**SERVICE MANUAL**
**LN-9625-00**
August — 2014

Ransburg

# *MicroPak 2e*
# *Single Bell Controller*


## MODEL: A13613-XX

**IMPORTANT: Before using this equipment, carefully read SAFETY PRECAUTIONS, starting on page 1, and all instructions in this manual. Keep this Service Manual for future reference.**

**Service Manual Price: $50.00 (U.S.)**

**NOTE:** This is the first release of this manual.

# CONTENTS

Ransburg

# SAFETY

## SAFETY PRECAUTIONS

Before operating, maintaining or servicing any Ransburg electrostatic coating system, read and understand all of the technical and safety literature for your Ransburg products. This manual contains information that is important for you to know and understand. This information relates to USER SAFETY and PREVENTING EQUIPMENT PROBLEMS. To help you recognize this information, we use the following symbols. Please pay particular attention to these sections.

**A WARNING! states information to alert you to a situation that might cause serious injury if instructions are not followed.**

**A CAUTION! states information that tells how to prevent damage to equipment or how to avoid a situation that might cause minor injury.**

**A NOTE is information relevant to the procedure in progress.**

While this manual lists standard specifications and service procedures, some minor deviations may be found between this literature and your equipment. Differences in local codes and plant requirements, material delivery requirements, etc., make such variations inevitable. Compare this manual with your system installation drawings and appropriate Ransburg equipment manuals to reconcile such differences.

Careful study and continued use of this manual will provide a better understanding of the equipment and process, resulting in more efficient operation, longer trouble-free service and faster, easier troubleshooting. If you do not have the manuals and safety literature for your Ransburg system, contact your local Ransburg representative or Ransburg.

**! WARNING**

➤ The user **MUST** read and be familiar with the Safety Section in this manual and the Ransburg safety literature therein identified.

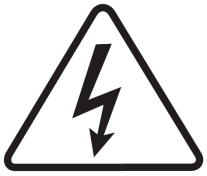
➤ This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the **WARNINGS** and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to ALL local building and fire codes and ordinances as well as **NFPA-33 SAFETY STANDARD, LATEST EDITION**, prior to installing, operating, and/or servicing this equipment.

**! WARNING**

➤ The hazards shown on the following pages may occur during the normal use of this equipment. Please read the hazard chart beginning on page 2.

| AREA<br>Tells where hazards may occur. | HAZARD<br>Tells what the hazard is. | SAFEGUARDS<br>Tells how to avoid the hazard. |
|---|---|---|
| **Spray Area**<br>  | **Fire Hazard**<br>Improper or inadequate operation and maintenance procedures will cause a fire hazard.<br>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction. | Fire extinguishing equipment must be present in the spray area and tested periodically.<br>Spray areas must be kept clean to prevent the accumulation of combustible residues.<br>Smoking must never be allowed in the spray area.<br>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.<br>When using solvents for cleaning:<br>• Those used for equipment flushing should have flash points equal to or higher than those of the coating material.<br>• Those used for general cleaning must have flash points above 100°F (37.8°C).<br>Spray booth ventilation must be kept at the rates required by NFPA-33, OSHA, country, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.<br>Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times.<br>Test only in areas free of combustible material.<br>Testing may require high voltage to be on, but only as instructed.<br>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.<br>If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.<br>Never use equipment intended for use in waterborne installations to spray solvent based materials.<br>The paint process and equipment should be set up and operated in accordance with NFPA-33, NEC, OSHA, local, country, and European Health and Safety Norms. |

| AREA<br>Tells where hazards may occur. | HAZARD<br>Tells what the hazard is. | SAFEGUARDS<br>Tells how to avoid the hazard. |
|---|---|---|
| **Spray Area**<br>  | **Explosion Hazard**<br>Improper or inadequate operation and maintenance procedures will cause a fire hazard.<br>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation.<br>Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction. | Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times.<br>Unless specifically approved for use in hazardous locations, all electrical equipment must be located **outside** Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33.<br>Test only in areas free of flammable or combustible materials.<br>The current overload sensitivity (if equipped) MUST be set as described in the corresponding section of the equipment manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power supply shutdown indicates a problem in the system which requires correction.<br>Always turn the control panel power off prior to flushing, cleaning, or working on spray system equipment.<br>Before turning high voltage on, make sure no objects are within the safe sparking distance.<br>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 50176.<br>Have fire extinguishing equipment readily available and tested periodically. |
| **General Use and Maintenance**<br>  | Improper operation or maintenance may create a hazard.<br>Personnel must be properly trained in the use of this equipment. | Personnel must be given training in accordance with the requirements of NFPA-33, EN 60079-0.<br>Instructions and safety precautions must be read and understood prior to using this equipment.<br>Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA-33, EN Norms and your insurance company requirements. |

| AREA<br>Tells where hazards may occur. | HAZARD<br>Tells what the hazard is. | SAFEGUARDS<br>Tells how to avoid the hazard. |
|---|---|---|
| **Spray Area / High Voltage Equipment**<br>  | **Electrical Discharge**<br><br>There is a high voltage device that can induce an electrical charge on ungrounded objects which is capable of igniting coating materials.<br><br>Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion. | Parts being sprayed and operators in the spray area must be properly grounded.<br><br>Parts being sprayed must be supported on conveyors or hangers that are properly grounded. The resistance between the part and earth ground must not exceed 1 meg ohm. (Refer to NFPA-33.)<br><br>Operators must be grounded. Rubber soled insulating shoes should not be worn. Grounding straps on wrists or legs may be used to assure adequate ground contact.<br><br>Operators must not be wearing or carrying any ungrounded metal objects.<br><br>When using an electrostatic handgun, operators must assure contact with the handle of the applicator via conductive gloves or gloves with the palm section cut out.<br><br>NOTE: REFER TO NFPA-33 OR SPECIFIC COUNTRY SAFETY CODES REGARDING PROPER OPERATOR GROUNDING.<br><br>All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded. Grounded conductive flooring must be provided in the spray area.<br><br>Always turn off the power supply prior to flushing, cleaning, or working on spray system equipment.<br><br>Unless specifically approved for use in hazardous locations, all electrical equipment must be located **outside** Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33. |

| **AREA**<br>Tells where hazards may occur. | **HAZARD**<br>Tells what the hazard is. | **SAFEGUARDS**<br>Tells how to avoid the hazard. |
|---|---|---|
| **Electrical Equipment**<br>  | **Electrical Discharge**<br>High voltage equipment is utilized in the process. Arcing in the vicinity of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.<br><br>Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.<br><br>Frequent power supply shutdown indicates a problem in the system which requires correction.<br><br>An electrical arc can ignite coating materials and cause a fire or explosion. | Unless specifically approved for use in hazardous locations, the power supply, control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas in accordance with NFPA-33 and EN 50176.<br><br>Turn the power supply OFF before working on the equipment.<br><br>Test only in areas free of flammable or combustible material.<br><br>Testing may require high voltage to be on, but only as instructed.<br><br>Production should never be done with the safety circuits disabled.<br><br>Before turning the high voltage on, make sure no objects are within the sparking distance. |
| **Toxic Substances**<br>  | **Chemical Hazard**<br>Certain materials may be harmful if inhaled, or if there is contact with the skin. | Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer.<br><br>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.<br><br>Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved. |

| AREA<br>Tells where hazards may occur. | HAZARD<br>Tells what the hazard is. | SAFEGUARDS<br>Tells how to avoid the hazard. |
|---|---|---|
| **Spray Area**<br>  | **Explosion Hazard—Incompatible Materials**<br>Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,Trichloroethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion. | Aluminum is widely used in other spray application equipment such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your coating supplier. Any other type of solvent may be used with aluminum equipment. |

# N O T E S

# INTRODUCTION

## GENERAL DESCRIPTION

The ***Ransburg MicroPak 2e Single Bell Controller*** (A13613-XX), is a free standing unit which provides voltage to a remotely located cascade and closed loop speed control for Ransburg atomizer units.

The Ransburg MicroPak 2e High Voltage Controller uses a combination of proven high voltage generation technology including microprocessor-based control with diagnostic and communication functions. A variable voltage output is used to supply a cascade that amplifies the voltage to a high value. It also uses both current and voltage feedback information to maintain the desired set point. The processor circuitry provides the maximum in applicator transfer efficiency, while maintaining the maximum safety

The Ransburg MicroPak 2e Atomizer Controller builds upon previous Ransburg control technology and tightly integrates the MicroPak 2e Atomizer Controller with the MicroPak 2e High Voltage Controller.

## SAFETY FEATURES

When used with the appropriate applicators and cascades, the Ransburg MicroPak 2e Single Bell Controller provides the ultimate in operational safety. The high voltage protections include Overvoltage, Overcurrent, Di/Dt, Dv/Dt and Interlock Open. In addition, the microprocessor circuits allow the use of output load curve control, which limits the high voltage output to safe levels when the controls are set responsibly and safe distances are observed and followed. The protections provided by the atomizer control include Overspeed, Underspeed, Loss of Bearing Air, Loss of Feedback and Interlock Open. These safety checks assure that the Atomizer is run within its safe operational limits. And finally, since the high voltage and atomizer controllers are tightly integrated, the operational status of each unit can be communicated to the other unit. This provides added benefits such as forcing a brake assisted stop of the Atomizer when an interlock opens.

## DISPLAYS

The front panel contains two LCD displays each containing four lines of 20 characters. These allow real-time monitoring of cascade voltage and current as well as bell speed and bearing air pressure. All readings are true values derived from feedback signals originating in the cascade and atomizer units.

In addition to providing a continuous display of operating parameters, the front panel display also provides a means to display and change user adjustable operating parameters such as Overcurrent, Over-voltage, Di/Dt and Dv/Dt.

