

Thermo***TRAC***TM

Model 7000

Installation and Operation Manual

VAL
ENVIRONMENTAL
SYSTEMS

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Introduction

Overview

ThermoTRAC's unique all-in-one design combines the features of a manual backup system, simple stand-alone controller and contactor panel.

Standard capabilities:

- Takes over control in the event of primary controller failure.
- Operates as a 9-stage thermostatically operated stand-alone controller.
- Up to six 2- or 4-pole contactors boosts power handling and circuit switching capability of primary controller.
- Eight 3-position toggle switches for automatic or manual operation of equipment connected to relays and contactors.
- Test and reset toggle switches for manual testing of system.
- Alarm on high/low temperature extremes.
- Alarm on power interruption.
- Built-in heavy-duty power surge suppressor.

Optional capabilities:

- Timed operation of minimum ventilation equipment.
- Run/pause timer for operation of air inlets or curtains.
- Load sequencing on power-up to prevent motor damage, tripped breakers and/or generator overload.
- Alarm on minimum ventilation equipment failure.
- Alarm on power supply failure in primary controller.
- Automatic alarm reset after power interruption.

Manual Organization

This manual includes installation, operation, application wiring and troubleshooting information.

While simple to use, the ThermoTRAC contains many interrelated features. We recommend the installer and operator(s) read this manual in its entirety to ensure they understand all of the ThermoTRAC's features and how those features work together.

A companion *Quick Guide* contains installation and initial use checklists to ensure your ThermoTRAC is properly installed and configured. Also included is a wiring plan worksheet that you can make copies of. A little planning before installation will ensure the ThermoTRAC's capability is fully used.

Symbols

You will find two symbols commonly used throughout this manual.



This symbol warns you that the text describes steps that involve going near terminals with potentially deadly voltage. Always shut off power to the ThermoTRAC and all attached devices before opening the cover.



This symbol means the text has extra importance since it is describing the importance of a feature or explaining a step to which you should pay close attention to avoid problems.

Operating Modes

Standby Backup

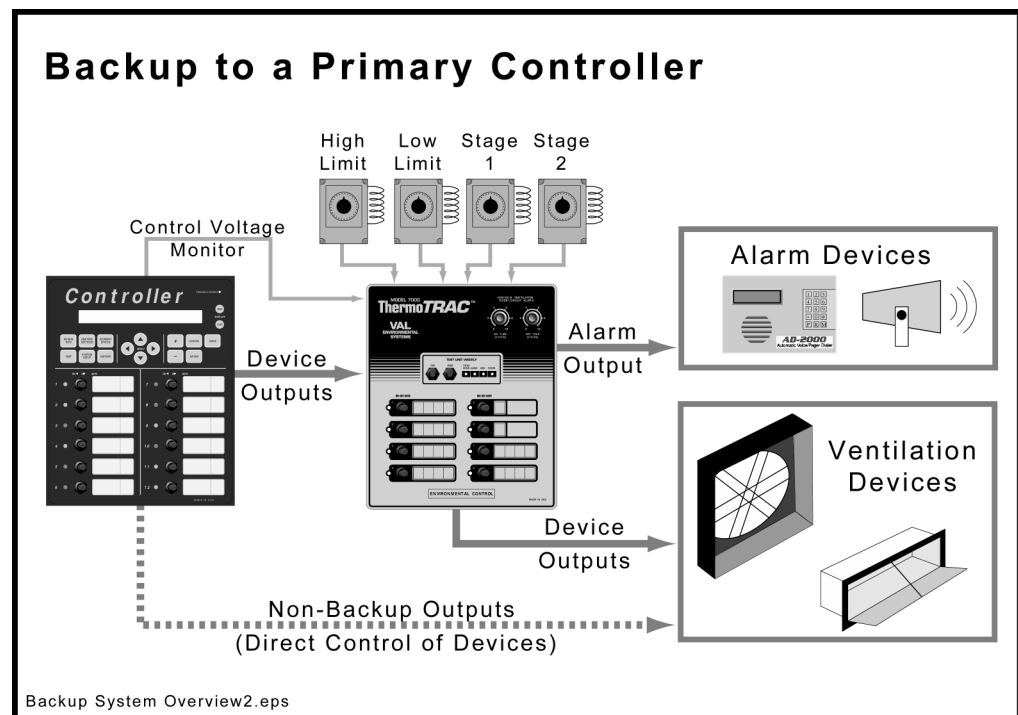
When the ThermoTRAC is configured for **backup operation** it will normally be in the standby mode, allowing the primary controller to maintain the building's environment. When a problem is detected, the ThermoTRAC switches to active backup state, and takes control of key ventilation devices.

Active Backup

In the active backup state, devices attached to the alarm relay are turned on and the backup thermostats take over control of all relays and contactors. The ThermoTRAC seizes control of all devices wired through it from the primary controller.

Any of the following events trigger a switchover to active backup:

- Room temperature exceeds limits defined by the High and Low Limit thermostats.
- Power interruption to the ThermoTRAC.
- A power supply failure in the primary controller is detected (optional).
- A minimum ventilation equipment failure is detected (optional).
- ThermoTRAC Timer malfunction (optional).

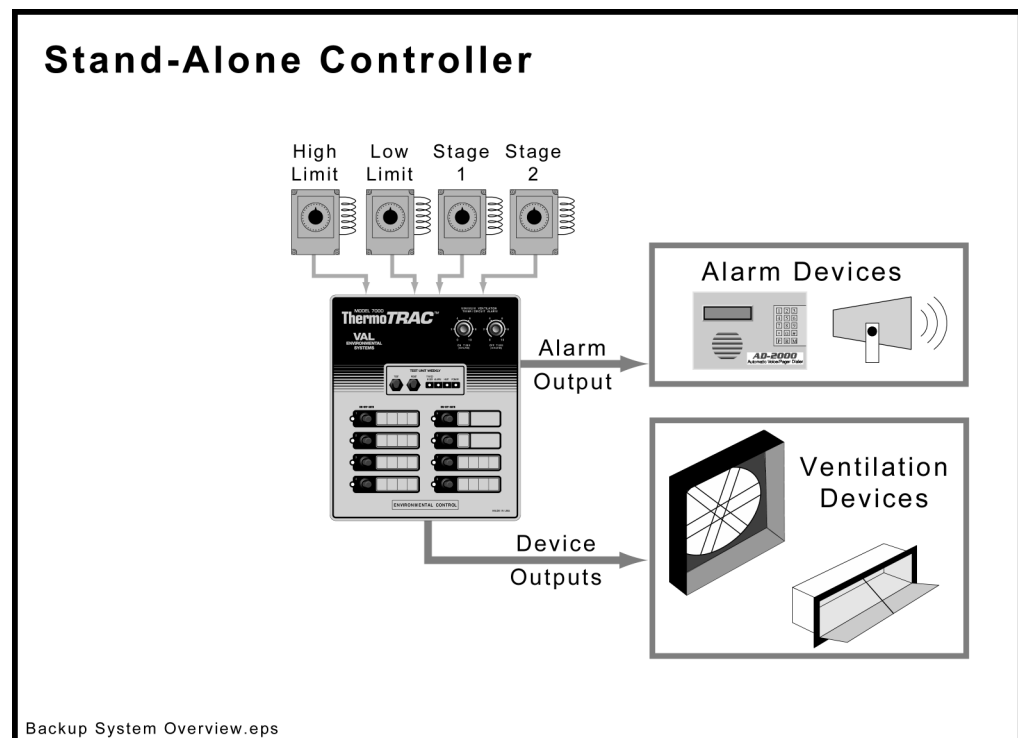


Stand-Alone

Stand-alone operation provides reliable, thermostatically controlled operation of up to 11 device groups in the standard configuration and 27 device groups when equipped with six 4-pole contactors. Stand-alone operation also supports problem detection and activation of the alarm relay.

Any of the following events will trigger an alarm condition.

- Room temperature exceeds limits defined by the High and Low Limit thermostats.
- Power interruption to the ThermoTRAC.
- A minimum ventilation equipment failure is detected (optional).
- ThermoTRAC Timer malfunction (optional).



Front Panel Operation

Lights



TIMED MODE

Illuminates when channel 1 (CH 1) is being controlled by the ON TIME and OFF TIME dials (requires optional ThermoTRAC Timer).

CH 1 can also be turned on (overridden) by a backup thermostat or primary controller input.



ALARM

Illuminates when the ThermoTRAC is in an active backup/alarm state. Devices connected to the alarm output terminals are turned on immediately.



HEAT

Illuminates when channel 9 (CH 9) is activated (ON).



POWER

Illuminates when the internal 24 VAC power transformer output is normal.

Toggle Switches



TEST

Momentarily flip TEST to confirm the ThermoTRAC's ability to enter the active backup/alarm state. This test should be performed at least weekly to verify proper operation of the ThermoTRAC and all connected equipment.



RESET

Momentarily flip RESET to remove the ThermoTRAC from an active backup/alarm state. If an alarm condition still exists, the ThermoTRAC immediately returns to an active backup/alarm state when RESET is released.

ON ◀ OFF ▶ AUTO



ON-OFF-AUTO

These toggle switches permit manual control of each output channel (CH). A status light associated with each channel illuminates when the channel is on.

ON/OFF: Setting the switch to ON or OFF overrides automatic operation. You can use this switch to test or turn off a device group for any reason.

AUTO: Setting the toggle switches to AUTO allows the ThermoTRAC (or primary controller) to control the output channel.

Timer Dials

The ON TIME and OFF TIME dials are only installed when the optional ThermoTRAC Timer is installed. Additional details about their use appears in the ThermoTRAC Timer section of this manual.



ON TIME

Sets the minimum ventilation power-on time for CH 1 when controlled by the TIMED MODE.

Setting the ON TIME dial to 0 disables the TIMED MODE feature for CH 1 and the AmpGuard™ minimum ventilation monitor.



OFF TIME

Sets the minimum ventilation power-off time for CH 1 when controlled by the TIMED MODE.

Determines the maximum allowable power-off time when the AmpGuard minimum ventilation monitor is enabled.

Alarm / Backup Inputs

Overview

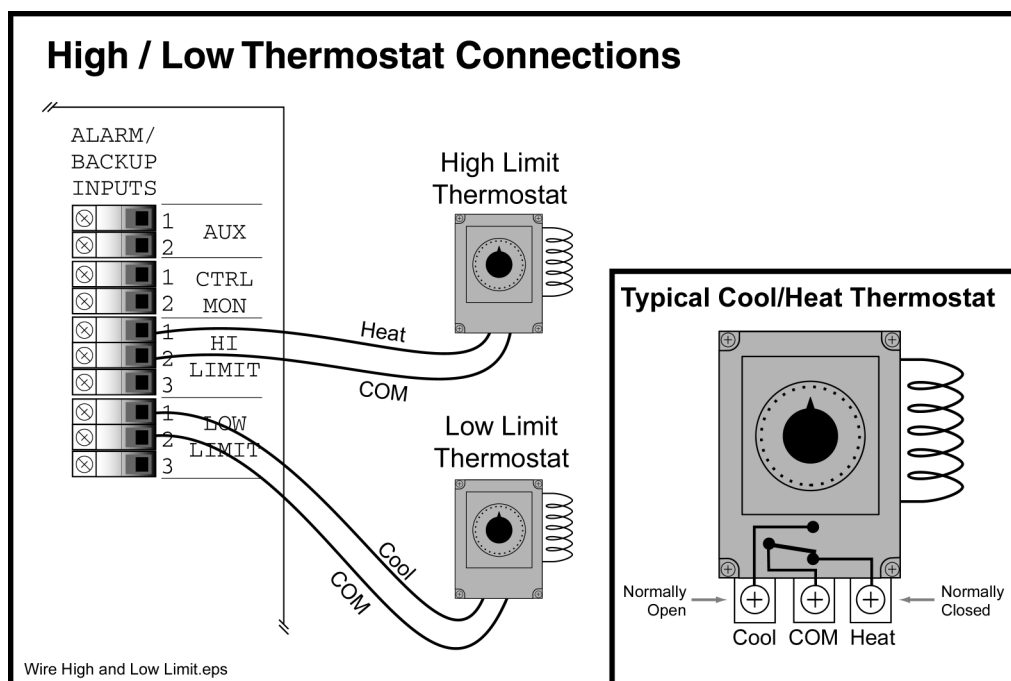
Key to the ThermoTRAC's operation is its ability to enter an active backup/alarm state should an animal health threatening condition develop. By connecting appropriate sensing devices to the ALARM/BACKUP INPUTS terminal block, the ThermoTRAC can be made aware of certain critical events or conditions.

The ThermoTRAC remains in an active backup/alarm state until the RESET switch is flipped, even if conditions return to normal.

High / Low Limit Thermostats

The High and Low Limit thermostats define the health threatening temperature extremes you want to avoid. **Test and adjust thermostats frequently.** The settings should match the desired environmental requirements and should match the primary controller's settings.

