

*Model: ACC7B*  
*PREAMPLIFIER / SIGNAL CONDITIONER*

*USER'S MANUAL*



HP-244  
August 2004

**H** **HOFFER FLOW CONTROLS, INC.**  
PERFECTING MEASUREMENT

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HOFFER FLOW CONTROLS' policy is to provide a user manual for each item supplied. Therefore, all applicable user manuals should be examined before attempting to install or otherwise connect a number of related subsystems.

During installation, care must be taken to select the correct interconnecting wiring drawing. The choice of an incorrect connection drawing may result in damage to the system and/or one of the components.

Please review the complete model of each item to be connected and locate the appropriate manual(s) and/or drawing(s). Identify all model numbers exactly before making any connections. A number of options and accessories may be added to the main instrument, which are not shown on the basic user wiring. Consult the appropriate option or accessory user manual before connecting it to the system. In many cases, a system wiring drawing is available and may be requested from HOFFER FLOW CONTROLS.

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HOFFER FLOW CONTROLS' policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering. The information contained in this document is subject to change without notice.

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## RETURN REQUESTS/INQUIRIES

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Direct all warranty and repair requests/inquiries to the Hoffer Flow Controls Customer Service Department, telephone number (252) 331-1997 or 1-800-628-4584. BEFORE RETURNING ANY PRODUCT(S) TO HOFFER FLOW CONTROLS, PURCHASER MUST OBTAIN A RETURNED MATERIAL AUTHORIZATION (RMS) NUMBER FROM HOFFER FLOW CONTROLS' CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned RMA number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

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1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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## LIMITED WARRANTY

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HOFFER FLOW CONTROLS, INC. ("HFC") warrants HFC's products ("goods") described in the specifications incorporated in this manual to be free from defects in material and workmanship under normal use and service, but only if such goods have been properly selected for the service intended, properly installed and properly operated and maintained. This warranty shall extend for a period of (1) year from the date of delivery to the original purchaser (or eighteen (18) months if the delivery to the original purchaser occurred outside the continental United States). This warranty is extended only to the original purchaser ("Purchaser"). *Purchaser's sole and exclusive remedy is the repair and/or replacement of nonconforming goods as provided in the following paragraphs.*

In the event Purchaser believes the goods are defective, the goods must be returned to HFC, transportation prepaid by Purchaser, within twelve (12) months after delivery of goods (or eighteen (18) months for goods delivered outside the continental United States) for inspection by HFC. If HFC's inspection determines that the workmanship or materials are defective, the goods will be either repaired or replaced, at HFC's sole determination, free of additional charge, and the goods will be returned, transportation paid by HFC, using the lowest cost transportation available.

Prior to returning the goods to HFC, Purchaser must obtain a Returned Material Authorization (RMA) Number from HFC's Customer Service Department within 30 days after discovery of a purported breach of warranty, but no later than the warranty period; otherwise, such claims shall be deemed waived. See the Return Requests/Inquiries Section of this manual.

If HFC's inspection reveals the goods are free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, HFC will notify the purchaser in writing and will deliver the goods back to purchaser upon (i) receipt of Purchaser's written instructions and (ii) the cost of transportation. If Purchaser does not respond within 30 days after notice from HFC, the goods will be disposed of in HFC's discretion.

HFC does not warrant these goods to meet the requirements of any safety code of any state, municipality, or any other jurisdiction, and purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

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### **Disclaimer:**

Specifications are subject to change without notice.  
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## **PREFACE**

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This manual provides all the necessary information to correctly install, operate, maintain and troubleshoot the Model ACC-7B preamplifier interface.

The ACC-7B is intended to provide the user with a suitable pulse interface between a frequency generating device and a data acquisition system.

This manual is organized to provide ease of use. Individual sections are provided to cover the Introduction, Installation, Functional Description, Calibration, and Maintenance and Troubleshooting. Illustrations have been used to improve the clarity of information provided in this manual.

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# **1 INTRODUCTION**

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## **1.1 INTRODUCTION**

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The Model ACC7B is a preamplifier with wave shaping that allows convenient interfacing between the turbine flowmeter and digital electronics.

The output signal has a square pulse wave form. Outputs are provided to suit most users requirements. Summation of the pulsing signal relates directly to the total flow throughput. The frequency of the signal relates directly to the flow rate or the velocity.

