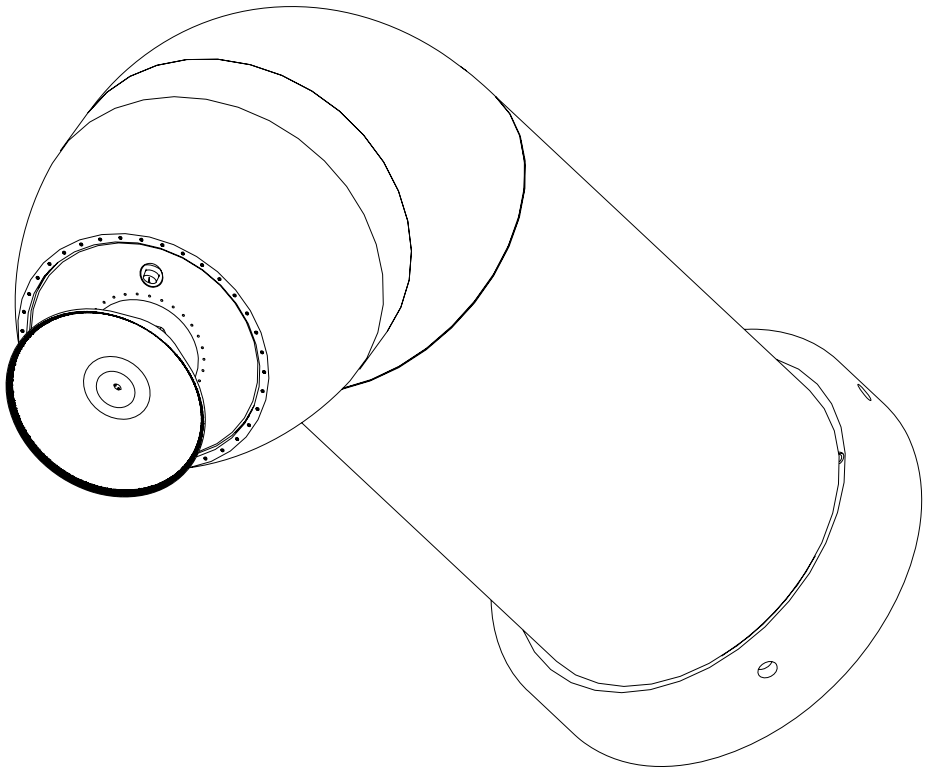
ITW Ransburg
Electrostatic Systems

SERVICE MANUAL
LN-9246-05

RMA™-303 ROBOT MOUNTED ROTARY ATOMIZER DIRECT CHARGE



MODEL: A11303

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

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

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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 set-up operations. Production should never be done with safety interlocks disabled. Never use equipment intended for use in waterborne installations to spray solvent based materials. The paint process and equipment should be set up and operated in accordance with NFPA-33, NEC, and OSHA requirements.

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.
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 shut-down 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. 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.
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, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your material supplier. Any other type of solvent may be used with aluminum equipment.

AREA Tells where hazards may occur.	**HAZARD** Tells what the hazard is.	**SAFEGUARDS** Tells how to avoid the hazard.
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.
Spray Area/ High Voltage Equipment 	There is a high voltage device that can induce an electrical charge on objects which is capable of igniting coating materials. Inadequate grounding will cause a spark hazard. A spark can ignite many coating materials and cause a fire or explosion.	Parts being sprayed must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 megohm. All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded. Any person working in the spray area must be grounded. Unless specifically approved for use in hazardous locations, the power supply and other electrical control equipment must not be used in Class 1, Division 1 or 2 locations.
Personnel Safety/ Mechanical Hazards 	The bell atomizer can rotate at speeds up to 70,000 rpm. At these speeds, the edge of the applicator can easily cut into skin. Loose articles of clothing can also be caught by the rotating bell.	Personnel must stay clear of the bell whenever it is rotating. Before touching the bell, the turbine air must be shut off. If the bell has been rotating, allow at least two minutes for it to come to a complete stop before touching it.
Robot Work Area - General Use and Maintenance	Improper use or maintenance can lead to hazardous conditions, particularly from unexpected robot manipulator movement.	Applicator adjustments or maintenance should be done after the robot is taken out of service. Do not adjust or repair the applicator if the robot is operating or standing ready to start. Refer to robot operating instructions for the procedures to take the robot out of service.

INTRODUCTION

FEATURES

Features which make the ***RMA™-303 Robot Mounted Rotary Atomizer*** advantageous for use in electrostatic applications include:

- Assembly components made of durable engineered resin material for optimum mechanical strength and solvent resistance.
- Heavy duty design ensures excellent service life even when subjected to the quick motions of robotic applications.
- Proven long life turbine motor capable of speeds up to 70 krpm. (See "Specifications" in the "Introduction" section of this manual for bell cup speed ratings.)
- Selection of different cups allows versatility of atomization and pattern size for base coat and clear coat. All cups are Titanium material for extended wear life.

  Patented, serrated edge bell cup provides excellent atomization quality at minimal rotational speeds.

  Serrated and non-serrated 65mm diameter bell assemblies available for application flexibility and color match.
- Inner and outer shaping air passages provide a wide range of pattern size options at low air consumption.
- Independent inner shaping air for pattern control and outer shaping air for cut-ins.
- Aerodynamic design for ease of cleaning external surfaces.
- 60° angled body provides more maneuverability and facilitates robotic programming.
- Small light weight package allows better maneuverability in tight areas.
- Speed control uses reliable magnetic pickup for fiber optic transmission of rotational speed data.
- Negligible maintenance down time. With the quick disconnect feature, an atomizer can be exchanged in less than 2 minutes for off-line maintenance.
- The easily removable front and rear shrouds, turbine assembly and the internally mounted fluid valves, make off-line maintenance more efficient and economical.
- Fast color changes are achieved using center feed fluid delivery and the fluid valves provide for simultaneous paint push out while solvent washes the feed tube and bell cup.
- Internal and external bell wash is quick and efficient. Solvent is controlled at the feed tube with an internally mounted solvent valve. Externally mounted regulators control the flow.
- Less waste to the spray booth, with the dump valve located internally next to the feed tube.
- No external high voltage cable. The internally mounted high voltage cascade requires only low voltage control wiring.
- Compact high voltage control system. The MicroPak cascade control takes only 1/4 of the space in a 19 inch Euro rack, leaving room for additional control modules.
- Various adapter plates available to match most robotic mounting configurations.
- Direct charging of fluid (solventborne paint) promotes high transfer efficiency.
- Large range of fluid tip sizes available.

GENERAL DESCRIPTION

Bell Cup Assembly

All bell cups are made of high strength Titanium. They are available in 65mm serrated, non-serrated for base coat applications and 65mm serrated for clear coat applications.

Air Bearing Turbine Assembly

The air bearing turbine assembly with bell cup is mounted to the air manifold assembly with a turbine retaining ring.

Air Manifold Assembly

The atomizer extension is angled at 60° for robot applications. The fluid feed tube and fiber optic turbine speed emitter are threaded into the front of the manifold. The turbine, fluid, and air manifold are separated from the bell plate assembly by five support rods. Nested between the manifolds and the bell plate is the high voltage cascade.

Bell Plate Assembly

The bell plate assembly is designed to be at ground potential when mounted to the robot plate component within the tubing bundle assembly. The air and fluid ports are compactly oriented for use in robotic applications. The interior air supplies are ported through the five support rods and also directly tubed to the air manifold assembly. On the exterior side of the bell plate, the ports are provided with o-ring seals so that the atomizer can be quickly mated and secured to the robot plate.

Robot Plate

The robot plate is a component of the tubing bundle assembly and intended to be permanently mounted to the robot. A wrist adapter is also available, which matches the robot's mounting configuration. The incoming air lines, fluid lines, low voltage cable, and fiber optic cable are connected to the fittings provided on the back of the robot plate. The bell plate of the atomizer assembly is secured to the robot plate with a threaded retaining ring.

Break-Away Feature (Optional)

The RMA-303 can be converted to have a break-away feature, by replacing the five (5) stainless steel screws with five (5) special designed plastic screws (77524-00). This feature is meant to reduce the damage to the atomizer, robot, etc. If a collision occurs, the five (5) plastic break-away screws fail and the atomizer will break free. This will leave the break-away ring and the mounting ring attached to the robot.

Power Supply and Controls

The high voltage cascade located inside the RMA-303 is controlled by the MicroPak™ control unit. The low voltage output of the MicroPak is multiplied by the internal cascade to the high voltage level required. This eliminates the need for a high voltage cable. A low voltage cable interconnects the cascade and MicroPak control. The MicroPak Eurocard format is designed to fit in a conventional 19 inch or 10 inch rack and requires a 24 V power input at a maximum 3 amps. The MicroPak and the internal cascade will produce voltages up to 100,000 VDC.

The MicroPak is designed to electronically limit current to provide safe operation in a spray booth. The voltage and current draw of the atomizer are continuously displayed on the MicroPak control panel. Voltage and overcurrent limits are adjustable on the front of the MicroPak. MicroPak internal safety circuits will shut down the system on over-current and cable faults.

With additional control modules, all of the functions of RMA-303 and MicroPak can be controlled by a programmable controller. A Serial Atomizer module pneumatically controls the speed of the rotary atomizer with dynamic feedback through a fiber optic transmitter located on the applicator. An AirTronic module pneumatically controls the atomizer's inner (pattern control) and outer (cut-in control) shaping air. A Serial Digital module pneumatically controls the paint, solvent, and dump valves located on the atomizer. An I/O module provides communication between these modules and the PLC.

The above modules are mounted in one 19 inch rack and interconnected through a common mother board.

SPECIFICATIONS *

Electrical

Power Supply Type: MicroPak

Charging Method: Direct

Output Voltage: 30-100 kV Variable

Output Current: 125 µA Maximum

Turbine Speed Control: Eurocard Atomizer Module

Inner/Outer Shaping Air Control: Eurocard AirTronic Module

Part Sprayability: Determine sprayability of part to be coated using Test Equipment (76652) (Paint Conductivity Meter)

Mechanical

Length: 13.2 inches (336.9mm)

Diameter: 4.5 inches (114mm)

Approximate Weight:
Atomizer Only: 12.2 lbs. (5.53 Kg)
Total Payload: 14.7 lbs. (6.67 Kg)
(Robot Plate & Adapter)

Turbine Type: Air Bearing Impulse Drive

Turbine Air Supply: Variable (See pages 9 & 10)

Maximum/Minimum Turbine Speed: Continuous
65mm Bell Cup 70K rpm max./ 20K rpm min.

Bearing Air Supply: (Nominal): 90 psig (±10 psi) (621 kPa ±69 kPa) 2.1 scfm (60 slpm)

Inner Shaping Air Supply: Variable (See Page 11) (Minimum 70 slpm)

Outer Shaping Air Supply: Variable (See Page 11)

Brake Air Supply: (Nominal): 60-100 psig (414-689 kPa)

Maximum Fluid Pressure Supply:
Paint: 200 psi (1379 kPa)
Solvent: 150 psi (1035 kPa)

Fluid Flow Rate: 25-700 cc/minute

Bell Cup Cleaning Time (Internal/External): 2-7 sec. (Approx.)

Color Change Time: Dependent on system configuration, fluid pressures, fluid viscosity, fluid line lengths, etc.

Speed Readout: Magnetic pick-up, unidirectional fiber optic transmission

Atomizer Replacement Time: Less than 2 minutes

Bell Cup Replacement Time: Less than 2 minutes

Minimum Control Equipment Requirements: (Versions listed or higher)

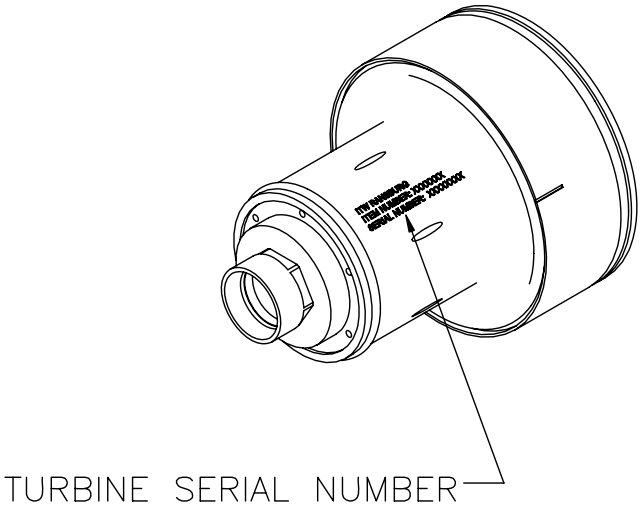
MicroPak	LECU5004-11 (V3.83)
Atomizer Module	76011-00 (V3.42)
I/O Module	76037-04 (V3.44) (4-20 mA)
	76037-03 (V3.44) (0-10V)
Node Adapter +	78444-00 (V3.41)

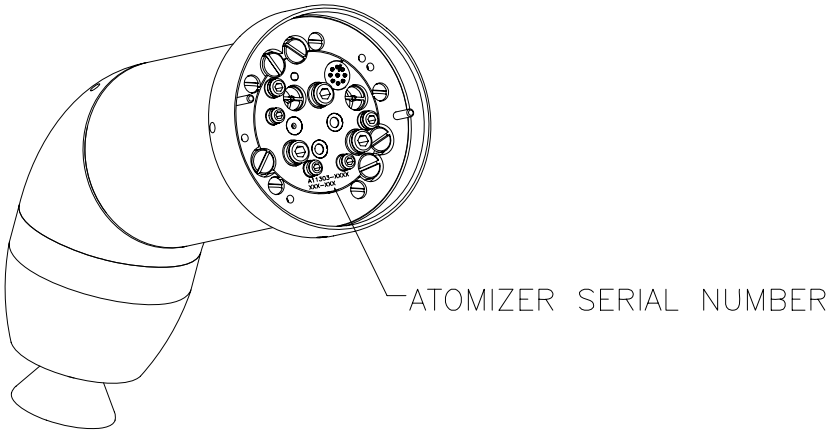
*** Specifications and ratings based on testing at sea level standard conditions.**

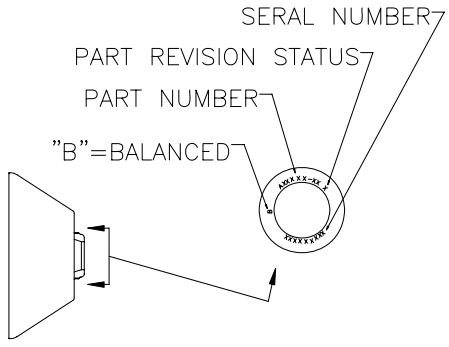
IMPORTANT NUMBERS

Record these numbers in a log book for future reference.

The last digits of the Atomizer serial number are also the Turbine serial numbers.



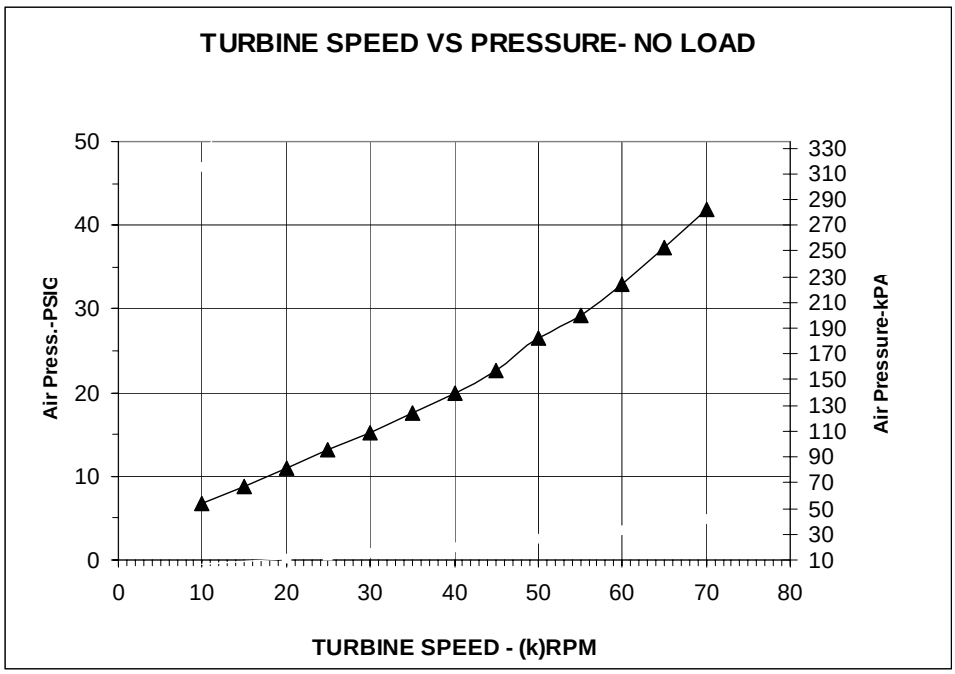


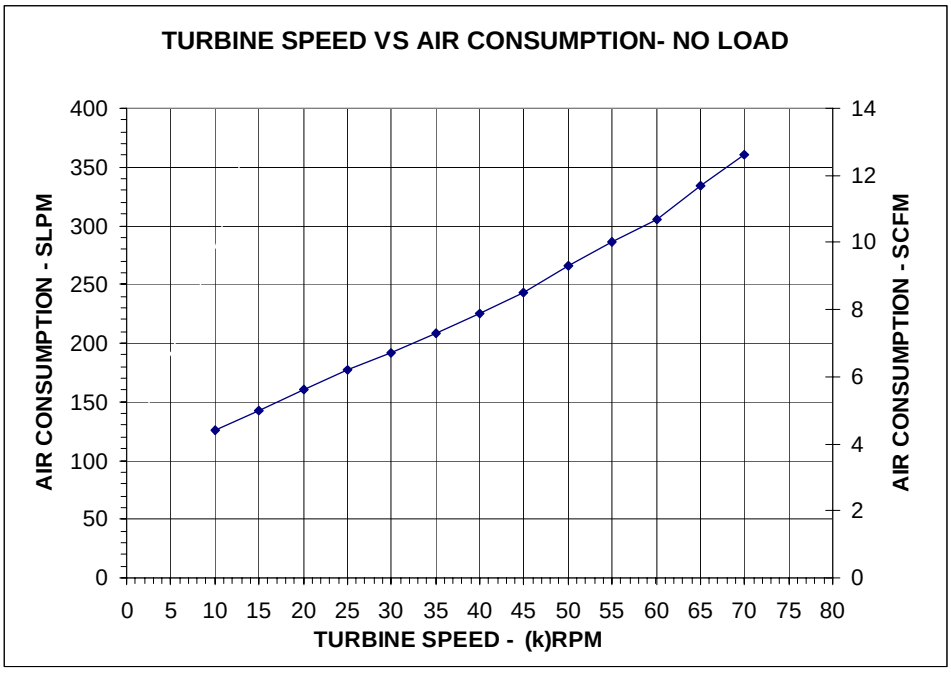


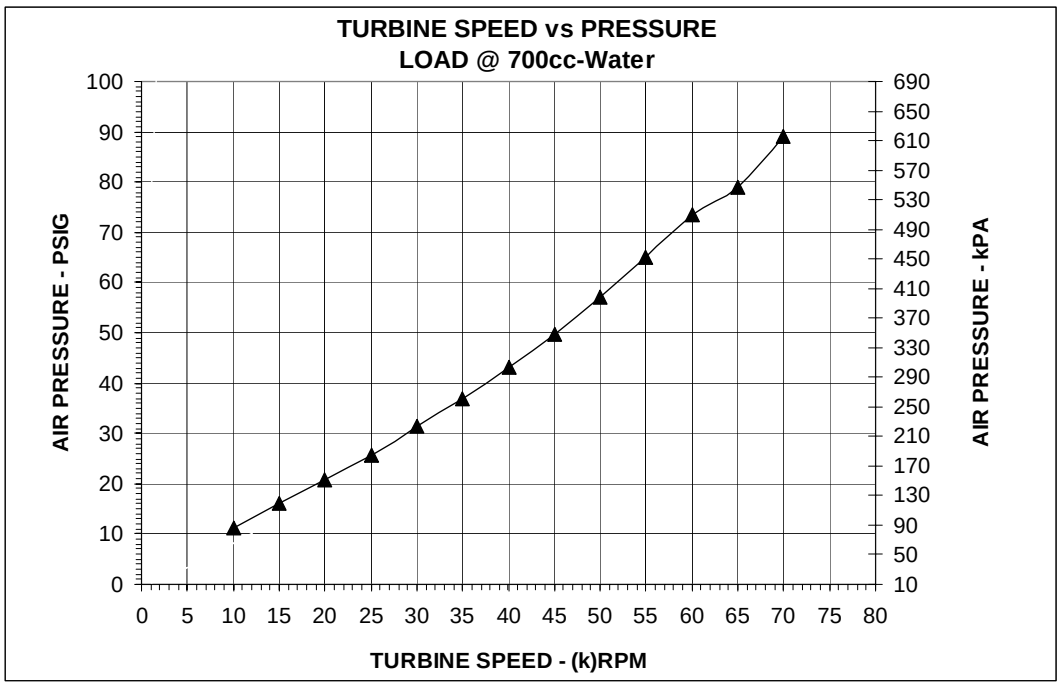
BELL CUP PART NUMBER/SERIAL NUMBER

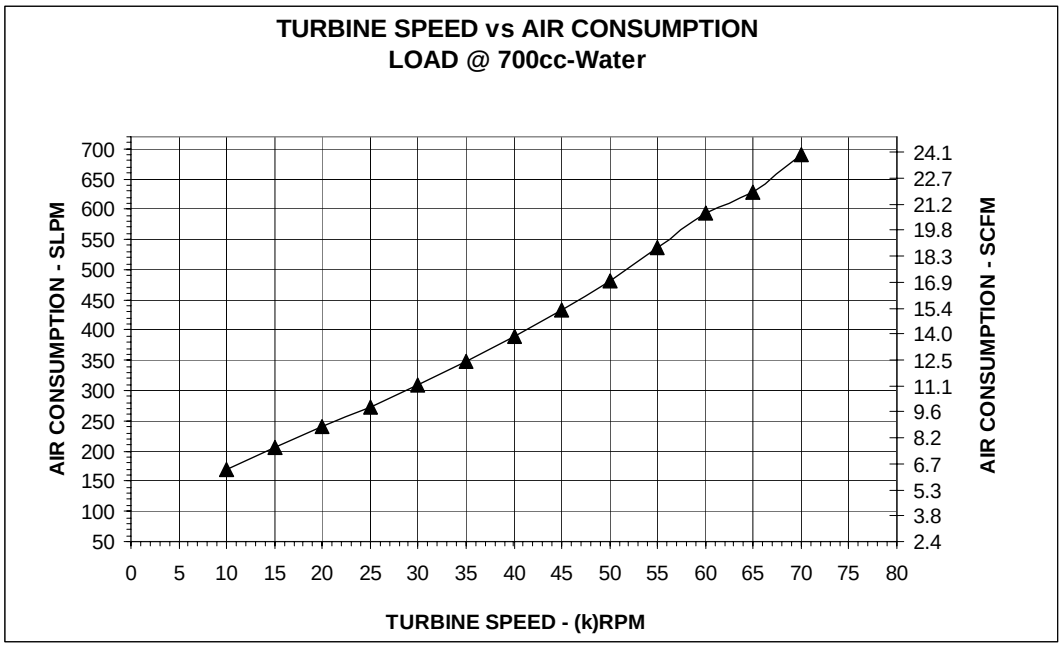
NOTE

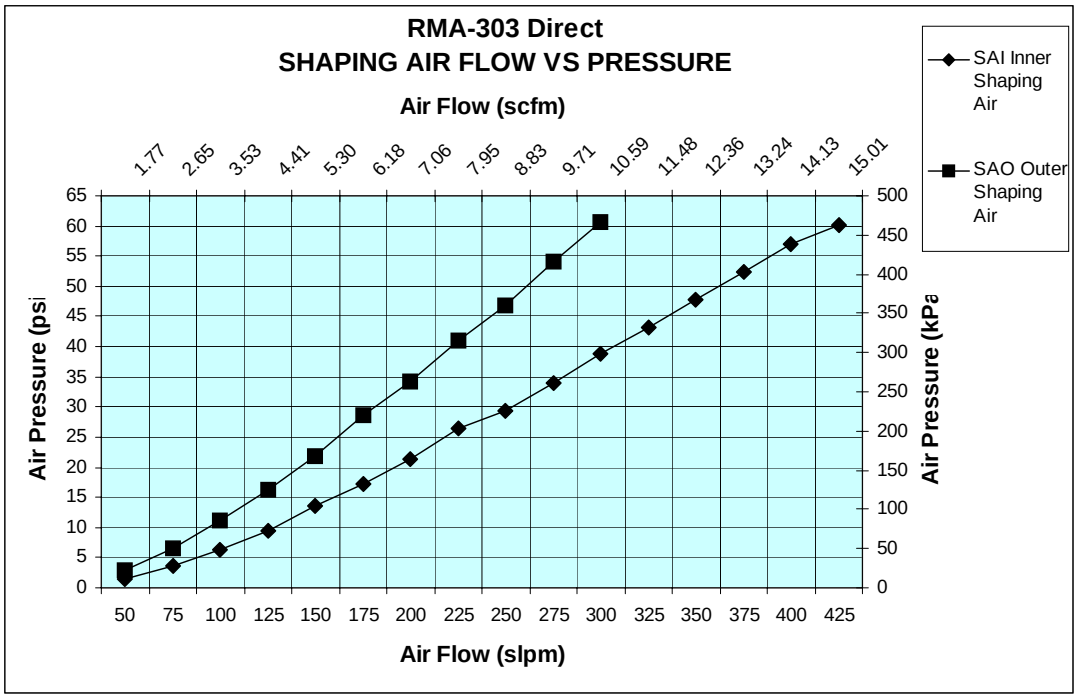
► **Graphical information provided for reference only.** Performance will vary depending on coating material viscosity and flow rate, supply tubing lengths, etc. (Pressure data shown was measured 12 inches (304.8mm) behind the applicator.)

