Ransburg

SERVICE MANUAL
LN-9240-02.1
(Replaces LLN-9240-02.1)
January - 2013

TURBODISK 2 ASSEMBLY

MODELS: 78715

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

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

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Ransburg

SAFETY

SAFETY PRECAUTIONS

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

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

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

A NOTE is information relevant to the procedure in progress.

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

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

⚠ WARNING

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

> This manual MUST be read and thoroughly understood by ALL personnel who operate, clean or maintain this equipment! Special care should be taken to ensure that the WARNINGS and safety requirements for operating and servicing the equipment are followed. The user should be aware of and adhere to ALL local building and fire codes and ordinances as well as NFPA 33 SAFETY STANDARD, 2000 EDITION, prior to installing, operating, and/or servicing this equipment.

⚠ WARNING

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

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Spray Area 	Fire Hazard Improper or inadequate opera-tion and maintenance procedures will cause a fire hazard. Protection against inadvertent arcing that is capable of causing fire or explosion is lost if any safety interlocks are disabled during operation. Frequent power supply shutdown indicates a problem in the system requiring correction.	Fire extinguishing equipment must be present in the spray area and tested periodically. Spray areas must be kept clean to prevent the accumulation of combustible residues. Smoking must never be allowed in the spray area. The high voltage supplied to the atomizer must be turned off prior to cleaning, flushing or maintenance. When using solvents for cleaning: Those used for equipment flushing should have flash points equal to or higher than those of the coating material. Those used for general cleaning must have flash points above 100°F (37.8°C). Spray booth ventilation must be kept at the rates required by NFPA 33, 2000 Edition, OSHA and local codes. In addition, ventilation must be maintained during cleaning operations using flammable or combustible solvents. Electrostatic arcing must be prevented. Test only in areas free of combustible material. Testing may require high voltage to be on, but only as instructed. Non-factory replacement parts or unauthorized equipment modifications may cause fire or injury. If used, the key switch bypass is intended for use only during setup operations. Production should never be done with safety interlocks disabled. Never use equipment intended for use in waterborne installations to spray solvent based materials.
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, Chapter 16, 2000 edition. 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. OSHA references are Sections 1910.94 and 1910.107. Also refer to NFPA 33, 2000 edition and your insurance company requirements.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Electrical Equipment 	High voltage equipment is utilized. Arcing in areas of flammable or combustible materials may occur. Personnel are exposed to high voltage during operation and maintenance. Protection against inadvertent arcing that may cause a fire or explosion is lost if safety circuits are disabled during operation. Frequent power supply shutdown indicates a problem in the system which requires correction. An electrical arc can ignite coating materials and cause a fire or explosion.	The power supply, optional remote control cabinet, and all other electrical equipment must be located outside Class I or II, Division 1 and 2 hazardous areas. Refer to NFPA No. 33, 2000 Edition. Turn the power supply OFF before working on the equipment. Test only in areas free of flammable or combustible material. Testing may require high voltage to be on, but only as instructed. Production should never be done with the safety circuits disabled. Before turning the high voltage on, make sure no objects are within the sparking distance.
Explosion Hazard / Incompatible Materials 	Halogenated hydrocarbon solvents for example: methylene chloride and 1,1,1,-Trichloro-ethane are not chemically compatible with the aluminum that might be used in many system components. The chemical reaction caused by these solvents reacting with aluminum can become violent and lead to an equipment explosion.	Aluminum is widely used in other spray application equipment - such as material pumps, regulators, triggering valves, etc. Halogenated hydrocarbon solvents must never be used with aluminum equipment during spraying, flushing, or cleaning. Read the label or data sheet for the material you intend to spray. If in doubt as to whether or not a coating or cleaning material is compatible, contact your material supplier. Any other type of solvent may be used with aluminum equipment.
Toxic Substances 	Certain material may be harmful if inhaled, or if there is contact with the skin.	Follow the requirements of the Material Safety Data Sheet supplied by coating material manufacturer. Adequate exhaust must be provided to keep the air free of accumulations of toxic materials. Use a mask or respirator whenever there is a chance of inhaling sprayed materials. The mask must be compatible with the material being sprayed and its concentration. Equipment must be as prescribed by an industrial hygienist or safety expert, and be NIOSH approved.

AREA Tells where hazards may occur.	HAZARD Tells what the hazard is.	SAFEGUARDS Tells how to avoid the hazard.
Spray Area / High Voltage Equipment 	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 must be supported on conveyors or hangers and be grounded. The resistance between the part and ground must not exceed 1 megohm. All electrically conductive objects in the spray area, with the exception of those objects required by the process to be at high voltage, must be grounded. Any person working in the spray area must be grounded. Unless specifically approved for use in hazardous locations, the power supply and other electrical control equipment must not be used in Class 1, Division 1 or 2 locations.
Personnel Safety / Mechanical Hazards 	The disk atomizer can rotate at speeds up to 40,000 RPM. At these speeds, the edge of the applicator can easily cut into skin. Loose articles can also be caught by the rotating disk.	Personnel must stay clear of the disk whenever it is rotating. Before touching the disk, the turbine air must be shut off. If the disk has been rotating, allow at least three minutes for it to come to a complete stop before touching it.

GENERAL SAFETY GUIDELINES

- The articles being coated MUST be grounded at all times.

⚠ WARNING

> The simple safety measures outlined here are vital. Failure to observe them could cause a spark capable of starting a fire.

- All components of the applicator system (except the atomizing head) MUST be grounded at all times.
- All contact points MUST be free of any accumulation of nonconductive residue.
- All electrically conductive objects, especially solvent containers within the spray area, MUST be either removed or grounded.

Any tool, if used improperly, can be dangerous. Safety is ultimately the responsibility of those using a tool. In like manner, safe operation of electrostatic coating processes is the responsibility of those who use such processes and those who operate electrostatic coating equipment. Procedures to be followed on conducting electrostatic coating operations safely are outlined in the Ransburg brochure IL-247: "Operating Your Electrostatic Coating System Safely". Additional copies are available from Ransburg upon request. All personnel connected with coating operations should read and understand this brochure. It is most important that the equipment operators and supervisory personnel understand the requirements for safe operation.

⚠ WARNING

> If ANY symptom of improper operation occurs, suspend use of the unit until the problem has been diagnosed and corrected. See the appropriate "Troubleshooting Guide" or contact your Ransburg representative.

Additional cards summarizing these safety requirements are available from Ransburg on request. These cards should be posted in the spraying area so that they can be readily referred to and serve as a reminder to personnel in that area of responsibility. Additional copies of the sign SL-00-07: "Cleaning Safety Requirements" are available upon request.

Each user should examine his own coating operation, develop his own safety program, and ensure that his workers follow correct procedures. Ransburg hopes that the information it provides is helpful to the user in establishing such a program.

In addition to the available cards, labels, brochures, and service manuals, the user should consult other standards and recognized safety authorities. Section 1910.107 of the regulations established under the Occupational Safety and Health Act [OSHA] apply to spray finishing operations. Paragraph (i) specifically applies to electrostatic hand spraying equipment. NFPA No. 33 "Spray Application", is another standard for spray painting operations. Chapters 9, 10, and 13 are specifically applicable to electrostatic coating. Copies of NFPA No. 33 are available from the National Fire Protection Association, Batterymarch Park, Quincy, Mass. 02269 (at nominal cost).

The National Fire Protection Association also publishes standards other than NFPA No. 33 relating to the control of fire hazards. NFPA No. 33 specifically refers to the following bulletins of the National Fire Protection Association as applicable to coating operations:

NFPA No.63: Dust Explosion, Industrial Plants
NFPA No.70: National Electrical Code
NFPA No.86A: Ovens and Furnaces
NFPA No.91: Blower and Exhaust Systems
NFPA No.654: Dust Explosions, Plastics Industry
NFPA No.77: Static Electricity, also contains much useful information. Copies of these brochures will be helpful in arriving at a program for safe operation.

Local codes and authorities also have standards to be followed in the operation of your spray equipment. Your insurance carrier will be helpful in answering questions that arise in your development of spray coating procedures.

All personnel MUST read and understand the following Ransburg Safety Publications:

IL-247: Operating Your Electrostatic Coating System Safely SL-77-01: Personnel Grounding

Ransburg also suggests that all personnel read the HEW publication "Spray Painting: Good Practices for Employees", number (NIOSH) 78-178 available from the regional NIOSH office or the U.S. Government Printing Office.

NIOSH and OSHA regional offices can provide information on OCCUPATIONAL SAFETY AND HEALTH ACT, including questions on standards interpretations, voluntary compliance information, copies of the OSHA Standards, OSHA Act, Employee Rights Posting Notice and Publications.

Personnel

- All personnel should read and understand local codes, appropriate NFPA bulletins, OSHA Act of 1970, and this service manual.

- Personnel working in the spray area MUST be adequately grounded. Insulated shoes such as rubber, composition, or cork soles should NOT be worn unless an alternate grounding method is provided. (See Ransburg Bulletin SL-77-01, "Personnel Grounding".)

⚠ WARNING

> ALWAYS turn power supply OFF prior to cleaning or working on equipment.

> ENSURE that the grounding hook has been properly secured to the motor housing.

- Personnel working on applicators MUST always be sure that the high voltage is off, the rotator has stopped and that the grounding hook has been properly secured to the motor housing.

Parts

- Articles being painted MUST be grounded at ALL times. Paint MUST NEVER be permitted to accumulate on workholders, particularly on points where workholders touch conveyor. Hooks MUST be clean to ensure proper contact. It is advisable to have extra sets of workholders to enable cleaning of the sets not being used at regular intervals. Areas of hanger contact should be sharp points or edges where possible.

- All electrically conductive objects within the spray area (including spray booth, paint tank, and conveyor) MUST BE GROUNDED. This requirement applies to the solvent safety container, paint containers, wash cans, and all other objects in the area.

Ventilation

We recommend interlocking the ventilation with the spraying equipment to ensure proper ventilation when equipment is in operation. See NFPA Bulletin No. 33.

Housekeeping

- Good housekeeping is essential to safe operation. Clean-up and maintenance schedules should be established by the user, based on observations of the initial production operations. Maintenance and safety cards should be posted in clear view of the operator.

- Normal fire protection measures are required. These include proper storage of paints, solvents, and waste, plus ready access to fire extinguishing equipment. For details, consult NFPA Bulletins No. 30, 33, 70 and 77, your local fire codes, local paint equipment standards, OSHA Act of 1970, and your insurance carrier's recommendations.

Floor Covering and Masking

If it is necessary to cover booth flooring, Ransburg suggests that the user employ a material which will NOT support combustion, such as Spark Gard Grade BWA-100.

Halogenated Hydrocarbons

⚠ WARNING

> A chemical reaction, resulting in the possibility of a pressure EXPLOSION, may occur if 1,1,1-Trichloroehtane, Methylene Chloride, or other Halogenated Hydrocarbon solvents are used in PRESSURIZABLE FLUID SYSTEMS having ALUMINUM or GALVANIZED WETTED PARTS. Such an explosion could cause DEATH, serious BODILY INJURY, and/or substantial property damage. See Ransburg Bulletins:

SL-81-05: HHC Explosion Hazard Danger Sign
SL-81-08: HHC Explosion Hazard Safety Bulletin

Consult your fluid supplier to determine the chemical content of your solvents.

NOTES:

INTRODUCTION

FEATURES

Features which make the Turbodisk™ 2 Applicator advantageous for use in electrostatic applications include:

- Proven turbine motor reliability.
- Patented serrated edge conical disk provides excellent atomization quality at minimal rotational speeds.
- Aerodynamic fairing design for ease of cleaning of external surfaces.
- Speed readout (or control) uses reliable magnetic pickup for fiber-optic transmission of rotational speed data. (optional)
- A majority of all assembly components which come in contact with the fluid material are made of either stainless steel or, which is impervious to most fluids.
- Negligible maintenance down time. With the quick disconnect feature, the lower Turbodisk 2 fluid section can be exchanged in minimal time for off line maintenance.
- Quick disconnect feature allows for other fluid control assemblies to be incorporated when desired.
- The easily removable lower fairing, turbine air motor assembly, and the externally mounted regulators and fluid valves, make off line maintenance more efficient and economical.
- Control air lines are color coded for ease of identification.
- Higher fluid delivery rates can be achieved using a dual feed fluid system.
- High flow regulators and fluid valves provide for simultaneous paint push out while solvent washes the feed tube and disk.

GENERAL DESCRIPTION

The Turbodisk 2 Applicator, because of it's high rotational speed, produces finer atomization, improved quality, and higher transfer efficiency with any of the wide variety of coating materials (such as waterborne and high solids) used in production finishing operations. It's speed is controlled by varying the drive air. The applicator assembly is designed for use on vertical overhead mounted reciprocators.

Quick Disconnect

-REFER TO FIGURES 16, 17, & 26

The Turbodisk 2 Applicator is a quick disconnect design that allows the lower fluid section that carries all the fluid/ air controls to be separated from the upper section carrying the tubing supply lines. The incoming air lines, fluid lines, high voltage cable, and fiber optic cable are connected to the fittings provided on the upper fixed bulkhead plate. Each bulkhead plate (upper and lower) utilizes special male and female fittings with o-rings that seal the fluid and air line passages when both sections are assembled together. Two latching mechanisms have been incorporated into the design allowing the lower section to be supported while the operator tightens or loosens the retaining screws that hold the upper and lower sections together. Alignment arrows engraved into the side of the bulkhead plates provide for quick visual assembly orientation.

Conical Disk Assembly

The Turbodisk 2 Applicator uses conical disk assemblies that are made from high grade aluminum construction and are force balanced to .10 grams•in or better. With the patented serrated edge, these disks come in sizes of 6, 9, and 12 inch diameters.

Turbodisk 2 Fairing
-REFER TO FIGURE 24

The Turbodisk 2 Applicator fairing is required for safe operation. The two piece fairing provides high voltage isolation from the metal rotator assembly and valve components, as well as ease of cleaning and maintenance. Provided on the fairing are (4) draw latches which allow for easy on/off removal of the lower fairing.

WARNING

> Both sections of the fairing to be in place when the Turbodisk 2 is in operation or when high voltage is supplied to the applicator.

Paint Valve Options
Four paint valve options in single or dual feed applications are available:

- No Valves (refer to Figures 7,12,18)
- 3-Way On/Off Valve (refer to Figures 8,13,19)
- Trigger and Dump Valve with High Flow Regulator (refer to Figures 9,14,20,25)
- Trigger and Dump Valve with Low Flow Regulator (refer to Figures 10,15,21,22,25)

Power Supply and Controls
In the system, the high voltage is supplied to the Turbodisk 2 by either the MicroPak™ Industrial power supply system or a Voltage Master™ series power supply.

The MicroPak Industrial power supply uses proven high voltage generator technology that is microprocessor controlled for diagnostics and communication. The controller is packaged in standard rack mounted Eurocard format for easy access and system integration.

The Voltage Master™ power supplies are general purpose heavy duty power supplies with years of proven reliability. They have variable voltage control, many safety features, and remote analog voltage control capabilities.

SPECIFICATIONS

Mechanical

Turbine Speed:	Variable to 40,000 rpm max. (6" conical disk)
Turbine Type:	Ball Bearing
Weight:	57 lbs. (approximately)
Length:	36 in.
Diameter:	13.25 in.
Turbine Air:	At max. speed (40krpm), requires 103.1 psi and 61.1 scfm, unloaded (see Figure 1)
Fluid Pressure Inlet:	See Figure 4
Single Fluid Flow Range:	
Waterborne:	To 1,200 cc/min.
Solvent Base:	To 1,500 cc/min.
High Solids:	To 1,000 cc/min. (80%+)
Air Inlet Trigger/ Dump:	70-100 psi
Air Pilot for Fluid Pressure:	See Figure 4

Electrical

Power Supply or Type:	MicroPak™ Industrial Voltage Master™
Charging Method:	Direct
Input Voltage:	0-100 kV
Turbine Speed Control or Monitor:	PulseTrack™ (Optional)

NOTES:

TYPICAL SPEED CHART (RPM's)

-REFER TO FIGURES 1 & 23

The following represents data collected under lab conditions. Flow meters were installed on each of the two 3/8 I.D. heated air lines used to supply the Turbodisk 2 turbine motor. The airflow through each flow meter was recorded and added together to obtain the total air flow through the system. The speed of the disk was monitored through the means of a PulseTrack™ system. The air heater was set at 120 degrees during all data collection.

Rotational speeds are unloaded and can be expected to drop 20 to 30% when under a fluid load condition. Heated turbine air increases efficiency of motor up to 10%. This chart should be used as a guide ONLY. Speeds will vary due to rotator wear, tubing size or lengths, etc.

NOTE

> Never run disk over it's maximum safe operating speed.

TYPICAL SPEED CHART - 10 HOLE ORIFICE PLATE

6" Conical Disk					
Disk Speed (RPM)	Supply Air Pressure (PSI)	Air Flow #1 (SLPM)	Air Flow #2 (SLPM)	Total Air Flow (SLPM)	Total Air Flow (SCFM)
5,000	6.6	140	100	240	8.5
10,000	10.5	190	140	330	11.7
15,000	18.2	260	200	460	16.2
20,000	27.8	340	260	600	21.2
25,000	40.4	440	350	790	27.9
30,000	56.3	560	460	1,020	36.0
35,000	76.4	730	610	1,340	47.3
40,000	103.1	930	800	1,730	61.1

9" Conical Disk					
Disk Speed (RPM)	Supply Air Pressure (PSI)	Air Flow #1 (SLPM)	Air Flow #2 (SLPM)	Total Air Flow (SLPM)	Total Air Flow (SCFM)
5,000	11.3	200	140	340	12.0
10,000	26	330	250	580	20.5
13,000	39.5	430	340	770	27.2
16,000	55.4	560	460	1,020	36.0
19,000	79.8	760	640	1,400	49.4
22,000	102	930	800	1,730	61.1

12" Conical Disk					
Disk Speed (RPM)	Supply Air Pressure (PSI)	Air Flow #1 (SLPM)	Air Flow #2 (SLPM)	Total Air Flow (SLPM)	Total Air Flow (SCFM)
2,000	8.7	170	120	290	10.2
4,000	18.6	270	200	470	16.6
6,000	31.0	370	290	660	23.3
8,000	48.3	500	400	900	31.8
10,000	68.5	670	560	1,230	43.4
12,000	95.8	880	750	1,630	57.6
12,500	102.0	930	780	1,710	60.4

Figure 1: Typical Speed Chart - 10 Hole Orifice Plate

INSTALLATION

EQUIPMENT

This system should be installed by, or under the supervision of an Ransburg representative. Should the need arise to replace any component assembly within the system, contact your Ransburg representative.

This manual concerns normal operation, maintenance, and service of the specified applicator assemblies. The air and fluid connections vary with different models and installations. This manual deals primarily with those at, or within the assembly.

AIR CONTROL

-REFER TO FIGURE 2

Air control of the applicator is from a standard Ransburg air logic panel, which includes two filters (one 40 micron filter located at the air logic station and one 5 micron filter located at the inlet of the in-line air heater panel). Clean, dry factory air must be provided to the inlet filter of the air logic station via a minimum 1/4-inch I.D. pipe and to the inlet filter of the heater panel via a minimum 3/4-inch I.D. pipe.

MOUNTING

-REFER TO FIGURE 17 & 24

The Turbodisk 2 assembly is mounted on the reciprocator using (4) 5/16-18 screws provided on the ram flange. Loosening (2) 1/4-20 screws on the same ram flange will allow the assembly to rotate. Position the Turbodisk 2 assembly so that the strain relief boot is positioned toward the incoming fluid and air lines and retighten.

Remove lower fairing by releasing the (4) quick release draw latches. Thread all the required air, high voltage, fiber optic, and fluid service lines through the strain relief boot. The strain relief boot may have to be cut larger in order to feed all the lines through. Refer to the 78718 assembly/schematic diagram for connection reference to upper bulkhead plate.

Reinstall lower fairing. Install conical disk and torque to 50-60 lb•in.

