
McAllister Technical Services

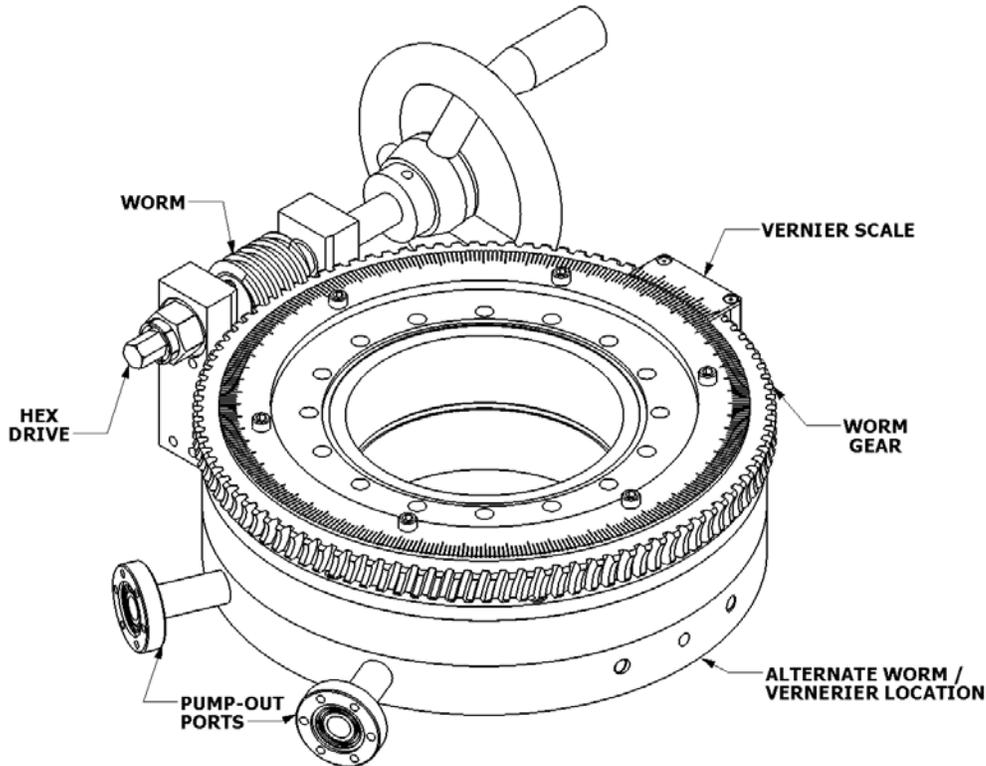
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DPRF Instructions



THANK YOU for your purchase of MTS' Differentially Pumped Rotary Platform (DPRF). It is the finest of its kind available. We appreciate the confidence you have placed in our

