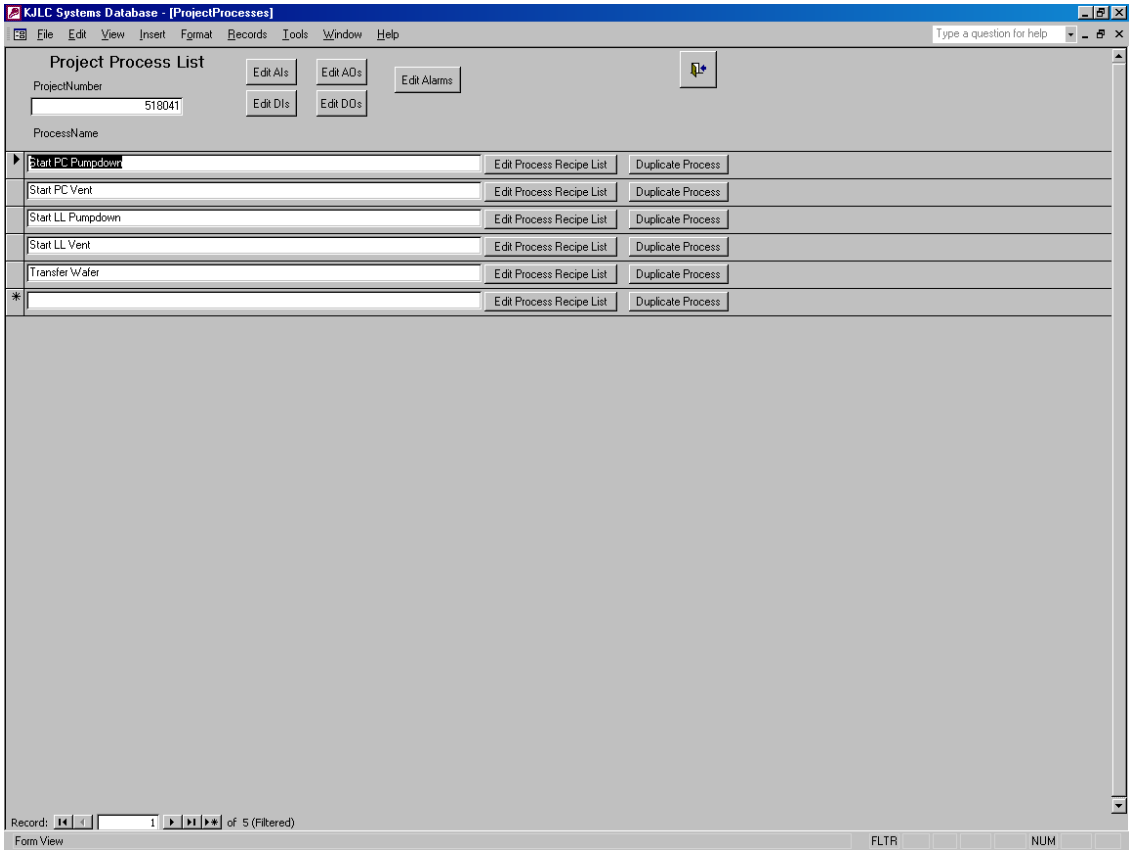
Operation

Software Operation Overview

Kurt J. Lesker Company G2 System Control Software consists of two components – a system database and a Runtime Engine. Together these software components provide the user with process automation, process (recipe) creation, system status, and manual control of the deposition tool. In addition to automation and control, this software incorporates such features as datalogging, alarming, password protection, interlocks, and offline process editing. The software runs on a Windows based computer with a standard CRT flat screen (or optional touchscreen), mouse, and keyboard.

System Database Overview

A Microsoft Access database is used for creating and modifying processes and recipes. The number of processes that can be created and saved is limited only by the number of records that can be stored by Microsoft Access. A process typically consists of several recipes, and recipes can be reused by multiple processes. Other features, such as process and recipe duplication, are available for efficient process creation and modification. Standard recipes, including chamber pumpdown and vent, are provided to help the user create "one button" processes. Process alarms are also created and stored in the system database to maximize tool flexibility.



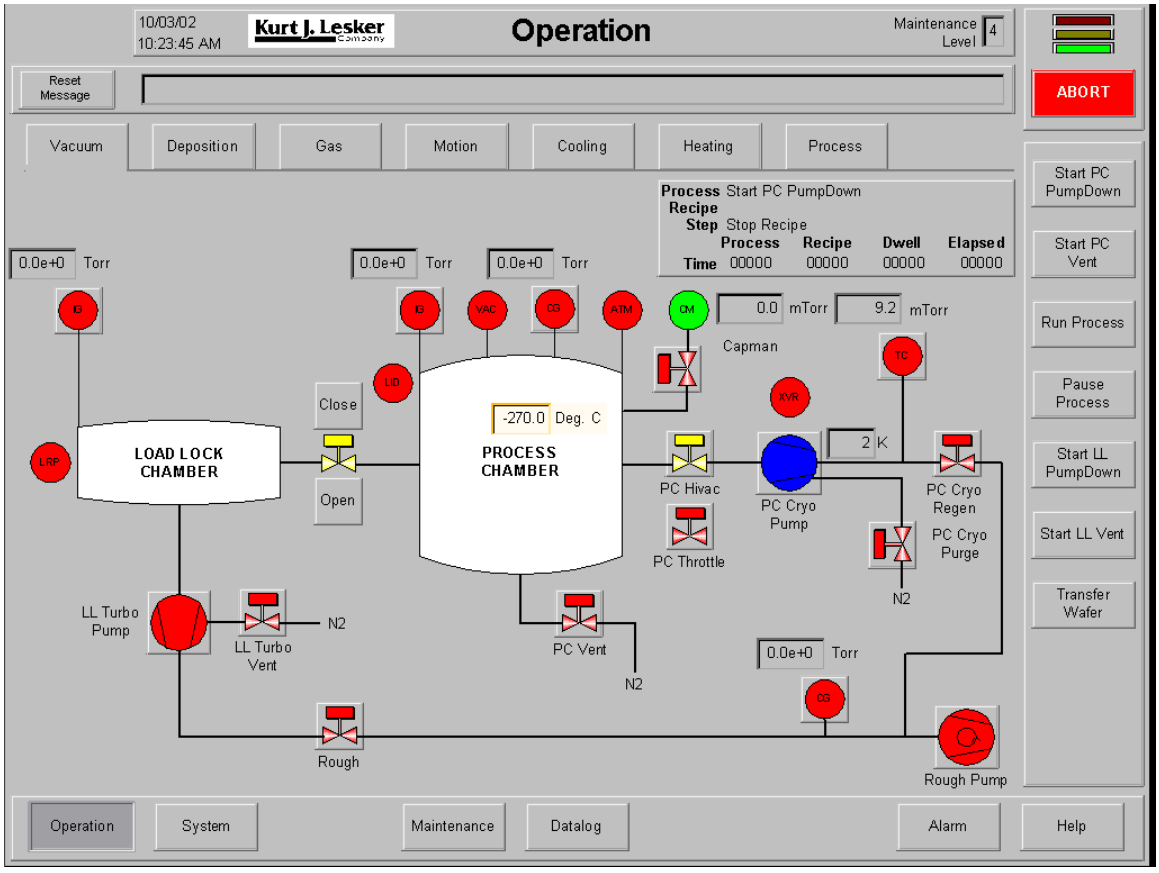
Project Process List Screen

Many forms are provided for entering and modifying process and alarm data. Other forms and tables are present in the database, but these items are used for system configuration by KJLC personnel only.

Refer to the following pages and sections for details regarding database operation.

Runtime Engine Overview

The runtime HMI (Human Machine Interface) enables the user to run the tool manually or in an automated fashion, as well as provides system and process feedback. An example of an HMI is shown below.



Operation – Vacuum Screen

In general, the following guidelines apply to the operation of the HMI:

1) All actions and selections are done with a single mouse click (or single push of the finger, in the event of touchscreen systems). There are NO double-click actions on any runtime screen.

2) All buttons are typically two state radio buttons that can be either up or down. When a button is visible (at the appropriate maintenance levels) it indicates either the state of a request to turn on a device, the state of a sequence, or the active navigation screens. Typically, a button that is "pressed" or down (and darker gray than the screen background) indicates that the user (or a process) is requesting the respective device to turn on. A button that is not pressed or up signifies a device that is being requested to turn off.
3) All devices that can be turned on or off typically have an indicator or icon inside their respective control buttons. While the state of the button indicates whether or not a device is requested to turn on or off, the color of the indicator or icon inside the button notifies the user of the actual state of the device; green indicates a device is on or open; red indicates a device is off or closed; yellow indicates either a device in the process of turning off/on (opening/closing) or the status of a device is indeterminate.
4) All alphanumeric entry fields typically have a gray text background until the appropriate maintenance level is entered. Once the maintenance level is high enough, all available alphanumeric entry fields change to a white text background. Depending on whether a field is numeric or alphanumeric, one of two popup entry windows will appear:

Pop-up Screen #1 – Numeric Entry

NOTE !
The maximum and minimum values for each numeric variable are displayed within the numeric entry pop-up screen.

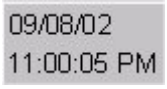
Pop-up Screen #2 – Alphanumeric Entry

All screens are available for viewing all of the time; no screens are password protected. The runtime software is capable of supporting up to 72 screens. This document is intended to provide information regarding the operation of ALL features currently available in KJLC Systems Software. The user should disregard features or screens not available in the runtime HMI on their respective system.

Common Icons

These common icons are found on many screens in the Runtime Software.

Time and Date Banner



The *Time and Date Banner* appears at the top left of all screens and displays the current windows time and date.

Maintenance Level Indicator

The *Maintenance Level Indicator* appears at the top right of all screens and displays the current maintenance level of the system.

Light Tower

The *Light Tower* appears in the top right corner of all screens. The green portion of the *Light Tower* is illuminated when no system alarms are present, the yellow portion is illuminated when a yellow alarm is detected, and the red portion of the *Light Tower* is illuminated when a red alarm is detected. Detailed descriptions of alarms can be found in Runtime Screens-15 and Access Forms-12 sections of this manual.

Abort Button

The *Abort Button* activates and displays the current abort condition. Press the button to activate a system abort. The button appears red when the system is not aborted and appears magenta when the system is aborted.

Interlock Message Text Box and Message Reset Button

The *Interlock Message Text Box* displays the current interlock event or red/yellow alarm message. Use the *Reset Message Button* to clear the message currently displayed.

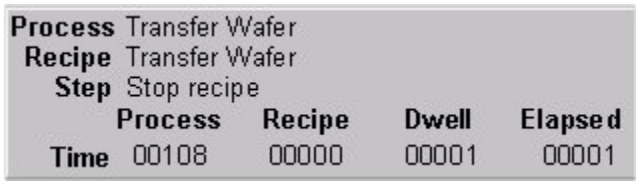
Navigation Buttons

The *Navigation Buttons* are used to navigate the major screen groups available from the runtime HMI. When a new *Navigation Button* is pressed, a different set of screens is made available to the user. See also *Navigation Tabs.*

Navigation Tabs

The *Navigation Tabs* are used to display the minor screens available in each major screen group from the HMI. A different set of *Navigation Tabs* appears each time a new *Navigation Button* is pressed.

Process Tracer



The *Process Tracer* provides constant feedback on all operation screens for the status of the current process.

Command Buttons

Command Buttons are used to run standard processes as well as user-selected processes. In addition to standard *Command Buttons*, two to five additional custom *Command Buttons* are available to be configured for the customer at the time of tool acceptance (number of custom buttons available depends on system configuration).

Terminology and Definitions

Access Forms - the portion of the HMI associated with the system database. These forms (or screens) are used when developing processes/recipes and configuring the Runtime Software.

Analog Inputs (AI) – system Input that can have many different numerical values (positive or negative), both integer and decimal. Analog Inputs include motor speeds, gas flows, pressures, temperatures, power supply feedback signals, etc.

Analog Outputs (AO) – system Output that can have many different numerical values (positive or negative), both integer and decimal. Analog Outputs include motor speed setpoints, gas flow setpoints, heater temperature and ramp setpoints, power supply setpoints, etc.

Discrete Input (DI) – system Input that can have only one of two values (i.e. on/off, 1/0, opened/closed). Discrete Inputs include vacuum switches, flow switches, gate valve positions, etc.

Discrete Outputs (DO) – system Output that can have only one of two values (i.e. on/off, 1/0, open close). Discrete Outputs include valves, pumps, power supply enable signals, heater enable signals, shutter open/close signals, etc.

HMI – Human Machine Interface. This refers to the computer control screens utilized by the operator to run the tool and monitor system status.

MFC – Mass Flow Controller.

PID Control – Proportional Integral Derivative Control. A type of control used in closed loop feedback systems.

Process – an automated sequence that consists of one or more recipes. The recipes specified in a given process are executed in a predefined (increasing numerical) order.

Process Token – this system variable is a numerical indicator that a process is active. The Runtime software may only execute one process at time. Thus, before a process may run, it must "pick up" the token while it is active and also signal other processes that a process is active. Once the current process "releases" the token, the next process may start. Examples of tasks that require a process token include all system database read/write operations and automated cryo regeneration.

Red Alarm – a Red Alarm occurs when a process parameter is out of tolerance to a high degree as specified by the process/recipe creator. Red Alarms can be configured to activate the System

Abort if desired. A Red Alarm is indicated by the red light on the Runtime Screens' Light Tower and also a Red Alarm message on the Runtime Screens' interlock message text box.

Recipe – an automated sequence that consists of one or more steps. Recipes can be thought of as the building blocks for processes. The steps specified in a given recipe are executed in a predefined (increasing numerical) order.

Runtime Screens – the portion of the HMI associated with the Runtime Software (as opposed to the system database forms). These are the screens most often used when operating the tool.

Runtime Software – the control software responsible for I/O system interface, control logic, process/recipe execution and a majority of the HMI. This may also be referred to as the Runtime Engine or Runtime.

Step – the part of a recipe that sets and checks system I/O. Steps can be thought of as the building blocks for recipes.

System Abort – in case of a dangerous situation, when the System Abort button is pressed on the HMI (or the system is aborted as the result of a red process alarm or device communications error) all processes are stopped and all Discrete and Analog Outputs are set to their default (startup) state as configured by the system database. Usually most Discrete Outputs are turned off and most Analog Output Setpoints are set to zero.

System I/O – system Inputs/Outputs. I/O refers to the electronic hardware controls for a system. Inputs are typically device signals that provide system status or feedback. Examples of Inputs include flow switches, vacuum switches, valve positions, pressures and motor speeds. Outputs are typically device signals that provide system control or manipulation. Examples of Outputs include pumps, valves, flow setpoints and power supply setpoints.

Upstream Pressure Control Mode – method of pressure control whereby effective pumping speed is held constant (i.e. fixed position throttle valve) and gas flow is varied to achieve a desired pressure. The point of gas introduction is referred to as being "Upstream" relative to the means of pumping.

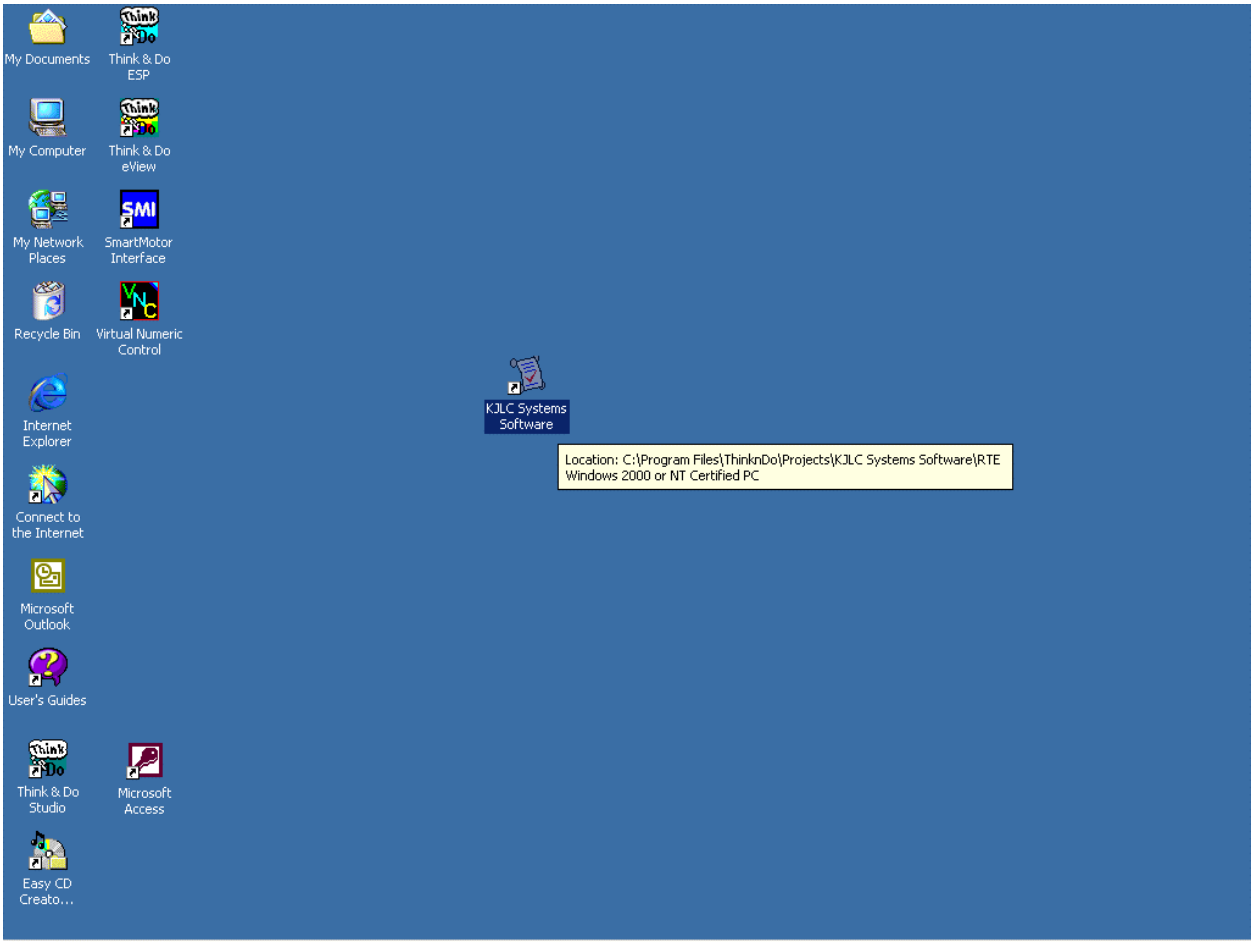
Yellow Alarm – a Yellow Alarm occurs when a process parameter is out of tolerance to a low degree as specified by the process/recipe creator. Yellow Alarms can not be configured to activate the System Abort. A Yellow Alarm is indicated by the yellow light on the Runtime Screens' Light Tower and also a Yellow Alarm message on the Runtime Screens' interlock message text box.

RUNTIME SCREENS

The following screens are described in this section:

Getting Started and Stopping Runtime Software

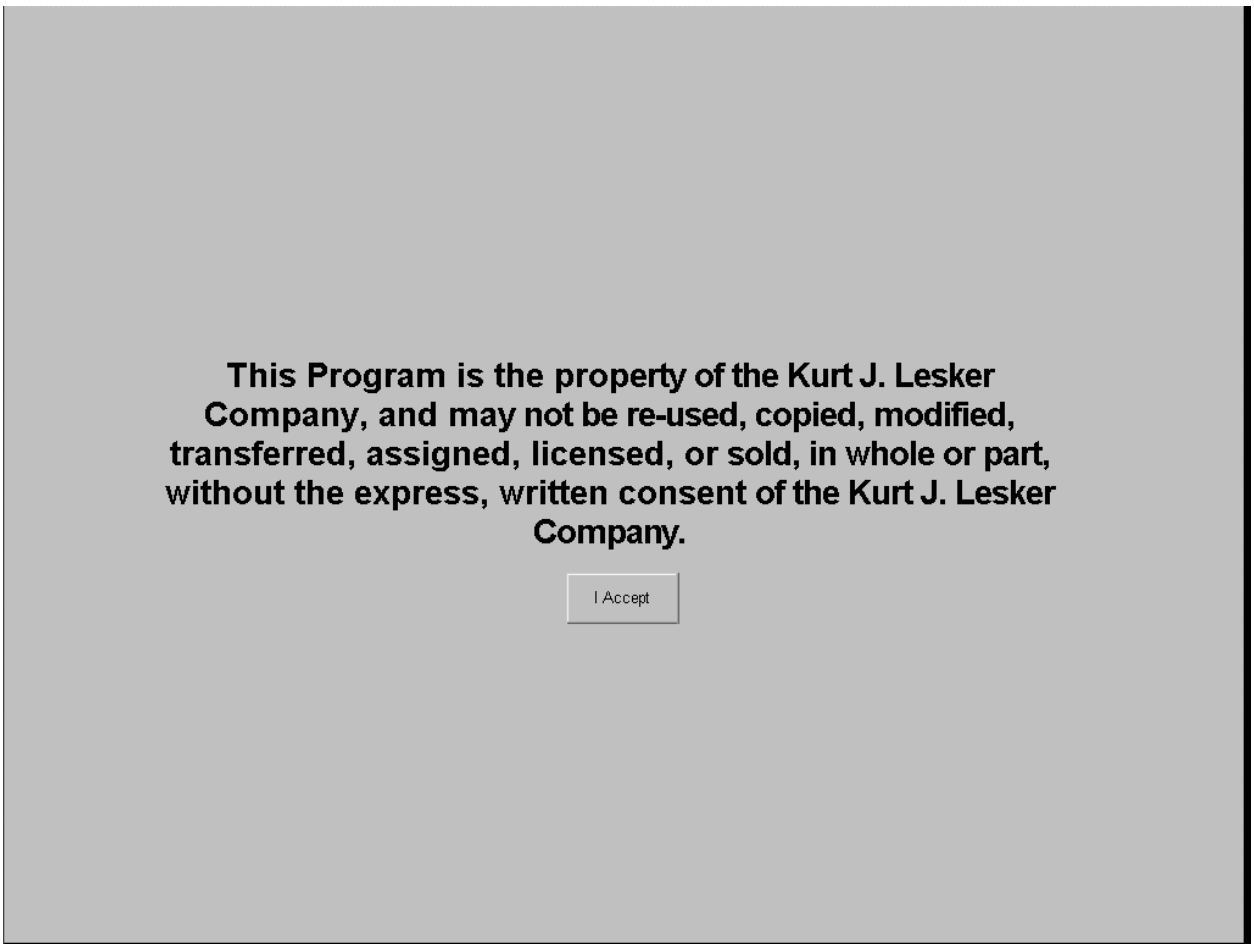
The system computer is configured to automatically start KJLC software every time it boots up. Additionally, if the runtime software has been stopped for maintenance purposes, it can be restarted by double-clicking the software icon on the Windows desktop.



Start-up Screen

Before starting the software or booting the computer, it is generally a good idea to verify the appropriate system components are on and in the correct state (i.e. power supplies on, cryo compressors/turbo controllers on, gauge controller on, etc.). Additionally, all gauges should be turned off manually on the system's vacuum gauge controller prior to starting system software (this is to prevent priority conflicts and communication errors between the gauge controller and the system control software).

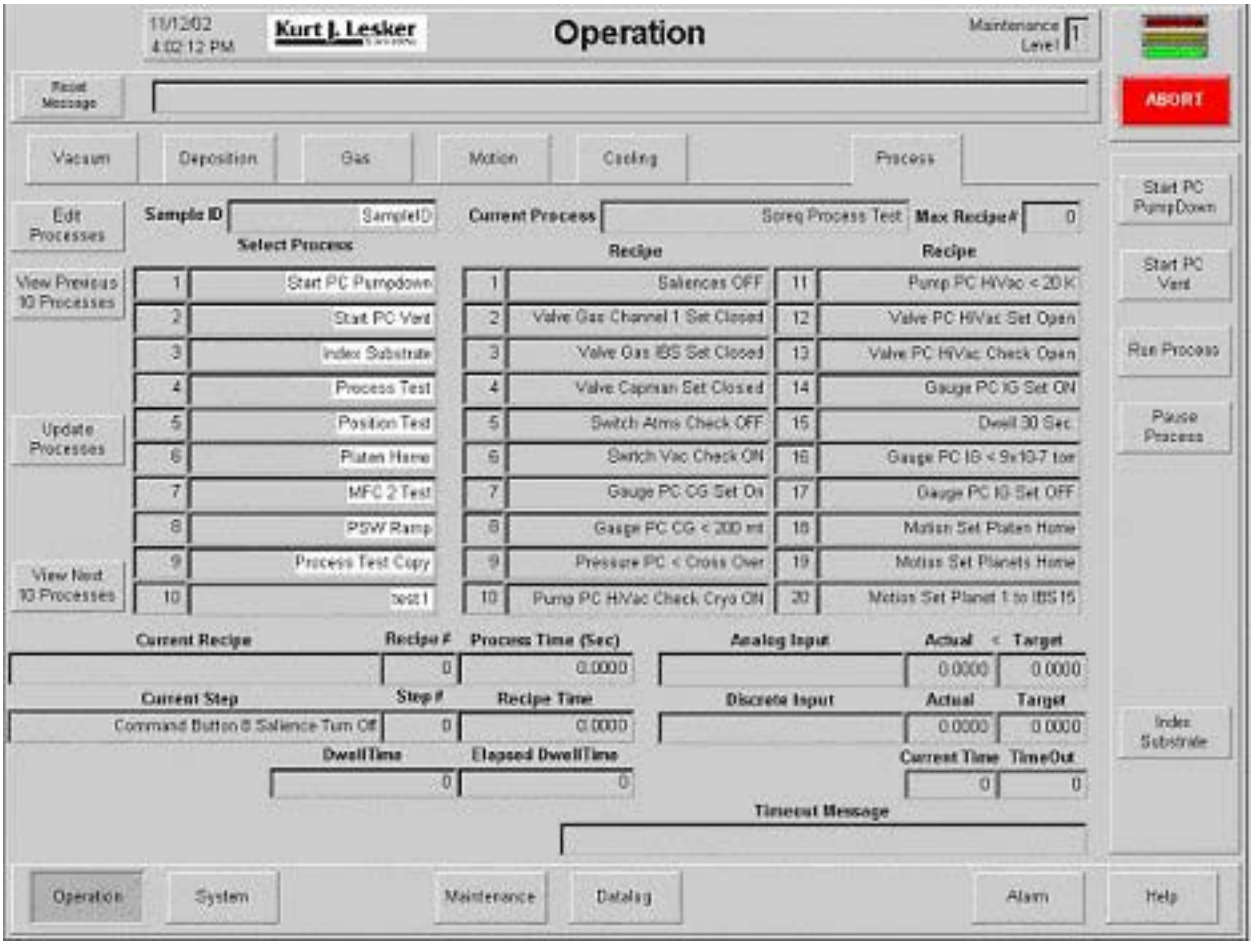
Once the system software is started (this can take 30-45 seconds before the first screen appears) a license splash screen is displayed that requires user acknowledgement prior to proceeding.



License Splash Screen

Although no other screens are accessible until the KJLC license terms are accepted, the runtime software is running in the background. This means that items requiring an initial state or recovery upon startup are addressed regardless of when the license is accepted. For example, if the system has a cryo pump (not an OnBoard) and the pump is cold enough, it will automatically be turned on. Likewise, if the same cryo pump requires regeneration and the software has been configured for automatic regeneration, the regeneration sequence will commence.

Once the license has been accepted, the vacuum screen is typically the first screen to appear:



Operation – Vacuum Screen

The initial Maintenance Level at system startup is level one. At this point, basic system operation is available to the user. Basic operations include pumping, venting, sample loading/unloading, process selection, and process execution. It is usually a good idea to pumpdown the system on startup (unless the system has a cryopump that requires regeneration, in which case pumpdown initiation must wait until the pump is ready). Running the standard PC Pumpdown process puts the system into a known state that is typically desirable before selecting and running a deposition process.

In addition to basic operator tasks, individual system devices can be manipulated and exercised through the use of maintenance levels two and three. Refer to the following pages regarding details on individual runtime screens.

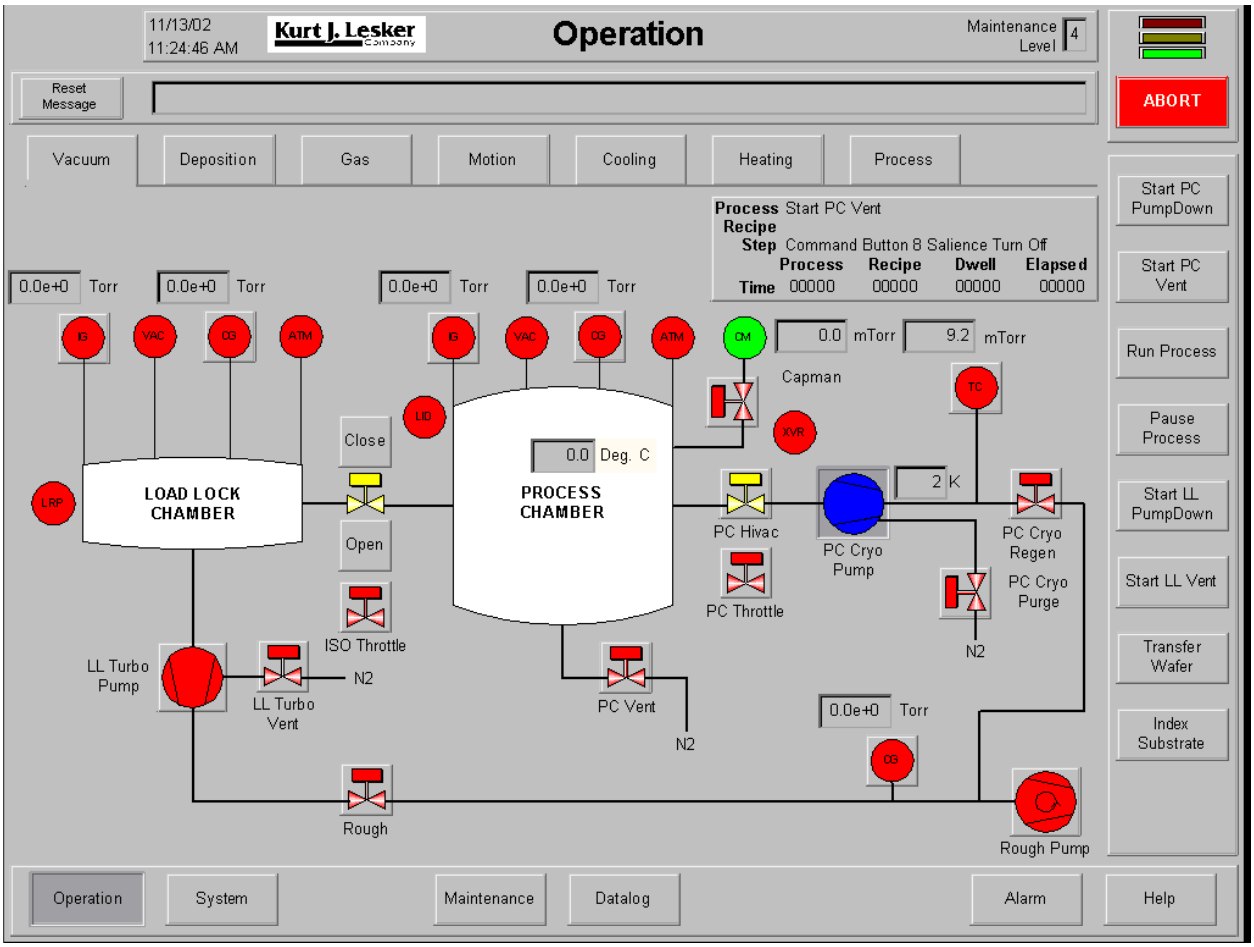
Refer to the Standard Recipes section for details on most Command Button processes.

Maintenance Level

The Maintenance Level number indicates the current Maintenance Level status of the tool. Maintenance Level 1 is typically reserved for basic operator level functions – pumpdown, vent, sample loading and unloading, process selection, and system monitoring. All screens are available at all Maintenance Levels, but individual controls (buttons, power supply setpoints, etc.) are not available until Maintenance Level 2 or higher is initiated. Maintenance Levels 2 and 3 are used for high level customer service functions. Maintenance Level 4 is reserved for KJLC personnel only and is not to be used by the customer for any reason (this mode is password protected for customer safety). Click on the Kurt J. Lesker Company logo on any screen, or go to the Maintenance/Login screen to enter a password and change the Maintenance Level.

Refer to the following sections and pages for details regarding the use of controls on individual runtime screens.

Operation – Vacuum Screen



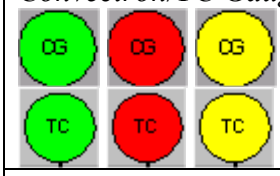
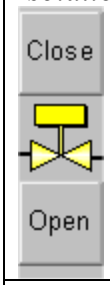
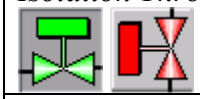
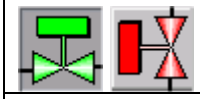
Operation – Vacuum Screen

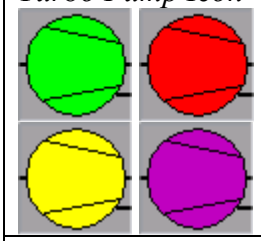
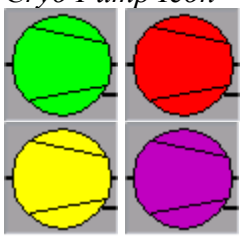
Using the Operation-Vacuum Screen

The following chart outlines the use of functional icons and data fields on this screen.

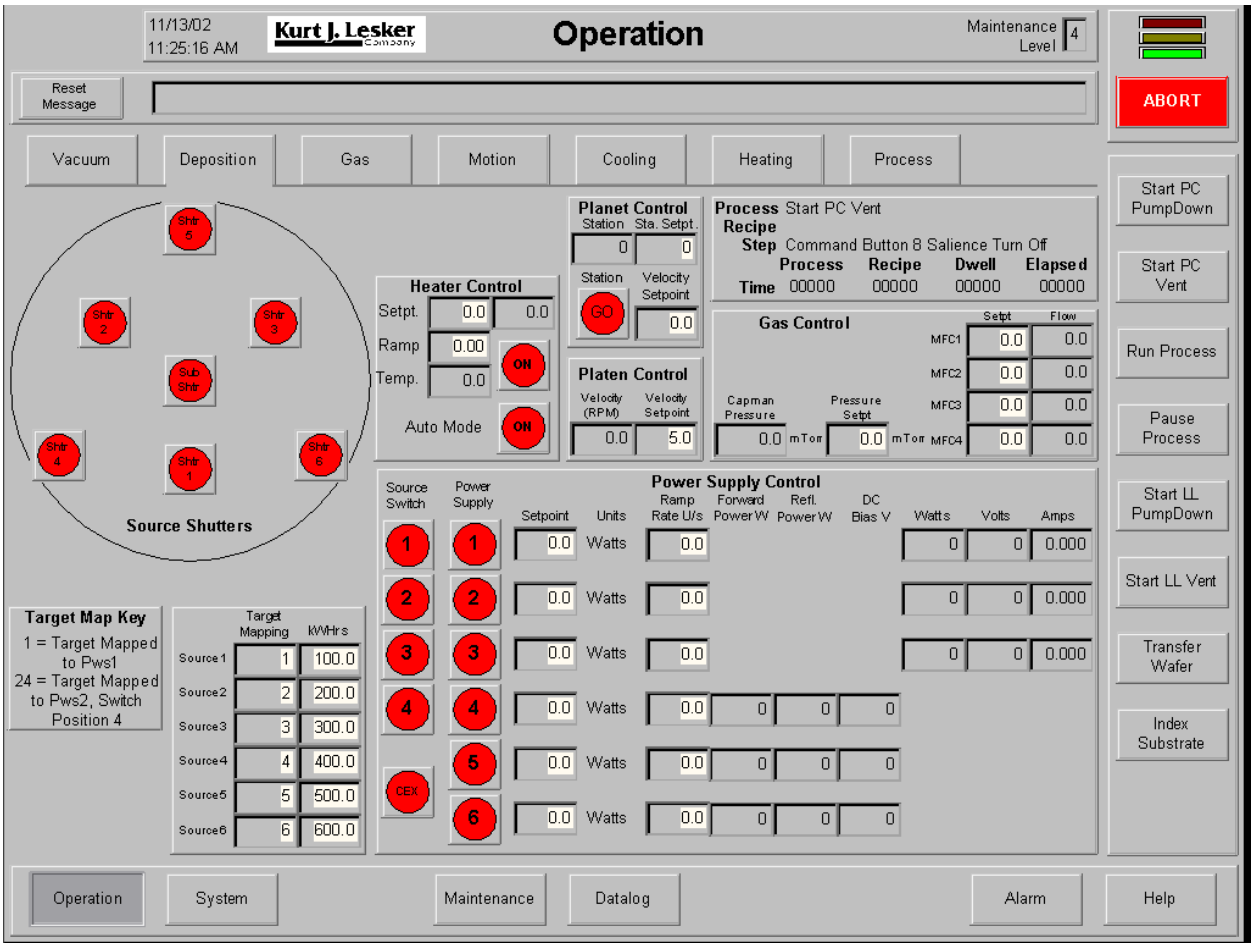
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Ion Gauge Icon 	Click the icon to change ion gauge status	Green = On Red = Off Yellow = Changing states

Vacuum Indicator 	No action. This icon is provided to display system status.	Green = Some vacuum present Red = Chamber at atmosphere
Convectron/TC Gauge Icon 	Click the icon to change gauge status	Green = On Red = Off Yellow = Changing state
Atmosphere Indicator 	No action. This icon is provided to display system status.	Green = Chamber at atmosphere Red = Vacuum present
Capacitance Manometer Icon 	No action. This icon is provided to display system status	Green = On (Always On)
LRP Icon 	No action. This icon is provided to display system status.	Green = Home (retracted) Red = Not home (extended)
Process Chamber Door/Lid Icon 	No action. This icon is provided to display system status.	Green = Closed Red = Open
Isolation Valve Icon(s) 	Click appropriate icon to change isolation valve status	Green = Open Red = Closed Yellow = Between states
Isolation Throttle Valve Icon 	Click the icon to change isolation throttle valve status	Green = Throttled Red = Not Throttled Yellow = Between states
Valve Icons 	Click the icon to change valve status	Green = Open Red = Closed Yellow = Between states
Crossover Indicator 	No action. This icon is provided to display system status.	Green = Chamber at crossover Red = Chamber not at crossover

Turbo Pump Icon 	Click the icon to change turbo pump status	Green = At speed Red = Stopped Yellow = Accelerating Magenta = Braking
Rough Pump Icon 	Click the icon to change rough pump status	Green = On Red = Off Yellow = Between states
Cryo Pump Icon 	Click the icon to change the cryo pump status	Red = Off Green = Temperature is above auto regen temperature (Cryopump is on) Magenta = Regen warmup Orange = Regen safety purge Yellow = Regen Rate of Rise Light Blue = Regen cooldown or temperature is less than auto regen temperature (Cryopump is on) Dark Blue = Temperature is less than regen cooldown temperature (Cryopump is on) NOTE: The cryo pump icon appears dark blue when it is on and operating normally.

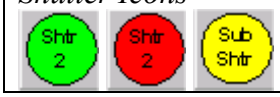
Operation – Deposition Screen

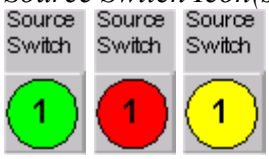
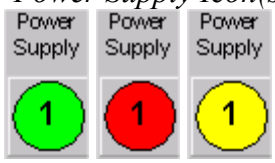
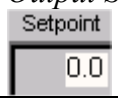
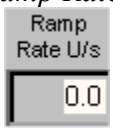


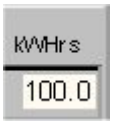
Operation – Deposition Screen

Using the Operation – Deposition Screen
The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Shutter Icons 	Click the icon to change shutter status	Green = Open Red = Closed Yellow = Between states

Power Supply Control *Source Switch Icon(s)* 	Click the icon to change source switch status	Green = On Red = Off Yellow = Between states Note: Source switch positions are interlocked such that only one can be active at a time and the corresponding power supply must be off prior to activating a particular position
Power Supply Icon(s) 	Click the icon to change power supply status	Green = On Red = Off Yellow = Between states
Output Setpoint 	Click text and enter desired power output setpoint	Set power output in Watts
Ramp Rate 	Click text and enter desired power supply ramp rate	Power supply output ramps to entered setpoint in units/sec NOTE: Set Ramp Rate PRIOR to setting power supply setpoint
Power Supply Feedback (Power, Voltage, etc.) 	None	Displays current power supply status
Source Target Material (Displayed next to the *Target Mapping* column)	Click text and enter current target material	Target material is displayed on deposition screen and recorded in process and manual datalogs

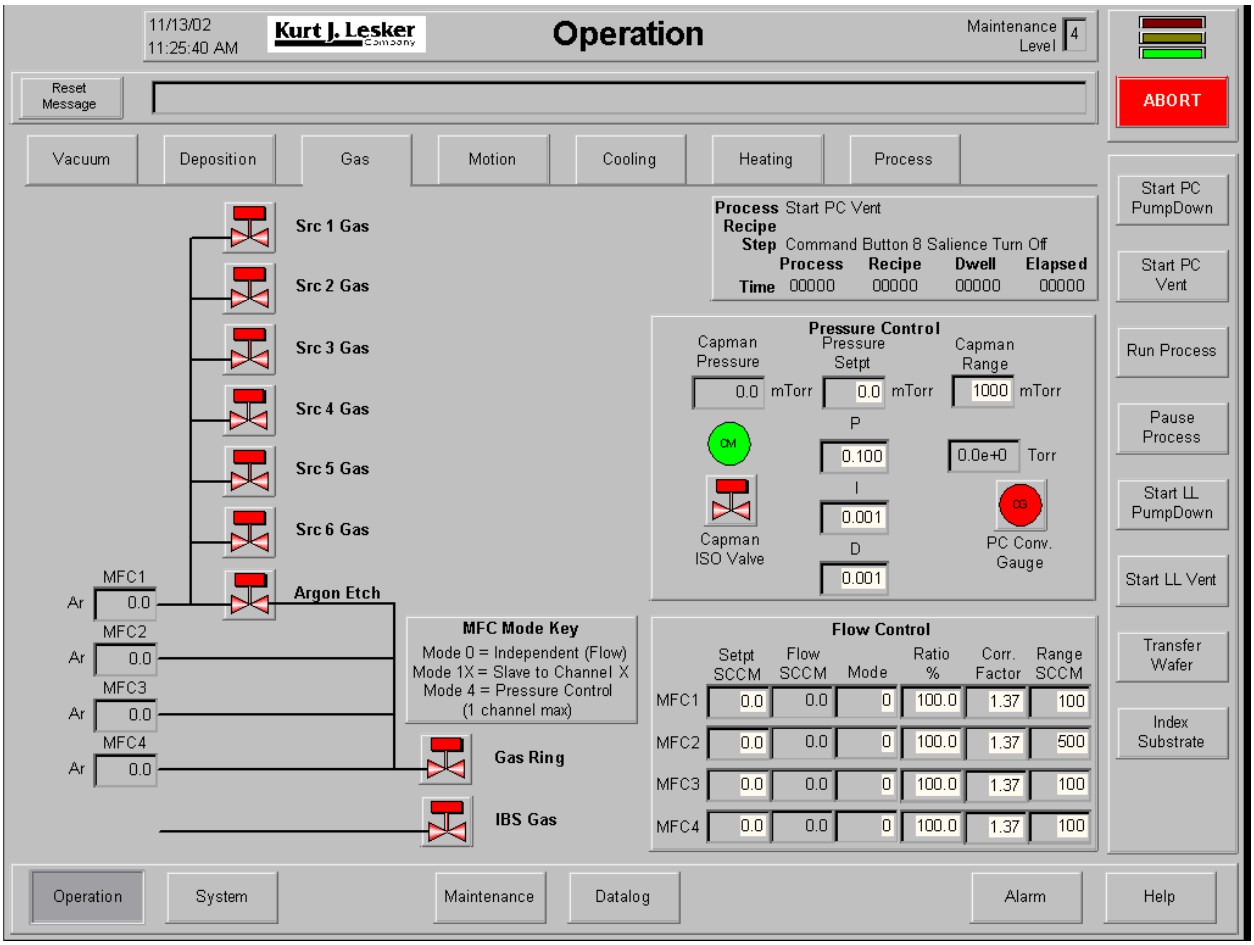
Source Power Supply Mapping 	Click text to map source to a particular power supply and switch position (if applicable)	The mapped source kilowatt hours counter will increment accordingly when the respective power supply is on and has positive output power.
Source KiloWatt Hours 	Displays current kilowatt hours for a particular target Click to zero or preset the kilowatt hours counter	The kilowatt hours counter increments accordingly based on the output state of the corresponding power supply The counter is set accordingly and increments from the preset value

Refer to Heater Screen icon chart for heater control operation details (see Runtime Screens-8).

Refer to Gas Screen icon chart for gas and pressure control operation details (See Runtime Screens-5).

Refer to Motion Screen icon chart for planet and platen control operation details (see Runtime Screens-6).

Operation – Gas Screen

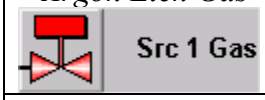


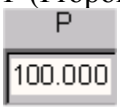
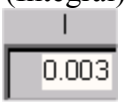
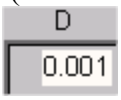
Operation – Gas Screen

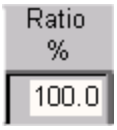
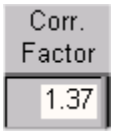
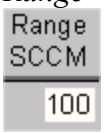
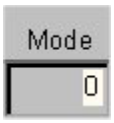
Using the Operation – Gas Screen
The following chart outlines the use of functional icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
PC Convectron Gauge 	Click icon to change gauge status	Green = On Red = Off Yellow = Between states

Gas Valve Icons *Sources 1-6* *IBS Gas* *Ring Gas* *Argon Etch Gas* 	Click icon to change valve status	Green = Open Red = Closed Yellow = Between states
Capacitance Manometer *Capman Gauge* 	No action. This icon is provided to display system status.	Green = On (Always On)
Capman Iso Valve 	Click icon to change valve status	Green = Open Red = Closed Yellow = Between states

Pressure Settings *Setpoint* 	Click text and enter desired setpoint	Sets desired chamber pressure in mTorr NOTE: Requires one MFC in Mode 4 and corresponding gas valve open.
P (Proportional) 	Click text and enter desired setpoint	Sets proportional term for pressure control loop. The proportional term determines the amount of change in gas flow to compensate for the difference between desired pressure and actual pressure – the greater the proportional term, the quicker the flow will change to adjust for pressure differences (large P terms can lead to instability). This is the most critical term for tuning the pressure control loop. Typically, as the throttle position increases (greater conductance = higher effective pumping speed), the P term must be increased to achieve the desired pressure (greater change in gas flow is required to affect a pressure change)
I (Integral) 	Click text and enter desired setpoint	Sets integral term for pressure control loop. This term typically does not need to be changed from its factory default value.
D (Derivative) 	Click text and enter desired setpoint	Sets derivative term for pressure control loop. This term typically does not need to be changed from its factory default value. NOTE: DO NOT adjust PID values for pressure control loop while in Pressure Control Mode.

Capman Settings *Range* 	Click text and enter desired value	Sets range of Capacitance Manometer in mTorr
MFC Settings *Setpoint* 	Click text and enter desired value	Sets MFC flow in sccm NOTE: Applies to Independent Mode only
Ratio % 	Click text and enter desired value	Sets MFC flow as a percent ratio of master channel (Slave Mode) Sets MFC contribution as a percent of full range (PID/Pressure Control Mode)
Correction Factor 	Click text and enter desired value	Sets gas correction factor for corresponding MFC (as a function of nitrogen calibration) Refer to MKS manual or web site for gas correction factor tables.
Range 	Click text and enter desired value	Sets flow range of corresponding MFC in sccm (max nitrogen flow)
Mode 	Click text and enter integer value	Sets mode of operation for corresponding MFC Mode 0 = Independent (Flow) Mode Mode 1X = Slave Mode (Channel X is master) Mode 4 = Upstream Pressure Control Mode

Gas Control Overview
The software supports control of up to 4 MFCs in flow or pressure control modes. Only one MFC can be designated as the "master" for upstream pressure control, but any of the remaining MFCs can be "slaved" to the master. Any MFC can be set for independent or slave flow mode at any time. The ranges for the gas flow and pressure hardware can be changed (in Maintenance Mode) to accommodate modifications at the customer site. Additionally, pressure control PID values can be changed manually (on the gas screen) or in a recipe to accommodate various throttle valve positions.

