KSI CONVEYORS, INC.
KSi Automation

KSi AutoTreat V4.0
System User's Manual
Do not attempt to operate or maintain this panel(s) until you have read and thoroughly understand all of the safety information contained in this manual. All such information must be taken seriously. This panel contains high voltage which can cause serious injury or death. If you do not understand any part of this manual, seek assistance from your supervisor or call KSi Conveyors, Inc. before operating this equipment.
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1 - Introduction

Document Scope and purpose, and general responsibilities.

Thank you for choosing KSi Conveyors, Inc. for your automation needs. We appreciate your business and will work diligently to ensure that you are satisfied with your choice.

Document Scope & Purpose

This document describes the logic and control functions provided by the control software. It includes sequence of operations for the PLC. It does not cover any equipment controlled by the panel. Safety and other necessary information should be included in the documentation for those specific components.

This manual is not intended to provide instruction on specific applications of the equipment nor on the safety practices common to your industry.

Owner Responsibilities

As the purchaser/owner/integrator of this equipment and control system, you have an obligation to design, install, operate and maintain the equipment in a manner that minimizes the exposure of people in your care to any potential hazards inherent in using this control system and associated equipment. This control panel(s) is a component of a process stream. It works together with other components to form a complete system. It cannot operate as a standalone component. Therefore it is critical that the owner of this equipment and control system:

- Has a clear and documented understanding of the process this panel is being used in, and of any resulting hazards or special requirements arising from this specific application.
- Allow only properly trained and instructed personnel to install, operate or service this equipment.
- Maintain a comprehensive safety program involving all who work with this panel(s) and other associated process equipment.
Establish clear areas of staff responsibility (e.g. operation, setup, sanitation, maintenance and repairs).

Perform an electrical hazard analysis to determine the Incident Energy Exposure to select the level of personal protection equipment and to determine the Flash Boundary. Refer to NFPA 70E for further information.

Provide all personnel with the necessary safety equipment.

Periodically inspect the equipment to insure that the doors, covers, guards and safety devices are in place and functioning, that all safety instructions and warning labels are intact and legible and that the equipment is in good working order.

In addition to the operating instructions, observe and enforce all applicable legal and other binding regulations, national and local codes.

Install the panel(s) in the process stream in accordance with the guidelines outlined in the chapter titled “Installation”.
Operator Responsibilities

As the person with the most to gain or lose from working safely, it is important that you work responsibly and stay alert. By following a few simple rules, you can prevent an accident that could injure or kill you or a co-worker.

- Disconnect, lockout and tagout electrical and all other energy sources before inspecting, cleaning, servicing, repairing or performing any other activity that exposes you to an electrical hazard.

- Do not operate, clean or service this panel until you have read and understood the contents of this manual. If you do not understand the information in this manual, bring it to the attention of your supervisor or call KSi Conveyors, Inc. for assistance.

- Understand and follow the safety practices required by your employer and this manual.

- Do not attempt to perform electrical work if you are not an electrically qualified worker. Know your limitations and do not attempt to perform electrical work beyond what you are capable of doing safely.

- Wear the appropriate personal protection equipment and use the appropriate tools for the electrical work to be performed.

- **PAY ATTENTION** to what you and other personnel are doing and to how these activities may affect your safety.

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**WARNING**

Failure to follow these instructions may result in serious personal injury or death.
Receiving Your Equipment

As soon as the panel is received, it should be carefully inspected to make certain the unit sustained no damage during shipment and that all items listed on the packing list are accounted for. All damage or shortages should be noted on the Bill of Lading. The purchaser must take immediate steps to file reports and damage claims with the carrier. All damages incurred during transit are the responsibility of the common carrier if the equipment was shipped FOB. Ownership passes to purchaser when the unit is loaded and accepted by carrier. By law, any claims for in-transit damage or shortage must be brought against the carrier by the purchaser.

Handling and Storage of Your Equipment

If the panel is not going to be installed soon after arrival, it should be stored in a dry location to protect against rust and corrosion. The panel is shipped from the factory mounted in a heavy shipping crate to prevent foreign materials and moisture from contaminating the panel during shipping. It is recommended that the panel remain in the crate until just prior to installation. Transport the panel from the unloading site to the installation or storage site by using a forklift or hand-truck. The panel should be picked up by the crate, not by the panel itself.
2 - Safety Information

Alerts, symbols, warnings and cautions for safe operation of the equipment.

Every year, accidents in the work place injure, maim and kill people. Some of these accidents involve electrical shock or arc flash. Although it may be impossible to prevent all accidents, those involving electrocution are completely preventable with the right combination of training, operating practices, safety devices and operator vigilance. The purpose of this section is to help educate panel users about potential hazards, unsafe practices and recommend hazard avoidance techniques.

Signal Words and Symbols

It is very important that operators and maintenance personnel understand the words and symbols that are used to communicate safety information. Signal words, their meaning and format have been standardized for U.S. manufacturers and published by ANSI. The European Community (E.C.) has adopted a different format based on the International Standards Organization (I.S.O.) and applicable machinery directives. Both formats are presented below.
Graphic symbols are not standardized, but most manufacturers will use some variation of the ones seen in this manual.

- **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

- **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

- **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury and/or property damage.

- **SAFETY INSTRUCTIONS** provides additional information that the operator needs to be aware of to avoid a potentially hazardous situation.

**Mandatory Lockout Power Symbol.** Disconnect, lockout and tagout electrical and all other energy sources before inspecting, cleaning or performing maintenance on this panel.

**International Safety Alert Symbol.** The exclamation point (!) surrounded by a yellow triangle indicates that an injury hazard exists. However, it does not indicate the seriousness of the potential injury. An exclamation point (!) is used with the DANGER, WARNING and CAUTION warnings. When used in conjunction with these symbols the potential injury is indicated.

**Electrocution Hazard Symbol.** This symbol indicates that an electrocution hazard exists. Serious injury or death could result from contacting high voltage.

**Electrocution Hazard Symbol.** (ISO format) This symbol indicates that an electrocution hazard exists. Serious injury or death could result from contacting high voltage points.
Mandatory Lockout Tagout Action Symbol (I.S.O. format). This symbol instructs the operator to disconnect, lockout and tagout all electrical power and other energy sources before inspecting, servicing or cleaning a panel.

Mandatory Read Manual Action Symbol (I.S.O. format). This symbol instructs personnel to read the Operator Manual before servicing or operating this panel.

Mandatory Read Manual Action Symbol. This symbol instructs personnel to read the Operators Manual before servicing or operating this panel.

This symbol indicates that an important maintenance or installation detail is being described. Special notice should be taken to heed the instructions to prevent damage to the equipment.

This symbol indicates that there is an arc flash explosion danger. Arc flash explosions can release tremendous amounts of energy instantaneously. This can propel debris, vaporized metal and extremely hot gases at very high velocities. Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.
This symbol indicates that appropriate personal protection equipment and clothing are required before inspecting, servicing or cleaning the control panel. Employees must wear and be trained in the use of appropriate protective equipment for possible electrical hazards they may face. Examples of protective equipment could include a hard hat, face shield, flame resistant neck protection, ear protectors, Nomex™ suit, insulated rubber gloves with leather protectors, and insulated leather footwear. All protective equipment must meet the requirements as shown in the latest edition of NFPA 70E. Protective equipment, sufficient for protection against the potential electrical flash, is required for every part of the body. The selection of the required thermal rated PPE depends on the incident energy level at the point of work.

This symbol indicates that only qualified personnel should inspect or service this panel and the connected electrical components. A qualified worker is someone who has the skill, knowledge, and ability to safely perform the work to which they are assigned.
Warning Signs

Warning signs are placed on the panel(s) to serve as reminders to anyone who is working on or near the panel that they must be careful and exercise proper care to avoid serious personal injuries, death or equipment damage. The warning signs that are commonly found on the control panels are described below. These signs should be inspected periodically by the Owner to make sure that all of the warning signs are in place and legible. If any of the warning signs are damaged or become illegible, please contact KSi Conveyors, Inc. for replacement signs.

Arc Flash Sign

This sign is designed to remind personnel working on or near this control panel of the electrical shock and arc flash explosion hazards. It also indicates key hazard avoidance techniques as well as ways to reduce the severity of potential injuries through the use of proper personal protection equipment.
Multiple Power Sources

This sign indicates that the panel may be powered from more than one source. All sources of power must be properly locked out and tagged out before the panel is fully de-energized.

UPS Voltage Sign

This sign indicates that there is an uninterruptible power supply in the panel (UPS) that will continue to provide a power source even if the primary power source to the panel is disconnected. The UPS must be properly locked out and tagged out before the panel is fully de-energized.
Incoming Power Hazard

This sign informs the electrical worker that the incoming power to the panel remains energized even when the main disconnect is in the “ON or “OFF” position. It will remain energized until the panel power source is de-energized and properly locked out.

