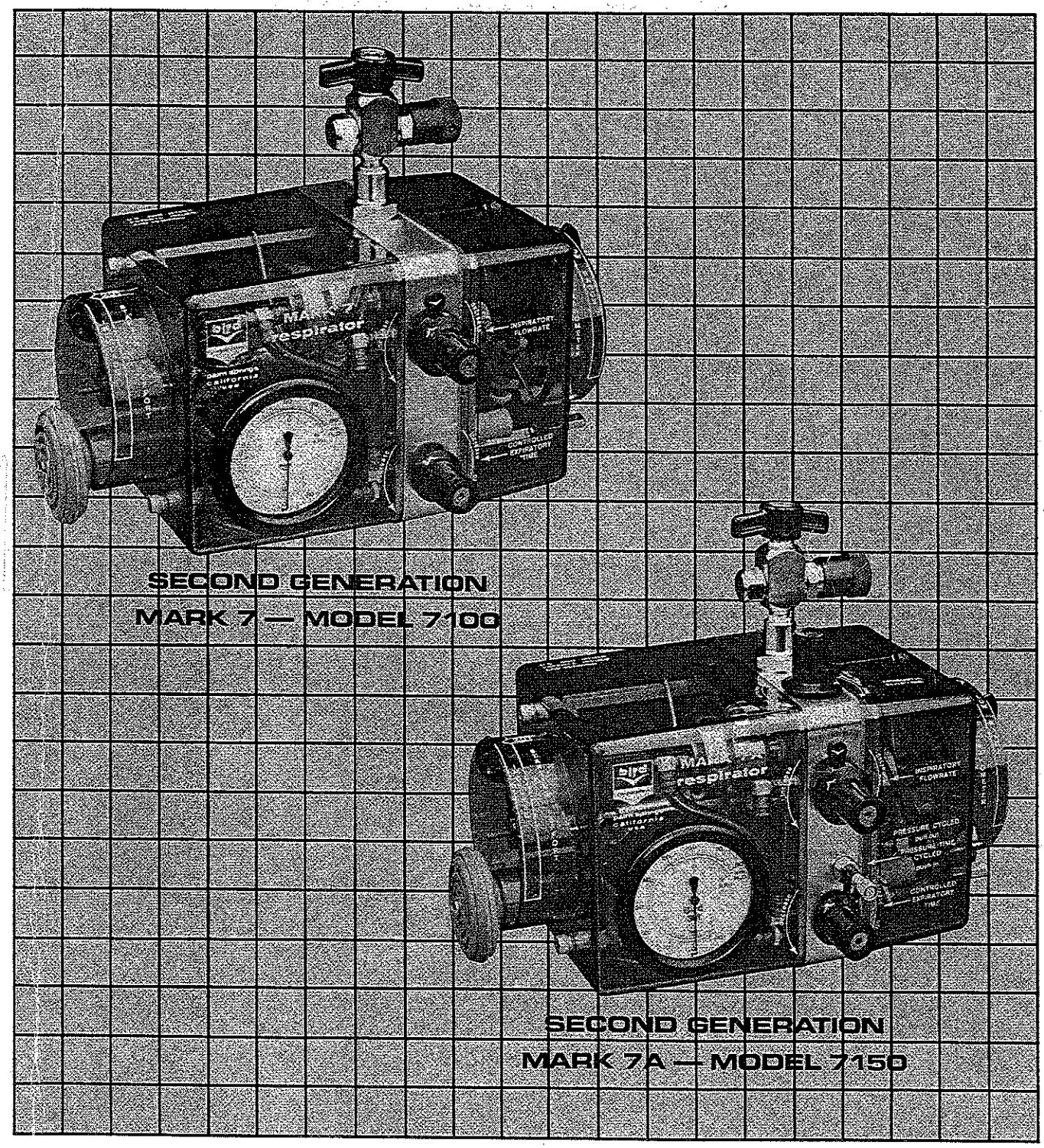
S.C. 92 - Rockford

BIRD® MARK 7 AND MARK 7A RESPIRATORS



SECOND GENERATION
MARK 7 — MODEL 7100

SECOND GENERATION
MARK 7A — MODEL 7150

SERVICE MANUAL

P/N L1012

$25.00

TABLE OF CONTENTS

SECTION 1
INTRODUCTION/MAINTENANCE SCHEDULE

Bird Products Corporation Respirators/Ventilators have been designed to provide the maximum amount of utilization with a minimum of maintenance. This manual will provide the information necessary to correctly disassemble, reassemble, calibrate and troubleshoot second generation Bird Mark 7 or Bird Mark 7A Respirator Units manufactured after 1976.

The Bird Mark 7 and/or 7A should be serviced by a Bird Products Corporation trained hospital/dealer service technician.

Bird Products Corporation recommends that the Mark 7 and 7A respirators be overhauled annually.

For service information, contact your Bird Distributor, or Bird Products Corporation,

Bird Products Corporation
1100 Bird Center Dr., Palm Springs, CA 92262
(760) 778-7200 • TLX: 9103805605
(800) 328-4139 • Telefax: (760) 778-7269

■ BIRD MARK 7 RESPIRATOR

INSPIRATORY PRESSURE	0 to 60 cmH_2O
PRESSURE RELIEF (ADJUSTABLE)	Preset at 30 cmH_2O
INSPIRATORY FLOWRATE	≥68 LPM
EXPIRATORY TIME	0.5 sec to ∞
STARTING EFFORT	−0.5 to −5.0 cmH_2O
DIMENSIONS	H — 8½" (22cm) W — 10½" (27cm) D — 6⅛" (16cm)
WEIGHT	5¾ lbs. (2.6kg)

■ BIRD MARK 7A RESPIRATOR

INSPIRATORY PRESSURE	0 to 60 cmH_2O
PRESSURE RELIEF (ADJUSTABLE)	Preset at 30 cmH_2O
INSPIRATORY FLOWRATE	≥68 LPM
EXPIRATORY TIME	0.5 sec to ∞
STARTING EFFORT	−0.5 to −5.0 cmH_2O
APNEUSTIC FLOWTIME	OFF to 0.3-3.0 seconds
DIMENSIONS	H — 8½" (22cm) W — 10½" (27cm) D — 6⅛" (16cm)
WEIGHT	6 lbs. (2.7kg)

GLOSSARY OF TERMS

■ INTERMITTENT POSITIVE PRESSURE BREATHING (IPPB): Assisted ventilation creating a positive pressure above zero on the manometer, in the airways during inspiration. Generally used for therapeutic purposes.

■ MARK SERIES, SECOND GENERATION: MARK 7, MARK 7A, MARK 8, MARK 8A, Bird Ventilator, and Bird Ventilator with Demand CPAP, manufactured after November 1976.

■ CYCLING: The means by which a respirator/ventilator turns itself on and off.

- Pressure Cycled: A device designed to deliver gas until a preset pressure is reached, regardless of volume delivered.
- Pressure/Time Cycled: A device that delivers a primary flow of gas until a preset pressure is reached and then a secondary phase provides a continuation of timed flow when airways are at maximum distention (i.e. Apneustic Flowtime).

■ VENTURI: A component used in Bird products to increase source gas by entraining ambient air or gas from a reservoir.

- Distally Gated Venturi: Tailors delivered flow during inspiration, in response to backpressure changes from patient's lungs. Distal gate closes during low terminal flow to allow cycling pressure attainment.

■ APNEUSTIC FLOWTIME: Bird terminology for a dynamic, time cycled, mechanical breath hold.

■ PRESSURE RELIEF VALVE: A spring loaded "pop off" device that limits positive pressure by venting gas out of the circuit.

■ NEBULIZER: A device designed to add water to inspired gas in the form of an aerosol.

SECTION 3
WARNINGS AND CAUTIONS

BEFORE REPAIR OR USAGE OF THIS DEVICE, THE WARNINGS AND CAUTIONS SHOULD BE READ AND UNDERSTOOD THOROUGHLY.

WARNINGS:
CONDITIONS MAY EXIST THAT COULD ADVERSELY AFFECT THE OPERATOR OR PATIENT.

CAUTIONS: Conditions may exist that could damage the equipment or other pieces of equipment.

NOTES: A specific point is made to assist the operator in its understanding.

WARNING

- *A BIRD RESPIRATOR/VENTILATOR WHICH DOES NOT MEET THE MANUFACTURER'S OPERATIONAL VERIFICATION SPECIFICATIONS SHOULD NOT BE USED UNTIL ALL NECESSARY REPAIRS HAVE BEEN MADE AND THE INSTRUMENT HAS BEEN CALIBRATED IN ACCORDANCE WITH THE MANUFACTURERS PUBLISHED PROCEDURE.*
- *THE BIRD MARK 7 AND/OR 7A SHOULD BE SERVICED AND/OR CALIBRATED BY A BIRD PRODUCTS CORPORATION TRAINED HOSPITAL/ DEALER SERVICE TECHNICIAN.*

CAUTIONS

- Only use Bird Authorized Replacement Components in the servicing of this device.

■ VENTURI SYSTEMS

The original rationale for the use of a VENTURI in a medical ventilator was two fold: 1) to act as an air dilutor when oxygen was used as the source gas powering the unit and 2) to increase the gas flow capability of the unit. With the proper design, a gated venturi can function as a "pneumatic clutch" yielding a tapered (decelerating) wave form as backpressure within the system begins to increase (Fig. 1).

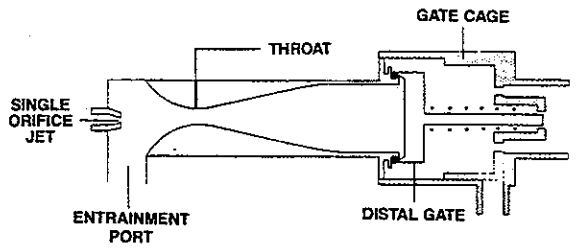


FIGURE 1

A venturi has two flow gradients. The primary gradient consists of a positive flow of gas passing through the jet orifice. The secondary gradient is developed by that flow of gas creating a pressure drop (sub-ambient) at the throat of the venturi (Fig. 2). The laws of physics are such that gas pressures always try to equilibrate. When a sub-ambient pressure is created by a venturi, gas from a higher pressure source will always move to a lower pressure in an attempt to maintain equilibrium between the two. The end result is the entrainment of additional gas molecules by the original source gas. This entrainment mechanism (pressure gradient) allows a pneumatic device to increase its total flow potential being delivered to the patient.

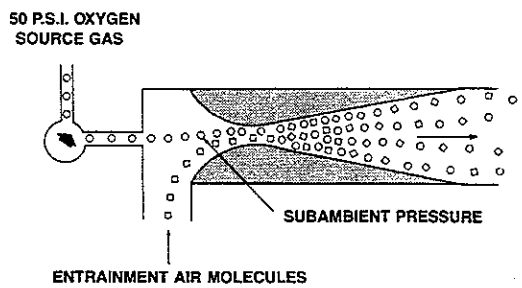


FIGURE 2

When the venturi is functioning, the mixed gas is delivered to the lungs under pressure (Fig. 3). However, as the lung continues to fill, pressures begin to equalize within the venturi and less air molecules are entrained (Fig. 4). The result is a higher oxygen concentration delivered to the lungs as the venturi entrains less air due to the back-pressure increasing within the system. When air molecules cease to be entrained at the end of inspiration, oxygen concentrations rise upward toward 100%.

Due to its design, a venturi CANNOT hold a constant dilution ratio unless an oxygen blending device and entrainment kit are utilized, especially in the presence of rising pressures within the system. Because of this design, oxygen concentrations being delivered to a patient may range from 40%-90% when the unit is being powered by 100% oxygen.

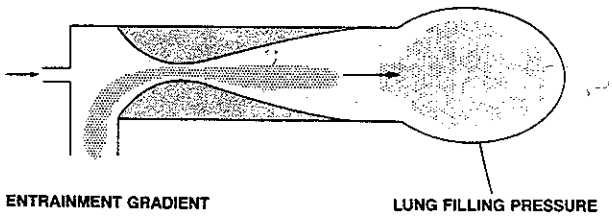


FIGURE 3

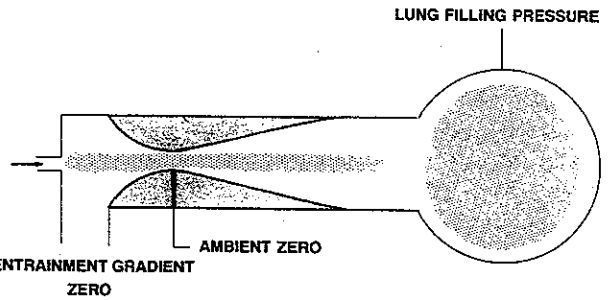


FIGURE 4

The major advantage of delivering gas via a venturi is achieved by the addition of a distal gate (Fig. 1). Bird venturi's utilize this gate to achieve a "pneumatic clutch" during the inspiratory flow of gas. As pressures increase within the lungs, the backpressure is sensed at the venturi gate. The increase in pressure, as the lungs fill, causes the gate to close. The greater the pressure, the quicker the gate closes. As the gate approaches the end of the venturi, it reduces the size of the delivery port thus allowing less gas to flow to the patient (Fig. 5). Toward the end of inspiration, this "pneumatic clutch" achieves a more laminar gas flow to the lungs.

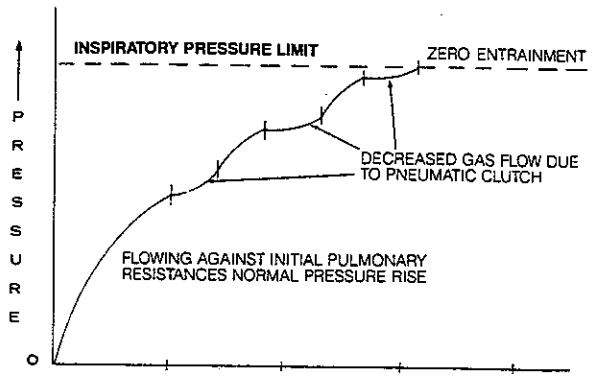


FIGURE 5

■ FLOW CARTRIDGES

The design of the flow cartridges evolved as a result of the need to direct gas flows within a ventilator. Three cartridges are currently available for this function:

1. Normally open cartridge.
2. Normally closed cartridge.

The NORMALLY OPEN CARTRIDGE is designed to allow gas to flow through the system until a pressure is introduced into the back of the cartridge at the servo port (Fig. 6). Once the cartridge is pressurized, the diaphragm exerts sufficient force to overcome a spring tension and the valve closes completely, blocking all flow (Fig. 7). As long as the cartridge is pressurized, no flow of gas is allowed. Once the closing pressure is released, the spring tension overcomes the pressure and gas is allowed to flow through the system.

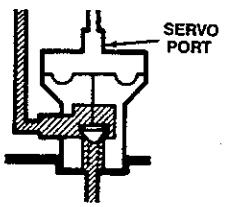


FIGURE 6

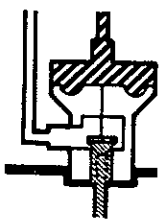


FIGURE 7

The NORMALLY CLOSED CARTRIDGE is similar to the normally open cartridge in many ways. Several of the components are interchangeable. The major difference in function is that pressurization of the diaphragm opens the cartridge from a closed position allowing gas flow through the system (Fig. 8). Pressure exerted on the master diaphragm will insure a continual flow. Once the pressure is decreased, the spring tension resets the poppet and the gas is blocked at the inlet of the cartridge (Fig. 9).

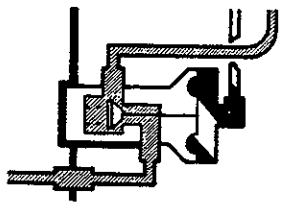


FIGURE 8

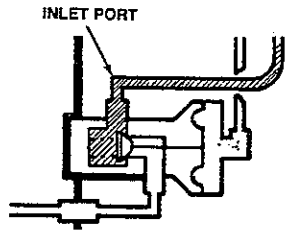


FIGURE 9

■ METERING MANIFOLD AND NEEDLE VALVE

The METERING MANIFOLD is utilized in Bird equipment to distribute source gas to three ports. The primary port is intended to give the clinician, in conjunction with the needle valve assembly, variable flows of gas through the ventilator (Fig. 10). The remaining two ports are utilized for accessory distribution of source gas to other circuits within the equipment.

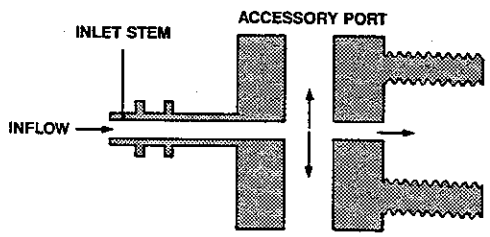


FIGURE 10

Gas entering the inlet stem is varied, as it flows through the metering port, by an adjustable needle valve (Fig. 11).

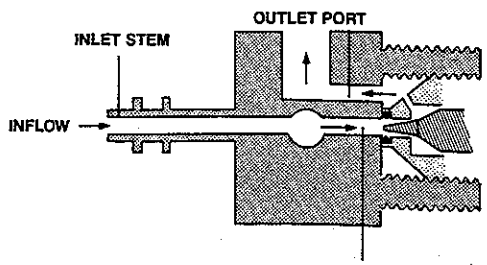


FIGURE 11

The NEEDLE VALVE ASSEMBLY is primarily involved in providing the correct position for the metering needle and its orifice (Fig. 12).

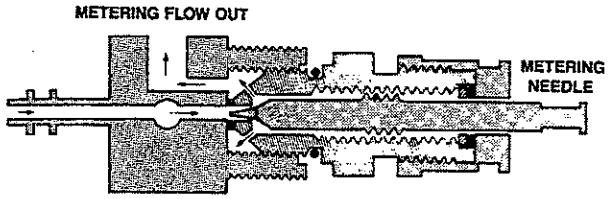


FIGURE 12

The metering orifice in all Bird equipment consists of straight, machined holes. Metering of gas is accomplished by the amount of travel required when the needle moves in or out of its orifice (Fig. 13).

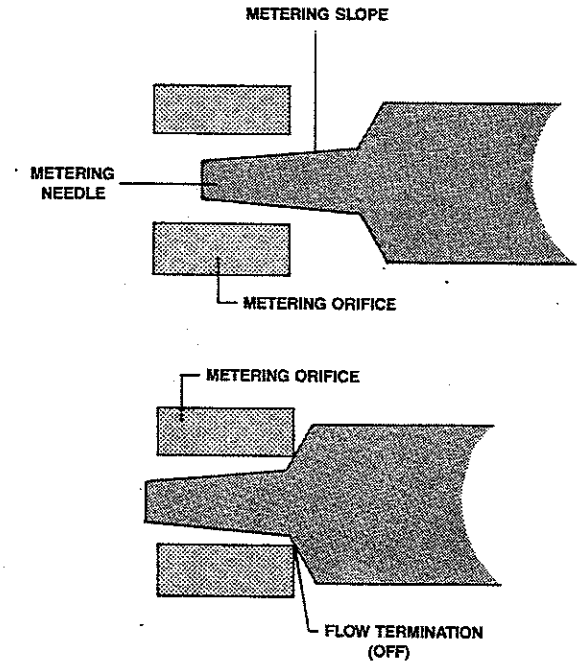


FIGURE 13

Problems appear as the metering orifice begins to "age". As long as the orifice seat is sharply defined, gas can be effectively stopped. After many hard "shut offs", an orifice seat may begin to wear and not obstruct gas flow as required (Fig. 14). This leads to a constant leak in the circuit and may cause the ventilator to malfunction.

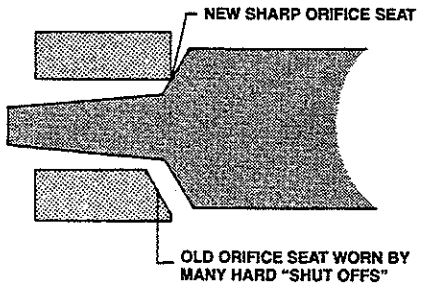


FIGURE 14

■ INDEXED CAM STOP

Since the source gas is metered by the amount of travel allowed the needle valve, it is important to have precise control over that movement. The INDEXED CAM STOP is utilized for limiting the rotation of the control knob (Fig. 15).

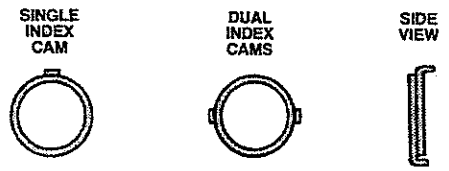


FIGURE 15

Pneumatic metering valves are the basic control of all variable functions of time and flow in each Bird respirator/ventilator. These valves control all gas flow being delivered to the patient or to the internal circuits of each piece of Bird equipment.

■ HIGH PRESSURE CHECK VALVE

The CHECK VALVE was designed to assist in directing gas flows within the timing circuits of Bird equipment.

Gas flows into the inlet of the valve and physically lifts the silicone sleeve off of its orifice, allowing gas to proceed through the outlet to the internal circuitry (Fig. 16). As backpressure builds up within the circuit, pressure is transmitted backward to the check valve through the outlet port. This pressure exerts the force required to push the silicone sleeve down onto the orifice, obstructing gas flow out of the circuit (Fig. 17).

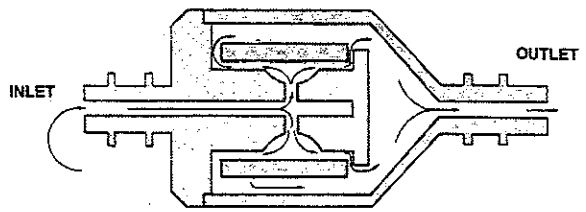


FIGURE 16

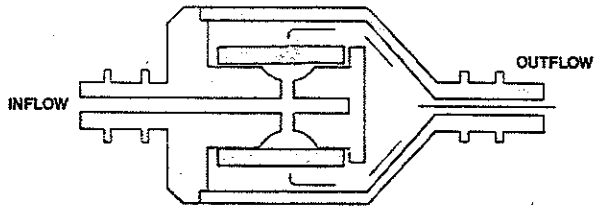


FIGURE 17

■ AMBIENT FILTER

The purpose of the AMBIENT FILTER is to prevent the entrainment of foreign material from the room into the respirator/ventilator. The external filter is easily removed for cleaning. By utilizing a (Phillips) screwdriver, the nylon filter screen may be removed, cleaned, sterilized and replaced as needed (Fig. 18).

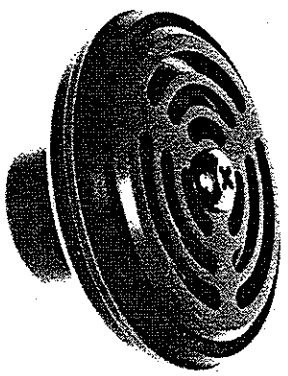


FIGURE 18

■ PRESSURE RELIEF VALVE

The PRESSURE RELIEF VALVE is utilized in breathing circuits to limit peak pressures or, to assist in the prevention of excessively high pressure situations from being transferred to the patient's airways. As pressures within the ventilator or breathing circuit rise to the preset operational tional range, the relief valve opens and vents the excess pressures above preset to ambient.

Each valve has a specific range, calibrated at the factory, depending upon the requirements of the equipment. Pressures can be adjusted in accordance to each individual need (Fig. 19).

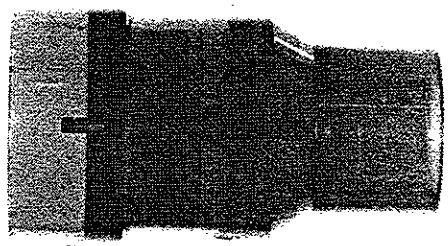


FIGURE 19

■ FIXED ORIFICE

In selected situations, there is a need to permanently meter gas flows at a specified rate. The FIXED ORIFICE adjusts that flow of gas based upon the radius and length of the orifice itself. This orifice may be found inside a coupling or within the tubing of the ventilator (Fig. 20).

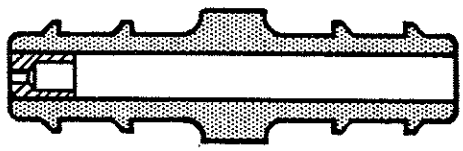


FIGURE 20

■ QUICK DISCONNECT SYSTEM

The QUICK DISCONNECT SYSTEM allows biomedical personnel to perform routine maintenance with a maximum of ease and yet provide secure, leak-proof junctions capable of withstanding the required internal pressures.

