

Electric Heater Basic:
Installation, Commissioning, Operation and Maintenance Manual
06-03-2016

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1 Safety Information

1.1 Responsibilities

Everybody in the manufacturing, sales, distribution, installation and use of equipment has specific responsibilities to ensure safety.

1.1.1 Manufacturer

The equipment manufacturer is responsible to provide the following:

Installation instructions

Operating instructions

- Schematics and wiring diagrams

- Start-up procedures

- Shut-down procedures

- Emergency procedures

Inspection, testing and maintenance instructions

1.1.2 Dealer/Installer

The installer is responsible for following the manufacturer's instructions for installing and commissioning of the system.

The process also includes showing the proper use of the equipment to the customer and explaining the required inspection, testing and maintenance programs of the user.

Failure to comply results in a voiding of all warranties both express and implied under the law.

1.1.3 User

The user is responsible for establishing a regularly scheduled safety training program. This program has to include a demonstration of understanding of the subject material by trainees. The user is responsible for documenting the training program and the results of the training program in writing.

The user is responsible for making the equipment manuals and the safety training material accessible for reference for all personnel.

It is the responsibility of the user to establish, schedule, and enforce the frequency of the inspection, testing and maintenance program based on the manufacturer's recommendations. The user is responsible for documenting the inspection, testing, and maintenance program and the corrective actions that have been taken.

Failure to comply may result in injury to personnel and/or property damage.

1.2 General

The system shall be installed and maintained by trained and qualified spray booth professionals. Qualified spray booth professionals are people who are familiar with the applicable laws, rules, standards and codes.

System shall not be used during Spray Mode. Spray booth needs to be purged according to the NFPA (National Fire Protection Association) and the AHJ (Authority Having Jurisdiction) requirements before operating the system. Operator needs to understand and follow relevant requirements.

Observe all warnings and make sure you are thoroughly familiar with this manual and the equipment.

Follow all general standards and good practices for spray booths and spray booth related equipment installations.

Proper protective equipment such as protective footwear, gloves, safety goggles, and ear plugs when noise levels exceed 80 decibels must be used.

Spray booths are not designed to be load bearing structures. Do not climb on top of the spray booth. Use proper equipment to reach difficult to access areas on spray booth.

Guards, covers, and components that prevent contact with electrically and/or pneumatically energized parts must not be removed or left open during operation.

It is impossible to list all potential hazards of this equipment. If you are uncertain of a procedure, please consult the AHJ on the issue.

Heater surface and duct may be hot! Outside surfaces of spray booth opposite from towers or inside duct runs may also get hot.

1.3 Electrical

Serious injury or death can result from improper installation. High voltage is present.

There are two sources of power in control panel. Disconnect and lock out both sources before adjusting or servicing system.

All electrical work is to be done by a licensed electrician to conform to applicable local and national codes.

All field wiring provided must be done in accordance with local codes or, in the absence of local codes, the National Electrical Code (NFPA 70).

All wiring must conform to the latest NEC codes 500, 501, 502, 505, 516.

System shall be interlocked with compressed air solenoid valve of spray gun. The System shall be disabled during Spray Mode.

Control Panel Testing:

In order to facilitate trouble shooting, the control panel is shipped with jumpers for the following three (3) safety circuits:

1. H1 to 51: External Interlocks
2. H2 to X7: Spray booth door switches
3. H2 to X9: Exhaust air flow switch (Spray Mode)

Test control panel with interlocks jumpered. Use the following Control Panel Test Sheet to verify correct operation of the panel. This test will eliminate the control panel as a source of issues that may arise during system installation. After testing, remove jumpers and connect control panel to all system components.

Serial#:

Motor HP: Phase:

FLA:

Date:

Built by:

Tested by:

Two sources of Power

Read Manual

Pulse logo

Torque Labels (4pcs)

Wiring Diagram

Schematic

Manual

High Pressure Air Labels (4pcs)

Burn Hazard Labels (10pcs)

Terminal block orientation

Screws tight

Wire labels

Software Version

E Stop

Aux Shutdown

Disconnect turns blower off

Pre-Heat

Y1 = 120VAC Blower contactor pulls in

Y3 = 120VAC/0VAC Lights ON/Off

Y4 = 0VAC Compressed air

Y6 continuity to 24H if HEAT on

Y7 NO Continuity to C1

Y8 Continuity to C1

Spray

Y1 = 0VAC

Y3 = 120VAC if LIGHT on

Y4 = 120VAC Compressed air

Y6 NO continuity to 24H if HEAT on

Y7 Continuity to C1

Y8 NO Continuity to C1

Flash-Off/Purge

Y1 = 0VAC

Y3 = 0VAC Lights

Y4 = 120VAC Compressed air

Y6 NO continuity to 24H

Y7 Continuity to C1

Y8 NO Continuity to C1

Flash Off

Y1 = 120VAC

Y3 = 0VAC Lights

Y4 = 0VAC Compressed air

Y6 continuity to 24H if HEAT on

Y7 NO Continuity to C1

Y8 Continuity to C1

X7 disconnected = HEAT off

2 Labeling Requirement

There are hazard information labeling requirements and general labeling requirements.

2.1 Hazard Information labeling requirements

It is the responsibility of the seller to inform about possible hazards. We identified 7 main hazard sources that require safety labels. The following safety labels have to be attached to the equipment.

If safety labels are removed or missing they have to be replaced!

For replacement safety labels contact California Pulse, Inc.

1. Read Manual Label

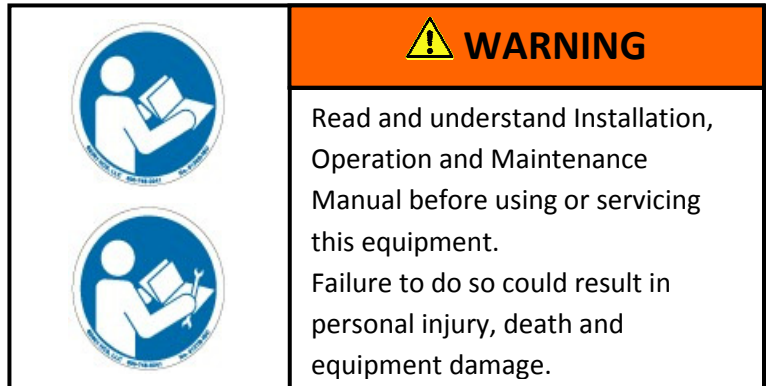
Installation, operation and servicing should only be done by qualified people.

Number of labels

One per control panel.

Location

Control Panel



2. Multiple Sources of Power Hazard

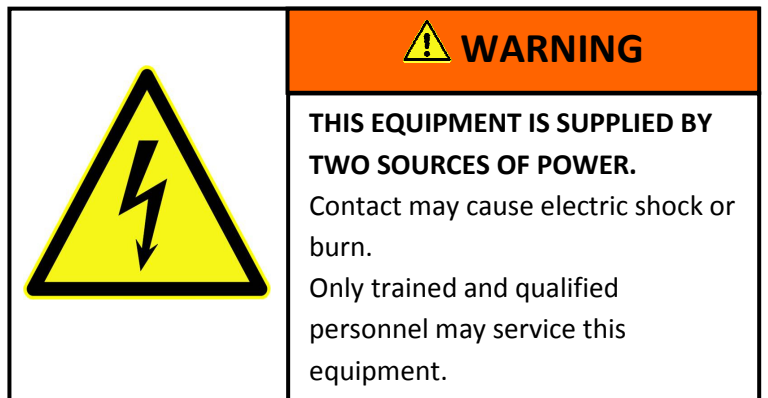
The control panel is supplied by multiple sources of power. When the disconnect on the control panel is turned off, not all sources of power may be disconnected.

Number of labels

One per control panel.

Location

Control panel



3. Blocking Explosion Relief Hazard

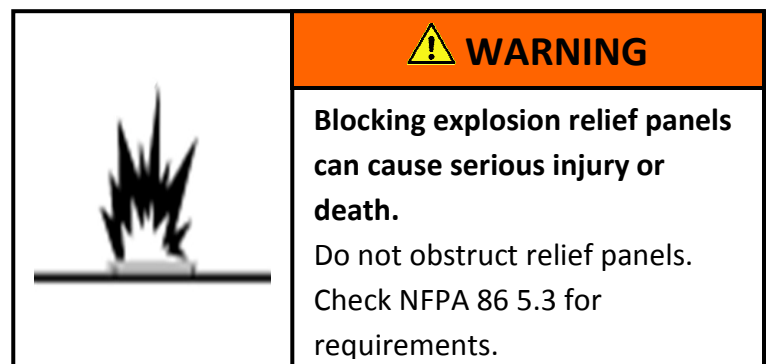
Various parts of the spray booth may serve an explosion relief purpose. It is imperative not to block explosion relief areas.