Panel Clearance Sign

This sign informs the owner that there is an OSHA and NEC requirement that space in front of the panel be kept clear for a minimum of 36 inches. The owner should consult these standards for additional information and guidance regarding this requirement.
Terms

Unless expressly stated elsewhere, the following terms shall have the meanings indicated below.

Alternate Method – A deviation from established procedures or policy that includes compensatory measures that assure equivalent objectives can be achieved by establishing and maintaining effective safety.

Approved – The result of a process implemented by qualified electrical workers or qualified supervisor that control measures effectively mitigate the electrical hazards associated with a task.

Approved Equipment – (1) listed equipment, or (2) unlisted equipment that is acceptable to the qualified workers who designed or will use the equipment and that is approved by Owner.

Authorized Work – Electrical work that a supervisor has permitted the qualified electrical worker(s) to perform based on an approved safe work procedure and appropriate work practices.

Barrier – A physical obstruction that is intended to prevent contact with exposed energized electrical conductors or circuit parts. Barriers can be temporary or permanent.

Clarify – To make codes, standards, and regulations understandable and free from confusion through an oral or written process.

Compelling Reason – The reason for authorizing workers to perform work on or near hazardous energized electrical circuit parts. The reasons include two types:

• Increased or additional hazards of de-energizing critical systems; and
• Unfeasible due to equipment design or operational limitations (e.g., testing of electric circuits that can only be performed with the circuit energized).

Conductive – Any material suitable for carrying electric current.

Contract Personnel/Worker – Individuals whose services are obtained from subcontractors and who are supervised by the Owner’s employees. Contract personnel are not employees of the Owner.

Critical Systems – Any system which would result in increased or additional hazards if de-energized, e.g., life support equipment, emergency alarm systems, hazardous location ventilation equipment, area lighting.

De-Energized – Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth. A state in which the conductor or circuit part to be worked on or near has been disconnected from energized parts, locked out and tagged out in accordance with established standards, tested/verified to ensure the absence of voltage, and grounded if determined necessary.

Electrical Hazard – A dangerous condition such that inadvertent or unintentional contact or equipment failure can result in shock, arc flash-burn, thermal burn, or blast.

Electrical Safety – Recognizing hazards associated with the use of electrical energy and taking precautions so that hazards do not cause injury or death.

Electrical One-Line Diagram – A record of all power sources to electrical equipment.

Electrical Work—(1) working on or near energized electrical parts; (2) servicing or
maintenance of potentially hazardous electrical equipment.

**Electrically Qualified Worker** – A worker who has successfully passed a formal electrical training program and has been determined by his/her supervisor to have the skill, knowledge, and abilities to safely perform the work to which he/she is assigned.

**Energized** – Electrically connected to a source of potential difference, or electrically charged to have a potential significantly different from that of earth in the vicinity. NOTE: “De-energized” parts that have not been verified and locked out and tagged out in accordance with established standards are considered energized.

**Flash Hazard** – A dangerous condition associated with the release of energy caused by an arc that suddenly and violently changes material(s) into a vapor.

**Hazardous Electrical Work** – All electrical operations in which workers may be exposed to an electrical hazard.

**Insulated** – Separated from other conducting surfaces by a dielectric (including airspace) offering a high resistance to the passage of current.

**Listed Equipment** – Equipment that meets nationally recognized standards. All listed equipment is approved for use consistent with the manufacturer’s instructions.

**Live Parts** – Electric conductors, busses, terminals, or components that are uninsulated or exposed and a shock hazard exists.

**Safety Watch** – A safety watch is a more stringent hazard control measure than the two-person rule and shall be implemented when there are grave consequences from a failure to follow safe-work procedures. The safety watch shall be a qualified electrical worker who must be responsible for monitoring qualified worker(s) performing high-hazard electrical work.

**Shock Hazard** – A dangerous condition associated with the release of energy caused by contact or approach to exposed electrical conductors or circuit parts nearer than the minimum air insulation distance.

**Standard Operating Procedure (SOP)** – A document which records the review of an operation to (1) identify the equipment, hazards, and operating limits that are present in the operation; (2) develop control measures that eliminate unacceptable risks; and (3) describe how an operation is to be safely performed.

**Subcontractors** – A party entering into a subcontract with the Owner.

**Two-Person Rule** – The requirement for two qualified electrical workers to be present in the workplace and to be aware of the other worker’s task while performing electrically hazardous work.

**Working Near** – Any activity inside the limited approach boundary or the flash protection boundary (see NFPA 70E) of exposed energized electrical conductors or circuit parts that are not put into an electrically safe work condition.
SAFETY

Working On – Coming in contact with exposed energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

100% Rule – Work on or near energized parts must be performed only after all participating qualified electrical workers are in 100% agreement on the work to be completed, on the sequence in which it should be performed, and that the hazards are fully controlled or mitigated.
Important Codes and Standards for Owners

There are many codes and standards that apply to the owner of this panel. These include both national and local standards and codes. It is the Owner's responsibility to identify and follow all applicable codes and standards. Listed below are several of the key national standards. This list is not a complete list of all applicable standards.

OSHA 1910.147

Control of this equipment must be in accordance with OSHA Standard 1910.147 "The control of hazardous energy (lockout-tagout)". This standard "requires employers to establish a program and utilize procedures for affixing appropriate lockout devices or tagout devices to energy isolating devices and to otherwise disable machines or equipment to prevent unexpected energizing, start-up or release of stored energy in order to prevent injury to employees". For further information on Lockout-Tagout requirements, see your company's Safety Director or refer to OSHA Standard 1910.147.

110.16 Flash Protection Field Marking

110.16 Flash Protection. Switchboards, panel boards, industrial control panels, and motor control centers in other than dwelling occupancies that are likely to require examination, adjustment, servicing or maintenance while energized, shall be field marked to warn qualified persons of potential electric arc flash hazards. The marking shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

FPN No. 1: NFPA 70E-2000, Electrical Safety Requirements for Employee Workplace, provides assistance in determining severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

FPN No. 2: ANSI Z535.4-2002, Product Safety Signs and Labels, provides guidelines for the design of safety signs and labels for application to products.
NFPA 79

NFPA 79 provides guidance for industrial control panels. The following Emergency Stop definitions come from this standard.

Emergency-Stop

Actuators of emergency stop devices shall be colored RED. The background immediately around the device actuator shall be colored YELLOW. The actuator of a push-button-operated device shall be of the palm or mushroom-head type.

Category-0 Stop

Where a Category 0 stop is used for the emergency stop function, it shall have only hardwired electromechanical components. In addition, its operation shall not depend on electronic logic (hardware or software) or the transmission of commands over a communications network or link.

Controlled Stop

The stopping of machine motion by reducing the electrical command signal to 0 once the stop signal has been recognized by the control but retaining power to the machine actuators during the stopping process. (IEC 204-1 and NFPA 79).
Hazard Review and Safety Instructions

**ARC FLASH HAZARD**

Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.

Arc flash accidents are most likely to occur during maintenance of the electrical system or when working on or near energized high voltage sources. This hazard does not exist when all electrical power sources have been disconnected, properly locked and tagged out. Serious injuries, burns or death could result from being in close proximity to or in the direct path of an arc flash explosion and the flying debris.

**ELECTROCUTION HAZARD**

Severe burns or death may result from contact with exposed high voltage sources.

Electrocution accidents are most likely to occur during maintenance of the electrical system or when working on or near energized high voltage sources. This hazard does not exist when the electrical power has been disconnected, properly locked and tagged out.

**AUTOMATIC START HAZARD**

Equipment controlled by this panel may start without warning, causing serious injury. STAY CLEAR.
Process equipment is usually controlled by an automated system and may start without warning. However, automatic startup by itself is not a hazard. Failure to properly disconnect, lockout and tagout all energy sources while inspecting, servicing or maintaining remotely controlled equipment creates a very hazardous situation. Serious personal injury may result. Always lockout and tagout all process equipment before inspecting, servicing or maintaining remotely controlled equipment.
3 – General Details

*General Description of the system Equipment and Operation.*

This control system is designed to automatically control a bulk seed site, both the transfer of seed through a legal for trade scale and accurately treating the seed based on recipe control, providing an information / transfer printout receipt when the job is complete.

