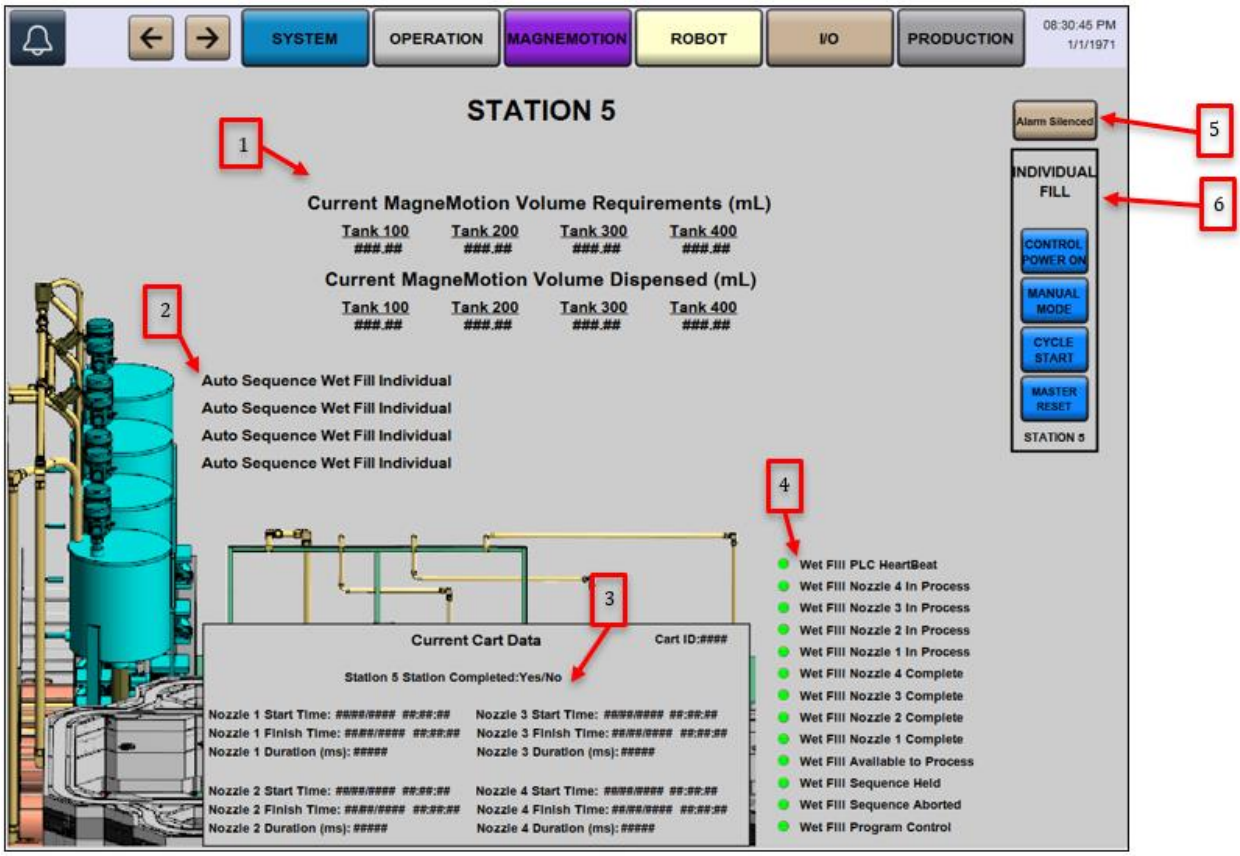

Figure 9-21 Station 5 Operation Screen

1) Station 5 Current Wetfill Volume Required / Dispensed values
2) Station 5 Auto Sequence Steps
3) Station 5 Current Cart Data / Navigate to MagneMotion Information Screen
4) Wetfill Station 5 Status Indicators
5) Station Alarm Silence
6) Station Mode Operators

9.6.2.6 Station 6 Operation Screen

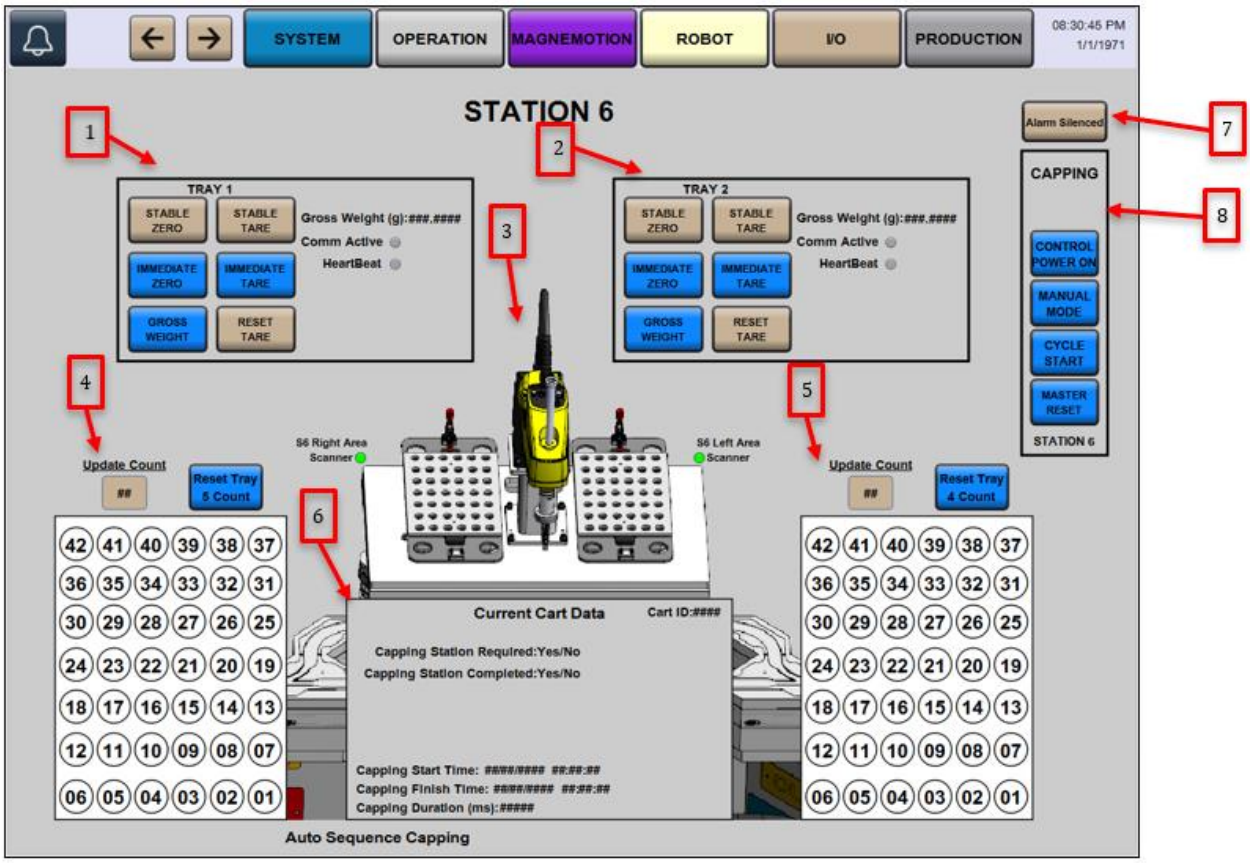

Figure 9-22 Station 6 Operation Screen

1) Station 6 Tray 1 Scale
2) Station 6 Tray 2 Scale
3) Navigate to Scara Robot Screen
4) Manually Update Tray 2 Count
5) Manually Update Tray 1 Count
6) Station 6 Current Cart Data / Navigate to MagneMotion Information Screen
7) Station Alarm Silence
8) Station Mode Operators