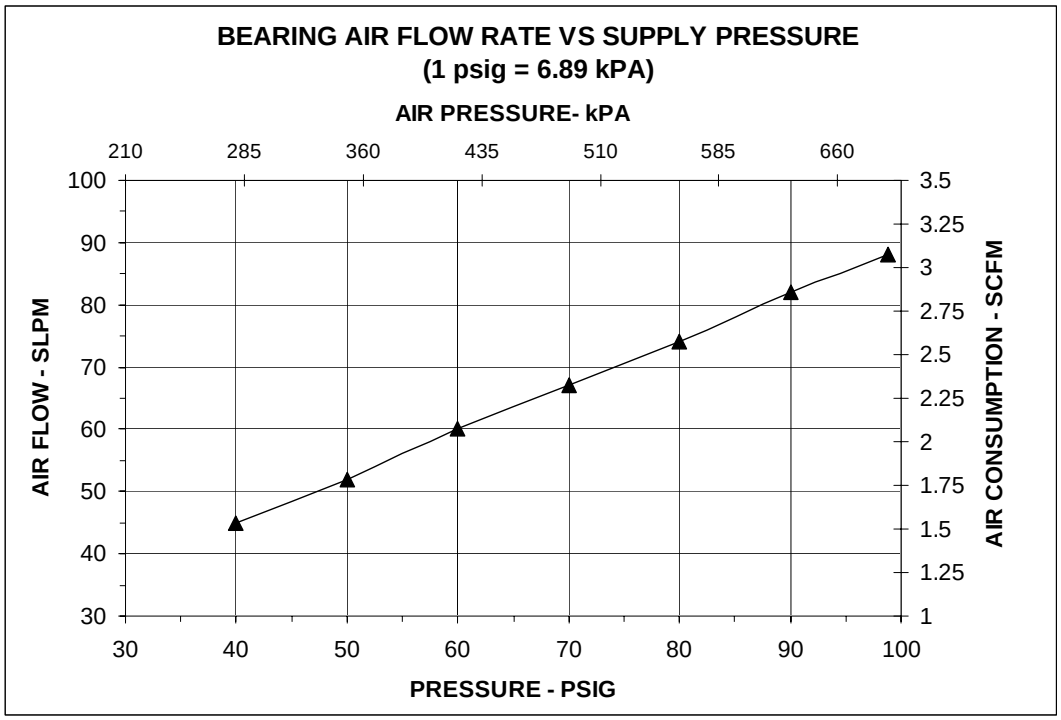


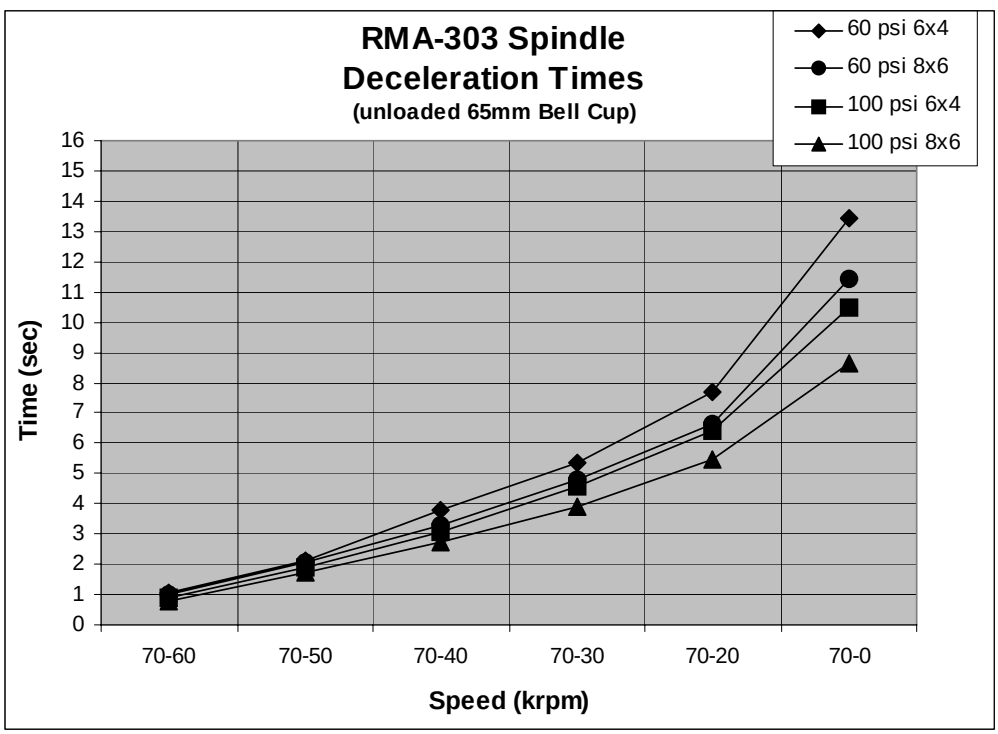



TURBINE SPEED vs PRESSURE
LOAD @ 700cc-Water
AIR PRESSURE - PSIG
AIR PRESSURE - kPA
TURBINE SPEED - (k)RPM
0 10 20 30 40 50 60 70 80 90 100
10 50 90 130 170 210 250 290 330 370 410 450 490 530 570 610 650 690
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

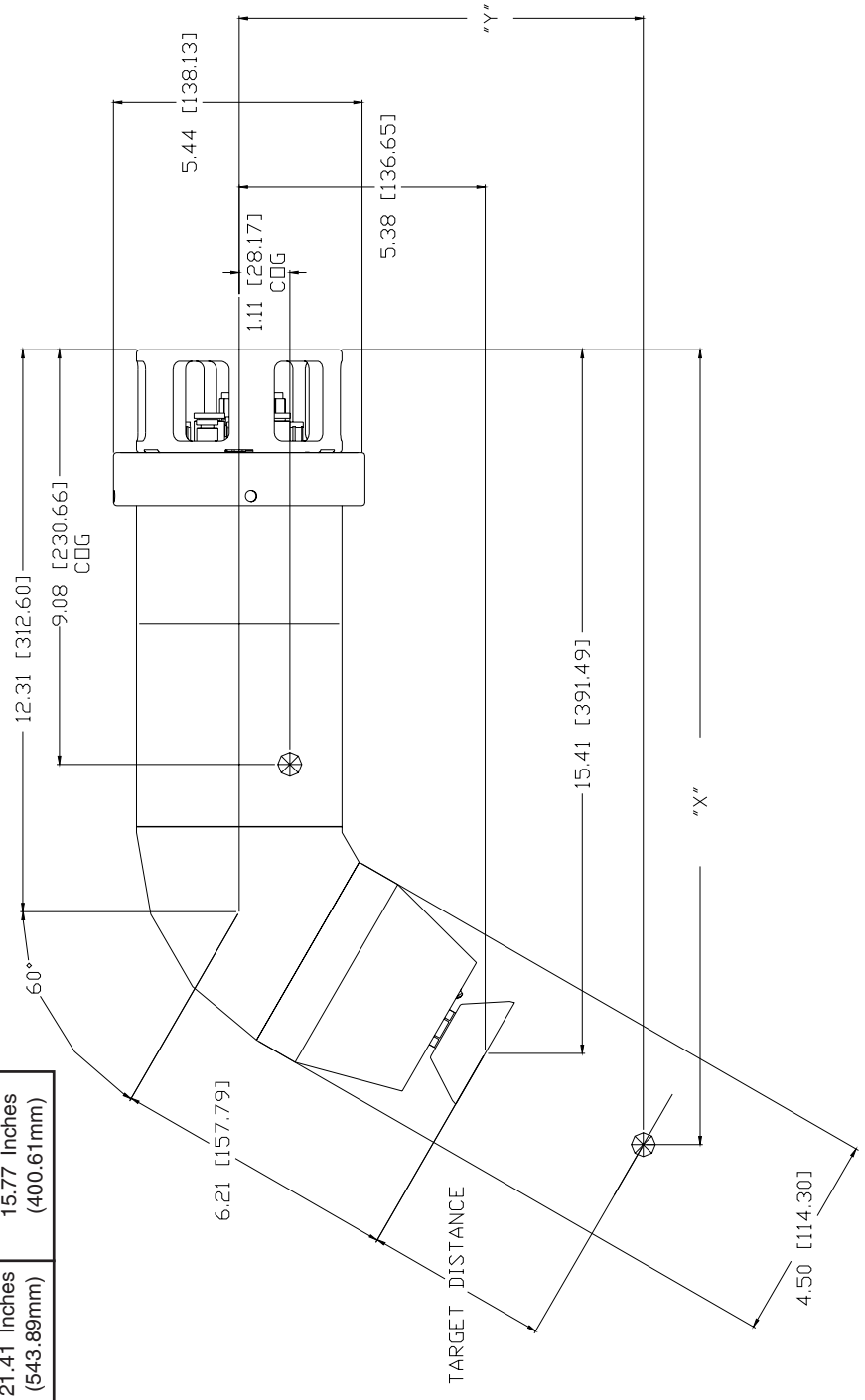

TURBINE SPEED vs AIR CONSUMPTION
LOAD @ 700cc-Water
AIR CONSUMPTION - SLPM
AIR CONSUMPTION - SCFM
TURBINE SPEED - (k)RPM
50 100 150 200 250 300 350 400 450 500 550 600 650 700
2.4 3.8 5.3 6.7 8.2 9.6 11.1 12.5 14.0 15.4 16.9 18.3 19.8 21.2 22.7 24.1
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80


RMA-303 Direct
SHAPING AIR FLOW VS PRESSURE
Air Flow (scfm)
1.77 2.65 3.53 4.41 5.30 6.18 7.06 7.95 8.83 9.71 10.59 11.48 12.36 13.24 14.13 15.01
Air Pressure (psi
65 60 55 50 45 40 35 30 25 20 15 10 5 0
Air Pressure (kPa
500 450 400 350 300 250 200 150 100 50 0
50 75 100 125 150 175 200 225 250 275 300 325 350 375 400 425
Air Flow (slpm)
SAI Inner Shaping Air
SAO Outer Shaping Air


BEARING AIR FLOW RATE VS SUPPLY PRESSURE
(1 psig = 6.89 kPA)
AIR PRESSURE- kPA
210 285 360 435 510 585 660
AIR FLOW - SLPM
100 90 80 70 60 50 40 30
AIR CONSUMPTION - SCFM
3.5 3.25 3 2.75 2.5 2.25 2 1.75 1.5 1.25 1
30 40 50 60 70 80 90 100
PRESSURE - PSIG



NOTE:
6mm X 4mm Results = 1 piece 25 ft. long
8mm X 6mm Results = 1 piece 6mm X 4mm, 6 ft. long and
1 piece 8mm X 6mm, 19 ft. long = 25 ft. long



65MM RMA-303 DIRECT TOOL POINT DIMENSIONS		
T.D.	X	Y
4 Inches (101.6mm)	17.41 Inches (442.29mm)	8.84 Inches (224.63mm)
6 Inches (152.4mm)	18.41 Inches (467.9mm)	10.58 Inches (268.63mm)
8 Inches (203.2mm)	19.41 Inches (493.09mm)	12.31 Inches (312.62mm)
10 Inches (254mm)	20.41 Inches (518.49mm)	14.04 Inches (356.62mm)
12 Inches (304.8mm)	21.41 Inches (543.89mm)	15.77 Inches (400.61mm)

Figure 1: RMA-303 Direct Tool Point, Center of Gravity, and Envelope Dimensions

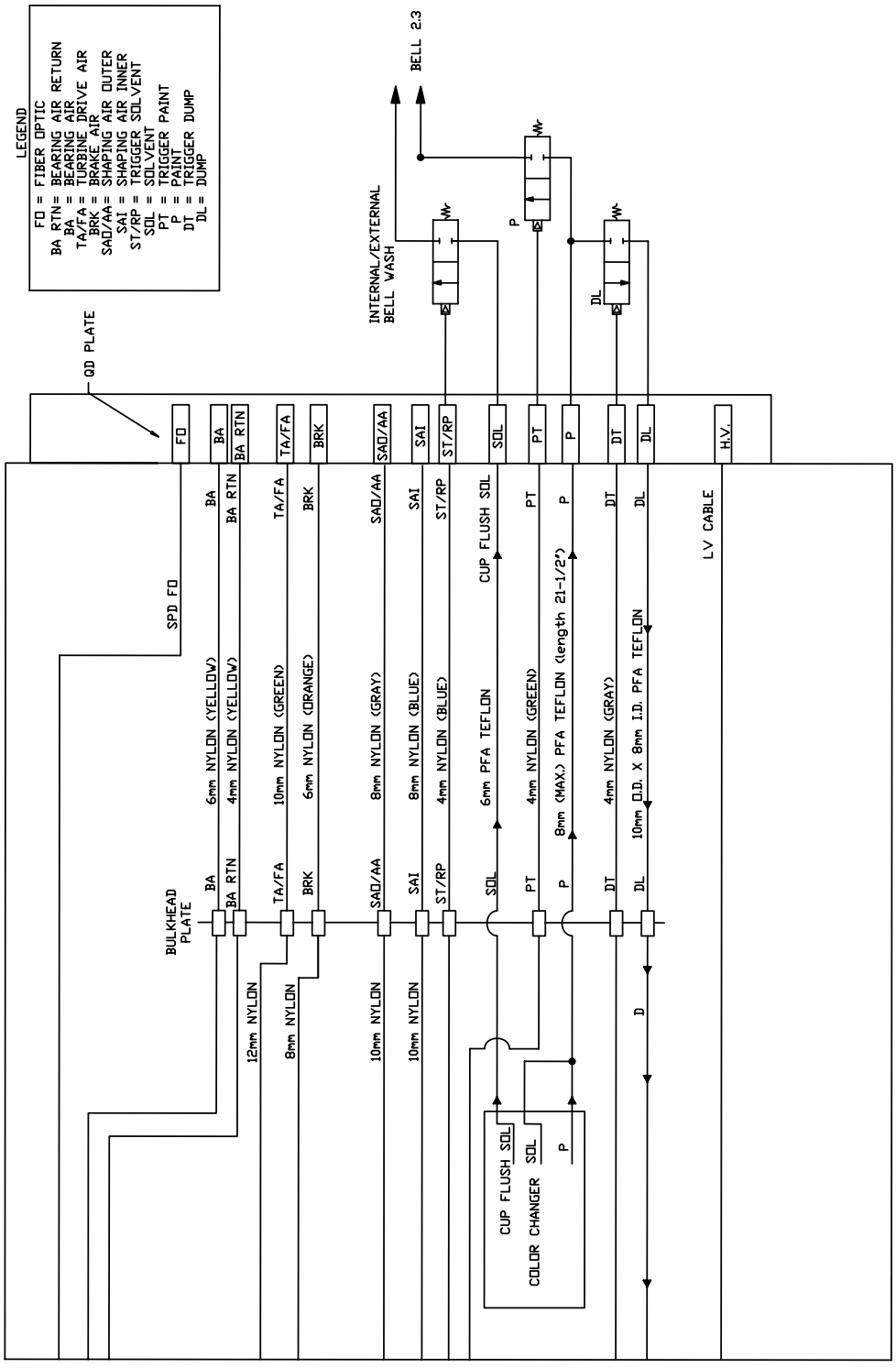


Figure 2: Circuit Schematic

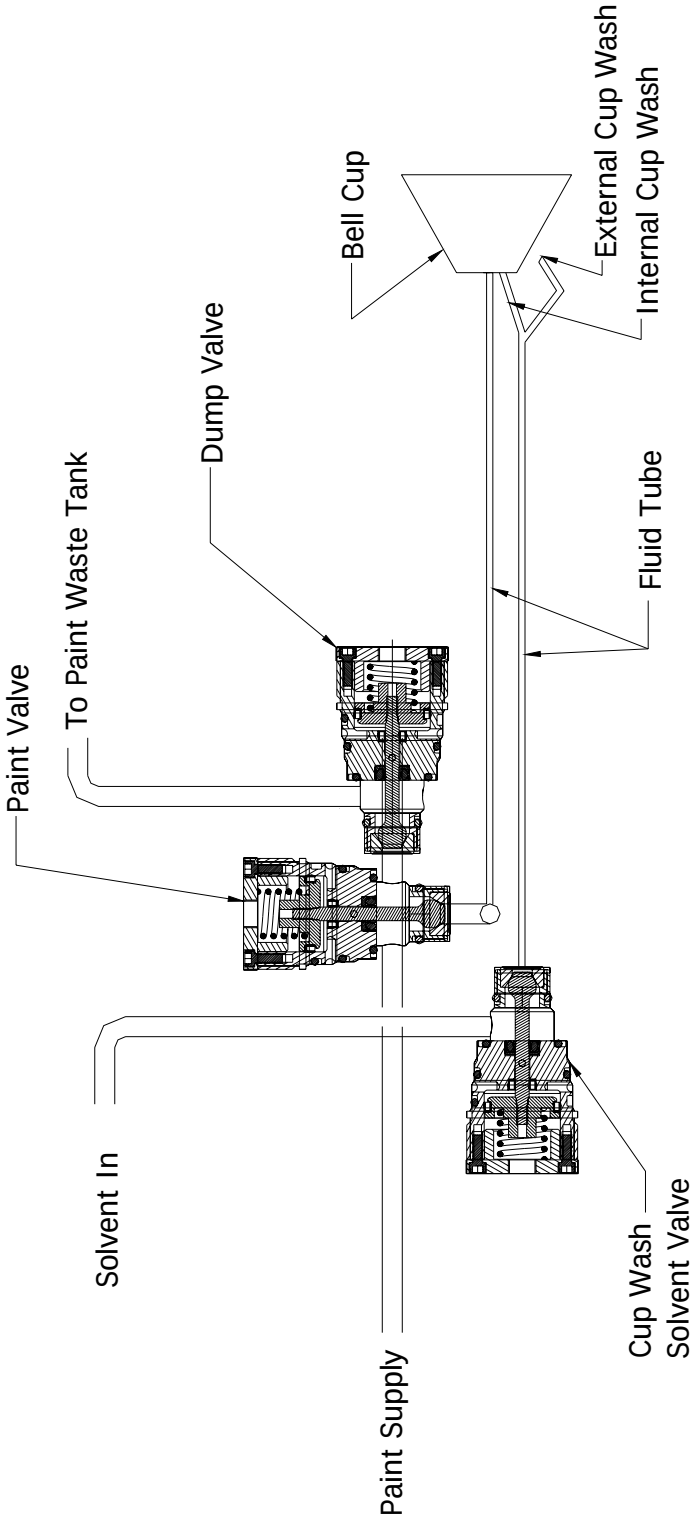


Figure 3: Valve Schematic

NOTES

INSTALLATION

AIR FILTER INSTALLATION

The following air filter installation guidelines are essential for optimum performance:

1. 25mm OD (1 inch OD) minimum inbound main air line.

2. Use only recommended pre-filters and bearing air filters as shown in Figure 5. Additional system air filtration (i.e., refrigerated air dryer) may also be used if desired.

3. Mount the bearing air filter as close as possible to the RMA-303. (DO NOT mount further than 30 feet (9.1 meters) away.)

3. DO NOT use Teflon tape, pipe dope, or other thread sealant downstream of the bearing air filter. Loose flakes of Teflon tape or other sealant can break loose and plug the very fine air holes in the turbine air bearings.

4. Air heaters are highly recommended for use in the system to minimize the effect of excessively humid conditions. If the heated air will exceed 120°F (48.9°C), the heater must be located after all filters to prevent damage to the filter media.

AIR PRESSURE REQUIREMENTS

	Tube Size	Air Pressure Requirements
Bearing Air Supply (B.A)	6mm OD (Yellow)	90psi +/- 10 (621+/- 69 kpa)
Bearing Air Return (B.A.)	4mm OD (Yellow)	80psi +/- 20 (at atomizer card) (552 +/- 138 kpa)
Turbine Air (T.A)	10mm OD (Green)	Variable
Cut-In Air (SAO) (Outer)	8mm OD (Gray)	Variable
Pattern Control Air (Inner) (SAI)	8mm OD (Blue)	Variable
Brake Air (BRK) (if used)	6mm OD (Orange)	60-100 psi (414 - 689 kpa)
Paint Valve Control (PT)	4mm OD (Green)	80 psi ± 10 (552 +/- 70 kpa)
Dump Valve Control (DT)	4mm OD (Gray)	80 psi ± 10 (552 +/- 70 kpa)
Cup Wash Solvent Valve Control (ST)	4mm OD (Blue)	80 -100 psi (552-873 kpa)

Figure 4: Air Tubing Connections

NOTE

► With the exception of fluid, dump, and bearing air, all other pilot and air supply lines should be bulkheaded and their diameters increased one size. For example: turbine air should be increased to a 12mm OD from bulkhead plate to the volume booster.

