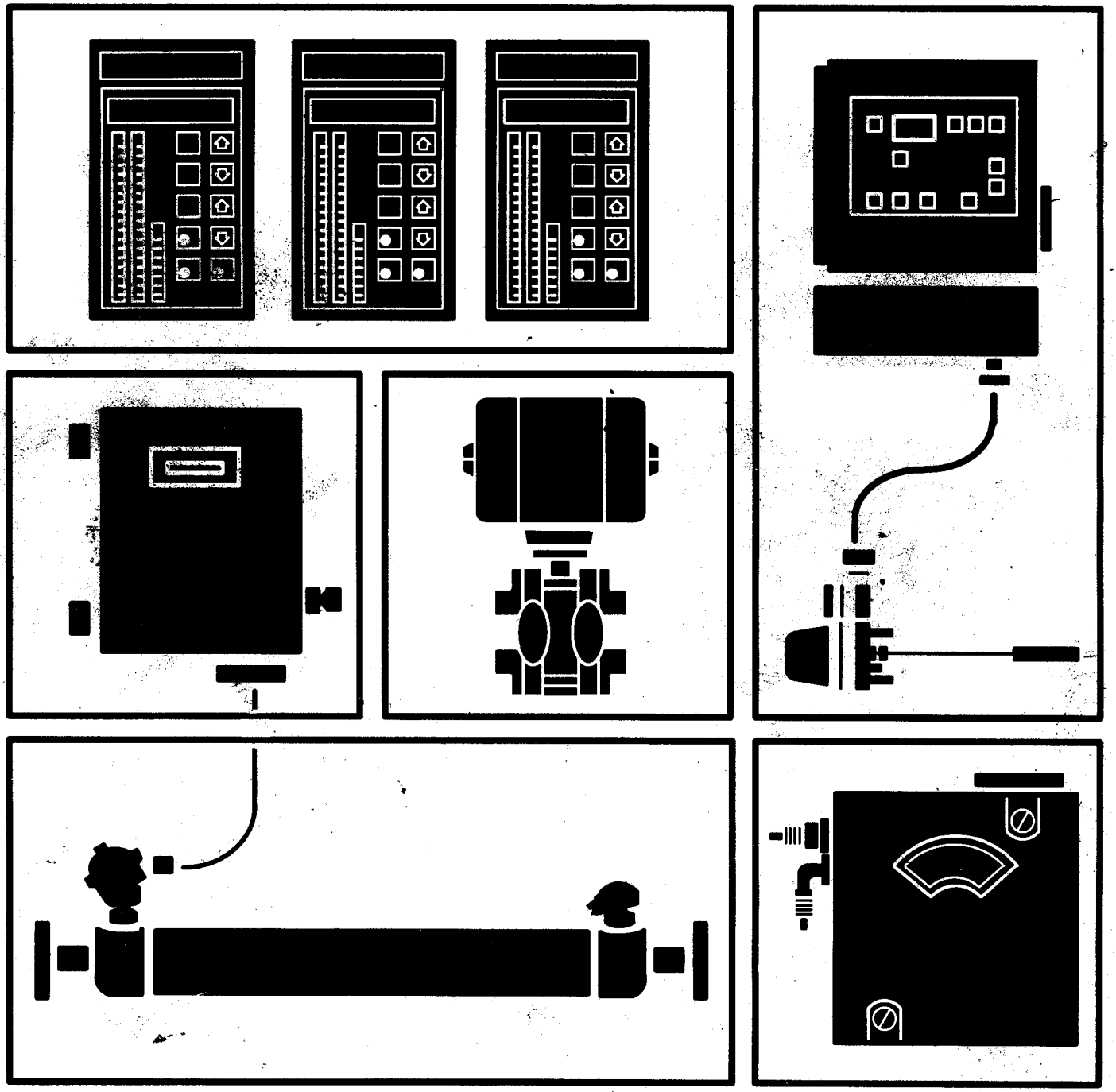
Bailey

PRODUCT INSTRUCTION

E22-38

INFIMAG 90™ Flowmeter

Type M□



Bailey® Seamless, Real-Time Process Management Solutions

Preface

This publication is for the use of technical personnel responsible for the installation, operation and maintenance of the Bailey INFIMAG 90™ flowmeter.

TM INFIMAG 90 is a trademark of the Bailey Controls Company.

List of Effective Pages

Total number of pages in this manual is 83, consisting of the following:

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Safety Summary

SPECIFIC WARNING	Do not, at any time, exceed the ratings listed on the nameplate. (p. 3-2)

SPECIFIC CAUTION	Before performing the procedure, be sure power to the flowmeter is OFF. Failure to do so could damage the electronics. (p. 3-7) Precautions must be taken during handling and assembly. The flange faces shall not come into direct contact with the ground, nor be damaged. Damaged flanges may result in a faulty installation. (p. 3-14) System repair must be performed only by qualified personnel and only after securing equipment controlled by the circuit. Altering or removing components from an active circuit may upset the process being controlled. (p. 7-1)

Sommaire de Securite

AVERTISSEMENT D'ORDRE SPECIFIQUE	On ne doit en aucune circonstance depasser les valeurs nominales figurant sur la plaque d'identification. (p. 3-2)

ATTENTION D'ORDRE SPECIFIQUE	Avant d'effectuer la procédure, assurez-vous que l'indicateur de débit n'est pas alimenté. Sinon, les composants électroniques pourraient subir des dommages. (p. 3-7) Manipulez et assemblez l'appareil avec précaution. Les faces des brides ne doivent pas entrer directement en contact avec la terre et ne doivent pas être endommagées. Des brides endommagées pourraient donner lieu à une installation défecteuse. (p. 3-14) La réparation du système ne doit êre effectuée que par le personnel qualifié et seulement une fois que l'équipement contôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé. (p. 7-1)

SECTION 1 – INTRODUCTION

OVERVIEW

The Bailey INFIMAG 90 flowmeter line provides accurate flow rate measurement of conductive liquids and slurries. Flow measurement is independent of pressure, temperature and viscosity.

INTENDED USER

The information in this publication is a guide for technical personnel responsible for the installation and operation of the Bailey INFIMAG 90 flowmeter.

EQUIPMENT DESCRIPTION

The Bailey INFIMAG 90 flowmeter consists of a nonintrusive, in-line measuring tube and either integral or remote electronics (see Figure 1-1).

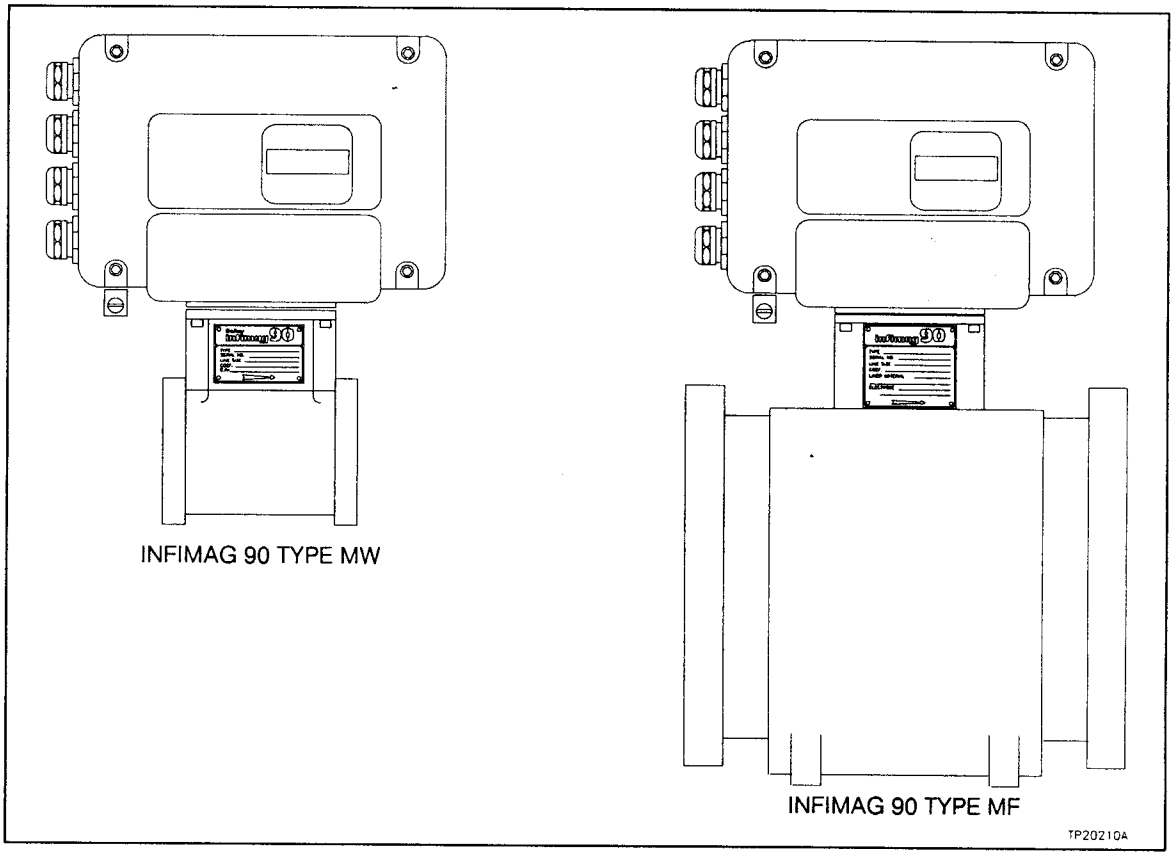


Figure 1-1. INFIMAG 90 Flowmeter

FEATURES

Patented Dual Modulation

The INFIMAG 90 flowmeter offers a one-of-a-kind dual modulation mode. This mode provides optimum response time, noise filtering and accuracy.

Choice of Fast, Slow and Dual Modulation

Optimizes the response time, accuracy and noise filtering characteristics of the flow being measured. The modulation mode can be configured while the flowmeter is on-line.

Wide Selection of Measuring Tube Material

The type MW flowmeter has a ceramic measuring tube that provides very high resistance to abrasion, corrosion and high temperatures. Rilsan® (nylon), polyurethane and Teflon® liner materials are available options on the Type MF flowmeters, providing a broad selection of materials to accommodate most applications.

Automatic Zero Adjustment

The INFIMAG 90 flowmeter uses the time-proven technology of a pulsed or modulated DC coil power supply, eliminating the need for zero adjustments.

Programmable Operating Parameters

Configuration parameters can be modified using two built-in pushbuttons located within the electronics. No separate accessories or tools are required.

Self-Diagnostics

Incompatibility of the configuration parameters with the operation of the flowmeter is automatically detected and indicated by an error message on the built-in four digit LCD in the electronics.

Wide Selection of Electrodes

Platinum, 316L stainless steel or Hastelloy C® electrodes are available to cover most application needs.

Low Power Consumption

Power consumption of the entire unit is 11 to 13 VA regardless of flowmeter size.

Integral or Remote Electronics

Select integral electronics for those applications that require the electronics be installed at the measurement site, or remote electronics when operating in high temperature environments or intrinsic safety applications (certifications pending).

Minimum Downtime

The INFIMAG 90 flowmeter requires limited maintenance when operated under normal conditions. The electronics can be replaced without recalibration.

Nonintrusive Measurement

The flowmeter design is such that no objects protrude into the flow stream.

® Rilsan is a registered trademark of ATO CHIME.
® Teflon is a registered trademark of E.I. Du Pont de Nemours and Co.
® Hastelloy C is a registered trademark of Union Carbide Company.

EQUIPMENT APPLICATION

The INFIMAG 90 flowmeter is especially suited to applications such as continuous process or batch control, volume counting and totalization. Some of the most notable applications include distribution and processing of water, chemical and petrochemical processes, sugar refineries, food industries, steel plants, pharmaceutical industries and mining.

INSTRUCTION CONTENT

Introduction This section provides a description of this instruction manual; its sections and their uses, with a brief description of the Bailey INFIMAG 90 flowmeter. Also included are instructions on how to use this document, product identification (nomenclature) and performance specifications.

Description and Operation This section describes the operation of the INFIMAG 90 flowmeter.

Installation The installation section details the tasks related to the installation of the flowmeter. The procedures provide guidelines for unpacking, location considerations, physical installation and wiring. The goal is to provide simple procedures for placing the flowmeter into service.

Operating Procedures The operating procedures section addresses configuration of the Bailey INFIMAG 90 flowmeter and the procedures that make the unit operational. This section describes the procedures for monitoring and changing the operating parameters of the INFIMAG 90 flowmeter.

Troubleshooting This section contains procedures for isolating problems that can occur with the INFIMAG 90 flowmeter. There are troubleshooting flowcharts that help with this process and provide corrective action. Error codes that appear on the display are also described in this section.

Maintenance This section includes maintenance information as it pertains to the Bailey INFIMAG 90 flowmeter.

Replacement Procedures This section details the procedures involved in replacing components of the Bailey INFIMAG 90 flowmeter.

Support Services The support services section includes ordering information for replacement parts and spare parts lists. This section also has information on training.

HOW TO USE THIS MANUAL

It is important for safety and operating reasons that you read and understand this manual. Until doing so, do not install or complete any tasks or procedures related to operation.

The sections of this instruction book are sequentially arranged as they relate to initial start-up; from unpacking to replacement procedures. After initial start-up, refer to the instruction as needed by section.

GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Definition
ANALOG	Continuously variable as opposed to discretely variable.
CABLE GLAND	A device that prevents leakage of fluid through the openings that the cables pass through.
CONFIGURATION	The act of setting up equipment to accomplish specific functions or a list of parameters associated with such a setup.
DIGITAL	A discretely variable signal usually having only two states, *on* or *off*.
EPROM	Electronically programmable read only memory. Contents remain when power is removed.
ESD	Electrostatic sensitive devices. Electronic components subject to damage or failure when exposed to static electricity that require special handling.
LCD	Liquid crystal display.
NVRAM	Nonvolatile random access memory. Retains stored information when power is removed.
OPTOCOUPLER	A device that isolates a signal source from its load.
PCB	Printed circuit board. A circuit for electronic apparatus made by depositing conductive material in continuous paths from terminal to terminal on an insulating surface.
PTFE	This is an acronym for polytetraflouroethylene, the chemical name for Teflon.
TOTALIZER	A device that records a total and expresses it as a whole. In the case of the INFIMAG 90 flowmeter, the expressed quantity is the volume of the fluid passing through the measuring tube.

REFERENCE DOCUMENTS

Number	Title
C-E22-38	INFIMAG 90 Product Specification
IEC 529	International Electromechanical Commission Standard, Publication 529 - Ingress Protection System for Enclosures.

TYPE MW NOMENCLATURE

Position	3	4	5	6	7	8	9	10	11	12	13	
TYPE MW	□	□	□	□	□	□	□	□	□	□	□	**INFIMAG 90 Magnetic Flowmeter, Wafer**
	A											**Electronics** Conventional
		0	0	2								**Meter Size In mm (in.)** 4 (5⁄32)
		0	0	3								6 (1⁄4)
		0	0	4								10 (3⁄8)
		0	0	5								15 (1⁄2)
		0	1	0								25 (1)
		0	1	5								40 (1 1⁄2)
		0	2	0								50 (2)
		0	3	0								80 (3)
		0	4	0								100 (4)
		0	6	0								150 (6)
					1							**Calibration** 1.0%
					5							0.5%[1]
						1						**Electronics Mounting** Integral
						2						Remote
							0					**Grounding Ring** None
							A					Stainless Steel (316L)
							B					Hastelloy C
								1				**Gasket Material** Teflon (PTFE)
								2				Klingerit®
									1			**Configuration** Standard Configuration[2]
									2			Factory Configuration
										0		**Flammable Atmosphere Rating - Electronics** Approvals Pending
											0	**FLammable Atmosphere Rating - Measuring Tube** Approvals Pending

NOTES:

1. 0.5% calibration not available for Types MWA002, MWA003 and MWA004.
2. Standard configuration includes: No flow threshold, 4 to 20 mA output, No alarm, Dual Modulation, Unidirectional flow

® Klingerit is a registered trademark of H.S. White Co.

TYPE MF NOMENCLATURE

Position	3	4	5	6	7	8	9	10	11	12	13	14	
TYPE MF	□	□	□	□	□	□	□	□	□	□	□	□	**INFIMAG 90 Magnetic Flowmeter, Flanged**
	A												**Electronics** Conventional
		0	8	0									**Meter Size In mm (in.)** 200 (8)
		1	0	0									250 (10)
		1	2	0									300 (12)
					1								**Calibration** 1%
					5								0.5%
						1							**Electronics Mounting** Integral
						2							Remote
							0						**Grounding Rings** Omit
							A						Carbon Steel
							B						Stainless Steel (316L)
							C						Hastelloy C
								1					**Liner Material** Teflon
								2					Polyurethane
								3					Rilsan
									1				**Electrode Material** Stainless Steel (316L)
									2				Hastelloy C
									3				Platinum[1]
										1			**Configuration** Standard Configuration[2]
										2			Factory Configuration
											0		**FLammable Atmosphere Rating - Electronics** Approvals Pending
												0	**FLammable Atmosphere Rating - Measuring Tube** Approvals Pending

NOTES:

1. Platinum electrodes are only available with MF □□□□□□□1 (Teflon liner) flowmeters.
2. Standard configuration includes: No flow threshold, 4 to 20 mA output, No alarm, Dual Modulation, Unidirectional flow

SPECIFICATIONS

Nominal Diameter	4, 6, 10, 15, 25, 40, 50, 80, 100, 150, 200, 250 and 300 mm (5/32, 1/4, 3/8, 1/2, 1, 1 1/2, 2, 3, 4, 6, 8, 10 and 12 in.) See Figures 1-2 and 1-3.
Measurement Range	0.045 to 2680 m^3/h (0.2 to 11,800 GPM) flow range. Refer to Table 1-1 for Type MW flowmeters and Table 1-2 for Type MF flowmeters.
Minimum Conductivity	
4 through 25 mm (5/32 through 1 in.) line size:	>10 μSiemens/cm (10 μmhos/cm)[1]
40 through 300 mm (1 1/2 through 12 in.) line size:	>5 μSiemens/cm (5 μmhos/cm)
Maximum Cable Length For Remote Electronics	Maximum length of cable from flowmeter to remote electronics is a function of fluid conductivity. Refer to Table 1-3.
Accuracy	
Type MW:	Refer to Table 1-4.
Type MF:	Refer to Table 1-5.
Maximum Fluid Pressure	
Type MW:	4000 kPa (600 psi)
Type MF:	1000 kPa (150 psi)
Power Supply	93 to 121 VAC, 57 to 63 Hz
Power Consumption	10 to 13 VA
Output Signal	
Current:	4 to 20 mA or 0 to 20 mA Load Resistor 0 to 1 kohm
Pulse:	5 msec (with electronic totalizer, 100 Hz max.) or 40 msec (with electromechanical totalizer, 12.5 Hz max.)
Relay Rating	48 VDC, 1 A or 220 VAC, 500 mA on resistive load.
Time Constant at 63%	Adjustable from 0.5 to 100 secs.
Construction Materials	
Type MW:	Measuring tube material: Ceramic (Aluminum Oxide Al_2O_3) Electrodes: Platinum Tube Body: Painted cast iron Electronics Unit: Light alloy coated with polyurethane paint
Type MF:	Measuring Tube: 304L stainless steel with carbon steel flanges (stainless steel on request) Liners: Rilsan, Polyurethane or PTFE Teflon. Electrodes: 316L stainless steel, Hastelloy C or Platinum. Tube Body and Electronics: Light alloy coated with polyurethane paint
Temperature Limit of Fluid	
Type MW:	Integral Electronics: 80°C (176°F) with maximum ambient temperature of 45°C (113°F). Remote Electronics: 150°C (302°F).
Type MF:	Fluid temperature is a function of the liner material. Refer to Table 1-6.

SPECIFICATIONS (continued)

Electronics Ambient Temperature	-25 to 55°C (-13 to 131°F)
Storage Temperature	-40 to 80°C (-40 to 176°F)
Certification	FM (Factory Mutual) approval and CSA (Canadian Standards Association) certification pending for: Nonincendive: Class I, Division 2, Groups A, B, C and D. Intrinsically Safe: Class I, Division 1, Groups C and D (for remote electronics only).
Environmental	
Measuring tube and Associated Electronics:	IP65 - Protected against ingress of dust. Protected against harmful effects of water jets.
Measuring Tube with Remote Electronics:	IP68 - Protected against ingress of dust. Protected against harmful effects when submerged under 3 m (10 ft) of water. IP (Ingress Protection System for Enclosures) Reference IEC (International Electromechanical Commission) Standard, Publication 529.

NOTE: 1. For conductivities between 5 and 10 µSiemens/cm (5 and 10 µmhos/cm) multiply measurement accuracy by 2.

Specifications are subject to change without notice.