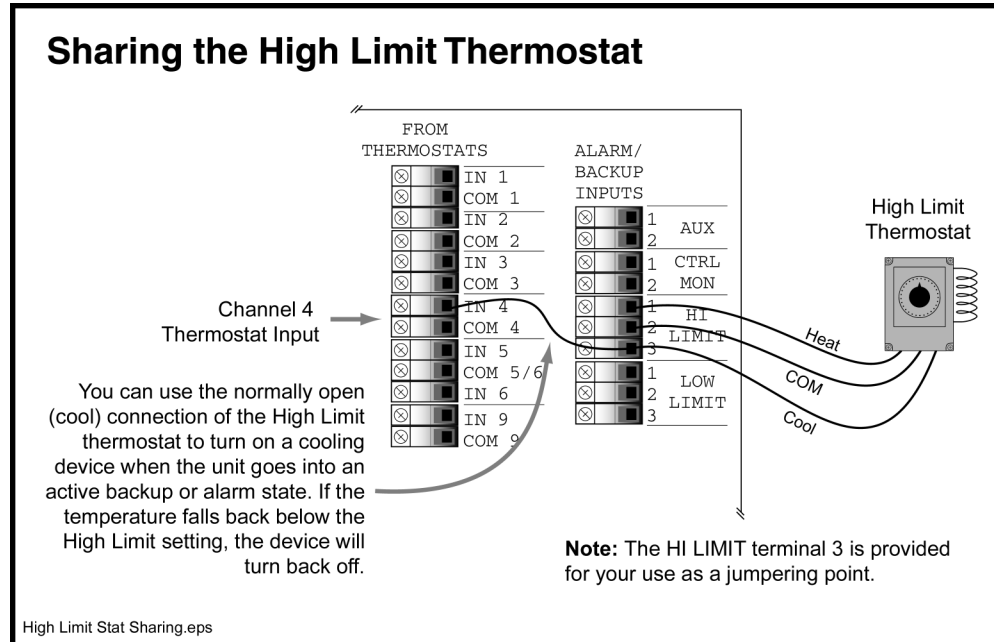
Connect the thermostats to the ALARM/BACKUP INPUTS terminal block as shown. Wire the thermostats so that an open circuit is created when the temperature limit setting is reached.



Place a jumper wire across terminals 1 and 2 for any unused inputs on the ALARM/BACKUP INPUTS terminal block.

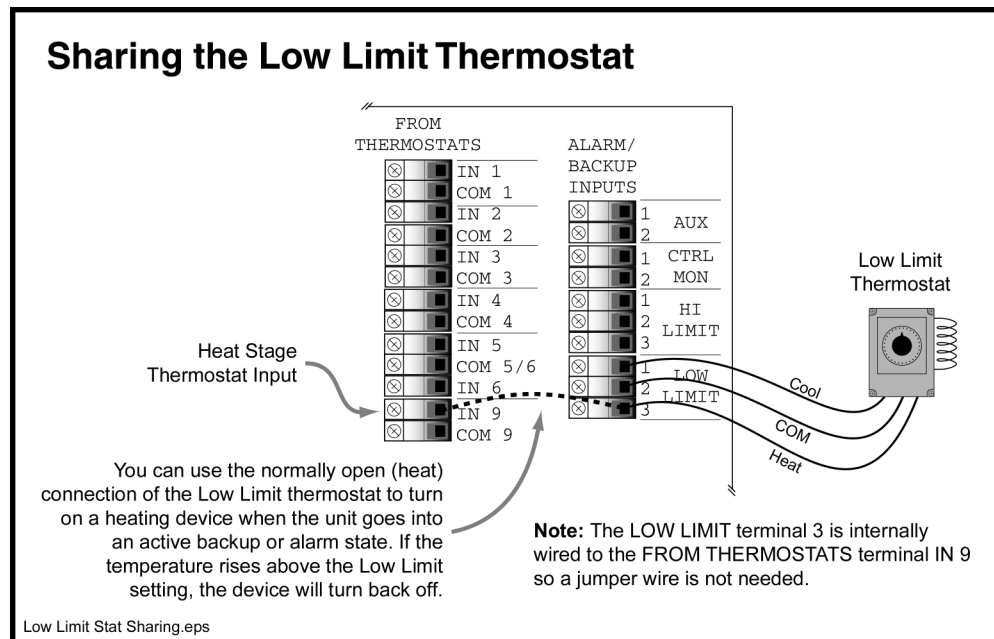
Sharing the High Limit Thermostat

The High Limit thermostat can also be wired as shown below to turn on a cooling device, possibly eliminating the need for one thermostat.



Sharing the Low Limit Thermostat

The Low Limit thermostat can also be used to control the heat stage (CH 9), the air inlet close channel (CH 6), or any other heating channel by using the thermostat's Heat output terminal.



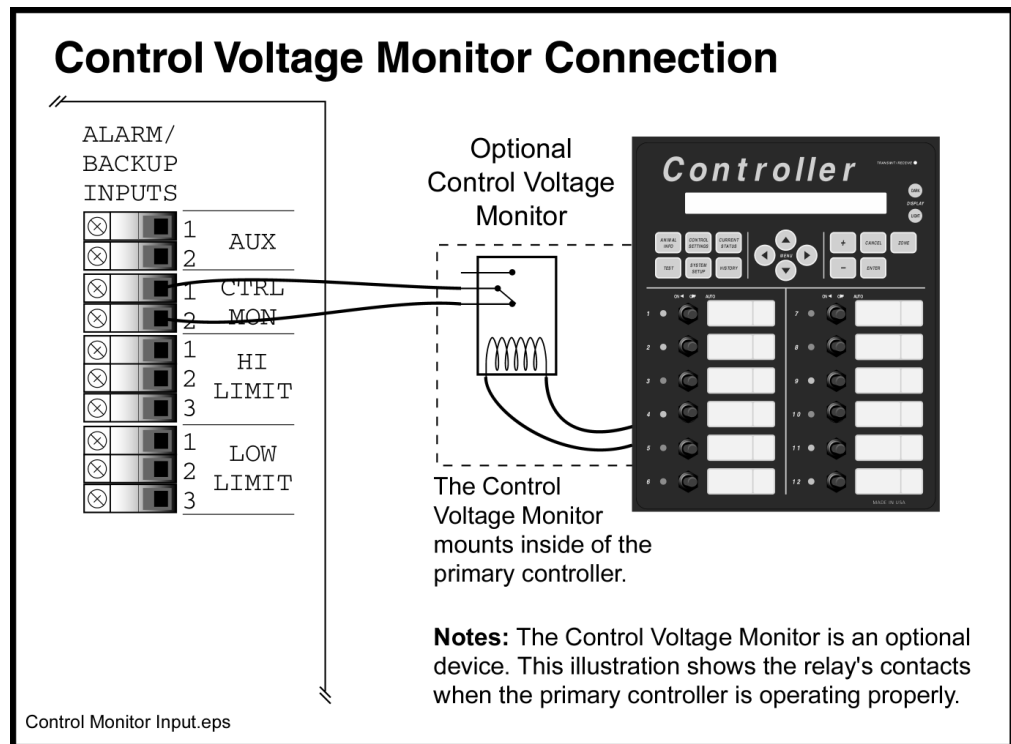
Control Voltage Monitor

The optional Control Voltage Monitor provides a way to monitor the primary controller's 12VDC power supply.

If the primary controller's power supply fails, or loses its output voltage for any reason, the ThermoTRAC will immediately go into an active backup/alarm state.

Install the Control Voltage Monitor assembly in the primary controller's enclosure. Refer to the installation instructions enclosed with the Control Voltage Monitor for mounting and wiring instructions.

Connect the "output" wires to the CTRL MON input terminals on the ALARM/BACKUP INPUTS terminal block inside the ThermoTRAC.



Place a jumper wire between CTRL MON terminals 1 and 2 if you did not install the optional Control Voltage Monitor.

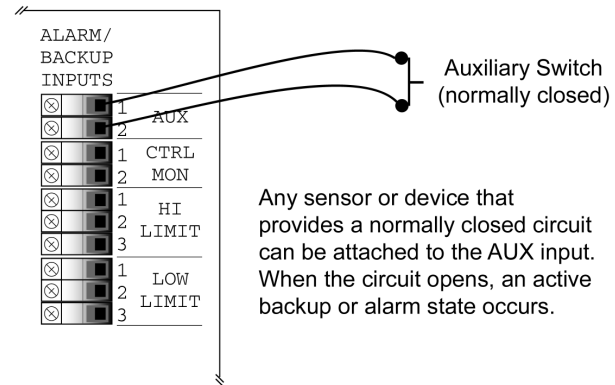
Auxiliary Input

The auxiliary (AUX) input can be any type of device that provides a normally closed circuit.



Caution: Do not wire the alarm relay output of your primary controller to the ThermoTRAC's AUX input. Several types of primary controller alarm conditions do not require a backup unit to take over.

Auxiliary Switch Connection



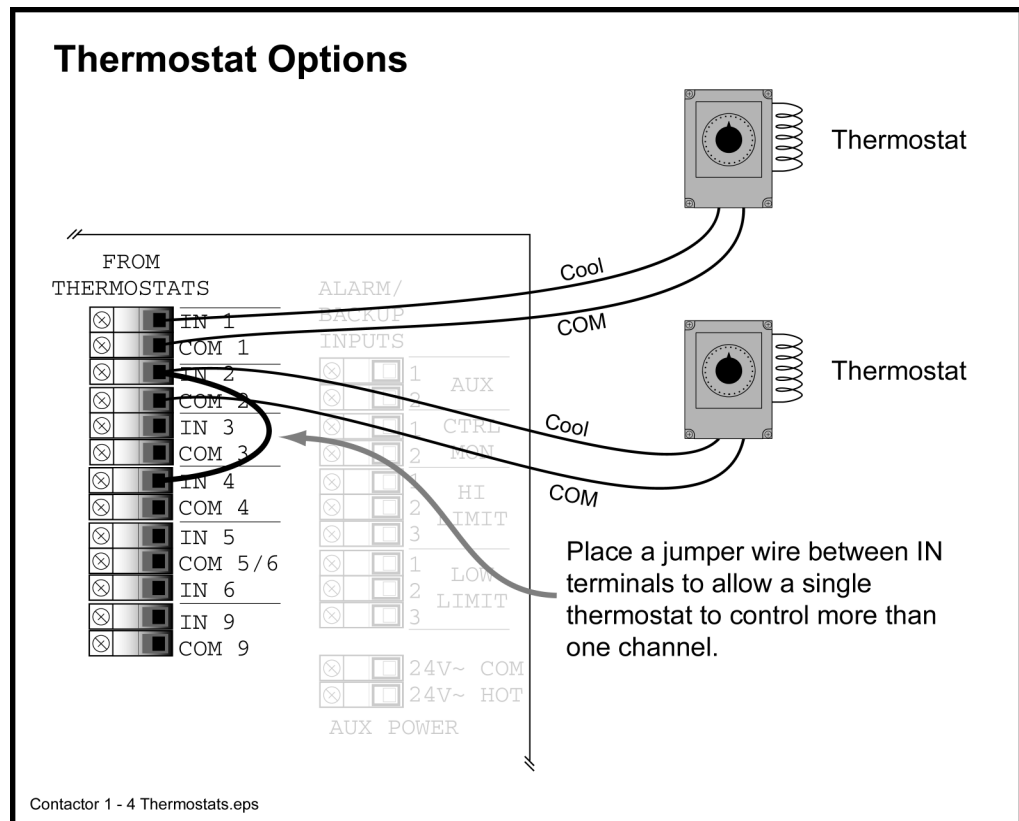
Wire Aux Input.eps

Thermostat Inputs

Channels 1 through 4 Thermostats

The IN 1-4 thermostats control CH 1-4 contactors when the ThermoTRAC is in the active backup state or configured for stand-alone operation.

Connect the thermostats to the FROM THERMOSTATS terminal block as shown below. Wire the thermostats in a way that creates a closed circuit when the desired setpoint temperature is reached.



Sharing Thermostats

Sharing thermostats across two or more channels is easily accomplished with jumper wires. The illustration above shows a thermostat shared between CH 2 and CH 4. This allows you to reduce the number of thermostats required in installations where two or more channels are turned on at the same temperature.



CH 7 and CH 8 contactors do not have thermostat inputs.

Air Inlet (Curtain) Thermostat

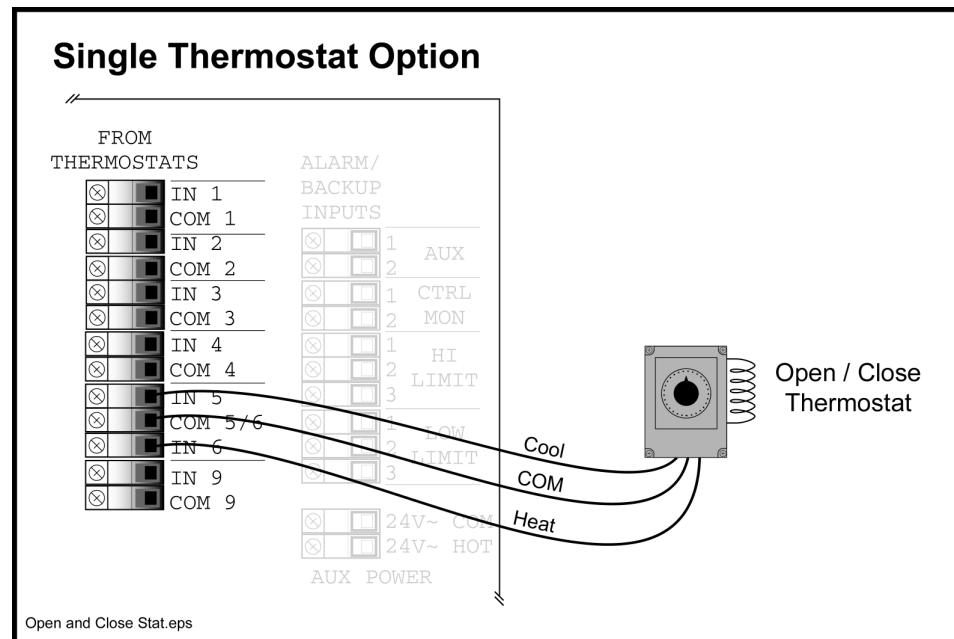
The CH 5 and CH 6 relays have interlock capability and are normally used to control the opening and closing of air inlets (or curtains).

The ThermoTRAC allows the primary controller, if present, to control these devices during normal conditions. When in an active backup state or in a stand-alone configuration, the ThermoTRAC seizes control of CH 5 and CH 6. Under this condition the thermostat(s) connected to the IN 5 and IN 6 terminals on the FROM THERMOSTAT terminal block are used to maintain the air inlet openings.

Single Thermostat Option

Using the single thermostat option requires a run/pause timer to maintain optimum temperature control and reduce equipment wear. If the ThermoTRAC Timer was installed, it has two dials dedicated to this purpose. Refer to the ThermoTRAC Timer section for more information.

The Air Inlet thermostat should be set to the desired building temperature.

