INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER RELIEF VALVE

MODEL
RV-110A
RV-110V

DRAWING NUMBER
AD933AA
AD934AA

MANUAL NUMBER
IOM-234

REVISION
Rev. A, 02/02/2021

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IMPORTANT SAFETY INFORMATION
READ ALL INSTRUCTIONS

Notes emphasize information and/or provide additional information to assist the user.

Caution messages appear before procedures that could result in damage to equipment if not observed.

Warning messages appear before procedures that could result in personal injury if not observed.

This manual is intended to be used as a basic installation and operation guide for the Welker Relief Valves, RV-110A and RV-110V. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in Appendix A of this manual.

The information in this manual has been carefully checked for accuracy and is intended to be used as a guide for the installation, operation, and maintenance of the Welker equipment described in this manual. Correct installation and operation, however, are the responsibility of the end user. Welker reserves the right to make changes to this manual and all products in order to improve performance and reliability.

BEFORE YOU BEGIN

Read these instructions completely and carefully.

IMPORTANT – Save these instructions for local inspector's use.

IMPORTANT – Observe all governing codes and ordinances.

Note to Installer – Leave these instructions with the end user.

Note to End User – Keep these instructions for future reference.

Installation of this Relief Valve is of a mechanical nature.

Proper installation is the responsibility of the installer. Product failure due to improper installation is not covered under the warranty.

If you received a damaged Relief Valve, please contact a Welker representative immediately.

Phone: 281.491.2331
Address: 13839 West Bellfort Street
Sugar Land, TX 77498

SECTION 1: PRODUCT INFORMATION

1.1 Introduction

We appreciate your business and your choice of Welker products. The installation, operation, and maintenance liability for this equipment becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance* (IOM) *Manuals* prior to installation and operation of this equipment is required for a full understanding of its application and performance prior to use.*

If you have any questions, please call Welker at 1-281-491-2331.

**The following procedures have been written for use with standard Welker parts and equipment. Assemblies that have been modified may have additional requirements and specifications that are not listed in this manual.*

1.2 Product Description

The Welker *RV-110A and RV-110V* Relief Valves are designed to protect instruments and regulators from overpressurization.

The RV-110A and RV-110V are small, compact relief valves that can be used in hazardous and non-hazardous gas applications where venting to atmosphere is acceptable. The RV-110V is also equipped with a threaded NPT outlet port for applications that require the venting of gases to safe areas (i.e., hazardous gas applications or applications where venting to atmosphere is not acceptable). The RV-110A and RV-110V have a low set pressure and high flow capacity while allowing no leakage from seventy to ninety percent (70–90%) of the set pressure. Both relief valves are designed with ASME standards in mind.

Welker may custom design the RV-110A and RV-110V to suit the particular application and specifications of each customer.

1.3 Specifications

The specifications listed in this section are generalized for this equipment. Welker can modify the equipment according to your company's needs. **Please note that the specifications may vary depending on the customization of your equipment.**