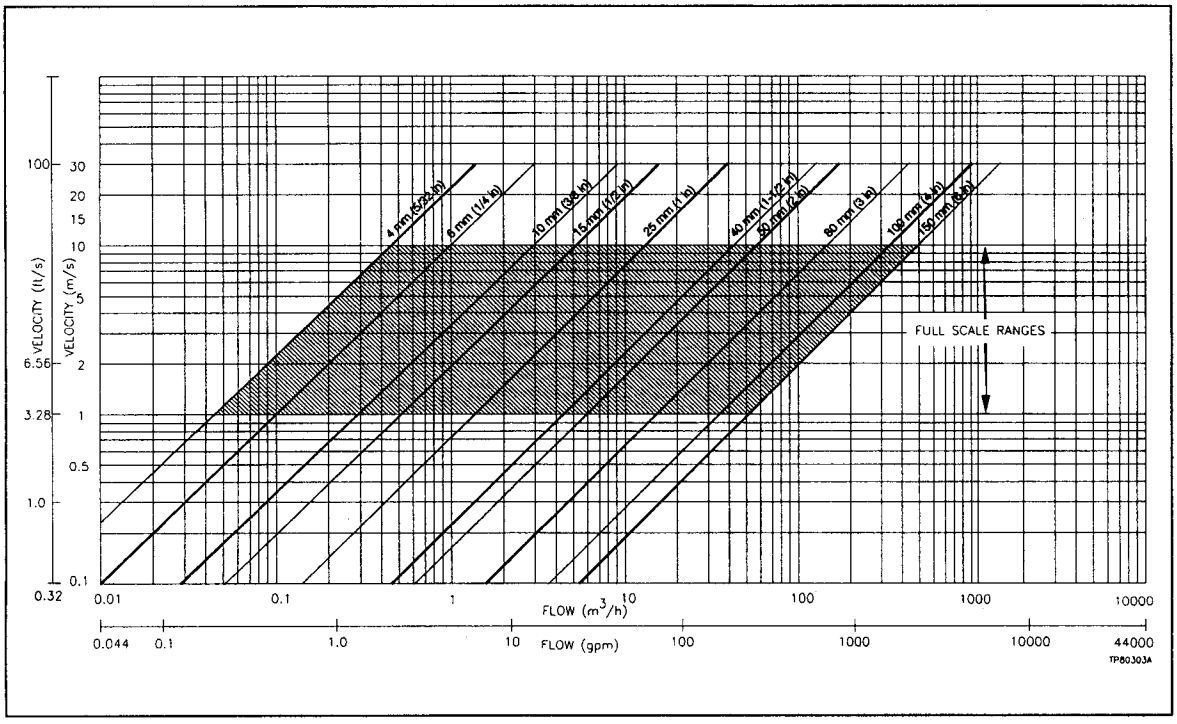


Figure 1-2. INFIMAG 90 Type MW Flowmeter Velocity/Flowchart

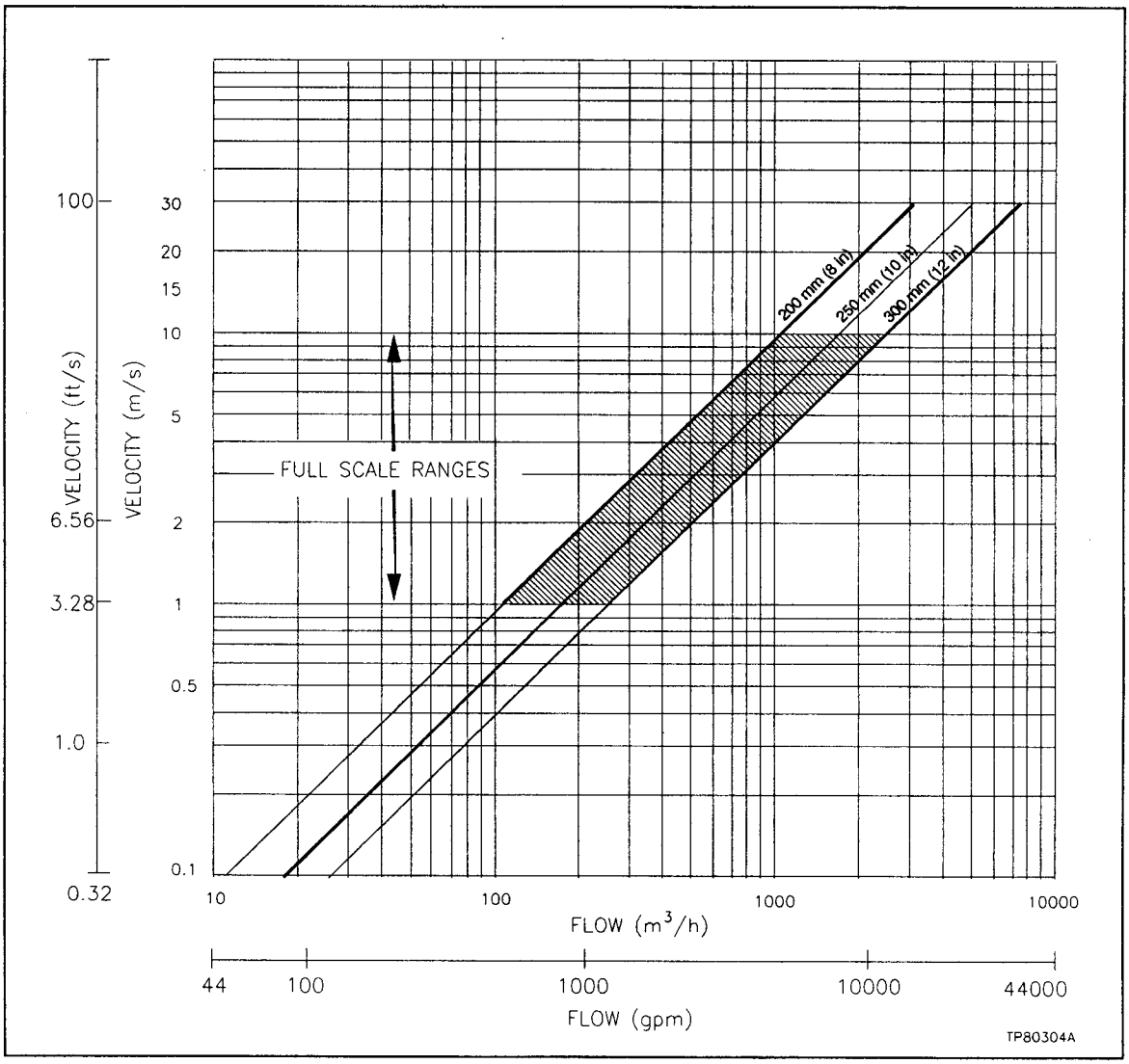


Figure 1-3. INFIMAG 90 Type MF Flowmeter Velocity/Flowchart

Table 1-1. Measurement Range for Type MW Flowmeters

Type	Nominal Diameter		Full Scale			
			@V=1 m/sec (3.3 ft/sec)		@V=10 m/sec (33 ft/sec)	
	mm	inches	m^3/h	GPM	m^3/h	GPM
MW ☐002	4	5/32	0.045	0.2	0.45	2.0
MW ☐003	6	1/4	0.1	0.4	1.0	4.5
MW ☐004	10	3/8	0.3	1.3	3.0	13.0
MW ☐005	15	1/2	0.5	2.2	5.0	22.0
MW ☐010	25	1	1.5	6.6	14.0	62.0
MW ☐015	40	1 1/2	4.5	20.0	45.0	198.0
MW ☐020	50	2	6.0	26.0	62.0	273.0
MW ☐030	80	3	16.5	73.0	163.0	718.0
MW ☐040	100	4	26.5	117.0	266.0	1171.0
MW ☐060	150	6	54.0	238.0	538.0	2369.0

Table 1-2. Measurement Range for Type MF Flowmeters

Type	Nominal Diameter		Full Scale			
			@V=1 m/sec (3.3 ft/sec)		@V=10 m/sec (33 ft/sec)	
	mm	inches	m^3/h	GPM	m^3/h	GPM
MF ☐080☐☐☐1	200	8	112.0	493.0	1128.0	4966.0
MF ☐080☐☐☐2			107.0	471.0	1075.0	4733.0
MF ☐080☐☐☐3			115.0	506.0	1161.0	5112.0
MF ☐100☐☐☐1	250	10	177.0	779.0	1781.0	7841.0
MF ☐100☐☐☐2			169.0	744.0	1697.0	7472.0
MF ☐100☐☐☐3			182.0	801.0	1832.0	8066.0
MF ☐120☐☐☐1	300	12	259.0	1140.0	2603.0	11460.0
MF ☐120☐☐☐2			252.0	1110.0	2528.0	11130.0
MF ☐120☐☐☐3			267.0	1176.0	2679.0	11795.0

Table 1-3. Maximum Cable Length for Remote Electronics

Maximum Distance Between Measuring Tube and Electronics m (ft)	Minimum Fluid Conductivity μSiemens/cm (μmhos/cm)
30 (100)	5 (5)
100 (330)	25 (25)
300 (1000)	100 (100)

Table 1-4. Accuracy Specifications for Type MW Flowmeters[1]

Type	2 m/sec (6 ft/sec) < Full Scale Fluid Velocity < 10 m/sec (33 ft/sec)				1 m/sec (3 ft/sec) < Full Scale Fluid Velocity < 2 m/sec (6 ft/sec)	
	% of Full Scale Flow		% of Full Scale Flow		% of Full Scale Flow	
	0 to 10	10 to 100	0 to 20	20 to 100	0 to 20	20 to 100
MW ☐ 0021[2] MW ☐ 0031[2] MW ☐ 0041[2]	N/A	N/A	≤0.2% of Full Scale	≤1.0% of Measurement	N/A	N/A
MW ☐ 0 ☐ 01 MW ☐ 0 ☐ 51	≤0.1% of Full Scale	≤1.0% of Measurement	N/A	N/A	≤0.2% of Full Scale	≤1.0% of Measurement
MW ☐ 0 ☐ 05 MW ☐ 0 ☐ 55	≤0.05% of Full Scale	≤0.5% of Measurement	N/A	N/A	≤0.1% of Full Scale	≤0.5% of Measurement

NOTES:
1. The optimum measuring conditions are given for turbulent flows.
2. MW ☐☐☐ ☐5 (0.5%) calibration accuracy not available for Types MWA002, MWA003 and MWA004.

Table 1-5. Accuracy Specifications for Type MF Flowmeters[1,2]

Type	2 m/sec (6 ft/sec) < Full Scale Fluid Velocity < 10 m/sec (33 ft/sec)		1 m/sec (3 ft/sec) < Full Scale Fluid Velocity < 2 m/sec (6 ft/sec)	
	% of Full Scale Flow		% of Full Scale Flow	
	0 to 10	10 to 100	0 to 20	20 to 100
MF ☐☐☐01	≤0.1% of Full Scale	≤1.0% of Measurement	≤0.2% of Full Scale	≤1.0% of Measurement
MF ☐☐☐05	≤0.05% of Full Scale	≤0.5% of Measurement	≤0.1% of Full Scale	≤0.5% of Measurement

NOTES:
1. The optimum measuring conditions are given for turbulent flows.
2. Type MF Flowmeters are calibrated using Dual Modulation.

Table 1-6. Type MF Flowmeter Fluid Temperatures[1]

Electronics	Maximum Fluid Temperature °C (°F)		
	Rilsan	Polyurethane	Teflon
Integral	65 (150)	70 (160)	80 (180)
Remote	65 (150)	70 (160)	120 (250)

NOTE:
1. Fluid temperature is a function of the liner material.

SECTION 2 – DESCRIPTION AND OPERATION

INTRODUCTION

This section describes the operation of the INFIMAG 90 flowmeter.

The INFIMAG 90 flowmeter line provides true flow rate measurement of conductive liquids and slurries. Flow measurement is independent of pressure, temperature and viscosity. The flowmeter has a nonintrusive, in-line measuring tube and either integral or remote electronics.

Uses for the INFIMAG 90 flowmeter include continuous process or batch control, volume counting and totalization. Well known uses include distribution and processing of water, chemical and petrochemical processes. Industries served include sugar refineries, food industries, steel plants, pharmaceutical industries and mining.

FUNCTIONAL OPERATION

Basic Operating Principle

Magnetic flow measurement is based on Faraday's Law of electromagnetic induction. The voltage induced in a conductive fluid that moves perpendicular to a magnetic field ($\vec{B}$) is directly proportional to the velocity of the fluid.

In the INFIMAG 90 flowmeter, a pair of coils (B1 and B2) located transversely to the measuring tube and conveying a pulsed DC current, produce an alternating magnetic field ($\vec{B}$). Constant control of the intensity of this current ensures a stable and reproducible magnetic field.

The two opposing electrodes (E1 and E2), a distance d apart, are located transversely with respect to the axis of the pipe and perpendicularly with respect to the axis of the coils. These electrodes pick up a voltage ($\vec{e}$) when a conductive fluid flows through the pipe with an average velocity ($\vec{V}$). Figure 2-1 shows this theory.

$e = kV$	where k is a constant for a given flowmeter.
$k = a \times B \times d$	where a is a geometrical factor depending on the shape and the geometry of the measuring tube.

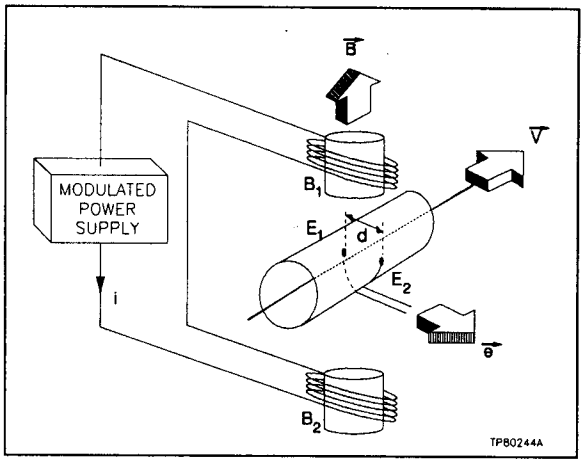


Figure 2-1. Operating Theory

AUTOMATIC ZERO

Flowmeters using a pulsed or modulated DC power supply for the coils do not require a zero adjustment. The zero is absolutely stable. This principle applies for all three types of modulation. See Figure 2-2 for an illustration of this principle.

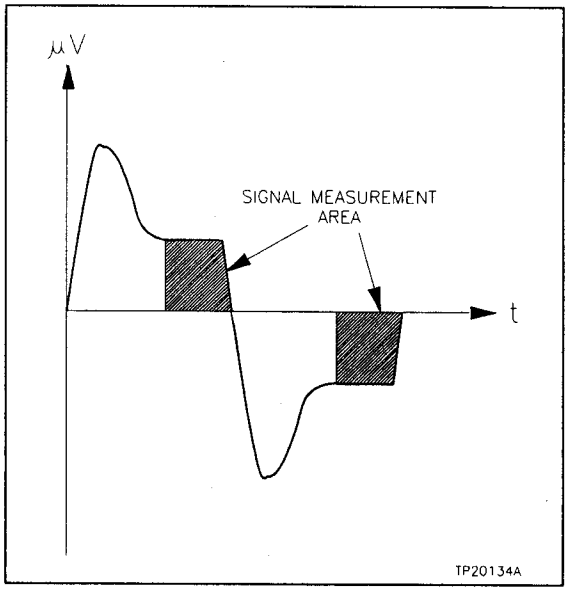


Figure 2-2. Signal Measurement Area

MODULATION

The INFIMAG 90 flowmeter offers the unique possibility of choosing between three types of modulation of the current that excites the coil generating the magnetic field. Choose fast, slow or dual modulation according to the type of fluid flow. This optimizes the response time, accuracy and noise filtering characteristics. The INFIMAG 90 flowmeter allows the operator to choose a mode while the unit is on site and in service.

Slow Modulation

This mode is suitable for avoiding zero drift whatever the type of fluid being measured, provided that the flow rate varies slowly (see Figure 2-3).

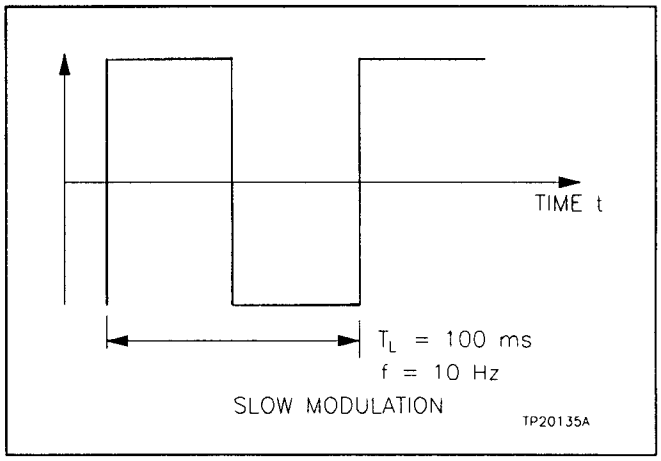


Figure 2-3. Slow Modulation

Fast Modulation

This mode allows a large number of measurements to be made per unit of time. It allows rapid variations in flow rate to be followed. This is suitable for heterogeneous liquids such as residual liquids left after processing waste water. Fast modulation omits the measurement noise of the liquids (see Figure 2-4).

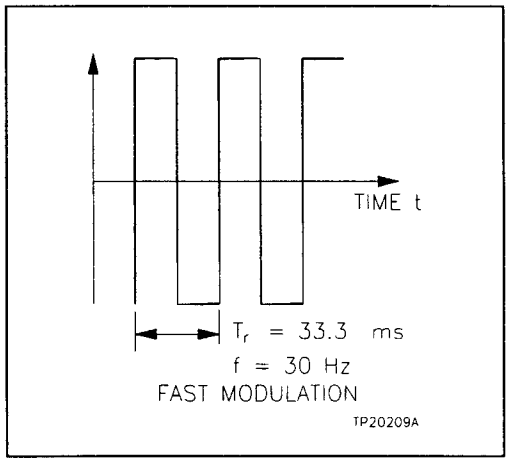


Figure 2-4. Fast Modulation

Patented Dual Modulation

The patented dual modulation mode combines 4½ fast modulation cycles and 1½ slow modulation cycle in a single

measuring cycle. This provides the double advantage of giving a filtered measurement with a fast response time and excellent zero stability (see Figure 2-5).

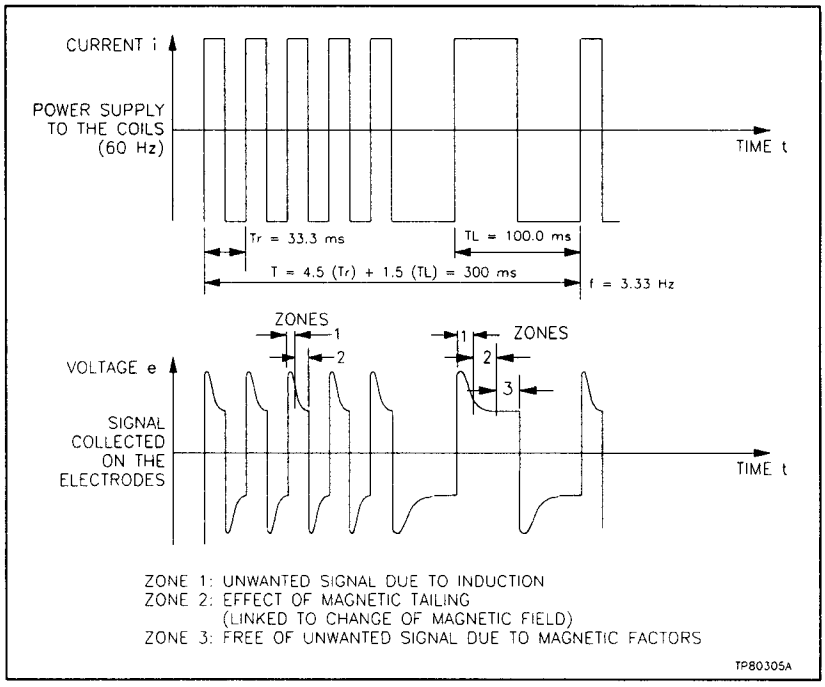


Figure 2-5. Dual Modulation Timing Diagram

SIGNAL PROCESSING

The microprocessor treats the signals corresponding to the three types of modulation. When using dual modulation, comparison of the signals obtained during the fast and slow phases takes place. Their difference corresponds to the zero drift. The final measurement corresponds to the fast modulation measurement corrected by the filtered zero drift. The filter time constant (T2) is long enough to ensure efficient filtering of the zero drift. This filtering has no effect on the response time (T1) of the final measurement (see Figure 2-6).

The typical filtering times for the three types of modulation are:

Fast Modulation:	2 to 3 seconds (T1)
Slow Modulation:	10 seconds (T1)
Dual Modulation:	2 to 3 seconds (T1) 5 to 20 seconds (T2)

NOTES:
1. T2 must always be greater than T1.
2. T2 is inoperative when in fast or slow modulation.

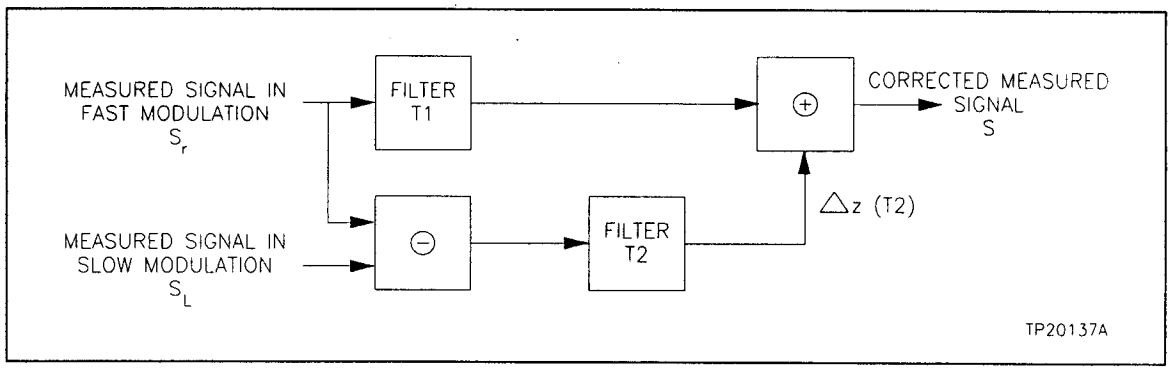


Figure 2-6. Signal Processing

INFIMAG 90 FLOWMETER PRODUCT RANGE

The INFIMAG 90 flowmeter product range includes two types of flowmeters. There is a series of wafer type (Type MW) and a series of flange type (Type MF). Each type has a 0.5 percent and a 1.0 percent calibration class. Refer to Table 2-1 for the types and sizes of flowmeters.

The flowmeters use the same electronics and differ only in the measuring tubes used.

Table 2-1. INFIMAG 90 Flowmeter Types

Type	Accuracy	Measuring Tube	Nominal Diameter mm (in.)	Nominal Pressure kPa (psi)	Electrodes	Electronics
MW[1]	<0.5% <1.0%	Ceramic	4 (5/32) 6 (1/4) 10 (3/8) 15 (1/2) 25 (1) 40 (1 1/2) 50 (2) 80 (3) 100 (4) 150 (6)	4000 (600)	Platinum Point	Integral or Remote
MF	<0.5% <1.0%	Rilsan, Polyurethane, Teflon (PTFE)	200 (8) 250 (100) 300 (12)	1000 (150)	Point Electrodes: -316L -Hastelloy C 276 -Platinum	Integral or Remote

NOTE:
1. 0.5 percent calibration not available for Types MWA002, MWA003 and MWA004.

