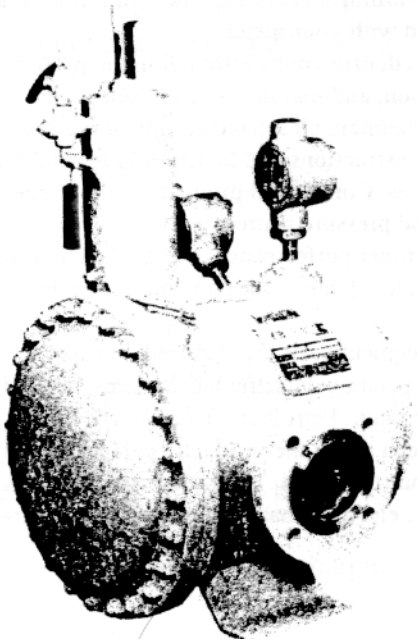
X-PS01
Revision 01

Brodie P-Style BiRotor Meters

Operating and Maintenance Instructions



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Essential Instructions

The Brodie BiRotor Meter is a product 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 operation.

English

Installation instruction for P-style Bi-Rotor for CE-MARK compliance

I . The amplifier for the P-style BI-Rotor must be installed with a shielded cable with a total shield coverage of I00%.
The shield must be connected to the housing over 360° . via a suitable cable gland on both ends.

2. Cable glands MUST provide RFI shielding over 360°.

Nederlands

Installatie-instrukties voor P-Style Bi-Rotor meters m.b.t. CE-markering

1. De kabel die wordt aangesloten aan de versterker van de P-style BI-Rotor dient een afgeschermde kabel to zijn welke 100% afscherming biedt.
De afscherming dient aan beide zijden over 360° aan de behuizing bevestigd to worden d.m.v. een geschikte kabelwartel..

2. Kabelwartels moeten afscherming bieden tegen radio-interferentie over 360°.

Français

Instructions d'installation pour les compteurs Bi-Rotor type P pour conformite a 1'aQrement CE

I . L'amplificateur pour le Bi-Rotor modele P doit etre raccorde avec un cable blinde a 100 % de recouvrement.
Ce blindage dolt etre relie au bonier en utilisant un presse-etoupe adequat de chaque c6te.

2. Les presse-etoupes doivent fournir une protection RFI avec ontinuite de masse.

January, 1996

Português

Instrucao sobre a instalacao do Bi-Rotor P-Style para cumprimento da CE-MARK

1. O amplificador do BI-Rotor P-Style deve ser instalado com um cabo blindado, com blindagem total de 100%.
   A blindagem deve estar ligada ao invdlucro acima de 360°, com uma bucha adequada, em ambas as extremidades.

2. As buchas do cabo DEVEM proporcionar uma blindagem RFl acima de 360°.

Italiano

Bi-Rotor serie P-Style istruzioni di montaggio amplificatore in accordo alle disposizioni CE

1. L'amplificatore nel caso del Birotor serie P-style deve essere installato con una totale schermatura del 100%.
   La schermatura deve essere collegata alla custodia su 360°, tramite opportuno pressacavo su ambedue i terminal].

2. 1 pressacavi DEVONO garantire una RFI schermante su 360°

Svenska

Installationsanvisning for CE-markt P-Style Bi-Rotor.

1. Fbrstarkaren for P-Style Bi-Rotor maste installeras med skarmad kabel, dar skarmen tacker till 100%.
   Skarmen maste anslutas over 360° , via en lamplig kabelforslutning i bada andar.

2. Kabelforslutning MASTE ge RFI avskarmning over 360°.

Español

Instrucciones de instalacidn del P-style Bi-Rotor tiara cumplimentar la MARCA CE

1. El arnplificador del P-style BI-Rotor debe ser instalado con un cable apantallado, con un grado de apantallamiento del 100%.
   La pantalla debe estar conectada a]a carcasa a to largo de los 360° en ambas terminaciones, mediante e1 adecuado casquillo del prensa

2. Los casquillos del prensa deben proporcionar apantallamiento RFI a to largo de los 360°

Dansk

Installations veiledning for P type Bi-Rotor til CE- maerkning.