The system employs a series of bayonet tapers that friction lock in their receptacles (Fig. 21). These connectors, when properly used, prevent inadvertent disengagement. The quick disconnect system has successfully been tested at 200 psig.

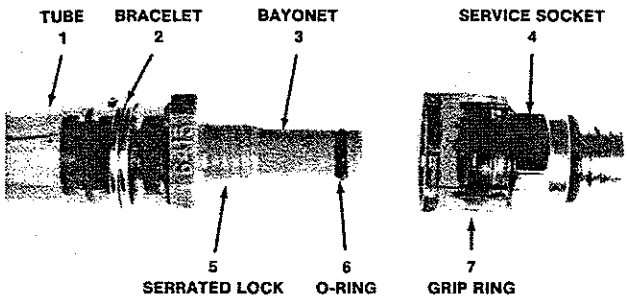
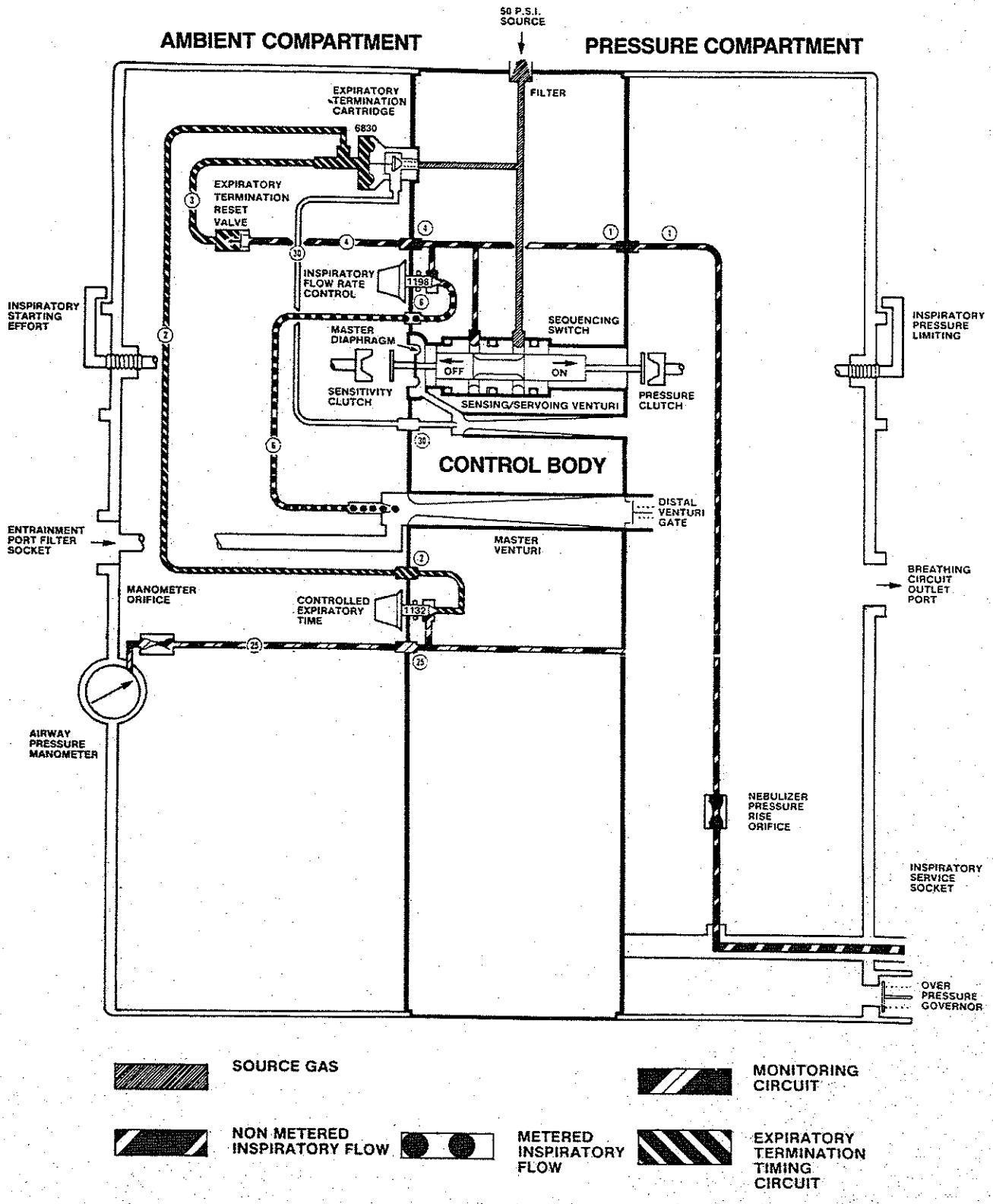
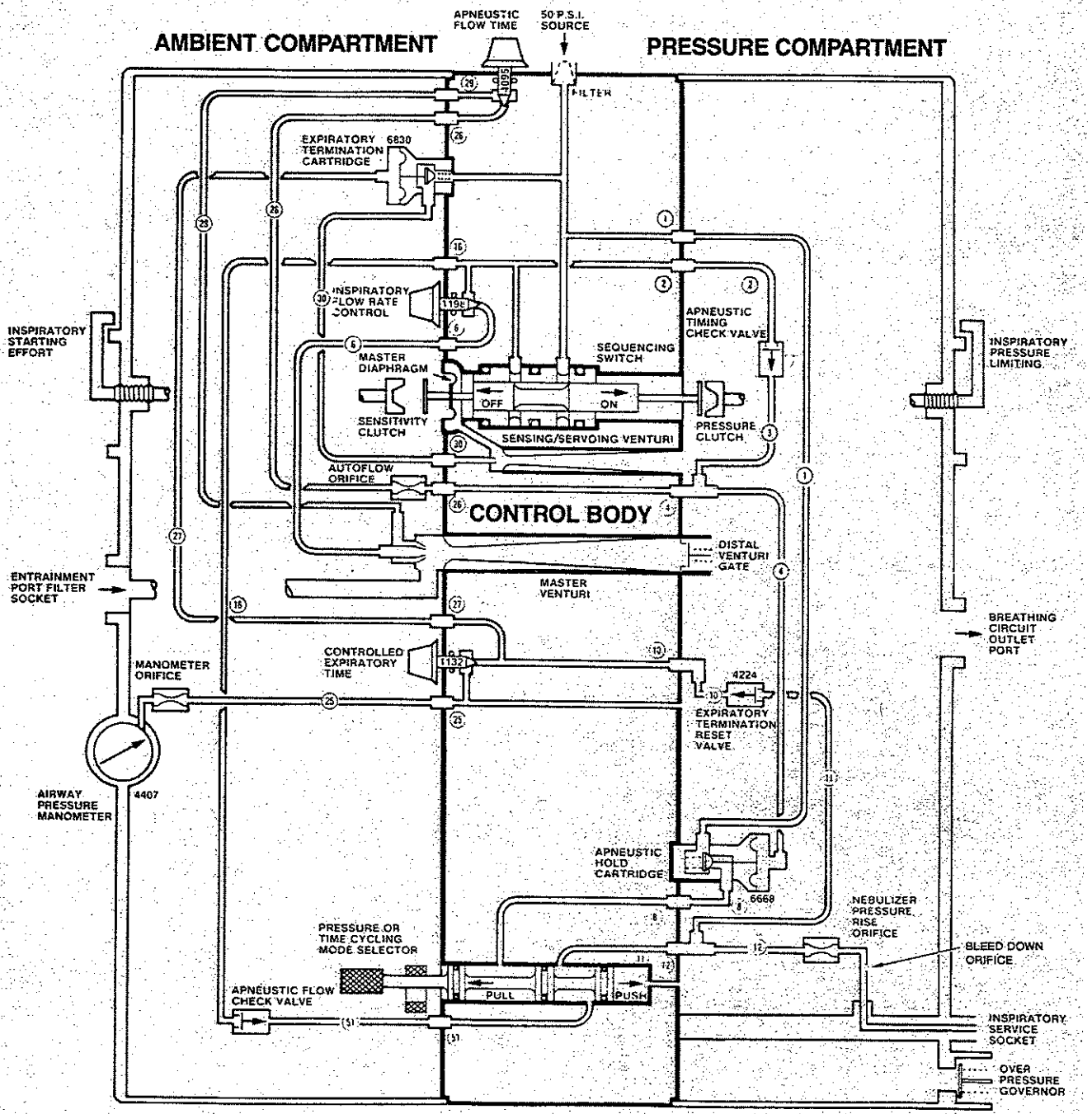

TUBE
1
BRACELET
2
BAYONET
3
SERVICE SOCKET
4
5
SERRATED LOCK
6
O-RING
7
GRIP RING

FIGURE 21

■ MARK 7® FLOW SCHEMATIC



■ MARK 7® WITH APNEUSTIC FLOWTIME FLOW SCHEMATIC



SECTION 6
DISASSEMBLY AND REASSEMBLY INSTRUCTIONS

The Bird respirators have been designed to provide the maximum amount of utilization with a minimum of maintenance. These instructions will provide the information necessary to disassemble and reassemble the Bird MARK 7 or MARK 7A Respirator.

WARNING:
THE BIRD MARK 7 AND/OR 7A SHOULD BE SERVICED/CALIBRATED BY A BIRD PRODUCTS CORPORATION TRAINED HOSPITAL/DEALER SERVICE TECHNICIAN.

To properly service the Bird respirators, a service tool kit, P/N 7723, is required.

The following special tools are included in P/N 7723 and are required for calibration and overhaul:

PART #	DESCRIPTION
P/N 0031	Ceramic Bushing Tool
P/N 0042	Lubewick
P/N 0631	Silicone-Base Lubricant
P/N 0924	Stylet
P/N 0916	Mainstream Stopper (22mm)
P/N 5497	Sensitivity Adjustment Tool
P/N 6711	Tube Removal Tool
P/N 6754	Calibration Regulator
P/N 6855	Orificed Adapter

In addition, the following commercially available tools are required:

5/16" Nut Driver
3/16" Allen Wrench
3/32" Allen Wrench
5/8" Open End Wrench
7/8" Open End Wrench
Truarc Pliers #1
Thin Bladed Screwdriver
1/2"-7/16" Open End Wrench
1/4"-5/16" Open End Wrench
Diagonal Cutting Pliers
Needlenose Pliers

A. DISASSEMBLY

1.0 AMBIENT COMPARTMENT REMOVAL

1.1 Remove (2) socket screws and washers using 3/16" allen wrench and carefully pull Ambient Compartment off until the hand timing rod clears the magnet (Fig. 22).

NOTE: To facilitate removal of Ambient Compartment, it will be necessary to dislodge the venturi tube assembly from the ambient filter inlet port.

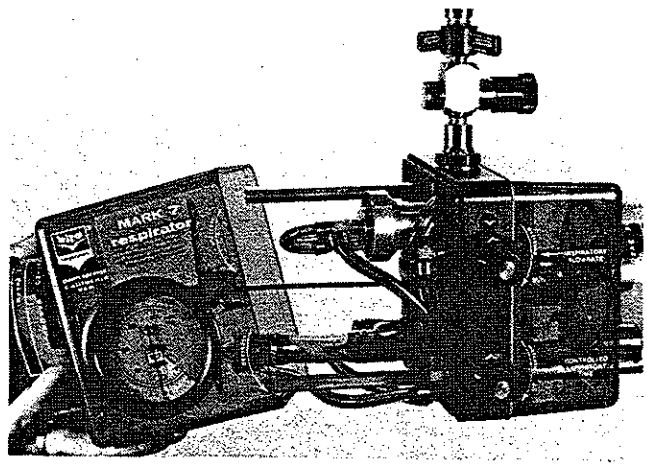


FIGURE 22

1.2 Using tube removal tool (P/N 6711), separate manometer tube #25 from quick disconnect at the Centerbody.

1.3 To remove manometer from Ambient Compartment, use 3/8" open end wrench to allow separation of mounting bracket from manometer, then remove manometer.

1.4 Using a 3/32" allen wrench, loosen the two (2) setscrews securing the Sensitivity Radius Arm to the magnet, then remove the arm.

1.5 Remove the magnet from the Ambient Compartment by rotating the assembly in a COUNTERCLOCKWISE direction.

1.6 Disassemble the Ambient Filter as follows:

- Using a Phillips screwdriver, remove the screw securing the filter holder to the filter housing.
- Using your fingers ONLY separate the remaining components for proper cleaning.

2.0 PRESSURE COMPARTMENT REMOVAL

2.1 Use 5/16" nut driver to remove inspiratory power drive line stud and nut seal.

2.2 With a 3/16" allen wrench, remove socket screw and washer, then pull off the Pressure Compartment.

NOTE: Do not attempt to pry loose with a screwdriver. Grasp the Pressure Compartment firmly and pull top back at an angle to break the seal.

2.3 Remove "L" shaped compartment seal from Centerbody (P/N 6813).

2.4 Using a 3/32" allen wrench, loosen the two (2) setscrews securing the Pressure Radius Arm to the magnet, then remove the arm.

2.5 Remove the magnet from the Pressure Compartment by rotating the assembly in a COUNTERCLOCKWISE direction.

3.0 CENTERBODY DISASSEMBLY

3.1 Remove all the tubing from both the Pressure and Ambient sides of the Centerbody using tube removal tool (P/N 6711).

Important: Retain the old tubing until a complete examination for defects has been made, replace if necessary.

3.2 Remove (4) compartment studs using a 5/16" open end wrench or nut driver.

3.3 The venturi gate cage is hand tight and may be removed by unscrewing in a COUNTERCLOCKWISE direction. Withdraw the venturi and jet cage assembly from Centerbody. Inspect and clean jet with stylet (P/N 0924), if occluded. Caution: Use only stylet (P/N 0924) to clean the jet orifice. Damage to the venturi jet orifice will adversely affect the performance of the respirator.

3.4 The SENSING/SERVO VENTURI is only hand tight. Remove by turning COUNTERCLOCKWISE. Use stylet (P/N 0924) to clean the venturi orifice, located in Centerbody, if occluded. Caution: Use only stylet (P/N 0924) to clean the jet orifice. Damage to the jet orifice will adversely affect the performance of the respirator.

3.5 INSPIRATORY FLOWRATE control disassembly.

- Using a 3/32" allen wrench, remove INSPIRATORY FLOWRATE control knob.
- With a 5/8" open end wrench, remove FLOWRATE control valve and adapter from Centerbody, being careful not to lose the small O-ring on the end of the valve.

3.6 CONTROLLED EXPIRATORY TIME control disassembly.

- Using a 3/32" allen wrench, remove the CONTROLLED EXPIRATORY TIME knob.
- Remove valve from Centerbody by loosening packing nut to allow a 1/2" open end wrench to gain access to valve body, being careful not to lose the small O-ring seal on the end of the valve.

3.7 Removal of the CONTROLLED EXPIRATORY TIME CARTRIDGE is NOT advised, but a thorough disassembly of the internal components is required.

- Using truarc pliers #1, remove external retaining ring at back of CARTRIDGE, then withdraw the CARTRIDGE cap, large diaphragm an cam button.
- Use truarc pliers #1 to remove the small internal retaining ring. This will expose the remaining CARTRIDGE components.

3.8 Remove hand timer rod and related parts as follows:

- Remove safety wire, then hand timer shaft locknut with 1/4" open end wrench.
- Remove Pressure Compartment armature plate and note O-ring bumper.
- With truarc pliers #1, remove large diaphragm retaining ring on Ambient side of Centerbody. This facilitates the removal of the remaining components from the Centerbody.
- Carefully withdraw the hand timer shaft, sensitivity armature plate, diaphragm assembly and spacer without disturbing the ceramic spindle.

3.9 Remove the ceramic switch as follows:

- Carefully remove the ceramic spindle from the bushing.
- With truarc pliers #1, remove retaining ring in front of bushing on Pressure Compartment side of Centerbody, then press out the ceramic bushing from the Ambient side, using special tool (P/N 0031). NEVER use any other device for removal.

NOTE: All 3 O-rings on the ceramic bushing should be removed from the Centerbody and discarded.

3.10 Remove all plastic grip rings and using either a 5/16" nut driver or open end wrench, remove all female quick-disconnect fittings from Centerbody.

3.11 Place the Centerbody in vise with padded jaws (Fig. 23) and using a 7/8" open end wrench, remove the inlet assembly and nylon filter.

3.12 Remove Bird logo and plug as follows:

- Using a thin bladed knife, carefully remove logo plug from Centerbody.
- With a screwdriver, remove the screw and nylon washer from Centerbody, directly behind logo plug.

3.13 Disassemble the rotary valve as follows:

- Using a 1/16" allen wrench, loosen the two (2) setscrews securing the rotary ON/OFF knob to the valve stem, then remove the knob.

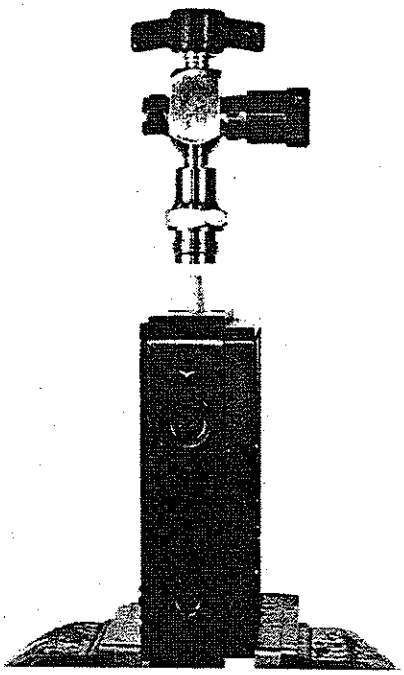


FIGURE 23

- Using a 5/8" open end wrench, remove spring retainer nut from the rotary valve body.

NOTE: It may be necessary to stabilize the rotary switch insert with a 1 1/16" open end wrench to facilitate the removal of the spring retainer nut.

- Remove the rotary switch insert and spring from the valve body by gently pulling to separate the components.

■ SUPPLEMENT — MARK 7A

To complete disassembly of the Bird MARK 7A, add steps 3.14-3.17 to the above Centerbody disassembly — Section 3.0.

3.14 Using a 7/16" open end wrench, remove the PRESSURE/TIME CYCLED SELECTOR SWITCH.

3.15 APNEUSTIC FLOWTIME CARTRIDGE removal and disassembly.

- With a 3/32" allen wrench, loosen setscrew at rear of Centerbody and remove APNEUSTIC FLOWTIME CARTRIDGE.
- With truarc pliers #1, remove external retaining ring at rear of CARTRIDGE, then withdraw CARTRIDGE cap, large diaphragm and cam button.
- Removal of the small internal retaining ring is accomplished by using truarc pliers #1. This will expose the remaining CARTRIDGE components.
- Using a padded vise (see Fig. 24), secure CARTRIDGE in place to facilitate removal of the mounting cap. With a 1/2" open end wrench, remove the mounting cap, then the poppet stem and return spring.

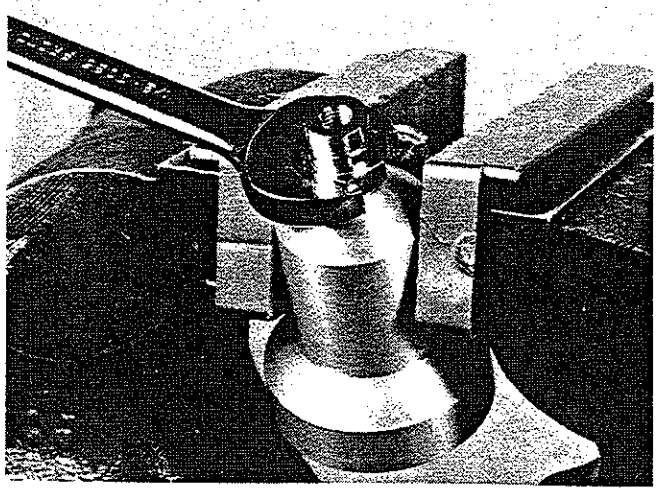


FIGURE 24

3.16 APNEUSTIC FLOWTIME control removal as follows:

- Use a 3/32" allen wrench to remove APNEUSTIC FLOWTIME control knob from valve.
- Using a 1/2" open end wrench, loosen packing nut to allow removal of the apneustic valve from the Centerbody. Remove the valve body

with a ½" open end wrench, being careful not to lose the small O-ring on the end of the valve.

3.17 Using a thin bladed screwdriver, remove the screw and nylon washer forming a plug on the bottom of the Centerbody.

4.0 VENTILATOR COMPONENT CLEANING

4.1 The components of the respirator may be soaked (with exception of the manometer, magnets and tubing assemblies) in a liquid detergent for superficial cleaning. After soaking, parts should be removed, rinsed and scrubbed, if necessary, to remove all traces of lubricant.

Following the completed assembly, it will be necessary to decontaminate with ethylene oxide gas sterilization to insure internal sterility of the respirator.

4.2 Particular attention should be paid to the ceramic switch. Use an abrasive type cleaner sparingly with a toothbrush and small diameter brush (Fig. 25) to clean completely. The clearance between the spindle and bushing is normally 0.0001 inch. These contacting surfaces should be thoroughly cleaned and rinsed in distilled water, if available, and blown dry with clean compressed air. The shoulders of the spindle should not be handled in any way once cleaned.

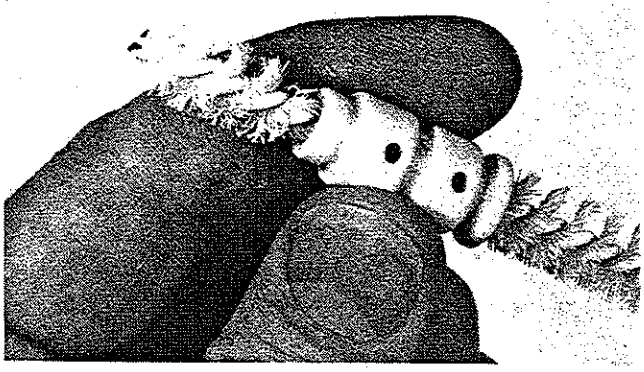


FIGURE 25

4.3 Clean, dry compressed air should be used to dry all channels in the Centerbody and all other components.

B. ASSEMBLY

5.0 CENTERBODY ASSEMBLY

5.1 With Centerbody in a padded vise, install new O-ring (P/N 5608) into inlet port. Inspect, clean or replace inlet filter (P/N 6804) and reinstall inlet assembly into Centerbody using ⅞" open end wrench to secure in place.

5.2 Assemble rotary ON/OFF valve as follows:

- Inspect O-ring (P/N 0143) on valve body wing nut assembly for flat spots, cuts or damage. Replace if necessary.
- Inspect O-rings (P/N 0114 and P/N 0274) on valve plunger for flat spots, cuts or damage. Replace if necessary.
- Place a small drop of lubricant (P/N 631) on O-ring (P/N 0114) on poppet, prior to installation.
- Reinstall components into valve body per exploded view (Fig. 26) and secure the spring retainer nut in place with a ⅝" open end wrench.

NOTE: It may be necessary to stabilize the valve insert in place with a 11/16" open end wrench while tightening the spring retainer nut in place.

- Temporarily connect the Centerbody to a gas source to determine at which point the gas flow, through the valve, is OFF. Using a 1/16" allen wrench, reinstall the rotary knob with the OFF position vertical on the valve.

5.3 Place O-rings (P/N 5999) onto female quick-disconnect studs, and with a 5/16" nut driver or open end wrench, reinstall into Centerbody (Fig. 27).

NOTE: Tapered socket (P/N 6835) is the tall socket and (P/N 4059) is the shorter socket.