INFIMAG 90 Type MW Flowmeter

This flowmeter uses a ceramic measuring tube (99.7 percent pure aluminum oxide, Al_2O_3). The measuring tube mounts between the piping flanges (wafer type).

INFIMAG 90 Type MF Flowmeter

This flowmeter uses a stainless steel measuring tube coated with Rilsan, polyurethane or PTFE (Teflon). It comes with assembly flanges.

INFIMAG 90 FLOWMETER ELECTRONICS

The light alloy, painted unit contains the electronics package. It has a power supply PCB assembly, a measurement PCB assembly and a display PCB assembly. See Figure 2-7 for a block diagram of the electronics package.

The electronics can either be integral with the measuring tube or remote. With integral electronics, the minimum fluid conductivity is 10 µSiemens/centimeter (10 µmho/centimeter) for 4 through 25 millimeters (5/32 through 1 inch) line sizes and 5.0 µSiemens/centimeters (5 µmho/centimeter) for 40 through 300 millimeter (1½ through 12 inch) line sizes. The minimum fluid conductivity of remote electronics is a function of the distance between the sensor and the electronics. Refer to Table 1-3 for the distance versus fluid conductivity values.

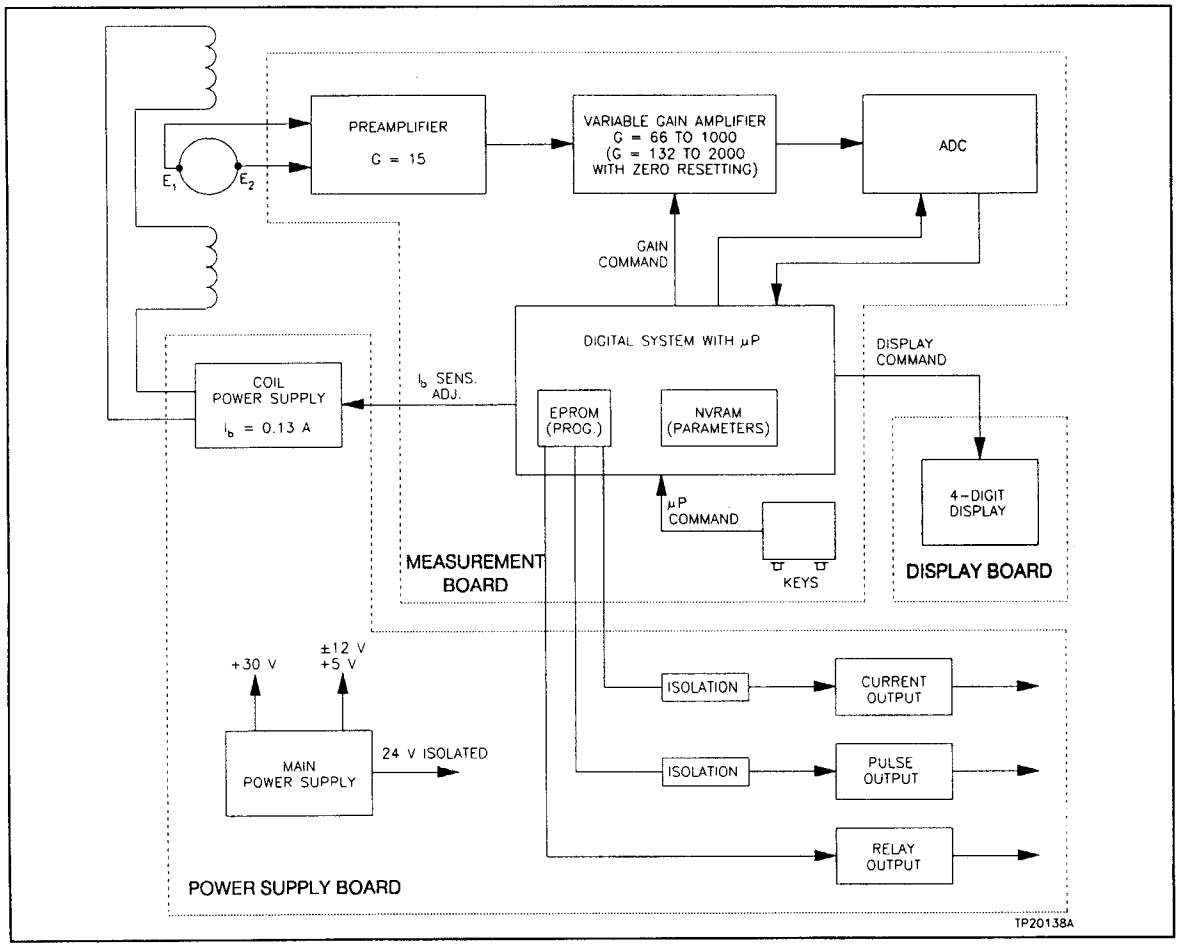


Figure 2-7. Electronics Block Diagram

Power Supply PCB Assembly

This PCB assembly carries coil power supply circuits (chopper) and the outputs (current, pulses and relay). Optocoupling provides output isolation. It also contains the connection terminals.

Measurement PCB Assembly

This PCB assembly carries the preamplifier and the variable gain amplifier driven by a microprocessor. The microprocessor also controls the three types of modulation (fast, slow and dual). The microprocessor is an eight-bit microcontroller. An EPROM stores the operating software. The INFIMAG 90 flowmeter uses NVRAM to store the configuration parameters if the power supply fails.

Display PCB Assembly

This PCB assembly carries the one-line, four-character alphanumeric liquid crystal display (LCD). The LCD displays the operating and output parameters when configuring the INFIMAG 90 flowmeter. It also displays the instantaneous flow rate or totalized volume during operation.

The display rotates 90 degrees clockwise and 90 degrees counterclockwise. This provides three possible viewing angles for optimum placement. Refer to ***INDICATOR POSITION*** in the installation section of this manual.

INFIMAG 90 FLOWMETER OPERATION

The configuration parameters of the INFIMAG 90 flowmeter can be changed on site and during service. The operating parameters, stored in NVRAM are:

- Nominal diameter of the flowmeter.
- Direction of flow.
- Choice of measurement unit.
- Choice of full scale.
- Flowrate displayed in engineering units or as percent of full scale.
- Current output signal value.
- Pulse scaling.
- Time constant.

- Output signal set to zero when flow rate drops below a set value.
- Dual modulation zero correction time.
- Reset to zero of totalized volume.
- Display of totalized volume in number of pulses.
- High or low alarm (closing of relay contact).
- Alarm threshold (if flow not reversible).
- Type of modulation.

PHYSICAL OPERATION

Configuring the Parameters

A keyboard with two keys allows display and adjustment of the various parameters. To access these two keys, open the electronics unit front cover. The T1 key is black and the T2 key is red. Refer to the operating procedures section for keyboard operation.

Digital values used in the calculation of flow rate or the generation of output signals.

MULTIPLE CHOICE PARAMETERS

These parameters select from a range of functions available that the flowmeter performs. Make the choice when the parameter is displayed by replying to the prompt. There are two types of parameters, accessible and protected.

The accessible parameters are those from DISP to thrS. The protected parameters are those from Unit to LAnG. Refer to the operating procedures section for more detail on these parameters.

DISPLAY

After selecting a parameter the display indicates the choice for which the INFIMAG 90 flowmeter has been set. This can be the instantaneous flowrate as a percentage of full scale or in engineering units, or the totalized volume as a number of pulses.

SECTION 3 – INSTALLATION

INTRODUCTION

This section of the manual aides in all levels of the installation process. The goal is to provide simple procedures for placing the flowmeter into service.

SPECIAL HANDLING

Metal oxide semiconductor (MOS) devices are subject to damage by static electricity. Therefore, observe these techniques during servicing, troubleshooting, and repair.

NOTE: Handling of the components of the INFIMAG 90 flowmeter is not recommended, except for changing the indicator position. Refer to **INDICATOR POSITION** in this section of the manual for further instructions.

1. Most assemblies with MOS devices come in a special antistatic bag. Keep the assembly in the bag as much as possible whenever the assembly is not in the system.

2. Assemblies containing MOS devices should be removed from their antistatic container only under certain conditions:

   a. When at a static-free workstation or when the bag is grounded at the field test site.

   b. Only after neutralizing the conductive area of the container.

   c. Only after firm contact with an antistatic mat and/or firmly gripped by grounded personnel.

3. Personnel handling assemblies with MOS devices should be neutralized to a static-free work station by a grounding wrist strap connected to the station or to a good ground point at the field site.

4. Do not allow clothing to contact MOS devices. Most clothing generates static electricity.

5. Avoid touching connectors or components.

6. Avoid partial connection of MOS devices. Most devices can be damaged by floating leads, especially the power supply connector. If an assembly must be placed in a live system, it should be done quickly. Do not cut leads or lift circuit paths when troubleshooting.

7. Be sure to ground the test equipment.

8. Avoid static charges during removal and replacement. Make sure the circuit board is fully clean around its leads, but do not rub or clean with an insulating cloth.

NOTE: An antistatic kit (ESD Field Service Kit, Bailey Part No. 1948385-1) is available for personnel working on devices containing MOS components. The kit contains a static-dissipative work surface (mat), a ground cord assembly, wrist bands and alligator clips.

UNPACKING AND INSPECTION

1. Check for any obvious damage to the carton or its contents. If damage is evident, notify the carrier and a Bailey Controls Company sales/service representative.

2. Remove any loose packing from the carton.

3. Carefully remove the measuring tube and electronics from the carton.

4. Inspect the nameplate to verify the unit received matches the desired function. See Figure 3-1 for an illustration of the nameplates. Each flowmeter comes with two nameplates. There is one on the measuring tube and one on the electronics.

WARNING	**Do not, at any time, exceed the ratings listed on the nameplate.**
AVERTISSEMENT	**On ne doit en aucune circonstance depasser les valeurs nominales figurant sur la plaque d'identification.**

LOCATION CONSIDERATIONS

When mounting the unit, be sure to leave ample clearance to open the cover of the electronics. Signal wiring should not run in the same conduit as power wiring. Use twisted, shielded pairs for best results. Avoid sources of radio frequency interference (RFI).

SAFETY CONSIDERATIONS

It is vital to heed all warnings and cautions appearing in this instruction manual.

FLOWMETER SELECTION

Select a flowmeter with a nominal diameter (ND) that yields a fluid velocity between 1 and 10 meters per second (3 and 30 feet per second) at selected full scale.

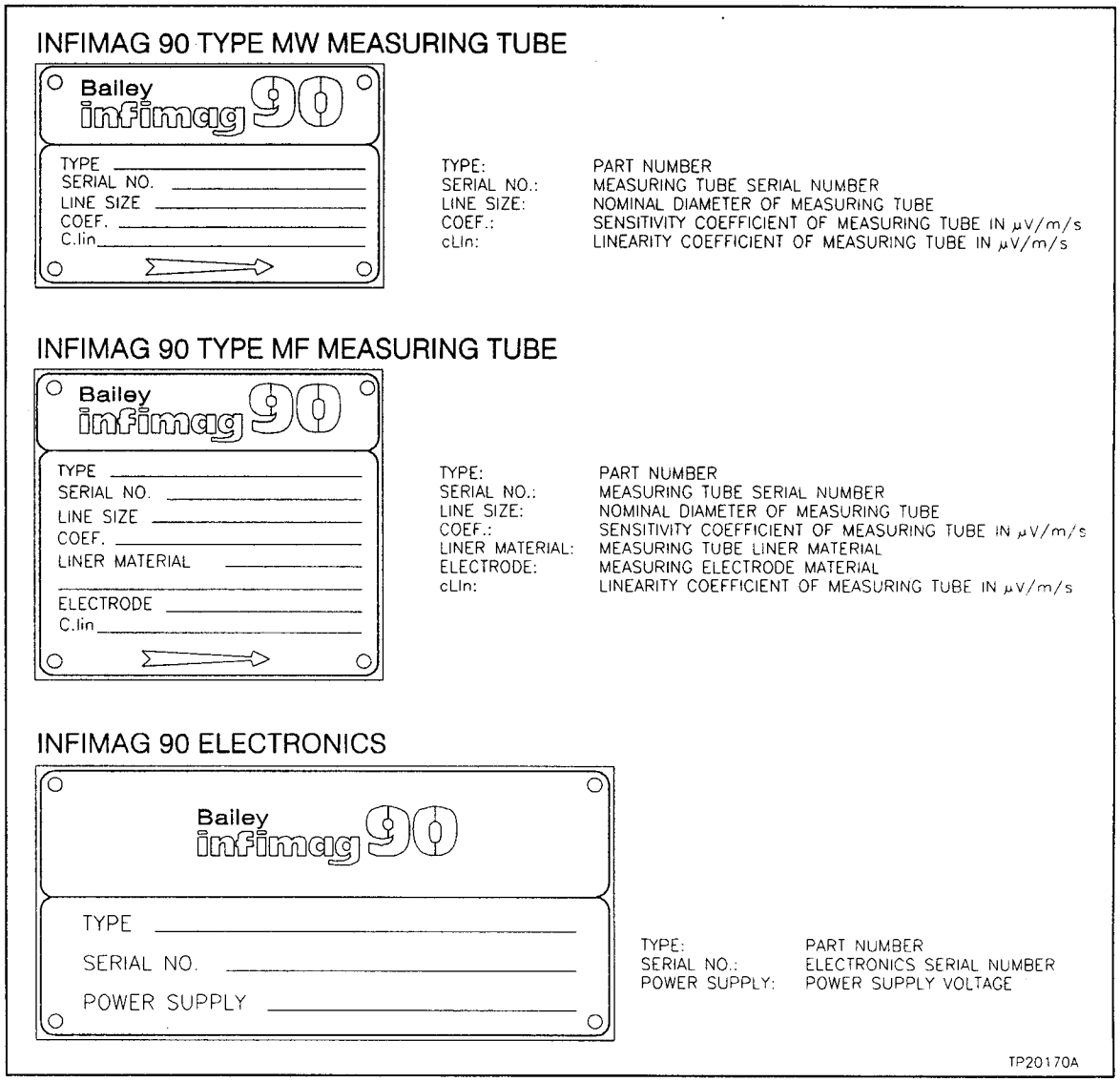


Figure 3-1. INFIMAG 90 Flowmeter Equipment Identification

Figures 1-2 and 1-3 are flow rate versus velocity charts for the Types MW and MF flowmeters. Use these charts to find the nominal diameter of the flowmeter and the diameter of the piping required.

Optimal Sensor

The optimal sensor is one that yields a fluid velocity of around 10 meters per second (30 feet per second) when at maximum flow. Try to select a flowmeter with a nominal diameter that is the same as the diameter of the pipe. If this is not practical, use suitable adapter unions.

Polluted Liquids

When fluids contain solid particles or sludge, maintain a minimum fluid velocity of 2 meters per second (6 feet per second). This is to prevent sedimentation inside the measuring tube. If the installation permits, use a vertical setup.

SETUP/PHYSICAL INSTALLATION

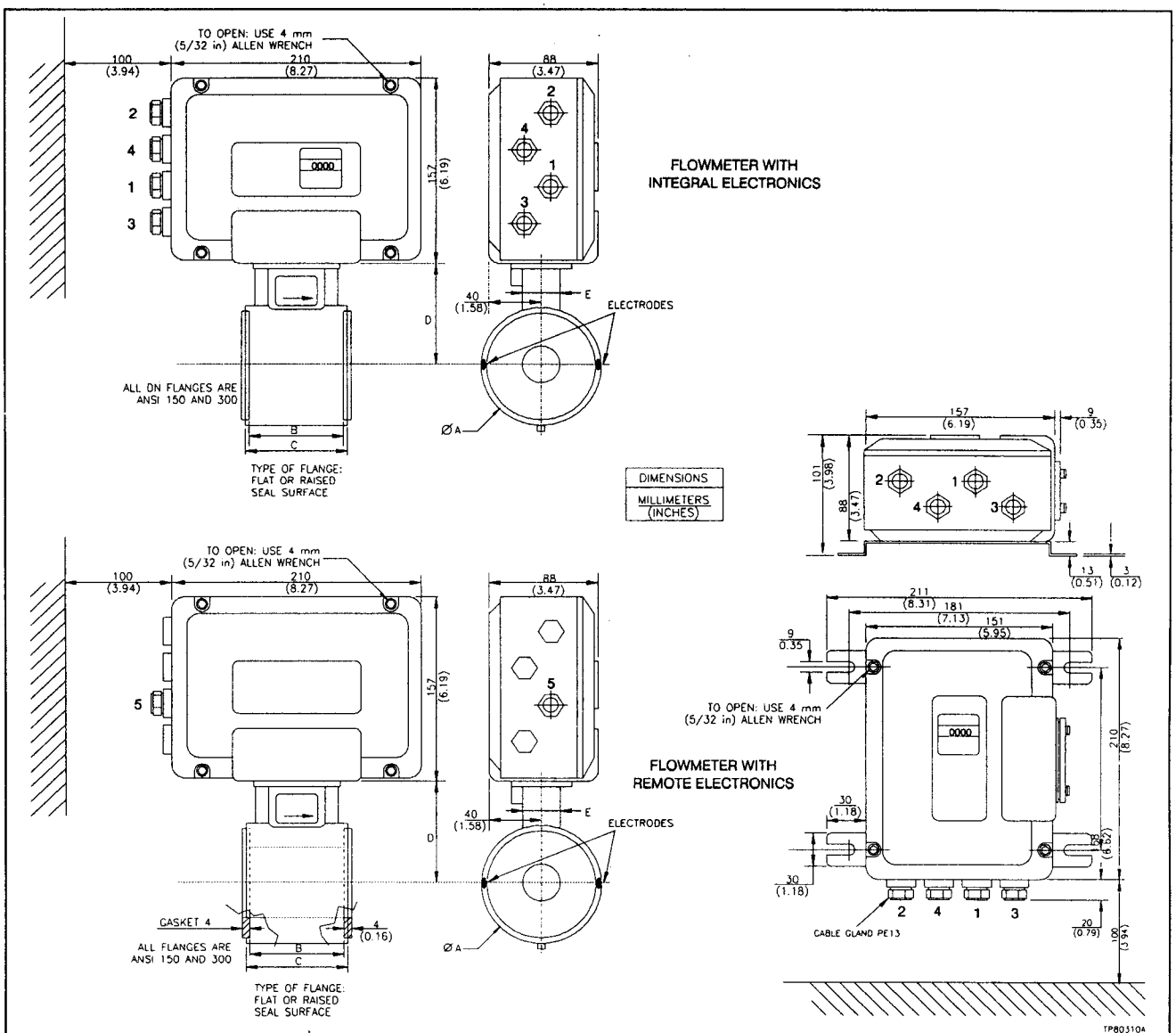
The Type MW flowmeter mounts between the flanges of the piping. The Type MW flowmeter comes with an ANSI 150 installation kit comprised of studs, washers, nuts, gaskets and centering devices. An ANSI 300 mounting kit is available on request. The Type MF flowmeter comes fitted with flanges to ANSI standards. No installation kit comes with this model.

Installation Considerations

See installation drawing Figure 3-2 for Type MW flowmeters, and Figure 3-3 for Type MF flowmeters. Install the flowmeter in any position provided the electrodes are in a horizontal plane (see Figure 3-6 for three possible mounting schemes). Take measures to ensure that the measuring tube is always full during operation.

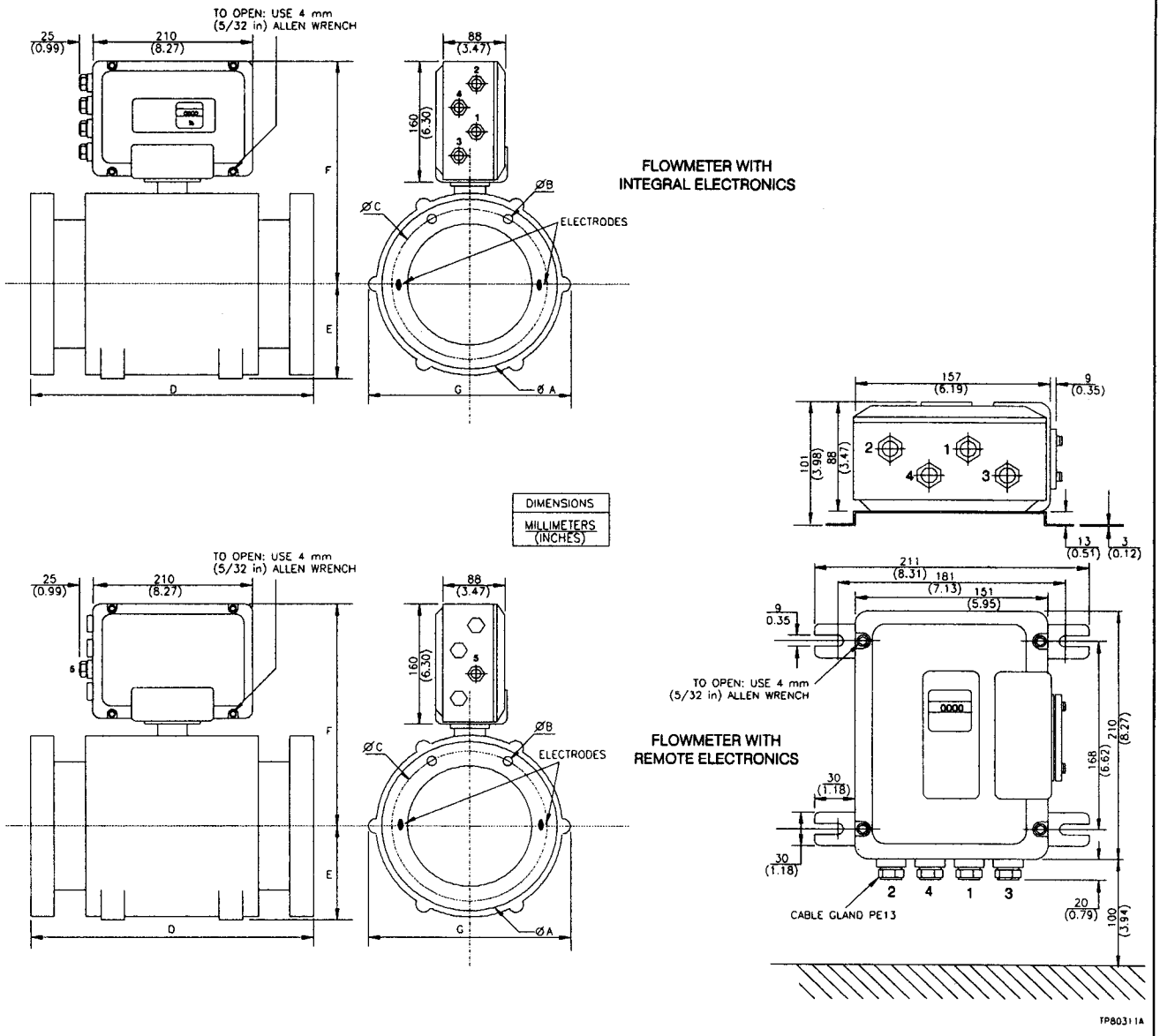
FLOW PROFILE

The operating ranges of the flowmeters always consider the fluid to be turbulent inside the measuring tube. Provide straight pipe sections with a minimum length of four times the nominal diameter of the measuring tube upstream and downstream of the measuring tube (see Figure 3-4).