INTERLOCKS

Flow of coating material should be locked out unless all of the following conditions are met:

1. Booth exhaust is turned on.
2. The turbine is spinning.
3. High voltage is on or in the bypass mode.

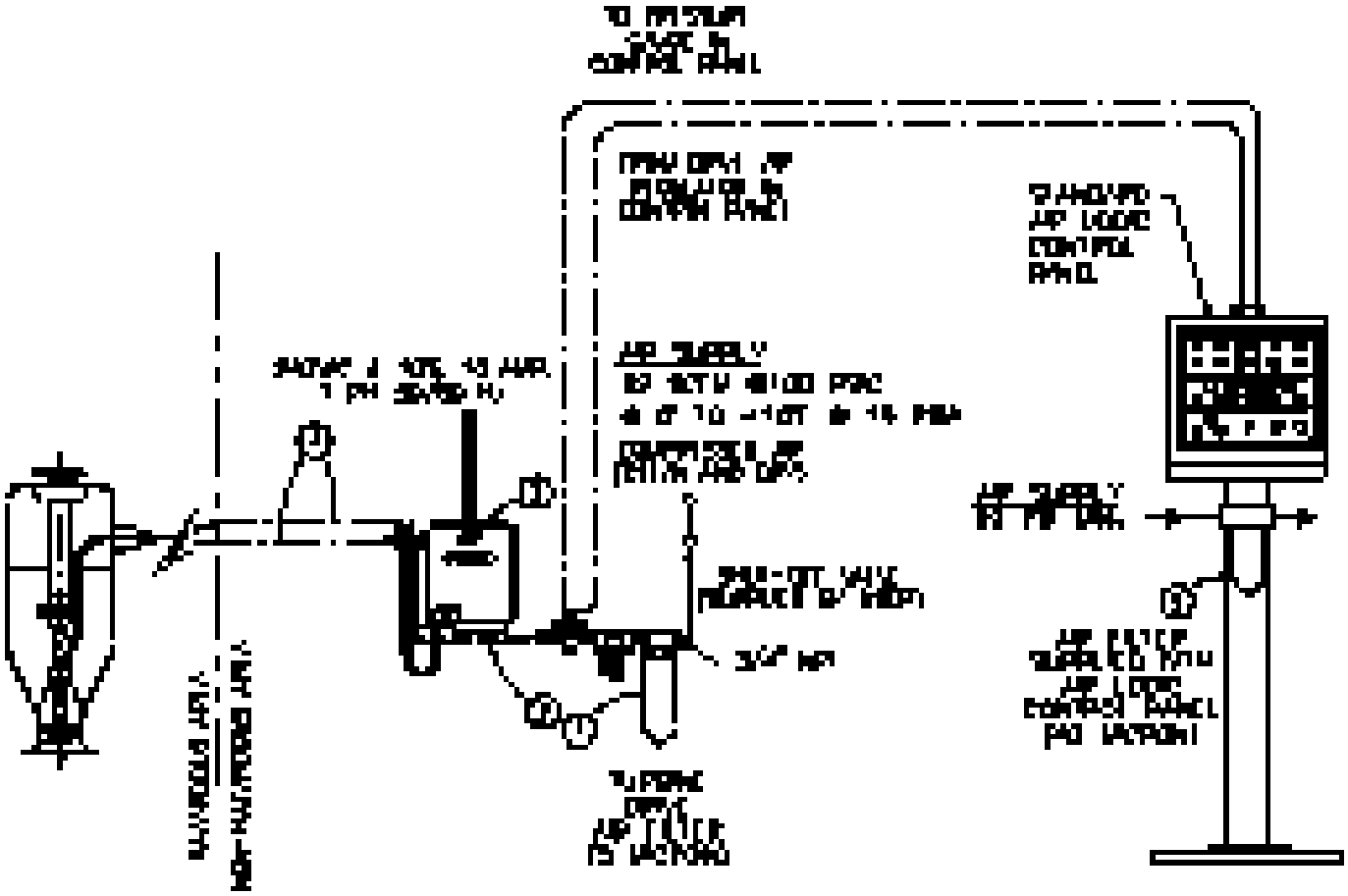

Figure 2: Typical Turbodisk 2 Drive Air System and Air Logic Control Panel

TYPICAL TURBODISK 2 DRIVE AIR SYSTEM & AIR LOGIC CONTROL PANEL - PARTS LIST (Figure 2)			
Item #	Part #	Description	Qty
1	78170-00	Regulator Assembly, Turbodisk 2 Drive Air (Includes the Following:)	1
	SSP-6439	Elbow, 1/4 O.D. Tube x 1/4 NPT Male Swivel	2
	SSV-8221	Regulator, 1/2 NPT Ported, Air Piloted	1
	7819-16	Nipple, 1/2 NPT x 1.5 Long, Brass Pipe	1
	LS0147	Regulator, 1" Ported, Manual Adj. Air, 0-125 psi, 250 CFM	1
	7596-12	Bushing, 1" NPT x 1/2 NPT, Brass	1
	GA-316	Gauge, 0-160 psig, 1/4 NPT, Air	1
	41-FP-1021	Nipple, 1" NPT x 3/4 NPT, Hex Reducing	1
	HAF-503	Air Filter, 3/4 NPT	1
2	78166-00	Hose Assembly, Compressed Air (Includes the Following:)	1
	78164-00	Hose, 3/4" I.D., Push-Loc Air	5 ft.
	78165-00	Fitting, Female SAE 45° Swivel x 3/4" I.D. Hose	2
3	20222-00	Air Heater Assembly	1
4	78176-01	Tubing, 1/2" O.D. x .375" I.D., Green Nylon	To Suit
5	SSM-5805	Air Filter, 1/4 NPT	1

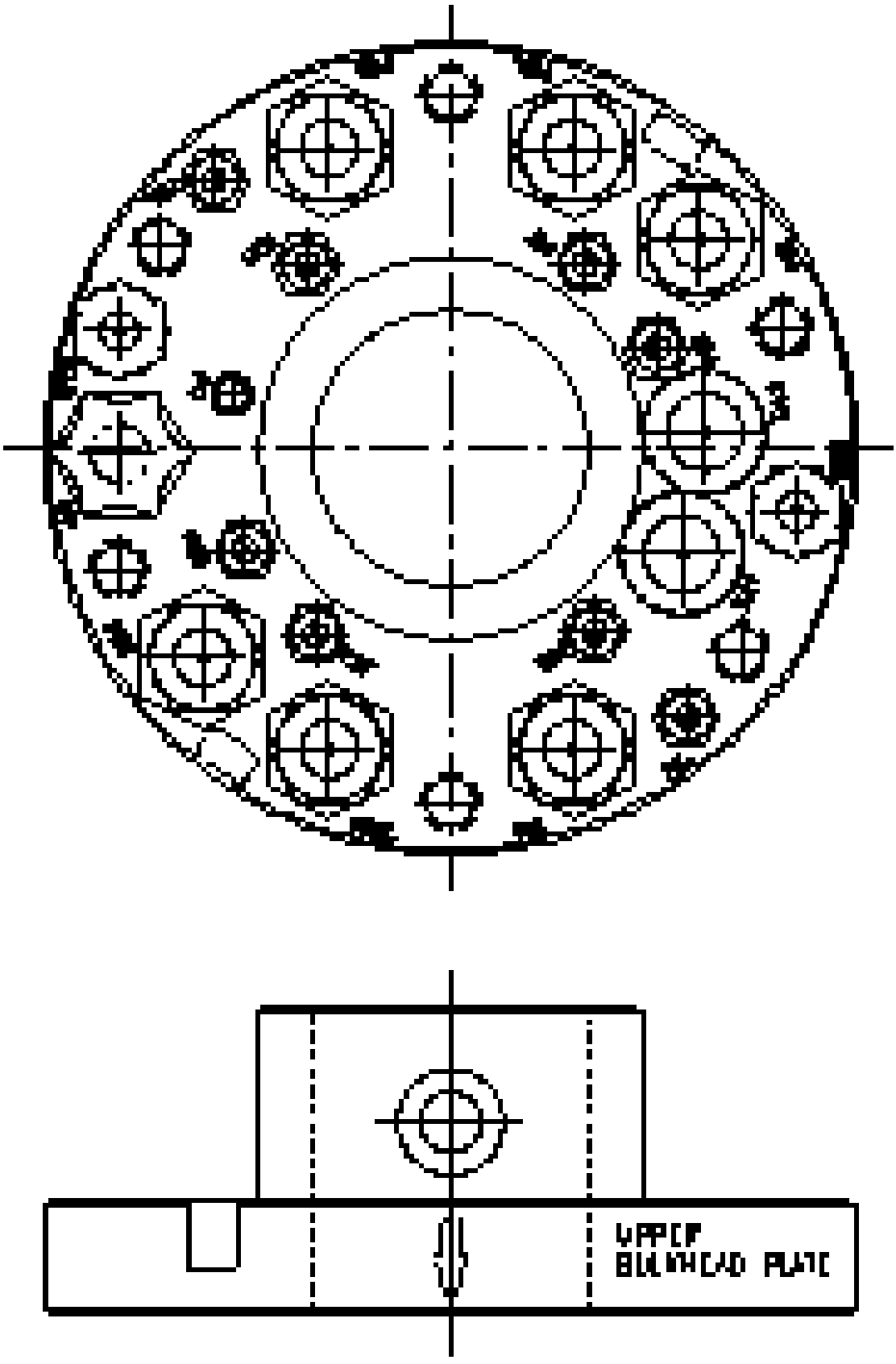

Figure 3a: Upper Turbodisk 2 Bulkhead Plate (Reference Figure 26)

TURBODISK 2 SIGNAL/PORT IDENTIFICATION TABLE (Figure 3b)		
Designation as Marked on Bulkhead	Description	Tubing Color
F.O	Fiber Optic Cable	Natural
HV	High Voltage Cable	Natural
P1D	Paint #1 Dump	Red
P1DL	Paint #1 Dump Line	Natural
R1H	Regulator #1 High	Orange
R1L	Regulator #1 Low	Yellow
P1S	Paint #1 Supply Line	Natural
P1R	Paint #1 Return Line	Natural
P1T	Paint #1 Trigger	Green
P2D	Paint #2 Dump	Black
P2DL	Paint #2 Dump Line	Natural
R2H	Regulator #2 High	Silver
R2L	Regulator #2 Low	Blue
P2S	Paint #2 Supply Line	Natural
P2R	Paint #2 Return Line	Natural
P2T	Paint #2 Trigger	Natural
S1.IN	Solvent #1 Supply	Natural
S2.IN	Solvent #2 Supply	Natural
T.A1	Turbine Air #1	Green
T.A2	Turbine Air #2	Green

Figure 3b: Turbodisk 2 Signal/Port Identification Table

OPERATION

CAUTION

> Fluids and lubricants used in this system must contain NO silicones!

> Do NOT operate the unit without an atomizer disk! Without a disk, overspeed, resulting in premature bearing failure, is possible.

> The air supplied to the motor must be dry, clean and free of oil or moisture. The atmospheric dew point should be 10°F or less. The air heater used should be adjusted only high enough to prevent condensation from forming on the motor housing or at the exhaust port.

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, Chapter 16).

As with any spray finishing system, operation of the Turbodisk 2 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:

- Fluid Type
- Fluid Flow Rate
- Turbine Speed
- Electrostatic Voltage
- Target Distance

COATING MATERIALS

The Turbodisk 2 can be used with a broad range of coating material conductivities. However, with waterborne paints, it may be necessary to isolate the paint supply from ground.

WARNING

> Isolated fluid supplies using either waterborne or highly conductive solvent base coatings can produce hazardous high voltage discharges which can cause fires or injury to personnel.

FLUID FLOW CONTROL

-REFER TO FIGURES 19-22

Fluid flow control is dependent on the valve configuration of the Turbodisk 2. If the Turbodisk 2 is configured with no valves or a 3-way valve, fluid flow is controlled externally at the paint source. If the Turbodisk 2 is equipped with a regulator, fluid flow can be controlled via the air pilot signal. The high flow and low flow regulators each have procedures on how to control and deliver consistent fluid flows. For more information on controlling the fluid delivery using regulators, refer to that specific manual which is included with the system.

To check fluid flow rates, the disk must be removed. See the maintenance section for removal procedure. The fluid can then be manually triggered to measure actual flow in a graduated beaker over a specified time period.

WARNING

> Danger of shock and/or personal injury can occur. Proper grounding procedures, which are outlined in the Ransburg safety bulletins, must be followed. Personnel must never work near or perform work on the turbine when the turbine is spinning or when high voltage is on.

FLUID VALVE CONTROL

Trigger and Dump

-REFER TO FIGURES 4 & 25

The fluid valves in the Turbodisk 2 are actuated by an air signal. The air pressure must exceed 70 psi to assure proper actuation of the valve. Applying air to the valve actuator turns on the fluid flow for that valve.

The trigger valve controls the paint flow to the disk. When actuated, paint flows through the valve to the fluid tube. The disk should be spinning at a RPM speed that is fast enough, (that when fluid is turned on) to enable the fluid to flow through the disk paint passage holes 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 flow to the disk at the prescribed input pressure.

FLUID & AIR PRESSURE REQUIREMENTS

-REFER TO FIGURE 4

Fluid and air pressure requirements are dependent on the fluid trigger valve configuration.

	No Valves 78718-01 thru -10	3-Way ON/OFF (18283) 78718-11 thru -20	Trigger/Dump w/High Flow (70171-04) Regulator 78718-21 thru -30	Trigger/Dump w/Low Flow DR-1 (74151) Regulator 78718-31 thru -xx
Air Pilot Fluid Regulator	----------	----------	100 psi max.	100 psi
Air Inlet Trig/ Dump Valve	----------	120 psi max.	70-100 psi	70-100 psi
Fluid Inlet Pressure	----------	300 psi max.	80-100 psi max.	80-100 psi max.
Solvent Inlet	----------	30-60 psi max.	30-60 psi max.	30-60 psi max.

Note: Trigger/dump valves (CCV-403-SS) are rated to 300 psi maximum inlet fluid pressure but are limited to the lower pressure limit of the fluid regulators.

Figure 4: Turbodisk 2 Fluid & Air Pressure Requirements

TURBINE SPEED

Turbine speed is determined by the drive air pressure at the rotary atomizer and fluid flow rate.

Turbine speed can be closed loop controlled using the fiber optic speed transmitter mounted at the back of the turbine rotator assembly as a speed input to remote speed controls such as the PulseTrack.

NOTE

> The disk rotational speed determines the quality of atomization and can be varied for different flow rates and viscosities. For optimum transfer efficiency and spray pattern control, the disk rotational speed should be set at the minimum required speed to achieve proper atomization. Excessive speed reduces transfer efficiency!

⚠ WARNING

> Do not exceed the maximum rated speed of 40,000 RPM for the 6 inch conical disk and 27,000 RPM for the 6 inch uni-disk.

Atomizers

-REFER TO FIGURE 5

⚠ WARNING

> Never operate any disk atomizer in excess of it's maximum rated speed ("K" number) as listed in the service manual. Excessive speed may cause the disk to disintegrate, causing serious damage and/or injury.

All atomizers manufactured after April 6, 1982, bear a “K” number. That number indicates the maximum safe rotation speed for that series in tens of thousands. For example:

9K = 9,000 RPM maximum safe speed,
40K = 40,000 RPM, etc.

If you have an atomizer that does not have a “K” number, contact your Ransburg representative for its maximum safe operating speed.

TYPICAL MAXIMUM SAFE OPERATING SPEEDS

Atomizer Disk	Part Number	Max. RPM
6" Uni-Disk	19830-06	27,000
8" Uni-Disk	19830-08	23,000
10" Uni-Disk	19830-10	15,000
12" Uni-Disk	19830-12	15,000
6" Conical	20485-62	40,000
9" Conical	20485-92	25,000
12" Conical	20485-12x	20,000

Figure 5: Typical Maximum Safe Operating Speeds

ELECTROSTATIC VOLTAGE

In the system, the high voltage is supplied to the Turbodisk 2 by either the MicroPak Industrial power supply system or Voltage Master series power supplies.

The MicroPak Industrial power supply uses proven high voltage generator technology that is microprocessor controlled for diagnostics and communication. The controller is packaged in standard rack mounted Eurocard format for easy access and system integration.

The Voltage Master power supplies are general purpose heavy duty power supplies with years of proven reliability. They have variable voltage control, many safety features, and remote analog voltage control capabilities.

TARGET DISTANCE

The distance between the Turbodisk 2 and the target will affect the finish quality, penetration and efficiency. Closer distances give wetter finishes and greater efficiency, while greater distances give drier finishes. The recommended normal disk edge to target range is 12 inches minimum for optimum performance.

NOTES:

MAINTENANCE

GENERAL

Verify daily that the operating parameters have not varied dramatically. A sudden change or even a gradual decay in performance could be early indications of component failure.

Normal maintenance procedures should be established and recorded at the initial start-up. All maintenance schedules are subject to variation based on use. Periodically review these maintenance schedules as equipment ages and needs change.

CLEANING PROCEDURES

⚠ WARNING

> Electrical shock and fire hazards can exist during maintenance. The power supply must be turned off before entering the spray area. Spray booth fans should remain on while cleaning with solvents.

> Never touch the disk atomizer while it is spinning. The edge of the disk can easily cut into human skin, gloves or other materials. Be sure the disk atomizer has completely stopped spinning before attempting to touch it. Approximate time for the disk to stop spinning after turning off the drive air is about three minutes.

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 Turbodisk 2 assembly in solvent or other liquids. Turbine components will be damaged.

> Do not soak the disk in solvent longer than 24 hours.

Internal Fluid Path Cleaning

With the high voltage turned off and the disk spinning, flush cleaning solvent through the incoming paint line or through the solvent inlet line. If it is desired to clean just the face of the disk off, flush solvent through the solvent inlet. If a color change is required, flush the entire system. The spinning disk will atomize the solvent and clean out the disk passages. If equipped, trigger the dump valve to catch the wasted paint from the incoming line, then flush the disk with solvent after closing the dump valve.

NOTE

> Solvent flushing of the system (except during color change) should be done with the disk dismounted and with waste solvent collected in a grounded container.

External Atomizer Surface Cleaning

WARNING

> To reduce the risk of fire or explosion, OSHA and NFPA 33 require that solvents used for exterior cleaning, including disk cleaning and soaking, be nonflammable (flash points higher than 100°F/37.8°C). Since electrostatic equipment is involved, these solvents should also be nonpolar. Examples of nonflammable, nonpolar 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 Turbodisk 2.

> Never lower the Turbodisk 2 assembly into a drum for flushing or color changing.

Disk Cleaning

Normally, the internal cleaning instructions will suffice to clean the disk. If flushing the disk does not remove all the residue, the disk may be removed for hand cleaning. Unscrew mounting nut and remove the disk by using the supplied disk puller.

Inspection of the disk is required to determine if wear to the serrated edge or damage has occurred. Wear can cause a reduction in transfer efficiency and excessive paint wrap on the atomizer fairing.

NOTE

> The turbine shaft must be held with a 7/16" open end wrench while using the disk puller.

WARNING

> Do not hold disk edge during removal. This could result in injury.

Clean the disk by soaking in an appropriate solvent to loosen paint residue. Do not soak for more than a 24 hour period. Use a soft cloth to remove the paint from the surface and a soft bristle brush to remove paint from the well area. The splash plate may need to be removed to clean the paint well. The screws must be retorqued to 24 lb•in after cleaning.

Reinstall the disk and torque the mounting nut to 50-60 lb•in.

WARNING

> Do not attempt to clean the disk edge while it is rotating. Do not attempt to slow down or stop the disk by holding a rag or a gloved hand against the edge. This could cause physical harm and/or damage to the disk.

CAUTION

> Do not use abrasive materials which will scratch or damage the disk. Cleaning pads such as Scotch-Brite® should not be used.

> Using an atomizer disk with paint buildup may cause an imbalance. This may result in bearing damage and turbine failure. This condition may also stress the disk when operating at high speeds.

> Before reinstalling the disk onto the shaft, check and clean the tapered mating surface for paint residue.

> Care must be taken when mounting the disk assembly to the motor shaft. The mounting nut should turn freely for several turns until it fully bottoms on the disk assembly.

VIBRATION NOISE

If the Turbodisk 2 is vibrating or making an unusual loud noise, it may mean that there is an unbalanced situation or a bearing failure. The disk could have dried paint or could be damaged. This situation should be corrected immediately. Do not continue to operate a noisy turbine.

WARNING

> If a disk has been mishandled or there appears to be damage on the face, DO NOT USE. Serious injury can result from rotating a defective disk. If there is a concern about the condition of a disk, please return it to Ransburg for evaluation.

TURBINE REPAIR & REBUILD

-REFER TO FIGURE 27

Turbine field repair or rebuild only after factory warranty expires. Any attempt to disassemble turbine during warranty period will void the warranty.

VALVES & REGULATORS

-REFER TO FIGURES 19, 20, 21, & 22

No maintenance is normally required on the valves or regulator other than flushing with solvent daily. Visual inspections should be made on the valves and regulator on a weekly basis. Should the valve or regulator not function properly, refer to the individual manuals for troubleshooting and repair procedures.

PREVENTIVE MAINTENANCE

Before any shutdown or maintenance, the fluid system should be thoroughly flushed. All cleaning should be done with a minimum of the appropriate clean solvent and clean, soft, lint free rags or soft brushes where indicated.

WARNING

> Do not stop disk rotation by using a rag or gloved hand.

> Make sure high voltage is off before approaching applicator.

> Follow proper grounding procedures.

CAUTION

> Because of the hazard of bearing penetration, solvents should be used sparingly. They should never be hosed directly onto the atomizer, motor housing or fiber optic juncture.

Daily Maintenance

WARNING

> Personnel working on applicators MUST always be sure that the high voltage is off, the fluid system is flushed and off, the rotator has stopped, and that the grounding hook has been properly secured to the motor housing.

- Clean the atomizer disk, motor housing, fairing, and as needed, the peripheral equipment with nonpolar high flash point solvents.

- To prevent solvent penetration beyond the slinger, a minimal air pressure of 5 to 10 psi should be applied to the motor in order to maintain a positive pressure. The motor should be run at operating speed for several minutes after cleaning to keep any solvent that has accumulated at the seals from penetrating into the motor housing.

- Inspect the disk edge and face. If damage exists, DO NOT USE. Return it to Ransburg for evaluation.

- Check the fluid feed tube to make sure it is not rubbing the disk.

Weekly Maintenance

- Follow the normal daily maintenance schedule, then:

- Monitor rotational speed at the control and verify it is within 5% of target speed.

- Monitor high voltage output indicated on the power supply display. Verify with high voltage probe and meter.

- Remove fairing and clean all internal components: valves, regulators, and tubing. Check tubing for evidence of pin-holes, kinks, and abrasions.

- If the muffler needs to cleaned (item is to be solvent cleaned) remove it from the motor. Clean and dry the muffler before reinstalling it.

- Check fluid flows by removing the disk and manually triggering the paint valve. Measure the amount of fluid in a graduated beaker over a specific time to determine flow rate.

- Clean and inspect the disk face. Look for wear, which can cause poor transfer efficiency and excessive paint wrap on the atomizer fairing. Disk removal, cleaning and inspection may be done more or less frequently, depending upon use.

DISASSEMBLY PROCEDURES

Prior to disassembly, verify the following:

- The atomizer disk, valves and regulator have been flushed with solvent and purged dry with air.

- The disk has stopped rotating.

- The air supply to the trigger valves and regulator have been turned off.

- The fluid and solvent supply have been turned off and the pressure has been relieved.

- The high voltage has been turned off and the motor housing grounded.

Turbine Cartridge Exchange

-REFER TO FIGURE 27

Removal

1. Remove disk mounting nut by holding the rotator shaft above the disk with a 7/16" open end wrench and unscrewing the mounting nut with a 3/8-inch wrench.

2. Install the Ransburg 19850-00 disk puller into disk to remove it.

3. Unlatch the four fairing draw latches and carefully remove lower fairing.

4. The lower fluid section of the Turbodisk 2 Applicator, containing the turbine cartridge, may now be disconnected for continued off line removal procedures through means of the "quick disconnect" feature incorporated into the unit.

WARNING

> Handle the disk with caution. The sharp edge can cut even though it is not rotating.

With a 5/16-inch wrench, loosen the six captive retaining screws used to hold the upper and lower sections together. Note: As the last screw releases, the lower unit will drop only enough to allow for the bulkhead plates to be separated. The two latching mechanisms on the bulkhead plates will hold the unit in place until the operator is ready to move the lower section to a proper work place.

5. Once the lower fluid section is placed in a stationary condition, the removal of the cartridge can be continued.

6. Next remove screws holding the fluid tube assembly.

7. With a 7/64-inch wrench, remove six socket head cap screws, which secures the turbine cartridge to the motor housing.

8. Using a 1/16-inch wrench, turn each of the three jack screws, located next to socket head cap screw, clockwise not more than one half turn at a time in sequence to separate the motor from the housing.

