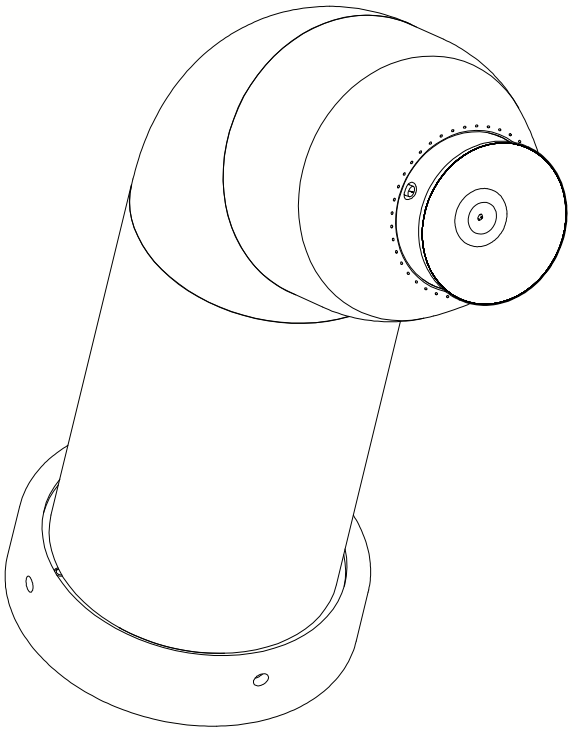
SERVICE MANUAL
LN-9266-11.3
(REPLACES: LN-9266-11.2)
April — 2013

Ransburg

RMA-303 Robot Mounted Rotary Atomizer Direct Charge



MODEL:A12867

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.)

CONTENTS

SAFETY

SAFETY PRECAUTIONS

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

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

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

A NOTE is information relevant to the procedure in progress.

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

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

! WARNING

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

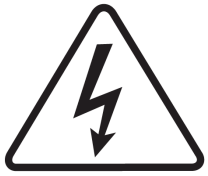
➤ This manual **MUST** be read and thoroughly understood by **ALL** personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the **WARNINGS** and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere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

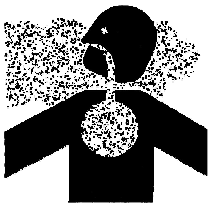
! WARNING

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

AREA 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 or Controller 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, country, and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents. Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times. Test only in areas free of combustible material. Testing may require high voltage to be on, but only as instructed. Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury. If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled. 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, OSHA, local, country, and European Health and Safety Norms.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Spray Area 	**Explosion 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 or Controller shutdown indicates a problem in the system requiring correction.	Electrostatic arcing must be prevented. Safe sparking distance must be maintained between the parts being coated and the applicator. A distance of 1 inch for every 10KV of output voltage is required at all times. Unless specifically approved for use in hazardous locations, all electrical equipment must be located **outside** Class I or II, Division 1 or 2 hazardous areas, in accordance with NFPA-33. Test only in areas free of flammable or combustible materials. The current overload sensitivity (if equipped) MUST be set as described in the corresponding section of the equipment manual. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if the current overload sensitivity is not properly set. Frequent power supply shutdown indicates a problem in the system which requires correction. Always turn the control panel power off prior to flushing, cleaning, or working on spray system equipment. Before turning high voltage on, make sure no objects are within the safe sparking distance. Ensure that the control panel is interlocked with the ventilation system and conveyor in accordance with NFPA-33, EN 50176. Have fire extinguishing equipment readily available and tested periodically.
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, EN 60079-0. 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, EN Norms and your insurance company requirements.

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

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Electrical Equipment 	**Electrical Discharge** High voltage equipment is utilized in the process. Arcing in the vicinity of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance. Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation. Frequent power supply shutdown indicates a problem in the system which requires correction. An electrical arc can ignite coating materials and cause a fire or explosion.	Unless specifically approved for use in hazardous locations, the power supply, control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas in accordance with NFPA-33 and EN 50176. 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.
Toxic Substances 	**Chemical Hazard** Certain materials may be harmful if inhaled, or if there is contact with the skin.	Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer. Adequate exhaust must be provided to keep the air free of accumulations of toxic materials. Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Spray Area 	**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 coating supplier. Any other type of solvent may be used with aluminum equipment.

N O T E S

INTRODUCTION

FEATURES

Features which make the RMA-303 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 insures 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.)
- Serrated and non-serrated bell cups are available for application flexibility and color match. All bell cups are made using Titanium material. The 55mm bell cup is also available in aluminum.
- Two independent shaping air supply tubes for pattern control.
- 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.
- 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 interior.
- 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 (solvent borne paint) promotes high transfer efficiency.
- Large range of fluid tip sizes available.

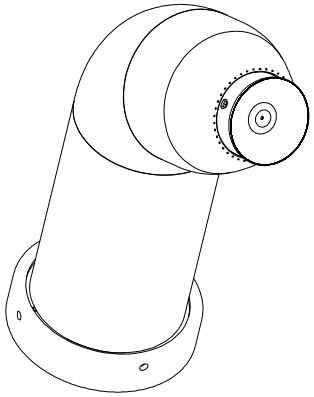


Figure 1: RMA-303 Robot Mounted Rotary Atomizer–Direct Charge

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. A 30mm and 55mm aluminum bell cup is available.

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 manifolds 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 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 minimizes 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. (The applicator will fall to the booth grate or floor).

Power Supply and Controls

The high voltage cascade is located inside the applicator and 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 format is designed to fit in a conventional 19-inch or 10-inch rack and requires a 24V 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 over-current 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 the 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. 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 / Mechanical

Electrical	
Power Supply Type:	MicroPak
Charging Method:	Direct
Output Voltage:	0-100 kV Variable
Output Current:	125 µA
Turbine Speed Control:	Atomizer Module
Part Spray ability:	Determine spray ability of part to be coated using Test Equip-ment (76652) (Paint Conductivity Meter)
Mechanical	
Length:.	(See RMA-303 Tool Point, Center of Gravity, and Envelope Dimensions (Single and Dual Flex) figure in the “Introduction” section.)
Diameter:	(See RMA-303 Tool Point, Center of Gravity, and Envelope Dimensions (Single and Dual Flex) figure in the “Introduction” section.)
Approximate Weight	
Atomizer Only:	17.3 lbs. (7.83 Kg) max.
Total Payload with Robot Plate & Adapter:	20.1 lbs. (9.12 Kg) max.
Turbine Type:	Air Bearing Impulse Drive
Turbine Air Supply:	Variable (See “Pressure Flow Data Charts” in the “Introduction” section.)
Maximum/Minimum Turbine Speed:	Continuous 70K rpm max./20K rpm min.
Maximum Angular Velocity for Turbine (Robot Motion):	250°/sec.
Tubing Bundle Max. Rotation:	450° in Either Direction
Bearing Air Supply at the Applicator: Nominal):	90 psig (±10 psi) (621 kPa ±69 kPa) 2.9 SCFM (82 slpm)
Shaping Air #1 (SAI) Supply:	Variable (See “Pressure Flow Data Charts” in the “Introduction” section.)

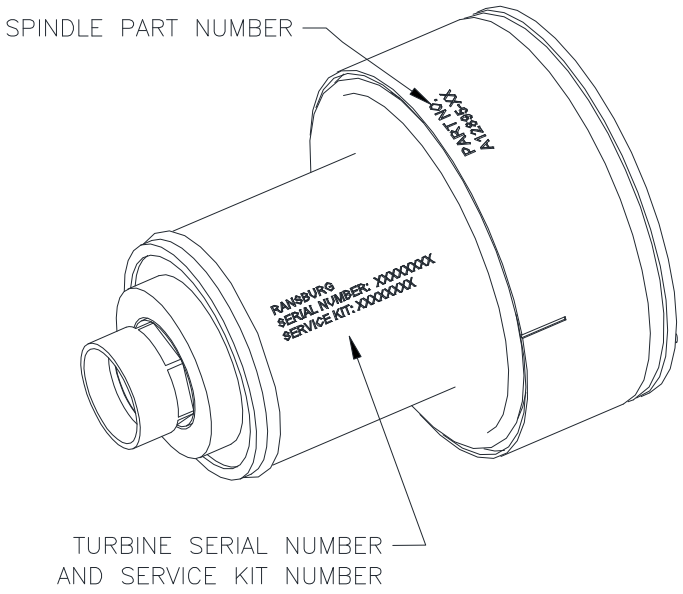
Mechanical (Continued)	
Shaping Air #2 (SAO) Supply:	Variable (See “Pressure Flow Data Charts” in the “Introduction” section.)
Brake Air Supply (Nominal):	60-100 psig (414-689 kPa)
Maximum Fluid Pressure Supply	
Paint:	200 psi (1379 kPa)
Solvent:	150 psi (1035 kPa)
Fluid Flow Rate:	25-700 cc/min. (300 cc/min. maximum for 30mm Bell Cup)
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 5 min.
Bell Cup Replacement Time:	Less than 2 min.
Minimum Control Equipment Requirements:	(Versions listed or higher)
MicroPak	LECU5004-17 (V.3.84)
Atomizer Module	A11925-00 (V.0.4)
I/O Module	A11435-00 (V.1.4) (0.01V) (4-20 mA)

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

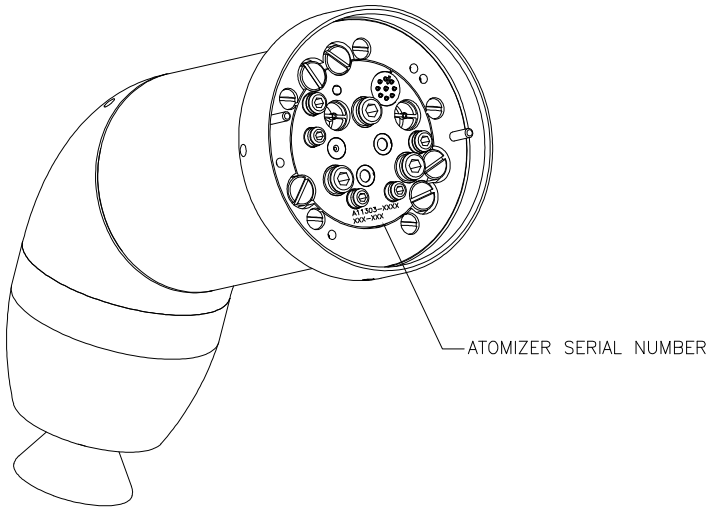
IMPORTANT NUMBERS

Record these numbers in a log book for future reference.

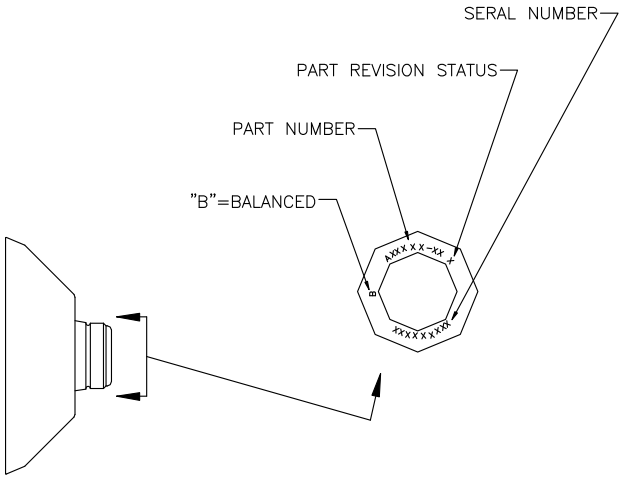
The last digits of the Atomizer serial number are also the Turbine serial numbers.



Turbine Serial Number



Atomizer Serial Number

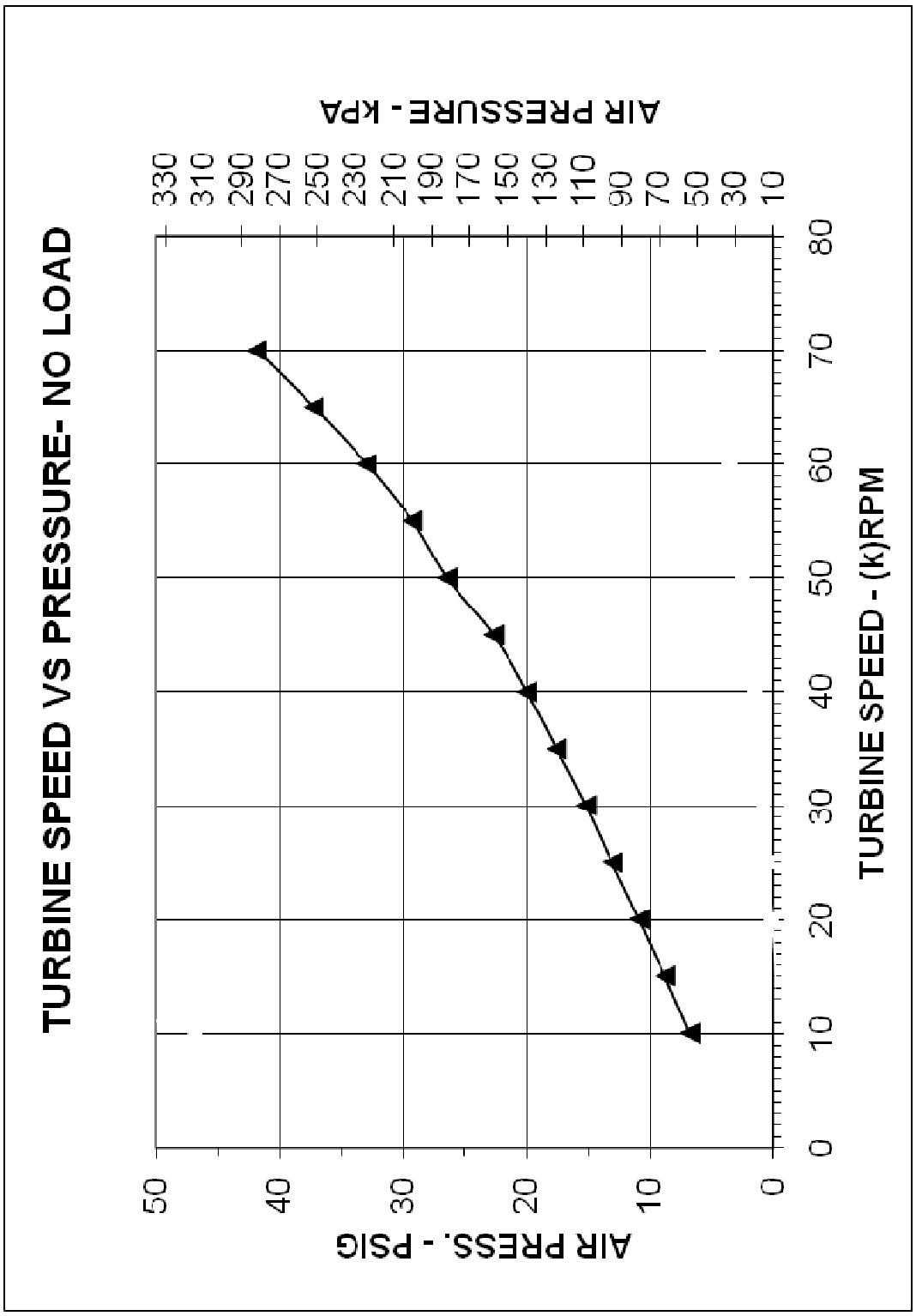


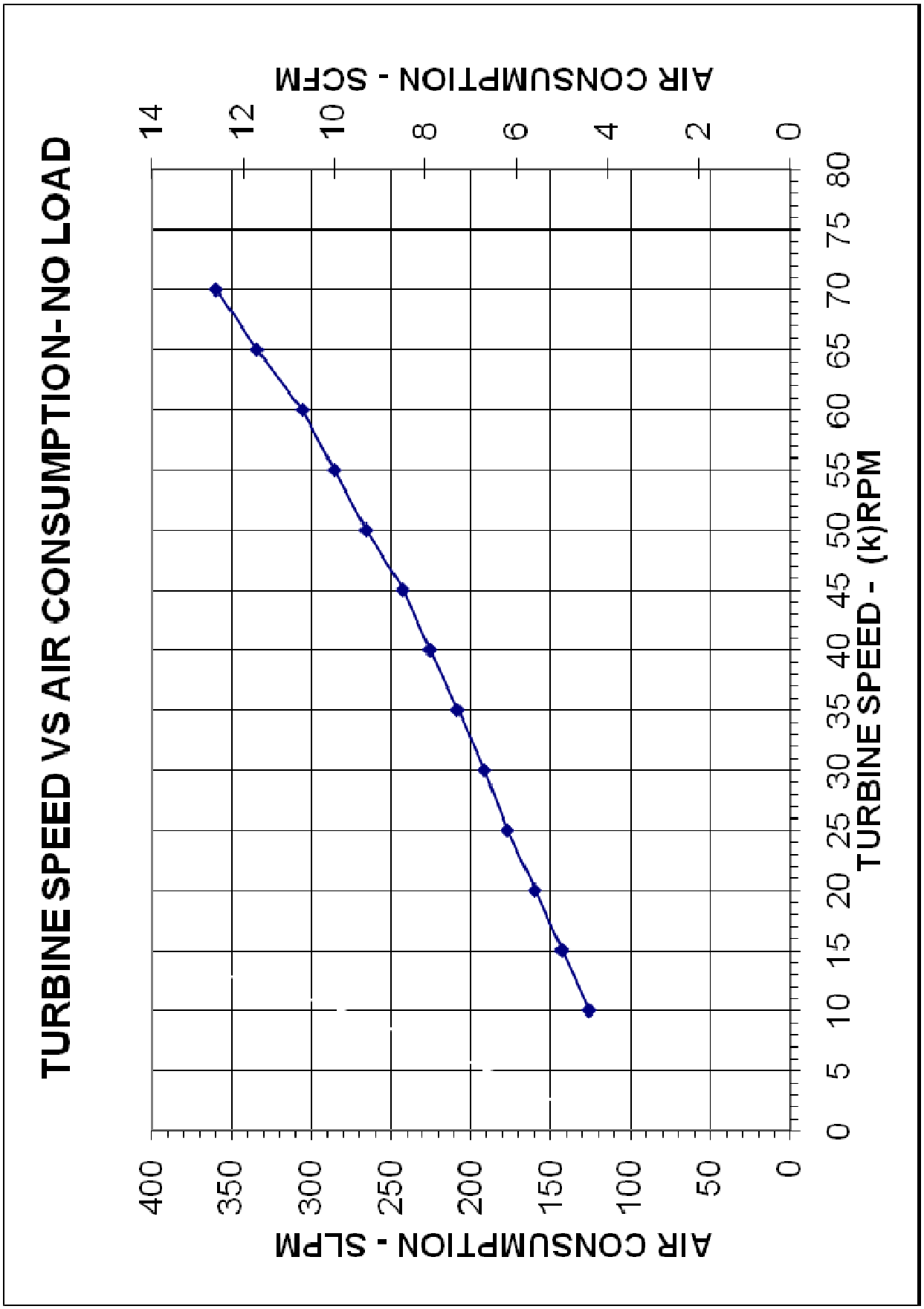
Bell Cup Part Numbers/Serial Number

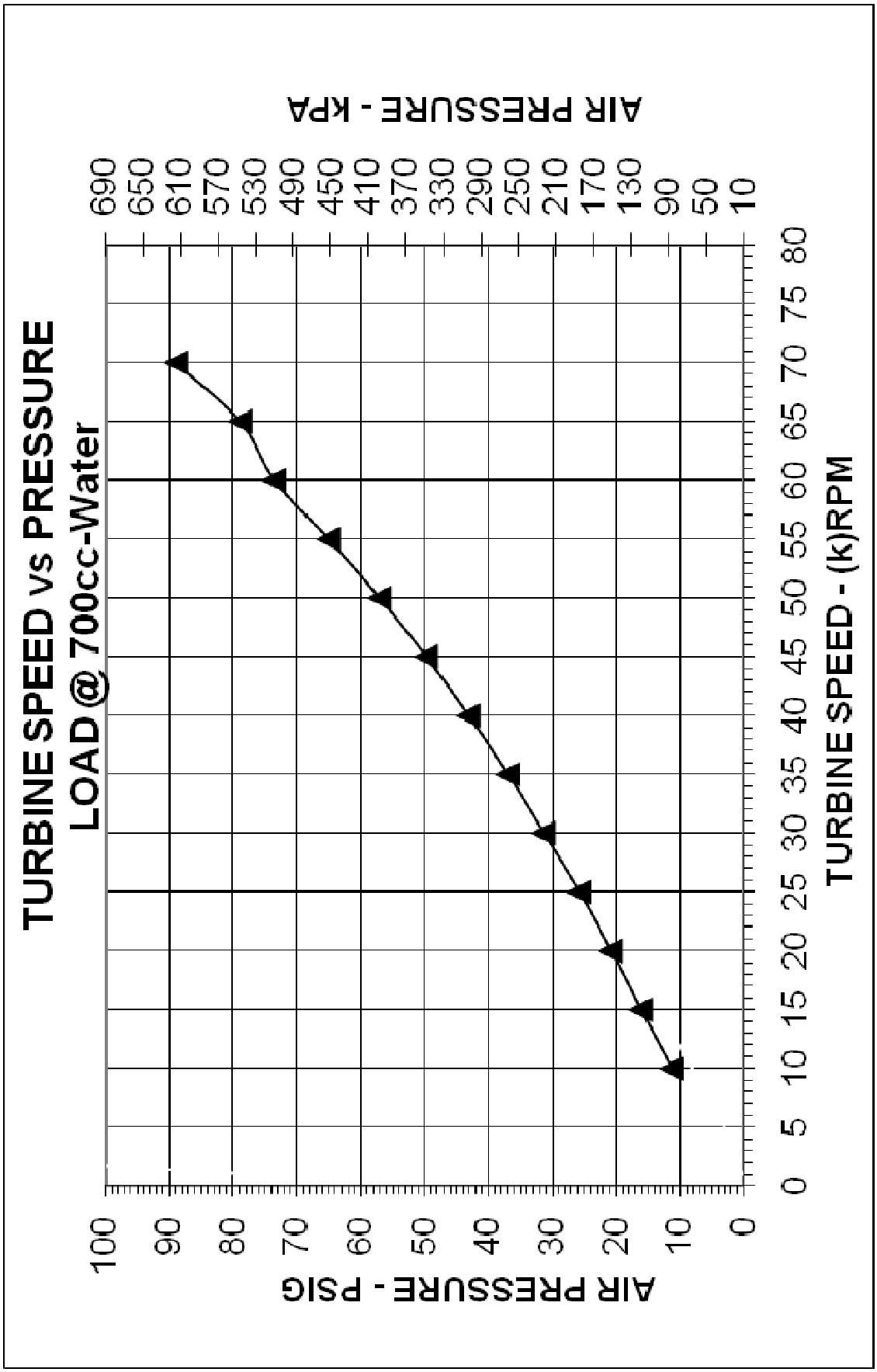
(cup only, not with splash plate)

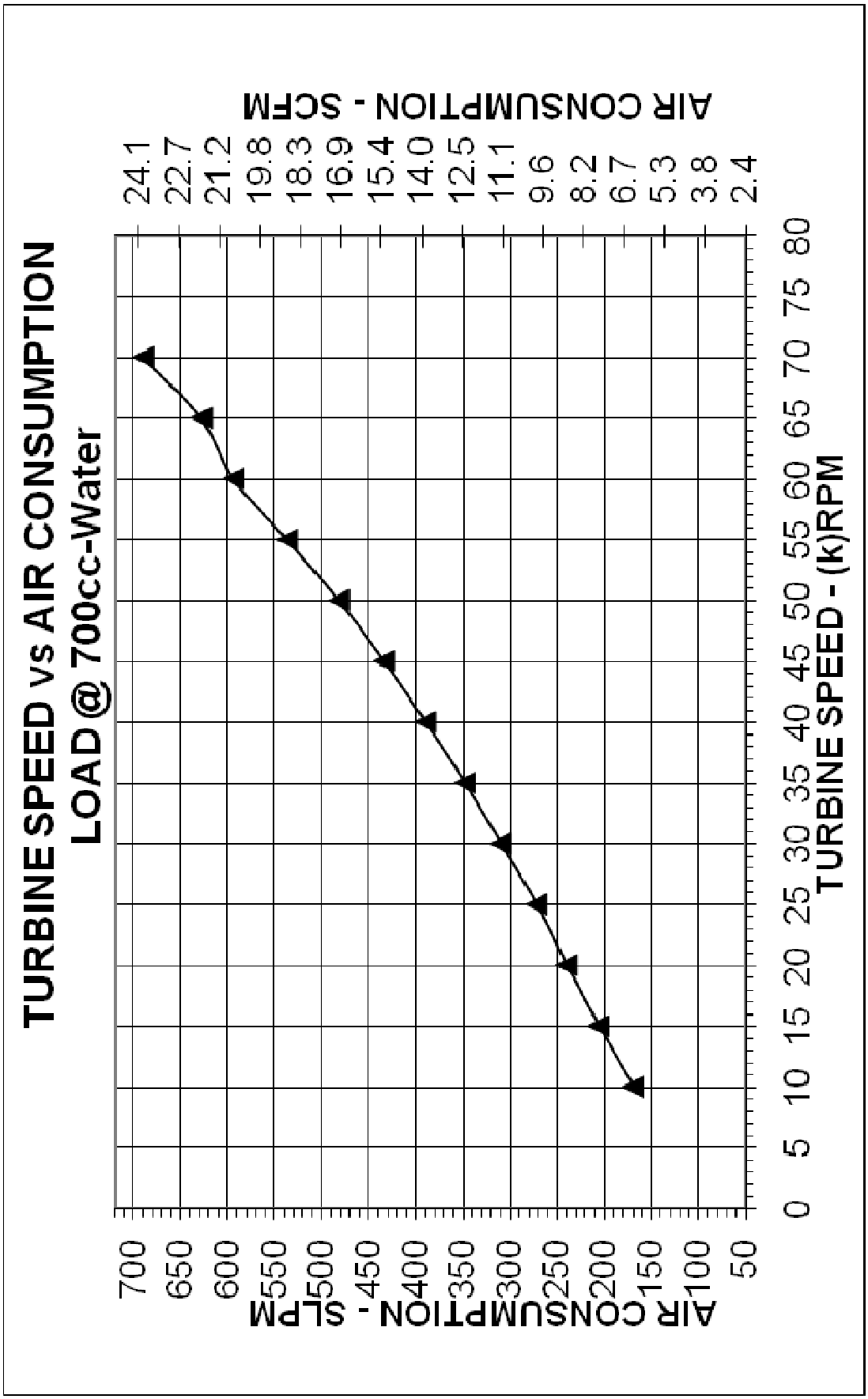
GRAPHS

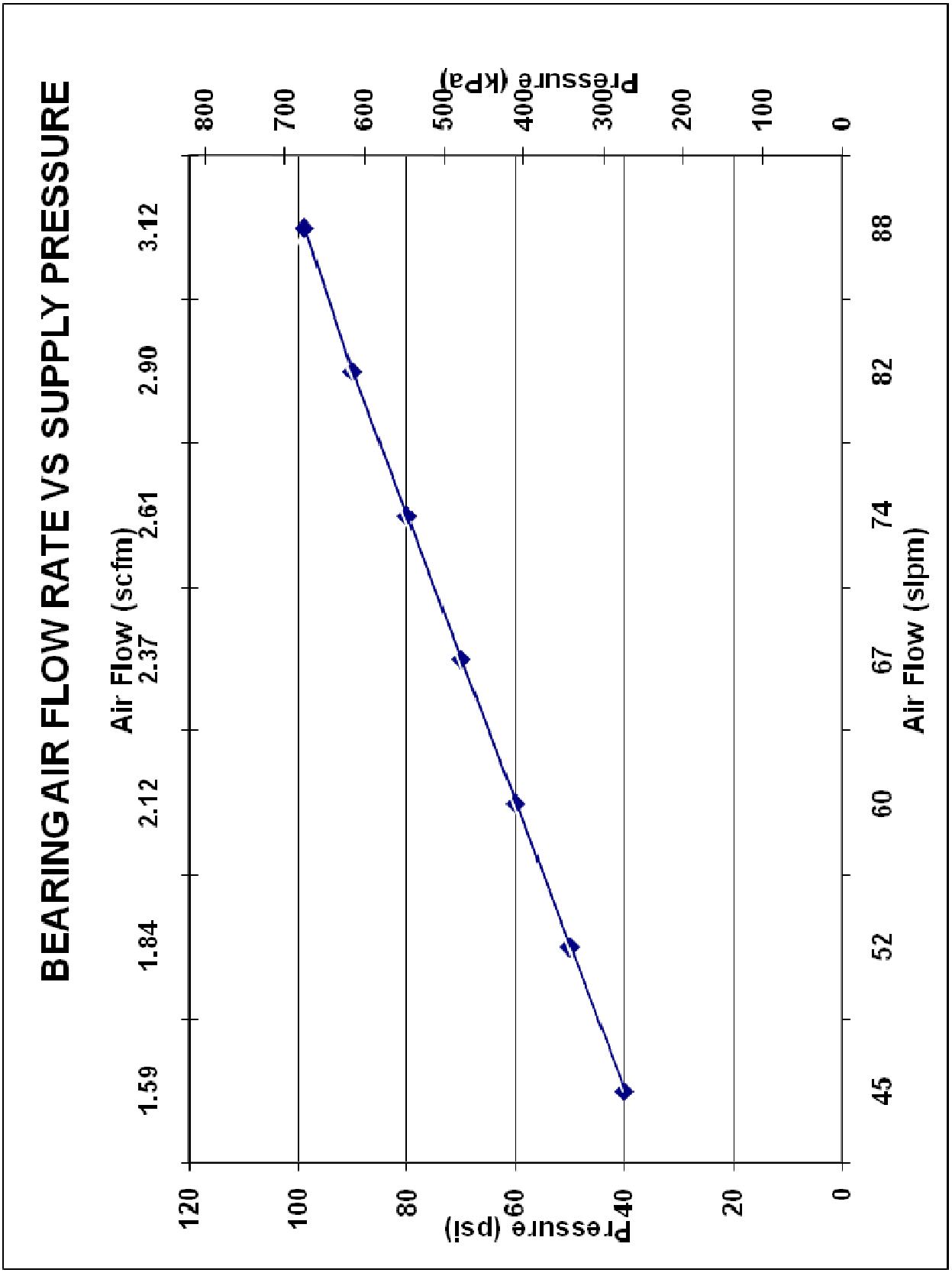
Graphical information provided for reference only for all charts. Unless otherwise specified, all pressure data shown was measured 12-inches (305mm) behind the applicator.