Number of labels

One.

Location:

One label on each blower.



4. Fan Hazard



Moving parts can cut and crush.

Number of labels

Two per blower

Location of labels

- A. Intake opening of blower housing
- B. Discharge opening of blower housing

	 WARNING
	<p>Moving parts can cut and crush. Do not operate fan without duct system connected. Follow lockout procedure before servicing.</p>

5. High pressure Air From Nozzles Hazard



Air flow from nozzles can cause eye injury. Air flow from nozzles may carry debris that can cause eye injury.

Number of labels

- A. Corner Tower Systems
One per corner tower.
- B. Gable Nozzle Systems
Four – one per corner

Location of labels

- A. Spray booth wall.
Approximately 2' from corner towers at eye level.

	 WARNING
	<p>High pressure air and flying debris from nozzles can cause eye injury and blindness. Wear safety goggles when nozzle system is operating.</p>

6. Burn Hazard - when electric heat option is added

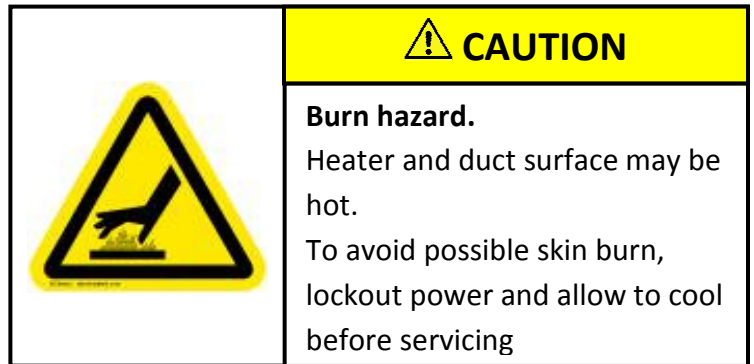
Exposed duct system parts can cause burns. Opposite side of spray booth where towers or ducts are in close proximity to or touching spray booth walls may get hot and pose a hazard.

Number of labels

System ships with 10 labels. Number of labels depends on system layout. Labels have to be able to warn people of the danger without people getting into a hazardous situation. Request more labels if it is determined that more labels are required to provide adequate warning of the danger.

Location of labels

Near heater and duct work where surface temperature may exceed 160F.



2.2 General Labeling requirement


1. System Name Plate

Number of Labels

One per system

Location of labels

Inside of control panel

	
California Pulse, Inc. 23433 Keator Road Apple Valley, CA 92307	
Model No.	<input type="text"/>
Serial No.	<input type="text"/>
Date of mfg.	<input type="text"/>
Motor hp	<input type="text"/>
Voltage	<input type="text"/>
Phase	<input type="text"/>
Full Load Amp	<input type="text"/>
Made in U.S.A.	

3 Principles of Drying Waterborne Paint

There are two factors that influence the drying of waterborne paints.

1. Turbulence

Waterborne coatings need turbulent air flow in order to eliminate the boundary layer and to speed up the evaporation rate of the water. The system creates an unparalleled level of turbulence through pulsing the air flow. **The system is a turbulence creation system not a dehumidification system!**

2. Relative Humidity Level in Booth

Waterborne coatings need a low level of relative humidity in order to dry at a fast rate. **A high level of relative humidity will significantly slow down flash-off times.** If the level of relative humidity rises above 50%, the operator should raise the temperature. Raising the spray booth temperature will lower the level of relative humidity. Raising the temperature by about 20F-30F should compensate for high relative humidity levels inside the spray booth.

The system includes a relative humidity gauge. The gauge should be mounted inside of the spray booth in a location where the humidity gauge is readable through a window. Check the gauge before starting a Flash-Off cycle. If the relative humidity level is above 50% inside the booth, raise spray booth set point temperature.

4 System Components

4.1 Intake filter

The intake filter is mounted in the inside of the spray booth cabin.

4.2 Blower

The system uses a high pressure blower to deliver the correct volume of air at the right pressure. A 9" diameter forward curved blower wheel is driven by a 2 HP motor. Standard is 208V/230V three phase. All other voltages are available. Please specify when ordering.

4.3 Electric Heater

The standard heater is a 30kW electric heater. Heater capacity may be different because of booth size or customer specifications.

4.4 Control Panel

The control panel has the following operators:

1. Disconnect switch,
2. Emergency stop button,
3. Mode selector switch:
 - a. Pre-Heat
 - b. Spray
 - c. Flash-Off
 - d. Bake
4. Heat On/Off button,
5. Light On/Off button.

4.5 Ducting

Standard duct components are used to connect the system pieces together. Duct sealing is imperative to achieve proper system performance.

5 System Specifications

Blower motor: 2HP 208/230/460VAC (all other voltages and single phase are considered an option)

Heater: 30kW (2 x 15kW) electric heater

Heater Voltage: has to be specified when ordering (208V, 230V, 460V, or 575V)

Fuses: 6pcs

Ferraz Shawmut

Amptrap

Part number depends on system capacity.

6 Installation and Commissioning

Follow manufacturer's installation instructions and the additional installation instructions in this manual.

Upon completed system commissioning all set points have to be documented in writing.

6.1 Blower and Heater

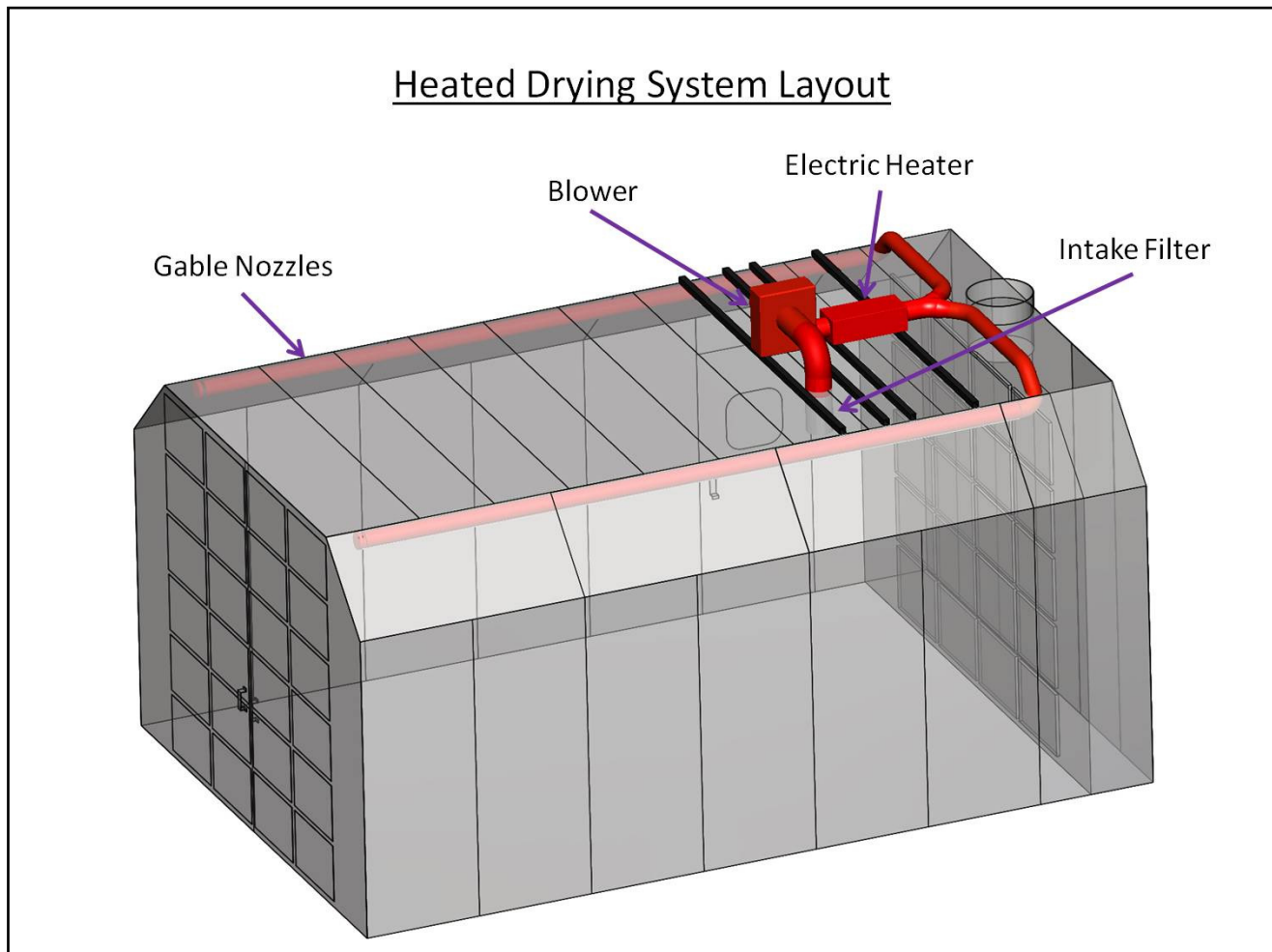
The blower and the heater should be installed on top of the spray booth. Blower and heater have to be supported on top of booth. Please refer to the heater manufacturer's documentation included in this manual for heater installation.