9.6.2.7 Station 7 & 8 Operation Screen

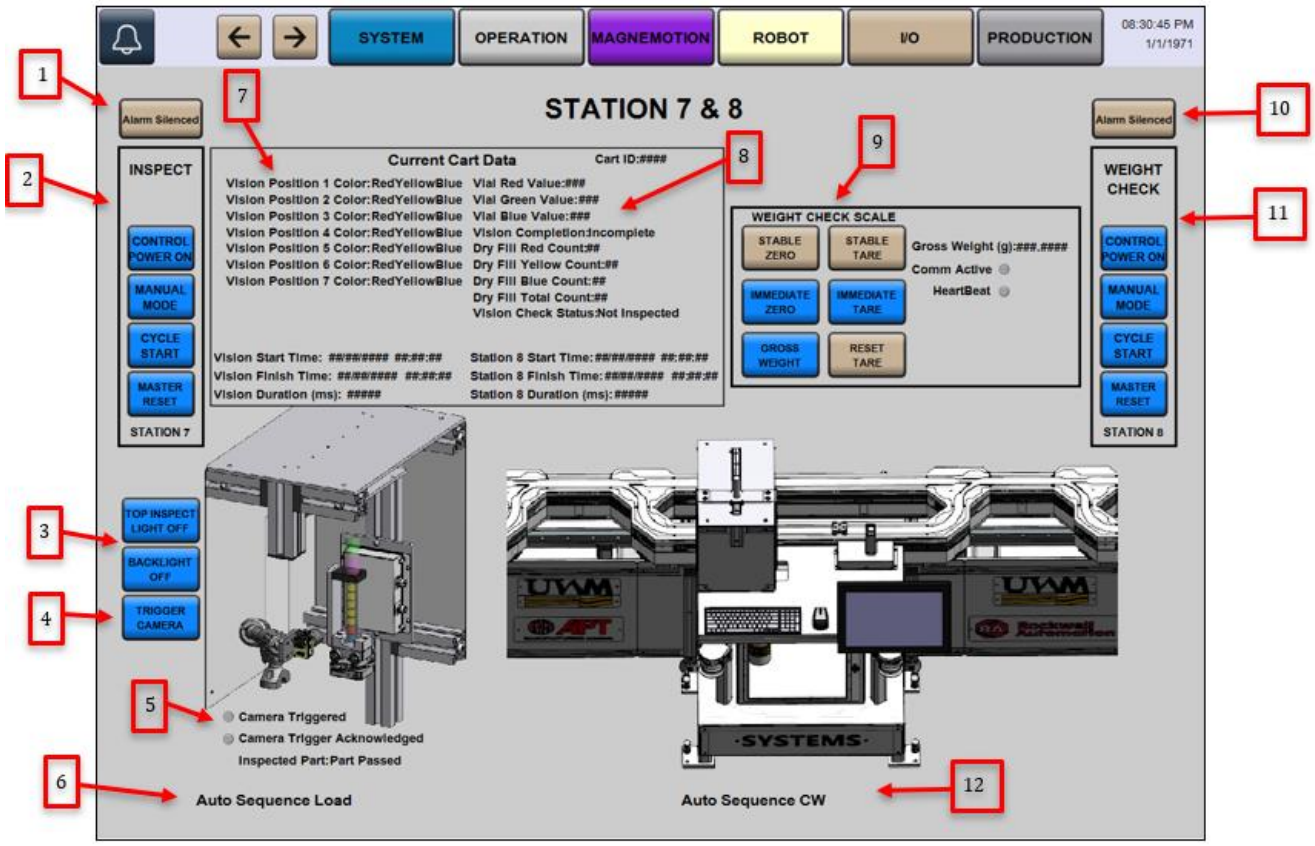

Figure 9-23 Station 7 & 8 Operation Screen

1) Station 7 Alarm Silence
2) Station 7 Mode Operators
3) Toggle Camera Inspect Lights
4) Trigger Camera
5) Camera Result Indicators
6) Station 7 Auto Sequence Steps
7) Station 7 Current Cart Data / Navigate to MagneMotion Information Screen
8) Station 8 Current Cart Data / Navigate to MagneMotion Information Screen
9) Station 8 Scale
10) Station 8 Alarm Silence
11) Station 8 Mode Operators
12) Station 8 Auto Sequence Steps

