



9060 High Voltage Controller for No.2 Process Handgun (HV2 - Electric Motor)

Model: 80102-21X (Electric Motor)



NOTE: This manual has been changed from revision **CP-13-03-R4** to revision **CP-13-03-R5**. Reasons for this change are noted under “Manual Change Summary” inside the back cover of this manual.

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SAFETY

SAFETY PRECAUTIONS

Before operating, maintaining or servicing any electrostatic coating system, read and understand all of the technical and safety literature for your 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.

WARNING

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

CAUTION

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

NOTE

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 associated 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 equipment, contact your local Carlisle Fluid Technologies representative or Carlisle Fluid Technologies technical support.


WARNING

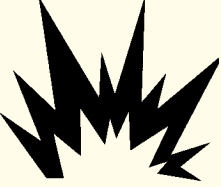

- The user **MUST** read and be familiar with the Safety Section in this manual and the safety literature therein identified.
- This equipment is intended to be used by trained personnel **ONLY**.
- This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain 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 AND EN 16985 SAFETY STANDARDS, LATEST EDITION**, or applicable country safety standards, prior to installing, operating, and/or servicing this equipment.

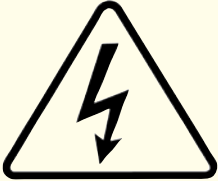
WARNING



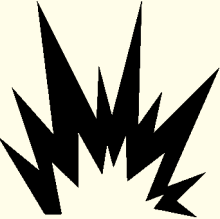
- The hazards shown on the following pages may occur during the normal use of this equipment.

Repairs may only be performed by personnel authorized by Carlisle Fluid Technologies.

<p>AREA Tells where hazards may occur.</p>	<p>HAZARD Tells what the hazard is.</p>	<p>SAFEGUARDS Tells how to avoid the hazard.</p>
<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 Power Supply or 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>Spray booth ventilation must be kept at the rates required by NFPA 33, EN 16985, country, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents.</p> <p>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.</p> <p>Test only in areas free of combustible material. 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. 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>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.</p>

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
<p>Spray Area</p> 	<p>Explosion 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.</p> <p>Frequent Power Supply or Controller shutdown indicates a problem in the system requiring correction.</p>	<p>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.</p> <p>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.</p> <p>Test only in areas free of flammable or combustible materials.</p> <p>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.</p> <p>Always turn the control panel power off prior to flushing, cleaning, or working on spray system equipment.</p> <p>Before turning high voltage on, make sure no objects are within the safe sparking distance.</p> <p>Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 16985.</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.</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>Spray Area / High Voltage Equipment</p> 	<p>Electrical Discharge</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 and operators in the spray area must be properly grounded.</p> <p>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, EN 16985.)</p> <p>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.</p> <p>Operators must not be wearing or carrying any ungrounded metal objects.</p> <p>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.</p> <p>NOTE: REFER TO NFPA 33, EN 16985 OR SPECIFIC COUNTRY SAFETY CODES REGARDING PROPER OPERATOR GROUNDING.</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. Grounded conductive flooring must be provided in the spray area.</p> <p>Always turn off the power supply prior to flushing, cleaning, or working on spray system equipment.</p> <p>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.</p> <p>Avoid installing an applicator into a fluid system where the solvent supply is ungrounded.</p> <p>Do not touch the applicator electrode while it is energized.</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>Electrical Discharge</p> <p>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.</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>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 16985.</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>Chemical Hazard</p> <p>Certain materials may be harmful if inhaled, or if there is contact with the skin.</p>	<p>Follow the requirements of the 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. Reference EN 12215 or applicable code.</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>
<p>Spray Area</p> 	<p>Explosion Hazard — Incompatible Materials</p> <p>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.</p>	<p>Spray applicators require that aluminum inlet fittings be replaced with stainless steel.</p> <p>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.</p>

INTRODUCTION

GENERAL DESCRIPTION

The Ransburg No. 2 Handgun Process

The No. 2 Process™ is an electrical atomization method for applying coatings to objects electrostatically. The No. 2 Process Handgun system applies a high voltage, negative, DC charge to the applicator bell, creating an electrostatic field between the bell and the target object. The target is electrically grounded through its support which may be stationary or moving; or through an electrical connection to a known true earth ground.

A regulated pressure fluid system delivers coating material to the bell when the gun is triggered. There, the fluid travels across the face of the rotating bell and becomes charged. The fluid is electrically atomized at the edge of the bell forming a fine mist which, under the influence of the electrostatic field, is attracted to and deposited on the target object. The forces between the charged particles and the grounded target are sufficient to turn almost all overspray around and deposit it on the side and back surfaces of the target. Thus, a high percentage of the spray is deposited on the target and overspray is controlled.

The 9060 High Voltage Controller

The *Ransburg 9060 High Voltage Controller* (80102-21X) is used to provide high voltage for the No. 2 Process Handgun. It uses a combination of proven high voltage generation technology and microprocessor-based control. It uses current feedback information to maintain the required kV output for the No. 2 Process Handgun. The processor circuitry provides the maximum in applicator transfer efficiency, while maintaining the maximum safety.

The 9060 Controller for the No. 2 Process Handgun has a fixed setpoint value which can **NOT** be adjusted. The triggering of the HV is initiated by the on-off switch on the No. 2 Process Handgun.

SAFETY FEATURES

The Ransburg 9060 High Voltage Controller provides maximized operational safety. The protections include detection

of Boot Faults, Ground Faults, Cable Faults, Feedback Signal Fault, Current Limit Fault and Overvoltage Fault. 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 high voltage controller is based on load.

DISPLAYS

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



Figure 1: 9060 High Voltage Controller (HV2)

NOTE

- The 9060 High Voltage Controller is factory supplied with a latch that can be opened using a tool such as quarter or flat screwdriver.

The 9060 High Voltage Controller is available as follows:

9060 HIGH VOLTAGE CONTROLLER		
9060 Part #	Used with No. 2 Gun Type	Gun No.
80102-211	Electric Motor, Domestic	19372-XX
80102-212	Electric Motor, European	19372-XX
80102-213	Electric Motor, China	19372-XX

SPECIFICATIONS

Environmental

Operating Temperature:	0°C to +40°C 32°F to +104°F
Storage and Shipping Temperature:	-40°F to +185°F -40°F to +185°F
Humidity:	95% Non-Condensing

Physical

Height:	16.5 cm (6.5 inches)
Width:	37.8 cm (14.9 inches)
Depth:	30.7 cm (12.1 inches)
Weight:	10.2 kg (22.5 lbs.)

Electrical

Input Voltage:	100-240 VAC
Input Current:	1A RMS (max)
Frequency:	50 or 60 Hertz
Wattage:	40 Watts (max)
Output Voltage:	100 kV DC (80102-21X)
Output Current:	160 Microamps (max)

