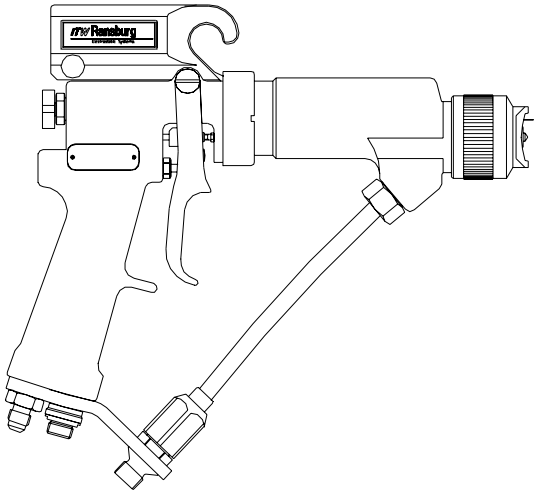
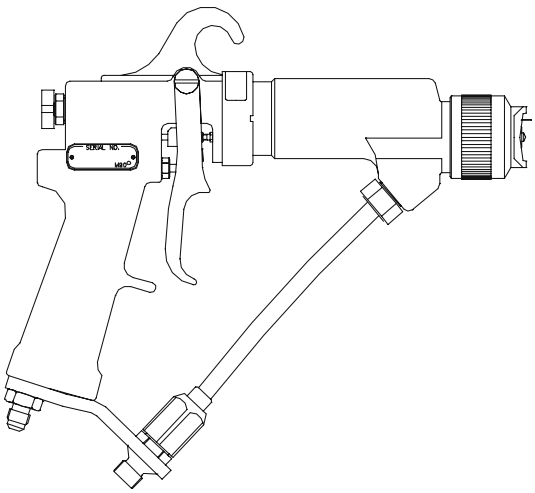
Ransburg

SERVICE MANUAL
AH-99-01.3
(Replaces AH-99-01.2)

M90 HANDGUNS





MODELS:

77073 FOR STANDARD 9040 / AVIATOR / MGS
77132 FOR STANDARD 9040 CLASSIC

CE

FM APPROVED

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: $30.00 (U.S.)

NOTE: This manual has been changed from revision **AH-99-01.2** to revision **AH-99-01.3**. Reasons for this change are noted under “Manual Change Summary” inside the back cover of this manual.

CONTENTS

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SAFETY

SAFETY PRECAUTIONS

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

⚠ WARNING

➤ The user **MUST** read and be familiar with the Safety Section in this manual and the ITW 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

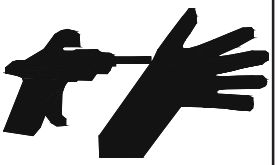
➤ The hazards shown on the following page may occur during the normal use of this equipment. Please read the hazard chart beginning on page 2.

AREA Tells where hazards may occur.	**HAZARD** Tells what the hazard is.	**SAFEGUARDS** Tells how to avoid the hazard.
Spray Area 	Fire Hazard Improper or inadequate operation and maintenance procedures will cause a fire hazard. 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 shutdown indicates a problem in the system requiring correction.	Fire extinguishing equipment must be present in the spray area and tested periodically. Spray areas must be kept clean to prevent the accumulation of combustible residues. Smoking must never be allowed in the spray area. The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance. When using solvents for cleaning: Those used for equipment flushing should have flash points equal to or higher than those of the coating material. Those used for general cleaning must have flash points above 100°F (37.8°C). 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. Electrostatic arcing must be prevented. Test only in areas free of combustible material. Testing may require high voltage to be on, but only as instructed. 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. The paint process and equipment should be set up and operated in accordance with NFPA 33, NEC, and OSHA requirements.
Toxic Substances 	Certain material may be harmful if inhaled, or if there is contact with the skin.	Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer. Adequate exhaust must be provided to keep the air free of accumulations of toxic materials. Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Explosion Hazard / Incompatible Materials 	Halogenated hydrocarbon solvents, for example: methylene chloride and 1,1,1, - Trichloroethane, are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.	Aluminum is widely used in other spray application equipment - such as material pumps, regulators, valves, etc. Check all other equipment items before use and make sure they can also be used safely with these solvents. 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 material supplier. Any other type of solvent may be used with aluminum equipment.
Electrical Equipment 	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. Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation. Frequent power supply shutdown indicates a problem in the system which requires correction. An electrical arc can ignite coating materials and cause a fire or explosion.	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. (Exception: AVIATOR series guns) Refer to NFPA 33. Turn the power supply OFF before working on the equipment. Test only in areas free of flammable or combustible material. Testing may require high voltage to be on, but only as instructed. Production should never be done with the safety circuits disabled. Before turning the high voltage on, make sure no objects are within the sparking distance.

AREA Tells where hazards may occur.	**HAZARD** Tells what the hazard is.	**SAFEGUARDS** Tells how to avoid the hazard.
Spray Area 	Electrostatic Arcing	Never operate the spray gun without properly grounding the following. A. Operators Operators must be grounded. Rubber soled insulating shoes should not be worn. Grounding leg straps may be used. Operators must maintain contact with the handle of the gun. If work gloves are used, the palm section should be cut out. Operators must remove from themselves all metal objects that are not grounded. **NOTE:** REFER TO NFPA 33 REGARDING OPERATOR GROUNDING. B. Parts being sprayed. Resistance between the part and a grounded conveyor must not exceed 1 megohm. C. Every metal and conductive object in the spray area. This includes the booth, parts hangers, fire extinguishers, conductive flooring, etc. Grounded conductive flooring must be provided in the spray area. Turn off voltage at the power supply before flushing out, cleaning, or removing any parts from the gun. Never install a spray gun into a fluid system using an isolated solvent supply. Do not touch gun electrode while gun is energized.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
General Use and Maintenance	Improper operation or maintenance may create a hazard. Personnel must be properly trained in the use of this equipment.	Personnel must be given training in accordance with the requirements of NFPA 33. Instructions and safety precautions must be read and understood prior to using this equipment. Comply with appropriate local, state, and national codes governing ventilation, fire protection, operation maintenance, and housekeeping. Reference OSHA, NFPA 33, and your insurance company requirements. Always turn power to the power supply OFF, unplug the electrical cord from its outlet, and remove the front panel fuse, before opening the power supply door. If necessary, lock the power supply out so that it cannot be turned ON until the work is finished. Whenever removing high voltage cables from equipment, ground the contact end of the cable by holding the cable such that the contact touches earth ground for several seconds. Do not touch the contact until it has been grounded. This will reduce the possibility of residual charge causing electrical shock. The High Voltage Multiplier Assembly contains energy storage components that can cause serious shock injury, and therefore is not field repairable. Warranty will be voided if the High Voltage Multiplier seal is broken. If the High Voltage Multiplier is defective contact your authorized ITW Ransburg representative for exchange or repair. The High Voltage Multiplier and high voltage cable contain significant capacitance that will store charge. Allow approximately 10 seconds for this charge to bleed off before opening the cabinet door or removing the high voltage cable from the power supply or spray gun.

AREA Tells where hazards may occur.	**HAZARD** Tells what the hazard is.	**SAFEGUARDS** Tells how to avoid the hazard.
General Use and Maintenance	Use of hand tools may cause cumulative trauma disorders (CTD's). CTD's or musculoskeletal disorders, involve damage to the hands, wrists, elbows, shoulders, neck and back. Carpal tunnel syndrome and tendinitis (such as tennis elbow or rotator cuff syndrome) are examples of CTD's. CTD's when using hand tools, tend to affect the upper extremities. Factors which may increase the risk of developing a CTD include: 1. High frequency of the activity. 2. Excessive force, such as gripping, pinching or pressing with the hands and fingers. 3. Extreme or awkward finger, wrist or arm positions. 4. Excessive duration of the activity. 5. Tool vibration. 6. Repeated pressure on a body part. 7. Working in cold temperatures.	Risk is reduced by avoiding or lessening the listed hazards. CTD's can also be caused by such activities as sewing, golf, tennis and bowling, to name a few. Pain, tingling, or numbness in the shoulder, forearm, wrists, hands, or fingers, especially during the night, may be early symptoms of a CTD. Do not ignore them. Should you experience any such symptoms, see a physician immediately. Other early symptoms may include vague discomfort in the hand, loss of manual dexterity, and nonspecific pain in the arm. Ignoring early symptoms and continued repetitive use of the arm, wrist and hand can lead to serious disability.
Personnel Safety / Fluid Injection Hazard (High Pressure Equipment) 	Fluid Injection Injury	Never let any part of the body come in direct contact with the fluid stream exiting from the nozzle. If fluid leaks occur in the gun or in the fluid delivery components, depressurize fluid system before servicing. Never aim the applicator at any part of the body under any circumstances. If you are injured by high pressure fluid injection, immediate medical treatment must be sought.

NOTES:

INTRODUCTION

GENERAL DESCRIPTION

The Ransburg Electrostatic Mix Process

This is a combined air/airless method for electrostatically applying coatings to objects. The M90 system applies a high voltage DC charge to the applicator electrode, creating an electrostatic field between the electrode and the grounded target. The target is electrically grounded through its support which may be either stationary or moving.

A regulated high pressure fluid system delivers coating material to the fluid nozzle and is atomized by passing through an orifice under pressure. The atomized spray particles become electrically charged under the influence of the electrostatic field surrounding the nozzle. The air supply to the gun aids in shaping the coating material into a desired pattern. The charged particles are attracted to and deposited on the target object. The forces between the charged particles and the grounded target are sufficient to turn most normal overspray around and deposit it on the back surface of the target. Therefore, a high percentage of the coating is deposited on the target.

A control unit provides either manual or automatic operation of the equipment. Controls normally include, but are not limited to, fan and conveyor interlocks and a protective current overload device.

M90 Handguns (Cascade / Classic)

The M90 Hand Gun applies a negative 85 kV DC charge to the coating materials at the point of atomization. This electrostatic charge allows a more efficient, uniform application of coating to the front, edges, sides, and back of products. The M90 system is highly suitable for applying coatings to a variety of surface configurations; large targets, small parts, tubular wares, concave and recessed parts, etc. Because it is a grounded fluid system, it is highly suitable for applying a wide range of solvent reduced coatings such as enamels, lacquers, epoxies, etc.

The M90 Handgun system includes the Handgun, Cable, Air and Fluid Hoses, and a Control Unit.

The Cascade Control Unit provides low voltage output to the gun and contains controls for AC on/off, high voltage adjust, kV and microamp meter.

The Classic Control Unit provides high voltage output to the gun and contains controls for AC on/off, high voltage adjust, kV and microamp meter.

M90 with Aviator

The M90 may be used with the Aviator power generator in hazardous locations. This equipment meets Class 1, Division 1, Group D hazardous location requirements. This allows moving the M90 power source inside most spray booths or areas where the standard control unit may not be conveniently located. Examples are airplane hangers, etc.

SPECIFICATIONS

Environmental / Physical

Gun Length:	10 inches
Weight:	32 ounces (Cascade) 29 ounces (Classic)
Hose & Cable Lengths:	36 ft (Optional: 50, 75, and 100 ft)
Atomizer Assembly:	77080-xxxx (See Figure 3: Nozzle Selection Guide)

Electrical

Operating Voltage:	85 kV maximum
Current Output:	
Cascade:	90 microamperes maximum
Classic:	200 microamperes maximum
Paint Resistance:*	.1 MΩ to ∞

*(Use Model No. 76652, Test Equipment)

Part Sprayability:	Determine sprayability of part to be coated using 76652, Test Equipment (see TE-98-01).

Mechanical

Fluid Pressure:	0-2800 psi (maximum)
Fluid Flow Rate:	Variable to 1,500 cc/minute
Air Pressure:	0-100 psi (maximum)

NOTES:

INSTALLATION

⚠ WARNING

► Install and route the hoses and cable so they are **NOT** exposed to temperatures in excess of 120°F and so that all hose bends are **NOT LESS** than a 6 inch (15 cm) radius. Failure to comply with these guidelines could cause equipment malfunctions that might create **HAZARDOUS CONDITIONS!**

⚠ WARNING

► **NEVER** wrap the applicator, associated valves and tubing, and supporting hardware in plastic to keep it clean. A surface charge may build up on the plastic surface and discharge to the nearest grounded object. Efficiency of the applicator will also be reduced and damage or failure of the applicator components may occur. **WRAPPING THE APPLICATOR IN PLASTIC WILL VOID WARRANTY.**

This information is intended ONLY to indicate general installation guidelines of this product and its working relationship to other ITW Ransburg system components. Each installation is unique and should be directed by an ITW Ransburg representative.

