PROBAT BURNS
Member of PROBAT Group
Roast Assured.™

G-240 Drum Roaster

For Batch Roasting of Coffee

OPERATING INSTRUCTIONS

Probat Burns, a division of Probat, Inc.
601 Corporate Woods Parkway
Vernon Hills, Illinois 60061
847-415-5293
sales@probatburns.com

WARNING!

1. This operator's manual is only valid for the machine/system described in the offer and order confirmation, as well as for the designated purpose of application.
2. Do not remove, alter or readjust the protection or safety devices.
3. Do not temporarily or permanently remove, alter or readjust any protection or safety device, during the operation of the machine/system.
4. Probat Burns recommends that the customer have the operators confirm in writing that they have received this operator's manual and duly noted its contents.
5. It is advisable to have the operator's manual translated for foreign workers, unless previous arrangements with Probat-Burns have been made.
6. Please pay attention to the above advice; otherwise, Probat-Burns cannot take any responsibility for the machine/system.

IMPORTANT ADVICE!

Regarding Possible Hazards if Handling the Machine/System Improperly.

Installation and repair of electrical equipment must be performed by authorized, licensed experts ONLY! Any contact with non-protected electrical elements (e.g. the control panel) may lead to FATAL ELECTROCUTION!

For any repairs, cleaning, and maintenance work inside or outside the machine, the master switch has to be secured in such a way that there is ABSOLUTELY NO POSSIBILITY of an unintentional start of the machine/system. To assure this, every fitter has to secure the master switch against a manipulation by non-authorized personnel BY HIS OWN PADLOCK.

Before starting the repair, cleaning and maintenance work, be sure that the machine/system is not too hot/too cold.

The machine/system should only be put into operation when all the safety equipment (safety switches, protection plates, protective coverings, etc.) have been installed and are working properly.

The machine/system must not be installed in a hazardous location, unless it has been ordered and designed specifically for this purpose, for RISK OF EXPLOSION!

The connections for utilities, such as electric current (voltage, frequency and number of conductors), water, steam, air, gas (pressure and temperature), have to be designed in accordance with the operating instructions. The connected capacities and loads must not be exceeded at the job site. Safety equipment, such as pressure or capacity regulators, is to be installed.

ATTENTION! Risk of personal injury and/or damage to machinery!

No one should stay near the machine during operation any longer than is absolutely necessary. Over long periods of time, hearing impairment may occur due to noise emissions. Machines having a noise level exceeding 80dBA must be installed in separate rooms; otherwise ear protection is required for operating personnel.

Lifting lugs for moving the equipment are to be screwed in completely, PRIOR to moving the machinery. At risk is breakage and/or damage to the equipment, as well as to any persons nearby!

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I. SAFETY

A. ROASTER SAFETY

- The Roaster is intended for the roasting and cooling of coffee beans. It has automatic interlock safety features. Modifications to the machine or its controls can bypass these safety features and result in serious accidents.

- Do not undertake any modifications on your own. Operate, clean, and maintain the machine as recommended in the Operating Instructions. Have specialists check the safety features regularly.

- If used improperly or not as intended, the machine may prove hazardous. There is a risk of smoldering fire and flammable gases present after a power outage. Only properly trained personnel should operate the machine.

- During the roasting process, a self-sustaining exothermic reaction begins from inside of the coffee beans at around 300ºF (150°C). Continuation of the roasting process after the desired degree of roast is achieved results in carbonization and the formation of dangerous gases if not followed by immediate, intensive cooling. Fires or overpressure caused by these burning materials can result in serious accidents.

- Operate the machine only when it is in good working condition and only if the water supply to the machine is intact. Switch off the burners immediately if you believe that control of the thermal reaction is not operating correctly. If the automatic system fails, open the manual valves available for emergency water. Preheat the Roaster only with an empty roasting chamber in order to prevent fires. Use the tryer/sampler, especially before reheating after brief-operating interruptions, to make sure that the roasting chamber is empty.

- Any of the following conditions are unsafe and can result in serious fires, or explosions:
  - Preset temperatures set too high.
  - Excessively long roasting times.
  - Use of insufficient water quantity.
  - Undersized or partially discharged batches, e.g. after incurring operating problems. This can result in fires and explosions that lead to serious accidents. Keep the batch weight within the allowable limits.

- While operating in Manual Mode, it is possible to determine new parameters and roasting profiles for different coffees. While operating in Manual Mode, certain critical roasting conditions can carry the risk of accidents. During MANUAL operation, a second properly instructed person should also observe the machine's operation and terminate the process immediately by spraying emergency water if critical roasting conditions occur.

- Coffee oil deposits in the roasting chamber exceeding 1/16" (1.5 mm) thickness can cause dangerous fires in the machine and release potentially dangerous quantities of flammable gas during roasting. These deposits can flake off in chips without being noticed. These flakes can overheat and start to smolder, while being carried off into other parts of the roasting system. These smoldering chips can result in damage to equipment, fires or explosions. Reduce the risk of accident by regularly inspecting the inside of the cooled machine (especially ducts, fans, and cyclones) and removing all deposits in a safe manner.

- For machines with the optional Thermal Cleaning system: If the necessary preconditions are missing or individual, necessary preparations have not been made, Thermal Cleaning of the machine carries a substantial risk of accident. Explosions and serious accidents may result. Carefully following the special instructions for the Thermal Cleanout Process. Material baked onto the fan impellers can chip off and result in imbalance and vibration. Mechanical damage can result, which in turn, can seriously endanger persons in the area. When the fans are in operation, do not stand in the impeller's centrifugal plane. In order to minimize risk, check regularly to see that the fans are running smoothly. Shut down vibrating fans immediately and arrange for proper repairs.

- Operating with one or several of the above conditions can result in smoldering fires or explosions. These can quickly lead to the release of large quantities of dangerous gases. These gases can escape from the system into the surrounding area, where they can be fatal to humans if inhaled.

- At the first indication of a fire, follow these steps until the fire is under control:
    1. Do not interfere with the automatic control system or turn off control power. Allow fans to operate providing airflow that is normally cooler than the burning material.
    2. Open the manual valves available for Emergency Water.
    3. Call the Fire Department.
    4. Shut off the fuel supply (if possible).
    5. Leave the room.
    6. Ventilate the room only if no open flames or excess heat is present.

- If the Roaster Cylinder stops with coffee inside, the coffee can start to smolder and burn, spreading to other pieces of equipment in the roasting system. Damage to the Roaster or downstream equipment can result.

- DO NOT turn off Control Power. This provides power to systems that may automatically correct hazardous conditions.

B. PRECAUTIONS

- Dust sitting on equipment or suspended in the air can be stirred up into a combustible mixture. A hot surface or a spark can cause a dust explosion resulting in a serious accident. Reduce the risk of accident enforcing good housekeeping and vacuuming dust collecting on top of ducts, equipment, and nearby structures.

- Allow welding or work with spark-generating tools near the machine ONLY if proper preparations have been made and the work has been approved by the responsible safety manager.

- Beware of high voltage when working on the Roaster system. Only qualified and licensed electricians should make repairs to the electrical installation. ***Only persons recommended by the burner manufacturer*** may repair the burner and its safety systems.

- Improper repairs are a common cause for safety risks. The system may be serviced and maintained only by competent and trained personnel. Work may only be performed when the system is shut off. To ensure this, the main breaker must be locked to prevent unintentional engagement. Before resuming operation, all safety devices, guards and thermal insulation must be correctly reinstalled. ***FOLLOW LOCKOUT – TAGOUT PROCEDURES***.

- The thermocouples must be properly installed in the roasting chamber and ducts of the Roaster to assure correct reading of temperatures. If not properly installed, thermocouples may read temperatures that are too low, preventing identification of overheating before human and automatic systems can respond. Serious accidents can result. Note thermocouple depth positions and sealing methods before removing.

- After thermocouple related maintenance is completed, check the position and sealing of the thermocouple. Then verify the displayed temperature by producing a known roast with known parameters of time and heat input.

- During roasting and Thermal Cleaning, a significant amount of hot air circulates in the roasting system. There is a danger of combustion at all sampling ports and openings to the atmosphere. When the machine is hot, keep all inspection ports and machine parts securely closed.

- The solenoid valves for emergency water to the roasting chamber and the cooling chamber are normally closed. In case of a fire during power failure, the operator may open the Roaster Emergency Water Valve and turn the Roaster Drum by hand using the supplied wrench. When the temperature in the roaster has dropped to safe levels, shut off the water and discharge the coffee from the roaster.

C. NOTES FOR SUPERVISORS

- Within your company, mandatory rules and instructions regarding accident prevention and environmental protection must be made known and be posted in a clearly visible place at the control station as a supplement to these user directions. (For example, see next page).

- Prevent operating errors in critical situations through organizational measures. Ensure that only authorized personnel can activate connections that are protected by key-operated switches or passwords.

- Increase employees' awareness of dangers through regular, periodic training sessions, fire alarm and fire-fighting possibilities.

- Provide marked escape and rescue routes and ensure that they are always clear!

- Periodically test the safety and danger awareness of the staff! Make sure that alarms are not ignored or circumvented.

- Allow new staff or trainees to work with the machine only under the continuous supervision of an experienced person.

- Make it absolutely clear who within your organization may perform operations on the roasting system.

USER DIRECTIONS

Scope: _____

Coffee Roaster Type: _____

Dangers For Man And Environment

Fire caused by defect temperature monitoring and oxygen supply
Smoldering fire and local overheating of the plant
Generation of gas, explosive gas mixtures & detonations
Incendiary gases and escape of toxic smoke Destruction
of the fan caused by imbalance
Risks of burn on hot parts and means

Preventive Measures And Rules Of Conduct

The accident prevention measures shall be adhered and can be verified by the security expert
The fire protection plan must always be known. The plan can be seen at: _____
The operating instructions for the Roaster & cleaning shall be adhered
The operating instructions can be seen at: _____
The Roaster must only be maintained and operated by skilled authorized personnel
Before every daily Roaster Start-Up, the water supply to the Roaster is checked and whether the Roaster chamber is completely empty
Escape routes and rescue routes must be kept clear
Questions regarding the operation of the Roaster and the new parameters and recipes are to be coordinated with: _____

Conduct In Case Of Faults

In case of fire you must:
- Turn off the burner immediately
- Not intervene with the automatic control
- Not open any dampers, gates or sampling port
- Close the main manual valve of the fuel supply

Do not intervene with the automatic control in case of faults
Any defects detected on the roasting plant must immediately be communicated to_____.
_____decides on the further measures.

Conduct in case of Accidents; First Aid

Instruct the operator to stop the Roaster
Report the accident immediately
Safeguard the scene of the accident
Rescue the injured
Administer first aid.

Maintenance & Waste Disposal

Cleaning and servicing must only be performed by the authorized persons, thereby adhering to the accident preventives.
Used oil and lubricants must be disposed according to environmental laws.

Consequences of Non-Observance

Injury, illness.
Damages of the roasting plant, the plant equipment and the building.
Product loss.
Possible demands for compensation by the professional association having liability for industrial safety and insurance.

Signature: _____

Date: _____

GLOSSARY OF TERMS

Automatic Clean Out (ACO) – A self cleaning mechanism of the Roaster whereby the Roaster temperature is raised to a point that burns off some of the accumulated buildup inside the Roaster and associated ductwork. (not available on all Roasters)

Afterburner – A Roaster exhaust emissions reduction device consisting of a natural gas or L.P. fired burner and exhaust assembly mounted above or downstream of the Roaster Chaff Cyclone and Roaster Fan. The Afterburner combusts unspent fuel, volatile gases, and some particulates produced by roasting coffee beans.

Burner(s) – Natural Gas fired burner, located in the rear of the Roaster used to heat the air used for roasting. Also present on the Afterburner.

Burner Rate – The amount, from 0-100%, that a burner valve is opened. This rate normally represents the heat input to the roasting process, and it may be limited for certain operations or Cycles.

Chaff Cyclone – Device used to separate particles from the airflow using centrifugal force exerted upon the particles in the air stream. Particles are forced down the inside walls of the Roaster & Cooler Cyclones where they are captured in a recovery can (Cooler) or through a rotary valve (Roaster) to a pellet mill or disposal container.

Chaff - The bean cavity parchment (similar to the outer hull) liberated during roasting. Its chemical composition resembles the green coffee bean but it has a bitter and poor flavor.

Chaff Cyclone Discharge Gate – A gate on the Chaff Cyclone discharge duct. Depending on the chaff handling system, this gate may need to be closed during ACO.

Charge Hopper – Bin positioned directly over the Roaster used to hold a charge of green beans waiting to be roasted.

Control Panel – The enclosure that houses the electrical and electronic devices used to control the Roasting processes.

Cooler – A chamber integrated into the Roster assembly having a perforated floor used to cool the roasted coffee beans after being discharged from the Roaster. Air is drawn up through the beans and the perforated floor and discharged to atmosphere through the Cooler cyclone.

Cooler Damper (P223) – An electro-pneumatic damper in the Cooler duct that is opened during the Cooling process and closed during the Destoning process. The damper is open all other times.

Cooler Discharge Gates - Doors that are closed during the Cooling process and open to discharge beans into the Destoning Tray.

Cooler Fan – Fan used for the Cooling process by pulling airflow through the Cooler Discharge Gates and creating a fluidized bed of roasted beans in the Cooler.

Destoner Damper (P439) – Damper in the Cooling Fan duct that is open during the Destoning process and closed during the Cooling process and to discharge roasted beans from the Destoning Hopper. The damper is closed at all other times.

Destoner Fan – Same as Cooler Fan

Destoner Hopper – Bin used to hold the roasted beans after being Destoned.

Destoning Chute – Vertical ducting leading from the Destoner Tray Discharge Foot to the Stoner Hopper.

EPA – Environmental Protection Agency

Firing Rate – See Burner Rate

NEC – National Electric Code. An electrical wiring code that all electricians and electrical contractors must abide.

Operator Interface – A CRT mounted in an enclosure that provides the Roaster operator with real-time Roast Cycle information, fault conditions and allows the operator to program & save Roaster strategies into the PLC or PC.

Parameter – Value or data that influences or control the operation of the Roaster System. Parameters are entered by the operator.

Pilot Gas Igniter – Electrical device similar to a spark plug that provides a spark to ignite the pilot flame of the burner.

PLC – Programmable Logic Controller. A computer located in the Control Panel that controls the Roaster.

Pop-Up – A small screen that appears when a Button is pressed. The Pop Up may allow the operator to enter parameter values or simply acknowledge or confirm a command.

Quench – A spray of water into the Roaster, Cooler or Roaster Cyclone to cool the beans, eliminate a high temperature condition or extinguish a fire.

Quench Cycle – Water cooling cycle occurring after the Roast Cycle ends.

Recipe – A specific selection of parameters used to define exactly how the Roaster will operate for a particular desired coffee roast. The parameters are grouped and saved together in the PLC or PC database and referenced by a Recipe number.

Recirculation Damper (P129) - A damper used on the Roaster to modify recirculation airflow in the Roaster. The damper is usually open but closed during the Quench & Purge Cycles.

Roaster – Refers to the R-Series Roaster.

Roaster Exhaust Fan – The fan that circulates the air through the Roaster and to the Afterburner.

Roaster Exhaust Damper (MR545) - A damper used on the Roaster to modify recirculation airflow in the Roaster. The damper is adjusted for Roasting operation and commanded by the PLC to 100% open during the Quench & Purge cycles and from 0-100% at other times.

Shielded Cable – A Cable consisting of two or more insulated conductors sheathed with a layer of metal foil. The foil sheath has a non-insulated conductor bonded to it while an insulated sheath encapsulates the entire bundle.

Stirrer – Propeller shaped device inside the Roasting chamber that is turned by a motor and gear reducing drive assembly.

Surge Hopper – Bin positioned directly over the Charge Hopper used to hold a charge of green beans waiting to be discharge into the Charge Hopper.

TAB – Thermal Afterburner

Tag – Operator Interface graphical object that can indicate a particular Roaster system operational state, Button label and display a parameter or variable.

Thermal Cleaning – See Automatic Clean Out

Thermocouple – An electrical device similar to a thermometer used to measure various temperatures in the Roaster system.

Turning Point – The temperature at which the Bean Temperature ceases to decrease and begins to increase. This action follows green bean charging into the Roaster. The Roaster strategy requires the Turning Point be reached in less than 90 seconds.

Variable – Data that can assume different numerical values. Data information that is processed and/or produced by the PLC but is not modifiable by the operator.