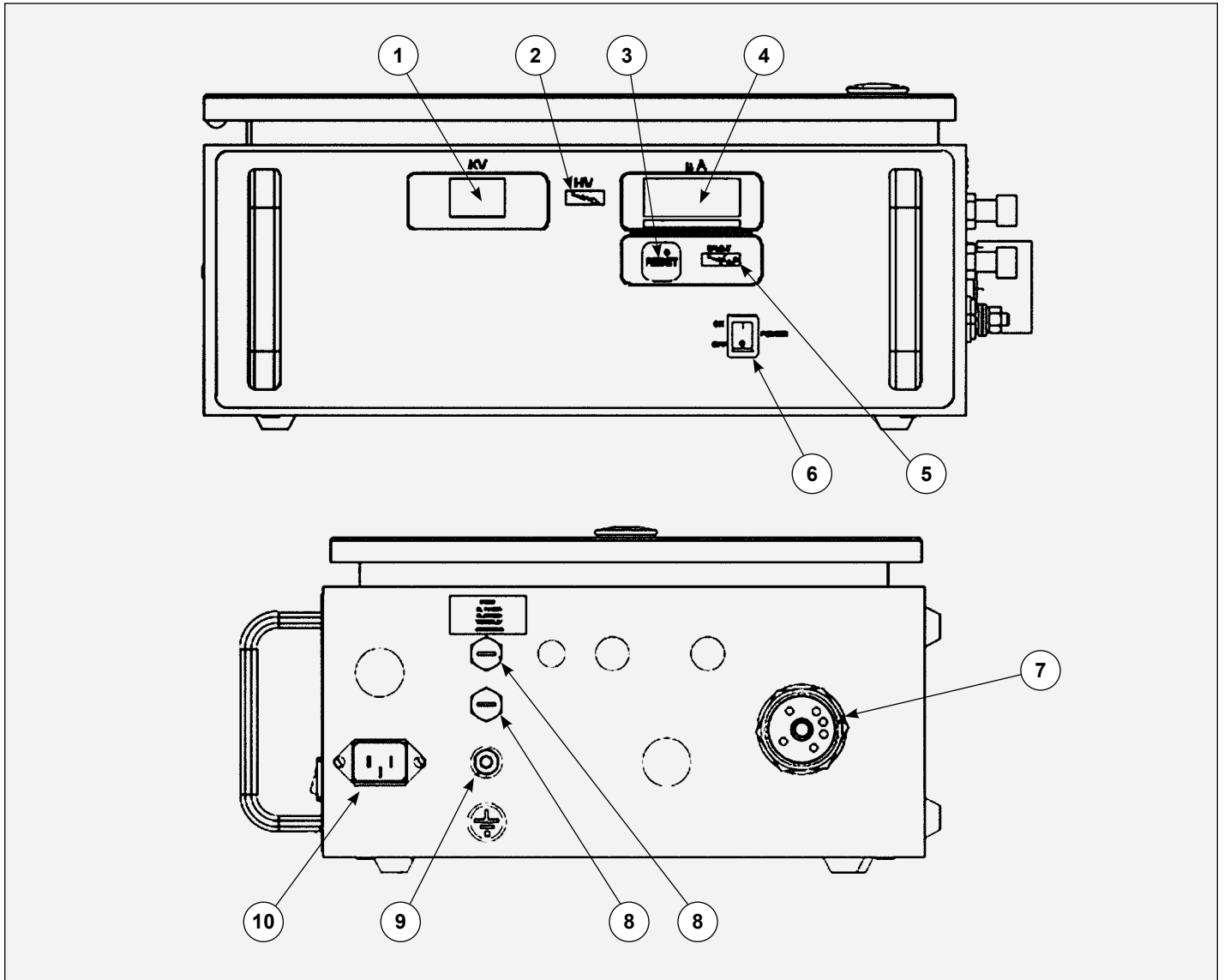


Figure 2: 9060 High Voltage Controller Features (HV2)

9060 CONTROLLER FEATURES	
No.	Description
1	kV Display
2	High Voltage On Indicator
3	Reset Button
4	µA Display
5	Fault Indicator
6	On-Off Switch
7	High Voltage Cable Connector
8	Fuses
9	Ground Lug
10.	AC Inlet Receptacle

OPERATOR INTERFACE

The 9060 HV2 Controller shown in Figure 3, has a simple operator interface consisting of two (2) LED (Light Emitting Diode) indicators, one (1) power switch, one (1) button, one (1) current LED bargraph, and two (2) screens containing seven-segment displays. The following describes the behavior of the interface components used with the No. 2 Process Handgun.

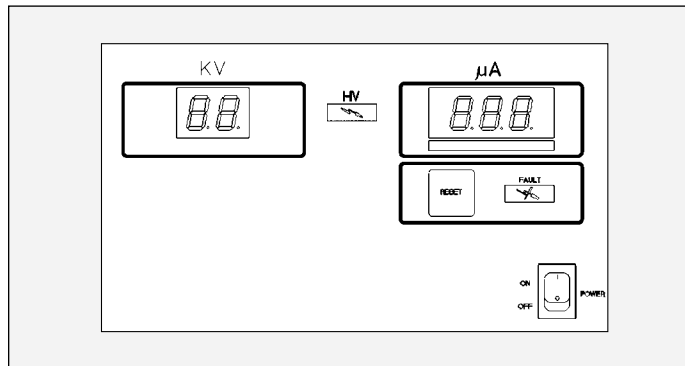


Figure 3: 9060 Operator Interface

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 period of approximately 5 seconds.

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 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 Operation portion of this manual.

BUTTONS

Reset Button

The reset button is used to clear fault or overload conditions when the trigger signal is OFF. This will NOT prevent any other active fault conditions from triggering a new fault.

NOTE

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

CONNECTION INTERFACE

The 9060 Controller connection interface shown in Figure 4, provides all of the required connections for setting up a No. 2 Process Handgun (80102-21X). This connection interface consists of one (1) high voltage cable connector, one (1) ground lug connection, two (2) fuses, and one (1) AC inlet receptacle.

CONNECTORS

High Voltage Cable Connector

The high voltage cable connector is the largest connector and is located on the far right of the connection interface. This connector is designed for use with the superflex high voltage cable 19370 that connects with the No. 2 Process Handgun.

Ground Lug Connection

The ground lug connection is located directly below the fuses and has a ground logo sticker directly below 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.

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 115VAC and 230 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.

Spare Fuses

The Controller also comes with two (2) spare fuses (250V, 1A, 5mm x 20mm) mounted in holders, inside the lid of the Controller.

SIGNAL INTERFACE

The 9060 Controller, when configured for use with the No. 2 Process Handgun, requires only one signal input for operation, the trigger signal.

The trigger signal input (J3-5) is controlled directly from the on-off switch located on the No. 2 Process Handgun.

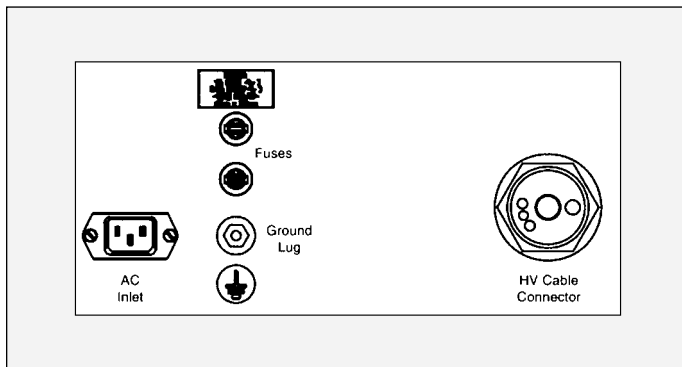


Figure 4: 9060 Connection Interface

INSTALLATION

GENERAL INFORMATION

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

⚠ WARNING

- The 9060 Controller **MUST** be located a minimum of 6.1m (20') outside or away from the target being sprayed.
- 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 High 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

Installation of the Controller **must be a minimum of 6.1m (20') from where the spray target is located** 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.

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.

For those few 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 TB1-N, TB1-L1 and TB1-EARTH GROUND (See Figures 5).
2. Remove the mounting hardware from the AC inlet receptacle and remove it from the side of Controller.
3. Install the Conduit Adapter Plate (See Accessories Section) in the hole where the AC inlet receptacle was removed (see Figure 6).
4. Install the AC input wiring (0.8mm² (18AWG) minimum) through the Conduit Adapter Plate using conduit and wire to TB1 as follows:

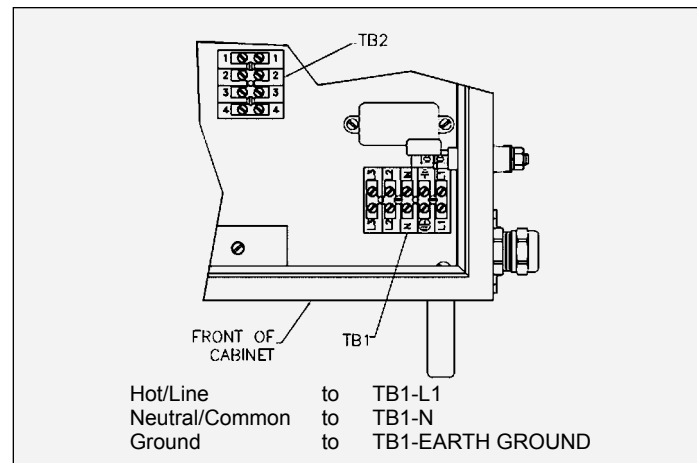


Figure 5: Location of TB1 & TB2 in Controller

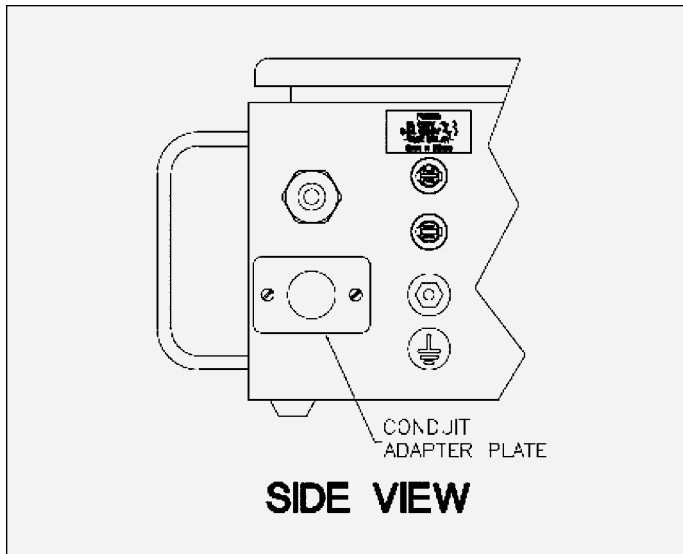


Figure 6: Installation of Conduit Adapter Plate

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

- Do **NOT** rely on the ground connection provided by generators and other portable power generation devices.
- 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** (80102-21X) shipped from the factory for either 110 VAC input or 240 VAC input will have a 72771-06, 1 Amp front panel fuses installed.