AIR HEATER REQUIREMENTS

Turbine drive air expands as it moves through the turbine wheel cavity and as it exits the turbine from the exhaust port. This expansion will cause cooling of the exhaust air and the surfaces it contacts. This same expansion cooling can occur across the shaping air exit ports. This cooling effect can cause surface temperatures to fall below the dew point of the booth, which will result in condensation on the interior and exterior of the atomizer, machine, and its components. It is even possible that the temperature of the supply air may be below the booth dew point, even without additional expansion cooling.

Condensation is especially probable in waterborne applications when booth temperature and relative humidity levels are typically maintained very high. This condensation will allow sufficient conductivity of the surfaces such that they act as an erratic ground source potential. This can cause damage to the equipment.

It is therefore, a requirement that turbine exhaust air temperature be maintained above the booth dew point to prevent condensation from forming on atomizer surfaces. Doing so will eliminate moisture as a potential defect in painted surfaces as well as extending equipment life. Thus, it is recommended that air heaters be installed into the atomizer air supply lines, i.e. turbine drive air, shaping air, and seal air. The air heaters must be of sufficient capacity, capable of raising the incoming air temperature at least 40°F (4.4°C) at a flow rate of 60 scfm per applicator.

The actual air heater process setting depends on applicator fluid flow rate load, booth conditions, turbine airflow settings, and incoming air temperature. The heater should be set as low as possible, sufficient to maintain the applicator surface temperatures above the dew point in the booth.

Example: With the incoming air temperature at 72°F (22.2°C), an RMA-303 with 65mm bell cup rotating unloaded at 60 krpm has a turbine outlet temperature drop of approximately 28°F (-2.2°C) (@ 40 krpm unloaded, ΔT ~ 14°F (-.10°C)). Referring to the ASHRAE Psychrometric chart, the saturation temperature range (dew point) of a spray booth maintained at 70-75°F / 65-70% RH is 62-68°F (21.1-23.9°C / 65-70° RH is 16.7-20°C). Thus it is almost certain that the surface temperatures of the applicator will fall below the dew point of the booth, and an air heater will be needed in this case.

To prevent condensation, an ITW air heater assembly should be assembled after the air filters. (Reference the current "Air Heater Assembly" service manual for further information.)

NOTE

► Failure to use an air heater may cause damage to equipment or ruin the finished component being processed.

AIR FILTRATION REQUIREMENTS

ITW Filter Model No.	Description / Specifications	Replacement Element Part No.
HAF-503	Pre-filter, removes coarse amounts of oil, moisture & dirt. Used upstream of RPM-417 pre-filter (used in systems with poor air quality).	HAF-15 Element, One
RPM-417	Pre-filter, coalescing type, 136 scfm, 98.5% efficiency particulate removal .3 to .6 micron, max. aerosol passed 1.0 micron, max. solid passed .4 micron (dependent upon scfm requirement per applicator, one RPM-417 can be used with up to three RMA-303 assemblies).	RPM-32 Elements, Carton of 4
RPM-418	Bearing air filter, coalescing type, 19 scfm, 99.995% efficiency particulate removal .3 to .6 micron, max. aerosol passed .6 micron, max. solid passed .2 micron (one per applicator).	RPM-33 Elements, Carton of 8

Figure 5: Required Air Filtration

⚠ CAUTION

► Air must be properly filtered to ensure extended turbine life and to prevent contamination of the paint finish. Air which is not adequately filtered will foul the turbine air bearings and cause premature turbine failure. The correct type of filters must be used in an RMA-303 system. The filter elements must be replaced on a regular schedule to assure clean air.

► **It is the end user's responsibility to ensure clean air at all times. Turbine failure resulting from contaminated air will not be covered under warranty.** Figure 5 shows the pre-filter(s) and bearing air filter which are recommended for use in RMA-303 systems. If other filters are incorporated in the system, the filters to be used must have filtering capacities equal or better than those shown in Figure 5.

► The user must ensure the bearing air supply is not inadvertently turned off while the RMA-303 air motor is turning. This will cause air bearing failure.

MOUNTING

The RMA-303 is equipped with a quick disconnect assembly. The quick disconnect feature consists of a robot plate which is permanently attached to the robot through a wrist adapter plate, and a mating bell plate which is a part of the RMA-303 atomizer assembly. The atomizer is secured to the robot plate with a threaded retaining ring.

ELECTRICAL AND FIBER OPTIC CONNECTIONS

The fiber optic connection is made on the back of the atomizer's robot plate. The fiber optic cable comes preassembled with connectors that are secured in place by set screws tightened from the side of the robot plate. An adequate ground must be provided to the mounting plate to ensure that fluid fittings, etc. are at ground potential.

FLUID CONNECTIONS

The paint, solvent, and dump fluid tubing are connected on the back of the robot plate with stainless steel compression fittings and PFA Teflon tubing. Fluid tubing requirements are shown in Figure 6.

TYPICAL INSTALLATION

Figure 7 shows a typical installation of the RMA-303 and the wiring installation of the applicator with the MicroPak.

	Fixed Atomizer	Pressure (Maximum)
Paint Line (P)	6mm ID / PFA, Teflon	200 psi max. (1379 kpa)
Cup Wash Solvent Line (SOL)	4mm ID / PFA, Teflon	150 psi max. (1033 kpa)
Dump Line (DL)	8mm ID / PFA, Teflon	200 psi max. (1379 kpa)

Figure 6: Fluid Tubing Connection Requirements

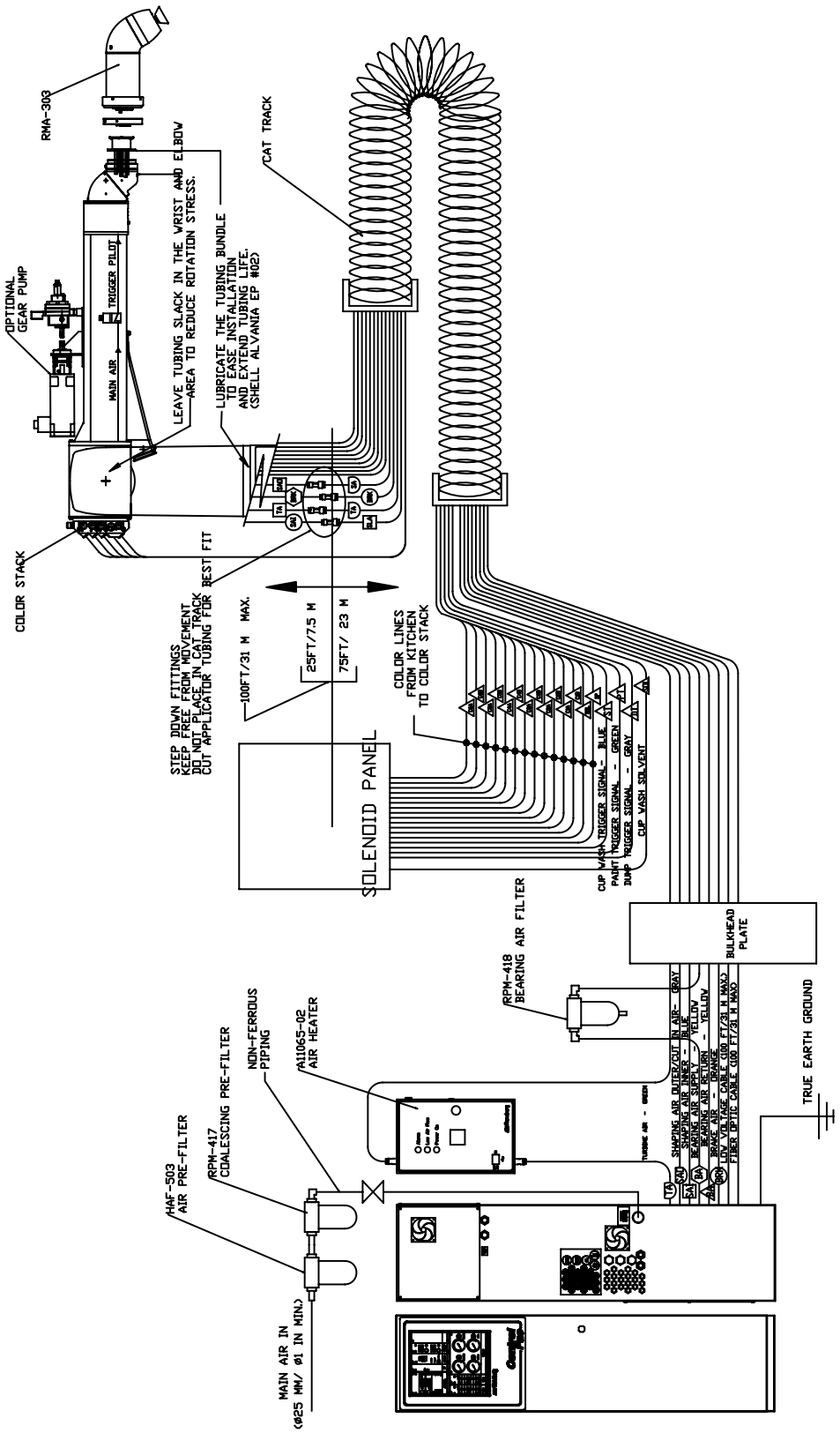


Figure 7: Typical Installation RMA-303

TUBING BUNDLE INSTALLATION

Typically, the tubing bundle is pulled through the robot arm from the robot wrist side. Keep the bundle taped except for the portion of the bundle that will be inside the arm. Pull the tubing through the wrist and arm, leaving about 250mm (10 inches) of tubing sticking out the front of the wrist plate (see Figure 8).

Fasten the cable bundle in the robot at the rear exit of the arm. Push the robot spacer plate and applicator mounting plate to the robot wrist plate aligning the top dead center marks of the spacer plate and robot wrist plate. Fasten using appropriate screws. Installing the tubing bundle in this fashion will increase tubing bundle life significantly.

BUNDLE LUBRICATION

When the tubing bundle is installed, it should be lubricated with a generous amount of lubricant to increase the service life of the tubes. A recommended lubricant is Shell Alvania EP #02. There are other lubricants that are available for use. Prior to using a lubricant, insure it is silicone free, resists heat breakdown, and is compatible with the materials being applied.

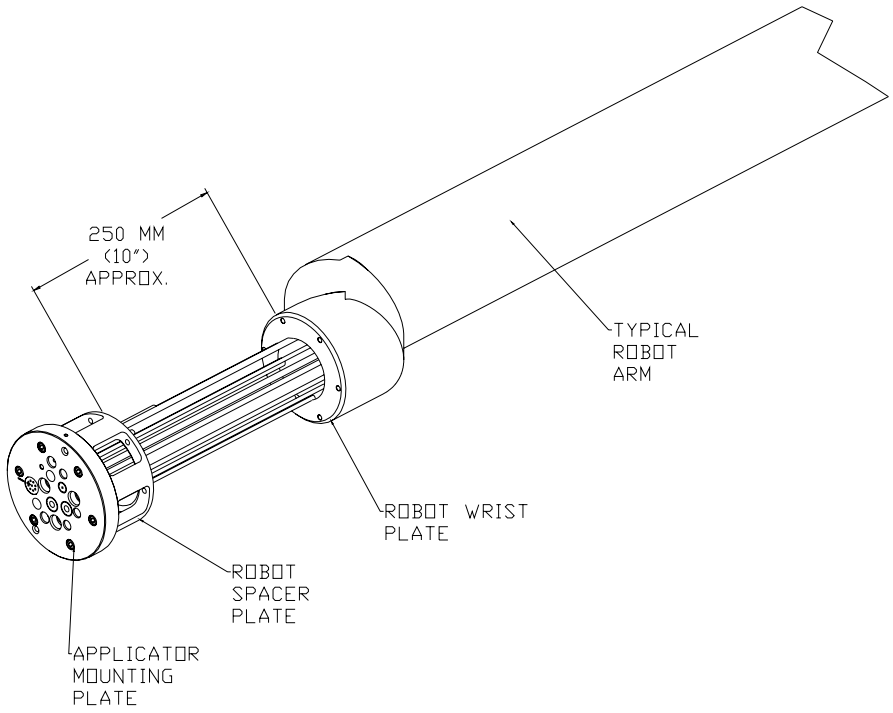


Figure 8: Tubing Bundle Installation

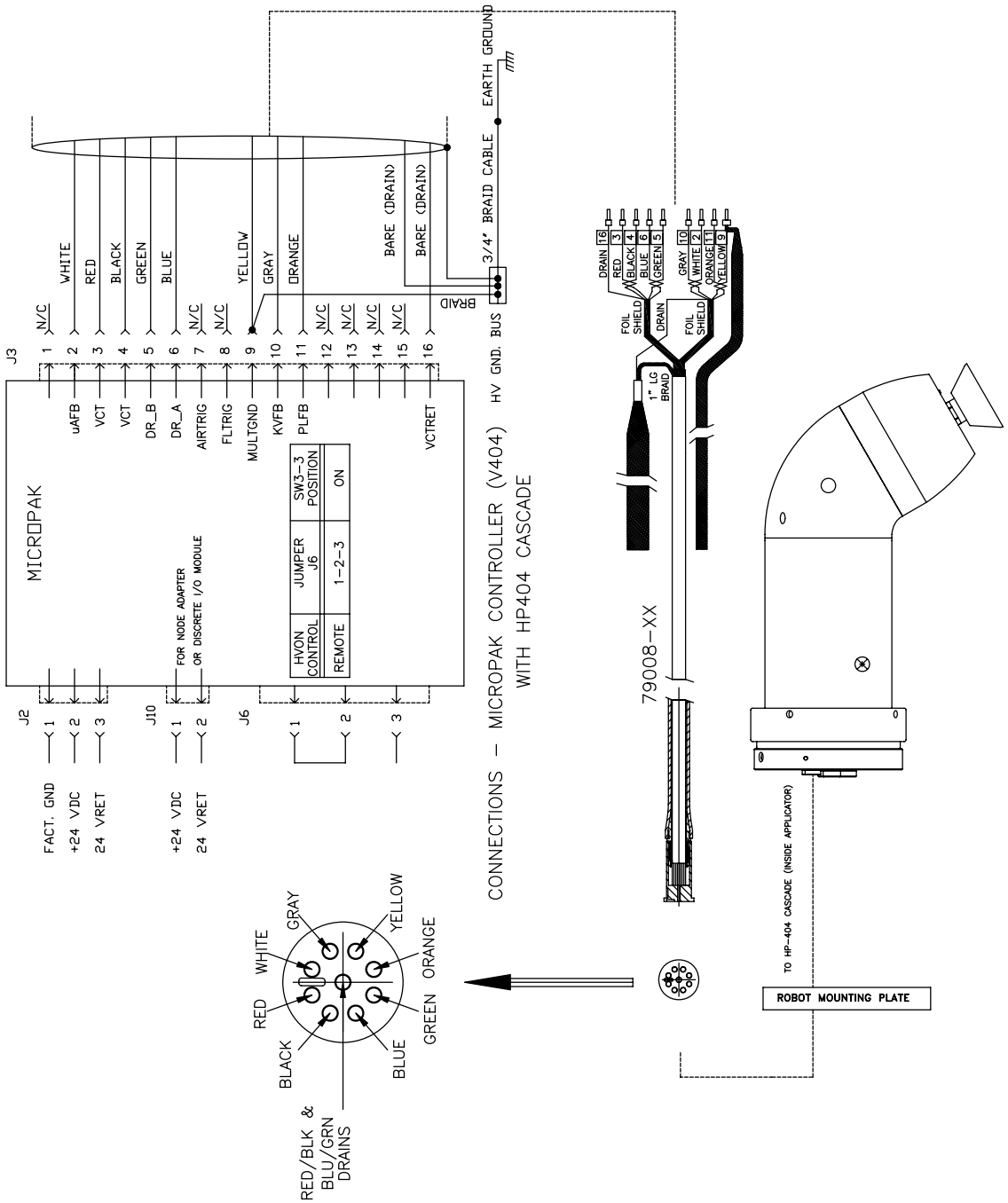


Figure 9: RMA-303 Wiring Installation

INTERLOCKS

The following system interlocks are required to prevent equipment damage:

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

⚠ CAUTION

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

► The bell cup must be removed when making flow checks. If the paint is turned on when the bell is mounted and the turbine shaft is not rotating, paint will enter the shaft and possibly damage the air bearing. Material flow checks (flow rate verification) must be made with the bell cup off and the turbine not rotating. Normally pneumatic interlocks will not allow the paint to trigger on when the turbine air is off. These interlocks may need to be bypassed with proper safety procedures as required.

⚠ WARNING

► Under normal operation, the high voltage and/or coating material must never be turned on unless the bell cup is mounted on the motor shaft and the turbine is rotating.

► Pneumatic input to the turbine air inlet must be controlled to prevent the turbine from exceeding the maximum rated speed of 70,000 rpm. (See "Specifications" in the "Introduction" section.)

► High voltage must never be turned on while cleaning solvent is being sprayed either through the applicator supply or the cup wash line. High voltage and both solvent triggers must be interlocked.

2. It should not be possible for the coating material to be sprayed unless the turbine is spinning.

3. Two interconnected bearing air ports are provided, one for supply air and the other to be used as a return signal for measuring bearing air pressure at the atomizer. If bearing air falls below 80 psi (551.6 kpa) at the atomizer, the turbine air should be automatically interlocked to shut off. This interlock is provided by the Serial Atomizer Module. (See current "Serial Atomizer" manual.)

4. High voltage must be interlocked with the solvent valve pilot signal to prevent solvent flow while high voltage is energized.

⚠ WARNING

► Never spray solvent with high voltage on.

5. Turbine air and brake air must be interlocked to prevent both from being used simultaneously. This interlock is provided by the Serial Atomizer Module (see current "Serial Atomizer"manual).

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

OPERATION

⚠ WARNING

➤ Operators must be fully trained in safe operation of electrostatic equipment. Operators must read all instructions and safety precautions prior to using this equipment (see NFPA-33).

As with any spray finishing system, operation of the RMA-303 involves properly setting the operating parameters to obtain the best finish quality for the coating material being sprayed, while maintaining correct operation and reliability of the equipment used. Adjustments to operating parameters, which cover spraying, cleaning, and on/off control, include:

- Coating Materials
- Fluid Flow Rate Control
- Fluid Valve/Trigger Control
- Turbine Speed
- Inner Shaping Air (Pattern Control)
- Outer Shaping Air (Cut-In Air)
- Brake Air
- Electrostatic Voltage
- Target Distance

⚠ WARNING

➤ Electrical discharge of a high electrical capacitance fluid/paint system can cause fire or explosion with some materials. If arcing occurs when a specific coating material is used, turn the system off and verify that the fluid is non-flammable. In these conditions the system is capable of releasing sufficient electrical and thermal energy to cause ignition of specific hazardous materials in air.

FLUID FLOW RATE CONTROL

Externally mounted fluid regulators or gear pumps are typically used to control fluid flow. Paint is supplied to the RMA-303 by way of the tubing bundle through the robot arm.

The atomizer assembly is equipped with micro-valves which are pneumatically operated to direct the flow of paint to either the feed tube or dump line and to supply an intermittent solvent to clean the interior and exterior of the bell cup.

The feed tube has several sized removable tips available from .7mm to 1.6mm. The viscosity and volume of the coating material being sprayed determines the correct size of feed tube tip for each installation.

Fluid Flow Rate Check

In the test mode, the flow rate can be measured by removing the bell cup from the atomizer, turning the fluid flow on, and capturing the material in a graduated beaker or measuring cup for a fixed period of time (shaping air, high voltage, and turbine air must be off).

⚠ WARNING

➤ Danger of shock and/or personal injury can occur. Proper grounding procedures must be followed. Personnel must never work around the turbine when the turbine is spinning or when high voltage is turned on.

FLUID VALVE CONTROL
(Trigger, Dump & Solvent)

(See "Figure 2: Circuit Schematic" in the "Introduction" section.) The fluid valves in the RMA-303 are actuated by an air signal. The air pressure must be greater than 70 psi to assure proper actuation of the valve. Applying air to the valve actuator turns on the fluid or air for that valve.

The paint trigger valve controls the paint flow to the bell. When actuated, paint flows through the valve to the fluid tube, and into the rear of the bell cup. The bell cup must be spinning at least 20,000 rpm when fluid is turned on to enable the fluid to flow through the bell paint passage and be atomized.

The dump valve controls the paint flow through the dump line. When actuated, paint flow is directed to the dump return line. This provides a method of rapidly removing paint from the incoming line for cleaning and/or color change. Normally, the dump valve is not actuated at the same time as the paint trigger valve since the trigger valve is intended to cause the fluid to flow to the bell at the prescribed input pressure.

The solvent valve controls the flow of cup wash solvent. When actuated, solvent flows through a separate fluid tube passage and into the rear of the bell cup . This provides cleaning of the inside of the bell cup and the exterior of the cup. The solvent valve should never be triggered at the same time as the paint trigger valve to prevent solvent from flowing backward into the paint line.

⚠ WARNING

► Never perform the interior/exterior cup clean process with high voltage on.

To color change the applicator, a solvent air chop must be provided through the main paint line (see "Figure 7 - Typical Installation RMA-303" in the "Installation" section).

⚠ CAUTION

► The normal fluid flow range is 25-700 cc/min. During a color change or when flushing the system, higher flow rates may be required. However, the maximum flow rate through the bell cup must not exceed 700 cc/min., to avoid solvent or paint from flooding into the internal portion of the air bearing motor assembly or front shroud.

► High voltage must be interlocked with the solvent valve to prevent solvent spraying while high voltage is on.

TURBINE SPEED

Turbine speed is determined by the input air pressure/flow at the rear of the atomizer.

Turbine speed is intended to be closed loop controlled using the fiber optic speed transmitter, located on the turbine manifold. A speed input to a remote speed controller, such as the Serial Atomizer module, is required.

NOTE

► The bell rotational speed determines the quality of atomization and can be varied for various paint flow rates and paint formulations. For optimum transfer efficiency and spray pattern control, the bell rotational speed should be set at the minimum required to achieve proper atomization. **Excessive speed reduces transfer efficiency!**

⚠ WARNING

► **DO NOT** exceed the maximum rated operating speed and turbine inlet pressure. Excessive speed may cause air turbine damage or damage to the bell.

BEARING AIR ADJUSTMENT

The nominal bearing air pressure is 90 psi (620.5 kpa), measured at the rear of the atomizer. Minimum pressure is 80 psi (551.6 kpa) and maximum pressure is 100 psi (689.5 kpa). The turbine should never be operated with less than 80 psi (551.6 kpa) bearing air pressure.

Bearing air must be present when turning the turbine on. Bearing air must remain on when the turbine air is turned off until the turbine stops spinning. Never turn off bearing air to cause the turbine to stop spinning. If connected, brake air can be used to slow the turbine.