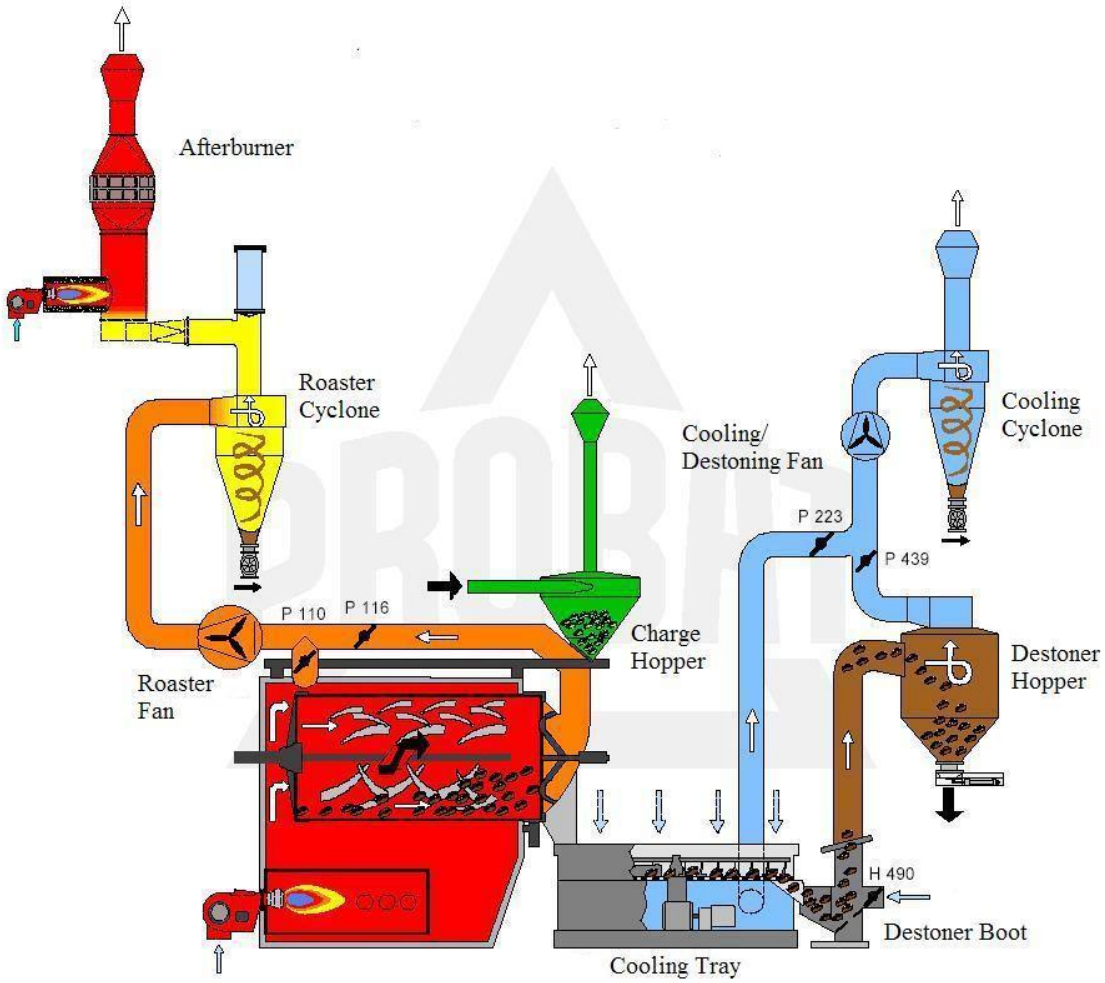
VAC – Alternating current voltage. The same type used to power appliances in a home.

VDC – Direct current voltage. The type used to power most automobile electrical systems.

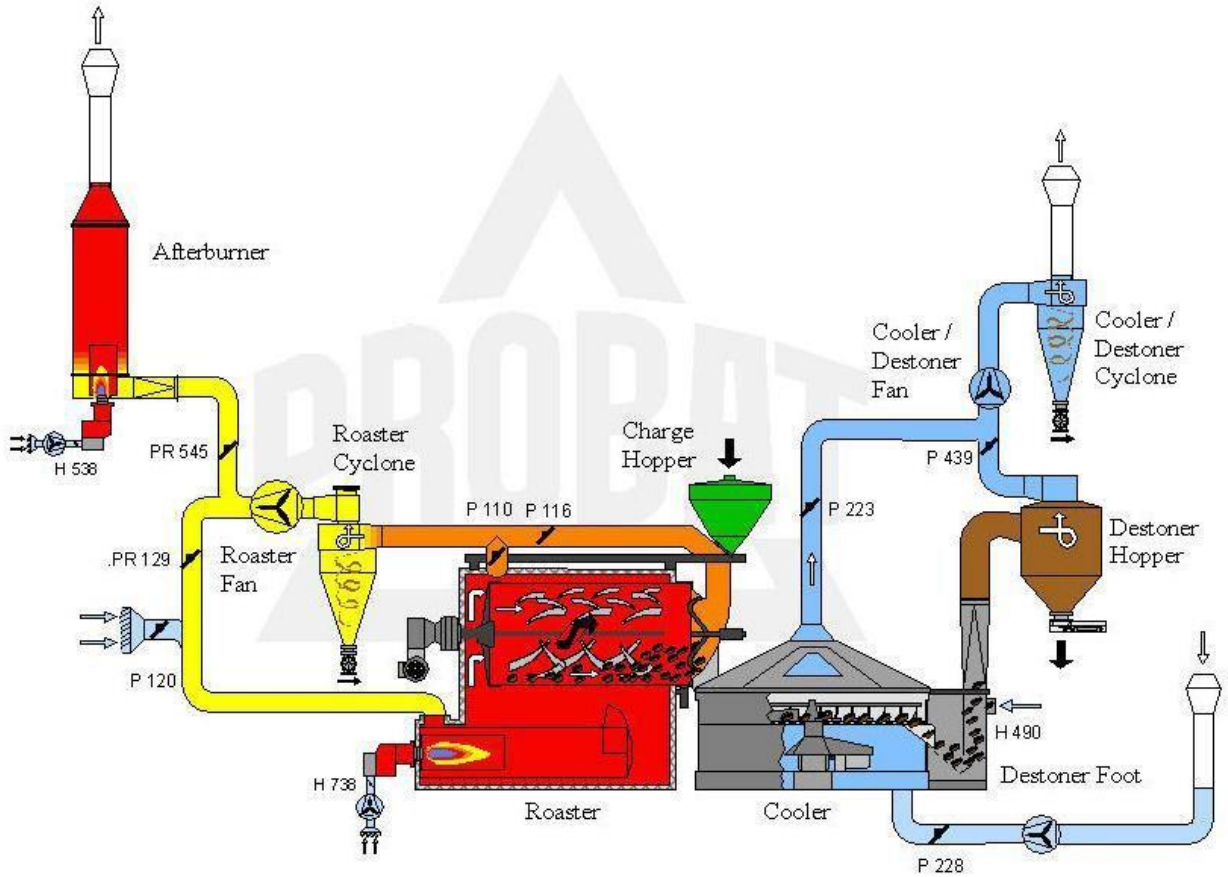
WATLOW® - A high temperature electromechanical safety device. If the high temperature limit is reached, its' contacts are opened and the gas flow is turned OFF.

III. THE ROASTING PROCESS

A. FLOW SHEET – NON-RECIRCULATING ROASTER



B. FLOW SHEET – RECIRCULATING ROASTER



C. CONTROL SYSTEM

The PROBAT BURNS Drum Roaster control system can be operated in MANUAL or AUTOMATIC modes to Charge, Roast, Cool, and Destone coffee while also controlling an Afterburner (if included). The unique Recipe control strategy employed allows the operator to select up to nine roasting Steps and vary the water volume for the Quench cycle. All roast Recipe variables can be modified in "real-time" - during the roasting process. When an optimum Recipe has been empirically developed, the saved Recipe parameters can be updated, allowing recall of up to 300 different recipes. The Roaster control strategy will also take preventative measures and notify the operator with an audible and visual alert if an Alarm or Fault condition occurs. An integral fail-safe strategy automatically shuts off the burner and opens water valves to the Roaster if certain over-temperature conditions occur. A color touch screen monitor & pushbutton switches allow operator control of the Roaster while a PLC controller and an industrial PC handles all processing and memory retention operations. The control system is further equipped with a Modem to allow PROBAT BURNS remote monitoring and reprogramming of the Roaster control program using a telephone or internet connection.

D. CAPACITY

Capacities are described as Pounds of Green Coffee roasted per hour. The actual capacity is always dependent on the green coffee quality, moisture content, and the degree of roasting desired. Nominal capacities for several common R-series Roasters are described below.

	Normal Batch Weight	Nominal Capacity
G240	450-525 pounds	
R1000 / R1000R	370-460 pounds	2200 pounds/hour
R1500 / R1500R	550-680 pounds	3300 pounds/hour
R2000R	730-900 pounds	4400 pounds/hour

E. ROASTING TIME

7 to 14 minutes.

F. MAXIMUM BATCH SIZE

	Maximum Batch Weight
R1000 / R1000R	460 pounds
R1500 / R1500R	680 pounds
R2000R	900 pounds

G. GREEN BEAN CHARGING

MANUAL Mode - with the Charge Hopper filled, the Roaster empty, and the burner ON, the Roaster can be charged with green coffee by pressing a pushbutton switch.

AUTO Mode - with the Charge Hopper filled, the Roaster empty, and the Roaster Discharge Door closed after discharging a previous batch, the roaster will heat up, and the Charge Hopper discharge gate will open to automatically begin the subsequent batch. However, the Charge Hopper must be filled immediately (within about 6 minutes) after emptying for consecutive batching to continue.

H. HEAT TRANSFER

The Roaster is an insulated, enclosed chamber. Inside is a rotating drum with mixing flights to agitate or stir the coffee, ensuring thorough & continuous circulation of the coffee beans within the drum and good exposure of the coffee to the heated airstream -- assuring rapid and uniform heat transfer. The Roaster Burner heats up recirculating air, which then is blown around the outside of the drum, into the roasting chamber, and through the agitated coffee. Heat transfer to the coffee occurs both by conduction through the drum walls and convection from the moving airstream. The Roaster Exhaust Fan extracts the hot air and gases from the roasting chamber and draws it through the Roaster Cyclone where chaff and dust are separated. Most of the roast air is subsequently exhausted to an Afterburner while the balance of the Roaster exhaust air is recirculated through Roaster Burner to be heated up again.

I. QUENCHING

To terminate the roasting process after the desired bean development is achieved, the addition of water, or 'quenching', is initiated. This may occur automatically by the Control System or manually by the operator pressing a pushbutton. The automatic Quench Water valve then opens and a water flowmeter measures a pre-programmed water quantity to be sprayed onto the roasting beans in the drum. The quantity of water can be adjusted to achieve various levels of residual moisture. Once the preset water quantity is reached, the Quench Water valve will close. Most of the water is released as steam, absorbing heat energy and stopping the roasting pyrolysis. But some of the sprayed water is also absorbed by the coffee beans, remaining as moisture trapped in the coffee, which is desirable in many circumstances, especially if the coffee is to be subsequently ground.

J. DISCHARGING

The Roaster automatically discharges the roasted coffee into the Cooling Tray after the Quenching & Drying Cycles have finished. The Cooling Tray Stirrer motor must be running for the discharge cycle to begin.

K. COOLING

The Roaster will discharge coffee into the Cooler Tray, the Stirrer starts and the Cooling/Destoning Fan pulls air through the roasted beans, cooling the coffee. This air is then pulled through the Cooler Cyclone, where chaff & dust particles are removed, then discharged to atmosphere – usually through a roof stack. The total Cooling time is defined by preset time intervals that may be adjusted by the operator. Once the Cooling timer expires, the Cooler Tray discharge gate opens automatically to deposit the roasted beans into the Destoner Foot. While one batch of coffee is being cooled, the Roaster is free to begin roasting another batch either through AUTOMATIC or MANUAL operation.

L. DESTONING

The Destoning Cycle normally proceeds automatically after the Cooling Cycle ends. Similar to the Cooling Cycle, the Cooling/Destoning Fan is energized during Destoning. However, two dampers change position so that the Fan airflow is not pulled through the coffee in the Cooler but rather through the Destoner Foot. The Stirrer Arms will rotate while the Cooler Discharge Gate is opened, allowing the roasted beans to flow into the Destoner Foot. Airflow through the bottom of the Destoner Foot lifts the coffee beans upward into the Destoner Hopper, while heavier debris and stones are left in the Destoner Foot. The destoning airflow is adjustable to allow a somewhat fine separation of the lightweight coffee from heavier debris and stones. Once the Destoning Cycle is complete, the Roasting System has completed its task and awaits a downstream signal (from the plant production system or by an operator pushbutton) to open the Destoner Hopper Discharge Gate. While one batch of coffee is being cooled and destoned, the Roaster is free to begin roasting another batch either through AUTOMATIC or MANUAL operation. Note, however, that either the Cooler or the Destoner Hopper MUST be empty for a new batch to be charged into the Roaster. This is necessary to ensure time is available for emptying the Cooler so that hot, roasted coffee has a place to be safely discharged for cooling.

M. EXHAUST GAS CLEANING – AFTERBURNER OPTION

In most cases, local environmental & pollution regulations require that the roast air be cleaned of undesired odors and gases before being released into the atmosphere. After chaff is removed from the roast air stream in the Roaster Cyclone a large portion of the air is exhausted through the Afterburner. Upon entering the Afterburner, the exhaust air is heated by one or more burners to the

temperature required – AS SPECIFIED AND PERMITTED BY LOCAL AIR QUALITY MANAGEMENT AUTHORITIES. This may be as low as 750°F, when using a Catalytic Afterburner, or 1450°F or higher when using a Thermal Afterburner. In either case, the exhaust air is heated in the presence of oxygen to such temperature that undesired gases are oxidized before being released to the atmosphere. The Afterburner is interlocked to the Roasting process -- Roasting may not proceed unless the Afterburner is ignited and operating at a minimum preset temperature. *The customer has the responsibility to operate the Afterburner consistent with all applicable environmental laws and regulations.*

IV. WATER SUPPLY

A. ROASTER EMERGENCY WATER

Attention

Despite automatic sensing of water pressure by the Roasting System, frequent testing of ALL Emergency Water Sprays should be employed in routine procedures.

Automatic Emergency Water

A high temperature condition inside the Roaster will cause automatic emergency water spray through the Quenching nozzle. With or without beans in the Roaster, if the BEAN TEMPERATURE exceeds 500°F (260°C), the control system will automatically dispense emergency quench water to the drum for 60 seconds and continue spraying until the BEAN TEMPERATURE drops below 300°F (150°C).

Manual Emergency Water

If desired, the operator may also spray water into the Roaster by pressing the ROASTER EMERGENCY QUENCH pushbutton on the control panel. This will cause emergency water to spray inside the drum at any time and continue for 30 seconds.

Power Supply Failure

In case of a power failure or the Main Control Power is turned off, the Roaster Emergency Water Hand Valve located on the Water Valve Train must be used.

Recommendation

Test the operation of the Roaster Manual Quench water system twice a year under operating conditions.

B. COOLER EMERGENCY WATER (IF INCLUDED)

Automatic Emergency Water

A high temperature condition inside the Cooling Tray will trigger emergency water sprays inside the cooler. If the COOLER TEMPERATURE exceeds 356°F (180°C), the control system will automatically dispense emergency water to the cooler for 15 seconds and until the temperature falls below 356°F (180°C).

Manual Emergency Water

If desired, the operator may also spray water into the Cooler by pressing the COOLER EMERGENCY QUENCH pushbutton on the control panel. This will cause emergency water to spray inside the cooler at any time and continue for 15 seconds.

Power Supply Failure

In case of a power failure or the Main Control Power is turned off, the Cooler Emergency Water Hand Valve located on the Water Valve Train must be used..

Recommendation

Test the operation of the Cooler Manual Quench water system twice a year under operating conditions to assure the nozzles are not blocked.

C. CYCLONE EMERGENCY WATER

Automatic Emergency Water

A high temperature condition inside the Roaster Cyclone will trigger emergency water sprays inside the cyclone. If the CYCLONE TEMPERATURE exceeds 350°F (176°C), the control system will automatically dispense emergency water to the cyclone for 60 seconds and until the temperature falls below 350°F (176°C).

Manual Emergency Water

If desired, the operator may also spray water into the Roaster Cyclone by pressing the ROASTER CYCLONE EMERGENCY QUENCH pushbutton on the control panel. This will cause emergency water to spray inside the cooler at any time and continue for 15 seconds.

Power Supply Failure

In case of a power failure or the Main Control Power is turned off, the Cyclone Emergency Water Hand Valve must be used.

Recommendation

Test the operation of the Cyclone Emergency Water Hand Valve twice a year under operating conditions to assure the nozzles are not blocked.

D. AFTERBURNER EMERGENCY WATER (IF INCLUDED)

Automatic Emergency Water – Catalytic Afterburners only

A high temperature condition inside the Catalytic Afterburner will trigger emergency water sprays to cool the catalyst material. If the CATALYST OUTLET TEMPERATURE exceeds 1200°F (650°C), the control system will automatically dispense emergency water to cool the catalyst for 15 seconds and until the temperature falls below 1200°F (650°C). Catalyst reactive lifespan is decreased substantially by operating for even short periods over 1250°F (680°C).