HIGH VOLTAGE CABLE

Position the No. 2 Process Handgun in the spray area and route the high voltage cable to the Controller. The cable should be routed so that it is not damaged by foot and vehicle traffic and also so that it is not close to areas of high temperature (129°F+). The operator should have free movement of the applicator and all bend radii of the cable should not be less than 6-inches (15 cm). Connect the high voltage cable to the Controller and tighten the retaining nut and set screw. If during the routing of the high voltage cable it is required to remove it from the No. 2 Handgun, care should be taken when reinstalling so that the high voltage cable is completely engaged.

⚠ WARNING

- The Controller **MUST** be **OFF** when the No. 2 Handgun is removed or reinstalled.

LOCAL MODE TRIGGER SIGNAL ONLY

The No. 2 Process Handgun (19372) uses the on-off switch on the back of the gun to activate a relay on the relay board (PN 76649-00) when the switch is on. The relay board is mounted on top of the cascade bracket inside the 9060 Controller chassis. When the No. 2 Process Handgun on-off switch is turned on, it activates a relay on the board which connects the trigger input (J3-5) to ground. This signal causes the main PC board to turn on the high voltage and supplies 24 VDC to the gun motor.

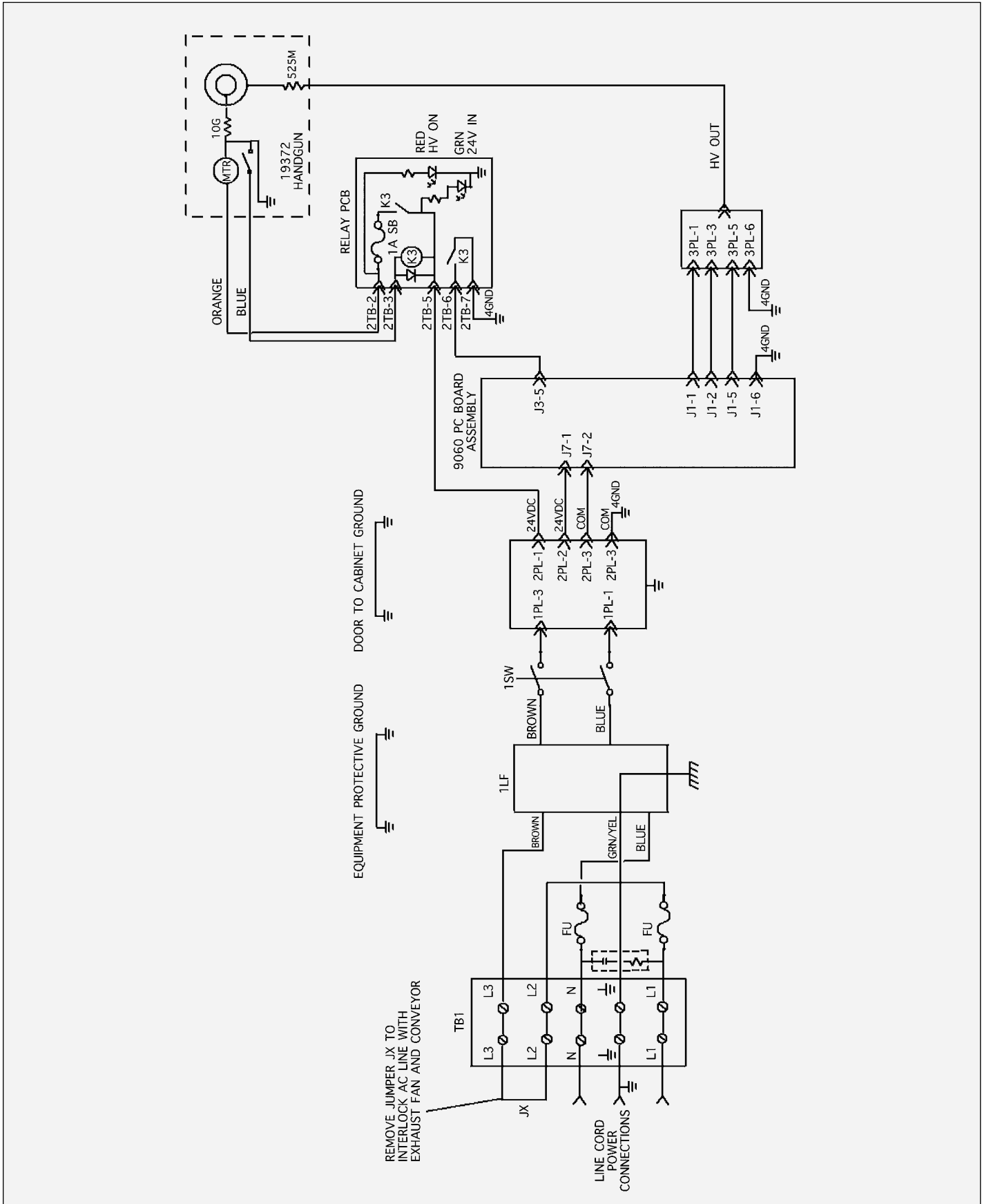


Figure 7: Controller Schematic (HV2)

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 type the 9060 Controller is configured for and the μA (microamp) display will show the current software revision level as shown in Figure 8. These items are displayed for approximately 5 seconds after the board powers up.

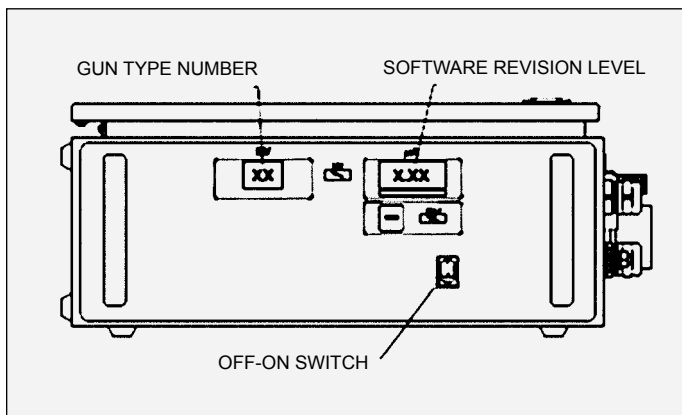


Figure 8: Controller Start-Up Display

The controller comes preconfigured for the No. 2 Process Handgun from the factory. The following table lists the display value and jumper settings for the unit. This table is a **reference** to verify that the gun configuration jumpers are in their correct positions if unexpected behavior is observed.

START-UP DISPLAY		
Type	Description	Jumpers
99	No. 2 Process Handgun (Electric Motor)	13

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

- **VERIFY** that the gun jumper configuration is set for the applicator type that is being used for the system.
- **DONOT** adjust the gun configuration jumpers. If they are incorrect, contact your Ransburg representative.
- **USE ONLY** the gun type configuration for the No. 2 Process Handgun (80102-21X). 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 on-off switch should **NOT** be in the on position. If this switch is ON it 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

High voltage is actuated by the presence of an active trigger signal. This is accomplished by turning the on-off switch of the No. 2 Process Handgun to the "on" position. The kV 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 9. 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.

