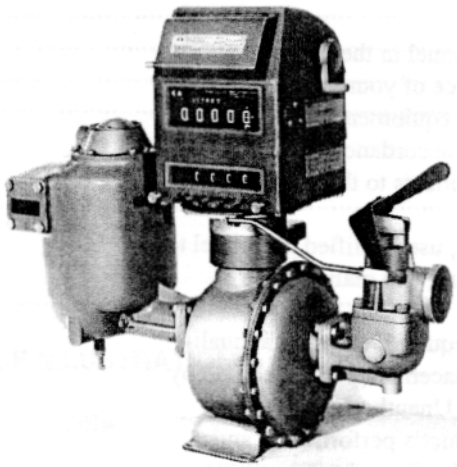
X-(B-40/50)
Revision 01

Series 40 and 50 BiRotor Meters

Operating and Maintenance Instructions



Series 40

Series 50

Brodie Meter Co., LLC
P.O. Box 450
19267 Highway North (30461)
Statesboro, GA 30459-0450
Phone: (912) 489-0200
Fax: (912) 489-0295
www.brodiemeter.com

Essential Instructions

The Brodie BiRotor Meter is a product of Brodie Meter Co., LLC. Brodie Meter Co., LLC designs, manufactures, and tests its products to meet many national and international standards. The products sold and distributed by Brodie Meter Co., LLC are sophisticated technical instruments that must be properly installed, used, and maintained to ensure they continue to operate within their normal specifications. The following instructions must be followed and integrated into your program when installing, using, and maintaining any of the products purchased from Brodie Meter Co., LLC.

- Read all instructions prior to installing, operating, and maintaining your meter. If this manual is not the manual you need, telephone (912) 489-0200, or the local Brodie Meter Co., LLC office, and the necessary manual will be mailed to you. Save this manual for future reference.
- If you do not understand the instructions, contact your sales representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with your meter.
- Inform and educate your personnel in the proper installation, operation, and maintenance of your meter.
- Install and maintain all related equipment as specified in the manual instructions and in accordance with local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program, and maintain the equipment.
- When replacement parts are required, ensure that qualified service personnel use replacement parts specified by Brodie Meter Co., LLC. Unauthorized parts and procedures can affect the product's performance and endanger your operation. Look-alike substitutions may result in fire, electrical hazards, or improper

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

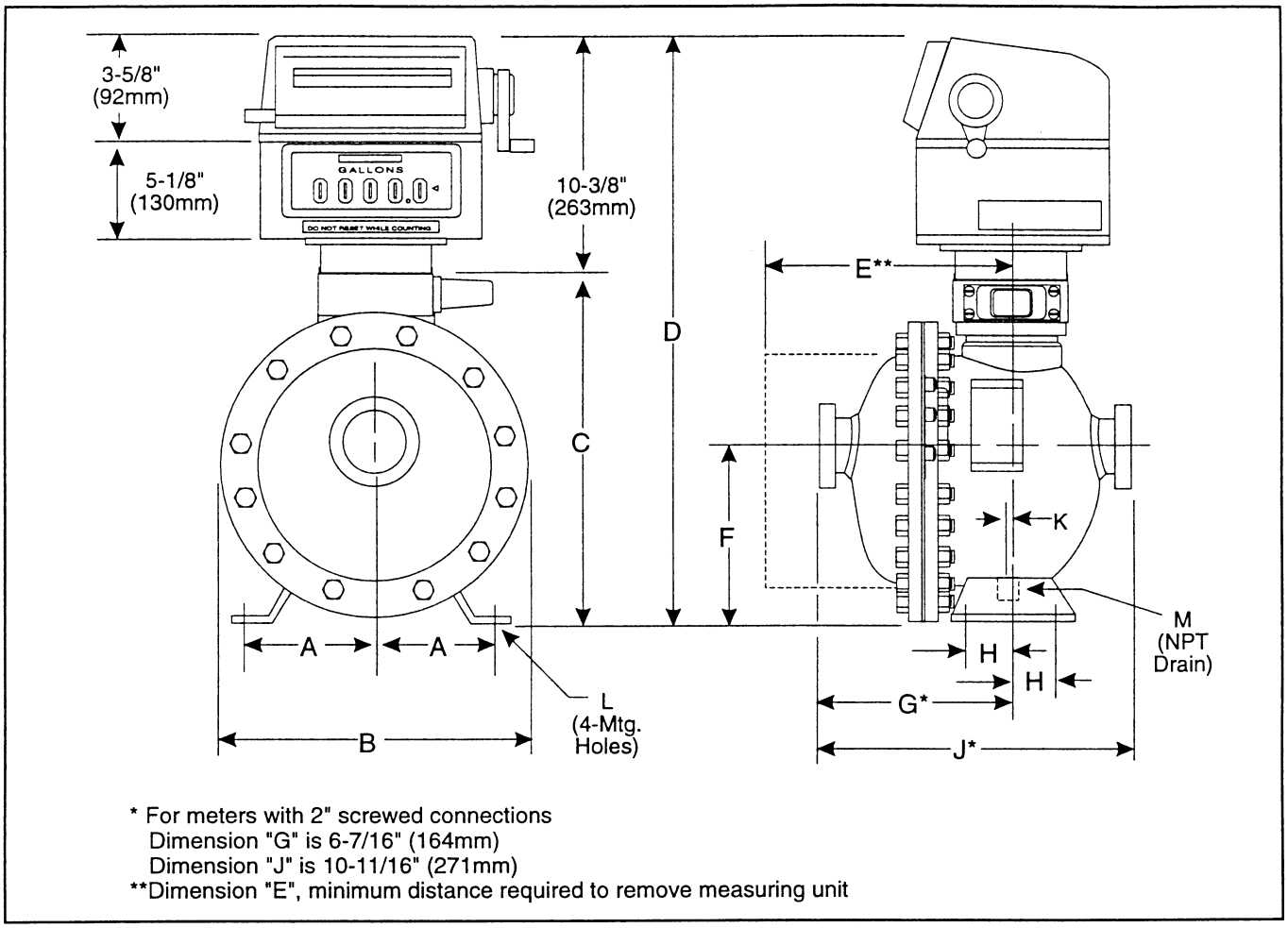

Figure 2-1 Dimensions

during shipment. If the packing case is damaged, the local carrier should be notified at once concerning his liability.

A report should be submitted to the Product Service Department, Brodie Meter Co., LLC , P.O. Box 450, Statesboro, Georgia, 30459.

Remove the envelope containing the packing list. Carefully remove the equipment from the packing case. Inspect for damaged or missing parts.

Refer to your packing list for information as to what is supplied with your particular order. In the event that any items are missing from your shipment, contact your local Brodie representative or Sales Office. The serial number of your meter and sales order number should be supplied at this time.

2-3 Return Shipment

To be able to process return goods quickly and efficiently, it is IMPORTANT that you provide essential information. Do not return any assembly or part without an "R.M.R."(Returned Materials Report), or a letter which describes the problem, correction action, if any, to be taken, and the work that is to be performed at the factory. R.M.R. forms can be obtained from Brodie Sales Offices or the Service Department, Brodie Meter Co., LLC , P.O. Box 450, Highway 301 N., Statesboro, Georgia, 30459.

