

# OptimAir® Mask-Mounted PAPR

## USER'S INSTRUCTIONS

### Mask-Mounted Powered Air-Purifying Respirator

#### WARNING

This manual, including the warnings and cautions inside, must be read and followed carefully by all persons who use or maintain this product, including those who have any responsibility involving its selection, application, service, or repair. This respirator will perform as designed only if used and maintained according to the instructions. Otherwise it could fail to perform as designed and persons who rely on this product could sustain serious personal injury or death.

The warranties made by MSA with respect to the product are voided if the product is not installed, used, and serviced in accordance with the instructions in this manual. We encourage our customers to write or call for a demonstration of this equipment prior to use or for any additional information relative to use or repairs. Call 1-800-MSA-2222 during regular working hours.

See separate insert for NIOSH Approval Information: P/N 818105

For More Information, call 1-800-MSA-2222 or Visit Our Website at [www.MSAnet.com](http://www.MSAnet.com)



**MINE SAFETY APPLIANCES COMPANY**  
PITTSBURGH, PENNSYLVANIA, U.S.A. 15230

# INTRODUCTION

## TABLE OF CONTENTS

Introduction .....	2
Description .....	7
Charging the Battery Pack .....	9
Respirator Assembly .....	11
Using the Respirator.....	13
Maintaining the Respirator .....	17
Test Method for OptimAir Mask-Mounted PAPR.....	21
Chart.....	24
Accessories .....	25
Ultravue Facepiece.....	27
UltraElite Facepiece .....	28
Advantage 3000 Facepiece.....	29
Advantage 4100 Facepiece.....	30

## CAUTIONS AND LIMITATIONS

- A- Not for use in atmospheres containing less than 19.5 percent oxygen.
- B- Not for use in atmospheres immediately dangerous to life or health.
- C- Do not exceed maximum use concentrations established by regulatory standards.
- F- Do not use powered air-purifying respirators if airflow is less than four cfm (115 lpm) for tight fitting facepieces or six cfm (170 lpm) for hoods and/or helmets.
- I- Contains electrical parts which have not been evaluated as an ignition source in flammable or explosive atmospheres by MSHA/NIOSH.
- J- Failure to properly use and maintain this product could result in injury or death.
- L- Follow the manufacturer's User's Instructions for changing cartridges, canisters, and/or filters.
- M- All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA, and other applicable regulations.
- N- Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration specified by the manufacturer.
- O- Refer to User's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.
- P- NIOSH does not evaluate respirators for use as surgical masks.
- FF-Respirators are to be fit tested prior to use with the heaviest cartridges, canisters, filters and/or accessories intended to be used. Fit testing should also be conducted while wearing all personal protective equipment intended to be used. See User's Instructions for fit test requirements.

# INTRODUCTION

## IMPORTANT NOTICE FOR RESPIRATORY PROTECTION PROGRAM ADMINISTRATORS

1. An adequate respirator protection program must include knowledge of hazards, hazard assessment, selection of proper respiratory protective equipment, instruction and training in the use of equipment, inspection and maintenance of equipment, and medical surveillance. (See OSHA regulations, Title 29 CFR, Part 1910.134, Sub-part I par. 1910.134 (b) (1)).
2. This respirator will perform as designed only if used and maintained according to the manufacturer's instructions. The Program Administrator and the users must read and understand these instructions before trying to use or service this product. We encourage our customers to write or call for information on this product before using it.
3. This respirator may be used only after proper instruction and training in its use as specified in OSHA regulations (Title 29 CFR, Part 1910.134, Sub-part I, par. 1910.134 (b) (3)).
4. This respirator may not be worn in an atmosphere which is immediately dangerous to life or health (from which the wearer cannot escape without the aid of a respirator). Under no circumstances should the respirator be used as an underwater device.
5. Users must wear suitable protective clothing and precautions must be taken so that the respirator is not worn in atmospheres that may be harmful to the device.

6. Do not alter, modify, or substitute any components without the approval of the manufacturer. Such alterations will void the NIOSH approval.
7. Inspect the respirator regularly and maintain it according to the manufacturer's instructions. Repairs must only be made by properly trained personnel.

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## LIMITATIONS

The OptimAir Mask-Mounted PAPR with OptiFilter Type HE filter cartridge, or Type HE particulate filter, are approved as high efficiency particulate air filter for powered air-purifying respirators. Filter does not remove gases or vapors from the air supply. No filter is designed for all substances, Therefore, you must know what the contaminant is, as well as its concentration, before selecting a respirator. This respirator does not supply oxygen. Do not use this respirator unless the surrounding air contains a minimum of 19.5 percent oxygen. The respirator may be used at temperatures between 0°F and 120°F, and may be worn under flame-retardant garments. If used below 40°F, a fully-charged battery may not operate the motor-blower for an entire shift.

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## RESPIRATOR USE LIMITATION

The wearer must comply with the following MSA respirator use limitations:

1. Maximum Use Concentration – Do not exceed any of the following:
  - a. 1000 times the exposure limit for the contaminants present.

# INTRODUCTION

- b. Immediately dangerous to life or health (IDLH) concentration for any contaminant present.
- 2. The limitations outlined in the applicable NIOSH approval.
- 3. Any applicable limitation contained in a standard established by a regulatory agency (such as OSHA) with jurisdiction over the wearer.
- 4. NIOSH allows this respirator to be used for protection against a mixture of particulates that are present simultaneously or alternately against one particulate then another (using the same filter) if the mixture meets the following conditions:
  - a. The filter must be approved for all particulate.
  - b. Particulates (dusts, mists, fumes, asbestos, radionuclides) can be mixed with any other particulate for which the filter is approved.
  - c. Contaminants present simultaneously must be below IDLH levels for the specific contaminants. If any one contaminant in the mixture exceeds the IDLH concentration then the entire mixture must be treated as IDLH and the respirator cannot be used (except for escape).

## **WARNING**

- 1. **This device does NOT supply oxygen. Use only in adequately ventilated areas containing at least 19.5 percent oxygen.**
  - 2. **This respirator must be used in conjunction with proper chemical or particulate cartridges for protection against specific contaminants.**
  - 3. **Do not use when concentrations of contaminants are unknown or immediately dangerous to life or health (IDLH). (See the respirator NIOSH approval plate P/N 818105 to determine if this device can be used for escape from those concentrations.)**
  - 4. **Do not use when appropriate exposure limit (OSHA, PEL, NIOSH REL, ACGIH TLV, etc.) is not known or when it is below the odor threshold or any other established warning level for the contaminant.**
  - 5. **Leave area immediately if:**
    - A. Breathing becomes difficult.**
    - B. Dizziness or other distress occurs.**
    - C. You taste or smell contaminant.**
    - D. You experience eye, nose or throat irritation.**
  - 6. **Use strictly in accordance with instructions, labels and limitations pertaining to this device.**
  - 7. **This respirator may not provide a satisfactory seal with certain facial characteristics, such as beards or large sideburns, that prevent direct contact between the skin and the sealing surface of the facepiece. Do not use this respirator if such conditions exist.**
  - 8. **Never alter or modify this device.**
  - 9. **This respirator is for use by trained and qualified personnel only.**
- Failure to follow the above warnings can result in serious personal injury or death.**

