



**WADSWORTH**  
*Control Systems*

*Maintaining the Climate for Growth*

# ***VC-100A and VC-2000 Instruction and Applications Manual Version 11.0***



5541 Marshall Street  
Arvada, Colorado 80002  
800.821.5829 303.424.4461 fax 303.424.6012  
[www.WadsworthControls.com](http://www.WadsworthControls.com)



Vent Automation consists of three elements: .....	3
1. Drive unit (VC 100A or VC 2000) .....	3
2. Vent control panel (LST, Versatile Vent or 2R) .....	3
3. Rack and pinion (aluminum or steel, sometime elbow arms are used) .....	3
1. Mounting the drive unit.....	3
2. Installing the vent control panel.....	3
3. Installing rack and pinion .....	3
4. Setting the limit switches.....	3
5. Testing the system.....	3
6. Adjusting the system.....	3
Drive Units .....	4
VC 100A ILS Specifications.....	4
Internal Limit Switches.....	5
Torque Protection .....	6
Vent Controls .....	6
Vent Control Options:.....	7
Lead Controls .....	7
LST (limit switch with transformer) Lead Control .....	7
Versatile Vent Lead Control.....	8
Follower Control .....	10
Rack and Pinion.....	10
What type of rack should I use?.....	10
How long of rack?.....	11
What rack material do I need? .....	11
How many rack and pinions should I order?.....	11
Step 1: Mounting the Drive Unit .....	11
Step 2: Vent Control Panel Installation .....	14
Step 3: Rack and Pinion .....	15
Step 4: Setting the Internal Limit Switches .....	15
Troubleshooting .....	17
Automatic Operation.....	18
Manual Operation.....	19
Straightening the Vents.....	19
Clean and Lubricate the Rack and Pinion Annually .....	19
LST Lead Vent Control Wiring Diagram .....	33
2R Follower Vent Control Diagram .....	34
Trouble Shooting Vent Control Panels.....	36
Protecting your investment: .....	39
WeatherGuard .....	39
Weather Station.....	40
Limited Warranty:.....	42

## Navigating the Manual



Boxes with the light bulb icon will highlight an important tip in using your VC-100A or VC-2000.



Boxes with the Exclamation Mark will have strongly recommended information or “must do’s” to ensure your VC-100A or VC-2000 runs optimally.

## Introduction

Thank you for choosing Wadsworth for your partner in vent automation. We think you will be glad that you chose to take advantage of Wadsworth’s 40 plus years of experience in automating vents.

Wadsworth is a US company and we are the only company that manufactures a complete system to automate greenhouse vents and side-roll-ups. Unlike others who simply import and distribute products, we have the bench strength to help you for years to come. Plus if you are using our environmental controls, we are your single-stop shop for a complete integrated system.

Your new system was engineered to provide you with the most economical and powerful vent control manufactured today. Our drive units set the standard for rugged yet smooth operation and reliability.

Your new control has gone through extensive testing and quality control before shipping. However, before attempting installation, inspect for any loose or damaged parts that may have resulted from mishandling in shipment. Notify Wadsworth immediately if there is any damage.

Many terms used throughout this manual may not be familiar to you. We have included a glossary for your convenience.

This installation and instruction manual was designed for use by all customers who purchased a VC-100A or VC-2000 drive unit with internal limit switches (ILS). Refer to the Table of Contents to locate page numbers referenced for the drive you have purchased. Drawings on how to connect the system are included along with a list of parts.

For your records and reference in case you ever need to call our Technical Support department, please fill in the following information:

Model of Unit	Serial Number

**Warning!**

**This motor can turn on/off without notice or prior warning. If you choose not to have the vent system caged or otherwise protected from access, it is critical that no one touch the unit or any of the attached parts. Contact with any of the movable components such as the shaft, vent or racks can result in serious bodily injury or death.**

**Vent Automation System****Vent Automation consists of three elements:**

1. Drive unit (VC 100A or VC 2000)
2. Vent control panel (LST, Versatile Vent or 2R)
3. Rack and pinion (aluminum or steel, sometime elbow arms are used)

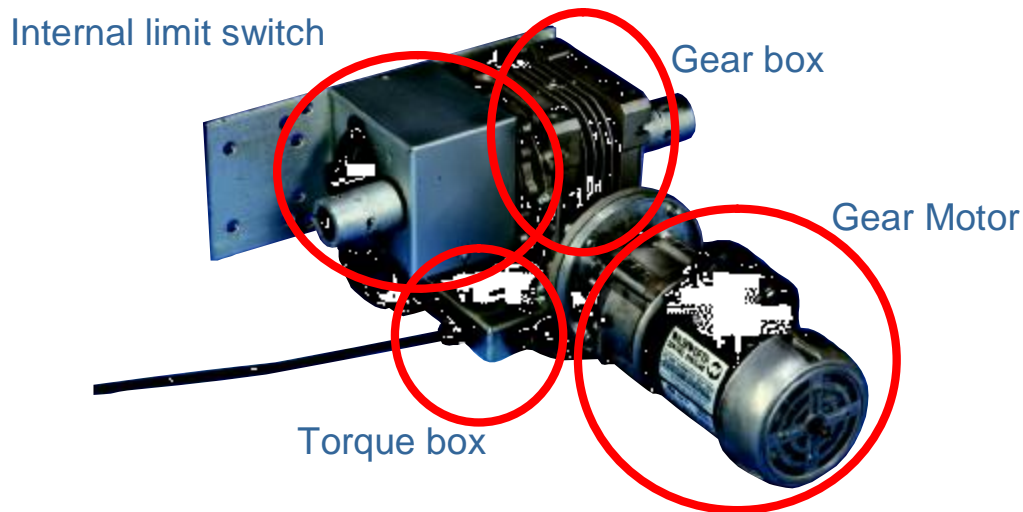
**Vent Automation Installation Overview:**

1. Mounting the drive unit
  - § Place drive unit in the center of the vent run
  - § Be sure to double through bolt
2. Installing the vent control panel
  - § Be sure to replace temporary cord with permanent wiring
3. Installing rack and pinion
  - § Space every 6-7 feet
  - § There should be 6" of rack when the vent is fully open.
  - § Clean and lubricate the rack upon installation and annually
4. Setting the limit switches
5. Testing the system
6. Adjusting the system

## Drive Units

Wadsworth Control Systems offers two sizes of drive units the VC 100A and the VC 2000. Wadsworth's drive units consist of four components:

1. Gear Motor (available sizes VC 100A or VC 2000)
2. Gear box come with all of our drive units.
3. Torque box, all of our drive units have a torque box. Wadsworth is the only company that offers both torque and reverse torque protection.
4. Limit switches, all of the drive units discussed in this manual have internal limit switches (ILS).



## Drive Unit Specifications Two Options

### VC 100A ILS Specifications

**VC-100A** is ideal for a smaller greenhouse. It can lift up to 75 feet or 4 foot polycarbonate roof ridge vent with rack and pinion or up to 125 feet of 4 foot polycarbonate side vent with rack and pinion operators.

- Motor: 1/20 horsepower, 115 volt, 60 Hz, 0.68 Amps.
- Ball bearing motor with copper windings – Class B insulation.
- Thermal overload protection with automatic reset.
- Internal Limit Switch
- Intermittent duty and quick reversing.
- Gear-reducer: Total ratio 1900:1 with final output of .84 RPM.
- Output torque is 500 in lb / 56 Nm
- Output gear reducer: Grease-immersed worm gear with tapered roller bearings on output shaft.
- Adjustable torque limit switch assembly
- Dual output shaft available in 1 3/8" or 1 5/8"

### Part Numbers:

- VC 100A with 1 3/8" shaft size Part # M-1090
- VC 100A with 1 5/8" shaft size Part # M-1092
- Shipping Wt. 53 lb / 24 kg

## VC 2000 ILS Specifications

*This drive unit is available in 1.2 RPM or 3RPM*

**VC-2000** is Wadsworth's most powerful drive unit. It meets the challenge of long vent runs and heavy vents. With its quiet running, low current, high output motor, the VC-2000 keeps your utility bills low. It can lift 325 feet of 4 foot polycarbonate roof ridge vent with aluminum frame on rack and pinion.

- Motor: 1/5 horsepower, 115 volt, 60 Hz, 2.5 amps
- Ball bearing motor with copper windings – Class B insulation.
- Thermal Overload Protection – Automatic Reset.
- Internal Limit Switch
- Quick Reversing and continuous duty.
- Gear reducer: 1350:1 Total Ratio
- **1.2 RPM or 3 RPM Final Output**
- Output Torque of 1500 in lb / 169 Nm
- Output gear reducer: Synthetic Grease Immersed Worm Gear with Tapered Roller-bearings on output shaft.
- Adjustable torque limit switch assembly
- Dual output shaft available in 1 3/8" or 1 5/8"

### Part Numbers:

- 1.2 RPM
  - § VC 2000 1.2RPM with 1 3/8" shaft size Part # M-1190
  - § VC 2000 1.2 RPM with 1 5/8" shaft size Part # M-1192
- 3 RPM
  - § VC 2000 3 RPM with 1 3/8" shaft size Part # M-1550
  - § VC 2000 3 RPM with 1 5/8" shaft size Part # M-1555
- Shipping Wt. 73 lb / 334 kg

### Internal Limit Switches

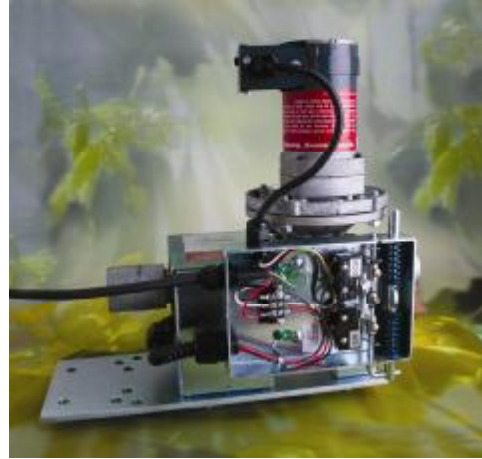
Limit switches shut the motor off when your vent is full open and fully closed.





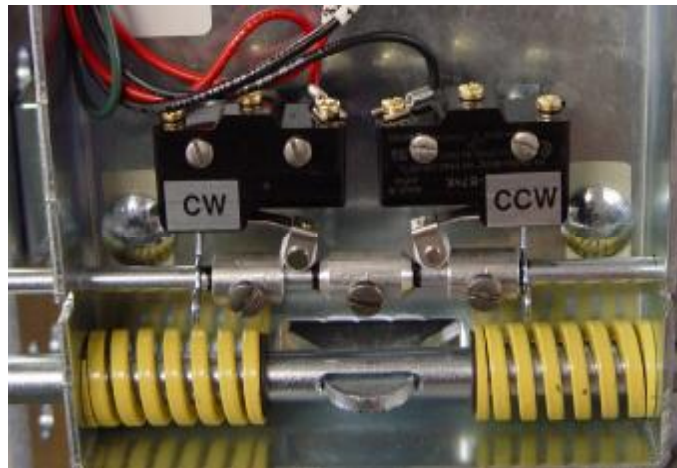
## Torque Protection

The torque box is part of the Drive Unit. It allows a backup means of stopping the motor if something gets jammed or breaks in the vent. Torque box is the flat silver box on all VC 100 and VC 2000 units.



Adjustable torque stops, the farther away from the switch's roller the more torque would be required to shut the motor off. Improper setting of the torque limits can cause excessive wear to the system.

Do not use torque settings as the primary means of shutting the system off.



## Vent Controls

Both the VC 100A and the VC 2000 drive units require a vent control panel. Wadsworth offers three models.

1. LST, which stands for limit switch with transformer
2. Versatile Vent, thus named because it can be used in any application
3. 2R, which stands for two relays

When selecting a vent control you need to consider the overall greenhouse system. Your choice of vent control depends on how you want your vents to open:

- § Incrementally (25%, 50%, 100%)
- § Proportionally (you define how many movements)
- § One movement (moves from fully open to fully closed)



This in turn depends on what type of environmental control you are using to control the temperature inside your greenhouse. Wadsworth offers solutions for virtually any scenario when in doubt please contact us 1.800.821.5829.

**Computerized environmental controls**, like our EnviroSTEP, open vents based on time, generally you can open them proportionally and define how large or small of movement the vent will make. These controls are best paired with our LST vent control.

**Traditional staged controls**, like our STEP 50A, pre-date computers and therefore need a vent control that can help manage the vent's position. Our Versatile Vent Control translates stages into timed vent movements and positions the vent in three increments based on time.

*You may remember using our incremental vent control panel with mercury switches that were mounted on the vent. We have stopped suggesting these because of mercury bans in the majority of states..*

The Versatile Vent Control can be ordered with a temperature sensor, this is an excellent solution if you do not have an environmental control and you are only operating vents or side walls.

**Leader and Follower Controls:** Wadsworth makes controls that can lead the movement of other vents and follower vent controls, which mimic the lead controls position. Lead controls have a transformer; this allows the vent control to be operated manually if there are any issues with the environmental control. The follower controls do not have a transformer, they simply have two relays and they require 24 VAC from an outside source, like the lead vent control.

### Vent Control Options:

#### Lead Controls

##### LST (limit switch with transformer) Lead Control



**Limit Switch with Transformer:** This vent control moves the vent from full open to full close. It relies on an environmental control to send a signal to open proportionally.

Features:

- § Toggle switches allow for manual operation
- § 24 VAC transformer which allows automatic operation
- § 2 relays.
- § The LST is a lead vent control; it can signal up to six 2R follower controls, the 2R drive units will move in unison with the LST lead control.

**Part # M-1001 shipping Wt. 10lbs / 5.5 kg**

## Operation:

There are two toggle switches on the control:

1. MAN/OFF/AUTO switch selects Manual or Automatic operation.
  - § MAN: In the manual mode, the LST will open or close to the positions set by the limit switches. The vent can be stopped in any position by selecting the OFF position of the MAN/OFF/AUTO switch.
  - § AUTO: If your vent control is connected to an environmental control you should leave the vent control switch in automatic.
  - § OPEN/CLOSE switch is only operable when the control is in the Manual position. When in Automatic the system moves according to commands from the external control. The vent control's operation depends on what type of environmental control it is connected to:
  - § Computerized controls, like the EnviroSTEP or the STEP Up, will open a vent in multiple proportions. **You must input the number of seconds it takes for the vent to move from full open to full closed position into the computerized environmental control.** Then the environmental control will send a signal to the LST control to open or close based on the temperature and humidity requirements in the greenhouse.
  - § Traditional staged controls, like the STEP 50A or the MiniSTEP, will open the vent in one movement. There are no increments. To increment this type of vent with a STEP 50A you need to use a Versatile Vent control.

**Versatile Vent Lead Control**

**Versatile Vent Control:** as the name states this is our most versatile vent control. It works with any type of environmental control and can even operate without an environmental control if you order a temperature sensor.

This control times how long it takes to move the vent from moves full open to full close. It then divides that number and opens the vent in three increments (25%, 50% 100%).

## Features:

- § Toggle switches allow for manual operation
- § 24 VAC transformer which allows automatic operation
- § 3 relays
- § The Versatile Vent is a lead vent control; it can signal up to six 2R follower controls, the 2R drive units will move in unison with the Versatile Vent lead control.