Place a copy of either of the above inside the shipping container and attach it physically to the material being returned. A copy of your packing list should be placed inside an envelope and attached to the outside of the shipping container, or placed inside the container.

2-4 Meter Installation, Storage and Shipment

The following is a general outline for the proper storage, shipment, installation, and start up of any Brodie BiRotor meter. Additional information on the proper use of Positive Displacement Meters can be obtained fromAPI Standard 1101 - Measurement of Petroleum Liquid Hydrocarbons by Positive Displacement Meter.

Storage

CAUTION: Mineral Spirits have been used as a testing agent in the calibration of this equipment - residual amounts of liquid may be present. Care should be taken in the handling and storage of this product.

A. Brodie meters are precision instruments and should

be handled with care. They should not be subjected to rough or improper handling or stored in an environment where moisture, extreme temperatures, or foreign material can damage the meter.

B. Flange covers must remain on the meter until it is ready for installation.
C. If extended storage is anticipated under harsh field conditions the meters should be stored in waterproof lined wooden boxes. Desiccant packs should be taped to the inside of the meter flanges to reduce the effects of humidity on the measuring element. Caution must be used to insure the desiccant packs are removed prior to installation.
D. If the meter is removed from service for an extended period of time it should be flushed with a light oil before being placed into storage. The meter flanges should be securely covered.

Shipment

A. If the meter is removed from service it must be thoroughly drained and neutralized before it is packed for shipment. Care must be taken to insure that product removed from the meter is disposed of in accordance with all applicable local, state, and federal laws.
B. The flanges should be sealed to keep residual fluid from leaking out of the meter during transport. The type of flange seal required will vary with the form of transportation used. Contact the carrier for specific instructions.
C. The meter should be securely mounted on a wooden skid for shipment. The original container supplied by Brooks or a solid wooden box should be used to protect the exterior of the meter.

Installation

WARNING: Compounds used in the making of elastomer gaskets, O-rings and seals will, by nature, deteriorate over an extended period of time. This is dependent on elastomer material, frequency of operation and the product being measured. Extreme caution should be used when measuring volatile liquids or when using a meter that has been stored for an extended period of time. Loss of seal integrity can result in leakage, damage to the equipment and/or personal injury.

NOTE: Flange covers must be removed prior to installation.

A. The BiRotor meter should be mounted on a secure foundation. Considerations for placement of a right angle adaptor and meter weight must be made when vertical installation is required.
B. Care should be taken to insure that the drain plug remains accessible.
   1. A valve may be installed on the drain line to facilitate draining water and sediment from the meter. A lockable valve is recommended to reduce the chance of accidently draining the meter.
   2. Any product drained from the meter, either manually or through a centralized drain system, must be disposed of in accordance with local, state, and federal laws.
C. Skid foundations and process piping must be properly secured in order to minimize line vibration at the meter.
D. Process piping should not place undue strain on the meter.
E. Provisions should be made to insure that thermal expansion does not raise line pressure above the maximum pressure rating of the meter.
F. All process piping must be clean and free of debris to insure foreign material does not enter the meter. For continuous protection a strainer should be installed upstream of the meter.
G. A flow limiting valve should be installed downstream of the meter to maintain adequate back pressure and to protect the meter from excessive flow rates.
H. If required, an air eliminator should be installed upstream of the meter.
I. Do not allow water to remain in the meter. If water has entered the meter remove the inner unit and clean it with a light lubricating oil.
J. Standard flow through the meter is from left to right. If right to left flow is required, consult your local Brooks agent or an authorized repair center.
K. The bolt pattern on the meter accessories allows the meter accessory stack to be rotated in 90 degree increments. The required position should be selected prior to installing electrical service to the meter. Care should be taken not to damage the capillary tube on the temperature compensator if so equipped.
L. Isolation valves should be installed on both ends of the meter run to minimize product loss when removing any of the components from the line.

Section 3 OPERATION

3-1 General

The following recommendations should be considered when the meter is first put into operation or any time that the meter has been drained.

Starting Flow Through the Meter

A. If large volumes of debris are expected in the process piping during start up it is recommended that the measuring element be removed from the meter until the lines are free of pipe scale, weld beads and other types of foreign material. A spool piece may be used as a temporary replacement for the meter. The strainer basket should be removed to eliminate the possibility of rupturing.

B. Slowly introduce product into the meter. Open the upstream valve while the downstream valve remains closed.
C. Slowly bleed air from the system through the high point vent.
D. Once all air has been eliminated, slowly open the downstream valve. Allow the meter to run at approximately 20 percent of the maximum rated flow for two minutes. Observe the rotation of the counter wheels to insure the meter is operating smoothly. Continue opening the downstream valve until it is fully open. Care should be taken to insure the maximum flow rate of the meter is not exceeded. Confirm that the setting on the flow control valve is properly fixed and is in control of the system.
E. Do not close valves quickly. This can cause a pressure spike which can damage the meter.
F. Do not make adjustments to the meter or its accessories while the meter is turning. When adjustor settings are changed, a small batch should be run through the meter prior to making the next proving run. This allows the adjustor components to shift to the new setting.
G. Prove the meter in order to establish a meter factor under actual operating conditions. Proving records and other pertinent meter data should be retained in order to establish a performance history for the meter.

Section 4 MAINTENANCE

WARNING: Extreme care must be exercised when the measuring chamber is exposed and handled. Hands must be kept clear of the timing gears, rotors and measuring chamber or serious personal injury can occur. Due to the precision balance of the rotors and timing gears, they can be set in motion very easily. Keep hands clear of these parts at all times. At no time should hands be used to brace these parts while servicing.

4-1 General

The amount of maintenance necessary for efficient meter performance depends upon such factors as:

A. Continuity of Operation - A meter which operates continuously, will require more attention than one on intermittent duty.
B. Rate of Flow - The practical life of any piece of equipment is proportional to its speed of operation. A meter operating at, or close to, its maximum rating will have a shorter life than one operating at a reduced rate.
C. Lubricating Value of Product - A meter handling a light lubricating oil will have a longer service life than one measuring a dry motor fuel.
D. Cleanliness of Product - Abrasive solid material entrained in the measured product will accelerate wear.

All meters should receive routine maintenance checks to avoid potential problems that could lead to failure. To a considerable extent, a meter's performance is dependent on the proper functioning of accessory equipment in use. The following list highlights some of the conditions and factors that may influence meter performance.

