WOODWARD

Component Maintenance Manual
Bronze Level

Product Name: CPC-II

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General Precautions

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment.

Practice all plant and safety instructions and precautions.

Failure to follow instructions can cause personal injury and/or property damage.

Revisions

This publication may have been revised or updated since this copy was produced. To verify that you have the latest revision, check manual *26455*, *Customer Publication Cross Reference and Revision Status & Distribution Restrictions*, on the *publications page* of the Woodward website:

www.woodward.com/publications

The latest version of most publications is available on the *publications page*. If your publication is not there, please contact your customer service representative to get the latest copy.

Proper Use

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty, thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

1. GENERAL INFORMATION

INTRODUCTION

This Component Maintenance Manual is intended to be used by customers and Woodward authorized service centers for repair or service of the CPC-II.

Bronze level service is preventative and routine maintenance that requires little to no specialized tooling, testing, or calibration procedures to maintain product between normal overhaul intervals. The manual is written with the assumption that the reader has access to the product manual and other Woodward documents referenced within this document.

1.1 Regulatory Compliance

The CPC-II is subject to safety regulatory certifications. See product manual 26488 for additional details. The service center performing the work on the CPC-II must not alter the construction such that the certifications are invalidated.

⚠WARNING

Disassembly of product will require handling of critical components used in a Zone 1 flameproof and/or Division 1 explosion proof design. Special care must be taken as to not damage these parts as it could compromise the method of protection for the product. Flamepaths are identified in drawing 9989-7001.

FLAMEPATH

Threaded Flamepaths: Care must be taken during handling and assembly to not damage threads. Inspect for damage to threads, which includes but is not limited to, galling, cross threading, and excessive wear. Damage to threads and/or thread fit can compromise the effectiveness of the method of protection. If any damage is discovered, contact Woodward prior to reinstallation or assembly into system.

Radial and Flat Joint Flamepaths: Care must be taken during handling and assembly to not damage the flat surface of the flamepath. Inspect primary surface and mating surface for damage, including but not limited to, scratches, porosity, and marks due to impact. Damage to these surfaces can compromise the effectiveness of the method of protection. If any damage is discovered, contact Woodward prior to reinstallation or assembly into system.

Repair of Flamepaths: The flameproof joints are not intended to be repaired. Return to Woodward for repair and maintenance if joints are damaged.

⚠WARNING

Explosion Hazard —Do not connect or disconnect while circuit is live unless area is known to be non-hazardous.

Substitution of components may impair suitability for Class I, Division 1 or 2, or Zone 2 applications.

1.2 Warnings and Notices

Important Definitions

This is the safety alert symbol used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

- **DANGER** - Indicates a hazardous situation, which if not avoided, will result in death or serious injury.
- **WARNING** - Indicates a hazardous situation, which if not avoided, could result in death or serious injury.
- **CAUTION** - Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
- **NOTICE** - Indicates a hazard that could result in property damage only (including damage to the control).
- **IMPORTANT** - Designates an operating tip or maintenance suggestion.

⚠WARNING

Personal Protective Equipment

The products described in this publication may present risks that could lead to personal injury, loss of life, or property damage. Always wear the appropriate personal protective equipment (PPE) for the job at hand. Equipment that should be considered includes, but is not limited to:

- **Eye Protection**
- **Hearing Protection**
- **Hard Hat**
- **Gloves**
- **Safety Boots**
- **Respirator**

Always read the proper Material Safety Data Sheet (MSDS) for any working fluid(s) and comply with recommended safety equipment.

⚠WARNING

Disconnect Power Supply

Before performing maintenance, always disconnect power and any hazardous voltages that may be connected. Follow all appropriate lockout/lockdown procedures.

⚠WARNING

Hazards due to insufficiently qualified personnel!

If unqualified personnel perform work on or with the control of unit, hazards may arise which can cause serious injury and substantial damage to property. Therefore, all work must be carried out by appropriately qualified personnel.

⚠WARNING

Remove pressure before servicing. Failure to do so may damage the CPC-II and/or cause injury.

1.3 Electrostatic Discharge Awareness

NOTICE

Electrostatic Precautions

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

To prevent damage to electronic components caused by improper handling, read and observe the precautions in Woodward manual *82715*, *Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, and Modules*.

Follow these precautions when working with or near the control:

1. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible, as these do not store static electric charges as much as synthetics.
2. Do not remove the printed circuit board (PCB) from the control cabinet unless absolutely necessary. If you must remove the PCB from the control cabinet, follow these precautions:
   - Do not touch any part of the PCB except the edges.
   - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
   - When replacing a PCB, keep the new PCB in the plastic antistatic protective bag it comes in until you are ready to install it. After removing the old PCB from the control cabinet, immediately place it in the antistatic protective bag.

1.4 List of Woodward Literature

Required Documents	
Product Manual **26615** –	CPC-II Current-to-Pressure Converter with Enhanced Dynamics
Installation Drawing **9999-1728-1** -	Kit, CPC-II, Pressure Transducer
Installation Drawing **9999-1728-6** -	Kit, CPC-II, Spring
Drawing **9989-7001** -	Flamepath Drawing
Reference Documents	
Manual **26455** –	Customer Publication Cross Reference and Revision Status & Distribution Restrictions
Product Manual **26758** –	CPC-DX Current to Pressure Converter Dual Transfer Skid
CPC-II Unit replacement Procedure **26824** –	CPC-DX Current to Pressure Converter Dual Transfer Skid, CPC-II Unit replacement procedure
Manual **82715** –	Guide for Handling and Protection of Electronic Controls, Printed Circuit Boards, & Modules

Woodward software-download section website (www.woodward.com/searchpublications).

If unable to access Woodward documentation, refer to contact list at the end of this manual.

1.5 List of Required Hardware or Materials

Special Tool(s)	• 8923-2376 - KIT - CPC II, TOOLS FOR CUSTOMER'S REPLACEMENT
Torque Wrenches	• Torque wrench (capable of 100 in-lbs)
Torque Screwdriver(s)	• 35 – 39 in-lbs (3.9 - 4.4 Nm) Type: slotted; Tip Size: .250 in
Basic Tools/Lubricants	• Screwdriver; Type: slotted; Tip Size: .250 in • Screwdriver; Type: slotted; Tip Size: .079 in • Steel bar (approx. 8 X 50 mm, 1 meter long (3/8 x 2 inch; 3.3 ft. long) • O-ring pick • Diagonal cutting pliers • Oil absorbent pads/mats • Lifting strap (minimum capacity 100 lbs / 50 kg) • Isopropanol cleaning fluid • GN paste (Molykote DX Paste or similar) • Dry lubricant MS-143-H (optional) • Petroleum jelly for O-ring lubrication • PC computer with Woodward PC Service Tool installed
Measuring Equipment	• Pressure gauge (range from 0 to 30 bar)

NOTICE

Tools are not contained within the replacement kit. Please order separately.

1.6 Woodward Required Software

9927-1885 – CPC-II PC Service Tool

Woodward website (www.woodward.com/software)

1.7 General Instructions

- Review the CMM and installation drawing before starting the replacement to be sure that all necessary tools are available and instructions are clear.
- Check the replacement parts kit to verify all replacement parts listed in the installation drawing are present. For questions, contact Woodward.
- Sort all parts for easy assembly.
- If not all parts are used, the unit or units must be inspected for completeness.
- Contact Woodward if an error is found during the replacement process.
- Clean the exterior of the CPC-II by hand prior to disassembly to prevent dirt and debris from contaminating the interior.
- O-rings:
    - Use the correct tool to install or remove O-rings. If using a protective cone on small O-rings, lubricate the O-ring and slide it onto the part being sure it does not twist.
    - If a cone is not used on large O-rings, use a pick under the O-ring to lift it onto the part until it is in the desired location.
- Retaining rings:
    - During installation, be careful not to over-extend or over-compress a retaining ring. All retaining rings should be installed with the sharp edge away from the pressure. Inspect all installed retaining rings to be sure they have been properly seated, fit snugly, and do not rotate freely on the parts they are installed on or in.
- Helicoils:
    - To prevent damage to mid-grip helicoils, install screws at a slow speed. DO NOT USE A HIGH-SPEED TOOL. Stainless steel screws MUST be lubricated with an anti-seize lubricant before turning them into mid-grip helicoils or aluminum parts.
- Disassembly:
    - Parts that have been disassembled and will be reused must be inspected closely for damage and replaced if necessary. Parts that have been disassembled should be kept in a clean container such that they can be readily identified against this procedure, reference drawings, or visual aids for proper reassembly.
- Screws:
    - All screws loosen with counterclockwise direction. In other situations, the direction will be specified.

2. PRESSURE TRANSDUCER REPLACEMENT

2.1 Replacement Kit Description

The purpose of this procedure is to show the correct sequence and method of pressure transducer replacement. Verify pressure value on nameplate to ensure proper kit is used.

- CPC-II Model - 10 bar, Replacement Kit: 8935-1205-10
- CPC-II Model - 25 bar, Replacement Kit: 8935-1205-25

2.2 Disassembly Procedure

NOTICE

Before starting any disassembly, connect to the CPC-II using the PC Service Tool. Download and save a .wset file from the service unit. Store the settings file on the PC in a place where you can find it for later use.

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A. Remove Cover Retention Clamp.

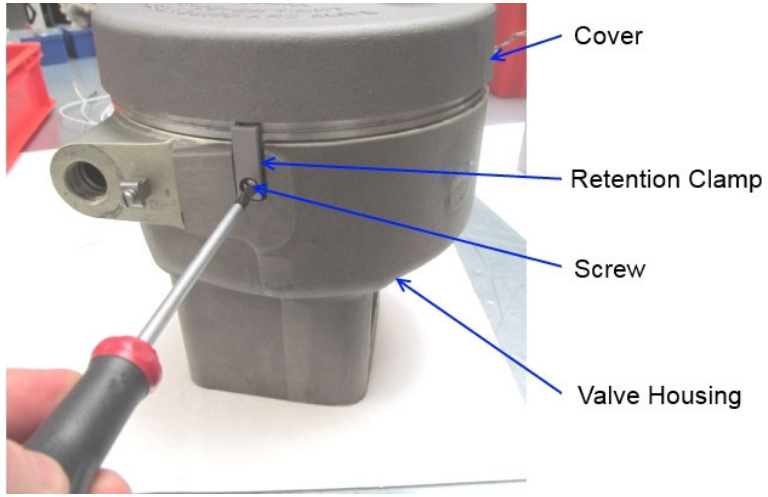


Figure 2-1. External Components – Retention Clamp

B. Remove cover (in case of difficulties, place the steel bar (1 m long) between the two cover lugs).

⚠WARNING

THREADED FLAMEPATH

Refer to Section 1.1 for specific instructions.

