

# ***GainTRAC™***

**“Select Series”**

***16 and 32 Channel Controllers***  
***Installation Manual***





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**PLEASE READ THIS WARRANTY CAREFULLY. IF YOU (THE PURCHASER) DO NOT AGREE WITH THE WARRANTY LIMITATIONS OR ITS TERMS AND CONDITIONS, PROMPTLY RETURN THIS PRODUCT, UNUSED, TO THE PLACE WHERE YOU OBTAINED IT FOR A FULL REFUND.**

**LIMITED WARRANTY:** Blue Earth Research, LLC. (hereinafter BEaR) warrants this Product to be free from defects in material and workmanship and agrees to repair or replace any Product which proves defective under these terms and conditions.

**IMPROVEMENTS:** BEaR reserves the right to alter or improve this Product without notice and without incurring obligation to alter or improve existing Products.

**LENGTH OF WARRANTY:** This Product is warranted for a period of twelve (12) months from the date of installation. Sensors are warranted for a period of twelve (12) months from the date of manufacture or six (6) months from the date of installation.

**WHO IS PROTECTED:** This warranty is valid only for the original installation and is not transferable.

**WHAT IS NOT COVERED:** The following are not covered by this warranty:

- 1) Damage, deterioration or malfunction resulting from, but not limited to: power fluctuations or surges, accident, misuse, abuse, neglect, fire, water, corrosion, lightning or other acts of nature, improper storage, unauthorized Product repair or modification, damage in shipment, removal or installation of this Product, or any other cause not related to a Product defect.
- 2) Cartons, batteries, and other accessories used in connection with this Product.
- 3) Product returned without customer identification.
- 4) Service required as a result of third party components.

**WHAT IS NOT REIMBURSABLE:** The following items are not reimbursable:

- 1) Troubleshooting, removal or installation charges.
- 2) Setup, calibration, adjustment or maintenance of this Product.
- 3) Shipping and insurance charges for returning this Product to BEaR.
- 4) Customer training.
- 5) Travel expenses.

**HOW TO GET WARRANTY SERVICE:** You have the option of having your dealer replace/exchange any defective Product or returning this Product freight prepaid and insured to BEaR. All Product returned to BEaR must have customer identification attached.

**CONSUMER CAUTION:** System configuration, software, operator control of the system, and the application, among other things, will affect this Product's performance. While this Product is considered compatible with its intended purpose, the specific functional implementation by the customers of this Product may vary. The responsibility for using this Product and programming it to achieve the intended purpose, is the sole responsibility of the Purchaser.

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- 2) **ANY OTHER DAMAGES, WHETHER INCIDENTAL, CONSEQUENTIAL, OR OTHERWISE FROM USE OR INABILITY TO USE THIS PRODUCT.**

**THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR THE LIMITATION OR EXCLUSION OF LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. THEREFORE, THE ABOVE EXCLUSIONS OR LIMITATIONS MAY NOT APPLY TO YOU.**

**THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE IN THE UNITED STATES OF AMERICA.**

**PURCHASER AGREES THAT THE SALE OF THIS PRODUCT BEARS A REASONABLE RELATIONSHIP TO THE STATE OF MINNESOTA AND THE LAWS OF THE STATE OF MINNESOTA SHALL GOVERN THE VALIDITY, CONSTRUCTION AND ENFORCEABILITY OF THIS WARRANTY, WITHOUT GIVING EFFECT TO THE CONFLICT OF LAWS PRINCIPLES THEREOF.**

**THE PURCHASER OF THIS PRODUCT AGREES THAT ALL CLAIMS BROUGHT IN RESPECT OF THIS WARRANTY SHALL BE BROUGHT IN A COURT LOCATED IN THE STATE OF MINNESOTA.**

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AS WITH ANY SOPHISTICATED CONTROL SYSTEM, THIS CONTROLLER CANNOT BE GUARANTEED TO PERFORM WITHOUT INCIDENT FOREVER. THERE ARE MANY CONDITIONS SUCH AS LIGHTNING STRIKES, PROGRAMMING ERRORS, AND EQUIPMENT FAILURE THAT COULD RESULT IN THIS CONTROLLER FAILING TO PERFORM ITS INTENDED FUNCTION. YOU MUST BE AWARE OF THIS AND BE WILLING TO TAKE THE NECESSARY PRECAUTIONS TO PREVENT FINANCIAL LOSS.

TO PROTECT AGAINST LOSS RELATED TO THE FAILURE OR MALFUNCTION OF THIS CONTROLLER, THE FOLLOWING SAFEGUARDS ARE REQUIRED:

1. A MANUAL BACKUP SYSTEM MUST BE INSTALLED. THIS SYSTEM MUST TAKE OVER IN THE EVENT OF A CONTROL SYSTEM MALFUNCTION.
2. AN ALARM SYSTEM MUST BE INSTALLED. THIS SYSTEM MUST PROVIDE A VISUAL INDICATION AND AUDIBLE WARNING OF ABNORMAL CONDITIONS.
3. A WEEKLY TEST OF THE MANUAL BACKUP SYSTEM AND ALARM SYSTEM MUST BE PERFORMED. THIS TEST CONFIRMS THAT THESE SYSTEMS ARE FUNCTIONING PROPERLY.
4. A DAILY CHECK OF THE CONTROL SYSTEM MUST BE PERFORMED. THIS CHECK CONFIRMS THAT THE SYSTEM IS OPERATING PROPERLY.
5. NON-FUNCTIONAL ALARM OR BACKUP SYSTEM COMPONENTS MUST BE REPAIRED IMMEDIATELY.

## Overview

This manual covers only the mounting and wiring of the GainTRAC models 1600 and 3200. Anyone responsible for programming and operating the controller should also read the *Operation Manual*.

GainTRAC’s advanced microprocessor-based design has made it possible to regulate the environments of livestock facilities with far greater precision than conventional thermostats and timers. It provides a consistent climate for your animals, resulting in better feed efficiency, better growth, and lower mortality.

The GainTRAC achieves this by carefully monitoring temperature, air speed, humidity, static pressure, feed use and water use. These “inputs” are used to determine when to turn fans on and off, when to open and close air inlets, when to turn on tunnel ventilation, and much more. Using the controller’s keypad, you will input operating parameters for each device group, desired building temperature (which can be adjusted automatically over time), and conditional decisions such as at what humidity level should fogging/misting be disabled.

## Symbols

There are two symbols commonly used throughout this manual.



This symbol means the text describes steps that involve going near terminals with potentially deadly voltage. Always shut off power to the GainTRAC 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.

## Component Description

### Controller

The GainTRAC 1600 and 3200 are single unit 16- or 32-channel controllers.

Variable speed stations (2VS) can be added to provide control for variable speed devices.

Sensors throughout the building provide data on air temperature, humidity, feeder run time, static pressure and water usage. The controller is normally mounted inside the building and can be accessed from a PC using the optional communications station. In addition to the PC connection, the controller can be attached to an alarm or auto-dialer that is turned on under the alarm conditions outlined in the *Operating Manual*.



**Warning:** A qualified electrician should install the GainTRAC. Failure to comply with all national and local electrical codes may void the warranty. Failure to seal all electrical conduit openings and cable entry points may also void the warranty.

### Communications Station

The optional communications station allows on-site communication between the GainTRAC and a personal computer.

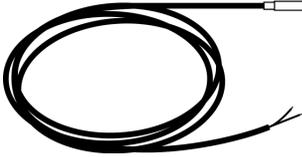
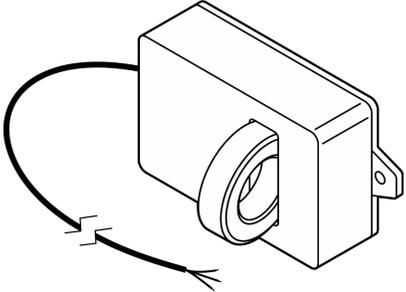
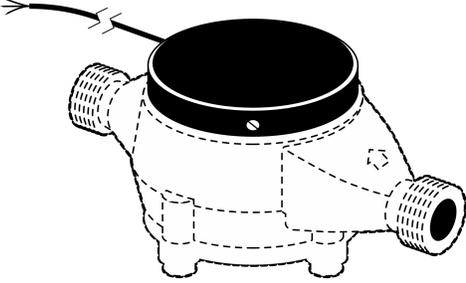
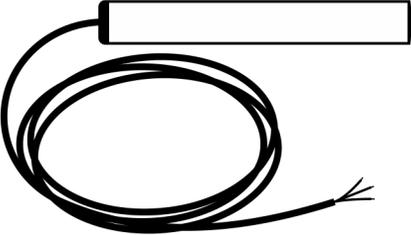
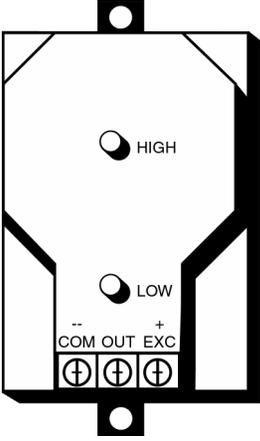
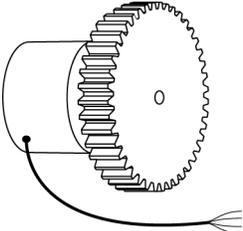
The communications station comes with a serial cable and a plug-in 120 VAC to 9 VDC power converter. If only 220-240VAC is available, you must find a transformer to convert that voltage down to 9-12VDC, 250ma output.

### Communications Station with Modem Attachment

The optional communications station with modem allows the grower to monitor and control the GainTRAC over the phone line from a PC at home or office.

The communications station comes with a plug-in 120 VAC to 9 VDC power converter. If only 220-240VAC is available, must find a transformer to convert that voltage down to 9-12VDC, 250ma output.

### Sensors

<p><i>Air/Temp Sensor</i></p>  <p>A coiled cable with a small cylindrical sensor at the end. Two callout boxes point to different sensor types.</p> <p>Temperature Sensor for measuring only the actual temperature.</p> <p>Air Speed / Temp Sensor for measuring Effective Environmental Temperature.</p>	
<p><i>Feed Sensor</i></p>  <p>A rectangular box with a circular opening on the side and a cable extending from the top.</p>	<p><i>Water Meter Sensor</i></p>  <p>A cylindrical device with a black top cap and a cable extending from the top. It has a threaded fitting on the side.</p>
<p><i>Humidity Sensor</i></p>  <p>A coiled cable with a rectangular sensor head at the end.</p>	<p><i>Static Pressure Sensor</i></p>  <p>A rectangular device with two pressure ports labeled 'HIGH' and 'LOW'. Below the ports are three terminals labeled 'COM', 'OUT', and 'EXC' with '+' and '-' signs.</p>
<p><i>Position Sensor</i></p>  <p>A gear-like sensor with a cable extending from the side.</p>	

## Mounting and Wiring

### Controller

Mount the controller indoors where the temperature remains between 30 degrees Fahrenheit (- 1 degree Celsius) and 110 degrees Fahrenheit (43 degrees Celsius). Do not mount the controller in direct sunlight. Place the controller away from motors and relays/contactors that switch high current. Do not install it in the same room where the animals live since the air tends to be corrosive to electronic circuits. A separate room or control office is a preferred location.