The input signal conditioning circuitry is designed to accept the low level turbine flowmeter signal while providing rejection of unwanted noise and spurious signals.

Two output signals are available. The first is a TTC/CMOS compatible output. The second is an open collector of a medium power transistor.

The unit is powered by a user supplied, filtered DC voltage. An on board regulator provides the required regulation and noise rejection.

## **1.2 PERFORMANCE CHARACTERISTICS**

### **INPUT**

- Input protected, RF and band pass filtered, adjustable trigger level.
- Input Impedance 40 kilo ohm (nominal).
- Trigger Sensitivity 10 millivolt RMS (minimum) 10 to 1000 Hz.
- Input over voltage protected to 120 volts RMS absolute max.

### **PULSE OUTPUT**

- Open Collector: Maximum off state voltage 60 volts. Maximum current 1.0 Amps.
- TTL/CMOS:  
Logic 0 = 0.0 volts.  
Logic 1 = 5.0 volts.  
Output capable of driving 6 standard TTL loads.

### **INPUT POWER**

- 8 to 35 VDC unregulated or 5 VDC +/- 5% regulated.  
**Note: 12 to 35 VDC is required when unit is equipped with pulse opt. #5.**
- Required current: 15 mA max.

### **ENVIRONMENTAL**

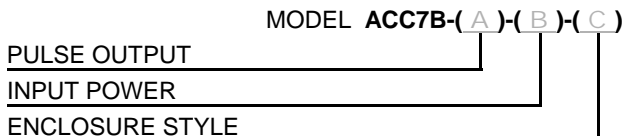
- Operating 0-70 °C
- Storage -20-70 °C

### **ENCLOSURES**

- General purpose case (standard), NEMA- 4, Explosion Proof

## 1.3 ORDERING INFORMATION

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### PULSE OUTPUT

MODEL ACC7B-(A)-( )-( )

#### OPTION (A)

- (1) TTL/CMOS
- (2) OPEN COLLECTOR
- (3) OPEN COLLECTOR WITH PULL UP TO V+
- (5) 0-10 V SQUARE WAVE (REQUIRED 12-35 VDC POWER)

### INPUT POWER

MODEL ACC7B-( )-(B)-( )

#### OPTION (B)

- (1) UNREGULATED 8-35 VDC
- (2) REGULATED 5 VDC

### ENCLOSURE STYLE

MODEL ACC7B-( )-( )-(C)

#### OPTION (C)

- (1) STYLE 1 CASE, GENERAL PURPOSE
- (3H/O) MEETS CLASS 1, DIV. 1 AND 2, GROUP D ONLY  
CLASS II, GROUPS E, F, G  
CLASS III  
NEMA 4X WITH 'O' RING  
CERTIFIED CSA, UL  
BODY KILARK #GECCT-3, STOCK #200-0945  
FLAT COVER, STOCK #200-0533, KILARK #GECBC.
- (3BH/O) MEETS CLASS I, DIV. 1 AND 2, GROUPS A, B, C, D  
CLASS 1, ZONES 1 AND 2, GROUPS IIB + H2, IIA  
CLASS II, DIV. 1 AND 2, GROUPS E, F, G  
CLASS III  
NEMA 3, 4, 7 (B, C, D), 9 (E, F, G)  
CERTIFIED CENELEC, CSA, UL, FM  
BODY KILARK #HKB, STOCK #200-0406  
DOME COVER, STOCK #200-0405, KILARK #HK2D.