# INTRODUCTION

## WARNING

- This respirator/filter provides **LIMITED** protection. It may help reduce exposure to airborne biological agents, including H1N1 (swine) flu virus, avian (bird) flu virus, other types of influenza, SARS, or other bacterial or viral biological agents and help reduce the risk for influenza infection during a pandemic, but will **NOT** eliminate the risk of exposure, infection, illness, or death.
  - This respirator/filter is certified by NIOSH to comply with the requirements specified for the designated filter efficiency level; however, appropriate authorities have **NOT** established a safe level of exposure to biological agents. Therefore, the respirator may **NOT** prevent transmission of influenza virus.
  - Refer to the Centers for Disease Control and Prevention (CDC) at [www.cdc.gov](http://www.cdc.gov) for guidance on the use of respirators to help decrease exposure to H1N1 virus or other airborne biological agents in community, home, and occupational settings. The CDC recommends fit testing, medical evaluations, and training for optimal effectiveness when a respirator is used in a non-occupational setting. Neglecting these preparatory measures may cause an unsafe condition. Respirators used in an occupational setting **MUST** be used in accordance with a complete respiratory protection program as required by OSHA, which includes proper selection, training, fit-testing, and fit-checking. Detailed information on a respiratory protection program is available by contacting OSHA or visiting [www.osha.gov](http://www.osha.gov).
  - Do **NOT** remove respirator in contaminated areas. The outer surface of the respirator **MUST** be treated as if it is contaminated at all times. Tight-fitting safety goggles, or a full-facepiece respirator, may further help prevent transmission of influenza virus.
  - The CDC recommends frequent hand washing and wearing gloves to help prevent transmission of disease due to exposure to surfaces where contaminants may be present, and also immediately following removal of the respirator.
  - Do **NOT** reuse or share maintenance-free respirators. **ALWAYS** clean cartridge-style respirators before reuse in accordance with the instructions provided.
  - This respirator/filter is **NOT** for use by (a) children, or (b) people with a medical condition that may be adversely affected by using it.
- Failure to follow all warnings and instructions can result in serious personal injury or death.



# DESCRIPTION

## DESCRIPTION

The OptimAir Mask-Mounted Powered Air-Purifying Respirator (PAPR) from MSA is certified by the National Institute for Occupational Safety and Health (NIOSH) as an air-purifying device designed only for use in atmospheres **NOT** immediately dangerous to life or health (IDLH).

The OptimAir Mask-Mounted PAPR is used with the Facepiece, which is available in small, medium or large sizes. If needed, Advantage® 4100, Ultravue® and Ultra Elite® Facepieces may be equipped with an integral welder's lens or clip-on welder's adapter (only used with Ultravue Facepieces). See Accessories/Spare Parts.

The motor-blower and replaceable high-efficiency filter are worn as an assembly attached to the facepiece. The rechargeable battery pack is worn on the support belt. A power cable connects the belt-mounted battery pack to the motor-blower on the facepiece. A battery charger is supplied with the respirator.

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## PRINCIPLE OF OPERATION

The motor-blower draws surrounding air through the filter which captures the particulate contaminant. Filtered air passes through to the facepiece and creates higher pressure than the surrounding atmosphere. Therefore, if a leak occurs, air will flow from inside the facepiece to the outside air. This is

referred to as positive pressure. Air flow also provides wearer comfort. The rechargeable NiMH battery pack supplies 4.8 volts (nominal) to the motor-blower. The battery pack is replaceable. A fully charged battery is designed to operate in excess of 8 hours. Then the battery pack can be re-charged in 3 hours using the standard charger.

The replaceable filter cartridge which traps the particulate contaminant is at least 99.97% efficient against 0.3 micron DOP aerosol.

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## RESPIRATOR FIT TEST

A qualitative or quantitative respirator fit test should be carried out for each wearer of this respirator to determine the amount of protection it will provide. Respirator fit tests are explained fully in the *American National Standard for Respiratory Protection*, ANSI Z88.2, which is published by the American National Standards Institute, 11 West 42nd Street, New York, New York 10036.

**Quantitative Test** — If a quantitative fit test is used, a fit factor that is at least 500 shall be obtained before that respirator is assigned to an individual.

**Qualitative Test** — If a qualitative fit test is used, only validated protocols are acceptable. The individual must pass a test designed to assess a fit factor of at least 100.

# DESCRIPTION

Powered Air-Purifying Respirators must be qualitatively or quantitatively fit tested in a negative-pressure mode (with blower off). This will cover use of the respirator in the powered air-purifying mode operation.

## EXPOSURE LIMITS

A listing of acceptable exposure limits from the following sources:

- American Conference of Governmental Industrial Hygienists (ACGIH)
- Occupational Safety and Health Administration (OSHA)
- National Institute for Occupational Safety and Health (NIOSH)
- American Industrial Hygiene Association (AIHA)

Contact MSA at 1-800-MSA-2222 for information.

### Exposure Limits for Mixtures

The American Conference of Governmental Industrial Hygienists (ACGIH) publishes the following information to determine the TLV of a mixture.

First determine the total concentration of the chemical mixture ( $C_{\text{Mixture}}$ ) from the individual contaminant concentrations ( $C_1, C_2, C_3, \dots$ ) using the following formula:

$$C_{\text{Mixture}} = C_1 + C_2 + C_3 + \dots$$

The TLV of the mixture is found by using the following formula where  $T_1, T_2, T_3, \dots$  are the individual contaminant TLVs and  $C_1, C_2, C_3, \dots$  are the individual contaminant concentrations:

$$T_{\text{Mixture}} = \frac{C_{\text{Mixture}}}{\frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \dots}$$

Only use these equations if the contaminants present are actually mixed. Some substances do not mix and may be present separately, for example, in pockets or at different levels. In that case, the lowest TLV of the substances present must be used to determine the appropriate respirator category for protection against all contaminants present.

# CHARGING THE BATTERY PACK

## UNPACKING & INSPECTION

The OptimAir Mask-Mounted PAPR kit consists of the following components:

- motor-blower
- battery pack
- support belt
- charger
- cable
- facepiece
- storage plug
- filter

### **⚠ CAUTION**

Thoroughly inspect all components of the respirator before the device is used. Read and observe all NIOSH approval limitations as they apply to using the OptimAir Mask-Mounted PAPR.

### **⚠ WARNING**

Do not use this storage plug while working in a contaminated atmosphere. Doing so will compromise respirator performance and void NIOSH approval. Use plug only during decontamination and storage to help prevent debris from coming out of cartridge. Failure to follow this warning can result in overexposure and serious personal injury.

### **⚠ CAUTION**

Do not drop the OptimAir Mask-Mounted PAPR. The battery pack can be damaged by impact. The case can be cracked and could allow water into the pack. If the unit is dropped, inspect the case for

cracks. If the motor blower no longer operates from the compromised battery pack, the battery pack must be replaced.

### **⚠ CAUTION**

The motor-blower housing can be damaged by impact. The blower impeller can be loosened or the motor shaft can be bent. If the unit is dropped, check the case for cracks. Listen closely to the sound of the motor. If the impeller binds or rattles, or if air output is reduced, the entire motor-blower must be replaced.

