

# TELEVAC TELEVAC TELEVAC TELEVAC



## INSTRUCTION MANUAL

### MP7ER/FR Remote Double Inverted Magnetron Cold Cathode Gauge

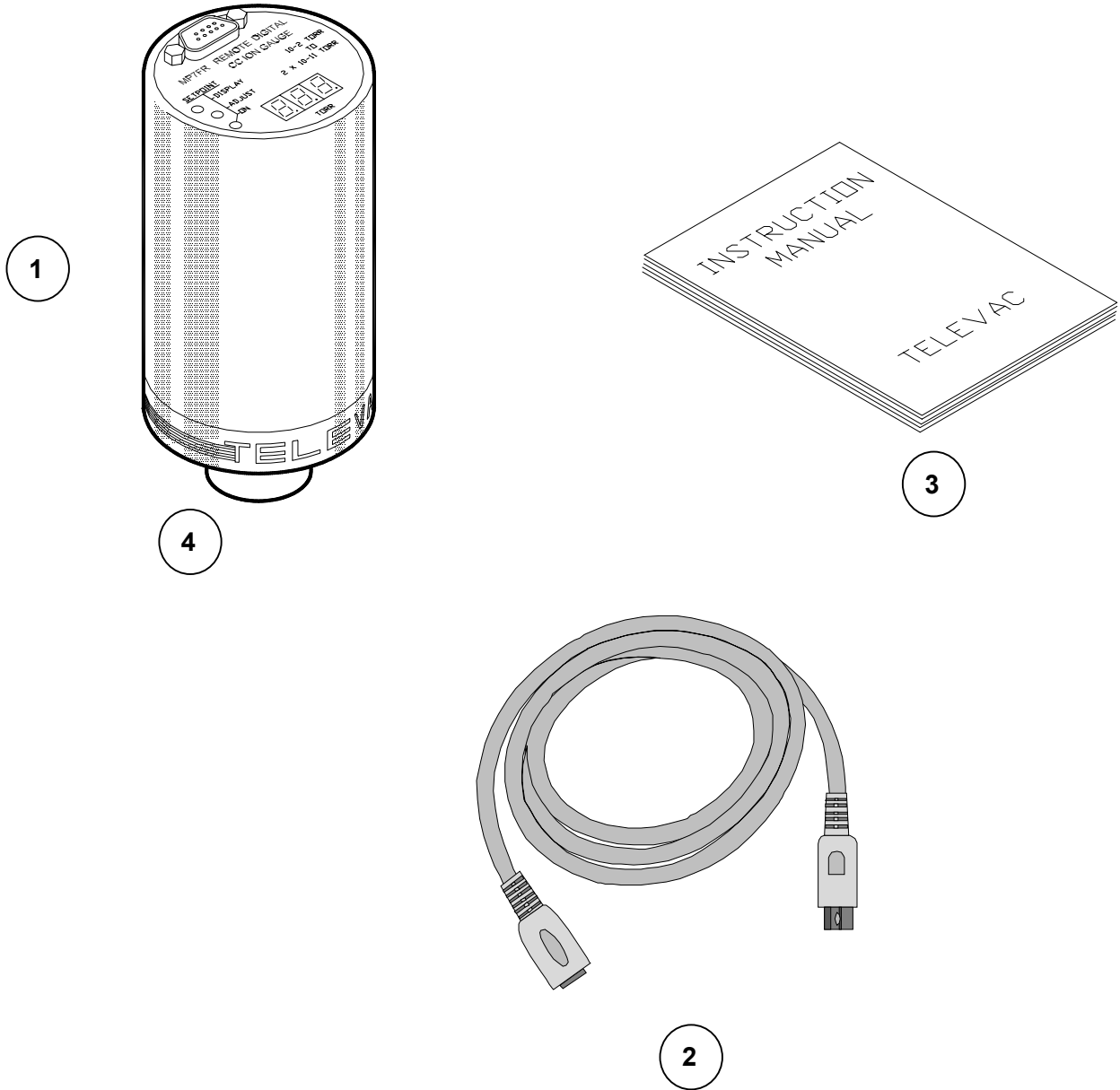
Range: 7ER 10<sup>-8</sup> to 10<sup>-2</sup> Torr  
7FR 10<sup>-11</sup> to 10<sup>-2</sup> Torr



