	Cincinnati Fire Department Fire Training Supplement DRILL BOOK	SECTION # 1 General Fire Fighting
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TOPIC # 12: Self Contained Breathing Apparatus – MSA Firehawk M7

The MSA Firehawk M7 is a pressure-demand, self-contained breathing apparatus consisting of the following components:

1. Firehawk M7 Carrier and Harness Assembly
2. Air Cylinder and Valve Assembly
3. Audi-Larm™ Audible Alarm with URC Assembly
4. PR14 First Stage Regulator
5. Firehawk Second Stage Regulator
6. Ultra Elite Face Piece
7. Firehawk M7 I-HUD
8. Firehawk M7 Control Module
9. Firehawk M7 Power Module
10. Clear Command Communication System

Firehawk M7 Carrier and Harness Assembly

The carrier consists of a backplate, a cylinder band with latch to hold the cylinder, the M7 Power Module, and a harness consisting of shoulder pads, chest strap, adjustable pull straps, lumbar pad, waist strap, and waist strap mounted regulator retainer. The carrier and harness assembly has integrated carrying handles that should be utilized to transport the SCBA when it is not in the donned position.

The Air Cylinder and Valve Assembly

The air cylinders are grey with green reflective striping, have a rated capacity of 66 ft^3 at 4500 psig, and are rated for 45 minutes of service. SCBA Cylinders should be recharged as soon as possible after use, as service life will be reduced if they are stored below 4000 psi.

CHANGE OUT AND REFILL ALL CYLINDERS THAT ARE BELOW 4000 PSI

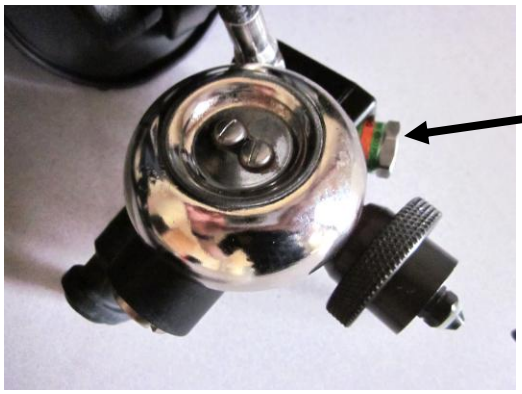
The valve assembly includes a metal valve body, pressure gauge, safety disc (burst disc), handwheel, and threaded connection for filling and attachment of Audi-Larm. The cylinder pressure gauge shows the air pressure in the cylinder and is calibrated in 100 psig increments. For example, a gauge reading of 40 is read as 40 x 100 or 4000 psig. The handwheel is used to open and close the cylinder valve.

Black and yellow checkered tape is used to indicate that the cylinder is a 1 hour cylinder and for Heavy Rescue Company use ONLY

Audi-Larm Audible Alarm with URC Assembly

The Audi-Larm Audible Alarm rings when there is approximately 25% of the SCBA's rated service time remaining. The alarm also rings when the cylinder valve is first opened as an audible indication that the alarm is functioning properly. A high pressure hose delivers air at cylinder pressure from the alarm to the first stage regulator.

The Audi-Larm assembly also includes a Universal Rescue Connection (URC). The URC Assembly is a male quickfill inlet for use by RAT Companies for emergency filling of the SCBA or during transfill operations. This connection should be covered by the attached rubber connector when not in use.

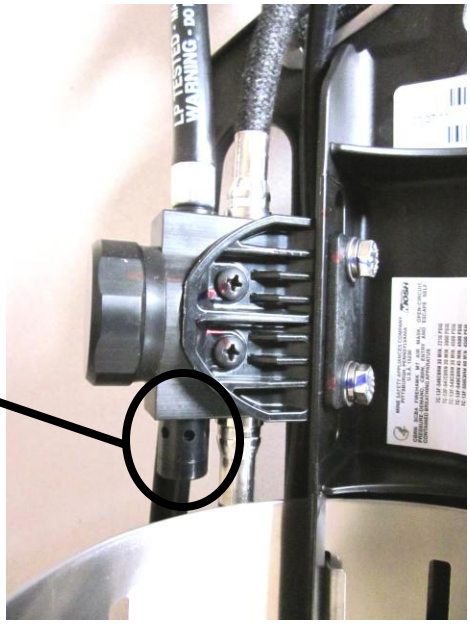


The URC Assembly includes a pressure relief valve for protection of the cylinder burst disc. The relief valve should be inspected daily for damage to the relief valve label.