⚠ CAUTION

► Bearing air **MUST** be ON and supplied at a minimum of 80 psig (551.6 kpa) whenever the turbine is operated. If not, severe bearing damage will occur. It is recommended that bearing air be left turned on at all times, except during maintenance or disassembly.

► Bearing damage (and subsequent turbine failure) caused by running the turbine without bearing air **WILL NOT** be covered under the ITW Ransburg warranty.

The RMA-303 is equipped with a bearing air return line to monitor bearing air pressure at the turbine manifold. When connected to the remote Serial Atomizer speed controller, operation of the turbine will automatically be shut down whenever the bearing air pressure falls below the dip switch setting of 80 psi (551.6 kpa).

INNER SHAPING AIR
(Pattern Control Air)

Shaping air is used to control the shape and size of the pattern. Lower pressure yields larger patterns, higher inner shaping air pressure creates a small sized pattern. Higher inner shaping may be used to assist with penetration of atomized particles into cavity areas. The amount of inner shaping air should be optimized for the specific application. Excessive air pressure will cause atomized particles to blow by the target, reducing electrostatic wrap and lowering transfer efficiency. Excessive air may also cause some paint particles to bounce off the target and deposit on the atomizer.

NOTE

► A minimum of 70 slpm (2.6 scfm) should always be kept flowing in the inner shaping air passage to keep the face of the applicator clean when using outer shaping air for cut-in applications and during manual cleaning breaks.

OUTER SHAPING AIR
(Cut-In Control Air)

Outer shaping air is commonly used when a very small pattern is required, such as cut-ins. Even when the outer (cut-in air) is used, a minimum of 70 slpm (2.6 scfm) air is required flow of inner air.

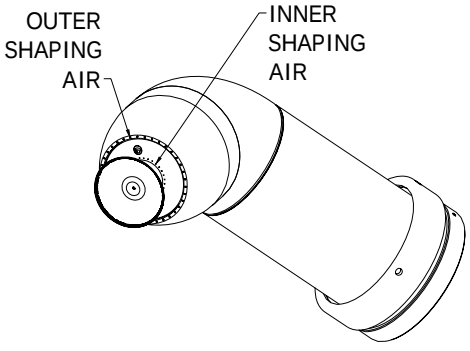


Figure 10: Shaping Air Positions

BRAKE AIR

Brake air is used to slow the turbine speed in a minimum length of time. It is advantageous for short cycle times during color change, or may be used to reduce speed or stop the turbine. Never operate brake air with the turbine air on. (See "RMA-303 Spindle Deceleration Times Chart" in the "Introduction" section.)

ELECTROSTATIC VOLTAGE

The RMA-303 Rotary Atomizer receives a low voltage control input from the MicroPak to control the operating electrostatic voltage. (Refer to the current "MicroPak" maual for detailed operating instructions.)

NOTE

► If paint defects occur, such as fatty edges or picture framing, reducing the voltage should be a last resort. To correct the problem, adjustments to lead and lag trigger adjustments should be optimized first.

► The electrostatic voltage applied to the RMA-303 will affect pattern size, transfer efficiency, wrap and penetration into cavity areas. A setting of 30-100 kV is appropriate for most applications.

TARGET DISTANCE

The distance between the RMA-303 atomizer and the target will affect the finish quality and efficiency. Closer distances give a smaller pattern, wetter finish, and greater efficiency. Greater distance will provide a large pattern size and drier finish. The MicroPak control circuit will enable the applicator bell to be operated within a few inches of the target without adjusting the voltage setting. The recommended target distance is 6 to 12 inches (152.4-304.8mm). In general, allow 1 inch (25.4mm) target distance for every 10 kV.

GENERAL OPERATING SEQUENCE

⚠ CAUTION

► It is recommended to leave bearing air on, unless the applicator is being serviced or removed for service.

Normally, for direct charge painting application, the process sequence should always be:

- Bearing air on (Always on)
- Turbine air on
- Turbine speed to application speed
- Shaping air on
- Start fluid flow off part
- Voltage on

After spraying the object, the sequence should be:

- Voltage lowered to 30-50 kV
- Fluid off
- Shaping air to setback volume
- Turbine speed to set back speed (30,000 rpm recommended)

Recommended sample cup flush sequence is as follows (voltage must be off) (internal and external cup wash):

1. Turbine speed set to 25,000-30,000 rpm.

2. Use outer shaping air only, no inner air. Set to 350-450 slpm (12.4-15.9 scfm).

3. Point atomizer at a grounded object such as a booth grate.

4. Maintain solvent pressure of 100-150 psi (689-1,034 kpa). Maintain air push pressure at 80-100 psi (552-689 kpa).

5. Use an alternating trigger sequence of solvent/ air to create a chopping effect. Always insure that the last step in the sequence is an air push.
A typical sequence is .2 seconds solvent, 1.0 second air push, 1.7 seconds solvent, and 2.0 seconds final air push. This sequence may be modified for other paints and applications.

6. It is recommended that an in-line fluid filter be installed to ensure that no foreign debris enters the fluid tip or the external wash nozzle.

The RMA-303 is versatile in processing the finish of a component. It can be setup as shown in Figure 11 to process the typical finish of a target. Sequence Event Explanation:

Recommended sample cup purge sequence is as follows (voltage must be off) (internal cup cleaning):

1. Turbine speed set to 25,000-30,000 rpm.

2. Increase inner shaping air to 350-450 slpm (12.4-15.9 scfm)

3. Paint atomizer at booth grate or insert into bell cleaning station.

4. Maintain solvent pressure of 100-150 psi. (689-1034 kpa). Maintain air push pressure at 80-100 psi (552-689 kpa).

5. Use an alternating trigger sequence of solvent/ air to create a chopping effect. Always insure that the last step in the sequence is an air push.

6. A typical sequence is .3 seconds solvent, 1.7 seconds air push; repeat 3 times. This sequence may be modified for other paint and applications.

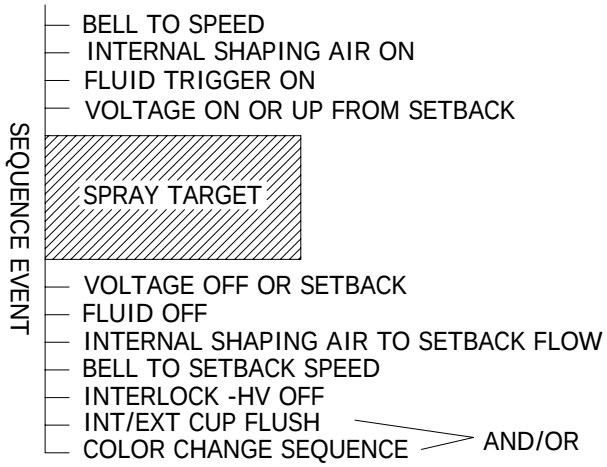


Figure 11: Typical Paint Sequence

Sequence Event Explanation:

1. ***Bell to Speed*** - This is accomplished by a set point command from either the PLC, robot, or other input device, through the I/O module.

2. ***Internal Shaping Air On*** - From a setback amount, a signal is sent to air control to increase direct flow to a desired level to achieve pattern size, film build, transfer efficiency, etc. Internal shaping air should never be set below 70 slpm (2.6 scfm) air flow rate unless performing an external cup flush, then set to 0 psi.

3. ***Outer Shaping Air*** - Outer shaping air should only be used for two purposes. One for cut-in applications. Increase air flow to 350-400 slpm (12.4-15.9 scfm) or while performing a cup flush, increase air flow to 350-400 slpm (12.4-15.9 scfm) and set inner air to 0 psi.

4. ***Trigger Fluid*** - An air signal is sent through the PT line of the tubing bundle. This should occur when the target is 6-12 inches (152.4-304.8mm) from the applicator centerline. (Not to be confused with target distance.)

5. ***Voltage On*** - The voltage is turned on from a signal to the MicroPak. The lag time to full voltage may be reduced if a setback voltage is used. Recommended setback voltage is between 30kV and 50kV.

6. ***Voltage Off/Setback Voltage*** - Immediately preceeds the trigger off. Using a setback voltage shortens the cascade voltage ramp up-time.

7. ***Fluid Trigger Off*** - This should occur when the target is typically 0-6 inches (0-152.4mm) past the applicator centerline.

8. ***Shaping Air to Setback*** - The setback flow of air should never be below 70 slpm (2.6 scfm) for the inner shape air except when performing a cup flush sequence.

9. ***Color Change Sequence*** - Used when color is changed one to the other. Typical sequence is shown in Figure 12. **(Note: During this sequence, the applicator should be moved to a position to collect the waste material.)** The sequence shown is a starting point for processing, but the final sequence will depend on the material being sprayed and the solvent used to purge the applicator with.

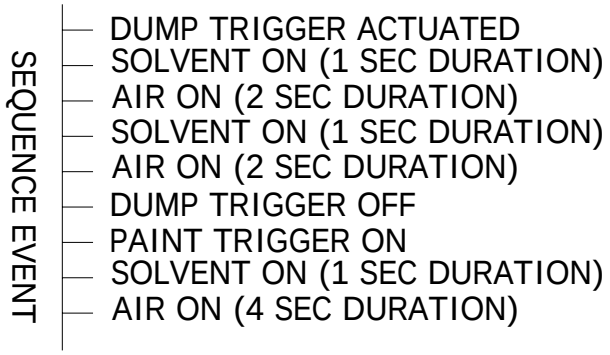


Figure 12: Typical Color Change Sequence

NOTES

MAINTENANCE

O-RINGS

All o-rings in this atomizer are solvent proof except the ones on the air bearing spindle. These o-rings must not be soaked in solvent; if these are exposed or soaked in solvent, they must be replaced. These o-rings are engineered to provide a fit between the air bearing spindle and it's mating parts to reduce or eliminate harmonic resonance (vibration).

Some o-rings are Teflon encapsulated. These o-rings have a limited amount of stretch and will not return to their original diameters if over-stretched. These o-rings are subject to being distorted more easily than rubber o-rings, so it is important that they be sufficiently lubricated when mating parts are installed onto them. They also will take a square set over time and should be replaced periodically if mating parts are removed repeatedly or if a new mating part is installed onto them.

Any o-ring that is cracked, nicked, or distorted must be replaced.

CLEANING PROCEDURES

⚠ WARNING

- Electrical shock and fire hazards can exist during maintenance. Micro-Pak supply must be turned off before entering the spray area and performing any maintenance procedures on the atomizer. Spray booth fans should remain on while cleaning with solvents.

- Never touch the atomizer bell while it is spinning. The front edge of the bell can easily cut into human skin or cut through gloves and other materials. Be sure the atomizer bell has stopped spinning before attempting to touch it. Approximate time for the bell to stop spinning after turning off turbine drive air is three minutes.

- Insure high voltage is off during any cleaning procedure.

In addition to the above Warning, which relates to potential safety hazards, the following information must be observed to prevent damage to the equipment.

⚠ CAUTION

- **DO NOT** immerse the RMA-303 turbine in solvent or other liquids. Turbine components will be damaged and warranty will be voided.

- Bearing air must be on during all cleaning procedures to protect the air bearing components.

Internal Fluid Path Purge Cleaning

Cleaning the incoming paint line (from paint supply source such as color manifold through the fluid manifold and bell assembly): Turn off the high voltage and turn on the color stack trigger valve for solvent supply. With the bell spinning, flush cleaning solvent through the incoming paint line and through the manifold passages, and out through the dump valve. Use restricted bell wash solvent to clean the fluid tube and bell cup. The spinning bell will atomize the solvent and clean out the bell passages. If desired, open the dump valve to flush through the dump line for a faster and contained system flush.

⚠ CAUTION

► The maximum flow rate of 700 cc/min. must not be exceeded during a flush routine. Use of an in-line fluid restricter is recommended. (Example: Hosco P/N RIL-6-AJ or similar)

External Atomizer Surface Cleaning

- Verify that the high voltage is turned off.
- All external surfaces may be cleaned using a mild solvent and lint free rags to hand wipe the RMA-303 Turbine drive air must be off, but leave bearing air on. The inner and outer shaping air should have approximately 70 slpm air flow through each to prevent the solvent from entering these passages.
- Do not spray the RMA-303 unit with a solvent gun used for cleaning. The cleaning fluid under pressure may aid conductive materials to work into hard to clean areas or may allow fluids to be forced into the turbine assembly.
- Do not reuse an atomizer bell cup that shows any sign of damage such as nicks, heavy scratches, dents, or excessive wear.
- Always final wipe all parts with a non-polar solvent and wipe dry (high flash Naphtha, etc.).

⚠ WARNING

► **NEVER** wrap the applicator 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.**

⚠ WARNING

► To reduce the risk of fire or explosion, OSHA and NFPA-33 require that solvents used for exterior cleaning, including bell cleaning and soaking, be nonflammable (flash points higher than 100°F/37.8°C). Since electrostatic equipment is involved, these solvents should also be non-polar. Examples of non-flammable, non-polar solvents for cleaning are: Amyl acetate, methyl amyl acetate, high flash naphtha, and mineral spirits.

► Do not use conductive solvents such as MEK to clean the external surfaces of the RMA-303 without a second cleaning with a non-polar solvent.

► When using a rag to hand wipe the RMA-303, the turbine air should be off, but leave both the shaping air and bearing air turned on. Insure that rotation has come to a complete stop.

VIBRATION NOISE

If the RMA-303 is vibrating or making an unusually loud noise, it usually means there is an imbalance situation. The atomizer bell cup may have dried paint on it or the bell may be physically damaged, or there may be paint trapped between the bell cup and shaft preventing the bell cup from properly seating. If any of these conditions exist, they **MUST** be corrected. Excessive imbalance caused by one of these conditions may result in bearing damage and turbine failure. Warranty **DOES NOT** cover failure caused by imbalanced loading conditions.

To determine if the bell is dirty or damaged, remove the bell cup and turn the turbine ON. If the noise is eliminated, the bell cup is the problem. If the noise continues, the turbine may be damaged and should be inspected. Excessive air required to achieve same speed may indicate a faulty or contaminated turbine. **DO NOT** continue to operate a noisy turbine.

⚠ WARNING

► If a bell cup comes off a rotating shaft because of motor seizing or any other reason, the Atomizer and bell cup must be returned to ITW Ransburg for inspection and evaluation to determine if the bell can be used in operation.

TURBINE MAINTENANCE

DO NOT attempt to rebuild the turbine. Any endeavor to disassemble a turbine during the warranty period will void the warranty. Contact your authorized distributor or ITW Ransburg for turbine rebuilding instructions.

GENERAL MAINTENANCE

Verify daily that the operating parameters have not varied significantly from the normal. A drastic change in high voltage, operating current, turbine air, or shaping air, can be an early indicator of potential component failure.

A laminated poster entitled “Rotary Atomizer Checklist (AER0075)" is included with the assembly Literature Kit to be posted near the station as a handy reference.

Due to the close proximity of high voltage to ground potential, a schedule must be developed for equipment maintenance (cleanliness).

PREVENTIVE MAINTENANCE

Daily Maintenance

(During Each Preventive Maintenance Break)

1. Verify that high voltage is OFF, and that both inner and outer shaping air, bearing air, and turbine drive air are ON.

2. Open the dump valve, flushing all paint from the supply lines and valve module.

3. Open the solvent valve, flushing all paint from the fluid tube and through the atomizer bell assembly.

4. Re-verify that high voltage is OFF, turbine drive air is OFF, and that the bell cup has stopped spinning. The bearing air and shaping air should remain ON.

5. Clean all external surfaces of the applicator using a lint-free rag dampened with solvent.

6. After cleaning, all conductive residue must be removed using a non-conductive solvent. Since electrostatic equipment is involved, these solvents should also be non-polar (Naphtha).

7. Inspect bell cup for nicks, dents, heavy scratches, or excessive wear. Replace if necessary.

8. Check the amount of paint build-up on the outer protective cloth covers, if used. If excessive, replace cover as required.

⚠ WARNING

► The high voltage must be turned OFF before entering the spray area and performing any maintenance procedures. Spray booth exhaust fan(s) should remain ON while cleaning the equipment with solvents.

⚠ WARNING

► Make sure high voltage is OFF before approaching applicator with solvent cloth.

► Do not use reclaim solvent containing d-Limonene. This can cause damage to certain plastic components.

► Do not stop bell rotation by using a rag or gloved hand against the bell cup edge.

⚠ CAUTION

► **Maximum flow rate should not exceed 700 cc/min.**

► Daily removal and soaking of the bell cup may not be required if the bell cup is properly flushed. However, the frequency of the feed tube and internal motor shaft inspection indicated under "Weekly Maintenance" can be done daily and later adjusted to weekly or as required depending on the results of the inspection.

⚠ WARNING

► In the event the bell cup comes in contact with a part, that cup should be replaced before continuing to spray.

⚠ WARNING

► Do not place high voltage test probe on bell edge unless rotation is fully stopped.

NOTE

► Refer to the "Troubleshooting Guide" in the "Maintenance" section for details on determining the causes of low or no high voltage at the bell cup.

Weekly Maintenance
(Prior to Start or End of Production Week)

- Monitor rotational speed of all bells at the speed control. Investigate cause if abnormal.
- Monitor high voltage and current output indicated on the MicroPak display. Investigate cause if abnormal.
- Check paint flow on all bells at minimum and maximum specified settings by taking beakered readings.
- Check solvent flow by opening solvent valve and taking a beakered reading (should be within approx. 10% of target flow rate).

⚠ CAUTION

► Maximum flow rate should not exceed 700 cc/min.

- Paint residue found in the shaping air holes is not acceptable and must be removed prior to assembly (see "Cleaning Shaping Air Holes" in the "Maintenance" section).
- Clean any paint on outer surface of front and rear housing with soft cloth dampened with solvent. (See "Warning" on avoiding the use of cleaning solvent containing d-Limonene.)
- Remove the front shroud and check for any signs of solvent or paint leakage. Clean as required.
- Remove bell cup and soak in solvent for 1-2 hours. Clean with a soft brush as required. Remove from cleaning solution and blow dry before replacing.

NOTE

➤ It may be necessary to remove the bell cups for cleaning more frequently than weekly. (See Note under "Daily Maintenance" in the "Maintenance" section.)

- With bearing air off, carefully inspect the feed tube tip and clean any paint build-up that has occurred on the feed tube tip. Using a pen light, determine if there is build-up of paint in the motor shaft and/or around the paint feed tube. If so, remove the motor assembly following the disassembly procedures and clean out the inside diameter of the motor shaft using a tube brush and solvent. Clean the outer surfaces of the feed tube.

⚠ WARNING

➤ Make sure that no solvent or other contamination is allowed to enter the motor assembly (air bearing and outer shaft).

- Visually inspect for signs of fluid leaks around fluid connections and manifold. Correct problem and clean paint from all components, including internal portion of shroud.
- Reinstall bell cup, and front shroud and replace cover on the outer housing (refer to "Disassembly Procedures" in the "Maintenance" section for definite instructions).

BELL CUP PREVENTIVE MAINTENANCE

It is the user's responsibility to ensure proper maintenance of the atomizer bell at all times. Bell cup failure due to inadequate cleaning or handling will not be covered under Warranty. The **"WARNING"** bullets listed are some examples of improper handling which could adversely affect performance or personnel safety and should not be attempted for any reason.

Bell Cup Handling

Always verify that high voltage is turned off and the atomizer bell has stopped spinning before performing any type of handling maintenance.

BELL CUP CLEANING

Always verify that high voltage is off and that the atomizer bell is spinning before performing any type of color change or bell flush cleaning cycle.

To reduce the risk of fire or explosion, the solvents used for exterior cleaning must have flash points above 100°F (37.8°C). Since electrostatic equipment is involved, these solvents must also be non-polar.

Solvents used for equipment flushing should have flash points equal to or higher than those of the coating material being sprayed.

1. The atomizer bell will normally be fully cleaned during a bell flush cycle. Flushing should be done before any down time or break in production. A bell flush cycle may also be required while spraying batch parts of the same color. Verify that high voltage is off and that the atomizer bell is spinning before flushing through the bell.

2. If there is any remaining paint build-up on any areas of the bell after flushing, the bell should be removed for hand cleaning. The bell's leading edge, spash plate, and serration cuts are some examples of areas for special attention.

Manual Inspection

3. Visually inspect the bell cup edge for signs of abrasion. If the edge is worn or chipped as the result of a collision with a part, replace the cup immediately.

4. Remove splash plate. Inspect for wear on the bell cup where the fluid leaves the large diameter of the splash plate. If any undercut in this area, the cup should be replaced. Also, check the three (3) pins between the front and rear splash plate halves. If worn, replace entire splash plate assembly.

5. Check the center holes of the splash plate for wear. The holes are angled and when new, you can not look directly through them straight on. Hold splash plate up to a light source and look straight into the holes. If light is clearly seen, the angled holes are worn and the splash plate must be replaced.

6. Splash plate assemblies may be soaked for a short time, under two hours, to loosen dried material. Clean with a soft bristle brush. Blow out center holes to dislodge material. Never use any kind of pick instrument to clean these holes, as it will damage them.

7. Soaking the bell in solvent may aid in loosening or removing paint build-up. It is recommended that the splash plate be removed and cleaned separately.

8. Use a soft bristle brush dipped in solvent to remove paint build-up from the serration cuts, paint feed holes or slots, and external and internal surfaces of the bell.

9. A soft, lint free rag dampened with solvent may be used to remove any paint residue from the external and internal surfaces of the bell.

10. After removing all paint build-up or residue, rinse the bell in clean solvent and blow dry.

11. Before reinstalling the bell on the shaft, check the mating surfaces of the thread and taper for any paint build-up or residue. Also, check the fluid tip, fluid tube outside diameter, and the shaft for any further paint build-up. These surfaces should be cleaned before installing the bell.

12. It is recommended that extra bell cups be purchased. The cups can then be cleaned off line in an automated cup cleaner.

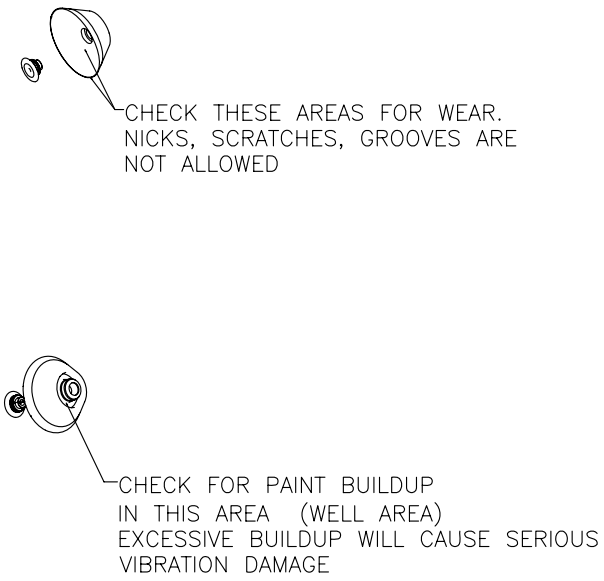


Figure 13: Inspection of Bell Cups

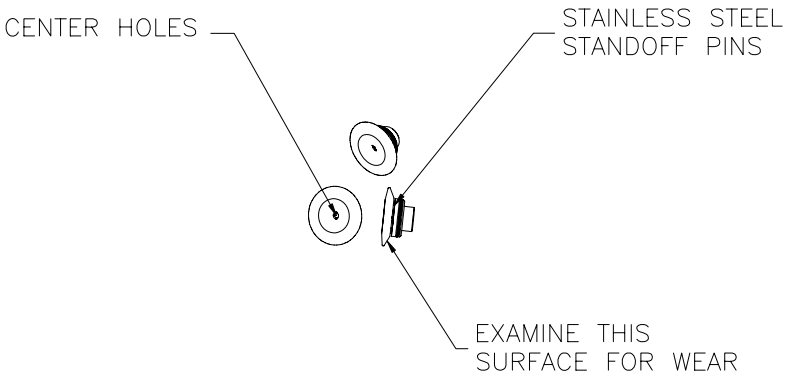


Figure 14: Splash Plate Assembly

CLEANING SHAPING AIR HOLES

In order to maintain uniform pattern control, the shaping air holes of the inner ring and the shaping air cap must be clean and free of any blockage.