**Part # M-1465 shipping Wt. 13lb / 6 kg (without the aspirated temperature sensor)**

**Part # M-1460 shipping Wt. 16 lb / 7.25 kg (with the aspirated temperature sensor)**

## Operation:

There are two toggle switches on the control:

1. MAN/OFF/AUTO switch selects Manual or Automatic operation.
  - § MAN: In the manual mode, it will open or close to the positions set by the limit switches. The vent can also be stopped in any position by selecting the OFF position of the MAN/OFF/AUTO switch.
  - § AUTO: If your vent control is connected to an environmental control you should leave the vent control switch in automatic. See below for more information on how it will operate.
2. OPEN/CLOSE switch is only operable when the control is in the Manual position. When in Automatic the system moves according to commands from the external control or the temperature sensor if it is set up as a stand alone unit. The vent control's operation depends on what type of environmental control it is connected to:
  - § Computerized controls, like the EnviroSTEP or the VersiSTEP, will open a vent in multiple proportions. **You must input the number of seconds it takes for the vent to move from full open to full closed position into the computerized environmental control.** Then the environmental control will send a signal to the control to open or close based on the temperature and humidity requirements in the greenhouse.
  - § Traditional staged controls, like the STEP 50A or the STEP 500 will send a signal to the Versatile Vent; the vent will open in three movements 25%, 50%, 100%.
  - § Used as a stand alone unit with a temperature sensor directly connected to the Versatile Vent it will open in three movements 25%, 50%, 100%. In this mode the temperature and vent position will be displayed.
  - § Refer to the Versatile Vent manual for full details on operating this vent control. All Wadsworth manuals are available on our website [www.WadsworthControls.com](http://www.WadsworthControls.com)

Features:

- § Displays temperature, vent position and has an alarm output
- § Toggle switches allow for manual operation
- § 24 VAC transformer which allows automatic operation
- § 3 relays.
- § The Versatile Vent is a lead vent control; it can signal up to six 2R follower controls, the 2R drive units will move in unison with the Versatile Vent lead control.

Includes:

- § Aspirated temperature sensor
- § 100' of cable

**Part # M-1460 shipping Wt. 16 lb / 7.25 kg (with the aspirated temperature sensor)**

**Part # M-1465 shipping Wt. 13lb / 6 kg (without the aspirated temperature sensor)**

## Follower Control

### 2R (two relay) Follower Control



#### Features:

- § Toggle switches allow for manual operation
- § 2 relays.
- § Up to six 2R follower controls can be connected to a Lead Control (LST or Versatile Vent) the 2R drive units will move in unison with the lead control.

**Part # M-1003 shipping Wt. 10lbs / 5.5 kg**

#### Operation

There are two toggle switches on the control:

1. MAN/OFF/AUTO switch selects Manual or Automatic operation.
  - § MAN: In the manual mode, it will open or close to the positions set by the limit switches. The vent can also be stopped in any position by selecting the OFF position of the MAN/OFF/AUTO switch.
  - § AUTO: If your vent control is connected to an environmental control you should leave the vent control switch in automatic. See below for more information on how it will operate.
2. OPEN/CLOSE switch is only operable when the control is in the Manual position. When in Automatic the system moves according to commands from the lead control (LST or Versatile Vent) or the temperature sensor if it is set up as a stand alone unit (meaning it has an aspirated temperature sensor connected directly to the Versatile Vent). The vent control's operation depends on what type of environmental control it is connected to:

One lead control can control up to six 2R followers, three on each side. When the lead control closes, the followers will each run to their own closed limits, even if the lead control finishes closing ahead of the followers.

### Rack and Pinion

Rack and pinion connects the vent to the shaft. As the drive unit turns the shaft, the rack pushes the vent open or pulls it closed.

What type of rack should I use?

- **Curved Rack** can give you extra clearance when space is tight and the rack might interfere with a curtain or aisle
- **Straight Rack** is used in most applications

### How long of rack?

- § There should be 6" of rack when the vent is fully open.
- § All models have 6" of rack movement per revolution of drive shaft.

### What rack material do I need?

- § Aluminum Rack is used in most applications
- § Steel Rack is generally used for open roof greenhouses that need extra strength, this does not apply to roof ridge vents.

### How many rack and pinions should I order?

- § Rack is usually placed every 6' to 7'.

## Installation Overview

*Please refer to each section for complete instructions on proper installation.*

1. Mount the drive unit
  - § Place drive unit in the center of the vent run.
  - § Be sure to double through bolt
2. Install the vent control panel
  - § Be sure to replace temporary cord with permanent wiring
3. Install rack and pinion
  - § Space every 6-7 feet
  - § There should be 6" of rack when the vent is fully open.
  - § Clean and lubricate the rack upon installation and annually
4. Set the limit switches
5. Test the system
6. Adjust the system

## Installation Instructions

### Step 1: Mounting the Drive Unit

Mount the drive unit in the center of the vent run.

The driveshaft couplings are designed to mount the driveshaft piping by means of drilling two holes through the piping that correspond to the coupling.



**We strongly recommend that you mount the drive unit near the center of the vent run.**

Wadsworth Controls recommends drilling and assembling the couplers as follows:

- Insert the drive shaft into the shaft coupler. Be sure that the driveshaft piping is inserted into the coupler's full depth.
- Use a marker to indicate the holes on all sides of the driveshaft piping.
- Remove the piping from the coupler and drill the two holes using a 3/8" drill bit.

Ensure the coupling is not attached to the driveshaft piping when you drill the coupling holes. If you hit the sides of the coupling with the drill, you could increase the coupling holes, creating a wobbling effect.





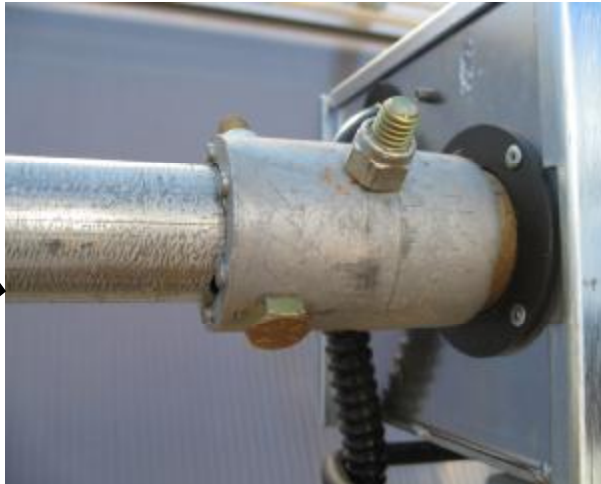
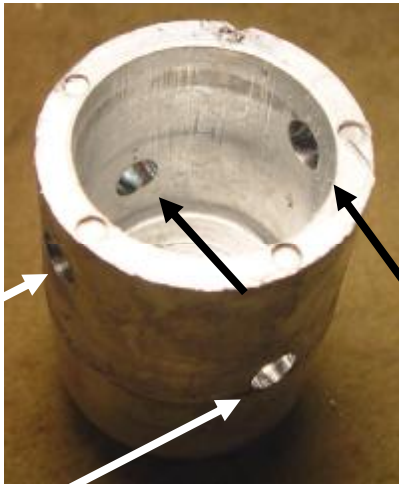
**Failure to drill both holes can result in long term damage and may cause physical harm.**

- Reinsert the driveshaft piping into the coupling. Use the four 3/8" by 2 3/4" L-8 bolts in the hardware kit that is included with the unit. Insert TWO bolts into each of the shaft couplers. Thread a 3/8" self-locking (ESNA) nut onto each bolt.



**If the drive unit is mounted outside or near a pad where water may drip or spray on it, install a splash guard over the motor to protect the motor bearings and extend the service life of the vent system.**

Example: Shaft Coupler drill points

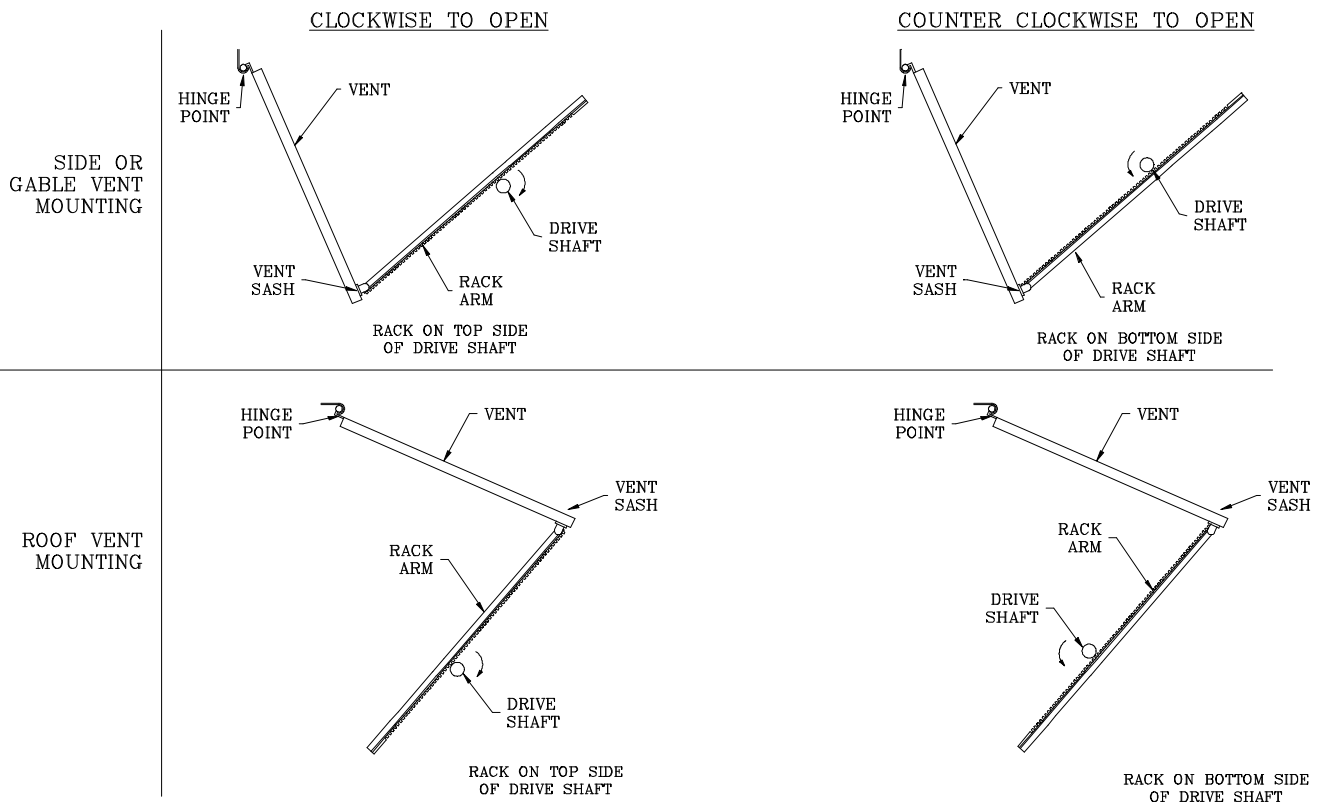
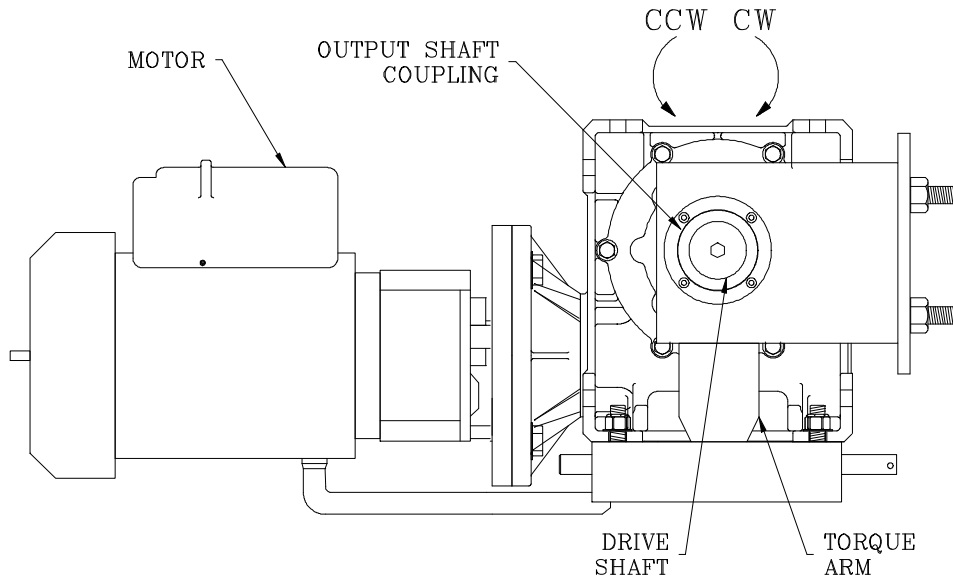


**Important! Tighten the nuts until they touch to shaft couplings. Tighten 1/4 turn more. Do not tighten further as you will damage the coupling.**

In the figure below, the vent machine is on the left, we're looking directly into one of the output shaft couplings that connect the vent machine to the drive shaft that turns the rack and pinion that move the vent.

When this manual uses the terms *clockwise* and *counter-clockwise*, it's in relation to the rotation of this output shaft coupling and the view of the machine shown in the figure. Note if the 'open' direction is clockwise or counterclockwise. Label the respective 'open' and 'close' directions on the keeper plates with a permanent marker.





**Step 2: Vent Control Panel Installation**

All wiring must conform to local and National Electrical Codes.

The black rubber power cord supplied with the drive unit and the gray power cord that comes with the vent control box are furnished so you may test your new vent system before installing it.

The short cords Wadsworth provided are only to be used for testing. **They must not be used in the final installation** because they can be unplugged leaving the system inoperable.

- Run hot, neutral and ground wires in conduit from your breaker panel to the control box. Connect the hot wire to terminal block 1, position 1 (TB-1-1). Connect the neutral wire to TB-1-2. Connect the ground wire to the green ground screw beside terminal block 1.
- Run 4 wires in conduit from the control box to a junction box near the vent motor. Fourteen gauge stranded THHN is suitable. Wire from the junction box to the vent machine through a short length of a liquid-tight flexible conduit ("flex"). Connect these wires as shown in the diagram on page 25.



The flexible conduit is required in order for the torque limit safety feature of the motor and gearbox to work correctly.

**Incorrect Installation****Correct Installation**

The short cords Wadsworth provided are only to be used for testing. They must not be used in the final installation. They are at risk of being unplugged which would leave the system inoperable.

## Rack and Pinion Installation

### Step 3: Rack and Pinion

Rack and pinion connects the vent to the shaft. As the drive unit turns the shaft, the rack pushes the vent open or pulls it closed.

#### What type of rack should I use?

- **Curved Rack** can give you extra clearance when space is tight and the rack might interfere with a curtain or aisle
- **Straight Rack** is used in most applications

#### How long of rack?

- § All of the aluminum rack has 6" of rack movement per revolution of drive shaft.
- § Rack should be 6" longer than the maximum open position
- § If the rack extends more than 6" or less than 4" when the vent is fully open, install "stop clamps" on at least two racks on either side of the drive unit.
  - Small U-bolts placed around the rack, or a bolt placed through a hole drilled in the rack make good stop clamps.
  - These clamps stop the rack at the pinion housing and provide reverse torque to shut the motor off if the vent goes past the open vent limit. Place the clamps to allow the vent to open fully before they come up against the pinion housing.

#### What rack material do I need?

- **Aluminum Rack** is used in most applications
- **Steel Rack** is generally used for open roof greenhouses that need extra strength.

#### How many rack and pinions should I order?

- Plan on placing a rack at each end of the vent then having a rack every 6' to 7'.

#### How should I lubricate the rack and pinion?

- Rack should be lubricated with Magna Lube, White Lithium, or LPS Dry Moly Lube.
- Rack and pinion should be lubricated upon installation and then they should be lubricated annually. When lubricating existing rack be sure to wipe them free of dirt before applying the lubricant.
- See illustration in the maintenance section to determine lubrication points.