1. A meter should be kept filled with the liquid it is measuring. Draining results in the formation of deposits which increase mechanical friction, thus decreasing service life. Any leaking shut-off or check valves should be repaired or replaced.
2. A petroleum meter should be kept free of water. Under normal circumstances regular inspection and drainage of storage tanks is sufficient protection.
3. Clean the strainer basket frequently.
4. Soft closing loading valves or shock chambers for eliminating water hammer should be kept in good working order.
5. The valves and operating mechanism of an air eliminator should be inspected on a routine basis. This is especially true where a critical air condition exists. For this reason meter performance is dependent on proper air elimination. Factors leading to difficult valve and air eliminator operating conditions include: gum formations caused by alternate wetting and drying, formation of corrosive vapors, and presence of salt air.
6. The meter counter should be protected from extreme weather and any potential hazardous condition.
7. A meter taken out of service for any length of time should be filled with light lubricating oil.
8. Proper Service Bulletins should be available for reference at all times.

4-2 Disassembly

Cleanliness is of prime importance when working on a precision instrument. The work area should be clean and the meter parts thoroughly washed. All Gaskets and O-rings should be removed, examined and replaced as required. This policy will assure maximum performance from your Brooks BiRotor Meter at less expense and with greater accuracy.

Removing the Measuring Unit

Reference Figures 6-1 through 6-3 and Tables 6-1 through 6-3 for basic part identification.

WARNING: All pressure must be relieved, flow stopped and electrical connections to the meter disconnected before any disassembly can take place. Failure to comply can result in serious personal injury and/or damage to the equipment. Service should be performed by trained and qualified personnel only.

1. Remove the Drain Plug and completely drain the meter.
2. Remove the Accuracy Adjustor and Counter Base Plate Assembly.
3. Remove Hex Nuts and Housing Cover from the Meter Housing.
4. Disconnect the Measuring Unit from the Meter Housing by first removing the Screws, Washers and Seal Washers from the unit.
5. Carefully lift the Measuring Unit away from the meter body and place on a clean dry surface.
6. The Measuring Unit may now be inspected. In some cases a thorough washing in cleaning solvent or kerosene will be sufficient to free the Rotors of corrosion or foreign material. In the event that solid material or corrosion prevents proper operation it will be necessary to remove the Rotors and Rear End Cover Assembly for further cleaning.

WARNING: Extreme care must be exercised when the Measuring Unit Assembly is exposed or handled. Hands must be kept clear of all Gears and Rotors or serious personal injury can occur. Due to the precision of the Rotors and Drive Gears, they can easily be set into motion. Keep Hands clear of these parts at all times. At no time should the hands be used to brace these parts while servicing.

4-3 Measuring Unit Disassembly

1. Position the Measuring Unit with the Front End Plate facing out in such a way as to afford easy access.
2. Loosen the two set screws (item 19) on the driven gear (item 34) and remove the gear, washers (item 12), and coupling jaw shaft (item 16).
3. Remove retaining ring (item 25) and washer (item 12). Loosen set screws (item 19) on the idler gear (item 17) and remove the gear, bushing (item 32) and washer (item 18).
4. Remove retaining ring (item 25) and bearing key (item 20 or 24) from the shaft (item 10) protruding from the 3-tooth rotor (item 5).
5. Block the rotors with a plastic or wooden dowel as illustrated in Figure 4-1.
6. Remove the screw (item 22), washers (items 21 and 23) and bearing key (item 24) from the shaft of the 4-tooth rotor (item 4).
   NOTE: Do not remove the front end cover at this time.
7. Rotate the measuring unit and remove the retaining screws (item 29). This will enable the removal of the timing gear cover (item 30) from the measuring unit body.
8. The Rotors and Rear End Cover can now be washed thoroughly with solvent or kerosene and inspected. If the Rotors show no evidence of contact with each other, and if the Timing Gears appear satisfactory, further disassembly will not be required.

4-4 Removing Timing Gears and Rotors

Severe scoring of the Rotors, or grit in the Bearings, may necessitate removal of the Rotors from the Rear End Cover.

1. Bend tabs out then remove Lock Nut Retainer (item 14) and Washer (item 15).
2. Using a small piece of rubber, or nylon stock, block the Timing Gears.
3. Timing Gears are taper fitted to the shafts and can be removed one at a time by striking the inside face of the gear (do not strike teeth) with a rubber mallet. Care should be taken not to damage the Rotor Shaft threads when removing the Timing Gears.
4. Remove the Bearing Spacers and Bearings from the Rear Cover.
   NOTE: Ball Bearings can be removed from the End Covers by gently tapping or pressing on the inner race of the Bearings from the inside of the End Cover.

