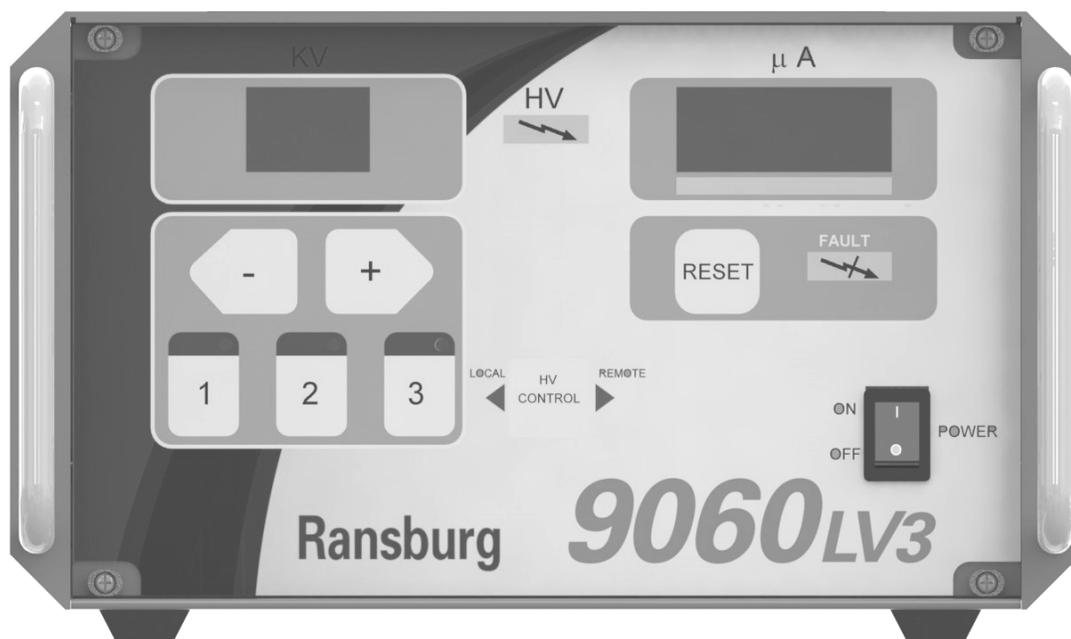


9060 CASCADE LOW VOLTAGE CONTROLLER (LV3 - Handguns)



MODEL: 80131-XXX

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.)

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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**, prior to installing, operating, and/or servicing this equipment.



WARNING

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

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Spray Area</p> 	<p>Fire Hazard</p> <p>Improper or inadequate operation and maintenance procedures will cause a fire hazard.</p> <p>Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent Controller shutdown indicates a problem in the system requiring correction.</p>	<p>Fire extinguishing equipment must be present in the spray area and tested periodically.</p> <p>Spray areas must be kept clean to prevent the accumulation of combustible residues.</p> <p>Smoking must never be allowed in the spray area.</p> <p>The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance.</p> <p>When using solvents for cleaning:</p> <p>Those used for equipment flushing should have flash points equal to or higher than those of the coating material.</p> <p>Those solvents used for cleaning must have a flash point at minimum of 5°C (9°F) greater than ambient temperature. It is the end users responsibility to ensure this condition is met.</p> <p>Spray booth ventilation must be kept at the rates required by NFPA-33, OSHA, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>Electrostatic arcing must be prevented.</p> <p>Test only in areas free of combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury.</p> <p>If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled.</p> <p>Never use equipment intended for use in waterborne installations to spray solvent based materials.</p> <p>The paint process and equipment should be set up and operated in accordance with NFPA-33, NEC, and European Health and Safety Norms.</p>

<p>AREA</p> <p>Tells where hazards may occur.</p>	<p>HAZARD</p> <p>Tells what the hazard is.</p>	<p>SAFEGUARDS</p> <p>Tells how to avoid the hazard.</p>
<p>Spray Area</p> 	<p>Fire and/or explosion.</p>	<p>Electrostatic arcing MUST be prevented.</p> <p>The 78789 control panel, LEPS5001 power supply and all other electrical equipment must be located outside Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33.</p> <p>Test only in areas free of flammable or combustible materials.</p> <p>The current overload sensitivity MUST be set as described in the OVERLOAD ADJUSTMENT Procedures section of this 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.</p> <p>Always turn the control panel off prior to flushing, cleaning, or working on spray system equipment.</p> <p>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 50176.</p> <p>Have fire extinguishing equipment readily available and tested periodically.</p>
<p>General Use and Maintenance</p> 	<p>Improper operation or maintenance may create a hazard.</p> <p>Personnel must be properly trained in the use of this equipment.</p>	<p>Personnel must be given training in accordance with the requirements of NFPA-33, EN 60079-0.</p> <p>Instructions and safety precautions must be read and understood prior to using this equipment.</p> <p>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.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Electrical Equipment</p> 	<p>High voltage equipment is utilized. Arcing in areas of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance.</p> <p>Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation.</p> <p>Frequent power supply shut-down indicates a problem in the system which requires correction.</p> <p>An electrical arc can ignite coating materials and cause a fire or explosion.</p>	<p>The power supply, optional remote control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas. Refer to NFPA-33 or EN 50176.</p> <p>Turn the power supply OFF before working on the equipment.</p> <p>Test only in areas free of flammable or combustible material.</p> <p>Testing may require high voltage to be on, but only as instructed.</p> <p>Production should never be done with the safety circuits disabled.</p> <p>Before turning the high voltage on, make sure no objects are within the sparking distance.</p>
<p>Toxic Substances</p> 	<p>Certain material may be harmful if inhaled, or if there is contact with the skin.</p>	<p>Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer.</p> <p>Adequate exhaust must be provided to keep the air free of accumulations of toxic materials.</p> <p>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.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Spray Area / High Voltage Equipment</p> 	<p>There is a high voltage device that can induce an electrical charge on ungrounded objects which is capable of igniting coating materials.</p> <p>Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion.</p>	<p>Parts being sprayed must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 megaohm. (Reference NFPA-33 or EN 50176)</p> <p>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.</p> <p>Any person working in the spray area must be grounded.</p> <p>Unless specifically approved for use in hazardous locations, the power supply and other electrical control equipment must not be used in Class 1, Division 1 or 2 locations or Class 1, Zone 0 for European Applications.</p>

NOTES

INTRODUCTION

GENERAL DESCRIPTION

The **Ransburg 9060 Cascade Low Voltage Controller** (80131-XXX) is used to provide high voltage for electrostatic application equipment. It uses a combination of proven high voltage generation technology and microprocessor-based control. It uses a variable voltage output to drive an external cascade that amplifies the voltage to a high kV level. It also uses current feedback information to maintain the desired set point. The processor circuitry provides the maximum in applicator transfer efficiency, while maintaining the maximum safety.

The 9060 Controller provides the selection and adjustment of set point values is performed from the controller front panel. The trigger of the HV is initiated by the airflow switch built into the controller which senses airflow triggered by a standard handgun.

SAFETY FEATURES

When used with the appropriate applicators and cascades, the Ransburg 9060 Cascade Low Voltage Controller provides maximized operational safety. The protections include detection of Ground Faults, Cable Faults, Feedback Signal Faults, Overvoltage, and Overcurrent. The microprocessor circuits provide a controlled output load curve, which limits the high voltage output to safe levels while monitoring control and feedback signals for unsafe conditions. Maximum operational safety is obtained when the correct applicator settings are used and when safe distances between the applicator and target are observed and followed. The maximum efficiency of the low voltage controller is based on load.

DISPLAYS

The front panel displays the high voltage set point as well as a reading of gun current output. The gun current is derived from feedback signals in the low voltage cable between the controller and the cascade.



Figure 1: 9060 Cascade Low Voltage Controller

The 9060 Low Voltage Controller (80131-XXX) is available as follows:

Part #:	Description
80131-21X	Vector R70AS Handgun
80131-31X	Vector R90AS Handgun
80131-41X	Vector AA90 Handgun
80131-51X	Vector R90AS Waterborne Handgun

SPECIFICATIONS

Environmental

Operating Temperature: 0°C to +40°C

Storage and Shipping Temperature: -40°C to +85°C

(Allow power supply to go to room temperature before use)

Humidity: 95% Non-Condensing

Physical

Height: 14.0 cm (5.5 inches)

Width: 21.6 cm (8.5 inches)

Depth: 19.1 cm (7.5 inches)

Weight: 3.4 kg (7.5 lbs.)