Emergency Water is not required with Thermal Afterburners. However, burner shutdown will occur if the OUTLET TEMPERATURE exceeds 1700°F (930°C).

Manual Emergency Water

Pressing the AFTERBURNER EMERGENCY pushbutton on the control panel will dispense water onto the catalyst material at any time and continue for 15 seconds.

Power Supply Failure

In case of a power failure or the Main Control Power is turned off, the Afterburner Emergency Water Hand Valve must be used.

Recommendation

Test the operation of the Afterburner Manual Emergency Water system twice a year under operating conditions to assure the nozzles are not blocked.

V. OPERATING INSTRUCTIONS

A. CONTROL PANEL INSTALLATION NOTES

- All wiring and installation work shall be performed by qualified personnel ONLY!
- All wiring and installation work shall conform to appropriate NEC, NFPA, & IRI standards. It is the customer's responsibility to ensure field wiring and installation meets all relevant national and local wiring codes.
- Wiring shall be installed in separate conduit according to voltage level as follows:
  - 120 to 575 VAC wiring: all conductors should have 600VAC insulation rating
  - Low voltage less than 30VAC/VDC, 4-20mA conductors must use shielded cable.
  - Thermocouples must use Type-K thermocouple cables -- shielded 18 AWG stranded preferred -- unbroken wiring from the thermocouple to the PLC or Safety Switch terminations. If terminations must be used, then use Type-K terminating components, matching the Chromel and Alumel parts at all contact points.
- Wiring to the Spark Igniters shall be rated 10k VAC or greater (this wire is normally provided with the roaster).
- All wiring, including jumper wires, shall be marked at both ends with their wire number or signal name
- All shielded cable shall have the shield conductor grounded at the Control Panel end ONLY! Use insulating tape to prevent grounding of the shield at the device ends.
- **VPN CONNECTION** for remote support: An Ethernet connection to switch in the Roaster Control Panel with a log in to the firewall must be provided for testing during the Start-up.

B. CONTROL PANEL OPERATORS

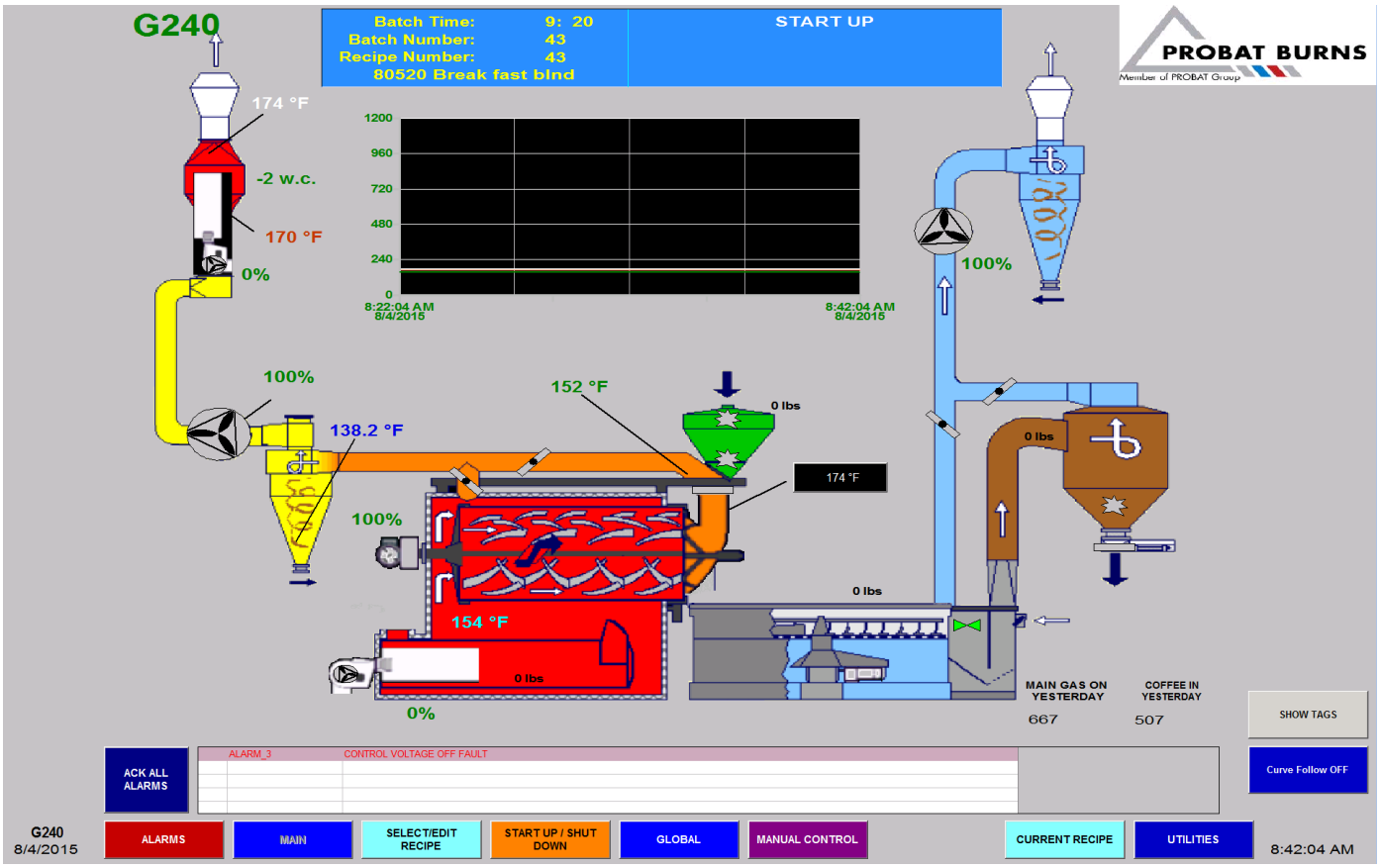
The Probat Burns Roaster control system has been designed to give the operator a wide range of flexibility to program the Roaster operation while still maintaining a high degree of safety. The basic functions for switches on the Control Panel are:

- **CONTROL POWER ON/OFF** - Pushbutton or switch to energize control circuits for the PLC to start and stop motors, activate solenoids, sound alarms, etc. Beware that motor voltage may still be present when Control Power is off!
- **ROASTER AUTO/MAN CYCLE** – Three -position selector switch to change between MANUAL and AUTOMATIC roasting modes. Switch also has momentary position to start the Roasting Cycle.
- **ROASTER BURNER START -** Push-pull button used to activate the burner control circuit (first detent) and to initiate purging and the ignition sequence for the Roaster burner (second detent).
- **AFTERBURNER BURNER START -** Push-pull button used to activate the burner control circuit (first detent) and to initiate purging and the ignition sequence for the Afterburner burner (second detent)..
- **QUENCH END ROAST** - Momentary pushbutton used to initiate the Quench / End Roast sequence. This pushbutton operates regardless of AUTO/MAN CYCLE position, and the pushbutton illuminates when the Quench / End Roast sequence is in progress.
- **ALARM/FAULT RESET**- Momentary pushbutton that illuminates when an active alarm is present. Press this button briefly to silence the Alarm Horn, and press this button for more than a second after correcting the alarm condition to reset the active alarm.
- **ROASTER EMERGENCY QUENCH** - Momentary pushbutton to activate the Roaster Emergency Water solenoid valve. It will also illuminate if Emergency Water spraying is initiated by the PLC, as when the Bean Temperature is too high.
- **AFTERBURNER EMERGENCY QUENCH** - Momentary pushbutton to activate the Afterburner Emergency Water solenoid valve. It will also illuminate if Emergency Water spraying is initiated by the PLC, as when the Afterburner Temperature is too high (Catalytic Afterburners only).
- **COOLER EMERGENCY QUENCH** - Momentary pushbutton to activate the Cooler Emergency Water solenoid valve. It will also illuminate if Emergency Water spraying is initiated by the PLC, as when the Cooler Temperature is too high.
- **CYCLONE EMERGENCY QUENCH** - Momentary pushbutton to activate the Roaster Cyclone Emergency Water solenoid valve. It will also illuminate if Emergency Water spraying is initiated by the PLC, as when the Cyclone Temperature is too high.
- **ADDITIONAL PUSHBUTTONS** and switches may be present depending on the configuration and options present on your roaster.

C. CONTROL PANEL HMI NAVIGATION

The Roaster operation is also controlled by a LCD touch screen operator interface. Pressing different areas and tags on the operator interface activates different functions for the roaster and displays different screens. Several screens are present for accomplishing separate tasks, but the operator will usually be using the *MAIN* screen.

Main Screen



The Main Screen was intended to provide quick reference to an operator of temperatures and status for the Roaster:

- **INFORMATION PANEL** – top-center of the screen
  - **LEFT SIDE** – Batch information display panel
  - **RIGHT SIDE** – Status Message display panel
- **NAVIGATION PUSHBUTTONS** – Change display to the other screens available.

- **REAL-TIME TREND** – Shows temperatures on a moving graph (tap on this to open an enlarged trend display with a legend to identify the temperatures being displayed).
- **GRAPHIC ROASTER ILLUSTRATION** – Shows animations to illustrate status.
- ALARM PANEL
  - **RIGHT SIDE** (Red Box) – Active alarms numbers and descriptions
  - **LEFT SIDE** – *ACK ALL ALARMS* pushbutton to acknowledge alarms, silence the alarm horn, and reset any active alarms that have been corrected (similar to the ALARM RESET pushbutton)

An illustration of the Roasting System and its components is displayed on this screen. Some devices on the screen change color to indicate separate conditions for that device:

- **RED** – color indicates the component is off, closed or in its de-energized state
- **FLASHING RED** – Fault condition is occurring when component is flashing
- **GREEN** – color indicates the component is on, open or in its' energized state
- **WHITE** – no signal is present to confirm open/closed state
- **ANIMATION** – Devices may appear to rotate and move or appear and disappear during operation. This is intended to make the screen more lively, and usually this is triggered by sensors in the System, but this movement does not represent actual conditions or rates of speed.

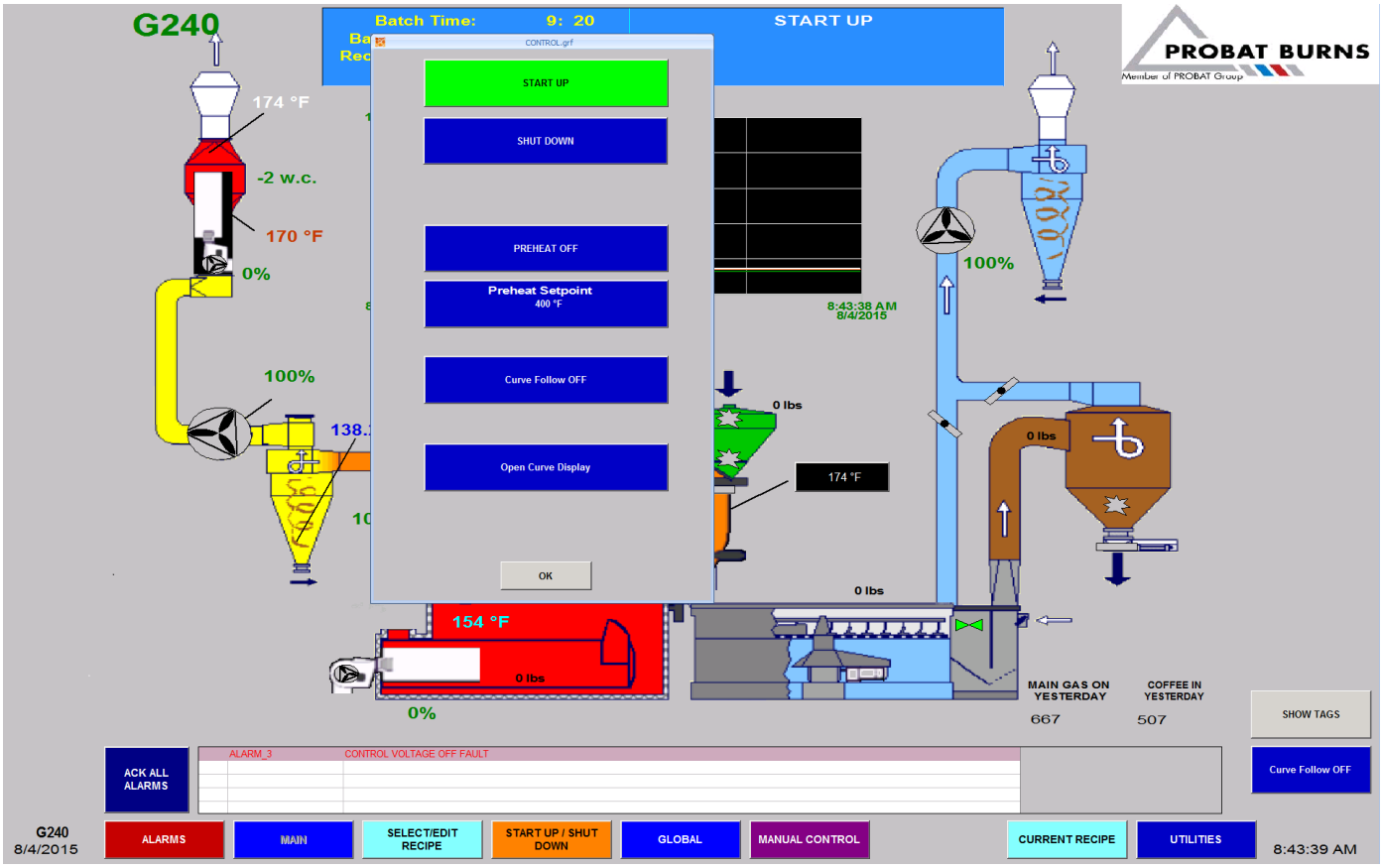
- **SHOW TAGS / HIDE DESC** – This pushbutton at the bottom-left on the screen allows either component descriptions or component designator numbers to be shown or hidden on the screen with each successive button press.
- **AFTERBURNER SETPOINT** (optional) – Pressing the Afterburner Temperature display will pop-up a menu allowing the user to change the Afterburner Temperature setpoint.
- **BEAN TEMPERATURE** – Pressing the Bean Temperature display will pop-up a menu allowing the user to change the roasting *END TEMPERATURE* (Stage 9 Bean Temperature) at any time until the End Temperature has been reached.

Screen & menu selectors are the buttons on the lower left side of the screen. Each screen will have screen selectors to navigate back to the original or different screen.

- **MANUAL OPERATION** – Navigation to *MANUAL OPERATION* screen allowing users to energize individual components for testing when the system is off. Also allows functions such as Roaster Discharge, Cooling & Destoning to be started/stopped.
- **ALARMS** – Navigation to *ALARM SUMMARY* screen showing faults currently present, *ACTIVE ALARMS*; faults that have been cleared, *PAST ALARMS*; and allows the user to reset faults and silence the horn, *ACK ALL ALARMS*.
- **SELECT\EDIT RECIPE** – Navigation to *RECIPE* screen to select recipes for download and if the proper login also edit the recipes.

