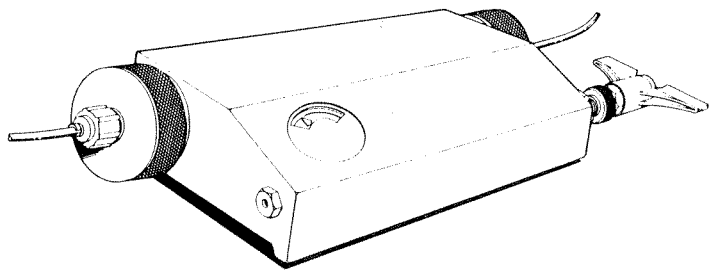
Waters
RCM 25x10
Operator's Manual



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Waters RCM 25x10

Operator's Manual

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INTRODUCTION

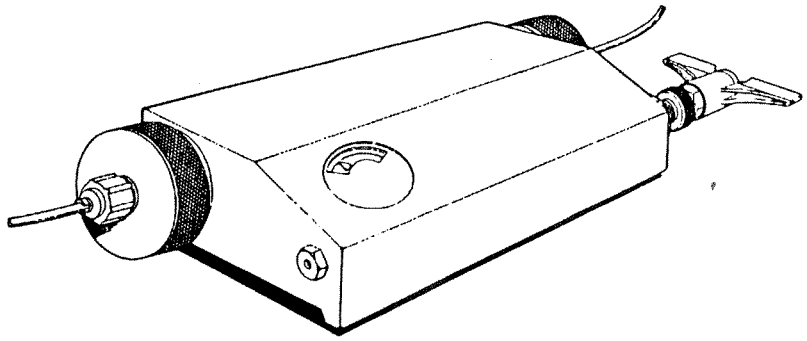

FIGURE 1-1 RCM 25x10

Waters RCM 25x10™ is a compact preparative cartridge module that applies and maintains radial compression on PrepPak® 25x10 cartridges and preparative Guard-Pak™ cartridges. This process:

Provides a more homogeneous packed bed structure
Increases cartridge efficiency
Eliminates channeling and void formation.

The Waters RCM 25x10 comes complete with a set of high performance non-metallic end fittings. Both the module and the end fittings are reusable. PrepPak 25x10 cartridges are available in a variety of high performance preparative packings and require no tools or fittings for installation in the RCM 25x10.

2

THEORY OF OPERATION

The RCM 25x10 applies pressure along the outside wall of a flexible tube containing the packed chromatographic bed. This allows the cartridge wall to mold around the packing material and decreases interstitial spaces within the bed. A tightly packed cartridge bed prevents packing material movement during high flow or rapid mobile phase changes during gradient operation (Figure 2-1).

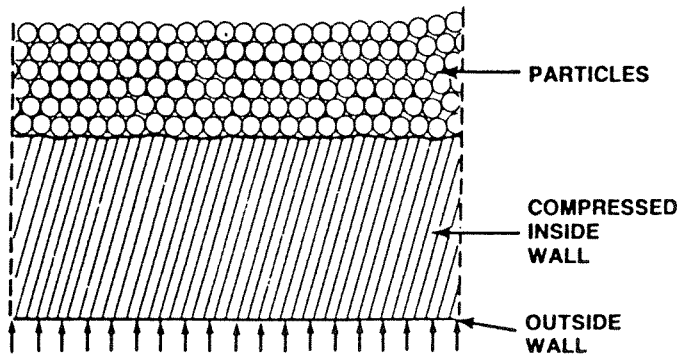

FIGURE 2-1 RADIALLY COMPRESSED CARTRIDGE BED

3

INSTALLATION

Installing the RCM 25x10 involves:

- Unpacking and inspection
- Connecting the unit to a chromatograph
- Preparing, installing, compressing, and conditioning a cartridge.

This section also includes information on replacing a cartridge in an installed RCM 25x10.

3.1 UNPACKING AND INSPECTION

The RCM 25x10 (Figure 3-1) consists of a housing that includes a pressure gauge, a pressure piston, a fill port, and two end connectors.

Unpack and check the package contents against the packing list to ensure that the shipment is complete. A startup kit (with its own packing list) is included with the RCM 25x10.

Inspect all items for damage. If you find any content discrepancy or damage, immediately contact the shipping agent and Waters Chromatography Division.