## CHARGING THE BATTERY PACK

The battery pack must be fully charged before the respirator is first used. Use only the P/N 10090981 battery charger from MSA. Other chargers can damage the battery due to internal wiring differences or incorrect charging rates.

The battery pack should be stored at a temperature range of 50°F to 85°F. If the battery pack has been stored in a “fully charged” condition for more than one week, the battery pack should be charged until a full charge is indicated.

### **⚠ WARNING**

Do not charge the battery pack where there are explosive concentrations of combustible gases, vapors, or mists. An explosion or fire can result. Replace the charger if the cord is damaged or worn, or if

# CHARGING THE BATTERY PACK

the case is cracked or distorted. Do not use a damaged charger. Doing so can result in serious personal injury or death, or create a fire hazard.

1. Line up the key in the charger cable plug with the slot in the female connector on the battery pack.
2. Push the plug into the female connector and turn the ring to secure it.
3. Plug the charger into a 115-120 V, 50, 60 Hz (standard AC) outlet. The charger can be used internationally with the appropriate adapter.



## **⚠ CAUTION**

**Voltages lower than 115V are not recommended. Voltages greater than 120V will damage the battery charger and battery pack.**

4. Charge the battery pack until a full charge is indicated.

## LED Signaling

Condition	LED Indication
Rapid Charge	Red
Charge Complete	Green
Charge Pending	Amber
Charge Failure	Red Flash
No AC or No Battery	OFF

The charger uses one LED. When the battery is charging, the LED will be Red. When the LED is Green the battery is fully charged. The battery can stay connected to the charger until it is needed. If the LED is Amber, the battery is not at the proper temperature. The charging will start when the battery pack reaches the optimum charging temperature of 35°F to 100°F. If the LED is flashing Red, there is a failure. Disconnect battery pack, and unplug charger. Plug charger back into outlet and reconnect battery pack to reset charger. If LED flashes Red during any part of the charge, after it has been reset, remove the battery from service.

# RESPIRATOR ASSEMBLY

## ASSEMBLING THE MASK-MOUNTED RESPIRATOR

1. If necessary, remove the coupling nut from the facepiece inhalation housing. The coupling nut may be used if the facepiece is used on MSA respirators. Check that the inhalation check valve and spider gasket are in the facepiece inhalation housing. The gasket is needed so that the facepiece and motor-blower will seal. The Ultravue Facepiece is shown above.



2. Thread the motor-blower coupling nut into the facepiece until resistance is encountered. Continue tightening the coupling nut an additional 60 degrees (the distance of two notches on the coupling nut) into the facepiece.
3. If attached, unthread the filter from the motor-blower assembly.



4. Check that there is a gasket in the motor-blower housing. The gasket is necessary so that the filter and motor-blower will seal.



## **⚠ WARNING**

Do not use the respirator if the spider gasket in the facepiece inhalation housing or the gasket in the motor-blower housing is missing or appears damaged. Failure to follow this warning will permit the contaminant to be drawn into the respirator and inhaled, resulting in serious respiratory injury or death.

5. Thread the filter into the motor blower and hand-tighten.



6. Line up the key on the battery cable plug with the slot in the female connector on motor-blower.



7. Push the plug into female connector and turn to secure.



# USING THE RESPIRATOR

## **⚠ WARNING**

- Do not wear this respirator unless you have received training in its use and have read all of the instructions.
- Do not use this respirator in an area that has less than 19.5% oxygen. The PAPR does not supply oxygen. Do not use the respirator as an underwater device.
- Do not use the respirator in an atmosphere containing gas or vapor contaminants. Do not use the respirator if the air contaminant is unknown or immediately dangerous to life or health (IDLH).
- The respirator filter is designed to provide limited protection from specific contaminants. See the filter label for specific information.
- If you are working with a contaminant which can be absorbed by your skin, wear protective clothing that will not allow the contaminant to contact your skin.

Failure to follow the above warnings can result in serious personal injury or death.

## **DONNING THE SUPPORT BELT AND BATTERY PACK**

1. Thread the belt through the belt loops on the battery pack.
2. Don the support belt. The battery pack may be worn on either side. Adjust the battery pack to a comfortable position.

## **DONNING THE FACEPIECE**

### **⚠ CAUTION**

Cover lenses are installed on the outside of the facepiece lens to protect the plastic surface. Do not use a cover lens in a high heat environment. High heat can cause the cover lens to distort.

## **ADJUSTABLE RUBBER HARNESS**

1. Adjust the facepiece headstraps so the end tabs are at the buckles. 
2. Grip the headstraps between the thumb and fingers with both hands. Insert your chin into the chin cup.
3. Pull the facepiece headstraps over your head. Smooth the straps flat against your head.
4. To tighten the lower (neck) straps, pull the straps straight back not out.

5. Tighten the side (temple) straps. 
6. Adjust the forehead strap if needed to position the lens for best vision.

# USING THE RESPIRATOR

## DONNING THE ADVANTAGE 3000 MODEL 3100 SINGLE PORT OR ADVANTAGE 4000 MODEL 4100 SINGLE PORT WITH RUBBER HARNESS

### WARNING

When using the Advantage 4000 Facepiece, ensure the inhalation valve disc is laying flat against the adapter orifice. Failure to follow this warning can result in serious personal injury or death.

1. Loosen the two bottom harness straps. Grip the straps by inserting thumbs through the straps. Insert chin well into lower part of facepiece and pull harness back over head.
2. Push the back of the harness downward toward the neck until it is centered at the back of the head.
3. If necessary hold the mask component housing with one hand and position the harness with the other hand, until obtaining a firm and comfortable fit against the face at all points.
4. Tighten the two bottom straps so that the mask is snug against face. The top two harness straps should be flat against the top of the head.
5. If the mask does not feel snug against the face, remove the mask and adjust the length of the two top straps. To adjust the top straps:
  - a. Remove the strap from the fastener button, by pulling the loose end of the strap away

- b. Move the slide away from the lens ring to allow the strap to slide through the lens ring connection. Adjust the length of the strap. Pull the straps to the next hole. Secure the strap in position by pulling the strap onto the button.
- c. Smooth the straps so that they are flat. Move the slide so that it is located at the lens ring connection.

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## DONNING THE RESPIRATOR WITH PLASTIC ADVANTAGE 3000 (MODEL 3100 SINGLE PORT) HARNESS

### Instructions to Don the Mask

**Note:** There are two recommended donning procedures.

#### Donning Procedure A

1. Completely loosen the two bottom straps. Spread the straps of the head harness with both hands and place chin into the mask. Pull harness over head all the way, until plastic cradle lies flat on back of head.
2. Tighten neck straps evenly so that the mask is snug against the face.
3. If necessary, adjust the mask and tighten harness by pulling loop on the back of harness.

#### Donning Procedure B

1. Completely loosen the two bottom straps, insert fingers and hold the loop on the back of the harness.
2. Place chin into the mask.

# USING THE RESPIRATOR

3. Pull the harness over head with loop, pull harness down to the back of the head until plastic cradle lies flat on back of head.
4. Tighten neck straps evenly so that the mask is snug against your face.