The ***Ransburg MicroPak 2e Single Bell Controller*** (A13613-XX), is available as follows:

| Part # | Description |
|---|---|
| A13613-00 | Bell Control, HP404/RP404 |
| A13613-01 | Bell Control, RP1000 |
| A13613-02 | AutoGun, HP404/HP505 |

# SPECIFICATIONS

## (At Sea-Level Conditions)

## Environmental / Physical

| | |
|---|---|
| **Operating Temperature:** | 0°C to +55°C |
| **Storage and Shipping Temperature:** | -40°C to +85°C |
| **Humidity:** | 95% Non-Condensing |
| **Cabinet Size:** | 13.0" Wide<br>18.0" Deep<br>7.0" Height |
| Weight: | 23 lbs. |

## Electrical

**DC Power Required: ***

| | |
|---|---|
| **Controller :** | 24V DC @ 0.5 Amps |
| **Cascade:** | 24V DC @ 6.0 Amps (fully loaded output), RansPak 1000 (RP1000) Cascade |
| | 24V DC @ 2.0 Amps (fully loaded output), HP404, RP404, HP505, A12760 and A12761 Cascades |

**AC Electrical Requirements:**
90-264 VAC @ 1.5 Amps
47/63 Hertz

*** DC power supplied from 24VDC built-in, regulated power supply which has overcurrent (40%) and overvoltage (20%) protection.**

**Controls**

**Network:**
EtherNet/IP

**Discrete Signals:**

**Inputs:**
Misc IO Interlock/Trigger
Door Interlock
Booth Air Interlock

**Outputs:**
Interlock Out
External Power Enable
System Alarm

**Controller Operating Range**

| | |
|---|---|
| **High Voltage:** | 0-100kV, settable in 1kV increments |
| **Current:** | |
| HP404/RP404 | 0-125 microamps |
| A12760/A12761 | 0-150 microamps |
| HP505 | 0-240 microamps |
| RP1000 | 0-1000 microamps |

## Pneumatic

**Pneumatic Inputs**

| | |
|---|---|
| **Supply Air:** | 0-100 psi (0-6.9 bar) filtered to 40 microns<br>80 psi (5.5 bar) minimum required for specified performance |
| **Bearing Air:** | Feedback of actual rotator bearing air pressure |

**Pneumatic Outputs**

| | |
|---|---|
| **Turbine Pilot Air:** | Zero to input pressure (variable) |
| **Brake Air:** | Zero to input pressure (On or Off) |

**These I/Os are not present on A13613-02**

## Optical

**Optical Input**

| | |
|---|---|
| **Bell Speed:** | Feedback of actual bell speed up to 99K RPM |

**This input is not present on A13613-02**

# INSTALLATION

## MICROPAK 2E INPUT POWER

Plug the detachable AC line cord into the receptacle on the rear of the MicroPak 2e Single Bell Controller Cabinet. Plug the other end into a properly grounded 110/230 Volt AC, 50/60 Hz. outlet. See Figure 1 below for location on the cabinet.

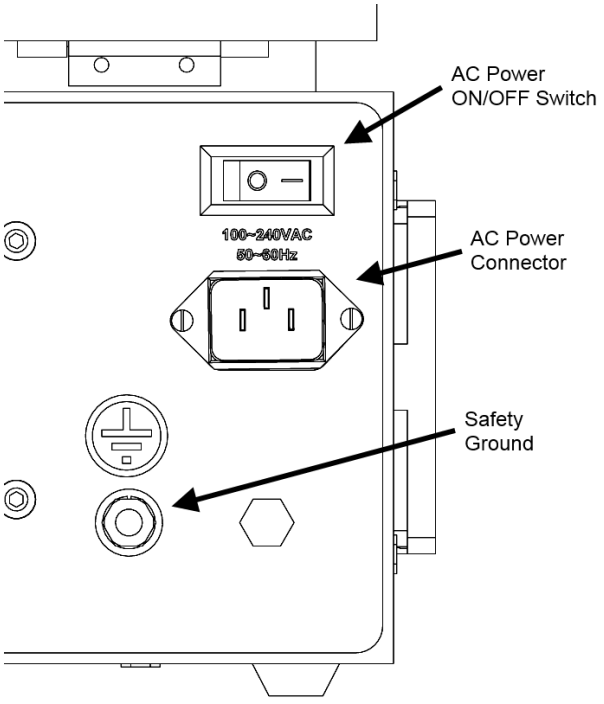



**Figure 1: Partial Rear View of Cabinet**

## SAFETY GROUND

Install the ground wire assembly supplied with the MicroPak 2e Single Bell Controller Cabinet from the ground stud on the rear of the cabinet to a true earth ground. For maximum noise immunity, cut the ground wire assembly to the shortest length required and reinstall the end lug before making connections.

**⚠ CAUTION**

➤ The ground wire assembly MUST be connected from the MicroPak 2e Single Bell Controller Cabinet ground stud to a true earth ground.

## LOW VOLTAGE CABLES

### Standard Low Voltage Cable For HP404/RP404/HP505 (A11353-XX)

Plug the connector of the low voltage cable assembly into the “LOW VOLTAGE” receptacle on the rear of the controller (see Figure 2). When making the connection, line the red dot on the connector with the red mark on the receptacle and push in until it clicks. To remove, simply pull back on the knurled portion of the connector.

### Standard Low Voltage Cable For RP1000 (A13745-XX)

Plug the connector of the low voltage cable assembly into the “LOW VOLTAGE” receptacle on the rear of the controller (see Figure 3). When making the connection, align the inner portion of the connector before screwing the connector firmly into place. To remove, reverse the operation.

## ETHERNET CABLES

### CAT 5 CABLE WITH RJ45

If the user plans to utilize the MicroPak 2e Single Bell Controller’s EtherNet/IP interface for remote control, they must provide a network connection for the Controller. This is done by plugging a standard CAT 5 cable into the RJ45 socket labeled “ETHERNET I/P” on the rear of the controller (see Figure 2).

# INTERLOCKS AND OUTPUTS

Interlock and output connections are made to connector P2 on the rear of the controller. P2 consists of three, 8 position terminal blocks A, B, and C (see Figure 5). To wire these terminal blocks, perform the following (see Figure 5):

1. Loosen the 2 screws of P2's connector housing and remove P2 from the controller.

2. Loosen the 4 screws holding the terminal block assembly to the inside of the connector housing and remove the terminal block assembly from the housing.

3. Feed the Output / Interlock cable(s) through the cable grommet attached to the connector housing and pull out the other side. It may be necessary to remove the cable grommet to fit the cable(s) through. If so, slide the grommet connections onto the cable(s) in the order shown in Figure 5 before pulling the cable through the connector housing.

**NOTE**

➤ For maximum noise immunity, all wiring should be run in cables having a foil shield with an overall braided shield. The foil shield provides 100% shielding, while the braid provides a means of making proper 360° shield terminations at the cable ends.

4. Strip the jacket off the cable(s) 3" from the end and remove the braid 1.5" from the end (see Figure 6).

5. Strip the individual cable wires, install appropriate wire ferrules, and connect to the terminal blocks according to Table 1.

**NOTE**

➤ If multiple Output / Interlock cables are used, connect the exposed 1.5" cable braids together using copper tape.

6. Rotate the connector housing to achieve desired routing of the cable bundle (right or left), then reinstall the terminal block assembly into the connector housing.

7. Tighten the connector grommet ensuring the grommet spring makes 360° contact with the exposed cable braid/copper tape for maximum noise immunity.

For maximum noise immunity, the shields of the output and interlock cables should also be connected to earth ground at the end opposite to the MicroPak 2e Single Bell Controller connections.

If it is necessary or desired to run the interlock and Output cable(s) through conduit, an adapter can be readily purchased that converts the PG21 male threads of the P2 connector housing to 3/4" NPT male threads. This adapter is available through McMaster-Carr as their Part Number 7842K7.