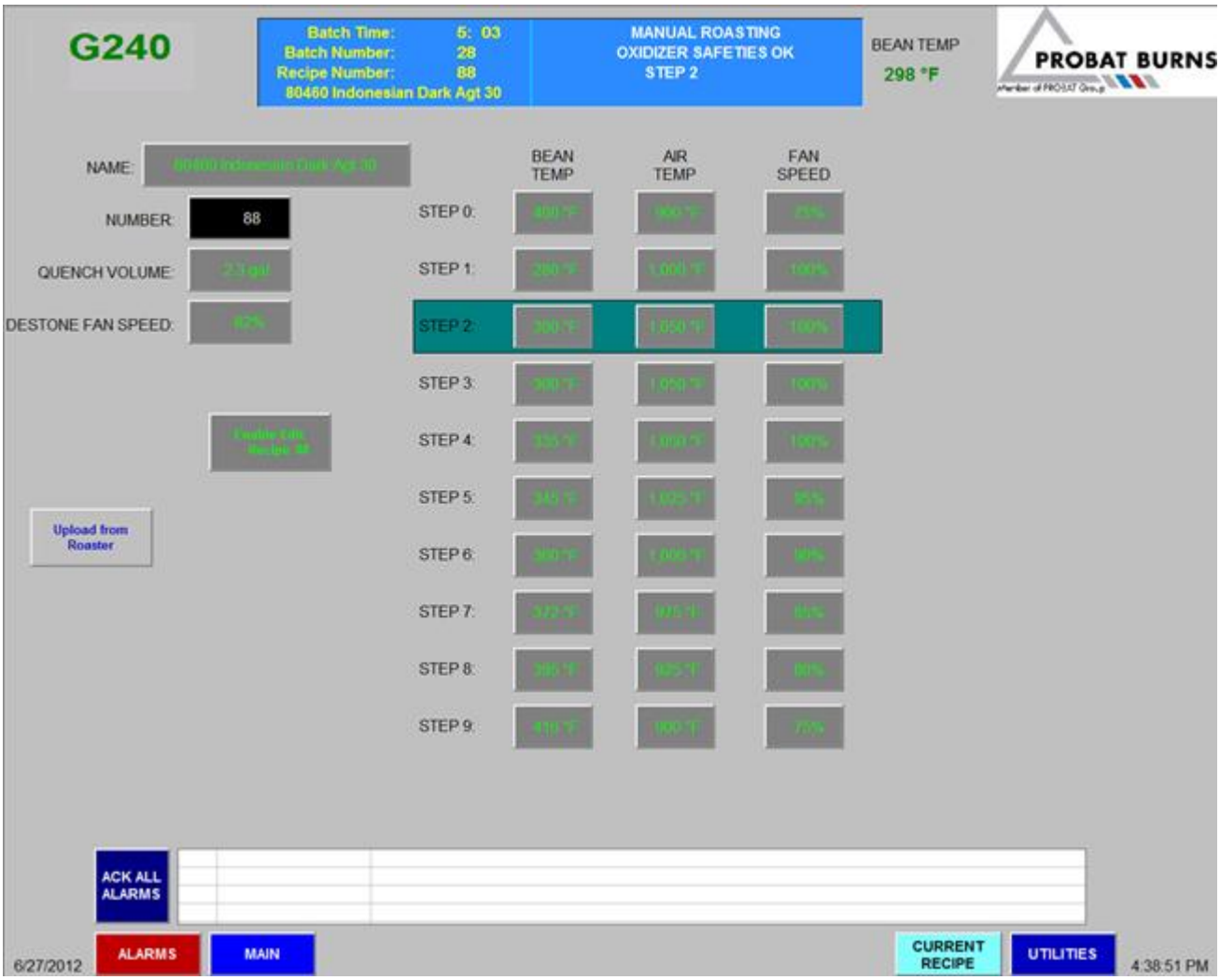
- **START UP/SHUT DOWN** – Menu providing access for users to start and stop the Roaster, Preheat the roaster, invoke profile roasting curve following, print & view current and previous roast cycles and shut down the PC HMI software.
- **GLOBAL** – Navigation to Global Parameters screen. Roasting variables not associated to a particular recipe such as cooling & charging times along with display of gas meter totals.
- **GRAPH** – displayed at the center of the screen; this displays a real-time plot of the Burner Air Temperature and Bean Temperature. A one hour period of time is shown. Pressing the *ZOOM IN* button will enlarge the graph. Pressing *CAT TREND* will enlarge the graph to full screen size and show a period of 24 hours of the Bean Temp, CAT Inlet Temp, and CAT Outlet Temp. Left and right arrows will allow the user to scroll backwards and forwards in the graph to show different times.

Start-Up/Shut Down Screen



- **STARTUP** – Starts up Roasting system by first testing dampers then energizes motors sequentially.
- **SHUTDOWN** – Turns off Roasting system by turning off burners, allowing the Roaster to cool below 200°F, then sequentially de-energizing motors.
- **PREHEAT OFF/ON** – Starts and stops the Preheat cycle.
- **PREHEAT SETPOINT** – Setpoint entry for the preheat temperature. Also shown on the Global screen.
- **CURVE FOLLOW ON/OFF** – Starts and stops the Probat Burns Profile Roasting curve following feature.
- **OPEN CURVE DISPLAY** – Switches to the Profile Roasting screen that displays a graphical plot of the roasting Time vs. Bean Temperature relationship for roasting. For the *Curve Display* screen, see page 38.
- **OK** – Closes the Start Up/Shut Down menu screen.

Recipe Screen(Login)



NAME	Simple text name given to the recipe
NUMBER	Recipe number assigned to the recipe
QUENCH VOLUME	Amount of quench water to be sprayed at the end of the roasting cycle.
CHARGING:	**BEAN TEMP** - Temperature at which Charging is first INITIATED
	AIR TEMP - Temperature to apply to achieve the desired Bean Temp
	P129 POSITION (Recycle Damper Position) - Percent open to apply to achieve the desired Bean Temp
	FAN SPEED - Percent speed to apply to achieve the desired Bean Temp

	MR545 POSITION (Exhaust Damper Position) - Percent open to apply when charging at the desired Bean Temp
STEPS 1 to 9:	**BEAN TEMP** - Temperature at which the respective roasting Stage is COMPLETED
	AIR TEMP - Temperature to apply to achieve the desired Bean Temp
	P129 POSITION (Recycle Damper Position) - Percent open to apply to achieve the desired Bean Temp
	FAN SPEED - Percent speed to apply to achieve the desired Bean Temp
	NOTE: The Exhaust Damper position is adjusted automatically, if needed, to obtain the desired Drum Pressure setting entered on the Global screen.

- **Recipe Selection.** Press on the yellow field next to the "Number" and enter the recipe number desired. This field is not editable when the "Enable Recipe Edit" pushbutton is pressed and "Recipe Edit Enabled" is engaged.
- **Recipe Values.** These are the parameters of the recipe selected and do not reflect the recipe loaded in the Roaster, called *Active Recipe*.
- **Download to Roaster.** Momentary pushbutton that downloads the recipe selected in Recipe Selection to the Roaster. After this action is performed the Selected recipe becomes the *Active Recipe*.
- **Upload from Roaster.** Momentary pushbutton that uploads the *Active Recipe* stored in the Roaster into the database folder of the Selected Recipe. After this action is performed the Selected recipe values will match those of the *Active Recipe*.
- **Save Recipe As Another Recipe.** Momentary pushbutton that copies the parameters of the Recipe selected in Recipe Selection into the Target Recipe.
- **Print Screen.** Momentary pushbutton that prints the Recipe screen.

Recipe Screen(Login) Edit Enable

This display is the *RECIPE* screen, with the proper Login, and Enable Edit Recipe engaged. This allows the user to modify values in a recipe and will be saved directly to the database.

NAME	Simple text name given to the recipe
NUMBER	Recipe number assigned to the recipe
QUENCH VOLUME	Amount of quench water to be sprayed at the end of the roasting cycle.
CHARGING:	**BEAN TEMP** - Temperature at which Charging is first INITIATED
	AIR TEMP - Temperature to apply to achieve the desired Bean Temp
	P129 POSITION (Recycle Damper Position) - Percent open to apply to

	achieve the desired Bean Temp
	FAN SPEED - Percent speed to apply to achieve the desired Bean Temp
	MR545 POSITION (Exhaust Damper Position) - Percent open to apply when charging at the desired Bean Temp
STEPS 1 to 9:	**BEAN TEMP** - Temperature at which the respective roasting Stage is COMPLETED
	AIR TEMP - Temperature to apply to achieve the desired Bean Temp
	P129 POSITION (Recycle Damper Position) - Percent open to apply to achieve the desired Bean Temp
	FAN SPEED - Percent speed to apply to achieve the desired Bean Temp
	NOTE: The Exhaust Damper position is adjusted automatically, if needed, to obtain the desired Drum Pressure setting entered on the Global screen.

- **Recipe Selection.** This field is not editable when the "Enable Recipe Edit" pushbutton is pressed and "Recipe Edit Enabled" is engaged.
- **Recipe Values.** These are the parameters of the recipe selected and do not reflect the recipe loaded in the Roaster, called *Active Recipe*. When yellow they can be edited.
- **Upload from Roaster.** Momentary pushbutton that uploads the *Active Recipe* stored in the Roaster into the database folder of the Selected Recipe. After this action is performed the Selected recipe values will match those of the *Active Recipe*.

Current Recipe Screen(Login)

This *CURRENT RECIPE* screen allows the user to modify recipe values that are currently stored in the PLC (Active Recipe). Any change to these values will take effect immediately. Only the yellow fields can be edited.

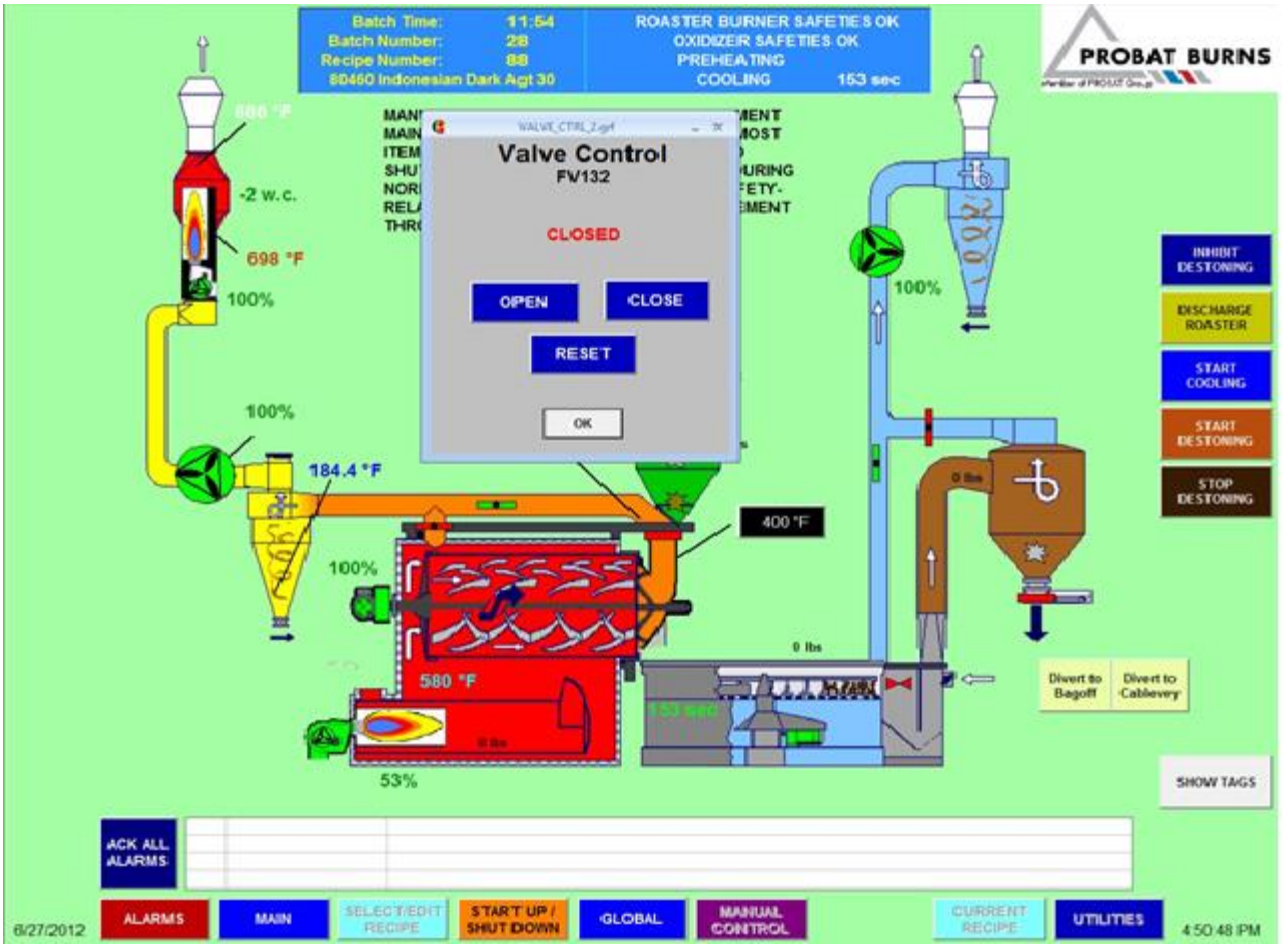
Global Parameters Screen

The Global Parameters screen containing roast variables and parameters not specific to any one recipe.

- **PREHEAT TEMPERATURE** – Setpoint Bean temperature while the Roaster is preheating.
- **AFTERBURNER TEMPERATURE** – Setpoint Afterburner temperature while the Afterburner burner is lit..
- **CHARGING TIME** Time the Charge Gate will be open to allow coffee to flow from the Feed Hopper into the Roaster
- **ROASTING NEGATIVE PRESSURE** – Setpoint variable negative pressure or vacuum in the Roaster desired by the operator during the roast process.

- **DRYING TIME** - Delay timing variable between end of Quench Cycle and Roaster discharge.
- **ROASTER DISCHARGE TIME** – Time the Roaster door is open to discharge beans. The Stirrer Arms sill also be ON while discharging.
- **COOLING TIME** - Time the coffee will be cooled in the Cooling Tray. Time begins when roaster discharges coffee into the Cooling Tray.
- **DESTONING TIME** - Time it takes for coffee to be transferred from the Cooling Tray into the Destoning Hopper. The Stirrer Arms will be ON while Destoning.
- **THERMAL CLEANING NEGATIVE PRESSURE** – Setpoint variable negative pressure or vacuum in the Roaster desired by the operator during the thermal cleaning process.

Manual Operations Screen

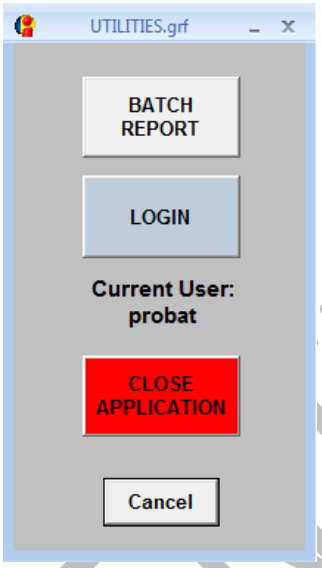


This screen allows the operator to troubleshoot discrete components of the Roasting system. Touching the graphic of a component will pop-up a menu screen allowing the operator to turn on or off, open or close, and even modify the speed of variable frequency devices. Shown above is the pop-up when the Drum Drive, MTR100, graphic symbol is pressed.

MANUAL CONTROL WAS INTENDED FOR MAINTENANCE TESTING ONLY -- MOST OF THE INDIVIDUAL COMPONENTS CANNOT BE ENERGIZED UNLESS ALL MOTORS ARE STOPPED. Some limited manual control is possible while roasting is in progress, and activating these devices causes a fixed sequence to occur, as described below:

- **DISCHARGE ROASTER** - Touching the Roaster Door opens the Roaster and turns on the Stirrer arms for the amount of time in the *Global* screen. Automatic Cooling and Destoning cycles will follow.
- **START COOLING** - Touching the Cooler motor starts the Cooling Cycle for the amount of time entered in the *Global* screen. Automatic Destoning cycle will follow.

- **START DESTONING** - Touching the Destoner Fan starts the Destoning Cycle and turns on the Stirrer arms for the amount of time entered in the *GLOBAL* screen time variable.
- **UTILITIES** – Pushbutton displays the *UTILITIES* popup.

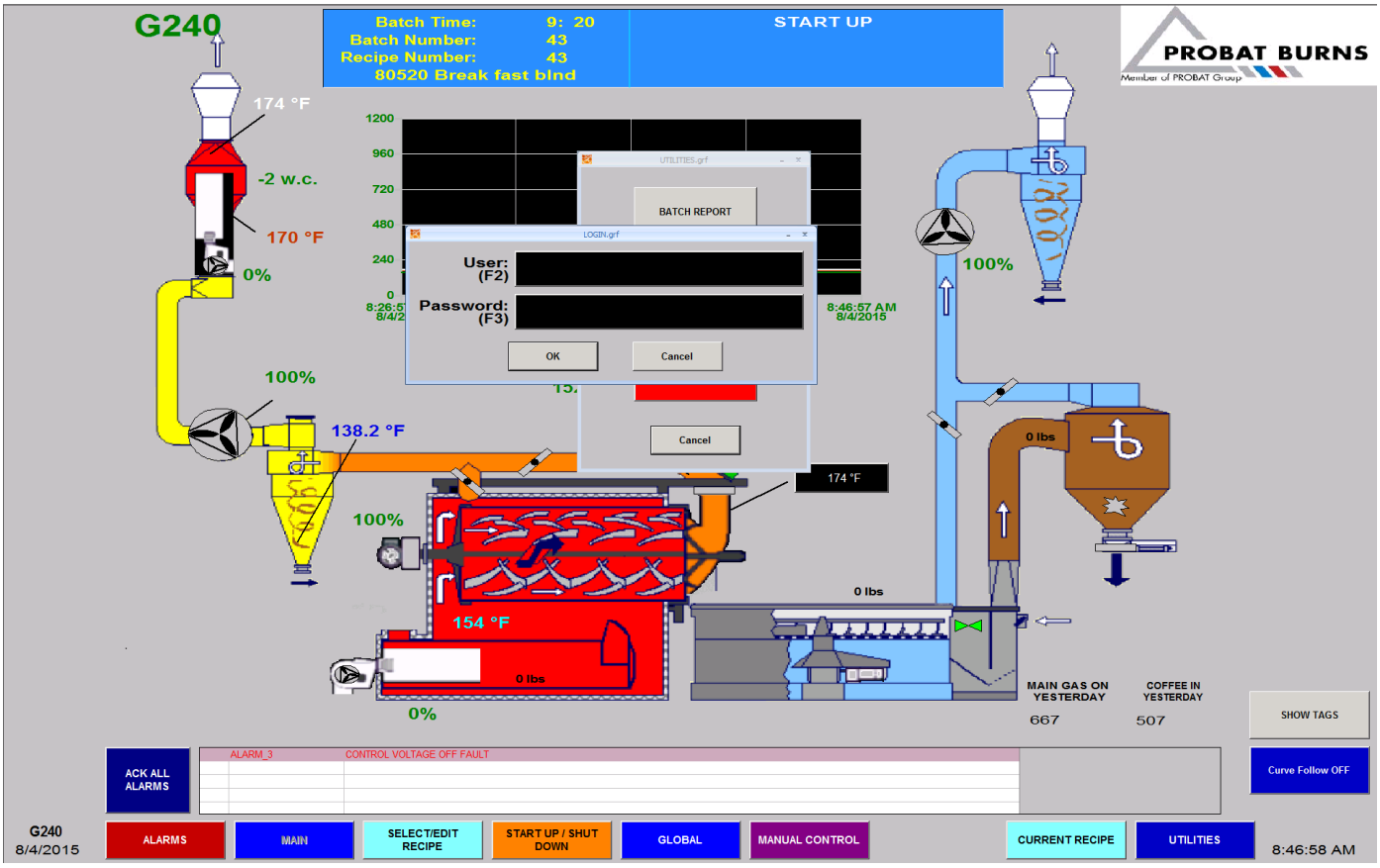


This popup allows the operator to access the Batch Reports, Login to the HMI program, and close the HMI program.

