Instruction Manual

Electromagnetic Flowmeters

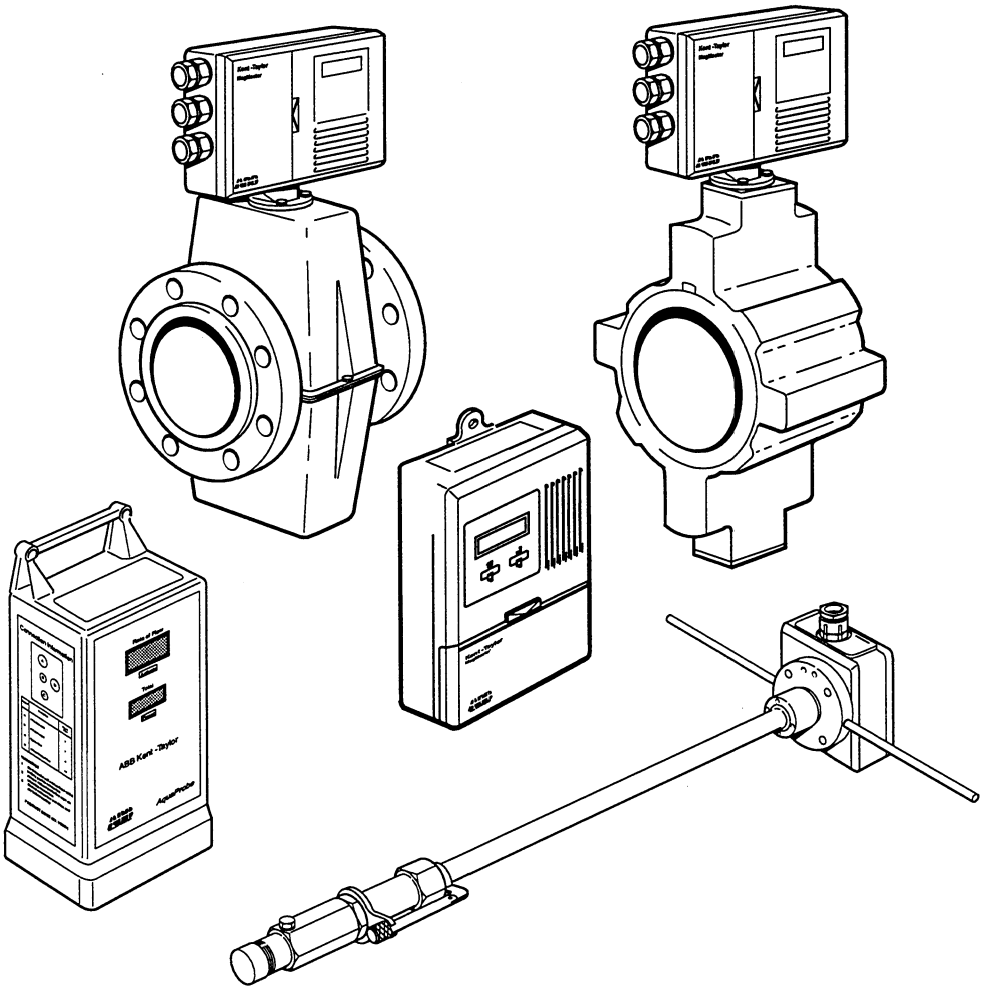


ABB Instrumentation

ABB KENT-TAYLOR

St Neots
ISO 9001 1987 and
EN 29001 1987
BS 5750 Part 1 : 1987
Certificate No. Q5907

Stonehouse
ISO 9001 1987 and
EN 29001 1987
BS 5750 Part 1 : 1987
Certificate No. FM 21106

Stonehouse
Certificate No.0255

The Company

ABB Kent-Taylor is an established world force in process instrumentation offering users a total capability in the wide range of product lines available, backed by the worldwide manufacturing, test, calibration and sales and service facilities that are expected from a market leader.

The quality, accuracy and performance of the Company's products result from over 100 years experience of instrument manufacture, combined with a continuous programme of innovative design and development to incorporate the latest technology.

The NAMAS Calibration Laboratory No. 0255(B) is just one of the ten flow calibration plants operated by the Company, and is indicative of ABB Kent-Taylor's dedication to quality and accuracy.

The Company's instrumentation is suitable for a wide range of industrial and scientific applications such as process control, batch processing, power generation, heat treatment, heating and ventilation, laboratories, food, chemical, petrochemical and water industries.

All products are backed by a high standard of technology, service and engineering support, from skilled, experienced sales and design engineers.

Health and Safety at Work Act 1974 (UK)

Section 6(4) of the above Act requires manufacturers to advise their customers on the safety and handling precautions to be observed when installing, operating, maintaining and servicing their products. Accordingly, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information

Notice

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of Technical Communications Department, ABB Kent-Taylor.

Use of Instructions

Warning. An instruction that draws attention to the risk of injury or death.

Caution. An instruction that draws attention to the risk of damage to the product, process or surroundings.

Note. Clarification of an instruction or additional information.

Information. Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

CONTENTS

INFORMATION

This manual includes the following documents:

INFORMATION

BOOK 1 HAZARDOUS AREA APPROVED VERSIONS

BOOK 2 MECHANICAL INSTALLATION

BOOK 3 ELECTRICAL INSTALLATION

BOOK 4 OPERATION

BOOK 5 FAULT FINDING

BOOK 6 ACCESSORIES AND SPARES

BOOK 7 KEYPAD VERSION

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Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant Books in this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

1 INTRODUCTION

MagMaster™ is a range of high performance electromagnetic flowmeters for the measurement of electrically conductive fluids and slurries, and is normally supplied as a calibrated system with the transmitter factory configured to a supplied full-bore or insertion probe sensor.

A wide range of options is available to suit most applications, including:

- Integral or remote transmitter
- Flanged or wafer style sensors
- Insertion Probes
- Approved Versions, including
  - Hazardous area operation
  - Hygienic
  - HART™ communication protocol.

The **AquaProbe** electromagnetic insertion flowmeter is designed for measurement of the velocity of water and for use in survey applications such as leakage monitoring and network analysis and in permanent locations where cost or space limitations preclude the use of conventional closed pipe meters.

AquaProbe is normally supplied as a calibrated system with an AquaProbe or a MagMaster Transmitter, factory configured to a supplied insertion probe sensor.

AquaMag is a 12 volt d.c. operated electromagnetic flowmeter measuring system comprising a sealed flow sensor and pre-calibrated, programmable transmitter unit, normally supplied as a calibrated system with transmitter factory configured to a supplied full-bore sensor.

1.1 Typical Systems

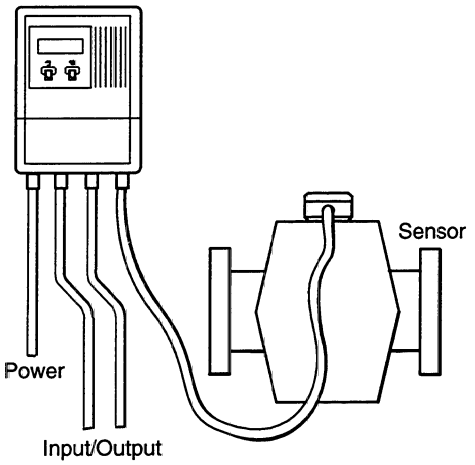


Fig. 1.1 MagMaster Transmitter with full bore sensor

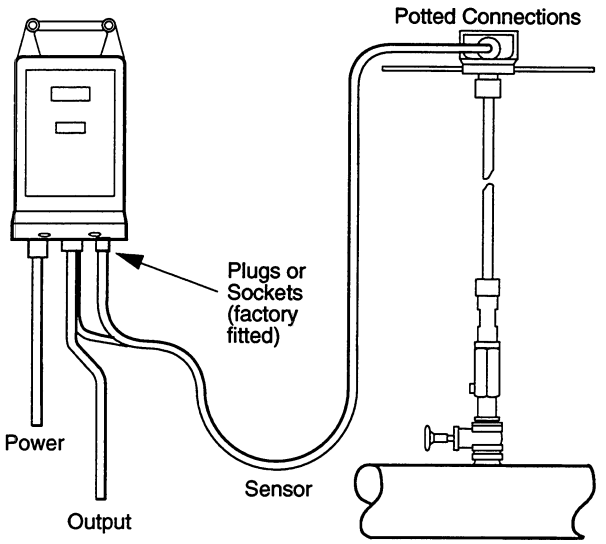


Fig. 1.2 AquaProbe Transmitter with AquaProbe Sensor

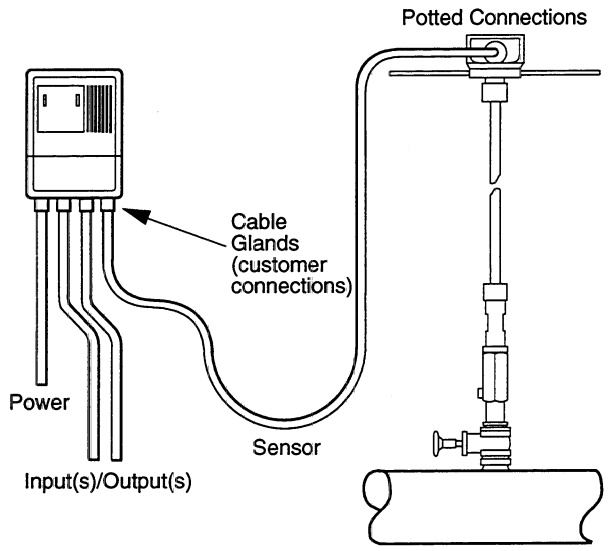


Fig. 1.3 MagMaster Transmitter with AquaProbe Sensor

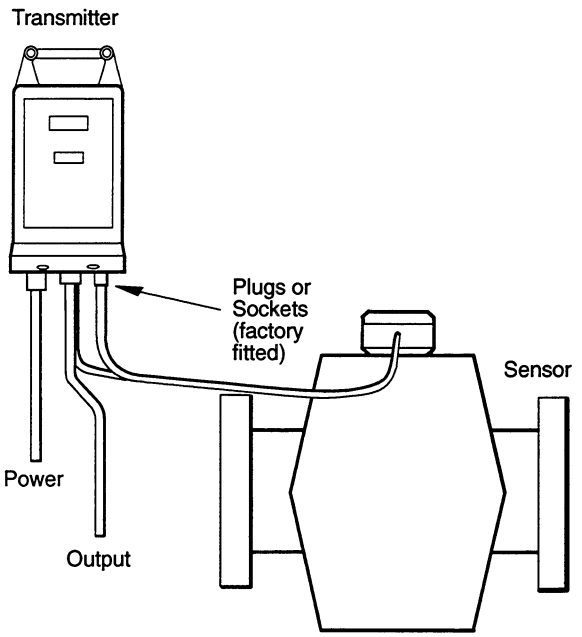


Fig. 1.4 AquaMag Transmitter with full bore sensor

Warning. National and/or local standards for use of slings and shackles, must be observed.

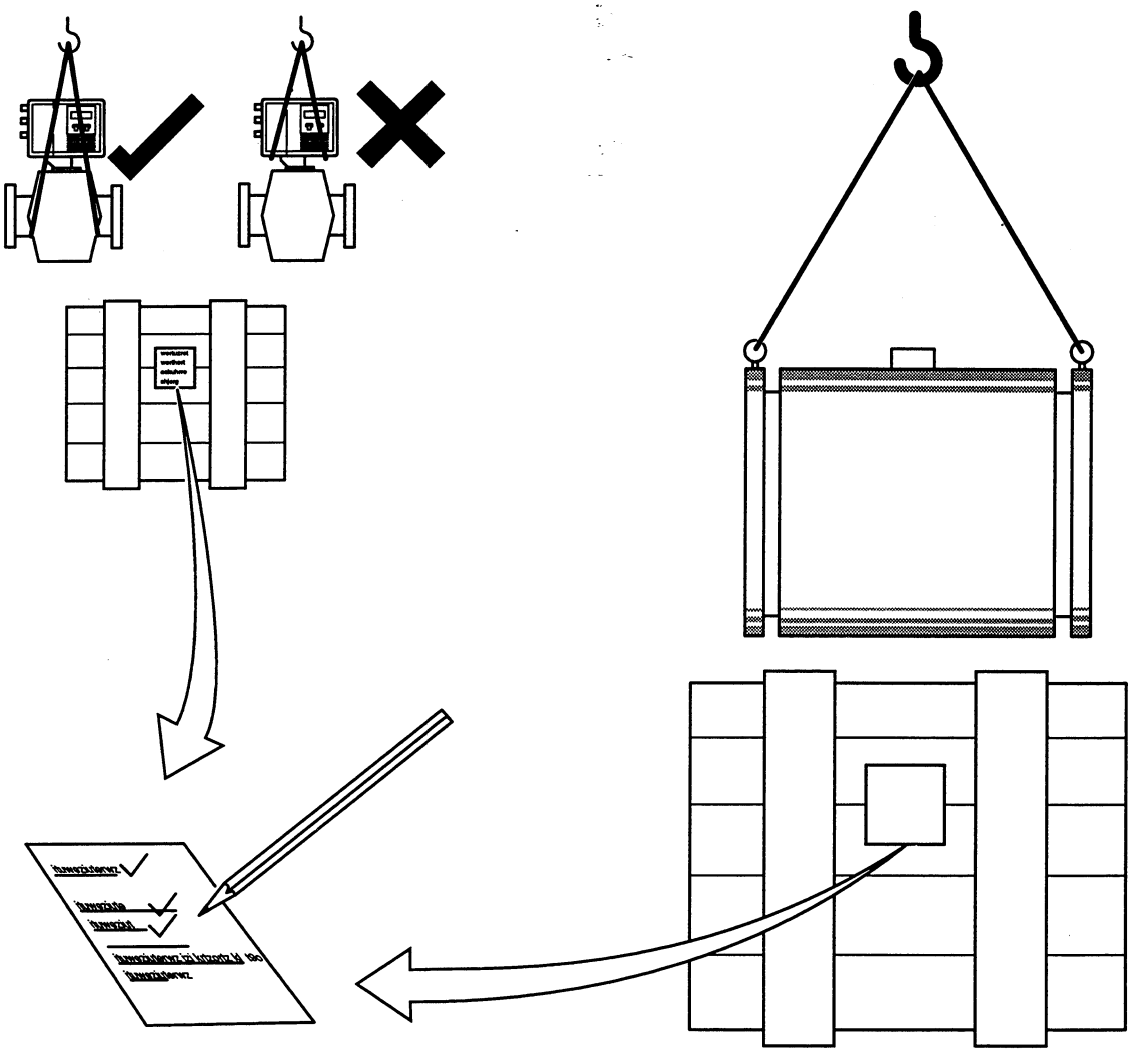
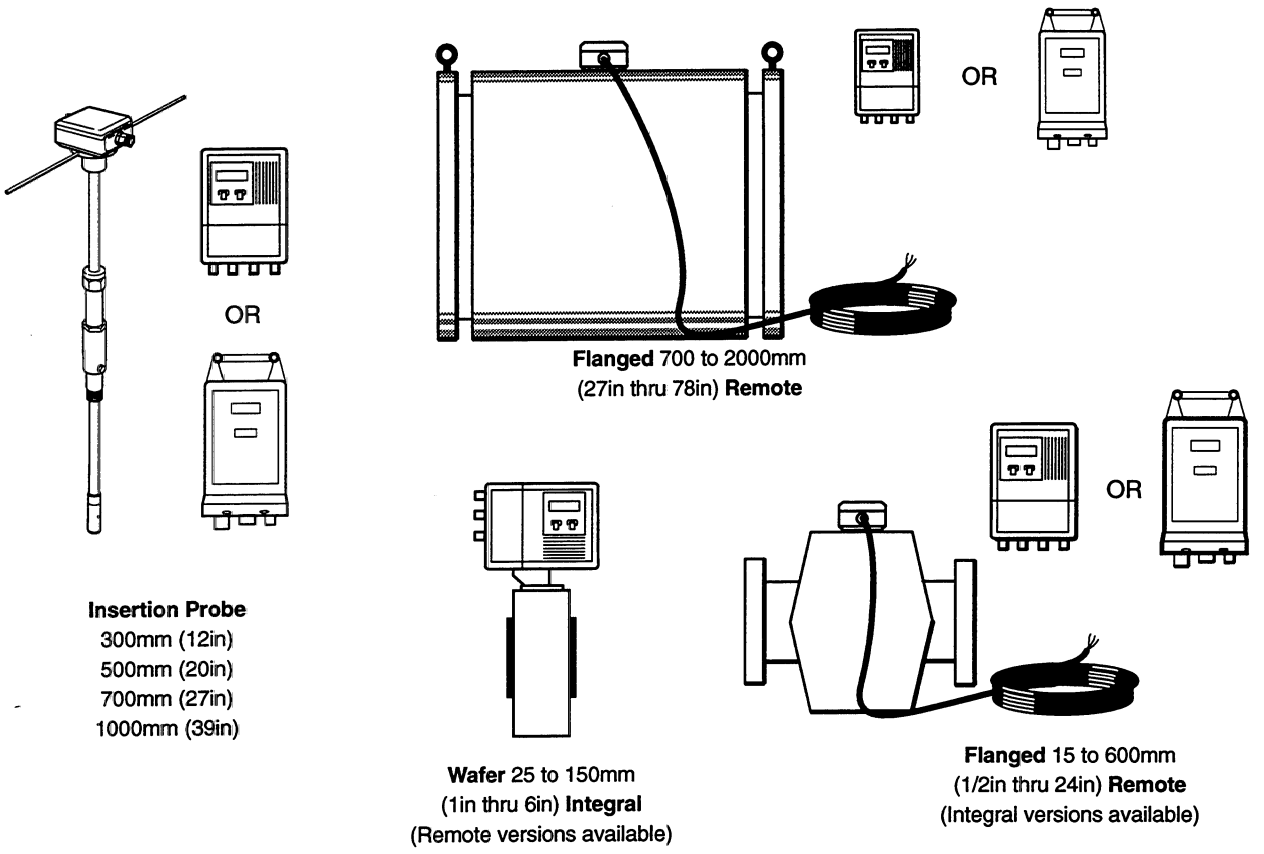


Fig. 2.1 Unpacking and Location of Identification Labels



Insertion Probe
300mm (12in)
500mm (20in)
700mm (27in)
1000mm (39in)

Flanged 700 to 2000mm
(27in thru 78in) **Remote**

Wafer 25 to 150mm
(1in thru 6in) **Integral**
(Remote versions available)

Flanged 15 to 600mm
(1/2in thru 24in) **Remote**
(Integral versions available)

Fig. 2.2 Typical Sensor Arrangements with Remote and Integral Transmitters

BOOK 1
Approvals

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SAFETY MEASURES

Warning.

- EXPLOSION HAZARD.
  SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- EXPLOSION HAZARD.
  DO NOT REMOVE FUSE OR DISCONNECT POWER LEADS WHILE CIRCUIT IS LIVE.
- THE LOCAL TERMINAL MUST NOT BE USED WHEN THERE IS AN EXPLOSION RISK.

MESURES DE SÉCURITÉ

Avertissement.

- RISQUE D'EXPLOSION.
  SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATÉRIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.
- RISQUE D'EXPLOSION.
  NE PAS RETIRER LE FUSIBLE NI DÉBRANCHER LES FILS D'ALIMENTATION TANT QUE LE CIRCUIT EST SOUS TENSION.
- NE PAS UTILIZEZ LE TERMINAL LOCAL EN ATMOSPHÈRE EXPLOSIVE

Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections of this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards

1 CENELEC AND SAA APPROVED FLOWMETERS

Warning.

- The instructions in this section apply only to systems supplied as suitable for Hazardous Area use, these bear a permanently fixed CENELEC/SAA label, BASEEFA certificate number Ex 91C2143 and Australian SAA number Ex 1489, attached to the Sensor. It does not apply to parts or spares supplied as non certified. This is particularly important where replacement equipment is to be incorporated into existing installations or when ordering spares. If in doubt contact ABB Kent-Taylor for advice before proceeding.

- It is essential that the equipment is installed and maintained in accordance with the appropriate standards for electrical equipment for use in flammable atmospheres. Any deviation from the specified installation or conditions of use, or unauthorised repairs or adjustments can invalidate assurances given by the certification of the unit.

- The contents of this book must be thoroughly understood before proceeding with any installation, maintenance, use or repair.

- Systems located in hazardous areas should only be installed and maintained by suitably trained personnel.

- The ultimate responsibility for the safety of any installation lies with the installing user/contractor.

1.1 Introduction

The range of hazardous area approved MagMaster Flowmeters available are listed in Table 1.1
Identification and their use is shown on a certification label, found on the side of the Sensor Termination Box.

Table 1.1 Types of Hazardous Area Approved Flowmeter

MagMaster Sensor Description	Type	Std	Ext
Flange type. 15mm to 150mm	HA3	60	120
Wafer type 25mm to 150mm	HA4	60	120
Flange type, 200mm to 600mm	HA5	60	100

Std. Standard temperature versions – Maximum process and ambient temperatures in °C.
Ext. High temperature versions which are fitted with a terminal box extension – Maximum process temperatures in °C; ambient temperature limits remain at 60°C.

Note. Actual process temperature limit may be restricted further by the temperature limit of the lining option chosen.

An example of a typical label is shown below:

ABB Kent-Taylor

MF-Series Type HA3

EEx e m ia IIC T4	Ex e ia m IIC T4
BASEEFA No.Ex 91C2413	AUS Ex 1489

Voltage Rating = 60Vrms | Um = 250Vrms
Rated Current (coil drive) = 0.5 Amp.
Tamb Max = 60°C
Tprocess_ liquid Max = 60°C

DO NOT OPEN WHILST ENERGIZED

Cenelec and SAA approved MagMaster Flowmeters for hazardous area operation are only available in the remote version.

The hazardous area MagMaster flowmeter sensors can be installed in locations defined as CENELEC approved Zone 1 or Zone 2:

EEx e ia m IIC T4 (T_{amb} = 60°C)

The inside of the pipe is certified to Zone 0.

The **transmitter** must be mounted in the **safe area.**

The approval is valid for the following countries:

Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, as a fully harmonised European Approval which the member countries have agreed to accept. It is also certified by SAA Australia, and Hungary.

The sensors provide complete protection as defined without the need to provide external zener barriers.

Special interconnecting cables are not required for fitting the units, as the standard MagMaster cables are suitable for this purpose. **However, a plant bonding conductor is required to comply with approval.**

1.2 Description

The hazardous area approved MagMaster is in nearly all respects identical to the nonhazardous version. The only significant difference is that the sensor termination box is larger, containing a multiple zener barrier assembly, the operation of which is transparent in normal use.