SAFE INSTALLATION

- Ground the spray booth, the paint supply, and the conveyor or work support.
- Ground all solvent and waste safety containers.
- Ground all work holders and hooks and keep them free of paint.
- Ground the target object to a structural ground and not back to the applicator system. Ensure that all target objects have a resistance to ground of one megohm or LESS.
- Ensure that all elements of the coating system are correctly grounded, connected, and located.
- Position all non-approved electrical apparatus (including, but not limited to, high voltage power supplies, fluid pumps, and air compressors) outside of the hazardous location. See the appropriate NFPA and/or OSHA guidelines for your application and equipment.
- Provide appropriate fire extinguishing equipment.
- Provide conductive flooring in all spray areas.
- Follow all NFPA guidelines.

TYPICAL M90 CASCADE HANDGUN INSTALLATION

Connect the low voltage cable to the control unit low voltage socket. Gently hand tighten the cable retaining nut. Connect the other end of the low voltage cable to the handgun, using a wrench to tighten.

⚠ CAUTION

► **DO NOT** overtighten the low voltage cable connection to the handgun. Damage to plastic parts may occur.

The control unit may be connected through conduit with an explosion-proof switch on or near the spray booth where it will be convenient to the operator, or may be connected with a power cord depending upon application requirement.

NOTE

► Refer to the control unit service manual for the circuit diagram and instructions to connect the control unit.

⚠ WARNING

➤ The control unit MUST be located at least three feet outside of the spray area. Install units in accordance with the code requirements. (See NFPA 33, 70, OSHA and local codes.)

NOTE

➤ The Aviator power generator may be located within the hazardous area.

⚠ WARNING

➤ Verify that the gun handle is actually grounded before operating it! This is done with a fully connected and operational system, by placing one lead of an ohmmeter to the handle and the other to the building electrical ground (cold water pipe, building structure, steel, etc.). They should be essentially zero.

➤ If a greater reading is obtained, check that the control unit is grounded. (See the control unit manual for grounding procedure.)

TYPICAL M90 CLASSIC HANDGUN INSTALLATION

Connect the high voltage cable to the control unit high voltage socket. Gently hand tighten the cable retaining nut. Connect the other end of the high voltage cable to the handgun, using an Allen wrench to tighten the set screw in the gun handle.

Connect the air hose to the inlet of the flow switch on the control unit. Connect the outlet of the flow switch with air hose to the handgun using a wrench.

The control unit may be connected through conduit with an explosion-proof switch on or near the spray booth where it will be convenient to the operator, or may be connected with a power cord depending upon application requirement.

NOTE

➤ Refer to the control unit service manual for the circuit diagram and instructions to connect the control unit.

⚠ WARNING

➤ The control unit **MUST** be located at least three feet outside of the spray area. Install units in accordance with the code requirements. (See NFPA 33, 70, OSHA and local codes.)

FILTERS

Install an air filter assembly onto the factory air.

⚠ CAUTION

➤ An air filter **MUST** be installed to prevent contamination of the coating material by the shaping air.

LINE HOSE - AIR

ITW Ransburg supplies a standard 36 foot hose. Optional hose lengths of 50, 75, and 100 feet are available.

LINE HOSE - FLUID

ITW Ransburg supplies a standard 36 foot hose. Optional hose lengths of 50, 75, and 100 feet are available. ITW Ransburg offers this hose ONLY as a complete assembly to ensure that the hose is properly grounded at each end fitting.

OPERATION

SAFE OPERATION

- Ground all operators by requiring that they hold the gun handle with a bare hand.
- Ground operators and all other persons in spray areas by requiring that they wear conductive soled shoes or grounding straps.
- Have exhaust fans operating while spraying.
- Exhaust fans must be interlocked with the control unit or Aviator.
- See that no more than one gallon of solvent per safety container per operator is inside of the hazard location.
- If ANY symptom of improper operation occurs, suspend use of the unit until the problem has been diagnosed and corrected. See Figure 1 "Troubleshooting Guide" or contact your authorized ITW Ransburg representative.
- Ground MUST be maintained during the addition of fluid to any supply container! Whenever transferring flammable fluid from one container to another, both containers MUST be properly connected to a proven ground first and then to each other. Personnel executing such a transfer MUST also be grounded.
- A chemical reaction, resulting in the possibility of a pressure EXPLOSION, may occur if 1, 1, 1-Trichloroethane, Methylene Chloride, or other Halogenated Hydrocarbon Solvents are used in PRESSURIZABLE FLUID SYSTEMS having ALUMINUM or GALVANIZED WETTED PARTS. Such an explosion could cause DEATH, serious BODILY INJURY and/or substantial property damage. Consult your fluid supplier to determine the chemical content of your solvents. (See SL-81-05 "HHC Explosion Hazard Danger Sign" and SL-81-08 "Halogenated Hydrocarbon Safety Bulletin".)
- Never flush the gun with solvent while electrostatics are on. Failure to turn off electrostatics while flushing may cause an IGNITION HAZARD.

THE RIGHT TECHNIQUE

Following are some basic electrostatic spray techniques. Depending on the spray target, it may be necessary to adjust the technique.

Spray Width Determination

The size of the object being coated is the determining factor in adjusting the spray pattern. The larger the object, the larger the required pattern width. This is accomplished by fluid nozzle selection. Air adjustment is used to remove "tails" from the spray pattern.

NOTE

► The degree of atomization is dependent on the viscosity of the paint formulation, the applied fluid pressure, and nozzle selection.

Gun to Target Distance

The distance between the gun and the target influences the appearance of the final finish of the object. If the gun is held too close (under 4 inches), runs and sags with excessive "bounce-back" may occur. If the gun is held too far from the object, the electrostatic attraction is decreased. Normally, the best spacing between gun and target is in the 6 to 12 inch area.

⚠ CAUTION

➤ The object being coated is maintained at ground potential. The spray gun operator is also grounded, therefore, the operator has as much attraction for the electrostatic paint as the object. To prevent "wrap-back" always keep the gun nozzle closer to the target than to the operator.

Overlap

For the best "hiding" and uniformity of film thickness, the stroke overlap should be approximately 50%. There should be some overlap at edges of the part to increase edge coverage. Overlap requirements may vary widely with different paint formulations and different compositions of objects being coated.

Triggering

Gun triggering (ON/OFF) depends largely on the desired results (the amount of wraparound required, edge coating, etc.). If the front and back of the object are being coated, proper gun technique can edge coat in some instances without making a specific pass for that purpose. Triggering the gun before the target is directly in front of the gun may cause heavy edge buildup on the leading edge of the target due to the electrostatic attraction.

PREPARATION

Paint

A selection of the proper paint mixture is essential to electrostatic operation. Paint test equipment may be obtained through your ITW Ransburg representative. (See IL-259 "REA, REM, & M90 - Paint Related Information" for paint formulation.) For further paint formulation and test procedures, consult your ITW Ransburg representative and/or your paint supplier.

Fluid Nozzle

Because of the design of the M90 applicators, the fluid nozzle precision is paramount to proper function. ITW Ransburg makes every effort to assure that all production of this part will meet the critical design standards necessary for all applications.

The selection of the best nozzle to apply a given coating to a specific article with maximum efficiency is not an exact science. Testing is usually necessary and wide experience with many types of coating applications helps. Your ITW Ransburg representative uses such experience and actual laboratory testing when recommending a nozzle for your application needs.

However, if parts, paints, or conveyor speeds are changed, a different nozzle may be required for best results. The following discussion and guide will assist the user in making their own nozzle selection whenever it becomes necessary. Selection should always be verified by actual tests to determine optimum efficiencies.

Refer to Figure 2 "Nozzle Selection Guide" for the choice of spray width and spray characteristics appropriate to the size and type of target. The maximum nozzle flow capacity depends on: the orifice size, the fluid pressure, the paint viscosity, and the spraying temperature. Always remember, for maximum paint economy any nozzle selected should always be operated at the lowest fluid pressure, which will give good atomization and the required flow rate.

⚠ CAUTION

➤ ITW Ransburg recommends the use of a fluid filter to reduce nozzle clogging.

MAINTENANCE

Good preventive maintenance is essential for safe and productive operation. Schedules should be established by the user, based on the following general information and observations of the initial production requirements. The ITW Ransburg maintenance and safety information should be made available to each operator.

Normal fire protection measures are necessary, including proper storage of paints and solvents and proper disposal of waste. Ready access to appropriate fire extinguishing equipment is required. For details, consult the appropriate ITW Ransburg and/or NFPA safety information, your local fire codes, local painting equipment standards, and the OSHA Act of 1970 as well as your insurance carrier's recommendations.

SAFE MAINTENANCE

- The user **MUST** read and be familiar with the "Safety" section in this manual and the ITW Ransburg safety literature therein identified.
- Routine management, care, and maintenance of the system is essential to ensure quality finishes, eliminate rejects, and reduce service requirements.
- Turn the control unit off prior to cleaning or servicing the equipment.
- Never immerse any part of, or all of an assembled applicator in any liquid.
- Periodically strip all workholders to maintain proper grounding of parts.
- Establish adequate cleaning and maintenance schedules based on observation of the initial production requirements.
- Employ fire protection measures, including proper storage of paints, solvents, and waste.
- The integrity of the system ground MUST be inspected regularly and maintained. (See IL-247 "Operating Your Electrostatic Coating System Safely".)

⚠ WARNING

► The user **MUST** read and be familiar with the safety instructions in this manual.

► If compressed air is used in cleaning, **REMEMBER** that high pressure air can be dangerous and should **NEVER** be used against the body**.** It can blind, deafen, and may even penetrate the skin. If used for cleaning equipment, the user should wear safety glasses.

► **ALWAYS** turn the control unit's power off or the supply air to the AVIATOR off prior to cleaning and servicing the equipment.

► **DO NOT** operate a faulty gun!

► Using applicators as solvent spray nozzles to clean other equipment or products, even without high voltage present, creates a fire or explosion hazard if ground integrity is broken. **NEVER** use an electrostatic applicator to spray solvent for any reason except to flush the applicator and **ONLY WHEN THE HIGH VOLTAGE IS OFF!** Always use the minimum amount of solvent to flush the applicator. Always flush into an approved, grounded container and be sure that both the applicator and operator are securely grounded.

► There is an **INJECTION HAZARD** with **ALL** hydraulically fed applicators. They will cause serious injury if fluid penetrates the skin. If injection should ever occur, seek medical treatment immediately.

► **Do not** place any part of the body in the path of the spray!

► **Do not** point the gun at any person!

► **Always** set the trigger stop lever to prevent accidental triggering of the gun.

SUITABLE SOLVENTS FOR CLEANING M90 HANDGUNS

When cleaning the M90 handgun, a suitable solvent for cleaning depends on the part(s) of the gun to be cleaned and the material that needs to be removed. ITW Ransburg recommends that all exterior cleaning be done with nonpolar solvents to prevent a conductive residue on critical components. We also understand that some of these solvents do not always meet the cleaning needs of some materials. If conductive polar solvents are used to clean the gun components, all residues must be removed using a nonconductive nonpolar solvent (i.e. high flash naphtha). If there are any questions as to what solvents are best for cleaning, contact your local ITW Ransburg distributor and/or your paint supplier.

The M90 handgun, air hoses, fluid hoses, and low voltage/high voltage cable assemblies should not be submerged or soaked in solvent. However, the outer surface of these items can be wiped with a suitable solvent. When the gun is disassembled into individual components, some of these items may be soaked in a suitable cleaning solvent. The items that cannot be soaked are noted throughout this manual. All o-ring and electrical components cannot be cleaned or soaked in any solvents.

⚠ WARNING

► **ENSURE** the power is **OFF** and the system is grounded before using solvent to clean **ANY** equipment.

► When using cleaning solvent, standard health and safety precautions should apply.

► Cleaning of the exterior surfaces of the handgun should be done with nonpolar solvents. If cleaning requires the use of polar solvents, the handgun should be wiped down with nonpolar solvent prior to going back into use.

ROUTINE SCHEDULE

Follow these maintenance steps to extend the life of the gun and ensure efficient operation.