Blower overload has to be adjusted to motor FLA. If motor over amps, restrict blower intake with a piece of sheetmetal.

There should be a 24" straight piece of duct between the blower intake and the 8" elbow.

There should be an 18" straight piece of duct between the blower and the heater.

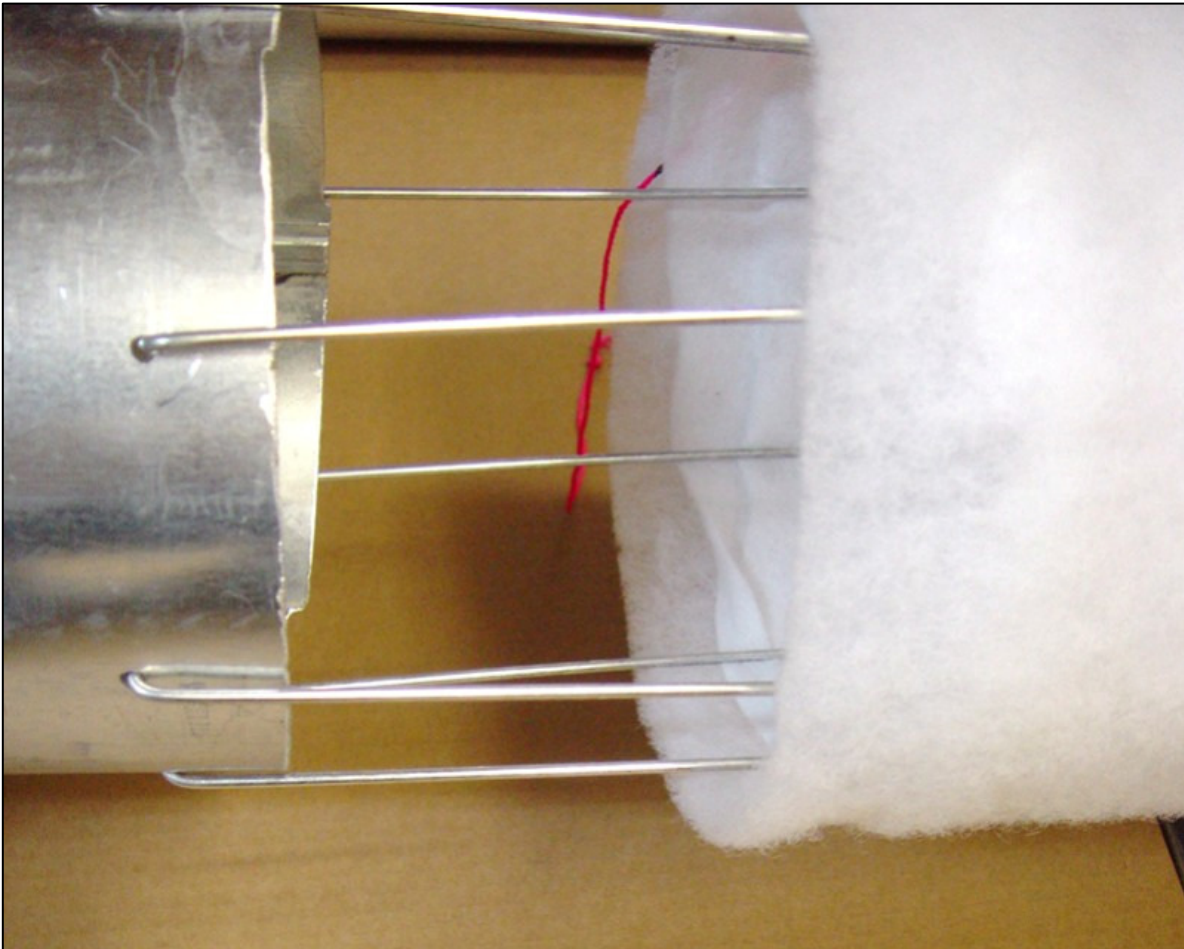
Cut the supplied 6" elbow in half to produce two 45 degree elbows. Install these onto the Y to create the 90 degree turns.



6.2 Intake Filter

The intake filter is attached directly to the 8" intake duct. After positioning blower and connecting intake ducting, cut both penetration for intake duct. Intake duct should protrude into booth about 1-1/2" – 2". Install L brackets to secure intake duct to booth.

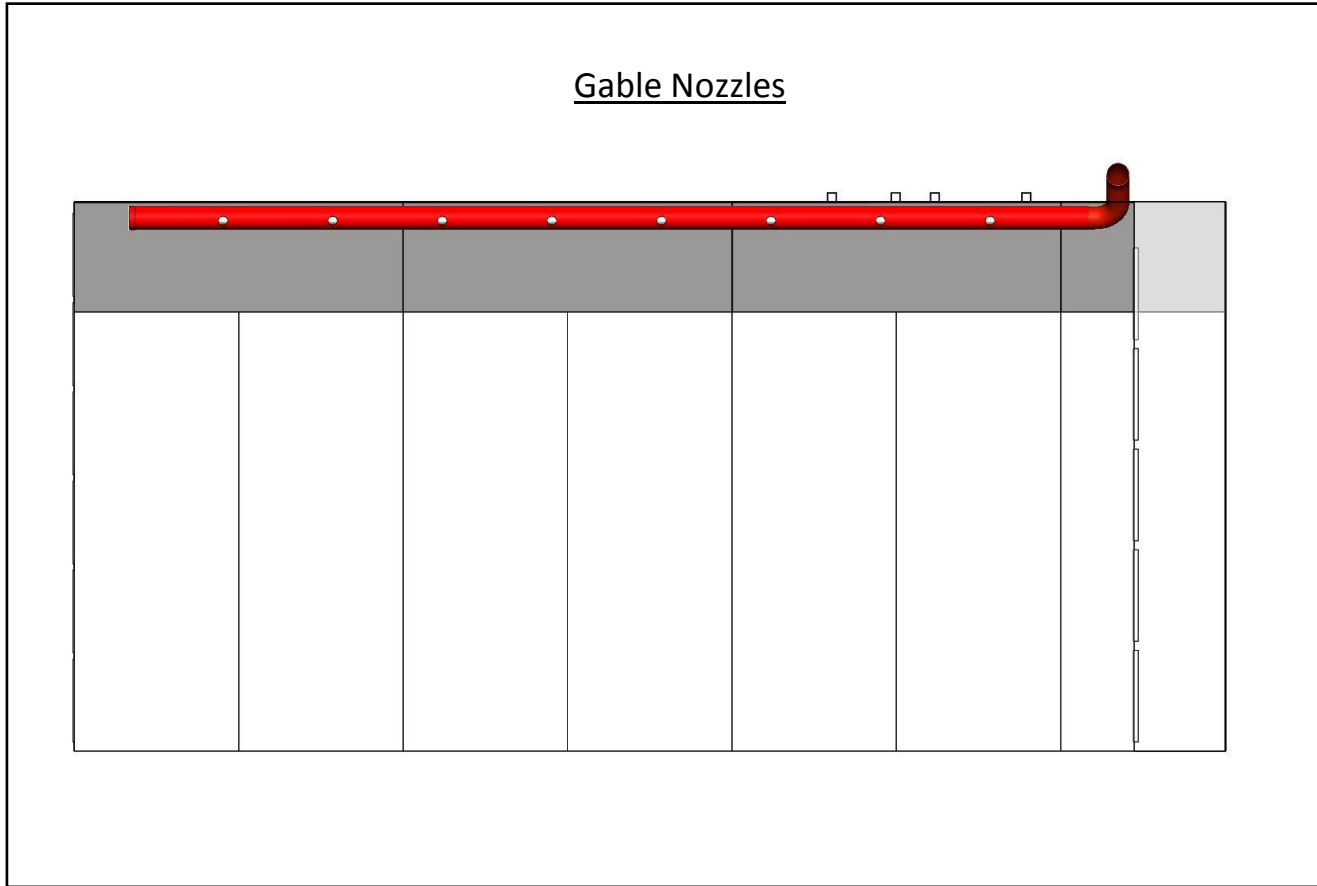
Drill 3/16" holes for filter frame legs at 1" from end of intake duct. Attach filter frame. Install filter sock over frame and tie filter to frame. Install hose clamp to secure filter in place.