C. Remove old O-ring from valve housing.

Figure 2-2. Cover and Valve Housing O-ring

D. Cut wire tie to free transducer wiring bundles.

E. Disconnect the three transducer wires from the terminal block on the PC board using slotted screwdriver (screwdriver size .079 in).

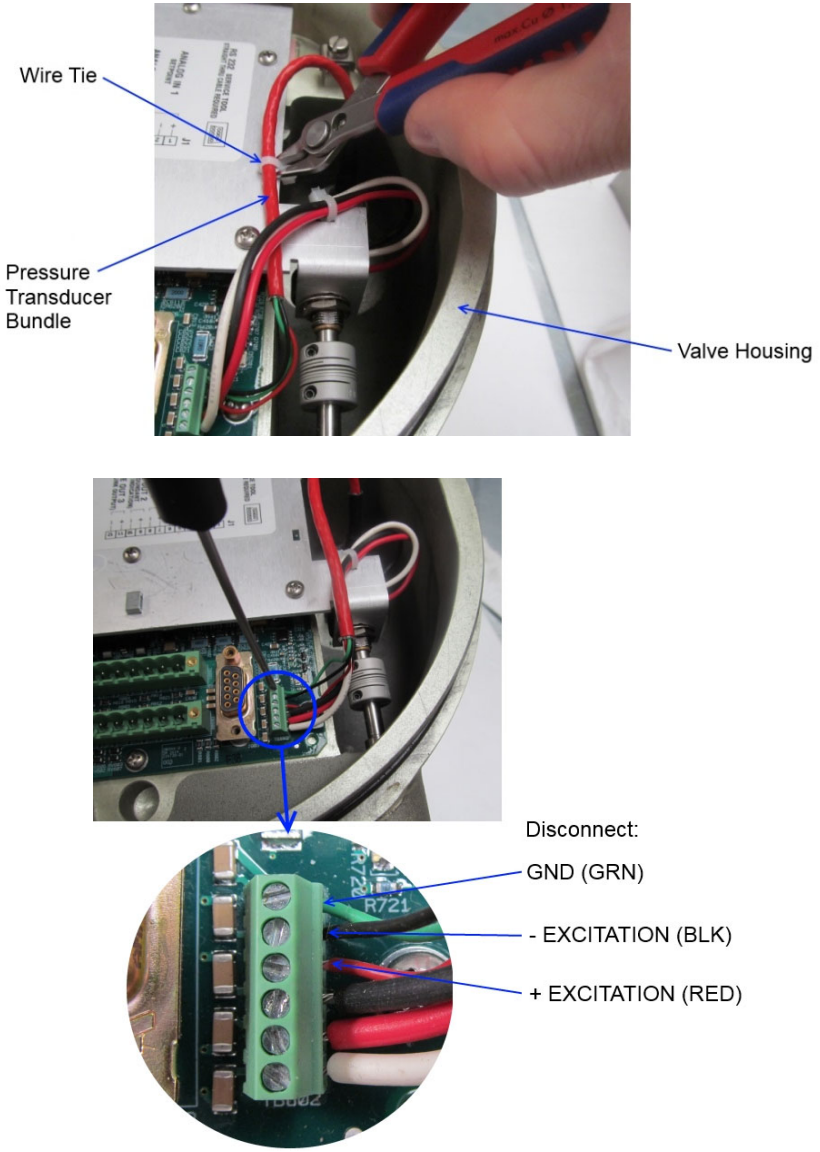


Figure 2-3. Wire Tie and Transducer Wires Location

F. Remove pressure transducer (use tool 1012-6806).

G. Clean machined sealing surfaces using isopropanol cleaning fluid.

H. Visually inspect all surfaces. Ensure there is no damage to sealing surfaces, hydraulic fluid contamination, or corrosion that is not easily removed with 30 Micron lapping film or chemical cleaning. Inspect all threads for damage or galling.

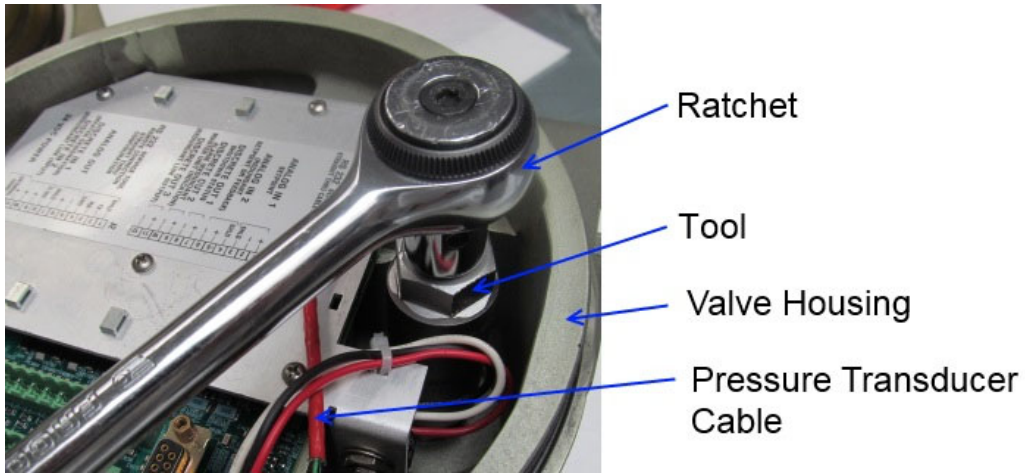


Figure 2-4. Tool Setup and Pressure Transducer Location

2.3 Assembly Procedure

A. Check the replacement parts kit to verify all replacement parts listed in the installation drawing are present.
B. Lubricate O-ring with petroleum jelly and install on pressure transducer.
C. Apply GN paste to the threads of pressure transducer.
D. Install pressure transducer into the valve housing with tool 1012-6806 and torque transducer to 80 ±8.0 lb-inches.

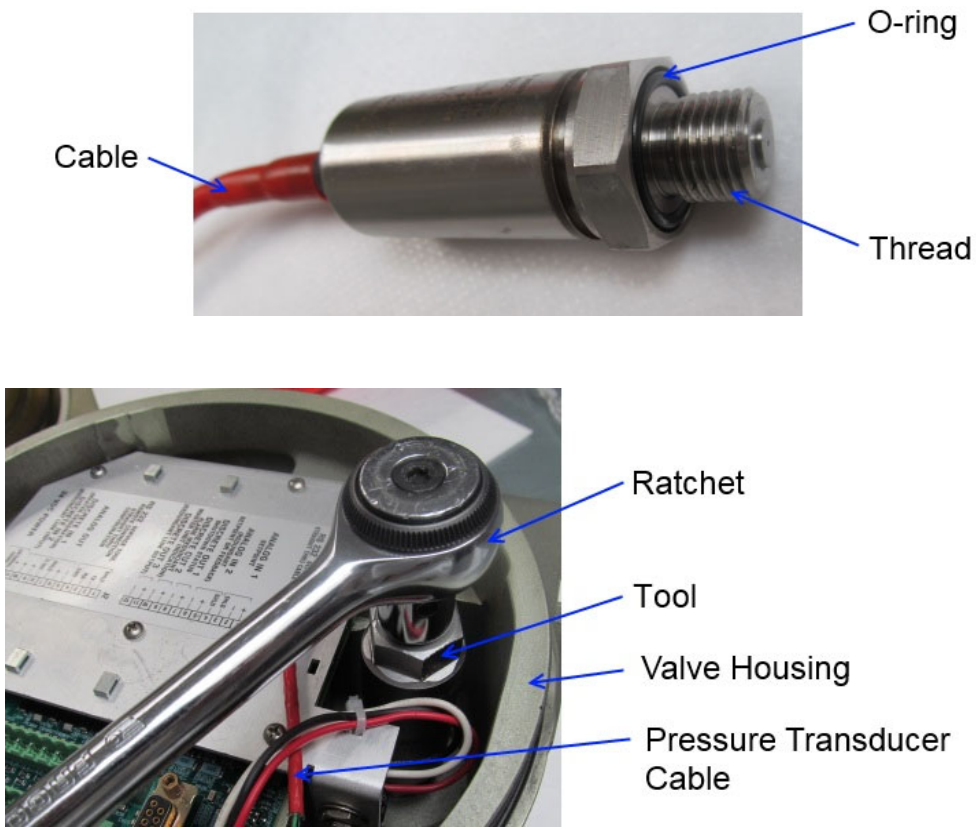


Figure 2-5. Prepare and Install Pressure Transducer

E. Cut shield wire down to the insulation on the pressure transducer. Trim red, black, and green wires to have 1/4 inch (6mm) of wire exposed.

F. Terminate the three wires of the pressure transducer to the wire terminal block of the PC board as shown in picture. Perform wire pull test to ensure proper installation of cables.

NOTICE

Do not over tighten screws on wire terminals. Doing so may result in permanent damage.

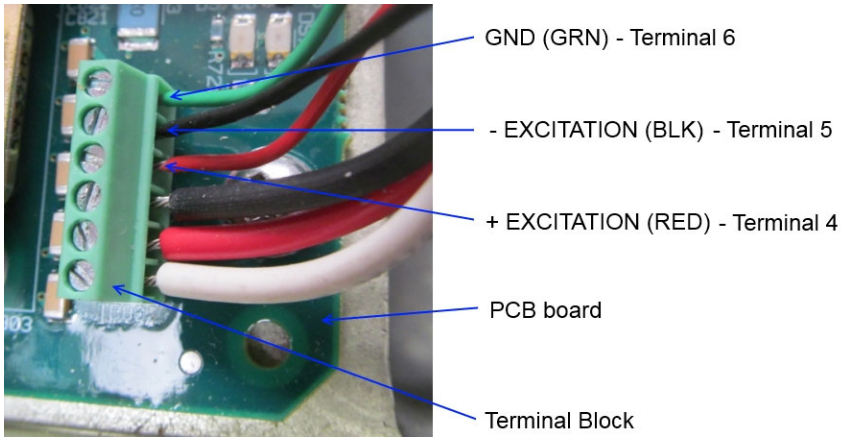


Figure 2-6. Properly Installed Transducer Wires in Terminal Block of PC Board

G. Install new wire tie on PCB cover to secure pressure transducer cable.

Note: An extra wire tie is included in the parts kit.

⚠WARNING

THREADED FLAMEPATH

Refer to Section 1.1 for specific instructions.

