X-4351-D
Revision 02

High Frequency Pulse Generator
Single and Dual Pulse

Installation and Operation Manual

Brodie Meter Co., LLC

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Manufacturers of BiRotors, Oval Gear Meters, and Control Valves

Essential Instructions

Brodie Meter Co., LLC designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Brodie Meter Co., LLC products.

- Read all instructions prior to installing, operating, and servicing the product. If this instruction manual is not the correct manual, telephone 1-912-489-0200 and the requested manual will be provided. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Brodie representative for clarification.
- Follow all warnings, cautions, and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation, and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable 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 product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by the manufacturer. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards, or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.
- Before opening the flameproof enclosure in a flammable atmosphere, the electrical circuits must be interrupted.
- It is the customer's responsibility to provide fire prevention measures and equipment per local regulations.
- Use of this equipment for any purpose other than its intended purpose may result in property damage and/or serious personal injury or death.

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Brodie Meter Co., LLC
Statesboro, Georgia, USA

Warranty

1. <u>LIMITED WARRANTY:</u> Subject to the limitations contained in Section 2 herein and except as otherwise expressly provided herein, Brodie Meter Co., LLC ("Brodie") warrants that the firmware will execute the programming instructions provided by Brodie, and that the goods manufactured or Services provided by Brodie will be free from defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Brodie, whichever period expires first. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services. Products purchased by Brodie from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Brodie has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If Buyer discovers any warranty defects and notifies Brodie thereof in writing during the applicable warranty period, Brodie shall, at its option, promptly correct any errors that are found by Brodie in the firmware or Services, or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Brodie to be defective, or refund the purchase price of the defective portion of the Goods/Services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Brodie are not covered by this limited warranty, and shall be at Buyer's expense. Brodie shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by an authorized Brodie representative. All costs of dismantling, reinstallation and freight and the time and expenses of Brodie's personnel for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Brodie. Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Brodie and can be amended only in a writing signed by an authorized representative of Brodie. Except as otherwise expressly provided in the Agreement, THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES. **It is understood that - corrosion or erosion of materials is not covered by our guarantee.**

2. <u>Limitation Of Remedy And Liability:</u> Brodie Shall Not Be Liable For Damages Caused By Delay In Performance. The Sole And Exclusive Remedy For Breach Of Warranty Hereunder Shall Be Limited To Repair, Correction, Replacement Or Refund Of Purchase Price Under The Limited Warranty Clause In Section 1 Herein. In No Event, Regardless Of The Form Of The Claim Or Cause Of Action (Whether Based In Contract, Infringement, Negligence, Strict Liability, Other Tort Or Otherwise), Shall Brodie's Liability To Buyer And/Or Its Customers Exceed The Price To Buyer Of The Specific Goods Manufactured Or Services Provided By Brodie Giving Rise To The Claim Or Cause Of Action. Buyer Agrees That In No Event Shall Brodie's Liability To Buyer And/Or Its Customers Extend To Include Incidental, Consequential Or Punitive Damages. The Term "Consequential Damages" Shall Include, But Not Be Limited To, Loss Of Anticipated Profits, Loss Of Use, Loss Of Revenue And Cost Of Capital.

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1.0 Introduction

1.1 Description

The Brodie High Frequency Pulse Generator is a photo electric device used to provide one or two output signals proportional to unit volume while maintaining a mechanical meter-to-register link. Both single and dual output units are available. Dual signal outputs are electrically 90° out of phase and are used primarily for pulse security. Although designed for use in meter proving, the HFPG can be used on any application requiring a high resolution signal indicating throughput or rate of flow.

Note: Units supplied prior to 1999 utilize 100 or 250 line discs. Reference assembly part number to identify your particular generator. High Frequency Pulse Generators manufactured after January 1999, utilize 100 or 256 line discs. Part numbers and information contained within this service manual will reference 100, 250, and 256 line discs.

It should be noted that units supplied with 256 line discs provide 2.4% more pulses per revolution than traditional 250 line discs, and consequently a 2.4% change in per unit volume.

Important: *Adjustments MUST BE MADE when replacing High Frequency Pulse Generators utilizing 250 line discs with the Generators using 256 line discs.*

Example:

Original HFPG with 250 pulses per revolution disc.
K-Factor = 123.4 counts per gallon

New HFPG with 256 Pulses per revolution disc
K-Factor is increased by 2.4%
123.4 X 0.024 = 2.9616 (2.4% of 123.4)
123.4 + 2.9616 = 1.26.3616
The new K-Factor is 126.4 counts per gallon (rounded to 4 digits)

250 line discs offered 250, 500, and 1,000 pulses per revolution.

256 line discs offer 256, 512, and 1,024 pulses per revolution.

1.2 Specifications

Caution

Do not operate generator in excess of specifications listed below.

Signals

Phase A and B: Dual Output 90° Electrically Out of Phase Phase Error: 15° Maximum
Amplitude: 0 to V+ (500 ohm Internal Pull-up, No Load); 0 to 5 Vdc +l- 0.2 Vdc (249 ohm Internal Pull-up, No Load)
Index: Open Collector, 1 Pulse per Revolution
25 Vdc maximum
100 mA maximum
Pulse Duration: 90 +1-10% of Shaft Rotation

Temperature Range:
-40 to 185F (-40 to 85C) Power Requirements
12 to 24 Vdc +l- 10%
88 to 144 mA (Depending on Input Voltage/ Output Configuration

Connections
1/2" Conduit

Enclosure
Explosion-proof Class C and D, Division 1, CSA, UL.

Load Impedance: 5 k ohms

Maximum RPM
Pulser Shaft: 1000 rpm maximum
Gear Changer: 250 rpm maximum

2.0 Receipt of Shipment

When you receive your equipment, inspect the outside of the packing case for damage which may have incurred during shipping.