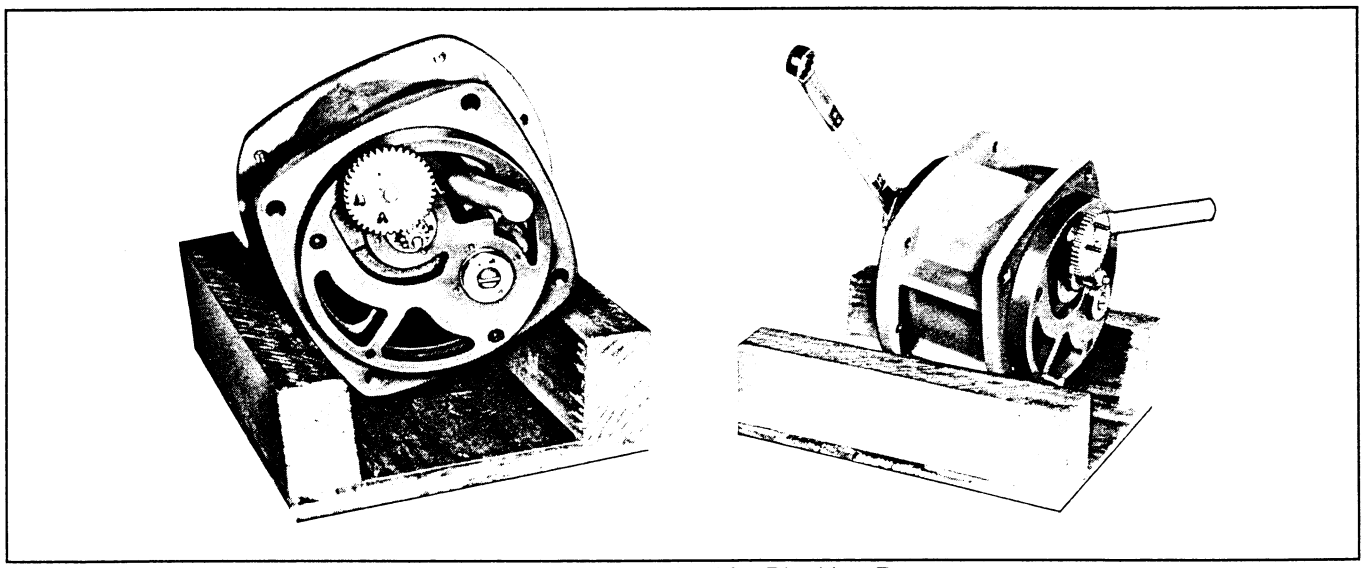

Figure 4-1 Proper Method for Blocking Rotors

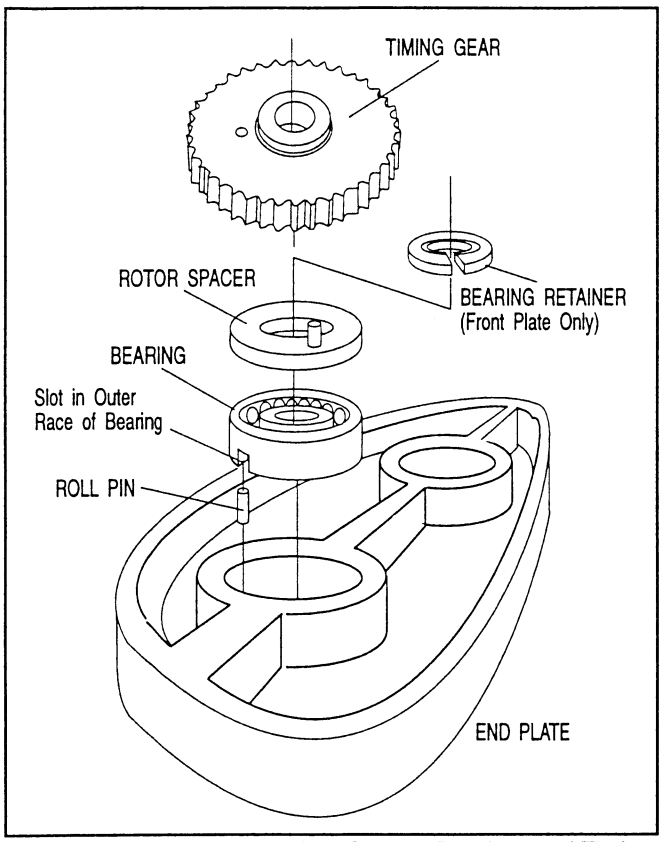

Figure 4-2 End Plate, Bearing, Spacer, Retainer and Timing Gear Alignment Detail

5. Separate the Rotors from the Rear End Cover.
6. Remove the Front End Cover and Bearings.

4-5 Cleaning the Measuring Unit

1. Scored metal should be removed with a file taking care only to remove the high points. Do not remove any more metal than is necessary.
2. Wash thoroughly in solvent or kerosene to remove all particles of grit or metal.
3. Lightly file the End Covers to remove any burrs or high spots. Use fine sand paper to remove corrosion and burrs from the surface of the bores that house the Bearings.
4. Ball Bearing should be cleaned and inspected for wear.
5. All Gears and Shafts in the Rear End Cover Assembly should be inspected. Check all O-rings and Gaskets for wear and/or distortion and replace as required.
   NOTE: All parts should be thoroughly cleaned in solvent, light fuel oil, kerosene or a suitable cleaning agent compatible with the metallurgy of the meter and the liquid being measured.

4-6 Measuring Unit Assembly

1. Refer to Figure 6-2. Lubricate all Bearings and O-rings with a light weight oil.
2. Install bearings (item 6) into the bearing bore of the front end cover (item 3). Press into place until the bearings are bottomed. Refer to Figure 4-2 for correct alignment.
   NOTE: The slot on the outer race of the Ball Bearing must align with the Roll Pin in the bottom of the bearing bore.
3. Arrange the measuring unit body such that the rear end rests in the cradled position.
4. Align the port openings of the front cover (item 3) with those of the meter body (item 1) using care to align the two locating dowel screws (item 27) with the corresponding holes. Secure the front end cover to the measuring unit body using socket head screws (item 28). Alternate from one side to the other when tightening.
5. Rotate the measuring unit body such that the front end cover is in the cradled position.
6. Install the two rotors so that the threaded, tapered rotor shafts protrude from the open end of the measuring unit body.
7. Attach the rear end cover (item 2) to the body using care to align the two locating dowel screws (item 27) with the corresponding holes.
8. Install the ball bearings (item 6) within the bearing bore of the rear end cover (item 2). Press into place until bottomed. See Figure 4-2 for correct alignment.
   NOTE: The slot on the outer race of the Ball Bearing must align with the Roll Pin in the bottom of the bearing bore.
9. Install the bearing spacer (item 11) onto the ball bearing (item 6).
   NOTE: The short tab on the spacer fits in the inner race of the ball bearing and the long tab seats into the slot on the timing gear.
10. Place the small timing gear (item 7) on the threaded shaft of the three tooth rotor (item 5) and the large timing gear (item 8) on the threaded shaft of the 4-tooth rotor (item 4).
    NOTE: The rotor shafts and timing gear bores are tapered allowing only one manner of assembly.
11. Place lockwasher (item 15) on the threaded rotor shaft. Engage the bent tab of the lockwasher with the hole in the flat side of the timing gear. Attach locknuts (item 14) to the threaded rotor shafts but do not tighten until the proper timing procedure and rotor clearance has been accomplished.
12. Timing (Reference Figures 4-3 and 4-4)
    A. Insert a holding device (nylon or wooden dowel) into the port opening of the front end plate to prevent the rotors from turning. Tighten the locknut (item 14).

WARNING: Extreme care must be exercised when the Measuring Unit Assembly is exposed or handled. Hands must be kept clear of all Gears and Rotors or serious personal injury can occur. Due to the precision of the Rotors and Drive Gears, they can easily be set into motion. Keep Hands clear of these parts at all times. At no time should the hands be used to brace these parts while servicing.

