Infrared Preheat Module User Guide

Version 1.1
March 10, 2022
Part No. 22140087

for use with:

PN 2050-0105 - Control Software
on
PN 22170002-0001 - Infrared Preheat Module User Guide

prepared by GPD Global® Documentation Department

GPD Global®
Precision Dispensing Systems

Contents

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Revision notes

Summary of document changes.

Date	Version	Notes
03/10/2022	1.1	**Updates** • Correction to heater element specification: use VAC in place of VDC. • Correction: Use "Revision notes" in place of "Release notes".
07/01/2020	1.0	**New** • Original release.

Legal

Trademarks

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- Optris® is a registered trademark of Optris Infrared Sensing, LLC

Throughout this manual, trademarks are used. Rather than put a trademark symbol in every occurrence of a trademarked name, we state that we are using the names in an editorial fashion only and to the benefit of the trademark owner with no intention of infringement of the trademark.

Disclaimers

GPD Global® devices are intended for the stated functions at the time of sale. GPD Global® is not liable for other uses.

IMPORTANT: Operation of a damaged device may cause personal injury and invalidate the warranty.			
IMPORTANT: L'utilisation d'une machine endommagée peut entraîner des blessures personnelles et invalider la garantie.	*WICHTIG* Die Bedienung einer beschädigten Maschine kann zu Verletzungen des Bedieners sowie zur Ungültigkeit der Garantie führen.	*IMPORTANTE* Il funzionamento di un'apparecchiatura danneggiata può causare lesioni personali e invalidare la garanzia.	*IMPORTANTE* La utilización de una máquina averiada puede provocar lesiones e invalidar la garantía.

Safety notices

HIGH VOLTAGE: **Shock hazard** - **Equipment is electrical in nature and shock may occur if used improperly or opened while powered**.

Shock, injury, and death may occur. Unplug system before any maintenance or plugging or unplugging components.

WARNING: **Appropriate use**

This equipment must be used in the manner indicated in these instructions. Use for any other purpose may cause damage to the equipment, injury, or death.

CAUTION: **Hot surface** - Do NOT touch. Can cause skin burns upon contact. Disconnect and lockout power and allow surface to cool before servicing.

CAUTION: **Warranty**

Any of the following that are done without the explicit and written approval of the manufacturer:

- conversions or additions,

- the use of non-original spare parts,

- repairs carried out by companies or persons that have not been authorized by the manufacturer

can lead to the warranty being rendered null and void. The manufacturer shall have no liability whatsoever for damage resulting from failure to follow the operation and maintenance instructions.

CAUTION: **Qualifications of operating and maintenance personnel**

The owner bears the responsibility for ensuring that operating and maintenance personnel have the required qualifications. The operation and maintenance instructions must be read and understood. Comply with the relevant applicable technical and safety regulations.

CAUTION: **Organizational measures**

The owner is to provide any personal protective equipment that is required. All the safety devices are to be checked regularly. Wear protective glasses and a protective suit for operation and cleaning to protect against any chemicals that may be sprayed out.

CAUTION: **Exhaust considerations**

End users should determine whether or not exhaust is required. Failure to provide exhaust may result in exposure to chemicals, resulting in illness injury and potentially death. When using hazardous materials, always provide enclosure with exhaust embedded and certified for use.

CAUTION: **Flammable and volatile compounds**

End users may select adhesives and compounds which are flammable and contain volatile organic compounds. End users must provide appropriate exhaust prevention of fire and other hazards in the final integration. Failure to provide such protection may result in fire resulting in damage to equipment the building in nearby environment, burns injuries and possibly death. End users must provide protection for fire risk generated by the chemicals of the use.

FLIR AX series camera

⚠️ *WARNING:* **Before using a liquid, read all MSDS and warning labels**

Make sure you read all applicable MSDS (Material Safety Data Sheets) and warning labels on containers before you use a liquid. The liquids can be dangerous. Injury to persons can occur.

⚠️ *CAUTION:* **High temperatures can cause damage to the camera**

Do not use the camera in temperatures more than +50° C (+122° F), unless other information is specified in the user documentation or technical data.

IMPORTANT: **For a complete list of safety notices**, refer to OEM instructions referenced here: *Related documents* (pg 5)*.*

Optris infrared thermometer

IMPORTANT: **Avoid abrupt changes** of the ambient temperature.

IMPORTANT: **Avoid mechanical violence on the head** as this may destroy the sensitive optical system.

IMPORTANT: **For a complete list of safety notices**, refer to OEM instructions referenced here: *Related documents* (pg 5)*.*

Touch screen monitor

⚠️ *WARNING:* **Do not expose touch screen monitor to moisture.**

To prevent the risk of fire or shock hazard, do not expose this product to moisture.

⚠️ *CAUTION:* **Do not touch LCD display screen with sharp or hard objects.**

⚠️ *CAUTION:* **Do not operate touch screen monitor under the following conditions:**

extreme heat, cold or humidity, areas susceptible to excessive dust and dirt; near any appliance generating a strong magnetic field; in direct sunlight.

⚠️ *CAUTION:* **Do not use abrasive cleaners, waxes, or solvents for cleaning.**

Warranty

General Warranty. Subject to the remedy limitation and procedures set forth in the Section "Warranty Procedures and Remedy Limitations," GPD Global warrants that the system will conform to the written description and specifications furnished to Buyer in GPD Global's proposal and specified in the Buyer's purchase order, and that it will be free from defects in materials and workmanship for a period of one (1) year. GPD Global will repair, or, at its option, replace any part which proves defective in the sole judgment of GPD Global within one (1) year of date of shipment/invoice. Separate manufacturers' warranties may apply to components or subassemblies purchased from others and incorporated into the system. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES,EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Limitations. GPD Global reserves the right to refuse warranty replacement, where, in the sole opinion of GPD Global the defect is due to the use of incompatible materials or other damages from the result of improper use or neglect.

This warranty does not apply if the GPD Global product has been damaged by accident, abuse, or has been modified without the written permission of GPD Global.

Items considered replaceable or rendered unusable under normal wear and tear are not covered under the terms of this warranty. Such items include fuses, lights, filters, belts, etc.

Warranty Procedures and Remedy Limitations. The sole and exclusive remedy of the buyer in the event that the system or any components of the system do not conform to the express warranties stated in the Section "Warranties" shall be the replacement of the component or part. If on-site labor of GPD Global personnel is required to replace the non-warranted defective component, GPD Global reserves the right to invoice the Buyer for component cost, personnel compensation, travel expenses and all subsistence costs. GPD Global's liability for a software error will be limited to the cost of correcting the software error and the replacement of any system components damaged as a result of the software error. In no event and under no circumstances shall GPD Global be liable for any incidental or consequential damages; its liability is limited to the cost of the defective part or parts, regardless of the legal theory of any such claim. As to any part claimed to be defective within one (1) year of date of shipment/invoice, Buyer will order a replacement part which will be invoiced in ordinary fashion. If the replaced part is returned to GPD Global by Buyer and found by GPD Global in its sole judgment to be defective, GPD Global will issue to Buyer a credit in the amount of the price of the replacement part. GPD Global's acceptance of any parts so shipped to it shall not be deemed an admission that such parts are defective.

Specifications, descriptions, and all information contained in this manual are subject to change and/or correction without notice.

Although reasonable care has been exercised in the preparation of this manual to make it complete and accurate, this manual does not purport to cover all conceivable problems or applications pertaining to this machine.

Introduction

About this manual

This document provides an overview and instructions for the Infrared Preheat Module.

System overview

The Infrared Preheat Module is designed for underside-infrared-heating operations.

A combination of temperature monitoring sensors accurately measure the temperature of the board in the work area to confirm the substrate is at operating temperature prior to sending the board downstream.

The Infrared Preheat Module immediately attempts to achieve set point when online. Alternatively, the system immediately shuts down the heaters and idles the controller when in idle/stop mode.

If errors occur, the user can use reset to clear any errors.

Control of the Infrared Preheat Module is activated via the control on the front panel.

Special features

The Infrared Preheat Module features:

- Quartz infrared heaters rapidly achieve target temperatures.
- Over board remote IR camera sensor measures the temperature of the top side of the board.
- Under board remote IR sensor measures the temperature of the underside of the board.
- The system stores recipes which persist through a power cycle.

Camera/Sensor monitoring

The infrared temperature monitoring camera and sensor both measure the temperature of product in the nest area.

The sensor confirms the substrate is at operating temperature and enables the system to determine if the process is "ready to go".

Online and offline states

The operator controls the online and offline states using the Online/Offline toggle button located on the front control panel.

Offline

Offline status is the non-operational/power up state. Equipment is idle and will not respond to heat requests from the system; i.e., "heater ready" is always false.

This is the safe/preferred state for any equipment change while the machine remains powered on.

Online

The system must be Online for any activation method to function. Equipment will respond to heat requests from the system, i.e., "heater ready" is asserted when surface of the board achieves the set point.

Online status is either actively running a process or waiting and immediately prepared to do so.

Pass through mode

All machine processes, except that of passing product through the machine via conveyor, can be inhibited by setting the PASS THROUGH button to on.

- If a board is present in the entrance station (upstream machine), the board moves via conveyor from the entrance station to the exit station (downstream machine). This sequence repeats until product is unavailable from the upstream equipment or the operator cancels the program.
- If no board is present in the entrance station (upstream machine), the Infrared Preheat Module signals the upstream machine to send a board. If no board becomes available, the Infrared Preheat Module remains in an offline state.

General theory of operation

A typical operational sequence for the Infrared Preheat Module:

1. The operator prepares the system for operations:
   a. Operator powers on the Infrared Preheat Module with the main power switch.
   b. The Infrared Preheat Module system initializes and attains offline state.
   c. Operator selects and activates an appropriate recipe. Lacking this operator action, the last selected recipe becomes the currently selected recipe.
   d. Operator sets PASS THROUGH button to off.
   e. Operator sets ONLINE/OFFLINE button to online. The currently selected recipe runs.

2. If a board is present in the entrance station (upstream machine), that board moves via conveyor from the entrance station to the nest station (work area).

3. When the board reaches the nest station, the Infrared Preheat Module sensors activate:
   a. Over board sensor (camera) turns on.
   b. Under board sensors (heaters) turn on.
   c. Operation of the under board sensor is verified to be working and properly positioned every time the heater is turned on to prevent over heating of the board under side.
   d. Under board temperature is checked against the initial temperature.