Damage incurred during shipment is the responsibility of the carrier and is not part of the factory warranty.

If the package is in good condition remove the envelope containing the packing list and carefully remove the equipment and all components included in the shipment from the packing case. Inspect for damaged or missing parts, referring to the packing list, and prior to discarding the packing material. If Items are missing from your shipment, contact your sales representative. Your sales order number will be required.

If the packing case is damaged, notify the local carrier immediately. If the equipment must be returned to the factory for repair or replacement, a Returned Materials Authorization (RMA) must be included with the equipment or components. RMA forms may be obtained from your sales representative or from the Product Service Department. In addition to the RMA, a Material Safety Data Sheet and a Decontamination Statement must be included with items being returned to the factory.

When packing the equipment or components for return to the factory, place the RMA and a copy of the packing list that was delivered with the equipment inside an envelope. Place the envelope inside the shipping container with the Item being returned and reference the RMA number on the outside of the shipping container.

Equipment returned to the factory without the proper documentation will be returned to sender at their expense.

Ship the container to:
Brodie Meter Co., LLC
Product Service Department
19267 Hwy. 301 North
Statesboro, GA 30461
Phone: 912-489-0200
Fax: 912-489-0294
service@brodiemeter.com

3.0 Storage, Installation And Operation

3.1 General

This section contains specific instructions for installation of the High Frequency Pulse Generator.

3.2 Installation

The High Frequency Pulse Generator is constructed in two independent units: the generator assembly, and the gear housing assembly. The Gear Housing Assembly is permanently installed in the meter accessory stack-up. An adaptor assembly on the gear housing assembly allows the generator to be quickly and easily transferred from one gear housing assembly to another.

The bottom plate of the generator has four 9/32" clearance holes for mounting to the meter. The top of the gear housing is tapped for 1/4 x 1/2" screws in twelve locations to facilitate the mounting of impulse contactors, registers, or other accessories.

3.3 Electrical Connections

3.3.1 Installation

Electrical connections for the generator should be made as shown in Figure 3.1.

For permanent installations where the generator is to be located no farther than 700 feet from the power source, prover counter or other unit, Belden No.8770, three conductor shielded cable or equivalent should be used.

If the power supply is to be located within 700 feet of the generator and the unit being pulsed is more than 700 feet from the generator Belden No. 8760, two conductor shielded cable must be used for the output signal. The 12 Vdc power would then be supplied to the generator through its own separate wiring (No.18 AWG - up to 700 feet). Reference Table 3.1 Recommended Cable Lengths.

The recommended cable lengths are based on 18 gauge tinned copper shielded cable with a load impedance of 5 k ohm (recommended

minimum) and cable capacitance of 27 pf/ft. When other type cables are used the factory should be consulted to determine permissible cable lengths. Dual channel signals must be run in separate cables.

Table 3.1 Recommended Cable Lengths

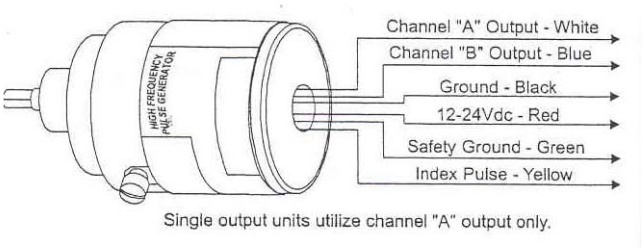
Pulse Output Frequency	Maximum Recommended Cable Lengths
1,000 Hz	3,700 ft.
2,000 Hz	1,850 ft.
3,000 Hz	1,185 ft.
4,000 Hz	925 ft.
5,000 Hz	740 ft.

3.3.2 Grounding

The shielding on the cable must be grounded at one end only to avoid error readings. It is recommended that grounding be made at the unit being pulsed.

Note: Internal moisture will cause failure of the unit. When fixed conduit is used it is strongly recommended that a Conduit Seal be used to prevent moisture from entering the unit at the conduit connection.

Figure 3.1 Electrical Connection Wiring Diagram



3.4 Operation

3.4.1 General

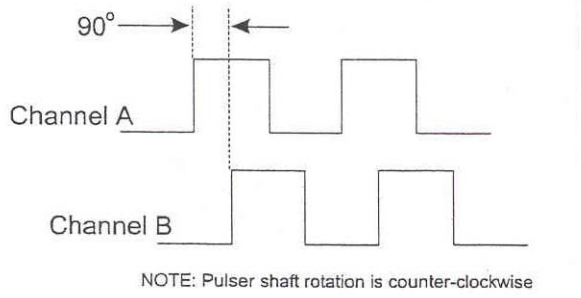
The High Frequency Pulse Generator is composed of a gear housing assembly and a pulse generating assembly. An interchangeable gear train within the housing utilizes change gears to adjust the ratio between the output shaft to the register and the shaft of the pulse generator. The rate of Pulses is determined by the ratio of the gear train between the meter and the pulse generator shaft.

Note: *The resolution of the Hall Effect Switch is one pulse/revolution of the rotating disc (one contact closure/100 or 256 pulses).*

A rotating disc with precisely spaced opaque and transparent slots is located within the pulse generator. As the disc rotates, it interrupts a light beam transmitted from a light emitting diode to a photo transistor, thus producing a pulsed electronic output. The signal is then picked up by a self-contained amplifier for shaping and amplifying. The resulting pulse from the pulse generator is a positive square wave.

An integral Hall Effect Switch, mounted at the base of the generator disc, generates one pulse per revolution of the disc. The resulting open collector signal may be used as a backup, check or independent system.

Figure 3.2 Timing Diagram



4.0 Maintenance

4.1 General

During normal operation, no routine maintenance or adjustment is necessary. If generator failure is suspected, refer to Section 5.0 Troubleshooting.