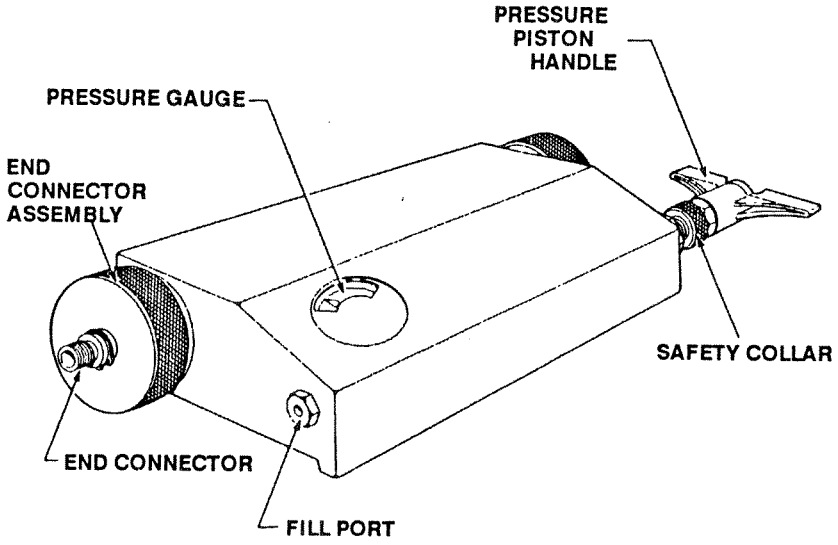

FIGURE 3-1 RCM 25x10 COMPONENTS

3.2 CONNECTING THE MODULE TO YOUR CHROMATOGRAPH

Connect the RCM 25x10 to your chromatograph between the injector and the detector in the same way that you would connect a steel or glass column.

Connect the tubing to the injector and detector first, then connect the RCM to these lines.

NOTE

PrepPak 25x10 cartridges and preparative Guard-Pak cartridges can be changed while the module is connected, or a module can be dedicated for each cartridge type you use.

Making the Injector and Detector Connections

1. Connect the union end of the RCM inlet tubing assembly (Figure 3-2) to the injector outlet tubing and finger tighten.

CAUTION

Be careful not to overtighten this connection. Overtightening can cause deformation within the union and result in excessive back pressure.

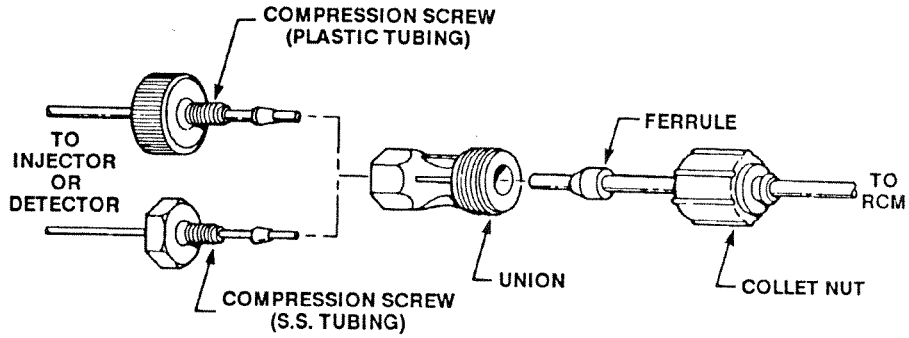

FIGURE 3-2 MAKING CONNECTIONS TO THE INJECTOR AND DETECTOR

2. Insert the tubing into the inlet of the RCM (Figure 3-3) until it bottoms, slide the ferrule in, then tighten the collet nut finger tight.

3. Use the procedure in steps 1 and 2 to connect the RCM outlet tubing to the detector inlet tubing.

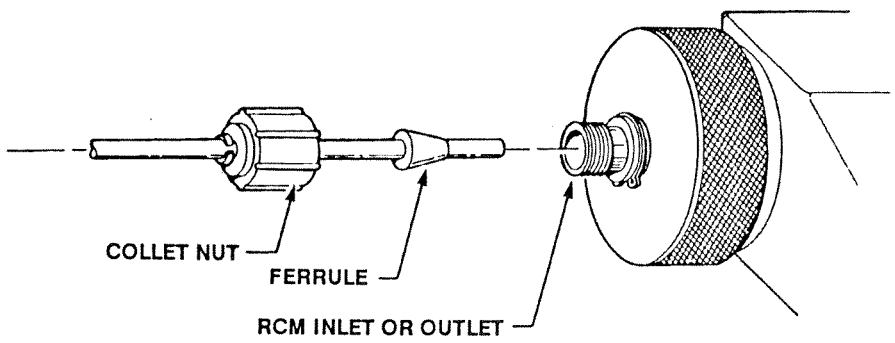

FIGURE 3-3 MAKING CONNECTIONS TO THE RCM

3.3 INSTALLING A CARTRIDGE

1. Remove the end-connector assemblies from the RCM 25x10 body.

2. Remove the protective caps from the cartridge. Ensure that both ends of the cartridge and the end connectors are clean and that the O-rings are intact.