Electrical

Input Voltage: 100-240 VAC

Frequency: 50 or 60 Hz

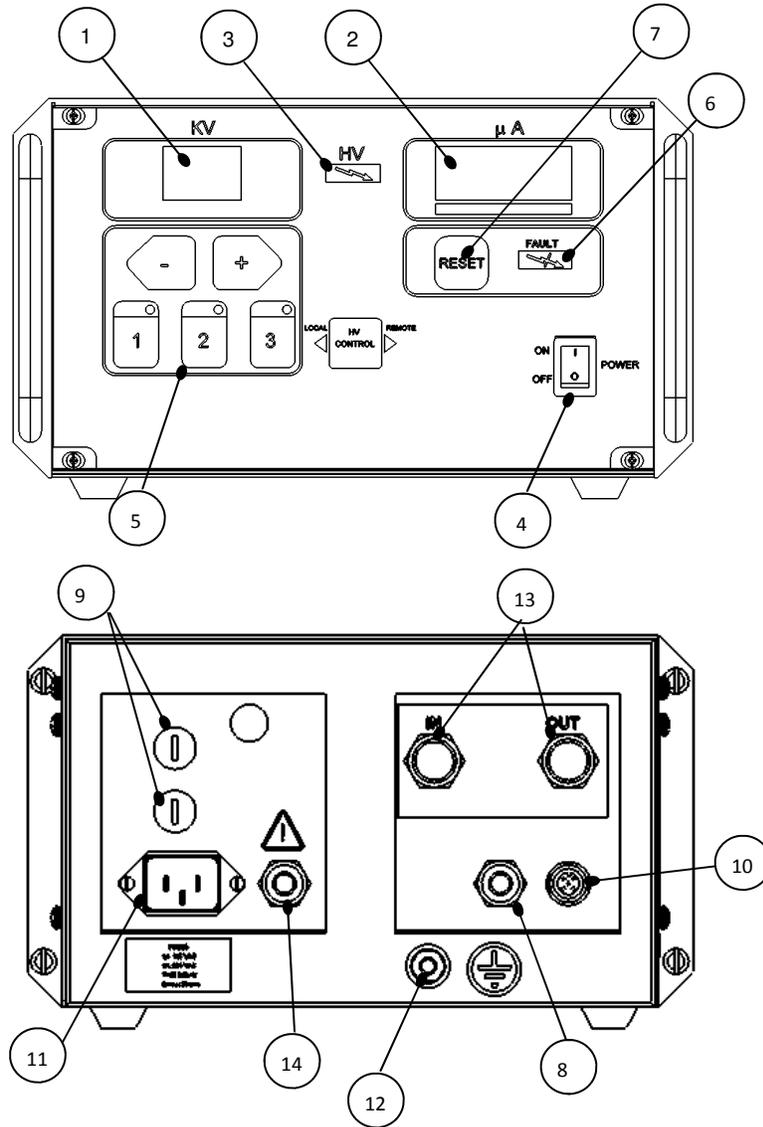
Current: 1 A max. RMS

Wattage: 40 watts (max.)

Output Voltage: 20-VDC (max.)

Output Current: 1A DC (max.)

Ground: Use known good earth ground



9060 CONTROLLER FEATURES			
No.	Description	No.	Description
1	Kilovolt Display	8	Standard I/O Connector
2	Micro Amp Display	9	Fuses
3	High Voltage On Indicator	10	Low Voltage Cable Connector
4	Unit ON — OFF Switch	11	AC Inlet Receptacle
5	Set Point Adjust Buttons	12	Ground Wire Assembly and Lug
6	Fault Indicator	13	Air Flow Switch Connector
7	Manual Reset Pad	14	Interlock I/O Connector

Figure 2: 9060 Cascade Low Voltage Controller Features

OPERATOR INTERFACE

The 9060 Controller shown in Figure 3, has a simple operator interface consisting of 7 LEDs (Light Emitting Diodes), one (1) power switch, seven (7) buttons, one (1) current LED bargraph, and two (2) screens containing seven-segment displays.

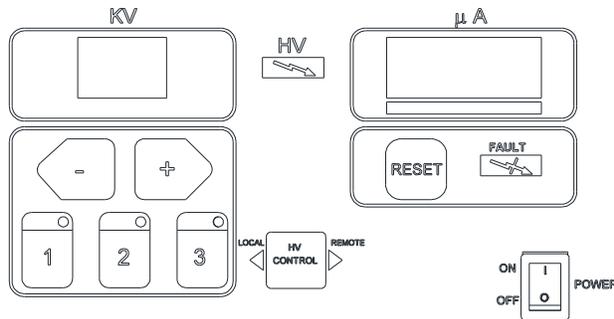


Figure 3: 9060 Operator Interface

SWITCHES

Power Switch

The 9060 Controller contains a single rocker switch for power On/Off selection. When the unit is powered on, the screens should be lit and display the gun display type information and the software version number for a short period of time.

LEDs

High Voltage On Indicator

The red High Voltage On Indicator is lit when a trigger signal has been received by the unit and the high voltage output from the cascade has been enabled.

Fault Indicator

The red Fault Indicator is lit when a fault occurs as determined by the microprocessor. When a fault occurs the light will turn on and the identification code (ID) for the fault will be displayed, blinking, on the μA meter display. For more information on the faults and fault ID codes, please refer the Fault Descriptions section in the Operations portion of this manual.

Local Mode LED Indicator

The local mode LED indicator is a left pointing triangle and is located on the left side the HV

control button on the center of the operator interface. This LED is lit when the Controller is in local mode.

Remote Mode LED Indicator

The remote mode LED indicator should **NOT** be lit for handgun units.

Active Preset LED Indicators (3)

The active preset LED indicators are located directly above each of the Preset Buttons. When a preset button is pushed to select the desired preset, in READY mode, the preset LED indicator directly above the button pressed will light up. Only one (1) preset light should be lit at any one time.

BUTTONS

The seven buttons on the operator interface are used to select the KV presets, reset overloads and faults, access other modes and to navigate as well as modify information that is displayed on the two seven-segment display screens (μA and kV).

The following lists the standard operating mode behavior for each button.

Preset 1 Button

The Preset 1 Button (to the left below the kV display) is used by itself to select "Voltage Preset 1" in the normal operating mode. If pressed with the reset button, at the same time, the screen will display the resettable High Voltage ON operating hours for 3 seconds on the display screens.

Preset 2 Button

The Preset 2 Button (in the center below the kV display) is used by itself to select "Voltage Preset 2" in the normal operating mode. If pressed with the reset button, at the same time, the screen will display the non-resettable High Voltage ON operating hours for 3 seconds on the display screens.

Preset 3 Button

The Preset 3 Button (to the right below the kV display) is used by itself to select "Voltage Preset 3" in the normal operating mode. If pressed with the reset button, at the same time, the system will enter the general diagnostic mode.

Left (-)/Right (+) Buttons

The left(-)/right(+) buttons in the normal operating mode are used to modify, decrease and increase respectively, the currently selected preset value. If the button is pressed and released, the preset value is changed by 1 kV at a time. If the button is held for over a 1/2 second, the value will begin changing by 5 kV increments.

Reset Button

The reset button is used in the normal operating mode to clear fault or overload conditions. This will **NOT** prevent any other active fault conditions from triggering a new fault.

HV Control Button

This button, shown in the center of Figure 3, is not functional for handgun units.

CONNECTION INTERFACE

The 9060 Controller connection interface shown in Figure 4, provides all of the required connections for setting up a local controlled painting system. This connection interface consists of one (1) low voltage cable connector, one (1) standard I/O connector, one (1) interlock I/O connector, one (1) ground lug connection, one (1) air flow switch connection, two (2) fuses, and one (1) AC inlet receptacle.

CONNECTORS

Low Voltage Cable Connector

The low voltage cable connector is located on the far lower right of the connection interface. This connector is designed for use with standard low voltage cable 76298. The low voltage cable connects the 9060 controller to the external cascade .

Standard I/O Connector

The standard I/O connector is located just left of the high voltage cable connector. This connector is provided as the entry point for a shielded multi-conductor cable used for remote I/O signals and includes the required cable grommet hardware to keep the cable in place with minimal strain. This connector is **NOT** used for

handgun units.

Interlock I/O Connector

The interlock I/O connector is located just to the right of the AC inlet receptacle. This connector is provided as the entry point for interlock signal wiring for the booth fan, conveyor, and solvent supply. The connector includes the required cable grommet hardware to keep wiring in place with minimal strain. For more information on the interlock connections, please see the "Installation" section of the service manual.

Ground Lug Connection

The ground lug connection is located below the standard I/O and has a ground logo sticker to the right of it. This lug is provided as an external ground connection point used to ground the 9060 to an earth ground via a ground cable. This ground lug connection can also be used as the ground point for the high voltage cable ground.

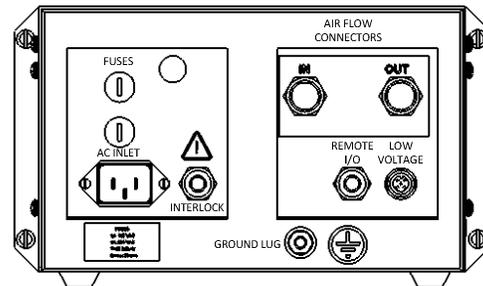


Figure 4: 9060 Connection Interface

Air Flow Switch Connection

The air flow switch connection is installed to provide a pneumatic trigger signal for handguns indicating that the trigger has been actuated. This signal is used to turn on the High Voltage output. Both threaded connectors of the air flow switch will come covered with red protected caps.

AC Inlet Receptacle

The AC inlet receptacle is a standard IEC C14 Appliance Inlet connector with a maximum rating of 250 VAC. It can handle both 110VAC and 240 VAC inputs at 50 or 60 Hz. The unit is shipped with the appropriate rated AC cord for the particular installation.

FUSES

Fuses

There are two (2) time delay fuses (250V, 1A, 5mm x 20mm) installed in fuse holders on the connection interface. They are located directly above the ground lug connection. They are present to provide a measure of safety against power surges through the AC input. The top fuse holder is connected in series between the HOT line (L) input connection and the Interlock AC line connection terminal 1TB-L2. The bottom fuse holder is connected in series between the neutral AC input connection and the neutral input connection of the AC line power filter.