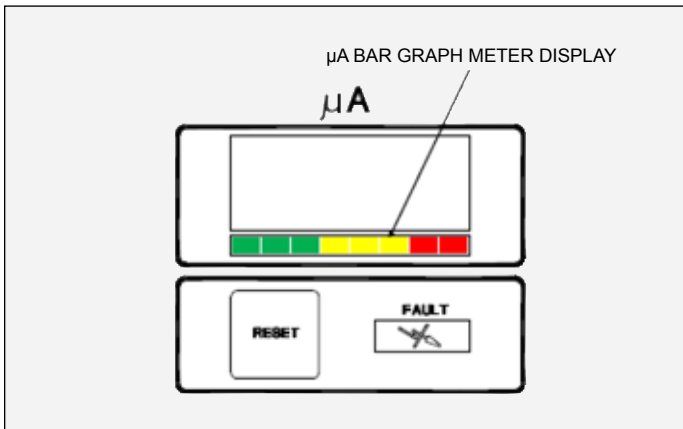


Figure 9: μ A Bar Graph Meter Display

⚠ WARNING

- ▶ If jumper J8 is left covering (shorting) both terminals, the high voltage will remain on or cause a boot fault (bF) when the unit is powered 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.

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 turn on the gun on-off switch. **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 10 for the location of KV test jumper J8. Ensure the jumper is installed on **ONLY ONE** post during power on to prevent a boot fault “bF”. *The terminals should only be shorted after the unit is completely powered on.*

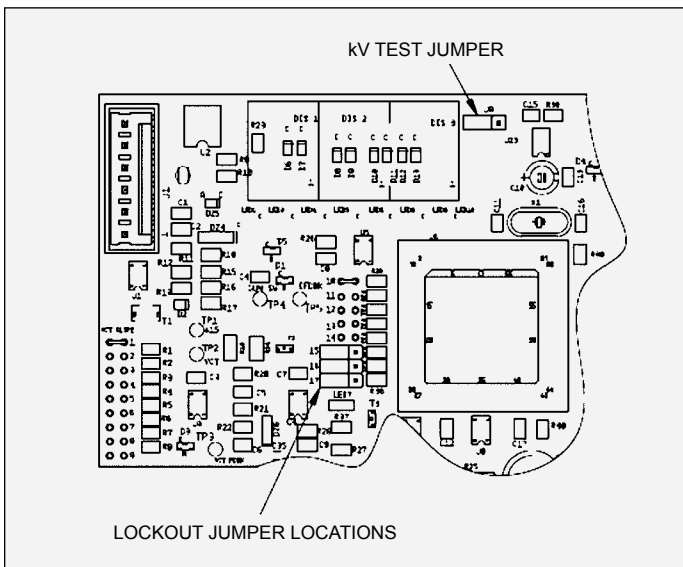


Figure 10: KV Test Jumper Location

SETPOINT OPERATIONS

Voltage Setpoint

The voltage on the 9060 High Voltage Controller, when configured for use with the No. 2 Process Handgun (80102-21X), is **NOT** adjustable. The Electric Motor No. 2 Handgun is designed to operate only at a set point of 100kV. **The display will always show 99kV.**

FAULTS

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 No. 2 Handgun on-off switch **MUST** be turned 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. In the case of a “bF” fault during spraying, 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 internal cascade. Check the wiring harness for loose pins, or replace the high voltage section. For additional information, refer to the Fault Troubleshooting Section.

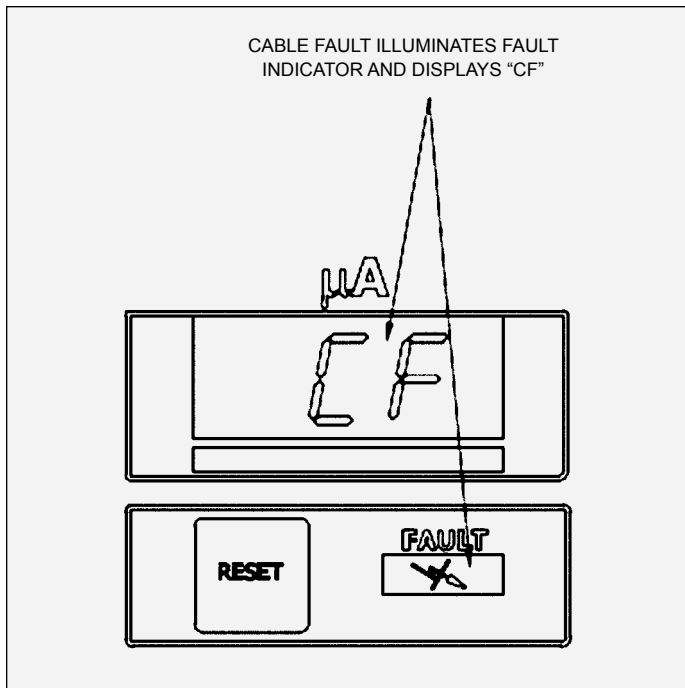


Figure 11: Cable Fault Display

Ground Fault (GF)

If this fault occurs, the fault indicator on the control unit will illuminate, a GF indication will show in the μ A 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 applicator and the control unit and may indicate a faulty cable or plug assembly. It can also be caused by a broken ground path between the high voltage section and the pc board. Check the wiring to the high voltage section. For more information, refer to Fault Troubleshooting Section.

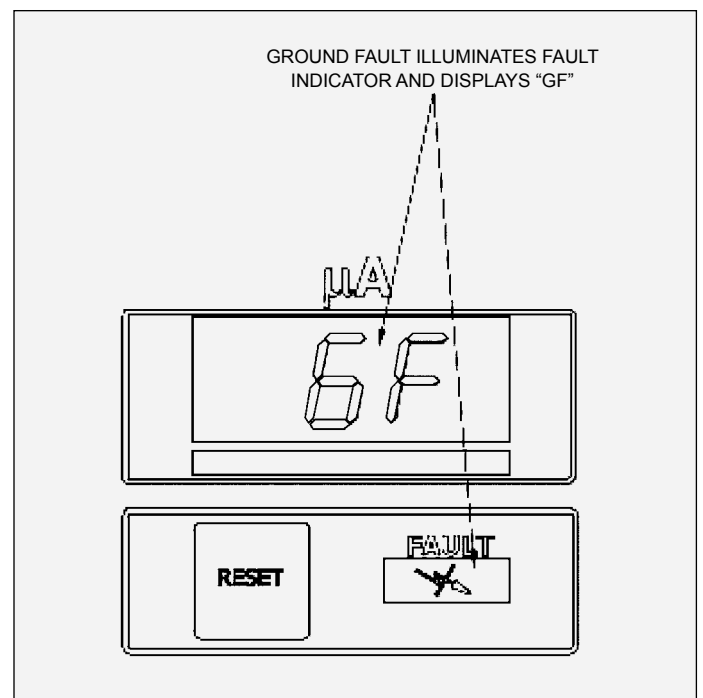


Figure 12: Ground Fault Display

NOTE

- The ground fault error code displayed on the μ A display appears very similar to the boot fault. Verify that the first character appears as a “6” representing the character “G” and not a lowercase “b” for a boot fault.

Current Limit Fault (CL)

This fault occurs if the output current exceeds the maximum current by 20 μ A. 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 bad pc board. Clean the applicator, check the paint formulation, or replace the pc board. See Fault Troubleshooting Section for more information.

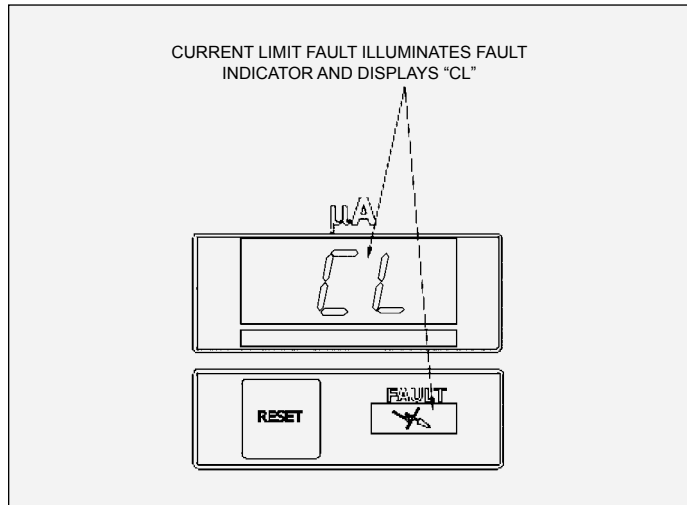


Figure 13: Current Limit Fault Display

Voltage Cable Fault (UC)

This fault will occur if the microprocessor detects a loss of the voltage feedback signal. This can be caused by a failed high voltage cable, a failed high voltage section, or a failed pc board. Refer to the Fault Troubleshooting Section at the end to determine if the problem is the control unit or the high voltage cable.

