



CONTROLS MANUAL

User Guide

AUGUST 8, 2023

REV B

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1 Cab Components

1.1 Cab Display



The Cab Display is an IFM CR1152 5" color touchscreen.

The Cab Display has four 'Function Key' buttons, which appear as a key with a centered lighted circle and one 'Rocker Switch' multi-function key, which appears as a button with a lighted circle and four directional arrows around this circle.

The Cab Display will be operational after turning on the ignition to the vehicle. It will be disabled during night mode operation only displaying a single LED light to indicate the control system is still active.

2 Rear Panel Components

2.1 Rear Display

The Rear Display is an IFM CR1150 5" color screen.

The Rear Display has four 'Function Key' buttons, which appear as a key with a centered lighted circle and one 'Rocker Switch' multi-function key, which appears as a button with a lighted circle and four directional arrows around this circle.

The Rear Display will be operational after turning on the ignition to the vehicle. It will be disabled during night mode operation only displaying a single LED light to indicate the control system is still active until any key is pressed, at which point it becomes enabled until no key is pressed for 5 minutes.

2.2 Switch Bank

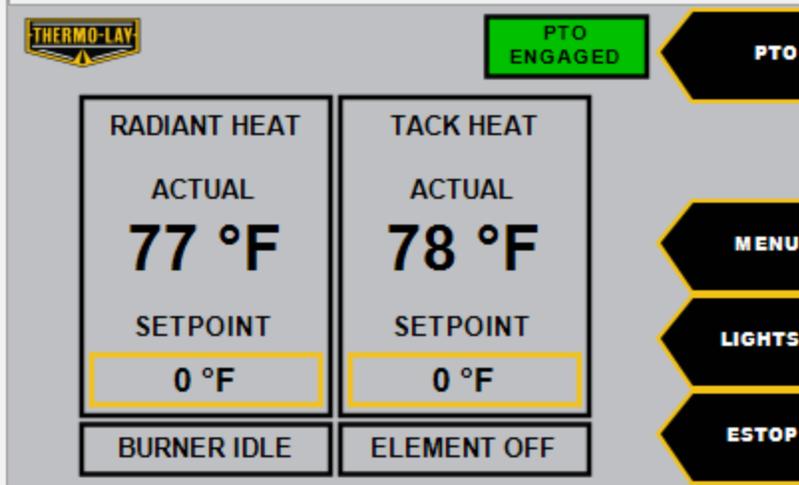
The rear panel keypad has two switch banks with push buttons for controlling certain aspects of the equipment. These functions are described in greater detail in their respective sections of the manual. Each key has a status light indicating the status of its function.

- White: button is enabled but the function is not running.
- Green: button is enabled, and the function is running.
- Red: button is disabled, and the function cannot be run.
- No Light: keypads are disabled (no power or in night mode).

3 Cab Display Controls

3.1 Main Screen

The Main Screen is where the status of some of the common features of the equipment can be viewed. The following features are available on this screen:



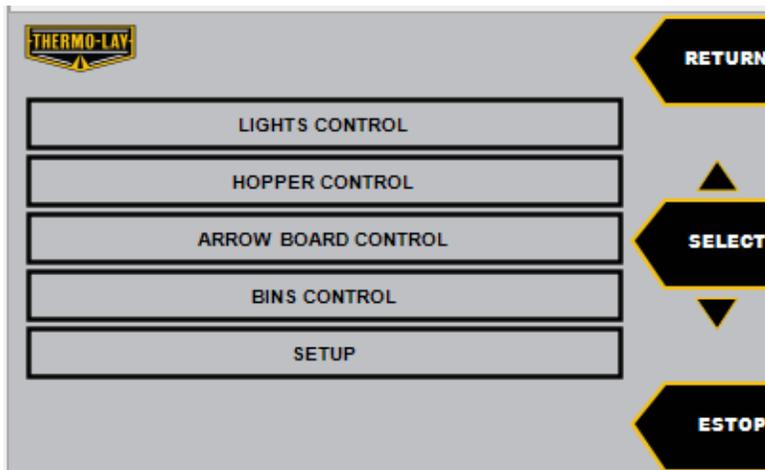
Function Keys	Action
PTO	Turns on and off the PTO. Status indicated by the banner to the left.
MENU	Press to go to the Main Menu
LIGHTS	Turn on and off any lights that are enabled.
ESTOP	Press to trigger the emergency stop.