PR 14 First Stage Regulator

The PR 14 First Stage Regulator reduces the pressure from the cylinder and valve assembly to an intermediate pressure (approximately 91 – 97 psi).

Inspect the pressure relief valve daily to ensure that the relief holes are clear and free of debris and other contaminants, and that the valve is properly secured.



Firehawk Second Stage Regulator

The Firehawk Second Stage Regulator is a pressure-demand regulator, which maintains a positive pressure in the facepiece while the air mask is in use. The bypass valve is red in color and is located on user's right side when the regulator is connected to the facepiece. The bypass valve can be opened by rotating the valve counter-clockwise until it stops. The regulator connects to the facepiece via a slide-to-connect system. On the regulator are two large release buttons that automatically turn off the flow of air as the regulator is doffed. The top button has the slide-to-connect design, which attaches to the rail system on the facepiece.

1. To start the flow of air once the regulator is donned inhale sharply.
2. To stop airflow push the top button in.
3. To doff the regulator press both the top and bottom buttons in.

Ultra Elite Facepiece

The Ultra Elite facepiece is available in three sizes (small, medium, and large); the size indicator is located in the center of the facepiece above the lens. Each fire fighter shall be fit tested annually to ensure proper sizing. Each facepiece has the following features:

- A super-hardcoated lens to meet the requirements of NFPA 1981
- A low-resistance, pressure-demand exhalation valve
- A speaking diaphragm for clear, short range communication

Each facepiece shall be engraved with the member's badge number.

Firehawk M7 I-HUD Heads-Up Display

The Firehawk M7 I-HUD utilizes LED light patterns that enable the user to see cylinder pressure status in one-quarter cylinder increments, PASS pre-alarms, battery status, and telemetry information while wearing the SCBA. The I-HUD transmitter, located in the M7 Control Module, wirelessly relays information to the I-HUD located in the user's facepiece. The I-HUD has a light sensor that automatically adjusts the brightness of the LEDs based on the ambient light levels of the surrounding environment.

Battery Cap **List of approved batteries**

Use only Duracell Ultra M3, Panasonic Photopower CR2 or Energizer CR2 Photo lithium batteries in the M7 I-HUD. Use of other batteries will affect the performance of the unit and void the Intrinsic Safety Approval. A list of approved batteries is marked on the inside of the M7 I-HUD near the battery cap.

The Firehawk M7 I-HUD indicates a low battery conditions as follows:

- Low battery in the I-HUD is indicated by a single flash of the yellow LED
- Low battery in M7 Power Module is indicated by a double flash of the yellow LED
- Low battery in both is indicated by alternating single and double flash of the yellow LED

To install the Firehawk M7 I-HUD:

1. Align the M7 I-HUD so that the LEDs face up and the semi-circular retaining clip is centered on the circular portion of the nose cup.
2. Work the M7 I-HUD down and past the nose cup until it is firmly seated on the round portion of the nose cup. Ensure that the baffles on the nose cup are not folded under the I-HUD once it is seated. Once properly seated the M7 I-HUD will not move within the facepiece.
3. Removal is the opposite of the installation but care must be taken to ensure that the I-HUD is pulled up and out with equal force on both sides of the I-HUD.

According to MSA the I-HUD is durable when exposed to the environment typically found inside the facepiece when properly installed. However care should be taken when handling the I-HUD outside of the facepiece and during installation and removal of the I-HUD, as it can easily be damaged if dropped or if pressure is unevenly applied to one side or the other.