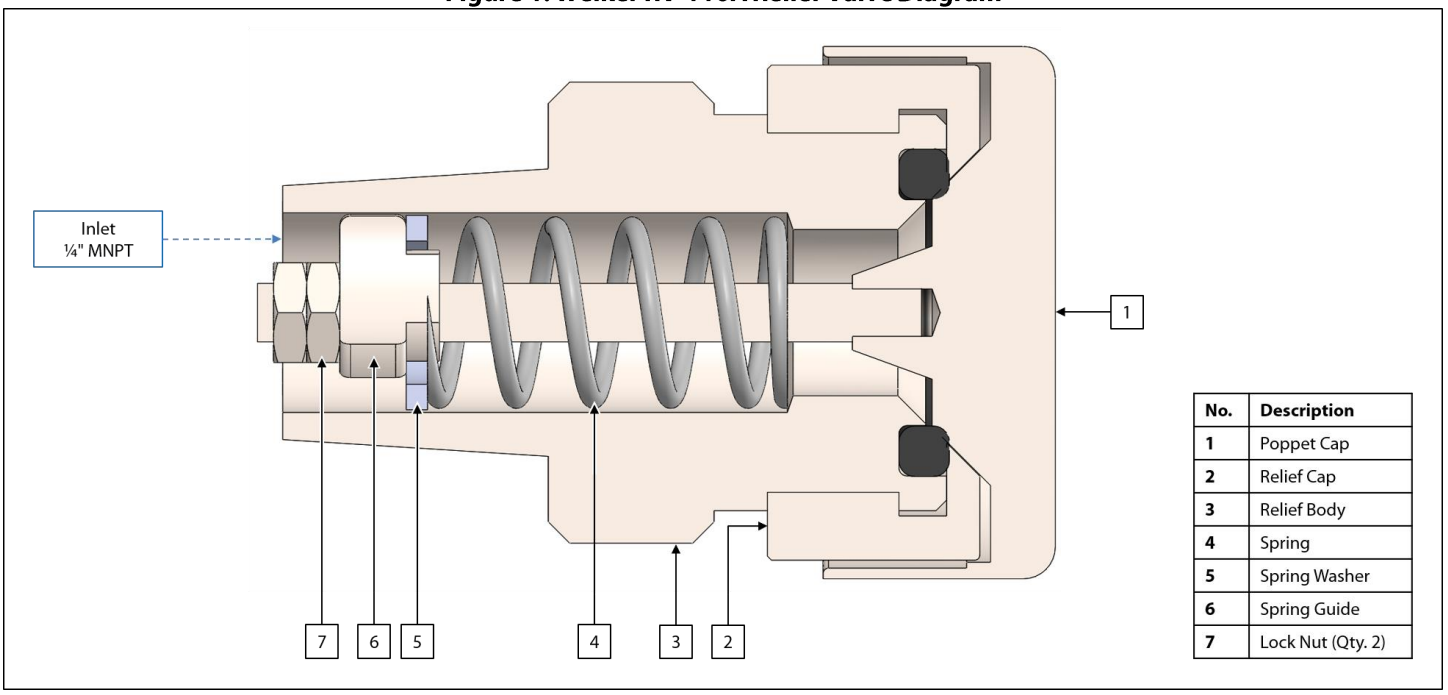
Table 1: RV-110A Specifications	
Materials of Construction	316/316L Stainless Steel Others Available
Maximum Allowable Inlet Pressure	300 psig (*20 barg*)
Temperature Range	-65 °F to 400 °F (*-53 °C to 204 °C*) Temperature Range May Vary Based on Seal Material Selection
Connections	**Inlet:** ¼" MNPT **Outlet:** Atmospheric
Flow Rate	Up to 70 scfm
Spring Range	15–30 psig (*0–2 barg*) 31–90 psig (*2–6 barg*) 91–140 psig (*6–10 barg*)
Feature	10% or 3 psig Overpressure Relief Capacity Adjustable
Industry Standards	CE Compliance* NACE Compliance

Table 2: RV-110V Specifications	
Materials of Construction	316/316L Stainless Steel Others Available
Maximum Allowable Inlet Pressure	500 psig (*34 barg*)
Temperature Range	-65 °F to 400 °F (*-53 °C to 204 °C*) Temperature Range May Vary Based on Seal Material Selection
Connections	**Inlet:** ¼" FNPT **Outlet:** ½" FNPT
Flow Rate	Up to 135 scfm
Spring Range	10–150 psig (*0–10 barg*) 151–250 psig (*10–17 barg*)
Feature	10% or 3 psig Overpressure Relief Capacity Adjustable Lockable
Industry Standards	CE Compliance* NACE Compliance