Master/Slave Operation
Master/Slave relationships are ratiometric based on flow. Multiple levels of this relationship are supported so that an MFC slaved to one channel could also be master to another. The flow of a given slave channel is based on the **actual flow** of the corresponding master channel, not the setpoint of the master. In this way, if the master channel is not flowing correctly or is otherwise limited, the gas composition remains correct. Additionally, if a given slave flow is limited based on that MFC's range, the flow setpoint for the corresponding master is limited to maintain the desired gas ration.

Pressure Control
The software uses closed loop PID control to accomplish upstream pressure control. When a given MFC is assigned to pressure control mode, the software adjusts that MFC's flow rate setpoint accordingly based on the desired pressure setpoint and the actual pressure reading supplied by the capacitance manometer. If any additional channels are slaved to the pressure control channel, then their flows will also be adjusted respectively.

EXAMPLE: SLAVE MODE

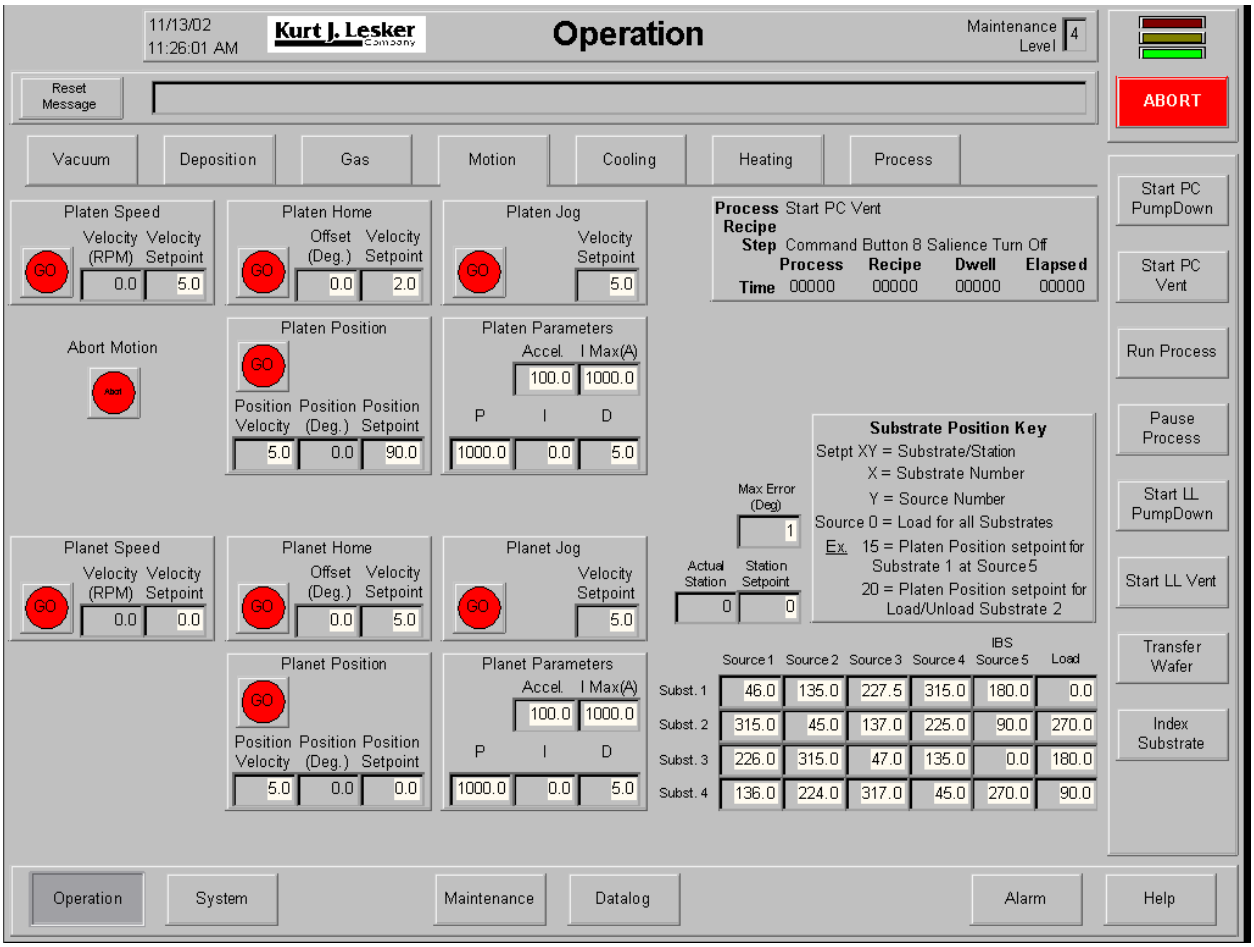
- Mode 11 for MFC 2 slaves MFC 2 to MFC 1. The flow setpoint for MFC 2 = (actual flow of MFC1) x (the ratio of MFC2).

  So if MFC1 actual flow = 100 sccm and MFC 2 ratio is 50%, MFC2 flow setpoint = 50 sccm.

SLAVE MODE NOTES

1. A channel cannot be slaved to itself. If this is requested, the channel will be set to Independent Mode with a flow setpoint of zero.
2. A circular slave relationship is not allowed. If two channels are slaved to each other, the highest number MFC is set to Independent Mode with a flow setpoint of zero.
3. If the setpoint for a slave channel is greater than its range, the setpoint for the slave is limited to its maximum and the corresponding setpoint for the master channel is set such that the desired gas composition is maintained.

Operation – Motion

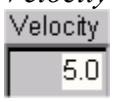
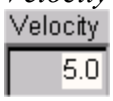


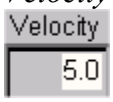
Operation – Motion Screen

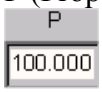
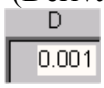
Using the Operation – Motion Screen

The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

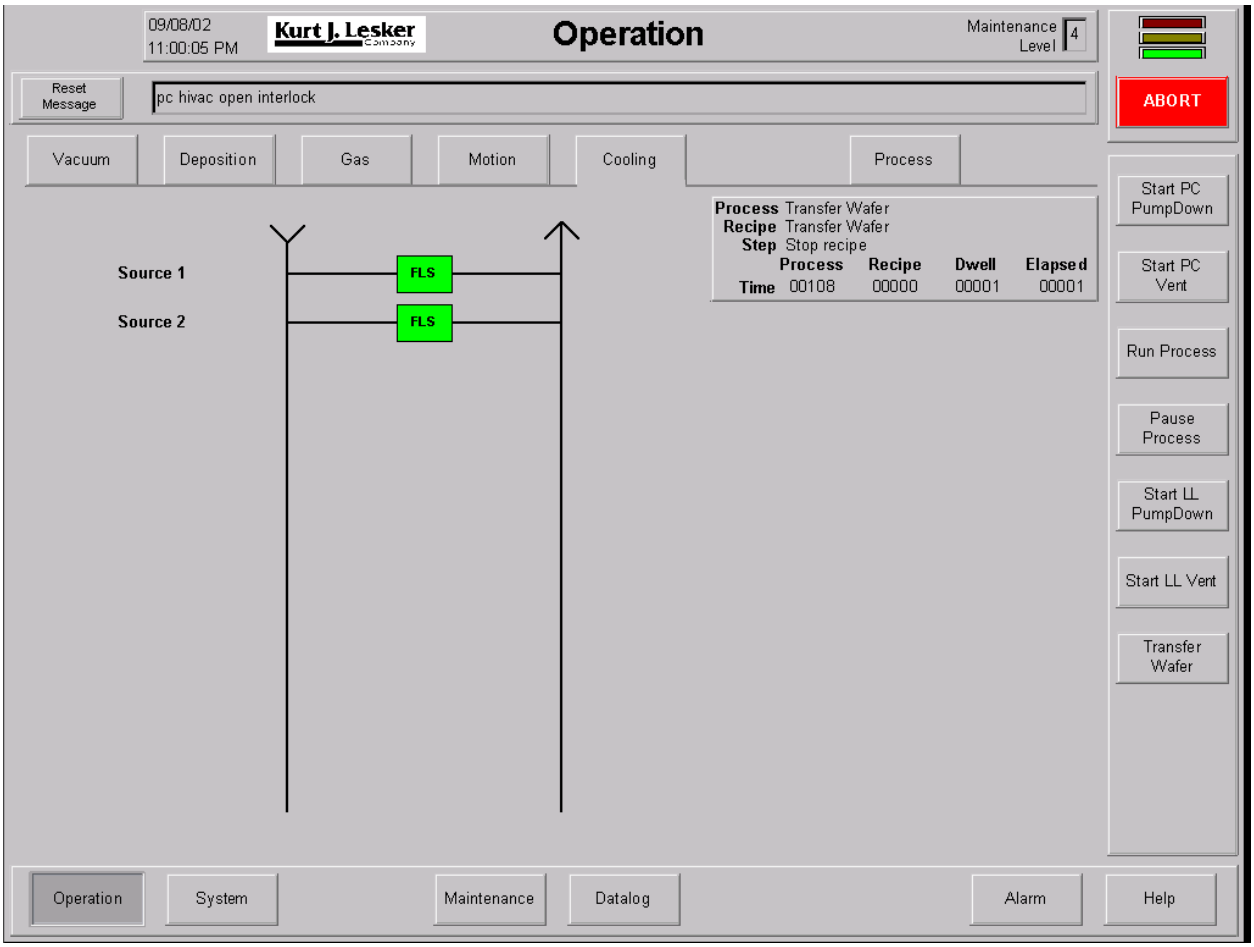
ICON or DATA FIELD	ACTION	RESULT
Axis Speed Settings *Velocity Setpoint* 	Click text and enter desired value	Sets axis velocity setpoint in rpm NOTE: Velocity setpoint should be set to zero after rotating at a set speed PRIOR to disabling velocity mode. Setting the velocity to zero prior to disabling velocity mode provides a smooth stop and helps to prevent sample shifting.
Enable Button 	Click icon to change status Axis rotates at set speed when button is pressed.	Enables/disables velocity Green = Rotate at desired setpoint Red = Stop
Axis *Home Settings* *Offset (Degrees)* 	Click text and enter desired value	Axis rotates to desired position (in degrees) after homing and resets current position to zero degrees
Velocity Setpoint 	Click text and enter desired value (Range = 0 to 5 rpm)	Axis homes using home velocity setpoint. Typically, a slower home velocity (2-3 rpm) works well for achieving homing precision
Enable Button 	Click icon to initiate home routine	Green = Homing Red = Done or not homing Axis goes to home position when button is pressed (Also see *Home Offset*).

Axis Jog Settings *Velocity Setpoint*  *Enable Button* 	Click text and enter desired value (Range = 0 to 5 rpm) Click icon to jog axis	Axis jog command utilizes velocity setpoint Green = Jogging (Button is pressed) Red = Not jogging (Button is released) Axis jogs while button is pressed.
Abort Motion Button 	Click icon to stop all motion	All axes of motion stop Green = Aborting (Button pressed) Red = Not aborting (Button not pressed)
Axis Position Settings *Position Velocity*  *Position (Degrees)*  *Position Setpoint*  *Enable Button* 	Click text and enter desired value (Range = 0 to 20 rpm) No action. This data field is provided to display system status. Click text and enter desired value Press button to move axis	Axis moves to position setpoint utilizing position velocity setpoint Indicates current axis position in degrees Axis moves to position when *Enable* button is actuated Axis moves to current position setpoint Green = Moving Red = Done or not moving

Axis Parameters Acceleration 	Click text and enter desired value	Sets axis acceleration for position, velocity, homing, and jog actions. Smaller acceleration values are preferred for smooth, error free motion – larger acceleration values start and stop the axis quickly and can shift samples.
I Max (A) 	Click text and enter desired value	Sets maximum motor current for all motion actions
P (Proportional) 	Click text and enter desired value	Sets proportional term for position actions. This term determines the amount of change in position to be applied in achieving the desired position (larger values can lead to unstable operation).
I (Integral) 	Click text and enter desired value	Sets integral term for position actions. This term does not usually need to be changed from its default value.
D (Derivative) 	Click text and enter desired value	Sets derivative term for position actions. This term does not usually need to be changed from its default value.
Station Setpoint 	Click text and enter desired substrate station	The runtime software sets the desired position in degrees based on the source/substrate position table, then enables the platen position button Refer to Substrate Position Key for station command details

Actual Station 	None	Displays the requested station for the active substrate The actual station is determined based on the station setpoint and the maximum position error
Maximum Error 	Click text to enter maximum allowable station error	The maximum error is used when comparing the platen position (in degrees) versus the desired station position. If the current platen position is within acceptable limits, the actual station reflects the station setpoint
Source X / Substrate X (**Substrate Position Key**)	Click text to enter the desired station setpoint in degrees	The platen will move to the desired position when the station setpoint is used in conjunction with the enable position button

Operation – Cooling



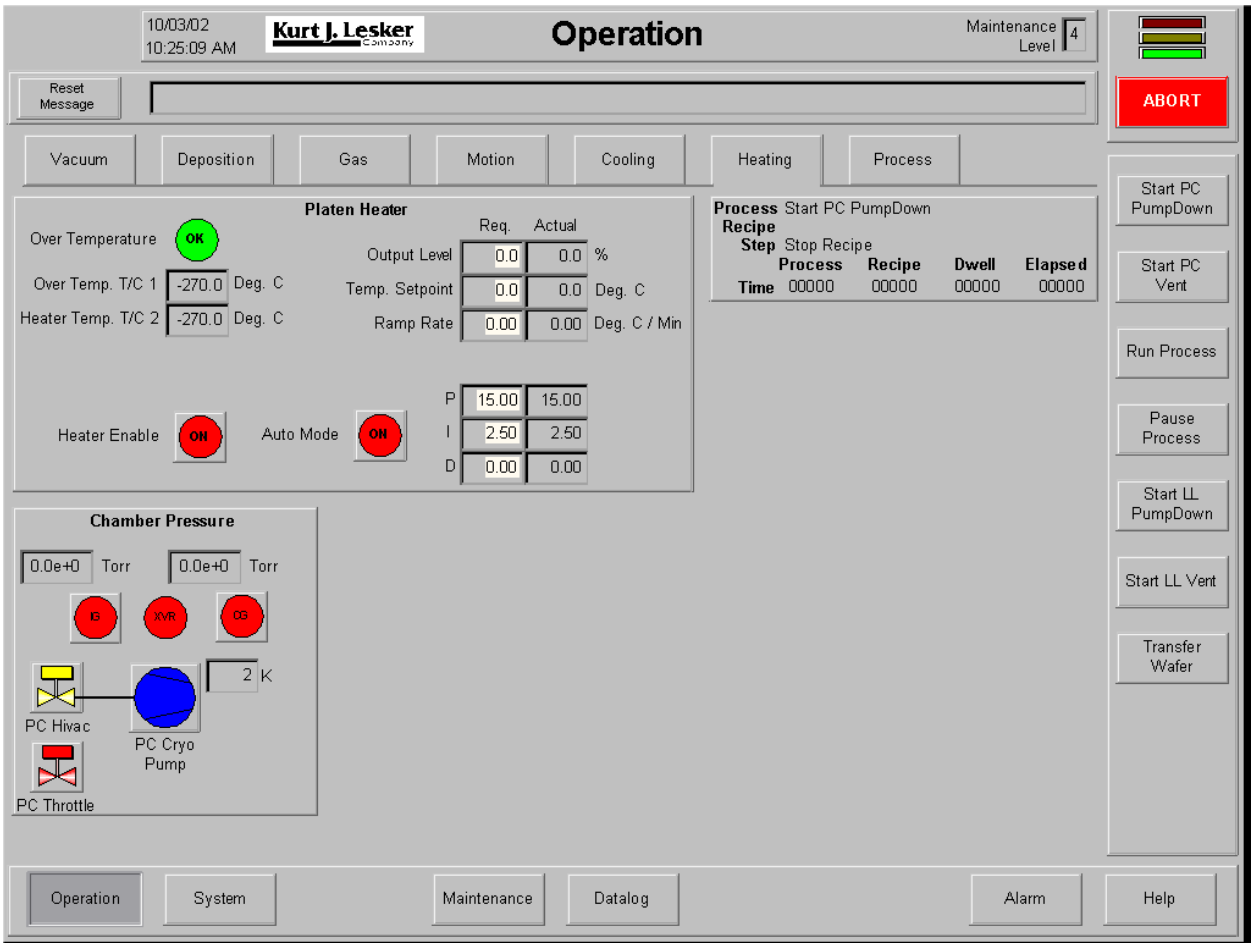
Operation – Cooling Screen

Using the Operation – Cooling Screen
The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Flow Switch(es) FLS FLS	No action. These icons are provided to display system status.	Green = Flow setpoint satisfied Red = Flow setpoint not satisfied

Operation – Heating

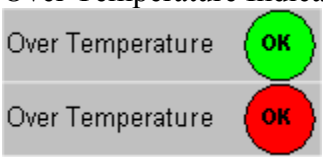
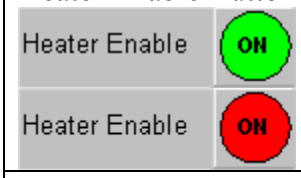
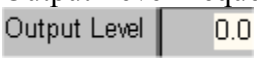
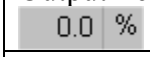
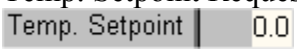
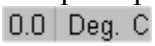


Operation – Heating Screen

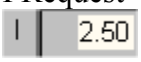
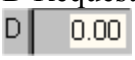
Using the Operation - Heating Screen
The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
T/C Temperature Display Over Temp. T/C 1 -270.0 Heater Temp. T/C 2 -270.0	None	Displays current temperature of corresponding thermocouple in Degrees C.

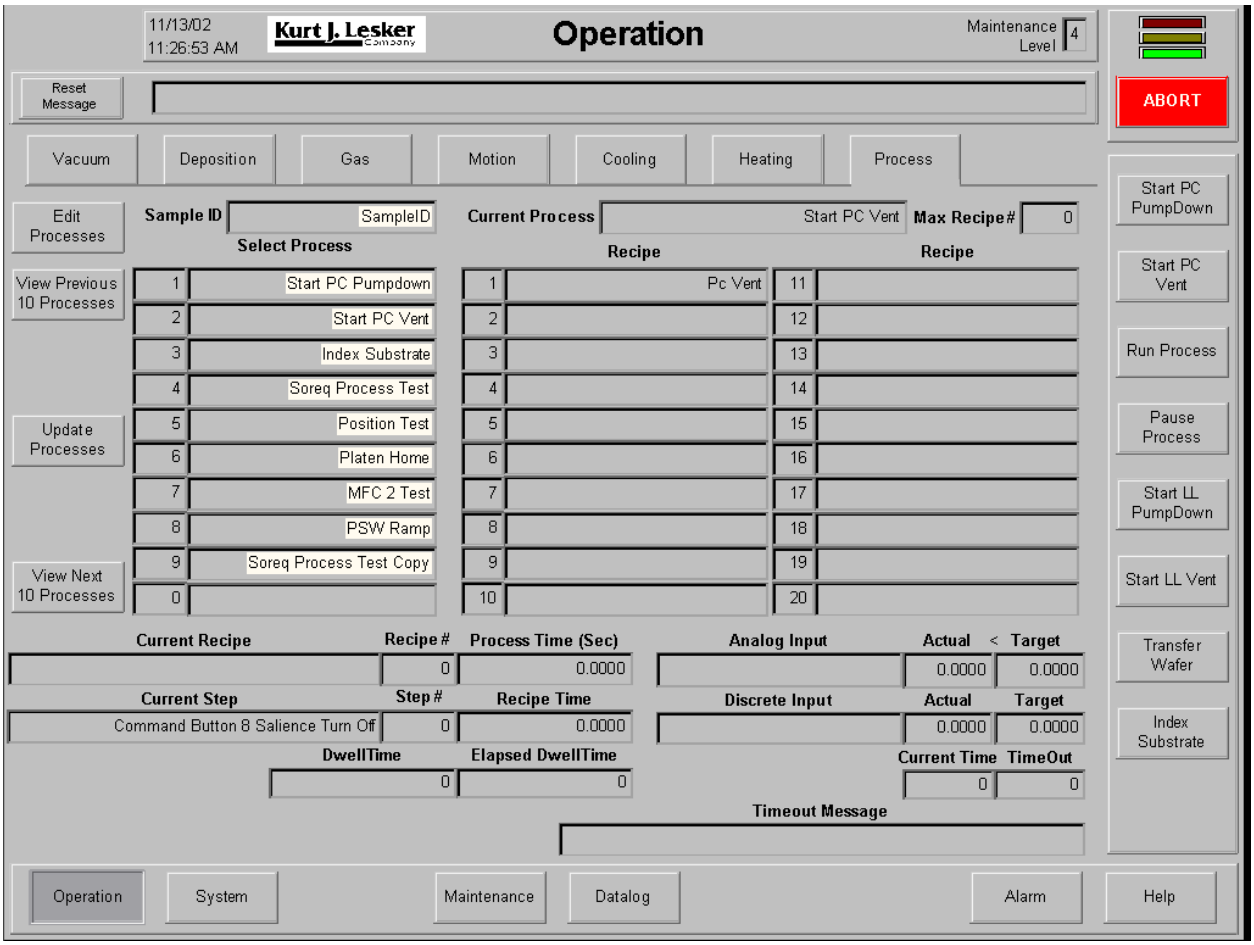
Over Temperature Indicator 	None	Green = Heater not over temperature Red = Heater over temperature
Heater Enable Button 	Press the button	Green = Heater On Red = Heater Off
Auto Mode Button 	Press the button	Green = Auto Mode Enabled Red = Auto Mode Disabled When Auto Mode is Enabled, Heater is controlled by Temperature setpoint rather than % power.
Output Level Request 	Select this field to set the desired Heater output as a percentage of full scale.	When Auto Mode is disabled, the heater can be controlled by power setpoint.
Output Level Actual 	None	Displays the current heater output as a percentage of full scale.
Temp. Setpoint Request 	Select this field to change the desired target Temperature Setpoint. This box also displays the current Temperature Setpoint.	When Auto Mode is enabled, this box is used in conjunction with the Ramp Rate box to achieve the desired temperature. If a ramp rate is desired, it must be entered PRIOR to entering the desired temperature.
Temp. Setpoint Actual 	None	When Auto Mode is enabled, this box displays the current temperature control setpoint. If a ramp rate has been specified, this box displays the temperature setpoint as it ramps up rather than the final target temperature (displayed in the Request box).

Ramp Rate Request Ramp Rate | 0.00	Select this field to enter the desired ramp rate for Auto Mode.	Once a ramp rate is entered followed by a new Temperature Setpoint Request, the heater will ramp to the desired value. NOTE: The ramp rate starting point is the CURRENT Temperature Setpoint Request, NOT the current temperature. To avoid delays in achieving the desired ramp temperature, be sure to set the Temperature Setpoint Request close to the actual temperature, then set the desired ramp parameters and finally the target temperature.
Ramp Rate Actual 0.00 | Deg. C / Min	None	Displays the current ramp rate
P Request P | 15.00	Select this field to enter the Proportional coefficient for the Auto Mode temperature control loop.	The corresponding value is displayed in the actual box and the control loop is immediately changed. CAUTION: Disable Auto Mode while adjusting PID parameters.
P Actual 15.00	None	Displays the current coefficient for Auto Mode control. The P term determines the change in heater output power applied to compensate for differences between actual and desired temperature. Typically, larger P terms are required for greater thermal mass.

I Request 	Select this field to enter the Integral coefficient for the Auto Mode temperature control loop.	The corresponding value is displayed in the actual box and the control loop is immediately changed. CAUTION: Disable Auto Mode while adjusting PID parameters.
I Actual 	None	Displays the current coefficient for Auto Mode control. This term does not typically need to be adjusted from its factory default value.
D Request 	Select this field to enter the Derivative coefficient for the Auto Mode temperature control loop.	The corresponding value is displayed in the actual box and the control loop is immediately changed. CAUTION: Disable Auto Mode while adjusting PID parameters.
D Actual 	None	Displays the current coefficient for Auto Mode control. This term does not typically need to be adjusted from its factory default value.

Refer to Vacuum Screen icon chart for Chamber Pressure icon information.

Operation – Process Screen

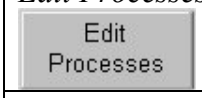
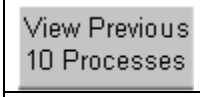
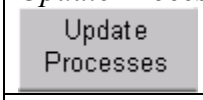
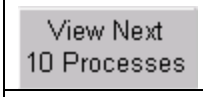
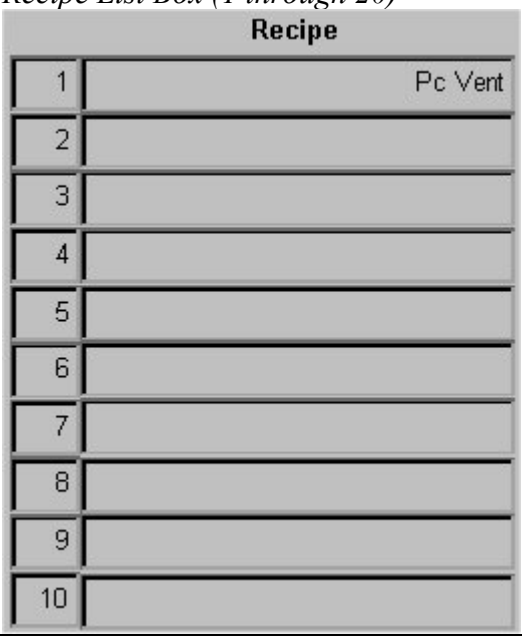


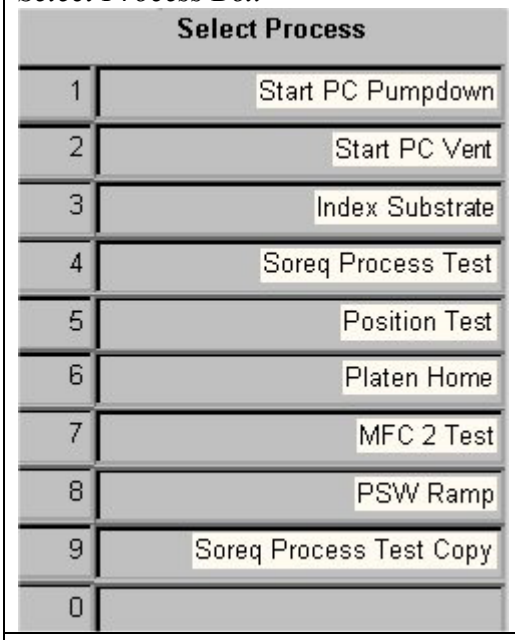
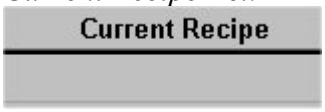
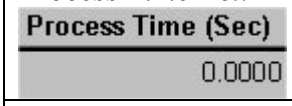
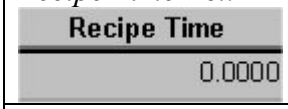
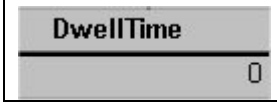
Operation – Process Screen

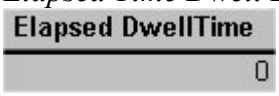
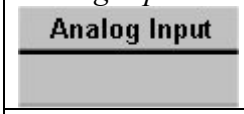
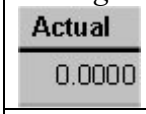
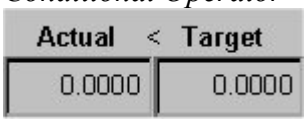
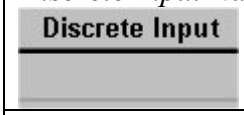
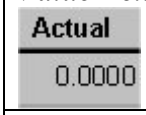
Using the Operation – Process Screen

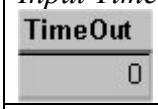
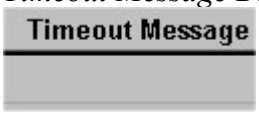
This screen is used to select a process to be executed in the automated deposition tool. This screen is also used to monitor the progress of the selected process. The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

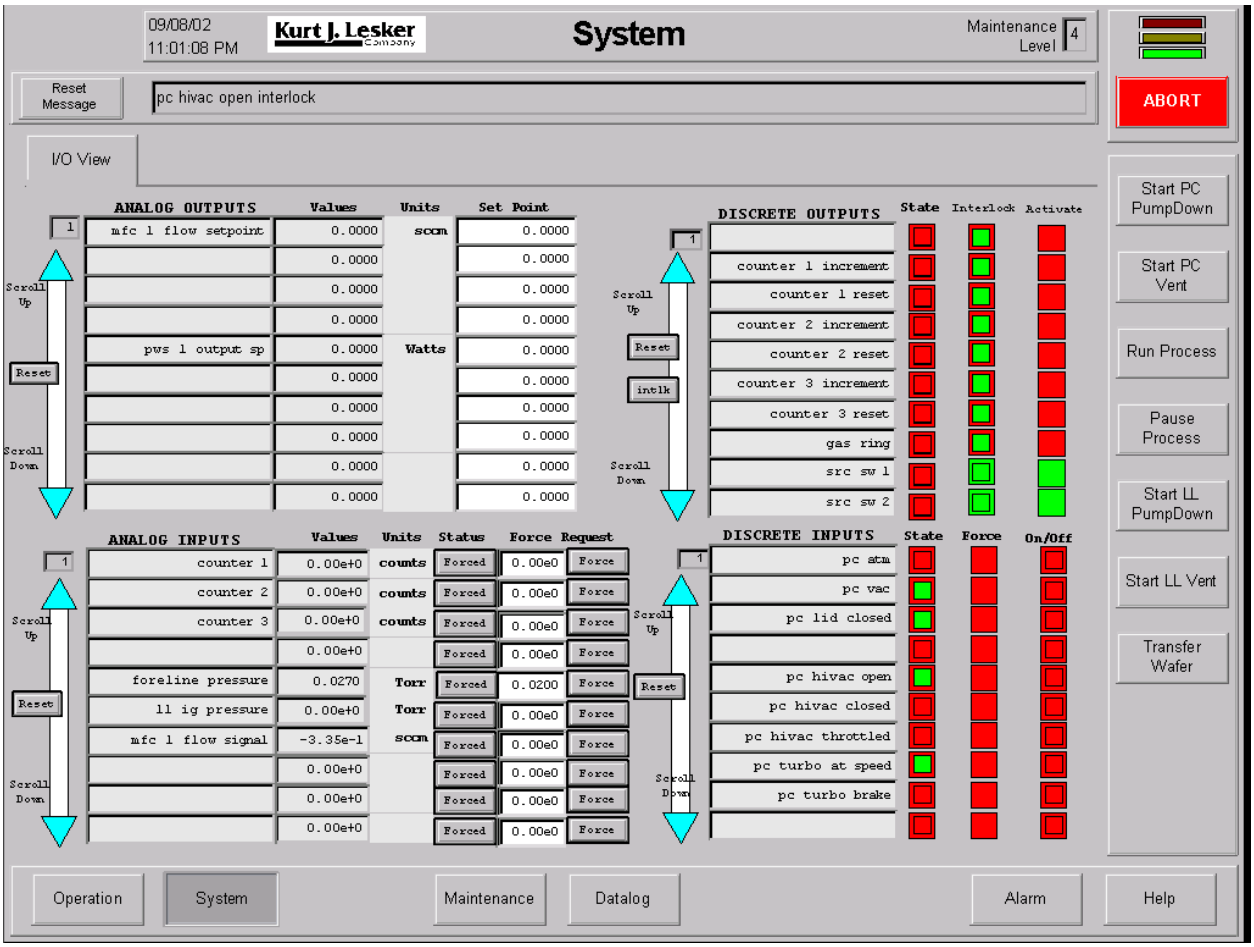
ICON or DATA FIELD	ACTION	RESULT
Edit Processes 	Press button to edit processes	Starts Microsoft Access and opens project database
View Previous 10 Processes 	Press button to view previous ten processes	Select process list scrolls to display previous ten processes
Update Processes 	Press button to update processes	Updates available list of processes from process database
View Next 10 Processes 	Press button to view next ten processes	Select process list scrolls to display next ten processes
Recipe List Box (1 through 20) 	No action. This box is provided to display system status.	Displays the first twenty recipes for the selected process

Select Process Box 	Click the *Process Name* text box	The process is selected as the current process. Pressing the *Run Process* button runs the selected process.
Current Recipe Box 	No action. This box is provided to display system status.	Displays the current recipe running for the active process. This box also displays the recipe number.
Process Time Box 	No action. This box is provided to display system status.	Displays total elapsed time for the current process
Current Step Box 	No action. This box is provided to display system status.	Displays current step name and number for active process
Recipe Time Box 	No action. This box is provided to display system status.	Displays total elapsed time for current recipe of active process
Dwell Time Box 	No action. This box is provided to display system status.	Displays dwell time setpoint for current step of active process

Elapsed Time Dwell Box 	No action. This box is provided to display system status.	Displays total elapsed time for current dwell step of active process NOTE: This box does not apply to steps that contain only a *Timeout* time
Analog Input Name Box 	No action. This box is provided to display system status.	Displays name of analog input signal for timeout step of current recipe
Analog Actual Value Box 	No action. This box is provided to display system status.	Displays actual value of analog input signal for timeout step
Analog Target Value Box 	No action. This box is provided to display system status.	Displays desired value of analog input signal for timeout step Also see *Greater Than/Less Than Conditional Operator*
Greater Than/Less Than Conditional Operator 	No action. This box is provided to display system status.	Displays comparison operator for analog input actual and target values
Discrete Input Name Box 	No action. This box is provided to display system status.	Displays name of discrete input signal for timeout step of current recipe
Discrete Input Actual Value Box 	No action. This box is provided to display system status.	Displays actual value of discrete input signal for timeout step
Discrete Input Target Value Box 	No action. This box is provided to display system status.	Displays desired value of discrete input for timeout step

Current Time Box 	No action. This box is provided to display system status.	Displays total elapsed time for conditional check of timeout step
Input Timeout Box 	No action. This box is provided to display system status.	Displays maximum time allowed for input to reach desired value (target value)
Timeout Message Box 	No action. This box is provided to display system status.	Displays timeout message from current recipe step if input signal does not reach target value within time allowed
Sample ID Box 	Click the text to enter an alphanumeric ID for the current sample	The current sample ID is displayed and recorded in the process datalog
Max Recipe # Box 	No action.	Displays the execution order number of the last recipe in the currently selected process

System – I/O View



System - I/O View Screen

Using the System - I/O View Screen

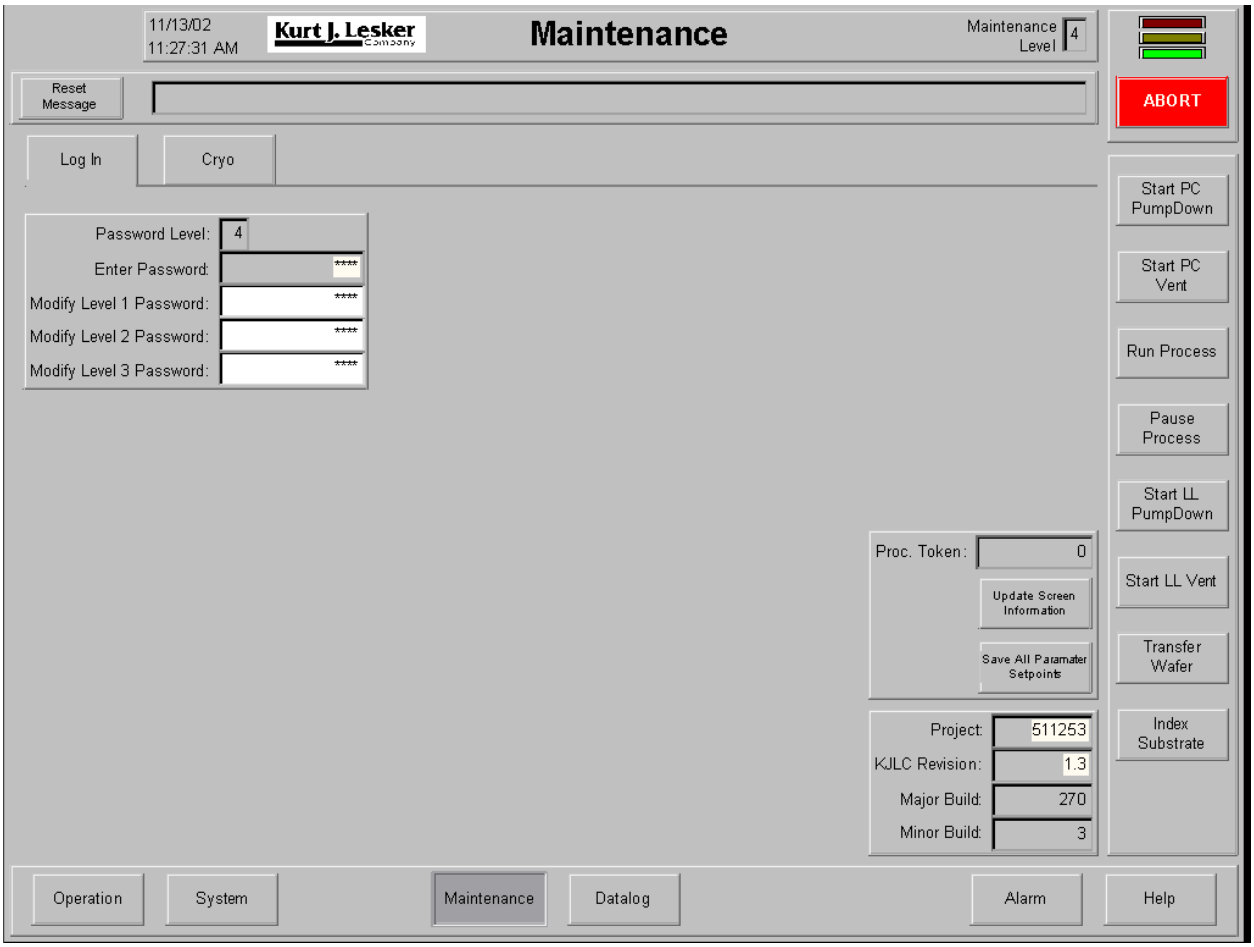
This screen is used to monitor the interlocks associated with system inputs and outputs. The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Starting Display Order Number	None	Indicates the display order number of the signal at the top of the list. Signals are displayed in groups of 10; a Starting Display Order number of 11 indicates that signals 11-20 are currently being displayed.
Scroll Up/Scroll Down Arrows	Click the arrow	Clicking the up arrow displays the previous 10 signals (list stops at #1); clicking the down arrow displays the next 10 signals (list stops at 500).
Discrete Output Signal Name	None	Displays name of signal as configured in the system database
Discrete Output State (inner indicator)	None	Red = Output signal is off Green = Output signal is on
Discrete Output State (outer indicator/button)	Press to toggle the state of an output request	Red = Request is off Green = Request is on
Discrete Output Interlock (inner indicator)	None	Red = Interlock condition not satisfied Green = Interlock condition satisfied
Discrete Output Interlock (outer indicator)	None	Red = Interlock activated (interlock conditions apply to output) Green = Interlock deactivated (no interlock conditions required to turn output on)
Discrete Output Activate Interlock	Press to toggle the activation of an interlock	Red = Interlock deactivated (interlock conditions not required or are ignored for the respective output) Green = Interlock activated (interlock conditions required to activate output)
Discrete Input Signal Name	None	Displays name of signal as configured in the system database

Discrete Input State (inner indicator)	None	Red = Input signal is off Green = Input signal is on
Discrete Input State (outer indicator)	None	Red = Force active Green = Force not active
Force Button	Press to toggle the activate a force condition	Red = Force not activated Green = Force activated
Force State On/Off Button and Indicator (inner and outer square, respectively)	Press to change the state to which the respective input is being forced	Red inner, Green outer = Input state forced off (if force active) Green inner, Red outer = Input state forced on (if force active) Red inner, Red outer = no force active
Analog Output Signal Name	None	Displays name of signal as configured in the system database
Analog Output Value	None	Displays the current value of the signal
Analog Output Units	None	Displays the units associated with the signal as configured by the system database
Analog Output Setpoint	Click the entry field to set the desired value	The value of the analog output signal is changed accordingly
Analog Input Signal Name	None	Displays name of signal as configured in the system database
Analog Input Value	None	Displays the current value of the signal
Analog Input Units	None	Displays the units associated with the signal as configured by the system database
Analog Input Forced Status	None	Indicates if the respective signal is currently forced Green = Forced
Analog Input Force Setpoint	Click the entry field to set the desired value	When the Forced Status indicator is green, the respective signal is forced to the desired setpoint
Analog Input Force Request Button	Click the button to toggle the force condition	When the Force Request is activated or deactivated, the value of the respective signal is forced or unforced accordingly

Maintenance – Log In



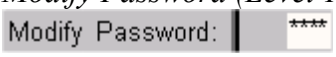
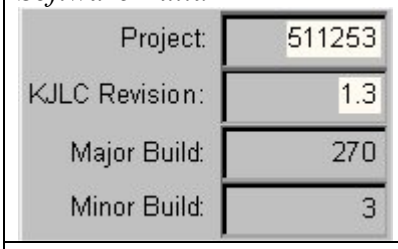
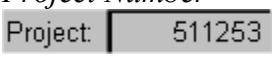
Maintenance – Log In Screen

Using the Maintenance – Log In Screen

This screen is used to navigate to a higher Maintenance Level. The following chart outlines the use of icons and data fields on this screen.

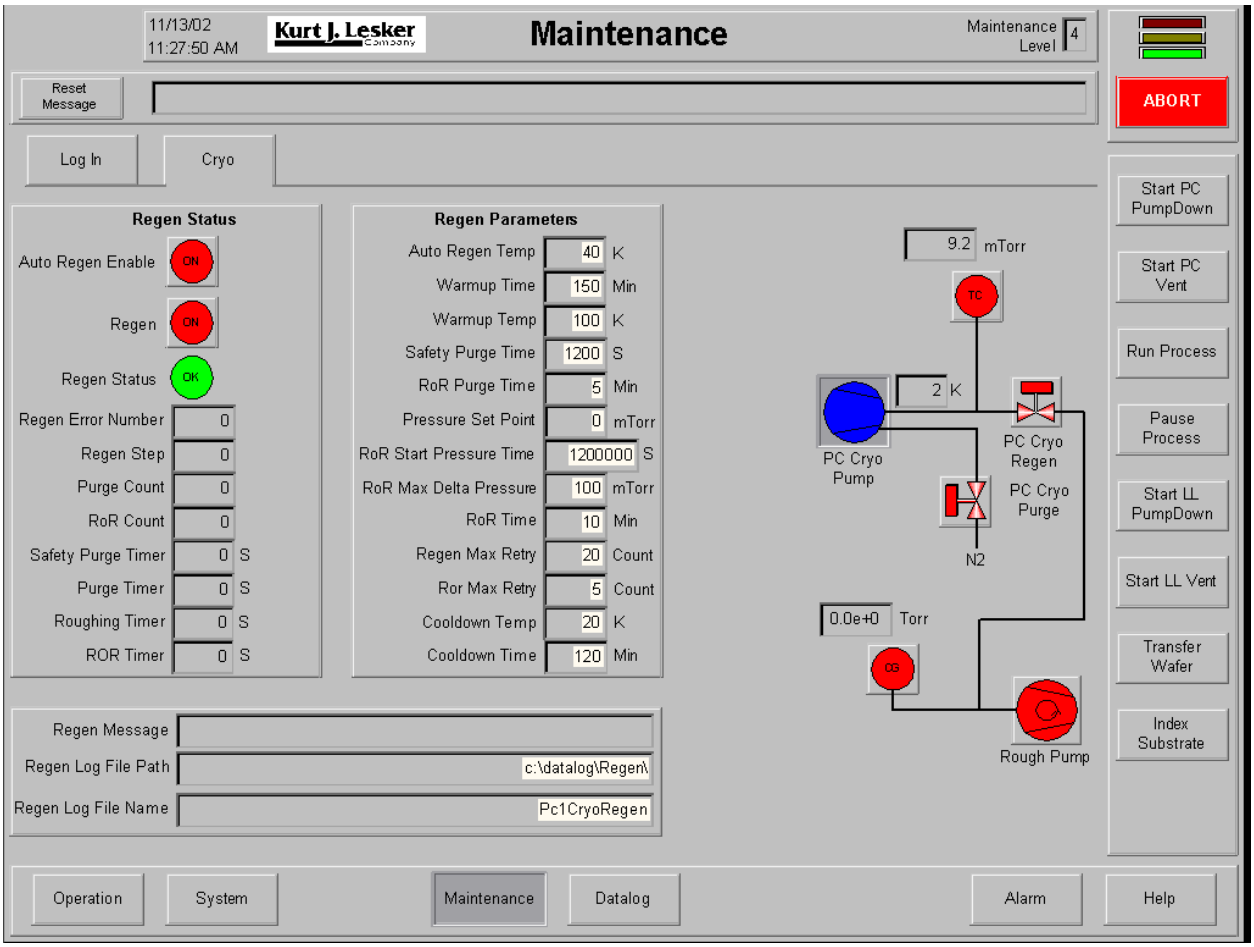
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Password Level Password Level: 4	No action. This box is provided to display system status.	Indicates current password level

Enter Password 	Click text to enter password	The password level is set based on the entered value. KJLC customers are provided with default password for levels 1, 2 and 3 that can be modified. Level 1 = 15151 Level 2 = 15152 Level 3 = 15153
Modify Password (Level 1-3) 	Click text to enter value	The password level is set to the entered value. NOTE: This option is only available in password level 3. It is strongly recommended that the customer change these passwords appropriately upon installation of the system.
Software Build 	No action. This box is provided to display system status.	Displays current major and minor builds for the Runtime Software, as well as current KJLC revision
Project Number 	Click to enter the current project number	The current project number for Runtime Software is updated NOTE: This option is only available to Maintenance Level 4
Process Token Number 	None	Displays current automated process token number. If number is zero, no processes are currently active.

Save All Parameter Setpoints 	Click the button	All PID control, device setup, position setpoints etc. are permanently stored NOTE: Ensure all power supply, heater, motion speed, gas flow and pressure setpoints are zero prior to using this button. If any of these values are not zeroed prior to this action, the current values will be used on software startup.

Maintenance – Cryo

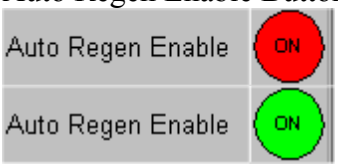
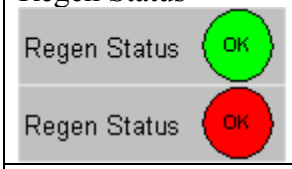
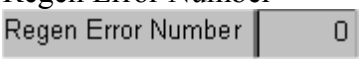
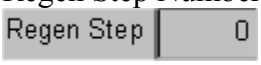
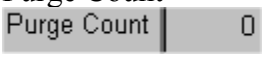


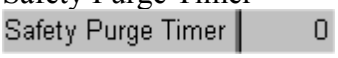
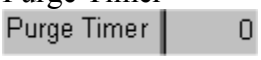
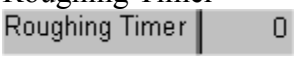
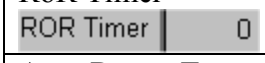
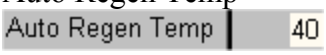
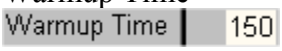
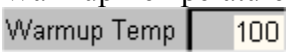
Maintenance – Cryo Screen

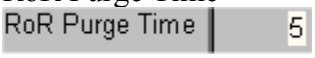
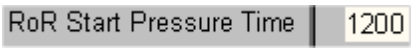
Using the Maintenance - Cryo Screen
The following chart outlines the use of icons and data fields on this screen.