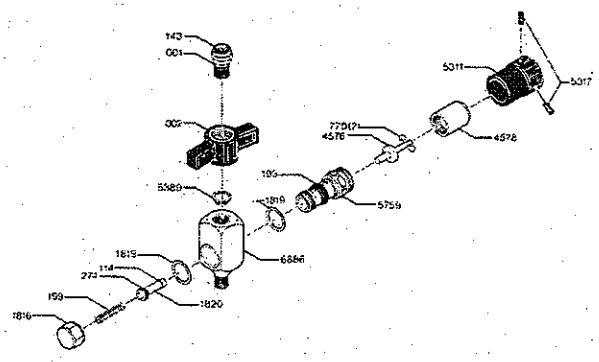
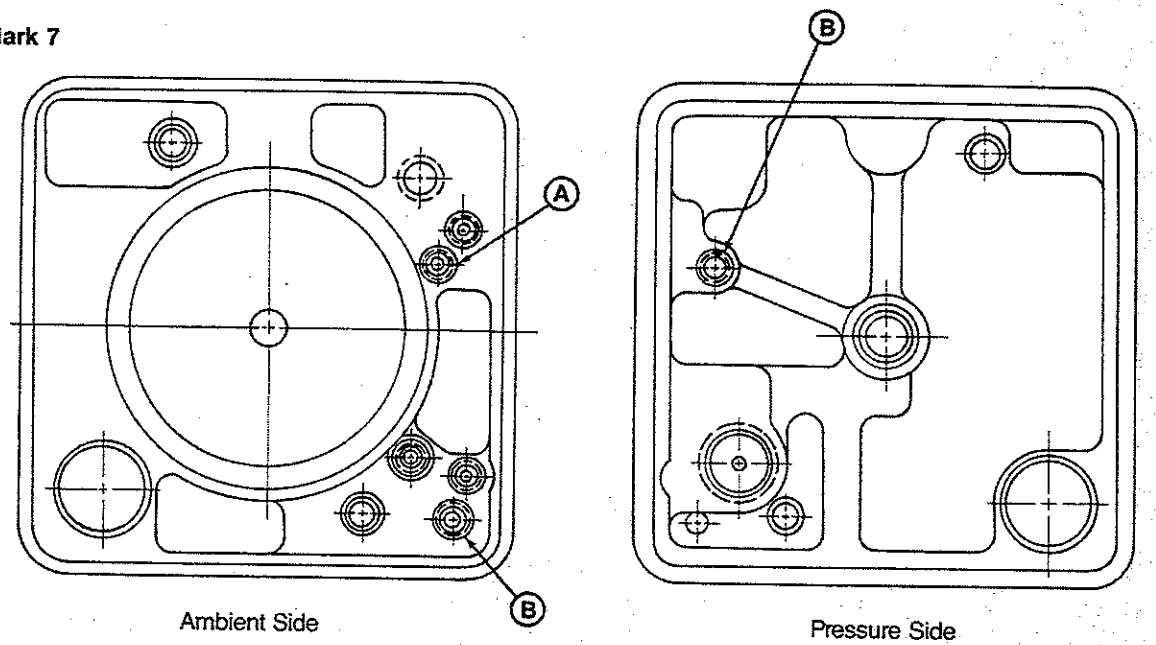


FIGURE 26

QUICK-DISCONNECT SOCKET LAYOUT

NOTE: Ⓐ 6835 tapered socket
Ⓑ 4059 tapered socket

Mark 7



Mark 7A

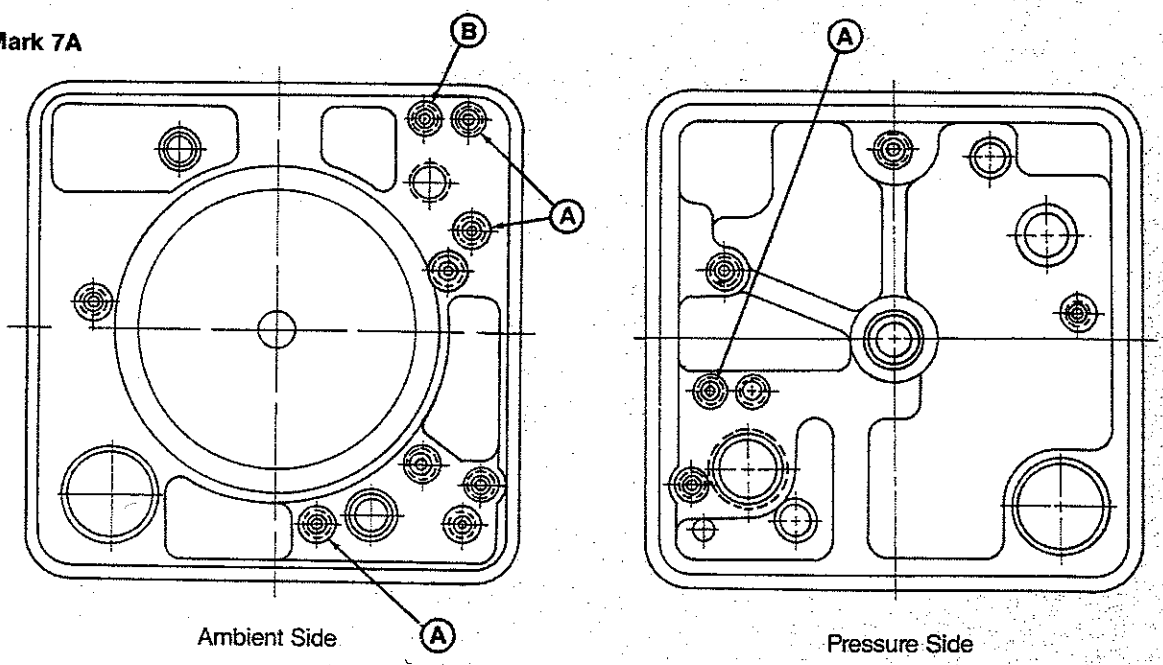


FIGURE 27

5.4 Reinstalling the ceramic bushing and spindle.

- Install 3 "new" O-rings (P/N 0193) on the ceramic bushing.
- Lightly moisten the O-rings with water and insert the bushing into the Centerbody using tool (P/N 0031) to press in place.
- Using truarc pliers #1, install the truarc retaining ring (with stamped numbers to outside) into Centerbody, securing ceramic bushing in place.
- Insert ceramic spindle carefully into bushing. Ensure that the long shoulder of the spindle is on the Pressure Compartment side (Fig. 28).

NOTE: Do not touch raised shoulders of spindle. Install using a clean tissue or cloth.

5.5 Reassemble hand timer rod and related parts as follows:

- Install the small washer (P/N 0135), sensitivity armature (P/N 0327), diaphragm (P/N 0714) and spacer bumper with O-ring (P/N 0124) onto the hand timer rod shaft (P/N 0346) (Fig. 28).
- Carefully insert the shaft into the ceramic switch spindle from the Ambient side (Fig. 28).

NOTE: Use finger to block spindle from falling out of the Pressure side of Centerbody as hand timer rod is installed into spindle.

- Install pressure armature plate (P/N 0327) and locknut onto hand timer rod (insure bumper O-ring P/N 0143 faces the ceramic switch), use needlenose pliers to stabilize the hand timer rod. Carefully tighten the locknut until there is zero end play in the armature plates.

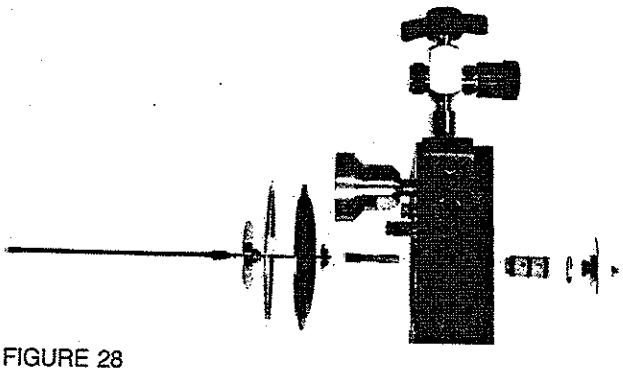


FIGURE 28

- Install ½" of new safety wire (P/N 298) through hand timer rod and locknut slot and secure in an "S" shape.
- Using truarc pliers #1, reinstall diaphragm retaining ring into Centerbody with flat side of ring flush against diaphragm.

5.6 CONTROLLED EXPIRATORY TIME CARTRIDGE reassembly, as follows:

- Inspect poppet O-ring (P/N 0306), seal (P/N 1367) and diaphragm (P/N 0168) for excessive wear or defects and replace if necessary.
- Reinstall components into CARTRIDGE (see Fig. 29 for exploded view of CARTRIDGE assembly).

NOTE: When installing diaphragm (P/N 1367) into CARTRIDGE, insert with the thin ridge facing toward the spring and plunger.

- Install diaphragm (P/N 0168) with nipple inserted into back of cam button (P/N 4209).

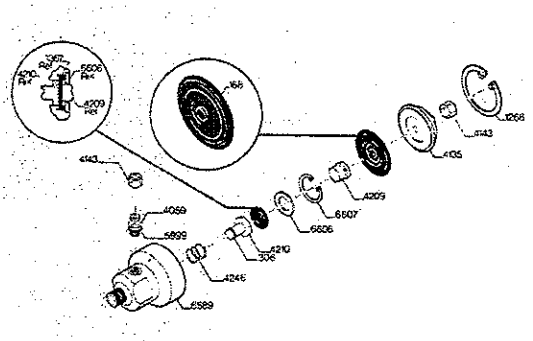


FIGURE 29

- Using retaining ring (with stamped numbers facing outward), secure CARTRIDGE cap in place with truarc pliers #1.

5.7 Reassemble CONTROLLED EXPIRATORY TIME valve (P/N 1132A) as follows:

- Check O-rings (P/N 0138, P/N 0114 and P/N 7849) for flat spots, cuts or damage. Replace if necessary. Use a ½" open end wrench to reinstall valve into Centerbody.
- Place a drop of lubricant (P/N 0631) on O-ring (P/N 0138) at valve stem.
- Install cam washer (P/N 4021), cam stop (P/N 4020) and packing nut onto valve body and secure in place using a ½" open end wrench.

NOTE: Install cam stop (P/N 4020) with the stop tab facing away from the Centerbody.

5.8 Reassemble INSPIRATORY FLOWRATE valve (P/N 1198) as follows:

- Check O-rings (P/N 0274 and P/N 0193) for flat spots or cuts. Replace if necessary. Use a ⅝" open end wrench to install FLOWRATE valve adapter (P/N 6811) into Centerbody.
- Inspect O-rings (P/N 0114, P/N 7849 and P/N 0138 on valve body) for flat spots or cuts. Replace if necessary. Using a ½" open end wrench, secure INSPIRATORY FLOWRATE valve to FLOWRATE valve adapter.
- Place a drop of lubricant (P/N 0631) on O-ring (P/N 0138) at valve stem.
- Install cam washer (P/N 4021), cam stop (P/N 4020) and packing nut onto valve body and secure in place using a ½" open end wrench.

NOTE: Install cam stop (P/N 4020) with the stop tab facing away from the Centerbody.

5.9 Reinstall SENSING/SERVO VENTURI into Centerbody. Hand tighten in place.

5.10 VENTURI reassembly as follows:

- Insure that the venturi jet is free of any obstructions, then hand tighten jet cage onto the venturi body (Fig. 30).

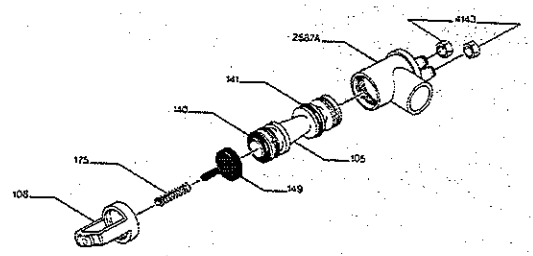


FIGURE 30

NOTE: It is important to perform the above step first to ensure the proper distance between the venturi jet and the venturi body is maintained.

- Smear a single drop of lubricant (P/N 0631) on the center of O-ring (P/N 0141) of the venturi body, then install in place.

NOTE: Do not lubricate O-ring (P/N 0140). Wipe clean with isopropyl alcohol.

- Prior to installation of the venturi gate cage on the main body, check the gate cage spring for proper length. The spring should be the same length as the gate shaft. Replace if necessary.
- Screw the gate cage assembly onto the venturi body until hand tight against the Centerbody.

5.11 Compartment stud installation as follows:

- Using a 5/16" open end wrench or nut driver, reinstall compartment studs in place.

NOTE: Short, polished studs are assembled on Pressure Compartment side with the inspiratory power driveline stud at the bottom. See Fig. 32 for proper positioning of the studs.

- Inspect O-ring (P/N 0114) on Compartment stud quick-disconnect socket for cuts or flat spots. Replace if necessary.
- Using a 5/16" open end wrench, reinstall orificed quick-disconnect socket (P/N 7345) at bottom stud.

5.12 Reinstall Bird logo and plug as follows:

- Using a screwdriver, replace nylon washer (P/N 0109) and screw (P/N 0189) into threaded opening at front of Centerbody, just above INSPIRATORY FLOWRATE control.
- With your hand, place Bird logo back into Centerbody and press in place.

■ SUPPLEMENT MARK 7A

To complete reassembly of the Bird MARK 7A, you will need to add steps 5.13-5.16 to the above Centerbody reassembly — Section 5.0.

5.13 APNEUSTIC FLOWTIME control assembly (P/N 4095).

- Inspect O-rings (P/N 0114, P/N 0138 and P/N 7849 on valve body) for flat spots, cuts or damage. Replace if necessary.
- Using a ½" open end wrench, secure APNEUSTIC FLOWTIME control valve to Centerbody.
- Place a drop of lubricant (P/N 0631) on O-ring (P/N 0138) on valve stem.
- Install two (2) cam stops (P/N 4020) and packing nut onto valve body and secure in place using a ½" open end wrench.

NOTE: Install cam stops (P/N 4020) with the stop tab facing away from the Centerbody.

5.14 APNEUSTIC FLOWTIME CARTRIDGE assembly to be as follows:

- Inspect CARTRIDGE O-rings (P/N 0328 and P/N 7849) for flat spots or cuts. Replace if necessary.
- Insert poppet and return spring into CARTRIDGE nose (see Fig. 31) and secure in place with mounting cap and ½" open end wrench.

NOTE: It will again be necessary to use the padded vise to stabilize the CARTRIDGE while tightening the mounting cap.

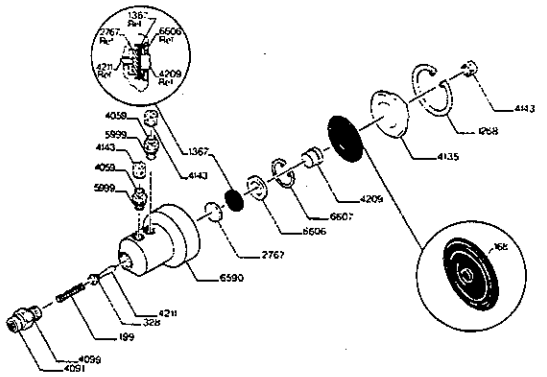


FIGURE 31

- Using a 3/32" allen wrench, secure APNEUSTIC FLOWTIME CARTRIDGE to Centerbody. See Fig. 32 for proper positioning of the CARTRIDGE.
- Inspect seal (P/N 1367) and diaphragm (P/N 0168) for excessive wear or defects. Replace if necessary.
- Reinstall internal components into CARTRIDGE (Fig. 31) per exploded view.

NOTE: When installing diaphragm (P/N 1367) into CARTRIDGE, insert with the thin ridge facing toward the spring and plunger.

- Install diaphragm (P/N 0168) with nipple inserted into back of cam button (P/N 4209).
- Using retaining ring (with stamped numbers facing outward), secure CARTRIDGE cap in place with truarc pliers #1.

5.15 PRESSURE/TIME CYCLED SELECTOR SWITCH assembly as follows:

- Inspect the three (3) O-rings (P/N 0138) for flat spots, cuts or damage. Replace if necessary.
- Place a drop of lubricant (P/N 0631) on each O-ring and insert rod into Centerbody. Secure in place with a 7/16" open end wrench.

5.16 Using a screwdriver, reinstall nylon washer (P/N 0109) and screw (P/N 0189) into threaded opening at bottom of Centerbody.

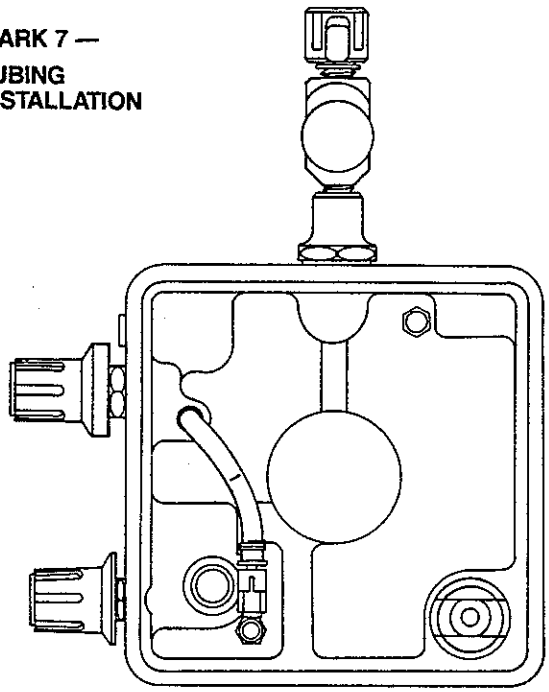
5.17 Tubing installation.

- Prior to tubing installation, check all quick-disconnect bayonet O-rings (P/N 6435) for flat spots or cuts. Replace if necessary.

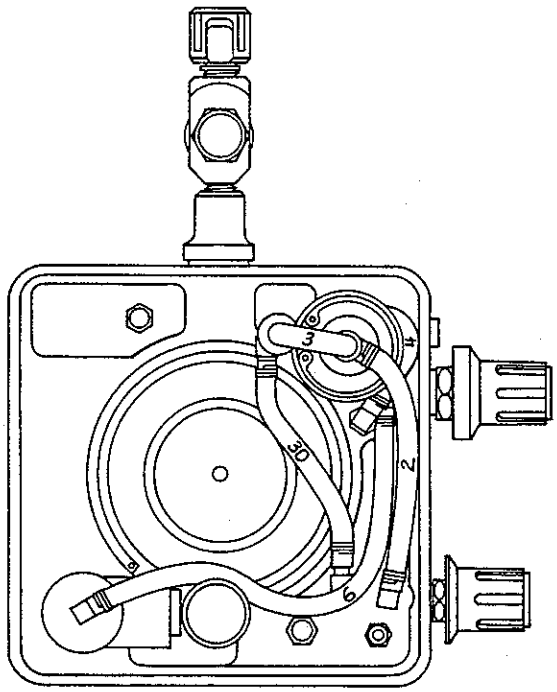
NOTE: Lubricate O-rings (P/N 6435) with Lubewick (P/N 0042) prior to installation.

- Replace all quick-disconnect grip rings (P/N 4143) prior to tube installation.
- Reinstall tubing per the numbered coding system found on the tubing and components or refer to Fig. 32.

MARK 7 — TUBING INSTALLATION

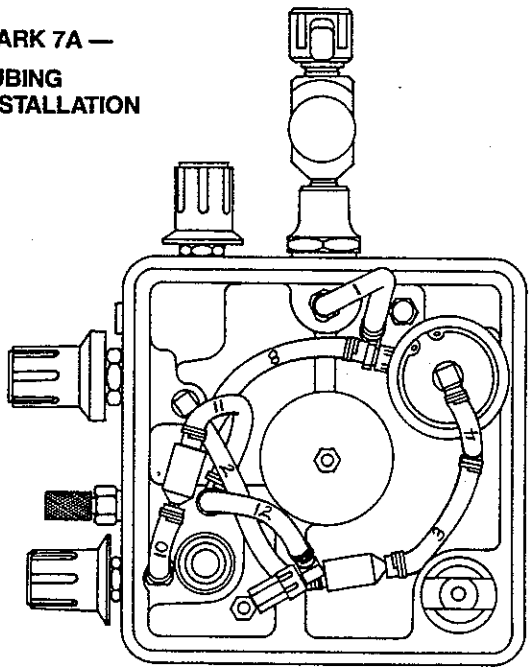


Pressure Compartment

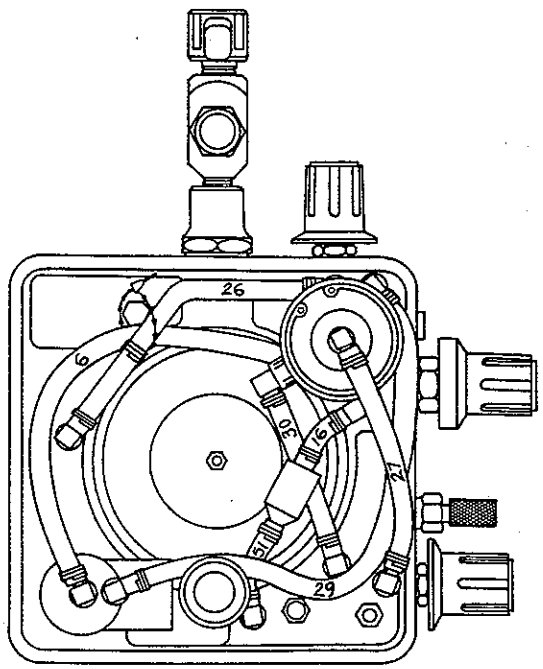


Ambient Compartment

MARK 7A — TUBING INSTALLATION



Pressure Compartment



Ambient Compartment

FIGURE 32

6.0 PRESSURE COMPARTMENT ASSEMBLY

6.1 Reassemble the magnet and pressure radius arm as follows:

- Inspect O-ring (P/N 0138) on pressure magnet assembly (P/N 0752) for flat spots, cuts or damage. Replace if necessary.
- Place a drop of lubricant (P/N 0631) on O-ring (P/N 0138) prior to installation.
- Install magnet assembly into Pressure Compartment by turning in a CLOCKWISE direction until the travel stops.
- Using a 3/32" allen wrench, secure the pressure radius arm assembly (P/N 0190) to the magnet, with the radius arm positioned at the extreme end of the low pressure range.

6.2 Reinstall "L" shaped Pressure Compartment seal (P/N 6813) in place on Centerbody.

6.3 Spread a thin layer of Lubewick (P/N 0042) on exposed surface area of seal prior to installation of Pressure Compartment.

6.4 Install Pressure Compartment and secure in place with 3/16" allen screw and washer at top stud, and 5/16" power socket and seal at bottom stud.

7.0 AMBIENT COMPARTMENT ASSEMBLY

7.1 Reassemble the magnet and sensitivity radius arm as follows:

- Install magnet assembly (P/N 0324) and yoke (P/N 0179) into Ambient Compartment by turning in a CLOCKWISE direction until the travel stops.
- Using a 3/32" allen wrench, secure the sensitivity radius arm assembly (P/N 0190) to the magnet, with the radius arm positioned at the extreme end of the decreased STARTING EFFORT range.

7.2 Install manometer into Ambient Compartment and secure in place with mounting bracket and two (2) 3/8" nuts.

7.3 Reconnect manometer tube (25) to Centerbody quick-disconnect stud.

7.4 Carefully slide Ambient Compartment over hand timer rod until seated against the Centerbody (Fig. 33).

NOTE: Make sure the venturi tube is positioned into the ambient filter inlet port.

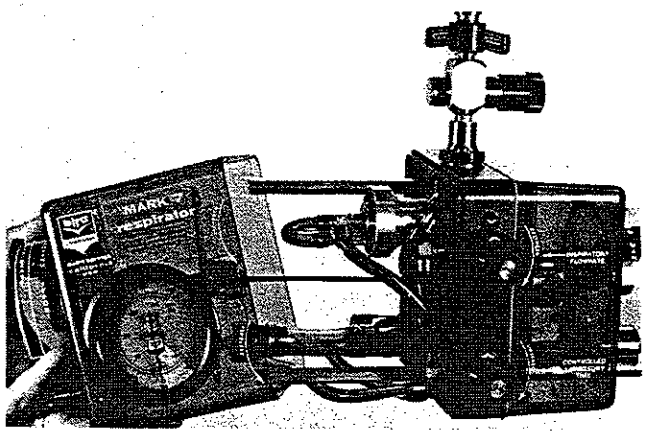


FIGURE 33

7.5 Use a 3/16" allen wrench and socket screws (2) with washers to secure Ambient Compartment in place.

7.6 Ambient Filter Assembly.

- Insert nylon mesh filter (P/N 5559) into filter holder (P/N 5560), then press the filter holder into the filter seal (P/N 2524).
- Secure the above assembly to the filter housing (P/N 4098) with Phillips screw (P/N 4368).
- Reinstall the ambient filter assembly to the Ambient Compartment.