**NOTE:** INSERT (X) IN MODEL NUMBER FOR EVERY OPTION NOT SPECIFIED.

## **1.4 WARRANTY**

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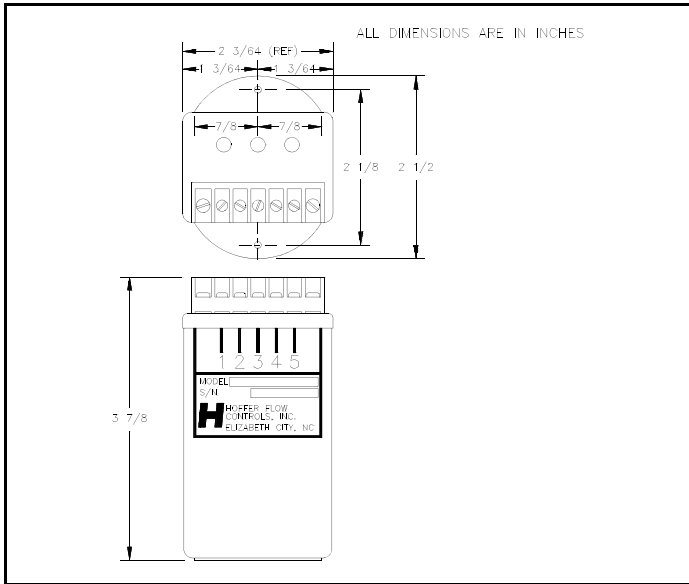
Hoffer Flow Controls warrants that all equipment will be free from defects in workmanship and material provided that such equipment was properly selected for the service intended, properly installed, and not misused. Equipment which is returned transportation prepaid to Hoffer Flow Controls within 12 months after delivery of goods, or 18 months from date of shipment on equipment for destination outside the United States, and is found by Hoffer Flow Controls inspection to be defective in workmanship or material, will be repaired or replaced at Hoffer Flow Controls sole option, free of charge and returned shipped using the lowest cost transportation prepaid.

In the event of product failure contact Hoffer Flow Controls at 252-331-1997 or 800-628-4584, for issuance of a **Returned Material Authorization (RMA)** number.

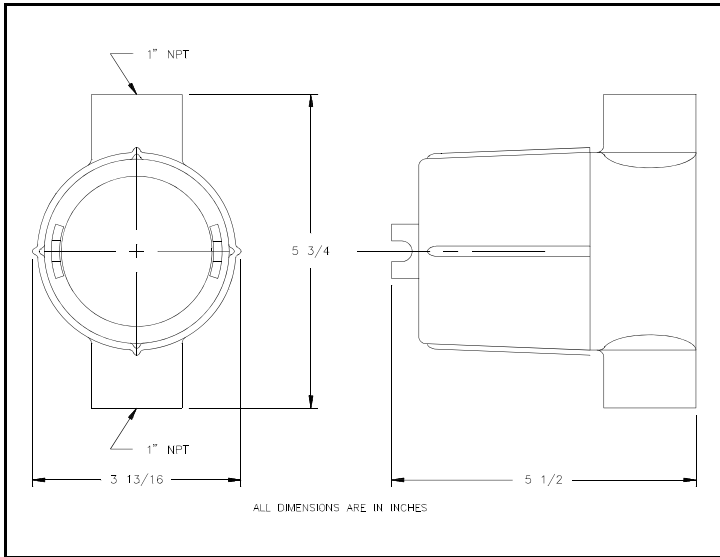
## 1.5 ENCLOSURE DETAIL

The ACC7B may be packaged in either the General Purpose case (Style 1), in an Explosion Proof case (Style 3), or in the NEMA 4 case (Style 5). Dimensions are given in Figures 1.2, 1.3, 1.4, and 1.5.

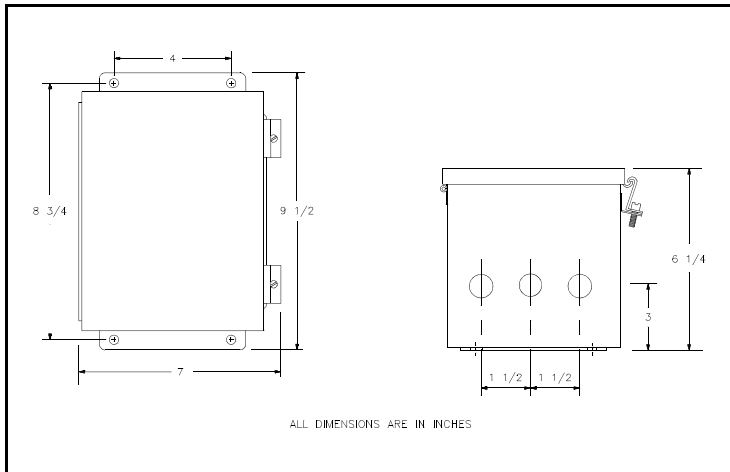
**Figure 1.2 General Purpose Case (Style1)**



**Figure 1.3 Explosion Proof Case (Style 3)**



**Figure 1.4 NEMA 4 Case (Style 5)**



## **1.6 SHIPPING AND HANDLING**

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**CAUTION - The ACC7B is a static-sensitive device and standard practice for static sensitive parts should be observed.**

In the event of malfunctioning equipment the following guidelines should be observed for the preparation and shipment of the equipment. Failure to do so may result in the material reaching its destination damaged.