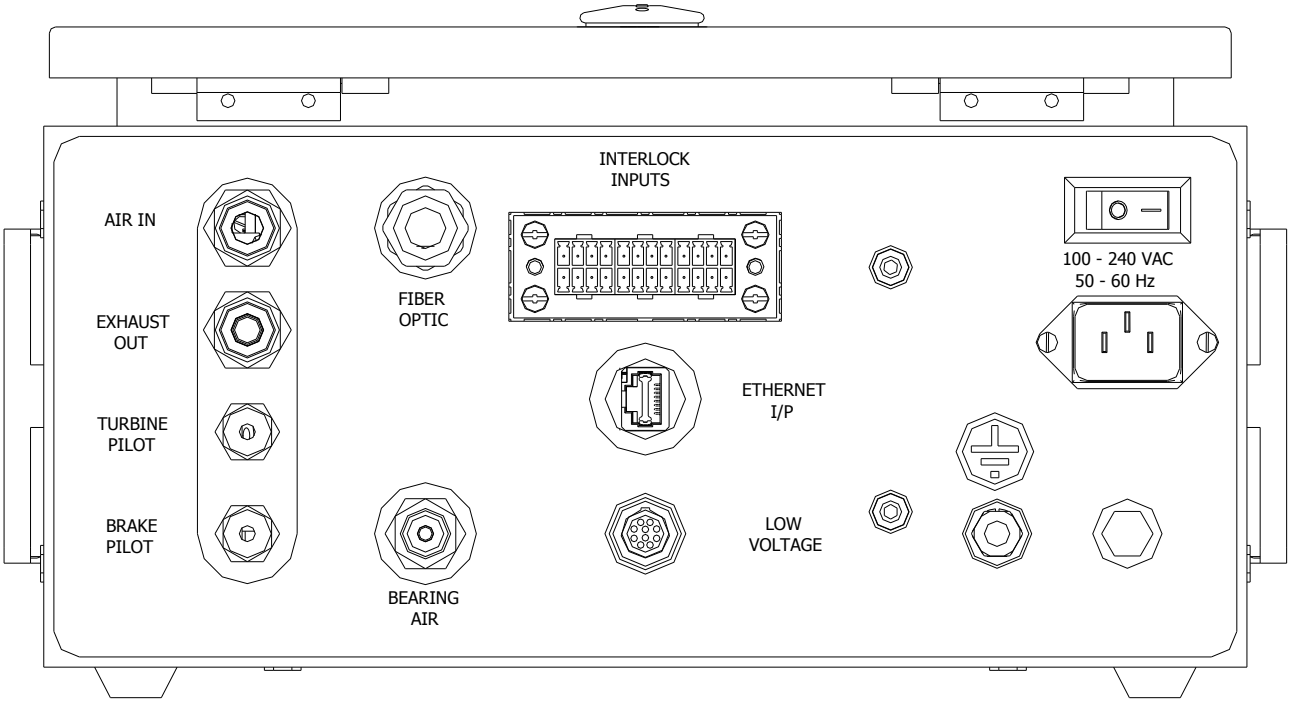



**Figure 2: Rear View of Controller Cabinet**

**Bell Control, HP404/RP404, A13613-00**

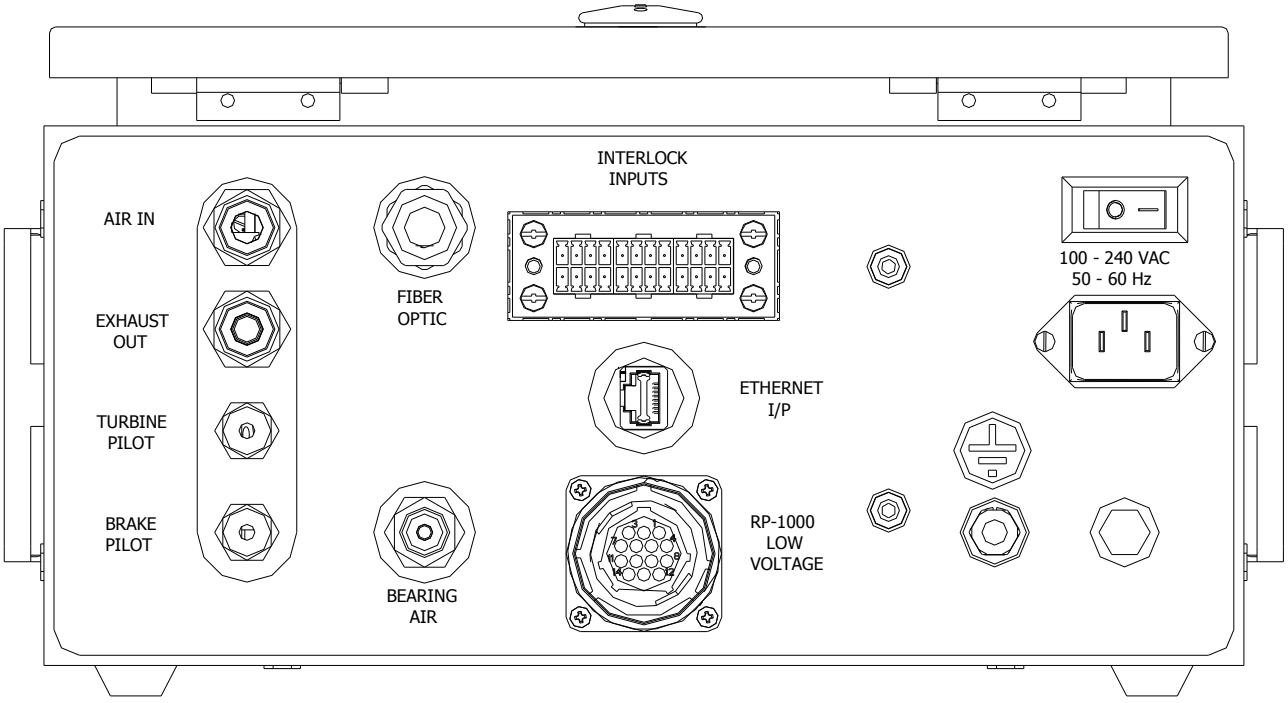



**Figure 3: Rear View of Controller Cabinet**

**Bell Control, RP1000, A13613-01**

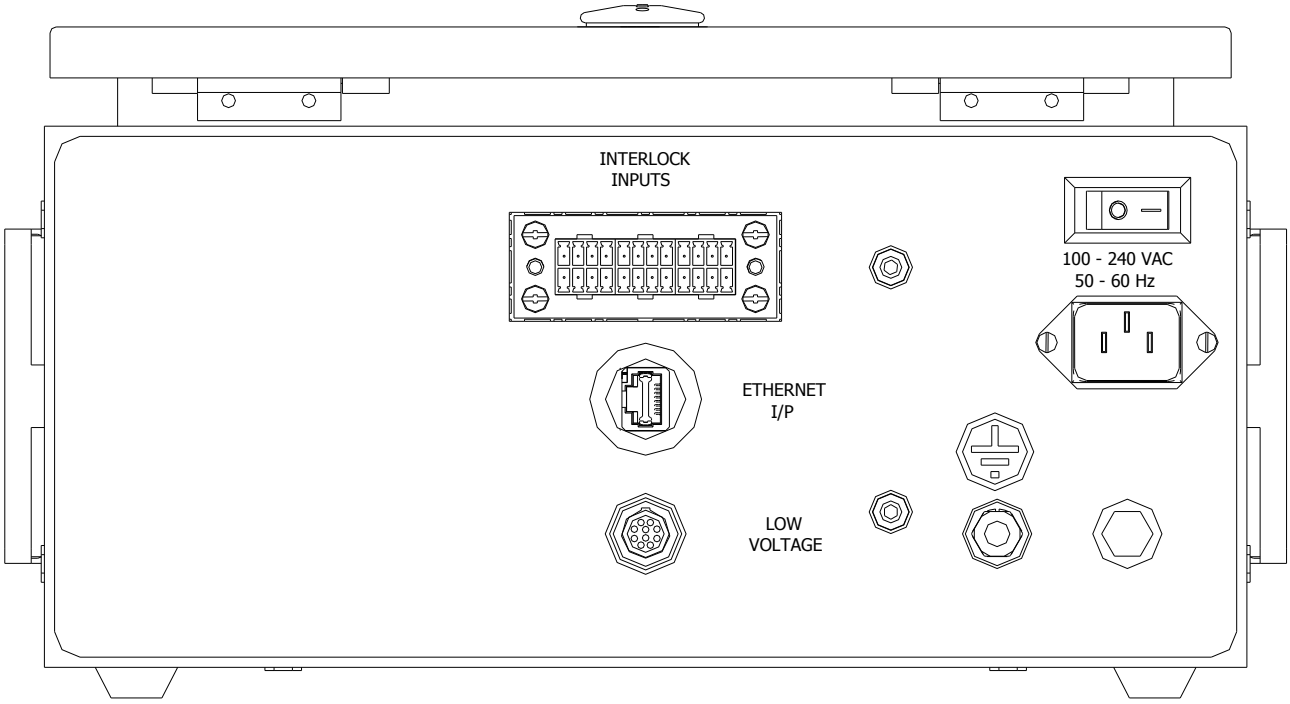



**Figure 4: Rear View of Controller Cabinet**

**AutoGun, HP404/HP505, A13613-02**

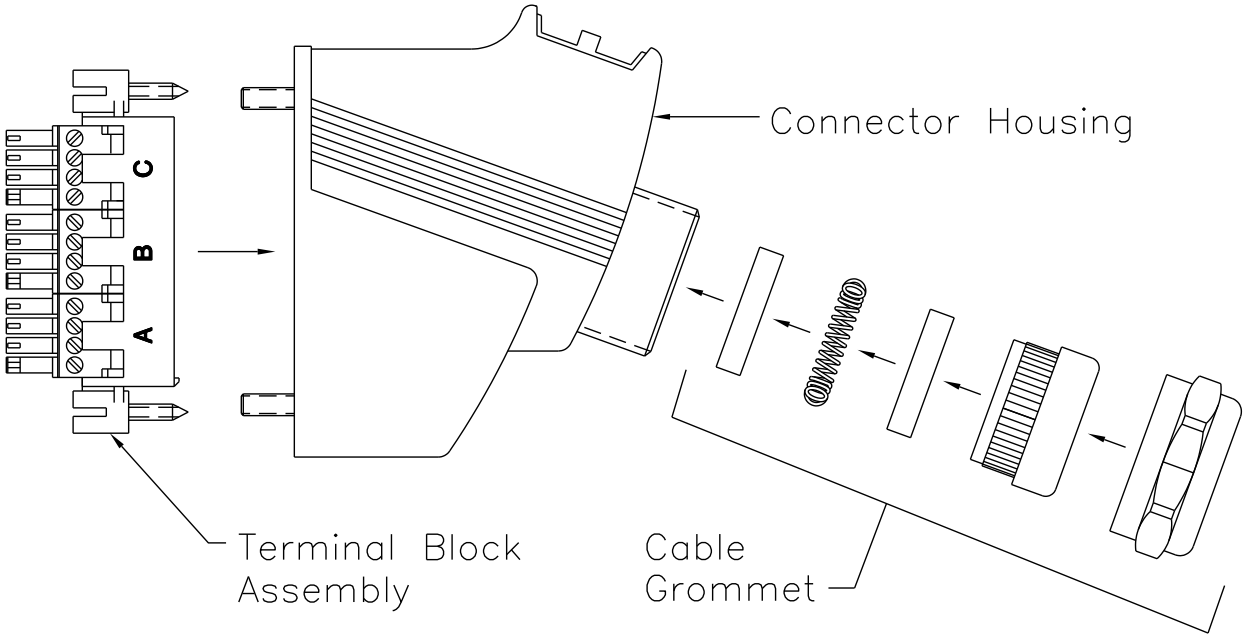



**Figure 5: Assembly of Connector P2**

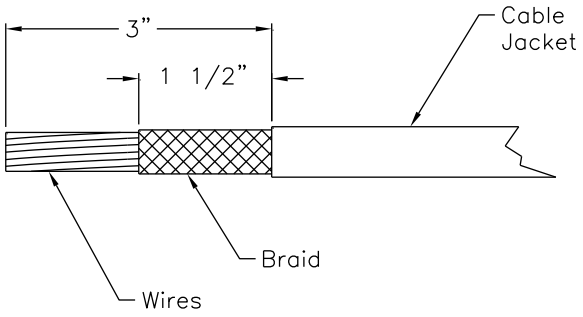



**Figure 6: Stripping of I/O Cables**

# DESCRIPTION OF TABLE 1 INTERLOCK AND OUTPUT TERMINALS

## Interlock Terminals

These terminals allow interlocking of high voltage and atomizer operation with safety components. In order to obtain high voltage or atomizer operation, the enabled MicroPak 2e Single Bell Control interlock terminals must have a connection between the (+) and (-) terminals by a jumper or voltage free contact. When an interlock is enabled, if the high voltage is activated without the interlock (+) and (-) terminals being connected together, high voltage output will not occur. These terminals are provided to interlock the controller with the exhaust fan and conveyor as required by NFPA-33. If an enabled interlock connection is momentarily lost, the connection must be restored and the controller fault cleared before the high voltage output can be turned back on.

**NOTE**

➤ The fourth interlock input *Remote Stop* cannot be disabled through software. If the user does not wish to use the Remote Stop input, a jumper must be installed to close the *Remote Stop* circuit. It can be placed between A4 and A8 of P2, or between J5-13 and J5-14 of the MicroPak 2e HV Controller (See current "*MicroPak 2e HV & Atomizer Controller*" service manual.).

## Output Terminals

Each output pair (+,-) is connected to an isolated relay contact which is rated 30 VDC @ 2 amps, maximum.

## External Power Enable

This signal indicates that the MicroPak 2e has power and is operating.

## System Alarm Out

This relay output signal indicates the MicroPak 2e Single Bell Controller is shutdown due to a fault condition. This signal reflects the fault status of both the HV controller and the Atomizer controller, such that if either unit is faulted the alarm will be activated.