* Applies only when used on Welker CE equipment

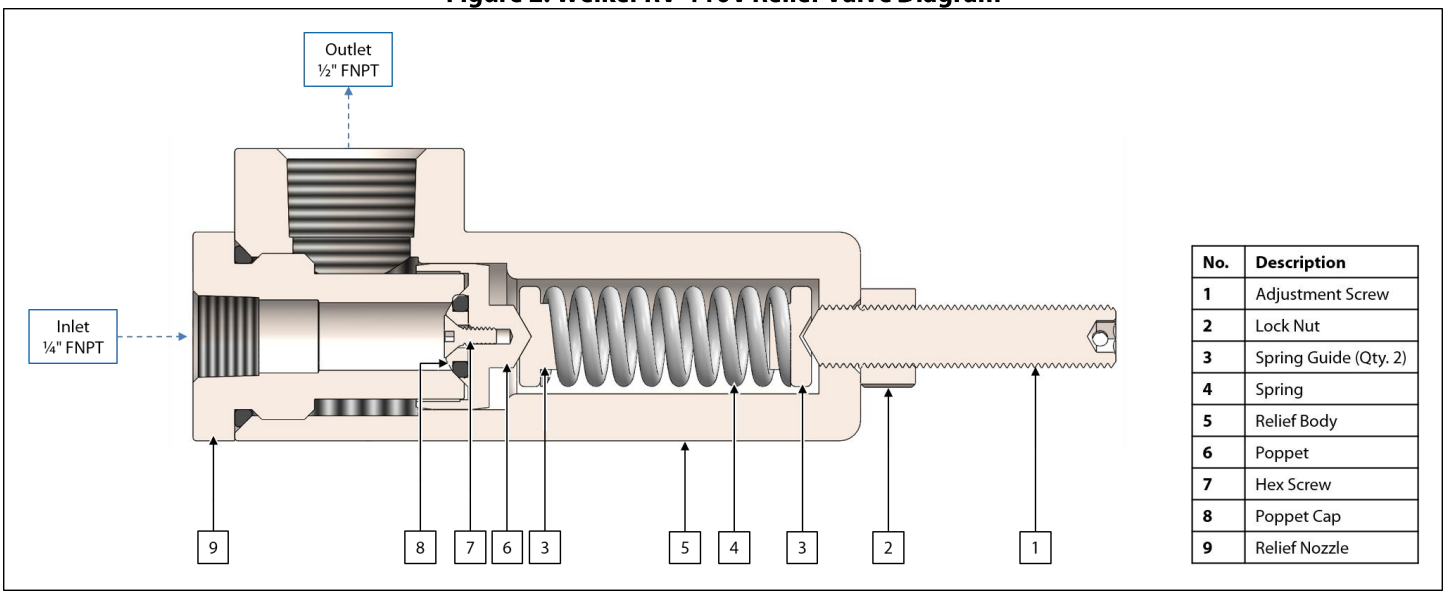
1.4 Equipment Diagrams

Figure 1: Welker RV-110A Relief Valve Diagram



No.	Description
1	Poppet Cap
2	Relief Cap
3	Relief Body
4	Spring
5	Spring Washer
6	Spring Guide
7	Lock Nut (Qty. 2)

Figure 2: Welker RV-110V Relief Valve Diagram



No.	Description
1	Adjustment Screw
2	Lock Nut
3	Spring Guide (Qty. 2)
4	Spring
5	Relief Body
6	Poppet
7	Hex Screw
8	Poppet Cap
9	Relief Nozzle

SECTION 2: INSTALLATION & OPERATION

2.1 Before You Begin

After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker representative if you received damaged equipment.

When sealing fittings with PTFE tape, refer to the proper sealing instructions for the brand used.

2.2 Setting, Testing, and Installing the RV-110A

If setting and installing an RV-110V, see *Section 2.3, Setting, Testing, and Installing the RV-110V.*

To accurately set the relief, a safe gas source, regulator, and pressure gauge are needed.

Setting the RV-110A

1. Ensure the terms and definitions for setting the RV-110A have been studied and are understood (*Table 3*).

Table 3: Terms and Definitions for Setting the RV-110A and RV-110V

Start-to-Leak (Crack) Pressure	3 psig or 10 percent (%) of the opening (set) pressure (whichever is greater) below the opening (set) pressure. This is the pressure at the relief valve inlet where the relieved fluid is first detected before normal relieving action takes place. A hissing sound is audible at crack pressure.
Opening (Set) Pressure	The relief valve inlet pop point pressure at which there is a measurable lift or discharge becomes continuous as determined by seeing, hearing, or feeling the exhaust.
Relieving Pressure	3 psig or 10 percent (%) of the opening (set) pressure (whichever is greater) above the opening (set) pressure. This is the pressure measured at the relief valve inlet at which the relieving capacity is determined. This point can be observed by a pressure drop indicated on the inlet pressure gauge.

2. Connect the regulator to a safe gas source.
3. Remove the two (2) lock nuts from the RV-110A (*Figure 1* and *Figure 4*).
4. Connect the RV-110A to the regulator outlet.
5. Rotate the poppet cap clockwise to close the RV-110A (*Figure 1* and *Figure 4*).
6. Apply auxiliary gas through the regulator to the RV-110A, and then set the regulator to the desired pressure.
7. Adjust the poppet cap until a slight hissing sound is audible (*Figure 1* and *Figure 4*). This is the start-to-leak (crack) pressure (*Table 3*).