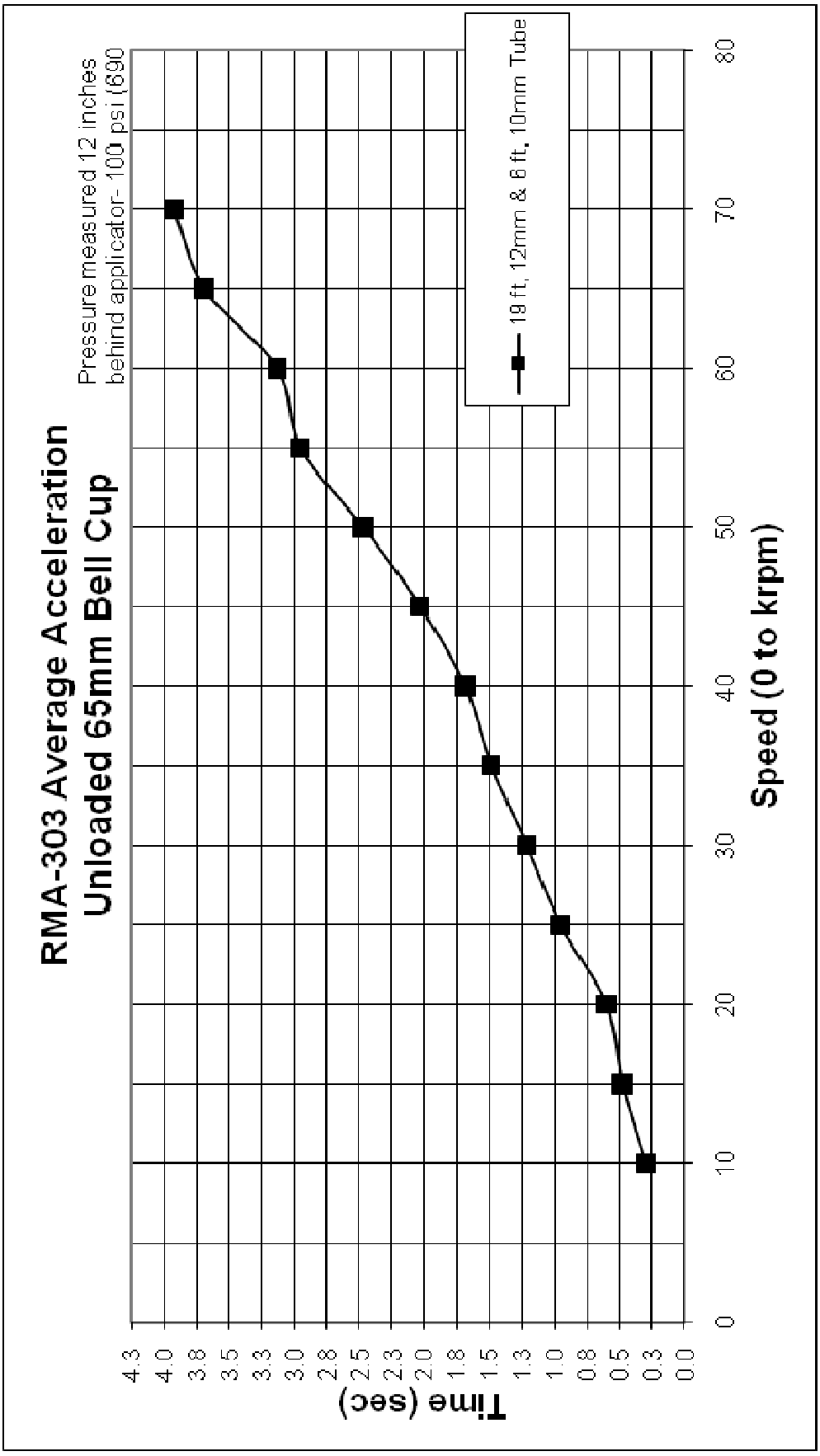


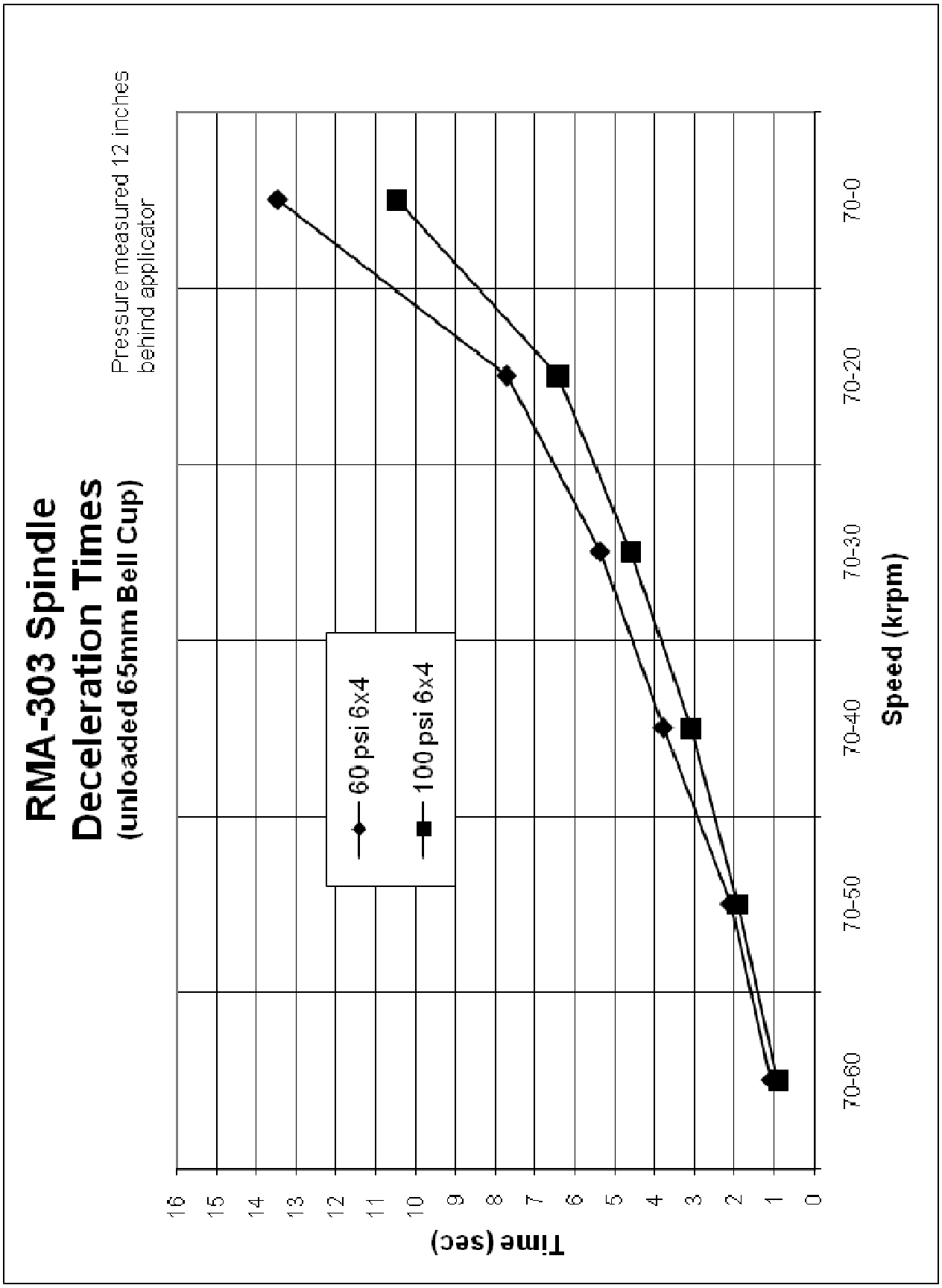

TURBINE SPEED VS AIR CONSUMPTION-NO LOAD
AIR CONSUMPTION - SLPM
400
350
300
250
200
150
100
50
0
AIR CONSUMPTION - SCFM
14
12
10
8
6
4
2
0
TURBINE SPEED - (K)RPM
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

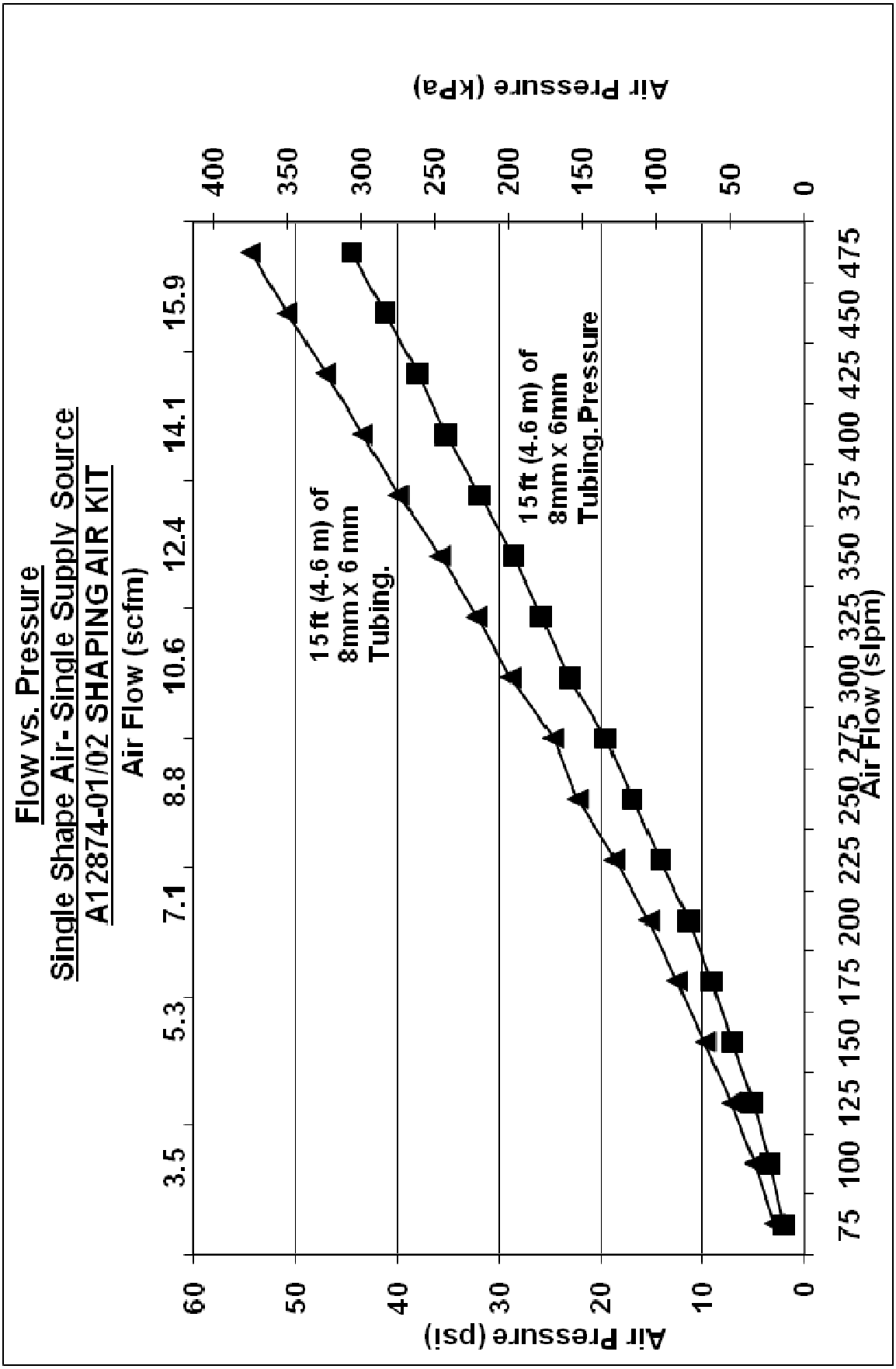

TURBINE SPEED vs PRESSURE
LOAD @ 700cc-Water
AIR PRESSURE - PSIG
AIR PRESSURE - KPA
TURBINE SPEED - (K)RPM
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
100 90 80 70 60 50 40 30 20 10 0
690 650 610 570 530 490 450 410 370 330 290 250 210 170 130 90 50 10

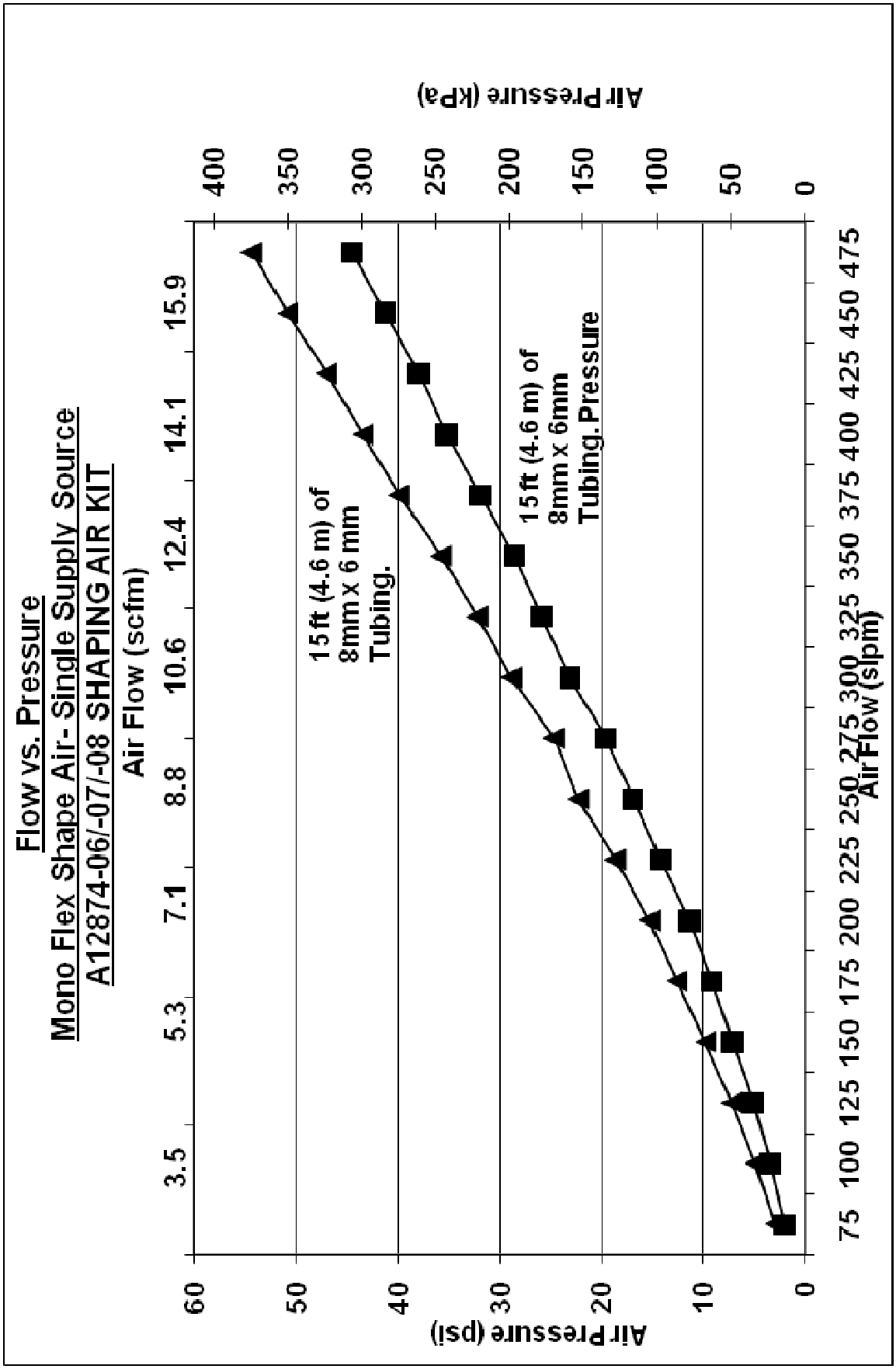

TURBINE SPEED vs AIR CONSUMPTION
LOAD @ 700cc-Water
AIR CONSUMPTION - SLPM
AIR CONSUMPTION - SCFM
TURBINE SPEED - (K)RPM
700
650
600
550
500
450
400
350
300
250
200
150
100
50
24.1
22.7
21.2
19.8
18.3
16.9
15.4
14.0
12.5
11.1
9.6
8.2
6.7
5.3
3.8
2.4
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

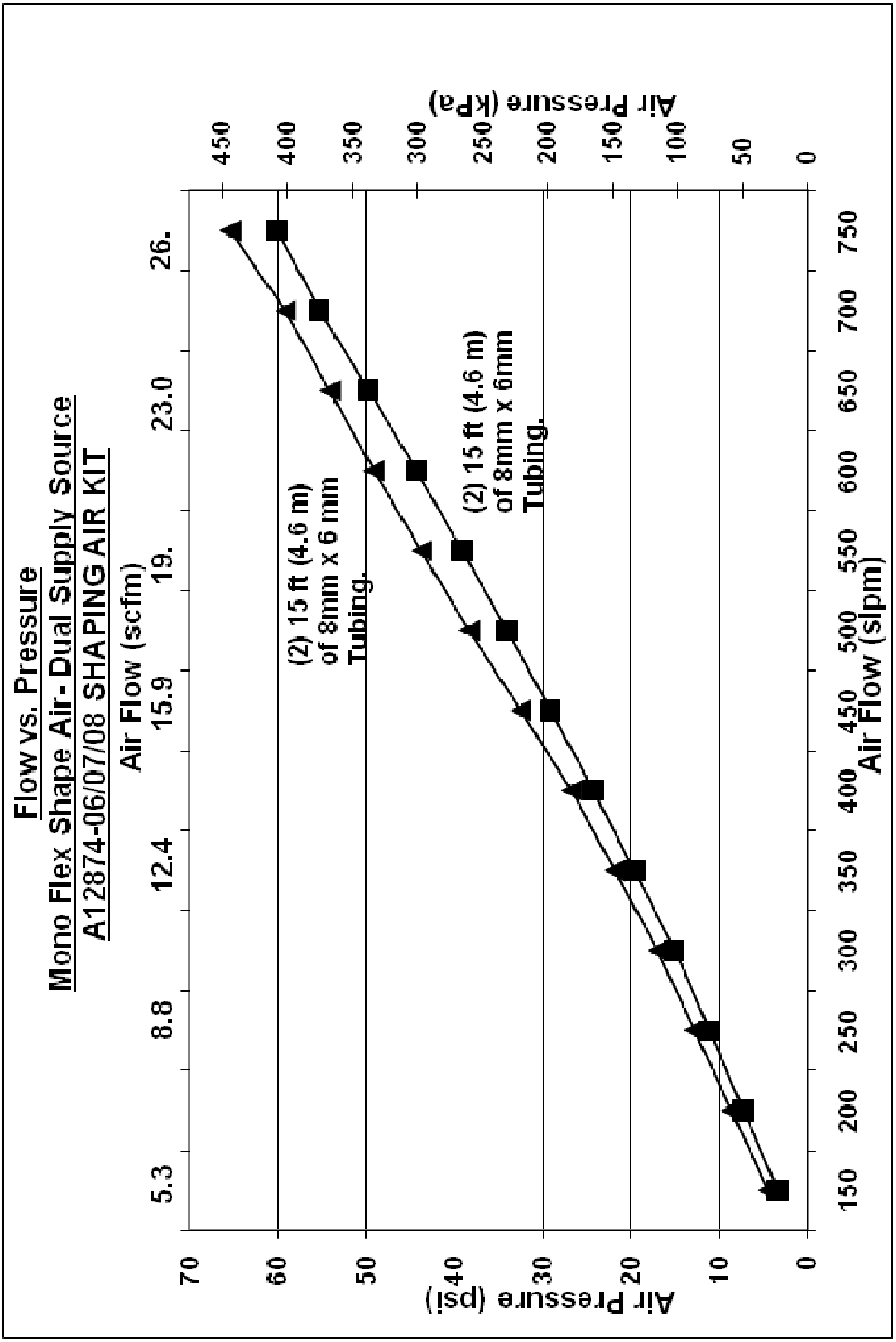

BEARING AIR FLOW RATE VS SUPPLY PRESSURE
Air Flow (scfm)
1.59
1.84
2.12
2.37
2.61
2.90
3.12
Air Flow (slpm)
45
52
60
67
74
82
88
Pressure (psi)
0
20
40
60
80
100
120
Pressure (kPa)
0
100
200
300
400
500
600
700
800

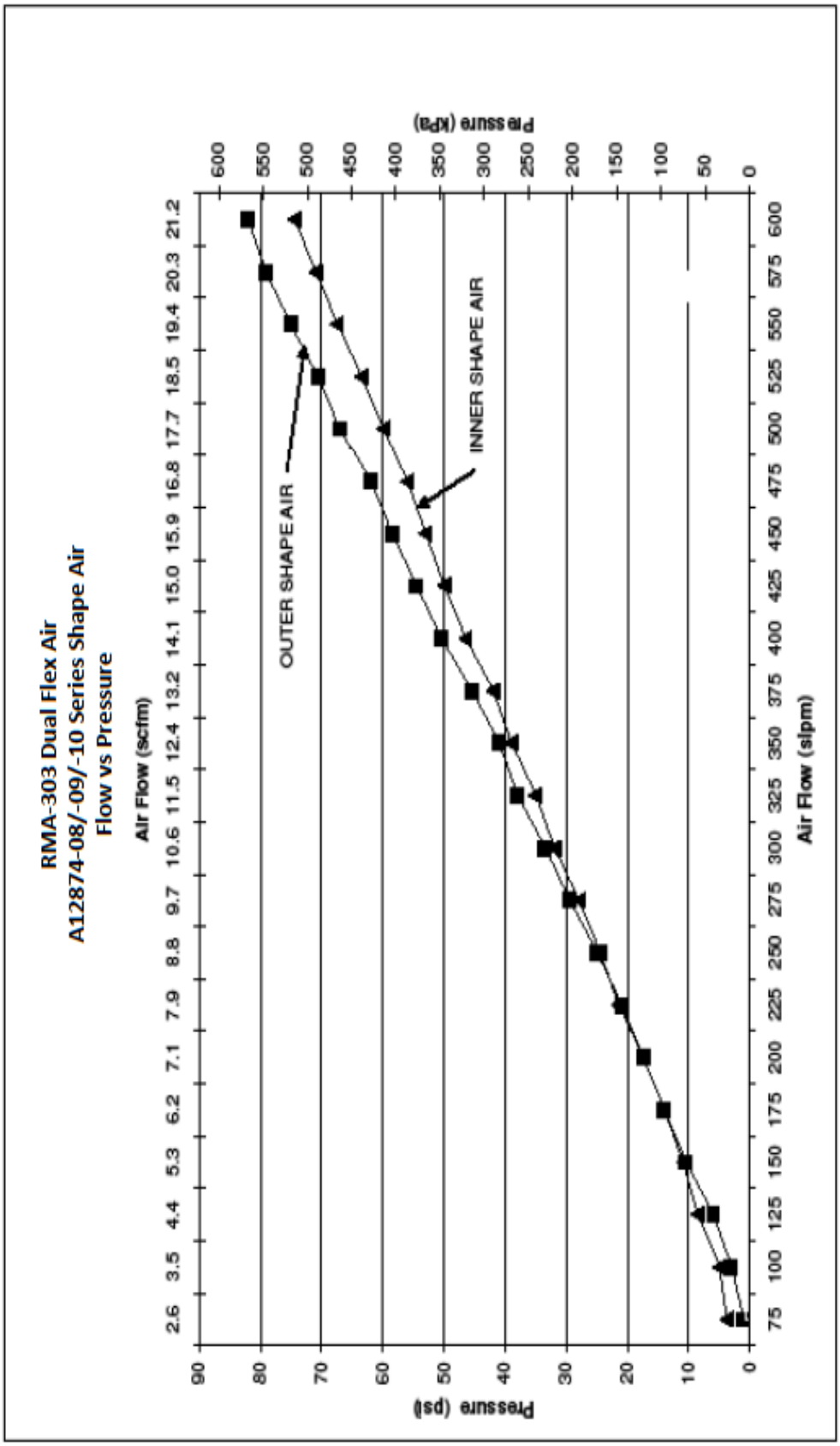

RMA-303 Average Acceleration
Unloaded 65mm Bell Cup
Pressure measured 12 inches
behind applicator- 100 psi (690
19 ft, 12mm & 6 ft, 10mm Tube
Time (sec)
4.3
4.0
3.8
3.5
3.3
3.0
2.8
2.5
2.3
2.0
1.8
1.5
1.3
1.0
0.8
0.5
0.3
0.0
Speed (0 to krpm)
0
10
20
30
40
50
60
70
80

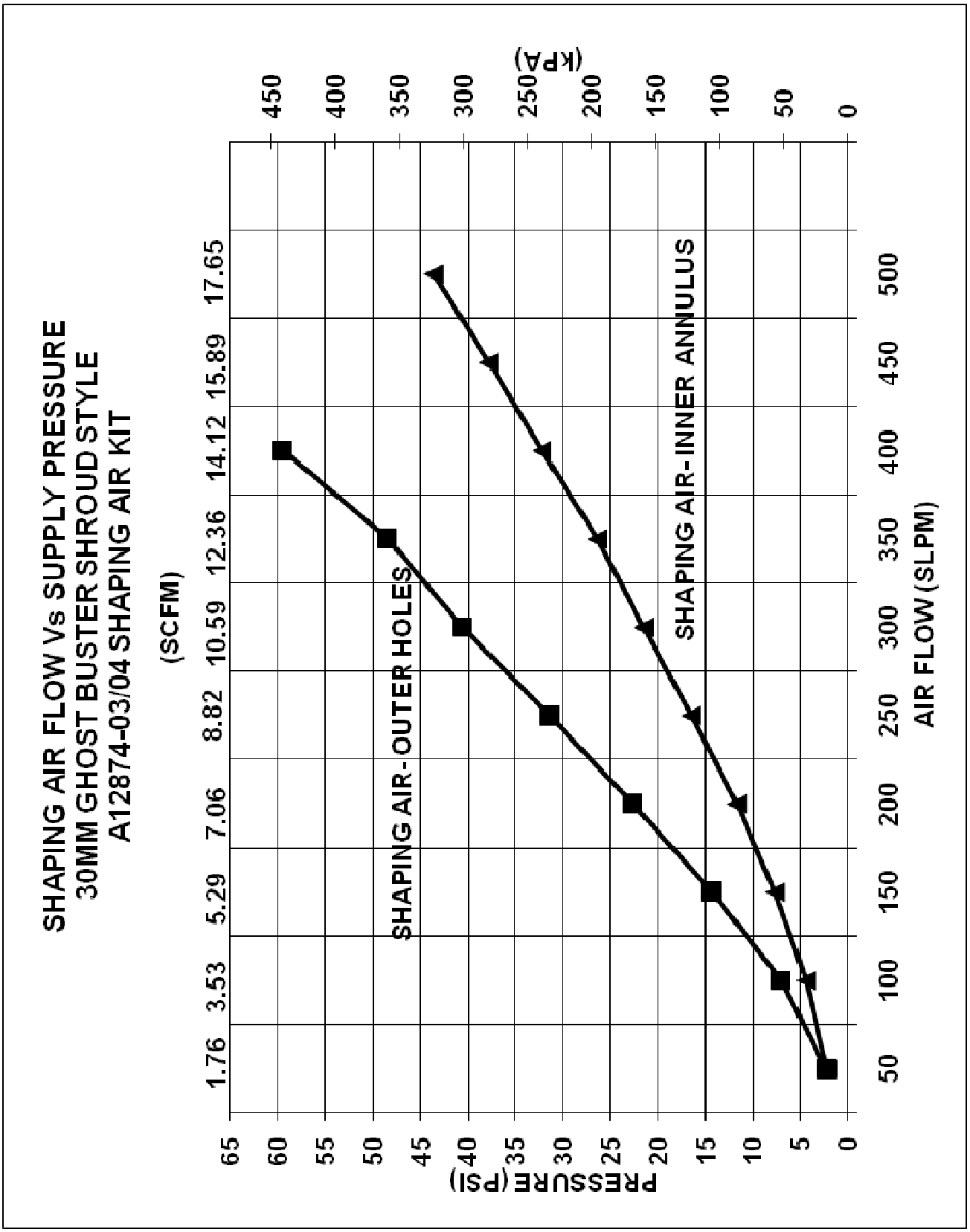

RMA-303 Spindle
Deceleration Times
(unloaded 65mm Bell Cup)
Pressure measured 12 inches
behind applicator
60 psi 6x4
100 psi 6x4
Time (sec)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Speed (krpm)
70-0
70-20
70-30
70-40
70-50
70-60

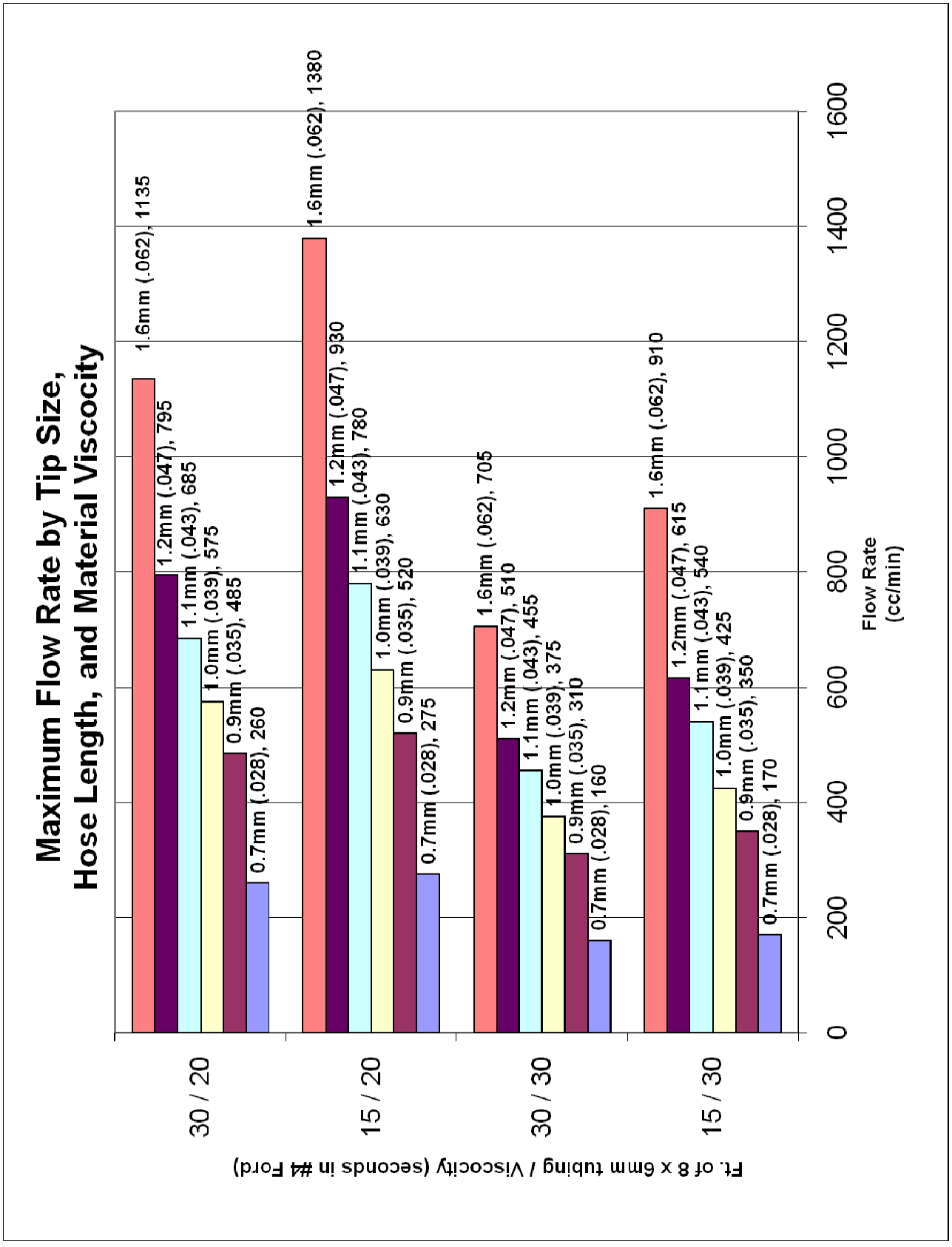

Flow vs. Pressure
Single Shape Air - Single Supply Source
A12874-01/02 SHAPING AIR KIT
Air Flow (scfm)
3.5
5.3
7.1
8.8
10.6
12.4
14.1
15.9
Air Pressure (psi)
0
10
20
30
40
50
60
Air Pressure (kPa)
0
50
100
150
200
250
300
350
400
Air Flow (slpm)
75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475
15 ft (4.6 m) of 8mm x 6 mm Tubing.
15 ft (4.6 m) of 8mm x 6mm Tubing. Pressure


Flow vs. Pressure
Mono Flex Shape Air- Single Supply Source
A12874-06/-07/-08 SHAPING AIR KIT
Air Flow (scfm)
3.5
5.3
7.1
8.8
10.6
12.4
14.1
15.9
Air Pressure (psi)
0
10
20
30
40
50
60
Air Pressure (kPa)
0
50
100
150
200
250
300
350
400
Air Flow (slpm)
75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475
15 ft (4.6 m) of 8mm x 6 mm Tubing.
15 ft (4.6 m) of 8mm x 6mm Tubing. Pressure

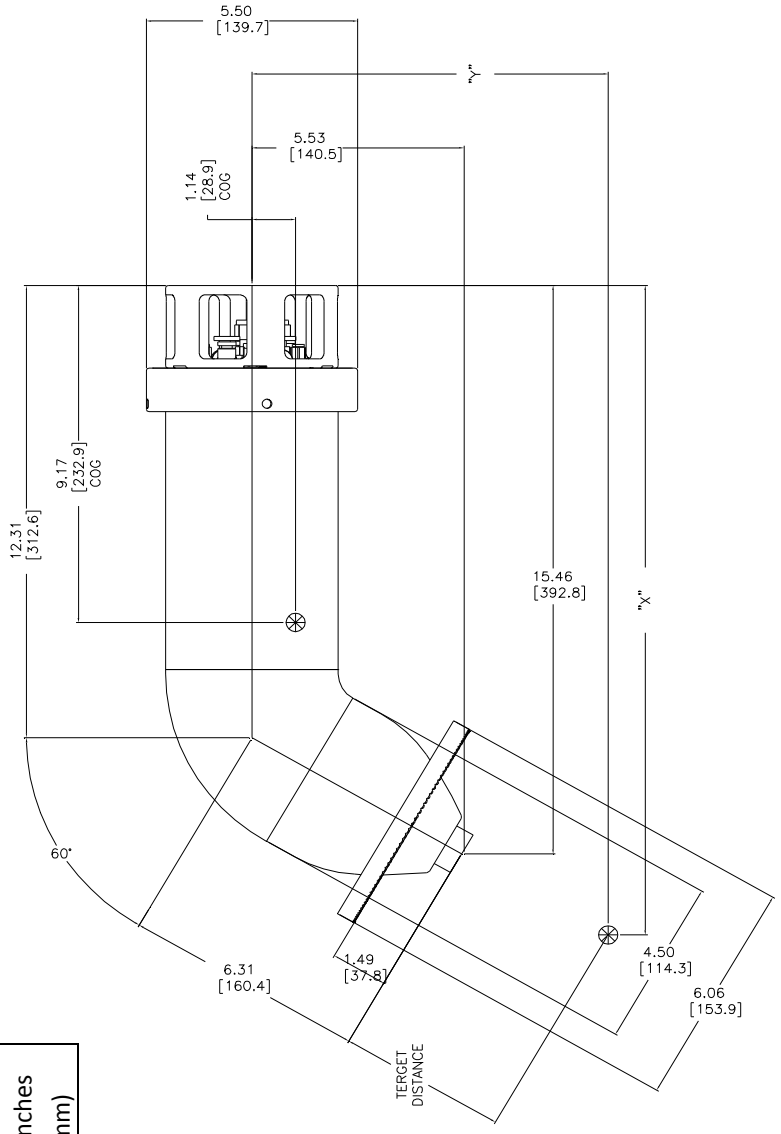

Flow vs. Pressure
Mono Flex Shape Air - Dual Supply Source
A12874-06/07/08 SHAPING AIR KIT
Air Flow (scfm)
5.3
8.8
12.4
15.9
19.
23.0
26.
Air Pressure (psi)
0
10
20
30
40
50
60
70
Air Flow (slpm)
150
200
250
300
350
400
450
500
550
600
650
700
750
Air Pressure (kPa)
0
50
100
150
200
250
300
350
400
450
(2) 15 ft (4.6 m) of 8mm x 6 mm Tubing.
(2) 15 ft (4.6 m) of 8mm x 6mm Tubing.

