TechnipFMC

Smith Meter® 3" Through 16" MV Series Turbine Meters

Service Manual

Bulletin MN02010 Issue/Rev. 0.2 (6/23)

Contents

1 General Information

1.1 Introduction

It is suggested that a detailed record be maintained for each meter. Nameplate data, progressive totalizer readings, meter factor, parts used, and other similar information provide background material for scheduling a preventive maintenance program. Maintenance is normally required when proving shows a dramatic shift in the K-factor or suitable repeatability cannot be obtained.

The time of the first inspection must be based on the operating conditions imposed by the installation. Flow rate, lubrication properties of the fluid, and the possibility of abrasive contaminants are points to consider. Then, at the time of inspection, the condition of the meter should indicate whether the inspection interval can be lengthened or shortened.

All parts, as they are removed, should be thoroughly inspected and, if necessary, cleaned in solvent.

Before any disassembly is performed on the meter, follow the steps below to ensure the trouble is in the meter.

1. Check that the meter is being operated within the proper flow rate. Refer to the nameplate on the side of the meter.
2. Check the pickup coil and the preamplifier for proper operation. An oscilloscope is necessary to determine the wave form of the pickup coil. Refer to MV Series Specifications bulletin (SS02016) for pickup coil specifications and preamplifier information.
3. Check for an electronic totalizer malfunction.
4. Check that the system flow temperature has stabilized, that there are no abnormal pressure fluctuations, and that there is proper system back pressure.
5. Check the valve operation in the system.
6. Check for air in the system.

After all other accessories have been checked and found to be operating normally, the turbine meter should be checked.

Before beginning any service procedure, stop product flow, drain the line in the direction of flow (if possible), and relieve the pressure from the system. Remove the turbine meter from the line and take it to a clean area for disassembly.

1.2 Return Procedures

No material can be returned from either a distributor or customer without receiving a properly executed Return Material Authorization (RMA). Once the RMA is received, the material may be returned in accordance with the instructions contained in the RMA.

Authorization for the return of either new or used material can only be granted by the Customer Service Department of TechnipFMC.

If the material to be returned is new and unused, the customer should supply the invoice number and the shipping order number of the original purchase.

For any units which have been installed and could contain a residue of product, it is the responsibility of the customer to properly flush and, if necessary, neutralize the inside of the equipment in question. If not properly accomplished, the customer must assume all responsibility for any injuries, property damages, or violations of state or local statutes.

All items to be returned must be freight prepaid to the Customer Service Department, TechnipFMC, P.O. Box 10428, Erie, Pennsylvania, USA 16514-0428 and shipped in accordance with all rules and regulations of the Department of Transportation and Environmental Protection Agency.

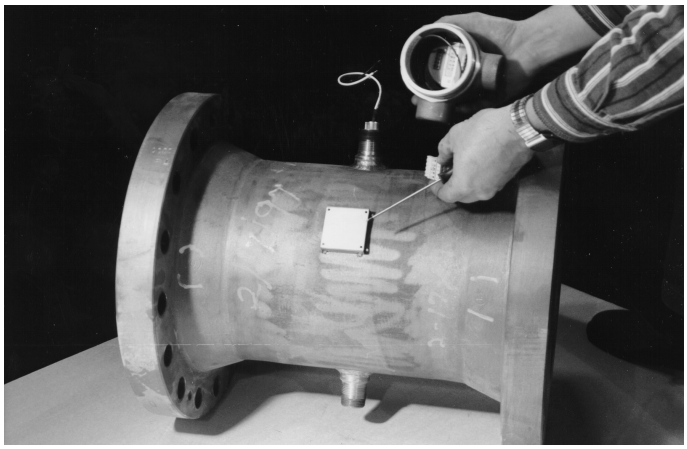
2 Service

2.1 Removal and Replacement of the Pickup Coil and Preamplifier with the Meter In Line

The following steps are for the removal and replacement of the pickup coil and preamplifier with the meter in line.