The crack pressure is 3 psig or 10% of the set pressure below the set pressure of the RV-110A, whichever is greater.

Table 4: Pressure Set Point			
Examples	**Start-to-Leak (Crack) Pressure (3 psig or 10% Below Set Pressure) (Whichever Is Greater)**	**Opening (Set) Pressure**	**Relieving Pressure (3 psig or 10% Above Set Pressure) (Whichever Is Greater)**
1	17 psig (*1.1 barg*)	20 psig (*1.3 barg*)	23 psig (*1.5 barg*)
2	135 psig (*9.3 barg*)	150 psig (*10.3 barg*)	165 psig (*11.3 barg*)

8. Ensure there are no leaks at any pressure below the crack pressure.
9. Adjust the set pressure accordingly.

- To increase the set pressure, rotate the poppet cap clockwise (*Figure 1* and *Figure 4*).
- To decrease the set pressure, rotate the poppet cap counterclockwise (*Figure 1* and *Figure 4*).

10. Once the set pressure has been adjusted, repeat steps 5–7 to confirm the RV-110A has the appropriate set pressure (*Table 3*).
11. Depressurize the regulator and remove the RV-110A.
12. Install the two (2) lock nuts to the RV-110A and tighten (*Figure 1* and *Figure 4*).

Use a hex socket wrench to tighten the two (2) lock nuts on the RV-110A (*Figure 1*).

13. Reconnect the RV-110A to the regulator outlet.

Testing the RV-110A

14. Set the regulator to a pressure slightly below the RV-110A crack pressure, and then slowly increase the pressure of the regulator until it is at the RV-110A crack pressure (*Table 3*). A slight hissing sound should be audible.

The crack pressure is 3 psig or 10% under the set pressure of the RV-110A, whichever is greater.

15. Slowly decrease the pressure of the regulator until it is slightly below the RV-110A crack pressure (*Table 3*). The hissing sound should stop as the RV-110A reseats.
16. Repeat steps 6–8 to adjust the set pressure if the RV-110A does not relieve pressure or reseat.
17. Slowly increase the pressure of the regulator until it is at the set pressure. A steady, audible simmer should be heard as the RV-110A is opening.
18. Slowly increase the pressure of the regulator until it is at the relieving pressure (*Table 3*). An audible pop should be heard as the RV-110A opens fully and a visible pressure drop should be measured on the pressure gauge. The poppet assembly will rapidly move back and forth as the pressure is relieving.
19. Reset the regulator to a pressure slightly below the crack pressure to verify that the RV-110A will reseal (*Table 3*).
20. If the RV-110A is to be used with the regulator it was set with, reset the regulator to the desired point.

Installing the RV-110A

Welker recommends installing a filter upstream of the RV-110A.

21. Wrap the threads of the RV-110A with PTFE tape or apply pipe dope to the threads.
22. Using a wrench, install the RV-110A to the correct port on the instrument it will be relieving.
23. Installation is complete and the RV-110A is now operational.

2.3 Setting, Testing, and Installing the RV-110V

If setting and installing an RV-110A, see *Section 2.2, Setting, Testing, and Installing the RV-110A*.

To accurately set the relief, a safe gas source, regulator, and pressure gauge are needed.

Setting the RV-110V

1. Connect the regulator to a safe gas source.
2. Connect the RV-110V to the regulator outlet.
3. Loosen the lock nut and screw the adjustment screw counterclockwise to open the RV-110V (*Figure 2* and *Figure 4*).

Use a 1/16" hex key to tighten or loosen the adjustment screw on the RV-110V.

4. Apply auxiliary gas through the regulator to the RV-110V, and then set the regulator to the desired pressure.
5. Adjust the adjustment screw until a slight hissing sound is audible. This is the crack pressure (*Table 3*).
6. Adjust the set pressure accordingly.

- To increase the set pressure, screw the adjustment screw clockwise.
- To decrease the set pressure, screw the adjustment screw counterclockwise.

7. Once the set pressure has been adjusted, repeat steps 5–7 to confirm the RV-110V has the appropriate set pressure (*Table 3*).
8. Tighten the lock nut to lock the adjustment screw into place (*Figure 2* and *Figure 4*).