The electronic unit due to its **STATIC SENSITIVE** nature should be wrapped in a material conforming to MIL-B-81705 , Type II, and packaged in a heat sealable bag conforming to MIL-P-81997. These steps are necessary to protect the equipment from electrostatic charge(s) that may occur during handling.

The package should then be marked with a sensitive electronic device caution label conforming to MIL-STD-129, appendix C. The equipment should then be wrapped in cushioning material, and placed into a close fitting box conforming to PPP-B-636 Domestic class.

The exterior shipping container should be marked with a sensitive electronic device caution label conforming to MIL-STD-129, Appen.C.

Clearly mark the factory provided **RMA** number on all paperwork and shipping boxes.

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## **2      INSTALLATION**

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### **2.1    INSTALLATION    WIRING    LAYOUT    FOR INTERCONNECTIONS**

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In considering the interconnections between the flowmeter and the flow measurement system some attention must be given to anticipated noise sources and to the coupling of these noise sources to the interconnecting wiring.

Noise signals may be coupled inductively or capacitively into the wiring between the flowmeter and the electronic measuring systems. In general, utilizing a shielded, twisted pair for the interconnection greatly reduces this coupling. The shield should be grounded on one end of the cable only. In general, grounding only on the electronic measuring system is best.

However, even with proper interconnecting cabling cross talk with other signal lines or power lines may still occur and should be avoided. Physical isolation of the wiring reduces the chance of potential problems.

### **2.2    INSTALLATION OF THE ACC7B**

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The model ACC7B should be placed in a convenient location which maintains access to the unit should repairs or readjustment be required.

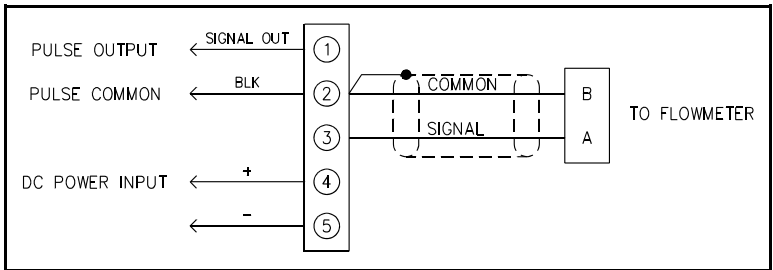
Refer to wiring installation Figure 2.1 for appropriate terminal interconnections. Connection to the terminal block should be carefully dressed to avoid having bare wires extending past the screw clamp on the terminal block. This is particularly important for units mounted within the explosion proof enclosure. Wires should be neatly dressed near the bottom of the enclosure to prevent problems when cover is installed.

Connect two conductor shielded signal cable from the flowmeter to terminals 3 and 2. Connect the shield to terminal 2. Ground the shield at one end only.

The ACC7B is factory wired to operate either from a regulated 5V DC or an unregulated but filtered voltage of 8 to 35V DC. Verify correct power is available for the power option selected. Connect the plus voltage to terminal 4 and connect the power return to terminal 5.

The output signal from the ACC7B is available in several forms, see model number designation for output type specified. For the pulse output connect wire to terminal 1, and connect pulse common to terminal 2.

**Figure 2.1 Installation wiring**



## **3 FUNCTIONAL DESCRIPTION**

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### **3.1 INTRODUCTION**

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The ACC7B is a preamplifier which will provide a frequency pulse output proportional to rate of flow. The unit is intended to provide the user with a suitable interface between a flow measurement sensor and a data acquisition system.

### **3.2 PRINCIPLE OF OPERATION**

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A block diagram showing functional blocks of the unit is depicted in Figure 3.1. The principle of operation is as follows.

The electronics unit receives the signal from the flowmeter pickup coil and converts it to a pulse output proportional to flow rate.