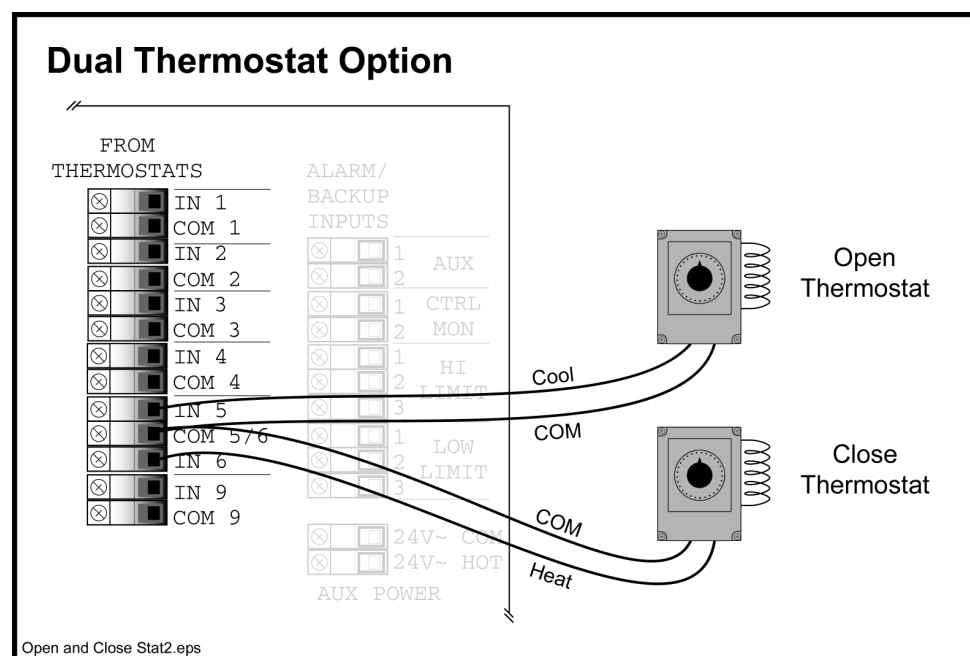


Dual Thermostat Option

The dual thermostat option should be considered if the optional ThermoTRAC Timer has not been installed. This will prevent unnecessary inlet/curtain movement when the building is within the targeted temperature range.

By wiring in a second thermostat, an inactive (dead) temperature band can be established by setting the Open Thermostat several degrees higher than the Close Thermostat. This will extend equipment life and minimize temperature swings, especially for quick reacting inlets and curtains.

Wire the thermostats in a way that creates a closed circuit when the setpoint temperature is reached.

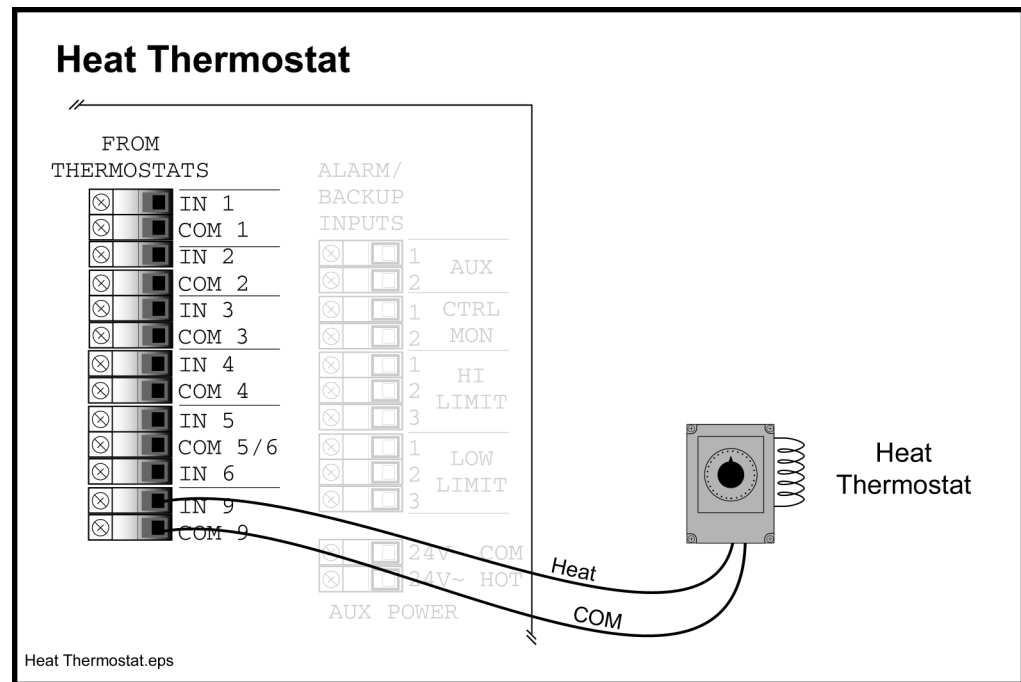


Be sure to remove the interlock jumpers when you use dual thermostat operation. Refer to the Air Inlet (Curtain) Output Channel Interlock section for more information.

Heat Thermostat

Connect a thermostat between the heat input (IN 9) terminals as shown below.

Wire this thermostat so that it creates a closed circuit when the setpoint temperature is reached.



Set this thermostat at the temperature your heating devices connected to CH 9 should turn on at.

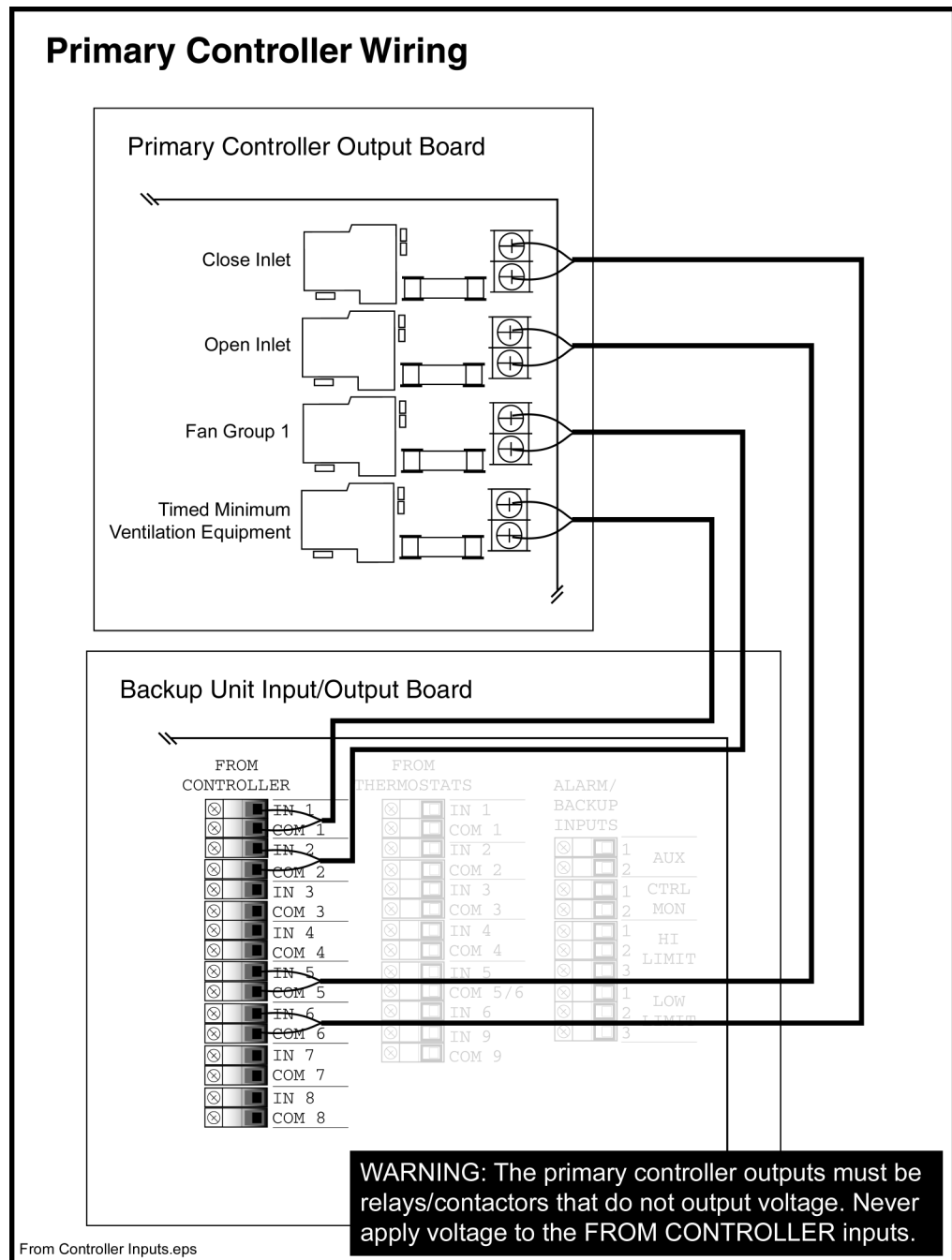
This thermostat is always enabled during stand-alone operation. It is also enabled during an active backup state when the ThermoTRAC is used as a backup to a primary controller.



CH 9 could also be used as a cooling channel. The term “heater” is used here simply as a label for the most likely use and to match the associated HEAT status light on the front panel. There is no manual override toggle switch associated with CH 9.

From Controller Inputs

Wire the output channels from your primary controller to the ThermoTRAC's FROM CONTROLLER terminal block.



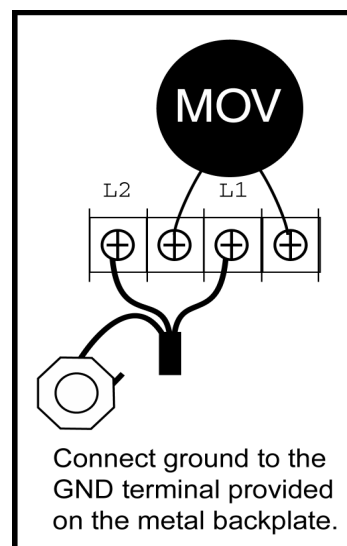
The FROM CONTROLLER inputs are disabled during active backup state and stand-alone configuration. This eliminates the possibility of a control conflict between the ThermoTRAC backup system and the primary controller.

Device Wiring

Power Transformer Input

The power transformer requires an input of 200 to 240 volts AC, 50/60 Hz.

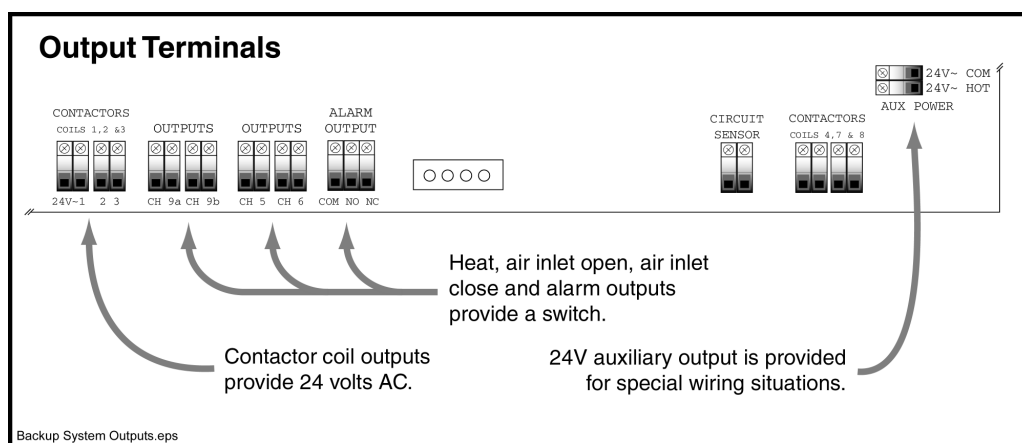
- Make power connections to terminals labeled L1 and L2. Use 14-16 gauge wire for this size terminal block.
- All wiring must be done in conformance with local and national codes.
- The maximum torque for these screw terminals is 12 inch-pounds.
- The MOV is field replaceable.



Output Terminals

All of the output terminals are located along the bottom edge of the input/output board. The CONTACTORS terminals provide 24 VAC for activating the contactors. The CH 9 (heat), CH 5 (air inlet open), CH 6 (air inlet close), and ALARM OUTPUT terminals can switch AC or DC loads from 12V to 240V.

The AUX POWER terminals makes 24 VAC available to power user-installed options and accessories. Do not draw more than .5A from these terminals.



Variable Speed Devices

The ThermoTRAC does not directly operate variable speed devices. You will need to add a variable speed control unit between the ThermoTRAC and any variable speed devices.

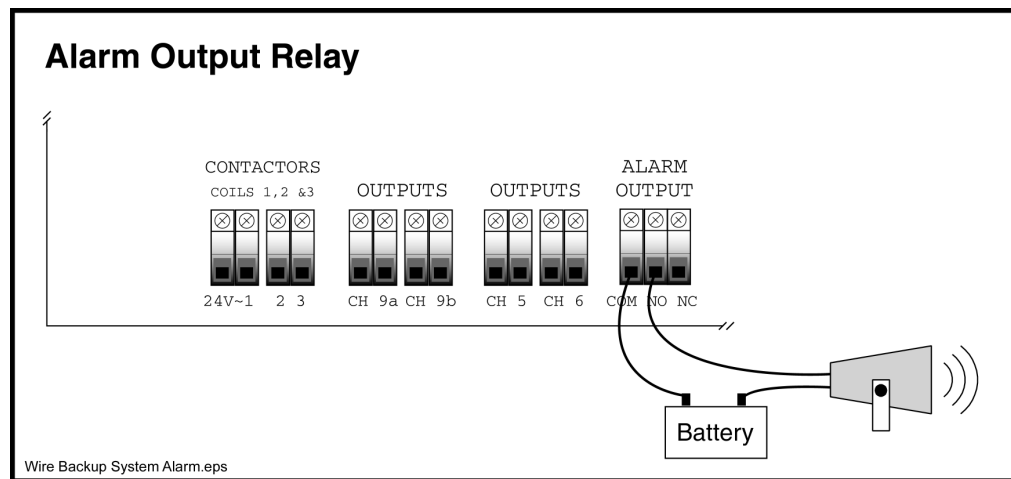
Alarm Output

AD-2000
Automatic Voice/Pager Dialer

The alarm output should be wired to a suitable device(s) such as an AD-2000 auto dialer, strobe light or siren. A backup battery to power any attached devices is recommended.

