INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
WELKER® PROBE REGULATOR

MODELS
IRD-1
IRD-2
IRD-4
IRD-6

DRAWING NUMBERS
AD025B0
AD081BA
AD170B0
AD260C0

MANUAL NUMBER
IOM-070

REVISION
Rev. G, 09/02/2015

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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, if not observed, could result in damage to equipment.

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

This manual is intended to be used as a basic installation and operation guide for the Welker® Probe Regulators, IRD-1, IRD-2, IRD-4, and IRD-6. For comprehensive instructions, please refer to the IOM Manuals for each individual component. A list of relevant component IOM Manuals is provided in the Appendix section 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 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 Probe Regulator 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 Probe Regulator, 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 product becomes that of the purchaser at the time of receipt. Reading the applicable *Installation, Operation, and Maintenance* (IOM) *Manual* 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® *IRD-1*, *IRD-2, IRD-4,* and *IRD-6* Probe Regulators are designed to provide an output pressure adequate for downstream instrumentation. The sample stream is regulated at the probe tip to minimize line pack and sample retention, allowing the regulated sample stream to reach the analyzer more quickly. The thermal fins mitigate the cooling brought on by the Joule-Thomson effect.

Welker may custom design the IRD-1, IRD-2, IRD-4, and IRD-6 to suit the particular application and specifications of each customer.