I . Forstaerkeren til P-typen Bi-Rotor skal installeres med 100 % afskxrmning. Skxrmningen skal vxre forbundet til kabinettet over 360 med passende kabelforskruninger i begge ender.

2. Kabel forskruning skal give RFI skxrming over 360 grader.

Suomi

CE-Merkinnan mukaiset asennusohieet P-Sivle Bi-Rotor virtausmittarille.

1. P-Style Bi-Rotor virtausmittarin vahvistimen asennuksessa on kaytettava hairi6suojattua kaapelia jossa kaapelin suojaus on 100%.
   Nairi6suojaus on liitettava koteloon koko kehalta (360°), kayttaen sopivia kaapelilapivienteja molemmissa paissa

2. Kaapelilapivientien TAYTYY antaa 360° suojaus radiotaajuista interferenssia vasten.

Deutsch

Alontage-Anweisiingen fur P-Style 13i-Rotorzahler, speziell fur die CE-Zulassunp,

1. Der Verstarker fur den P-Style BI-Rotorzahlermuss mit einem Verbindungskabel versehen werden, das 100% abgeschirmt ist.
   Die Abschirmung muss uber 360° mit dem Gehause verbunden werden mittels emer zugelassenen PG-Verschraubung auf beiden Seiten.

2. Die PG-Verschraubungen mussen eine 360° EMV Abschirmung garantieren.

Instruction Cross Reference
X-(B60/90) Models B-60 through B-92
X-(B-63DEB High Pressure Models B-63 through B-95
X-(BA-89) Model BA-89
X-BA-103 High Pressure Models BA-103 through BA-135
X-(B-173 DEB) APL BiRotor Models B-173 through B-195
X-BA-203 APL Models BA-203 through BA-235

WARNING
This publication must be read in its entirety before performing any operation. Failure to understand and follow these instructions could result in serious personal injury and/or damage to the equipment.

Should this equipment require repair or adjustment, contact the nearest Brodie Sales Office. It is important that service be performed only by trained and qualified service personnel. If this equipment is not properly serviced, serious personal injury and/or damage to the equipment could result.

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Section 1 INTRODUCTION

1-1 General

The Brodie P-Style BiRotor Meter is a positive displacement flow meter designed to provide an electrical output signal directly proportional to liquid flow. All P-Style units are equipped with one (standard) or two (optional) pickoff coils which produce a simple pulse output. The preamplifier is designed to convert the low level sine wave-shape signal from the pick-off into a 0 to 5 volt square wave output signal capable of triggering auxiliary readout equipment.

1-2 Specifications

For standard meter specifications, pressure drop and materials of construction reference the appropriate BiRotor Model Service Instructions or design specification sheet.

Connections

Mechanical: 3-16", 150, 300 and 600 lb. ANSI Flg.(Reference appropriate design specification sheet)

Electrical: Class I, Group D, Division 1, Explosion Proof condulet with terminal strip connections

Recommended Connecting Cable: Belden 8770, 3 Conductor Shielded, 18 gauge stranded. Maximum cable length 3,000 Feet (914 meters)

Condulet Connection Size: 1 " Ratings: Based on meter selected

Product Temperature Range

Standard: -20 to 150°F (-29 to 65°C)

Optional: Up to 450°F(232°C) Performance

Meter: See Table 1-1

Preamplifier

Power Required: 6-28 Vdc at 20 mA

Input Sensitivity: 5 mV Peak-to peak at 5 Hz

Frequency Range: 4 to 10,000 Hz

Output Signal: TTL (0-5 V or Voltage Dependent pulsed dc

Section 2 INSTALLATION

2-1 General

This section contains specific instructions for receipt and installation of the equipment.

2-2 Receipt of Equipment

When the equipment is received, the outside of the packing case should be checked for any damage incurred 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, 30458.

Remove the envelope containing the packing list. Carefully remove the equipment from the packing case. Make sure spare or replacement parts are not discarded with the packing material. Inspect for damaged or missing parts.