6.3 Ducting

There may be some dings and dents in the surface of the painted snap lock duct. This is a normal condition of snap lock duct. Only about 25% - 30% of the duct surface is visible when the sections are installed in the booth. During assembly rotate duct sections so that surface/coating imperfections are not visible and lengthwise duct seam is also out of sight.

Elbow end of powder coated duct assembly will be against end wall of spray booth. The picture below shows a front flow booth. Elbow is against exhaust filter wall.



Install ducting according to the general duct layout illustration. Use the powder coated 5" elbows to access inside of the booth. Secure powder coated elbow to duct work on top of booth. Install powder coated STRAIGHT duct pieces together on the floor. The average auto booth will have five 5' duct sections on each side of the booth. Install end cap. Tape all seams.

Lift assembled duct section into place. Use 3" U clamps to mount duct section to the wall. Do not put the U clamp over the joint where the straight section meets the elbow. You may have to rotate straight section to correctly position nozzles. Install nozzles as per instruction below.

After nozzle installation rotate straight duct section so that nozzles are aimed at the top of the door. Tek screw straight section to elbow. Tape seam where elbow meets the straight section. Install U clamp over seam.

When system installation is complete, turn on system to blow out possible debris and contaminants. Usually there are metal shavings that fall inside of the duct works during the installation process. **To avoid injury, always wear safety glasses during installation and when the system is turned on!**

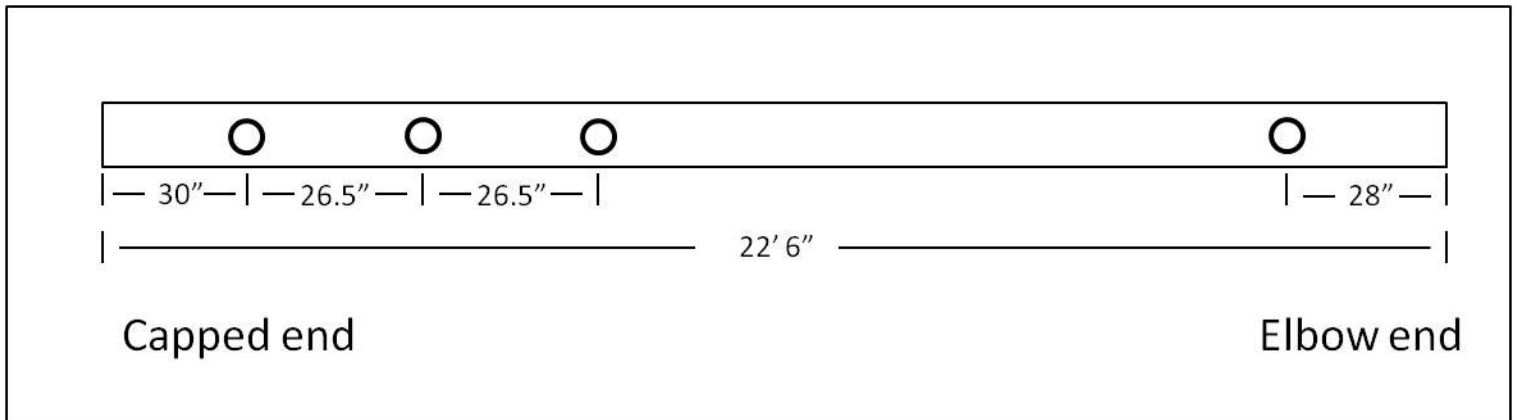
6.4 Nozzle Installation

There will be 9 nozzles on each side in a typical automotive booth. Use a chalk line to mark centerline of nozzles. Mark hole centers.

6.4.1 Nozzle Spacing

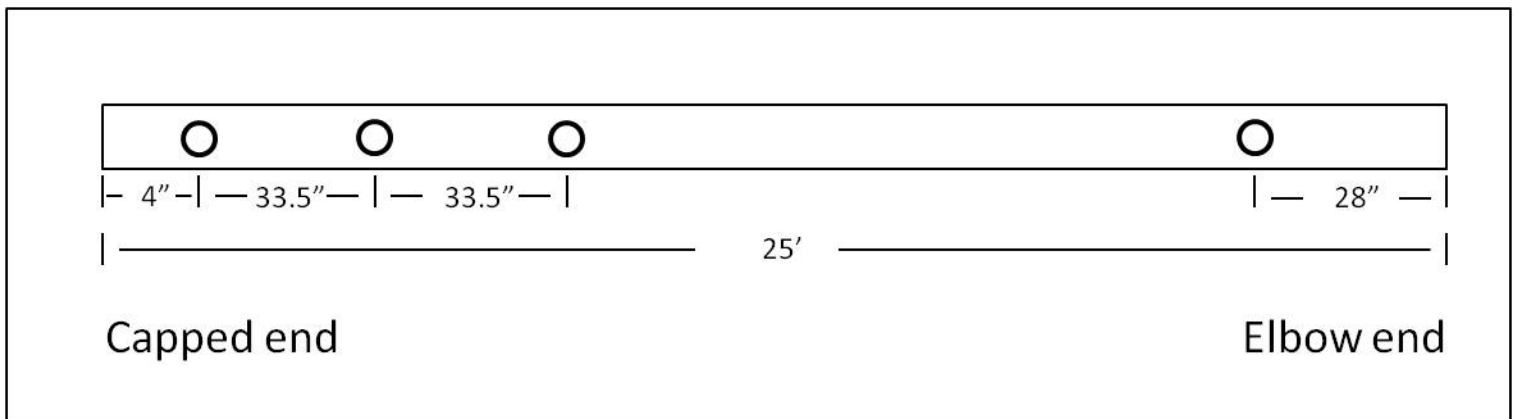
6.4.1.1 Short Booth: 24'

Cut one straight section of powder coated duct in half. Assemble a 22.5' duct section with 4 full lengths and one half length of powder coated duct.



6.4.1.2 Long Booth: 28'

Use five full lengths of powder coated duct. Assemble a 25' section of duct. Line up nozzle centers along a chalk line according to the following picture.



6.4.2 Non Adjustable Nozzles

Cut 1" holes with a hole saw according to the correct pattern for the booth. Please see patterns above for a 24' long and a 28' long booth. Install the foam nozzles over the holes.

6.4.3 Adjustable Nozzles (Option)

Cut 1.5" holes with a hole saw.



Center nozzle on the hole. Center mounting holes on tabs on the chalk line. Drill 1/8" rivet holes and rivet nozzle into hole.



Put foam ring over nozzle. Clean chalk line off of duct.



6.5 Control Panel

Install according to applicable standards.

6.6 Explosion Relief

Verify that there is sufficient explosion relief area as per NFPA86 5.3. **You may have to create additional explosion relief area.**

6.7 Interlocks

Install all interlocks as per schematics. Installer shall test and document in writing all interlock set points upon completed installation.

1. Automatic high temperature limit switch(es):

Location: in heater

Set point is 300F

2. Manual High temperature limit switch:

Location: in heater

Set point is 350F

3. Manual high temperature limit switch of spray booth oven:

Location: intake ducting of blower

Set point is 200F.

4. Air flow switch in heater:

Location: in heater. Pickup tubing has to be installed into intake duct of blower per manufacturer's instruction. Set point is 700cfm. Set point has to be adjusted to turn heater off if air flow is below the standard system air flow of approximately 700cfm. This equals about 2,000fpm of air velocity in the 8" diameter duct. Measure air velocity in duct and adjust air pressure switch to open at about 1700fpm. You can restrict the air flow to 1700fpm by covering the filter box with a plastic bag.

5. Air solenoid valve

Location: Compressed air flow line supplying spray gun.

Set point: Has to turn off compressed air supply of spray booth during Class A oven modes.

6. Door switches

Location: Spray booth doors.

Set point: Heat has to turn off when doors are opened during Class A oven modes.