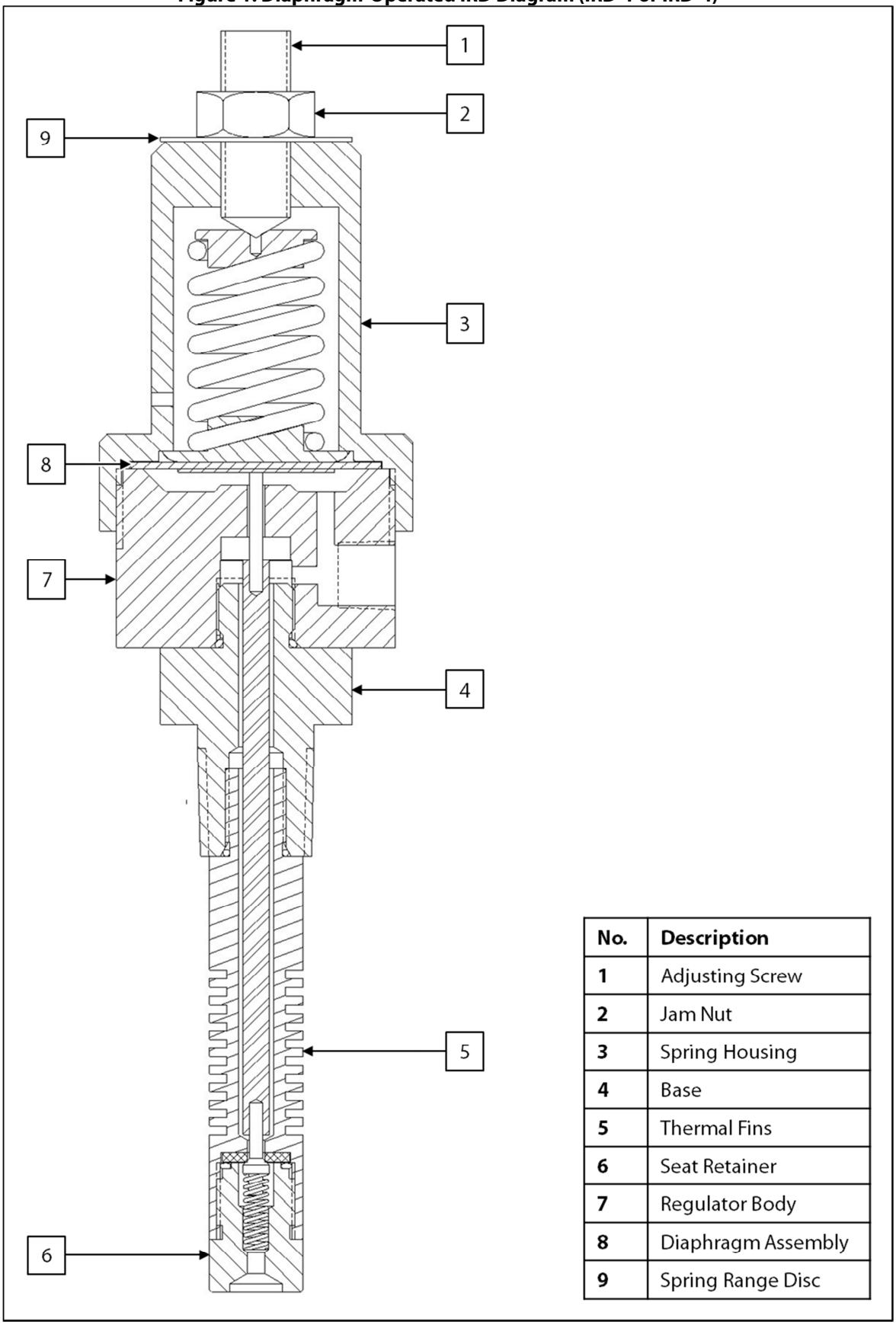
1.3 Specifications

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

Table 1: IRD Specifications	
Products	Natural Gas and Other Gases and Liquids Compatible With the Materials of Construction
Materials of Construction	316/316L Stainless Steel, PTFE, and Viton® Others Available
Maximum Allowable Operating Pressure	**IRD-1, IRD-2, and IRD-6:** 5000 psig @ -20 °F to 100 °F (*344 barg @ -28 °C to 37 °C*) **IRD-4:** 3600 psig @ -20 °F to 100 °F (*248 barg @ -28 °C to 37 °C*)
Connections	**Outlet:** 1/4" FNPT **Pipeline:** 1/2", 3/4", 1", or 2" MNPT
Output Range	**IRD-1:** 75-200 psig (*5-13 barg*) **IRD-2:** 100-500 psig (*6-34 barg*) **IRD-4:** 0-25 psig (*0-1.7 barg*); 0-50 psig (*0-3.4 barg*); 20-100 psig (*1.3-6 barg*); or 75-200 psig (*5-13 barg*) **IRD-6:** 250-1500 psig (*17-103 barg*)
Insertion Length	2.2" Standard for 2" and 3" Pipe 3.6" Standard for 4" and 6" Pipe 5.9" Standard for 8", 10", and 12" Pipe Others Available
Flow Coefficient (C_v)	**IRD-1, IRD-2, and IRD-6:** 0.092 **IRD-4:** 0.138
Operation	**IRD-1 and IRD-4:** Diaphragm-Operated **IRD-1, IRD-2, and IRD-6:** Piston-Operated
Options	Extreme Service Tip High-Flow Insulation Blanket Pre-Set Regulator Pre-Set Relief Valve Pressure Gauge Relief Valve CE Compliance CRN Certification