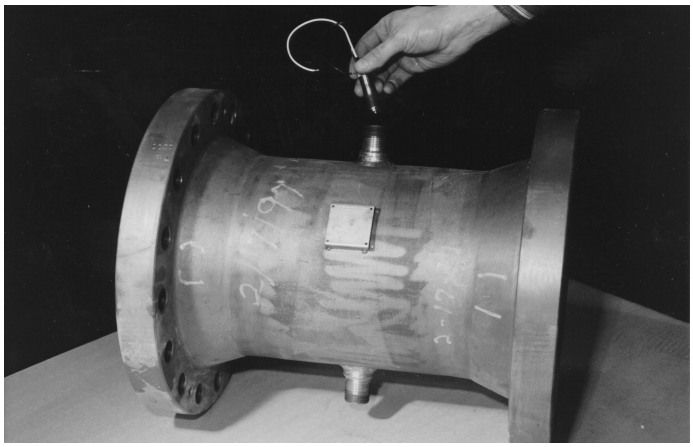
1. Make certain power has been disconnected from the meter.
2. Loosen the set screws on the cover and remove them from the junction box by turning counterclockwise.
3. Disconnect the pickup coil wires and output wiring from the preamplifier.
4. Remove the conduit and unscrew the junction box from the meter by turning it counterclockwise. See Figure 1: Removing the Conduit and Junction Box below.

Figure 1: Removing the Conduit and Junction Box



5. Remove the pickup coil from the meter by turning it counterclockwise. See Figure 2: Removing the Pickup Coil from the Meter belowFigure 2: Removing the Pickup Coil from the Meter below

Figure 2: Removing the Pickup Coil from the Meter



6. Check the resistance of the coil (the nominal direct current (DC) coil resistance is 5,000 ohms) to determine if the coil is faulty.

7. To remove the PA-6, remove the #6-32 round-head screw. See Figure 3: Removing the PA-6 belowbelow and Figure 4: Removing the Round-Head Screw on the next page. Removing the screw permits the removal of the metal clip. See Figure 5: Removing the Metal Clip on the next page.

Figure 3: Removing the PA-6

Figure 4: Removing the Round-Head Screw

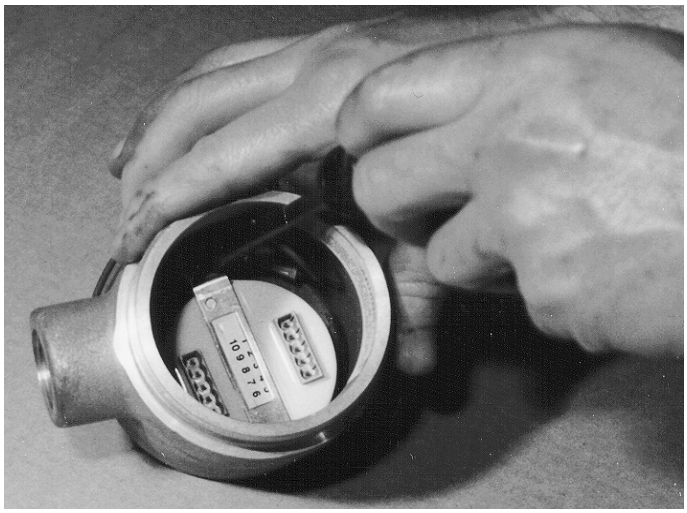
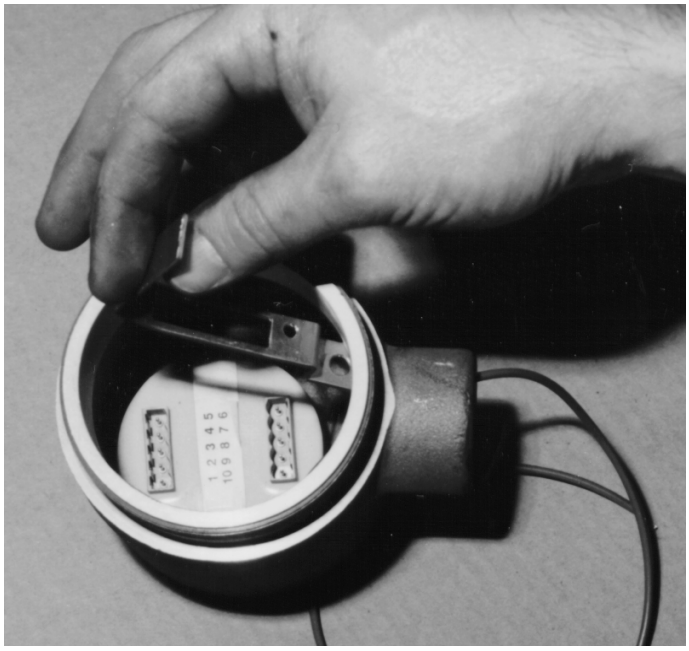