7. Exhaust VFD running

Location: Set of contacts on VFD.

Set point: If contacts do not prove during Spray Mode, compressed air solenoid valve must close. If contacts do not prove during Class A oven modes, heat has to turn off.

8. Fire suppression

Location: On fire suppression system.

Set point: Waterborne drying system and heater must turn off during a fire alarm condition. Check the requirements of the Authority Having Jurisdiction to determine exhaust system requirements.

9. Blower auxiliary contactor

Location: In control panel.

Set point (non listed panel): Heat must be off if blower auxiliary contactor does not prove.

Set point (listed panel): Heat will be off if motor started trips.

6.8 Exhaust VFD Programming Sample

We do not provide support for VFD wiring and programming! The following are simply some examples and guide lines. If you need help with setting up the VFD, please call the VFD manufacturer's help line.

6.8.1 Hitachi SJ200-xxxNFU2

The following is an example of programming parameters for a Hitachi SJ200-xxxNFU2 drive.

Jumper position: 1 to PCS

Hitachi SJ200-015NFU2		
A001	02	Frequency source
A002	01	Run command source
A020	00	Multi-speed frequency setting
A021	05	Set speed #1
A022	60	Set speed #2
A044	00	V/f characteristic curve selection
A092	03	Acceleration time (0.01)
B031	10	Software lock mode selection
B037	00	
B091	01	Coast to stop
B130	01	Over-voltage LADSTOP enable (00)
C002	02	Terminal 2 function
C003	03	Terminal 3 function
C014	00	Cancel E13 alarm code
D001	00	
C026	00	Alarm terminal AL02 close when VFD runs
F003	05	Deceleration time (10)

6.8.2 World Wide Electric VFD

WWEVFD-x-xxx		
F_001	00	Enable FWD or REV
F_009	00	Primary speed
F_010	05	Preset speed #1
F_011	60	Preset speed #2
F_035	???	Motor nameplate voltage
F_082	01	Stop mode
F_084	03	Motor overload protection
F_052	03	Input terminal X1
F_053	04	Input terminal X2
F_131	-3	Relay output terminal

7 Training Program

New operators, maintenance personnel, and supervisors must complete initial training before starting to work with, maintain, service or supervise equipment. After the initial training, all people involved in the supervision, use, cleaning, maintenance, or testing of the equipment shall receive periodic training.

These periodic training sessions shall be documented in writing in the training log. The training log shall include the training sheets and the test materials. The training sheet shall include at least the date and time, topic of session, trainer name and attendees names. The effectiveness of the training program shall be evidenced by testing the knowledge of the people receiving the training. Testing is necessary to prove that personnel understood the training materials. This testing shall be done in writing. Records shall be kept for not less than three (3) years.

The training program shall be kept up to date with changes in the equipment, operating procedures, materials used, etc. Training materials, including but not limited to the training materials of the spray booth or spray booth oven, and all other equipment used in association with the particular refinishing process, and this manual shall always be available for reference for personnel involved in the operation, supervision, maintenance, and testing of the system.

Training program topics shall include:

1. Potential safety hazards.
2. Safety and emergency equipment.
3. The importance of constant operator awareness.
4. Operating, maintenance, and emergency procedures.

Training program records shall be kept for not less than three (3) years.

7.1 Potential Safety Hazards

Please see Safety Information section at the beginning of this manual.

7.2 Safety Equipment Storage and Use

Personnel shall to be instructed in the storage, maintenance and use of personal protective, safety and emergency equipment that they might be required to use.

7.3 Operator Awareness

Operators have to be aware of potential sources of hazards while using the equipment. These hazards include but are not limited to the hazards identified by the safety labels. It is impossible to list every possible hazard in this manual. Operators have to be able to use common sense based on their knowledge of the equipment, materials used and the process they are participating in.

7.4 Operating, Maintenance, and Emergency Procedures

7.4.1 System Start-up

Turn disconnect to ON position. Select desired mode through mode selector switch.

7.4.2 System Shut Down

Push Emergency Stop button. Turn disconnect into OFF position.

7.4.3 Lockout Procedure - Sample

The user is responsible for:

1. Completing all bold letter lists.
2. Writing down house procedures for sanctioning compliance violations of lockout procedures.
3. Determining if there are any additional steps needed for verifying the isolation of the equipment.

Lockout Procedure for California Pulse, Inc. waterborne paint drying system.

Purpose

This procedure establishes the minimum requirements for the lockout of energy isolating devices whenever maintenance or servicing is done on machines or equipment. It shall be used to ensure that the machine or equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any servicing or maintenance where the unexpected energization or start-up of the machine or equipment or release of stored energy could cause injury.

Compliance With This Program

All employees are required to comply with the restrictions and limitations imposed upon them during the use of lockout. The authorized employees are required to perform the lockout in accordance with this procedure. All employees, upon observing a machine or piece of equipment which is locked out to perform servicing or maintenance shall not attempt to start, energize, or use that machine or equipment.

Type of compliance enforcement to be taken for violation of the above.

You have to determine the appropriate consequences of such violation.

Sequence of Lockout

(1) Notify all affected employees that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.

Name(s)/Job Title(s) of affected employees and how to notify.

<i>List of Names</i>	<i>List of Job Tittles</i>	<i>Method of Notification</i>
1.		
2.		
3.		
<i>Etc.</i>		

(2) The authorized employee shall refer to the company procedure to identify the type and magnitude of the energy that the machine or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy.

Type(s) and magnitude(s) of energy, its hazards and the methods to control the energy.

- | Types of energy | Voltage/Phase | Air Pressure | Control of Energy |
|--------------------------|----------------------|---------------------|--------------------------|
| 1. Electricity | | | |
| 2. Electricity | | | |
| 3. Compressed air | | | |
| Etc. | | | |

(3) If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).

Type(s) and location(s) of machine or equipment operating controls.

- | Type of Machine/Controls | Location of Machine/Controls |
|---------------------------------|-------------------------------------|
| 1. | |
| 2. | |
| Etc. | |

(4) De-activate the energy isolating device(s) so that the machine or equipment is isolated from the energy source(s).

Type(s) and location(s) of energy isolating devices.

- | Type of Energy Isolating Device | Location of Energy Isolating Device |
|--|--|
| 1. | |
| 2. | |
| Etc. | |

(5) Lock out the energy isolating device(s) with assigned individual lock(s).

(6) Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

Type(s) of stored energy - methods to dissipate or restrain.

- | Types of Energy | Method of Dissipation/Restrain |
|------------------------|---------------------------------------|
| 1. | |
| 2. | |
| Etc. | |

(7) Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate.

Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment.

Method of verifying the isolation of the equipment.

Measure voltage on all three legs on the isolated side of the disconnect. All three should read 0VAC.

Measure voltage on the isolated side of the 110VAC breaker in the control panel. There should be 0VAC.

(8) The machine or equipment is now locked out.

Restoring Equipment to Service. When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps shall be taken.

(1) Check the machine or equipment and the immediate area around the machine to ensure that nonessential items have been removed and that the machine or equipment components are operationally intact.

(2) Check the work area to ensure that all employees have been safely positioned or removed from the area.

(3) Verify that the controls are in neutral.

(4) Remove the lockout devices and reenergize the machine or equipment.

Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.

(5) Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.

8 System Operation

The user has to be trained in the operation of the system.

The system can be switched among the different modes by turning the mode selector switch. The System has the following user selectable modes of operation:

8.1 Pre-Heat Mode

Default cycle time: 10 minutes

Pre-Heat Mode is not a Prep-Mode. There should be no human occupation of the booth during Pre-Heat Mode.

Turn Mode selector switch to Pre-Heat position. If the Heat button is pressed, the system will deliver heated air through the gable nozzles.

8.2 Spray Mode

Default cycle time: 90 minutes

Turn Mode selector switch to Spray position. Heating system and blower will be off. Non timed cycle. System will stay in Spray Mode until the operator switches to another mode.

8.3 Flash Off

Default cycle time: 7 minutes

Turn Mode selector switch to Flash Off. The system goes into an automatic Purge Mode. When the Purge cycle timer expires, the system enters Flash-Off Mode. The blower starts. If the Heat switch is on, the heater will turn on. Timed cycle. When the Flash-Off cycle timer expires, the system shuts down.

8.4 Bake Mode

Default cycle time: 40 minutes

Turn Mode selector switch to Bake. The system goes into an automatic Purge Mode. When the Purge cycle timer expires, the system enters Bake Mode. The blower starts. If the Heat switch is on, the heater will turn on. Timed cycle. When the Bake cycle timer expires, the system shuts down.