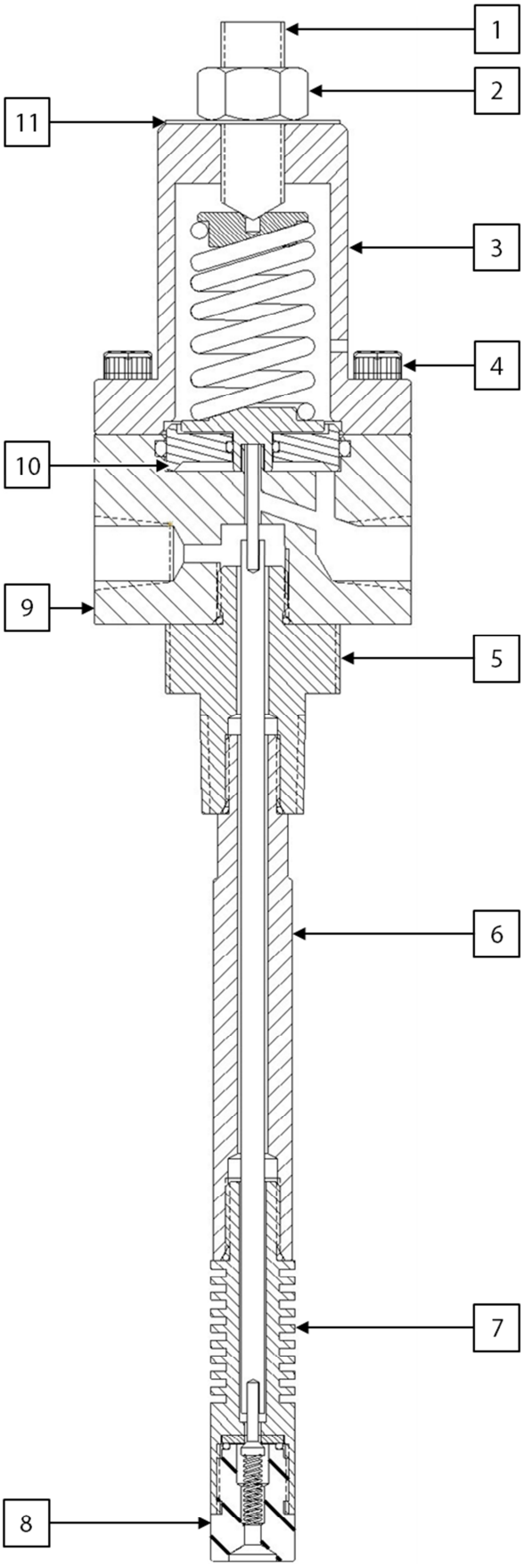
1.4 System Diagrams

Figure 1: Diaphragm-Operated IRD Diagram (IRD-1 or IRD-4)



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Housing
4	Base
5	Thermal Fins
6	Seat Retainer
7	Regulator Body
8	Diaphragm Assembly
9	Spring Range Disc

Figure 2: Piston-Operated IRD With Shaft Extension Diagram (IRD-1, IRD-2, or IRD-6)



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Housing
4	Cap Screw (Qty. 8)
5	Base
6	Outer Shaft Extension
7	Thermal Fins
8	Seat Retainer
9	Regulator Body
10	Piston Assembly
11	Spring Range Disc

2.1 Before You Begin

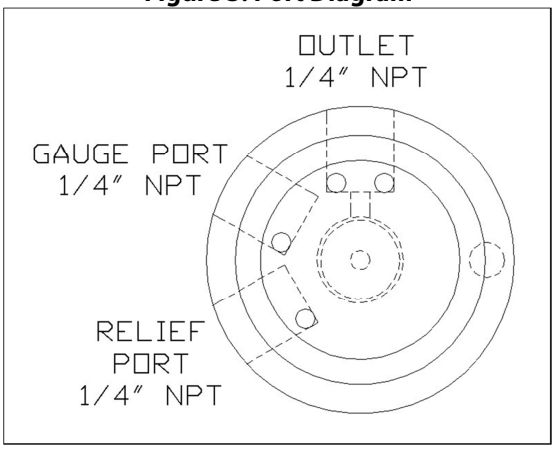
After unpacking the unit, check the equipment for compliance and any damage that may have occurred during shipment. Immediately contact a Welker® representative if you received damaged equipment.

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

2.2 Installation

1. As necessary, install a pressure gauge to the gauge port (*Figure* 3).

Figure 3: Port Diagram



Welker can install a relief valve and pressure gauge if requested at the time of order.

2. Use a safe auxiliary gas supply to set the relief valve to the proper pressure. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief valve for instructions on setting the relief.

If a Welker® Relief Valve is used, Welker can set the relief valve prior to shipment if requested at the time of order.

3. Install the set relief valve to the relief valve port (*Figure 3*).
4. Depressurize the pipeline.

The pipeline must be depressurized prior to installing and removing the unit.

5. Install the IRD to the pipeline.
6. Install customer-supplied 1/4" tubing or other fittings to the outlet port on the IRD (*Figure 3*).
7. Close any valves connected to the IRD.

8. In a counterclockwise direction, back off the adjusting screw on the regulator subassembly so that the unit is closed (i.e., no setting or tension on the spring) (*Figure 1 or 2*).
9. Pressurize the pipeline.
10. Check for leaks and repair as necessary.