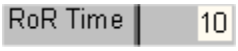
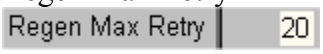
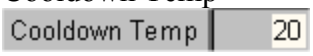
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

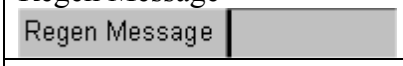
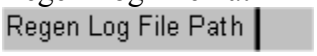
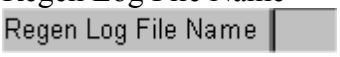
Refer to the Cryo Regeneration and Startup Sequence description following the icon chart for details regarding the automated regeneration sequence.

ICON or DATA FIELD	ACTION	RESULT
Auto Regen Enable Button 	Press the button to enable/disable Auto Regen	Red = Automatic Regen Disabled Green = Automatic Regen Enabled When enabled, cryo pump regeneration will occur if cryo temperature is greater than maximum allowable value while system is running or upon system startup. Regeneration will no occur if another automated process is running.
Regen Button 	Press the button to start/stop Regen	Red = Regen inactive Green = Regen in progress This button can be used in a maintenance mode to manually initiate cryo pump regeneration. Regeneration will not occur if another automated process is running.
Regen Status 	None	Red = Regen error Green = Regen status normal
Regen Error Number 	None	Displays the current error number for a regeneration. Reserved for KJLC troubleshooting purposes.
Regen Step Number 	None	Displays the current regeneration step. 1 = Close All Valves 2 = Warmup 3 = Safety Purge 4 = Purge/ROR 5 = Cooldown
Purge Count 	None	Displays the current number of attempted Purge/RoR (Rate-of-Rise) cycles. The regeneration routine can perform a maximum of 20 Regen cycles before a regeneration fails.

RoR Count 	None	Displays the number of attempted Rate-of-Rise checks for the current Purge cycle. The regeneration routine can perform a maximum of 5 RoR attempts for a given purge.
Safety Purge Timer 	None	Displays the elapsed value of the Safety Purge Timer for the current regeneration.
Purge Timer 	None	Displays the elapsed value of the Purge timer for the current Purge cycle.
Roughing Timer 	None	Displays the elapsed value of the timer associated with the pump evacuation portion of the purge cycle.
RoR Timer 	None	Displays the elapsed time for the current Rate-of-Rise check
Auto Regen Temp 	Select this field to enter the maximum allowable temperature before an automatic Regen will occur. This box also displays the current Auto Regen Temp value.	The current cryo pump temperature is compared to this setpoint to determine if regeneration is required. This comparison occurs at system startup and during system operation if Auto Regen is enabled.
Warmup Time 	Select this field to enter the maximum allowable warmup time for step 1 of a regen sequence. This box also displays the current Warmup Time value.	The cryo pump must warmup within the specified time limit to successfully complete step 1 of an automatic regeneration.
Warmup Temperature 	Select this field to enter warmup temperature for step 1 of the regeneration sequence	Cryopump must warmup to specified temperature within warmup time to successfully complete step 1 of an automatic regeneration

Safety Purge Time 	Select this field to enter the desired purge time prior to beginning the Purge/RoR cycles. This box also displays the current Safety Purge Time value.	Upon completion of the warmup step, the cryo pump is purged with dry nitrogen for the specified time prior to beginning the Purge/RoR cycles. This is necessary to reduce the potential presence of combustible gasses prior to turning on the thermocouple gauge in cryo pump, as this gauge is a source of ignition.
RoR Purge Time 	Select this field to enter the desired purge time for the Purge/RoR cycles. This box also displays the current Purge Time value.	At the beginning of each Purge/RoR cycle, the cyro pump is purged with dry nitrogen for the specified time.
Pressure Set Point 	Select this field to enter the desired pressure for cryo pump evacuation. This box also displays the current pressure setpoint	After the purge phase of a Purge cycle is complete, the regen routine verifies that the foreline has achieved this setpoint and then evacuates the cryo pump until the cryo thermocouple gauge also reads at or below this pressure. If this pressure is not achieved, the current Purge/RoR cycle fails and the Purge counter is incremented.
RoR Start Pressure Time 	Select this field to enter the maximum allowable time for the foreline and/or pump to achieve the desired Pressure Set Point during pump evacuation. This box also displays the current Time value.	The foreline and cryopump, respectively, must achieve the desired Pressure Set Point within the time specified to start a Rate-of-Rise test. Otherwise, the current Purge/RoR cycle fails and the Purge counter is incremented.

RoR Max Delta Pressure 	Select this field to specify the maximum allowable pressure increase for the Rate-of-Rise test. This box also displays the current maximum value.	This delta pressure value is used in conjunction with the RoR Time specified and compared to the pump's actual RoR.
RoR Time 	Select this field to specify the desired time for the RoR check. This box also displays the current RoR Time value.	The once the cryopump has been evacuated to the desired Pressure Set Point and all valves are closed, the change in pump pressure must not exceed the Max Delta Pressure for the duration of the time specified.
Regen Max Retry 	Select this field to enter the maximum number of Regen cycles desired. This box also displays the current Max Retry value.	The regeneration routine will perform the specified number of Regen retries before failing. A Regen cycle consists of one purge and 1-5 RoR attempts per purge.
RoR Max Retry 	Select this field to enter the maximum number of RoR retries desired. This box also displays the current Max RoR Retry value.	The regeneration routine will perform the specified number of RoR retries before failing the current Regen cycle. A Rate-of-Rise consists of evacuating the pump to the desired pressure and performing a Rate-of-Rise test.
Cooldown Temp 	Select this field to enter the desired Cooldown temperature for an automatic regeneration. This box also displays the current Cooldown Temp value.	The regeneration routine successfully completes when the cryo pump reaches the target temperature within the allowed time.

Cooldown Time 	Select this field to enter the desired Cooldown Time for an automatic regeneration. This box also displays the current Cooldown Time value.	The regeneration routine successfully completes when the cryo pump reaches the target temperature within the allowed time.
Regen Message 	None	Displays the current regen step description or error message
Regen Log File Path 	Select this field to change the desired location for the automatic regeneration log file.	Each time an automatic regeneration is initiated, a unique log file is created in the specified location documenting all of the parameters on the cryo screen.
Regen Log File Name 	Select this field to change the desired name of the automatic regeneration log file.	Each time an automatic regeneration is initiated, a unique log file is created with the specified name. The current date and time are appended to this text giving each log a unique name.

Refer to Vacuum Screen icon chart for information regarding vacuum plumbing shown on this screen.

Cryo Regeneration and Startup Sequence

The Runtime software supports three standard cryo pump control and maintenance features: automatic startup, one button regeneration sequence and automatic regeneration. Each of these features is described below.

Automatic pump startup applies to situations when the Runtime software is first started. Upon Runtime startup, the software immediately checks the temperature of the cryo pump. If the pump is below the Auto Regen Temperature (typically 40K), the software automatically starts the pump to try and cool it to the operating temperature range (usually less than 20K). This check only occurs once when the software is first started.

One button regeneration is available in maintenance levels 2 and above. To start the automated regeneration sequence, press the regen button in the upper left hand corner of the Cryo screen.

NOTE !

Automated regen is a process similar to pumpdown and vent. Only one process may be run on the tool at a time. If a regen is in progress, the user may not start a pumpdown, vent or any other process.

The Runtime software regeneration sequence executes as follows:

1) The software verifies no other processes are in progress, clears any previous regen errors and starts the regeneration (Regen indicator turns green).
2) The rough pump and foreline convectron gauge are turned on, then the cryo pump is turned off. Additionally, all backing and regeneration valves are closed.
3) The sequence waits for the cryo pump to warm up to the Warmup Temp within the allotted Warmup Time. If the pump fails to warm up quickly enough, the regeneration sequence fails.
4) Once the cryo pump has warmed up, the sequence purges the pump for the period of time specified by the Safety Purge Time plus an additional second. Once this purge is complete, the sequence turns on the cryo thermocouple gauge.

NOTE !

The purpose of the Safety Purge is to remove potentially combustible gases prior to turning on the cryo thermocouple gauge (a source of ignition). Regardless of whether an automated or manual regeneration is being performed, the thermocouple gauge is interlocked such that it cannot be turned on until the pump is off and has been purged for a period of time greater than the Safety Purge Time. Anytime the pump is started again, the interlock is reset (no longer satisfied) and requires that the pump be purged again before the interlock is satisfied.

5) After the safety purge is complete, the sequence starts the purge/regeneration/Rate-of-Rise (RoR) cycles. The software will perform up to 20 RoR cycles (Regens) prior to failing an automated regeneration as specified by the Regen Max Retry parameter. Additionally, each Regen attempt may consist of one RoR Purge and between 1 and 5 RoR retries (evacuation followed by a RoR test) as specified by the RoR Max Retry parameter.

   Initially, the pump is purged for the specified RoR purge time. Once the purge is complete, the purge valve is closed and the sequence verifies that the foreline pressure is below the Pressure Set Point. If the foreline pressure does not reach the setpoint within the specified RoR Start Pressure Time, the regeneration fails. Once the foreline is at or below pressure, the regen valve is opened and the pump is evacuated. If the cryo thermocouple gauge fails to reach the Pressure Set Point within the RoR Start Pressure Time, the sequence will attempt up to four more times to evacuate the pump and achieve the desired Pressure Set Point. If the setpoint is achieved, the software closes the regen

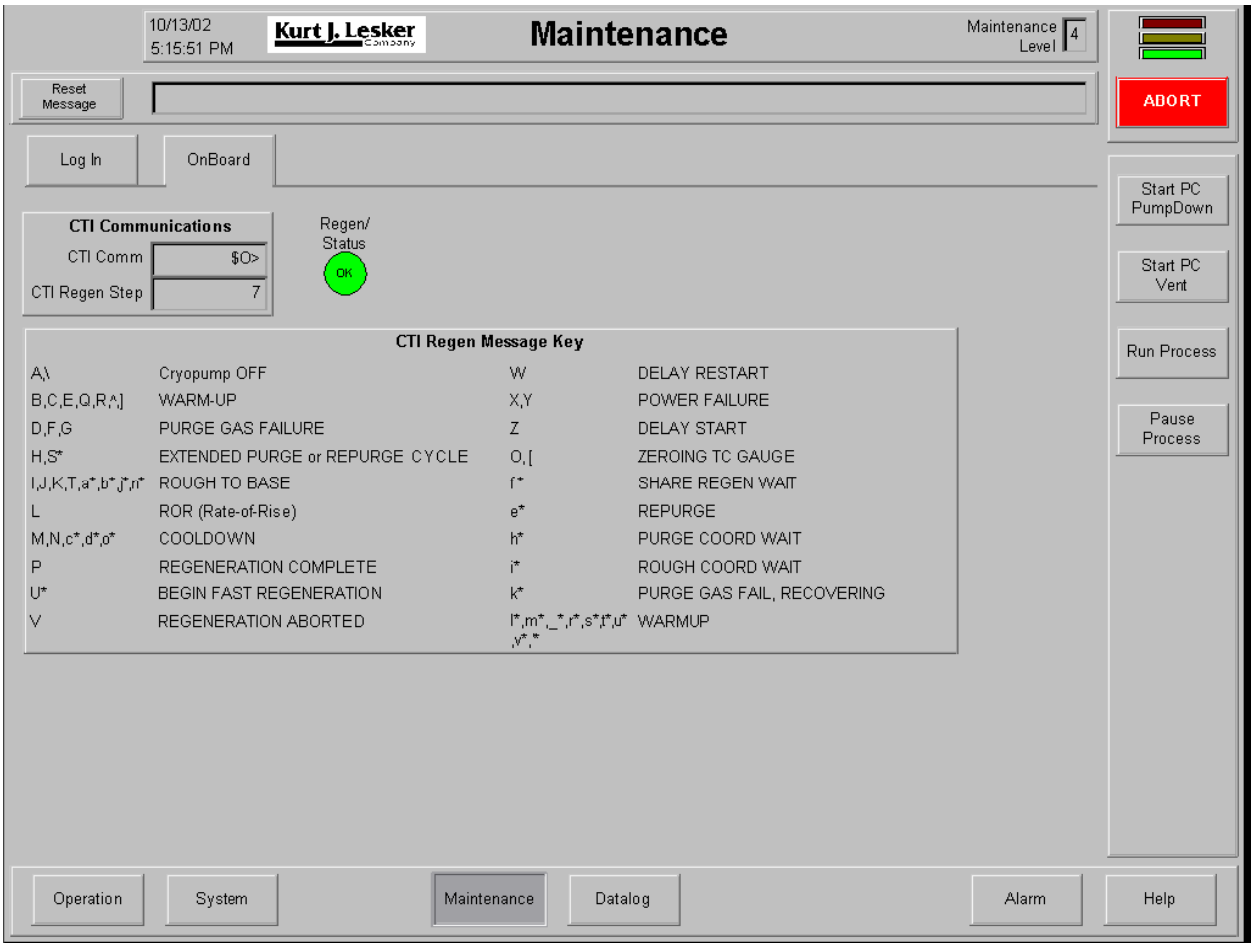
valve and begins a RoR test; other wise, a new Purge/RoR cycle is started. In order for the RoR test to pass, the change in cryo pump pressure must not exceed the RoR Max Delta Pressure over the specified RoR time (usually an average Rate-of-Rise of less than 10mTorr/minute, or 100 mTorr over 10 minutes, signifies a successful regeneration). If all of the Regens fail (up to a maximum of twenty), the regeneration sequence fails.

6) Once the RoR test has passed, the sequence starts the Cooldown phase. The cryo pump must cool down to the specified Cooldown Temperature within the specified Cooldown time. If this does not occur, the regeneration sequence fails.

Once the automated regeneration sequence has completed successfully, the Regen indicator will turn red and the Regen error indicator will still be green indicating no errors. The Regen message box will contain a successful regen message.

The Auto Regen feature, when activated, enables the Runtime software to automatically regenerate the cryo pump as needed. Ordinarily, if the software first starts and the pump is not below the Auto Regen Temperature, it will not automatically regenerate the cryopump. However, if the Auto Regen feature was enabled prior to the previous Runtime shutdown, the software will automatically start a Regen (provided no other processes are active). Additionally, anytime the cryo pump temperature rises above the Auto Regen Temperature (and no other process is active), the Runtime software will automatically initiate a Regen. Maintenance level 2 or higher is required to enable the Auto Regen feature. Once this feature is enabled, however, an automatic regeneration can start regardless of the current Maintenance level.

Maintenance – Cryo OnBoard



Maintenance – Cryo OnBoard

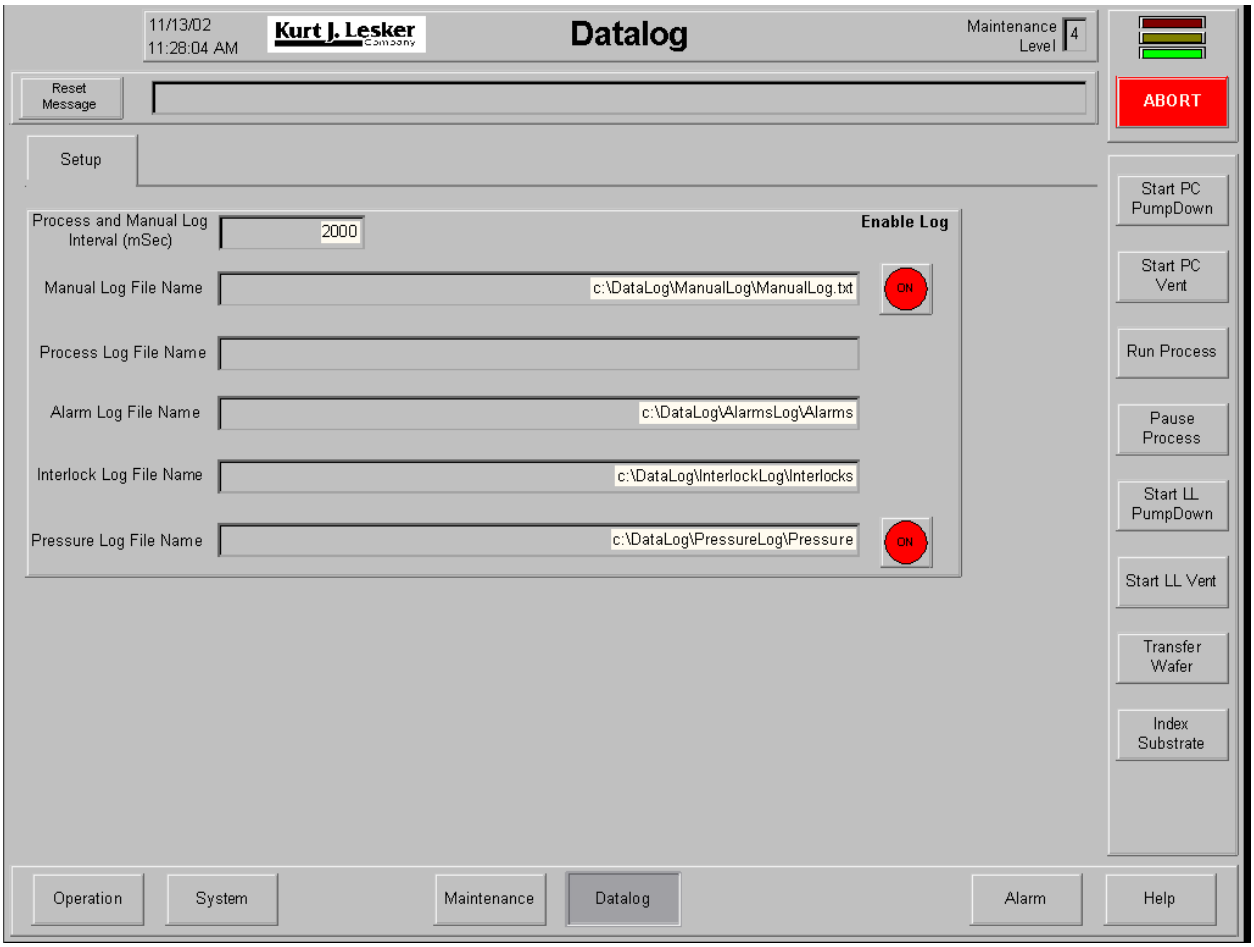
Using the Maintenance – Cryo OnBoard Screen
The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
CTI Comm CTI Comm $O>	None	Displays the messages sent to and received from the OnBoard cryo pump

CTI Regen Step 	None	Displays the current step of the on board regen sequence
Regen/Status Indicator 	None	Displays the status of regen activity at the OnBoard cryo pump Red = Pump is off and not regenerating (not ready) Yellow = Pump is regenerating Green = Pump is on and not regenerating (ready)

Datalog – Setup Screen

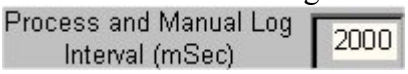


Datalog – Setup Screen

Using the Datalog - Setup

This screen is used to track and initiate system datalog information. The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Process and Manual Log Interval 	Click to enter desired value	Sets interval for manual and process datalogging in milliseconds NOTE: Minimum = 2000 msec
Manual Log File Name 	Click to enter filename and path	Manual log information will be stored in corresponding file name
Process Log File Name 	No action. This box is provided to display system status.	Process information is stored in corresponding file name. This file name is generated at the time a process is selected and run
Alarm Log File Name 	Click to enter filename and path	All alarm events are logged in corresponding file (appending)
Interlock Log File Name 	Click to enter filename and path	All interlock events are logged in corresponding file (appending)
Pressure Log File Name 	Click to enter filename and path	All pressure gauge readings (in mTorr) are logged in corresponding file when log is enabled
Enable Log 	Press icon to enable log	Data logging is initiated for corresponding datalog set Green = Logging Red = Not Logging

Alarm – Process Alarms Screen

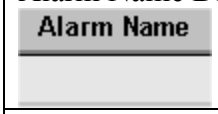
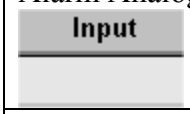
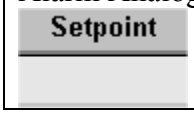
Alarm – Process Alarms Screen

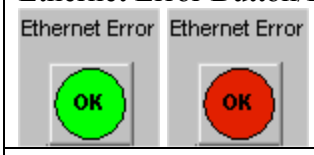
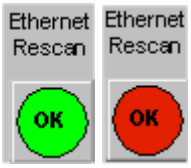
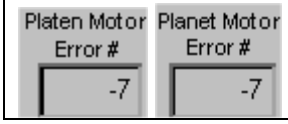
Using the Alarm – Process Alarms Screen

This screen is used to monitor system alarms. The following chart outlines the use of icons and data fields on this screen.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Update Alarms Button Update Alarms	Press the Update Alarms Button	The first 25 alarms are read/updated from the project database and displayed on the screen

Start Button 	Press the Start Alarm Button	The button turns green anytime the alarm is active. An alarm may be started and stopped manually, as in maintenance mode, or from a process
Yellow Button 	Press the Yellow Alarm Button	The button turns yellow when a yellow condition has occurred for the corresponding alarm. The yellow button will reset the yellow alarm, but if the alarm is still active and the yellow condition is still present, the button will still be illuminated. Besides pressing the yellow button, this alarm is also reset by starting a new process.
Red Button 	Press the Red Alarm Button	The button turns red when a red condition has occurred for the corresponding alarm. The red button will reset the red alarm, but if the alarm is still active and the red condition is still present, the button will still be illuminated. If the red alarm is configured to abort the process, the system (as well as the current process) will be aborted unless the alarm is cleared or turned off. Besides pressing the red button, this alarm is also reset by starting a new process.
Alarm Name Display 	None	Displays corresponding alarm name
Alarm Analog Input Display 	None	Displays system analog input signal monitored by alarm
Alarm Analog Setpoint Name 	None	Displays system analog output (setpoint) monitored by alarm

Ethernet Error at Slot # Display 	None	Displays the slot number of the corresponding I/O module currently experiencing a communications error.
Ethernet Error Button/Indicator 	Press the button to reset an Ethernet Communications Timeout Error	Green = No Timeout Error Red = Timeout Error
Ethernet Rescan Button/Indicator 	Press the button to reset module errors and rescan I/O	Green = No Error Red = Error
Motor Error # Indicator 	None	Displays the current error number for the corresponding axis (refer to motor manufacturer documentation)

Help – Help Screen

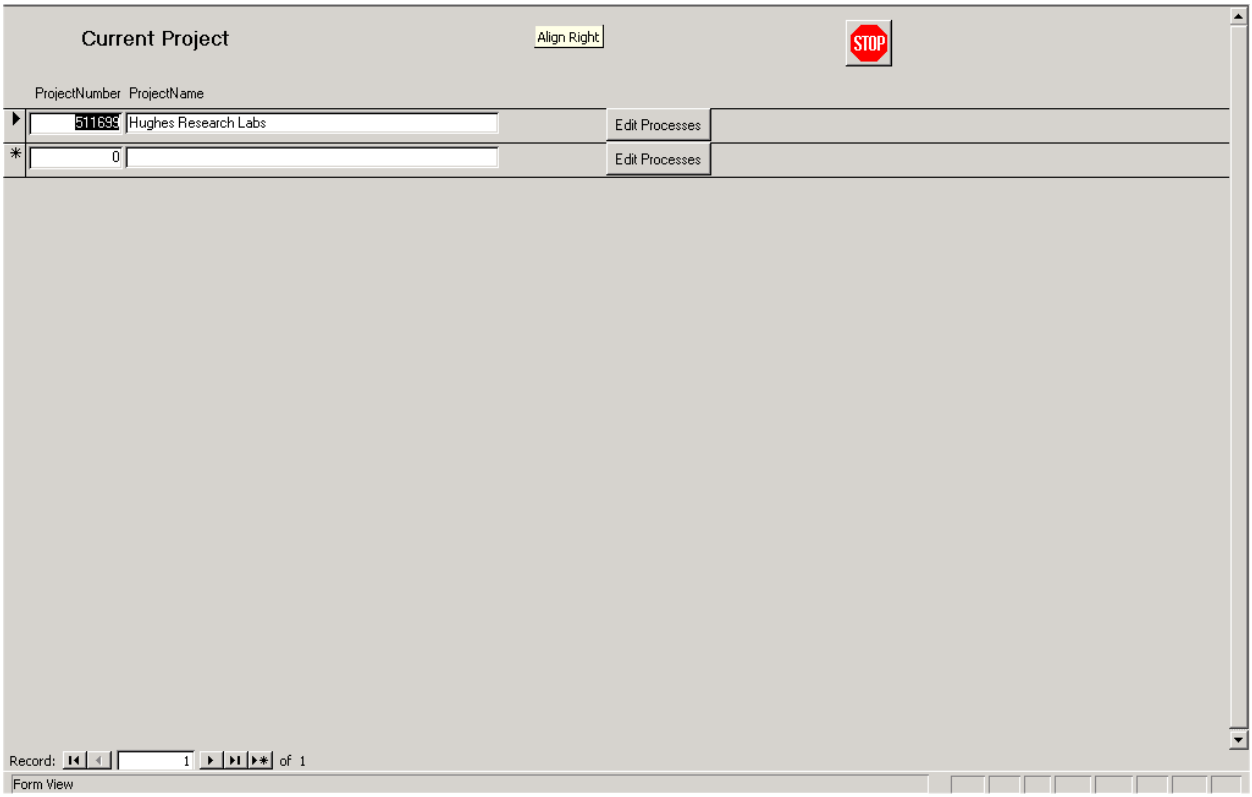
This screen is reserved for future use. For technical assistance, please contact:

Kurt J. Lesker Company
Process Equipment Division
1515 Worthington Avenue
Clairton, PA 15025
Phone: 412-233-4200
Fax: 412-233-4275
Toll Free: 1-800-245-1656
www.lesker.com

ACCESS FORMS

The following forms are described in this section:

Current Project Form

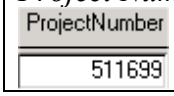


Current Project Form

Using the Current Project Form

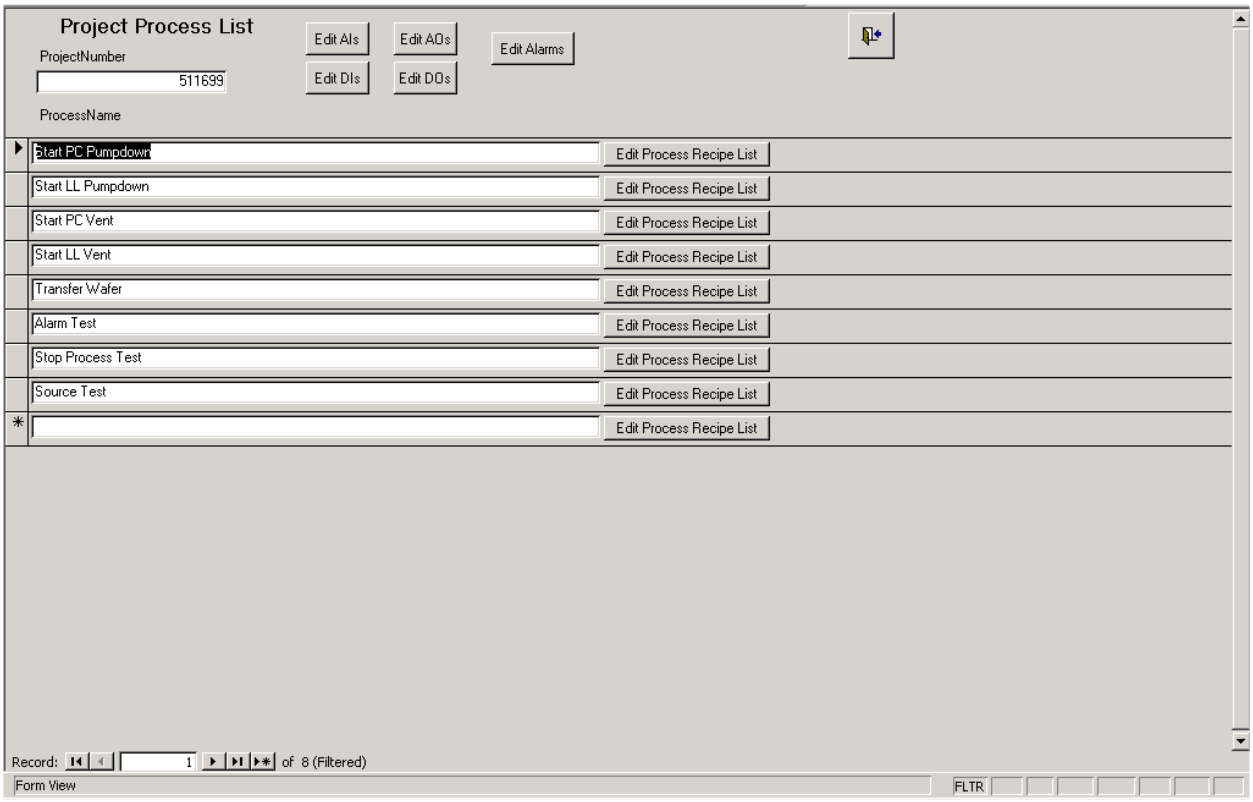
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Stop 	Press the Stop button	Closes the project database and closes Access
Project Number 	None	Displays the current (active) Project Number for the Runtime Software

Project Name ProjectName Research Labs	None	Displays the current Project Name
Edit Processes Edit Processes	Press the Edit Processes button	Opens the Project Process List form

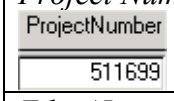
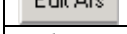
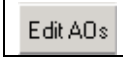
Project Process List Form

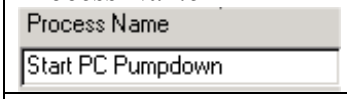


Project Process List Form

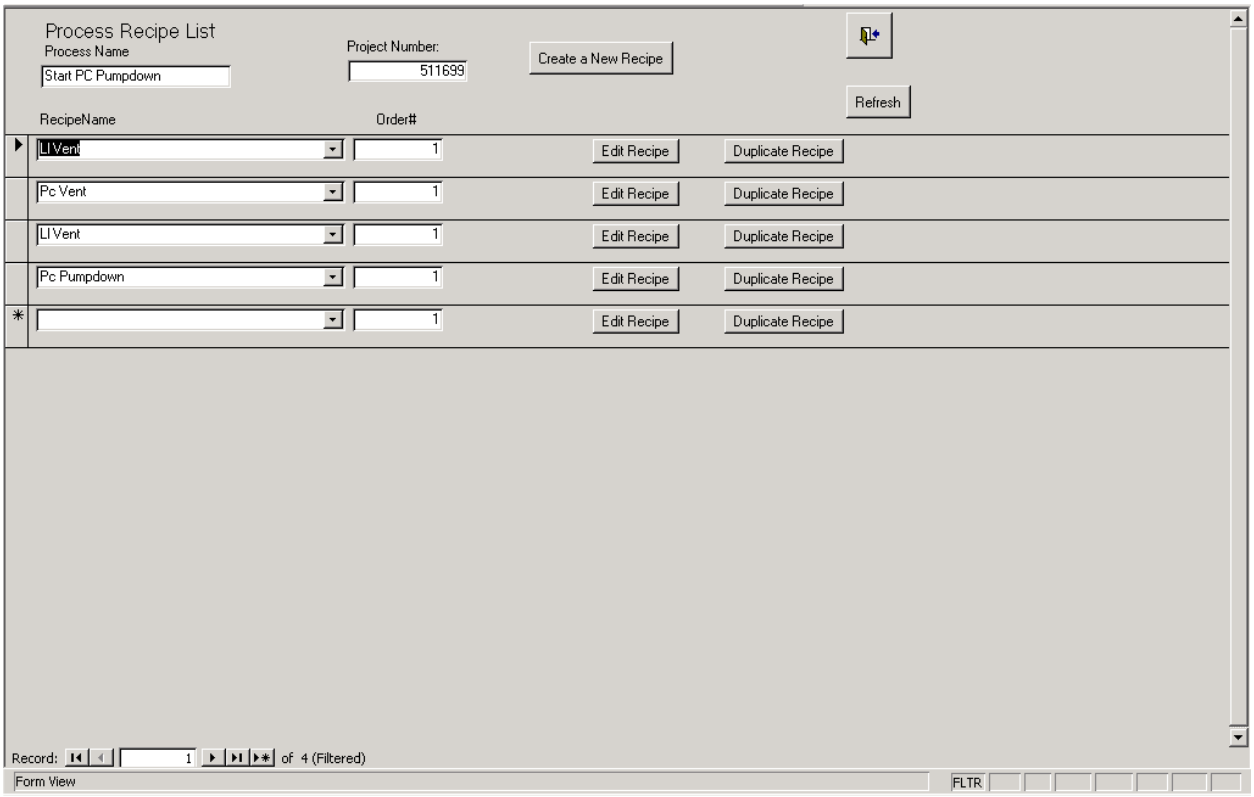
Using the Project Process List Form
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Project Number 	None	Displays the current Project Number
Edit AIs 	Press the Edit AIs button	Opens the Edit AIs form
Edit AOs 	Press the Edit AOs button	Opens the Edit AOs form

Edit Alarms 	Press the Edit Alarms button	Opens the Edit Alarms form
Edit DIs 	Press the Edit DIs button	Opens the Edit DIs form
Edit DOs 	Press the Edit DOs button	Opens the Edit DOs form
Close Form 	Press the Close Form button	Closes the current form
Process Name 	None	Displays the current Process being modified
Edit Process Recipe List 	Press the Edit Process Recipe List button	Opens the Process Recipe List form

Process Recipe List Form

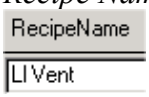
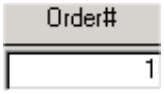


Process Recipe List Form

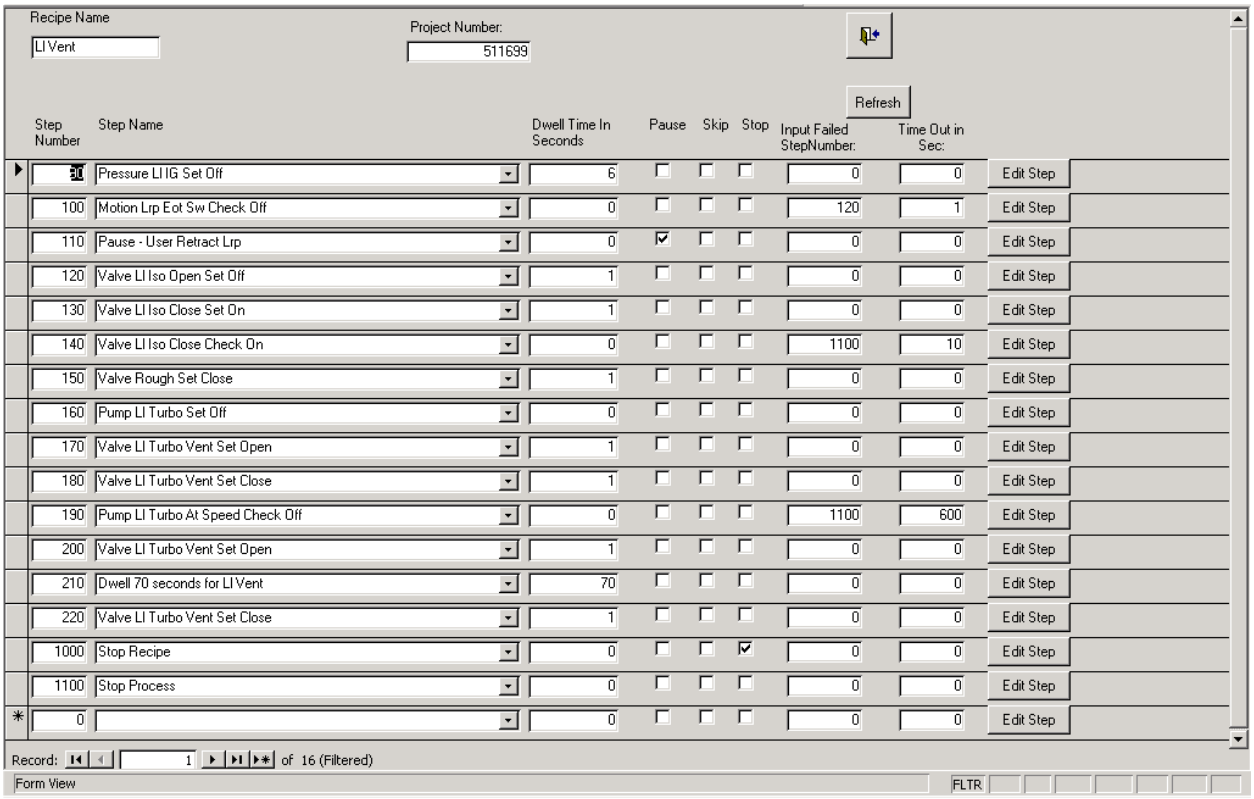
Using the Process Recipe List Form
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Process Name Process Name Start PC Pumpdown	None	Displays the current Process being modified
Project Number ProjectNumber 511699	None	Displays the current Project Number

Close Form 	Press the Close Form button	Closes the current form
Refresh 	Press the Refresh button	Updates the pulldown list of recipe names available for selection Use this button when returning to this form from the Create a New Recipe form
Recipe Name  **NOTE**: Use the arrow button on the right of the Recipe Name data field to select from a scroll down list of all saved recipe names.	Press the pulldown arrow to open a list of Project Recipes and highlight the desired recipe	The highlighted recipe is added to the current process
Edit Recipe 	Press the Edit Recipe button	Opens the Edit Recipe form
Duplicate Recipe 	Press the Duplicate Recipe button	Opens the Duplicate Recipe form
Order Number Text Box 	Click the Order Number box and enter the desired process sequence number for the corresponding recipe Right click any Order Number box and choose "Sort Ascending"	Recipes are executed in the order displayed Reorders the Process Recipes in increasing numerical order

Edit Recipe Form

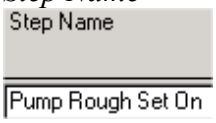
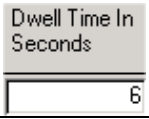


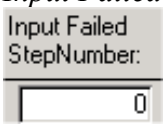
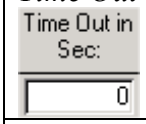
Edit Recipe Form

Using the Edit Recipe Form
The following chart outlines the use of icons and data fields on this form.

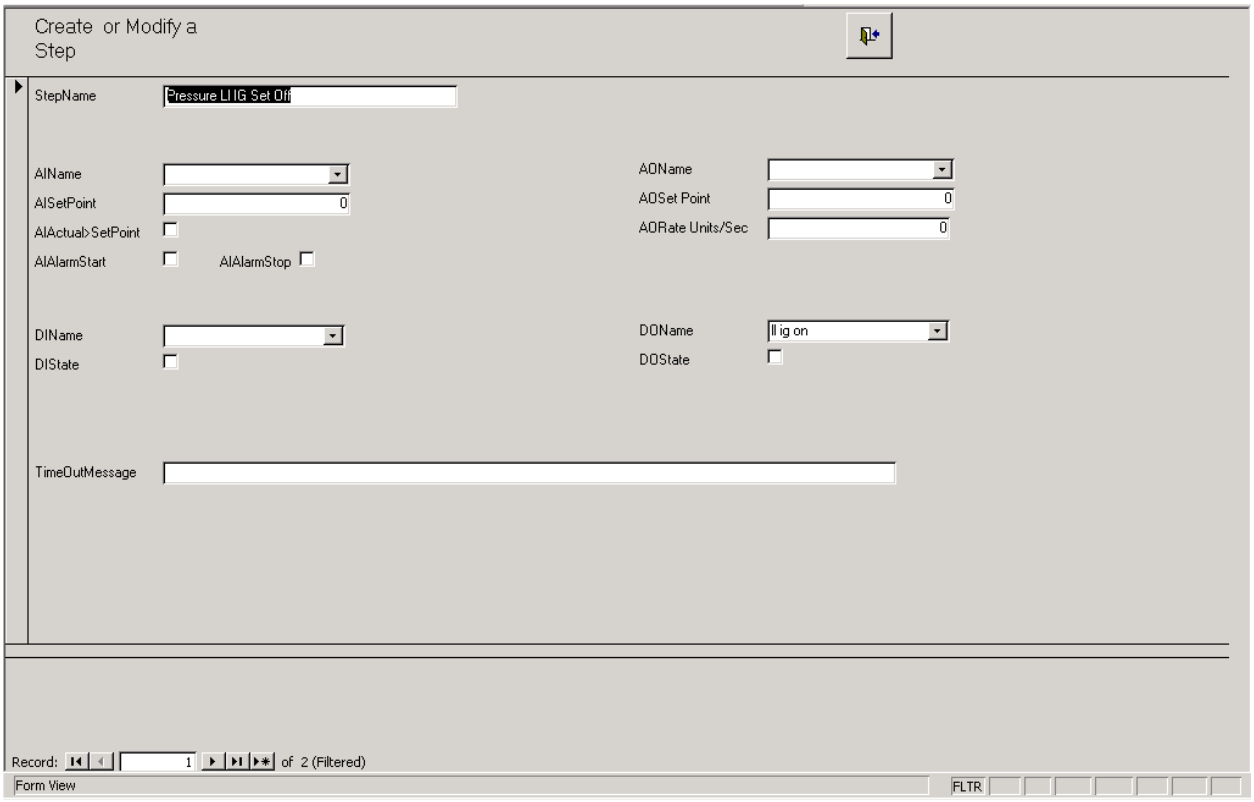
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Recipe Name RecipeName LI Vent	None	Displays the current Recipe being modified
Project Number ProjectNumber 511699	None	Displays the current Project Number

Close Form 	Press the Close Form button	Closes the current form
Refresh 	Press the Refresh button	Updates the pulldown list of Step Names Use this button after entering a new Step Name on this form
Step Number 	Click the Step Number box and enter the desired sequence number for the corresponding step Right click and choose "Sort Ascending"	Steps are executed in the order displayed Steps are sorted and displayed in increasing numerical order
Step Name  NOTE: Use the arrow button on the right of the Recipe Name data field to select from a scroll down list of all saved recipe names.	Click the pulldown arrow and select the desired Step Name Click the Step Name box and enter a new Step Name	The highlighted Step is added to the current Recipe The new Step Name is added to the current Recipe (use the Refresh button to view the new Step Name in the pulldown list)
Dwell Time In Seconds 	Click the Dwell Time box and enter the desired Dwell Time	When the Process is run, the next Recipe Step will not be executed until the Dwell Time has expired (see also Time Out)
Pause 	Click the Pause check box	When the Process is run, the current Recipe Step will be executed and the Process will pause indefinitely (Process is resumed by pressing the Resume button on the Operation screens)

Skip 	Click the Skip check box	When the Process is run, the current Recipe Step will not be executed
Stop 	Click the Stop check box	When the Process is run, checking this box signals the program that current Recipe is complete
Input Failed Step Number 	Click the Failed Step Number box and enter the desired Step Number	If the condition specified by the current Step has not been satisfied within the Time Out time, the Recipe executes the Input Failed Step Number rather than the next sequential Step Number
Time Out in Sec 	Click the Time Out in Seconds box and enter the desired Time Out time	See "Input Failed Step Number" result
Edit Step 	Press the Edit Step button	Opens the Edit Step form

Create or Modify a Step Form

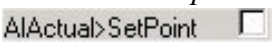


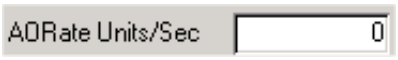
Create or Modify a Step Form

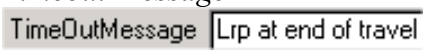
Using the Create or Modify a Step Form
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

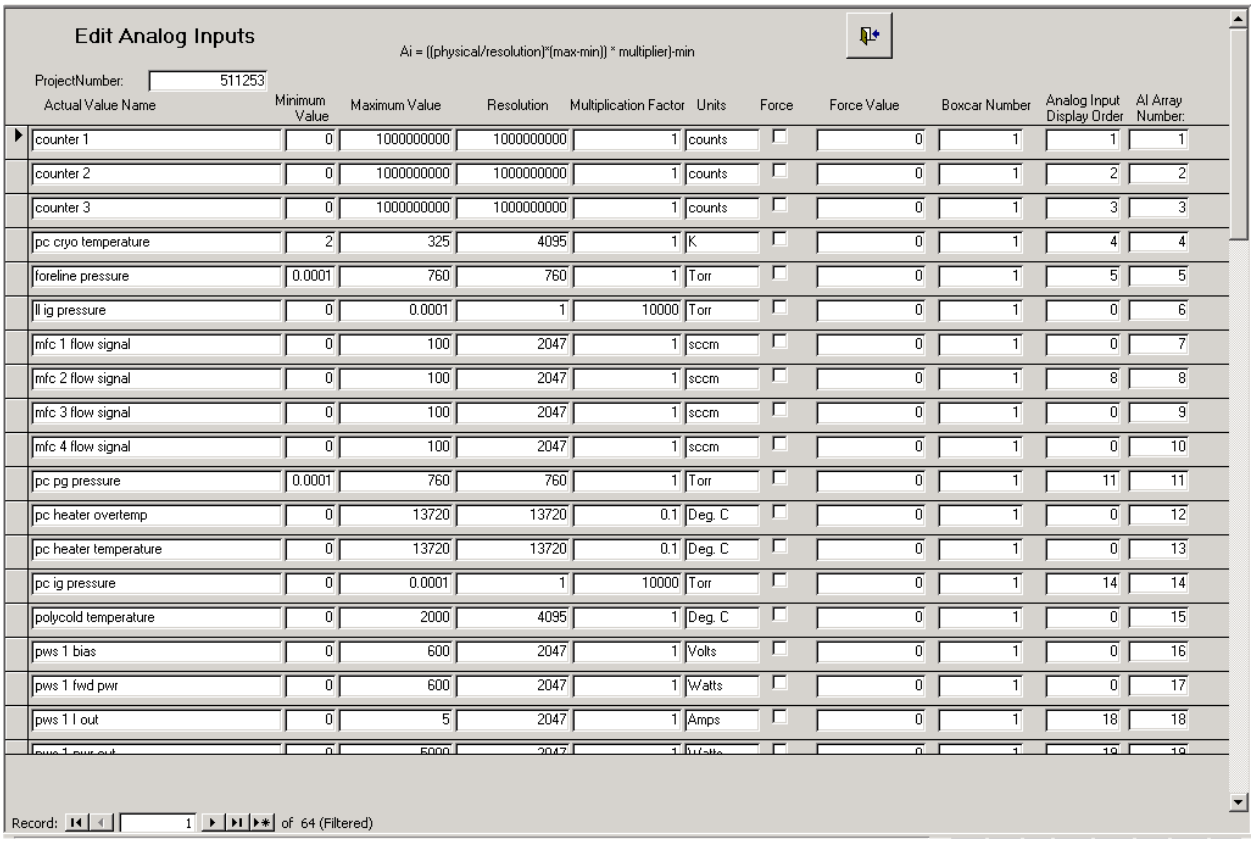
Icon or Data Field	Action	Result
Close Form 	Press the Close Form button	Closes the current form
Step Name 	None	Displays the current Step being modified

AI Name  NOTE: Use the arrow button on the right of the AI Name data field to select from a scroll down list of all Analog Input signals.	Click the pulldown arrow and highlight the desired Analog Input	The selected input is used in conjunction with the Setpoint, Setpoint > Actual, and Alarm boxes to create a Recipe Step with a condition check (see also "Time Out" on Edit Recipe form
AI Setpoint  	Click the AI Setpoint box and enter the desired setpoint	The Setpoint is compared to the actual value of the analog input when this Step is executed. If the desired condition is not true, the program will continue to compare the values for the entire Time Out time
AI Actual> Setpoint  	Click the Actual > Setpoint check box	When the Recipe Step is executed, the actual value of the Analog Input must be greater than the Setpoint for the Step condition to be satisfied
AI Alarm Start  	Click the AI Alarm Start check box	The associated Analog Input (selected from the Analog Input pulldown box) Alarm is activated and remains active until the Alarm Stop check box is selected in a future Recipe Step If the Alarm is not stopped before the Process stops, the Alarm condition will continue to be evaluated
AI Alarm Stop  	Click the AI Alarm Stop check box	The associated Analog Input (selected from the Analog Input pulldown box) Alarm is stopped

AO Name  NOTE: Use the arrow button on the right of the Analog Output Name data field to select from a scroll down list of Analog Output signals.	Click the pulldown arrow and highlight the desired Analog Output	The selected Analog Output is set to the desired Setpoint utilizing the AO Rate
AO Setpoint  	Click the AO Setpoint Box and enter the desired value	The Analog Output is set to the desired Setpoint utilizing the AO Rate
AO Rate Units/Sec  	Click the AO Rate box and enter the desired value	The Analog Output is ramped (up or down) to the desired Setpoint If the Ramp Rate is zero, the Analog Output is immediately set to the desired setpoint with no ramp
DI Name  NOTE: Use the arrow button on the right of the DI Name data field to select from a scroll down list of all Discrete Input signals.	Click the DI Name box and select the desired Discrete Input signal	The highlighted DI is used in conjunction with the DI State check box to create a Recipe Step with a condition check (see also "Time Out" on Edit Recipe form
DI State  	Click the DI State check box	If the DI State check box is checked this signifies that the corresponding Discrete Input signal must be "on" or "true" for the Step condition to be satisfied If the box is not checked, the signal must be "off" or "false"

DO Name  NOTE: Use the arrow button on the right of the DO Name data field to select from a scroll down list of all Discrete Output signals.	Click the DO Name box and select the desired Discrete Output signal	The highlighted DO is turned on or off based on the DO State check box
DO State  	Click the DO state check box	If the DO state check box is checked this signifies that the corresponding Discrete Output signal is turned on If the check box is not checked, the signal is turned off
Timeout Message  	Click the TimeOutMessage box and enter the desired message	If the Step condition is not satisfied after the Time Out time expires, this message is displayed on the Process screen

Edit Analog Inputs Form



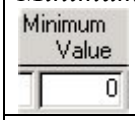
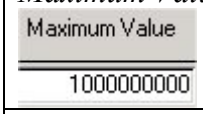
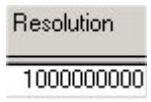
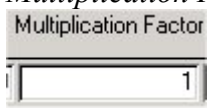
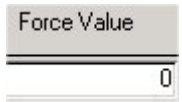
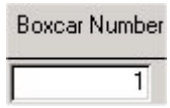
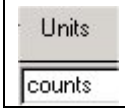
Actual Value Name	Minimum Value	Maximum Value	Resolution	Multiplication Factor	Units	Force	Force Value	Boxcar Number	Analog Input Display Order	AI Array Number:
counter 1	0	1000000000	1000000000	1	counts		0	1	1	1
counter 2	0	1000000000	1000000000	1	counts		0	1	2	2
counter 3	0	1000000000	1000000000	1	counts		0	1	3	3
pc cryo temperature	2	325	4095	1	K		0	1	4	4
foreline pressure	0.0001	760	760	1	Torr		0	1	5	5
ll ig pressure	0	0.0001	1	10000	Torr		0	1	0	6
mfc 1 flow signal	0	100	2047	1	sccm		0	1	0	7
mfc 2 flow signal	0	100	2047	1	sccm		0	1	8	8
mfc 3 flow signal	0	100	2047	1	sccm		0	1	0	9
mfc 4 flow signal	0	100	2047	1	sccm		0	1	0	10
pc pg pressure	0.0001	760	760	1	Torr		0	1	11	11
pc heater overtemp	0	13720	13720	0.1	Deg. C		0	1	0	12
pc heater temperature	0	13720	13720	0.1	Deg. C		0	1	0	13
pc ig pressure	0	0.0001	1	10000	Torr		0	1	14	14
polycold temperature	0	2000	4095	1	Deg. C		0	1	0	15
pws 1 bias	0	600	2047	1	Volts		0	1	0	16
pws 1 fwd pwr	0	600	2047	1	Watts		0	1	0	17
pws 1 I out	0	5	2047	1	Amps		0	1	18	18
pws 1 pwr out	0	5000	2047	1	Watts		0	1	19	19

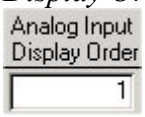
Edit Analog Inputs Form

Using the Edit Analog Inputs Form
The following chart outlines the use of icons and data fields on this form.