4. The board is heated up to temperature.

5. The board moves via conveyor to the exit station (downstream machine) and the Infrared Preheat Moduleremains in online state.

6. The process of loading a board from upstream, heating it in the nest station, and then unloading it to the downstream machine continues until product is unavailable from the upstream equipment or the operator cancels the program.

7. If an error occurs at almost any point during the process, an error displays to notify the operator. When the operator resets/clears the error, the system initializes and returns to offline state.

8. When processing is complete, the operator clears the Infrared Preheat Module of all product and powers off the machine.

Specifications

Capacity
    Product clearance . . . . . Above board
    Product thickness . . . . . Up to 6.35 or 9.525 mm (1/4" or 3/8")
                     Minimum/Maximum can vary; based on width of product and its rigidity
    Product dimensions . . . Up to maximum of 609.6 x 609.6 mm (24" x 24")
    Conveyor load capacity. Up to maximum of 13.6 kg (30 lbs)
Dimensions (W x D x H) . . . . . 1109 mm x 1261mm x 1597 mm (44" x 50" x 63")
Weight . . . . 195 kg (430 lb)
Power
    Supply voltage . . . . Input: 50 Amps @ 230 V
    Frequency . . . . 50/60 HZ
    Consumption rating . . . . 10 kw
    Power cable . . . . Customer supplies connection hardware to bare end of cable per
                     customer's facility requirements/specifications for needed voltage.
Temperature
    Operating range . . . . . . +10° C to +50° C (50° F to 122° F)
    Facility range. . . . . +10° C to +40° C (50° F to 104° F)
Heaters
    Heater elements . . . . . . Quartz, 18 elements, 230 VAC
Conveyor
    In compliance with . . . . IPC SMEMA 9851 Mechanical Equipment Interface
                     Standard specification per SMEMA Interface Standard 1.2
Ventilation
    Exhaust port‡ diameter. 101.6 mm (4") diameter
    Flow rate per port . . . . . 7,079 l/min (250 CFM)
    ‡Customer supplies ducting to exhaust port
Communications
    User interface . . . . Touch Screen with Infrared Preheat Module User Guide control software
    µSD card . . . . Software storage media
    External input . . . . SMEMA compatible
    Communication cables . Cat6
    External trigger signal . . Dry contact via SMEMA Protocol

System requirements

Summary of software and equipment needed to operate and control the Infrared Preheat Module:

- Control Software (PN 2050-0105) - factory installed
- Infrared camera (over board temperature)
- Infrared thermometer (under board temperature)
- Infrared quartz heat unit
- Computer/HMI (user interface)

Related documents

For additional information about devices integrated with system function, refer to the following documents.

NOTE: All of these documents are included in your *Dispenser Manuals* documentation package.

- *Infrared Camera User Manual for FLIR-AX8* - PN 22140088
- *Infrared Thermometer User Manual for Optris* - PN 22140089

Installation

The Embedded Infrared Heater is factory installed.

⚠️ *IMPORTANT:* Install machine in accordance with applicable standards and regulations, and read all safety instructions.

1 - Prepare and unpack

1. Prepare an area to meet machine [Specifications](#) (pg 4).

2. Carefully unpack the machine and any boxes accompanying it - use the packing slip to identify all items.

Table 1: Package contents

Item	Part Number
Infrared Preheat Module	22170002-0001
Power Cable	22198555
Network Cable	6000-0756
SMEMA Cables	2100-0385
User Guide	22140087

2 - Inspect equipment

Visually inspect the machine for any damage due to shipping. If any damage is observed, notify the carrier at once. Claims for damage must be made by the consignee to the carrier.

⚠️ *CAUTION*: The system should not be used if damaged or defective.

⚠️ *IMPORTANT:* Operation of a damaged machine may cause personal injury and invalidate the warranty.

3 - Position and level

The Infrared Preheat Module is designed for SMEMA conveyor operations.

1. Carefully position the machine in place with a forklift.

2. Adjust the machine laterally so the conveyor rails are aligned with both upstream/downstream conveyors so product can transfer smoothly.

3. Level the system:
   a. Place a precision level on one of the X-axis conveyor rails.
   b. As necessary, adjust machine leveling feet with an end wrench making any necessary adjustments to overall machine height.

   ⚠️ *IMPORTANT:* Maintain conveyor height and alignment settings so the exit end of the conveyor is within 0.8 mm (1/32") of the downstream conveyor.

   c. Repeat the two previous steps for Y-axis by placing one end of level on each conveyor rail.

4 - Install system

1. Install the touchscreen and plug in its power and signal cables.

2. As needed, hook up ventilation per [Specifications](#) (pg 4).

3. Verify the following:
    –   The main power switch is turned off.
    –   All safety shields are closed.
    –   All cabinet doors are closed and secured.

5 - Connect cables

Connect cables to the following service panel ports:

NOTE: Use Figure [Service panel connection locations](#) (pg 7) to identify the ports located on the service panel.

1. Connect network cable from one machine to the next to make the downstream machine a slave to the upstream machine.

2. Connect SMEMA cables into the SMEMA connector ports so the Infrared Preheat Module can communicate with upstream and/or downstream machines.

3. Plug the power cable into the AC power outlet and an appropriate power receptacle. Refer to [Specifications](#) (pg 4).

Service panel connection locations
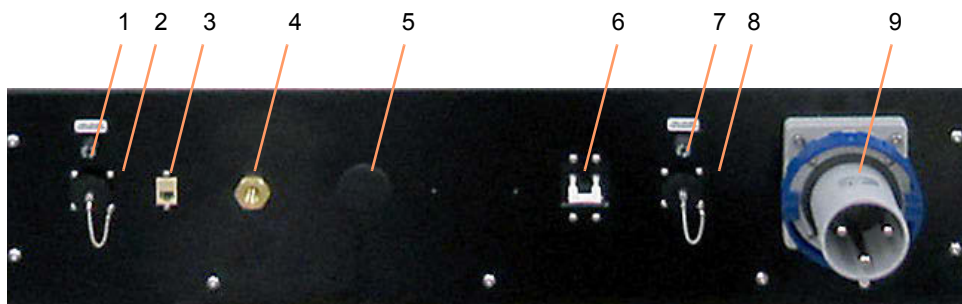
Item	Name	Description
1, 7	Fuse holder	Fuses located here.
2, 8	SMEMA connector ports	Ports for communicating with upstream and downstream conveyorized systems.
3	Network	Ethernet connector for external data acquisition/streaming. Connect to external computer or controller.
4	N/A	Not currently used.
5	N/A	Not currently used.
6	Main circuit breaker	Electrical switch protects circuits from damage caused by excess current. Can be reset.
7	Same as 1	
8	Same as 2	
9	Power inlet	Power cord connector.

Set up

Power up system

1. Turn on the circuit breaker. Refer to <u>Service panel connection locations</u> (pg 7).

2. Turn on the main power switch. Refer to <u>Control panel</u> (pg 10).

Power down system

To power down after finishing work in progress:

1. Set the system to offline by pressing the ONLINE/OFFLINE button. Refer to <u>Control panel</u> (pg 10).

2. Turn off the main power switch. Refer to <u>Control panel</u> (pg 10).

To immediately power down:

Press the Emergency Stop button on the control panel.

Touchscreen

As needed, change the viewing angle of the touch screen to accommodate the user.

Select recipe

Choose a recipe per <u>Select recipe</u> (pg 21) instructions to verify machine is operational after set up is complete.
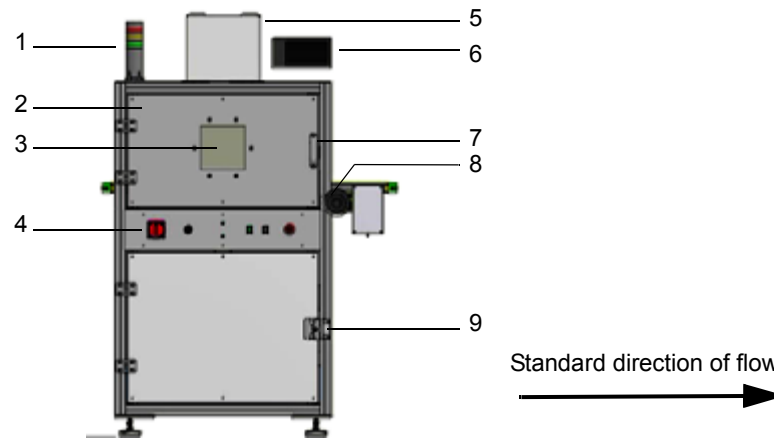
User interface

Operator station

All elements of the operator station are accessible from the front of the machine. A touch screen provides access to the control software. Mechanical override controls are within easy reach. Safety systems provide immediate feedback.

Figure 1: Front of Infrared Preheat Module User Guidet

Standard direction of flow

Item	Name	Description
1	Status light tower	Indicates machine status conditions by turning on colored lights (and audible alarm for certain conditions), each of which represents a given state. Refer to Alarm states (pg 45).
2 & 3	Safety shield door	Window (Item 3) in the heat-proof ceramic-glass safety shield (Item 2) provides a view of the interior work area.
4	Control panel	Operator-accessible mechanical controls. Refer to Control panel (pg 10).
5	Over board remote IR sensor (& housing)	Remote IR camera sensor measures the temperature of the top side of the board.
6	Touch screen	User interface; provides user with monitor and virtual keyboard/numeric keypad.
7	Door handle	Provides access to work area, i.e., heated area and conveyor. Opening the safety shield trips a safety interlock and generates a safety violation.
8	Conveyor crank handle	For manually adjusting distance between conveyor rails for board height.
9	Access door latch	Provides access to electrical cabinet.

Safety systems

Under board and over board sensors track changing temperatures at appropriate times. If a heater is determined to not be changing temperature when it should be, the heater is disabled and an error is reported.

System safety design calls for the front safety shield door to be closed at all times when the machine is in operation. If the safety shield door is opened during operation, the machine ceases all activity immediately – the same as pressing the Emergency Stop button. Any time a

safety violation occurs, a safety message displays on the touch screen. When an error occurs, the red stack light on the .Status light tower (pg 13) turns on, and an audible alarm sounds.