Display Objects	Function
Radiant Heat Box	Displays the current temperature reading from the radiant heat thermocouple as well as the active setpoint. A 'Sensor Break' banner will appear over the temperature reading if the controls detect a break in the thermocouple wires.
Burner Status Box	Displays the status of the burner. <ul style="list-style-type: none"> - Burner Off: The burner is turned off and will not fire. - Burner Idle: The burner is on but not firing, generally in this state when at or above setpoint. - Burner On: The burner is on and firing. - Burner Fault: The burner failed to light or was put out and failed to relight
Tack Heat Box	Displays the current temperature reading from the tack heat thermocouple as well as the active setpoint. A 'Sensor Break' banner will appear over the temperature reading if the controls detect a break in the thermocouple wires.

Tack Element Status Box	Displays the status of the element. <ul style="list-style-type: none"> - Element Off: The tack element is not energized, generally in this state when at or above setpoint. - Element On: The tack element is energized and heating the tack oil.
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3.2 Main Menu

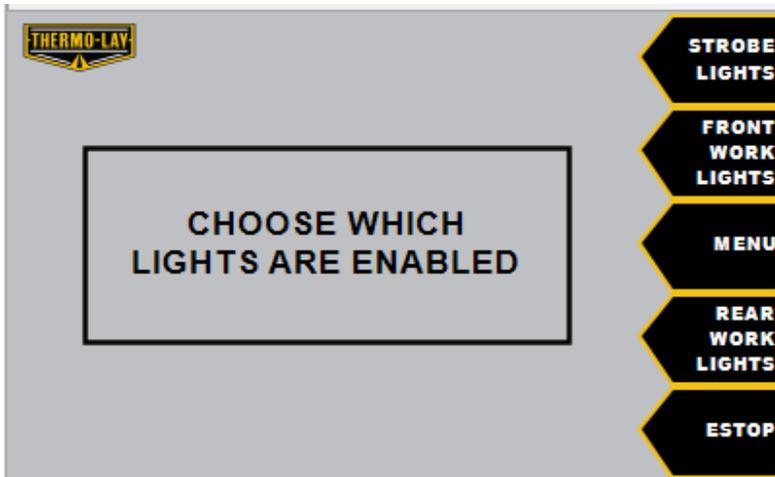
The Main Menu screen allows control of certain functions of the equipment via the Cab Display



Function Keys	Action
RETURN	Press to go to the Main Screen.
SELECT	Press to select the highlighted sub menu. The up and down rocker arrows move the highlight to the next menu in the column in their respective directions.
ESTOP	Press to trigger the emergency stop. This button is in the same position on every sub menu.

3.2.1 Lights Control

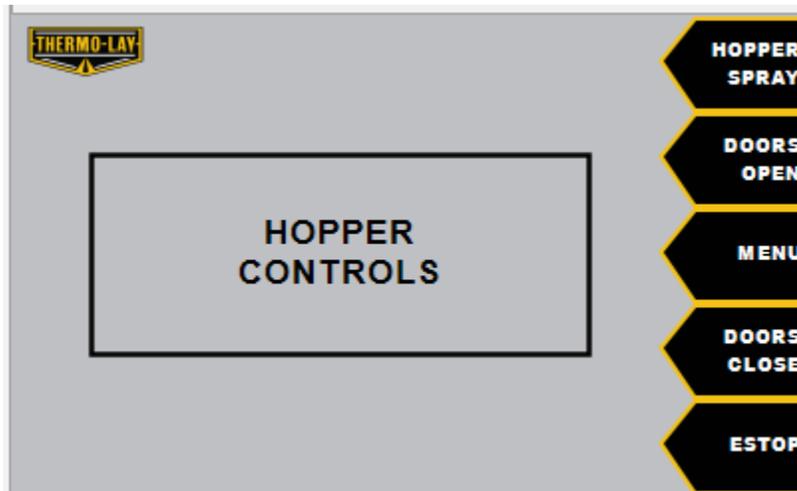
A sub menu for disabling/enabling which lights are turned on from the Main Screen.