Mounting brackets for the GainTRAC are enclosed with the unit. Attach these to the back of the controller before mounting it in the building.

Before you drill holes into the enclosure, mark their locations and make sure that you do not drill into circuit boards and cables.



Unless absolutely necessary, do not remove the circuit boards. They are static sensitive and should always be handled with appropriate grounding and electrostatic precautions.

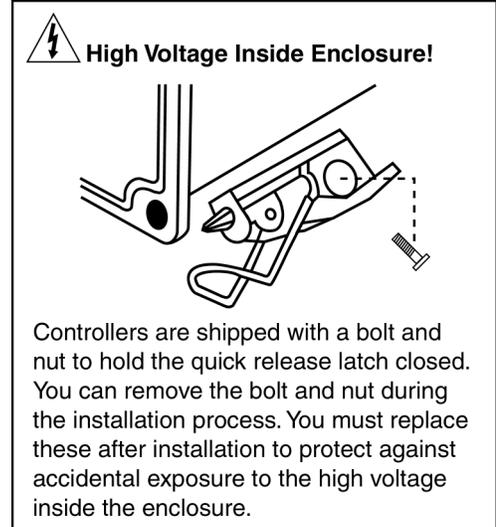
### You've Heard It Before...

Never connect or disconnect wires while the power is on. The warranty does not cover damage caused by improper handling.

Always touch a grounded surface before working on electronic equipment. Static shocks can destroy sensitive electronic circuits.

A good ground for your electrical system and the GainTRAC controller is essential. An alternative ground could be a water pipe or a buried copper rod. Electrical conduit is often **not** grounded.

When attaching wires to terminals, first strip off about ¼" of insulation. If you attach more than one wire to a terminal, twist the leads together before securing them to the terminal. Tighten terminal screws securely, being careful not to over tighten them. Gently tug on the wires to make sure they are secure.



## Installing the Memory Card

The memory card stores the controller software, alarm detail and recorded history, as well as the operating parameters the user inputs for the controller. It is usually located in a socket on the left side of the control board.

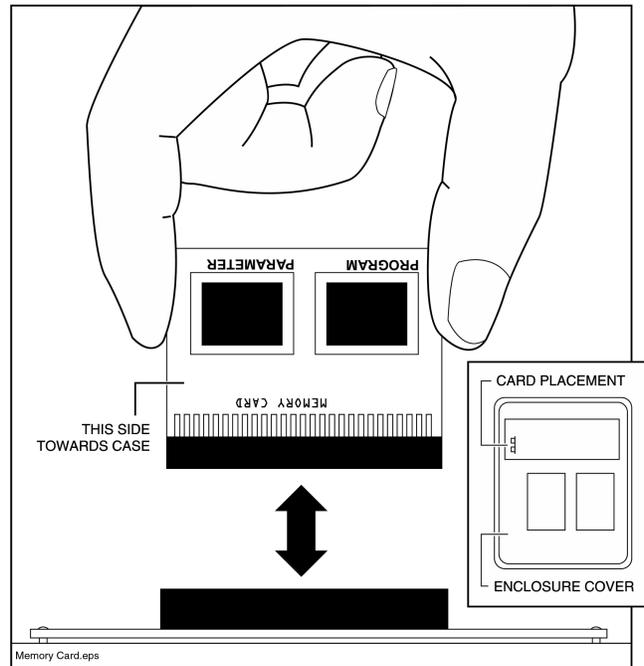
Your controller shipped with the memory card uninstalled. The memory card is located in a plastic bag inside the controller enclosure.

## Installing / Removing a Memory Card

Always touch a ground before you touch the circuit boards. Never install or remove memory cards without turning off the power to the controller.

To install the memory card, match the key in the card base to the slot in the socket on the control board and insert firmly.

If you ever need to remove it, grab it on the outside edges, then pull out carefully rocking it slightly back and forth.



## Circuit Protection

### Circuit Breakers

The controller should be wired to an independent circuit breaker. Ideally each equipment output channel should have its own breaker to insure that tripping one breaker will not affect other devices in the ventilation system.

Motors must have a thermal overload protection device or impedance protection. The overload should auto-reset for any essential equipment.

### Power Surges

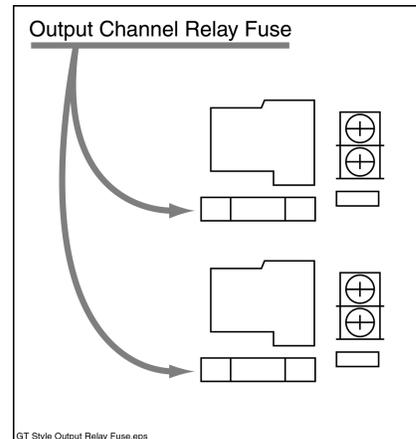
## Deadbolt™

The GainTRAC is protected against *normal* voltage surges, but lightning induced surges could damage the equipment. We recommend use of a Deadbolt™ surge suppressor to reduce damage from lightning and other types of power surges. Lightning damage is not covered by the warranty.

### Fuse Replacement

The fuse on the power supply is a 2.5 Amp 250VAC (5 x 20mm) fast-acting interrupting type (Littelfuse® 216 02.5 or equivalent).

Each output relay has a 20 Amp 3AB ceramic body slow-acting fuse (Bussmann® MDA-20 or equivalent 0.25 x 1.25"). Electrical load should be no more than 16A, 1HP at 120VAC and 1½HP at 240V.



## Conduit and Connections

High voltage wires should enter the control enclosure from the bottom so they can be easily connected to the relay terminals. Low voltage sensor wiring should be brought in from the side and connected to the input terminals near the top. Make sure there are no frayed wires because the control board may press against the wires when the controller's cover is closed.

To avoid electrical shorts or damage due to moisture, you should never run conduit openings through the top of the box. Conduit and hubs should be corrosion resistant plastic or fiberglass. Use only UL approved NEMA 4X rated conduit hubs. Connect hubs to conduit before connecting to the control enclosure. Use only liquid-tight strain-relief connectors to bring cables into the box.

### Clearance Holes for Standard Conduit

Trade Size (inches)	Hole Size (inches)
1/2	0.875
3/4	1.125
1	1.375
1 1/4	1.750
1 1/2	2.000
2	2.500
2 1/2	3.000
3	3.625

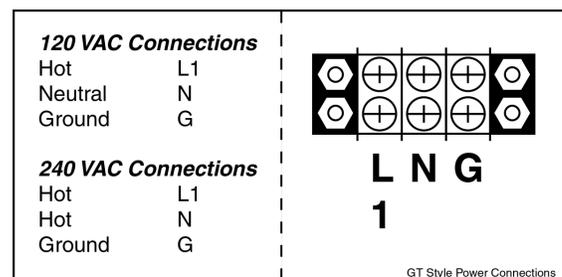
Conduit Hole Sizes.eps

## Power Supply



The power supply is a 90-265VAC, 50-60 Hertz universal power supply. It does not have a 110/220 voltage switch because it determines the voltage automatically.

- Make power connections to terminals labeled N and L1. Ground goes to the terminal marked as ground (G).
- To ensure the GainTRAC alarms on loss of power in either leg of 220V at your electrical service panel, we recommend wiring the control for 220V when it is available.
- A main power disconnect must be provided by the installer to allow the controller to be shut off.
- The maximum torque for the power input terminals is 8 inch-pounds.
- Use 18 to 14 gauge wire.



**Warning:** Do not tap power from the power supply for other devices. The extra power draw may cause the controller to malfunction.

## Sensor Wiring

Use shielded 16 to 24 gauge (or .5mm to 1.2mm for metric users) stranded wire, such as Carol<sup>®</sup> AWM style 2426, to connect sensors to input channels. Wire can be twisted pair or straight type. The shielding should be grounded to GND at the controller’s terminal block.

Only 22 to 24 gauge wire will fit the Scotchlok<sup>®</sup> connectors supplied with the sensors.

## Wire Spacing

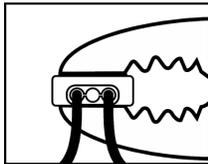
If a sensor or communication cable runs parallel to power cables, allow a separation of at least 12” (30cm) to avoid interference. Do not run sensor or communication cables through conduit with power wires.

## Sensors

Suspend sensors from the ceiling to ensure free airflow. Sensors should hang close to the animals, but should be out of their reach. Leave enough wire so you can tie up several loops of slack to keep the sensor at the right height. If you must replace a bad sensor in the future, the extra length allows you enough wire to cut off the old sensor and still have plenty to splice to the new sensor.

As you install sensors, record wire length and gauge on the Sensor Data Sheet at the end of this manual. The person programming the controller will need these values.

## Splices



3M Scotchlok<sup>®</sup> connectors are recommended for splicing (22-24 gauge wire only). Apply firm, even pressure to a button to ensure good contact. The button will be flush when properly sealed.

The splice between the wire and the sensor lead should be protected from the corrosive air in the building. The best splices can be made using the gel-filled 3M Scotchlok connectors enclosed with the sensors. These create low-resistance, corrosion-resistant connections. Wrap your splice well in electrical tape.

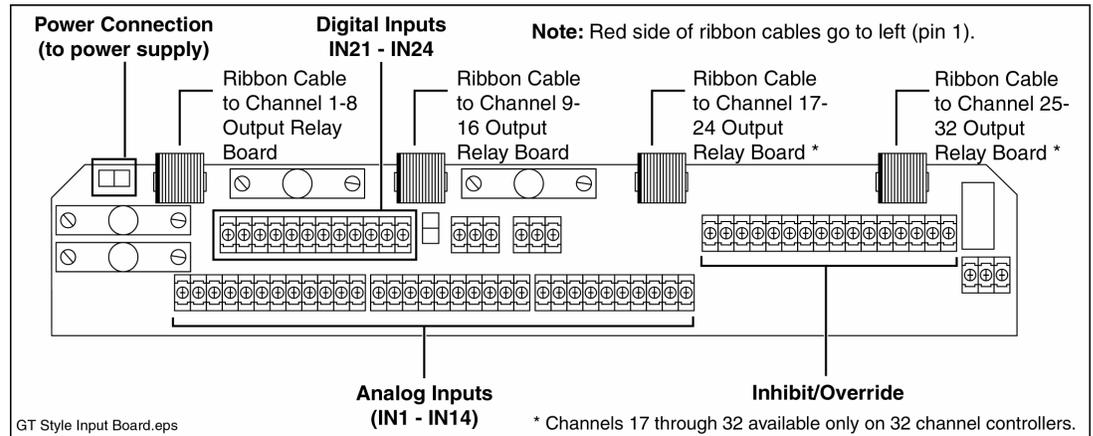
Replacement sensors can be connected by cutting the old sensor lead and making a new connection with a Scotchlok connector. It is not necessary to strip the insulation from the individual wires when using Scotchlok connectors.