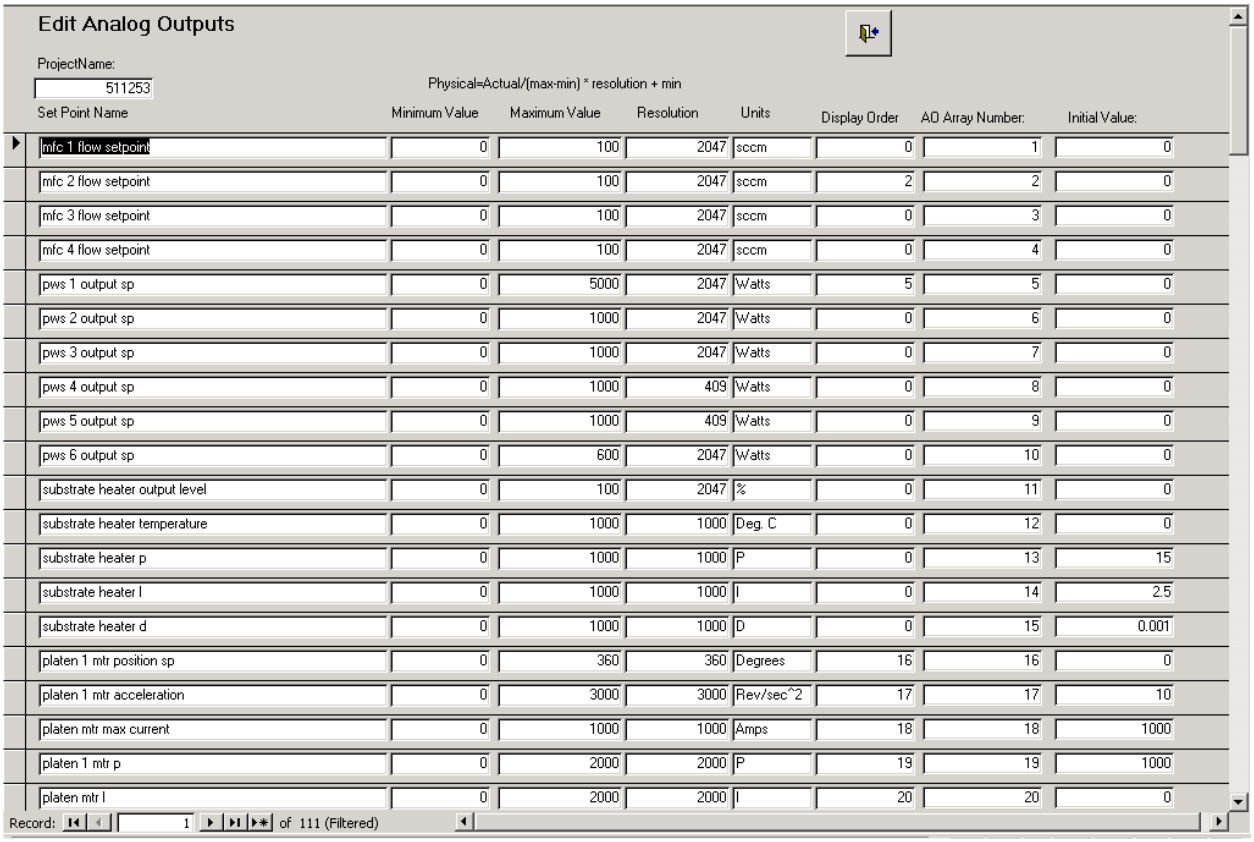
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Project Number ProjectNumber: 511253	None	Displays the current project number
Actual Value Name Actual Value Name counter 1	Click the textbox to enter the desired name of the new analog input signal	A new signal is created for system configuration and recipe use

Minimum Value 	Select the textbox and enter the minimum input value	The minimum value is used for calculation purposes in the runtime software
Maximum Value 	Select the textbox and enter the maximum value	The maximum value is used for calculation purposes in the runtime software
Resolution 	Select the textbox and enter the resolution for the physical I/O signal	The resolution is used in conjunction with the minimum and maximum values to convert the runtime physical value to engineering units
Multiplication Factor 	Select the textbox and enter the multiplication factor for the signal	This factor is used as an additional scaling feature for analog inputs, to be used in conjunction with resolution.
Force Checkbox 	Click the checkbox to select or deselect forcing the respective analog signal	When selected, the signal is forced to the Force Value continuously in the runtime software.
Force Value 	Click the textbox and enter the desired value	Used in conjunction with the Force checkbox
Boxcar Number 	Click the textbox and enter the desired value (1-20)	Values greater than 1 configure the runtime software to employ boxcar averaging on the desired signal to average out noise and fluctuations. A value of 10 reads the signal 10 times (one time every 50milliseconds) before generating an average value. 50 milliseconds is the runtime software logic solve time.
Units 	Select the textbox and enter the desired units for the signal	The units are displayed on the ioview screen in the runtime software.

Display Order 	Select the textbox and enter the desired display order array number	The signal is displayed on the runtime I/O View screen based on its display number. Signals with a zero value are not displayed in I/O View, nor are they available in recipes. Additionally, signals directly related to graphical icons on the runtime screens affect the transparency of their respective icons Signals numbered within the datalogging range are automatically logged during processes.
AI Array Number 	Select the textbox and enter the array number for new signals (existing signals should not be changed)	Signals are mapped between database recipe steps and the runtime software via the array number.
Close Form 	Press the Close Form button	Closes the current form

Edit Analog Outputs Form



Set Point Name	Minimum Value	Maximum Value	Resolution	Units	Display Order	AO Array Number:	Initial Value:
mfc 1 flow setpoint	0	100	2047	sccm	0	1	0
mfc 2 flow setpoint	0	100	2047	sccm	2	2	0
mfc 3 flow setpoint	0	100	2047	sccm	0	3	0
mfc 4 flow setpoint	0	100	2047	sccm	0	4	0
pws 1 output sp	0	5000	2047	Watts	5	5	0
pws 2 output sp	0	1000	2047	Watts	0	6	0
pws 3 output sp	0	1000	2047	Watts	0	7	0
pws 4 output sp	0	1000	409	Watts	0	8	0
pws 5 output sp	0	1000	409	Watts	0	9	0
pws 6 output sp	0	600	2047	Watts	0	10	0
substrate heater output level	0	100	2047	%	0	11	0
substrate heater temperature	0	1000	1000	Deg. C	0	12	0
substrate heater p	0	1000	1000	P	0	13	15
substrate heater I	0	1000	1000	I	0	14	2.5
substrate heater d	0	1000	1000	D	0	15	0.001
platen 1 mtr position sp	0	360	360	Degrees	16	16	0
platen 1 mtr acceleration	0	3000	3000	Rev/sec^2	17	17	10
platen mtr max current	0	1000	1000	Amps	18	18	1000
platen 1 mtr p	0	2000	2000	P	19	19	1000
platen mtr I	0	2000	2000	I	20	20	0

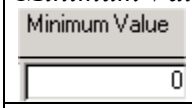
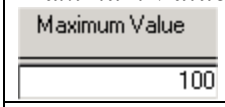
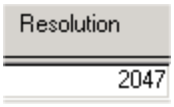
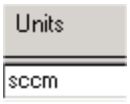
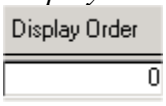
Record: 1 of 111 (Filtered)

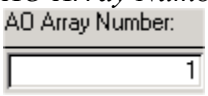
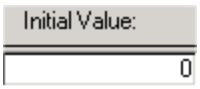
Edit Analog Outputs Form

Using the Edit Analog Outputs Form
The following chart outlines the use of icons and data fields on this form.

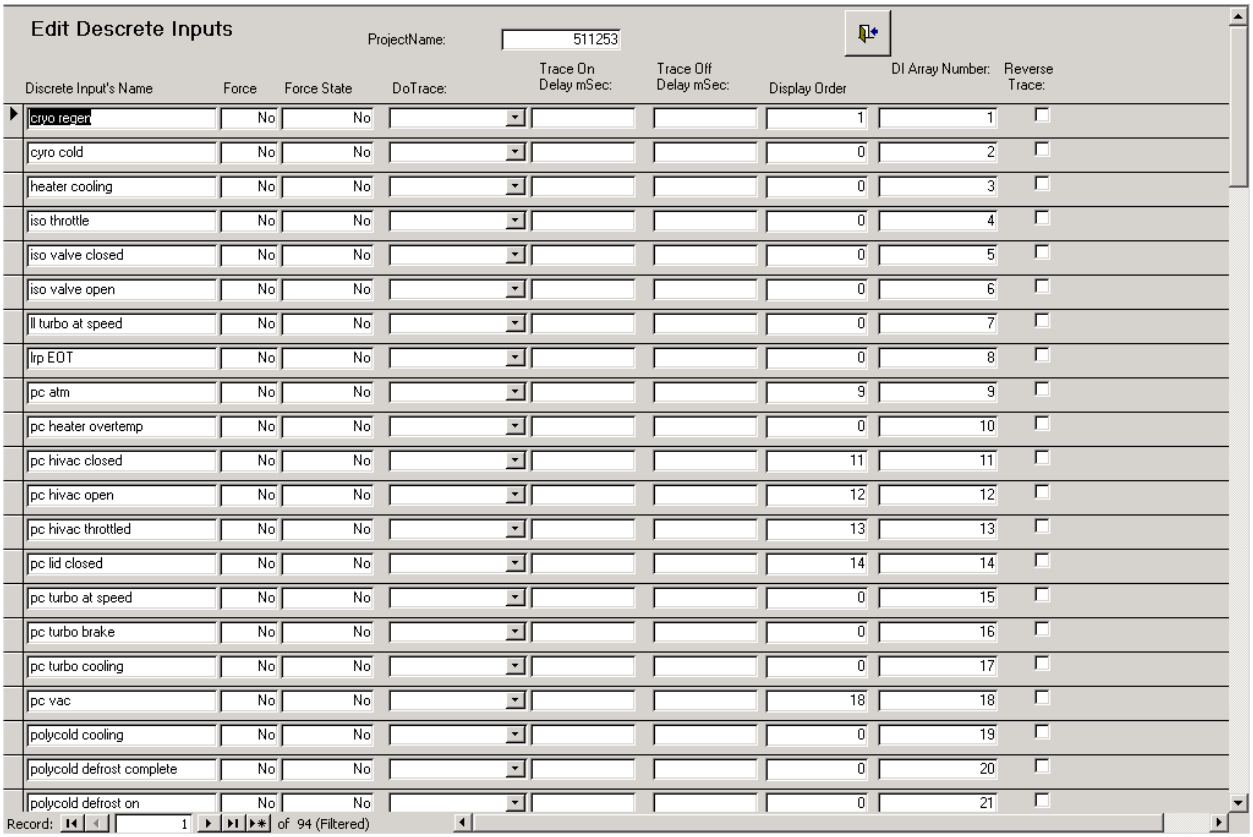
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Project Name ProjectName: 511253	None	Displays the current project number
Setpoint Name Set Point Name mfc 1 flow setpoint	Select the textbox and enter the desired analog output signal name	A new analog output signal is created in the database for system configuration and recipe use

Minimum Value 	Select the textbox and enter the minimum setpoint	The minimum setpoint is used for control and entry purposes in the runtime software
Maximum Value 	Select the textbox and enter the maximum setpoint	The maximum setpoint is used for control and entry purposes in the runtime software
Resolution 	Select the textbox and enter the resolution for the physical I/O signal	The resolution is used in conjunction with the minimum and maximum values to convert the runtime setpoint value from engineering units to I/O units
Units 	Select the textbox and enter the desired units for the signal	The units are displayed on the I/O View screen in the runtime software. Additionally, the units field is sometimes used to provide system configuration information. For example, the units of the source kilowatt hours variables provides target material information that is displayed on the deposition screen and datalogged.
Display Order 	Select the textbox and enter the desired display order array number	The signal is displayed on the runtime I/O View screen based on its display number. Signals with a zero value are not displayed in I/O View, nor are they available in recipes. Additionally, signals directly related to graphical icons on the runtime screens affect the transparency of their respective icons Signals numbered within the datalogging range are automatically logged during processes.

AO Array Number 	Select the textbox and enter the array number for new signals (existing signals should not be changed)	Signals are mapped between database recipe steps and the runtime software via the array number.
Initial Value 	Select the textbox and enter the desired value for the signal upon software startup	The setpoint is set to the specified value upon system initialization and also during any system abort. This is a retentive value and is also used for things such as mfc and capman range, tuning PID values, etc.
Close Form 	Press the Close Form button	Closes the current form

Edit Discrete Inputs Form

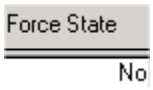
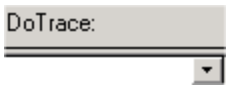
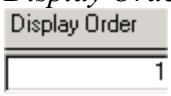
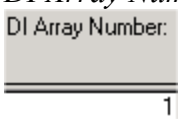


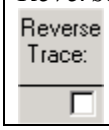
Edit Discrete Inputs Form

Using the Edit Discrete Inputs Form
The following chart outlines the use of icons and data fields on this form.

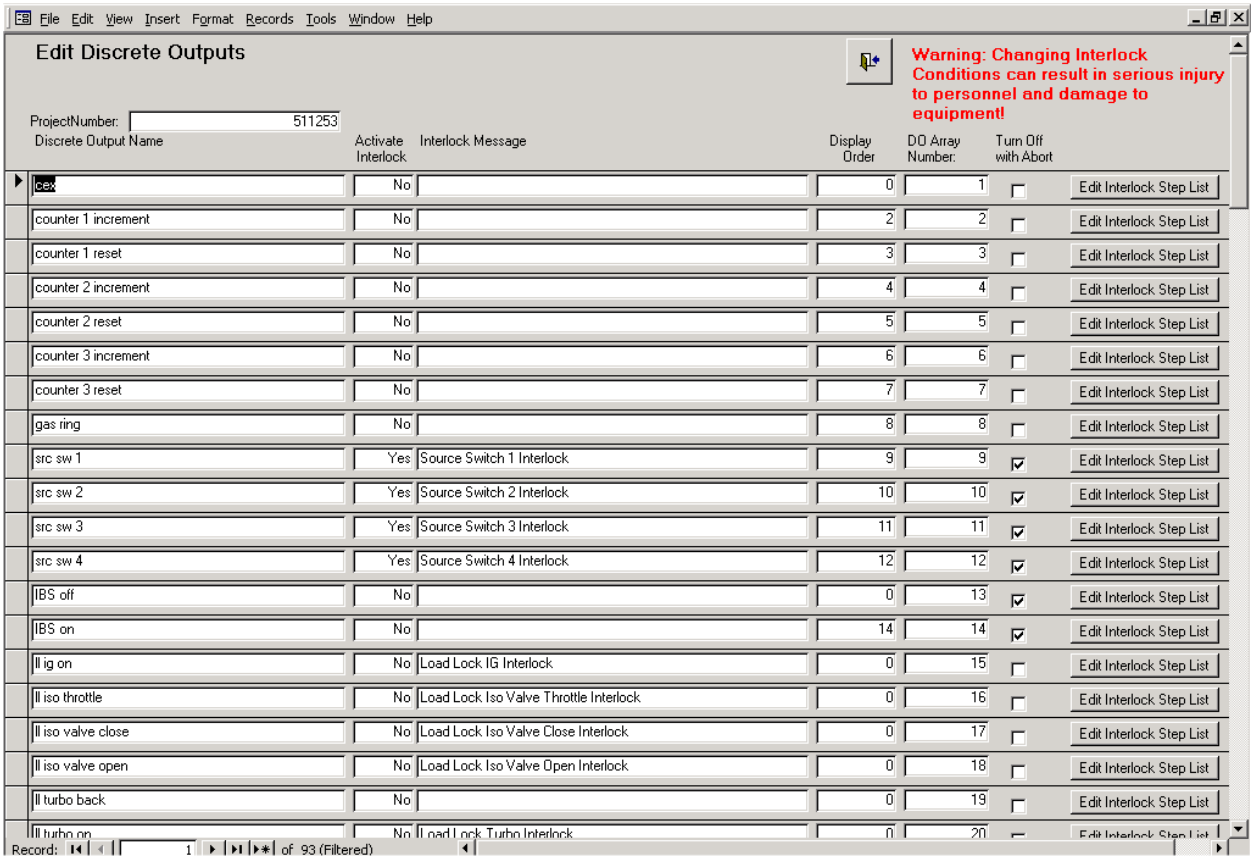
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
ProjectName ProjectName: 511253	None	Displays the current project number
Force Force No	Click the textbox and enter yes or no (or "1" or "0")	The input signal is forced to the corresponding force state continuously

Force State 	Click the textbox and enter yes or no (or "1" or "0")	When force is selected, the input signal is forced to the corresponding state continuously
DoTrace 	Click the pulldown menu and select the desired discrete output signal	The discrete input "traces" or follows the state of the corresponding discrete output signal (typically used for "virtual" inputs or devices with no state feedback)
Trace On Delay mSec 	Click the textbox and enter the desired delay time in milliseconds	The discrete input on state tracks the corresponding discrete output on signal after the trace on time has elapsed
Trace Off Delay mSec 	Click the textbox and enter the desired delay time in milliseconds	The discrete input off state tracks the corresponding discrete output off signal after the trace off time has elapsed
Display Order 	Select the textbox and enter the desired display order array number	The signal is displayed on the runtime I/O View screen based on its display number. Signals with a zero value are not displayed in I/O View, nor are they available in recipes. Additionally, signals directly related to graphical icons on the runtime screens affect the transparency of their respective icons Signals numbered within the datalogging range are automatically logged during processes.
DI Array Number 	Select the textbox and enter the array number for new signals (existing signals should not be changed)	Signals are mapped between database recipe steps and the runtime software via the array number.
Close Form 	Press the Close Form button	Closes the current form

Reverse Trace 	Click the checkbox	The input signal state tracks the corresponding discrete output signal but with the sense reversed (0 = on,1=off)

Edit Discrete Outputs Form



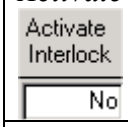
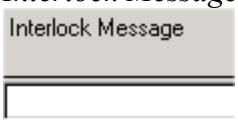
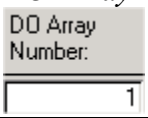
Edit Discrete Outputs Form

Using the Edit Discrete Outputs Form

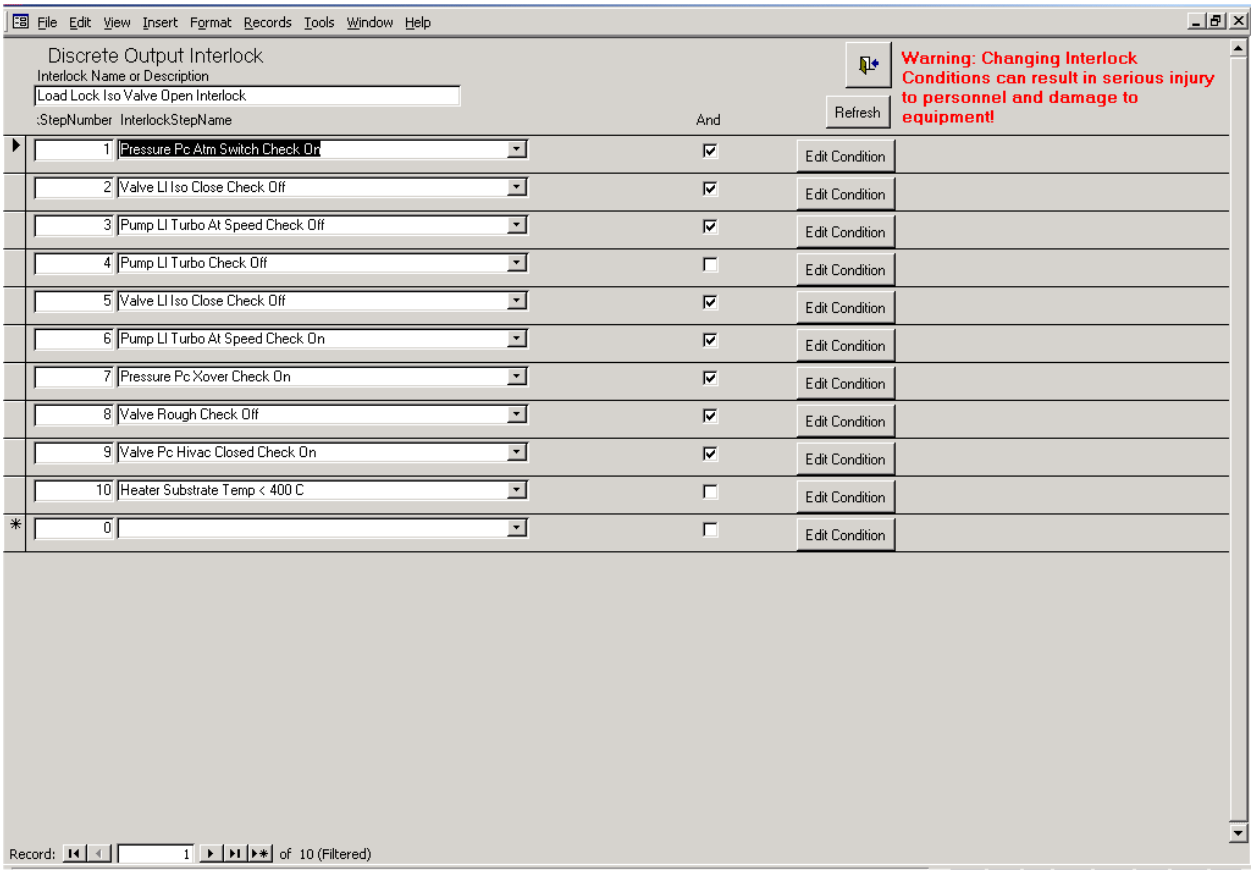
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Project Number ProjectNumber: 511253	None	Displays the current project number
Discrete Output Name Discrete Output Name cex	Click the textbox and enter the name of the new signal	A new signal is created for system configuration and recipe use

Activate Interlock 	Type yes or no (or "1" or "0") in the textbox	The output is interlocked based on the interlock step list when the interlock is activated
Interlock Message 	Click the textbox and enter the desired message	The interlock message is displayed on the runtime screen in the event an attempt is made to exercise the respective output when its interlock is not satisfied
Display Order 	Select the textbox and enter the desired display order array number	The signal is displayed on the runtime I/O View screen based on its display number. Signals with a zero value are not displayed in I/O View, nor are they available in recipes. Additionally, signals directly related to graphical icons on the runtime screens affect the transparency of their respective icons Signals numbered within the datalogging range are automatically logged during processes.
DO Array Number 	Select the textbox and enter the array number for new signals (existing signals should not be changed)	Signals are mapped between database recipe steps and the runtime software via the array number.
Turn Off with Abort 	Click the checkbox	When selected, the respective output will be turned off anytime a system abort occurs
Edit Interlock Step List 	Click the button	When selected, the edit interlock steps form is displayed for the respective signal
Close Form 	Press the Close Form button	Closes the current form

Edit Interlock Steps Form

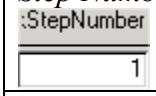


Edit Interlock Steps Form

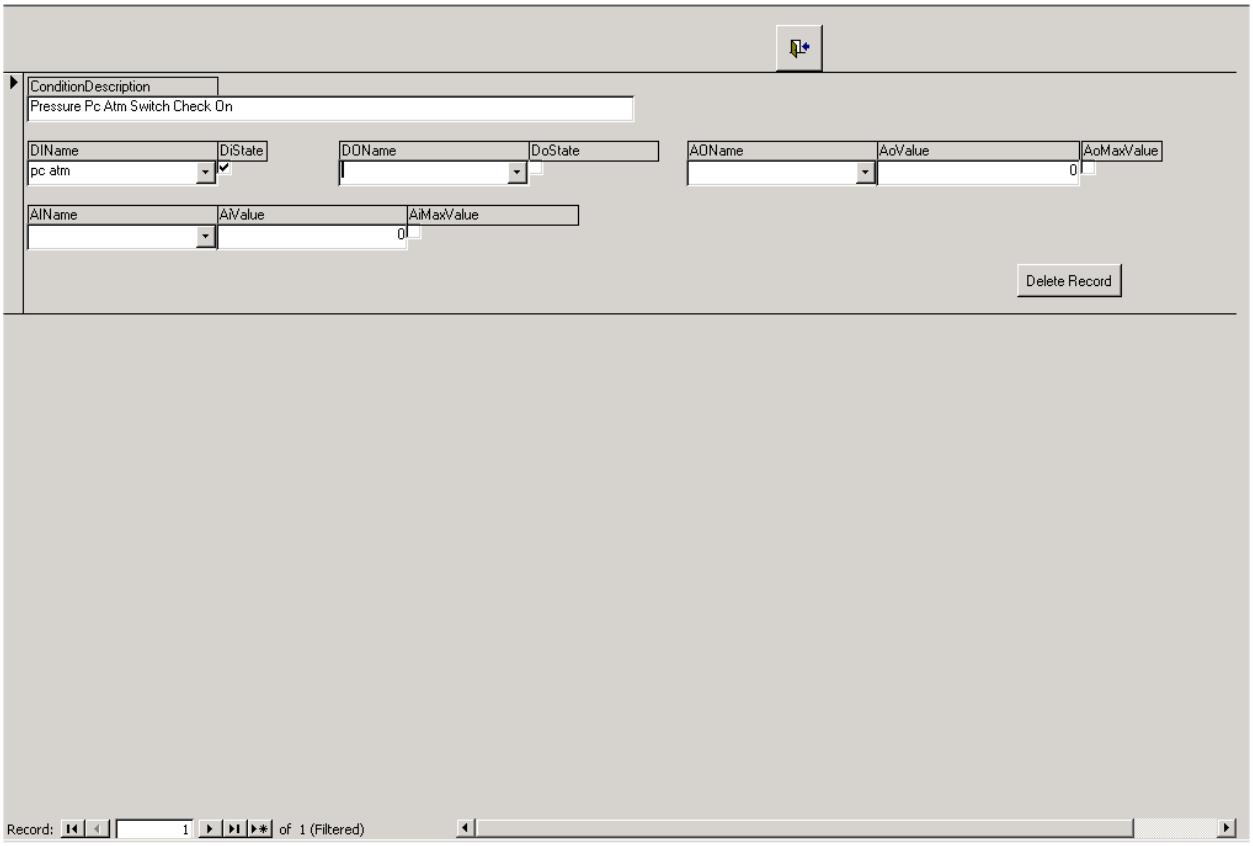
Using the Edit Interlock Steps Form
The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Interlock Name Interlock Name or Description Load Lock Iso Valve Open Interlock	None	Displays the current interlock message for the output currently being edited

Step Number 	Click the textbox to enter the desired step number (numbers 1-10, 10 maximum)	The corresponding interlock checks are executed in the desired sequence
Interlock Step Name 	Click the pulldown menu to select and existing step or type in a new step name	The selected step is included in the interlock list
And 	Click the checkbox	The selected interlock step is combined with the next step to form an interlock string, all of whose conditions must be met to satisfy the interlock. Each time the and checkbox is not checked signifies a new interlock or group of interlock conditions (an "or" instead of an "and")
Edit Condition 	Click the button	The edit interlock conditions form is displayed for the respective interlock condition
Refresh 	Click the button	When a new interlock step is created, this button is used to make the step available for selection from the pulldown menu without leaving this form
Close Form 	Press the Close Form button	Closes the current form

Edit Interlock Step Conditions Form

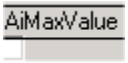
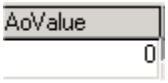
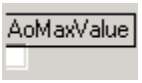


Edit Interlock Step Conditions Form

Using the Edit Interlock Step Conditions Form
The following chart outlines the use of icons and data fields on this form.

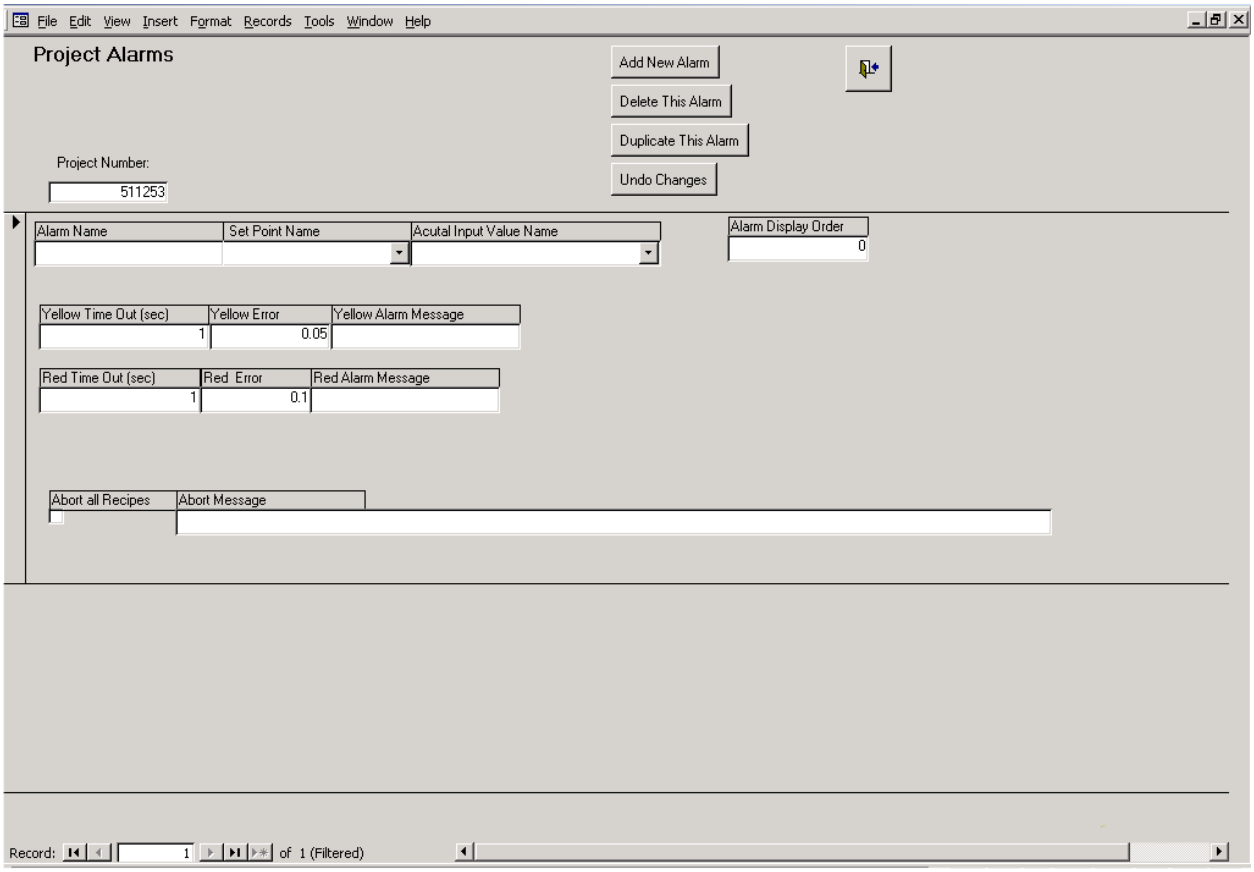
NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

Icon or Data Field	Action	Result
Close Form 	Press the Close Form button	Closes the current form

AI Name  NOTE: Use the arrow button on the right of the AI Name data field to select from a scroll down list of all Analog Input signals.	Click the pulldown arrow and highlight the desired Analog Input	The selected input is used in conjunction with the AI Value and AI MaxValue, boxes to create an Interlock Step
AI Value  	Click the AI Value box and enter the desired setpoint	The Setpoint is compared to the actual value of the analog input when this Step is executed.
AI Max Value  	Click the check box	If this box is checked, when the Interlock Step is executed, the actual value of the Analog Input must be greater than the Setpoint for the step condition to be satisfied
AO Name  NOTE: Use the arrow button on the right of the Analog Output Name data field to select from a scroll down list of Analog Output signals.	Click the pulldown arrow and highlight the desired Analog Output	The selected input is used in conjunction with the AO Value and AO MaxValue, boxes to create an Interlock Step
AO Value  	Click the AO Value box and enter the desired setpoint	The Setpoint is compared to the actual value of the analog output when this Step is executed.
AO Max Value  	Click the check box	If this box is checked, when the Interlock Step is executed, the actual value of the Analog output must be greater than the Setpoint for the step condition to be satisfied

DI Name  NOTE: Use the arrow button on the right of the DI Name data field to select from a scroll down list of all Discrete Input signals.	Click the DI Name box and select the desired Discrete Input signal	The highlighted DI is used in conjunction with the DI State check box to create an Interlock Step condition
DI State 	Click the DI State check box	If the DI State check box is checked this signifies that the corresponding Discrete Input signal must be "on" or "true" for the Step condition to be satisfied If the box is not checked, the signal must be "off" or "false"
DO Name  NOTE: Use the arrow button on the right of the DO Name data field to select from a scroll down list of all Discrete Output signals.	Click the DO Name box and select the desired Discrete Output signal	The highlighted DO is checked for an on or off condition based on the DO State check box
DO State 	Click the DO state check box	If the DO state check box is checked this signifies that the corresponding Discrete Output signal must be turned on for the condition to be satisfied If the check box is not checked, the signal must be turned off
Delete Record 	Click the button	Use the delete record button to delete the interlock step from the list of available steps

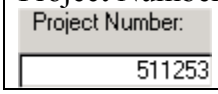
Project Alarms Edit

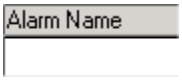
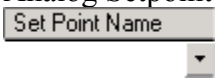
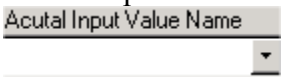
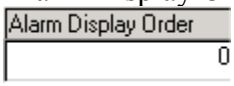


Project Alarms Edit Form

Using the Project Alarms Edit Form
This form is used to create and modify system alarms. The following chart outlines the use of icons and data fields on this form.

NOTE !
This chart describes system operation in Maintenance Level 3. Some functions may not be accessible at lower Maintenance Levels.

ICON or DATA FIELD	ACTION	RESULT
Project Number Display 	None	Displays current project number

Add New Alarm 	Press button	The next available blank alarm record is displayed for alarm creation
Delete This Alarm 	Press button	The alarm currently displayed is deleted from the project database
Duplicate This Alarm 	None	This button is reserved for future use
Undo Changes 	Press button	Changes made to the alarm currently displayed or undone and the alarm configuration is returned to its unmodified state
Alarm Name 	Select this field to enter or modify the alarm name. This box also displays the current alarm name.	The currently displayed alarm name has the associated parameters
Analog Setpoint 	Press the pulldown menu button and select the desired Analog Output (setpoint) signal. This box also displays the current setpoint name.	The currently displayed Analog Setpoint is utilized for the corresponding alarm. All available system Analog Outputs are displayed in the pulldown menu in alphabetical order.
Actual Input Value Name 	Press the pulldown menu button and select the desired Analog Input signal. This box also displays the current Input name.	The currently displayed Analog Input signal is utilized for the corresponding alarm. All available system Analog Inputs are displayed in the pulldown menu in alphabetical order.
Alarm Display Order 	Select this field to enter the desired Alarm Display Order. This box also displays the current Display Order value.	The currently displayed Order number is assigned to the corresponding alarm. The number of alarms that can be stored in the database is practically unlimited, but only Display Orders 1-25 are used by the system. Display Orders can be shuffled and swapped to make particular alarms available for a given recipe/process

Yellow Time Out (sec) Yellow Time Out (sec)	Select this field to enter the maximum time allowed for a system condition before a yellow alarm occurs. This box also displays the current Time Out value.	The Time Out value is used to decide when a Yellow Alarm occurs. The Time Out timer is reset every time the condition clears, as well as when the alarm is first activated. The timer is only enabled when the corresponding alarm is active.
Red Time Out (sec) Red Time Out (sec)	Select this field to enter the maximum time allowed for a system condition before a red alarm occurs. This box also displays the current Time Out value.	The Time Out value is used to decide when a Red Alarm occurs. The Time Out timer is reset every time the condition clears, as well as when the alarm is first activated. The timer is only enabled when the corresponding alarm is active.
Yellow Error Yellow Error	Select this field to enter the maximum allowable input deviation from setpoint prior to generating a yellow alarm. This box also displays the current Error value.	The Analog Input value is multiplied by the Error value and compared to the Analog Setpoint while the alarm is active. For example, if an error of +/- 5% is desired, the Error value should be 0.05.
Red Error Red Error	Select this field to enter the maximum allowable input deviation from setpoint prior to generating a red alarm. This box also displays the current Error value.	The Analog Input value is multiplied by the Error value and compared to the Analog Setpoint while the alarm is active. For example, if an error of +/- 10% is desired, the Error value should be 0.10.
Yellow Alarm Message Yellow Alarm Message	Select this field to enter the desired Yellow Alarm Message. This box also displays the current message.	If a Yellow Alarm occurs, the corresponding message will be displayed in the Message box at the top of all system Runtime screens and time stamped in the system alarm datalog.

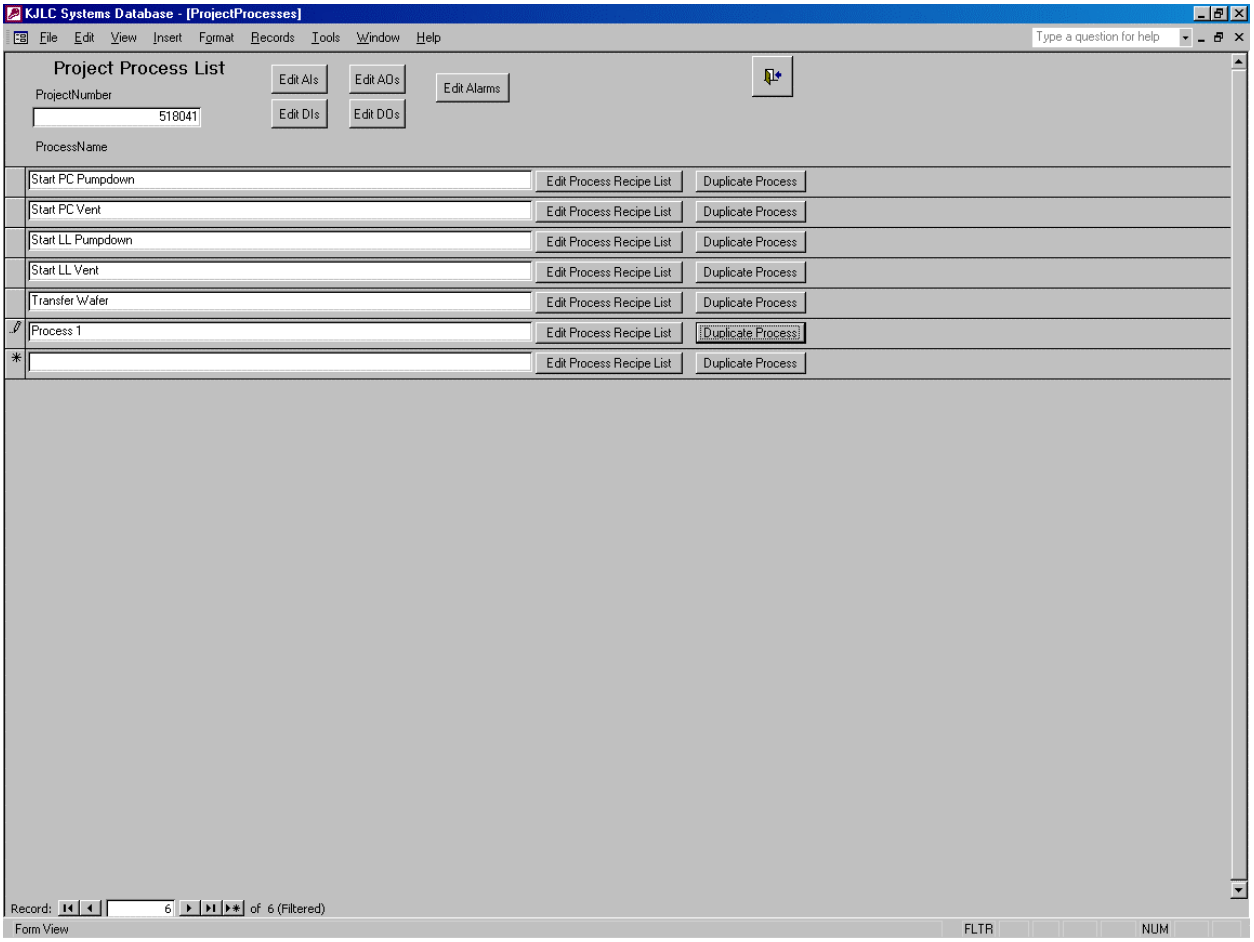
Red Alarm Message 	Select this field to enter the desired Red Alarm Message. This box also displays the current message.	If a Red Alarm occurs, the corresponding message will be displayed in the Message box at the top of all system Runtime screens and time stamped in the system alarm datalog.
Abort All Recipes Checkbox 	Select/unselect this box to make the corresponding Red Alarm an abort condition	If a Red Alarm occurs and this box is checked, the appropriate system outputs will immediately turn off and the current process will be aborted (stopped).
Abort Message 	Select this field to enter the desired Red Alarm Abort Message. This box also displays the current Abort Message.	If a Red Alarm occurs and the Abort Checkbox is selected, the Abort Message will be displayed in the Message box at the top of all Runtime screens.
Record Index Selector 	Press the arrow buttons to view the desired record (alarm) number	The corresponding alarm is displayed. The number of alarms that can be stored in the database is practically unlimited, but only Display Orders 1-25 are used by the system. Use this tool to view/modify all alarms and quickly navigate between desired alarms.
Close Form Button 	Press the button	Project Alarms form is closed and the user is returned to the previous form (Project Processes)

Duplicate Process

The Systems database features a Duplicate Process feature that allows the user to create a copy of a process and rename it. The user can create one or multiple copies at a time. Once a copy of the desired process is created, the user can quickly edit one or more recipes in the new process to achieve the desired results. For example, the user could copy a process and change only the recipe involving the dwell time for a particular layer, thus achieving a different film thickness.

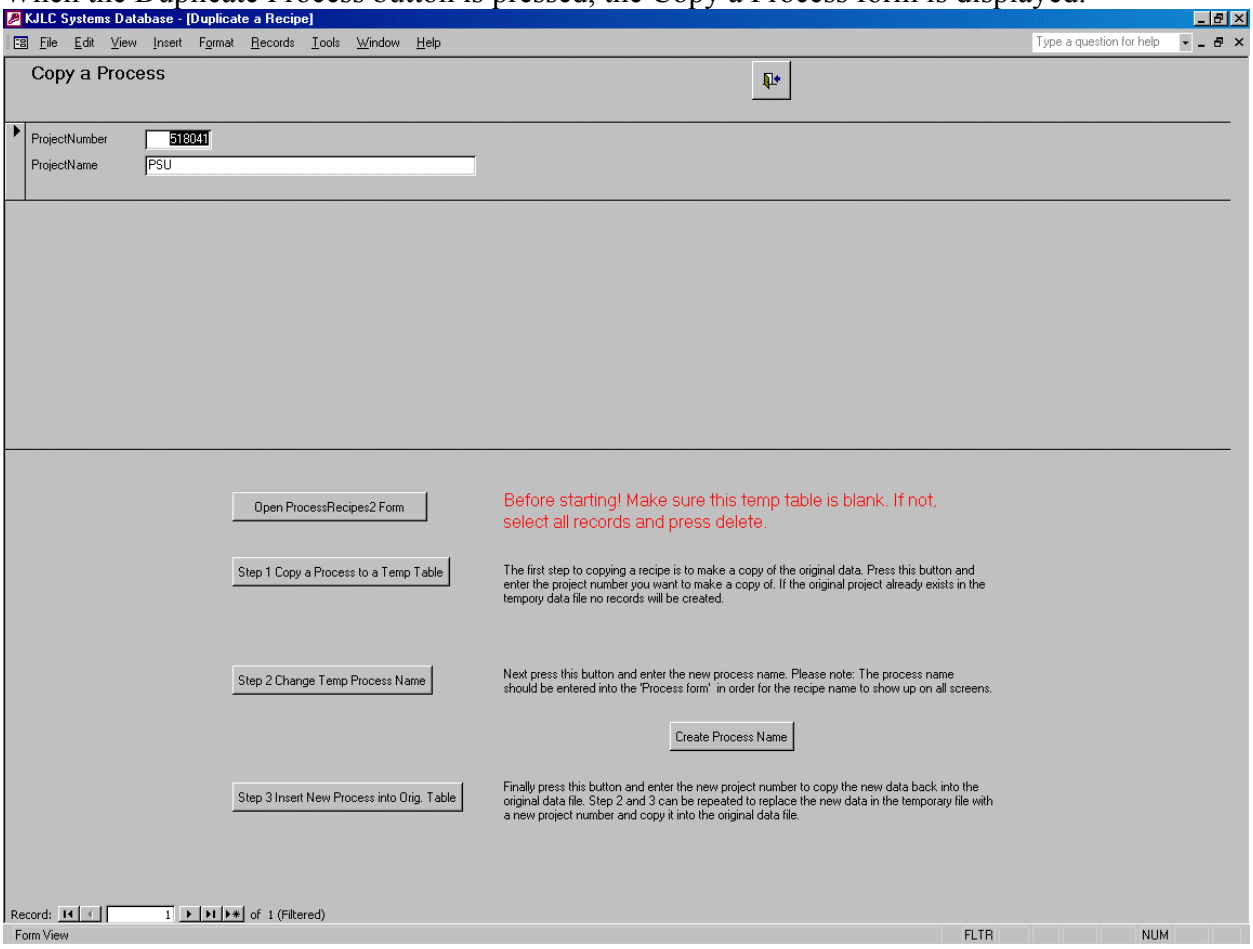
To copy a process, first press the Duplicate Process button next to the desired process name.