SIGNAL INTERFACE

The 9060 controller local mode is used for handguns, or very simple automatic gun systems. Handguns require only one signal input for operation, the trigger signal. Though not necessary for operation, there are also two (2) output relay contact signals, HV on and Fault, that can be useful for triggering remote devices such as lights or other safety indicators. The physical signal interface is provided via the terminal block 2TB and the connector J3 on the PC Mainboard.

Trigger Signal

The trigger signal input (J3-5) for handgun units comes **preconfigured** as a sinking signal input wired directly to the air flow switch. Please refer to the "Installation" section of this service manual for more information.

High Voltage On (Relay Output, Dry Contact)

The "HV on" signal (2TB-2) is a relay controlled signal, can be configured as either an AC or DC signal using the Relay Common Input as the signal source. For information regarding the relay contact voltage ratings, please refer to the "Relay Output Contacts" portion of the "Installation" section of the manual. This relay signal is activated when the High Voltage cascade is turned on.

Fault (Relay Output, Dry Contact)

The "Fault" signal (2TB-4) is a relay controlled

signal, can be configured as either an AC or DC signal using the Relay Common Input as the signal source. For information regarding the relay contact voltage ratings, please refer to the "Relay Output Contacts" portion of the "Installation" section of the manual. This relay signal is activated when a Fault Condition or Overload Condition has faulted the 9060 Controller.

Relay Common Input

The relay common input (2TB-3) is a shared connection between the Fault and HV on relay outputs. This is the source of their output voltage. It can be wired to either an AC or DC signal. It is most commonly connected to the 24 VDC power provided at (2TB-1). This allows the relays to output 24 VDC signals without the use of any outside power sources.

INSTALLATION

GENERAL INFORMATION

The following section contains general information on the installation of the 9060 Cascade Low Voltage Controller.



WARNING

- ▶ The 9060 Controller **MUST** be located outside of the hazardous area.
- ▶ The User **MUST** read and be familiar with the “Safety” section of this manual.
- ▶ 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 requirements of operating and servicing safely are followed. The user should be aware of and adhere to ALL local building and fire codes and ordinances as well as NFPA-33, OSHA, and all related country safety codes prior to installing, operating, and/or servicing this equipment.
- ▶ Only approved applicators should be used with the 9060 Cascade Low Voltage Controller.

NOTE

- ▶ As each installation is unique, this information is intended to provide general installation information for the 9060 Controller. Consult your authorized Ransburg distributor for specific directions pertaining to the installation of your equipment.

LOCATION OF THE 9060

Install the Controller in an area **outside the hazardous location** in accordance with federal, state, and local codes. The area should protect the Controller from the possibility of environmental intrusion (such as dust or moisture), have ambient temperatures that do not exceed 40°C, and be as close to the applicator as possible to minimize the length of the high voltage cable.



CAUTION

- ▶ **DO NOT** locate the Controller near or adjacent to heat producing equipment such as ovens, high wattage lamps, etc.

The Controller may be free standing on any flat surface.

ELECTRICAL NOISE

Electrical noise refers to stray electrical signals in the atmosphere at various signal strengths and frequencies that can affect the operation of equipment. One of the best ways to prevent this is to shield the equipment and cables within 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 control unit or Controller, the grounded enclosures provide this envelope. For the cables that connect the applicator to the control unit or Controller, a shielded cable has been used. The shield consists of an overall foil 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 is directed to an AC line filter as soon as it enters the cabinet. This method filters out most of the noise that comes in on the AC line. For maximum noise immunity, if the AC line is wired using conduit instead of the provided AC line cord, it should connect to the filter as soon as it enters the cabinet with as short of leads as possible. Additional noise protection can be provided by running the AC input line to the control panel in grounded conduit.

For maximum noise protection any user supply 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 connector (conduit fitting) at each end of the cable (conduit) that makes contact to the shield (conduit) in a full 360° circle around the cable (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 pigtailling) is not an effective method of shielding and actually makes things worse (see Figure 5).

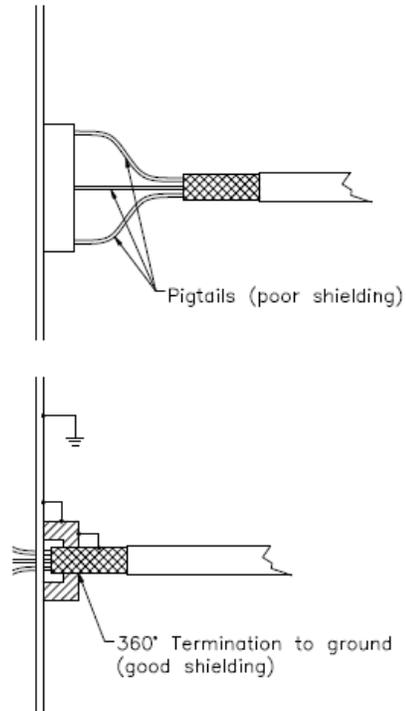


Figure 5: Pigtailling Connection

It is recommended that all AC I/O (interlocks) be run in conduit. If desired and codes permit, cabling may be used for these signals, but for maximum noise immunity the cabling must contain overall foil and braided shields and be terminated as described in the preceding paragraph.

Cable is recommended for all of the analog and digital remote I/O control signals including the relay controlled DC I/O (high voltage output signal, fault output signal). Again, for maximum noise immunity the cabling must contain overall foil and braided shields and be terminated in a continuous 360° manner as described in the preceding paragraph. Special fittings have been provided on the control panel for termination of these cables at that point. The use of these fittings is described in the corresponding sections of this manual.

Using the methods previously described, the 9060 Controller have been successfully tested to the stringent standards of the Electromagnetic Compatibility Directive of the European Union. The results conclude that these units are neither a source of electrical noise nor

affected by electrical noise when the above methods are utilized.

I/O CONNECTIONS

For maximum noise immunity, I/O wiring should be run in conduit or 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 to cabinet connection points. To make I/O connections using shielded cable, perform the following:

1. Remove the cable grommet hardware from the desired I/O connector housing (See Figure 6).
2. Route the desired length of I/O cable through the connector housing and mark 1" span of cable that passes through the connector housing to be stripped to braid (See Figure 7).
3. Remove cable and strip marked 1" section to cable braid.
4. Slide the cable grommet hardware onto the cable in the order shown in Figure 7.
5. Route the cable back through the connector housing and connect its wires to the desired I/O terminals inside the 9060 Controller.
6. Tighten the cable grommet ensuring the grommet spring makes 360° contact with the exposed braid of the cable, for maximum noise immunity.
7. For maximum noise immunity, connect the braid of the cable to earth ground at the end opposite the Controller.

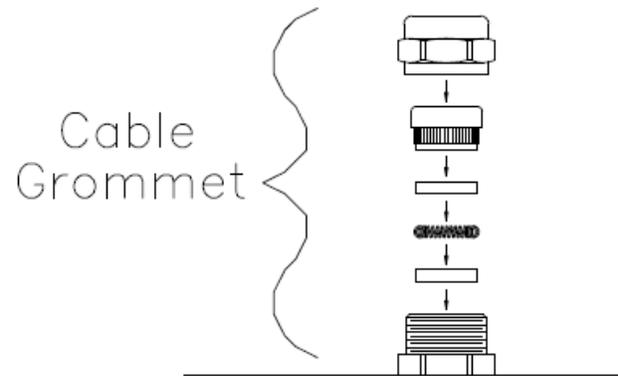


Figure 6: Cable Grommet

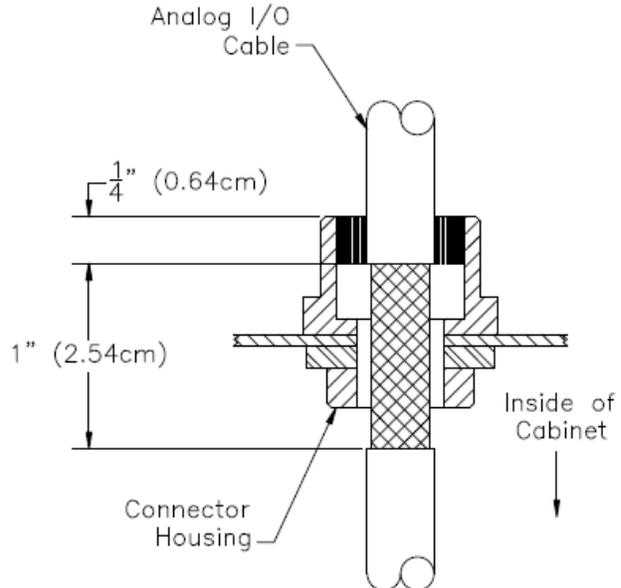


Figure 7: I/O Cable Stripping

AC INPUT CONNECTIONS

For non-conduit installations, plug the detachable AC line cord into the receptacle on the side of the 9060 Controller. Plug the other end of the line cord into a properly grounded 120 volt AC outlet.

NOTE

➤ In general, conduit must be used for approved AC installation, however, if national and local codes permit, the AC power may be supplied via the factory supplied line cord. If conduit is utilized, the Controller AC input wiring may be routed through an optional explosion proof switch mounted on or near the spray booth where it will be convenient to the operator.