4.2 Lubrication

No lubrication, other than that supplied at the factory, is required under normal operation.

4.3 Standard Unit Part Number and Assembly

Information is supplied on the name tag from which the complete assembly part number may be derived.

Each unit is supplied with a metal plate (attached to the accessory block), which contains pertinent part number information.

To determine your part number:
1. Read the nameplate:
   Rev. A (IN lower side)
   Rev. B (OUT far side)
   Rev. C (OUT top side)
2. Match information in Step 1 with information in Table 4.1.

Figure 4.1 Generator Installation

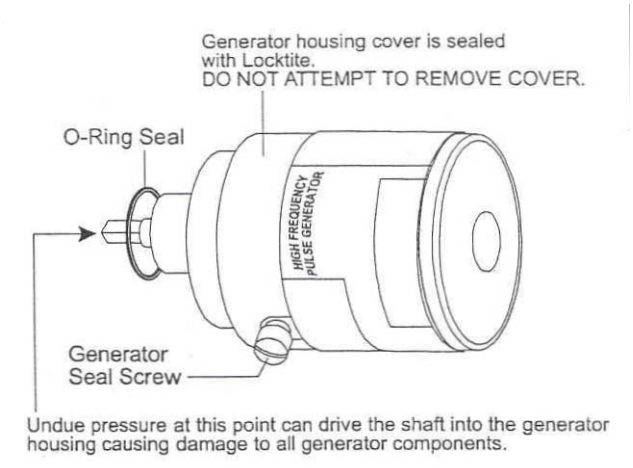
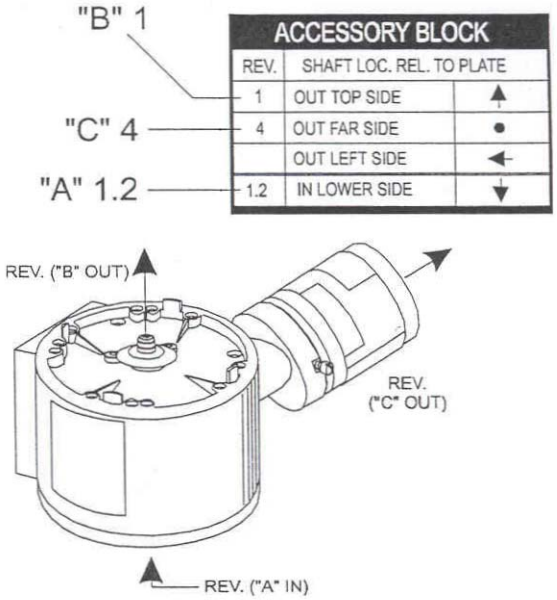


Figure 4.2 Nameplate (Input/Output Data)



4.4 Changing Generator Output Range

The pulses per revolution of output of any given standard unit are field changeable to any other standard pulse output.

Changing the pulse output requires either a change in the gearing of the accessory gear housing and/or replacement of the generator assembly. Once the pulses per revolution of output desired is located in Table 4.1, the correct part number for the unit is then read from the first column.

To determine the part number needed to accurately change output range:
1. Determine the pulses per revolution required.
2. Locate the appropriate part number from Table 4.1, column 1.
3. Locate this same complete assembly part number in the row of figures across the top of Table 7.1. Convert to the proper assembly by replacing all part numbers that are different with those listed.
4. Compare accessory gear housing part numbers and replace as necessary. Proceed to step 5 and 6 if replacement is required.
5. Locate the new accessory housing part

number from Figure 7.2.
6. Order gear assemblies as required. Reference Table 7.2.

4.5 Disassembly (Reference Figure 7.1)

Caution

Power must be OFF before performing any disassembly or reassembly procedures. Failure to disconnect power could result in serious personal injury and/or damage to the equipment.

4.5.1 Removal of Generator

1. Loosen seal screws.

NOTE: The Seal Screws which hold the Generator to the Adaptor Assembly are held by Retaining Rings. Do not attempt to loosen more than three (3) revolutions.

2. Remove the generator assembly from the adaptor by pulling straight out. Gentle prying may be necessary, however do not use force.
3. Inspect all wires, O-Rings, shafts and bearings for damage or wear and replace as required.
4. No further disassembly of the generator should be performed as this is a factory replaceable item containing no adjustment or serviceable parts.

Caution

Under no circumstances should the sealed generator housing be opened. There are no user serviceable components inside.

4.5.2 Installation of Generator

(Reference Figures 4.1 and 4.3)

Be sure that the generator seal screws are properly aligned in the countersunk slots of the adaptor housing. If the generator will not seat properly, it may be necessary to rotate the generator shaft to align with the coupling on the shaft of the adaptor housing. DO NOT FORCE the shaft into the coupling as serious damage could occur. See Figure 4.3.

4.5.3 Generator Adaptor, Gear and Shaft Assembly

1. Remove screws and adaptor from the gear housing being careful/ not to damage the shims.
2. Inspect the shaft and gear assembly for looseness in the bushings. Inspect the bevel gear, spacer and coupling for wear.

Note: *Certain Assemblies require the use of Spacers. Reference Figure 7.1 Detail A-A.*

3. Hold the shaft assembly in by applying light pressure to the coupling of the adaptor housing.
4. Press the roll pin from the bevel gear and remove the gear and spacer (if required).
5. Gently remove the shaft and coupling from the adaptor housing taking care not to damage the shims. Replace shims as required.
6. Pull out bushings and replace as required.

4.5.4 Output Coupling - Accessory Gear Housing

1. Remove the cotter pin, coupling, slinger, O-Ring and spacer from the output shaft.
2. Inspect all parts for wear or damage and replace as necessary.