#### TELEVAC

A DIVISION OF *THE FREDERICKS COMPANY*  
2400 PHILMONT AVE.  
HUNTINGDON VALLEY, PA 19006

# PARTS LIST



#	QTY	ITEM DESCRIPTION
1	1	7ER/FR Remote Cold Cathode Electronics
2	1	Cable (specified at ordering)
3	1	Instruction Manual
4	1	Sensor

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**PLEASE READ THIS MANUAL THOROUGHLY BEFORE USING GAUGE. REPORT ANY PROBLEMS IMMEDIATELY.**

## **Description and Instrument Operation**

The MP7ER/FR series Remote Module provides a compact stand-alone measurement solution for applications that do not require traditional panel-mounted instrument readouts. These modules can provide local readout and control or can be interfaced directly with a PLC, chart recorder, or data acquisition system. The MP7ER/FR series of instruments use the time proven reliable and rugged TELEVAC 7ER/FR Sensor, which can be changed in seconds. These instruments operate from low voltage DC and are easily integrated into the largest process system with a minimal effort. Likewise, the MP7ER/FR Remote Gauge can be used as a small stand-alone vacuum measurement solution.

## **Features**

- » **Wide range 10<sup>-2</sup> to 10<sup>-11</sup> Torr**
- » **Fast restart at high vacuum**
- » **No x-ray limit**
- » **Reduced external magnetic field**
- » **Compact design**
- » **Rugged/durable**
- » **No-filament burnout**
- » **No degassing required**
- » **Long life**
- » **Cleanable sensor (7ER)**

## Safety Instructions

**START BY READING THESE IMPORTANT SAFETY INSTRUCTIONS AND NOTES** collected here for your convenience and repeated with additional information at appropriate points in these instructions



These safety alert symbols in this manual or on the Product rear panel mean cautions - personal safety, property damage or danger from electrical shock. Read these instructions carefully.

In these instructions the word “**product**” refers to the **MP7ER/FR** and all of its approved parts and accessories.

*NOTE: These instructions do not and cannot provide for every contingency that may arise in connection with the installation, operation, or maintenance of this product. Should you require further assistance; please contact Televac at the address on the title page of this manual.*

**This product has been designed and tested to offer reasonably safe service provided in it's installed, operated and serviced in strict accordance with these safety instructions.**



Failure to comply with these instructions may result in serious personal injury, including death, or property damage.

These safety precautions must be observed during all phases of operation, installation, and service of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Televac disclaims all liability for the customer's failure to comply with these requirements.



The service and repair information in this manual is for the use of **Qualified Service Personnel**. To avoid shock, do not perform any procedures in this manual or perform any Servicing on this product unless you are qualified to do so.

- ✓ **READ Instructions** – Read all safety and operating instructions before operating the product.
- ✓ **RETAIN instructions** – Retain the Safety and Operating Instructions for future reference.
- ✓ **HEED warnings** – Adhere to all warnings on the product and in the operating instructions.
- ✓ **FOLLOW instructions** – Follow all operating and maintenance instructions.
- ✓ **ACCESORIES** – Do not use accessories not recommended in this manual as they may require a technician to restore the product to its normal operation.



To reduce risk of fire or electric shock, do not expose this product to rain or moisture.

# CHAPTER 2 (cont.)

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## Safety Instructions (cont.)



**Objects and Liquid Entry – Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts that could result in a fire or electric shock. Be careful not to spill liquid of any kind onto the products.**



**Do not substitute parts or modify instrument.**  
**Because of the danger on introducing additional hazards, do not install substitute parts or perform any unauthorized modifications to the product. Return the product to Televac for service and repair to ensure that safety features are maintained. Do not use this product if it has unauthorized modifications.**