9.6.2.8 Station 9 Operation Screen

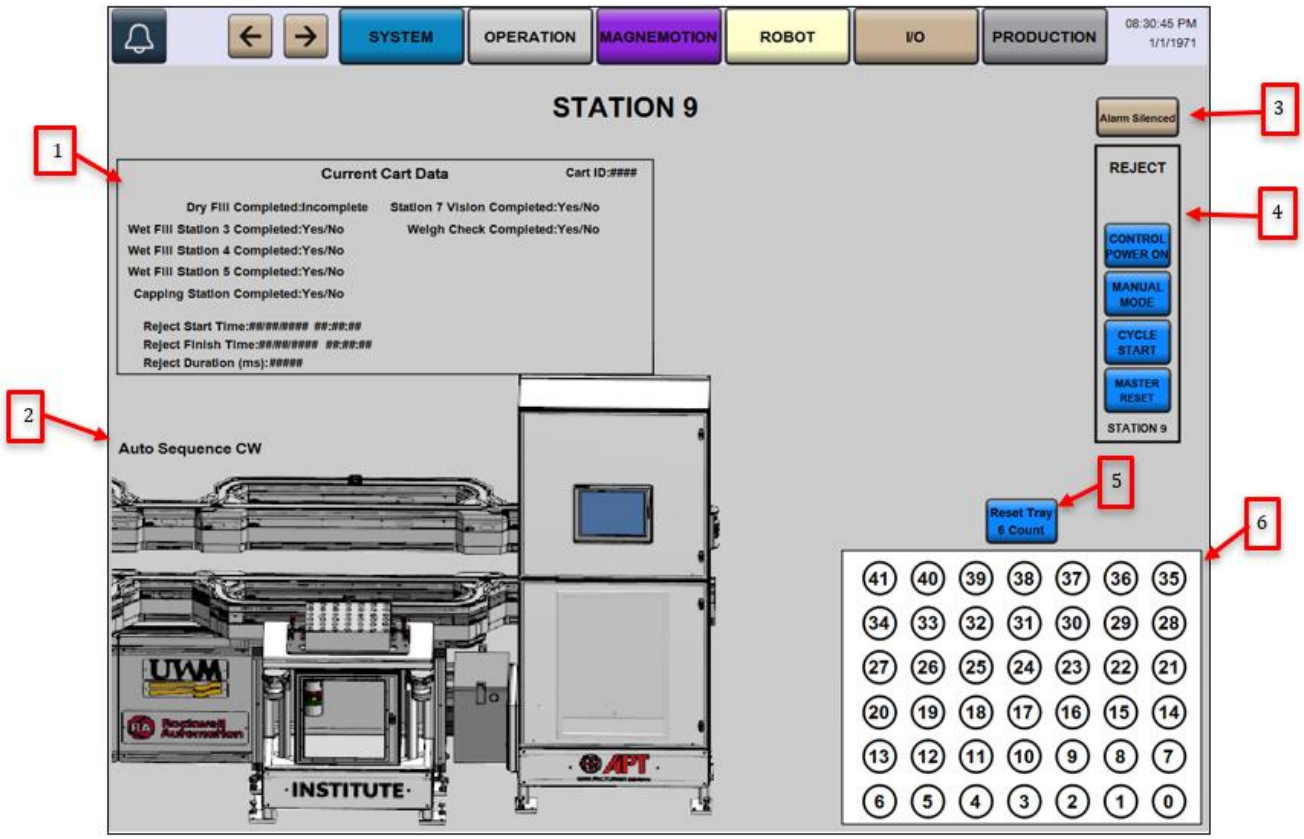

Figure 9-24 Station 9 Operation Screen

1) Station 9 Current Cart Data / Navigate to MagneMotion Information Screen
2) Station 9 Auto Sequence Steps
3) Station 9 Alarm Silence
4) Station 9 Mode Operators
5) Reset Station 9 Tray Count
6) Reject Tray Count Indicators / Navigate to Reject Tray Vial Information

9.6.2.9 MagneMotion Operation Screen

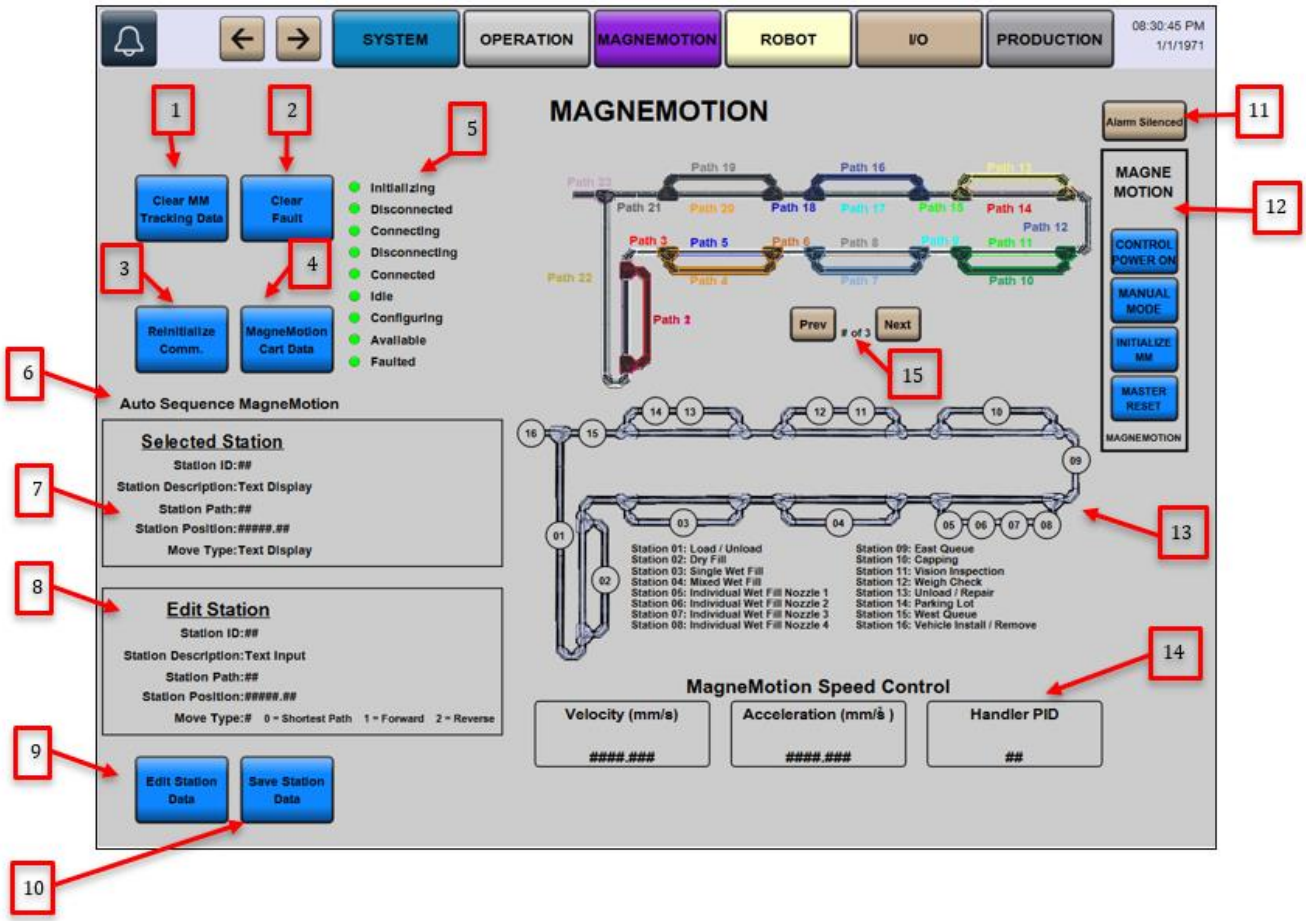

Figure 9-25 MagneMotion Operation Screen

1) Clear MagneMotion Tracking Data
2) Clear MagneMotion Faults
3) Reinitialize MagneMotion Communication
4) Navigate to MagneMotion Information Screen
5) MagneMotion Status Indicators
6) MagneMotion Auto Sequence Steps
7) Current selected MagneMotion station data – Shows MagneMotion data on selected cart station
8) Edit selected MagneMotion station data – edit selected cart station and save to store values
9) Edit Station Data – Allows user to edit the selected station
10) Save Station Data – Stores the Data in the edited station into the current selected station
11) Silence MagneMotion Station Alarm
12) MagneMotion Mode Operators
13) MagneMotion cart at Station Indicators (Green when present) – Tap to show Selected Station Data
14) MagneMotion Speed Controls