4.5.5 Type I Bottom Plate and Through Drive Shaft

1. Remove the snap ring holding the through drive shaft adaptor to the bottom plate.
2. Remove the four screws and bottom plate from the gear housing.
3. Remove the through drive shaft being careful not to lose or damage shims.
4. Inspect gear, shaft, bushing, shims and bearing for damage and/or wear.

4.5.6 Type II Bottom Plate and Idler Gear Bracket Assemblies

1. Remove the four screws and bottom plate from the gear housing.
2. Remove the two screws and idler gear bracket from the bottom plate.

Figure 4.3 General Assembly - Exploded View

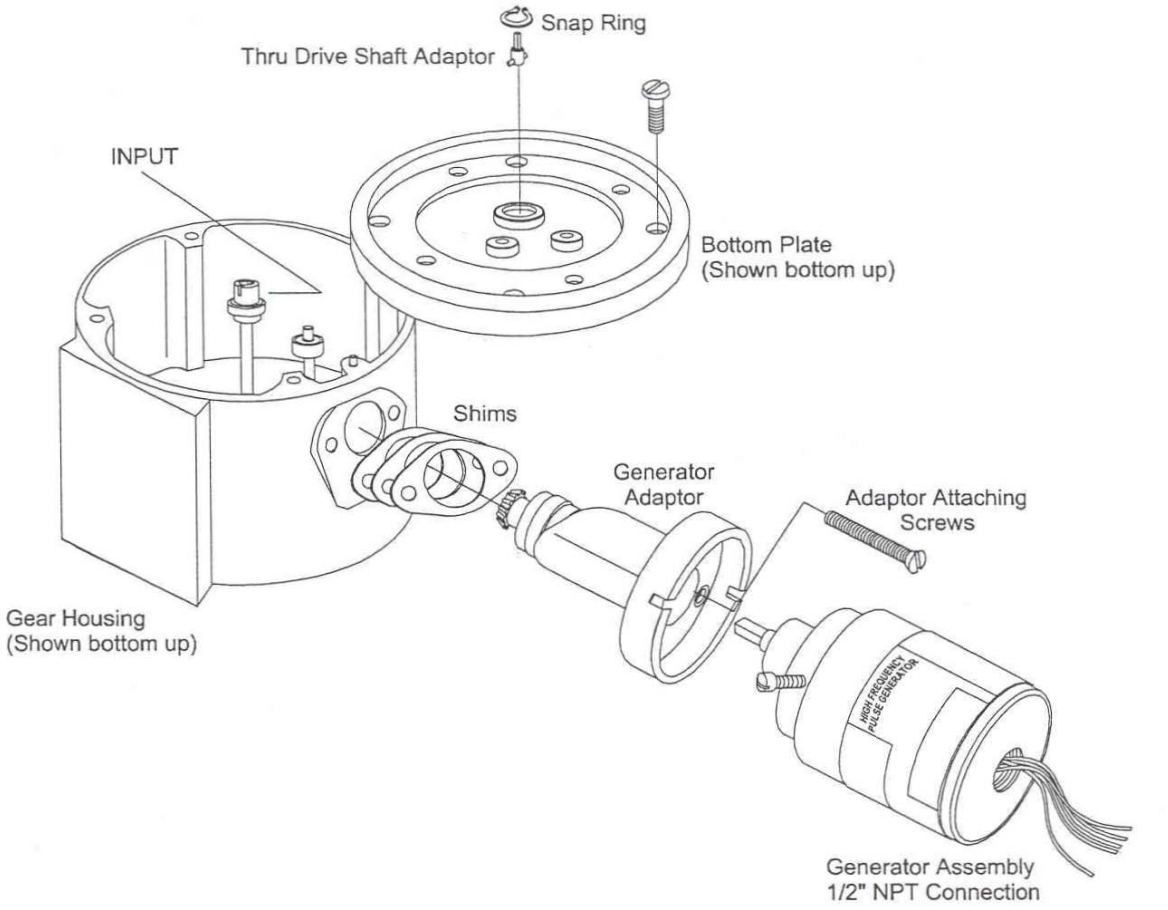


Figure 4.4 Type I - Bottom View (Plate Removed)

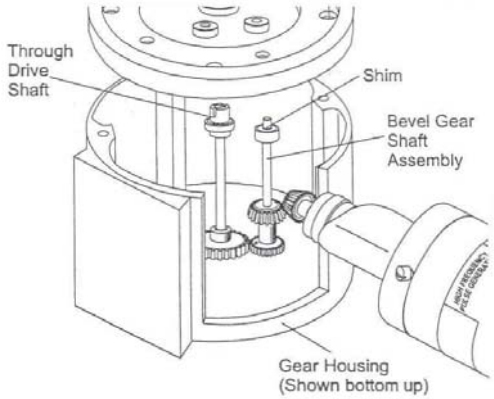


Figure 4.5 Type II - Bottom Plate and Adaptor

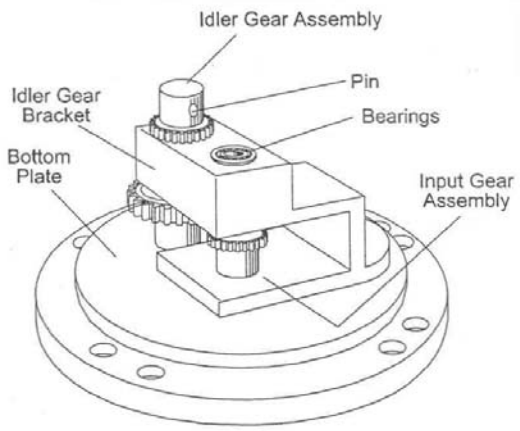
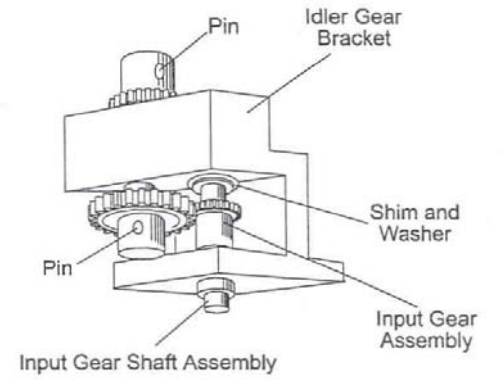