## Interlock Out

This relay output signal indicates the MicroPak 2e Single Bell Controller has determined all enabled interlocks are closed, cascade power is present and cascade feedback signals are operating as expected. When this output is active and the System Alarm output is inactive, the controller is ready to be activated.

***TABLE 1***

| **Interlocks:** | **P2 Terminal** |
|---|---|
| Door (+) | A1 |
| Door (-) | A5 |
| Booth Air (+) | A2 |
| Booth Air (-) | A6 |
| Misc Interlock / Trigger (+) | A3 |
| Misc Interlock / Trigger (-) | A7 |
| Remote Stop (+) | A4 |
| Remote Stop (-) | A8 |
| **Outputs:** | |
| External Power Enable (+) | C3 |
| External Power Enable (-) | C7 |
| System Alarm Out (+) | C2 |
| System Alarm Out (-) | C6 |
| Interlock Out (+) | C1 |
| Interlock Out (-) | C5 |

**NOTE**

➤ The following sections which describe Bell Connections and Operations do not apply to AutoGun controllers (i.e. A13613-02)

# MICROPAK 2e BELL CONNECTIONS

## PNEUMATICS

### Air Supply

The air needed to control a Ransburg Atomizer unit is provided through the *AIR IN* connector shown in Figures 2 and 3. This is a standard push to connect air fitting which accepts 5/16“ (8 mm) OD pneumatic tubing.

### Exhaust Out

This fitting is used to discharge any waste air from the speed control regulator and brake valve. It is a standard push to connect air fitting which accepts 5/16“ (8 mm) OD pneumatic tubing. The location of the Exhaust Out connector is shown in Figures 2 and 3.

### Turbine Pilot

This output is generated by the E to P speed control. Due to the large quantity of air required to drive an atomizer unit, this output must be used as an air pilot signal to a 1:1 volume booster provided by the user. One suitable volume booster is Ransburg part number A11111-00. The *TURBINE PILOT* connection is a standard push to connect air fitting which accepts 5/32“ (4 mm) OD pneumatic tubing. The location of the Turbine Pilot connector is shown in Figures 2 and 3.

### Brake Pilot

This output is generated by an on/off air valve. It can be used directly to drive the atomizer’s brake air input. The connection is a standard push to connect air fitting which accepts 5/32“ (4 mm) OD pneumatic tubing. The location of the Brake Pilot connector is shown in Figures 2 and 3.

### Bearing Air

This input is used to monitor the pressure of the bearing air being supplied to the atomizer. It connects directly to a 0-100 psi P-to-E sensor which the MP2e controller continuously monitors. The low pressure fault setting defaults to 80 psi for all Ransburg atomizers. The connection is a standard push to connect air fitting which accepts 5/32“ (4mm) OD pneumatic tubing. The location of the Bearing Air connector is shown in Figures 2 and 3.

## BELL SPEED FEEDBACK
## Fiber Optic

This signal is provided via a fiber optic cable from the atomizer to the MP2e controller. It is used to monitor and control the rotational speed of the bell unit. The fiber optic cable enters the MP2e Single Bell Controller cabinet through a compression fitting labeled *FIBER OPTIC*, on the rear of the cabinet. (See Figures 2 and 3.) Enough cable should be placed inside the cabinet to have a gentle loop before entering the fiber optic cable retaining block. (See Figure 7) Before inserting the cable into the retaining block, verify the nylon clamp screw is not protruding into the cable

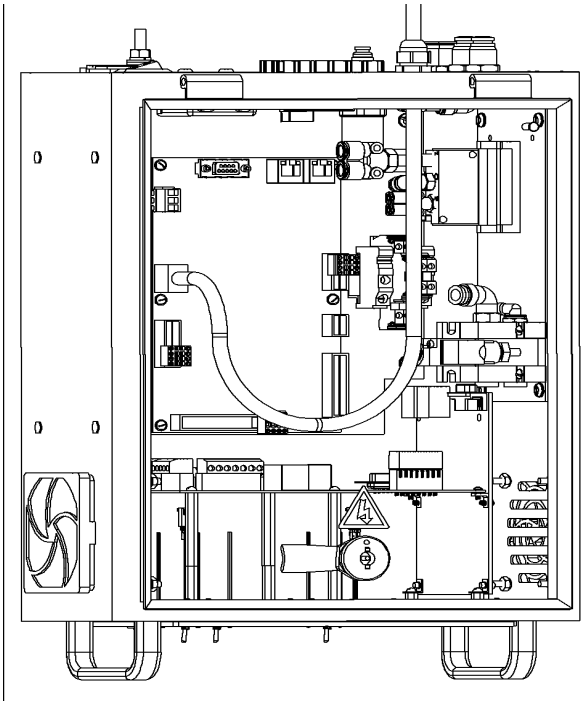


**Figure 7: Fiber Cable Position**

hole. Once the hole is clear insert the fiber cable into the hole until it is fully seated. Then tighten the nylon screw to hold the cable in place and tighten the compression fitting to retain the looped cable.

# BELL INTERLOCKING

The following system interlocks are required to prevent equipment damage.

- Bearing air should remain on at all times and only shut-off by turning off the main air to the pneumatic control cabinet.

- Turbine air must be removed if bearing air falls below 80 psi (551.6 kPa) at the atomizer. To facilitate this, Ransburg atomizers provide two interconnected bearing air ports, one for supply air and the other to be used as a return signal for measuring bearing air pressure at the atomizer. If bearing air falls below 80 psi (551.6 kPa) at the atomizer, the turbine air should be automatically interlocked to shut off. **This interlock is provided by the MicroPak 2e Atomizer Controller.** (See current *MicroPak 2e HV & Atomizer Controller* service manual.)

- Turbine air and brake air must be interlocked to prevent both from being used simultaneously. **This interlock is provided by the MicroPak 2e Atomizer Controller.** (See current *MicroPak 2e HV & Atomizer Controller* service manual.)

- It should not be possible for the coating material to be sprayed unless the turbine is spinning. **It is the user's responsibility to implement this interlock.**

- High voltage must be interlocked with the solvent valve pilot signal to prevent solvent flow while high voltage is energized (direct charge only). **It is the user's responsibility to implement this interlock.**

- Any other interlocks required by local, national code or international code.

**CAUTION**

➤ When the turbine air is turned off, the turbine will continue to operate or "coast down" for about two minutes. Provisions should be made to assure that the operator waits at least three minutes, after shutting off the turbine air and before shutting off the main air supply.

➤ The bell cup must be removed when making flow checks. If the paint is turned on when the bell cup is mounted and the turbine shaft is not rotating, paint will enter the shaft and possibly damage the air bearing. Material flow checks (flow rate verification) must be made with the bell cup off and the turbine not rotating. This is a special maintenance condition and not for normal operation. Normally pneumatic interlocks will not allow the paint to trigger on when the turbine air is off.

**WARNING**

➤ The high voltage and/or coating material must never be turned on unless the bell cup is mounted on the motor shaft and the turbine is rotating.

➤ Pneumatic input to the turbine air inlet must be controlled to prevent the turbine from exceeding the maximum rated speed of the configured atomizer. (See "Specifications" in the "Introduction" section.) This behavior is provided by the MicroPak 2e Atomizer Controller (See current *MicroPak 2e HV & Atomizer Controller* service manual).

➤ High voltage must never be turned on while cleaning solvent is being sprayed either through the applicator supply or the cup wash line. High voltage and both solvent triggers must be interlocked (direct charge only).

➤ **Never spray solvent with high voltage on.**

# MICROPAK GROUNDING THEORY

Electrical noise refers to stray electrical signals in the atmosphere at various signal strengths and frequencies that can affect the operation of electrical equipment. One of the best ways to prevent this is to shield the equipment and cables with a continuous ground envelope, such that any incident noise will be conducted to earth ground before it can affect the circuit conductors.

For conductors inside the MicroPak 2e Single Bell Controller, the grounded enclosure provides this envelope. For the low voltage cable that run from the controller to the atomizer or spray gun, a shielded cable has been used. The shield consists of an overall foiled shield in combination with an overall braided shield. This provides the most effective shielding, as the foil covers the “holes” in the braid, and the braid allows for practical 360° termination at both ends of the cable.

The AC input cord is not shielded, but instead is directed to an AC line filter as soon as it enters the cabinet. This filter filters out any noise that comes in on the AC line. For maximum noise immunity the AC line is connected to the filter as soon as possible after it enters the cabinet. Additional noise protection can be provided by running the AC input line to the controller in grounded conduit, which is the recommended method and is required by some codes.

For maximum noise protection any user supplied input/output (I/O) wiring should be made using shielded cable or conduit which is connected to earth ground in a continuous 360° fashion at both ends. The best way to do this is to use a conductive connector/fitting at each end of the cable/conduit that makes contact to the shield/conduit in a full 360° circle around the shield/conduit and makes contact to the grounded enclosure in the same fashion. Connecting the drain wire of a shield to a ground point on or in the cabinet (usually referred to as pigtailing) is not an effective method of shielding and can actually make things worse (see Figure 6).

A special cable grommet fitting has been provided for I/O connector P2 of the controller (see Figure 3). When the nut is tightened, the spring in the grommet compresses and makes 360° contact with the braid of the cable. This electrically connects the cable braid to ground via the connector housing and controller back panel.

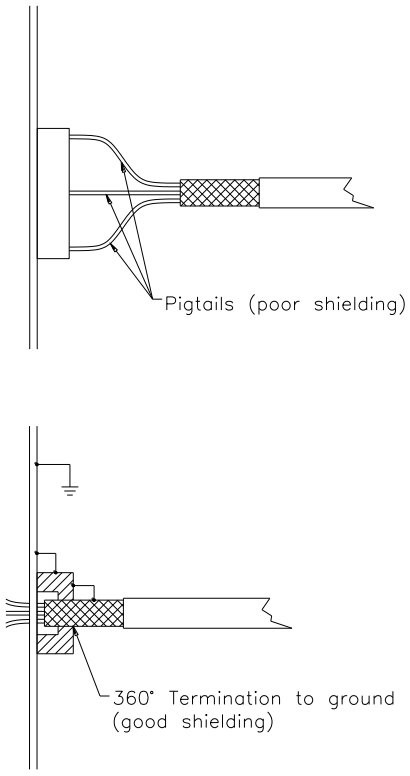



**Figure 8: Cable Connection Examples**

# NOTE REGARDING DIP SWITCHES

Unlike previous MicroPak controllers, the new MicroPak 2e does not use dipswitches to control hardware configuration. Configuring the system is now done entirely through configuration menus which are accessible through the front panel display and interface.