1.3 Specification

This is identical to the nonhazardous area versions except that the maximum ambient and process temperatures may be lower. Note that the T4 (Tamb max = 60°C) also covers T1, T2, and T3 classifications.

1.4 Installation

Installation of a Hazardous Area MagMaster is similar to that of the standard version described elsewhere in this manual, but it is essential to pay attention to the following points:

Transmitter – The MagMaster transmitter must be located in the safe area. It must be connected to a single phase supply rated at no more that 240 volts. This supply must have an isolator and be fused with an HRC fuse not exceeding 30 Amps rating.
(HRC – HBC high rupture/breaking capacity)

Sensor Cable – Standard or armoured MagMaster sensor cable may be used. These cables may also be run in conduit. The cable between the remote Sensor and the Transmitter must only be that supplied for the purpose by ABB Kent-Taylor Ltd. Other types of cable may not be substituted, even for part runs. Where joints between cables have to be made (e.g. for repairs, or for junctions in panels etc.) use only the ABB Kent-Taylor junction box (see Accessories and Spares section). Where joints are to be made in hazardous areas, the junction box must be approved for this duty.

Glands – Glands as supplied are suitable; substitute glands or conduit fittings must conform to Ex 'e' requirements (70°C) and be suitable for the cable being used.

Earthing – Connect a plant bonding conductor to the anti-rotation device fitted to the sensor.

To comply with approval requirements, the plant bonding conductor or PEC (Protective earth conductor/potential equalising conductor) must be 4mm² or greater, connect to the plant safety earth (earth mat) and provide less than 1 ohm to earth.

Environmental Protection – The approval permits installation below ground level where provision has been made to prevent flooding. However to accommodate accidental flooding (e.g. following a pump failure) or if moisture ingress is possible, the sensor connection box must be potted as soon as connections are completed. Potting is supplied.
For a dry location with no possibility of flooding, it is recommended that the unit is not potted.

Information. Certification does not apply to submerged or buried sensors.

1.4.1 Sensor Box Wiring

The wiring details (see below) are, in general, the same as the standard (non-Hazardous Area) remote version. **However since the safety of the system depends upon reliable connections, the following points must be observed:**

- Prepare cables with care as shown in Book 3 **except** that bared cable ends must be 10mm long, and not 5mm as for the standard version.
- Remove all wire cuttings.
- Note routing of outer screen earth drain wire (see illustration below).
- Sleeve all exposed conductors.
- Fully insert wires into terminal blocks up to the insulation.
- Ensure that terminals, cable clamps, glands etc. are fully tightened.

⚠ **Caution** The sensor connection box contains low value fuses. Under no circumstances should low impedance voltage be applied or electrode cleaning be attempted.

1.5 Safety of Pressurised Flowlines

If the flowmeter is to operate at significantly more than one bar, see the following EECS Newsletter extract.

The extract applies to any electromagnetic flowmeter operated above atmospheric pressure. It is not a limitation on the use of the equipment so much as a limitation of the approval standards, If the plant is deemed unconditionally safe by the following criteria then the contents of the newsletter do not apply.

System is Unconditionally Safe if:

- Operation is nominally 1 bar.
- Pipeline is operated with no explosive gas mixture.
- Pipeline is full of liquid, at any rated pressure.
- Pipeline is reduced to atmospheric pressure before being allowed to drain.
- Pipeline is vented or depressurised, whether empty, full or partly full.
- Transmitter is working normally.
- Transmitter is switched off.

Recommendation – Mount sensor in a low part of pipe run, i.e. pipe normally full.

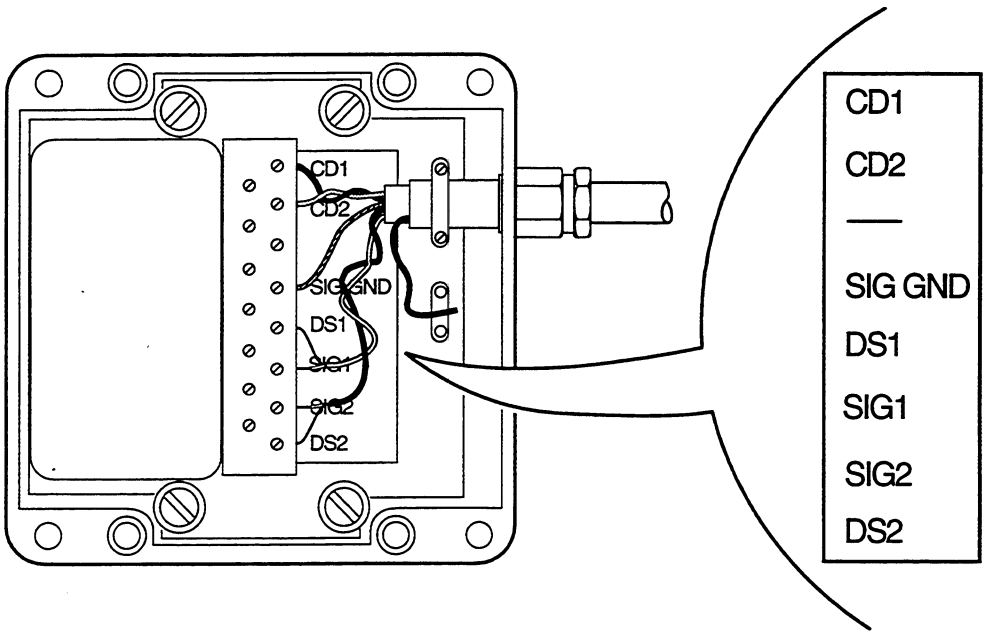


Fig. 1.1 Sensor Box Wiring

EXTRACT FROM EECS NEWSLETTER NUMBER 15 (OCTOBER 1991)

Certification of intrinsically safe apparatus for use at non-atmospheric pressure.

The certification of intrinsically safe electromagnetic flowmeters and like devices which have probes protruding into the process fluids have given us cause for concern for some time. The problem stems from the possibility of voids which contain flammable atmospheres occurring within the process fluid. If the user can guarantee that such voids will not occur, then the inside of the pipe or vessel can be classified as a safe area and no further precautions are needed. If voids may occur but the pressure is not greater than atmospheric, then the problem is already taken care of by the intrinsic safe certification of the circuit of which the probes form a part. Unfortunately, the pressure in the pipe or vessel is almost certainly above atmospheric, and this is where the problem really lies. The intrinsic safety Standard is written and provides data only for explosive mixtures at atmospheric pressure. We do know that as the pressure of an explosive mixture increases, the minimum ignition energy (MIC) required to initiate an explosion, decreases. The amount of information which we have available on this topic is very limited, but we do know that the MIC decreases at an alarming rate as the pressure increases.
EECS put the problem to the members of the Heads of Testing Laboratories Working Group (HOTL) and after some discussion, the unanimous conclusions were as follows:

a. Certificates of conformity with the European Standard are valid only for apparatus which operates at atmospheric pressure;

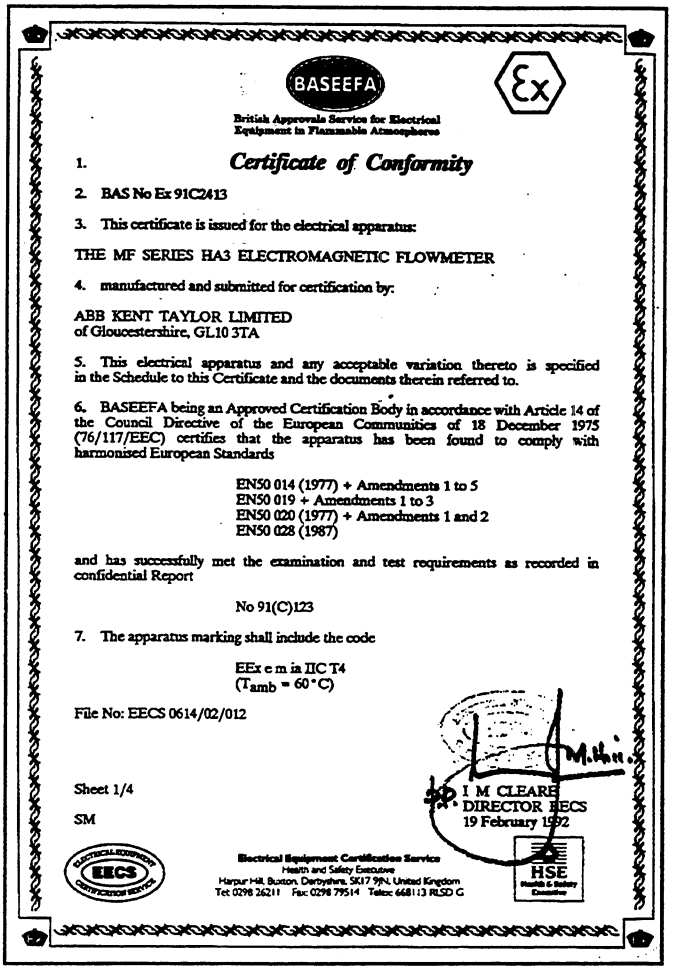
b. the manufacturer must be informed that any certificate of conformity will not be valid for cases where the apparatus is exposed to pressures significantly above atmospheric;

c. a national or inspection certificate may be issued for the apparatus if testing (with the appropriate factors of safety) shows that it is safe for use at the specified elevated pressure.

We have discussed this recommendation with the BASEEFA Advisory Council who have agreed that, if satisfactory measures to prevent the occurrence of voids cannot be taken, we should advise applicants of the limitations of certification of equipment of this type and ask them for confirmation that any danger arising from this source has been recognised and catered for.

Reproduced from EECS Newsletter No. 15 courtesy EECS, Buxton, Derbyshire

1.6 The Approval Certificate



BASEEFA

British Approvals Service for Electrical Equipment in Flammable Atmospheres

1. *Certificate of Conformity*

2. BAS No Ex 91C2413

3. This certificate is issued for the electrical apparatus:

THE MF SERIES HA3 ELECTROMAGNETIC FLOWMETER

4. manufactured and submitted for certification by:

ABB KENT TAYLOR LIMITED
of Gloucestershire, GL10 3TA

5. This electrical apparatus and any acceptable variation thereto is specified in the Schedule to this Certificate and the documents therein referred to.

6. BASEEFA being an Approved Certification Body in accordance with Article 14 of the Council Directive of the European Communities of 18 December 1975 (76/117/EEC) certifies that the apparatus has been found to comply with harmonised European Standards

EN50 014 (1977) + Amendments 1 to 5
EN50 019 + Amendments 1 to 3
EN50 020 (1977) + Amendments 1 and 2
EN50 028 (1987)

and has successfully met the examination and test requirements as recorded in confidential Report

No 91(C)123

7. The apparatus marking shall include the code

EEx e m ia IIC T4
(T_{amb} = 60°C)

File No: EECS 0614/02/012

Sheet 1/4

SM

I M CLEARE
DIRECTOR EECS
19 February 1992

Electrical Equipment Certification Service
Health and Safety Executive
Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom
Tel: 0298 26211 Fax: 0298 79514 Telex: 668113 HSED G

HSE

Extracts from remaining 'Sheets 2 to 4 of 4 sheets' of CERTIFICATE OF CONFORMITY BAS No Ex 91C2413 dated 19 February 1992.

APPARATUS

MF Series HA3 Electromagnetic Flowmeter
Um = 250V r.m.s.
Un = 60V r.m.s.

The apparatus is coded EEx e m ia IIC T4
(Tamb = 60°C. Tprocess fluid = 60°C)

1.6.1 Variation One

To permit the range of MF Series Electromagnetic flowmeters to be constructed in an alternative manner for the 25mm to 150mm diameter pipes which results in the process pipework not being provided with fixing flanges. This range is designated MF Series HA4 Electromagnetic Flowmeters.

1.6.2 Variation Two

To permit the range of MF Series Electromagnetic flowmeters to be extended to include to include nominal diameters from 200mm to 600mm. This range is designated the MF Series HA5 Electromagnetic Flowmeters.

1.6.3 Variation Three

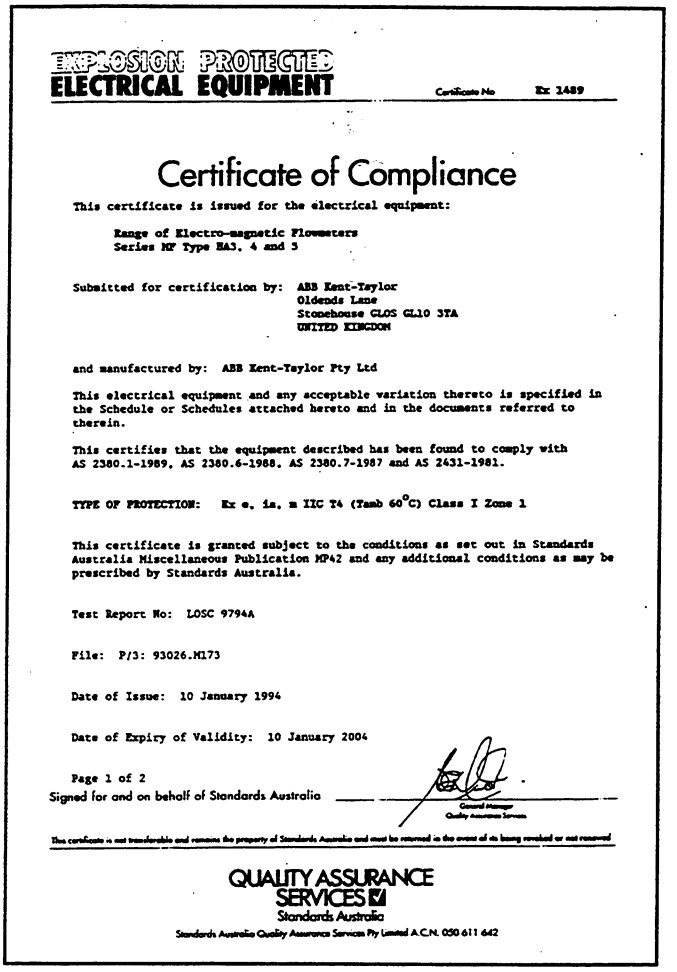
To permit the terminal box, enclosing the electrode safety shunt unit, to be mounted on an extended stalk on any of the range of sizes or styles. This provides a thermal gradient when the process fluid temperature exceeds the normally permitted ambient temperature limit or for installations where steam cleaning of pipework may be required. The safety assessment and the code of the apparatus is unaffected by this change but the permitted process fluid temperatures are as follows:

HA3 15mm to 150mm
EEx e m ia IIC T4
(Tamb max = 60°C. Tprocess fluid max = 120°C)

HA4 25mm to 150mm
EEx e m ia IIC T4
(Tamb max = 60°C. Tprocess fluid max = 120°C)

HA5 200mm to 600mm
EEx e m ia IIC T4
(Tamb max = 60°C. Tprocess fluid max = 100°C)

Caution.
The actual process fluid temperature limit may be lower depending on the lining option chosen.



EXPLOSION PROTECTED
ELECTRICAL EQUIPMENT

Certificate No. Ex 2489

Certificate of Compliance

This certificate is issued for the electrical equipment:

Range of Electro-magnetic Flowmeters
Series MF Type HA3, 4 and 5

Submitted for certification by: ABB Kent-Taylor
Oldends Lane
Stonehouse GLOS GL10 3TA
UNITED KINGDOM

and manufactured by: ABB Kent-Taylor Pty Ltd

This electrical equipment and any acceptable variation thereto is specified in the Schedule or Schedules attached hereto and in the documents referred to therein.

This certifies that the equipment described has been found to comply with AS 2380.1-1989, AS 2380.6-1988, AS 2380.7-1987 and AS 2431-1981.

TYPE OF PROTECTION: Ex e, ia, m IIC T4 (Tamb 60°C) Class I Zone 1

This certificate is granted subject to the conditions as set out in Standards Australia Miscellaneous Publication MP42 and any additional conditions as may be prescribed by Standards Australia.

Test Report No: LOSC 9794A

File: P/3: 93026.M173

Date of Issue: 10 January 1994

Date of Expiry of Validity: 10 January 2004

Page 1 of 2

Signed for and on behalf of Standards Australia

General Manager
Quality Assurance Services

This certificate is not transferable and remains the property of Standards Australia and must be returned in the event of its being revoked or not renewed

QUALITY ASSURANCE SERVICES
Standards Australia

Standards Australia Quality Assurance Services Pty Limited A.C.N. 050 611 642

2.1 Introduction

The range of hazardous area approved MagMaster Flowmeters are listed in Table 2.1 and 2.2.

Identification and use is shown on certification labels – on the side of the terminal box on remote sensors and a corresponding label on the remote transmitter, or, a label on the transmitter only in the case of an integral transmitter and sensor.

Three versions are offered:

a) A remote version consisting of a sensor and transmitter bearing both CSA and FM markings; a major achievement in Hazardous Area approvals. This innovative design employs a multiple zener barrier assembly, the operation of which is transparent in normal use. The barrier is an internal part of the sensor which simplifies installation. The cable entering the Hazardous area is no different to that supplied on the standard product and has no special segregation requirements or any external zener barriers to install, but still offers full Intrinsic Safety inside the pipe section. This version is also certified for use in many other countries worldwide.

b) A remote version with CSA markings but with lower installed cost. This offers non-incendive protection inside the pipe section.

c) An integral version with CSA markings with still lower installed cost. This offers non-incendive protection inside the pipe.

These three versions are depicted in Table 2.2, with a descriptive title and a designation of duty or location.

2.2 Specific Requirements

2.2.1 Supply

Supply to the transmitter must be single phase supply rated at no more than 240 volts. This supply must be fitted with a means of disconnection and be fused with a fuse suitable for the cable employed but not exceeding 35 Amps

2.2.2 Wiring

The safety of the system depends on making reliable connections, and ensuring that connections are checked for being neither loose nor too tight.

Sensor wiring

The cable between the remote Sensor and the Transmitter must only be that supplied for the purpose by ABB Kent-Taylor Ltd. Other types of cable may not be substituted, even for part runs. Where joints between cables have to be made (e.g. for repairs, or for junctions in panels etc.) use only the ABB Kent-Taylor junction box (see Accessories and Spares section). The junction box must be approved for the relevant duty.

Caution.
The DIV 2 Hazardous (Intrinsically safe electrodes) version has a different sensor terminal connection block to all the other variants. (The terminal box is also larger). For this version only, the bared cable ends must be 10mm (0.4") long, and not 5mm as for all other versions.

Transmitter wiring

The transmitter is not designed to accept rigid conduit direct entry. If rigid conduit is employed, the last few feet must be run in flexible conduit and the transmitter be fitted with face sealing adaptors of the type specified in this manual. Alternatively, armoured or standard cable may be used with the face sealing cable glands as specified in this manual.

Only the 0.5" NPT glands and adaptors specified in the manual may be used.

2.2.3 Environmental Considerations

The required NEMA Enclosure Rating must be maintained.

2.2.4 Potting

It is not necessary to pot the remote terminal box unless environmental conditions demand it.
It may be necessary to seal the conduit entry to prevent moisture entering the terminal box via the conduit.
Conduit entries must be sealed if the terminal box is to be potted.

2.2.5 General

Only the specified cables and adaptors may be fitted, and in the manner described elsewhere in this manual.
Some of these options may not be suitable for a particular installation. For example, if mechanical damage to cable could occur, only armoured cable or conduit would be used. Local and National requirements may also preclude some of the above methods.

2.2.6 MagMaster Sensor Temperature Limits

Table 2.1 Temperature Limits

MagMaster Sensor Description	Type	Std	Ext
Flange type. 15mm to 150mm	HA3	60	120
Wafer type 25mm to 150mm	HA4	60	120
Flange type, 200mm to 600mm	HA5	60	100

Std. Standard temperature versions – Maximum process and ambient temperatures in °C.

Ext. High temperature versions which are fitted with a terminal box extension – Maximum process temperatures in °C; ambient temperature limits remain at 60°C.

Note.
Actual process temperature limit may be restricted further by the temperature limit of the lining option chosen.

Table 2.2 Typical Labels for FM and CSA Approved Flowmeters

FM/CSA DIV 2 HAZARDOUS REMOTE ONLY	SENSOR ABB Kent-Taylor CLASS I, DIV 2 GROUPS A,B,C,D Electrodes are intrinsically safe Enclosure 6P ABB Kent-Taylor Limited Stonehouse, Glos. England GL10 3TA Made in England FM APPROVED TRANSMITTER ABB Kent-Taylor ABB Kent-Taylor Limited Stonehouse, Glos. England GL10 3TA CODE SER No SUPPLY 20VA FREQUENCY 47 to 440Hz CLASS I, DIV 2 GROUPS A,B,C,D ENCLOSURE 4X Made in England FM APPROVED	According to codes of practice, national and local requirements; intended suitable for a DIV 2 location with DIV 1 classification inside the pipe (Electrodes are intrinsically safe).
CSA DIV 2 HAZARDOUS REMOTE ONLY	SENSOR ABB Kent-Taylor CLASS I, DIV 2 GROUPS A,B,C,D Electrodes are non incendive ENCLOSURE 6P ABB Kent-Taylor Limited Stonehouse, Glos. England GL10 3TA Made in England TRANSMITTER ABB Kent-Taylor ABB Kent-Taylor Limited Stonehouse, Glos. England GL10 3TA CODE SER No SUPPLY 20VA FREQUENCY 47 to 440Hz CLASS I, DIV 2 GROUPS A,B,C,D ENCLOSURE 4X Made in England	According to codes of practice, national and local requirements; intended suitable for a DIV 2 location with DIV 2 classification inside the pipe (Electrodes are non-incendive).
CSA DIV 2 HAZARDOUS INTEGRAL ONLY	TRANSMITTER ABB Kent-Taylor ABB Kent-Taylor Limited Stonehouse, Glos. England GL10 3TA CODE SER No SUPPLY 20VA FREQUENCY 47 to 440Hz CLASS I, DIV 2 GROUPS A,B,C,D Electrodes are non incendive ENCLOSURE 4X Made in England	According to codes of practice, national and local requirements; intended suitable for a DIV 2 location with DIV 2 classification inside the pipe (Electrodes are non-incendive).

BOOK 2
Mechanical Installation

CONTENTS

BOOK 2 MECHANICAL INSTALLATION

Contents	Page
SAFETY MEASURES	1
1 INTRODUCTION	1
2 INSTALLATION CONDITIONS	2
3 INSTALLATION	4
3.1 Transmitters	4
3.1.1 Location	4
3.1.2 Mounting	4
3.2 Sensors	5

1 INTRODUCTION

This book describes the mechanical installation of MagMaster™ and AquaMag ranges of electromagnetic flowmeters.

Attention to safety measures, installation conditions and general precautions will ensure trouble free operation.