8.5 Purge Mode

Default cycle time: 180 seconds

Purge Mode is an automatic mode that is tied to the end of Spray Mode. When the system is switched out of Spray Mode, the booth will purge before entering the selected mode. If the operator is simply switching through Spray Mode to access another mode, the system will not purge. The operator has to switch out of Spray Mode position under two seconds in order to avoid the Purge Mode.

Cycle times can be changed by purchasing a factory programmed chip.

8.6 Emergency Stop Button

The E Stop button shuts down the system in case of an emergency.

8.7 Light Button

Turn lights on and off.

8.8 Heat Button

The heat button has a built in indicator light. The light turns on continuously if the button was pushed and the heater is turned on. The light blinks if the buttons was pushed but heater is not on.

8.9 Disconnect Switch

The disconnect switch disconnects the 3 phase power inside the control panel.

9 Inspection, Testing and Maintenance

Establishing and following an inspection, testing, and maintenance program is the responsibility of the user. The frequency of inspection is determined by many factors that vary location by location. The list of tasks and the frequency of the inspection, testing and maintenance tasks is only a guideline.

Inspection, testing and maintenance shall be done by competent and reliable personnel who are familiar with spray finishing application and the inherent characteristics of materials used.

Inspection, testing, maintenance, alterations, component replacement has to be recorded. Records of inspection, testing and maintenance shall be kept for not less than one year or until the next scheduled inspection, testing or maintenance whichever is longer.

Sample Inspection Sheet is at the end of this manual. **This is a sample only not a final version!**

Note problems found. Write a separate report if necessary and attach to system documents. Do not use system if problem(s) are not corrected.

Additionally follow heater manufacturer's maintenance guidelines.

9.1 Filter

Every 30 days

The filter sock should be inspected and replace if necessary. Used filters must be discarded according to NFPA 33 10.4.2.

9.2 Clean Outside of Ducting

Every 30 days

Towers should be thoroughly wiped down monthly to prevent overspray accumulation.

9.3 System Pressure

Every 12 months

Insert pressure tester tubing into nozzle opening and record pressure to verify system performance. Record pressure reading.

9.4 Blower - Noises

Every 6 months

The blower should be inspected for unusual noises and checked for unusual vibrations.

9.5 Blower - Overspray

Every 6 months

The blower should be inspected for overspray deposits. Remove intake duct and exhaust duct. Look for paint deposits on blower wheel. Clean as necessary.

9.6 Blower - Motor Amps

Every 6 months

Blower motor amperage draw shall be checked. Significant amp draw increase may indicate leak(s). Significant amp draw decrease may indicate increased system resistance. Determine cause of change and make corrective action(s) as necessary.

9.7 Ducting - Overspray

Every 6 months

Ducting should be inspected for overspray deposits. Ducting can be inspected when

- ducting is removed from blower for blower inspection
- intake filter is changed,
- or more frequently and in other locations (not only at blower and intake areas) if determined necessary by the user.

Overspray shall be cleaned from the inside of the duct work. Overspray accumulation poses a significant risk of fire. Overspray has to be cleaned from inside and outside of equipment on a regular basis.

9.8 Ducting

Every 12 months

Ducting should also be inspected for leaks. Generally leaks can be found by noise and/or putting hand over duct connections. Re-seal as necessary.

9.9 Electrical Connections

Every 12 months

All electrical connections should be checked for tightness. Tighten to specifications of applicable electrical code.

9.10 System Labeling

Every 12 months

The system should have the following labels attached.

1. Red manual
2. Two sources of power
3. Blower labels
4. Explosion relief labels
5. High pressure air from nozzles
6. System name plate (motor starter name plate)
7. Burn hazard

It is part of the maintenance procedure to verify that all labels are in place and legible. Replace any missing, damaged or non legible labels. Please read Section 2 for more information about the required system labels.

10 Additional Notes and Directions

10.1 Not a Zero Clearance Heater

Since the heater is used as a process heater, inlet air temperature may be significantly higher than inlet air temperature of the same heater in a comfort heating application.

Since temperature inside heater may be higher than 160F, **this is not a zero clearance heater**. Check with the Authority Having Jurisdiction to determine installation requirements.

10.2 Duct Insulation

Tape all seams with duct tape. Do not compress insulation. Compressing insulation causes loss of insulation rating.

10.3 Blower

The blower housing has to be insulated also. **DO NOT INSULATE BLOWER MOTOR! BLOWER MOTOR WILL BURN OUT!**

10.4 Heater

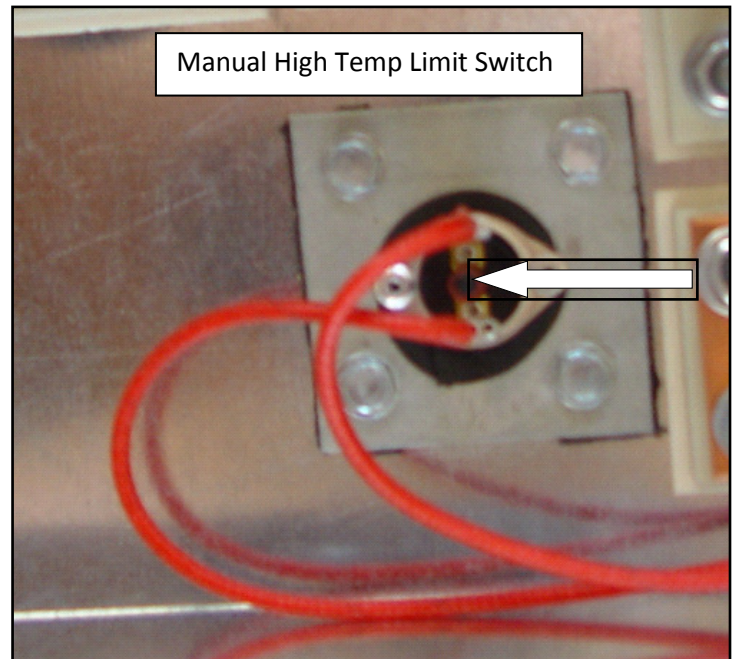
Insulate electric heater. **DO NOT INSULATE HEATER CONTROL PANEL!**

10.5 High Temperature Limit Switch Reset Procedure

If the following conditions are met the heater should produce heat:

- Pre-Heat, Flash, or Bake Mode selected
- Purge timer expired. If Flash or Bake modes are selected, the system first purges the booth.
- Heat light is on solid. If heat light blinks when heat is expected then manual high temperature limit switches are probably not a problem.

1. Lockout, tag out the power to the electric heater
2. Heater location can be difficult and dangerous to access.
Access method may change from one location to the other. Determine safe access procedure for heater and incorporate this into the training program. Use this method to access heater.
3. Turn off heater disconnect and open door.
4. Locate MANUAL high temperature limit switches.
Location of high temperature limit switches may vary from heater to heater.
5. Press the button between the two terminals to reset these switches. Button will “click” if it had to be reset.
6. Close door and turn on disconnect.
7. Remove lockout, tag out equipment.
8. Re energize system.



If there is still not heat, the heater air flow switch may not prove.

10.6 High Temperature Limit Switch Testing

The high temperature limit switches have to be regularly tested. There are four high temperature limit switches located in the system:

1. Automatic re set high temperature limit switches (2pieces)

Location: in heater

Setting: 300F out

2. Manual re set high temperature limit switch

Location: in heater

Setting: 350F

3. Manual re set high temperature limit switch

Location: waterborne paint drying system intake duct.

Setting: 200F

10.6.1 Visual inspection:

Check for signs of obvious damage.

10.6.2 Temperature Set Point Testing Process:

1. Lock out system.
2. Drill hole (1/8"-1/4") diameter at heater discharge.
3. Install a temperature sensor into hole.
4. Bypass heater air flow switch.
5. Block blower intake to slow down air flow.
6. Turn on system.
7. Monitor discharge temperature with temperature sensor. Document the temperature at which automatic high temperature limit switch activated.
8. Lock out system.
9. Bypass automatic high temperature limit switch.
10. Turn system on.
11. Monitor heater discharge temperature. Document temperature at which manual high temperature limit switch activated.
12. Lock out system.
13. Take jumper off of automatic high temperature limit switch.
14. Reactivate blower air flow switch.
15. Remove temperature sensor probe
16. Seal temperature probe opening.
17. Compare temperature limit switch set points to actual reading. If there is more than a +- 10% difference, replace the switch.
18. Turn system on/energize system.