Several Times Daily

- Turn the control unit power OFF!
- Set the trigger stop lever and inspect the air cap for paint accumulation. Clean as frequently as necessary with a soft bristled brush and a suitable solvent.
- Clean all insulating surfaces in the system. Remove paint accumulation from the exterior of the gun and low voltage or high voltage cable with a solvent dampened cloth.

⚠ CAUTION

► **NEVER** soak or submerge the electrical components of the gun, i.e., cascade barrel assembly, hook/transformer assembly or cable assembly. Damage and failure may occur.

Daily (or at start of each shift)

- Verify that ALL solvent safety containers are grounded!
- Check within 20 feet of the point of operation (of the gun) and remove or ground ALL loose or ungrounded objects.
- Inspect workholders for accumulated coating materials (and remove such accumulations).
- Check that atomizer assembly is clean and undamaged.
- Check the gun electrode for damage.
- Clean the fluid filter, if necessary.
- Turn the control unit power ON. Its green pilot should light or Aviator will be audible.
- Run a voltage output test.

Gun High Voltage Output Test (Cascade / Classic)

Use high voltage probe assembly (76652-01).

NOTE

► For Cascade Guns: Prior to performing the voltage output test on the gun, test the control unit using tester LTST5000-00.

1. Set the meter dial to the kV scale. Plug the high voltage probe into the side of the meter.
2. Attach the ground clamp to a proven earth ground.

⚠ WARNING

► Injury to personnel and damage to equipment is probable if the ground clip is **NOT ATTACHED**. This step **MUST** be accomplished before voltage is applied.

3. Make sure all grounded objects are at least 2 feet away.
4. Line up the hole in the test probe and the electrode. Slide the test probe straight over the electrode wire of the gun.
5. Holding the metal portion of the high voltage probe in your hand, trigger the gun so voltage exists at the electrode.

⚠ WARNING

► To provide proper equipment to operator ground, the conductive handle of the probe **MUST** be held in the bare hand of the operator. To avoid a shock hazard, the meter should **NEVER** be disconnected from the probe during high voltage contact.

6. Read the voltage displayed on the meter.
7. Turn the voltage to the gun OFF, and pull the test probe straight off the electrode.

Shutdown (or at end of shift)

1. Turn the control unit power OFF. Turn OFF supply air to AVIATOR generator.
2. Turn the paint supply OFF.
3. Turn the shaping air supply OFF.
4. Wipe the gun, cable, and hoses with a rag and a suitable cleaning solvent.
5. Flush the fluid lines and gun. Then bleed the fluid pressure to zero, and allow the solvent to remain in the lines (see “Flushing Procedures” in the “Maintenance” section).
6. Set the trigger stop lever.

NOTE

► If production downtime is to be short, the fluid lines may not require flushing (depending on the coating material being used). If the solids in the coating settle slowly, the lines will not need to be flushed as soon after shutdown as with fast settling solids. The paint being used and the length of downtime will determine the need for flushing. Metallic paint and primer will require flushing sooner than other types of coating material.

⚠ CAUTION

► If the coating material is fast settling and the fluid lines are not flushed soon enough, the internal passages may become clogged. This can lead to excessive downtime for repair.

Weekly

- Check the entire system for damage, leaks, and paint accumulation.
- Clean the atomizer assembly.

HANDGUN ASSEMBLY CLEANING PROCEDURE

Routine Cleaning Equipment Needed

- An appropriate solvent
- Solvent safety container (grounded)
- Small soft-bristled brush

For efficient electrostatic operation, keep the gun's exterior and low voltage / high voltage cable free of paint accumulation. This prevents the loss of voltage to ground with a resultant reduction in transfer efficiency.

⚠ CAUTION

➤ Before cleaning the nozzle assembly, turn the control unit **OFF** and flush the fluid line with a compatible solvent until clean. Turn the paint and air supplies **OFF**. Trigger the gun to relieve both fluid and air pressures.

⚠ WARNING

➤ Ensure supply pressures have been bled to zero prior to servicing the gun. Failure to do so may cause personal injury.

➤ If the fluid nozzle is completely clogged, triggering the gun will not release the pressure. Cover the end of the gun with a heavy rag and loosen the nozzle nut slowly into a grounded catch container.

➤ Any broken or damaged components should be replaced. Any damage to the gun may result in **UNSAFE** operating conditions.

1. Turn OFF the control unit power. Turn OFF supply air to the AVIATOR power generator.

2. Turn the paint and air supplies OFF. Relieve both fluid and air pressures. Set the trigger stop lever.

3. Unscrew the nozzle nut completely from the barrel.

4. With the front of the barrel tilted downward, remove the air and fluid nozzles.

5. Clean all parts in a suitable solvent and examine for wear and damage. To clear the fluid nozzle orifice, blow compressed air through the tip in the opposite direction of flow. Soaking in solvent and/or brushing may also be necessary to clean the orifice. Replace as necessary.

6. Clean all exterior surfaces of the gun with a rag and a suitable solvent.

7. Assemble the parts in reverse order of disassembly.

⚠ CAUTION

➤ A wire brush or metal tools must **NEVER** be used. **NEVER** use a cleaning tool that is harder than the plastic parts. If a deposit cannot be removed with solvent and a rag or the soft brush, soak the part in solvent **ONLY** until the deposit can be removed! **NEVER** soak the gun body, barrel, or hook transformer!

⚠ WARNING

➤ **NEVER** wrap the applicator, associated valves and tubing, and supporting hardware in plastic to keep it clean. A surface charge may build up on the plastic surface and discharge to the nearest grounded object. Efficiency of the applicator will also be reduced and damage or failure of the applicator components may occur. **WRAPPING THE APPLICATOR IN PLASTIC WILL VOID WARRANTY**.

FLUSHING PROCEDURES

The fluid system should be thoroughly cleaned by flushing with a clean compatible solvent whenever a color change is made, or when the gun will not be used for an extended period.

1. Turn OFF the control unit power. Turn OFF supply air to the AVIATOR power generator.
2. Turn the paint supply OFF.
3. Turn the shaping air supply OFF.
4. Tilt the gun down and trigger until it is clear of paint.
5. Set the trigger stop lever and remove the nozzle nut, air nozzle, and fluid nozzle.
6. Connect the solvent supply.
7. Release the trigger stop and run solvent through the system until it runs clear.
8. Disconnect the solvent supply.
9. Trigger the gun until it is clear of solvent. After the preceding steps are complete, the gun is ready for color change, storage, or maintenance.

GUN REPAIR

All repairs should be made on a clean, flat surface. If a vise is used to hold parts during service or repair, do NOT clamp onto plastic parts and always pad the vise jaws!

Apply dielectric grease (LSCH0009-00) to the following parts when assembling:

- All Rubber O-Rings (Teflon o-rings do not need lubrication)
- Needle Shaft Assembly 73352-00
- Packing Tube 72378-01
- Transformer/Hook Assembly 71202-XX
- Air Valve Rod Assembly 79310-00

Apply sealant (7969-10) to the external threads of the following parts when assembling:

- Air Valve Retaining Nut 78635-00
- Spring Cap 77015-00

EQUIPMENT REQUIRED

- Special Multi-Purpose Gun Wrench 19749-00
- Nozzle Tool 72468-00
- 2.5mm Wrenches 74133-00 (2)
- Nozzle Wrench 76428-00
- Spanner Wrench 20254-01
- 3/32-inch Allen Wrench
- Open End Wrenches: 15/16, 7/8, 11/16, 9/16, 7/16, 3/4, 3/8, and 1/4-inch
- Screwdriver (blade)
- Dielectric Grease LSCH0009-00
- Medium Strength Sealant 7969-10
- Plastic or Wood Dowel Rod, 5/16-inch diameter

TO REMOVE THE GUN FROM THE WORK SITE

⚠ CAUTION

➤ **ALWAYS** remove the gun from the work site for service or repair!

➤ **DO NOT** use any silicone lubricants in order to avoid paint defects.

1. Flush the gun. (Refer to "Flushing Procedures".)

2. With a wrench, loosen and unscrew the fluid hose nut. Remove the fluid hose assembly.

3. With a wrench, lock the air fitting in place and loosen the air hose nut using a second wrench. Completely unscrew the nut and remove the air hose assembly.

NOTE

➤ If the low voltage cable is to be replaced, see "Low Voltage Cable Replacement".

4. **Cascade Handgun:** Loosen the low voltage cable nut from the plug assembly with a wrench and unscrew the nut by hand. Remove the low voltage cable by pulling it from the plug assembly.

   Classic Handgun: Loosen the setscrew in the hose bracket that retains the swivel fluid fitting, but do not remove. With a wrench, loosen the air fitting. Then simultaneously, while unscrewing the air fitting by hand, pull the hose bracket and high voltage cable from the handle.

5. Remove the gun from the work site.

BARREL ASSEMBLY

NOTE

➤ If during testing it is found that the cascade section of the barrel is bad, repair of the barrel is not an option. The only course of action is to replace the barrel assembly.

Removal

1. Use the spanner wrench to loosen the air cap retaining nut and then unscrew it completely by hand.

2. Remove the air cap and fluid nozzle by hand. The fluid nozzle may require removal from the air cap using the nozzle tool. Screw the nozzle tool into the back of the fluid nozzle and pull it straight out.

3. Using a flat head screwdriver, remove the two shoulder screws that retain the trigger to the handle.

4. While holding the ground spring (located under the trigger and over the air valve stem) back toward the handle, remove the trigger from the handle. Remove the grounding spring from the air valve stem.

5. Using a 3/4-inch open end wrench, unscrew the fluid tube connector from the barrel and slide it down the fluid tube.

6. Use the special multi-purpose wrench to loosen the retaining nut that secures the barrel to the gun handle. After unscrewing the retaining nut, slide it forward.

7. Hold the gun handle and fluid tube so the barrel points downward. With the other hand, pull the barrel forward to separate it from the handle. Once the barrel has cleared the handle, remove the spring from the spring retainer and set it aside. If the fluid tube will not come loose from the barrel, rotate the barrel back and forth on the axis of the fluid tube until it comes loose.

8. If the Teflon seal does not pull out with the fluid tube, care must be taken when removing this part not to damage the sealing surfaces within the barrel's fluid inlet chamber.

9. There is no need to remove the retaining ring or nut from the barrel unless they are damaged. If they are to be replaced, lift one end of the retaining ring over the captive ridge and spiral it off the end of the barrel. Then the retaining nut can be removed.

⚠ CAUTION

► Use care in removing the retaining ring. If it is spread too much it could break.

Disassembly

1. Remove the trigger adjustment nut and spring retainer from the needle shaft using two 3/8-inch open end wrenches.

2. Position the barrel so the front is facing down. Using the small spanner tool on the special multi-purpose wrench, unscrew the packing nut from the rear of the barrel by turning it counterclockwise.

3. Holding the barrel in one hand and with a firm pull, remove the needle shaft assembly from the packing chamber of the barrel. The trigger adjustment nut can be reinstalled for additional grip.

4. Remove the packing nut, rear seal retainer, seal container subassembly, and packing tube from the rear of the needle shaft. The spring-loaded u-cup and o-ring can now be removed from the seal container.

5. Loosen the ball valve needle using two 2.5mm wrenches to unlock the jam nut. Then unscrew both parts off the front of the needle shaft. The seal spreader, u-cup seal and seal pusher can now be removed.

6. Remove the valve seat body and Teflon seal from the front of the barrel using the nozzle wrench. If the seal does not pull out with the valve seat body, care must be taken when removing this part not to damage the sealing surfaces within the barrel chamber.

Cleaning and Inspection

1. Clean the packing chamber of the barrel with a suitable solvent and a soft bristle bottle brush. Do not submerge or soak the barrel in solvent. If the chamber has dry paint in it and cannot be cleaned out, the barrel MUST BE REPLACED.

⚠ WARNING

► Soaking or submerging the barrel could allow solvents into the high voltage section of the barrel, leading to gun failure and/or possible dangerous conditions that could result in property damage and personnel injury.

2. Examine the plastic section of the needle shaft and the packing tube for signs of carbon tracking. Also inspect the air passages and packing chamber of the barrel for signs of scratches, additional carbon tracking, or dried paint. Shine a small flashlight into the front of the barrel to highlight any damage in these areas.

⚠ CAUTION

► Barrels with dry paint, scratches, or high voltage tracking marks in the air and/or packing chamber passages MUST BE REPLACED. Neglecting to replace the barrel may lead to reduced gun efficiencies and premature component failure.