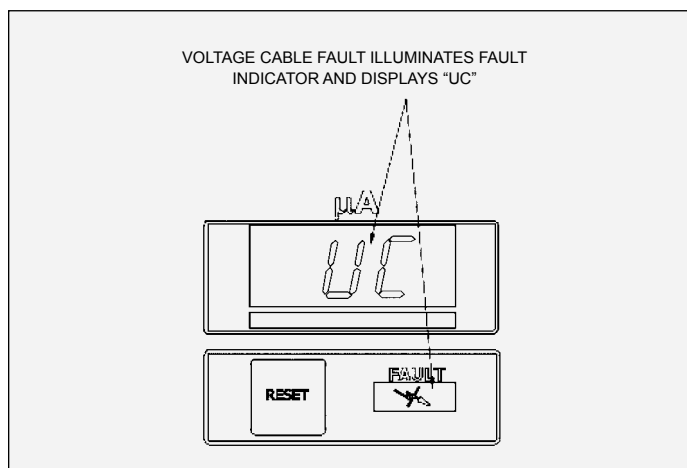


Figure 14: Voltage Cable Fault Display

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.

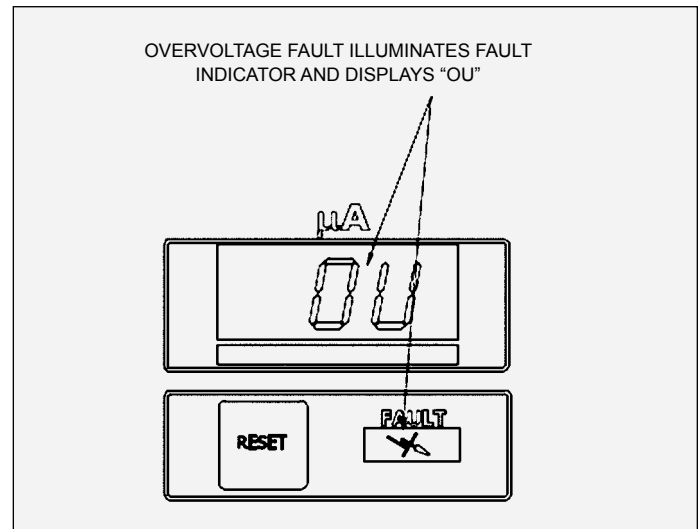


Figure 15: Over Voltage Fault Display

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, refer to the Fault Troubleshooting Section to determine if the problem is with the high voltage section or the main pc board.

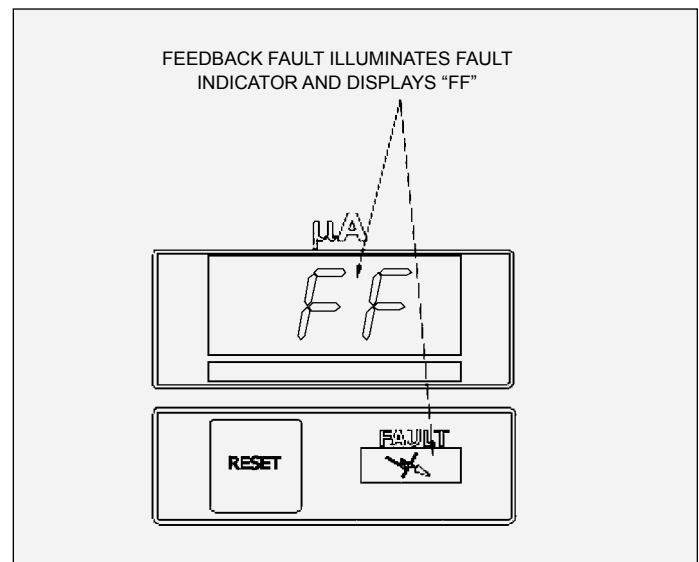


Figure 16: Feedback Fault Display

Boot Fault (bF)

This fault will occur during the start-up sequence if the No. 2 Handgun on-off switch is in the on position. It is designed to prevent immediate triggering after start-up as immediate high voltage is a safety concern. The unit should be allowed to enter the “ready” state prior to being triggered, which takes about 5 seconds and is indicated by 000 on the μA display. This fault also prevents the high voltage from being triggered if the microprocessor resets. For additional information, refer to the Fault Troubleshooting Section.

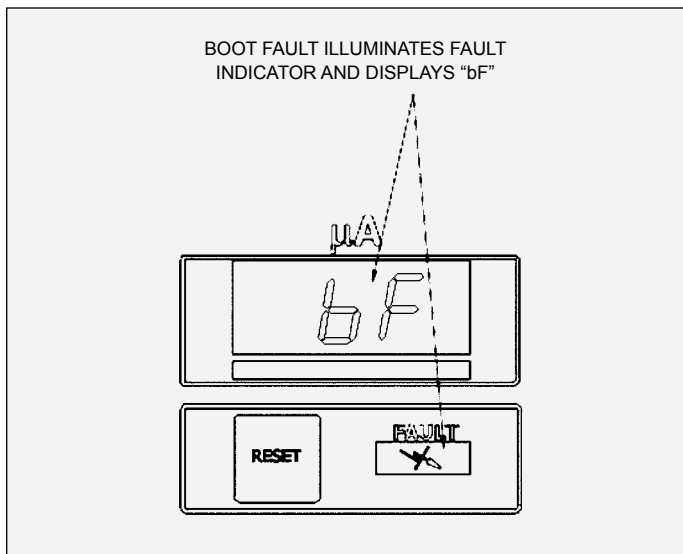


Figure 17: Boot Fault Display

NOTE

- The boot fault error code displayed on the μA display appears very similar to the ground fault. Verify that the first character appears as a lowercase “b” not the ground fault character “6”.
- The boot fault **ONLY** occurs during the powering on of the voltage controller.
- The boot fault **CAN** occur during during painting if a brown out or arcing situation in the gun or cable of high section cause a system reset.

MAINTENANCE

ROUTINE PREVENTIVE MAINTENANCE

In general, little maintenance is necessary to ensure proper operation. It is important, however, to keep the interior of the unit clean and free from moisture or foreign material. For this reason:

1. Keep the exterior of the unit free from dust accumulation.
2. Always clean the exterior prior to opening the cabinet door.
3. Open the cabinet door only to perform maintenance or repair.
4. If the power supply end of the high voltage cable becomes dirty, clean the end of the cable with a suitable, clean, non-polar solvent and apply a light coat of dielectric grease. On a yearly basis, check to ensure that the dielectric grease (LSCH0009) is covering the electrical contact point in the High Voltage Tube. If not, add grease as needed.

NOTE

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

CAUTION

- Do not immerse any part of, or all of an assembled applicator in any liquid.

TROUBLESHOOTING Ground Test Procedure

Equipment Required:

Ohmmeter - To Measure Resistance

If shocks or sparks are noticed at any point in the spray system, immediately turn off the power supply and check the complete system for proper grounding. Proper grounding of the spray gun system can be verified as follows:

1. Ensure that the clamp of the 14 AWG Ground Wire Assembly is connected to true earth ground. The resistance between the clamp and a known earth ground should read less than 10 ohms.
2. Place one end of the ohmmeter on the clamp of the Ground Wire Assembly and the other end on the Power Supply ground stud. If the ohmmeter reads greater than 10 ohms, replace the 14 AWG Ground Wire Assembly.
3. Connect one end of the ohmmeter to the Power Supply ground stud and the other to the metal gun handle. If the ohmmeter reads greater than 10 ohms repair or replace the high voltage cable.

KV Output Test

When a lack of high voltage at the spray gun indicates a problem, a kV Output Test of the Power Supply may be performed to help determine whether it is at fault.