It is best to leave the shaping air supply ON during normal production break cleaning periods. Shaping air can be reduced to 70 slpm during this time. This will help material from entering the passage ways.

Periodically (weekly) the outer shaping air cap and the inner shaping air ring should be removed and thoroughly cleaned. Use of an ultrasonic cleaner would make cleaning of hole diameters easier. Inspect all holes for blockage. Blow holes clear with compressed air after some time of soaking in solvent. DO NOT use any type of pick to clear the holes. Damage may result to parts and could affect performance of the equipment. If holes are damaged (oversized holes, blockage, gouges) it must be replaced.

RMA-303 PREVENTIVE MAINTENANCE SCHEDULE

Procedure	Frequency							
	Mid-Shift	End of Shift	Weekly	2 Weeks	Monthly	3 Months	6 Months	Yearly
Mid Shift Cleaning • Wipe shroud • Visually inspect cup	X							
End of Shift Cleaning • Wipe shroud • Wipe bell cup down • Change covers		X						
Shaping Air Shroud • Clean inner shape air ring • Clean outer shape air ring • Remove and clean	X	X	X					
Bell Cup removal/inspection/ cleaning		X	X					
Fluid Tip inspection/cleaning		X	X					
Inspect Valve and Seat Assembly in valve module for leaking				X				
Replace Valves and Seats in valve module							X	
High Voltage Cable Inspections					X			
High Voltage Testing						X		
Regreasing of High Voltage Cables						X		
Inspect all screws • Replace if broken • Inspect for wear • Tighten per specifications					X			
Turbine: Ground Brush Ring • Inspect for wear • Replace						X	X	
Inspection of tubing bundle					X			
Regrease tubing bundle							X	

(Continued On Next Page)

RMA-303 PREVENTIVE MAINTENANCE SCHEDULE (Cont.)								
	Frequency							
Procedure	Mid-Shift	End of Shift	Weekly	2 Weeks	Monthly	3 Months	6 Months	Yearly
Replace tubing bundle								X
Inspect turbine spindle taper and threads			X					
Replace bell cups								X
Replace splash plates							X	

DISASSEMBLY PROCEDURES

NOTE

► For reassembly instructions, use the reverse of the following disassembly procedures.

NOTE

► To facillitate Atomizer removal from hose manifold, a robot program should be made that purges all paints and solvents from the RMA-303. Ideally it would then position the bell assembly in a bell removal position where the bell cup is pointed downward at a 30° angle. Any residual solvents would be contained in the "J bend" of the robot wrist.

Atomizer Removal/Replacement

Using the applicator removal tool (76772-00), insert the pin diameter of the wrench into one of the four (4) holes of OD of the quick disconnect ring. Apply a force to the tool in a counter-clockwise direction as shown in Figure 15. Completely remove ring from robot mount plate and pull applicator straight out.

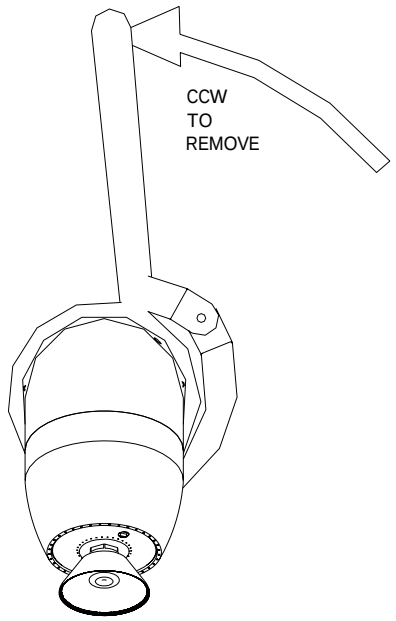


Figure 15: Applicator Removal from Robot

⚠ WARNING

➤ Prior to removing applicator fom the robot, the following tasks must be completed:

- Robot put into E-stop mode, locked, and tagged-out.
- All fluid passages are cleaned, purged out, and depressurized.

⚠ WARNING

➤ Carefully remove the quick disconnect ring to insure any residual line pressure has been relieved to atmosphere.

Bell Cup Removal / Replacement

NOTE

➤ The bell cup should always be the first component removed if any maintenance is performed. Following the procedure will minimize the risk of damage to the cup.

Lay the applicator on its side of a clean and secure area, preferably an area where regular maintenance is performed. Using the large open end of the bell cup/combo wrench (A11284-00) on the flats of the turbine shaft, carefully hold the outside of the bell cup with one hand while applying a clockwise force to the wrench. The bell cup is a right hand thread and must be turned counter-clockwise to remove.

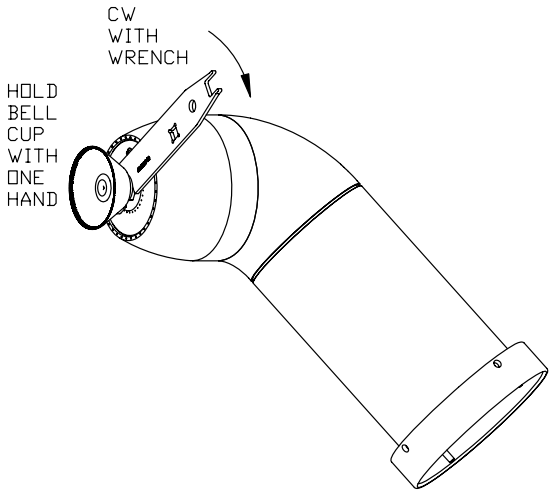


Figure 16: Bell Cup Removal

Place the bell cup in a safe, secure place. Carefully inspect the cup for any damage. If there is any damage to the cup, it must be replaced.

⚠ CAUTION

➤ Failure to replace a damaged bell cup will cause premature turbine failure. Warranty will not be honored if the bell cup is damaged.

To re-install a cup, position the wrench as shown. Insert a torque wrench into the square in the wrench to apply approximately 100-150 lbs•in (11-17 Nm) torque. Hold the cup and tighten the torque wrench in a counter-clockwise direction.

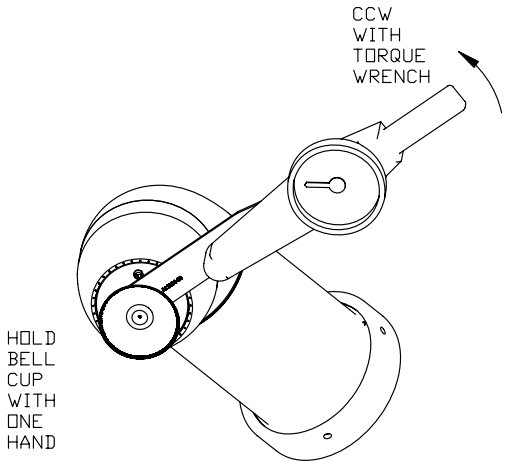


Figure 17: Bell Cup Installation

Splash Plate Removal

After removing the bell cup from the applicator, put it on a plastic or wood surface to prevent damage to the edge of the cup. Using the splash plate removal tool (A11388-00), insert the small end of the tool into the end of the splash plate assembly. Press the splash plate out. It may be necessary to tap lightly with a hammer.

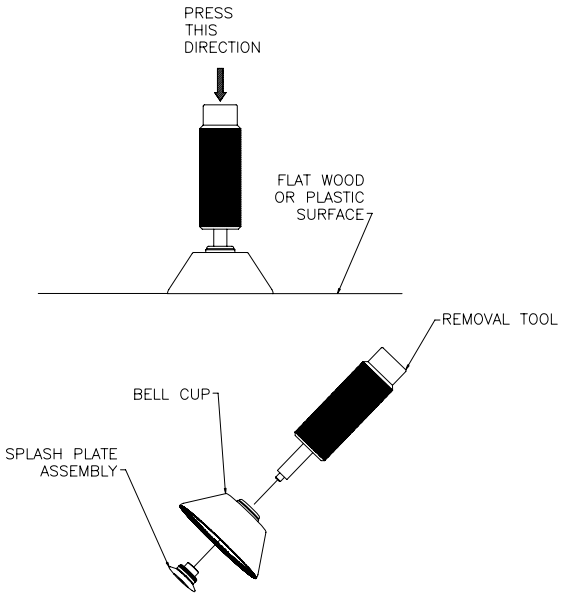


Figure 18: Splash Plate Removal

CAUTION

- Failure to tighten the bell cup in place may cause vibration of the applicator and/or premature turbine failure.

Splash Plate Insertion

Turn the splash plate removal tool over and use the large diameter end to press the splash plate back in place by hand. It may be necessary on occassions to use an arbor press to install the splash plate. Press splash plate to a hard stop (see Figure 19). To ensure, check the gap between the splash plate and the bell cup with the "GO-NOGO" gage (A11535-00) provided in the Tool Kit. The gap must fall within the limits of the gage. Replace splash plate if required.

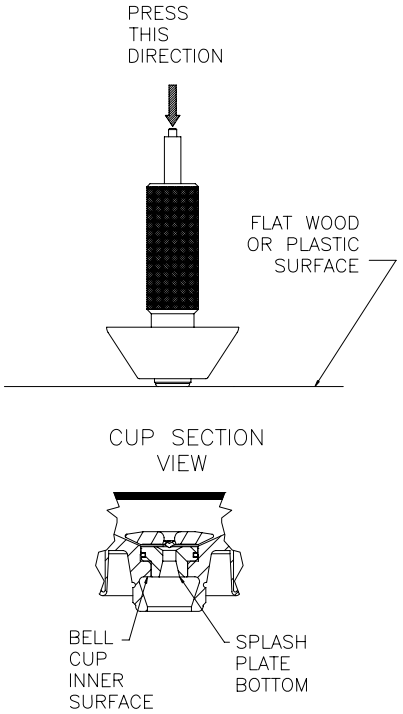


Figure 19: Splash Plate Insertion

To Use the "GO-NOGO" Gage A11535-00 (For A11266-00 and A11266-01 Bell Cups)

Carefully try to insert the large wire (NOGO) between the bell cup surface and the splash plate edge. Do not force. If wire slides under the splash plate easily, the gap is too wide and possibly the splash plate is not fully seated. Reinstall the splash plate and recheck. If wire does not go under the splash plate this time, try to insert the small diameter end (GO) between the surfaces. If it slides in easily, the proper gap is set. If the small end of the wire can not be inserted, replace the splash plate with a new one and recheck.

NOTE

► **DO NOT** force the gage between the surfaces, damage to either surface may occur.

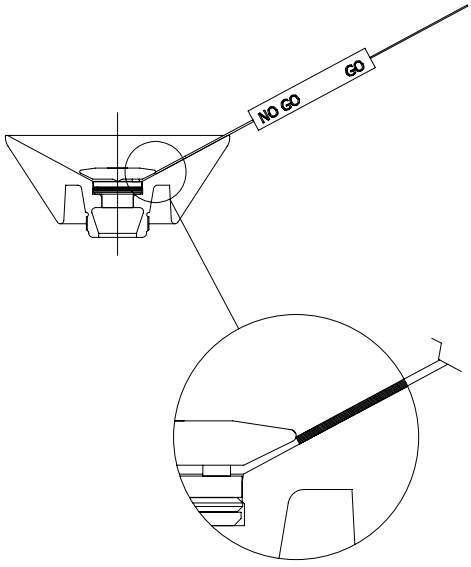


Figure 20: "GO-NOGO" Gage

Shroud Removal / Replacement

Removal

Remove five (5) screws from back of applicator. Remove break-away ring and quick disconnect ring. Pull shroud off.

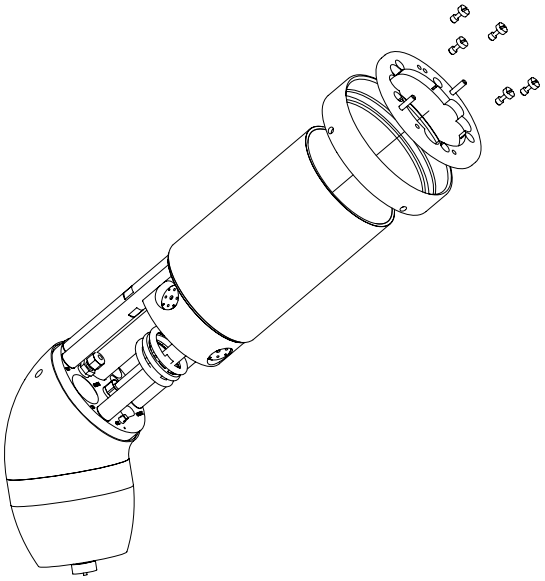


Figure 21: Shroud Removal

Replacement

Push the shroud back into place. A light tap on the end may be required to seat the shroud in position. Slide the quick disconnect ring over the shroud.

Reinstall break-away ring by aligning the four (4) holes with the dowel pins on the recessed face of the rear manifold. Reinstall the five (5) stainless steel screws. Tighten evenly to 15-20 lbs•in (1.69-2.26 Nm) torque. If you are using the optional plastic break-away screws, tighten evenly to 5 lbs•in (.56 Nm) torque. The break-away ring must lie flat against the face of the rear manifold.

⚠ CAUTION

► **DO NOT** overtighten the five (5) optional plastic break-away screws or they may break under normal operating conditions.

Inner / Outer Shaping Air Manifold Removal / Replacement

Removal

Remove the outer shaping air manifold by turning it off by hand in a counter-clockwise direction. The strap wrench (A11253-00) may also be used. Remove the fitting, ferrule, and external cup wash line from the inner shaping air manifold by turning the fitting in a counter-clockwise direction. Remove the inner shaping air manifold by turning it off in a counter-clockwise direction. A 1/4-20 threaded screw may be screwed into the cup wash port to provide additional leverage to remove the inner shaping air manifold.

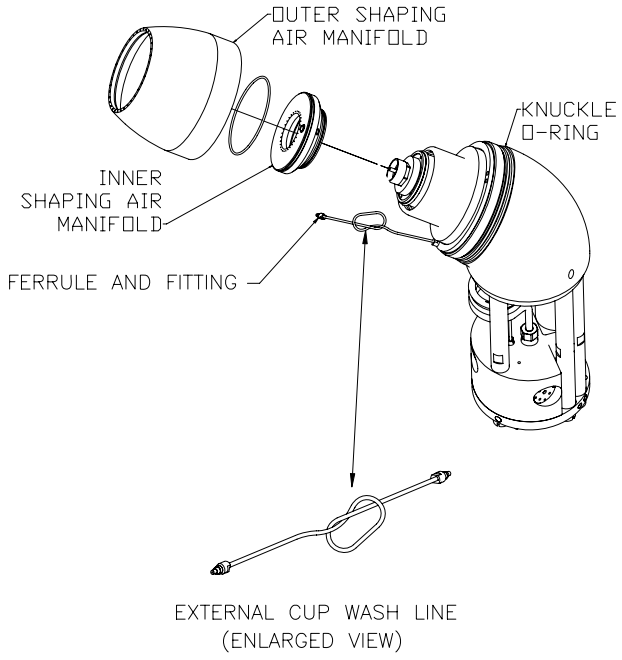


Figure 22: Interior / Exterior Shaping Air Manifold

Reassembly

(Lightly lubricate all o-rings prior to assembling.) Carefully install the inner shaping air ring onto the turbine threads. Be careful not to cross-thread. Tighten in a clockwise direction until it seats against the turbine. If replacing the solvent tube, install into the atomizer body first and tighten with a 3/16" end-wrench. Before installing the other end into the inner shaping air ring, check the position of the 1/4-20 threaded hole. If it is less than 180° from the fitting installed in the atomizer body, you must install a loop (as shown in Figure 22) to prevent tube from becoming pinched when outer shaping air ring is installed. Do not kink the tube when installing loop (granny knot) (see Figure 22).

Turbine Removal / Replacement

Removal

Remove the turbine retaining ring by using the strap wrench (A11253-00), turning the turbine retaining ring in a counter-clockwise direction. Pull the turbine out while rocking it from side to side.

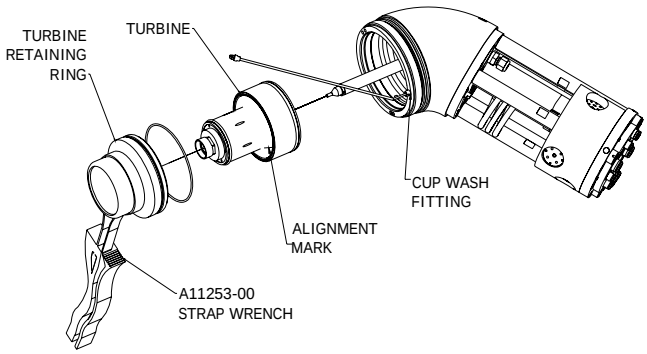


Figure 23: Turbine Removal

Replacement

Apply a light coating of o-ring lubricant to all the o-rings and the threads of the turbine and turbine retaining ring pior to assembly. Push the turbine down into the cavity in the atomizer body. Align the mark on the turbine with the cup wash fitting on the body. (Lightly lubricate o-ring with petroleum jelly.) Install the turbine retaining ring and o-ring by hand. Use the strap wrench to tighten an additional 1/8-1/4 turn. Check centering of fluid tube. If fluid tube is centered, the turbine is fully seated. If not, check tightness with strap wrench. If tube is not centered, again remove turbine and check for causes, such as an o-ring fell off, fiber optic not fully installed, foreign material on seating surface, etc. Reinstall and recheck tube centering.

Fluid Tip Removal / Replacement

Removal

To remove the fluid tips, use the tip/tube removal tool (A11229-00). Insert the tool over the tip and engage the four (4) prongs of the tool into the four (4) slots in the tips (see Figure 24).

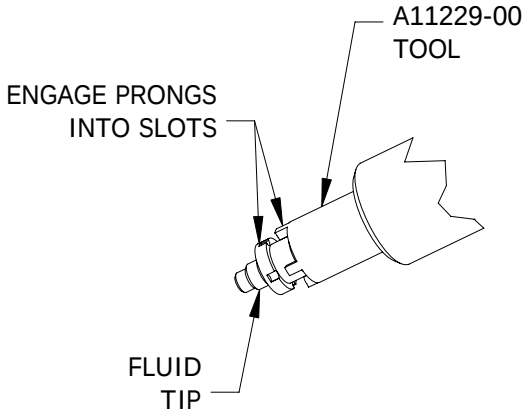


Figure 24: Fluid Tip Removal

NOTE

► To remove, turn the tip **CLOCKWISE**.
The thread on the tip is **left hand.**

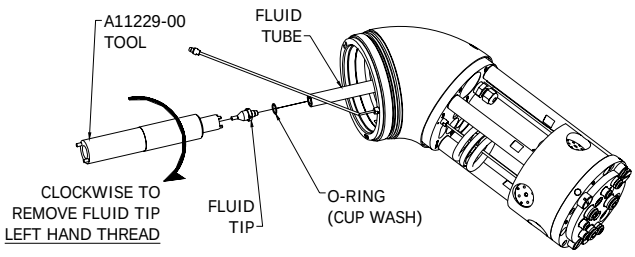


Figure 25: Fluid Tip

The fluid tip may be removed either with the turbine in place, or the turbine off the unit. Figure 25 shows removing the tip with the turbine in place.

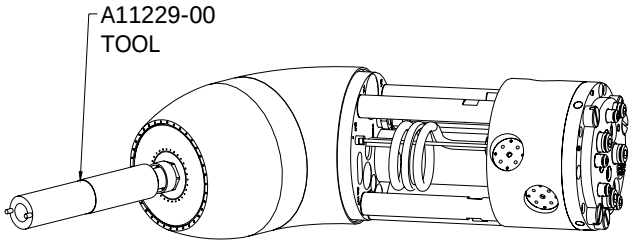


Figure 26: Fluid Tip Removal

This allows removal and replacement of the fluid tip while the applicator is on-line.

Replacement

Insure the tip openings are fully open and clean. Apply an o-ring lubricant to the o-ring to help hold it in place on the fluid tip. Insert the o-ring into the undercut groove on the tip. Place the tip on the tool and tighten in a **counter-clockwise** direction into the fluid tube. **Do not over-tighten.** There will be a small gap between the flange of the fluid tip and the fluid tube (see Figure 27). Insure the o-ring is properly positioned when complete. Tighten to 25-30 lbs•in (2.83-3.4 Nm) torque.

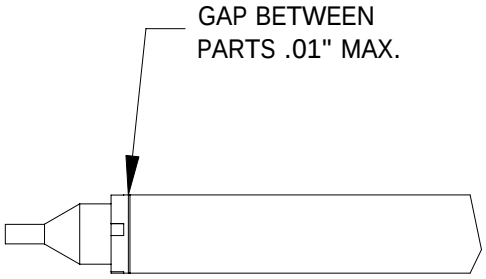


Figure 27: Fluid Tip / Tube Gap

Fluid Tube Removal / Replacement

Removal

Using the fluid tip/tube removal tool (A11229-00), place the pinned end of the tool towards the fluid tube retaining nut and engage the pins into the holes. Turn the tool counter-clockwise to remove (see Figure 28).

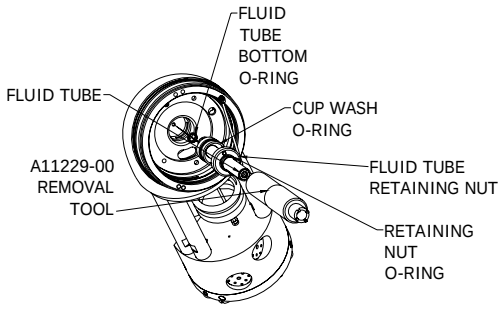


Figure 28: Fluid Tube Removal

Replacement

Lubricate all o-rings with A11545-00 o-ring lubricant. Push the fluid tube into the pocket of the atomizer body. Seat the tube by pushing while rocking the tube from side to side. Install the fluid tube retaining nut over the tube. Tighten the retaining nut firmly tight using the removal tool in a clockwise direction. Tighten to 65-75 lbs•in (7.34-8.47 Nm).

Rear Plate / Rear Manifold / Cascade Removal and Replacement

Removal

Remove the cup wash and the fluid coil fitting from the rear valve manifold. Both are removed by turning counter-clockwise. The ferrule(s) should be retained with the coil and the cup wash line. Remove the five (5) air bolts using a wide bladed screwdriver.