NOTE !
Prior to starting the duplicate process sequence, it is a good idea to copy the name of the source process to the Windows clipboard. To accomplish this, highlight the desired process name and press <Ctrl> C. The name of the source process will be entered several times during the copy sequence



Project Processes Form

When the Duplicate Process button is pressed, the Copy a Process form is displayed.



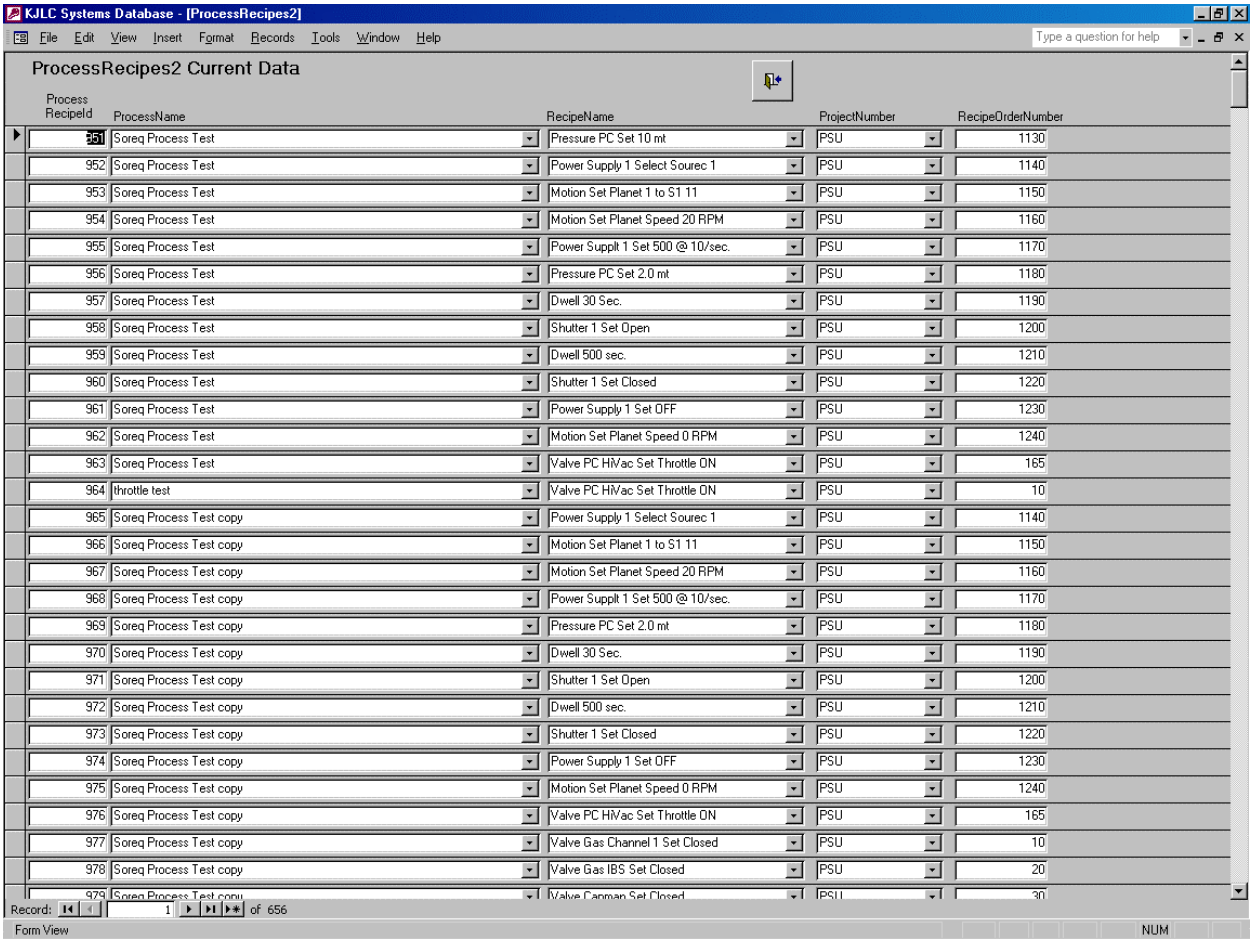
Copy a Process Form

Copying a process involves five basic operations:

1) The temporary table into which the source process is copied must be emptied of any previous processes (if desired)
2) The source process is copied into a temporary table
3) The desired name of the new process is created in the Project Process List
4) The name of the process copy in the temporary table is changed to the new process name
5) The new process is copied back into the desired project

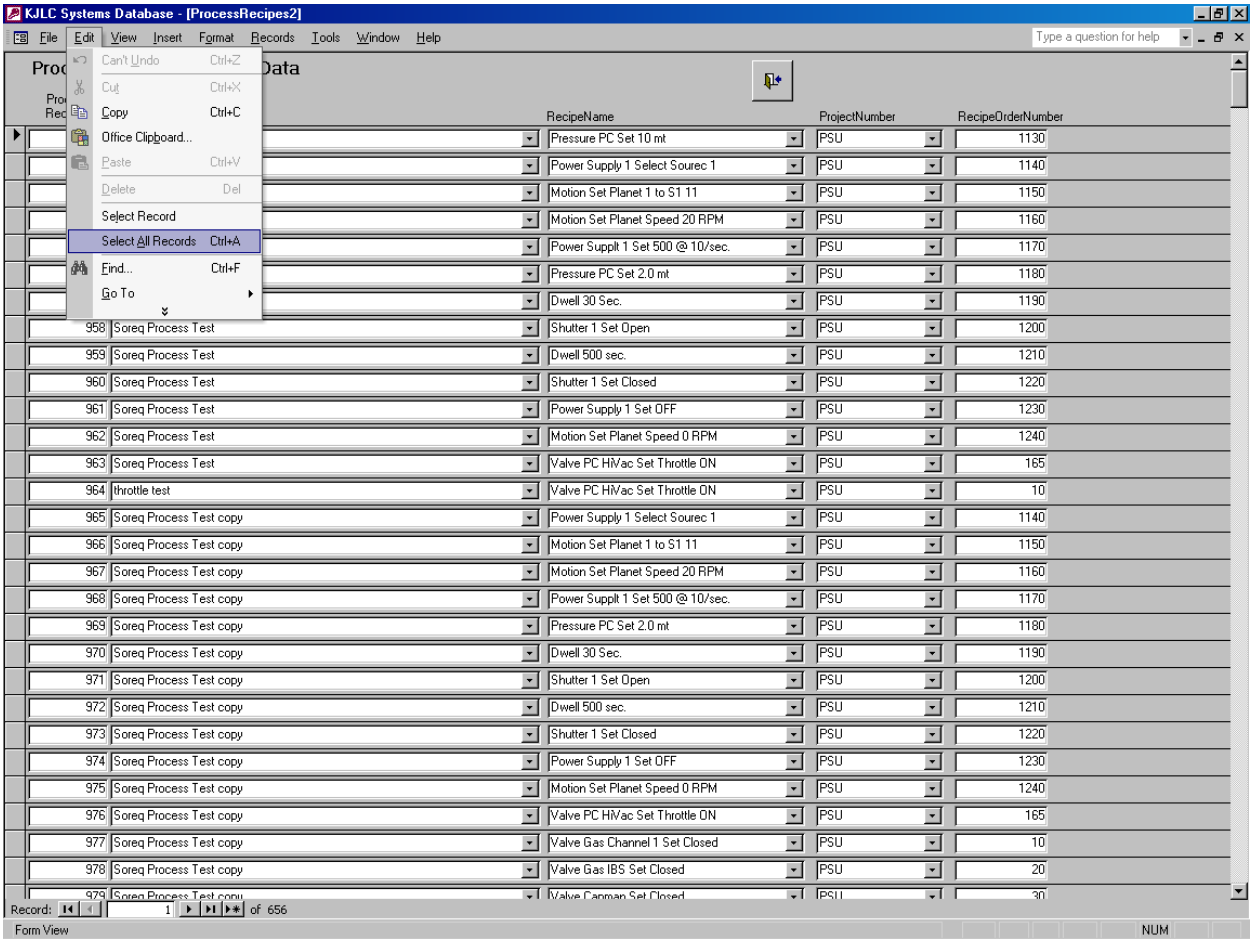
The following screens show these operations step by step.

First, press the Open Process Recipes 2 Form button to display the contents of the temporary table.



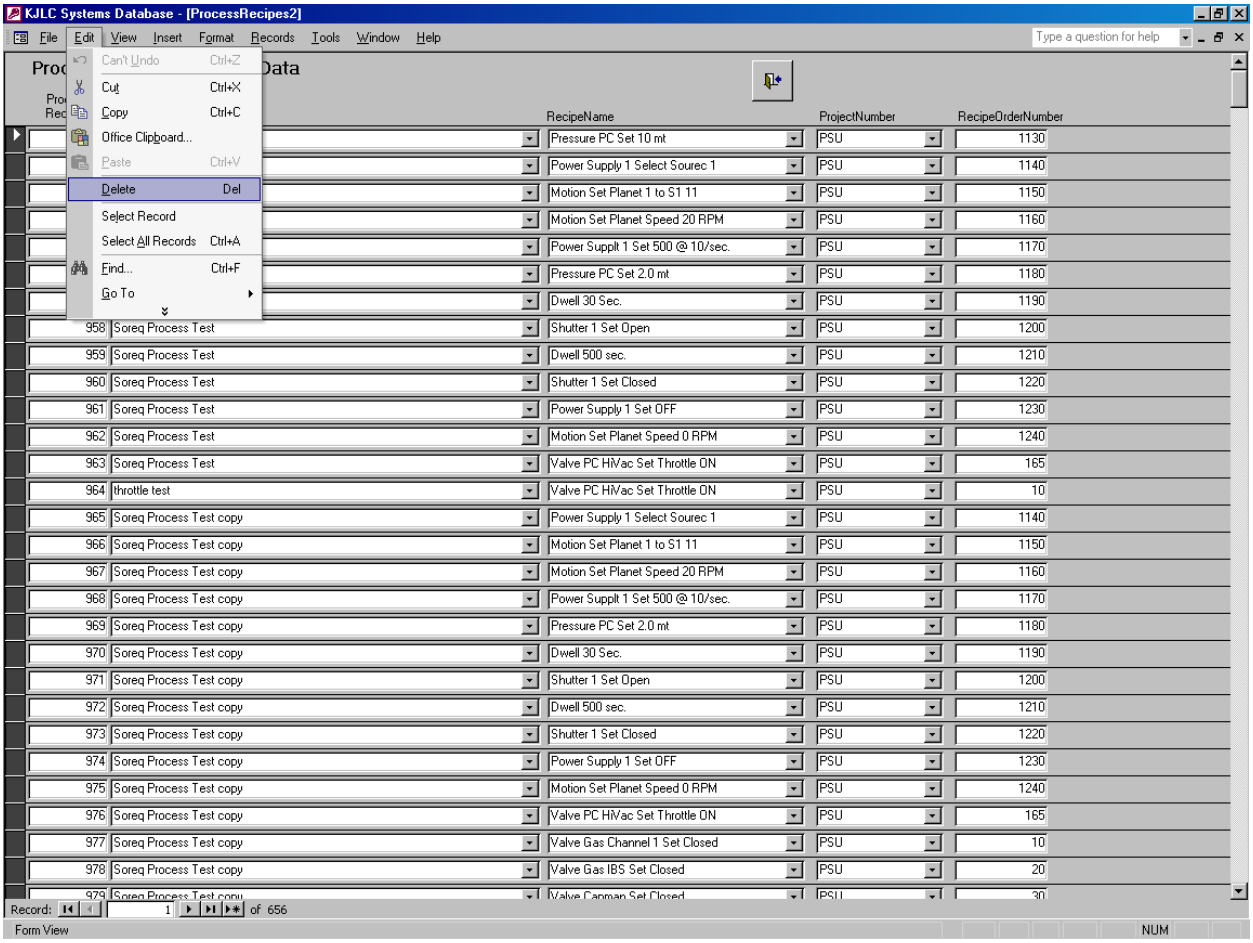
Process Recipes 2 Form

Unless the temporary copy table has been emptied previously, it will contain the last process copied. To empty the temporary table, select the Edit pulldown menu and choose Select All Records.



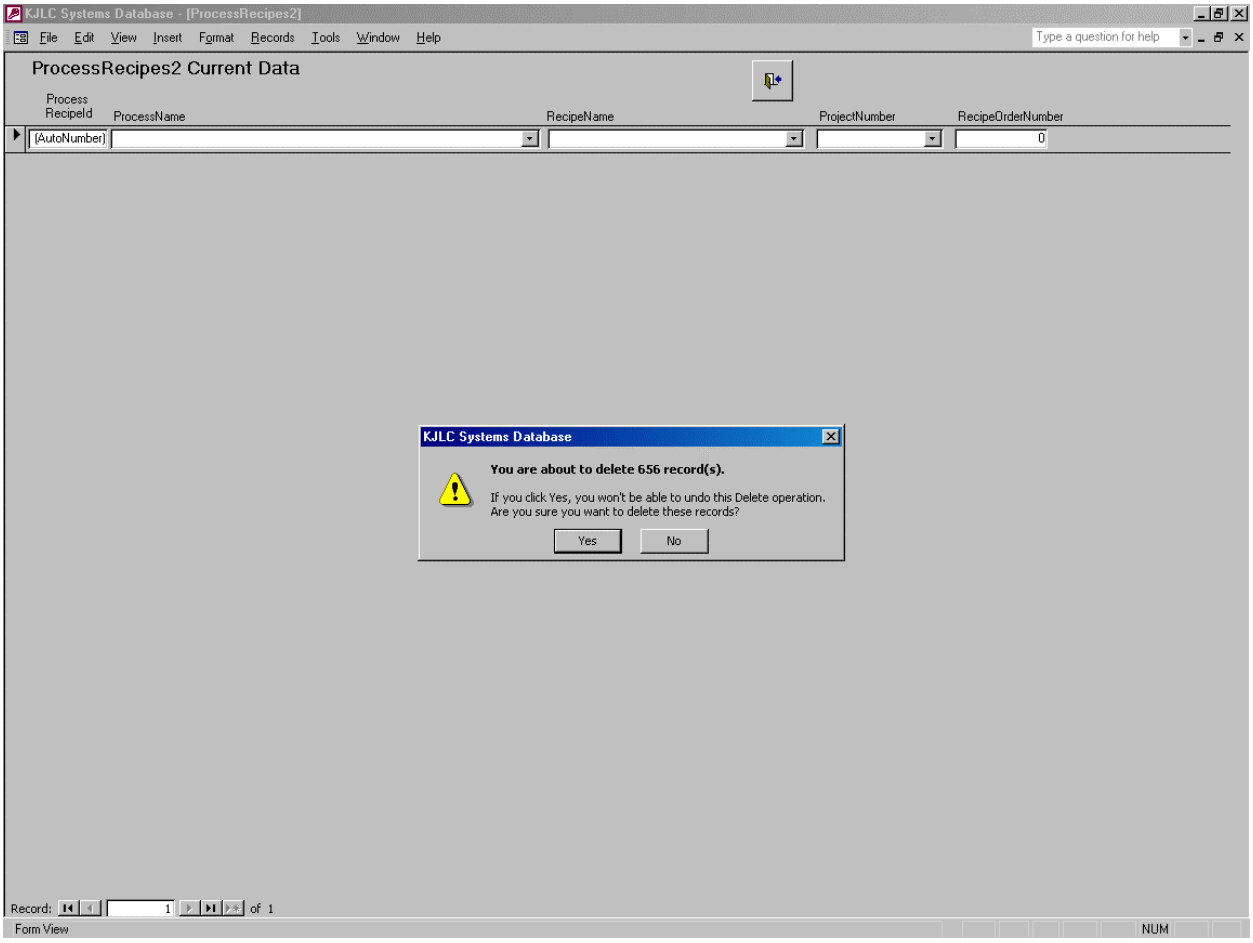
Select All Records on Process Recipes 2 Form

Once all of the old records in the temporary table have been selected, select the Edit pulldown menu and choose Delete.



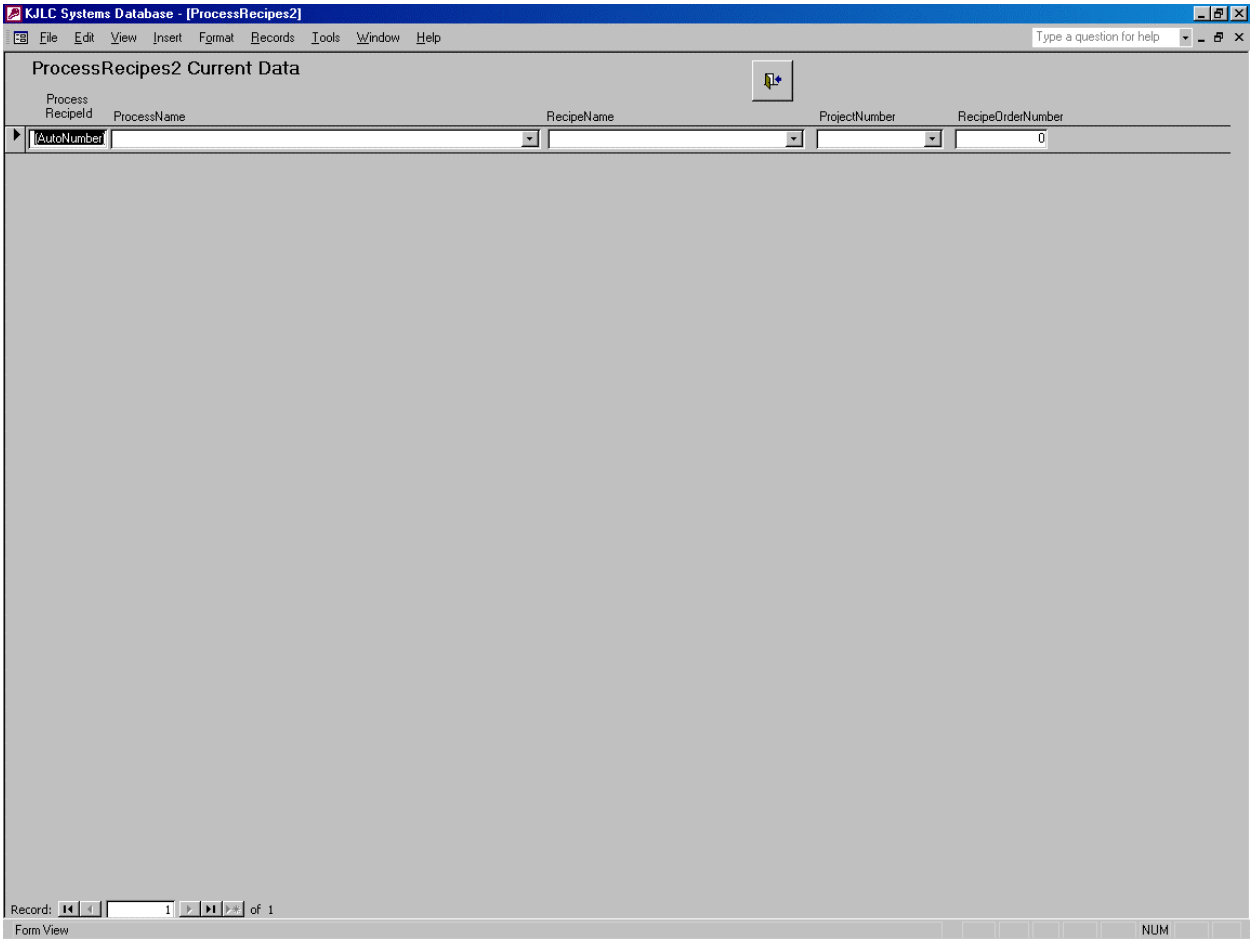
Delete All Records on Process 2 Form

The user will be prompted by Access to confirm deleting the old records. Press the Yes button.



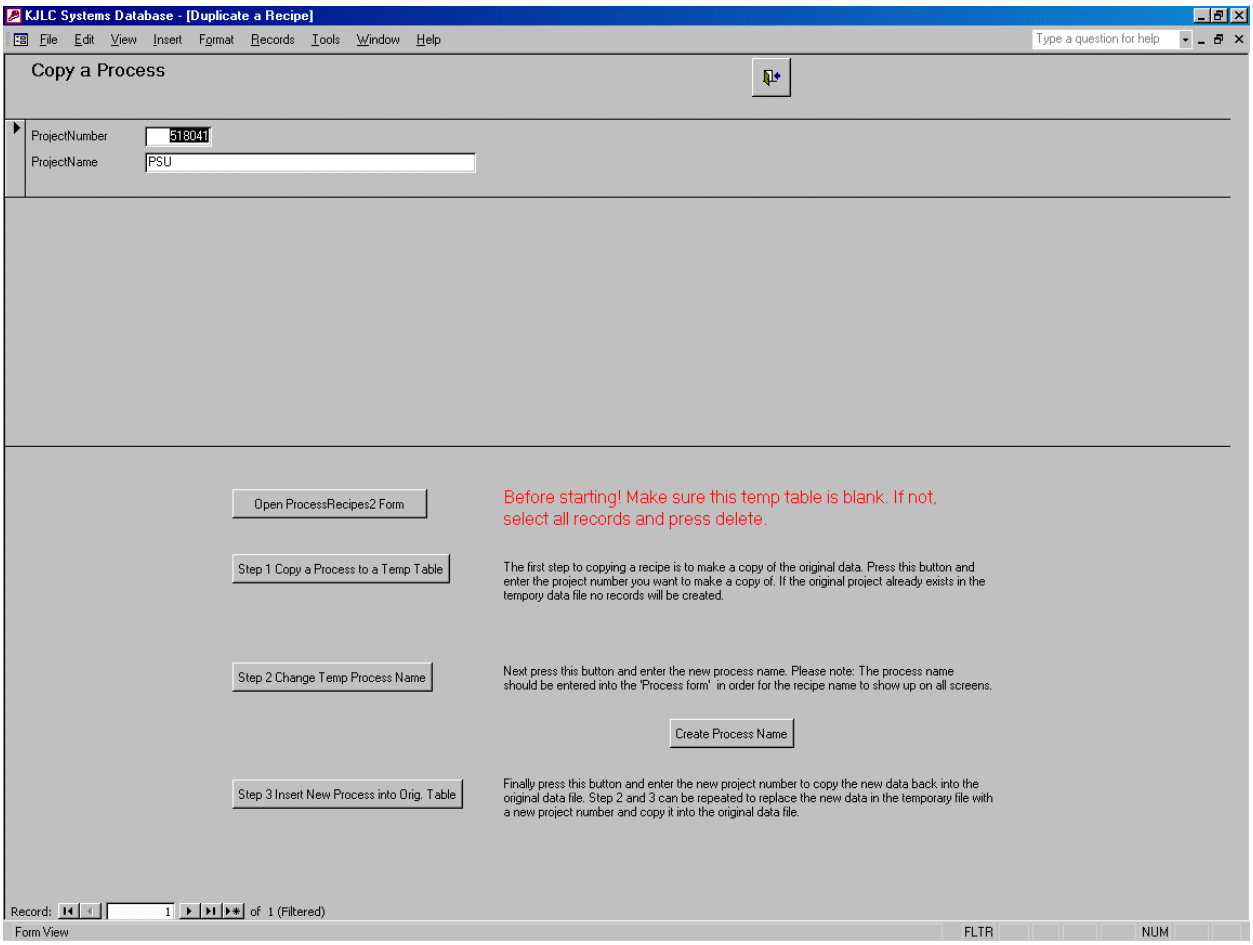
Confirm Delete Records

After all of the previous records in the temporary table have been deleted, the Process Recipes 2 Form should appear empty.



Process Recipes 2 Form (empty)

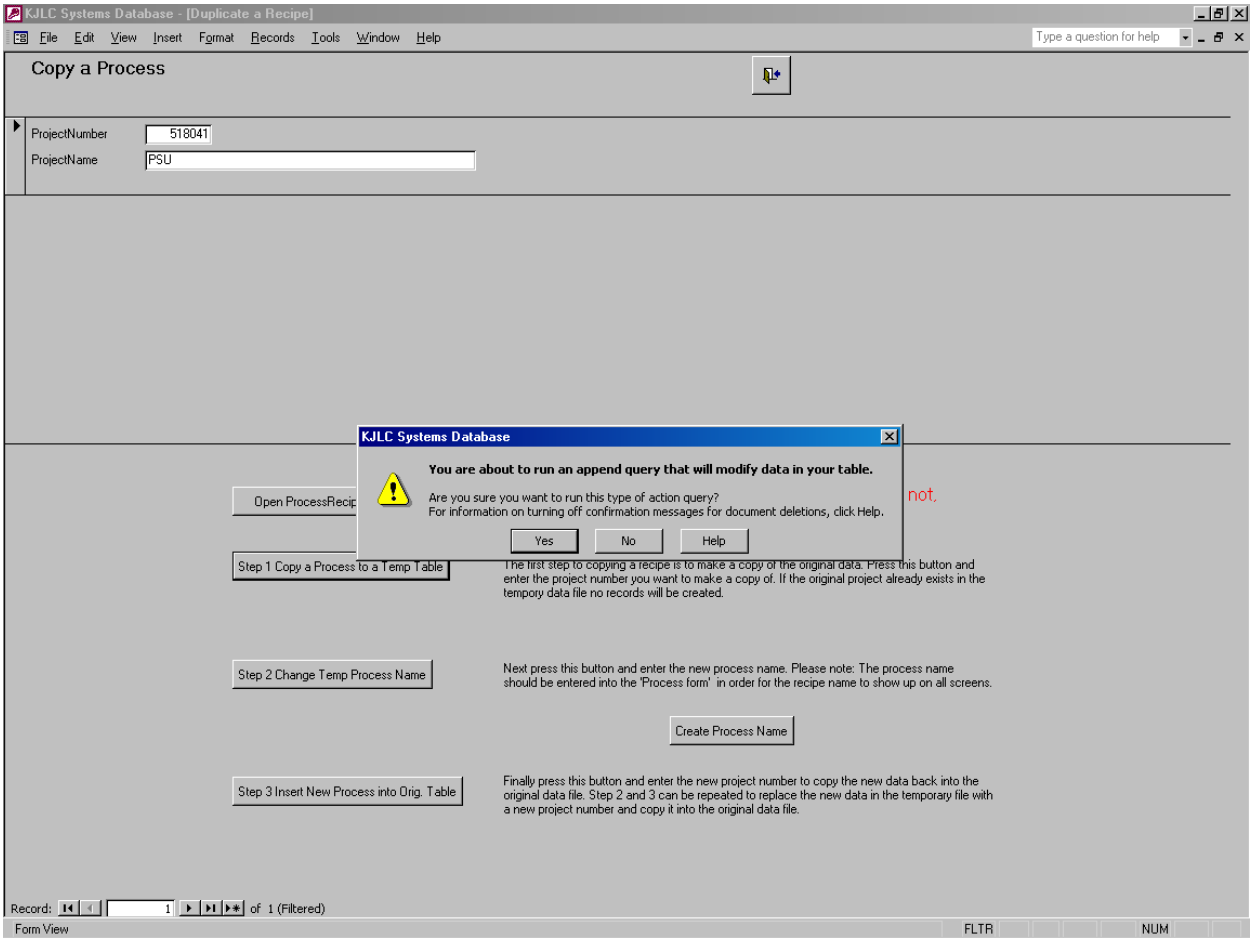
Once the temporary table is empty, press the exit door button at the top of the form. The source process can now be copied.



Copy a Process Form

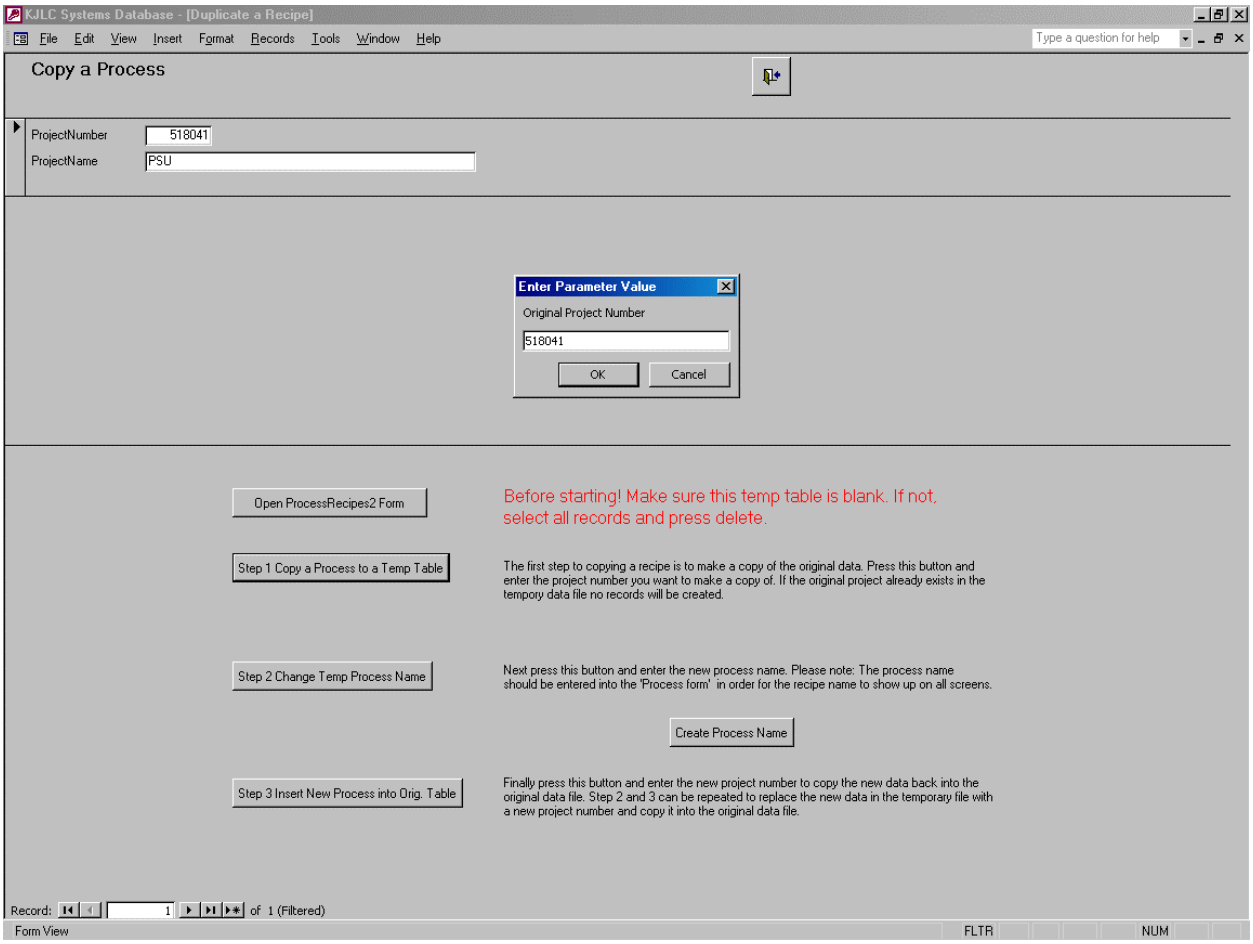
Press the Step 1 Copy a Process to a Temporary Table button on the Copy a Process form.

First Access prompts the user to confirm the append operation. Press the Yes button.

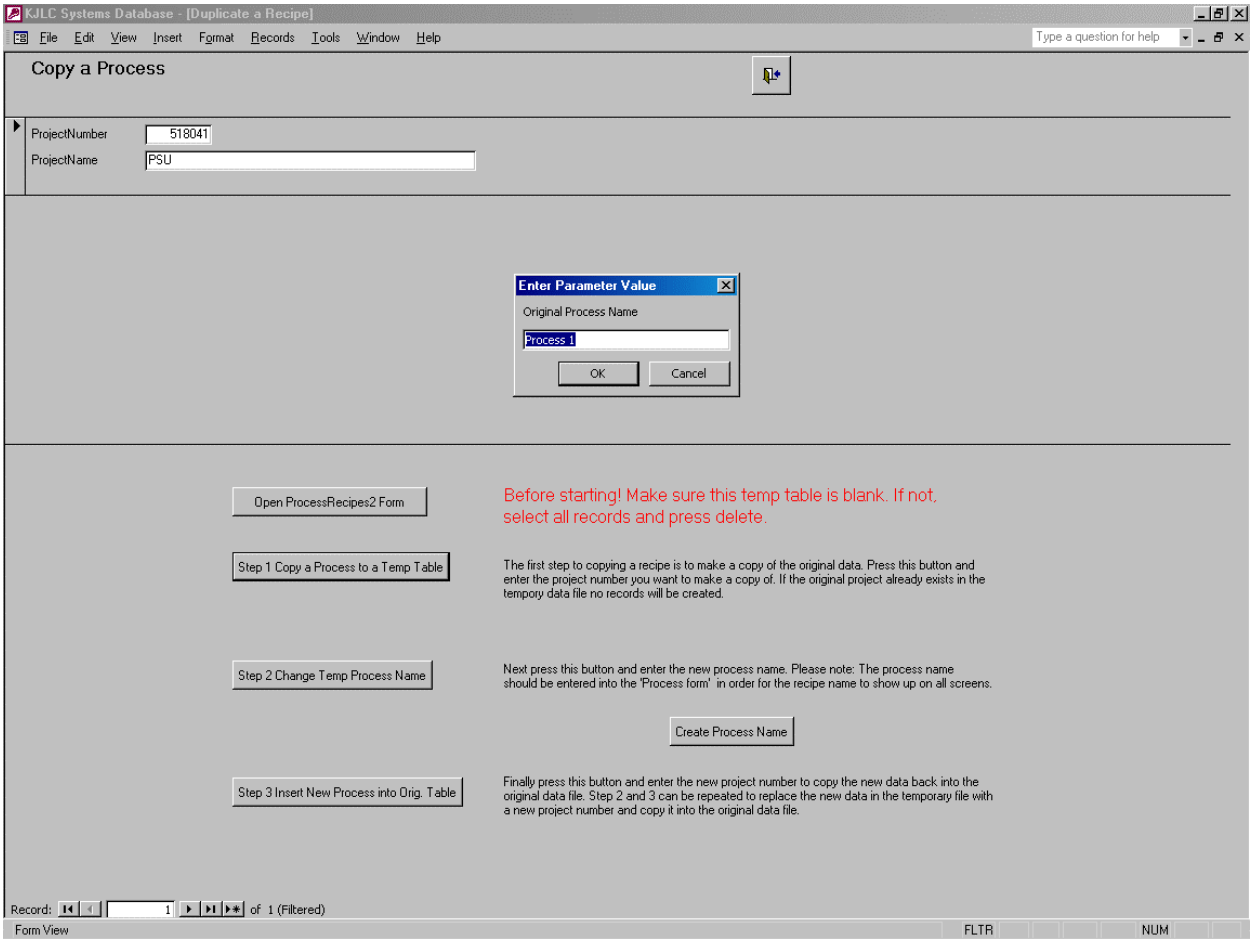


Confirm Start Append Operation

Next, the system prompts the user for the Project number and the name of the source project. Enter the project number shown at the upper right hand corner of the Copy a Process form for the first prompt and use the Windows paste function (<Ctrl> V) to paste the name of the source process in the text field of the second prompt (this is the process name originally copied to the Windows clipboard before initiating the duplicate process function).

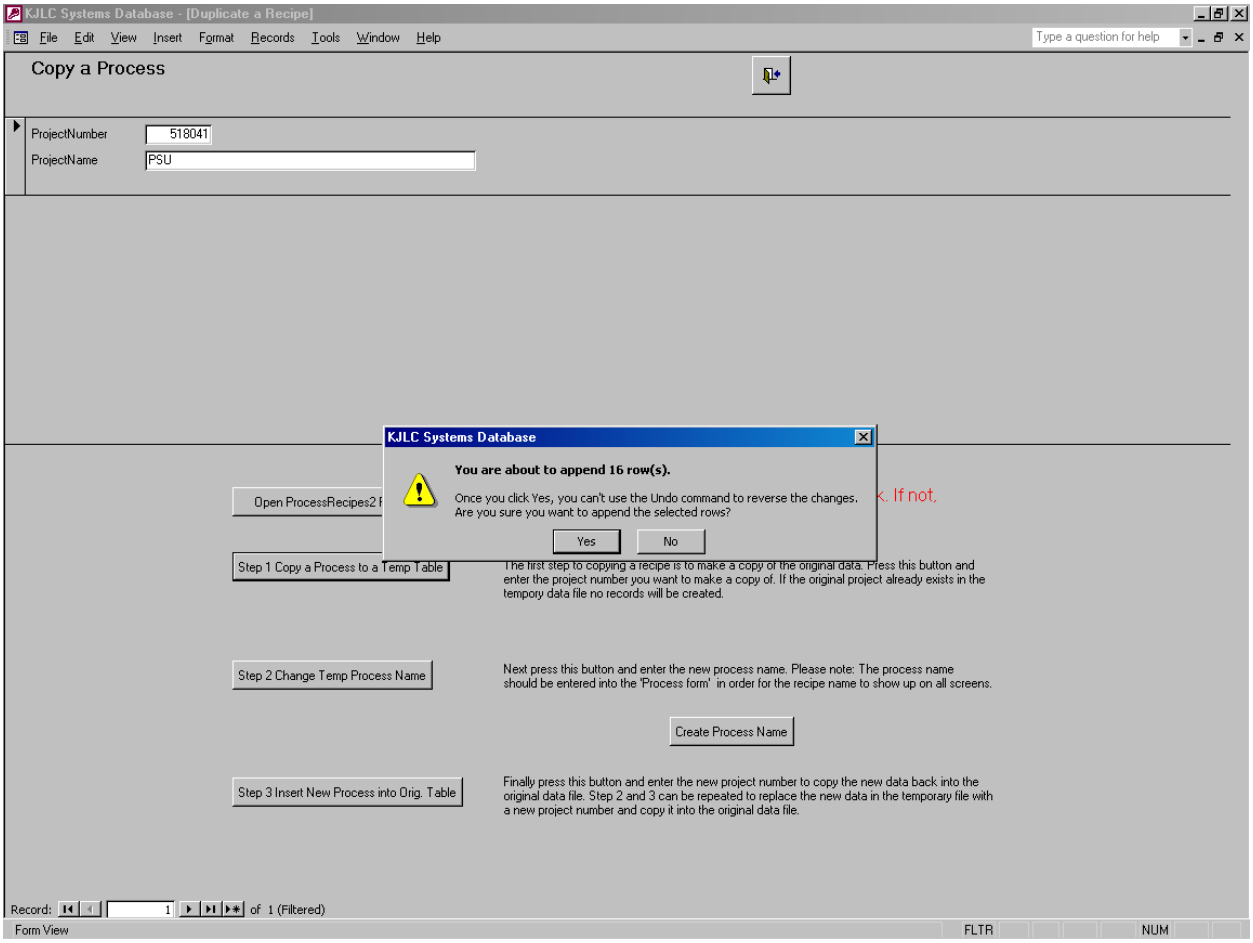


Enter Project Number of Source Project



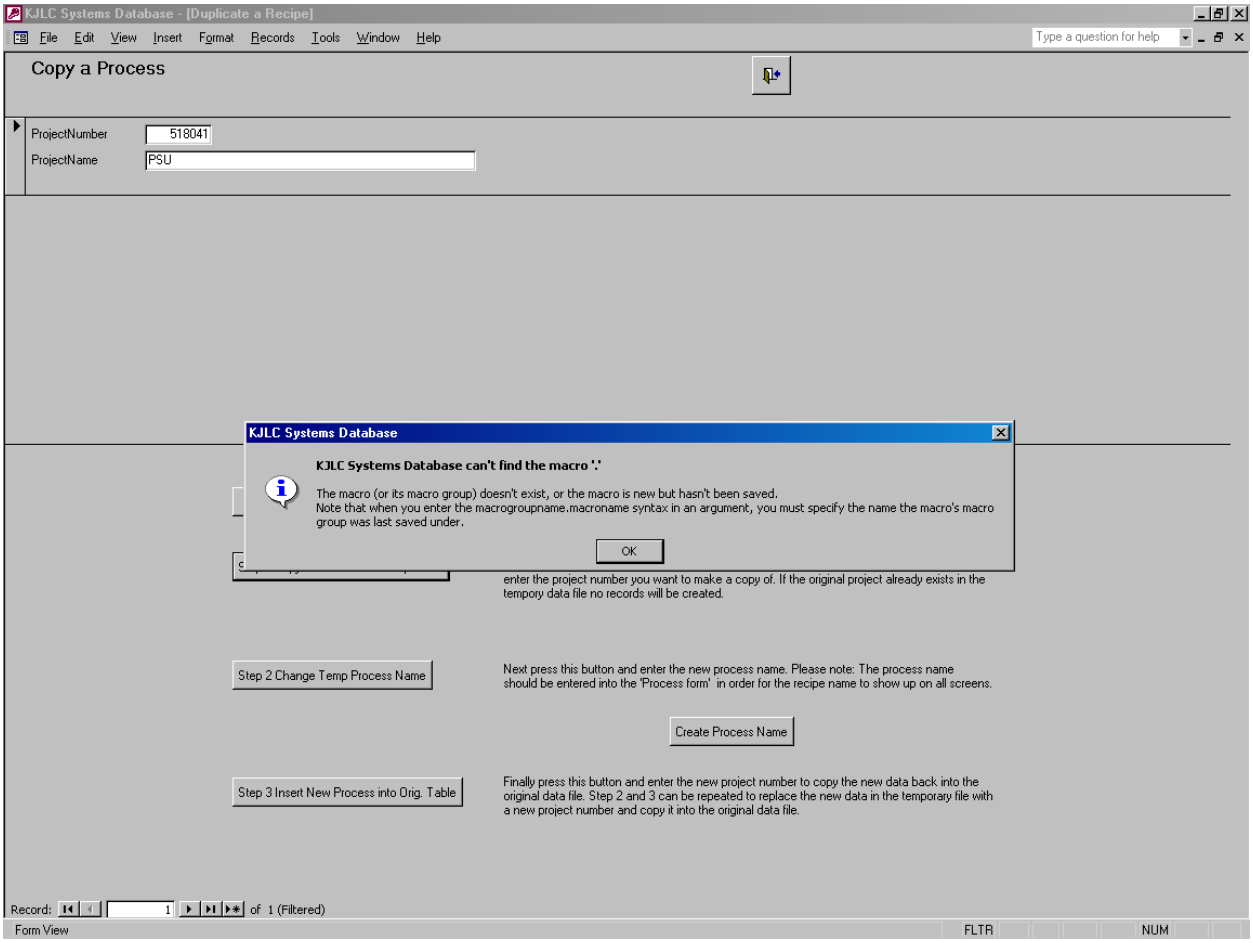
Paste Name of Source Process

Access will again prompt the user to confirm pasting the source process into the temporary table. Press the Yes button.



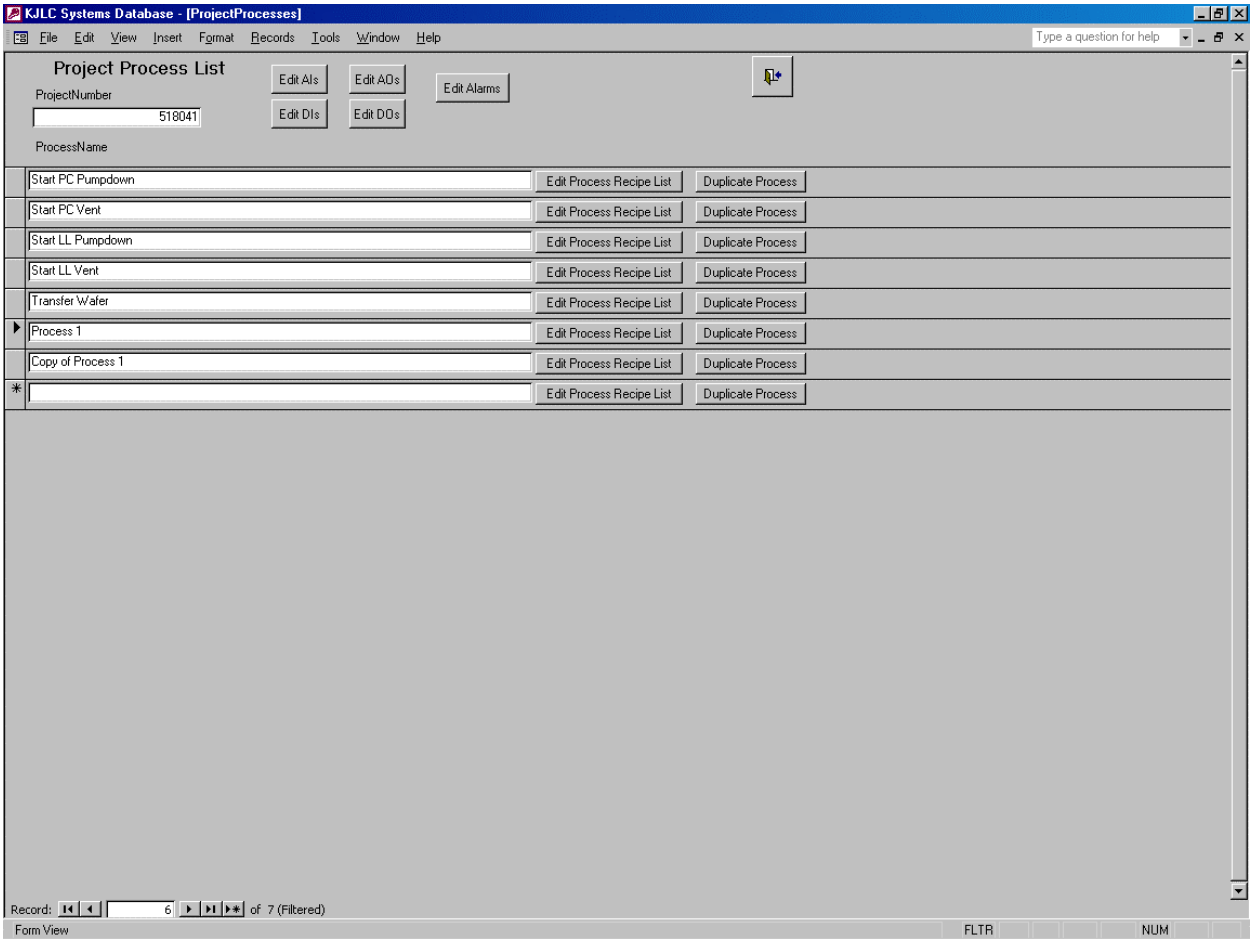
Confirm Append Source Process to Temporary Table

Next, press the Create Process Name button on the Copy a Process form. Access will report an error.