The I-HUD will operate in two different modes, Automatic Intermittent Mode and Continuous Pressure Display Mode. The automatic intermittent mode is the default mode for the Firehawk M7 SCBA. While in the automatic intermittent mode, as each quarter cylinder pressure level has been reached, a unique LED pattern will be displayed for approximately 20 seconds When 25% of the rated cylinder pressure has been reached, a single flashing red LED will be displayed and will continue to flash until the unit is turned off. The I-HUD will display cylinder pressure continuously while in continuous pressure display mode. The I-HUD must be within approximately 18 inches of the Control Module to properly receive the signal

Turning Continuous Operation Mode On:

1. Press the green mode button on the Control Module.
2. Hold the button in for 3 seconds or until you hear a single beep from the Power Module Continuous Operation Mode can only be activated when the system is pressurized. The life of the battery in the I-HUD will be shortened in Continuous Operation Mode.

Turning Continuous Operation Mode Off:

1. Press the green mode button on the Control Module.
2. Hold the button in for 3 seconds or until you hear a single beep from the Power Module Continuous Operation Mode will automatically deactivate if low battery status is reached in the I-HUD.

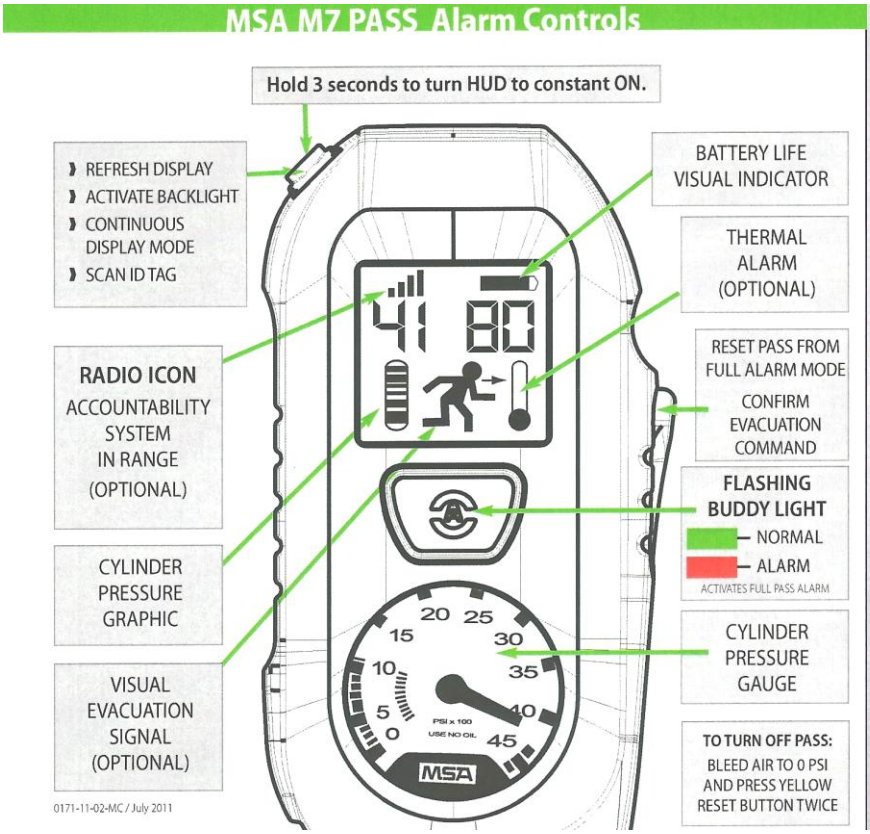
MSA FireHawk® M7 I-HUD Light Patterns

L1	L2	R1	R2	R3	Alerts
		●	●	●	**Three green LEDs** Full to ¾ cylinder pressure
		●	●		**Two green LEDs** ¾ to ½ cylinder pressure
		●		●	**Two flashing yellow LEDs** ½ to ¼ pressure
			●		**One flashing red LED** ¼ to empty pressure
	●				**Flashing yellow LED** Low battery. Single flash I-HUD. Double flash Control Module
	●				**Single orange LED** PASS Pre-Alarm
●	●				**Red and orange LEDs** Evacuate

The I-HUD utilizes the LED light Patterns shown to the left to display cylinder pressure status, low battery status of the I-HUD and Power Module, and the evacuation signal.