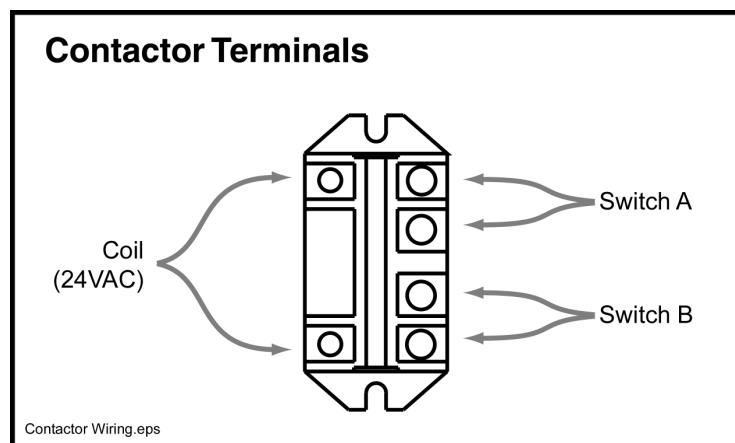
Wiring

The alarm relay and ALARM OUTPUT terminal block are on the input/output board. The normally open (NO) connection has continuity during an alarm condition. The normally closed (NC) connection has continuity when there is no alarm.



Contactor Wiring

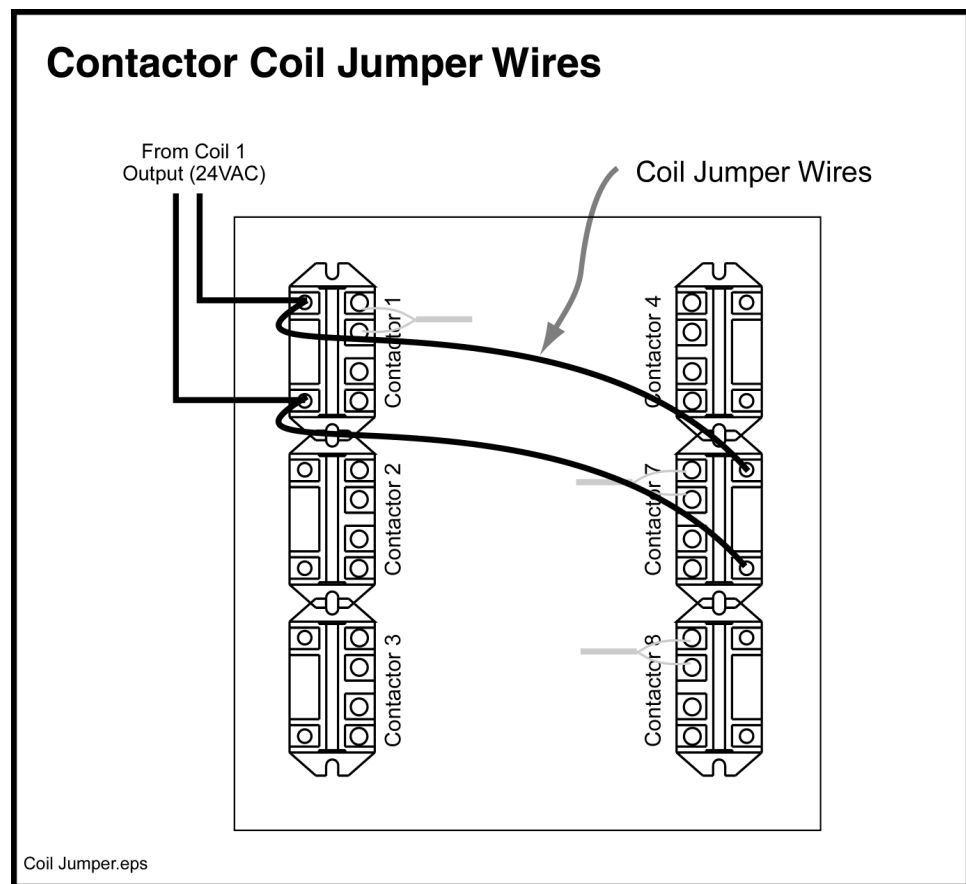
All of the standard contactor coils are wired for you. Each of these contactors can switch power to two independent circuits.



Optional 2-Pole Contactors

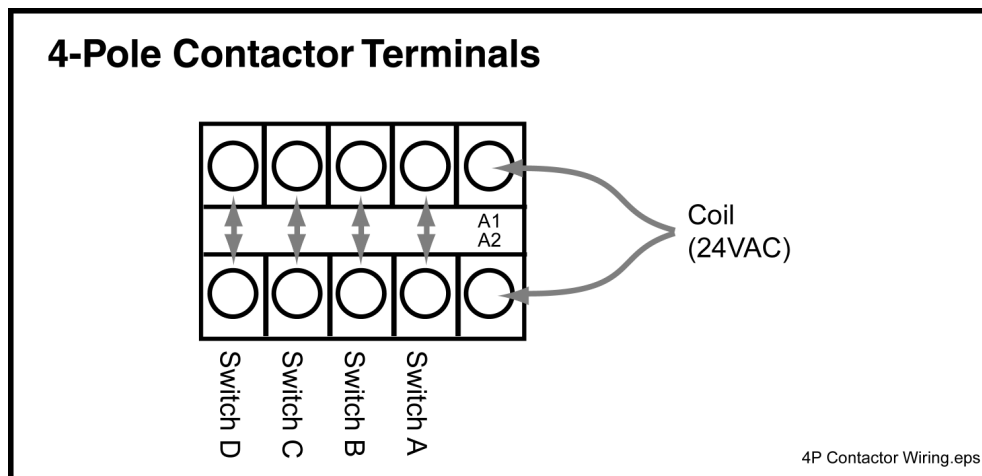
Contactors CH 7 and CH 8 are optional – and when installed operate completely independent of the backup condition (active or standby). They have FROM CONTROLLER inputs (IN 7/8) that are always enabled, but no FROM THERMOSTAT inputs. These two contactors can be used for any purpose. For example, you might:

- Attach the heater output (CH 9a or 9b) to IN 7 so a larger load can be switched. (The ON-OFF-AUTO toggle switch can now be used to manually control the heater if desired.)
- Jumper the coil connections from contactor 1 to contactor 7 as shown below to gain additional circuit switching capability.



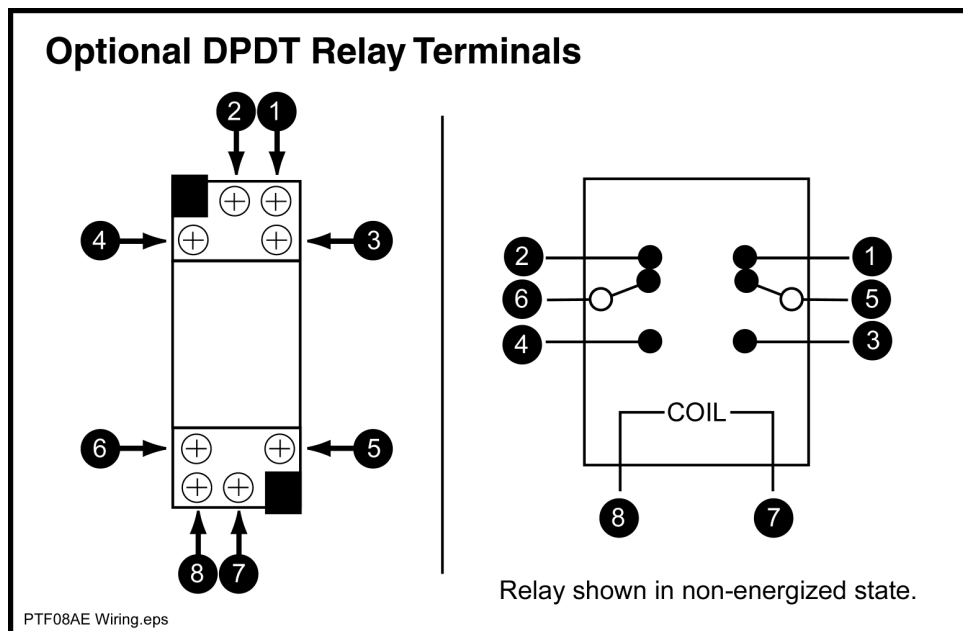
Optional 4-Pole Contactors

Any or all of the 2-pole contactors (CH 1-4 and CH 7-8) can be replaced with a 4-pole contactor to double the circuits that can be switched by a single contactor.



Optional DPDT Relays

Space is provided on the metal backplate to install two double-pole, double-throw (DPDT) relays. These optional relays provide additional wiring options such as interlocking tunnel inlets with sidewall inlets and inhibiting sidewall fans. Some wiring examples are shown near the back of this manual. You should carefully consider your ventilation needs and develop a wiring plan to meet those needs. A blank wiring worksheet is provided in the Quick Guide.



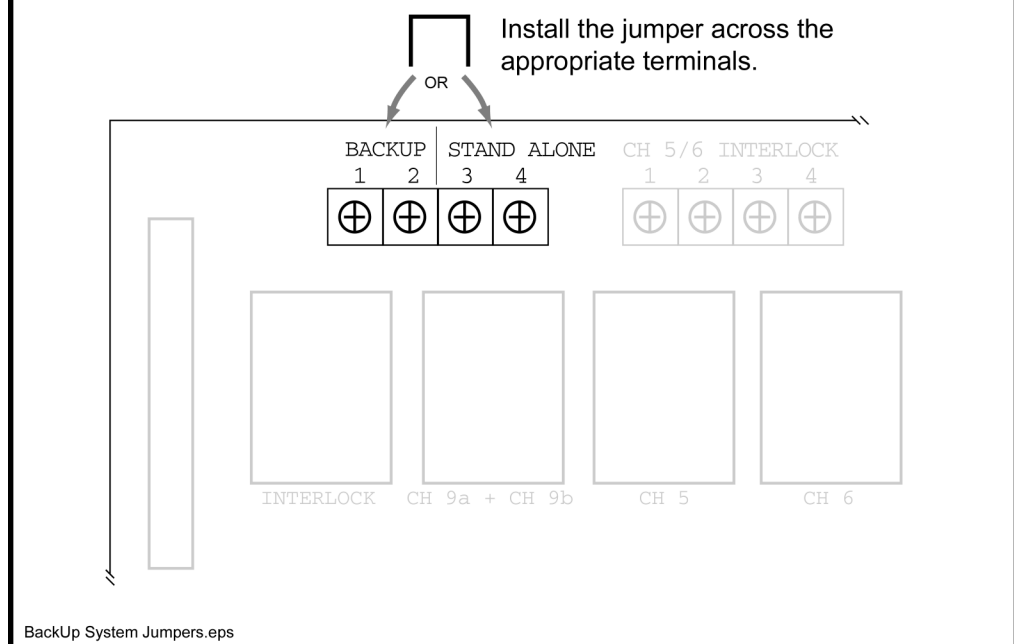
Backup / Stand-Alone Jumper and DIP Switch

ThermoTRAC Input/Output Board

You must install a jumper across terminals 1-2 or 3-4.

- If you are backing up a primary controller or using the ThermoTRAC as a contactor panel, install the jumper across terminals 1-2.
- If you are using the ThermoTRAC as a stand-alone controller, install the jumper across terminals 3-4.

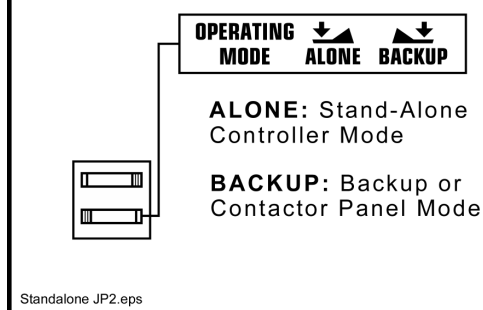
Backup / Stand-Alone Jumpers



ThermoTRAC Timer DIP Switch Setting

For Timer equipped models, set the OPERATING MODE DIP switch to ALONE or BACKUP. Refer to the illustration in the ThermoTRAC Timer section for the location of this switch.

Operating Mode DIP Switch



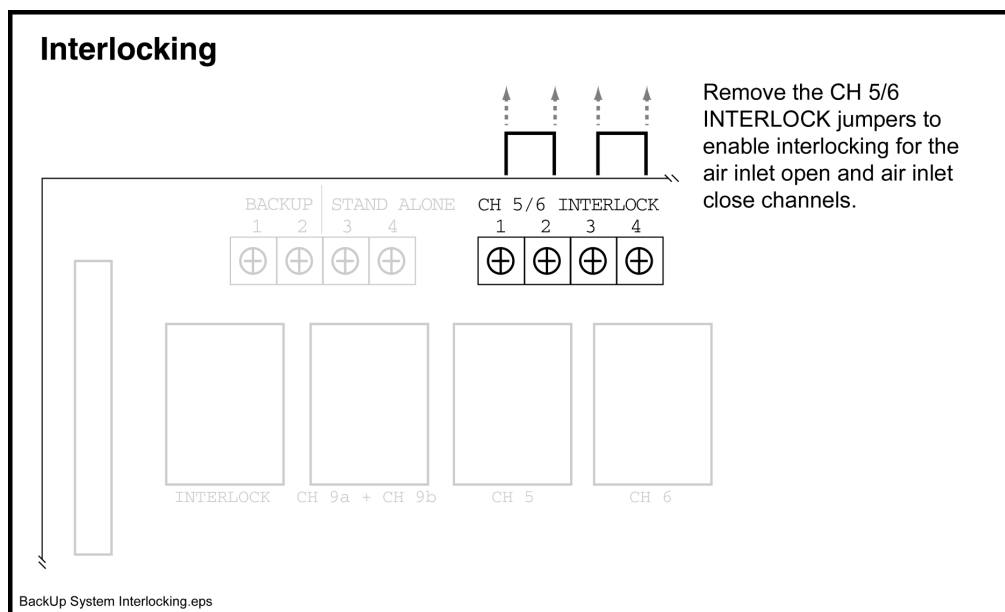
Air Inlet (Curtain) Output Channel Interlock

You must remove the CH 5/6 INTERLOCK jumpers to enable interlocking. This ensures that the air inlet open and air inlet close channels are never energized at the same time. The screw terminals are identified as 1-2-3-4.