## Terminal Connectors

Make all sensor connections to the sensor terminals on the controller’s input/output board. There are 14 analog inputs (temperature, humidity, feed sensors and static pressure) and four digital inputs (water meter and digital alarm).

## Input Terminals

All sensors must be connected to the inputs at the top of controller's input/output board. There are two terminal strips for inputs. One strip is for analog inputs (1 through 14) and the other is for digital inputs (21 through 24). Input number 1 is at the left.



Some inputs have a 12V output that is required by certain sensors. Analog terminals 1 through 4 and all digital inputs have the 12V output available.

### Analog Sensors (Inputs 1 to 14)

Attach the following sensors to these inputs. Record the connection on the Sensor Data Sheet at the end of this manual.

- Air/Temp sensors
- Outside temperature sensor
- Humidity sensor (assign to one of the inputs 1 through 4)
- Feed sensor
- Static pressure sensor (assign to one of the inputs 1 through 4)
- Position sensor

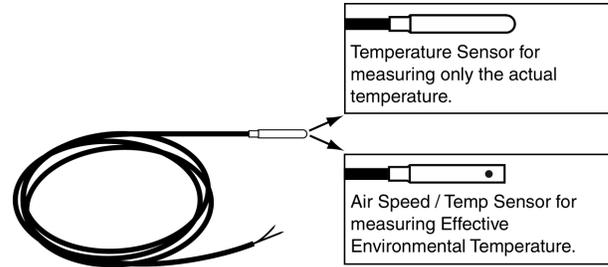
### Digital Sensors (Inputs 21 to 24)

- Water meter sensor
- Digital alarms

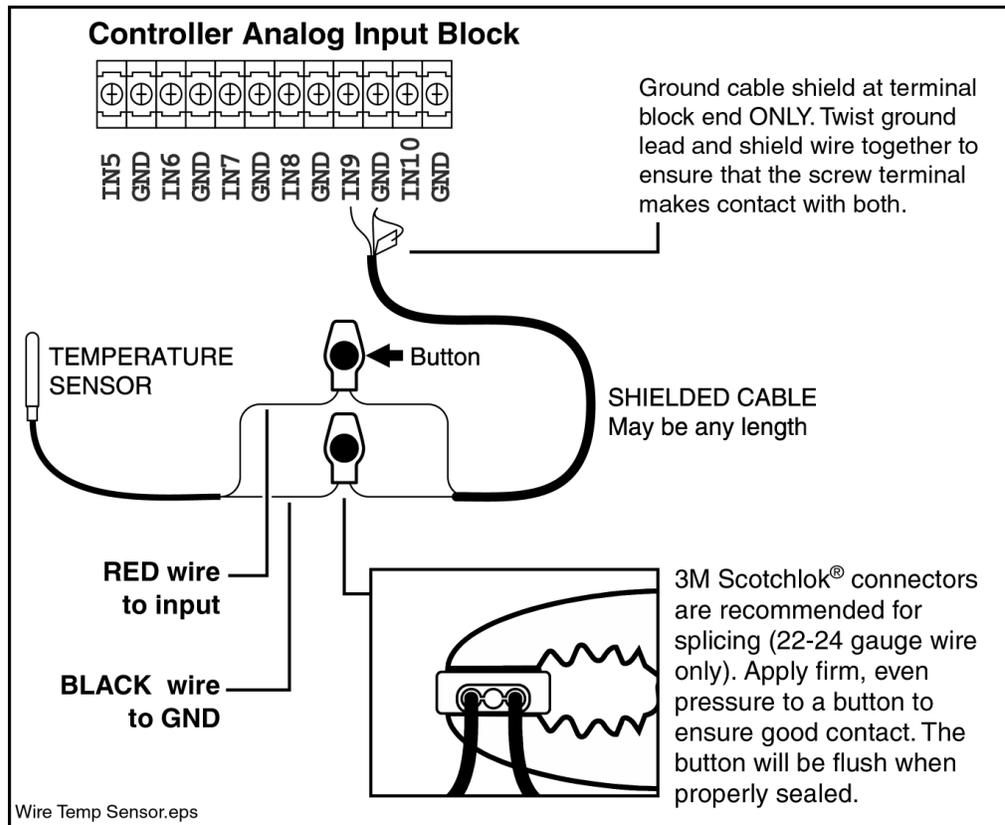
## Temperature Sensors

Suspend sensors from the ceiling to ensure free airflow. Sensors should hang close to the animals, but should be out of their reach.

For best results, keep the sensors out of sunlight, away from moving machinery, heaters, power wiring, sprinklers, or lights. Center sensors between heating devices.

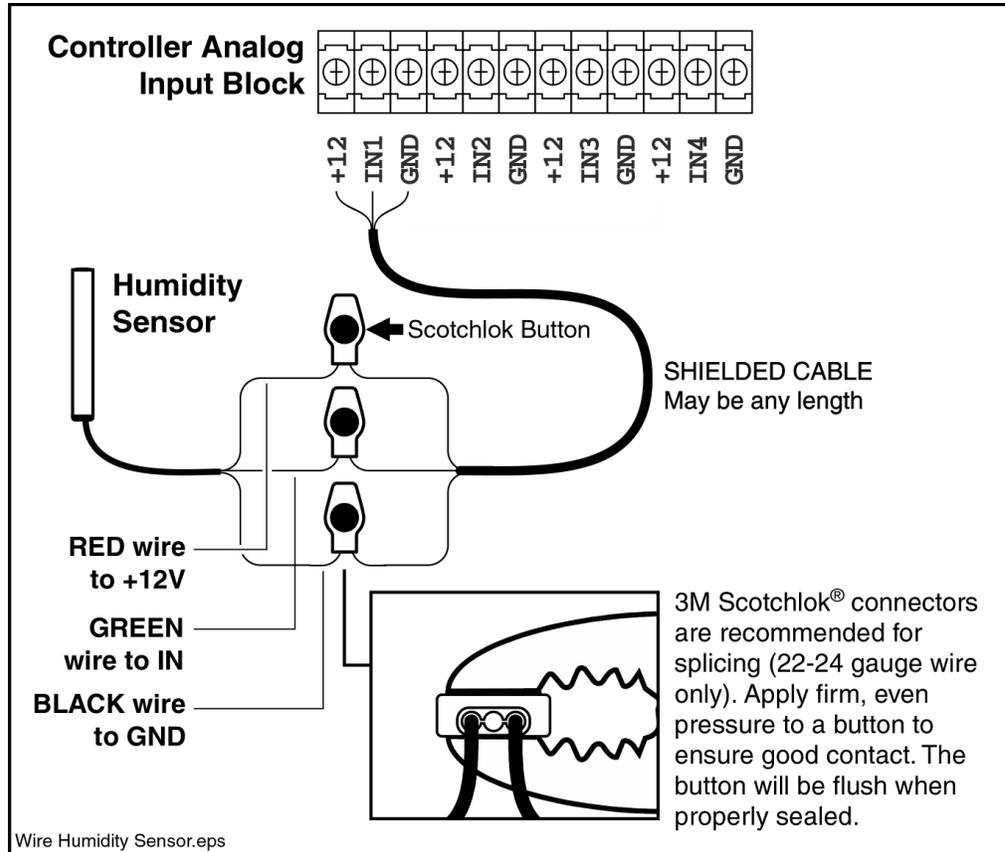
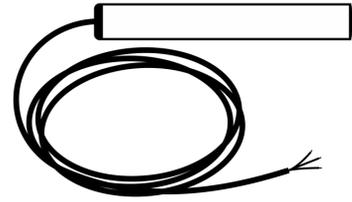


Connect sensors to the input/output board as shown below making sure to ground the shielding as well as the black wire.



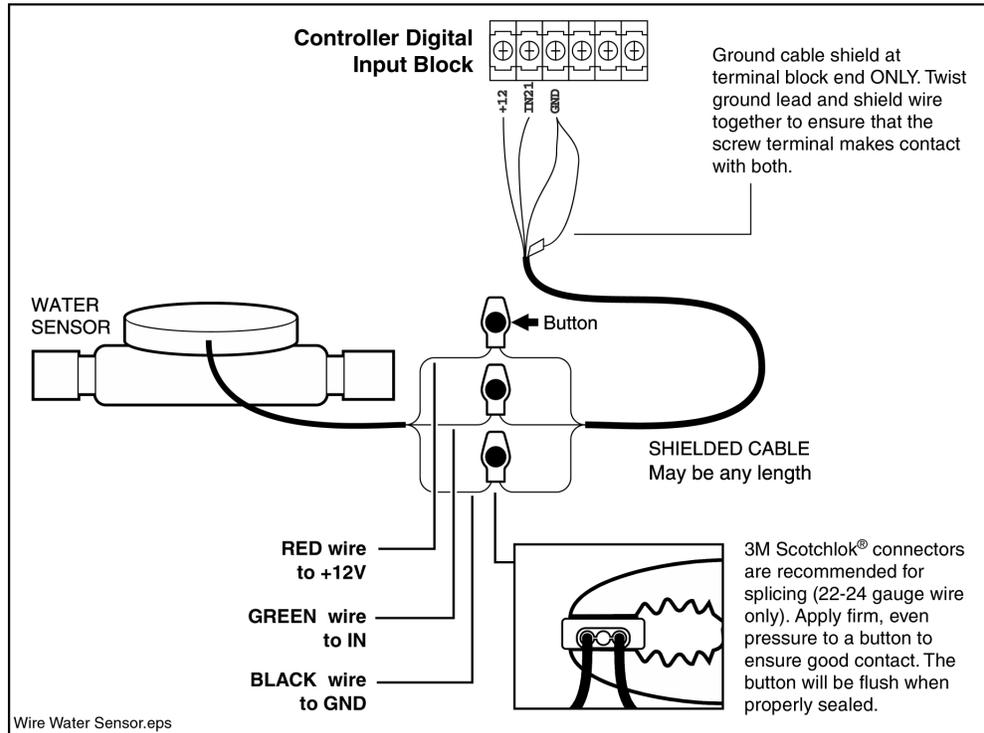
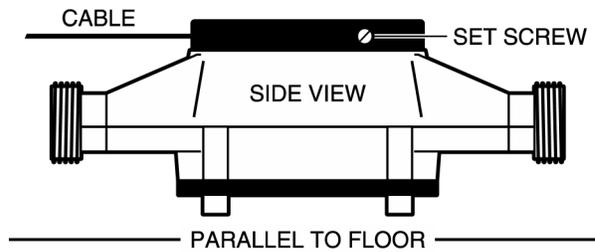
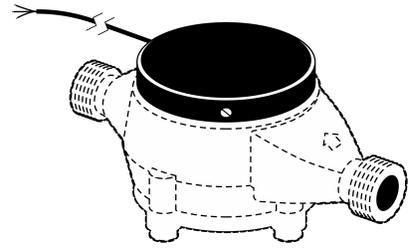
## Humidity Sensor

Follow the same procedure as the temperature sensors. Position the humidity sensor in the center of the building. The humidity sensor is a three-wire device and must be connected to one of the three-connection inputs, labeled 1 through 4 on the input board.