Refer to your packing list for information as to what is supplied with your particular meter. 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, 30458.

Table 1-1 Typical Performance Accuracy

	METER	DOUBLE CASE								
		B-62 B-63 B-64 B-65	B-72 B-73 B-74 B-75	B-82 B-83 B-84 B-85	B-89	B-92 B-93 B-94 B-95	BA-103 BA-104 BA-105	BA-113 BA-114 BA-115	BA-123 BA-124 BA-125	BA-133 BA-134 BA-135
		MAXIMUM FLOW RATE (gpm)								
		250	425	600	800	1000	1500	2500	3500	8750
VISCOSITY	LINEARITY	MINIMUM FLOW RATE (gpm)								
0.5 CP	±0.15%	38	64	90	120	150	C/F	C/F	C/F	C/F
	±0.25%	28	47	66	88	110	C/F	C/F	C/F	C/F
	±0.50%	18	30	42	56	70	C/F	C/F	C/F	C/F
1.0CP	±0.15%	25	43	60	80	100	150	250	350	875
	±0.25%	16	28	39	52	65	98	163	228	569
	±0.50%	11	19	27	36	45	68	113	158	394
5.0 CP	±0.15%	10	17	24	32	40	60	100	140	350
	±0.25%	7	12	17	23	29	44	73	102	254
	±0.50%	5	8	11	15	19	29	48	67	166
20.0 CP	±0.15%	2	3.40	4.80	6.40	8	12	20	28	70
	±0.25%	1.45	2.47	3.48	4.64	5.80	8.70	14.50	20.30	50.75
	±0.50%	0.93	1.57	2.22	2.96	3.70	5.55	9.25	12.95	32.38
100.0 CP	±0.15%	0.40	0.68	0.96	1.28	1.60	2.40	4.00	5.60	14
	±0.25%	0.25	0.43	0.60	0.80	1.00	1.50	2.50	3.50	8.75
	±0.50%	0.19	0.32	0.45	0.60	0.75	1.13	1.88	2.63	6.57

C/F = Consult Factory

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 Installation

A. Mechanical

General considerations prior to installation include those typical to positive displacement meters and those particular to your meter. Reference mechanical Service Information pertinent to your meter model and description.

B. Electrical

Meter location, in regard to existing system components, is critical to operation as high amplitude interference can impede the output signal from the meter. Sources of interference may include electrical equipment such as motors, solenoids, relays, etc. To minimize inference by outside sources it is recommended that signal cables be run independent of power cables and that shielded cable be used (grounded at one end only). If an electric motor or inference inducing coil is nearby, the ideal condition is to have the meter pick-off coil positioned perpendicular to, and relatively centered on, the inducing coil. This will minimize interference.

2-5 Electrical Connections

The preamplifier printed circuit board is mounted within an explosion proof condulet pre-assembled at the factory. Interconnecting wiring to output registration equipment should be made at this point.

Warning: All power to the unit should be off and disconnected **before attempting any wiring** operation. Failure to comply could result in serious personal injury and/or damage to the equipment.

All wiring can be accessed at terminal strip TB1 as illustrated in Figure 2-1. Access is made by removing the threaded condulet cover. Note power requirements, recommended wire gauge and limitations outlined in Section 1-2 Specifications.

Section 3 OPERATION

3-1 General

Before operation, check all mechanical and electrical connections for proper installation. Should adjustments be required it should be noted that all meter adjustments and/or compensations are accomplished through the instrumentation. Reference Table 3-1 for typical K-Factor (Pulses per engineering unit).

Table 3-1 K-Factor (Pulses per Engineering Unit)

Size	BiRotor Series	Nominal K-Factor	
		Pulses/Gal	Pulses/Barrel
3"	B-70P	100	4200
4"	B-80P	50	2100
4&6"	B-89P	46	1932
6"	B-90P	29	1218
8"	BA-100P	20	840
10"	BA-110P	14	588
12"	BA-120P	-	350
16"	BA-130P	-	185

NOTE: For applications requiring K-Factors other than those listed, consult factory.

