DYNACOM

Designing Clean Air Solutions

16711 Hilltop Park Place
Chagrin Falls, OH 44023
Phone: 800-229-7664 Fax: 440-543-9390
www.dynacomonline.com

United Air Specialists, Inc.

a CLARCOR company

OWNER'S MANUAL

Model SHN-20 Shown

SMOG-HOG® ELECTROSTATIC PRECIPITATOR
MODELS: SHN-10, SHN-20, SHN-40 AND SHN-50

KNOW YOUR EQUIPMENT

READ THIS MANUAL FIRST.

Your Smog-Hog® SHN should provide many years of trouble-free service. This manual will help you understand the operation of your SHN unit. It will also help you understand how to maintain it in order to achieve top performance. For quick future reference, fill in the unit information in the spaces below. Should you need assistance, call the United Air Specialists, Inc. customer service number shown below. To expedite your service, have the following information available when contacting UAS.

UAS ORDER #: _____

UNIT MODEL #: _____

UNIT SERIAL #: _____

SYSTEM ACCESSORIES:

_____

_____

_____

INSTALLATION DATE: _____

UNITED AIR SPECIALISTS, INC. CUSTOMER SERVICE

1-800-252-4647

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SAFETY PRECAUTIONS

We have provided many important safety messages in this manual on your Smog-Hog SHN. Always read and obey all safety messages.

This is the safety alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others. All safety messages will follow the safety alert symbol and the word “DANGER” “WARNING” or “CAUTION”. These words mean:

DANGER — **Indicates a hazardous situation which, if not avoided, will result in death or serious injury.**

WARNING — **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

CAUTION — **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

CAUTION — **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.**

IMPORTANT SAFETY INSTRUCTIONS

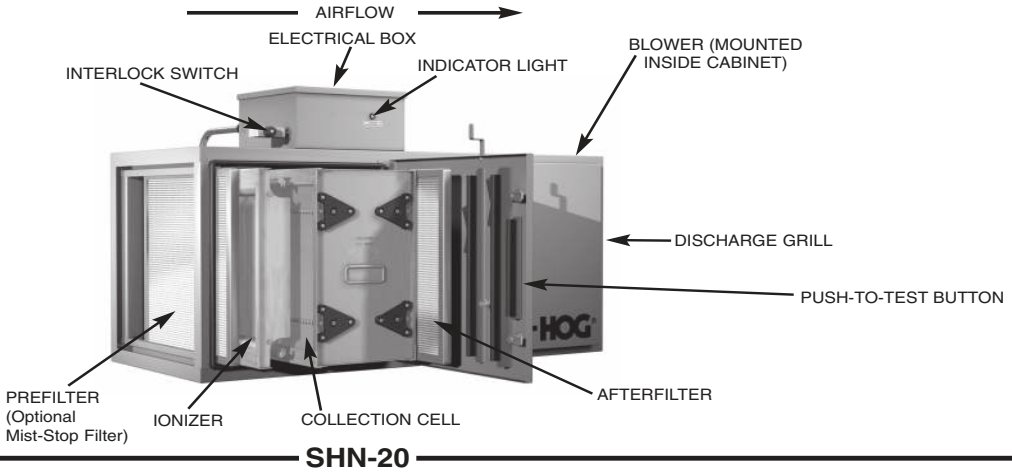
WARNING

To reduce the risk of fire, electric shock, or injury when using your air cleaner, follow these basic precautions:

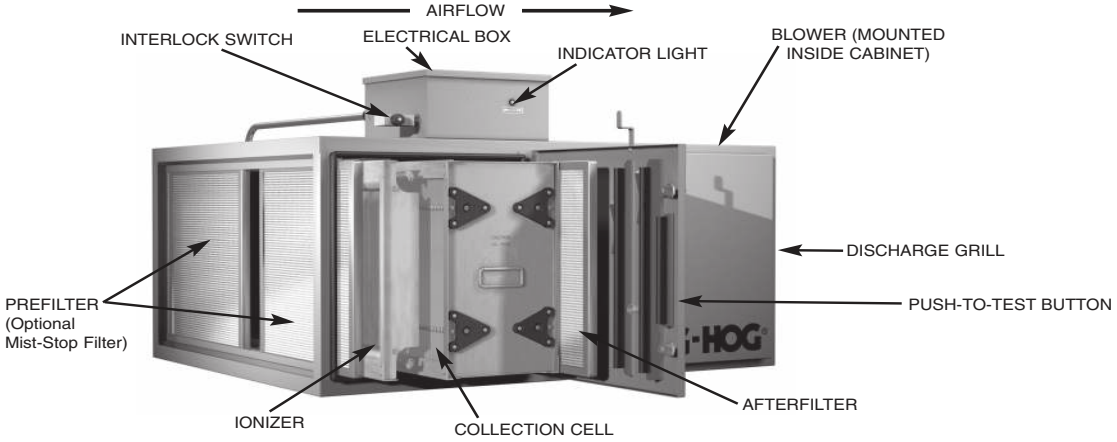
- Wear protective clothing and safety glasses when handling collector components or servicing the unit.
- Use proper lifting and rigging equipment to install your electronic precipitator.
- The electronic precipitator should be properly grounded prior to servicing.
- Disconnect power before servicing.
- Replace all access panels before operating.
- Do not operate the unit with component doors open.
- Electrical connections should only be made by qualified personnel and be in accordance with local and national codes and regulations.
- Do not use in explosive atmospheres.
- Do not collect emissions which are explosive.
- Use non flammable cleaners.
- Keep flammable materials and vapors, such as gasoline, away from unit.
- The unit should be inspected frequently and contaminants removed to prevent excessive accumulation which may result in flash-over or fire damage.
- Operate only in a safe and serviceable condition.
- Operating temperature to the air stream should not exceed 120° F (49° C).

Smog-Hog® Electrostatic Precipitator Installation and Service

SHN-10



SHN-20



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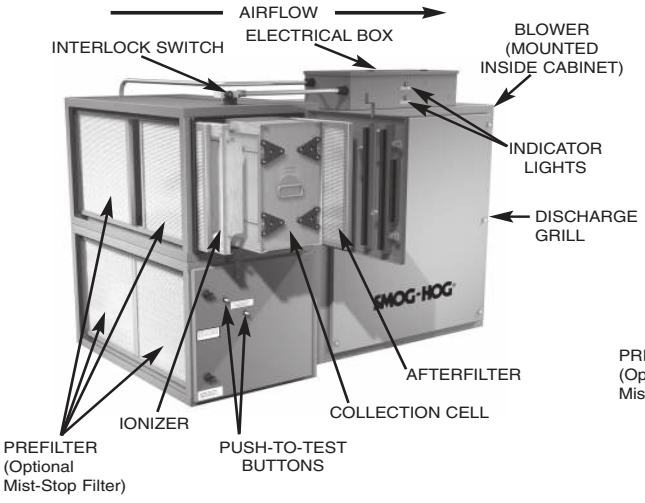
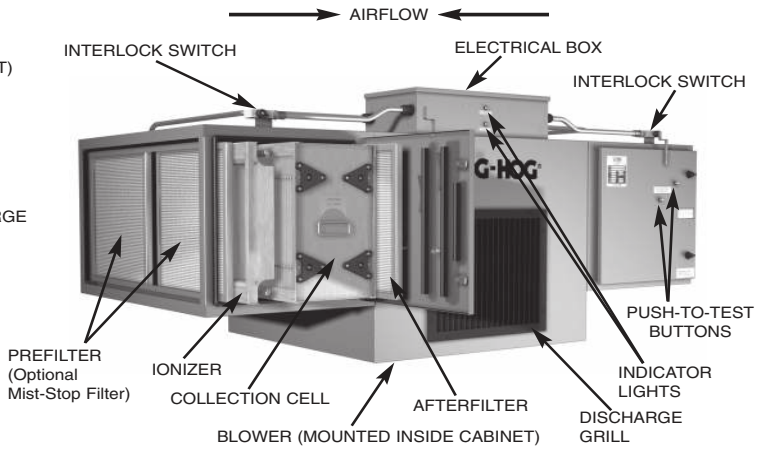


SHN-50-T



SMOG-HOG NOMENCLATURE

Smog-Hog electronic air cleaners are available in a variety of configurations and sizes. Codes shown below identify characteristics which might be built into a given unit. The model number completely identifies the design and can be found on the unit nameplate. For example, a model designated SHN-10-H could be defined according to descriptions listed below (see bold):

SHN - SMOG-HOG N-Series
10 - Airflow in 100s of CFM (i.e., 10 @ 1,000 CFM, etc.)
H - High static pressure blower*
HH - Higher static pressure
XB - Without blower*
T - Tee-shaped unit (SHN-50 only)
M - Double pass models*
*Not available on SHN-50 models

Models SHN-10, SHN-20, SHN-40 & SHN-50

This type of Smog-Hog is a self-contained, two-stage, Penney-type, electrostatic precipitator complete with fully-interlocked, energy-limiting, high voltage power supply, mechanical prefilter, ionizer, collection cell, afterfilter, blower assembly, indicator light, interlock switch and push-to-test buttons. Models available include:

SHN-10 SHN-40
SHN-20 SHN-50-T

Models SHN-10-XB, SHN-20-XB, SHN-40-XB

This type of Smog-Hog is a self-contained, two-stage, Penney-type, electrostatic precipitator complete with fully-interlocked, energy-limiting, high voltage power supply, mechanical prefilter, ionizer, collection cell, afterfilter, indicator light, interlock switch and push-to-test buttons. XB units are designed for use in a ducted application where a blower is included in the existing ventilation system. Models available include:

SHN-10-XB
SHN-20-XB
SHN-40-XB

SHN Series Voltages Available

Voltage	Phase	HZ	Voltage	Phase	HZ
115	1	60	230	3	60
115	1	50	400	3	50
208	3	60	460	3	60
220	3	50	575	3	60

1. INSPECTION NOTE

Upon receipt of your unit, check for any shipping damage. A damaged carton indicates that the equipment may have received rough handling during shipping that may have caused internal damage. Notify your delivery carrier and enter a claim if any damage is found.

2. INSTALLATION PLANNING

A. Unducted or Area Capture. Consideration should be given to the placement of the precipitator to maximize its effectiveness. The number of units required to clean the air will depend on the layout of the room and the concentration of pollutants.

Because it is necessary to develop proper airflow patterns, the placement and number of precipitators should be as suggested by UAS or your local representative.

B. Ducted or Source Capture. When your Smog-Hog is used as a ducted source collector, the enclosure or pick-up hood design is important for adequate capture of contaminants. Drive pulleys and belts have been selected to provide proper airflow at the design static pressure specified. Pulleys and belts should not be replaced without first contacting UAS Customer Service at 1-800-252-4647.

⚠ CAUTION

Do not operate this equipment in the presence of combustible vapors or gases.

C. Access Clearance. Allow at least 36” (914mm) door swing and access clearance on the door side of the unit. All models require 18” (457mm) clearance from the electrical junction box on top of the unit to any overhead obstruction to allow adequate access.

3. INSTALLATION

Carefully remove the unit from the shipping container, inspecting for shipping damage. For ease of installation, open access door and remove the cell, ionizer and filters from the cabinet.

Ceiling mounted units are suspended by means of 1⁄2” threaded rods run through weld nuts in the top corners of the units. (Refer to page 3 and 4 for weld nut locations on all but XB models.) Additional support should be used for auxiliary equipment or ducting.

Reinstall the components removed earlier to facilitate the mounting of the unit.

A. Unit Mounting. Models SHN-10 and SHN-20 are designed for suspended mounting. Units can be provided with eyebolts for chain hanging, but the length of chain should be kept level. The preferred method of hanging is by threaded rods through the top of the cabinet. If chain is used, it should be of the welded link type, with a 2,000 lb. (8900 N.) test strength or better. “S” hooks used for connections should be closed. The chain should be hung vertically. If any angle is introduced, the chain and fasteners should be sized to handle the added tension. Models SHN-40 and SHN-50 may be suspended by rods but are not approved for chain hanging.

CAUTION

The Smog-Hog should not be used for support of personnel or material. Check with local building code/structural engineer to ensure proper installation to roof truss or column.

B. Metal Truss Supported Ceilings. Figure 1 shows an SHN-20 unit suspended from a metal truss supported ceiling. Customer should take care to determine that the truss will be sufficient to support the weight. As shown, angle iron braces are secured between two steel trusses. Rod length should be kept to a minimum.