For installations where it is required to run the AC input wiring in conduit, perform the following:

1. **Ensure the AC line cord is unplugged** and remove the AC inlet receptacle wiring from 1TB-N, 1TB-L1 and 1TB-EARTH GROUND (See Figures 8 and 9).
2. Remove the mounting hardware from the AC inlet receptacle and remove it from the side of Controller.
3. Install the Conduit Adapter Plate (supplied) in the hole where the AC inlet receptacle was removed (see Figure 10).
4. Install the AC input wiring (0.8mm² (18AWG) minimum) through the Conduit Adapter Plate using conduit and wire to TB1 as follows:

Hot/Line	to 1TB-L1
Neutral/Common	to 1TB-N
Ground	to 1TB-EARTH GROUND

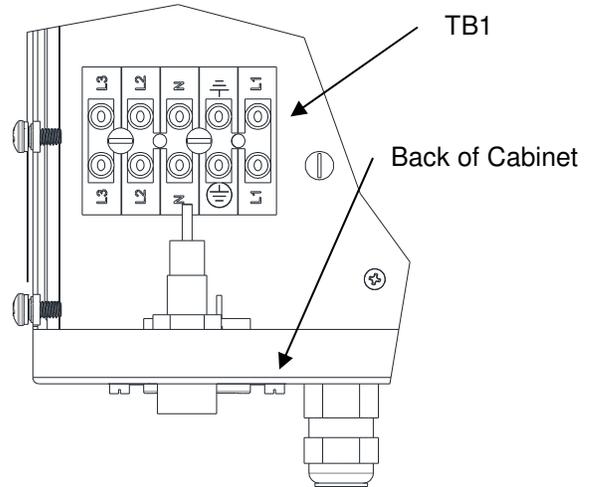


Figure 8: Location of TB1 in Controller

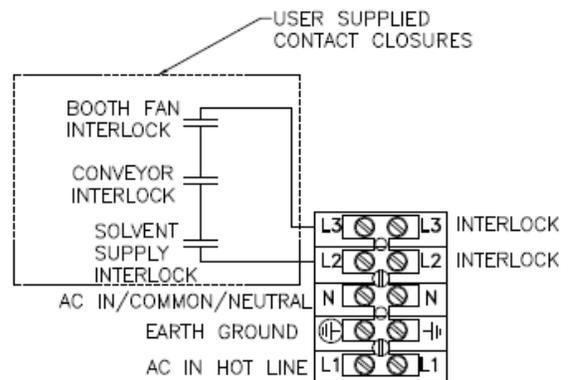


Figure 9: TB1 Interlock Wiring

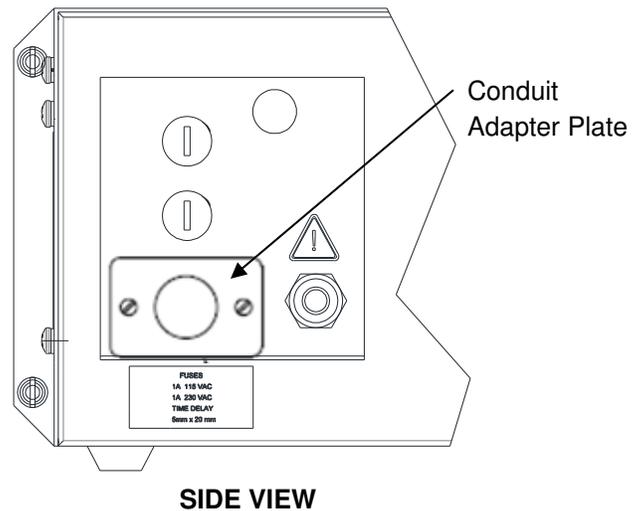


Figure 10: Installation of Conduit Adapter Plate

SAFETY GROUND

Crimp the appropriate connector onto the ground wire assembly and install from the Controller ground stud, located on the side panel, to a true earth ground.



CAUTION

► The ground wire assembly **MUST** be connected from the Controller ground stud to a true earth ground.

INPUT VOLTAGE SELECTION

The 9060 Controller accepts universal input voltage between 100 and 240 VAC at 50 or 60 Hz. There is no need to change any switch settings when changing input from 110 to 240 VAC or from 240 to 110 VAC.

NOTE

► **All 9060 units** (80131-XXX) shipped from the factory for either 110 VAC input or 240 VAC input will have a 72771-06, 1 Amp front panel fuses installed.

INTERLOCKS

Interlocks required by code are as follows:

- Booth Fan Interlock - When the booth fan is on, a contact closure is made.
- Conveyor Interlock - When the conveyor is moving, a contact closure is made.
- Solvent Interlock - When solvent supply to the applicator is off, a contact closure is made.



WARNING

► Failure to connect interlocks could result in a fire or explosion.



WARNING

► **ALWAYS** ensure that high voltage is **OFF** before flushing the spray applicator with solvent. **NEVER** flush the spray applicator with high voltage **ON**, as this is a severe fire hazard and risk to personnel safety. It is recommended that the high voltage control be interlocked with the solvent flush signal so that high voltage is automatically locked out whenever flushing occurs. Consult your authorized Ransburg representative for information on interlocking the high voltage **OFF** signal with the solvent flush signal.

As outlined in NFPA-33, OSHA, and EN 50176, the AC power line must be series interlocked with both the exhaust fan and conveyor.

To install the Controller interlocks perform the following:

1. Turn the 9060 Controller off, disconnect it from its AC source, and remove the fuses.



WARNING

► **ALWAYS** double check that the Controller is **unplugged from its AC outlet** before working with any internal wiring.

3. Using a small blade screwdriver, remove the factory installed test jumper from 1TB-L2 to 1TB-L3.
4. Using a shielded cable for the interlock wiring (supplied by user), route through the interlock connector on the side of the 9060 Controller and terminate 1TB-L2 and 1TB-L3 as shown in Figure 11. The shielded cable must have a minimum rating of 300V

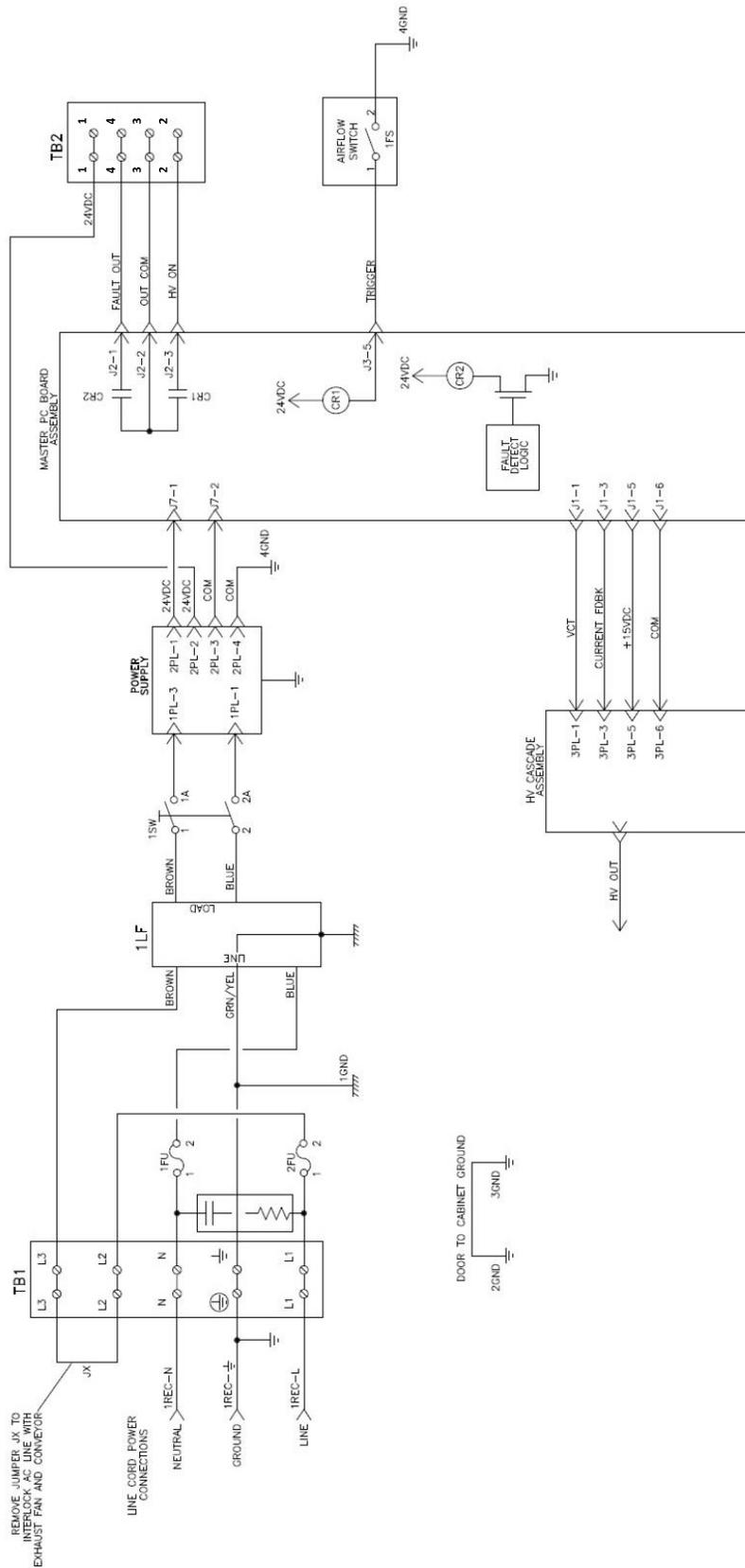


Figure 11: Controller Schematic

and 105°C and its conductors should be 0.8mm² (18 AWG) minimum. Secure the cable to the interlock connector as described in “I/O Connections” in the “Installation” section of this manual so that the shield of the cable is connected to the chassis of the enclosure.