Equipment Required:

Calibrated Ransburg High Voltage Test Probe and Meter (76652-01)

KV Output Test Procedure

1. Turn AC power to the power supply OFF.
2. Remove the high voltage (HV) cable from the power supply.

⚠ WARNING

► Whenever removing high voltage cables from equipment, ground the plug end of the cable(s) by contacting the plug to electrical ground. **DO NOT** touch the plug until it has been grounded. This will eliminate the possibility of residual charge causing electrical shock.

3. Attach the appropriate HV cable to the Test Probe (76652-01), properly ground the probe to a true earth ground and turn the Test Probe Meter on (see Operation Manual of 76652-01 Tester).
4. Insert the Test Probe HV cable into the Power Supply HV Tube until it bottoms out.

NOTE

► Ensure that the Test Probe HV cable makes good contact both inside the Test Probe and inside the Power Supply HV Tube.

5. Turn the power supply ON.
6. Open the cabinet door and position jumper J8, shown in Figure 10, on the main PC Board so that it covers (shorts) both terminals. Note the position must be changed after boot or a boot fault "bF" will occur.
7. Read the output voltage displayed on the meter, then turn the power supply OFF. If the voltage reads 93-100kV, the problem is not the Power Supply, therefore the HV Cable and spray gun should be checked for the cause. If the voltage **DOES NOT READ** correctly, the problem is with power supply. Consult the "Troubleshooting Guide" to locate the specific problem.
8. Disconnect the Test Probe (76652-01) and reposition jumper J8 so that it covers only one terminal. When ready to resume spray operations, reconnect the spray gun HV cable and turn the power supply on.

Bench Testing

Equipment Required: Volt/Ohmmeter

The "Troubleshooting Guide" provides information for troubleshooting the power supply when improper operation is obtained and the problem has been traced to the power supply.

Proper troubleshooting should **ONLY** be accomplished with specific test equipment by qualified electronics technicians or authorized Carlisle Fluid Technologies representatives.

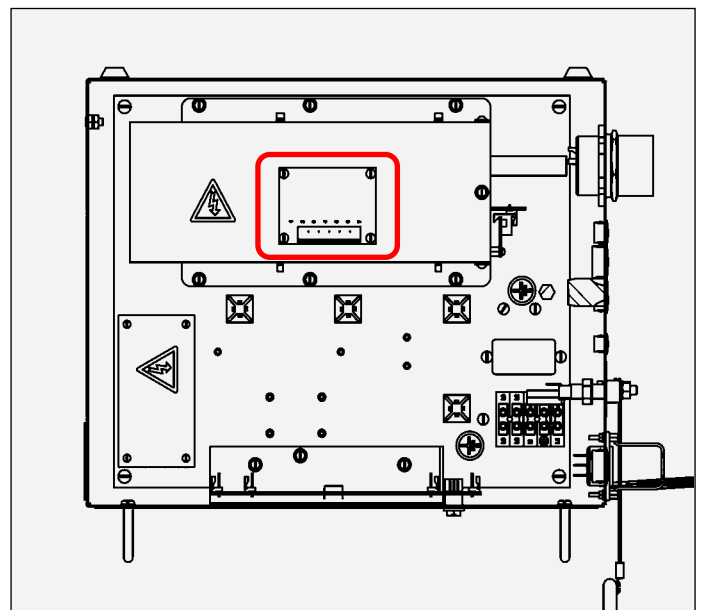
Before troubleshooting, ensure that the power supply is plugged into a live outlet of appropriate voltage. All electrical measurements in the "Troubleshooting Guide" are nominal and may vary as much as $\pm 10\%$ depending on the test conditions and the test equipment used. Refer to Figure 17 for location of parts called out in the "Troubleshooting Guide".

For bench testing, jumper J8 should be used to trigger the high voltage output (see "KV Test Jumper" previously discussed in this section).

Diagnostic LED's

There a single diagnostic LED located on the main power supply 1PS. It is a flashing red LED that indicates the pc board is running.

There are two diagnostic LED's located on the relay board, position shown below. LED1 is a green LED that indicates 24 VDC input is being received from the power supply, and should be lit whenever the power supply ON/OFF switch is ON. LED2 is a red LED that indicates 24 VDC is being output to the gun motor. LED2 should be lit whenever the gun on-off switch is turned ON.



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	Possible Cause	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.	Check for loose wiring between the pc board connector and the high voltage section by pulling on each wire. Repair if necessary. Insure both connectors are secure and re-test for CF fault.
		Replace high voltage section.
		Send entire unit in for repair.
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.	Check for loose wiring between the pc board connector and the high voltage section by pulling on each wire. Repair if necessary. Insure both connectors are secure and re-test for GF fault.
		Replace high voltage section.
		Send entire 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.	Check connections using two finger pull test to ensure they are connected.
		Replace the pc board.
Boot Fault (bF) while painting	A Boot Fault while painting indicates the pc board re-booted due to a high voltage arc in the system. The location of the arc could be in the gun (due to a connection problem) or in the power supply cascade.	To determine if the problem is in the power supply, use a different gun (if available). If the arcing is determined to be in the control unit, send it in for repair. If the arcing is in the gun, refer to the latest handgun manual AH-13-01 for testing and inspection procedures for the shaft resistor and in-line resistor.
		Send entire system in for repair, gun and control unit.
Boot Fault (bF) during startup	The Boot Fault indicates that the microprocessor has detected the gun on-off switch in the on position during the start-up sequence.	Turn off the gun on-off switch. Turn off the voltage controller, turn the gun on-off switch to the "off" position, turn on the voltage controller and wait for 000 µA on the display.
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 for the 80102-21X units is set to 140 µA.	This may indicate the paint conductivity is too high (resistance too low) or the outside of the applicator is contaminated with paint.

(Continued On Next Page)



FAULT TROUBLESHOOTING GUIDE (Cont.)

Fault	Possible Cause	Solution
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.	<p>Clean outside of the applicator.</p> <p>Replace barrel or applicator.</p> <p>Send applicator in for repair.</p>
Feedback Fault (FF)	The Feedback Fault indicates there is no current feedback or it is incorrect. It typically occurs with the high voltage on.	<p>Securely attach a ground wire to the applicator electrode.</p> <p>Set the high voltage to maximum and short the KV test jumper.</p> <p>The current reading on the control unit should rise up to the maximum current output. If it does not, send the applicator in for repair.</p>
Voltage Cable Fault (UC)	The Voltage Feedback Fault indicates the cascade drive signal is not present. It typically occurs when high voltage is triggered.	<p>Turn off the voltage controller and remove the high voltage cable from the voltage controller.</p> <p>Turn on the power and place a jumper across the KV Test Jumper. If the fault occurs, send the voltage controller in for repair. If no fault occurs, replace the high voltage cable.</p>

GENERAL TROUBLESHOOTING GUIDE

General Problem	Possible Cause	Solution
<i>Black Display when from panel switch is turned to the “ON” position.</i>	No AC power present	Ensure voltage across terminals L1 and N of terminal block 1TB is between 90 and 264 VAC.
	Blown or Defective Fuse	Replace blown/defective fuse
	Connector 7PL not properly plugged into main PC board	Properly attach connector.
	Improper input line voltage	Verify connection to the voltage across terminals L2 and N of 1TB is between 90 and 264 VAC.
	Defective ON/OFF switch 1SW	Voltage across terminals 1A and 2A of ON/OFF switch 1SW should be between 90 and 264 VAC. If not, replace switch 1SW.
	Defective power supply 1PS	Voltage across terminals 2 and 3 of plug 7PL on main PC board should be 24 VDC. If not, replace power supply 1PS.
<i>Motor Rotating, But No Or Low kV Output At Spray Gun</i>	Defective spray gun or high voltage cable.	Perform a Current Output Test on the power supply. If proper readings are obtained, check cable or spray gun for cause. (See Spray Gun’s Service Manual.)
	Loose or broken wire in power supply.	Check all wiring connections for integrity. Repair wiring as needed.
	Main PC board defective.	If spare board present, replace board or Send <u>entire</u> unit in for repair.
	Defective high voltage multiplier.	Send <u>entire</u> unit in for repair.