## FACEPIECE FIT CHECK (Face-to-Facepiece Seal)

To test facepieces for leakage using a negative pressure method:

1. Block the filter opening.
- 
2. Inhale so that the facepiece collapses against your face. Hold your breath for 10 seconds. The facepiece should remain collapsed.
  3. If the facepiece does not remain collapsed, readjust the headstraps and repeat steps 1 and 2.
  4. If you cannot get a seal by adjusting the headstraps, check the facepiece for leaks. See *Maintaining the Respirator*. Locate the problem and correct it before using the respirator.

**Leave the area immediately if any of the following symptoms occur**

- breathing becomes difficult
- dizziness or other distress occurs
- you taste or smell the contaminant

- you experience eye, nose or throat irritation.

### **⚠ WARNING**

**If you bump or impact the cartridges, leave area immediately and check the security of the cartridge. Perform an Air Tightness Test before re-entry.**

### **⚠ WARNING**

**This device may not seal properly with your face if you have a moustache, beard, gross sideburns or other physical characteristics that interfere with the face-to-facepiece seal (see ANSI Z88.2). If the facepiece does not seal against your face, non-respirable air can leak into the facepiece, reducing or eliminating the protection. The face-to-facepiece seal must be tested before each use. DO NOT USE A FACEPIECE THAT DOES NOT SEAL.**

## CONNECTING THE BATTERY PACK

1. Line up the key on battery cable plug with the slot in female connector on battery pack.
2. Push the plug into female connector and turn to secure.
3. Turn the switch located on the battery pack on.
4. Attach the retaining clip to your shirt or belt to secure the power cable.

# USING THE RESPIRATOR

## **⚠ CAUTION**

Return to a safe atmosphere and discard the respirator immediately if the facepiece becomes discolored, crazed, blistered or cracked, or if other signs of deterioration of the facepiece, motor-blower, filter or battery pack are observed.

## **⚠ CAUTION**

You can breathe through the respirator with the motor-blower off, but breathing resistance may be noticed, as with a negative-pressure respirator.

## DECONTAMINATION

The OptimAir Mask-Mounted PAPR may be used in some applications which may require decontamination of personal and respiratory equipment before the respirator may be removed. One such application is asbestos-exposure decontamination.

Turn the motor-blower off before entering a decontamination shower. The OptimAir Mask-Mounted PAPR still provides respiratory protection with the motor-blower off, because all air is still drawn through the filter. However, breathing resistance will be greater than when the motor-blower is supplying air to the facepiece.

## REMOVING THE RESPIRATOR

1. Return to fresh air and clean the outer surfaces of the respirator before removing the facepiece.
2. Turn the power switch off.
3. Place your fingertips behind the headstraps. Place your thumbs on the buckles.
4. Pull the top of the buckles away from your head. Repeat as needed to loosen the headstraps.
5. Grip the facepiece by the inhalation housing.
6. Pull the facepiece out, then up over your head.



## **⚠ CAUTION**

**Do not pull the Ultravue Facepiece by the exhalation valve assembly. The facepiece rubber or the valve assembly can be damaged.**

7. Remove the retaining clip from your shirt or belt.
8. Remove the support belt. Be careful that you do not drop the battery pack.

# MAINTAINING THE RESPIRATOR

## MAINTAINING THE RESPIRATOR

A maintenance program must be established. This program must include cleaning and sanitizing, component inspection and replacement of worn or damaged parts. See the appropriate parts lists for correct replacement part numbers.

### **⚠ CAUTION**

**Only trained personnel are to maintain the respirator. Use only genuine MSA parts. Do not make repairs or design modifications other than as recommended by MSA or NIOSH certification will be voided.**

## FILTER AND BATTERY PACK

### Service Times

Filter and battery pack (P/N 10090978) are designed to supply a minimum of four cubic feet per minute (cfm) of respirable air to the facepiece for a shift. Actual service time may vary; however, air flow must not drop below 4 cfm. Factors which will affect how long the filter can be used include the type and concentration of the contaminant. If breathing resistance is noticeable, replace the filter.

1. Replacing the filter:

### **⚠ WARNING**

**The filter is not designed to be cleaned and reused. Do not try to clean the filter. You may damage the inside of the filter and eliminate res-**

**piratory protection, resulting in serious respiratory injury or death.**

### **⚠ WARNING**

**Do not remove the filter in a contaminated area. Return to a safe atmosphere and remove any contaminant from the surface. Do not remove the filter while the motor-blower is running. With the filter removed, contamination from the surfaces of the respirator can be drawn into the facepiece. Failure to follow this warning can result in serious respiratory injury or death.**

- a. Turn the motor-blower off.
- b. Clean the surface of the filter.
- c. Turn the filter counter-clockwise (left) and unthread it from the motor-blower.
- d. Ensure the gasket located in the air intake hole on the side of the motor-blower is in place.



### **⚠ WARNING**

**Do not install the filter or use the respirator if the gasket is missing or appears damaged. Failure to follow this warning can cause the contaminant to be drawn into the respirator and can result in serious respiratory injury or death.**

# MAINTAINING THE RESPIRATOR

- e. Thread the new filter into the motor-blower air intake and hand-tighten against the gasket.
2. Replacing the battery pack:
  - a. Remove the pack from the support belt.
  - b. Loosen the ring and pull the two connectors apart.
  - c. To re-install the battery pack, clip the battery pack on the support belt.
  - d. Line up the key on the battery cable plug with the slot in the female connector on the battery pack.
  - e. Push the plug into the female connector and turn the ring to secure it.



## **▲ WARNING**

**Inspect the respirator after it has been cleaned and sanitized. Failure to observe this warning can cause you to be exposed to the contaminant, resulting in serious personal injury or death.**

## **CLEANING AND DISINFECTING**

Confidence Plus® Germicidal Cleaner (P/N 10009971) from MSA is recommended. Refer to the label for use instructions. A solution as effective as Confidence Plus Cleaning Solution and compatible with MSA respirator components may be substituted.

## **▲ WARNING**

**Be careful that you do not breathe or touch the contaminant in handling the respirator or its parts. Use equipment designed to protect you from the specific contaminant. Failure to follow this warning can result in serious personal injury or death.**

1. Preparing the cleaner:
  - a. Follow the instructions with the Confidence Plus Cleaning Solution.
  - b. If the Confidence Plus Cleaning Solution is not used, prepare in accordance with the instructions provided with cleaning products.
2. Remove excess contaminant from the respirator. A vacuum cleaner equipped with high-efficiency filters to prevent recirculation of contaminant may be used.
3. Unthread the motor-blower threaded insert from the facepiece inhalation housing.
4. Clean and disinfect the facepiece:
  - a. Remove filters, cartridges, or canisters from the facepiece.
  - b. Remove any protective cover lens. This will prevent water from becoming trapped between the primary respirator lens and the cover lens (the trapped water will obscure vision).
  - c. Remove the nosecup (if used). This will facilitate cleaning the inside of the facepiece.
  - d. Remove the exhalation valve cover. This will allow access to the rubber exhalation valve.
  - e. Thoroughly wash the facepiece and components in the cleaning

# MAINTAINING THE RESPIRATOR

solution. A soft bristle (not wire) brush or sponge may be used to clean the facepiece. Be sure to clean under the exhalation valve.

- f. Disinfect the facepiece and components by submerging the facepiece and components for the recommended time period.
- g. Rinse the facepiece and components in clean, warm (110°F), preferably running water. Drain.