Replace switch if there is more than 10% deviation in a positive or a negative direction from the set point.

11 Limited Warranty

Heater is warranted under the manufacturer's warranty. Please see the Warranty on page 21.

11.1 Terms of Warranty

Systems made by California Pulse, Incorporated, hereinafter called "Seller," are warranted to the original end user, hereinafter called "Purchaser" against defects in workmanship or materials under normal usage for a period of twelve (12) months, from the installation date of the system or fourteen (14) months from the shipping date of the system, whichever comes first. This limited warranty applies only to the original Purchaser, who acquired the System from Seller or from Seller's distributor.

This limited warranty shall not apply to:

- A. Equipment that is not installed and commissioned by a qualified spray booth contractor in accordance with "Seller's" installation instructions.
- B. Equipment that is not installed in accordance with all Local, State and/or Federal laws or regulations.
- C. Equipment that has been altered in any way, from its original factory configuration.
- D. Equipment that is not registered through the www.californiapulse.com web site within thirty (30) days of installation.
- E. Any part or component, which has been abused or failed as a result of poor maintenance, installation or neglect.
- F. Any labor costs Purchaser incurs in the process of removing a defective part and installing the replacement part.
- G. Damage caused by acts of God, such as Lightning, Earthquakes, Tornadoes and Storms of any kind.
- H. Filters are considered consumable items and are not covered by any warranty.

Purchaser shall obtain a Return Merchandise Authorization (RMA) number from Seller before returning any parts to Seller. Purchaser is responsible for shipping the parts to Seller's location at 23433 Keator Road, Apple Valley, CA 92307. Purchaser is responsible for all shipping costs of the replacement parts from Seller's facility at 23433 Keator Road, Apple Valley, CA 92307 to Purchaser facility.

The foregoing warranty shall be exclusive and in lieu of any other warranty, express or implied, including warranties of merchantability and fitness for a particular purpose and all other warranties otherwise arising by operation of law, course of dealing, custom, trade, or otherwise.

This limited warranty gives Purchaser specific legal rights, which vary from state to state. To the extent allowable under law, "Seller's" liability for consequential and incidental damages is expressly disclaimed. "Seller's" liability in all events is limited to, and shall not exceed, the original purchase price. In the event of a dispute, the controversy will be decided by binding arbitration by the Los Angeles County Arbitration Association.

11.2 Warranty Activation - Information Needed for Warranty Activation

Date of installation

Name of facility

Contact person at facility

Phone Number of facility

Street address

City
State
Postal code
Country

Distributor
Contact person at distributor
Telephone number of distributor
Installer company (if different from distributor)
Name of installer
Telephone number of installer

Control panel serial number
Blower serial number

Voltage
Amperage draw of motor
Elevation of facility
Pressure inside of gable nozzles ("wc)
 Nozzle 1
 Nozzle 5
 Nozzle 8

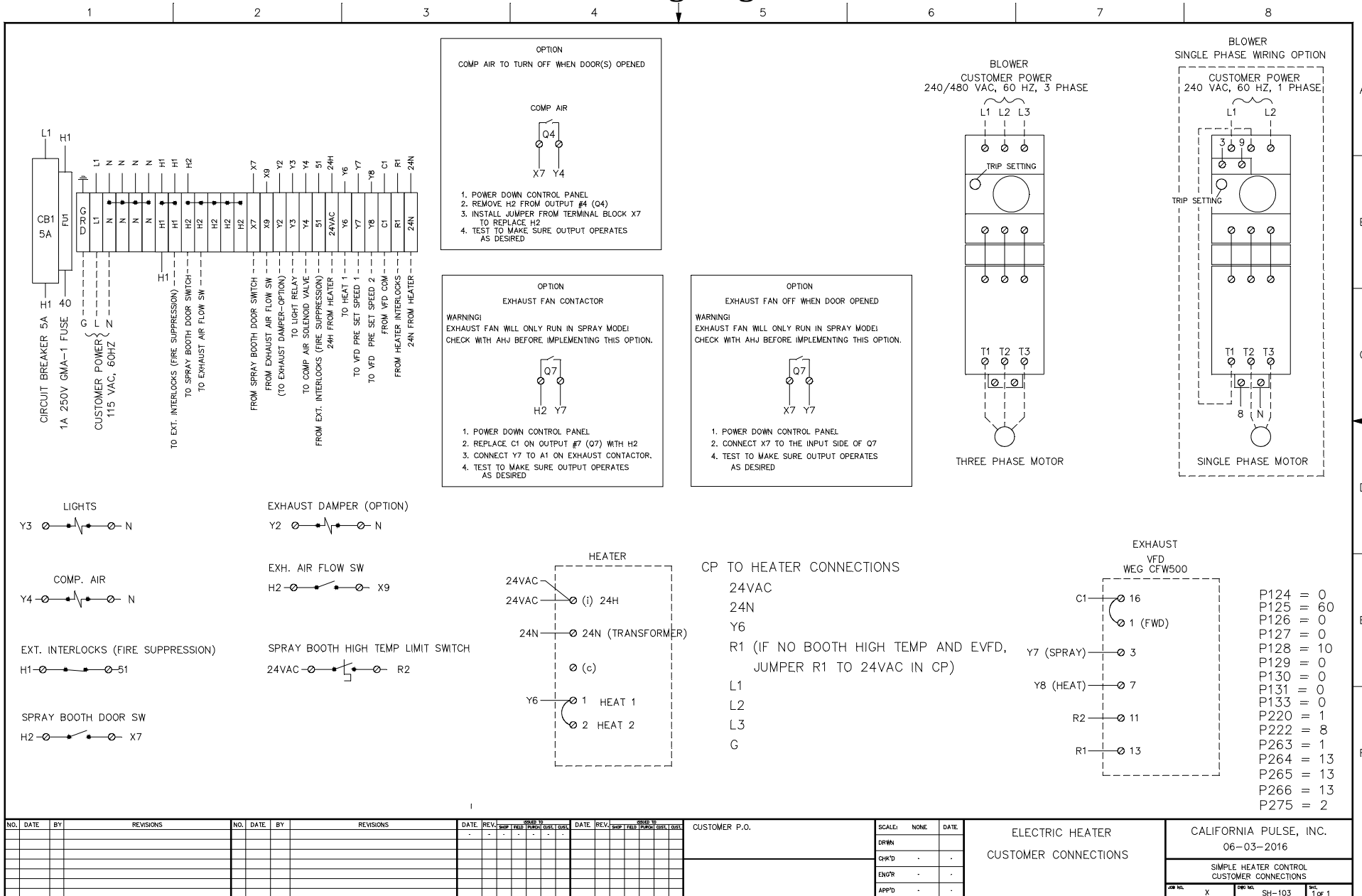
Labels installed according to instructions in manual:

1. Read manual
2. Two sources of power
3. Blower labels
4. Explosion relief labels
5. High pressure air from nozzles
6. System name plate (control panel label)
7. Hot surfaces

11.3 Warranty Registration - Registration Web Site

Please log onto our web site to register your system warranty: www.californiapulse.com. Please click the Warranty Registration button on the left.

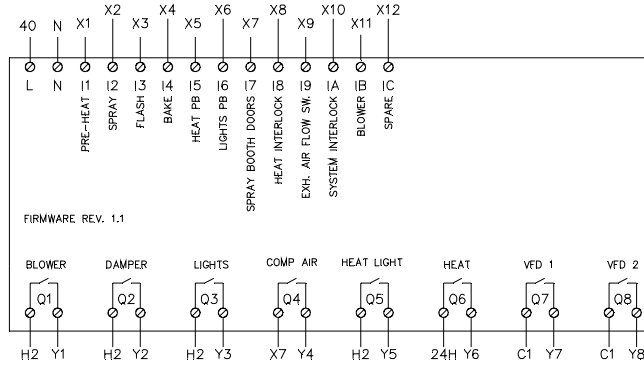
12 Wiring Diagrams



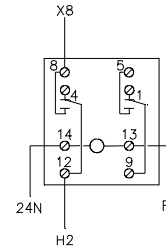
NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DATE	REV.	CHK'D	APP'D	DATE	SCALE:	NONE	DATE	ELECTRIC HEATER	CUSTOMER CONNECTIONS	CALIFORNIA PULSE, INC.	06-03-2016
CUSTOMER P.O.																	SIMPLE HEATER CONTROL CUSTOMER CONNECTIONS		
SH-103																	1 of 1		