2.3 Setting the Regulator

1. Ensure that the pipeline is pressurized. The pressure gauge on the IRD should read 0 psig.
2. Loosen or tighten the adjusting screw until the IRD pressure gauge reads the desired outlet pressure (*Figure 1 or 2*).
3. Tighten the jam nut on the adjusting screw to secure the adjusting screw at the desired outlet pressure (*Figure 1 or 2*).
4. The IRD is now operational.

SECTION 3: MAINTENANCE

3.1 Before You Begin

1. **Welker recommends that the unit have standard yearly maintenance under normal operating conditions.** In cases of severe service, dirty conditions, excessive usage, or other unique applications that may lead to excess wear on the unit, a more frequent maintenance schedule may be appropriate.
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. This eases the installation of the seals and reduces the risk of damage when positioning them on parts. Welker recommends non-hydrocarbon-based lubricants, such as Krytox®, for use with all sample cylinder seals and silicone-based lubricants, such as Molykote® 111, for use with seals not exposed to the sample product.

Wipe excess lubricant from the seals, as it may adversely affect analytical instrument results.

After the seals are installed, the outer diameter of shafts and inner diameter of cylinders may be lubricated to allow smooth transition of parts.

3. All maintenance and cleaning of the unit should be performed on a smooth, clean surface.

3.2 Maintenance

1. Depressurize the pipeline.

The pipeline must be depressurized prior to installing and removing the unit.

2. Disconnect the customer-supplied tubing or other fittings from the outlet port on the IRD (*Figure 3*).
3. Remove the IRD from the pipeline.

Regulator Maintenance

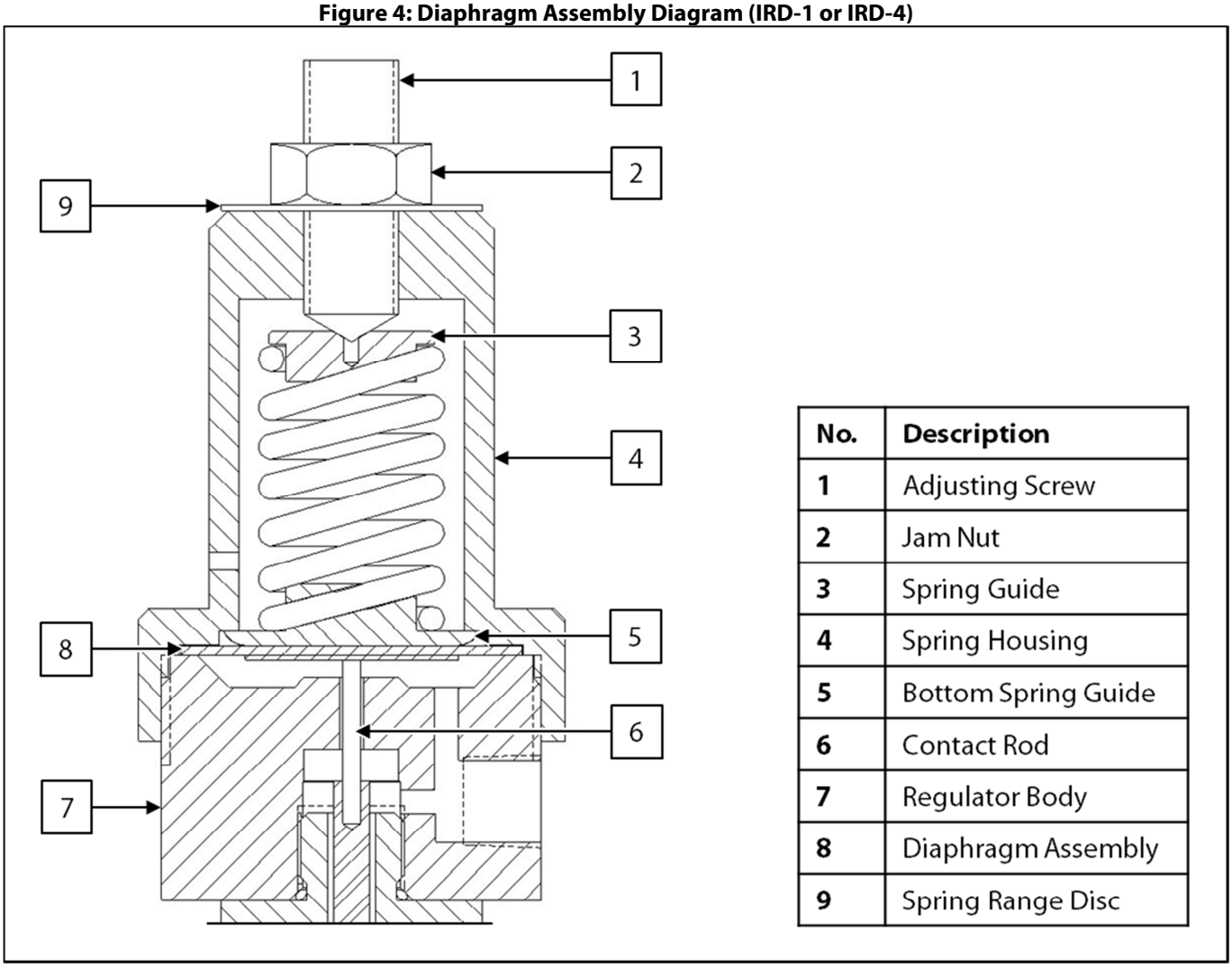
Maintenance should not be performed on the regulator until the regulator has been isolated from all pressure.