**General Control Panel Description**

The system consists of one or more control panels as follows:

- **Main Panel** - This panel houses the PLC, I/O, motor control, main disconnect, power distribution, and control power transformer. In many cases there may be additional panels, which also have motor controls, main disconnect and power distribution. The same specification below will apply to all the panels that are part of the KSi Automation system.
General Panel Specifications

Some general specifications that apply to the above panel include:

1) NEMA 4 steel enclosure
2) Ground lug
3) Wire Color (From NFPA 79)
   a) **GREEN (with or without one or more YELLOW stripes)** – Shall be used to identify the equipment grounding conductor where insulated or covered.
   b) **BLACK** – Ungrounded line, load, and control conductors at line voltage.
   c) **RED** – Ungrounded ac control conductors, at less than line voltage.
   d) **BLUE** – Ungrounded dc control conductors.
   e) **YELLOW** – Ungrounded control circuit conductors that may remain energized when the main disconnecting means is in the OFF position. These conductors shall be YELLOW throughout the entire circuit, including wiring in the control panel and the external field wiring.
   f) **WHITE OR NATURAL GRAY** – Grounded circuit conductor.
   g) **BLUE WITH WHITE STRIPE** – Grounded (current-carrying) dc circuit conductors.
   h) **WHITE WITH YELLOW STRIPE** – Grounded (current-carrying) ac control circuit conductors that remain energized when the disconnecting means is in the OFF position. For additional circuits powered from different sources that remain energized when the main disconnecting means is in the OFF position, striping colors other than GREEN, YELLOW or BLUE shall be used for the unique identification of the grounded conductors.
4) Terminal Colors – Same as wire colors above.
5) Estop – A Category 0 Estop is used.
Summary of Terms

- **KSi AutoTreat** – KSi batching and treating controls fully integrated into one touch screen operator interface.
- **KSi AutoBatch** – KSi batching controls. (has all the same features as KSi AutoTreat less all the treater controls)
- **KSi VariRate** – Seed metering function that measures seed flow rate by looking at the declining weight from the scale and uses a variable opening gate on the scale discharge to adjust the flow rate to match the user input desired treating rate. It also matches the treatment flow to the seed flow rate on a continuous basis.
- **KSi MultiFlow** – KSi’s dual scale system that allows for continuous scaling and treating
- **Control** – Area of system that allows operator to interface with and “control” the system through the auto system control process
- **Data** – Area of system that allows the operator to add, view and edit data as it relates to customers, bins, recipes, orders and transactions as well as run certain reports
- **System** – Area of system that relates to the setup, configuration and calibration of the KSi Automation system
- **Support** – Area of system for the operator to view specific system support documents
- **Order** – A certain amount of a particular seed and a specified treatment recipe that you want to run for a particular customer.
- **Liquid Sources** – Any configuration of a liquid source that includes a pump and flow measuring device, such as a scale or flow meter
- **Recipes** – A recipe consists of at least one liquid source and a specific rate for each liquid source
- **Seed Cal Weight** – Quantity of seed (grams) contained in the Bayer/Gustafson seed calibration cylinder. KSi AutoTreat uses this number to determine how fast to turn the seed wheel to deliver the seed rate that has been asked for.
- **Discharge Shot Control** – The ability to discharge the scale hopper in "shots". Example, discharge a 5000 lb scale in two 2500 lb shots.
- **Auto-Discharge** – Sets the discharge conveyors, including the treater inlet and outlet conveyors, to turn on and off automatically based on when the process needs them to run.
General Icons

The **Home Icon** represents the Home page of the KSi AutoTreat system. Selecting this icon returns the system to the Home page. This icon is located on every page through the KSi AutoTreat system in the upper left hand corner.

The **Data Icon** represents the Data section of the KSi AutoTreat system. Navigate to this page to view, enter and edit data as well as run reports.

The **System Icon** represents the System Setup section of the KSi AutoTreat system. Navigate to this page to setup and calibrate specific equipment.

The **Support Icon** represents the Support section of the KSi AutoTreat System. Navigate to this page to view system supporting documents, such as manuals, electrical schematics, operator agreements, etc.

The **Control Icon** represents the Control section of the KSi AutoTreat system. Navigate to this page to control and monitor equipment. Orders can also be setup from this page.

The **Back Icon** represents a “page back” button. This icon will show up throughout the KSi AutoTreat system when it makes sense that the operator may want to navigate back one page.

The **Calculator Icon** represents a calculator and it will open up the Windows calculator application when selected. This icon is located on every page through the KSi AutoTreat system in the upper right hand corner.

**Save/Edit Icon** – Any changes made to a record need to be saved before leaving the page otherwise the changes will be lost.

**New Icon** – To create a new record, complete the form and press this icon.

**Delete Icon** – To delete the selected record, press this delete icon.
Detailed Control Panel Descriptions

More detailed outlines of the various controls used on this job are as follows:

**Main Panel**

This control panel houses the main controller, associated I/O, and motor control for this seed transfer system. The controller is an Automation Direct, P3000 and may include expansion modules. Motor starters / VFD’s are located in this panel and power supply requirements will be noted and labeled above the main disconnect. It uses a NEMA 4 enclosure and external components. Operator interface for this system is through a KSi supplied Windows 7, industrial, touch screen PC.

**Push Buttons**

ESTOP - Category 0 controls the power to the PLC outputs and motor starters. Control Power is maintained on the PLC CPU even when the ESTOP is engaged. Push the button to engage and pull the button to release. The button is not illuminated while depressed. There is an on screen alert to let the operator know when the ESTOP is engaged.
Starting KSi V4 Application

Open the V4 Application by double clicking the KSi V4 Controls Icon on the desktop or clicking the KSi logo on the Windows taskbar.

This will open up the KSi V4 Application to the Home Page, as shown to the right. The Home page has navigation options to the four main parts of the system. Refer to page 22 for details on the different pages.

When the system is first opened up, the Control page is locked out and cannot be accessed as shown to the right. In order to access the Control page, the operator must navigate to the Support page and enter the operator name and check the box to agree to the operating terms.

The picture to the right shows the support page. An applicator name “KSi” has been entered and the “I agree with the above statements” has also been checked. When this is done, the Controls page becomes unlocked.

While the Applicator Name field is required, the other two fields, Applicator License and Applicator Company are not required for operation. These will, however, be recorded with every transaction and printed on the transaction receipt.
4 – SYSTEM SETUP

Description and functionality of the System Page

The system section of the KSi AutoTreat is the area of the system that allows the specific KSi AutoTreat system to be setup, configured and calibrated. There are parts of this that are locked out to the operator and can only be accessed by a certified KSi technician. Setting up liquids/liquid sources, calibrating pumps and accessing applicator/treater settings are examples of what can be done from this area.
APPLICATORS / TREATERS

Applicators are setup and configured from the “APPLICATORS” selection. Each applicator, or treater, will have specific setup and control parameters depending on the site configuration and type and brand of the applicator/treater being controlled. In the image shown below, a KSi Applicator is being controlled and the system is setup and configured accordingly. These settings will be initially configured and setup by the KSi Controls Technician that performs the startup, but occasionally some of these settings need to be changed by the operator to maximize efficiency with the V4 AutoTreat System. Once you make any changes, make sure to press the save button before leaving the page.
Below is a description of each of the configuration options from the Applicator Setup Screen.

1) **Applicator Name** – Represents the name of the applicator that the system is controlling.

2) **Delay Off Hi** – In the case of using a seed wheel, this value represents how many seconds the system will wait to start the inlet conveyor once the surge hopper high level sensor signal goes away.

3) **PreStart** – This value is how many seconds the system will wait to discharge seed into the applicator once the system is ready to treat. Generally, this is at least a few seconds to give the drum some time to ramp up to full speed.

4) **Atomizer Speed** – Applicable only if using a KSi Applicator, this value is the percent speed that the atomizer will run during treating mode.

5) **Drum Auto** – This is the percent speed that the drum will run when treating.

6) **Drum Slow** – This is only applicable using a KSi Applicator. This value is the slow speed that the drum will run when first starting to treat. When first initiating the treating process, the drum will run at this speed for the seconds configured in (7). With a KSi Applicator this speed is generally set to 0 and the Drum Slow sec is set to 10 – 15 seconds.

7) **Drum Slow (sec)** – This is how many seconds the drum will run at the speed set in (6).

8) **Monitor Delay** – This is how many seconds the system will wait, once the treating process starts, to begin monitoring the liquid accuracy. Typically, this is set between 20-35 seconds.

9) **Liquid Off Delay** – This value is how many seconds the liquids will continue to apply once the treating system is no longer receiving anymore seed.

10) **Shutdown (sec)** – This is how many seconds the system will run for the shutdown mode. The shutdown mode starts as soon as seed is no longer being delivered into the applicator.

11) **Idle (sec)** – How many seconds the system will wait before switching from shutdown mode to cleanout mode. This is only used when controlling a treater that requires the drum to reverse direction in order to clean out.

12) **Cleanout (sec)** – After the Shutdown (10) and Idle (11) time, this is how many seconds the drum will continue to run to clean.

13) **Air Purge (sec)** – This is only applicable if the applicator has an air purge entry into the atomizing section of the applicator.

14) **Loadout Delay** – This is how many seconds the loadout conveyor will continue to run once the cleanout process of the drum is complete.