# CHAPTER 3

## Principles of Sensor Operation

### **Double Inverted Magnetron Cold Cathode Gauge**

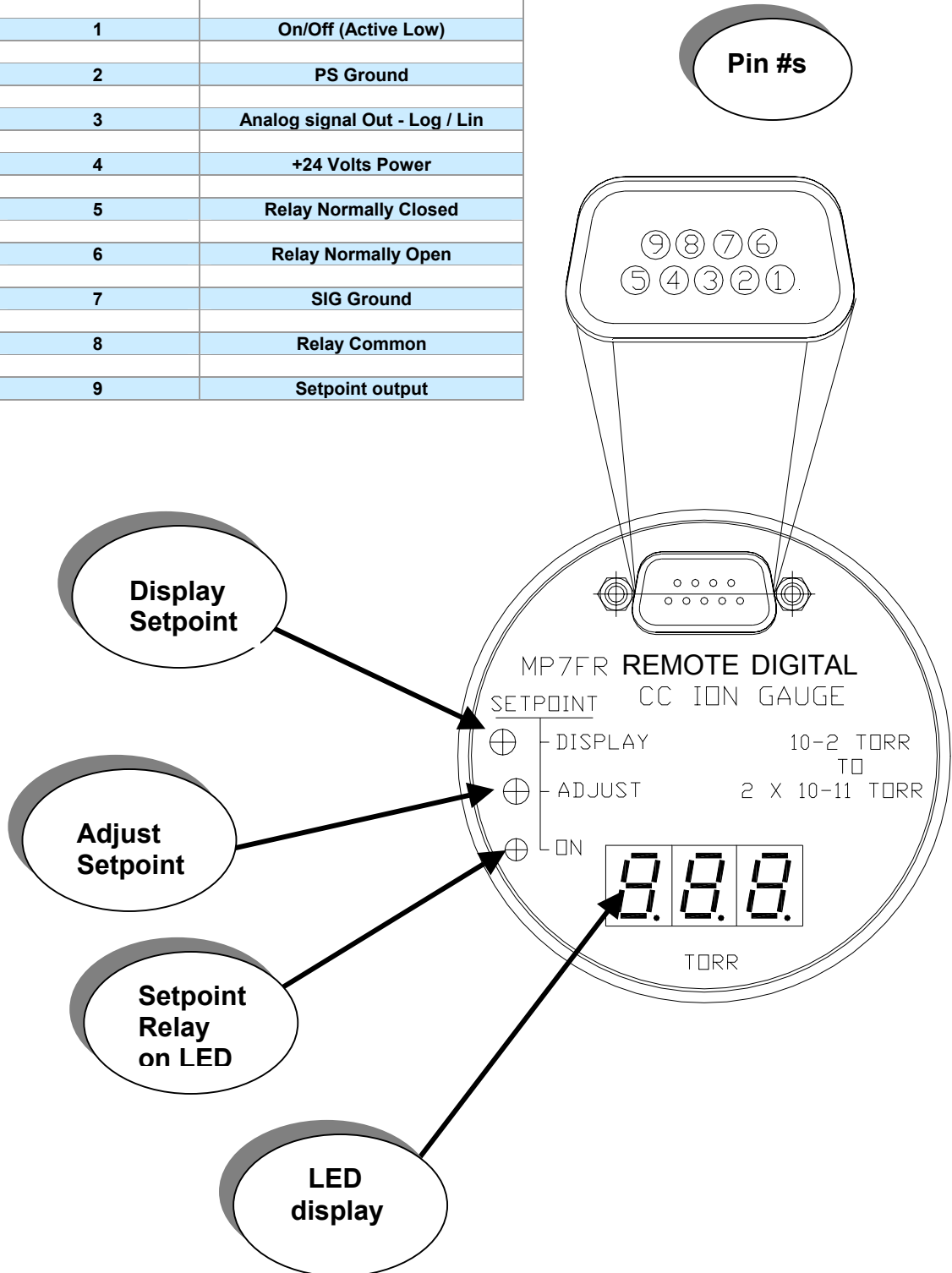
The cold cathode gauge is a high vacuum sensor that measures pressure by ionizing the residual gases in a magnetron discharge. The body of the gauge serves as a cathode, and is at ground potential. The anode operates at voltages up to 4000 volts. The permanent magnet traps electrons in the gauge to sustain the discharge at very low pressure. This gauge is sensitive to gas type. Because of the relative ruggedness of this gauge and since it has no filament to burn out, it is often used in applications where hot cathode gauges are not reliable.