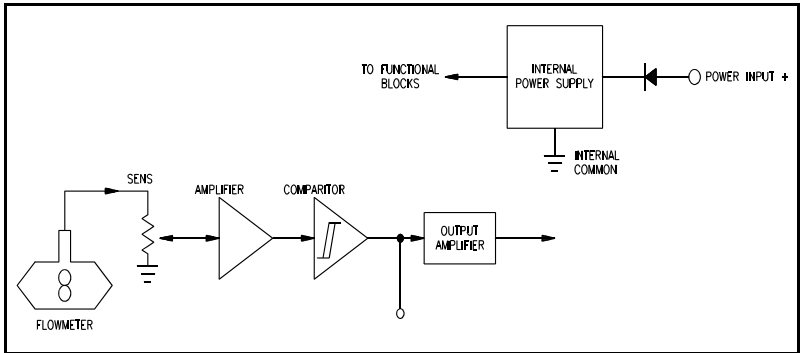
The electronics unit requires input power of 8 to 35 VDC (standard) and 12 to 35 VDC when equipped with a 0 to 10 volt pulse output.

The frequency signal which is generated from the flowmeter is connected to the ACC7B with a twisted shielded pair cable. The signal enters the SENSITIVITY control which is used to reject unwanted noise by raising the trigger threshold above the background noise present.

The low level flowmeter signal is then passed through a signal conditioning chain where it is filtered, amplified and shaped into a train of digital pulses whose frequency is related to the volume flow rate and where each pulse represents a discrete volume of fluid.

The pulse train is then fed into the output stage which will generate the required pulse output level desired.

**Figure 3.1 Block Diagram**



## 4 CALIBRATION PROCEDURE

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### 4.1 INTRODUCTION

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In general, all flow measurement systems supplied by Hoffer Flow Controls have been factory tested and configured as specified by the user, at the time of purchase, free of charge.

The ACC7B requires no field calibration.

### 4.2 REQUIRED TEST EQUIPMENT

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In order to adjust the sensitivity and troubleshoot the ACC7B the following suggested equipment list is provided:

| MANUFACTURE | PART NUMBER | DESCRIPTION         |
|-------------|-------------|---------------------|
| Fluke       | 8060A       | True RMS Multimeter |
| Spectrol    | 8-T000      | Adjustment Tool     |

### 4.3 CONTROLS AND ADJUSTMENTS

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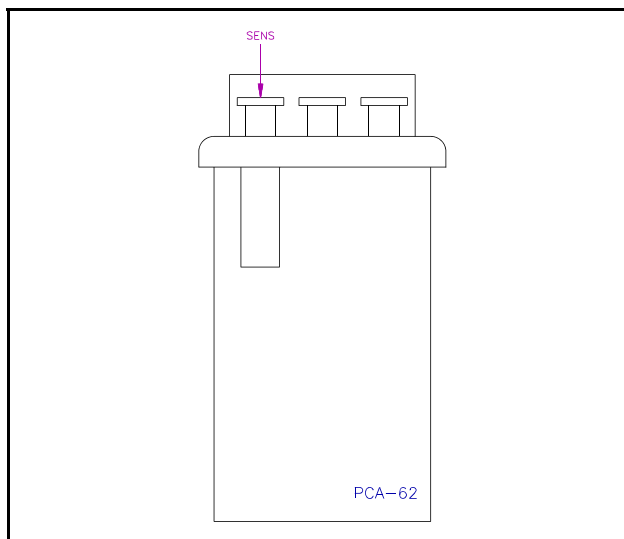
**SENSITIVITY:** A twenty turn control used to set the threshold sensitivity level above the ambient noise pickup.

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**NOTE:** IT IS NECESSARY TO OPEN THE COVER OF THE ENCLOSURE BY REMOVING TWO SCREWS ON SIDE OF BOX AND LIFTING COVER. TWO PRINTED CIRCUIT CARDS ARE ATTACHED. THE "RANGE" DIP SWITCH MAY BE PROGRAMMED WITH A PEN. INPUT POWER SHOULD BE REMOVED DURING THIS STEP.

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**Figure 4.1 Control and Adjustment Detail**



## 5 MAINTENANCE

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### 5.1 INTRODUCTION

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Hoffer Flow Controls flow measurement systems are constructed to give a long service life in the targeted measuring field and service environment. However, problems do occur from time to time and the following points should be considered for preventive maintenance and repairs.