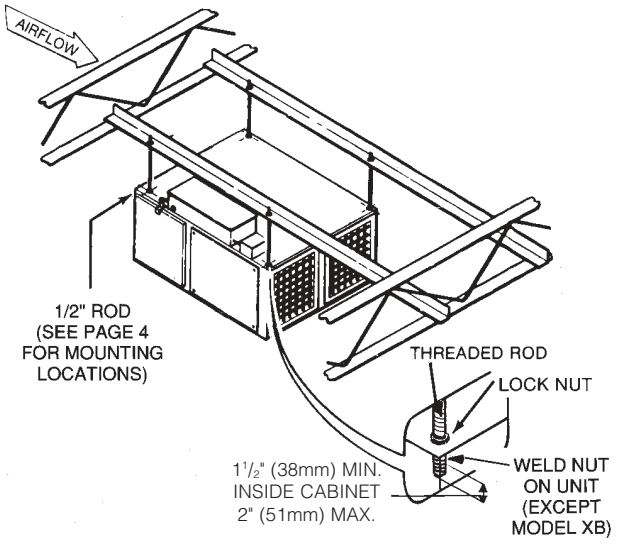
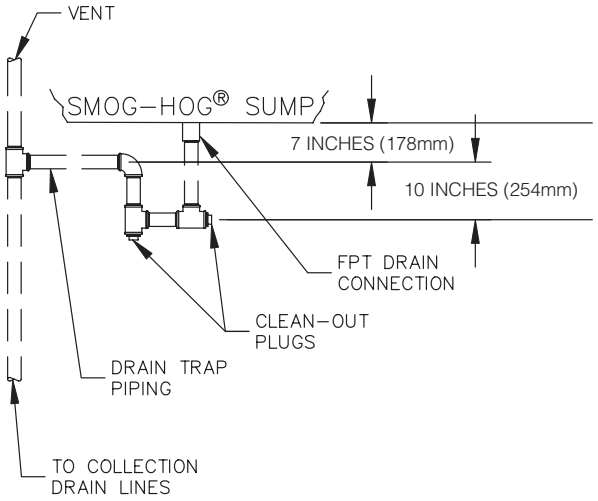


Figure 1
Ceiling Mounted Unit

C. Column or Wall Mounting. Figure 2 shows an SHN-50 (T-shaped) unit suspended from a cantilevered frame from which the 1⁄2" threaded rods are suspended. Rods are threaded into weld nuts located at the corners of the blower cabinet. Rod length should be kept to a minimum.

4. DRAINS

All SHN units are supplied with 1-1⁄2" FPT drain connections. If dry material is to be collected, then drains should be plugged. If contaminant will run off the components, a 1-1⁄2" drain trap should be installed. Refer to illustration.



NOTES: Main drain line should be sufficiently sloped, 1.5 inches (38mm) diameter and vented. All plumbing should conform with all state and local codes.

CAUTION

Appropriate design criteria as provided by a plumbing/ mechanical contractor should be utilized to ensure proper control of drainage from the SHN Unit.

5. DISCHARGE GRILL

The four-way adjustable air discharge grill can be set to any open position desired.

A. Unducted Installation (for area capture)

The discharge grill should be set for maximum contaminant capture and even dispersion of clean air. The pattern should be suggested by UAS or your local representative.

B. Ducted Installation (for direct capture)

The discharge grill can be set to any position compatible with personnel comfort.

6. ELECTRICAL REQUIREMENTS

CAUTION

When electrical control panels are supplied by others, an electrical interlock should be provided for the power pack circuit and the SHN exhaust blower. The power pack circuit should not be on-line with the exhaust blower off-line. This is an unsafe condition.

The only electrical connection required is a power source to the terminal block as shown in the wiring diagram (Refer to Appendix B) inside the top electrical junction box. Refer to unit nameplate for voltage specifications.

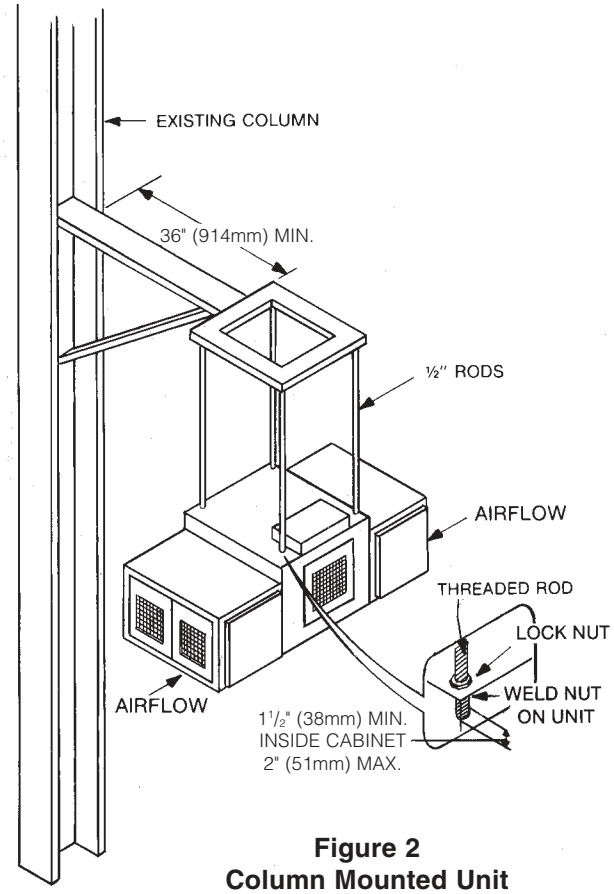


Figure 2
Column Mounted Unit

Units are factory wired for the voltage requirement indicated to UAS by the customer. The electrical box has knockouts. Therefore, whatever electrical connectors are standard in your plant may be used for the power line into the unit.

The power switch for operating the unit and any fused disconnect switch should be supplied by the customer and located remotely (not supplied as part of the Smog-Hog).

7. MOTOR/BLOWER CHECKOUT

For proper airflow, the blower should be operating in the correct direction. If the blower is operating in the reverse direction, air will move in the proper direction, but at significantly reduced rates. Refer to Figure 3 for access to blower compartment. To check rotation:

1. Place SHN unit off line.
2. Remove or open blower panel to the SHN unit to observe rotation.
3. Place SHN unit on line for less than one minute.
4. Place SHN unit off line.
5. As the blower pulley slows down, observe the direction of rotation.
6. Note directional arrow located on the blower housing.

⚠ WARNING

Extreme care should be exercised when operating blowers with motor/drive belts exposed. Loose fitting clothing can easily be drawn into these moving parts.

7. If blower wheel is not rotating in the correct direction, disengage main three-phase fused disconnect switch.

⚠ WARNING

Do not attempt to rewire electrical “live” connections.

8. Open power panel and reverse any two of the three wires at the terminal strip (L1, L2 and L3).
9. Engage the fused disconnect and place SHN unit on line, confirming blower rotation.

When the Smog-Hog is used in a ducted application, blower speed is increased to compensate for the static pressure loss of the ducting. After ducting is installed, and with the unit operating, measure the current flow to the unit using an amp probe. The ampere reading should not exceed the FLA rating on the motor nameplate. If current flow is excessive, reduce blower speed by adjustment of the variable pitch sheave on the motor.

⚠ CAUTION

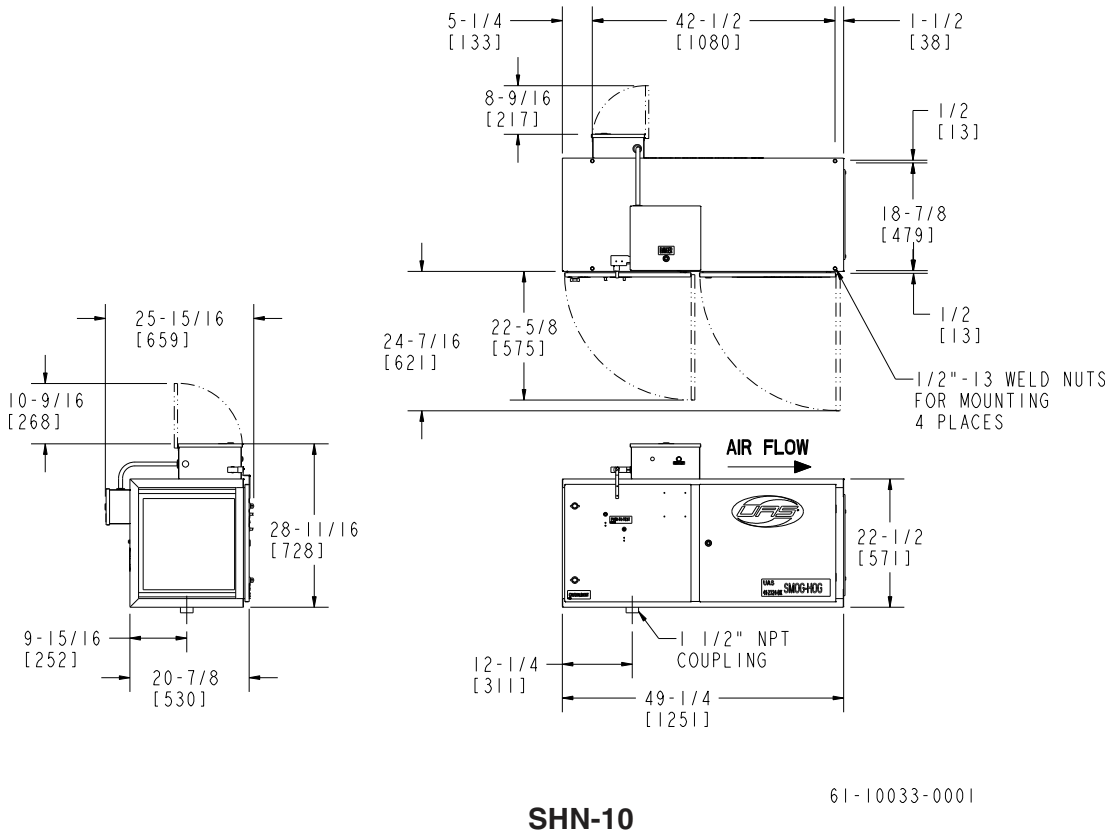
If the blower is rotating backwards, some air motion is noticeable. If the blower is rotating correctly, the access door will be closed by the negative pressure within the cabinet.

Single-phase units (i.e. 115/1/50-60) are prewired for proper rotation and line hook-up. Simply connect to single phase input circuit and unit is ready for operation.

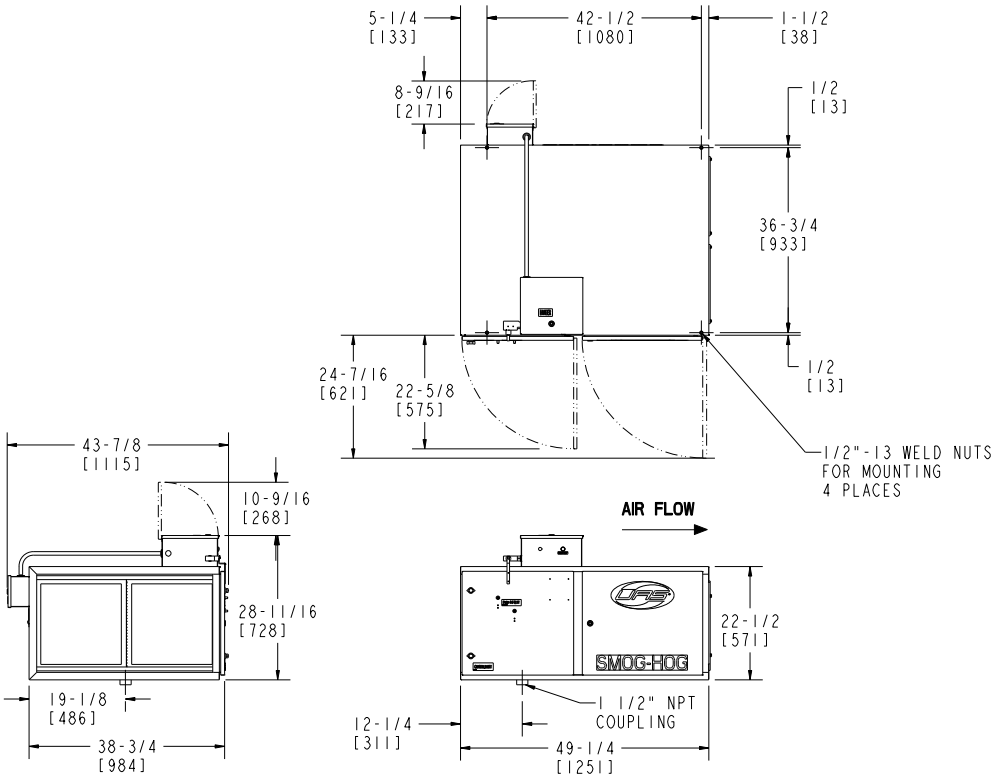
Input to the high voltage power pack should not exceed 130 Volts, 60 Hertz. This is supplied by a power source or the step-down transformer as shown in the wiring diagram inside the main electrical junction box on all units. Refer to Appendix B.