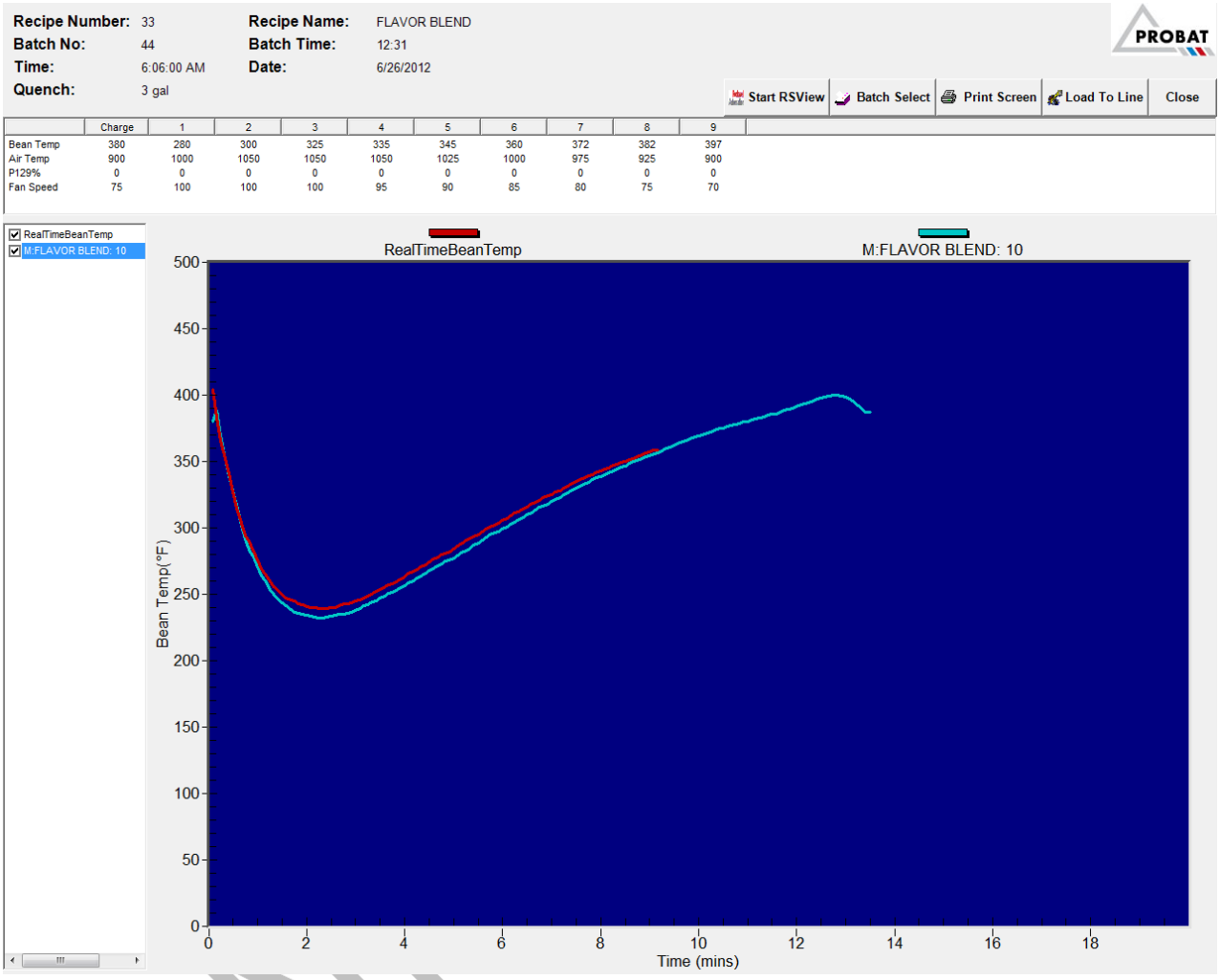
BATCH REPORT – Pressing this pushbutton opens a popup to enter the date range of the batches you want to select. Choose a range and a spreadsheet will display with the batch data. This spreadsheet can be printed as well, if a printer exists.

CLOSE RSVIEW APPLICATION – Pressing this pushbutton closes the entire HMI application. This should only be used if instructed to do so by a Probat representative. If an operator inadvertently presses this then the recovery is to Restart the computer.

LOGIN – Pressing this pushbutton opens the *LOGIN* popup. On this popup the operator enters a valid user name and password and depending on the level can access certain screens.

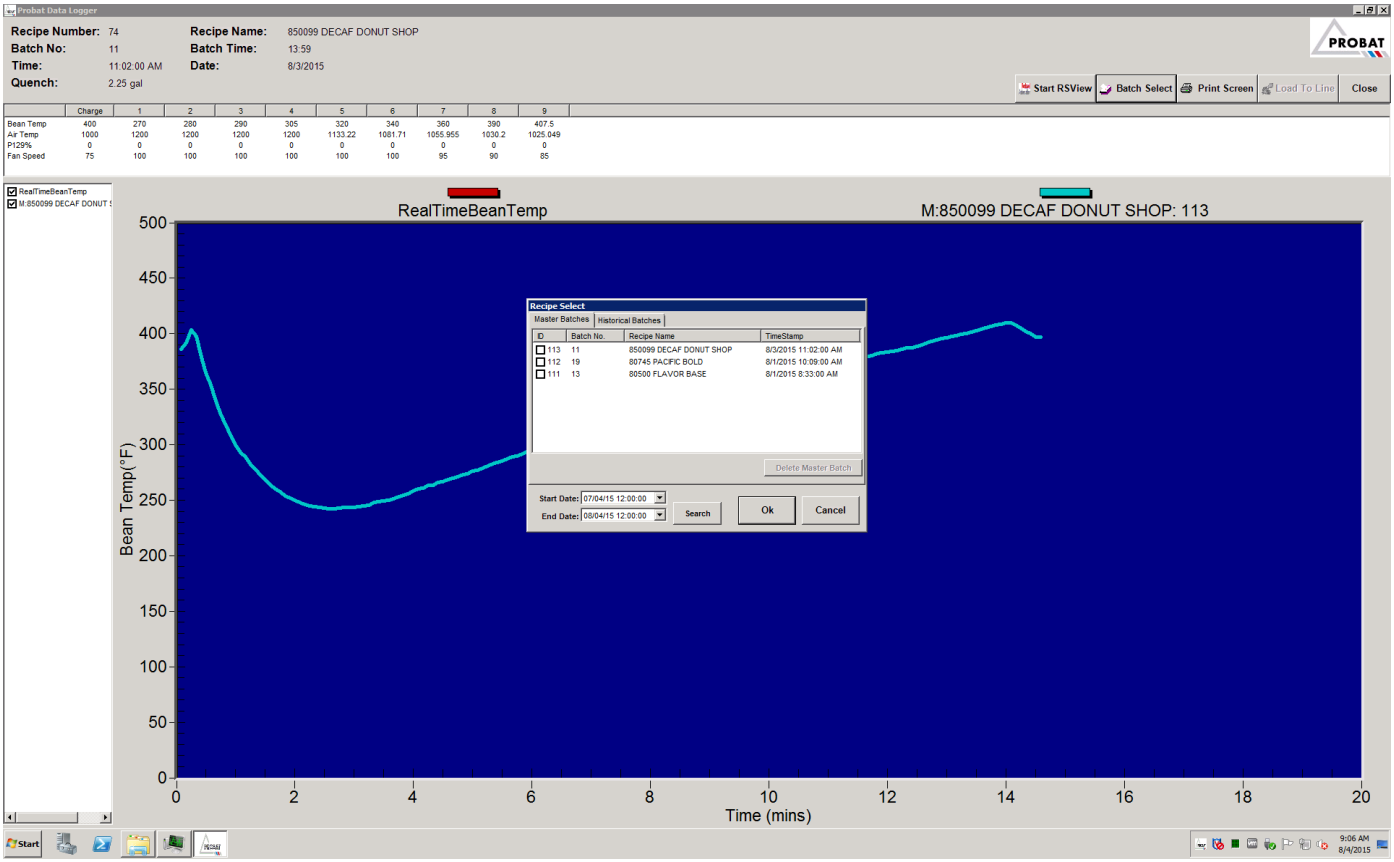

G240
Batch Time: 9: 20
Batch Number: 43
Recipe Number: 43
80520 Break fast blnd
START UP
PROBAT BURNS
Member of PROBAT Group
174 °F
-2 w.c.
170 °F
0%
100%
138.2 °F
100%
154 °F
0 lbs
0%
100%
0 lbs
174 °F
0 lbs
BATCH REPORT
User: (F2)
Password: (F3)
OK
Cancel
Cancel
8:46:57 AM 8/4/2015
MAIN GAS ON YESTERDAY
667
COFFEE IN YESTERDAY
507
SHOW TAGS
Curve Follow OFF
ACK ALL ALARMS
ALARM_3
CONTROL VOLTAGE OFF FAULT
G240
8/4/2015
ALARMS
MAIN
SELECT/EDIT RECIPE
START UP / SHUT DOWN
GLOBAL
MANUAL CONTROL
CURRENT RECIPE
UTILITIES
8:46:58 AM

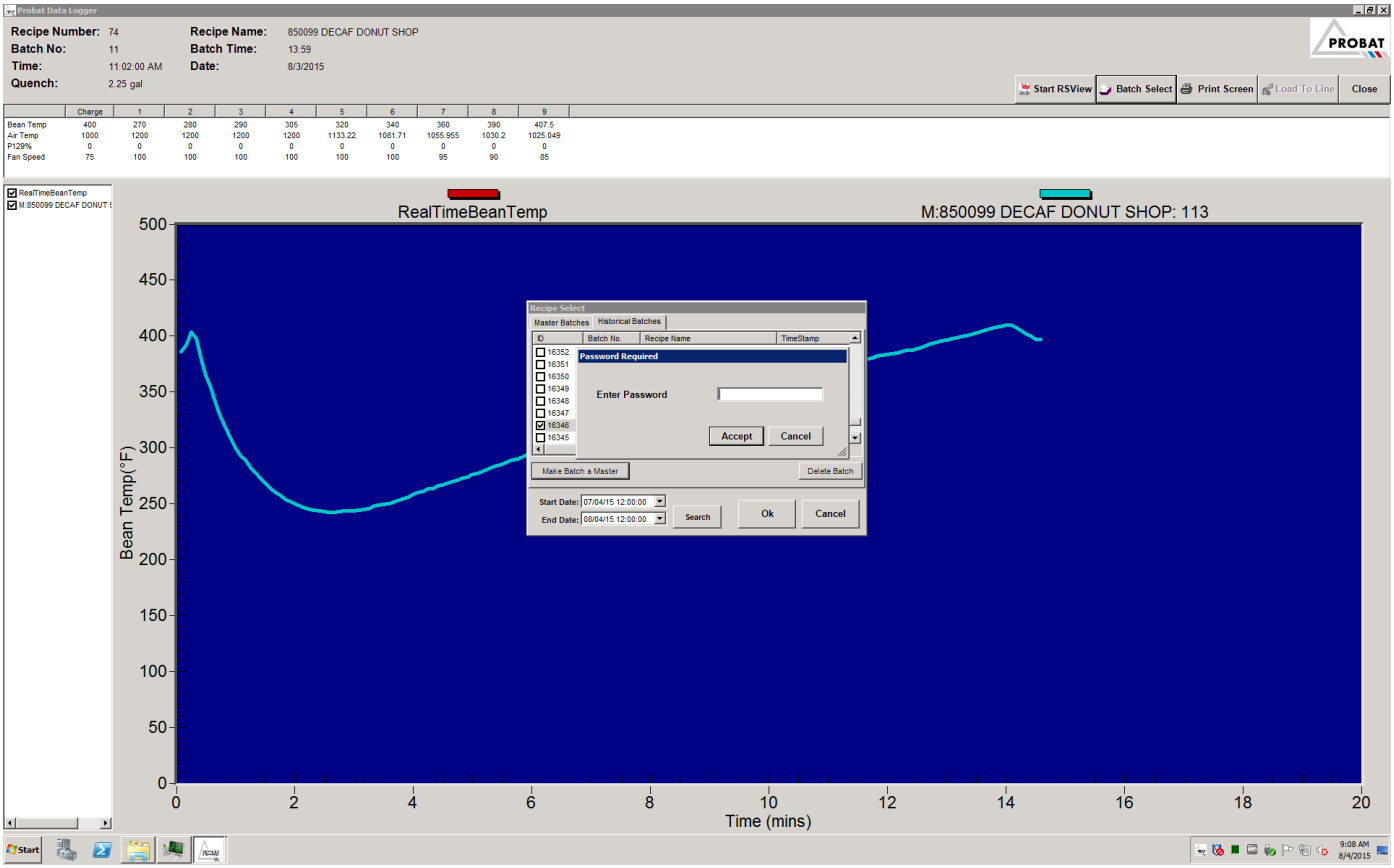
Curve Display Screen

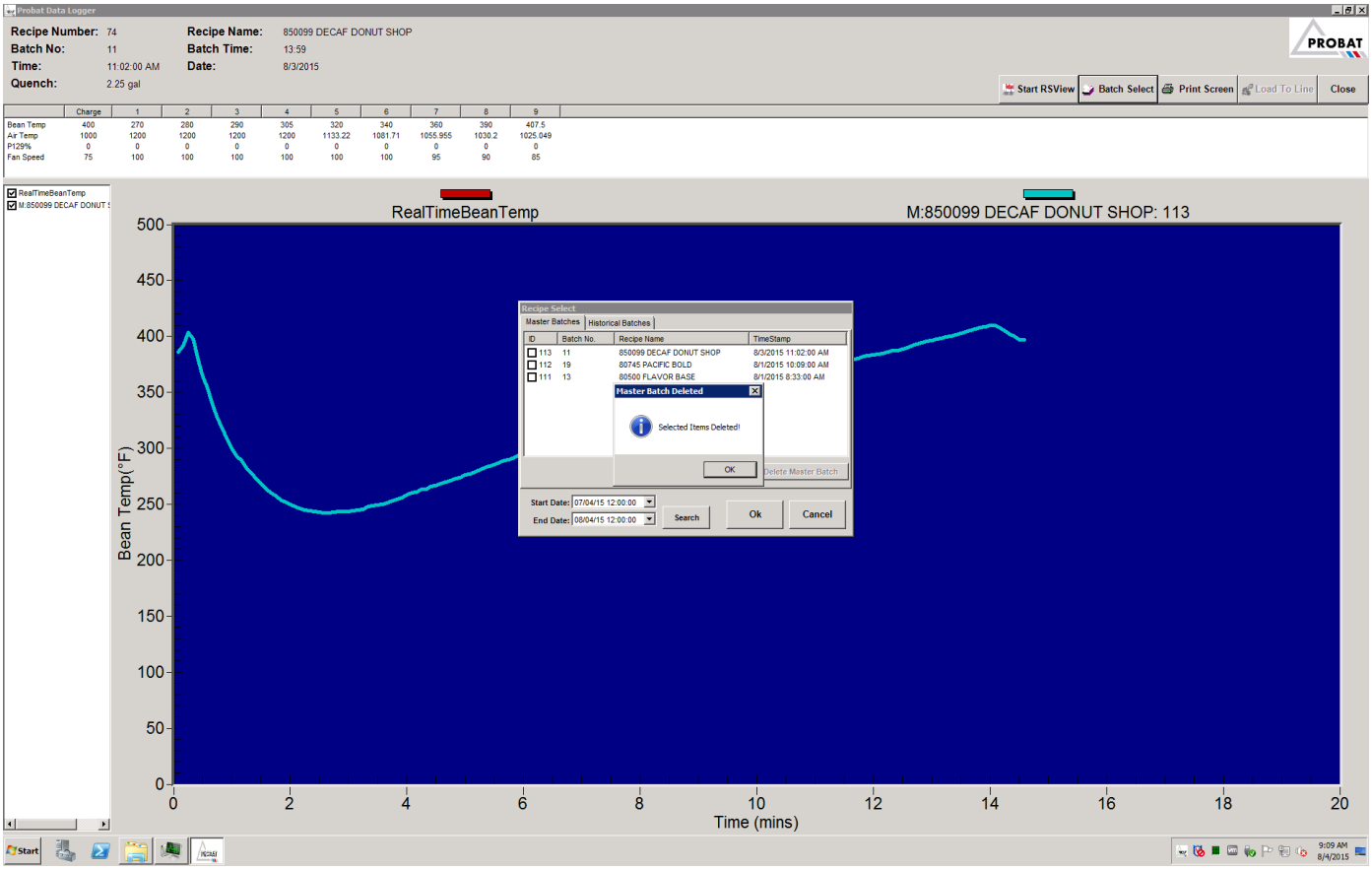


This screen allows the operator to view the curve, roast data, and recipe data from previously roasted batches. A report for a specific batch is available for selection once that corresponding batch has been released from the Destoner hopper.

