Thierica (Thy-ree-ka) n. 1. Expert manufacturer of *really cool* equipment.

TYCO VALVES & CONTROL

Dual Painting System

Thierica Equipment #12095-010

OPERATION/SEQUENCE OF EVENTS

INDEX

START-UP

1. Clear working area from any obstructions.
   - Turn on main air to the system.
   - Turn on the Electrical Disconnect located on the Main Thierica Electrical Cabinet.
   - Reset all Emergency Stops. (Thierica Electrical Cabinet, Paint Booths, Load Stations, Unload Stations)
   - Press "*Control Power On*" located on the Main Enclosure. The button's green light should turn on.
   - Reset any alarms.

2. Run the **Auto Start-up Routine**:
   - From the touch screens, press START-UP SCREEN. (Bottom center of the screen)
   - From this screen, press START UP. (Top left of the screen)
   - Under START-UP ROUTINE DIAGNOSTICS, all of the lights should be green and there should not be any red X in this window.
   - Under BLUE LINE START-UP ROUTINE or SILVER LINE START-UP ROUTINE, press I. The system should automatically start the blowers, oven heater. The button will change to green I during this routine. To stop the START-UP ROUTINE CONTROL, press O.

3. Run the **Auto Cycle**:
   - From the touch screens, press START-UP SCREEN. (Bottom center of the screen)
   - Under BLUE LINE AUTO CYCLE or SILVER LINE AUTO CYCLE, press I. The respective line will be placed in Automatic. The button will change to green I when the system is in Automatic. To place the system in Manual, press O.
   - Note: any alarm will place the system in Manual.
4. The Paint System is now ready for production.

LOAD STATION OPERATIONS

The sequence of operations for the Load Station is as follows.

- After the operator has loaded the part, the Line Ready pushbutton may be pushed.
- Note: Each of the Line Ready pushbuttons (Load Station and Paint Booth) will need to be pushed before the conveyor will index.
- After the Index Count Down has finished, the conveyor will index.

There is a dome light on the Main Panel. The color definitions are as follows.

- **Red - Steady** – There is a fault with the system. Check the alarm pages at the touch screen.
- **Green - Steady** – The system is in Automatic mode.
- **Amber - Steady** – The system is in Manual mode.

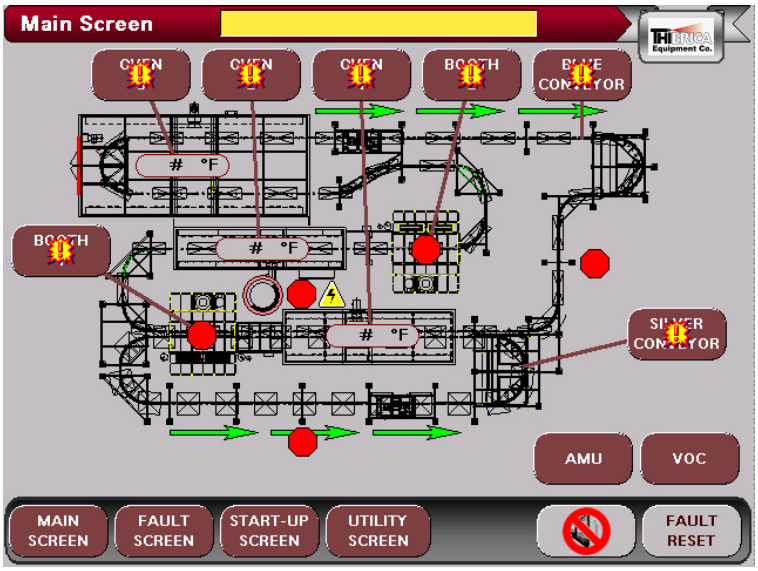
SHUT-DOWN

After the last part has been removed from the system, run the Auto shut-down routine:

- From the touch screen, press START-UP SCREEN. (Bottom center of the screen).
- From this screen, press SHUT DOWN. (Top left of the screen)
- Under SHUT-DOWN ROUTINE CONTROL, press I. The system should automatically stop the blowers, oven heater. The button will change to green I during this routine.
- The oven exhaust and recirculation blowers will stop after the oven temperatures Oven 1 Temp °F # , Oven 2 Temp °F # and Oven 3 Temp °F # are below 150 deg F.
- To stop the SHUT-DOWN ROUTINE CONTROL, press O.

PAGE DESCRIPTIONS

MAIN SCREEN

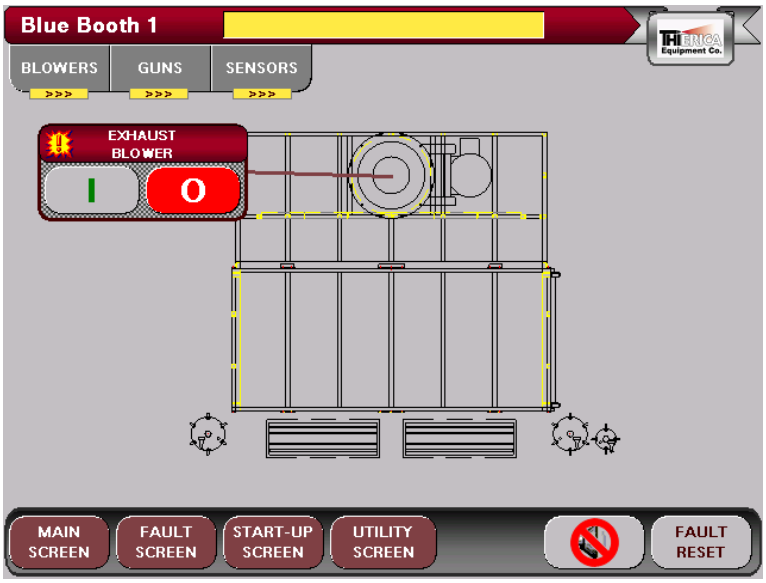


1. The  is displayed when the system is first turned on. This screen displays the layout of the system and shows the status of the dome lights.
2. The Local Message Display (at the top of the screen) will show the current condition that is preventing a required action. This display will pop-up on every screen.
3. Each area of the machine is accessed from this screen:
   -  BLUE & SILVER LINE PAINT BOOTH
   -  BLUE LINE PAINT BOOTH
   -  DUAL USE PRE-HEAT / SILVER CURE OVEN
   -  BLUE LINE PRIME OVEN
   -  BLUE LINE TOP COAT OVEN
   -  BLUE LINE CONVEYOR
   -  SILVER LINE CONVEYOR
   -  AIR MAKE-UP UNIT