SMOG-HOG Hanging Weights

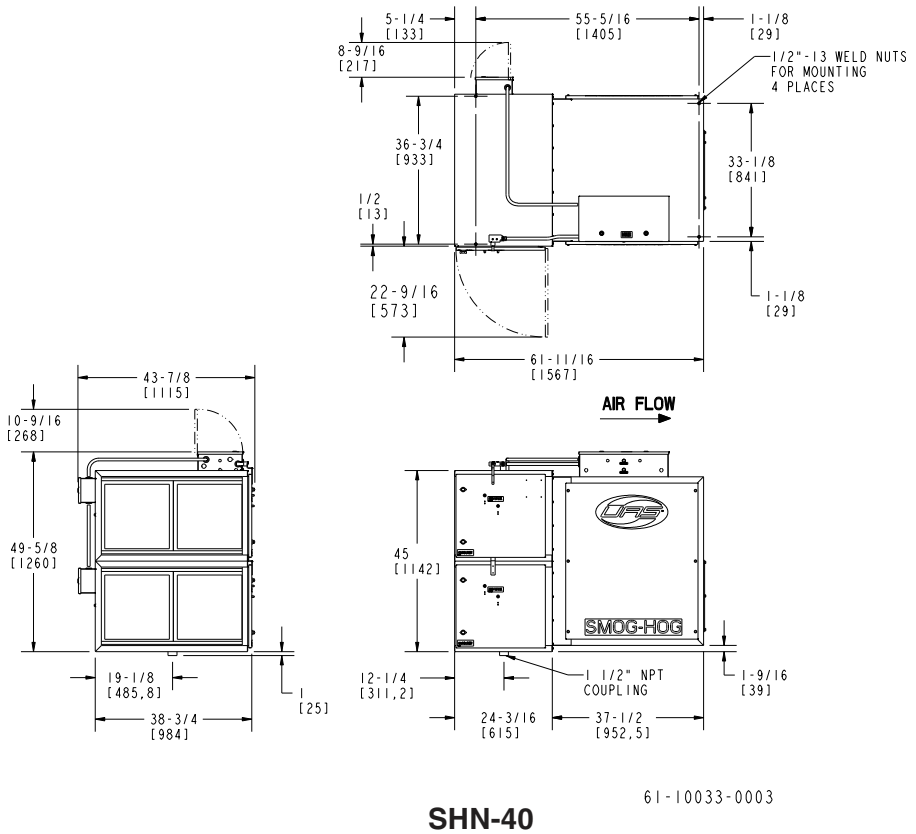
Model	Weight (lbs)
SHN-10-XB	160
SHN-10	300
SHN-10-M	340
SHN-20-XB	420
SHN-20	450
SHN-20-M	650
SHN-40-XB	950
SHN-40	975
SHN-40-M	1,300
SHN-50-T	680



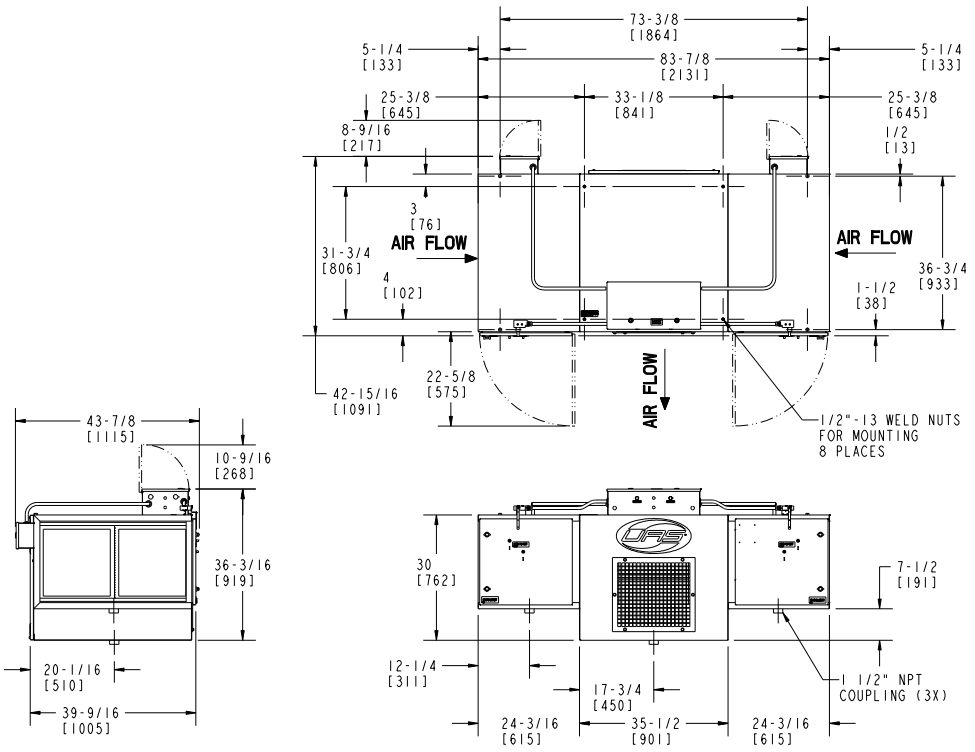
SHN-10
Dimensions and Mounting Hole Locations



SHN-20



SHN-40
Dimensions and Mounting Hole Locations

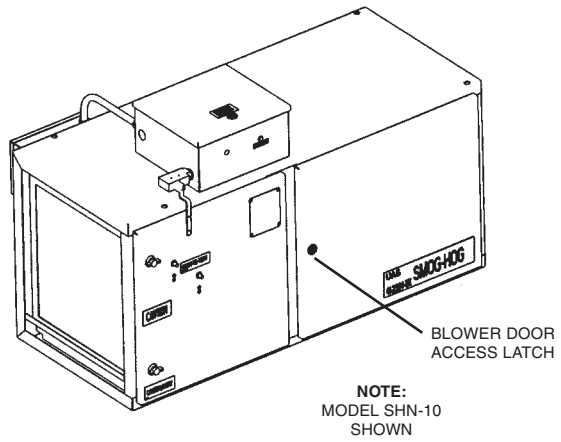


SHN-50-T

The indicator light on the unit is illuminated when high voltage is present at the power pack. If the indicator light is flashing or fails to illuminate when power is on-line, refer to section 11.

Drive Set Access Procedure

1. Shut down blower.
2. Open blower access door using 10mm or 3/8" hex tool.



NOTE:
MODEL SHN-10
SHOWN

Figure 3
Unit Access

8. DESCRIPTION OF COMPONENTS

(Refer to page 1 for photos of individual model components)

A. Prefilters. Heavy-duty, reusable, aluminum mesh, industrial service filters aid in air distribution and mechanically remove large particles not suitable for precipitation. Filters are interchangeable with afterfilters.

B. Mist-Stop Filters (optional) 2" (58mm) aluminum mesh or coalescing type filters for use on applications with coolant mist. Filters mechanically remove oil droplet/coolant mist from air stream. This allows the ESP filter to operate for longer intervals between servicing. The Mist-Stop filters are washable.

C. Ionizing Sections. Ionizing sections are independent of collection cells for ease of maintenance. The frame, of rugged aluminum construction, supports tungsten steel ionizing wires. Each wire is spring mounted and easily replaced in the field. The springs, wire support bars and ceramic standoff insulators are located out of the airstream, behind a three-sided aluminum extrusion with an airfoil design, to further limit insulator contamination. An extremely dense ionizing field and integral bypass prevention baffles assure ionization of all particles entering the precipitator.

D. Collection Cells. Parallel plate collection components are of aluminum construction. Triangular insulators, which afford a longer path to ground, are located completely out of the dirty airstream. This arrangement maintains nominal operating voltages longer, thus reducing the frequency of cleaning. The insulators, along with the cell's long plate design, assure maximum efficiency and retention of collected contaminant.

E. Afterfilters. Heavy-duty, reusable, industrial aluminum mesh filters aid even air distribution across the cells and trap any collected contaminant that could release from the cells during start and stop operations.

F. Power Supply. The proprietary design high-voltage power supply is current limited to protect both the power supply and components in a dead short condition. Power consumption is 75 watts maximum. The power supply is located in an external electrical box.

G. Push-to-Test Buttons. An exclusive UAS feature, these buttons verify electrical continuity during equipment operation without the use of a meter. They are also a convenient means to ground any residual charge in components before removing them from a deactivated unit. Refer to Figure 14.

H. Blower. A belt-driven, low speed, centrifugal-type blower with sealed ball bearings is shock-mounted to the cabinet to reduce noise and vibration.

I. Drive. Motors are continuous-duty, totally enclosed, and fastened to adjustable motor mounts. The motor is equipped with a variable speed motor pulley allowing on-site blower speed adjustment.

J. Discharge Grill. Four-way-direction, individually adjustable deflectors permit adjustment of cleaned air distribution for specific application requirements.

K. Cabinet. This 16-gauge steel housing is of wraparound construction with all seams welded. The cabinet is prepared in a phosphatized wash cycle. The finish coat is an electrostatically-applied powder paint, baked to ensure a durable hard finish. The electrostatic compartment features bypass baffles on the door and rear wall to guide the contaminated airstream through the components.

L. Component Access Door. Doors are hinged for easy access and interlocked to shut down high voltage when opened.

M. Access Door (Drive Set). A separate hinged door allows access to motor and blower for easy adjustment (Refer to Figure 3).

THE FOLLOWING SECTIONS ARE FOR THE USE OF TRAINED PERSONNEL ONLY

⚠ CAUTION

Hazardous live and moving parts are exposed during the following procedures. Switch off/isolate the electrical supply to the Smog-Hog Air Cleaning System before servicing.

⚠ CAUTION

Risk of electrical shock. A residual DC voltage will remain on high voltage components for a short time after power is removed. Prior to handling, ground components using an insulated screwdriver, refer to Figures 4 and 5.

⚠ NOTICE

Cleaning and servicing should only be done by qualified and trained personnel. Some collected contaminants may be hazardous. Consult factory or local safety personnel before servicing unit and for proper disposal of collected contaminants.

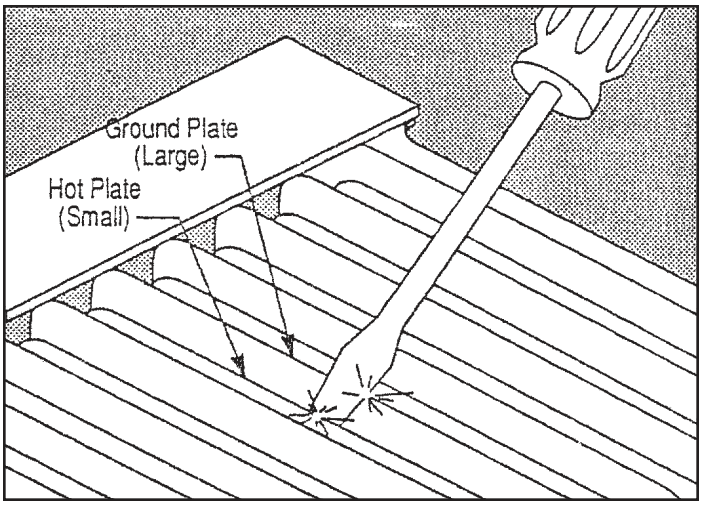


Figure 4
Grounding the Collection Cell

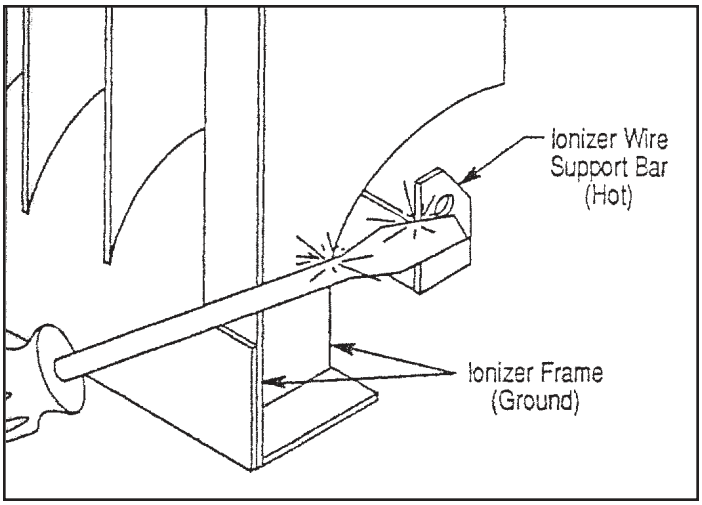


Figure 5
Grounding the Ionizer

9. MAINTENANCE

Normal maintenance is confined to periodic cleaning of the ionizer, cell and filters, including checking the drive belt tension.

A. Cleaning Instructions

Ground the collection cell and ionizer by turning off unit and depressing both push-to-test buttons. This will remove any residual charge from components and open component access door.

Remove the dirty collection components (prefilter, ionizer, cell and afterfilter) from cabinet.

While there are many methods of cleaning, certain key cleaning criteria contribute to the effectiveness of every method. These include the type of detergent, detergent strength, water temperature, agitation/impingement, duration, rinse procedure and dry-out time.

Type of Detergent. In general, the detergent used on most applications will be alkaline in nature. It is extremely important that the detergent have a built-in buffering agent to prevent deterioration to the aluminum. Detergents are available through United Air Specialists for specific applications and contaminants.

Detergent Strength. Detergent concentration, or "strength," in a mixture with water varies with the application from 1:1 to 5:1 to even 20:1 parts water to parts detergent, refer to detergent manufacturer's directions. More or less detergent may eventually be required for effective cleaning at reasonable detergent cost. Typically, 20:1 is recommended as a starting point. Experimentation is recommended.

⚠ CAUTION

Never mix acid and alkaline detergent for manual cleaning. Detergent mixing could cause rapid heat release, gel formation or other undesirable conditions.