Controls

Figure 2: Control panel
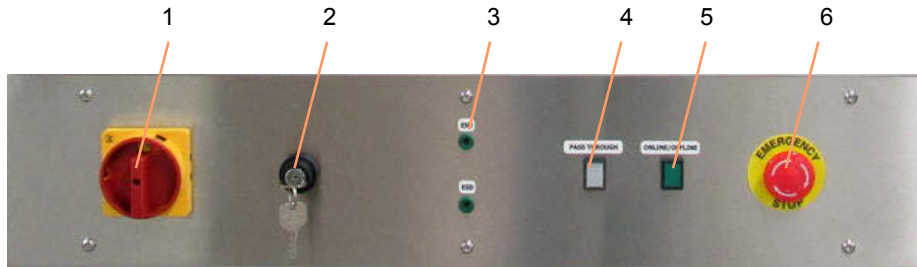
Item	Name	Description
1	Main power switch	Connects/Disconnects all power to the machine.
2	override key switch	For activities related to set up, maintenance, and troubleshooting. Allows you to open the safety shield door without activating a safety violation.
3	ESD	Grounding connections for operator use.
4	ONLINE/OFFLINE button	• Toggles the machine between online and offline states. • Button lamp illuminates when system is Online. • The machine is idle unless put in Online state.
5	PASS THROUGH button	• Toggles the conveyor between pass through and no pass through states. • Button lamp illuminates when system is in Passthrough state. *NOTE*: PASS THROUGH button must be set prior to putting machine online.
6	Emergency Stop switch	Press this button to stop and disable all motor movement and abort any active recipe. A safety violation message will display and the system must be reset. Provides same results as opening the safety shield door unless the override key switch is enabled.

Work area

The work area is enclosed by the machine hood and safety shield door. Automatic board processing operations occur within the work area.

Product travels into the work area automatically on a conveyor. Product typically remains stationary during process operations.

Figure 3: Infrared Preheat Module work area

Camera sensor

The camera sensor is preset at the factory. Access to this system is limited to qualified and trained personnel and/or GPD Global technicians only. Reference: Infrared camera sensor (pg 46).

Indicators

Main screen indicators

The following indicators display on the Main screen.

Figure 4: Indicators located on Main screen.
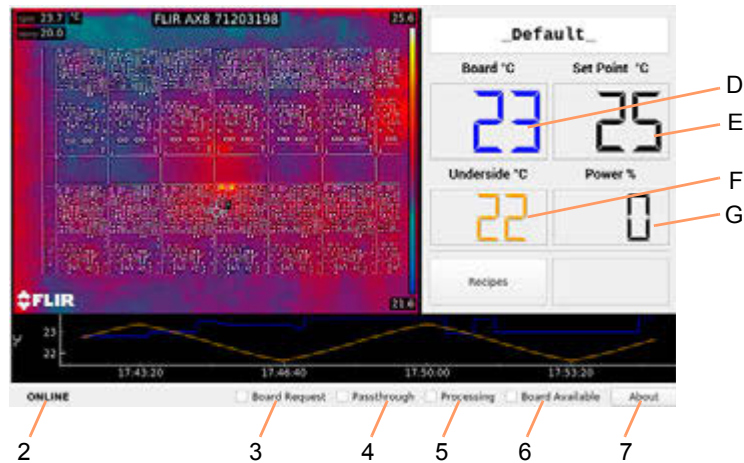
Item	Name		Item	Name
D	Board ° C		2	ONLINE OFFLINE ERROR/INITIALIZING
E	Set Point ° C		3	Board Request
F	Underside ° C		4	Passthrough
G	Power %		5	Processing
			6	Board Available

For additional detail about each indicator, refer to Main (pg 40).

Error message

If an error occurs, an error dialog displays with an error code. Refer to Error codes (pg 28).

Figure 5: Example of error message with error code.
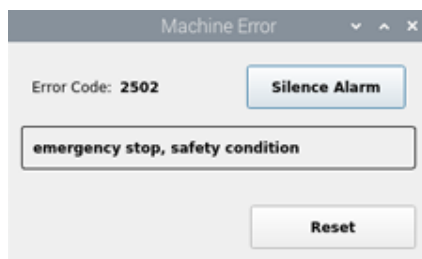
.Status light tower

The status light tower indicates machine status conditions by turning on colored lights, each of which represents a given state. Refer to Alarm states (pg 45).

An audible alarm is also available. Refer to Safety violations (pg 31)

Screens

Refer to <u>Screens and dialogs</u> (pg 39) for an example of each user interface screen plus details about any button and field present.

Keypad operations

NOTE: If you use a glove or stylus to operate the touch screen, a capacitive type glove/stylus is required.

Display keyboard or numeric keypad

Touch the *left arrow* icon next to:

- *value* field to display popup *numeric keypad*

- *alphanumeric* field to display popup *keyboard*
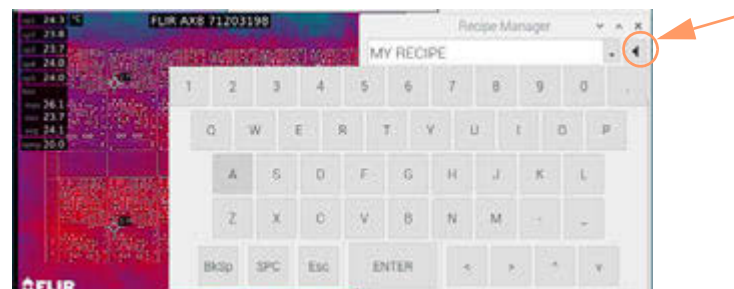
Key functions

Key	Description	Function
BkSp	Backspace	Erases character before (to left of) the cursor's current position.
SPC	Space	Enters a space.
Esc	Escape	Cancels an entry and closes the keypad.
ENTER	Enter	Saves an entry and closes the keypad.
<	left arrow	Moves cursor left.
>	right arrow	Moves cursor right.
^	up arrow	Moves cursor up through drop down menu.
v	down arrow	Moves cursor down through drop down menu.

Drop down menu

Touch the drop down menu icon to display menu contents. In sample below, available recipes are displayed.
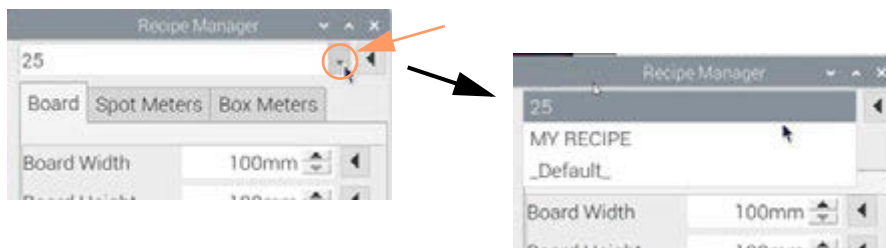
Increment/Decrement value

Use increment/decrement buttons to increase/decrease a displayed value by 1.

Text entry

Use the popup keyboard to type alphanumeric entries.

Numeric entry

Use the popup numeric keypad to type a numeric value or use the increment/decrement buttons to change displayed value. When entering a value, you may need to erase (BkSp key) the prior value before entering the new value.

Decimal places

Parameter values display decimal places when appropriate. If you try to enter decimal places where they are not used/displayed, the decimal portion of your entry will be ignored.

Basic operations

Power on

1. Turn on the main power switch.

2. Perform Start up (pg 16) procedure.

Power off

⚠️ *WARNING*: **ALWAYS cycle the entire machine** through the power off procedure rather than just cycling/turning off the computer; otherwise, the computer may not function effectively.

1. Set the system to offline by pressing the ONLINE/OFFLINE button.

2. Press the Emergency Stop button to assert a safety violation.

⚠️ *CAUTION*: Prior to cycling the machine through the power off/on procedure, assert a safety violation. The safety violation physically removes power from the heaters.

3. Turn off the main power switch.

⚠️ *CAUTION*: Prior to cycling the machine through the power off/on procedure, assert a safety violation. The safety violation physically removes power from the heaters.

Emergency stop

An Emergency Stop button is located on the machine control panel. Press the Emergency Stop button to stop and disable all motor movement.

Using the Emergency Stop button has the same result as tripping the safety interlock circuit – a safety violation message displays and any active program is aborted.

Use of the Emergency Stop button aborts any active program, and a machine reboot is unnecessary.

Start up

During start up, a sequence of operations occurs: initialization, device detection, starting services, and starting controllers. Progress through each operation is displayed via a series of Embedded Ceramic Infrared Heaters.

Figure 6: The beginning of a normal, successful start up

Wait for successful Embedded Ceramic Infrared Heater.

Wait for the Embedded Ceramic Infrared Heater to indicate a normal, successful start up has been completed.

Successful start up: If all operations are successful, the startup sequence launches into the application proper.

Figure 7: A successful start up launches the application Main screen.
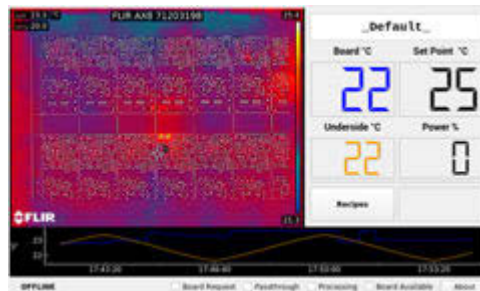
Failed start up: If a failure occurs during start up, the system halts and the last screen displayed provides information as to the cause.

If a start up failure occurs, refer to [Troubleshooting](#) (pg 27).

Figure 8: Example of failed start up.

Connection to camera

During system startup, "Media not connected" may display for several seconds. When the connection is complete, the live video image displays.

If a connection error occurs, refer to Troubleshooting (pg 27).