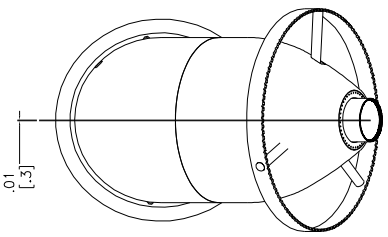

RMA-303 Dual Flex Air
A12874-08/-09/-10 Series Shape Air
Flow vs Pressure
Air Flow (scfm)
2.6 3.5 4.4 5.3 6.2 7.1 7.9 8.8 9.7 10.6 11.5 12.4 13.2 14.1 15.0 15.9 16.8 17.7 18.5 19.4 20.3 21.2
Air Flow (slpm)
75 100 125 150 175 200 225 250 275 300 325 350 375 400 425 450 475 500 525 550 575 600
Pressure (psi)
90 80 70 60 50 40 30 20 10 0
Pressure (kPa)
600 550 500 450 400 350 300 250 200 150 100 50 0
OUTER SHAPE AIR
INNER SHAPE AIR


SHAPING AIR FLOW Vs SUPPLY PRESSURE
30MM GHOST BUSTER SHROUD STYLE
A12874-03/04 SHAPING AIR KIT
(SCFM)
1.76
3.53
5.29
7.06
8.82
10.59
12.36
14.12
15.89
17.65
(kPA)
450
400
350
300
250
200
150
100
50
0
SHAPING AIR- OUTER HOLES
SHAPING AIR- INNER ANNULUS
PRESSURE (PSI)
65
60
55
50
45
40
35
30
25
20
15
10
5
0
AIR FLOW (SLPM)
50
100
150
200
250
300
350
400
450
500


Maximum Flow Rate by Tip Size,
Hose Length, and Material Viscocity
Ft. of 8 x 6mm tubing / Viscocity (seconds in #4 Ford)
30 / 20
15 / 20
30 / 30
15 / 30
0
200
400
600
800
1000
1200
1400
1600
Flow Rate
(cc/min)
1.6mm (.062), 1135
1.2mm (.047), 795
1.1mm (.043), 685
1.0mm (.039), 575
0.9mm (.035), 485
0.7mm (.028), 260
1.6mm (.062), 1380
1.2mm (.047), 930
1.1mm (.043), 780
1.0mm (.039), 630
0.9mm (.035), 520
0.7mm (.028), 275
1.6mm (.062), 705
1.2mm (.047), 510
1.1mm (.043), 455
1.0mm (.039), 375
0.9mm (.035), 310
0.7mm (.028), 160
1.6mm (.062), 910
1.2mm (.047), 615
1.1mm (.043), 540
1.0mm (.039), 425
0.9mm (.035), 350
0.7mm (.028), 170

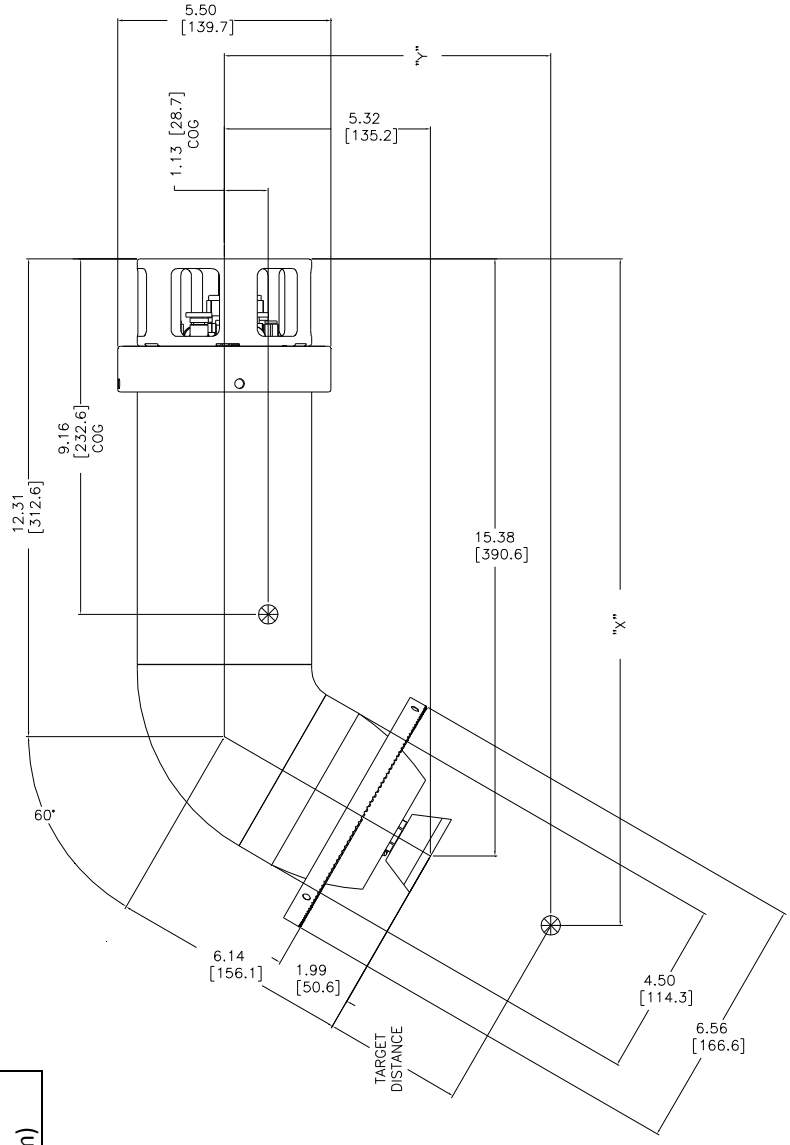
RMA-303 TOOL CENTER POINT DIMENSIONS (30mm)

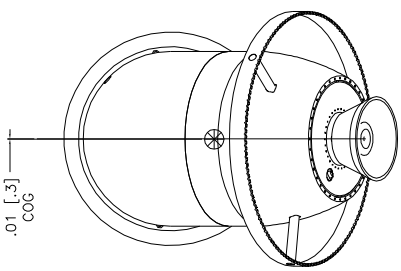




30MM RMA-303 DIRECT TOOL POINT DIMENSIONS		
TD	X	Y
4-inches (101.6mm)	17.46-Inches (443.6mm)	8.93-Inches (226.9mm)
6-Inches (152.4mm)	18.46-Inches (469.0mm)	10.66-Inches (270.9mm)
8-Inches (203.2mm)	19.46-Inches (494.4mm)	12.40-Inches (314.9mm)
10-Inches (254mm)	20.46-Inches (519.8mm)	14.13-Inches (358.9mm)
12-Inches (304.8mm)	21.46-Inches 545.2mm)	15.86-Inches (402.9mm)

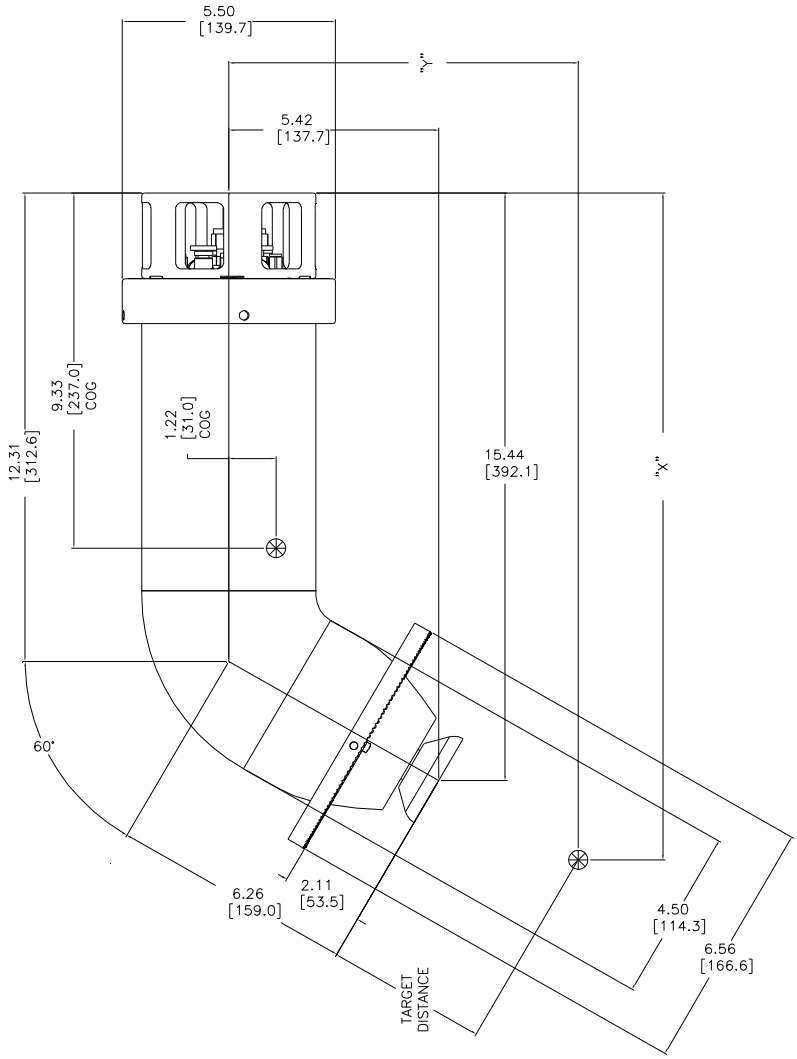
RMA-303 TOOL CENTER POINT DIMENSIONS (55mm)

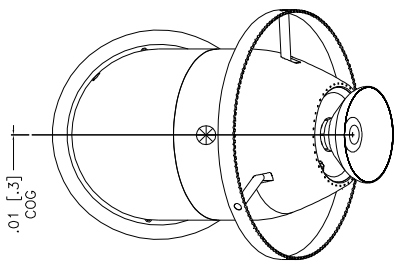




55MM RMA-303 DIRECT TOOL POINT DIMENSIONS		
TD	X	Y
4-inches (101.6mm)	17.74-Inches (450.6mm)	8.79-Inches (223.2mm)
6-Inches (152.4mm)	18.74-Inches (476.0mm)	10.52-Inches (267.2mm)
8-Inches (203.2mm)	19.74-Inches (501.4mm)	12.25-Inches (311.1mm)
10-Inches (254mm)	20.74-Inches (526.8mm)	13.98-Inches (355.1mm)
12-Inches (304.8mm)	21.74-Inches 552.2mm)	15.72-Inches (399.1mm)

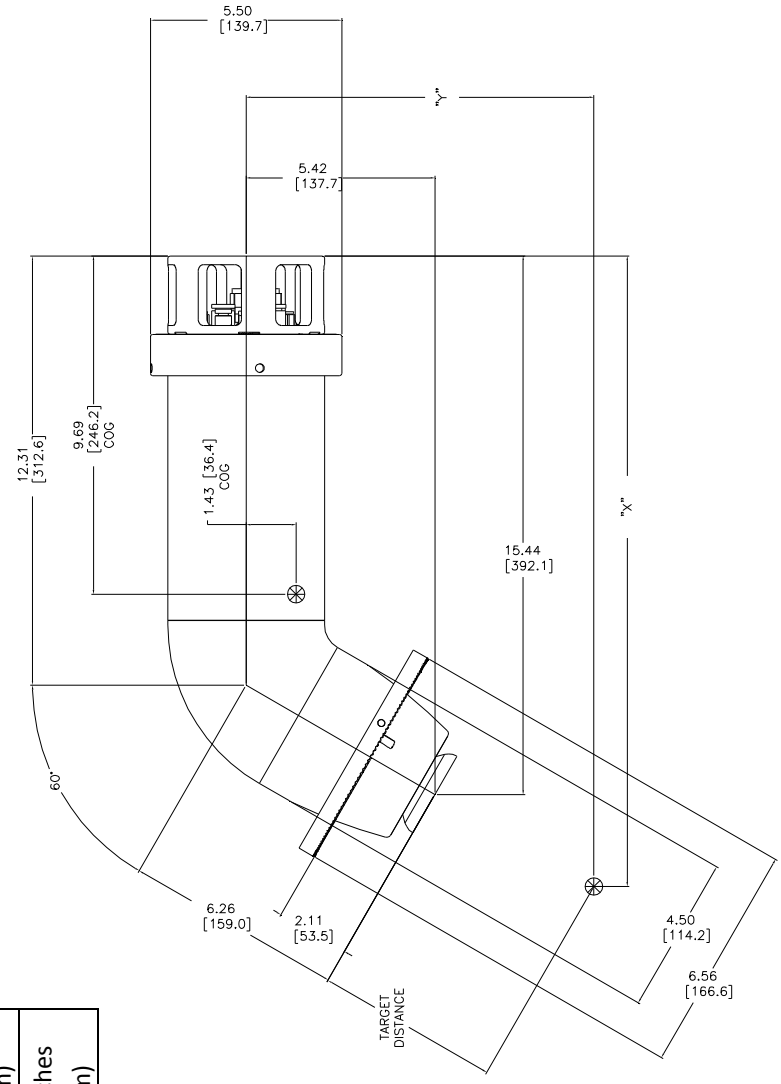
RMA-303 TOOL CENTER POINT DIMENSIONS (65mm Mono Flex)

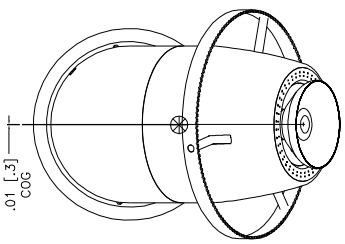




65MM RMA-303 DIRECT TOOL POINT DIMENSIONS (MONO FLEX)		
TD	X	Y
4-inches (101.6mm)	17.44-Inches (442.9mm)	8.88-Inches (225.7mm)
6-Inches (152.4mm)	18.44-Inches (468.3mm)	10.62-Inches (269.7mm)
8-Inches (203.2mm)	19.44-Inches (493.7mm)	12.35-Inches (313.6mm)
10-Inches (254mm)	20.44-Inches (519.1mm)	14.08-Inches (357.6mm)
12-Inches (304.8mm)	21.44-Inches (544.5mm)	15.81-Inches (401.6mm)

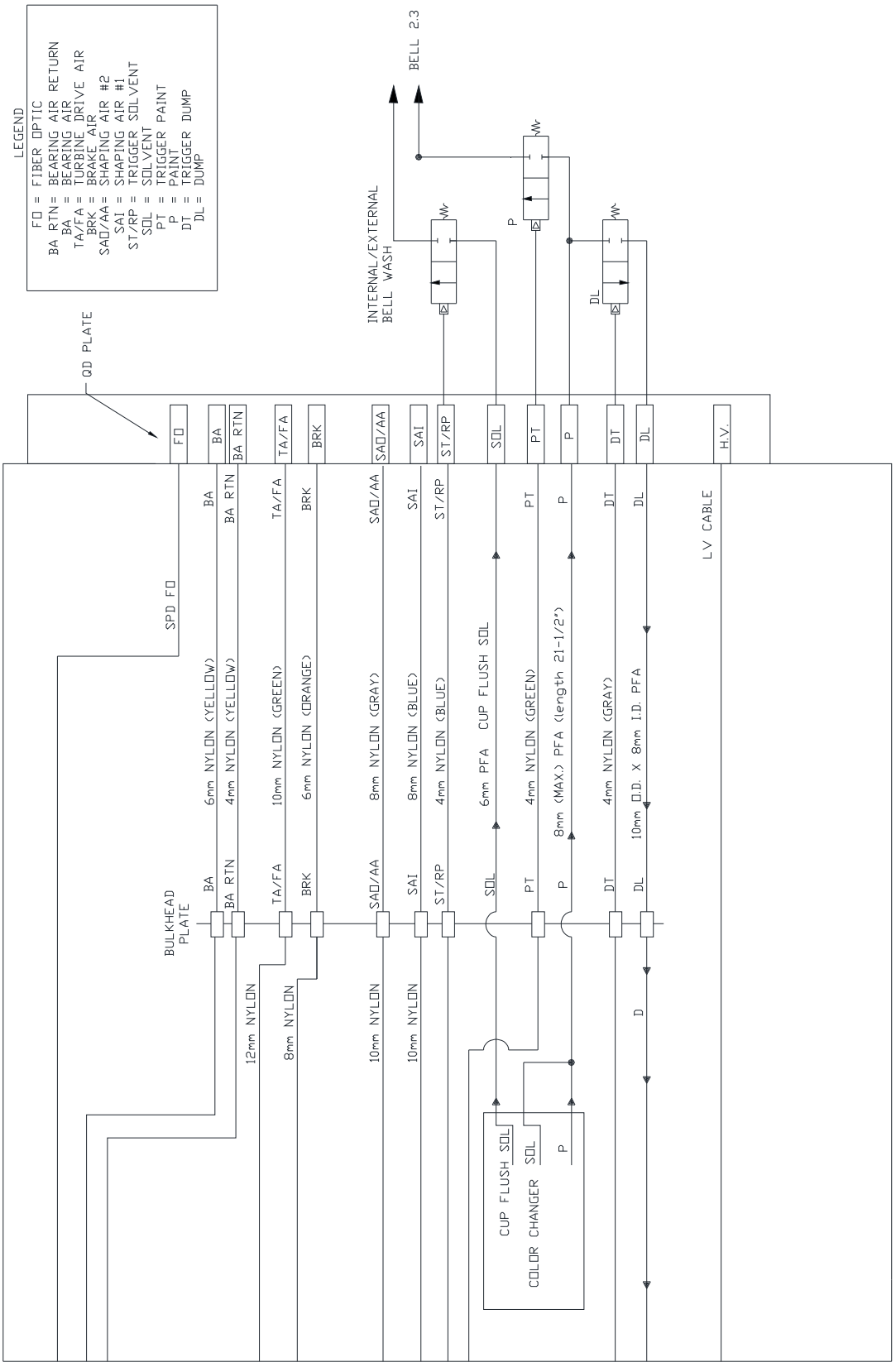
RMA-303 TOOL CENTER POINT DIMENSIONS (65mm Dual Flex)



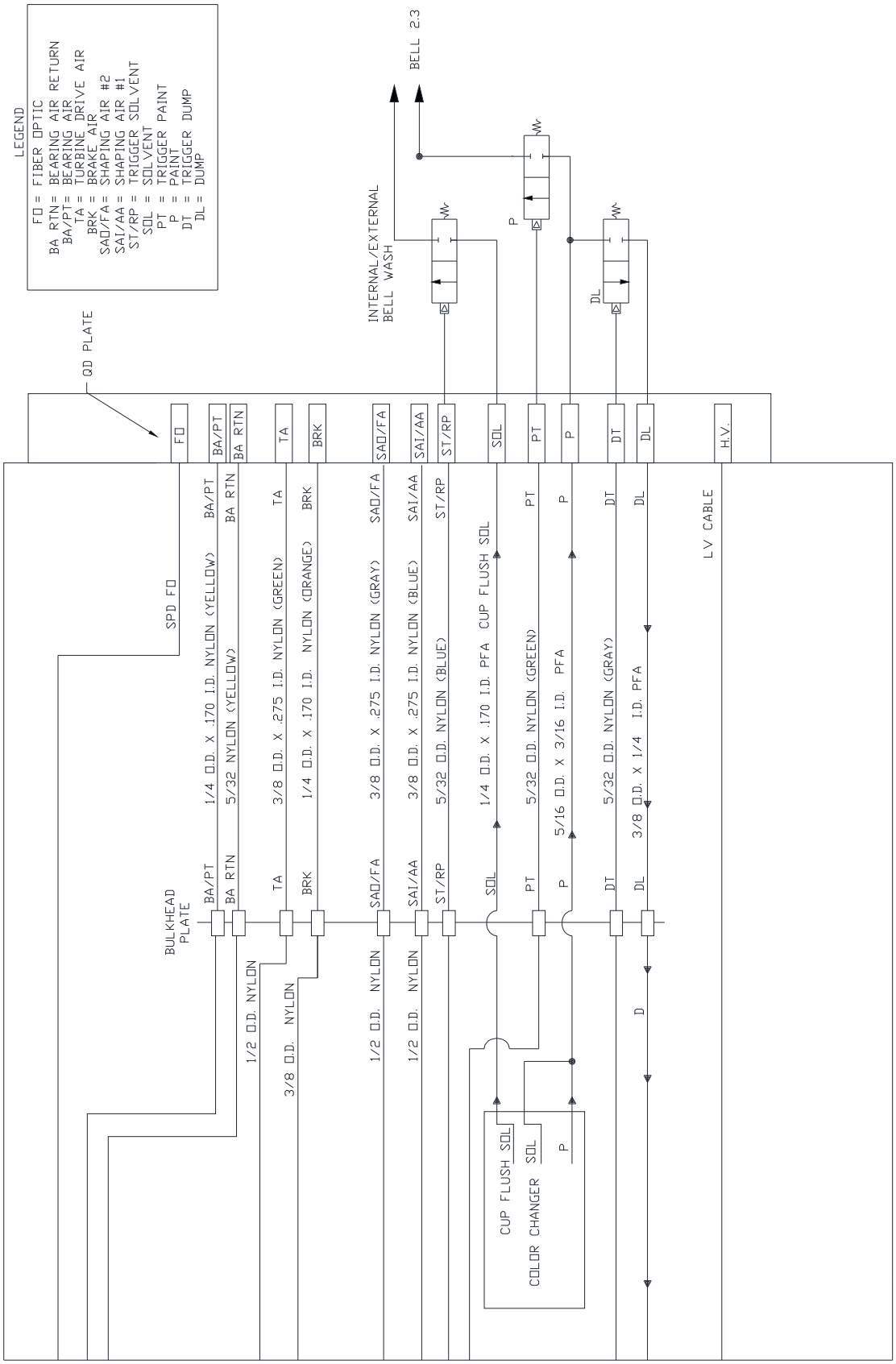


65MM RMA-303 DIRECT TOOL POINT DIMENSIONS (DUAL FLEX)		
TD	X	Y
4-inches (101.6mm)	17.44-Inches (442.9mm)	8.88-Inches (225.7mm)
6-Inches (152.4mm)	18.44-Inches (468.3mm)	10.62-Inches (269.7mm)
8-Inches (203.2mm)	19.44-Inches (493.7mm)	12.35-Inches (313.6mm)
10-Inches (254mm)	20.44-Inches (519.1mm)	14.08-Inches (357.6mm)
12-Inches (304.8mm)	21.44-Inches (544.5mm)	15.81-Inches (401.6mm)

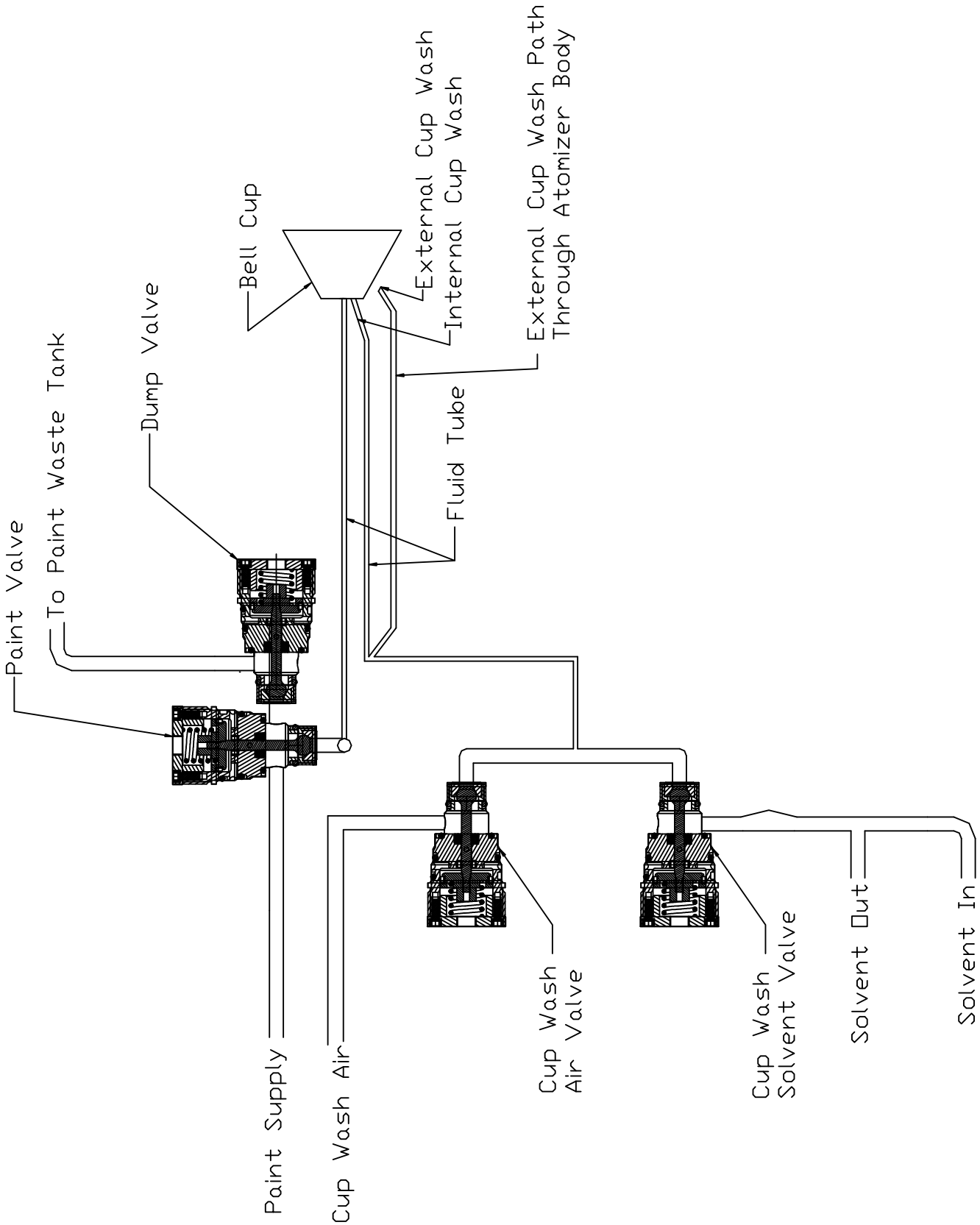
CIRCUIT SCHEMATIC (METRIC)



CIRCUIT SCHEMATIC (Fractional)



VALVE SCHEMATIC



INSTALLATION

AIR FILTER INSTALLATION

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

1. Use 25mm OD (1-Inch OD) minimum inbound main air line.
2. Use only recommended pre-filters and bearing air filters as shown in “Air filtration Requirements” chart in the ”Installation” section. 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.)
4. DO NOT use tape, pipe dope, or other thread sealant downstream of the bearing air filter. Loose flakes of tape or other sealant can break loose and plug the very fine air holes in the turbine air bearings.
5. Air heaters are highly recommended for use in the system to minimize the effect of excessively humid conditions and maintain turbine load capabilities. 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.

N O T E

Each applicator must have its own filter for bearing air. Recommended: RPM-418 or equivalent.

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

Volume Booster Recommendation (Turbine Air):

Ransburg Part # A11111-00

- Pilot Operated Regulator Non-Bleed Pilot
- SCFM-200
- Supply - 300 P.S.I.
- Temperature Range: 40˚ - 120° F

TUBE SIZE/AIR PRESSURE REQUIREMENTS			
	Metric Tube Bundle	**Fractional Tube Bundle**	**Air Pressure Requirements**
Bearing Air Supply (BA/PT)	6 X 4mm (Yellow)	1/4" OD X .170" ID (Yellow)	90 psi +/- 10 kPa) (621 +/- 69 kPa)
Bearing Air Return (BA RTN)	4mm (5/32") (Yellow)	4mm OD (5/32") (Yellow)	80 psi +/- 20 (at atomizer card (552 +/- 138 kPa)
Turbine Air (T.A.)	10 x 7mm (Natural)	3/8" OD X .275" ID (Green)	Variable
Pattern Control Air #2 (SAO/FA)	8 X 6mm (Gray)	3/8" OD X .275 ID (Gray)	Variable
Pattern Control Air #1 (SAI/AA)	8 X 6mm (Blue)	3/8" OD X .275 ID (Blue)	Variable
Brake Air (BRK) (if used)	6 X 4mm (Orange)	1/4" OD X .170" ID (Orange)	60-100 psi (414-689 kPa)
Paint Valve Control (PT)	4mm OD (5/32") (Natural)	4mm OD (5/32") (Green)	80 psi +/- 10 (552 +/- 70 kPa)
Dump Valve Control (DT)	4mm OD (5/32") (Silver)	4mm OD (5/32") (Silver)	80 psi +/- 10 (352 +/- 70 kPa)
Cup Wash Solvent Valve Control (ST/RP)	4mm OD (5/32") (Blue)	4mm OD (5/32") (Blue)	80-100 psi (552-873 kPa)

EQUIPMENT GROUNDING / SAFETY RECOMMENDATIONS

In electrostatic coating systems, the flow of high voltage power from the power supply to the atomizer is insulated from ground and isolated from all other functions equipment. When the voltage reaches the atomizer, it is transferred to the coating material where, by introducing a negative charge, it causes the atomized fluid to seek the nearest positive ground. In a properly constructed and operated system, that ground will be the target object.

The directed conduction of the electric charge, through its array of wires, cables, and equipment, is accompanied by a variety of stray electrical charges passing through the air by various means such as: air ionization, charged particles in the air and radiated energy. Such charges may be attracted to any conductive material in the spray area. If the conductive material does not provide a safe drain to electrical ground, which will allow the charge to dissipate as fast as it accumulates, it may store the charge. When its electrical storage limit is reached, or when it is breached by external circumstances (such as the approach of a grounded object or person, or one at lower potential), it may discharge its stored charge to the nearest ground. If there is no safe path to ground (such as a ground wire or braided cable) it may discharge through the air as a spark. A spark may ignite the flammable atmosphere of a spray area. The hazard area extend from the point of origin up to as much as a twenty-foot radius. (See the NFPA-33 for definition and limitations of a hazard area.)