Water Temperature. Detergents can be up to twice as effective in hot water and hot water alone is very effective in softening built-up residue. Water temperature should be 130°F (54°C) to 150°F (66°C), not to exceed 160°F (71°C).

Agitation/Impingement. These methods are virtually the same, with impingement being the most extreme form of agitation. Any liquid movement over built-up residue will dissolve some of the contaminant, allowing

detergent to work on the next layer. A reduction in cleaning time duration usually results.

Cleaning Cycle Duration. In most cleaning methods, adequate time should be allowed for the detergent to dissolve the contaminant thoroughly. Reaction time will vary depending on detergent strength, temperature and agitation. Guidelines for mixing, heating and expected results are included on detergent specification sheets.

Rinse Procedure. Cleaned components should be rinsed off quickly and thoroughly to remove any remaining contaminants. Even if the components appear to be clean, some detergent residue may remain. This should be removed because the residue may contribute to voltage bleed-down when the components are placed in service. Also, even though the detergent is "buffered" (i.e., treated to prevent deterioration of the aluminum), prolonged contact with the components could cause minor corrosion. As with cleaning, hot water should be used for rinsing.

Dry-Out Time. Collection components should be dry before the system is placed into operation. Start-up of a wet system causes dead shorts and/or arcing conditions. Wet ionizers, collector cells and mesh filters should be placed in a warm room until they are dry. Techniques such as hand wiping insulators and blowing dry with compressed air will shorten drying time.

B. Component Cleaning Methods

The manual cleaning method selected will depend on the type of contaminant, rate of deposit, facility limitations such as cleaning time windows (process down time) and available utilities. The following three acceptable cleaning methods may be included in such a plan.

Hot Detergent Soak Tank. This method involves placing components in an agitated solution of hot water and detergent, and is the most effective method. This procedure will remove most contaminants collected in the SHN unit with proper detergent selection.

Components should not be placed in highly concentrated detergent solutions or allowed to soak for extended periods (e.g., overnight), especially at elevated temperatures. Extended soaking (e.g., days) in solvent or detergent solution will degrade components over time and should be avoided.

Automatic Parts Washers. Certain commercially-available units combine and automate the features necessary for effective cleaning, including water heating, detergent injection, agitation, rinsing and drying.

Portable Pressure Washer. A self-contained pressure washer with a spray wand can be an effective cleaning method, providing it is used with caution. Care should be taken not to expose collection cell plates to close-up and prolonged blasts of high temperature or high pressure water. Cell plates deform under continuous exposure to such conditions.

C. Other Cleaning Considerations

The previous methods address the cleaning of Smog-Hog components only. The cabinetry should also be periodically cleaned (e.g., during normal planned maintenance downtimes). Each time manual maintenance is performed, the cabinet high voltage feed-thru insulators should be thoroughly cleaned. Voltage output of the power packs should also be checked when maintenance is performed.

UAS and/or our local representatives can provide assistance in choosing the best method for cleaning Smog-Hog components in your application.

D. When are Components Clean?

Collection components should have a clean, not necessarily "new," aluminum appearance after cleaning. Discoloration will not affect system efficiency. The following is a checklist for acceptable components:

• Ionizer

1. Aluminum frame and plates are free of contaminant buildup.
2. Ceramic standoff insulators are clean and white (no residual coating). Cracked or carbon-tracked insulators (black streaking) have been replaced.
3. Wire and springs intact and taut, centered between plates and free of contaminant build-up.
4. Contact springs and contact screws are properly aligned (contact springs not deformed).
5. Bent or broken parts have been repaired or replaced.

• Collecting Cell

1. Aluminum frame is square, plates are parallel and hot plates are centered between ground plates.
2. Residual particulate has been removed between plates and at corner supports. Material bridging across plates has been removed.
3. Triangular insulators front and rear side are free of contaminant. Cells with carbon-tracked insulators (black streaking) have been replaced.
4. Contact springs and contact screws are properly aligned (contact springs not deformed).
5. Bent or broken parts have been repaired or replaced.

• Prefilters/Afterfilters

1. Aluminum media and frame are free of contaminant.
2. Frame is square and media is intact.
3. Filters are always installed with drain holes down and arrow on their frames in the direction of airflow.

• Cabinet

1. Ceramic feed-thru insulators are clean and white.
2. Door gaskets (where applicable) are clean and intact.
3. Component tracks are free of contaminant (for component grounding).
4. Module sumps and bottom drains are clean and free-flowing.
5. Walls, ceiling and doors are free of heavy buildup.

6. Blower has been checked for heavy buildup, clean if required. Blower housing drain is open (when provided).
7. If so equipped, preconditioning accessories (vee-bank filters, cooling coils, etc.) have been checked for excessive pressure drop, clean if required.

10. PERIODIC MAINTENANCE AND ADJUSTMENT

A. Replacement of Door Gaskets

Should leakage occur, an adjustment of the latch paws (by bending) on the back of the door handles may solve the problem. However, extreme care should be exercised in compressing the door gasket beyond its design limits. Before adjusting for gasket deflection, check for the following:

- Door or cabinet damage.
- Deformed or torn gasket.
- Leakage from some other source.

Collection components should be removed and replaced with great care to preserve gasket integrity. Should damaged gasket require replacement, order 7 ft. (2134mm) of gasket part number 42-0168 (BUNA-N) for each door.

TO CHANGE GASKET:
(Refer to Figures 6 & 7)

1. Remove existing gasket, making sure to scrape off any residual silicone sealant.
2. Trim one edge of gasket neatly and evenly.
3. The door gasket internally has three lips to one side of the gasket and one lip to the other side. The door gasket should be installed with the three lips towards the interior of the cabinet.
4. The door gasket should be formed to the complete cabinet lip edge before applying silicone sealant. Place the trim edge at the top center of the cabinet lip edge and press gasket in place, ending at the same location. Do not trim excess.
5. Remove door gasket and apply silicone sealant to the inside of gasket or on the inside edge of the cabinet lip edge. Place the trim edge at the top center of the cabinet lip edge and press gasket in place, ending at the same location. Remove excess silicone sealant and trim gasket. Make sure the gasket is firmly bottomed on the lip edge by tapping with a rubber mallet or the gasket may not seal against the door properly.
6. Check that the distance from the inner face of the access door to the latch tongue measures 7/8" (22mm). Slight adjustments may be necessary due to sheet metal variations.

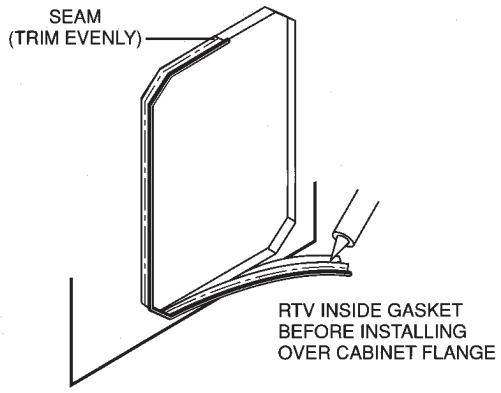


Figure 6

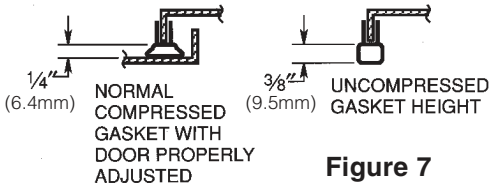


Figure 7

B. Replacement of Ionizer Wire

- Remove the damaged wire from each spring. Replace spring if damaged.
- Loop one end of the new wire over the bottom spring then extend the top spring and loop the end of the wire over the spring (see Figures 8 & 9). Pliers may aid this operation.
- Release the spring gently. The wire is now taut and automatically centered.

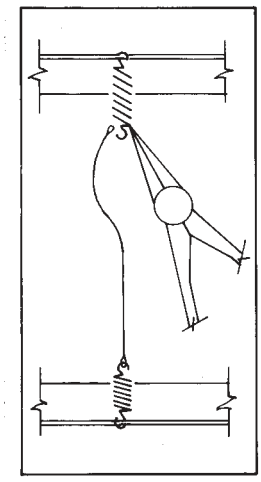


Figure 8
Attaching New Ionizer Wire

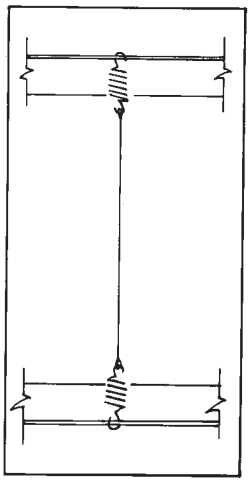


Figure 9
Correct Ionizer Wire Position

NOTE: In the event that replacement wires are not available, the ionizer may remain in service. Remove the broken wire(s) and springs from assembly until replacement is available.

C. Airflow Adjustment

The motor is equipped with a variable pitch pulley to allow for minor adjustments in cubic feet per minute (CFM) of airflow.

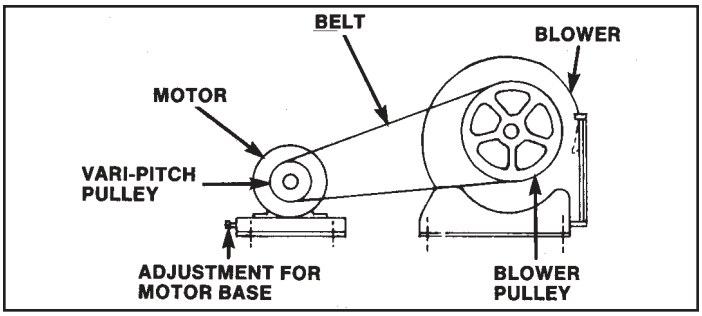


Figure 10
Motor/Blower Schematic

Increasing blower speed (RPM) will increase airflow (CFM) and current (amps). To increase speed, close the variable pitch pulley from “Normal Setting” (Fig. 11A) toward “Fully Closed” (Fig. 11B). Decreasing blower speed will decrease airflow and current. To decrease speed, open the variable pitch pulley from “Normal Setting” (Fig. 11A) toward “Fully Open” Fig. 11C).

To adjust the variable pitch pulley:

1. Loosen motor base nuts, adjust motor slide base and remove the drive belt.
2. Loosen set screw “A” to clear the drive key between pulley halves.
3. Remove the key.
4. Adjust pulley in increments of one turn to the desired setting.
5. Install key and tighten set screw “A.”
6. Install drive belt.
7. Loosen set screw “B.”
8. Align belt centerlines of motor and blower pulleys using straight edge and square.
9. Set belt tension using a belt tension gage.

⚠ CAUTION

Improper Blower Speeds Adversely Affect System Performance. Contact Uas Before Adjusting Motor Variable Pulley Settings.

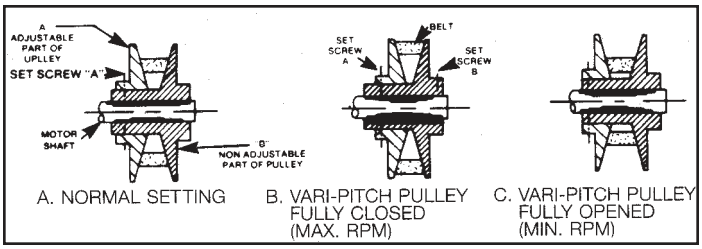


Figure 11
Motor Pulley Settings

11. TROUBLESHOOTING

Tools Required:

- Screwdriver 8” (200mm) or longer with plastic handle
- Volt-Ohm-Meter — used to check low voltage input (115 VAC) and continuity (OHMS)
- High Voltage Probe (optional) — used to check high voltage power supply. Range: from 0 to 15 KVDC

⚠ CAUTION

Risk of electrical shock. The high voltage circuits to the ionizer and collector should be grounded before removing/installing high voltage wires and/or removing the ionizer(s)/collector cell(s). Grounding can be accomplished by waiting one minute after placing power in the off position or refer to Figures 4 and 5. The power pack total current output is limited to a maximum of 5 milliamps to ensure personnel safety.

⚠ WARNING

The SHN Series is equipped with an external limit switch (120 VAC to the power packs) engaging and disengaging by the component access door. The limit switch should be engaged manually after placing the power in the on position to the SHN unit, and disengaged when placing power in the off position during the troubleshooting steps. The engagement and disengagement of the limit switch is not identified in the troubleshooting steps.

⚠ WARNING

Power pack enclosures service voltage can range from 120VAC to 460VAC. When servicing the power pack enclosure, place power in the off position by the disconnect switch supplied by others.

Troubleshooting Procedures

High voltage issues can generally be isolated by referring to the indicator light.

- When the light illuminates, high voltage is present from the power pack to the ionizer and collector cell circuits.
- A flashing indicator light indicates a failure in the high voltage circuits.

There are four conditions which may cause a flashing indicator light.

a) The high voltages are below specifications to the ionizer and/or the collector cell circuit(s).

b) There is an arcing condition to the ionizer and or collector cell circuit(s).

c) There is a dead short condition.

d) The power pack has failed.