### Step 4: Setting the Internal Limit Switches

Limit switches shut the motor off when your vent is full open and fully closed.

Setting the limit switches

Set the open limit\*:

§ On the drive unit's internal limit switch, remove the 'open' traveling nut Keeper Plate.

§ Set the vent control panel's switch to Manual.

§ Turn the other switch to the Open position.

§ Allow the vent to open the desired position which will be your vents full-open position.

Note: If the motor runs in the reverse direction swap wires 3 & 5 of TB-1 in the vent control panel.

§ When fully open, move the toggle switch on the vent control panel to the Off position.

§ On the drive unit's internal limit switch, turn the 'open' travel nut towards the open limit switch until the switch 'clicks'.

§ Replace the 'open' Keeper Plate.

Set the close limit\*:

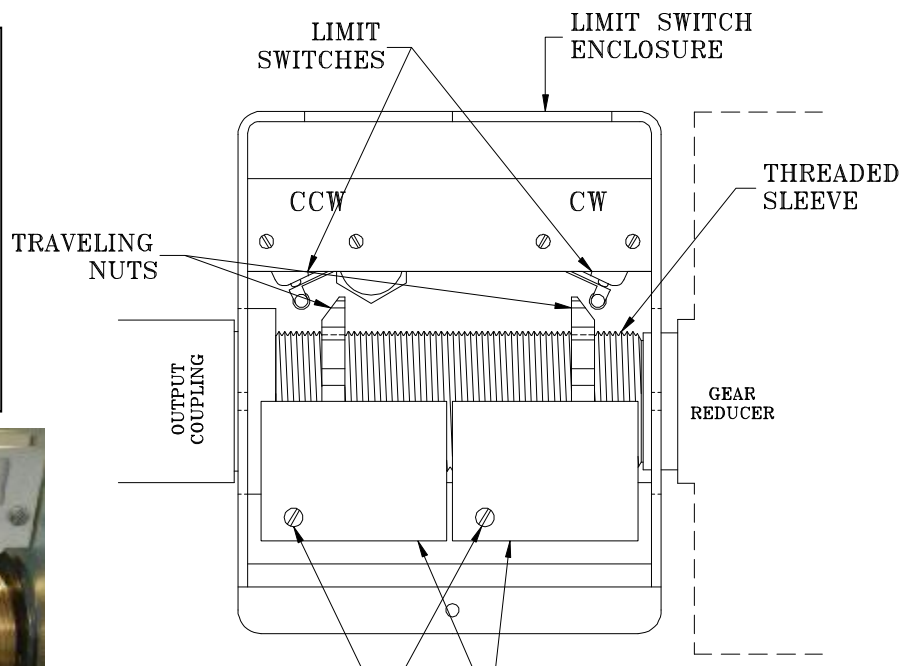
- § Manually move the vent so that it is cracked, almost closed.
- § Remove the 'close' traveling nut Keeper Plate (note you only loosen the screw you do not need to completely remove them).
- § Turn the nut so it moves *toward* the limit switch until you hear the switch click. (Always replace Keeper Plates after adjustment.)
- § Move the vent open another 6"-12" to allow that switch to reset. Now close the vent and let the limit switch stop movement.
- § Finally adjust the 'close' traveling nut one or two teeth at a time until the vent closes at the right position.
- § If the close position is between two of the teeth positions, loosen the screws under CCW or CW depending on which direction moves the vent to the close position. Once the screws are removed adjust the limit switch, micro switch arm up or down to adjust the position for the closed vent.

If possible, manually move the vent so that it is open a crack before power is applied.

**Important: If a drill motor is used for this, remove the keeper plates.**

### Important!

To prevent damage: when operating this motor with a drill motor, disengage the keeper plates from the traveling nuts on the limit switch.



If the close position is between two of the teeth positions, loosen the screws under CCW or CW depending on which direction moves the vent to the close position. Once the screws are removed adjust the limit switch, micro switch arm up or down to adjust the position for the closed vent

**Step 5: Initial Check out Procedure**

With all items in place and secured, you are ready for initial check-out. If, during the first few steps you find that the vent is running in the wrong direction it is easy to fix. Simply go to the vent control panel and swap the two wires that are on Terminal Block 1, positions 3 and 5. This will reverse the direction the drive unit runs.

- § Move the toggle switch to the OFF position.
- § Move the OPEN / CLOSE toggle switch to the appropriate position, depending on if you want to open or close the vent.
- § Use the temporary cord Wadsworth supplied with the unit to supply power to the unit.
- § Move the toggle switch to the MAN position to operate the unit manually. After approximately 6 seconds, the vent will start moving in the direction selected.
  - § Note: You must connect a 2R follower control to a lead control (LST or Versatile Vent) to test it. The 2R does not have a 6 second delay of its own. It will begin running when the lead control starts.
- § Use the vent control panel to test the unit to ensure it is rotating in the correct direction:
- § Set the Open/Close switch to Open.
- § Set the switch to Manual. After a six second time delay, the vent will start opening.
- § Quickly note the direction the vent is moving, and then turn the vent off using the Manual/Off/Automatic switch.
- § If the vent began to open, no changes are needed.

**Troubleshooting****What if my drive unit is running the wrong direction?**

- § If the vent is moving the wrong direction, the motor needs to be reversed. Simply interchanging the two wires on points 3 and 5 of TB-1 in the vent control panel. (Refer to interconnect diagrams.)

**What if my drive unit will not move?**

If a system will not move the drive unit is probably torqued off. In this instance the drive unit will tilt and render the unit inoperable. There are several possible issues:

1. something is binding in the vent
2. the vent is not aligned
3. the torque needs to be adjusted

**Something is binding in the vent**

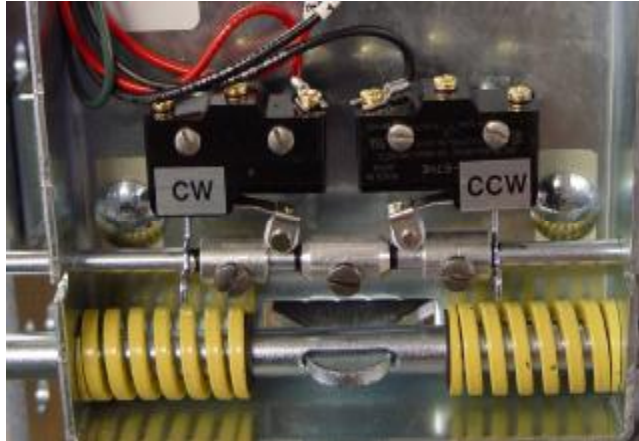
- § Find whatever is binding the vent (Bent rack, ladder in the way of the vent...)
- § Remove the obstacle
- § Push the motor end of the drive unit up and down and it should start running again.

**The vent is not aligned**

- § If the drive unit is not moving the vents need to be straightened and lubricated.
- § After straightening your vent test your internal limits to ensure they are properly adjusted.

**The torque needs to be adjusted**

- § The last step is to make a minor adjustment in the torque limit box. We strongly suggest that all other measures be used prior to adjusting the torque limit switch.
- § To adjust the torque, push up on the actuator arm. You should hear a click, if you do not hear a click that is the switch that is being actuated to torque off the drive unit.
- § Once you have identified the switch that is being actuated move the torque stop away from the arm. The adjustment should be very small, never move the torque stop more than 1/16" at a time. Do not move the torque stop more than the cotter pin stop allows.



Run the vent several times to ensure torque adjustments are properly set.



**Never move the torque stop more than 1/16" at a time and never more than the cotter pin stop allows.**

### Automatic Operation

Once your vent automation system is installed you can connect it to an environmental control which ties all of the heating and cooling equipment together to maintain the proper temperature. Using a centralized system not only helps maintain the desired temperature it also reduces energy costs because using one sensor eliminates heating and cooling equipment from running at the same time.

The operation of your vent automation will depend on what type of environmental control and vent control you are using. When selecting a vent control you need to consider the overall greenhouse system. Your choice of vent control depends on how you want your vents to open:

- § Incrementally (25%, 50%, 100%)
- § Proportionally (you define how many movements)
- § One movement (moves from fully open to fully closed)

This in turn depends on what type of environmental control you are using to control the temperature inside your greenhouse.

**Computerized environmental controls**, like our EnviroSTEP, open vents based on time, generally you can open them proportionally and define how large or small of movement the vent will make. These controls are best paired with our LST vent control.

**Traditional staged controls**, like our STEP 50A, pre-date computers and therefore need a vent control that can manage the vent's position. Our Versatile Vent Control translates stages into timed vent movements and positions the vent in three increments based on time.

**Leader and Follower Controls:** Wadsworth makes controls that can lead the movement of other vents and follower vent controls, that moved based on the lead controls position. Lead controls have a transformer; this allows the vent control to be operated manually if there are any issues with the environmental control. The follower controls do not have a transformer, they simply have two relays and they require 24 VAC from an outside source, like the lead vent control.



## Manual Operation

If you have a lead control, like the LST or the Versatile Vent you can operate the vent system manually. When the OPEN/CLOSE position is set to OPEN, the vent will run to its open limit without incrementing and stop. When the OPEN/CLOSE position is set to CLOSE, the vent will run to its closed limit without incrementing and stop. You may manually stop the vent at intermediate positions by moving the AUTO/OFF/MAN switch from MAN to OFF.

## Maintenance

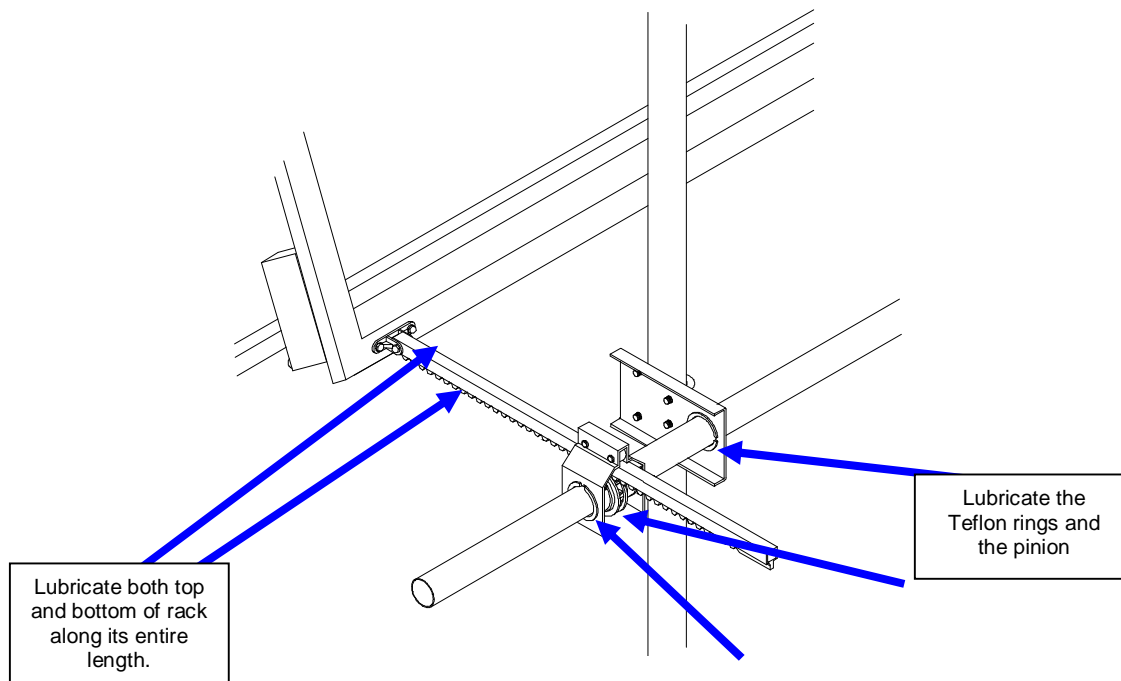
### Straightening the Vents

To straighten the vents, should they become skewed, do the following:

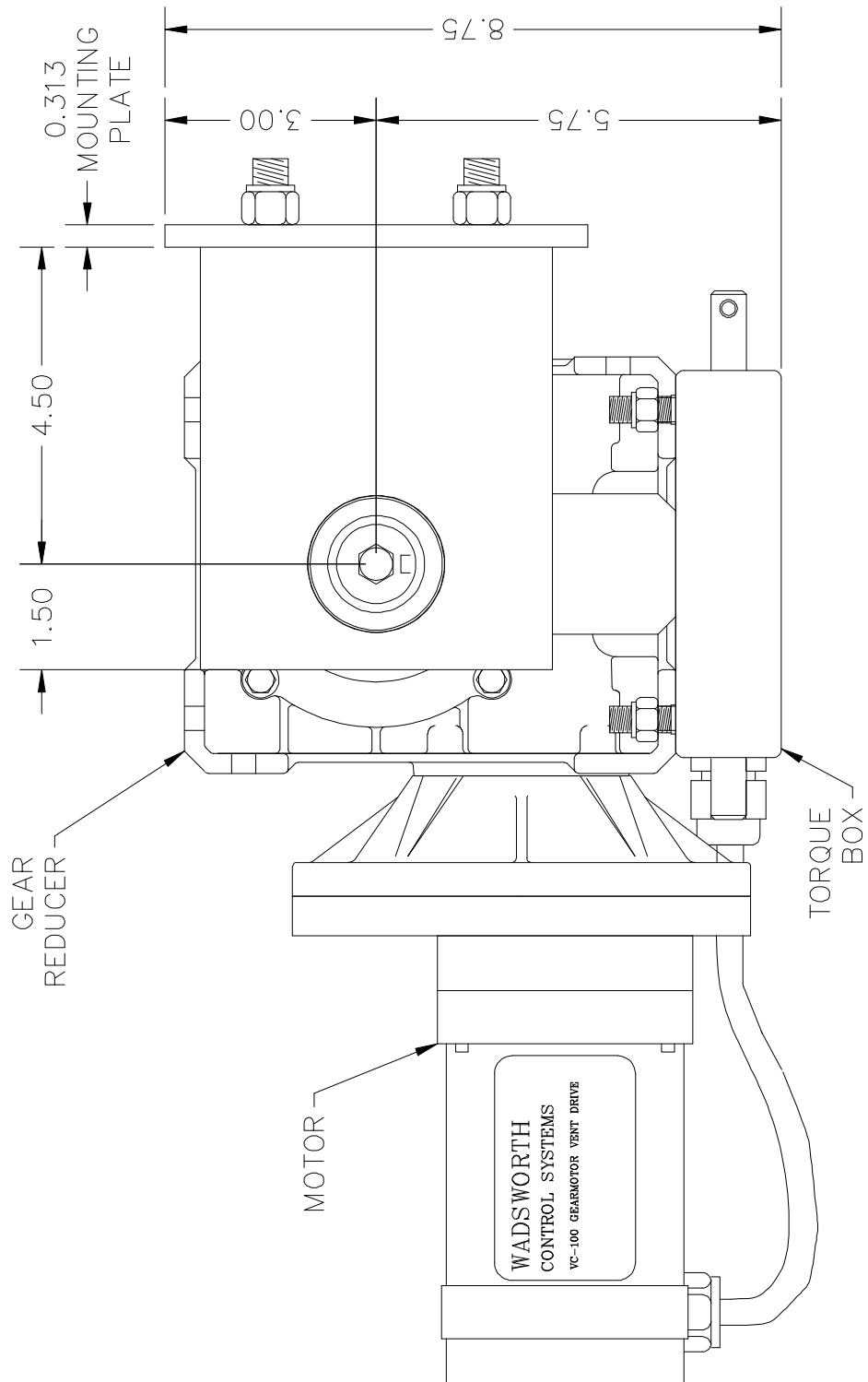
- § Shut the vent all the way to the closed position.
- § Loosen the set screws on the pinion gear.
- § Adjust the frame and make sure it is straight.
- § Align the rack and pinions to be straight.
- § Tighten the set screws on the pinion gear.
- § Lubricate the rack and pinion.
- § Test full open to full close position.
- § Ensure the internal limit settings are still accurate.