## **⚠ CAUTION**

**If not rinsed thoroughly, cleaning agent residue may irritate the wearer's skin.**

- h. The facepiece and components should be air-dried or hand-dried with a clean lint-free cloth.

## **⚠ CAUTION**

**Do not force-dry the parts by placing them in a heater or direct sunlight. This will cause the respirator to deteriorate.**

- i. After the facepiece is dry, inspect the facepiece thoroughly for missing or damaged parts. Reinstall the exhalation valve cover. Install the nose cup (if used) and a new cover lens (if used). The facepiece may be stored in a clean storage bag to protect from contamination until the next use.

## **⚠ CAUTION**

**Alcohol should not be used as a germicide, because it may deteriorate the rubber.**

5. Use a damp cloth or sponge saturated with Confidence Plus cleaning solution or an equivalent solution to wipe the motor-blower and battery pack housing and battery cable clean.

## **⚠ CAUTION**

**Do not place the motor-blower or battery pack in any liquid. The blower impeller can be loosened or the motor shaft can be bent. If the motor-blower is dropped, check the housing for cracks. Listen closely to the motor. If the impeller binds or rattles, or if air output is reduced, the entire motor-blower must be returned to MSA for repair.**

6. Clean the support belt. Thoroughly wash and rinse the support belt in the Confidence Plus cleaning solution or an equivalent cleaning solution. A soft brush or sponge may be used.

## **RESPIRATOR STORAGE**

The battery pack (P/N 10090978) should be stored within a temperature range of 50°-85°F. If the battery pack has been stored in a "full charged" condition for more than one week, the battery pack should be charged until a full charge is indicated. Higher temperatures will shorten battery life. Lower

## MAINTAINING THE RESPIRATOR

temperatures will decrease capacity and operating time will be reduced. The other OptimAir Mask-Mounted PAPR components can be stored at temperatures of 0°F to 120°F.

# TEST METHOD FOR OPTIMAIR MASK-MOUNTED PAPR

## TEST METHOD FOR THE OPTIMAIR MASK-MOUNTED PAPR

The test method should only be used if any one of the OptimAir Mask-Mounted PAPR components (charger, battery pack, or motor-blower) is not functioning properly. This method will outline the steps needed to evaluate the proper electrical functions of each of the com-

ponents of the Mask-Mounted PAPR. A digital multimeter is required.

### Testing the Charger:

The OptimAir Mask-Mounted PAPR comes standard with a dual-rate smart-charger. This charger has a status indication LED. There is no testing of the charger. The LED will indicate if there is a problem during charging.

LED Color	Status	Description
Red	Rapid Charge	Charger is supplying maximum current to battery pack for charging.
Green	Charge Complete	Battery Pack is charged and a maintenance charge is being delivered to offset self-discharge.
Amber	Charge Pending	Battery Temperature is outside the charge range. If the battery is too hot, charge will not begin until temperature falls. If temperature is too low, charger will trickle charge until the battery temperature increases sufficiently to begin rapid charge.
Red Flash	Charge Failure	Charger failure can occur in any one of four ways: 1) No Thermistor – This will be checked in the battery pack test. 2) No Voltage – This will be checked in the battery pack test. 3) Clock Time Out – This occurs when charger fails to transition to maintenance charge from rapid charge. In this case the clock turns the charger off before cell damage can occur. 4) Over Temperature – This can occur if the batteries become too hot during rapid charge. *If the charger fails, refer to "Testing the Battery Pack" section. You will need to determine if the battery pack or the charger is bad.
Off	No AC/Battery	If the LED is off then the unit is not plugged in, or there is no battery attached to the charger.

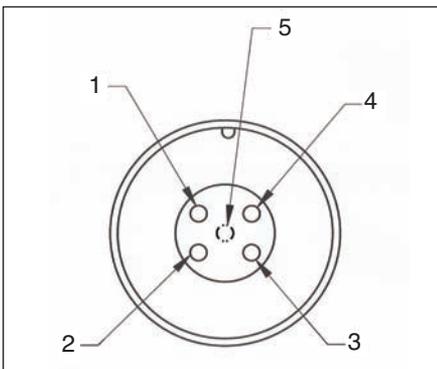
# TEST METHOD FOR OPTIMAIR MASK-MOUNTED PAPER

## TESTING THE BATTERY PACK:

The electrical function of the battery pack can be measured by using a multimeter and measuring voltage and resistance across the pins of the connector.

### Before Testing:

1. Examine the battery pack for cracks or other physical damage. If any of these conditions exists, replace the battery pack.
2. Fully charge the battery before testing. If the charger failed during the charging process follow these steps below to determine the cause.
  - a. Unplug the charger from the outlet to reset the charger's electronics.
  - b. Plug the charger back in and connect a different battery to the charger.
  - c. If the charger fails again during charging the charger is defective and should be replaced. If the charger completes a successful charge the original battery is defective and should be replaced.
3. Align connector/battery pack like the diagram below.



### A Testing the Open Circuit Voltage across the Switch:

1. Set the multimeter to measure voltage.
2. Turn the switch on the battery pack to the "OFF" position.
3. Place the positive probe on pin 2 and the negative lead on to pin 3.
4. The voltage should read 0 Volts.
5. Turn the switch to "ON".
6. The voltage should now read above 4.8 Volts minimum.

### B Testing the Open Circuit Voltage across the Recharge Circuit:

1. Set the multimeter to measure voltage.
2. The switch can be "ON" or "OFF".
3. Place the positive probe on pin 1 and the negative lead on to pin 3.
4. The voltage should read above 4.8 Volts minimum.

### C Testing the Thermistor for Charger Control:

1. Set the multimeter to measure resistance.
2. The switch can be "ON" or "OFF".
3. Place the positive probe on pin 4 and the negative lead on to pin 3.
4. The resistance should read between  $7K\Omega$  and  $18K\Omega$ . This measurement is temperature dependent, so the battery pack must be between  $50^{\circ}F$  and  $85^{\circ}F$ .

**A battery pack failing any of the above tests is defective and should be replaced.**

**Note:** Attempting to charge a battery pack which failed the test for "Open Circuit Voltage Across the Recharge Circuit" or the tests for "Thermistor

# TEST METHOD FOR OPTIMAIR MASK-MOUNTED PAPR

Resistance will result in an indication of charge failure status by the charger. In this case, the battery pack is defective and should be replaced.

Indication of charge failure status when attempting to charge a battery which passes these tests is an indication of charger failure and the charger must be replaced.

## TESTING THE MOTOR-BLOWER:

The function of the motor-blower can be tested by using an MSA flowmeter and a multimeter. (MSA adapter P/N 491046 and flow check meter P/N 487995 are required to run the flow test)

### Before Testing:

1. Examine the motor-blower for cracks or other physical damage. If any of these conditions exists, replace the battery pack.

2. Using a good battery pack as determined by the previous tests, fully charge the battery until a full charge is achieved.

### D Testing the Flow of the Motor-Blower:

1. Assemble the motor-blower to the battery pack.
2. Attach the motor-blower to the flow meter per the supplied instructions.
3. Turn on the Mask-Mounted PAPR and notice the volumetric flow.
4. This flow must be above 115 lpm.