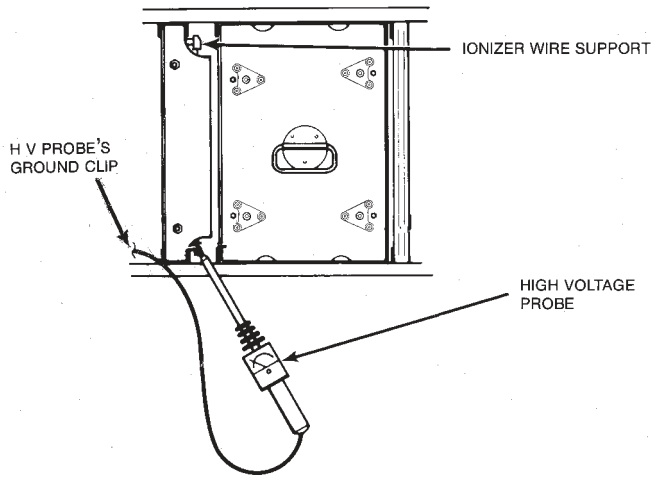


Figure 12
Checking Ionizer Voltage

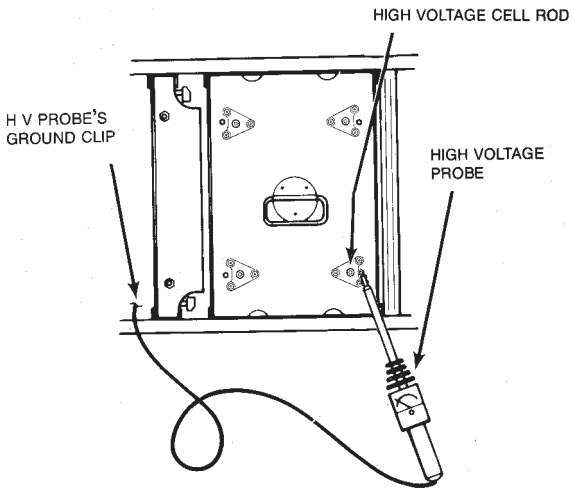


Figure 13
Checking Cell Voltage

A high voltage probe is required to measure high voltages to the ionizer and collector circuits to the unit, as well as to perform the "Bench Test Procedure" (Section 12). As an accessory, a high voltage probe can be purchased for a multimeter.

High Voltage Specifications:
Ionizer Circuit Operating Range: 10.0 to 11.8 KVDC
Collector Cell Circuit Operating Range: 5.0 to 7.5 KVDC

There are two factors which will elevate ionizer voltages above 12.0 KVDC:

- The ionizer wires are heavily coated with contaminant (two to three times or greater, the diameter of the wire). This will decrease collection efficiency.
- There are "run away" voltages to the power pack requiring power pack replacement, above 12.0 KVDC to the ionizer circuit, and 7.6 KVDC to the collector cell circuit.

There will be continuous cell arcing if cell voltages exceed 7.5 KVDC. This is also caused by "run away" voltages to the power pack requiring power pack replacement. A high voltage measurement can be performed by removing both the high voltage wires from the power pack to determine high voltage output. The high voltage measurement should not exceed "High Voltage Specifications."

If there is a dead short condition or arcing, the problem is typically within the collector cell. Follow Step 1 below to ensure power pack is operational. Install all ionizers and collector cells within the unit with proper electrical alignment before proceeding with Troubleshooting Steps below. Refer to Figure 14.

Step 1 and 2 do not require a high voltage probe.

STEP 1
CHECK THE POWER PACK

The power should be placed in the off position to the power pack. Carefully disconnect both high voltage wires (Ionizer #8 and Collector #7) from the power pack. The high voltage wires should carefully be placed away from the ionizer and collector cell power pack connectors, eliminating the high voltage wires from contacting the power pack connectors. Place the power to the unit in the on position; the indicator light should be illuminated.

- If the indicator light is illuminated, the power pack is operational. Proceed to Step 2.
- If the indicator light is flashing (high voltage wires #8 and #7 disconnected from the power pack), the power pack should be replaced.
- If the indicator light is not illuminated, verify there is 120 VAC to the power pack. Place power in the off position to the unit, and remove the 120 VAC wires from the power pack. Connect a meter to the two 120 VAC wires and place the power in the on position. If 120 VAC is not present, there are problems upstream from the power pack, complete the following until the problem is corrected:
  - o The electrical disconnect should be in the "on" position.
  - o Ensure the limit switch is mechanically engaged to the component access door.
  - o Check limit switch failure (120 VAC) to the power pack circuit. (Measure VAC before the limit switch and engage limit switch measuring voltage after the limit switch). The mechanical engagement of the limit switch should be checked by closing the component access door.
  - o Check for blown fuses to the main disconnect.
  - o Check if fuses are failed to the primary and or secondary side of the step down transformer (if equipped).
  - o Check for loose wire terminal screws or disconnected wires at the terminal blocks.
  - o Check for indicator light failure. Check wire connections (#9 and #2) to the power pack, and to the indicator light. The indicator light is an LED

which requires correct wiring polarity since the power pack output is DC voltage. The LED will not illuminate if the wiring polarity is incorrect. The power pack has two wires to the indicator light, wire #9 (+), wire #2 (-). The power pack terminals are identified with the identical numbers. LED assembly is with two wires, wire #9 (+) to the red wire, wire #2 (-) to the black wire. VDC measurement with wires #9 and #2 (to the indicator light) disconnected: 7.9 to 10, with wires #9 and #2 connected 3.8 to 6.0.

Place power in the off position and connect all wires which have been disconnected before proceeding to the next section.

Parts should be replaced as required.

STEP 2
CHECK COLLECTOR CELL(S) AND IONIZER(S)

A flashing indicator light is associated with arcing or high voltage below specifications. If the sound of arcing is not evident, high voltages are below specifications. The ionizer(s) and collector cell(s) should be manually cleaned if the high voltages are below specifications. Refer to Step 3 for measuring high voltages.

The following steps are a process of elimination in identifying the problems to the ionizer/collector cell circuits. The power pack connectors are identified as “Ionizer #8” and “Collector #7.” All connectors on the power pack are identified with name and wire number, with the exception of the ground connector (green wire to this connection). The wires within the power pack enclosure are identified with numbers.

(a) Disconnect high voltage wire #8 “Ionizer from the power pack with high voltage wire #7 connected to the power pack. Place power in the on position.

Is the indicator light illuminated? If so, the cell circuit/ components are operational proceed to step (b). If the indicator light is flashing, perform the following. Place power in the off position and remove the cells components. Place power in the on position, is the indicator light illuminated? If the indicator light is illuminated, the problem is within the collector cell. If the indicator light is flashing, the problem is the high voltage feed through insulator (dirty, cracked, carbon tracked) and/or the high voltage wire (wire insulation has deteriorated).

If the indicator light is flashing with the cells components installed, perform the following:

Remove the collector cells and inspect for the following conditions.

COLLECTOR CELL PROBLEMS WHICH COULD CAUSE A FLASHING INDICATOR LIGHT

Sometimes removing the collector cell(s) and installing the collector cell(s) into the unit will clear a flashing indicator light condition. If not, check the causes below:

- Dirty collector cell(s) (contaminant build up) requiring manual cleaning.
- “Wet” collector cell(s) not properly dried after a wash cycle or manual cleaning procedure. Use compressed air to accelerate the drying time.
- Deformed collector cell contact springs contacting a “grounded surface,” including cabinet high voltage feed through insulator contact spring.
- Bent cell plate(s) in close proximity to the opposing cell plate(s).
- Misaligned contact springs between the collector cells and/or the high voltage feed through insulator.
- Warped cell plates due to:
  - o Improper handling
  - o High temperature process airstream and/ or
  - o High temperature hot water utilized for washing the components (above 180°F (82°C) for both conditions)

  Parts should be replaced as required.

The Bench Test Procedure (Section 12) will determine which components are causing a flashing indicator light.

(b) Indicator light is illuminated with the high voltage wire #7 connected to the collector cell connector on the power pack. Place power in the off position and connect high voltage wire #8 to the ionizer connector on the power pack and place power to the on position.

Is the indicator light illuminated? If so, the ionizer circuit/ components are operational. If not:

- Place power in the off position and remove ionizer components.
- Place power in the on position.
- Is the indicator light illuminated or flashing?
- If illuminated, the problem is within the ionizer(s).
- If the light is flashing, the problem is the high voltage feed through insulator (dirty, cracked, carbon tracking), and/or the high voltage wire (wire insulation has deteriorated causing a dead short condition).

The indicator light is flashing with the ionizers components installed, perform the following:

IONIZER PROBLEMS WHICH COULD CAUSE A FLASHING INDICATOR LIGHT

Sometimes removing the ionizer(s) and installing ionizer(s) back into the unit will clear a flashing light condition. If indicator light is still flashing, check possible causes below:

- Dirty ionizer(s) (contaminant build up) requiring manual cleaning.
- “Wet” ionizer(s), not properly dried after a wash cycle or manual cleaning procedure. Use compressed air to accelerate drying time.
- Deformed ionizer contact springs in close proximity to a “grounded surface.”
- Misaligned contact springs between the ionizers, or at the high voltage feed through insulator.
- Cabinet high voltage feed through insulator contact spring misaligned with the ionizer.

- Broken ionizer wires
- Contaminant build, cracked, carbon tracking stand off insulators.
- Carbon tracking (black streak) to the ionizer stand off insulators and or high voltage feed through insulator (replace insulator)
- Ionizer wires not “taut.”
- Bent ionizer wire support bar in close proximity to a “grounded surface.”
- Bent ground plates in close proximity to the ionizer wires.

Parts should be replaced as required and connect all wires.

The Bench Test Procedure (Section 12) will determine which components are causing a flashing indicator light.

STEP 3
CHECKING HIGH VOLTAGE PROBE MEASUREMENTS

⚠ CAUTION

The unit blower is on line during Step 3 with the component access door open. The component access door could close suddenly due to the airflow from the unit blower.

A high voltage probe (Refer to manufacturer’s instructions) is required to measure high voltage output from the power pack. (See Figures 12 and 13.) If the indicator light is flashing or not illuminated, perform Step 1 and 2.

Place power on to the unit.

Open the component access door and connect the ground wire from the high voltage probe to the bare metal surface.

Engage the limit switch and place the tip of the high voltage probe as illustrated to Figures 12 and 13. The high voltage measurement should be 10.0 to 11.8 KVDC to the ionizer circuit and 5.0 to 7.5 KVDC to the collector cell circuit. If the high voltages are below specifications, refer to step 2, “Ionizer Problems” and/or “Collector Cell Problems,” Bench Testing may also be required. Low ionizer voltage will decrease the collector cell voltage but low cell voltage will not affect the ionizer voltage.

The high voltage probe can be used to determine which circuit is arcing or a dead short condition by isolating each circuit ionizer or collector cell.

Disconnect high voltage wire #7 (collector cell) and measured high voltage to the ionizer circuit (high voltage wire #8), refer to Figure 12.

Connect high voltage wire #7 and disconnect high voltage wire # 8.

Measure high voltage to the collector cell circuit (high voltage wire #7), refer to Figure 13.

Fluctuating high voltage during a measurement will indicate an arcing circuit.

12. Bench Test Procedure

TOOLS REQUIRED

- One power pack
- Two high voltage wires, 6 ft. (1829mm) in length, with test clips at each end of the wire
- High voltage probe (Refer to operating instructions by the manufacturer). If a high voltage probe is not available, install a UAS indicator light (Part No. 02-10561-G) to power pack terminals (+) 9 and (-) 2. Red wire to power pack terminal (+) 9 and black wire to terminal (-) 2.
- AC cable with three prone plug (for wall receptacle). Opposing end of cable should have two connectors for the power pack “L” and “N.” There should be a test clip for the ground wire. The ground wire should be secured to the ground stud of the power pack.

High Voltage Specifications:
Ionizer Circuit Operating Range: 10.0 to 11.8 KVDC
Collector Cell Operating Range: 5.0 to 7.5 KVDC

A multimeter with the high voltage accessory should be used for accurate high voltage measurements. (Follow the manufacturer’s instructions.) The ground wire from the high voltage probe should be grounded to a bare metal surface.

Do not use a power pack that is not within the high voltage specifications. Refer to “Testing the Power Pack” (Section 11).

PROCEDURE
TESTING THE IONIZER

1. Select one ionizer to be tested.
2. Connect one high voltage wire to the ionizer contact spring and the other end to the power pack connector identified as “Ionizer #8.”
3. Connect the other high voltage wire (use as a ground wire) to the metal frame of the ionizer and the other end to the ground stud on the power pack.
4. AC cable should be connected to the power pack with ground wire secured to the ground stud on the power pack.
5. Connect AC cable plug to the wall outlet.
6. Measure high voltage with the high voltage probe, ionizer voltage should be 10.0 to 11.8 KVDC, not to exceed 12.0 KVDC. If ionizer voltage exceeds 12.0 KVDC, the ionizer wires are moderately to extremely coated with contaminant (clean ionizer wires), or the power pack is not within specifications. There is a high problem if the indicator light is flashing.
7. If there is an arcing condition, determine the problem and repair.
8. Disconnect AC cable plug from the wall outlet.

IONIZER PROBLEMS WHICH COULD CAUSE A DEAD SHORT CONDITION/ARCING CONDITIONS (BLINKING INDICATOR LIGHT) Refer to step 2.