9.6.2.10 Tray Vial Information Operation Screen

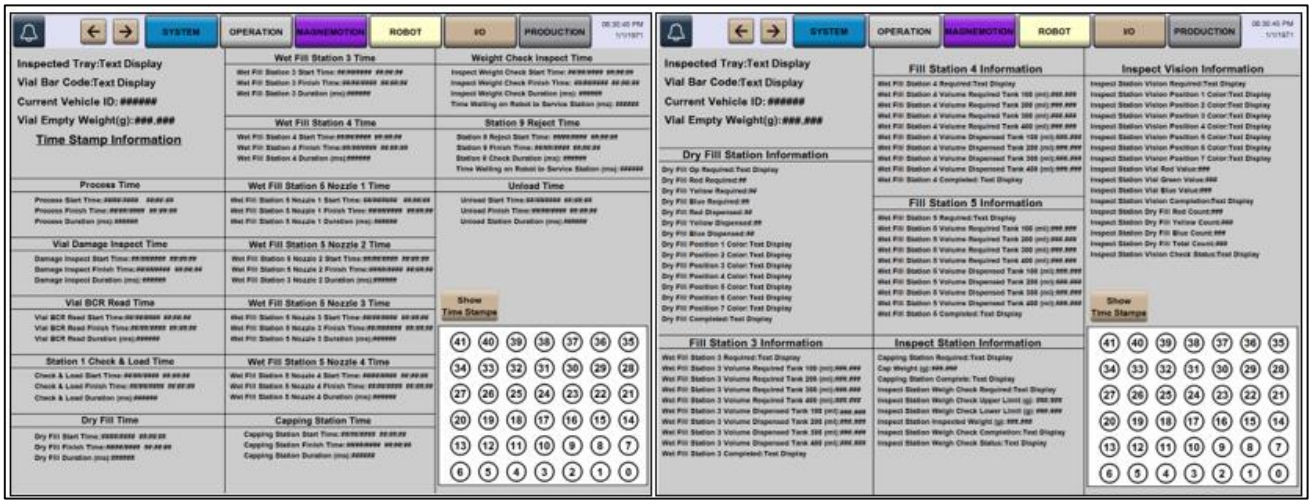

Figure 9-26 Vial Tray Information Operation Screen

This screen shows all the process data that is sent throughout all the stations during Auto Cycle and gets stored into the Inspected Tray's process data. Vial indicators are green when a vial is present and touching a vial indicator displays the vial process data.

9.6.2.11 MagneMotion Cart Information Operation Screen

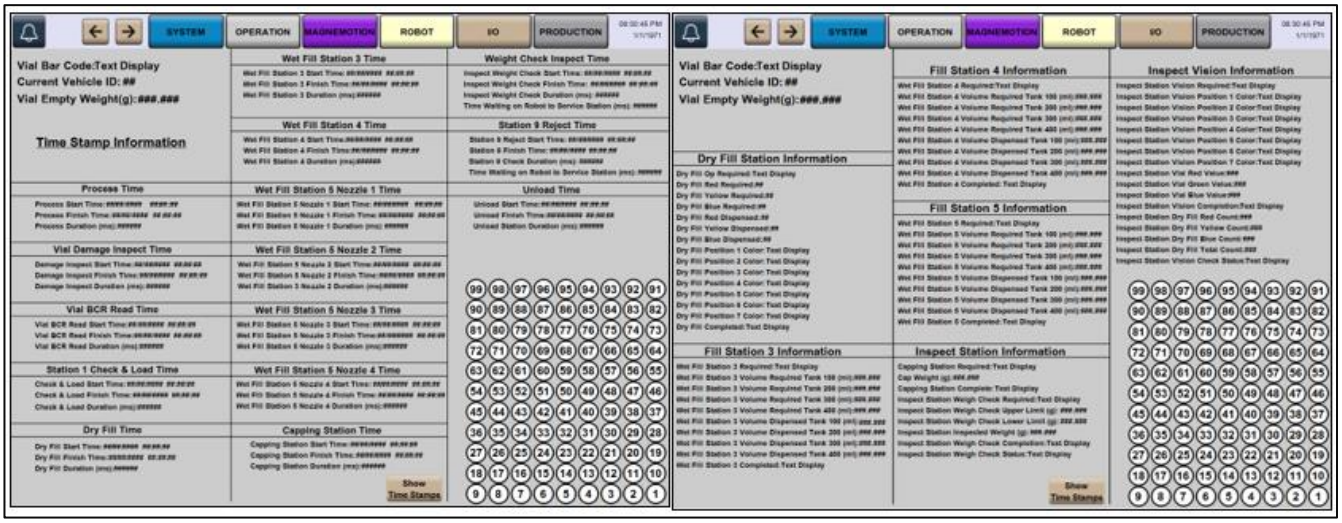

Figure 9-27 MagneMotion Information Operation Screen

This screen shows all the process data that is sent throughout all the stations during Auto Cycle and gets stored into the Inspected MagneMotion cart process data. Cart indicators are green when a cart is active (cart vehicle ID between 1 – 99) and touching a cart indicator displays the process data.