## SENSOR OPERATION AND INSTALLATION

- 1.0 Connect the gauge to the vacuum system, (can be connected in any position, but mounting with the vacuum port facing down eliminates any chance of particles entering into the gauge).
- 2.0 Assure that there are no leaks.
- 3.0 Apply 24 DC volt power between pin #4 (+) and #2 (-). Monitor the signal output with a digital volt meter between pin # 3 (+) and pin # 7. The display will show "OFF" and the signal output will be between 10.5 volts and 14.5 volts.
- 4.0 The gauge is activated by grounding the wire from pin # 1 of the connector and may be operated over any vacuum range, however, the following cautions.
  - 4.1 Activate the gauge only at pressures below 10<sup>-2</sup> Torr. Continuous operation above this range will result in build up of contaminants inside the gauge and will produce errors in reading. In addition, at even higher pressures the gauge may falsely indicate lower pressures by having passed beyond the peak of its curve.
  - 4.2 Initial activation of the gauge at pressures below 10<sup>-6</sup> Torr may exhibit a delay in providing an accurate reading of pressure until the electrical discharge within the tube has established itself. This initial delay increases significantly at even lower pressures. Once established the discharge within the tube is maintained over the entire range. A very rough estimate of start time can be calculated as  $T, \text{ sec} = 1/\text{pressure in } \mu\text{Torr}$ .
- 5.0 While the pressure is above the range of the gauge it will display "HI" and the signal output will be just above the highest reading. If, on the other hand the pressure is below the lower gauge limit, the display will display "LO" and the signal output will remain at its lowest value.
- 6.0 The trip pressure for the setpoint relay can be displayed by pressing the "Display Setpoint" button. It can also be read as a voltage – anytime – on the wire pin # 9 of the connector. The display will show the setpoint pressure as a blinking number (to distinguish it from a pressure reading) until the button is again pressed or it times out automatically after 60 seconds. The setpoint pressure can be changed only during the blinking display by means of the labeled adjustment screw. The new value is retained in memory and the corresponding new voltage is provided at the setpoint terminal on the connector and is scaled in the same way as the signal output.

## SENSOR OPERATION AND INSTALLATION (cont.)

PIN#	PIN OUTS
1	On/Off (Active Low)
2	PS Ground
3	Analog signal Out - Log / Lin
4	+24 Volts Power
5	Relay Normally Closed
6	Relay Normally Open
7	SIG Ground
8	Relay Common
9	Setpoint output



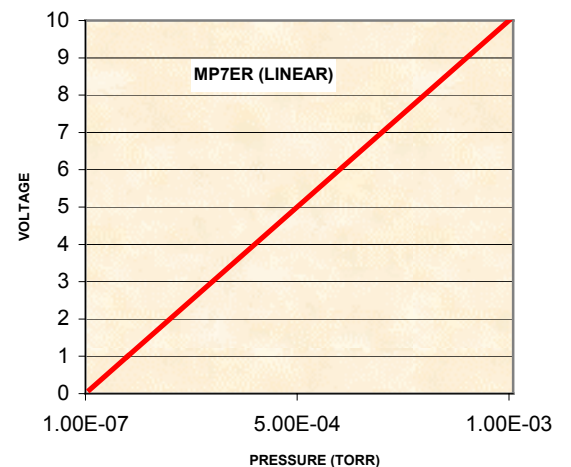
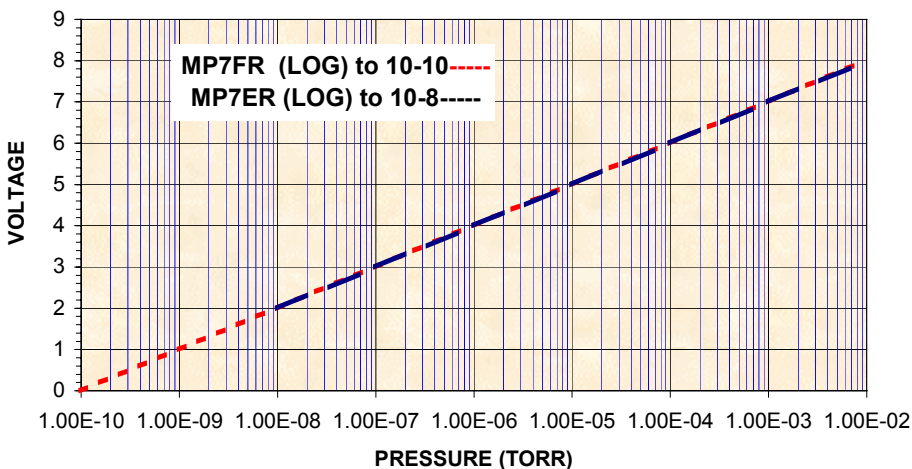
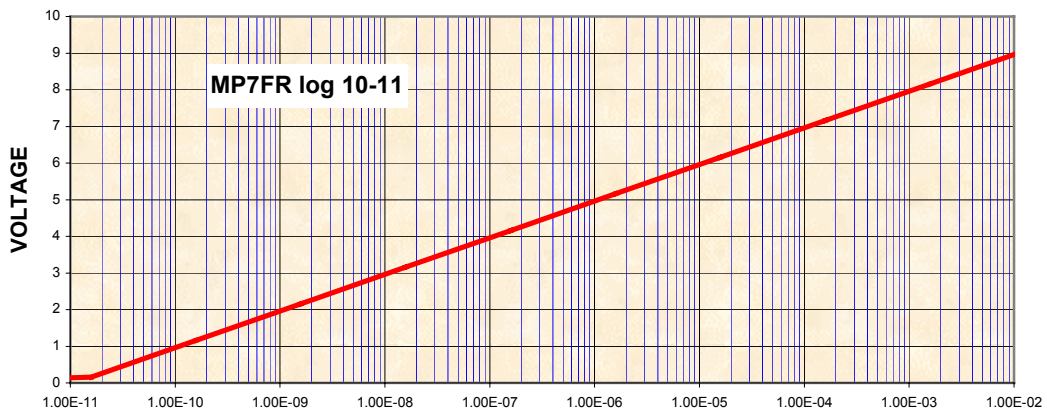