Function Keys	Action
STROBE LIGHTS	Enable/disable the strobe lights.
FRONT WORK LIGHTS	Enable/disable the front work lights.
MENU	Press to return to the Main Menu
REAR WORK LIGHTS	Enable/disable the rear work lights

3.2.2 Hopper Controls

A sub menu for controlling the hopper hydraulics from the Cab Display.

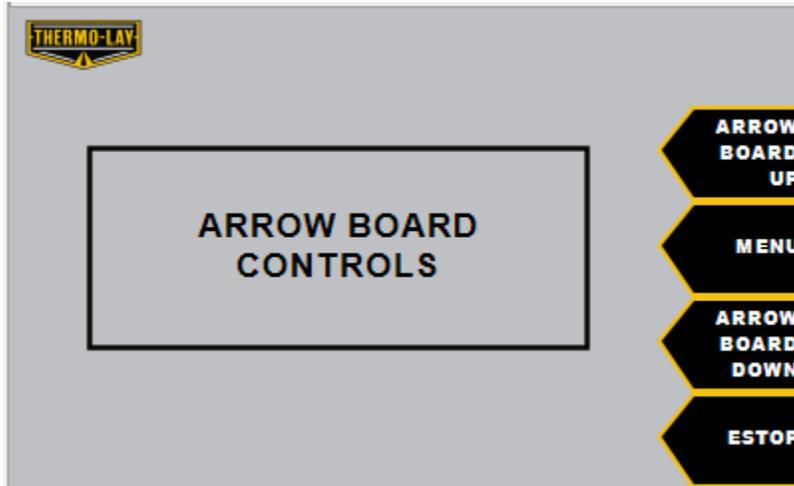


Function Keys	Action
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HOPPER SPRAY	Turn on/off the hopper spray function. Latching function.
DOORS OPEN	Press to open the hopper doors. Momentary function.
MENU	Press to return to the Main Menu
DOORS CLOSE	Press to close the hopper doors. Momentary function.

3.2.3 Arrow Board Controls

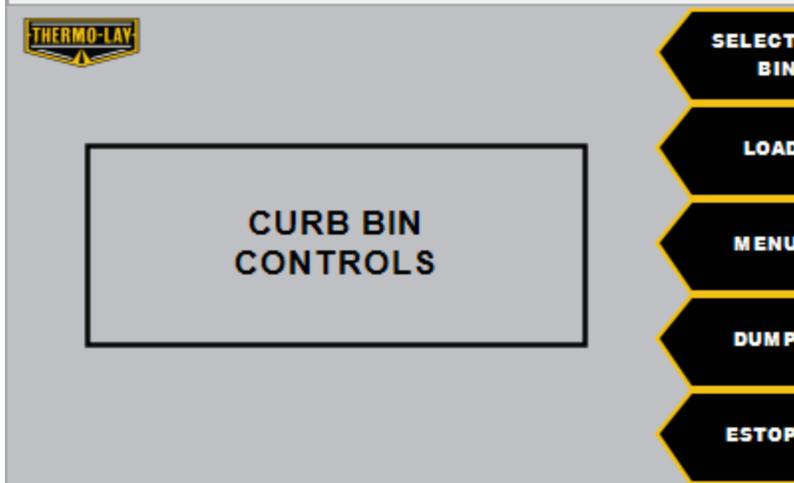
A sub menu for controlling the arrow board hydraulics from the Cab Display.



Function Keys	Action
ARROW BOARD UP	Press to raise the arrow board. Momentary function.
MENU	Press to return to the Main Menu
ARROW BOARD DOWN	Press to lower the arrow board. Momentary function.