### Clean and Lubricate the Rack and Pinion Annually

Wadsworth Controls recommends using MagnaLube-G Teflon Grease, White Lithium, or LPS Dry Moly Lube, to wipe down the rack and lubricate your vent controls once a year. Lubricate both sides of the rack as well as the Nylatron bearings inside the unit as shown below:

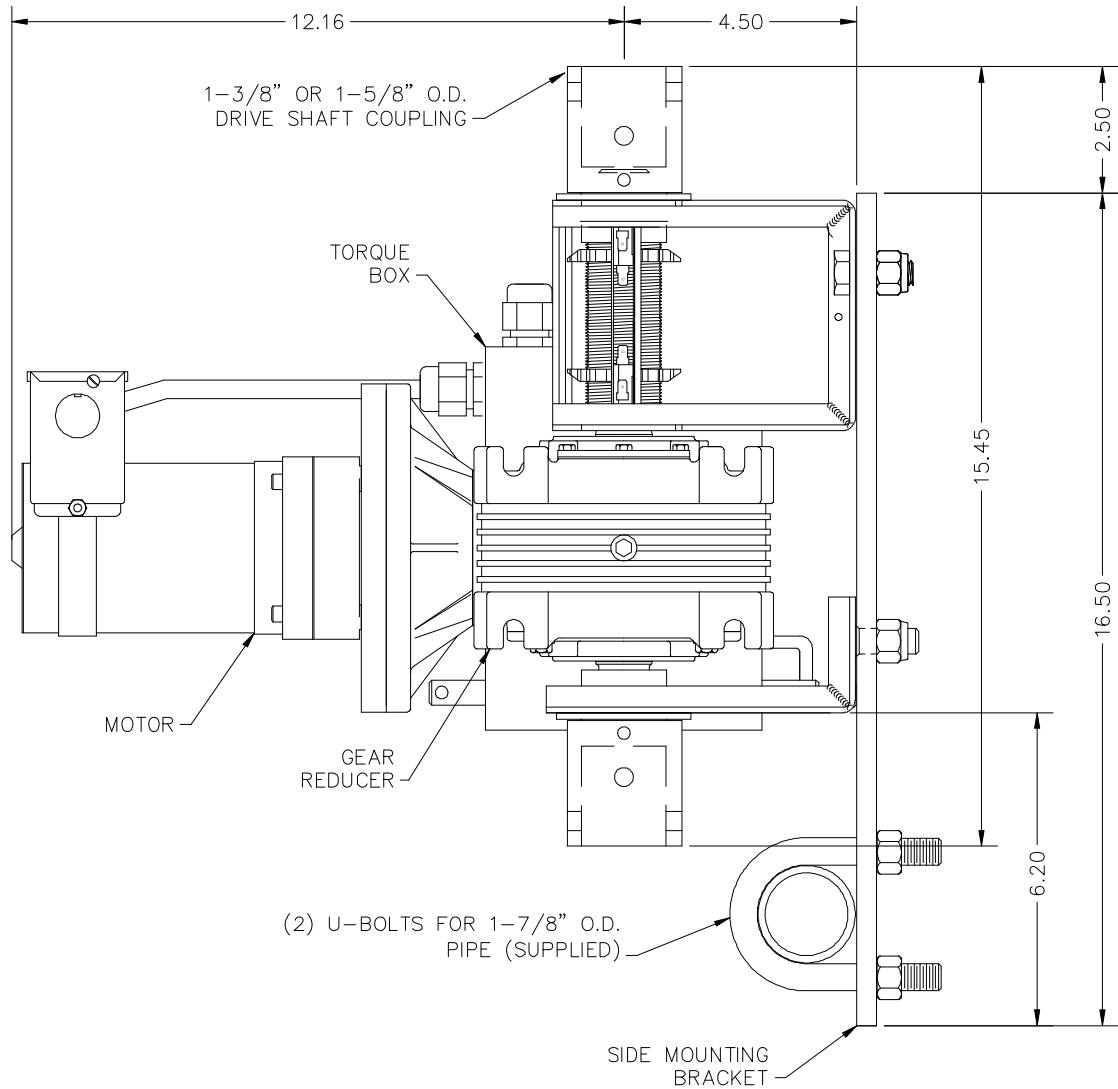


VC-100A / ILS DRIVE UNIT \* SIDE VIEW  
DIMENSIONS



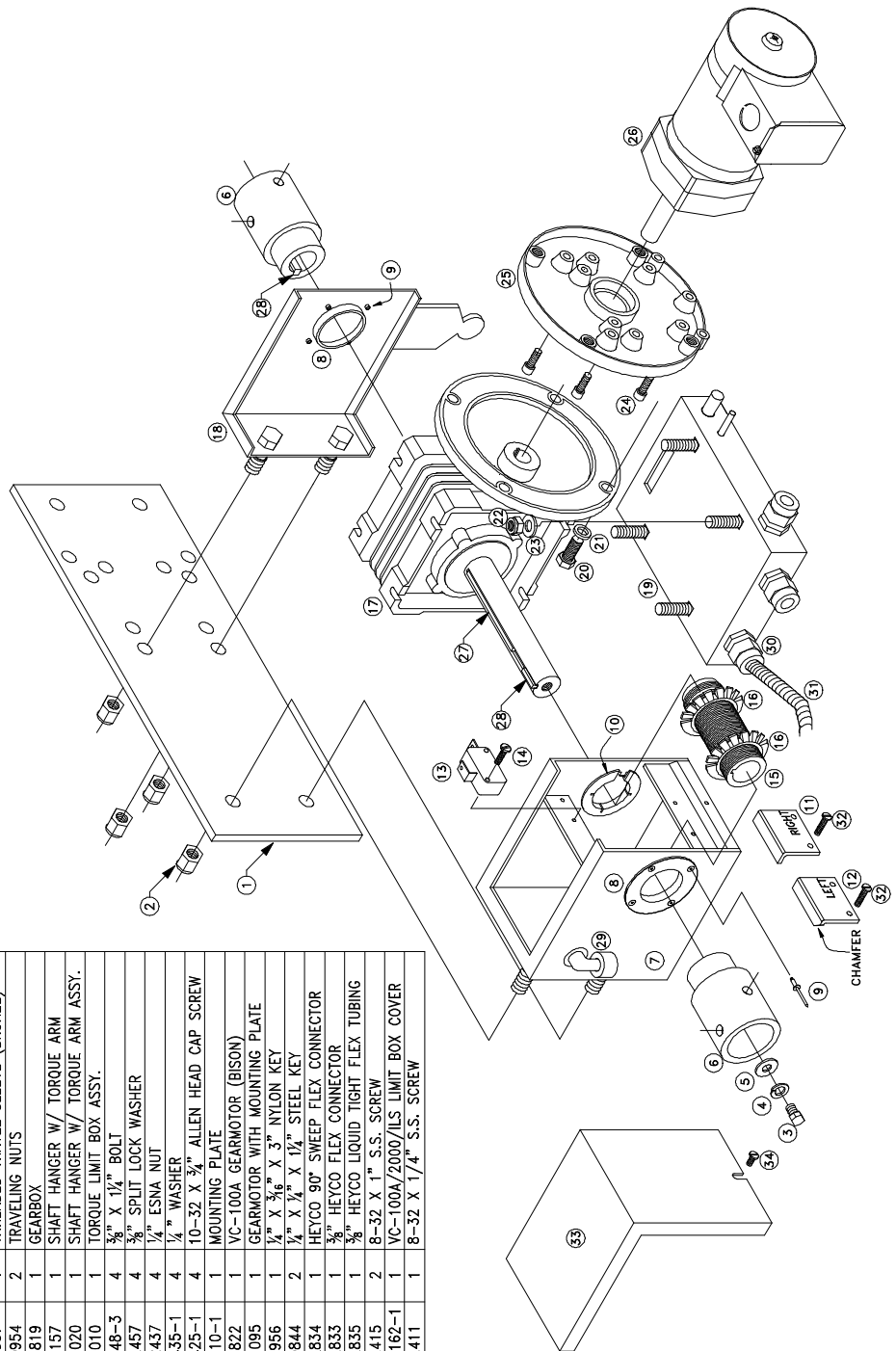
**VC 100A ILS Drive Unit Top View**

VC-100A / ILS DRIVE UNIT \* TOP VIEW  
DIMENSIONS

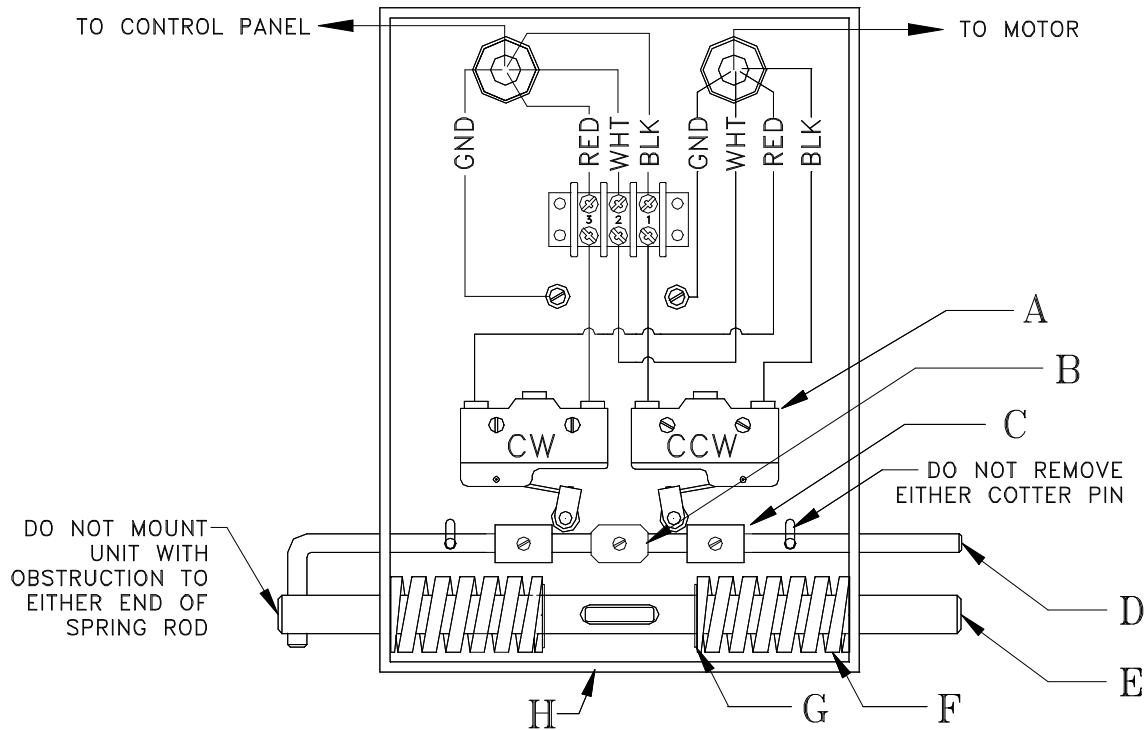


**VC 100A ILS  
Exploded Isometric View**
**VC-100A / ILS  
EXPLODED ISOMETRIC VIEW**

ITEM NUMBER	PART NUMBER	QTY.	DESCRIPTION
1	F-0166	1	VC-100A / 2000 SIDE MOUNTING PLATE
2	H-2468	4	1/2" ESNA NUT
3	H-2440	2	5/16-18 X 1" BOLT
4	H-2443	2	5/16" LOCK WASHER
5	H-2443-2	2	5/16" FENDER WASHER
6	F-0909	2	1 1/2" COUPLER
7	F-0902	2	1 1/2" COUPLER
8	F-0162	1	LIMIT BOX ASSY.
9	H-2014	2	NYLATRON RIVET BUSHING
10	H-1201	8	RIVET 1/2" - 3/16" GRIP RANGE
11	H-0741	1	1 1/2" NYLATRON SNAP BUSHING
12	F-0162-2	1	KEEPER PLATE - RIGHT
13	F-0162-3	1	KEEPER PLATE - LEFT (CHAMFERED)
14	E-0130	2	SWITCH PRECISE SNAP ACTION
15	H-2363	4	SCREW 4-40 X 3/4"
16	F-0957	1	THREADED TRAVEL SLEEVE (BRONZE)
17	S-0954	2	TRAVELING NUTS
18	E-1819	1	GEARBOX
19	F-0157	1	SHAFT HANGER W/ TORQUE ARM
20	S-1020	1	SHAFT HANGER W/ TORQUE ARM ASSY.
21	S-1010	1	TORQUE LIMIT BOX ASSY.
22	H-2448-3	4	3/8" X 1 1/4" BOLT
23	H-2457	4	3/8" SPLIT LOCK WASHER
24	H-2437	4	1/4" ESNA NUT
25	H-2435-1	4	1/4" WASHER
26	H-2425-1	4	10-32 X 3/4" ALLEN HEAD CAP SCREW
27	F-0910-1	1	MOUNTING PLATE
28	E-1822	1	VC-100A GEARMOTOR (BISON)
29	M-1095	1	GEARMOTOR WITH MOUNTING PLATE
30	F-0956	1	1 1/2" X 3/16" X 3" NYLON KEY
31	H-0844	2	1/4" X 1/4" X 1 1/4" STEEL KEY
32	H-2834	1	HEYCO 90° SWEEP FLEX CONNECTOR
33	H-2833	1	3/8" HEYCO FLEX CONNECTOR
34	H-2835	1	3/8" HEYCO LIQUID TIGHT FLEX TUBING
35	H-2415	2	8-32 X 1" S.S. SCREW
36	F-0162-1	1	VC-100A/2000/ILS LIMIT BOX COVER
37	H-2411	1	8-32 X 1/4" S.S. SCREW