# CHAPTER 5

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## Recorder Outputs

Pressure (TORR)	LOG (7FR 10 -11) VOLTAGE	LOG (7ER or 7FR 10-10) VOLTAGE	LINEAR (7ER) VOLTAGE
"LO"		-0.1	-0.1
1.00E-11	0	-0.1	-0.1
1.00E - 10	1	0	-0.1
1.00E - 09	2	1	-0.1
1.00E - 08	3	2	-0.1
1.00E - 07	4	3	0
1.00E - 06	5	4	0.01
1.00E - 05	6	5	0.1
1.00E - 04	7	6	1
1.00E - 03	8	7	10
1.00E - 02	9	8	10.2
"HI"		9.2	10.2

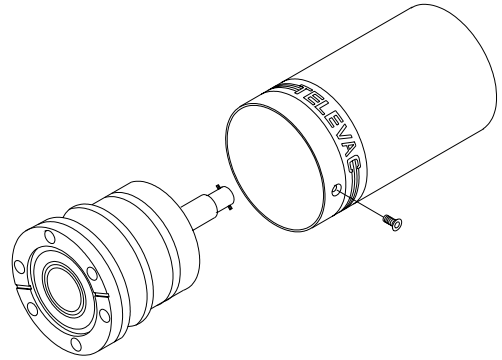


## Maintenance

No maintenance is required beyond periodic cleaning or replacement of a contaminated sensor. The 7ER is cleanable whereas the 7FR requires sensor replacement.

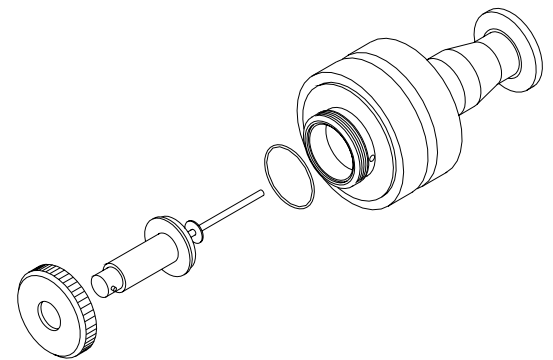
### 1.0 Disassembling the 7ER/7FR

- 1.1 Remove the sensor from the vacuum chamber.
- 1.2 Disconnect power from the sensor.
- 1.3 Remove the single flat socket screw from the bottom of the sensor can.
- 1.4 Carefully slide the can away from the bottom flange, until it is completely off.



### 2.0 Cleaning the sensor ( 7ER only )

- 2.1 Unscrew the cap to expose the anode assembly (to remove, rotate cap counter clockwise).
- 2.2 Gently lift the anode assembly upwards to separate it from the body.
- 2.3 Remove the "O" ring from the body, being careful not to scratch the "O" ring seat. Wipe it off with a lint free tissue making sure that it is still intact (no cracks or tears). It should be round and not flattened.
- 2.4 Blast the entire anode assembly and body at 30 psi using 70-140 mesh glass bead abrasive. Scotch -Brite or polishing cloth also can be effective.
- 2.5 After cleaning, blow out any residual glass beads or dust with dry air.
- 2.6 Rinse with alcohol, followed with a rinse of de-ionized water.
- 2.7 Dry anode assembly and the body in a clean oven @ ~ 200° F.
- 2.8 Re-grease the "O" ring with Apiezon L or M Grease. (A vacuum approved grease). DO NOT APPLY EXCESS GREASE. "O" ring should be shiny.
- 2.9 Install "O" ring in body..
- 2.10 Replace the anode assembly in the body after the "O" ring has been installed.
- 2.11 Screw the cap on and hand tighten.