- VOC FAULT CONTROL (Engineering Use Only)

4. The red stop sign icons indicate an E-Stop has been pushed and needs to be reset (twist to release).
5. The yellow triangle icon indicates that the control power is off at the main panel.
6. The flashing yellow & orange icons over the screen pushbuttons indicate a fault condition in this area. (See **FAULT SCREEN** below)
7. The buttons located on the bottom toolbar are the same on every screen. The control for these buttons are as follows:
   - MAIN SCREEN – Change to the MAIN SCREEN. Monitor system. Start System Start Up & Shut Down routines.
   - FAULT SCREEN – Change to the FAULT SCREEN(s). View current & past alarms.
   - START-UP SCREEN – Change to the START-UP SCREEN.
   - UTILITY SCREEN – Change to the UTILITY SCREEN. Perform a dome light test. Log into user accounts. View date and time clock.
   - – Silence the current alarm horn.
   - FAULT RESET – Press this button to reset any system faults. The button will flash if there is an active system fault. If the fault is still active, it will not reset.

BOOTH >> BLOWERS



1. The 

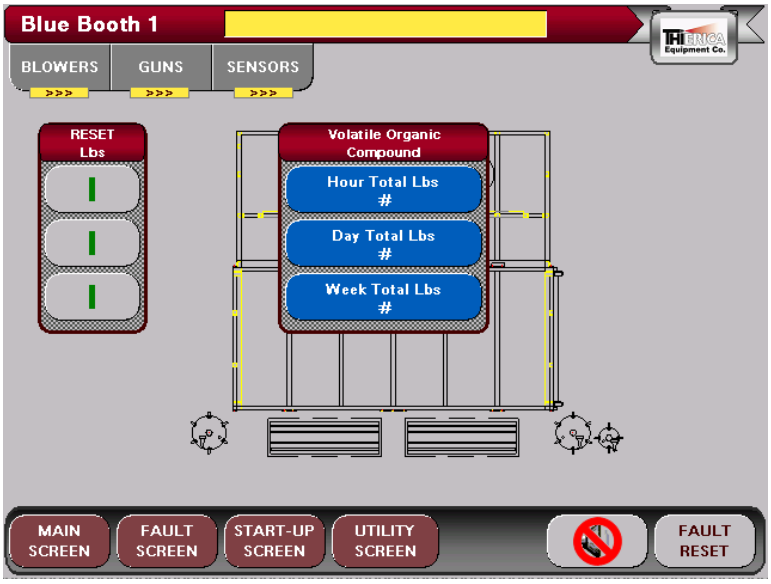
are accessed from this screen.
   - Note: this access is common to all Booth screens.
2. The 

and 

starts with the blowers control.
3. The start/stop control is by the 

buttons.
4. The flashing yellow & orange icons  over the screen pushbuttons indicate a fault condition in this area. (See **FAULT SCREEN** below)

BOOTH >> GUNS



1. Under 

, three items are shown:
   - 

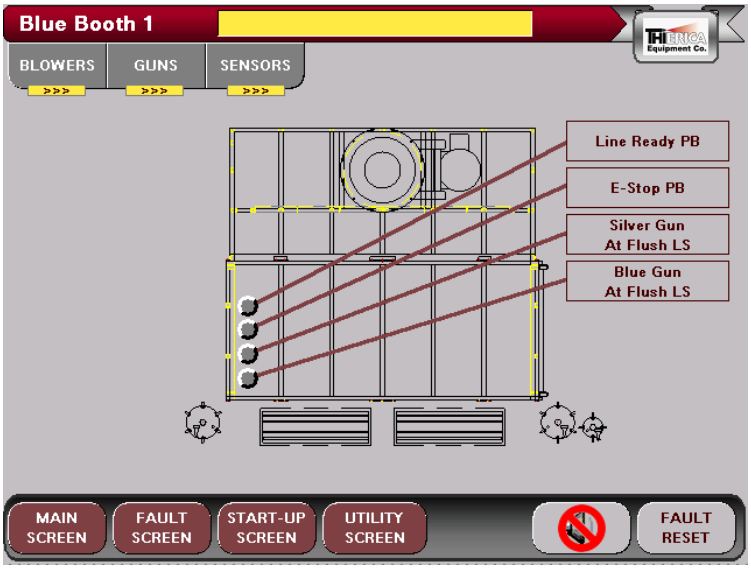
– The total VOC for the current hour.
   - 

– The total VOC for the current day.
   - 

– The total VOC for the current week.
2. The 

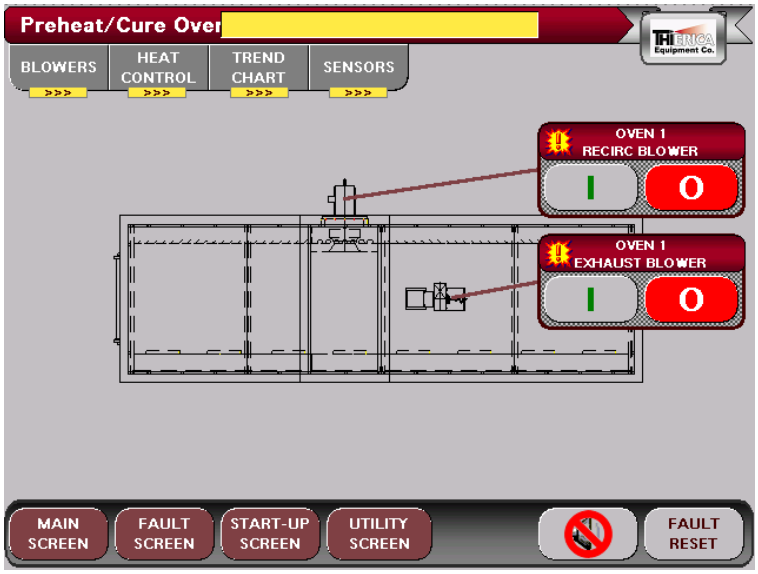
buttons are only visible when an Engineer is logged in.
   - Note: each total can be individually reset and has a confirmation button.