9.6.3 Robot Screens

9.6.3.1 LR-Mate Robot Screen

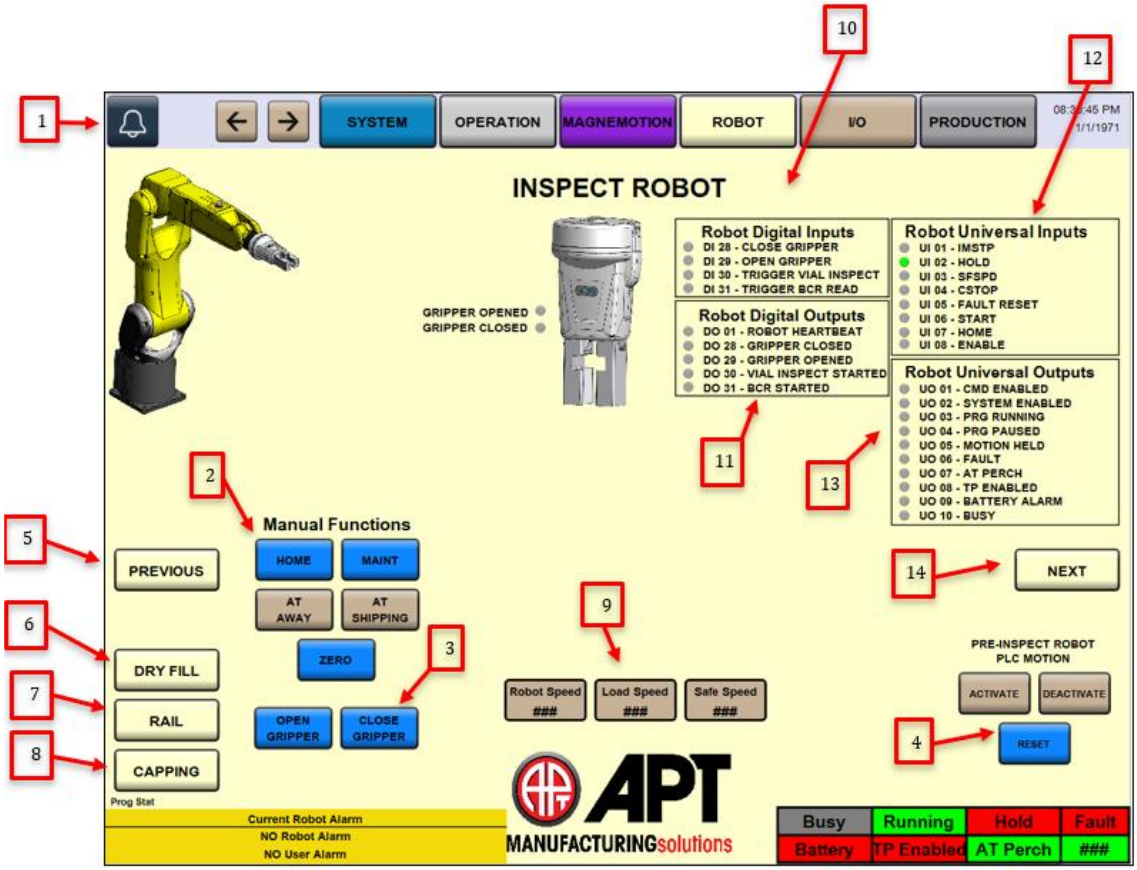

Figure 9-28 LR-Mate Robot Screen

1) Display Current Faults
2) Manual Function Operators and Indication of State; Select Button to Move Robot to the Desired Position.
3) End of Arm Tooling Manual Function and Status Indicators
4) Robot UOP Commands and Indicators
5) Navigate to Previous Robot Screen
6) Navigate to M1iA Robot Screen
7) Navigate to CR7 Robot Screen
8) Navigate to Scara Robot Screen
9) Robot Speed Control
10) Robot Digital Input Signals from Process PLC
11) Robot Digital Output Signals to Process PLC
12) Robot UI Signal Indicators to Process PLC
13) Robot UO Signal Indicators to Process PLC
14) Navigate to Next Robot Screen

9.6.3.2 M1iA Robot Screen

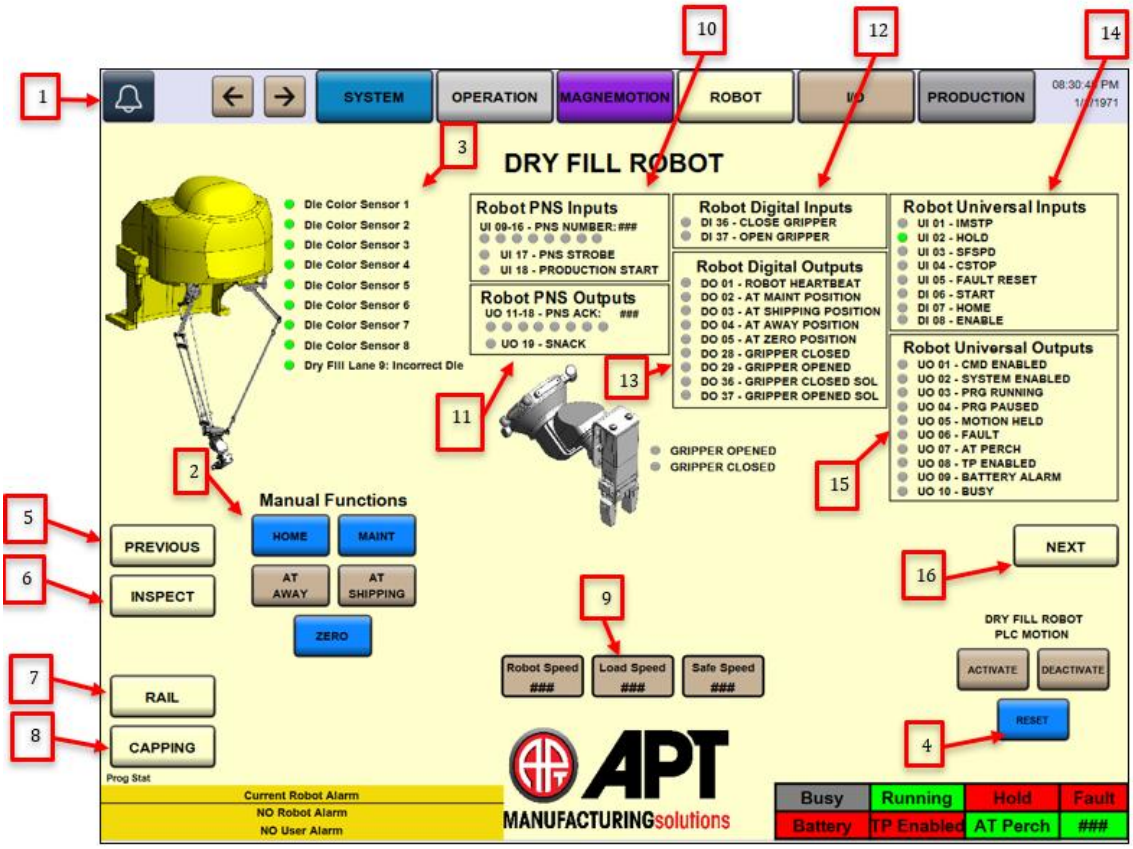

Figure 9-29 M1iA Robot Screen

1) Display Current Faults
2) Manual Function Operators and Indication of State; Select Button to Move Robot to the Desired Position.
3) Dice Tray Color Sensor Status Indicators
4) Robot UOP Commands and Indicators
5) Navigate to Previous Robot Screen
6) Navigate to LR-Mate Robot Screen
7) Navigate to CR7 Robot Screen
8) Navigate to Scara Robot Screen
9) Robot Speed Control
10) PNS Input Data to the Robot from the Process PLC
11) PNS Output Data Echoed Back from Robot to the Process PLC
12) Robot Digital Input Signals from Process PLC
13) Robot Digital Output Signals to Process PLC
14) Robot UI Signal Indicators to Process PLC
15) Robot UO Signal Indicators to Process PLC
16) Navigate to Next Robot Screen