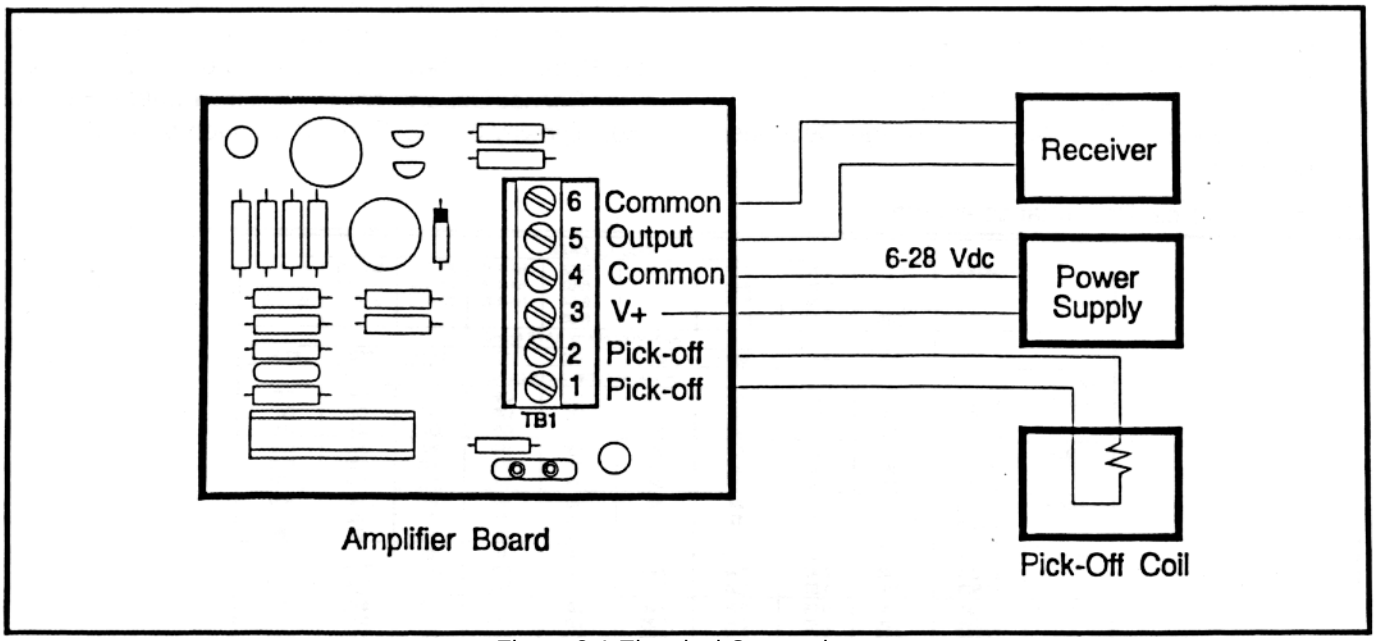

Figure 2-1 Electrical Connections

3-2 Principle of Operation

As liquid enters the intake of the measuring element, two finely timed rotors divide the liquid into precise segments of known volume and then return them to the flowing stream. During this transition the rotation of the two rotors is directly proportional to volumetric throughput. At this time volume indication can be produced using conventional gearing and mechanical registers, or in the case of the P-Style Meter, by an electronic output.

An electronic output signal is generated by passing a slotted rotating disc (mechanically attached to, and turning in unison with, the timing gears) through the magnetic field of a reluctance type pick-off device. The resultant signal is shaped by an amplifier mounted directly on the meter and then transmitted as a conditioned pulse output to readout or control instrumentation. Optional dual-channel operation is achieved by using two pick-off assemblies reacting to a common disc. Outputs of the two discs are typically 90° electrically out of phase.

3-3 Disassembly

Warning: All power to the meter and electrical components must be off and disconnected, all flow stopped, and all pressure relieved before attempting any service procedure. Failure to adhere to this procedure could result in serious personal injury and/or damage to the equipment.

Reference the Brodie Service Information Manual that best describes the mechanical unit for detailed mechanical disassembly procedures.