In some situations you may want to disable interlocking or give one channel priority over the other:

- To allow both channels to come on at the same time, jumper terminals 1-2 and 3-4. This completely disables CH 5 to CH 6 interlocking.
- To give CH 6 priority over CH 5, jumper only terminals 1-2. With this jumper, a close *command* always overrides an air inlet open command.
- To give CH 5 priority over CH 6, jumper only terminals 3-4. With this jumper, an open *command* always overrides an air inlet close command.

The term “command” means a condition such as a thermostat reaching a set temperature.



To reduce the possibility of equipment problems, **do not** install the CH 5/6 INTERLOCK override jumpers. With these jumpers installed, it is possible to simultaneously activate the open and close relays. In standby mode the primary controller has control of these channels.

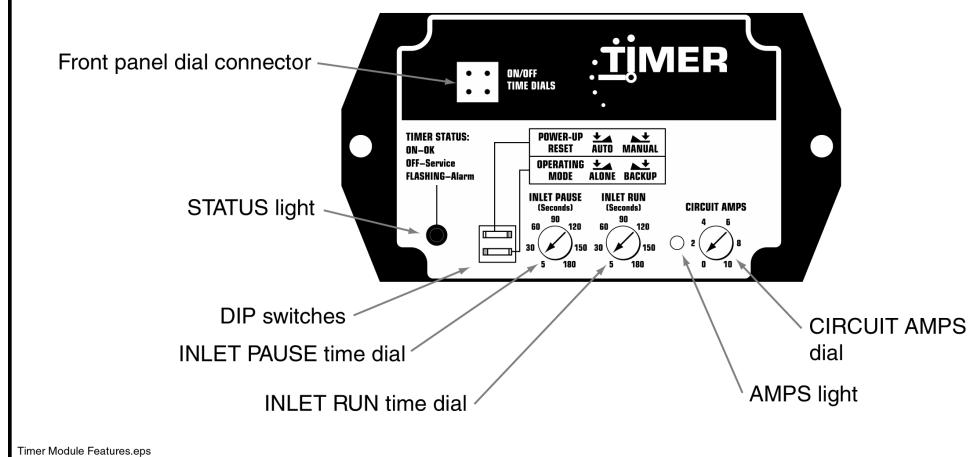
ThermoTRAC Timer

Overview

The ThermoTRAC Timer includes the following capabilities:

- Timed ON/OFF operation of the minimum ventilation output (CH 1).
- Timed RUN/PAUSE operation of an air inlet or curtain (CH 5-6).
- Power-on sequencing of CH 1-6 to reduce peak power demands.
- Ability to return to normal operation after a power interruption.
- Monitoring of critical minimum ventilation devices.

Optional Timer Features



Refer to the instructions enclosed with the ThermoTRAC Timer for mounting and wiring instructions.

In the unlikely event the ThermoTRAC Timer fails, your ThermoTRAC controller will still provide basic backup functions based on thermostat settings.



Caution: The following pages include procedures that require you to make adjustments to the ThermoTRAC Timer located inside the enclosure. Be sure to shut off all power to the ThermoTRAC and all attached devices before opening the ThermoTRAC enclosure.

Timed Minimum Ventilation

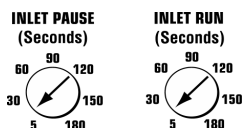


Set the ON TIME and OFF TIME dials on the ThermoTRAC front panel to the times you want to use for CH 1. The timer is enabled during an active backup state or at all times when the ThermoTRAC is used as a stand-alone controller.

The backup thermostat can always override the timer's off time. The TIMED MODE light on the front panel illuminates when the ThermoTRAC Timer is controlling CH 1.

If you are using the AmpGuard sensor, refer to the Minimum Ventilation Monitoring section of this manual for more information about how these dials are used.

Timed Run/Pause Air Inlet Operation



Set the INLET RUN and INLET PAUSE dials to the times you want to use when opening or closing the air inlets (CH 5-6).

The ThermoTRAC Timer controls the run and pause times associated with the open and close channels when the ThermoTRAC is in an active backup state or configured as a stand-alone controller.

Power Sequencing

The ThermoTRAC activates output channels in stages to reduce the surge on the power system if any of the thermostats for CH 1-4 or the timed circuits (CH 1, CH 5-6) are set to turn on at the same time during:

- A restart after a power interruption. This will cause an initial 10-second delay before applying power to CH 2-4 and CH 5-6.
- Transition from standby to active backup state.

This feature is especially beneficial at sites where a backup generator is used.

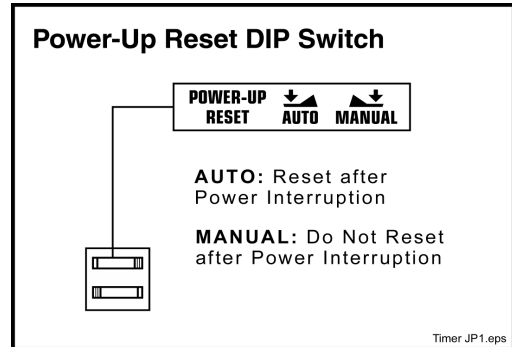
Delay after power up or transition	Output channel
0 seconds	CH 1
3 seconds	CH 5 or 6
8 seconds	CH 2
13 seconds	CH 3
18 seconds	CH 4

This sequence assumes thermostats are activating all channels. The sequence would skip any channels not being activated by a thermostat.

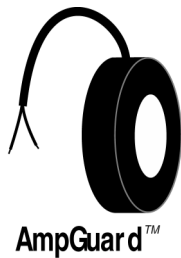
Power-Up Reset

The ThermoTRAC can be configured to remain in an active backup/alarm state after a power interruption or to automatically reset if no alarm conditions exist.

The POWER-UP RESET switch located on the ThermoTRAC Timer determines which action will be taken.



With the automatic reset feature enabled, if a backup/alarm condition exists after a power up, the ThermoTRAC returns to the active backup/alarm state until the condition is fixed. The RESET switch on the front panel must be flipped to resume normal operation.

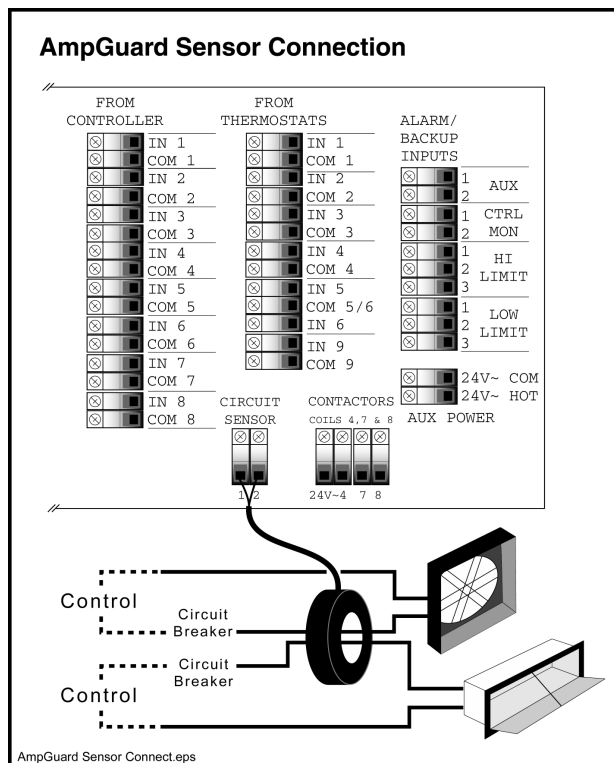


Minimum Ventilation Monitoring

The AmpGuard feature provides a way to monitor minimum ventilation devices such as fans and air inlets. When AmpGuard detects a drop in load current, it causes a switch over to an active backup/alarm state.

Attach the AmpGuard sensor to the CIRCUIT SENSOR terminal block and wire in your minimum ventilation devices.

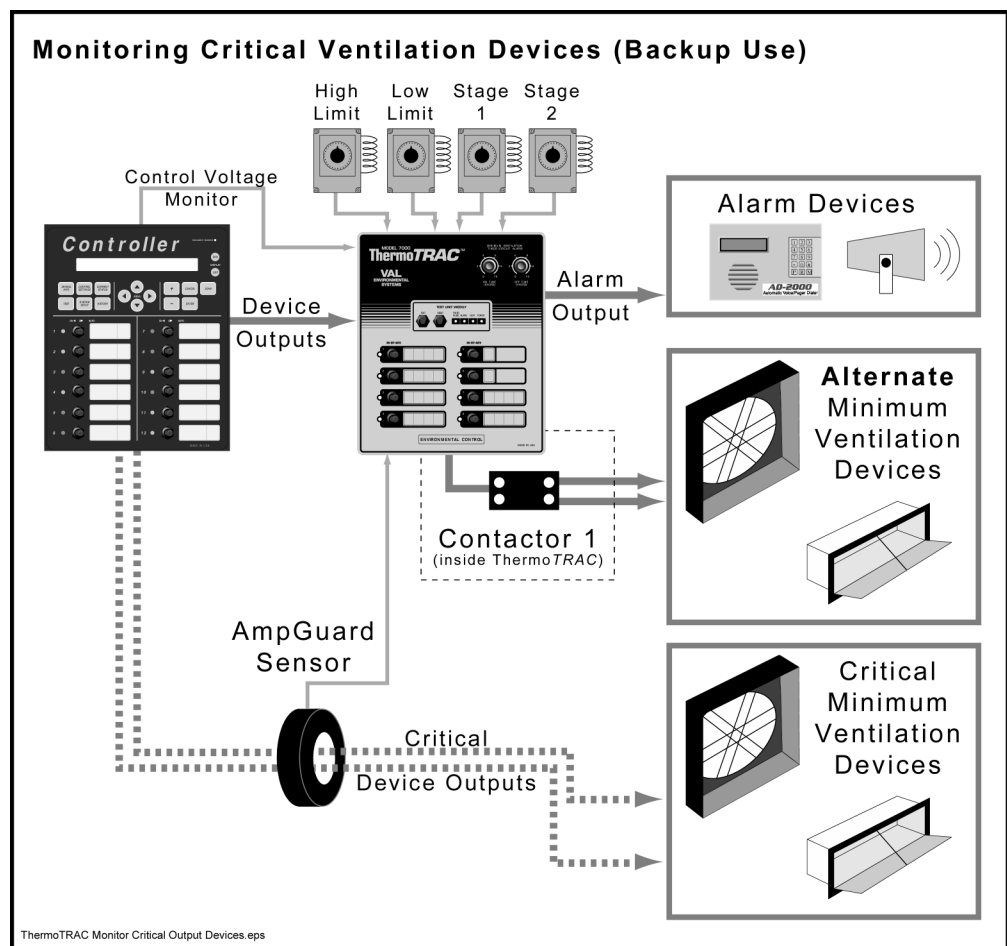
See the illustrations on the next two pages.



AmpGuard (Backup Use)

In the configuration shown below, the AmpGuard sensor constantly monitors the power level and on/off times of the critical minimum ventilation devices operated by the primary controller.

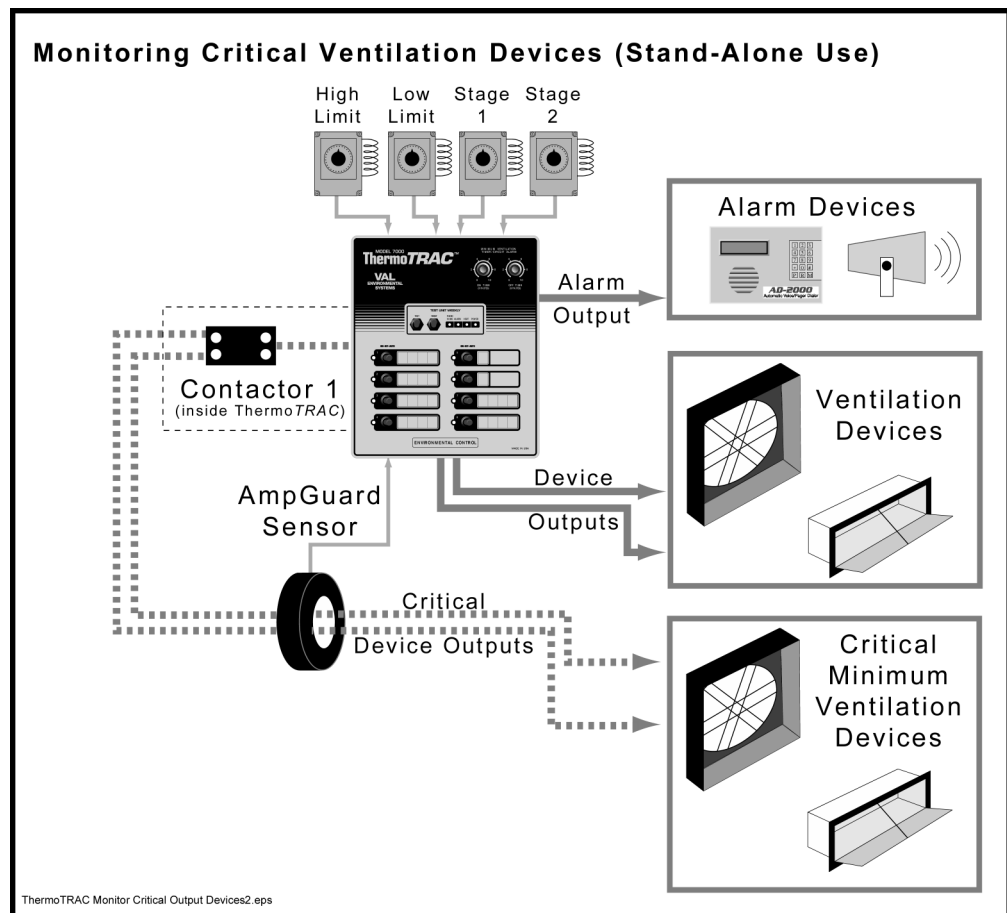
When AmpGuard senses a power-related problem, it automatically energizes the alarm output and turns on **alternate** minimum ventilation devices connected to CH 1, ensuring adequate fresh air in the building. Typically, the ON TIME and OFF TIME dials on the ThermoTRAC are set to the same time settings used for the primary controller's critical minimum ventilation equipment.