Figure 9: Upon successful connection, live video replaces the 'Media not connected' message
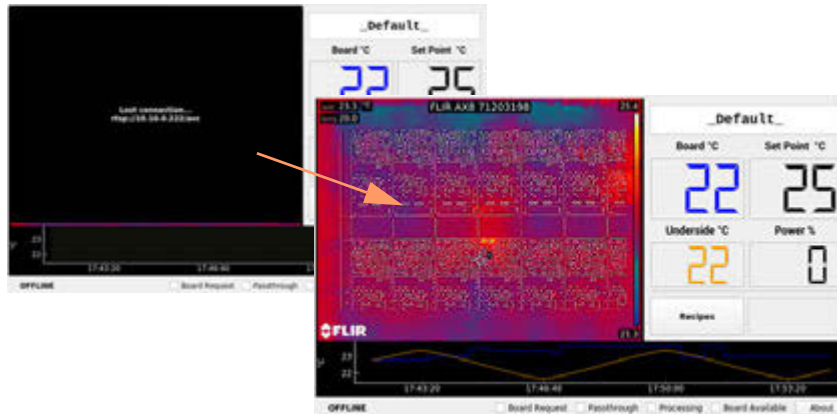
Camera warm up

Wait approximately 10 minutes for completion of the camera warm up process as indicated by the absence of all temperature *prefixes*. For examples and definitions of prefixes, refer to Camera warm up period (pg 47).

The camera image displayed immediately after startup will fluctuate until temperature measurements become stable. Refer to Cold start instability (pg 46).

Set online/offline state

The system starts up in the offline state. It must be set online in order to run a process.

1. On startup, the last selected recipe is the currently selected recipe.

2. Toggle the Infrared Preheat Module to an online or offline state using the ONLINE/OFFLINE button.

    When system is online, the ONLINE/OFFLINE button illuminates, plus the Main screen indicators (pg 12) confirm the status.

Run system

Run in heat mode

To run the system in heat mode:

1. Verify the option of pass through mode is turned off. For details, refer to Run in pass through mode (pg 19).

2. Set the system to online per Set online/offline state (pg 19).

Run in pass through mode

Use the pass through state to inhibit all machine processes except that of passing product through the machine via the conveyor. Use this when a product requires no functions from the machine but you want to move boards from the upstream unit to the downstream unit.

Table 2: Toggle Pass through mode on/off

To:	Do this:
Turn ON pass through mode	*NOTE*: PASS THROUGH button must be set prior to setting machine to online. 1 - Press the PASS THROUGH button located on the control panel. 2 - Verify pass through mode has been activated – the Passthrough box located in the Main screen status bar should be checked.
Turn OFF pass through mode	1 - Press the PASS THROUGH button located on the control panel. 2 - Verify pass through mode has been deactivated – the Passthrough box located in the Main screen status bar should be unchecked.

Load boards

SMEMA operations

Boards load and unload automatically per SMEMA operations. The system communicates when it is busy or awaiting a board using:

- upstream SMEMA logic and motor controls to load a board
- downstream SMEMA logic and motor controls to unload a board

Board position

For optimum heating, regardless of board size, board position **must**: be positioned at front right-hand corner of the heated area - refer to Figure 10. This is both the origin point (0,0) of the heated area and the location of the nest present sensor.

Best practices assumes board is positioned with its longest dimension parallel to the conveyor rail. (Only the front conveyor rail is shown in Figure 10.)

Figure 10: *Top view - Proper board placement (regardless of board size) above heated work area*
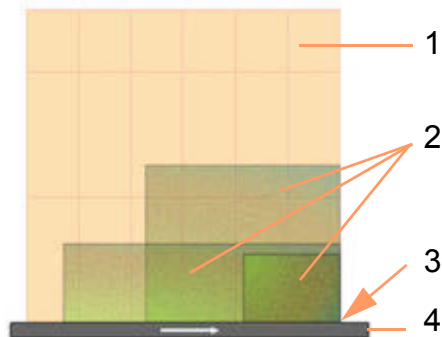
Item	Name
1	Heated work area
2	Correct board placement illustrated for various board sizes
3	Origin point (0,0)
4	Front conveyor rail
	Direction of travel arrow

Check temperature readiness

The temperature is ready when the Board Available check box (located in the Main screen status bar) indicates a board is ready to be sent to the downstream machine. Refer to .

Use recipes

> *NOTE:* If you use a glove or stylus to enter values on the touch screen, a capacitive type glove/stylus is required.

Select recipe

The recipe name displayed in the first field of the Recipe Manager (pg 41) is the currently selected recipe.

To select a recipe:

1. From the Main (pg 40) screen, touch the RECIPES button to open the Recipe Manager (pg 41).

2. Touch the drop down menu icon. Available recipes display.
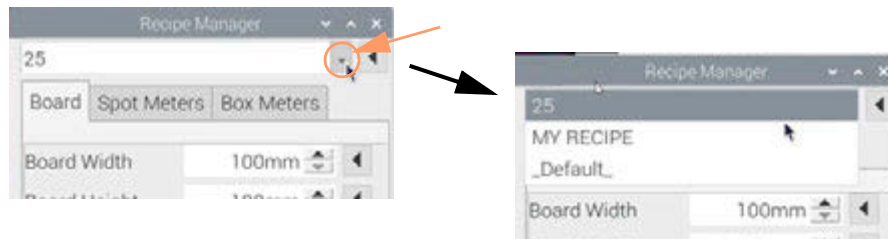
3. From the recipes listed, touch the name of desired recipe.

    The name of the newly selected recipe displays and the drop down menu disappears.

4. Touch the OK button to make your selection the currently selected recipe.
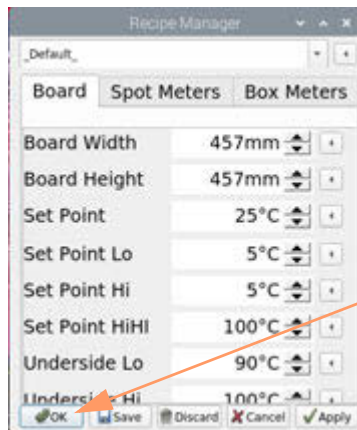
Change recipe heat parameters

To change the value of any displayed parameter, including the name, of an existing recipe:

1. Touch the RECIPES button on the Main (pg 40) screen.

    The Recipe Manager (pg 41) opens.

2. From the Recipe Manager, select the recipe you want to edit per Select recipe (pg 21).

3. Using Keypad operations (pg 14), make desired edits to any/all of the Board parameters (pg 42), Spot Meters parameters (pg 43), and/or Box Meters parameters (pg 44).

4. *Optional*: To preview the effects of an edit without saving it to the recipe:
   a. Touch the APPLY button.
   b. Run a test.
   c. If you're not happy with the results, either make additional changes and continue to the next step or touch the CANCEL button to exit the recipe dialog without saving the modifications.

5. When edits are complete, touch the SAVE button to save modifications.

Add recipe

To add a recipe:

1. From the Main (pg 40) screen, touch the RECIPES button to open the Recipe Manager (pg 41).

2. From the Recipe Manager (pg 41), select an existing recipe to use as the basis of the new recipe.

   HINT: If one is available, select an existing recipe similar to the one you want to create.

3. Display the keyboard by touching the left arrow icon next to the recipe name field.

4. Key in a recipe name.

   NOTE: Recipes names can consist of up to 30 alphanumeric characters.

5. Touch the keyboard ENTER button.

6. Touch the SAVE button.
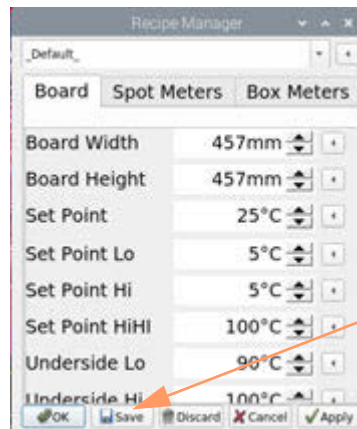
The newly named recipe is saved and the Recipe Manager closes.

7. To finish creating the new recipe:
    a. Reopen the Recipe Manager by touching the RECIPES button.
    b. Select your newly saved recipe from the drop down menu.
    c. Edit and save parameter values, as needed, per Change recipe heat parameters (pg 21).

Delete recipe

Discarding a recipe deletes it from the database.

1. From the Main (pg 40) screen, touch the RECIPES button to open the Recipe Manager (pg 41).

2. From the Recipe Manager (pg 41), select the recipe you want to delete.

3. Touch the DISCARD button to delete the recipe.

Clear an error

If an error occurs, an error dialog displays that provides keywords and an error code to help you deduce the problem and find a solution.

NOTE: An error condition places unit offline.

To clear an error:

1. Release the Emergency Stop switch on the control panel.

2. Note the information displayed by the error dialog.

Figure 11: Error dialog with error code (2502) and key phrases (emergency stop, safety condition)
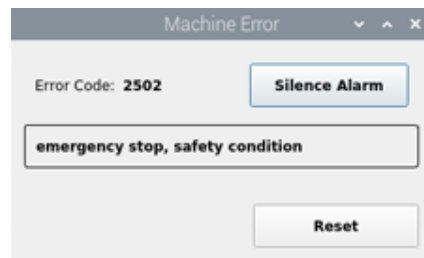
3. Clear all error issue conditions:
    a. Pull out Emergency Stop switch.
    b. Close all safety shields.

4. If a beeping alarm is sounding, Silence audible alarm (pg 24).

5. Touch the RESET button in the error dialog.

    This action reactivates the alarm in case an additional alarm condition occurs.

The system should become operational.

Silence audible alarm

An audible alarm sounds when an alarm condition occurs.

To silence and reactivate a beeping alarm:

1. Touch the SILENCE ALARM button located in the error dialog to turn off the audible alarm.
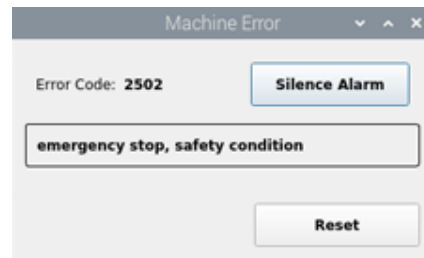
2. Touch the error dialog RESET button.

    The error dialog closes and the system resets and attempts to re-initialize.

Adjustments

Over board sensor position

The position of the over board camera can be adjusted – forward, backward, side-to-side, rotated – with a series of brackets. Camera position is set at the factory. Typically, no further adjustments should be necessary.

Conveyor adjustments

The conveyor is factory set to accommodate customer's original product width and thickness [Specifications (pg 4)]. Thereafter, each time product of a different width and/or thickness is to be processed, perform the following procedure to adjust the conveyor:

1. **Width.** To adjust the distance between the conveyor rails for product width, use the manual hand crank – push inward on the hand crank to engage the conveyor rails.

   ⚠️ *WARNING:* **Use extreme caution when safety shield is open.**

   As necessary, open and close the safety shield and clear the safety violation condition throughout this procedure.