However, there is one set of “factory-only” dipswitches on each of the MicroPak 2e boards. These switches are used to set the internal board address and to configure a watchdog timer which aids in detecting software malfunctions. Therefore they are not to be changed by the user as they are reserved for factory use only.

N O T E S

# OPERATION

## OPERATING CONTROLS

### AC Power ON/OFF Switch

### (Figure 1)

Turns AC Power to the MicroPak 2e Single Bell Controller On or Off.

**N O T E**

➤ This switch is located on the rear of the controller.

### (Remaining Controls—Figure 9)

### MicroPak 2e ON/OFF Switch

The rocker switch at the left edge of the Front Panel is for power On/Off selection. The switch controls the application of 24V DC to the *MicroPak 2e HV Controller*.

### Local / Remote Switch

This is a two position toggle switch used to determine if the Local (Front Panel) controls are active or if the Remote EtherNet/IP controls are active. If the switch is up (Local Mode) the Front Panel controls can change parameters, enable or disable the high voltage, and clear faults. The Remote EtherNet/IP connection can look at parameters and values, but cannot change them or enable/disable the high voltage output. If the switch is down (Remote Mode) the opposite is true except that the Front Panel switch may be changed to local Mode at any time to disable the Remote Controls and to enable the Local Controls. Note that if the switch is set to Remote when power is applied, the unit will automatically switch to RUN mode after 3 seconds.

### HV On / Off Switch

This is a return-to-center momentary toggle switch. It is only active when the Local/Remote mode switch is set to Local. It is used to enable or disable the High Voltage output and also to clear system faults. When the System Checks and Current Status are OK, flipping the switch to the up position (HV On) will enable the high voltage output. Flipping it to the down position (HV Off) will disable the High Voltage Output. If there is a system fault, flipping this switch to the down position (also known as the Reset position) will reset (clear) any faults currently detected by the system.

### Atomizer On / Off Switch

This is a two position toggle switch. When in LOCAL mode, it enables or disables an attached atomizer (i.e. run or stop). When the controller is in REMOTE mode this switch is ignored.

### LED'S

### Power LED

The Green Power LED is located directly above the ON/OFF rocker switch, It is on whenever controller 24 VDC power is On.

### HV Fault LED

The red HV Fault LED is lit when the system detects a fault condition When operating in "Local Mode", it is cleared by flipping the HV On/Off switch to the OFF (Reset) position. If the system is still in a fault condition, it will immediately be lit as the system detects the fault.

### High Voltage LED

The green High Voltage LED displays the current state of the High Voltage Output. This LED is illuminated whenever High Voltage is being supplied.

### Atomizer Fault LED
The red Atomizer Fault LED is lit when the Atomizer subsystem detects a fault condition. This condition will be displayed on the Atomizer status screen.

### Atomizer LED
The green Atomizer LED is lit when the Atomizer controller commands the turbine to spin.

## BUTTONS

The seven buttons used to control the viewing and entry of information on the two 4 X 20 character displays are:

### HV/AT Button
The High Voltage/Atomizer Button (just below the right display) is used to toggle the active display between the “Atomizer” and “High Voltage” displays. Note that the active display always has a ■ (block character) in the lower right corner.

### Screen Button
The Screen Button (just below the right display) is used to change (toggle) to the next Menu screen in the currently selected display. The menu screens wrap around so that after the last screen it will return to the first screen.

### Up and Down Buttons
The buttons above and below the Set Button in the middle (the Up and Down Buttons) are used to move the selection indicator vertically to a value to be selected by the Set Button. When in a value entry menu, the Up and Down buttons are used to increase or decrease the value being entered.

### Set Button
This labeled button (in the middle) is used to select the value to change and to enter the change after it has been made.

### Left and Right Buttons
The buttons to the right and left of the Set Button (the Left and Right Buttons) are used to move the selection horizontally.

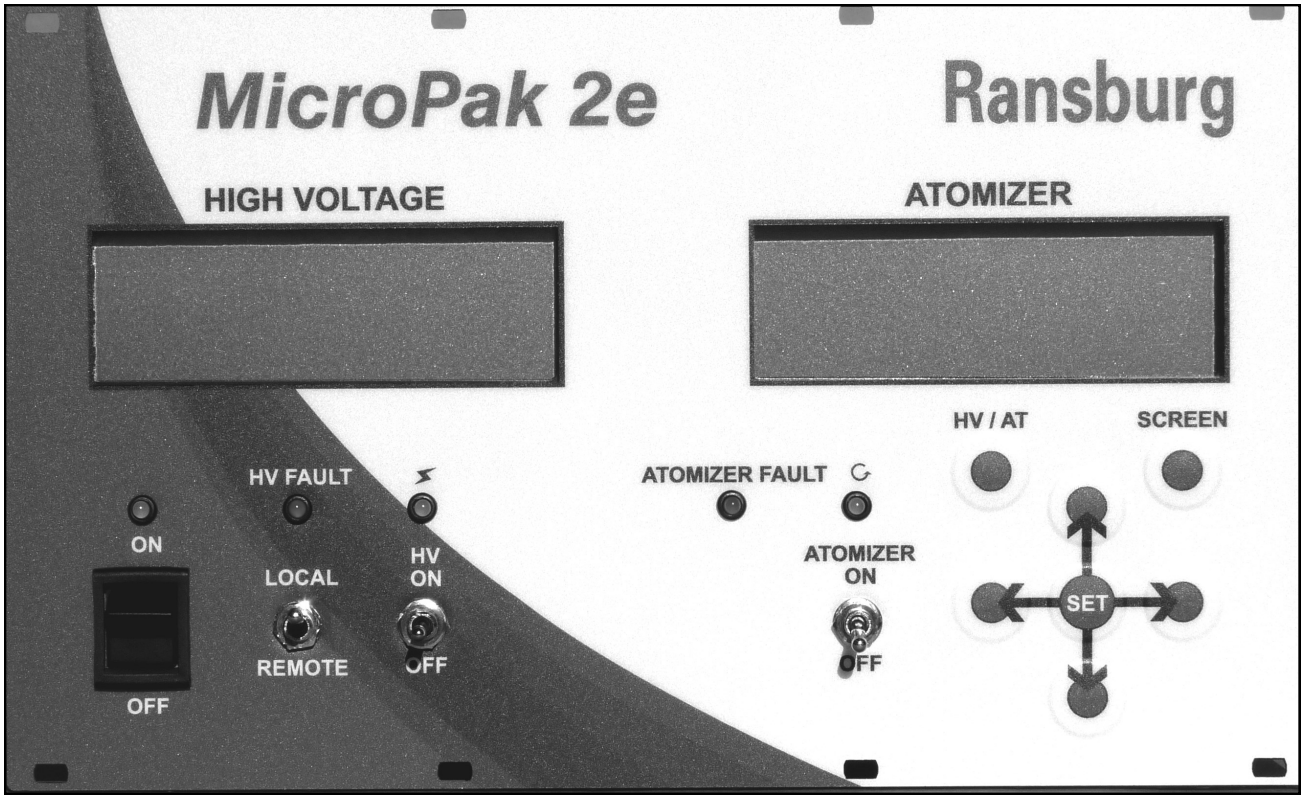



**Figure 9: Operator Interface**

# DISPLAYS

## (Figure 10 and 11)

As seen previously in Figure 9, there are two 4 X 20 character LCD displays located on the Front Panel. All modification of parameters and real-time display of feedback readings is done using them.

## HIGH VOLTAGE DISPLAY

The HIGH VOLTAGE display contains information directly related to the high voltage controller.

The default High Voltage display is shown in Figure 10 below. Line 1 of the display shows the current high voltage setpoint (KVSet) in kilo volts. The arrows which enclose the value (000) indicate that it may be changed. Line 2 of the display shows the current high voltage reading (KVAct) and microAmp reading (uAAct) from the cascade. Line 3 of the display shows the status of cascade feedback (CHecK) and communications (COMmunications) as both being OK. Line 4 of the display shows that high voltage (HV) is Off and controller STatuS (Sts) is STPD (Stopped, i.e. not active). Note at the end of line 4, there is a ■ (block character). This indicates the active display, that is the one the menu control buttons will act on.

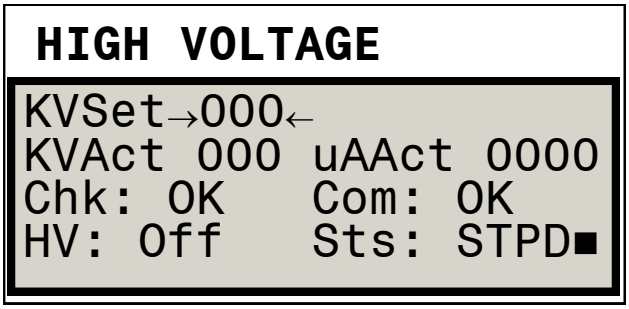



**Figure 10: High Voltage Run Menu Screen**

## ATOMIZER DISPLAY

The ATOMIZER display contains information directly related to the atomizer controller when one is included.

The default Atomizer display is shown in Figure 11 below. Line 1 of the display shows the configured atomizer type. Line 2 shows the turbine speed setpoint (KRPM-Sp) in thousands of RPMs, followed by current turbine speed reading (RPMAct) based on turbine feedback. Line 3 of the display shows that there are no atomizer faults. Line 4 of the display shows the current reading of the Bearing Air feedback pressure, in psi.

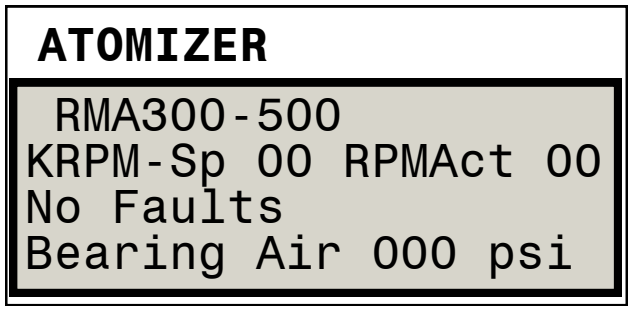



**Figure 11: Atomizer Run Menu Screen**

# MENU OPERATIONS

On all of the MicroPak 2e menus, if a parameter can be changed it will be proceeded by a blinking "→" and followed by a blinking "←" to show that it is a changeable value. If there is more than one changeable value on a screen, pressing the Up or Down and Left or Right Buttons will move the selection "→ ←"s to the next value. If there are no changeable values on a screen then the "Active Screen Indicator" in the lower right corner will blink. When the selection "→ ←"s surround the value you wish to change, press the Set Button. If the value to be changed requires a password, either the User, System or Config Password Menu will be displayed allowing you to enter the required password. After entering the Password, you are returned to the originally selected value. If the password was entered correctly, the value may now be changed. If the entry was incorrect, the password screen will again be displayed. Once a password has been successfully entered, it will remain active for a period of time that depends on the password type. It

then times out and must be re-entered to make further changes. During the active time, the block character indicating the active screen will alternate with the letters U, S or C corresponding to entry of the User, System or Config password. The activated time period for these password types decreases as the privilege level increases (U = 4, S = 3 and C = 2 minutes).