⚠ CAUTION

> Failure to perform this step correctly may result in misalignment and possible damage.

> Use caution in removing cartridge to prevent it from falling out of the housing.

Installation

Always check the inside of the motor housing and clean, if required, with a minimum amount of an appropriate cleaning solvent and a soft cloth.

1. Using a 1/16-inch wrench, retract the three jack screws.

⚠ CAUTION

> Lightly lubricate o-rings with petroleum jelly before assembly. Fit parts with o-rings very carefully. They must not be allowed to distort, unseat or break.

2. With o-rings in place on the nozzle plate and housing, insert the turbine cartridge into motor housing.

3. Secure the rotator assembly to the housing with six socket head cap screws. Tighten the screws in sequence until the cartridge is fully engaged into the housing to prevent misalignment and possible damage. Torque to 10 lb•in.

4. To avoid losing the jack screws during normal operation, torque to 2-3 lb•in.

Turbine Cartridge Service

This cartridge is a precision instrument and should be handled with care. The bearings are preloaded to 30 pounds and dynamically balanced to 0.01 grams•in or better.

NOTE

> Bearings used in this cartridge contain special grease that is available exclusively to Ransburg. The purchase of replacement bearings from sources other than Ransburg is not recommended.

Turbine field repair or rebuild ONLY after factory warranty expires. Any attempt to disassemble turbine during the warranty period will void the warranty.

Disassembly

-REFER TO FIGURE 28

1. After turbine cartridge has been removed from housing, secure the rotating assembly by inserting a 1/4-inch wrench, which may be secured in a vise for this procedure, in the hex socket at the rear end of shaft and remove slinger with a spanner wrench.

2. With the 1/4-inch wrench still inserted in the hex socket at the rear end of shaft, remove hex nut using a 15/16-inch box end wrench.

3. Secure a wheel puller tool to turbine rotator. Rotate the center screw of the tool until the rotor is free of the shaft. Remove key.

4. Using a 5/64-inch wrench, remove the six flat head socket screws which secure bearing retainer to bearing housing. Remove the retainer.

5. Support bearing housing, front face down, on two parallel supports on the arbor press table. Press shaft from the housing. Remove spacer from the shaft.

⚠ CAUTION

> The space between the supports must be greater than the outside diameter of front bearing.

6. On the arbor press table, support the assembled shaft/bearing, front end down, on the two parallel supports. With the bearing faces resting on the supports, press the shaft free of the bearing.

7. Remove rear bearing, spring, spring retainer (wave spring washer, and shims in some older models instead of spring and spring retainer), and bearing spacer from bearing housing. It may be necessary to press the bearing from the housing using a wood or plastic rod or tool handle inserted through the bore from the front.

⚠ CAUTION

> Never use a tool that is harder than the part it is used on.

8. With a 5/64-inch wrench, remove the six flat head socket screws from nozzle plate. Remove the nozzle plate.

9. Remove all o-rings.

Inspection and Preparation

⚠ CAUTION

> Failure to observe the following cautions will result in diminished performance and premature motor failure.

- Never use any silicone compound in this system!
- Never use any lubrication on the bearings!
- Never use any solvent on the bearings!
- Never exert force on one race of a bearing assembly that may be transmitted to the other race through the bearings! Force and resistance must always be on the same race in order to prevent damage.
- Do not enlarge the nozzle passages during cleaning, as it will effect performance.
- Always observe the specified torque in tightening fasteners.
- Clean all parts thoroughly with an appropriate, clean solvent. Inspect them for wear or damage and replace as required.
- Check all flow passages for obstruction, particularly the nozzle plate. Clear as required.
- Discard all bearings and o-rings and replace with new. Lightly lubricate o-rings with petroleum jelly before assembly. Fit parts with o-rings very carefully. They must not be allowed to distort, unseat, or break.

Assembly

1. With o-ring in its groove on the rear face of bearing housing, secure nozzle plate in place with the six screws.

NOTE

> Torque the screws to 10 lb•in. Do NOT lubricate o-ring.

2. Using a press tool device on the arbor press table, place front bearing over the rear end of shaft. Insert the shaft into the press tool rear end down and press the shaft through the bearing until the bearing seats against the shoulder on the shaft.

3. Place bearing housing on the arbor press table, front face up, resting on two parallel supports.

4. Insert the bearing/shaft into the bore of the bearing housing. With o-ring in place against it, place bearing retainer over the shaft so that it rests on the bearing. Place the press tool, large end down, over the shaft so that it rests against the bearing retainer. Press until the bearing seats in the housing.

5. Remove the assembly from the press and secure the retainer with the six screws.

NOTE

> Torque the screws to 10 lb•in.

6. From the rear of the assembly, place bearing spacer over the shaft and into the bore so that it seats against the front bearing.

7. From the rear of the assembly, place spring and spring retainer over the shaft and into the bore over the bearing spacer. In some older models, shims and a wave spring washer are used in place of the spring and retainer. In those models, place shims and wave spring washer over the shaft and into the bore.

8. With the housing assembly, front face down, resting on two parallel supports on the arbor table, place the rear bearing over shaft. Be sure that o-ring is in place in its groove in the housing bore. Place the small end of the press tool over the end of the shaft so that it rests against the inner face of the bearing. CAREFULLY press the bearing onto the shaft.

⚠ CAUTION

> The same number of shims that were removed from the assembly MUST be placed into it or the bearing preload will NOT be correct! Each unit is individually preloaded. The number of shims used for this purpose may vary from unit to unit. It is therefore necessary that the same number of shims be installed in a repaired unit as were removed. If more than one unit is serviced at one time, be SURE that the shims removed from each unit are returned to that same unit!

9. With the assembly still on the press table, place the turbine rotor, flanged side up, over the shaft. Insert key into the key slot in the shaft, align it with the key slot in the rotor, and press the rotor down until the key is engaged. With the small end of the press tool against the rotor flange, press it onto the shaft until it seats.

⚠ CAUTION

> The outer face of the bearing should be a slip fit into the bore of the housing. Be careful that the bearing does not hang up on the outer edge of the bore during the pressing.

10. Place hex nut and the 15/16-inch box end wrench on the rear end of the shaft. Secure the rotating assembly by inserting a 1/4-inch wrench, which may be secured in a vise for this procedure, in the hex socket at the rear end of the shaft. Secure the nut using the box end wrench.

CAUTION

> If the key is not secure or is missing, the unit will malfunction!

11. With the shaft still secured from rotation, screw slinger onto the front end of the shaft and secure it using a spanner wrench.

NOTE

> Torque the nut to 350 lb•in.

NOTES:

TROUBLESHOOTING GUIDE

General Problem	Cause	Solution
Fluctuating Pattern	1. Not enough back pressure on regulator.	1. See regulator manual for diagnosis.
Light Coverage on Some Parts	1. Part hangers, hooks, are not clean.	1 a. Clean hangers. b. Check ground continuity. (Must be less than 1 Megohm.)
Poor Transfer Efficiency	1. Low voltage. 2. Disk RPM to high. 3. Booth flow to high. 4. Disk edge to part distance to great.	1. Check disk voltage with H.V. probe. 2. Slow disk speed. 3. Reduce booth air flow. 4. Decrease conveyor loop diameter.
Low Current Readings	1. Dirty H.V. contacts.	1. Clean and/or replace.
High Current Readings / Power Supply Overloads	1. Target distance to close. 2. Conductive paint. 3. Fairing dirty. 4. H.V. cable breakdown. 5. Fluid tube pinholed to ground on conductive paint systems. 6. Isolation mounting rod dirty or carbon tracked.	1. Check target distance. Ideal target distance is 12 inches minimum. 2. Solvent base paint conductivity should be between .05 and 20 megohms on Ransburg paint test meter. 3. Clean with nonpolar solvent. 4. Replace cable. 5. Check tubing routing for areas where fluid tube comes near a ground. 6. Clean with nonpolar solvent or replace.
Low Voltage	1. Power Supply 2. Faulty H.V. switch or junction tank. 3. H.V. cable.	Use following procedure to isolate problem: - Verify power supply output. Refer to power supply manual for procedure. - Remove the fairing and measure input voltage to the rotator assembly by removing the H.V. cable from the connector fitting and inserting it into the H.V. probe. If voltage is low, replace H.V. cable with a known good one and retest. - If voltage is still low, check for bad connections in the H.V. Junction or Switch Tank. Refer to procedures in the proper manual. - Reinstall the H.V. cable. Check voltage at the rotator housing.

Figure 6: Troubleshooting Guide

NOTES:

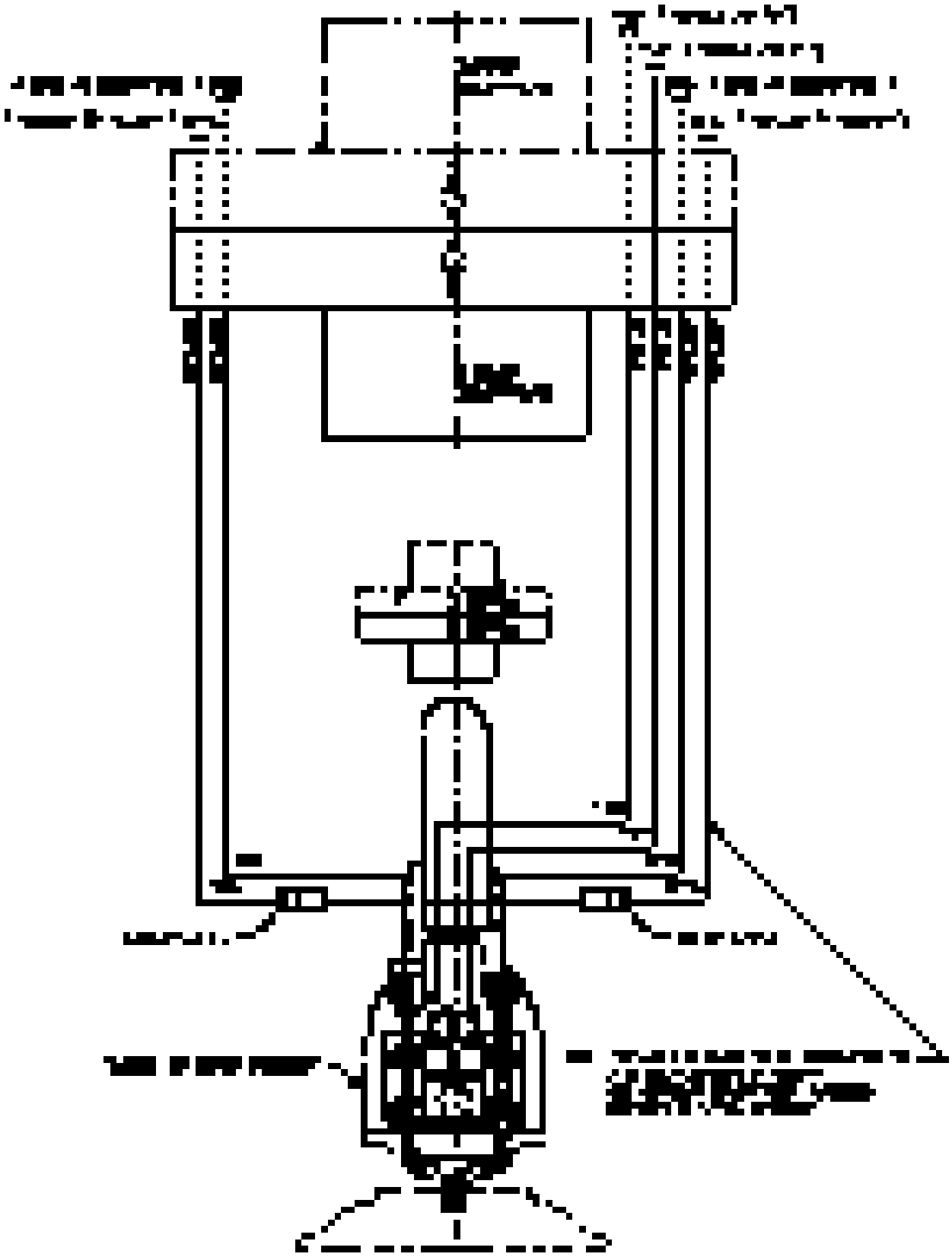

Figure 7: Typical No Valve Application Schematic - Dual Fluid Supply Option
(Reference Figure 12)

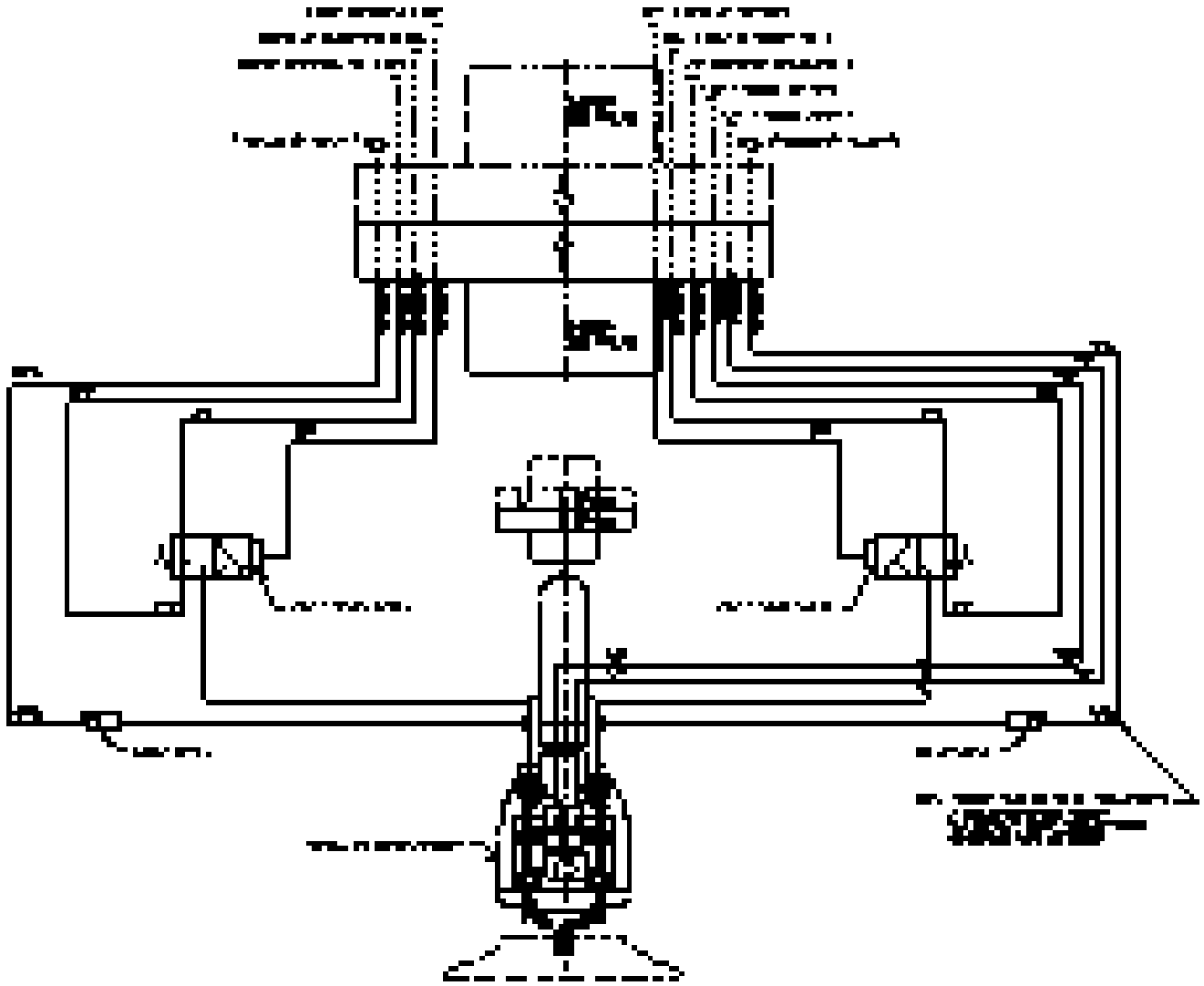

Figure 8: Typical 3-Way Valve Application Schematic - Dual Fluid Supply Option
(Reference Figure 13)

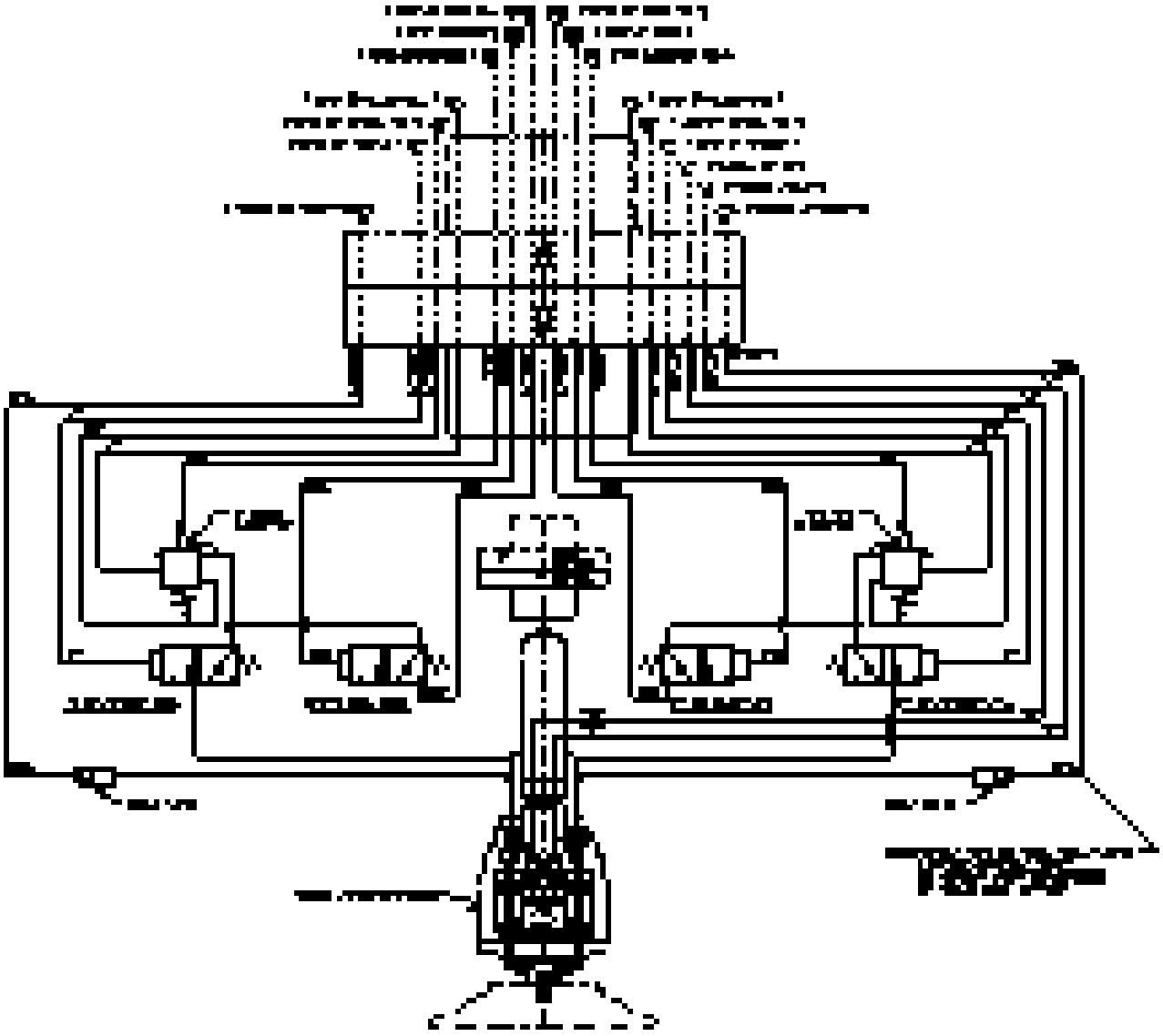

Figure 9: Typical Trigger and Dump Valve Application with (High Flow) Fluid Regulator Schematic - Dual Fluid Supply Option (Reference Figure 14)

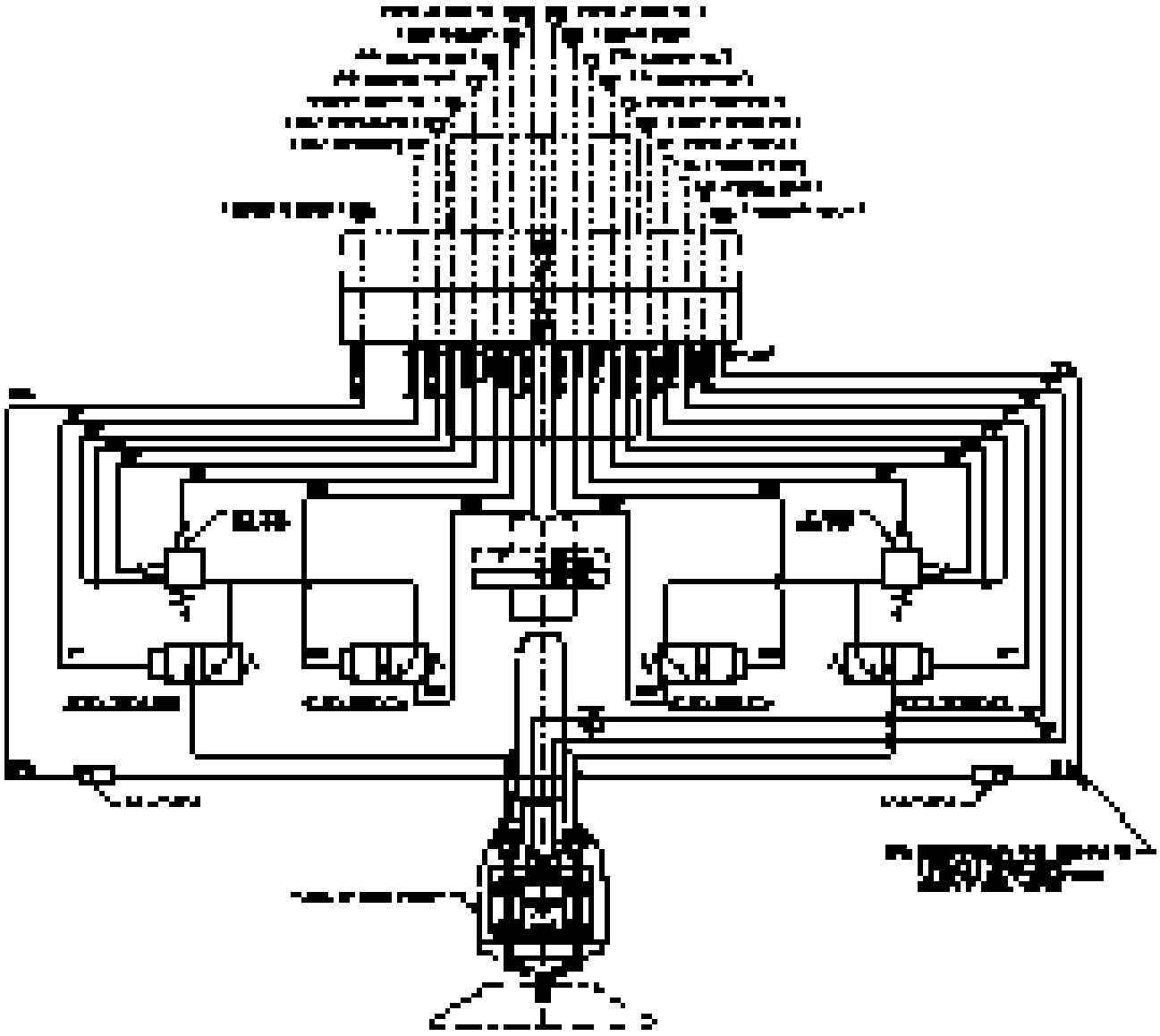

Figure 10: Typical Trigger and Dump Valve Application with DR-1 Fluid Regulator Schematic - Dual Fluid Supply with Recirculating Option (Reference Figure 15)