   ⚠️ *CAUTION:* **Do not bind product**

   Do not adjust conveyor width so tightly that the conveyor binds the product.

2. **Recipe.** Supply recipe with new values for Board Width and Board Height. Refer to Board parameters (pg 42).

Conveyor speed

Conveyor speed can be adjusted only by a GPD Global technician.

Routine maintenance

Periodic operations

Infrared Preheat Module

Periodically wipe the external surfaces of the with machine a clean, dry, soft cloth.

Under board remote IR sensor

Refer to safety and maintenance instructions in OEM instructions referenced here: *Related documents* (pg 5)*.*

Over board remote IR sensor (camera)

Refer to safety and maintenance instructions in OEM instructions referenced here: *Related documents* (pg 5)*.*

Touch screen monitor

⚠️ *CAUTION:* **Do not use abrasive cleaners, waxes, or solvents for cleaning.**

Suggested spare parts

Table 3: Spare parts for Infrared Preheat Module, PN 22170002-0001

Description	General Location	Part No.	Qty
Conveyor Belt, High Temperature	Conveyor	D0093	2
Fuse, 1 Amp, 250V, Slow Blow, 5X20 MM	SMEMA	4300-0112	2
Thermal Cut Out - 141° C nominal, 167° C one shot cut out	Right-hand side of front con-veyor rail (behind conveyor rail heat shield)	22193152	1
SD Card, Preloaded	HMI controlled heater	22100166	1

Troubleshooting

This section is intended for use by maintenance/service personnel. As needed, contact the GPD Global Service Department at https://helpdesk.gpd-global.com/support/home or +1.970-245-0408.

⚠️ *IMPORTANT*: Before performing any troubleshooting, read all Safety notices (pg 3).

Problems and remedies

For issues not listed here, refer to Error codes (pg 28) and/or Known issues (pg 53).

Start up sequence halts

If the system fails to detect hardware or a disconnect occurs, verify the network cable is plugged in.

Connection error message displays

If an error message similar to the following image displays, the network communications cable may have become disconnected from the HMI. Verify the network cable is plugged in.

Figure 12: Connection error message
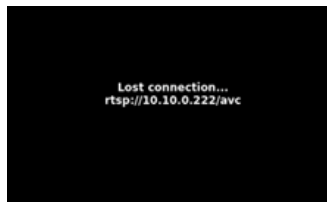
Heater not changing temperature when expected

If the heater is not changing temperature when you expect it to:

- Check the circuit breaker. If the circuit breaker is off, turn it on.
- Hi power may not be connected due to a blown thermal fuse. Inspect the fuse and replace if needed.
- The thermocouple may be broken. Contact the GPD Global Service Department for help.

Known issues pending resolution

The software for this product is under constant development, and some issues are known but not yet fixed. They are described here: Known issues (pg 53).

Error codes

Table 4: Error codes for Infrared Preheat Module

Error Code	Symbol	Description	Notes
1500	AppError	unspecified error	This is a general, undefined and unexpected failure
1501	OvertempConditionDetected	The OptrisCT underboard temperature sensor is reporting an over temp condition	This is a hardware limit set on the OptrisCT device itself.
1502	UnderboardTemperature-OutOfLimit	The OptrisCT underboard temperature sensor is reporting a temperature in excess of UnderboardLimitHiHi	
1503	UnderboardSensorHead-OutOfLimit	The OptrisCT underboard temperature sensor head is reporting a temperature in excess of UnderboardHeadLimitHiHi	
1504	OverboardSensorHeadOut-OfLimit	The FLIR sensor is reporting a sensor head temperature above OverBoardHeadTemperatureLimitHi	Mfg Temp limit is 50°C
1505	OverboardTempertureOut-OfLimit	The maximum reported over board temperature exceeds the SetPointLimitHiHi	
1506	HeaterElementsNotHeating	Power is applied to heaters for more than 30 seconds and the heaters' temperature has not changed by more than 10°C	Sensor is a thermocouple embedded in the heater element array at position A1
1507	UnderboardSensorFailure	Power is applied to heaters and the underboard sensor reported temperature is not changing.	Process Error > 10 and sensor value delta (30s) < 1
1508	OverBoardSensorNonResponsive	FLIR sensor is reporting no temperature changes within a 53 second period - delta=0.0	It's expected that the sensor will report at least 0.2°C changes relatively frequently. This is an indication of the sensor being 'locked up'
1509	CPUTemperatureOutOfLimit	System's CPU temperature exceeds CPU Temperature Limits HiHi	Mfg. recommends maximum of 5°C
Machine Controller			
2500	AppError	preheater application error	
2501	ConveyorState	unexpected conveyor state	
2502	EmergencyStop	emergency stop, safety condition	
Conveyor			
3500	ConveyorAppError	unspecified application error	
3550	ConveyorMotorState	unexpected motor state	
3551	ConveyorUpstreamState	unexpected upstream state	
3552	ConveyorDownstreamState	unexpected downstream state	
3554	ConveyorParkingTimeout	timeout parking board	there was a timeout positioning the board from within the machine

Table 4: Error codes for Infrared Preheat Module

Error Code	Symbol	Description	Notes
3555	ConveyorBoardNotPresent	board not present	a board that was expected is not present at the nest sensor
3556	ConveyorBoardPresent	board still present	a board is unexpected present at the nest sensor
3557	ConveyorUnloadAborted	board unload was aborted	the unload operation of a board was aborted
3558	ConveyorUnloadTimeout	timeout waiting to unload board	the machine downstream never made a request for a board
3559	ConveyorBoardEntering	board unexpected at entry	
3560	ConveyorBoardExiting	board unexpected at exit	
3561	ConveyorBoardLost	board location unknown	the board timed out while moving between the entry and nest sensor
Motor Controller			
4500	MotorAppErr	unspecified application error	
4550	MotorStatus	motor controller status	the motor controller status flags are in error
4551	MotorFault	motor controller faulted	the motor controller faulted and is in an error condition
4552	MotorCom	motor controller communication	the communication link to the motor controller is down
Downstream			
5500	DownstreamAppError	unspecified application error	
5550	DownstreamBoardAvailable	timeout waiting for request	the downstream machine took too long to request a board
5551	DownstreamBoardExit	timeout waiting for board exit	the board took too long to appear at the exit sensor
5552	DownstreamBoardClearExit	timeout waiting for board to clear exit	the board took too long to clear the exit sensor
5553	DownstreamBoardExitUnexpected	board unexpected at exit sensor	a board was unexpectedly detected at the exit sensor
Upstream			
6500	UpstreamAppError	unspecified application error	
6550	UpstreamBoardRequest	timeout waiting for board	the upstream machine did not make a board available in time
6551	UpstreamBoardEntry	timeout waiting for board entry	the upstream machine took too long to send the board
6552	UpstreamBoardClearEntry	timeout waiting for board to clear entry	the board did not clear the entry sensor in time

Table 4: Error codes for Infrared Preheat Module

Error Code	Symbol	Description	Notes
6553	UpstreamBoardEntryUnex-pected	board unexpected at entry sensor	a board was unexpected at the entry sensor

System management

Safety violations

Create a safety violation

A safety violation message displays whenever any of these conditions occur:

- safety switch is tripped
- limit error is reported

To create a safety violation, do either of the following:

- press the Emergency Stop button
- open the safety shield door (without the override key)

NOTE: To clear a safety violation, refer to Clear an error (pg 23).

Create an audible alarm

An audible alarm sounds whenever an alarm condition occurs.

To create an audible alarm, do either of the following:

- press the Emergency Stop button
- open the safety shield door (without the override key)

NOTE: To turn off an audible alarm, refer to Silence audible alarm (pg 24).

Update software

Is update available?

When an update for the control software is available, an UPDATE button will display on the About (pg 39) screen.

To determine whether or not an update is available:

1. From the Main screen, touch the ABOUT button located in the status bar to open the About (pg 39) screen.

2. Look for an UPDATE button on the About screen:
   – If no update is currently available, the UPDATE button will not be present.
   – If an update is available, an UPDATE button will be present. Skip to How to update software (pg 32).

Figure 13: An UPDATE button is present when an update to the control software is available.

How to update software

To update the control software:

1. Obtain the most current software release from GPD Global via download.

2. Copy the update file to a USB device.

   Example of update file name: `22170002-0001_01.00.00.tar.gz`

   IMPORTANT: The file must be placed in a folder path of `\GPDGlobal\Software.`

   Example:

   `I:\GPDGlobal\Software\22170002-0001_01.00.00.tar.gz`

3. Plug the USB device into the HMI USB port located on side of the touch screen/HMI.

4. From the Main screen, touch the ABOUT button located in the status bar to open the About (pg 39) screen.

5. Touch the UPDATE button.

The UPDATE button is present only when an update is available.

Figure 14: *An UPDATE button is present when an update to the control software is available.*

6. Wait for the installer application to appear. It may take several seconds for the installer application to display.

7. Touch the YES button to begin installation. Alternatively, touch the NO button to abort installation.

If you pressed YES, installation begins. Messages display in the installer window. When installation is complete, the OK button becomes enabled.

8. When the reboot dialog displays, touch YES.

⚠️ *CAUTION*: **Always** reboot after a software update; otherwise, undefined behavior may result.

(Pressing the NO button causes the installer window to disappear and the application window to reappear.)

The software update is complete.

References

Recipes

Default recipe

On start up, the last selected recipe becomes the default selected recipe.

X, Y coordinates

Camera meter coordinates (x, y) are defined in the Spot Meters tab and the Box Meters tab of the Recipe Manager (pg 41).

- Coordinates for both Spot and Box meters are expressed in units of camera coordinates.
- Origin point coordinates (0, 0) of the camera view are located in the upper left corner.