9.6.3.3 CR7 Robot Screen

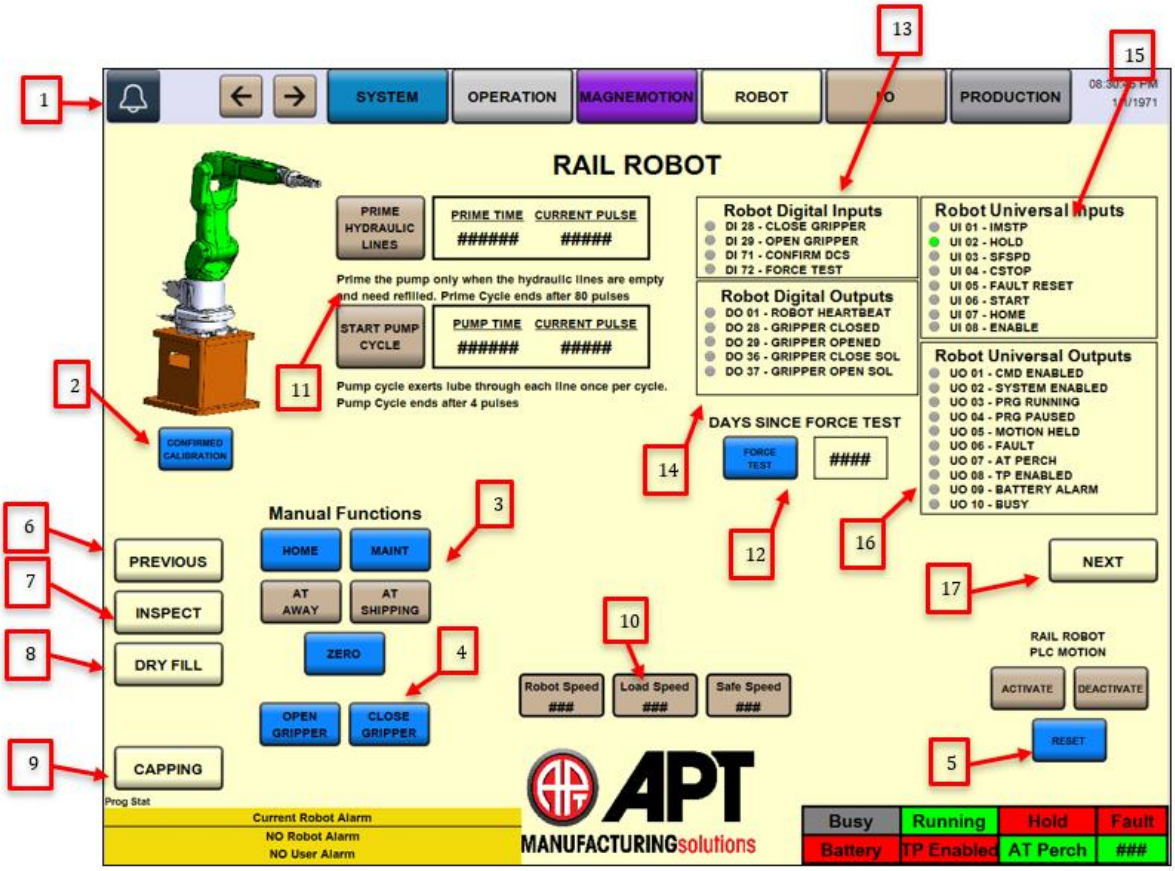

Figure 9-30 CR7 Robot Screen

1) Display Current Faults
2) Confirm CR7 Collaboration – Ensure no one is touching the Robot
3) Manual Function Operators and Indication of State; Select Button to Move Robot to the Desired Position.
4) End of Arm Tooling Manual Function and Status Indicators
5) Robot UOP Commands and Indicators
6) Navigate to Previous Robot Screen
7) Navigate to CR7 Robot Screen
8) Navigate to M1iA Robot Screen
9) Navigate to Scara Robot Screen
10) Robot Speed Control
11) Lube Pump Controls
12) Force Test Controls
13) Robot Digital Input Signals from Process PLC
14) Robot Digital Output Signals to Process PLC
15) Robot UI Signal Indicators to Process PLC
16) Robot UO Signal Indicators to Process PLC
17) Navigate to Next Robot Screen

9.6.3.4 Scara Robot Screen

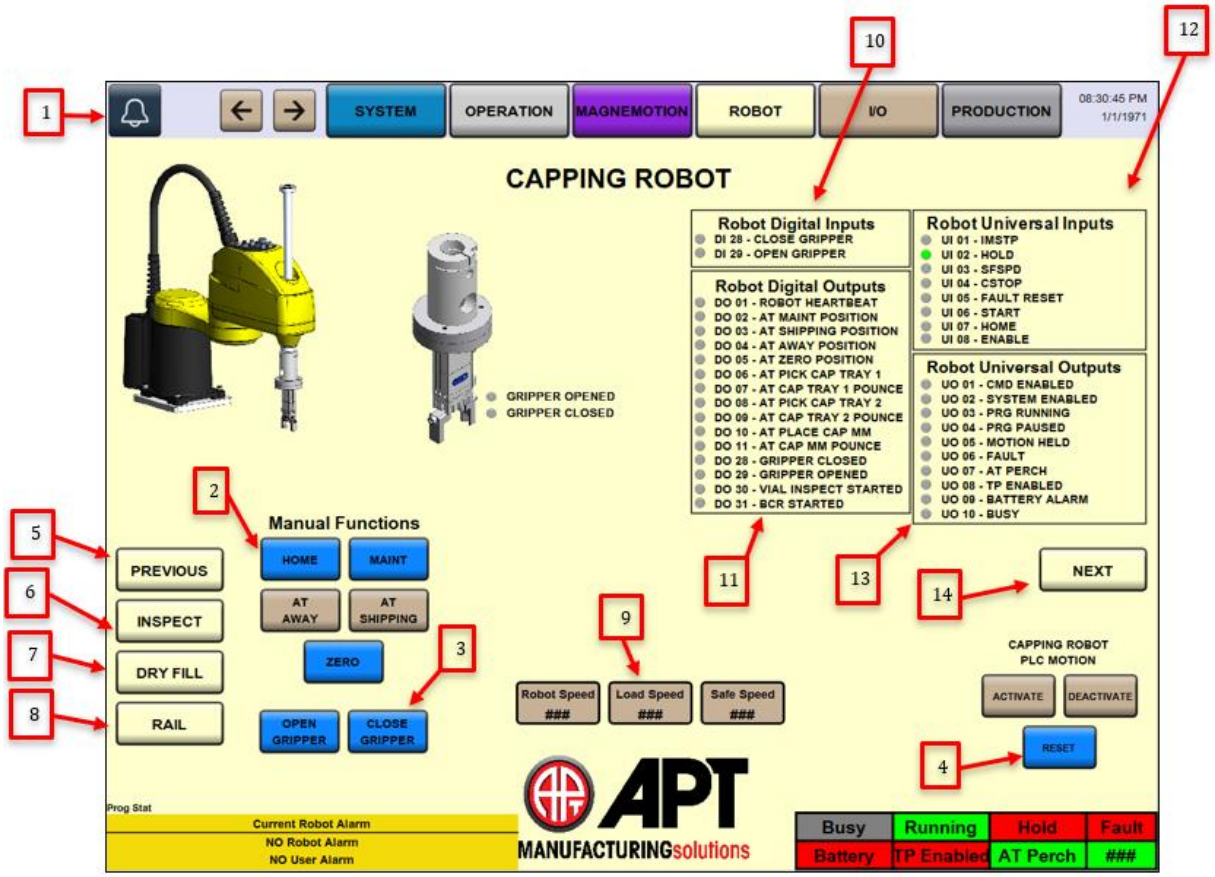

Figure 9-31 Scara Robot Screen

1) Display Current Faults
2) Manual Function Operators and Indication of State; Select Button to Move Robot to the Desired Position.
3) End of Arm Tooling Manual Function and Status Indicators
4) Robot UOP Commands and Indicators
5) Navigate to Previous Robot Screen
6) Navigate to LR-Mate Robot Screen
7) Navigate to M1iA Robot Screen
8) Navigate to CR7 Robot Screen
9) Robot Speed Control
10) Robot Digital Input Signals from Process PLC
11) Robot Digital Output Signals to Process PLC
12) Robot UI Signal Indicators to Process PLC
13) Robot UO Signal Indicators to Process PLC
14) Navigate to Next Robot Screen

9.6.4 I/O Screens

1) Status Indicator of I/O
2) Navigate to I/O Master Block #1
3) Navigate to I/O Master Block #2