Access Macro Error

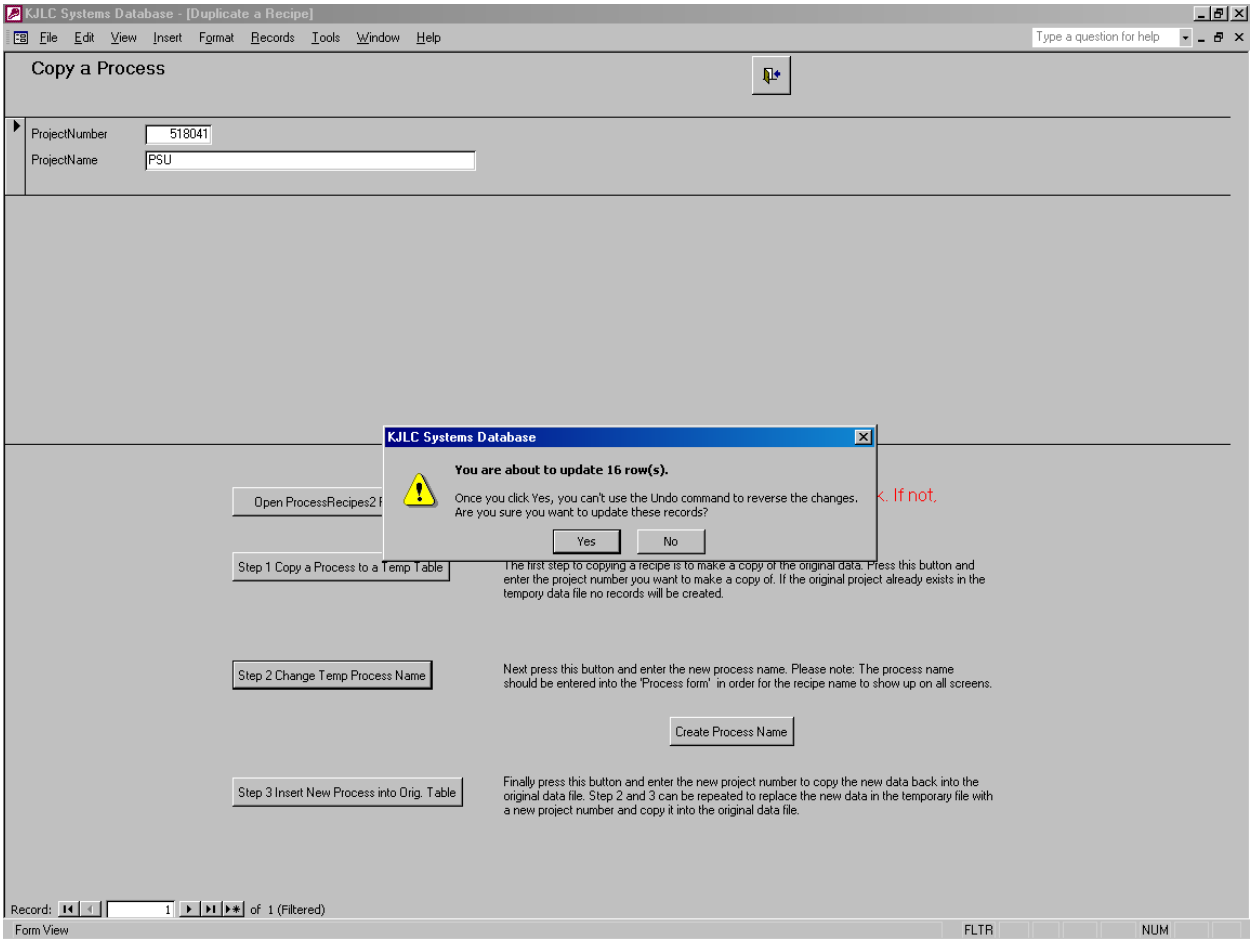
Press OK to acknowledge the error. The Project Process List form is displayed.



Project Process List Form

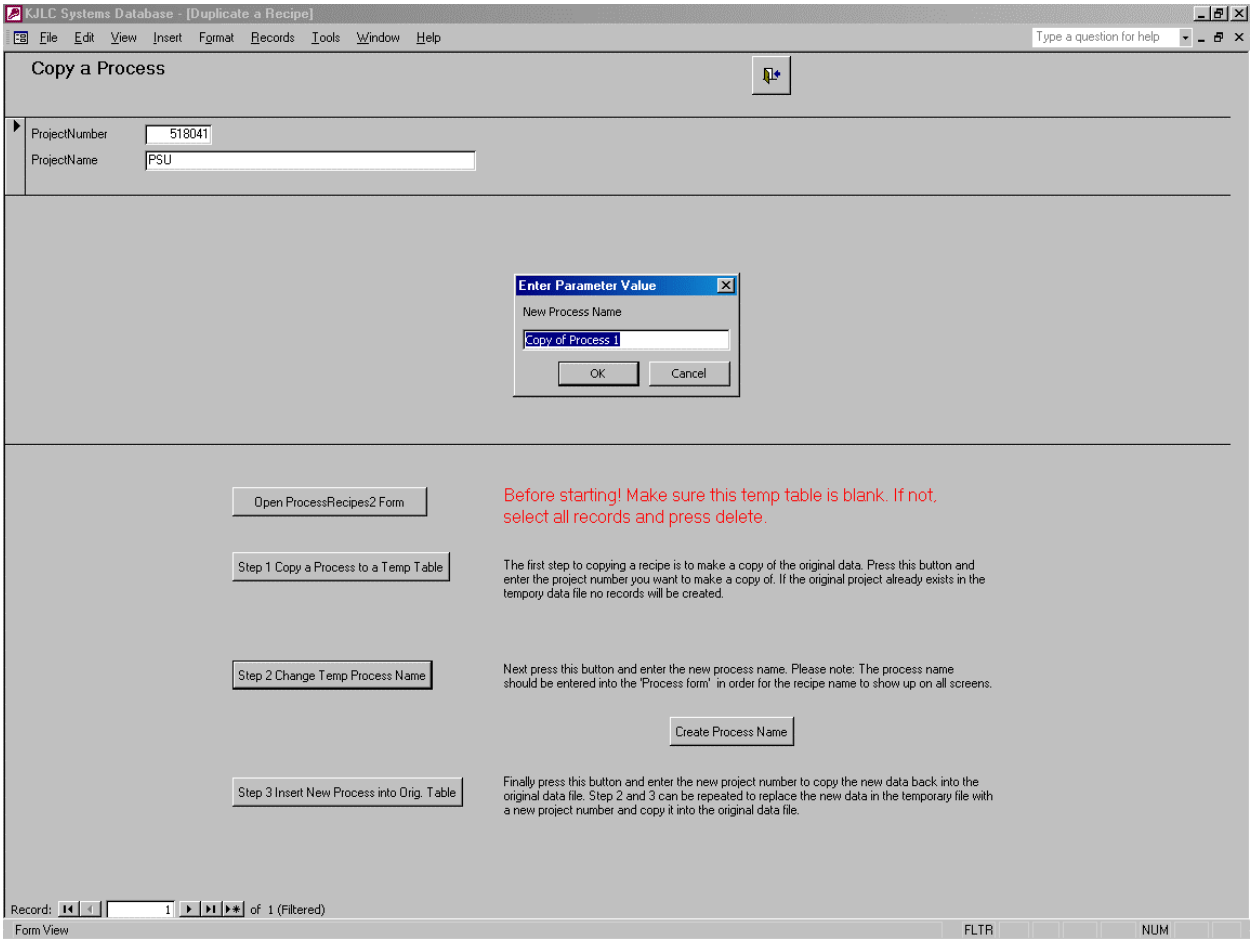
Paste the name of the source process from the Windows clipboard and then modify the name as desired. Press the exit button at the top of the form to return to the Copy a Process form.

Press the Step 2 Change Temp Process Name button on the Copy a Process form. Again, Access will prompt the user to confirm starting an update operation. Press the Yes button.



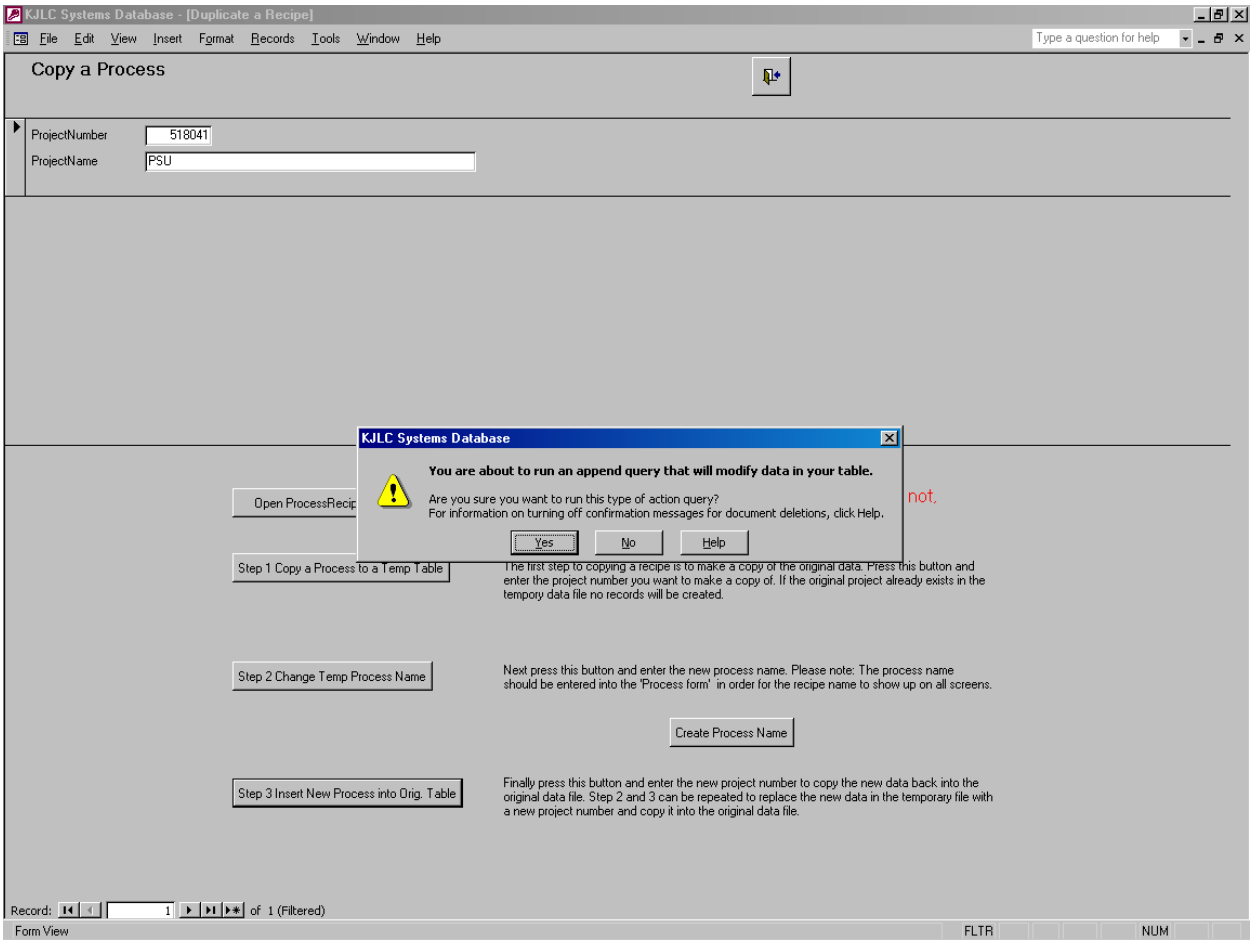
Update Records Prompt

The user is prompted to enter the desired name of the new process. Use the Windows paste tool and modify the name accordingly.



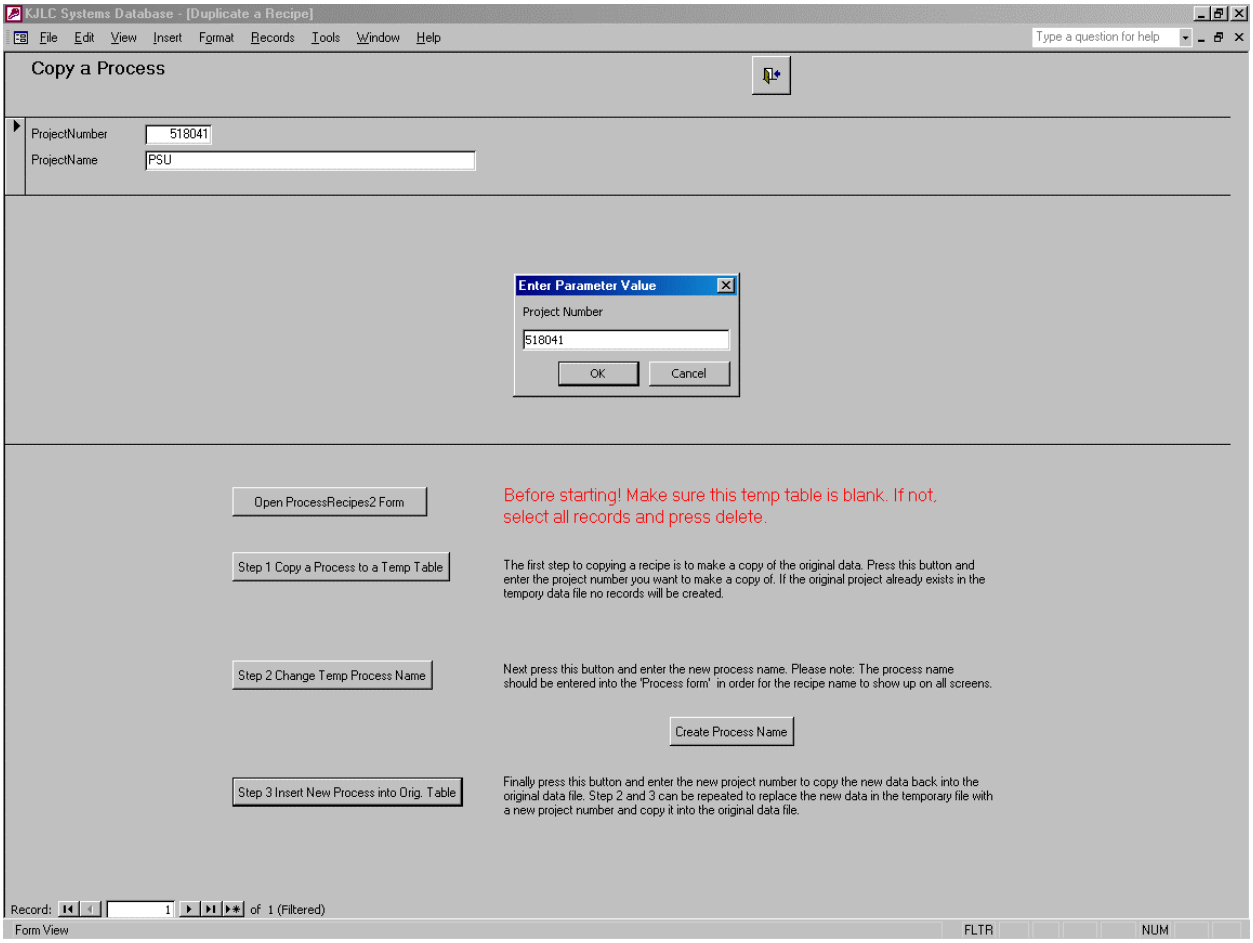
Enter New Process Name

Once the process copy in the temporary table has been renamed, press the Step 3 Insert New Process Into Orig. Table button. Access will prompt the user to confirm starting an append operation. Press the Yes button.



Confirm Starting an Append Operation Form

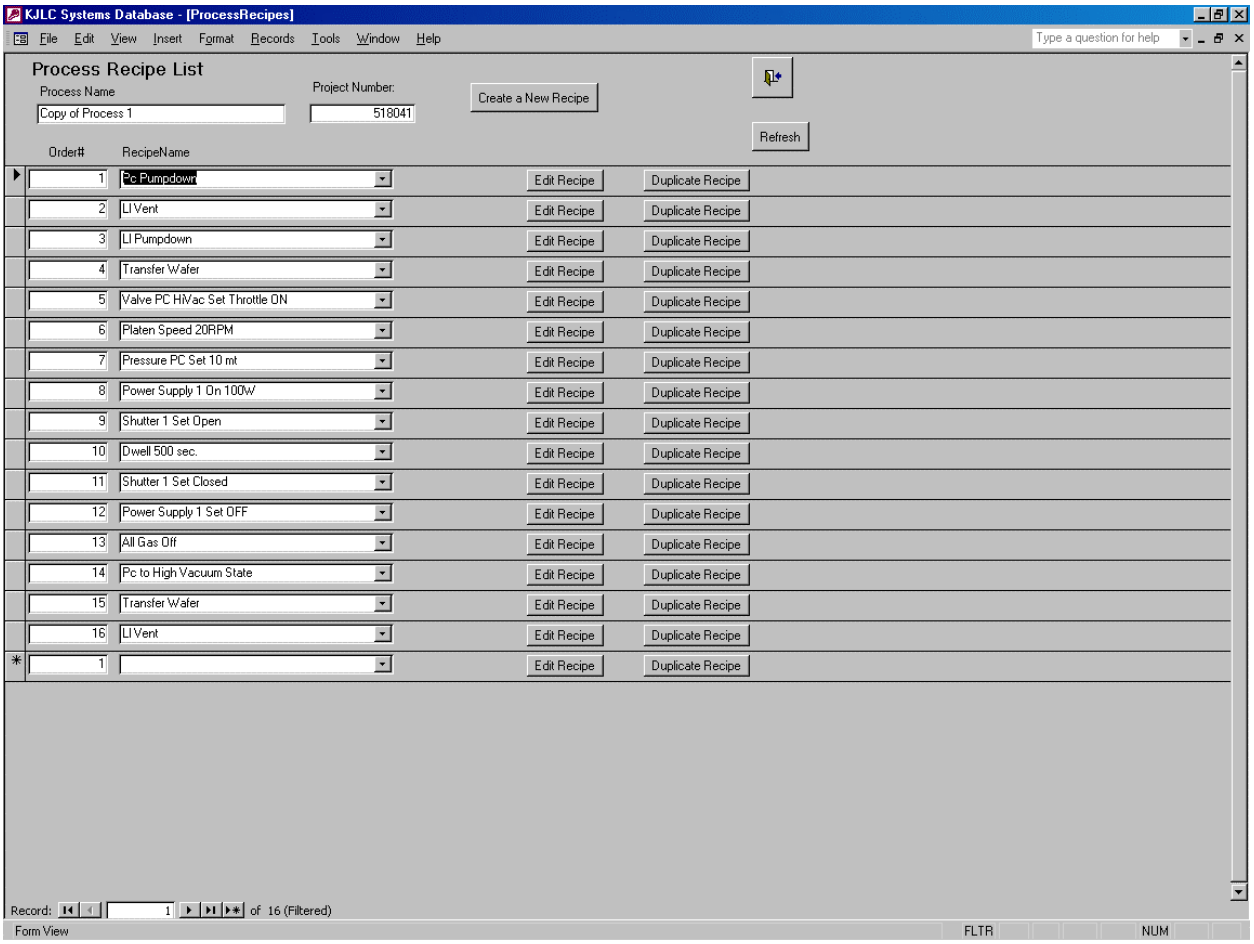
The software prompts the user for the destination project number. Enter the project number shown in the upper left hand corner of the Copy a Process form.



Enter Destination Project Number

If multiple copies of the same process are desired, return to the Create Process Name step described earlier and follow the steps accordingly. As long as the temporary table contains the desired process to be copied, the user can make as many copies as desired by simply creating the new process name, renaming the contents of the temporary table and pasting the new process back into the original project.

Once the duplicate process sequence is complete, close the Copy a Process form. It's a good idea to press the Edit Process Recipe List button for the newly created process and verify that it contains the desired recipes.

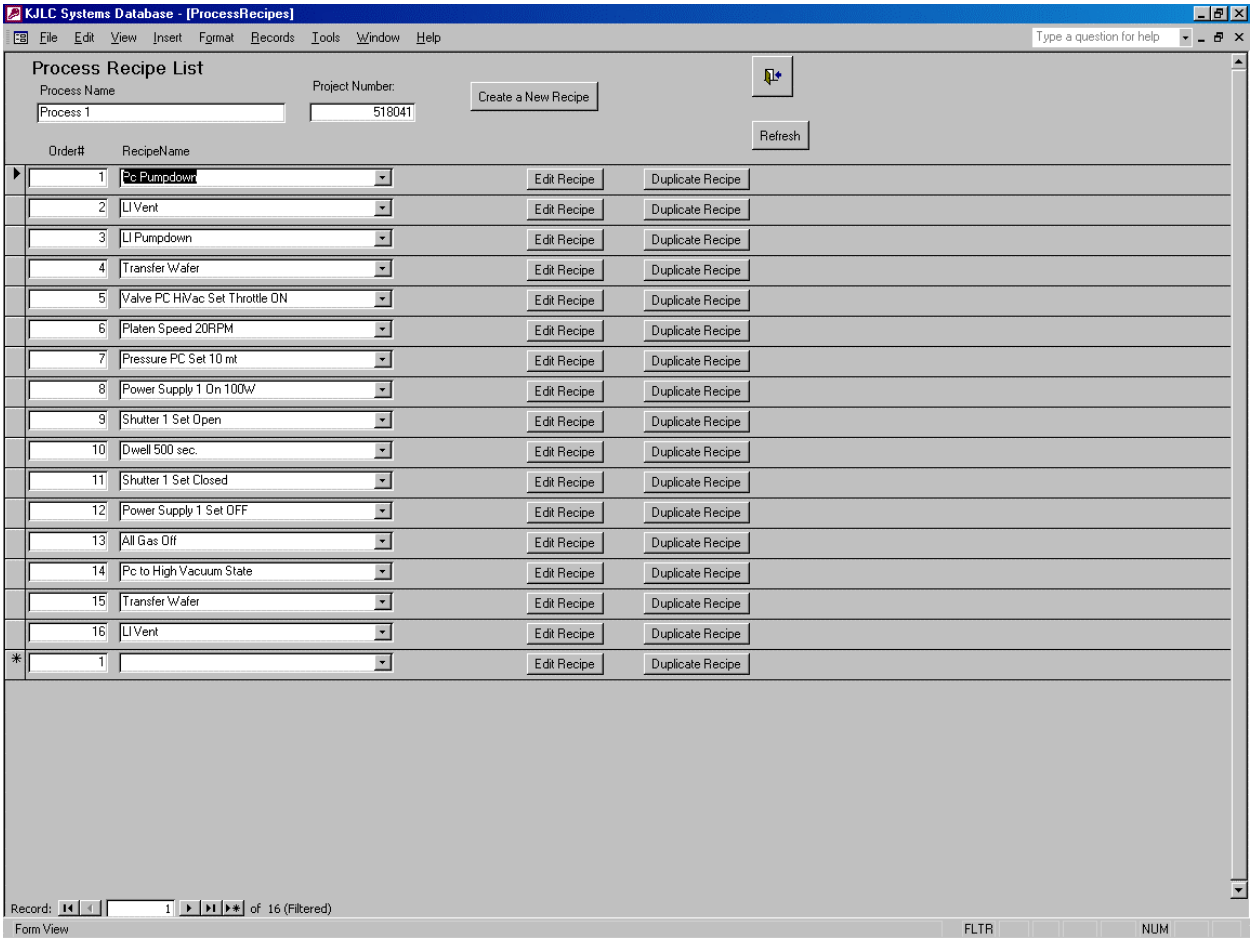


Process Recipe List Form

Duplicate Recipe

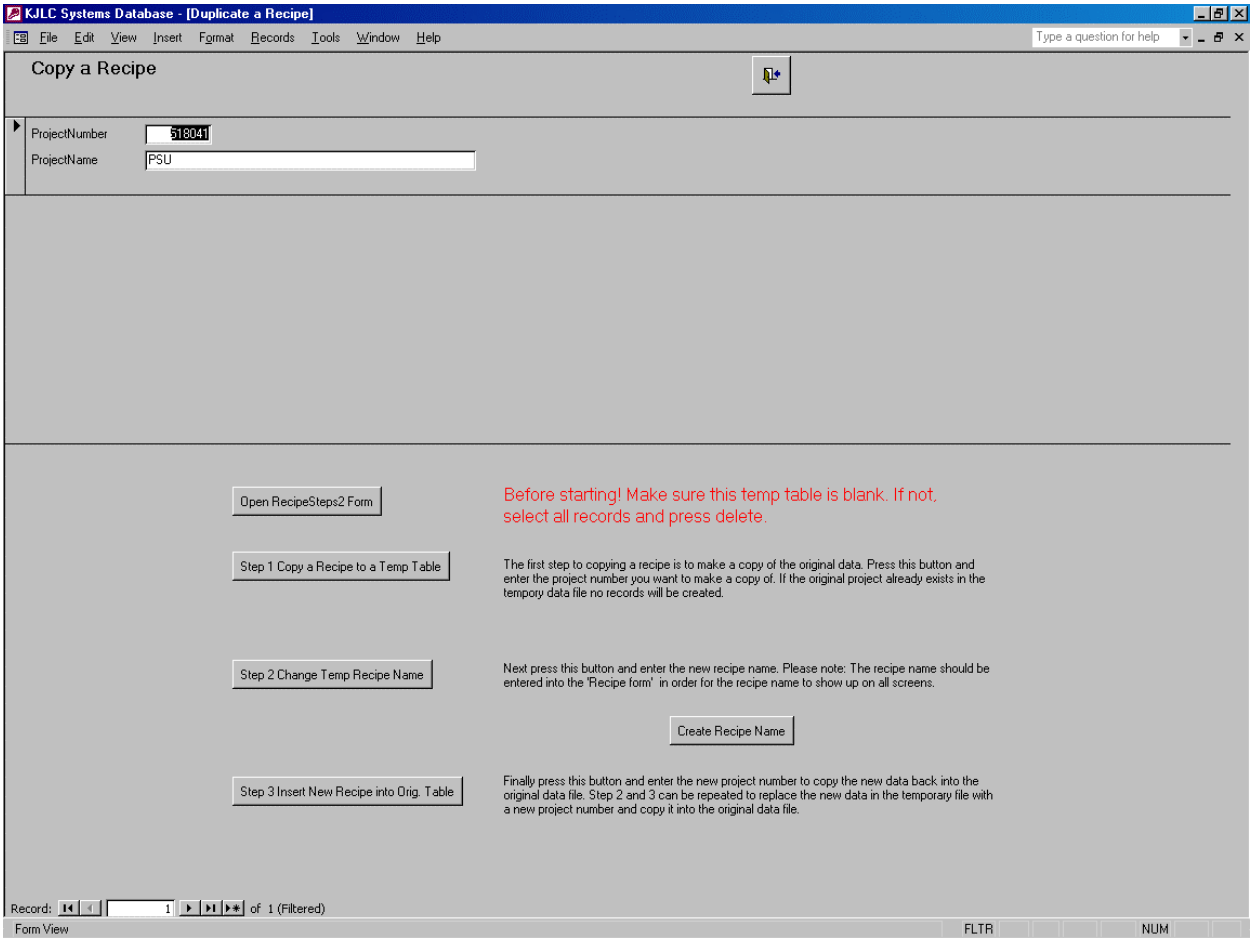
Recipe duplication utilizes the exact same sequence as Process duplication with one exception. Unlike Process duplication, the systems database will prompt the user for the name of the new recipe to paste from the temporary table back into the desired project. The systems database assumes that multiple recipes are present in the temporary table of recipe copies and thus prompts the user for the specific copy desired.

To duplicate a recipe, press the Duplicate Recipe button on the Process Recipe List form. Just as with the duplicate process sequence, it is a good idea to paste the name of the source recipe to the Windows clipboard prior to starting the duplication sequence.



Process Recipe List Form

Once the Duplicate Recipe button is pressed, the Copy a Recipe Form is displayed.



Copy a Recipe Form

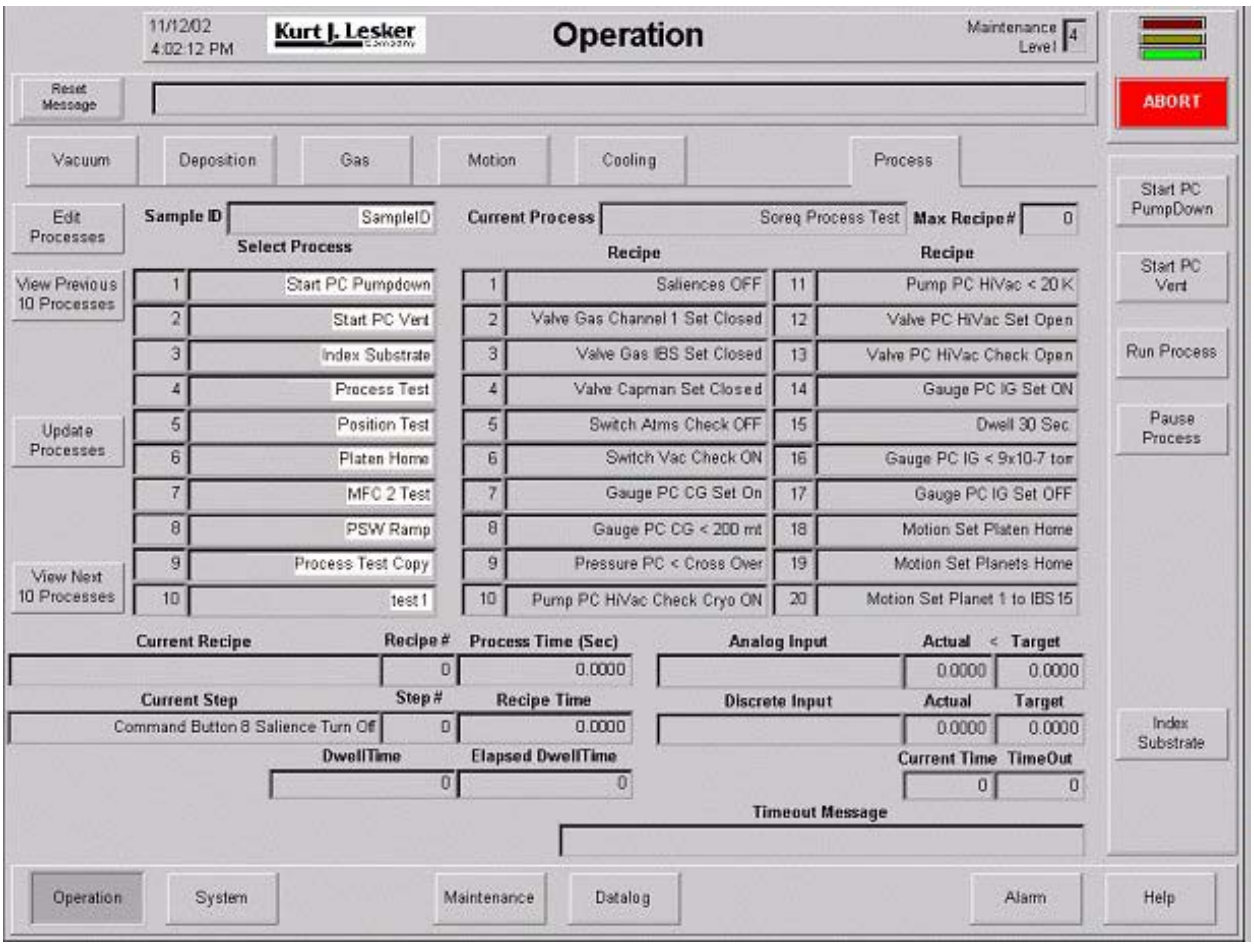
Refer to the Duplicate Process section for details regarding the duplicate recipe sequence.

PROCESSES

The following information is included in this section:

Creating/Editing Processes and Recipes

To edit the system database press the 'Edit Processes' button on the 'Operation/Process' screen of the runtime software (requires maintenance level 2 or higher).



Operation – Process Screen

⚠ CAUTION

Please note that Access must be properly shut down in order for any change to be permanently saved. It is always best to exit Access after making any changes by using the 'exit door' provided on each Access form and the 'stop sign', provided on the 'Show Project' form. The 'stop sign' will close the Access database and save any changes.

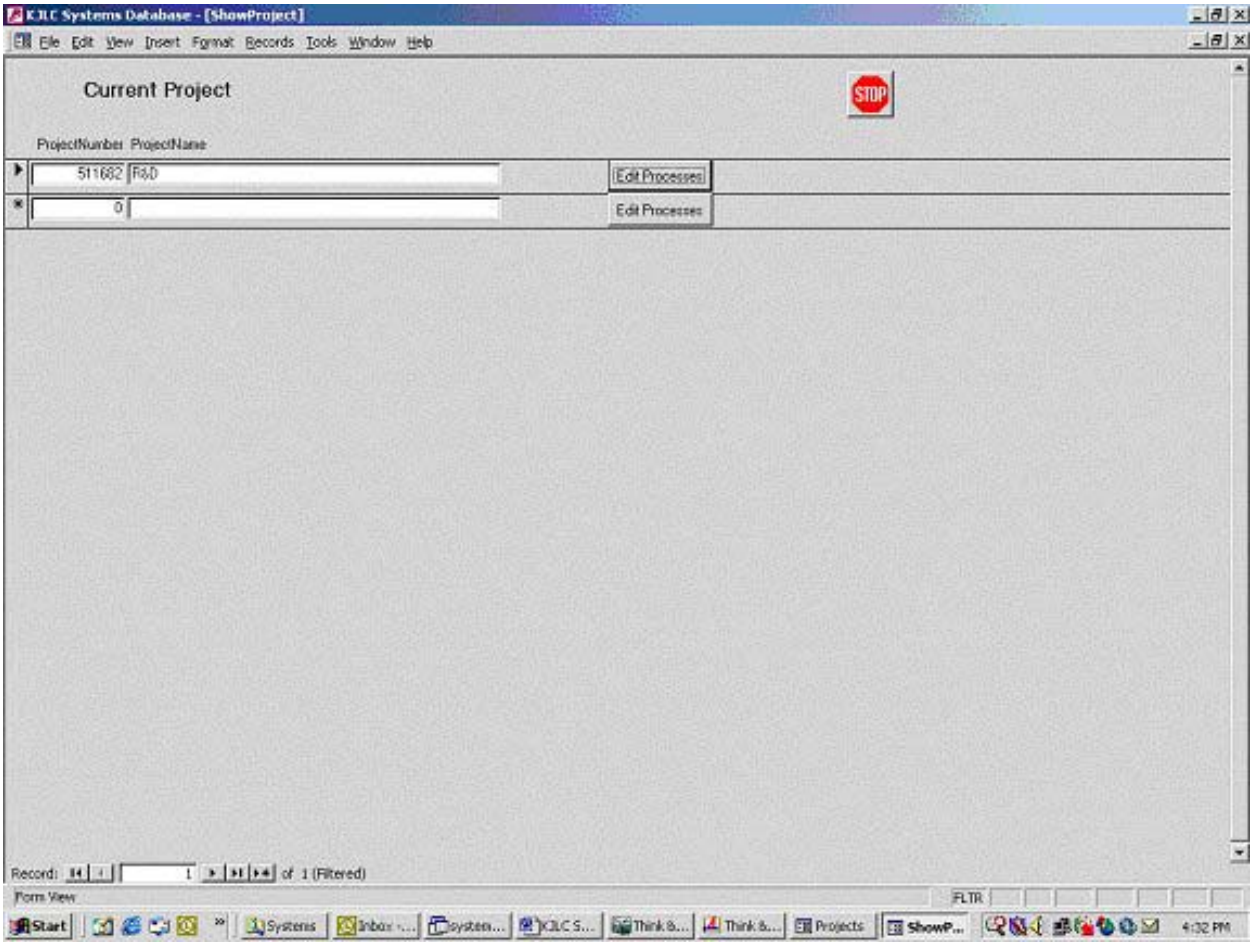
The Systems folder should be saved on a regular basis when changes to the database are made to minimize database data loss. All KJLC systems PCs include a CD-RW to make project backup fast. It is recommended that the RTE and the Access database be shut down when saving the data to ensure a true error free copy is created. Many data log files are saved to the Data Log folder. This data should also be saved to a CD on a regular basis or at a minimum deleted from the hard drives to conserve space. Don't forget to empty the Recycle Bin.

NOTE !

See section 3-1-7 for back-up instructions and procedure.

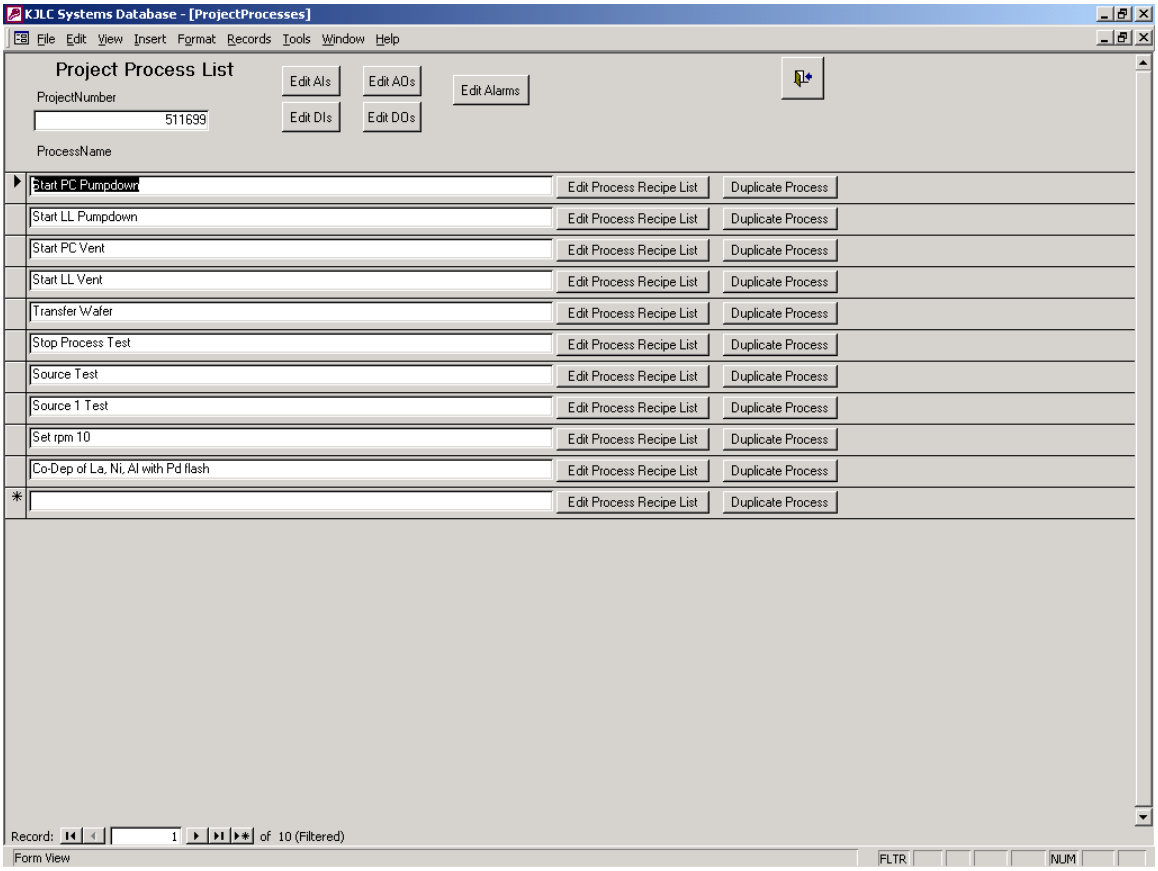
It may be desirable to leave the database open when fine-tuning a process or checking an instruction set. Make sure that the 'editing pencil' in the left column has changed into an arrow before trying a change in the RTE. Click another field to change the 'edit pencil' back into an arrow. Don't leave the database open when it is not in use.

The database can be opened from the Operation-Process screen (at Maintenance Level 2 or higher) in the Entivity run time project or from Start/Programs/Access from the Windows toolbar and selecting the 'systems.mdb' database. The database will open to the 'Show Project' form that will display the current project number and the project name. This page should not be modified.



Current Project Form

Selecting the 'Edit Processes' button will bring up the 'Process' form that lists the current processes included in the database. If you have more than one system, KJLC personnel can have more than one project show up on this form. This is no problem if only one master database is maintained at a time. This means that all processes and modifications are made to the master database and then copied to the second or third system.



Project Process List Form

A process is a collection of recipes in a predefined order of execution. A recipe is a collection of steps in a predefined order of execution. Processes can be written to prepare the system to run a second process or to put the system back into a safe state other than the abort conditions (you may want to turn off all motion and all power supplies but not close the HiVac valve, for example).

Abort conditions generally stop all motion and set all analog outputs (set points) to their initial conditions as well as shutting off any outputs that have been checked to shut off on the Discrete Outputs form. Even after aborting a process you can always run a pump down to return the system to a vacuum state.

The steps contain the information the RTE needs to open valves, turn on pumps, set power levels and check conditions along with the timing and next step information. This software doesn't work like 'state machine' software that sets the conditions of all outputs with every command. If an operator or a recipe turns a pump on, it will remain on until a recipe or operator requests that it be turned off. The software interlocks will prevent an output from being turned on if the interlock conditions are not met. Discrete outputs can be shut off when an abort occurs by

checking a box on the 'DOs' setup form in Access (this type of detailed configuration is typically reserved for KJLC personnel).

Process Troubleshooting

A process that seems to stop for no apparent reason can be diagnosed using the interlock messages displayed on the RTE screens or by looking at the last recipe step run. Check the recipe to see if the recipe or step was written correctly. Since many system parameters are logged in the process log and all interlocks are logged in the interlock file, check these files when problems arise. See section 3-1-6 of this manual for further details.

Process and Recipe Design Guidelines

Good recipe design is vital to maximize recipe functions and reuse. In most cases, one step recipes should be avoided. Think of a recipe as a reusable sequence that handles a particular function like setting a temperature, checking that the desired temperature has been reached in the expected amount of time and handling what happens if there is a problem. Recipe functional blocks will make the process easier to understand and maximize recipe reuse. Refer to Duplicate Process Form (section Access Forms-13) for details on the duplicate process feature.

Recipes can be written with various degrees of complexity. The simplest recipes don't include any checks at all; they just set outputs on and off and set setpoints. Novice users should write a few simple recipes to get an idea of what can be accomplished with a recipe.

It's a good idea to try a process in manual mode first before writing a recipe. This also helps when diagnosing a problem with a recipe. Use your knowledge of vacuum science to anticipate problems and jot down interlocks that you may not have expected while running a process in manual mode. Check steps in a recipe allows the user to perform other tasks if the check fails. Outputs that are interlocked make excellent checks to include in a recipe. A recipe's check steps make the recipe more robust, but make recipe writing more complex. Make sure to include an explanation of what failed to happen in every check step to make debugging recipes easier.

Advanced recipe writing techniques include sending the project to a special page or highlighting saliencies around buttons. If saliencies are used, make sure to turn them off before moving on if you don't want them to stay on. Advanced features are added to the software from time to time as required to offer maximum recipe writing flexibility.

Predefined Processes – Every project contains several predefined processes that were written by KJLC personnel and are started and stopped from special buttons located on the right hand side of the RTE user interface. The buttons text will match the process name. The following five process names have been reserved and their associated recipes and steps should never be modified or deleted without the approval of KJLC personnel.

Process Name	**Recipe name**
Start PC PumpDown	PC Pumpdown
Start PC Vent	PC Vent
Start LL PumpDown	LL Pumpdown
Start LL Vent	LL Vent
Transfer Wafer	Transfer Wafer

Naming Convention

Proper database management hinges on adopting and following a standard naming convention for naming processes, recipes, steps, and messages. The Access forms have been setup to alphabetize pull down selection lists. Using a standard naming convention simplifies the selection process, but any valid string can be used for a name. Typing in the name will automatically fill in the next matching name until a character doesn't match the existing list.

Process Names – Process names should convey the function of the process and any specific process variables. There aren't any pull-down menus involved with the process names but you can sort the list by right clicking on a field and selecting 'sort ascending'.
Example: 'Source 1 Test 100 W for 1 Hour'

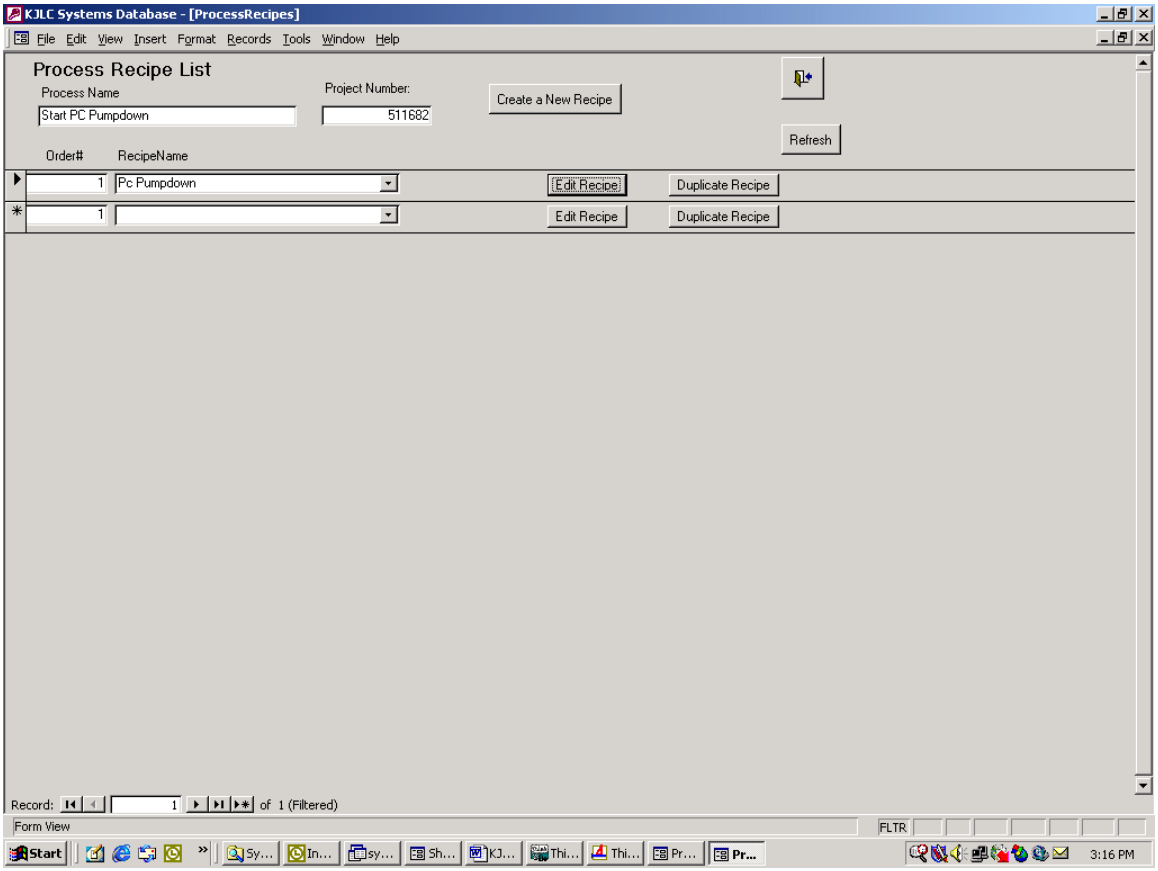
Recipe Names – Recipe names can be selected from a pull down list and therefore should follow a structured naming convention. Make recipes small enough to maximize reuse. When recipes are small their function is more easily described. Consider naming the recipe first by device type, then device name, then action, and finally state or value. Consider including the recipe creation date in the recipe name or in the recipe author name.
Examples: 'Power Supply 1 On 250W 10W/s'
'Pressure Control Source 1 Mfc1'

Step Names – Most steps work on specific types of devices such as pumps, valves, motors, gauges, etc.. Use these device types to start naming a recipe step. Next use the device name following the name used in the input/output pull down menus. Follow the device name with the requested command such as 'check' or 'set' and the value used. Checks should include the '>' or '<' sign and any alarming or ramping should also be included. It's easy to pick a similar step name from the list and change the name in the 'step name' field and press the 'edit step' button. Make the new step the way you want it and you are done.