The unit should be completely assembled and ready for calibration.

A numbering system is utilized so that one can easily identify the steps involved with each major operation.

Please complete each numbered step in the sequence outlined to obtain the calibration parameters required. If the suggested parameters cannot be met, refer to the troubleshooting instructions at the end of each system.

Special "Bird" items will be required for the calibration of the "Bird" MARK 7 and MARK 7A Respirator. These special items may be obtained from Bird Products Corporation under the following part numbers (see Fig. 34):

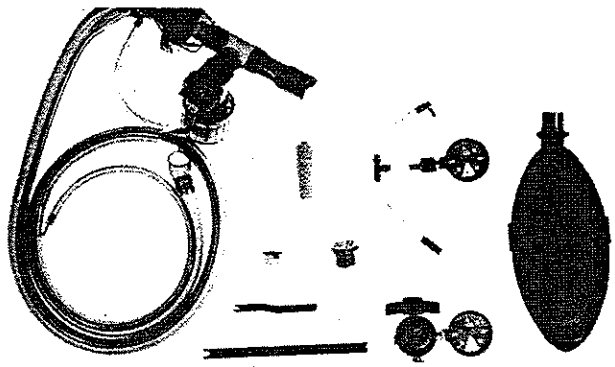


FIGURE 34

PART #	DESCRIPTION
P/N 0042	Lubewick
P/N 0133S	Positive Phase Breathing Assembly
P/N 0409	Test Lung
P/N 0916	Mainstream Stopper
P/N 5497	Sensitivity Adjustment Tool
P/N 6711	Tube Removal Tool
P/N 6754	Calibration Regulator
P/N 6758	0-60 P.S.I.G. Calibration Gauge
P/N 6855	Orificed Adapter

Units manufactured prior to November 1, 1978, require the following part numbers for controlled expiratory time valve update:

PART #	DESCRIPTION
P/N 0122	Packing Nut
P/N 7736	Spring

Additional tools required for this calibration procedure include:

- 3/16" Allen Wrench
- 3/32" Allen Wrench
- 1/4" Nut Driver
- 5/16" Nut Driver
- 1/2" × 7/16" Open End Wrench
- Common Screwdriver (small, thin blade)
- Stopwatch

NOTE: Units manufactured after June 30, 1977, incorporate broached valves. Additionally, all replacement valves and control knobs will be of the broached style. When indicated during calibration, fine adjustment of the valve stem may be accomplished through the control knob (Fig. 35).

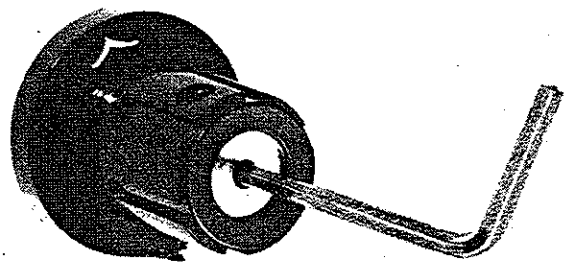


FIGURE 35

A. PREPARING UNIT FOR CALIBRATION

1.0 DISCONNECT RESPIRATOR FROM SOURCE GAS.

1.1 With MASTER SWITCH "OFF", install calibration regulator (P/N 6754) between gas supply and wing nut atop centerbody.

1.2 Turn source gas "ON", pull red locking ring forward and rotate regulator clockwise for a pressure of 50 psig (static). Lock regulator by pushing red ring back.

1.3 Secure positive phase breathing assembly to pressure compartment.

1.4 Remove the Pressure Relief Valve (P/N 4230) from the pressure compartment and install a Mainstream Stopper (P/N 0916) in its place.

B. CALIBRATION OF THE UNIT

2.0 AIRWAY PRESSURE MANOMETER

2.1 Using a small, thin bladed, common screwdriver, remove the black bezel ring around the face of the manometer.

NOTE: Insert the thin blade between black bezel ring and manometer encasement.

2.2 Use the same screwdriver to rotate the adjusting screw at either the 12:00 o'clock or 3:00 o'clock position, left or right as needed, to center needle at zero.

2.3 Tap gauge to (shock needle) check for zero.

2.4 Reinstall bezel and recheck for zero.

2.5 Troubleshooting airway pressure manometer.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Manometer will not calibrate.	1. Internal malfunction.	1. Replace manometer (P/N 0145R).
Manometer will not register pressure change with ventilator active.	1. Tube disconnected. 2. Internal malfunction.	1. Insure tube 25 is connected to manometer and centerbody. 2. Replace manometer (P/N 0145R).

3.0 INSPIRATORY FLOWRATE

3.1 Remove INSPIRATORY FLOWRATE knob by inserting 3/32" allen wrench into opening located on side of knob.

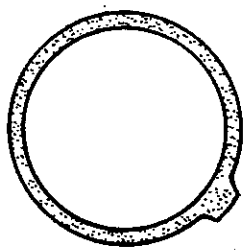


FIGURE 36

3.2 Use ½" open end wrench to position and secure a single cam stop at the 5:00 o'clock position on the INSPIRATORY FLOWRATE valve. (Fig. 36)

3.3 Rotate valve stem full clockwise. Use a pencil to mark end of stem at the 12:00 o'clock position.

3.4 Rotate valve stem counterclockwise until pencil mark is at the 9:00 position.

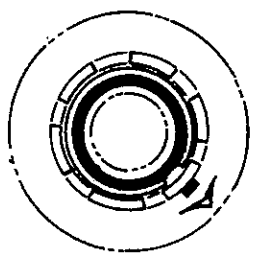


FIGURE 37

3.5 Apply Lubewick (P/N 0042) to O-ring on outside of retention cap and carefully install knob with index clockwise to cam stop.

3.6 Insert Orificed Adapter (P/N 6855) into end of breathing assembly and push pressure selector arm to end of medium range.

3.7 Mark 7
Cycle Respirator "ON". Flow through orificed adapter should register between 18-24cmH_2O on manometer. Rotate the INSPIRATORY FLOWRATE knob full counterclockwise; airway manometer should now register greater than 34cmH_2O.

Mark 7A
Cycle ventilator "ON". Flow through orificed adapter should register between 14-18cmH_2O on manometer. Rotate the INSPIRATORY FLOWRATE knob full counterclockwise; airway manometer should now register greater than 30cmH_2O.

3.8 Troubleshooting INSPIRATORY FLOWRATE

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Minimum flow through orificed adapter lower than: Mark 7: 18cmH_2O Mark 7A: 14cmH_2O	1. Leak in breathing assembly connection.	1. Secure connections.
	2. Driving pressure less than 50 psig with MASTER SWITCH "OFF."	2. Increase to a static 50 psig.
	3. Airway manometer not calibrated to zero.	3. Recalibrate.
	4. Leak in INSPIRATORY FLOWRATE system.	4. Insure tube 6 is secured to centerbody and venturi (ambient compartment). Mark 7 — Apply leak detection solution (i.e. snoop) to connections on Tube 6 (ambient compartment) with respirator "ON." Correct any connection that bubbles continuously. Mark 7A — Apply leak detecting solution to connections on tubes 16 and 51 (ambient compartment) with respirator "ON." Correct any tube or connection that bubbles continuously. Use ½" open end wrench to remove valve to check condition of small O-ring (P/N 0114) on end of valve. Replace if necessary. Mark 7A — Apply leak detecting solution to both ends of tube 12 in pressure compartment. Correct leaks.
	5. Faulty INSPIRATORY FLOWRATE valve.	5. Replace with new Flowrate Valve (P/N 1198).
Minimum flow through orificed adapter higher than: Mark 7: 24cmH_2O Mark 7A: 18cmH_2O	1. Static driving pressure greater than 50 psig.	1. Reduce to 50 psig.
	2. Cam stop not positioned at 5:00 o'clock.	2. Readjust.
	3. Gas escaping from tubing or connections in the pressure compartment.	3. Remove pressure compartment and apply leak detecting solution on all tubes and connections. Correct leak.
	4. Gas escaping into pressure compartment from old or worn O-rings on ceramic switch.	4. Remove ceramic switch from centerbody, clean and install new O-rings (P/N 0193).
	5. Gas escaping around worn O-ring on EXPIRATORY TIME valve (P/N 0114).	5. Use ½" open end wrench to remove valve to check condition of small O-ring on end of valve. Replace if flat, cut or worn.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Maximum flow through orificed adapter less than: Mark 7: 34cmH_2O Mark 7A: 30cmH_2O	1. Pressure escaping between pressure compartment and centerbody gasket.	1. Check and correct.
	2. Leak in the INSPIRATORY FLOWRATE system.	2. Insure tube 6 is secured to centerbody and venturi (ambient compartment). Replace with new Flowrate Valve (P/N 1198).
	3. Leak around main diaphragm and retaining ring.	3. Remove ambient compartment and apply detecting solution. Correct leak.

4.0 INSPIRATORY POWER DRIVELINE

4.1 Remove orificed adapter from the end of the breathing assembly.

4.2 Disconnect INSPIRATORY POWER DRIVELINE from the respirator. Connect male end of the Inspiratory Power Driveline Gauge (P/N 6758, 0-60 psig) into the INSPIRATORY POWER DRIVELINE socket on the respirator. Reconnect the INSPIRATORY POWER DRIVELINE to the female end of the gauge.

4.3 Cycle respiratory "ON". Pressure on the test gauge should read between 12-25 psig.

4.4 If the pressure observed is not within the acceptable range, proceed to Step 4.6, Troubleshooting INSPIRATORY POWER DRIVELINE.

4.5 If the gauge pressure (12-25 psig) is within the acceptable range, remove the test gauge and reconnect the INSPIRATORY POWER DRIVELINE to the respirator.

4.6 Troubleshooting INSPIRATORY POWER DRIVELINE.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Cannot achieve at least 12 psig.	1. Leak in breathing assembly connection.	1. Secure.
	2. Source pressure less than 50 psig (static).	2. Adjust source pressure and system pressure.
	3. Leak in INSPIRATORY POWER DRIVELINE system.	3. Mark 7 — Apply leak detecting solution to both ends of tube #1. Mark 7A — Apply leak detecting solution to both ends of tube #12.
Pressure greater than 25 psig.	1. Source Pressure greater than 50 psig (static).	1. Adjust source pressure and system pressure.

5.0 PRESSURE-CYCLED LIMIT CONTROL

5.1 Mark 7
Rotate INSPIRATORY FLOWRATE control full clockwise.

Mark 7A
Rotate INSPIRATORY FLOWRATE control full clockwise and insure PRESSURE/TIME-CYCLED SELECTOR SWITCH is "OUT".

5.2 Insert test lung onto breathing assembly.

5.3 Loosen both setscrews on the pressure control arm with a 3/32" allen wrench, but do not remove the indicator arm.

5.4 Push "in" hand timer rod to cycle the unit "ON" and rotate the end of the pressure magnet shaft with a screwdriver until the unit cycles "OFF" (hand timer rod moves "OUT") at 20 cmH_2O.

5.5 Secure the position of the magnet shaft with the screwdriver while rotating the selector arm until it points at number 20 on the pressure compartment.

5.6 Position the selector arm approximately 1/16" from the outside end of the shaft and tighten equally the two setscrews to secure.

5.7 Cycle respirator "ON" and note pressure limit on manometer. Adjust if this varies from 20cmH_2O.

5.8 Troubleshooting PRESSURE CYCLE control.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Will not cycle "OFF" at 20cmH_2O with selector arm at 20.	1. Requires calibration. 2. Leak in breathing assembly or gas escaping from pressure compartment or pressure relief valve venting at a pressure less than 20cmH_2O.	1. Calibrate per Steps 5.1-5.7. 2. Check each possibility and correct.

6.0 STARTING EFFORT (SENSITIVITY)

6.1 Remove P/N 0409, Test Lung, from breathing assembly and insert a mouthpiece.

6.2 Loosen both setscrews of sensitivity control arm with 3/32" allen wrench, but do not remove indicator arm.

6.3 Adjust the magnet in the ambient compartment with Sensitivity Adjustment Tool (P/N 5497) until a slow and gentle inspiratory effort cycles the unit "ON" at $-2cmH_2O$ as indicated on the manometer.

6.4 Stabilize the sensitivity magnet with the adjustment tool and carefully align the selector arm to the number 20 on the ambient compartment.

6.5 Position this selector arm so that it is flush with the end of the magnet shaft and tighten equally the two setscrews to secure arm to shaft.

6.6 Recheck for a $-2cmH_2O$ with a gentle inspiratory effort.

6.7 Troubleshooting STARTING EFFORT.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Respirator cycles "ON" at a sub-ambient pressure other than $-2cmH_2O$ with selector arm set at 20.	1. Requires calibration. 2. Leak in breathing assembly.	1. Calibrate per Steps 6.1-6.6. 2. Correct.

7.0 CERAMIC SWITCH "CHATTER TEST"

7.1 Position the following controls as indicated:

- PRESSURE SELECTOR — full counter-clockwise (minimum).
- SENSITIVITY SELECTOR — full counter-clockwise (minimum).
- CONTROLLED EXPIRATORY TIME — full clockwise ("OFF")
- MARK 7A PRESSURE/TIME CYCLED SELECTOR — switch "OUT".
- INSPIRATORY FLOWRATE — full counter-clockwise (maximum).
- Push hand timer rod "IN".

7.2 Unit should now "chatter" at an even rhythm. If the respirator fails to chatter or chatter is uneven in rhythm, slowly rotate PRESSURE SELECTOR arm clockwise to balance the magnets.

7.3 If the respirator still fails to chatter or chatter is uneven in rhythm, it will be necessary to remove the ceramic switch for cleaning.

8.0 MARK 7A — APNEUSTIC FLOWTIME

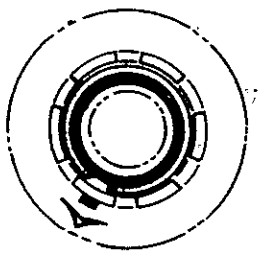
8.1 Insert test lung onto breathing assembly and position the respirator controls as follows:

- PRESSURE SELECTOR at 20.
- SENSITIVITY SELECTOR at 20.
- INSPIRATORY FLOWRATE full clockwise.
- PRESSURE/TIME-CYCLED SELECTOR switch "IN".
- CONTROLLED EXPIRATORY TIME control knob at the 12:00 o'clock position.

8.2 Remove APNEUSTIC FLOWTIME control knob and secure cam stops at the 7:00 o'clock and 5:00 o'clock positions.

8.3 Rotate valve stem counterclockwise until a 3 second apneustic time is obtained.

NOTE: This is measured from the moment the red hand timer rod moves "OUT" until the exhalation gate opens.



8.4 Lubricate the O-ring on the retention cap and install control knob with index resting above the 7:00 o'clock cam stop and secure in place. (Fig. 38)

FIGURE 38

8.5 Recheck for 3 second APNEUSTIC FLOWTIME with the control knob full counter-clockwise and less than .5 second delay in the clockwise position.

NOTE: Broached valve; fine adjustments can be made with a 3/32" allen wrench inserted in the end of the control knob.

8.6 Rotate CONTROLLED EXPIRATORY TIME control full clockwise "OFF".

8.7 Troubleshooting APNEUSTIC FLOWTIME.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Cannot obtain minimum or maximum APNEUSTIC FLOWTIME.	1. Faulty valve or O-ring (P/N 0114).	1. Use ½" open end wrench to remove valve. Inspect valve and O-ring. Replace worn parts.
	2. Leak in the APNEUSTIC FLOWTIME tubing or connections.	2. Remove pressure compartment to leak test connections at both ends of tubes 1, 2, 3, 4 and 8. Remove ambient compartment to leak test connections at both ends of tubes 26, 29, 16 and 51.
	3. Worn O-rings on PRESSURE/ TIME-CYCLED SELECTOR ROD.	3. Use 7/16" open end wrench to remove. Replace O-rings and lightly lubricate with special lubricant (P/N 0631).
	4. Malfunction in apneustic cartridge.	4. Check operation of cartridge.

9.0 CONTROLLED EXPIRATORY TIME

9.1 Remove controlled expiratory time knob with 3/32" allen wrench.

NOTE: Units manufactured after November 1, 1978; remove Spring (P/N 7736) and proceed to Step 9.2. Units manufactured prior to November 1, 1978; in order to facilitate stability in the controlled expiratory timing valve, perform the following modification update:

- Remove packing nut from valve with ½" open end wrench and discard.
- Install Packing Nut (P/N 0122) and O-ring (P/N 0193) onto valve body and finger tighten in place.

NOTE: Cam Washer (P/N 4021) and Cam Stop (P/N 4020) should remain on the valve.

9.2 Position the following controls as indicated:

- CONTROLLED EXPIRATORY TIME stem — full clockwise.
- INSPIRATORY FLOWRATE control — full clockwise.
- MARK 7A PRESSURE/TIME CYCLED SELECTOR SWITCH — "OUT"
- PRESSURE SELECTOR arm to 20.
- PRESSURE SELECTOR arm to 20.

9.3 Respirator should not cycle automatically. Insure that the unit will remain in the "OFF" position for a minimum of 3 minutes. If the respirator cycles during the 3-minute test period, refer to Step 9.10, Troubleshooting, before continuing with Step 9.4.

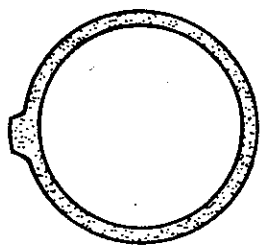


FIGURE 39

9.4 Secure a single cam stop at the 9:00 o'clock position. (Fig.39)

9.5 Rotate the CONTROLLED EXPIRATORY TIME stem counterclockwise until an expiratory time of 3.0 seconds (± .5 sec.) is obtained. Begin timing from the moment the exhalation valve opens until it immediately closes.

9.6 If applicable, position Spring (P/N 7736) over valve in slotted area of packing nut.

9.7 Apply Lubewick to O-ring on retention cap and carefully install control knob with index at the 12:00 o'clock position.

NOTE: Apply sufficient pressure to control knob until contact with valve stem has been made and secure with 3/32" allen wrench.

9.8 Recheck for 3.0 seconds (±.5 sec.) expiratory time.

9.9 Rotate control knob counterclockwise against cam stop. Check for an expiratory time of between .5-1.0 seconds. Rotate control knob full clockwise "off" when parameters are satisfied.

NOTE: To increase or decrease the minimum expiratory time, reposition the cam stop. A counterclockwise movement will decrease the expiratory time.

9.10 Troubleshooting CONTROLLED EXPIRATORY TIME.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
Respirator cycles automatically with CONTROLLED EXPIRATORY TIME stem full clockwise.	1. SENSITIVITY SELECTOR arm adjusted to minimum sensitivity or requires calibration.	1. Readjust to 20 or recalibrate.
	2. Worn, cut or torn O-ring (P/N 0114) on end of EXPIRATORY TIME valve.	2. Remove valve to check condition of O-ring. Replace if worn.
	3. Leak in the EXPIRATORY TIME system.	3. **Mark 7** — Remove ambient compartment, cycle respirator "ON" (without test lung) and place a leak detecting solution on both ends of tubes 2, 3, and 30. Also place solution around retaining ring on back side of expiratory termination cartridge. Correct any leaks in system. **Mark 7A** — Remove ambient compartment cycle respirator "ON" (without test lung) and place a leak detecting solution on both ends of tubes 27 and 30. Also place solution around retaining ring on back side of expiratory termination cartridge. Correct any leaks in system. **Mark 7A** — Remove pressure compartment to apply leak detecting solution on both ends of tube 10 and check valve.
	4. Malfunction in expiratory termination cartridge.	4. Check operation of cartridge.

10.0 PRESSURE RELIEF VALVE

10.1 Remove mainstream stopper from pressure compartment and reinstall PRESSURE RELIEF valve.

10.2 Remove test lung and increase PRESSURE SELECTOR arm full clockwise.

10.3 Cycle respirator "ON" and occlude end of breathing assembly several times to allow venting of the relief valve before calibration.

10.4 Manometer needle should register 30cmH_2O. Use ¼" nut driver or open end wrench to adjust PRESSURE RELIEF valve to desired venting pressure.

10.5 Troubleshooting PRESSURE RELIEF valve.

PROBLEM	POTENTIAL CAUSE	CORRECTIVE ACTION
30cmH_2O cannot be reached.	1. PRESSURE RELIEF valve adjusted for a lower venting pressure.	1. Adjust to a higher venting pressure.
	2. Leak in breathing circuit.	2. Find and correct.
	3. Gas leaking between pressure compartment and centerbody gasket.	3. Secure.
	4. Gas escaping from pressure compartment to ambient compartment.	4. Remove ambient compartment and apply leak detecting solution on retaining ring around master diaphragm and diaphragm itself. Correct leak.

C. CALIBRATION TEST

If the following parameters are not met, refer to B., Calibration of the Unit, to obtain correct values. Insure a static 50 psig driving pressure to the respirator.

11.0 AIRWAY PRESSURE MANOMETER

11.1 Turn MASTER SWITCH "OFF" and remove test lung from breathing assembly.

11.2 Check for zero reading on gauge.

12.0 INSPIRATORY FLOWRATE

12.1 Insert Orificed Adapter (P/N 6855) onto breathing assembly and turn MASTER SWITCH "ON".

12.2 Rotate PRESSURE SELECTOR arm to end of medium range and insure that the CONTROLLED EXPIRATORY TIME control is full clockwise — "OFF".

12.3 Cycle respirator "ON" and rotate the INSPIRATOR FLOWRATE control to the following positions. Flow through the orificed adapter should produce the parameters below:

INSPIRATORY FLOWRATE Position	Airway Manometer Pressure
Full clockwise (5:00 o'clock position)	MARK 7 18-24 cmH_2O MARK 7A 14-18 cmH_2O
Full counterclockwise	MARK 7 34 cmH_2O or higher MARK 7A 30 cmH_2O or higher

13.0 INSPIRATORY POWER DRIVELINE

13.1 Remove Orificed Adapter (P/N 6855) from breathing assembly.

13.2 Insert Inspiratory Power Driveline Gauge (P/N 6758, 0-60 psig) into INSPIRATORY POWER DRIVELINE socket.

13.3 Cycle respirator "ON" and recheck for pressure reading between 12-25 psig.

13.4 Remove Inspiratory Power Driveline Gauge (P/N 6758) and reconnect INSPIRATORY POWER DRIVELINE.

14.0 PRESSURE-CYCLED LIMIT

14.1 Insert test lung onto breathing assembly.

14.2 Mark 7
Rotate INSPIRATORY FLOWRATE and CONTROLLED EXPIRATORY TIME control knobs full clockwise.

Mark 7A
Rotate INSPIRATORY FLOWRATE and CONTROLLED EXPIRATORY TIME control knobs full clockwise and insure the pressure/time cycled selector switch is "OUT".

14.3 Position the PRESSURE SELECTOR arm to 20 and cycle the respirator "ON".

14.4 The unit should cycle "OFF" (hand timer rod moves "OUT") at 20 cmH_2O.

15.0 STARTING EFFORT

15.1 Remove test lung and insert mouthpiece onto breathing assembly.

15.2 Position SENSITIVITY SELECTOR arm to 20. A slow and gentle inspiratory effort should cycle the respirator "ON" at a -2cmH_2O, as indicated on manometer.

16.0 CHATTER TEST

16.1 Mark 7
Remove test lung and adjust respirator for maximum INSPIRATORY FLOWRATE, minimum pressure, minimum sensitivity, EXPIRATORY TIME, "OFF" and MASTER SWITCH "ON".

Mark 7A
Remove test lung and adjust respirator for maximum INSPIRATORY FLOWRATE, minimum pressure, minimum sensitivity, PRESSURE/TIME-CYCLED SELECTOR SWITCH "OUT", EXPIRATORY TIME "OFF" and MASTER SWITCH "ON".

16.2 Respirator should chatter at a steady, even rhythm.

17.0 MARK 7A — APNEUSTIC FLOWTIME

17.1 Install test lung, adjust INSPIRATORY FLOWRATE to minimum, push the PRESSURE/TIME-CYCLED SELECTOR SWITCH "in" and insure APNEUSTIC FLOWTIME control is full clockwise.

17.2 Adjust STARTING EFFORT and PRESSURE SELECTOR arm to 20 and cycle respirator "ON". Observe a short delay (less than .5 seconds) from the time the hand timer rod moves "OUT" until the exhalation gate "opens".