3.2.4 Bins Controls

A sub menu for controlling the bin hydraulics from the Cab Display.



Function Keys	Action
SELECT BIN	Press to switch between controlling the curb side and street side bins
LOAD	Press to load the selected bin. Momentary function.
MENU	Press to return to the Main Menu
DUMP	Press to dump the selected bin. Momentary function.

3.3 Setup Pages

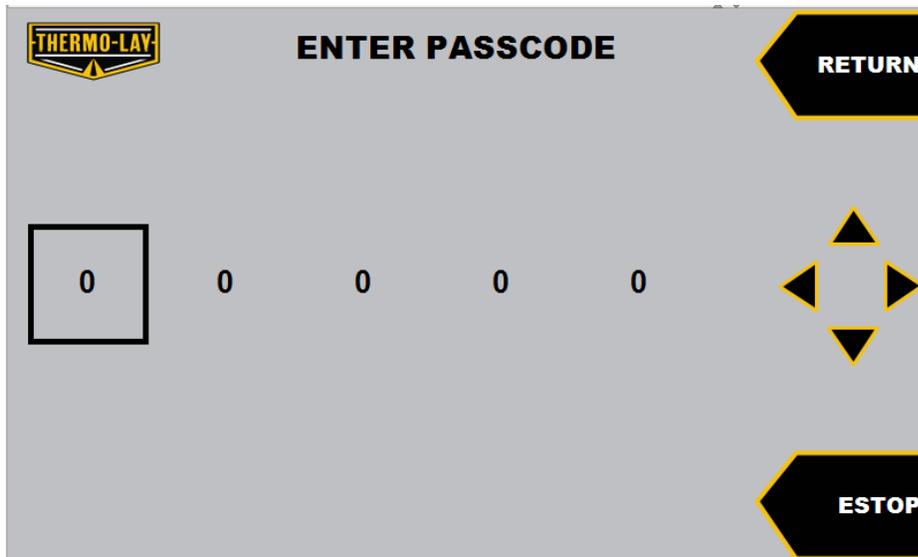
The Setup Pages allow for control of various functional settings on the equipment.

WARNING

All settings in this area are factory set and should be only modified in the direction of or by Thermo-Lay.

3.3.1 Passcode Screen

Upon entering Setup from the Main Menu, the display will issue a prompt for the setup passcode. The rocker arrow keys are used to enter the passcode which is set as **8 3 6 4 2**. The right and left arrows change the selected digit, and the up and down arrows change the selected digits value. Once the passcode is entered correctly the display will automatically enter the setup area. The passcode need not be entered again until the display is powered down. Press the return key before the passcode is entered to return to the Main Menu.



3.3.2 Setup Page Navigation

All of the setup pages have the same navigation functions

Function Keys	Action
RETURN	Press to return to the Main Menu.
NEXT	Press to move to the next Setup Page.

To change a setting in the Setup Pages, touch the screen in the yellow box that shows the setting's value. A touch-enabled keypad will appear allowing entry of a new value.



3.3.3 Valve PWM Settings

The valve PWM settings screens allow for changes to the amount of electrical current driving the coil of the valve. The settings range from 0 – 1023 units with higher units

providing more current, and thus shifting the valve spool further. In testing, it has been found that in general, the valves have an operating range of 300 – 500 units. A running count of hours the PTO has been engaged for is also shown on the first page. The PWM frequency at which to drive the valves is settable on the third page, this value should only change if a new valve coil with different published specifications is used.