3. Inspect the sealing area on the front needle shaft section for wear. If any signs of roughness or unevenness are found, the needle shaft must be replaced.

NOTE

➤ Check all parts for damage or wear. Replace those that are damaged or worn with new parts.

➤ Inspect the sealing areas for wear at the front and rear of the needle shaft. If rough or uneven, replace it.

Reassembly

1. Install a new Teflon seal and the valve seat body into the chamber at the front of the barrel. Use the nozzle wrench to tighten.

2. Place the seal pusher onto the front needle shaft section with the flat side forward.

3. Push a new u-cup seal onto the front needle shaft section with the cup portion forward.

4. Place the seal spreader onto the front needle shaft section with the flattest side forward.

5. Screw the jam nut onto the threads of the front needle shaft section until it reaches the bottom of the threads. Then screw the ball valve needle on by hand until it bottoms on the threads of the needle shaft. Using two 2.5mm wrenches, tighten the jam nut against the ball valve needle.

6. Fill the inner diameter of the packing tube with dielectric grease. Insert the needle shaft, rear section first, into the packing tube. Rotate the needle shaft while moving it back and forth inside the packing tube until fully inserted.

7. With your finger, wipe the excess grease from both ends of the packing tube. Using the excess grease, apply a thin film to the outer surface of the packing tube.

NOTE

➤ Be generous with the dielectric grease when applying it to the packing tube and needle shaft. This helps to remove air voids from this chamber. DO NOT apply so much grease that it creates an air lock during assembly of the gun.

8. Apply a light film of dielectric grease to a new o-ring and install it into the external groove of the rear seal container.

9. Insert a new spring-loaded u-cup into the seal container (with the concave side facing outward). Use the rear seal retainer to fully seat the u-cup.

10. Place the rear seal container subassembly (with the u-cup seal rearward) onto the back of the needle shaft and slide it onto its sealing area.

11. Install the rear seal retainer onto the rear needle shaft section.

12. Place the packing nut with the slots rearward onto the rear needle shaft section.

13. Screw the trigger adjustment nut onto the rear needle shaft section with the hexagon rearward and the spring retainer with the hexagon forward. Do not lock the hexagon nuts in place.

14. Install the needle shaft subassembly into the packing chamber from the rear of the barrel with the ball valve needle forward.

15. Push the needle shaft subassembly forward until the packing nut will engage it's mating thread in the barrel and screw it into place by hand approximately 3 turns.

16. Tighten the packing nut using the special multi-purpose wrench until there is a firm resistance felt while moving the needle shaft in and out. Then tighten it an additional 1/16 to 1/8 turn.

17. Push the needle shaft forward until the ball valve needle seats into the valve body.

18. Adjust the trigger adjustment nut as far forward as possible.

19. Adjust the needle shaft spring retainer until the rear of the hexagon is 11/16-inch from the rear surface of the barrel packing chamber (refer to Figure 1). The dimension shown is for both Cascade and Classic style handguns.

20. Hold the spring retainer in place and screw the front trigger adjustment nut rearward until contact is made. Use two 3/8-inch open end wrenches to tighten and lock the adjustment nuts in place on the needle shaft.

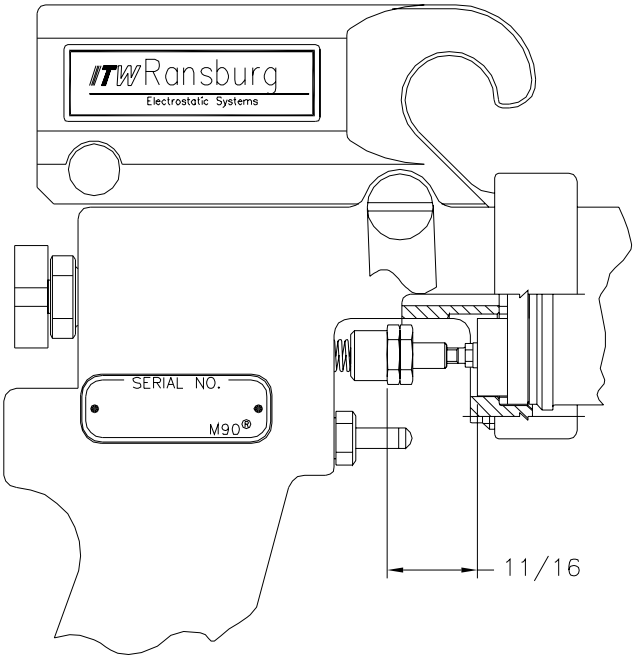


Figure 1: Trigger Nut Adjustment for Cascade/Classic Guns

Attaching Barrel to Handle

1. If the barrel retaining nut has been removed, it will have to be reinstalled before the barrel can be attached to the handle.

2. Place the retaining nut over the rear of the barrel and slide it forward as far as possible.

3. Spread the retaining ring and place it onto the barrel. Starting at one end, lift the retaining ring over the captive ridge and spiral into place.

4. Insert the new Teflon seal into the fluid inlet chamber in the barrel or insert the new Teflon seal onto the tip of the fluid tube assembly.

5. Place the large hole of the gasket over the needle shaft and onto boss of the barrel packing chamber.

6. **Cascade Handgun:** While holding the barrel with the air nozzle pointing downward, install the needle shaft spring into the spring retainer. Align the electrical connectors of the barrel with the mating holes in the hook/transformer assembly and the needle shaft spring with the spring recess in the handle. While sliding the barrel into the handle cavity, align the fluid tube subassembly with the fluid inlet camber in the barrel and seat the barrel against the gasket. Ensure the needle shaft spring did seat into the handle recess and the fluid tube into the fluid inlet chamber.

Classic Handgun: While holding the barrel with the air nozzle pointing downward, install the needle shaft spring into the spring retainer. Align the large bore of the barrel with the resistor housing and the needle shaft spring with the spring recess in the handle. Ensure that the conductive sponge has been installed into the barrel cavity. While sliding the barrel into the handle cavity, align the fluid tube subassembly with the fluid inlet camber in the barrel and seat the barrel against the gasket. Ensure the needle shaft spring did seat into the handle recess and the fluid tube into the fluid inlet chamber.

⚠ CAUTION

► Be sure the conductive sponges are in place inside the barrel chamber. Without these parts, proper output voltage may not be attained. **(Classic Only)**

7. While holding the barrel in place, screw the retaining nut onto the handle by hand and then tighten using the special multi-purpose wrench. Then screw the retaining nut of the fluid tube subassembly into the barrel fluid inlet chamber and tighten using a 3/4-inch open end wrench.

NOTE

► Torque the barrel retaining nut to 8 to 10 lb•ft or after hand tightening, torque an additional 1/16 to 1/8 turn using the special multi-purpose wrench.

8. Check the spacing between the back of the spring retainer and the handle. It should be about 1/8-inch. If not, check for one of the following:

   - Gasket has been left out
   - Loose retaining nut
   - Loose valve seat body
   - Improper setting of the trigger adjustment nut and spring retainer

9. Place the grounding spring over the air valve stem.

10. Pull the grounding spring back and slide the trigger into position.

11. Secure the trigger with the two shoulder screws.

FAN AIR VALVE

Removal

1. Turn control knob to the open position (screwed fully out, counterclockwise).

2. With a 9/16-inch open end wrench, unscrew the retaining nut and remove the entire valve assembly.

Disassembly

1. Turn the control knob clockwise to the closed position or until it bottoms on the retaining nut.

2. Secure the control knob in a vise (do not over tighten, it could break) with the needle pointing upward.

3. With a 1/4-inch wrench on the wrench flats of the needle, unscrew the needle and remove it from the control knob stem.

⚠ CAUTION

► With the control knob turned fully into the retaining nut the tension on the spring is relieved. If it is not, the needle could be projected from the control knob stem and cause personal injury.

4. Remove the spring from the control knob stem.

5. Unscrew the control knob and pull it out of the retaining nut.

6. With a small rod (1/4-inch diameter), push the two washers and Teflon o-ring out of the retaining nut.

Cleaning and Inspection

1. Discard both o-rings. They should be replaced with new ones.

2. Clean the parts in a suitable solvent.

3. Check all components for damage and also check the needle for wear. Replace any damaged or worn parts.

Reassembly

1. Apply a light coating of dielectric grease to a new o-ring and slide it over the threads of the retaining nut until it sets into the thread relief.

2. Apply a light coating of dielectric grease to the control knob threads and screw it into the retaining nut to the closed position or until it bottoms.

3. Place the first washer, a new Teflon o-ring, and then a second washer onto the control knob stem. Slide the components into the retaining nut bore.

4. Place the spring over the control knob stem and into the retaining nut bore.

5. Secure the control knob in a vise with the control knob stem pointing upwards. Apply a small amount of medium strength thread locker to the threads of the control knob stem.

6. Screw the needle onto the control knob stem and with a 1/4-inch wrench, tighten the needle.

Reinstall

1. Turn the control knob to the open position (screwed fully out, counterclockwise).

2. Screw the retaining nut into the handle by hand. Using a 9/16-inch open end wrench, secure the retaining nut into the handle.

3. Screw the control knob to its closed position.

AIR VALVE

Removal

1. Remove the trigger and ground spring from the handle (refer to “Trigger” in the “Maintenance” section).

2. With a standard blade screwdriver, remove the air valve cap from the back of the handle.

3. Remove the compression spring from the back of the air valve rod assembly.

4. From the front of the handle, push the air valve rod assembly rearward until it can be removed by hand from the back of the handle. Do not use any tools to grip the air valve for it can damage its sealing surface.

NOTE

► A rod (1/8-inch diameter or smaller) can be used to push the assembly out the back of the handle until it can be gripped with the fingers.

5. With a 3/8-inch wrench, completely remove the retaining nut with the internal u-cup seal.

Cleaning and Inspection

1. Remove the o-ring from the air valve cap.

2. Clean all components with a suitable solvent.

3. Inspect the air valve rod assembly for wear and/or damage. If any wear is found on the air valve rod assembly, it and the u-cup seal must be replaced.

⚠ CAUTION

► The seal internal to the air valve retaining nut cannot be reused once it has been removed from its holder.

4. Inspect all other parts for damage. Replace any damaged components.

5. Inspect the brass seat in the handle for damage or wear. If damaged or worn, the handle must be replaced.

Reinstall

1. Install the new spring loaded u-cup seal, spring side (cup portion) outward, into the air valve retaining nut. Apply a coating of Teflon thread sealant to the threads of the retaining nut and screw it fully into the handle. Use 3/8-inch open end wrench to tighten.

2. Apply a thin film of lubricant around the shaft, just behind the brass tip of the air valve rod assembly.

3. Install the air valve, rod end first, into the air valve chamber from the back on the left hand side of the handle and push it through the retaining nut.

4. Install the compression spring onto the back of the air valve.

5. Apply a thin film of lubricant on the o-ring and install it into the thread relief of the air valve cap.

6. Install the assembled air valve cap containing the o-ring seal into the handle using a standard blade screwdriver.

TRIGGER

Removal

NOTE

► The gun trigger can be replaced either with the gun online or removed from service. If the following procedure is to be done online, make sure that all fluid and air sources are shut off to the gun and the pressure in the lines is relieved. Most of all, make sure that the power supply is turned off!

1. Remove the two shoulder screws that attach the trigger to the gun.

2. Hold the ground spring in position and remove the trigger from the gun assembly.

3. Remove the ground spring from the rod portion of the air valve and set it aside for safe keeping.

Cleaning and Inspection

1. Clean the trigger with a suitable solvent and dry.

2. Inspect the trigger for damage or wear and replace if necessary.

Reinstall

1. Install the ground spring onto the rod portion of the air valve and hold it in place.

2. Slide the trigger onto the handle and align the holes with the threaded holes in the handle.

3. Insert the shoulder screws through the holes of the trigger and screw them into the handle by hand.

4. Secure the shoulder screws to the handle using a flat blade screwdriver.

NEEDLE SHAFT RETURN SPRING REPLACEMENT

Removal

1. Remove the trigger and ground spring from the gun (refer to “Trigger” in the “Maintenance” section).

2. Loosen the barrel retaining nut and slide it forward on the barrel.

3. Pull the barrel forward until there is enough clearance between the needle shaft spring retainer and the handle to remove the spring.