Remove the three (3) rear plate mounting screws using a 3/16" Allen wrench. Pull both the rear valve manifold and the rear plate away from the applicator. Loosen the fiber optic and low voltage cascade connector set screws about four turns. Push the cascade connector out of the rear plate towards the applicator, pull the fiber optic cable out. Both the rear plate and the rear valve manifold may now be removed.

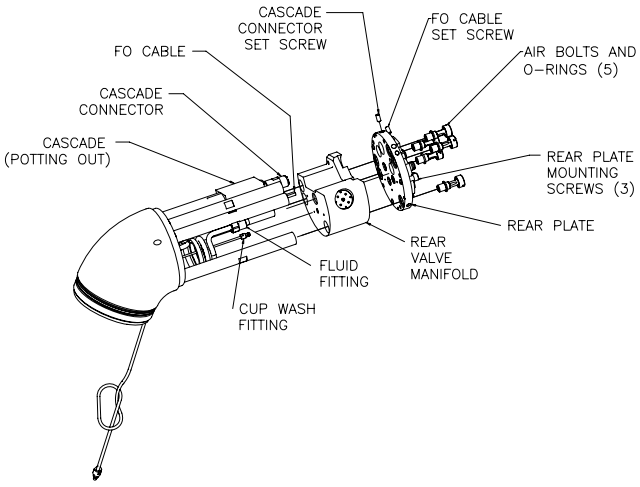


Figure 29: Rear Valve Manifold Removal

Cascade Removal / Replacement

Removal

Remove all components, shroud, break-away ring, rear plate, and rear manifold. (See "Rear Plate/ Rear Manifold/Cascade Removal/Replacement" in the "Maintenance" section.) Pull the cascade straight out of the knuckle.

Replacement

Use a small amount of dielectric grease (LSCH0009) on the end of the spring of the cascade and the wire in the knuckle. Also, apply a small amount of grease into the concentric rings around the spring.

Install the cascade with the potted side of the cascade towards the ouside of the applicator.

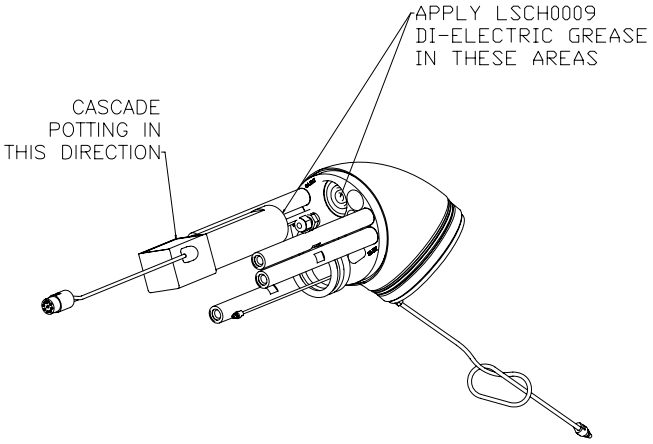


Figure 30: Cascade Removal

By hand, attach the rear plate to the rear valve manifold using the three (3) mounting screws. Do not fully tighten. The rear plate is designed such that it mounts to the rear valve manifold only one way. Pull the assembly into the proper position based on the position of the single air tube and the single hole for the air tube in the rear valve manifold. Pull the coiled tube fitting and ferrules into the port for fluid and tighten clockwise into place. Hand tighten until stop, then tighten 1/2-3/4 turn with a wrench. Attach the cup wash fitting and ferrule in the cup wash port and tighten into place. Hand tighten until stop, then tighten 1/8-1/4 turn more with a wrench. Push the cascade connector into the hole in the rear plate for it. Align the timing mark on the plate with the timing mark on the connector using a 3/16" Allen wrench (see Figure 31).

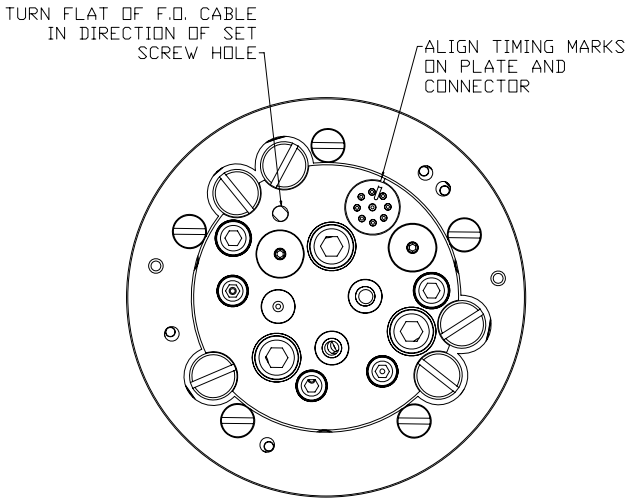


Figure 31: Rear Plate Alignments

Tighten the set screw in place. Tighten to 10 lbs•in (1.13 Nm) torque. Align the flat of the fiber optic cable perpendicular to the set screw. Tighten the set screw with a 3/16" Allen wrench. Tighten to 10 lbs•in (1.13 Nm) torque. Install the five (5) air bolts by hand. Tighten each bolt in a circular pattern. Tighten the three (3) rear plate mounting screws using a 3/16" Allen wrench, 15 lbs•in torque (1.70 Nm).

Rear Manifold Removal / Replacement

Removal

Remove the rear manifold from the applicator (see "Cascade Removal/Replacement" in the "Maintenance" section). Inspect the valve weep ports on the manifold body for leaks or contamination. If any paint is visible in these areas, the valves need to be replaced.

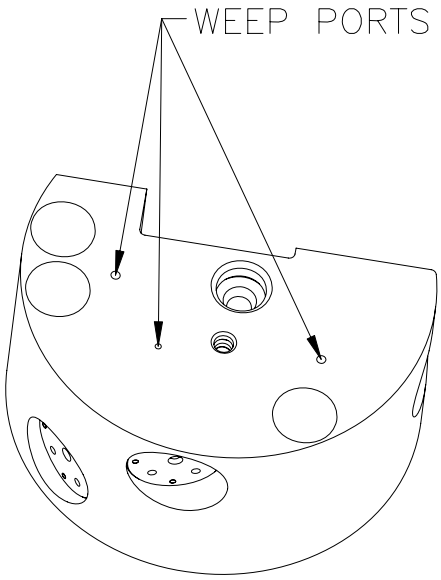


Figure 32: Weep Port Locations

Using the valve removal tool (A10766-00), engage the four (4) pins on the tool to the corresponding four (4) hole pattern in the top of the valve. Using a 1/2" (13mm) socket, end wrench, or adjustable wrench, remove the valve by turning counter-clockwise.

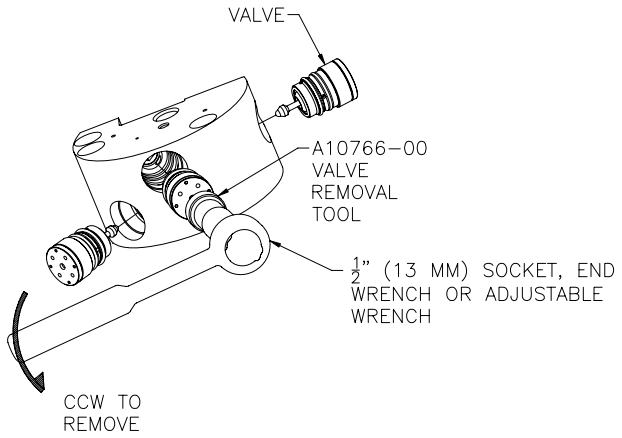


Figure 33: Valve Removal

Using the seat removal tool (A10756-00), insert the smaller hex end into the block to engage the seat female hex. Using a 3/8" (10mm) socket end wrench, or adjustable wrench, remove the seat by turning counter-clockwise.

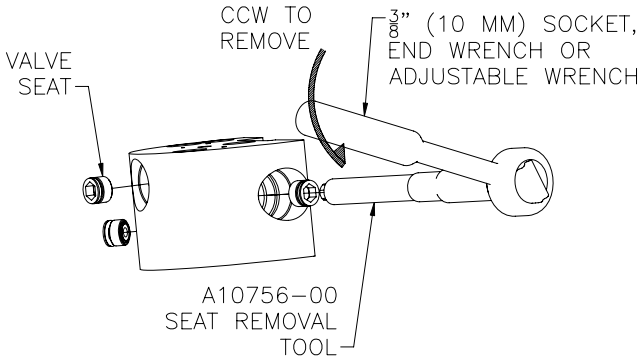


Figure 34: Seat Removal

Valve and Seat Inspection

Inspect the valves and seats for any build-up of materials. Valves should be cleaned with an appropriate cleaning solvent to remove the material on it.

NOTE

► A seat should not be replaced unless there are indications of valve leakage in operation.

Replacement

Lubricate the seat o-ring using a suitable lubricant. By hand, using the seat tool (A10756-00), carefully start the seat into the pocket for the seat.

NOTE

➤ Carefully start the seat into the pocket. It may be easily cross threaded.

Hand tighten the seat in place. Using a torque wrench with a 3/8" (10mm) socket, torque the valve seats to 15-20 lbs•in (1.7-2.3 Nm).

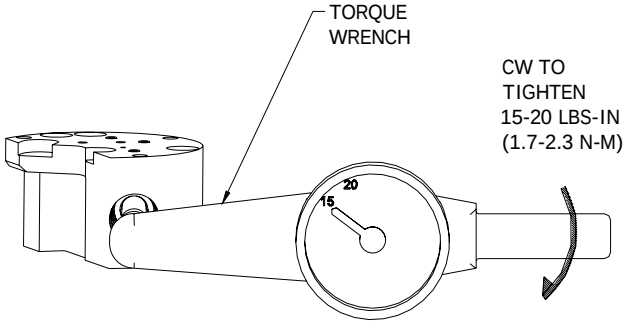


Figure 35: Valve Seat Torque

⚠ CAUTION

➤ Always use a torque wrench to torque the seats in place. Over-torquing the seats may cause permanent irrepairable damage to the rear manifold.

Lubricate the valve o-rings with a suitable o-ring lubricant. By hand, start the threads clockwise of the valve into the pocket. Tighten using a 1/2" (13mm) socket and torque to 15-20 lbs•in (1.7-2.3 Nm).

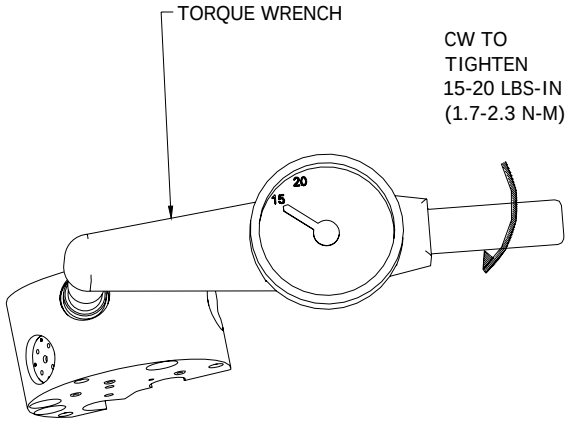


Figure 36: Valve Torque

Support Rod, Fluid Coil, Cup Wash Line Removal / Replacement

Removal

Using wrench (A11284-00), remove each of the support rods. Each is removed by turning counter-clockwise.

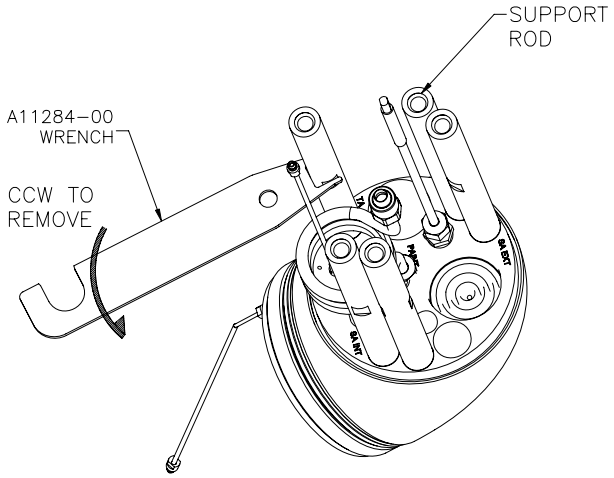


Figure 37: Support Rod Removal

Remove external cup wash line by unscrewing the solvent fitting. Remove cup wash connection line by removing the solvent fitting and ferrules. Remove the coiled tube assembly by removing the fluid fitting in a counter-clockwise direction.

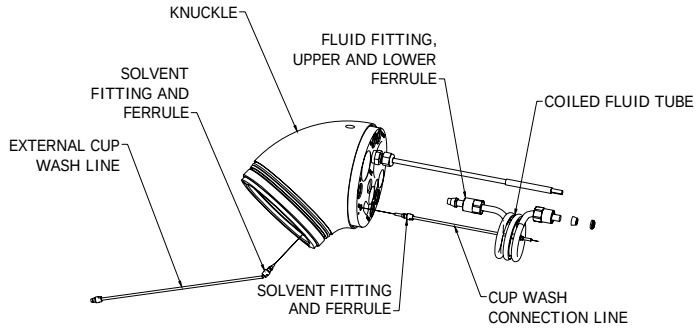


Figure 38: Fluid / Cup Wash Line Removal

Replacement

Attach the cup wash connection line in the knuckle and tighten the fitting and ferrule clockwise hand tight. Then tighten 1/8-1/4 turn more with a wrench.

Attach the fluid coil, upper and lower ferrule to the knuckle. Attach the external cup wash line by installing the solvent fitting and ferrule on the turbine side of the knuckle. Tighten nut on fluid coil by hand until stop. Tighten with wrench another 1/2-3/4 turn.

Lubricate all the o-rings on the support tubes with the appropriate lubricant. Install each until the thread has bottomed out in the knuckle using wrench (A11284-00). Torque 10-15 lbs•in (1.13-1.7 Nm).

Fiber Optic Cable Removal / Replacement

Removal

Remove the fiber optic nut and fitting from the knuckle. Loosen the fiber optic transmitter using the removal tool (78279-00) on the fiber optic nut. Push while twisting on the fiber optic cable from the cascade side of the knuckle until the connector nut (black) of the transmitter is visible. Loosen the connection nut and pull the fiber optic cable out of the cascade side of the knuckle.

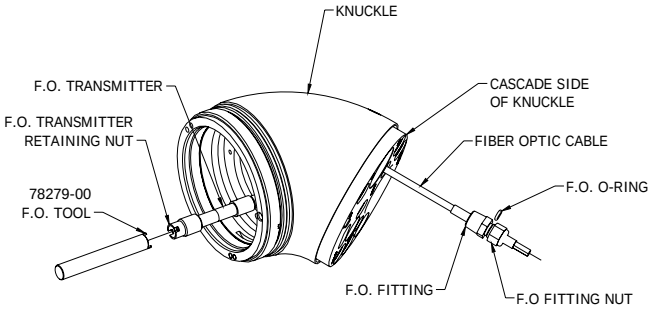


Figure 39: Fiber Optic Transmitter Removal

Replacement

Slide the tube fitting, nut, and o-ring over the cable. Push the bare cable end of the fiber optic cables through the knuckle hole, cascade side. Push the cable far enough through the knuckle to connect the fitting of the fiber optic transmitter to the cable end. Gently pull the fiber optic transmitter into the hole. Slide the retaining nut over the transmitter and tighten clockwise using removal tool (78279-00). Install the fitting into the cascade side of the knuckle. Slide the o-ring and nut toward the fitting and tighten the nut in place (snug).

Turbine Ground Brush Ring Removal / Replacement (A11517-00 Ground Brush Ring Kit)

Remove the air bearing turbine from the atomizer.

Remove the two (2) screws holding the ground brush ring assembly to the rear of the turbine with a 2mm hex-key wrench. Discard both the screws and brush ring.

Install the new brush ring with the half moon undercut shapes facing away from the back of the turbine and in-line with the two (2) mounting screw holes. The half moon undercuts should be approximately flush with turbine body when fully inserted.

Tighten the two (2) screws to 3-5 lbs•in torque (.34-.56 Nm) (see Figure 40).

Turbine O-Ring Replacement (Figure 40)

Remove air bearing turbine from the atomizer.

Remove all exterior o-rings.

Lightly lubricate all o-rings with A11545 Petrolatum jell before reinstalling.

O-ring Kit A11534-00 contains all required o-rings for replacement.

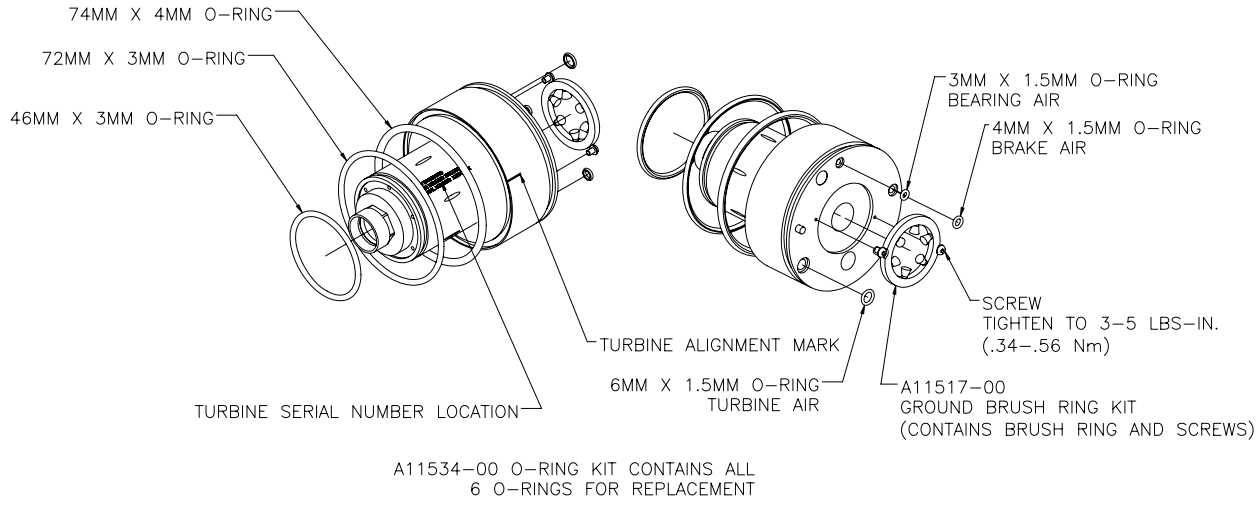


Figure 40: Turbine Ground Brush Ring Removal / Replacment and Turbine O-Ring Replacement

TROUBLESHOOTING GUIDE

General Problem	Possible Causes	Corrective Action
Bad Spray Pattern	1. Bell cup damaged	1. Replace bell cup.
	2. Low voltage	2. See "Low Voltage" below.
	3. Paint lodged in shaping air ring.	3. Disassemble and clean (see "Maintenance" section).
Low or No High Voltage	1. High current draw	1. a. Paint resistivity to be .1 MΩ to ∞. b. Replace coiled fluid line.
	2. Solvent valve is actuated	2. Remove solvent valve air pilot signal (high voltage must be interlocked with the solvent valve air pilot signal to prevent solvent flow while high voltage is energized).
	3. Loss of low voltage cable connection between robot and bell plates	3. a. Remove atomizer and inspect low voltage connections on both plates. Verfiy alignment marks between connectors and plates and verify that connector face is flush with plate. Verify that set screws are secure, but not too tight, as this will prevent the spring-loaded pins on the robot plate from extending and making contact. b. Faulty low voltage cable.
	4. Improperly mounted air turbine	4. Verify correct orientation of air turbine so that high voltage spring makes contact with metal pad on turbine assembly.
	5. Improper limiting current and voltage settings	5. To readjust settings, refer to "MicroPak" operating manual.
	6. Atomizer grounding out (usually indicated by high current draw or by MicroPak over-current fault light)	6. a. Clean atomizer externally with non-polar solvent. b. Check the atomizer for internal fluid leaks. c. Check for fluid leaks at quick disconnect mounting (between bell plate and robot plate). d. Check for internal arcing (usually indicated by internal sparking sounds). e. Make sure cascade low voltage connection is properly shielded.

(Continued On Next Page)

General Problem	Possible Causes	Corrective Action
Low or No High Voltage (Cont.)	7. Faulty low voltage connections (usually indicated by MicroPak feedback fault light)	7. a. Make sure quick disconnection electrical connection is aligned and clean. b. Check low voltage connection at cascade.
	8. Faulty high voltage connection	8. a. Remove cascade and check continuity between cascade connection and turbine shaft.
	9. MicroPak or cascade failure	9. Refer to "MicroPak" service manual for detailed "Troubleshooting Guide".
	10. Improper color change (i.e., paint or solvent in dump line)	10. Optimize color change.
Low Transfer Efficiency (or light coverage)	1. Low or no high voltage	1. Verify high voltage at bell cup edge. Normally, a high voltage setting of 70-100 kV is appropriate for most applications.
	2. Poor grounding of parts being coated	2. Verify that parts being coated are properly grounded (the electrical resistance between the part and ground must not exceed 1 megohm).
	3. Excessive turbine speed	3. For optimum transfer efficiency and spray pattern control, the bell rotational speed should be set at the minimum required to achieve proper atomization of the coating material.
	4. Excessive inner/outer shaping air	4. Shaping air should be set at the minimum volume required to gently direct the spray pattern toward the part being coated. Excessive shaping air will cause some atomized particles to "blow-by" the part or bounce back onto the atomizer.
	5. Excessive target distance	5. The recommended target distance is between 6-12 inches (152.4-304.8 Nm) (see "Target Distance" in the "Operation" section of this manual).
No Turbine Air	1. Turbine drive air not present	1. Verify supply air pressure.
	2. Bearing air return signal not present	2. a. Verify bearing air return signal. b. Increase bearing air supply pressure to 90 psig (±10 psig) (620.5 ± 68.9 kpa).
	3. Brake air is activated	3. Remove brake air signal (turbine air and brake air must be interlocked to prevent both from being used simultaneously).

(Continued On Next Page)

General Problem	Possible Causes	Corrective Action
Speed Feedback Fault	1. Damaged fiber optic cable between robot plate and control panel	1. Repair or replace fiber optic cable.
	2. Connection at robot or bell plate is loose	2. Re-install cable and tighten locking set screw.
	3. Fiber optic transmitter failure	3. Replace fiber optic transmitter.
	4. Bad transceiver module	4. Replace transceiver module.
	5. Excessive vibration	5. a. Check bell cup for damage. b. Check bell cup for excessive paint buildup. c. Insure bell cup is tightened properly. d. Check cup and shaft tapers for cleanliness
No Fluid Flow	1. Turbine is not rotating	1. Verify rotation of turbine (the paint valve air pilot must be interlocked with the turbine speed feed back signal to ensure that paint does not flow into the air bearing).
	2. Fluid valve does not actuate	2. a. Verfiy that air pilot signal is present. b. Fluid valve air pilot pressure is too low. Increase air pressure to 70 psig (482.6 kpa) minimum. c. Replace fluid valve.
	3. Clogged fluid tube	3. Remove and inspect fluid tube.
	4. Bad transceiver module	4. Replace transceiver module.
Continuous Fluid Flow	1. Fluid valve open	1. a. Remove air pilot signal. b. If still open, replace fluid valve.
	2. Fluid valve seat damaged or worn	2. Replace fluid valve seat.
Uncontrollable Fluid Flow	1. Insufficient back pressure to fluid regulator	1. Replace fluid tube with the next smaller inner diameter size.
	2. Fluid regulator does not control flow (system)	2. Disassemble fluid regulator and inspect for failed components (system).