TESTING COLLECTOR CELL

1. Select one collector cell to be tested.
2. Connect one high voltage wire to the collector cell contact spring and the other end to the power pack connector identified as “Collector #7.”
3. Connect the other high voltage wire (use as a ground wire) to the metal frame of the collector cell and the other end to the ground stud on the power pack.
4. AC cable should be connected to the power pack connectors with ground wire secured to the ground stud on the power pack.
5. Connect AC cable plug to the wall outlet.
6. Measure high voltage with the high voltage probe, collector cell voltage should be 5.0 to 7.5 KVDC, not to exceed 7.5 KVDC. The collector cell will not maintain high voltages above 7.5 KVDC. The collector cell will continuously arc. Usually this condition is caused by a power pack above the “High Voltage Specifications.” The power pack should be replaced. There is a high voltage problem if the indicator light is flashing.
7. If there is an arcing condition, determine the problem and repair.
8. Disconnect AC cable plug from the wall outlet.

COLLECTOR CELL PROBLEMS WHICH COULD CAUSE A DEAD SHORT/ARCING CONDITIONS (FLASHING INDICATOR LIGHT). Refer to step 2.

TESTING THE POWER PACK

1. Connect AC cable to the power pack connectors with the ground wire secured to the ground stud on the power pack.
2. Connect AC cable plug to wall outlet.
3. Measure high voltage with high voltage probe at the connectors “Ionizer #8” and “Collector #7,” Refer to high voltage specifications, section 11. The power pack has failed if the indicator light is flashing
4. Disconnect AC cable plug from the wall outlet.
5. Replace power pack if high voltage measurements are above or below high voltage specifications.

13. Replacement Parts

To order replacement parts, refer to “Smog-Hog Parts List” on page 17. Order through your local UAS representative or contact United Air Specialists at 1-800-252-4647. Please have the unit model number, serial number (from component access door) and part numbers available when ordering.

Properly Aligned SHN Assembly

ITEM NO:	PART NO:	DESCRIPTIONS:	QUANTITY REQUIRED*
1	02-2339-S	COLLECTION CELL ASSEMBLY	2
2	02-0037-S	IONIZER ASSEMBLY	2
3	37-0027	COLLECTION CELL FEED THRU INSULATOR	1
4	37-0026	IONIZER FEED THRU INSULATOR	1
5	36-0014	CELL/IONIZER INSULATOR SPRING	2
6	36-0077	GROUND SPRING	4
7	30-0387	COLLECTION CELL CONTACT SCREW	3
8	30-0389	IONIZER CONTACT NUT	3
9	30-0388	IONIZER CONTACT SCREW	3
10	36-0016	IONIZER CONTACT SPRING	1
11	42-0082	PUSH TO TEST BUTTON	2
12	36-0009	COLLECTION CELL CONTACT SPRING	1

SHN-20 CONFIGURATION SHOWN
*For SHN-20 Unit

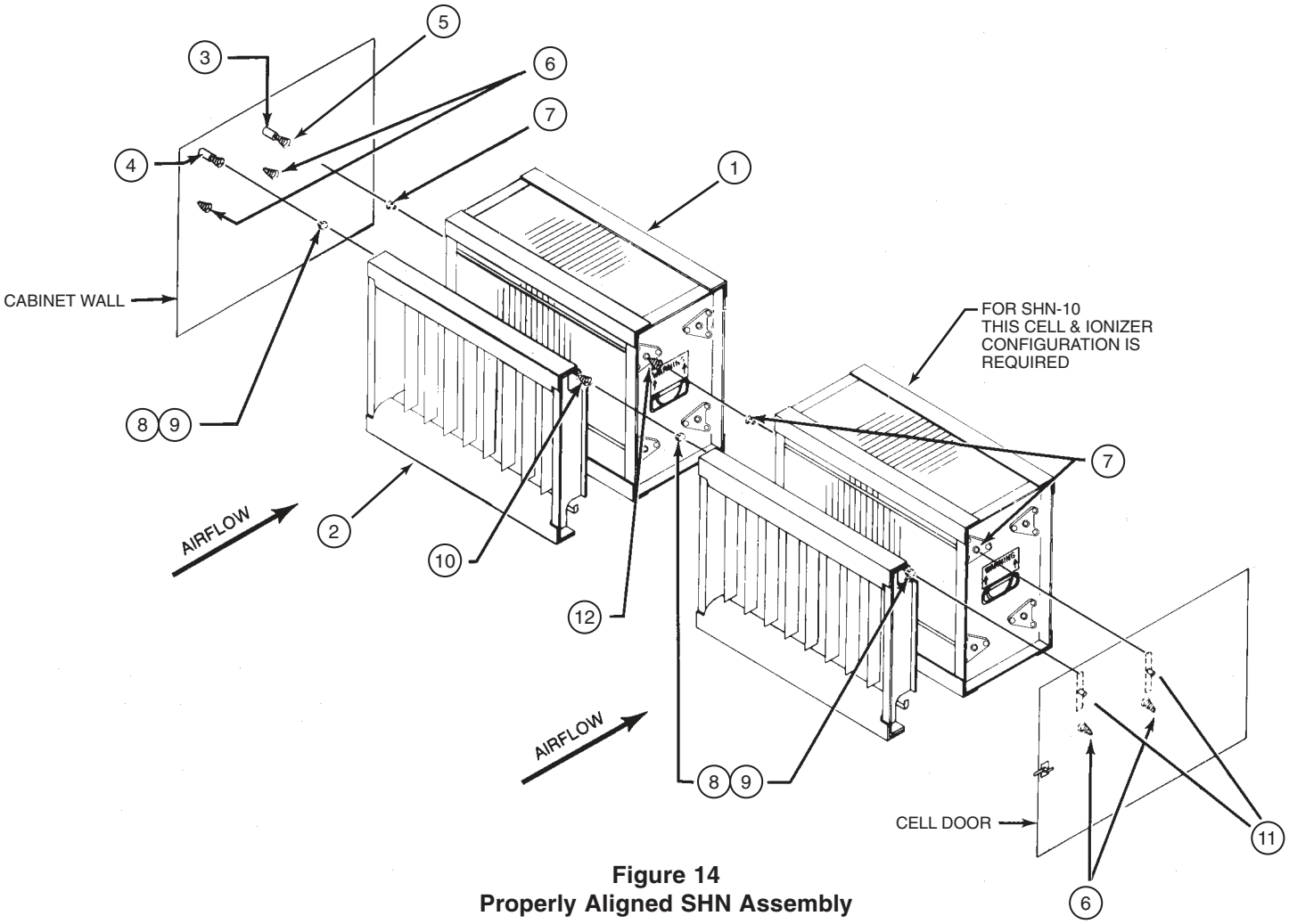


Figure 14
Properly Aligned SHN Assembly

SMOG-HOG PARTS LIST

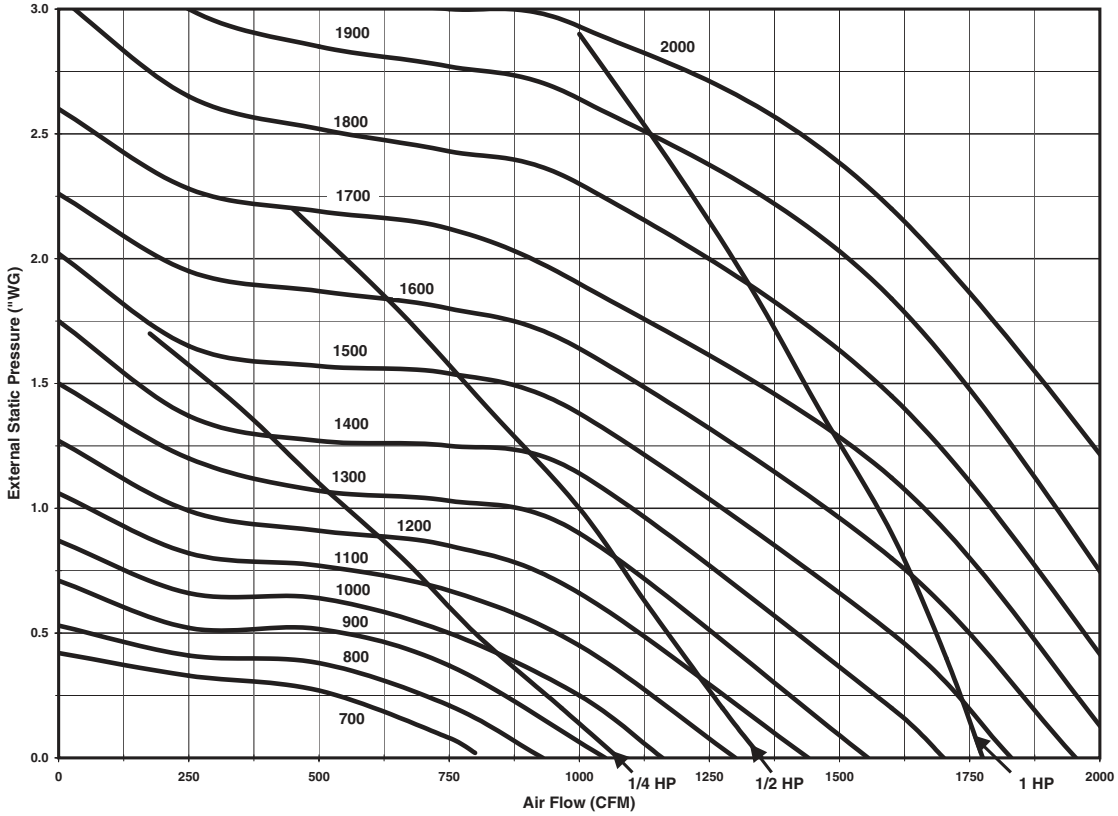
COMPONENT DESCRIPTION		PART NUMBER
POWER SUPPLY - POSITIVE (UL RECOGNIZED)		21-1216
POWER SUPPLY - NEGATIVE (UL RECOGNIZED)		21-1220
GREEN 12 VDC LED TYPE INDICATOR LIGHT W/TERMINALS		02-10561-G
100 V.A. STEP-DOWN TRANSFORMER	(208V to 115V)	21-1275-100
(FOR SHN-10 & SHN-20)	(230V or 460V to 115V)	21-1274-100
	(575V to 115V)	21-1276-100
150 V.A. STEP-DOWN TRANSFORMER	(208V to 115V)	21-1275-150
(FOR SHN-10-M, SHN-20-M, SHN-40 & SHN-50-T)	(230V or 460V to 115V)	21-1274-150
	(575V to 115V)	21-1276-150
350 V.A. STEP-DOWN TRANSFORMER	(208V to 115V)	21-1275-350
(FOR SHN-40-M)	(230V or 460V to 115V)	21-1274-350
	(575V to 115V)	21-1276-350
LIMIT SWITCH, CABINET DOOR INTERLOCK		20-0005
GASKET, EDGE (BUNA-N)		42-0168
BLOWER-BELT DRIVE 3/4” SGL 9-7 – SHN-10		32-0059
BLOWER-BELT DRIVE 3/4” DBL 9-7 – SHN-20		32-0036
BLOWER-BELT DRIVE 1” SGL 15-15 – SHN-40 & 50-T		32-0063
MOTOR-7-1/2HP, 208-230-460/3/60		22-0288
MOTOR-5HP, 208-230-460/3/60		22-0023
MOTOR-3HP, 190-208-230-460/3/50-60		22-0022
MOTOR-1HP, 208/3/60		22-0012
MOTOR-2HP, 208-230-460/3/60		22-0039
MOTOR-1/2HP, 115-230/1/60		22-0001
MOTOR-1/2HP, 190-208-230-460/3/60		22-0002
MOTOR-1HP, 575/3/60		22-0047
BELTS		BASED ON ORDER
PULLEYS		BASED ON ORDER
COLLECTION CELL GPN		02-2339-S
IONIZER ASSY-9 WIRE		02-0037-S
OPTIONAL MIST-STOP FILTERS		
FILTER, COALESCING TYPE, 2” SHN-10		33-10071-0001
FILTER, COALESCING TYPE, 2” SHN-20, 40 & 50*		33-10071-0002
FILTER, ALUMINUM MESH, 2” SHN-10		33-10072-0001
FILTER, ALUMINUM MESH, 2” SHN-20, 40 & 50*		33-10072-0002