## VC-100A TORQUE BOX ASSEMBLY AND PARTS LAYOUT



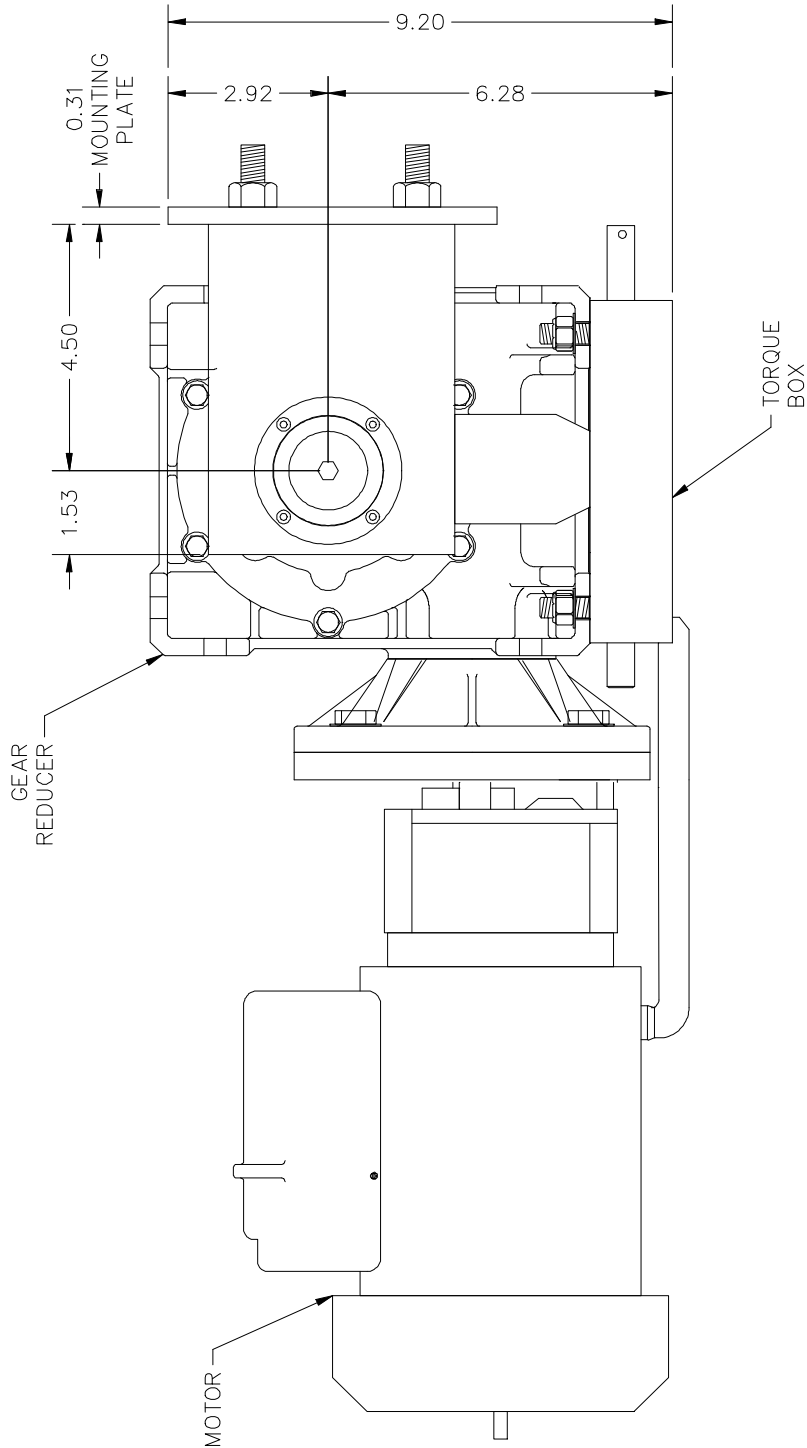
### LETTER VC-100A TORQUE BOX PART NUMBERS

	WADSWORTH PART NUMBER	DESCRIPTION	QUANTITY PER UNIT
A	E-0131	MICROSWITCH	2
B	F-1005	REVERSE TORQUE LIMIT SWITCH	1
C	F-1004	TORQUE ADJUSTMENT STOP	2
D	F-0404	SWITCH ROD	1
E	F-0801	SPRING ROD	1
F	H-2307	SPRING	2
G	H-2802	"E" RING	2
H	S-1010	COMPLETE TORQUE PANEL ASSY.	

THE VC-100A TORQUE BOX ASSEMBLY HAS BEEN MODIFIED TO INCLUDE A REVERSE TORQUE LIMIT STOP AS SHOWN IN THE DRAWING. PLACEMENT OF THE STOP IS MIDWAY BETWEEN THE TWO ROLLER SWITCHES THAT ARE USED IN THE ACTIVATION OF TORQUE LIMITING. THIS NEW STOP WILL ACTIVATE ONE OF THE LIMIT SWITCHES IN CASE THE DRIVE UNIT FAILS TO REVERSE DIRECTION.

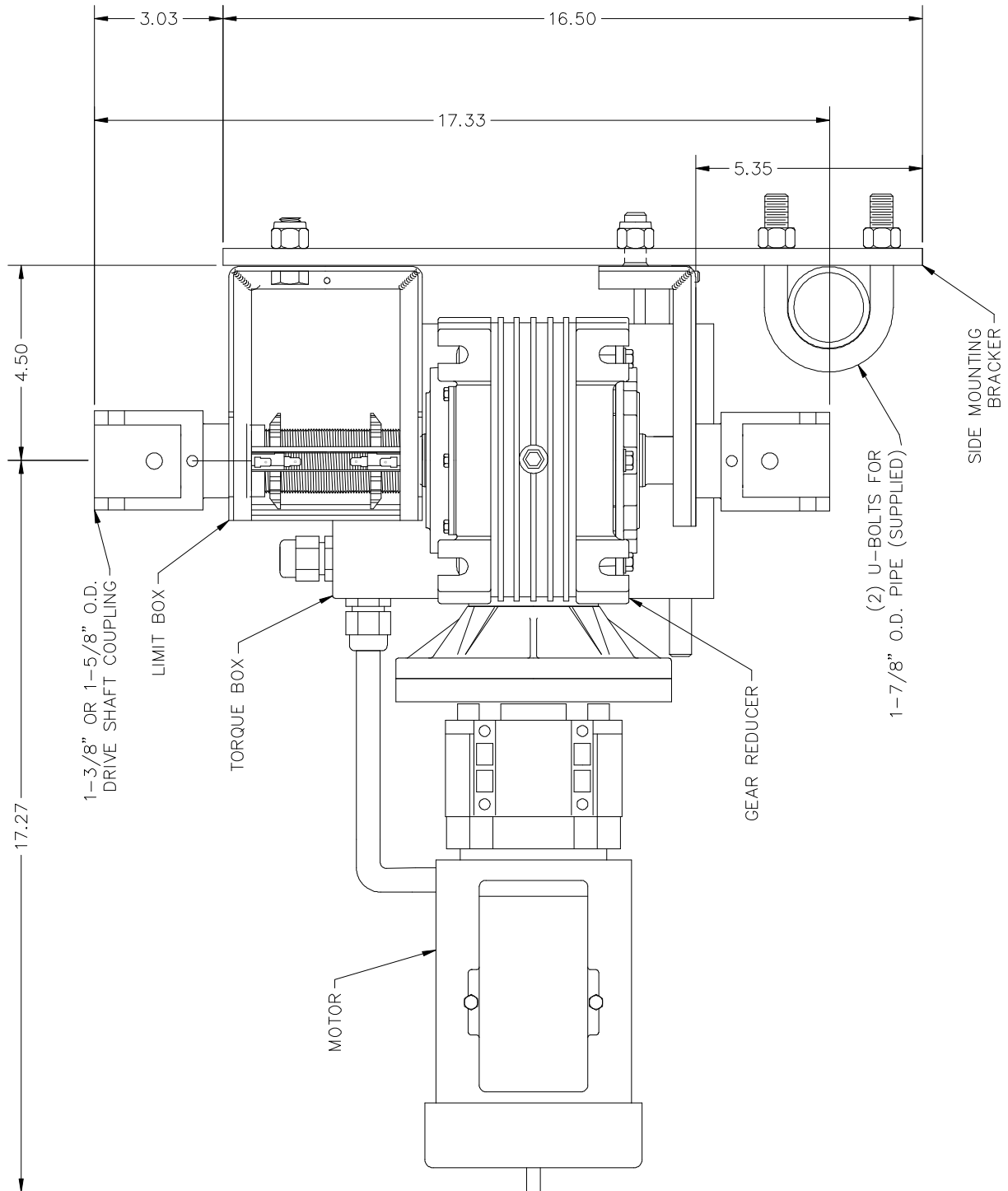
CHECK THIS STOP ANYTIME THE UNIT FAILS TO RUN. IF IT HAS ACTIVATED ONE OF THE SWITCHES, LOOSEN THE SCREW THAT HOLDS IT IN PLACE AND BACK IT OFF. THIS WILL THEN FREE THE UNIT TO RUN BACK FROM WHERE IT STOPPED. AFTER THE UNIT HAS RUN BACK FAR ENOUGH TO FREE ITSELF, RESET THE STOP TO ITS ORIGINAL, CENTERED, POSITION ON THE TORQUE SWITCH ROD.

VC-2000 / ILS DRIVE UNIT \* SIDE VIEW  
DIMENSIONS



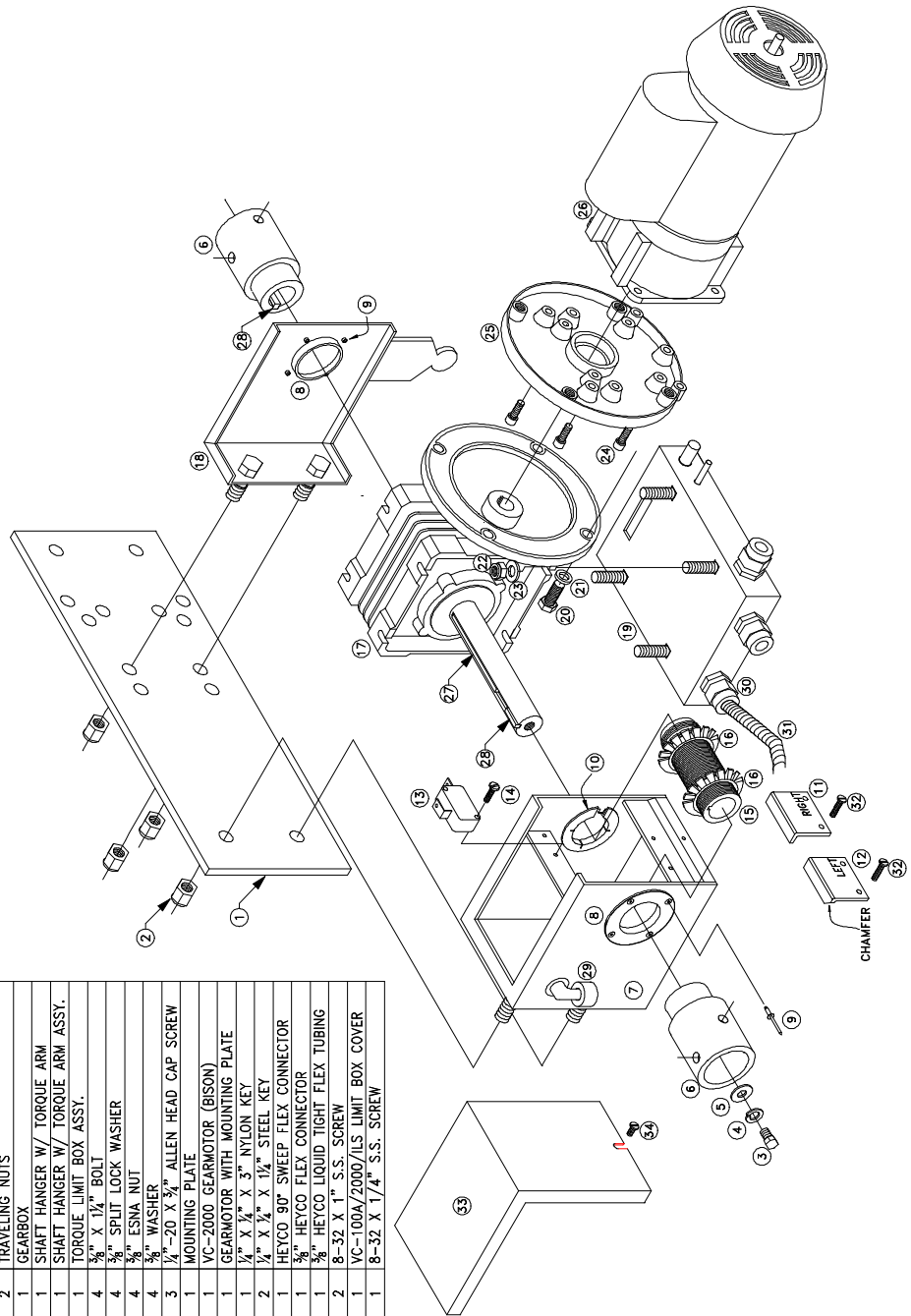


VC-2000 / ILS DRIVE UNIT \* TOP VIEW  
DIMENSIONS



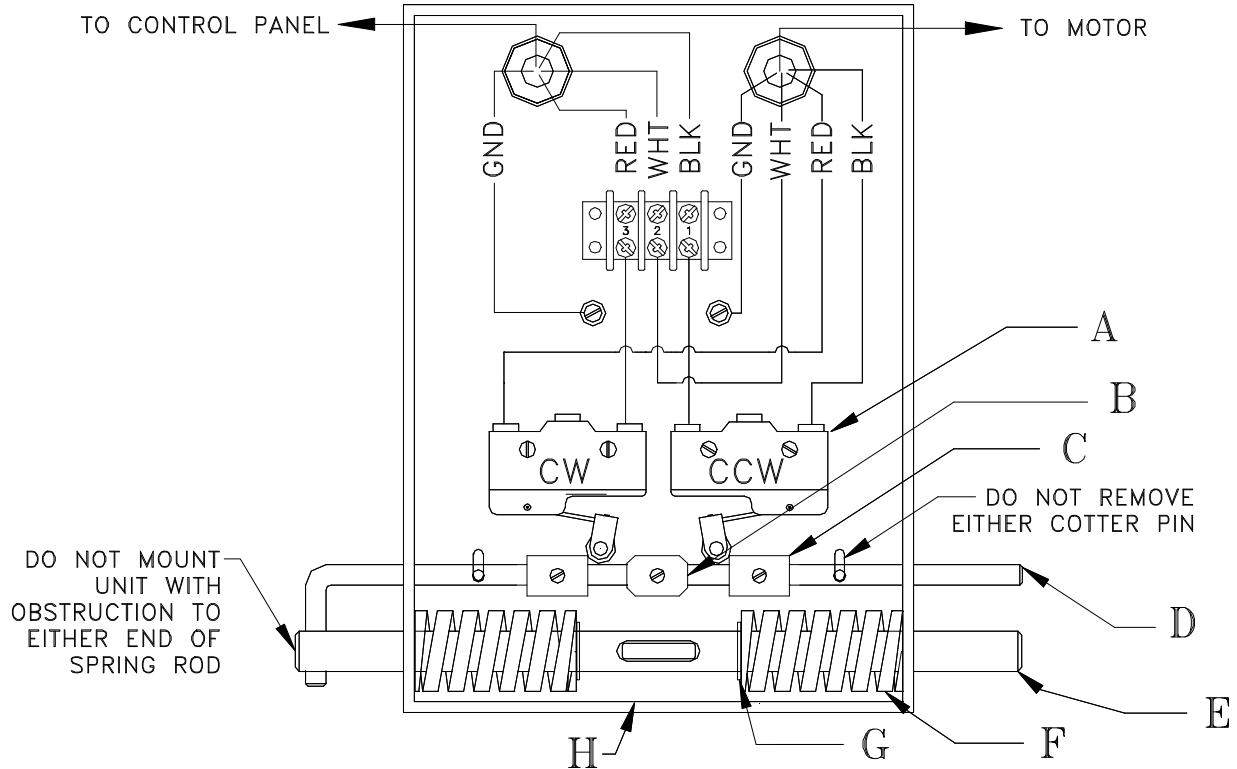
**VC 2000 ILS  
Isometric View**
**VC-2000 / ILS  
EXPLODED ISOMETRIC VIEW**