Figure 9-32 Safety I/O Screen Slot 3

Figure 9-34 Safety I/O Screen Slot 4

Figure 9-33 Safety I/O Screen Slot 5

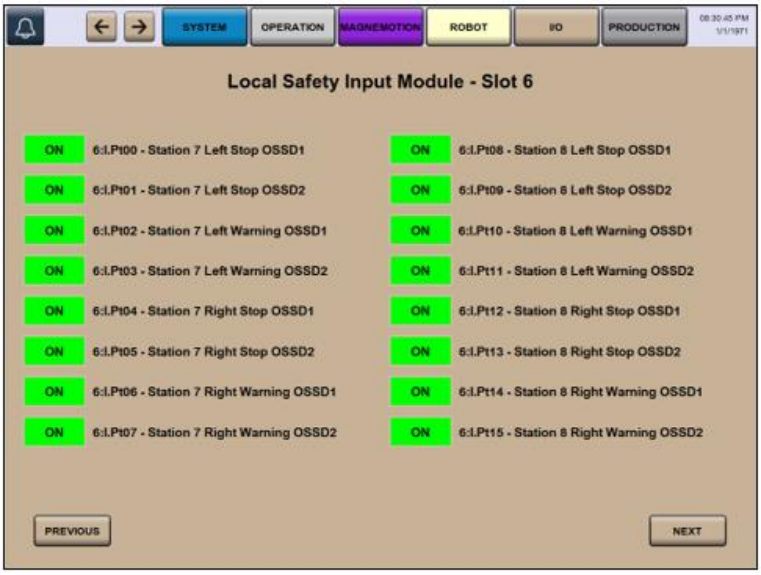

Figure 9-38 Safety I/O Screen Slot 6

Figure 9-37 Safety I/O Screen Slot 7

Figure 9-36 Safety I/O Screen Slot 11

Figure 9-35 I/O Screen Slot 16

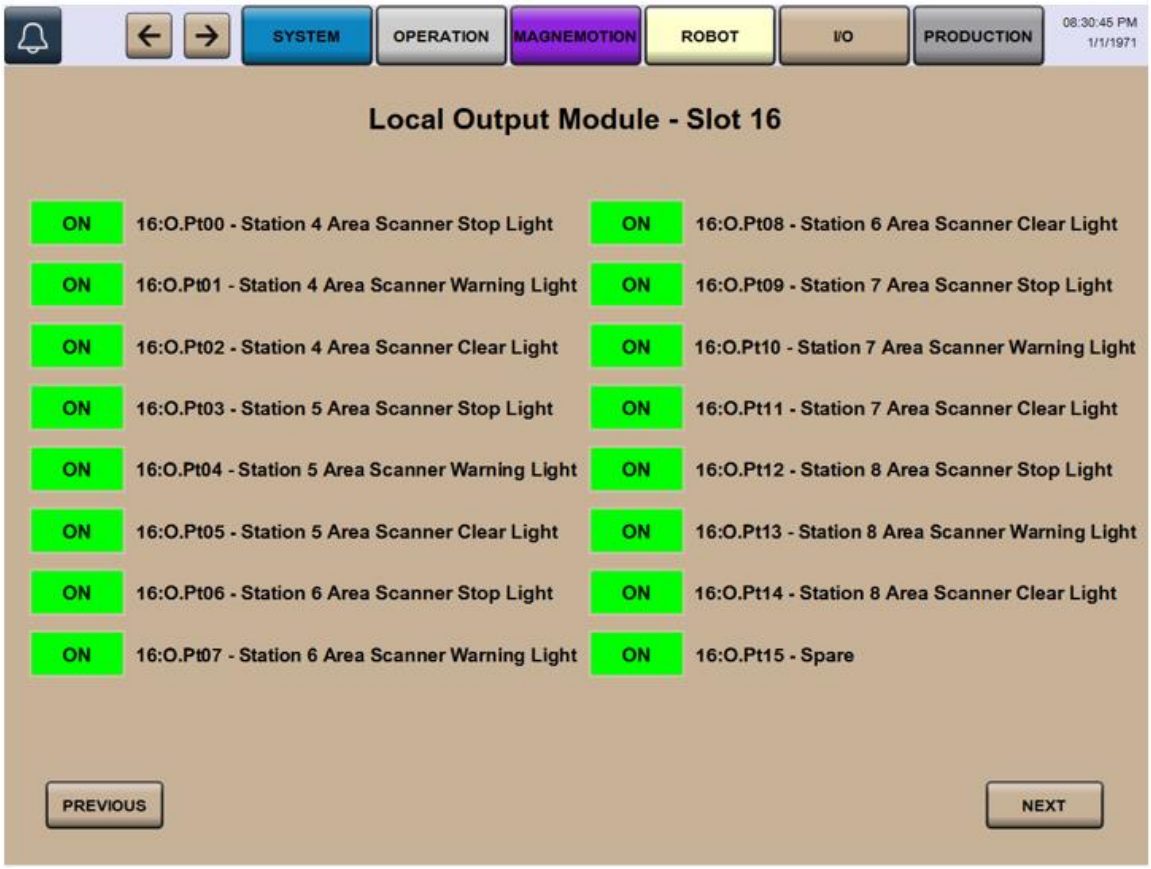

Figure 9-39 I/O Screen Slot 16

9.6.5 Production Data Screen

Figure 9-40 Production Data Screen

9.7 Fault Listings

9.7.1 Station 1 Faults

Alarm 01: LRMate7L Robot HeartBeat Fault – Check Robot Controller
Alarm 02: Station 1 Tray 1 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 03: Station 1 Tray 2 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 04: Station 1 Tray 3 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 05: Station 1 Robot Faulted – See Teach Pendent for Details

9.7.2 Station 2 Faults

Alarm 01: Spare
Alarm 02: Spare
Alarm 03: Spare
Alarm 04: Spare
Alarm 05: Station 2 Robot Faulted – See Teach Pendent for Details

9.7.3 Station 3 Faults

Alarm 01: Wet Fill PLC Heartbeat Fault – Check Filler Panel & Controller
Alarm 02: Spare
Alarm 03: Spare
Alarm 04: Spare
Alarm 05: Spare

9.7.4 Station 4 Faults

Alarm 01: Wet Fill PLC Heartbeat Fault – Check Filler Panel & Controller
Alarm 02: Spare
Alarm 03: Spare
Alarm 04: Spare
Alarm 05: Spare

9.7.5 Station 5 Faults

Alarm 01: Wet Fill PLC Heartbeat Fault – Check Filler Panel & Controller
Alarm 02: Spare
Alarm 03: Spare
Alarm 04: Spare
Alarm 05: Spare

9.7.6 Station 6 Faults

Alarm 01: SR3iA SCARA Robot Heartbeat Fault – Check Robot Controller
Alarm 02: Station 6 Tray 1 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 03: Station 6 Tray 2 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 04: Spare
Alarm 05: Scara Robot Faulted – See Teach Pendent for Details

9.7.7 Station 8 Faults

Alarm 01: Spare
Alarm 02: Station 8 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 03: Station 6 Tray 2 Scale Heartbeat Fault – Check Scale ACT350 Controller
Alarm 04: Spare
Alarm 05: Spare