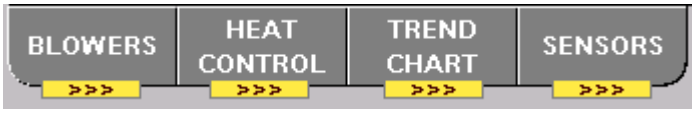
BOOTH >> SENSORS



1. This screen shows the state of additional sensors in the booth, grey for off and green for on.
   - Line Ready PB – The Line Ready pushbutton.
   - E-Stop PB – The Emergency Stop pushbutton.
   - Silver Gun At Flush LS – The Gun At Flush limit switch.

OVEN >> BLOWERS



1. The 

are accessed from this screen.
   - Note: this access is common to all Oven screens.
2. The 

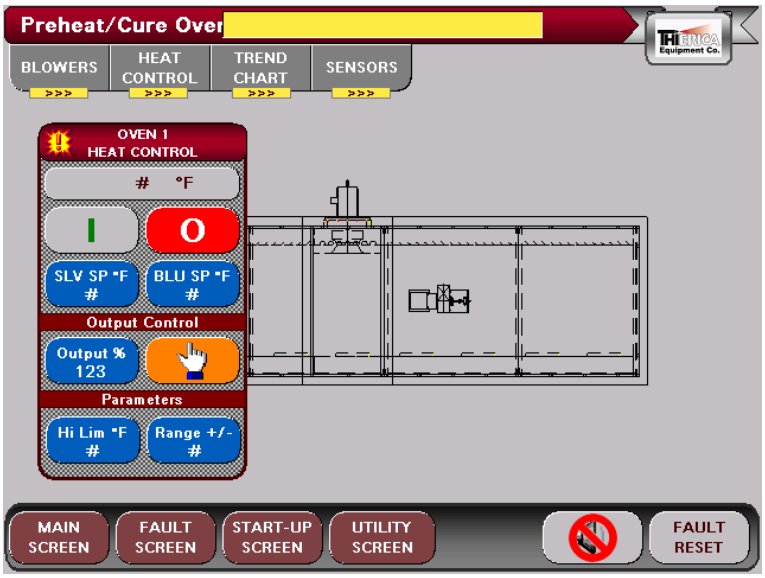
, 

and 

starts with the blowers control.
3. The start/stop control is by the 

buttons.
4. The flashing yellow & orange icons  over the screen pushbuttons indicate a fault condition in this area. (See **FAULT SCREEN** below)

OVEN >> HEAT CONTROL



1. The 

window contains the following:
   - The 

will show the current oven temperature in degrees F. The window will be:
     - Grey when the temperature is below the set point range.
     - Green when it is within the range.
     - Red when it is above range.
   - The oven heat is started and stopped with the 

buttons.
   - The 

will set the oven temperature in degrees F.
   - The 

is set by:
     -  for manual control. This mode will set the output as a fixed percentage (see 1.4.c below).
     -  for automatic control. This mode will adjust the output as needed to hold the temperature set point (see 1.3 above).
     - 

will show the current output to the heaters and allow the manual output to be set. The range is 0-100 percent.
2. The 

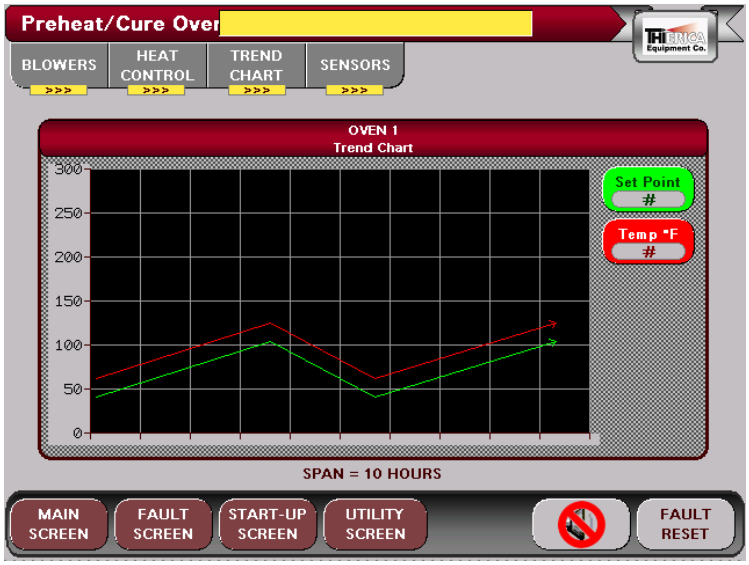
are used to:
   - 

set the high limit of the system in degrees F. The range is 0-300 deg. F.

- 

set the range in degrees F. This is a plus or minus tolerance to be added to and subtracted from the set point (see 1.3 above). The range is 0-50 deg. F.