ITEM NUMBER	PART NUMBER	QTY.	DESCRIPTION
1	F-0166	1	VC-100A / 2000 SIDE MOUNTING PLATE
2	H-2488	4	1/2" ESNA NUT
3	H-2440	2	3/8"-18 X 1" BOLT
4	H-2443	2	3/8" LOCK WASHER
5	H-2443-2	2	3/8" FENDER WASHER
6	F-0909	2	1 1/2" COUPLER
7	F-0902	2	1 1/2" COUPLER
8	F-0162	1	LIMIT BOX ASSY.
9	H-2014	2	NYLATRON RIVET BUSHING
10	H-1201	8	RIVET 1/2"-3/8" GRIP RANGE
11	H-0741	1	1 1/2" NYLATRON SNAP BUSHING
12	F-0162-2	1	KEEPER PLATE - RIGHT
13	F-0162-3	1	KEEPER PLATE - LEFT (CHAMFERED)
14	E-0150	2	SWITCH PRECISE SNAP ACTION
15	H-2363	4	SCREW 4-40 X 3/4"
16	F-0957	1	THREADED TRAVEL SLEEVE (BRONZE)
17	S-0954	2	TRAVELING NUTS
18	F-1827	1	GEARBOX
19	F-0163	1	SHAFT HANGER W/ TORQUE ARM
20	S-1121	1	SHAFT HANGER W/ TORQUE ARM ASSY.
21	S-1110	1	TORQUE LIMIT BOX ASSY.
22	H-2448-3	4	3/8" X 1 1/4" BOLT
23	H-2457	4	3/8" SPLIT LOCK WASHER
24	H-2459	4	3/8" ESNA NUT
25	H-2458	4	3/8" WASHER
26	H-2430-1	3	1/4"-20 X 3/4" ALLEN HEAD CAP SCREW
27	F-0910-1	1	MOUNTING PLATE
28	E-1824	1	VC-2000 GEARMOTOR (BISON)
29	M-1195	1	GEARMOTOR WITH MOUNTING PLATE
30	F-0956	1	1/4" X 1/4" X 3" NYLON KEY
31	H-0844	2	1/4" X 1/4" X 1 1/4" STEEL KEY
32	H-2834	1	HEYCO 90° SWEEP FLEX CONNECTOR
33	H-2835	1	3/8" HEYCO FLEX CONNECTOR
34	H-2835	1	3/8" HEYCO LIQUID TIGHT FLEX TUBING
35	H-2415	2	8-32 X 1" S.S. SCREW
36	F-0162-1	1	VC-100A/2000/ILS LIMIT BOX COVER
37	H-2411	1	8-32 X 1/4" S.S. SCREW



**VC 2000 ILS  
Torque Box**

# VC-2000 TORQUE BOX ASSEMBLY AND PARTS LAYOUT



## VC-2000 TORQUE BOX PART NUMBERS

LETTER	WADSWORTH PART NUMBER	DESCRIPTION	QUANTITY PER UNIT
A	E-0131	MICROSWITCH	2
B	F-1005	REVERSE TORQUE LIMIT STOP	1
C	F-1004	TORQUE ADJUSTMENT STOP	2
D	F-0173	SWITCH ROD	1
E	F-0172	SPRING ROD	1
F	H-2305	SPRING	2
G	H-2802	"E" RING	2
H	S-1110	COMPLETE TORQUE PANEL ASSY.	

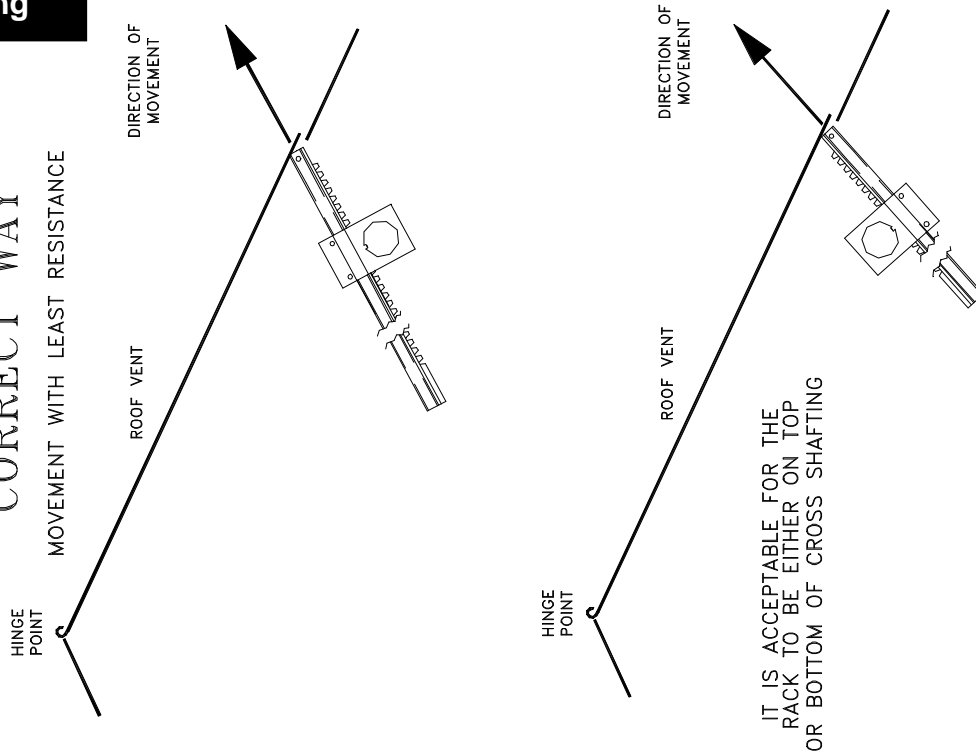
THE VC-2000 TORQUE BOX ASSEMBLY HAS BEEN MODIFIED TO INCLUDE A REVERSE TORQUE LIMIT STOP AS SHOWN IN THE DRAWING. PLACEMENT OF THE STOP IS MIDWAY BETWEEN THE TWO ROLLER SWITCHES THAT ARE USED IN THE ACTIVATION OF TORQUE LIMITING. THIS NEW STOP WILL ACTIVATE ONE OF THE LIMIT SWITCHES IN CASE THE DRIVE UNIT FAILS TO REVERSE DIRECTION.

CHECK THIS STOP ANYTIME THE UNIT FAILS TO RUN. IF IT HAS ACTIVATED ONE OF THE SWITCHES, LOOSEN THE SCREW THAT HOLDS IT IN PLACE AND BACK IT OFF. THIS WILL THEN FREE THE UNIT TO RUN BACK FROM WHERE IT STOPPED. AFTER THE UNIT HAS RUN BACK FAR ENOUGH TO FREE ITSELF, RESET THE STOP TO ITS ORIGINAL, CENTERED, POSITION ON THE TORQUE SWITCH ROD.