It is a simple, but vital matter to be sure that all conductive objects within the spray area are grounded. All cabinets, housing, bases, supports, and stands, which are not by design, insulated from ground, be connected directly and **INDIVIDUALLY** to earth ground. ***Resting on a concrete floor or being attached to a building column may not always be sufficient ground.***

In order to provide the best ground connection possible, always attach a ground wire or insulated braided cable t the terminal indicated by the ground symbol and then to a proven ground. Always check ground connections for integrity. Some items, such as rotators and paint stands, may be supported on an insulator, but all components of the system up to the insulator **MUS**T be grounded.

NOTE - Ransburg recommends that ground connections to earth ground be 3/4” insulated copper braided wire. Grounds between assemblies within a machine should be ran to a central point within the machine using #18 insulated stranded copper wire minimum. All connections should be mechanically sound and have less than 5 ohms of resistance between assemblies and the common point. The resistance between the central point and earth ground should be less than 5 ohms as well.

Where items are mounted directly on structural components such as building columns, the ground connection MUST still be made. In many cases the structural component may be painted or coated with an insulated material and in all cases, the equipment will provide the necessary connection at one end, but the user must be sure that the other end is secured to an earth ground. This may be achieved by the use of a standard ground

clamp (properly secured), by brazing or by piercing the structural component enough to assure connection. All ground connections should be made to the most conductive metallic structural ground available.

To be sure that everything is properly grounded, the following steps should be undertaken at least daily:

1. Inspect all ground wires. Look for good, firm joints at all points of connection. Look for breaks in the ground wire. Repair all defects IMMEDIATELY!
2. Inspect the floor or grates for excessive accumulation of dried coating material or other residue. If there is any, remove it!

SAFE GROUNDING IS A MATTER OF PROPER EQUIPMENT MAINTENANCE AND INSTALLATION, CORRECT OPERATION AND GOOD HOUSEKEEPING. Daily inspection of grounding apparatus and conditions, however, will help prevent hazards that are cause by normal operations.

BE SURE THAT:

1. All objects in the spray area are grounded.
2. Personnel in the spray area are properly grounded. (Conductive safety shoes and coveralls.)
3. That the target object is properly grounded (less than 1 megohm resistance).
4. That the high voltage is off except during normal application.
5. That the high voltage is off and applicators are grounded during maintenance operations.
6. The spray area is kept free of accumulated coating deposits.
7. All combustible liquids in the spray area (outside of automatic delivery systems) are kept to minimum and are kept in fire safe, grounded containers. (See NFPA-30 and chapter 6 of NFPA-33.)
8. Proper ventilation is provided.
9. Personnel must thoroughly understand the equipment, its operation and maintenance, and all safety precautions.

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 car occur across the shaping air exit ports. This cooling affect 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.

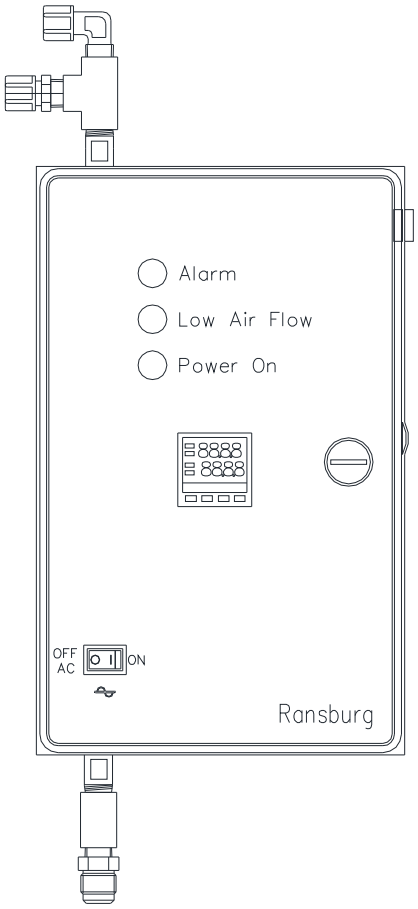
The actual air heater process setting depends on applicator fluid flow rate load, booth conditions, turbine airflow settings, and incoming air temperature. The heater should be set as low as possible, sufficient to maintain the applicator surface temperatures above the dew point in the booth.

Example: With the incoming air temperature at 72°F (22.2°C), and 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, ∆~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 Ransburg air heater assembly (A11065-05) 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.

NOTE - Connect air heater to turbine air tubing.



A11065-05 Air Heater

AIR FILTRATION REQUIREMENTS		
Ransburg Filter Model No.	**Description / Specifications**	**Replacement Element Part No.**
HAF-503	Pre-filter, removes coarse amounts of oil, moisture and dirt. Used upstream of HAF-508 pre-filter (used in systems with poor air quality.	HAF-15 Element One
HAF-508	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 HAF-508 can be used with up to three RMA-303 assemblies).	HAF-38 Elements, Carton of 4
RPM-418	Bearing air filter, coalescing type,19 SCFM, 99.995% efficiency particulate removal .3 to .6 micron, max. RMA-303 passed .6 micron max. solid passed .2 micron (one per RMA-303)	RPM-33 Elements, Carton of 8

! 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 turbine failure. The correct type filters musts be used in an RMA-303 system. The filter elements must be replaced regular schedule to assure clean air.
- It is the user's responsibility to ensure clean air at all times. Turbine failure resulting form contaminated air will not be covered under warranty. If other filters are incorporated in the system, the filters to be used must have filtering capacities equal or better than those shown in "Air Filtration Requirements Charts."
- 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.

NOTE

- Each applicator must have its own filter for bearing air. Recommended: RPM-418 or equivalent.

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 pre-assembled 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.

Maximum amount of splices for any length of cable is 3, including the robot plate and transceiver card. The speed detection signal may be affected if splices are exceeded. Length in any combination for the fiber optic is 100-feet.

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 tubing. Fluid tubing requirements are shown in "Fluid Tubing Connection Requirements" below.

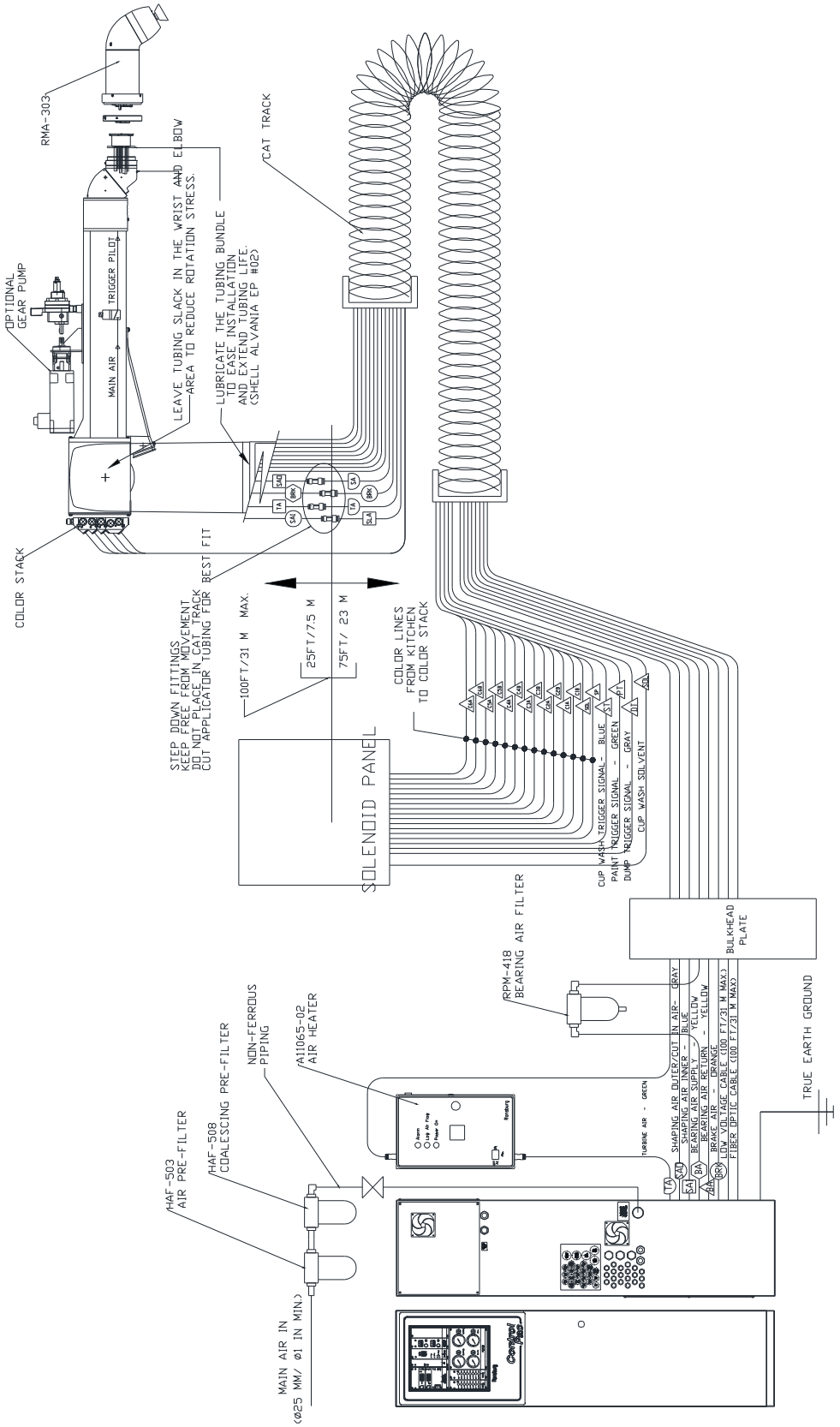
TYPICAL INSTALLATION

The "Typical Installation of RMA-303" figure in the "Installation" section shows a typical installation of the RMA-303 and the wiring installation of the applicator with the MicroPak.

FLUID TUBING CONNECTION REQUIREMENTS

	Fixed Atomizer	Pressure (Maximum)
Paint Line (P)	8mm OD X 5mm ID 3/8" OD X 1/4" ID, PFA	200 psi max. (1379 kPa)
Cup Wash Solvent Line (SOL)	6mm OD X 4mm ID 1/4" OD X .170" ID, PFA	150 psi max. (1033 kPa)
Dump Line (DL)	10mm OD X 7mm ID Nylon 3/8" OD X 1/4" ID, PFA	200 psi max. (1379 kPa)

TYPICAL INSTALLATION OF RMA-303



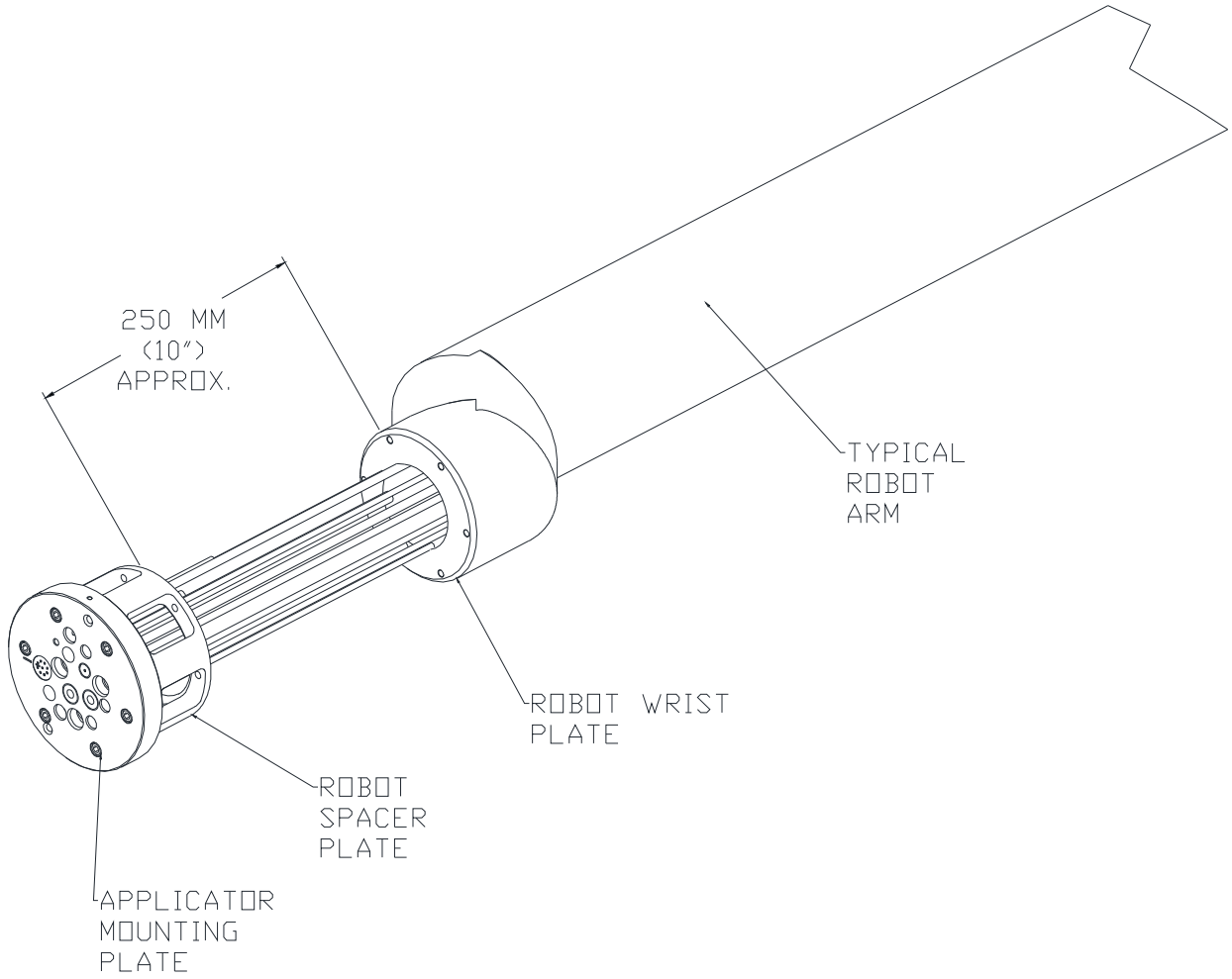
TUBING BUNDLE INSTALLATION

Typically, the tubing bundle is pulled through the robot arm from the robot wrist side. Keep the bundle taped except for the bundle that will be inside the arm. Pull the tubing through the wrist and arm, leaving about 250mm (10-inch) of tubing sticking out the front of the wrist plate. (See “Tubing Bundle Installation” figure in the “Installation” section.)

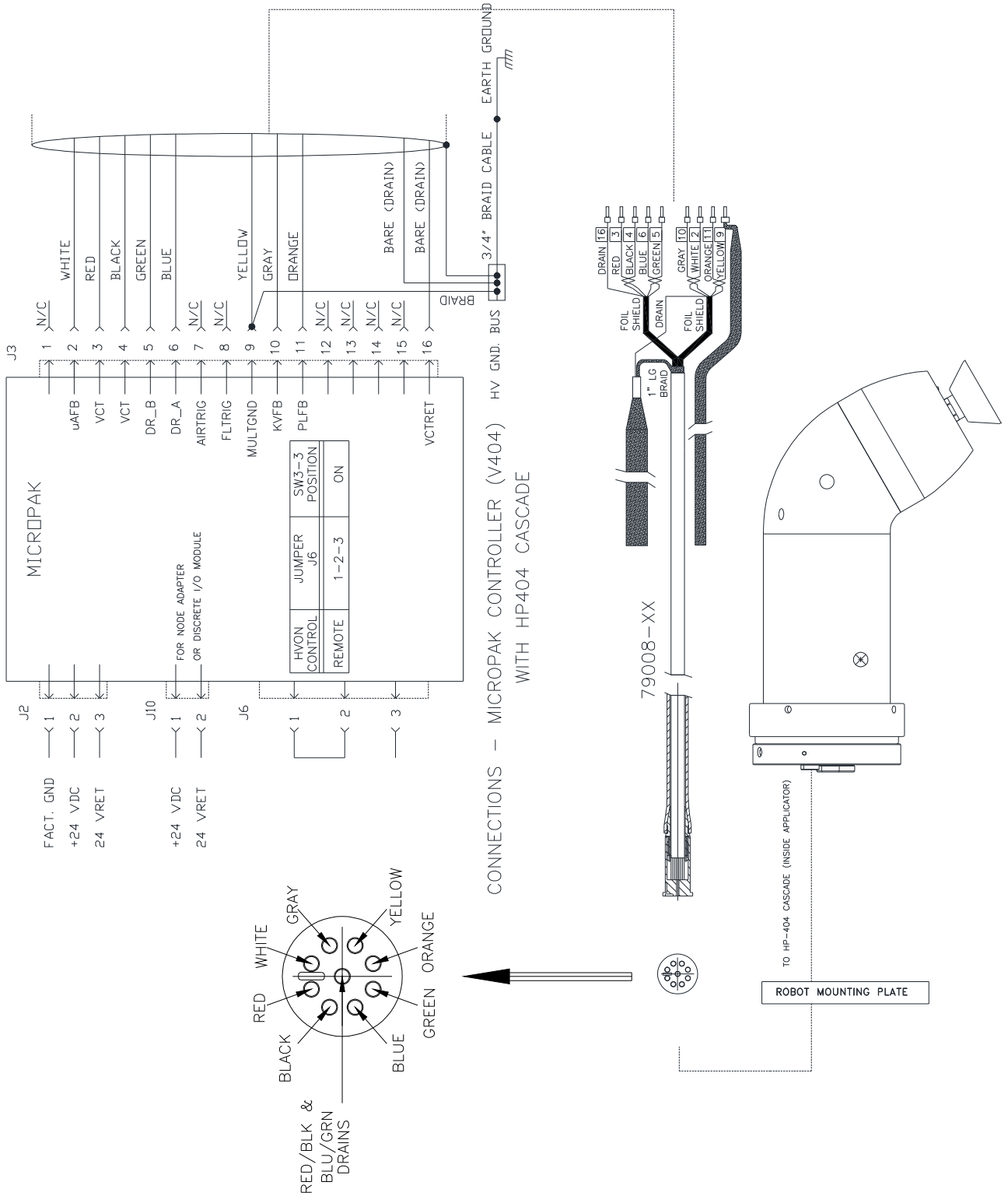
Fasten the cable bundle at the exit of the arm. Push the robot spacer plate and applicator mounting plate to the robot wrist plate aligning the top dead center marks of the spacer plate and robot wrist plate. Fasten using appropriate screws. Install the tubing bundle in this fashion will increase tubing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

BUNDLE LUBRICANT

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, ensure it is silicone free, resists heat breakdown, and is compatible with the materials it will contact. It is recommended that tubing bundles be re-greased every six months maximum.



RMA-303 WIRING INSTALLATION



INTERLOCKS

The following system interlocks are required to prevent equipment damage.

- Bearing air should remain on at all times and should be shut-off by turning off the main air to the pneumatic control cabinet.
- It should not be possible for the coating material to be sprayed unless the turbine is spinning.
- Two inter-connected 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" service manual.)
- High voltage must be interlocked with the solvent valve pilot signal to prevent solvent flow while high voltage is energized (direct charge only).
- 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" service manual.)
- Any other interlocks required by local national code or international code. The following system interlocks are required to prevent equipment damage:

! 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.

! WARNING

- The high voltage and/or coating material must never be turned on unless the bell cup is mounted on the motor shaft and the turbine is rotating.
- Pneumatic input to the turbine air inlet must be controlled to prevent the turbine from exceeding the maximum rated speed of 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 (direct charge only).
- Never Spray solvent with high voltage on.

N O T E S

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 control
- Turbine speed
- Bearing air adjustment
- Shaping 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 the 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 - 1.6mm (.027-inch - .062-inch).. The viscosity and volume of the coating material being sprayed determine the correct size of feed tube tip for each installation. (Reference “Fluid Tip Flow Rate” chart in the “Introduction” section.)

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.

(See “Circuit Diagram” 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 (482.6 kPa) 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 30,000 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 bell cup. This provides cleaning of the inside of the bell cup. The outside of the cup is simultaneously cleaned by a nozzle mounted on the shaping air ring and shroud. 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.

To color change the applicator, a solvent air chop must be provided through the main paint line (see ”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, high 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. (See “Speed and Pressure” charts in the “Introduction” section.)

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.

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).

W A R N I N G

•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 Ransburg warranty.

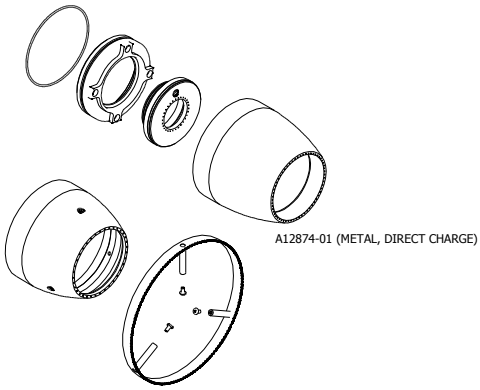
SHAPING AIR KIT #1

A12874-01/02 Shaping Air Kits for 55mm Bell Cups (A11730-00/01 and A11783-00) (Pattern Control Air) Shaping air is used to control the shape and size of the spray pattern. Lower pressure yields larger patterns, high shaping air pressure creates a smaller pattern. Higher shaping air may assist with penetrations of atomized particles into cavity areas. The amount of shaping air should be optimized for the specific applications. 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.

Connection is made using the “blue” 8mm tube labeled “SAI” on the tubing bundle. The other 8mm tube is labeled “SAO” and is “gray” in color and must be plugged. However, if additional air is required, this tube can be connected to a secondary controlled air source. Precautions must be taken that one does not have a significantly higher pressure than the other to avoid back flow. This shaping air combination can be used with either the aluminum 55mm bell cup or the 55mm Titanium bell cup. “Air Flow” information can be found in the “Introduction” section of this manual.

N O T E

NOTE - A minimum of 70 slpm (2.6 SCFM) should always be kept flowing in the shaping air passage to keep the face of the applicator clean during manual cleaning breaks.



A12874-01 (METAL, DIRECT CHARGE)

A12074-02 (METAL, DIRECT CHARGE WITH RING)

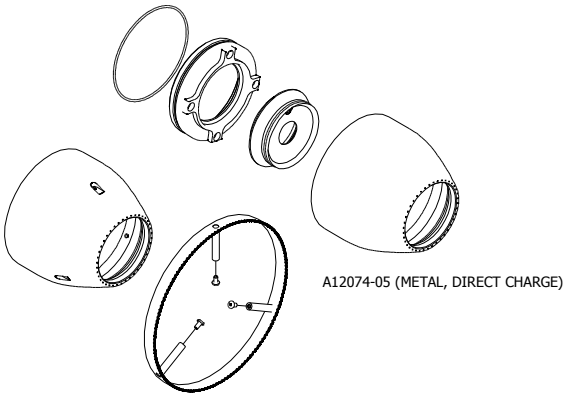
SHAPING AIR KIT #2

A12874-06/06 Shaping Air Kits (Mono Flex Air - Direct Charge - for Use with All 65mm Bell Cups Only)

As the name implies,. Both shaping air outlets supply air that is counter to the rotation of the bell cup. This combination will provide a pattern size from 10-inch to 24-inch (250mm - 610mm) depending on air flow, fluid flow, and cup rotation speed. Connection is made using the “blue” 8mm tube labeled “SAI” on the tubing bundle. The other 8mm tube labeled “SAO” is “gray” in color and must be plugged. However, if additional air is required, this tube can be connected to a secondary controlled air source. Precautions must be taken that one does not have a significantly higher pressure than the other to avoid any back flow. This shaping air combination can be used with any 65mm bell cup. (See “Pressure and Flow Data Charts” in the “Introduction” section.)

N O T E

NOTE - A minimum of 70 slpm (2.6SCFM) should always be kept flowing in the inner shaping air passage to keep the face of the applicator clean during manual cleaning breaks.



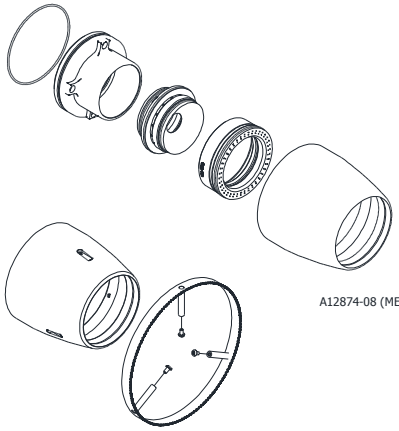
A12074-05 (METAL, DIRECT CHARGE)

A12874-06 (METAL, DIRECT CHARGE WITH RING)

SHAPING AIR KIT #3

A12874-08/09 Dual Flex Shaping Air Kits for 65mm Bell Cups

As the name implies, both shaping air outlets supply air that is counter to the rotation of the bell cup. This combination will provide a pattern size from 3-inch to 10-inch (76mm - 254mm) depending on bell rotation speed, fluid flow, and air flow. Both sets of shaping air holes are independently controlled. The inner set of holes are supplied by connecting the “blue” tube labeled “SAI” on the tubing bundle to a regulated air source. The outer set of shaping air holes are supplied by connecting the “gray” tube labeled “SAO” on the tubing bundle to a regulated source. The air supplies work in combination with each other to provide desired results. This combination of shaping air can be used with any 65mm bell cup.



A12874-08 (METAL, DIRECT CHARGE)

A12874-09 (METAL, DIRECT CHARGE WITH RING)

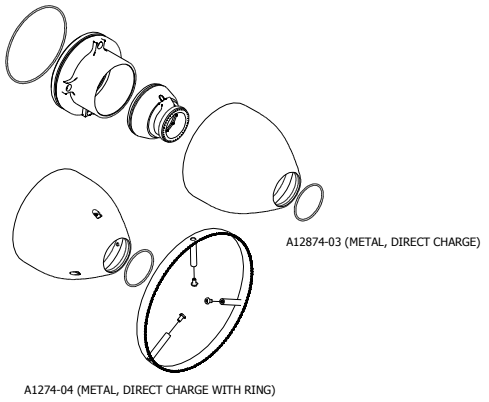
SHAPING AIR KIT #4

A12874-03/04 Shaping Air Kits (Dual Air 30mm Bell Cups)

This combination provides for two air sources to gain better pattern control, eliminates a secondary “ghost” pattern, and the ability to penetrate into deep cavities. The first air is connected to the “blue” tubes labeled “SAI” on the tubing bundle. This air exits through an annulus between the outside diameter of the ball cup and the inside diameter of the shaping air manifold. The second air is connected to the tube labeled “SAI” and is “gray” in color. This air exits a concentric series of holes at the front of the atomizer. This shaping air combination can be used with either the aluminum 30mm bell cup or the Titanium 30mm bell cup. “Air Flow” information can be found in the “Introduction” section of this manual.

N O T E

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 during manual cleaning breaks.

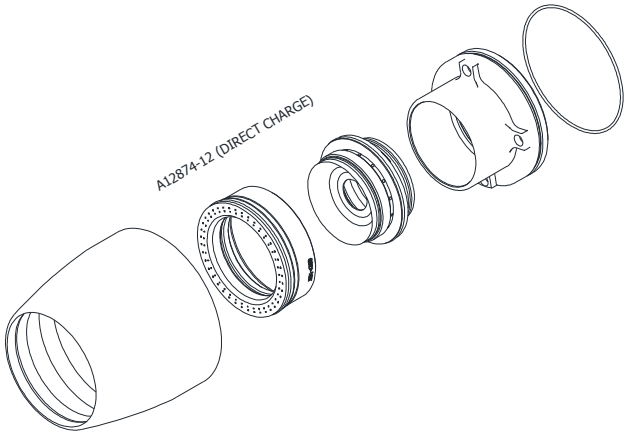


A1274-04 (METAL, DIRECT CHARGE WITH RING)

SHAPING AIR KIT #5

A12874-12 Dual Flex Shaping Air Kit for 55mm Bell Cups

As the name implies, both shaping air outlets supply air that is counter to the rotation of the bell cup. Both sets of shaping air holes are independently controlled. The inner set of holes are supplied by connecting the “blue” tube labeled “SAI” on the tubing bundle to a regulated air source. The outer set of shaping air holes are supplied by connecting the “gray” tube labeled “SAO” on the tubing bundle to a regulated source. The air supplies work in combination with each other to provide desired results. This combination of shaping air can be used with any 65mm bell cup.



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.

Approximate brake times to reduce the turbine speed are shown in “Deceleration Time Chart” in the “Introduction” section. These times are based on 60 psi (413.7 kPa) and 100 psi (689 kPa) air pressure at the back of applicator.

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” manual for detailed for operating instructions.)

N O T E

If paint defects occur, such as fatty edges or picture framing, reducing the voltage should be a last resort. To correct the problem, 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 to 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 10kV.

GENERAL OPERATING SEQUENCE

! WARNING

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

Normally, for 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. Set 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 ensure 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.

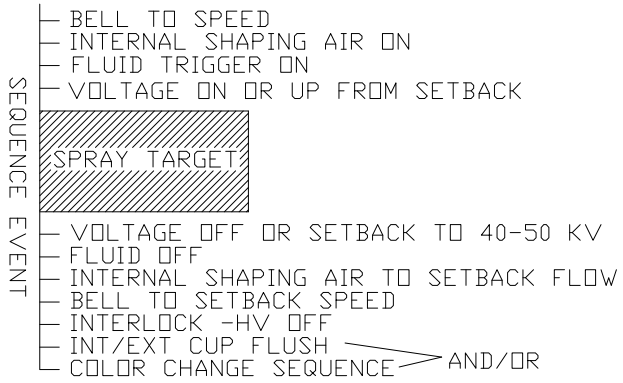
The RMA-303 is versatile in processing the finish of a component. It can be setup as shown in “Typical Paint Sequence” figure.

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

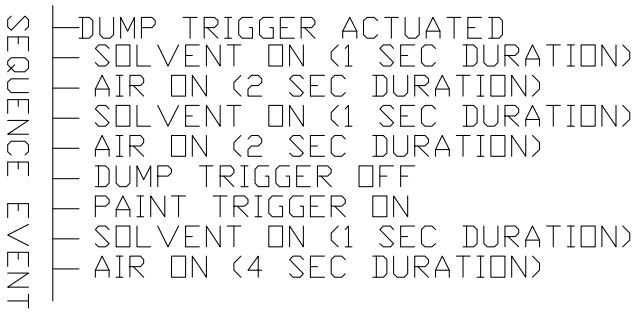
1. Turbine speed set to 25,000-30,000 rpm.
2. Increase shaping air to 350-450 slpm (12.4-15.9 SCFM).
3. Paint atomizer at booth grate or insert into bell cleaning station.
4. Maintain solvent pressure of 100-150 (689 -1,034 kPa). Maintain air push pressure at 80-100 psi (552-689 kPa).

5. Use an alternating trigger sequence of solvent/air to create a chopping effect. Always ensure 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.

Typical Paint Sequence



Typical Color Change 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. **Shaping Air** - Set to 350-400 SCFM while performing a cup flush.
3. **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 30 kV and 50 kV.
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 Off/Setback Voltage** - Immediately precedes the trigger off. Using a setback voltage shortens the cascade voltage ramp up time.
6. **Fluid Trigger Off** - This should occur when the target is typically 0-6-inches (0-152.4mm) past the applicator centerline.
7. **Shaping Air to Setback** - The setback flow of air should never be below 70 slpm (2.6 SCFM) for the shape air.
8. **Color Change Sequence** - Used when color is changed one to the other. Typical sequence is shown in “Typical Color Change Sequence” figure in the “Operation” section. **(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.