Testing the RV-110V

9. Set the regulator to a pressure slightly below the RV-110V crack pressure, and then slowly increase the pressure of the regulator until it is at the RV-110V crack pressure (*Table 3*). A slight hissing sound should be audible.

The crack pressure is 3 psig or 10% of the set pressure below the set pressure of the RV-110V, whichever is greater.

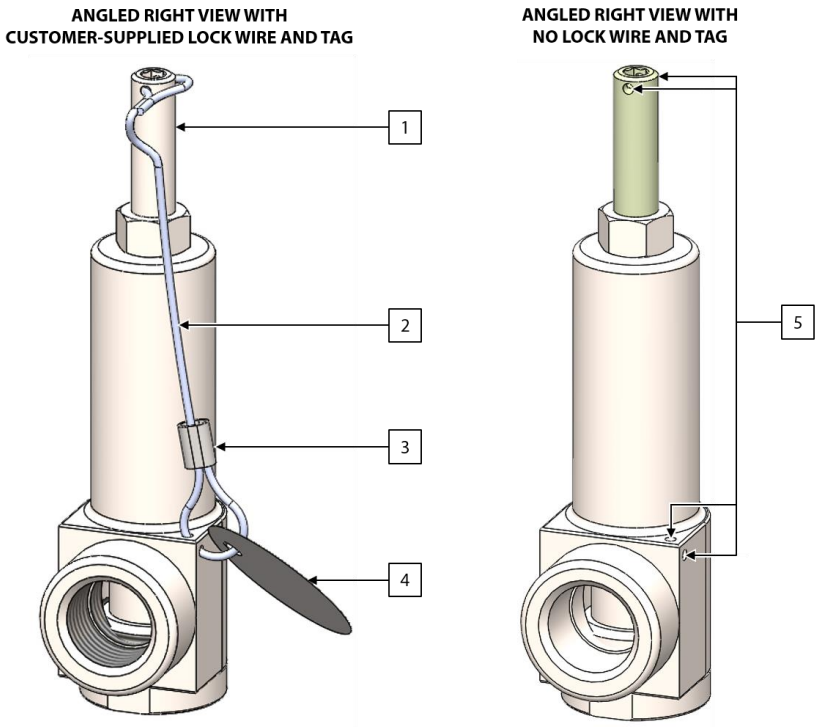
10. Slowly decrease the pressure of the regulator until it is slightly below the RV-110V crack pressure (*Table 3*). The hissing sound should stop as the RV-110V reseats.
11. Repeat steps 5–7 to adjust the set pressure if the RV-110V does not relieve pressure or reseat.
12. Slowly increase the pressure of the regulator until it is at the set pressure. A steady, audible simmer should be heard as the RV-110V is opening.
13. Slowly increase the pressure of the regulator until it is at the relieving pressure (*Table 3*). An audible pop should be heard as the RV-110V opens fully and a visible pressure drop should be measured on the pressure gauge.
14. Reset the regulator to a pressure slightly below the crack pressure to verify that the RV-110V will reseal (*Table 3*).
15. If the RV-110V is to be used with the regulator it was set with, reset the regulator to the desired point.

Installing the RV-110V

Welker recommends installing a filter upstream of the RV-110V.

16. If desired, install a customer-supplied adjustment lock wire and/or tag to the adjustment lock wire holes (*Figure 3*).

Figure 3: Adjustment Lock Wire Installation Diagram



No.	Description
1	Adjustment Screw
2	Adjustment Lock Wire (Not Included - For Reference Only)
3	Compression Sleeve (Not Included - For Reference Only)
4	Instrument Tag (Not Included - For Reference Only)
5	Adjustment Lock Wire Holes (Qty. 4)

The RV-110V may be locked after it has been set. Locking the RV-110V can help avoid changes in relief settings (e.g., due to vibration or operator interference).

17. Wrap the threads of the instrument the RV-110V will be relieving with PTFE tape or apply pipe dope to the threads.
18. Using a wrench, install the RV-110V to the ¼" MNPT threads on the instrument it will be relieving.
19. Installation is complete and the RV-110V is now operational.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance.** Based on the operating conditions and/or site requirements, adjustments to the maintenance schedule may be necessary.
2. Prior to maintenance or disassembly of the unit, it is advisable to have a repair kit available for repairs of the system in case of unexpected wear or faulty seals.