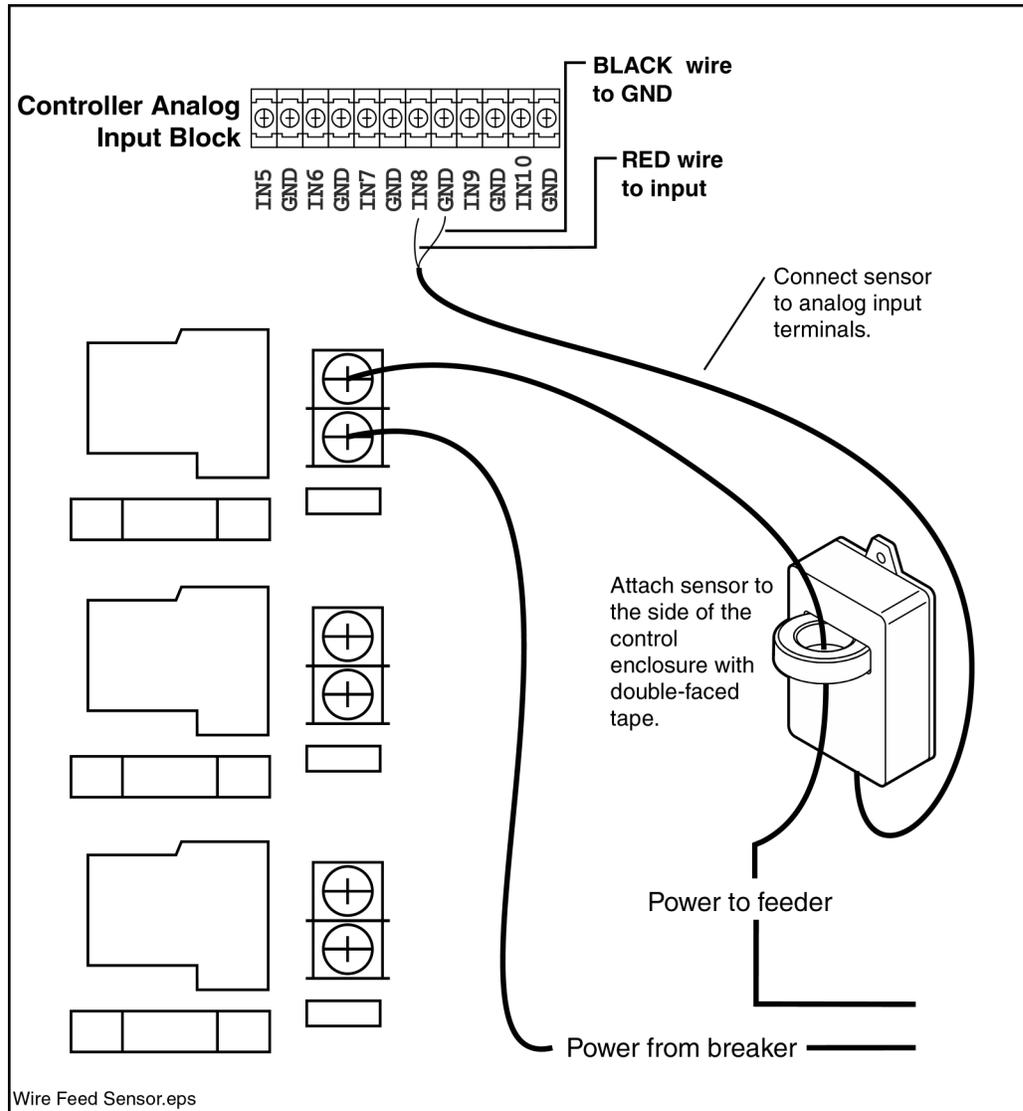
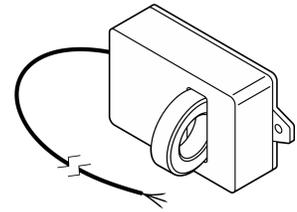
## Water Flow Meter

The electronic water meter sensor is made to fit on the Badger™ flow meter RCDL 25 (or a compatible unit) as shown below. Any other orientation may cause inaccurate readings and early failure. The water meter hooks up to the controller's **digital** inputs. If you use another meter with two electrical connections, wire through IN and GND and verify that the control is reading the signal. Improper connections or incompatible sensors may ground out the input/output board and cause noticeable controller malfunction until the wiring is corrected.



### Feed Sensor

Feed sensors should be mounted inside the controller enclosure with the feeder power wire running through the sensor loop. If a single sensor monitors multiple feeder circuits, run the wires from all feeder groups the same direction through the sensor loop.

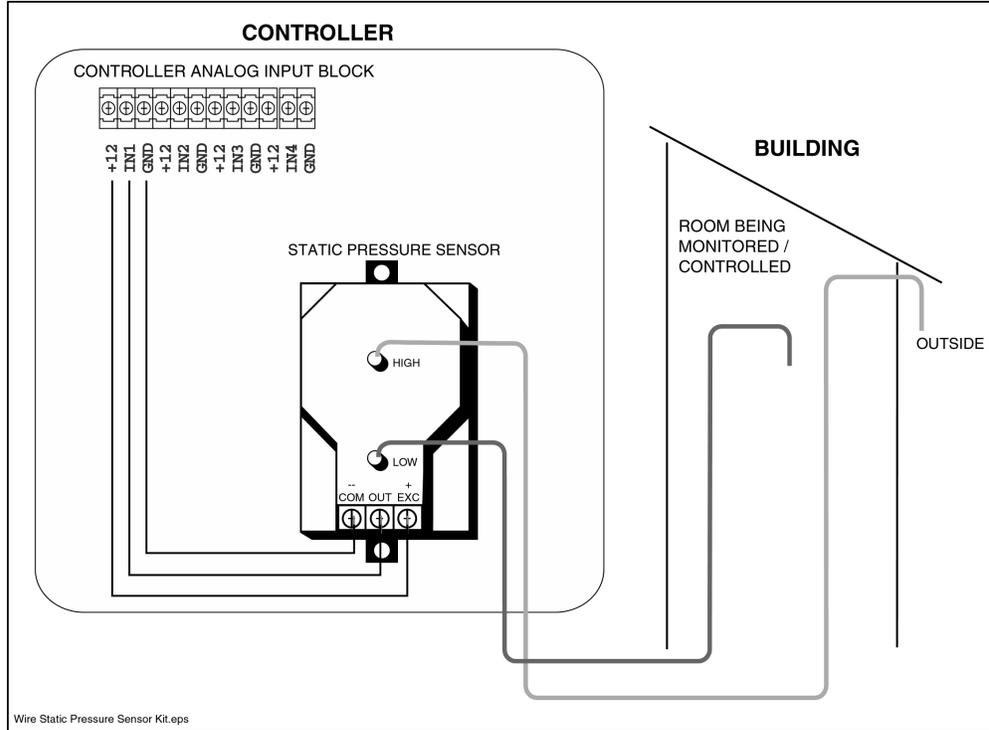


Wire Feed Sensor.eps

The best use for a single feed sensor is monitoring your silo auger motor. This provides a clear indication of all feed entering the building and it provides an alarm when the feed silo is empty.

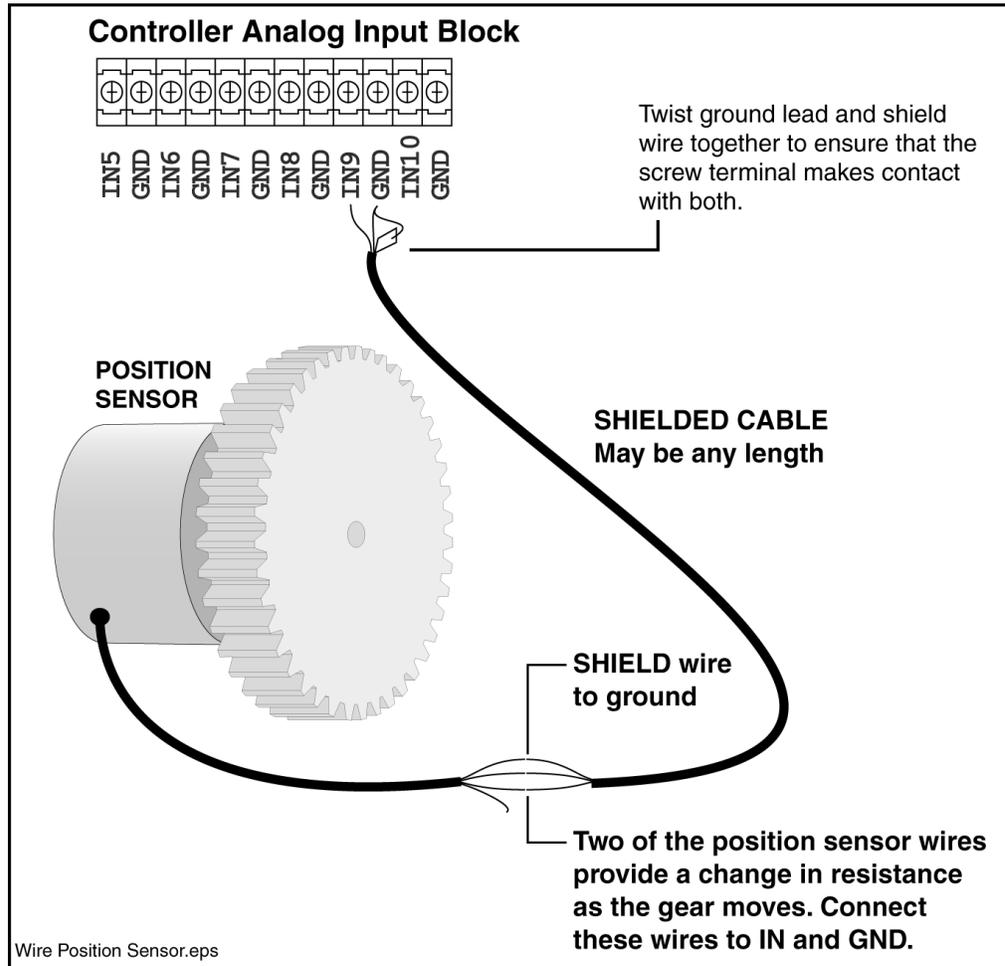
### Static Pressure Sensor

Connect the static pressure sensor to the +12, IN and GND input terminals for one of the analog inputs.



## Position Sensor

A position sensor allows the controller to determine the current opening size of a curtain, ridge vent, chimney damper or inlet. If the position sensor has more than two leads, find two that provide a smooth change in resistance as the sensor is turned. You may need an Ohmmeter to measure this.



## Digital Alarm

Digital alarms provide warnings of almost any emergency condition you need to be informed about. Any no-voltage circuit that can be switched will provide an alarm to the controller.