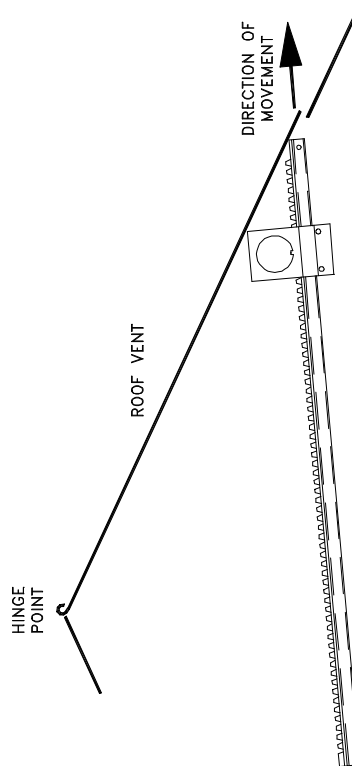
**Roof Vent Rack and Pinion Mounting**

**ROOF VENT RACK & PINION MOUNTING**

**CORRECT WAY**  
MOVEMENT WITH LEAST RESISTANCE

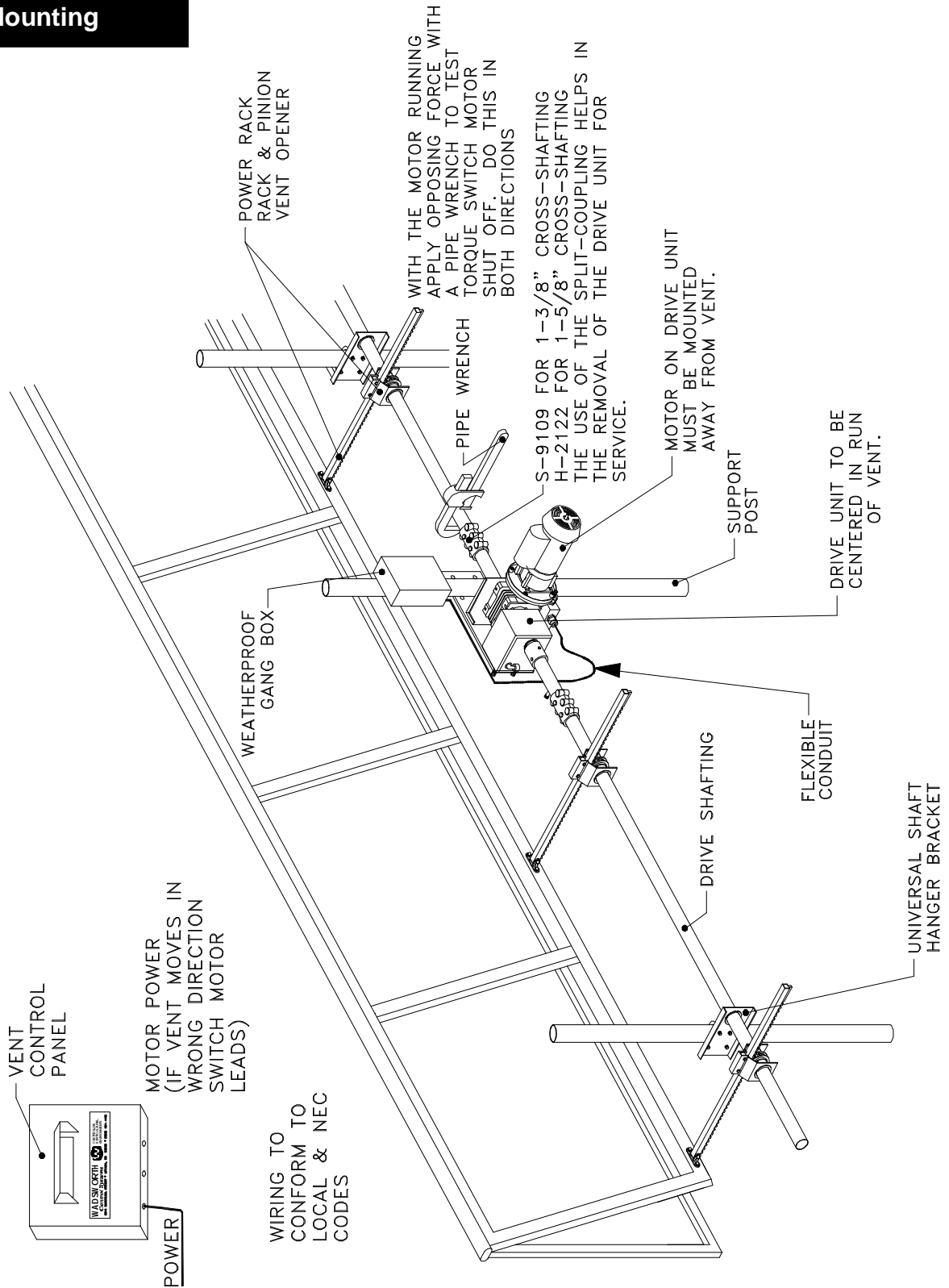


**WRONG WAY**  
SHAFTING MOUNTED TOO HIGH



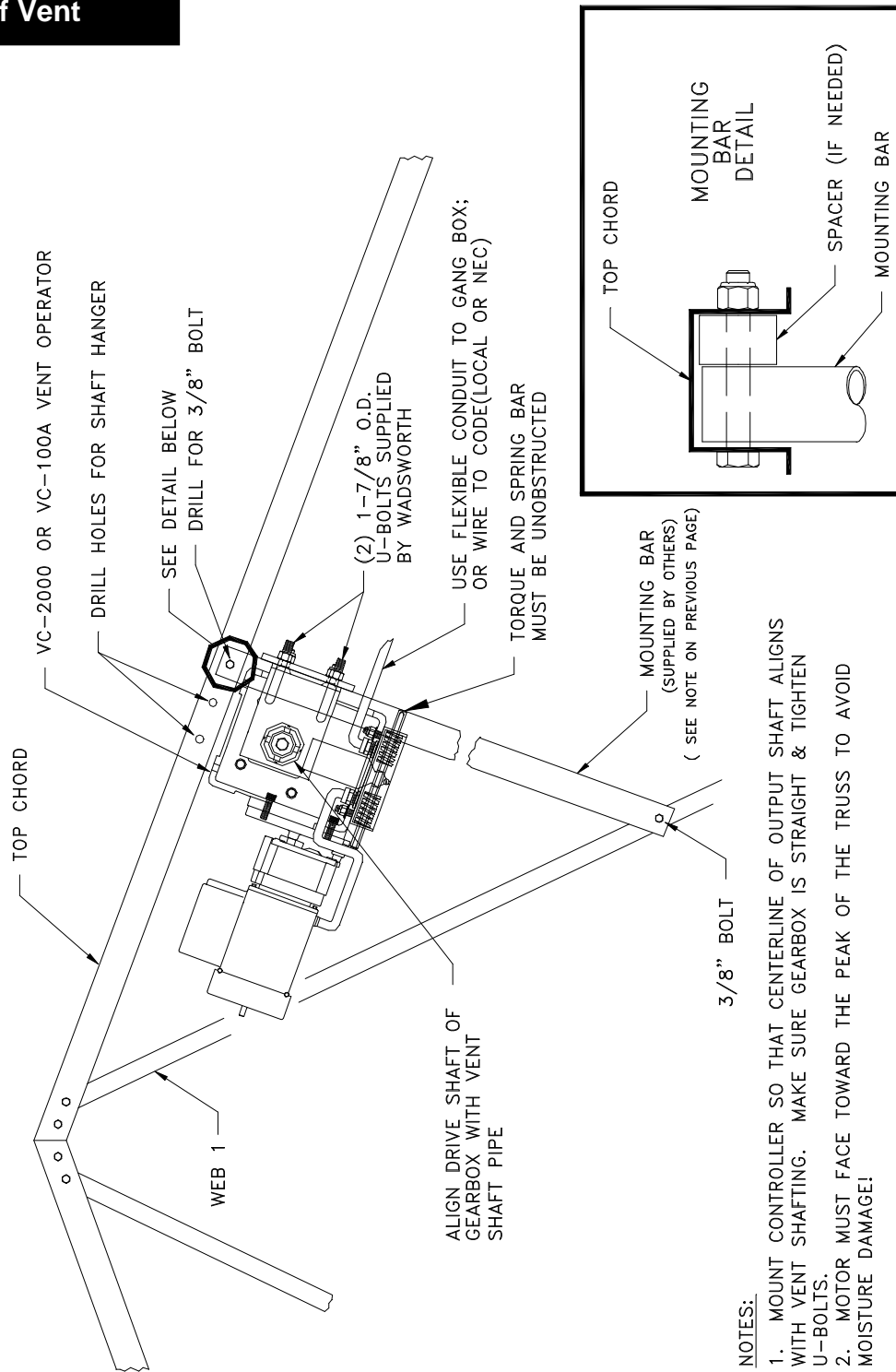
## Side or End Vent Mounting

# MOUNTING FOR SIDE/END WALL VENTS



**End View Mounting  
Roof Vent**

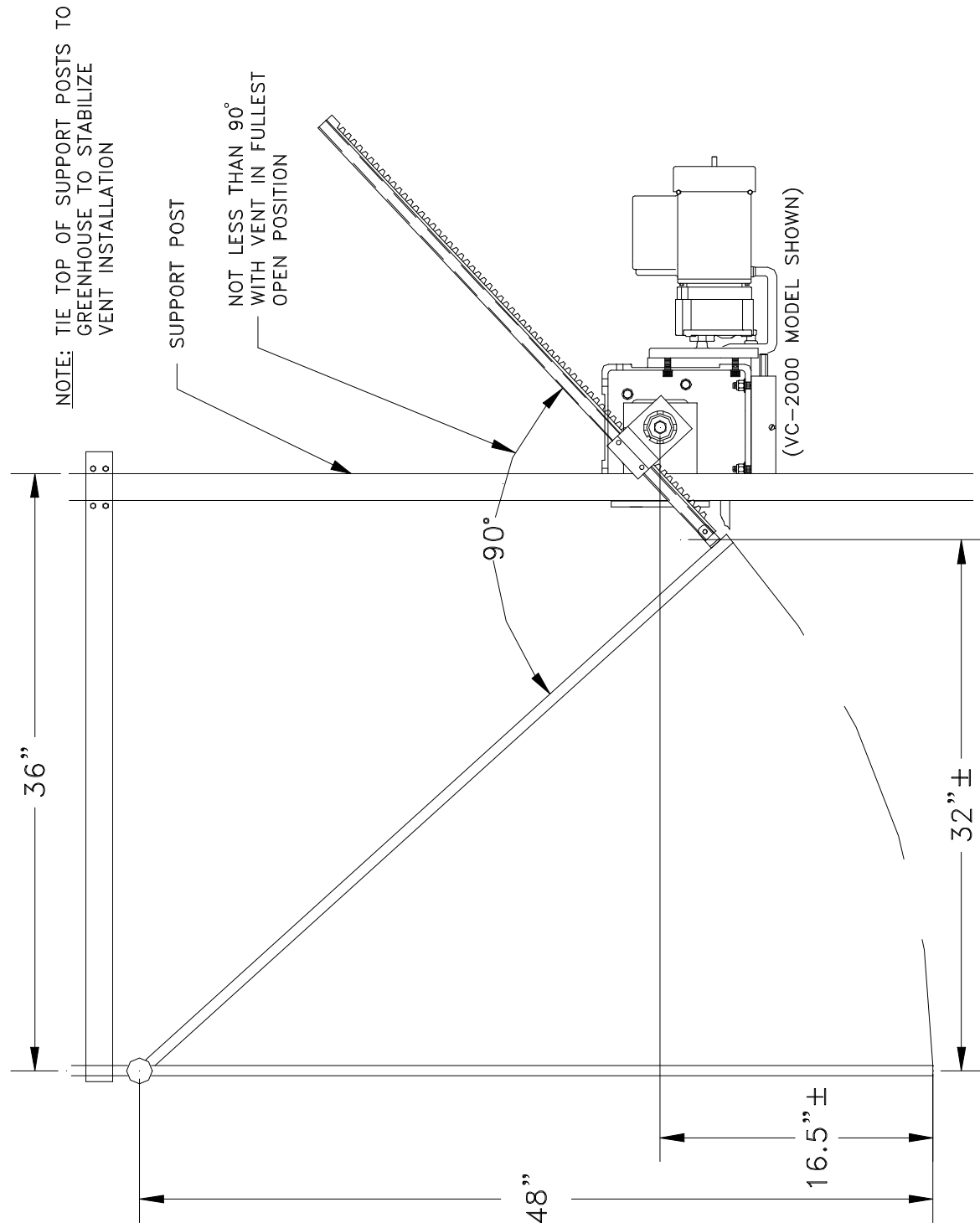
# MOUNTING FOR ROOF VENT END VIEW





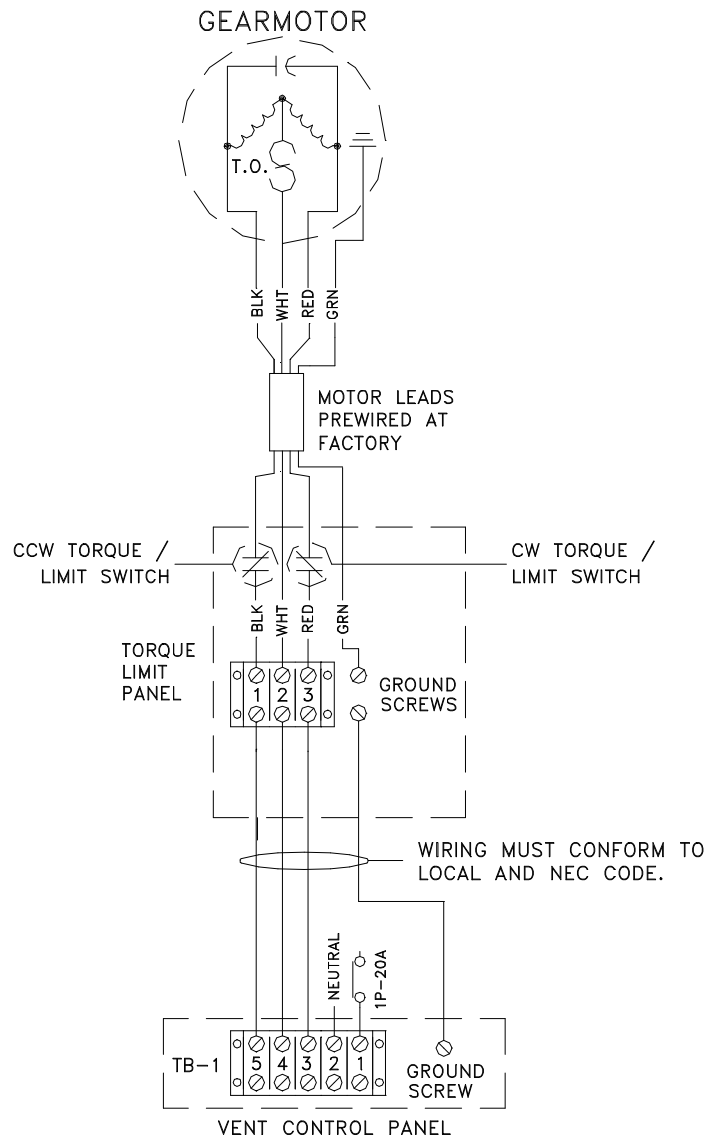
**Vent Motor  
Location**

## VENT MOTOR LOCATION



**Drive Unit  
Interconnect**

## DRIVE UNIT INTERCONNECT DRAWING

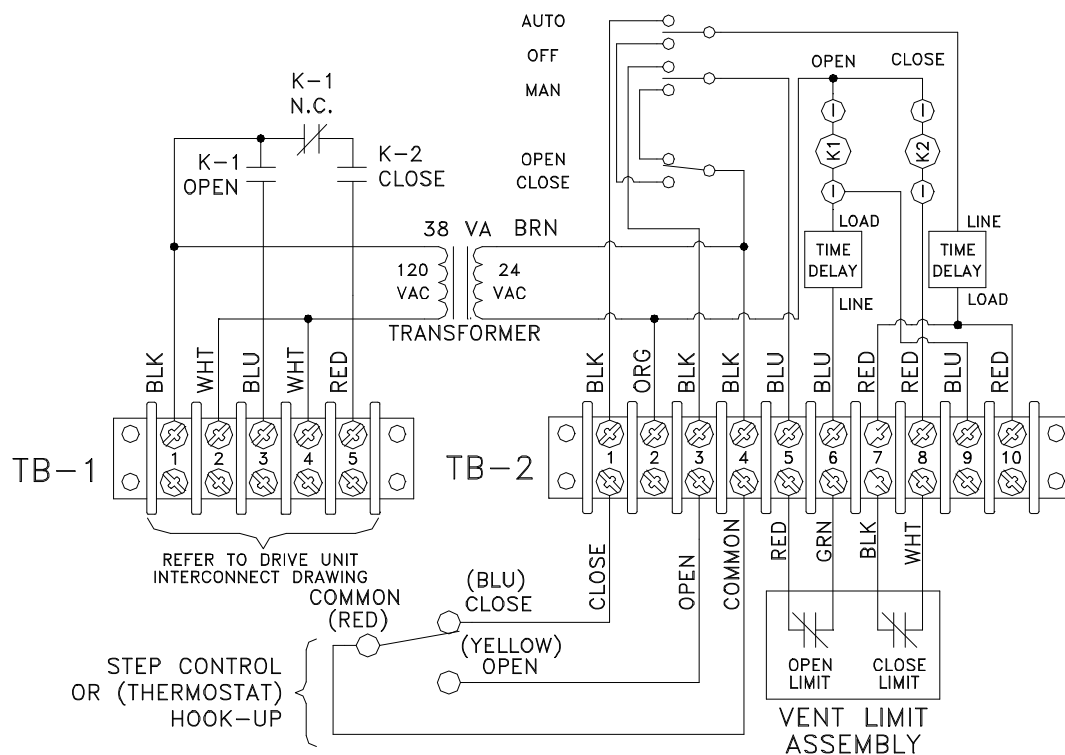
**NOTICE:**

VENT MUST MOVE IN THE DIRECTION INDICATED BY THE "OPEN-CLOSE" SWITCH WHEN THE "AUTO-OFF-MANUAL SWITCH IS IN THE "MAN" POSITION. IF ROTATION IS REVERSED, REMOVE POWER & INTERCHANGE WIRES ON 3 AND 5 ON TB-1 IN CONTROL PANEL. DO NOT INTERCHANGE LIMIT SWITCH LEADS ON TB-2.

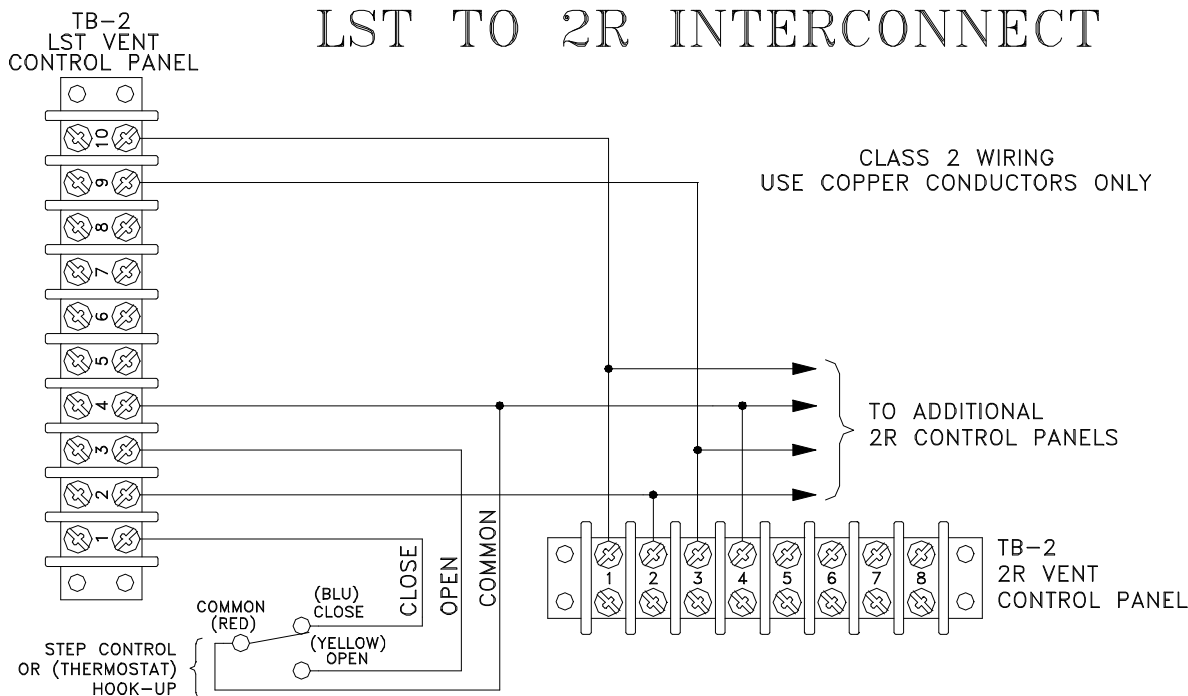
**CAUTION:**

REMOVE POWER FROM CONTROL BEFORE REVERSING WIRES.