The bearing type used in the flowmeter was chosen to give compromise between long life, chemical resistance, ease of maintenance and performance. A preventive maintenance schedule should be established to determine the amount of wear which has occurred since last overhaul. See users manual for flowmeter for further instructions.

A spare parts list has been provided which, at the discretion of the user, may be user stocked. Consult with the manufacturer if an abridged spare parts list is sought. The recommended spare parts list may be found following this section and in the users manual for the flowmeter.

In case the flow measurement system malfunctions or becomes inoperative, a trouble shooting procedure follows.

Factory consultation is available to assist in diagnosing problems. In addition, factory repair parts and service are available for individuals who wish to utilize this service.

### 5.2 TROUBLE SHOOTING AND MAINTENANCE

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- **ALL PRINTED CIRCUIT CARDS ARE WARRANTED FOR ONE YEAR AFTER DATE OF SALE.**
- **ALL PRINTED CIRCUIT CARDS MAY BE FACTORY REPAIRED AT A NOMINAL FEE FOR PARTS AND LABOR AFTER WARRANTY PERIOD.**

In case of an inoperable or malfunctioning system the following procedures can be used to isolate the faulty wiring, printed circuit boards and/or alternate causes. The majority of repairs can be made in the field thereby reducing the time a unit is out of service.

The necessary documentation is contained within this manual with the exception of the calibration data sheet for the turbine flowmeter. This calibration is supplied separately.

Factory consultation is available to assist in diagnosing problems. Please note that in some cases factory repairs can be performed more easily than can be accomplished in the field.

Failure conditions are listed and the possible corrective actions given to eliminate the observed problem.

| <b>OBSERVED CONDITION</b>  | <b>POSSIBLE CAUSE</b>  | <b>CORRECTIVE ACTION</b>  |
|--|--|---|
| <ul style="list-style-type: none"> <li>● UNIT DOES NOT PRODUCE A PULSE OUTPUT WITH FLOW PRESENT</li> </ul> | <ul style="list-style-type: none"> <li>● POWER LOSS</li> <li>● BAD PICKUP COIL OR CABLE.</li> <li>● STALLED TURBINE FLOWMETER.</li> <li>● BAD ACC7B</li> <li>● SENSITIVITY ADJUSTED FULLY COUNTER CLOCKWISE</li> </ul> | <ul style="list-style-type: none"> <li>● CHECK INTERCONNECTING WIRING AND HOST SYSTEM.</li> <li>● CHECK PICKUP COIL AND CABLE FOR CONTINUITY AND LEAKAGE. REPLACE AS REQUIRED.</li> <li>● REMOVE FLOWMETER AND REPAIR AS REQUIRED BY MANUFACTURERS RECOMMENDATIONS.</li> <li>● REPAIR OR REPLACE</li> <li>● ADJUST SENSITIVITY</li> </ul> |
| <ul style="list-style-type: none"> <li>● PULSE OUTPUT</li> <li>● WITH NO FLOW PRESENT</li> </ul>           | <ul style="list-style-type: none"> <li>● INPUT NOISE</li> <li>● BAD PICKUP COIL OR CABLE</li> <li>● EXTREME SHOCK OR VIBRATION OF PIPING</li> <li>● POWER SUPPLY MALFUNCTION</li> <li>● BAD ACC7B</li> </ul>           | <ul style="list-style-type: none"> <li>● TURN SENSITIVITY CCW UNTIL FALSE OUTPUT STOPS</li> <li>● CHECK PICKUP COIL AND CABLE FOR CONTINUITY AND LEAKAGE. REPLACE AS REQUIRED.</li> <li>● DAMPEN OR RELOCATE PIPING</li> <li>● CHECK AND REPAIR AS REQUIRED</li> <li>● REPAIR OR REPLACE</li> </ul>                                       |



### 5.3 REPLACEMENT PARTS

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| <b>PART NUMBER</b> | <b>DESCRIPTION</b>               |
|--------------------|----------------------------------|
| ACC7B-(1)-(1)-(3)  | TTL/CMOS PULSE OUTPUT            |
| ACC7B-(2)-(1)-(3)  | OPEN COLLECTOR PULSE OUTPUT      |
| ACC7B-(3)-(1)-(3)  | OPEN COLLECTOR WITH PULLUP TO V+ |
| ACC7B-(5)-(1)-(3)  | 0 TO 10 VDC PULSE OUTPUT         |