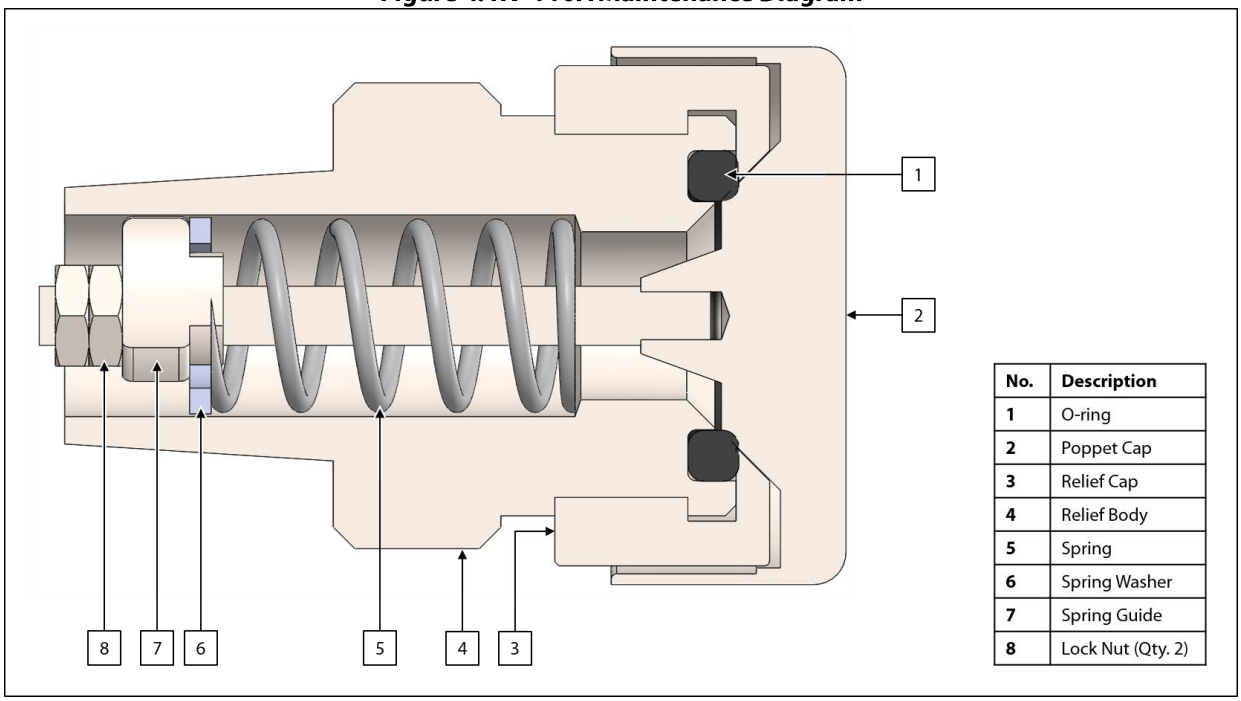
New seals supplied in spare parts kits should be lightly lubricated before being installed to ease the installation of the seals and reduce the risk of damage when positioning them on parts. Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.

For sample-exposed seals, Welker recommends non-hydrocarbon-based lubricants, such as Krytox®.
For non-sample-exposed seals, Welker recommends either non-hydrocarbon-based lubricants or silicone-based lubricants, such as Molykote® 111.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.
4. Welker recommends having the following tools available for maintenance. Please note that the exact tools required may vary by model.
    a. 1/16" Hex Key
    b. 3/16" Hex Key
    c. 3/16" Hex Socket Wrench
    d. 1½" Pipe Wrench
    e. 10" Crescent Wrench
    f. 12" Crescent Wrench
    g. Seal Picker