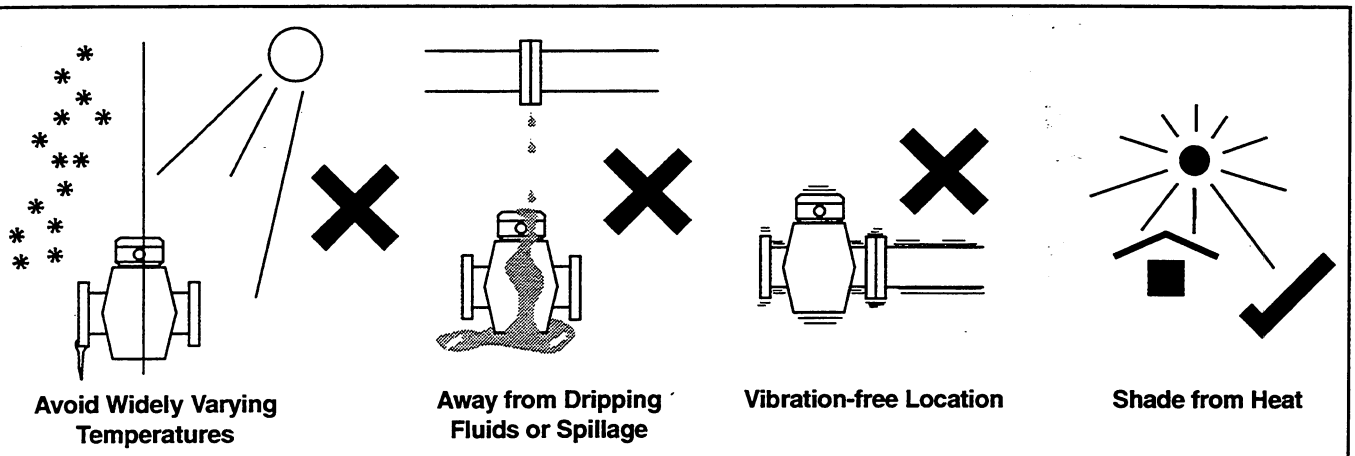
Note. Not all available versions are approved. Mechanical Installation covers general aspects of both approved and non-approved products.

Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections of this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment, and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

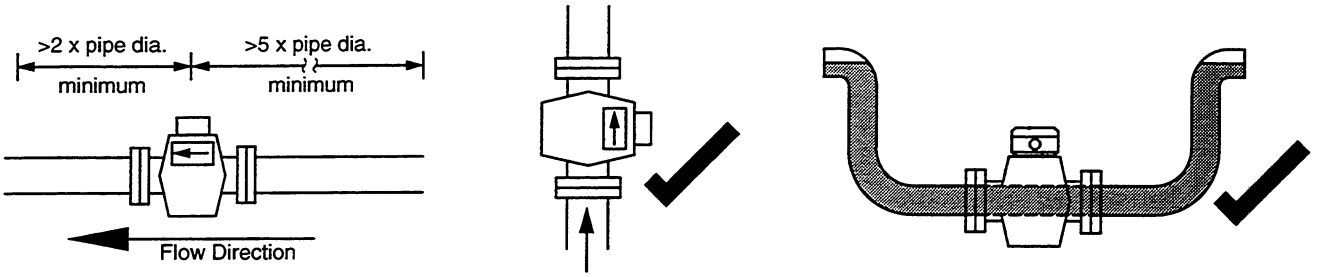
Warning.

- Mating Hygienic end connections, clamps and supplied gaskets as ordered may have a lower pressure and temperature limit than that shown on the sensor data label.



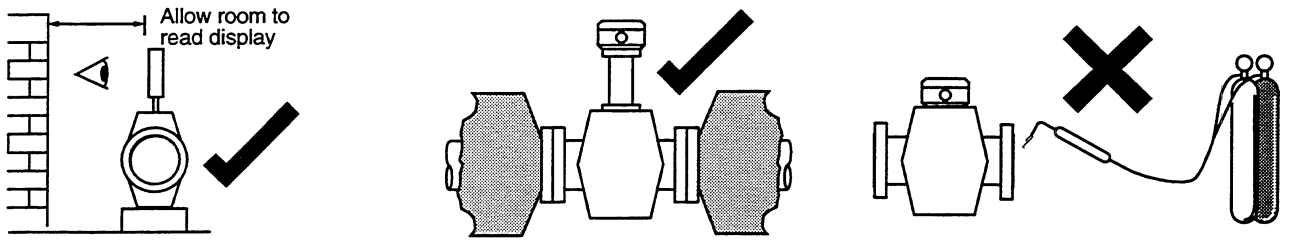
Avoid Widely Varying Temperatures | Away from Dripping Fluids or Spillage | Vibration-free Location | Shade from Heat

Fig. 2.1 Environmental Conditions



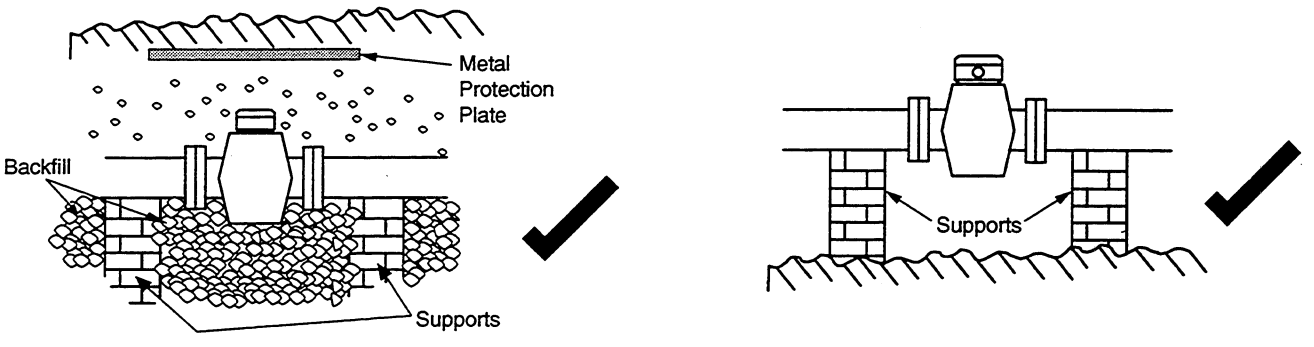
Typical Installation | Flow Direction | Fluid Level

Fig. 2.2 Flow Conditions



Location | Lagging (High Temperature Version) | Avoid Heat Near Linings

Fig. 2.3 Location and General precautions



Under Ground | Above Ground

Fig. 2.4 Location and General Precautions

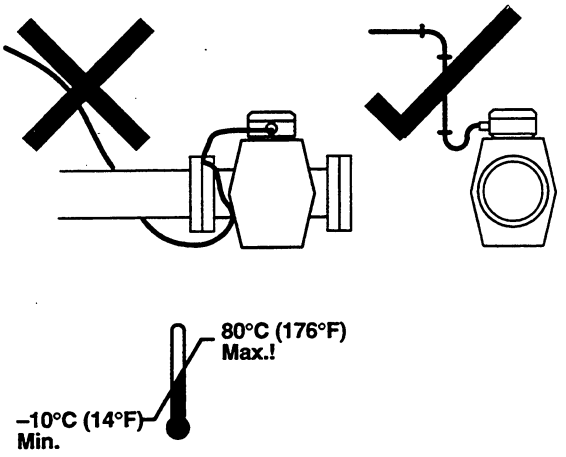


Fig. 2.5 Cable Routing

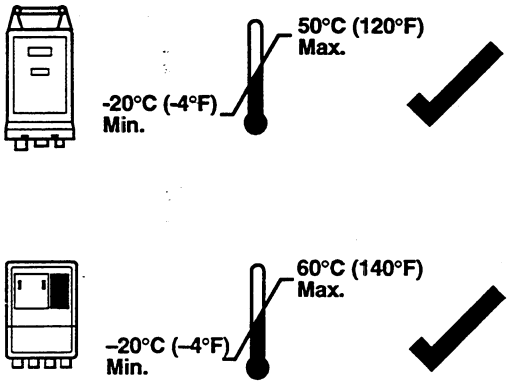


Fig. 2.7 Within Temperature Limits

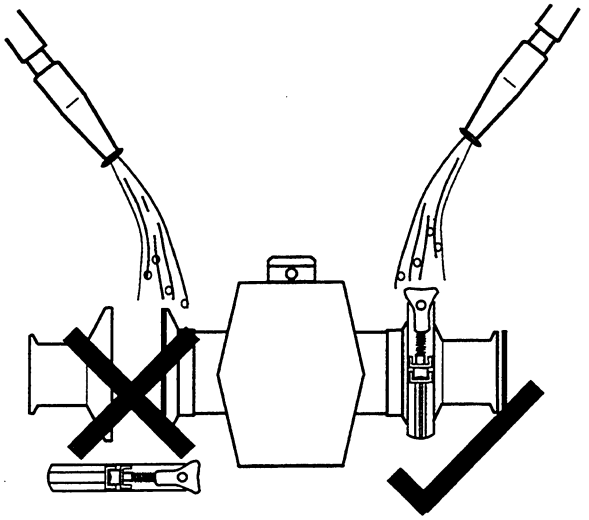
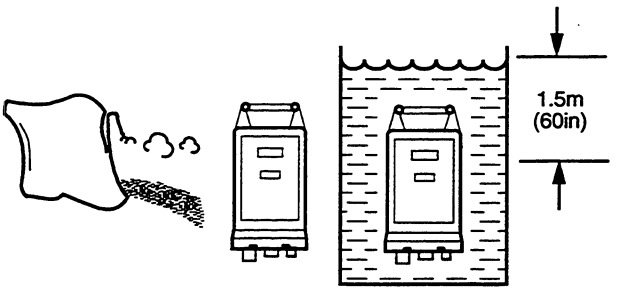
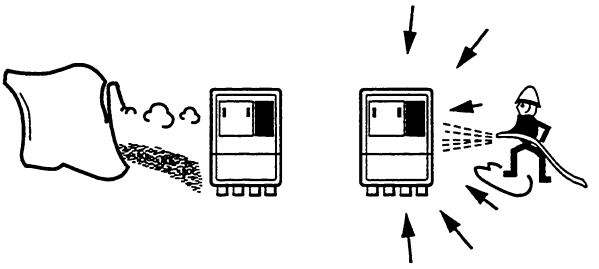


Fig. 2.6 Cleaning Precautions for Hygienic Sensors



IP68 (NEMA 6)



IP65 (NEMA 4)

Fig. 2.8 Within Environmental Rating

3 INSTALLATION

3.1 Transmitter

3.1.1 Location

Select a location where the transmitter unit will not be subject to undue vibration or exposed to environmental conditions beyond the degree of protection. The location chosen should be free from harsh electrical noise such as that from adjacent equipment, cables, r.f.i. or e.m.i.

3.1.2 Mounting

Caution. Do not overtighten fixings, especially on an uneven surface.

Providing that free access is available to allow the display to be viewed as required, the unit can be either wall mounted or panel mounted with masonry fixings or nuts and bolts respectively via the fixing holes provided.

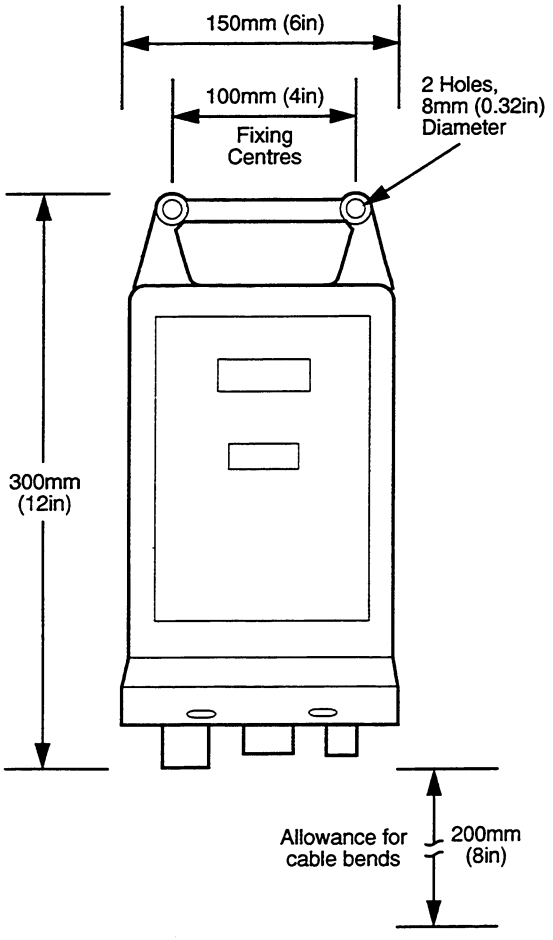


Fig. 3.1 AquaMag Transmitter Mounting Details

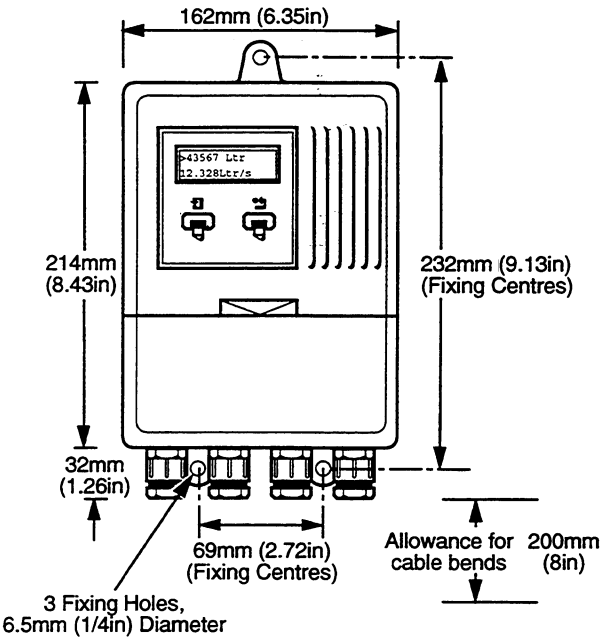


Fig. 3.2 MagMaster Transmitter Mounting Details

3.2 Sensors

Caution.
- Do NOT exceed the maximum working pressure marked on the equipment.
- Use stainless steel (austenitic) bolts, studs and nuts for flanged sensors below 200mm bore.

Sensor size Nominal Bore		Maximum Misalignment	
(mm)	(in.)	(mm)	(in.)
≤ 50	≤ 2	1.5	0.06
50 to 300	2 to 12	2	0.08
> 300	>12	4	0.16

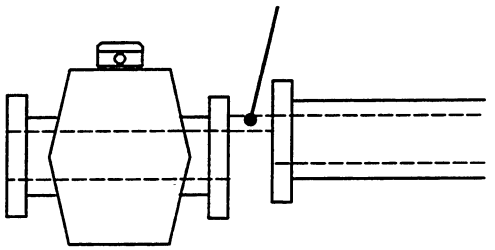


Fig. 3.3 Sensor Alignment

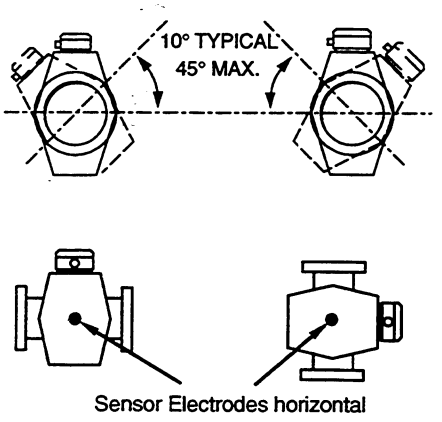


Fig. 3.4 Sensor Position

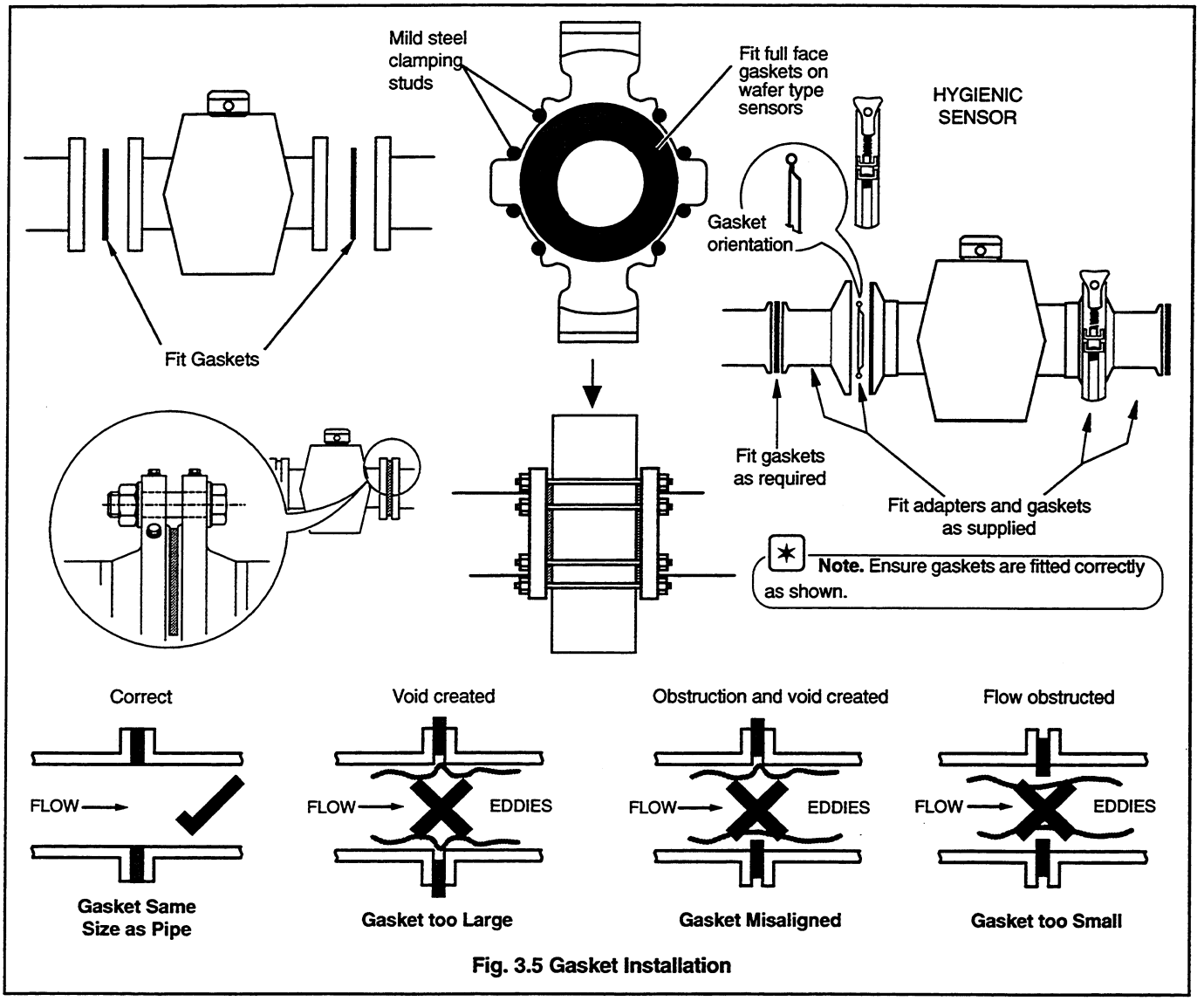


Fig. 3.5 Gasket Installation

...3 INSTALLATION

Caution. Do not rely on flange bolts or studs for electrical connection.

Information. See ELECTRICAL INSTALLATION book for ground wiring.

...3.2 Sensors

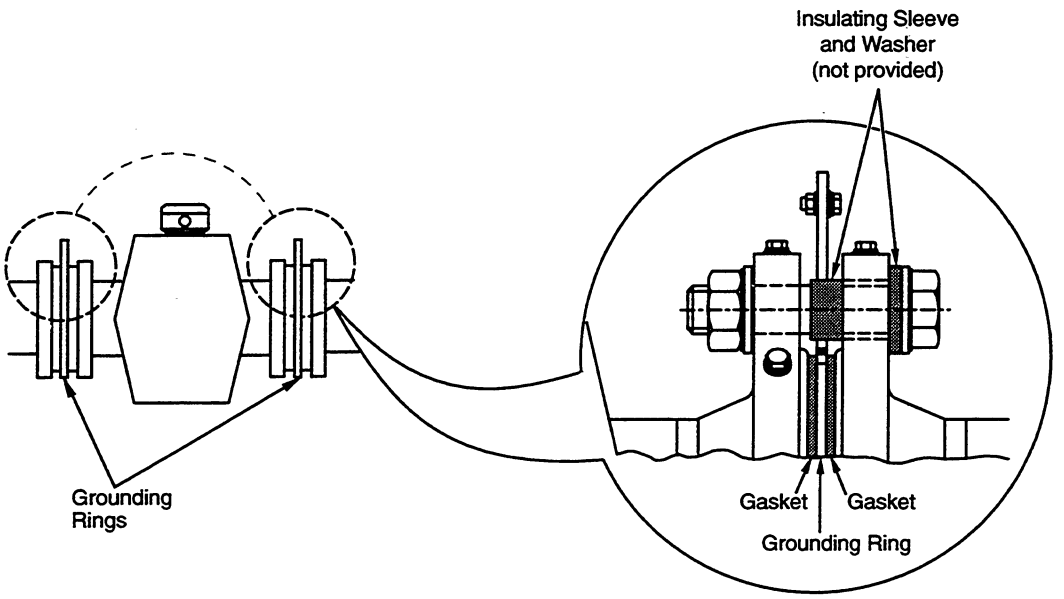


Fig. 3.6 Mounting in Pipelines with Cathodic Protection

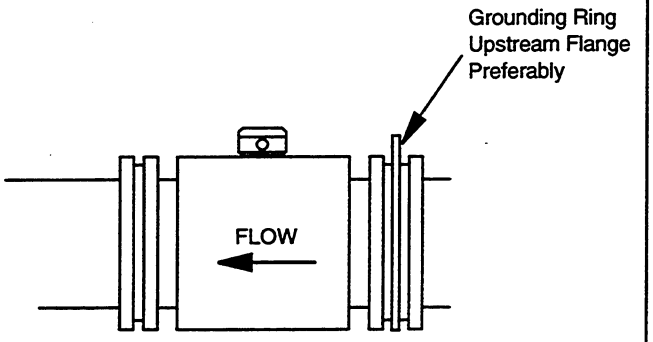


Fig. 3.7 Mounting in Plastic Pipelines – Sensors without Grounding Electrodes

Recommended Bolt Torques for Flanged Mag Meters.