4. Loosen the jam nut on the adjusting screw (*Figure 1 or 2*).
5. In a counterclockwise direction, back off the adjusting screw to relieve tension on the spring.
6. As necessary, perform maintenance on the relief valve. Refer to the *Installation, Operation, and Maintenance* (IOM) *Manual* for the relief valve for maintenance instructions.
7. If the IRD has a diaphragm assembly, continue to step 8. If the IRD has a piston assembly, proceed to step 17.

If the regulator assembly is screwed together, it has a diaphragm assembly.
If the regulator assembly is bolted together, it has a piston assembly.

Diaphragm Assembly

Figure 4: Diaphragm Assembly Diagram (IRD-1 or IRD-4)



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring Housing
5	Bottom Spring Guide
6	Contact Rod
7	Regulator Body
8	Diaphragm Assembly
9	Spring Range Disc

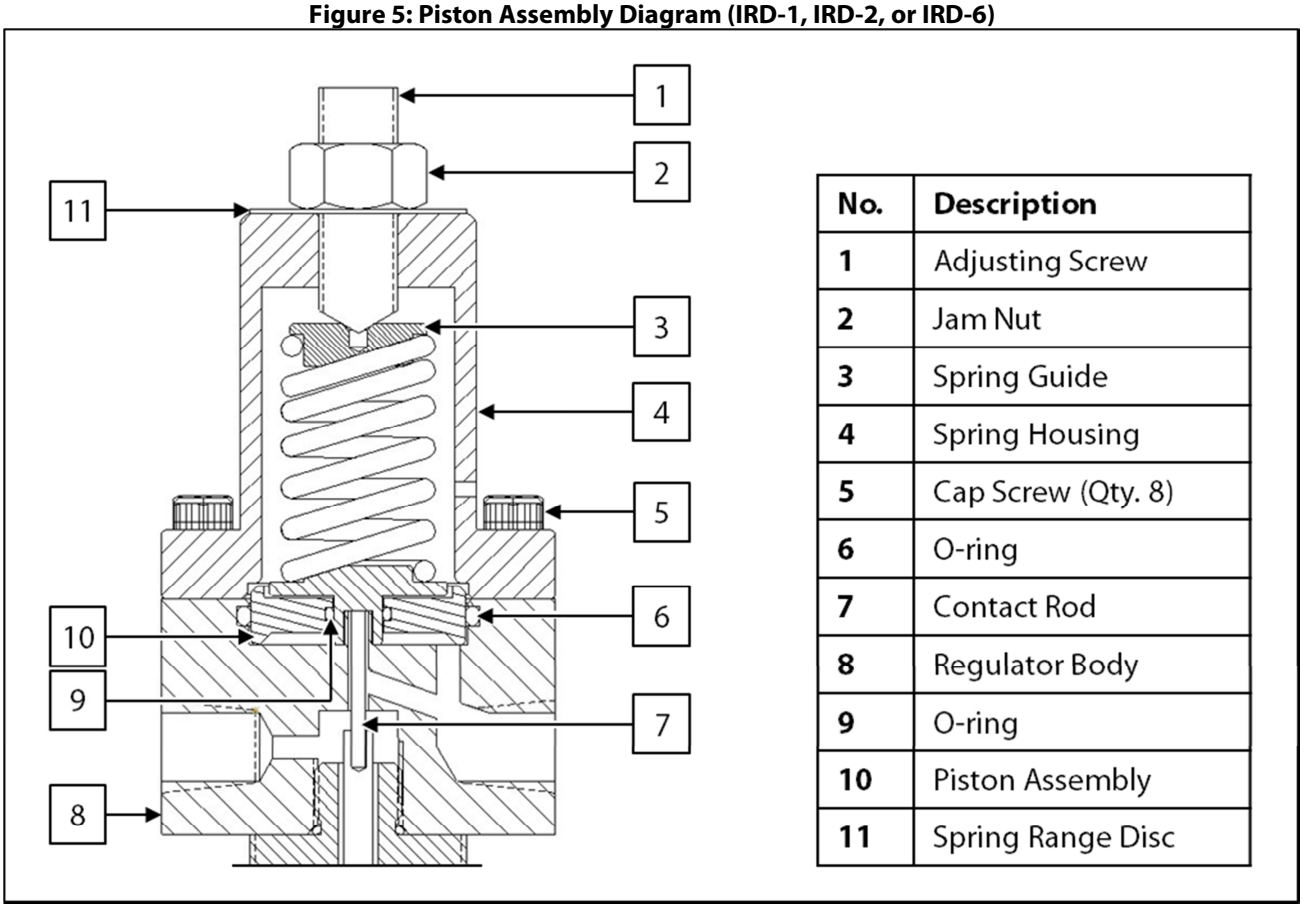