Figure 4.6 Type II - Idler Gear Bracket Assembly



Note: *The input gear assembly, shims and washer are now loose and should be guarded against loss. Inspect the idler gear assembly (for looseness in the idler gear bracket), gears and shims. Replace as required.*

3. If further disassembly is required, or to remove idler gears from the assembly:
   a. Drive out the pins holding the gears to the shafts.
   b. Remove gears from the shafts.
   c. Remove shims (if required).
   d. Remove the shaft from the idler gear bracket.
4. Remove the input shaft assembly from the bottom plate by removing the snap ring. Inspect the shaft, bearing and bushing for wear.

4.5.7 Bevel Gear Shaft Assembly

1. Remove the bevel gear shaft assembly from the gear housing. Note position of shims (top and bottom) and remove.
2. Inspect all gears bushings, shims and shafts for wear.

4.5.8 Output Shaft

This section does NOT apply to straight through drive assemblies without the idler gear bracket.

1. Remove the output shaft.

2. Note position of shims and remove.

3. Inspect all gears, shafts and shims and replace as required.

4.5.8 Housing Assembly

Inspect all bearings and bushings for wear or damage and replace as required.

4.6 Reassembly (Reference Figures 7.1)

Shim as required to obtain proper gear mesh, face alignment and shaft end play.

4.6.1 Output Shaft Assembly

(This section DOES NOT apply to straight through drive assemblies without idler gear bracket.)
1. Place shims as required on output end of shaft.
2. Place output shaft assembly into the bearing in the gear housing.

4.6.2 Bevel Gear Shaft Assembly

1. Place shims on the gear end of the shaft as required.
2. Place the shaft into the gear housing, gear down, making sure that gears mesh properly and that the shaft is fully seated in the housing.
3. Return shim (if required) to the bushing end of the shaft.

4.6.3 Bottom Plate and Drive Through Shaft

(This section applies to the straight through drive assemblies WITHOUT idler gear bracket.)
1. Replace shims (as required) on the square end of the shaft.
2. Place the through drive shaft into the bearing in the gear housing making sure that gears mesh properly.
3. Align the bottom plate with the locating pin of the gear housing making sure that through drive shaft and bevel gear shaft are seated properly and secure into position using four screws.
4. Replace the through drive shaft adaptor and the retaining ring.

4.6.4. Bottom Plate and Idler Gear Bracket

(This section DOES NOT apply to straight through drive assemblies without idler gear bracket.)
1. If previously removed, install the idler gear assembly into the idler gear bracket and shim as required.

2. With the idler gear held upside down, place the washer and shims (as required) over the bottom bearing in the idler gear bracket and align the holes.
3. Gently insert the input gear assembly into the idler gear bracket and align the gear, washer and shims with the bearing.
4. Insert the input gear shaft through the bracket, gears, shims, washer and bearing and align the pin with the slot in the input gear.
5. With the assembly still upside down, insert the Input shaft through the bottom plate, align the mounting holes in the bracket with the bottom plate and attach with two screws.
6. Install the input shaft adaptor and the retaining ring into the slotted end of the input shaft.
7. With the output shaft and bevel gear assemblies installed in the gear housing, place the bottom plate with the idler gear bracket onto the gear housing, align with the locating pin and assure that all gears mesh properly. Rotate the input shaft to assure a proper seat. DO NOT FORCE the bottom plate onto the gear housing.
8. Attach the bottom plate to the gear housing using the four screws previously removed.

4.6.5 Output Coupling

1. Install spacer, O-Ring, slinger and coupling onto the output shaft.
2. Install Cotter Pin.

4.6.6 Generator Adaptor, Gear and Shaft Assembly

1. Replace shim (as required) over adaptor neck (Gear end).
2. Install the adaptor onto the gear housing taking care not to damage shims. Secure with screws.

Note: *It may be necessary to rotate the output coupling to obtain proper gear mesh.*

Note: *Due to specific tolerance dimensions, to insure proper alignment of the bevel gear "G" with bevel gear "H" (Figure 4.7), the shaft and gear assembly must be purchased as a complete unit.*

If the shaft was removed, reassemble following steps 3 though 8 below.

3. Return bushings to the adaptor.
4. Place shims (as required) over the square end of the shaft assembly.
5. Place the coupling over the square end of the shaft and secure with cotter pin.
6. Insert the shaft through the bushings in the adaptor housing from the generator end.
7. Return shims (as required) and spacer to the round end of the shaft.
8. Replace gear and secure in position with the roll pin.

4.6.7 Installation - Generator Assembly

Align the seal screws of the generator with the counter-sunk slots of the adaptor. To properly seat the generator it may be necessary to rotate the output coupling on the gear housing while exerting light pressure to the generator assembly. When the coupling and shaft of the generator assembly line up, a proper seat should be established. Under no circumstances should the shaft be FORCED into the coupling as serious damage to the generator could result.

Table 4.1 High Frequency pulse Generator Assembly

Figure 4.7 Gear Train Assemblies - Type I and Type II

(Reference Table 4.1, Column 2)

Information shown in Table 4.1 pertains to both single and dual output units. Complete assembly numbers have been shown using a place holder of "XX". If your unit utilizes a dual output signal "XX" is replaced by the number "23". Single output units use the number "13".