Size	ANSI Class 150		ANSI Class 300		ANSI Class 600		ANSI Class 900	
1/2	10	15	15	20	10	14	20	27
1	10	15	15	20	25	34	40	54
1 1/2	15	20	25	35	45	61	85	115
2	25	35	15	20	30	41	60	81
3	40	55	30	40	70	95	115	156
4	30	40	45	60	125	169	225	305
5	45	60	75	100	195	264	350	475
6	60	80	65	90	180	244	295	400
8	75	100	120	160	305	414	560	759
10	70	95	150	200	365	495	605	820
12	95	130	230	310	405	549	660	895
14	120	160	215	290	*515*	*698*	*840*	*1139*
16	115	155	310	420	*740*	*1003*	*1180*	*1600*
18	175	240	335	455	*1025*	*1390*	*1770*	*2400*
20	155	210	400	540	*1025*	*1390*	*2250*	*3051*
24	220	300	675	915	*1650*	*2237*	*3945*	*5349*
26	215	290	740	1000	*1665*	*2257*	*5080*	*6887*
28	195	265	840	1140	*2010*	*2725*	*6325*	*8575*
30	225	305	1030	1395	*2300*	*3118*	*7260*	*9843*
32	310	420	1275	1725	*2950*	*4000*	*8950*	*12134*
34	285	385	1420	1925	*3290*	*4461*	*10700*	*14507*
36	325	440	1475	2000	*4100*	*5559*	*12050*	*16337*
38	340	460	1475	2000	*4100*	*5559*	*13275*	*17998*
40	320	435	1475	2000	*4100*	*5559*	*12150*	*16473*
42	375	510	1640	2225	*5600*	*7592*	*13150*	*17829*
44	385	520						
46	400	540						
48	420	565						
50	435	585						
52	450	610						
54	470	635						
	ft. lbs.	Nm	ft. lbs.	Nm	ft. lbs.	Nm	ft. lbs.	Nm

Notes

Notes

BOOK 3
Electrical Installation

CONTENTS Page

SUPPLEMENTARY INSTRUCTIONS TO BOOK 3 ELECTRICAL INSTALLATION

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2 CABLE INFORMATION 2
2.1 IEC Installation Practice 2
2.1.1 4-Core Cable Identification 2
2.1.2 4-Core Cable Preparation 2
2.2 North American Installation Practice 3
2.2.1 6-Core Cable Identification 3
2.2.2 6-Core Cable Preparation 3

3 CABLE CONNECTIONS 4
3.1 Sensor Terminal box Connections (Remote System) 4
3.1.1 IEC Wiring Practice 4
3.1.2 North American Wiring Practice 4
3.2 Transmitter Sensor Cable Connections (Remote Transmitter Only) 5

1 INTRODUCTION

1 INTRODUCTION

The cable supplied with your MagMaster flowmeter may not be as described in Book 1 or Book 3 ELECTRICAL INSTRUCTIONS. (Cable Part Numbers are printed/embossed on the cable sheath)

The alternative cables are as follows:

STT 3200/3400 Standard 4-Core Cable as used in IEC installation practice.

STT 3300 Armoured 4-Core Cable as used in IEC installation practice.

STT3350 Standard 6-Core Cable as used in North American installation practice.

and are as described in this supplement.

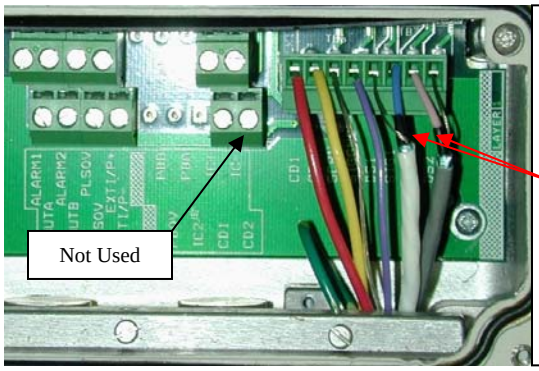
MAGMASTER INTERCONNECTION CABLE

Solution for installations that show the following alarms.

- Alm Coil
- Alm Mtsnsr

INTERCONNECTING CABLE MUST BE INSTALLED AS SHOWN

Signal Converter



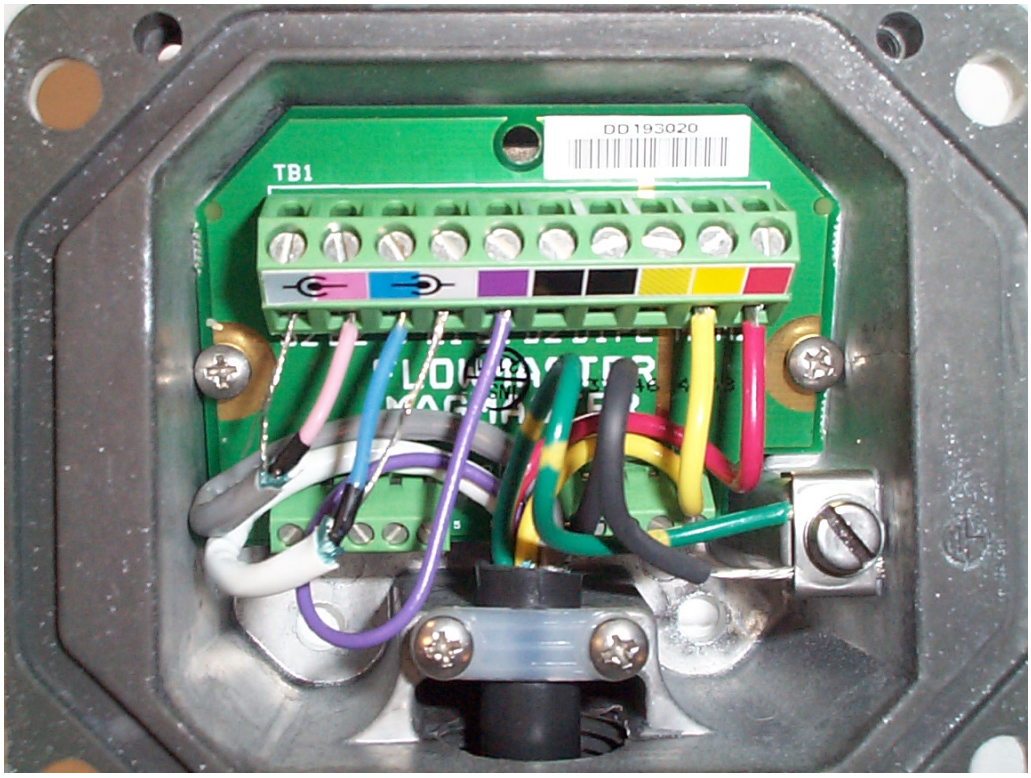
Wiring From Mag Sensor

Note: Ensure that NONE of the cores or screens are able to short to other cores or any metalwork.

ENSURE black antimicrophonic layer is removed from the inner pink and blue wires.

! See Manual for further details
C WAAB0085-1

Flow Tube



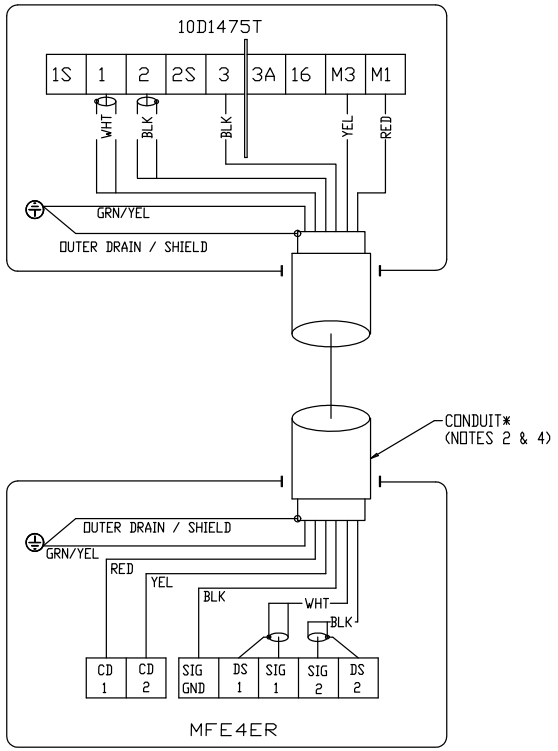
REV	AUTHORITY	REVISION DESCRIPTION	DWN BY	CHKD BY	APVD BY

DO NOT CONNECT SIGNAL CABLE SHIELDS IN METER CONNECTION BOX

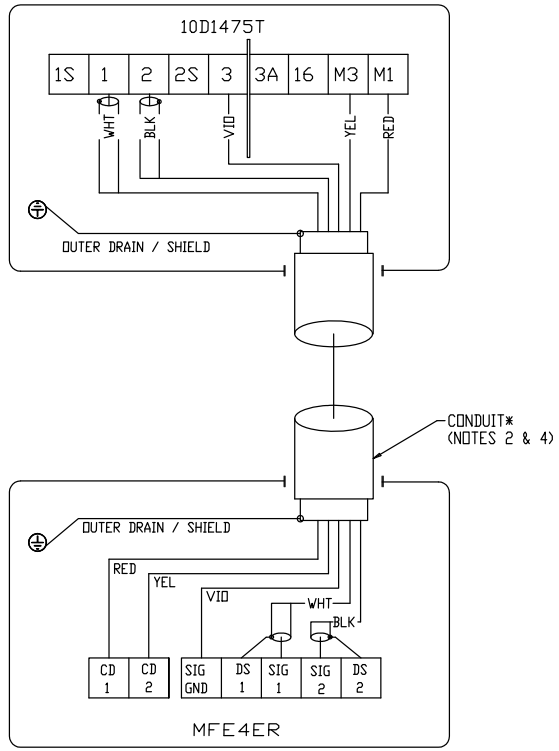
NOTES:

1. (*)INDICATES SUPPLIED BY CUSTOMER.
2. REFER TO MAGMASTER IB FOR WIRE PREPERATION.
3. ALL WIRING TO BE ENCLOSED IN METAL CONDUIT SUPPLIED BY CUSTOMER.
4. UNUSED CONNECTIONS MUST BE PLUGGED TO MAINTAIN NEMA 4 RATING.
5. ALL CONDUIT CONNECTIONS ARE 1/2" NPT.

WIRING WITH STT-3350 or STT-3300 CABLE



WIRING WITH STT-3500 CABLE



INTERCONNECTION WIRING MODEL 10D1475T MAG FLOWMETER TO REMOTE MOUNTED MFE4ER TRANSMITTER

ABB
WARMINSTER, PA 18974 USA

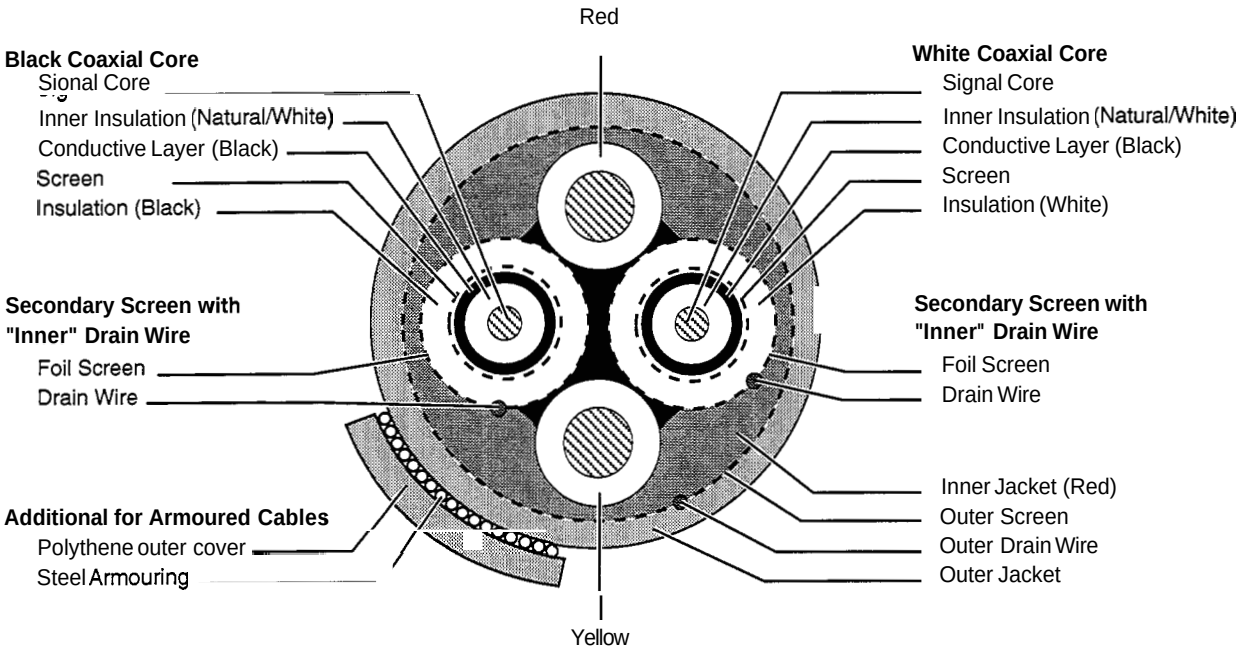
DWN	S. FOLBERTH 24 APR 00	ENGR	T.E.M. 23 JUL 03	Q/E	---	PART NUMBER	REV
CHKD	---	MOD	10D1475T	M/E	---	ID-50-1903	2
SUPV		AUTH	DP0105-71-03				
REF DWG		B/M		SCALE- NONE		DRAWING NUMBER	

UNLESS OTHERWISE SPECIFIED			PROCESS SH No.	
√	.X=±.1	.XXX=±.005	FRACTION=±1/64	TOOLING
	.XX=±.02		ANGLE=1/2°	INSPECTION PROCESS