## 3.0 Bake-out of the sensor ( 7FR )

- 3.1 Without removing the sensor from the vacuum system, separate the electronic block from the sensor as described in **Section 1.0 (Disassembling the 7ER/7FR )**.
- 3.2 After separating the electronics from the sensor, but before disassembling of the sensor for cleaning, use a marker to mark the orientation and positions of the magnets relative to each other and relative to the stainless steel sensor tube. These are aligned at the factory for optimum performance of the sensor. When reassembling after cleaning, reassemble in reverse order with the magnets in their original respective locations and like pole surfaces facing each other (N to N, S to S).
- 3.3 Holding the magnets, use a 1/32" Allen wrench to remove three setscrews on the top aluminum holding ring.
- 3.4 Slide away the magnet's washers and aluminum spacers from the tube's body. Do not remove the lower aluminum holding ring (one that is closest to the flange).
- 3.5 Bake out the sensor using heat tape, blanket or other means with temperature controls. Temperature on the gauge's surface should not exceed 350°C. **NOTE:** if the bake out temperature does not exceed 180°C for 2 hours, the sensor could be baked out with the magnets in place.
- 3.6 After cooling the sensor down to room temperature, re-assemble with the magnets in their original respective locations and like pole surfaces facing each other (N to N, S to S).
- 3.7 Put the electronic block onto the sensor and secure it with flat socket screw.

# CHAPTER 7

## Calibration

All instrumentation is calibrated at the factory. No further calibration at the customer's facility should be required, even if the gauge tube is replaced.

For a reliable recalibration at a later date, it is necessary to have a reference standard vacuum system whose pressure is known to be accurate. For such a calibration, the instrument and sensor tube should be returned to the factory for re-certification. However, if the vacuum calibration verification must be done at the customer's facility, a knowledgeable electronics technician trained in vacuum calibration should operate equipment of certifiable accuracy.

## Troubleshooting

- 1.0 If display consistently displays "HI", the pressure may be above the gauge upper limit (1 x 10<sup>-2</sup> TORR) units to the gauge or there may be a leak locally. Check the integrity of the vacuum connection and, if the 7E sensor is used, check the o-ring seal on the sensor tube.
- 2.0 If the display constantly reads "LO", the sensor may have become inoperative. Check for correct reassembly after bake out.

NOTE: If, after doing some or all of the above, the unit is still inoperative, return to the factory for repair.

## Specifications

### Measurement Range Output Options

1. Log 10<sup>-10</sup> to 10<sup>-2</sup> Torr
2. Linear 10<sup>-8</sup> to 10<sup>-3</sup> Torr
3. Log 2 X 10<sup>-11</sup> to 10<sup>-2</sup> Torr

### Accuracy

+/-0.2 of decade of reading

### Input Voltage/Power

Required +24 V DC @ 250 mA  
Power ON Indicator LED is included

### Setpoint Relay

Form C Contact

### Operating Temperature

+ 15 to 50C

### Sensor Material

Stainless Steel (Type 304)

### Range

MP7ER: 10<sup>-2</sup> TO 10<sup>-8</sup> TORR  
MP7FR 10<sup>-2</sup> TO 10<sup>-11</sup> TORR