Figure 5: Removing the Metal Clip



8. For reassembly, reverse the procedure.

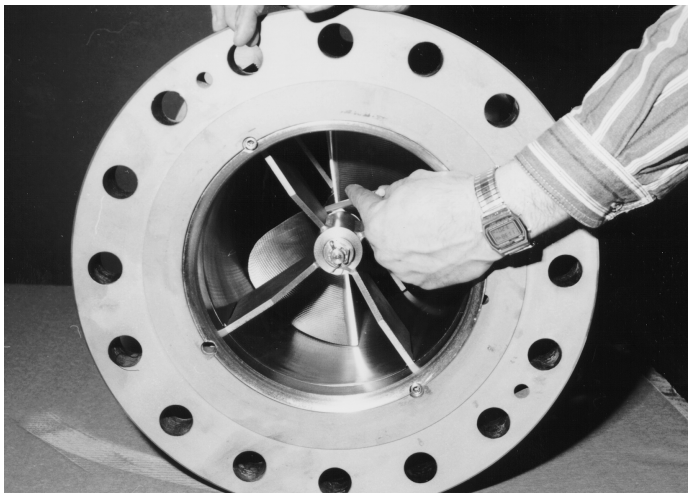
> **Caution:** The pickup coil must be fully seated. Use pliers on knurls, if necessary.

2.2 Removal and Replacement of the Measuring Element

1. Drain product from the line.
2. Ensure the power has been disconnected from the meter.
3. Remove the junction box from the meter. See section 2.1: Removal and Replacement of the Pickup Coil and Preamplifier with the Meter In Line on page 5.
4. Ensure that the meter is properly supported before removing bolts and nuts.
5. With the meter removed, check the flow conditioner to ensure that it is clean and free of debris.
6. Ensure that the rotor can rotate. See Figure 6: Ensuring the Rotor Can Rotate below. Restriction of movement will greatly affect the performance of the meter.

> **Caution:** Use a pencil or similar non-metallic object to turn rotor. The edges of the rotor are sharp and could cause personal injury if proper caution is not taken.

Figure 6: Ensuring the Rotor Can Rotate

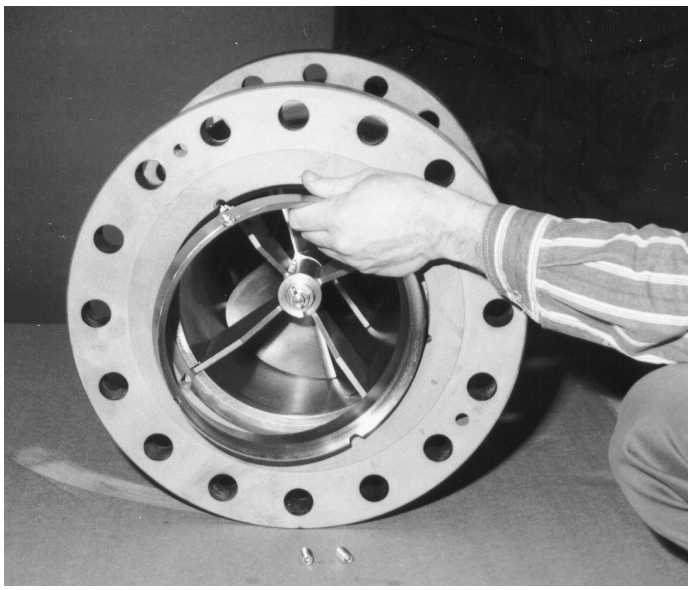


7. Place the meter housing on its side on a sturdy surface, blocking it to prevent rolling.
8. Remove the retaining ring screws marked “I” (on the inside of the ring). These screws have threads on the housing side only and are used for tightening the ring into the housing. The screws marked “R” can be used to jack the ring out of the

housing, if necessary. These screws have threads on the ring side only. Tightening these screws force the ring out of the housing. Remove the retaining ring. See Figure 7: Removing the Retaining Ring below.

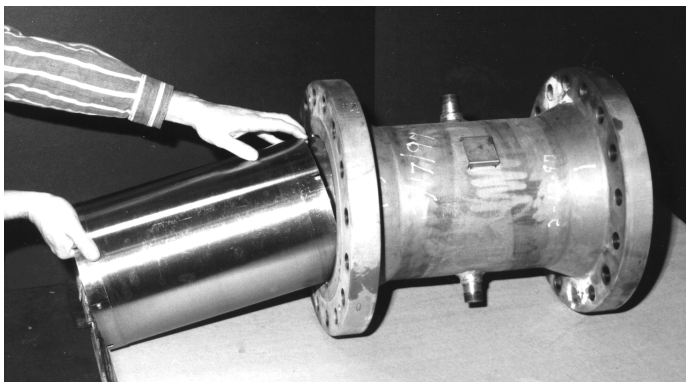
> **Note:** In many instances, removal of the ring may be completed by removing all the screws and taking the ring out or using the measuring element to push against the back side to start the ring moving out of the housing.