THERMO-LAY Valve PWM Settings Page 1 of 3

Hydraulic Tools	1023	RETURN
Tack Spray	1023	
Tack Load	1023	NEXT
Anti-Bridge Forward	1023	
Anti-Bridge Reverse	1023	PTO Hours: 0
Doors Open	1023	
Doors Close	1023	ESTOP

THERMO-LAY Valve PWM Settings Page 2 of 3

Auger Reverse	1023	RETURN
Auger Dispense	1023	
Auger Full Speed	1023	NEXT
Lift Up	1023	
Lift Down	1023	ESTOP
Arrow Board Up	1023	
Arrow Board Down	1023	

THERMO-LAY Valve PWM Settings Page 3 of 3

Street Bin Load	1023	RETURN
Street Bin Dump	1023	
Curb Bin Load	1023	NEXT
Curb Bin Dump	1023	
Auxiliary	1023	ESTOP
PWM Frequency (Hz)	100	

3.3.4 Temperature Control Screens

The temperature control screens allow for changes to the temperature input configuration and the control tolerance of the temperature setpoints.

- Thermocouple Settings: These settings should match what is published on the datasheet of the Thermocouple to Analog converter boards found in the rear panel. They should remain at factory settings unless a new signal converter is used.
- Control Hysteresis: The accuracy at which the Burner/Element will control the setpoint temperature. A higher value results in less accurate control but with the Burner/Element running less. Example: If set to 5, the Burner/Element will turn on only when the temperature falls below the setpoint by 5 degrees or more.

The screenshot shows a control interface for 'Heat Transfer Oil Thermocouple'. It features a 'THERMO-LAY' logo in the top left. The title 'TEMP CONTROL SETTINGS' is centered at the top. Below the title, the text 'Heat Transfer Oil Thermocouple' is displayed. The interface contains several input fields and buttons. On the right side, there are three large, black, arrow-shaped buttons labeled 'RETURN', 'NEXT', and 'ESTOP'. The settings are organized as follows:

Min Temp (°F)	Max Temp (°F)
32	572
Min Sensor Reading	Max sensor Reading
4000	20000
Control Hysteresis	5

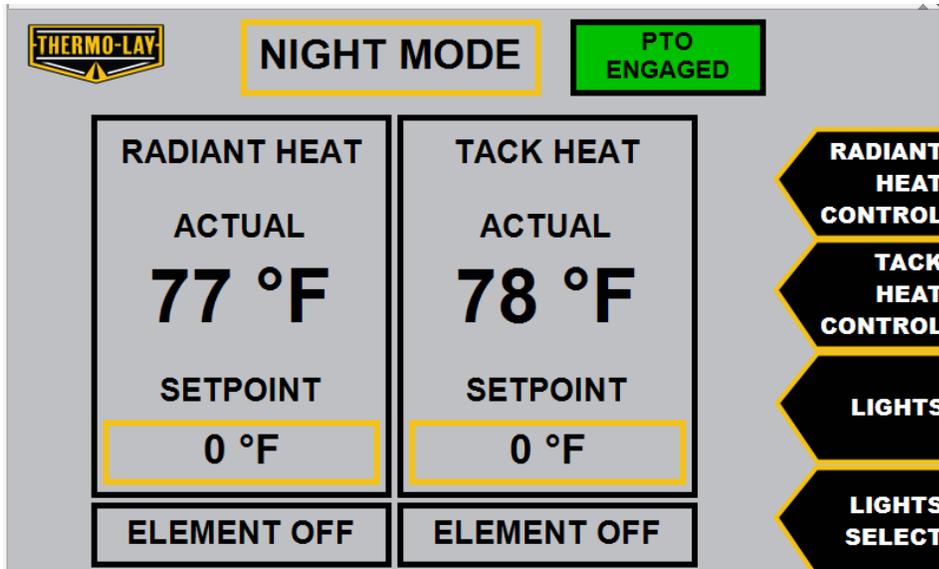
The screenshot shows a control interface for 'Tack Oil Thermocouple'. It features a 'THERMO-LAY' logo in the top left. The title 'TEMP CONTROL SETTINGS' is centered at the top. Below the title, the text 'Tack Oil Thermocouple' is displayed. The interface contains several input fields and buttons. On the right side, there are three large, black, arrow-shaped buttons labeled 'RETURN', 'NEXT', and 'ESTOP'. The settings are organized as follows:

Min Temp (°F)	Max Temp (°F)
32	572
Min Sensor Reading	Max sensor Reading
4000	20000
Control Hysteresis	5

4 Rear Display Controls

4.1 Main Screen

The Main Screen is where the status of some of the common features of the equipment can be viewed. It is also used to set temperature setpoints for the radiant and tack heat. The following features are available on this screen:



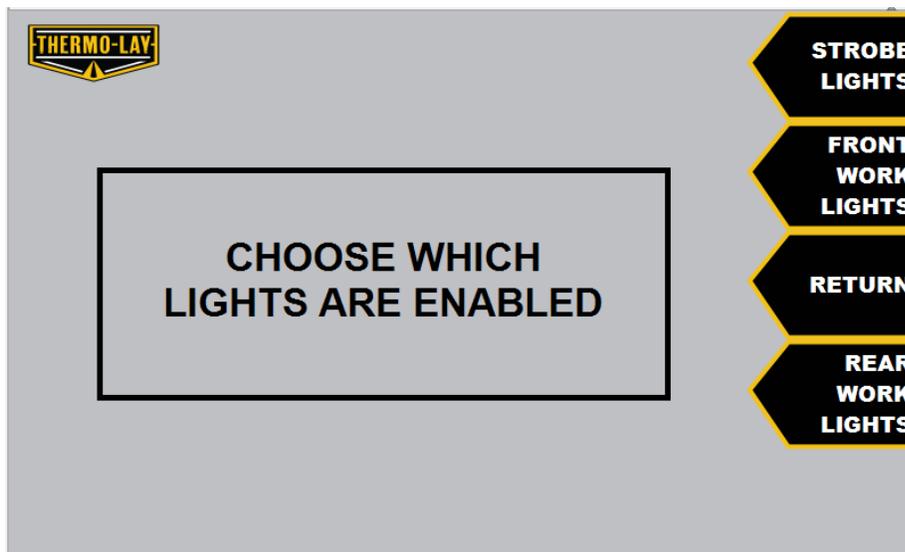
Function Keys	Action
RADIANT HEAT CONTROL	Press to go to the radiant heat setpoint control screen.
TACK HEAT CONTROL	Press to go to the tack heat setpoint control screen.
LIGHTS	Turn on and off any lights that are enabled.
LIGHTS SELECT	Press to go to the lights control screen.

Display Objects	Function
Radiant Heat Box	Displays the current temperature reading from the radiant heat thermocouple as well as the active setpoint. A 'Sensor Break' banner will appear over the temperature reading if the controls detect a break in the thermocouple wires.
Burner Status Box	Displays the status of the burner. <ul style="list-style-type: none"> - Burner Off: The burner is turned off and will not fire.

	<ul style="list-style-type: none"> - Burner Idle: The burner is on but not firing, generally in this state when at or above setpoint. - Burner On: The burner is on and firing. - Burner Fault: The burner failed to light or was put out and failed to relight. - Element Off: Night Mode ONLY. The heating element for the radiant heat is not energized. - Element On: Night Mode ONLY. The heating element for the radiant heat is energized.
Tack Heat Box	Displays the current temperature reading from the tack heat thermocouple as well as the active setpoint. A 'Sensor Break' banner will appear over the temperature reading if the controls detect a break in the thermocouple wires.
Tack Element Status Box	Displays the status of the element. <ul style="list-style-type: none"> - Element Off: The tack element is not energized, generally in this state when at or above setpoint. - Element On: The tack element is energized and heating the tack oil.
PTO Engaged Banner	Appears when the PTO is running (turned on from the Cab Display).
Night Mode Banner	Appears when the equipment is running in night mode.

4.2 Lights Control

A screen for disabling/enabling which lights are turned on from the Main Screen.