Nominal Diameter mm (in.)		Dimensions mm (in.)					Weight kg (lb)	
		φA	B	C	D	E		
4	(5/32)	50 (1.97)	84 ±0.7 (3.31 ±0.027)	92 (3.62)	75 (2.96)	30 (1.18)	4.7	(10.4)
6	(1/4)	50 (1.97)	84 ±0.7 (3.31 ±0.027)	92 (3.62)	75 (2.96)	30 (1.18)	4.7	(10.4)
10	(3/8)	50 (1.97)	84 ±0.7 (3.31 ±0.027)	92 (3.62)	75 (2.96)	30 (1.18)	4.7	(10.4)
15	(1/2)	50 (1.97)	84 ±0.7 (3.31 ±0.027)	92 (3.62)	75 (2.96)	30 (1.18)	4.7	(10.4)
25	(1)	67 (2.64)	84 ±0.7 (3.31 ±0.027)	92 (3.62)	80 (3.15)	30 (1.18)	5	(11.0)
40	(1.5)	86 (3.38)	90 ±0.7 (3.55 ±0.027)	98 (3.86)	95 (3.74)	30 (1.18)	5.8	(12.8)
50	(2)	99 (3.90)	100 ±0.7 (3.94 ±0.027)	108 (4.26)	100 (3.94)	25 (0.99)	6.5	(14.3)
80	(3)	131 (5.16)	155 ±0.7 (6.12 ±0.027)	163 (6.42)	120 (4.73)	35 (1.38)	9.1	(20.0)
100	(4)	160 (6.30)	170 ±0.7 (6.70 ±0.027)	178 (7.01)	145 (5.71)	40 (1.58)	12	(26.5)
150	(6)	215 (8.47)	244 ±0.7 (9.61 ±0.027)	252 (9.93)	175 (6.90)	40 (1.58)	25.4	(56.0)

Figure 3-2. INFIMAG 90 Type MW Flowmeter Installation Drawing



Flange Rating	Pressure kPa (psi)	No. of Holes	Nominal Diameter mm (in.)	Dimensions mm (in.)								Weight kg (lb)
				φA	φB	φC	Rilsan Liner D	Polyurethane and PTFE Liner D	E	F	G	
ANSI 150 lb. RF	1000 (150)	8	200 (8)	340 (13.38)	22 (0.87)	295 (11.61)	411 (16.18)	417 (16.42)	215 (8.46)	430 (16.93)	450 (17.73)	62 (137)
	1000 (150)	12	250 (10)	395 (15.55)	22 (0.87)	350 (13.78)	461 (18.15)	467 (18.39)	250 (9.84)	470 (18.50)	525 (20.69)	80 (176)
	1000 (150)	12	300 (12)	445 (17.52)	22 (0.87)	400 (15.7)	511 (20.12)	517 (20.35)	285 (11.22)	500 (19.69)	595 (23.44)	97 (214)

Figure 3-3 INFIMAG 90 Type MF Flowmeter Installation Drawing

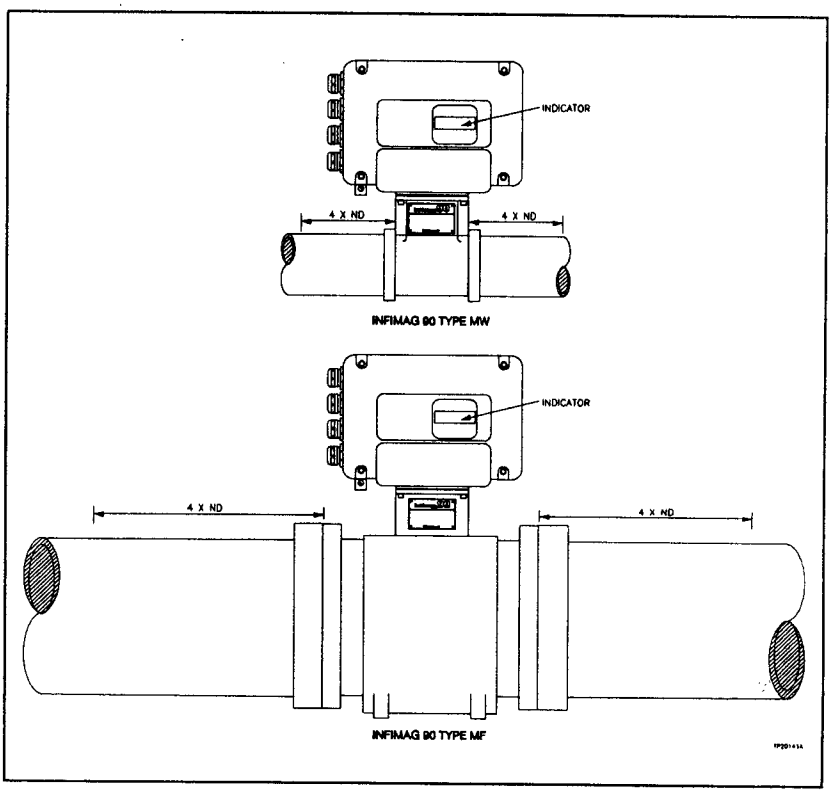


Figure 3-4. Flowmeter Installation with Straight Pipe Sections

INDICATOR POSITION

To aid in viewing, the LCD rotates 90 degrees clockwise and 90 degrees counterclockwise. See Figures 3-5 and 3-6 for illustrations of LCD rotation.

The flowmeters come with the LCD in an upright position. These procedures assume the rotation to be from this position.

To perform this procedure, use a 4 millimeter allen key and two flat-head screwdrivers - one large and one small.

CAUTION	**Before performing the procedure, be sure power to the flowmeter is OFF. Failure to do so could damage the electronics.**
ATTENTION	**Avant d'effectuer la procédure, assurez-vous que l'indicateur de débit n'est pas alimenté. Sinon, les composants électroniques pourraient subir des dommages.**

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen-head screws that secure the flowmeter electronics assembly lid (Figure 3-5).

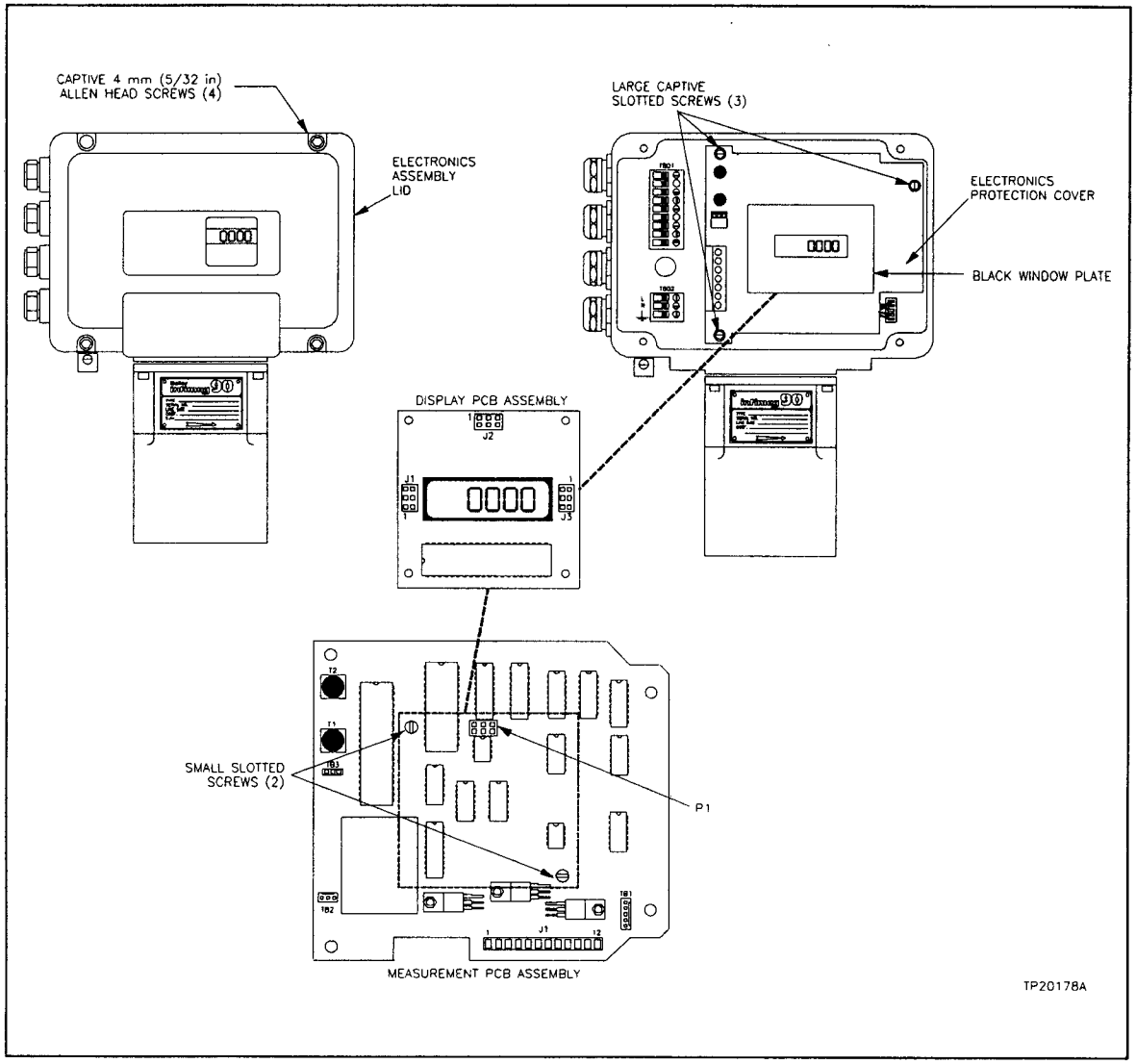


Figure 3-5. Removing the LCD

3. Remove the flowmeter electronics assembly lid.

4. Use the large flat-head screwdriver to loosen the three captive large slotted screws that secure the electronics protection cover to the electronics assembly.

5. Remove the electronics protection cover.

NOTE: Whenever the electronics protection cover is removed, follow the procedures outlined under SPECIAL HANDLING in this section of the manual.

6. Use the small flat-head screwdriver to remove the two small slotted screws that secure the display PCB assembly to the measurement PCB assembly.

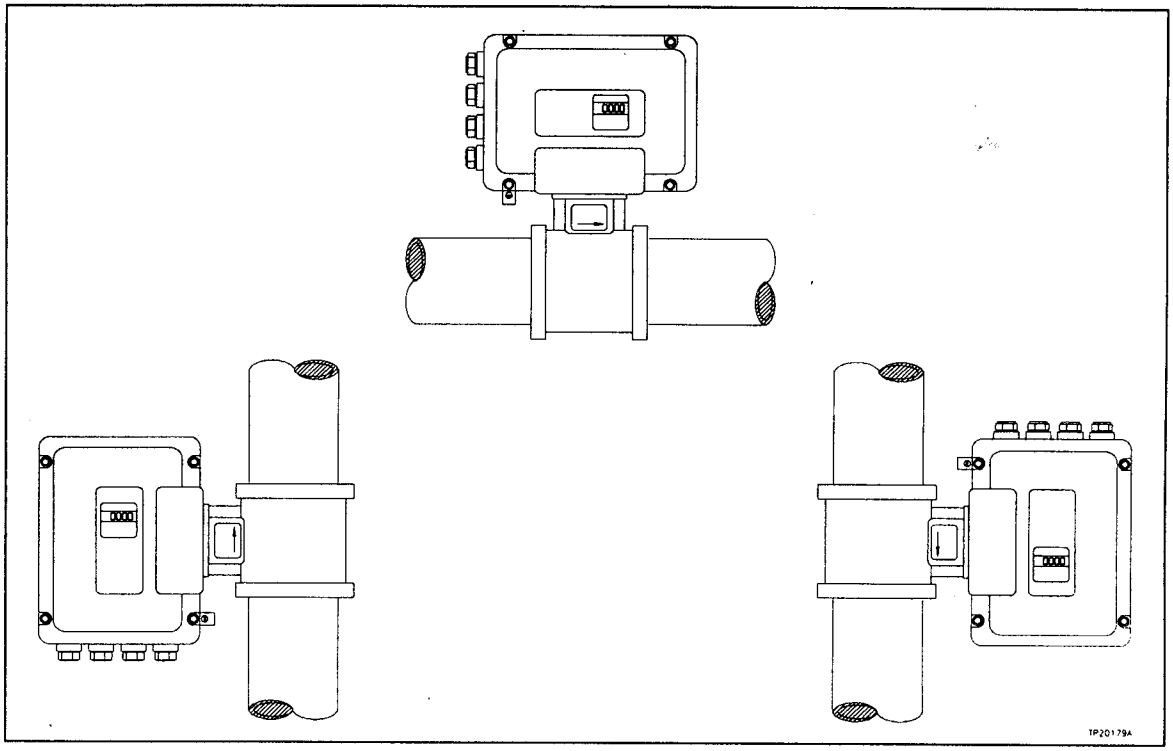


Figure 3-6. LCD Rotation

7. Gently lift the display PCB assembly to disengage connector J2 from P1 on the measurement PCB assembly.

8. Depending on the desired viewing orientation, rotate the display PCB assembly either 90 degrees clockwise or 90 degrees counterclockwise.

   a. For clockwise rotation, plug display PCB assembly connector J1 into P1 on the measurement PCB assembly.

   b. For counterclockwise rotation, plug display PCB assembly connector J3 into P1 on the measurement PCB assembly.

9. Replace the two screws removed in Step 6.

10. Pop the black window plate out of the electronics protection cover.

11. Rotate the black window plate 90 degrees and insert it into the electronics protection cover.

12. Replace the electronics protection cover and tighten the three screws.

13. Replace the lid to the flowmeter electronics assembly and tighten the four allen-head screws.

PIPING DIAMETER REDUCTION

When the inside diameter of the flowmeter is less than that of the piping diameter, specific diameter reduction techniques must be employed.

To maintain undisturbed flow, use convergent/divergent adapters with apex angles less than or equal to 15 degrees (see Figure 3-7). This ensures negligible head loss.

FILLING OF MEASURING TUBE

Ensure that the measuring tube remains full of liquid throughout the measuring process. If unable to do this with a standard setup, use a siphon arrangement (see Figure 3-8).

NOTE: In this case, changes in fluid level in the main pipe do not affect measurement.

SPECIAL SETUPS

The flowmeter requires minimum maintenance when operated under normal conditions. If used for fluids that carry solid particles or fluids that cause scaling, cleaning may be necessary. Do this using chemical or mechanical means. In this case, install the flowmeter so that removal is possible

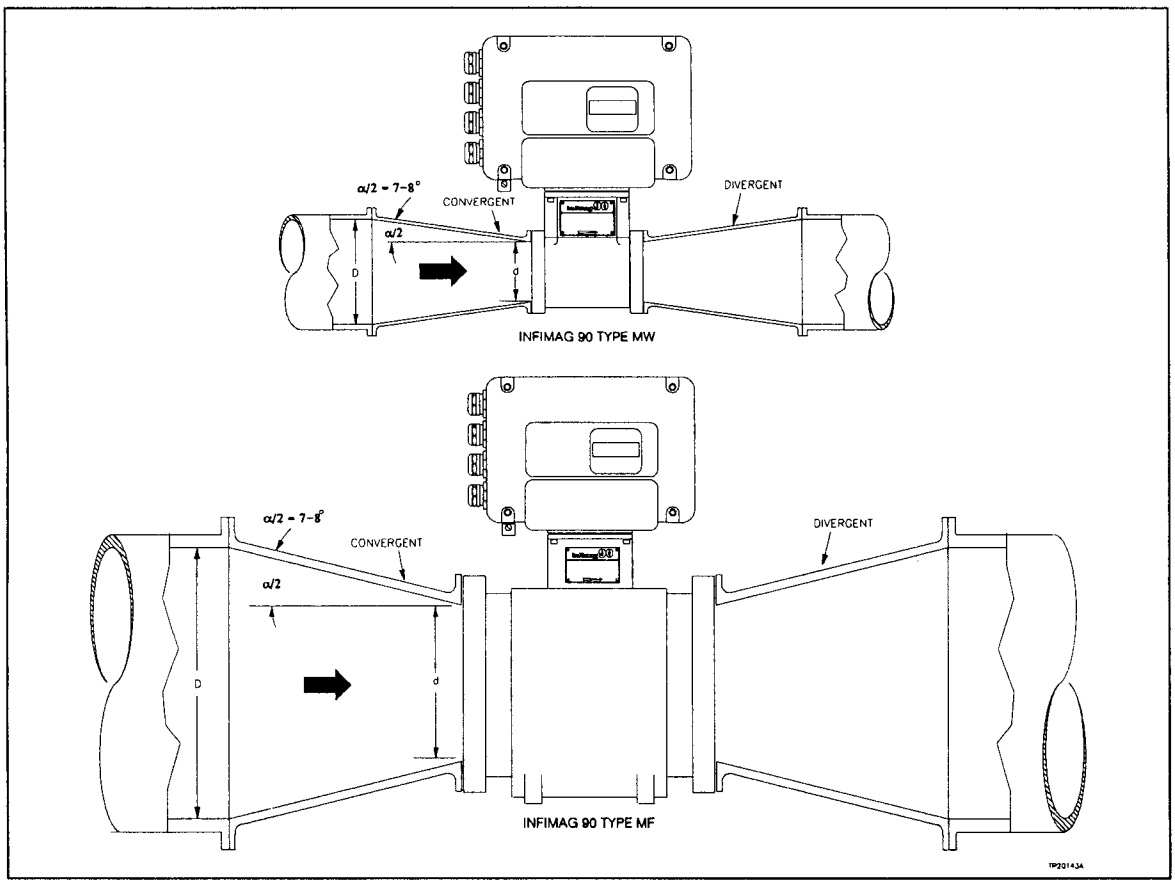


Figure 3-7. Piping Diameter Reduction

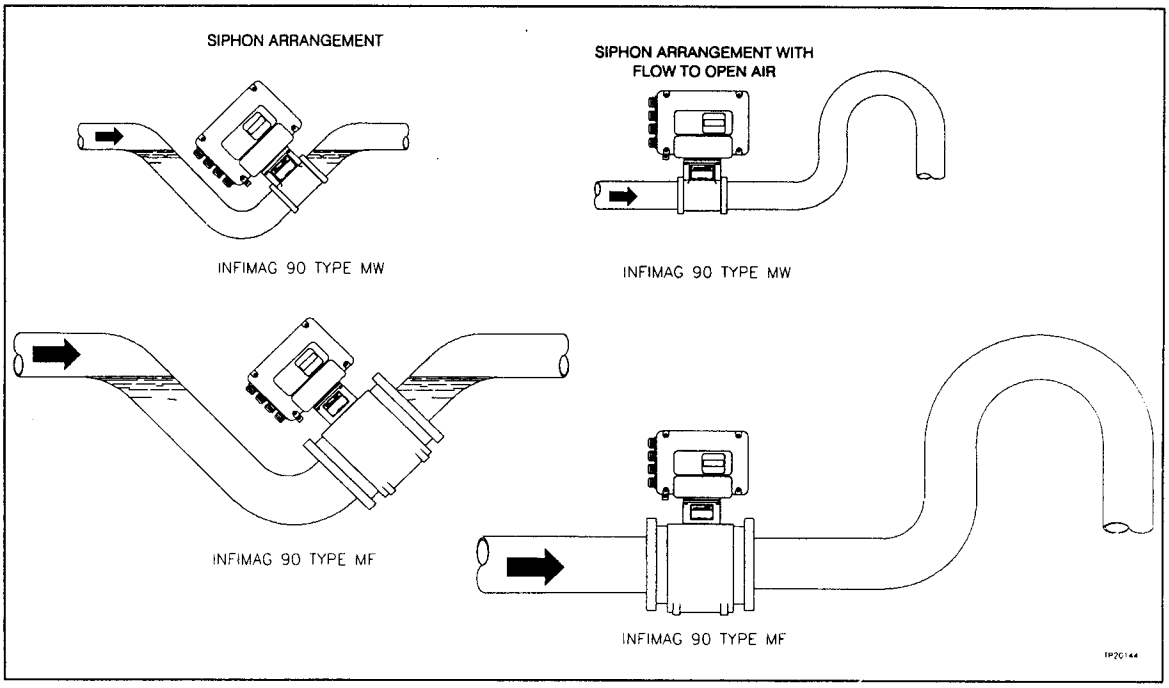


Figure 3-8. Siphoning Arrangements

without stopping the flow of the fluid. See Figure 3-9 for bypass setups.

NOTE: Due to the wide variety of possible installations and applications for the INFIMAG 90 flowmeter, mechanical or chemical cleaning procedures must be devised and implemented by the customer.