PARTS IDENTIFICATION

78715 TURBODISK 2 ASSEMBLY MODEL IDENTIFICATION

Turbodisk 2 Assemblies are available with the various options as follows:

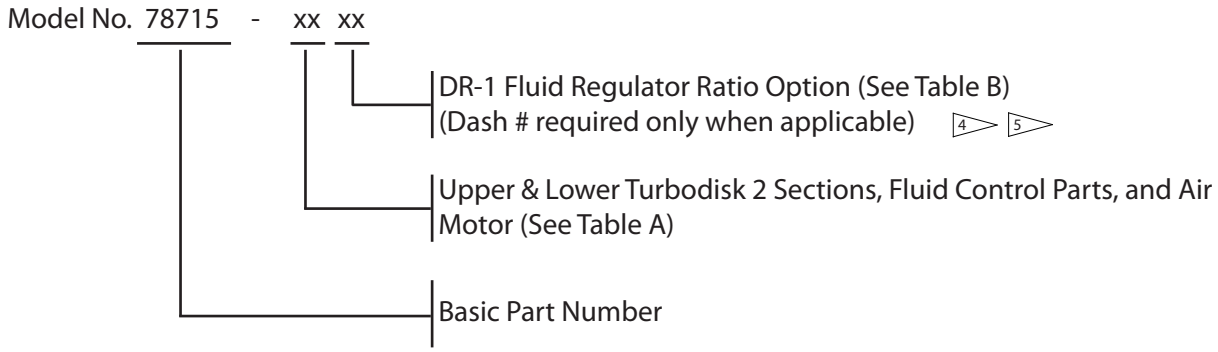

Figure 11: Turbodisk 2 Assembly Standard Model Identification

TABLE "A" (Figure 11)

Dash #	Basic Turbodisk 2 Assy	Turbine Air Motor Assy	Air Heater & Filter/Reg. Assy	Disk Mounting Nut 3	Description
01	78718-01	78175-01	78781-00	19836-01	No valves, Down Feed CW, Single Fluid System, 3/8 ID Tubing Option
02	78718-02	78175-01	78781-00	19836-01	No valves, Down Feed CW, Single Fluid System, 1/4 ID Tubing Option
03	78718-03	78175-01	78781-00	19836-01	No valves, Down Feed CW, Dual Fluid System, 3/8 ID Tubing Option
04	78718-04	78175-01	78781-00	19836-01	No valves, Down Feed CW, Dual Fluid System, 1/4 ID Tubing Option
05	78718-01	78175-11	78781-00	19836-02	No valves, Down Feed CCW, Single Fluid System, 3/8 ID Tubing Option
06	78718-02	78175-11	78781-00	19836-02	No valves, Down Feed CCW, Single Fluid System, 1/4 ID Tubing Option
07	78718-03	78175-11	78781-00	19836-02	No valves, Down Feed CCW, Dual Fluid System, 3/8 ID Tubing Option
08	78718-04	78175-11	78781-00	19836-02	No valves, Down Feed CCW, Dual Fluid System, 1/4 ID Tubing Option
21	78718-11	78175-01	78781-00	19836-01	3-Way On/Off, Down Feed CW, Single Fluid System, 3/8 ID Tubing Option
22	78718-12	78175-01	78781-00	19836-01	3-Way On/Off, Down Feed CW, Single Fluid System, 1/4 ID Tubing Option
23	78718-13	78175-02	78781-00	19836-01	3-Way On/Off, Down Feed CW, Dual Fluid System, 3/8 ID Tubing Option

* See "Parts List Bullet Definition Table" on page 37.

TABLE "A" (Figure 11) - (Continued)

Dash #	Basic Turbodisk 2 Assy	Turbine Air Motor Assy	Air Heater & Filter/Reg. Assy	Disk Mounting Nut 3	Description
24	78718-14	78175-02	78781-00	19836-01	3-Way On/Off, Down Feed CW, Dual Fluid System, 1/4 ID Tubing Option
25	78718-11	78175-11	78781-00	19836-02	3-Way On/Off, Down Feed CCW, Single Fluid System, 3/8 ID Tubing Option
26	78718-12	78175-11	78781-00	19836-02	3-Way On/Off, Down Feed CCW, Single Fluid System, 1/4 ID Tubing Option
27	78718-13	78175-12	78781-00	19836-02	3-Way On/Off, Down Feed CCW, Dual Fluid System, 3/8 ID Tubing Option
28	78718-14	78175-12	78781-00	19836-02	3-Way On/Off, Down Feed CCW, Dual Fluid System, 1/4 ID Tubing Option
1 41	78718-21	78175-02	78781-00	19836-01	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CW, Single Fluid System, 3/8 ID Tubing Option
1 42	78718-22	78175-02	78781-00	19836-01	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CW, Single Fluid System, 1/4 ID Tubing Option
1 43	78718-23	78175-02	78781-00	19836-01	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CW, Dual Fluid System, 3/8 ID Tubing Option
1 44	78718-24	78175-02	78781-00	19836-01	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CW, Dual Fluid System, 1/4 ID Tubing Option
1 45	78718-21	78175-12	78781-00	19836-02	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CCW, Single Fluid System, 3/8 ID Tubing Option
1 46	78718-22	78175-12	78781-00	19836-02	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CCW, Single Fluid System, 1/4 ID Tubing Option
1 47	78718-23	78175-12	78781-00	19836-02	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CCW, Dual Fluid System, 3/8 ID Tubing Option
1 48	78718-24	78175-12	78781-00	19836-02	Trigger & Dump Valve w/Fluid Reg. (High Flow), Down Feed CCW, Dual Fluid System, 1/4 ID Tubing Option
2 61	78718-31	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Single Fluid System, Non-Circulating Fluid Return, 3/8 ID Tubing Option
2 62	78718-32	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Single Fluid System, Non-Circulating Fluid Return, 1/4 ID Tubing Option
2 63	78718-33	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Dual Fluid System, Non-Circulating Fluid Return, 3/8 ID Tubing Option
2 64	78718-34	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Dual Fluid System, Non-Circulating Fluid Return, 1/4 ID Tubing Option
2 65	78718-35	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Single Fluid System, Recirculating Fluid Return, 3/8 ID Tubing Option
2 66	78718-36	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Single Fluid System, Recirculating Fluid Return, 1/4 ID Tubing Option
2 67	78718-37	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Dual Fluid System, Recirculating Fluid Return, 3/8 ID Tubing Option

* See "Parts List Bullet Definition Table" on page 37.

TABLE "A" (Figure 11) - (Continued)

	Dash #	Basic Turbodisk 2 Assy	Turbine Air Motor Assy	Air Heater & Filter/Reg. Assy	Disk Mounting Nut 3	Description
2	68	78718-38	78175-02	78781-00	19836-01	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CW, Dual Fluid System, Recirculating Fluid Return, 1/4 ID Tubing Option
2	69	78718-31	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Single Fluid System, Non-Circulating Fluid Return, 3/8 ID Tubing Option
2	70	78718-32	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Single Fluid System, Non-Circulating Fluid Return, 1/4 ID Tubing Option
2	71	78718-33	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Dual Fluid System, Non-Circulating Fluid Return, 3/8 ID Tubing Option
2	72	78718-34	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Dual Fluid System, Non-Circulating Fluid Return, 1/4 ID Tubing Option
2	73	78718-35	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Single Fluid System, Recirculating Fluid Return, 3/8 ID Tubing Option
2	74	78718-36	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Single Fluid System, Recirculating Fluid Return, 1/4 ID Tubing Option
2	75	78718-37	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Dual Fluid System, Recirculating Fluid Return, 3/8 ID Tubing Option
2	76	78718-38	78175-12	78781-00	19836-02	Trigger & Dump Valve w/DR-1 Fluid Reg. (Low Flow), Down Feed CCW, Dual Fluid System, Recirculating Fluid Return, 1/4 ID Tubing Option

* See "Parts List Bullet Definition Table" on page 37.

TABLE "B" (Figure 11)

Dash #	Description	Ratio Ref.	Regulator Assy
01	Non-Circulating Fluid Return DR-1, Single Fluid System	1:2	78719-01
02	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:2	78719-01 & -21
03	Non-Circulating Fluid Return DR-1, Single Fluid System	1:4	78719-02
04	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:4	78719-02 & -22
05	Non-Circulating Fluid Return DR-1, Single Fluid System	1:6	78719-03
06	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:6	78719-03 & -23
07	Non-Circulating Fluid Return DR-1, Single Fluid System	1:8	78719-04
08	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:8	78719-04 & -24
09	Non-Circulating Fluid Return DR-1, Single Fluid System	1:10	78719-05
10	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:10	78719-05 & -25
11	Non-Circulating Fluid Return DR-1, Single Fluid System	1:3	78719-06
12	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:3	78719-06 & -26
13	Non-Circulating Fluid Return DR-1, Single Fluid System	1:1	78719-11
14	Non-Circulating Fluid Return DR-1, Dual Fluid System	1:1	78719-11 & -31
21	Recirculating Fluid Return DR-1, Single Fluid System	1:2	78719-41
22	Recirculating Fluid Return DR-1, Dual Fluid System	1:2	78719-41 & -61
23	Recirculating Fluid Return DR-1, Single Fluid System	1:4	78719-42
24	Recirculating Fluid Return DR-1, Dual Fluid System	1:4	78719-42 & -62
25	Recirculating Fluid Return DR-1, Single Fluid System	1:6	78719-43
26	Recirculating Fluid Return DR-1, Dual Fluid System	1:6	78719-43 & -63
27	Recirculating Fluid Return DR-1, Single Fluid System	1:8	78719-44
28	Recirculating Fluid Return DR-1, Dual Fluid System	1:8	78719-44 & -64
29	Recirculating Fluid Return DR-1, Single Fluid System	1:10	78719-45
30	Recirculating Fluid Return DR-1, Dual Fluid System	1:10	78719-45 & 65
31	Recirculating Fluid Return DR-1, Single Fluid System	1:3	78719-46
32	Recirculating Fluid Return DR-1, Dual Fluid System	1:3	78719-46 & -66
33	Recirculating Fluid Return DR-1, Single Fluid System	1:1	78719-51
34	Recirculating Fluid Return DR-1, Dual Fluid System	1:1	78719-51 & -71

* PARTS LIST BULLET DEFINITION TABLE (Figure 11)

1. General Application Guideline: Use for fluid flow rates above 750 ml/min.

2. General Guideline: Use for fluid flow rates from 25 to 1500 ml/min.
Note: Assemblies using DR-1 fluid regulators (part number 74151-xx)

3. (1) Disk mounting nut (see Table "A") is included with this assembly. When installing disk (not included), torque mounting nut to 50 - 60 lb•in. (Recommended: 3/8" hex bit socket with square drive torque wrench.)

4. DR-1 Non-circulating fluid return applies (see Table "B").

5. DR-1 Recirculating fluid return applies (see Table "B").

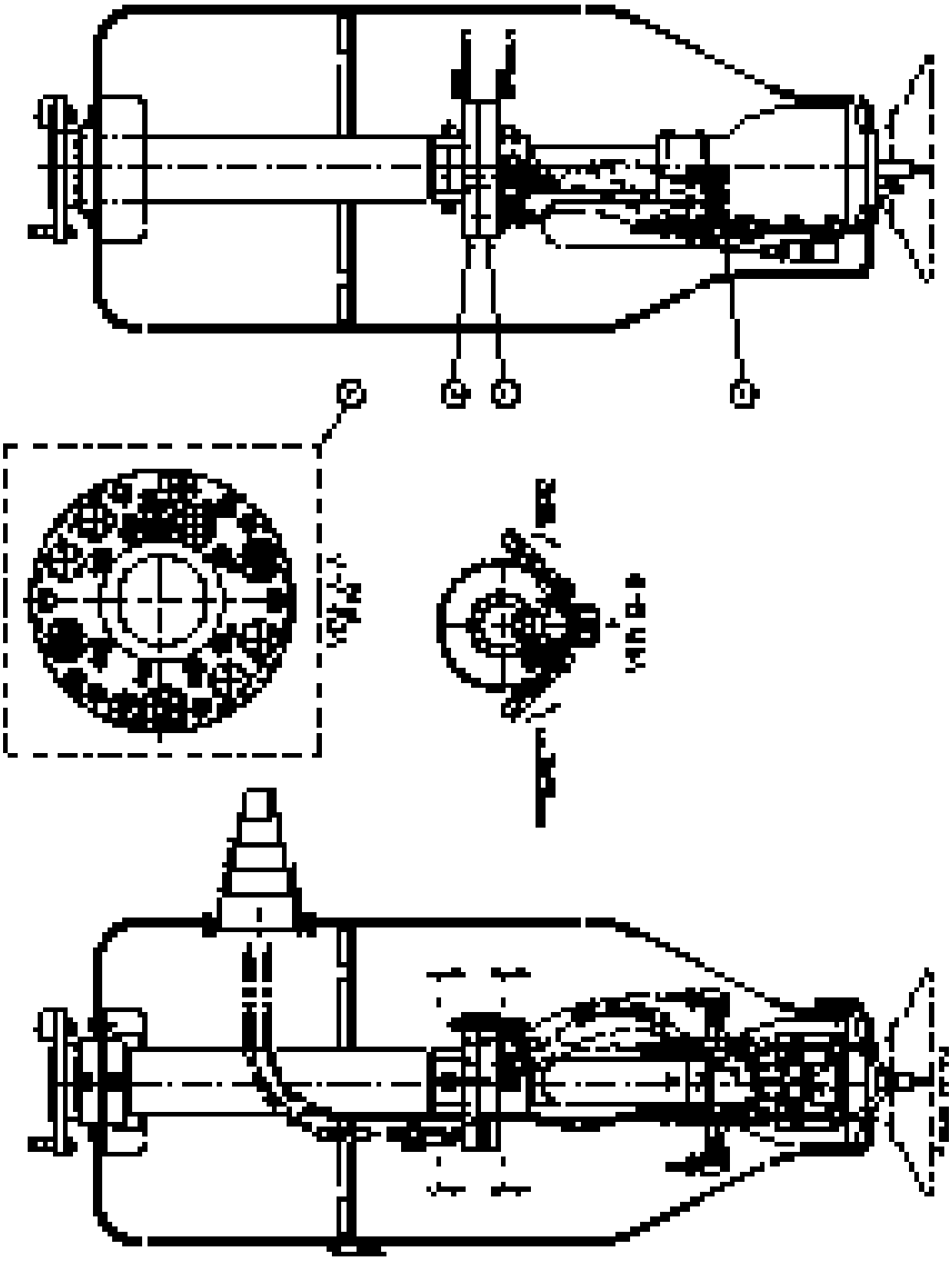

Figure 12: 78718-04 Turbodisk 2 Assembly, No Valves,
Dual Fluid Supply System, 1/4 I.D. Tubing Option

78718-04 TURBODISK 2 ASSEMBLY - PARTS LIST (Figure 12)			
Item #	Description	Part #	Qty
1	Assembly, Basic Lower Turbodisk 2 Fluid Section	78733-02	1
2	Assembly, Basic Upper Turbodisk 2 Bulkhead and Fairing	78731-01	1
3	Fitting Package, Upper Turbodisk 2 Bulkhead, 1/4 I.D.	78729-04	1
4	Fluid Supply Line Package, Lower Turbodisk 2 (No Valves)	78732-01	2
5	Hook Assembly, Grounding (Not Shown)	15946-00	1
6	Puller Assembly, Disk (Not Shown)	19850-00	1

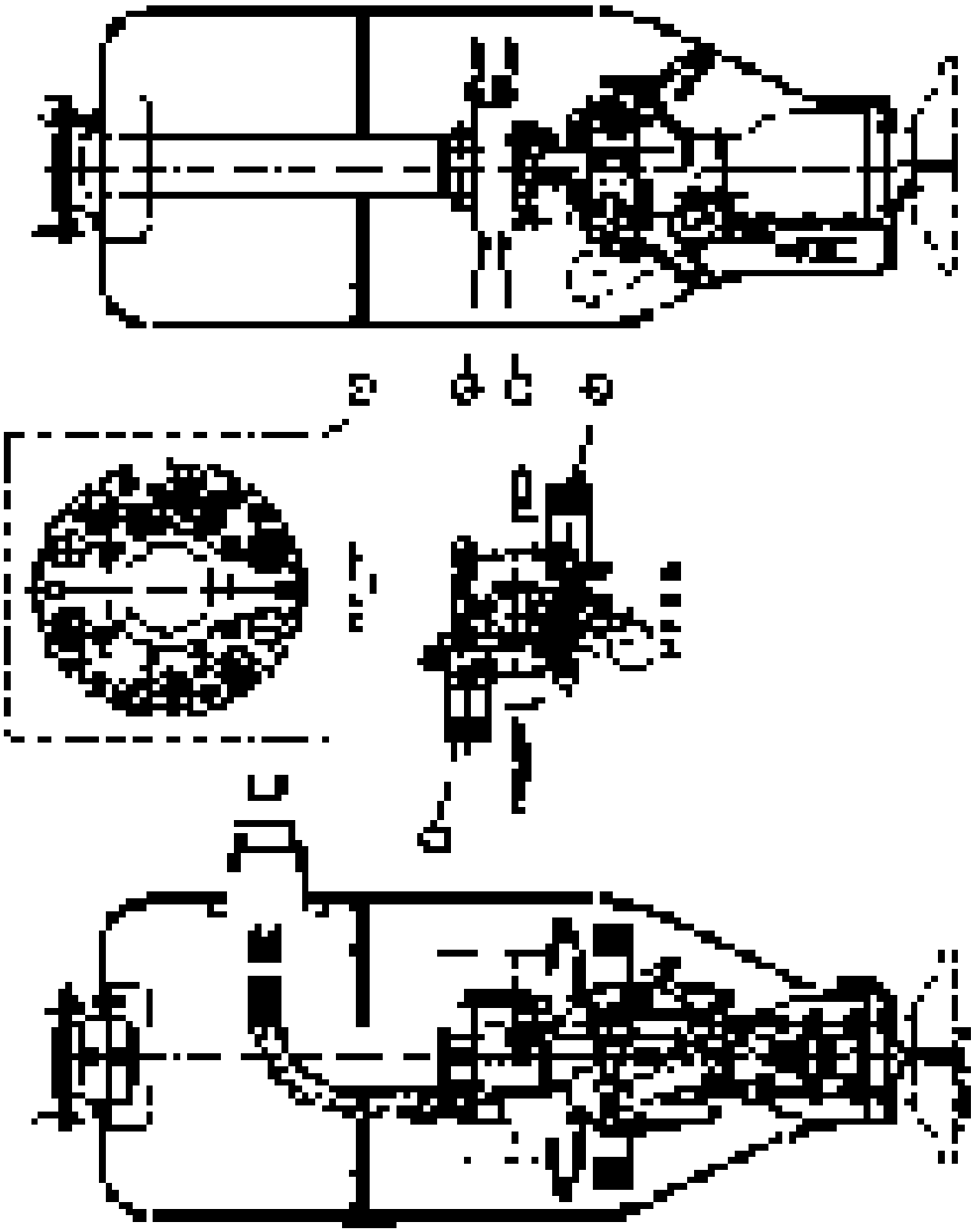

Figure 13: 78718-14 Turbodisk 2 Assembly, 3-Way Valve (On/Off),
Dual Fluid Supply System, 1/4 I.D. Tubing Option

78718-14 TURBODISK 2 ASSEMBLY - PARTS LIST (Figure 13)			
Item #	Description	Part #	Qty
1	Assembly, Basic Lower Turbodisk 2 Fluid Section	78733-02	1
2	Assembly, Basic Upper Turbodisk 2 Bulkhead and Fairing	78731-01	1
3	Fitting Package, Upper Turbodisk 2 Bulkhead, 1/4 I.D.	78729-08	1
4	Assembly, 3-Way Valve w/Fluid Line Package, #1 Feed	78723-01	1
5	Assembly, 3-Way Valve w/Fluid Line Package, #2 Feed	78723-02	1
6	Hook Assembly, Grounding (Not Shown)	15946-00	1
7	Puller Assembly, Disk (Not Shown)	19850-00	1