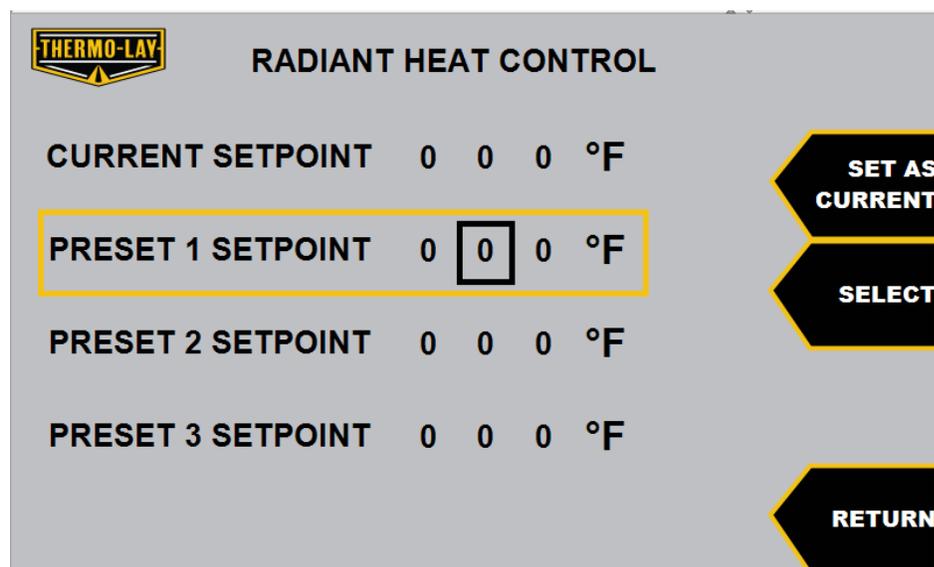


Function Keys	Action
STROBE LIGHTS	Enable/disable the strobe lights.

FRONT WORK LIGHTS	Enable/disable the front work lights.
RETURN	Press to go to the Main Screen.
REAR WORK LIGHTS	Enable/disable the rear work lights.

4.3 Radiant Heat Control/Tack Heat Control

Screens for setting the current radiant heat and tack heat setpoints or selecting/modifying up to 3 preset setpoints.



Function Keys	Action
SET AS CURRENT	Press to change the current setpoint to the highlighted preset setpoint.
SELECT	Press to scroll between the current and preset setpoints. The currently selected setpoint is highlighted by a yellow border.
RETURN	Press to go to the Main Screen.

4.3.1 Changing a Setpoint

The rocker arrow keys are used to change the highlighted setpoint.

- Up/Down changes the value of the highlighted digit.
- Right/Left changes the digit of the highlighted setpoint.

5 Trouble Screens

Certain events will trigger both the Cab and Rear Display to show trouble message on a red banner that takes up the entire screen.



Trouble Text	Meaning
REAR ESTOP PRESSED!!	The Estop button on the rear panel has been pressed. Release the button to clear the message.
CAB ESTOP PRESSED!!	The Estop button on the cab display has been pressed. Click the Estop button on the cab display again to clear the message.
CONTROL NETWORK CONNECTION LOST!	The rear display lost communication with the cab display. Check the CAN communication wiring to the cab display. Check that the cab display is functioning correctly.
CAN BUS ERROR REAR DISPLAY	The cab display lost communication with the rear display. Check the CAN communication wiring to the rear display. Check that the rear display is functioning correctly.
CAN BUS ERROR VALVE CONTROL	The cab display lost communication with the valve module. Check the CAN communication wiring to the valve module, located in the valve enclosure. Check the power wiring to the valve module.
CAN BUS ERROR CABINET IO	The cab display lost communication with the rear panel IO module. Check the CAN communication wiring to the IO module, located in the rear panel. Check power wiring to the IO module.
CAN BUS ERROR 6 BANK SWITCHES	The cab display lost communication with the rear panel 6 bank switch pack. Check the CAN communication wiring

	to the switch bank, located on the rear panel. Check power wiring to the switch bank.
CAN BUS ERROR 8 BANK SWITCHES	The cab display lost communication with the rear panel 8 bank switch pack. Check the CAN communication wiring to the switch bank, located on the rear panel. Check power wiring to the switch bank.