H. Lubricate new cover O-ring with petroleum jelly and install onto the housing.

I. Apply GN paste (or MS-143H if available) to the threads of the valve housing cover. Install cover by rotating clockwise and hand tighten to snug only by placing a 1-meter bar between the two cover lugs as shown in the picture below. Cover should tighten almost completely by hand with no tools.

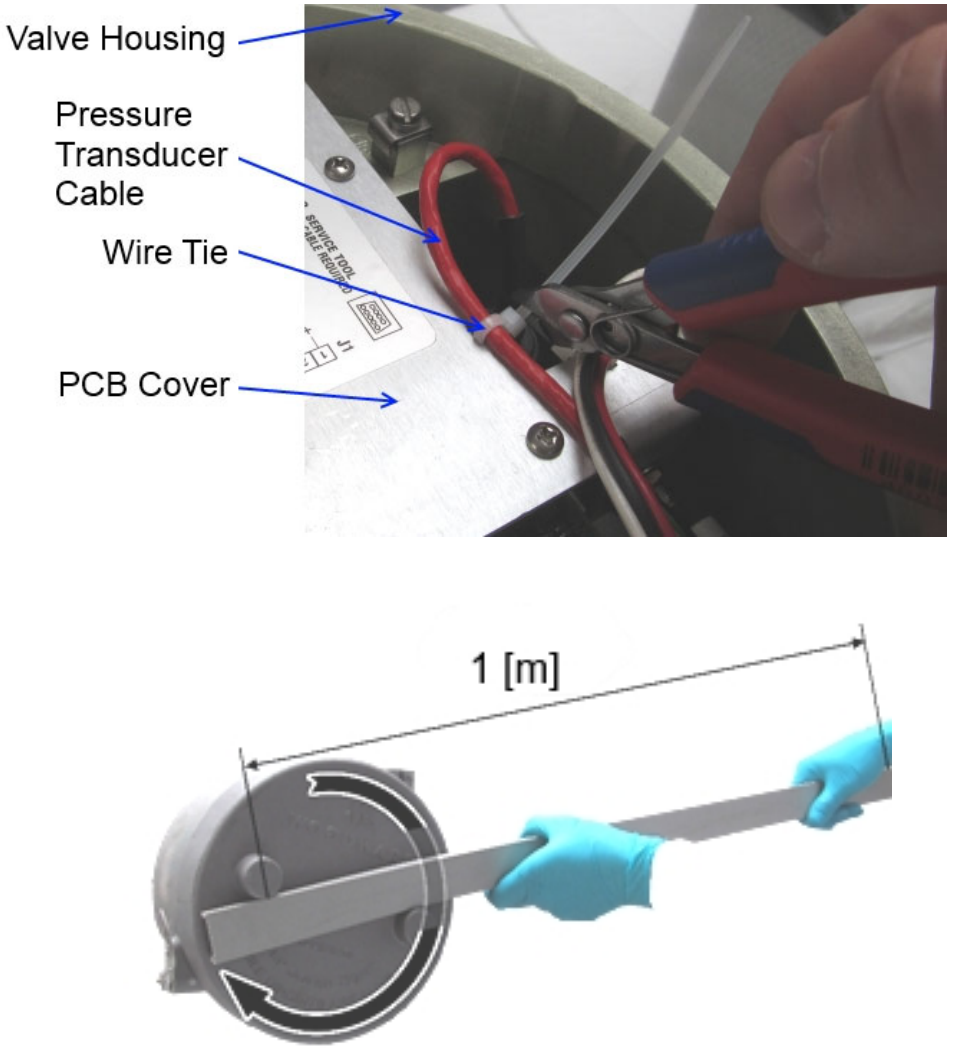


Figure 2-7. PCB Wire Tie and Valve Housing Cover Installation

J. Apply GN paste to the threads of the screw and secure the clamp by installing the screw through clamp into valve housing. Torque the screw to 37 ±2 lb-inches.

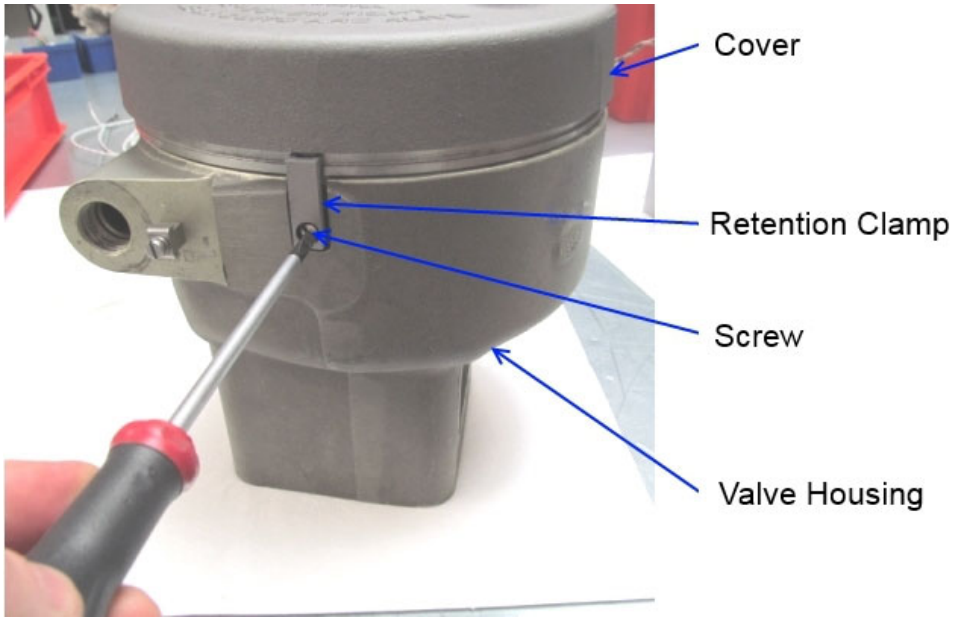


Figure 2-8. Retention Clamp Installation

2.4 Verification & Calibration

A. Connect supply, control, and drain line (hydraulic). Close the control line using an external ball valve. Install pressure gauge on the control line between ball valve and CPC unit.

Note: Be careful not to damage the unit being controlled (remove linkage, install isolation valve on the control line etc.).

B. Verify that the hydraulic and electrical connections are correct. See product manual for more information.

C. Confirm that the hydraulic and electrical power to the CPC-II is turned off. Remove the top cover of the CPC-II (take care to not damage threaded surface or contaminate them, as it may result in moisture ingress or explosion hazard).

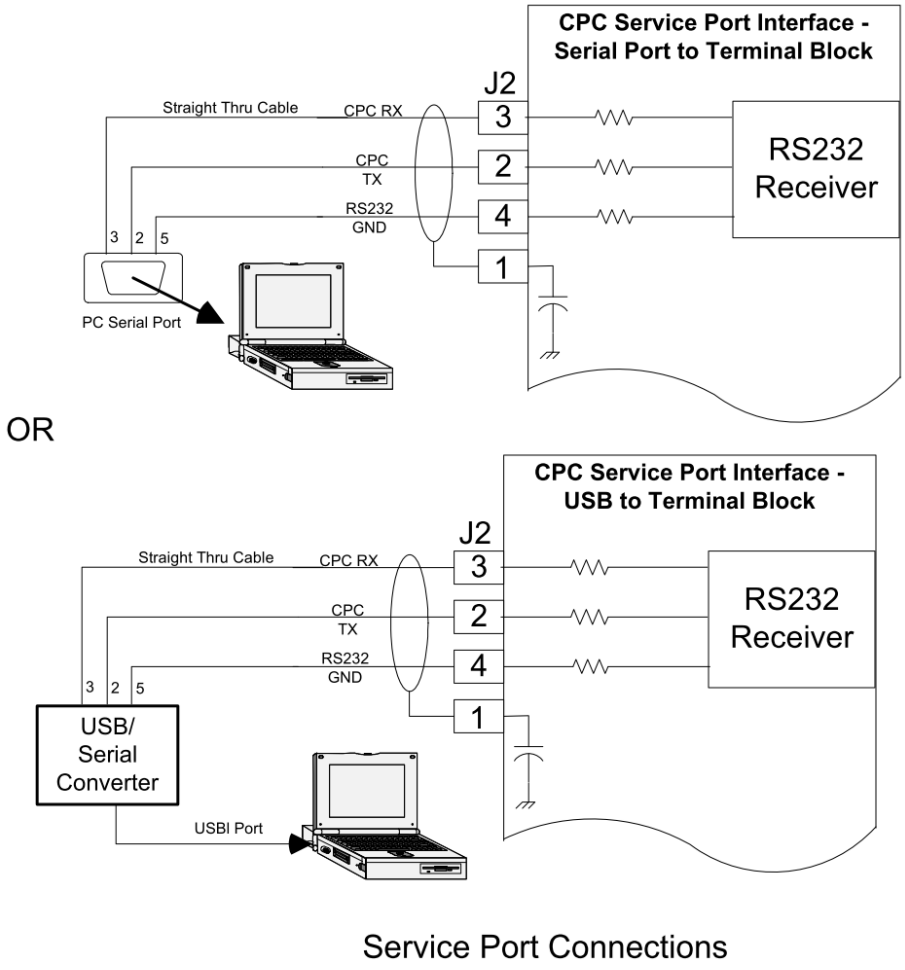
D. Apply electrical power to CPC-II.

E. Start the hydraulic supply system.

F. Connect a PC Service Tool to CPC-II according to picture. See CPC-II manual for more information.

G. Operate the unit using CPC-II PC Service Tool. See CPC-II manual for more information.

Note: For the manual setpoint to control the output pressure, the analog setpoint must be at or below 4 mA. If either analog input is commanding a setpoint higher than zero, the system disregards the manual setpoint.



Service Port Connections

Figure 2-9. Service Port Connections

H. Purge all air from the system. Go to the Performance Trend & Manual Operation screen. Adjusting the pressure setpoint up and down several times will aid purging air. Allow for warm-up time.

I. Go to the Detailed Diagnostics screen and look at the faults that were triggered. Reset active and logged faults.

J. Change CPC-II PC Service Tool Screen to Analog Input Settings screen. Input scaling ranges (4 – 20mA) ①, 1.50 – 5.50Bar for 10Bar CPC-II version ②, 1.50 – 17.50Bar for 25Bar CPC-II version ②. See picture.