17.3 Rotate the APNEUSTIC FLOWTIME control full counterclockwise. The delay mentioned above should be 3.0 seconds.

17.4 Rotate APNEUSTIC FLOWTIME control full clockwise, pull PRESSURE/TIME-CYCLED SELECTOR SWITCH "OUT" and slide safety catch into position.

18.0 CONTROLLED EXPIRATORY TIME

18.1 Insure test lung is attached to breathing assembly.

18.2 Adjust STARTING EFFORT SELECTOR to 20, position the PRESSURE SELECTOR to 20 and rotate CONTROLLED EXPIRATORY TIME control to the 12:00 o'clock position.

18.3 Check for a 3.0 second (±.5 sec.) delay from the opening of the exhalation valve (respirator "OFF") until it closes (respirator "ON").

18.4 Rotate the CONTROLLED EXPIRATORY TIME knob full counterclockwise and check for a .5 to 1 second expiratory time.

18.5 Rotate this control full clockwise "OFF" and insure respirator does not cycle for at least 3 minutes.

19.0 PRESSURE RELIEF VALVE

19.1 Remove test lung from the breathing assembly and position PRESSURE SELECTOR arm full clockwise.

19.2 Cycle respirator "ON" and occlude end of breathing assembly.

19.3 Observe pressure manometer for stabilization of needle at 30cmH_2O pressure or adjust to desired relief pressure.

19.4 Adjust PRESSURE SELECTOR arm back to 20.

19.5 Turn MASTER SWITCH "OFF" and source gas "OFF". Remove calibration regulator and breathing assembly from respirator.

CALIBRATION IS NOW COMPLETE.

If the following parameters are not met, refer to Section 7 — Calibration and Troubleshooting, of this manual.

1.0 AIRWAY PRESSURE MANOMETER

1.1 Turn MASTER SWITCH OFF and remove test lung from breathing assembly.

1.2 Check for zero reading on gauge.

2.0 INSPIRATORY FLOWRATE

2.1 Insert Orificed Adapter (P/N 6855) onto breathing assembly and turn MASTER SWITCH ON.

2.2 Rotate PRESSURE SELECTOR arm to end of medium range and insure that the CONTROLLED EXPIRATORY TIME control is full clockwise — OFF.

2.3 Cycle respirator "ON" and rotate INSPIRATORY FLOWRATE control to the following positions. Flow through the orificed adapter should produce the parameters below:

INSPIRATORY FLOWRATE Position	Airway Manometer Pressure
Full clockwise (5:00 o'clock position)	MARK 7 18-24 cmH_2O MARK 7A 14-18 cmH_2O
Full counterclockwise	MARK 7 34 cmH_2O or higher MARK 7A 30 cmH_2O or higher

3.0 INSPIRATORY POWER DRIVELINE

3.1 Remove Orificed Adapter (P/N 6855) from breathing assembly.

3.2 Insert Inspiratory Power Driveline Gauge (P/N 6758, 0-60 psig) into INSPIRATORY POWER DRIVELINE socket.

3.3 Cycle respiratory "ON" and recheck for pressure reading between 12-25 psig.

3.4 Remove Inspiratory Power Driveline Gauge (P/N 6758) and reconnect INSPIRATORY POWER DRIVELINE.

4.0 PRESSURE-CYCLED LIMIT

4.1 Insert test lung onto breathing assembly.

4.2 Mark 7
Rotate INSPIRATORY FLOWRATE and CONTROLLED EXPIRATORY TIME control knobs full clockwise.

Mark 7A
Rotate INSPIRATORY FLOWRATE and CONTROLLED EXPIRATORY TIME control knobs full clockwise and insure the pressure/time cycled selector switch is "OUT."

4.3 Position the PRESSURE SELECTOR arm to 20 and cycle the respirator ON.

4.4 The unit should cycle off (hand timer rod moves OUT at 20cmH_2O).

5.0 STARTING EFFORT

5.1 Remove test lung and insert mouthpiece onto breathing assembly.

5.2 Position SENSITIVITY SELECTOR arm to 20. A slow and gentle inspiratory effort should cycle the respirator ON at a $-2cmH_2O$, as indicated on manometer.

6.0 CHATTER TEST

6.1 Mark 7
Remove test lung and adjust respirator for maximum INSPIRATORY FLOWRATE, minimum pressure, minimum sensitivity, EXPIRATORY TIME OFF and MASTER SWITCH ON.

Mark 7A
Remove test lung and adjust respiratory for maximum INSPIRATORY FLOWRATE, minimum pressure, minimum sensitivity, PRESSURE/TIME-CYCLED SELECTOR SWITCH OUT, EXPIRATORY TIME OFF and MASTER SWITCH ON.

6.2 Respirator should chatter at a steady, even rhythm.

7.0 MARK 7A — APNEUSTIC FLOWTIME

7.1 Install test lung, adjust INSPIRATORY FLOWRATE to minimum, push the PRESSURE/TIME-CYCLED SELECTOR SWITCH IN and insure APNEUSTIC FLOWTIME control is full clockwise.

7.2 Adjust STARTING EFFORT and PRESSURE SELECTOR arm to 20 and cycle respirator ON. Observe a short delay (less than .5 seconds) from the time the hand timer rod moves out until the exhalation gate opens.

7.3 Rotate the APNEUSTIC FLOWTIME control full counterclockwise. The delay mentioned above should be 3.0 seconds.

7.4 Rotate APNEUSTIC FLOWTIME control full clockwise, pull PRESSURE/TIME-CYCLED SELECTOR SWITCH OUT and slide safety catch into position.

8.0 CONTROLLED EXPIRATORY TIME

8.1 Insure test lung is attached to breating assembly.

8.2 Adjust STARTING EFFORT SELECTOR to 20, position the PRESSURE SELECTOR to 20 and rotate CONTROLLED EXPIRATORY TIME control to the 12:00 o'clock position.

8.3 Check for a 3.0 second (±.5 sec.) delay from the opening of the exhalation valve (respiratory OFF) until it closes (respirator ON).

8.4 Rotate the CONTROLLED EXPIRATORY TIME knob full counterclockwise and check for a .5 to 1 second expiratory time.

8.5 Rotate this control full clockwise OFF and insure respirator does not cycle for at least 3 minutes.

9.0 PRESSURE RELIEF VALVE

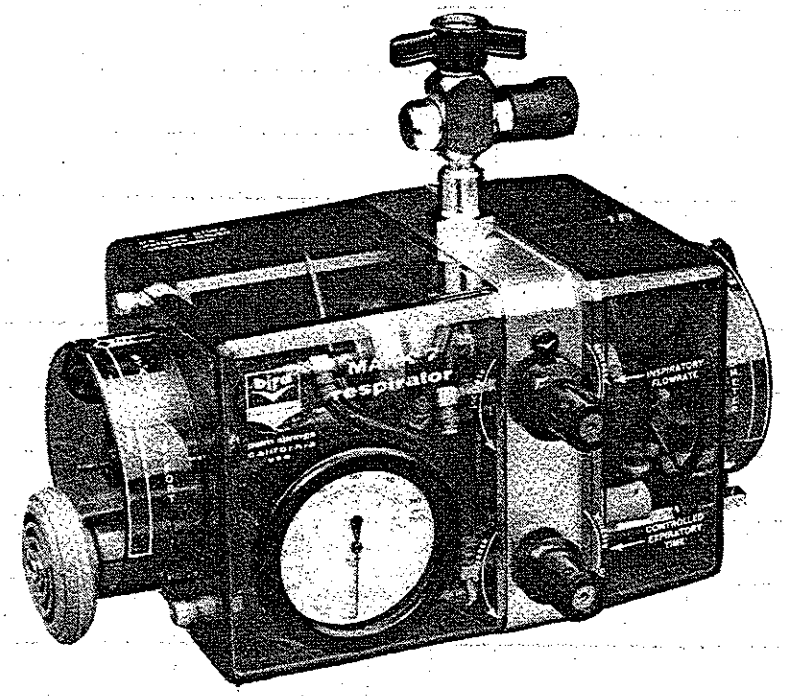
9.1 Remote test lung from the breathing assembly and position PRESSURE SELECTOR arm full clockwise.

9.2 Cycle respirator ON and occlude end of breathing assembly.

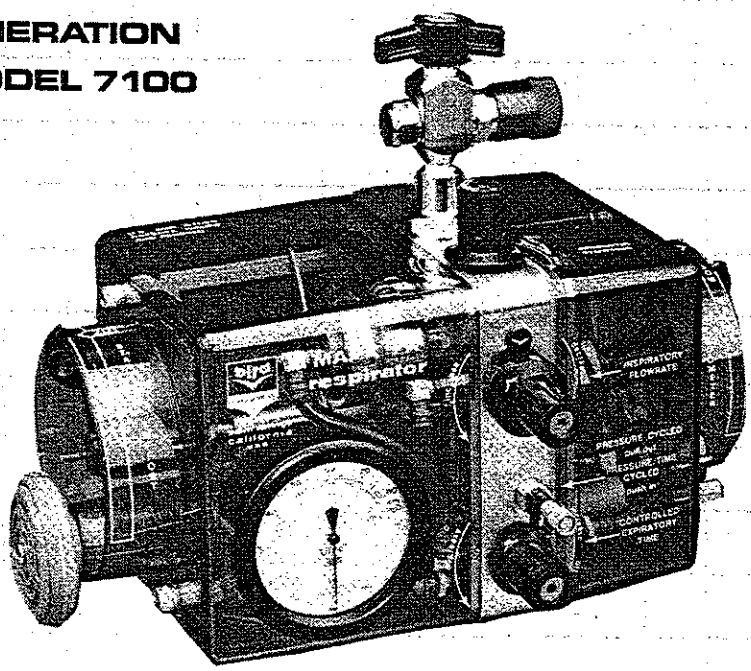
9.3 Observe pressure manometer for stabilization of needle at 30 cmH_2O pressure or adjust to desired relief pressure.

9.4 Adjust PRESSURE SELECTOR arm back to 20.

9.5 Turn MASTER SWITCH OFF and source gas OFF.



SECOND GENERATION
MARK 7 — MODEL 7100



SECOND GENERATION
MARK 7A — MODEL 7150

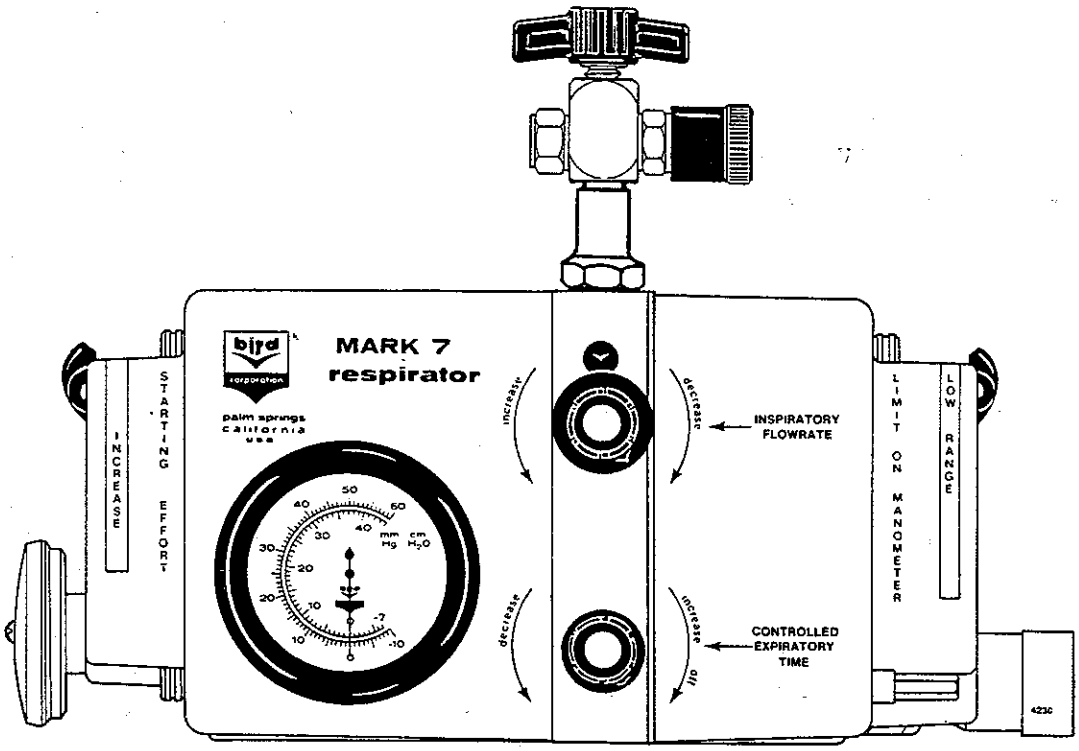
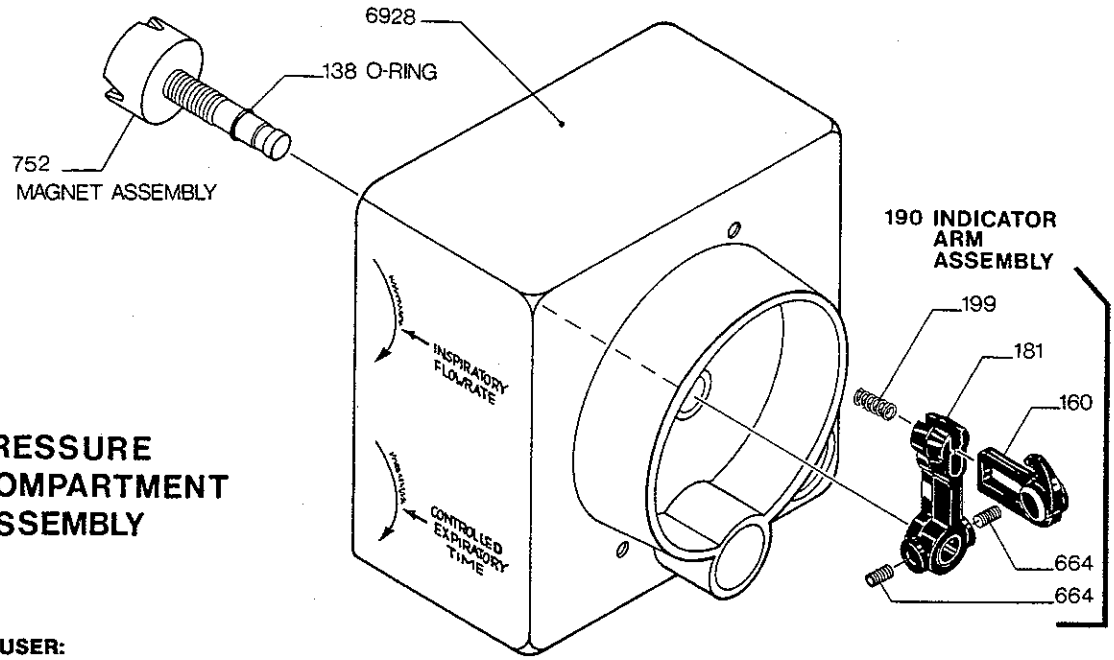

bird
corporation
palm springs
california
usa
MARK 7
respirator
INCREASE
STARTING EFFORT
increase
decrease
INSPIRATORY
FLOWRATE
decrease
increase
CONTROLLED
EXPIRATORY
TIME
LIMIT ON MANOMETER
LOW RANGE
4230

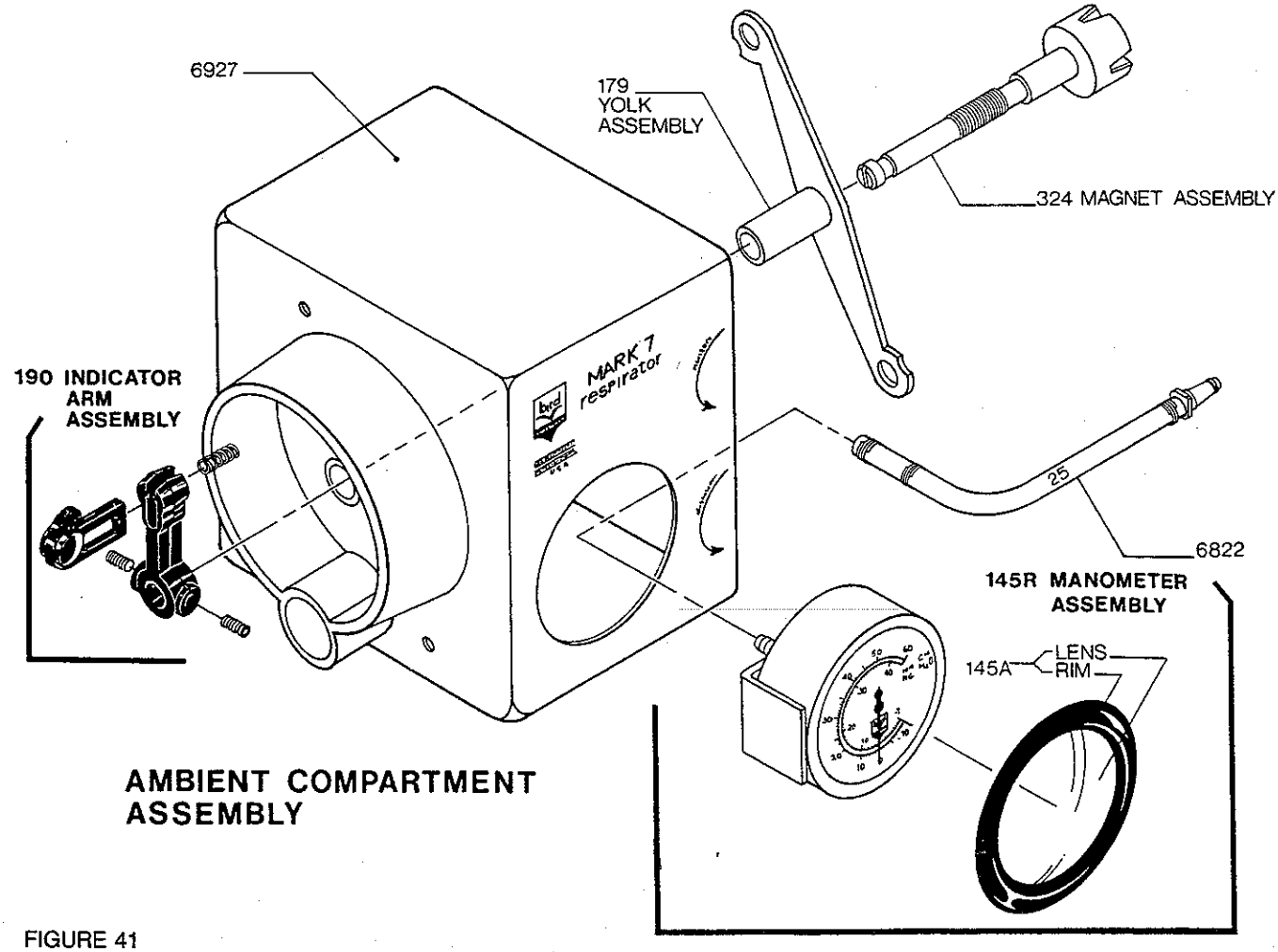
FIGURE 40



PRESSURE COMPARTMENT ASSEMBLY

NOTE TO THE USER:

Several of the component parts illustrated in this publication are not identified by part numbers and are shown only for the sake of completeness. Those parts not identified by part number are not for sale. If it is necessary to replace such a part, order the assembly in which it is shown.



AMBIENT COMPARTMENT ASSEMBLY

FIGURE 41

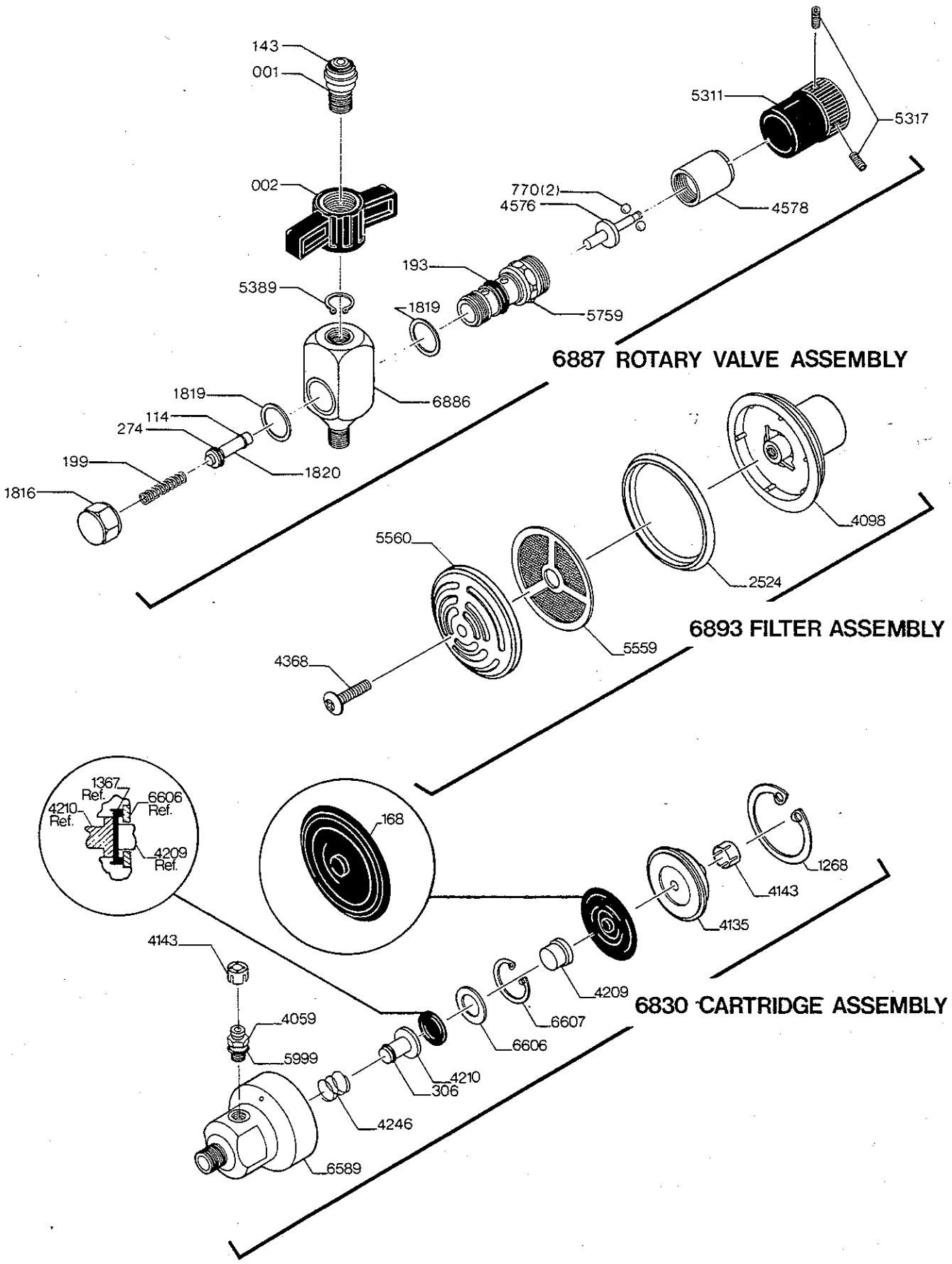

143
001
002
5389
1819
6886
1819
114
274
199
1816
1820
193
1819
5759
5311
5317
770(2)
4576
4578
6887 ROTARY VALVE ASSEMBLY
5560
4368
5559
2524
4098
6893 FILTER ASSEMBLY
1367
Ref.
4210
Ref.
6606
Ref.
4209
Ref.
168
4143
4059
5999
6589
4246
4210
306
6606
6607
4209
4135
4143
1268
6830 CARTRIDGE ASSEMBLY