The controller has four digital inputs (numbered 21 through 24 on the input board) which can be connected to digital alarms or water meters.

The term "digital" refers to two possible states for a circuit: open and closed. You can set up each digital alarm input to sense for an open or a closed circuit. The circuit must be a simple switch with no voltage applied.

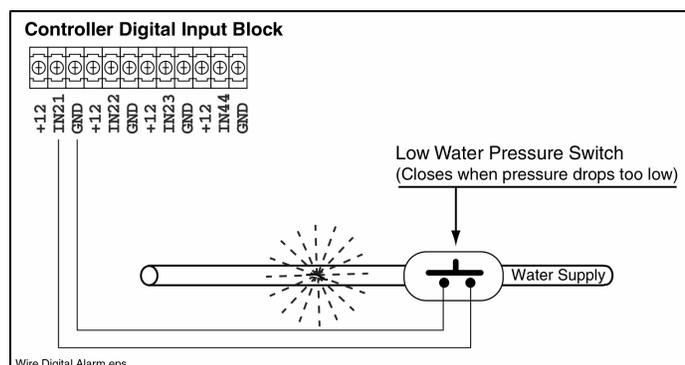


Attaching circuits with voltage to the controller's digital inputs will damage the controller.

Some possible uses for the digital inputs:

- Attach a low water pressure switch to detect water line breaks or empty water tanks. This can be especially important where evaporative cooling or fogging is used.
- Attach a gas pressure switch to detect an interruption in gas.
- If you are running three-phase power, you can set up a switch to detect the loss of a phase.
- Attach a level switch to indicate when your feeder bin is empty.
- If your curtain drop has an output switch or the capability to have a switch/relay added, you can alarm when the curtain drops.
- You can hook up a door switch to alarm when people enter your building, or when the door remains open.

The controller allows you to set up the digital alarm in several ways. For example, you can alarm when the circuit becomes open or becomes closed and you can delay an alarm to avoid false alarms.



## Output Terminals

### Output Channel Load Specifications

Check the load on each channel. Light groups and tunnel fan groups will likely be your highest amperage circuits. The relays are rated at 16A, 1HP at 120VAC and 1½ HP at 240VAC. They will sustain a 200 percent startup surge for up to three seconds.

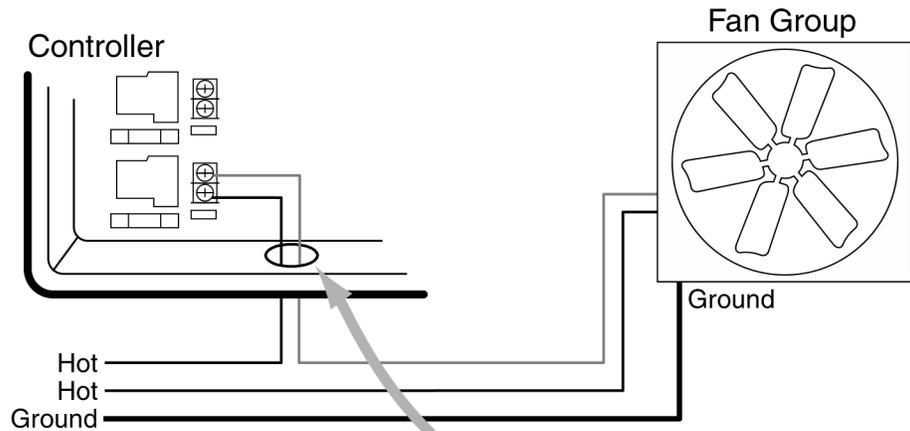
Use a contactor or divide equipment into several groups as necessary to avoid overloading a relay.

### Wiring

Bring the wire from an output channel through the bottom of the controller and up between the banks of relays to the proper terminal. The control wire should be run from the circuit breaker to the GainTRAC relay and then out to the device or device contactor.

We recommend dedicating a separate circuit breaker for each channel. That way, if there is a problem with one of the device groups, it won't disable your entire ventilation system.

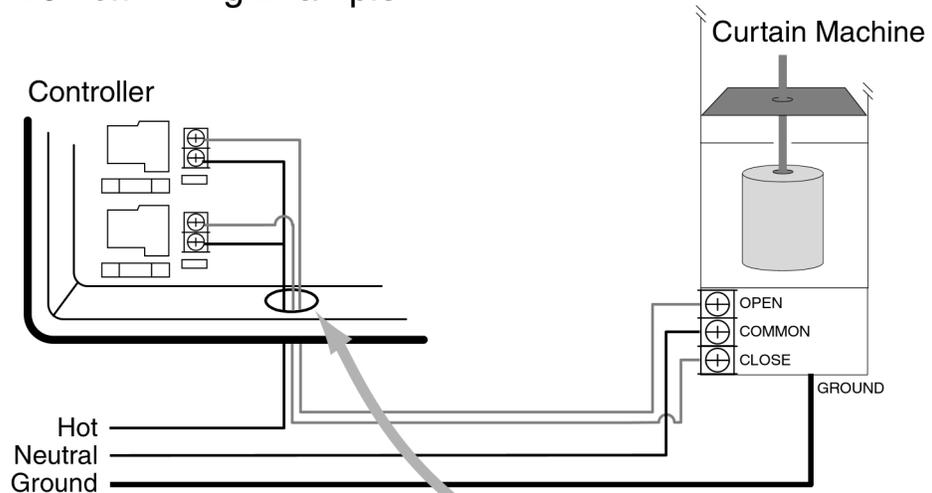
### 220 Volt Wiring Example



High voltage wires must be brought up through the bottom center of the enclosure and secured to the middle of the PC board with adhesive mounting pads and cable ties.

Wire 16\_32 Channel Output Board.eps

### 120 Volt Wiring Example

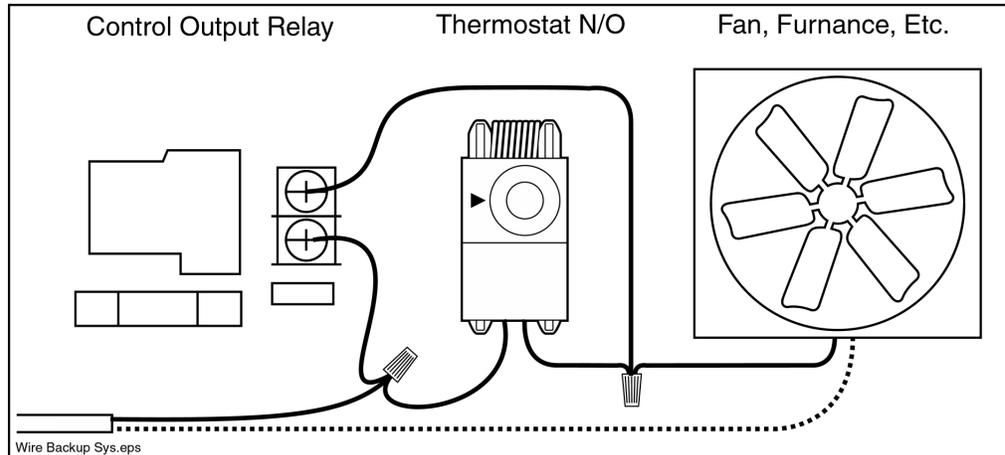


High voltage wires must be brought up through the bottom center of the enclosure and secured to the middle of the PC board with adhesive mounting pads and cable ties.

Wire 16\_32 Channel Output Board2.eps

## Backup Systems

Setting backup devices that allow heat and ventilation in case of a power failure or other type of failure is essential for the safety of the animals.



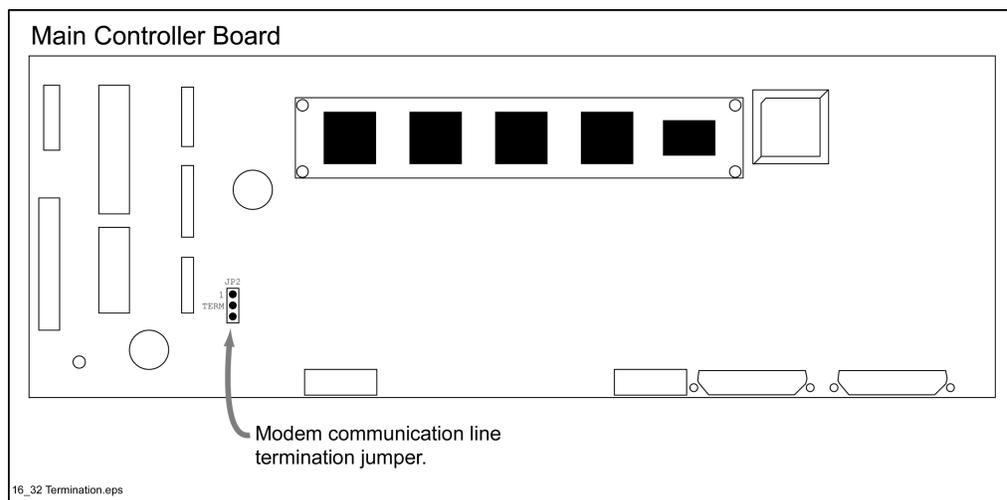
Thermostats should be installed to backup heaters, fans and inlets. Natural ventilation buildings need curtain drops. Thermostats can be wired to the devices they will operate, and in parallel with the GainTRAC as shown above.

## Communications Station

You can attach a communications station to the GainTRAC to enable remote access from a computer. This access gives you many of the same capabilities as using the controller's keypad. Refer to the manual that came with your communications station for wiring instructions.

Up to 16 GainTRAC controllers can be wired to the same communications station. You may need to terminate the "modem" communication line at the appropriate controller (described below).

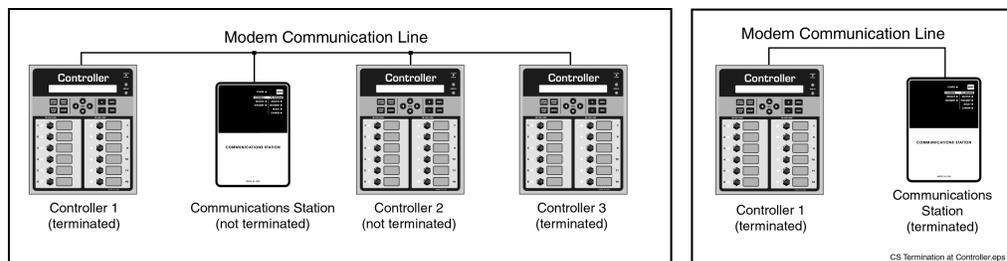
### Terminating the Controller



- Jumper top two pins (pins 1-2) ..... Terminated
- Jumper bottom two pins (pins 2-3) ..... Not Terminated

If the GainTRAC **is not** at the terminal end of a group of GainTRAC controllers and a communications station, the GainTRAC modem communications line needs to be un-terminated.

If the GainTRAC **is** at the terminal end of a group of GainTRAC controllers and a communications station, or no communications station is attached, the GainTRAC modem communication line needs to be terminated.