15) **Drum Run Forward** – Check this box if the drum should run forward during the treating cycle. Uncheck if the drum should run reverse during the treating cycle.

16) **Drum End Forward** – Check this box if the drum should run forward during the cleanout cycle. Uncheck if the drum should run reverse during the treating cycle.

17) **VariRate** – Check this box if KSi VariRate is being used as the seed metering device.

18) **VariRate Conveyor** – Check this box if a conveyor is being used between the VariRate scale and the Applicator.
In addition to the settings on the previous page, there are also settings related to the VariRate gate, VariRate Conveyor and Seed Wheel. Depending on the configuration and the equipment at the site, these settings may or may not be used with the Applicator. If not being used, “N/A” should be selected from the drop down box. In the image below, the system is setup with VariRate, but does not have a VariRate conveyor as the scale is stacked directly over top of the applicator. To configure the settings for any of these 3 sections, click the database icon to the left of the drop down box.

**VariRate:**
- **Initial Boost (%)** – Percentage that the VariRate gate boosts open as soon as the treating process starts.
- At reaching the desired **Empty Weight (lbs)** the VariRate gate will open 100% to fully empty the scale hopper.
- In a multiflow setting at reaching the **Crossover Weight (lbs)** the open scale gate closes to start discharging the second scale. By doing so a continuous even flow of seed to the treater is accomplished.

**VRConveyor:**
- **Pre Treat** – How many seconds the system will start treating before the travel time is up.
- **Travel** – How many seconds the seed takes to travel between the VariRate gate and the Applicator.
- **Post Treat** – How many seconds the system will continue to treat after the travel time.

**Seed Wheel:**
- **SW Off Delay** – How many seconds the seed wheel will run once the low level sensor does not see seed anymore.
- **Global Cal Factor** – A global cal factor that affects all seed sources ran through the system.
- **Adjust By (%)** – At the end of each run the cal factor for the seed source drawn from may be adjusted by this factor.
LIQUID SOURCES

Liquid sources are setup and configured from the “LIQUID SOURCES” selection. Each liquid source will have specific configurations and setup / control parameters. Here new liquids are added to the system and set up by the operator. Each liquid source is tied to a specific liquid (Liquid Name), pump and either flow meter (FM) or Loss-In-Weight (LIW) liquid scale.

Select the liquid stand to view/edit from the table on the left and that record will populate the fields on the right. This record can now be edited and then saved.

The first section of the form, shown on the right, is general information related to the liquid source. This information should all be setup when the system is started up by a KSi Technician. However, there may be occasions when it is necessary to come to this part of the system and adjust the fault tolerances. The Fault Over and Under Tolerances are creating a window around the setpoint and the over TM and under TM are setting how many seconds the actual value can be outside of that tolerance window before the system shuts down and forces a pause.

The FM Cal Factor value will be automatically set when a calibration cycle is run for the particular liquid source.
Liquid Name Selection

The next section of the form is where the liquid that is going to be run through this liquid source is selected from a drop down box of liquids that have been entered in the system.

To add a new liquid to the system, select the database icon to the left of the drop down box. This opens up the Configure Liquid Lots window to add new liquids.

Configure Liquid Lots

Each liquid is defined by its Lot Number, which is entered in the upper text box to the right. Below that the liquid name is selected from the drop down box.

Important: Entering a unique lot number for each liquid is required even if the operator does not use this number. For best practice use incremental numbers for each liquid in this field.

If the desired liquid name is not in the drop down list, click the database icon to the left.

This opens up a new window where a new liquid name can be added. Use the 3 buttons to the right to overwrite an existing name, add a new row to the data table or delete the selected row.

Once the liquid lot is setup with a unique lot number and a liquid name, this can then be selected from the liquid name drop down box in the liquid source setup form.
The Pump, Flow Meter and Scale selection on this form will be setup by the KSi technician when performing the startup. If using a flow meter, the scale should be set to N/A and when using a Scale to monitor liquid flow the flow meter should be set to N/A.
TRANSFERS

This section can only be accessed by a certified KSi Controls Technician.
SCALES

Scales are setup and configured from the “SCALES” selection. The system will be setup with the correct scale to match the specific site by the KSi technician. However, it may be necessary to access the Scale Config section to adjust the scale and timer settings.

To open the Config Scale page, select the database icon to the left of the config drop down box. From this page, you can change settings related to the scale.

The **Batch Size (lbs)** is used by the system to determine the max draft size of an order. The batch size must not exceed the capacity rating of the scale or hopper. If an order is entered for more weight than this batch size, the system will automatically create multiple drafts to complete the order.

The **Fill Alarm** is the time during which the scale is expected to fill. When the scale is not filled within this time a signal is given alerting the operator that it is taking longer to fill the scale than expected.

**Empty Weight (lbs)** – Once the scale weight goes below the empty weight setting, the system waits for the **Empty time (sec)** to pass. After that the scale is considered empty by the system.

**Dis Delay (sec)** – How many seconds the scale discharge conveyor will run after the scale is empty.
AUX SETUP

The KSi V4 AT system is capable of controlling up to two 120V auxiliary devices. To open the auxiliary setup timers, click the “AUX SETUP” button. This will open the Auxiliary Device Setup window.

![Auxiliary Device Setup Window](image)

Depending on the system layout these times are dependent either on the seed wheel operating or the VariRate gate being open. The first time resembles a time on delay, which means so many seconds after the seed wheel has started or the VariRate gate has opened the auxiliary device will start. The second time resembles a time off delay, which means so many seconds after the seed wheel has stopped or the VariRate gate has closed the auxiliary device will stop.
CALIBRATION

Liquid sources are calibrated from the “CALIBRATION” selection. When using a flow meter as the liquid metering device, it is recommended that the operator calibrate the flow meter twice a day and any time a new slurry or liquid is being used through the flow meter. This process should also be done if a mix tank is refilled or if the latch on the IP pump is loosened and reset, as this could alter the way the liquid flows through the pump. When using Loss-In-Weight, it is recommended that this process is run every time the liquid is changed, as this calibration process determines the density of the product when the liquid source is setup as Loss-In-Weight. To navigate through the different liquid sources, select the left and right, white arrows under the calibration process window.

From this page, the pump can be jogged by pressing and holding the “Jog” button. This will turn the pump on at the percent speed that is set to the left of the jog button. In the example above, if the jog button was to be pressed now, the pump would turn on at 50% speed until the jog button was released.
Running a Calibration Cycle

1. Set valves on liquid source and calibration tube to calibrate, and jog product to zero line on calibration tube. Drain product back to zero if product was jogged beyond the zero mark. (If using a cal tube squeegee, it is important to make sure that the squeegee is pulled all the way to the top of the cal tube)

2. Once the liquid is on the zero mark, set the run time for 180 sec and the percent speed slow enough so that it doesn’t overflow the calibration tube. Once the time and speed is set, press the “Start” button. This will begin pumping liquid into the cal tube at the set speed for the set time.

3. Once the start button is pressed, the start button will begin flashing green. Stay on this page until the calibration cycle is complete.

4. Once the cal cycle has completed, read the actual volume in the cal tube and enter that amount in the Tube XX oz. field and then press “Calculate”. Once calculate is pressed, a new Cal Factor will appear under the calculate button and the calibration process is complete.
BIN FILL CONTROL

Control for the bin fill conveyors is found by navigating to the Support page, and then selecting the Bin Fill button in the bottom left corner of the screen, beside the exit button.

The Bin Fill page will be configured to match the needs of the specific site. There is HOA control of each piece of bin fill equipment and there is also a main “Start” and “Stop” button. The start and stop button will control the bin fill equipment when they are in auto and will interlock the pieces of equipment together. There are 3 general configurations:

1) Standard Bin Fill, no overbin:

2) One Overbin:

3) Two Overbins:

When operating an overbin, select which bin the overbin plow should move to by selecting the bin number from the list for the appropriate overbin. Note that the overbin plow must be in auto in order for the plow to move to the selected bin automatically.
5 – DATA

Description and functionality of the Data Page

The data section of the KSi AutoTreat system is designed to allow the operator to view, create and edit data as it pertains to the KSi AutoTreat system. Within this area, there is access to Customers, Seed Sources, Recipes, Orders, Transactions and Reports. The information that shows up and what is editable will depend on what section is opened up. The layout of the data page shows that Customers, Seed Sources and Recipes make up an Order and completed Orders make up Transactions. Any information that is entered into the KSi AutoTreat system or orders ran through the KSi AutoTreat system will be accessible from this Data Page. It is recommended that no data is deleted from the system, but rather marked as in-active.
CUSTOMERS

Customers can be viewed, created and edited from the “CUSTOMERS” selection. When entering an order the customers selection will come from the “active” customers entered here.