3. Connect the cartridge (Figure 3-4) to the spacer (or to the union and Guard-Pak cartridge) and insert into the RCM chamber. Be sure that the spacer or Guard-Pak cartridge is closest to the inlet.

4. Replace the end-connector assemblies onto the RCM 25x10 and tighten them equally at both ends until hand tight.

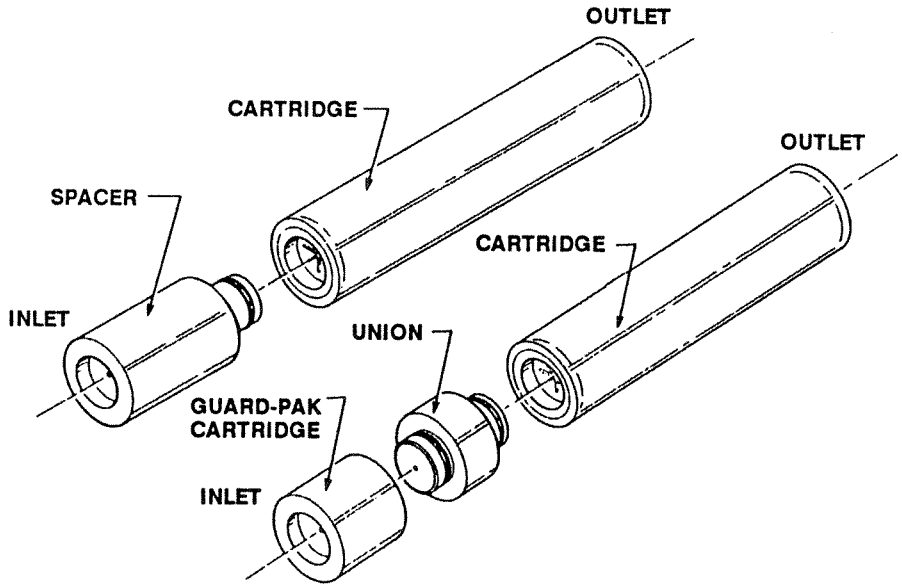

FIGURE 3-4 RCM 25x10 CARTRIDGES

3.4 COMPRESSING A CARTRIDGE

1. Unscrew the piston until it stops (Figure 3-5).

2. Fill a 20-ml syringe with water. Applying firm but not excessive force, insert the end into the fill port (Figure 3-5), and fill the unit. The unit holds approximately 15 ml.

NOTES

Use only a plastic or safety approved glass syringe. (A 20 ml syringe is provided in the startup kit.) Adding 5% methanol or isopropanol to water will prevent bacterial growth. When using normal phase or a silica cartridge, use IPA as the compression fluid.

3. Turn the piston handle (Figure 3-6) until the pressure gauge indicates approximately 500 psi. If the piston bottoms before reaching the desired pressure, back the piston out to decompress the module, add fluid with the syringe, and recompress.

4. When the cartridge is pressurized, tighten the safety collar finger tight against the retaining nut (Figure 3-6).

CAUTION

Do not start flow without compressing the cartridge.