Part Number (Complete	Type Gear	Input per/ Rev "A"	Ratio Input "A" to Output "B"	Output per Rev. "B"	Pulses per One (1) Rev.	Disc Line Number	Accessory Gear Housing			Number of Teeth**						
							"A" Lower	"C" Far	"B" Top	A	B	C	D	E	F	C	H
741-XX-622-09	I	(1) Unit	1:1	(1) Unit	100	100	1	1	1					31	31	16	16
741-XX-622-10	I	(1) Unit	1:1	(1) Unit	250	250	1	1	1					31	31	16	16
741-XX-622-11	I	(1) Unit	1:1	(1) Unit	500	250	1	2	1					42	21	16	16
741-XX-622-08	I	(1) Unit	1:1	(1) Unit	1,000	250	1	4	1					42	21	32	16
741-XX-622-26	I	(1) Unit	1:1	(1) Unit	256	256	1	1	1					31	31	16	16
741-XX-622-27	I	(1) Unit	1:1	(1) Unit	512	256	1	2	1					42	21	16	16
741-XX-622-25	I	(1) Unit	1:1	(1) Unit	1,024	256	1	4	1					42	21	32	16
741-XX-622-07	II	(1) US Gal.	2.67:1	(10) Liters	100	100	2.67	1	1	27	36	21	42	31	31	16	16
741 -XX-622-06	II	(1) US Gal.	2.67:1	(10) Liters	1,000	250	2.67	4	1	27	36	21	42	42	21	32	16
741-XX-622-24	II	(1) US Gal.	2.67:1	(10) Liters	1,024	256	2.67	4	1	27	36	21	42	42	21	32	16
741-XX-622-05	II	(1) US Gal.	4.2:1	(1/10) BBL	100	100	4.2	1	1	20	42	21	42	31	31	16	16
741-XX-622-15	II	(1) US Gal.	4.2:1	(1/10) BBL	500	250	4.2	2	1	20	42	21	42	42	21	16	16
741-XX-622-04	II	(1) US Gal.	4.2:1	(1/10) BBL	1,000	250	4.2	4	1	20	42	21	42	42	21	32	16
741-XX-622-29	II	(1) US Gal.	4.2:1	(1/10) BBL	512	256	4.2	2	1	20	42	21	42	42	21	16	16
741-XX-622-23	II	(1) US Gal.	4.2:1	(1/10) BBL	1,024	256	4.2	4	1	20	42	21	42	42	21	32	16

5.0 Troubleshooting

Table 5.1 has been provided to aid in basic troubleshooting. Disassembly procedures are covered in Section 4.0 Maintenance. If the unitis found to be in need of repair, it is important that servicing be preformed by trained and qualified service personnel and it is recommended the user contact the Brodie Meter Co., LLC Repair Department.

Table 5.1 Troubleshooting

Condition	Possible Cause
Gear train turning with NO output pulse registration.	Prover counter not operating properly.
	Improper electrical connection.
	Insufficient voltage to generator.
	Generator amplifier not operating.
	Broken shear coupling between generator and gear housing.
	Improper alignment between shear coupling and generator shaft.
Gear train not turning.	Foreign material between gears in the gear train.
	Improper gear alignment.
	Broken shear coupling below accessory gear housing.
	Broken gear teeth.
Too many counts received at the prover counter.	Shielding on connecting cable grounded at both ends.
	Sensitivity control on prover counter not adjusted properly.
	Excessive vibration on meter stack-up.
	Incorrect gearing.
	Incorrect lines on disc.
Too few counts received at the prover counter.	Input voltage lower than specified limits.
	Sensitivity control on prover counter not adjusted properly.

6.0 Warranty Claim Procedures

To make a warranty claim, you, the Purchaser, must:

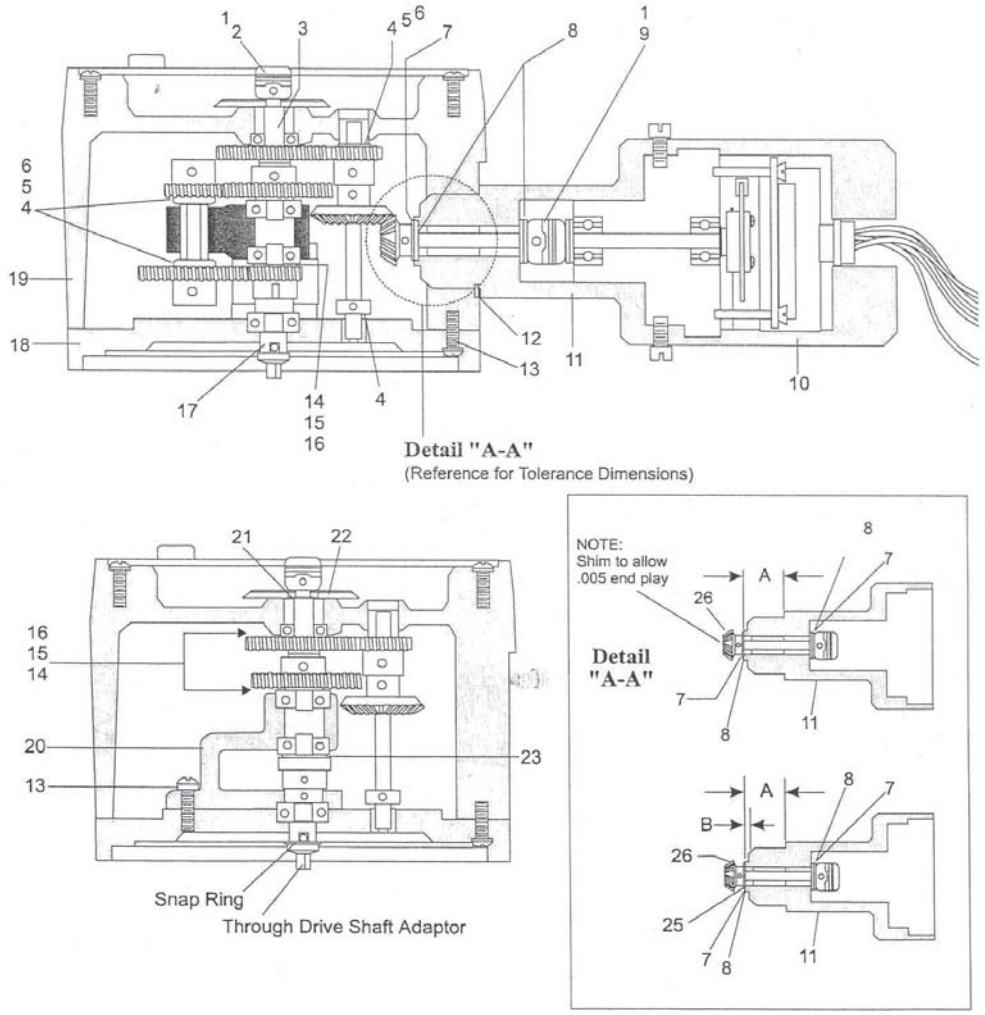
1. Provide Brodie with proof of the Date of Purchase and proof of the Date of Shipment of the product in question.
2. Return the product to Brodie within twelve (12) months of the date of original shipment of the product, or within eighteen (18) months of the date of original shipment of the product to destinations outside of the United States. The Purchaser must prepay any shipping charges. In addition, the Purchaser is responsible for insuring any product shipped for return, and assumes the risk of loss or damage of the product during shipment.
3. To obtain Warranty service or to locate the nearest Brodie office, sales, or service center call (912) 489-0200.
4. When contacting Brodie for product service, the purchaser is asked to provide information as indicated on the following page entitled “Customer Problem Report” (Appendix B).
5. For product returns from locations outside the United States, it will be necessary for you to obtain the import consignment address so that Brodie’s customs broker can handle the importation with the U.S. Customs Service.
6. Brodie Measurement Services offers both on call and contract maintenance service designed to afford single source responsibility for all its products.
7. Brodie reserves the right to make changes at any time to any product to improve its design and to insure the best available product.