When an evacuation signal has been sent an alternating red and orange LED will be displayed until the user acknowledges the signal by pressing the yellow reset button on the Control Module twice in rapid succession.

The I-HUD has a buddy light that flashes red when the SCBA has reached 25% of the cylinders rated pressure. The buddy light is not visible to the user while the SCBA is in use.



Firehawk M7 Control Module with Integrated PASS

The Firehawk M7 Control Module serves as the user interface with the SCBA, the wireless transmitter for the I-HUD, and houses the integrated PASS motion sensor. The Firehawk M7 Control Module is equipped with an analog gauge as well as an LCD display to provide the user with the following vital information:

- Numeric and Iconic Cylinder Pressure Status
- Battery Status
- Thermal Alarm
- Time Remaining
- Radio Status Icon
- Visual Evacuation Signal

The Firehawk M7 Control Module turns on automatically when the user opens the SCBA cylinder valve. As the system pressure reaches approximately 200 psi, both visible and audible alarms activate automatically, indicating the unit is functional. Audible alarms are emitted from the Firehawk M7 Power Module. **NO AUDIBLE ALARMS ARE EMITTED FROM THE CONTROL MODULE** The unit remains in monitor mode until the user closes the cylinder valve, purges the system pressure, and presses the (Yellow) reset button two times within approximately one second.

Integrated PASS

The PASS motion sensor is housed within the Firehawk M7 Control Module. While the SCBA is in use, if the user is motionless for approximately 20 seconds, the PASS enters pre-alarm mode with the following audible and visual indicators:

- Power Module sounds 3 progressively louder tones
- Control Module Alarm Button and Power Module buddy lights slowly flash red
- I-HUD display flashes an orange LED

Movement of the Control Module cancels the PASS pre-alarm.

If the user remains motionless for 30 seconds (pre-alarm mode plus an additional 10 seconds) the PASS enters full alarm mode with the following audible and visual indicators:

- Power Module repeatedly sounds two high-pitched tones followed by a buzz
- Control Module Alarm Button and Power Module buddy lights rapidly flash red

The user can cancel the PASS full alarm by pressing the (Yellow) reset button on the Control Module two times within approximately one second.

The PASS can be set into full alarm mode at any time (even without air pressure) by pressing and holding the alarm button on the Control Module for approximately 3 seconds.

NOTE: The Firehawk M7 Control Module can monitor temperature conditions. If the user is exposed to more than the pre-set limit of time/temperature, the thermometer icon on the Control Module display will flash and the Power Module will sound a tone every 3 seconds.

Changing the Firehawk M7 Control Module Display Mode

1. Press the top mode (green) button once, this will light the Control Module display and refresh the I-HUD display.
2. While the display is lit, press the top mode button (green) again. This will toggle the display from remaining cylinder pressure to calculated remaining service time.

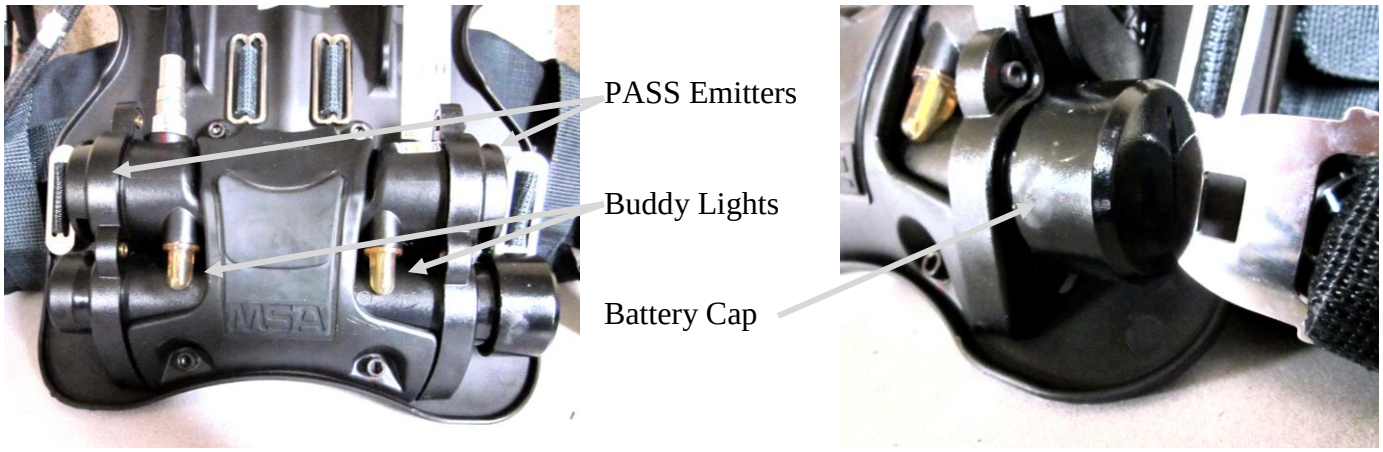
NOTE: Actual time remaining may be less than the calculated time displayed. Increases in breathing rate may reduce remaining time more than expected. The time displayed is based on the continuation of the average breathing rate over the last three minutes.