Leak Check Certificate

Model _____ Date _____ Job# _____ Checked by: _____

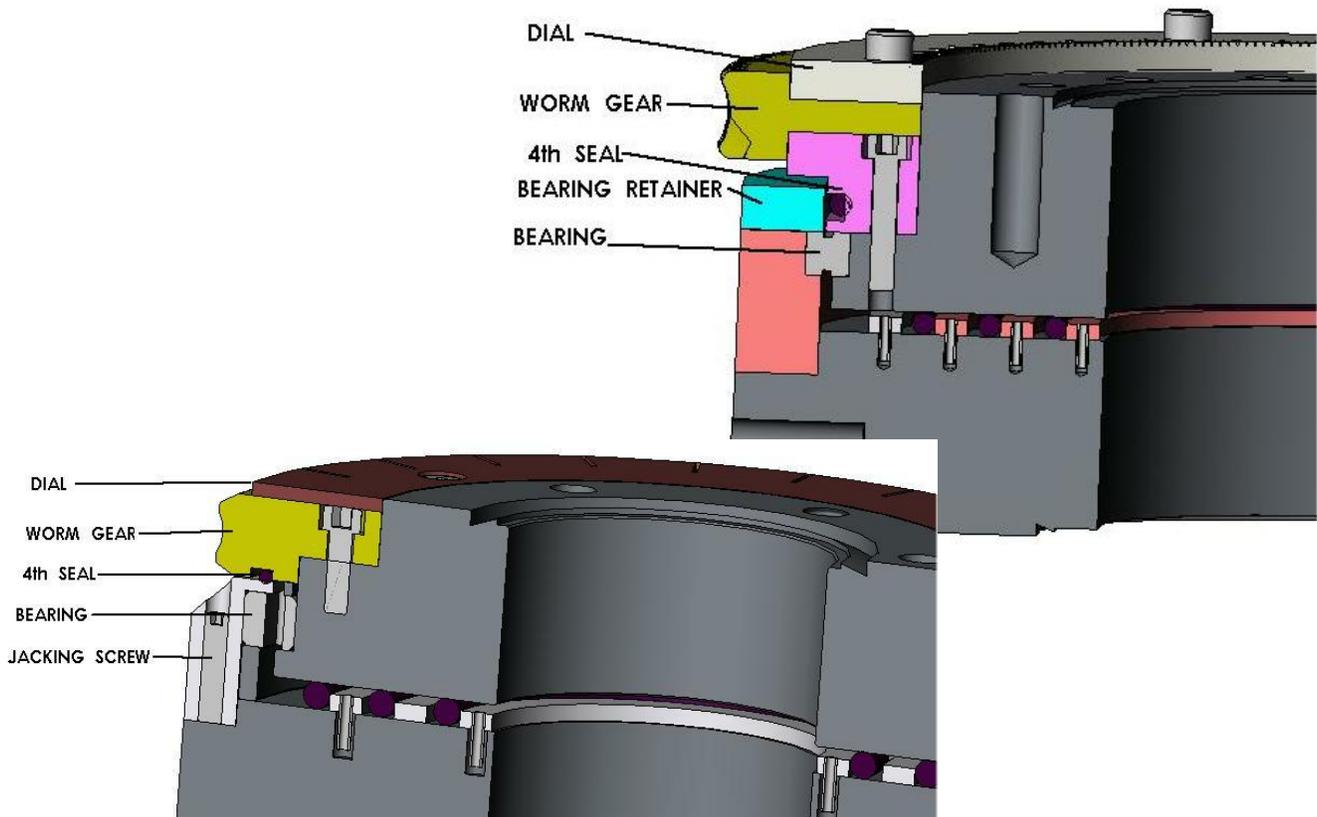
DPRF

This is to certify that the above-referenced product has been checked on a helium mass spectrometer leak detector having a sensitivity greater than 5×10^{-10} std. cc/sec and has been found to have no measurable leak.

company. We encourage your comments and suggestions on this product and its manual.

The only metal components exposed to vacuum are type 304 stainless steel and 6061 aluminum. There are two differential pumping volumes, isolated by three fluorocarbon seals. These volumes are pumped through the 1.33" OD mini-ports located at the perimeter of the seal.

Linear and lateral alignment is maintained by a special ball bearing made of hardened carbon steel. These bearings will corrode. Do not allow moisture to condense on or in the seal. Do not allow LN₂ to chill the seal. To prevent moisture, dust and/or debris from entering the bearing, there is a fourth seal to protect it. (This feature is unique to MTS differentially pumped rotary platforms.)



Please read and follow these instructions to ensure years of trouble-free service.

Upon receipt: Inspect the carton for external damage. If found, file the appropriate claim with the carrier.

When unpacking: Inspect the unit for hidden damage from shipment. DPRF platforms are shipped with custom foam-in-place packing. We have found this to be the best way. The foam is separated approximately half way inside the carton with thin white plastic. The unit is also bagged in polyethylene and the flanges are covered with aluminum foil and plastic covers. This bagging is necessary to assure no packing material or foreign matter is able to contaminate the unit while in transit. We recommend the packing box with the packing be saved, if possible, for equipment storage or possible future shipment.

Installation: The DPRF is shipped clean and ready to install. Remove the protective polyethylene bags and flange covers. Be certain no foreign residue or particles adhere to the device or the sealing flange knife edges. As a precaution, it is recommended the flanges be wiped with a lint free cloth prior to installation. Install the DPRF on your chamber/manipulator/instrument as you would any other Conflat type flange. Use standard, 0.080" thick, flat copper gaskets. For the tapped flanges, use the bolt sizes recommended in the following table for installation.