- Replace the top cover, secure the screws, replace the fuses, and reconnect the AC source.

NOTE

► Some codes may require the interlock wiring to be run in conduit. In this case, shielded cable is not necessary, but the conductors used should still meet the rating specified above.

NOTE

► The interlock contacts (supplied by user) should be rated for at least 1 amp at 240 VAC.

NOTE

► The total resistance of the series interlocks between L2 and L3 should be less than 300 Ω.

LOW VOLTAGE CABLE

Insert the connection control unit end of the low voltage cable into the controller. Make sure that the male notch on the low voltage cable lines up with the female notch on the controller, push in (by hand) as far as it will go, then tighten the nut. Use the same procedure to connect the low voltage cable to an external cascade unit. Refer to Figure 12.



WARNING

► The Controller **MUST** be **OFF** when the applicator is removed or reinstalled.

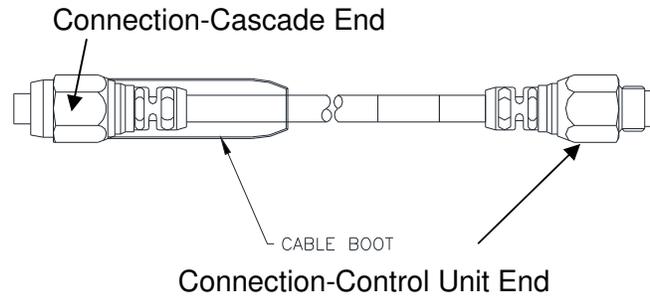


Figure 12: Low Voltage Cable

RELAY CONTACT OUTPUTS

A set of relay contacts for high voltage (CR1) and fault (CR2) conditions is provided at 2TB-2 and 2TB-4 (See Figure 8). One end of these relay contacts are connected together and also connected to a source input terminal 2TB-3 (See Figure 11). When a source voltage is present at 2TB-1 and either the high voltage is on or a fault condition occurs, the source voltage will become available at the output end of the corresponding contact. Maximum contact ratings are as follows:

MAXIMUM CONTACT RATINGS

Description	DC	AC
Max. Switching Capacity	60W	62.5VA
Max. Operating Voltage	125VDC	125VAC
Max. Operating Current	2A	2A

When wiring to 2TB, use a shielded cable and route the wiring through the standard I/O connector as described in the “I/O Connectors” section of this manual.

NOTE

► An internal 24 VDC source voltage is available at 2TB-1. Using a jumper wire, this voltage may be connected to 2TB-3 to be used as the source voltage for the relay contact outputs. In this case, the total current sourced should not exceed 1 amp.

HANDGUN TRIGGER SIGNAL

Handguns use a flow switch (13742-01 or 13742-02) to provide the trigger signal. One of the listed flow switches is mounted inside the 9060 Controller chassis via the Air Flow Switch Connector on the side panel. When the handgun trigger is pressed and flow starts, the flow switch is activated and triggers the high voltage.

For reference, when replacing a flow switch, perform the following:

1. **Turn the 9060 Controller off, disconnect it from its AC source, and remove the fuses.**
2. Unscrew the front four (4) screws and slide the cover off.

! WARNING

▶ **ALWAYS** double check that the Controller is **unplugged from its AC outlet** before working with any internal wiring.

3. The flow switch should have the ground (green) lead connected to the ground screw on the base plate shown in Figure 13. The trigger signal (blue) lead should be connected to the trigger signal input on the J3-5 plug header that is connected to the PC board.
4. Verify that J5, shown on Figure 14, has the shunt covering pins 1 and 2.
5. Replace the top cover, secure the screws, replace the fuses, and reconnect the AC source.

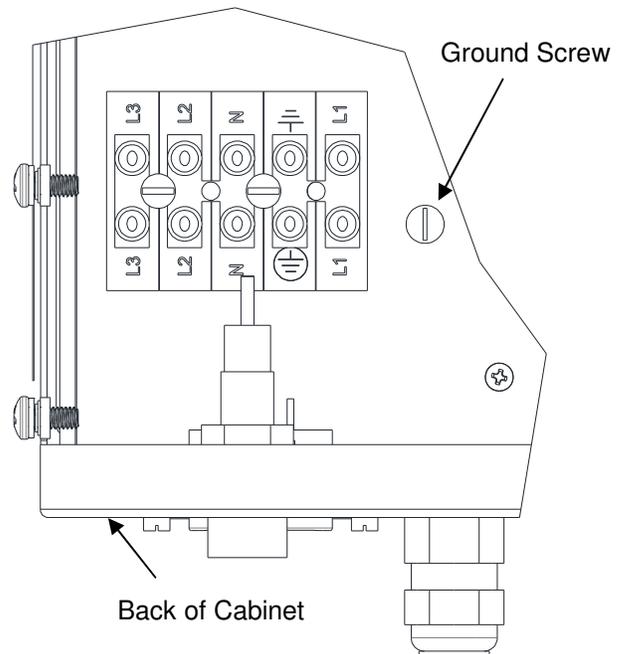


Figure 13: Ground Screw on Base Plate

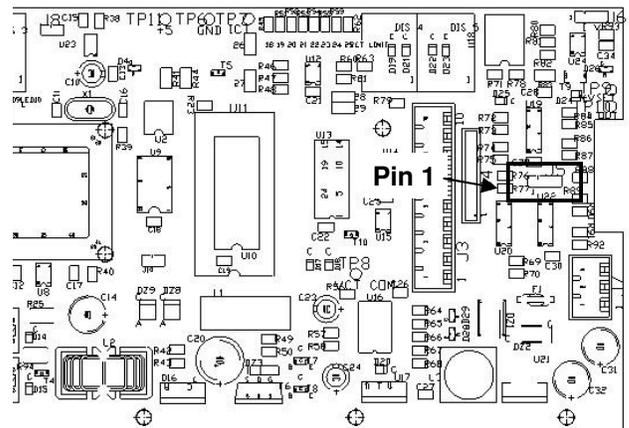


Figure 14: PC Mainboard Jumper J5 Location

OPERATION

START-UP

After all installation procedures are completed, operation of the applicator may begin. When the ON-OFF switch is turned on, the kV display will show the applicator configuration the 9060 Controller is configured for and the μA (microamp) display will show the current software revision level as shown in Figure 15. These items are displayed for approximately 10 seconds.

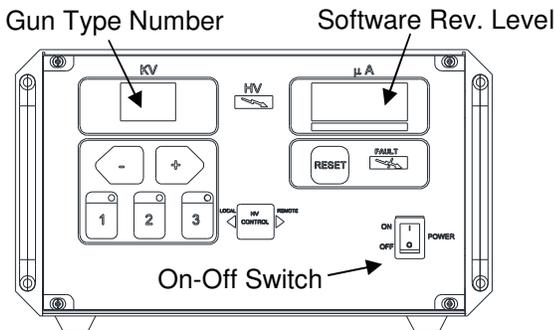


Figure 15: Controller Start-Up Display

The controller comes preconfigured for its corresponding handgun from the factory. The following table lists the applicator types shown on the display as per the current revision of this manual and is a **reference** to verify that the gun configuration jumpers are in their correct positions if unexpected behavior is observed.

START-UP DISPLAY		
Type	Unit (Gun)	Jumpers
65	80131-21X (79501)	10,12
85	80131-31X (79500)	10
85	80131-41X (79580)	None
85	80131-51X (79523)	10

After the initial start-up delay, the unit will be configured for the applicator based on the gun type jumper settings and is ready for standard operation.

! WARNING

- **DO NOT** adjust the gun configuration jumpers, if they are incorrect contact your Ransburg representative.
- **USE ONLY** the gun type configuration for the specific applicator being used. Using the wrong configuration may allow for operation outside the recommended parameters and values for the applicator and can result in **damage** or **un-safe operation**.

NOTE

- During start-up, the gun trigger input should **NOT** be active. An active trigger signal will cause a non-resettable **boot fault** (bF) and prevent the unit from being operated. This is designed to prevent unintended firing of the high-voltage immediately after start-up. Please refer to the “Fault Section” of this manual for more information.

BASIC OPERATIONS

The basic operations are general operations that are available

Triggering

High voltage is actuated by the presence of an active trigger signal. This is normally accomplished by pulling the trigger of the handgun to start the flow of air through the applicator. When the applicator is triggered, an air flow switch is activated, and the trigger signal is issued to the 9060 unit.

The kV setpoint is displayed on the kV display, the actual current draw on the μA display, and the high voltage light illuminates. Under the μA display is a bar graph meter that illuminates according to the actual current draw shown in Figure 16. The green and yellow regions of the bar graphs meter indicate output current is in the optimum range for maximum transfer

efficiency. The red region of the bar graph indicates high output current causing decreased transfer efficiency. If high output, check maintenance of applicator and external equipment of the power supply .