7.0 Parts List

This section contains the necessary parts required for routine maintenance and service of the High Frequency Pulse Generator. Each parts list also contains the recommended spare and replacement parts denoted by an asterisk. For Items not listed, or additional information, consult factory. When ordering, the following information must be furnished:

1. Part Number
2. Model Number of the unit
3. Serial Number
4. Quantity required.

Figure 7.1 Exploded View of High Frequency Pulse Generator



Tolerance - Dimensions

Shaft and Gear Assembly (Item 26)	A	B
741-12-328-00	.791 / .783	--
741-12-328-01	1.010 / 1.002	.232 / .222
741-12-328-02	.916 / .908	.130 / .120

Table 7.1 Parts List - Complete Assembly

Item	Description	Part Number		Qty.	Dual	741-23-622-09	741-23-622-10	741-23-622-11	741-23-622-08	741-23-622-26	741-23-622-27	741-23-622-25	741-23-622-07	741-23-622-06	741-23-622-24	741-23-622-05	741-23-622-15	741-23-622-04	741-23-622-29	741-23-622-23	741-23-623-01
					Single	741-13-622-09	741-13-622-10	741-13-622-11	741-13-622-08	741-13-622-26	741-13-622-27	741-13-622-25	741-13-622-07	741-13-622-06	741-13-622-24	741-13-622-05	741-13-622-15	741-13-622-04	741-13-622-29	741-13-622-23	741-13-623-01
		Single Output	Dual Output																		
1	Shear Coupling & Cotter Pin	W4125		1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	Spacer	741-12-038-01		1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	Shim	741-12-006-04		1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
5	Shim	741-12-006-03		A/R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6	Shim	741-12-006-05		A/R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
7	Shim	741-12-006-00		A/R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
		741-12-006-01		A/R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
		741-12-006-02		A/R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
8	Bushing	788-14-035-00		2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
10	Generator Assembly 100 Line Disc w/ 1/2" NPT	228-00-602-37	229-00-602-17			X		X					X			X					
	Generator Assembly 256 Line Disc w/ 1/2" NPT	228-00-602-46	229-00-602-25							X		X			X						
11	Generator Adaptor	741-12-013-00										X	X	X	X	X	X	X			
12	Shim .004	21448										X	X	X	X	X	X	X			
	Shim .008	21449										X	X	X	X	X	X	X			
13	Screw	150533										X	X	X	X	X	X	X			
14	Shim	741-12-006-01				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
15	Shim	741-12-006-00				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
16	Shim	741-12-006-02				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
17	Input Shaft Assembly	741-12-325-00				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
18	Bottom Plate Asssembly	741-12-301-01				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
19	Housing Assembly	741-12-330-02				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
20	Idler Gear Assembly	741-12-320-00				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
21	O-Ring	152064				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
22	Slinger	4532				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
23	Washer	741-00-054-00				X	X	X	X	X	X	X	X	X	X	X	X	X		X	
25	Spacer	741-00-054-60											X			X					
		794-24-067-02				X	X	X		X											
26	Shaft and Gear Assembly (Includes gear, roll pin, shaft coupling, and cotter pin)	741-12-328-00											X	X	X	X		X			
		741-12-328-01																			
		741-12-328-02																			
27	Complete Accessory Gear Housing (Includes Item 1-6 and 13-26 above). See Table 7.2 for Gear Assembly part numbers.	741-12-502-00 (1.05:4:1)																			
		741-12-502-02 (1.05:1:1)																			
		741-12-502-08 (4.2:4:1)														X		X			
		741-12-502-10 (4.2:4:1)																X		X	
		741-12-502-12 (2.67:4:1)											X	X	X						
		741-12-502-13 (2.67:4:1)											X								
		741-12-502-16 (1:4:1)											X								
		741-12-502-18 (1:1:1)							X			X									
		741-12-502-25 (1:0.25:1)						X													
		741-12-502-32 (4.2:1:1)																			