*Note: (1) Filter per SHN-20
(2) Filter per SHN-40 & 50

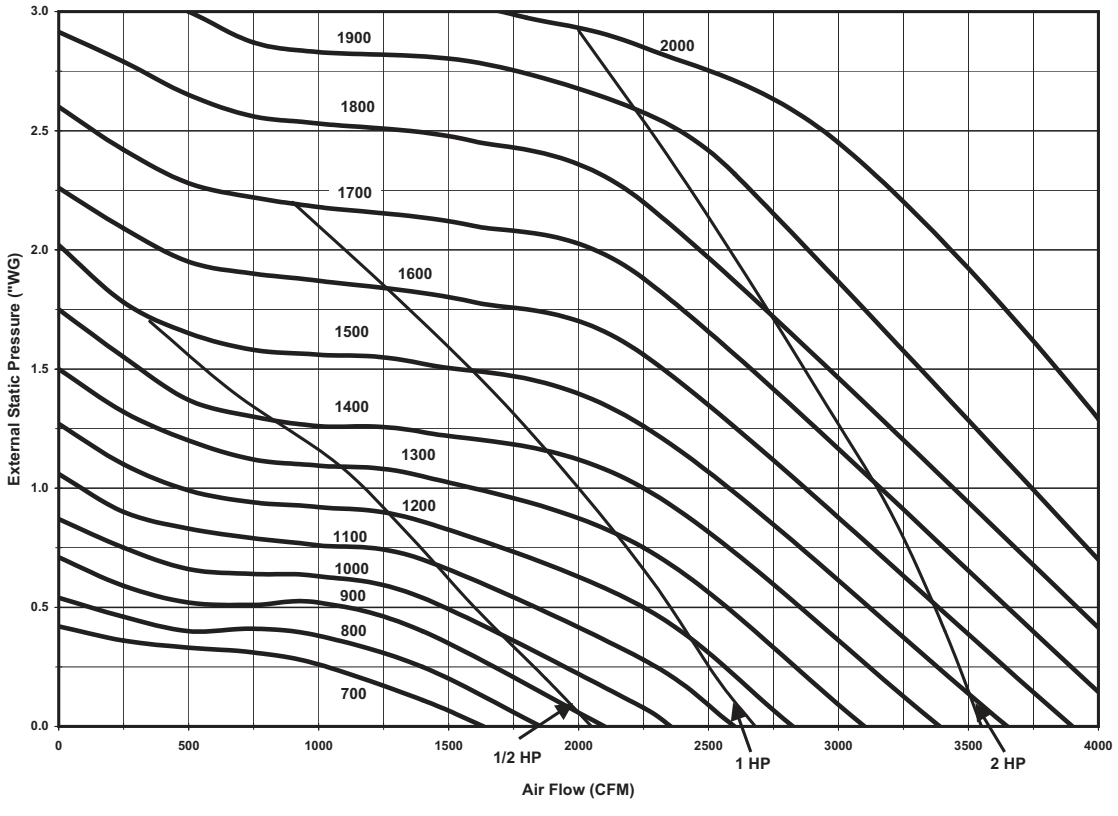
14. APPENDIX A

SHN SERIES
AIRFLOW CURVES

SHN-10

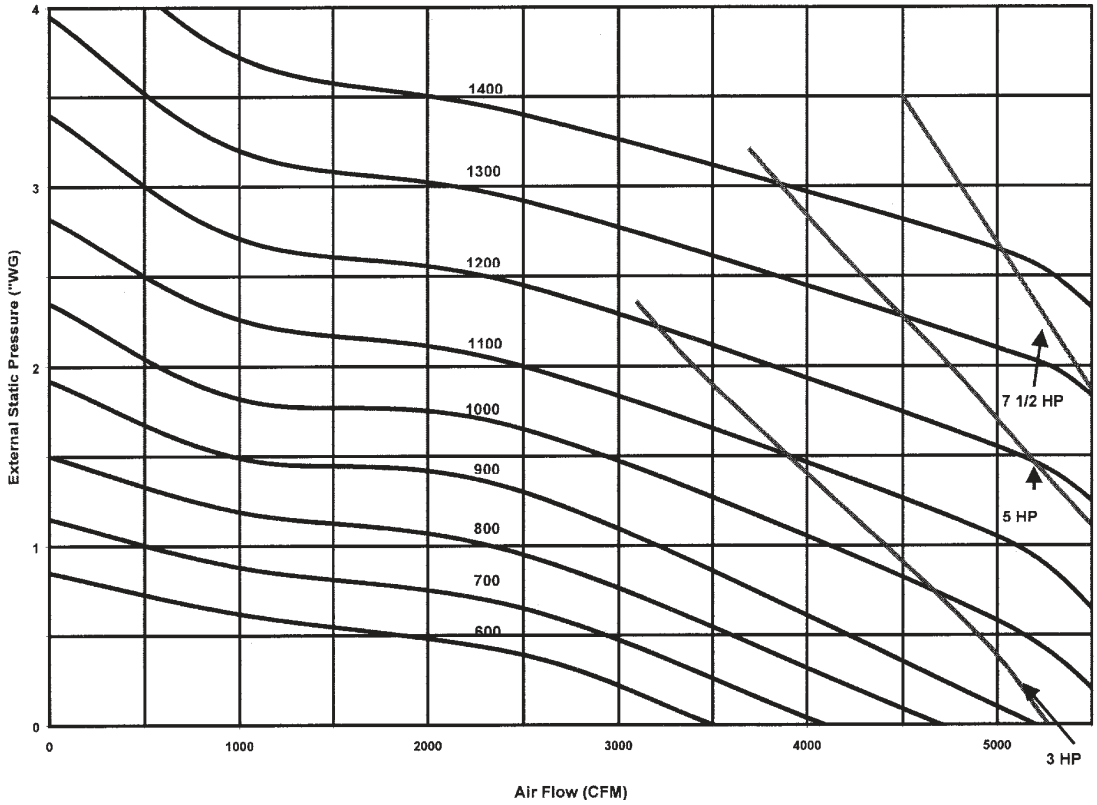


SHN-20

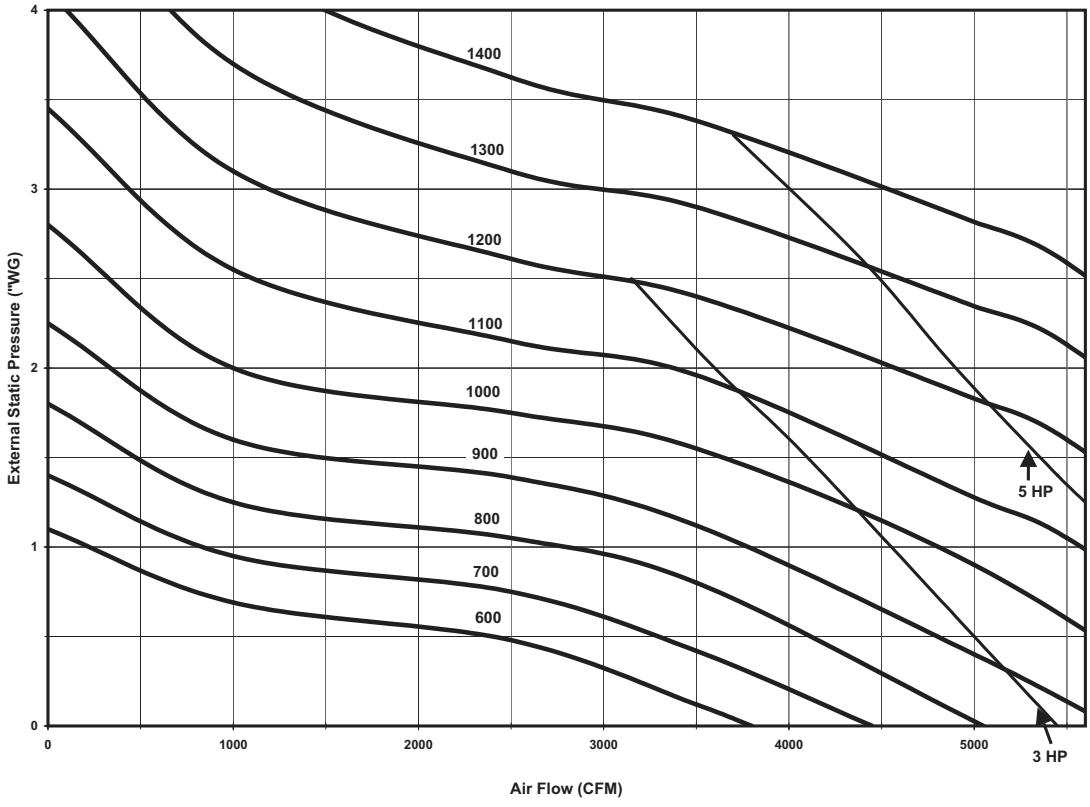


SHN SERIES
AIRFLOW CURVES

SHN-40

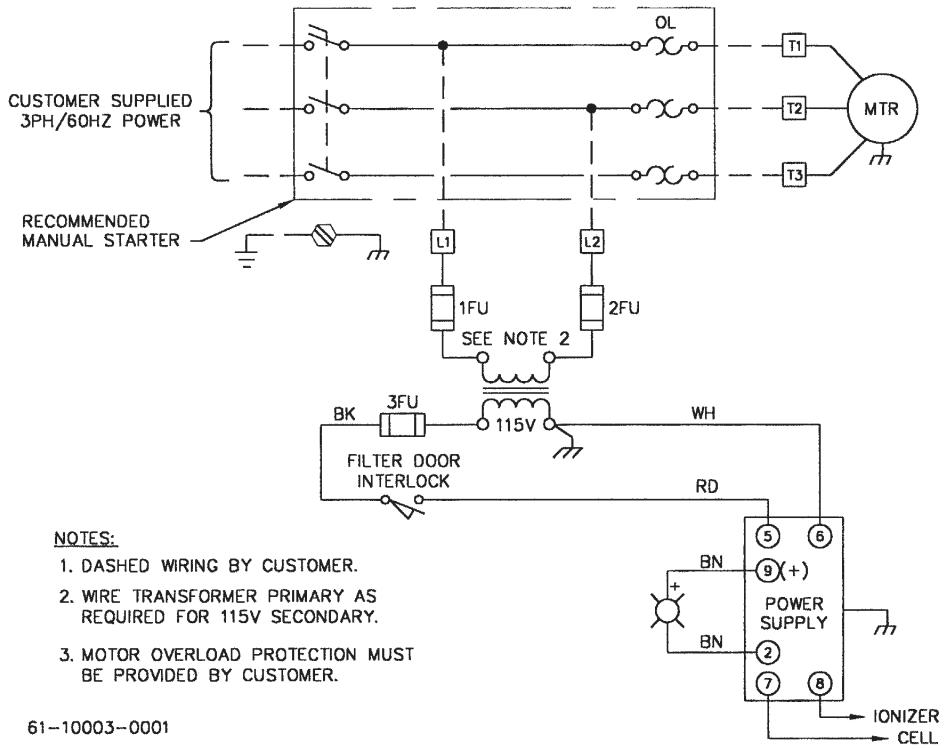


SHN-50-T



APPENDIX B WIRING DIAGRAMS

SHN-10/20



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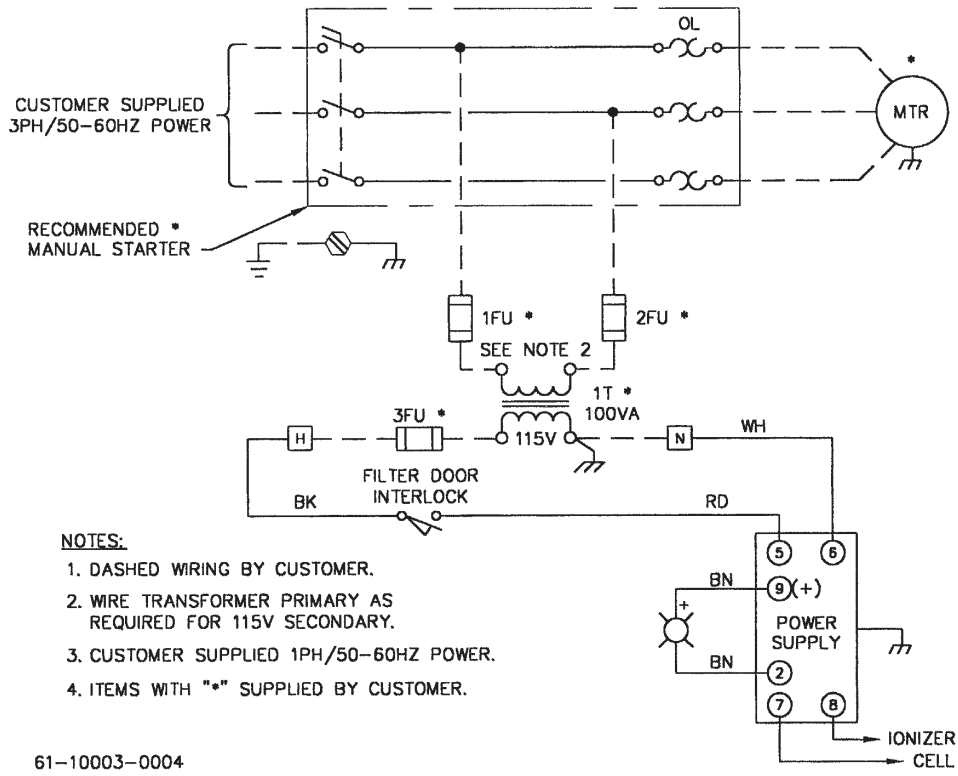
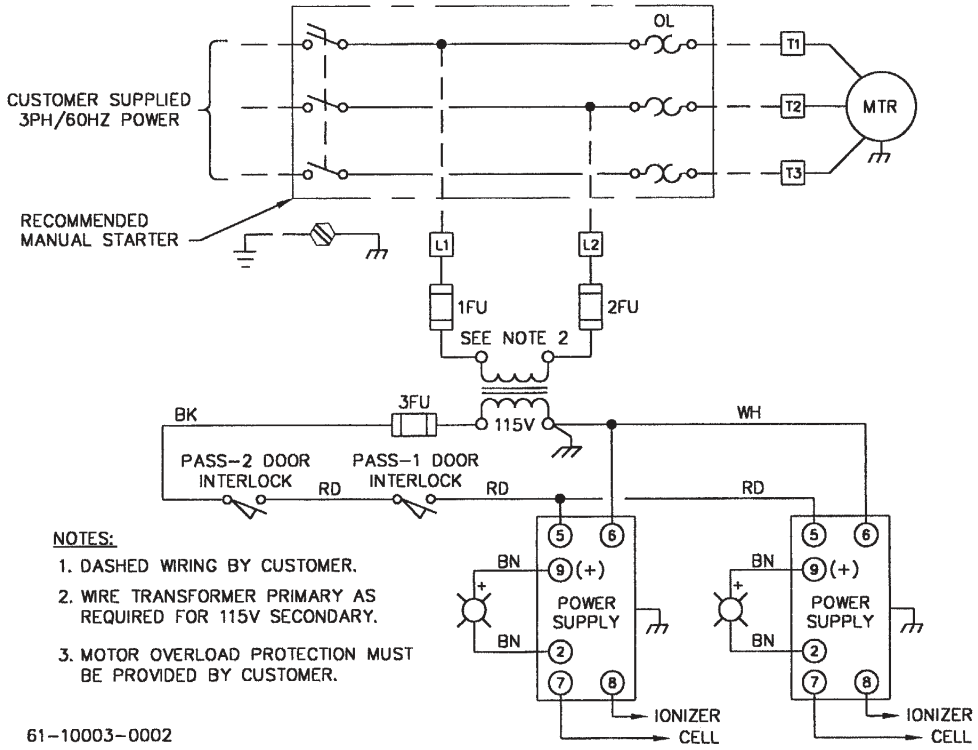
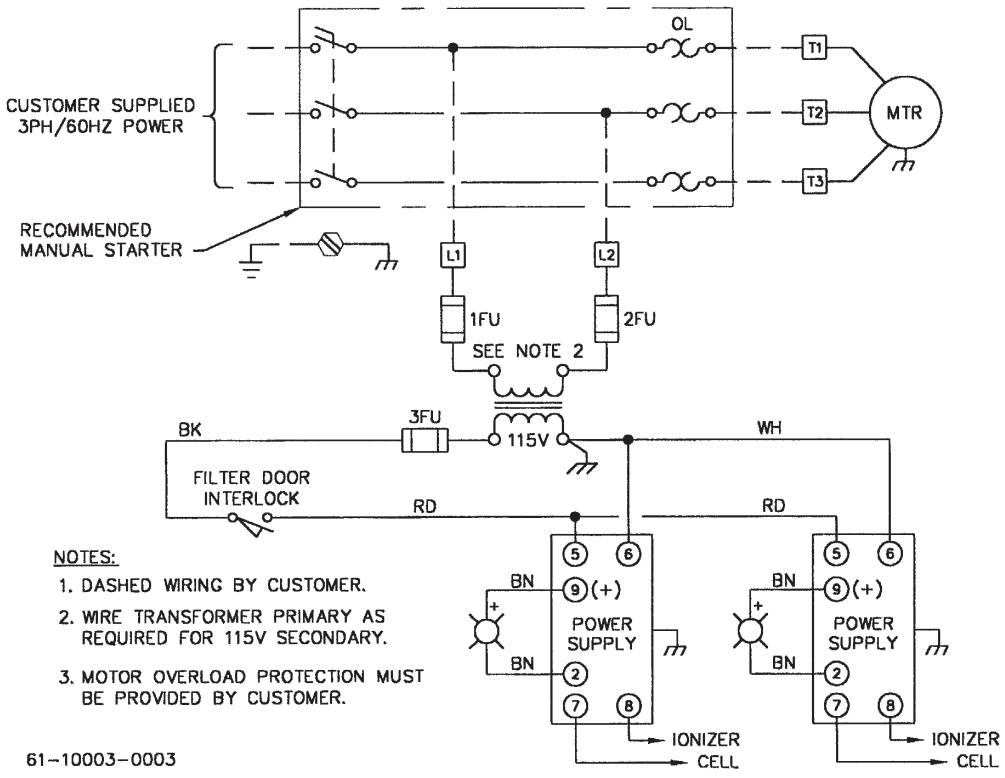