Figure 15: Camera meter coordinate fields identified in Recipe Manager.
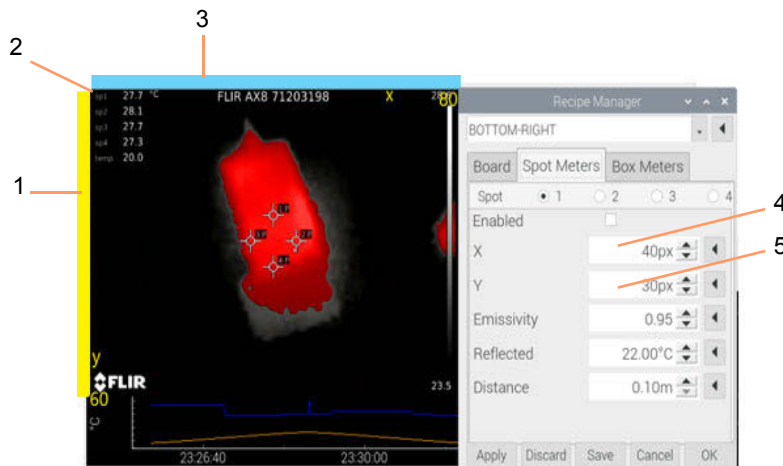
Item	Name	Description
1	Y axis	y=0 is the origin point y=60 is the bottom of the image
2	origin point	(0,0) is located in upper left corner of camera view.
3	X axis	x=0 is the origin point x=80 is the point on the camera image situated furthest to the right
4	X coordinate field	0 to 79 range.
5	Y coordinate field	0 to 59 range.

Temperature control vs temperature ready

Stand-alone heating systems do not have to account for possible moments of occlusion by the dispense system gantry.

Temperature control. Temperature control is performed by comparing the process SetPoint value against the process Value. The difference between the two is the process Error.

- – the SetPoint Value is the recipe SetPoint parameter.
- – the source of the process Value is the infrared camera sensor. The *simple mean* value of all active Spots and Boxes (box average) is calculated with the result being the process Value.

Temperature ready. The temperature ready condition is based on the process SetPoint, the SetPointLimits (low/high), and the current process Value.

- – the source of the process Value is the infrared camera sensor. The *simple mean* value of all active Spots and Boxes (box average) is calculated with the result being the process Value.
- – If the process Value falls within the range defined by the SetPoint and the Lo/Hi limits, the process is considered Ready.

Process parameters

This overview of the fundamental process parameters illustrates how these parameters inter-relate with the programming to produce desired results for operations.

Table 5: Parameter definitions

Name	Type	Description	Notes
Set Point	°C	Target temperature for board top surface	
Set Point Low	offset	Lowest acceptable temperature for 'process ready'	This is an offset value from the current `Set Point`. This value is *added* to the set point to calculate the high limit.
Set Point High	offset	Highest acceptable temperature for 'process ready'	This is an offset value from the current `Set Point`. This value is *subtracted* from the `Set Point` to calculate the low limit.
Set Point Low Low	offset	Lowest possible value at which the machine will operate.	NOT USED
Set Point High High	offset	Highest temperature allowed for the top surface of the board. If this temperature is exceeded the machine is immediately shutdown and placed in an error condition. This is done to prevent damage to the board and/or itself.	Note that the value compared to this limit is `Process Value Max` i.e. the highest reported temperature - not the mean temperature.
UnderBoard Limit Low	°C	Value at which the system begins to limit the power output to the heaters. When the process value is at or above this value and below the `UnderBoard Limit High`, output power is reduced by inverse of the difference between the process value and the `UnderBoard Limit High`. If the process value is below this value, the power output is not limited (i.e. 100% allowed.)	scaling function: $$power * \frac{(limit_{hi} - pv)}{\left(\frac{(limit_{hi} - limit_{lo})}{100.0}\right)}$$
UnderBoard Limit High	°C	Value at which systems disallows power to the heaters. If the process value exceeds this value, no power is allowed to the heaters (i.e. the power is limited to 0%).	
UnderBoard Limit High High	°C	Value at/above which the system will immediately shut down and placed in an error condition. This is done to prevent damage to the board and/or itself.	
Product Height	mm	Board/product height in millimeters	Height refers to the distance between the conveyor rails.
Product Width	mm	Board/product width in millimeters	Width refers to the distance along the conveyor direction of travel.

Camera sensor setup

- Box meter contributes *mean temperature* to Aggregate Process Value
- Box meter contributes *maximum temperature* to Process Variable Maximum
- IR Sensor Resolution 80 × 60 pixels

Screens and dialogs

This section provides an overview of the functions provided by each screen/dialog, and details for any field and button present.

- About (pg 39)
- Main (pg 40)
- Recipe Manager (pg 41)

About

The About screen details the version and release date of the control software, plus the name, part number, and serial number of the device controlled by the control software.

The About screen is opened by clicking ABOUT in the status bar of the Main screen.

Figure 16: About screen

The About screen also indicates when a control software update is available; notice the appearance of the UPDATE button. For further details, refer to Update software (pg 31).

Figure 17: An UPDATE button is present when an update to the control software is available.

Main

The Main screen displays when system start up is completed. Use the Main screen to:

- access the Recipe Manager
- view the camera display
- view a plot of temperatures monitored over time
- monitor the top and bottom side temperatures of the board
- monitor the current process set point and amount of heater power
- monitor recipe selection, current system state, and other status information

Figure 18: Main screen
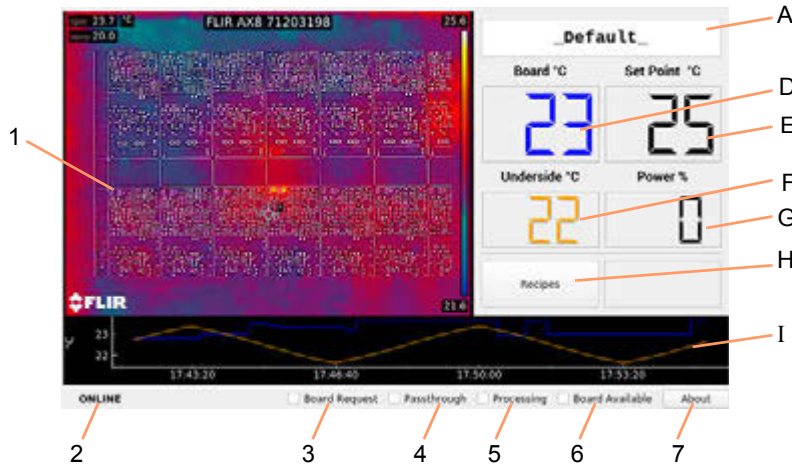
Item	Name	Description
A	[varies]	Current recipe
D	Board ° C	Current top side temperature
E	Set Point ° C	Process set point
F	Underside ° C	Current bottom side temperature
G	Power %	Current heater power (% of full scale)
H	Recipes	Opens Recipe Manager (pg 41).
I	Time/Temperature graph	Plot of top/bottom temperatures over time.
1	Camera image	IR camera sensor image
2	ONLINE OFFLINE ERROR INITIALIZING	Indicator of current status: • If ONLINE, the machine is online • If OFFLINE. the machine is offline • If ERROR, the machine is in an error condition and the error dialog displays. • If INITIALIZING, the machine is initializing into the Offline state.
3	Board Request	If checked, board has been requested by the upstream machine.
4	Passthrough	If checked, machine is currently operating in conveyor passthrough mode; i.e., it will not heat a loaded board.
5	Processing	If checked, board is currently in the process of being heated up to temperature.
6	Board Available	If checked, board is ready to be sent to the downstream machine.
7	About Button	Opens About (pg 39) dialog.

Recipe Manager

Use the Recipe Manager to create, edit, delete, or activate a recipe. It also enables you to test recipe modifications as if they were the active recipe without saving the changes to the recipe.

The Recipe Manager dialog is opened by clicking the SELECT RECIPE button on the Main screen.

Common tab elements

The elements noted and described in this section are common to all tabs in the Recipe Manager.

Item		Description
recipe name		Name of the currently selected recipe.
Tabs		Tab selections available: • Board - opens a tab of Board parameters (pg 42) • Spot Meters - opens tab of Spot Meters parameters (pg 43) • Box Meters - opens tab of Box Meters parameters (pg 44)
button bar	OK	Makes the currently selected recipe the active recipe. If you have modified the recipe, you will be prompted to save/lose those modifications.
	SAVE	Saves modifications to the selected recipe without making it the active recipe.
	DISCARD	Deletes the selected recipe from the database.
	CANCEL	Exits the dialog without saving modifications.
	APPLY	Makes the currently selected recipe *and any modifications* the active recipe. *TIP:* Use APPLY to test the effect of modifications without saving those changes to the recipe database.

Board parameters

Board parameters define the board to be processed.
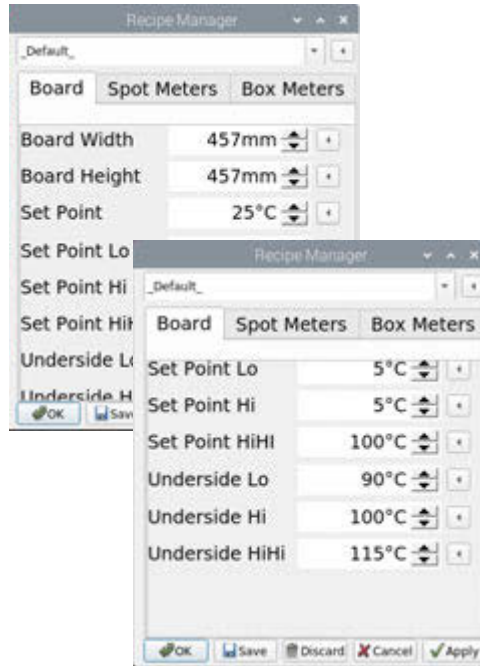
Item		Description
Board tab	Board Width	Distance (mm) between the conveyor rails.
	Board Height	Distance (mm) along the conveyor direction of travel - the axis of motion.
	Set Point	Desired value of the Process Variable (pg 56).
	Set Point Lo	Used together, Set Point Lo and Set Point Hi establish a numerical process limit range. When the process value falls within this range, the process is *ready*. If the process value is outside this range, the process is *not ready*.
	Set Point Hi	
	Set Point HiHi	The upper limit for a process variable at which damage is possible to the machine or the product. Typically, when a process value exceeds a high high limit, the equipment reports an error and shuts itself down to prevent damage.
	Underside Limit Lo	The low value of the process acceptance range for the underside of the board.
	Underside Limit Hi	The high value of the process acceptance range for the underside of the board.
	Underside Limit HiHi	The upper limit for a process acceptance range at which damage is possible to the machine or the product. Typically, when a process value exceeds a high high limit, the equipment reports an error and shuts itself down to prevent damage.