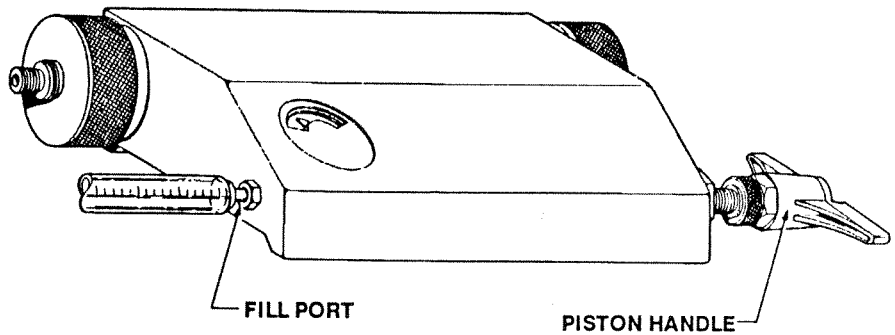

FIGURE 3-5 ADDING FLUID

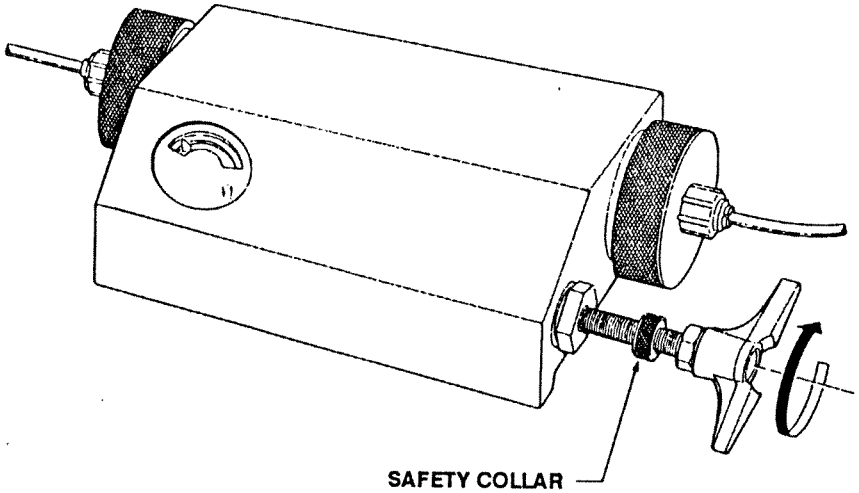

FIGURE 3-6 COMPRESSING THE CARTRIDGE

NOTES

When flow is stopped, it is normal for module pressure to drop to a level lower than the initial setting. For example, a module compressed to 500 psi may drop to 300 psi when flow is stopped.

Module pressure will drop after initial compression and may require readjustment.

When flow is started, it is normal for module pressure to rise moderately above the initial setting. This is caused by the pressure of the flowing mobile phase within the cartridge.

Pressure Limits: maximum mobile phase pressure 1500 psi
maximum module compression 2000 psi

CAUTION

To prevent damaging the cartridge, do not allow the pump pressure to exceed the pressure applied to the cartridge.

3.5 CONDITIONING A CARTRIDGE

Cartridges are slurry packed and then dried for shipment. The cartridges should be wetted with 5-10 cartridge volumes of the stronger eluting component of the mobile phase before a final purge with the actual mobile phase. (The cartridge volume without the Guard-Pak is 50 ml.) Equilibration between the mobile phase and the packing material is established when a stable baseline can be produced. Refer to your cartridge care and use manual for equilibration information.

3.6 REPLACING A CARTRIDGE

1. Stop the flow.
2. Depressurize the cartridge by unscrewing the piston until it stops.
3. Place an absorbent towel under the unit, then remove one end-connector assembly. A small amount of fluid (4-5 ml) will be released from the chamber.
4. Remove the cartridge from the chamber. If the cartridge separates from the spacer (or from the Guard-Pak cartridge and union), remove the other end-connector assembly and remove the remaining segment.
5. Attach the spacer (or Guard-Pak cartridge and union) to the new cartridge (Figure 3-4) and insert it into the RCM chamber. Be sure that the Guard-Pak cartridge is closest to the inlet.
6. Replace the end-connector assembly(s) onto the RCM 25x10 and tighten (equally) until hand tight.
7. Fill a 20-ml syringe with water, insert the end into the fill port (Figure 3-4), and replace the lost fluid.
8. Turn the piston handle until the pressure gauge indicates the desired pressure. If the piston bottoms before reaching the desired pressure, back the piston out to decompress the module, add fluid with the syringe, and recompress.
9. When the cartridge is pressurized, tighten the safety collar finger tight against the retaining nut.
10. Resume flow.

4

MAINTENANCE

4.1 TROUBLESHOOTING THE RCM 25x10

Use the table below for troubleshooting your RCM 25x10.