Figure 7.2 Gear Assemblies

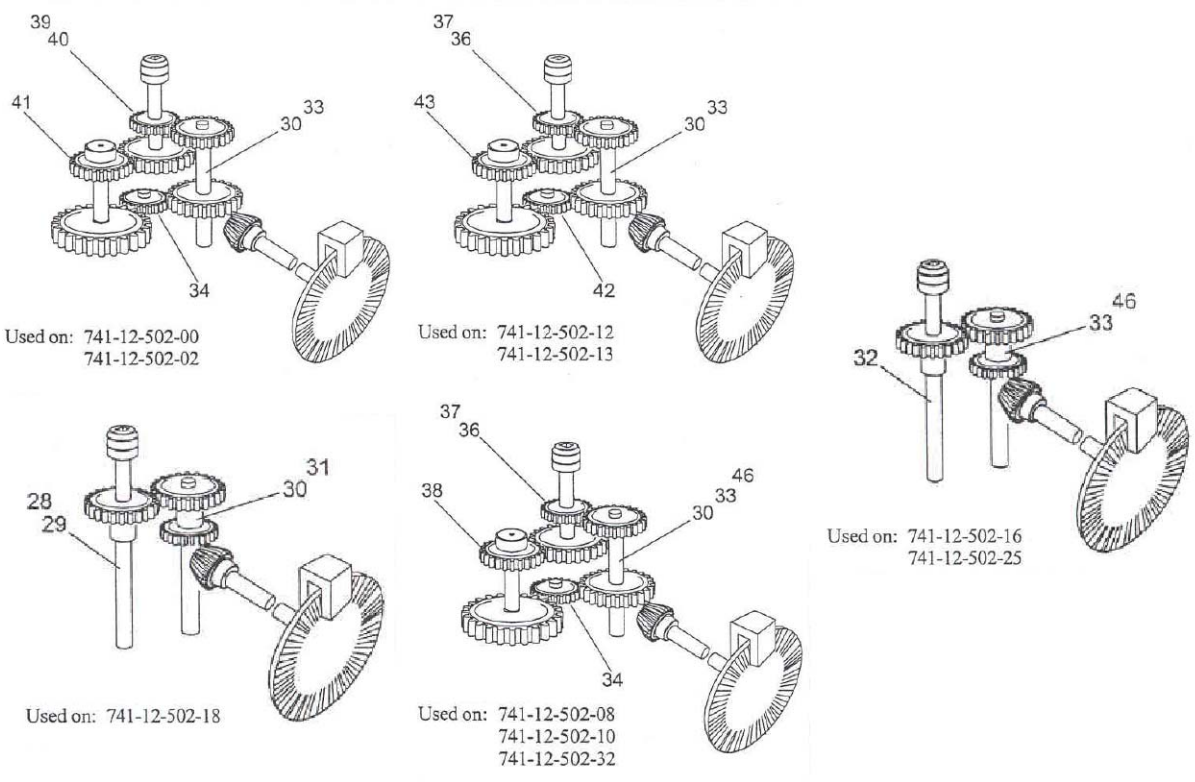


Table 7.2 Parts List - Gear Assemblies

Item	Description	Part Number	Qty.	741-12-502-00	741-12-502-02	741-12-502-08	741-12-502-10	741-12-502-12	741-12-502-13	741-12-502-16	741-12-502-18	741-12-502-25	741-12-502-32
28	Through Drive Shaft Assembly	741-12-341-02	1								X		
30	Bevel Gear Shaft Assembly	741-12-327-02	1		X		X		X		X		
32	Through Drive Shaft Assembly	741-12-341-01	1									X	
33	Bevel Gear Shaft Assembly	741-12-327-01	1	X		X		X		X			
34	Input Gear Assembly	741-12-315-00	1	X	X	X	X			X			X
36	Output Shaft Assembly	741-12-326-02	1				X						
37	Output Shaft Assembly	741-12-326-05	1			X							X
38	Idler Gear Assembly	741-12-317-03	1			X	X						X
39	Output Shaft Assembly	741-12-326-04	1		X								
40	Output Shaft Assembly	741-12-326-07	1	X									
41	Idler Gear Assembly	741-12-317-00	1	X	X								
42	Input Gear Assembly	741-12-315-02	1					X	X				
43	Idler Gear Assembly	741-12-317-01	1					X	X				
46	Bevel Gear Assern.	741-12-327-07	1									X	X

Appendix A - Customer Problem Report

Brodie Meter Co., LLC

19267 Highway 301 North (30461)
PO Box 450
Statesboro, GA 30459-0450

Phone: (912) 489-0200
Fax: (912) 489-0294
www.brodiemeter.com

Customer Problem Report

For faster service, complete this form and return it along with the affected equipment to customer service at the address indicated below.

Company Name: _____

Technical Contact: _____ Phone: _____

Repair PO#: _____ If Warranty, Unit S/N: _____

Invoice Address: _____

_____

_____

Shipping Address: _____

_____

_____

Return Shipping Method: _____

Equipment Model #: _____ S/N: _____ Failure Date: _____

Description of Problem: _____

_____

_____

What was happening at time of failure? _____

_____

_____

Additional Comments: _____

_____

_____

Report Prepared By: _____ Title: _____

If you require technical assistance, please contact the Product Service Department at:

Phone: (912) 489-0200
Fax: (912) 489-0294
service@brodiemeter.com

Reminder:
All items being returned must be packaged separately. A decontamination statement and the MSDS sheet(s) must be placed on the outside of the shipping container.

Brodie Meter Co., LLC: Manufacturers of BiRotors, Oval Gear Meters, and Control Valves

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Brodie Meter Co., LLC

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