Cleaning and Inspection

1. Clean all the components in a suitable solvent and dry.

2. Check all components for wear, fatigue, or damage and replace as required.

Reinstall

1. Install a new spring into the needle shaft spring retainer.

2. Slide the barrel back into the handle cavity until it seats against the barrel gasket.

3. Check the spring to ensure it has seated into the handle recess and tighten the barrel retaining nut.

4. Reinstall the trigger and ground spring (refer to “Trigger” in the “Maintenance” section).

LOW VOLTAGE CABLE PLUG ASSEMBLY REPLACEMENT

Removal

1. Remove the gun from service (refer to “To Remove the Gun from the Work Site” in the "Maintenance" section).

2. Use a 3/32-inch hexagon Allen wrench to loosen (DO NOT remove) the set screw that retains the low voltage cable plug assembly to the handle. The set screw is located toward the bottom of the handle on the front side.

3. Hold the bottom of the plug assembly and pull it straight out of the handle.

⚠ CAUTION

► Trying to twist or unscrew the low voltage cable plug assembly from the handle will damage the low voltage plug and the hook/transformer. If this occurs, both components have to be replaced.

Cleaning and Inspection

1. The low voltage cable plug assembly should not be cleaned or soaked in any solvents. If the assembly is contaminated, it must be replaced.

2. Examine the low voltage cable plug assembly for damage to the housing, broken wires, and/or broken solder joints. If any are found, the assembly must be replaced.

3. Examine the (5) o-rings of the low voltage cable plug assembly and replace any that are damaged.

4. If the old low voltage cable plug assembly is to be reinstalled into the gun, it should be tested first. (Refer to “Low Voltage Control Unit Test Assembly” manual, TE-96-01).

Reinstall

1. Apply a light coating of dielectric grease to the (3) o-rings and insert the low voltage cable plug assembly into the handle. (DO NOT push the assembly fully into the handle).

2. Rotate the plug assembly until the slot in the aluminum housing is aligned with the set screw in the handle.

3. Push the low voltage cable plug assembly into the handle until it seats into the hook/transformer assembly.

4. Tighten the set screw until it seats into the alignment slot of the low voltage cable plug assembly.

LOW VOLTAGE CABLE REPLACEMENT

Removal

⚠ WARNING

➤ Prior to working and/or performing maintenance on any part of the assembly, make sure that the control unit, AVIATOR, or MGS system are turned off (locked and/or tagged out). Also make sure that all residual voltage is drained from the system by grounding the electrode.

1. Using a wrench, unscrew the low voltage cable assembly from the low voltage cable plug assembly in the handle.

2. Remove the low voltage cable assembly from the plug assembly by pulling straight out.

3. Unscrew the low voltage cable assembly from the control unit.

4. Remove the low voltage cable assembly from the fluid and air hose bundle.

Cleaning and Inspection

1. If prior testing has shown that the low voltage cable assembly is bad, the cable assembly must be replaced.

NOTE

➤ The low voltage cable assembly is not repairable due to its construction. The cable assembly must be replaced.

2. If the low voltage cable assembly has not been tested, it should be tested. (Refer to “Low Voltage Control Unit Test Assembly” manual, TE-96-01).

3. The low voltage cable assembly can be wiped with a suitable solvent. DO NOT soak or submerge the cable assembly in solvent.

4. Check the full length of cable for wear or breaks in the cable sheath. If any are found, the cable assembly should be replaced.

Reinstall

1. Connect the low voltage cable assembly to the low voltage cable plug assembly of the handle.

⚠ CAUTION

➤ **DO NOT** over tighten the low voltage cable connection to the handgun as damage to the plastic parts may occur.

2. Route the low voltage cable assembly back to the low voltage control unit and attach the cable assembly into the air and fluid hose bundle.

3. Connect the low voltage cable assembly to the low voltage control unit.

RESISTOR HOUSING ASSEMBLY REPLACEMENT

1. Lubricate two new o-rings with dielectric grease and install them onto resistor housing.

⚠ CAUTION

► Be sure that the conductive sponges are in place inside the barrel chamber and inside resistor housing. Without these sponges, proper output voltage may not be obtained.

2. Lubricate the new resistor housing assembly with dielectric grease and insert into the handle from the top.

3. Reinstall the hook.

4. Remove both old conductive sponges from barrel chamber. Use a long wire with one end bent into a hook.

5. Install two new conductive sponges into the barrel chamber.

6. Install the barrel (see "Barrel Assembly" in the "Maintenance" section).

7. Install HV cable (see "High Voltage Cable Assembly" in the "Maintenance" section).

HIGH VOLTAGE CABLE REPLACEMENT

⚠ WARNING

► Prior to any service to the HV cable, **ALWAYS** turn the power supply **OFF** prior to cleaning or working on it.

NOTE

► It may be desirable to remove the high voltage cable assembly for some service situations depending upon the extent of service being performed.

1. Follow procedures in "To Remove the Gun from the Work Site" in the "Maintenance" section.

2. Disengage the fluid inlet and separate at the swivel fitting.

3. Loosen (but do not remove) two set screws with a 3/32-inch Allen wrench. One will be located in the bracket and the other at the lower front end of the handle.

4. Remove the air fitting from handle.

5. Pull the cable with hose bracket **STRAIGHT OUT** of the chamber as you perform step 4 above.

6. With a thin blade, lift the one end of the snap ring out of its groove and spiral it off the end of the cable.

7. Remove the cable from the air and fluid hose bracket.

HIGH VOLTAGE CABLE ASSEMBLY

1. Remove the ring from the cable end as in previous step 7.

2. Place the cable end into the center hole in the air and fluid bracket.

3. Place the ring over the end of the cable and with a blade, lift one end of it into its groove and spiral it into place.

4. Insert the air fitting through the bracket and slide a new o-ring down over the top of the air fitting.

⚠ CAUTION

➤ Prior to installing the bracket subassembly to the handle, make sure the conductive sponge is in the resistor housing chamber.

⚠ CAUTION

➤ Clean the HV cable tip with a nonconductive solvent and a dry, lint-free cloth before inserting it into the resistor housing.

➤ Inspect the high voltage cable tip for any contamination, carbon tracking, or burn marks. **DO NOT** use a cable that shows any of these defects.

NOTE

➤ Pack enough dielectric grease into the resistor housing chamber to encapsulate the HV cable tip.

5. Start the high voltage cable into the resistor housing chamber but do not secure it.

6. Screw the air fitting into the air inlet chamber of the handle with an 11/16-inch wrench.

7. Secure the two set screws with a 3/32-inch Allen wrench.

FILTER, TUBE, AND LINE INSTALLATION AND REPLACEMENT

-REFER TO FIGURES 5 & 8

Filter Removal

1. Remove fluid filter retaining nut from swivel fitting.

2. Loosen the set screw in the hose bracket and remove the swivel fitting.

3. Remove the fluid filter, clean and/or replace as necessary.

Filter Installation

1. Insert the fluid filter into the swivel fitting, filter end first.

2. Insert the swivel fitting into the hose bracket.

3. Screw the filter retaining nut onto the swivel fitting and tighten using a 3/4-inch open end wrench.

4. Tighten the set screw using a 3/32-inch Allen wrench.

Fluid Tube Assembly

1. Install a new Teflon seal on the tip of the fluid tube subassembly and insert that end into the fluid inlet chamber of the barrel. Then screw the fluid tube retaining nut into the barrel and tighten using a 3/4-inch open end wrench.

2. Insert the fluid filter into the swivel fitting, filter end first.

3. Insert the swivel fitting into the hose bracket.

4. Screw the filter retaining nut onto the swivel fitting and tighten using a 3/4-inch open end wrench.

5. Tighten the set screw using a 3/32-inch Allen wrench.

Fluid Line Removal

1. Disconnect the whip hose from the swivel fitting.

2. Disconnect the fluid hose from the paint supply.

Fluid Line Installation

1. Connect the fluid hose to the paint supply.

2. Connect the whip hose to the swivel fitting.

Air Line Removal

1. Disconnect the air hose assembly from the air fitting using appropriate wrenches.

2. Disconnect the air hose assembly from the factory air line regulator.

Air Line Installation

1. Connect the air hose assembly to the factory air line regulator.

2. Connect the air hose assembly to the air fitting using appropriate wrenches.

To Return the Gun to the Work Site

1. Attach the air hose assembly to gun air inlet fitting.

2. Attach the whip hose to the swivel fitting.

3. Connect and secure the low or high voltage cable assembly to the handle of the gun.

4. Turn the power, air, and fluid ON at the source and return the gun to service.

Nozzle Identification	*Operating Parameters*	
M90 Fluid Nozzle Part #	**Nozzle Orifice Size in Inches**	**Pattern Width at 10 in.**
77080-0509	0.009	5 in.
77080-0511	0.011	5 in.
77080-0513	0.013	5 in.
77080-0811	0.011	8 in.
77080-0813	0.013	8 in.
77080-0815	0.015	8 in.
77080-0818	0.018	8 in.
77080-1009	0.009	10 in.
77080-1011	0.011	10 in.
77080-1013	0.013	10 in.
77080-1015	0.015	10 in.
77080-1018	0.018	10 in.
77080-1021	0.021	10 in.
77080-1311	0.011	13 in.
77080-1313	0.013	13 in.
77080-1315	0.015	13 in.
77080-1318	0.018	13 in.
77080-1321	0.021	13 in.
77080-1326	0.026	13 in.
77080-1511	0.011	15 in.
77080-1513	0.013	15 in.
77080-1515	0.015	15 in.
77080-1518	0.018	15 in.
77080-1521	0.021	15 in.
77080-1715	0.015	17 in.
77080-1718	0.018	17 in.
77080-1721	0.021	17 in.
77080-1726	0.026	17 in.
77080-1731	0.031	17 in.
77080-1921	0.021	19 in.
77080-1926	0.026	19 in.
77080-1931	0.031	19 in.

The first two digits of the nozzle dash number indicate the spray pattern width in inches at a distance of 10 inches from the target. The second two digits indicate the orifice size in thousandths of inches.

For example: 77080-1015 has a 10 inch spray pattern width and an orifice size of 0.015.

Figure 2: Nozzle Selection Guide

The M90 gun incorporates a new feature, that being a locating air cap. Refer to Figure 3 for a view showing the locating pin and receiver holes. This feature gives the capability to spray with a fan pattern in either horizontal or vertical positions.

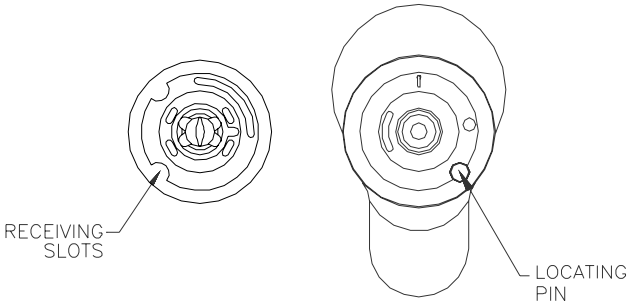


Figure 3: Air Cap Alignment

TROUBLESHOOTING GUIDE

General Problem	Possible Cause	Solution
Poor Atomization & Distribution	1. Partially clogged nozzle	1. Clean out.
	2. Low fluid pressure	2. Increase pump air pressure.
	3. Viscosity too high	3. Try nozzle with narrower fan or smaller orifice.
	4. Improper nozzle	4. Try nozzle with narrower fan or smaller orifice.
	5. Badly worn nozzle	5. Replace.
	6. High voltage electrode bent	6. Straighten electrode or replace nozzle assembly.
	7. Low shaping air pressure	7. Readjust shaping air pressure.
Poor Wraparound	1. Poor atomization	1. See above.
	2. Excessive exhaust velocity	2. Reduce (with code limits).
	3. Excessive fluid pressure	3. Reduce air pressure to pump.
	4. Gun held too close to target	4. Hold gun further back.
	5. Paint too conductive	5. Consult ITW Ransburg technical assistance.
	6. Poor target ground	6. Check ground integrity from target through support to ground.
Paint Wraps Back on Operator	1. Poor ground on parts	1. Check that parts are fully grounded, strip workholders.
	2. Gun held too far from parts	2. Hold gun closer.
	3. Booth exhaust insufficient or improperly routed	3. Increase, or adjust direction, change booth filter.
	4. Improper spray technique	4. Keep gun directed at work.
No Paint Delivery	1. Clogged nozzle	1. Blow out nozzle.
	2. Clogged hose or filters	2. Clean.
	3. No pressure at paint pump	3. If pump air supply OK, consult pump manual.