TABLE 4-1 TROUBLESHOOTING GUIDE

SYMPTOM	REASON	CORRECTIVE ACTION
Inability to achieve desired compression	Too much air in unit	Unscrew compression piston. Fill the unit with water and apply pressure on the syringe until there is considerable resistance.
High system back pressure	External resistance	Determine resistance before and after the RCM.
	Union plugged	Disconnect union and free obstruction with needle.
	Inlet or outlet connector/tube assembly plugged	Attach connector/tube assembly to pump and try to free the blockage with pressure or replace the tubing assembly.
	Cartridge inlet plugged	Follow cleaning instructions found in cartridge care and use manual.

TABLE 4-1 TROUBLESHOOTING GUIDE (CONT'D)

SYMPTOM	REASON	CORRECTIVE ACTION
Rapid pressure loss	Leak	Locate the source of the leak using the chart below:
	Leak Location	
	Leak from chamber end connector	Replace chamber end connector O-rings. See Section 4.4 for the procedure.
	Leak from pressure piston	Replace piston O-ring. See Section 4.3 for the procedure.
	Leak from fill port	Replace check valve. See Section 4.2 for the procedure.
	Leak from gauge	Replace gauge. See Section 4.5 for the procedure.
Slight loss of pressure with time	Cartridge compressed for first time, media occasionally settles	Adjust piston to return pressure to desired compression range. It may be necessary to add water.
	Weep into cartridge	1. Disconnect the RCM 25x10 from system. 2. Repressurize. 3. Dry the ends of the tubing. 4. Let sit for twenty minutes. The leak may be the cartridge mobile phase being squeezed out of the cartridge. 5. Dry tubing again. (If more liquid forms on the end of the tubing, the compression fluid may be entering the cartridge.) 6. Decompress the cartridge and remove from the RCM. 7. Inspect the small connector O-ring, and cartridge where the fluid was observed. Remove any dirt particles.. 8. Insert the cartridge into the RCM and recompress.

4.2 REPLACING THE CHECK VALVE

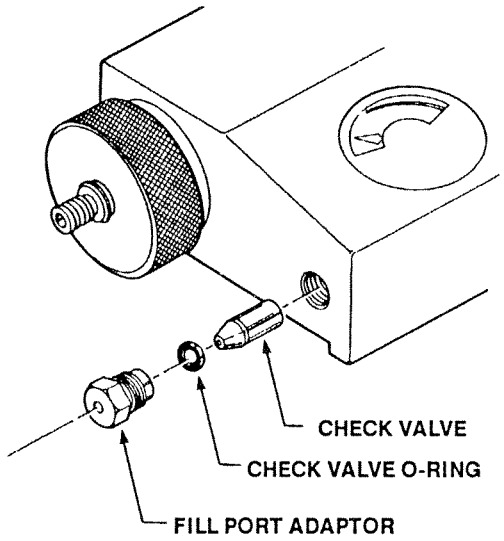

FIGURE 4-1 REPLACING THE CHECK VALVE

1. Stop flow.
2. Disconnect the RCM 25x10 from the system.
3. Release compression by unscrewing the piston all the way until it stops.
4. Place an absorbent towel under the RCM. Use a 7/16-inch wrench (**do not use pliers**) to remove the fill port adaptor.
5. Remove the check valve O-ring.
6. Turn the RCM 25x10 on its end with the fill port facing down. Tap the RCM 25x10 to eject the check valve.
7. Rinse the chamber with water to remove any debris.
8. Insert a new check valve with the flat end first (Figure 4-1).
9. Insert a new O-ring and center it over the end of the check valve.

10. Replace the fill port adaptor and tighten with the 7/16-inch wrench.
11. Fill a 20 ml syringe with water and refill the RCM.
12. Reconnect the RCM to the system.
13. Pressurize the RCM and check for leaks.
14. Resume flow.