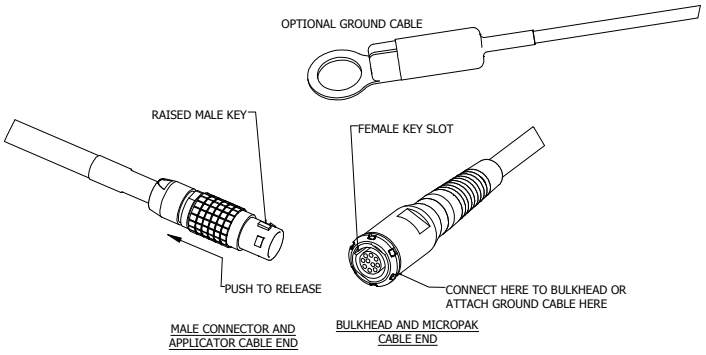
LOW VOLTAGE CABLE INSTALLATION AND REMOVAL (See "Quick Disconnect Cables" and "Low Voltage Cable On Robot" figures)

A low voltage cable is provided to send power to the high voltage cascade in the atomizer as well as sending important information during operation back to the MicroPak controls. One piece of the cable is a permanent length of approximately 60-inches (1.5 meters) from the robot plate end. The connecting Cable can be ordered in various lengths depending on the distance required to reach from the robot arm to the MicroPak controller. The ends of the cables have a male and female quick disconnect end. This provides for a quick and easy removal of the cable at the robot plate if servicing or replacement is required.

It is important the quick disconnect fitting be secured to a good ground source. The A12241-XX cable is supplied with a ground cable which can be secured to the bulkhead connector and the other end to a known ground source. The cable can also be grounded by attaching the bulkhead connector to a grounded bulkhead plate. The bulkhead plate can be nor more than 1/8-inch (3.18mm) in thickness. The bracket should be made as in "Low Voltage Cable On Robot" figure to hold the connector from turning. To mate the connectors, align the raised key section of the cable on the applicator end with the key groove of the cable that goes to the MicroPak. Push the male end into the mating connector until an audible click is heard. Tug on cable to ensure that it is locked in place. To remove this section from the robot plate, remove the applicator. Locate the set screw holding the flanged plastic 9 pin connector. Loosen with a 3/32" hex key wrench. Pull the cable out from the robot plate end. Install new cable In reverse direction, align the 9 pin connector with the alignment mark on the robot plate face and tighten set screw. Torque 5-10 lbs•in (0.56-1.13 Nm).

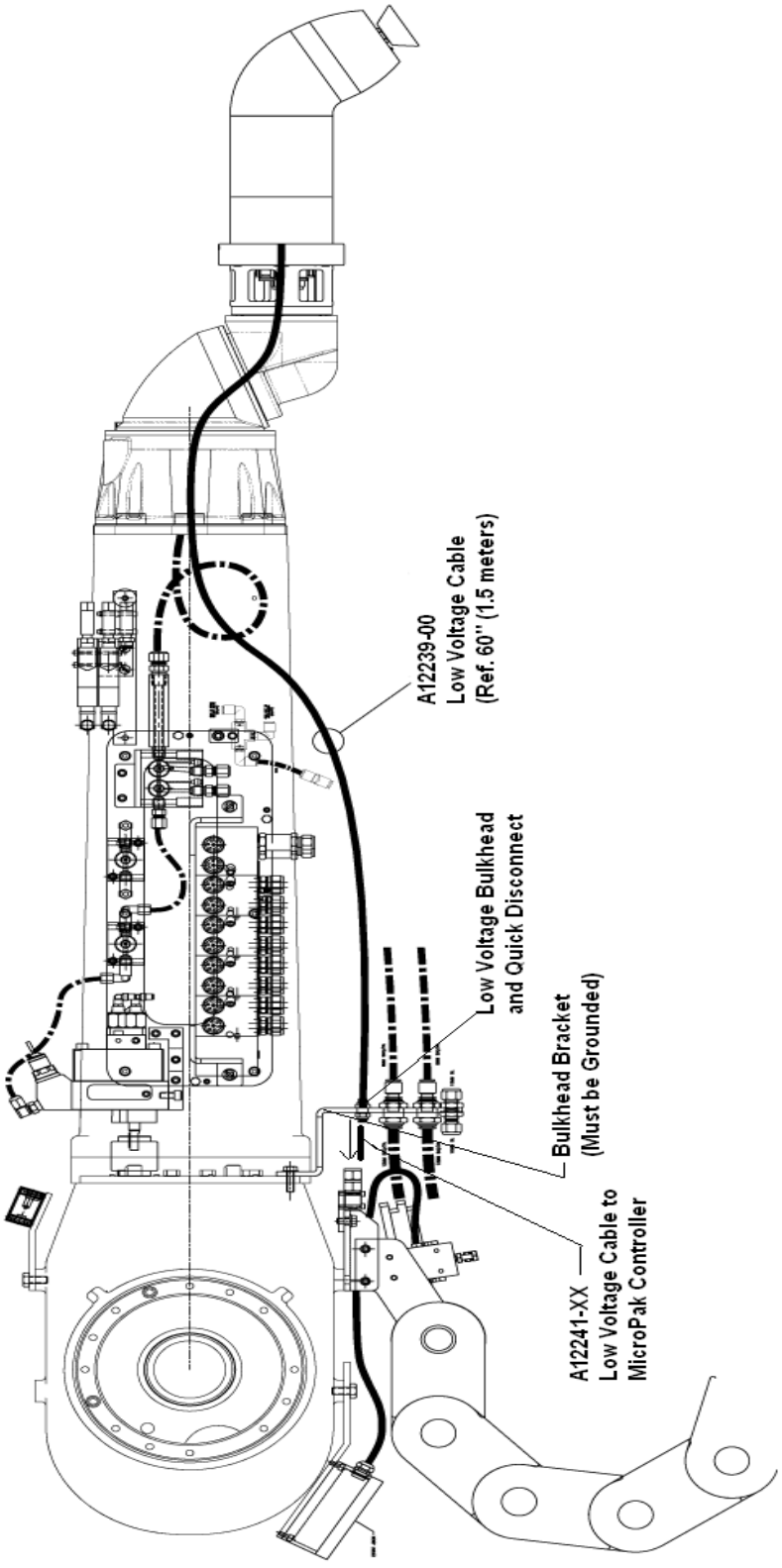
WARNING

•Cable connector shell must be electrically grounded. Electrical noise or other interference may result.



Quick-Disconnect Cables

LOW VOLTAGE CABLE ON ROBOT



N O T E S

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 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.

A suitable lubricant is food grade petroleum jell or A11545-00 Petrolatum Jell.

CLEANING PROCEDURES

⚠ WARNING

•Electrical shock and fire hazards can exist during maintenance. MicroPak 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.

•Ensure high voltage is off during any manual 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, open the dump valve and flush the incoming paint line with solvent or an air/solvent chop. Make sure the last step of the sequence is air to purge the dump line of remaining solvent. To speed the loading of the new paint, leave the dump line open to allow the air in front of the paint push to escape. The length of time the dump valve is open de-

pends on several factors such as viscosity, paint pressure, etc. Timing should be such that the dump is closed as the paint reaches the trigger valve in the atomizer. Paint in the dump line may cause high voltage issues.

The fluid coil and fluid tube can be cleaned independently by actuating the solvent valve in the atomizer. **High voltage must be turned off during this operation and the bell cup must be spinning (typically 30,000 rpm for cup flushing sequences).**

Bell Cup Cleaning (Cup Wash) Without Cleaning the Incoming Paint Line

Turn off the high voltage and trigger valve. With the bell spinning at 30,000 rpm, turn on the external solvent valve to allow cleaning solvent to flow through the manifold passages, through the fluid tube, and onto the bell. The spinning bell will atomize the solvent, clean out the bell passages both internally and externally. It is always required to blow the solvent line dry after the cleaning operation. Typical bell speed during the cup flush sequence is 30,000 rpm. Follow sequence as outlined for cup wash in “General Operating Sequence” in the “Operation” section.

CAUTION

•The maximum flow rate of 700 cc/min. must not be exceeded during a flush routine. Use of an in-line fluid restrictor is recommended.

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 (if applicable) 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 applicator 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.
- For best operating conditions, the atomizer surfaces must be dry.
- 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. Ensure 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 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 Ransburg for 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” (AER0075-02) is included with the assembly in the 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 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 bell cup tightness. Tighten to 50-70 lbs•in (5.65-7.91 Nm) torque.
9. Check the amount of paint build-up on the outer protective cloth covers, if used. If excessive, replace covers as required. If cloths are wet, find source and replace with dry cloth covers.

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.

•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 below 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.

•Do Not place high voltage test probe on bell edge unless rotation is fully stopped.

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

N O T E

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 belts 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).
- Paint residue found in the shaping air holes is not acceptable and must be removed prior to applicator use (see “Cleaning Shaping Air Holes” in the “Maintenance” section).
- Clean any paint on outer surface of front and rear housing with a 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 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.
- 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.

N O T E

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

- 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, replace cover on the outer housing. (Refer to “Disassembly Procedures” in the “Maintenance” section for definite instructions.)
- Recheck bell cup tightness. Torque to 50-70 lbs•in (5.65-7.91 Nm).

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 the Warranty. The **“DO NOT”** bullets (see “Operator/ Maintenance Warnings” in the “Maintenance” section) 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 Replacement

Bell cup wear is dependent on many factors such as bell speed, flow rate, and type of coating being applied.

The bell cups shown in the photos indicates if a bell cup has some useable life or should be replaced. Photo 1 shows a bell cup that has some useable life. The grooves worn around the splash plate pins are shallow. The general appearance of the cup surface is smooth and uninterrupted. Photo 2 shows a bell cup that needs to be replaced, as well as the splash plate that was installed into the cup. The grooves are deep, a visible groove exists at the outer edge diameter of the splash plate and there are noticeable lateral grooves extending towards the outer edge of the cup.

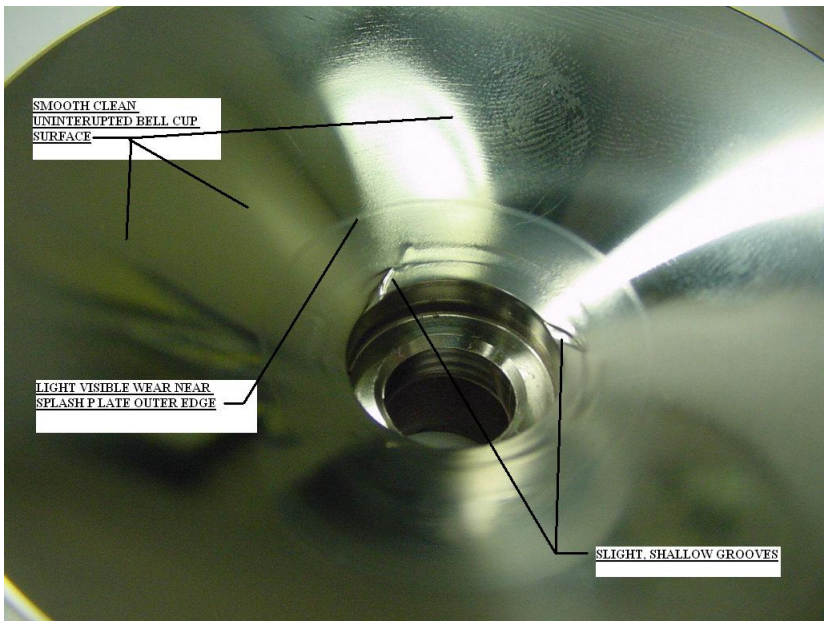


Photo 1

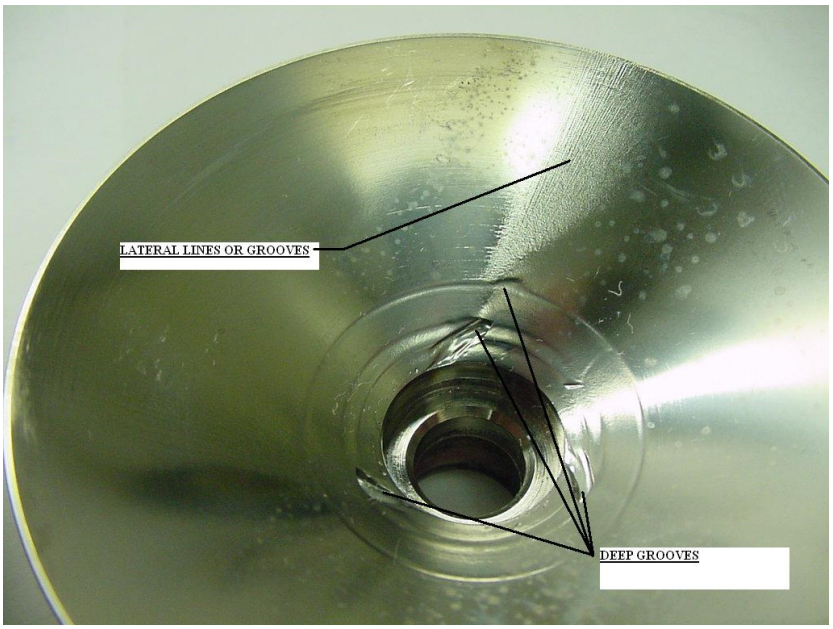


Photo 2

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 should 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 in 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 cup should be removed for hand cleaning. The bell's leading edge, splash plate, serration cuts, and rear of cup are some examples of areas for special attention.

Bell Cup Soaking

3. Bell cups and splash plates can be soaked in a heated solution for up to 2 hours in an ultrasonic cleaner (120°F. 49°C maximum). Bell cups alone may be soaked for an extended amount of time.

Manual Inspection

4. Visually inspect the bell cup edge for signs of abrasion. If the edge is excessively worn or badly chipped as the result of a collision with a part, replace the cup immediately
5. 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 assembly.
6. Check the center holes of the splash plate for wear. 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.
7. Splash plate assemblies may be soaked for a short time, under 2 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.
8. 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.
9. 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.
10. Check the well cavity in the back of the bell cup. This cavity must be cleaned manually. It will not be cleaned during purge cycles or interior or exterior cup flushes.
11. 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.
12. After removing all paint build-up or residue, rinse the bell in clean solvent and blow dry.
13. 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.

14. It is recommended that extra bell cups be purchased. The cups can then be cleaned off line in an automated cup cleaner.
15. Reinstall cups to proper torque 50-70 lbs•in (5.65-7.91 Nm).

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 stop 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, and gauges) it must be replaced.

RMA-303 PREVENTIVE MAINTENANCE SCHEDULE

	Frequency (Maximum)							
Procedure	**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 cloth cover		**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**	
Low Voltage Cable Inspections					**X**			
High Voltage Testing						**X**		
Inspection of Tubing Bundle					**X**			
Regrease Tubing Bundle							**X**	
Replace Tubing Bundle								**X**
Inspect Turbine Spindle taper and threads		**X**	**X**					
Replace Bell Cups							**X**	**X**
Inspect all screws • Replace if broken • Inspect for wear • Tighten per specifications					**X**			
Replace Splash Plates						**X**	**X**	
Inspect and Clean Spindle Bore and Fluid Tube OD		**X**	**X**					
Inspect for Fluid Leaks	**Daily**							
Check External Cup Flush Carbide Tip for blockage	**X**	**X**						

DISASSEMBLY PROCEDURES

N O T E

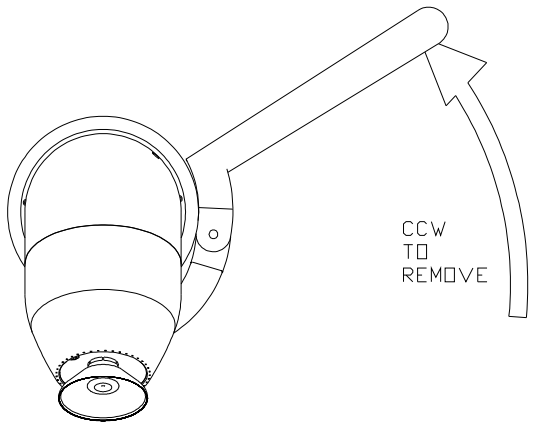
For reassembly instructions, use the reverse of the following disassembly procedures.

To facilitate 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.

All O-rings described in the “Maintenance” section of this manual should be lubricated with a food grade petroleum jelly or with A11545 lubricant.

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 “Applicator Removal from Robot” figure.



Applicator Removal from Robot

W A R N I N G

•Prior to removing applicator from 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.

- Air turned off.

W A R N I N G

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

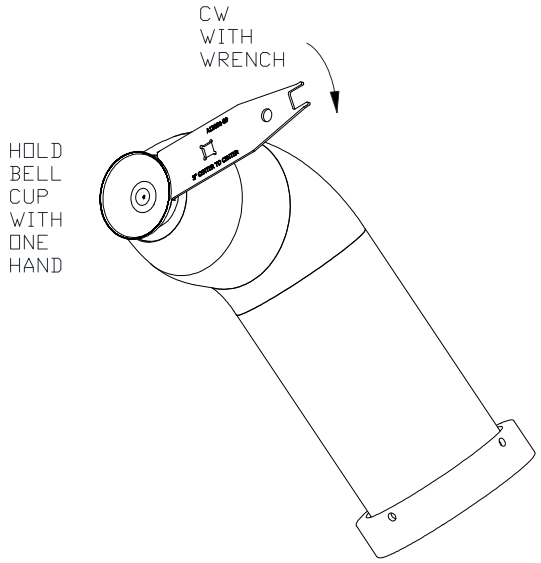
Bell Cup Removal / Replacement

N O T E

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 irregular maintenance is performed. Using the large open end of the bell cup / combo wrench (A12061-00) 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.

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



Bell Cup Removal

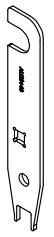
CAUTION

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

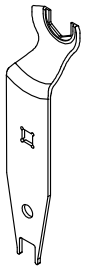
NOTE

For removal of the 30mm or 55mm bell cups, you must use bell cup wrench A11284-00. For the 65mm bell cups you must use AA12061-00 bell cup wrench.

Bell Cup Wrenches

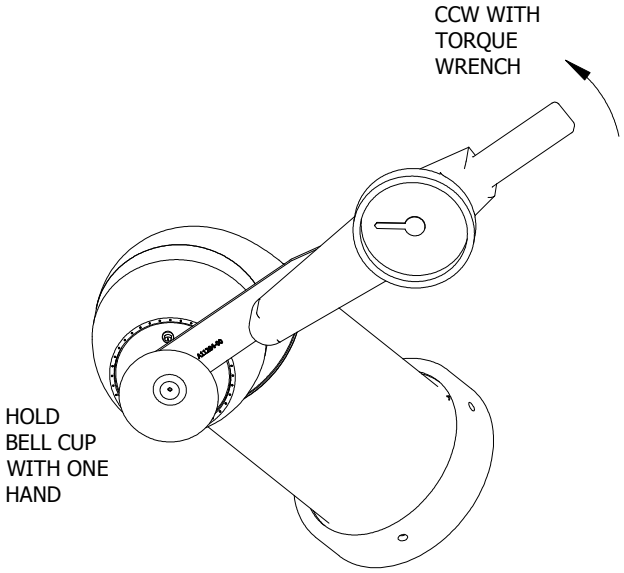


A11284-00 BELL CUP WRENCH
USE ON 30M AND 55MM BELL CUPS ONLY



A12061-00 BELL CUP WRENCH
USE ON 65MM BELL CUPS ONLY

To re-install a cup, position the wrench as shown. Insert a torque wrench into the square in the wrench to apply approximately 50-70 lbs•in (5.69-7.91 Nm) torque. Hold the cup and tighten the torque wrench in a counter-clockwise direction.



Bell Cup Installation

NOTE

There is a 3-inch center-to-center distance between the bell cup and the 3/8-inch socket square on the wrench. This distance must be factored in when reading the proper torque on the wrench.

Example: A desired true torque is desired using a 9-inch effective length torque wrench. Wrench offset is 3-inches.

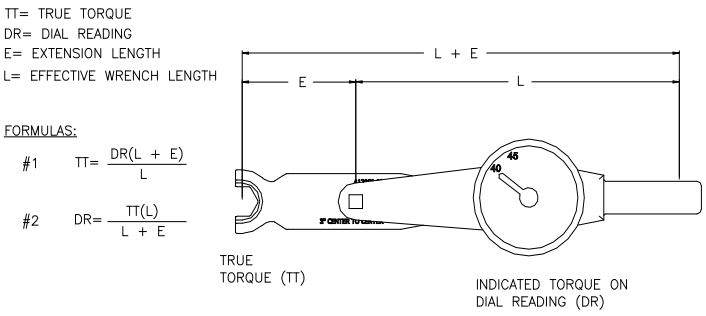
L= 9-inches

TT=50 lbs•in

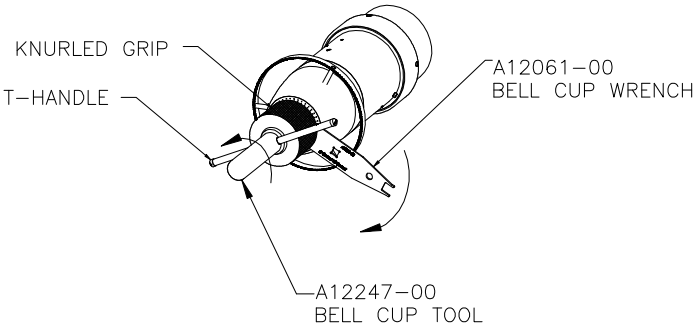
E= 3-inches

DR = is dial reading.

$DR=\frac{50\ (9)}{(9+3)}$ DR=37.5 lbs•in



Effective Length Torque Wrench



Bell Cup Removal Tool

Bell Cup Removal Tool (65mm Bell Cups Only) A11247-00 (Optional Accessory)

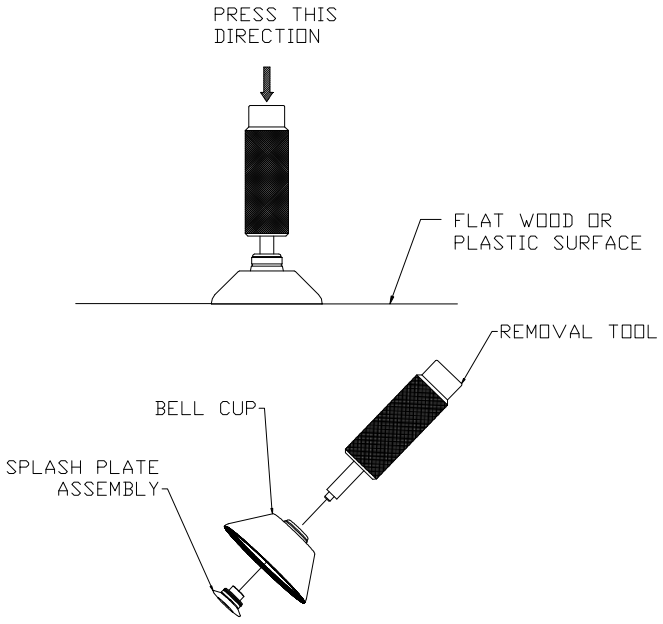
This tool is meant to aid in the removal of bell cups that are abnormally tight on the spindle shaft. Typically, bell cups are easily removed by hand with the aid of the standard bell cup wrench (A12061-00). To prevent bell cups from becoming difficult to remove, care should be taken to remove wet or old dried paint from shaft and bell cup taper and threads before bell cups are assembled to the atomizer.

Before using the bell cup removal tool, clean the exterior of the bell cup with clean solvent and dry it. This will improve the tool's ability to grip the cups surface.

To install the tool, first engage the bell cup wrench (A12061-00) to the shaft hex behind the bell cup. Place the bell cup tool (A12247-00) over the front of the bell cup and tighten the knurled portion in a counter-clockwise direction until very tight (left hand thread). (See "Bell Cup Removal Tool" figure for proper engagement of tool on bell cup.) While holding the bell cup wrench on the spindle shaft, grasp the T-handle on the bell cup tool and turn in a counter-clockwise direction until bell cup is loosened. If tool rotates or slips, tighten tool further and retry.

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.



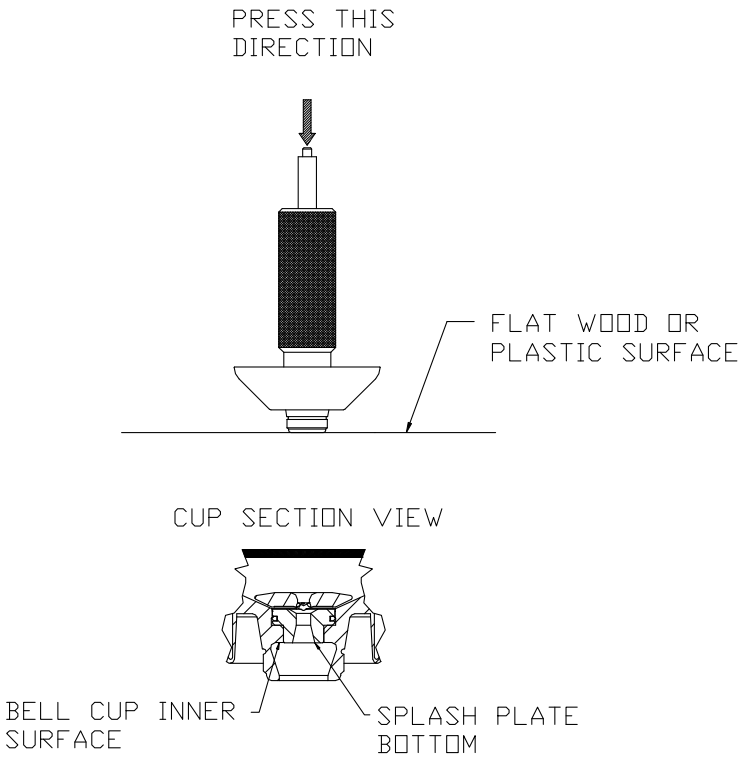
Splash Plate Removal

CAUTION

•Failure to replace a damaged bell cup will cause vibration of the applicator and/or premature turbine failure.

Splash Plate Insertion (55mm and 65mm Bell Cups)

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 occasions to use an arbor press to install the splash plate. Press splash plate to a hard stop (see “Splash Plate Insertion” figure).



Splash Plate Insertion

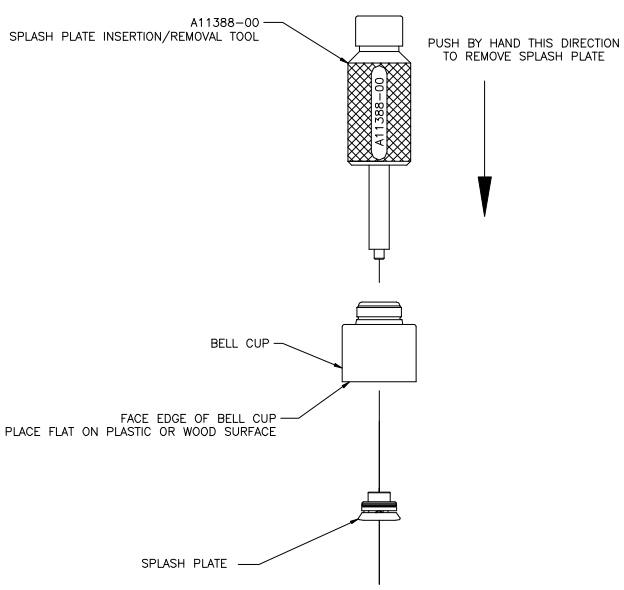
A11968-01/02 Bell Cup and Splash Plate Assembly

Splash Plate Removal

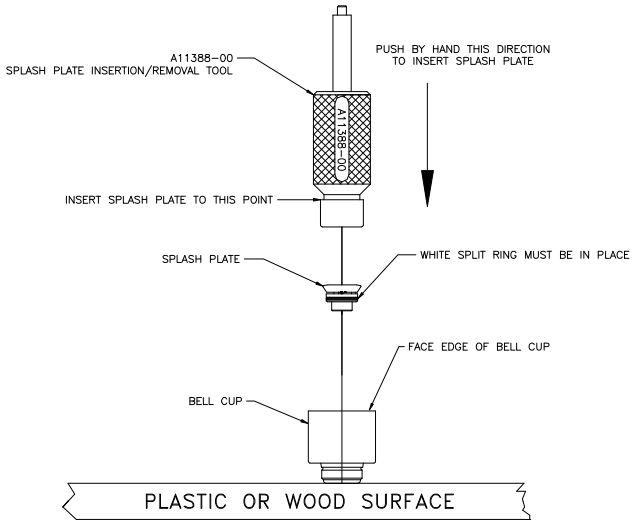
After removing the bell cup from the applicator, put it on a plastic or wood surface to prevent damage to the edge of the cup. Using the splash plate removal tool (A11388-00), insert the small end of the tool into the end of the splash plate assembly. Press the splash plate out. It may be necessary to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

Splash Plate Insertion (55mm and 65mm Bell Cups)

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 occasions to use an arbor press to install the splash plate. Press splash plate to a hard stop. Face of bell cup should line up with undercut as shown on tool (see “Splash Plate Insertion” figure).



Splash Plate Removal

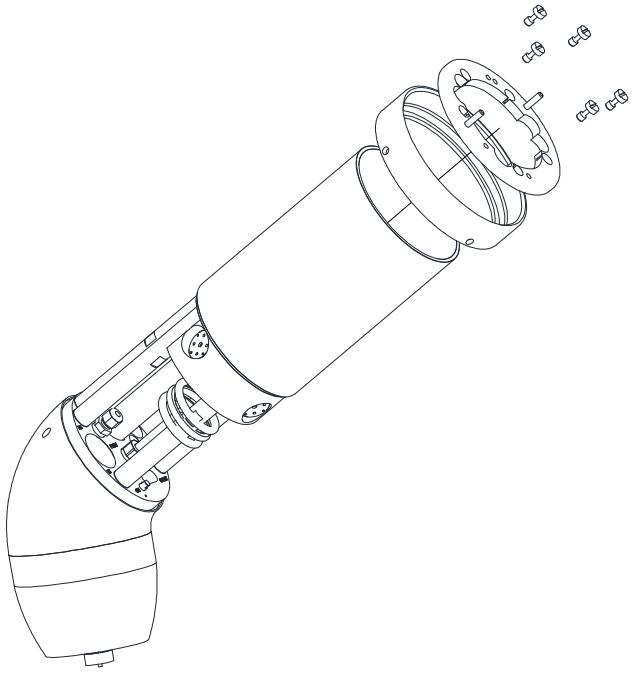


Splash Plate Insertion

Shroud Removal / Replacement

Removal

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



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 rig must lie flat against the face of the rear manifold.

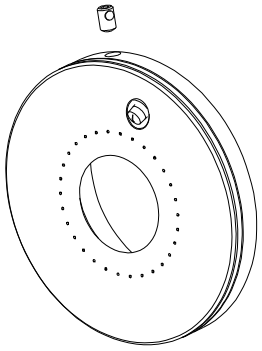
CAUTION

•DO NOT over-tighten the five (5) optional plastic break-away screws or they may break under normal operating conditions.

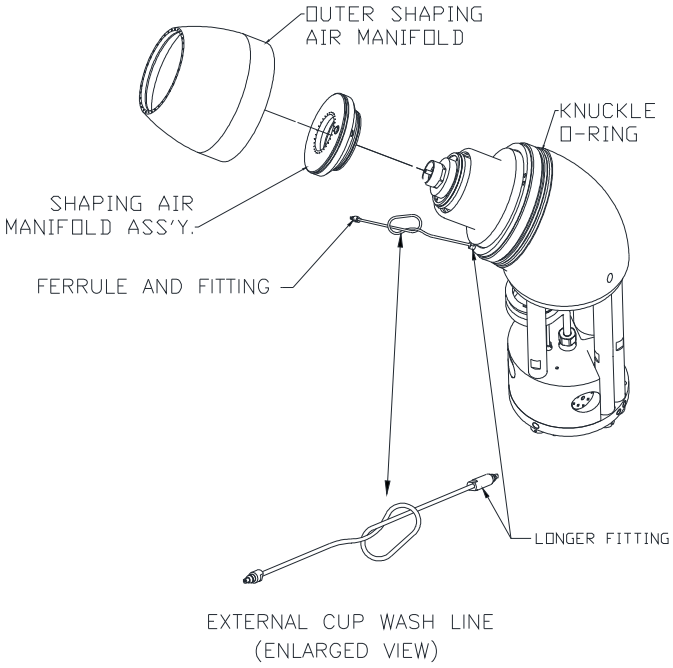
Inner / Outer Shaping Air Manifold, Solvent Tube Removal / Replacement

Air Manifold Removal

Remove the outer shaping air manifold by turning it off by hand in a counter-clockwise direction. A strap wrench 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 using a 3/16” end-wrench. Loosen set screw (A11253-00) on inner shaping air manifold with a 5/64” hex-wrench enough to allow manifold to be removed from the turbine body. Remove the inner shaping air manifold by turning it off in a counter-clockwise direction (see “Inner/Outer Shaping Air Manifold, Solvent Tube Removal/Replacement” figure).