### Mounting Orientation

None

### Ion Control

Ion ON/OFF Control is included

### Adjustment Potentiometer

Setpoint

### Calibration Medium

Dry Air or Nitrogen

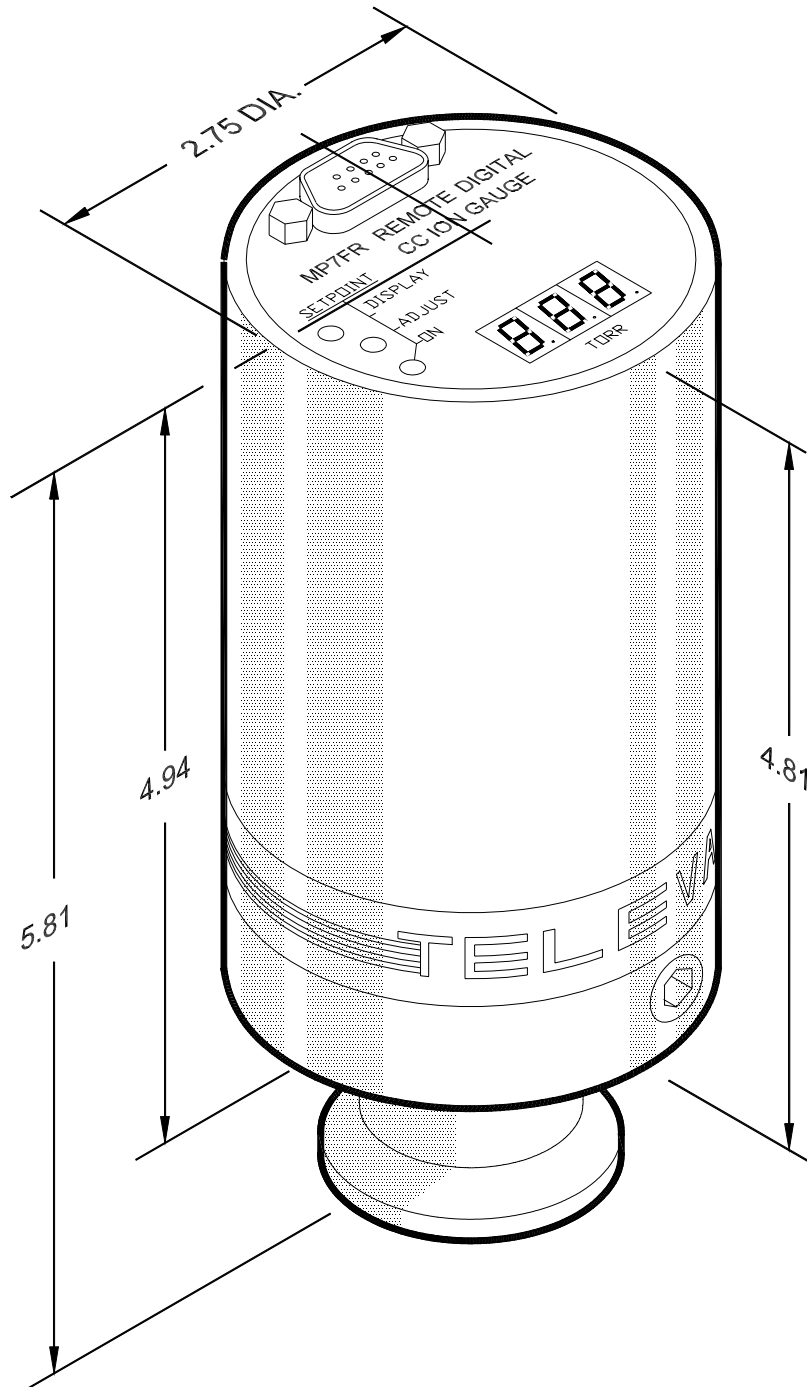
### Overpressure Tolerance

150 PSI

# CHAPTER 10

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## Dimensions



## Unpacking and Inspection

Before each unit is installed or operated, a quick inspection should be performed and the following noted:

- a. damage to the unit (scratches, nicks, dents, cracks, etc.)
- b. missing: screws, switches or switch hardware
- c. broken barrier strips, etc.
- d. broken or loose components within instrument

Should any of the above problems be encountered, contact the factory immediately. Any unauthorized repairs will void the warranty.

## Warranty information

The Televac division warrants instruments and components to be free of defects in material and workmanship for a period of one year after the date of shipment unless otherwise specified in the quotation or product literature. No salesman, Representative or agent of the Fredericks Company, or its divisions is authorized to give any guarantee or warranty or make any representation in addition or contrary to those stated herein.

Other than those expressly stated herein, **there are no other warranties of any kind, express or implied and specially excluded but not by way of limitation, are the implied warranties of fitness for a particular purpose and merchantability. It is understood and agreed the seller's liability whether in contract, in tort, under any warranty, in negligence or otherwise shall not exceed the return of the amount of the purchase price paid by the purchaser and under no circumstances shall seller be liable for special, indirect, incidental or consequential damages. The price stated for the equipment is a consideration in limiting seller's liability. No action regardless of form, arising out of transactions of this agreement may be brought by purchase more than one year after the cause of action has accrued, seller's maximum liability shall not exceed and buyer's remedy is limited to either (1) repair or replacement.**