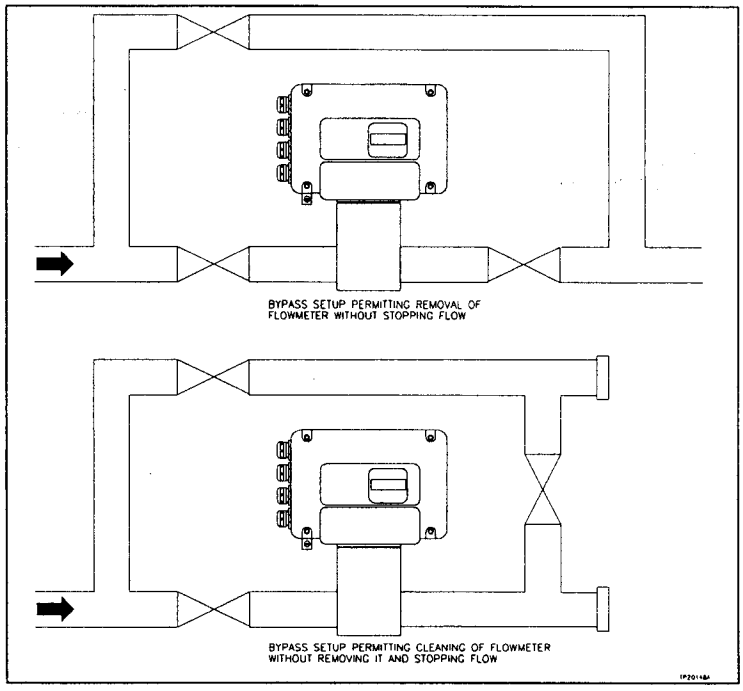


Figure 3-9. Bypass Setups

INFIMAG 90 Type MW Flowmeter Installation

NOTE: To ease assembly, use a spot of glue on the outer faces of the measuring tube to hold the gaskets in place.

1. It is mandatory to use the centering devices included in the mounting kit to align the measuring tube with the piping. The number of centering devices depends on the measuring tube dimensions and weight, and the type of flanges. See Figure 3-10 for an illustration of flange face parallelism.

2. Install the bolts and tighten by hand. Refer to Table 3-1 for the number of bolts and the maximum torque.

3. Progressively torque two diametrically opposite bolts, moving around in 90 degree steps until tightening the last bolt. See Figure 3-11 for an illustration of Type MW flowmeter installation.

NOTES:
1. Use a torque wrench to stay within the permitted values (refer to Table 3-1).

2. If the gaskets are PTFE, tighten the bolts again after 24 hours.

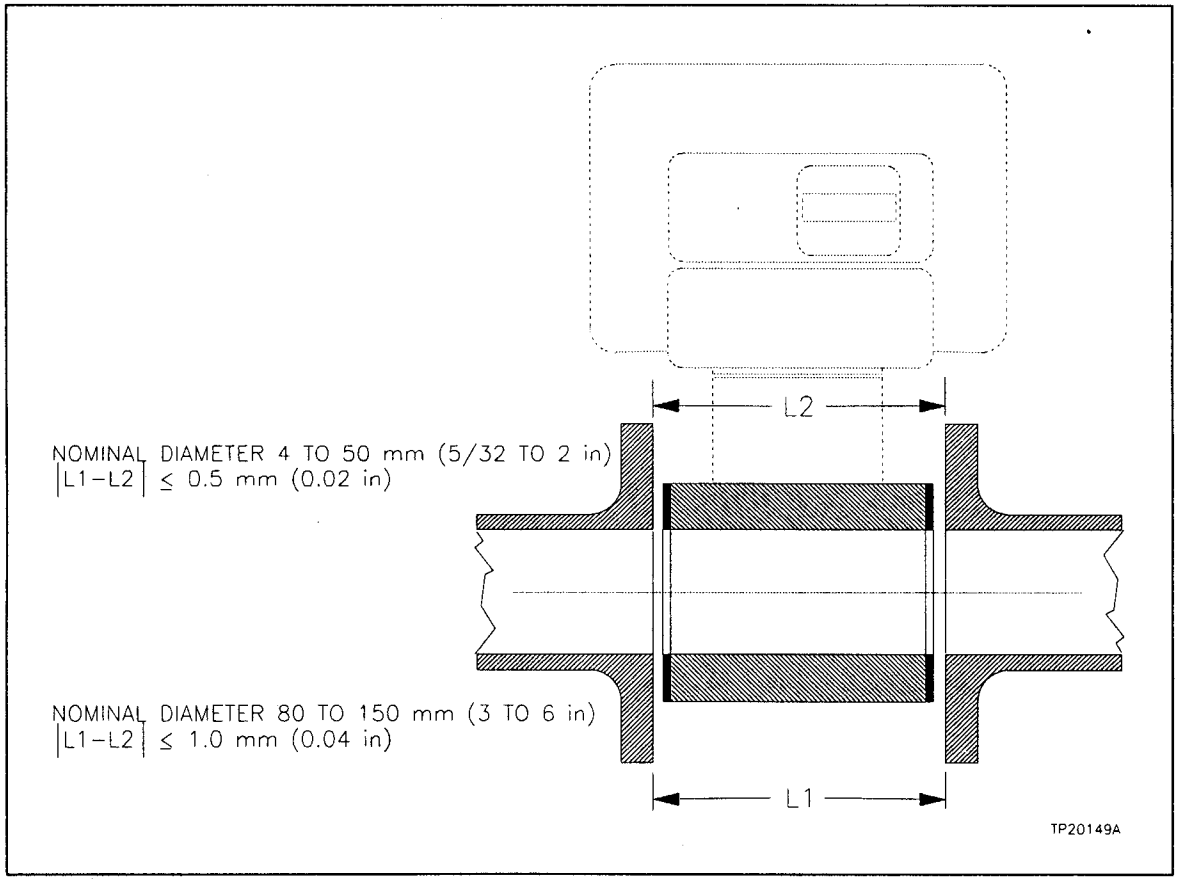


Figure 3-10. Flange Face Parallelism

Table 3-1. Maximum Torque for Flange Bolts, INFIMAG 90 Type MW Flowmeter

Measuring Tube Diameter, mm (in.)		Number of Flange Bolts	Maximum Tightening Torque for Bolts, Nm (ft-lb)	
4	(5/32)	4	50	(36)
6	(1/4)	4	50	(36)
10	(3/8)	4	50	(36)
15	(1/2)	4	50	(36)
25	(1)	4	50	(36)
40	(1 1/2)	4	100	(73)
50	(2)	4	120	(88)
		8 (ANSI 300 lb)	60	(44)
80	(3)	4	120	(88)
		8 (ANSI 300 lb)	120	(88)
100	(4)	4	120	(88)
		8 (ANSI 300 lb)	200	(147)
150	(6)	8	200	(147)
		12 (ANSI 300 lb)	150	(110)

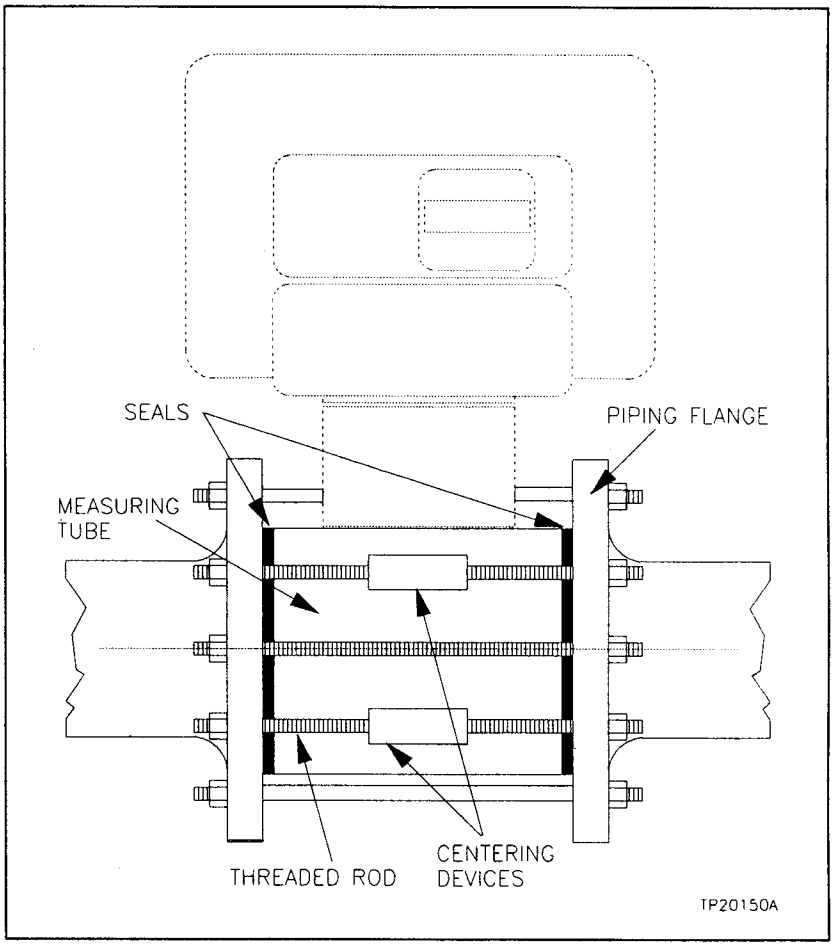


Figure 3-11. Type MW Flowmeter Installation

INFIMAG 90 Type MF Flowmeter Installation

NOTE: Remove the protectors installed on the flanges (to protect the liner) before installation.

CAUTION	**Precautions must be taken during handling and assembly. The flange faces shall not come into direct contact with the ground, nor be damaged. Damaged flanges may result in a faulty installation.**
ATTENTION	**Manipulez et assemblez l'appareil avec précaution. Les faces des brides ne doivent pas entrer directement en contact avec la terre et ne doivent pas être endommagées. Des brides endommagées pourraient donner lieu à une installation défecteuse.**

FLANGE SEALING

Assemble measuring tubes with soft liners (polyurethane) without flange gaskets. For measuring tubes with PTFE liners, use either no gasket, or composite PTFE gaskets when the tube carries corrosive or high temperature fluids. Assemble measuring tubes with Rilsan liners with soft gaskets made of Neoprene, Perbunan™, Viton™, or Ehtylene-Propylene (EP rubber).

FLANGE TIGHTENING

Refer to Table 3-2 for the number of flange bolts and the maximum tightening torque.

1. Check that the seal contact surfaces are clean before assembly.

2. Grease the bolts before assembly.

3. Tighten the bolts evenly, starting with two diametrically opposite bolts, then move around in 90 degree steps until tightening the last bolt.

NOTES:
1. Use a torque wrench to stay within the permitted values (refer to Table 3-2).

2. If the gaskets are PTFE, tighten the bolts again after 24 hours.

™Perbunan is a trademark of Mobay Chemical Corporation.
™Viton is a trademark of E.I. Du Pont de Nemours and Co.

Table 3-2. Maximum Torque for Flange Bolts, INFIMAG 90 Type MF Flowmeter

Measuring Tube Diameter, mm (in.)	Number of Flange Bolts	Maximum Tightening Torque for Bolts, Nm (ft-Lb)	
		PTFE Liner	Rilsan and Polyurethane Liners
200.0 (8)	8	100 (73)	120 (88)
250.0 (10)	12	100 (73)	150 (110)
300.0 (12)	12	110 (81)	150 (110)

WIRING CONNECTIONS AND CABLING

Electronics Installation

When using remote electronics, either fix it on a panel or on a 50 millimeter (2-inch) vertical or horizontal tube. See Figures 3-2 and 3-3 for further detail.

GROUNDING

It is the responsibility of the customers and/or their installation/wiring contractor to ensure that the flowmeter, other associated control or test equipment and all exposed conductive materials are properly grounded in accordance with local, National Electrical Code or Canadian Electrical Code regulations; and are not a hazard, including under fault conditions, to operation and service personnel.

The INFIMAG 90 flowmeter provides for a connection of a grounding conductor. Do not use it as a common point for other electrical equipment. See Figure 3-12 for the location of this ground connection terminal.

NOTES:

1. Because of the prevailing differences in soil conditions throughout the world and differences in acceptable practices, it is not within the scope of this instruction to describe grounding electrode systems. It is the responsibility of the customer to ensure that a grounding electrode system which is acceptable to the local building and wiring codes exists at the facility where the INFIMAG 90 flowmeter is to be installed.

   The NEC, Article 250, Section H, details requirements for grounding electrode systems acceptable in the United States. The CEC, Section 10, paragraphs 700 through 712, details the requirements for grounding electrode systems acceptable in Canada.

2. The structural metal frame of a building shall not be used as the required equipment grounding conductor for the INFIMAG 90 flowmeter.

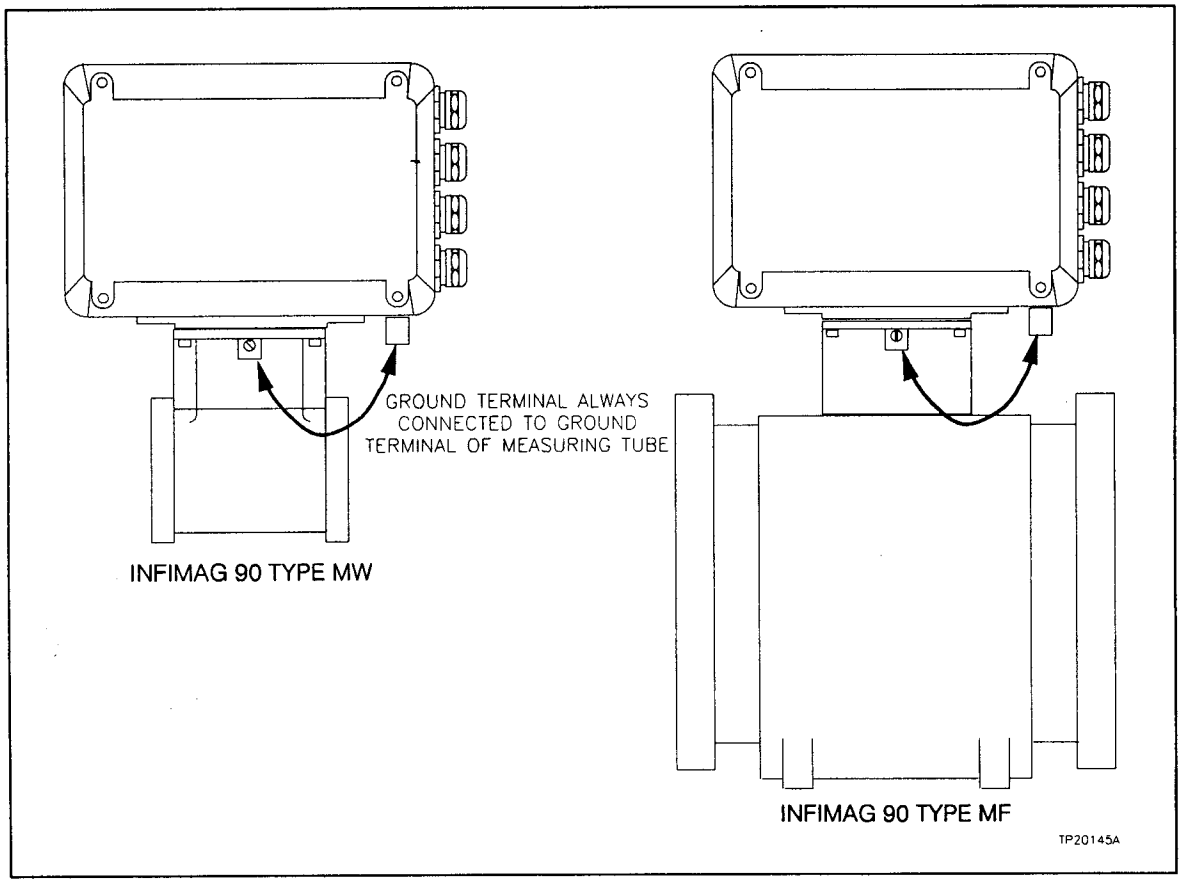


Figure 3-12. Ground Connection Locations

Pipe Made of Conducting Material and Not Insulated From the Fluid

Connect the two pipe flanges to the external ground terminal of the flowmeter using two wires or cables with a maximum wire gage of 14 AWG (see Figure 3-13).

Pipe Made of Nonconducting Material or Insulated From the Fluid.

1. Install two grounding rings upstream and downstream of the flowmeter. The grounding rings are available as a nomenclature option, or refer to Tables 8-4 and 8-5 in the support services section of this manual for part numbers. The gaskets shown in Figure 3-14 are not included.

2. Connect the grounding rings to the external ground terminal of the flowmeter using two wires or cables with a maximum wire gage of 14 AWG (see Figure 3-14).

NOTE: The grounding ring material must be compatible with the fluid carried.

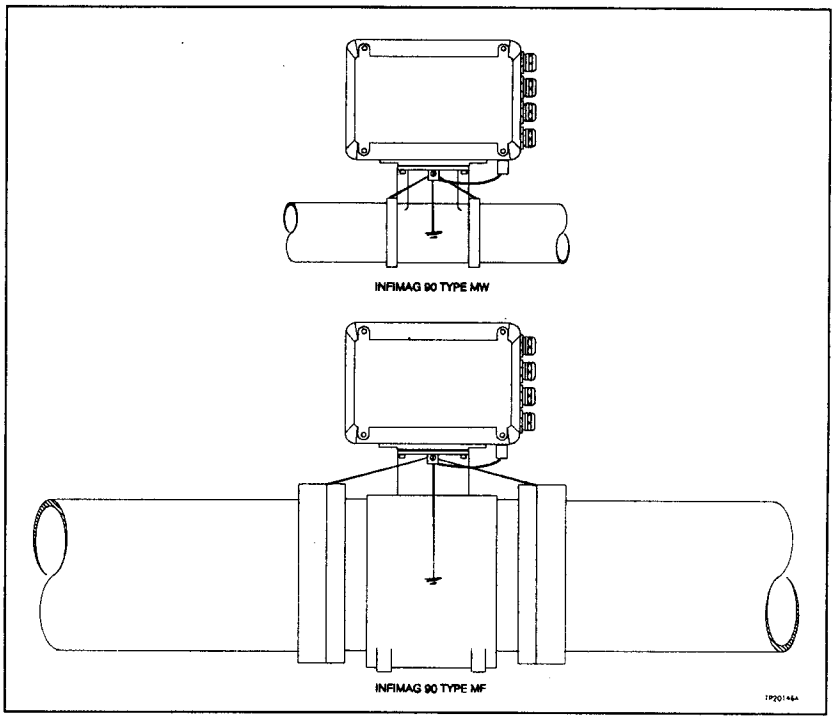


Figure 3-13. Grounding to a Pipe Made of Conducting Material and Not Insulated from the Fluid

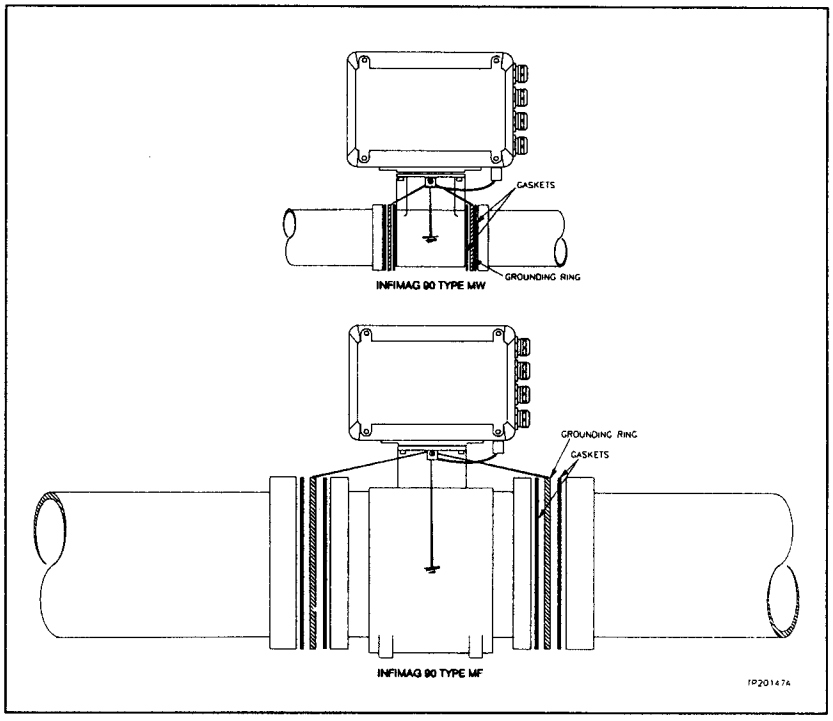


Figure 3-14. Grounding to a Pipe Made of Nonconducting Material or Insulated from the Fluid

Electrical Connections

INTEGRAL ELECTRONICS

Standard Power Supply and Current Output

See Figure 3-15 for the standard electrical connections.

1. Make the electrical connections using two separate cables of 8.0 to 15.0 mm (0.3 to 0.6 in.) outside diameter, containing conductors with a maximum wire gage of 18 AWG.

2. Tighten the cable-glands properly to provide adequate seals.

Optional Outputs (All Outputs May Be Used)

See Figure 3-15 for the optional output connections.

1. Make the electrical connections using four separate cables of 8.0 to 15.0 mm (0.3 to 0.6 in.) outside diameter, with a maximum wire gage of 18 AWG.

2. Tighten the cable-glands properly to provide adequate seals.

REMOTE MOUNTED ELECTRONICS

The maximum length of the cable connecting the measuring tube to the electronics is a function of the fluid conductivity. The longest cable permitted is 100 meters (300 feet). Refer to Table 1-3 for conductivity versus cable length.