(Continued On Next Page)

General Problem	Possible Causes	Corrective Action
Fluid and/or Air Leakage Between the Robot and Bell Manifold Plates	1. Atomizer mounting nut is loose 2. O-ring is missing 3. O-ring is damaged	1. Tighten mounting ring. 2. Install o-ring. 3. Visually inspect for damage and replace.
Fluid Leakage In Fluid Manifold or Bell Plate	1. O-ring is damaged 2. Outer diameter of tubing coil is damaged	1. Replace o-ring. 2. Inspect tubing coil for scratches and replace if damaged.
Fluid Leakage Around Fluid Valve	1. Damaged o-ring(s) on outer diameter of valve body. 2. Damaged or worn needle seals inside valve assembly	1. Replace o-ring(s). 2. Replace valve assembly.
Turbine Cannot Attain Desired Speed	1. Excessive vibration 2. Low or no bearing air	1. a. Check bell cup for damage. b. Check bell cup for excessive paint buildup. c. Bell cup loose - tighten to proper torque. d. Check cup and shaft tapers for cleanliness. 2. a. Check bearing air pressure (minimum 80 psi). b. Check filters for contamination. c. Check for bent or damaged bearing air line. d. Poor turbine air pressure - plant air. e. Damaged speed control cards.

PARTS IDENTIFICATION

RMA-303 ROTARY ATOMIZER DIRECT CHARGE MODEL IDENTIFICATION *

When ordering, use A11303-ABCD as indicated by Tables A, B, C, and D. Four digits must follow the basic part number, for example:

A11303 - 1 2 3 4

Basic Part Number

Bell Cup Style (Table A)

Fluid Tip Size (Table B)

(Table C) **Fluid Coil**

(Table D) **Valve Manifold Assembly**

*** Model number and serial number of the atomizer is located on the face of the rear plate assembly. (See "Important Numbers" in the "Introduction" section.)**

TABLE A - Bell Cup Styles		
Dash #	**Description**	**"A"**
1	65mm Serrated (Clear & Waterborne Primer)	A11267-00
2	65mm Serrated	A11266-00
3	65mm Non-Serrated	A11266-01

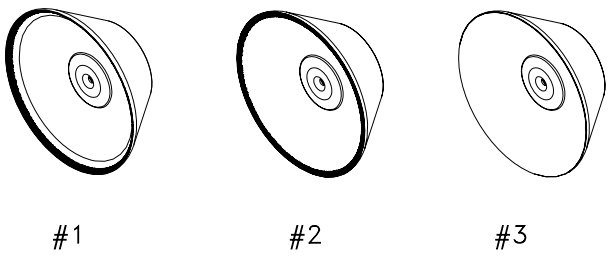


Figure 41: Bell Cup Styles

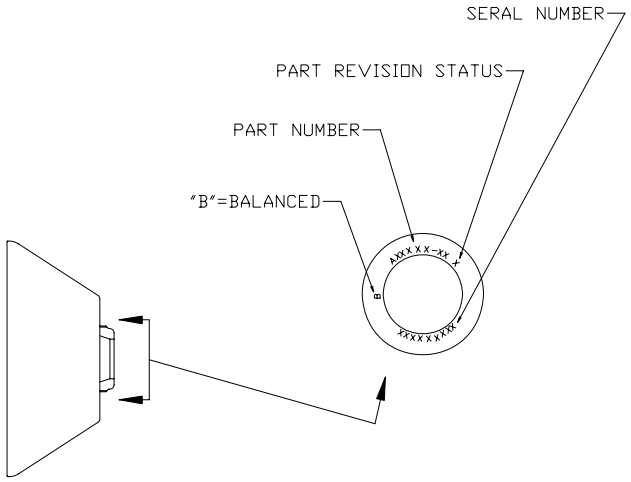


Figure 42: Bell Cup Part Number / Serial Number

TABLE B - Fluid Tip Selection		
Dash #	**Description - Ø "A"**	**"B"**
1	.028 / .7mm Opening	A11240-01
2	.035 / .9mm Opening	A11240-02
3	.043 / 1.1mm Opening	A11240-03
4	.047 / 1.2mm Opening	A11240-04
5	.062 / 1.57mm Opening	A11240-05
6	.039 / 1.0mm Opening	A11240-06

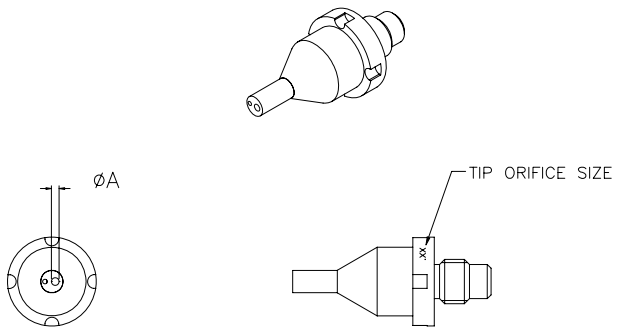


Figure 43: Fluid Tip Sizes

TABLE C - Fluid Coil		
Dash No.	**Description**	**"C"**
1	.25" OD X .125" ID for Highly Resistive Materials (Clear Coat)	77531-00
2	.25" OD X .170" ID for Conductive Materials (Base / Clear)	77517-00
3	.25" OD X .125" ID for Highly Conductive Materials (Base / Clear)	78450-00

Fluid Coils (Separate Sales Parts Only)

If purchasing spare parts, they must be modified as explained.

To ensure proper sealing and holding, the fittings require that the ends of the Teflon fluid coils have a groove cut into them as shown. Use groove cutter A11567-00, by sliding the end of the tool over the Teflon tubing until it bottoms out. Hold the tubing in one hand and the tool in the other. Make three complete revolutions of the tool on the tubing in the direction of the arrow stamped on the tool. To remove the tool, hold the tube and the main body of the tool with one hand, slide the rear portion of the tool back until it stops. Pull out the tubing from the end of the tool. By pulling back the rear portion of the tool, it relieves the pressure of the cutting edge off of the tubing before sliding it out. Trim off ends to dimensions shown. End should be cut off square. Slide the fitting and ferrules onto the tube as shown. The tapered ferrule must go past the newly cut groove to properly lock into place when installed.

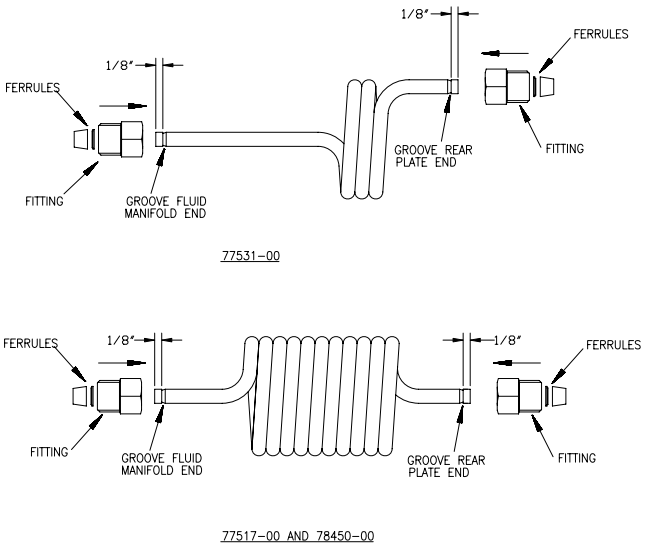


Figure 44: Fluid Coils

TABLE D - Valve Manifold Assembly		
Dash #	**Description**	**"D"**
1	Single Purge Manifold	A11241-00

*** Model number and serial number of the atomizer is located on the face of the rear plate assembly.**

NOTES

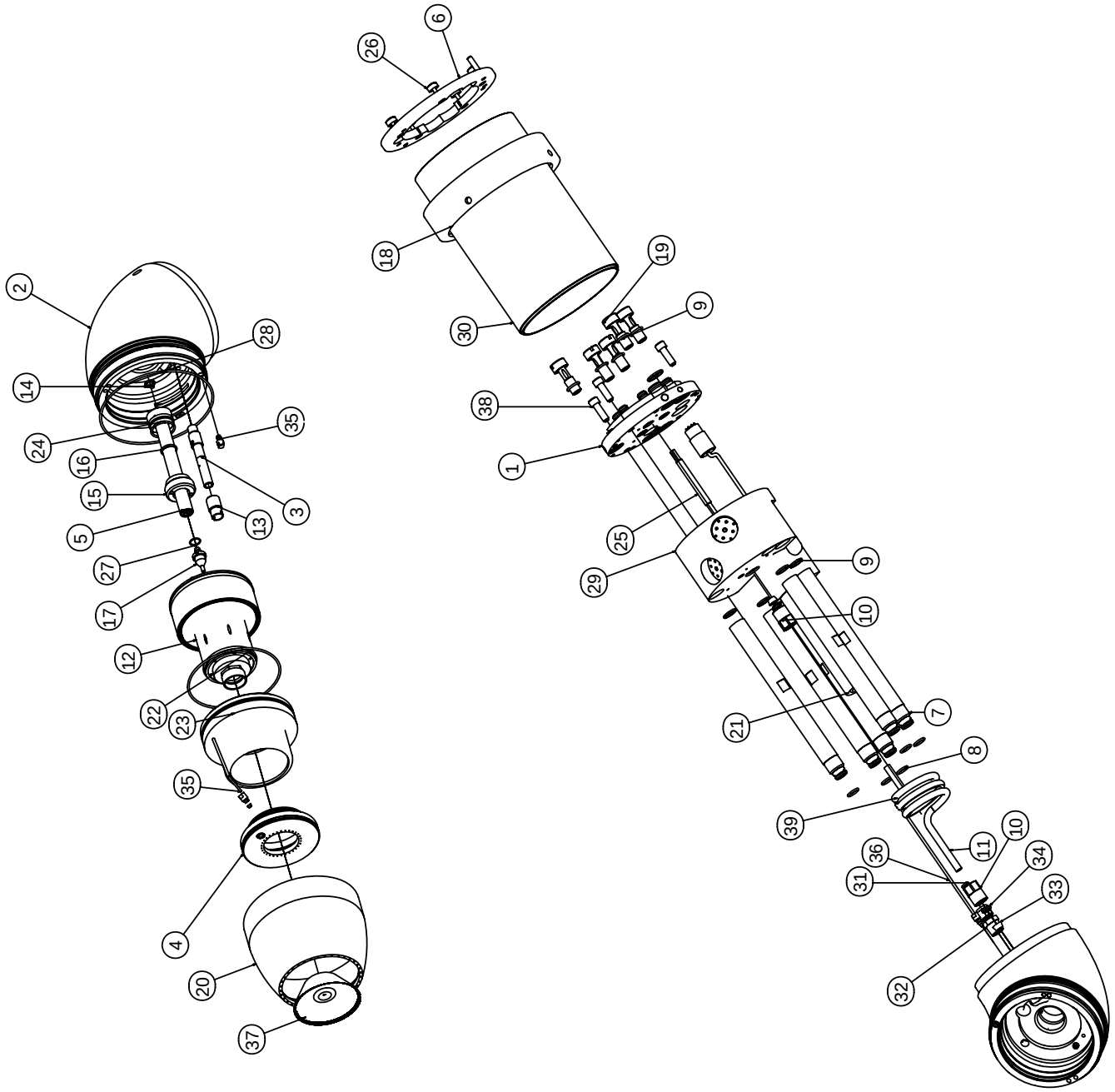


Figure 45: RMA-303 Assembly

RMA-303 ASSEMBLY - PARTS LIST (Figure 45)

Item #	Part #	Description	Qty
1	A11206-00	Assembly, Applicator Rear Plate	1
2	A11230-00	Assembly, Knuckle RMA-303	1
3	75911-00	Assembly, Fiber Optic Transmitter	1
4	A11227-00	Assembly, Shaping Air Manifold	1
5	A11245-00	Assembly, Fluid Tube RMA-303	1
6	A11203-00	Assembly, Break-Away Ring	1
7	A11214-00	Rod Support	5
8	79001-14	O-Ring, Solvent Proof	5
9	79001-07	O-Ring, Solvent Proof	10
10	78449-00	Fitting, Fluid	2
11	**See Table C**	Coil, Fluid	1
12	A11081-00	Assembly, Spindle	1
13	78278-00	Nut, Fiber Optic Tensioning	1
14	79001-40	O-Ring, Solvent Proof	1
15	A11226-00	Retainer, Fluid Tube	1
16	79001-42	O-Ring, Solvent Proof	1
17	**See Table B**	Fluid Tip	1
18	A11201-00	Ring, Quick Disconnet	1
19	77508-00	Bolt, Air	5
20	A11244-00	Shroud, Outer Shaping Air	1
21	79010-01	Assembly, Cascade HP-404	1
22	79001-11	O-Ring, Solvent Proof	1
23	A11228-00	Turbine Retaining Ring	1
24	79001-41	O-Ring, Solvent Proof	1
25	75921-03	Cable, Fiber Optic	1
26	77524-00	Screw, Break-Away	5
27	79001-44	O-Ring, Solvent Proof	1
28	79001-22	O-Ring, Solvent Proof	1
29	A11241-00	Assembly, Valve Manifold	13
30	A11255-00	Shroud, RMA-303	1
31	7554-05	O-Ring, Solvent Resistant	1
32	76703-00	3/16" ODT X 1/4" NPT	1
33	EMF-203-04	Ferrule, Front, 1/4" ODT	2
34	EMF-202-04	Ferrule, Rear, 1/4" ODT	2
35	A11351-01	Assembly, Tubing, Cup Wash line	1
36	A11351-02	Assembly, Tubing, Cup Wash Line	1
37	**See Table A**	Assembly, Bell	1
38	7959-24C	Screw, 1/4-20 X 3/4" Lg. SHCS	3

TYPICAL BELL CUP PARTS BREAKDOWN (Figure 46)			
Complete Assembly (1)	**Description**	**Cup Only (2)**	**Splash Plate Assembly (3)**
A11267-00	65mm Serrated (Clear Coat)	A11262-00	A11269-00
A11266-00	65mm Serrated (Base Coat)	A11257-00	A11269-00
A11266-01	65mm Non-Serrated (Base Coat)	A11254-00	A11269-00

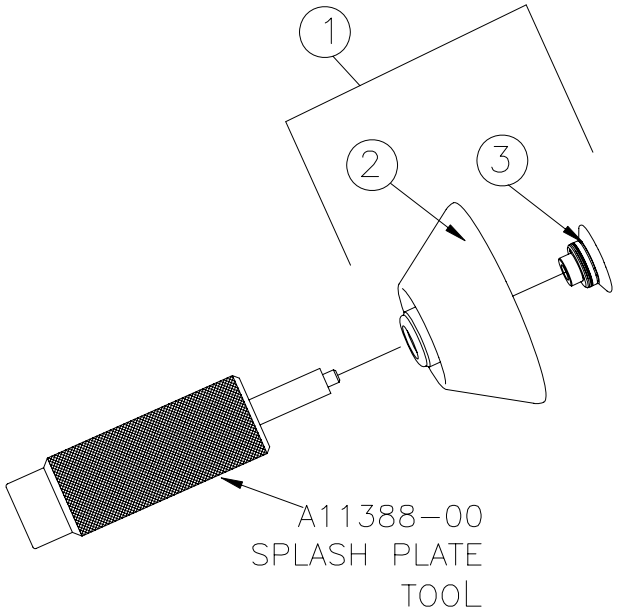
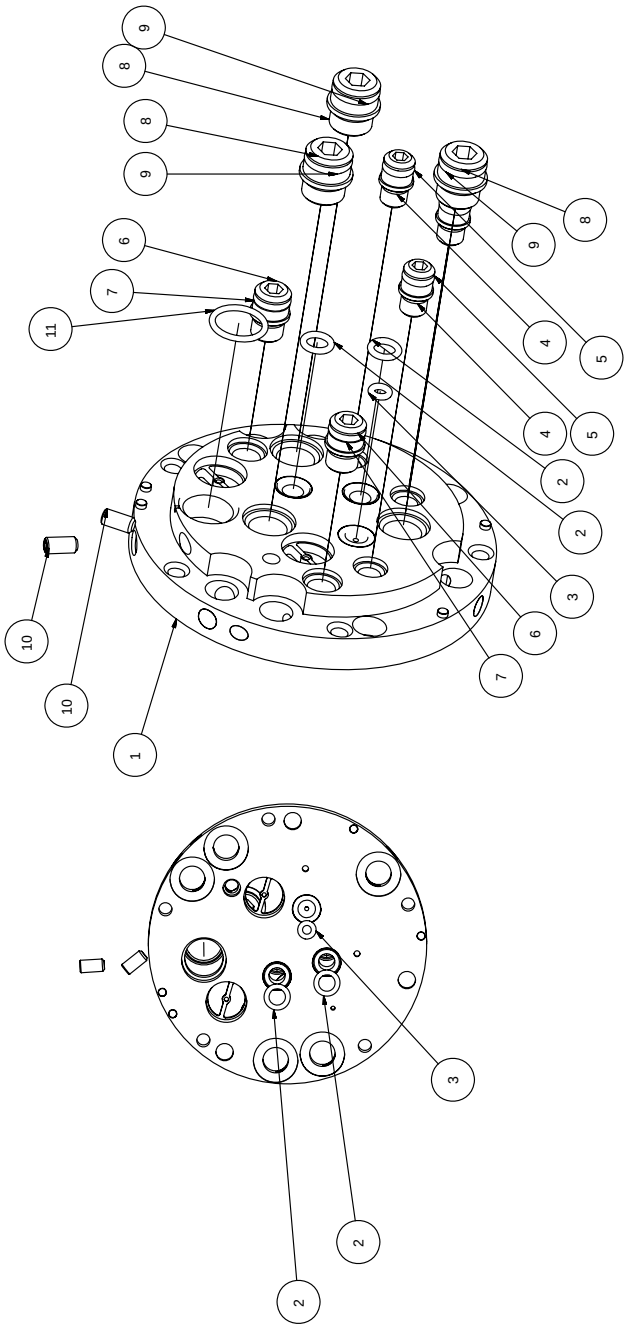


Figure 46: Bell Cup Parts Breakdown



A11206-00 REAR PLATE ASSEMBLY - PARTS LIST (Figure 47)			
Item #	Part #	Description	Qty
1	A11205-00	Assembly, Plate, Rear RMA-303 Single Purge	1
2	79001-40	O-Ring, Solvent Proof	4
3	79001-39	O-Ring,Solvent Proof	2
4	77507-00	Air Stud, Small Machined	3
5	79001-05	O-Ring, Solvent Proof	3
6	77506-00	Air Stud, Medium Machined	2
7	79001-06	O-Ring, Solvent Proof	2
8	77505-00	Air Stud, Large	3
9	79001-07	O-Ring, Solvent Proof	3
10	SSF-2052	Set Screw, 3/8" Lg. X 10-24	2
11	79001-09	O-Ring, Solvent Proof	1

Figure 47: A11206-00 Rear Plate Assembly

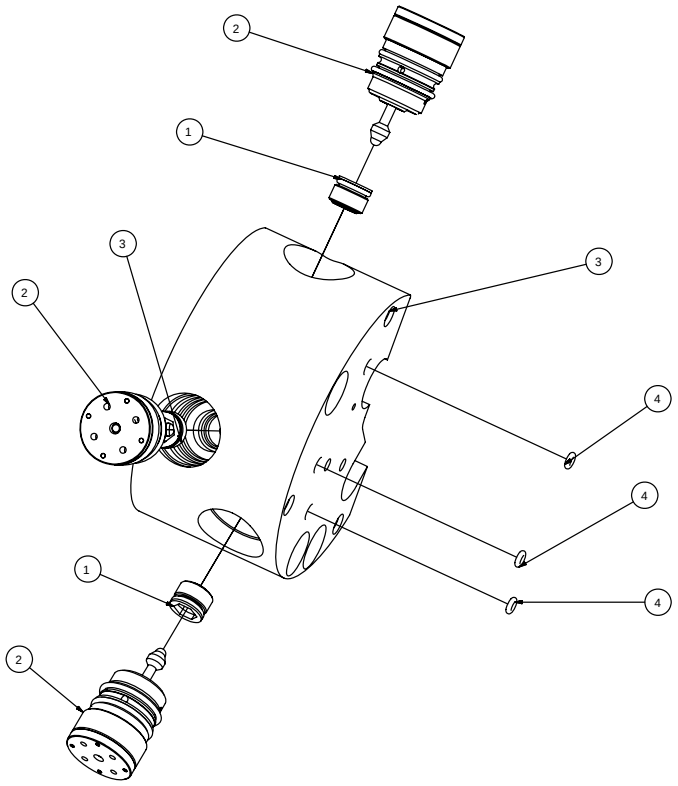


Figure 48: A11241-00 Valve Manifold Assembly

A11241-00 VALVE MANIFOLD ASSY. - PARTS LIST (Figure 48)			
Item #	**Part #**	**Description**	**Qty**
1	77367-00	Seat, Valve	3
2	78949-00	Assembly, Valve	3
3	A11213-00	Valve Manifold, RMA-303	1
4	79001-38	O-Ring, Solvent Proof	3

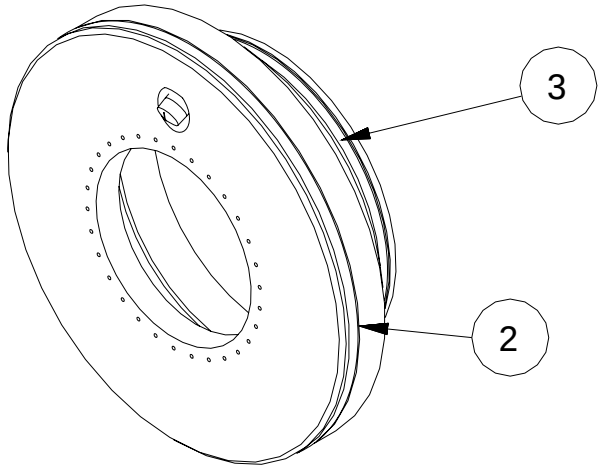
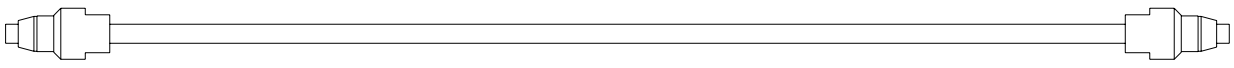


Figure 49: A11227 Shaping Air Manifold Assembly

A11227 SHAPING AIR MANIFOLD ASSY. - PARTS LIST (Figure 49)			
Item #	**Part #**	**Description**	**Qty**
1	----	----	--
2	79001-11	O-Ring, Solvent Proof	1
3	LSOR0005-12	O-Ring, Teflon Encapsulated, Viton	1
4	----	----	--

NOTE: A11227 Shaping Air Manifold Assembly is sold as an assembly with the o-rings as shown. O-rings may be purchased separatly as spare parts.