OVEN >> TREND CHART



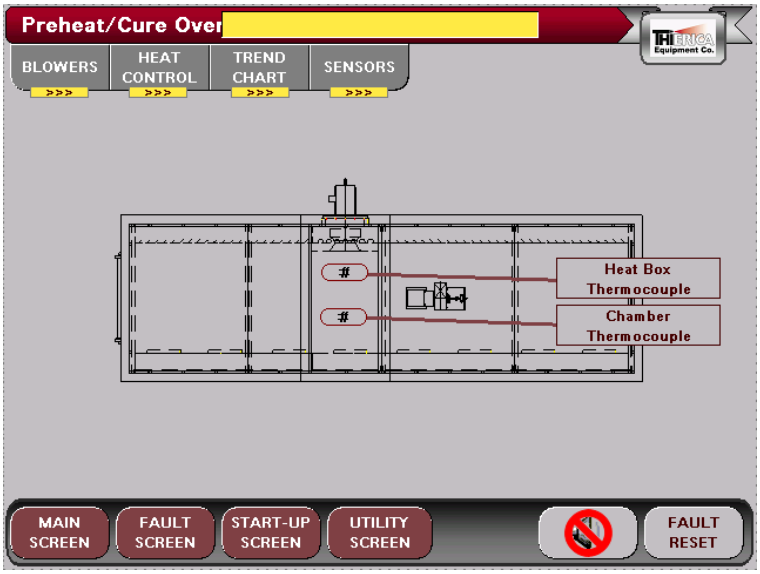
1. The 

window contains the following:
   - 

to show the oven set point and a matching pen.
   - 

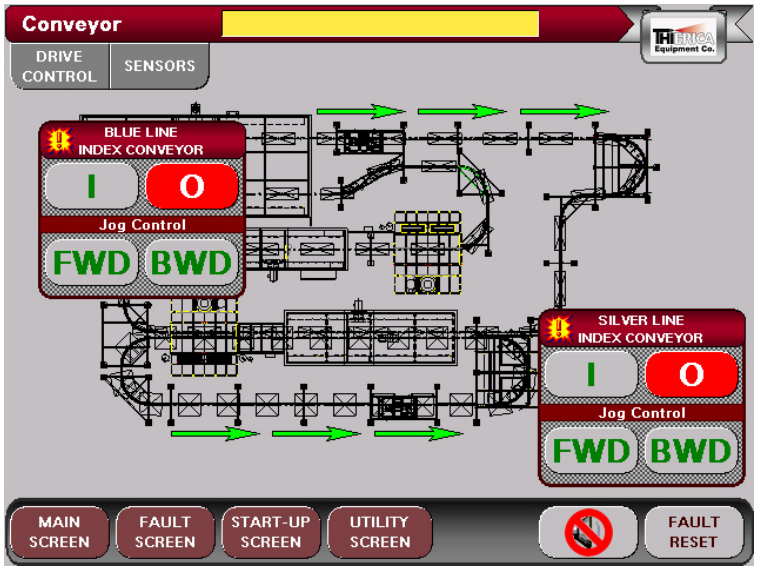
to show the current oven temperature in degrees F. and a matching pen.
   - The range is 0-300 degrees F.
   - The time span is 10 hours (one hour between squares).

OVEN >> SENSORS



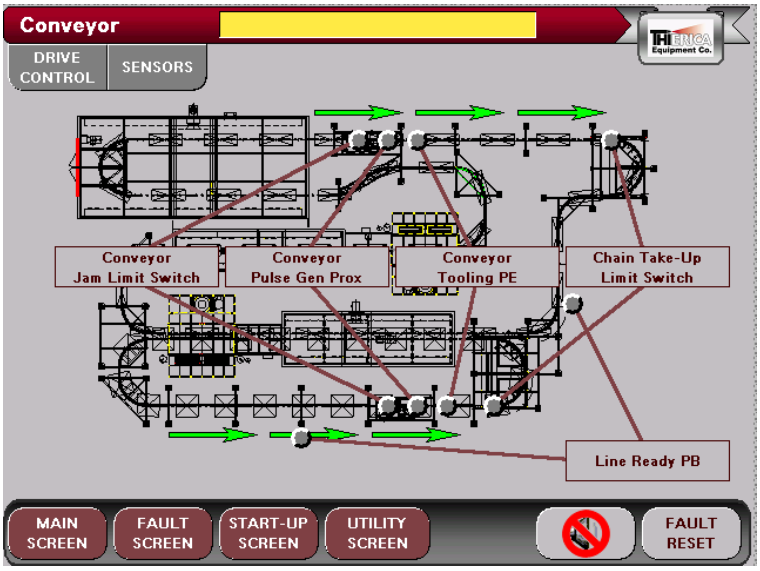
1. This screen shows the following:
   - Heat Box Thermocouple to indicate the temperature in the heater box, in degrees F.
   - Chamber Thermocouple #1 to indicate the temperature in the oven, in degrees F.

CONVEYOR >> DRIVE CONTROL



1. The SENSORS are accessed from this screen.
2. The BLUE CONVEYOR and SILVER CONVEYOR starts with the drive control.
3. The start/stop control is by the I O buttons. This will start and stop an index of each conveyor.
4. The flashing yellow & orange icons over the screen pushbuttons indicate a fault condition in this area. (See **FAULT SCREEN** below)
5. Under Jog Control there are FWD BWD buttons. These will jog the respective conveyor forward and backwards. There is a 5 second limit on each jog motion.
6. When the conveyor is in motion, there will be a flashing to indicate motion.