Figure 4: Troubleshooting Guide

General Problem	Possible Cause	Solution
Excessive Surging	1. Restriction in pump air line	1. Remove restriction.
	2. Insufficient pump capacity	2. Secure larger pump or reduce output.
	3. Clogged paint filter	3. Service or replace.
	4. Low air volume capacity	4. Check factory air capacity.
	5. Nozzle too large	5. Replace with correct nozzle.
Persistent Nozzle Clogging	1. Paint allowed to dry in nozzle or line	1. Flush lines with solvent after each use.
	2. Paint gun filter too coarse or damaged	2. Replace or change to finer screen paint filter.
	3. Paint pigments too coarse	3. Pre-filter paint and/or use larger nozzle orifice.
Paint Leaks Through Center of Nozzle (Failure to Shut Off)	1. Loose nozzle cap	1. Tighten nut.
	2. Improper trigger adjustment	2. Readjust.
	3. Defective or dirty valve seat	3. Flush out or replace as needed.
Paint Leaks Around the Nozzle Cap	1. Loose nozzle cap	1. Tighten nut.
	2. Fluid seal worn	2. Replace seal.
Paint Leaks at Rear of Barrel	1. Loose packing nut	1. Tighten packing nut.
Orange Peel or Rough Finish	1. Evaporation rate too fast	1. Use slower evaporating solvent.
	2. Poor atomization	2. See "Poor Atomization".
	3. Viscosity too high	3. Add solvent or heat.
Paint Runs or Has Poor Hiding Qualities	1. Low solids paint	1. Use less solvent.
	2. Low viscosity	2. Use less solvent.
	3. Excessive delivery	3. Use smaller nozzle, wider fan angle, lower pump pressure.

Figure 4: Troubleshooting Guide (Continued)

PARTS IDENTIFICATION

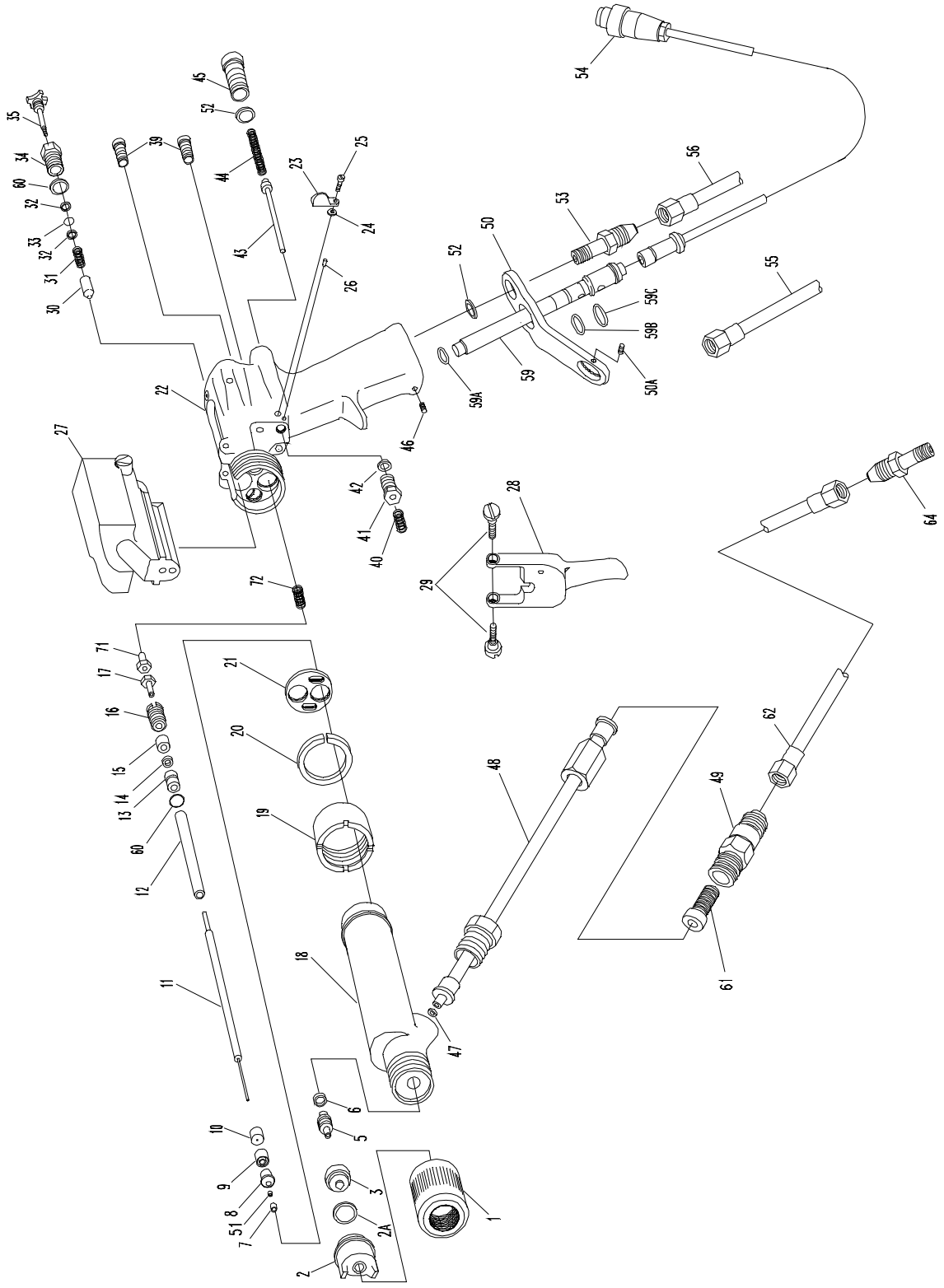


Figure 5: M90 Cascade Handgun (77073)

M90 CASCADE HANDGUN (77073) - PARTS LIST (Figure 5)

Item #	Part #	Description
1	77095-00	Nut, Nozzle
2	78140-00	Nozzle, Air
2A	LSOR0005-11	O-Ring, Solvent Proof
3*	77080-xxxx	Nozzle, Fluid
4	----------	----------
5	75442-00	Valve Seat Body Assembly
6	72375-03	Seal
7	73350-00	Needle, Valve, Ball
8	73344-00	Spreader, Seal
9	73345-00	Seal, U-Cup, Front
10	73346-00	Pusher, Seal
11	73352-00	Needle/Shaft Assembly
12	72378-01	Tube, Packing
13	73347-00	Container, Rear Seal
14	74330-00	U-Cup Seal
15	73348-00	Retainer, Rear Seal
16	73354-00	Nut, Packing
17	78822-00	Nut, Trigger Adjusting
18	77082-00	Barrel Assembly w/ HV Cascade
19	75324-00	Nut, Barrel Retainer (For Composite Handle)
20	75327-00	Retaining Ring, Barrel
21	72360-00	Gasket
22	78641-00	Handle (Composite)
23	77093-00	Lever, Blade
24	20099-03	Spring, Wave
25	75389-00	Screw
26	72399-01	Pin, Cylinder
27	71202-01	Hook/Transformer Assembly w/ ON/OFF Switch
	71202-00	Hook/Transformer Assembly w/o ON/OFF Switch
28	18871-00	Trigger Assembly (Two Finger)
29	6144-00	Screw, Shoulder (2 Required)
30	78788-00	Needle, Valve
31	18829-00	Spring, Compression
32	18833-00	Washer, Retaining (2 Required)
33	13076-08	O-Ring, Solvent Proof
34	77019-00	Housing
35	77018-00	Screw, Adjusting
36	----------	----------
37	----------	----------
38	----------	----------
39	77015-00	Cap (2 Required)
40	72474-01	Spring, Compression
41	78635-00	Nut, Retaining (Rod Seal)
42	10051-05	Seal, Spring Loaded U-Cup
43	79310-00	Rod Assembly, Air Valve, Dual Stage
44	17130-00	Spring, Compression
45	79317-00	Cap, Air Valve
46	19603-16F	Set Screw, Handle
47	72375-02	Seal (Teflon), Fluid Tube
48	77096-01	Tube, Fluid
49	76105-00	Swivel, High Pressure
50	73753-00	Bracket, Line and Cable Assembly
50A	19603-06F	Screw Set
51	73351-00	Nut, Jam
52	7554-11	O-Ring, Solvent Resistant (2 Required)

See "Parts List Bullet Definition Table" on page 36.

(Continued on Next Page)

M90 CASCADE HANDGUN (77073) - PARTS LIST (Figure 5)

Item #	Part #	Description
53	74189-00	Fitting, Air Line
54**	78084-xx	Low Voltage Cable Assembly (For Standard 9040/MGS)
	78085-xx	Low Voltage Cable Assembly (For Aviator)
55**	7994-xx	Fluid Line Assembly
56**	74187-xx	Lightweight Air Line (Standard)
59	76875-11	Low Voltage Cable Plug Assembly (For Standard 9040/MGS)
	76875-12	Low Voltage Cable Plug Assembly (For Aviator)
59A	7554-08	O-Ring, Solvent Resistant (3 Required)
59B	7554-10	O-Ring, Solvent Resistant
59C	7554-12	O-Ring, Solvent Resistant
60	72209-05	O-Ring, Solvent Resistant (2 Required)
61	7720-01	Filter, Fluid (.005 Spacing) (Standard)
	7720-02	Filter, Fluid (.009 Spacing)
62	76104-00	Hose, Whip, High Pressure
64	71880-06	Nipple, Double Male
65	72468-00	Nozzle Tool (Not Shown)
66	19749-00	Multi-Purpose Wrench (Not Shown)
67	----------	----------
68	74133-00	Ball Seat Wrenches (Not Shown)
69	76428-00	Nozzle Wrench (Not Shown)
70	20254-01	Spanner Wrench (Not Shown)
71	78823-00	Nut, Spring Retainer, Trigger Adjustment
72	78824-00	Spring, Compression

See "Parts List Bullet Definition Table" on page 36.

PARTS LIST BULLET DEFINITION TABLE (Figure 5)

* Dash number (-XXXX) indicates fluid nozzle configuration.
See Figure 2 "Nozzle Selection Chart" in the "Service" section for nozzle specifications and order number identification.

** Dash number (-XX) reads in feet (i.e., -36 = 36 feet). These items are available in standard lengths of 36, 50, 75, and 100 feet. When ordering Low Voltage Cable, use footage for -XX.

RECOMMENDED SPARE PARTS - M90 CASCADE HANDGUN (77073)

Description	Part Number	No. of Guns				Notes
		1-2	3-4	5-6	7-8	
Rebuild Kit	78930-03	1	2	2	3	
Valve Screw	75442-00	1	2	3	3	
Needle, Valve, Ball	73350-00	1	2	3	3	
Jam Nut	73351-00	1	2	3	3	
Wrench	19749-00	2	2	4	4	
Barrel Nut	75324-00	1	2	2	3	Fits handle with 1-7/8" diameter threads
Barrel Ring	75327-00	1	2	2	3	Fits handle with 1-7/8" diameter threads
Trigger Screw	6144-00	2	2	4	4	
Hook Transformer	71202-xx	1	2	2	3	xx must be replaced with -01 for tranformer w/switch, -00 for transformer without switch
Air Nozzle	78140-00	1	2	3	4	
Fluid Nozzle	77080-xxxx	1	2	3	4	Specify nozzle configuration as per nozzle selection chart.
Fluid Tube	77096-01	1	2	2	3	
Low Voltage Cable	78084-xx (MGS/9040)	1	1	2	2	xx must be replaced with desired length of 36, 50, 75, or 100 feet.
	78085-xx (Aviator)	1	1	2	2	
Fluid Line	7994-xx	1	2	3	4	xx must be replaced with desired length of 36, 50, 75, or 100 feet.
Fluid Filter	7720-xx	1	2	3	4	xx must be replaced with -01 for .005 spacing or -02 for .009 spacing.
Disposable Gun Cover	GC-100-K5	1	2	3	4	

Figure 6: Recommended Spare Parts - M90 Cascade Handgun (77073)

MISC. PARTS - M90 CASCADE HANDGUN (77073)

Item #	Part #	Description
Accessories:	7969-10	Sealant, Pipe Dope (Loctite)
	7969-11	Sealant, Low Strength (Loctite)
	LSCH0009-00	Dielectric Grease, 1 oz.
	GC-100-K5	Disposable Gun Covers
	77696-00	Kit for 76875-xx Solvent Proof O-Ring Includes: (1) 79001-09 O-Ring, (1) 79001-07 O-Ring, (3) 79001-06 O-Rings, and (1) 77697-00 Instruction Sheet)
High Pressure Disconnects:	74147-00	1/4 NPSM(F)
	20404-00	1/4 NPSM(M)