Inner/Outer Shaping Air Manifold, Solvent Tube Removal/Replacement (55mm)



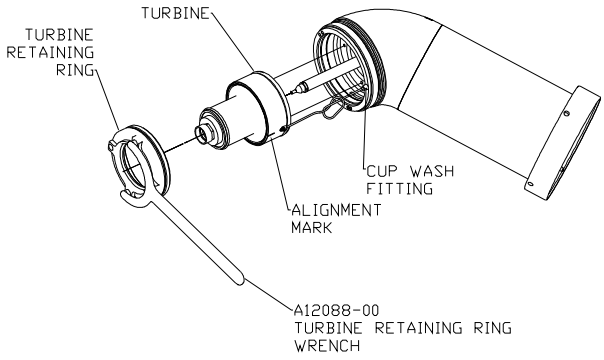
Interior/Exterior Shaping Air Manifold for 55mm Bell Cup

Shaping Air Manifold Reassembly

(Lightly lubricate all O-rings prior to assembling.) Carefully install the inner shaping air ring onto the turbine threads. Tighten in a clockwise direction until it seats against the turbine. Install set screw and tighten until it stops on the turbine body, then tighten to 5 lbs•in (0.564 Nm) torque to prevent shaping air ring/manifold from rotating. Do not overtighten! If replacing the solvent tube, install longer fitting into the atomizer body first and tighten with a 3/16" end-wrench. Install fitting into atomizer body until ferrule is seated to a stop. Test by pulling/pushing tube, tighten until no movement then 1/8 turn more. 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 "Interior/Exterior Shaping Air Manifold for 55mm Bell Cup" figure) to prevent tube from becoming pinched when outer shaping air ring is installed. Do not kink the tube when installing loop (see "Interior/Exterior Shaping Air Manifold for 55mm Bell Cup" figure). **Turbine Removal / Replacement**

Removal

Remove the turbine retaining ring by using the strap wrench (A12088-00), turning the turbine retaining ring in a counter-clockwise direction. Pull the turbine out while rocking it from side to side.



Turbine Removal

Replacement

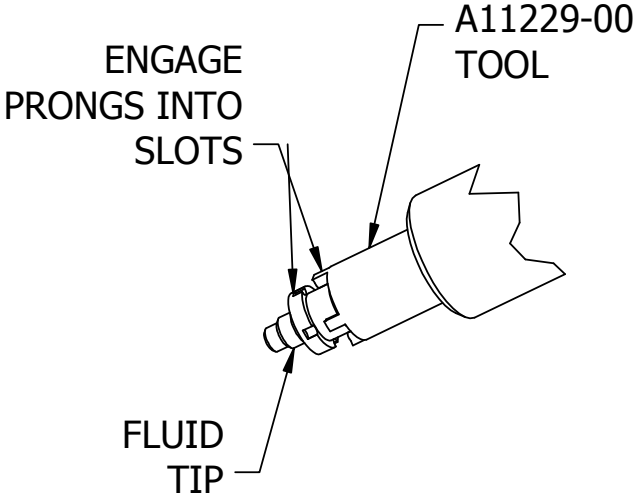
Apply a light coating of O-ring lubricant to all the O-rings and the threads of the turbine and turbine retaining ring prior to assembly. Push the turbine down into the cavity in the atomiz-

er body. Align the mark on the turbine with the mark on the atomizer body. Install the turbine retaining ring and o-ring by hand. Use the spanner wrench to tighten an additional 1/8-1/4 turn. (Lightly lubricate O-ring with petroleum jelly.) Check centering of fluid tube. If fluid tube is centered, the turbine is fully seated. If not, check tightness with spanner 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

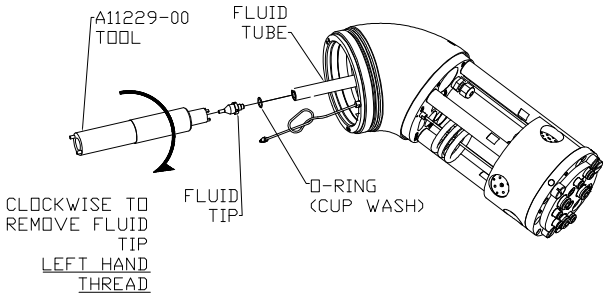
To remove the fluid tips, use the tip/tube removal tool (A11229-00). Insert the tool over the tip and engage the four (4) prongs of the tool into the four (4) slots in the tips (see “Fluid Tip Removal” figure).



Fluid Tip Removal

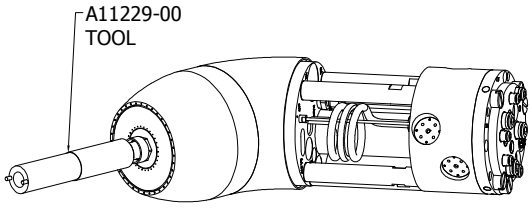
N O T E

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



Fluid Tip

The fluid tip may be removed either with the turbine in place, or the turbine off the unit. “Fluid Tip” figure shows removing the tip with the turbine in place.



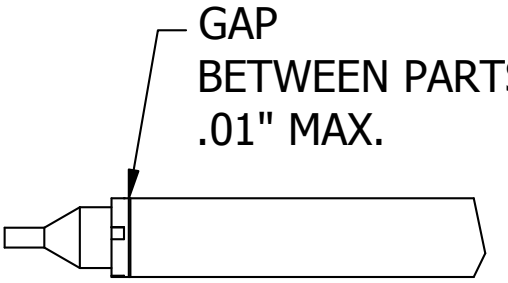
Fluid Tip Removal

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

Replacement

Ensure 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 "Fluid Tip/Tube Gap" figure). Ensure the O-ring is properly positioned when complete. Tighten to 25-30 lbs•in (2.83-3.4 Nm) torque.



Fluid Tip / Tube Gap

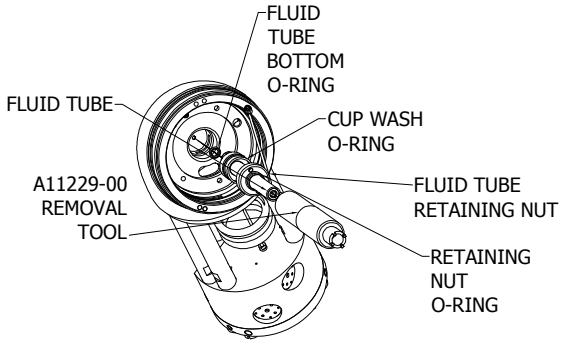
CAUTION

•When removing fluid tip while turbine is still installed, make sure to clean paint or fluid that may leak and run onto the shaft or threads.

Fluid Tube Removal / Replacement

Removal (Turbine Removed)

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 "Fluid Tube Removal" figure).



Fluid Tube Removal

Replacement

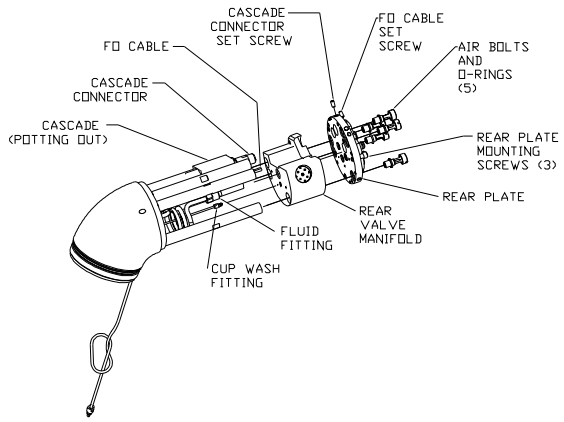
Lubricate all O-rings with A11545-00 O-ring lubricant. Push the fluid tube into the pocket of the atomizer body. Seat the tube by pushing while rocking the tube from side to side. Install the fluid tube retaining nut over the tube. Tighten the retaining nut firmly tight using the removal tool in a clockwise direction. Tighten to 65-75 lbs0149in (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.

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 front of the applicator, pull the fiber optic cable out. Both the rear plate and the rear valve manifold may now be removed.



Rear Valve Manifold Removal

Cascade Removal / Replacement

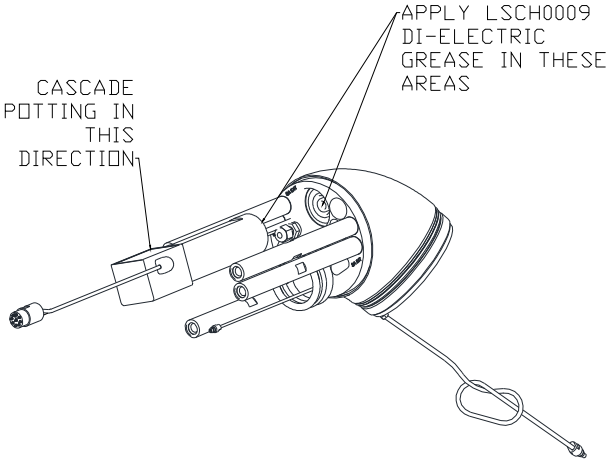
Removal

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

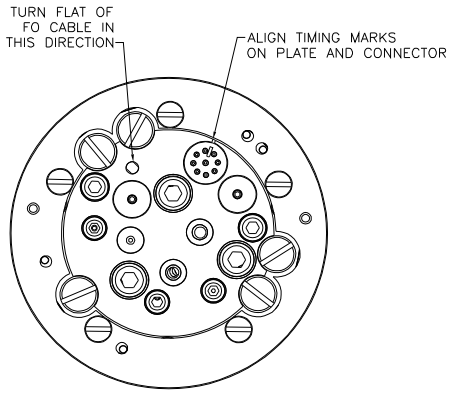
Use a small amount of dielectric grease (LSCH0009) on the end of the spring of the cascade and the wire in the knuckle. Also apply a small amount of grease into the concentric rings around the spring.

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



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 was 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 3/32”Allen wrench (see “Rear Plate Alignments” figure).**



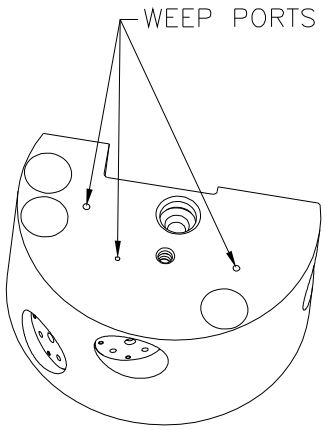
Rear Plate Alignments

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

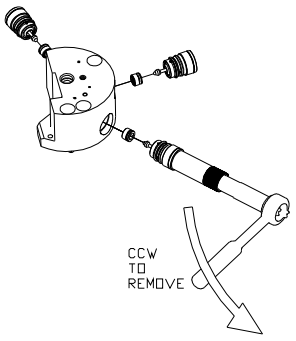
Removal

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.



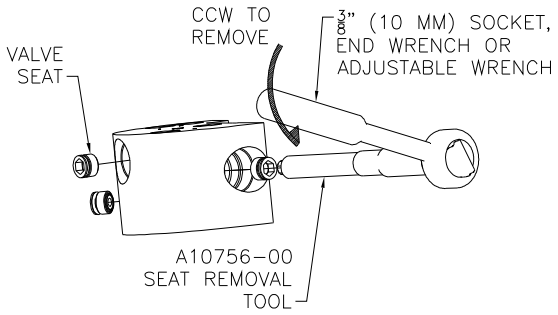
Weep Port Locations

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.



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.



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.

N O T E

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

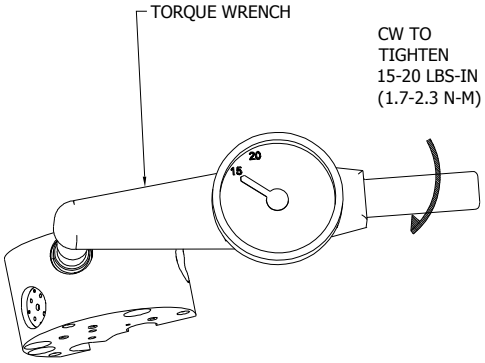
Replacement

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.

N O T E

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 /8” (10mm) socket, torque the valve seats to 15-20 lbs•in (1.7-2.3 Nm).

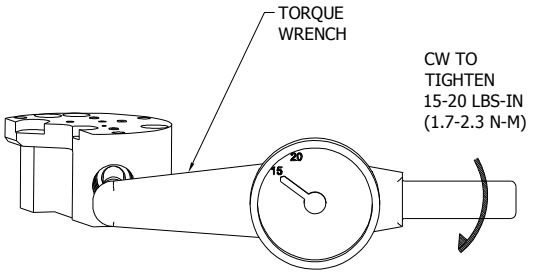


Valve Seat Torque

CAUTION

•Always use a torque wrench to torque the seats in place. Over-torqueing the seats may cause permanent irreparable 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) after valve is down.

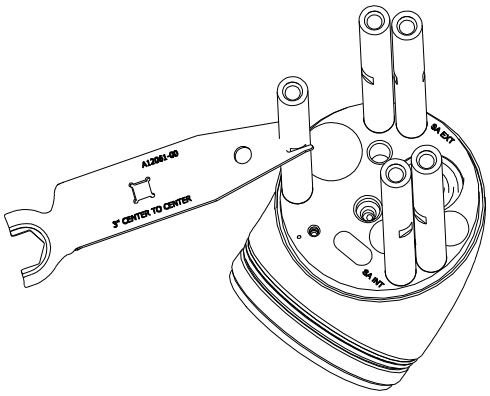


Valve Torque

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

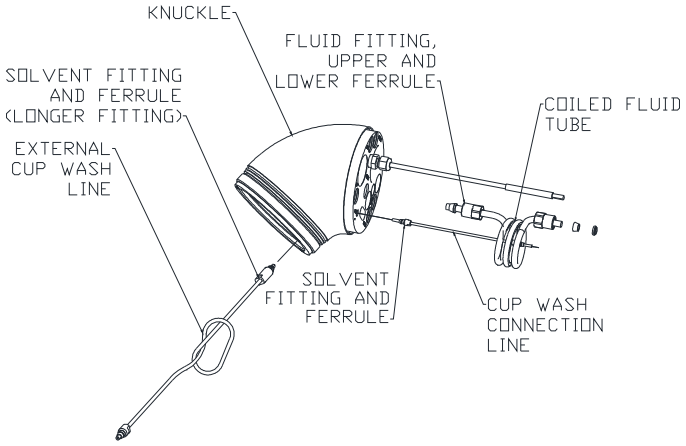
Removal

Using wrench (A11284-00 or A12061-00), remove each of the support rods. Each is removed by turning counter-clockwise.



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.



Fluid / Cup Wash Line Removal

Replacement

Install the cup wash assembly with the longer end going into the knuckle (atomizer body) first. Tighten until ferrule is seated. To test push/pull the tube. If movement is felt, tighten until stopped. Tighten 1/8 turn more.

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 or A12061-00). Torque 10-15 lbs•in (1.13-1.7 Nm).

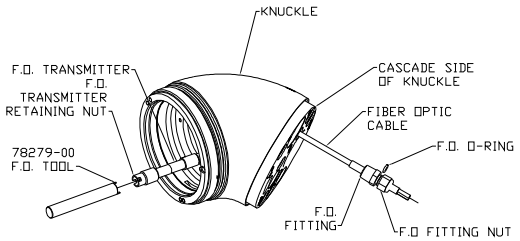
Fiber Optic Cable Removal/Replacement

Removal

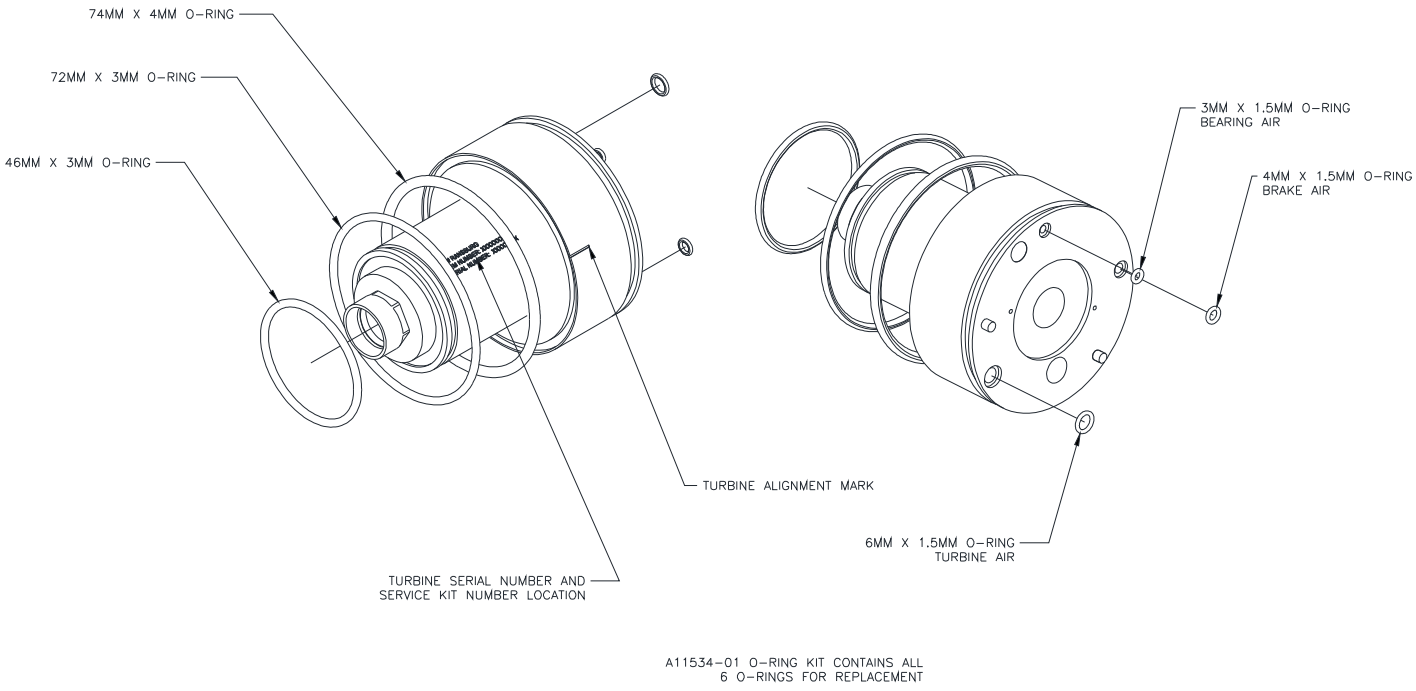
Remove the fiber optic nut and fitting from the knuckle. Loosen the fiber optic transmitter using the removal tool (78279-00) on the fiber optic nut. Push while twisting on the fiber optic cable from the cascade side of the knuckle until the connector nut (black) of the transmitter is visible. Loosen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

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).



Fiber Optic Transmitter Removal



Turbine O-Ring Replacement

TROUBLESHOOTING GUIDE

General Problem	Possible Causes	Corrective Action
Bad Spray Pattern	1. Bell cup damaged 2. Low voltage 3. Paint lodged in shaping air ring	1. Replace bell cup. 2. See "Low or No High Voltage" below. 3. Disassemble and clean (see "Maintenance" section).
Low or No High Voltage	1. High current draw	1. a. Paint resistivity to be .1 MW to h. 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. Verify 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 high voltage parts	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 externally with non-polar solvent. 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.

TROUBLESHOOTING GUIDE (Cont.)

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. Make sure quick disconnect electrical connection is aligned and clean. a. 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).

TROUBLESHOOTING GUIDE (Cont.)

General Problem	Possible Causes	Corrective Action
Speed Feedback Fault	1. Damaged fiber optic cable between robot plate and control panel	1. Repair or replace the fiber optic cable.
	2. Connection at robot or bell plate is loose	2. Reinstall 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. Ensure 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. Verify that air pilot signal is present. b. Fluid valve air pilot signal 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. Inspect and retighten.
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 paint and solvent.
Fluid and/or Air Leakage Between the Robot and Bell Manifold Plates	1. Atomizer mounting nut is loose	1. Tighten mounting ring.
	2. O-ring is missing	2. Install O-ring.
	3. O-ring is damaged	3. Visually inspect for damage and replace.
Fluid Leakage In Fluid Manifold or Bell Plate	1. O-ring is damaged	1. Replace O-ring.
	2. Outer diameter of tubing coil is damaged	2. Inspect tubing coil for scratches and replace if damaged.
Fluid Leakage Around Fluid Valve	1. O-ring is damaged	1. Replace o-ring(s).
	2. Outer diameter of tubing coil is damaged	2. Inspect tubing coil for scratches and replace if damaged.

TROUBLESHOOTING GUIDE (Cont.)		
General Problem	**Possible Causes**	**Corrective Action**
Turbine Cannot Attain Desired Speed	1. Excessive vibration	1. a. Check bell cup for damage. b. Check bell cup for excessive paint buildup. c. Bell cup loose - tighten to proper torque. d. Poor turbine air pressure - plant air. e. Have manufacturing check bell cup balance.
	2. Low or no bearing air	2. a. Check bearing air pressure (minimum 80 psi) (352 kPa). 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.
	3. Loss of fiber optic/no feed back	3. Damaged fiber optic sensor, bad cable, too many splices. Maximum three (3) slices permitted.

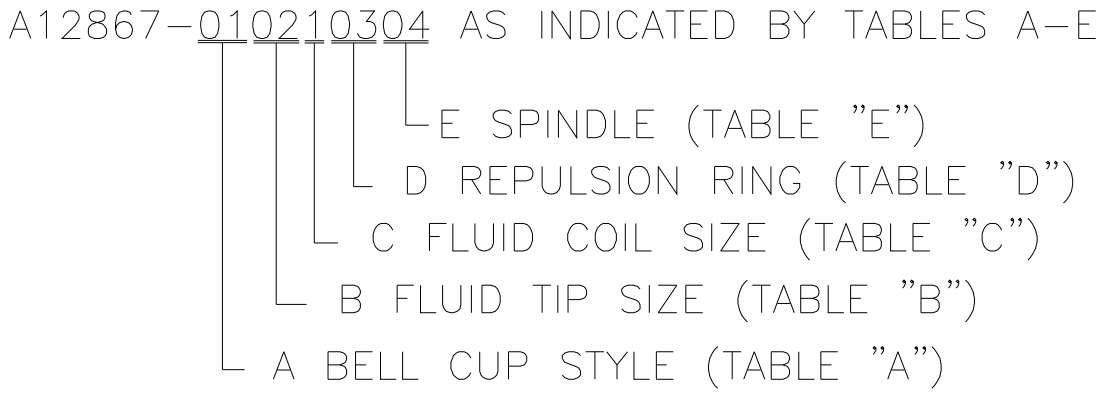
N O T E S

PARTS IDENTIFICATION

RMA-303 DIRECT CHARGE ROTARY ATOMIZER MODEL IDENTIFICATION

When ordering, use A12867-ABCDE as indicated by Tables A, B, C, D, and E. Five (5) digits must follow the basic part number.

For Example:

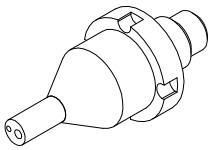


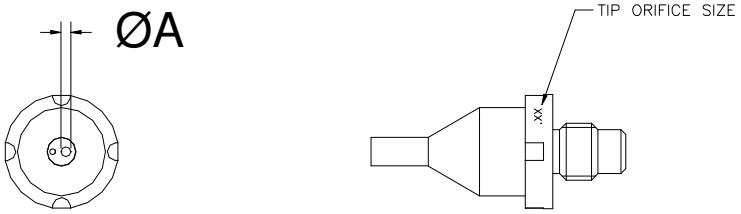
*** Model number and serial number of the atomizer is located on the face of the rear plate assembly. (See "Important**

Numbers" in the "Introduction" section.)

TABLE "A" BELL CUP SELECTION

DASH NO.	A	DESCRIPTION
01	A11730-00	55 MM STANDARD SERRATED TITANIUM (TISF)
02	A11783-00	55 MM STANDARD SERRATED ALUMINUM (ALSF)
03	A11968-00	30 MM SERRATED TITANIUM
04	A11968-01	30 MM SERRATED ALUMINUM
07	A12900-00	65 MM SERRATED TITANIUM (TISF)
08	A12900-01	65 MM NON-SERRATED TITANIUM (TIF)
09	A13114-00	55 MM SERRATED TITANIUM (TISF)
10	A13114-01	55 MM NON-SERRATED TITANIUM (TIF)
11	A11730-01	55 MM STANDARD NON-SERRATED TITANIUM (TISF)
12	A12900-02	65MM SER. TITANIUM/LONG LIFE SPLASH PLATE (TISF)
13	A12900-03	65MM NON. SER. TITANIUM/LONG LIFE SPLASH PLATE (TIF)
14	A12900-04	65MM SER. ALUMINUM/PLASTIC SPLASH PLATE
15	A12900-05	65MM NON. SER. ALUMINUM/PLASTIC SPLASH PLATE





Fluid Tip Selection

TABLE "B"
FLUID TIP SELECTION

DASH NO.	B	DESCRIPTION
01	A11240-01	.028"/ 0.7 MM OPENING
02	A11240-02	.035"/ 0.9 MM OPENING
03	A11240-03	.043"/ 1.1 MM OPENING
04	A11240-04	.047"/ 1.2 MM OPENING
05	A11240-05	.062"/ 1.6 MM OPENING
06	A11240-06	.039"/ 1.0 MM OPENING

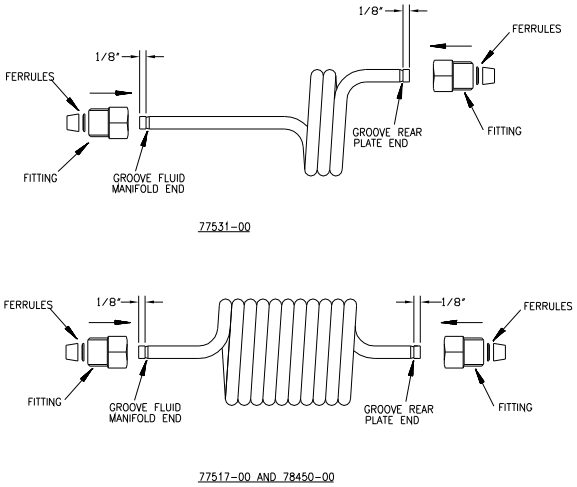
TABLE "C"
FLUID COIL SELECTION

DASH NO.	C	DESCRIPTION
1	77531-00	.25 OD X .125 ID FOR HIGHLY RESISTIVE MATERIALS (CLEAR COAT)
2	77517-00	.25 OD X .170 ID FOR CONDUCTIVE MATERIALS (BASE/CLEAR)
3	78450-00	.25 OD X .125 ID FOR HIGHLY CONDUCTIVE MATERIALS (BASE/CLEAR)

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 fluid coils have a groove cut into them as shown. Use groove cutter A11567-00, by sliding the end of the tool over the 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 grooved to properly lock into place when installed.



Fluid Coils

Fitting and Ferrule Replacements	
Part #	**Description**
78449-00	Fluid Fitting
EMF-203-04	Front Ferrule
EMF-202-04	Rear Ferrule

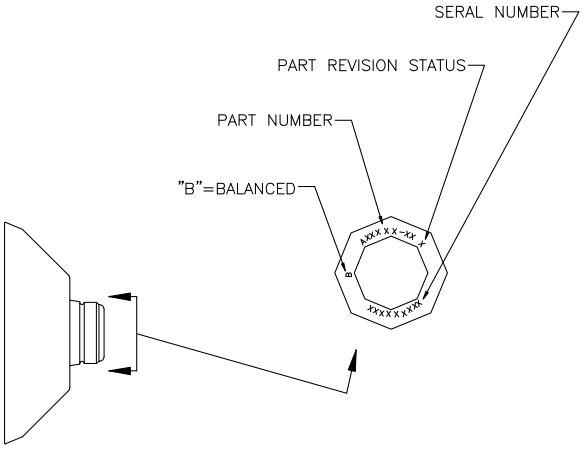
TABLE "D" SHAPE AIR / REPULSION RING

DASH NO.	D	E	DESCRIPTION
01	A12874-01	A12090-01	55MM STANDARD
02	A12874-02	A12090-01	55MM STANDARD WITH REPULSION RING
03	A12874-03	A12090-01	30MM
04	A12874-04	A12090-01	30MM WITH REPULSION RING
05	A12874-05	A12090-02	65MM MONO FLEX
06	A12874-06	A12090-02	65MM MONO FLEX WITH REPULSION RING
07	A12874-08	A12090-02	65MM DUAL FLEX
08	A12874-09	A12090-02	65MM DUAL FLEX WITH REPULSION RING
09	A12874-01	NONE	55MM STANDARD
10	A12874-02	NONE	55MM STANDARD WITH REPULSION RING
11	A12874-03	NONE	30MM
12	A12874-04	NONE	30MM WITH REPULSION RING
13	A12874-05	NONE	65MM MONO FLEX
14	A12874-06	NONE	65MM MONO FLEX WITH REPULSION RING
15	A12874-08	NONE	65MM DUAL FLEX
16	A12874-09	NONE	65MM DUAL FLEX WITH REPULSION RING
17	A12874-12	NONE	55MM DUAL FLEX
18	A12874-12	A12090-02	55MM DUAL FLEX

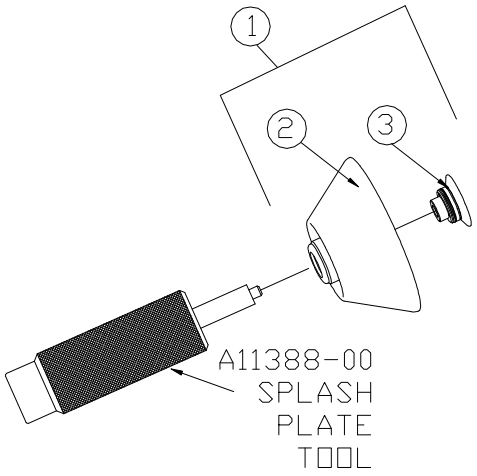
TABLE "E" SPINDLE SELECTION

DASH NO.	E	DESCRIPTION *
00	NONE	NONE
01	A12895-00	SPINDLE, W/SHAPE AIR HOLES
02	A12895-01	SPINDLE, W/NO SHAPE AIR HOLES
03	A12895-03	SPINDLE, W/SHAPE AIR HOLES
04	A12895-04	SPINDLE, W/NO SHAPE AIR HOLES