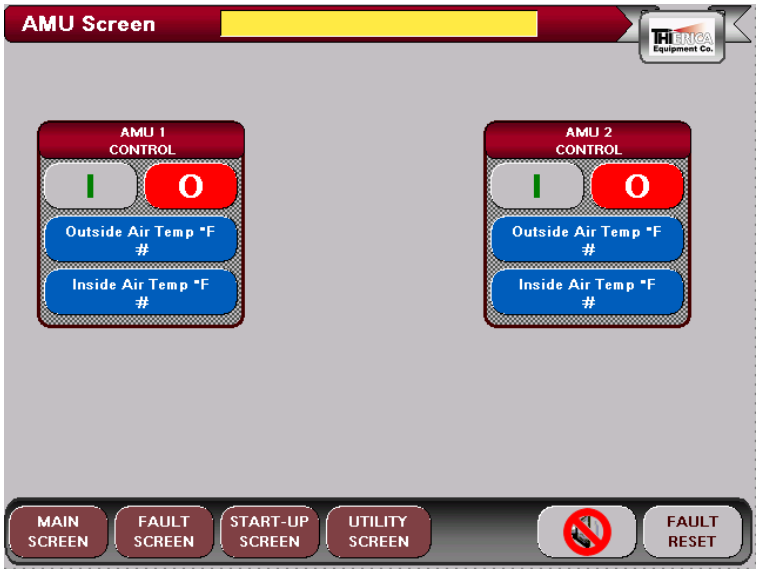
CONVEYOR >> SENSORS



1. This his screen shows the state of additional sensors in the booth, grey for off and green for on:
   - Conveyor Jam Limit Switch – The Conveyor Jam Limit Switch.
   - Conveyor Pulse Gen Prox – The Conveyor Pulse Generator Prox. Switch.
   - Conveyor Tooling PE – The Conveyor Tooling Photo Eye.
   - Chain Take-Up Limit Switch – The Conveyor (Chain) Take Up Limit Switch.
   - Line Ready PB – The Line Ready pushbutton.

2. The oven door switch is also shown on this page.

AMU (Air Make-Up Unit)



1. The 

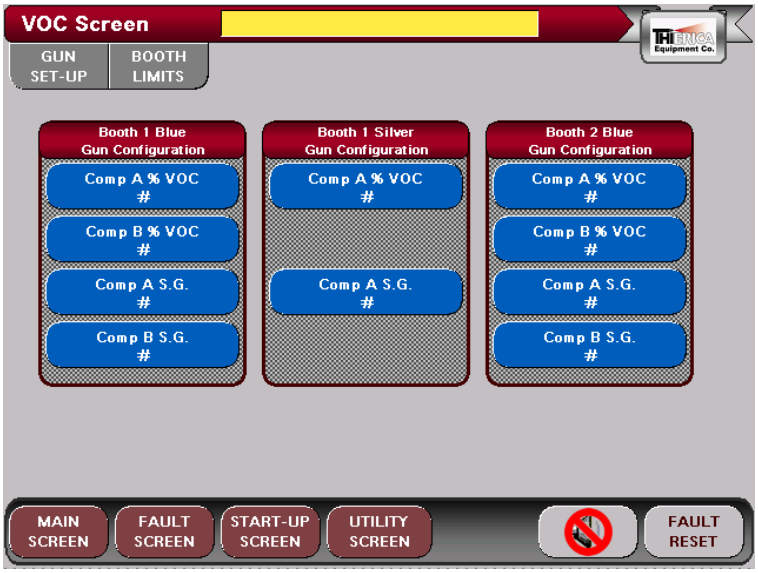
window contains the following for both AMU 1 and AMU 2:
   - The start/stop of the units is with the 

buttons.
   - 

will show the Outside Air Temp. in Deg. F.
   - 

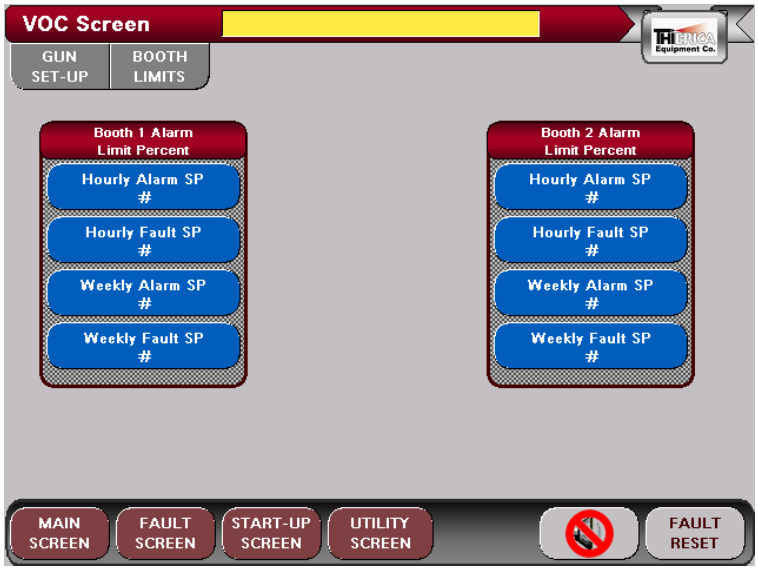
will show the Inside Air Temp. in Deg. F

VOC >> GUN SET-UP



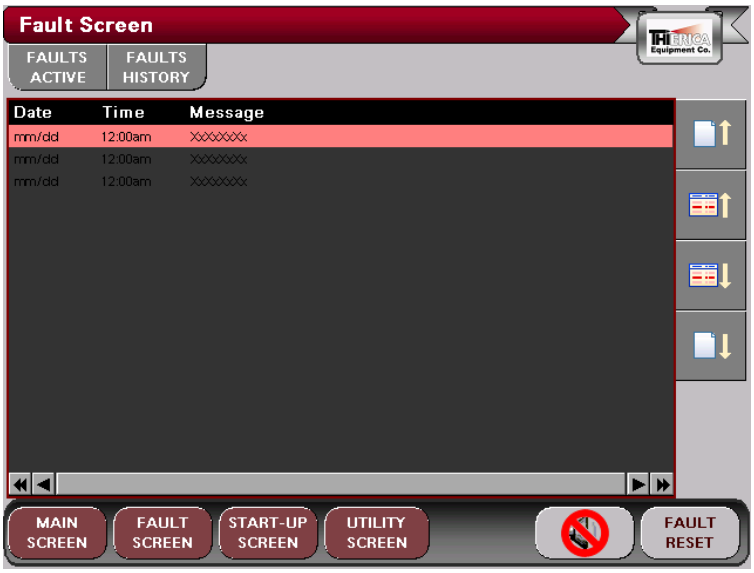
1. **NOTE**: Access to this page is limited to “ENG” or above.
2. The SENSORS are accessed from this screen
3. The Booth 1 Blue Gun Configuration, Booth 1 Silver Gun Configuration and Booth 2 Blue Gun Configuration windows contain the following for each gun in each booth:
   - Comp A % VOC # will show the percentage of VOC used in component A.
     - The range can be entered from 0 to 100 %
   - Comp B % VOC # will show the percentage of VOC used in component B.
     - The range can be entered from 0 to 100 %
   - Comp A S.G. # will show the Specific Gravity of the VOC used in component A.
     - The range can be entered from 0 to 2.
   - Comp B S.G. # will show the Specific Gravity of the VOC used in component B.
     - The range can be entered from 0 to 2.