- **SCREEN LAYOUT**
  - **ROAST DETAILS** – top-left of the screen.
  - **RECIPE DETAILS** – upper-center of the screen.
  - **BATCH DISPLAY ENABLE**– left-side of the screen.
  - **CURVE DISPLAY** – bottom-right of the screen.
- **START RSVIEW** – This pushbutton is used to initialize the HMI program from a startup of the computer.
- **BATCH SELECT** – This pushbutton is used to select the batches to display. A date range is entered and then under the Historical tab all batches within that range are available for selection.
- **PRINT SCREEN** – This pushbutton will print the *Batch Reports* screen to the default printer linked to the computer. A printer must be setup.


Probat Data Logger
Recipe Number: 74
Recipe Name: 850099 DECAF DONUT SHOP
Batch No: 11
Batch Time: 13.59
Time: 11:02:00 AM
Date: 8/3/2015
Quench: 2.25 gal
PROBAT
Start RSView
Batch Select
Print Screen
Load To Line
Close
Charge 1 2 3 4 5 6 7 8 9
Bean Temp 400 270 280 290 305 320 340 360 390 407.5
Air Temp 1000 1200 1200 1200 1200 1133.22 1081.71 1055.955 1030.2 1025.049
P129% 0 0 0 0 0 0 0 0 0 0
Fan Speed 75 100 100 100 100 100 100 95 90 85
RealTimeBeanTemp
M:850099 DECAF DONUT S
RealTimeBeanTemp
M:850099 DECAF DONUT SHOP: 113
Recipe Select
Master Batches
Historical Batches
ID Batch No. Recipe Name TimeStamp
113 11 850099 DECAF DONUT SHOP 8/3/2015 11:02:00 AM
112 19 80745 PACIFIC BOLD 8/1/2015 10:09:00 AM
111 13 80500 FLAVOR BASE 8/1/2015 8:33:00 AM
Delete Master Batch
Start Date: 07/04/15 12:00:00
End Date: 08/04/15 12:00:00
Search
Ok
Cancel
Bean Temp(°F)
Time (mins)
0 50 100 150 200 250 300 350 400 450 500
0 2 4 6 8 10 12 14 16 18 20
Start
9:06 AM
8/4/2015


Probat Data Logger
Recipe Number: 74
Recipe Name: 850099 DECAF DONUT SHOP
Batch No: 11
Batch Time: 13.59
Time: 11:02:00 AM
Date: 8/3/2015
Quench: 2.25 gal
PROBAT
Start RSView
Batch Select
Print Screen
Load To Line
Close
Charge 1 2 3 4 5 6 7 8 9
Bean Temp 400 270 280 290 305 320 340 360 390 407.5
Air Temp 1000 1200 1200 1200 1200 1133.22 1081.71 1055.955 1030.2 1025.049
P129% 0 0 0 0 0 0 0 0 0 0
Fan Speed 75 100 100 100 100 100 100 95 90 85
RealTimeBeanTemp
M:850099 DECAF DONUT S
RealTimeBeanTemp
M:850099 DECAF DONUT SHOP: 113
Recipe Select
Master Batches
Historical Batches
ID Batch No. Recipe Name TimeStamp
16352
16351
16350
16349
16348
16347
16346
16345
Password Required
Enter Password
Accept
Cancel
Make Batch a Master
Delete Batch
Start Date: 07/04/15 12:00:00
End Date: 08/04/15 12:00:00
Search
Ok
Cancel
Bean Temp(°F)
Time (mins)
0 50 100 150 200 250 300 350 400 450 500
0 2 4 6 8 10 12 14 16 18 20
Start
9:08 AM
8/4/2015


Probat Data Logger
Recipe Number: 74
Recipe Name: 850099 DECAF DONUT SHOP
Batch No: 11
Batch Time: 13:59
Time: 11:02:00 AM
Date: 8/3/2015
Quench: 2.25 gal
PROBAT
Start RSView
Batch Select
Print Screen
Load To Line
Close
Charge 1 2 3 4 5 6 7 8 9
Bean Temp 400 270 280 290 305 320 340 360 390 407.5
Air Temp 1000 1200 1200 1200 1200 1133.22 1081.71 1055.955 1030.2 1025.049
P129% 0 0 0 0 0 0 0 0 0 0
Fan Speed 75 100 100 100 100 100 100 95 90 85
RealTimeBeanTemp
M:850099 DECAF DONUT SHOP: 113
Bean Temp(°F)
Time (mins)
Recipe Select
Master Batches
Historical Batches
ID Batch No. Recipe Name TimeStamp
113 11 850099 DECAF DONUT SHOP 8/3/2015 11:02:00 AM
112 19 80745 PACIFIC BOLD 8/1/2015 10:09:00 AM
111 13 80500 FLAVOR BASE 8/1/2015 8:33:00 AM
Master Batch Deleted
Selected Items Deleted!
OK
Delete Master Batch
Start Date: 07/04/15 12:00:00
End Date: 08/04/15 12:00:00
Search
Ok
Cancel
Start
9:09 AM
8/4/2015

HOW TO…

D. START ROASTER

The Roaster motors that are essential to operation are started automatically and sequentially by the control system at the operator request.

- Set the Main Power Disconnect handle on the Control Panel to ON. The System PC will boot-up and the display turn on.
- Pull the Control Power panel mount button to the first detent, then momentarily to the second detent. This activates control power, starts the Roaster Drum turning, and causes TESTING DAMPERS to be displayed as several dampers are moved opened and closed to test their activation. This test of the dampers must be completed before the next Startup step can be initiated.
- Open the Start Up/Shut Down menu and select *Startup*. The touch screen button will turn green, and motors in the system will start automatically.

E. STOP ROASTER

The Roaster burners and motors are turned off sequentially. A period of cooling down may take place when turning off the Roaster. Ensure no coffee is in the Roaster or Cooling Tray.
Open the Start Up/Shut Down menu and select *SHUTDOWN*. The button will turn red.
The Roaster & Afterburner burners will be turned off if they were on, and their pushbutton lamps will go off.
The Status Window will display *SHUTDOWN*.
If the Roaster is hot, COOLDOWN will be displayed in the Status Window.
When all temperatures for the Roaster has cooled below 200°F, the motors will be sequentially de-energized. Some motors may re-start for 5-10 minutes if the temperature rises again above 200°F.
When all temperatures are below 200°F, push the Control Power pushbutton OFF.

F. START ROASTER BURNER

The Roaster needs to be purged of all combustible gasses before igniting the pilot light.

- Pull the ROASTER BURNER START/STOP panel mount button to the first detent. After about 20-seconds to check the gas safety valves, ROASTER BURNER SAFETIES OK will be displayed in the Status Window.

- Pull the ROASTER BURNER START/STOP panel mount button momentarily to the second detent. The roaster burner lighting sequence will be started, requiring up to five minutes to complete. When completed, the image of a small flame will be displayed in the roaster oven to indicate the pilot flame is lit.

After pulling the ROASTER BURNER START/STOP switch to the second detent, as described above, the switch lamp will begin blinking to indicate the Roaster is purging. The Purge Cycle will take several minutes, depending on the roaster piping configuration. During this time, the Purge Air Damper P120 will open, the Recirc Damper PR129 will close, and the Exhaust Damper PR545 will be positioned to 100% open until the Purge Cycle is complete. On non-recirculating air roasters, only PR545 will opened until the Purge Cycle is complete.

The PLC will signal the Honeywell burner controller to ignite the Roaster pilot flame once the purge cycle is completed. Once the Honeywell burner controller detects pilot flame ignition, the Roaster main gas valves are opened. The ROASTER BURNER START/STOP switch lamp will stop flashing and illuminate continuously while the flame is detected, and the image of a small flame will be displayed on the screen.

G. START AFTERBURNER BURNER

WARNING
Always start the Roaster Burner BEFORE starting the Afterburner. Raw gas trapped in the Roaster section may explode if purged into a lit Afterburner.

The Afterburner needs to be purged of all combustible gasses before igniting the pilot light.

Pull the AFTERBURNER BURNER START/STOP panel mount button to the first detent. After about 20-seconds to check the gas safety valves, AFTERBURNER BURNER SAFETIES OK will be displayed in the Status Window.
Pull the AFTERBURNER BURNER START/STOP panel mount button momentarily to the second detent. The afterburner lighting sequence will be started, requiring up to two minutes to complete. When completed, the image of a small flame will be briefly displayed in the afterburner, then a larger flame will be shown as the burner automatically fires to heat the unit to its setpoint temperature (touch the temperature displayed onscreen to view or change the setpoint temperature).

After pulling the AFTERBURNER BURNER START/STOP switch to the second detent, as described above, the switch lamp will begin blinking to indicate the Roaster is purging. The Afterburner purge cycle will take up to two minutes, and

then the PLC will signal the Honeywell burner controller to ignite the Afterburner pilot flame. Once the Honeywell burner controller detects pilot flame ignition, the Afterburner main gas valves are opened. The AFTERBURNER BURNER START/STOP switch lamp will stop flashing and illuminate continuously while the flame is detected. After this burner is lit, the PLC will begin modulating the burner automatically to meet the Afterburner Temperature setpoint.

H. AFTERBURNER SETPOINT

For a Catalytic Afterburner, this setpoint refers to the Inlet Temperature measured at the inlet side of the catalyst. For a Thermal Afterburner, this temperature refers to the Outlet Temperature measured at the top of the Afterburner chamber. Pressing the screen display of the inlet temperature will pop-up a scratchpad to allow the operator to view or change the setpoint.

I. ROAST CYCLE – AUTOMATIC OPERATION

All aspects of the Roasting Cycle including Charging, Cooling, and Destoning are controlled by the Roaster PLC; and this results in more repeatable and accurate roasting due to the repeatability and accuracy of computerized automation.

UPSTREAM INTERLOCK: Transporting Green Beans to the Charge Hopper is performed by the Production System external to the Roaster controls. The roaster PLC provides a signal to the Production System. Roasting parameters will use the variables entered in the *ACTIVE RECIPE* screen.

The Automatic Operation sequence is as follows:

1. Enter appropriate values in *GLOBAL PARAMETERS* and *CURRENT RECIPE* screens and position the panel mount ROASTER AUTO/MAN CYCLE switch to the AUTO position.
2. Open the Start Up/Shut Down menu and press **PREHEAT OFF/ON** to start preheating the Roaster. Skip Steps 2 & 4 if preheating is not desired.
3. Ensure TRANSPORT COMPLETE is shown above the Charge Hopper HMI graphic and the Charge Hopper Low Level sensor graphic is colored to indicate beans have been transported to the hopper and the Transport cycle is completed.
4. Once the Roaster has preheated to the programmed setpoint for the desired time, turn off the preheat cycle by pressing **PREHEAT OFF/ON**.
5. Press the panel mount momentary ROASTER AUTO/MAN CYCLE START pushbutton to begin roasting.
6. The burner will begin modulating to the **Charging Air Temp** setpoint.
7. Once the **Charging Bean Temp** is reached, the Charge Hopper discharge gate will open to charge the Roaster with coffee. While charging, Recirc Damper PR129 will be adjusted to the setpoint entered in **Charging P129 Position** and the circulating fan will be 100%. The Aroma Damper P116 will close and the Smoke Damper P110 will open while charging to prevent beans from entering the Aroma Duct.

8. After the **Charging Time** has expired, the burner will modulate to the **Stage 1 Air Temperature** setpoint, Recirc Damper PR129 will adjust to the opening % of **Step 1 P129 Position,** the circulating fan will adjust to the % speed of **Step 1 Fan Speed,** and Exhaust Damper PR545 will begin continually modulating to meet **Roasting Negative Pressure** setpoint (as shown on the Global Settings screen.
9. Once the Bean temperature reaches **Step 1 Bean Temp**, the Step 2 setpoints for **Air Temp, P129 Position and Fan Speed** will be met.
10. Roasting continues until the Bean temperature equals the **Step 9 Bean Temp** or the operator presses the panel mount QUENCH END ROAST pushbutton switch. At this time, the burner valve modulates to 0%, the Smoke Damper P110 opens, the Roaster Fan goes to 100%, the Make-up Air Fan goes to 100%, and the quench water solenoid valve opens to spray water onto the coffee in the amount of **Quench Volume**.
11. A delay occurs, **Drying Time** on the Globals screen, between the end of the quenching and the beginning of Roaster discharge into the Cooling Tray.
12. The moment the Drying Time delay ends, the Roaster door will open to begin discharging beans into the Cooling Tray, and the Cooler Stirring Arms and Cooling Fans are turned on.
13. The Roaster door will remain open for the period of time defined in **Roaster Discharge Time**.
14. The Cooler Stirring Arms will remain on for the period of time defined in **Stirring Time**.
15. Assuming green beans have successfully been transferred to the Charge Hopper, when the Roaster door closes from discharging, the burner will again modulate to **Charging Air Temperature**. Alternatively, if green beans are not present in the Charge Hopper or if TRANSPORT COMPLETE is NOT shown on the screen at the time when the roaster Discharge Door closes, then a warning fault will occur to notify the operator that Automatic batch start has been disabled. The operator must again press the ROASTER AUTO/MAN CYCLE START pushbutton to begin roasting the next batch.
16. The coffee will continue to cool in the Cooling Tray for the amount of time in **Cooling Time** while the Roaster begins to roast another batch of coffee.
17. The Destoning Cycle will begin immediately after the **Cooling Time** expires, and this will continue for the time defined by **Destoning Time**, the Stirrer Arms will turn on while destoning.
18. The Roaster control system will automatically discharge the Destoning Hopper once **Destoning Time** expires and the Plant System or downstream control signals to the Roasting control system to ENABLE DESTONER DISCHARGE.