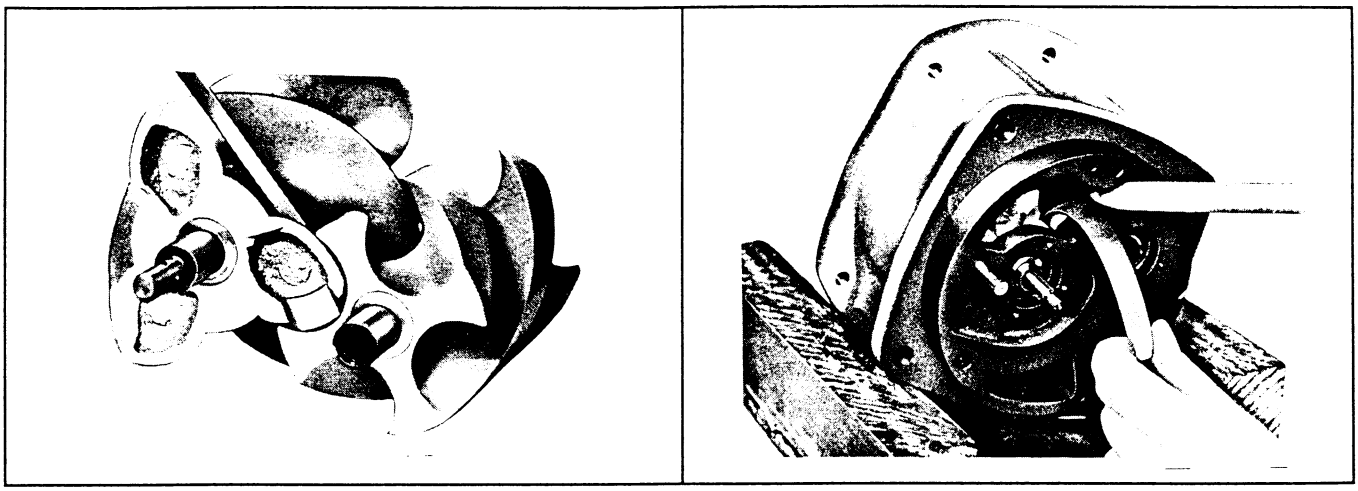

Figure 4-3 Proper Method for Timing

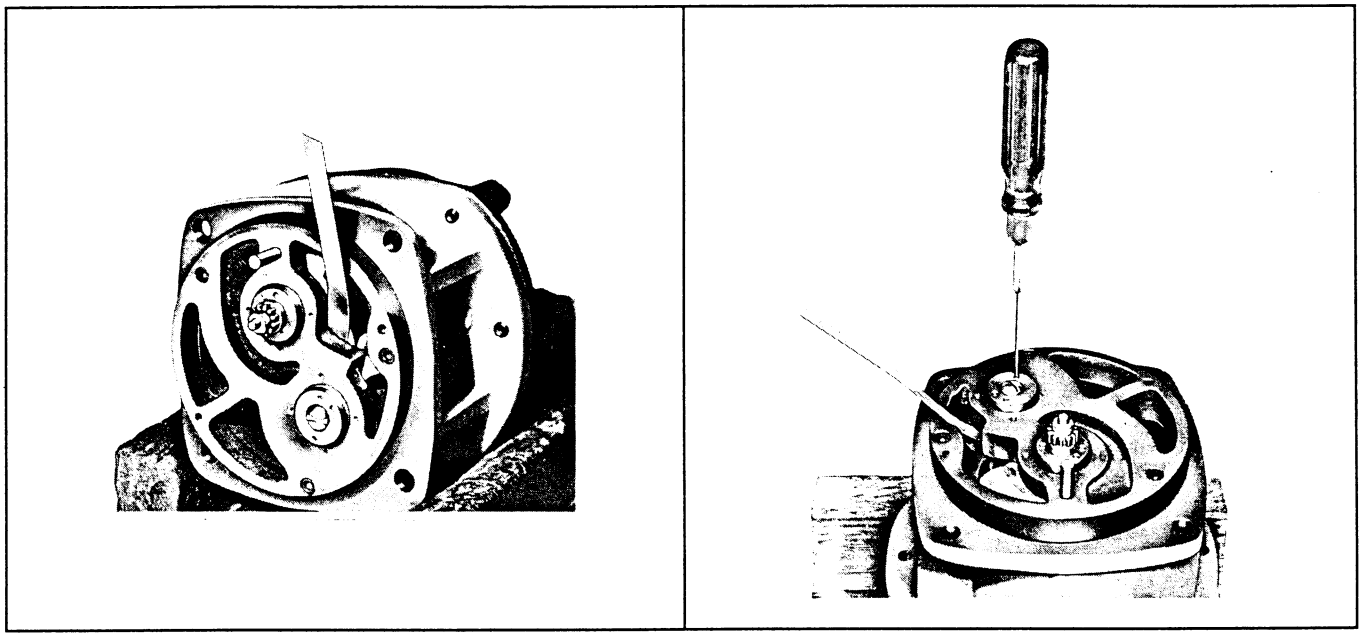

Figure 4-4 Proper Method for Setting Rotor End Clearance

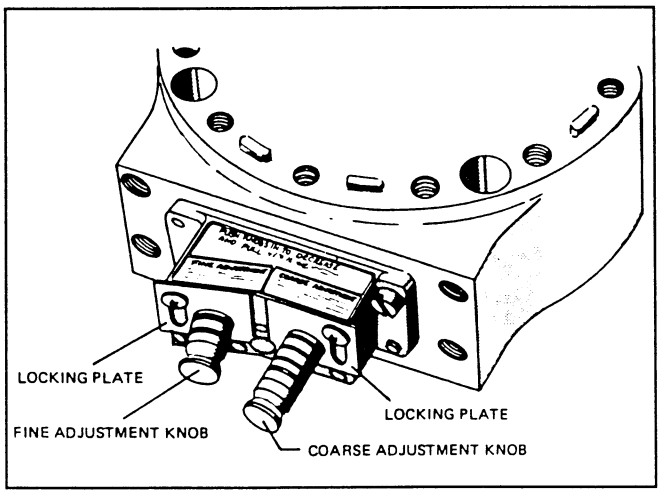

Figure 4-5 Accuracy Adjustment

B. Place a 0.004 inch feeler gauge between a lobe of the 3-tooth rotor and the flute of the 4-tooth rotor through the port opening of the front end plate as shown in Figure 4-3.
C. Using the holding device to keep the rotors from turning, tighten locknut (item 14) of the large timing gear (item 8) on the shaft of the 4-tooth rotor.
D. Remove the feeler gauge and restricting dowel and check to see if rotors spin freely. Hands must be kept clear of all Gears and Rotors or serious personal injury can occur.
E. Repeat steps "B" through "D" for the 3-tooth rotor.
F. Check for proper clearance at several points between the rotors. If rotors do not spin freely or if there is contact between the rotors the timing procedure must be repeated.

4-7 Complete Meter Assembly

1. Refer to Figure 6-1. Position the gasket (item 2) onto the measuring unit and attach to the front dome cover (item 4) with screws (item 3).
2. Position the meter housing gasket (item 11) onto the meter housing (item 12), replace the front dome assembly and secure with screws and nuts (items 9 and 10).
3. Install the counter base plate gasket (item 5) on the meter housing.
4. Mate the counter base plate assembly (item 16) with the coupling shaft on the measuring unit and attach with screws (item 17).
5. Position and install the adjustor (item 18) with the attached coupling on top of the counter base plate and secure with screws (item 19).
   NOTE: The coupling (item 20) on the bottom of the adjustor must mate properly with the output shaft of the counter base plate assembly for proper operation.
6. Reinstall all other accessories as required. See Section 3 -Operation for Start-up recommendations.

4-8 Meter Adjustment

Refer to Figure 4-5. The standard mechanical BiRotor meter is supplied with a Series 4200 Adjustor whereby incremental changes can be made to calibrate meter output with registration equipment. This is accomplished by changing the gear ratio between the meter Packing Shaft and the Counter. To make adjustments:

1. Remove the protective security cover of the Adjustor.
2. Lift the Adjustor Locking Plate.
3. Adjust the meter as required. Adjustment Knobs are labeled for COARSE and FINE adjustment. Each groove of the COARSE adjustment equals 0.6% of the volume delivered. Each groove of the FINE adjustment is equal to 0.05% of the volume delivered.
   NOTE: Pushing the adjustment knobs IN decreases the counter reading. Pulling the adjustment knobs OUT increases the counter reading.

Section 5 TROUBLESHOOTING

5-1 General

Table 5-1 has been provided to aid in basic troubleshooting. Disassembly procedures are covered in Section 4 - Maintenance.