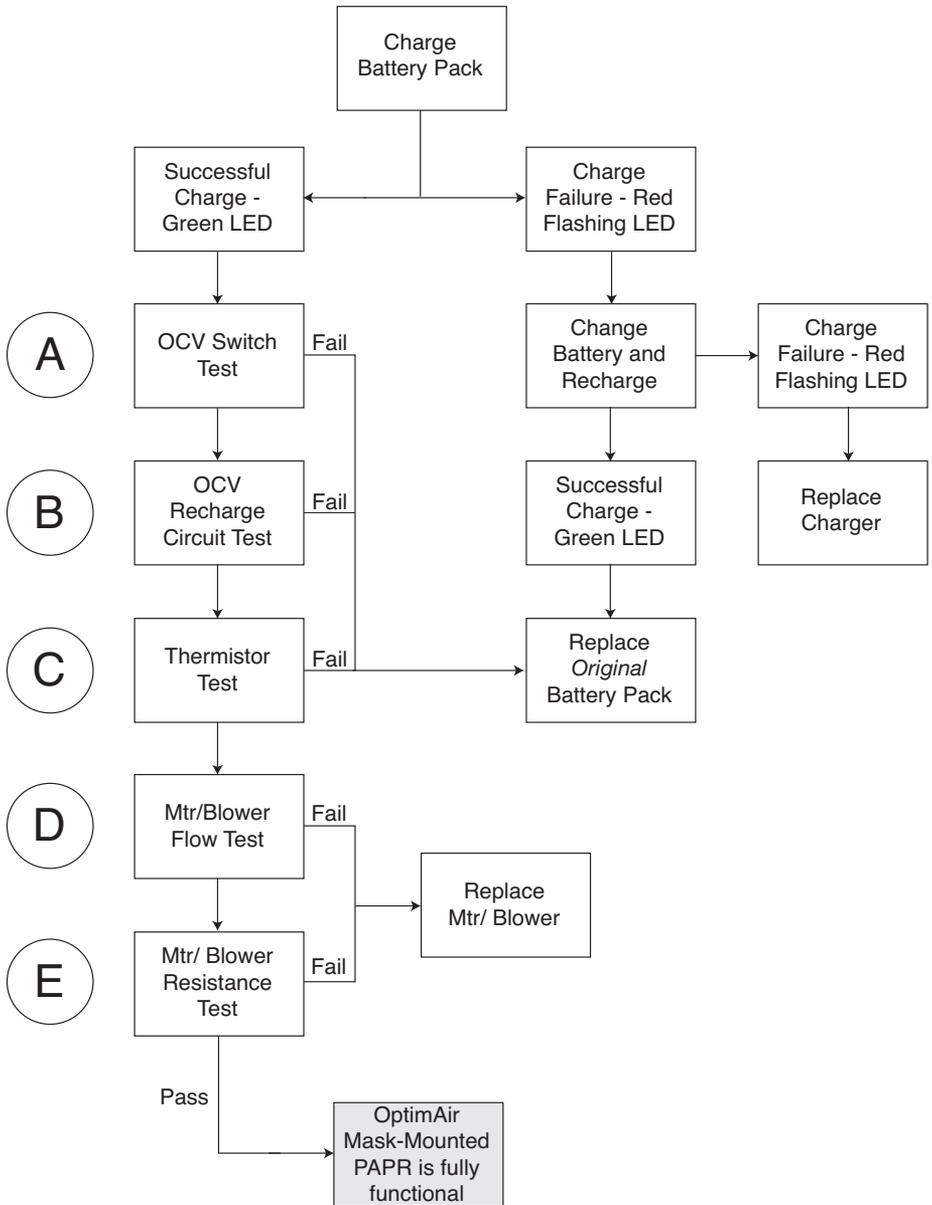
### E Testing the Resistance of the Motor:

1. Refer to Diagram 1 for proper pin locations.
2. Set the multimeter to measure resistance.
3. Place the positive probe on pin 2 and the negative probe on pin 3.
4. The resistance should be less than 10W.

Quick Reference Chart – Battery Tests

Test	Multimeter Setting	Positive Probe	Negative Probe	Switch Setting	Value
Open Circuit Voltage Switch Circuit	Voltage	Pin 1	Pin 2	Off/On	0 / >4.8 Volts
Open Circuit Voltage Recharge Circuit	Voltage	Pin 4	Pin 2	On or Off	> 4.8 Volts
Thermistor Resistance Charger Control Circuit	Resistance	Pin 3	Pin 2	On or Off	7KΩ–18KΩ

# CHART



# ACCESSORIES

## INSTALLING THE NOSECUP FOR ULTRAVUE/ULTRA ELITE FACEPIECE

1. Place the nosecup in the facepiece and position it so its rubber ring faces toward the plastic retainer ring.
2. Starting at the top, stretch and push the rubber ring of the nosecup under the plastic retainer ring of the speaking diaphragm assembly.
3. Continue stretching the nosecup ring and work it into place.
4. For Ultra Elite masks only, stretch the oval opening in the nosecup around the lip on its component housing.



## INSTALLING NOSECUP FOR ADVANTAGE 3000/4000 MASKS ONLY

1. Place nosecup into facepiece with notch of nosecup facing the bottom of facepiece.
2. Place bottom of nosecup under facepiece seal.
3. Stretch nosecup over Inhalation Valve Housing ensuring notch of nosecup is over tab of inhalation valve housing.
4. Stretch nosecup around lip on inhalation valve housing ensuring nosecup is in place.

## SPECTACLE KIT

Spectacle kits are available for the Ultravue (P/N 454819), Ultra Elite (P/N 804638), and Advantage 3000/4000 (P/N 10029298) Facepieces. The kit includes the support assembly, a rubber block, and the spectacle frame. Prescription lenses can be obtained locally or through MSA.

## ADJUSTING THE SPECTACLES

1. To move the spectacles closer to your face, pull the frame prongs out of the rubber block.
2. To move the spectacles farther from your face, push the frame prongs into the rubber block.
3. To move the spectacles up or down, slide the rubber block up or down on the support arms.



# ACCESSORIES

## PARTS

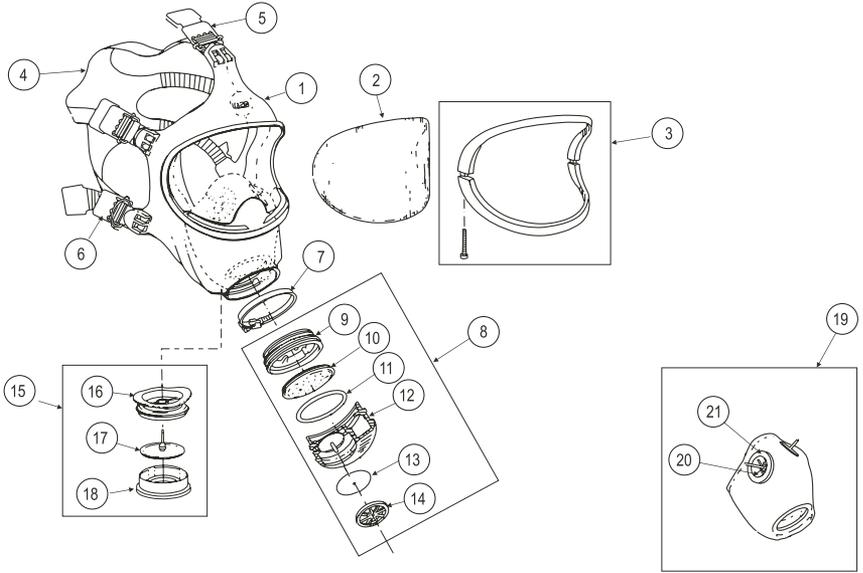
### **Confidence Plus Cleaner**

(P/N 100009971)