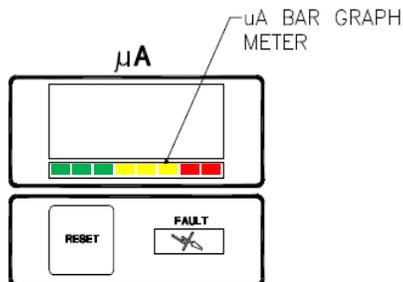


Figure 16: μA Bar Graph Meter Display

Measuring “High Voltage On” Time

The 9060 Cascade Low Voltage Controller records the amount of time the high voltage is triggered on up to 99,999 hours. This value is display on the kV and μA displays of the unit. There are two registers that retain this information, one that may be reset, the other that is permanently retained in memory. The number of hours the unit’s high voltage has been on may be displayed by depressing at the same time the preset 1 and reset buttons (See Figure 17). The display will show hours of use for 3 seconds. This is the resettable register.

To reset this register, press the reset button while the hours are displayed.

To view the non-resettable register, press the preset 2 and reset buttons at the same time. This display will show the hours for 3 seconds.

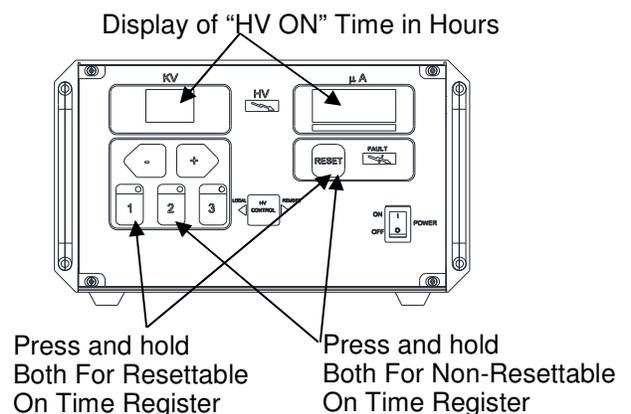


Figure 17: Display “High Voltage On”

LOCKOUTS

There are lockouts that may be done at the PC board (see Figure 18). These lockouts may be used individually or in combination as required. If the jumpers are disconnected, the original functions are re-enabled. After changing any jumpers, the AC power must be cycled for the new setting to take affect.

NOTE

► Some lockouts are sealed using sealant to prevent them from being modified for safety reasons. These lockouts should **ONLY** be modified by Ransburg Authorized Representatives.

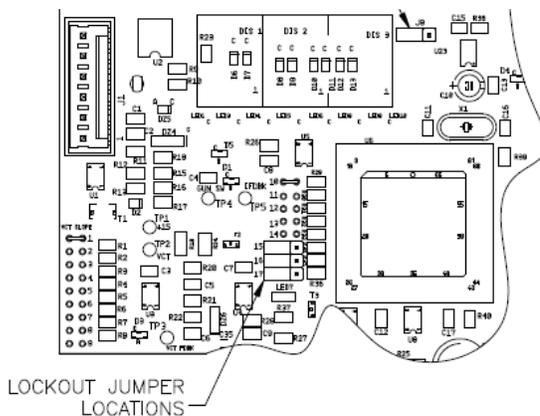


Figure 18: Lockout Jumper Location

Front Panel Lockout

This feature locks out any changes to the kV setting from the front panel of the Controller.

1. Set the kV to the desired value using the front panel buttons. This must be set prior to installing the jumper.
2. Turn AC power off and access the interior of the Controller.
3. Place the jumper across the two (2) pins at location 16 on the main PC board (See Figure 19).
4. Close the Controller and turn AC power back on. Pressing the front panel +, -, or setpoint buttons will now have no affect on the kV setting.

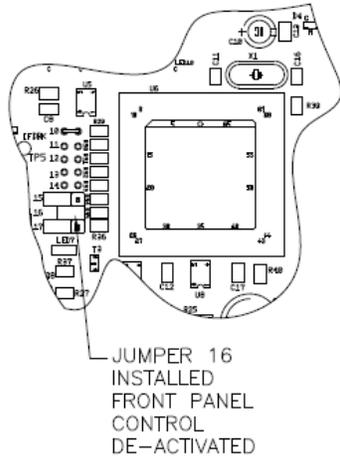


Figure 19: Jumper Location - Front Panel Lockout

Overload

The overload circuit may be activated for applications that require overload indication or notification of high current draws of the applicator. The default overload value is set in the software to the maximum microamp rating minus 10 microamps.

1. Turn AC power off and access the interior of the Controller.
2. Place the jumper across the two (2) pins at location 17 on the main PC board (See Figure 20).
3. Close the Controller and turn AC power back on. An overload fault will now occur if the microamp display exceeds the overload value.

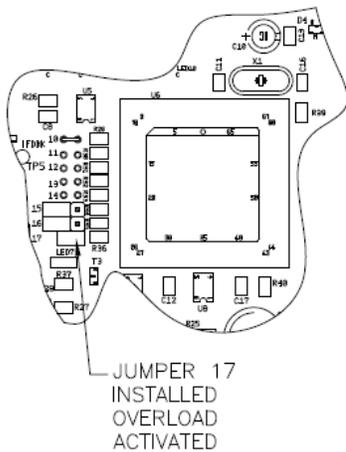


Figure 20: Jumper Location - Overload

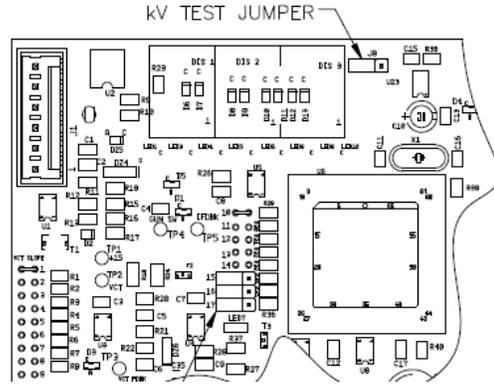


Figure 21: Lockout Jumper Location

KV TEST JUMPER

To assist in testing and troubleshooting, a jumper (J8) has been added to the main PC board. By covering (shorting) both terminals of this jumper, the high voltage of the spray applicator can be activated. Thus, for testing and troubleshooting, high voltage output can be obtained without the need to trigger air through the spray applicator. **After testing, the jumper must be repositioned so that it covers only one terminal (open) or the high voltage will stay on all the time.** See Figure 21 for the location of test jumper J8.

! WARNING

➤ If jumper J8 is left covering (shorting) both terminals, high voltage will be on whenever the AC power is turned on.

NOTE

➤ Use Ransburg Calibrated Equipment **ONLY** for testing and troubleshooting. Refer to the “Accessories” section of this manual for part numbers for testing equipment.

SETPOINT OPERATIONS

Voltage Setpoints

The voltage on the 9060 Cascade Low Voltage Controller is adjustable between 20 kV and full

kV DC. There are 3 voltage setpoints (presets); 1, 2, and 3. Each of these setpoints can be individually adjusted between 20 kV and full kV DC. The three (3) factory preset voltages are listed in the following table:

Factory Presets	
Preset	Value
1	Full kV minus 20 kV
2	Full kV minus 10 kV
3	Full kV

NOTE

► The full kV DC value is determined by the gun type configuration for the particular applicator that is being used, **NOT** the full KV value of the cascade.

Setting the Setpoint

When the applicator is off, the present setpoint can be changed by pressing the 1, 2, or 3 buttons on the front panel shown in Figure 22. The setpoint that is currently selected will have the LED light in the upper right corner of the button lit.

Single Pushes Increment Voltage Down (-) or Up (+) in Single Increments. Holding Button Increments Voltage Down (-) or Up (+) in Increments of 5 kV.

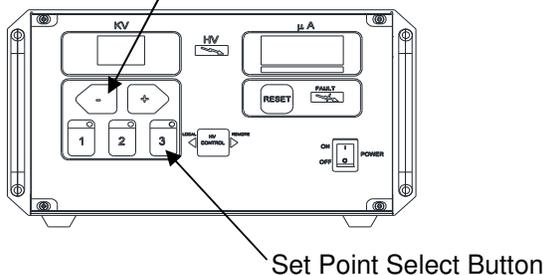


Figure 22: kV Adjust/Setpoint Buttons

Adjusting Presets

To adjust one of the preset setpoints, ensure the applicator is off in local mode and select the desired setpoint by pressing the corresponding setpoint button. The setpoint can then be adjusted between 20 kV and full kV using the +

and - buttons on the front panel of the 9060 Controller shown in Figure 22. Single pushes of the + or - buttons will increment or decrement the currently selected preset in units of 1. When the + or - buttons are held in for longer than a 1/2 second, the kV display will begin incrementing or decrementing in units of five (5).

Resetting Faults

During operation, various faults can occur based upon the operating conditions or if any problems with the 9060 unit arise. If a fault occurs, to reset a fault, the trigger of the gun **MUST** be off and then press the Reset Button. This will clear the fault status and put the unit back into operation unless a fault condition is still present. Please refer to the “Fault Description” portion of the Operation Section of this Service manual for more information on a specific fault and how to correct it.

NOTE

► There is a **5 second** fault reset delay timer that *inhibits* the triggering of high voltage immediately after a fault reset.

FAULT DESCRIPTIONS

For in depth troubleshooting information on the 9060, please refer to the “Fault Troubleshooting” portion of the Maintenance Section of this service manual. If a fault occurs, the Fault Indicator on the front of the Controller will light and a fault code will be displayed on the microamp display. Faults can be reset by pressing the Reset button on the front of the Controller or by using the remote I/O reset signal.