K. Download settings file (Settings>Save from Device to file).

L. After saving, open settings file (Settings>Edit Settings file). Go to Analog/Discrete Output Configuration screen.

M. Change “100% of range” in Pressure Readback Settings to 5.50Bar. Go to Analog Input Configuration screen. Adjust “0% of Range” and “100% of Range” under Scaling to 1.50Bar and 5.50Bar respectively. Save and close.

N. Load settings file (Settings>load settings file to device).

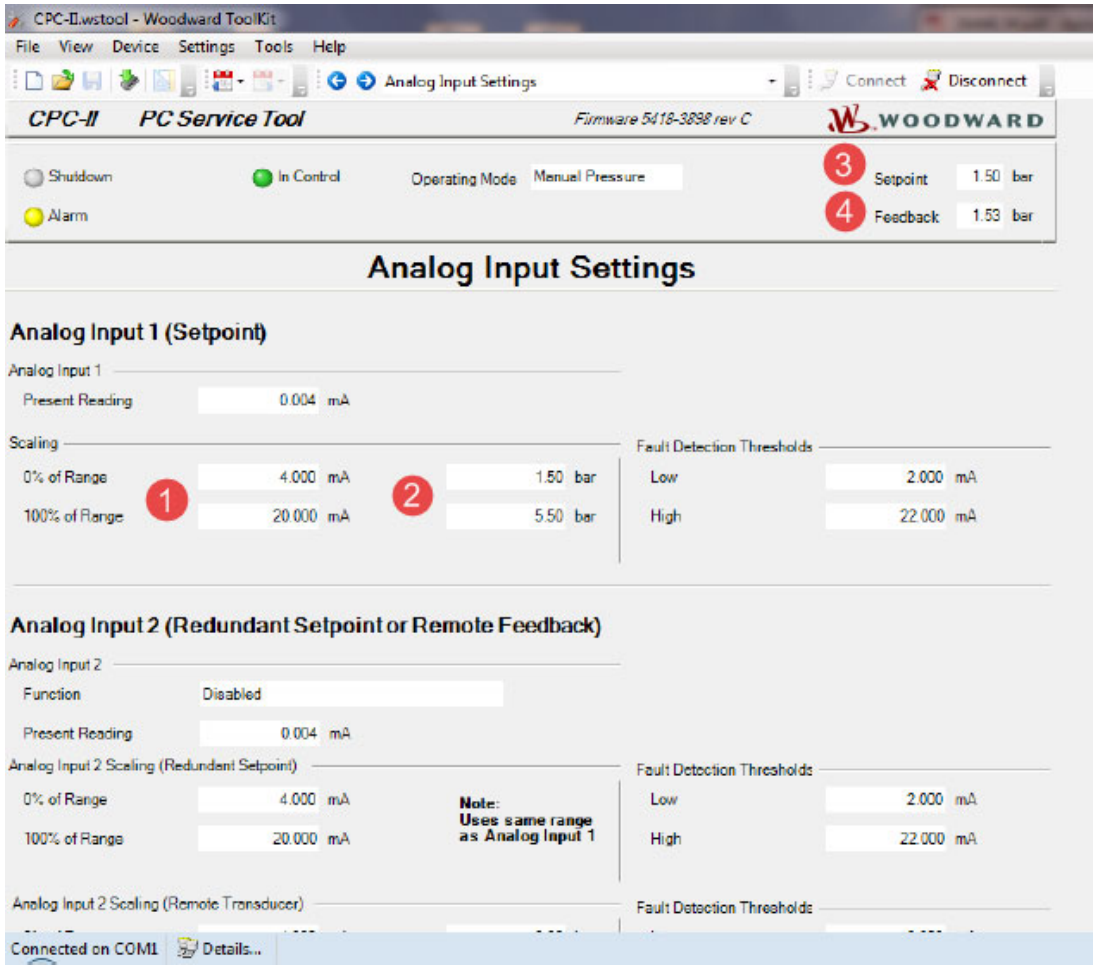


Figure 2-10. CPC-II Service Tool Analog Input Settings Screen

O. Change CPC-II PC Service Tool screen to Performance Trend & Manual Operation screen.

P. In manual mode, input value of 1.50Bar as a setpoint ③.

Q. Verify the values for the Pressure ④ and Current ⑤ feedback are within limits. The limits are inserted in the table.

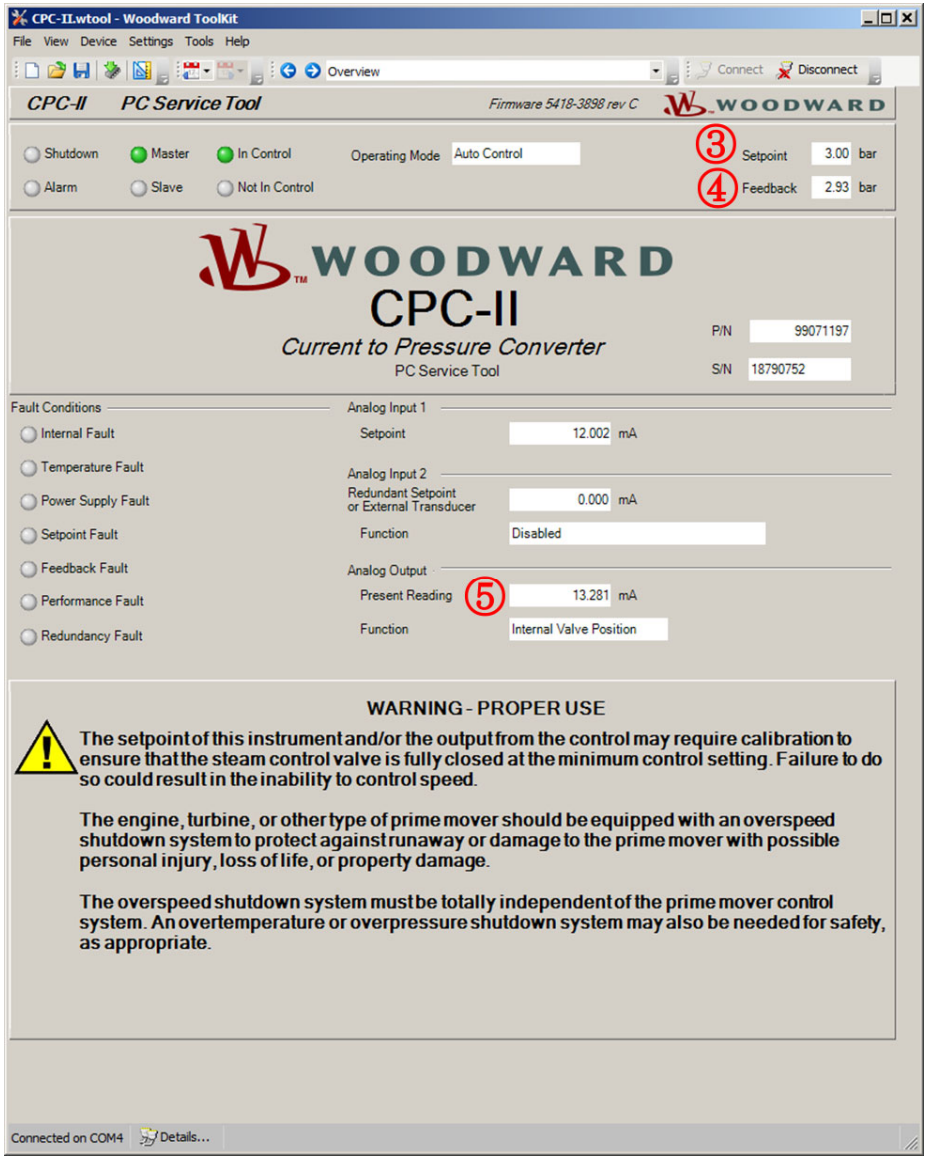


Figure 2-11. CPC-II Service Tool Overview Screen

R. Repeat step – L – and – M - with “Demand” values from the table.

S. If values are out of allowable limits, contact Woodward.

T. Go to the Detailed Diagnostics screen and review any faults that were triggered. Refer to the product manual in case of any faults.

U. Load the settings from saved file “Load Settings File to Device”. Verify that all settings are re-loaded. Ensure that Input, Output, and Alarm/Shutdown configurations are all correct.

V. Re-commission the unit following the standard instructions in the product manual if necessary.

10Bar CPC-II Version

	Demand [mA]	Demand [Bar]	Limits of the feedback current [mA] ⑤	Limits of the feedback pressure [Bar] ④
0%	4	1.50	3.97 - 4.03	1.47 - 1.53
25%	8	2.50	7.94 - 8.06	2.44 - 2.56
50%	12	3.50	11.91 - 12.09	3.42 - 3.58
75%	16	4.50	15.88 - 16.12	4.40 - 4.60
100%	20	5.50	19.85 - 20.15	5.38 - 5.62

25Bar CPC-II Version

	Demand [mA]	Demand [Bar]	Limits of the feedback current [mA] ⑤	Limits of the feedback pressure [Bar] ④
0%	4	1.50	3.97 - 4.03	1.47 - 1.53
25%	8	5.50	7.94 - 8.06	5.38 - 5.62
50%	12	9.50	11.91 - 12.09	9.29 - 9.71
75%	16	13.50	15.88 - 16.12	13.20 - 13.80
100%	20	17.50	19.85 - 20.15	17.11 - 17.89

Figure 2-12. 10Bar and 25Bar CPC-II Version Tables

3. SPRING REPLACEMENT

3.1 Replacement Kit Description

The purpose of this procedure is to show the correct sequence and method of spring replacement:
- CPC-II Model - 10 bar, Replacement Kit: 8935-1209
- CPC-II Model - 25 bar, Replacement Kit: 8935-1209

3.2 Disassembly Procedure

NOTICE

Before starting any disassembly, connect to the CPC-II using the PC Service Tool. Download and save a .wset file from the service unit. Store the settings file on the PC in a place where you can find for later use.