Figure 7: Removing the Retaining Ring



9. Remove the measuring element by sliding the entire assembly out of the inlet end of the housing. See Figure 8: Removing the Measuring Element below.

Figure 8: Removing the Measuring Element



10. To reinstall measuring element, see section 2.5: Installation of the Measuring Element on page 13.

2.3 Disassembly of the Measuring Element

1. Once the measuring element has been removed from the housing, note the four set screws aligned with the slots on the exterior of the measuring tube, highlighted in red in Figure 9: Set Screw Locations below. The set screws need to be removed before removal of the internal parts of the measuring element can begin.

Figure 9: Set Screw Locations

2. Remove the cotter pin, castle nut, and self-aligning washers from one end of the through shaft. This will enable the removal of all internal parts.

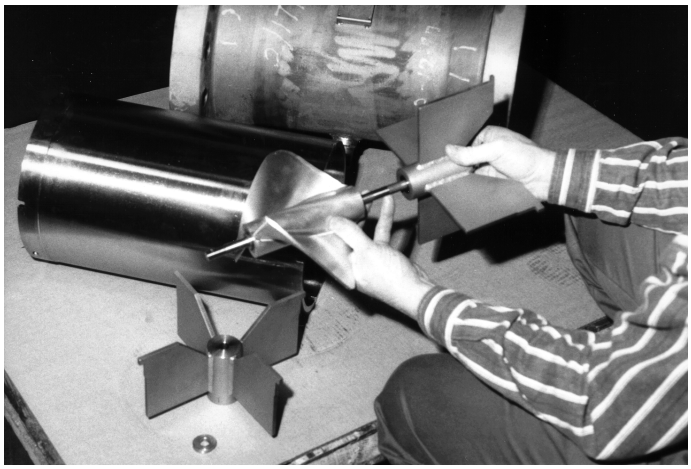
> **Note:** The 3" size uses self-locking nuts instead of cotter pins.

3. Working from the same end of the measuring element, remove the stator. See Figure 10: Removing the Stator below.

Figure 10: Removing the Stator

The remaining stator, shaft, and rotor can be removed from the other end of the measuring tube. Take note of the direction the rotor is installed. This rotor is not bidirectional. If it is not placed in the proper orientation, the meter will not operate properly. To separate the shaft from the remaining stator, remove the cotter pin, nut, and washers. The stators cannot be slid over the entire length of the shaft. They must be removed and installed over their appropriate end. Do not force the stator over the shaft as damage to the shaft and stator will result. See Figure 11: Separating the Shaft from the Remaining Stator below.

Figure 11: Separating the Shaft from the Remaining Stator



These parts can now be separated for cleaning, inspection, and replacement, if necessary.

> **Note:** Special care should be taken when handling the rotor, shaft, and stators to avoid damage to any bearing surfaces or part features. The bearings are not replaceable.

2.4 Reassembly of the Measuring Element

1. Inspect all parts to be clean and free of defects. All bearing surfaces must be free of burrs and defects. All bearings and fastening parts should have a film of light oil before installation.
2. Slide the rotor on the shaft over the bearing area. Ensure that there is free movement between the rotor and shaft by turning the shaft in the rotor.
3. Put one of the stators on the shaft, one set of self-aligning washers, and nut. The nut should be placed on the shaft at least to where the threads are through the end of the nut and the hole on the shaft lines up with the notches on the nut (except for the 3" size).
4. Insert this subassembly into the measuring tube from the appropriate end to position the rotor in the proper direction. Align the stator tabs with the appropriate slots in the measuring tube. The stators must be installed in only one position. Note the punch marks on the edge of the tube and fin of the stator. One end has one punch on the stator and each side of the slot, while the other end has two. Position the proper stator fin in the proper slot.

   > **Note:** On 3" MVTM meters, the radial location of the stators is not controlled. The amount of change in performance is insignificant and therefore the stators can be installed in any radial location.