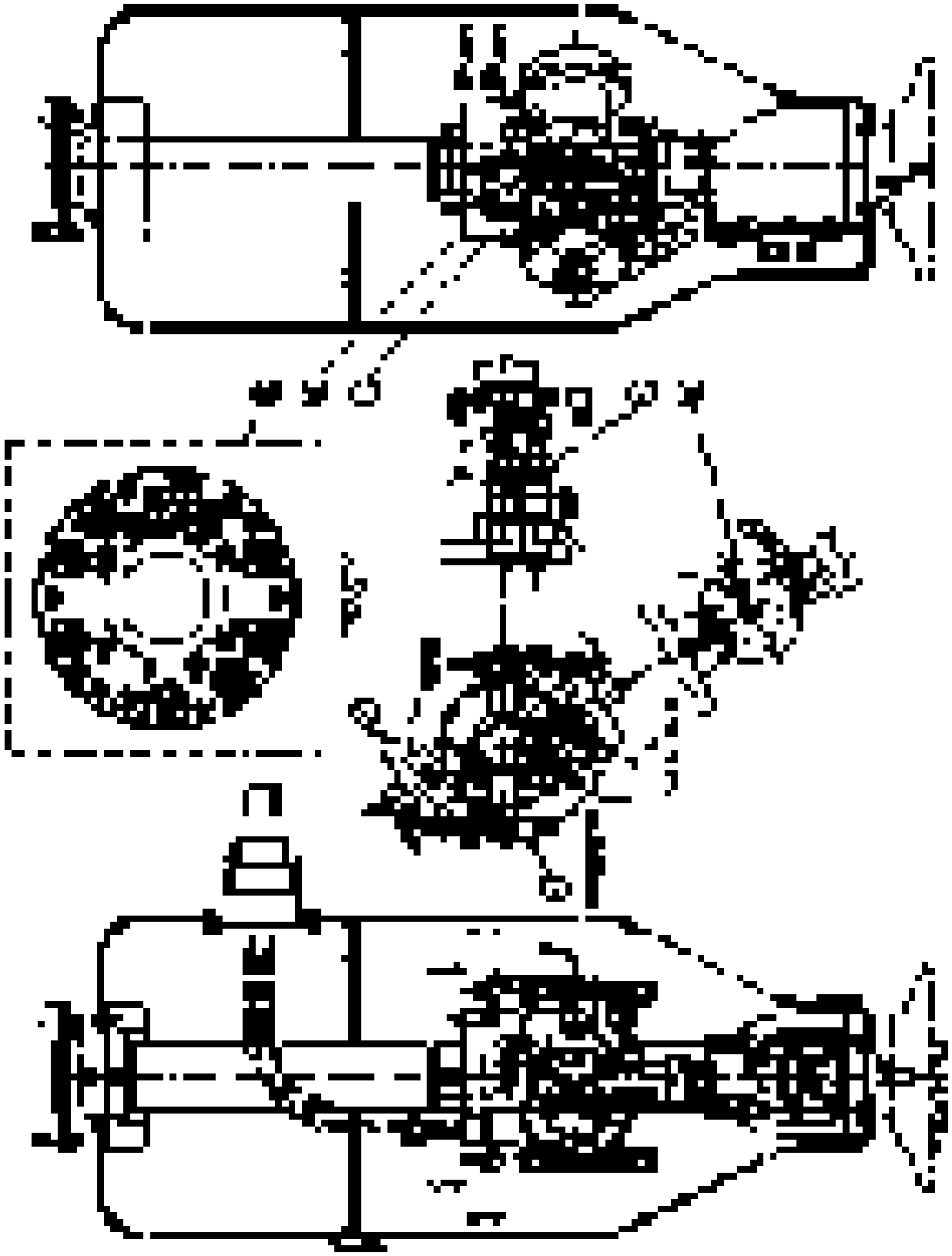

Figure 14: 78718-24 Turbodisk 2 Assembly, Trigger & Dump Valve w/Fluid Regulator (High Flow), Dual Fluid Supply System, 1/4 I.D. Tubing Option

78718-24 TURBODISK 2 ASSEMBLY - PARTS LIST (Figure 14)			
Item #	Description	Part #	Qty
1	Assembly, Basic Lower Turbodisk 2 Fluid Section	78733-02	1
2	Assembly, Basic Upper Turbodisk 2 Bulkhead and Fairing	78731-01	1
3	Fitting Package, Upper Turbodisk 2 Bulkhead, 1/4 I.D.	78729-12	1
4	#1 Trigger and Dump Valve Assembly w/Fluid Line Package	78722-01	1
5	#2 Trigger and Dump Valve Assembly w/Fluid Line Package	78722-02	1
6	#1 Fluid Regulator Assembly, High Flow, w/Fluid Line Package	78714-03	1
7	#2 Fluid Regulator Assembly, High Flow, w/Fluid Line Package	78714-04	1
8	Hook Assembly, Grounding (Not Shown)	15946-00	1
9	Puller Assembly, Disk (Not Shown)	19850-00	1

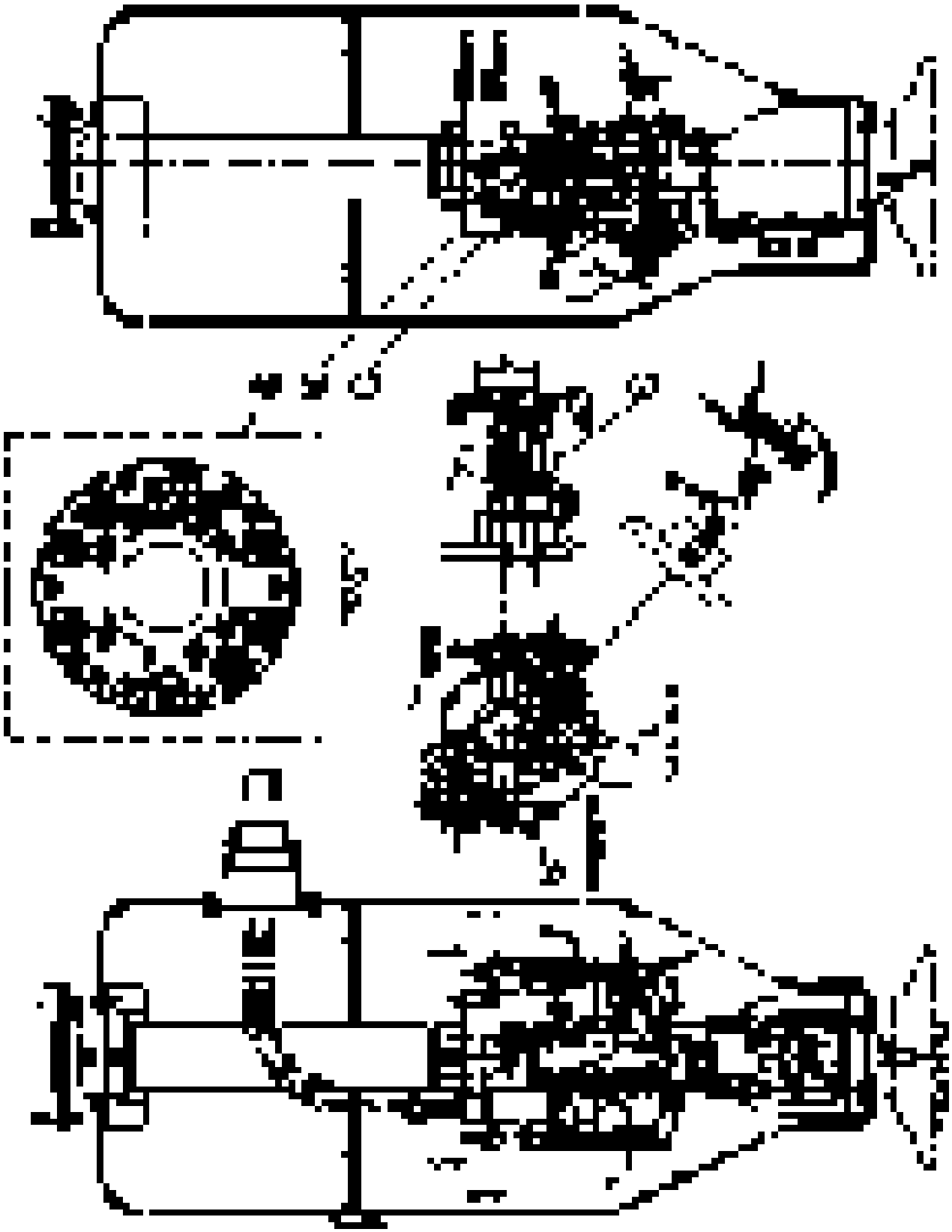

Figure 15: 78718-38 Turbodisk 2 Assembly, Trigger & Dump Valve w/DR-1 Fluid Regulator (Low Flow) Recirculating Fluid Return, Dual Fluid Supply System, 1/4 I.D. Tubing Option

78718-38 TURBODISK 2 ASSEMBLY - PARTS LIST (Figure 15)			
Item #	Description	Part #	Qty
1	Assembly, Basic Lower Turbodisk 2 Fluid Section	78733-02	1
2	Assembly, Basic Upper Turbodisk 2 Bulkhead and Fairing	78731-01	1
3	Fitting Package, Upper Turbodisk 2 Bulkhead, 1/4 I.D.	78729-20	1
4	#1 Trigger and Dump Valve Assembly w/Fluid Line Package	78722-01	1
5	#2 Trigger and Dump Valve Assembly w/Fluid Line Package	78722-02	1
6	Hook Assembly, Grounding (Not Shown)	15946-00	1
7	Puller Assembly, Disk (Not Shown)	19850-00	1

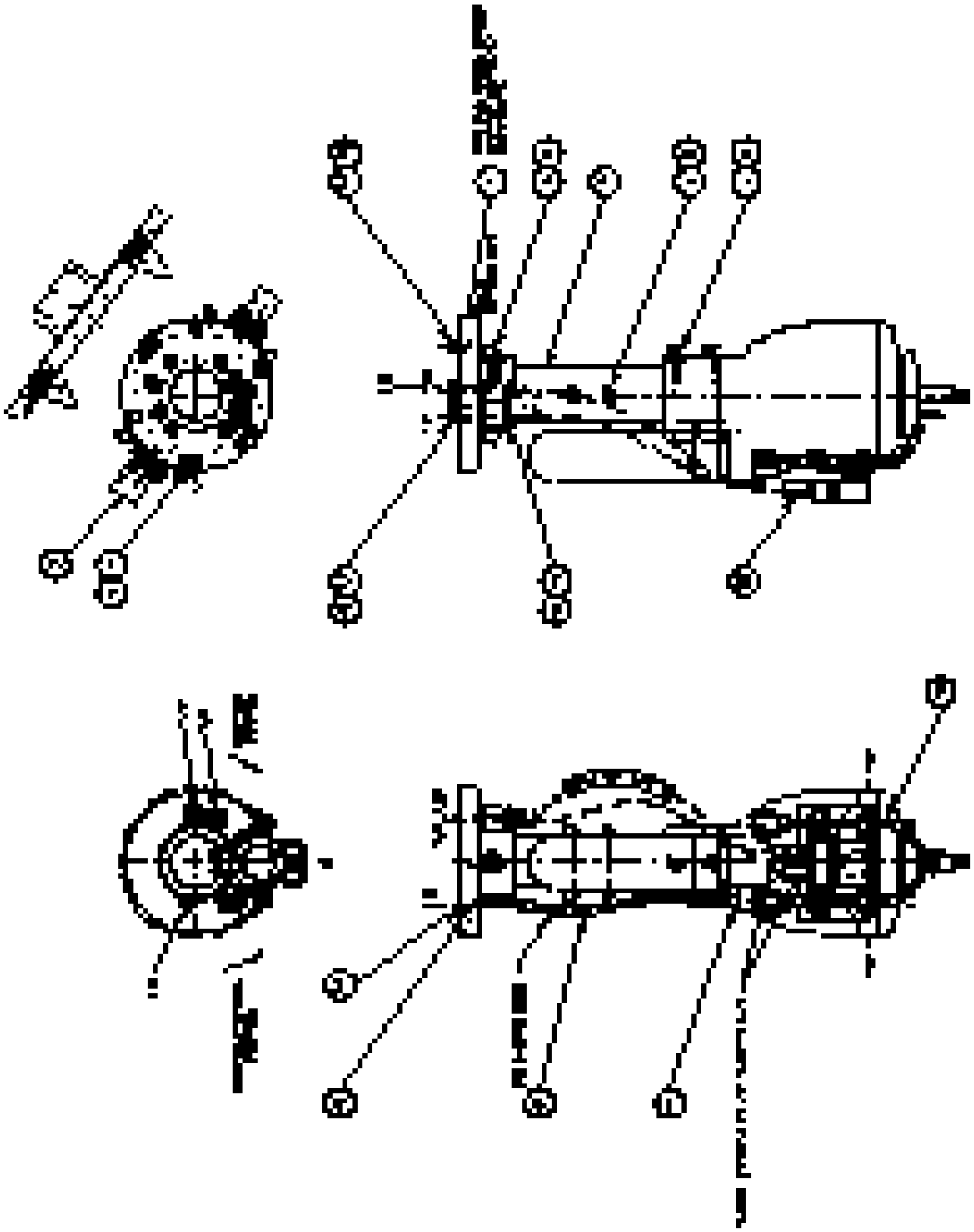

Figure 16: 78733 Basic Lower Turbodisk 2 Fluid Control Assembly (Dual Feed)

78733 LOWER TURBODISK 2 FLUID CONTROL ASSEMBLY - PARTS LIST (Figure 16)			
Item #	Description	Part #	Qty
1	Bulkhead, Lower, Turbodisk 2 Quick Disconnect	78700-00	1
2	Assembly, Latching, Bulkhead, Turbodisk 2 Fluid Section (Includes the Following): (Note: Qty is per each assembly)	78724-00	2
	Latch, Machined, Turbodisk 2 Fluid Section	78706-00	1
	Bracket, Machined, Latch Mounting	78707-00	1
	Sleeve, Machined, Turbodisk 2	78708-00	2
	Screw, Socket Head, 1/4 Shoulder x 1" Long, SST	78725-32F	1
	Locknut, Hex Thin (Jam) Nylon-Insert, #10-32, SST	78726-05	1
	Spring, Torsion, Latch	78728-00	2
	Washer, Flat, #10, SST	78405-03	1
3	Screw, Socket Head Cap, 1/4-20 x 3/8 Long	7959-12C	4
4	Washer, Lock, 1/4, Standard Helical Spring	7734-06	4
5	Screw, Socket Head Cap, 3/8-24 x 1" Long	8471-32F	2
6	Washer, Lock, 3/8, Standard Helical Spring	7734-12	2
7	Screw, Socket Head Cap, 5/16-24 x 1" Long	8532-32F	6
8	Washer, Lock, 5/16", Standard Helical Spring	7734-07	6
9	Extension, Turbodisk 2 Assembly	78709-00	1
10	Tube, Feed, Overhead Installation (Down Feed)	70976-01	2
11	Transmitter, Fiber Optic, RPM	SMC-29	1
12	Assembly, Fiber Optic Cable	78713-00	1
13	Screw, Set, #10-24 x 3/8 Long, SST w/Nylon Tip	SSF-2052	1
14	O-Ring, Solvent Proof, .250 I.D. x .062 Cross Section	SSG-8128	9
15	Stud, Air, Small	77507-00	8
16	Stud, Air, Extra Large	78705-00	2
17	O-Ring, Solvent Proof, .562 I.D. x .062 Cross Section	SSG-8165	2
18	Fitting, Male Connector, 3/8" NPT, 1/2" O.D. Tube Size	78168-00	2
19	Cap, Identification, Green, 1/2" O.D. Tube Size	78169-00	2
20	Tubing, Nylon, Green, 1/2" O.D. x 3/8" I.D. x 13" Long	78176-01	2

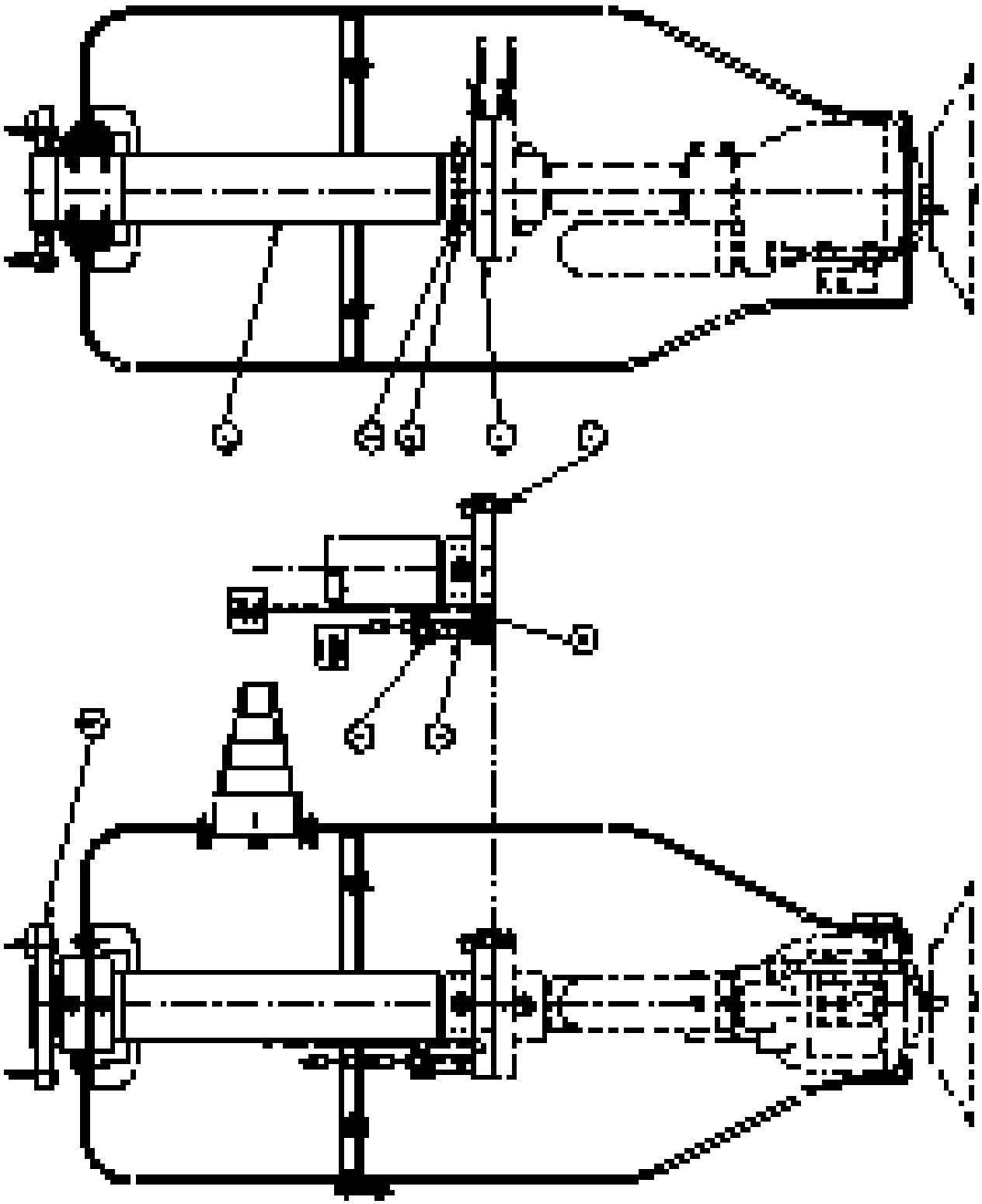

Figure 17: 78731 Upper Turbodisk 2 Bulkhead Plate and Fairing Mounting

78731 UPPER TURBODISK 2 BULKHEAD PLATE & FAIRING MOUNTING - PARTS LIST (Figure 17)			
Item #	Description	Part #	Qty
1	Plate, Bulkhead, Upper, Turbodisk 2	78699-00	1
2	Screw, Socket Head Cap, 3/8-24 x 1" Long	8471-32F	2
3	Washer, Lock, 3/8, Standard Spring	7734-12	2
4	Insulator	78710-00	1
5	Screw, Retaining, Flange Mount, 3/8-16	78703-01	6
6	Screw, Set, Hex Socket, #10-24 x 3/8 Long, SST	SSF-2052	1
7	Fitting, High Voltage, Turbodisk 2 Bulkhead	78704-02	1
8	Nut, Ferrule, Nylon, 5/8-20	13521-03	1
9	Flange, Support, Turbodisk 2 Assembly (Includes the Following):	70381-00	1
	Flange, Support	70380-00	1
	Bulkhead	70379-00	1
	Clamp, Toe	70378-00	2
	Screw, 5/16-18 x 1-1/2 Long, Hex Head Cap	8156-48C	4
	Washer, Lock, Spring, 5/16	7734-07	4
	Screw, 1/4-20 x 1-1/2 Long, Hex Head Cap	7958-48C	2
	Washer, Lock, Spring, 1/4	7734-06	2
10	Kit, Disposable Cover, Turbodisk 2 Fairing (Not Shown)	78143-00	1