FIGURE 42

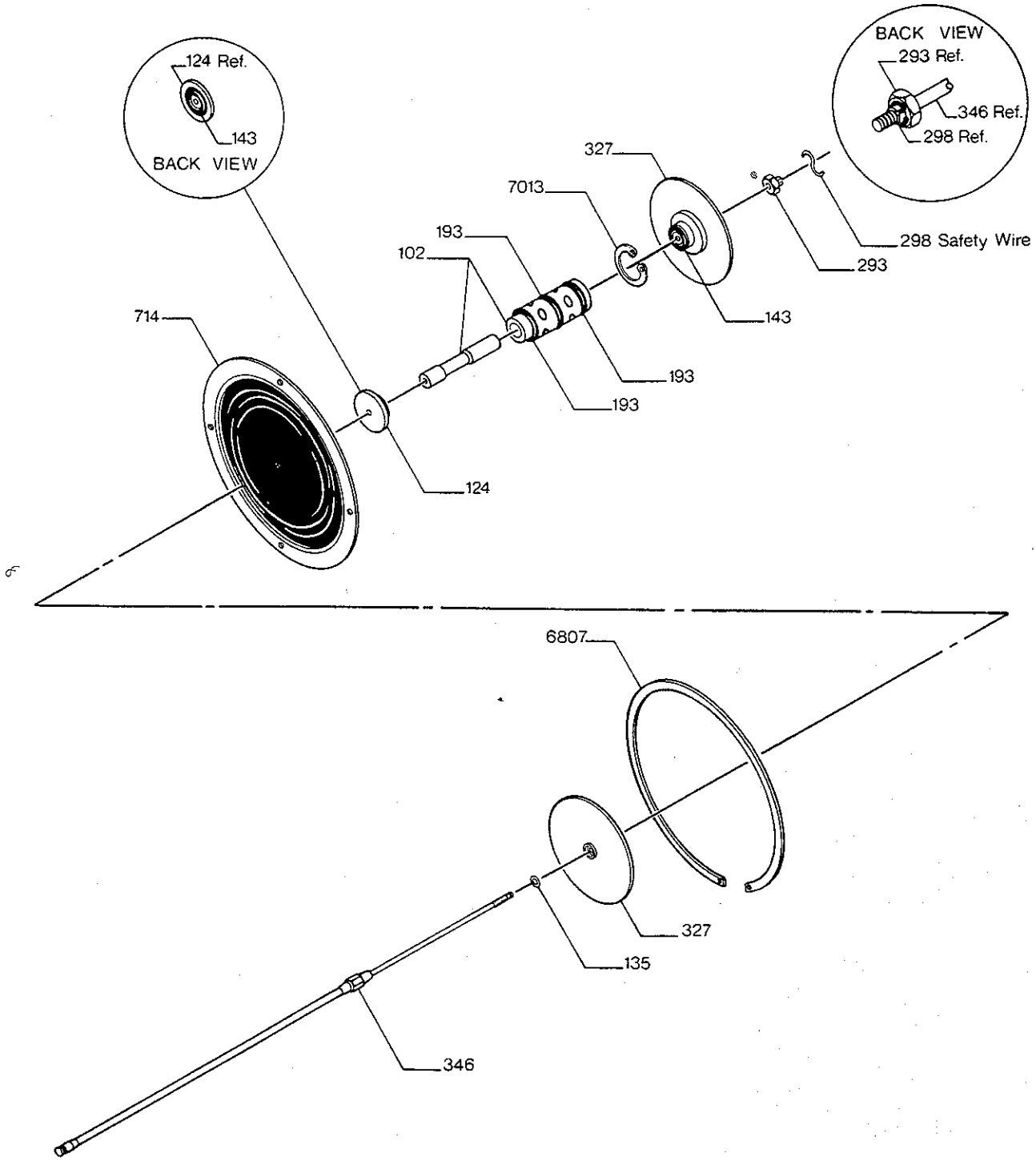

124 Ref.
143
BACK VIEW
BACK VIEW
293 Ref.
346 Ref.
298 Ref.
327
7013
193
102
298 Safety Wire
293
143
714
193
193
124
6807
327
135
346

FIGURE 43

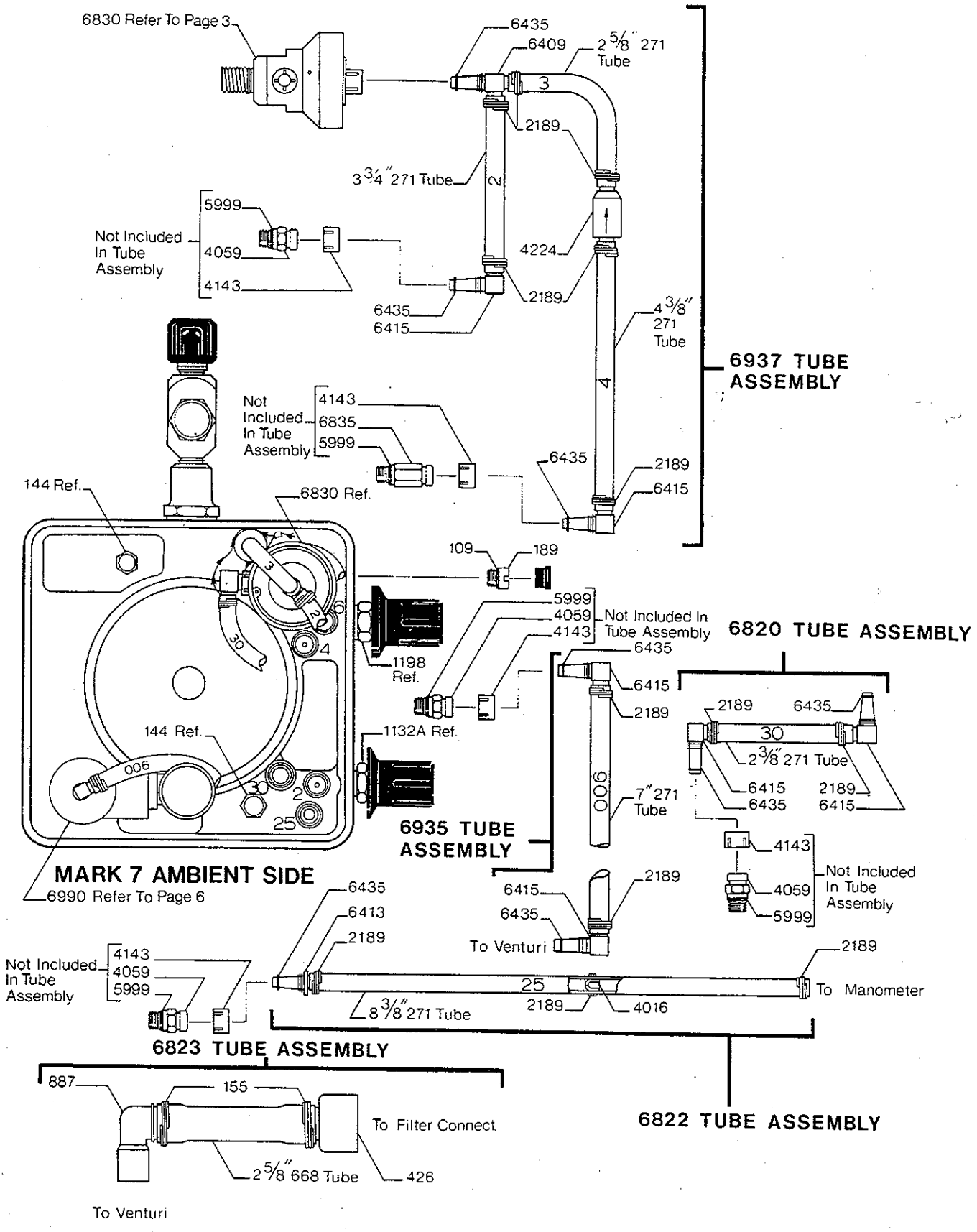

6830 Refer To Page 3
6435
6409
2 5/8" 271 Tube
3
2189
3 3/4" 271 Tube
2
5999
Not Included In Tube Assembly
4059
4143
4224
6435
6415
2189
4 3/8" 271 Tube
4
6937 TUBE ASSEMBLY
Not Included In Tube Assembly
4143
6835
5999
6435
2189
6415
144 Ref.
6830 Ref.
109
189
5999
4059
4143
Not Included In Tube Assembly
6820 TUBE ASSEMBLY
6435
6415
2189
1198 Ref.
1132A Ref.
144 Ref.
006
6935 TUBE ASSEMBLY
2189
6435
30
2 3/8" 271 Tube
6415
6435
2189
6415
7" 271 Tube
4143
4059
5999
Not Included In Tube Assembly
MARK 7 AMBIENT SIDE
6990 Refer To Page 6
6435
6413
2189
6415
6435
2189
To Venturi
Not Included In Tube Assembly
4143
4059
5999
25
2189
4016
8 3/8" 271 Tube
2189
To Manometer
6823 TUBE ASSEMBLY
6822 TUBE ASSEMBLY
887
155
To Filter Connect
2 5/8" 668 Tube
426
To Venturi

FIGURE 44

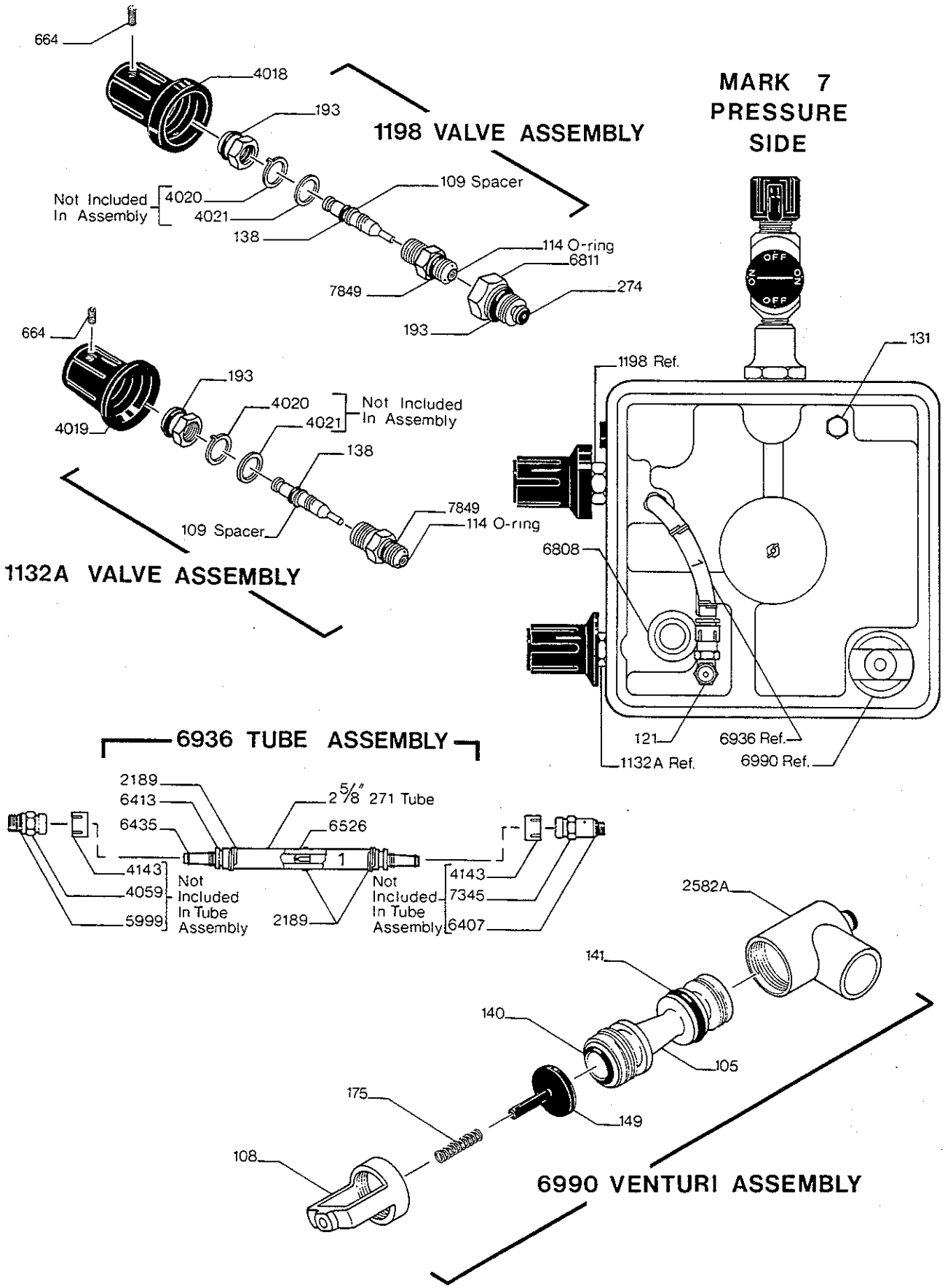

664
4018
193
1198 VALVE ASSEMBLY
MARK 7
PRESSURE
SIDE
Not Included
In Assembly
4020
4021
109 Spacer
138
114 O-ring
6811
7849
274
193
664
193
4020
Not Included
In Assembly
4021
4019
138
7849
114 O-ring
109 Spacer
1132A VALVE ASSEMBLY
OFF
ON
ON
OFF
131
1198 Ref.
6808
121
6936 Ref.
1132A Ref.
6990 Ref.
6936 TUBE ASSEMBLY
2189
6413
2 5/8" 271 Tube
6435
6526
4143
4059
5999
Not
Included
In Tube
Assembly
2189
Not
Included
In Tube
Assembly
4143
7345
6407
2582A
141
140
105
175
149
108
6990 VENTURI ASSEMBLY

FIGURE 45

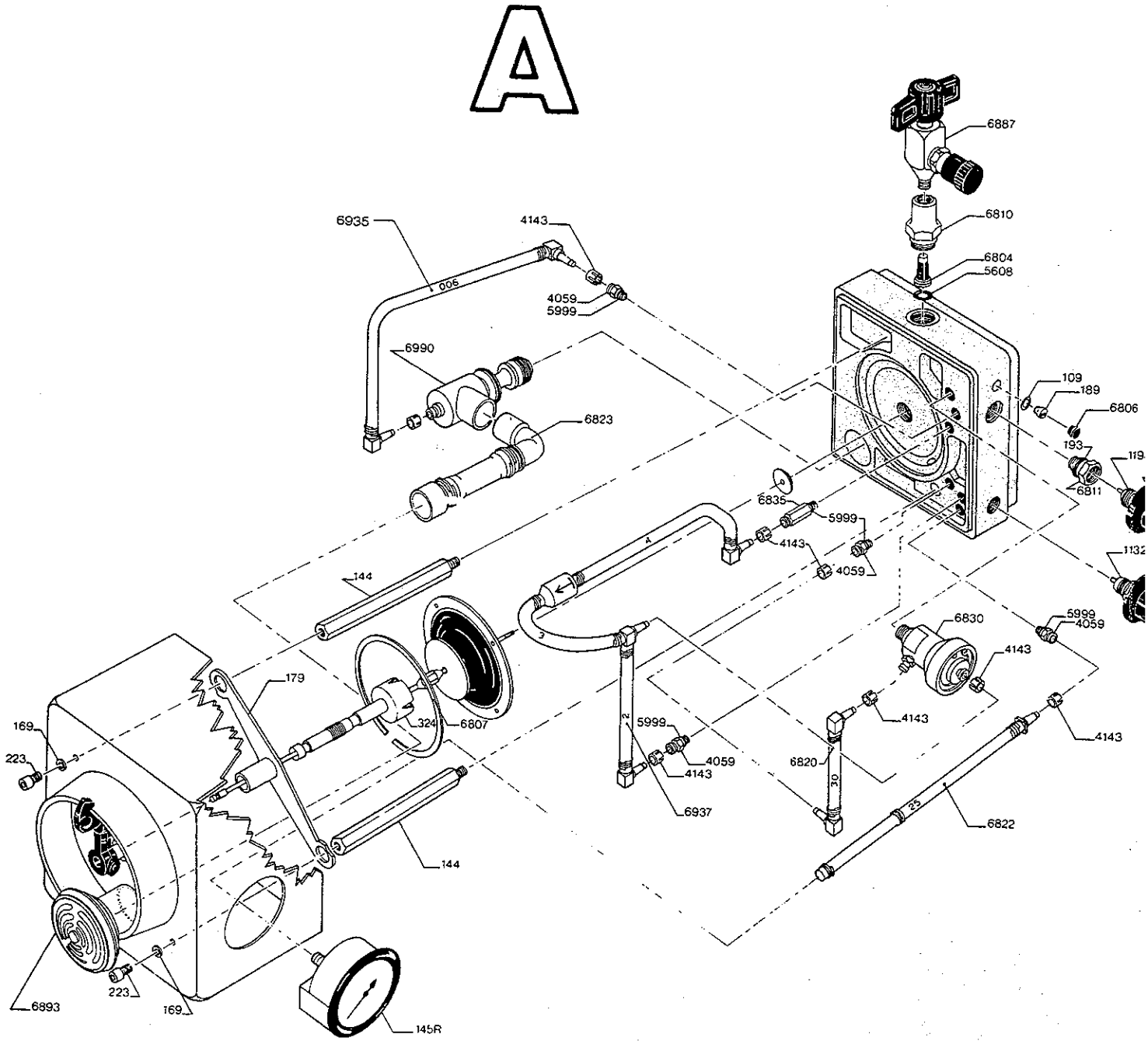
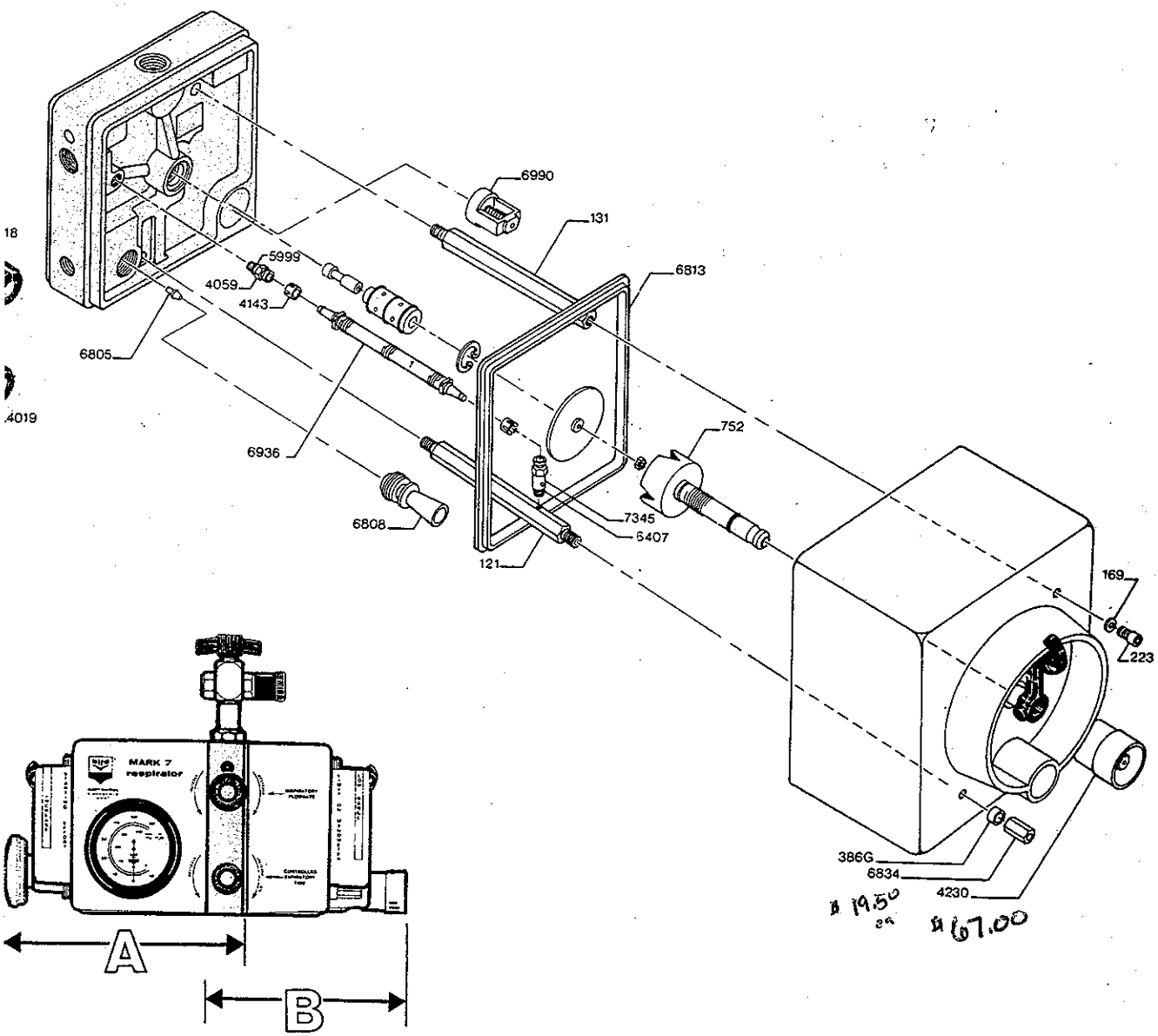

A
6887
6810
6804
5608
6935
4143
005
4059
5999
6990
6823
109
189
6806
193
119
6811
6835
5999
4143
4059
1132
144
A
6830
5999
4059
4143
179
169
223
324
6807
5999
4059
4143
6820
4143
4143
6937
30
35
6822
144
6893
223
169
145R