This image shows the customers data page. The table on the left shows the entire list of customers and the form on the right shows the information for the customer that is selected and highlighted in blue on the left. To enter a new customer, type the information in the form to the right of the table and then select the “New Entry” icon. To make changes to a customer record, select the record from the table on the left, and then make any changes to the customer. Once the changes are done, press the “Save” button. (refer to page 22 for more details on the New, Save and Delete icons).

If there is a customer that is no longer active, check the “In-Active” box in the top right corner above the customer information and then save. This will remove this customer from the drop down selection boxes when selecting a customer for an order. Once an order has been created for a customer, that customer can no longer be deleted without first deleting the order. For this reason, it is recommended not to delete customers, but rather, to make them inactive.
SEED SOURCES

Seed sources can be viewed, created and edited from the “SEED SOURCES” selection. Seed sources include both bulk bins and seed boxes. When entering an order the seed source selection will come from the “active” seed sources entered here.

This image shows the seed sources data page. The table on the left shows the entire list of seed sources and the form on the right shows the information from the seed source that is selected and highlighted in blue on the left.

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Inventory</th>
<th>Capacity</th>
<th>Wheel Cal</th>
<th>Pre Act</th>
<th>Source Type</th>
<th>Amount Type</th>
<th>Min Order</th>
<th>WT Unit</th>
<th>CNT Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bin 01</td>
<td>1000000</td>
<td>1000000</td>
<td>1000000</td>
<td>1000000</td>
<td>1000000</td>
<td>Bin</td>
<td>Seed Count Unit</td>
<td>5</td>
<td>50</td>
<td>1400000</td>
</tr>
</tbody>
</table>

**Name** – This is the seed source name given to the specific seed source. This is the name that will show up when selecting a seed source for an order.

**Location** – Optional field that is for reference only.

**Inventory** – How many lb. or units (depending on the selection of the source type) of inventory are currently in this seed source. Every time an order is ran from the particular seed source, the scaled amount will be deducted from this inventory level.

**Capacity** – This is how many lb. or units (depending on the selection of the source type) of seed the selected seed source can hold. On the Control page, when viewing the seed source, a green background to the source will reflect how much seed is left in the seed source. An example of this is shown to the right.
Wheel Cal – When using a seed wheel, this value is required before you run the AutoTreat system. This allows the seed wheel to accurately calculate and control the rate of seed through the seed wheel on the treater. Use the gram scale and calibration beaker provided with the seed treater. Put the beaker on the scale and Zero the scale (we only want the weight of the seed included in this number, not the container also) then fill level full with a sample of seed from the tank (do not pack or force seed into the beaker). It is best to get this weight while you are filling your tanks and it is at that point when you have the best access to the seed. It is good practice to take a sample of seed from each semi and then average them together to get the best value for this field.

Wheel Cal Auto Adjust – When this is checked, the system will automatically compare the actual seed ran through the seed wheel and what the seed wheel thought it did and make an adjustment to the cal factor for the particular seed source.

Pre Act – The Preact value is established when the Preact, Dis Rate and Cleanout Time are set to 0 and an order is run. This value is the weight of seed on the conveyors between the tank gate and the scale while the scale is filling. This value lets the system know how much seed to anticipate in the system between the tank discharge gate and the scale. The system then knows how much sooner the tank gate must be closed so that when the system is cleaned out you receive the requested seed amount on the order.

Pre Act Auto Adjust – When this is selected the system will compare the target to the actual delivered amount at the end of every batch and make an adjustment to the Pre Act value to continually fine tune the accuracy of the system.

Dis Rate – This value is established when the Preact, Dis Rate and Cleanout Time are set to 0 and an order is run. This value lets the system know the rate at which seed discharges from the tank in lbs/sec. This value is used to determine how long the tank gate should remain open when a seed amount is requested that is less than the Preact amount. We always use weight based control (Preact) when possible because it is more accurate and repeatable. However, when the requested amount is less than the Preact the system automatically detects this and will run a “Fill by Time” cycle where the gate will remain open for a specified amount of time that is determined by this value.

Cleanout Time – This value is also established when the Preact, Dis Rate and Cleanout Time are set to 0 and an order is run. This is the amount of time (sec) that the system gives the conveyors to clean out after the tank gate shuts. This will vary from tank to tank (the farther the tank is from the scale the higher this value will be). Determining this value automatically ensures that your system is running as efficiently as possible without any dead time.

Seed Count – Enter seeds per lb as provided from the seed company’s delivery ticket. When a seed amount is entered using seed count units this number is required so the system can calculate the number of lbs required to fill an order of X Units.

Source Type – This will either be a bin or a box and this determines the graphic that will be displayed on the control page for the selected seed source.

Amount Type – This selection determines how orders will be ran from the selected bin. The three options are shown in the image to the right. What is selected here will determine how an order is set up when choosing qty of seed to deliver. Example, if Seed Count Unit is selected on the seed source, all orders run through this seed source will be created in units.
**Min Order** – This is the minimum order size that can be ordered from this seed source.

**Wt Unit** – This value is needed if the Amount Type for the seed source is set to Weight Unit. This will define in the system how many lbs are in a unit.

**CNT Unit** – This value is needed if the Amount Type for the seed source is set to Seed Count Unit or if recipes are created for treating oz/unit. This defines in the system how many seeds are in a unit for the specific seed source.

**Seed Lot** – The seed lot is an optional field but does allow for more detailed tracking of the specific seed that was run through the system. The seed lot is selected from a drop down box that is populated from the different seed lots entered in the system. To edit or add a new seed lot, select the database icon to the left of the drop down box. This will open up a popup window to configure seed lots. From here, new seed lots can be added or edited. Rather than deleting old seed lots, it is recommended that seed lots that are not currently being used are marked as “In-Active”. When a seed lot is marked inactive, it will not show up in the seed lot selection drop down box.

**Seed Variety** – The seed variety is very similar to the seed lot in that it is not required but it does give some additional tracking of the specific seed that was ran through the system. The seed variety is selected from the drop down box from varieties that have already been setup in the system. To edit or add a new seed variety, select the database icon to the left of the drop down box. From this page, new seed varieties can be added. Similar to the seed lot ID’s, rather than deleting seed varieties, check the unused varieties as “In-Active” so that they no longer are showing up in the seed variety selection drop down box.

The Seed Variety also can have the seed kind (Soybean, Wheat, Etc), Seed Brand and Seed Company tied to it as well. These fields are optional and do not need to be used.

The final two selections on this form are related to the configuration of the site and will be setup by KSI when the automation is setup.
RECIPES

Recipes can be viewed, created and edited from the “RECIPES” selection. When entering an order, the recipe selection will come from the “active” recipes entered here.

This image shows the recipes data page. The table on the left shows the entire list of recipe items and the form on the right shows the information from the recipe item that is selected. In this example, there are three different recipes entered, “No Treat”, “Gold Recipe” and “Gold+ Recipe”. By looking at the table on the left, you can see the rate and the source for each item related to the item. To search and view a specific recipe, type the recipe name in the search box below the table and press the search icon. When setting up an order, the recipe will be selected from a drop down box using the Recipe Name.

Each of the items can be edited by selecting the recipe item on the left, making the changes to the form and then pressing save.
Setting up a New Recipe

1) Select the database icon to the left of the Recipe Name drop down selection. This will open up a Liquid Recipe Config window where recipes can be setup and edited.

2) From this page, type in the name of the recipe in the top field and then a recipe description in the 2nd field if desired. Also, select if this recipe will need to turn on either of the two auxiliaries, and if so, check the appropriate aux. check box. The last field on this form is for a recipe comment, if that is desired. Once the recipe name is added and setup, this page can be closed.

3) The next step is to add a treating rate to each recipe item. Select the recipe from the recipe selection drop down box.

4) Select the liquid source for the first item in the recipe. When the liquid source is selected, the liquid name of the selected source will show up in gray text below the liquid source.

5) In the last field, enter the rate and then select the rate type.
   a. Mg per seed – used when applying treatment on a per seed basis. This will use the seeds/lb value on the seed source.
   b. Oz per cwt – used to apply treatment on a per weight basis. This is equivalent to oz/100.
   c. Oz per unit – used to apply treatment on a per seed count unit basis. This will use the seeds/lb value on the seed source.

6) Repeat steps 3-5 for every additional item that is being used within the new recipe being created.
ORDERS

Orders can either be created from the Orders data page or they can be setup from the Control page. This section shows how to create an order from the Data section of the system. Any order that is setup from here can be selected and ran from the control page at a later time.

This image shows the orders data page. In this example, there is one order created, Smith Farms_021914. As noted by the complete box not being checked on top of the order details on the right, this order has not been run. When setting up an order from here, complete this form and then press the “New Entry” icon. This will save the order and allows it to be run at any time from the Control page. Once an order has been run, it cannot be run again under the same order name. An order that is complete can be copied, but in order for it to be run again, the order name needs to be changed to a unique name and the Complete check box on top of the order form needs to be unchecked. With those changes, the new entry icon can be pressed and then that order can be run.