Examples: 'Power Supply 1 Set 250W Ramp 10W/s'
'Power Supply 1 Set On'
'Valve Pc Hivac Throttle Check On'

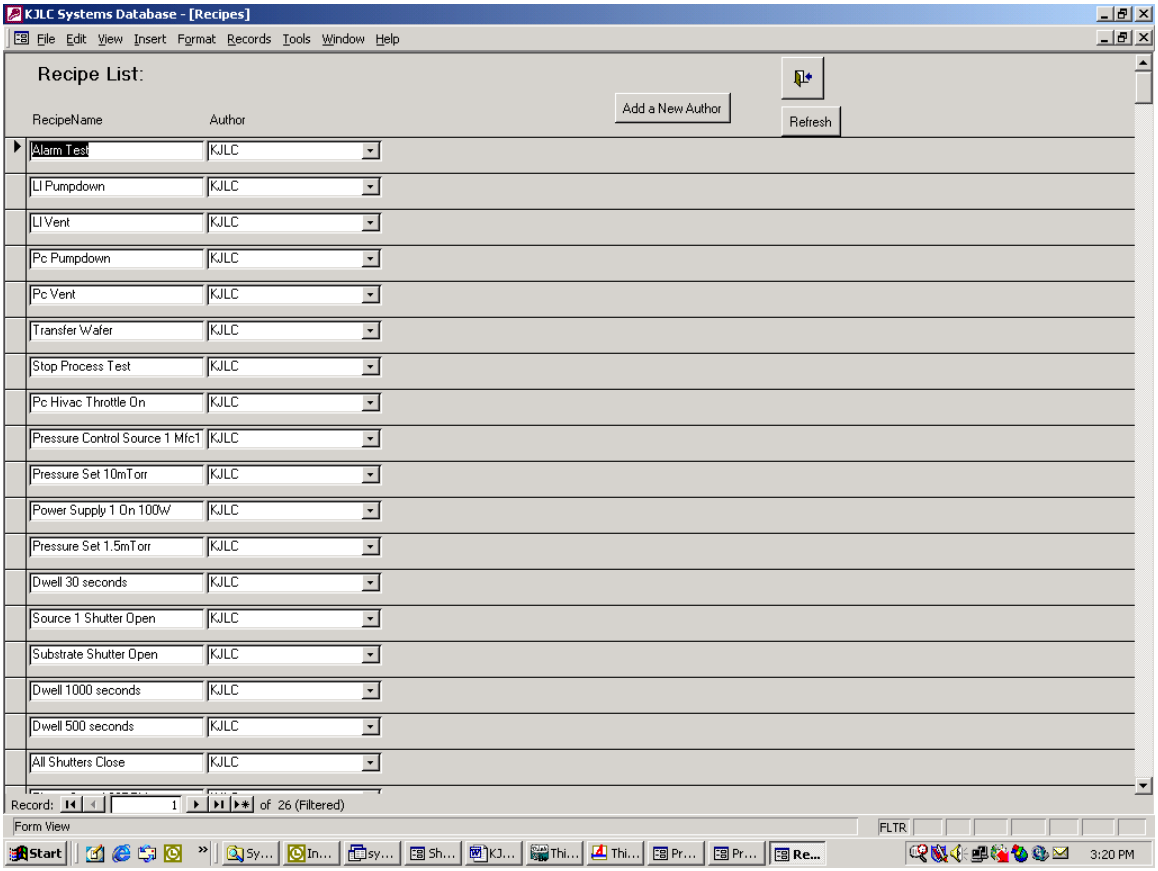
User Defined Processes- From the 'Process Recipe List' form an operator can create as many processes as they would like by entering a unique process name (see - Naming Conventions) as a new record and pressing the 'edit process recipe list' button beside the desired process. This button brings up the 'ProcessRecipes' form. Duplicating a process is described later. This form's order number will affect the order that the processes are displayed on the RTE Operation/Process screen.

NOTE !
The current RTE program is limited to 500 processes. Deleting seldom-used processes and adding them back to the end of the list will reorder the processes read by the RTE project.



Process Recipe List Form

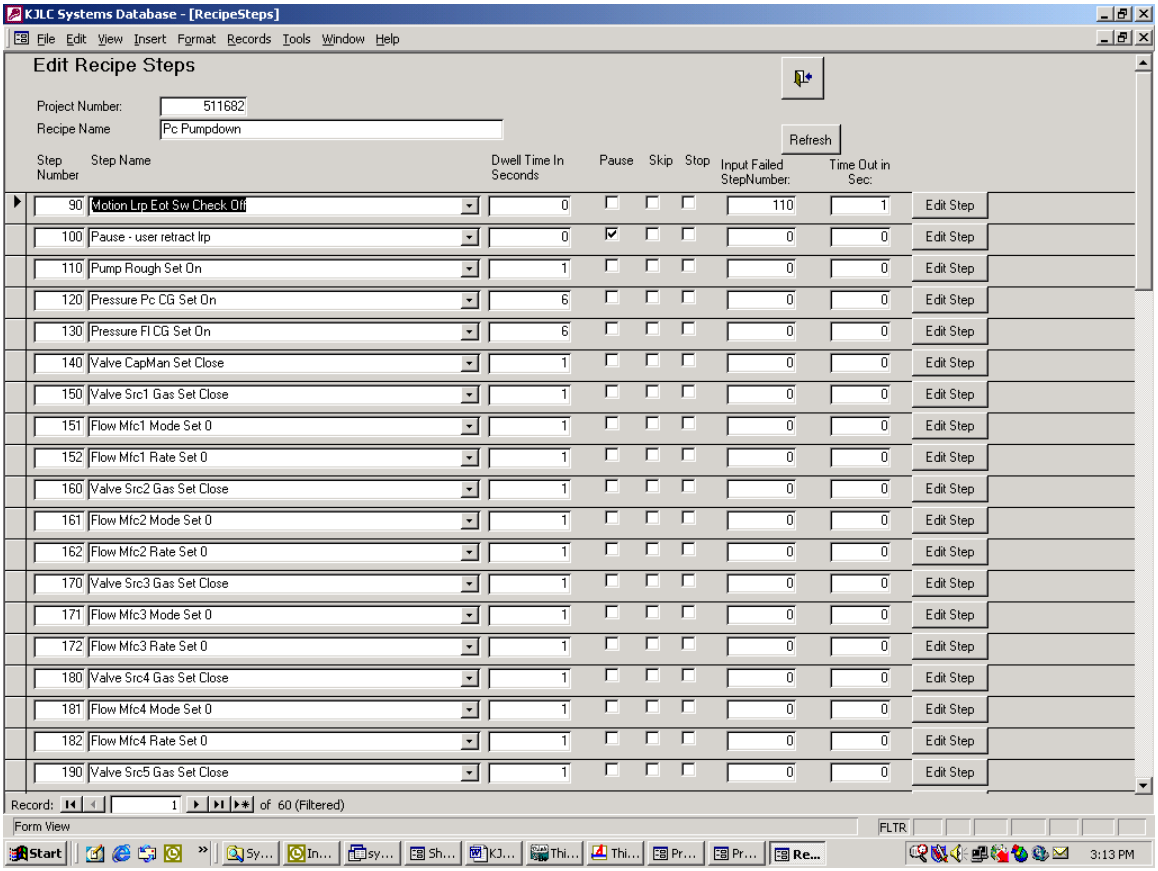
Existing recipes can be selected from the pull down list. To add a new recipe press the 'Create a New Recipe' button that will take you to the 'Recipes' form where you can enter a unique recipe name (see - Naming Conventions) and author name. Refer to the Duplicate Recipe form section for details on using the duplicate recipe feature.



Recipe List Form

Pressing the 'Add a New Author' button and filling in a unique name can add new authors. The author field is not required but can be used to track who wrote a specific recipe. The KJLC initials will designate the recipe created by KJLC personnel. Since this is a text field, a date designation can be added if desired. Pressing the 'close door' button will close the 'Authors' form and return to the 'Recipes' form. Press the 'Refresh' to update the author pull down list. After closing the 'recipes' form the 'Refresh' button should be pressed to add the new recipe to the pull down menu. Please note that closing any form and reopening it will automatically refresh the form.

Modifying a Recipe – After creating a recipe and adding it to a process list, it should be given a process execution order and modified to include the desired command set or steps. Pressing the 'Edit Recipe' button will open the 'RecipeSteps' form. This form allows the operator to create a series of instructions similar to programming in Basic.



Edit Recipe Steps Form

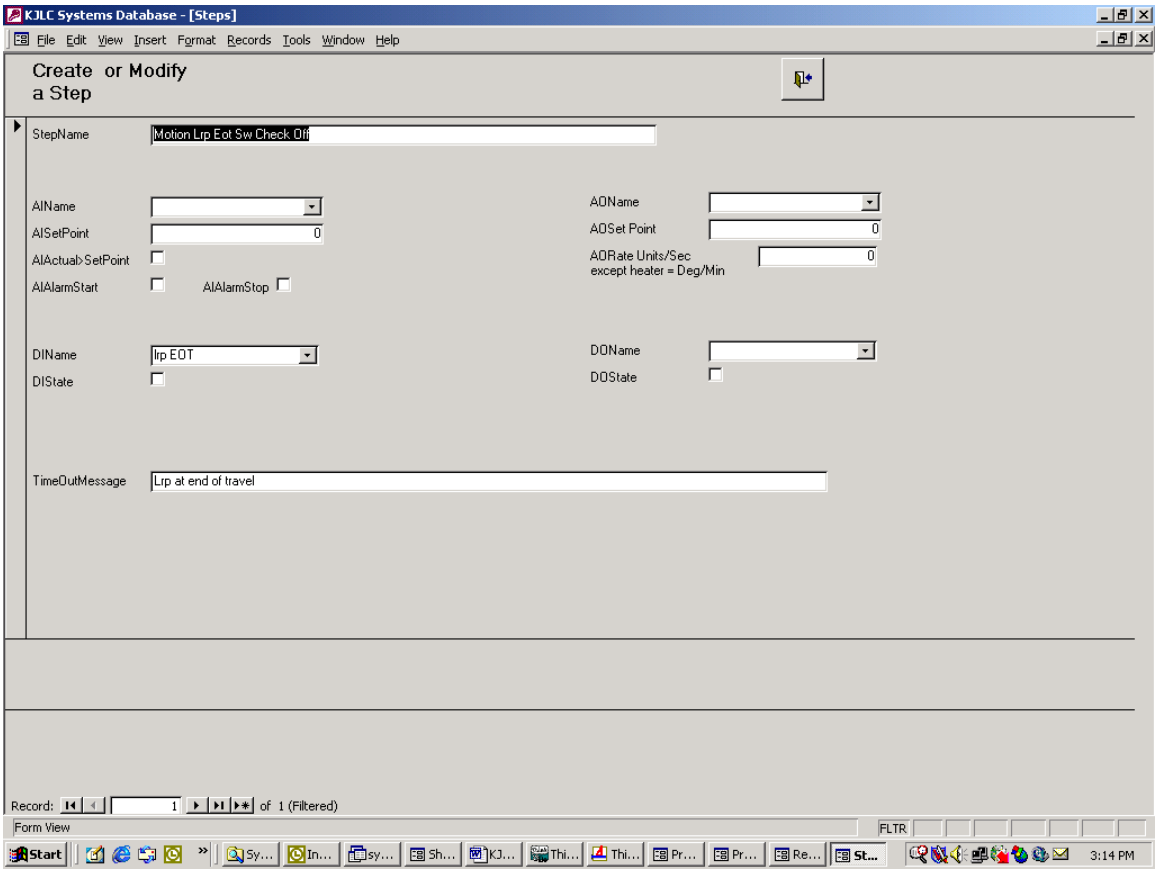
Each step should be given a unique 'step number'. This number will be used by the RTE to determine the execution order of the steps in the recipe. Start the step numbers high enough to add more steps at the beginning of the recipe if needed and leave enough numbers between steps to add steps if required.

The step numbers can be reordered anytime by right clicking on the 'step number' column and selecting 'Sort Ascending' to change their display order.

NOTE !
This form's display order will not affect the execution order.

Study the KJLC recipes for examples of how to create recipes that are designed for maximum reuse and performance. Next fill in the remaining information on the step you are editing. The 'step name' can be selected from the pull down list or if the desired step isn't on the list, create a new one (see - Naming Conventions) by typing it into the 'step name' field and pressing the 'edit Step' button.

The 'Steps' form allows the operator to define an analog input (AI) to check against a desired value, a discrete input (DI) to check against a desired state, an analog output (AO) to set to a desired value and a discrete output (DO) to turn a device or function on or off. A pull down list is provided for selecting the desired input or output. Make sure the values entered are in the same units as the database units for that input or output. The units for each analog input and output can be found on the Systems-I/O screen of the RTE. When selecting an input, a timeout message should also be created describing the failed step condition.



Create or Modify a Step Form

The AI section provides a field for the 'AISetPoint' and an "AIActual>SetPoint' checkbox. Checking this box means that if the AI is greater than the set point the condition will be true and the recipe will move on to the next step. If the box is not checked, the AI must be less than the

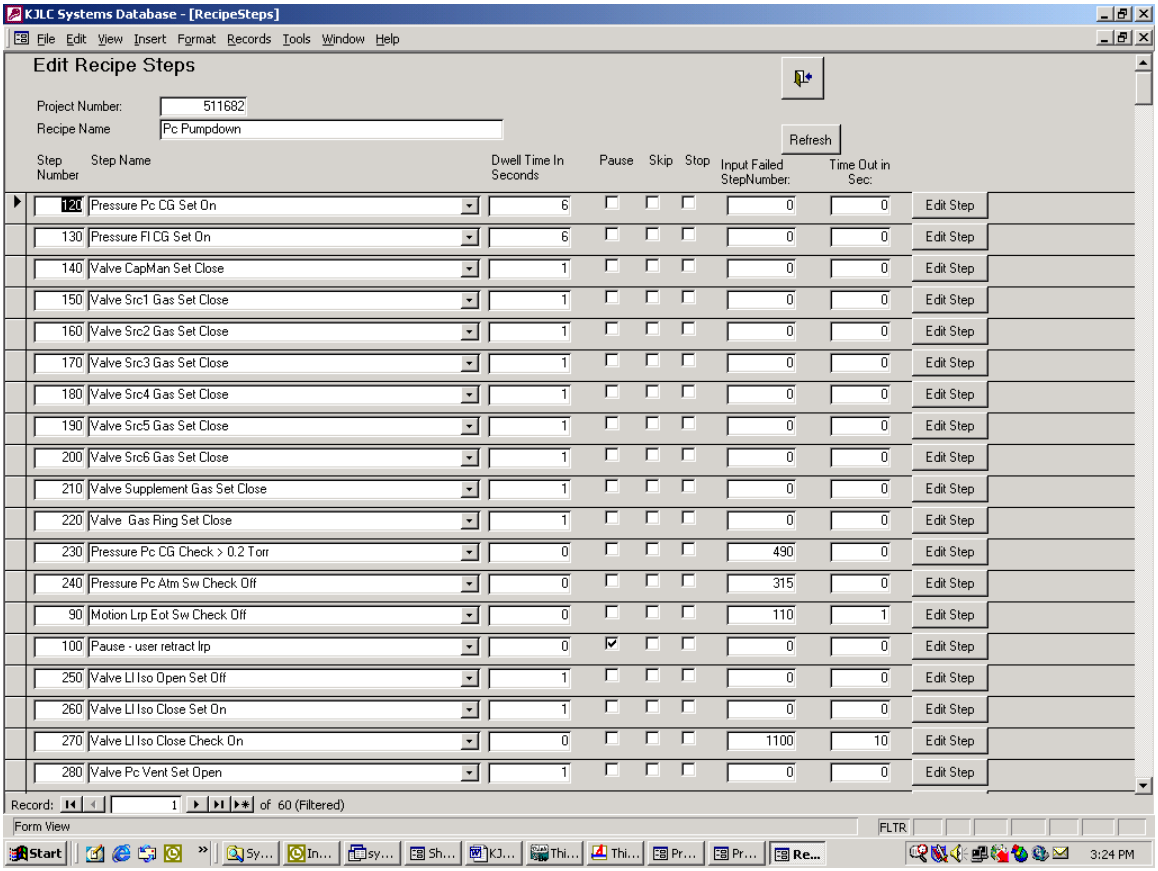
set point for the condition to be true. If the condition doesn't become true within the time defined on the 'RecipeSteps' form, the recipe will execute the step number entered in the 'Input Failed Step Number' field. If the step number doesn't exist in the recipe, the next valid step number will be executed. The DI follows the same conditional checking and time out as the AI. The AI also includes a checkbox to start and stop an AI specific alarm program. The alarm program will continue to check the AI until it is shut off from the alarm screen or from a recipe step. The alarm can be programmed to warn the operator of a problem or to abort the process as defined by the alarm (see – Alarm Programming).

The AO section provides a field to set the desired output value and a ramp value if desired. Leaving the ramp value blank will set the AO to the desired value immediately. Selecting a ramp value will activate the ramp program for the AO that will increment the actual AO set point from the initial, every scan (~50 ms), until the 'AO SetPoint Value' is reached. The ramp rate is entered as Units/sec for all AOs except the heater set point, which is entered in Degrees/min.

The DO section provides a way to turn a function or output on or off. Selecting a 'DO Name' and checking the checkbox will make the output true. Leaving the checkbox blank will make the output false.

Closing the 'Steps' form will return the operator to the 'RecipeSteps' form.

Pushing the 'Refresh' button will update the steps listed on the Step Name pull down list.



Edit Recipe Steps Form

The 'Dwell Time in Sec' field allows the operator to define the minimum time the recipe will remain on the current step. The RTE first reads all the step settings from the database and then starts a dwell timer. When the dwell timer is finished any inputs are evaluated. If all conditions are true and the pause button is not active the recipe moves on to the next step. If the conditions aren't true the RTE will wait any additional time remaining on the 'Time Out in Sec' timer or until the conditions become true which ever comes first. If the time out timer expires the recipe will jump to the 'Input Failed Step Number'.

The 'Pause' checkbox allows the operator to pause the current recipe step until the pause button is acknowledged from the user interface screen. The Time Out timer is evaluated before the pause button so a recipe will move on to the 'Input Failed Step Number' even if the step is paused and the next step will be paused unless the process is aborted. If the Input condition is true the RTE will wait until the user presses the 'Resume Process' button. The pause button is reset when the abort button is pressed, an alarm condition calls for an abort or the process is stopped.

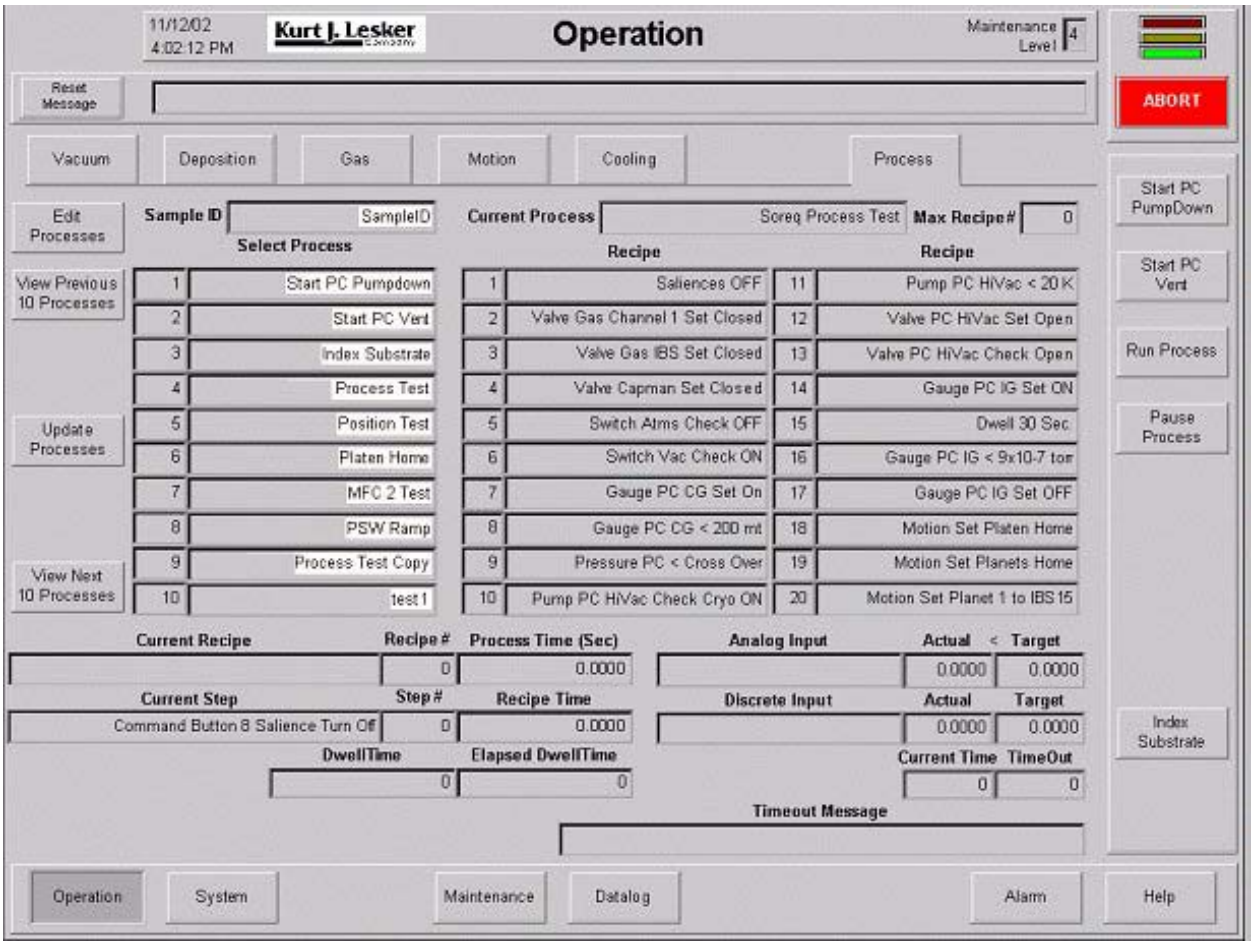
The 'Skip' checkbox allows the recipe creator to skip a step without removing it from the recipe. It acts as a placeholder or reminder so the step can easily be added back into the recipe.
The 'Stop' checkbox tells the RTE that this is the last step in the recipe that should be executed. Every recipe should contain at least one stop recipe step.

The 'Input Failed Step Number' field is the recipe step number that will be executed when the input time out timer expires.

The 'Time Out in Sec' is the time in seconds that the RTE will wait for the desired discrete input or analog input to become true.

Running Processes

To run a process other than the standard processes provided on the Command Buttons, select the Process tab on any one of the Operation screens and the Process screen appears.



Operation – Process Form

Select the desired process by clicking a name from the list of ten processes shown. If the desired process does not appear, use the View Next and View Previous buttons to display all of the available processes in the database in groups of ten. If a new process has been created but does not appear, the Update Processes button can be used to refresh the list. This button is only available when the list is displaying the first ten processes in the database. If the user has currently displayed processes 21-30, they must first use the View Previous button to go back to the first ten processes before the update button is available.

Once a process has been selected, the white text background of the process names turns gray while the runtime engine reads all of the recipes in the selected process. No other process may be selected while the recipe list is updating. Once the recipe list is complete, pushing the Run

Process button on any screen will run the currently selected process. The user is free to view any screen while a process is running, but must also beware that recipes have the ability to automatically set the desired screen to be displayed during any portion of the active process. While the process screen contains the most detailed information regarding the individual steps and recipes of an active process, the Process Tracer on most of the other screens does contain much of the same information.

Once the Run Process button is pressed, the text on the button changes to read Stop Process. If this button is pressed while a process is running, the active process stops and the system is left in the state dictated by the most recently executed recipe step. Pressing the Run Process button again (without selecting a new process) runs the currently selected process from the beginning.

Pressing the Pause button while a process is running pauses the process indefinitely on the current recipe step. The next step will not be executed until the Resume Button is pressed.

Pressing the Abort button at any time (whether a process is active or not) will stop the current process and set system devices to a safe state. The Abort must be acknowledged prior to proceeding with system operation.

Standard Recipes

KJLC computer controlled systems are provided with several standard recipes for basic system automation. These recipes include PC Pumpdown and Vent, LL Pumpdown and Vent (for loadlocked systems) and Wafer Transfer (for loadlocked systems). Some examples of these recipes are shown in the tables below. Following the PC pumpdown recipe is a detailed description of the recipe steps for reference. These recipes are taken from a standard cryo-pumped system with a loadlock chamber.

KJLC generally recommends creating smaller, more modular recipes to keep them manageable. These recipes are larger and more complex than typical recipes and were created this way for a reason. The intent of these standard recipes, in addition to being used for automated pumpdown and vent sequences, is to be able to "string" them together along with other process recipes (i.e. deposition recipes) to create true one button processes. For example, the user might create a process with the following recipes:

1) PC Pumpdown (prepares the process chamber for a deposition
2) LL Vent (allows the operator to load a new part)
3) LL Pumdown
4) Wafer Transfer (allows the operator to move the part to the process chamber)
5) Deposition Layer 1 (user created recipe)
6) Deposition Layer 2 (user created recipe)
7) Deposition Layer 3 (user created recipe)
8) Wafer Transfer (allows operator to move part back to loadlock chamber)
9) LL Vent (allows operator to unload a finished part)

NOTE: A "-1" in the Pause, Skip and Stop columns indicates that the respective box has been selected on the Recipe form.

NOTE: Steps that are described as applying only to specific system configurations may have the "Skip" box selected on particular systems (i.e. steps that involve a loadlock chamber may be skipped if the system does not have a loadlock chamber). These steps remain in the standard recipe as these recipes are designed to be used for multiple system configurations.

PC Pumpdown Recipe

Recipe Name	Project Number	Step Number	StepName	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Pumpdown	516103	11	Command Button 1 Salience Turn Off	0	**0**	**0**	**0**	0	0
Pc Pumpdown	516103	12	Command Button 2 Salience Turn Off	0	**0**	**0**	**0**	0	0
Pc Pumpdown	516103	13	Command Button 3 Salience Turn Off	0	**0**	**0**	**0**	0	0

Recipe Name	Project Number	Step Number	StepName	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Pumpdown	516103	14	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	15	Command Button 5 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	16	Command Button 6 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	17	Command Button 7 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	18	Command Button 8 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	19	Command Button 9 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	20	Screen Set Vacuum	0	0	0	0	0	0
Pc Pumpdown	516103	90	Motion Lrp Eot Sw Check Off	0	0	0	0	110	1
Pc Pumpdown	516103	100	Pause - User Retract Lrp	0	-1	0	0	0	0
Pc Pumpdown	516103	110	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Pc Pumpdown	516103	120	Pressure Pc CG Set On	6	0	0	0	0	0
Pc Pumpdown	516103	130	Pressure Fl CG Set On	6	0	0	0	0	0
Pc Pumpdown	516103	140	Valve CapMan Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	150	Valve Src1 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	151	Flow Mfc1 Mode Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	152	Flow Mfc1 Rate Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	160	Valve Src2 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	161	Flow Mfc2 Mode Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	162	Flow Mfc2 Rate Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	170	Valve Src3 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	171	Flow Mfc3 Mode Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	172	Flow Mfc3 Rate Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	180	Valve Src4 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	181	Flow Mfc4 Mode Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	182	Flow Mfc4 Rate Set 0	0	0	0	0	0	0
Pc Pumpdown	516103	190	Valve Src5 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	200	Valve Src6 Gas Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	210	Valve Supplement Gas Set Close	0	0	0	0	0	0

Recipe Name	Project Number	Step Number	StepName	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Pumpdown	516103	220	Valve Gas Ring Set Close	0	0	0	0	0	0
Pc Pumpdown	516103	230	Pressure Pc CG Check > 0.2 Torr	0	0	0	0	490	0
Pc Pumpdown	516103	235	Pump Rough Set On	1	0	0	0	0	0
Pc Pumpdown	516103	240	Pressure Pc Atm Sw Check Off	0	0	0	0	310	0
Pc Pumpdown	516103	250	Valve Ll Iso Open Set Off	1	0	0	0	0	0
Pc Pumpdown	516103	260	Valve Ll Iso Close Set On	1	0	0	0	0	0
Pc Pumpdown	516103	270	Valve Ll Iso Close Check On	0	0	0	0	1100	10
Pc Pumpdown	516103	280	Valve Pc Vent Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	290	Pressure Pc Atm Sw Check On	0	0	0	0	1100	300
Pc Pumpdown	516103	300	Dwell 10 seconds	10	0	0	0	0	0
Pc Pumpdown	516103	310	Valve Pc Vent Set Close	1	0	0	0	0	0
Pc Pumpdown	516103	315	Pressure Ll IG Set Off	6	0	0	0	0	0
Pc Pumpdown	516103	320	Valve Rough Set Close	1	0	0	0	0	0
Pc Pumpdown	516103	330	Pump Ll Turbo Set Off	1	0	0	0	0	0
Pc Pumpdown	516103	340	Valve Ll Turbo Vent Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	350	Valve Ll Turbo Vent Set Close	1	0	0	0	0	0
Pc Pumpdown	516103	360	Pump Ll Turbo At Speed Check Off	0	0	0	0	1100	300
Pc Pumpdown	516103	370	Valve Ll Turbo Vent Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	380	Dwell 30 Seconds Ll Vent	30	0	0	0	0	0
Pc Pumpdown	516103	390	Valve Ll Turbo Vent Set Close	1	0	0	0	0	0
Pc Pumpdown	516103	400	Valve Ll Iso Close Set Off	1	0	0	0	0	0
Pc Pumpdown	516103	410	Valve Ll Iso Open Set On	1	0	0	0	0	0
Pc Pumpdown	516103	420	Valve Ll Iso Open Check On	0	0	0	0	1100	10
Pc Pumpdown	516103	430	Pressure Fl CG Check < .2 Torr	0	0	0	0	1100	30
Pc Pumpdown	516103	440	Valve Rough Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	445	Valve Pc Rough Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	450	Pressure Pc CG Check < 500 Torr	0	0	0	0	1100	120
Pc Pumpdown	516103	460	Pump Ll Turbo Set On	1	0	0	0	0	0

Recipe Name	Project Number	Step Number	StepName	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Pumpdown	516103	470	Pressure Pc CG Check < 0.2 Torr	0	0	0	0	1100	360
Pc Pumpdown	516103	480	Dwell 5 Seconds Additional Pc Rough	5	0	0	0	0	0
Pc Pumpdown	516103	485	Valve Pc Rough Set Closed	2	0	-1	0	0	0
Pc Pumpdown	516103	490	Valve Ll Iso Open Set Off	1	0	0	0	0	0
Pc Pumpdown	516103	500	Valve Ll Iso Close Set On	1	0	0	0	0	0
Pc Pumpdown	516103	510	Valve Ll Iso Close Check On	0	0	0	0	1100	10
Pc Pumpdown	516103	515	Pump Rough Set Off	1	0	-1	0	0	0
Pc Pumpdown	516103	520	Valve Pc Hivac Set Open	1	0	0	0	0	0
Pc Pumpdown	516103	530	Valve Pc Hivac Open Check On	0	0	0	0	1100	15
Pc Pumpdown	516103	540	Pressure Pc CG Check < 0.05 Torr	0	0	0	0	1100	10
Pc Pumpdown	516103	550	Pressure Ll IG Set Off	6	0	0	0	0	0
Pc Pumpdown	516103	560	Pressure Pc IG Set On	15	0	0	0	0	0
Pc Pumpdown	516103	570	Pressure Pc IG Check < .00009 Torr	0	0	0	0	1100	600
Pc Pumpdown	516103	999	Command Button 1 Salience Turn Green	1	0	0	0	0	0
Pc Pumpdown	516103	1000	Stop Recipe	0	0	0	-1	0	0
Pc Pumpdown	516103	1100	Stop Process	0	0	0	0	0	0

PC Pumpdown Recipe Steps Description

1) Steps 11-19: Turn off all background salience for all command buttons in case any are turned on from a previous process (there is no problem with turning off saliences for command buttons that don't appear on the runtime screens – it is a good idea to write a generic recipe that turns them all off regardless of whether or not they are invisible). No dwell time or timeout is required for this action. This step applies to all system configurations.
2) Step 20: Set the screen number variable to 1 to automatically display the vacuum screen (screen #1) when this step is executed. No dwell time or timeout is required for this action, but it can take up to five seconds for the new screen to appear and start displaying current data. This step applies to all system configurations.
3) Step 90: Verify that the LRP is retracted by using a check step for LRP not retracted (the LRP must be retracted before the loadlock isolation valve can be closed). If the check

step passes (LRP is not retracted), the recipe moves to the next sequential step. If the check step fails (meaning the LRP is retracted), the recipe moves to InputFailStepNumber 110 and skips the next sequential step(s). No dwell time is required for this step, but a small timeout value is a good idea (1 second). This step applies to loadlocked systems.

4) Step 100: Pause the current process and prompt the user to manually retract the LRP so the automated process can continue. The user is prompted by the fact that this step sets the command button 4 (Pause button) background salience to blue indicating that operator intervention is required. Additionally, the step name is displayed in the process tracer on the vacuum screen. Once the Resume button is pressed (the Pause button reads "Resume" when it is pressed and "Pause when it is not pressed) the recipe will continue. No dwell time or timeout is required for this step, but the "Pause" checkbox must be checked. This step applies to loadlocked systems.
5) Step 110: Turn off the blue background salience for command button 4 now that the user has pressed the Resume button. No dwell time or timeout is required for this step. This step applies to loadlocked systems.
6) Step 120: Turn on the process chamber convectron gauge (in case the system has just been started and the gauge is not already on). A six second dwell time is used with this step to allow the gauge to turn on and the pressure reading to stabilize. This step applies to all systems.
7) Step 130: Turn on the foreline (roughing line) convectron gauge (in case the system has just been started and the gauge is not already on). A six second dwell time is used with this step to allow the gauge to turn on and the pressure reading to stabilize. This step applies to all systems.
8) Steps 140-220: Close capacitance manometer isolation valve and all gas valves. Set all MFCs to independent flow mode and zero all MFC flow setpoints. No dwell time or timeout is required for these steps. These steps apply to all systems (there is no problem turning off valves and MFCs that do not exist in a given system configuration – it is a good idea to write a generic recipe that turns off all of these devices regardless of whether or not they are present).
9) Step 230: Check the process chamber convectron gauge pressure for greater than 0.2 Torr (typical crossover pressure). If the check step passes, the recipe will execute the next sequential step(s) that rough the process chamber to crossover. If the check step fails, the recipe will skip the next sequential step(s) and move to the portion of the recipe that starts the process chamber turbo pump (if applicable) or checks the cryo pump temperature. This step requires no dwell time or timeout. This step applies to all system configurations.
10) Step 235: Turn on system rough pump. This step requires no dwell time or timeout. This step applies to all system configurations.
11) Step 240: Check the process chamber atmosphere switch for not at atmosphere (some level of vacuum present). If the check step passes, the recipe will execute the next sequential step(s) that vent the process chamber to atmosphere. If the check step fails, the recipe will skip the next sequential step(s) and move to the portion of the recipe that vents

the loadlock chamber. No dwell time or timeout is required for this step. This step applies to loadlocked systems.

12) Steps 250-270: Turn off the loadlock isolation valve open signal, turn on the loadlock isolation valve close signal and verify that the isolation valve actually closed. The isolation valve is closed to vent the process chamber only (it may already be closed in which case this set of steps will execute very quickly). There are no dwell times required for these steps, but a 10 second timeout value is used to give the isolation valve time to cycle from the open to the closed position. This step applies to loadlocked systems. The process is stopped (InputStepFailedNumber 1100) if this valve cannot be closed.
13) Steps 280-310: Open the process chamber vent valve and verify that the chamber reached atmosphere. Once the chamber reaches atmosphere, vent for an additional 10 seconds and close the vent valve. A dwell time of 10 seconds is associated with the additional vent step and a timeout of 300 seconds is allowed for the process chamber to reach atmosphere initially. This step applies to loadlocked systems. The process is stopped (InputStepFailedNumber 1100) if the chamber does not reach atmosphere.
14) Step 315: Turn off the loadlock ion gauge prior to venting the loadlock chamber. A six second dwell time is used to allow the gauge time to turn off. This step applies to loadlocked systems.
15) Step 320: Close the system roughing valve (also backs the loadlock turbo). No dwell time or timeout is required for this step. This step applies to loadlocked systems.
16) Step 330: Turn off the loadlock turbo pump prior to venting. No dwell time or timeout is required for this step. This step applies to loadlocked systems.
17) Step 340: Open the loadlock turbo vent valve to slow down the loadlock turbo pump. A dwell time of 1 second is used to introduce a controlled amount of vent gas to the turbo to facilitate deceleration. This step applies to loadlocked systems.
18) Step 350: Close the loadlock turbo vent valve prior to waiting for the turbo pump to slow down below the speed setpoint frequency. No dwell time or timeout is required for this step. This step applies to loadlocked systems.
19) Step 360: Check for the loadlock turbo speed to fall below the speed setpoint. This step has a timeout value of 300 seconds. This step applies to loadlocked systems. The process is stopped (InputStepFailedNumber 1100) if the loadlock turbo does not slow down.
20) Steps 370-390: Open the loadlock turbo vent valve, dwell 30 seconds and close the vent valve to finish venting the loadlock chamber. A dwell time of 30 seconds is used between opening and closing the vent valve. This step applies to loadlocked systems.
21) Steps 400-420: Refer to steps 250-270.
22) Step 430: Check the foreline (roughing line) convectron gauge pressure to verify the rough pump is functioning prior to roughing the chamber(s). A timeout value is provided to allow the roughing pump time to evacuate the roughing line. This step applies to loadlocked systems. The process is stopped (InputStepFailedNumber 1100) if the roughing line pressure is not below the check step setpoint.
23) Step 440/445: Open the system roughing valve (or pc roughing valve if no loadlock is present). No dwell time or timeout is required for this step. These steps apply to all systems.

24) Step 450: Check the process chamber convectron gauge pressure for a value less than 500 Torr (gross vacuum level check) to verify that the chamber is being roughed. A timeout value of 120 seconds allows the rough pump time to start evacuating the chamber. This step applies to all systems. The process is stopped (InputStepFailedNumber 1100) if the chamber does not reach this initial pressure.
25) Step 460: Turn on the loadlock turbo pump. No dwell time or timeout is required for this step. This step applies to loadlock systems.
26) Step 470: Check the process chamber convectron gauge pressure for a value less than 0.2 Torr (typical crossover pressure). A timeout value of 360 seconds is provided for the rough pump (and turbo pump on loadlocked systems) to evacuate the process chamber. This step applies to all system configurations. The process is stopped (InputStepFailedNumber 1100) if the chamber does not reach this crossover pressure.
27) Step 480-485: Rough the process chamber for an additional 5 seconds to accommodate small pressure fluctuations associated with closing the roughing valve and/or loadlock isolation valve, then close the roughing. A dwell time of 5 seconds is assigned to the roughing step. These step applies to all systems.
28) Steps 490-510: Refer to steps 250-270.
29) Step 515: Turn off the roughing pump to prevent backstreaming on oil-sealed pumps. No dwell time or timeout is required for this step. This step applies to non-loadlocked systems.
30) Steps 520-530: Turn on the process chamber hivac valve open signal and verify that the valve actually opened. A timeout value of 15 seconds is provided for the valve to cycle from the closed to the open position. This step applies to all systems. The process is stopped (InputStepFailedNumber 1100) if the valve does not open.
31) Step 540: Check the process chamber convectron gauge pressure for a value less than 0.05 Torr. A timeout value of 10 seconds is provided for the hivac pump to evacuate the process chamber to this initial pressure prior to turning on the ion gauge. This step applies to all system configurations. The process is stopped (InputStepFailedNumber 1100) if the chamber does not reach this initial pressure.
32) Steps 550-560: Turn off the loadlock ionization gauge (if it is already on) and turn on the process chamber ion gauge. Dwell times in these two steps allow sufficient time for one gauge to turn off and the other gauge to turn on and stabilize. This step applies to all systems.
33) Step 570: Check the process chamber ion gauge pressure for a value less than 0.00009 Torr. A timeout value of 600 seconds is assigned to achieve a base pressure prior to starting a process. The process is stopped (InputStepFailedNumber 1100) if the chamber does not reach this base pressure. This step applies to all systems.
34) Step 999: Turn the background salience color for command button 1 (Pc Pumpdown button) to green, alerting the operator that the Pc Pumpdown process completed successfully. No dwell time or timeout is required for this step. This step applies to all systems.
35) Step 1000: This step stops the current recipe and alerts the process to move on to the next recipe. No dwell time or timeout is required for this step. This step applies to all systems.

36) Step 1100: This step stops the current process and is normally used when an error or fault has occurred during the current recipe. No dwell time or timeout is required for this step. This step applies to all systems.

PC Vent Recipe

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Vent	516103	11	Command Button 1 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	12	Command Button 2 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	13	Command Button 3 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	14	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	15	Command Button 5 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	16	Command Button 6 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	17	Command Button 7 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	18	Command Button 8 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	19	Command Button 9 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	20	Screen Set Vacuum	0	0	0	0	0	0
Pc Vent	516103	30	Pressure Pc CG Set On	6	0	0	0	0	0
Pc Vent	516103	40	Pressure Fl CG Set On	6	0	0	0	0	0
Pc Vent	516103	100	Motion Lrp Eot Sw Check Off	0	0	0	0	120	1
Pc Vent	516103	110	Pause - User Retract Lrp	0	-1	0	0	0	0
Pc Vent	516103	115	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Pc Vent	516103	120	Valve Ll Iso Open Set Off	1	0	0	0	0	0
Pc Vent	516103	130	Valve Ll Iso Close Set On	1	0	0	0	0	0
Pc Vent	516103	140	Valve Ll Iso Close Check On	0	0	0	0	1100	10
Pc Vent	516103	145	Pressure Pc IG Set Off	6	0	0	0	0	0
Pc Vent	516103	170	Valve Src1 Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	175	Flow Mfc1 Mode Set 0	0	0	0	0	0	0
Pc Vent	516103	176	Flow Mfc1 Rate Set 0	0	0	0	0	0	0
Pc Vent	516103	180	Valve Src2 Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	185	Flow Mfc2 Mode Set 0	0	0	0	0	0	0
Pc Vent	516103	186	Flow Mfc2 Rate Set 0	0	0	0	0	0	0
Pc Vent	516103	190	Valve Src3 Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	195	Flow Mfc3 Mode Set 0	0	0	0	0	0	0
Pc Vent	516103	196	Flow Mfc3 Rate Set 0	0	0	0	0	0	0
Pc Vent	516103	200	Valve Src4 Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	205	Flow Mfc4 Mode Set 0	0	0	0	0	0	0
Pc Vent	516103	206	Flow Mfc4 Rate Set 0	0	0	0	0	0	0
Pc Vent	516103	210	Valve Src5 Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	215	Valve Src6 Gas Set Close	0	0	0	0	0	0

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Pc Vent	516103	220	Valve CapMan Set Close	0	0	0	0	0	0
Pc Vent	516103	225	Valve Supplement Gas Set Close	0	0	0	0	0	0
Pc Vent	516103	230	Valve Gas Ring Set Close	0	0	0	0	0	0
Pc Vent	516103	240	Valve Pc Hivac Throttle Set Off	1	0	0	0	0	0
Pc Vent	516103	245	Valve Pc Hivac Set Close	1	0	0	0	0	0
Pc Vent	516103	250	Valve Pc Hivac Check Close	0	0	0	0	1100	15
Pc Vent	516103	255	Dwell Pc Hivac Valve Close	1	0	0	0	0	0
Pc Vent	516103	270	Valve Pc Rough Set Closed	1	0	-1	0	0	0
Pc Vent	516103	280	Valve Pc Vent Set Open	1	0	0	0	0	0
Pc Vent	516103	290	Pressure Pc Atm Sw Check On	0	0	0	0	1095	600
Pc Vent	516103	300	Dwell 5 seconds additional pc vent	5	0	0	0	0	0
Pc Vent	516103	310	Valve Pc Vent Set Close	1	0	0	0	0	0
Pc Vent	516103	999	Command Button 2 Salience Turn Green	2	0	0	0	0	0
Pc Vent	516103	1000	Stop Recipe	0	0	0	-1	0	0
Pc Vent	516103	1095	Valve Pc Vent Set Close	1	0	0	0	0	0
Pc Vent	516103	1100	Stop Process	0	0	0	0	0	0

LL Pumpdown Recipe

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
LI Pumpdown	516103	11	Command Button 1 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	12	Command Button 2 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	13	Command Button 3 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	14	Command Button 4 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	15	Command Button 5 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	16	Command Button 6 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	17	Command Button 7 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	18	Command Button 8 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	19	Command Button 9 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	20	Screen Set Vacuum	0	0	0	0	0	0
LI Pumpdown	516103	70	Valve LI Turbo Vent Set Close	1	0	0	0	0	0
LI Pumpdown	516103	80	Pressure FI CG Set On	6	0	0	0	0	0
LI Pumpdown	516103	90	Pump Rough Set On	1	0	0	0	0	0
LI Pumpdown	516103	100	Motion Lrp Eot Sw Check Off	0	0	0	0	120	1
LI Pumpdown	516103	110	Pause - user retract lrp	0	-1	0	0	0	0
LI Pumpdown	516103	115	Command Button 4 Salience Turn Off	0	0	0	0	0	0
LI Pumpdown	516103	120	Valve LI Iso Open Set Off	1	0	0	0	0	0
LI Pumpdown	516103	130	Valve LI Iso Close Set On	1	0	0	0	0	0
LI Pumpdown	516103	140	Valve LI Iso Close Check On	0	0	0	0	1100	10
LI Pumpdown	516103	150	Pressure FI CG Check < .2 Torr	0	0	0	0	1100	60
LI Pumpdown	516103	160	Valve Rough Set Open	1	0	0	0	0	0
LI Pumpdown	516103	170	Pressure FI CG Check < 500 Torr	0	0	0	0	1100	60
LI Pumpdown	516103	180	Pump LI Turbo Set On	1	0	0	0	0	0
LI Pumpdown	516103	190	Pump LI Turbo At Speed Check On	0	0	0	0	1100	300
LI Pumpdown	516103	200	Pressure Pc IG Set Off	6	0	0	0	0	0
LI Pumpdown	516103	210	Pressure LI IG Set On	15	0	0	0	0	0

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
LI Pumpdown	516103	999	Command Button 5 Salience Turn Green	0	**0**	**0**	**0**	0	0
LI Pumpdown	516103	1000	Stop Recipe	0	**0**	**0**	**-1**	0	0
LI Pumpdown	516103	1100	Stop Process	0	**0**	**0**	**0**	0	0

LL Vent Recipe

Recipe Name	Project Number	Step Number	StepName	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
LI Vent	516103	11	Command Button 1 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	12	Command Button 2 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	13	Command Button 3 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	14	Command Button 4 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	15	Command Button 5 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	16	Command Button 6 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	17	Command Button 7 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	18	Command Button 8 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	19	Command Button 9 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	20	Screen Set Vacuum	0	**0**	**0**	**0**	0	0
LI Vent	516103	90	Pressure LI IG Set Off	6	**0**	**0**	**0**	0	0
LI Vent	516103	100	Motion Lrp Eot Sw Check Off	0	**0**	**0**	**0**	120	1
LI Vent	516103	110	Pause - User Retract Lrp	0	**-1**	**0**	**0**	0	0
LI Vent	516103	115	Command Button 4 Salience Turn Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	120	Valve LI Iso Open Set Off	1	**0**	**0**	**0**	0	0
LI Vent	516103	130	Valve LI Iso Close Set On	1	**0**	**0**	**0**	0	0
LI Vent	516103	140	Valve LI Iso Close Check On	0	**0**	**0**	**0**	1100	10
LI Vent	516103	150	Valve Rough Set Close	1	**0**	**0**	**0**	0	0
LI Vent	516103	160	Pump LI Turbo Set Off	0	**0**	**0**	**0**	0	0
LI Vent	516103	170	Valve LI Turbo Vent Set Open	1	**0**	**0**	**0**	0	0
LI Vent	516103	180	Valve LI Turbo Vent Set Close	1	**0**	**0**	**0**	0	0
LI Vent	516103	190	Pump LI Turbo At Speed Check Off	0	**0**	**0**	**0**	1100	600
LI Vent	516103	200	Valve LI Turbo Vent Set Open	1	**0**	**0**	**0**	0	0
LI Vent	516103	210	Dwell 30 seconds for LI Vent	30	**0**	**0**	**0**	0	0
LI Vent	516103	220	Valve LI Turbo Vent Set Close	1	**0**	**0**	**0**	0	0
LI Vent	516103	999	Command Button 6 Salience Turn Green	0	**0**	**0**	**0**	0	0
LI Vent	516103	1000	Stop Recipe	0	**0**	**0**	**-1**	0	0
LI Vent	516103	1100	Stop Process	0	**0**	**0**	**0**	0	0

Transfer Wafer Recipe

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Transfer Wafer	516103	11	Command Button 1 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	12	Command Button 2 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	13	Command Button 3 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	14	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	15	Command Button 5 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	16	Command Button 6 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	17	Command Button 7 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	18	Command Button 8 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	19	Command Button 9 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	20	Screen Set Vacuum	0	0	0	0	0	0
Transfer Wafer	516103	100	Motion Lrp Eot Sw Check Off	0	0	0	0	120	1
Transfer Wafer	516103	110	Pause - User Retract Lrp	0	-1	0	0	0	0
Transfer Wafer	516103	115	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	120	Motion Lrp Eot Sw Check On	0	0	0	0	1100	1
Transfer Wafer	516103	130	Pause - User Confirm Z-Shift Position	0	-1	0	0	0	0
Transfer Wafer	516103	135	Command Button 4 Salience Turn Off	0	0	0	0	0	0
Transfer Wafer	516103	140	Motion Platen Velocity Set Off	5	0	0	0	0	0
Transfer Wafer	516103	150	Motion Platen Home Set On	1	0	0	0	0	0
Transfer Wafer	516103	185	Motion Platen Moving Check Off	0	0	0	0	1100	60
Transfer Wafer	516103	190	Pressure Pc CG Check < 0.2 Torr	0	0	0	0	1100	1
Transfer Wafer	516103	210	Pump Ll Turbo At Speed Check On	0	0	0	0	1100	1
Transfer Wafer	516103	220	Valve Pc Hivac Set Close	1	0	0	0	0	0
Transfer Wafer	516103	230	Valve Pc Hivac Check Close	0	0	0	0	1100	10
Transfer Wafer	516103	240	Pressure Fl CG Check < .2 Torr	0	0	0	0	1100	1
Transfer Wafer	516103	260	Valve Ll Iso Close Set Off	1	0	0	0	0	0
Transfer Wafer	516103	270	Valve Ll Iso Open Set On	1	0	0	0	0	0

Recipe Name	Project Number	Step Number	Step Name	DwellTime InSeconds	Pause	Skip	Stop	InputFail StepNumber	TimeOut Sec
Transfer Wafer	516103	280	Valve LI Iso Open Check On	0	**0**	**0**	**0**	1100	10
Transfer Wafer	516103	290	Pause - User Load/Unload Sample	0	**-1**	**0**	**0**	0	0
Transfer Wafer	516103	295	Command Button 4 Salience Turn Off	0	**0**	**0**	**0**	0	0
Transfer Wafer	516103	300	Motion Lrp Eot Sw Check Off	0	**0**	**0**	**0**	315	1
Transfer Wafer	516103	310	Pause - User Retract Lrp	0	**-1**	**0**	**0**	0	0
Transfer Wafer		315	Command Button 4 Salience Turn Off	0	**0**	**0**	**0**	0	0
Transfer Wafer	516103	320	Motion Lrp Eot Sw Check On	0	**0**	**0**	**0**	1100	1
Transfer Wafer	516103	330	Valve LI Iso Open Set Off	1	**0**	**0**	**0**	0	0
Transfer Wafer	516103	340	Valve LI Iso Close Set On	1	**0**	**0**	**0**	0	0
Transfer Wafer	516103	350	Valve LI Iso Close Check On	0	**0**	**0**	**0**	1100	10
Transfer Wafer	516103	360	Valve Pc Hivac Set Open	1	**0**	**0**	**0**	0	0
Transfer Wafer	516103	370	Valve Pc Hivac Open Check On	0	**0**	**0**	**0**	1100	10
Transfer Wafer	516103	375	Pressure LI IG Set Off	6	**0**	**0**	**0**	0	0
Transfer Wafer	516103	380	Pressure Pc IG Set On	6	**0**	**0**	**0**	0	0
Transfer Wafer	516103	999	Command Button 7 Salience Turn Green	0	**0**	**0**	**0**	0	0
Transfer Wafer	516103	1000	Stop Recipe	0	**0**	**0**	**-1**	0	0
Transfer Wafer	516103	1100	Stop Process	0	**0**	**0**	**0**	0	0

Troubleshooting

Software Interlocks

Some I/O on the system requires safety interlocks to prevent harm to personnel and/or equipment. All discrete outputs on the system may be assigned a single interlock or group of interlock conditions. Discrete outputs include control signals that: 1) turn power supplies on or off, 2) open or close valves, 3) enable heating/cooling, 4) initiate motion, 5) turn on pumps and 6) turn on gauges. Refer to the system database and the Discrete Outputs section for details regarding interlock configuration and specific output interlock details.