Instruction Cross Reference
X-(B-60/90) Models B-60 through B-92
X-(B-63DEB High Pressure Models B-63 through B-95
X-BA-103 High Pressure Models BA-103 through BA-135
X-(BA-89) Model BA-89
X-(B-173 DEB) APL BiRotor Models B-173 through B-195
X-BA-203 APL Models BA-203 through BA-235

1. Disconnect associated hardware, accessories and wiring to the Pre-amp Condulet. This includes the pickoff wires.
2. Remove the condulet and pre-amp assembly from the meter.
3. Remove the retaining screws from the cap and pick-off assembly.

NOTE: Hold extension with 3/4" open end wrench to break union.

4. Remove locking key.
5. Refer to the Service Information Manual for your particular meter for disassembly of the meter.
6. Remove pick-off assembly from measuring unit by turning counter clockwise. Care should be taken to avoid damage to the Pick-off.
7. Remove 0-ring and inspect for nicks, cuts or damage. Replace as required.
8. Inspect and clean surface of the pick-off with a non-abrasive solvent.

NOTE: Do not disassemble pick-off and pick-off extension except to replace pick-off. Loctite thread locker 272 or equivalent must be used on threads before reassembly of the pick-off and extension

9. Remove dog bone and inspect O-rings. Replace as required.

3-4 Pick-off Reassembly

1. Replace dog bone and O-rings. Lubricate O-rings for ease of installation.
2. Return the pick-off to the well. (Carefully turn clockwise until the pick-off is resting against the output disc.) **DO NOT TIGHTEN OR USE FORCE.**
3. Turn the pick-off 45 to 90° in the counter-clockwise direction to obtain the appropriate clearance between the rotating output disc and the pick-off. Lock in place using the locking key. (Slots in the key must line up with the tapped holes.)
4. Replace gaskets, cap, retainer and screws.
5. Thread pick-off wiring through the condulet housing and assemble the condulet into position using the union.
6. Return all electrical connections to their proper terminal strip locations.
7. After assuring proper mechanical and electrical connections have been made or reconnected, power up the unit.
8. Reference Table 3-1 for typical output pulses per engineering unit and adjust readout instrumentation as required.
9. Prove the meter.

Section 4 MAINTENANCE

4-1 General

No regularly scheduled maintenance is required for the electronics provided with the P-Style BiRotor Meter. Reference Service Instructions pertinent to your meter for mechanical considerations. Reference Section 5 Troubleshooting for problems associated with electrical output signals.

Section 5 TROUBLESHOOTING

5-1 General

This troubleshooting information is presented as an aid in identifying and correcting operational problems which may occur concerning the electrical pick-off and-preamplifier. Reference Service Information Bulletins particular to your meter for mechanical considerations.

Occurrences associated with the preamplifier assembly could be "no pulse, or irregular output from the amplifier module". Action should be taken based on the following conditions. (Reference associated Service Literature pertinent to your meter for mechanical considerations.)

Table 5-1 Troubleshooting

No Output Pulses from the Amplifier Module	
CAUSE 1. Input voltage to amplifier below minimum required for operation.	CORRECTION ACTION 1. Replace Pick-off
2. Damaged Amplifier Module	2. Replace Amplifier Module
3. Meter not operating	3. Reference Mechanical Instruction Manual for Meter.

Irregular or varied pulse signals could be associated with the mechanical mechanism of the meter. Reference the Brodie Service Information Manual that best describes the mechanical unit for corrective action to be taken. Items to consider include:

1. Position of Pick-off/Disk. See Section 3-1 for proper clearance.
2. Damaged rotating disk.
3. Blocked or partially blocked rotors. 4.
Inconsistent power source
5. Inferred Inductance. See Section 2 Installation.

5-2 Standard Test Procedures

Equipment Required:

Power Supply: 0-28 Vdc
Signal Generator: 10 to 3500 Hz (Sine Wave)
Oscilloscope

Jumper Plug Location

There are two positions for jumper plug J1. With the jumper plug in position A-C any power supply between 628 Vdc will produce a 0-5 V square wave. With the jumper plug (J1) in position B-C any power supply between 6-28 Vdc will provide a signal approximately 1.5 Vdc less than the voltage supplied. Reference Figure 5-1.