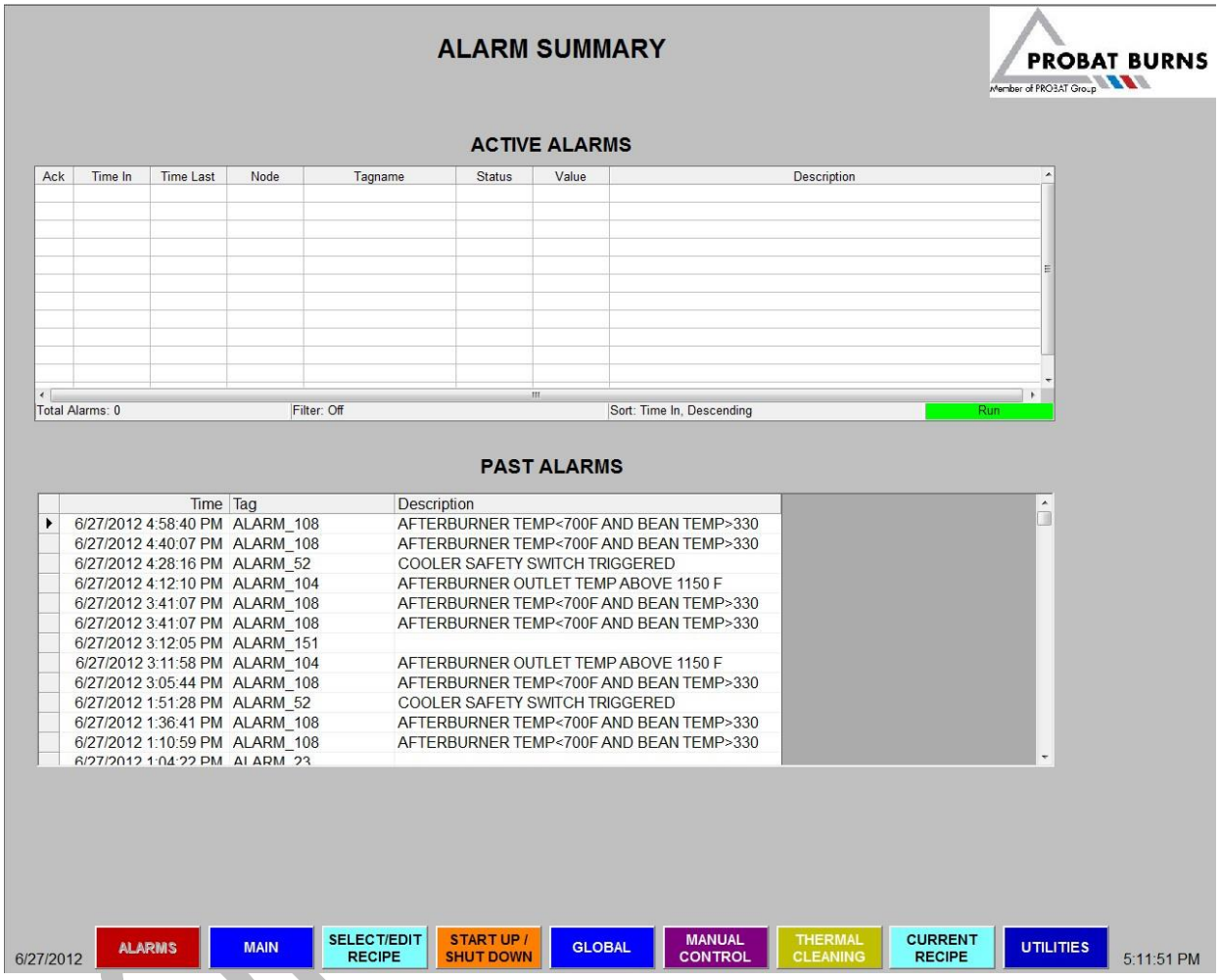
J. ROAST CYCLE – MANUAL OPERATION

All aspects of the Roasting Cycle excluding Charging are controlled by the PLC; very little operator control is required. Transporting Green Beans to the Charge Hopper is performed by the transport system external to the Roaster controls. Roasting parameters will use the variables entered in the *ACTIVE RECIPE* & *GLOBAL PARAMETERS* screen.

See the Automatic Operation cycle description above. The only difference between Automatic and Manual roasting is in how Charging occurs. With MANUAL roasting, the panel mount momentary ROASTER AUTO/MAN CYCLE switch must be pressed to start each batch. This mode of operation is normally used while recipes are being developed, when individualized roasting is desired, or when time periods must exist between batches.

VI. ALARMS

A. ALARM SUMMARY SCREEN



If an Alarm occurs, it will be listed on the *ALARM SUMMARY* screen. Each Alarm will be listed with its respective NUMBER, its date and time of occurrence, and a brief description. If a fault condition is still present when the **Ack All Alarms** button is pressed, the Alarm will still be listed under ACTIVE ALARMS and again under PAST ALARMS with a new time stamp. Each list may be viewed by using the **UP/DN** arrows. The PAST ALARMS list is never cleared and cumulatively logged to the PC hard drive.

- NOTE: When reporting alarms to Probat Burns, please note the ALARM NUMBER. Some alarms have very similar descriptions, so the ALARM NUMBER is more useful to diagnose a problem for correction.

- **ACK ALL ALARMS** - If an Alarm occurs, the NUMBER and alarm description will appear in the red alarm box at the top of the screen and the horn on the

Main Control panel will sound. Pressing **Ack All Alarms** in this or other screens will silence the horn and reset the fault if the condition has been corrected.

B. ALARM MESSAGES

NOTE: Some alarms listed here may not be present or active on your system depending on configuration and option requirements.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
1	24V DC SUPPLY FLT	120VAC Control Voltage ON, 24VDC off	Burners Off, further roasting inhibited, Manual Operation inhibited	Check fuses and breakers; possible loose wire or failed power supply.
2	SPARE			
3	CONTROL VOLTAGE OFF FAULT	120VAC or 24VDC Control voltage detected but 120VAC transformer voltage off	Burners Off, further roasting inhibited, Manual Operation inhibited	Check fuses and breakers; possible loose wire or failed power supply.
4	SPARE			
5	SPARE			
6	SPARE			
7	SPARE			
8	PC-TO-PLC COMMUNICATION FAULT	Ethernet communication between PC and PLC disrupted for more than 10 sec.	None, Warning to Operator Only	Check Ethernet cabling.
9	PANEL VIEW COMMUNICATION FAULT	not used	None, Warning to Operator Only	
10	SPARE			
11	ANALOG INPUT MODULE FAULT	not used	Advisory alarm only. Likely control failures reported by other alarms.	Check circuits with blinking indicator on PLC module.
12	ANALOG OUTPUT MODULE FAULT	Not used	Advisory alarm only. Likely control failures reported by other alarms.	Check circuits with blinking indicator on PLC module.
13	SPARE			
14	SPARE			
15	SPARE			
16	SPARE			
17	RECIPE NUMBER OUT OF BOUNDS FAULT	Recipe number entered or submitted in system is less than 1 or greater than 300	Warning to Operator Only.	Correct recipe number entry.
18	RECIPE MISMATCH	Recipe name transported from Green delivery system does not match stored Recipe in Roaster	Inhibits charge until the names match.	Change the recipe in Roaster to match name in charge gate.
19	SPARE			
20	SPARE			
21	SPARE			
22	Burners ON after Roaster Idle for 1 hour	Burners were left on	Advisory Alarm Only	Review Operation Protocals with Management

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
23	AFTERBURNER TEMPERATURE BELOW 750 WHILE ROASTING	Afterburner Setpoint set too low.	Advisory Alarm Only	Increase the Afterburner Temperature Setpoint
24	AFTERBURNER EMERGENCY QUENCH PUSHBUTTON PRESSED	Emergency Water for Afterburner activated by panel mounted pushbutton switch or Temperature exceeded MAX value.	If Afterburner E-Quench, then burner for Afterburner OFF.	Temperatures must fall below thresholds and EMERGENCY QUENCH timer must complete..
25	ROASTER EMERGENCY QUENCH PUSHBUTTON PRESSED	Emergency Water for ROASTER activated by panel mounted pushbutton switch or Temperature exceeded MAX value.	If Roaster E-Quench, then burner for Roaster OFF and Drum Discharge Inhibited.	Temperatures must fall below thresholds and EMERGENCY QUENCH timer must complete..
26	ROASTER CYCLONE EMERGENCY QUENCH PUSHBUTTON PRESSED	Emergency Water for ROASTER CYCLONE activated by panel mounted pushbutton switch or Temperature exceeded MAX value.	If Roaster Cyclone E-Quench, then burner for Roaster OFF and Drum Discharge Inhibited	Temperatures must fall below thresholds and EMERGENCY QUENCH timer must complete..
27	COOLER EMERGENCY QUENCH PUSHBUTTON PRESSED	Emergency Water for COOLER activated by panel mounted pushbutton switch or Temperature exceeded MAX value.	If Cooler E-Quench, then Cooler quench engaged.	Temperatures must fall below thresholds and EMERGENCY QUENCH timer must complete..
28	THERMAL CLEANING "ACKNOWLEDGE" NOT PRESSED FLT	"ACKNOWLEDGE" touch screen button not pressed during Thermal Cleaning Cycle at 2 min intervals	Thermal Cleaning Cycle stopped. Accumulated Roasting Time timer not reset.	Restart thermal cleaning, and assure operator is present to Ack alarms every two minutes while cleaning.
29	SPARE			
30	SPARE			
31	SPARE			
32	PSL139 LOW PNEUMATIC PRESSURE	PSL139 – Low Pressure switch indicates low Pneumatic pressure.	All burners OFF and inhibited, Roasting inhibited.	Correct low air pressure or low compressed airflow (intermittent low pressure) condition.
33	SPARE			
34	SPARE			
35	SPARE			
36	SPARE			
37	SPARE			
38	SPARE			
39	SPARE			
40	SPARE			
41	ROASTER CYCLONE CHAFF TRANSPORT LOW VACUUM FAULT	Not used	Inhibit charge gate.	Correct chaff handling system condition and clear buildup likely in cyclone.
42	SPARE			

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
43	GREEN COFFEE TRANSPORT INTERLOCK NOT RECEIVED FLT	Green Bean transport taking too long. Transfer Complete Signal from Prod'n System not received by Stage 8 of batch in progress.	Disable automatic charging for subsequent batch.	When charge hopper is again filled and Transfer Complete signal received, then operator must press the pushbutton to initiate subsequent batch roasting.
44	FEED HOPPER EMPTY DURING AUTOMATIC OPERATION FLT	Feed Hopper low level sensor, LSL114, does not detect coffee in Feed Hopper 10 minutes into batch while in Automatic Operation Mode.	Inhibit Automatic charging.	Correct green coffee feeding to deliver batches sooner. Operator must press the pushbutton to initiate subsequent batch roasting.
45	FEED HOPPER HIGH LEVEL FAULT	LSH114 - Feed Hopper high level sensor detects a high level off coffee in the hopper.	Inhibit Charge gate.	High level switch must be cleared to proceed. Operator must press the pushbutton to initiate subsequent batch roasting.
46	FEED HOPPER NOT EMPTY BY TIME FAULT	Feed Hopper low level sensor, LSL114, detects coffee still in hopper 2 seconds before discharge timer expires.	Advisory alarm only.	Correct slow bean flow while charging.
47	COFFEE IN FEED HOPPER DURING THERMAL CLEANING	Feed Hopper low level sensor, LSL114, detects coffee in the hopper when Thermal Cleaning is attempted.	Inhibits Thermal cleaning.	Thermal cleaning is halted or prevented with product in the charge hopper
48	TURNING POINT TIMER EXPIRED FAULT	After charging the Roaster, the Bean temperature is above Stage 1 temperature when the Batch Time is 90 sec.	Stop Roast Cycle. Turn Burner OFF	Batch size too small.
49	COFFEE IN ROASTER WHEN CYCLE START PRESSED	Coffee in Roaster bit not cleared, Coffee still in Roaster	Feed Hopper discharge inhibited. Roaster burner to low-fire.	Operator message response required to proceed.
50	SPARE			
*51	COFFEE NOT DISCHARGED FROM COOLER FAULT	Logic shows coffee in the Cooling Tray while the Roaster is attempting to discharge.	Inhibit Charge gate.	Cooling and Destoning delayed excessively or cooling and destoning times exceed roasting time.
52	COOLER SAFETY SWITCH TRIGGERED OR DOOR OPENED FLT	ZSC142- The Cooling Tray Hood Inspection Door has been opened.	Stop Stirrer Motor. If less than 10 sec then no alarm, but if more then alarm. Motor resumes running once door closed.	Reset switch, close door, and reset alarm. Beware this delays destoning time, so roaster may discharge onto coffee in the cooler.
53	COOLER SAFETY SWITCH TRIGGERED OR DOOR OPENED FLT	ZSC143- The Cooling Tray Inspection Hatch has been opened.	Stop Stirrer Motor. If less than 10 sec then no alarm, but if more than alarm. Motor resumes running once door closed.	Reset switch, close door, and reset alarm. Beware this delays destoning time, so roaster may discharge onto coffee in the cooler.
54	SPARE			
55	SPARE			
56	SPARE			

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
57	NO STIRRERS AT ROASTER DISCHARGE	Cooler Stirrers are not running when Roaster Discharge Cycle is engaged.	Close all Cooler tray doors or check Motor Overload.	There should be a subsequent alarm for cooler door open or motor fault. Stirrers must be on to discharge.
58	DRUM NEGATIVE PRESSURE TOO HIGH	PDT100 - Pressure transmitter detects high negative pressure (-2") in the drum.	Advisory alarm only.	PR129 damper stuck closed or blocked recirc duct.
59	DRUM NEGATIVE PRESSURE TOO LOW	PDT100 - Pressure transmitter detects low negative pressure (0") in the drum.	Advisory alarm only.	While roasting: PR129 setting open too far (Some systems allow -0.10" w.c.); smoke/steam may escape roaster.
60	EMERGENCY ROASTER DISCHARGE INHIBIT	An emergency situation has occurred in the Roaster that is inhibiting the Roaster door from opening. Example is Roaster E-Quench.	Inhibit Roaster discharge until Bean Temperature falls below 300 degF and Inhibit condition is reset. System into Shutdown mode. All extraction of Product is fully Manual.	Check calibration and placement of Product Thermocouple to assure proper reading.
*61	EMERGENCY COOLER DISCHARGE INHIBIT	An emergency situation has occurred in the Cooling Tray or ducting that is inhibiting the Cooling Tray from discharging. Example would be Cooler E-Quench	Inhibit Destoning until fault is cleared. Inhibit Cooler Fresh air.	Check calibration and placement of Product Thermocouple to assure proper reading. Inspect product.
*62	AFTERBURNER CATALYSER BED DIFF PRESSURE HIGH FLT	PDS250 - The differential pressure switch has detected 1.75" of pressure across the Afterburner catalyst bed	Advisory only	Chaff blocking catalyst airflow. Cool system and inpect/clean catalyst.
*63	AFTERBURNER CATALYSER BED DIFF PRESSURE HIGH HIGH FLT	PDS250 - The differential pressure switch has detected 2.25" of pressure across the Afterburner catalyst bed	Inhibit Charge gate	Chaff blocking catalyst airflow. Cool system and inpect/clean catalyst.
64	SPARE			
65	SPARE			
66	ROASTER CYCLONE PRE-ALARM	Roaster cyclone temperature too high (450)	Advisory alarm only.	Fire hazard: Prevent further roasting until cyclone is cleaned.
67	SPARE			
68	SPARE			
69	SPARE			
70	SPARE			
71	SPARE			
72	SPARE			
73	SPARE			
74	SPARE			
75	SPARE			
76	SPARE			