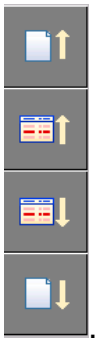
VOC >> BOOTH LIMITS



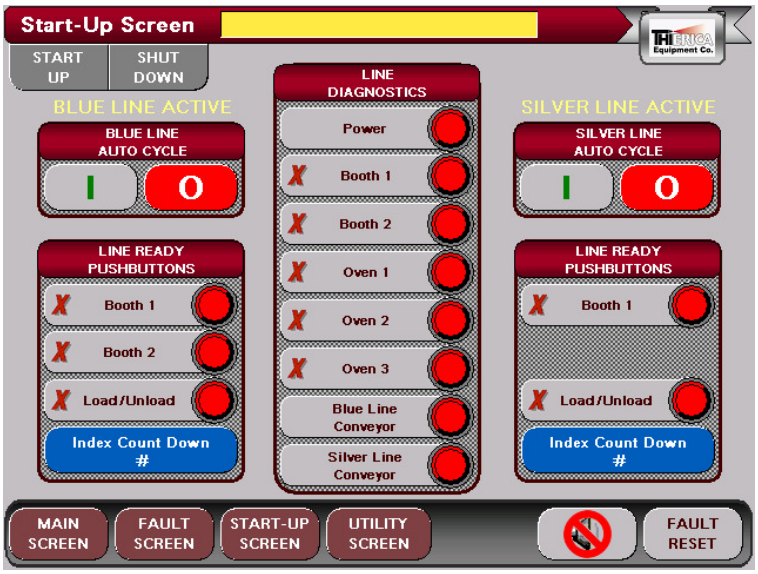
1. **NOTE**: Access to this page is limited to "ENG" or above.
2. The Booth 1 Alarm Limit Percent and Booth 2 Alarm Limit Percent windows contain the following for each booth:
   - Hourly Alarm SP # will show the percentage of allowed VOC usage (**each hour**) in this booth to sound an alarm.
     - The range can be entered from 0 to 100%
     - 100% is six pounds of VOC.
   - Hourly Fault SP # will show the percentage of allowed VOC usage (**each hour**) in this booth to sound an alarm AND **shut off the gun**.
     - The range can be entered from 0 to 100%
     - 100% is six pounds of VOC.
   - Weekly Alarm SP # will show the percentage of allowed VOC usage (**each week**) in this booth to sound an alarm.
     - The range can be entered from 0 to 100%
     - 100% is five hundred pounds of VOC.
   - Weekly Fault SP # will show the percentage of allowed VOC usage (**each week**) in this booth to sound an alarm AND **shut off the gun**.
     - The range can be entered from 0 to 100%
     - 100% is five hundred pounds of VOC.

FAULT SCREEN



1. The  are accessed from this screen.
2. There are two screens that make up the fault screen section. The first screen (shown above) is the  screen. This screen is for viewing current faults with the system. The second screen is the  screen (not shown). This screen is for viewing past faults on the system. Press the buttons in the upper left hand corner to switch between the screens  . Fault messages are displayed with the most recent at the top of the list. See the fault code section for help in troubleshooting the fault messages.
3. Use the arrow keys on the right to scroll or page up and down the list  .
4. See the TROUBLESHOOTING section, below.

START-UP SCREEN



1. The START UP | SHUT DOWN are accessed from this screen.
2. Under LINE DIAGNOSTICS each area may be enabled or disabled as needed:
   - Power will display a pop-up window to show the system power status.
   - Booth 1 will display a pop-up window to show Booth 1 status and allow it to be enabled or disabled.
   - Each of the other area pop-up windows will function in a similar manner.
3. The “BLUE LINE ACTIVE” or the “SILVER LINE ACTIVE” text will show when each line is active.
   - Only one line may be active at a time (see Start-Up below).
4. Under BLUE LINE AUTO CYCLE the system can be placed in:
   - I O automatic or manual. If all areas are ready (see above):
     - Booth 1 “Line Ready” pushbutton must be pushed, unless disabled.
     - Booth 2 “Line Ready” pushbutton must be pushed, unless disabled.
     - The Load/Unload “Line Ready” pushbutton must be pushed, unless disabled.
     - The Index Count Down must be at zero.