Double check that your mating equipment has standard thickness flanges. These recommended bolt lengths are for standard thickness Conflat type flanges. **USING INCORRECT LENGTH BOLTS FOR INSTALLATION CAN DAMAGE THE DPRF ASSEMBLY.** The bolts may be supplied by you, or you may use a DPRF bolt set available from McAllister Technical Services.

| Model | Nominal Flange Size | Bolts SAE & Metric Sizes |
|----------|---------------------|--|
| DPRF275 | 2.75" (70 mm) | 1/4-28 X 7/8 & 8-32 X 1/2 M6 X 1 X 20 & M4 X 0.8 X 15 |
| DPRF450 | 4.5" (114 mm) | 5/16-24 X 1-1/4 & 8-32 X 1/2 M8 X 1.25 X 30 & M4 X 0.8 X 15 |
| DPRF600 | 6.0" (150 mm) | 5/16-24 X 1-1/2 & 8-32 X 1/2 M8 X 1.25 X 35 & M4 X 0.8 X 15 |
| DPRF800 | 8.0" (200 mm) | 5/16-24 X 1-3/4 & 8-32 X 1/2 M8 X 1.25 X 40 & M4 X 0.8 X 15 |
| DPRF1000 | 10" (250 mm) | 5/16-24 X 1-3/4 & 8-32 X 1/2 M8 X 1.25 X 40 & M4 X 0.8 X 15 |

One mini-conflat is marked "Inner". This means that this is connected to the innermost differential volume and the other mini conflat to the outer differential volume. If only single-stage differential pumping is being used, at least the inner one must be pumped, and it is probably a good idea to pump on both stages. **NEVER ALLOW EITHER OF THE TWO PUMPING PORTS TO REMAIN UNCOVERED.** The DPRF is sensitive to foreign matter entering the sealing system. The seal effectiveness and useful life are affected by the cleanliness of its environment. Particles can migrate through the pumping ports, contaminating the chambers, and this can cause seal failure. At all times, do one of the following:

- 1) connect the ports to suitable pumps
- 2) cover the ports with the plastic caps provided (always remove during bake-out and replace with materials which will not melt)
- 3) cover with clean foil or other suitable material.

The ports are etched or stamped with the labels “INNER” and “OUTER”. The markings are found on the mini-flange perimeters. Remove the protective caps to read these markings. The OUTER stage port is for the roughing pump, the INNER stage port is for the high vacuum pump.

Suggested pumping:

OUTER stage: >1.6 CFM at <10 microns

Connect a roughing pump to the OUTER port flange. The roughing system must have a pumping speed of 1 CFM, or greater, measured at the port flange, and be capable of achieving a vacuum base pressure of at least 10 microns, measured at the DPRF pumping port flange. The platform should be protected from backstreaming oil or other contaminants with suitable traps.

INNER stage: ~2 l/s at $\sim 10^{-6}$ torr

Connect a high vacuum pump to the INNER port flange. The high vacuum system should have a pumping speed of ~2 l/s or greater, measured at the INNER flange, and be capable of achieving an operating pressure of at least 5×10^{-6} Torr, measured at the DPRF pumping port flange. Higher pumping speeds and lower operating pressures will decrease the effective leak rates and decrease the pressure bursts upon rotation. Care must be taken to insure that significant pump speed losses due to conductance restrictions do not occur by using long lengths of small diameter tubing to connect suitable pumps. This is the most common cause of poor performance upon initial installation.

Using one stage pumping only:

If you wish to use only one pump stage, connect the pump to the INNER port. Cap off the OUTER port or plumb the OUTER port into the INNER port but *DO NOT* seal the OUTER port. Using one pump or no pump on the DPRF may cause the system base pressure to degrade and limit ultimate system base pressure but will not harm the DPRF.

Rotation:

The DPRF may be rotated continuously in either direction. The direction of rotation may be reversed at any time. Small pressure bursts may be observed near the DPRF as it is rotated. This is normal. This is due to the surface friction between stainless steel and the seal. Mass spectrometer studies show the bursts to be mostly water, methane, CO and CO₂ with small amounts of H₂. When pumping on both pumping ports, the typical pressure burst observed, with a system base pressure of 2×10^{-10} Torr, will be 0.5 to 1.0 decade. Typical system base pressure recovery times range from 5 to 50 seconds, depending upon system condition and pumps used.

Bakeout:

Bakeout in normal fashion, but NEVER exceed 150°C at the DPRF during bakeout. Higher temperatures can damage the seals. Monitor the temperature during bakeout. Never rotate the DPRF during bakeout or when it is above ambient temperature. Always remove any motor or limit switches before bakeout.