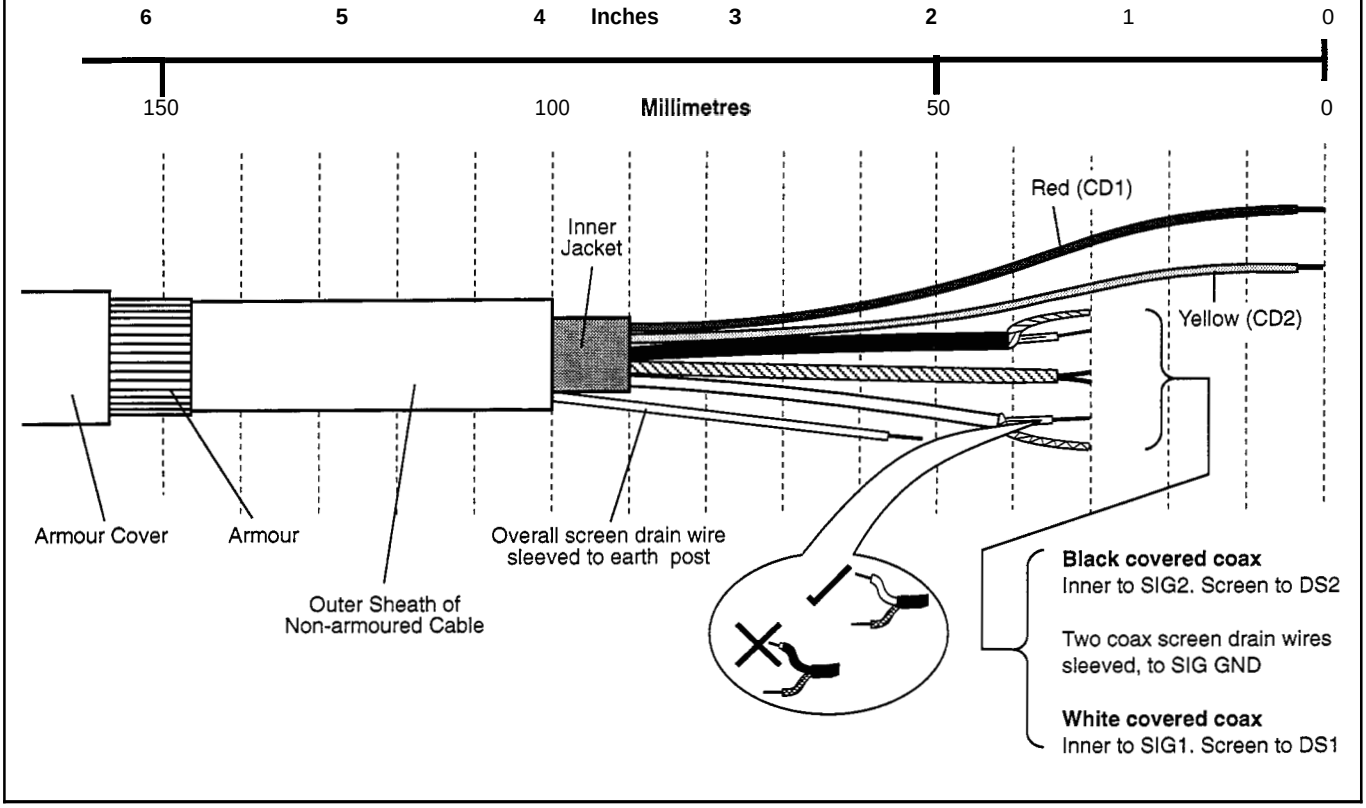
2 CABLE INFORMATION

2.1 IEC Wiring Practice

2.1.1 4-Core Cable Identification

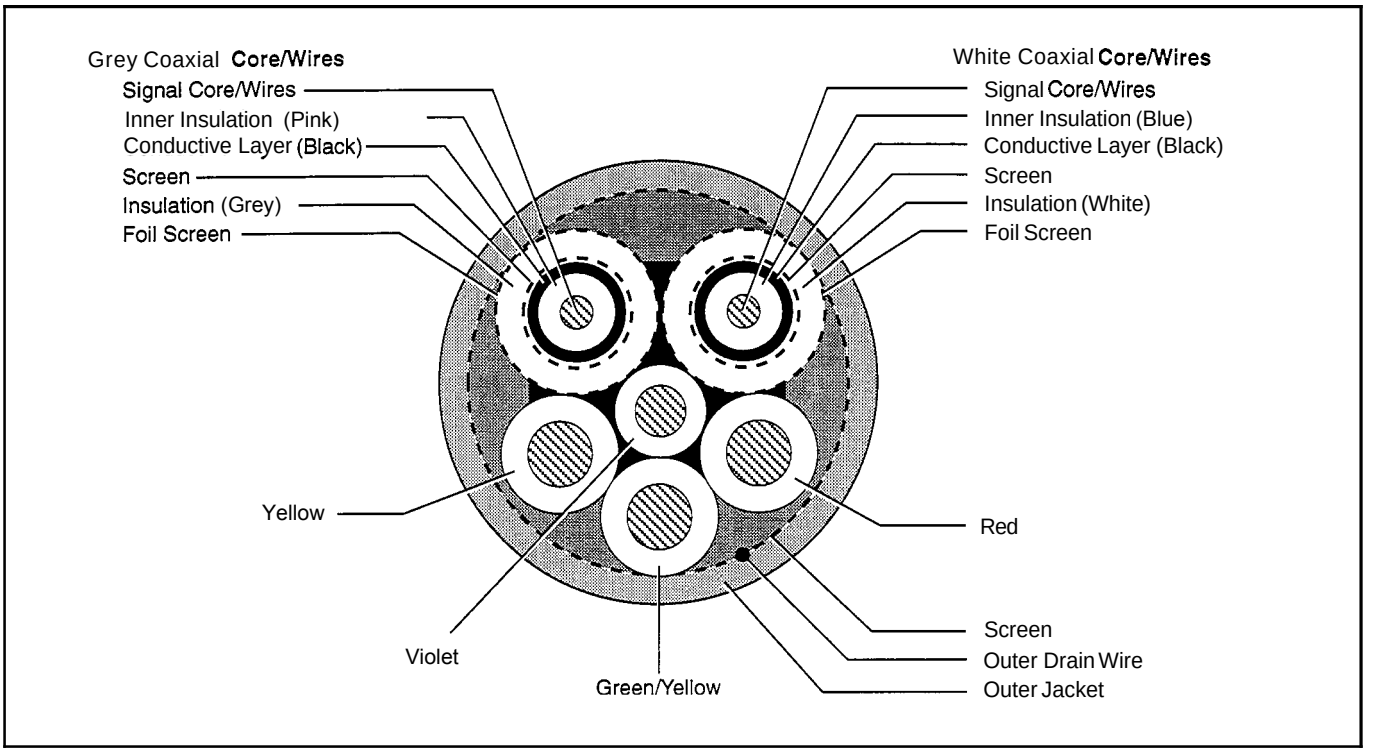


2.1.2 4-Core Cable Preparation

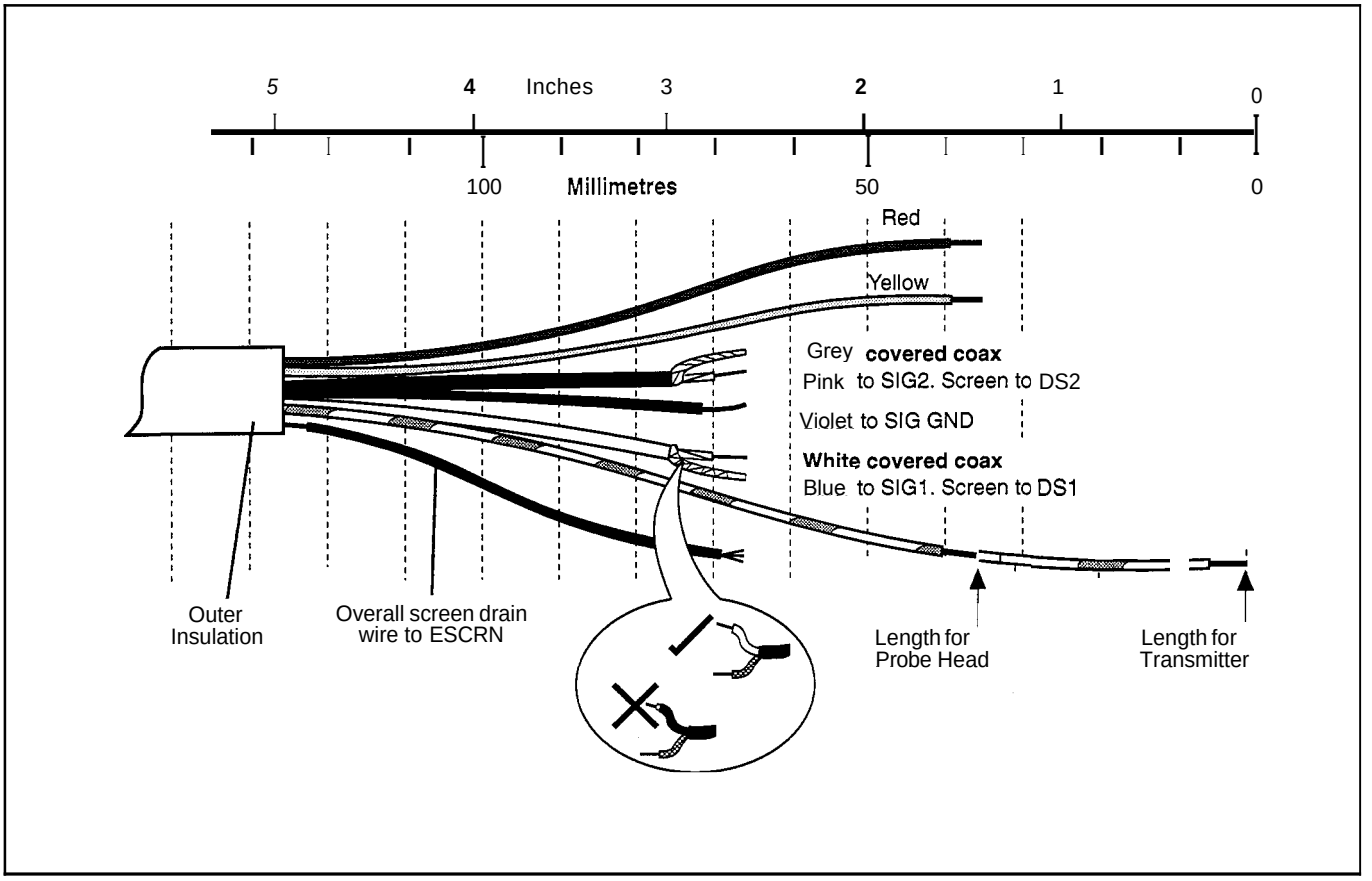


2.2 North American Wiring Practice

2.2.1 6-Core Cable Identification



2.2.2 6-Core Cable Preparation

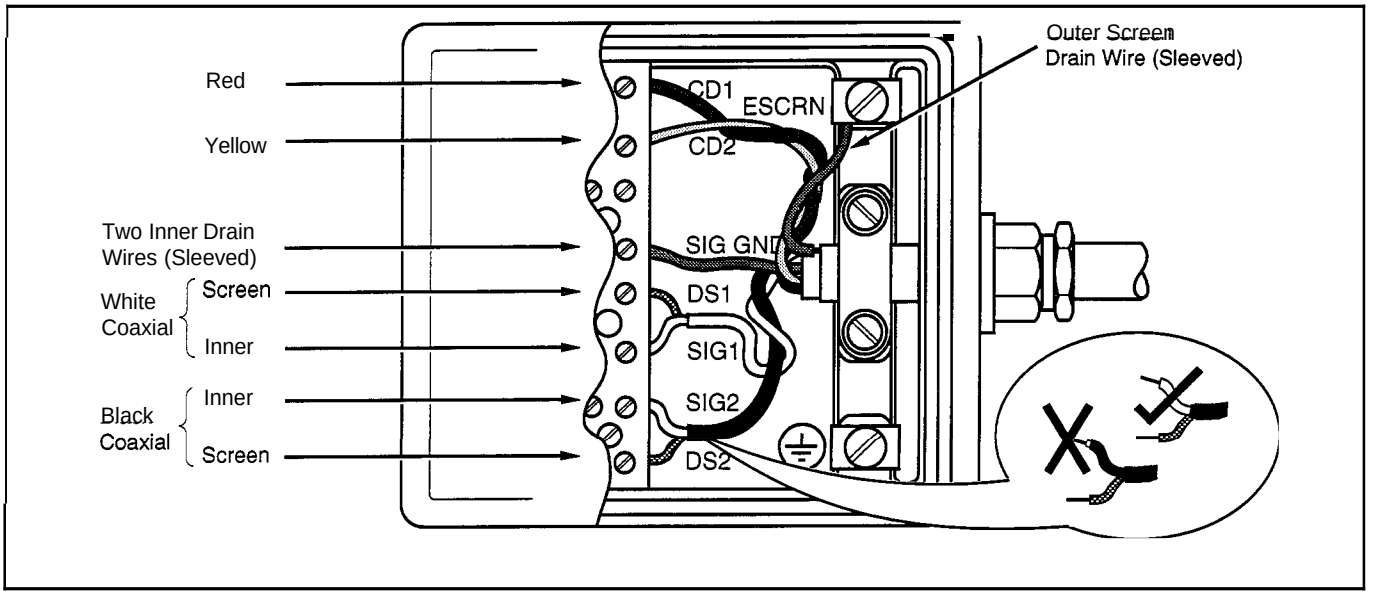


3 CABLE CONNECTIONS

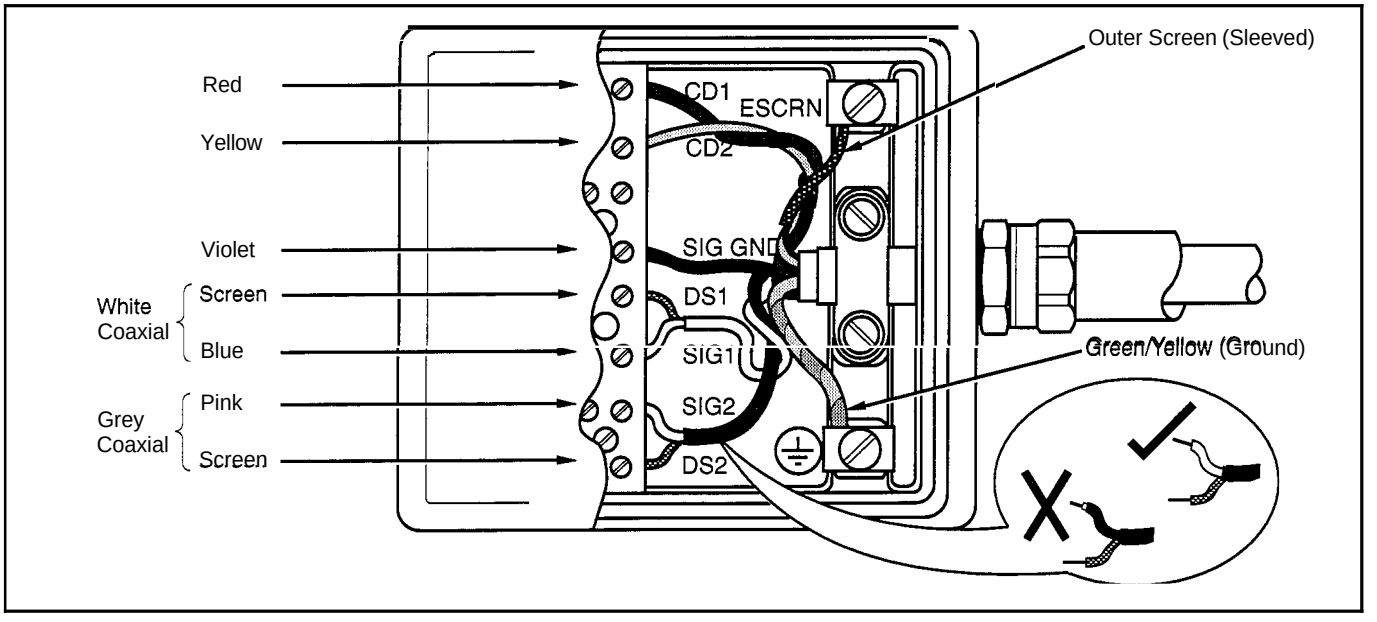
- **Remove any exposed black conductive layer from under coaxial screens.**
- Make connections only as shown.
- Sleeve all bare wiring.
- Twist RED and YELLOW cores lightly together.
- Twist WHITE and BLACK coaxial cables lightly together.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

- Refer to ENVIRONMENTAL PROTECTION (BOOK 3).
- Internal appearance of Terminal Box may vary from that shown.

3.1.1 IEC Wiring Practice - General Locations only (For Hazardous Area Versions see Book 1)



3.1.2 North American Wiring Practice – General Locations and CSA-Hazardous (Non-incendive electrodes). For all other Hazardous Area Versions see Book 1.

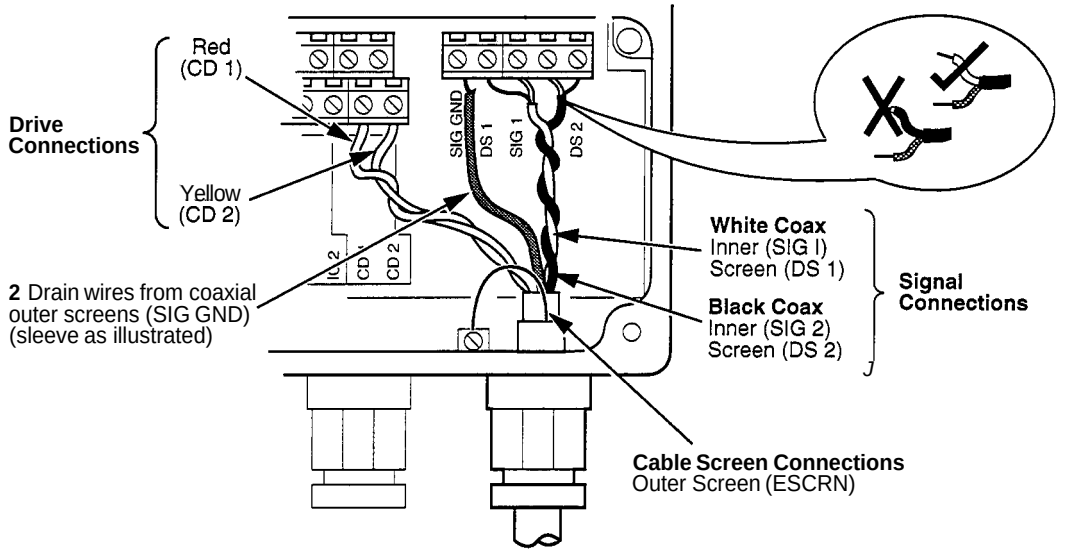


3.2 Transmitter Sensor Cable Connections (Remote Transmitter Only)

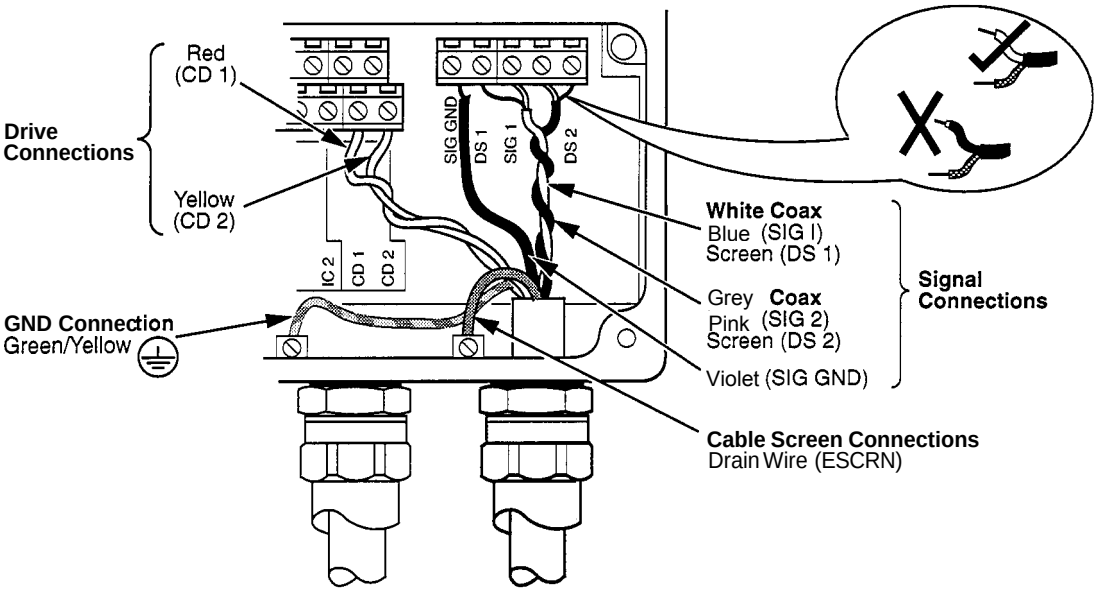
Caution.

- **Remove any exposed black conductive layer from the inner insulation of both coaxial cables.**
- Substitute sensor cable of any kind is not acceptable.
- Do not make connections except as shown.
- Twist cable pairs together as shown.
- Sleeve ALL bare wires.
- Sensor cable may only be joined using company supplied junction box - available separately.

3.2.1 IEC Wiring Practice



3.2.2 North American Wiring Practice



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✶ Note. Not all versions referred to are available as approved. This book covers general aspects for hazardous and general approved products.

SAFETY MEASURES

Warning.

- EXPLOSION HAZARD.
  SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- EXPLOSION HAZARD.
  DO NOT REMOVE FUSE OR DISCONNECT POWER LEADS WHILE CIRCUIT IS LIVE.
- THE LOCAL TERMINAL MUST NOT BE USED WHEN THERE IS AN EXPLOSION RISK.

MESURES DE SÉCURITÉ

Avertissement.

- RISQUE D'EXPLOSION.
  SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATÉRIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.
- RISQUE D'EXPLOSION.
  NE PAS RETIRER LE FUSIBLE NI DÉBRANCHER LES FILS D'ALIMENTATION TANT QUE LE CIRCUIT EST SOUS TENSION.
- NE PAS UTILIZEZ LE TERMINAL LOCAL EN ATMOSPHÈRE EXPLOSIVE.

Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections of this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment, and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

1 INTRODUCTION

This book describes the electrical installation of the MagMaster Transmitter with full bore and insertion type electromagnetic flowmeters.

Attention to the installation procedures, safety measures and general precautions will ensure trouble free operation of the system.

2 GROUNDING

2.1 Full bore Sensors

Caution.
- Do NOT rely on the flange bolts or studs for electrical connection.
- All earth bonding (grounding) must be in accordance with relevant national and local safety standards.

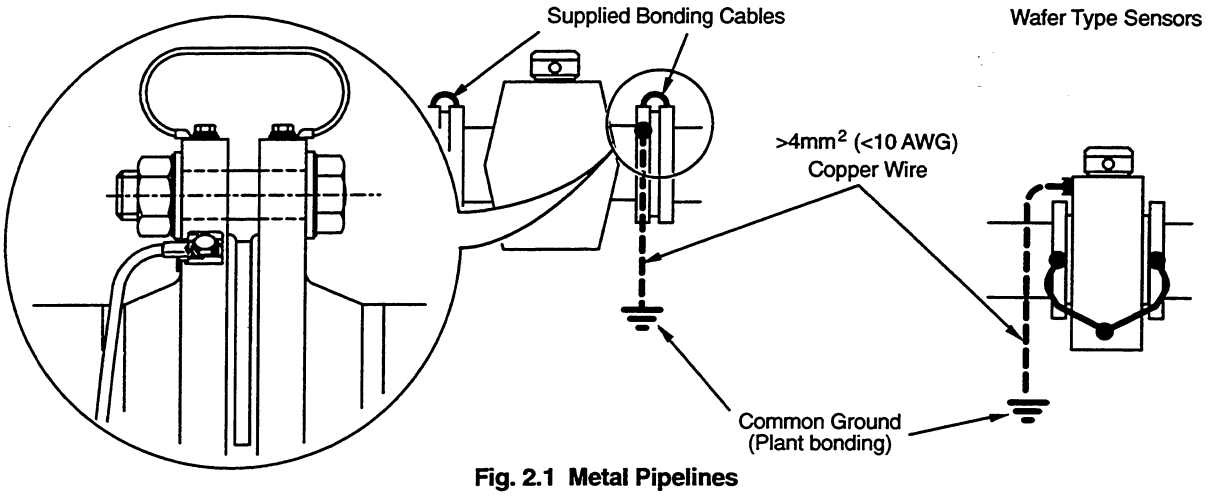
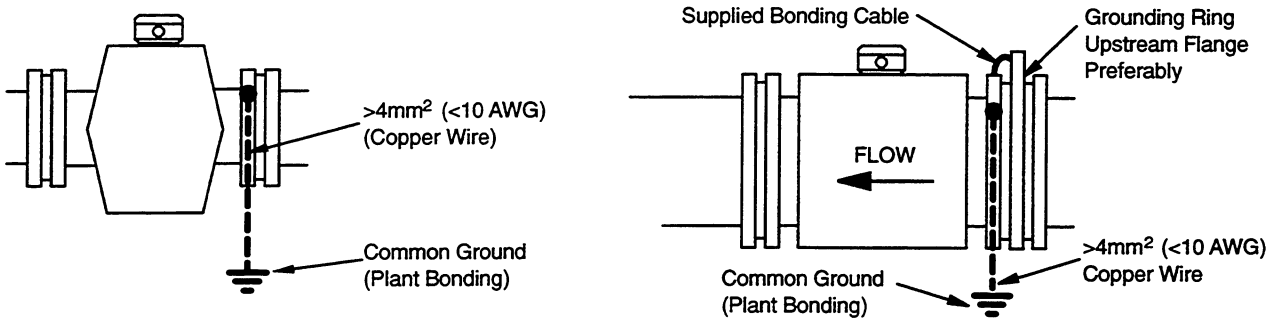


Fig. 2.1 Metal Pipelines



Sensors with internal grounding electrodes

Sensors without grounding electrodes

Fig. 2.2 Plastic Pipelines

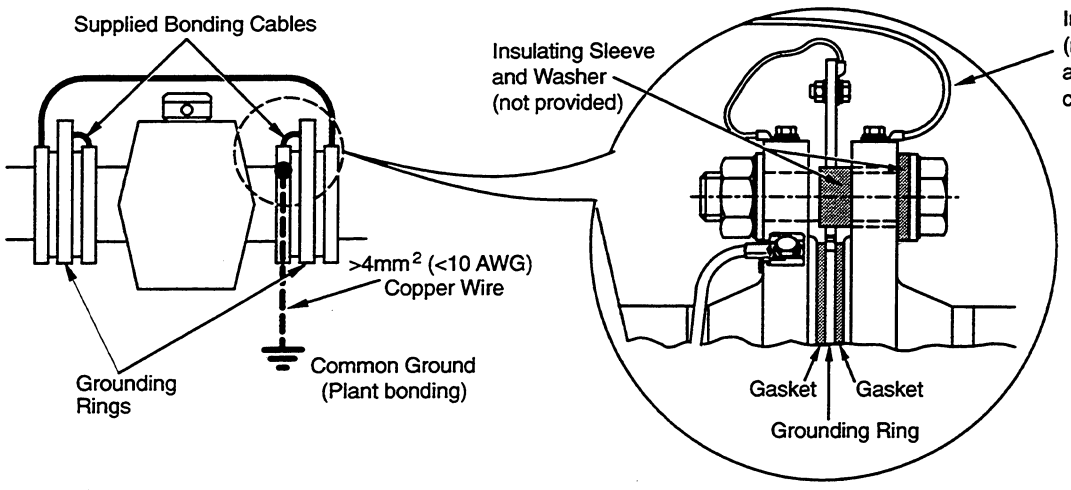


Fig. 2.3 Pipelines with Cathodic Protection

2.2 Insertion Probe Sensors

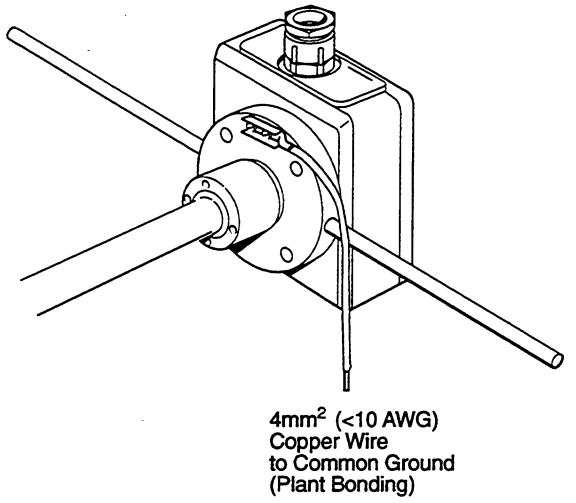


Fig. 2.4 Ground connection to the Probe Sensor

3 INSTALLATION

3.1 Connection Requirements

3.1.1 Sensors

Caution.

- Each connection MUST be insulated from all others; in particular, NO connections must be made to screens or drain wires except as shown.
- All cable entries must be properly sealed.
- Glands must be appropriate for sealing on the cable size in use.
- Unused cable entries must be plugged.
- Electrical installation and earthing must be in accordance with relevant national and local standards.
- The transmitter and sensor are supplied as a matched system. Check serial numbers to ensure matched pair.

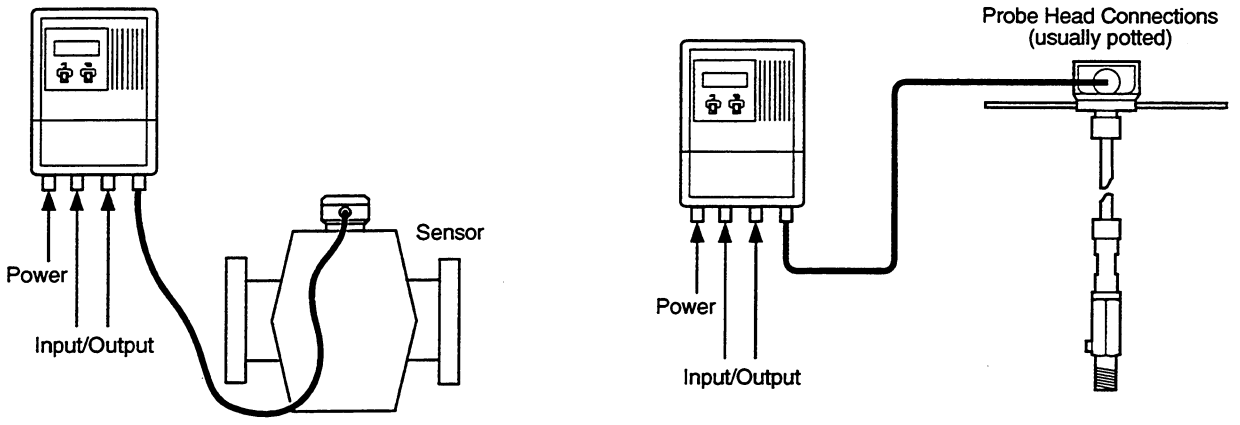


Fig. 3.1 Connection Requirements

Sensor Connections

Sensors are usually supplied with an integral cable and potted head connections. The transmitter end of the cable, the power supply and any output cables must be prepared and connected as detailed in the relevant parts of this book. If the sensor has been supplied unpotted, connections must also be made to the full-bore sensor terminal box or probe head (Fig. 3.1) and then potted on completion – see ENVIRONMENTAL PROTECTION.