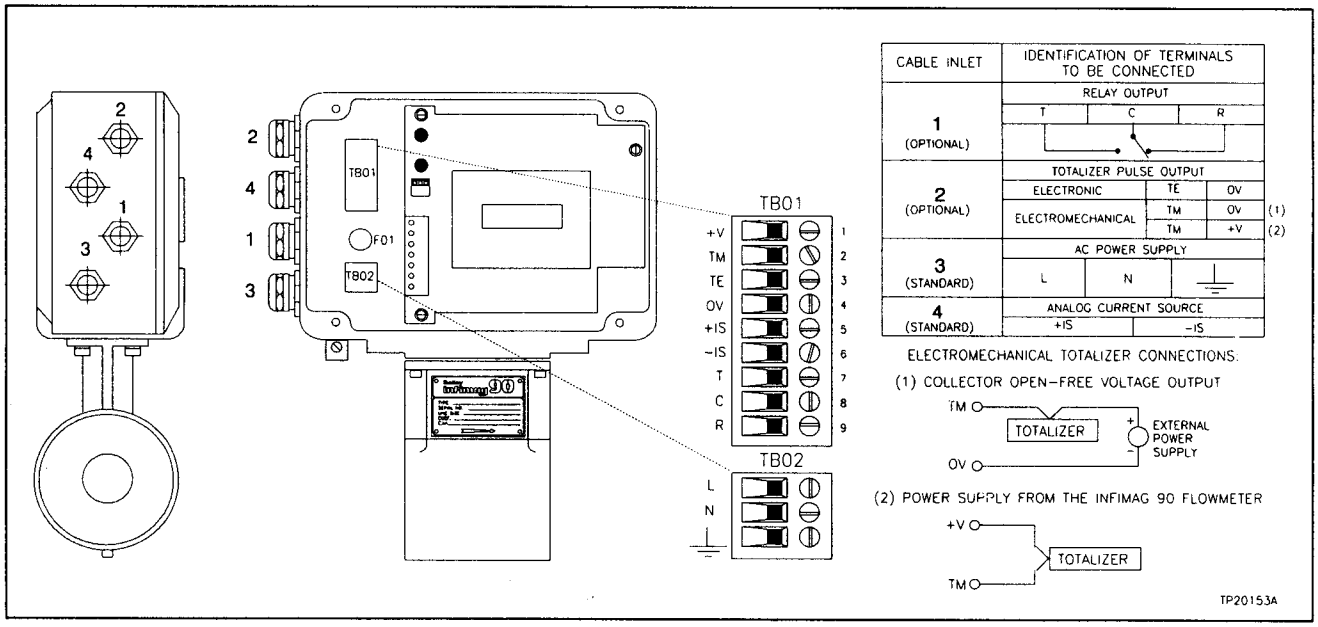


Figure 3-15. Electrical Connections for Flowmeter with Integral Electronics

The electronics comes with one end of the cable connected. The customer must connect the other end to the remote terminal housing.

Use three separate cables with a maximum wire gage of 14 AWG to make connections to the electronics (power supply input and outputs). See Figure 3-16 for the electrical connections.

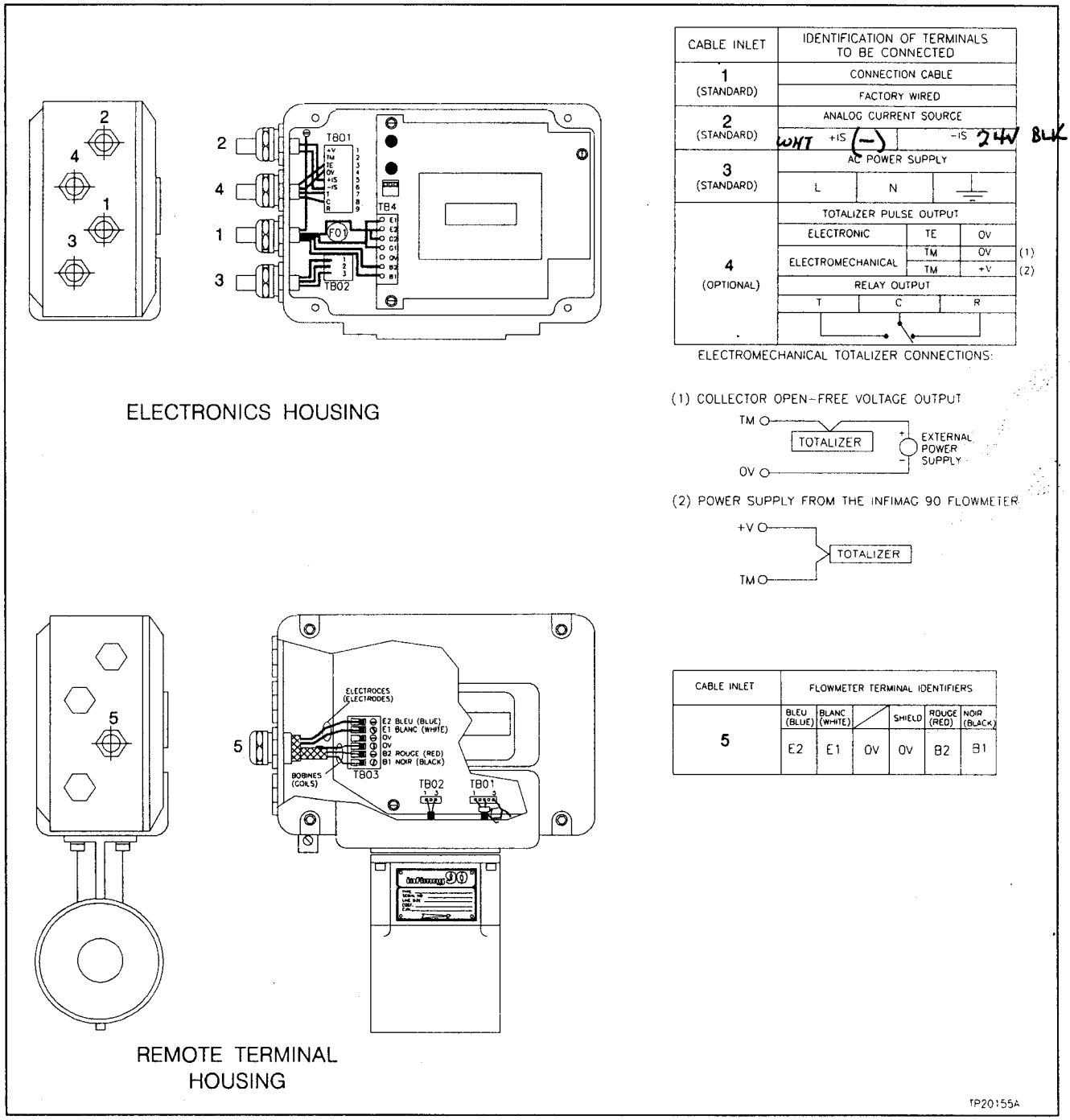


Figure 3-16. Electrical Connections for Flowmeter with Remote Electronics

SECTION 4 – OPERATING PROCEDURES

INTRODUCTION

This section describes the procedures for monitoring and changing the operating parameters of the INFIMAG 90 flowmeter. It also describes the parameters that must be entered before placing the flowmeter into service.

NORMAL OPERATING CONSIDERATIONS

INFIMAG 90 flowmeters can be configured on site when in service. This procedure requires no disassembly or special accessories. Check parameters while in service. New parameter values need validation before they are stored in NVRAM.

There are two keys, **T1** and **T2** on the INFIMAG 90 (see Figure 4-1). Use **T1** to display the next parameter. Use **T2** to validate the value of the parameter.

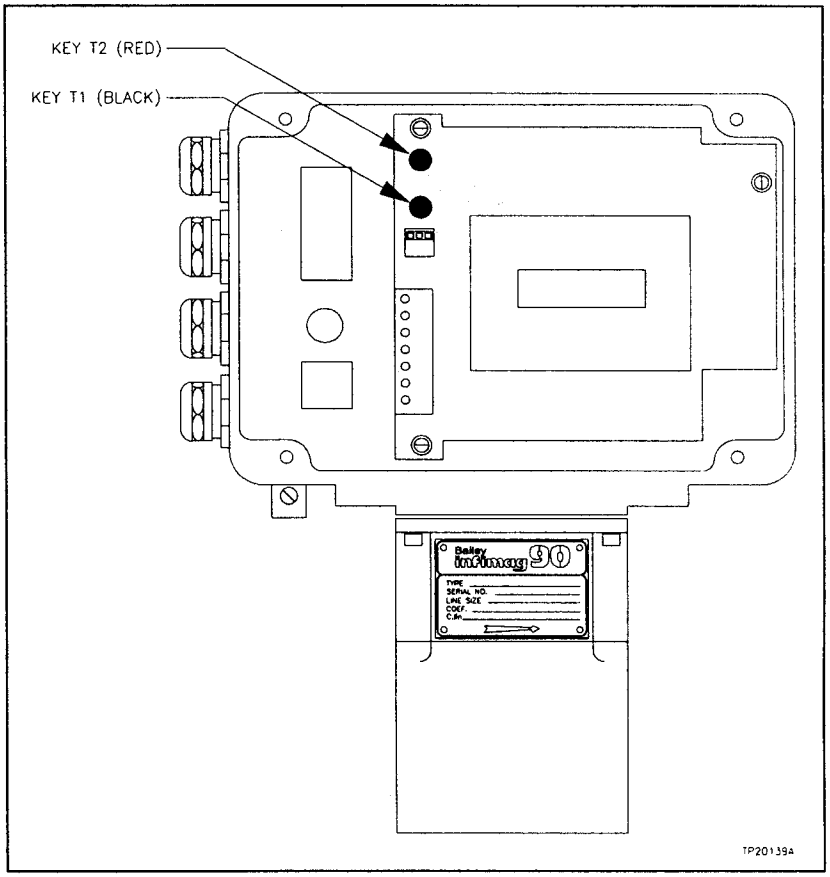


Figure 4-1. T1 and T2 Key Locations

Keyboard Operation

All of the parameters appear in a pull down menu.

1. To access the pull down menu, press the **T1** key.

2. To display the value of the parameter, press the **T2** key.

3. To change the value of a parameter:

   a. For accessible parameters, press the **T2** key. The parameter on the display begins flashing.

   b. For protected parameters, while pressing and holding the **T2** key, press the **T1** key. The parameter on the display begins flashing.

4. To display a new value, press the **T1** key.

5. To validate the new value, press the **T2** key. The value on the display stops flashing.

6. To return to the pull down menu, press the **T1** key.

7. To move on to the next parameter in the menu, press the **T1** key.

8. Repeat Steps 2 through 7 until the configuration is complete.

If an incompatibility between the parameters selected and the operating mode exists, the INFIMAG 90 flowmeter detects it and displays an error message. Refer to Table 5-1 in the troubleshooting section for more detail on the error codes.

Parameter Descriptions

Refer to Table 4-1 for descriptions of, and the choices available for the accessible parameters. Refer to Table 4-2 for descriptions of, and the choices available for the protected parameters. Use these two tables along with the configuration menu flowchart, Figure 4-2, and the parameter change procedures to configure the INFIMAG 90 flowmeter.

Table 4-1. Accessible Parameter Descriptions

Mnemonic	Name	Choice Mnemonics	Description	Extreme Values
dISP	Display	oPo	% of full scale	Two Way: -150 to +150% One Way: 000.0 to +150%
		EnGU	Engineering units	-9999 to +9999 units
		totA	Totalized volume	-9999 to +9999 units
d.Un	Display of the units	YES	The units selected from the dISP parameter appear every 10 seconds	
		no	No units appear	
CLrt	Totalizer reset		Resets the totalizer to 0	
rtFL	Response time	XXXX	Response time in seconds	0.5 to 100 seconds
CrFL	Zero correction time	XXXX	Zero correction time for dual modulation in seconds	0 to 600 seconds Appears only if dual modulation is selected
thrS	Flow rate threshold	XXXX	Output signals drop to 0 when the flow rate falls below a chosen value	In the chosen unit
PrtP	Protected parameter		Validation using the **T2** key allows access to the protected parameters	

Table 4-2. Protected Parameter Descriptions

Mnemonic	Name	Choice Mnemonics	Description	Extreme Values
UnIt	Unit	LPh	Liters per hour	
		CMPh	Cubic meters per hour	
		UGPM	U.S. gallons per minute	
		I GPM	Imperial gallons per minute	
SIZE	Nominal Diameter	XXXX	Measuring tube diameter chosen from a stack of values	In mm if unit is CMPH or LPH, in in. if unit is UGPM or IGPM
SCAL	Full Scale Value	XXXX	Sets the full scale value for the flowmeter	In the chosen unit
POS1	Pulse output scaling < 10 Units	XXXX	Volumetric units per pulse output counting pulse scaling - if these values are 0, there is no pulsed output	In the chosen unit per pulse. if pos1 is selected, pos2 is automatically zero. if pos2 is selected, pos1 is automatically zero
POS2	> 10 units	XXXX		
dIr.	Direction of flow	r. FL	Reversible flow - the flow rate is two-way and the alarm output is inhibited	Minus sign if reversed flow, no sign if forward flow
		ALOP	Alarm output - the alarm relay output is active	No sign
ALAr	Alarm	no	No alarm	Alarm output is inactive
		LoAL	Low alarm	Relay contact closes if flow rate≤ threshold
		HI AL	High alarm	Relay contact closes if flow rate ≥ threshold
AthS	Alarm threshold	XXXX	Sets the trip point for the alarm	From 0 to 100% of full scale in the chosen unit
outP	Output signal for flow rate	0-20	Allows choice of output range	0 to 20 ma
		4-20		4 to 20 ma

Table 4-2. Protected Parameter Descriptions (continued)

Mnemonic	Name	Choice Mnemonics	Description	Extreme Values
tot.	Type of totalizer	LoFr	Electromechanical	Pulsed output: 40 msec bandwidth at maximum frequency of 12.5 Hz
		HI Fr	Electronic	Pulsed output: 5 msec bandwidth at maximum frequency of 100 Hz
Modu	Type of modulation	SLo.	Slow modulation	Pulse excitation frequency: 30 Hz
		FASt	Fast modulation	Pulse excitation frequency: 10 Hz
		dUAL	Dual modulation	Combination of fast and slow cycles
rEJ	Noise rejection	YES	Software-driven minimization of the effect of noise peaks on the measurement signal	
		no		
COEF	Sensitivity coefficient	XXXX	Coefficient specific to measuring tube	0 TO 999.9 µV/m/sec
CLIn	Linearity coefficient	XXXX	Adjusts linearity during calibration	-99.99 TO 99.99 µV/m/sec
dECA	Output stage offset	XXXX	Sets the output stage zero current point	00.00 TO 10.00
PCAL	Output stage gain	XXXX	Parameter of adjustment of the amplifier output current gain	0.500 TO 1.500
LAnG	Language used for mnemonics	FrAn	French	
		EnGL	English	

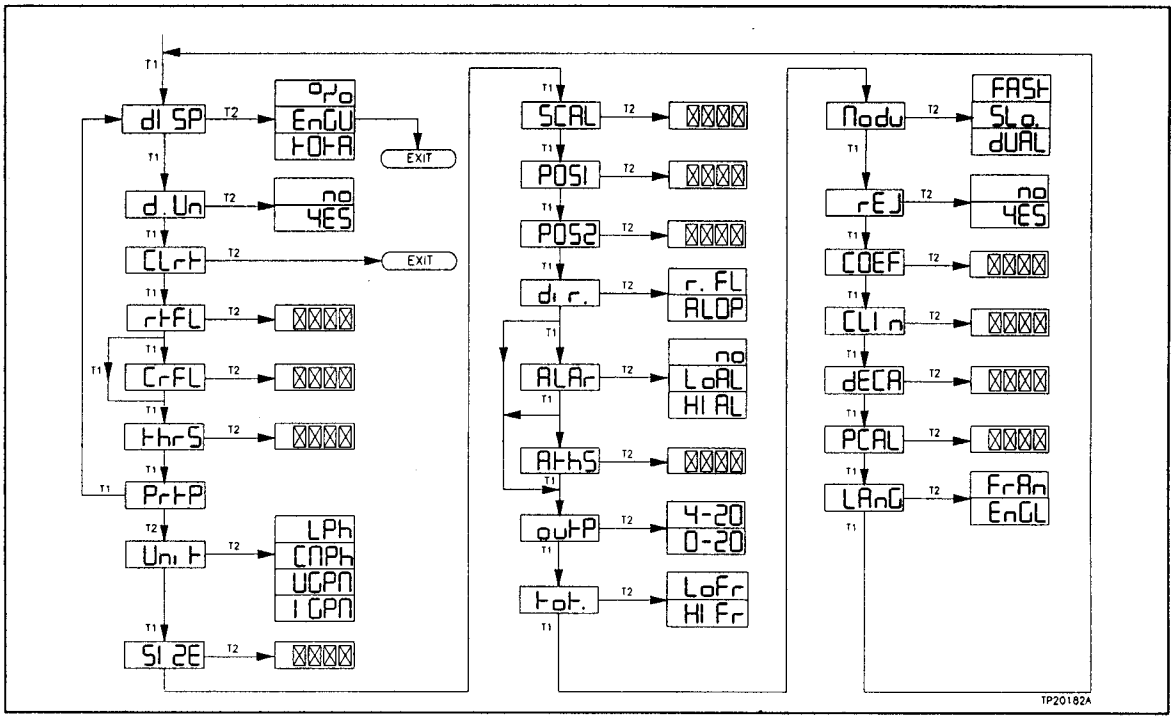


Figure 4-2. INFIMAG 90 Flowmeter Configuration Menu Flowchart

Accessible Parameter Modification

1. Press the **T1** key to access the pull down menu.

2. Press the **T1** key successively until reaching the desired parameter.

3. Press the **T2** key to display the value of the parameter.

4. Press the **T2** key again and observe the current value begin to flash.

5. Press the **T1** key until reaching the desired value.

6. Press the **T2** key to validate the new value.

   NOTE: When the value to be changed is a number, repeat Steps 5 and 6 for all four digits.

7. Press the **T1** key to go back to the pull down menu.

8. To get out of the pull down menu:

   a. If the changed parameter was the dISP parameter, the flowmeter returns to the measuring mode upon validation of the new value.

   b. If the changed parameter was any other besides the dISP parameter, press the **T1** key until reaching the dISP mnemonic, then press the **T2** key three times.

Protected Parameter Modification

1. Press the **T1** key to access the pull down menu.

2. Press the **T1** key until reaching the PrtP mnemonic.

3. Press the **T2** key to validate the PrtP mnemonic.

4. Press the **T1** key successively until reaching the desired parameter.

5. Press the **T2** key to display the value of the parameter.

6. While pressing and holding the **T2** key, press the **T1** key and observe the current value begin to flash.

7. Press the **T1** key until reaching the desired value.

8. Press the **T2** key to validate the new value.

NOTE: When the value to be changed is a number, repeat Steps 7 and 8 for all four digits.

7. Press the **T1** key to go back to the pull down menu.

8. To get out of the pull down menu, press the **T1** key until reaching the dISP mnemonic, then press the **T2** key three times.

PREOPERATING ADJUSTMENTS

Check the data on the measuring tube and electronics nameplates (see Figure 3-1). Make sure the data (SIZE, COEF and CLIn) agrees with the displayed values.

NOTES:
1. Always enter the nominal diameter (SIZE mnemonic) before the full scale value (SCAL mnemonic).

2. Do not alter the PCAL and dECA values (factory set).

The sensitivity coefficient (COEF mnemonic) for the 1 percent accuracy class comes from a calibration with water for a full scale corresponding to a fluid velocity of 3 meters per second (10 feet per second).

All 0.5 percent accuracy class flowmeters are calibrated (i.e., COEF determined) for the velocity corresponding to 100 percent of the full scale selected.

The second calibration coefficient (CLIn) also occurs during the factory calibration.

The flowmeter normally comes with a standard configuration:

- Output signal: 4 to 20 mA
- Dual modulation (zero correction time set to ten seconds).
- Unidirectional flow.
- No flow threshold or alarm.

NOTE: All configuration parameters can be easily modified. Refer to ***NORMAL OPERATING CONSIDERATIONS*** in this section of the manual for more detail.

Modulation Selection

Generally, INFIMAG 90 flowmeters leave the factory programmed for dual modulation operation. After ensuring there is no zero drift problem, fast modulation may be selected.

Response Time

OUTPUT SIGNAL RESPONSE TIME.

The response time at 63 percent of the output signal is shown by the mnemonic rtFL (see Figure 4-3).

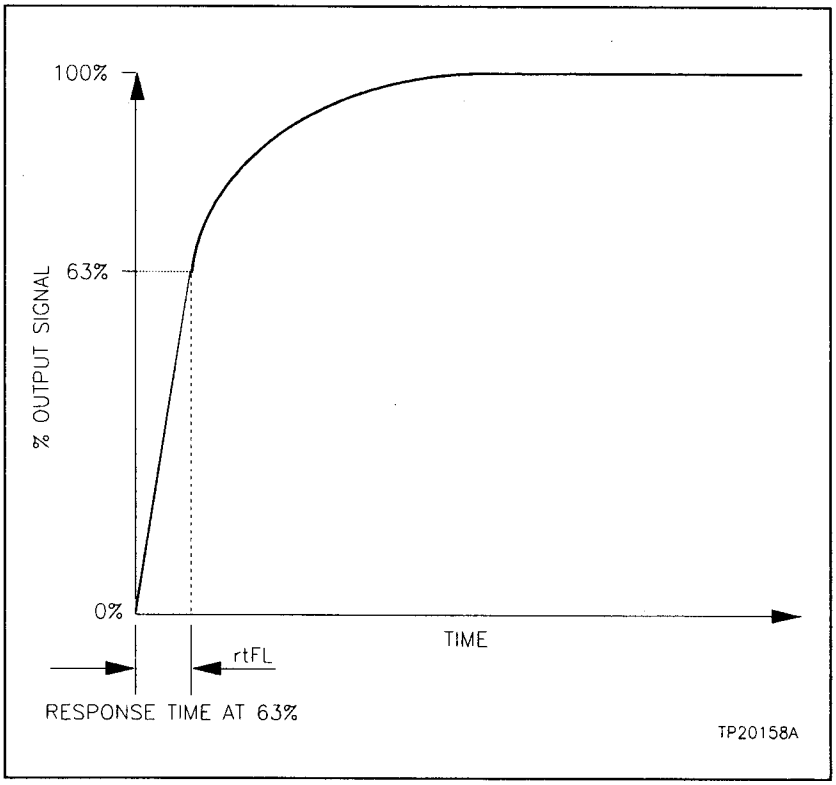


Figure 4-3. Response Time

Let be the response time displayed at 63 percent, then according to the equation:

$$1 - \% = e^{-T/t},$$

the response times are:

T1 = 2.3 x at 90%
T2 = 3.0 x at 95%
and T3 = 4.6 x at 99%.

ZERO CORRECTION TIME (CrFL)

This function only applies when using dual modulation. The standard value for CrFL is 10 seconds. Be sure that CrFL is always greater than rtFL.

If measurement noise is high (very low frequency noise), and if the displayed filtering time is insufficient, increase CrFL (the limit values are 0 to 600 seconds) before altering the response time (rtFL).

NOTES:
1. The filtering time corresponding to CrFL has no effect on the response time of the final measurement.