8. Unscrew the spring housing from the regulator body.
9. Remove the spring guides and spring.
10. Remove the diaphragm assembly.
11. Inspect the diaphragm for wear. Replace as necessary.
12. Place the diaphragm assembly on the top of the regulator body with the bottom spring guide facing up.
13. Place the spring on the diaphragm assembly. Ensure that the spring is sitting on the bottom spring guide.
14. Return the spring guide to the top of the spring.
15. Install the spring housing to the regulator body.

When reassembling the upper housing, HAND-TIGHTEN ONLY.

16. Proceed to step 29.

Piston Assembly

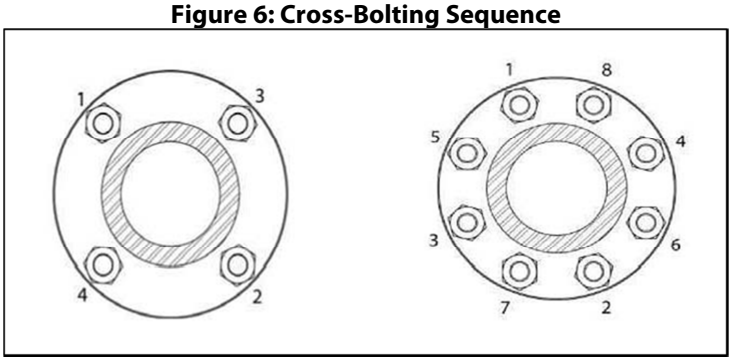
Figure 5: Piston Assembly Diagram (IRD-1, IRD-2, or IRD-6)



No.	Description
1	Adjusting Screw
2	Jam Nut
3	Spring Guide
4	Spring Housing
5	Cap Screw (Qty. 8)
6	O-ring
7	Contact Rod
8	Regulator Body
9	O-ring
10	Piston Assembly
11	Spring Range Disc