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
77	SPARE			
78	ROASTER SUPPLY AIR/OVEN WATLOW HIGH TEMP	TSSH118	Turn off Roaster burner.	Oven fire or excessive air temperature in recipe.
79	ROASTER SUPPLY AIR/OVEN SOFTWARE HIGH TEMP	TE118	Turn off Roaster burner	Oven fire or excessive air temperature in recipe or exceeds 1000 during Thermal Cleaning
80	ROASTER BURNER OFF WHEN COMMANDED ON FLT	If the Roaster main gas valve circuit is not energized 25 sec after the Burner Controller has been energized.	Inhibit Roasting	Defective burner controller or loose controller wiring.
81	ROASTER BURNER ON WHEN COMMANDED OFF FLT	If the Roaster main gas valve circuit energized when the Burner Controller circuit has been de-energized. 120VAC inadvertently on the main gas valve circuit	Turn off Roaster burner controller enable output	Residual gases burning in oven; defective pilot solenoid valve.
*82	ROASTER BURNER VALVE FAILURE DURING PURGE FLT	Limits not made during the Purge cycle.	Inhibit Roaster burner ignition	Confirm burner positioner operation and adjust low-fire limit switch.
83	ROASTER BURNER VALVE LOW FIRE FAULT	ZSC211 - Low-fire limit switch input not triggered when valve commanded to 0%	Inhibit Roaster burner ignition	Confirm burner positioner operation and adjust low-fire limit switch.
84	ROASTER BURNER VALVE HIGH FIRE FAULT	ZSO211 - High-fire limit switch input not triggered when valve commanded to 100%	Inhibit Roaster burner ignition	Confirm burner positioner operation and adjust high-fire limit switch.
85	SPARE			
86	ROASTER BURNER CONTROLLER FAULT	BSC200 - Roaster Burner Controller fault output triggered	Turn off Roaster burner	Pilot flame establishing period exceeded; clean flame detector, set spark gap, check pilot gas supply, reset burner controller and restart.
87	ROASTER COMBUSTION FAN LOW PRESSURE FAULT	PSL210	Turn off Roaster burner. Turn off Afterburner burner	Fan failure, blocked filter, or blocked duct to burner.
88	ROASTER FAN LOW PRESSURE FAULT	PSL220 - The circulation fan pressure switch is not detecting air flow	All burners off and inhibited	Fan failure or blocked sensor pipe. Check pressure switch adjustment and circuit. Check connection pipe for obstruction.
89	SPARE			
90	ROASTER GAS PRESSURE LOW FAULT	PSL200	Inhibit Roaster burner ignition	Check gas supply pressure, especially during peak demand periods. Check regulator.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
91	ROASTER GAS PRESSURE HIGH FAULT	PSH201	Inhibit Roaster burner ignition	Check gas supply pressure, especially when moving to low fire. Check regulator.
92	SPARE			
93	ROASTER GAS TRAIN LEAK DETECTOR FAULT	PDSS200	Inhibit Roaster burner ignition	Main gas valves leaking; blocked leak detector sensing lines.
94	ROASTER BURNER CHAMBER HIGH PRESSURE FAULT	PSH218	Turn off Roaster burner. Inhibit Roaster burner ignition	Overpressure. Quench rate too high; smoke damper too slow.
95	SPARE			
96	AFTERBURNER BURNER OFF WHEN COMMANDED ON FLT	If the Afterburner main gas valve circuit is not energized some time after the Burner Controller has been energized.	Inhibit AB burner	Defective burner controller or loose controller wiring.
97	AFTERBURNER BURNER ON WHEN COMMANDED OFF FAULT	If the Afterburner main gas valve circuit energized when the Burner Controller circuit has been de-energized. 120VAC inadvertently on the main gas valve circuit	Turn off AB burner controller output	Residual gases burning in oven; defective pilot solenoid valve.
98	SPARE			
99	AFTERBURNER BURNER VALVE LOW FIRE FAULT	ZSC232 - Low-fire limit switch input not triggered when valve commanded to 0%	Inhibit AB burner ignition	Confirm burner positioner operation and adjust low-fire limit switch.
100	AFTERBURNER BURNER VALVE HIGH FIRE FAULT	ZSO232 - High-fire limit switch input not triggered when valve commanded to 100%	Inhibit AB burner ignition	Confirm burner positioner operation and adjust high-fire limit switch.
101	SPARE			
102	AFTERBURNER BURNER COMBUSTION FAN LOW PRESSURE	PSL230	Turn off AB burner	Fan failure, blocked filter, or blocked duct to burner.
103	CAT AFTERBURNER INLET TEMP PRE-ALARM (1000°F)	TE251	Advisory only.	Fire Hazard; Prevent further roasting until afterburner is cleaned.
104	CAT AFTERBURNER OUTLET TEMP PRE-ALARM (1150°F)	TE252	Advisory only.	Smoke quantity exceeds catalyst capacity; reduce quench flowrate; reduce batch size; lighten coffee color
105	AFTERBURNER BURNER CONTROLLER FAULT	BSC250 - Afterburner Burner Controller fault output triggered	Turn off AB burner controller output	Pilot flame establishing period exceeded; clean flame detector, set spark gap, check pilot gas supply, reset burner controller and restart.
106	AFTERBURNER GAS PRESSURE LOW FAULT	PSL250	Turn off AB burner	Check gas supply pressure, especially during peak demand periods. Check regulator.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
107	AFTERBURNER GAS PRESSURE HIGH FAULT	PSH251	Turn off AB burner	Check gas supply pressure, especially when moving to low fire. Check regulator.
108	SPARE			
109	AFTERBURNER GAS TRAIN LEAK DETECTOR FAULT	PDSS250	Turn off AB burner	Main gas valves leaking; blocked leak detector sensing lines.
110	AFTERBURNER INLET WATLOW HIGH TEMP (1100°F)	TSSH251	Turn off AB burner	Fire Hazard; Check for fires in system or gas valve linkage failure.
111	AFTERBURNER OUTLET WATLOW HIGH TEMP (1200°F)	TSSH252	Turn off AB burner	Fire Hazard; Volatile gas concentration too high; Check for fires in system or gas valve linkage failure.
112	PROCESS WATER SUPPLY MANUAL VALVE NOT OPEN FLT	ZSO100	All burners OFF and ignition inhibited	Open valve or adjust limit switches.
113	SPARE			
114	SPARE			
115	ROASTER QUENCH WATER FLOW FLT	FSL104	Advisory only	Quench flowrate too slow or flowswitch defective.
116	SPARE			
117	SPARE			
118	SPARE			
119	SPARE			
120	SPARE			
121	EXCESS QUENCH TIME FAULT	Recipe quench volume not reached in timely fashion.	Advisory only.	Check water supply or clean spray nozzle.
*122	ROASTER QUENCH METER FAULT	FQTI100 - Input from sensor not received during Roaster quench	Advisory only.	Inspect Water clock.
123	SPARE			
*124	ROASTER CYCLONE EMERGENCY QUENCH LOW FLOW FAULT	FSL106	Alarm only	Check water supply or replace flow switch.
*125	COOLING TRAY EMERGENCY QUENCH LOW FLOW FAULT	FSL107	Alarm only	Check water supply or replace flow switch.
*126	AFTERBURNER EMERGENCY QUENCH LOW FLOW FAULT	FSL261	Alarm only	Check water supply or replace flow switch.
127	SPARE			
128	SPARE			
129	THERMAL CLEANING BEAN TEMP FAULT	Bean Temperature reading too high during Thermal Cleaning	Turn OFF and Inhibit Roaster Burner	Cool unit and check for burning debris in drum and oven.
130	BEAN TEMP 15DEGF ABOVE END TEMP AT LAST STAGE	Bean temperature is greater than the Recipe End Temperature during the last stage.	Roaster E-Quench. Roaster Burner OFF & Drum discharge inhibited	Fire hazard: Exothermic heat out of control or end temperature reduced accidentally while roasting.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
131	BEAN TEMPERATURE HIGH LIMIT FLT > 500°F	TE119 - When coffee is in the roaster at any time	Roaster E-Quench. Roaster Burner OFF & Drum discharge inhibited	Broken thermocouple or burning material in roasting drum.
*132	ROASTER AROMA PIPE TEMPERATURE SOFTWARE HIGH PRE-ALARM (650°F)	TE117	Advisory only	Possible burning material in aroma duct ahead of the thermocouple. Disabled for thermal clean.
133	ROASTER AROMA PIPE TEMPERATURE WATLOW HIGH LIMIT FLT (700°F)	TSSH117	Roaster E-Quench if Coffee in Roaster. Roaster burner OFF & Inhibited	Broken thermocouple or burning material in aroma duct ahead of the thermocouple.
134	COOLER HIGH TEMPERATURE FAULT (350°F)	TE130	Cooler E-Quench, Drum Inhibit, Destoning Inhibit, Fresh Air Fan stopped, Roaster Burner OFF	Broken thermocouple or burning material in Cooler tray.
135	ROASTER CYCLONE HIGH TEMPERATURE FAULT (500°F)	TE201	Roaster Burner OFF, Drum Inhibit, Roaster Cylone E-Quench	Broken thermocouple or burning material in cyclone.
136	THERMAL CLEANING ROASTER AIR/OVEN HIGH TEMPERATURE FAULT (1000°F)	TE118	Roaster Burner OFF & Thermal Clean off and not complete.	Broken thermocouple or burning material in oven.
137	SPARE			
138	CUMULATIVE ROASTING TIME >80 HOURS – THERMAL CLEANING REQUIRED	Repeat alarm each time Charge Hopper Discharge Gate opened.	Advisory alarm only.	Perform thermal cleaning when next convenient.
139	SPARE			
140	SPARE			
141	BURNER OVEN THERMOCOUPLE CIRCUIT	TE118	N/A	Broken thermocouple or disconnected wire.
142	SPARE			
143	SPARE			
144	BEAN TEMPERATURE THERMOCOUPLE CIRCUIT FAULT	TE119	Roaster E-Quench engaged.	Broken thermocouple or disconnected wire.
145	AROMA PIPE THERMOCOUPLE CIRCUIT	TE117	Roaster E-Quench engaged.	Broken thermocouple or disconnected wire.
146	COOLER HOOD THERMOCOUPLE CIRCUIT	TE130	Cooler E-Quench engaged.	Broken thermocouple or disconnected wire.
147	ROASTER CYCLONE THERMOCOUPLE CIRCUIT FAULT	TE201	Roaster Cyclone E-Quench engaged.	Broken thermocouple or disconnected wire.
148	AFTERBURNER OUTLET THERMOCOUPLE CIRCUIT	TE252	Afterburner E-Quench engaged.	Broken thermocouple or disconnected wire.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
149	AFTERBURNER INLET THERMOCOUPLE CIRCUIT FAULT	TE251	Afterburner E-Quench engaged.	Broken thermocouple.
150	AFTERBURNER INLET TEMPERATURE HIGH SOFTWARE FAULT (1100°F)	TE251	Afterburner E-Quench engaged.	Fire Hazard; Check for fires in system or gas valve linkage failure.
151	AFTERBURNER OUTLET TEMPERATURE HIGH SOFTWARE FAULT (1200°F)	TE252	Afterburner E-Quench engaged.	Smoke quantity exceeds catalyst capacity; reduce quench flowrate; reduce batch size; lighten coffee color
152	SPARE			
153	SPARE			
154	SPARE			
155	SPARE			
156	ROASTER DRUM VFD FAULT	SC100	Roaster burner OFF. Roaster drum motor OFF	Check drum motor and mechanical linkage. Replace VFD.
157	SPARE			
158	SPARE			
159	SPARE			
160	ROASTER DRUM MOTOR OVERLOAD FAULT	MTR100	Roaster burner OFF. Roaster drum motor OFF	Check drum motor and mechanical linkage. Check setting on overload.
161	SPARE			
162	SPARE			
*163	COOLING TRAY STIRRER MOTOR OVERLOAD FAULT	MTR130	Stirrer motor OFF Inhibit further Charging	Check cooler stirrer motor and mechanical linkage. Check setting on overload.
164	ROASTER FAN VFD FAULT	SC220	Roaster burner OFF. Roaster fan motor OFF	Check fan motor and mechanical linkage. Replace VFD.
165	ROASTER FAN MOTOR OVERLOAD FAULT	MTR220	Roaster burner OFF. Roaster fan motor OFF	Check fan motor and mechanical linkage. Check setting on overload.
166	ROASTER COMBUSTION FAN MOTOR OVERLOAD FAULT	MTR210	Roaster burner OFF	Check fan motor and mechanical linkage.
*167	COOLER FRESH AIR FAN MOTOR OVERLOAD FAULT	MTR228	Inhibit further Charging	Check fan motor and mechanical linkage.
168	COOLER/DESTONER FAN MOTOR OVERLOAD FAULT	MTR150	Inhibit Charging	Check fan motor and mechanical linkage.
*169	ROASTER CYCLONE AIRLOCK MOTOR OVERLOAD FAULT	MTR240	Inhibit Charging	Check airlock motor and mechanical linkage.
*170	COOLER CYCLONE AIRLOCK MOTOR OVERLOAD FAULT	MTR140	Advisory alarm only.	Check airlock motor and mechanical linkage.
171	SPARE			

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
172	SPARE			
173	AFTERBURNER COMBUSTION FAN MOTOR OVERLOAD FAULT	MTR230	Afterburner burner OFF	Check fan motor and mechanical linkage.
174	SPARE			
175	SPARE			
176	ROASTER DRUM ROTATION FAULT	SSL100	Roaster burner OFF.	Check drum and mechanical linkage and replace sensor.
177	SPARE			
178	SPARE			
179	SPARE			
180	SPARE			
181	ROASTER FAN ROTATION FAULT	Not used		
182	SPARE			
183	SPARE			
184	SPARE			
185	ROASTER CYCLONE AIRLOCK ROTATION FAULT	SSL240	Inhibit Charging	Check airlock linkage and replace sensor.
186	COOLER CYCLONE AIRLOCK ROTATION FAULT	SSL140	Inhibit Charging	Check airlock linkage and replace sensor.
187	SPARE			
188	SPARE			
189	SPARE			
190	SPARE			
191	SPARE			
192	FEED HOPPER DISCHARGE GATE NOT CLOSED FAULT	ZSC114	Inhibit Charging	Cycle gate to dislodge beans; clean gate slide and linkage; adjust limit switches.
193	FEED HOPPER DISCHARGE GATE NOT OPEN FAULT	ZSO114	Inhibit Charging.	Cycle gate to dislodge beans; clean gate slide and linkage; adjust limit switches.
194	ROASTER DOOR NOT CLOSED FAULT	ZSC113	Inhibit Charging	Cycle door to dislodge beans; clean door mechanism and linkage; adjust limit switches.
195	ROASTER DOOR NOT OPEN FAULT	ZSO113	Inhibit Charging	Cycle door to dislodge beans; clean door mechanism and linkage; adjust limit switches.
196	COOLING TRAY DISCHARGE GATE NOT CLOSED FAULT	ZSC131	Inhibit Charging.	Cycle gate to dislodge beans; clean gate mechanism and linkage; adjust limit switches.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
197	COOLING TRAY DISCHARGE GATE NOT OPEN FAULT	ZSO131	Inhibit Charging.	Cycle gate to dislodge beans; clean gate mechanism and linkage; adjust limit switches.
198	SPARE			
199	SPARE			
200	SPARE			
201	SPARE			
202	DESTONER HOPPER DISCHARGE GATE NOT CLOSED FAULT	ZSC132	Inhibit Charging & Destoning.	Cycle gate to dislodge beans; clean gate mechanism and linkage; adjust limit switches.
203	DESTONER HOPPER DISCHARGE GATE NOT OPEN FAULT	ZSO132	Inhibit Charging & Destoning.	Cycle gate to dislodge beans; clean gate mechanism and linkage; adjust limit switches.
204	DRUM LIFTER NOT UP FAULT	not used	Cylinder Motor OFF	Cycle lifter to dislodge debris; clean lifter mechanism and linkage; adjust limit switches.
205	DRUM LIFTER NOT DOWN FAULT	ZSC119	Cylinder Motor OFF	Cycle lifter to dislodge debris; clean lifter mechanism and linkage; adjust limit switches.
206	SMOKE DAMPER P110 NOT CLOSED FAULT	ZSC110	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
207	SMOKE DAMPER P110 NOT OPEN FAULT	ZSC110	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
208	AROMA DAMPER P116 NOT CLOSED FAULT	ZSC116	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
209	AROMA DAMPER P116 NOT OPEN FAULT	ZS0116	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
210	SPARE			
211	SPARE			
212	SPARE			
213	SPARE			
214	SPARE			
215				
216	FRESH AIR DAMPER P120 NOT CLOSED FAULT	ZSC120	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
217	FRESH AIR DAMPER P120 NOT OPEN FAULT	ZSO120	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
218	SPARE			
219	SPARE			
220	SPARE			
221	SPARE			
222	COOLING DAMPER P223 NOT CLOSED FAULT	ZSC223	Subsequent Charging, Cooling and Destoning inhibited.	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
223	COOLING DAMPER P223 NOT OPEN FAULT	ZSO223	Subsequent Charging, Cooling and Destoning inhibited.	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
224	COOLER FRESH AIR DAMPER P228 NOT CLOSED FAULT	ZSC228	Subsequent Charging, Cooling and Destoning inhibited.	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
225	COOLER FRESH AIR DAMPER P228 NOT OPEN FAULT	ZSO228	Subsequent Charging, Cooling and Destoning inhibited.	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
226	RECIRCULATION DAMPER P129 NOT CLOSED FAULT	ZSC129	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
227	RECIRCULATION DAMPER P129 NOT OPEN FAULT	ZSO129	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
228	SPARE			
229	SPARE			
230	SPARE			
231	SPARE			
232	SPARE			
233	SPARE			
234	DESTONING DAMPER P439 NOT CLOSED FAULT	ZSC439	Inhibit charging	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
235	DESTONING DAMPER P439 NOT OPEN FAULT	ZSO439	Inhibit charging	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
236	DESTONING HOPPER NOT EMPTY FAULT	LSL132 - Destoning Hopper low level sensor triggered too long after discharge is opened	Advisory alarm only.	Discharge gate blocked or sensor sensitivity adjustment needed.
237	DESTONING HOPPER HIGH LEVEL FAULT	LSH132	Advisory alarm only.	Destoner overfilled or sensor sensitivity adjustment needed.

No.	Alarm Message	Possible Cause	Roaster Action	Troubleshoot/Op Action
238	ROASTED COFFEE TRANSPORT INTERLOCK NOT RECEIVED FAULT	Destoning hopper low level present and Prodn System signal to discharge destoner hopper not received by mid-roast batch time.	Advisory alarm only	Reminder to clear the destoner hopper to avoid holdup of consecutive batches.
239	SPARE			
240	ROASTER EXHAUST DAMPER MR545 NOT CLOSED FAULT	ZSC545	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
241	ROASTER EXHAUST DAMPER MR545 NOT OPEN FAULT	ZSO545	Roaster burner OFF	Cycle damper to dislodge debris; clean damper mechanism and linkage; adjust limit switches.
242	CO MONITOR PURGE BLOWER VACUUM HIGH		Advisory Alarm only	
243	CO MONITOR SYSTEM ERROR		Advisory Alarm only	
244	CO MONITOR LEVEL HIGH (18K ppm)		Advisory Alarm only	
245	CO MONITOR LEVEL HIGH (30K ppm)		Roaster burner OFF. Roaster E-Quench engaged	
246	SPARE			
247	ROASTER EXHAUST DAMPER MR545 NOT IN POSITION FAULT	FCV545 - Feedback position error between commanded position	Roaster burner OFF & inhibited	Cycle damper to dislodge debris; clean damper mechanism & linkage; calibrate positioner feedback
248	SPARE			
249	SPARE			
250	SPARE			
251	SPARE			
252	SPARE			
253	SPARE			
254	RECIRCULATION DAMPER P129 NOT IN POSITION FAULT	FCV129 - Feedback position error between commanded position	Roaster burner OFF & inhibited	Cycle damper to dislodge debris; clean damper mechanism and linkage; calibrate positioner feedback.
255	SPARE			