A. Remove cover by loosening four screws (Hex key size 6 mm).

B. Remove only two of the three spring assembly screws (Hex key size 7/64 in).

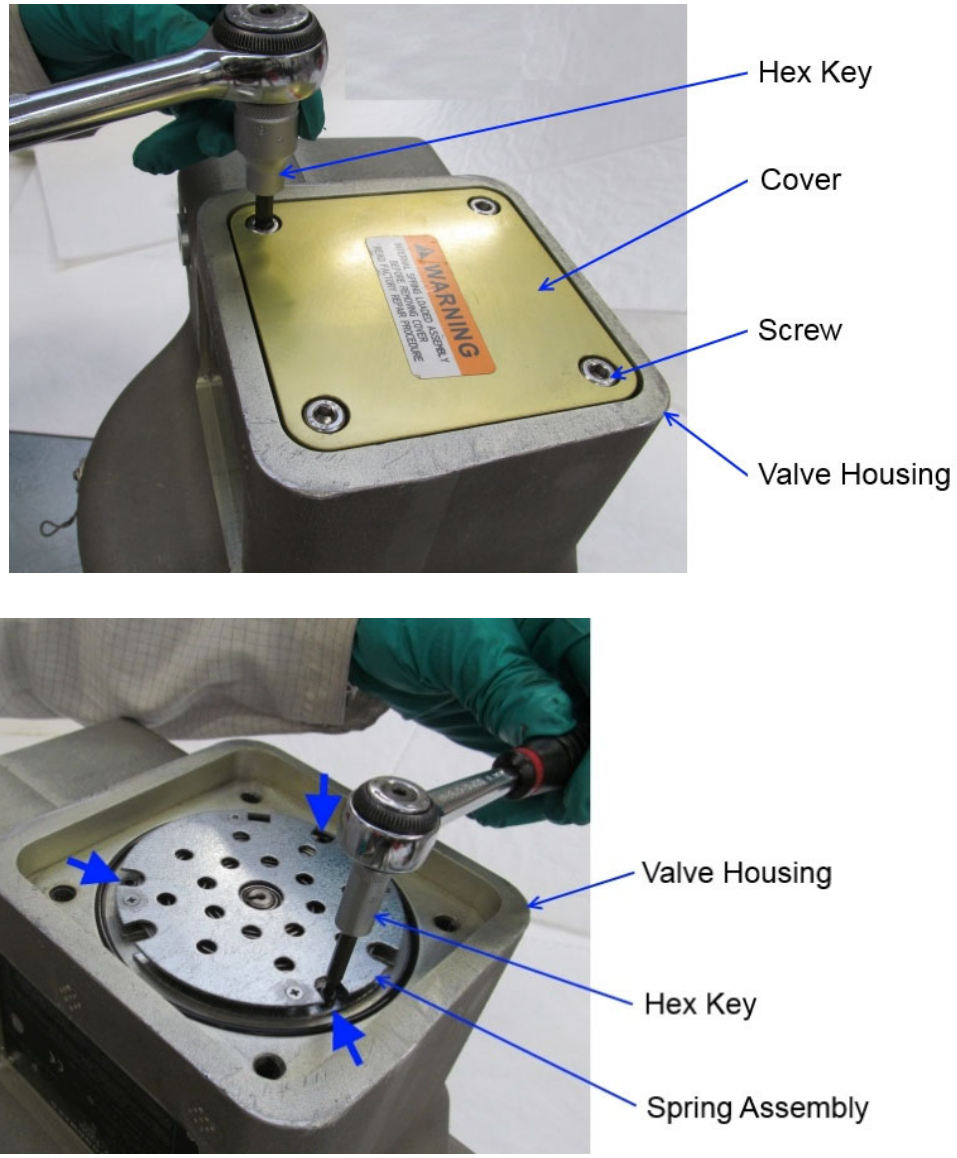


Figure 3-1. Spring Cover and Spring Assembly

C. Put a rod (e.g., screwdriver) in one of the open holes to hold spring in place.

⚠CAUTION

Spring is under tension and may rotate.

D. Remove the last screw.

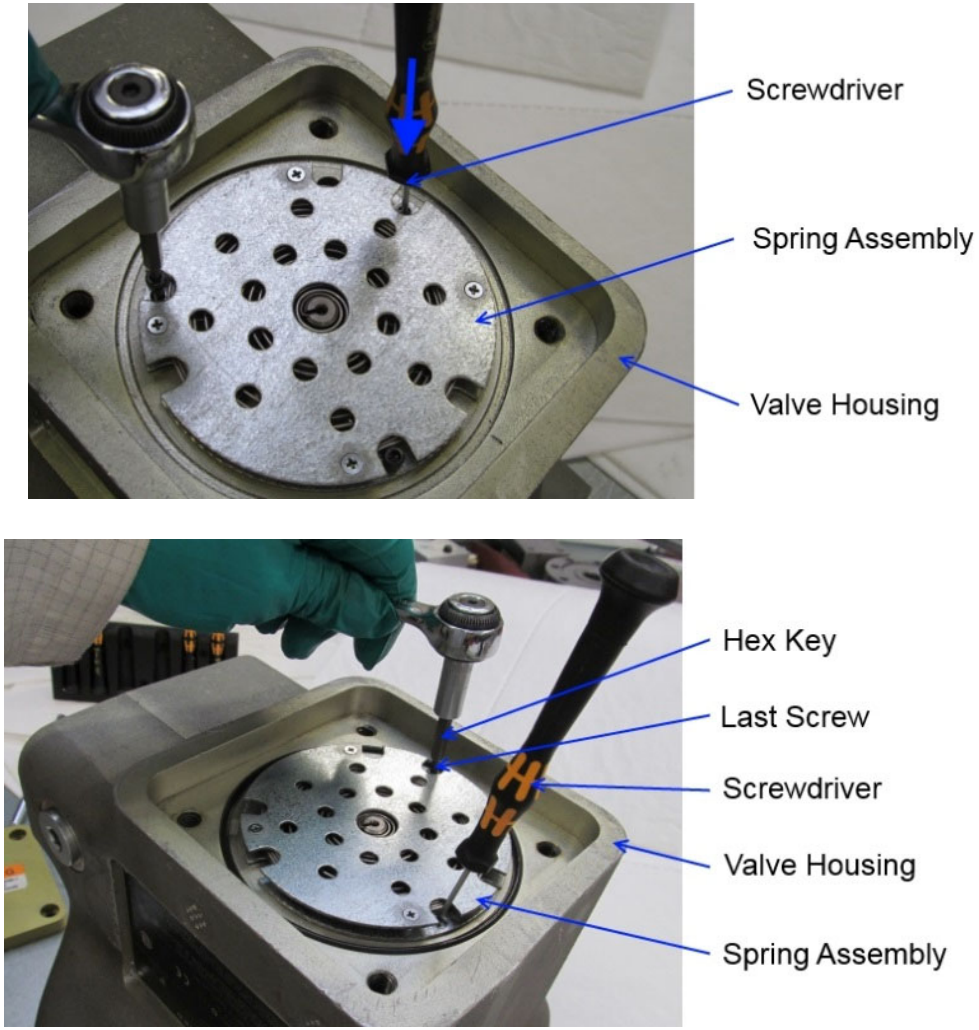


Figure 3-2. Spring Cover Removal

E. Holding the spring assembly with one hand, remove the rod with other hand.

   The spring will rotate over 1 and 1.5 turns and is under slight tension so its release is not dangerous.