4.3 REPLACING THE PISTON O-RING

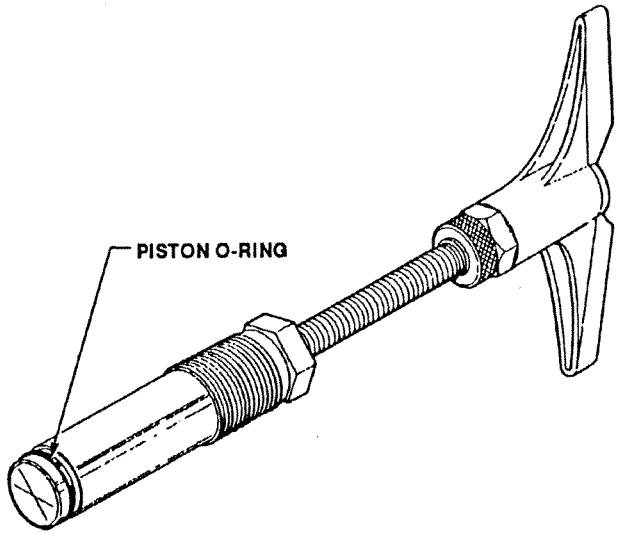

FIGURE 4-2 REPLACING THE PISTON O-RING

1. Stop flow.
2. Release compression by unscrewing the piston all the way until it stops.
3. Place an absorbent towel under the RCM. Use a one-inch wrench (**do not use pliers**) to remove the piston assembly.
4. Rinse the chamber with water to remove any debris.
5. Remove the O-ring from the end of the piston and replace it with a new O-ring (Figure 4-2). Lightly lubricate the O-ring with vacuum grease.

6. Replace the piston assembly and tighten snugly with the one-inch wrench **(do not apply excessive force)**.
7. Fill a 20 ml syringe with water and refill the RCM.
8. Pressurize the RCM and check for leaks.
9. Resume flow.

4.4 REPLACING THE END CONNECTOR O-RINGS

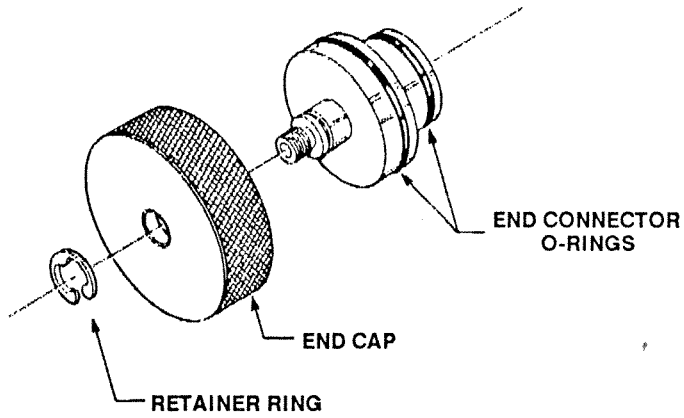

FIGURE 4-3 REPLACING THE END CONNECTOR O-RINGS

1. Stop flow.
2. Release compression by unscrewing the piston all the way until it stops.
3. Place an absorbent towel under the RCM.
4. Disconnect the tubing from the end-connector assembly to be removed.
5. Remove the end-connector assembly.
6. Remove the retainer ring from the end-connector assembly then remove the connector from the end-connector assembly.
7. Remove the O-rings from the connector and replace with new O-rings. Lightly lubricate the large O-ring with vacuum grease.

8. Insert the end connector into the end cap and install the retainer ring.
9. Install the end-connector assembly on the RCM and tighten hand tight.
10. Connect the tubing and tighten finger tight.
11. Fill a 20-ml syringe with water and refill the RCM.
12. Pressurize the RCM and check for leaks.
13. Resume flow.

4.5 REPLACING THE PRESSURE GAUGE

1. Stop flow.
2. Release compression by unscrewing the piston all the way until it stops.
3. Place an absorbent towel under the RCM.

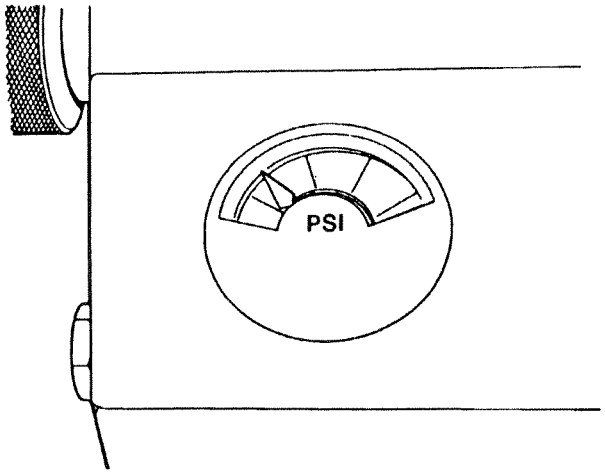

FIGURE 4-4 REPLACING THE RCM PRESSURE GAUGE

WARNING

Wear protective goggles before performing the next step.

4. Carefully break the gauge window with a small hammer and screwdriver and remove all pieces.

WARNING

The retaining ring may spring out as it is removed.