NOTE: If a WRENCH icon appears on the Control Module display, IMMEDIATELY remove the SCBA from service and contact the Mask Service Unit or either Heavy Rescue 9 or 14.

For each action of the Control Module there are corresponding sounds and visual changes. The chart below outlines the possible combinations of visual and audible indicators:

Action		Audible Indicator Power Module	Visible Indicator Control Module
Automatic Activation with the system pressurized		Single rising tone with bee-bop	GREEN/RED LED flash front panel
Manual Activation		Start-up single rinsing tone with bee-bop (also full alarm)	GREEN/RED LED flash front panel - red light flashing
Sensing Mode (with or without pressure)		None	GREEN LED flashing
pre-alarm with or without pressure	First 4 seconds (approx.)	low volume, low urgency	RED LED Flashes
	Second 4 seconds (approx.)	Medium volume Medium urgency	
	Last 4 seconds (approx.)	High volume, high urgency	
Full Alarm (with or without pressure)		Full volume, high urgency with a buzz	RED LED Flashes
Deactivation of full alarm	1st push of reset button	Bee	RED LED Flashes
	2nd push of reset button		GREEN LED flashes
Deactivation of pre-alarm (with shaking or movement of unit)		None	GREEN LED Flashes
Thermal alarm activation		1 beep every 3 seconds	Flashing thermometer icon
Radio link with base station	link is established	None	Radio link indicator icon in upper left corner of display
	out of range	None	Radio link indicator icon disappears
Evacuation signal received		continuous beep beep	flashing "running man" icon
Low battery		1 beep every 5 seconds	empty battery icon on display
Redundant alarm (cylinder pressure below 25%)		None	RED LED Flashes

Firehawk M7 Power Module



The Firehawk M7 Power Module is located on the lower portion of the backplate and houses the batteries, serves as the cylinder stop, emits audible PASS alarms, and has buddy lights. The Power Module is linked to the Control Module via the power cable.

The Power Module uses four C alkaline batteries to supply the Control Module with power. The system notifies the user when the batteries need to be replaced by:

- Emitting 1 audible beep every 5 seconds from the Power Module
- Displaying an empty battery icon on the Control Module Display
- A double flashing yellow LED on the I-HUD

To replace batteries in the Firehawk M7 Power Module:

1. Unthread the battery cap on the Firehawk M7 Power Module by rotating the battery cap in the counter-clockwise direction. (The male end of the waist buckle may be inserted into the slot on the battery cover if needed)
2. Remove the four C batteries from the battery tube.
3. Insert four C batteries following the diagram inside the battery tube.
4. Verify that the o-ring on the cap is held in place, free of damage and debris, and not twisted in the gasket retention grove in the battery cap.
5. Install the battery cap on the Firehawk M7 Power Module battery tube.
6. Tighten the battery cap by rotating it clockwise until it is fully seated. Failure to fully seat the battery cap may prevent the battery tube from being fully water tight.