NOTE

► **Any** fault code not listed that appear on the screen are a likely indication of a PC board failure due to possible arc damage.

Cable Fault (CF)

This fault will occur if high voltage is active and the microprocessor detects that no current is being supplied to the applicator. This indicates a connection problem from the control unit to the handgun barrel assembly. Typical causes include a faulty low voltage cable, stuck pins on the plug assembly, or contaminated contacts on the applicator. This may also indicate a faulty barrel assembly for a handgun. For additional information, refer to the Fault Troubleshooting Section.

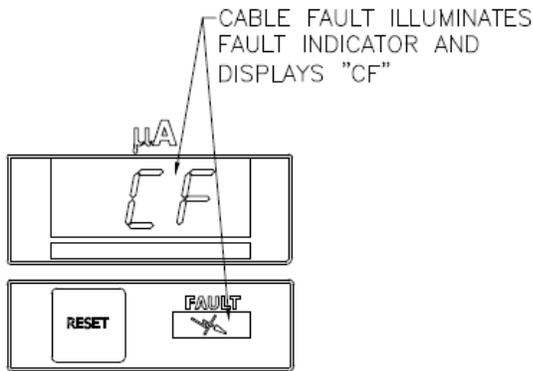


Figure 23: Cable Fault Display

Ground Fault (GF)

If this fault occurs, the fault indicator on the control unit will illuminate, a GF indication will show in the uA display. This fault will occur if the microprocessor detects a loss of ground at the high voltage section. If this fault occurs, reset the fault. This fault can be caused by a broken ground path between the handgun and the control unit and may indicate a faulty cable or plug assembly. For more information, refer to Fault Troubleshooting Section.

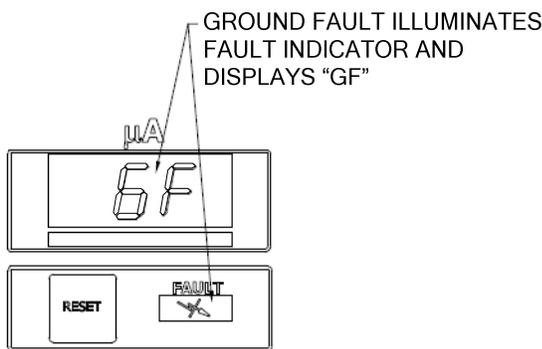


Figure 24: Ground Fault Display

Overload Fault (OL)

This fault will occur if the overload feature is active (see 'Overload Activation' previously in the "Operation" section) and the output current exceeds the overload current value. This can be caused by excessive overspray on the applicator or paint formulation that is too conductive. Clean the applicator, check the paint formulation, or move overload jumper (JP17) to the open position.

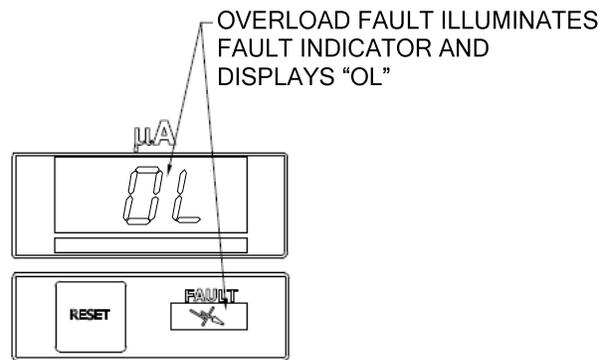


Figure 25: Overload Fault Display

Current Limit Fault (CL)

This fault occurs if the output current exceeds the maximum current by 20µA. This fault can be caused by excessive overspray on the applicator or a paint formulation that is too conductive. It may also be caused by a failed handgun barrel or faulty pc board. Clean the applicator, check the paint formulation, and re-test. See Fault Troubleshooting Section for more information.

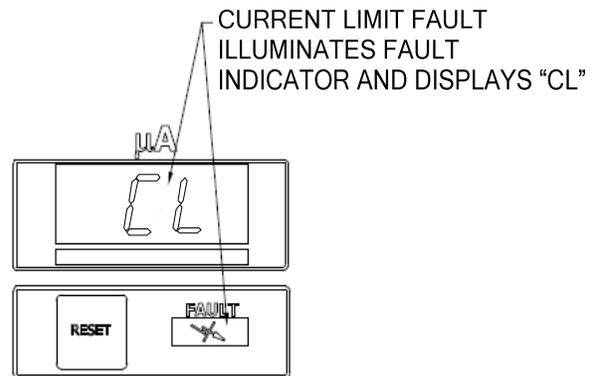


Figure 26: Current Limit Fault Display

Voltage Cable Fault (UC)

This fault will occur if the microprocessor detects a loss of the voltage feedback signal. This may indicate a failed pc board. See Fault Troubleshooting Section for more information.

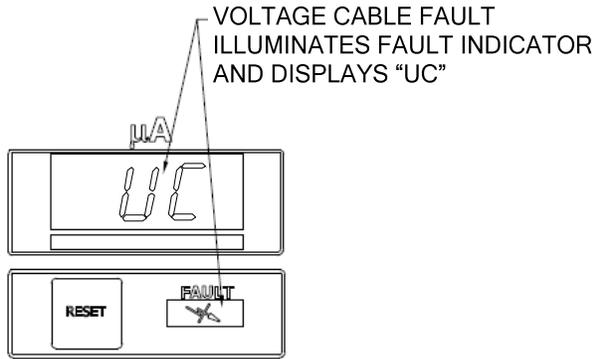


Figure 27: Voltage Cable Fault Display

Feedback Fault (FF)

This fault will occur if the microprocessor detects a loss of the current feedback signal. If this occurs, reset the fault. If this fault occurs repeatedly, replace the handgun barrel or the pc board.

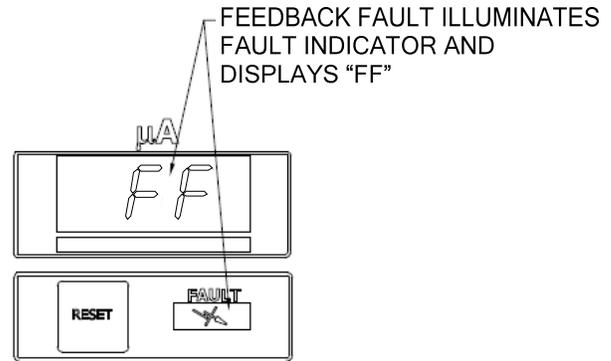


Figure 29: Feedback Fault Display

Over Voltage Fault (OU)

This fault will occur if the microprocessor detects the unit is trying to output voltage above the required for the specific applicator type. If this occurs, reset the Controller. If this fault continues to occur, replace the main PC board.

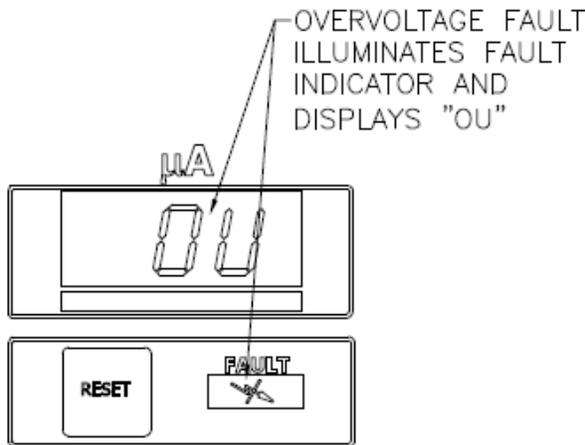


Figure 28: Over Voltage Fault Display

Boot Fault (bF)

This fault will occur during the start-up sequence if an active trigger signal is present. It is designed to prevent immediate triggering after start-up as the unit should be allowed to enter the “ready” state prior to being triggered. This fault also prevents the high voltage from being fired if the microprocessor resets. For additional information, refer to the Fault Troubleshooting Section.

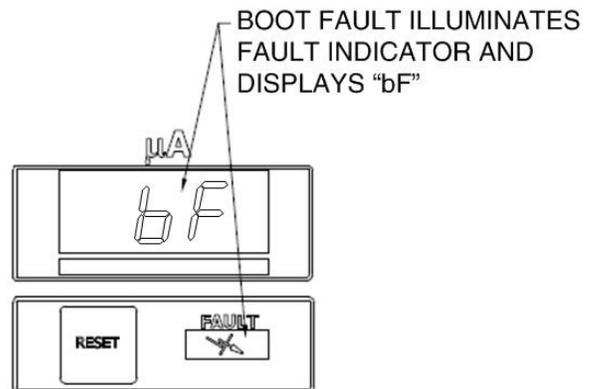


Figure 30: Boot Fault Display

MAINTENANCE

TROUBLESHOOTING GUIDE

General Problem	Possible Cause	Solution
Blank Display	<ol style="list-style-type: none"> 1. No power 2. Blown fuse 	<ol style="list-style-type: none"> 1. Check the power connections and verify they are fully connected and power is available. Power cycle the unit off and back on. 2. Check Fuses and replace if blown using the replacement fuses inside the lid of the unit.

FAULT TROUBLESHOOTING GUIDE

WARNING

► Before troubleshooting gun and control unit problems, flush the gun with solvent and purge with air. Some of the tests will require high voltage to be applied to the gun, so the gun must be empty of paint and solvent.