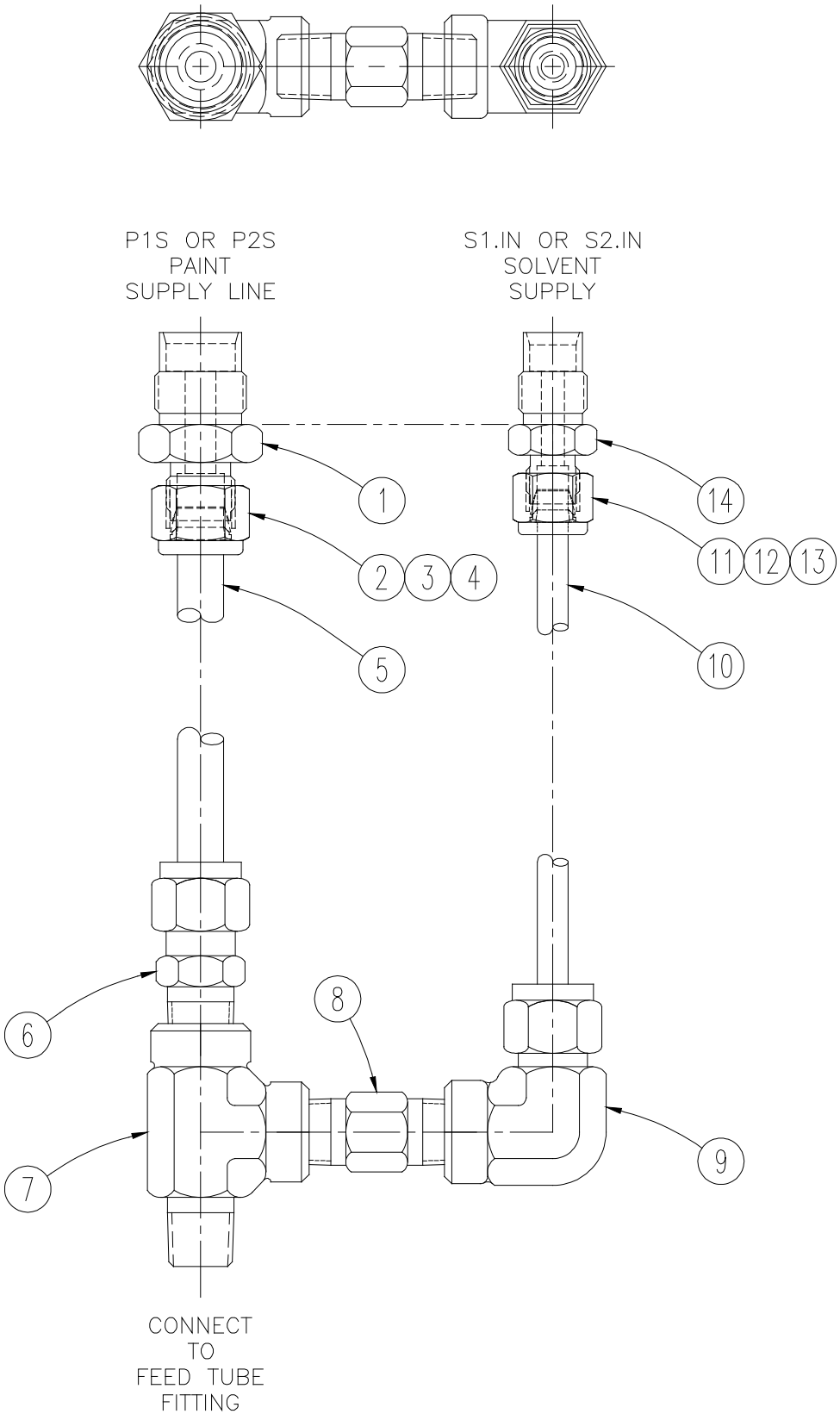

Figure 18: 78732 Fluid Supply Line Package - Basic (No Valves)

78732 FLUID SUPPLY LINE PACKAGE - PARTS LIST (Figure 18)			
Item #	Description	Part #	Qty
1	Fitting, Fluid, Female, 3/8 O.D. Tube, Quick Disconnect	78702-02	1
2	Nut, Hex, 11/16, 3/8 O.D. Tube, SST	70591-03	1
3	Ferrule, Back, Tube, 3/8	70606-03	1
4	Ferrule, Front, Tube, 3/8	70607-03	1
5	Tubing, 3/8 O.D. x 1/4 I.D., (FEP) SSP-5020	7"	
6	Fitting, Male Connector, 3/8 O.D. Tube x 1/4 NPT, SST	41-FTC-1002	1
7	Fitting, Street Tee, 1/4 NPT (M) x 1/4 NPT (F), SST	LSFI0004-01	1
8	Valve, Check, 1/4 NPT (M) x 1/4 NPT (M)	SSV-809	1
9	Fitting, Elbow, 1/4 O.D. Tube x 1/4 NPT (F), SST	LSFI0006-01	1
10	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	8"
11	Nut, Hex, 9/16, 1/4 O.D. Tube, SST	70591-01	1
12	Ferrule, Back, Tube, 1/4	70606-01	1
13	Ferrule, Front, Tube, 1/4	70607-01	1
14	Fitting, Fluid, Female, 1/4 O.D. Tube, Quick Disconnect	78702-01	1

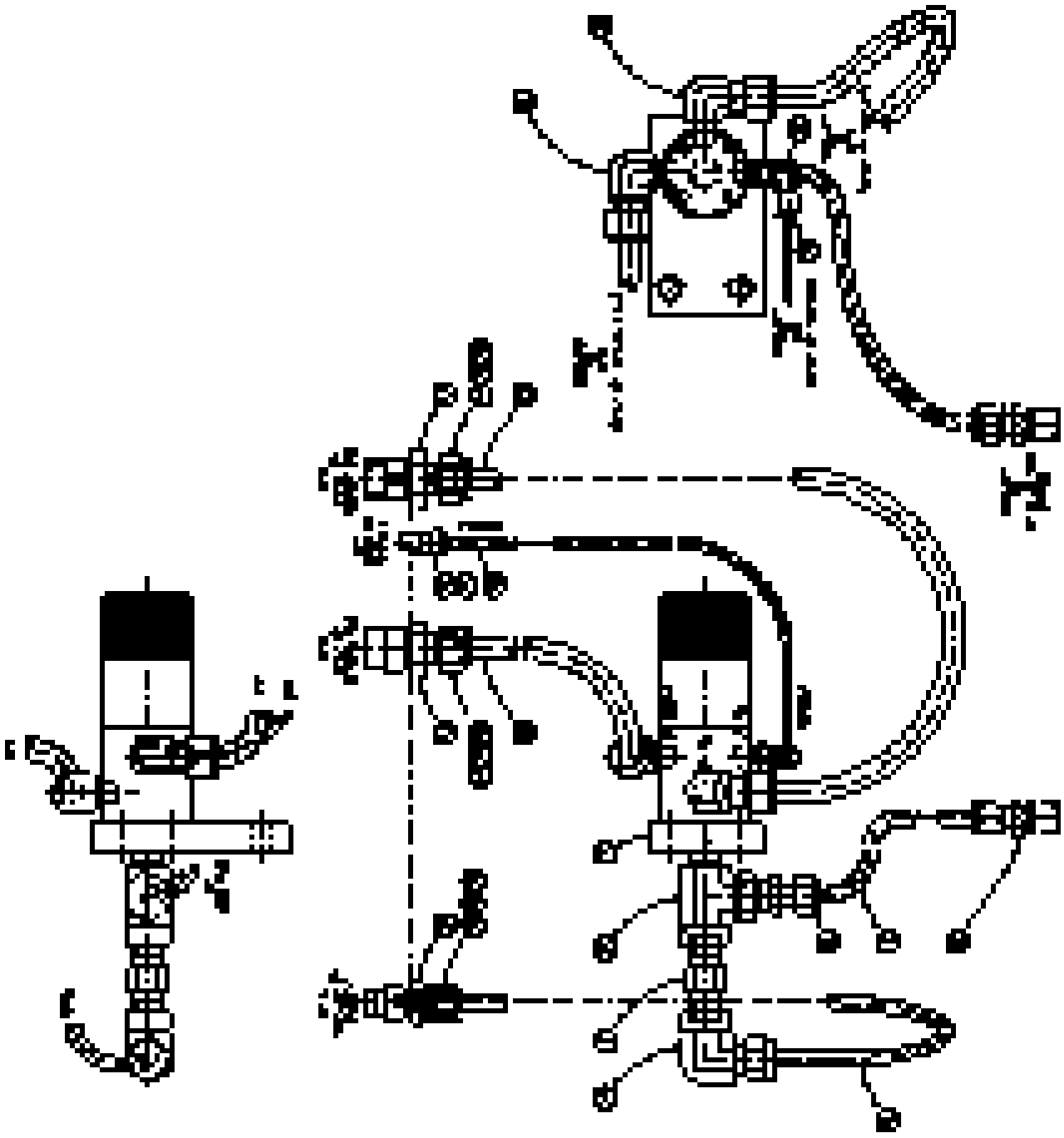

Figure 19: 78723-xx 3-Way Valve Assembly w/Fluid & Air Line Package

78723-xx 3-WAY VALVE ASSY W/FLUID & AIR LINE PACKAGE - PARTS LIST (Figure 19)			
Item #	Description	Part #	Qty
1	Assembly, Fluid Valve, 3-Way, Rectangular Base	18283-02	1
2	Fitting, Street Tee, 1/4 NPT (Male) x 1/4 NPT (Female), SST	LSFI0004-01	1
3	Valve, Check, 1/4 NPT (Male) x 1/4 NPT (Male)	SSV-809	1
4	Fitting, Female Elbow, 1/4 O.D. Tube x 1/4 NPT, SST	LSFI0006-01	1
5	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	13"
6	Fitting, Male Connector, 1/4 O.D. Tube x 1/4 NPT, SST	70590-01	2
7	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	11"
8	Fitting, Male Elbow, 3/8 O.D. Tube x 1/8 NPT, SST	LSFI0007-06	2
9	Fitting, Male Elbow, Swivel, 5/32 O.D. Tube x 1/8 NPT, Brass	41-FTP-1006	1
10	Tubing, 5/32 O.D. x .106 I.D.:		
	Green Nylon (For 78723-01)	77536-03	6.5"
	Natural Nylon (For 78723-02)	77536-05	6.5"
11	Cap, 5/32 O.D. Tube:		
	Green Identification (For 78723-01)	77545-03	2
	Natural Identification (For 78723-02)	77545-04	2
12	Fitting, Male Connector, 5/32 O.D. Tube x 1/16 NPT	78716-01	1
13	Tubing, 3/8 O.D. x 1/4 I.D., (FEP)	SSP-5020	10"
14	Nut, Hex, 11/16, 3/8 O.D. Tube, SST	70591-03	2
15	Ferrule, Back, Tube, 3/8	70606-03	2
16	Ferrule, Front, Tube, 3/8	70607-03	2
17	Fitting, Fluid, Female, 3/8 O.D. Tube, Quick Disconnect	78702-02	2
18	Tubing, 3/8 O.D. x 1/4 I.D., (FEP)	SSP-5020	7"
19	Nut, Hex, 9/16, 1/4 O.D. Tube, SST	70591-01	1
20	Ferrule, Back, Tube, 1/4	70606-01	1
21	Ferrule, Front, Tube, 1/4	70607-01	1
22	Fitting, Fluid, Female, 1/4 O.D. Tube, Quick Disconnect	78702-01	1

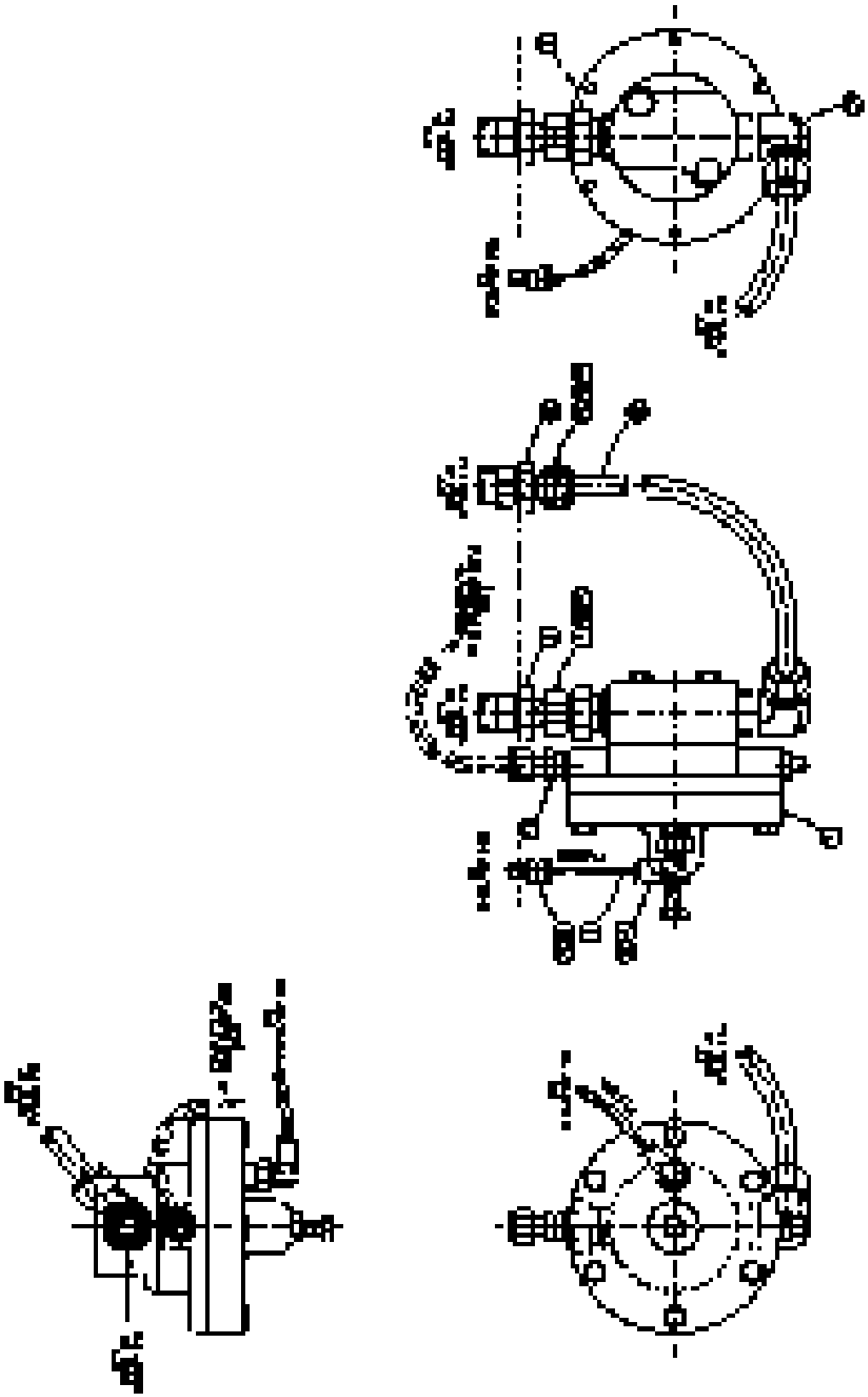

Figure 20: 78714-xx High Flow Fluid Regulator Assembly w/Fluid & Air Line Package

78714-xx HIGH FLOW FLUID REGULATOR ASSY W/FLUID & AIR LINE PACKAGE - PARTS LIST (Figure 20)			
Item #	Description	Part #	Qty
1	Fluid Regulator Assembly, High Flow	70171-04	1
2	Fitting, Male Elbow:		
	1/2 O.D. Tube x 1/2 NPT (For 78714-01 & -02)	77767-04	1
	3/8 O.D. Tube x 1/2 NPT (For 78714-03 & -04)	77767-02	1
3	Fitting, Male Adapter:		
	1/2 NPT x 1/2 O.D. Stem (For 78714-01 & -02)	77768-03	1
	1/2 NPT x 3/8 O.D. Stem (For 78714-03 & -04)	77768-02	1
4	Fitting, Swivel Male Elbow, 5/32 O.D. Tube x 1/4 NPT	72070-10	1
5	Cap, 5/32 O.D. Tube:		
	Yellow Identification (For 78714-01 & -03)	77545-12	2
	Blue Identification (For 78714-02 & -04)	77545-01	2
6	Fitting, Male Connector, 5/32 O.D. Tube x 1/16 NPT	78716-01	1
7	Tubing, 5/32 O.D. x .106 I.D.:		
	Yellow Nylon (For 78714-01 & -03)	77536-07	6"
	Blue Nylon (For 78714-02 & -04)	77536-04	6"
8	Fitting, Fluid, Female, Quick Disconnect:		
	1/2 O.D. Tube (For 78714-01 & -02)	78702-03	2
	3/8 O.D. Tube (For 78714-03 & -04)	78702-02	2
9	Nut, Hex:		
	7/8, 1/2 O.D. Tube, SST (For 78714-01 & -02)	70591-05	2
	11/16, 3/8 O.D. Tube, SST (For 78714-03 & -04)	70591-03	2
10	Ferrule, Back, Tube:		
	1/2 (For 78714-01 & -02)	70606-05	2
	3/8 (For 78714-03 & -04)	70606-03	2
11	Ferrule, Front, Tube:		
	1/2 (For 78714-01 & -02)	70607-05	2
	3/8 (For 78714-03 & -04)	70607-03	2
12	Tubing, (FEP) :		
	1/2 O.D. x 3/8 I.D. (For 78714-01 & -02)	55994-26	7.5"
	3/8 O.D. x 1/4 I.D. (For 78714-03 & -04)	SSP-5020	7.5"
13	Fitting, Male Connector, 1/4 O.D. Tube x 1/4 NPT	70590-01	1

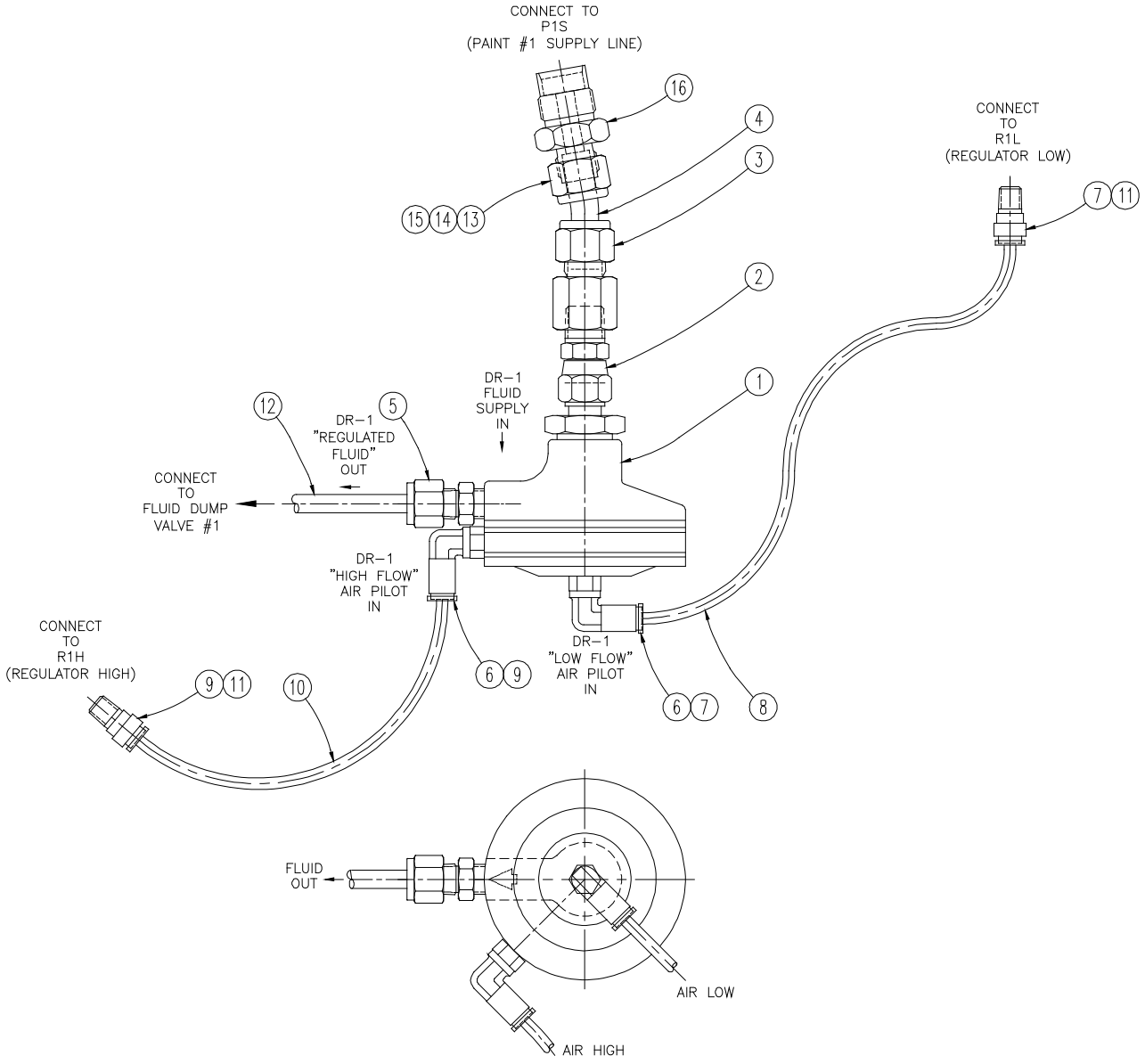

Figure 21: 78719-xx Fluid Regulator Assembly, Low Flow, w/Fluid & Air Line Package (Non-Circulating Fluid Return)

78719-xx FLUID REGULATOR ASSY, LOW FLOW, W/FLUID & AIR LINE PACKAGE (Non-Circulating) - PARTS LIST (Figure 21)			
Item #	Description	Part #	Qty
1	DR-1 Fluid Regulator Assembly, Low Flow, 2-Stage	See Table "A"	1
2	Adapter, Swivel, 1/4 NPSF x 1/4 NPTM, SST	101-9120	1
3	Fitting, Female Connector, 3/8 O.D. Tube x 1/4 NPT	41-FTC-1005	1
4	Tube, Fluid Supply, 3/8" O.D. x .035 (Wall)	78720-00	1
5	Fitting, Paint, 1/4" O.D. Tube x 1/8 NPSM	70589-05	1
6	Fitting, Swivel Male Elbow, 5/32" O.D. Tube x 10-32 Thread	72070-11	2
7	Cap, 5/32" O.D. Tube:		
	Yellow Identification (For 78719-01 thru -11)	77545-12	2
	Blue Identification (For 78719-21 thru -31)	77545-01	2
8	Tubing, 5/32" O.D. x .106" I.D.:		
	Yellow Nylon (For 78719-01 thru -11)	77536-07	8.5"
	Blue Nylon (For 78719-21 thru -31)	77536-04	8.5"
9	Cap, 5/32" O.D. Tube:		
	Orange Identification (For 78719-01 thru -11)	77545-13	2
	Gray Identification (For 78719-21 thru -31)	77545-11	2
10	Tubing, 5/32" O.D. x .106" I.D.:		
	Orange Nylon (For 78719-01 thru -11)	77536-08	6.25"
	Silver Nylon (For 78719-21 thru -31)	77536-06	6.25"
11	Fitting, Male Connector, 5/32 O.D. Tube x 1/16 NPT	78716-01	2
12	Tubing, 1/4" O.D. x .156 I.D., (FEP)	55994-23	7"
13	Nut, Hex, 11/16, 3/8 O.D. Tube, SST	70591-03	1
14	Ferrule, Back, Tube, 3/8	70606-03	1
15	Ferrule, Front, Tube, 3/8	70607-03	1
16	Fitting, Fluid, Female, 3/8 O.D. Tube, Quick Disconnect	78702-02	1

TABLE "A" (Figure 21)		
Assembly #	Regulator #	Regulator Ratio
78719-01	74151-01	1:2
78719-02	74151-02	1:4
78719-03	74151-03	1:6
78719-04	74151-04	1:8
78719-05	74151-05	1:10
78719-06	74151-06	1:3
78719-11	74151-11	1:1
78719-21	74151-01	1:2
78719-22	74151-02	1:4
78719-23	74151-03	1:6
78719-24	74151-04	1:8
78719-25	74151-05	1:10
78719-26	74151-06	1:3
78719-31	74151-11	1:1