## **Expansion Stations**

You can attach a variable speed expansion station (2VS) to GainTRAC models 1600 and 3200. Refer to the installation manual that came with your expansion station for wiring instructions.

## Alarm

**Note:** Always test alarm operation.

The GainTRAC will alarm on:

- High/low temperature
- Power outage
- Feeder over/under run time (with optional feed motor sensor)
- Over/under consumption of water (with optional water meter sensor)
- Static pressure (with optional static pressure sensor)
- Digital alarm input
- Communication errors and certain memory errors

The alarm connection may be wired to whatever device is necessary to provide a warning of alarm conditions, usually an auto dialer or siren.

**Backup alarm devices must be installed in case of controller failure.**

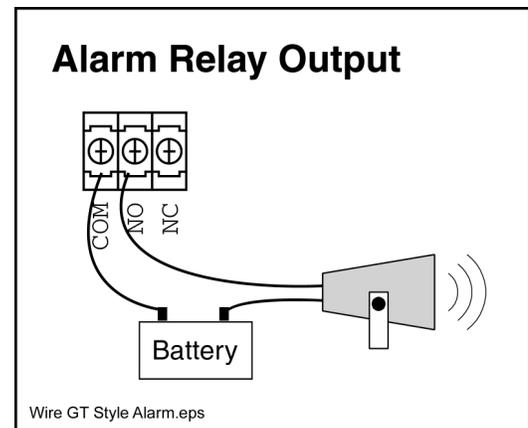
## Wiring

The alarm relay is on the input board near the top of the GainTRAC enclosure. The normally open (NO) dry-contact (no voltage) connection has continuity during an alarm condition and could be used to turn on a device such as a siren, strobe light or auto dialer. The normally closed (NC) connection will have continuity when there is no alarm.

Multiple GainTRAC controllers can be wired in series for a normally closed alarm or in parallel for a normally open connection.

## Specifications

The alarm relay is SPDT rated 120/240VAC 3A. Alarm devices should be fused externally.



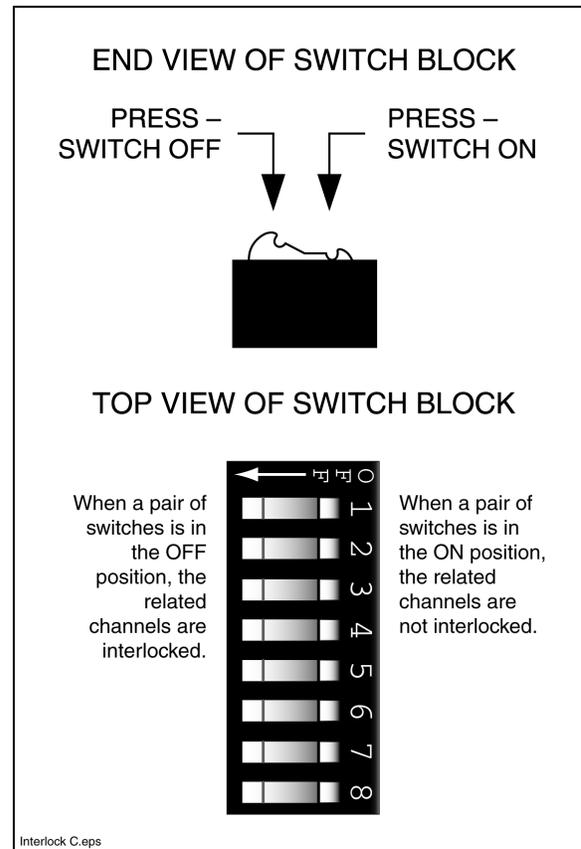
## Channel Interlocking

Devices that require an open and close channel such as curtain machines, inlets and chimney dampers, should be interlocked.

This prevents sending open and close signals simultaneously to curtain or inlet machines, which could damage equipment.

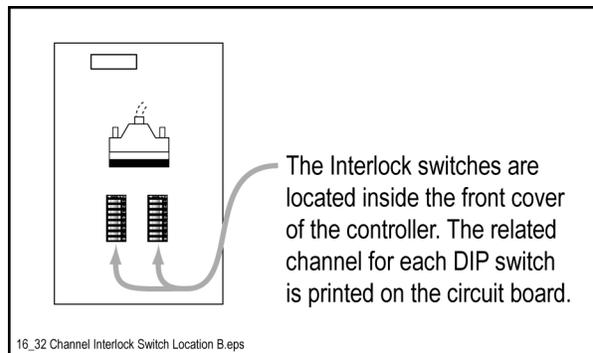
In the event two interlocked channels are switched on, the first channel on has priority.

Set interlocking with the DIP switches located on the inside of the switch panels on the door of the controller. When the switches are in the OFF position, the channels are interlocked. When ON, the channels are not interlocked.



For inlet devices installed on these channels, set the appropriate switches OFF. For example, if Curtain Group #1 is on channels 1 and 2, then interlock (move to OFF) switches 1 and 2.

An odd-numbered channel can be interlocked with the next even-numbered channel (1 & 2, 3 & 4, and so on). Interlocking must always be done in pairs.



# Testing

## Equipment Groups

Verify that all interlocks are properly set for open/close devices.

Manually switch each equipment group ON and OFF with the front panel toggle switches. Verify the connection of the proper devices to each channel. Run each device long enough to confirm that it is fully functional and properly adjusted.

## Backup Systems

Test the backup equipment override thermostats and curtain drops. Make sure these devices operate the way they are expected to before depending on them to protect animals.

## Alarms

Turn off the electricity to the controller. This will cause an alarm and allow you to verify that each alarm device is operational.

Clear any ACTIVE ALARM by pushing ENTER while the alarm is on the screen.

Failure to clear an alarm will prevent the alarm relay from resetting.

# Sensor Data Sheet

## Worksheet C10 - Sensor Calibration

Air Sensors	Cable Length	Wire Gauge	Location (If applicable)	Input Channel Number	Sensor Cal. Numbers
Air/Temp #1					
Air/Temp #2					
Air/Temp #3					
Air/Temp #4					
Air/Temp #5					
Air/Temp #6					
Air/Temp #7					
Air/Temp #8					
Air/Temp #9					
Air/Temp #10					
Air/Temp #11					
Air/Temp #12					
Outside Air/Temp #13					

Humidity Sensor	Cal. #1 (10485 is default)	Cal. #2 (51118 is default)	Input Channel Number
Humidity #0			

Water Meter Sensor	PPG Cal. (25 is default)	Input Channel Number
Water Meter #1		

Feed Sensor	Cal. # (100 is default)	Minimum Amps	Input Channel Number
Feeder #1			
Feeder #2			

Static Pressure Sensor	ADC Cal. #1 (6554 is default)	ADC Cal. #2 (58982 is default)	WC Cal. #1 (0.000 is default)	WC Cal. #2 (0.250 is default)	Input Channel Number
SPS #1					

Building Name:

Building Number:

Zone Number:

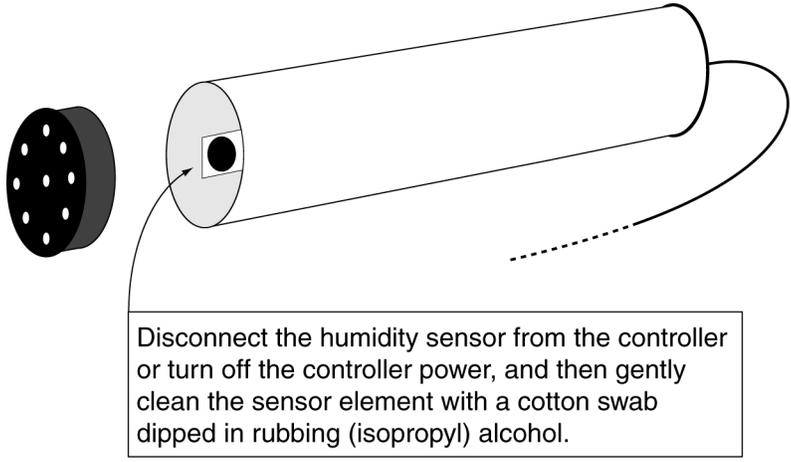
Sensor Calibration Worksheet.vsd

## Specifications

<b>Fuses:</b>	Power Supply Input: 2.5 Amp 250VAC (5 x 20 mm) fast-acting interrupting type (Littelfuse 216 02.5 or equivalent)  Output Channel: 20 Amp 3AB ceramic body slow-acting type (Bussmann MDA-20 or equivalent 0.25 x 1.25")
<b>Power Input:</b>	120VAC / 240VAC 1.6A Maximum <i>Maximum torque on power input terminal screws is 8 inch-pounds.</i>
<b>Output:</b>	16 output circuits for model 1600 and 32 output circuits for model 3200. Normally open relays.  120VAC, 1 HP / 240VAC, 1.5 HP maximum per circuit.  16A, 120VAC / 240VAC maximum general purpose per circuit.  120VAC, 8.3A / 240VAC, 5.46A Tungsten rating per circuit.  Model 1600: 256A maximum total for any combination of outputs active at the same time.  Model 3200: 300A maximum total for any combination of outputs active at the same time.
<b>Alarm Output:</b>	120VAC / 240VAC, 3A general purpose, NO/NC connection.
<b>Sensor Inputs:</b>	14 analog and 4 digital
<b>Environmental:</b>	Type 4, 4X, 12, 13
<b>Dimensions:</b>	Width is approximately 16.75"  Depth is approximately 10.25 inches  Height is approximately 18.75 inches

## Troubleshooting

<b>1. Power/Display</b>		
No Display.	1.1a	Verify the controller has power by turning a toggle switch to ON. If a light comes on, try step 1.1b. If no light, you probably do not have power coming to the controller. Check 1.2a.
	1.1b	Display is too light. Press DISPLAY DARK on controller keypad for several seconds.
	1.1c	A row of dark boxes means the memory is possibly dead or the memory card is not installed. Open the control and verify the connection of ribbon cables between boards. Make sure the memory card is securely put into the board. Disconnect and then reapply power.
No Power.	1.2a	Circuit breakers are tripped or turned off.
	1.2b	Fuse on the controller power supply is blown. Replace with equivalent.
	1.2c	Terminal connections on power supply are not tight.
Display light keeps turning off.	1.3a	Normal operation. It's programmed to turn off one minute after you're done using the keypad. This will add years to its useful life and save electricity.
<b>2. Sensor Readings</b>		
Temperature reading is N/A or -412°.	2.1a	Air sensor is disconnected or wire is cut. Check continuity in cable/sensor. Resistance through the cable and sensor should be about 1100 ohms. If higher check for cable, splice, or sensor damage.
	2.1b	Temperature is beyond the operating range (Outside -60°F to 120°F, Inside 30° to 130°F).
	2.1c	Sensor is defective. Connect new sensor.
	2.1d	If readings are N/A, verify that sensor is installed by checking the List Control Devices menu.
Temperature reading is wrong.	2.2a	Check temperature at sensor with an accurate thermometer.
	2.2b	Wrong wire gauge input. Read wire gauge from wire and input in Sensor Calibration & Setting menu for all air sensors.
	2.2c	Wrong cable length input. Check cable length to each sensor and input to Sensor Calibration & Setting menu.
	2.2d	Mis-calibrated sensor. Adjust by adding/subtracting cable length. Add about 7 feet (varies by wire gauge) to drop the reading by 0.1 degree F. Subtract length to increase reading.
	2.2e	Sensors mis-numbered in programming. Verify position of sensors by dipping in water then swinging rapidly to cool them. Within 20 seconds, you should see a noticeably cooler reading for that sensor (Current Status menu). If sensors are mis-numbered, a different sensor reading will drop. To correct, you must rewire the sensors in question to the proper input channels.
	2.2f	Sensor or connection splice is bad. Cut sensor above splice. Cut off splice. Reconnect and check to see if sensor is working. If not, replace sensor.