F. Remove old spring assembly.

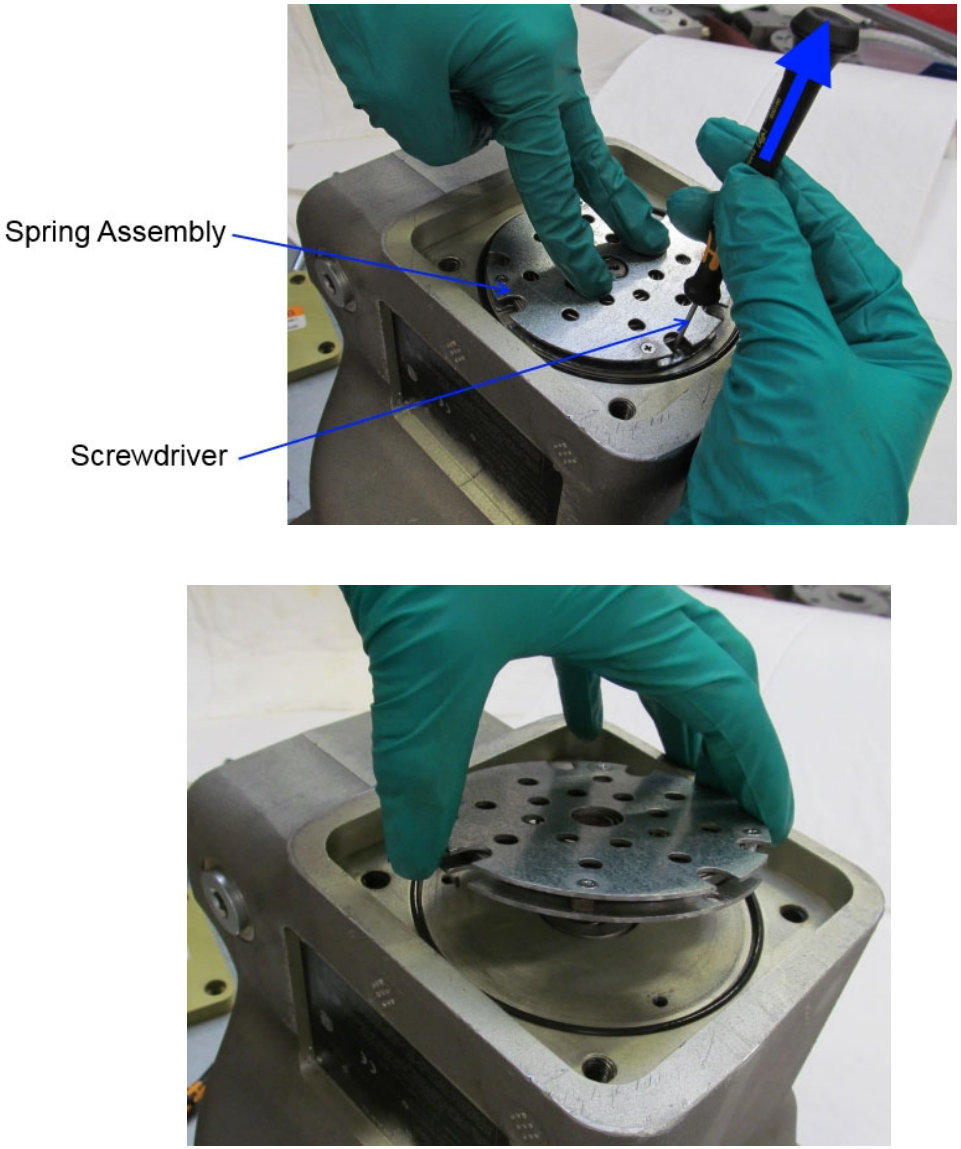


Figure 3-3. Spring Assembly Removal – Final Steps

G. Remove O-ring.
H. Clean all surfaces using isopropanol. After cleaning, visually inspect all surfaces.

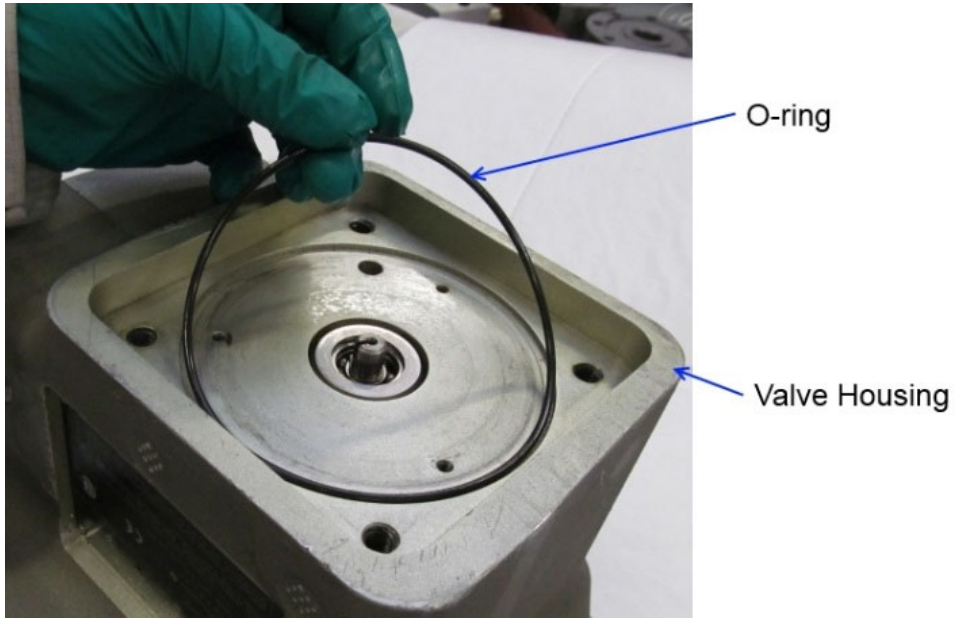


Figure 3-4. O-ring Removal

3.3 Assembly Procedure

A. Check the replacement parts kit to verify all replacement parts listed in the installation drawing are present.

B. Use a slotted screwdriver to set the position – turn the control shaft fully in the clockwise direction to a hard stop. Shaft should rotate freely. If the torque is over 0.427 Nm (3.78 lb-in) between the hard stops, possible contaminant build up has occurred. Contact Woodward if encountering this condition.

C. Orient the new spring assembly with the heads of the plate assembly screws facing away from the valve housing.

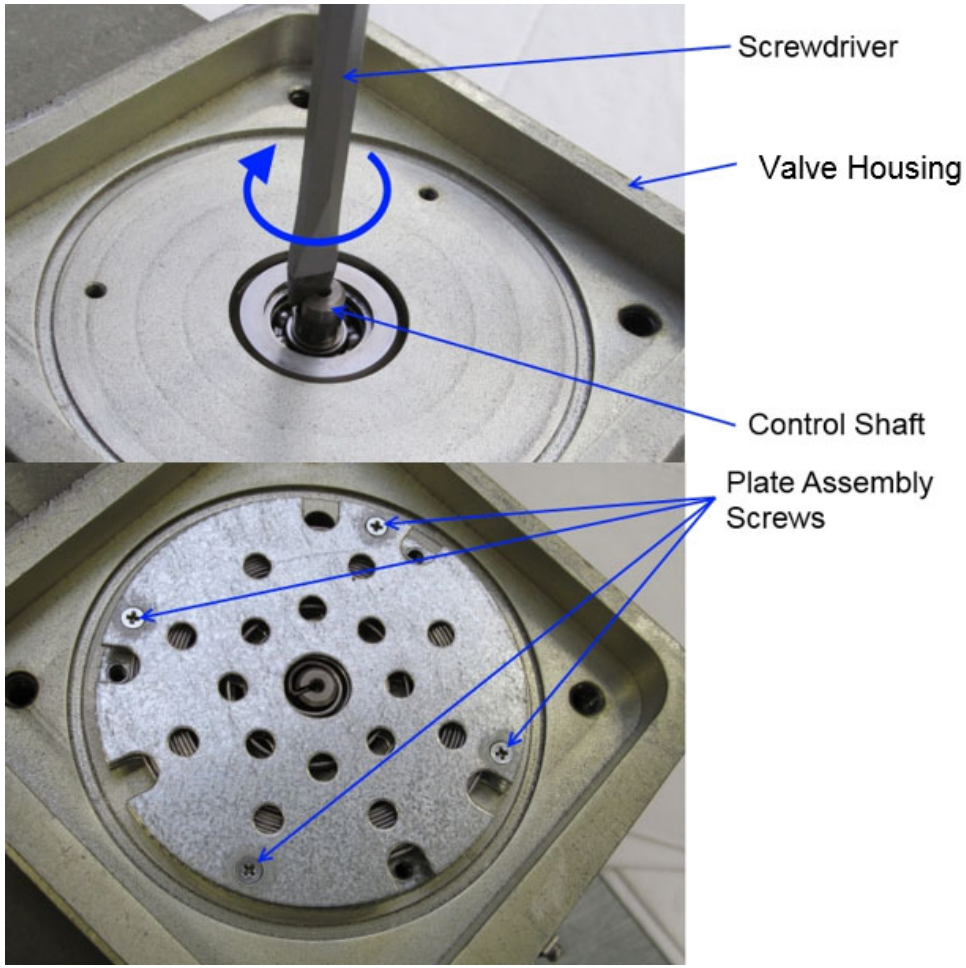


Figure 3-5. Control Shaft and Plate Assembly Screw Locations

D. Install spring assembly into the valve housing being sure to engage the spring tang into the slot of the control shaft.

E. Mark the return spring and housing with a marker as shown. Make sure that the spring assembly holes line up with the housing holes. If the holes do not line up, rotate the spring slightly in the clockwise direction.

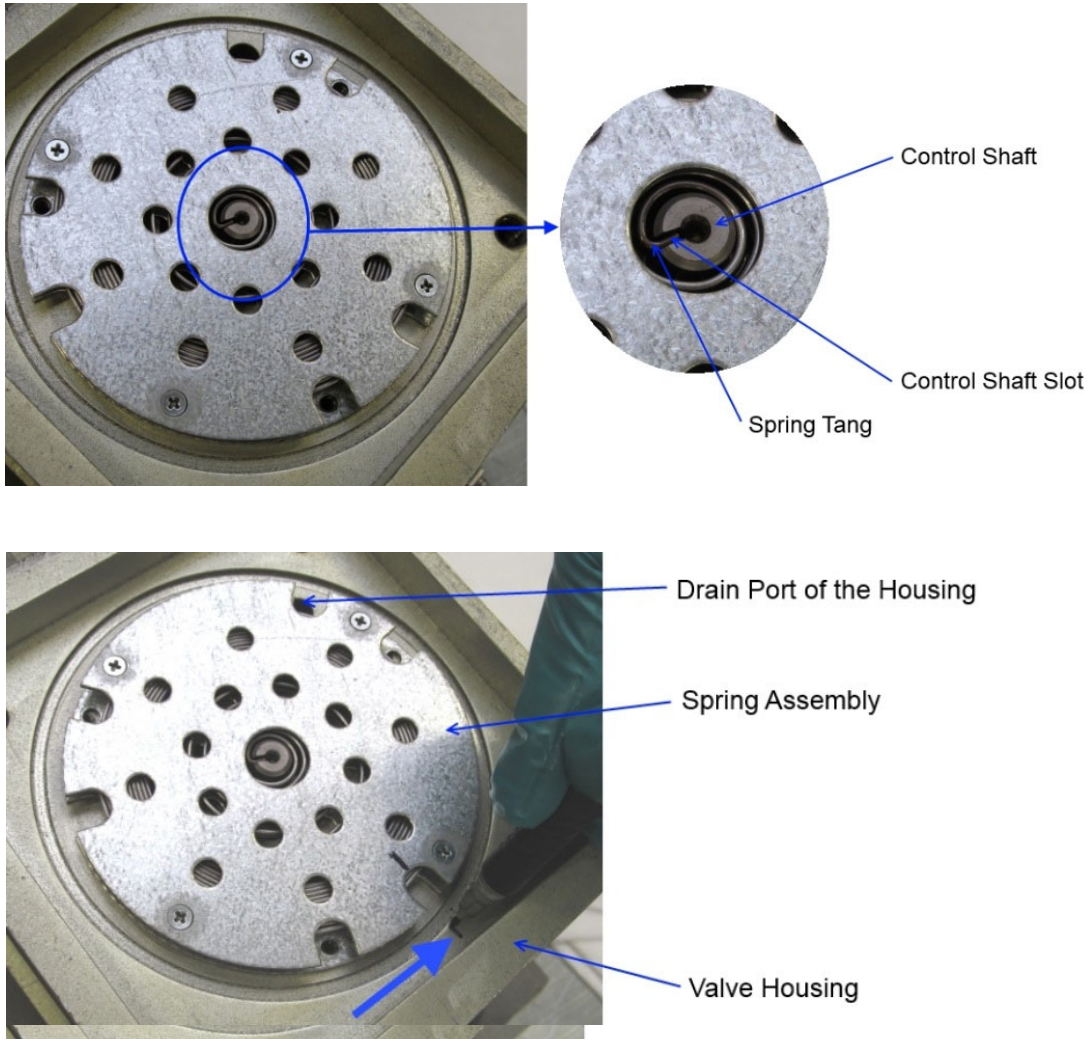


Figure 3-6. Spring Tang Highlight and Marking of Return Spring and Housing

F. Rotate the spring assembly **1** and **2/3 turns** in the clockwise direction and hold.

NOTICE

Make sure that the spring is rotated in the clockwise direction.