AmpGuard (Stand-Alone Use)

When the ThermoTRAC is used as a stand-alone controller, the AmpGuard sensor monitors power to critical minimum ventilation devices connected to CH 1.

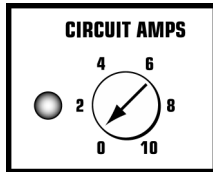
When AmpGuard senses a power-related problem, it automatically energizes the alarm output to notify of a potential life threatening condition. This output could alternately be wired to a contactor that would switch on additional minimum ventilation devices.



How the AmpGuard Works

The AmpGuard feature monitors the “Load” current (Amps) drawn when the minimum ventilation devices are running and the maximum OFF Time when they are stopped. Setting the OFF TIME dial to zero requires the monitored devices to be running continuously.

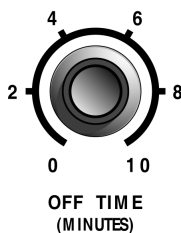
CIRCUIT AMPS Dial Setting



This setting determines how much load current must be drawn when the monitored devices are running. Set the CIRCUIT AMPS dial at 0 to disable the AmpGuard feature. Follow the steps below to properly set this dial.

- 1 Verify that only one wire from each minimum ventilation device has been routed through the AmpGuard sensor.
- 2 Turn the minimum ventilation devices on and visually verify proper operation of the equipment.
- 3 Turn the CIRCUIT AMPS dial on the ThermoTRAC Timer fully clockwise to 10. If the CIRCUIT AMPS light does not go off, go to step 5.
- 4 Now slowly turn the dial back toward 0 stopping at exactly the point where the light turns on.
- 5 If the light is on when the dial is at or near 10 (the load current is greater than 10 Amps), turn off the monitored equipment. If the light turns off, the AmpGuard will work. If not, recheck your wiring and confirm the dial is at 10. You may need to reduce the number of circuits being monitored.

Off Time for Monitored Devices



Set the OFF TIME dial on the front panel to match the expected off time for the devices. During operation, the actual device off time is compared to the OFF TIME dial setting. As long as the actual time is less than the dial setting, no alarm is generated.

The minimum power-on time is fixed at 10 seconds, independent of the front panel ON TIME dial setting. Setting the ON TIME dial to 0 disables the AmpGuard feature.

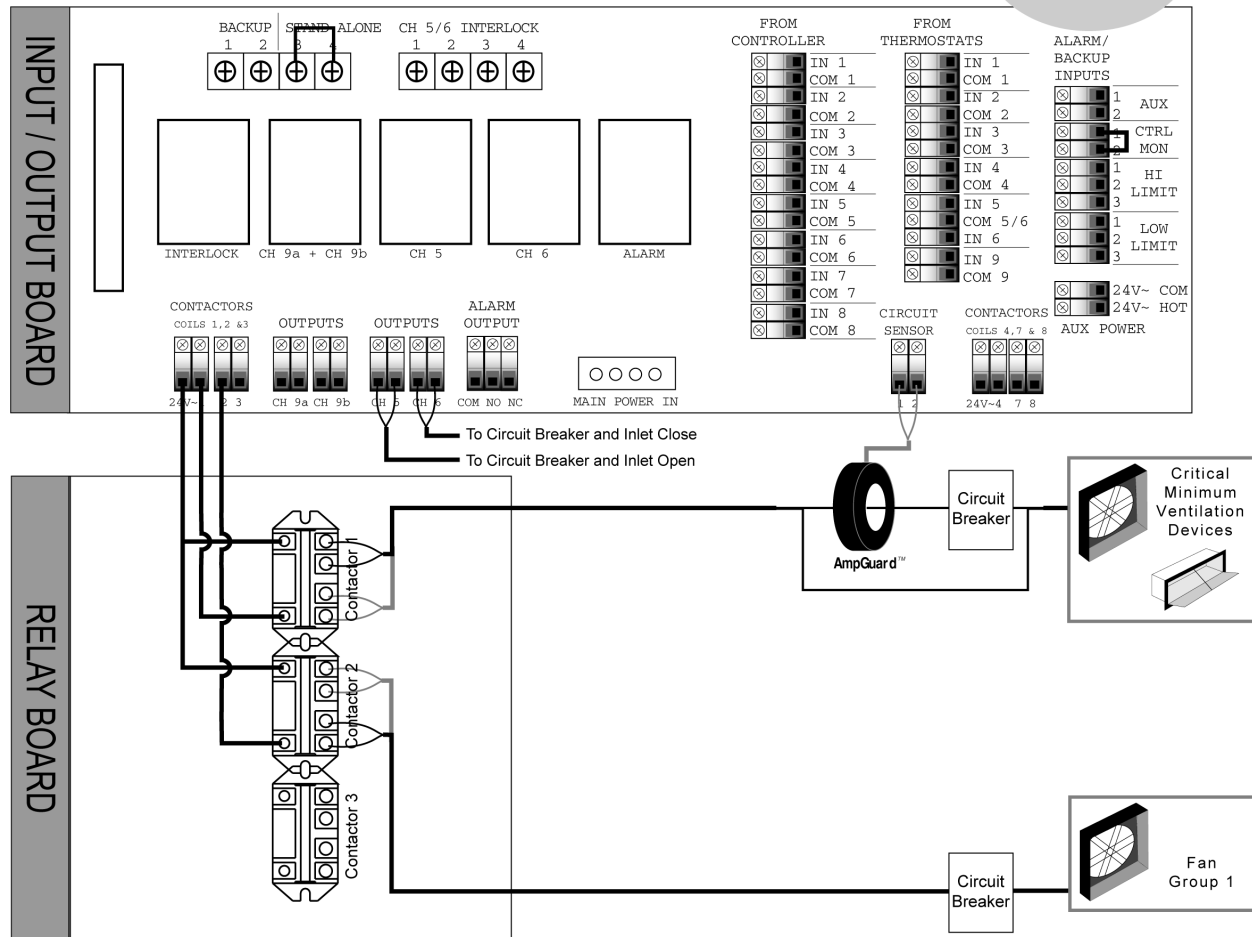


When used as a backup system, always set the ThermoTRAC OFF TIME dial to a little longer than the primary controller's off time to prevent false alarms. (The alarm sounds when the power-off period for devices connected to CH 1 exceeds the OFF TIME dial setting.)

System Wiring Examples

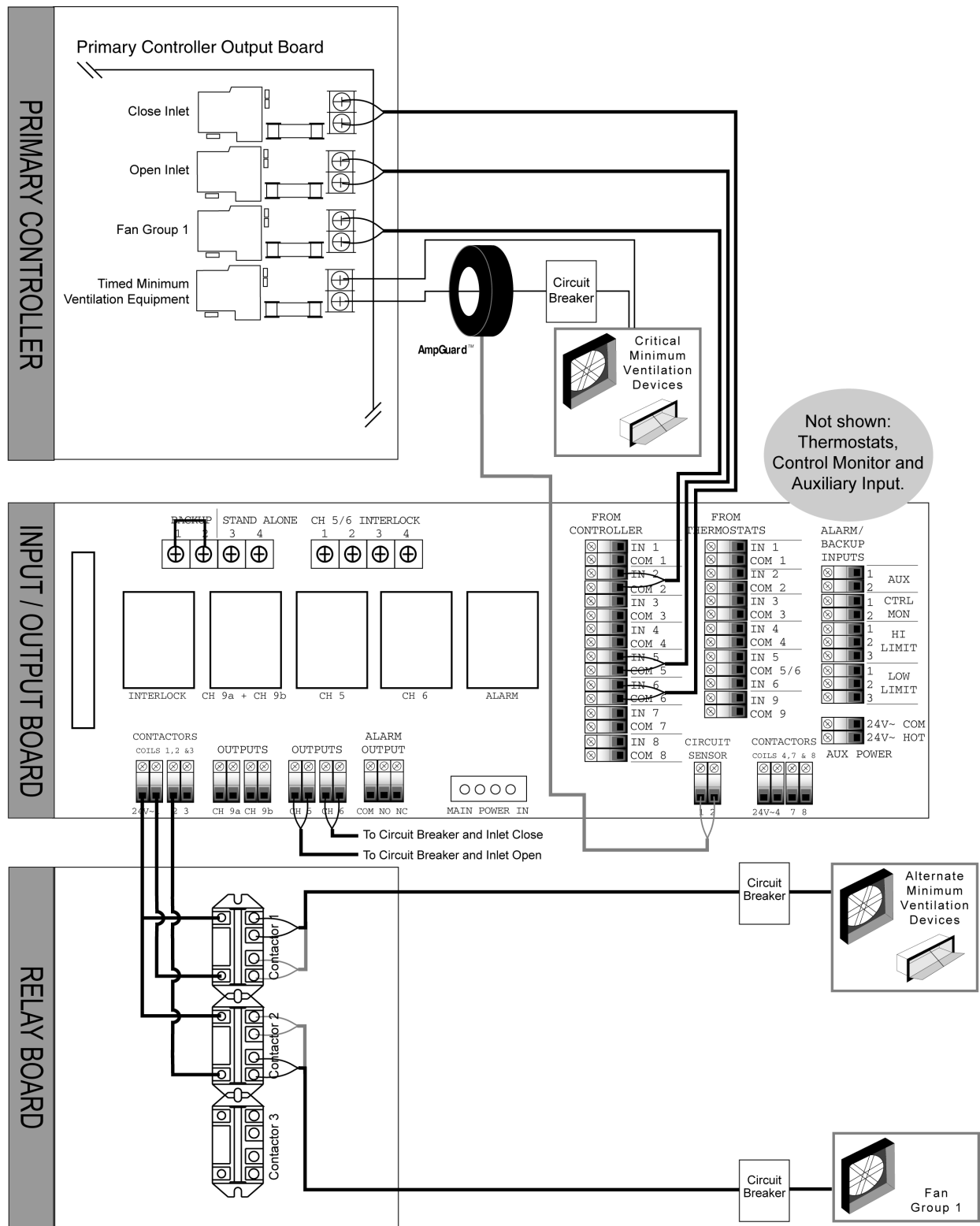
Stand-Alone Operation with AmpGuard

Not shown:
Thermostats and
Auxiliary Input.



Wire Stand Alone Mode.eps

Backup / Contactor Panel Operation with AmpGuard



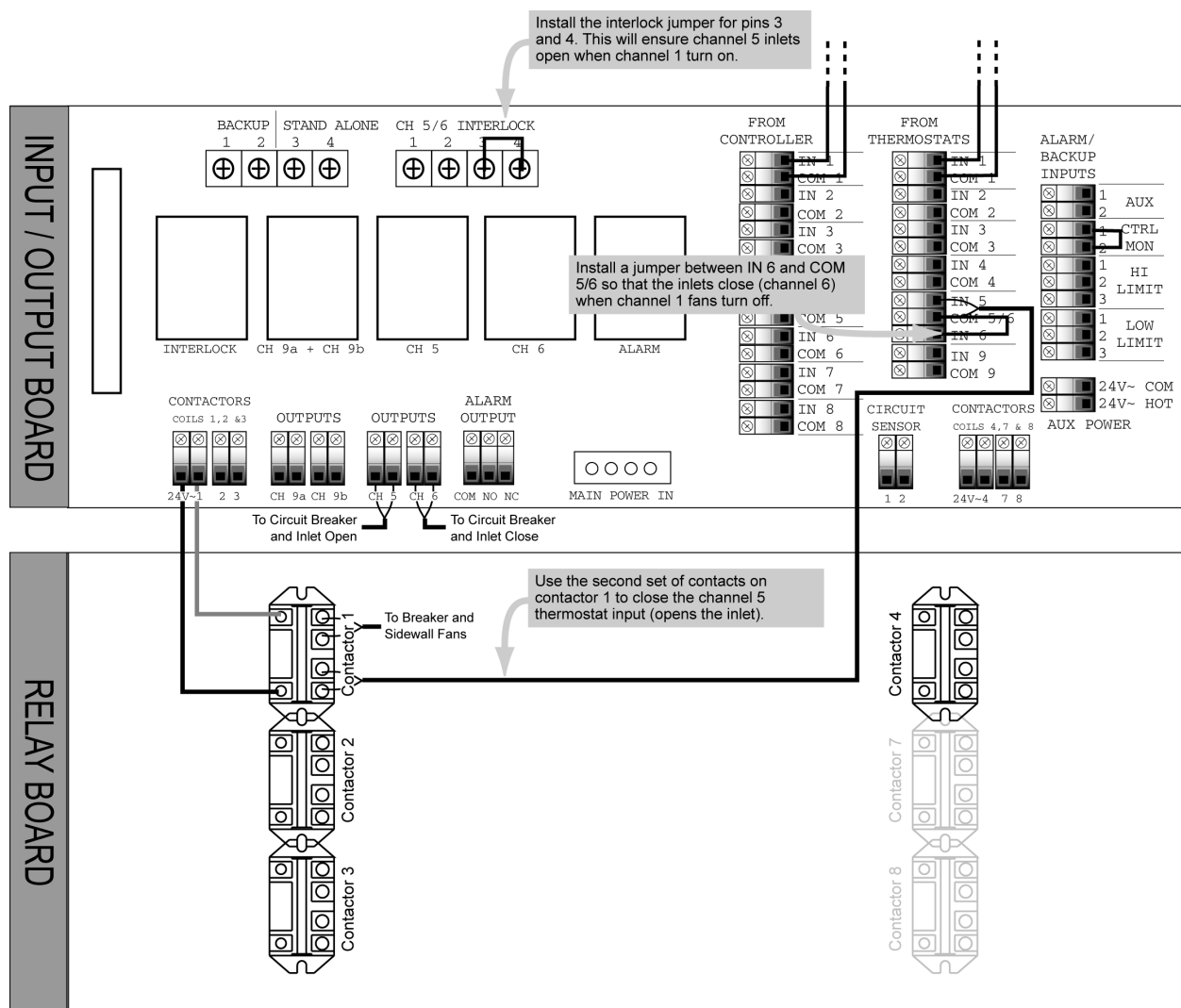
Wire Backup Mode.eps

Synchronizing Timed Fans with Inlets

This wiring example shows how to synchronize inlet and fan operation. It requires the ThermoTRAC Timer to be installed. When CH 1 fans are running, CH 5 (inlet open) is turned on. When CH 1 fans are off, CH 6 (inlet close) is turned on.