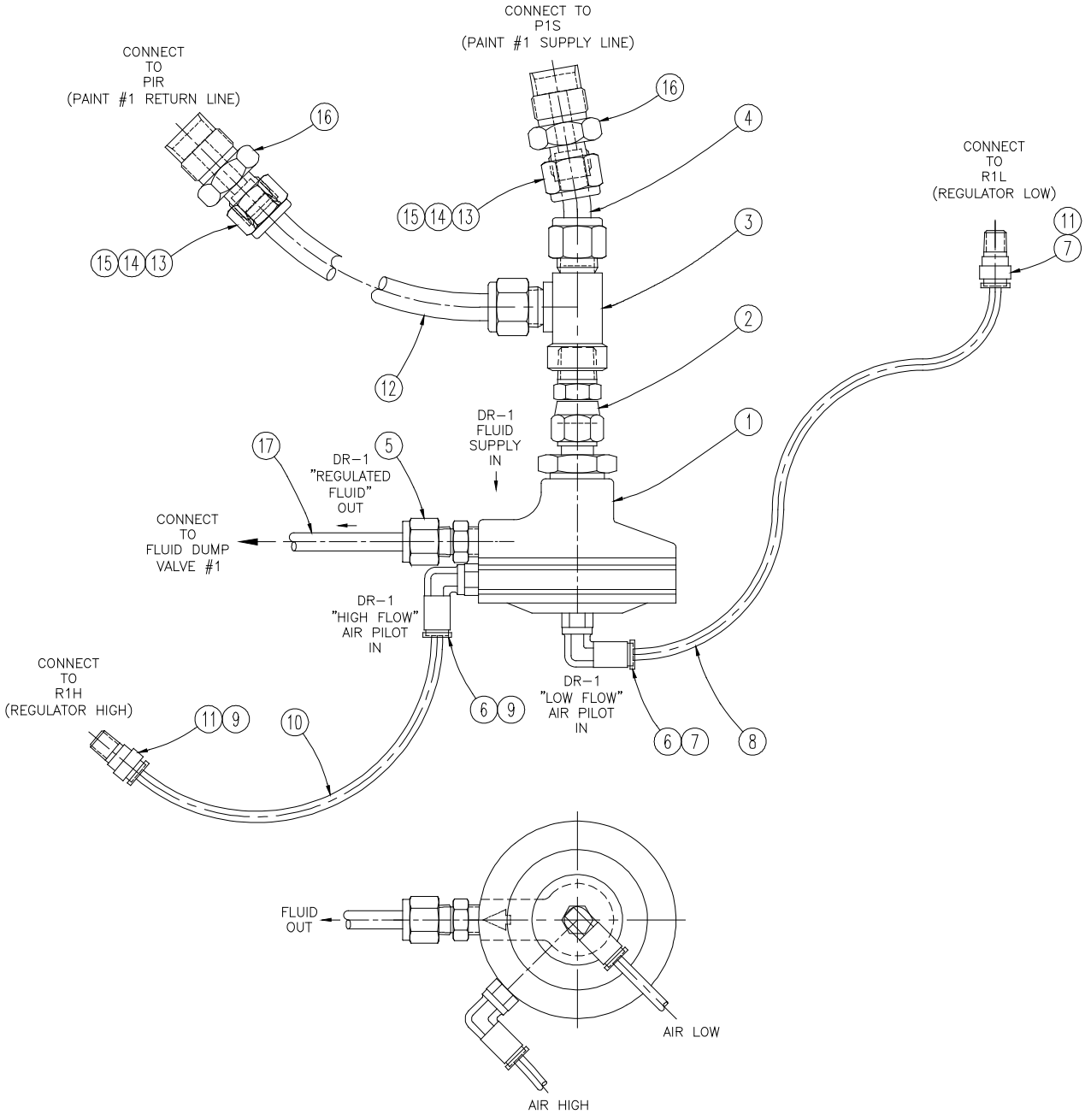

Figure 22: 78719-xx Fluid Regulator Assembly, Low Flow, w/Fluid & Air Line Package (Recirculating Fluid Return)

78719-xx FLUID REGULATOR ASSY, LOW FLOW, W/FLUID & AIR LINE PACKAGE (Recirculating) - PARTS LIST (Figure 22)			
Item #	Description	Part #	Qty
1	DR-1 Fluid Regulator Assembly, Low Flow, 2-Stage	See Table "A"	1
2	Adapter, Swivel, 1/4 NPSF x 1/4 NPTM, SST	101-9120	1
3	Fitting, Female Run Tee, 3/8 O.D. Tube x 1/4 NPT	78721-06	1
4	Tube, Fluid Supply, 3/8" O.D. x .035 (Wall)	78720-00	1
5	Fitting, Paint, 1/4" O.D. Tube x 1/8 NPSM	70589-05	1
6	Fitting, Swivel Male Elbow, 5/32" O.D. Tube x 10-32 Thread	72070-11	2
7	Cap, 5/32" O.D. Tube:		
	Yellow Identification (For 78719-41 thru -51)	77545-12	2
	Blue Identification (For 78719-61 thru -71)	77545-01	2
8	Tubing, 5/32" O.D. x .106" I.D.:		
	Yellow Nylon (For 78719-41 thru -51)	77536-07	8.5"
	Blue Nylon (For 78719-61 thru -71)	77536-04	8.5"
9	Cap, 5/32" O.D. Tube:		
	Orange Identification (For 78719-41 thru -51)	77545-13	2
	Gray Identification (For 78719-61 thru -71)	77545-11	2
10	Tubing, 5/32" O.D. x .106" I.D.:		
	Orange Nylon (For 78719-41 thru -51)	77536-08	6.25"
	Silver Nylon (For 78719-61 thru -71)	77536-06	6.25"
11	Fitting, Male Connector, 5/32 O.D. Tube x 1/16 NPT	78716-01	2
12	Tubing, 3/8" O.D. x 1/4" I.D., (FEP)	SSP-5020	8"
13	Nut, Hex, 11/16, 3/8 O.D. Tube, SST	70591-03	2
14	Ferrule, Back, Tube, 3/8	70606-03	2
15	Ferrule, Front, Tube, 3/8	70607-03	2
16	Fitting, Fluid, Female, 3/8 O.D. Tube, Quick Disconnect	78702-02	2
17	Tubing, 1/4" O.D. x .156 I.D., (FEP)	55994-23	7"

TABLE "A" (Figure 22)		
Assembly #	Regulator #	Regulator Ratio
78719-41	74151-01	1:2
78719-42	74151-02	1:4
78719-43	74151-03	1:6
78719-44	74151-04	1:8
78719-45	74151-05	1:10
78719-46	74151-06	1:3
78719-51	74151-11	1:1
78719-61	74151-01	1:2
78719-62	74151-02	1:4
78719-63	74151-03	1:6
78719-64	74151-04	1:8
78719-65	74151-05	1:10
78719-66	74151-06	1:3
78719-71	74151-11	1:1

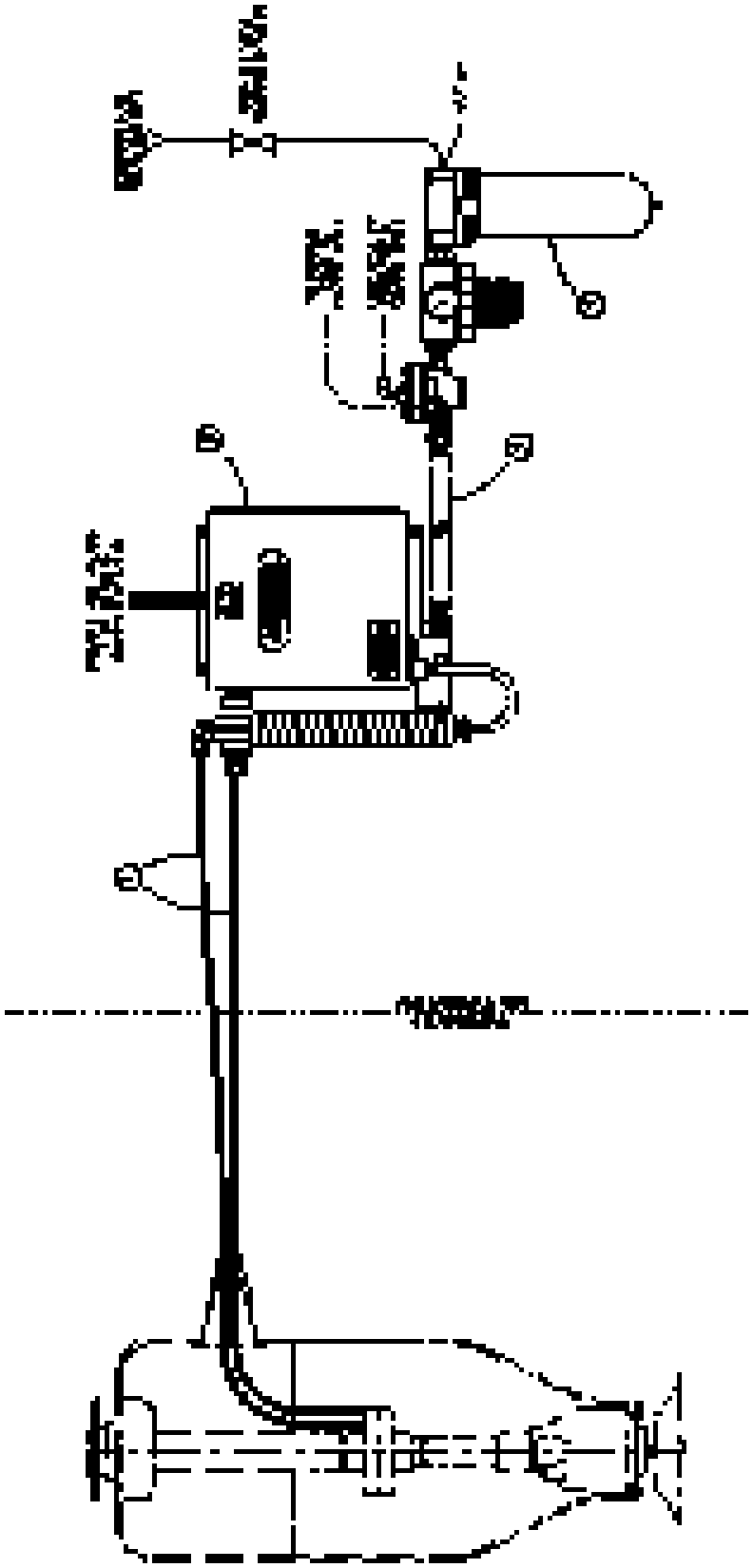

Figure 23: 78781 Turbodisk 2 Air Heater and Filter/Regulator Assembly

78781 TURBODISK 2 AIR HEATER & FILTER/REGULATOR ASSEMBLY - PARTS LIST (Figure 23)			
Item #	Description	Part #	Qty
1	Regulator Assembly, Turbodisk 2 Drive Air	78170-00	1
2	Hose Assembly, Compressed Air	78166-00	1
3	Air Heater Assembly	20222-00	1
4	Tubing, 1/2" O.D. x .375" I.D., Green Nylon	78176-01	(Ref)

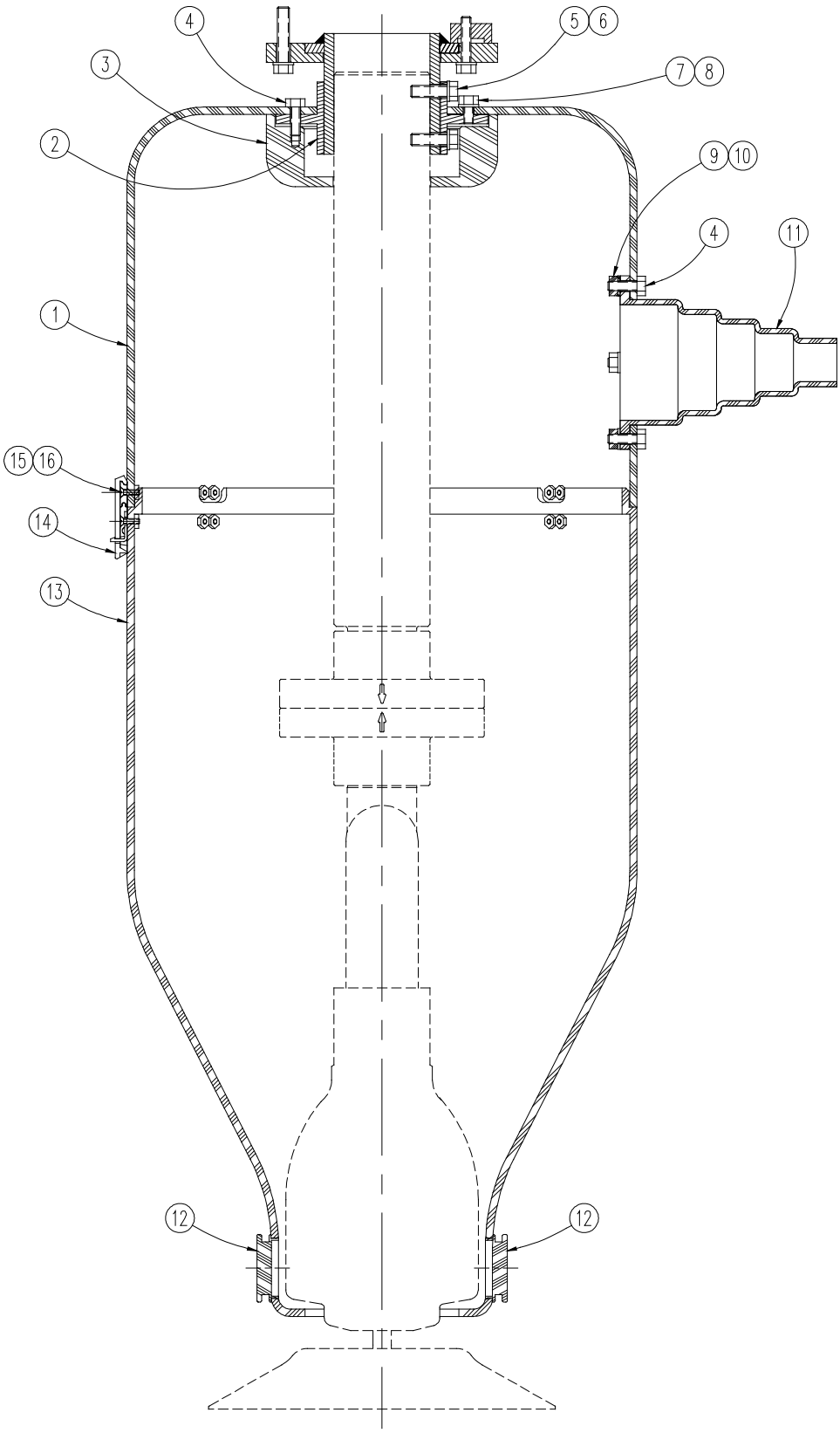

Figure 24: 78189 Turbodisk 2 Quick Release Fairing Assembly

78189 TURBODISK 2 QUICK RELEASE FAIRING ASSEMBLY - PARTS LIST (Figure 24)			
Item #	Description	Part #	Qty
1	Bulkhead, Machined, Turbodisk 2	78185-00	1
2	Flange, Machined, Turbodisk 2 Support	70147-00	1
3	Flange, Machined, Nylon Support	70148-00	1
4	Screw, 1/4-20 x 3/4 Long, Nylon Hex Head	4322-24C	6
5	Screw, 5/16-24 x 1" Long, Hex Head	8156-32F	2
6	Lock Washer, 5/16 Helical Spring	7734-07	2
7	Screw, 1/4-20 x 1/2" Long, Hex Head	7958-16C	6
8	Lock Washer, 1/4 Internal Tooth	7776-06	6
9	Flat Washer, 1/4 Nylon	72471-01	4
10	Nut, 1/4-20 Nylon Hex	72472-09	4
11	Boot, Strain Relief	72128-00	1
12	Plug, Machined, Feed Tube Adjustment	70909-00	2
13	Shroud, Machined	78186-00	1
14	Latch, Machined, Shroud	78184-00	4
15	Screw, #6-32 x 1/2 Long, Nylon Flat Heat	78188-00	16
16	Nut, #6-32 Nylon, Hex	8351-08	16
17	Kit, Turbodisk 2 Shroud Disposable Cover (Not Shown)	78143-00	1

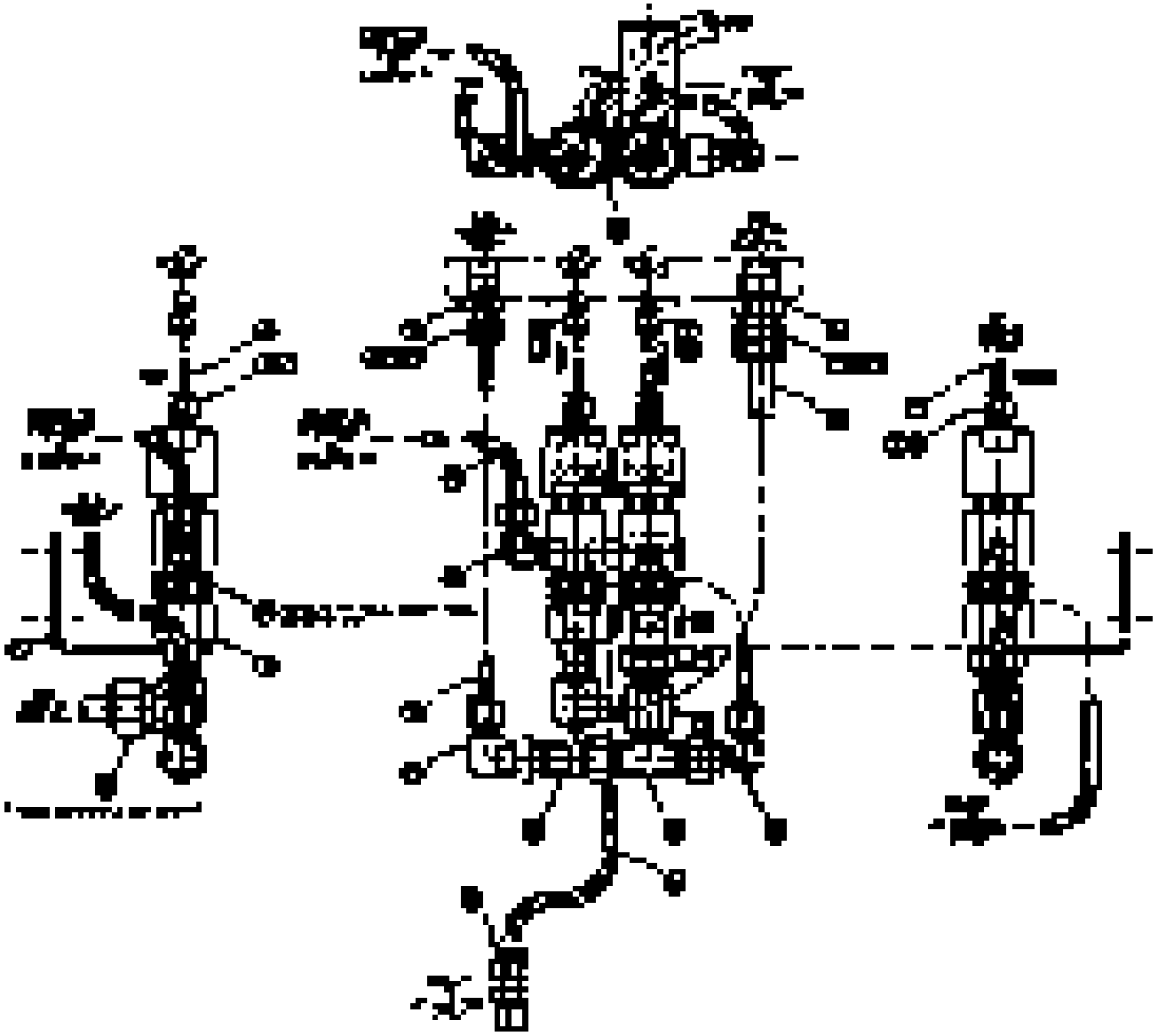

Figure 25: 78722-xx (2) Valve Assembly - Trigger & Dump

78722-xx (2) VALVE ASSEMBLY - TRIGGER & DUMP - PARTS LIST (Figure 25)

Item #	Description	Part #	Qty
1	Bracket, Fluid Valve Mounting	78712-00	1
2	Fitting, Male Elbow, 1/2 O.D. Tube x 1/4 NPT, SST	77767-03	1
3	Adapter, Turbodisk 2 Dump Valve	78711-00	1
4	Fluid Valve Assembly	CCV-403-SS	2
5	Pipe Nipple, 1/4-18 NPT x 7/8 Long	SSP-440	1
6	Fitting, Male Connector, 5/32 O.D. Tube x 1/8 NPT	41-FTP-1018	2
7	Cap, 5/32 O.D. Tube:		
	Red Identification (For 78722-01)	77545-05	2
	Black Identification (For 78722-02)	77545-02	2
8	Tubing, 5/32 O.D. x .106 I.D.:		
	Red Nylon (For 78722-01)	77536-02	9.5"
	Black Nylon (For 78722-02)	77536-01	9.5"
9	Fitting, Male Connector, 5/32 O.D. Tube x 1/16 NPT	78716-01	2
10	Cap, 5/32 O.D. Tube:		
	Green Identification (For 78722-01)	77545-03	2
	Natural Identification (For 78722-02)	77545-04	2
11	Tubing, 5/32 O.D. x .106 I.D.:		
	Green Nylon (For 78722-01)	77536-03	9.5"
	Natural Nylon (For 78722-02)	77536-05	9.5"
12	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	7"
13	Fitting, Female Elbow, 1/4 O.D. Tube x 1/4 NPT, SST	LSFI0006-01	1
14	Valve, Check, 1/4 NPT (Male) x 1/4 NPT (Male)	SSV-809	1
15	Fitting, Male Branch Tee, 1/4 NPT	76462-00	1
16	Fitting, Male Connector, 1/4 O.D. Tube x 1/4 NPT, SST	70590-01	1
17	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	11.5"
18	Fitting, Reducing Adapter, 1/8 NPT(M) x 1/4 NPT(F), SST	SSP-39	1
19	Nut, Hex Jam, 5/8-18 UNF, SST	SSF-8125	1
20	Adapter, Trigger Valve	CCV-12-SS	1
21	Tubing, 1/2 O.D. x 3/8 I.D., (FEP)	55994-26	7.5"
22	Fitting, Male Elbow, 1/4 O.D. Tube x 1/4 NPT, SST	LSFI0007-01	2
23	Tubing, 1/4 O.D. x .170 I.D., (FEP)	76698-01	6.75"
24	Nut, Hex, 7/8, 1/2 O.D. Tube, SST	70591-05	1
25	Ferrule, Back, Tube, 1/2	70606-05	1
26	Ferrule, Front, Tube, 1/2	70607-05	1
27	Fitting, Fluid, Female, 1/2 O.D. Tube, Quick Disconnect	78702-03	1
28	Fitting, Fluid, Female, 1/4 O.D. Tube, Quick Disconnect	78702-01	1
29	Nut, Hex, 9/16, 1/4 O.D. Tube, SST	70591-01	1
30	Ferrule, Back, Tube, 1/4	70606-01	1
31	Ferrule, Front, Tube, 1/4	70607-01	1
32	Tool, Valve (Not Shown)	CCV-7	1