EXAMPLE: A 24 Vdc power supply hooked to the preamp **will** provide an output of approximately 22.5 Vdc with jumper plug J1 in position B-C and 24 Vdc in position A-C.

Test Procedure:

1. Connect the test equipment to the terminal board, as shown in Figure 5-2.
2. Set the DC power supply to 12 Vdc.
3. Set the signal generator to 50 Hz and the amplitude to 40 mV peak to peak (15 mV RMS) at the input to the pre-amp board.
4. The output should be 5 V square wave (+/-10%) or with J1 connected in position B-C on the terminal board, equal to the supply voltage.
5. Frequency to square wave should be the same as the input frequency.
6. Vary the DC supply from 7 to 28 Vdc and the output should not change (J1 in position A-C). With J1 connected in position B-C the output will change with the supply.

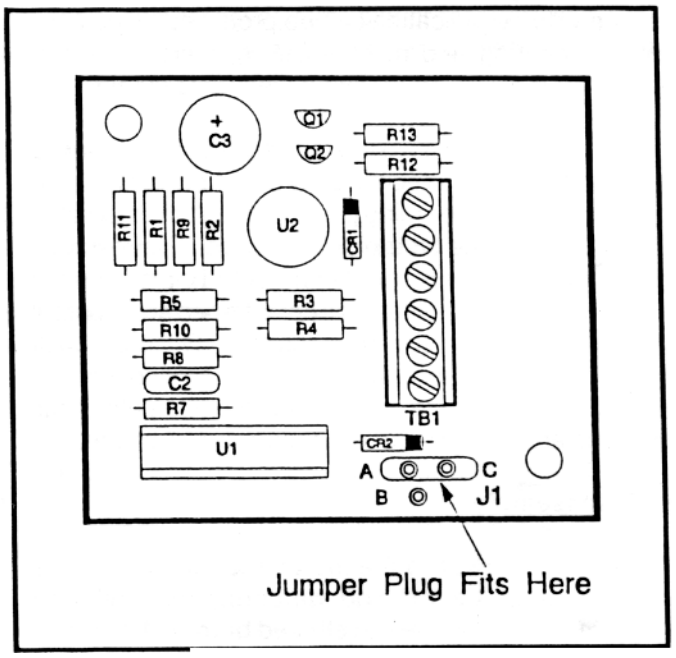

Figure 5-1 Jumper Position

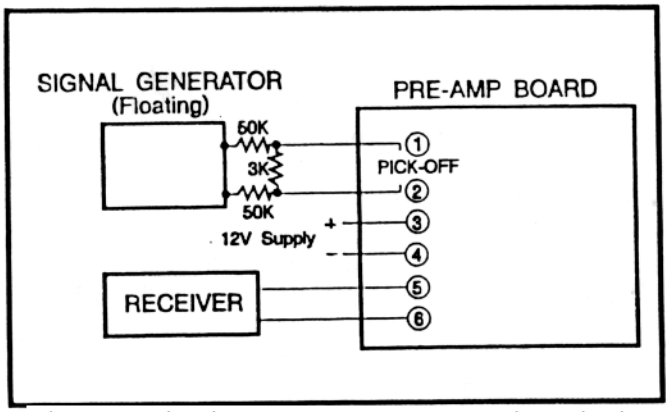

Figure 5-2 Signal Generator to Pre-amp Interface Circuit

Section 6 PARTS LIST

6-1 General

This section contains the necessary parts to make any standard unit described in this publication. For items not listed, or additional information, consult the factory. When ordering, the following information must be furnished. A. Brodie Serial Number B. Part Number, if available C. Part Description D. Quantity required

Table 6-1 Parts List - Pick-off Assembly

ITEM	DESCRIPTION	PART NUMBER	QTY.'
1	Pick-off	133032	1
2	O-ring	157093-022	1
3	O-ring	157084-022	1
4	O-ring	157345-022	1
5	Key	133037	1
6	Gasket	133027	1
7	Cap	133026	1
8	Lock Clip	158815	2
9	Lock washer	152119	8
10	Screw	150907	8
11	Gasket	72024	1
12	Retainer	133038	1
13	Pick-off Extension	C/F	1
14	Dog bone	C/F	1

* **NOTE:** Quantity shown is for "P" Meters equipped with a single pick-off.