3.2 Maintenance: RV-110A

Figure 4: RV-110A Maintenance Diagram

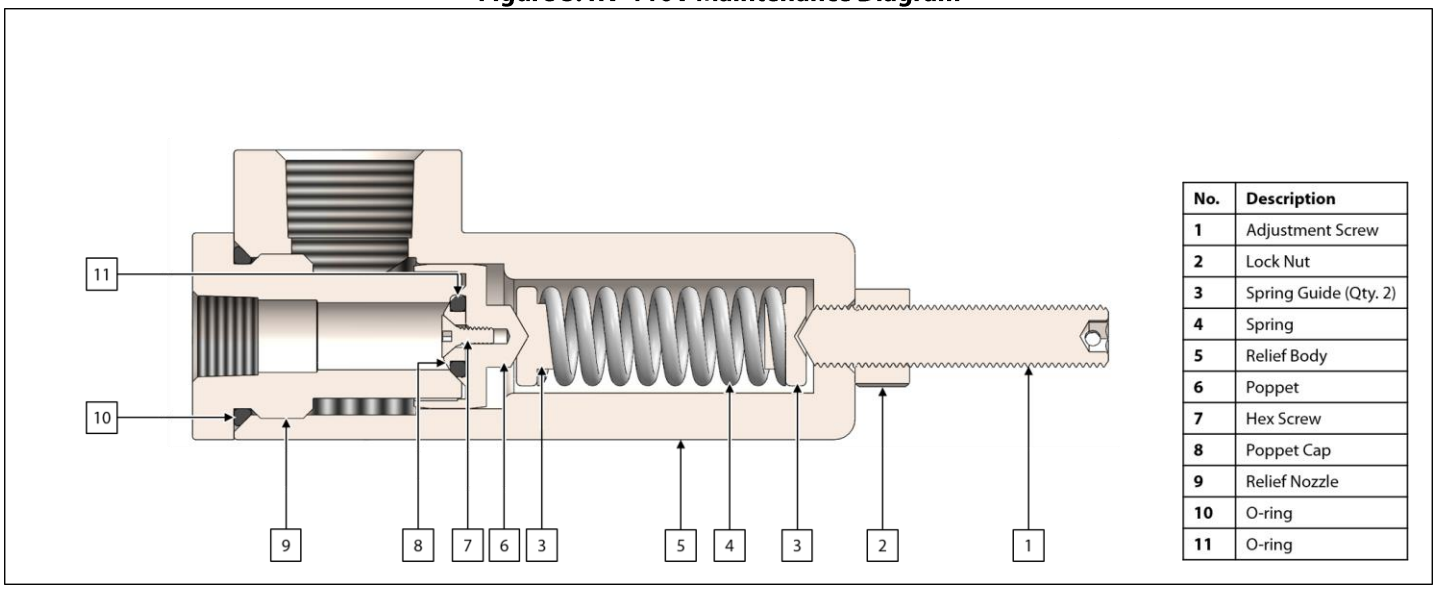


No.	Description
1	O-ring
2	Poppet Cap
3	Relief Cap
4	Relief Body
5	Spring
6	Spring Washer
7	Spring Guide
8	Lock Nut (Qty. 2)

1. Isolate and depressurize the RV-110A from the supply source.
2. Remove the RV-110A from the supply.
3. Remove the two (2) lock nuts with a hex socket wrench (*Figure 1* and *Figure 4*).
4. Rotate the poppet cap counterclockwise to unthread and remove the poppet cap (*Figure 1* and *Figure 4*).
5. Inspect the poppet cap for nicks and scratches. Replace as necessary.
6. Unscrew the spring guide and remove the spring washer and spring (*Figure 1* and *Figure 4*).
7. Discard the old spring and replace with a new spring (*Figure 1* and *Figure 4*).
8. Using two (2) crescent wrenches, remove the relief cap (*Figure 1* and *Figure 4*).
9. Remove and replace the O-ring on the relief body face (*Figure 4*).
10. Screw the relief cap onto the relief body (*Figure 1* and *Figure 4*).
11. Insert the poppet cap assembly into the relief cap and rotate clockwise to tighten (*Figure 1* and *Figure 4*).
12. Insert the spring and spring washer, and then screw the spring guide onto the poppet (*Figure 1* and *Figure 4*).
13. Using a hex socket wrench, tighten the two (2) lock nuts onto the poppet (*Figure 1* and *Figure 4*).
14. The RV-110A is now ready to be reset and reinstalled. See *Section 2.2, Setting, Testing, and Installing the RV-110A*, for instructions on setting, testing, and installing the RV-110A.