Morning Check of the Firehawk M7 SCBA

1. Check the pressure gauge on the SCBA cylinder to verify that the cylinder is full.
2. Pressurize the system by opening the cylinder valve; listen for the M7 Power Module to sound and for the Audi-Larm Alarm to ring briefly.
3. Observe the LED display of the I-HUD and verify that the LEDs illuminate and correspond with the cylinder pressure.
4. Ensure that the alarm button/ buddy light on the Control Module and the buddy lights on the Power Module are slowly flashing green.
5. Compare the cylinder pressure gauge to the Control Module display and analog gauge, the readings should be within 450 psig.
   If your readings are not within these parameters **DO NOT USE THE SCBA.**
6. Allow the Control Module to remain motionless for approximately 20 seconds. Listen for the Power Module to sound the low volume repeated tones of the PASS pre-alarm. Verify the following:
   - The alarm button on the Control Module slowly flashes red
   - The buddy lights on the Power Module slowly flash red
   - The orange LED is illuminated on the I-HUD display
7. Remain motionless for approximately 10 more seconds until the full PASS alarm activates. Listen for the Power Module to sound the loud PASS alarm, and verify the following:
   - The alarm button on the Control Module rapidly flashes red
   - The buddy lights on the Power Module rapidly flash red
   - The orange LED on the I-HUD display extinguishes
8. Reset the PASS alarm by pressing the yellow reset button on the Control Module two times within approximately one second.
9. Check the manual activation of the PASS alarm by pressing and holding the Alarm button in the center of the Control Module for approximately three seconds. Listen for the PASS alarm to sound. Reset the PASS alarm as in Step 8.
10. Allow the Control Module to remain motionless for approximately 20 seconds until the PASS pre-alarm sounds, shake the Control Module to reset the alarm.
11. Close the cylinder valve fully. After the cylinder valve is closed fully check for air leaks by listening and observing the Control Module gauge for decreases in pressure. If there is a large drop in pressure or you hear an air leak do not use the SCBA.
12. Check bypass operation by turning the red bypass knob counter-clockwise; ensure that air flows from the regulator. Close the bypass knob.
13. Inspect the regulator for damage and attach it to the facepiece, ensure proper attachment by pulling on the regulator.

14. Don the facepiece and inhale sharply to start air flow. Breathe down the remaining air until the I-HUD display and the Control Module pressure reading drops below 1050 psig. You should have the following visual and audible indications:
    - A flashing red LED on the I-HUD display
    - Audi-alarm ringing
    - Alarm button on Control Module will flash red
    - Buddy Lights on Power Module will flash red

    These alarms should continue until the air pressure is 200 psig or less, if they do not remove the SCBA from service.
15. When the pressure falls below 200 psig, turn the Control Module off by pressing the yellow reset button two times within approximately one second.

Facepiece Fit Check:

For the next two steps you can seal the facepiece either by covering the facepiece inlet with the palm of your hand or by connecting the Firehawk regulator to the facepiece and NOT open the cylinder valve to pressurize the SCBA.

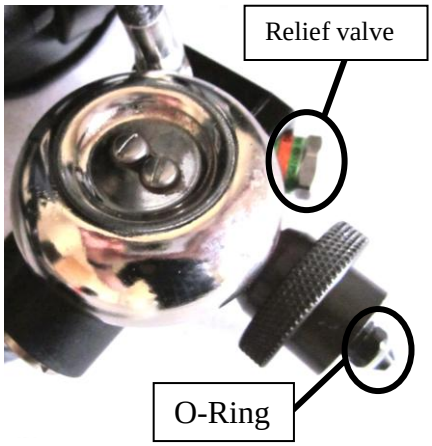
1. While wearing the facepiece, seal the facepiece inlet and inhale. Hold your breath for 10 seconds. The facepiece should remain collapsed against your face for the entire 10 seconds. If it does not, re-adjust the facepiece and test again. **If this does not correct the leak, do not use the facepiece.**
2. Test the exhalation valve by taking a deep breath and hold it. Seal the facepiece and exhale. If the exhalation valve is stuck you may feel a heavy rush of air around the facepiece. You may need to exhale sharply to open the exhalation valve. If this does not release the valve do not use the facepiece.