6. Use retainer ring pliers to remove the gauge retaining ring (Figure 4-5).
7. Pressurize the RCM slightly to unseat the gauge, then grasp the center of the gauge with needle nose pliers and pull it straight out of the housing (Figure 4-6).
8. Lubricate the O-ring on the new gauge, insert the gauge and orient it properly, press the gauge into place, and insert the retaining ring.
9. Fill a 20-ml syringe with water and refill the RCM.
10. Pressurize the RCM and check for leaks.
11. Place a few drops of epoxy on the edge of the new gauge window and position it on the gauge.
12. Resume flow.

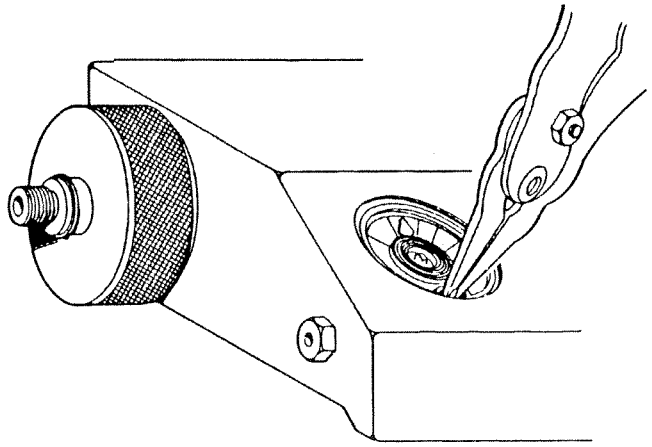

FIGURE 4-5 REMOVING THE GAUGE RETAINING RING

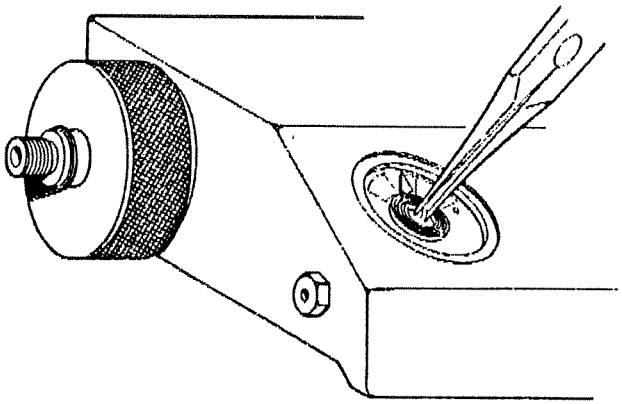

FIGURE 4-6 REMOVING THE GAUGE

APPENDIX A

Dimensions	Height: 5.1 cm (2.00 inches) Depth: 10.2 cm (4.00 inches) including piston handle Length: 30.5 cm (12.00 inches) piston extended and not including tubing assemblies
Pressure Limits	Maximum Mobile Phase Pressure 10 MPa (100 atm or1500 psi) Maximum Module Compression 14 MPa (135 atm or 2000 psi)

LIST OF RECOMMENDED REPLACEMENT PARTS

Description	Part Number
Spacer	15859
Connector (without O-rings)	15816
E-ring for connector	15858
Check valve	82888
Fill port adaptor	88458
Gauge	15871
Gauge window	15872
Gauge retaining ring	84746
O-rings	
Large connector	15833
Small connector -for reverse phase	15834
Small connector -for normal phase	15848
Fill port	75490
Pressure piston	15854
Tube assembly	15861
Union, 1/8 to 1/16-inch tubing	82732
Syringe, 20-m	15857

WARRANTY/SERVICE INFORMATION

Waters Service Department Message Center
1-800-252-HPLC
(USA only)

APPENDIX B

LIMITED PRODUCT WARRANTY

Millipore Corporation, including its Waters Chromatography Division (Waters), provides this limited warranty (the Warranty) to protect customers from non-conformity in the product workmanship or materials. The Warranty covers all new products manufactured by Waters and its subsidiaries.

The Warranty is as follows:

Waters warrants that all products sold by them will be of good quality and workmanship. The products will be fit for their intended purpose(s) when used strictly in accordance with Waters instructions for use during the applicable warranty period.

The foregoing warranty is exclusive and in lieu of all other express and implied warranties, including but not limited to fitness for any other purpose(s). In no event will Waters be liable for consequential, economic or incidental damages of any nature. Waters reserves the right not to honor this warranty if the products are abused by the customer. The Warranty will not be deemed to have failed of its essential purpose so long as Waters is able and willing to repair or replace any non-conforming part or product.