3.1.2 Transmitter

Caution. Unused cable entries must be blanked with the permanent blanking plugs supplied.

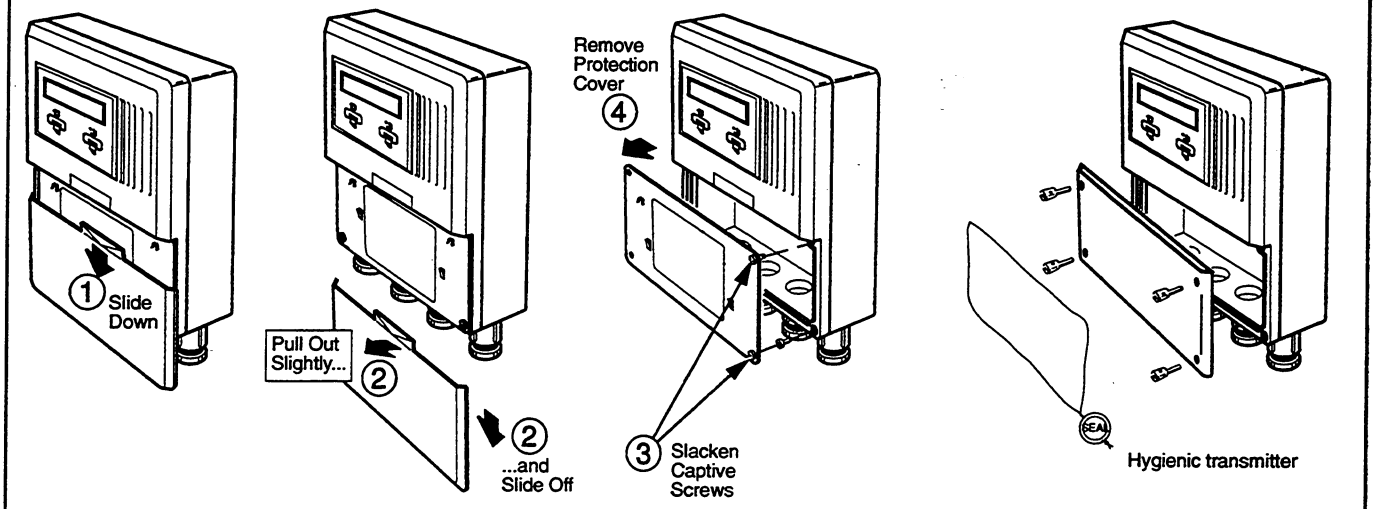


Fig. 3.2 Connection Terminal Access

Transmitter Connections

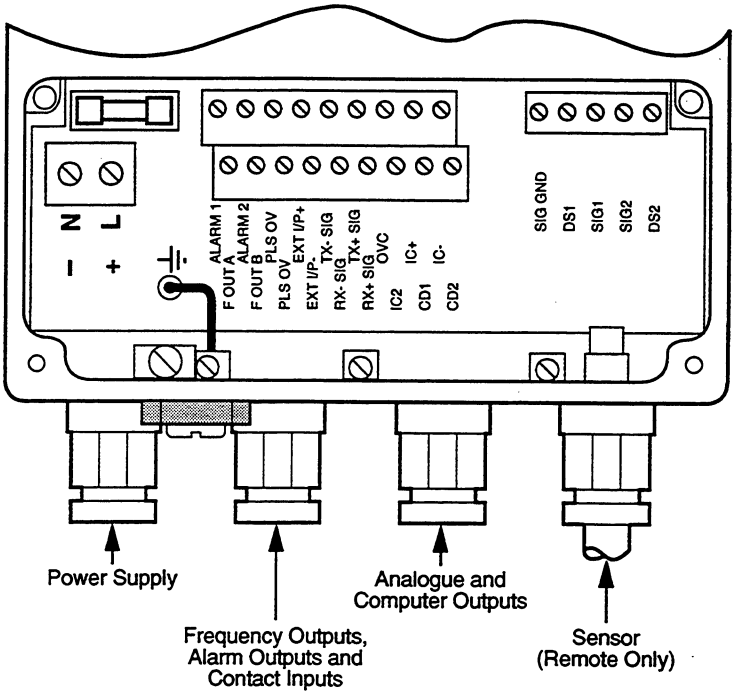


Fig. 3.3 Cable/Conduit Entries

3.2 Cable Identification (Fig. 3.4)

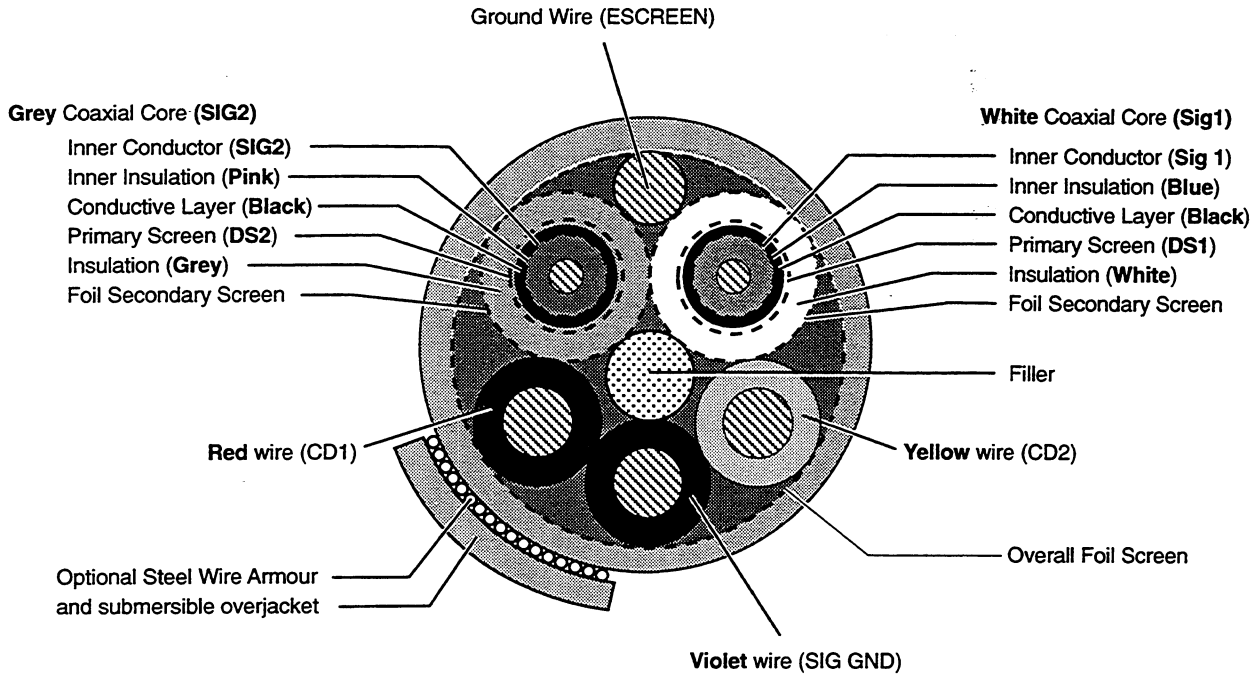


Fig. 3.4 Cable Identification

3.3 Cable Preparation (Fig. 3.5)

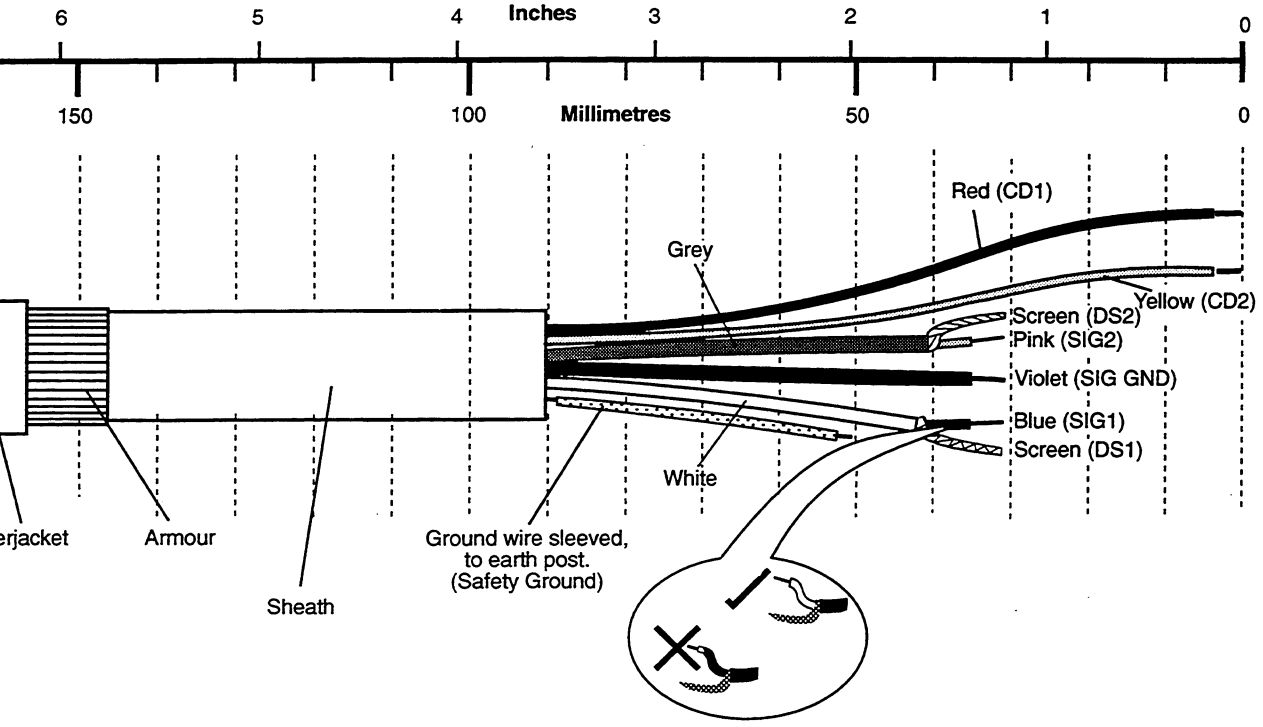


Fig. 3.5 Cable Preparation

3.4 Sensor Terminal Box Connections (Remote System) – Fig. 3.6

Caution.

- **Remove any exposed black conductive layer from under coaxial screens.**
- Make connections only as shown.
- Sleeve all bare wiring.
- Twist RED and YELLOW cores lightly together.
- Twist WHITE and GREY coaxial cables lightly together.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

Information.

- Refer to ENVIRONMENTAL PROTECTION (APPENDIX A).
- Internal appearance of Terminal Box may vary from that shown.
- Hazardous area approved flowmeters – see BOOK 1.

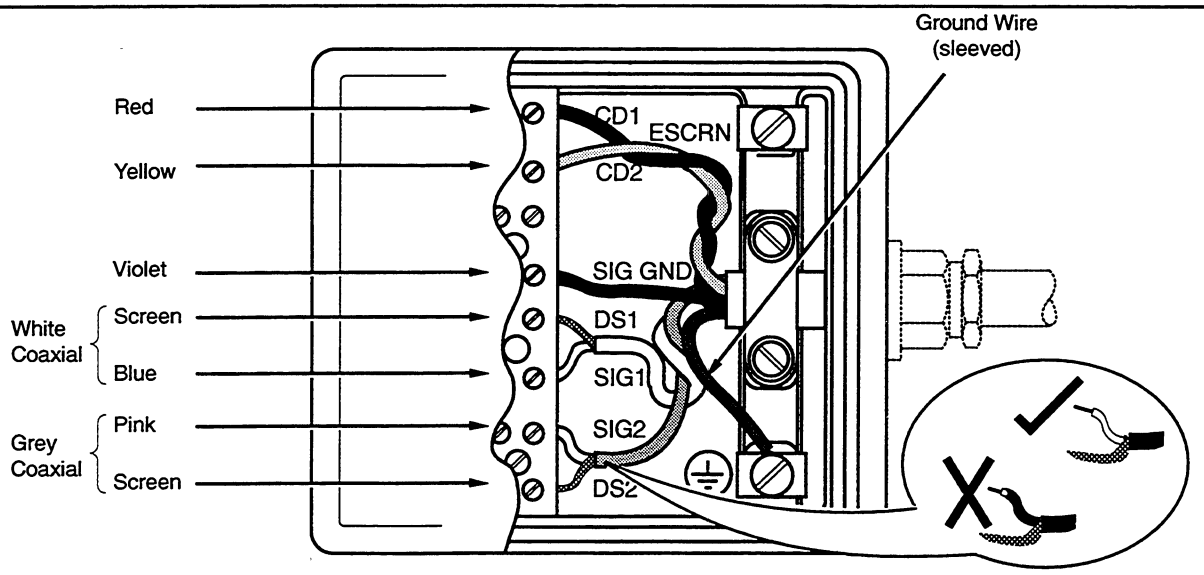


Fig. 3.6 Terminal Box Connections

3.5 Transmitter Sensor Cable Connections (Remote Transmitter) Fig. 3.7

Caution.

- **Remove any exposed black conductive layer from the inner insulation of both coaxial cables.**
- Substitute sensor cable of any kind is not acceptable.
- Do not make connections except as shown.
- Twist cable pairs together as shown.
- Sleeve ALL bare wires.
- Sensor cable may only be joined using company supplied junction box - available separately.

Information.

- Environmental protection – See APPENDIX
- Hazardous area approved flowmeters – See Book 1

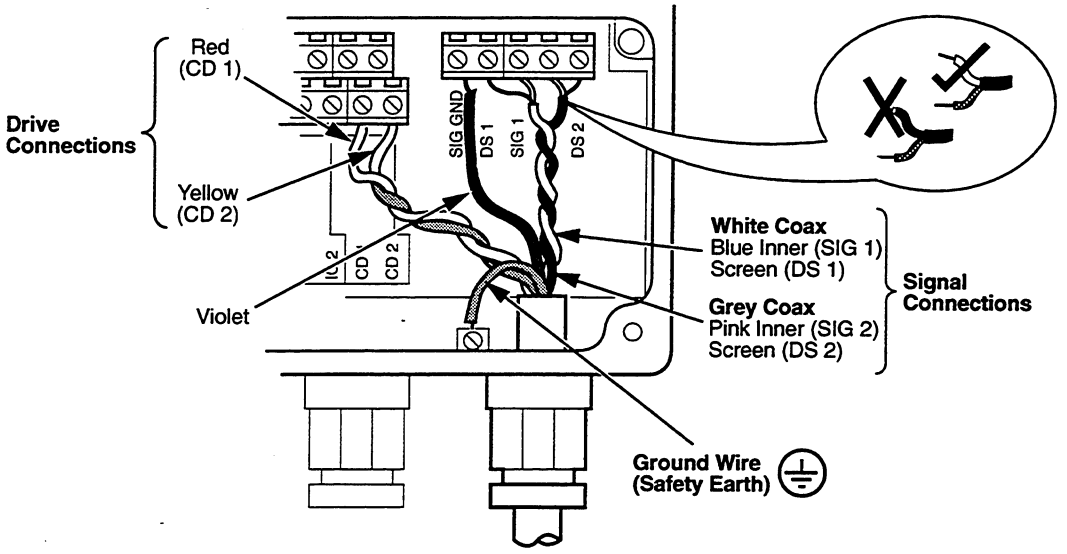
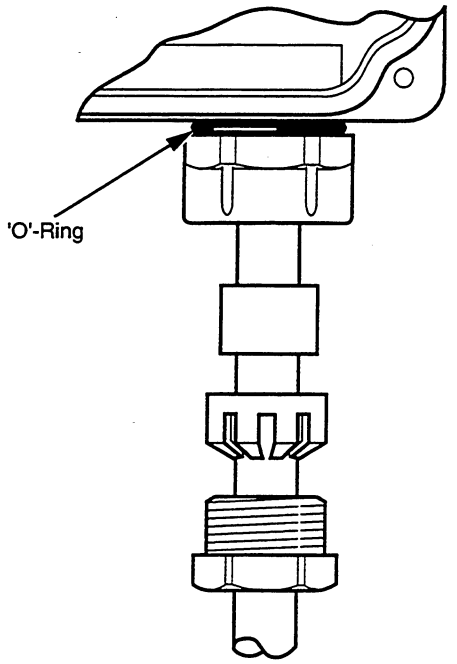


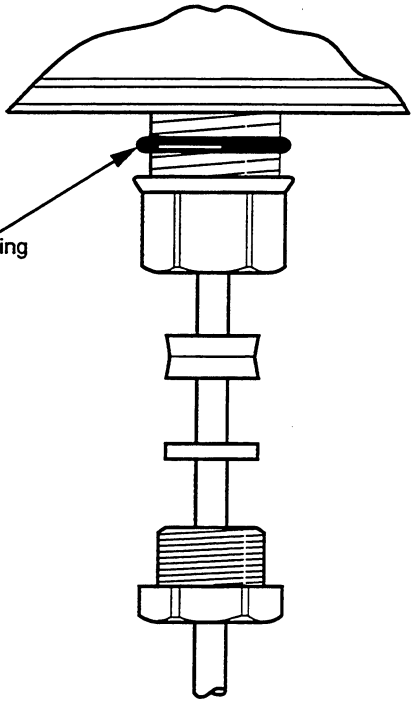
Fig. 3.7 Sensor Cable Connections

3.6 Cable Glands and Conduit Fixings

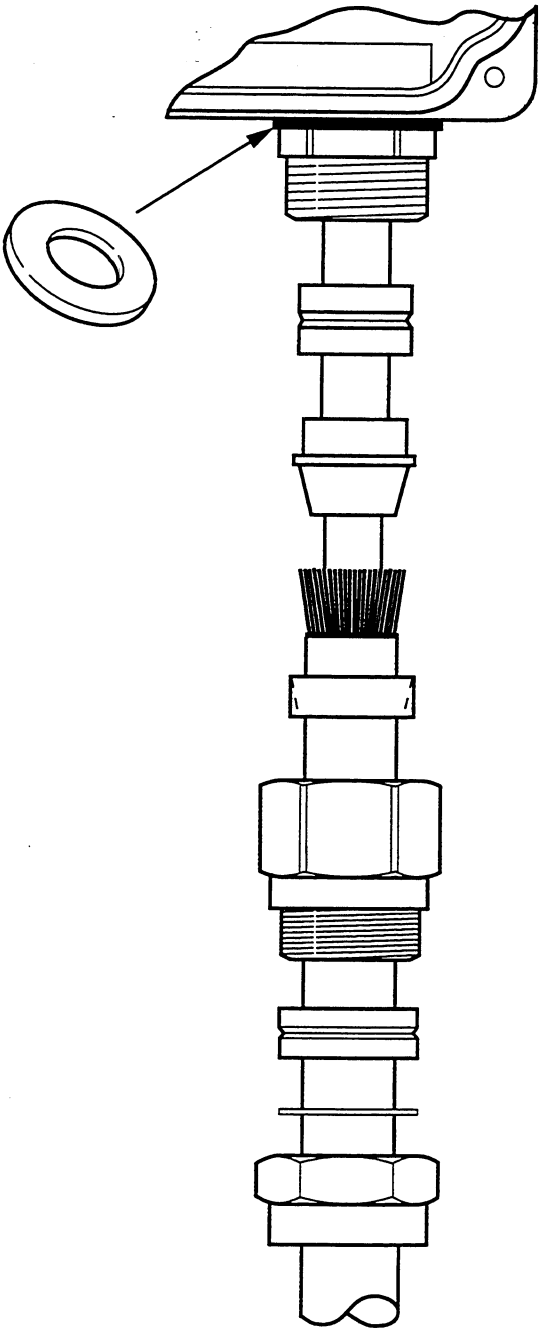
3.6.1 Cable Glands (IEC – 20mm)



A – Gland for Sensor Cable (Transmitter or Sensor)



B – Gland for other Field Connections



C – Gland for Armoured Cables (Transmitter or Sensor)

Fig. 3.8 Cable Glands (IEC Installation Practice)

3.6.2 Conduit Adaptors (N. American – 0.5") – Fig. 3.9

Warning.
- Rigid conduit must NOT be fitted to the transmitter.
- Transmitter adaptors must incorporate a face seal.
- Sensor adaptors must incorporate cable/conduit sealing.
- Cable/conduit sealing is advisable on transmitter adaptors.
- Torque settings for the hubs and outer nuts on the specified adaptors is 20ft. lbs minimum, 25ft. lbs. maximum.

Information.
- Suitable adaptors for transmitter (mandatory for FM installations):
  APPLETON
  ST-50 PLUS STG-50 or STB-50 PLUS STG-50.
  Reusable ONLY with replacement ferrule STF-50.
  O.Z. GEDNEY
  4Q-50, 4Q50T or 4Q-50TG.
- When fitting conduit adaptor hubs to the transmitter, start with an outer adaptor and also temporarily fit an adaptor hub at the opposite end, to aid location of the transmitter gland plate. Fit and tighten hubs consecutively from initial hub.

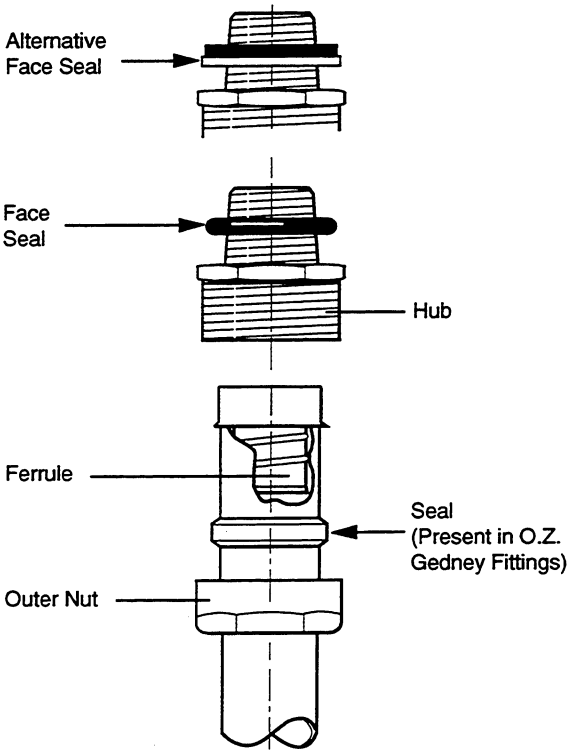


Fig. 3.9 Conduit Adaptors

3.6.3 Cable Glands (N. American – 0.5") – Fig. 3.10

Warning.
- Transmitter glands must be fitted with a face seal.
- Torque settings (hubs only) – 20ft. lbs minimum, 25ft. lbs. maximum.
- Outer nuts – hand tight plus a half turn only.