2. Set CrFL such that measurement noise is limited.

Noise Rejection Mode

After enabling this function, the stability of the output signal improves when large amplitude noise pulses are present at the measuring tube electrodes during flow of heterogeneous fluids. Signal variation is truncated to 30 percent of full scale.

Use this mode for flow rates that vary slowly (variation in flow rate less than 30 percent of full scale), or if the very low frequency (less than 1 hertz) measurement noise is very high.

NOTE: This function is to be used with extra care.

RECOMMENDED APPLICATION (rEJ = YES)

See Figure 4-4, EXAMPLE 1 for a graphic representation of this application.

NONRECOMMENDED APPLICATION (rEJ = NO)

In this case, if the rEJ mnemonic is validated, changeover to a higher flow rate occurs stepwise. Each step will be limited to a 30 percent flow increase with respect to the full scale. The result is an increase in response time. See Figure 4-4, EXAMPLE 2 for a graphic representation.

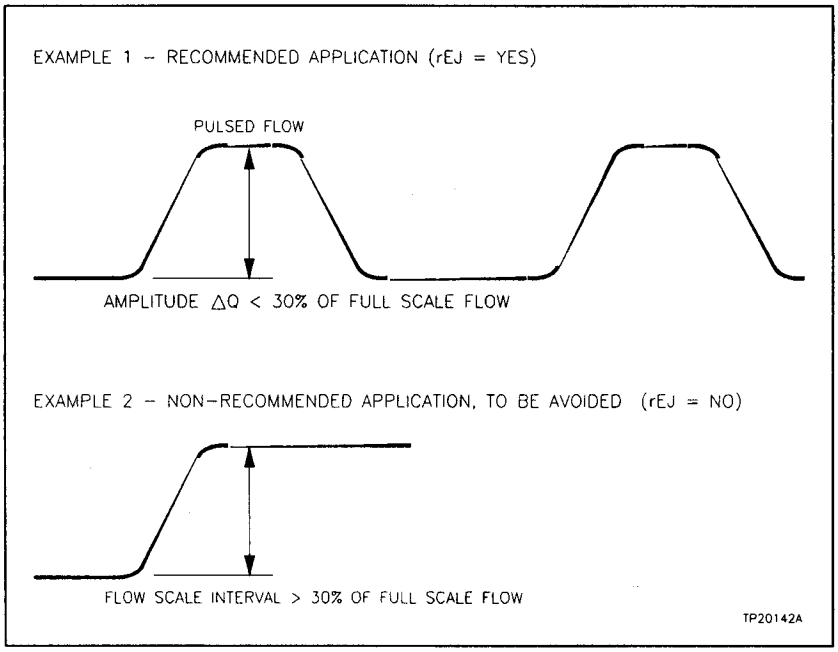


Figure 4-4. Noise Rejection

SECTION 5 – TROUBLESHOOTING

INTRODUCTION

This section contains procedures for isolating problems that can occur with the INFIMAG 90 flowmeter. There are troubleshooting flowcharts that help with this process and provide corrective action. Error codes that appear on the display are also described in this section.

ERROR MESSAGES AND CORRECTIVE ACTION

Table 5-1 lists the error codes that appear on the LCD if a parameter malfunction occurs. It also includes corrective action.

PROBLEM DETERMINATION AND VERIFICATION PROCEDURES

Refer to the troubleshooting flowcharts, Figures 5-1 through 5-4 to isolate and correct a malfunction if one occurs.

Table 5-1. Error Codes

Mnemonic	Designation	Probable Cause	Corrective Action
inIt	Initialization	If the voltage was cut off when the flowmeter was displaying flow or totalized volume, this parameter is briefly displayed at turn-on, then is replaced by the flow or volume display.	If this error code remains displayed, check all parameters.
PArE	Parameter storage fault	NVRAM blank or defective.	1. Switch the power off, and then on again. 2. Check all parameters. If the same message appears, the problem is likely to be with the NVRAM. 3. Replace the electronics assembly and enter the parameters. Refer to **ELECTRONICS ASSEMBLY REPLACEMENT** in the replacement section of this manual.
ErrE	Adjustment impossible	Gain cannot be adjusted (ND, requested full scale and sensitivity coefficient are incompatible).	Enter proper values for size, scal and coef.

Table 5-1. Error Codes (continued)

POEr	Pulse output saturated	Measurement is accurate, but pulse output saturates (maximum pulse output frequency at full scale flow is exceeded).	Increase the pulse output scaling, pos1 and pos2.
ErGn	Gain error	Amplifier gain error indicates a fault in the electronics. The flowmeter still functions, but the measurements are incorrect.	Replace electronics assembly. Refer to **ELECTRONICS ASSEMBLY REPLACEMENT** in the replacement section of this manual.

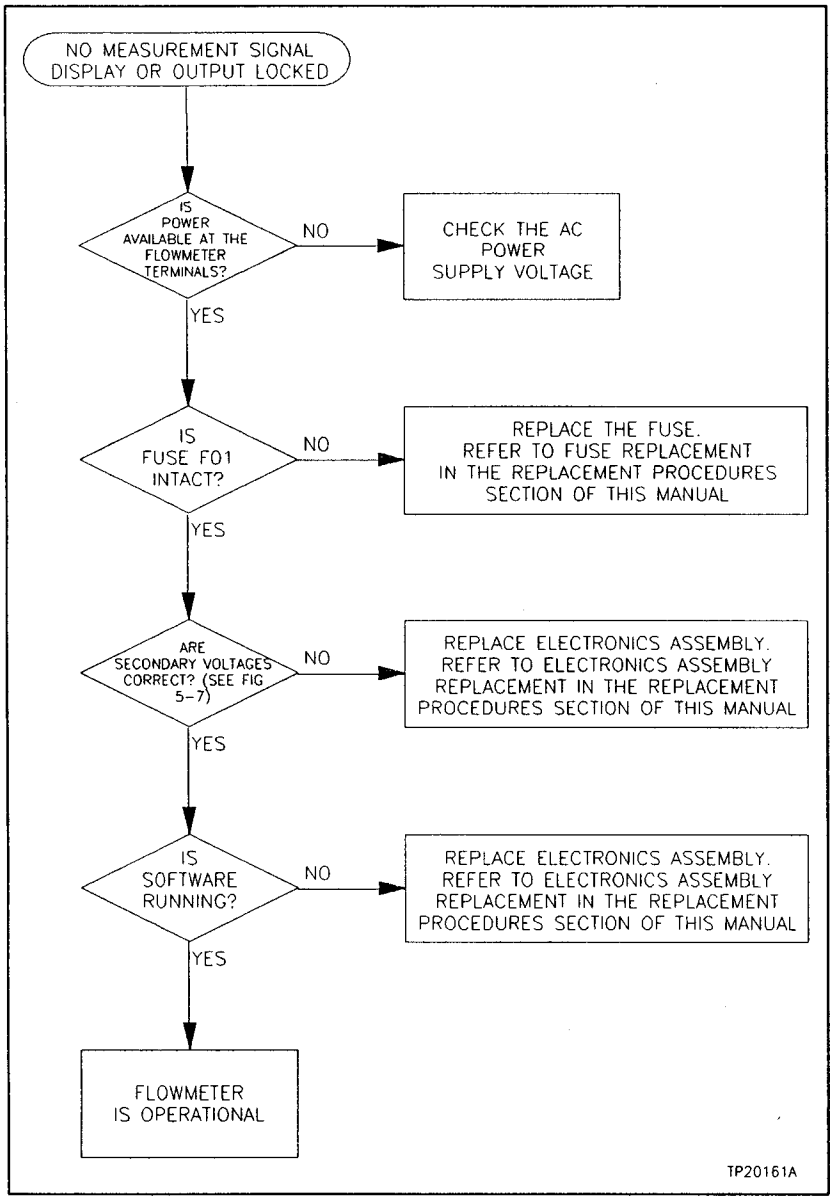


Figure 5-1. No Measurement Signal Display or Output Signal (or Display) Locked Troubleshooting Flowchart

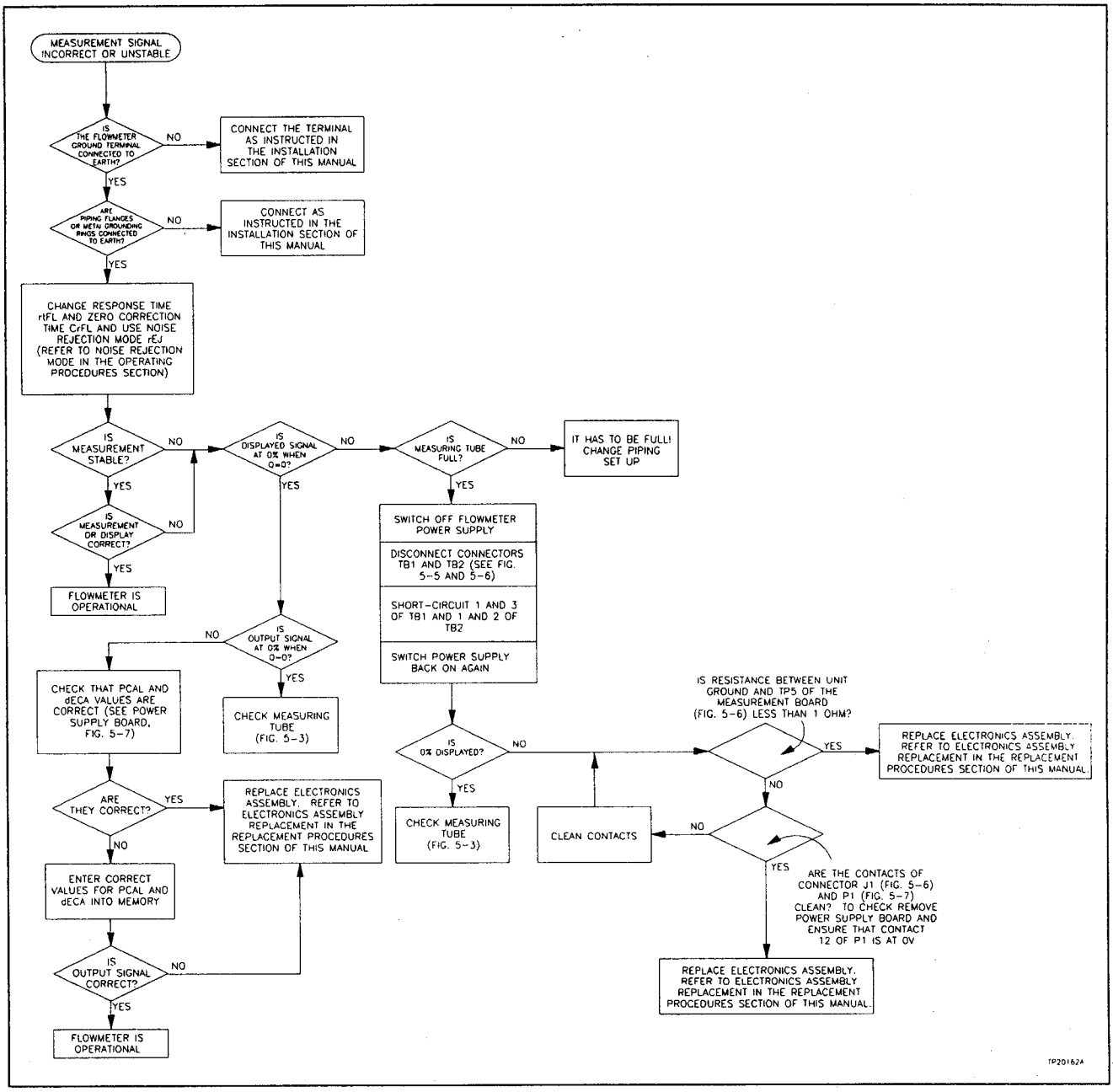


Figure 5-2. Measurement Signal Unstable or Incorrect Troubleshooting Flowchart

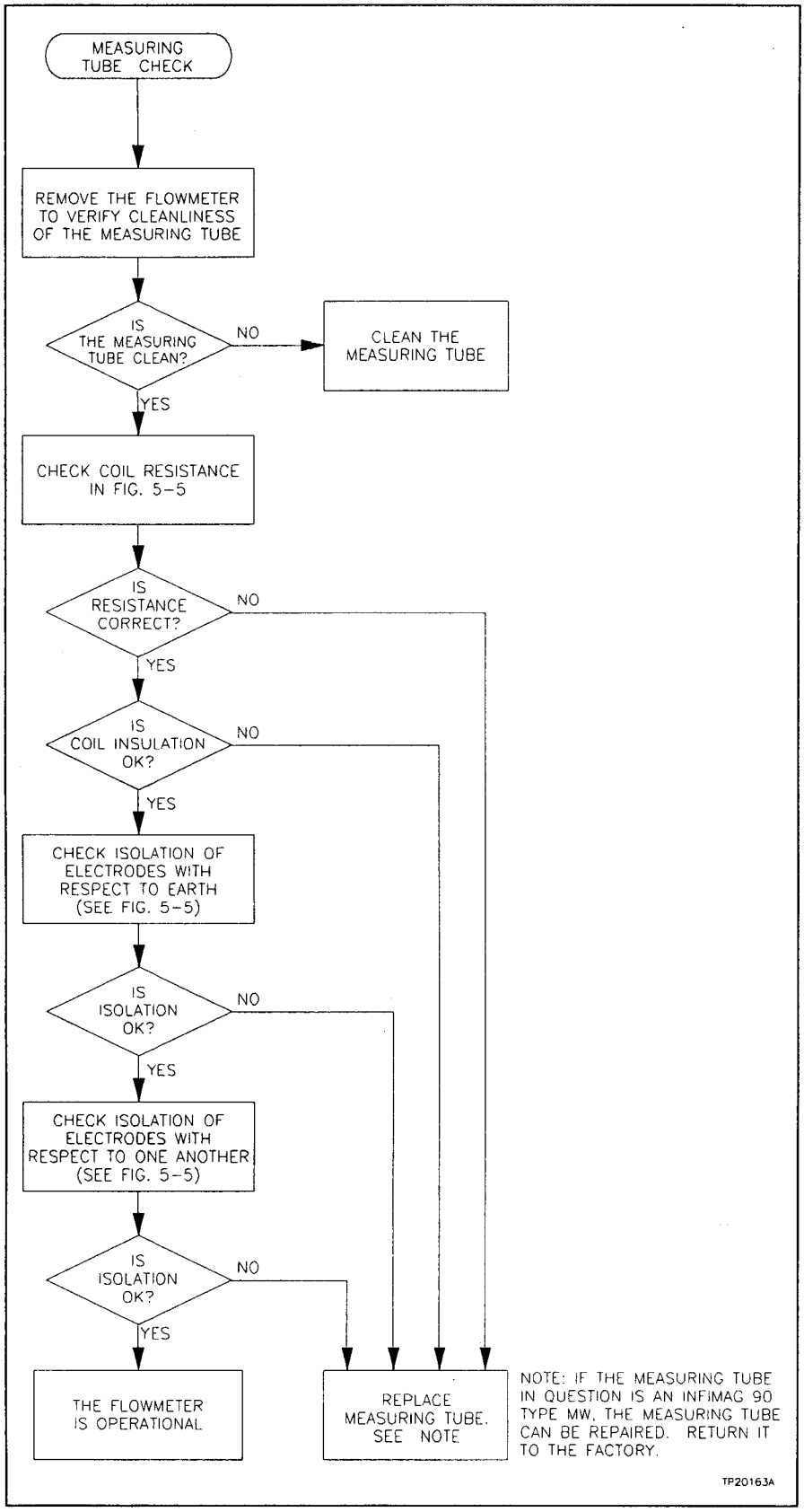


Figure 5-3. Measuring Tube Troubleshooting Flowchart

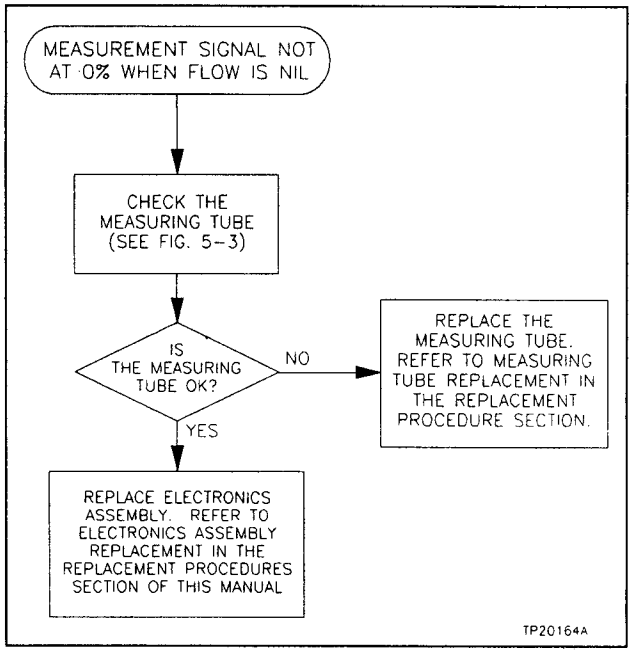


Figure 5-4. Measurement Signal Not at 0 Percent When Flow is Nil Troubleshooting Flowchart

FLOWMETER TYPE	RESISTANCE MEASUREMENTS		
MW AND MF	INSULATION RESISTANCE MEASURED BETWEEN		RESISTANCE R IN OHMS
	COILS	1 OF TB2 AND 5 OF TB1 (0 V)	R > 100M
	ELEC-TRODES	1 AND 5 OF TB1 3 AND 5 OF TB1 1 AND 3 OF TB1	R > 100M
MW	COIL RESISTANCE MEASURED BETWEEN 1 AND 2 OF TB2		
	NOMINAL DIAMETER mm(in.)	R(ohms)	
	4 (5/32) 6 (1/4) 10 (3/8) 15 (1/2)	115	85 < R < 190
	25 (1) 40 (1.5) 50 (2) 80 (3) 100 (4) 150 (6)	104 98 72 110 85 62	78 < R < 176 65 < R < 145 45 < R < 105 65 < R < 145 50 < R < 115 33 < R < 75
MF	COIL RESISTANCE MEASURED BETWEEN 1 AND 2 OF TB2		
	NOMINAL DIAMETER mm(in)	R(ohms)	
	200 (7.874) 250 (9.843) 300 (11.811)	60 44 54	45 < R < 84 32 < R < 62 40 < R < 76