When a numeric value is being changed, a value change menu, similar to the one shown in Figure 12, will be displayed. In this menu the Left and Right Buttons allow the user to select from the two methods available to change a value.

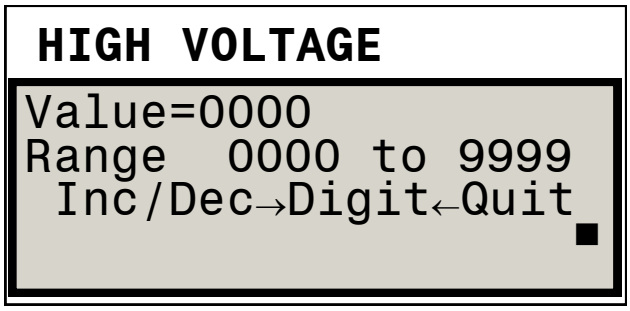



**Figure 12: Value Change Screen**

If the Inc/Dec method is selected, the user is shown the screen seen in Figure 13. In this mode, the Up and Down buttons (above and below the SET Button) can be used to incrementally change the value. The value will increase with the up button and decrease with the down button until it reaches the maximum or minimum allowed value.

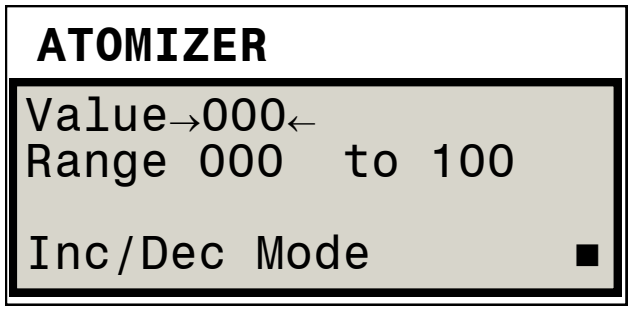



**Figure 13: Inc/Dec Change Mode Screen**

If the Digit method is selected, the user is shown the screen seen in Figure 14. This shows the current value to be modified, the low and high limits for the selected parameter and the digit mode options to change the current value. The "-" option allows the user to negate the current value displayed. The “Null” option causes the current value to be cleared allowing the user to begin entry of a new value. The ‘number’ option ("→0←") enables the Up and Down Buttons to select the next digit to be added to the value when the user presses the Set Button. The “Save” option saves any changes made in this screen and exits. And the “Quit” option cancels any changed made in the screen and exits.

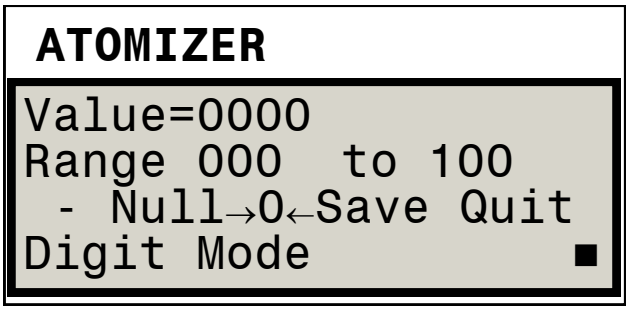



**Figure 14: Digit Mode Change Screen**

# ETHERNET/IP NETWORK SETUP

The EtherNet/IP interface of the MicroPak 2e Single Bell Controller is delivered with a default IP address of 192.168.0.3. If this address is not compatible with the users private control network, the controller address must be customized to reside on the users network. This is accomplished by first setting the IP address of the controller to an available address in the users network, then enabling the EtherNet/IP interface and finally saving the new configuration before cycling power.

To make these changes, the user must access the MicroPak 2e Configuration menus. This is done by setting the Remote/Local switch to Local and turning on AC power to the MicroPak 2e Single Bell Controller. This causes the

controller to boot-up and pause, waiting for the user to select either Run, Configuration or Diagnostics on the ATOMIZER display. Use the Up and Down Arrow pushbuttons to move the selection arrows to enclose → Configuration← and then pressing the SET pushbutton to enter Configuration Mode. Input focus then shifts to the HIGH VOLTAGE display where the user can use the Up and Down arrow and the SET pushbuttons to modify the IP address, enable the EtherNet/IP interface and save the new configuration.

Refer to the "MicroPak 2e HV & Atomizer Controller" manual, Ransburg number LN-9624-00 for further details.

# OPERATING PROCEDURES

**(See Figure 1 and 9 for Operating Controls)**

## Typical Local Mode

1. Ensure the AC power, safety ground, low voltage cable, and interlock connections are made. Ensure the pneumatic connections for supply air, turbine pilot, bearing air feedback and brake air (if used) are made. Also ensure that the fiber optic cable which provides bell speed feedback is installed. Refer to the "Installation" section of this manual for descriptions of the above connections.

2. Enable the main turbine air supply. Failure to do this will cause the Atomizer controller to detect a Bearing Air Fault, which will prevent all operation.

3. Set the Local/Remote switch to LOCAL.

4. Set the Atomizer On/Off switch to OFF.

5. Turn the AC Power ON/OFF switch (see Figure 1) to the ON position.

6. Turn the MicroPak 2e ON/OFF switch to the ON position. The HIGH VOLTAGE and ATOMIZER displays will become active along with the green MicroPak 2e Power Indicator located above the switch.

7. Press the Set Button to place the controller into RUN mode. The two display screens will now look like figures 10 and 11.

8. Ensure the over-current setpoint (Max uA Limit) is set above the maximum expected current, or an overload fault will occur. The over-current setpoint can be adjusted using the front panel operator interface described in the previous section titled *MENU OPERATIONS*.

9. Move the Atomizer On/Off Switch to the ON position. The green Atomizer On Indicator should be lit.

10. Adjust the bell speed setpoint (TurbnSpdSet) to the desired value.

11. Momentarily push the High Voltage On/Off Switch to the ON position. The green High Voltage On Indicator should turn on.

12. Using the front panel operator interface , adjust the KV Setpoint (KVSet) to the desired value.

13. To turn high voltage off, momentarily move the High Voltage On/Off Switch to the OFF position.

14. To turn the atomizer off, move the Atomizer On/Off Switch to the OFF position.

15. When finished spraying, turn the AC Power ON/OFF Switch (see Figure 1) to the OFF position to prolong the life of the internal fan.

## Typical Remote Mode

1. Ensure the AC power, safety ground, low voltage cable, interlock and Ethernet connections are made. Ensure the pneumatic connections for supply air, turbine pilot, bearing air feedback and brake pilot (if used) are made. Also ensure that the fiber optic cable which provides bell speed feedback is installed. Refer to the “Installation” section of this manual for descriptions of the above connections.

2. Enable the main turbine air supply. Failure to do this will cause the Atomizer controller to detect a Bearing Air Fault, which will prevent operation.

3. Set the Local/Remote switch to REMOTE.

4. Set the Atomizer On/Off switch to OFF.

5. Turn the AC Power ON/OFF switch (see Figure 1) to the ON position.

6. Turn the MicroPak 2e ON/OFF switch to the ON position. The HIGH VOLTAGE and ATOMIZER displays will become active along with the green MicroPak 2e Power Indicator located above the switch.

7. Ensure the remote controller (e.g. PLC) is able to establish EtherNet/IP communications with the MicroPak 2e Single Bell controller. The state of communications can easily be verified on the High Voltage Display Fault Screen. When a connection is active, the status line will display **“HVC EIP AT”**. When no connection is active the status line will display “**HVC eip AT”**. Notice that the case of “eip” is used to distinguish whether or not a connection exists.

   Since a description of using EtherNet/IP is beyond the scope of this manual, the user is directed to the “MicroPak 2e HV & Atomizer Controller” manual for further details, Ransburg number LN-9624-00.

8. From the remote controller, set an appropriate value for Max uA Limit based on the expected load and the cascade being used.

9. From the remote controller, set the desired bell speed and enable the atomizer.

10. From the remote controller, set the desired KV setpoint and enable high voltage.

11. Disable the high voltage from the remote controller.

12. Disable the Atomizer from the remote controller.

13. When finished spraying, turn the AC Power ON/OFF Switch (see Figure 1) to the OFF position to prolong the life of the internal fan.

# MAINTENANCE

## FAULT AND WARNING INFORMATION

The MicroPak 2e controller has been designed to detect a number of high voltage and speed related faults. These faults cause brief fault descriptions (14 characters or less) to be displayed on either the High Voltage or Atomizer display screen. If the reader requires further clarification regarding a particular fault they should refer to the "MicroPak 2e HV & Atomizer Controller" manual, Ransburg number LN-9624-00 for further details.

## TROUBLESHOOTING HIGH VOLTAGE

Following are some areas to investigate when high voltage faults occur:

- Dirty atomizer interior or exterior.
- Conductive solvent residue on atomizer assembly.
- Moisture inside or outside of atomizer body, causing continuity or partial continuity back to ground.
- Moisture inside or outside of air lines back to ground (high humidity).
- Loose connections or defective low voltage cable.
- Loose or defective ground connections.
- Dump lines not clean or dry leading back to ground.
- Target not grounded and causing arcing to ground.

## CABLE CONTINUITY TEST

When problems arise, the Cable Continuity Test can be performed to help determine whether the problem is with the MicroPak 2e HV controller or the cable and/or cascade assembly

**WARNING**

➤ Because this test involves access to the interior of the MicroPak 2e Single Bell controller cabinet, where hazardous voltages may be present, it should only be performed by qualified electronics technicians.

To conduct the test, perform the following:

1. Ensure that the controller is disconnected from the AC source.

2. Using the supplied cabinet key, unlock and open top panel of the controller cabinet (see Figure 15).

3. Disconnect connector J7 (see Figure 16) from the rear of the problem MicroPak 2e HV controller. Leave the other end of the Low Voltage Cable connected to the atomizer being used.