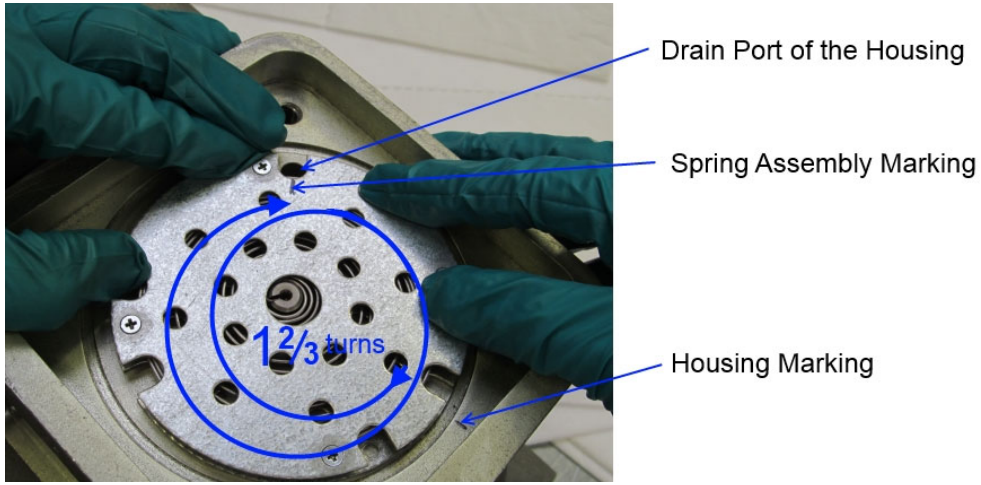


Figure 3-7. Spring Assembly Installation and Orientation

G. Put rod (e.g. screwdriver) in the hole to hold spring in place.

H. Install two of three screws through the spring assembly plate into the valve housing.

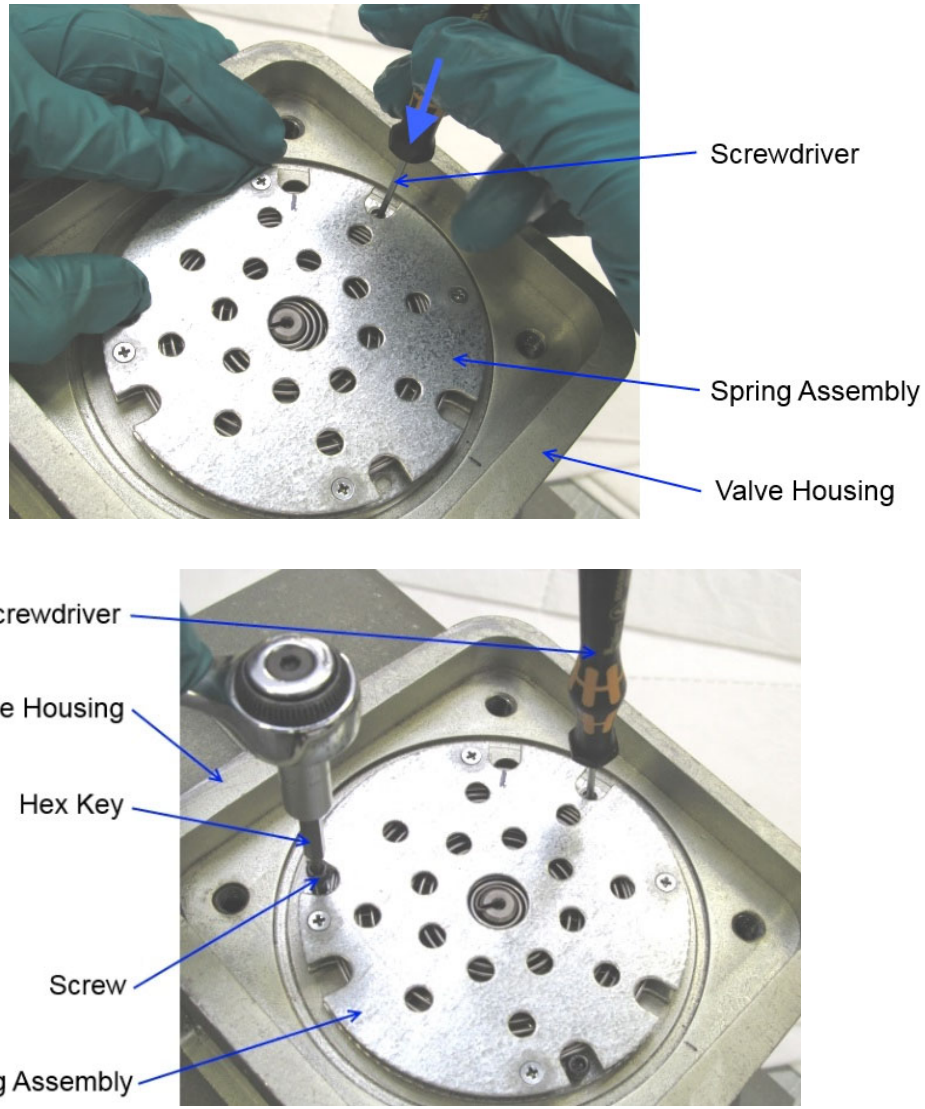
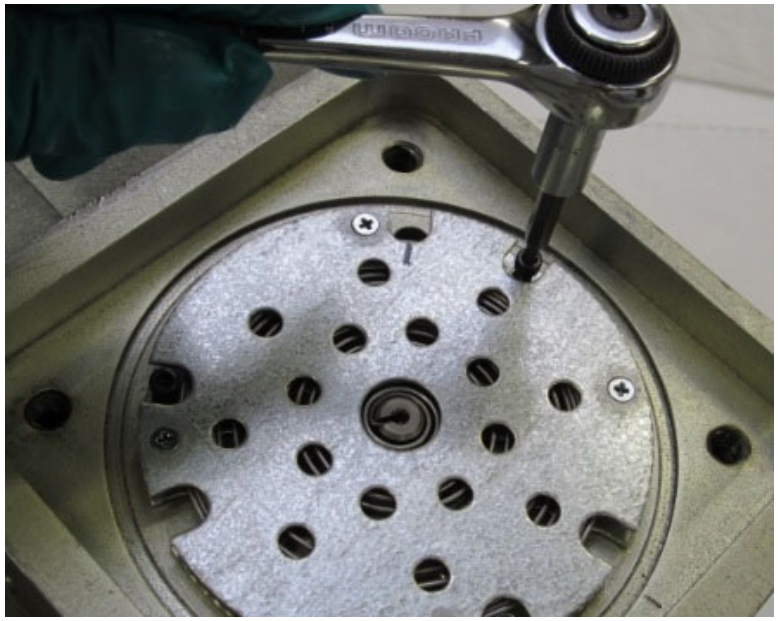


Figure 3-8. Installation of Spring Assembly Screws

I. Remove holding rod (screwdriver) and install remaining screw. Torque all three screws to 26 ± 2 lb. - inches.

J. Lubricate new O-ring with petroleum jelly and install into the face groove in the base of the housing.



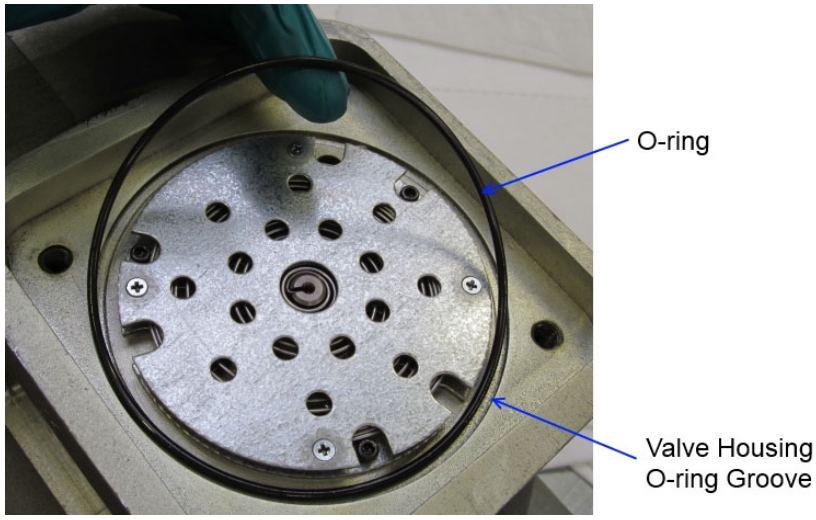


Figure 3-9. Installation of Final Spring Assembly Screws and O-ring

K. Orient the housing cover with the O-ring counter bore facing the housing and install into the housing over the spring assembly.

L. Apply GN paste to the threads of screws and install through the cover into the housing. Torque screws to 88.4 ± 6 lb-inches.

Note: If replacing electronics cavity cover O-Ring, perform steps H, I, and J from section 2.3.

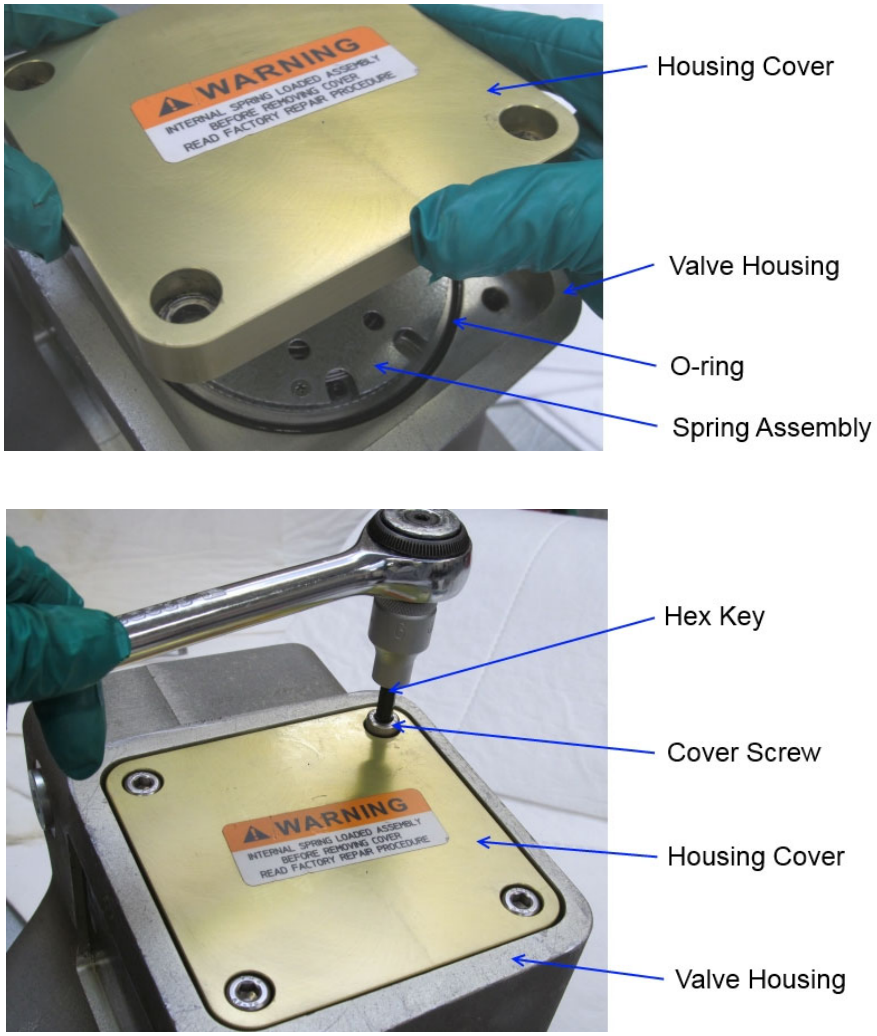


Figure 3-10. Installation of Spring Assembly Cover

3.4 Verification & Calibration

A. Connect supply, control, and drain line (hydraulic). Close the control line using an external ball valve. Install pressure gauge on the control line.