FIGURE 46

B



$19.50 ea $67.00

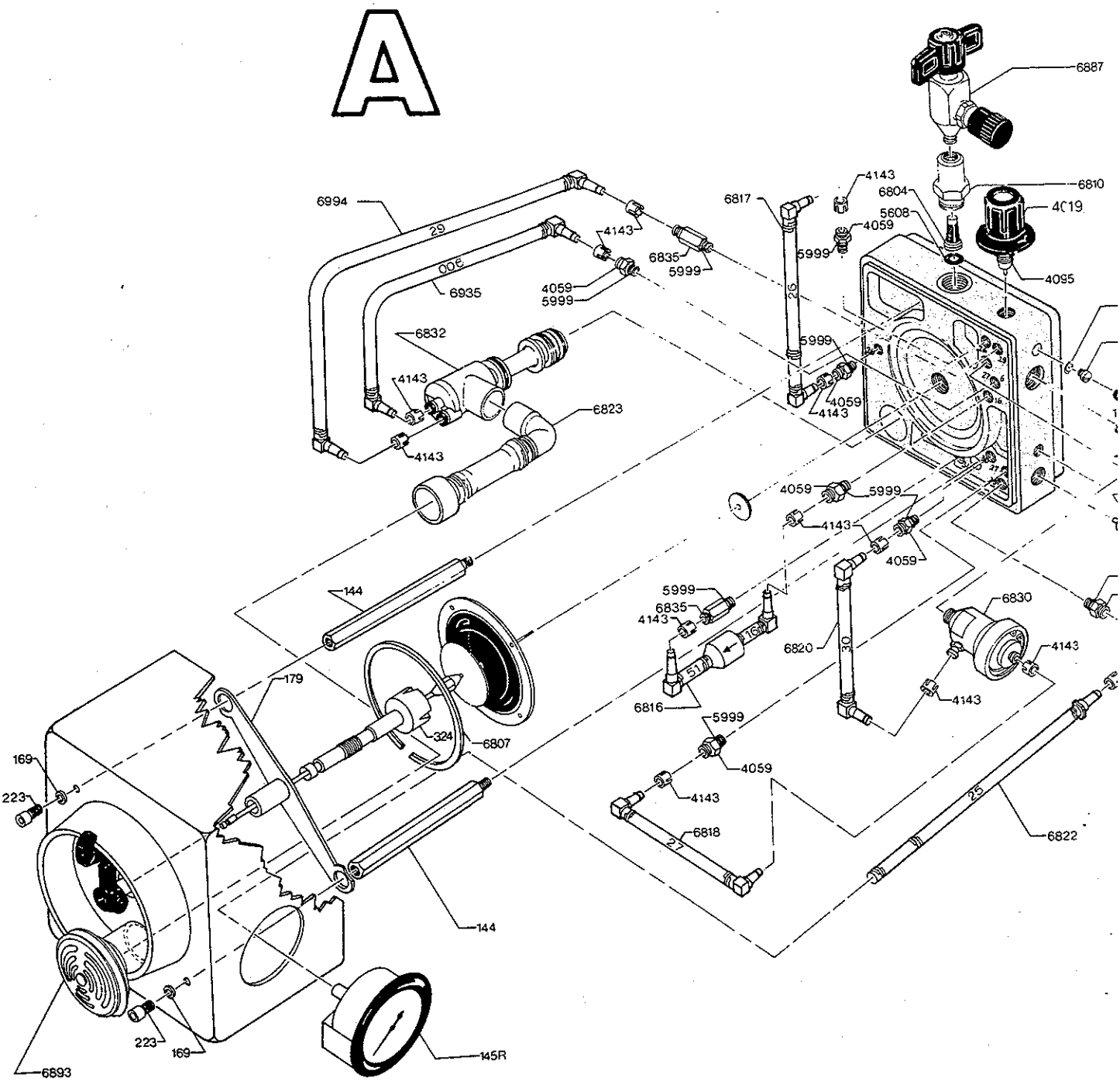
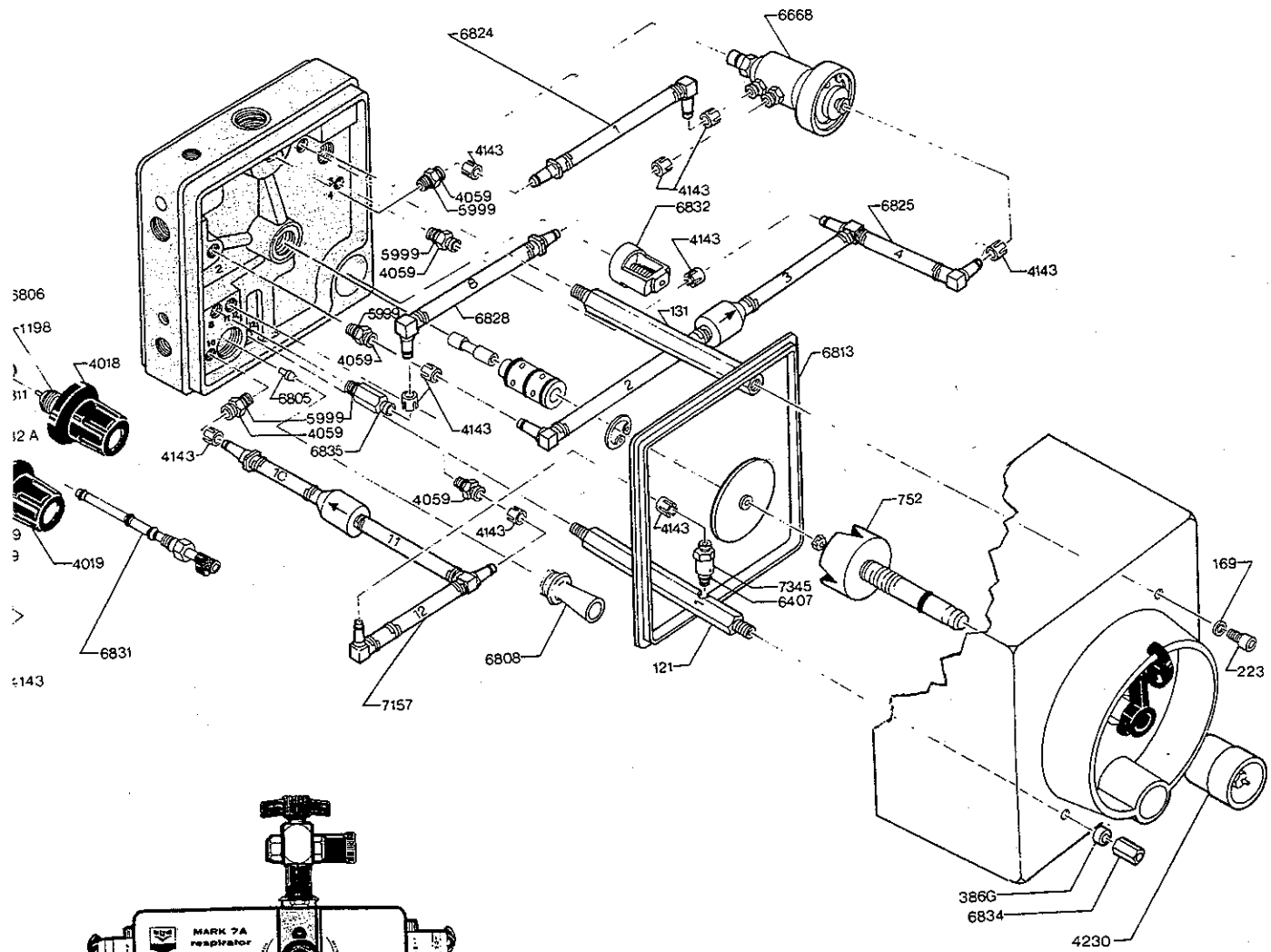
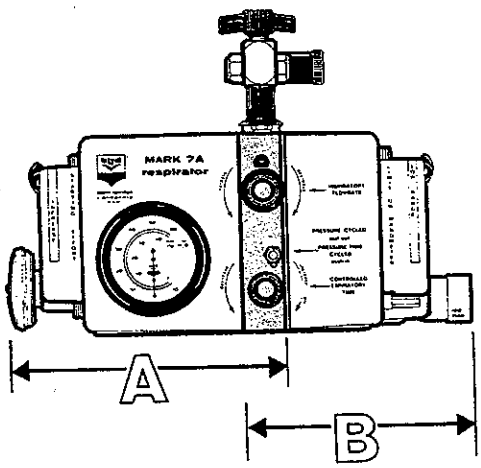

A
6887
6994
29
300
6935
4143
6835
5999
4059
5999
6817
4143
6804
6610
5608
4059
4019
5999
4095
6832
4143
6823
4143
5999
4059
4143
4059
5999
4143
4059
144
5999
6835
4143
6830
6820
4143
6816
5999
4059
4143
6818
6822
179
324
6807
169
223
144
223
169
6893
145R

FIGURE 47

B


6824
6668
4143
4059
5999
6832
6825
6828
131
6813
6805
6835
752
4019
6831
6808
121
7157
7345
6407
169
223
386G
6834
4230
4018


MARK 7A
respirator
A
B

7A

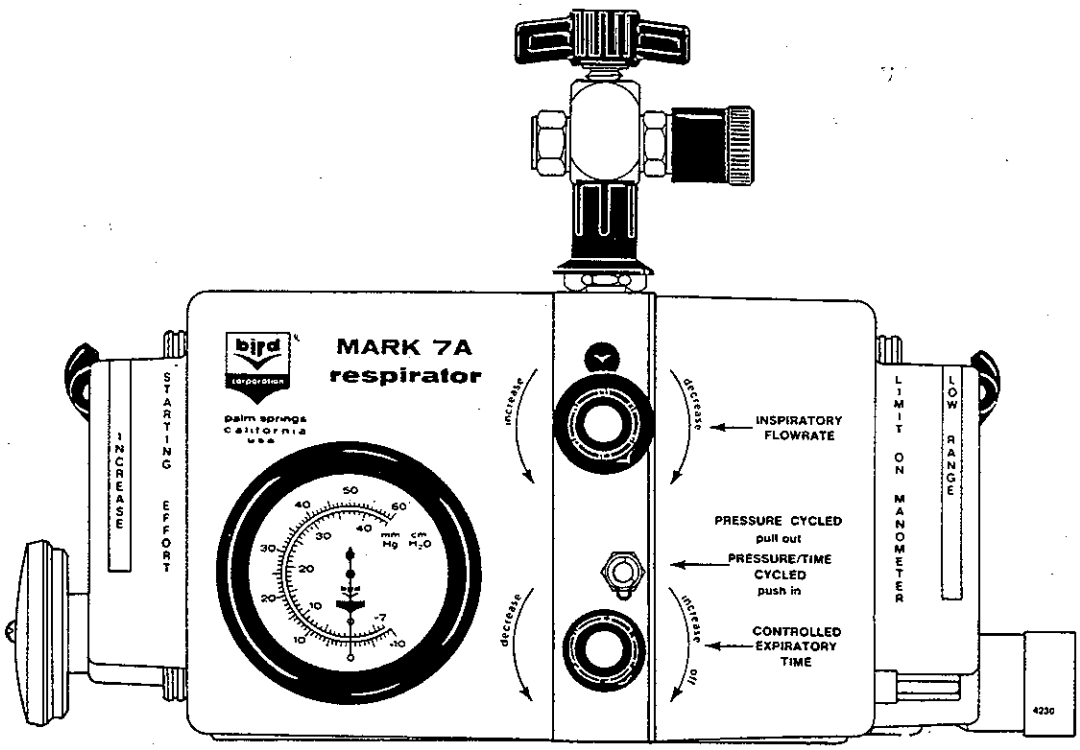
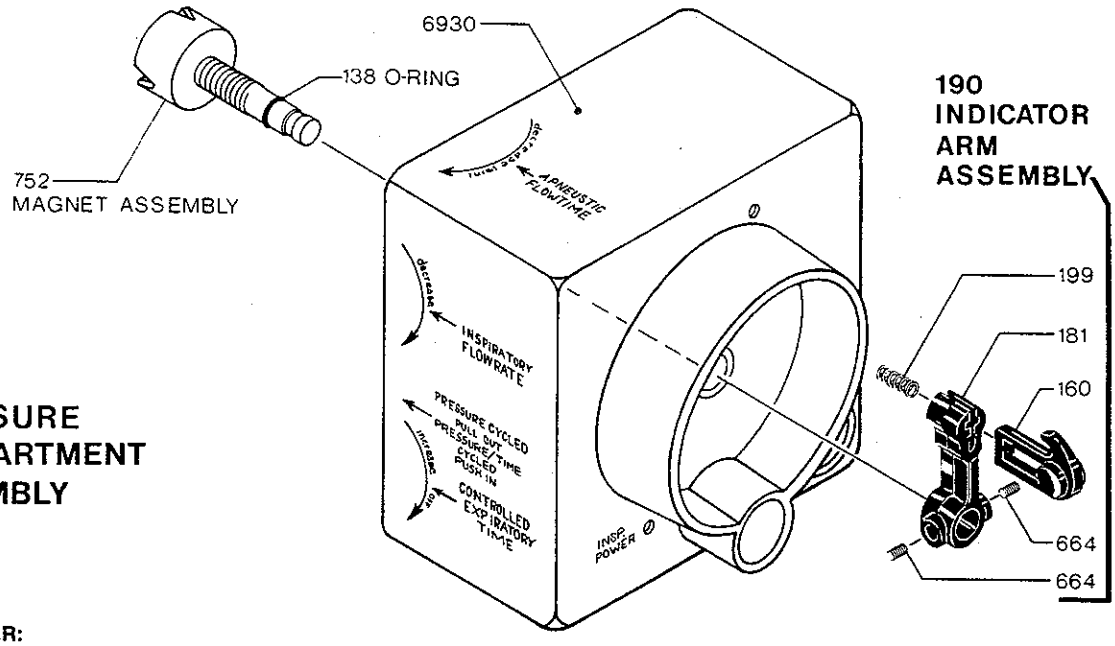

bird
corporation
MARK 7A
respirator
palm springs
california
usa
INCREASE
STARTING EFFORT
mm Hg
cm H2O
increase
decrease
INSPIRATORY FLOWRATE
PRESSURE CYCLED
pull out
PRESSURE/TIME CYCLED
push in
CONTROLLED EXPIRATORY TIME
LIMIT ON MANOMETER
LOW RANGE
4230

FIGURE 48



NOTE TO THE USER:

Several of the component parts illustrated in this publication are not identified by part numbers and are shown only for the sake of completeness. Those parts not identified by part number are not for sale. If it is necessary to replace such a part, order the assembly in which it is shown.

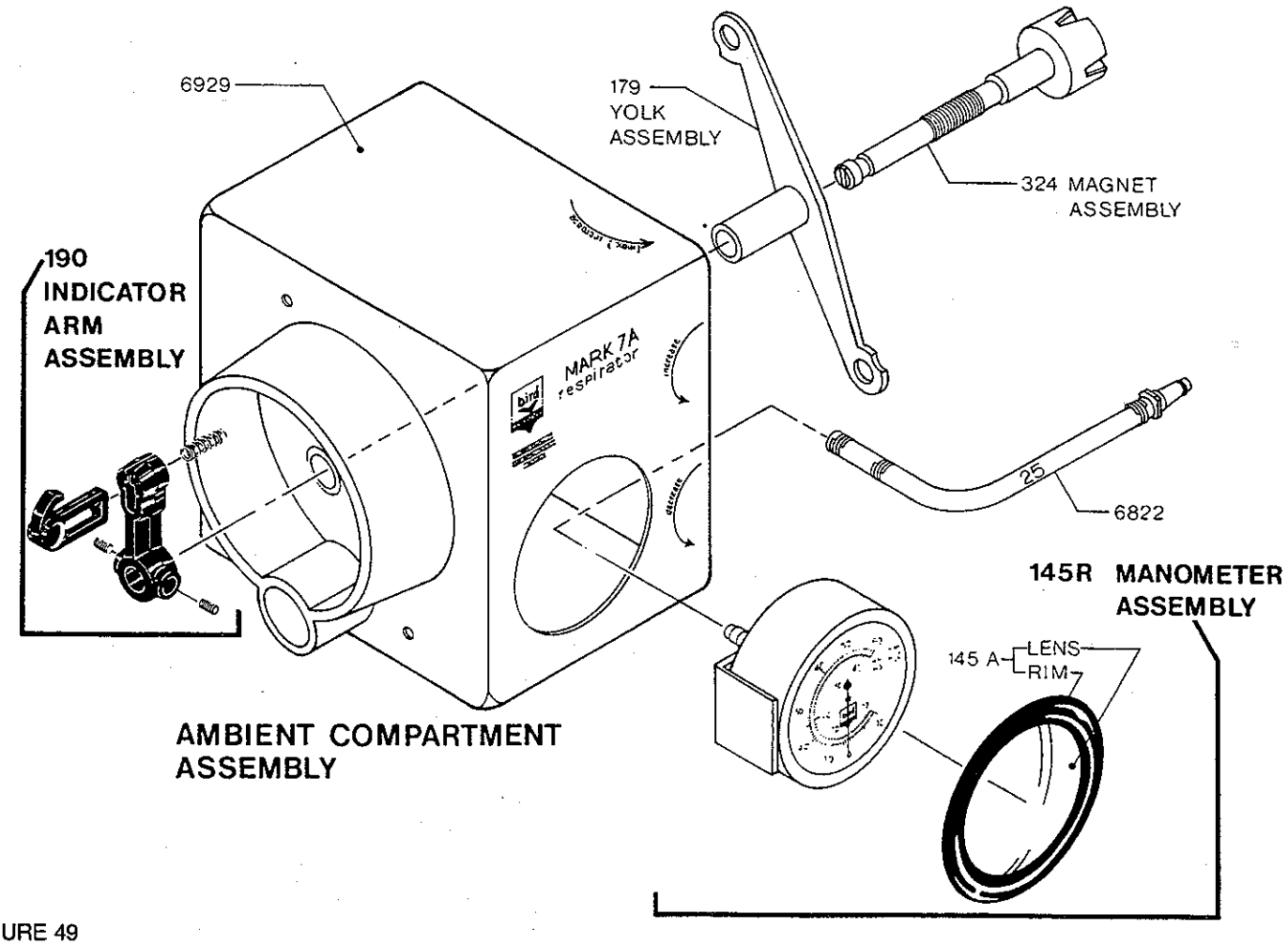


FIGURE 49

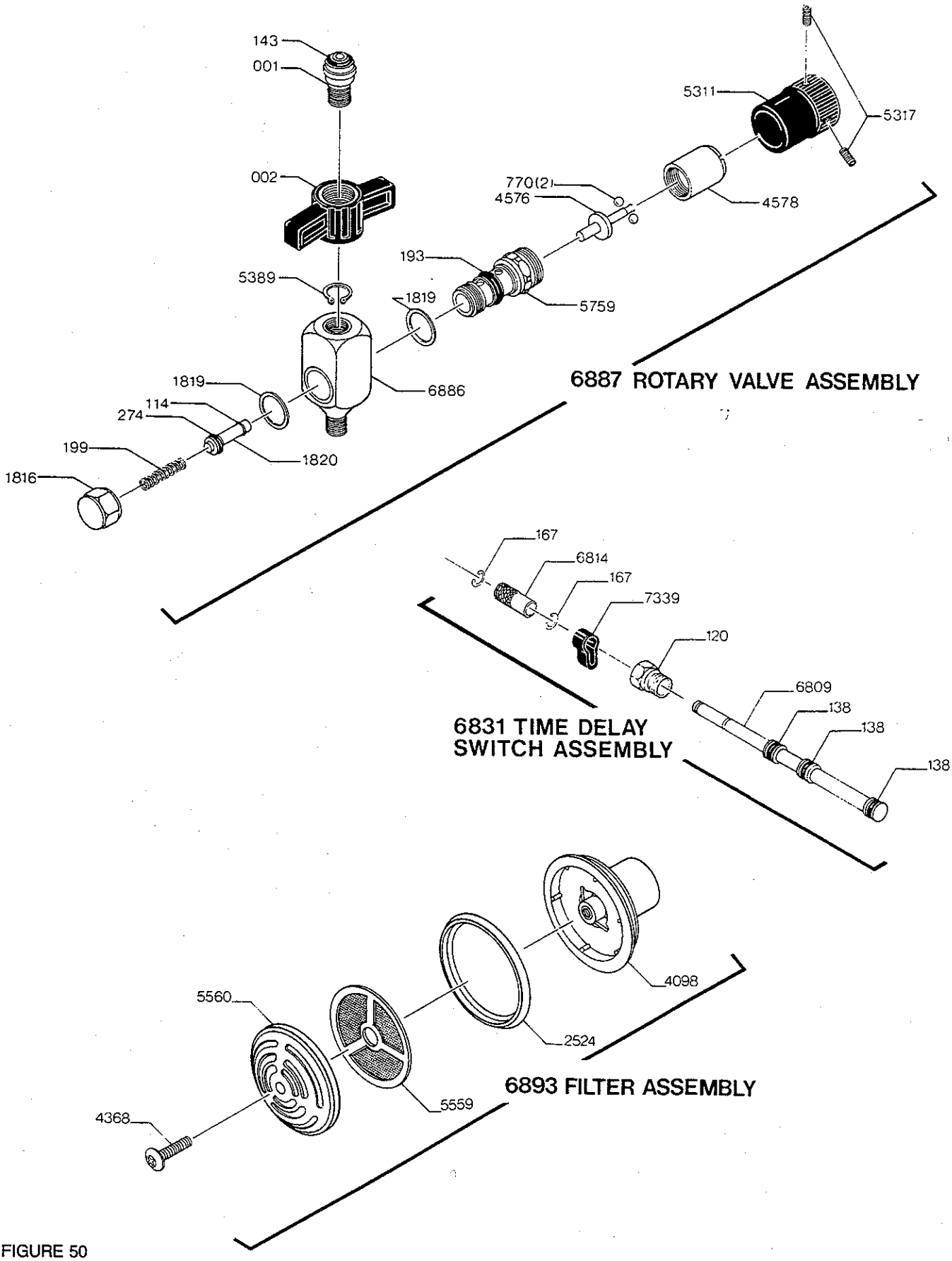

143
001
002
5389
1819
6886
1819
114
274
1820
199
1816
193
770(2)
4576
5759
5311
5317
4578
6887 ROTARY VALVE ASSEMBLY
167
6814
167
7339
120
6809
138
138
138
6831 TIME DELAY
SWITCH ASSEMBLY
5560
4368
5559
2524
4098
6893 FILTER ASSEMBLY

FIGURE 50

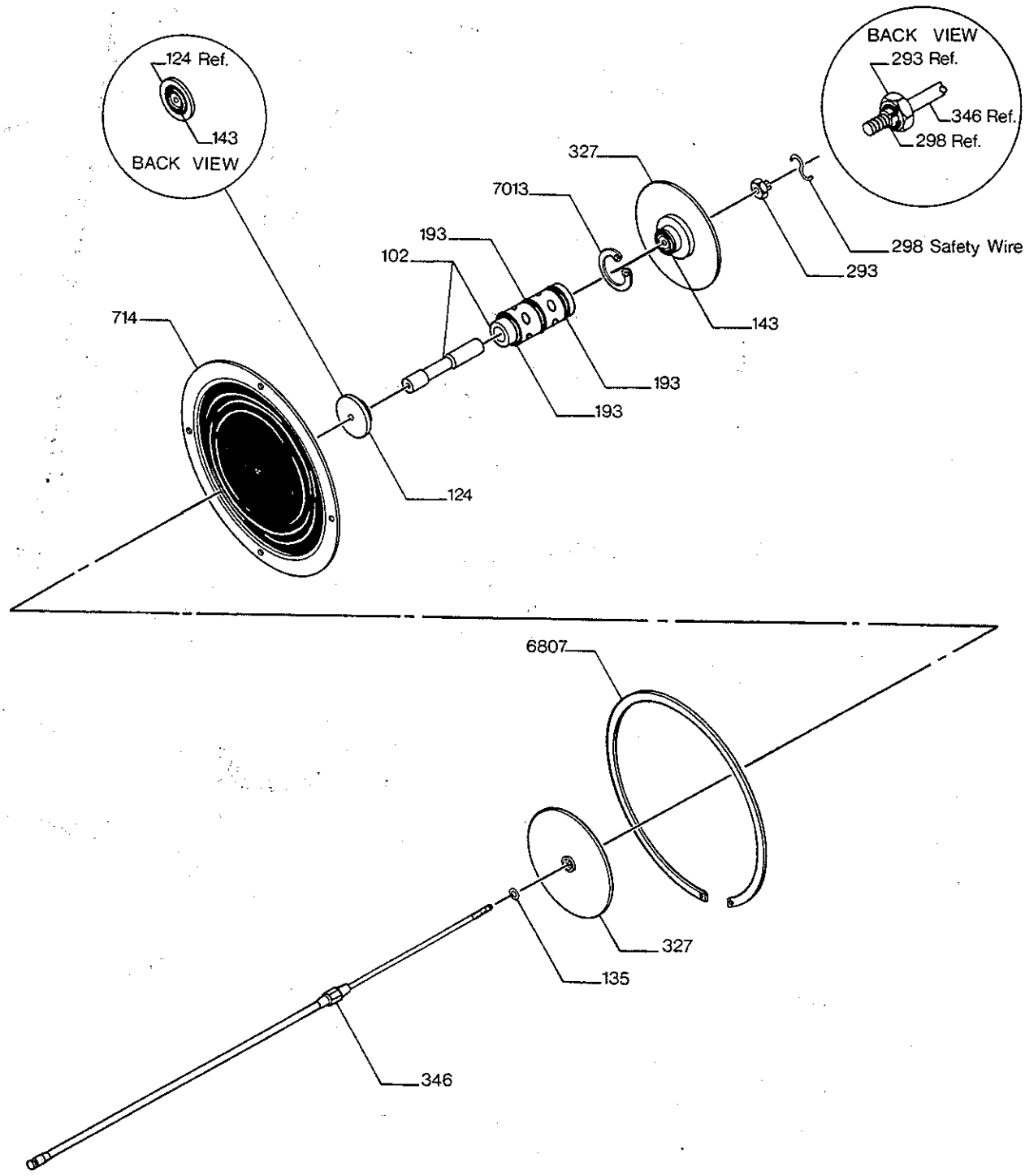

124 Ref.
143
BACK VIEW
BACK VIEW
293 Ref.
346 Ref.
298 Ref.
327
7013
193
102
714
298 Safety Wire
293
143
193
193
124
6807
327
135
346