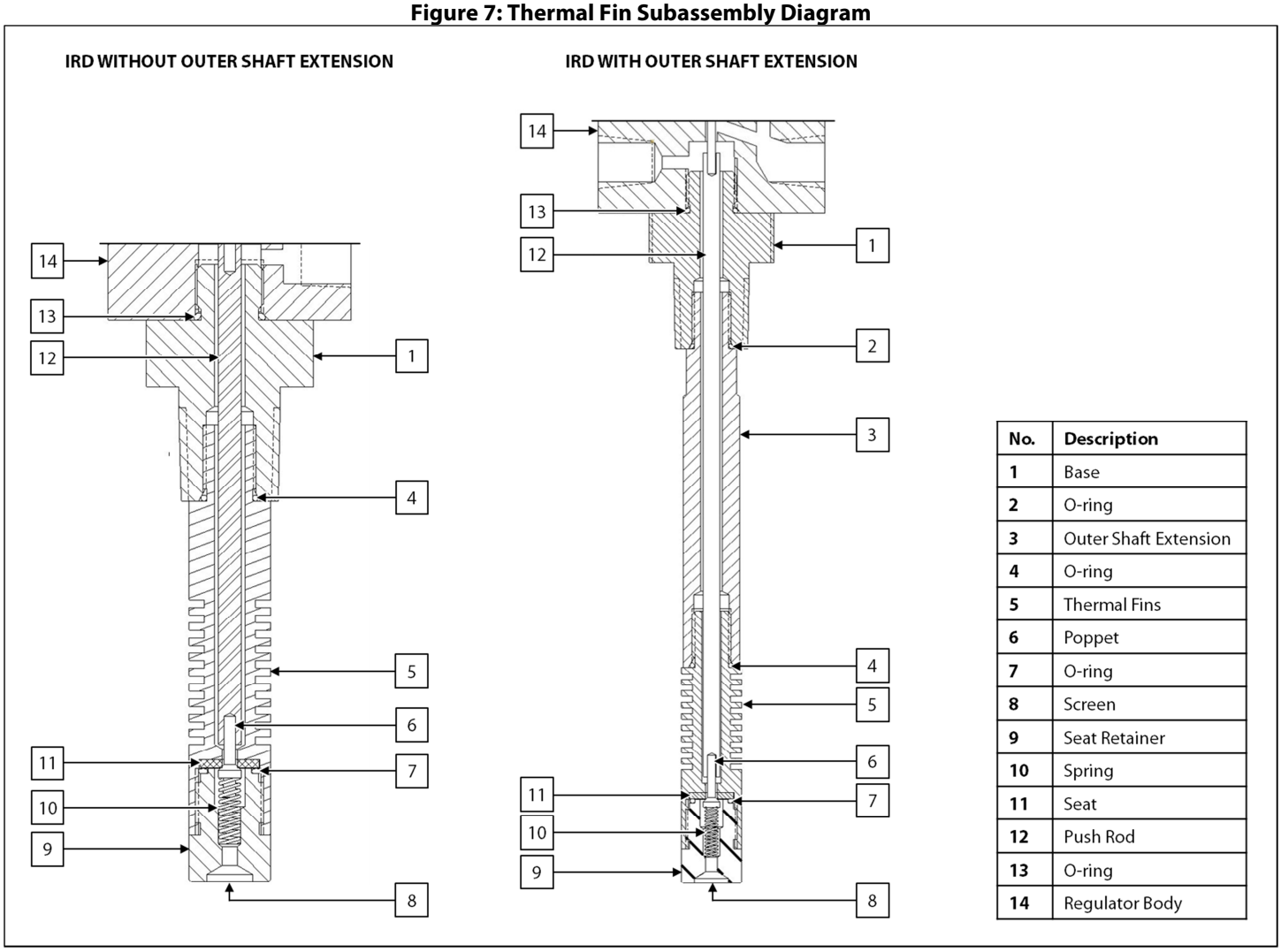
17. Unscrew the cap screws from the spring housing.
18. Separate the spring housing from the regulator body.
19. Remove the spring guides and spring.
20. Remove the piston assembly.
21. Replace the O-ring in the piston assembly.
22. Replace the O-ring in the regulator body.
23. Inspect the sealing surfaces of the piston assembly for scratches. Replace as necessary.
24. Return the piston assembly to the regulator body and gently push into place.
25. Place the spring on the piston. Ensure that the spring is sitting on the bottom spring guide.
26. Return the spring guide to the top of the spring.
27. Install the spring housing to the regulator body.
28. Following a cross-bolting sequence, install and tighten the cap screws to secure the spring housing to the regulator body (*Figure 6*).