If the flowmeter is found to be in need of repair, it is recommended that the user contact the nearest Brodie Service or Sales Office. It is important that service be performed by trained and qualified service personnel.

Section 6 PARTS LIST

6-1 General

This section contains the necessary parts required to make up any standard unit that is covered in this bulletin. Each parts list also contains the recommended spare or replacement parts denoted by an asterisk. For parts not listed, or for additional information, consult factory.

When ordering, the following information must be furnished.

1. Part Number and Description
2. Model Number of Flowmeter
3. Serial Number of Flowmeter
4. Quantity Required

When ordering items of a material or special construction not indicated in the parts list, the Specific Material of Construction must be included.

Table 5-1 Troubleshooting

Symptom	Possible Cause	Remedy
Meter runs but counter does not register	Broken Coupling P/N W-4125 between Counter Base Plate and Adjustor	Replace Coupling
	Faulty Adjustor	Replace Adjustor
	Faulty Register	Replace Register
Meter runs but is noisy	Meter is not properly timed	Re-time Meter
	Damaged Rotors	Service or replace rotors
	Worn bearings	Replace Ball Bearings
	Bad gears in Counter Base Plate Assembly	Replace Counter Base Plate Assembly
Meter runs but only very slowly; not noisy; low delivery rate	Strainer screen clogged	Remove and clean strainer screen
	Float jammed in low position in Air Eliminator causes butterfly valve to close.	Service Air Eliminator
Meter will not run	Meter locked or jammed	Service Meter
	Float in Air Eliminator Collapsed	Replace float
Air Eliminator constantly bleeds liquid from air release	O-ring on poppet bad	Replace O-ring
	Pilot valve tip bad	Replace pilot valve
Shutoff valve does not give positive shutoff when closed	Valve poppet O-ring bad	Replace O-ring

Table 6-1 Meter Assembly Parts List

Item	Description	Part Number		Req.
		Series 40	Series 50	
1	Measuring Unit	40215-000	50215-000	1
	High Temp. 325°F	40215-300	50000-306	
	High Temp. 325°F/All Ferrous	----	50000-307	
	125 lb. Flg.	----	50000-002	
	150 lb. Flg./All Ferrous	----	50000-003	
	150 lb. ANSI Flg.	----	50000-007	
2*	Measuring Unit Gasket	41506	51506	1
3	Screw	151005-019	151010	10
4	Front Dome Assembly			
	125 lb. Brodie Square Flg.	40430	50430	1
	150 lb. ANSI	40430-011	50430-100	1
5	2" Flange	51308	51308	AR
	2-1/2" Flange	51309	51309	AR
6	Gasket	51307	51307	AR
7	Cap Screw - 2" Flg.	150787	150787	AR
	2-1/2" Flange	51309	51309	AR
8	Nut	151547	151547	AR
9	Cap Screw	150773	150773	20
10	Nut	151589	151589	20
11*	Gasket	50434	50434	1
12	Housing			
	125 lb. Brodie Sq. Flg.	50615	50615	1
	150 lb. ANSI Flg.	50615-101	50615-101	1
	125 lb. Flg. w/ Steam Jacket	----	50615-004	1
13	Washer	151850	151841	1
14	Drain Pipe	154707	154707	1
15*	Gasket	51156	51156	1
16	Counter Base Plate	51750-500	51750-500	1
17	Screw	151253	151253	9
18*	Adjustor	4200	4200	1
19	Screw	150565	150565	4
20*	Coupling	W-4125	W-4125	1