WIRING DIAGRAMS

SHN-10/20-M

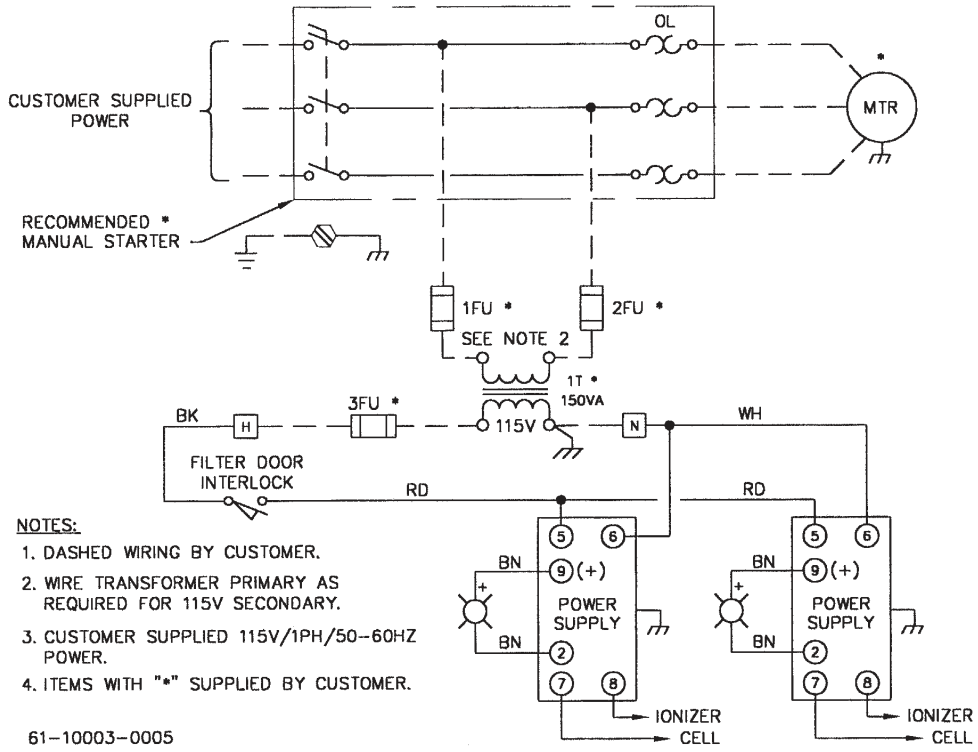


SHN-40



WIRING DIAGRAMS

SHN-40-XB



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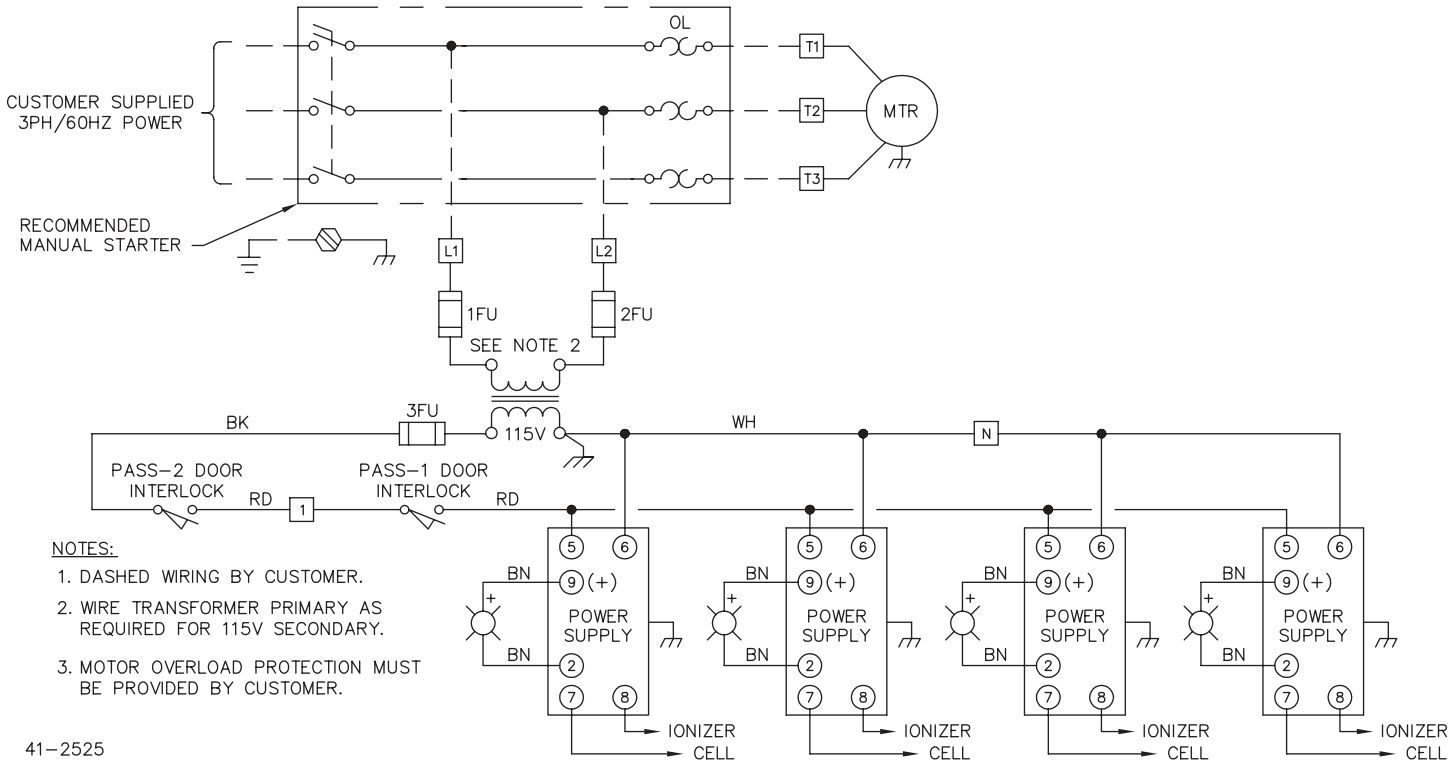
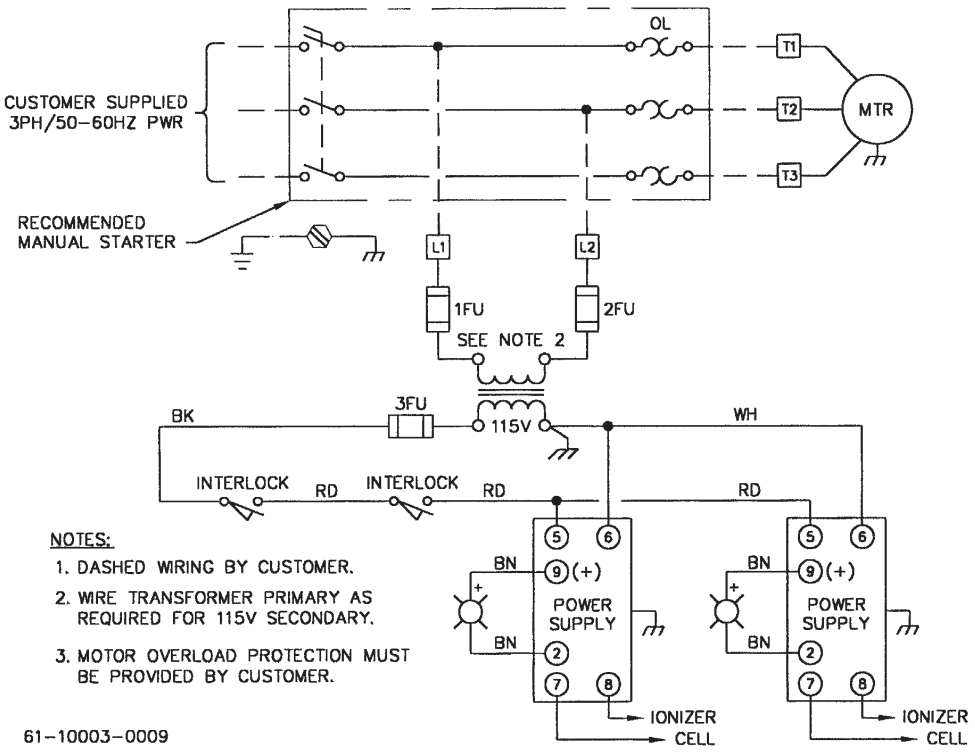


WIRING DIAGRAMS

SHN-50-T



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4440 Creek Road • Cincinnati, Ohio 45242 USA
National Phone: 1-800-252-4647
Telephone: (513) 891-0400 • Fax: (513) 891-4882
www.uasinc.com

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