	2.2e	If all sensors are reading low by about the same amount, the control board must be replaced.
Humidity sensor reading bad.	2.3a	<p>Sensor is dirty or has moisture inside. Disconnect sensor from controller or shut off controller power. Remove bottom cap. Dip a cotton swab in rubbing (isopropyl) alcohol and then gently clean the sensor element. The sensor may read high for a short period of time after cleaning.</p>  <p>Disconnect the humidity sensor from the controller or turn off the controller power, and then gently clean the sensor element with a cotton swab dipped in rubbing (isopropyl) alcohol.</p> <p>NEVER TOUCH sensor with fingers.</p>
	2.3b	Ensure there is nothing draining the 12 volt supply to the input. If there is, disconnect the other device. Then turn off the power to the controller and back on again.
Feeder sensor is wired but reading improperly.	2.4a	Is the amperage set above zero and below the actual amperage reading?
	2.4b	Is the wire running through the loop of the sensor?
	2.4c	If there is a second feeder wire, do the two run the same direction through the sensor loop?
	2.4d	Have you set feeder ON/OFF time cycles? The sensor will not read power outside of a feeder ON cycle.
<b>3. Equipment</b>		
One equipment group does not turn on.	3.1a	Is the controller on?
	3.1b	Manually turn the toggle switch for that group to ON. If the equipment turns on, go to 3.1c. If it does not turn on, go to 3.1d.
	3.1c	Check the programming for the equipment group. The group is either not installed or is not set up right. Check <i>Operating Manual</i> for information on how to set up this type of equipment.

	3.1d	Check the fuse by the appropriate relay. Replace it if it is blown. Otherwise, do you hear the relay inside the enclosure click when you turn the toggle switch ON and OFF? If it clicks, go to 3.1m. If not, go to 3.1e.
	3.1e	Do other groups in the same column turn on? If not, open the enclosure and check ribbon cable connection from relay board to control board. If it still does not turn on, go to 3.1f.
	3.1f	If there is still no relay click when you flip the switch ON, bypass the relay to see if equipment works. If it does, change out relay board.
	3.1m	Check the circuit breaker for that equipment group. If tripped or off, turn on. If on, go to 3.1n-p.
	3.1n	Equipment may not be wired correctly. Verify wiring of all groups by turning them on one at a time manually and making sure the equipment is on.
	3.1o	Wire may be damaged. Check wiring for damage. Verify wire connection in electrical box and at equipment.
	3.1p	Equipment may be bad.
	3.1q	Are sensors properly programmed? Verify that your sensor parameters are entered properly and that temp sensors are properly numbered. See item 2.2.
Nothing runs when on AUTO.	3.2a	Beginning Head Count is zero. Must be more than zero for auto control to operate.
	3.2b	Check the List Equipment menu. Equipment may not have been programmed into the controller.
Fuses/circuit breakers keep blowing on a channel.	3.3a	Verify that you don't have more than 16A on the circuit. You may have to divide the equipment on that channel or wire in a contactor. If your thermal-protected contactor is shutting the group off, check to see it is set for the proper amperage.
	3.3b	Motor may not have thermal overload protection device or may not be impedance protected.
	3.3c	Equipment is defective, shorting out circuit.
	3.3d	Wire may be damaged. Follow wire to check condition. Especially possible if plastic Romex <sup>®</sup> wire staples were not used to hold wires.
	3.3e	Relay board may need to be replaced.
Group turns off when another group turns on.	3.4a	Interlock is enabled for a channel. Check the Channel Interlocking section of the <i>Installation Manual</i> for information on adjusting Channel Interlock switches.
Feeder is not turning on.	3.6a	If feeder turns on when you manually turn it to ON, you must program the feeder cycles. Check the <i>Operation Manual</i> for setting up feeder cycles.
	3.6b	Scroll through alarms and clear any feeder run time alarms. Excessive feeder run time alarms turn off feeder.
Curtain is open more/less than machine says.	3.7a	Check curtain drops. Do the curtains need to be cranked up manually and reconnected to the curtain drops?

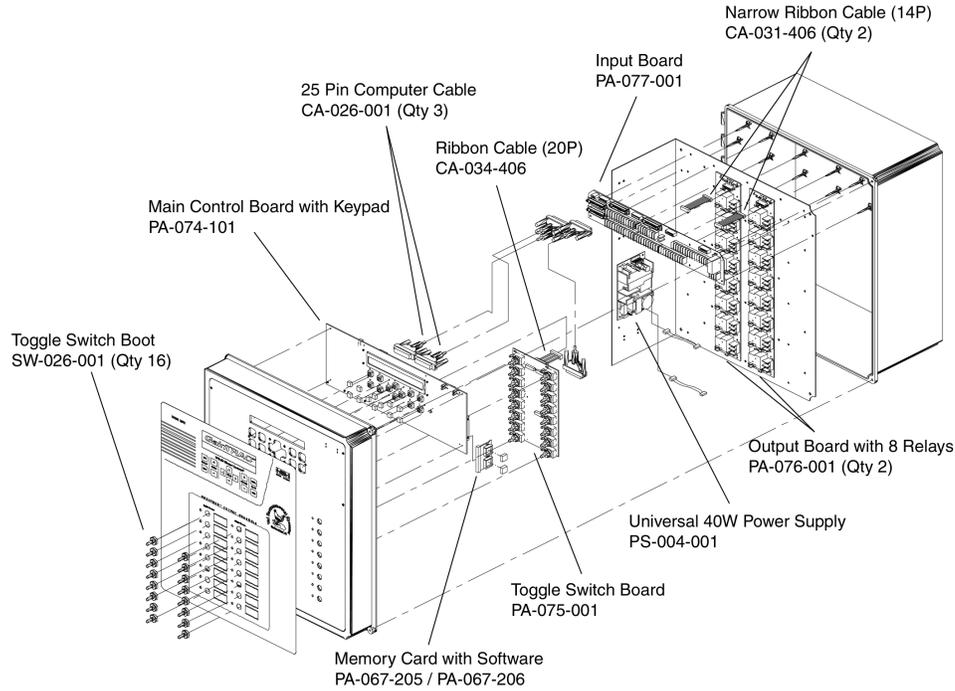
	3.7b	Turn the curtain close or open channel ON and move curtain to top or bottom manually. Turn back to AUTO. The curtain will self adjust the next time it tries to open or close completely.
	3.7c	Are the limit switches on the curtain machine set properly?
My static pressure is too high/low.	3.8a	Refer to the <i>Operation Manual</i> for information on adjusting the curtain/inlet open size settings to the number of fans running.
Equipment groups are set to come on at same temp but don't.	3.9	Is the Power Up Load Delay Time set more than a few seconds? This will delay the time between groups turning on for the first five minutes after the controller is powered up.
Furnace does not start.	3.10	Has the furnace been off during summer months? Have you bled the line?
	3.10a	Is the furnace/heater interlocked with a curtain? If it is, the heater will not start if the curtain is open.
<b>4. Setpoint Temperature</b>		
The setpoint I set yesterday didn't hold. It's too low today.	4.1a	If your animal age was 1 yesterday and you set up ramping yesterday, your animal age is changing daily. If you want to return to an age of 1, go to the Current Animal Information menu (Current Bird Information menu for controllers used in poultry operation).
	4.1b	Make sure that ramping is set up properly. For an explanation of ramping, see the <i>Operation Manual</i> .
I want to make a one day or short term change in my setpoint without changing everything.	4.2a	You can change the ramp temporarily without changing any settings by using the Ramp Offset in the Temperature Control Settings menu. Raise or lower the temperature up to 12 degrees Fahrenheit. You must change it back to zero when you want to return to your normal settings.
I've input my ramp points and setpoints, but nothing's working.	4.3a	Is your animal age between ramp points? The controller calculates setpoint temperatures for in-between ages each day at midnight. In that case, the setpoint temperature won't appear to be adjusted until the next day.
	4.3b	Check the Temperature Control menu item to ensure the controller isn't in a "parked" (OFF) state.
<b>5. Security</b>		
Someone has changed the parameters I set.	5.1	Add a password code for security (see the <i>Operation Manual</i> ). The controller is not secure without a password. Those who need to can collect data from the controller but they will be limited in what they can change.
I forgot my password.	5.2	Call service and ask for a one-day password.

<b>6. Control Pad</b>		
I can't get out of a menu category.	6.1a	Press CANCEL until you move to the first menu screen.
	6.1b	If you press keys and the menu does not change, you are probably still in the process of changing information. Finish making your change with PLUS/MINUS. Press ENTER to confirm. If you do not want the changes you've made, press CANCEL to prevent an accidental change from being entered into the controller. Now you should be ready to move to another menu screen.
I have no idea where I am in the menu system.	6.2	Press CANCEL three times. You will always return to the starting menu by using CANCEL.
I'm unable to change the group number.	6.3	Use PLUS/MINUS to change a group number. After you press ENTER to change a parameter, you cannot change the group until you confirm your choice with ENTER or exit with CANCEL.  If you change duty cycles for fogger/mister/cool pad groups or the number of fans for curtains or inlets, the process is a little different. While on a duty cycle/fan group menu, PLUS/MINUS changes the cycle/fan groups number rather than the group number. To change group, scroll with UP to the FULL ON menu. Press PLUS/MINUS to change the group number. Press DOWN to move into the duty cycle/fan group menus, and change your cycle parameters for that group.
<b>7. Alarm</b>		
I get alarms on screen but no alarm dial out or siren.	7.1a	Do you have an auto dialer or audio alarm hooked to the controller? The controller has an alarm connection but does not provide an alarm.
	7.1b	Have you cleared previous alarms? Check the Alarms/Error menu for an active alarm. Press ENTER to clear an alarm.
	7.1c	Are your controller alarms hooked up as a normally closed, series circuit? Do you have a short across the wires between the controller and the alarm that prevents the controller from communicating alarms to the alarm device?
	7.1d	Is the alarm hooked up to the alarm relay connection on the controller input/output board?
I get constant alarms.	7.2a	Is the alarm device hooked up to the proper normally closed or normally open side of the alarm relay?
My feeder/water alarms are increasing.	7.3a	As your animals grow, they consume more water and feed. Assuming they are healthy, that you have no leaks in the water or feed lines, and that feed and water are getting to the animals, you probably need to raise your limits.
	7.3b	If your feeder shows a constant run time, make sure the Minimum Amps calibration setting for the feeder sensor is above 0.