Figure 7: Misc. Parts - M90 Cascade Handgun (77073)

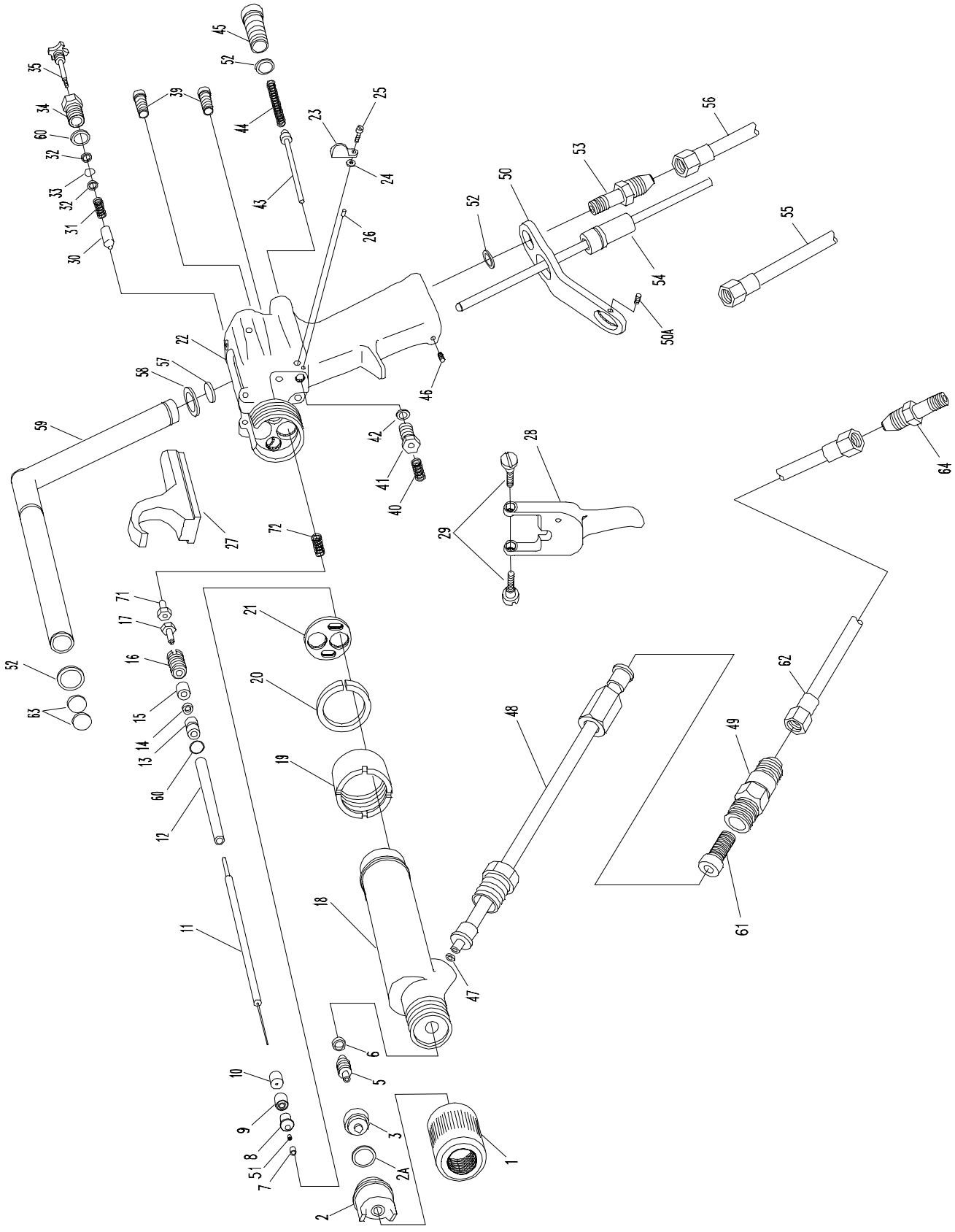


Figure 8: M90 Classic Handgun (77132)

M90 CLASSIC HANDGUN (77132) - PARTS LIST (Figure 8)

Item #	Part #	Description
1	77095-00	Nut, Nozzle
2	78140-00	Nozzle, Air
2A	LSOR0005-11	O-Ring, Solvent Proof
3*	77080-xxxx	Nozzle, Fluid
4	----------	----------
5	75442-00	Valve Seat Body Assembly
6	72375-03	Seal
7	73350-00	Needle, Valve, Ball
8	73344-00	Spreader, Seal
9	73345-00	Seal, U-Cup, Front
10	73346-00	Pusher, Seal
11	73352-00	Needle/Shaft Assembly
12	72378-01	Tube, Packing
13	73347-00	Container, Rear Seal
14	74330-00	U-Cup Seal
15	73348-00	Retainer, Rear Seal
16	73354-00	Nut, Packing
17	78822-00	Nut, Trigger Adjusting
18	77133-00	Barrel Assembly
19	75324-00	Nut, Barrel Retainer (For Composite Handle)
20	75327-00	Retaining Ring, Barrel
21	LREM0012-00	Gasket
22	78641-00	Handle (Composite)
23	77093-00	Lever, Blade
24	20099-03	Spring, Wave
25	75389-00	Screw
26	72399-01	Pin, Cylinder
27	18824-00	Hook
28	18871-00	Trigger Assembly (Two Finger)
29	6144-00	Screw, Shoulder (2 Required)
30	78788-00	Needle, Valve
31	18829-00	Spring, Compression
32	18833-00	Washer, Retaining (2 Required)
33	13076-08	O-Ring, Solvent Proof
34	77019-00	Housing
35	77018-00	Screw, Adjusting
36	----------	----------
37	----------	----------
38	----------	----------
39	77015-00	Cap (2 Required)
40	72474-01	Spring, Compression
41	78635-00	Nut, Retaining (Rod Seal)
42	10051-05	Seal, Spring Loaded U-Cup
43	79310-00	Rod Assembly, Air Valve, Dual Stage
44	17130-00	Spring, Compression
45	79317-00	Cap, Air Valve
46	19603-10F	Set Screw, Handle
47	72375-02	Seal (Teflon), Fluid Tube
48	77096-01	Tube, Fluid
49	76105-00	Swivel, High Pressure
50	73753-00	Bracket, Line and Cable Assembly
50A	19603-06F	Screw Set
51	73351-00	Nut, Jam
52	7554-11	O-Ring, Solvent Resistant (3 Required)

See "Parts List Bullet Definition Table" on page 40.

(Continued on Next Page)

M90 CLASSIC HANDGUN - PARTS LIST (Figure 6)

Item #	Part #	Description
53	74189-00	Fitting, Air Line
54**	LREA4003-xx	High Voltage Cable Assembly (For Standard 9040)
55**	7994-xx	Fluid Line Assembly
56**	74187-xx	Lightweight Air Line (Standard)
57	14061-08	Conductive Sponge
58	7554-10	O-Ring, Solvent Resistant
59	70397-02	Resistor Housing
60	72209-05	O-Ring, Solvent Resistant (2 Required)
61	7720-01	Filter, Fluid (.005 Spacing) (Standard)
	7720-02	Filter, Fluid (.009 Spacing)
62	76104-00	Hose, Whip, High Pressure
63	14061-05	Conductive Sponge (2 Required)
64	71880-06	Nipple, Double Male
65	72468-00	Nozzle Tool (Not Shown)
66	19749-00	Multi-Purpose Wrench (Not Shown)
67	----------	----------
68	74133-00	Ball Seat Wrenches (Not Shown)
69	76428-00	Nozzle Wrench (Not Shown)
70	20254-01	Spanner Wrench (Not Shown)
71	78823-00	Nut, Spring Retainer, Trigger Adjustment
72	78824-00	Spring, Compression

See "Parts List Bullet Definition Table" on page 40.

PARTS LIST BULLET DEFINITION TABLE (Figure 8)

* Dash number (-XXXX) indicates fluid nozzle configuration.
See Figure 2 "Nozzle Selection Chart" in the "Service" section for nozzle specifications and order number identification.

** Dash number (-XX) reads in feet (i.e., -36 = 36 feet). These items are available in standard lengths of 36, 50, 75, and 100 feet. When ordering High Voltage Cable, use footage for -XX.

RECOMMENDED SPARE PARTS - M90 CLASSIC HANDGUN (77132)

Description	Part Number	No. of Guns				Notes
		1-2	3-4	5-6	7-8	
Rebuild Kit	78930-03	1	2	2	3	
Valve Screw	75442-00	1	2	3	3	
Needle, Valve, Ball	73350-00	1	2	3	3	
Jam Nut	73351-00	1	2	3	3	
Wrench	19749-00	2	2	4	4	
Barrel Nut	75324-00	1	2	2	3	Fits handle with 1-7/8" diameter threads
Barrel Ring	75327-00	1	2	2	3	Fits handle with 1-7/8" diameter threads
Trigger Screw	6144-00	2	2	4	4	
Air Nozzle	78140-00	1	2	3	4	
Fluid Nozzle	77080-xxxx	1	2	3	4	Specify nozzle configuration as per nozzle selection chart.
Fluid Tube	77096-01	1	2	2	3	
High Voltage Cable	LREA4003-xx	1	1	2	2	xx must be replaced with desired length of 36, 50, 75, or 100 feet.
Fluid Line	7994-xx	1	2	3	4	xx must be replaced with desired length of 36, 50, 75, or 100 feet.
Fluid Filter	7720-xx	1	2	3	4	xx must be replaced with -01 for .005 spacing or -02 for .009 spacing.
Disposable Gun Cover	GC-100-K5	1	2	3	4	
Resistor Housing	70397-02	1	2	2	3	
Conductive Foam	14061-08	1	2	2	3	
Conductive Foam	14061-05	2	4	4	6	

Figure 9: Recommended Spare Parts - M90 Cascade Handgun (77132)

MISC. PARTS - M90 CLASSIC HANDGUN (77132)

Item #	Part #	Description
Accessories:	7969-10	Sealant, Pipe Dope (Loctite®)
	7969-11	Sealant, Low Strength (Loctite®)
	LSCH0009-00	Dielectric Grease, 1 oz.
	GC-100-K5	Disposable Gun Covers
High Pressure Disconnects:	74147-00	1/4 NPSM(F)
	20404-00	1/4 NPSM(M)

Figure 10: Recommended Spare Parts - M90 Cascade Handgun (77132)

WARRANTY POLICIES

LIMITED WARRANTY

ITW 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 ITW 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 ITW 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.**

FLUID HANDLING: One (1) year from date of purchase (i.e., Totalizer, CCV Valves, etc.).

AIR BEARING ROTATORS: Fifteen thousand (15,000) hours or three (3) years, whichever occurs first. Warranty period begins on the date of purchase.

ITW 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. ITW 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 ITW Ransburg's opinion the warranty item in question, or other items damaged by this part was improperly installed, operated or maintained, ITW 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.