5. Replace the other stator in the measuring tube taking care to line up the shaft in the stator before positioning the stator in its proper position. Add one set of self aligning washers and nut.
6. Tighten the nuts equally on both ends. Place a cotter pin in one end to hold the shaft and nut while the other end is torqued to the proper value. See Table 1: Torque Values on page 15.
7. Install the remaining cotter pin. This particular step in the assembly process requires some attention to detail and patience to ensure the proper torque is achieved. Note that lubrication should also be applied to overcome friction. If the

required torque is achieved (see Table 1: Torque Values on page 15) and the cotter pin is not able to be properly inserted through the castellated nut and hole in the shaft, additional work must be done to ensure the proper torque is applied to the shaft and the castellated nuts are properly secured using the cotter pins. The additional work requires the cotter pin to be removed from the castellated nut which did not have a torque applied. Once this cotter pin is removed, back off the castellated nut to where one to two (or more, if needed) slots pass by the hole in the shaft. Once this nut has been backed off, reinstall the cotter pin (a new cotter should be used) and proceed to torque the other castellated nut to the required torque value. This process may be repeated until the proper torque value is achieved while the safe and easy installation of the cotter pin is observed. See Table 1: Torque Values on page 15

8. Insert the four set screws in the exterior of the measuring element that align with the slots in the tube that accommodate the fins of the stators. Tighten the set screws 6 to 7 ft•lb (dry). Alternately, you can use Loctite 242 (threadlocker) and hand tighten, plus one quarter turn beyond. This is a requirement for all MVTM measuring elements, 3 through 16".
9. Check to see if the rotor is free to rotate in the measuring tube. See Figure 6: Ensuring the Rotor Can Rotate on page 8. Restriction of movement will greatly affect the performance of the meter.

> **Caution:** Use a pencil or similar non-metallic object to turn the rotor. The edges of the rotor are sharp and could cause personal injury if the proper caution is not taken.

2.5 Installation of the Measuring Element

The measuring element is now ready to be installed in the housing.

> **Note:** On the side of the measuring tube is a locator for the pin. This must be lined up with the slot in the housing on the inlet end. (This pin is omitted on the 3" MVTM models. Any radial location is permitted.)

Slide the measuring element into the housing, align the locator pin (if applicable), and ensure the tube is fully engaged against the back side of the housing. See Figure 12: Aligning the Locator Pin belowand Figure 13: Ensuring the Tube is Fully Engaged below.

Figure 12: Aligning the Locator Pin

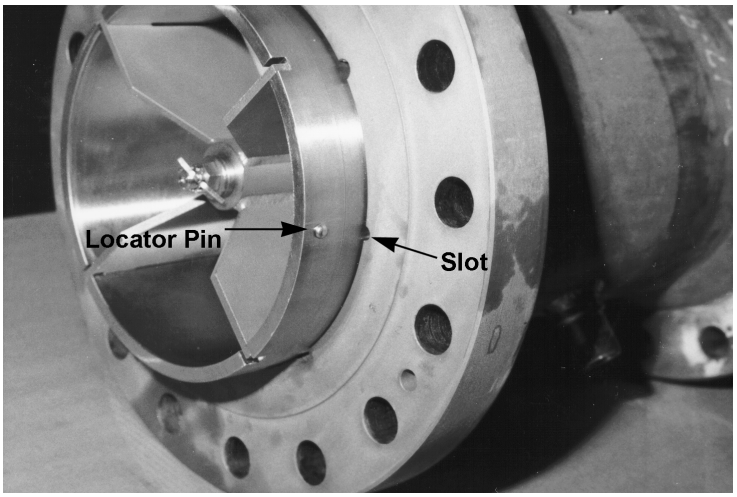
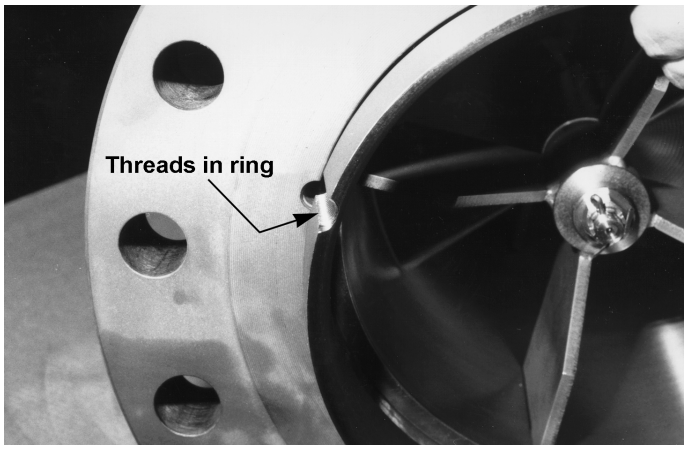