FIGURE 51

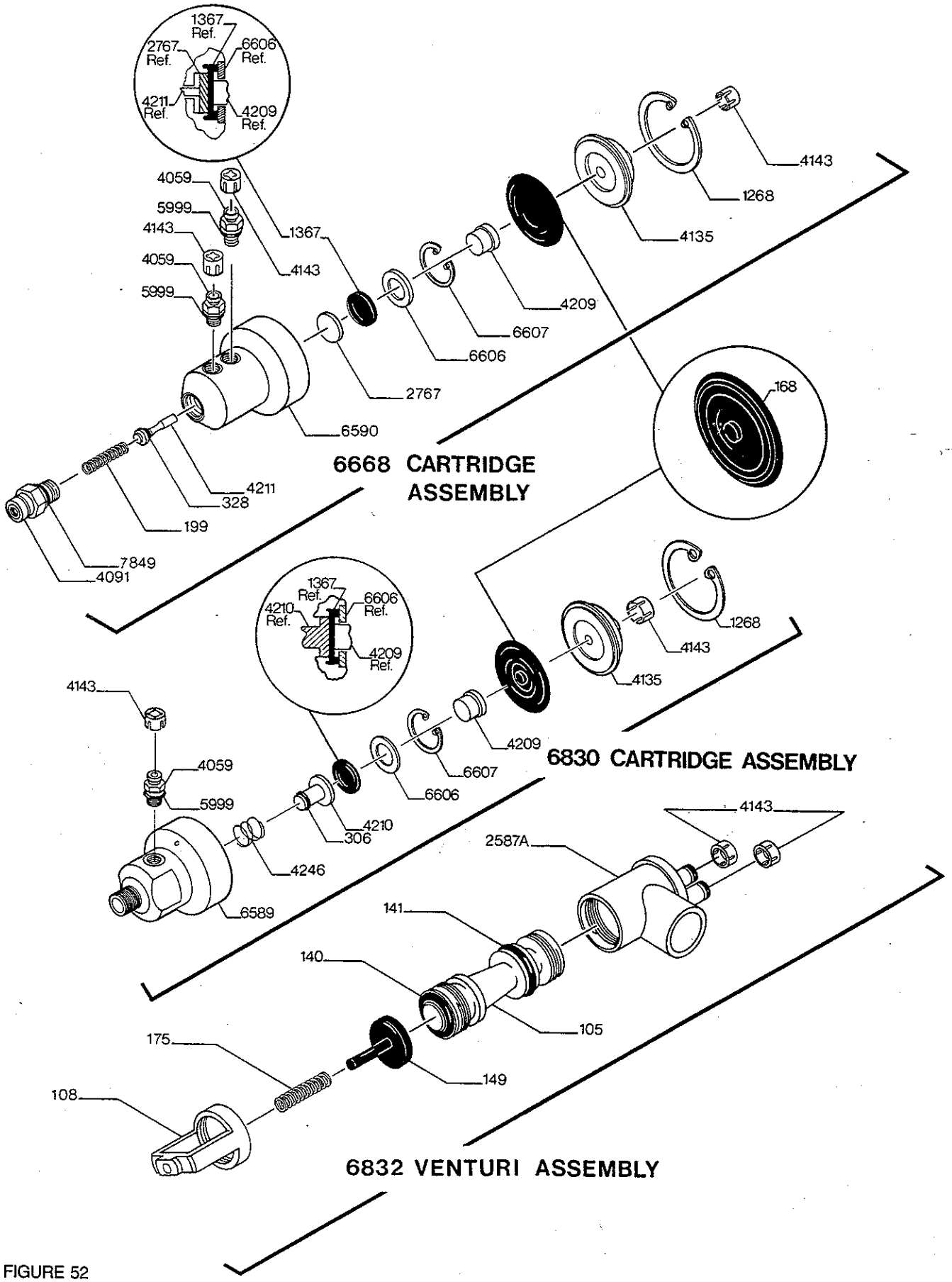

1367 Ref.
2767 Ref.
6606 Ref.
4211 Ref.
4209 Ref.
4059
5999
4143
4059
5999
1367
4143
4143
1268
4135
4209
6607
6606
2767
6590
4211
328
199
7849
4091
6668 CARTRIDGE ASSEMBLY
168
1367 Ref.
4210 Ref.
6606 Ref.
4209 Ref.
1268
4143
4135
4143
4059
5999
4209
6607
6606
4210
306
4246
6589
6830 CARTRIDGE ASSEMBLY
4143
2587A
141
140
105
175
149
108
6832 VENTURI ASSEMBLY

FIGURE 52

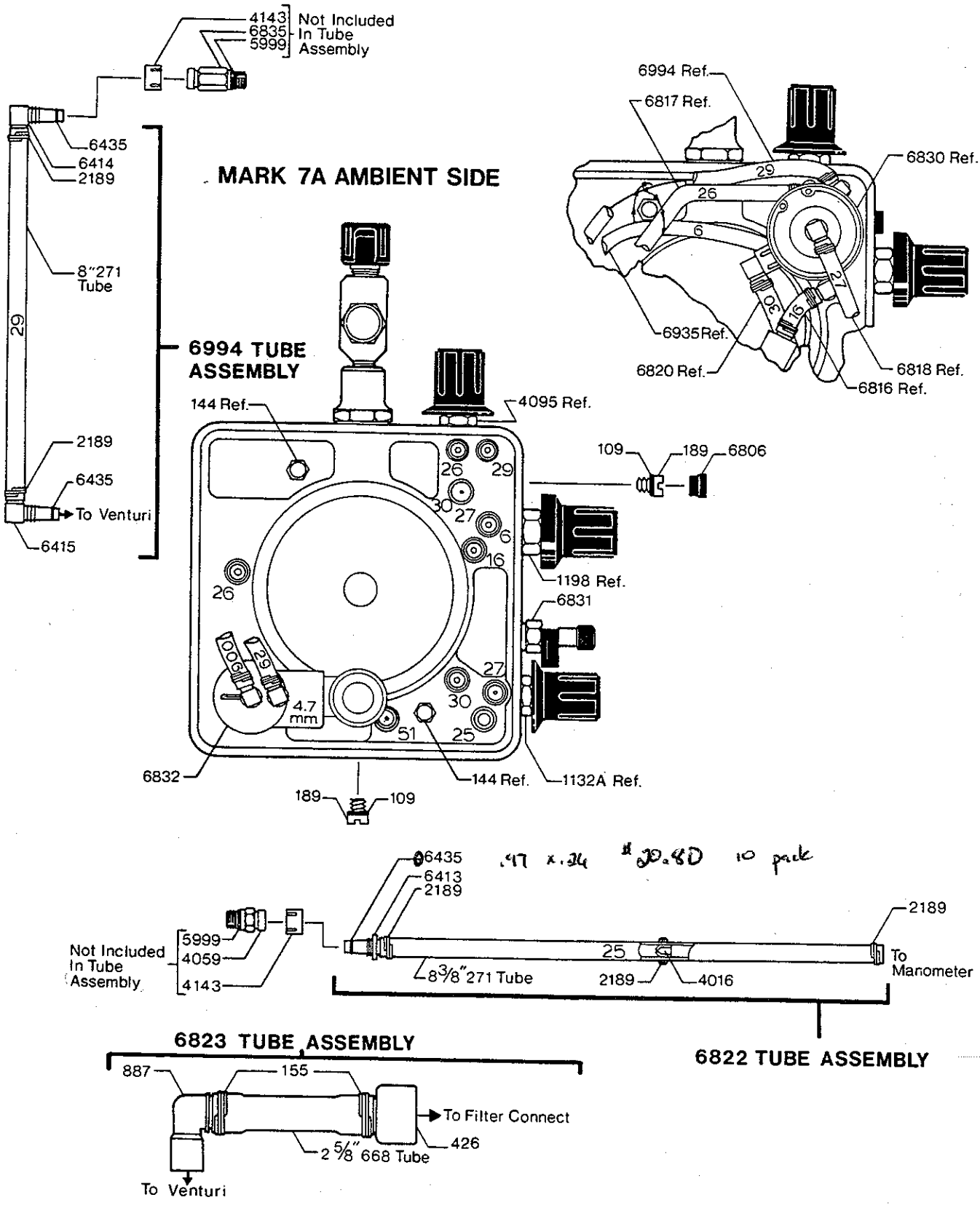

4143
6835
5999
Not Included In Tube Assembly
6435
6414
2189
8"271 Tube
29
2189
6435
To Venturi
6415
6994 TUBE ASSEMBLY
MARK 7A AMBIENT SIDE
6994 Ref.
6817 Ref.
6830 Ref.
6935 Ref.
6820 Ref.
6818 Ref.
6816 Ref.
144 Ref.
4095 Ref.
109
189
6806
1198 Ref.
6831
4.7 mm
6832
144 Ref.
1132A Ref.
189
109
6435
6413
2189
5999
4059
4143
Not Included In Tube Assembly
8 3/8" 271 Tube
25
2189
4016
To Manometer
6822 TUBE ASSEMBLY
6823 TUBE ASSEMBLY
887
155
To Filter Connect
426
2 5/8" 668 Tube
To Venturi

FIGURE 53

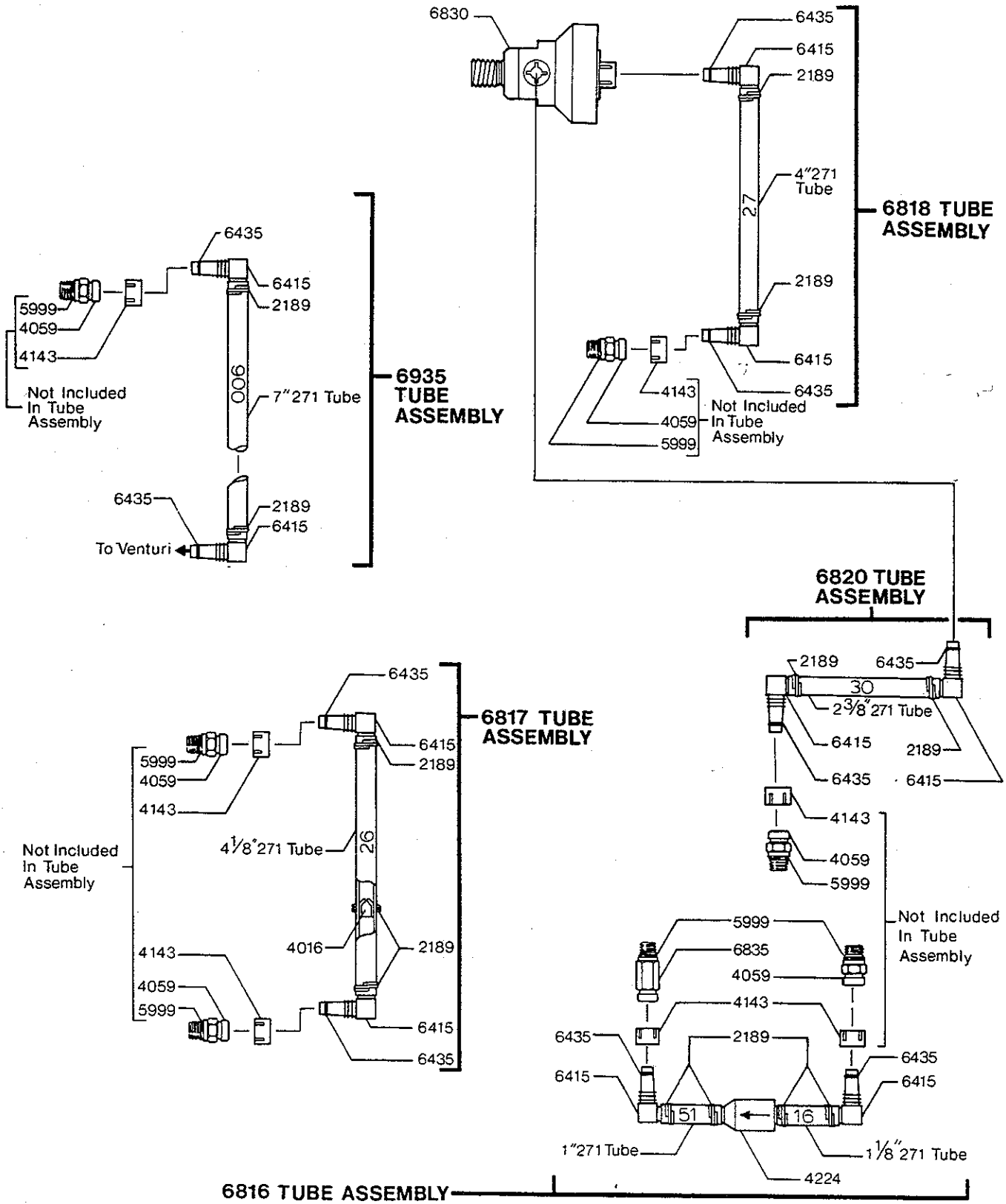
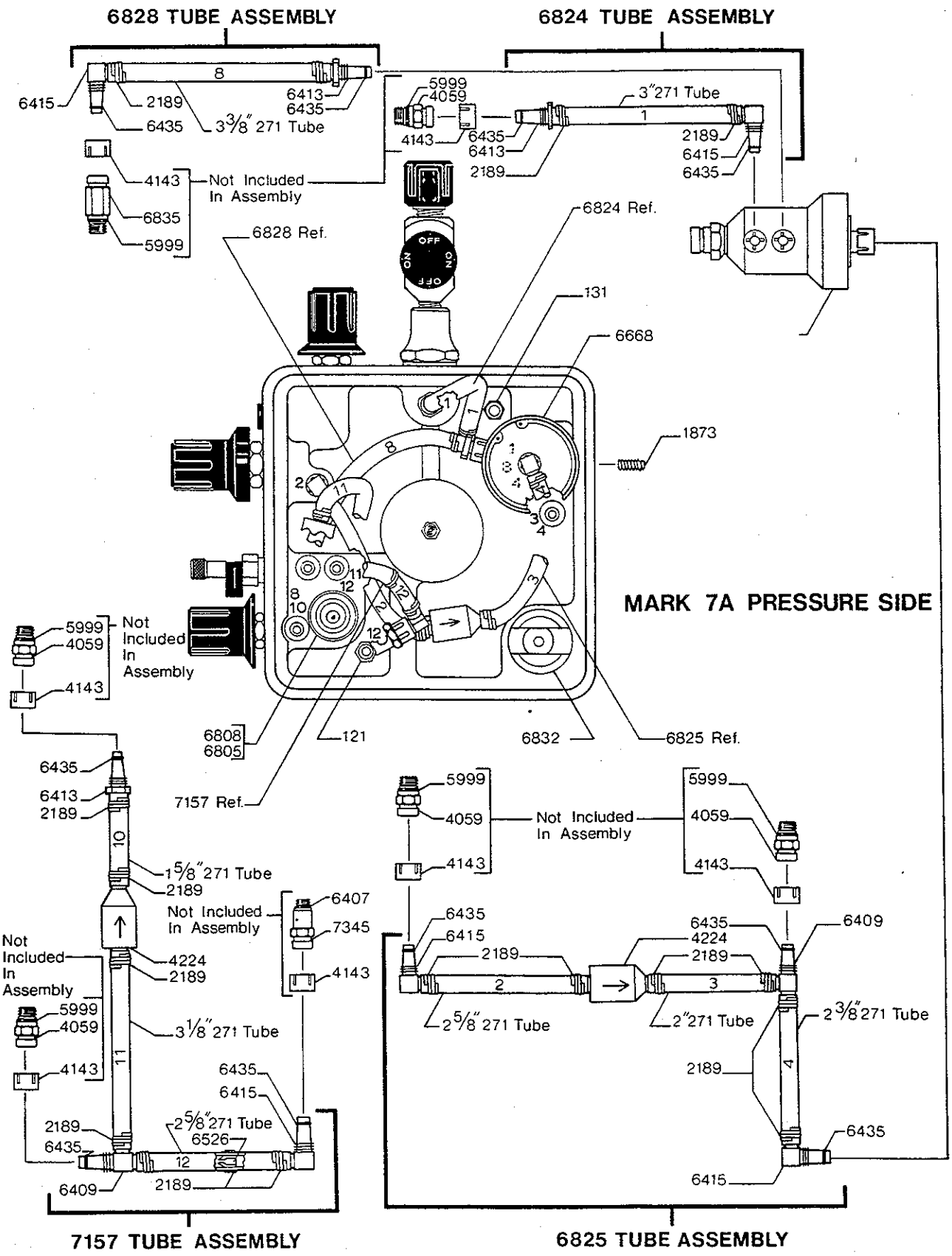
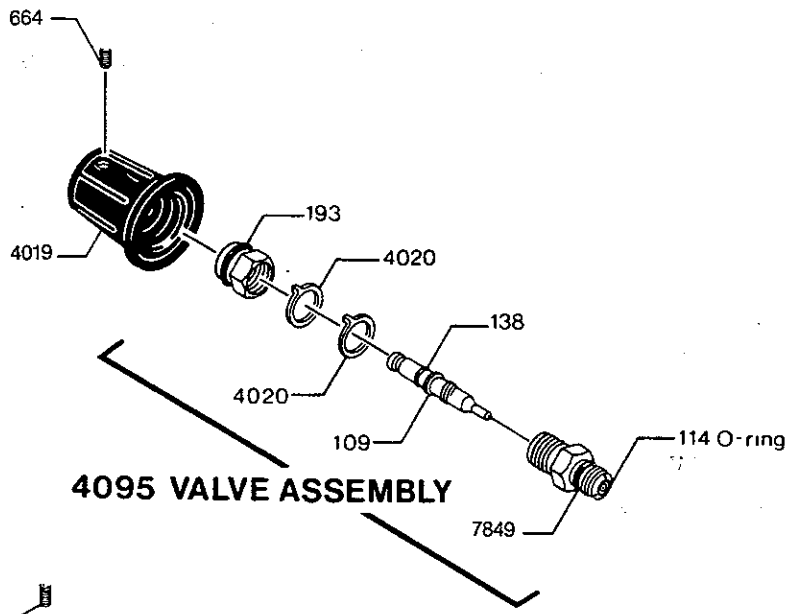
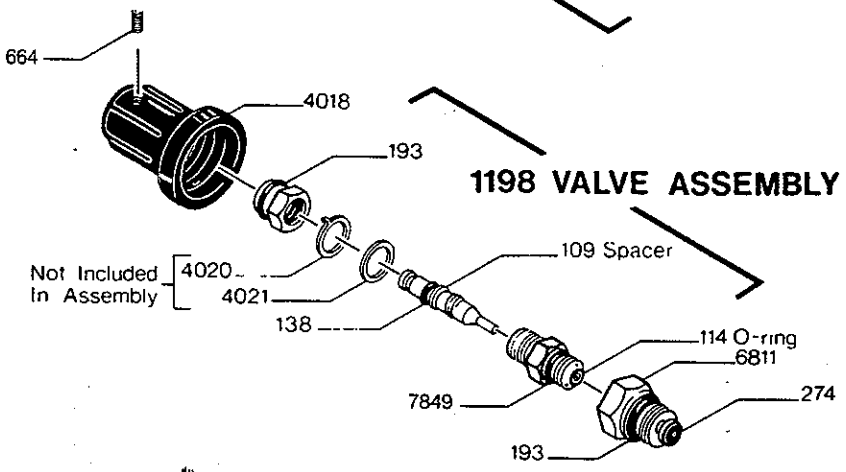

6830
6435
6415
2189
4"271 Tube
27
6818 TUBE ASSEMBLY
2189
6415
6435
4143
4059
5999
Not Included In Tube Assembly
6435
6415
2189
5999
4059
4143
Not Included In Tube Assembly
006
7"271 Tube
6935 TUBE ASSEMBLY
6435
2189
6415
To Venturi
6820 TUBE ASSEMBLY
2189
6435
30
2 3/8" 271 Tube
6415
2189
6435
6415
4143
4059
5999
Not Included In Tube Assembly
6435
5999
4059
6415
6435
Not Included In Tube Assembly
4 1/8" 271 Tube
26
6817 TUBE ASSEMBLY
4143
4059
5999
4016
2189
6415
6435
5999
6835
4059
4143
6435
6415
2189
6435
6415
51
16
1"271 Tube
1 1/8" 271 Tube
4224
6816 TUBE ASSEMBLY

FIGURE 54

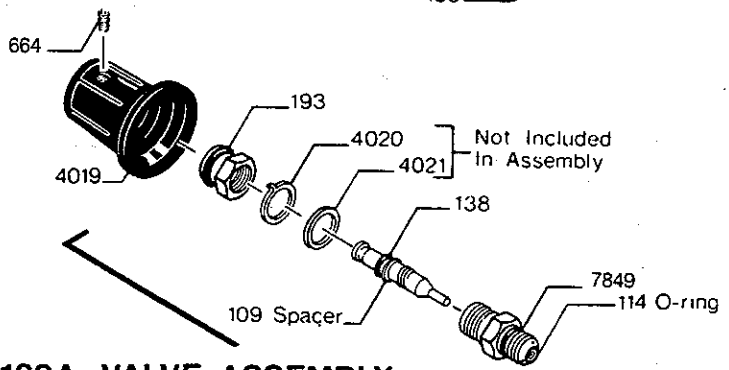

6828 TUBE ASSEMBLY
6824 TUBE ASSEMBLY
6415
2189
6435
6413
6435
3⅜" 271 Tube
8
5999
4059
4143
6435
6413
2189
3"271 Tube
1
2189
6415
6435
4143
6835
5999
Not Included In Assembly
6828 Ref.
6824 Ref.
131
6668
1873
MARK 7A PRESSURE SIDE
5999
4059
4143
Not Included In Assembly
6808
6805
121
6832
6825 Ref.
7157 Ref.
6435
6413
2189
10
1⅝" 271 Tube
2189
Not Included In Assembly
6407
7345
4143
Not Included In Assembly
5999
4059
4143
4224
2189
3⅛" 271 Tube
11
6435
6415
2189
6435
2⅝" 271 Tube
6526
12
2189
6409
7157 TUBE ASSEMBLY
5999
4059
4143
Not Included In Assembly
5999
4059
4143
6435
6415
2189
2
2⅝" 271 Tube
6435
4224
2189
3
2"271 Tube
6409
2⅜" 271 Tube
4
2189
6435
6415
6825 TUBE ASSEMBLY



4095 VALVE ASSEMBLY



1198 VALVE ASSEMBLY



1132A VALVE ASSEMBLY

SECTION 10
CLEANING AND DECONTAMINATION

Ventilators manufactured by Bird Products Corporation are compatible with ethylene oxide gas sterilization. Breathing circuits are compatible with ethylene oxide gas sterilization and liquid agents, activated glutaraldehyde and quaternary ammonium agents, used according to manufacturer's instruction. For cleaning, use only detergents compatible with plastic materials.

CAUTION: Phenols must **NOT** be used. Plastics mus not be abused by excessive thermal stress or incompletely vaporized (liquid phase) ETO. **DO NOT** steam autoclave or otherwise subject ventilators or components manufactured by Bird Products Corporatior to temperatures over 60°C (140°F).

The products of Bird Products Corporation (Bird herein) are warranted to be free from defects in materials and workmanship and to meet the published specifications.

The liability of Bird under this warranty is limited to replacing, repairing or issuing credit, at the discretion of Bird, for the parts that become defective or fail to meet published specifications during the warranty period; Bird will not be liable under this warranty unless (A) Bird is promptly notified in writing by Buyer upon discovery of defects or failure to meet specifications; (B) the defective unit or part is returned to Bird, transportation charges prepaid by Buyer; (C) the defective unit or part is received by Bird for adjustment no later than four weeks following the last day of the warranty period; and (D) Bird's examination of such unit or part shall disclose, to its satisfaction, that such defects or failures have not been caused by misuse, neglect, improper installation, unauthorized repair or alteration or accident.

Any authorization of Bird for repair or alteration by the Buyer must be in writing to prevent voiding warranty. In no event shall Bird be liable to Buyer for loss of profits, loss of use, consequential damage or damages of any kind based upon a claim for breach of warranty, other than the purchase price of any defective product covered hereunder.

Bird warranties as hereinabove set forth shall not be enlarged, diminished or affected by, and no obligation or liability shall arise or grow out of the rendering of technical advice or service by Bird or its agents in connection with Buyer's order of the products furnished hereunder.

■ LIMITATIONS OF LIABILITIES

This warranty does not cover normal maintenance such as cleaning, adjustment or lubrication and updating of equipment or parts. This warranty shall be void and shall not apply if the equipment is used with accessories or parts not manufactured by Bird or authorized for use in writing by Bird, or if the equipment is not maintained in accordance with a prescribed schedule of maintenance.

The warranty stated above shall extend for a period of one year from date of delivery, with the following exceptions:

1. Electrical components for remote monitoring of physical variables such as temperature, pressure, oxygen saturation or flow are warranted for ninety (90) days from date of receipt.
2. Elastomeric components and other parts or components subject to deterioration over which Bird has no control are warranted for sixty (60) days from date of receipt.

The foregoing is in lieu of any other warranty, expressed or implied, including, without limitation, any warranty of merchantability, except as to title, and can be amended only in writing by a duly authorized representative of Bird.

Bird Products Corporation
1100 Bird Center Dr., Palm Springs, CA 92262
(760) 778-7200 • TLX: 9103805605
(800) 328-4139 • Telefax: (760) 778-7269