APPENDIX

PAINT AND SOLVENT SPECIFICATIONS

	REA™ / EFM™ EVOLVER	REM™ / M90™	NO. 2 HAND GUN	TURBODISK™	AEROBELL® II*** AEROBELL® AEROBELL® 33 RMA-101™
RECOMMENDED VISCOSITY USING A ZAHN NO. 2	18 TO 30 SEC	18 TO 30 SEC	20 TO 60 SEC	20 TO 60 SEC	20 TO 60 SEC
PAINT ELECTRICAL RESISTANCE**	.1 MΩ TO ∞	.1 MΩ TO ∞	.1 TO 1 MΩ	.1 MΩ TO ∞	.1 MΩ TO ∞
RECOMMENDED DELIVERY (UP TO)	1000 cc/min	1500 cc/min	180 cc/min	1000 cc/min	500 cc/min

GUIDE TO USABLE SOLVENT SELECTION

Chemical Name	Common Name	Category	Flash Point†† (TCC)	*CAS Number	Evap. Rate†	Elec. Res.**
DICHLOROMETHANE	Methylene Chloride	Chlorinated Solvents		75-09-2	**14.5**	HIGH
VM & P NAPHTHA	Naptha	Aliphatic Hydrocarbons	65°F	8030-30-6	**10**	HIGH
ACETONE		Ketones	-18°F	67-64-1	**5.6**	LOW
METHYL ACETATE		Esters	90°F	79-20-9	**5.3**	LOW
BENZENE		Aromatic Hydrocarbons	12°F	71-43-2	**5.1**	HIGH
ETHYL ACETATE		Esters	24°F	141-78-6	**3.9**	MEDIUM
2-BUTANONE	MEK	Ketones	16°F	78-93-3	**3.8**	MEDIUM
ISO-PROPYL ACETATE		Esters	35°F	108-21-4	**3.4**	LOW
ISOPROPYL ALCOHOL	IPA	Alcohols	53°F	67-63-0	**2.5**	LOW
2-PENTANONE	MPK	Ketones	104°F	107-87-9	**2.5**	MEDIUM
METHANOL	Methyl Alcohol	Alcohols	50°F	67-56-1	**2.1**	LOW
PROPYL ACETATE	n-Propyl Acetate	Esters	55°F	109-60-4	**2.1**	LOW
TOLUOL	Toluene	Aromatic Hydrocarbons	48°F	108-88-3	**1.9**	HIGH
METHYL ISOBUTYL KETONE	MIBK	Ketones	60°F	108-10-1	**1.6**	MEDIUM
ISOBUTYL ACETATE		Esters	69°F	110-19-0	**1.5**	LOW
ETHANOL	Ethyl Alcohol	Alcohols		64-17-5	**1.4**	LOW
BUTYL ACETATE		***Esters***	**78°F**	***123-86-4***	***1.0***	***LOW***
ETHYLBENZENE		Aromatic Hydrocarbons	64°F	100-41-4	**.89**	HIGH
1-PROPANOL	n-Propyl Alcohol	Alcohols	74°F	71-23-8	**.86**	LOW
2-BUTANOL	sec.-Butyl Alcohol	Alcohols	72°F	78-92-2	**.81**	LOW
XYLOL	Xylene	Aromatic Hydrocarbons	79°F	1330-02-07	**.80**	HIGH
AMYL ACETATE		Esters	106°F	628-63-7	**.67**	MEDIUM
2-METHYLPROPANOL	iso-Butyl Alcohol	Alcohols	82°F	78-83-1	**.62**	LOW
METHYL AMYL ACETATE		Esters	96°F	108-84-9	**.50**	LOW
5-METHYL-2-HEXANONE	MIAK	Ketones	96°F	110-12-3	**.50**	MEDIUM
1-BUTANOL	n-Butyl Alcohol	Alcohols	95°F	71-36-3	**.43**	LOW
2-ETHOXYETHANOL		Glycol Ethers	164°F	110-80-5	**.38**	LOW
2-HEPTANONE	MAK	Ketones	102°F	110-43-0	**.40**	MEDIUM
CYCLOHEXANONE		Ketones	111°F	108-94-1	**.29**	MEDIUM
AROMATIC-100	SC#100	Aromatic Hydrocarbons	111°F		**.20**	HIGH
DIISOBUTYL KETONE	DIBK	Ketones	120°F	108-83-8	**.19**	MEDIUM
1-PENTANOL	Amyl Alcohol	Alcohols		71-41-0	**.15**	LOW
DIACETONE ALCOHOL		Ketones	133°F	123-42-2	**.12**	LOW
2-BUTOXYETHANOL	Butyl Cellosolve	Glycol Ethers	154°F	111-76-2	**.07**	LOW
CYCLOHEXANOL		Alcohols	111°F	108-93-0	**.05**	LOW
AROMATIC-150	SC#150	Aromatic Hydrocarbons	149°F		**.004**	HIGH
AROMATIC-200		Aromatic Hydrocarbons	203°F		**.003**	HIGH

FASTER ⇑ SLOWER ⇓

***** CAS Number: Chemical Abstract Service Number.
****** Electrical Resistance using the ITW Ransburg Meter.
******* Solvent Base Configuration Only.
† Information Obtained From: http://solvdb.ncms.org
†† The lowest temperature at which a volatile fluid will ignite.
Evaporation Rate is Based Upon Butyl Acetate Having a Rate of 1.0

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NOTE: Chart provides resistance and control information that we feel is necessary when using ITW Ransburg equipment.

VISCOSITY CONVERSION CHART

Poise	Centipoise	DuPont Parlin 7	DuPont Parlin 10	Fisher 1	Fisher 2	Ford Cup 3	Ford Cup 4	Gardner - Holdt Bubble	Gardner - Lithographic	Krebs Unit KU	Saybolt Universal SSU	Zahn 1	Zahn 2	Zahn 3	Zahn 4	Zahn 5	Sears Craftsman Cup	Din Cup 4
.1	10	27	11	20			5	A-4			60	30	16					10
.15	15	30	12	25			8	A-3			80	34	17					11
.2	20	32	13	30	15	12	10				100	37	18					12
.25	25	37	14	35	17	15	12	A-2			130	41	19					13
.3	30	43	15	39	18	19	14	A-1			160	44	20					14
.4	40	50	16	50	21	25	18	A			210	52	22				19	15
.5	50	57	17		24	29	22			30	260	60	24				20	16
.6	60	64	18		29	33	25	B		33	320	68	27				21	18
.7	70		20		33	36	28			35	370		30				23	21
.8	80		22		39	41	31	C		37	430		34				24	23
.9	90		23		44	45	32			38	480		37	10			26	25
1.0	100		25		50	50	34	D		40	530		41	12	10		27	27
1.2	120		30		62	58	41	E		43	580		49	14	11		31	31
1.4	140		32			66	45	F		46	690		58	16	13		34	34
1.6	160		37				50	G		48	790		66	18	14		38	38
1.8	180		41				54		000	50	900		74	20	16		40	43
2.0	200		45				58	H		52	1000		82	23	17	10	44	46
2.2	220						62	I		54	1100			25	18	11		51
2.4	240						65	J		56	1200			27	20	12		55
2.6	260						68			58	1280			30	21	13		58
2.8	280						70	K		59	1380			32	22	14		63
3.0	300						74	L		60	1475			34	24	15		68
3.2	320							M			1530			36	25	16		72
3.4	340							N			1630			39	26	17		76
3.6	360							O		62	1730			41	28	18		82
3.8	380										1850			43	29	19		86
4.0	400							P		64	1950			46	30	20		90
4.2	420										2050			48	32	21		95
4.4	440							Q			2160			50	33	22		100
4.6	460							R		66	2270			52	34	23		104
4.8	480								00	67	2380			54	36	24		109
5.0	500							S		68	2480			57	37	25		112
5.5	550							T		69	2660			63	40	27		124
6.0	600							U		71	2900			68	44	30		135
7.0	700									74	3375				51	35		160
8.0	800								0	77	3380				58	40		172
9.0	900							V		81	4300				64	45		195
10.0	1000							W		85	4600					49		218
11.0	1100									88	5200					55		
12.0	1200									92	5620					59		

VISCOSITY CONVERSION CHART (Continued)

Poise	Centipoise	DuPont Parlin 7	DuPont Parlin 10	Fisher 1	Fisher 2	Ford Cup 3	Ford Cup 4	Gardner - Holdt Bubble	Gardner - Lithographic	Krebs Unit KU	Saybolt Universal SSU	Zahn 1	Zahn 2	Zahn 3	Zahn 4	Zahn 5	Sears Craftsman Cup	Din Cup 4
13.0	1300							X		95	6100					64		
14.0	1400								1	96	6480							
15.0	1500									98	7000							
16.0	1600									100	7500							
17.0	1700									101	8000							
18.0	1800							Y			8500							
19.0	1900										9000							
20.0	2000									103	9400							
21.0	2100										9850							
22.0	2200										10300							
23.0	2300							Z	2	105	10750							
24.0	2400									109	11200							
25.0	2500							Z-1		114	11600							
30.0	3000									121	14500							
35.0	3500							Z-2	3	129	16500							
40.0	4000									133	18500							
45.0	4500							Z-3		136	21000							
50.0	5000										23500							
55.0	5500										26000							
60.0	6000							Z-4	4		2800							
65.0	6500										30000							
70.0	7000										32500							
75.0	7500										35000							
80.0	8000										37000							
85.0	8500										39500							
90.0	9000										41000							
95.0	9500										43000							
100.0	10000							Z-5	5		46500							
110.0	11000										51000							
120.0	12000										55005							
130.0	13000										60000							
140.0	14000										65000							
150.0	15000							Z-6			67500							
160.0	16000										74000							
170.0	17000										83500							
180.0	18000										83500							
190.0	19000										88000							
200.0	20000										93000							
300.0	30000										140000							

Note: All viscosity comparisons are as accurate as possible with existing information. Comparisons are made with a material having a specific gravity of 1.0.

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VOLUMETRIC CONTENT OF HOSE OR TUBE (English Units)

I.D. (inches)	cc/ft.	Cross Section ($in.^2$)	Length				
			5ft. (60")	10ft. (120")	15ft. (180")	25ft. (300")	50ft. (600")
1/8	2.4	.012	.003 gal. .4 fl. oz.	.006 gal. .8 fl. oz.	.010 gal. 1.2 fl. oz.	.016 gal. 2.0 fl. oz.	.032 gal. 4.1 fl. oz.
3/16	5.4	.028	.007 gal. .9 fl. oz.	.014 gal. 1.8 fl. oz.	.022 gal. 2.8 fl. oz.	.036 gal. 4.6 fl. oz.	.072 gal. 9.2 fl. oz.
1/4	9.7	.049	.013 gal. 1.6 fl. oz.	.025 gal. 3.3 fl. oz.	.038 gal. 4.9 fl. oz.	.064 gal. 8.2 fl. oz.	.127 gal. 16.3 fl. oz.
5/16	15.1	.077	.020 gal. 2.5 fl. oz.	.040 gal. 5.1 fl. oz.	.060 gal. 7.6 fl. oz.	.100 gal. 12.7 fl. oz.	.199 gal. 25.5 fl. oz.
3/8	21.7	.110	.029 gal. 3.7 fl. oz.	.057 gal. 7.3 fl. oz.	.086 gal. 11.0 fl. oz.	.143 gal. 18.4 fl. oz.	.287 gal. 36.7 fl. oz.
1/2	38.6	.196	.051 gal. 6.5 fl. oz.	.102 gal. 13.1 fl. oz.	.153 gal. 19.6 fl. oz.	.255 gal. 32.6 fl. oz.	.510 gal. 65.3 fl. oz.

VOLUMETRIC CONTENT OF HOSE OR TUBE (Metric Units)

I.D. (mm)	cc/m	Cross Section (mm^2)	Length				
			1.5m	3.0m	4.5m	6.0m	7.5m
3.6	10.2	10.2	15.3 cc	30.5 cc	45.8 cc	61.1 cc	76.3 cc
5.6	24.6	24.6	36.9 cc	73.9 cc	110.8 cc	147.8 cc	184.7 cc
6.8	36.3	36.3	54.5 cc	109.0 cc	163.4 cc	217.9 cc	272.4 cc
8.8	60.8	60.8	91.2 cc	182.5 cc	273.7 cc	364.9 cc	456.2 cc

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MANUAL CHANGE SUMMARY

This manual was published to replace Service Manual **AH-99-01.2**, *M90 Hand Guns*, to make the following changes:

1. **"Safety"** section - Entire section revised.

2. **"Introduction"** section - revised:
   - "Ransburg Electrostatic Mix Process"

3. **"Installation"** section - revised:
   - "Warning" added.

4. **"Operation"** section - revised:
   - "Safe Operation"
   - "Preparation - Paint and Fluid Nozzle"

5. **"Maintenance"** section - Entire section revised.

6. **"Service"** section - removed and added to "Maintenance" section.

7. **"Parts Identification"** section - Entire section revised.

8. **"Appendix"** section revised:
   - Revised "Paint and Solvent Specifications"
   - Revised "Viscosity Conversion Chart"
   - Revised "Volumetric Content of Hose or Tube"

Service Manual Price: $30.00 (U.S.)

Manufacturing
1910 North Wayne Street
Angola, Indiana 46703-9100
Telephone: 260/665-8800
Fax: 260/665-8516

Technical/Service Assistance

Automotive Assembly and Tier I	Telephone: 800/ 626-3565	Fax: 419/ 470-2040
Industrial Systems	Telephone: 800/ 233-3366	Fax: 419/ 470-2071
Ransburg Guns	Telephone: 800/ 233-3366	Fax: 419/ 470-2071

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

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