Spot Meters parameters

Spot meter parameters define metering for a specific coordinate on the top side of the board.
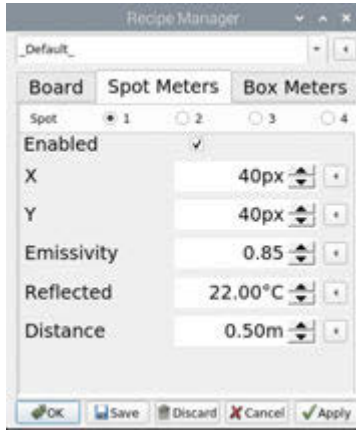
Item		Description
Spot Meters tab	Spot 1 Spot 2 Spot 3 Spot 4	A Spot Meter (pg 56) is used to monitor a specific *coordinate* on the top side of the board. Selecting one of these radio buttons allows that specific meter to be edited.
	Enabled	A meter must be enabled for it to be used.
	X	Coordinates of the spot. Also refer to X, Y coordinates (pg 36).
	Y	
	Emissivity	Emissivity (pg 55) is a measure of radiation emitted from the board.
	Reflected	Represents the Reflected apparent temperature (pg 56) which is used to compensate for the radiation reflected in the board.
	Distance	Distance (pg 55) is the amount of space between the board and the front lens of the camera.

Box Meters parameters

Box meter parameters define metering for a specific rectangular area on the top side of the board.
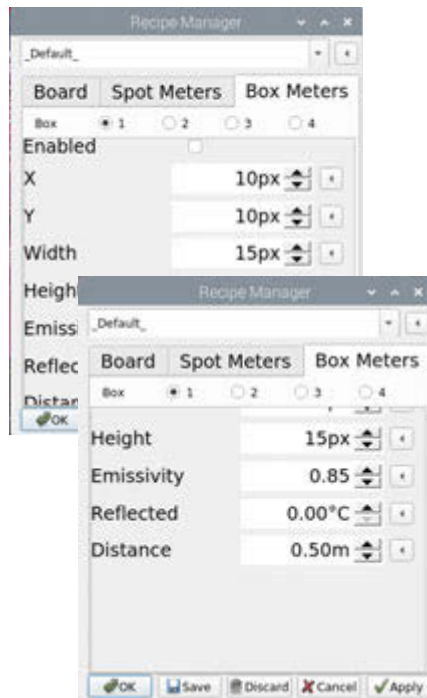
Item		Description
Box Meters tab	Box 1 Box 2 Box 3 Box 4	A Box Meter (pg 55) is used to monitor a specific *area* on the top side of the board. Selecting one of these radio buttons allows that specific meter to be edited.
	Enabled	A meter must be enabled for it to be used.
	X	Location of the upper left corner of the box. Also refer to X, Y coordi-
	Y	nates (pg 36).
	Width	Width of the box.
	Height	Height of the box.
	Emissivity	Emissivity (pg 55) is a measure of radiation emitted from the board.
	Reflected	Represents Reflected apparent temperature (pg 56) which is used to compensate for the radiation reflected in the board.
	Distance	Distance (pg 55) is the amount of space between the board and the front lens of the camera.

Alarm states

The status light tower illuminates to indicate machine status conditions. The light colors typically used are red, amber, and green. Each color is associated with information and/or error messages. Only one light at a time will illuminate.

Typical states represented by color indicators:

- **Green** - running; normal operating condition
- **Amber** - offline; system is idle
- **Red** - error; condition requires action by the operator. Audible alarm is activated.

Infrared camera sensor

NOTE: Aside from the guidelines in this document, refer to OEM instructions referenced here: *Related documents* (pg 5)*.*

The infrared camera is used as the over board remote IR sensor to measure the temperature of the top side of the board.

By supplying the following object parameters to the camera, the camera compensates for the effects of these different radiation sources and accurately measures – online and automatically – temperature.

- The reflected apparent temperature
- The distance between the object and the camera
- The relative humidity
- Temperature of the atmosphere

Cold start instability

Camera power turns on/off automatically with system power.

The following figure is representative of a fairly common camera image that displays immediately after startup. This image is indicative of the temperature measurements being unstable.

Figure 19: Example of camera image displaying temperature measurements being unstable.
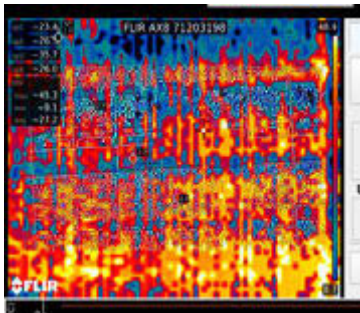
After allowing the camera to self calibrate and thermally stabilize, the image clears and the temperatures report as stable, similar to the following figure. To determine with certainty if temperatures are stable or unstable, refer to Camera warm up period (pg 47).

Figure 20: Example of camera image after temperature measurements have settled into stability.
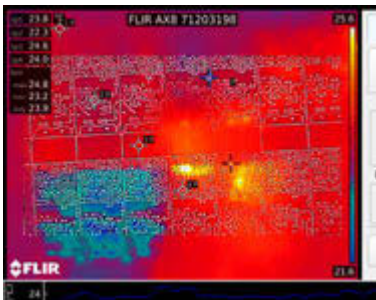
Camera warm up period

The camera requires a warm up period when first powered on. Immediately after a cold start, the camera reports temperatures as unstable by displaying a *prefix* (refer to Figure 21). When all prefixes disappear, the camera reports accurate temperatures.

NOTE: It is **inadvisable** to use the system **before the prefixes disappear** because reported temperatures are invalid until the prefixes are no longer displayed.

NOTE: The camera warm up period applies to powering the camera up, not necessarily to how warm it is; i.e., a stable temperature state must be achieved, not a particular temperature value.

Figure 21: Until the camera has warmed up, temperatures reported in the camera view are unstable and display a prefix. (A) Prefixes = unstable temperatures. (B) No prefixes = stable temperatures.
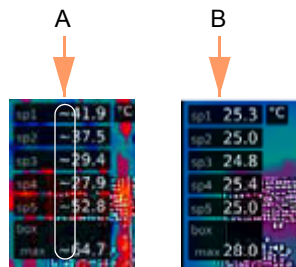
Table 6: Key to prefixes

Prefix	Stability of reported value	Description of actual value
	stable	Stable
>	inaccurate	Less than reported temperature
<	inaccurate	More than reported temperature
O	inaccurate	Outside range
*	inaccurate	Outside calibration range
~	inaccurate	Unstable

Under board sensor

NOTE: Aside from the guidelines in this document, refer to OEM instructions referenced here: *Related documents* (pg 5)*.*

An infrared sensor (thermometer) is used as under board remote IR sensor to measure the temperature of the underside of the board.

Assembly drawings

IR Preheat Module Assembly

REVISION HISTORY			
REV	DATE	BY	DESCRIPTION
-	-	-	-

1597
[63 in]

1261
[50 in]

1109
[44 in]

NOTE NOT ALL PARTS PRESENT

DESCRIPTION: PRE-HEAT OPTION_IR HEAT_24X24			DRAWING NUMBER
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Conveyor

PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	12	10/2135	CAM FOLLOWER - 1/2 DIA
2	1	3500-0114	MOTOR_STEPPER_HI-TORQUE_NEMA 23_24VDC
3	1	22160247	HANDLE,CRANK,MODIFIED
4	4	22161157	END PULLEY, 9mm BELT
5	8	22161158	IDLER PULLEY, 9mm BELT
6	4	22161159	END CAP, RAIL
7	2	22170112	BASE_CONVEYOR_PREHEAT
8	6	22170122	COVER_CONVEYOR_PREHEAT
9	2	22170140	RAIL_CONVEYOR_28X28_40" LG
10	1	22170141	DRIVE PLT_MOTOR/HEX SHAFT_9MM BELT
11	1	22170142	MOUNT PLT_MOTOR_PRE-HEAT CVYR
12	1	22170143	DRIVE PLT_HEX BUSHING/SHAFT_9MM BELT
13	1	22170145	PULLEY_KNURLED_FIXED_PRE-HT CVYR
14	1	22170146	PULLEY_KNURLED_MOVING_PRE-HT CVYR
15	1	22170147	DRIVE SHAFT_HEX_PRE-HT CVYR
16	1	22170148	BUSHING_HEX HOLE_3/8"
17	2	22170149	BEARING SPACER_3/8ID 10MM LG
18	1	22170150	BEARING SPACER_3/8ID 8MM LG
19	1	22170151	BEARING SPACER_3/8ID 4MM LG
20	4	22170152	RAIL CAP_CONVEYOR_9MM BELT_20.49
21	2	22170153	BELT BED_TEFLON_20.49 LG
22	1	22170154	COVER_BELT/PULLEY_PRE-HT CVYR
23	1	22170155	BRKT_CVYR_ANCHOR_ACME_PREHEAT
24	1	22170156	BRKT_CVYR_ANCHOR_PREHEAT
25	1	22170157	BRKT_CVYR_RAIL MT_ACME_PREHEAT
26	1	22170158	BRKT_CVYR_RAIL MT_PREHEAT
27	2	22170159	COVER_CVYR_IR_PREHEAT
28	1	22170160	BRKT_CRANK_CVYR_PREHEAT
29	1	22170161	OD_ACME_1/2-10_SST_CNVYR_PREHEAT
30	1	22170162	COLLAR_ACME_1/2-10_PREHEAT
31	1	22170163	SHAFT_3/8_HAND_CRANK_PREHEAT
32	4	22206004	TRANSITION PLATE,ENDCAP
33	2	B1032	BEARING_CARIDGE_42MM LG_15MM RAIL
34	2	B1033	BEARING_RAIL_15MM_670MM
35	1	B8049	BEARING_BALL_RADIAL_.625ID 1.375OD .344W
36	3	B8050	BEARING_BALL_RADIAL_.375ID .875OD .281W
37	2	D0093	BELT_CONVEYOR_HI-TEMP_.350W .042T 96.5L
38	1	D1505	COLLAR 5/8 IN. CLAMP
39	1	D1542	COUPLER_SST_3/8 SHAFT_3/4 OD_1" LG
40	1	D1543	COLLAR_ANCHOR_3/8 SHAFT
41	1	D3048	PULLEY_TIMING_STL_14XL037_1/4 BORE
42	1	D3049	PULLEY_TIMING_STL_60XL037_3/8 BORE
43	8	SABAM040070008	SCREW,BUTTON HEAD,4MMX.7 X 8MM,ALLOY PLATED
44	5	SABSM030050012	SCREW,BUTTON HEAD,3MMX.5 X 12MM,SST
45	1	SABSM040070006	SCR.A.BH.SST.MET.M4X.7_6MM LG