3.3 Maintenance: RV-110V

Figure 5: RV-110V Maintenance Diagram



No.	Description
1	Adjustment Screw
2	Lock Nut
3	Spring Guide (Qty. 2)
4	Spring
5	Relief Body
6	Poppet
7	Hex Screw
8	Poppet Cap
9	Relief Nozzle
10	O-ring
11	O-ring

1. Isolate and depressurize the RV-110V from the supply source.
2. Remove the RV-110V from the supply source.
3. Unscrew the lock nut and remove from the adjustment screw (*Figure 2* and *Figure 5*).
4. Inspect the seal on the lock nut. Replace the lock nut as necessary.
5. Using a hex key, unscrew the adjustment screw and remove it from the relief body (*Figure 2* and *Figure 5*).
6. Unscrew the relief nozzle from the relief body (*Figure 2* and *Figure 5*).
7. Remove and replace the O-ring in the base of the relief nozzle (*Figure 5*).
8. Remove the poppet (*Figure 2* and *Figure 5*).
9. Inspect the poppet for nicks and scratches. Replace as necessary.
10. Using a hex key, unscrew the hex screw in the poppet cap (*Figure 2* and *Figure 5*).
11. Remove the poppet cap (*Figure 2* and *Figure 5*).
12. Remove and replace the O-ring in the poppet / poppet cap assembly (*Figure 5*).
13. Remove the two (2) spring guides and spring (*Figure 2* and *Figure 5*).
14. Inspect the two (2) spring guides and spring for nicks and scratches. Replace as necessary.
15. Replace the O-ring in the poppet / poppet cap assembly (*Figure 5*).
16. Using a hex key, screw the hex screw into the poppet cap (*Figure 2* and *Figure 5*).
17. With the seal on the lock nut facing down, screw the adjustment screw into the top of the lock nut and thread it through approximately one-half (½) the length of the adjustment screw (*Figure 2* and *Figure 5*).
18. Ensure the inside of the relief body is clear of debris (*Figure 2* and *Figure 5*).
19. Thread the adjustment screw into the relief body until the point of the adjustment screw can be seen inside the relief body (*Figure 2* and *Figure 5*).

Do not thread the adjustment screw all the way into the relief body. The point of the adjustment screw will help the spring guide seat properly when placed inside the relief body.

20. Insert one (1) spring guide into the relief body with the divot facing down (*Figure 2* and *Figure 5*). Ensure the divot is resting on top of the adjustment screw point.
21. Place the spring on top of the spring guide (*Figure 2* and *Figure 5*).
22. Insert the remaining spring guide on top of the spring (*Figure 2* and *Figure 5*). Ensure the divot is facing up.
23. Place the poppet / poppet cap assembly on top of the spring guide (*Figure 2* and *Figure 5*). Ensure the point sits inside the spring guide divot.
24. Screw the relief nozzle into the relief body (*Figure 2* and *Figure 5*).
25. The RV-110V is now ready to be reset and reinstalled. See *Section 2.3, Setting, Testing, and Installing the RV-110V*, for instructions on setting, testing, and installing the RV-110V.

3.4 Troubleshooting

Table 5: Model RV-110A and RV-110V Troubleshooting		
Issues	**Possible Causes**	**Solutions**
The relief valve does not open and relieve at set pressure.	The relief valve may be jammed from sitting in service for too long.	Yearly calibration and maintenance are required for the relief valve. Welker recommends sending the relief valve to the factory for calibration and/or repairs. **NOTE:** The relief valve has a 2% deviation from the set pressure point. For example, if the relief valve has a set pressure at 100 psig, the set pressure may deviate up to 102 psig.
The relief valve does not close or reseat.	Debris may have entered the relief valve and compromised the seal.	Examine the seal for debris. Replace as necessary. See *Section 3.2, Maintenance: RV-110A*, or *Section 3.3, Maintenance: RV-110V*, for instructions on replacing the seal. **NOTE:** Welker recommends installing a filter upstream of any system in which the relief valve is installed. This will stop debris from entering the relief valve and compromising the seal.

APPENDIX A: REFERENCED OR ATTACHED DOCUMENTS

Welker *Installation, Operation, and Maintenance* (IOM) *Manuals* suggested for use with this unit:

- None

Other *Installation, Operation, and Maintenance* (IOM) *Manuals* suggested for use with this unit:

- None

Welker drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD933AA (RV-110A)
- Assembly Drawing: AD934AA (RV-110V)

NOTES

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