*Recommended Spare Part

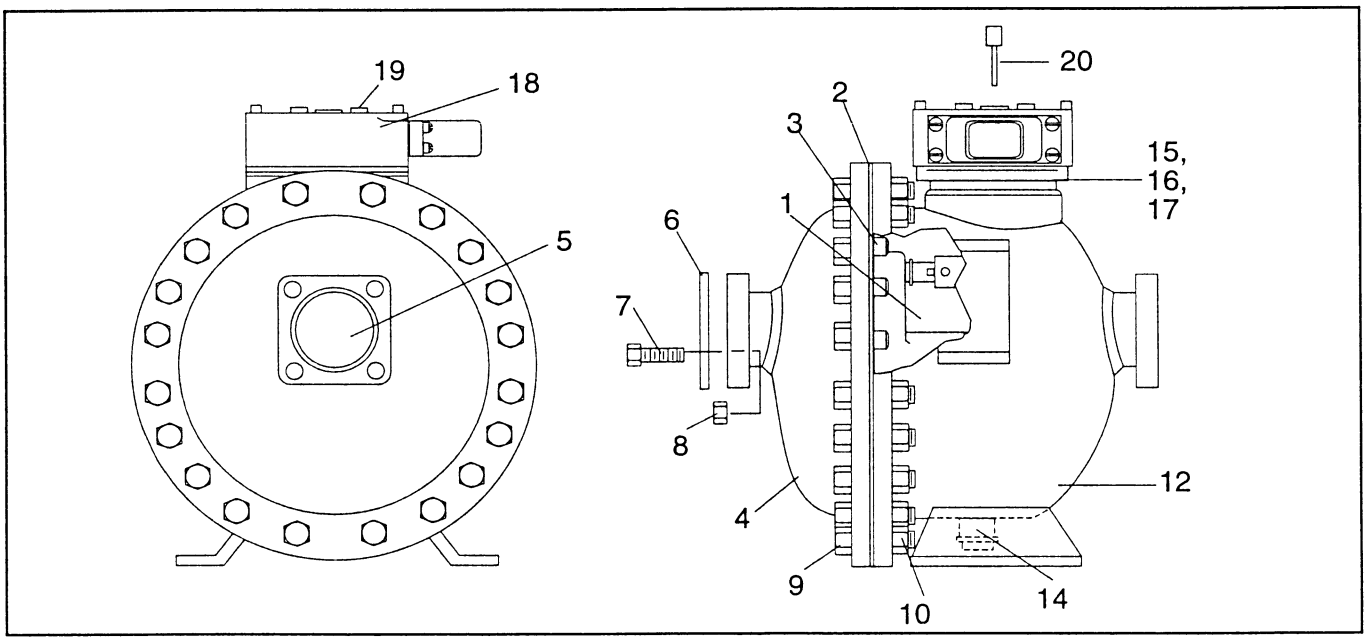

Figure 6-1 Meter Assembly of Series 40 and 50

Table 6-2 Measuring Assembly Parts List

Item	Description	Part Number		Req.
		Series 40	Series 50	
1	Measuring Unit	40211-001	50212-001	1
2	Rear End Cover	40266	50266	1
3	Front End Cover	40231-001	50231-001	1
4**	4-Tooth Rotor (Std.) High Temp. 325°F High Temp. 450°F Cast Iron	40586 40586-300 ---- ----	50586 50586-300 50586-401 50586-001	1
5**	3-Tooth Rotor (Std.)	40276	50276	1
6*	Ball Bearing	155184	155184	4
7**	Timing Gear (3T)	40591	50591	1
8**	Timing Gear (4T)	40596	50596	1
9	Groove Pin	153636-019	153636	1
10	Stub Shaft	51579-002	51579-002	1
11	Spacer	40294	40294	2
12	Thrust Washer	151907	151907	3
13*	Drive Gear	50243 (12T)	50234 (12T)	1
14	Locknut	40592	40592	2
15	Lockwasher	41593	41593	2
16	Coupling Shaft	60523-001	60523-001	1
17*	Idler Gear	40241 (40T)	50241 (48T)	1
18	Thrust Washer	151907	151881	1
19	Set Screw	150969	150969	4
20	Bearing Key	50238-001	50238-001	1
21	Lockwasher	152119	152119	1
22	Screw	150156	150156	1
23	Washer	151902	151902	1
24	Bearing Key	50238	50238	1
25	Retainer Ring	156484	156484	2
26	Roll Pin	153547	153547	4
27	Dowel Screw	51567	51567	4
28	Screw	151010 (3)	151010	4
29	Screw	151032 (5)	151033	8
30	Timing Gear Cover	41601	51601	1
31	Bushing	155151	155151	2
32	Bushing	155152	155152	1
33	Idler Shaft	50244	50244	1
34*	Driven Gear	40242 (36T)	50242 (24T)	1
35	Washer	----	151921	1

*Recommended Spare Part

**NOTE:Items 4 and 5 are supplied as a set.
Items 7 and 8 are supplied as a set.

Section 1 INTRODUCTION

1-1 General

The Brodie BiRotor Meter is a precision made, accurate flow measurement device which utilizes the positive displacement principle of operation. It is designed to measure crude and refined petroleum products as well as many industrial liquids.

1-2 Description

The standard meter consists of a measuring unit installed in an outer housing or case, an adjustor for calibration and selected registration equipment.

As product enters the intake of the measurement element, two finely timed rotors divide the liquid into precise segments of known volume and return those segments to the flowing stream. During this transition, the rotation of the two rotors is directly proportional to volumetric throughput. The rotors are always dynamically balanced, but hydraulically unbalanced, and have no metal-to-metal contact with one another or the measuring unit housing. Volume indication is determined by mechanical output gearing leading to registration devices.

The accuracy adjustor, located on the output shaft of the counter drive gearing of the mechanical meter, permits the operator to adjust output registration to read in exact units of volume. It allows for adjustments up to +/-3% of meter throughput in determining accurate measurement. The meter may be supplied with any of several accessory items including two-stage electric valves, preset counters, high frequency pulse generators, impulse contactors, etc. These units provide various functions for local and/or remote control and readout.

NOTE: Before placing the meter into service reference the appropriate instruction manuals for all accessories. This includes hook-up, electrical wiring, and specification requirements and restrictions.

1-3 Meter Model Number

The meter Model Number, Serial Number, Flow Range and Operating Pressure appear on the nameplate attached to the meter body. This information is vital to proper operation and identification, and should not be removed for any reason.

1-4 Specifications

The following specifications apply to the meter unless otherwise stated.

Materials of Construction

Housing: Welded Steel construction combining castings and drawn steel plates.
Measuring Unit
- Rotors: Heat Treated Aluminum (Std.)
- Rotor Shafts: E.T.D.150
- Rotor Bearings: Stainless Steel
- Body and End Covers: Cast Iron

Counter Base Plate (Not used on P-Series)
- Body: Steel
- O-rings: Viton (Std.)
- Counter Base Drive Gears: Stainless Steel
- Drive Shafts: Stainless Steel
- Drive Shaft Ball Bearings: Stainless Steel

Ratings

WARNING: Do not use this meter in excess of the values specified below. Failure to heed this warning may result in serious personal injury and/or damage to the equipment.

Connections: 2", 150 lb. ANSI or 2" Screwed
Maximum Working Pressure: 125 psi (862 kPa)
Maximum Working Temperature:-20 to 150°F (-29 to 65°C); Optional to 325°F (162°C) max.
Capacities: See Table 1-1 Below

Table 1-1 Flow Capacity

Capacity - Gasoline/Light Oils				
Series	U.S. gpm	Imp. gpm	Bbls/ Hr.	Liters/ Min.
40	10-100	8.3-83	14-143	38-378
50	15-150	12-125	21-214	57-568

Section 2 INSTALLATION

2-1 General

This section contains the procedure for receipt and installation of the meter. Specific instructions for accessory equipment should be obtained from individual bulletins covering those products.

Table 2-1 Dimensions, Refer to Figure 2-1

	Series 40		Series 50	
	inches	mm	inches	mm
A	4-5/32	106	4-5/32	106
B	11-5/16	287	11-5/16	287
C	13-1/16	332	13-1/16	332
D	23-7/16	595	23-7/16	595
E*	12	305	13	330
F	6-1/2	165	6-1/2	165
G**	6-7/8	175	6-7/8	175
H	2-1/16	52	2-1/16	52
J**	11-1/2	292	11-1/2	292
K	---	---	1/4	6
L	9/16	14	9/16	14
M	3/4	---	3/4	---

* Minimum distance required to remove measuring unit
** For meters with 2" screwed connections
"G" is 6-7/16" (164mm)
"J" is 10-11/16" (271mm)

2-2 Receipt of Equipment

When the equipment is received, the outside of the packing case should be checked for any damage incurred