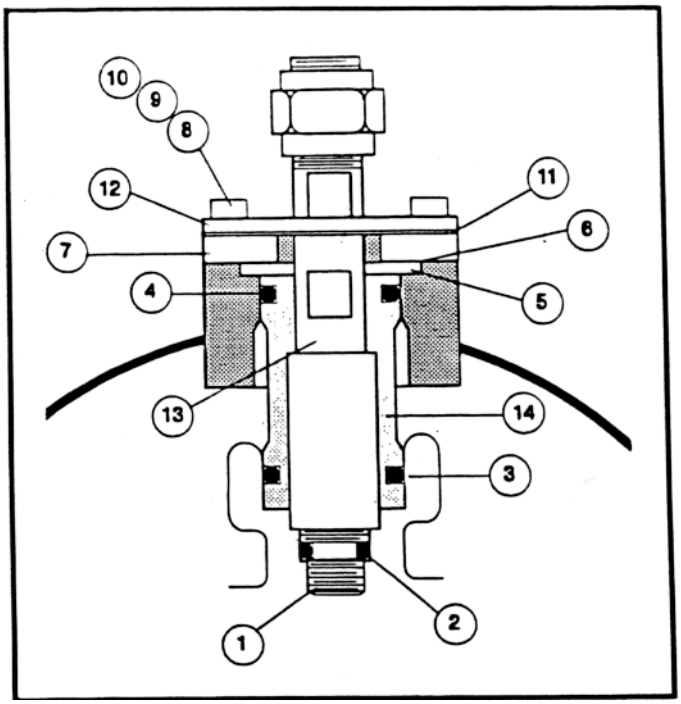

Figure 6-1 Pick-off Assembly

Table 6-2 Parts List - Preamplifier

ITEM	DESCRIPTION	PART NUMBER	QTY.
1	Housing	894-00-072-11	1
2	O-ring	159670	1
3	Amplifier Board Ass'y	ES-097Y-167-AAA	1
4	Washer	159673	2

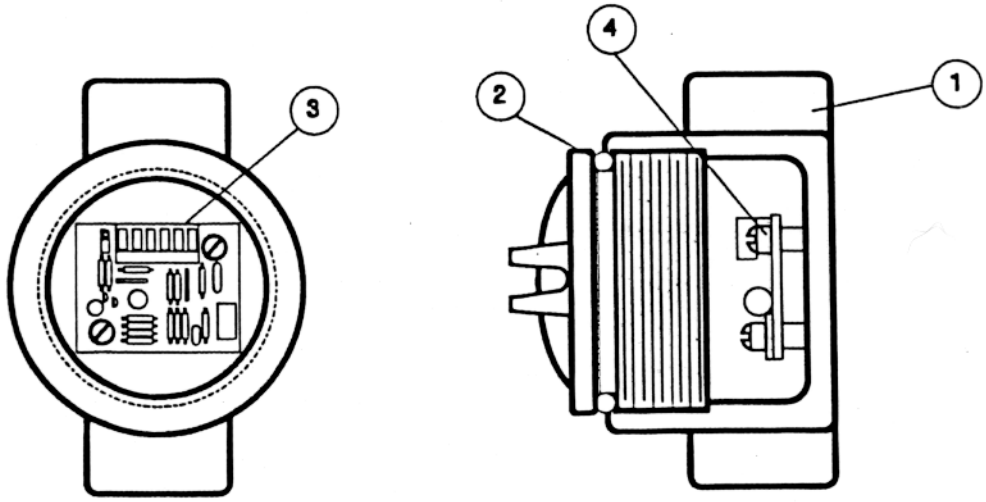

Figure 6-2 Preamplifier Assembly