NOTE:
A11351-01 - Install between rear of turbine manifold and valve manifold assembly.
A11351-02 - Install between turbine manifold assembly and shaping air manifold.

Figure 50: A11351-01/02 Cup Wash Line Assemblies

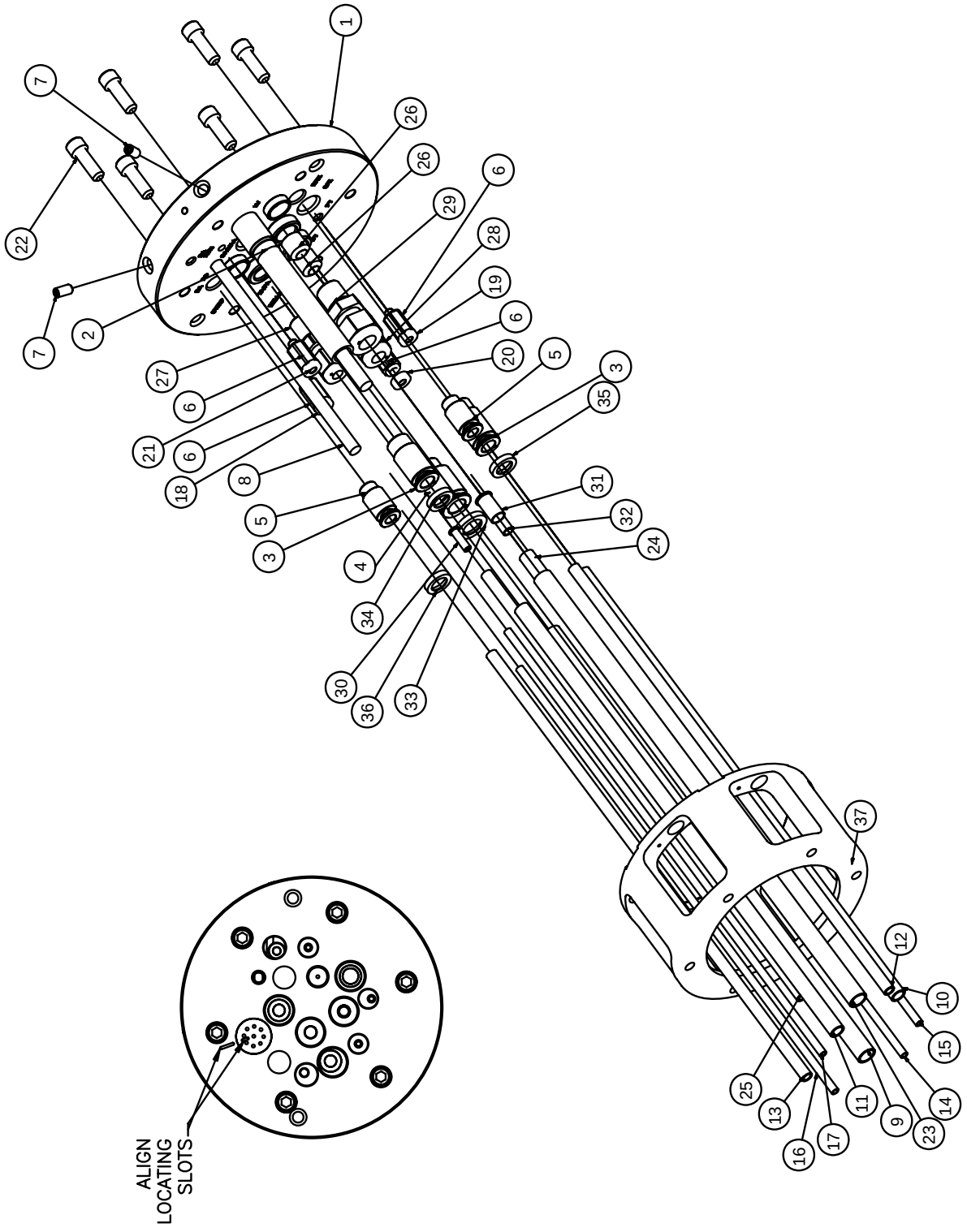
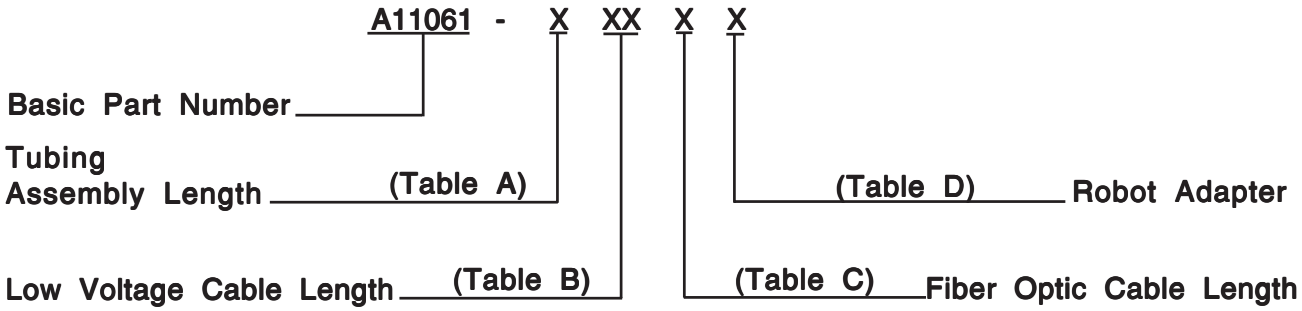


Figure 51: A11061-XXXXX Tubing Bundle Assembly

A11061-XXXXX TUBING BUNDLE ASSEMBLY MODEL IDENTIFICATION

When ordering, use A11061-ABCD as indicated by Tables A, B, C, and D . Five digits must follow the basic part number, for example:



A11061-XXXXX TUBING BUNDLE ASSY. - PARTS LIST (Figure 51)

Item #	Part #	Description	Qty	Port Location	Notes
1	A11062-00	Assembly, Robot Mounting Plate	1	----	
2	"K"	Assembly, Cable Low Voltage	1	LV	
N/A	"U"	Extension, Low Voltage Cable	1	----	
3	A10891-03	Fitting, 1/4" BSP X 8mm ODT, Straight	2	SAI/AA, SAO	3
4	A10891-04	Fitting, 1/4" BSP X 10mm ODT, Straight	1	TA/FA	2
5	A10891-02	Fitting, 1/8" BSP X 6mm ODT, Straight	2	BA, BRK	3
6	77544-01	Male Connector, 4mm ODT X 10-32 THD	4	P1T, D1T, ST, BA, RTN	2
7	SSF-2052	Set Screw, 3/8" Lg. X 10-24	2	----	
8	"L"	Fiber Optic Cable	1	FO	
9	A10839-06	Tube, 10mm OD X 8mm ID, Green	"H"	TA/FA	
10	A10893-07	Tube, 8mm OD X 6mm ID, Blue	"H"	SAI/AA	
11	A10893-04	Tube, 8mm OD X 6mm ID, Gray	"H"	SAO	
12	A10840-09	Tube, 6mm OD X 4mm ID, Orange	"H"	BRK	
13	A10840-08	Tube, 6mm OD X 4mm ID, Yellow	"H"	BA	
14	77536-06	Tube, 4mm OD X 2.7mm ID, Silver	"H"	DT	
15	77536-03	Tube, 4mm OD X 2.7mm ID, Green	"H"	PT	
16	77536-04	Tube, 4mm OD X 2.7mm ID, Blue	"H"	ST	
17	77536-07	Tube, 4mm OD X 2.7mm ID, Yellow	"H"	BA, RTN	
18	77545-01	Cap, 5/32" OD Tube, Blue Identification	1	ST	
19	77545-03	Cap, 5/32" OD Tube, Green Identification	1	PT	
20	77545-11	Cap, 5/32" OD Tube, Gray Identification	1	DT	
21	77545-12	Cap, 5/32" OD Tube, Yellow Identification	1	BA,RTN	
22	7959-24C	Screw, 1/4-20 X 3/4" Lg. SHCS	6	----	
23	A10841-01	Tubing, PFA 10mm OD X 8mm ID	"H"	DL	
24	A10841-02	Tubing, PFA Teflon, 8mm OD X 6mm ID	"H"	P	
25	A10841-03	Tubing, PFA Teflon, 6mm OD X 4mm ID	"H"	SOL	
26	A11063-00	Insert, Fluid	2	DL, P	
27	A10890-04	Fitting, 6mm ODT X 1/8" BSP	1	SOL	2
28	A10890-02	Fitting, 8mm ODT X 1/4" BSP	1	P	2
29	A10890-03	Fitting, 10mm X 1/4" BSP	1	DL	2
30	A10895-03	Insert, Metric Tube, 6mm	1	SOL	1
31	A10895-01	Insert, Metric Tube, 10mm	1	DL	1
32	A10895-02	Insert, Metric Tube, 8mm OD	1	P	1
33	A11207-06	Cap, 10mm, Green	1	TA/FA	
34	A11208-08	Cap, 8mm, Gray	1	SAO/AA	
35	A11208-10	Cap, 8mm, Blue	1	SAI	
36	A11209-05	Cap, 6mm, Yellow	1	BA	
37	"M"	Robot Adapter	1	----	

PARTS LIST BULLET DEFINITION TABLE

3 Apply blue thread adhesive 7969-031 to threads prior to assembly.

2 Apply Teflon pipe thread sealant 7969-10 to threads as required.

1 Install tube inserts fully into Teflon tubing before installing tubing into fitting.

TABLE A - Tubing Assembly Length

Dash No.	Description	"H"
0	Air Tubing (Not Included)	N/A
1	15' Long Tubing Assembly	15 Ft.
2	30' Long Tubing Assembly	30 Ft.

NOTE:
For lengths above 30 Ft., the SA1, SA2, and BRK require the next larger nominal size ID tubing. This tubing is to be supplied by User or Integrator.

The turbine air (TA) is 6 ft. long and must be increased by a minimum of 1 size larger. This tubing and conversion fittings are to be supplied by the User or Integrator. (Some conversion fittings can be found in the "Service Kits" in the "Parts Identification" section of this manual.)

TABLE B - Low Voltage Cable Length

Dash No.	Description	"K"	"U"
00	No Cable	----	----
01	25' Low Voltage - Non-Junction	79008-25	----
02	40' Low Voltage - Non-Junction	79008-40	----
03	50' Low Voltage - Non-Junction	79008-50	----
04	75' Low Voltage - Non-Junction	79008-75	----
05	100' Low Voltage - Non-Junction	79008-100	----
06	15' Robot to JB; 15' JB to MicroPak	79008-15J	77062-15
07	15' Robot to JB; 40' JB to MicroPak	79008-15J	77062-40
08	15' Robot to JB; 60' JB to MicroPak	79008-15J	77062-60
09	15' Robot to JB; 75' JB to MicroPak	79008-15J	77062-75
10	25' Robot to JB; 25' JB to MicroPak	79008-25J	77062-25
11	25' Robot to JB; 50' JB to MicroPak	79008-25J	77062-50
12	25' Robot to JB; 75' JB to MicroPak	79008-25J	77062-75
13	40' Robot to JB; 15' JB to MicroPak	79008-40J	77062-15
14	40' Robot to JB; 25' JB to microPak	79008-40J	77062-25
15	40' Robot to JB; 40' JB to MicroPak	79008-40J	77062-40
16	40' Robot to JB; 60' JB to MicroPak	79008-40J	77062-60
17	50' Robot to JB; 40' JB to MicroPak	79008-50J	

TABLE C - Fiber Optic Cable Length

Dash No.	Description	"L"
0	Fiber Optic Cable (Not Included)	N/A
1	15 Ft. Long Fiber Optic Cable	SMC-424-5
2	25 Ft. Long Fiber Optic Cable	SMC-424-6
3	50 Ft. Long Fiber Optic Cable	SMC-424-2
4	75 Ft. Long Fiber Optic Cable	SMC-424-7
5	100 Ft. Long Fiber Optic Cable	SMC-424-1
6	40 Ft. Long Fiber Optic Cable	SMC-424-8

TABLE D - Robot Adapter

Dash No.	Description	"M"
0	Adapter (Not Included)	N/A
1	Adapter (Fanuc P-155, P-145)	78983-00
2	Adapter (ABB 5400, 5002)	79107-00
3	Adapter (Fanuc P-200)	79131-00
4	Adapter (Kawasaki - KE610L)	A10847-00
5	Adapter (Motoman - PX2850)	A10848-00
6	Adapter (Motoman - PX2900)	A10849-00
7	Adapter (B & M LZ2000)	A10851-00

RMA-303 RECOMMENDED SPARE PARTS

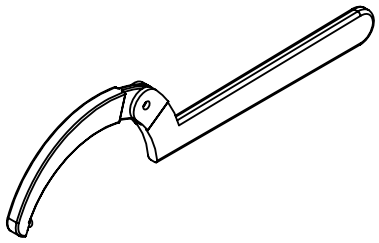
Part #	Description	Qty
A10839-06	Tube, 10mm X 8mm, Green	--
A10840-08	Tube, 6mm X 4mm, Yellow	--
A10840-09	Tube, 6mm X 4mm, Orange	--
A10841-01	Tube, PFA, 10mm X 8mm ID	--
A10841-02	Tube, PFA, 8mm X 6mm ID	--
A10841-03	Tube, PFA, 6mm X 5mm ID	--
A10891-02	Fitting, 6mm OD	1
A10891-03	Fitting, 8mm OD	1
A10891-04	Fitting, 10mm OD	1
A10893-04	Tube, 8mm X 6mm, Gray	--
A10893-07	Tube, 8mm X 6mm, Blue	--
A10895-01	Insert, Metric Tube, 10mm OD	1
A10895-02	Insert, Metric Tube, 8mm OD	1
A10895-03	Insert, Metric Tube, 6mm OD	1
A11063-00	Insert, Fluid	2
A11081-00	Air Turbine Assembly	0-1
A11245-00	Fluid Tube	0-1
77367-00	Valve Seat Assembly	3-5
77524-00	Break-Away Screw, Machined	8
77563-03	Tube, 4mm X 2.7mm, Green	--
77563-04	Tube, 4mm X 2.7mm, Blue	--
77536-06	Tube, 4mm X 2.7mm, Gray	--
77536-07	Tube, 4mm X 2.7mm, Yellow	--
77544-01	Male Connector	2
EMF-203-04	Front Ferrule, 1/4" OD Tubing	0-2
EMF-202-04	Back Ferrule, 1/4" OD Tubing	0-2
78449-00	Fitting	0-1
78949-00	Fluid Valve Assembly	3-5
79008-XX	Low Voltage Cable	1
SMC-424-X	Fiber Optic Cable	1
79001-05	O-Ring, Solvent Proof	1
79001-06	O-Ring, Solvent Proof	0-1
79001-07	O-Ring, Solvent Proof	1
79001-09	O-Ring, Solvent Proof	2
79001-11	O-Ring, Solvent Proof	0-2
79001-14	O-Ring, Solvent Proof	2
79001-22	O-Ring, Solvent Proof	2
79001-38	O-Ring, Solvent Proof	2
79001-39	O-Ring, Solvent Proof	1
79001-40	O-Ring, Solvent Proof	3
79001-42	O-Ring, Solvent Proof	1
79001-44	O-Ring, Solvent Proof	1
79010-01	Cascade Assembly	1
75911-00	Fiber Optic Transmitter Assembly	1
78278-00	Nut, Fiber Optic Transmitter	0-1
75921-03	Fiber Optic Cable Assembly	0-1
7959-24C	Screw, 1/4-20 X 3/4" SHCS	4-6
SSF-2052	Set Screw, #10-32 UNC X 3/8" Long, SHCS	3
A11224-00	Shroud/Shaping Air Ring	0-1
A11227-00	Shaping Air Manifold Assembly	0-1
A11255-00	Shroud	0-1
A11228-00	Turbine Retaining Ring	0-1
A11214-00	Rod Support	1-2

(Continued On Next Page)

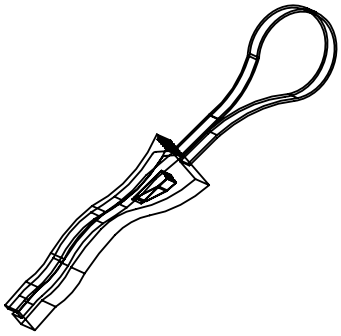
RMA-303 RECOMMENDED SPARE PARTS (Cont.)

Part #	Description	Qty
A11351-01	Cup Wash Tubing Assembly	0-1
A11351-02	Cup Wash Tubing Assembly	1-2
A11517-00	Conductive Brush Ring Kit	0
A11534-00	O-Ring Kit (Turbine - Exterior, 5 O-Rings)	1
Select Option Below	**Fluid Tip Size**	
A11240-01	.7mm (.028")	0-1
A11240-02	.9mm (.035")	0-1
A11240-03	1.1mm (.043")	0-1
A11240-04	1.2mm (.047")	0-1
A11240-05	1.6mm (.062")	0-1
A11240-06	1.0mm (.039")	0-1
Select Option Below	**Bell Cup**	
A11267-00	65mm Serrated (Clear, Waterborne Primer)	0-1
A11266-00	65mm Serrated, Base Coat	1
A11266-01	65mm Non-Serrated, Base Coat	1
Select Option Below	**Fluid Coil**	
77531-00	1/4" OD X .170" ID, PFA, Clear Coat	0-1
78450-00	1/4" OD X .125" ID, PFA, High Conductive Paints, Base Coat	0-1
77517-00	1/4" OD X .170" ID, PFA, Base Coat	0-1

All tools are included with atomizer assembly.

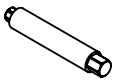


76772–00
SPANNER WRENCH

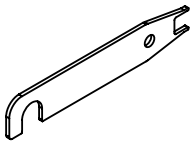


A11253–00
STRAP WRENCH

78279–00
FIBER OPTIC TOOL

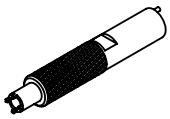


A10766–00
MICROVALVE SEAT REMOVAL TOOL

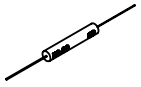


A11284–00
BELL CUP/COMBO WRENCH

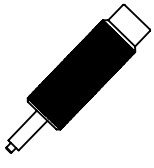
A10756–00
MICROVALVE REMOVAL TOOL



A11229–00
FEED TUBE/TIP REMOVAL TOOL



A11535–00
SPLASH PLATE GAGE



A11388–00
SPLASH PLATE TOOL

Figure 52: Assembly Tools

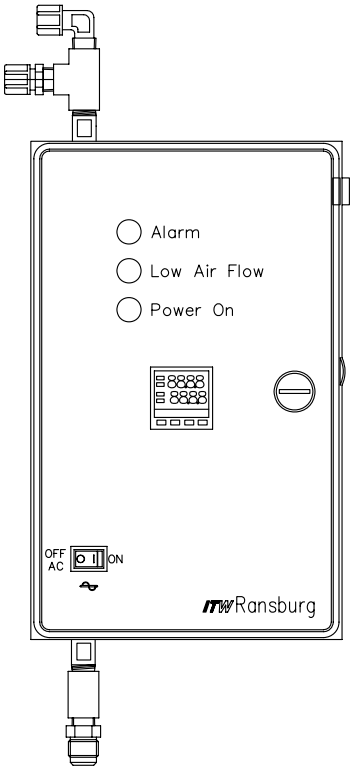


Figure 53: A11065-02 Air Heater

ACCESSORIES

Part #	Description
LSCH0009-00	Dielectric Grease (8 oz. Tube)
76652-01	Kit for measuring high voltage. (Includes Multi-Function Meter (76634-00) and High Voltage Probe Assy. (76667-00).
76652-02	Kit for measuring short circuit current (SCI), resistance, and sprayability. Includes Multi-Function Meter (76634-00) and Test Lead Assy. (76664-00).
76652-03	Kit for measuring paint resistivity. (Includes Multi-Function Meter (76634-00) and Paint Probe Assy. (7922-00).
76652-04	Deluxe Kit (Performs all functions listed above.) Includes Multi-Function Meter (76634-00), Paint Probe Assy. (7922-00), Test Lead Assy. (76664-00), and High Voltage Probe Assy. (76667-00).
A11567-00	Grooving Tool, 1/4" OD Tube

SERVICE KITS

Part #	Description
RPM-32	Pre-Filter Replacement Element
RPM-33	Bearing Air Filter Element
74947-06	Cable Assy. (Low Voltage Cable), 30 Ft.
74947-04	Cable Assy. (Low Voltage Cable), 75 Ft.
74947-05	Cable Assy. (Low Voltage Cable), 100 Ft.
74793-01	Cascade RansPak 1000, Right Angle Connection
74793-02	Cascade RansPak 1000, Straight Connection
A11570-01	Reducing Straight Connector, Push To Connect, 6mm OD Tube To 4mm OD Tube
A11570-02	Reducing Straight Connector, Push To Connect, 8mm OD Tube To 4mm OD Tube
A11570-03	Reducing Straight Connector, Push To Connect, 8mm OD Tube To 6mm OD Tube
A11570-04	Reducing Straight Connector, Push To Connect, 10mm OD Tube To 4mm OD Tube
A11570-05	Reducing Straight Connector, Push To Connect, 10mm OD To 6mm OD Tube
A11570-06	Reducing Straight Connector, Push To Connect, 10mm OD To 8mm OD Tube
A11570-07	Reducing Straight Connector, Push To Connect, 12mm OD To 8mm OD Tube
A11570-08	Reducing Straight Connector, Push To Connect, 12mm OD To 10mm OD Tube

LUBRICANTS AND SEALERS

Part #	Description
A11545-00	Petrolatum Jell Lubricant for all O-Rings
7969-031	Thread Sealant (Blue,) Loctite 23971
7969-10	Thread Sealant (White), Loctite 59231, Teflon Paste

AIR FILTERS / ELEMENT REPLACEMENT

ITW Part #	Qty. Elements Per Carton	Used On
RPM-32	4	RPM-417, Pre-Filter
RPM-33	8	RPM-418, Bearing Air Filter

LIMITED WARRANTY

ITW Ransburg will replace or repair without charge any part and/or equipment that fails 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 VOIDS 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, (example: guns, power supplies, control units, etc.), is one (1) year from date of purchase. **WRAPPING THE APPLICATOR IN PLASTIC, SHRINK-WRAP, ETC., WILL VOID THIS WARRANTY.**

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

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.

VOLUMETRIC CONTENT OF HOSE OR TUBE (English Units)

I.D. (inches)	cc/ft.	Cross Seaction (sq. in.)	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

METRIC CONVERSIONS

Pressure	Distance	Weight
kPA X .145 = PSI	Millimeters X .0394 = Inches	Grams X .035 = Ounces
mPa X 145.04 = PSI	Meters X 39.37 = Inches	Kilograms X 2.205 = Pounds
Bars X 14.50 = PSI	Meters X 3.281 = Feet	
PSI X 6.894 = kPa	Inches X 25.40 = Millimeters	Pounds X .4536 = Kilograms
PSI X .0069 = mPa	Inches X .0254 = Meters	Oucnes X 28.349 = Grams
PSI X .0689 = Bars	Feet X .3048 = Meters	

Service Manual Price:a $50.00 (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.

ISO 9001 Quality Systems

ENVIRONMENTALLY CONCERNED

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03/06