**Flow Check Meter** (P/N 487995) and  
Adapter (P/N 491046)

## demand facepiece

Ultravue Facepiece Assemblies	
Item	Description
471218	Small, Hycar
457126	Medium, Hycar
471230	Large, Hycar
480251	Small, Silicone
480247	Medium, Silicone
480255	Large, Silicone

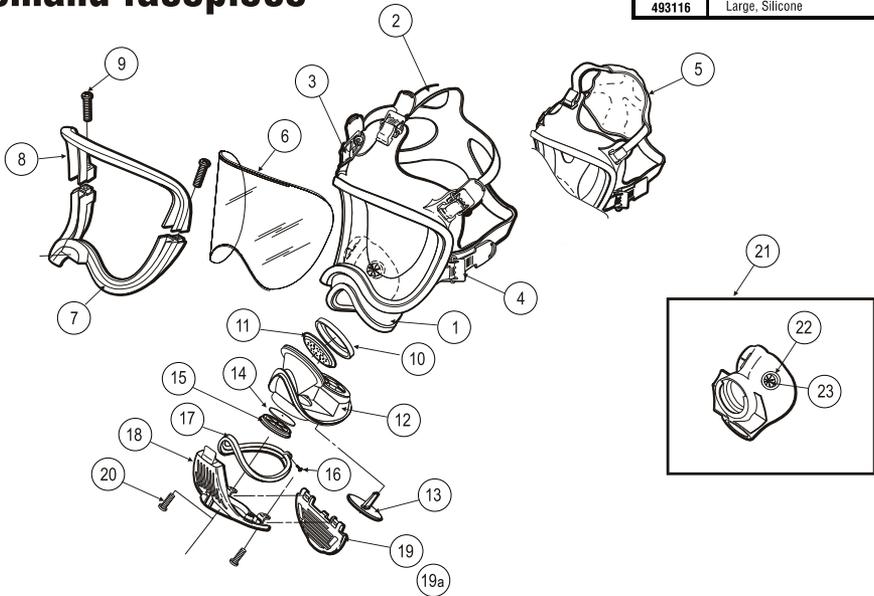


Ultravue Facepiece Components			Ultravue Facepiece Components		
Item No.	Part No.	Description			
1	471577	Small, Faceblank Hycar	10	*	Speaking Diaphragm (Flat Side Toward Retainer Ring)
	468084	Medium, Faceblank Hycar	11	*	O-Ring
	471580	Large, Faceblank Hycar	12	*	Housing
	480224	Small, Faceblank Silicone	13	*	Inlet Valve
	480223	Medium, Faceblank Silicone	14	*	Inlet Valve Spider
	480225	Large, Faceblank Silicone	15	482865	Exhalation Valve Assembly
2	96677	Lens	16	*	Exhalation Valve Body
3	471249	Small Lens Ring (Gray)	17	*	Exhalation Flapper Valve
	464358	Medium Lens Ring (Black)	18	*	Exhalation Valve Cover
	471250	Large Lens Ring (Gold)	<b>Accessories</b>		
4	458173	Harness	19	471710	Small Nosecup
5	96662	Buckle (3 Req'd)		471711	Medium Nosecup
6	457190	Buckle With "D" Ring (2 Req'd)		471712	Large Nosecup
7	458212	Clamp	20	804823	Valve Disk
8	488609	Inlet Assembly	21	804822	Valve Seat
9	*	Retainer Ring			

\* Item Available in Assembly

# Ultra Elite®

## demand facepiece



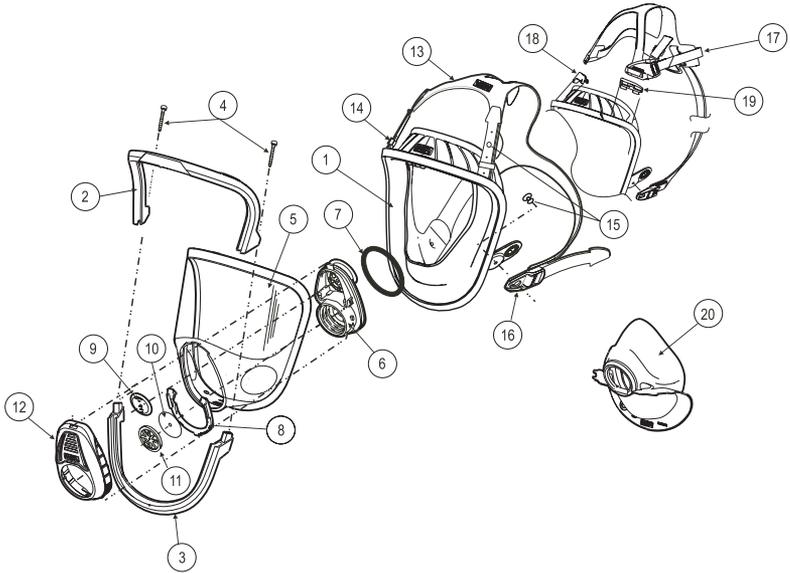
UltraElite Facepiece Assemblies	
Part No.	Description
493064	Small, Hycar
493020	Medium, Hycar
493108	Large, Hycar
493072	Small, Silicone
493028	Medium, Silicone
493116	Large, Silicone

UltraElite Facepiece Components			UltraElite Facepiece Components		
Item No.	Part No.	Description	Item	Part No.	Description
1	491028	Small, Faceblank, Hycar	16	804812	Component Housing Ring Screw
	490138	Medium, Faceblank, Hycar	17	804811	Component Housing Ring
	491039	Large, Faceblank, Hycar	18	804820	Cover, Component Housing
	491388	Small, Faceblank, Silicone	19	804831	Door, Component Housing
	491387	Medium, Faceblank, Silicone	19a	10116528	Door, Component Housing, ClearCommand
	491389	Large, Faceblank, Silicone	20	804821	Component Housing Screw (2 req.)
2	804830	Rubber Harness (With Buckles)	<b>Accessories</b>		
3	804828	Buckle Assembly (3 Req'd)	21	495188	Nosecup Medium (With Valves)
4	804807	Buckle Assembly With D-Ring		495189	Nosecup Large (With Valves)
	805016	E-Z Don Harness, Small (With Buckles)	22	804822	Nosecup Valve Seat
5	805015	E-Z Don Harness, Medium (With Buckles)	23	804823	Nosecup Valve Disc
	805017	E-Z Don Harness, Large (With Buckles)	Not Shown	804638	Spectacle Kit with Wrap Around Wire
6	805019	Lens Hardcoat	Not Shown	493581	Spectacle Kit with Center Bar
7	804805	Lower Lens Ring	Not Shown	491500	Cover Lens, Clear, 25 per package
8	804804	Upper Lens Ring	Not Shown	805456	Cover Lens, Tinted, 25 per package
9	804806	Lens Ring Screw	Not Shown	10024074	ClearCommand Amplifier Kit
10	804808	Speaking Diaphragm Retainer	Not Shown	10051290	ClearCommand Amplifier Radio Interface Kit
11	804809	Speaking Diaphragm	Not Shown	10023055	ClearCommand Bracket and Voicemitter Kit
12	804810	Component Housing	Not Shown	806168	Vari-Clear Personal Communication System
13	804832	Exhalation Valve			
14	804813	Inlet Disc			
15	805011	Valve Spider			