Information.
- Suitable Cable Glands: (mandatory for FM installations):
  O.Z. GEDNEY
  SR-50-375 or SR-504
  APPLETON
  CG 3150 or CG-3150S (and STG-50 sealing ring).
  THOMAS & BETTS
  2521.
- When fitting cable glands to the transmitter, start with an outer gland and also temporarily fit a gland at the opposite end, to aid location of the transmitter gland plate. Fit and tighten glands consecutively from initial gland.

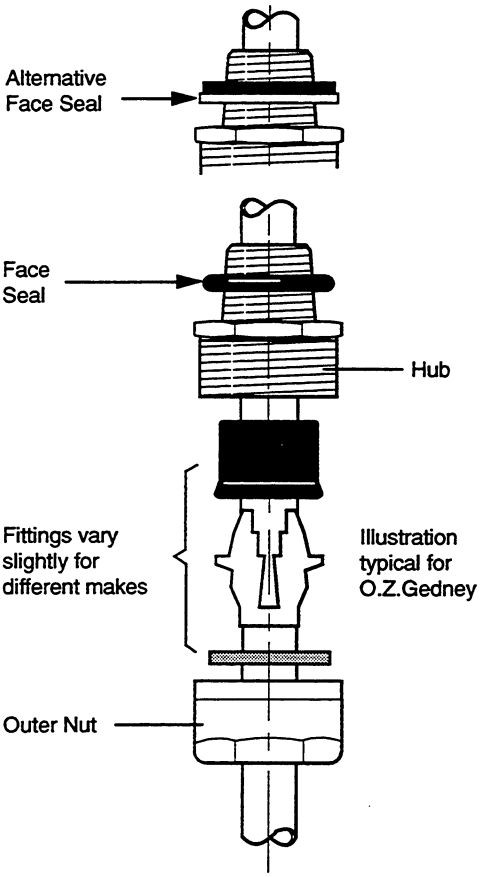
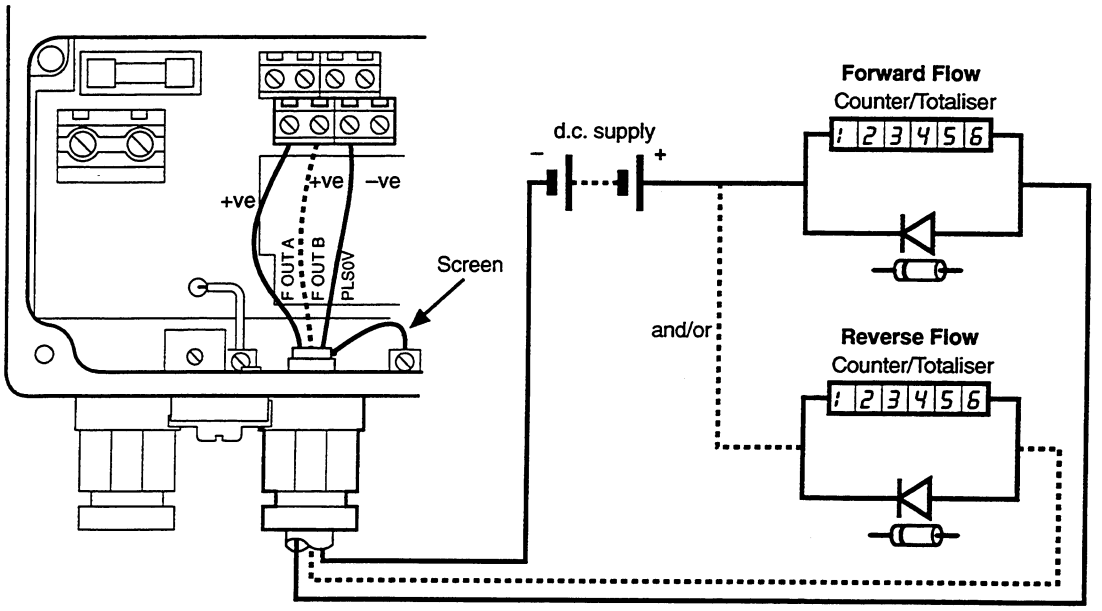


Fig. 3.10 Cable Glands

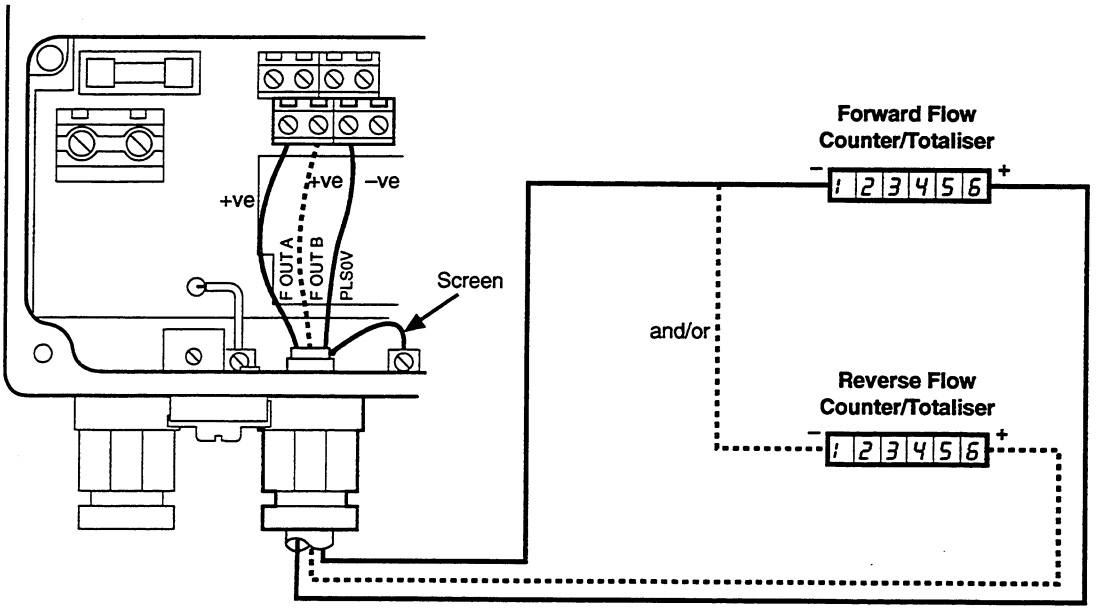
3.7 Input/Output Connections

Caution.
- Refer to SPECIFICATION SHEET for Input/Output ratings.
- Inductive loads must be suppressed or clamped to limit voltage swings
- Capacitive loads must be inrush current limited.
- Hazardous area requirements are not considered in the following pages.

3.7.1 Frequency Outputs – Fig. 3.11



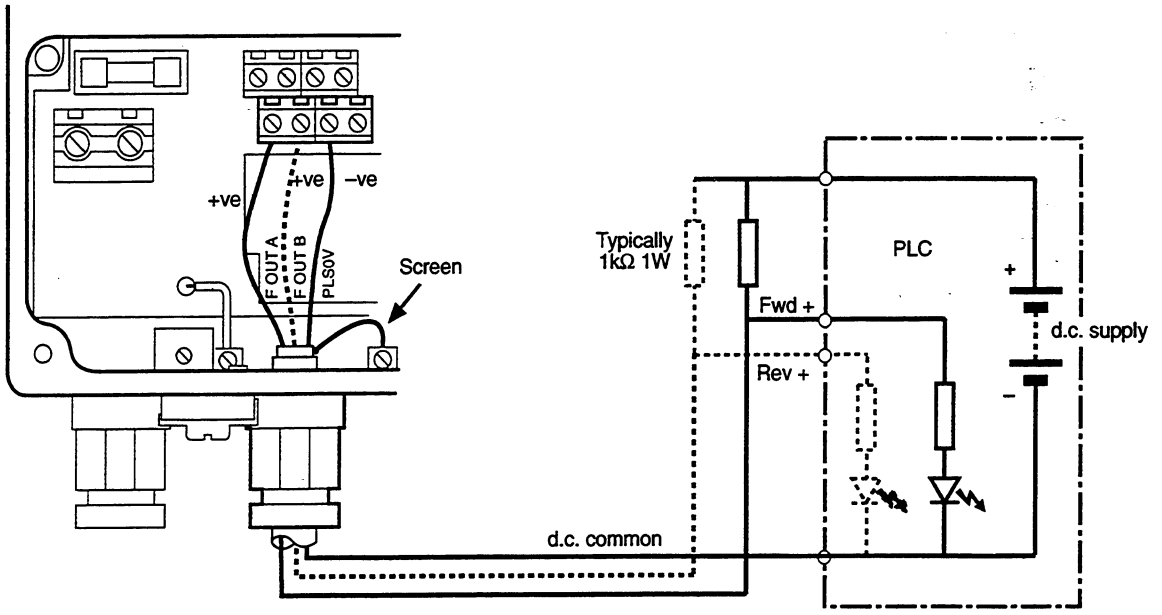
Electromechanical Connections



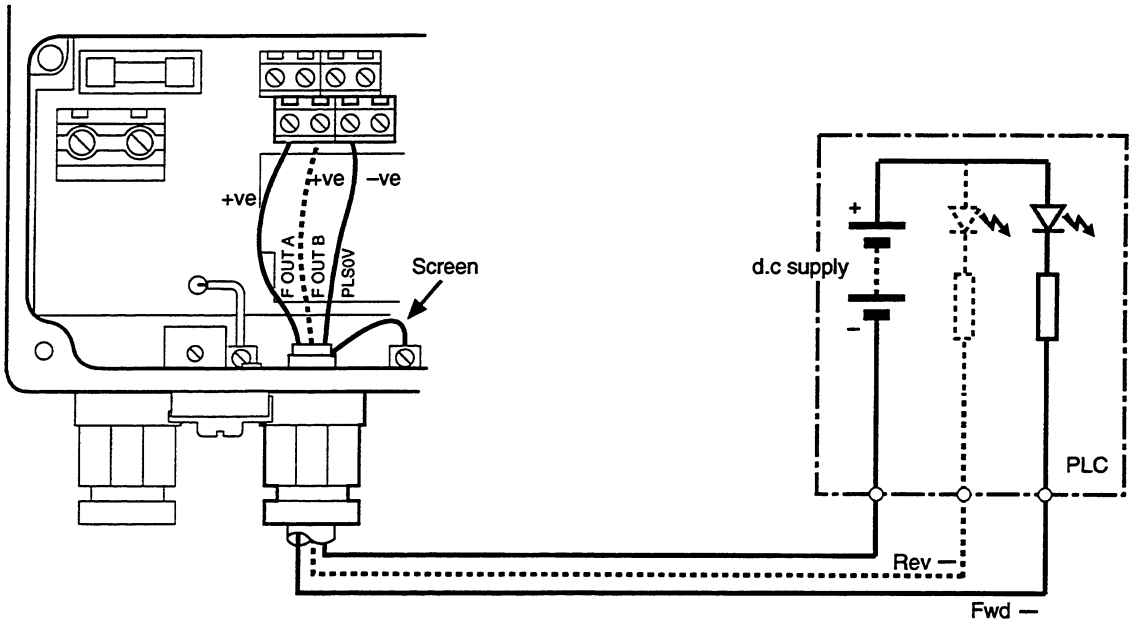
Telemetry, Electronic Counters etc.

Fig. 3.11 Frequency Output Connections

3.7.2 PLC Interface – Fig. 3.12



PLC – Common -ve



PLC – Common +ve

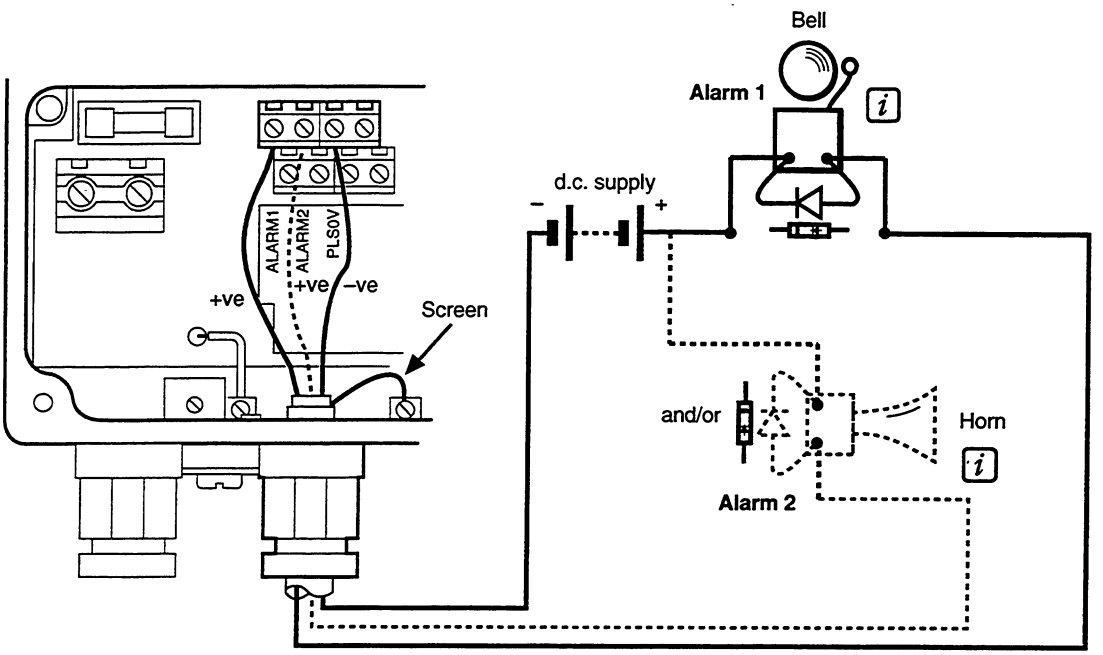
i **Information.**
Frequency Output illustrated. The same interfacing applies to the alarm outputs.

Fig. 3.12 Frequency Output Connections

3.7.3 Alarm Outputs – Fig. 3.13

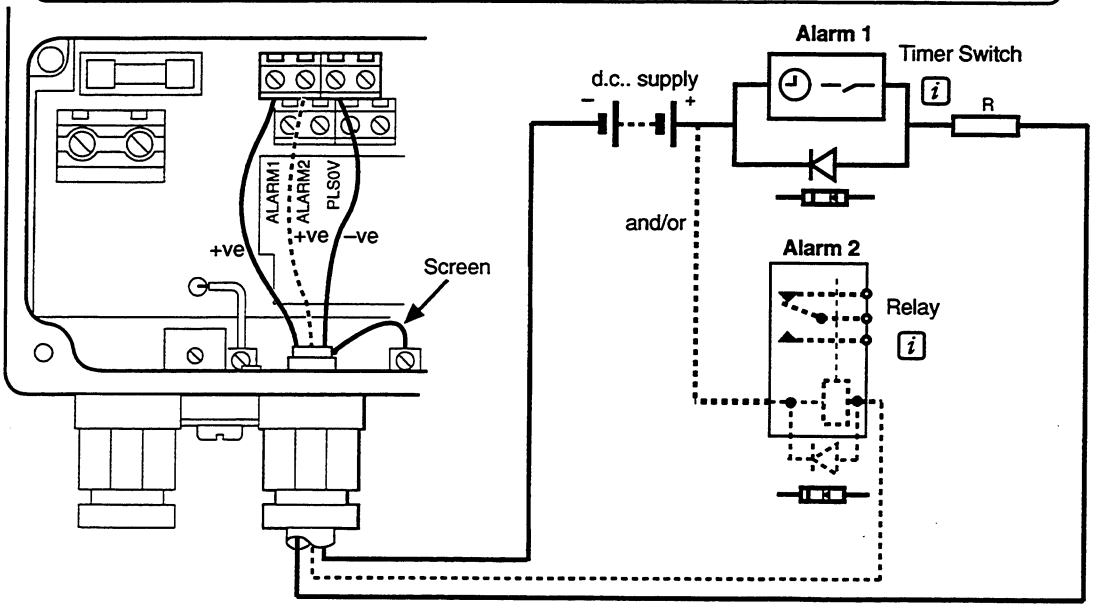
Information.
- Inductive loads may be suppressed by diodes (D) – 1N4004 or similar.
- Inrush currents are limited to 1 Amp by resistor R – e.g. 27Ω 1W for 24V systems.
- Operation of outputs is programmable – see Configuration Manual for details.
- Frequency and Alarm outputs share a common return with contact input.
- External isolators not normally required, as the pulse, alarm and contact circuits are electrically separated from all other Magmaster connections.

Information. Bell and Horn shown for example only. Use any suitable alarm device, e.g. lamp, siren, buzzer etc.



Alarms

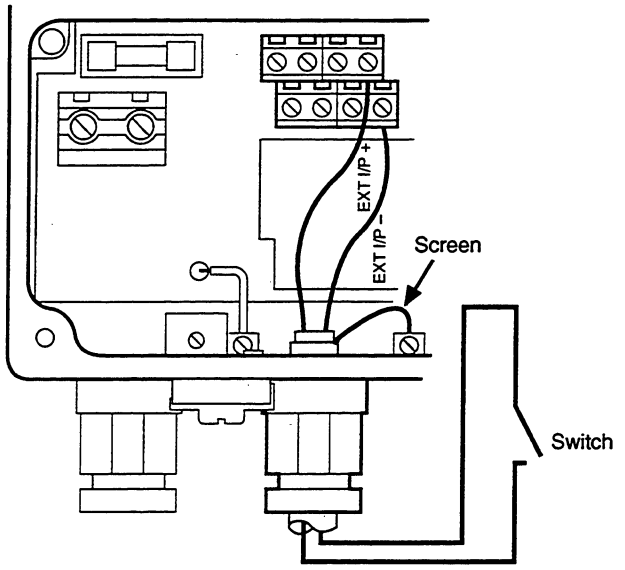
Information. Relay and Timer Switch shown for example only. Connect as required.



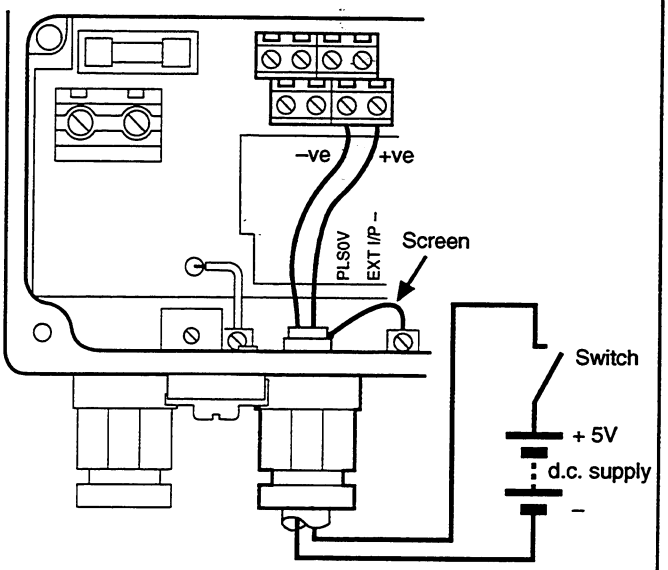
Relay and Timers

Fig. 3.13 Alarm Output Connections

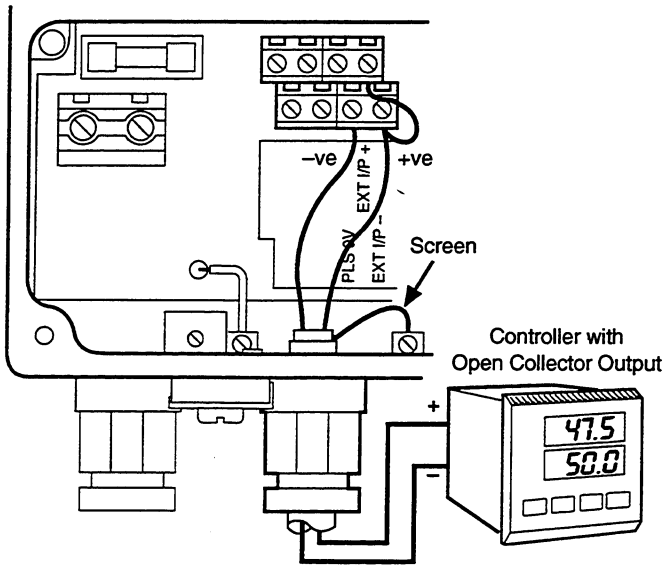
3.7.4 Contact Input – Fig. 3.14



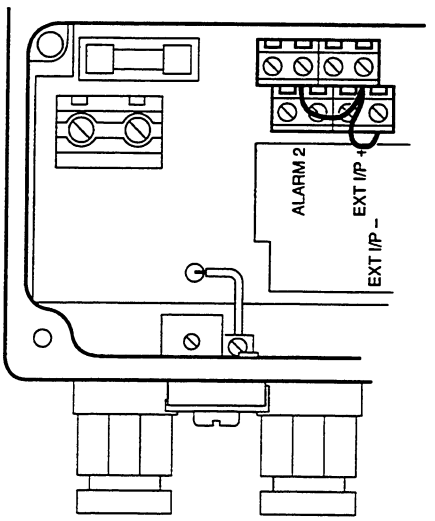
Volt-free Contact



Voltage Signal or Logic Signal



Open Collector (or Grounded Contact)