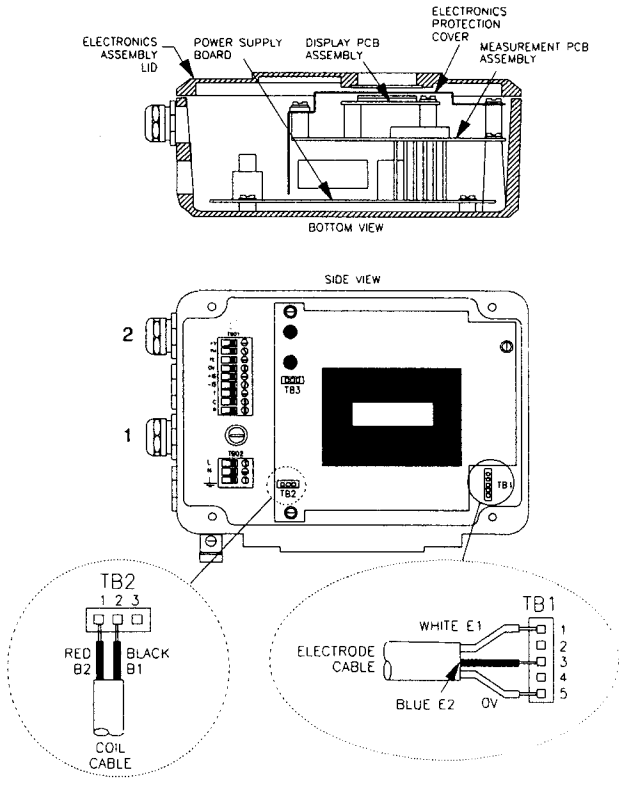


Figure 5-5. Troubleshooting Diagram

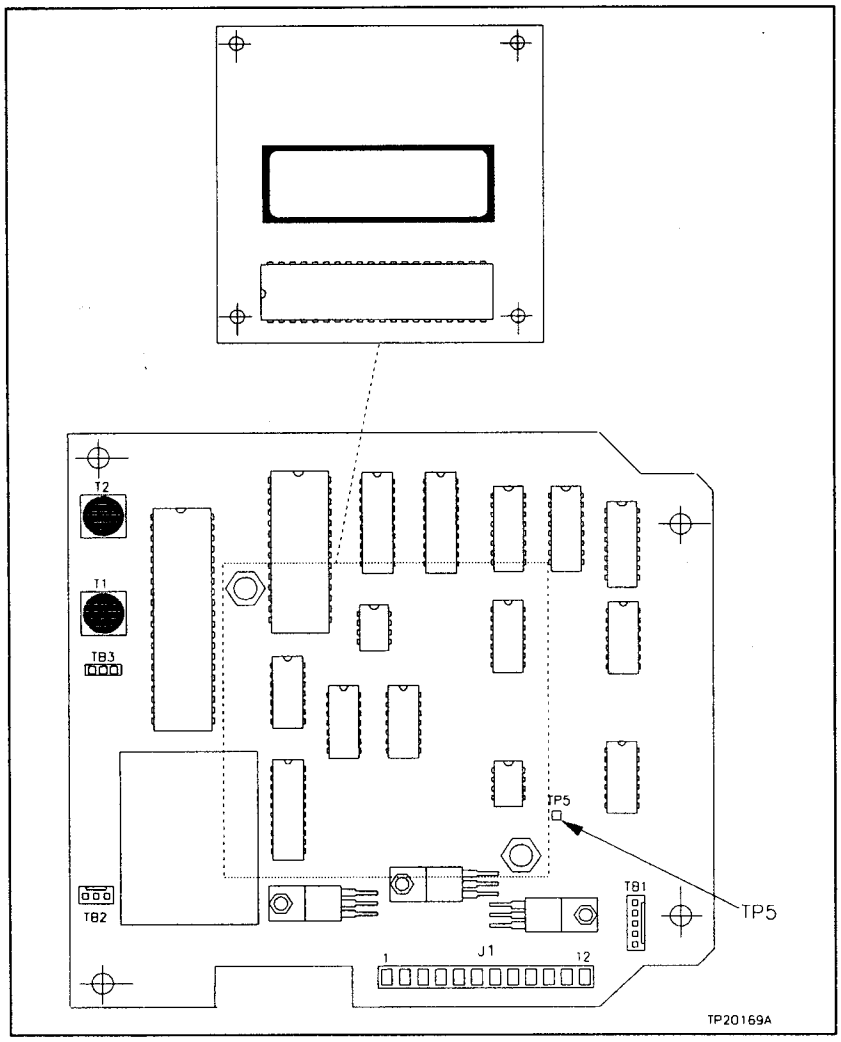


Figure 5-6. Measurement and LCD PCB Assemblies

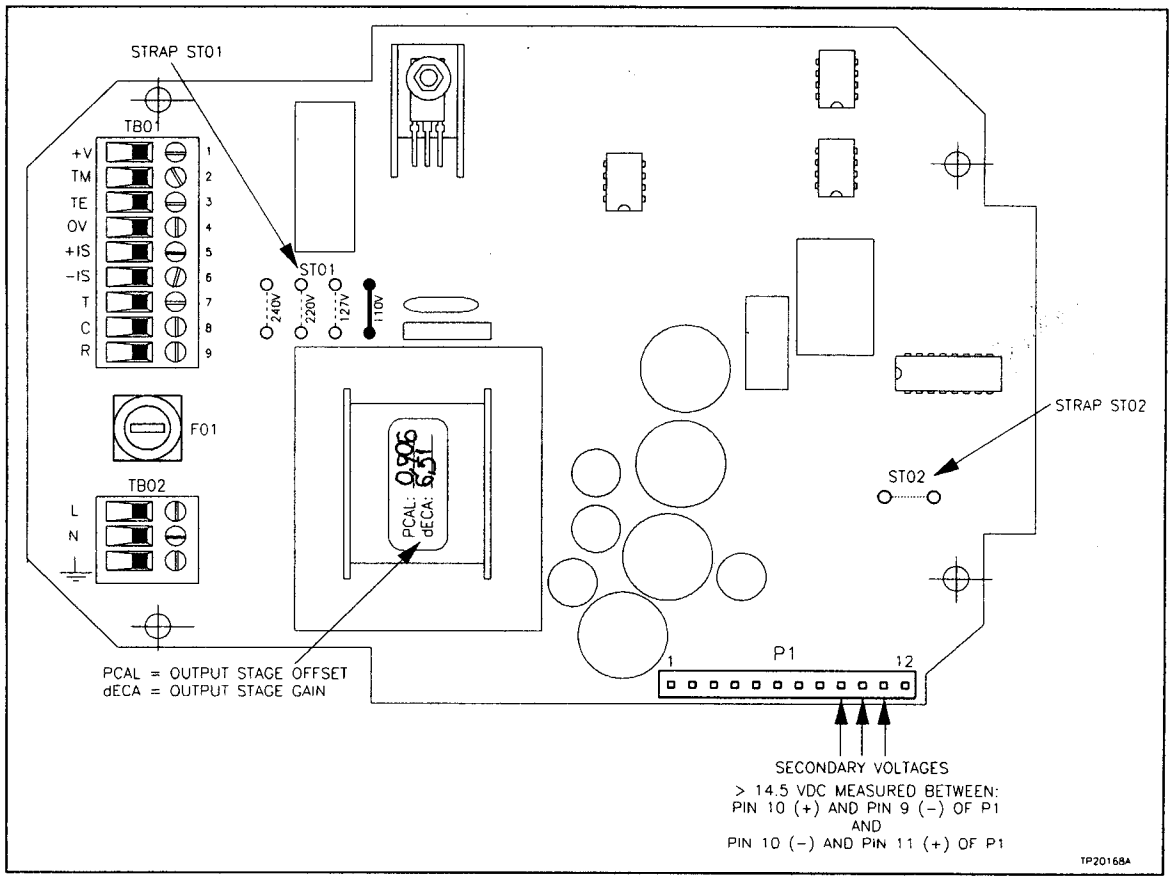


Figure 5-7. Power Supply PCB Assembly

SECTION 6 – MAINTENANCE

INTRODUCTION

The INFIMAG 90 flowmeter requires limited maintenance when operated under normal conditions. However, if used for fluids that carry solid particles or fluids that cause scaling, cleaning may be necessary. Accomplish this using chemical or mechanical means. If cleaning is necessary, install the flowmeter so that removal is possible without stopping the flow of the fluid. See Figure 3-9 in the installation section for bypass setups.

NOTE: Due to the wide variety of possible installations and applications for the INFIMAG 90 flowmeter, mechanical or chemical cleaning procedures must be devised and implemented by the customer.

SECTION 7 – REPLACEMENT PROCEDURES

INTRODUCTION

CAUTION	**System repair must be performed only by qualified personnel and only after securing equipment controlled by the circuit. Altering or removing components from an active circuit may upset the process being controlled.**
ATTENTION	**La réparation du système ne doit être effectuée que par le personnel qualifié et seulement une fois que l'équipement contôlé par le circuit est fixé en place. La modification ou le retrait des composants d'un circuit actif pourraient perturber le processus contrôlé.**

Bailey Controls Company does not recommend printed circuit board repair in the field. Equipment requiring repair should be returned to the factory or your nearest Bailey Controls Company service center.

NOTES:

1. Whenever the electronics protection cover is removed, follow the procedure outlined under **SPECIAL HANDLING** in the installation section of this manual.

2. After replacing components, do not forget to check the flowmeter for correct operation. Be sure to properly close the electronics unit after putting it back into service.

PROCEDURES

The only tools required to perform these procedures are a 4 millimeter allen key and two flat head screwdrivers, one large and one small.

Fuse F01 Replacement

Refer to Figure 3-15 for the location of Fuse F01.

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen screws that secure the flowmeter electronics lid and remove the lid.

3. Using the large screwdriver, turn the fuse holder 1/8-turn counterclockwise.

4. Remove the fuse from the fuse holder and replace with the same type fuse (160 mA, 250 V).

Measuring Tube Replacement

The measuring tube of the INFIMAG 90 Type MW flowmeter cannot be repaired. Therefore, replacement is required. The measuring tube of the INFIMAG 90 Type MF flowmeter can be repaired. The Type MF flowmeter measuring tube must be returned to the factory for repair.

Refer to the illustrations in the installation section of this manual for the locations of the various components.

MEASURING TUBE REPLACEMENT FOR INFIMAG 90 FLOWMETERS WITH INTEGRAL ELECTRONICS

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen screws that secure the flowmeter electronics lid.

3. Use the large screwdriver to loosen the three captive screws securing the electronics protection cover to the electronics housing and remove the cover.

4. Disconnect connectors TB1 and TB2 from the measurement PCB assembly.

5. Remove the ground connection from the ground terminal of the measuring tube.

6. Use the 4 mm allen key to remove the four allen head screws that secure the measuring tube to the electronics housing.

7. Feed the wires through the hole in the bottom of the electronics housing.

8. Reverse Steps 7 through 2 of this procedure to install the new (or repaired) measuring tube, and then go on to Step 9.

NOTES:
1. Do not forget to install the gasket during assembly.

2. Tighten the four allen head screws that connect the measuring tube to the electronics to 2 to 2.5 Nm (18 to 22 in.- lb).

9. Enter the new measuring tube sensitivity (COEF) and linearity coefficient (cLIn) as indicated on the new (or repaired) measuring tube identification plate. Refer to the operating procedures section to enter these values.

MEASURING TUBE REPLACEMENT FOR INFIMAG 90 FLOWMETERS WITH REMOTE ELECTRONICS

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen screws that secure the remote terminal housing lid and remove the lid.

3. Disconnect connectors TB01 and TB02 from the remote terminal board.

4. Remove the ground connection from the ground terminal of the measuring tube.

5. Use the 4 mm allen key to remove the four allen head screws that secure the measuring tube to the remote terminal housing.

6. Feed the wires through the hole in the bottom of the remote terminal housing.

7. Reverse Steps 6 through 2 of this procedure to install the new (or repaired) measuring tube, and then go on to Step 8.

NOTES:
1. Do not forget to install the gasket during assembly.

2. Tighten the four allen head screws that connect the measuring tube to the electronics to 2 to 2.5 Nm (18 to 22 in.-lb).

8. Enter the new measuring tube sensitivity (COEF) and linearity coefficient (cLIn) as indicated on the new (or repaired) measuring tube identification plate. Refer to the operating procedures section to enter these values.

Electronics Replacement

Refer to the illustrations in the installation section of this manual for the locations of the various components.

ELECTRONICS REPLACEMENT FOR INFIMAG 90 FLOWMETERS WITH INTEGRAL ELECTRONICS

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen screws that secure the flowmeter electronics lid and remove the lid.

3. Use the large screwdriver to loosen the three captive screws securing the electronics protection cover to the electronics housing and remove the cover.

4. Disconnect connectors TB1 and TB2 from the measurement PCB assembly.

5. Use the small screwdriver to remove the wires from TB01 and TB02 on the power supply PCB assembly. Label the wires to assure proper assemly into the new electronics.

6. Loosen the cable glands and remove the cables.

7. Remove the ground connection from the ground terminal of the electronics housing.

8. Use the 4 mm allen key to remove the four allen head screws that secure the measuring tube to the electronics housing.

9. Feed the wires through the hole in the electronics housing.

10. Reverse Steps 9 through 2 of this procedure to install the new electronics, and then go on to Step 11.

NOTES:
1. Do not forget to install the gasket during assembly.

2. Tighten the four allen head screws that connect the measuring tube to the electronics to 2 to 2.5 Nm (18 to 22 in.-lb).

11. Enter the measuring tube sensitivity (COEF) and linearity coefficient (cLIn) as indicated on the measuring tube identification plate into the new electronics. Refer to the operating procedures section to enter these values.

ELECTRONICS REPLACEMENT FOR INFIMAG 90 FLOWMETERS WITH REMOTE ELECTRONICS

1. Be sure power is removed from the flowmeter.

2. Use the 4 mm allen key to loosen the four captive allen screws that secure the flowmeter electronics lid and remove the lid.

3. Use the large screwdriver to loosen the three captive screws securing the electronics protection cover to the electronics housing and remove the cover.

4. Use the small screwdriver to remove the wires from TB01 and TB02 on the power supply PCB assembly, and TB4 on the measurement PCB assembly. Label the wires to assure proper installation into the new electronics.

5. Loosen the cable glands and remove the cables.

6. Remove the ground connection from the ground terminal of the electronics housing.

7. Reverse Steps 6 through 2 of this procedure to install the new electronics, and then go on to Step 8.

NOTES:
1. Do not forget to install the gasket during assembly.

2. Tighten the four allen head screws that connect the measuring tube to the electronics to 2 to 2.5 Nm (18 to 22 in.-lb).

8. Enter the measuring tube sensitivity (COEF) and linearity coefficient (cLIn) as indicated on the measuring tube identification plate into the new electronics. Refer to the operating procedures section to enter these values.

Cable Replacement

In most cases, replacement cables come with both ends terminated. If a cable is ordered that needs to be cut to the proper length, terminate the remote terminal housing end as in Figure 7-1. In either case, see Figure 3-16 to install the cable.

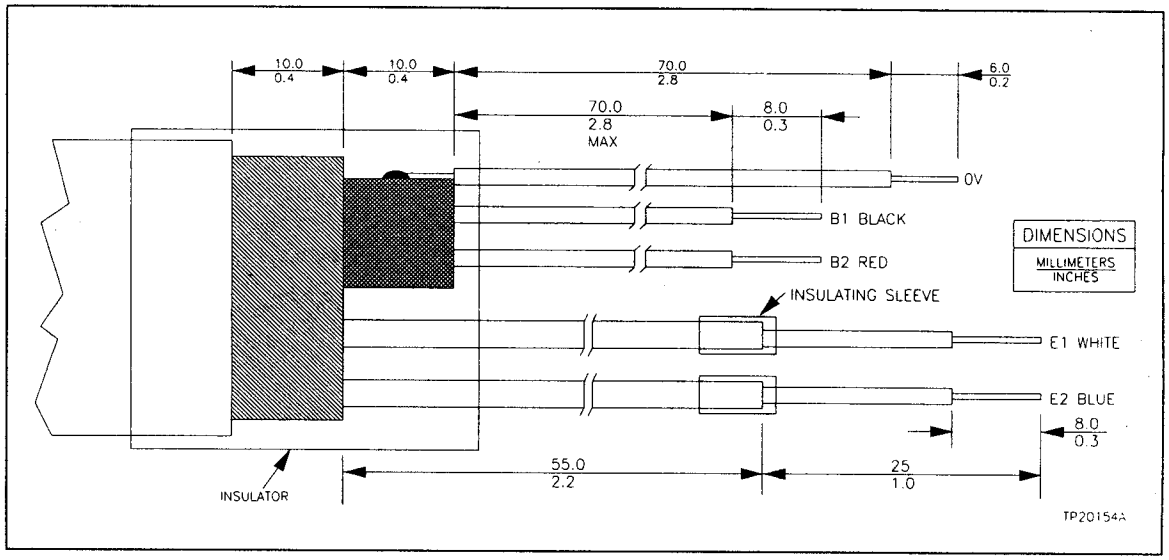


Figure 7-1. Cable Stripping

SECTION 8 – SUPPORT SERVICES

INTRODUCTION

Bailey Controls Company is ready to help in the use, application and repair of its products. Contact your nearest sales office to make requests for sales, applications, installation, repair, overhaul and maintenance contract services.

REPLACEMENT PARTS

When making repairs, order replacement parts from a Bailey sales office. Provide this information:

1. Part description, part number, and quantity.

2. Nomenclature and serial numbers (if applicable).

3. Bailey instruction manual number, page number, and reference figure that identifies the part.

When you order standard parts from Bailey Controls, use the part numbers and descriptions from the replacement parts lists in Tables 8-1 through 8-6. Order parts without commercial descriptions from the nearest Bailey Controls sales office.

The electronics and measuring tube come calibrated from the factory. If these components need to be replaced, calibration coefficients listed on the measuring tube identification plate must be programmed into the INFIMAG 90 flowmeter.

Spare Parts and Accessories

Connection cable for remote electronics - Bailey Controls part number 6639891-1-□, where the length of the cable is specified in the □.

2 inch pipe mounting bracket - Bailey Controls part number 1948843-1.

Antistatic kit - Bailey Controls part number 1948385-1.

Spare Parts Lists

Tables 8-1 through 8-6 list the spare parts that may be required for the Bailey INFIMAG 90 flowmeters.

Table 8-1. Sensor Part Numbers for INFIMAG 90 Type MW Flowmeters

Nominal Diameter mm (in.)		Calibration (%)	Gasket Material	Sensor Part Number
4	(5/32)	1.0	Teflon	1948835-00211
			Klingerit	1948835-00212
6	(1/4)	1.0	Teflon	1948835-00311
			Klingerit	1948835-00312
10	(3/8)	1.0	Teflon	1948835-00411
			Klingerit	1948835-00412
15	(1/2)	1.0	Teflon	1948835-00511
			Klingerit	1948835-00512
		0.5	Teflon	1948835-00551
			Klingerit	1948835-00552
25	(1)	1.0	Teflon	1948835-01011
			Klingerit	1948835-01012
		0.5	Teflon	1948835-01051
			Klingerit	1948835-01052
40	(1 1/2)	1.0	Teflon	1948835-01511
			Klingerit	1948835-01512
		0.5	Teflon	1948835-01551
			Klingerit	1948835-01552
50	(2)	1.0	Teflon	1948835-02011
			Klingerit	1948835-02012
		0.5	Teflon	1948835-02051
			Klingerit	1948835-02052
80	(3)	1.0	Teflon	1948835-03011
			Klingerit	1948835-03012
		0.5	Teflon	1948835-03051
			Klingerit	1948835-03052
100	(4)	1.0	Teflon	1948835-04011
			Klingerit	1948835-04012
		0.5	Teflon	1948835-04051
			Klingerit	1948835-04052
150	(6)	1.0	Teflon	1948835-06011
			Klingerit	1948835-06012
		0.5	Teflon	1948835-06051
			Klingerit	1948835-06052

Table 8-2. Sensor Part Numbers for INFIMAG 90 Type MF Flowmeters

Nominal Diameter mm (in.)	Calibration (%)	Liner Material	Electrode Material	Sensor Part Number
200 (8)	1.0	Teflon	Stainless Steel (316L)	1948836-0801111
			Hastelloy C	1948836-0801112
			Platinum	1948836-0801113
		Polyurethane	Stainless Steel (316L)	1948836-0801121
			Hastelloy C	1948836-0801122
		Rilsan	Stainless Steel (316L)	1948836-0801131
			Hastelloy C	1948836-0801132
	0.5	Teflon	Stainless Steel (316L)	1948836-0805111
			Hastelloy C	1948836-0805112
			Platinum	1948836-0805113
		Polyurethane	Stainless Steel (316L)	1948836-0805121
			Hastelloy C	1948836-0805122
		Rilsan	Stainless Steel (316L)	1948836-0805131
			Hastelloy C	1948836-0805132
250 (10)	1.0	Teflon	Stainless Steel (316L)	1948836-1001111
			Hastelloy C	1948836-1001112
			Platinum	1948836-1001113
		Polyurethane	Stainless Steel (316L)	1948836-1001121
			Hastelloy C	1948836-1001122
		Rilsan	Stainless Steel (316L)	1948836-1001131
			Hastelloy C	1948836-1001132
	0.5	Teflon	Stainless Steel (316L)	1948836-1005111
			Hastelloy C	1948836-1005112
			Platinum	1948836-1005113
		Polyurethane	Stainless Steel (316L)	1948836-1005121
			Hastelloy C	1948836-1005122
		Rilsan	Stainless Steel (316L)	1948836-1005131
			Hastelloy C	1948836-1005132

Table 8-2. Sensor Part Numbers for INFIMAG 90 Type MF Flowmeters (continued)

Nominal Diameter mm (in.)	Calibration (%)	Liner Material	Electrode Material	Sensor Part Number
300 (12)	1.0	Teflon	Stainless Steel (316L)	1948836-1201111
			Hastelloy C	1948836-1201112
			Platinum	1948836-1201113
		Polyurethane	Stainless Steel (316L)	1948836-1201121
			Hastelloy C	1948836-1201122
		Rilsan	Stainless Steel (316L)	1948836-1201131
			Hastelloy C	1948836-1201132
	0.5	Teflon	Stainless Steel (316L)	1948836-1205111
			Hastelloy C	1948836-1205112
			Platinum	1948836-1205113
		Polyurethane	Stainless Steel (316L)	1948836-1205121
			Hastelloy C	1948836-1205122
		Rilsan	Stainless Steel (316L)	1948836-1205131
			Hastelloy C	1948836-1205132

Table 8-3. Electronics Part Numbers for INFIMAG 90 Flowmeters

Electronics Part Number	Electronics Mounting
1948837-1	Integral.
1948838-1	Remote (includes electronics and remote terminal housing).

Table 8-4. Grounding Ring Part Numbers for INFIMAG 90 Type MW Flowmeters

Nominal Diameter mm (in.)	Grounding Ring Material	Grounding Ring Part Number
4 (5/32)	316L Stainless Steel	6639836-21
	Hastelloy C	6639836-31
6 (1/4)	316L Stainless Steel	6639836-21
	Hastelloy C	6639836-31
10 (3/8)	316L Stainless Steel	6639836-21
	Hastelloy C	6639836-31
15 (1/2)	316L Stainless Steel	6639836-22
	Hastelloy C	6639836-31
25 (1)	316L Stainless Steel	6639836-23
	Hastelloy C	6639836-31
40 (1 1/2)	316L Stainless Steel	6639836-24
	Hastelloy C	6639836-31
50 (2)	316L Stainless Steel	6639836-25
	Hastelloy C	6639836-31
80 (3)	316L Stainless Steel	6639836-26
	Hastelloy C	6639836-31
100 (4)	316L Stainless Steel	6639836-27
	Hastelloy C	6639836-31
150 (6)	316L Stainless Steel	6639836-28
	Hastelloy C	6639836-31

Table 8-5. Grounding Ring Part Numbers for INFIMAG 90 Type MF Flowmeters

Nominal Diameter mm (in.)	Grounding Ring Material	Liner Material	Grounding Ring Part Number
200 (8)	Carbon Steel	All	6639837-1
	316L Stainless Steel	All	6639837-4
	Hastelloy C	All	6639837-5
250 (10)	Carbon Steel	Teflon	6639837-6
		Polyerethane	6639837-11
		Rilsan	6639837-6
	316L Stainless Steel	Teflon	6639837-9
		Polyerethane	6639837-14
		Rilsan	6639837-9
	Hastelloy C	Teflon	6639837-10
		Polyerethane	6639837-15
		Rilsan	6639837-10
300 (12)	Carbon Steel	Teflon	6639837-16
		Polyerethane	6639837-21
		Rilsan	6639837-16
	316L Stainless Steel	Teflon	6639837-19
		Polyerethane	6639837-24
		Rilsan	6639837-19
	Hastelloy C	Teflon	6639837-20
		Polyerethane	6639837-25
		Rilsan	6639837-20

Table 8-6. Mounting Kit Part Numbers for INFIMAG 90 Type MW Flowmeters[1]

Nominal Diameter mm (in.)		Mounting Kit Part Number	
		ANSI 150	ANSI 300
4	(5/32)	1948866-0051	1948866-0052
6	(1/4)	1948866-0051	1948866-0052
10	(3/8)	1948866-0051	1948866-0052
15	(1/2)	1948866-0051	1948866-0052
25	(1)	1948866-0101	1948866-0102
40	(1 1/2)	1948866-0151	1948866-0152
50	(2)	1948866-0201	1948866-0202
80	(3)	1948866-0301	1948866-0302
100	(4)	1948866-0401	1948866-0402
150	(6)	1948866-0601	1948866-0602

NOTE:
1. There is no mounting kit for INFIMAG 90 Type MF Flowmeter.

TRAINING

Bailey Controls has modern training facilities that provide service and repair instruction. These facilities are available for training of your personnel. Contact a Bailey Controls sales office for specific information and scheduling.

TECHNICAL DOCUMENTATION

Additional copies of this manual are available at the nearest sales office at a reasonable charge.

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