EXHAUST CONTACTOR OPERATION IN SPRAY MODE
 TO OPERATE A CONTACTOR, REPLACE 24VAC ON Q7 WITH H2
 CONNECT CONTACTOR COIL TO THE Y7 SCREW

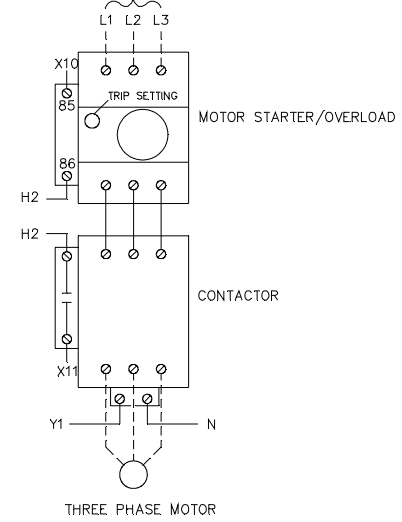
TECO
 SG2-20HR-A
 SMART RELAY



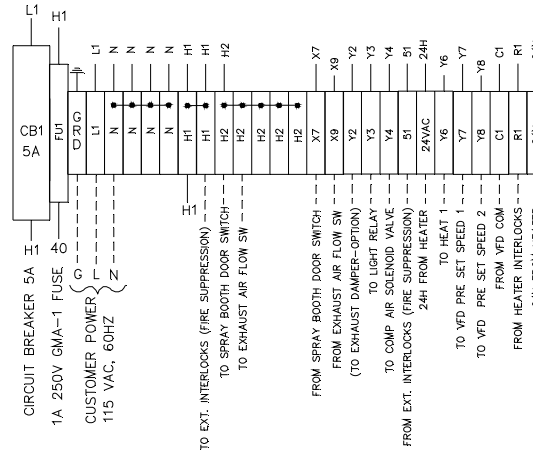
HEATER INTERLOCK RELAY
 24VAC



CUSTOMER POWER
 240/480 VAC, 60 HZ, 3 PHASE

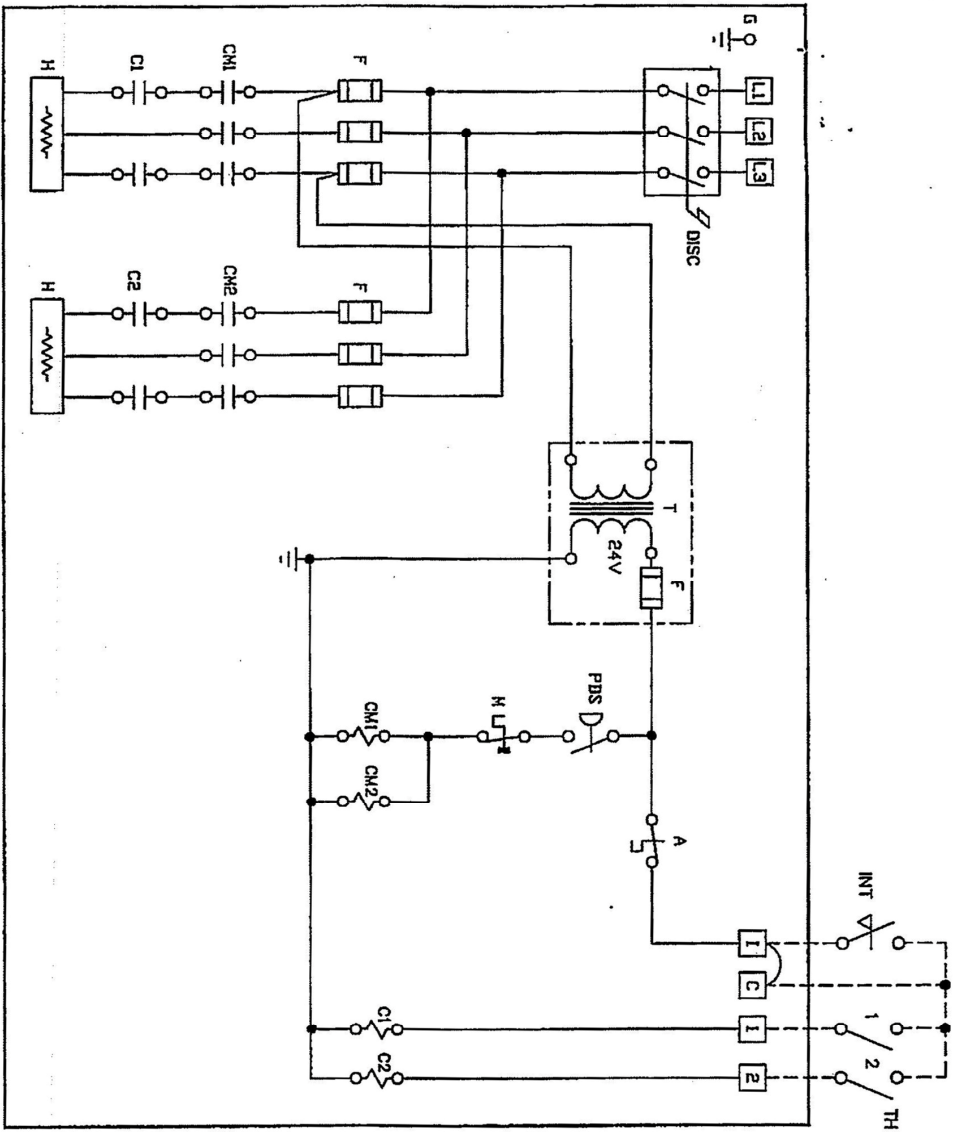


MAXIMUM TORQUE SPECIFICATIONS:
 GROUND BLOCK: 7 lb/in, 0.8 N/m
 TERMINAL BLOCKS: 4 lb/in, 0.5 N/m
 MOTOR STARTER: 18 lb/in, 2.0 N/m
 CONTACTOR: 9 lb/in, 1.0 N/m



NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DATE	REV.	DESIGNED BY	CHECKED BY	DATE	REV.	SCALE	DATE	CUSTOMER P.O.	
														NONE		ELECTRIC HEATER	
																CALIFORNIA PULSE, INC.	
																ELECTRIC HEATER CP WIRING	
																02-06-2015	
																JOB NO.	SH-102
																	1 of 1

13 Heater Schematic



IMPORTANT

Enlever le pont entre les bornes I & C avant de connecter le circuit de verrouillage.
 Faire le câblage suivant les codes nationaux et locaux.
 Lire attentivement les instructions avant de câbler et d'utiliser l'appareil.
 Le Serpentin Thermolec est représenté par un cadre en gros trait.
 Tout câblage en dehors du cadre est un "câblage typique fait par d'autres".

IMPORTANT

Remove jumper between terminals I & C before connecting the interlock circuit.
 Wire in accordance with National and local codes.
 Read the instructions carefully before wiring and operating the unit.
 The frame in bold line represents the Thermolec Heater.
 All wiring outside this frame is "typical wiring by others".

LEGENDE

- A Sonde thermique à réenclenchement automatique
- C1,C2 Contacteur de contrôle
- CM Contacteur secondaire
- DISC Sectionneur
- F Fusible ou élément fusible
- H Élément chauffant
- M Sonde thermique à réenclenchement manuel
- PDS Interrupteur à différentiel de pression
- T Transformateur de contrôle

LEGEND

- A Automatic reset thermal cut-out
- C1,C2 Control contactor
- CM Back-up contactor to manual cut-out
- DISC Disconnect switch
- F Fuse or fusible link
- H Heating element
- H Manual reset thermal cut-out
- PDS Pressure differential switch
- T Control transformer



THERMOLEC

Title / Titre

Drawing number / Numéro de dessin

3C24 - 7000 - 6200 - 0000

14 Sample Inspection Sheet

Electric Heater Safety Interlock Inspection Sheet																	
Inspection Schedule	Date Inspection & Completed	Inspector (sign name in top half of box and print name on bottom half of box)	Explosion relief of spray booth oven	Air flow switch		Automatic high temperature limit switch		Manual high temperature limit switch in heater		Manual high temperature limit switch of spray booth		Compressed air flow switch	Compressed air solenoid valve	Blower motor interlock, auxiliary contactor	Exhaust damper operation		
				Set point	Test	Set point	Test	Set point	Test	Set point	Test						
Startup																	
6 months after startup																	
1 year after startup																	
2 years after startup																	
3 years after startup																	
4 years after startup																	
5 years after startup																	
6 years after startup																	
7 years after startup																	
8 years after startup																	
9 years after startup																	