*** Customer must verify spindle part number located on outer housing, see page 13.**

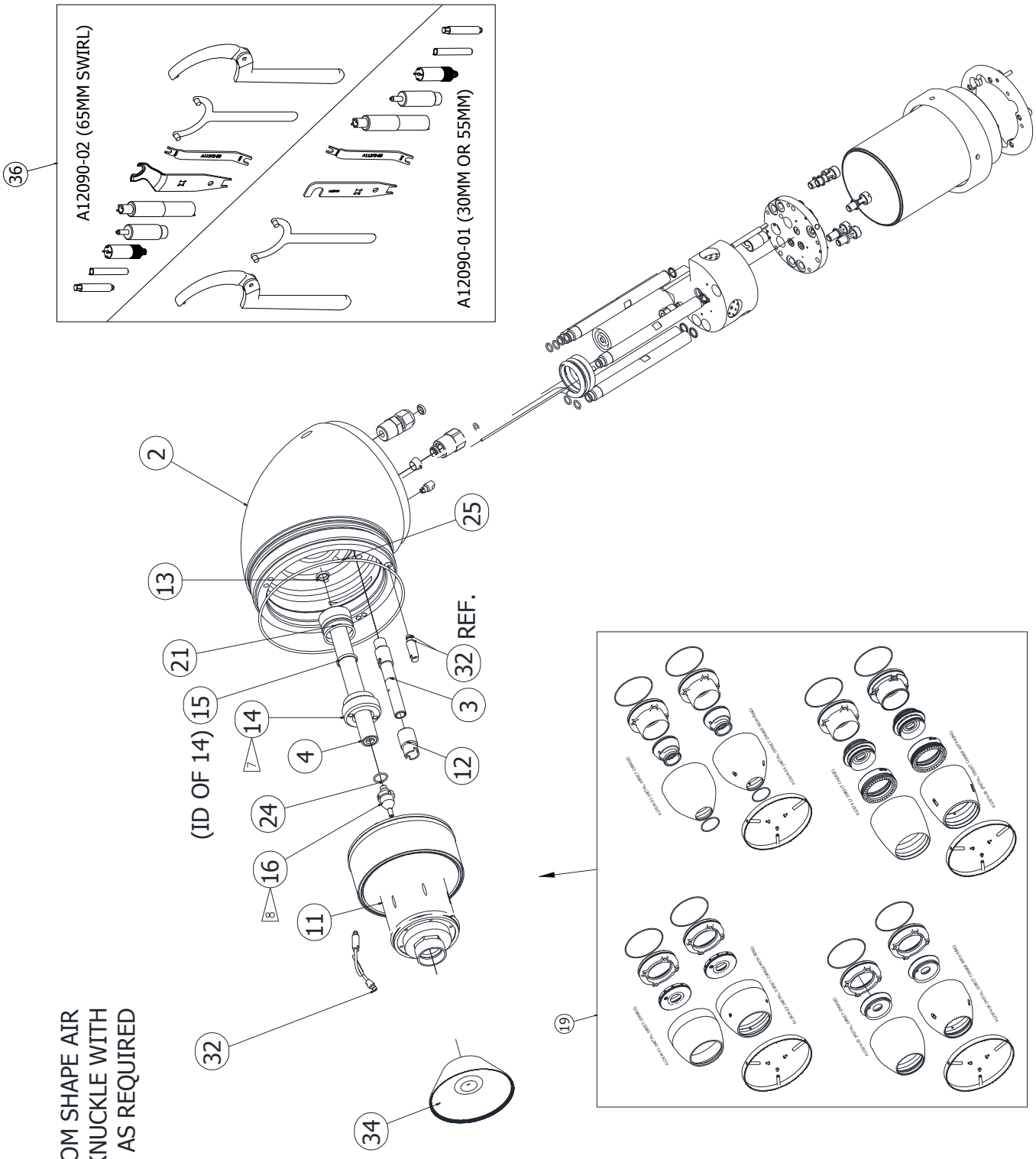


Bell Cup Part Number / Serial Number



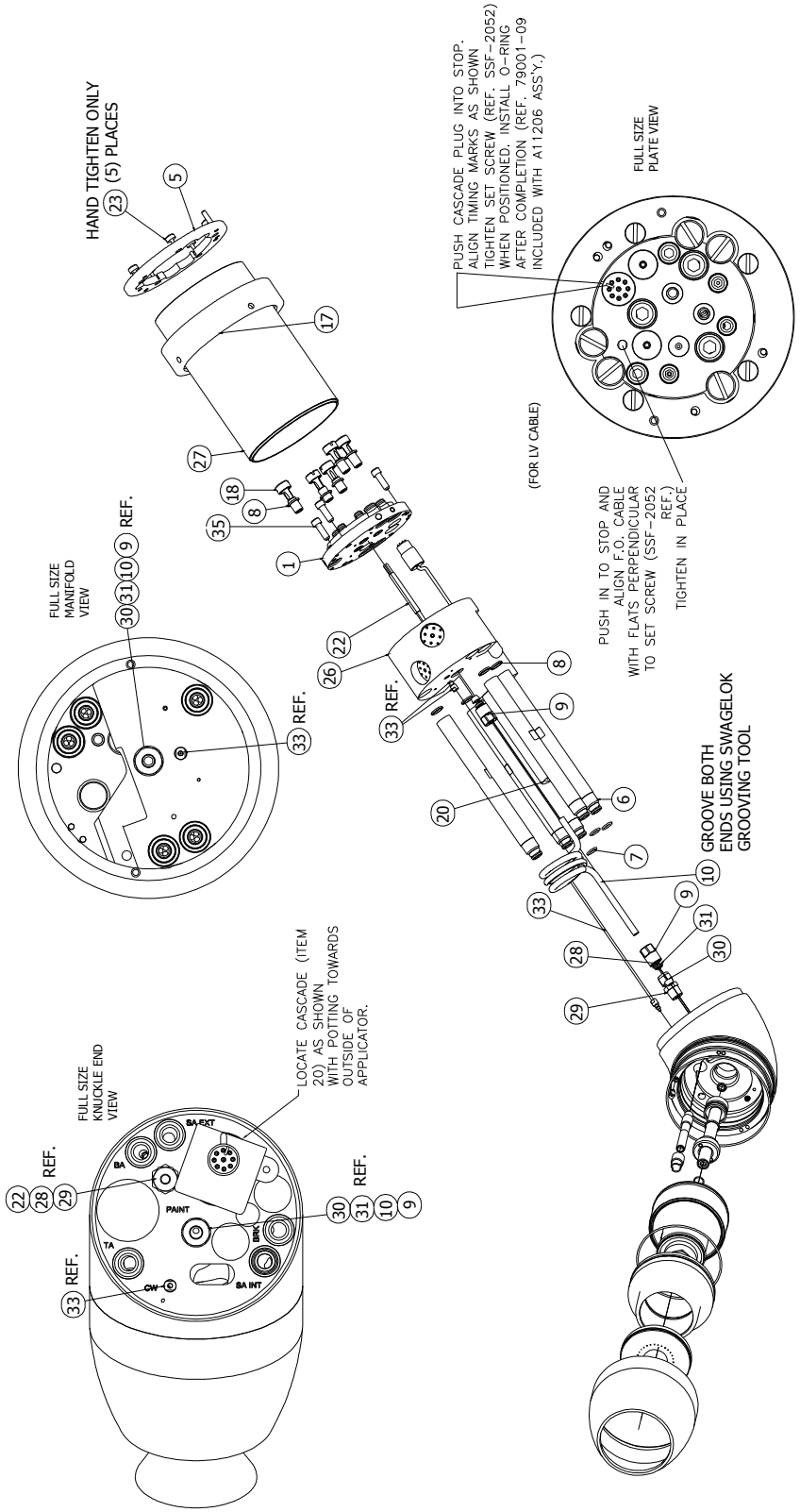
Bell Cup Parts Breakdown

TYPICAL BELL CUP PARTS BREAKDOWN			
Complete Assembly 1	**Description**	**Cup Only 2**	**Splash Plate Assembly 3**
A11730-00	55mm Titanium Serrated (TISF)	A11732-00	A11269-00 (White Color)
A11730-01	55mm Titanium Non-Serrated (TIF)	A12522-00	A11269-00 (White Color)
A11738-00	55mm Aluminum Serrated (ALSF)	A11782-00	A11269-00 (White Color)
A11968-00	30mm Titanium Serrated (TIS)	A11964-00	A11954-00 (White Color)
A11968-01	30mm Aluminum Serrated (ALS)	A11964-01	A11954-00 (White Color)
A13114-00	55mm Titanium Serrated Flip Edge (TISF) (Single Piece Cup)	A13113-00	A11269-00 (White Color)
A13114-01	55mm Titanium Non-Serrated (TIF) (Single Piece Cup)	A13113-01	A11269-00 (White Color)
A12900-00	65mm Titanium Serrated (TISF) (Single Piece Cup)	A12886-00	A12071-00 (Black Color)
A12900-01	65mm Titanium Non-Serrated (TIF) (Single Piece Cup)	A12886-01	A12071-00 (Black Color)
A12900-02	65mm Titanium Serrated (TISF) W/ Long Life Splash Plate	A12886-00	A13004-00 (Black Color)
A12900-03	65mm Titanium Non-Serrated (TIF) W/ Long Life Splash Plate	A12886-01	A13004-00 (Black Color)
A12900-04	65mm Aluminum Serrated W/ Plastic Splash Plate	A12886-02	A12071-00 (Black Color)
A12900-05	65 mm Aluminum Non-Serrated W/ Plastic Splash Plate	A12886-03	A12071-00 (Black Color)



See breakdown on page 92

RMA-303 Assembly

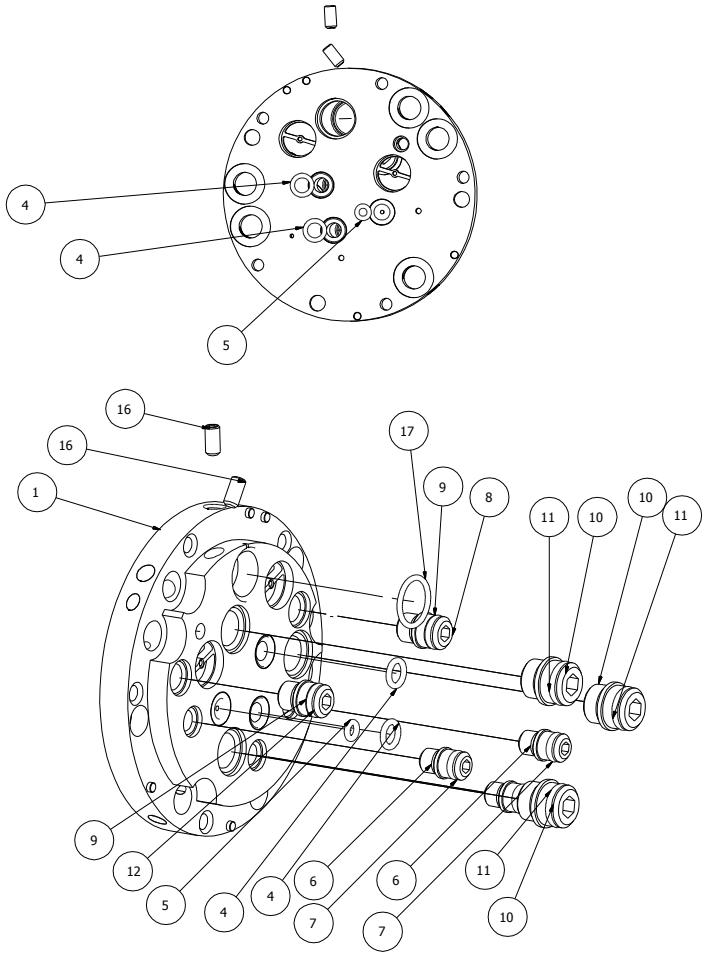


RMA-303 Assembly

RMA-303 BILL OF MATERIALS			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	A11206-00	ASS'Y., APPLICATOR REAR PLATE
2	1	A11230-00	ASSY.' KNUCKLE RMA-303
3	1	75911-00	ASS'Y, FIBER OPTIC TRANSMITTER
4	1	A11245-00	ASS'Y, FLUID TUBE RMA-303
5	1	A11203-00	ASS'Y, BREAK AWAY RING
6	5	A11214-00	ROD, SUPPORT
7	5	79001-14	O-RING, SOLVENT PROOF
8	10	79001-07	O-RING, SOLVENT PROOF
9	2	78449-00	FITTING, FLUID
10	1	C	COIL, FLUID
11	1	E	ASS'Y., SPINDLE **SEE NOTE #1**
12	1	78278-00	NUT, FIBER OPTIC TENSIONING
13	1	79001-40	O-RING, SOLVENT PROOF
14	1	A11226-00	RETAINER, FLUID TUBE
15	1	79001-42	O-RING, SOLVENT PROOF
16	1	B	FLUID TIP
17	1	A11201-00	RING, QUICK DISCONNECT
18	5	77508-00	BOLT, AIR
19	1	D	SHAPING AIR KIT
20	1	79010-01	ASS'Y. CASCADE HP404
21	1	79001-41	O-RING, SOLVENT PROOF
22	1	75921-03	CABLE, FIBER OPTIC
23	5	7683-16C	SCREW
24	1	79001-44	O-RING, SOLVENT PROOF
25	1	79001-22	O-RING , SOLVENT PROOF
26	1	A11241-00	ASS'Y., VALVE MANIFOLD
27	1	A11255-00	SHROUD, RMA-303
28	1	7554-05	O-RING, SOLVENT RESISTANT
29	1	76703-00	3/16 ODT X 1/4 NPT
30	2	EMF-203-04	FERRULE, FRONT 1/4 ODT
31	2	EMF-202-04	FERRULE REAR 1/4 ODT
32	1	A11351-05	ASS'Y, TUBING **SEE NOTE #2**
33	1	A11351-02	ASS'Y, TUBING
34	1	A	ASS'Y., BELL
35	3	76566-24C	SCREW, SHCS
TOOLS & LITERATURE TO BE SHIPPED WITH EACH APPLICATOR			
36	1	E	TOOL KIT, RMA-303
37	1	77141-19	LITERATURE KIT (NOT SHOWN)

NOTE #1 Customer must verify spindle part number located on outer housing, see page 13.

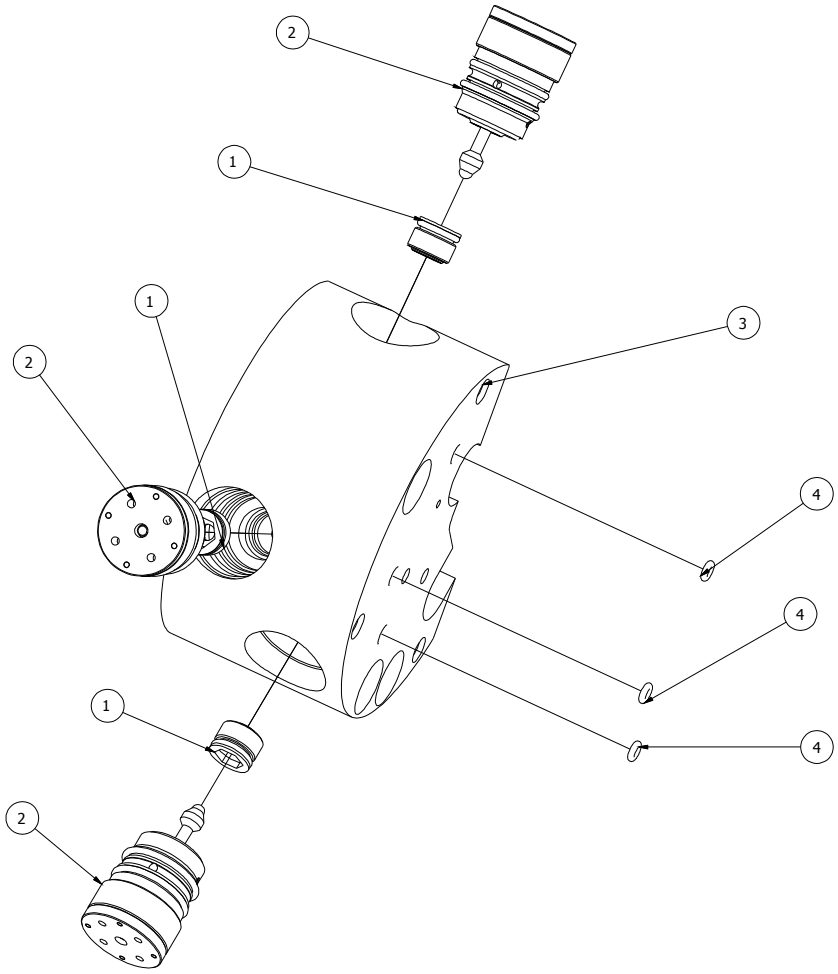
NOTE #2 longest fitting end installed into Knuckle (Air Manifold) Assembly.



A11206-00 Rear Plate Assembly

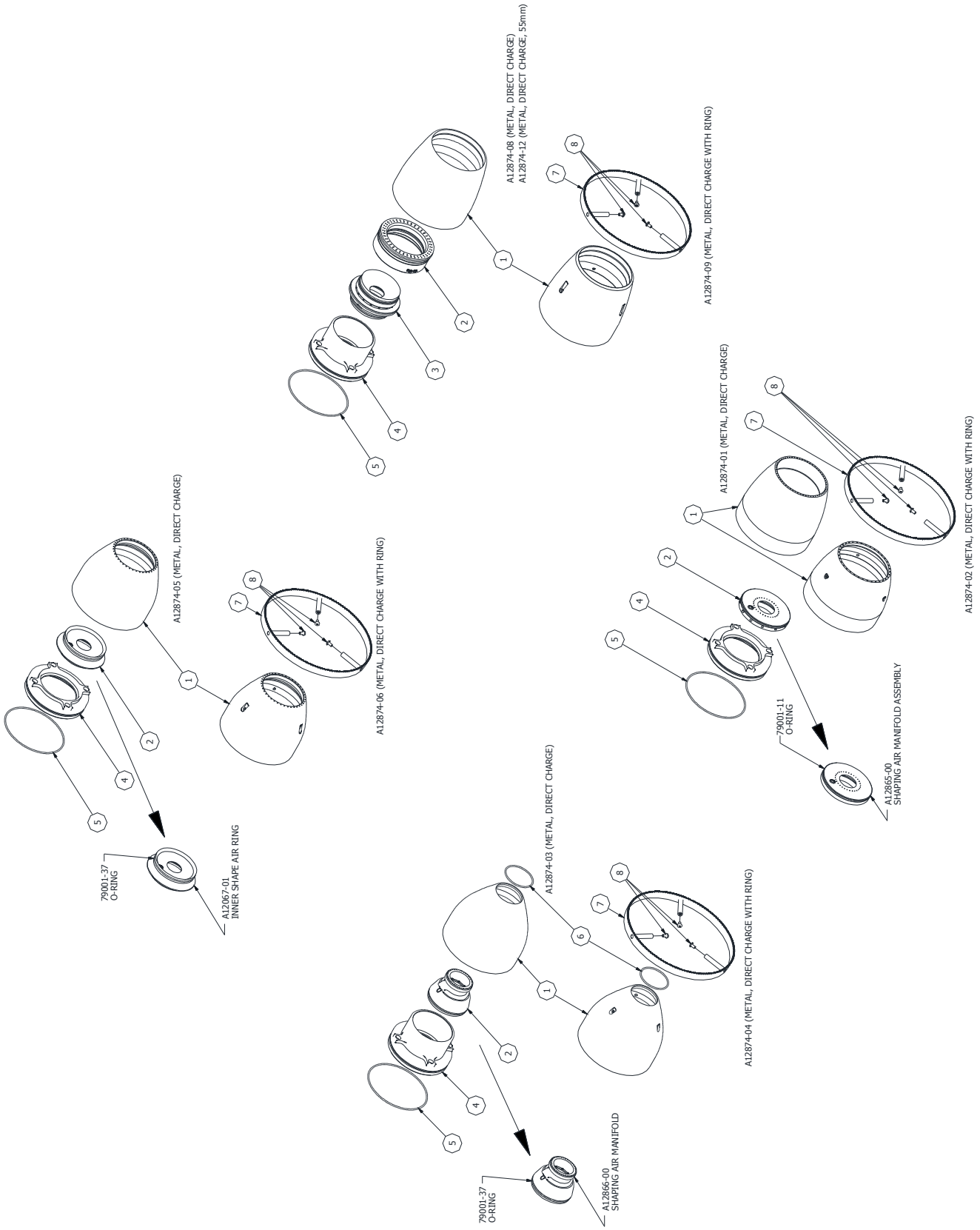
A11206-00 REAR PLATE ASSEMBLY - PARTS LIST			
Item #	**Part #**	**Description**	**Qty**
1	A11205-00	Assembly, Plate, Rear, RMA-303 Single Purge	1
4	79001-40	O-Ring, Solvent Proof	4
5	79001-39	O-Ring, Solvent Proof	2
6	77507-00	Air Stud, Small Machined *	3
7	79001-05	O-Ring, Solvent Proof	3
8	77506-00	Air Stud, Medium Machined *	2
9	79001-06	O-Ring, Solvent Proof	2
10	77505-00	Air Stud, Large Machined *	3
11	79001-07	O-Ring, Solvent Proof	3
12	77506-00	Air Stud, Medium Machined *	1
16	SSF-2052	Set Screw, 3/8" Lg. X 10-24	2
17	79001-09	O-Ring, Solvent Proof	1

*	Add 7969-10 to threads as required.



A11241-00 Valve Manifold Assembly

A11241-00 VALVE MANIFOLD ASSEMBLY - PARTS LIST			
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

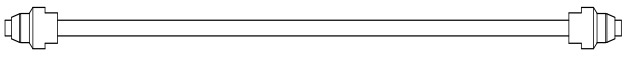


Shaping Air Kits

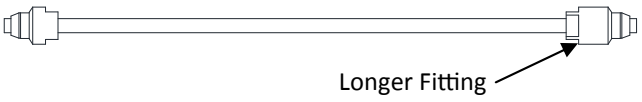
SHAPING AIR KIT ASSEMBLY PARTS BREAK-DOWN										
Part #	**Description**	**A**	**B**	**C**	**D**	**E**	**N**	**P**	**R**	**S**
A12874-01	Direct Charge, 55mm	A11244-01	A12872-00	-	A12078-01	-	-	-	-	-
A12874-02	Direct Charge with Repulsion Ring, 55mm	A11725-01	A12872-00	-	A12078-01	A11945-02	-	-	-	3
A12874-03	Direct Charge, 30mm	A11967-00	A12873-00	-	A12066-01	-	-	1	-	-
A12874-04	Direct Charge with Repulsion Ring, 30mm	A11967-01	A12873-00	-	A12066-01	A11945-00	-	1	1	3
A12874-05	Direct Charge, Mono Flex	A12068-01	A12083-01	-	A12078-01	-	-	-	-	-
A12874-06	Direct Charge with Repulsion Ring, Mono Flex	A12068-02	A12083-01	-	A12078-01	A11945-01	-	-	1	3
A12874-08	Direct Charge, Dual Flex	A12074-01	A12084-01	A12871-01	A12066-01	-	1	-	-	-
A12874-09	Direct Charge with Repulsion Ring, Dual Flex	A12074-02	A12084-01	A12871-01	A12066-01	A11945-02	1	-	1	3
A12874-12	Direct Charge Dual Flex	A13116-01	A13229-01	A13228-01	A12066-01		1	-		

NOTE: Set screw for all shape air manifolds is A12253-00.

SHAPING AIR KIT - PARTS LIST			
Item #	**Part #**	**Description**	**Qty**
1	A	Outer Shroud	1
2	B	Shaping Air Ring	1
3	C	Inner Shaping Air Ring	N
4	D	Turbine Retaining Ring	1
5	79001-11	O-Ring, Solvent Proof	1
6	79001-52	O-Ring, Solvent Proof	P
7	E	Repulsion Ring	R
8	77580-08C	Screw, 6-32X1/4" LG Button Cap Screw, SS	S



A11351-02 Cup Wash Line Assembly

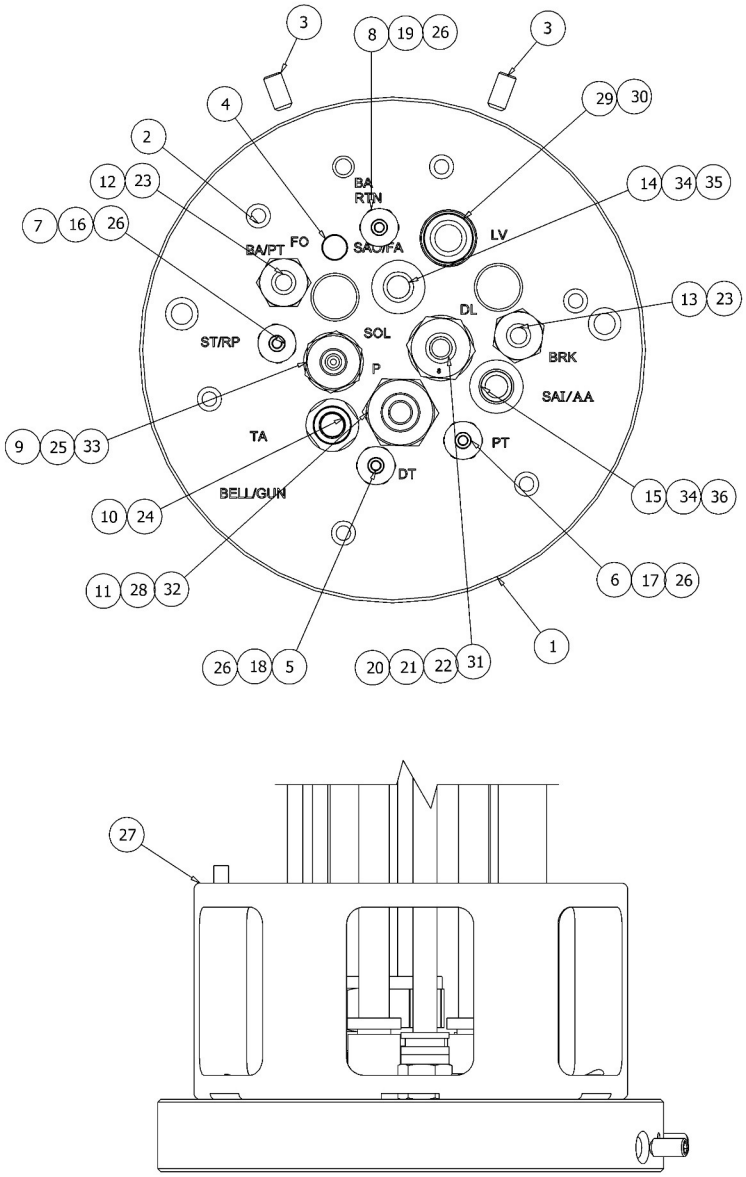


A11351-05 Cup Wash Line Assembly

NOTE -

A11351-02 - Install between valve manifold assembly and shaping air manifold.

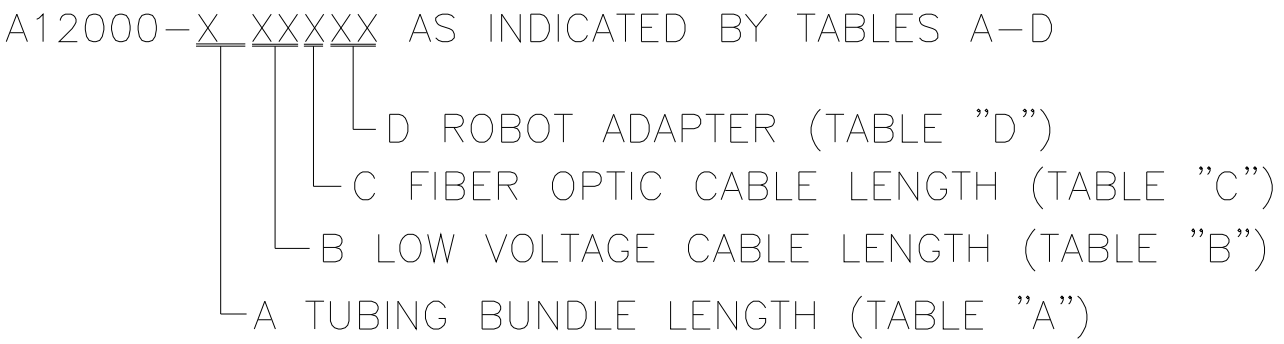
A11351-05 - Install between rear of turbine manifold and valve manifold assembly.



A12000-XXXXXX Tubing Bundle Assembly (Fractional)

A12000-XXXXXX TUBING BUNDLE ASSEMBLY (FRACTIONAL) MODEL IDENTIFICATION

When ordering, use A12000-A through D. Six (6) digits must follow the basic part number. For example:



	A121000-XXXXXX TUBING BUNDLE ASSEMBLY (FRACTIONAL) PARTS LIST				
	ITEM	QTY	PART NUMBER	DESCRIPTION	PORT LOCATION
	1	1	A11062-00	ASSEMBLY, ROBOT MOUNTING PLATE	———
8	2	6	76566-24C	SCREW, 1/4-20 X 3/4 LG. S.H.C.S.	———
	3	2	SSF-2052	SET SCREW 3/8 LG X 10-24	———
	4	1	C	FIBER OPTIC CABLE	FO
	5	A	77536-06	TUBE, 4MM OD X 2.7 MM ID (SILVER)	DT
	6	A	77536-03	TUBE, 4MM OD X 2.7 MM ID (GREEN)	PT
	7	A	77536-04	TUBE, 4MM OD X 2.7 MM ID (BLUE)	ST/RP
	8	A	77536-07	TUBE, 4MM OD X 2.7 MM ID (YELLOW)	BA RTN
	9	A	76698-01	TUBING, PFA 1/4 OD X .170 ID	SOL
4	10	6 FT.	A10608-01	TUBE, 3/8 OD X .275 ID, NYLON (GREEN)	TA
	11	A	76698-04	TUBING, PFA 3/8 OD X 1/4 ID	P
	12	A	A10609-02	TUBING, 1/4 OD X .170 ID, NYLON (YELLOW)	BA/PT
	13	A	A10609-01	TUBE, 1/4 OD X .170 ID, NYLON (ORANGE)	BRK
	14	6 FT.	A10893-04	TUBE, 8MM OD X 6MM ID, NYLON (GRAY)	SAO/FA
	15	6 FT.	A10893-07	TUBE, 8MM OD X 6MM ID, NYLON (BLUE)	SAI/AA
	16	1	77545-01	CAP, 5/32 O.D. TUBE, BLUE IDENTIFICATION	ST/RP
	17	1	77545-03	CAP, 5/32 O.D. TUBE, GREEN IDENTIFICATION	PT
7	18	1	77545-11	CAP, 5/32 O.D. TUBE, GRAY IDENTIFICATION	DT
	19	1	77545-12	CAP, 5/32 O.D. TUBE, YELLOW IDENTIFICATION	BA RTN
	20	A	A10841-02	TUBING, PFA 8MM OD X 6MM ID	DL
7	21	1	A10890-02	FITTING, 8MM ODT X 6MM IDT X 1/4 BSPT	DL
	22	1	A11063-00	INSERT, FLUID	DL
10	23	2	A12003-00	MALE CONNECTOR, 1/4 OD T X 1/8 UNIFIT	BA/PT, BRK
7	24	1	77947-00	FITTING, MODIFIED, 3/8 OD X 1/4 NPT	TA
7	25	1	A12002-00	FITTING, 1/4 ODT X 1/8 BSPT	SOL
7	26	4	77544-01	MALE CONNECTOR, 4 MM ODT X 10-32 THD.	P1T,D1T,ST,BA RTN
	27	1	D	ROBOT ADAPTER	-
7	28	1	A12001-00	FITTING, 3/8 ODT X 1/4 BSPT	P
	29	1	E	LOW VOLTAGE CABLE (QUICK DISCONNECT)	LV
	30	1	B	LOW VOLTAGE CABLE ASSEMBLY	———
9	31	1	A10895-02	INSERT, METRIC 8MM T O.D.	DL
9	32	1	77539-04	INSERT, TUBE	P
9	33	1	77539-02	INSERT, TUBE	SOL
10	34	2	A10891-03	FITTING, 8MM O.D. X 1/4 BSPT	SAI/AA, SAO/FA
	35	1	A11208-08	CAP, 8MM (GRAY)	SAO/FA
	36	2	A11208-10	CAP, 8MM (BLUE)	SAI/AA

10 APPLY 7969-03 TO THREADS AS REQUIRED

9 INSTALL TUBE INSERTS FULLY INTO TUBING BEFORE INSTALLING TUBING INTO FITTING.

8 INSTALL 76566-24C (REF) S.H.C.S. INTO ROBOT ADAPTER.

7 APPLY 7969-10 TO THREADS AS REQUIRED

6 LABEL LOOSE ENDS OF TUBING WITH SIGNAL ABBREVIATION FOR IDENTIFICATION.

5 WRAP 88010-00 ELECTRICAL TAPE AROUND ALL TUBES AND CABLES AT 2 FOOT INTERVALS.

4 TURBINE AIR LINE TO BE 6 FT. LONG

TABLE A - Tubing Assembly Length

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

NOTE

For lengths above 15 Ft., the SAI, SAO, and BRK require the next larger nominal size ID tubing. This tubing is to be supplied by User or Integrator.

Turbine air (TA) to be supplied at a maximum length of 6 Ft. User or Integrator must increase to 12mm OD tube after 6 Ft.