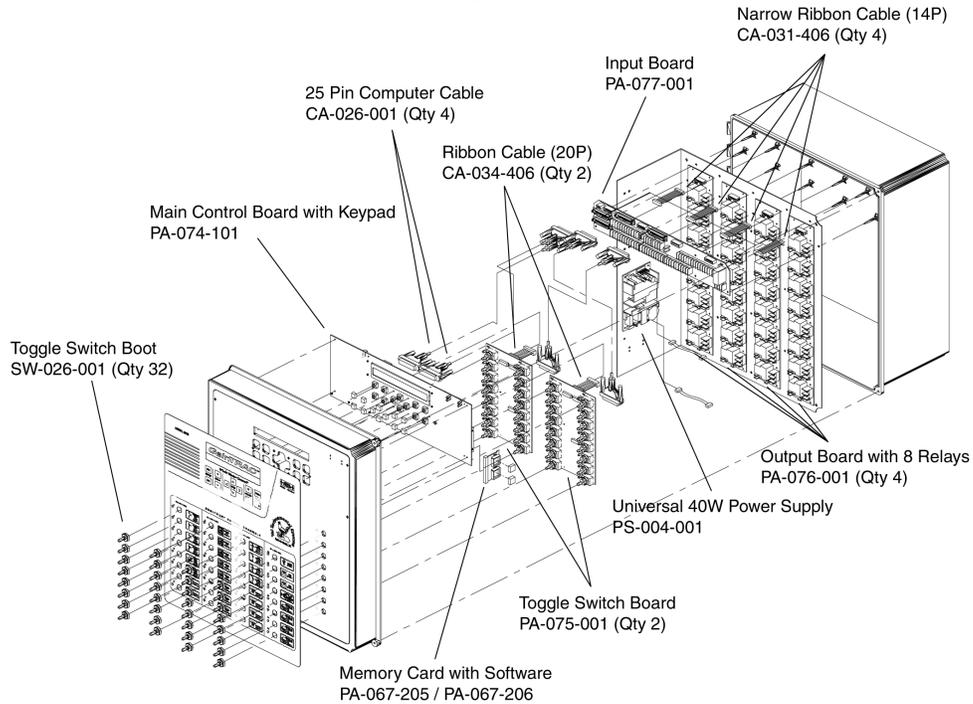
<b>8. Communications</b>		
Communications station is not talking with the controller.	8.1a	Are the communications station and controllers wired properly? Multiple controllers should be wired in parallel with the communications station. Check the polarity (+/-) of the connections. See the instructions that came with the communications station.
	8.1b	Is the modem set right for terminal or non-terminal position in wiring order? See the instructions that came with the communications station.
	8.1c	Ensure you have entered the controller's serial number in the communication software.
<b>9. Purge Settings</b>		
My controller never purges.	9.1a	Purging does not occur when the curtains are open, so if they are always open, it will appear that purging does not occur.
	9.1b	Purge ON/DELAY times are incorrect. Make sure your times are in hours, minutes and seconds. Refer to the <i>Operation Manual</i> for Purge Settings.
	9.1c	High/low temp inhibits are wrong. Purges will not occur when inside temperature is above high temp inhibit or below low temp inhibit.
	9.1d	Do you have any sidewall fan groups designated as Purge fans?
	9.1e	Are curtains set for the Natural operating mode and the Opening Temp is too low? If curtains are opening on their own, they restart purge timer.
	9.1f	Do you have purge openings for curtains or inlets set above zero?
Fans purge, but they all run at separate times.	9.2a	Check the time settings for your purge fans.
	9.2b	Is the Power Up Load Delay Time set too long? More than a few seconds?
<b>10. Inlet/Curtain Settings</b>		
Full opening not enough or too much.	10.1a	Check the Fan Groups On and Full Opening Size menu items to make sure both are correct.
	10.1b	Is the cable machine at the end of its run? Maybe it is geared wrong. Change the pulley system to allow a wider opening.
	10.1c	Check run time and full opening distance. If these are not correct, the inlet/curtain will not open properly for any setting.
Not opening when fans run.	10.2a	Have you set them up to open proportionally to number of fan groups running? See the <i>Operation Manual</i> for setting up inlets and curtain openings.
Not shutting completely.	10.3a	Is the Minimum Opening Size correct? Choose zero if you want them to shut all the way.
	10.3b	If the Equipment Status screen shows a 0 inch opening, use a manual winch to close the device completely.
Inlets open and shut without a fan running.	10.4	Are they opening when stir fans run? Do you have stir fans marked as proportional fans?

<b>11. Position Sensor</b>		
I keep getting Out of Position Alarms.	11.1a	Run the calibration process for the position sensor that appears to be causing the problem. Refer to the <i>Operation Manual</i> for instructions. Check the position sensor to controller wiring.
<b>12. Static Pressure</b>		
My inlets or curtains are opening more than they need.	12.1a	Under the inlet or curtain menu, check the Fan Groups On X Open Size XX" menu items. These settings are minimum openings for your inlets with a given number of fan groups on.
My inlets aren't responding to fans going on.	12.2a	Fan groups for exhausting air should be marked Yes for proportional control in the fan menus.
My Fan On Static Pressure Below alarm is not working.	12.3a	The alarm's delay time must be set for less than the fan run time. The alarm is checked only when one or more fans set as proportional are running.
My inlets keep moving and can't find a proper position.	12.4a	Are you trying to run two groups of static pressure controlled devices at once? For example, two sets of inlets? Set one to open automatically to fixed positions (Operating mode: Natural only) and the other to respond to static pressure.
	12.4b	Increase the Static Pressure Pause Timer setting in the inlet menu.
	12.4c	Full Open and Full Close distances and times need to be set accurately.
	12.4d	Setpoint Close and Open may be too tight to the Static Pressure Setpoint.
Static Pressure reading .250 constantly.	12.5a	The static pressure sensor is not connected to input terminal.

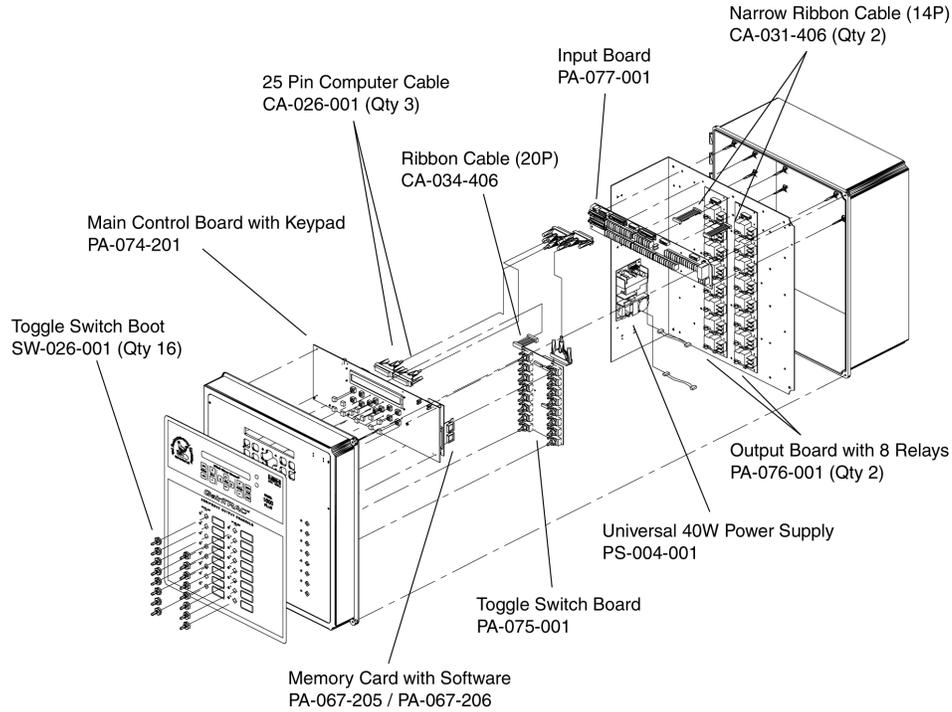
# GainTRAC 1600 Parts Diagram



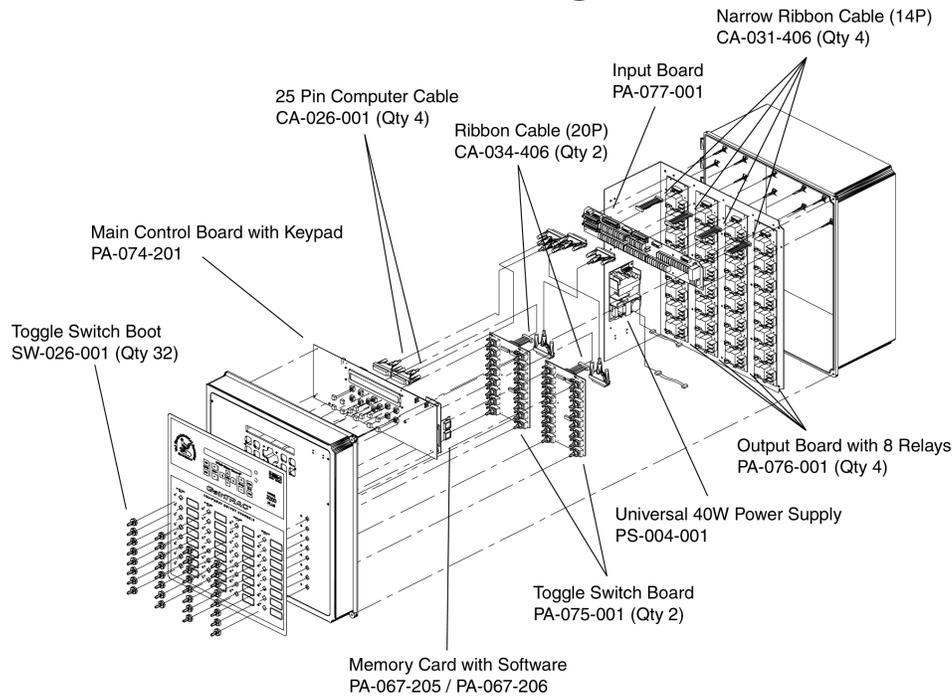
# GainTRAC 3200 Parts Diagram



# GainTRAC 1600 Plus Parts Diagram



# GainTRAC 3200 Plus Parts Diagram



## 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-Co  
210 East Main Street  
Coldwater, OH 45828 USA  
Toll Free 800-998-2526  
Fax 419-678-2200

### Important Records

#### Serial Numbers

Controller \_\_\_\_\_

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

#### Phone Numbers

Sales Rep \_\_\_\_\_

Electrician \_\_\_\_\_

Plumber \_\_\_\_\_

My Modem \_\_\_\_\_

_____	_____
_____	_____