Fault	Description	Solution
Cable Fault (CF)	The Cable Fault indicates the control unit does not detect a high voltage section on the end of the cable. The fault typically occurs at a high voltage trigger.	<ol style="list-style-type: none"> 1. Check for a loose connection on the low voltage cable and tighten if necessary. Insure both connectors are secure and re-test for CF fault. 2. Replace low voltage cable and re-test. 3. Send unit in for repair.

Fault	Description	Solution
Ground Fault (GF)	The Ground Fault is typically caused by a ground connection problem, and can create a safety hazard. It can occur without high voltage and will not reset.	<ol style="list-style-type: none"> 1. Check for loose connection on the low voltage cable, and tighten if necessary. Insure both connectors are secure and re-test for GF fault. 2. Turn off control unit power. Measure resistance from ground to handgun air inlet fitting-if greater than 5 ohms, replace low voltage cable and re-test. 3. Send unit in for repair.
Over-Voltage Fault (OU)	The Over Voltage Fault indicates the output voltage exceeds the design specifications. It typically occurs during a high voltage trigger.	<ol style="list-style-type: none"> 1. Check connections using two finger pull test to ensure they are connected. 2. Replace the main pc board. 3. Send high voltage control unit in for repair.
Over-Load Fault (OL)	The Over Load Fault indicates the current output has exceeded the overload threshold. This fault is only active if jumper 17 is shorted. The overload threshold is <u>normally</u> set at 10 μ A below the maximum output of the applicator.	<ol style="list-style-type: none"> 1. This may indicate the paint conductivity is too high (resistance too low) or the outside of the applicator is contaminated with paint. Test paint for proper conductivity or clean applicator with non-polar solvent. Ensure dump lines are clean.
Current Limit Fault (CL)	The Current Limit Fault indicates the current output of the gun has exceeded the maximum allowable output current. It typically occurs with the high voltage on.	<ol style="list-style-type: none"> 1. This may indicate the paint conductivity is too high (resistance too low) or the outside of the applicator is contaminated with paint. Test paint for proper conductivity or clean applicator with non-polar solvent. Ensure dump lines are clean. 2. Replace applicator and re-test. If problem still exists, replace main pc board. 3. Send applicator in for repair.
Feedback Fault (FF)	The Feedback Fault indicates there is no current feedback or it is incorrect. It typically occurs with the high voltage on.	<ol style="list-style-type: none"> 1. Replace handgun barrel assembly. 2. Send low voltage controller in for repair.

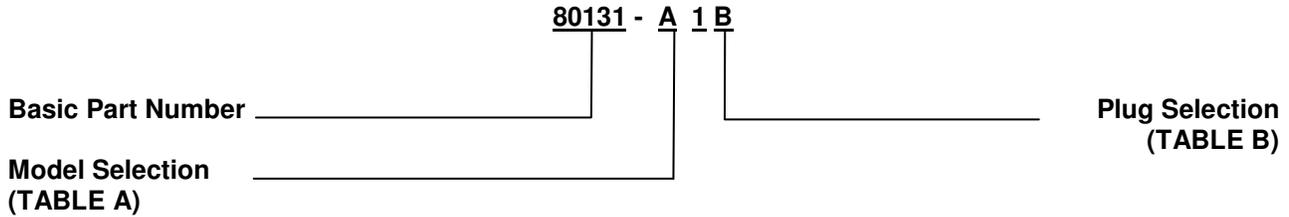
Fault	Description	Solution
Voltage Cable Fault (UC)	The Voltage Feedback Fault indicates the cascade drive signal is not present. It typically occurs when high voltage is triggered.	<ol style="list-style-type: none"> 1. Replace the barrel assembly and re-test. 2. Replace the main pc board and re-test.
Boot Fault (bF)	The Boot Fault indicates that an active trigger signal was detected during the start-up sequence.	<ol style="list-style-type: none"> 1. Turn off the voltage controller. 2. Ensure that the gun trigger is not pressed so the remote trigger input signal is not active. 3. Turn on the voltage controller to verify that a trigger signal is not present and that the unit enters the 'ready' state. 4. Send the voltage controller in for repair or contact technical support.

NOTES

PARTS IDENTIFICATION

9060 CASCADE LOW VOLTAGE CONTROLLER MODEL IDENTIFICATION *

When ordering, use 80131-A1B as indicated by Table A and B. Three digits must follow the basic part number, for example:



* Model number and serial number of the voltage controller is located on the left outside face of the main enclosure.

Table A - Model Selection	
Dash No.	Description
2	Vector R70AS Handgun
3	Vector R90AS Handgun
4	Vector AA90 Handgun
5	Vector R90AS Waterborne Handgun

Handgun Model Reference	
Model	Description
79501-XXX	Vector R70AS Handgun
79500-XXX	Vector R90AS Handgun
79580-XXX	Vector AA90 Handgun
79523-XXX	Vector R90AS Waterborne Handgun

Table B - Plug Selection	
Dash No.	Description
1	Domestic 
2	Europe 
3	China 

9060 Cascade Low Voltage Controller - Parts List	
Part #	Description
13742-01	Air Flow Switch (80131-21X, 31X, 51X Units)
13742-02	Air Flow Switch (80131-41X Units)
72771-06	Fuse (250V, 1A, 5mm x 20mm)
79390-20	9060 Cascade Low Voltage Controller PC Mainboard for 80131-21X
79390-22	9060 Cascade Low Voltage Controller PC Mainboard for 80131-31X, 51X
79390-24	9060 Cascade Low Voltage Controller PC Mainboard for 80131-41X
79428-00	Power Supply, 24V (24VDC Power Supply 1PS)
76434-01	Switch, Rocker (On-Off Switch)

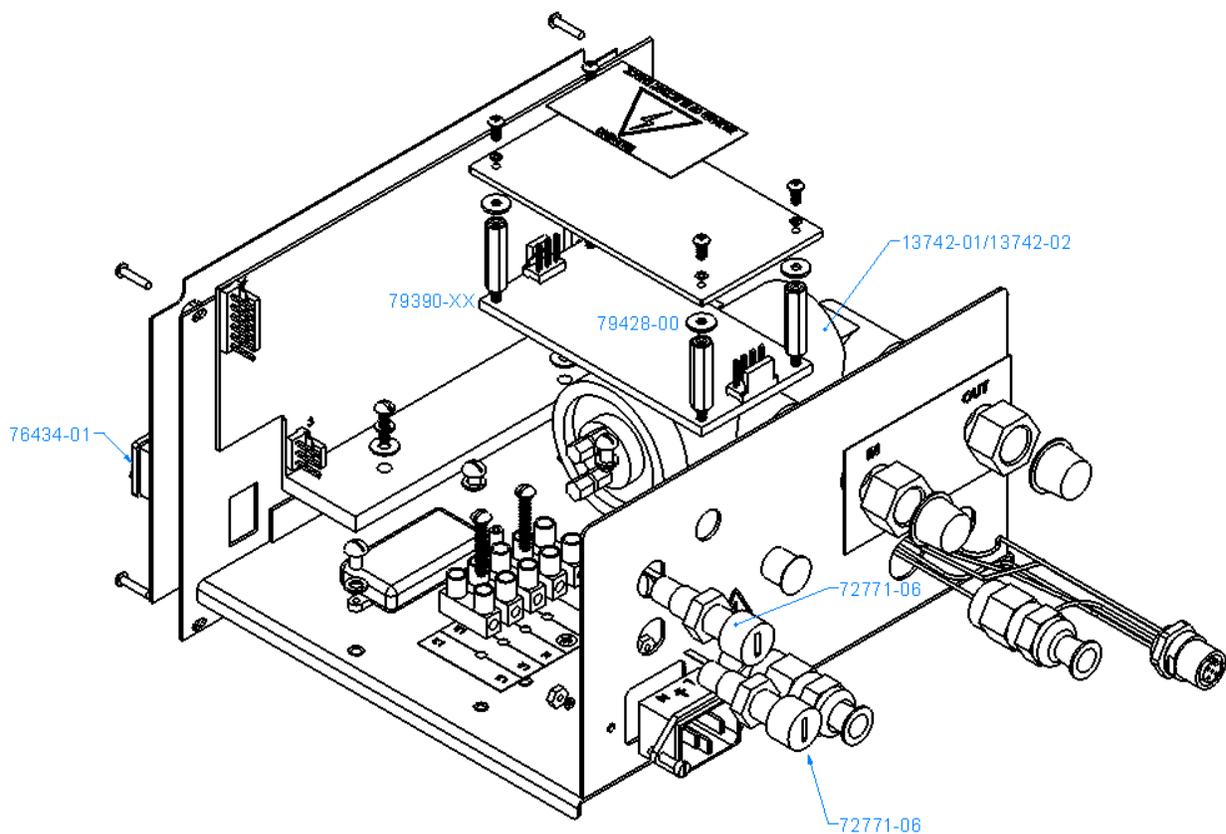


Figure 31: Part Identifications

ACCESSORIES

9060 Low Voltage Controller - Accessories List	
Part #	Description
76652-01	HV Probe
76652-02	Meter w/Test Leads
76652-03	Paint Test Probe w/Meter
76652-04	Deluxe Kit (Include HV Probe, Meter w/Test Leads, and Paint Test Probe)

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.

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.