TABLE B - Low Voltage Cable Length

Dash No.	"B"	"E"	Description	Length
00	--	--	No Cable	--
01	A12241-15	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Hard Wire Version End at MicroPak)	15 Ft.
02	A12241-25	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Hard Wire Version End at MicroPak)	25 Ft.
03	A12241-40	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Hard Wire Version End at MicroPak)	40 Ft.
04	A12241-50	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Hard Wire Version End at MicroPak)	50 Ft.
05	A12241-75	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Hard Wire Version End at MicroPak)	75 Ft.
06	A12433-25	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	25 Ft.
07	A12433-50	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	50 Ft.
08	A12433-75	A12239-06	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	75 Ft.
09	--	A12239-25	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	25 Ft.
10	--	A12239-50	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	50 Ft.
11	--	A12239-75	Low Voltage Cable, Quick Connect to MicroPak (Quick Connect Version End to Stand-Alone Micro-Pak)	75 Ft.

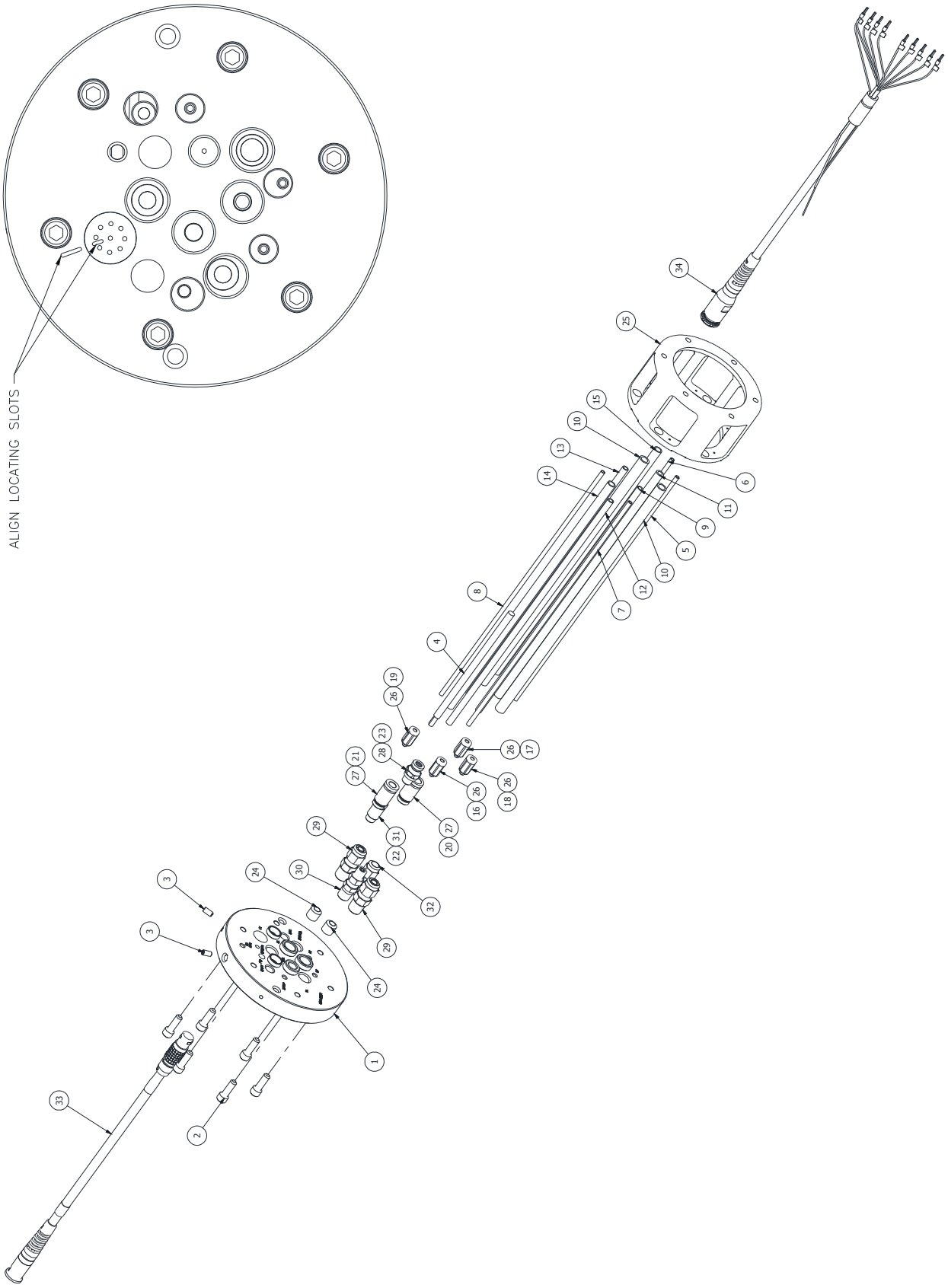
TABLE C - Fiber Optic Cable Length		
Dash No.	**Description**	**"C"**
00	Fiber Optic Cable (Not Included)	N/A
01	3 Ft. Long, Fiber Optic Cable	A12409-01
02	6 Ft. Long Fiber Optic Cable	A12409-02
03	10 Ft. Long Fiber Optic Cable	A12409-03
04	15 Ft. Long Fiber Optic Cable	A12409-04
05	25 Ft. Long Fiber Optic Cable	A12409-05
06	40 Ft. Long Fiber Optic Cable	A12409-06
07	50 Ft. Long Fiber Optic Cable	A12409-07
08	65 Ft. Long Fiber Optic Cable	A12409-08
09	75 Ft. Long Fiber Optic Cable	A12409-09
10	100 Ft. Long Fiber Optic Cable	A12409-10

TABLE D - Robot Adapter		
Dash No.	**Description**	**"D"**
0	Adapter (Not Included)	N/A
1	Adapter (Fanuc P-155, P-145, P-50)	78983-00
2	Adapter (ABB 5400, 5002)	79107-00
3	Adapter (Fanuc P-200, P-250)	79131-00
4	Adapter (Kawasaki - KE61OL)	A10847-00
5	Adapter (Motoman - PX2850)	A10848-00
6	Adapter (Motoman - PX2900)	A10849-00
7	Adapter (B & M LZ2000)	A10851-00
8	Adapter (ABB 5400 Enhanced Wrist)	A12036-00

INSTALL 76566-24C (REF) S.H.C.S. INTO ROBOT ADAPTER.

N O T E S

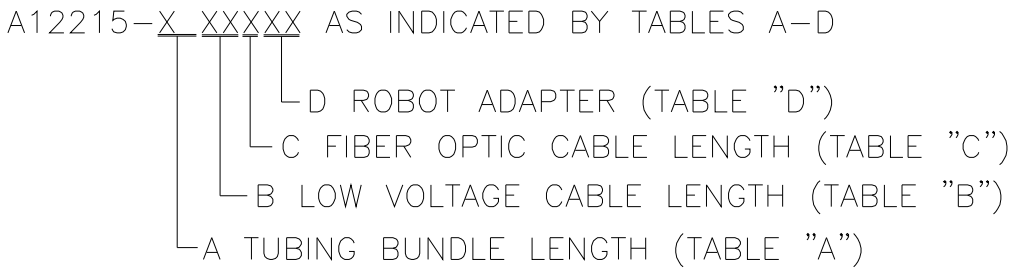
Tubing Bundle Nomenclature	
SAO	Outer Shaping Air (Outer Air)
SAI	Inner Shaping Air (Inner Air)
BA	Bearing Air Supply
BRG, RTN	Bearing Air Return
PD	Dump Trigger
DL	Dump Out
PT	Paint Trigger
P	Paint Supply
ST	Solvent Trigger
SOL	Solvent Supply
TA	Turbine Air Supply
LV	Low Voltage Cable Port
FO	Fiber Optic Cable Port
CWA	Cup Wash Air
ATI	Cup Wash Air Trigger
BRK	Brake Air
GND	Ground Cable



A12215-XXXXXX Tubing Bundle Assembly (Metric)

A12215-XXXXXX TUBING BUNDLE ASSEMBLY (METRIC) MODEL IDENTIFICATION

When ordering, use A12215-XXXXXX as indicated by Tables A through D. Six (6) digits must follow the basic part number. For example:



A12215-XXXXXX TUBING BUNDLE ASSEMBLY (METRIC) - PARTS LIST				
ITEM	QTY	PART NUMBER	DESCRIPTION	PORT LOCATION
1	1	A11062-00	ASSEMBLY, ROBOT MOUNTING PLATE	———
2	6	76566-24C	SCREW, 1/4-20 X 3/4 LG. S.H.C.S.	———
3	2	SSF-2052	SET SCREW 3/8 LG X 10-24	———
4	1	C	FIBER OPTIC CABLE	FO
5	A	77536-06	TUBE, 4MM OD X 2.7 MM ID (SILVER)	DT
6	A	77536-03	TUBE, 4MM OD X 2.7 MM ID (GREEN)	PT
7	A	77536-04	TUBE, 4MM OD X 2.7 MM ID (BLUE)	ST/RP
8	A	77536-07	TUBE, 4MM OD X 2.7 MM ID (YELLOW)	BA RTN
9	A	A10841-03	TUBING, PFA 6MM OD X 4 MM ID	SOL
4 10	A	A12211-00	TUBING, 10 MM OD X 7 MM ID NYLON NATURAL	DL/TA
11	A	76698-02	TUBING, PFA 5/16 OD X 3/16 ID	P
12	A	A10840-08	TUBE, 6MM OD X 4 MM ID (YELLOW)	BA/PT
13	15 FT.	A10840-09	TUBE, 6MM OD X 4 MM ID (ORANGE)	BRK
14	15 FT.	A10893-04	TUBE, 8MM OD X 6 MM ID (GRAY)	SAO/FA
15	15 FT.	A10893-07	TUBE, 8MM OD X 6 MM ID (BLUE)	SAI/AA
16	1	77545-01	CAP, 5/32 O.D. TUBE, BLUE IDENTIFICATION	ST
17	1	77545-03	CAP, 5/32 O.D. TUBE, GREEN IDENTIFICATION	PT
18	1	77545-11	CAP, 5/32 O.D. TUBE, GRAY IDENTIFICATION	DT
19	1	77545-12	CAP, 5/32 O.D. TUBE, YELLOW IDENTIFICATION	BA RTN
20	1	A11208-10	CAP, 8 MM (BLUE)	SAI/AA
21	1	A11208-08	CAP, 8 MM (GRAY)	SAO/FA
22	1	A11209-03	CAP, 6 MM (ORANGE)	BRK
23	1	A11209-05	CAP, 6 MM (YELLOW)	BA/PT
24	2	A11063-00	INSERT, FLUID	DL,P
25	1	D	ROBOT ADAPTER	-
7 26	4	77544-01	MALE CONNECTOR, 4 MM ODT X 10-32 THD.	P1T,D1T,ST,BA RTN
9 27	2	A10891-03	FITTING, 1/4 BSP X 8 MM ODT STRAIGHT	SAI/AA, SAO/FA
28	1	A12213-00	FITTING, MODIFIED 4MM X 6MM X 1/8 BSPT	BA/PT
7 29	2	A12209-00	FITTING, 7MM X 10 MM ODT X 1/4 BSP	DL/TA
7 30	1	A12212-00	FITTING, 4MM X 6 MM ODT X 1/8 BSP	SOL
9 31	1	A10891-02	FITTING, 1/8 BSP X 6 MM ODT STRAIGHT	BRK
7 32	1	A12210-00	FITTING, 3/16 X 5/16 ODT X 1/4 BSP	P
33	1	A12239-06	LOW VOLTAGE CABLE (QUICK DISCONNECT)	LV
34	1	B	LOW VOLTAGE CABLE ASSEMBLY	———

9 APPLY 7969-03 TO THREADS AS REQUIRED

8 INSTALL 76566-24C (REF) S.H.C.S. INTO ROBOT ADAPTER.

7 APPLY 7969-10 TO THREADS AS REQUIRED

6 LABEL LOOSE ENDS OF TUBING WITH SIGNAL ABBREVIATION FOR IDENTIFICATION.

5 WRAP 88010-00 ELECTRICAL TAPE AROUND ALL TUBES AND CABLES AT 2 FOOT INTERVALS.

4 TURBINE AIR LINE TO BE 6 FT. LONG

TABLE A - Tubing Assembly Length

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

NOTE

For lengths above 15 Ft., the SAI, SAO, and BRK require the next larger nominal size ID tubing. This tubing is to be supplied by User or Integrator.

Turbine air (TA) to be supplied at a maximum length of 6 Ft. User or Integrator must increase to 12mm OD tube after 6 Ft.

Table B Low Voltage Cable Length

DASH NO.	B	DESCRIPTION	LENGTH
00	----	N/A	---
01	A12241-15	LOW VLOTAGE CABLE- QUICK CONNECT TO MICROPAK	15 FT.
02	A12241-25	LOW VOLTAGE CABLE- QUICK CONNECT TO MICROPAK	25 FT.
03	A12241-40	LOW VOLTAG E CABLE- QUICK CONNECT TO MICROPAK	40 FT.
04	A12241-50	LOW VOLTAGE CABLE- QUICK CONNECT TO MICROPAK	50 FT.
05	A12241-75	LOW VOLTAGE CABLE- QUICK CONNECT TO MICROPAK	75 FT.
06	A12241-100	LOW VOLTAGE CABLE- QUICK CONNECT TO MICROPAK	100 FT.
07	A12241-150	LOW VOLTAGE CABLE- QUICK CONNECT TO MICROPAK	150 FT.

TABLE C - Fiber Optic Cable Length

Dash No.	Description	"C"
00	Fiber Optic Cable (Not Included)	N/A
01	3 Ft. Long, Fiber Optic Cable	A12409-01
02	6 Ft. Long Fiber Optic Cable	A12409-02
03	10 Ft. Long Fiber Optic Cable	A12409-03
04	15 Ft. Long Fiber Optic Cable	A12409-04
05	25 Ft. Long Fiber Optic Cable	A12409-05
06	40 Ft. Long Fiber Optic Cable	A12409-06
07	50 Ft. Long Fiber Optic Cable	A12409-07
08	65 Ft. Long Fiber Optic Cable	A12409-08
09	75 Ft. Long Fiber Optic Cable	A12409-09
10	100 Ft. Long Fiber Optic Cable	A12409-10

TABLE D - Robot Adapter

Dash No.	Description	"D"
0	Adapter (Not Included)	N/A
1	Adapter (Fanuc P-155, P-145, P-50)	78983-00
2	Adapter (ABB 5400, 5002)	79107-00
3	Adapter (Fanuc P-200, P-250)	79131-00
4	Adapter (Kawasaki - KE61OL)	A10847-00
5	Adapter (Motoman - PX2850)	A10848-00
6	Adapter (Motoman - PX2900)	A10849-00
7	Adapter (B & M LZ2000)	A10851-00
8	Adapter (ABB 5400 Enhanced	A12036-00

8 INSTALL 76566-24C (REF) S.H.C.S. INTO ROBOT ADAPTER.

RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS		
Part #	**Description**	**Qty**
A12895-XX *	Air Turbine Assembly	0-1
A11214-00	Rod Support	1-2
A11245-00	Fluid Tube	0-1
75911-00	Fiber Optic Transmitter Assembly	1
75921-03	Fiber Optic Cable Assembly	0-1
77367-00	Valve Seat Assembly	3-5
77524-00	Break-Away Screw, Machined	8
EMF-203-04	Front Ferrule, 1/4" OD Tubing, Fluid Coil	0-2
EMF-202-04	Back Ferrule, 1/4" OD Tubing, Fluid Coil	0-2
78278-00	Nut, Fiber Optic Transmitter	0-1
78449-00	Fitting, Fluid Coil	0-1
78949-00	Fluid Valve Assembly	3-5
A12409-XX	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
79001-04	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
79001-37	O-Ring, Solvent Proof	1-2
79001-54	O-Ring, Solvent Proof	1-2
79008-XX	Low Voltage Cable	1
79010-01	Cascade Assembly	1
LSOR0005-12	O-Ring, FEP Encapsulated	1-2
7959-24C	Screw, 1/4-20 X 3/4" Long, SHCS	4-6
SSF-2052	Set Screw, #10-32 UNC X 3/8" Long, SHCS	3
A11351-03	Cup Wash Tubing Assembly	0-1
A11351-02	Cup Wash Tubing Assembly (Front)	1-2
A11534-01	O-Ring Kit (Turbine - Exterior, 5 O-Rings)	1

*** Customer must verify spindle part number located on outer housing, see page 13.**

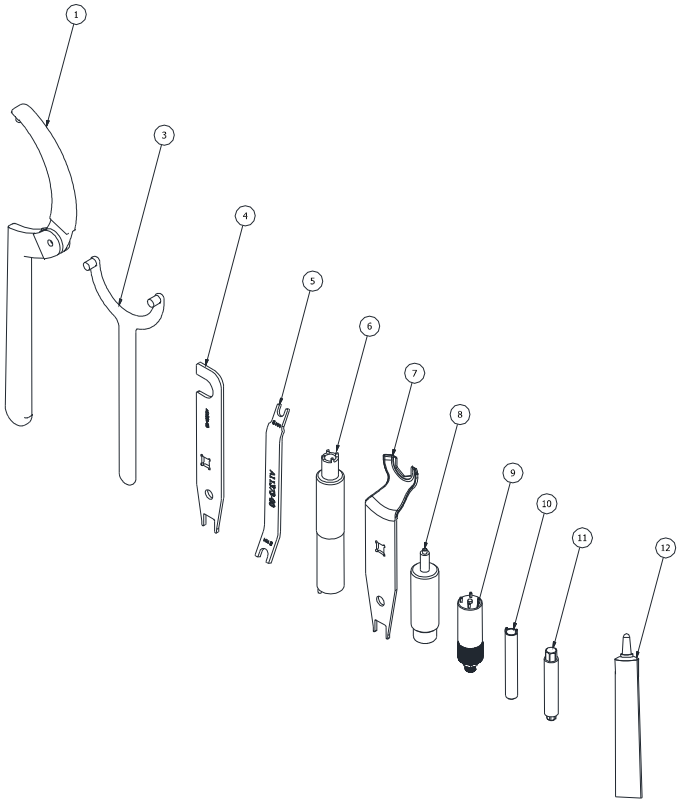
RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS (Continued)		
Part #	**Description**	**Qty**
Select Option Below - Fluid Tip Size		
A11240-01	.7mm (.028")	0-1
A11240-02	.9mm (.035")	0-1
A11240-03	1.1mm (.043")	0-1
A11240-04	1.2mm (.047")	0-1
A11240-05	1.6mm (.062")	0-1
A11240-06	1.0mm (.039")	0-1
Select Option Below - Bell Cup Assembly W/Splash Plate		
A11730-00	55mm Titanium Serrated (TISF)	1
A11730-01	55mm Titanium Non-Serrated (TIF)	1
A11783-00	55mm Aluminum Serrated (ALSF)	1
A13114-00	55mm Serrated Titanium (TISF)	1
A13114-01	55mm Titanium Non-Serrated (TIF)	1
A11968-00	30mm Titanium Serrated (TIS)	1
A11968-01	30mm Aluminum Serrated (ALS)	1
A12900-00	65mm Titanium Serrated (TISF)	1
A12900-01	65mm Titanium Non-Serrated (TIF)	1
A12900-02	65mm Titanium Serrated W/Long Life Splash Plate (TISF)	1
A12900-03	65mm Titanium Non-Serrated W/Long Life Splash Plate (TIF)	1
A12900-04	65mm Aluminum Serrated W/Plastic Splash Plate	1
A12900-05	65mm Aluminum Non-Serrated W/Plastic Splash Plate	1
Select Option Below - Bell Cup Only		
A11732-00	55mm Titanium Serrated (TISF)	1
A12522-00	55mm Titanium Non-Serrated (TIF)	1
A11782-00	55mm Aluminum Serrated (ALSF)	1
A11964-00	30mm Titanium Serrated (TIS)	1
A11964-01	30mm Aluminum Serrated (ALS)	1
A12886-00	65mm Titanium Serrated Flip Edge (TISF)	1
A12886-01	65mm Titanium Serrated (TIF)	1
A12886-02	65mm Aluminum Serrated	
A12886-03	65mm Aluminum Non-Serrated	
A13113-00	55mm Titanium Non-Serrated (TISF) One piece Cup	1
A13113-01	55mm Titanium Non-Serrated Flip Edge (TIF) One Piece Cup	1
Select Option Below - Splash Plate Assembly		
A11269-00	For 55mm Bell Cups (White)	1-2
A11954-00	For 30mm Bell Cups (White)	1-2
A12071-00	For 65mm Bell Cups (Black)	1-2
A13004-00	For 65mm Bell Cups (Black) Long Life	1-2
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
Select Option Below - Shaping Air Kit A12874-01 (55mm)		
A11244-01	Outer Shroud, 55mm	0-1
A12872-00	Shaping Air Ring, 55mm	0-1
A12078-01	Turbine Retaining Ring	0-1
LSOR0005-12	O-Ring	1
79001-11	O-Ring	1
A11253-00	Set Screw	1-2

RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS (Continued)		
Part #	**Description**	**Qty**
Select Option Below - Shaping Air Kit A12874-02 (55mm) Repulsion Ring		
A11725-01	Outer Shroud, 55mm	0-1
A12872-00	Shaping Air Ring	0-1
A11945-02	Repulsion Ring	0-1
A12078-01	Turbine Retaining Ring	0-1
LSOR0005-12	O-Ring	1
79001-11	O-Ring	1
77580-08C	Screw	3
A12253-00	Set Screw	1-2
Select Option Below - Metric Tubing Bundle A12215		
A12211-00	Tube, 10mm X 7mm, Natural	--
A10840-08	Tube, 6mm X 4mm, Yellow	--
A10840-09	Tube, 6mm X 4mm, Orange	--
A12210-00	Tube Fitting, 5mm X 8mm X 1/4" BSPT, 5/16" X 3/16"	2
76698-02	Tube, PFA, 8mm X 5m ID, 5/15" OD X 3/16" ID	--
A10841-03	Tube, PFA, 6mm X 4mm ID	--
A12213-00	Fitting, 6mm OD, Modified	1
A10891-03	Fitting, 8mm OD	1
A12209-00	Fitting, 10mm OD	1
A10893-04	Tube, 8mm X 6mm, Gray	--
A10893-07	Tube, 8mm X 6mm, Blue	--
A11063-00	Insert, Fluid, PTFE	2
77536-03	Tube, 4mm X 2.7mm, Green	--
77536-04	Tube, 4mm X 2.7mm, Blue	--
77536-06	Tube, 4mm X 2.7mm, Gray	--
77536-05	Tube, 4mm OD X 2.7mm, Natural	--
77536-07	Tube, 4mm X 2.7mm, Yellow	--
77536-01	Tube, 4mm OD X 2.7mm ID, Black	--
77544-01	Male Connector	2
EMF-103-04	Front Ferrule, 1/4" OD Tubing	0-2
EMF-1202-04	Back Ferrule, 1/4" OD Tubing	0-2
SSF-2052	Set Screw, #10-32 UNC X 3/8" Long, SHCS	3
A12212-00	Fitting, 6mm X 4mm X 1/8" BSPT, Stainless Steel	0-1
A12409-XX	Fiber Optic Cable	1

RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS (Continued)		
Part #	**Description**	**Qty**
Select Option Below - Fractional Tubing Bundle A12000		
77544-01	Male Connector, 4mm ODT X 10-32 Thd.	2
A11063-00	Insert,	2
A12399-00	Robot Mount Plate (RMA-303 Dual Purge)	0-1
A12003-00	Male Connector, 1/4" OD X 1/8" UNIFIT	0-1
77947-00	Fitting, Modified, 3/8" OD X 1/4" NPT	1
A12002-00	Fitting, 1/4" ODT X .170 IDT X 1/8" BSFT	1
SSF-2052	Set Screw, 3/8" Lg. X 10-24, Nylon, Tip	3
77536-07	Tube, 5/32" OD, Yellow	--
77535-01	Tube, 5/32" OD, Black	--
77536-03	Tube, 5/32" OD, Green	--
77536-04	Tube, 5/32" OD, Blue	--
77535-05	Tube, 5/32" OD, Natural	--
77536-06	Tube, 5/32" OD, Silver	--
A10609-01	Tubing, 1/4" OD X .170" ID, Nylon, Orange	--
A10609-02	Tubing, 1/4" OD X .170" ID, Nylon, Yellow	--
A12409-XX	Fiber Optic Cable	1
A12239-00	Low Voltage Cable, Quick-Disconnect	1
A12241-XX	Low Voltage Cable Assembly	0-1
A1068-01	Tubing, 3/8" OD X .275" ID, Nylon, Green	--
A10893-04	Tubing, 8mm OD X 6mm ID, Nylon, Gray	--
A10893-07	Tubing, 8mm OD X 6mm ID, Nylon, Blue	--
76698-01	Tubing, 1/4" OD X .170" ID, PFA	--
A10841-02	Tubing, 8mm OD X 6mm ID, T.O. PFA	--
76698-04	Tubing, 3/8" OD X 1/4" ID, PFA	--
A10890-02	Fitting, 8mm ODT X 6mm IDT X 1/4" NPT	0-1
A12001-00	Fitting, 3/8" ODT X 1/4" BSPT	0-1
A10895-02	Insert, 8mm Tube OD	1
77539-04	Insert, Tube	1
77539-02	Insert, Tube	1
A10891-03	Fitting, 8mm X 1/4" BSPT	1

RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS (Continued)		
Part #	**Description**	**Qty**
Select Option Below - Shaping Air Kit A12874-03 (30mm)		
A11967-00	Outer Shroud	0-1
A12873-00	Shaping Air Ring	0-1
A12066-01	Turbine Retaining Ring	0-1
79001-11	O-Ring	1
79001-37	O-Ring	1
79001-52	O-Ring	1
A12253-00	Set Screw	1-2
Select Option Below - Shaping Air Kit A12874-04 (30mm) Repulsion Ring		
A11967-01	Outer Shroud	0-1
A12873-00	Shaping Air Ring	0-1
A11945-00	Repulsion Ring	0-1
77580-08C	Screw	3
A12066-01	Turbine Retaining Ring	0-1
79001-11	O-Ring	1
79001-52	O-Ring	1
79001-37	O-Ring	1
A12253-00	Set Screw	1-2
Select Option Below - Shaping Air Kit A12874-05 (Mono Flex)		
A12068-01	Outer Shroud	0-1
A12083-01	Shaping Air Ring	0-1
A12078-01	Turbine Retaining Ring	0-1
79001-11	O-Ring	1
79001-37	O-Ring	1
A12253-00	Set Screw	1-2
Select Option Below - Shaping Air Kit A12874-06 (Mono Flex) Repulsion Ring		
A12068-02	Outer Shroud	0-1
A12083-01	Shaping Air Ring	0-1
A12078-01	Turbine Retaining Ring	0-1
A11945-01	Repulsion Ring	0-1
77580-08C	Screw	3
79001-11	O-Ring	1
79001-37	O-Ring	1
A12253-00	Set Screw	1-2

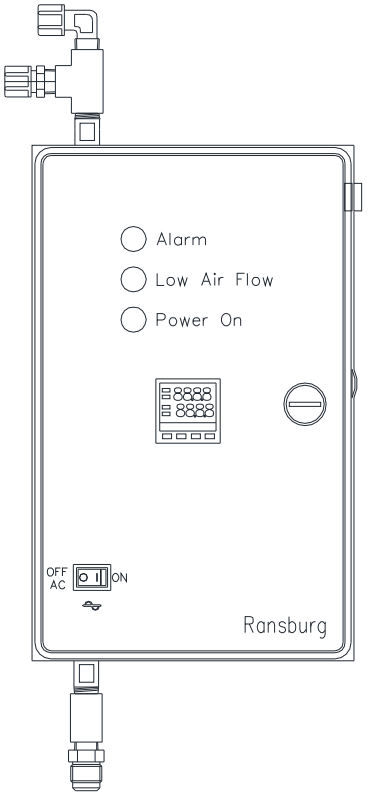
RMA-303 DIRECT CHARGE RECOMMENDED SPARE PARTS (Continued)		
Part #	**Description**	**Qty**
Select Option Below - Shaping Air Kit A12874-08 (Dual Flex)		
A12074-01	Outer Shroud	0-1
A12084-01	Shaping Air Ring	0-1
A12871-01	Inner Shaping Air Ring	0-1
A12066-01	Turbine Retaining Ring	0-1
79001-11	O-Ring	1
79001-37	O-Ring	1-2
79001-54	O-Ring	1
A12253-00	Set Screw	1-2
Select Option Below - Shaping Air Kit A12874-09 (Dual Flex Repulsion Ring)		
A12074-02	Outer Shroud	0-1
A12084-01	Shaping Air Ring	0-1
A12066-01	Turbine Retaining Ring	0-1
A12871-01	Inner Shaping Air Ring	0-1
A11945-02	Repulsion Ring	0-1
77580-08C	Screw	3
79001-11	O-Ring	1
79001-37	O-Ring	1-2
79001-54	O-Ring	1
A11253-00	Set Screw	1-2
Select Option Below - Shaping Air Kit A12874-12 (55mm Dual Flex)		
A13116-01	Outer Shroud	0-1
A13229-01	Shaping Air Ring	0-1
A12066-01	Turbine Retaining Ring	0-1
A13228-01	Inner Shaping Air Ring	0-1
A12066-01	Turbine Retaining Ring	0-1
79001-11	O-Ring	1
A11253-00	Set Screw	1-2



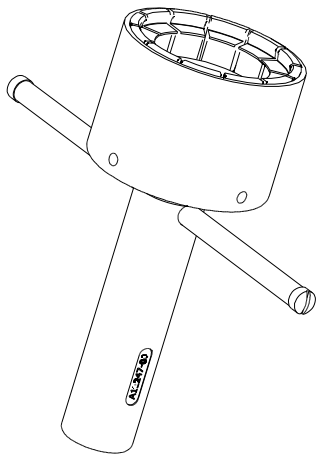
ASSEMBLY TOOL KIT	A	B	DESCRIPTION
A12090-01	1	0	55MM STANDARD
A12090-02	0	1	30 MM AND 65MM

BILL OF MATERIALS			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	76772-00	WRENCH, SPANNER
2	-	-	-
3	1	A12088-00	WRENCH, TURBINE RETAINING RING
4	A	A11284-00	BELL CUP / COMBO WRENCH
5	1	A11373-00	TOOL, TUBING REMOVAL (RMA-303 INDIRECT)
6	1	A11229-00	TOOL, FLUID TIP/TUBE REMOVAL
7	B	A12061-00	WRENCH, BELL CUP
8	1	A11388-00	TOOL, SPLASH PLATE REMOVAL
9	1	A11922-00	TOOL, VALVE REMOVAL
10	1	78279-00	TOOL, FIBER OPTIC
11	1	A10766-00	TOOL, VALVE SEAT REMOVAL
12	1	LSCH0009-00	DI-ELECTRIC GREASE, 0.88 OZ.

Assembly Tools



A11065-05 Air Heater



A12247-00 Bell Cup Tool

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 spray ability. 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	*Groove Tool, ¼" OD Tube*

SERVICE KITS	
Part #	**Description**
HAF-15	*Pre-Filter Replacement Element*
HAF-38	*Pre-Filter Replacement Element*
RPM-33	*Bearing Air Filter Element*
A11065-05	*Air Heater*
A12247-00	*Bell Cup Removal Tool*
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,)*
7969-10	*Thread Sealant (White),*

AIR FILTER / REPLACEMENT		
Ransburg Part #	**Qty. Elements Per Carton**	**Used On**
HAF-15	1	HAF-503
HAF-38	4	HAF-508
RPM-33	8	RPM-418

Changes made to LN-9266-11.3 Service Manual:

- Page 72 - Added instructions on longer fitting installation.
- Page 77 - Added instructions on longer fitting installation
- Page 85 - Added dash numbers 14 and 15 to Table “A”.
- Page 88 - Added –04 and –05 to Typical Bell Cup Parts Breakdown table
- Page 91 - Item 32 was A11351-01
- Page 95 - A11351-05 was A11351-01
- Page 104 - A11351-05 was A11351-01
- Page 105—Added A12900-04 &-05, also added A12866-02 & -05

WARRANTY POLICIES

LIMITED WARRANTY

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

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

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

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

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

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

EXCLUSIONS:

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

Ransburg

Manufacturing

1910 North Wayne Street

Angola, Indiana 46703-9100

Telephone: 260-665-8800

Fax: 260-665-8516

Technical Service — Assistance

320 Philips Ave.

Toledo, Ohio 43612-1493

Telephone (toll free): 800-233-3366

Fax: 419-470-2233

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

Form No. LN-XXXX-00
Litho in U.S.A.
07/12