4. Using an ohmmeter, measure the resistance values between the wires of MicroPak connector J7. The readings should be as shown in Table 2. If any of the readings are significantly outside the values listed in Table 2, the low voltage cable and/or cascade should be checked for the cause of the problem. Otherwise, the cause of the problem is most likely the controller.

5. Reconnect connector J7 and close and relock the cover of the controller cabinet.

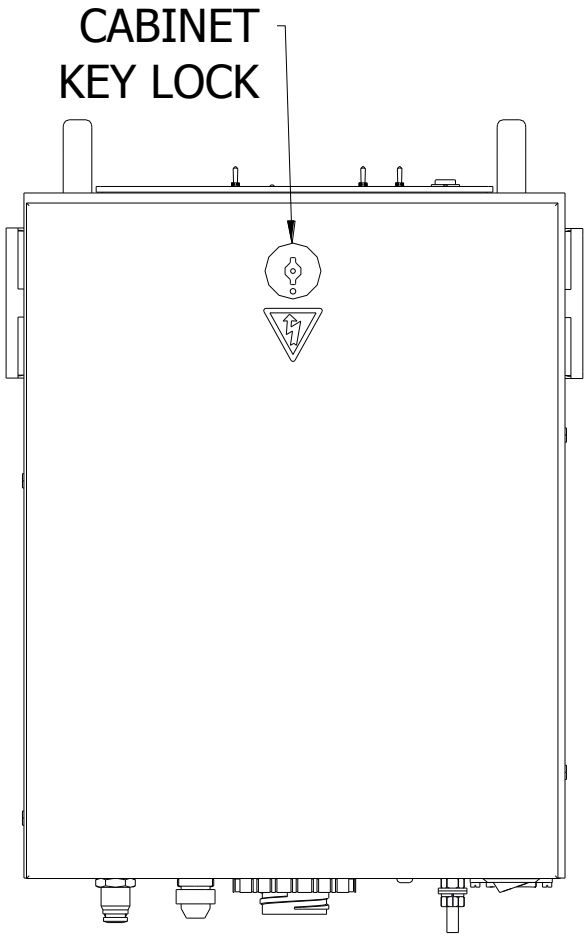



**Figure 15: Cabinet Top View**

# TROUBLESHOOTING SPEED CONTROL

During troubleshooting it is important to recognize the automatic shutdown modes and consider the circumstances which might cause them. Some common system problems which cause the MicroPak 2e Atomizer Controller to go to automatic shutdown are:

1. Bearing air supply pressure momentarily drops below the required threshold when the system air supply cannot maintain pressure during periods of high air consumption.

2. Paint or solvent contamination in the rotator causing blockage of the fiber optic speed feedback signal.

3. Damage to the fiber optic cable causing a reduced intensity of the speed feedback signal at the MicroPak 2e Atomizer Controller, i.e. reduced intensity from the fiber optic cable.

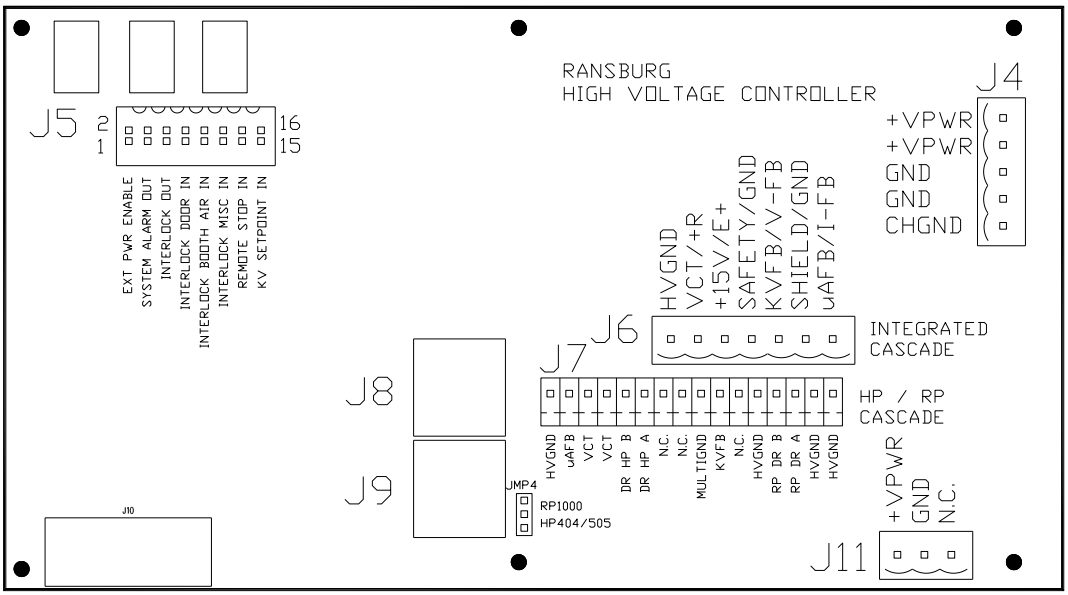



**Figure 16: MP2E Connector Locations**

# TROUBLESHOOTING GUIDE

**WARNING**

➤ The "Troubleshooting Guide" below requires measurement of potentials that can cause serious bodily injury if proper measuring procedures are not followed. For this reason, proper troubleshooting should ONLY be conducted by qualified electronics technicians using specific test equipment.

| General Problem | Possible Cause | Solution |
|---|---|---|
| **MicroPak Power Indicator and Meters do not light up when MicroPak 2e ON/OFF Switch is turned ON** | AC Power ON/OFF switch on rear of controller not turned ON. | Turn AC power ON/OFF switch ON. |
| | Improper input line voltage. | Ensure voltage across terminals 2 and 3 of CON1 (see Figure 17) of 24VDC power supply is between 90 and 264 VAC. |
| | Fuse of 24VDC power supply is defective. | Check fuse and replace if defective (see Figure 17). |
| | Defective 24VDC power supply. | Voltage across terminals 1 and 8 of connector CON2 (see Figure 17) of 24VDC power supply should be 24VDC. If not replace 24VDC power supply. |
| | Defective MicroPak 2e Control Unit. | If none of the suggestions above resolves the issue, replace the A13338 MicroPak 2e Control Unit. |
| **No or Low kV Output at Spray Gun when HV ON Indicator (green LED) is Lit** | High voltage is not set to proper value. | Set the high voltage setpoint using either the EtherNet/IP interface or the front panel operator interface. |
| | Local/remote switch in wrong position. | Put local/remote switch in proper position. |
| | Defective atomizer or low voltage cable. | Perform a Cable Continuity Test. If proper readings are not obtained, check cable or atomizer for cause (see current "Atomizer" Service Manual). |
| | Loose or broken wire in power supply. | Check all wiring connections for integrity. Repair wiring as needed. |

**(Continued On Next Page)**

# TROUBLESHOOTING GUIDE (Cont.)

| General Problem | Possible Cause | Solution |
|---|---|---|
| **No kV Output at Spray Gun and HV ON Indicator (green LED) is not Lit** | Local/remote switch in wrong position. | Put local/remote switch in proper position. |
| | Improper interlock connection. | Ensure enabled interlock connections have the (+) and (-) terminals connected together through a jumper or voltage free contact as detailed in the “Installation” section of this manual. |
| | High Voltage On input not activated. | Verify the controller operates as expected in local mode. Then review the programming of the EtherNet/IP “Originator” (i.e. PLC, Robot or PC) to locate a cause. |
| | Defective MicroPak 2e Control Unit. | If none of the suggestions above resolves the issue, replace the A13338 MicroPak 2e Control Unit. |
| **Power Supply Overloads Excessively** | Parts are too close to the atomizer. | Ensure sufficient distance between atomizer and parts. |
| | Overload setpoint set too sensitive. | Increase the Max uA Limit through either the EtherNet/IP interface or the front panel operator interface. |
| | Defective atomizer or cable. | Check all wiring connections for integrity. Repair wiring as needed. |
| | Defective MicroPak 2e Control Unit. | If none of the suggestions above resolves the issue, replace the A13338 MicroPak 2e Control Unit. |
| **Component not working, but kV Output OK** | Wiring to/from component loose or broken. | Repair loose or broken wire. |
| | Defective component. | Replace component. |

# TROUBLESHOOTING GUIDE (Cont.)

## Table 2. Ohm meter Measurements in Ohms from MicroPak 2e Connector J7 through the Low Voltage Cable to the HP404 Cascade.

| Signal | IFB | Vct | Vct | HP_DrB | HP_DrA | SigGnd | kVFB | VctRet |
|---|---|---|---|---|---|---|---|---|
| **From Wire** | 2 (white) | 3 (red) | 4 (black) | 5 (green) | 6 (blue) | 9 (grn/yel) | 10 (gray) | 16 (bare) |
| **To Wire** | | | | | | | | |
| 2 (white) | XX | open ckt. | open ckt | open ckt | open ckt | 19K - 21K | 400K-600K | open ckt |
| 3 (red) | | XX | 0 - 3 | 0 - 3 | 0 - 3 | open ckt | open ckt | open ckt * |
| 4 (black) | | | XX | 0 - 3 | 0 - 3 | open ckt | open ckt | open ckt * |
| 5 (green) | | | | XX | 0 - 3 | open ckt | open ckt | open ckt * |
| 6 (blue) | | | | | XX | open ckt | open ckt | open ckt * |
| 9 (grn/yel) | | | | | | XX | 400K-600K | open ckt |
| 10 (gray) | | | | | | | XX | open ckt |
| 16 (bare) | | | | | | | | XX |