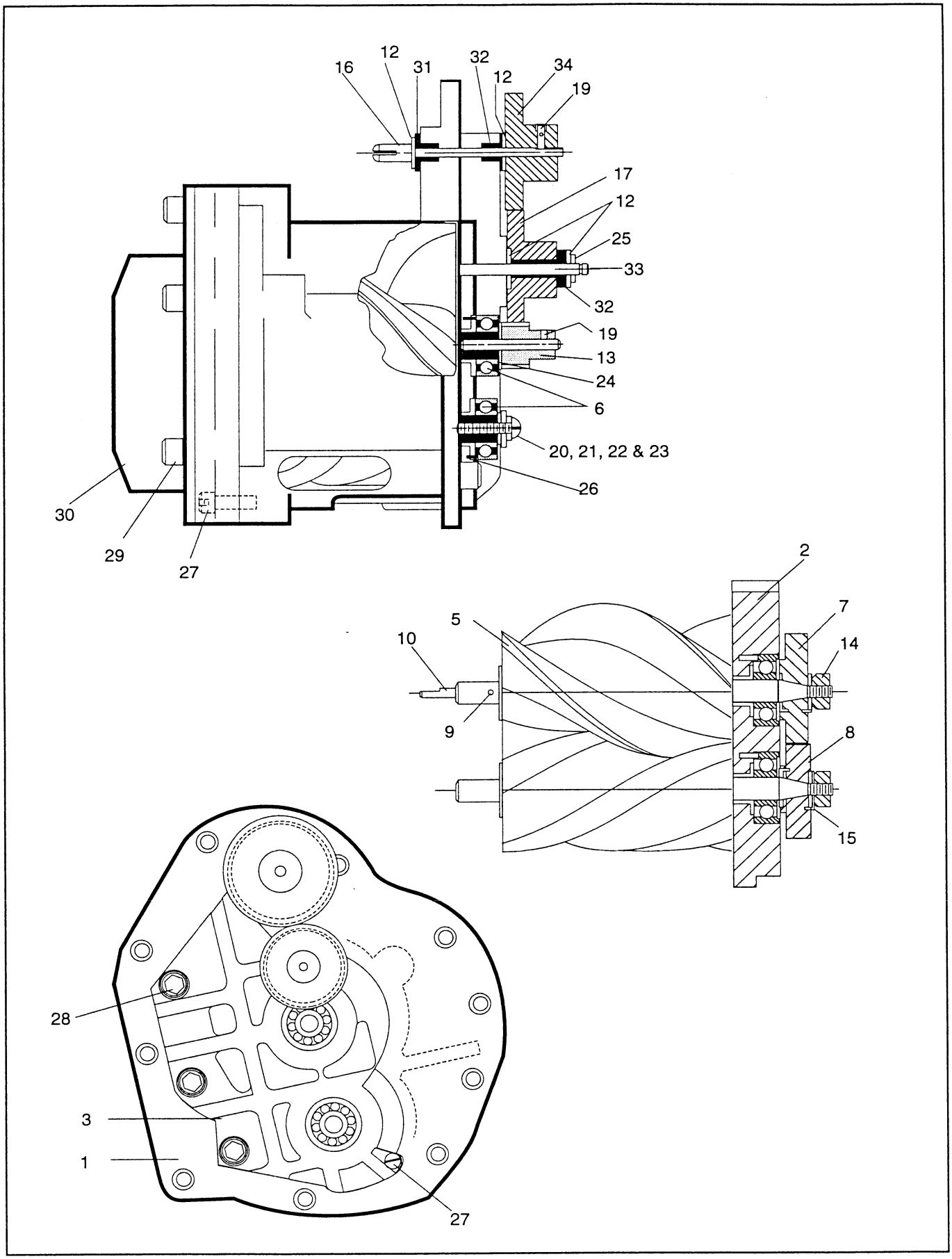

Figure 6-2 Meter Unit Assembly of Series 40 and 50

Table 6-3 Counter Base Plate Assembly Parts List

Item	Description	Part Number	Req.
1	Base Assembly	51775-501	1
2	Mounting Block	51761-300	1
3	Bracket Assembly	51760-500	1
4*	Packing Shaft & Gear Ass'y	51785-500	1
5	Bevel Pinion	51769-500	1
6	Roll Pin	153549	1
7	Pinion Shaft Ass'y	51765	1
8	Packing Gland	52153-011	1
9	Screw	150533	2
10*	O-ring	157303-022	1
11*	O-ring	152064-022	1
12*	Bearing	155195	1
13	Washer	151891	1
14	Spring Clip	153942	1
15*	Bevel Gear & Pinion Gear Ass'y (Items 3-7, 11-14)	W-51760-500	1
16	Screw	150527	4
17	Lockwasher	152257-019	4
18	Screw	150529	2

*Recommended Spare Parts

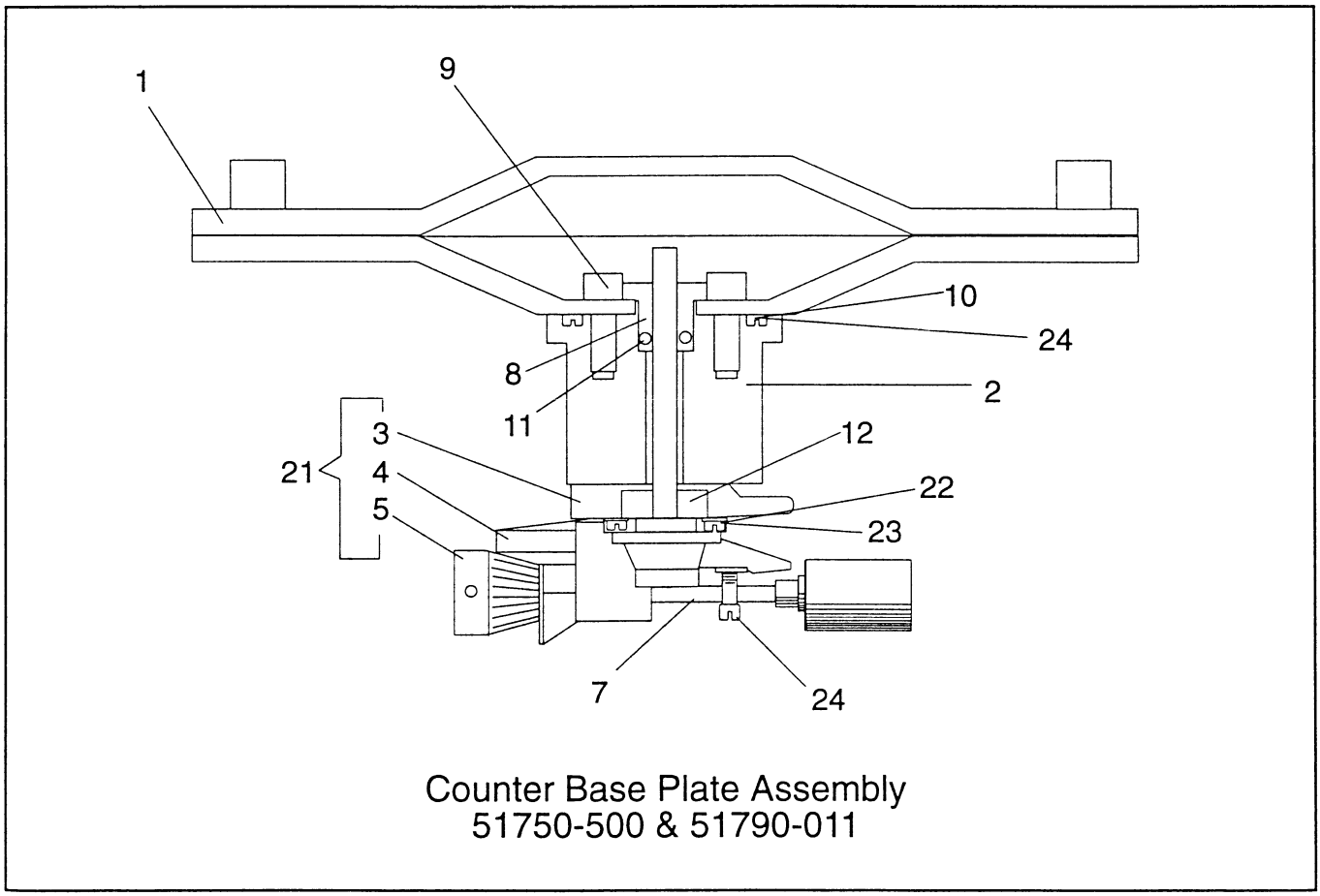

Figure 6-3 Counter Base Plate Assembly