Accessories included:

1. Hex wrench kit
2. Lubrication kit consisting of 1 each:
 - High temperature silicone/MoS₂ (black) grease for lead screws
 - High temperature silicone (clear) grease for bearings

Maintenance: Under normal conditions your DPRF will provide years of trouble-free service, especially if the following simple maintenance is performed. After several bakeouts, it may be necessary to relubricate the worm shaft and/or main bearing. Use the MoS₂ grease in the supplied syringe. The disk dial, worm gear and inner bearing retainer ring can be removed for bearing access. Note that the "O" ring seal above the bearing is to keep moisture and dirt out of the bearing. If your application is in a clean, moisture-free environment, this seal can be removed, thereby reducing torque required to rotate the platform. When replacing the screws in the disk dial, worm gear and inner bearing retainer ring, be sure to re-coat the threads with an anti-sieze compound.

Seal wear is not normally a problem when used as designed but high use or continuous operation will reduce service life of the seals. We recommend the DPRF be returned to the factory for service involving disassembly/assembly. The main reason for this policy is the sensitivity of DPRF units to contamination and mechanical damage of interior components and surfaces.

These units can be successfully serviced in the field if a clean work environment is available and adequate skill and care are used. The equipment warranty does not cover units which, in the sole judgement of McAllister Technical Services, may have been damaged during attempted customer repair.

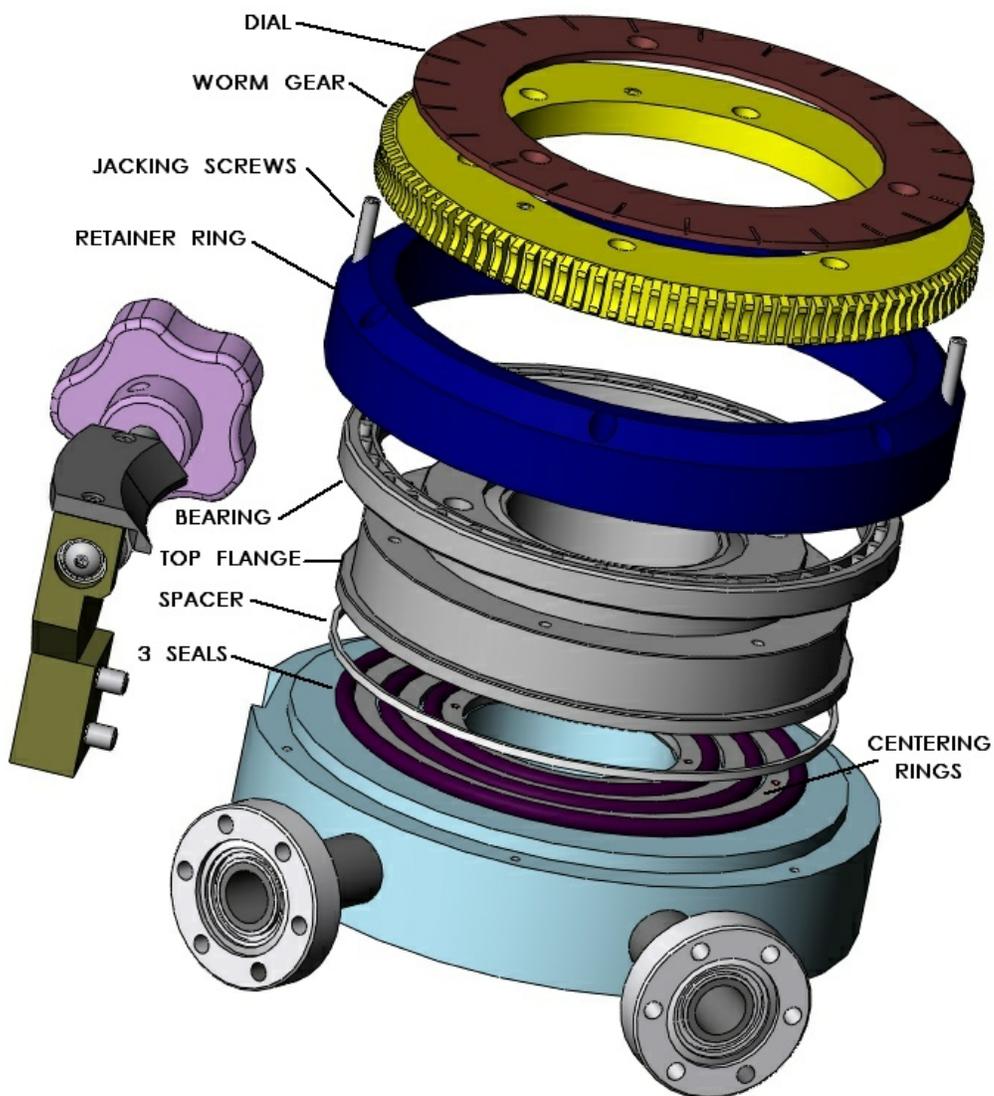
Field disassembly procedure:

Remove the DPRF from use and cap the pumpout ports. Remove the Vernier scale. Remove the worm drive bracket and motor unit, if mounted.

Thoroughly clean all exposed surfaces with alcohol and lint free wipes. Move the DPRF to a clean work area. Remove the bolts/screws from the disk dial, bronze worm gear and inner bearing retainer ring. Remove the bolts/screws from the outer bearing retainer ring. Remove the disk dial and worm gear. The outer bearing retainer ring may be removed by tightening the jacking screws (set screws) evenly to lift the outer retaining ring off the lower body/flange.

The bearing housing ring can now be removed from the lower flange and the upper flange can be removed from the bearing. Special care needs to be taken with the bearings. If the bearing needs re-lubrication, use a high-temperature synthetic grease. Make sure none of the bearing lube comes in contact with vacuum-exposed surfaces. Protect the sealing surfaces from mechanical damage at all times.

Remove and clean all interior components. Use alcohol and lint free wipes. Inspect seal surfaces and seals for damage or wear. Replacement seal kits are available from McAllister Technical Services. If replacing the seals, handle the seals only with clean, lint free gloves. Replace the centering rings. Place the seals between the spacers. Clean and/or replace and re-lubricate the bearing. Reassemble the DPRF. Please note that the whole assembly is a precision device. The parts are machined to within 0.001" to insure the proper load on the seals. Make sure the rings are all correctly aligned, the bearing and top flange are fully seated and the screws are well lubricated with anti-seize compound and not over tightened.



Test the DPRF:

1. Pump on the INNER mini-conflat with a helium mass spectrometer leak detector. Bag check for 30 seconds. No leak should be observed with a sensitivity of 5×10^{-10} std. cc He/sec.
2. Install platform on leak detector and pump on the OUTER volume. Bag check for 30 seconds. No leak should be observed with a sensitivity of 5×10^{-10} std. cc He/sec.

Lubrication:

The bearings are lubricated with McAllister Technical Services' MoS₂ high temperature lubricant. The user may need to add more lubricant from time to time, depending on the frequency and temperature of bakeouts and operating environment.

Flexibility:

Since we are unable to predict the way in which each DPRF will be used, we have allowed some flexibility. On Models DPRF450 and larger, if the handwheel interferes with something on your vacuum chamber, you may remove it by removing the screw at its center and simply turn the hex end of the shaft with a ratchet wrench to actuate the rotary platform. Also, by reversing the shaft in the worm gear bracket, the handwheel can be placed on the opposite end. The entire worm gear bracket can be removed for easy bakeout or for rapid, non-precise rotation, by simply removing the socket head cap screws that hold the worm bracket on to the DPRF base. The worm gear bracket is self-aligning and takes only a moment to reinstall.

Packing for re-shipment:

DPRF platforms are sensitive to contamination. As such, normal precautions in shipment are inadequate. If the need arises to re-ship the unit, or put the unit in storage, follow these guidelines.

- 1) Work on a clean surface when packing.
- 2) Seal off both pumpout mini-ports with flange/gasket sets or snugly fitting plastic caps.
- 3) Protect and seal the flange surfaces. Use the original cover plates and clean foil, if possible.
- 4) Double bag unit in polyethylene bags. Seal each bag separately. Heat seal if possible. This is necessary to assure no packing material or foreign matter is able to contaminate the unit in transit.
- 5) Re-use original carton with foam-in-place packing if available. If not, use suitable, non-migrating padding. Use adequate padding. Some shippers require 6" of padding be used for them to guarantee safe arrival of shipments. If the unit is being stored, or shipped to another user, include this manual in the package.

Parts and factory service:

Replacement parts and non-warranty factory service are available on a fast turnaround basis. Please consult the factory with your specific need.

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