*** - Meter reading may vary in the megohms range due to capacitance across pins.**

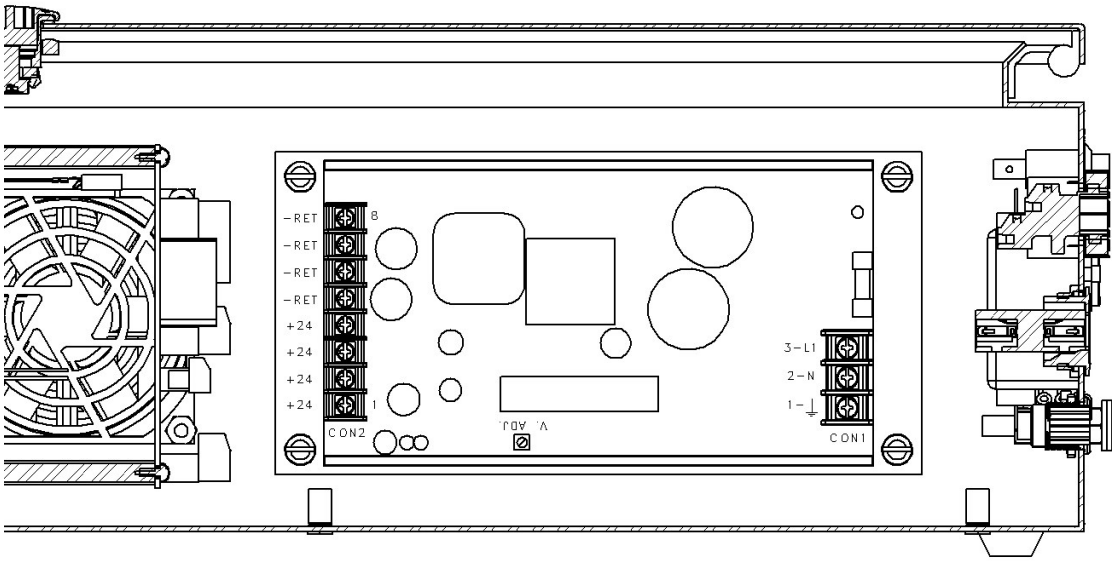



**Figure 17: View of CON1, CON2 and Fuse**

| MicroPak 2e High Voltage Controller - Parts List | |
|---|---|
| **Part #** | **Description** |
| A13338-XX XX XX | MicroPak 2e HV & Atomizer Controller<br>For replacement use, the user should order the same model (-XXXXXX) that was listed on the original invoice. |
| A13245-00 | MicroPak 2e High Voltage Controller PC Board—Atomizer Control |
| A13248-00 | MicroPak 2e Analog Output, 4-20mA add-on board |
| A11111-00 | Volume Booster, 1:1 |
| 78643-00 | E/P Transducer, High Speed, High Flow, DIN Rail Mount, 0-10V : 0-100PSI |
| A11485-00 | Pneumatic Solenoid, minimum 4mm bore, 0-120 PSI |
| A13596 | Pressure Transducer, 0-100 PSI : 0-10V |

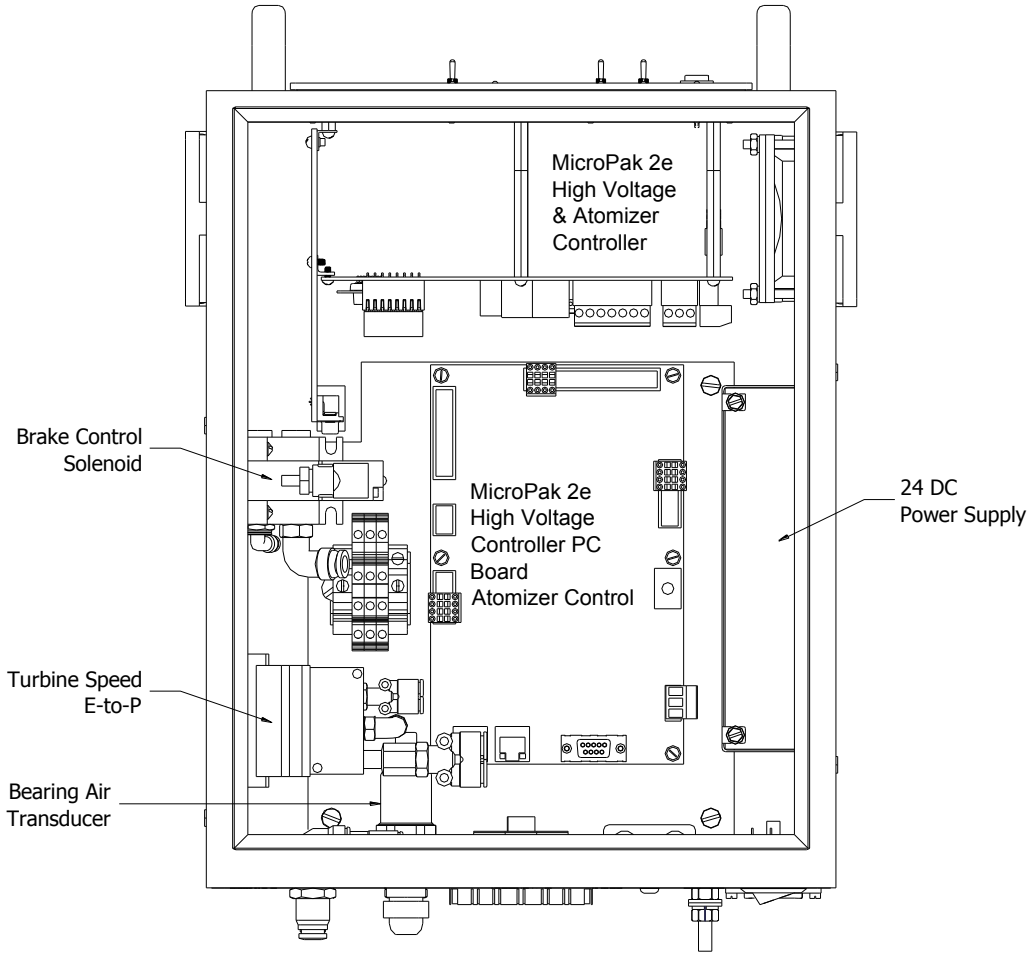



**Figure 18: Inside View A13613-00 and A13613—01**

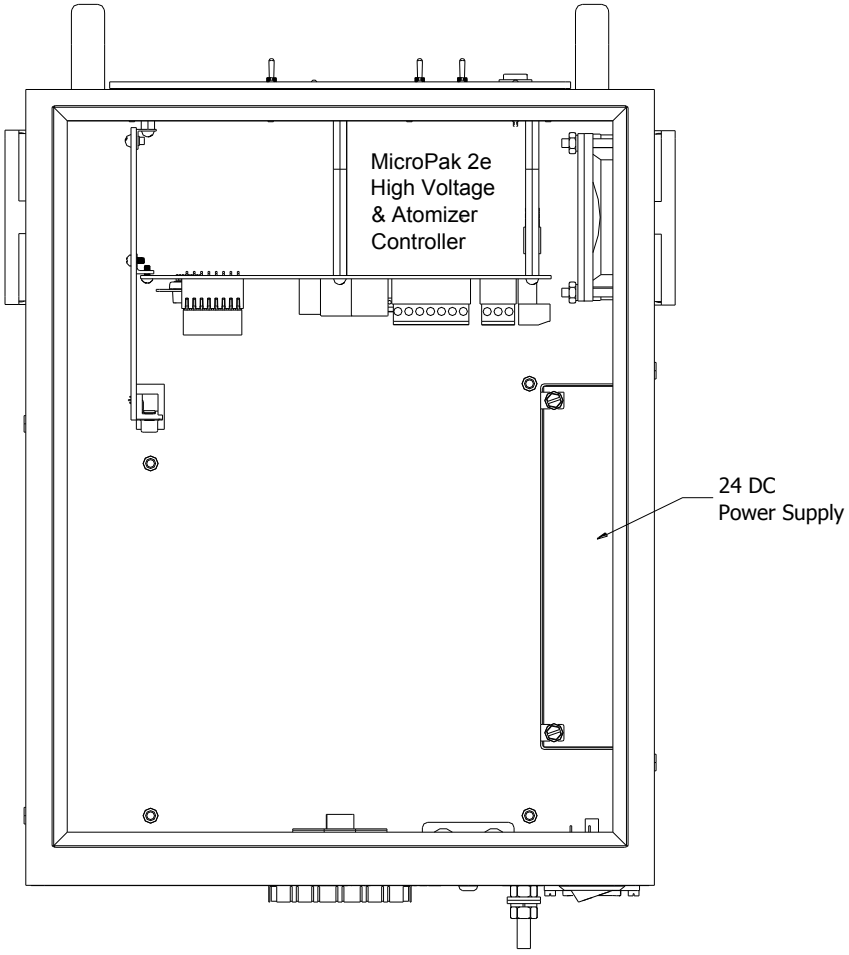



**Figure 19: Inside View A13613-02**

## NOTES

# WARRANTY POLICIES

## LIMITED WARRANTY

Ransburg will replace or repair without charge any part and/or equipment that falls within the specified time (see below) because of faulty workmanship or material, provided that the equipment has been used and maintained in accordance with Ransburg's written safety and operating instructions, and has been used under normal operating conditions. Normal wear items are excluded.

**THE USE OF OTHER THAN RANSBURG APPROVED PARTS, VOID ALL WARRANTIES.**

SPARE PARTS: One hundred and eighty (180) days from date of purchase, except for rebuilt parts (any part number ending in "R") for which the warranty period is ninety (90) days.

EQUIPMENT: When purchased as a complete unit, (i.e., guns, power supplies, control units, etc.), is one (1) year from date of purchase.

**WRAPPING THE APPLICATOR, ASSOCIATED VALVES AND TUBING, AND SUPPORTING HARDWARE IN PLASTIC, SHRINK -WRAP, OR ANY OTHER NON-APPROVED COVERING, WILL VOID THIS WARRANTY.**

**RANSBURG'S ONLY OBLIGATION UNDER THIS WARRANTY IS TO REPLACE PARTS THAT HAVE FAILED BECAUSE OF FAULTY WORKMANSHIP OR MATERIALS. THERE ARE NO IMPLIED WARRANTIES NOR WARRANTIES OF EITHER MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. RANSBURG ASSUMES NO LIABILITY FOR INJURY, DAMAGE TO PROPERTY OR FOR CONSEQUENTIAL DAMAGES FOR LOSS OF GOODWILL OR PRODUCTION OR INCOME, WHICH RESULT FROM USE OR MISUSE OF THE EQUIPMENT BY PURCHASER OR OTHERS.**

EXCLUSIONS:

If, in Ransburg's opinion the warranty item in question, or other items damaged by this part was improperly installed, operated or maintained, Ransburg will assume no responsibility for repair or replacement of the item or items. The purchaser, therefore will assume all responsibility for any cost of repair or replacement and service related costs if applicable.

# Ransburg

**Manufacturing**

1910 North Wayne Street

Angola, Indiana 46703-9100

Telephone: 260-665-8800

Fax: 260-665-8516

**Technical Service — Assistance**

320 Philips Ave.

Toledo, Ohio 43612-1493

Telephone (toll free): 800-233-3366

Fax: 419-470-2233

**Technical Support Representative will direct you to the appropriate telephone number for ordering Spare Parts.**

© 2014 Ransburg. All rights reserved.
Models and specifications subject to change without notice.

Form No. LN-9625-00
Litho in U.S.A.
03/14