# Advantage® 3000

## model 3100 single port

Advantage 3100 Facepiece Assemblies	
Part No.	Description
10028999	Small with Rubber Harness
10028998	Medium with Rubber Harness
10029000	Large with Rubber Harness
10031343	Small with Advantage (Plastic) Harness
10031342	Medium with Advantage (Plastic) Harness
10031344	Large with Advantage (Plastic) Harness

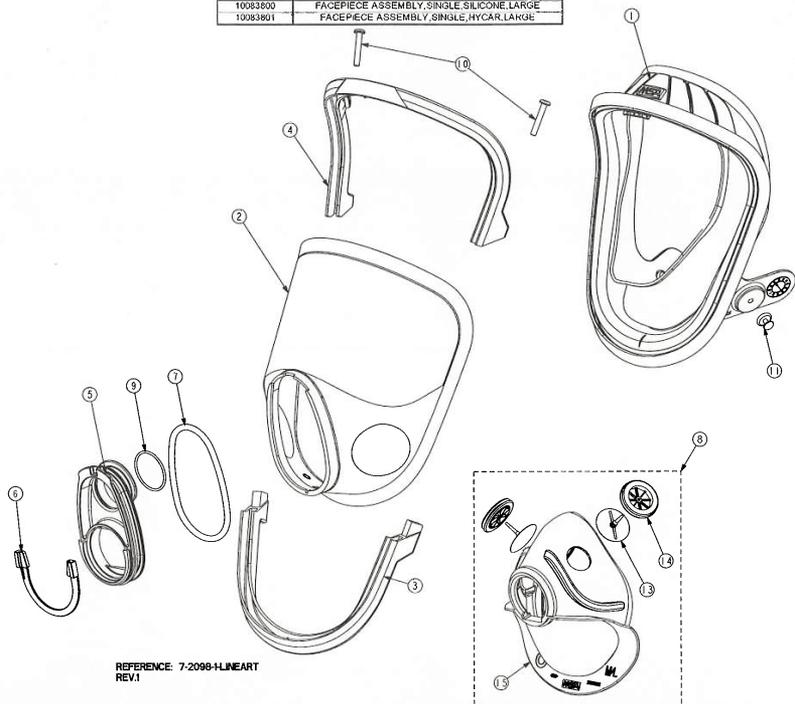


Advantage 3100 Facepiece Components			Advantage 3100 Facepiece Components		
Item No.	Part No	Description	Item No.	Part No	Description
1	10025280	Small, Faceblank Silicone	14	*	2 - Slide
	10025258	Medium, Faceblank Silicone	15	*	4 - Harness Button
	10025259	Large, Faceblank Silicone	16	*	2 - Buckle
-Kit-	10030785	Lens Ring Kit	14	10030797	Slide for Classic Rubber Harness, 10 per Package
2	*	1 - Upper Lens Ring	15	10030795	Harness Button , 12 per Package
3	*	1 - Lower Lens Ring	16	10030796	Buckle for Classic Rubber Harness, 6 per Package
4	*	2 - Lens Ring Screw	-Kit-	10030798	Advantage (Plastic) Harness Kit
5	10025282	Single Port Lens	17	*	1 Advantage Harness
-Kit-	10030791	Single Port Housing Replacement Kit	18	*	1 Right Adapter Clip
6	*	1 - Single Port Housing	19	*	1 Left Adapter Clip
7	*	1 - O-ring	<b>Accessories</b>		
8	*	1 - Retainer Clip	20	10030792	Medium/Large Nose Cup
9	10030789	Exhalation Valve, 6 per Package		10030793	Small Nose Cup
10	10030788	Inhalation Valve, 10 per Package	Not Shown	10029298	Spectacle Kit
11	10025292	Spider Gasket	Not Shown	10031542	Cover Lens, Clear, 25 per Package
12	10025291	Cover	Not Shown	10031543	Cover Lens, Smoke, 25 per Package
-Kit-	10030794	Classic Rubber Harness Kit			
13	*	1 - Rubber Harness			

\* Item Available in Kit

# ADVANTAGE<sup>®</sup> 4000

ADVANTAGE 4000 ASSEMBLY	
PART NUMBER	DESCRIPTION
10083792	FACEPIECE ASSEMBLY, SINGLE, SILICONE, MEDIUM
10083793	FACEPIECE ASSEMBLY, SINGLE, HYCAR, MEDIUM
10083795	FACEPIECE ASSEMBLY, SINGLE, SILICONE, SMALL
10083797	FACEPIECE ASSEMBLY, SINGLE, HYCAR, SMALL
10083500	FACEPIECE ASSEMBLY, SINGLE, SILICONE, LARGE
10083601	FACEPIECE ASSEMBLY, SINGLE, HYCAR, LARGE



REFERENCE: 7-2098-HLINEART  
REV1

ADVANTAGE 4000 SINGLE PORT FACEPIECE COMPONENTS				ADVANTAGE 4000 SINGLE PORT FACEPIECE COMPONENTS (CONT.)			
ITEM NO.	PART NUMBER	QTY REQD	DESCRIPTION	ITEM NO.	PART NUMBER	QTY REQ	DESCRIPTION
1	10073455	1	FACEBLANK, HYCAR, SMALL	10	10026562	2	SCREW, SST, 4M X 25MM LG, PHIL PAN HD
	10073457		FACEBLANK, HYCAR, LARGE	11	10025288	2	BUTTON HEAD HARNESS
	10073459		FACEBLANK, HYCAR, MEDIUM	465008	1	BAG DRAWSTRING	
	10083926		FACEBLANK, SILICONE, SMALL	10029294	1	COVER, LENS	
	10083927		FACEBLANK, SILICONE, LARGE	10075903	1	CLOTH HEAD HARNESS ASSEMBLY	
	10083925	FACEBLANK, SILICONE, MEDIUM	10075901	1	RUBBER HEAD HARNESS		
2	10074738	1	LENS, SINGLE PORT 4100-H	NOSECUP ASSEMBLY COMPONENTS (ITEM 8)			
	10094808	1	LENS, SINGLE PORT 4100-S	ITEM NO.	PART NUMBER	QTY REQ	DESCRIPTION
3	10073461	1	LENS RING, LOWER, BLACK	13	304787	2	DISC, VALVE
4	10073460	1	LENS RING, UPPER, BLACK	14	491124	2	SEAT, VALVE
5	10061973	1	HOUSING, INLET	15	10065305	1	NOSE CUP, MEDIUM/LARGE, TPE
6	10061896	1	UCLIP		10065306		NOSE CUP, SMALL, TPE
7	10025297	1	O-RING, HOUSING, SILICONE				
8	10065903	1	NOSECUP ASSEMBLY, MED/LG				
	10065904		NOSECUP ASSEMBLY, SMALL				
9	10084819	1	O-RING, SIZE, 2-024				



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