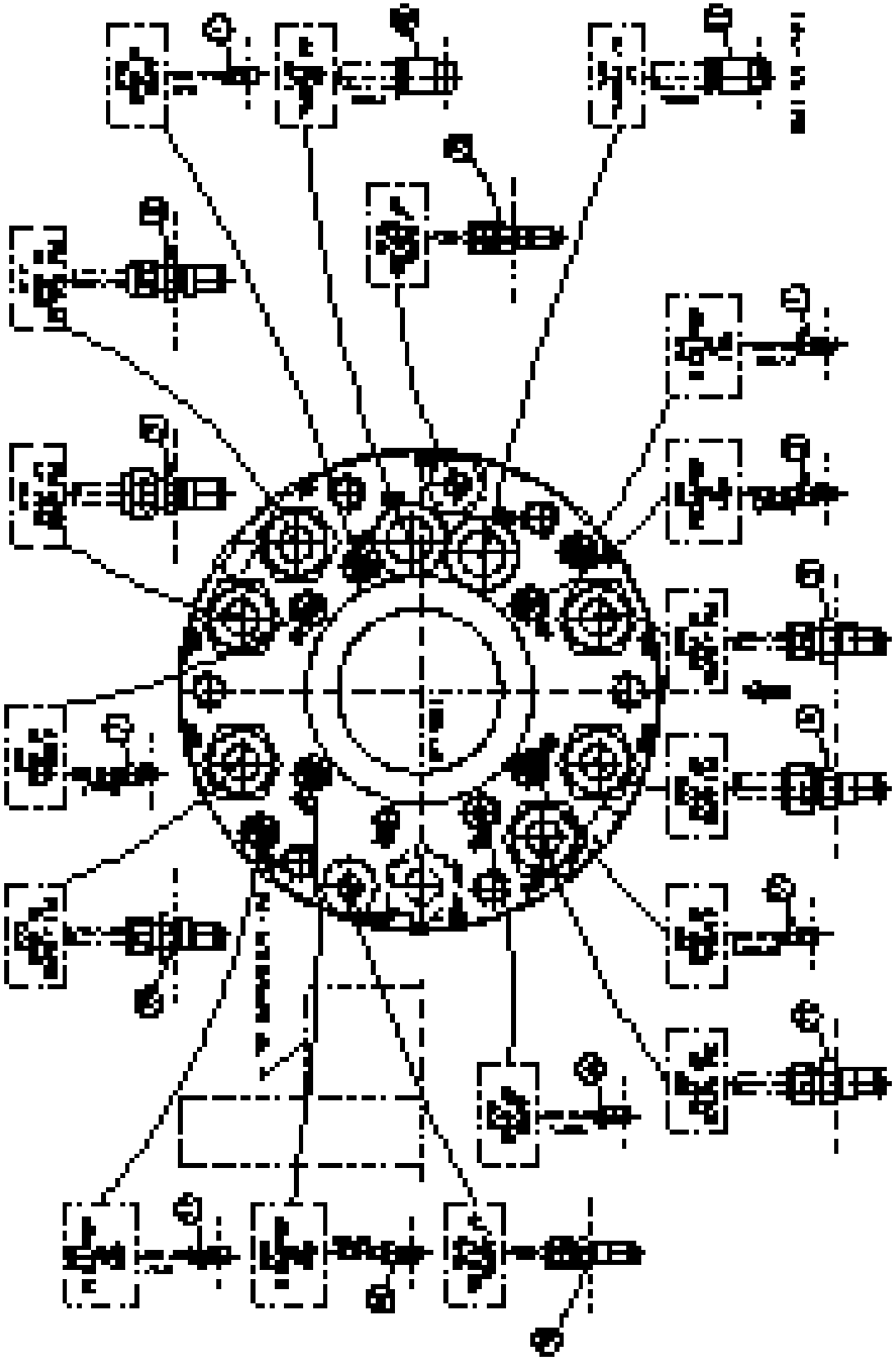

Figure 26: 78729 Upper Turbodisk 2 Bulkhead Plate Fitting Layout
(Reference Figures 3a & 3b)

78729 UPPER TURBODISK 2 BULKHEAD PLATE FITTING - PARTS LIST (Figure 26)			
Item #	Description	Part #	Qty
1	P1D Fitting Subassembly	78730-01	1
2	P1DL Fitting Subassembly	78730-02	1
3	R1H Fitting Subassembly	78730-03	1
4	R1L Fitting Subassembly	78730-04	1
5	P1S Fitting Subassembly:	Select Option	
	3/8 I.D.	78730-05	1
	1/4 I.D.	78730-06	1
6	P1R Fitting Subassembly:	Select Option	
	3/8 I.D.	78730-07	1
	1/4 I.D.	78730-08	1
7	P1T Fitting Subassembly	78730-09	1
8	P2D Fitting Subassembly	78730-10	1
9	P2DL Fitting Subassembly	78730-11	1
10	R2H Fitting Subassembly	78730-12	1
11	R2L Fitting Subassembly	78730-13	1
12	P2S Fitting Subassembly:	Select Option	
	3/8 I.D.	78730-14	1
	1/4 I.D.	78730-15	1
13	P2R Fitting Subassembly:	Select Option	
	3/8 I.D.	78730-16	1
	1/4 I.D.	78730-17	1
14	P2T Fitting Subassembly	78730-18	1
15	S1.IN Fitting Subassembly	78730-19	1
16	S2.IN Fitting Subassembly	78730-20	1
17	T.A1 Fitting Subassembly	78730-21	1
18	T.A2 Fitting Subassembly	78730-22	1

Note: Reference Figure 3B for fitting identification designation.

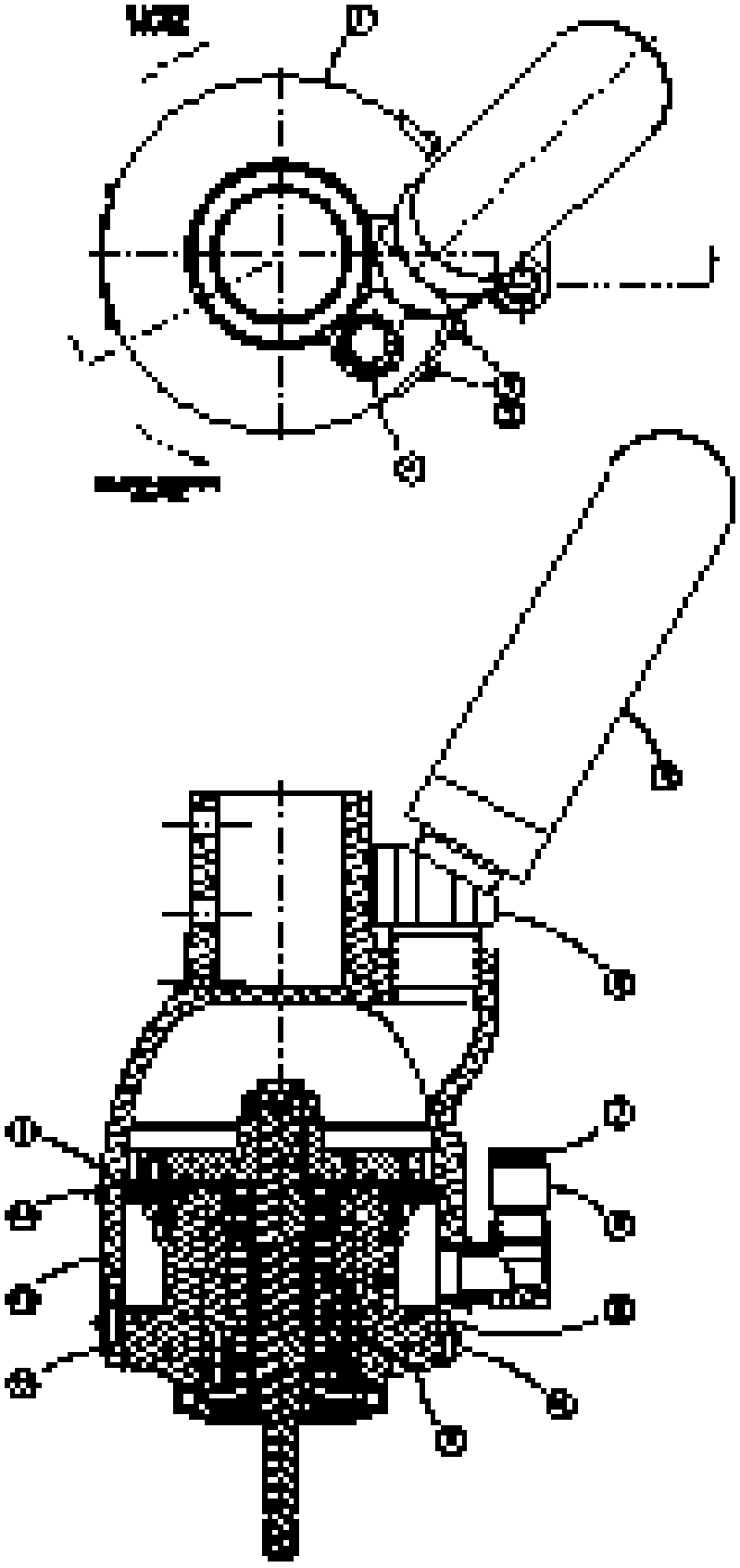

Figure 27: 78175-xx Turbodisk 2 Air Turbine Assembly

78175-xx TURBODISK 2 AIR TURBINE ASSEMBLY - PARTS LIST (Figure 27)

Item #	Description	Part #	Qty
1	Housing Assembly, Machined, Turbodisk 2 Upgrade	78174-00	1
2	Screw, #8-32 x 5/16 Long, Slotted Round Head	7735-10C	8
3	Lock Washer, #8 Helical Spring	7734-03	8
4	Plug, Protective	LS0135	1
5	Muffler, 1" NPT Polyethylene Exhaust	78163-00	1
6	Fitting, Machined, Exhaust Muffler Adapter	78173-00	A*
7	Identification Cap, 1/2" O.D. Tube, Green	78169-00	2
8	Fitting, 1/2" NPT x 1/2" O.D. Tube	78168-00	2
9	O-Ring, 4.239 I.D. x .070 c/s, Solvent Resistant	7554-74	2
10	Screw, #8-32 x 3/8 Long, Socket Head Set	7716-12C	3
11	Air Motor Assembly, Turbodisk 2	B*	1
12	Screw, #6-32 x 1/2 Long, Socket Head Cap	10773-16C	6
13	Nameplate, Turbodisk 2	70870-00	1
14	Drive Screw	7612-43	4

* See corresponding column in Table "A"

TABLE "A" (Figure 27)

Part #	Description	A	B	Notes**
78175-01	Air Motor Assembly, CW Rotation, w/o Exhaust Adapter	0	70879-406	
78175-02	Air Motor Assembly, CW Rotation, w/Exhaust Adapter	1	70879-406	1
78175-11	Air Motor Assembly, CCW Rotation, w/o Exhaust Adapter	0	70879-456	
78175-12	Air Motor Assembly, CCW Rotation, w/Exhaust Adapter	1	70879-456	1

** See "Parts List Bullet Definition Table"

** PARTS LIST BULLET DEFINITION TABLE (Figure 27)

1 The exhaust adapter is required only when the orientation of the fluid valving will not allow the exhaust muffler to be installed directly into the turbine housing. If the installed system provides an interference, then it may be possible to re-orient the fluid valving so that the exhaust adapter is not required.

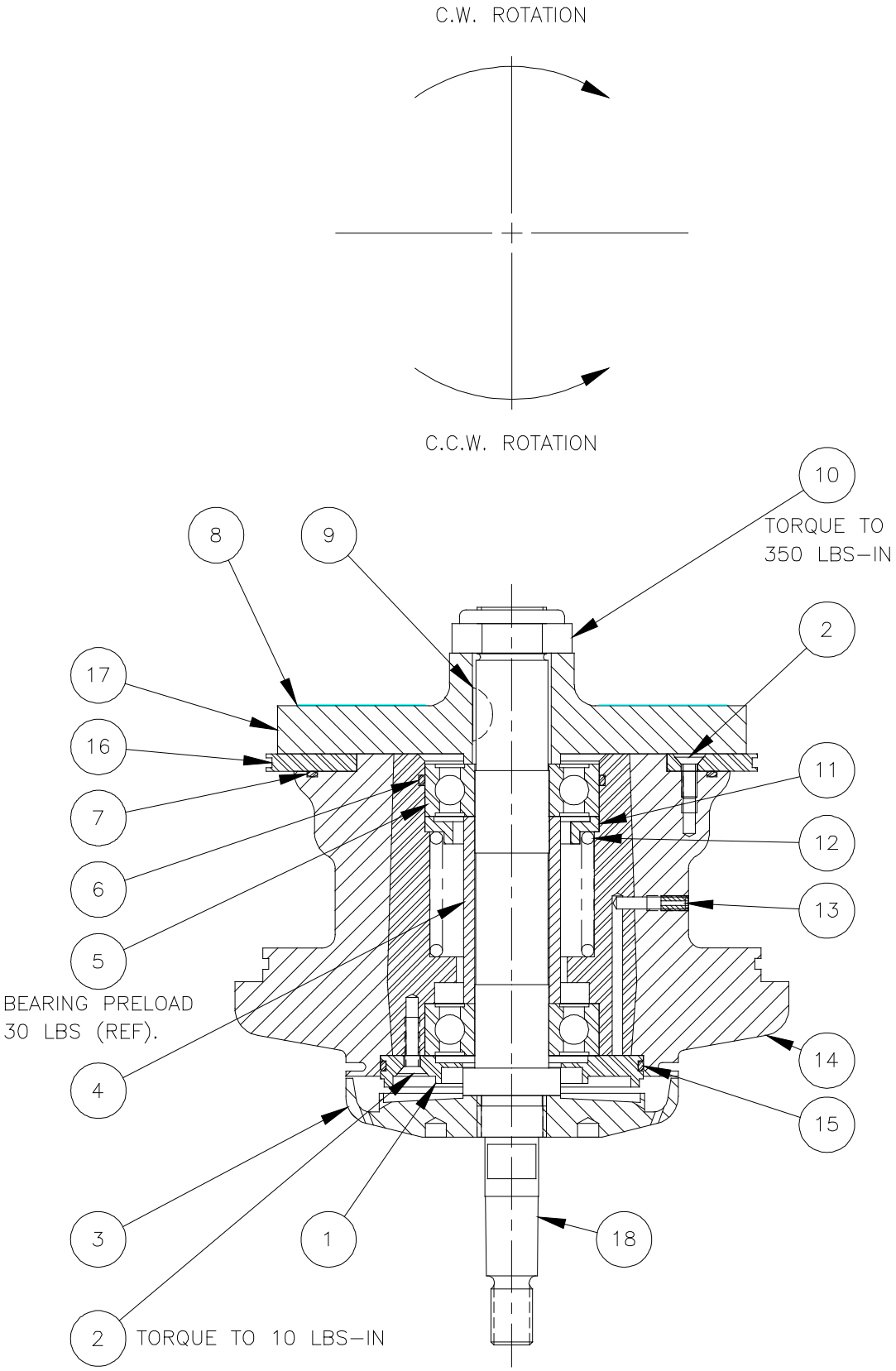

Figure 28: 70879-xxx Turbodisk 2 Turbine Cartridge Assembly

70879-xxx TURBODISK 2 TURBINE CARTRIDGE ASSEMBLY - PARTS LIST (Figure 28)			
Item #	Description	Part #	Qty
1	Retainer, Bearing	70873-00	1
2	Screw, #6-32 x 3/8 Long, Hex Socket, Flat Head	78232-12C	12
3	Slinger	70876-00	1
4	Spacer, Bearing	20298-00	1
5	Bearing, Ball	70896-00	2
6	O-Ring, 1.614 I.D., Solvent Resistant	7554-77	1
7	O-Ring, 3.489 I.D., Solvent Resistant	7554-73	1
8	Decal, 20292-xx Turbodisk	73180-02	1
9	Key, Woodruff, 1/2 Dia.	8310-01	1
10	Nut, Self-Lock, 5/8-18, UNF	7729-10	1
11	Seat, Spring	20966-00	1
12	Spring, Compression	70868-00	1
13	Screw, Set, Special	70871-00	1
14	Housing, Bearing, Machined	70875-00	1
15	O-Ring, 2.239 I.D., Solvent Resistant	7554-17	1
16	Plate, Nozzle	A*	1
17	Rotor, Turbine	B*	1
18	Shaft, Air Motor	C*	1

* See corresponding column in Table "A"

TABLE "A" (Figure 28)				
Part #	Description	A	B	C
70879-206	Motor, Turbodisk 2, CW Rotation	20291-06	20292-31	70897-01
70879-256	Motor, Turbodisk 2, CCW Rotation	20291-56	20292-32	70897-02
70879-406	Motor, Turbodisk 2, CW Rotation	20291-10	20292-31	70897-01
70879-456	Motor, Turbodisk 2, CCW Rotation	20291-60	20292-32	70897-02

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.

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

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

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

EXCLUSIONS:

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

APPENDIX

PAINT AND SOLVENT SPECIFICATIONS

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

GUIDE TO USABLE SOLVENT SELECTION

CHEMICAL NAME	COMMON NAME	CATEGORY	*CAS NUMBER	EVAP. RATE†	ELECTRICAL RESISTANCE**
DICHLOROMETHANE	Methylene Chloride	Chlorinated Solvents	75-09-2	14.5	HIGH
METHYL ACETATE		Esters	79-20-9	11.8	LOW
VM & P NAPHTHA	Naptha	Aliphatic Hydrocarbons	803-232-4	10	HIGH
ACETONE		Ketones	67-64-1	5.6	LOW
BENZENE		Aromatic Hydrocarbons	71-43-2	5.1	HIGH
ETHYL ACETATE		Esters	141-78-6	3.9	MEDIUM
2-BUTANONE	MEK	Ketones	78-93-3	3.8	MEDIUM
ISO-PROPYL ACETATE		Esters	108-21-4	3.4	LOW
ISOPROPYL ALCOHOL	IPA	Alcohols	67-63-0	2.5	LOW
2-PENTANONE	MPK	Ketones	107-87-9	2.5	MEDIUM
METHANOL	Methyl Alcohol	Alcohols	67-56-1	2.1	LOW
PROPYL ACETATE	n-Propyl Acetate	Esters	109-60-4	2.1	LOW
TOLUOL	Toluene	Aromatic Hydrocarbons	108-88-3	1.9	HIGH
METHYL ISOBUTYL KETONE	MIBK	Ketones	108-10-1	1.6	MEDIUM
ISOBUTYL ACETATE		Esters	110-19-0	1.5	LOW
ETHANOL	Ethyl Alcohol	Alcohols	64-17-5	1.4	LOW
BUTYL ACETATE		Esters	123-86-4	1.0	LOW
ETHYLBENZENE		Aromatic Hydrocarbons	100-41-4	.89	HIGH
1-PROPANOL	n-Propyl Alcohol	Alcohols	71-23-8	.86	LOW
2-BUTANOL	sec.-Butyl Alcohol	Alcohols	78-92-2	.81	LOW
XYLOL	Xylene	Aromatic Hydrocarbons	133-02-07	.80	HIGH
AMYL ACETATE		Esters	628-63-7	.67	MEDIUM
2-METHYLPROPANOL	iso-Butyl Alcohol	Alcohols	78-83-1	.62	LOW
METHYL AMYL ACETATE		Esters	108-84-9	.50	LOW
5-METHYL-2-HEXANONE	MIAK	Ketones	110-12-3	.50	MEDIUM
1-BUTANOL	n-Butyl Alcohol	Alcohols	71-36-3	.43	LOW
2-ETHOXYETHANOL		Glycol Ethers	110-80-5	.38	LOW
2-HEPTANONE	MAK	Ketones	110-43-0	.40	MEDIUM
CYCLOHEXANONE		Ketones	108-94-1	.29	MEDIUM
AROMATIC-100	SC#100	Aromatic Hydrocarbons		.20	HIGH
DIISOBUTYL KETONE	DIBK	Ketones	108-83-8	.19	MEDIUM
1-PENTANOL	Amyl Alcohol	Alcohols	71-41-0	.15	LOW
DIACETONE ALCOHOL		Ketones	123-42-2	.12	LOW
2-BUTOXYETHANOL	Butyl Cellosolve	Glycol Ethers	111-76-2	.07	LOW
CYCLOHEXANOL		Alcohols	108-93-0	.05	LOW
AROMATIC-150	SC#150	Aromatic Hydrocarbons		.004	HIGH
AROMATIC-200		Aromatic Hydrocarbons		.003	HIGH

FASTER ⇑ SLOWER ⇓

* CAS Number: Chemical Abstract Service Number.
** Using the Ransburg Meter.
*** Solvent Base Configuration Only.
† Information Obtained From: http://solvdb.ncms.org
Evaporation Rate is Based Upon Butyl Acetate Having a Rate of 1.0

NOTE: This page provides resistivity determination and control information that we feel is necessary when using our electrostatic equipment.

VISCOSITY CONVERSION CHART

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

VISCOSITY CONVERSION CHART (Continued)

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

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

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

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

NOTES:

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

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