(Continued On Next Page)



TROUBLESHOOTING GUIDE

General Problem	Possible Cause	Solution
Front Panel Display On, Gun Switch On, No kV at Gun, Motor Not Rotating	Defective spray gun or high voltage cable.	Test gun switch and cable (See Spray Gun's Service Manual).
	The connectors J2 and J3 on the PC Mainboard or the connection 2TB-1 not be properly attached to their respective locations.	Properly attach connector J3 and verify that trigger input line is connected into the 5th position from bottom of case. Verify continuity between 1CON-3 and J3-5 (See Figure 18). Properly attach J2 and verify continuity between 1CON-2 and J2-3 as well as J2-2 and 2TB-1(B).
	Loose or broken wire in power supply.	Perform a Current Output Test on the power supply. If proper readings are obtained, check cable or spray gun for cause. (See Spray Gun's Service Manual.)
	Main PC board defective.	Check all wiring connections for integrity. Repair wiring as needed. Send <u>entire</u> unit in for repair.
Excessive Current Draw	Short in cable or gun	Remove cable from power supply. If problem goes away, check gun or cable for cause.
	Defective main PC board	Replace high voltage multiplier.
	Defective high voltage multiplier	
Excessive Shocking	Discontinuity in ground circuit	Perform the Ground Test Procedure as describe in the "Maintenance" section of this manual.

SERVICE LEVEL

Personnel who service this unit must be qualified electronics technicians. Replacement parts are designed to be made at the assembly level. See “Parts Identification” section of this manual for part numbers and ordering information.

⚠ WARNING

- **ALWAYS** turn power to the power supply **OFF**, unplug the electrical cord from its outlet, remove the front panel fuse, and lock the power supply out before making repairs or replacements.

⚠ CAUTION

- **DO NOT** attempt to make repairs to the printed circuit board!
- **DO NOT** attempt to make repairs beyond those described. All others should be made **ONLY** by Ransburg service personnel.

REPLACEMENT PROCEDURES

Before making replacements, check for defective wiring or connections between the affected components. If there is a broken wire, defective insulation, or dirty, loose or corroded connections, repair or replace them before going to the expense of replacing a component.

Fuses 1FU & 2FU

1. Insert screwdriver into slot into the respective fuse holder, push in, and rotate counter-clockwise.
2. Remove screwdriver and fuse holder will slide out.
3. Remove fuse from fuse holder and replace with new fuse (See “Parts Identification” section of this manual for part numbers).

NOTE

- Two (2) spare fuses, included from the factory, are located on the inside of the top lid of the cabinet.

4. Insert fuse holder back into front panel and with a slight inward pressure, rotate screwdriver clockwise until it locks into place.
5. Secure cabinet lid and plug power supply back in.

ON/OFF Switch 1SW

1. Ensure power supply is unplugged from AC outlet and open cabinet lid.
2. Remove the four quick connect terminals from the rear of ON/OFF switch 1SW.

⚠ WARNING

- **ALWAYS** double check that the power supply is unplugged from its AC outlet before working with any internal wiring.

3. Press panel retaining clips on top and bottom of switch 1SW together and push switch out of panel from the inside.

NOTE

- It is recommended that the four ON/OFF switch wires be tagged with their respective terminal connections to 1SW before removing.

4. Press new switch (See “Parts Identification” section of this manual for part numbers) into panel opening with terminals 1A and 2A to the bottom of the cabinet.
5. Reconnect the four quick connect terminals to the new switch as follows:

From	To
1LF-RED or BLACK	1SW-1
1LF-BLUE	1SW-2
2TB-3	1SW-1A
2TB-4	1SW-2A

6. Secure cabinet door and plug power supply back in.

High Voltage Multiplier

1. Remove HV cable from power supply.
2. Ensure power supply is unplugged from AC outlet and open cabinet lid.

3. Unplug connector 3PL from the top of the high voltage multiplier oscillator and 4PL from relay board.
4. Remove the screws that mount the high voltage multipliers' aluminum housing to the bottom panel.
5. Remove the high voltage multiplier assembly out from the power supply.
6. Remove the (3) screws that secure the aluminum housing to the high voltage multiplier.
7. Install the aluminum housing on the new high voltage multiplier (See "Parts Identification" section of this manual for part numbers). Ensure connector faces the front of the housing before installing.
8. Install the high voltage multiplier assembly in the power supply by securing the (6) mounting screws to the back panel.
9. Attach connector 3PL back into the high voltage multiplier oscillator and 4PL into the relay board.
10. Secure the cabinet lid and plug the power supply back in.
11. Reinstall HV cable.

Main PC Board

WARNING

► Main PC Board failure is typically due to arcing somewhere in the system, indicated by "bF" faults during painting. Replacing the pc board without finding the root cause will result in failure of the replacement pc board.

1. Ensure power supply is unplugged from AC outlet and open cabinet lid.
2. Disconnect plugs/connectors J7, J3, J2, and J1 from main PC board. (see Figure 18).

3. Remove (3) screws from heat sink base and lift the PC board out.
4. Insert new PC Board (See "Parts Identification" section of this manual for part numbers) and secure the (3) heat sink screws.
5. Reconnect plugs J7, J3, J2, and J1.
6. Secure the cabinet lid and plug the power supply back in.

Power Supply 1PS

1. Ensure power supply is unplugged from AC outlet and open cabinet lid.
2. Remove the (4) screw from the 1PS cover plate and remove the plate.

WARNING

► ALWAYS double check that the power supply is unplugged from its AC outlet before removing the cover plate from power supply 1PS.

3. Remove connectors 1PL and 2PL from power supply 1PS.
4. Remove the (4) cover plate standoffs from power supply 1PS and remove the power supply from the unit.
5. Install new 1PS power supply (See "Parts Identification" section of this manual for part numbers) using the (4) cover plate standoffs. Ensure larger terminal strip (2PL) of power supply 1PS faces the front of unit as shown in Figure 17.
6. Connect connectors 1PL and 2PL to new power supply and reinstall cover plate.
7. Secure cabinet door and plug power supply back in.