The inlet pause time is still enabled so you may want to turn the INLET PAUSE dial (on the ThermoTRAC Timer) to zero. A three second pause automatically occurs when the inlet switches direction to eliminate the possibility of damage to your inlet motor due to a sudden direction change.

The CH 5/6 INTERLOCK jumper and the jumper across IN 6 and COM on the FROM THERMOSTAT terminal block are what creates the normally closed inlet with the ability to open when CH 1 fans turn on.



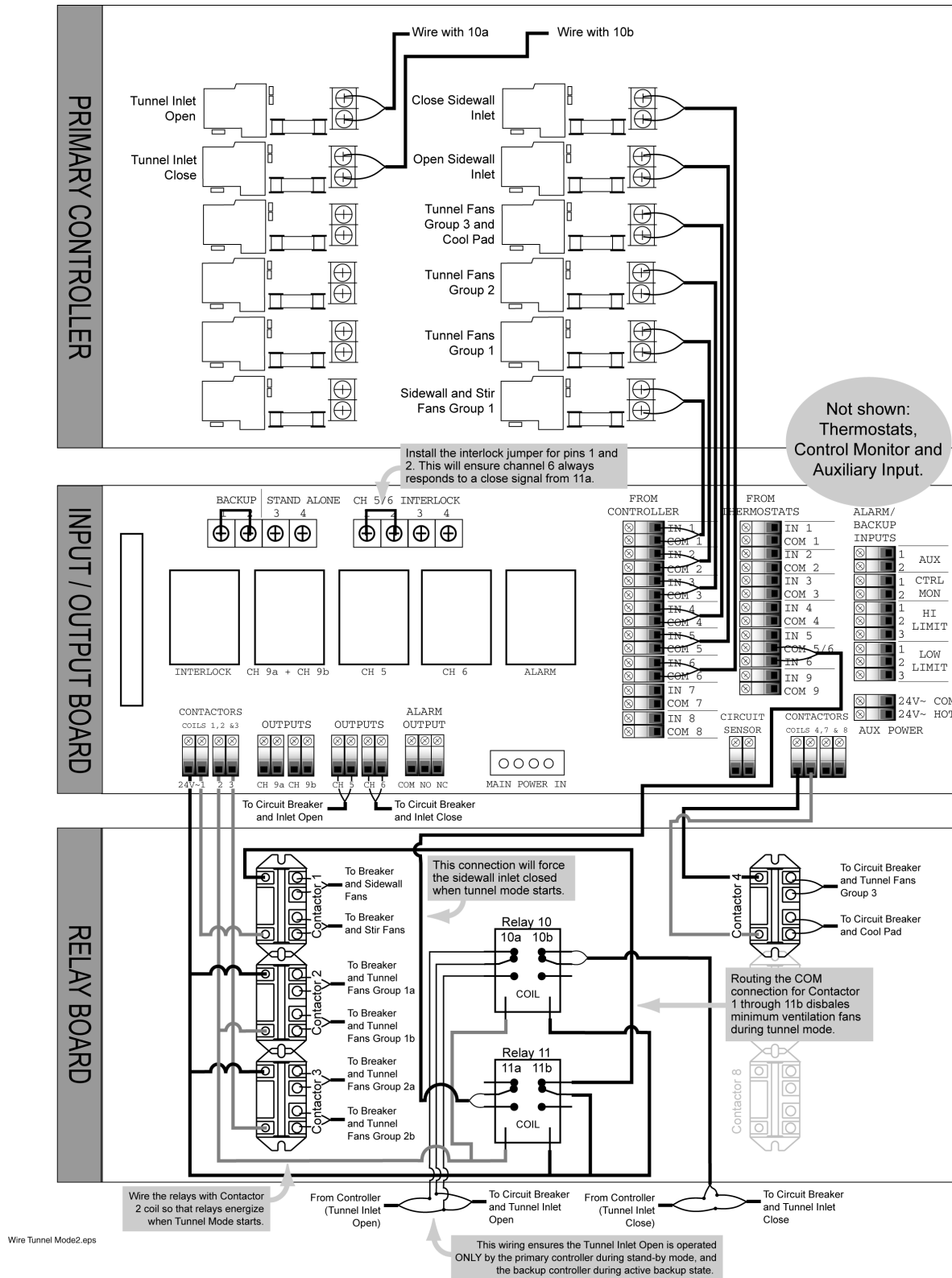
Sync fans and inlets.eps

Standby Mode - Tunnel Transition

Many buildings use sidewall ventilation most of the time, but transition to one or more stages of tunnel ventilation on warm days. The example below and the wiring illustration on the next page show how the ThermoTRAC can be used to back up a primary controller that provides sidewall ventilation with the ability to transition to three stages of tunnel ventilation.

See the wiring example on next page.

Channel	Inputs Used	Equipment Controlled	Comments
CH 1a	Control and Thermostat	Sidewall Fans	Contactor 1 is inhibited during tunnel mode (see connection to 11b).
CH 1b		Stir Fans	
CH 2a	Control and Thermostat	Tunnel Fan Group 1a	First stage of tunnel ventilation.
CH 2b		Tunnel Fan Group 1b	
CH 3a	Control and Thermostat	Tunnel Fan Group 2a	Second stage of tunnel ventilation.
CH 3b		Tunnel Fan Group 2b	
CH 4a	Control and Thermostat	Tunnel Fan Group 3	Third stage of tunnel ventilation.
CH 4b		Cool Pad	Evaporative cooling.
CH 5	Control and Thermostat	Sidewall Inlet Open	Sidewall inlet is forced closed during tunnel mode (see connection to 11a).
CH 6		Sidewall Inlet Close	
CH 7a			Not used in this example.
CH 7b			Not used in this example.
CH 8a			Not used in this example.
CH 8b			Not used in this example.
CH 9a			Not used in this example.
CH 9b			Not used in this example.
CH 10a	Parallel with Contactor 2 Coil.	Tunnel Inlet Open.	Wire with primary controller output so that tunnel inlet is forced open when relay 10 is energized.
CH 10b		Tunnel Inlet Close	Wire normally closed in series with primary controller output. Note: <i>Once opened, the tunnel inlet may not close during an active backup state. This temporary situation is acceptable in most applications.</i>
CH 11a	Parallel with Contactor 2 Coil.	Sidewall Inlet Close.	Connect normally open to CH 6 thermostat input (forces sidewall inlet closed during tunnel mode).
CH 11b		Inhibit Contactor 1	Wire normally closed in series with contactor 1 coil.

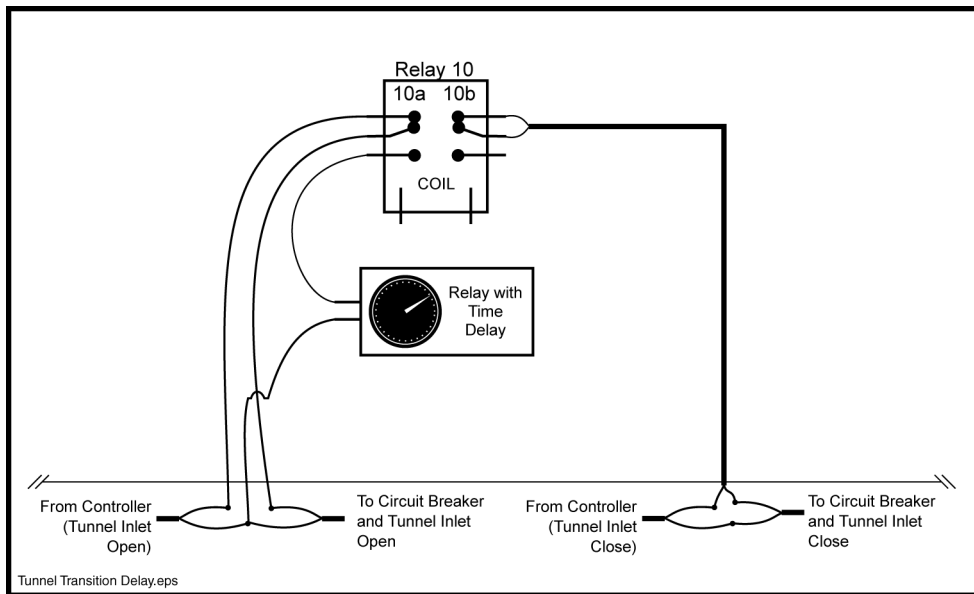


The ON/OFF status light on the front panel for CH 1 may remain on even after CH 1 has been disabled by 11b because the light operates independent of contactor 1. However, the contactor will be inactive.

Standby Mode - Tunnel Transition with Curtain Delay

Some curtain machines need a few seconds of delay between open and close motions. The illustration below shows how a delay relay can be added to Relay 10 to provide a pause before a tunnel curtain is opened. This provides the needed delay if a tunnel curtain happens to be closing when the ThermoTRAC goes into backup mode.

The illustration is an option to the tunnel transition illustration shown on the previous page. Relay 10 and the Relay with Time Delay are both optional parts.

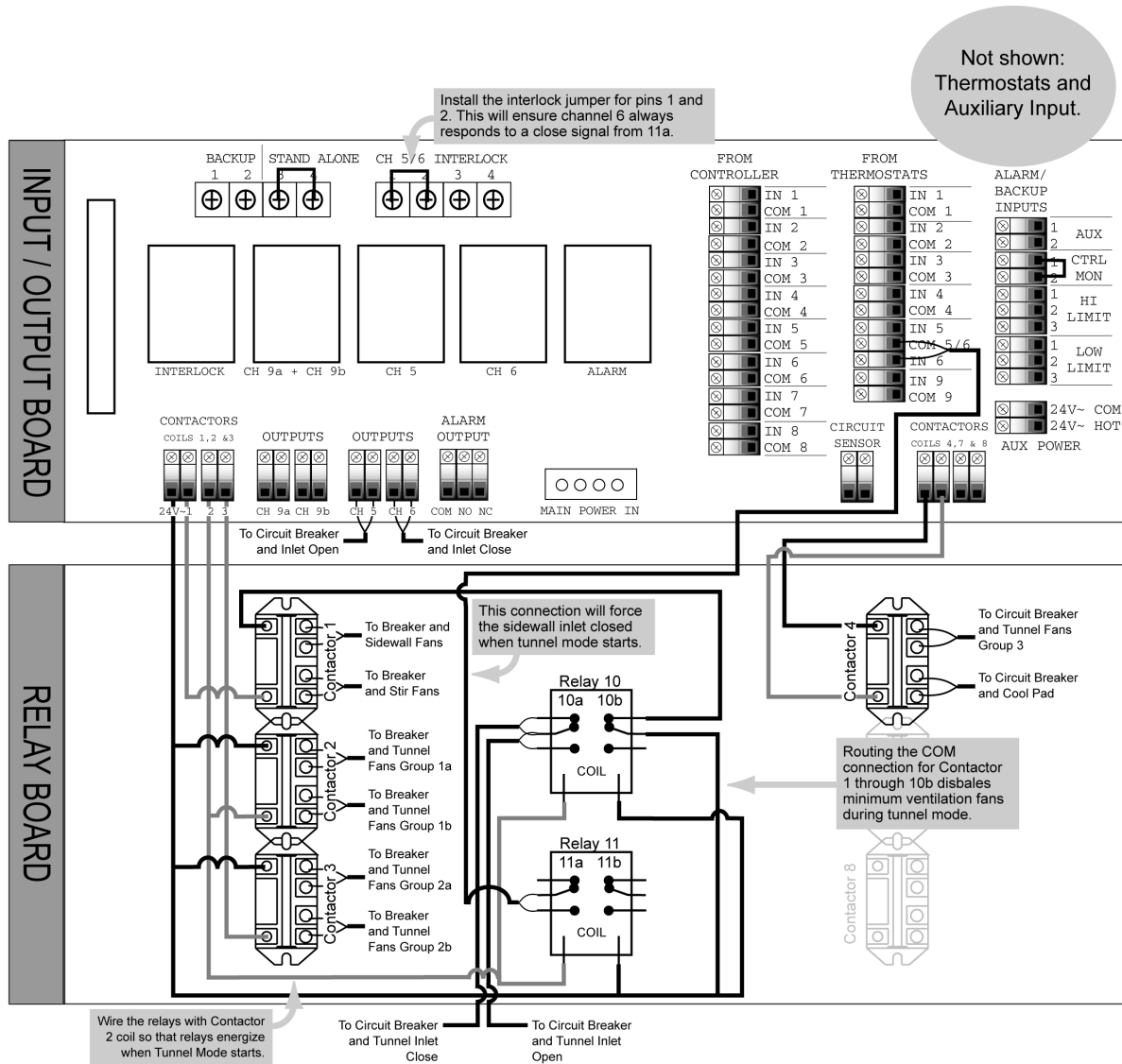


Stand-Alone Mode - Tunnel Transition

Many buildings use sidewall ventilation most of the time, but transition to one or more stages of tunnel ventilation on warm days. The example below and the wiring illustration on the next page show how the ThermoTRAC can be used as a stand-alone controller that provides sidewall ventilation with the ability to transition to three stages of tunnel ventilation.