Monthly Mask/Post Fire Inspection:

Perform the daily mask check as outlined and then inspect the following items:

1. Facepiece
    a. Inspect for the rubber for deterioration, dirt, cracks, tears, holes, or tackiness.
    b. Inspect the head harness straps for tears, loss of elasticity, or missing buckles.
    c. Inspect the lens for cracks, scratches, and a tight seal with the facepiece rubber.
    d. Ensure the exhalation valve is clean and operates easily. The valve must move off the seat and return when released.
    e. Inspect the facepiece inlet for damage. Ensure the spider gasket and valve disc are present.
    f. Inspect the facepiece rubber around the Clear Command Voice Amplifier bracket for holes or tears.
2. Firehawk I-HUD
    a. Inspect for cracks or other signs of damage which could allow contaminants to enter the housing.
    b. Ensure moisture or debris is not present in the battery compartment.
    c. Ensure the battery compartment o-ring on the battery compartment cap is free of debris and not damaged or missing.
    d. Reinstall the I-HUD in the facepiece.

3. Clear Command Communication System
    a. Remove the amplifier housing from the facepiece and inspect for signs of damage.
    b. Ensure the battery compartment is free of moisture or debris.
    c. Reassemble the amplifier housing on the facepiece.
    d. Depress the on/off button and the release it.
    e. Look through the facepiece lens, the red LED on top of the unit should be illuminated.
    f. Scrape a fingernail lightly across the voice emitter microphone assembly while listening for the sound to be reproduced in the amplifier speaker.
    g. Depress and release the on/off button again. The LED should turn off.
4. Cylinder and Valve Assembly
    a. Inspect the cylinder body for cracks, dents, weakened areas, broken or peeling fibers, or signs of heat-related damage.
    b. Inspect the cylinder valve for signs of damage.
    c. Ensure the needle and gauge face are clearly visible and that the gauge stem is not bent.
5. Audi-Larm Audible Alarm with URC assembly
    a. Unthread the Audi-Larm coupling nut from the cylinder valve and inspect the coupling nut for thread damage.
    b. Ensure there is an o-ring present and not damaged. Replace if damaged.
    c. Ensure the bell is properly aligned and that the screws are tight. If the bell is loose take the SCBA out of service.
    d. Inspect the relief valve for damage. Ensure the relief valve label is not damaged and that the relief valve ports are not showing. If damaged, take the SCBA out of service. Reattach the Audi-Larm to the cylinder valve and ensure the coupling nut is hand tight.



6. PR 14 First Stage Regulator
    a. Inspect the regulator mounting bracket for cracks, weakened areas, signs of heat or chemical related damage and ensure the regulator mounting bracket screws are secure.
    b. Inspect the hose connections and ensure the hoses are properly secured.
    c. Inspect the pressure relief valve. Ensure that the relief holes are clear and free of debris or and that the pressure relief valve is properly secured.
    d. Inspect the high pressure hose between the First Stage Regulator and the Audi-Larm for cuts or severe abrasions.
7. Firehawk M7 Control Module
    a. Inspect the gauge hose and power cable for any visible signs of damage and ensure they are securely attached to the Control Module.
    b. Inspect for external cracks in the housing and ensure the rubber cover is not damaged or missing.
    c. Ensure the buttons are not damaged or missing.

8. Firehawk M7 Power Module
    a. Inspect the housing for external cracks and ensure the Power Module, battery tube, and cylinder stop are securely attached to the backplate.
    b. Ensure that the PASS emitter covers are not obstructed by dirt or debris.
    c. Ensure the power cable is securely attached; the fitting should not be able to be unthreaded by hand.
    d. Remove the cap from the battery tube and ensure the o-ring is present and properly installed. If the o-ring is missing it must be replaced.
    e. Inspect the inside of the battery tube. Ensure that the battery terminals are not corroded and that the tube is free of moisture and debris.
    f. Replace the battery cap.
9. Carrier and Harness
    a. Operate the latch wing on the cylinder band to ensure that it opens and closes properly and that it holds the cylinder securely in place. If the cylinder band and latch are locked, the latch wing should not turn.
    b. Inspect the backplate for cracks, weakened areas, or signs of heat or chemical related damage.
    c. Inspect all harness components for cuts, tears, abrasions or other signs of damage.