9.7.8 CR7 Faults

Alarm 01: CR7 Rail Robot Heartbeat Fault – Check Robot Controller
Alarm 02: Spare
Alarm 03: Spare
Alarm 04: Spare
Alarm 05: CR7 Rail Robot Faulted – See Teach Pendent for Details

9.7.9 Safety Faults

Alarm 00: Safety Panel Emergency Stop Activated
Alarm 01: Safety Panel Emergency Stop Faulted – Check for Wire Break or Short
Alarm 02: Process Panel Emergency Stop Activated
Alarm 03: Process Panel Emergency Stop Faulted – Check for Wire Break or Short
Alarm 04: Robot Panel Emergency Stop Activated
Alarm 05: Robot Panel Emergency Stop Faulted – Check for Wire Break or Short
Alarm 06: Symbiont Panel Emergency Stop Activated
Alarm 07: Symbiont Panel Emergency Stop Faulted – Check for Wire Break or Short
Alarm 08: Robot Rail North Light Curtain Faulted – Check for Wire Break or Short
Alarm 09: Robot Rail South Light Curtain Faulted – Check for Wire Break or Short
Alarm 10: Station 1 Area Scanner Left Stop Zone Faulted – Check for Wire Break or Short
Alarm 11: Station 1 Area Scanner Left Warning Zone Faulted – Check for Wire Break or Short
Alarm 12: Station 1 Area Scanner Right Stop Zone Faulted – Check for Wire Break or Short
Alarm 13: Station 1 Area Scanner Right Warning Zone Faulted – Check for Wire Break or Short
Alarm 14: Station 2 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 15: Station 2 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 16: Station 3 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 17: Station 3 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 18: Station 4 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 19: Station 4 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 20: Station 5 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 21: Station 5 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 22: Station 6 Left Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 23: Station 6 Left Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 24: Station 6 Right Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 25: Station 6 Right Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 26: Station 7 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 27: Station 7 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 28: Station 8 Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 29: Station 8 Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 30: Station 9 Left Area Scanner Stop Zone Faulted – Check for Wire Break or Short

Alarm 31: Station 9 Left Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 32: Station 9 Right Area Scanner Stop Zone Faulted – Check for Wire Break or Short
Alarm 33: Station 9 Right Area Scanner Warning Zone Faulted – Check for Wire Break or Short
Alarm 34: Guard Door Lock Faulted – Check for Wire Break or Short
Alarm 35: Safety Relay Output Control Faulted – Check for Wire Break, Short or EDM Feedback
Alarm 36: Safety Relay Output Power Faulted – Check for Wire break, Short or EDM Feedback
Alarm 37: Fanuc LR-Mate 7L Emergency Stop Activated
Alarm 38: Fanuc LR-Mate 7L Emergency Stop Safety Instruction Faulted – Check Robot Communication
Alarm 39: Fanuc CR7 Emergency Stop Activated
Alarm 40: Fanuc CR7 Emergency Stop Safety Instruction Faulted – Check Robot Communication
Alarm 41: Fanuc SR3iA Emergency Stop Activated
Alarm 42: Fanuc SR3iA Emergency Stop Safety Instruction Faulted - Check Robot Communication
Alarm 43: Fanuc M1iA Emergency Stop Activated
Alarm 44: Fanuc M1iA Emergency Stop Safety Instruction Faulted - Check Robot Communication
Alarm 45: Safety Input Card Slot 3 Faulted
Alarm 46: Safety Input Card Slot 4 Faulted
Alarm 47: Safety Input Card Slot 5 Faulted
Alarm 48: Safety Input Card Slot 6 Faulted
Alarm 49: Safety Input Card Slot 7 Faulted
Alarm 50: Safety Output Card Slot 11 Faulted
Alarm 51: Safety Input Connection Faulted Fanuc LR-Mate
Alarm 52: Safety Input Connection Faulted Fanuc CR7
Alarm 53: Safety Input Connection Faulted Fanuc SR39A
Alarm 54: Safety Input Connection Faulted Fanuc M1iA
Alarm 55: System Safety Mismatch, Please Verify System Safety has not been Tampered with

10 Appendix A – Equipment / Process Flow

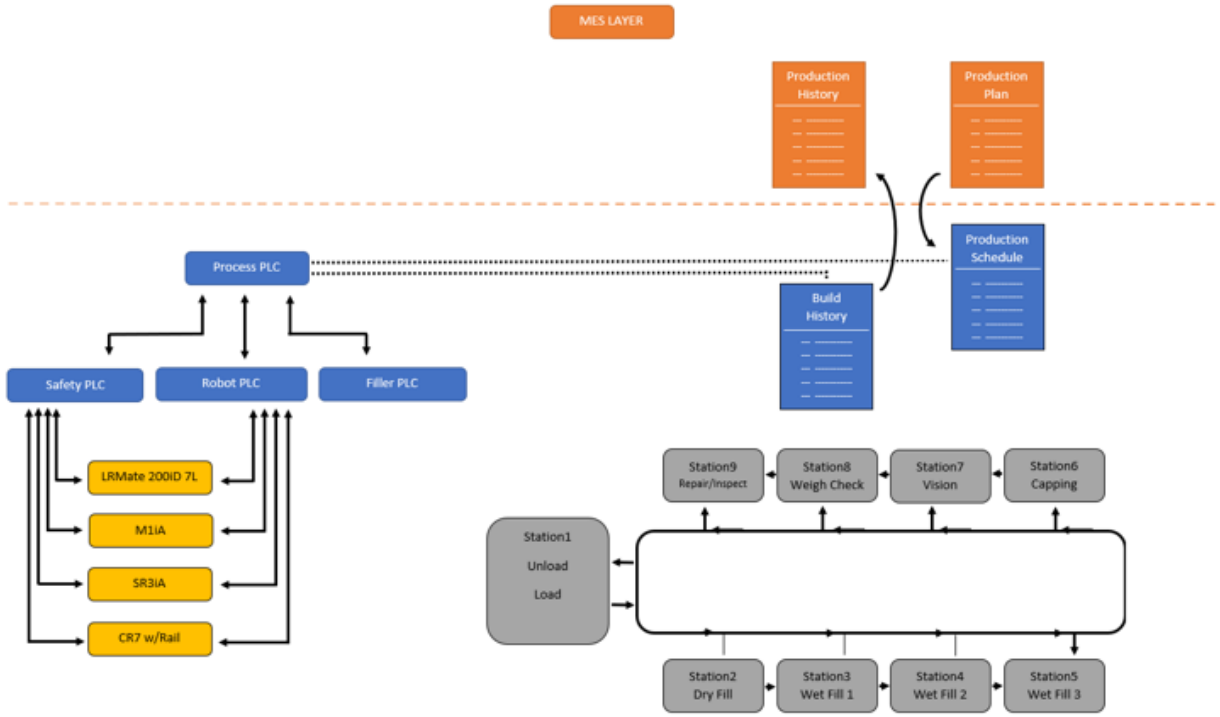

Figure 10-1 Equipment / Process Flow Diagram