It is also important to note that the seed amount that is selected here needs to be entered so that it matches the seed source amount type. Example, if the amount type on the seed source is units, then the entry on the order form needs to be in units and vice versa.

For more information on how to setup an order and for more explanation on these fields, refer to page 58.
Transactions can be viewed from the “TRANSACTIONS” selection. This shows all the orders that have been completed through the system.

This image shows the transaction data page. The table on the left shows the entire list of transactions and the form on the right shows the information from the order that is selected and highlighted in blue on the left.

On this report, each treatment delivered is shown as a line item. It may appear that the same transaction is showing up multiple times but in reality, it is showing each treatment item for every transaction. To view details on the transaction, select the record from the table on the left and then the Transaction, Recipe Item, and Application rates and targets show up on the form to the right.
To view the order information and the seed information related to each transaction, select the database icon to the left of the Transaction drop down box. This opens up the transaction record which shows everything related to the transaction except for the treatment item details.
REPORTS

This page allows you to reprint a transaction receipt for past orders. This is also where the 8.5 x 11 printer option is enabled or disabled.

The above image shows the reports page. This page will list all of the transactions that have been run on the system. To print a transaction, select the transaction so it is highlighted blue and then press the print transaction icon. This will print the transaction to the default printer that is installed on the computer.

Under the print transaction icon there is Print Enable / Disable Toggle button. If this is enabled, a transaction receipt will be printed to the default printer installed on the computer every time an order is completed. If this option is disabled, a ticket will still print to the roll ticket printer automatically, but not to the computer printer. It is important to note that if orders will be run using shot control; this print option needs to be enabled. This is because the shot ticket prints to the computer printer and the shot is required to print between each shot.
6 – CONTROL

Description of the Control Area of the KSi AutoTreat system

The control section of the KSi AutoTreat system is the area of system that allows the operator to interface with and "control" the system through the auto system control process. From this page, the operator can run each device in hand or manual mode as well as create and run orders. On this page, the seed transfer equipment (conveyors, gates, legs, etc) are shown in zones. There are three of these zones represented by an arrow to show the transferring of seed from one area to the next.
**HOA / TRANSFER ZONES**

All of the transfer equipment can be found in one of the three zones shown on the control screen. The three zones are: Scale Fill Zone, Scale Discharge Zone and Applicator Discharge Zone.

The zones symbols are collapsed by default and will signal their condition to the operator by showing gray for off, green for running and red if any of the devices have faulted. The bar to the left of the triangle represents the air device/gate and if the gate is open, this bar will turn green. The large triangle represents the conveyors or transfer equipment and if any of the conveyors are running this triangle will turn green. If any of the equipment faults, this triangle will turn red. The tip of the triangle represents any bypass valve and/or bypass valve proof that would be in the specific zone. To open/close a zone, click on the triangle and it will open up. Once the zone is open, the equipment within the zone can be cycled through by clicking the left and right, white arrows under the equipment. The pictures below show the zone collapsed, and then also open.

These two pictures show the zone open and collapsed with the scale fill conveyor running. As the zone is cycled through with the arrows, each device has an Auto, Off, Forward and Reverse (if applicable). There is also a percent speed text box that will be used if the conveyor is being controlled by a VFD with speed reference (this is most common on applicator inlet and outlet conveyors).

If one of the devices in the zone faults, the arrow will flash red letting the operator know that one of the drives within that zone needs attention. The operator can then open up the zone, and cycle through the devices until the device is found that shows the red flashing bar under the device. This device will also show a “RESET” button. Once the reason for the fault has been found and the fault cleared (resetting the motor starter inside the panel, for example), press this “RESET” button to clear the fault.
**SEED SOURCE**

Each seed source that is setup and marked as active from the seed source setup page can be toggled through on the control page. There are three different levels of information that can be shown and these different states can be toggled through by clicking the seed source graphic. The images to the right show the different levels of details that can be shown or hidden depending on operator preference.

To cycle between seed sources, select the left and right, white arrows that are show below the variety. By default, the seed source that matches the current order will be shown.

It is important to note, that the seed source that is selected here, will determine which gate can be operated from the scale fill zone symbol. For example, to manually control the gate on bin 3, bin 3 needs to be selected from the seed source.

**SCALE**

Similar to the seed source, the scale can be toggled between three different levels of information depending on how much the operator wants to see. The images to the right show the different levels. The most common level of information is the middle one, as it shows the draft size of the current order in addition to the current weight of the scale and the rate of change in lb/min. In order to zero the scale, the scale symbol needs to be opened all the way up until the “ZERO” button is visible. The scale can only be zeroed if a job is not currently running and there is no motion on the scale. In order to zero the scale, press and hold this button for three sec.

To view NTEP information related to the scale, press the “i” icon to the top right of the scale. This will open up a pop up window that shows NTEP information related to the KSi AT V4 Application.

Additional NTEP information can be accessed by selecting the G-S.1 ID button in the top right corner of each page.
MULTIFLOW

The KSi MultiFlow scale system is designed to increase throughput capacity and efficiency by continually batching and treating seed for an order.

If the system is setup as a MultiFlow scaling system, the Control page will show dual scales as opposed to just a single scale hopper. Each of the 2 scales has the same three levels of information and these can be toggled through by clicking on the scale graphic. See the images below.

With the MultiFlow scaling system, the automation system will continuously batch multiple drafts without ever stopping the flow through the Applicator. The system will fill scale A and then switch over and fill scale B, while scale A is discharging. This cycle will continue until the last draft has been satisfied.

If either scale loses signal with the PLC the below error will flash across the top of the screen and the system will not continue until the signal is re-established. If this happens, make sure that the scale indicator is turned on inside the panel. It may be necessary to do a power cycle on the indicator to re-establish the connection.
APPLICATOR/TREATER

Much information is contained in the Applicator symbol. Similar to the previous symbols the different dropdowns of the Applicator symbol are made visible by pressing the graphic each time a change of the dropdown is desired. The following graphics show each stage of the Applicator dropdown symbol.

The 2nd image shows Off/Fwd/Rvs Control for the drum. In order to run the equipment on the applicator in hand, the details mode needs to be toggled until this view shows. Select the right and left arrows to cycle through the different devices on the Applicator/Treater (drum, atomizer, seed wheel, air purge). If one of these devices faults, this is where the fault needs to be reset.
LIQUID SOURCE

The liquid sources graphic can also be touched on to cycle between different levels of information that can be displayed.

The middle picture above shows the HOA control for the pumps. All the pumps that are configured for the specific site will show up here and can be cycled through by selecting the left and right arrows. If a pump motor faults, this is where the fault needs to be reset.

The picture on the right is showing a recipe that is setup and active in the system. All the recipes that are setup can be cycled through by pressing the left and right arrows.

The image to the right shows what the pump graphic looks like when the pump is running. As shown in the picture, the background of the pump graphic is green signaling that the pump is in operation.

If any of the liquid sources are set up using a scale and Loss-In-Weight to monitor the liquid flow the liquid source will appear with a scale readout above the liquid name as shown in the image to the right. If the system loses signal with the scale on the liquid stand, the scale display on the screen will flash “COMM FAULT” as well as a banner across the top of the screen showing “SCALE COMMUNICATION FAULT”. These errors will go away as soon as the PLC re-establishes connection with the scale indicator.
CONTROL BAR

Order – Press this icon to load or setup a new order.

Start – Once an order is loaded, press this icon to start the order. To end an order, press and hold this icon for 3 seconds while an order is running. This will end the scale filling cycle and let the process move to the scale discharge stage.

Print – Once the order is completed, pressing this icon will print a ticket to the office printer. This will only work if the print option is enabled from the Data/Reports page. A ticket will automatically print every time an order is completed, so pressing this button will print an additional copy.

Next – When running an order, press this icon to skip to the next part of the process.

Pause – When running an order, press this icon to pause the entire system. When the system is paused this button will flash yellow letting you know that it is paused. To un-pause, press this icon again.
SETTING UP AN ORDER

From the control page, an existing, non-completed order can be loaded, or a new order can be created. Pressing the Order icon opens an order wizard popup window, shown below.

**Loading an Order**

To load an existing order, that isn't complete, press the “Search” button. This opens up an order search window that lists all the incomplete orders. Once an order is completed it is removed from this list. From this window, search for the desired order by typing in the search box under the order list and press enter. Once the order is found, select the order in the table to highlight it blue and then press the load button in the bottom right hand corner. This loads the order into the control page and the order is ready to start.
Setting up a New Order

To setup a new order select the “New” button on the Order Wizard page. From this page, the operator can select a customer, seed source, and recipe and define the order details as shown below. When the order wizard is opened, the order shown is the previous order loaded.