Note: Be careful not to damage the controlled unit (remove linkage, install isolation valve on the control line etc.).

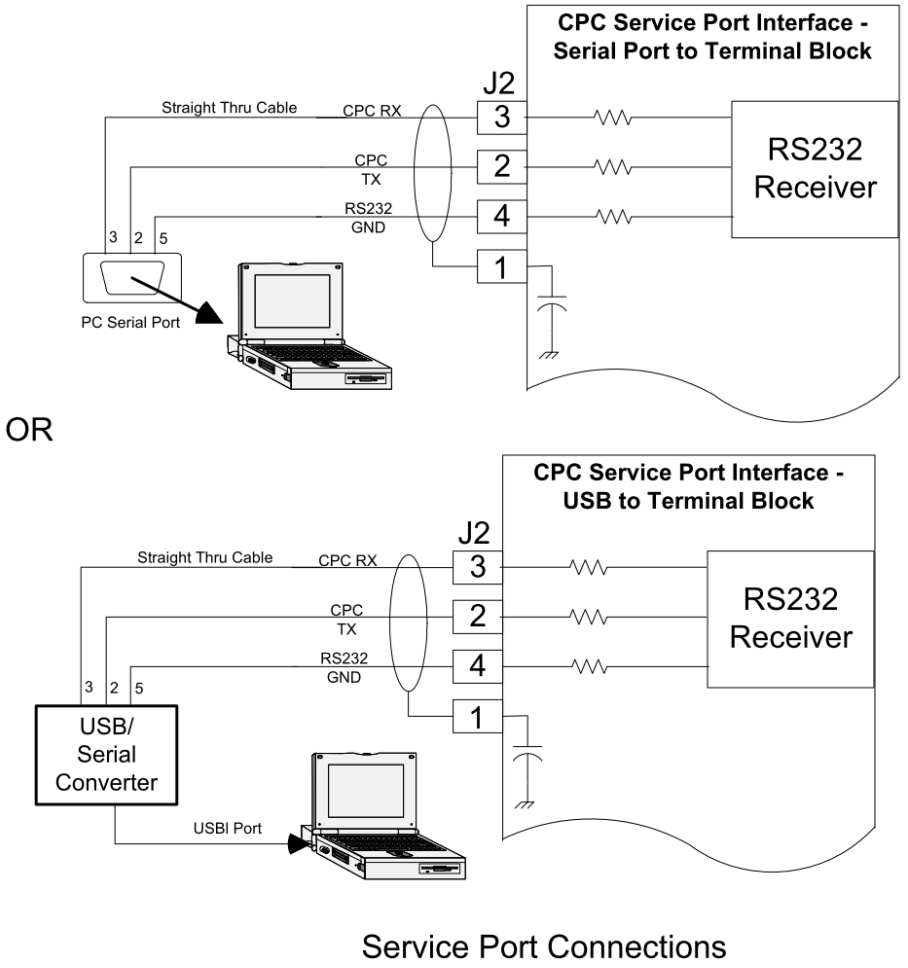
B. Verify that the hydraulic and electrical connections are correct. See Product Manual for more information.

C. Confirm that the hydraulic and electrical power to the CPC-II is turned off. Remove the top cover of the CPC-II (take care not to damage threaded surface and not to contaminate them – it may result in moisture ingress or be an explosion hazard).

D. Apply electrical power to CPC-II.

E. Start the hydraulic supply system.

F. Connect a PC Service Tool to CPC-II according to picture. See CPC-II manual for more information.



Service Port Connections

Figure 3-11. Service Port Connections

G. Operate the unit using CPC-II PC Service Tool. See CPC-II manual for more information.

Note: For the manual setpoint to control the output pressure, the analog setpoint must be at or below 4 mA. If either analog input is commanding a setpoint higher than zero, the manual setpoint will be ignored.

H. Purge all air from the system. Go to the Performance Trend & Manual Operation screen. Adjusting the pressure setpoint up and down several times will aid purging air. Allow for warm-up time.

I. Go to the Detailed Diagnostics screen and look at the faults that were triggered. Reset Active and logged faults.

J. Change CPC-II PC Service Tool Screen to Analog Input Settings screen.
Input Scaling Ranges (4 – 20mA) ①,
1.50-5.50Bar for 10Bar CPC-II version ②,
1.50-17.50Bar for 25Bar CPC-II version ②.

K. Download settings file (Settings>Save from Device to File).

L. After saving, open settings file (Settings>Edit Settings File). Go to Analog/Discrete Output Configuration screen.

M. Change “100% of range” in Pressure Readback Settings to 5.50 Bar. Go to Analog Input Configuration screen. Adjust “0% of range” and “100% of range” under Scaling to 1.50 Bar and 5.50 Bar respectively. Save and close.

N. Load settings file (Settings>Load Settings File to Device).

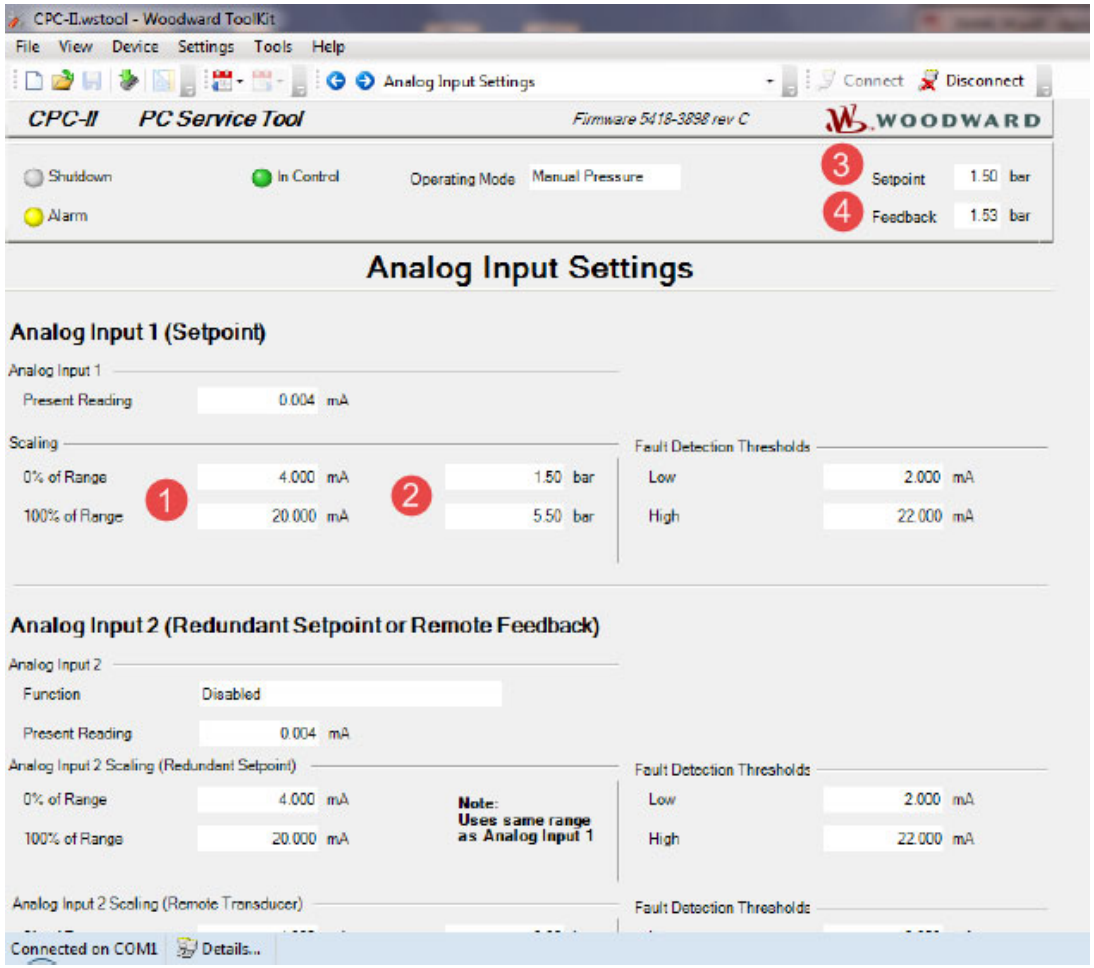


Figure 3-12. CPC-II Service Tool Analog Input Settings

O. Input value:
3.50Bar for 10Bar CPC-II version as a Setpoint (3)
9.50Bar for 25Bar CPC-II version as a Setpoint (3)

P. Verify Pressure Feedback (4) (±0.25Bar of margins).

Q. In the last step, verify that the servo is fully closed when the control signal is below 2mA or the power source is removed. The return spring should have enough tension to force connection of control pressure to drain.

R. Input value:
3.50Bar for 10Bar CPC-II version as a Setpoint (3)
OR
9.50Bar for 25Bar CPC-II version as a Setpoint (3)

S. Remove electric supply to CPC-II.

T. Verify output pressure is removed from the control line. Check pressure gauge indication. (This will not be zero due to internal leakage of the unit).

U. Go to the Detailed Diagnostics screen and review any faults that were triggered. Refer to the product manual in case of any faults.

V. You may configure the CPC-II to perform a self-check upon power up. When the self-check function is enabled, the display status of the spring check function is automatic when performed during power up. You may enable or disable the spring check by configuring the Alarms and Shutdowns screen. See Chapter 6 in the product manual 26615.

W. Load the settings from saved file “Load Settings File to Device”. Verify that all settings are re-loaded. Ensure that Input, Output, and Alarm/Shutdown configurations are all correct.

X. Re-commission the unit following the standard instructions in the product manual if necessary.

4. REVISION HISTORY

REVISION DATE	REVISION LETTER	DESCRIPTION OF CHANGE	PAGE #
01/2022	A	Updated introduction section	5
01/2022	A	Added Repair of Flamepath note and deleted Table 1 of EN 60079-1:2007	5

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