5. Under 

each “Line Ready” pushbutton may be enabled or disabled as needed:
   - 

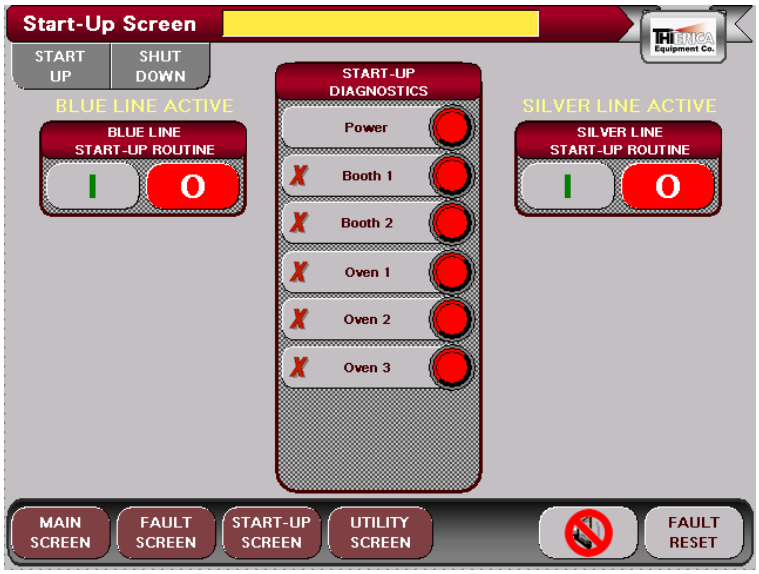
will enable or disable (override) the “Line Ready” pushbutton in Booth 1.
   - 

will enable or disable (override) the “Line Ready” pushbutton in Booth 2.
   - 

will enable or disable (override) the “Line Ready” pushbutton at the Load/Unload Station.
   - 

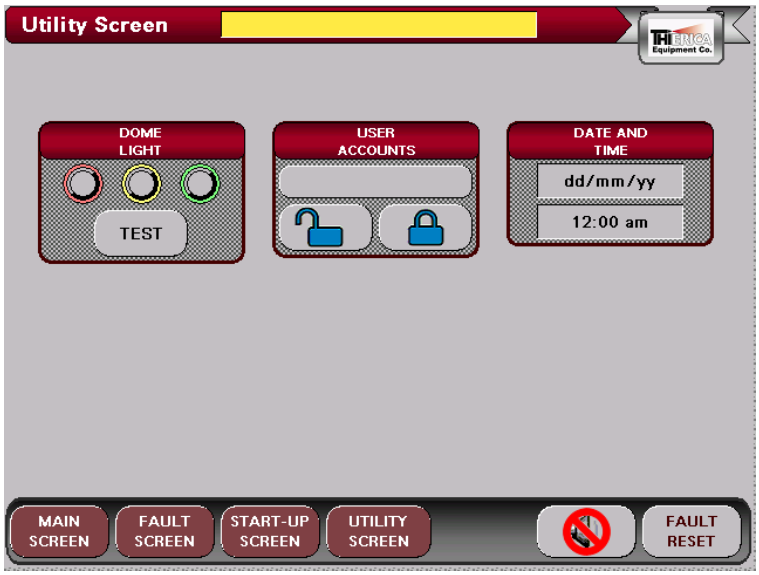
will show the time in minutes until the conveyor may index.

START-UP SCREEN >> START-UP



1. Under START-UP DIAGNOSTICS each area may be enabled or disabled as needed for automatic start-up:
   - Power will display a pop-up window to show the system power status.
   - Booth 1 will display a pop-up window to show Booth 1 status and allow it to be enabled or disabled.
   - Each of the other area pop-up windows will function in a similar manner.
   - **NOTE**: The silver line will only use Booth 1 and Oven 1.
2. Under BLUE LINE START-UP ROUTINE the system can:
   - I O start/stop the automatic start-up. If all areas are ready (see above)

UTILITY SCREEN



1. Under 

window, the dome light can be tested. During the test, each color of the dome light(s) will be on for two seconds.
2. Under 

window, the screen security will be allow. This is for future use.
3. Under 

window, the current date & time are displayed.

TROUBLESHOOTING

WARNING:

Access to the THIERICA electrical enclosure while energized must only be by a qualified person. This enclosure contains high voltages and a potential for electrical arc flash hazard. A **qualified person** according to NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces, Article 1-5.4.1: "…shall be trained and knowledgeable of the construction and operation of equipment or a specific work method, and be trained to recognize and avoid the electrical hazards that might be present with respect to that equipment or work method. Such persons shall also be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools and test equipment. One can be considered qualified with respect to certain equipment and methods, however, still be unqualified for others. Such persons permitted to work within limited approach of exposed energized conductors and circuit parts shall, at a minimum, be additionally trained in all of the following:

(a) The skills and techniques necessary to distinguish exposed energized parts from other parts of electric equipment

(b) The skills and techniques necessary to determine the nominal voltage of exposed energized parts

(c) The approach distances specified in Table 2-1.3.4 of Part II and the corresponding voltages to which the qualified person will be exposed

(d) The decision-making process necessary to determine the degree and extent of the hazard and the personal protective equipment and job planning necessary to perform the task safely"

FAULT	CAUSE	REMEDY
[000] Control Power Off Fault	-The control power to the system has been turned off	-Reset all Emergency Stops -Press CONTROL POWER ON -Verify system power is on -Check Safety E-stop wiring
[001] Main Enclosure E-Stop Fault	-Emergency Stop was pressed	-Reset the emergency stop -Verify emergency stop wiring
[002] Blue Load Station E-Stop Fault	-Emergency Stop was pressed	-Reset the emergency stop -Verify emergency stop wiring
[003] Silver Load Station E-Stop Fault	-Emergency Stop was pressed	-Reset the emergency stop -Verify emergency stop wiring
[004] Silver Booth E-Stop Fault	-Emergency Stop was pressed	-Reset the emergency stop -Verify emergency stop wiring
[005] Blue Booth E-Stop Fault	-Robot Controller Emergency Stop was pressed -Robot Teach Pendant Emergency Stop was pressed	-Reset the emergency stop -Press "Fault Reset"
[012] Fire Protection Fault	-The fire protection system has issued an alarm	-Check the fire protection system -Press "Fault Reset"
[014] AMU 1 Heartbeat Fault	-Communication to the AMU has failed	-Check the wiring to the AMU -Power cycle the 702-RTA unit
[015] AMU 2 Heartbeat Fault	-Communication to the AMU has failed	-Check the wiring to the AMU -Power cycle the 702-RTA unit
[100] Dual Oven Exhaust Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[101] Dual Oven Recirc Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[110] Dual Oven Htr. Box Over Temp. Fault	-The temperature in The Heater Box is above the set point limit	-Check the thermocouple wiring
[111] Dual Oven Chamber Over Temp. Fault	-The temperature in The Oven is above the set point limit	-Check the thermocouple wiring
[112] Dual Oven Htr. Box Hi Limit Fault	-The temperature in the Heater Box is above the high limit	-Check the thermocouple wiring
[113] Dual Oven Chamber Hi Limit Fault	-The temperature in The Oven is above The high limit	-Check the thermocouple wiring
[114] Dual Oven Not At SP Fault	-The oven did not reach set point in the time allowed	-Adjust the oven set point -Place the Oven Output Control in automatic
[115] Dual Oven Burner Off Fault	-The burner did not give an "ON" signal in the time allowed	-Check the burner controller
[200] Blue Line Primer Oven Exhaust Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[201] Blue Line Primer Oven Recirc Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension

[210] Blue Line Primer Oven Htr. Box Over Temp. Fault	-The temperature in The Heater Box is above the set point limit	-Check the thermocouple wiring
[211] Blue Line Primer Oven Chamber Over Temp. Fault	-The temperature in The Oven is above the set point limit	-Check the thermocouple wiring
[212] Blue Line Primer Oven Htr. Box Hi Limit Fault	-The temperature in the Heater Box is above the high limit	-Check the thermocouple wiring
[213] Blue Line Primer Oven Chamber Hi Limit Fault	-The temperature in The Oven is above The high limit	-Check the thermocouple wiring
[214] Blue Line Primer Oven Not At SP Fault	-The oven did not reach set point in the time allowed	-Adjust the oven set point -Place the Oven Output Control in automatic
[215] Blue Line Primer Oven Burner Off Fault	-The burner did not give an "ON" signal in the time allowed	-Check the burner controller
[300] Blue Line Top Coat Oven Exhaust Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[301] Blue Line Top Coat Oven Recirc Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[310] Blue Line Top Coat Oven Htr. Box Over Temp. Fault	-The temperature in The Heater Box is above the set point limit	-Check the thermocouple wiring
[311] Blue Line Top Coat Oven Chamber Over Temp. Fault	-The temperature in The Oven is above the set point limit	-Check the thermocouple wiring
[312] Blue Line Top Coat Oven Htr. Box Hi Limit Fault	-The temperature in the Heater Box is above the high limit	-Check the thermocouple wiring
[313] Blue Line Top Coat Oven Chamber Hi Limit Fault	-The temperature in The Oven is above The high limit	-Check the thermocouple wiring
[314] Blue Line Top Coat Oven Not At SP Fault	-The oven did not reach set point in the time allowed	-Adjust the oven set point -Place the Oven Output Control in automatic
[315] Blue Line Top Coat Burner Off Fault	-The burner did not give an "ON" signal in the time allowed	-Check the burner controller
[320] Blue Line Top Coat Oven Door Open Fault	-The oven doors were open when the conveyor was in motion	-Close the oven doors -Press "Fault Reset"
[400] Blue/Silver Line Booth Exhaust Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[410] Booth 1 VOC 6 Lbs Warning	-The VOC warning limit for this hour has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[411] Booth 1 VOC 6 Lbs Fault	-The VOC fault limit for this hour has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[412] Booth 1 VOC 500 Lbs Warning	-The VOC warning limit for this week has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"

[413] Booth 1 VOC 500 Lbs Fault	-The VOC fault limit for this week has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[500] Blue Line Booth Exhaust Start/Current Fault	-The Motor Starter or Current Switch did not respond in the time allowed	-Check the Motor Starter setting -Check the motor belt for proper tension
[510] Booth 2 VOC 6 Lbs Warning	-The VOC warning limit for this hour has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[511] Booth 2 VOC 6 Lbs Fault	-The VOC fault limit for this hour has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[512] Booth 2 VOC 500 Lbs Warning	-The VOC warning limit for this week has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[513] Booth 2 VOC 500 Lbs Fault	-The VOC fault limit for this week has been reached	-Wait for the next hour to -Adjust the Booth Limits (See Page 20) -Press "Fault Reset"
[600] Silver Line Conveyor Drive Fault	-The AC Drive's ready signal is not on	-Press "Fault Reset" -Verify power on the drive -Verify motor disconnect is on -Disconnect power from the drive for 30 seconds then turn back on -Refer to the drive manual for additional troubleshooting
[602] Silver Line Conveyor Jam Fault	-The Conveyor Pulse Generator Prox. did not give a signal in the time allowed	-Check for a jammed part -Check for a loose belt on the drive motor -Check the adjustment of the prox
[603] Silver Line Conveyor Take Up Fault	-The Chain Take-Up limit switch is activated	-Check the wiring on the switch -Check the position of the spring slide at the chain take up
[604] Silver Line Conveyor Index Spacing Fault	-The distance between racks were not the same	-Check the number of links between the racks near the Tooling PE
[700] Blue Line Conveyor Drive Fault	-The AC Drive's ready signal is not on	-Press "Fault Reset" -Verify power on the drive -Verify motor disconnect is on -Disconnect power from the drive for 30 seconds then turn back on -Refer to the drive manual for additional troubleshooting

[702] Blue Line Conveyor Jam Fault	-The Conveyor Pulse Generator Prox. did not give a signal in the time allowed	-Check for a jammed part -Check for a loose belt on the drive motor -Check the adjustment of the prox
[703] Blue Line Conveyor Take Up Fault	-The Chain Take-Up limit switch is activated	-Check the wiring on the switch -Check the position of the spring slide at the chain take up
[704] Blue Line Conveyor Index Spacing Fault	-The distance between racks were not the same	-Check the number of links between the racks near the Tooling PE