See the wiring example on next page.

Channel	Inputs Used	Equipment Controlled	Comments
CH 1a	Thermostat	Sidewall Fans	Contactor 1 is inhibited during tunnel mode (see connection to 10b).
CH 1b		Stir Fans	
CH 2a	Thermostat	Tunnel Fan Group 1a	First stage of tunnel ventilation.
CH 2b		Tunnel Fan Group 1b	
CH 3a	Thermostat	Tunnel Fan Group 2a	Second stage of tunnel ventilation.
CH 3b		Tunnel Fan Group 2b	
CH 4a	Thermostat	Tunnel Fan Group 3	Third stage of tunnel ventilation.
CH 4b		Cool Pad	Evaporative cooling.
CH 5	Thermostat	Sidewall Inlet Open	Sidewall inlet is forced closed during tunnel mode (see connection to 11a).
CH 6		Sidewall Inlet Close	
CH 7a			Not used in this example.
CH 7b			Not used in this example.
CH 8a			Not used in this example.
CH 8b			Not used in this example.
CH 9a			Not used in this example.
CH 9b			Not used in this example.
CH 10a	Parallel with Contactor 2 Coil.	Tunnel Inlet Open & Close.	
CH 10b		Minimum Ventilation Inhibit	Wire normally closed in series with contactor 1 coil.
CH 11a	Parallel with Contactor 2 Coil.	Sidewall Inlet Close.	Connect normally open to CH 6 thermostat input (forces sidewall inlet closed during tunnel mode).
CH 11b			Not used in this example.



Wire Tunnel Model1.eps



The ON/OFF status light on the front panel for CH 1 may remain on even after CH 1 has been disabled by 10b because the light operates independent of contactor 1. However, the contactor will be inactive.

Troubleshooting

Check This First!

If this is a new installation, or if an electrician has recently worked on the system, the first troubleshooting step should be to look for installation related problems as listed below. *The troubleshooting symptoms and recommended corrective actions assume that you have first checked for these possible conditions.*

- 1** Ribbon cables are correctly installed and fully seated.
- 2** The appropriate CH 5/6 INTERLOCK jumpers are installed or removed and the screws are tight.
- 3** Backup/Stand-alone jumper is correctly installed and the screws are tight.
- 4** Plug-in relays are all installed and fully seated.
- 5** All wiring is correct and complete.
- 6** TIMER INSTALLED / TIMER BYPASSED switch is set correctly.
- 7** Front panel dials cable is fully seated in Timer connector.
- 8** Dials and configuration switches on Timer are set correctly.

Troubleshooting Aids

- 1** The 24V AUX POWER terminals may be used as a temporary source of 24 VAC to troubleshoot relay/contactors problems. Simply connect wires from these terminals to the coil terminals of any suspect relays.
- 2** Swap CH 5, CH 6 and CH 9 relays to determine if one of these relays is bad.

Power Light Off (or dim)

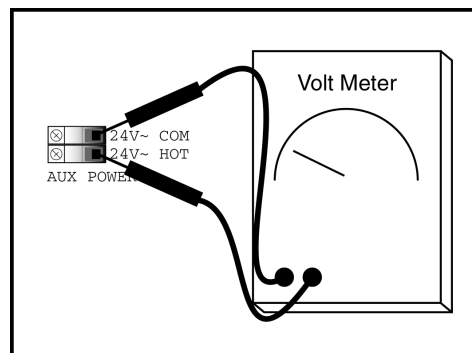
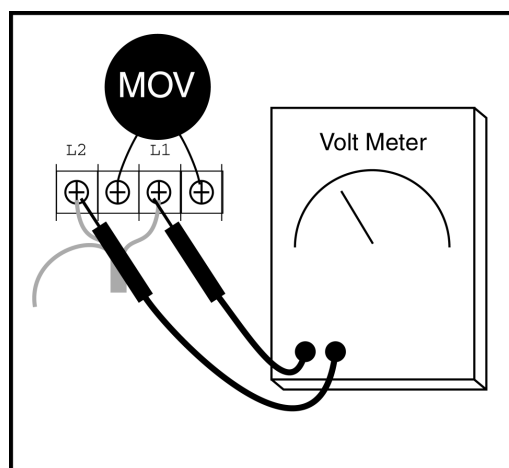
The POWER light on the front panel monitors the transformer's 24V secondary output. The 24V powers the circuitry that operates the relays and contactors.

If the power, alarm, or channel status lights are dim, disconnect power for a minimum of 30 seconds to reset the solid-state fuse. If the lights come on briefly and then go out or dim again, a wiring short may exist. Check all of your 24V wiring.

If the light does not illuminate after power is applied to the ThermoTRAC:



- 1** Check the circuit breaker and power wiring to the ThermoTRAC.
- 2** Open the enclosure and locate the L1-L2 terminals on the transformer assembly. Confirm the voltage measures 200-240V.
- 3** Check that the 4-pin power cable on the transformer assembly is fully seated.
- 4** Locate the AUX POWER output terminal block. The transformer is OK if the voltage here measures 22 to 26V.
- 5** Check your 24V wiring. Improper wiring of the 24V circuitry, an overloaded transformer or a shorted relay/contactors coil will cause the resettable fuse on the transformer assembly to momentarily open up. A systematic method of disconnecting wires and relays will reveal the location of the short.
- 6** Check to be sure the ribbon cable is fully seated at both ends.



Temporary 24 VAC Power

One option to keep equipment running, on a temporary basis, is to place a jumper wire across the appropriate contactor output terminals. The other is to wire-in a temporary transformer as described below. Any 20VA or larger transformer will work. Check with your local electrician or HVAC dealer for availability.



- 1 Disconnect all power to the ThermoTRAC.
- 2 Disconnect and remove the existing transformer. With the transformer disconnected, all ThermoTRAC Timer functions are lost. This solution provides basic, non-timed functions.
- 3 Connect the 24 VAC terminals on the temporary transformer to the AUX POWER terminal block.
- 4 Connect the 115/230 VAC terminals on the transformer to a power source.



The AUX POWER terminals are normally used for powering accessories but can also serve as input power terminals on a temporary basis.

Alarm will not “Reset” (ALARM light stays on)

- 1 Verify all ALARM/BACKUP INPUTS have a closed circuit. Temporarily short out each input and flip the RESET switch to locate the culprit.
- 2 If you are using the Control Voltage Monitor, is the primary controller receiving power? Does the primary controller appear to be working?
- 3 Swap the INTERLOCK plug-in relay with the ALARM relay to confirm the alarm relay is operating properly.
- 4 For ThermoTRAC Timer equipped units, check the TIMER STATUS light inside the enclosure. A blinking light indicates an alarm condition was detected (refer to the next section: Correcting ThermoTRAC Timer Problems). Replace Timer if the light is not illuminated. Check that all cables are firmly attached.
- 5 Are the AmpGuard monitored devices all operating properly? Is the CIRCUIT AMPS dial set correctly?

Correcting ThermoTRAC Timer Problems

If the ThermoTRAC Timer does not appear to be working properly, check the following:

- 1** Are Timer cables fully seated into connectors?
- 2** Is the TIMER INSTALLED/BYPASSED slide switch set correctly.
- 3** Are the front panel dials plugged into the Timer?
- 4** Are the POWER-UP RESET and OPERATING MODE switches on the Timer set correctly?
- 5** Are the three dials on the Timer set correctly?
- 6** Is the TIMER STATUS light on or flashing? If not, replace Timer.
- 7** Is the AmpGuard circuit sensor installed properly?

Timer LED Status Codes

LED State	Status
Continuous ON	Normal
1 flash, then pause	Backup/alarm state triggered at ALARM/BACKUP INPUTS terminal block or there was power interruption
2 flashes, then pause	AmpGuard detected a problem
3 flashes, then pause	Timer detected a low power input
Continuous OFF	Severe Timer failure or not receiving power

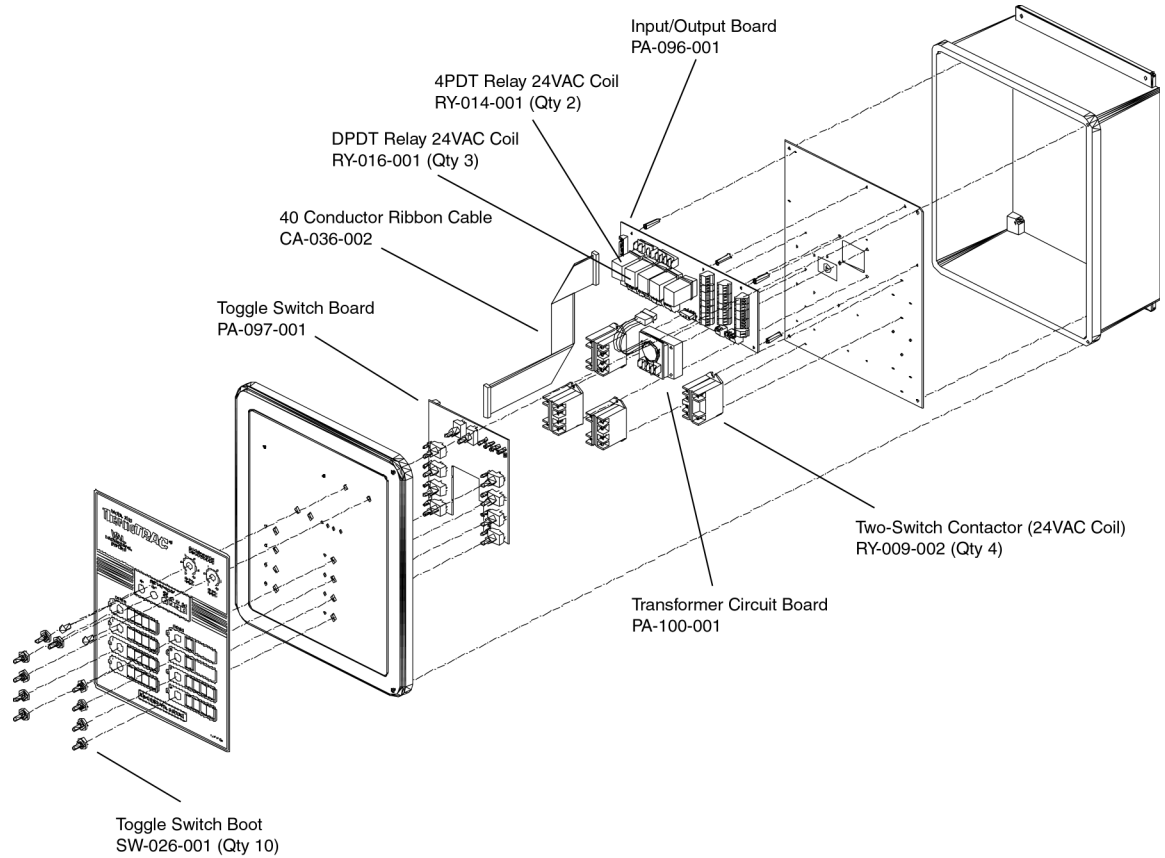
Power Outage Causes Unwanted Backup State

The optional ThermoTRAC Timer has a POWER-UP RESET switch that allows the ThermoTRAC to reset to standby mode after a power interruption (as long as no other alarm conditions exist). However, a short power outage between 50 and 300 milliseconds may leave the ThermoTRAC in an unwanted backup state. This sometimes occurs when power is switched from a line to a generator by a power company as part of an energy-saving program.

If this occurs, a time delay relay is available to solve the problem. The relay is wired into the input power of the ThermoTRAC to ensure any power interruption always exceeds 300 milliseconds.

Appendix

Parts Diagram



Specifications

Operating Temperature Range: 32° to 120° Fahrenheit / 0° to 50° Celsius

Power Input: 200 to 240 volts AC, 50/60 Hz. (Includes surge protection)

Transformer Fusing: Soldered in place – self-resetting type.

Load Ratings for CH 1-4 and CH 7-8:

<u>Load Type</u>	<u>Contact Ratings</u> (2 or 4-pole type contactor)
Resistive/General	25A, 120-277 VAC
Tungsten	1.5 kW, 120 VAC
Motor	1.5 HP, 120 VAC
	20 FLA / 120 LRA, 120 VAC
	3 HP, 240-277 VAC
	17 FLA / 100 LRA, 277 VAC

Load Ratings for CH 5-6, CH 9, and CH 10-11:

Resistive/General	10A, 120-240 VAC
Motor	1/2 HP, 120-240 VAC

Load Rating for Alarm:

Resistive/General	3A, 120-240 VAC
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Load Rating for AUX POWER output:

General	.5A, 24 VAC
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Backup/Alarm Enable Inputs: (Normally closed)

Control Voltage Monitor
 Auxiliary (air quality)
 High Temperature Limit
 Low Temperature Limit

Status Lights: (Solid-state – LED type)

Transformer Power OK
 Active Backup/Alarm State
 Timed Mode Active
 Channels 1-9 On/Off

Main Enclosure:

Type: Type IP-65
 Outside Dimensions: 13.5” wide, 15.5” tall, and 6.5” deep

Important Records

Important Records

Serial Numbers

Controller	

Phone Numbers

Sales Rep	
Electrician	
Plumber	
My Modem	

Service

For assistance, make sure you have checked the parameters in your controller and have reviewed the appropriate sections of this manual, especially the Troubleshooting section.

If you still need assistance, contact:

Val Environmental Systems
2599 Old Philadelphia Pike
Bird-In-Hand, PA 17505

Phone (717) 392-3978
Fax (717) 392-8947