Figure 13: Ensuring the Tube is Fully Engaged

1. Replace the retaining ring in the housing, making sure the threaded half hole in the retaining ring is mated with the half hole with no threads in the housing and vice versa. Install screws in the holes marked “I” to tighten the ring against the measuring element. These holes have threads on the housing side only. See Figure 14: Replacing the Retaining Ring on the next page Tighten to the proper torque values. See Table 1: Torque Values on the next page

Figure 14: Replacing the Retaining Ring



2. Next, install the screws marked “R” on the ring to plug the holes. This provides the jack screws for removal of the retaining ring next time. These holes have threads on the retaining ring side only. Tighten to the proper torque values to ensure they don’t vibrate loose. See Table 1: Torque Values below
3. line as required and reconnect the electrical connections, as necessary. See Figure 15: PA-6 Preamplifier Wiring on the next page for PA-6 wiring.
4. Ensure all connections are secure and the covers are in place prior to turning the power on and operating the meter.

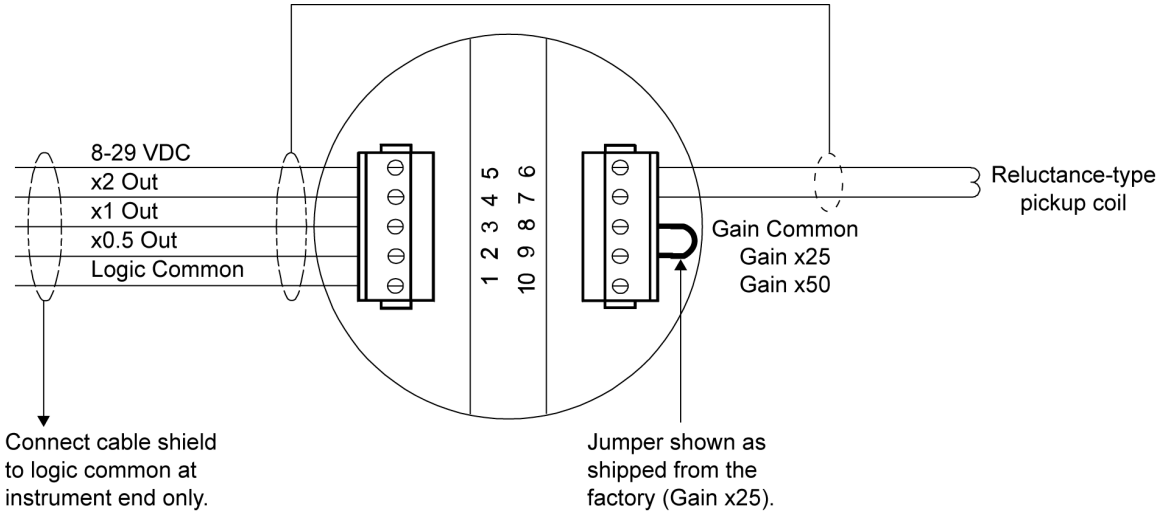
Table 1: Torque Values

Meter Size	Shaft Nut		Retaining Ring Set Screws		
	Size	Torque	Size	Torque "I"	Torque "R"
3"	10-32	23.5 pound-inch (lb-in)	10-32	23.5 lb-in	10 lb-in
4"	1/4-20	4.0 pound-foot (lb-ft)	10-32	23.5 lb-in	10 lb-in
6"	1/4-20	4.0 lb-ft	1/4-20	4 lb-in	2 lb-in
8"	1/2-13	34 lb-ft	7/16-14	22 lb-ft	11 lb-ft
10"	1/2-13	34 lb-ft	7/16-14	22 lb-ft	11 lb-ft
12"	1/2-13	34 lb-ft	1/2-13	34 lb-ft	17 lb-ft
16"	5/8-18	75 lb-ft	1/2-13	34 lb-ft	17 lb-ft

2.6 Wiring Connections

2.6.1 Single Channel Transmission

Figure 15: PA-6 Preamplifier Wiring



Note: In wiring the reluctance-type pickup coil, the white wire must be connected to Terminal 6 and the black wire to Terminal 7. This is critical when used for dual-pulse input to an electronic instrument.

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