Regardless of whether the system is being run in an automated or manual fashion, software interlocks are constantly being evaluated for select discrete outputs. In maintenance level 3, most interlock conditions can be overridden (refer to IOView screen section) for maintenance purposes.

⚠ CAUTION
Software interlocks are intended to protect personnel and equipment. KJLC should be contacted prior to attempting to defeat safety interlocks for any reason.

If a software interlock is not satisfied when a process or user attempts to activate an output, the request is turned off and an interlock description message is displayed in the Title Message box on the runtime screens. Additionally, any such interlock event is logged and time stamped (refer to Datalog File and Data Manipulation section).

Listed below are some example software interlocks:

Process Chamber Ion Gauge-

1) Hivac valve must not be closed –and-
2) Loadlock ion gauge must be off
3)

Process Chamber Hivac Valve

1) Chamber must be at or below crossover pressure –and-
2) Loadlock ISO valve must be closed (loadlock option) –and-
3) Chamber hivac pump must be ready (cold cryo or turbo at speed)

Process Chamber Vent Valve

1) Hivac valve must be closed –and-
2) Loadlock ISO valve must be closed (loadlock option) –and-
3) Substrate heater temperature < 80 degrees C (heater option)

Process Chamber Roughing valve (non-loadlocked system)

1) Process chamber hivac valve must be closed –and-
2) Rough pump must be on

Deposition Power Supply

1) Chamber must be at or below crossover pressure –and-
2) Cooling flow switch for respective source must be satisfied

Substrate Heater (heater option)

1) Chamber must be at or below crossover pressure –and-
2) ALL cooling flow switches must be satisfied –and-
3) Chamber hivac valve must not be closed

Platen Home/Velocity/Position

1) LRP must be retracted (loadlock option)

Loadlock ISO Valve Open (loadlock option)

1) Process chamber at atmosphere –and-
2) ISO Valve Close output signal off –and-
3) Loadlock turbo at speed input signal off –and-
4) Loadlock turbo on output signal off

-or-

1) ISO Valve Close output signal off –and-
2) Loadlock turbo at speed input signal on –and-
3) Process chamber at or below crossover pressure –and-
4) Process chamber hivac valve closed –and-
5) Substrate Heater temperature < 400 degrees C (heater option)

Loadlock ISO Valve Close (loadlock option)

1) LRP must be retracted (loadlock option) –and-
2) ISO Valve Open output signal off

Power Supply Source Switch (source switch option)

1) All other switch positions must be turned off except the desired position –and-
2) Respective Power supply must be off

-or-

1) All other switch positions must be turned off except the desired position –and-
2) Desired switch position must already be on –and-
3) Respective power supply must already be on

Turbo Pump On (turbo pumped systems)

1) Rough pump must be on

Vacuum Gauging

All system vacuum gauges are controlled and monitored by the SRS gauge controller. This includes ionization, convection/pirani and thermocouple gauges. Refer to SRS manual for operation details.

Problems with vacuum gauge control can originate from one of three areas – software interlocks (described earlier in this section), gauge controller configuration (refer to device manual) and computer/controller communications. In the event of a catastrophic power loss or a suspected problem with remote control of the SRS unit, refer to the KJLC setup parameters for the gauge controller listed below:

Remote Communications Setup

Menu>Remote>RS232

1) Baud rate – 57,600
2) Data bits – 8
3) Parity – none
4) Flow control – none

Process Relays Setup (Process Channel 1 is associated with gauge PG1)

Process>Channel 1>Edit rules

1) Setpoint – 0.2 Torr
2) Setpoint activation – below

Process>Channel 1

"Auto" mode

If parameters for the SRS controller need to be reset, it is a good idea to follow these steps:

1) Set SRS parameters as shown above
2) Turn off ALL gauges (ion and pirani)
3) Turn off SRS controller power
4) Stop KJLC runtime software
5) Turn on SRS controller power
6) Start KJLC runtime software

Remote control of the SRS unit can be verified two ways. First, verify the presence of a vertical double arrow flashing on and off in the upper right hand corner of the SRS screen when the KJLC runtime software is active (double arrow indicates RS232 communication). Second, in maintenance mode, turn on the roughing line convectron gauge and verify that the gauge indicator turns green and the runtime HMI pressure reading matches the readout on the SRS controller.

Hardware Interlocks

Hardware (electrical) interlocks typically apply to hazardous equipment such as deposition power supplies and heating power supplies. Some example hardware interlocks are listed below.

Deposition Power Supplies

1) Process chamber vacuum switch must be on or true –and-
2) Process chamber must be at or below crossover pressure (SRS process channel 1) -and-
3) Process chamber lid or access door(s) must be closed –and-
4) Substrate heater overtemperature controller must have no alarm (heater option) –and-
5) All source cooling flow switches must be satisfied –and-
6) All tuning network cooling flow switches must be satisfied (when present)
7) External or auxiliary hardware interlocks

Heater Power Supply

All Deposition power supply interlocks apply except for tuning network flow switches.

If all of the hardware interlock conditions are not met, the system power supplies will not energize regardless of whether or not software interlocks are satisfied.

Refer to KJLC systems circuit board documentation for details regarding hardware interlocks and indicators.

Ethernet I/O

KJLC computer controlled systems utilize an Ethernet connection to control discrete and analog inputs and outputs. This I/O typically controls or monitors valves, pumps, power supplies, gas flow, capacitance manometer(s), temperatures and switches. This I/O is constantly being scanned and updated whenever the runtime software is active. Scanning can be verified by physically observing the indicators on the Ethernet I/O communications module located on the control drawer/panel(s) inside the system equipment rack. The Ethernet module has two green indicators for connection feedback and a red indicator that flashes very quickly indicating computer communication activity.

Problems with this I/O can be verified by checking the error status indicator and Slot Error Number information found on the Alarms screen. If there is any type of error with this I/O, the Ethernet error indicator will be red. Additionally, if a particular module is having a problem, that module can be identified through the Slot Error Number. If there are no errors, this Error Number will be –1. A zero indicates that the main Ethernet communications module has a problem, and numbers 1-8 indicate a problem with a particular I/O module (i.e. discrete, analog, thermocouple etc.). Refer to the Alarms screen section for more details.

Animatics SmartMotor

KJLC computer controlled systems typically use DC Servo motors that communicate serially via RS232. These motors are in constant communication with the computer anytime the runtime software is active. General motor status can be verified in two ways. First, each motor(s) has two illuminated indicators on it to display power, communication and error status. Second, the motor Axis Error Number displayed on the Alarms screen provides some detailed information regarding the motor status. Error Numbers other than –7 indicate some type of problem with the motor. Refer to the Animatics manual for details.

PID Control Loop Tuning

KJLC Runtime software utilizes built in PID controls for pressure and temperature control. Occasionally, it may be necessary to adjust PID values for different heating applications (temperature control) or different pressure ranges (pressure/flow control). Refer to Runtime screen sections for basic information regarding the effect of control loop coefficients. It is important to note that different PID parameters may be required for different applications. For example, one Proportional term may work well for heating from 20-150 degrees C, while another term may work well from 200-700 degrees C. PID terms are available as recipe variables to meet these requirements.

Default Parameters

Default values for most system devices (MFC and capman ranges, PID values, etc.) can be found in the system software backup CD provided with the tool. Refer to the Access forms section for details regarding Analog Output (Ao) system variables.

Datalog and Data File Manipulation

KJLC runtime software automatically generates several different datalog files depending on the current process or task. Additionally, some manual datalogging capabilities are included with the software.

There are six types of datalog files available for monitoring system performance and troubleshooting. These files are process, manual, interlock, alarms, pressure and regen. Datalog files are stored in folders named accordingly based on the type of data file and are all comma delimited text files with a ".log" extension. These folder names can be modified if needed (refer to Datalog screen section). All datalog files are automatically generated except for the manual log and the pressure log. Datalog files pertaining to cryo pump regeneration are only created on systems with non OnBoard cryo pumps. The datalog file types are described below.

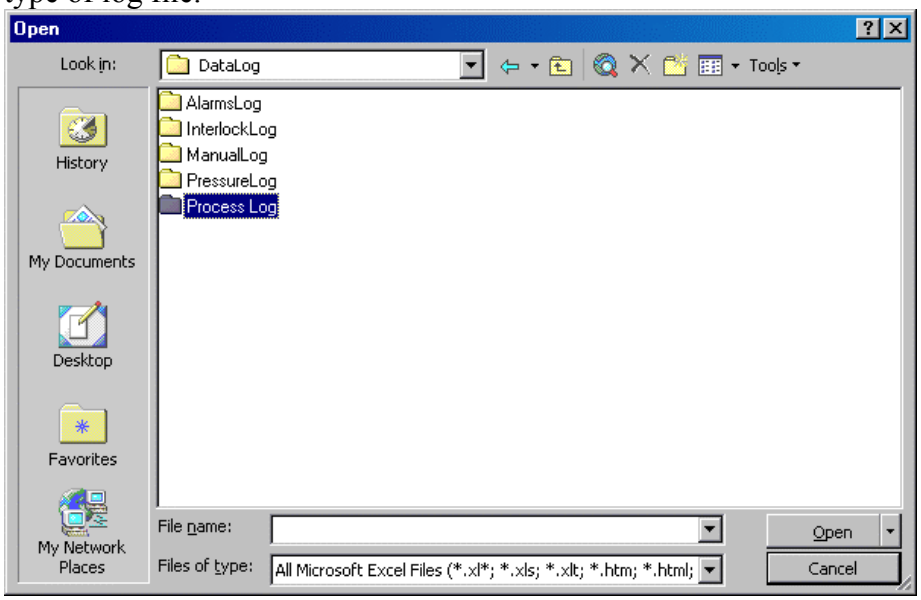
Process Log (automatic)

Every time an automated process is run using the Command Buttons on the runtime screens, a unique datalog file is created. The name of the file is name of the process concatenated with the date and time the process was started. This includes not only customer user processes, but also pumpdowns, vents and sample transfers.

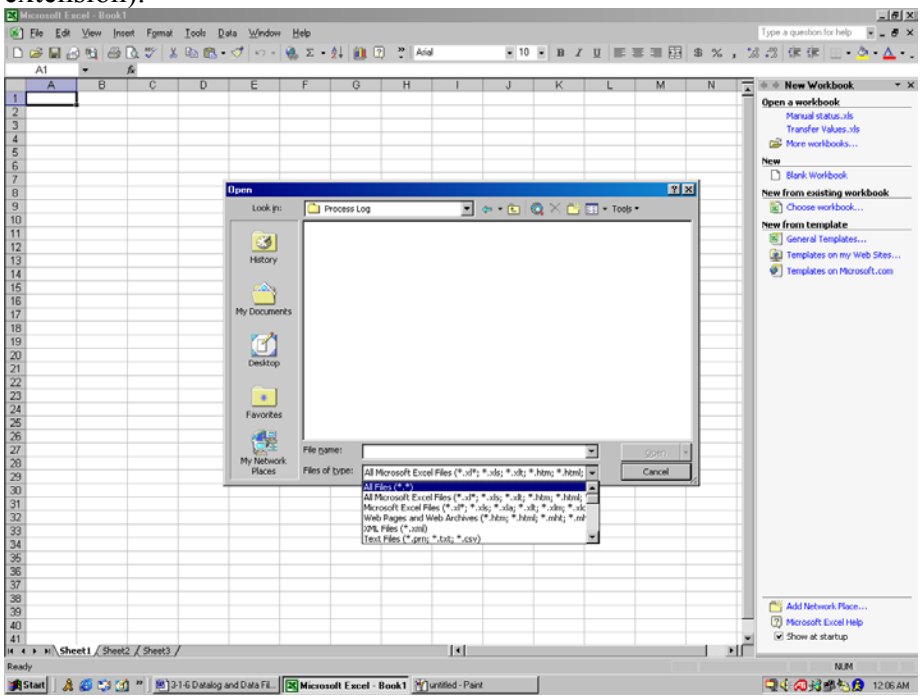
Over 200 data items are logged for any given process. The names of the items are located at the beginning or top of the datalog file/spreadsheet (datalog files are typically imported into Excel). The data items are logged based on an interval set on the Datalog screen. System datalogging can occur as fast every 2 seconds. Typical items logged include time, date, process name, recipe name, maintenance level and sample identification. Additionally, many system I/O variables are logged. The runtime software has four types of I/O variables: discrete inputs, discrete outputs, analog inputs and analog outputs. The process log records the first 50 discrete inputs, analog inputs and analog output variables in the active project (total of 150 variables). This log also records the first 70 discrete output variables in the project. The first 50 (or first 70) variables of a given type are determined by that variable's display order number in the system database. Refer to the Edit I/O forms sections for details regarding display order numbers.

Process logs (and all other datalog file types) are typically imported in to Excel for display and data manipulation. Refer to the guidelines shown below for importing data from a datalog file.

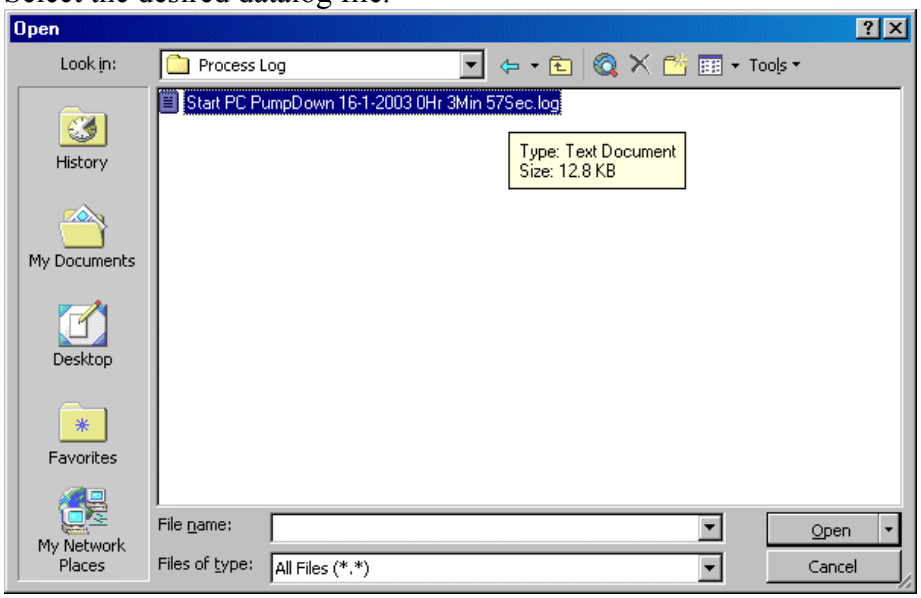
1) Start Excel and choose File>Open. Go to the C:\datalog folder and choose the desired type of log file.



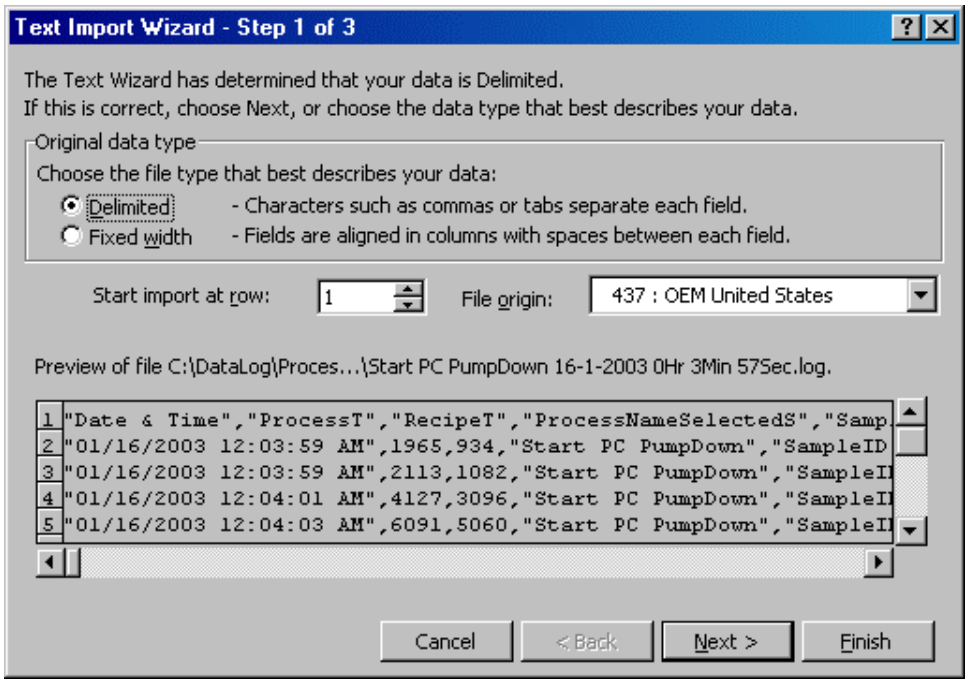
2) Change the "Files of Type" parameter to All Files (enables selecting files with ".log" extension).



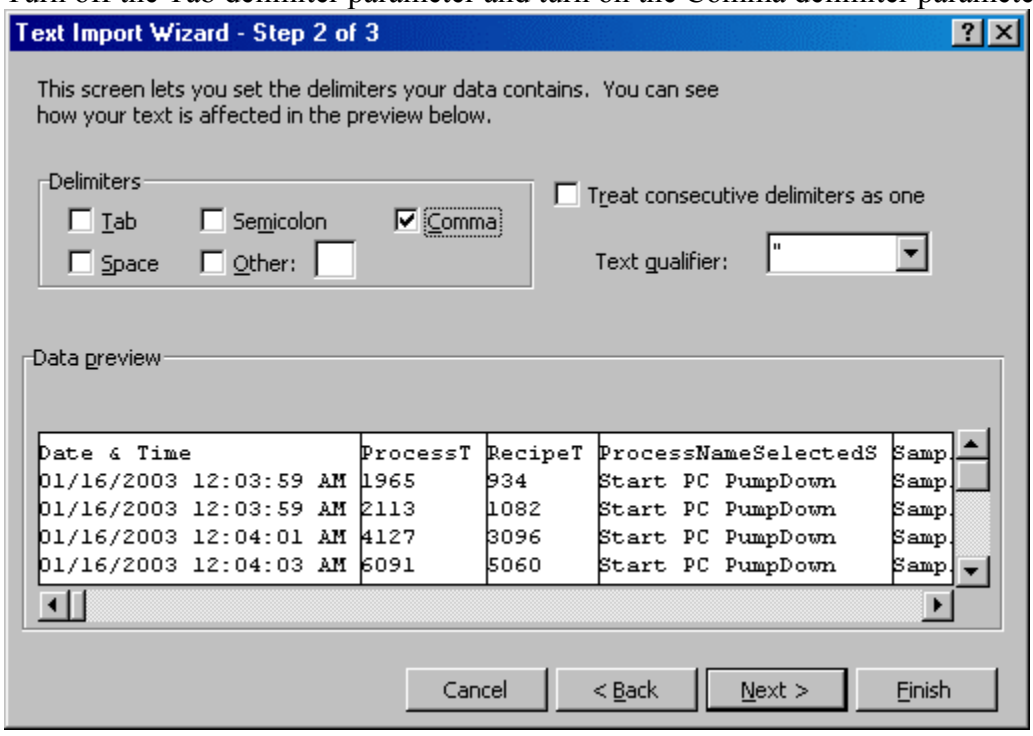
3) Select the desired datalog file.



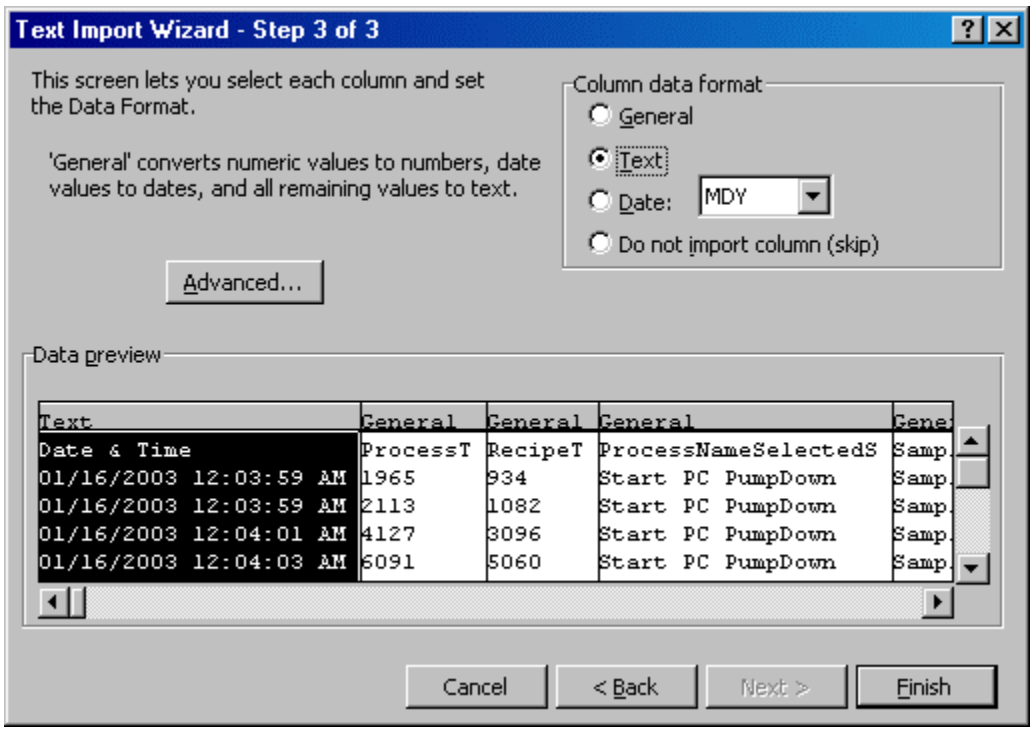
4) Excel will automatically display the Text Import Wizard. Ensure file type is set to "Delimited".



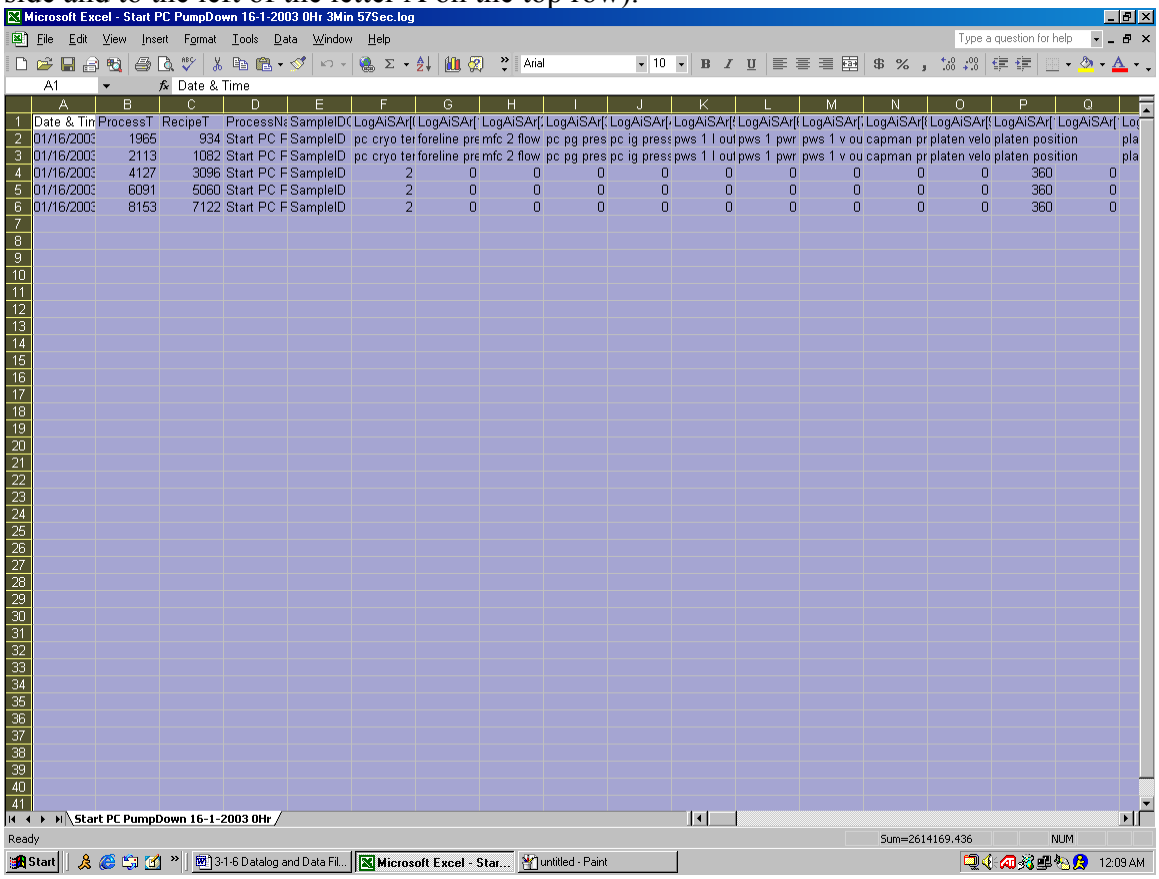
5) Turn off the Tab delimiter parameter and turn on the Comma delimiter parameter.



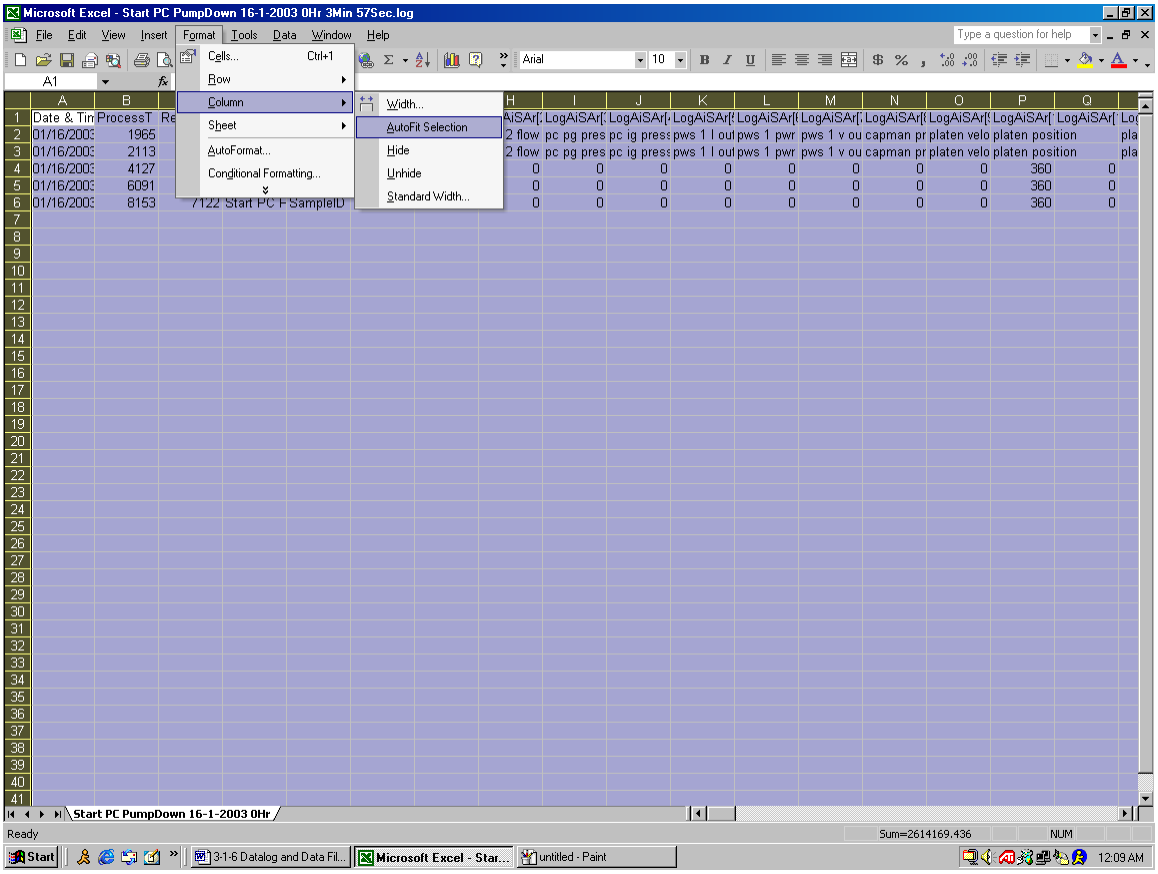
6) Set the Column data format to "Text".



7) Once the log file has been imported, select all rows and columns by clicking the upper left hand square in the corner of the spreadsheet (above the number 1 on the left hand side and to the left of the letter A on the top row).



8) Choose Format>Column>AutoFit Selection to automatically adjust column widths for variable names.



These guidelines can be used for importing all KJLC log files.

Manual Log (manually started)

The manual log records all of the same I/O variables as the Process log and is initiated manually from the Datalog screen. Refer to the Datalog screen for details.

Alarms Log (automatic)

The alarms log logs any yellow or red alarm that occurs in a process, along with the time and date of the alarm. Refer to Edit Alarms form and Alarms screen for more alarm details.

Interlock Log (automatic)

The interlock log records the name of the interlock not satisfied anytime a particular discrete output is requested to turn on but cannot be turned on. The interlock log is

for software interlocks only. Refer to the troubleshooting section and also to the Edit Discrete Outputs form section for more interlock details.

Pressure Log (manually started)
The pressure log records all gauge pressures in milliTorr. This includes ion gauges, convectron/pirani gauges, and capacitance manometers. This log has a fixed interval of 5 minutes.

Refer to Software File Structure and Maintenance (section 3-1-7 of this manual) for details on backing up and maintaining the systems datalog folder.

Software File Structure and Maintenance

KJLC computer control software consists of three components – the runtime engine, Access database and datalog folder. The runtime software is basically compiled source code and cannot be edited by the user (KJLC source code is available to be purchased as an option). The Access database and datalog files are intended to be edited and manipulated by the user as needed. It is the responsibility of the customer to periodically backup the system software and database, as well as remove or archive the datalog information.

File Structure

The runtime software and database are stored in the C:\systems folder. The database is named "systems.mdb". The runtime software is inside a folder entitled "RTE…certified PC" (abbreviated). The datalog folder is located directly on C:\.

Maintenance

All KJLC computers come standard with a CDRW drive to facilitate software backup and maintenance. KJLC recommends that software backup and archiving should be done by the customer at least once every three to six months. If the user is creating new recipes and processes in the database on a weekly or daily basis, then software backup should occur more frequently. It is up to the user to determine if more frequent backups are required. CDR or CDRW discs may be used for backups and it is possible to do multiple backups on one CD depending on the size of the database or datalog files (KJLC does not recommend using CDRW discs or storing multiple backups on a single CD).

Backup Systems Folder

To backup the systems folder (database and runtime software), follow these steps:

1) Stop the runtime software (refer to Getting Started, section Runtime Screens-1).
2) Close the database (if it is open) and close the Access program (if it is active).
3) Insert a blank CD into the CDRW drive. After a few seconds the Roxio project selector window will appear. Choose the Make a Data CD>dataCD project path.
4) When the dataCD project window appears, drag and drop the C:\systems folder from the top portion of the window to the bottom portion.
5) Click the red Record button and, when prompted, choose OK for the CD writing parameters (speed, don't finalize cd, etc.).
6) When the CD is complete, confirm the completion and close the dataCD project window. When prompted, the user does not have to save the configuration unless it is desired. Next, close the Roxio Easy CD Creator window.

7) Using Windows Explorer, double click the CDRW drive and ensure that the backup was successful by verifying the presence of the folder on the CD. Close Windows Explorer.

The runtime software and database are now backed up on the CD.

Backup/Archive Datalog folder

To backup the datalog folder, follow these steps:

1) Stop the runtime software (refer to Getting Started, section Runtime Screens-1).
2) Insert a blank CD into the CDRW drive. After a few seconds the Roxio project selector window will appear. Choose the Make a Data CD>dataCD project path.
3) When the dataCD project window appears, drag and drop the C:\datalog folder from the top portion of the window to the bottom portion.
4) Click the red Record button and, when prompted, choose OK for the CD writing parameters (speed, don't finalize cd, etc.).
5) When the CD is complete, confirm the completion and close the dataCD project window. When prompted, the user does not have to save the configuration unless it is desired. Next, close the Roxio Easy CD Creator window.
6) Using Windows Explorer, double click the CDRW drive and ensure that the backup was successful by verifying the presence of the folder on the CD. Once the backup has been verified, delete the C:\datalog folder from the computer and empty the recycle bin on the Windows desktop. Close Windows Explorer.

The datalog folder is now backed up on the CD.

Restoring Systems Folder

In the event that the runtime software or database is somehow corrupted or unrepairable, it may be necessary to restore the systems software from the most recent backup CD. Follow these steps:

1) Rename the C:\systems folder by appending a brief description of the problem to the folder name, such as "C:\systems corrupt database not repairable".
2) Using Windows Explorer, copy the systems folder from the most recent CD backup to the C:\ drive.
3) Once the copy is complete, right click the C:\systems folder and choose Properties. Unselect the Read Only box and, when prompted, choose to apply changes to this folder, subfolders and files. Close Windows Explorer.
4) If the systems database in the unrepairable systems folder was not damaged and is usable, copy the systems.mdb file from the renamed systems folder to the current systems folder (overwrite the systems.mdb that was just copied from the backup CD). This is most

desirable as the latest database file has the most recent processes, recipes and alarms contained within it.

5) Restart the software and choose Update Processes on the Process screen (if the automated process option was purchased). Verify that all processes are present.
6) On the Alarms screen (in the appropriate Maintenance Level), choose Update Alarms and verify that the correct alarms are active in the runtime software (refer to Alarms screen section for details).
7) Run an automated process (such as PC Pumpdown) to verify system operation.

The systems software is now restored. The user should be aware that any new processes and any changes to existing processes created between the last system backup and the system restoration (if the latest database was unusable). Additionally, any changes to gas/pressure control parameters (such as PID coefficients or gas correction factors) and heating parameters (such as PID coefficients) that occurred since the last system software backup will not be present. It is a good idea to keep these parameters written down or documented in a file on the runtime PC somewhere.

Software Upgrades

Periodically, KJLC will address performance issues with the runtime software or add features to the runtime software as well as the database. Depending on the nature of the changes, KJLC may request that the customer send KJLC a recent backup of their software to facilitate creating a software revision that may be installed by the customer. Some revisions pertaining to software performance and existing features will be available to the customer at no charge; other revisions will be available to be purchased as an option.

Typically, upgrading the runtime software involves copying a new systems or RTE folder from a CD provided by KJLC to the computer's C:\ drive (refer to Software File Structure and Maintenance, section 3-1-7). Follow the instructions included with the revision CD for loading software upgrades.

MANUAL PROCEDURES

The following procedures are described in this section:

START-UP (COLD START PROCEDURE)

1) Verify all EMO buttons are reset (pulled out).

2) Turn on the Main Circuit Breaker on the front of the main power distribution box (located behind a hinged access panel at the front of the instrument rack).

3) Rotate the On/Off switch on the front of the instrument rack to the Start position (there should be an audible "click" or "thump" as the main power distribution box starts) and then return the switch to the On position.

4) Turn on individual branch circuit breakers on the front of the main power distribution box (branch breakers are located next to the main breaker behind the hinged access panel at the instrument rack).

5) Turn on the UPS for the system computer (if computer controlled).

6) Turn on individual component power switches as required (cryo compressors, power supplies, turbo controllers, etc.).

7) Start system software on computer (if computer controlled).

EMERGENCY OFF RECOVERY PROCEDURE

1) Press the Abort button on system computer or PLC (if system is computer or PLC controlled). If system power has been off for an extended period of time and the UPS battery is depleted, disregard this step for computer controlled systems.

2) If possible, verify that alarm or emergency condition has been corrected or is no longer a problem.

3) Follow Cold Start Procedure listed above.

SAMPLE LOADING

1. Make sure that a sample and carrier are loaded on to the LRP end-effecter (fork), and that nothing is loaded onto the platen assembly.

2. Make sure that the load-lock chamber is pumped down to at least 100 mTorr.

3. Open the isolation valve between the Load-lock and Process Chambers.

4. Jog the platen rotation to accept sample transfer.
   (Align the two ceramic stand-offs on the platen assembly via the view-port)

5. Open the substrate shutter (if applicable).

6. Lower the platen assembly to the bottom-most position using the hand wheel on the transfer Z-shift located on the chamber top-plate.

7. Extend the Linear Rack & Pinion drive (LRP), by rotating the knob on the LRP's rotary feedthrough.

8. Visually align the sample carrier with the counter bore on the sample platen using the chamber viewport.

9. When the carrier is aligned, raise the platen assembly using the transfer Z-shift until the carrier is lifted from the LRP end-effecter (fork). This is considered the "Transfer Position".

10. Retract the LRP completely (until it reaches the mechanical limit).

11. Raise the transfer Z-shift to the up-most position so that the platen is engaged in the heater assembly.

12. Close the load-lock isolation valve between the load-lock and the process chamber.

⚠ CAUTION
Use Caution when raising and lowering the z-shift when the LRP is extended to avoid serious equipment damage.

⚠ CAUTION
Use Caution when jogging the platen rotation while the LRP is extended to avoid serious equipment damage.

⚠ CAUTION
be sure to open substrate shutter before lowering platen assembly.

SAMPLE UNLOADING

1. Make sure that nothing is loaded onto the LRP end-effecter.

2. Make sure that the load-lock chamber is pumped down to at least 100 mTorr.

3. Open the isolation valve between the Load-lock and Process Chambers.

4. Jog the platen rotation to accept sample transfer.
   (Align the two ceramic stand-offs on the platen assembly via the view-port.)

5. Open the substrate shutter (if applicable).

6. Lower the platen assembly to the "transfer position" using the hand wheel on the transfer Z-shift located on the chamber top-plate.

7. Extend the Linear Rack & Pinion drive (LRP), by rotating the knob on the LRP's rotary feedthrough.

8. Adjust the platen height if necessary so that the "fork" can be extended under the shoulder of the sample carrier.

9. Jog the LRP so that the fork is fully engaged with the carrier.

10. Carefully jog the platen rotation if necessary.

11. When the fork is aligned, lower the platen assembly using the transfer Z-shift until the carrier is lifted off of the platen.

12. Retract the LRP completely (until it reaches the mechanical limit).

13. Raise the transfer Z-shift to the up-most position so that the platen is engaged in the heater assembly.

14. Close the load-lock isolation valve between the load-lock and the process chamber.

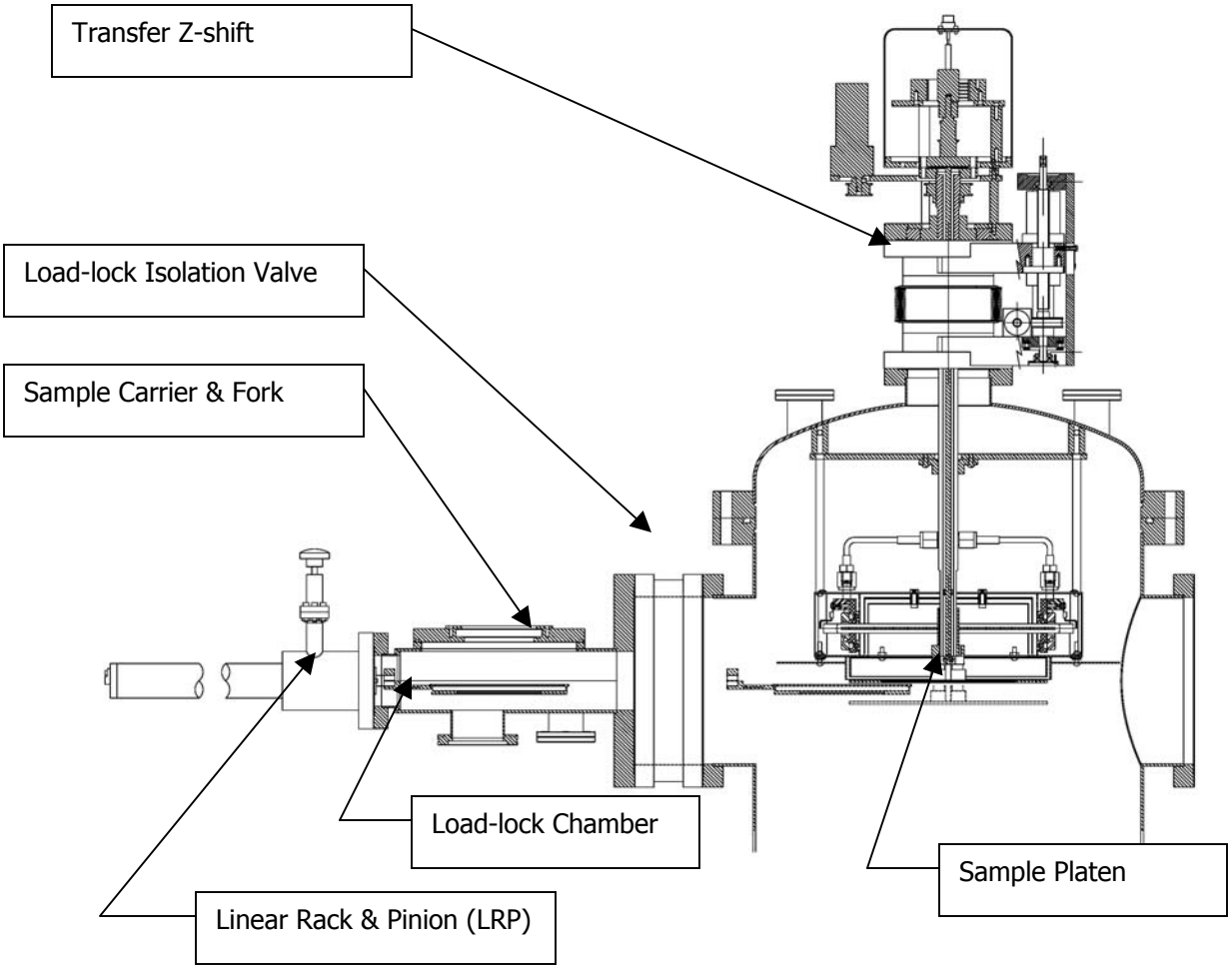

Use Caution when jogging the platen rotation while the LRP is extended to avoid serious equipment damage

⚠ CAUTION

Use Caution when raising and lowering the z-shift when the LRP is extended to avoid serious equipment damage.

⚠ CAUTION

Be sure to open substrate shutter before lowering platen assembly.



SAMPLE TRANSFER ASSEMBLY

HOIST OPERATION

The process chamber top-plate can be raised and lowered for maintenance using the top plate hoist. The hoist remote control pendant is located on an accessory shelf at the front of the process chamber. With the hoist lifted, the system operator can access the chamber internals for maintenance purposes.

⚠ CAUTION
Do not catch fingers under the top plate when lowering the hoist.

⚠ CAUTION
Do not operate the substrate rotation with the hoist up.

⚠ CAUTION
Do not operate the hoist with the LRP extended.

⚠ CAUTION
Do not raise or lower the hoist with the substrate shutter open.

⚠ CAUTION
Use caution to properly align the top flange when lowering the hoist to prevent serious equipment damage.