Customer

To choose a customer for the order, select the customer from the customer table in the top left of this window. By default, the only customer showing will be the customer that was selected for the previous order, to show all active customers click on the search box under the Customer title. The customer list will show all active customers and this list can be scrolled through until the customer is found and then selected. Also, the desired customer can be searched by typing part of the customer name in the search box and pressing enter. Note that the entire customer name does not need to be typed in, when searching, any matching results will be shown in the list. The table can also be scrolled to the right to see more detailed customer information. The customer selected will appear below the table to show which customer is selected.
Seed Source

To select the seed source, click search field and the entire list of active seed sources will populate in this table. Find the desired seed source and select it. The source name and variety name of the selected seed source will show up below the table.

Recipe

The next step in setting up an order is to select the desired treatment recipe. To select the recipe, click on the search field and all the active recipes will show in this table. The recipes can be searched for by typing part of the desired recipe name in the search box and pressing enter. In the example in the bottom right picture, “a” was searched for and it brought up all the recipes that had “a” in the name. Select and highlight the desired recipe.
**Order Details**

The last part of the order is to define additional details related to the order. The image below shows this information.

**Order Name** – This needs to be a unique order name as no two orders can have the same name. If the operator does not care about what the order name is, this field can be left blank and when the order is created a random number will be generated as the unique order name. In case this field is not changed from the previous order, the system again will generate a unique number for the order name.

**Seed Amount** – This is the amount of seed that the system will deliver. How the amount type is setup on the seed source will determine how this quantity will be defined on the order. For example, if the seed source is setup as “Pound Unit” than lbs. need to be entered here, if the seed source is setup as “Seed Count Unit” than units need to be entered in this field. Once the order is loaded, this order size displays in the purple information box above the seed source and this will also show how the seed quantity is being ordered. This will help the operator to make sure the order isn’t set up for 15,000 units when the intention was to order 15,000 lb. The two images to the right show what this purple information box looks like. As shown, the order on the left will be for 100 seed count units and the order on the right will be for 100 lb.

**Treat Rate** – This is the lb/min rate at which the system will deliver the seed through the applicator/treater using either VariRate control or seed wheel control.

**Enable Treater** – This option needs to be checked if the order will be using KSi AutoTreat to apply treatment to the seed. If the system is AutoBatch only or if the system is bypassing the treater, this needs to be unchecked.

**Shot Control** – If the order needs to be delivered out of the scale in shots, as opposed to the entire scaled amount being delivered, this check box should be checked.

**Auto Loadout** – Check this box if the system should automatically control the scale discharge conveyors. Typically this box should be checked.

**Destination** – This is a drop down box, which is populated from pre-determined destinations. This will determine how the equipment after the scale will interlock together.

Once the order is setup, press the load order button in the bottom right hand corner of the order setup page.
**Modify an Order**

To modify the loaded order, select the “Order” icon and press the “Modify” button. This will open up the order setup page and anything on the order can be adjusted from there and then loaded.

**Repeat an Order**

Once an order is complete the order can be repeated by opening up the Order Wizard and selecting the “Repeat” button. This will open up the order information page populated with all the information from the previous order. From here, the order can be modified and loaded, or, if just the load button is pressed, the system will automatically assign a random number for the order name and load the exact same order into the system, ready to be run again.
RUNNING AN ORDER

1) Once an order has been loaded into the control page, the order is ready to be started. To start the order, press the Start icon on the control menu. As soon as the start button is pressed, notice that the first three icons become grayed out.

2) Once the start icon is pressed, the next step is to enable the seed source. No equipment will start until the seed source is enabled. There will be a small green arrow flashing to the left side of the “Enable” button above this seed source. Press this enable button to continue to the process and start delivering seed from the seed source to the scale.

3) Once the seed source is enabled, the enable button turns green and the equipment will begin to turn on to deliver seed to the scale. The image below shows how the system will look when filling the scale. Notice that the bar and arrow on the scale fill zone are green, this is indicating that the conveyors are running and the bin gate is open. On the scale graphic, there will also be text that reads, “FILL”. This identifies that the system is in the fill sequence of the order.

4) The system will fill the scale up to the target draft weight (This can be seen directly under the scale if the scale details are open to the middle option (see pg 51 on how to do this)). In the example shown above, the system is targeting 100 lb. The bin gate will close once the scale weight equals the draft size minus the Pre Act. Example, if the Pre Act is 5 lb. in this example, the bin gate will close as soon as the scale reaches 95 lb (the Pre Act is explained in more detail on page 41). Once the bin gate closes, the conveyors will continue to run for the set clean out time as defined on the seed source setup for the specific seed source the system is pulling from. Once the clean out time is complete the system will print the first part of the ticket printout on the Epson roll printer.

It is critical that the Epson printer is able to print this ticket. If it can’t print, due to being out of paper, being unplugged from the system or the power being turned off, the system will not continue. It is highly recommend that spare rolls of paper are kept on hand for this reason.
5) As soon as the cleanout time is done, the system will switch over to discharge mode. At this point, if treat is enabled for the particular order, the system will pause and wait for the operator to select the “Press to Continue Treating” button. This graphic is shown to the right. Notice also that the text on the scale switched to now read “DISCHARGE”. This lets the operator know that the system is in discharge mode. If treat is not enabled on the order setup, this continue button will not pop up and the system will continue directly into discharge mode and transfer seed out of the scale.

6) At this point the operator should verify that the liquid sources are setup correctly to deliver treatment to the atomizing head of the applicator, as well as make sure all the treatment lines are primed. Once everything is confirmed to start treating, press this continue button.

7) Once this button is pushed the equipment will start up to begin treating. As shown in the image to the right, the drum has started up and the applicator load out conveyor has started up as well. As soon as the drum and startup time has been reached (see Applicator/Treater setup on pg. 27), the system will begin to deliver seed into the applicator and the pumps will turn on to begin treating seed.

On the image below, the operator can see what equipment is on and running by the green indicators. In this job shown, the scale gate is open, the applicator drum and atomizer are running, the liquid sources are pumping treatment and the applicator discharge conveyor is running.
8) Once the scale has returned to zero lb. (in the case of VariRate) or the low level sensor no longer senses seed (in the case of a seed wheel), the pumps will turn off and the system will begin to shut down. The image to the right shows the drum in cleanout mode, “STG 2”. At this point, the drum and discharge conveyor will continue to run until the cleanout time is completed. These timer settings are described in more detail on page 27.

9) Once the timeout is completed, the system will automatically print the remainder of the ticket to the roll printer.

It is critical that the Epson printer is able to print this ticket. If it can’t print, due to being out of paper, or being unplugged from the system, or the power being turned off, the system will not continue. It is highly recommend that spare rolls of paper are kept on hand for this reason.

The system will also print the transaction receipt to the office printer if that option is enabled. The transaction is also automatically written to the database (refer to page 46 for more details on this). At this point, 2 green check marks will appear beside the order name under the control bar informing the operator this order is complete.

10) Once the green check marks appear, a new order can be created by selecting the order wizard icon and either loading an order, creating a new order, or repeating the order again.
SHOT CONTROL

The order can also be setup to pause the system before the scale discharges and ask the operator how many lb. should be delivered from the scale. This is considered a “shot”. It is also important to note that in order for the shot control to work, the print option must be enabled from the reports page (as shown in the image to the right).

To enable shot control, check the “Shot Control” check box when setting up an order. When this is checked, the system will pause before discharging the scale every time to ask the operator whether to discharge “ALL” or “SHOTS”. Below is a picture of the all or shots selection.

If “ALL” is selected than the scale will open up and discharge all of the scale content and the order will continue and complete as normal.

If “SHOTS” is selected than a second window will pop up asking the operator to enter the target shot size. The picture to the right shows this shot control window. The black box with green text displays the current scale weight. The text field under the scale reading is where the operator enters the desired shot size. There are also three setting fields that are useful for calibrating the accuracy of the shot delivery control.

PreAct – Since the gate takes a second or so to get completely closed, the system needs to start closing the gate a little bit earlier than the target weight. This field defines how many lb. early the gate should close. This is typically between 70-140 lb.

Settle – This is how many sec the system gives the scale to “settle” after the gate closes before the system gets the scale weight. This ensures that the shot size printing on the shot ticket is accurate.

Empty – Once this Empty weight is passed the system will empty the scale out without asking for another shot. Example, if the empty weight is set to 50 lb and the current shot will leave 70 lb. left in the scale the system will stop at 70 lb. and then ask for an additional shot. In that same scenario, if the empty weight was set to 75 lb. the shot would have continued until the scale returned to zero lb.
To start the shot press the green “Start Shot” button. Once the shot has started, the system will continue to discharge and the scale gate will open and the system will begin treating as usual. Once the shot target minus the shot PreAct is reached, the scale gate will close and the system will ask the operator to print the shot.