DESCRIPTION: PRE-HEAT OPTION_IR HEAT_24X24		DRAWING NUMBER
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Base Plate

9X WAGO DOUBLES
(W/ JUMPERS)

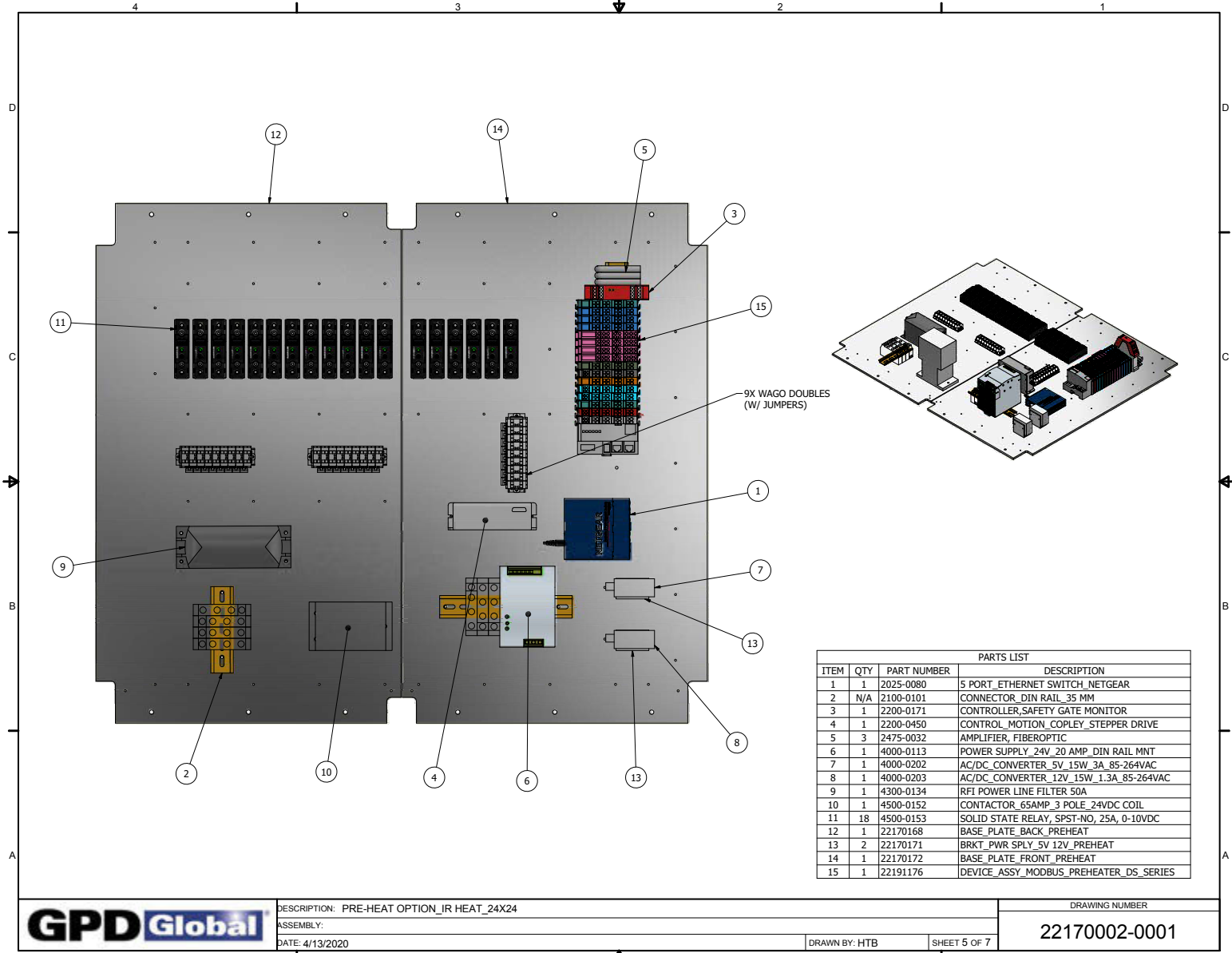| PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	2025-0080	5 PORT_ETHERNET SWITCH_NETGEAR
2	N/A	2100-0101	CONNECTOR_DIN RAIL_35 MM
3	1	2200-0171	CONTROLLER,SAFETY GATE MONITOR
4	1	2200-0450	CONTROL_MOTION_COPLEY_STEPPER DRIVE
5	3	2475-0032	AMPLIFIER, FIBEROPTIC
6	1	4000-0113	POWER SUPPLY_24V_20 AMP_DIN RAIL MNT
7	1	4000-0202	AC/DC_CONVERTER_5V_15W_3A_85-264VAC
8	1	4000-0203	AC/DC_CONVERTER_12V_15W_1.3A_85-264VAC
9	1	4300-0134	RFI POWER LINE FILTER 50A
10	1	4500-0152	CONTACTOR_65AMP_3 POLE_24VDC COIL
11	18	4500-0153	SOLID STATE RELAY, SPST-NO, 25A, 0-10VDC
12	1	22170168	BASE_PLATE_BACK_PREHEAT
13	2	22170171	BRKT_PWR SPLY_5V 12V_PREHEAT
14	1	22170172	BASE_PLATE_FRONT_PREHEAT
15	1	22191176	DEVICE_ASSY_MODBUS_PREHEATER_DS_SERIES

DESCRIPTION: PRE-HEAT OPTION_IR HEAT_24X24

ASSEMBLY:

DATE: 4/13/2020

DRAWN BY: HTB

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DRAWING NUMBER

22170002-0001

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Known issues

Reported temperatures do not change – even in decimal place

A start up failure may have occurred if reported temperatures do not change - not even in the decimal place.

NOTE: The Infrared camera sensor (pg 46) rarely fails to start properly; however, we are working with the vendor for resolution of this issue.

To remedy the situation:

1. Power down the system per Power off (pg 16).

    IMPORTANT: Power down the whole machine, not just the computer. Powering down only the computer will NOT remove power from the camera.

2. Wait 15-30 seconds.

3. Restart the system per Power on (pg 16).

Displayed image is monochromatic (or nearly so)

A start up failure may have occurred if the displayed image appears monochromatic or nearly monochromatic.

NOTE: The Infrared camera sensor (pg 46) rarely fails to start properly; however, we are working with the vendor for resolution of this issue.

To remedy the situation:

1. Power down the system per Power off (pg 16).

    IMPORTANT: Power down the whole machine, not just the computer. Powering down only the computer will NOT remove power from the camera.

2. Wait 15-30 seconds.

3. Restart the system per Power on (pg 16).

Heater power on at computer boot up

Heater elements may remain in a powered condition (generating heat) if you reboot the computer (either warm or cold restart) without cycling power for the entire machine.

NOTE: If the computer is turned off or reset:
*   you may not realize the above is happening and/or
*   the computer loses control of the heaters.

To remedy the situation:

1. Power down the system per Power off (pg 16).

    IMPORTANT: Power down the whole machine, not just the computer. Powering down only the computer will NOT remove power from the camera.

2. Wait 15-30 seconds.

3. Restart the system per Power on (pg 16).

Application window disappears

If the application window disappears with no indication of what has happened and no error messages display, it's likely the application crashed.

To remedy the situation:

1. Power down the system per Power off (pg 16).

    IMPORTANT: Power down the whole machine, not just the computer.

2. Wait 15-30 seconds.

3. Restart the system per Power on (pg 16).

Glossary

Aggregated Process Value

A process variable value derived from multiple sensor inputs. Example: an infrared camera may report temperatures from multiple spots. These values are averaged to form a single aggregated process variable.

Aggregated Process Variable Maximum / Minimum

When a process variable is derived from multiple sensor values (Aggregated PV), the reported value is typically the *mean* of all sensor values. The process variable Maximum is the maximum value of the set of sensors while the process variable Minimum is the minimum value of the set of sensors.

Board Height

Distance (mm) between the conveyor rails.

Board Width

Distance (mm) along the conveyor direction of travel - the axis of motion.

Box Meter

A box meter monitors a specified *rectangular area*.

Distance

Parameter representing the amount of space between the board and the front lens of the camera is used to compensate for the following facts:

* Radiation from the target is absorbed by the atmosphere between the board and the camera.

* Radiation from the atmosphere itself is detect by the camera.

Emissivity

Parameter representing the measure of how much radiation is emitted from the board compared to that from a perfect blackbody of the same temperature.

Limit Low

The low value of the process acceptance range.

Limit Low Low

Limit at which damage is possible to the machine or the product. When a process value exceeds (falls below) a low low limit, the equipment reports an error and shuts itself down to prevent damage.

Limit Hi (High)

A high limit is the high value of a process acceptance range.

Limit Hi Hi (High High)

A limit at which damage is possible to the machine or the product. Typically, when a process value exceeds a high high limit, the equipment reports an error and shuts itself down to prevent damage.

Example: If an infrared camera has a maximum environmental operating temperature of 50°C (a high high limit) and the temperature of that camera reaches 51°C, the system shuts down all operation and reports an error condition.

OverBoard

The top side of the board/product.

PV

Abbreviation for Process Variable.

Power Output

The amount of power being applied to the heating elements. Expressed as *percent of full scale* where *scale* is defined as *maximum current draw* of the heating unit.

Process Limits Range

A process limit range defines a high/low numerical range. When the process value falls within this range, the process is *ready.* If the process value is outside this range, the process is *not ready*.

Process Variable

(**PV**) A process variable is the current measured value of a particular part of a process which is being monitored or controlled. Example: the temperature of a PCB.

Reflected apparent temperature

Parameter used to compensate for the radiation reflected in the board. If the emissivity is low and the board temperature relatively far from that of the reflected, it will be important to set and compensate for the reflected apparent temperature correctly.

Set Point

A set point is the desired value for a process variable.

Spot Meter

A spot meter monitors a specified *coordinate*.

UnderBoard

The bottom side of the board/product.