Figure 6: Cross-Bolting Sequence



Thermal Fin Subassembly Maintenance

Figure 7: Thermal Fin Subassembly Diagram



No.	Description
1	Base
2	O-ring
3	Outer Shaft Extension
4	O-ring
5	Thermal Fins
6	Poppet
7	O-ring
8	Screen
9	Seat Retainer
10	Spring
11	Seat
12	Push Rod
13	O-ring
14	Regulator Body

29. While holding the thermal fin subassembly with a crescent wrench, use a second crescent wrench to unscrew the seat retainer.
30. Remove the spring and poppet.
31. Examine the seating face of the poppet for scratches or damage. Replace as necessary.

> ⚠ Debris or scratches on the poppet will prevent positive shutoff of the regulator.

32. Use a small, pointed instrument to carefully remove the seat from the thermal fin subassembly.
33. Inspect the seat for debris or scratches. Replace as necessary.

> ⚠ Debris or scratches on the seat will prevent positive shutoff of the regulator.

34. Replace the O-ring on the seat retainer.

35. Use solvent to clean the screen in the seat retainer.

Welker recommends using a solvent that does not leave a film when dry and will not adversely affect analytical instrument results, such as rubbing alcohol.

36. Install the seat to the thermal fin subassembly.
37. Guide the poppet into the seat.
38. Return the spring to the poppet.
39. Return the seat retainer to the thermal fin subassembly and tighten firmly.
40. If the IRD has a shaft extension, hold the shaft extension with a crescent wrench and use a second crescent wrench to unscrew the base from the shaft extension.
41. If the IRD has a shaft extension, replace the O-ring on the shaft extension.
42. Unscrew the thermal fin subassembly from the base or shaft extension. When the thermal fin subassembly is removed, the contact rod and push rod should easily slide out. As necessary, gently tilt the unit back and forth until both pieces slide out, taking care not to misplace the small contact rod.
43. Replace the O-ring on the thermal fin subassembly.
44. Unscrew the base from the regulator body.
45. Replace the O-ring on the base.
46. Screw the base into the regulator body.
47. If the IRD has a shaft extension, screw the thermal fin subassembly into the shaft extension.
48. Carefully slide the push rod into the thermal fin subassembly until it slips onto the poppet. If the IRD has a shaft extension, the push rod must slide through the shaft extension until it reaches the thermal fin subassembly.

The push rod should fit easily over the poppet and should not stack on top of it. The IRD will not be able to be reassembled correctly if the push rod is stacked on top of the poppet.

49. Insert the contact rod into the push rod.
50. Install the regulator subassembly to the thermal fin subassembly or to the top of the shaft extension. The unit should screw on easily.

If the unit does not screw on easily, loosen the unit slightly, and then gently move the unit back and forth until the contact rod slips into the regulator body hole.

51. The IRD is now ready for installation. See *Section 2.2, Installation,* for instructions on installing the IRD.

APPENDIX

Referenced or Attached Documents

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

- IOM-033: Welker® RV-1, RV-2, RV-2CP, and RV-3 Relief Valves
- IOM-073: Welker® CV-1 Check Valve
- IOM-105: Welker® NV-1 and NV-2 Instrument Valves

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

- Generant Series VRV Vent Relief Valve (Welker® IOM-V175)
- Swagelok® O, 1, 18, 20, and 26 Series Integral-Bonnet Needle Valves (Welker® IOM-V136)
- Swagelok® R Series Proportional Relief Valves (Welker® IOM-V086)
- WIKA Type 232.53 and Type 233.53 Bourdon Tube Pressure Gauges (Welker® IOM-V171)

Welker® drawings and schematics suggested for use with this unit:

- Assembly Drawing: AD025BO (IRD-1; Diaphragm-Operated)
- Assembly Drawing: AD081BA (IRD-2)
- Assembly Drawing: AD170BO (IRD-4)
- Assembly Drawing: AD260CO (IRD-6)

NOTES

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

welker.com