Press the “Print Shot” button to print a shot to the office printer. Once again, the print option needs to be enabled from the Reports page before the next shot can be started.

Once the shot has been printed, the system will pause again asking the operator to enter a new shot size and press “Start Shot” again. **It is important to note that the shot ticket for the last shot needs to be printed before the entire order will complete.** Once all the shots are complete and the scale has returned to zero pounds, the order will complete as usual.
7 – BEST PRACTICES

List of Best Practices and Troubleshooting Tips

This section lists some daily best practices as well as some troubleshooting tips related to the KSi V4 Automation System.
DAILY BEST PRACTICES

- Turn power on if you powered off the night before. When cycling power for any reason, remember to cycle power on both the AutoBatch main panel and the AutoTreat panel.
- Make sure that the E-Stop button is released.
- Run under-bin in reverse to dump any water off belt that may have accumulated due to condensation, rain or melting snow.
- Check to make sure that air compressor is on and that the air pressure is set between 90 and 100 lbs on the air manifold.
- Make sure that the scale readout on the touch screen is reading the scale weight. It is a good idea to stand or put weight on the scale and make sure that the touch screen registers that weight; even though the automation system will alert you should it loose communication with the indicator.
- Calibrate each of your pumps twice a day.

  ▪ Flow Meter Calibration Process
    o Possibly the single most important point that can affect system accuracy (and probably the most misunderstood) is the flow meter calibration procedure. *The data proves that slower and longer calibration cycles provide the most accurate calibration and system accuracy results.*
    o Use the following guidelines when setting up the calibration cycle:
      o Optimal Calibration Cycle Time is 120-180 seconds. It is better to run the pump slower (as slow as 10% speed) to get the cycle time longer.
      o Optimal Calibration Cycle Volume is 90-100 oz. This is the second item of importance when running a flow meter calibration.
      o The pump speed should be adjusted to allow optimal cycle time *first* and optimal cycle volume *second*. This provides the best combination for the control system to work with the flow meter in establishing an accurate calibration factor. This procedure should happen at least once per day per flow meter.
      o **PLEASE NOTE:** You can run the pump in recirc before a calibration cycle and watch the flow rate at various pump speeds to get a better idea of the appropriate speed settings for optimal calibration.
      o **PLEASE NOTE:** KSi AutoTreat automatically begins each cal cycle using a cal factor of 1, *not* using the previously established cal factor. This means that if you intend to run the cal cycle more than once as a check you must make a note of the cal factor after each cal cycle is run. Then by comparing each cal cycle’s calibration factor you can make a judgment on repeatable accuracy.
- Reset manual valves to drain cal tube and direct liquid to treater. Prime if needed. You are now ready to run your system.
TROUBLESHOOTING / FAQ’S

MY AUTOBATCH SYSTEM IS NOT ACCURATE WITHIN +/- 5/10 LBS

- If the system is consistently + or – the same amount you can turn auto adjust on for that bin or you can manually adjust the PreAct on that particular bin to make the system more accurate:
  - If you are consistently getting more seed than you are wanting than you need to INCREASE your PreAct by the over amount that you are getting into your scale. Example: If you ask for 2500 lbs and you get 2550 lbs than you need to increase your PreAct by 50 lbs.
  - If you are consistently getting less seed than you are wanting than you need to DECREASE your PreAct by the under amount that you are getting into your scale. Example: If you ask for 2500 lbs and you get 2450 lbs than you need to decrease your PreAct by 50 lbs.
  - (Side Note: If your PreAct is not consistent and varies more than 10+ lbs every run, first verify consistent air pressure and free, smooth action on the gate. If gate action is smooth and consistent then the simple reality is that at some point in the conveyor system there is some surging going on. This can be due to belt slippage and/or transfer rate too high for your specific configuration. Slight surging can happen primarily in the inlet of the scale fill conveyor. If better accuracy is required it is recommended that belt tension is checked and/or rate is decreased slightly to provide more consistent control.)
MY CONVEYORS WILL NOT START

- This could be due to a motor fault.
  - Go to the particular conveyor that will not start and make sure that the conveyor is not faulted. If the conveyor is faulted, reset the conveyor by cycling through the devices in the correct zone and then pressing the reset button, and then try running the conveyor by putting it in FWD.
  - If the conveyor faults again than you need to open up the panel door and make sure that all the knobs on the motor starters are in the vertical position. If any of the starters are tripped and positioned at 11 o’clock than you need to turn the knob completely to the left into a horizontal position and then back to the right so that it is completely vertical. Once you have reset this knob close the panel door, turn the power back on, and reset the conveyor as described above.

MY AIR GATES WILL NOT OPEN

- This could be due to the Pause button being pushed. If the pause button is pushed than none of the air gates will open.
  - Go to the control page and make sure that the Pause button is not flashing yellow. If it is flashing than push the pause button to unpause.
  - This could be due to not enough air pressure.
    - If you do not have enough air pressure you should be getting an Air Pressure Fault appearing on the top of the screen. If you see this message, make sure that your air pressure is set to 90-100 lbs.
    - The gate could also not be opening in auto because it is waiting for something to happen such as a conveyor downstream is not turned on.

THE SEED WHEEL WEIGHT DOES NOT MATCH THE SCALE WEIGHT ON THE TICKET

- This could be due to inconsistency when capturing the seed cal weight.
  - Make a practice of filling, leveling, and measuring your seed cal weight the same way each time.
  - Make sure that your seed cal weight is not including the container weight.
This could be due to minor inconsistencies related to seed wheel fill characteristics.

- Anything that may cause the seed wheel pocket fill to vary from the cal container fill (such as seed size vs. volume shape/volume fill compression) can cause variations. It is recommended to compensate for minor inconsistencies using “Final Adjust Factor” on the “AutoTreat Setup” page.

**Seed Wheel Calibration Must be Monitored**

- As noted above, it is possible that the systems calculation of actual seed rate is inaccurate due to errors in sampling and/or weighing the seed sample and in the flow/pocket fill characteristics of different seed sizes in the seed wheel.
- Accuracy of application is affected when the calculated total amount of seed through the seed wheel does not match the actual scaled amount of seed. This is because KSi AutoTreat must match treatment application to the seed rate calculated by the seed wheel as the seed wheel is the rate control device.
- If the seed wheel calculation at the end of the run does not match the actual scaled weight, then perform one of the following:
  - Turn on the Wheel Cal Auto Adjust – The system will make automatic adjustments to fine tune the seed wheel calibration.
  - Make a manual adjustment to the Seed Source “Wheel Cal” value on the specific seed source. How to do this:
    - \[(\text{Scale Weight} / \text{Seed Wheel Totalized}) \times \text{Wheel Cal}\]
    - Example:
      - current wheel cal = 1050
      - Scale weight = 5000 ; Seed wheel totalized = 5075
      - \[(5000/5075) \times 1050 = 1034\]
      - New wheel cal value = 1034

**MY SCALES AREN’T COMMUNICATING**

- If the scales aren’t communicating and you are getting a scale communication fault it is possible that the scale indicators inside the panel or on the liquid stand needs to be restarted. To do this, simply cycle power to the indicator and the signal should re-establish.
MY ACCURACY, AS CALCULATED BY USING THE SEED WHEEL AND LIQUID TOTALS ON THE PRINTOUT, IS GOOD, AND MY SEED WHEEL TOTAL MATCHES MY SCALED WEIGHT, BUT I AM REALLY USING MORE OR LESS LIQUID IN TOTAL AT THE END OF A DAY

- This could be due to an inaccurate calibration on the flow meter. It is recommended that when this is noticed that you immediately re-calibrate the flow meter for the treatment PAC that is demonstrating error.
  - Re-calibrate using numbers and methods as accurate as possible; make sure the cal tube is level so your readings are accurate. Start exactly on zero and get an exact reading of the total volume at the end. If you misread the tube volume and use a lower number the system will over apply liquid, if you use a number that is higher the system will under apply liquid.
  - In the case of adjusting for this error as noted. It is recommended that you perform three calibrations in a row. Make a note of each final cal factor when the cal cycle is done. They should be essentially the same number each time. Please do not make adjustments to the flow meter settings on the AutoTreat Setup page to make calibration compensations.

I CAN'T PRINT MY TICKET

- This is most likely because the system does not think that the job is complete. Make sure that the scale is reading 5 lbs or less and/or make sure that you have printed the last shot for your shot ticket.

MY EPSON PRINTER ISN'T PRINTING AND I'M GETTING A PRINT ERROR

- If the system can't print to the Epson printer the job will not continue. In this case, it is most likely because the Epson printer is out of paper, not plugged into the automation panel, or the power is turned off on the printer.