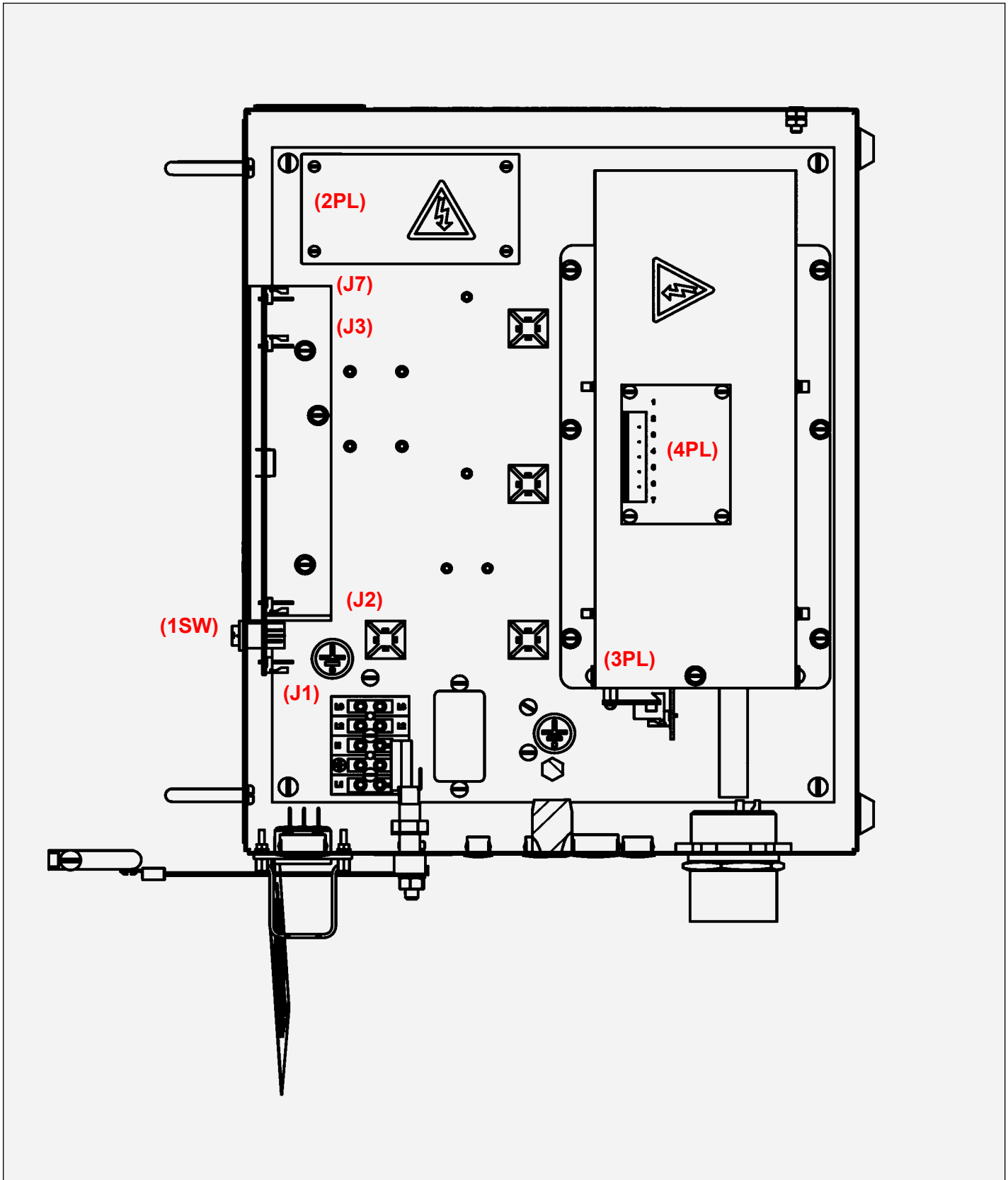


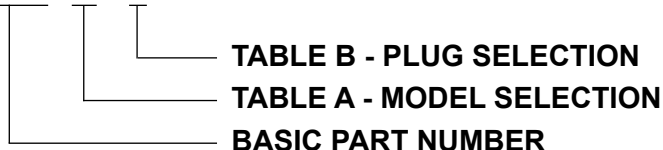
Figure 18: 9060 (80102-21X) Internal Component Locations

PARTS IDENTIFICATION

9060 HIGH VOLTAGE CONTROLLER MODEL IDENTIFICATION*




When ordering, use 80102-A1B as indicated by Table A and B.
Three digits must follow the basic part number, for example:

80102 - 2-1-X



* 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	No. 2 Process Gun - Electric Motor

TABLE "B" - PLUG SELECTION		
Dash No.	Description	
1	Domestic	
2	European	
3	China	

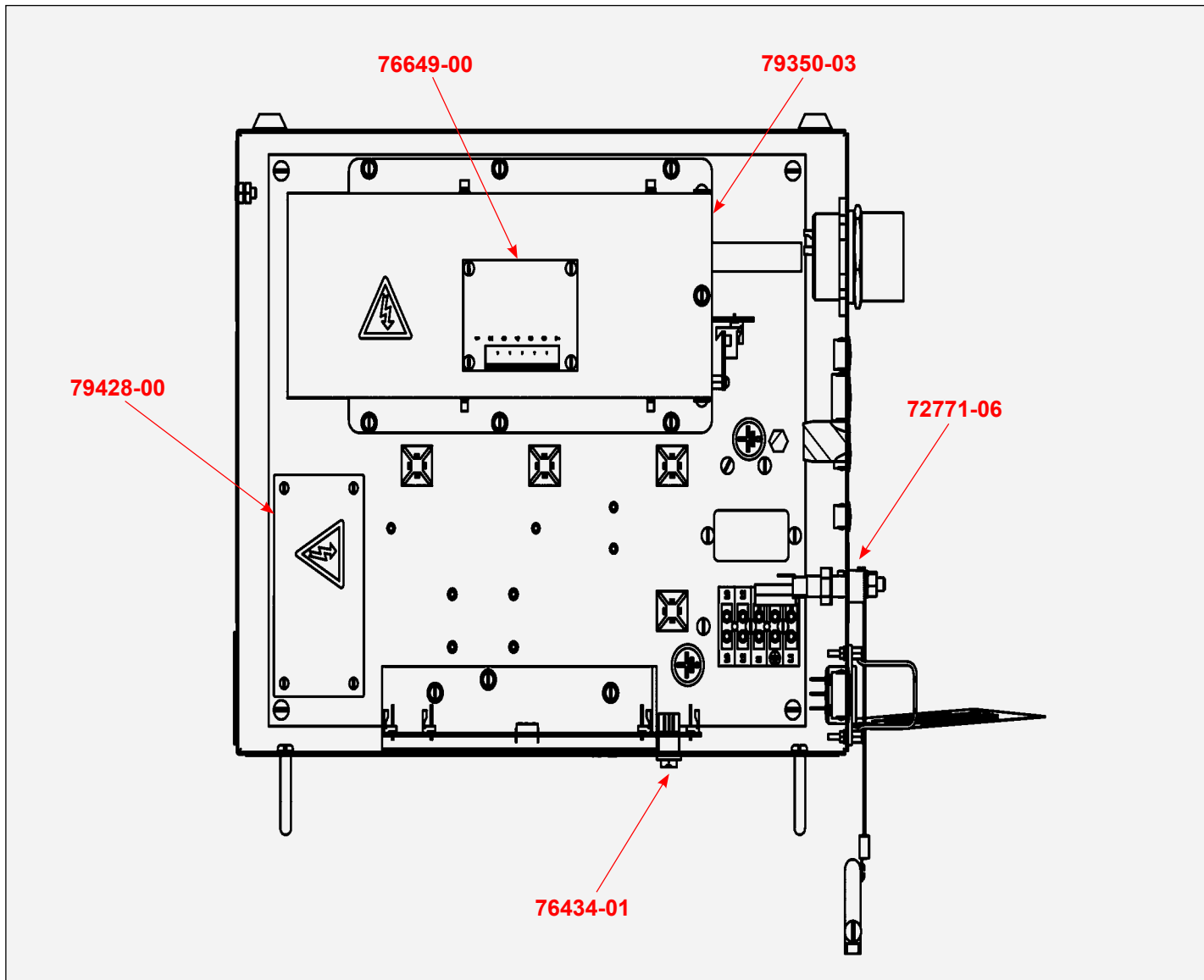


Figure 19: Parts Identifications

9060 HIGH VOLTAGE CONTROLLER - PARTS LIST

Part #	Description
72771-06	Fuse (250V, 1A, 5mm x 20mm)
76434-01	Switch, Rocker (On-Off Switch)
	9060 High Voltage Controller PC Mainboard - repeated arcing will cause damage to the pc board. The control unit must be sent in for repair to rectify the root cause of the pc board failure.
79428-00	Power Supply, 24V (24VDC Power Supply 1PS)
19370-XX	Cable Assembly, Superflex, (XX denotes cable length) (not shown)
79350-03	9060 High Voltage Cascade Sub Assembly

9060 HIGH VOLTAGE CONTROLLER - ACCESSORIES LIST

Part No.	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)
LSCH0009	Dielectric Grease (.88 oz tube)
76453-00	Conduit Adapter Kit
20868-00	120 Volt Circuit Tester

MANUAL CHANGE SUMMARY

CP-13-03-R5 - Replaces CP-13-02-R4 with the following changes:

No.	Change Description	Page(s)
1.	Update to newest manual design.	All
2.	Changed trigger signal description.	15
3.	Changed block diagram to include relay board.	16
4.	Modified "Resetting Faults" instructions.	18
5.	Removed references to external cascade.	19, 25
6.	Changed description of "bF" faults.	21
7.	Change to "Diagnostic LED's" section to include relay board LED's.	23
8.	Addition of "bF while painting" troubleshooting section.	24
9.	Changed instructions to remove main pc board , added "bF" fault note and unplugging relay board.	29
10.	Modified figure 18	30
11.	BOM change to add relay board, remove main pc board part number modified figure 19.	32

WARRANTY POLICY

This product is covered by Carlisle Fluid Technologies' materials and workmanship limited warranty. The use of any parts or accessories, from a source other than Carlisle Fluid Technologies, will void all warranties. Failure to reasonably follow any maintenance guidance provided, may invalidate any warranty.

For specific warranty information please contact Carlisle Fluid Technologies.

For technical assistance or to locate an authorized distributor, contact one of our international sales and customer support locations.

Region	Industrial / Automotive	Automotive Refinishing
Americas	Tel: 1-800-992-4657 Fax: 1-888-246-5732	Tel: 1-800-445-3988 Fax: 1-800-445-6643
Europe, Africa Middle East, India	Tel: +44 (0)1202 571 111 Fax: +44 (0)1202 573 488	
China	Tel: +8621-3373 0108 Fax: +8621-3373 0308	
Japan	Tel: +81 45 785 6421 Fax: +81 45 785 6517	
Australia	Tel: +61 (0) 2 8525 7555 Fax: +61 (0) 2 8525 7575	

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