## LST INTERNAL WIRING DIAGRAM

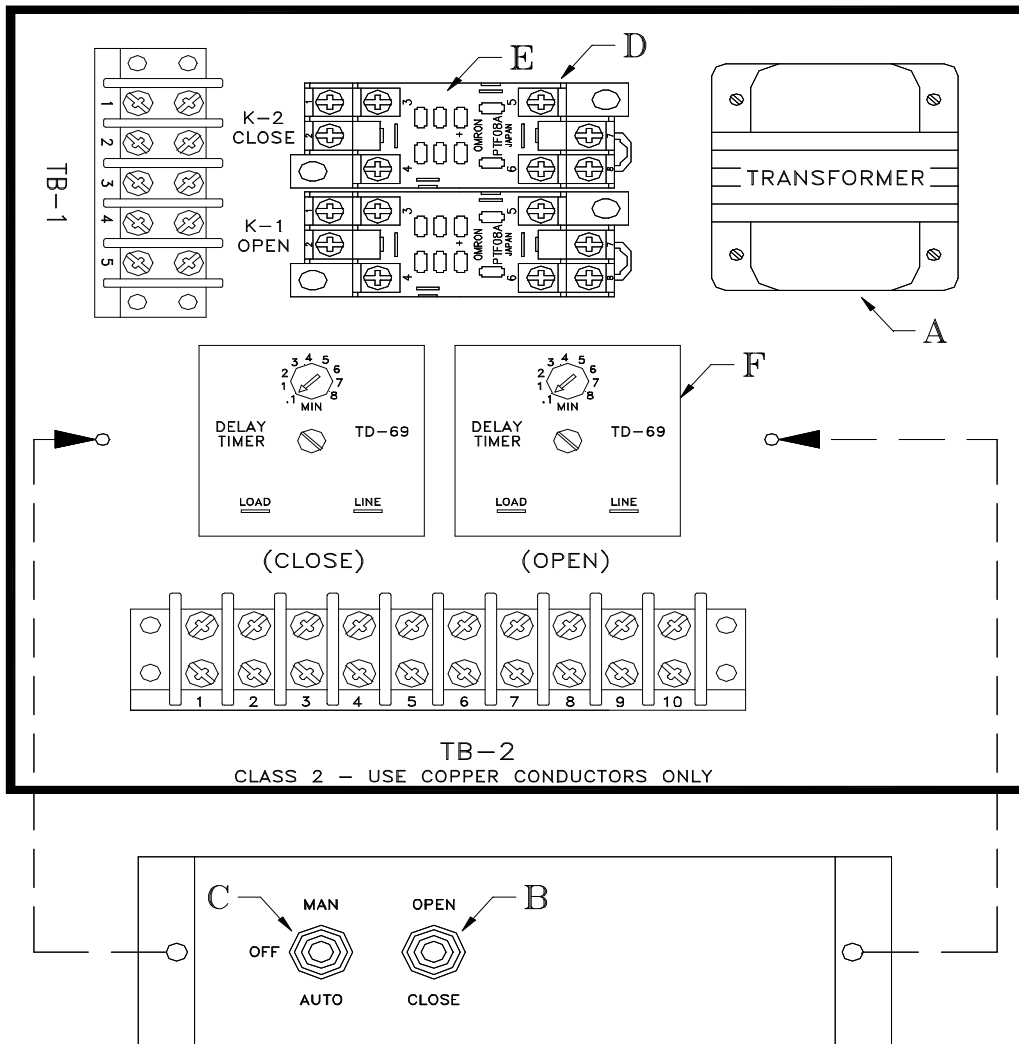


## LST TO 2R INTERCONNECT



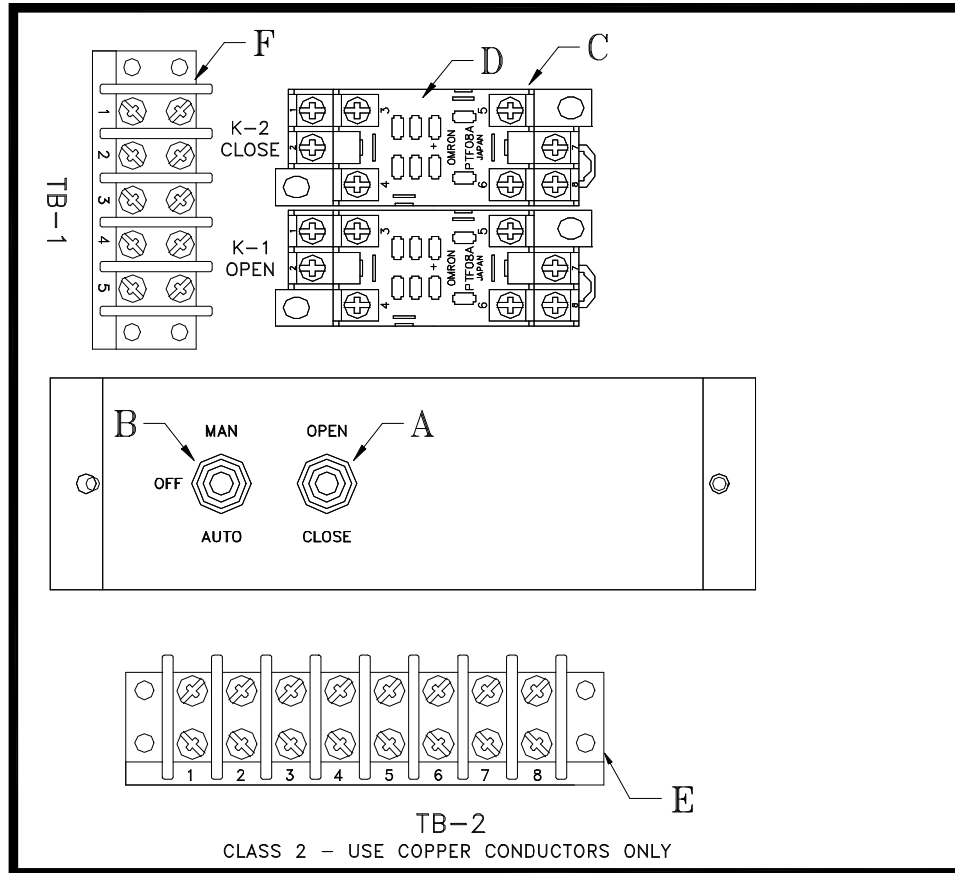
**LST Vent Control  
Panel**

# LST CONTROL PANEL VC-100A LST AND VC-2000 LST



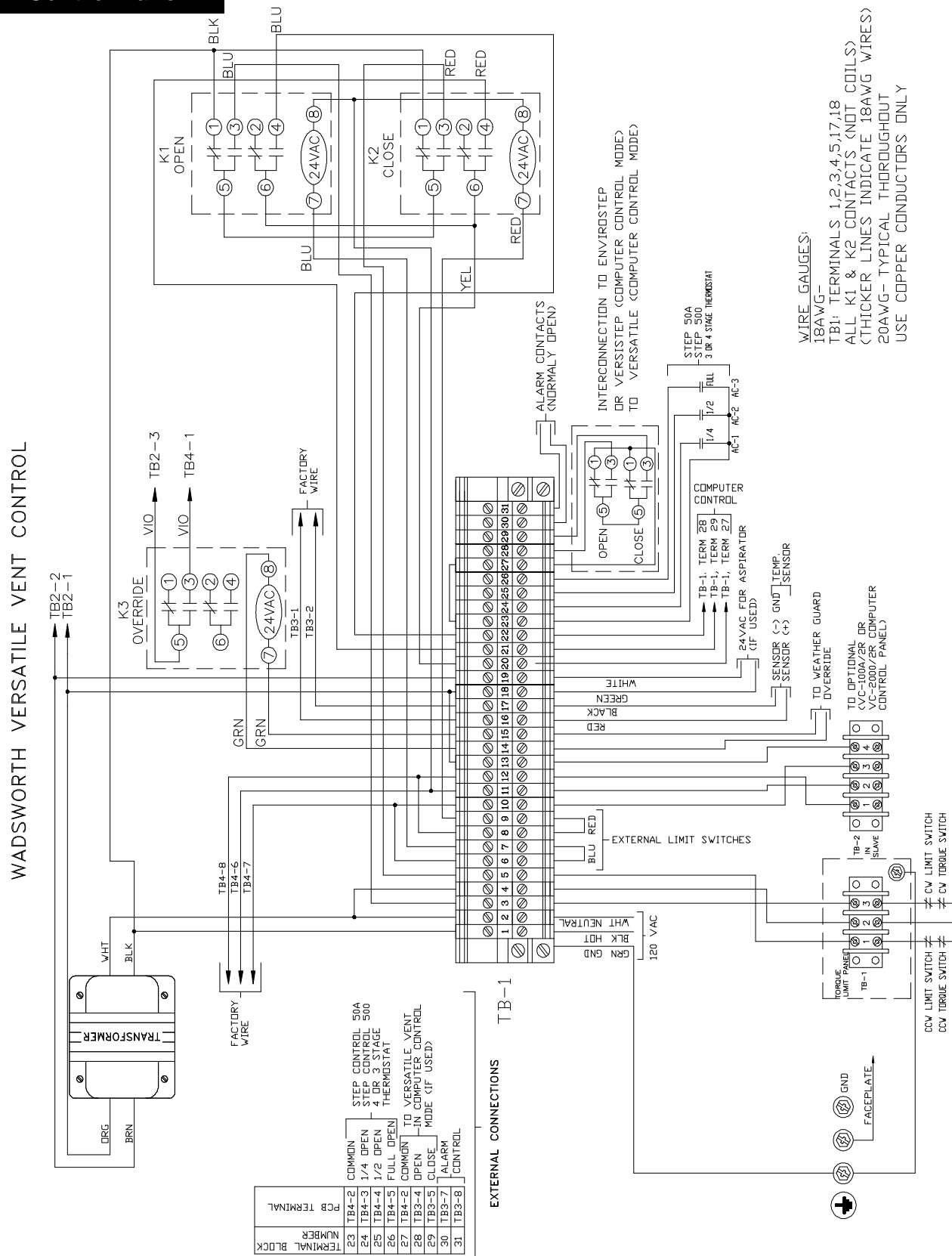
LETTER	WADSWORTH PART NUMBER	DESCRIPTION	QUANTITY PER UNIT
A	E-0603	TRANSFORMER	1
B	E-0105	SPDT SWITCH	1
C	E-0106	DPDT SWITCH NCO	1
D	E-0402	RELAY SOCKET	2
E	E-0327	24 VAC RELAY	2
F	E-0350	TIME DELAY	2

# 2R CONTROL BOX



LETTER	WADSWORTH PART NUMBER	DESCRIPTION	QUANTITY PER UNIT
A	E-0105	SPST SWITCH	1
B	E-0106	DPDT SWITCH NCO	1
C	E-0402	RELAY SOCKET	2
D	E-0327	24VAC RELAY	2
E	H-1014	8 POINT TERMINAL BLOCK	1
F	H-1007	5 POINT TERMINAL BLOCK	1

## Versatile Vent Control Panel



**Trouble Shooting Vent Control Panels**

Problem	Solution
Vent will not operate in AUTO but does in MAN	On an LST or 2R unit, this problem points to not having a 24 VAC switched input into Terminals 1 & 3 of TB-2. Trace the source of 24 VAC power for the unit. Verify that the transformer is working and the circuit breaker is on.
Vent will not operate in AUTO or MAN	<ol style="list-style-type: none"> <li>Verify that the OPEN and CLOSE control relays operate:               <ul style="list-style-type: none"> <li>If the relays operate, a torque limit switch on the vent gear motor assembly may be tripped. The gear motor itself may have failed.</li> <li>If the relays do not operate, test for 120 VAC into TB-1 Terminals # 1 &amp; 2.</li> </ul> </li> <li>If 120 VAC is present, check for 24 VAC between terminals # 2 and # 4 on TB-2. If not, replace transformer in LST. In 2R unit, check back to the source of 24 VAC power, either I, LST or computer.</li> <li>If 24 VAC is present, select MAN and OPEN on switch panel of the control. Verify 24 VAC between Terminals # 2 &amp; 6 of TB-2. If not, check open limit switch and wires to it in the vent limit assembly. If present, then in LST jumper out time delay relay and in 2R units, replace the open relay.</li> </ol>
Vents open, will not close.	<p>LST model- bypass the CLOSE time relay by placing a jumper wire between positions 4 and 10 of TB-2. Place switches to MAN and CLOSE, check for operation.</p> <p>2R model – Verify 24 VAC is present between Terminals # 1 and #2 of TB-2. If not, go back to the unit that provides 24 VAC power for the 2R unit and check for proper operation.</p>
Erratic or intermittent problems.	<ol style="list-style-type: none"> <li>Determine if the problem is in the OPEN or CLOSE direction.</li> <li>Jumper out the time delay relay that corresponds to the direction the problem is occurring. If it cures the problem, then replace that time delay. Part # E-0350</li> <li>Inspect the control wiring and the cable to the vent limit assembly. Check for loose or pinched wires in either of these.</li> <li>Use of thermostat wire can lead to erratic operation. It is small-gauge solid wire, and often breaks inside its insulation. When the wire breaks in this way, it can make intermittent connections. Replace thermostat wire with stranded wire.</li> </ol> <p>Note: Wind buffeting and vibration can cause erratic or intermittent problems.</p>



**Glossary**

**Drive Shaft** – A pipe supported by shaft hangers that runs the length of a vent with pinions (on rack and pinion systems) attached or elbow arm operators attached. The pipe will either be of 1 3/8" or 1 5/8 " outside diameter (O.D.).

**Drive Unit** – Made up of the following sub-assemblies:

**Gear motor:** Electrical motor with its own gear-reducer section.

**Gear-reducer** – The part of the unit that allows for the input of the gear motor to be further reduced in speed to accomplish the task of lifting a run of vents. Attached to its outputs are the output shaft couplers.

**Torque Box** – Attached to the bottom of the gear-reducer. Electrical connections from the control panel and gear motor are made inside this device. It also houses parts for the torque adjustments.

**Lead Control** – These vent controls have a transformer, relays and toggle switches. If the environmental control has any issues one can still operate the vent from this control because it has a transformer for power.

**Limit Switch with Transformer** – LST Vent Control has a low voltage limit switch to stop the vent in full open or close positions. A transformer which provides power to the motor starter relays. It can be operated in the manual mode without a temperature sensor. It relies on the environmental control to send a signal to increment.

**Shaft-Hanger** – A device used to support the drive shafting. Wadsworth Control Systems manufactures a universal shaft hanger bracket for either the 1 3/8" or 1 5/8" size pipe.

**Follower (or 2R model vent control)** - A vent control panel that derives its automatic running abilities from a LEADER control panel. 2R stands for two relays, this vent control box only has two relays and toggle switches there is no transformer.

**Vent Control Panel** – The electrical control box. Different models are available: Limit Switch with Transformer, Versatile Vent, and 2R.

## Protecting your investment:

To protect your greenhouse and roof vents we suggest using a Weather Station or Weather Guard system. Both of these systems work to override vent movement and close the vent in the event of high winds, precipitation or cold outdoor temperatures. A Weather Station is used with Integrated controls (EnviroSTEP, VersiSTEP, microSTEP) a Weather Guard is used with staged controls or if you do not have an environmental control.

## WeatherGuard

Protect your vent automation system by adding a WeatherGuard. You're adding a valuable member to your team, one that won't complain about the weather. Instead it will take action to protect your greenhouse and crop against harsh weather. The WeatherGuard protects your greenhouse by overriding normal operations to close vents or retract curtain systems when high winds, cold weather, rain or snow might cause damage to your crop or your greenhouse.



### Features:

- § Weather instruments measure wind speed and direction, precipitation and temperature.
- § Mounted on a 22' mast.
- § Control box sends override signal directly to your vent or curtain control.
- § Easy to program.
- § Displays weather status.
- § Controls up to 10 vent machines.
- § Includes 100' of cable.
- § Control comes in a sturdy metal cabinet with a locking door. 16 x 16 x 5

### Protection:

- § Closes windward vents in high winds. It is usually programmed to close at slightly higher speeds than the windward vents.
- § Vents are protected from cold temperature and precipitation.
- § Outdoor curtains can be retracted in high winds or if there is precipitation.
- § Indoor curtains uncover and gutter heaters can be turned on to protect the structure from snow damage.

### Part # M-4835

Call 1.800.821.5829 to order or to learn more about this valuable system.

## Weather Station

Protect your vent automation system by adding a Weather Station. You're adding a valuable member to your team, one that won't complain about the weather. Instead it will take action to protect your greenhouse and crop against harsh weather. The Weather Station protects your greenhouse by sharing important data with your environmental control allowing the system to close vents or retract curtain systems when high winds, cold weather, rain or snow might cause damage to your crop or your greenhouse.



### Features:

- § Weather instruments measure wind speed and direction, precipitation, sunlight intensity and accumulated light for the day, outdoor humidity and temperature.
- § Mounted on a 22' mast.
- § Signals your environmental control (EnviroSTEP, VersiSTEP or microSTEP) to respond to outdoor conditions.
- § Includes 100' of cable.

### Protection:

- § Closes windward vents in high winds. It is usually programmed to close at slightly higher speeds than the windward vents.
- § Vents are protected from cold temperature and precipitation.
- § Outdoor curtains can be retracted in high winds or if there is precipitation.
- § Indoor curtains uncover and gutter heaters can be turned on to protect the structure from snow damage.

### Part # M-4825

Call 1.800.821.5829 to order or to learn more about this valuable system.

**Wadsworth Control Systems, Inc.****Office Phone:**

Hours: 8:00 AM - 5:00 PM Mountain Standard Time

1-800-821-5829

303-424-4461

Fax: 303-424-6012

**To Place an Order:**

800-482-7943

Fax: 303-424-6012

**Technical Support:**

Hours: 7:00 AM – 4:00 PM Mountain Standard Time

1-800-482-7943 (24/7 paging is available in the event of an emergency)

303-456-0436

Fax: 303-424-2389

**Address:**

5541 Marshall Street

Arvada, CO 80002

**Sales and Marketing:**

[sales@WadsworthControls.com](mailto:sales@WadsworthControls.com)

**General Information:**

[info@wadsworthcontrols.com](mailto:info@wadsworthcontrols.com)

**Limited Warranty:**

Wadsworth Controls warrants that products of its own manufacture are free from defects of material and workmanship at the time of shipment by Wadsworth Controls. Wadsworth Controls extends no warranty of any kind on part or components purchased by Wadsworth Controls and any warranty on such parts or components is limited to the warranty granted by the original manufacturer or supplier thereof, if any. This warranty does not extend to goods subjected to misuse, neglect, accident, improper installation or alteration. This warranty is in lieu of any and all warranties under the Uniform Commercial Code relating to implied warranties of Merchantability and Fitness For A Particular Purpose and in lieu of all other warranties, express or implied, except as to title. There are no warranties which extend beyond the description on the face thereof. The warranty expressed herein may be amended only by written instrument signed by an officer of Wadsworth Controls. The sole liability of Wadsworth Controls under this warranty is limited to replacing, repairing or issuing credit (at Wadsworth Controls discretion) for any products which are returned to Wadsworth Controls by Buyer during the warranty period. Wadsworth Controls obligation shall be additionally conditioned upon (a) Wadsworth Controls being promptly notified in writing upon discovery of such defects by Buyer, (b) the product being returned to Wadsworth Controls, transportation charges prepaid by Buyer, within 12 months from the date of shipment from Wadsworth Controls, and (c) Wadsworth Controls examination of such unit disclosing, to Wadsworth Controls satisfaction, that any defect has not been caused by misuse, neglect, improper installation, repair, alteration or accident.