Warranty Service

Warranty service will be performed at no charge and at Waters option in one of two ways: (1) the product will be repaired at a Waters repair facility or replaced; (2) replacement parts with appropriate installation instructions will be sent to the customer.

Non-conforming products or parts will be repaired, replaced with new or like-new parts, or refunded in the amount of the purchase price, when the product is returned. Warranty service will be performed only if the customer notified Waters during the applicable warranty period.

Warranty service will not be performed on:

a. Any product or part which has been repaired by others, improperly installed, altered, or damaged in any way.

b. Products or parts identified prior to sale as not manufactured by Waters. In such cases, the warranty of the original manufacturer will apply.

c. Products that malfunction because the customer has failed to perform maintenance, calibration checks, or observe good operating procedures.

Repair or replacement will not be made:

a. For expendable items if such items were operable at the time of initial use.

b. Because of decomposition due to chemical action.

c. For used equipment.

Warranty Period

The warranty period begins when the product is installed or, in the case of a customer installation, fifteen days after shipment from Waters. In no case will the warranty period extend beyond 15 months from date of shipment. If an item is replaced during its warranty period, the replacement part will be warranted for the balance of the original warranty period.

The warranty period for the RCM 25x10 is as follows:

90 DAYS

Housing
Inlet and Outlet Connector Assembly
Pressure Gauge
Check Valve

30 DAYS

Replacement Parts
Service Workmanship

EXPENDABLE ITEMS

Cartridge
O-Rings

ORDERING INFORMATION

Call:1-800-252-HPLC

WHERE TO PLACE ORDERS

Mail Orders -- Millipore Corporation, Waters Chromatography Division,
34 Maple Street, Milford, MA 01757
Attn: Order Processing Department

Telephone orders* -- 1-800-252-HPLC Customer Sales Department

Telex Orders -- 94-8413

*Confirming orders mailed after a telephone order has been placed must be clearly marked CONFIRMING to avoid duplication.

HOW TO PLACE ORDERS

Normally, delays or errors in processing orders are caused by incorrect or incomplete information. To minimize delays and errors in processing your orders, please provide all of the information requested below. Please list part numbers in ascending numerical order.

1. Catalog numbers and descriptions are given.
2. Quantity desired.
3. Complete purchase order number--orders cannot be processed without it. Requisition numbers are insufficient.
4. Complete "Ship To" address and marking if applicable.
5. Complete "Bill To" address if other than "Ship To".
6. Required delivery date.
7. Method of transportation desired.
8. Name and telephone number of person to contact if clarification is required.

PRICING

Prices listed are FOB Milford, MA, unless otherwise agreed. Prices and product information contained in any catalog or price list were current at the time of printing. In a continuing effort to provide the finest products available, Waters reserves the right to change specifications, models, or prices without notice and without liability for such changes. Where price changes have occurred, prices prevailing at time of receipt of your order will apply.

TERMS OF PAYMENT

Our terms are net 30 days from invoice date with approved credit. If your credit has not been previously established with Waters, our terms are payment in advance or COD.

SHIPMENTS–DAMAGES–CLAIMS–RETURNS

SHIPMENTS

As all shipments are made FOB Milford, MA, we suggest insurance be authorized on all shipments. Instruments and major components will be packed and shipped via surface, unless otherwise requested. Supplies and/or replacement parts are packed and shipped via UPS, UPS Blue, air parcel post, or parcel post unless otherwise requested.

DAMAGED SHIPMENTS

The Interstate Commerce Commission has held that carriers are as responsible for concealed damage as for visible damage in transit. Unpack shipment promptly after receipt as there may be concealed damage even though no evidence of it is apparent. When concealed damage is discovered, cease further unpacking of the unit involved and request immediate inspection by local agent or carrier and secure written report of his findings to support claim. This request must be made within 15 days of receipt. Otherwise, claim will not be honored by the carrier. Do not return damaged goods to factory without first securing an inspection report and contacting Waters for a return authorization number.

FILING OF CLAIMS

After a damage inspection report has been secured, Waters will cooperate fully in supplying replacements and handling of a claim which may be initiated by either party.

RETURNS

No returns may be made without prior notification and authorization. If for any reason it is necessary to return material to us, please contact our customer service department or your nearest Waters subsidiary/representative for a return authorization number and forwarding instructions.