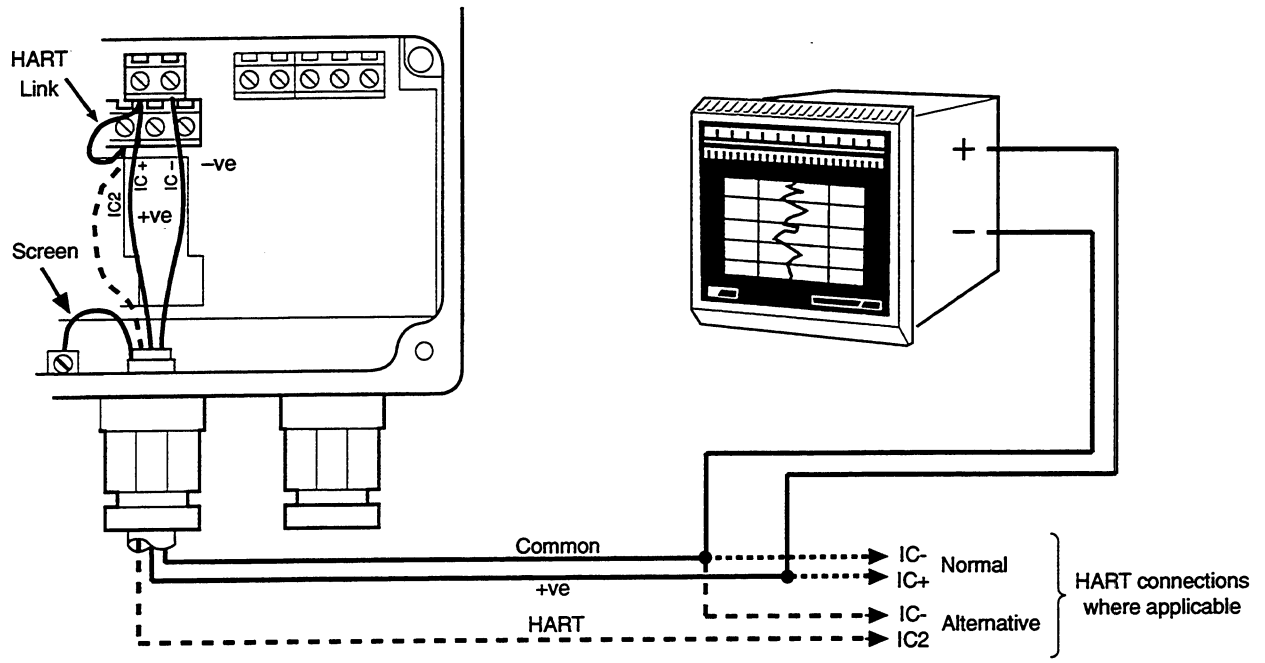


Using an Alarm for Automatic Range Change

Fig. 3.14 Contact Input Connections

3.7.5 Current Output – Fig. 3.15 and 3.16

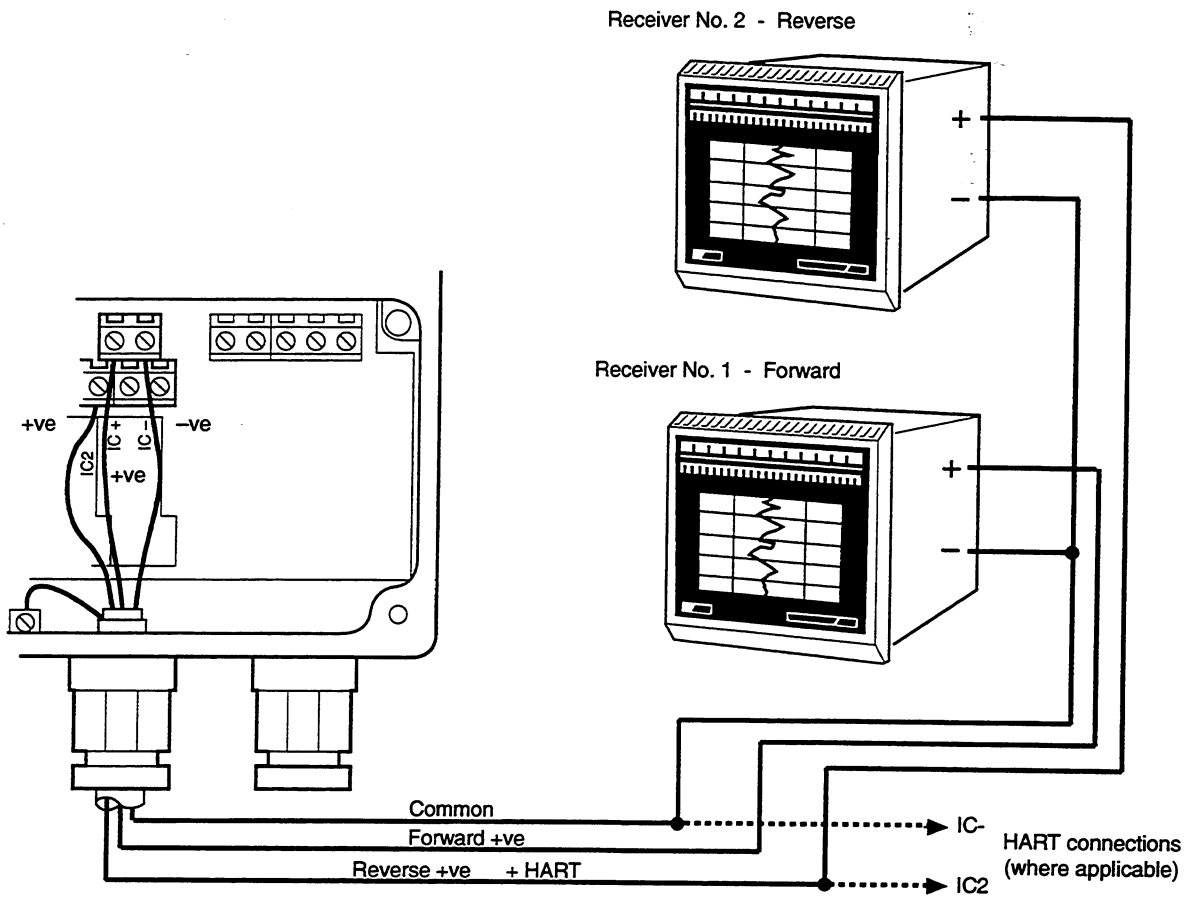
Information.
- Output is fully programmable – see Configuration Manual.
- Output is electrically separated from all other MagMaster connections.
- External isolators are not normally required and may significantly limit accuracy if used.



Information. For MULTIDROP HART installations, remove 'HART Link' and connect HART systems directly to IC2: this allows the analog output function to be retained.

Fig. 3.15 Current Output Connections: Standard

... Current Output

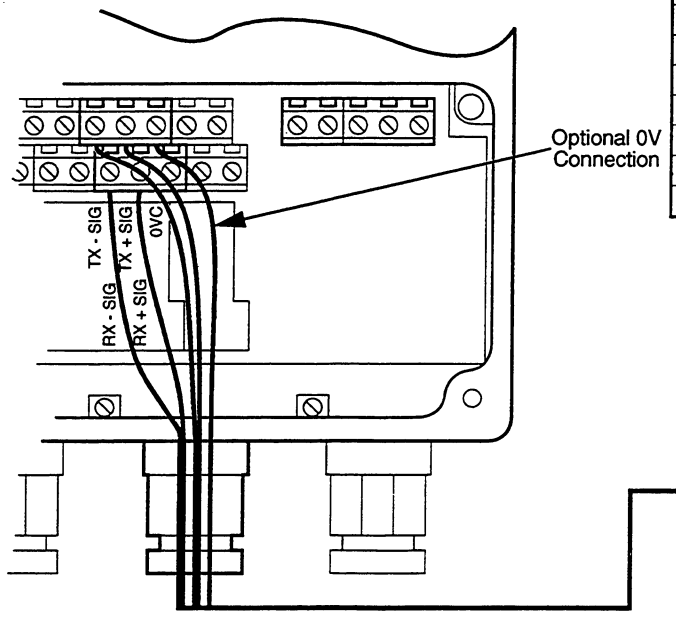


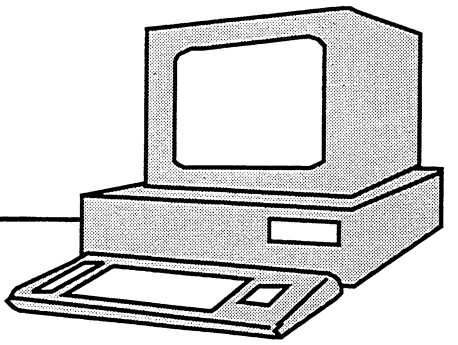
Information. HART option: MULTIDROP Mode cannot be used with this configuration

Fig. 3.16 Current Output Connections: Dual Current Option

3.7.6 Computer Connection – Fig. 3.17 and 3.18

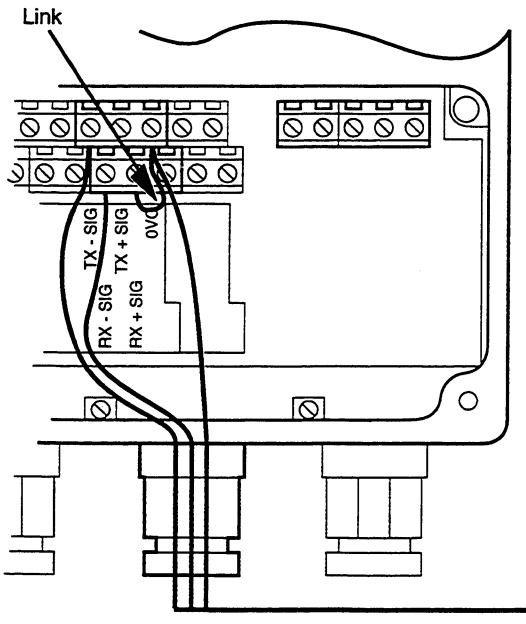
Information.
- RS422/423 option is electrically isolated from all other MagMaster connections.

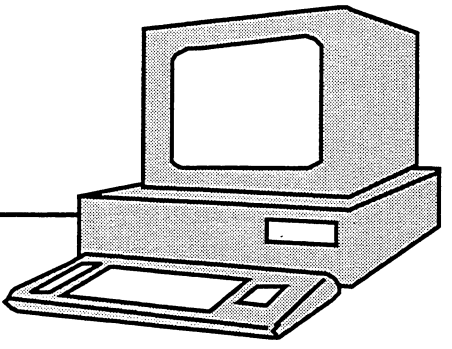




MagMaster TERMINALS		RS422 Connection NAME	APPLE Connector (8 Pin MCC)
TX -SIG	CONNECT TO	RX DATA –	5
Tx + SIG		RX DATA +	8
RX -SIG		TX DATA –	3
RX + SIG		TX DATA +	6
0VC		SIGNAL GROUND	4
–		DCD } Link	7 } Link
–		DTR } together	1 } together
–		DSR }	2 }

Fig. 3.17 RS 422 Connections (Balanced)





MagMaster TERMINALS		RS232 Name	9 PIN PC Connector	25 PIN PC Connector	Hygienic Adaptor Cable
TX-SIG	CONNECT TO	RXD	2	3	Red
TX+SIG		–	–	–	–
RX–SIG		TXD	3	2	Blue
RX+SIG		GND	5	7	Yellow
0VC		(Linked)	(Linked)	(Linked)	Green
–		DTR } Link	4 } Link	20 } Link	–
–		DSR } together	6 } together	6 } together	–
–		RTS } Link	7 } Link	4 } Link	–
–		CTS } together	8 } together	5 } together	–

Fig. 3.18 RS 423 Connections (Single Ended or RS 232)

3.7.7 Power Supply Connections – Figs. 3.19 and 3.20

Warning.
- DISCONNECT THE SUPPLY FROM ANY CABLES BEING TERMINATED ON THE TRANSMITTER.
- Electrical installation and earthing must be in accordance with relevant national and local standards.

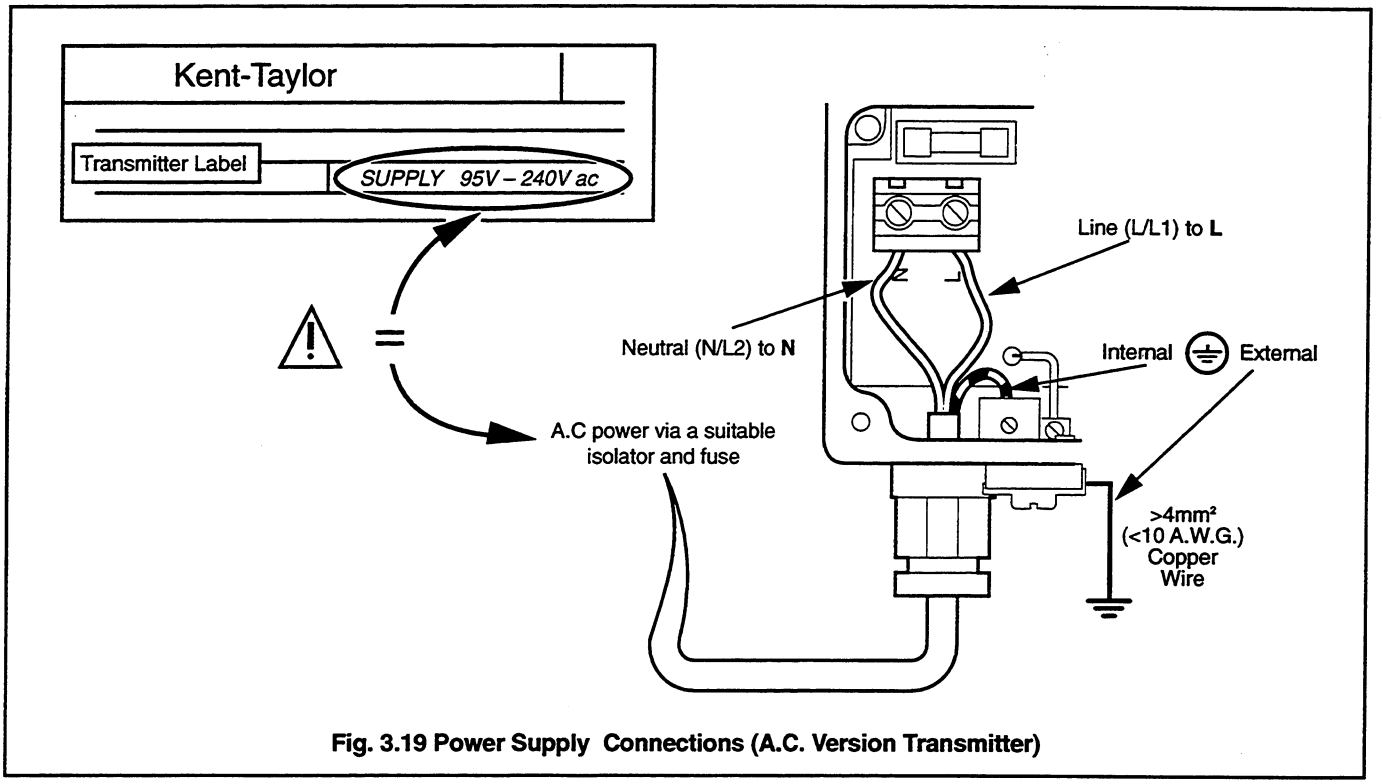


Fig. 3.19 Power Supply Connections (A.C. Version Transmitter)

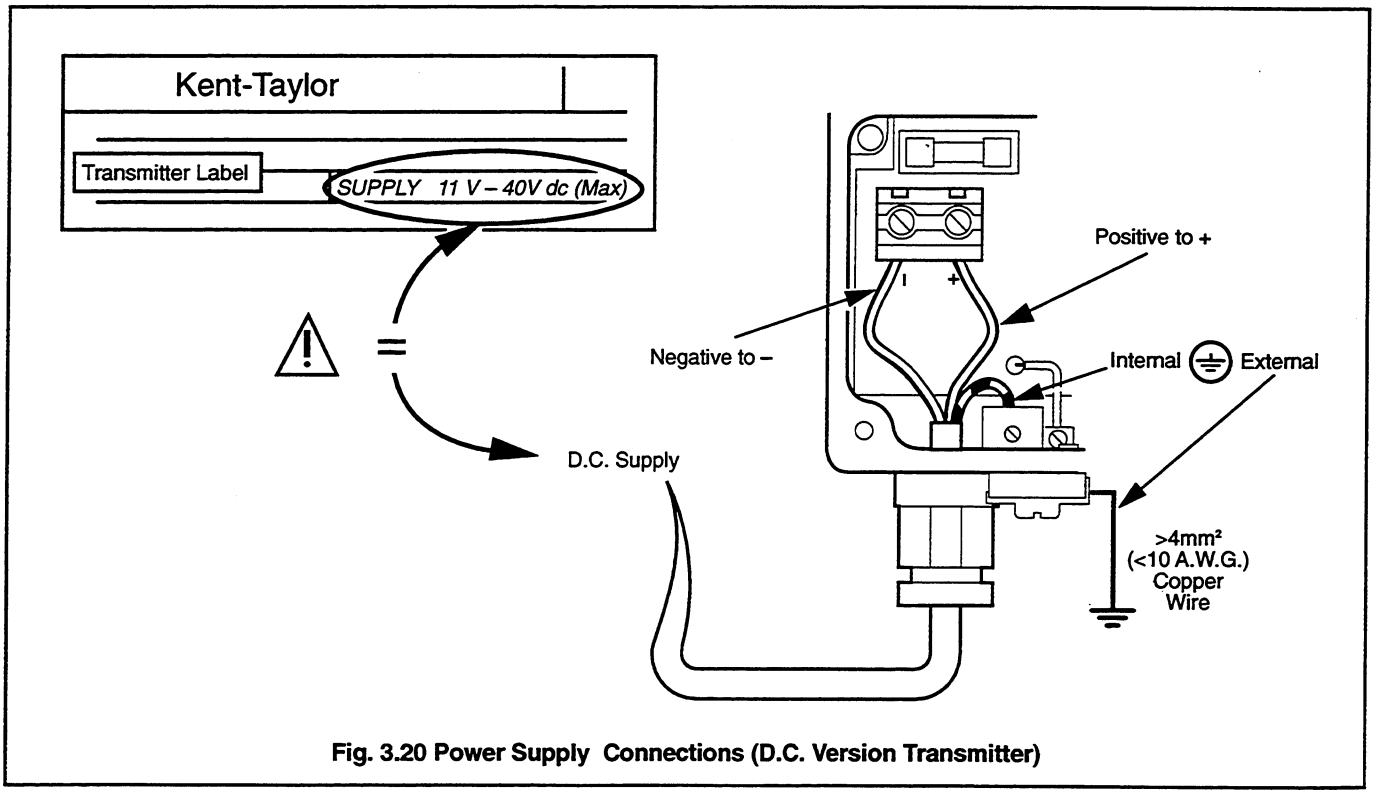


Fig. 3.20 Power Supply Connections (D.C. Version Transmitter)

Warning.

- Potting materials are toxic – use suitable safety precautions.
- Read the manufacturers instructions carefully before preparing the potting material.
- The remote sensor terminal box connections must be potted immediately on completion to prevent the ingress of moisture. For hazardous area versions – see HAZARDOUS AREA APPROVALS.
- Check all connections before potting – see ELECTRICAL INSTALLATION.
- Do not overfill the terminal box or allow the potting material to come into contact with the 'O' ring or groove.
- Do not let potting material enter conduit, if used.

APPENDIX B – MAGMASTER BLOCK DIAGRAM

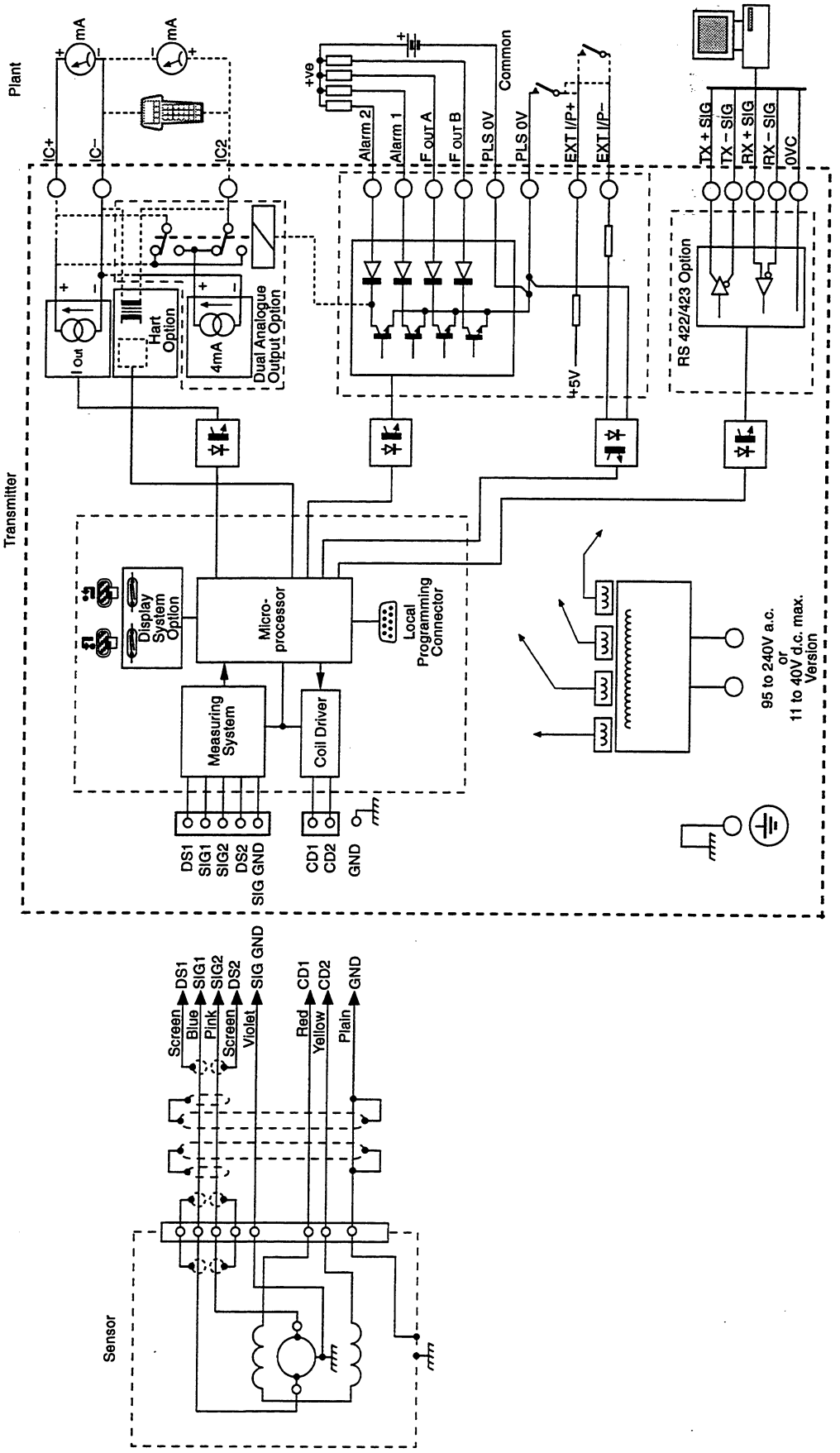


Fig. B1 MagMaster Block Diagram

BOOK 4
Operation

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BOOK 4 OPERATION

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SAFETY MEASURES

Warning.

- EXPLOSION HAZARD.
  SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- EXPLOSION HAZARD.
  DO NOT REMOVE FUSE OR DISCONNECT POWER LEADS WHILE CIRCUIT IS LIVE.
- THE LOCAL TERMINAL MUST NOT BE USED WHEN THERE IS AN EXPLOSION RISK.

MESURES DE SÉCURITÉ

Avertissement.

- RISQUE D'EXPLOSION.
  SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATÉRIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.
- RISQUE D'EXPLOSION.
  NE PAS RETIRER LE FUSIBLE NI DÉBRANCHER LES FILS D'ALIMENTATION TANT QUE LE CIRCUIT EST SOUS TENSION.
- NE PAS UTILIZEZ LE TERMINAL LOCAL EN ATMOSPHÈRE EXPLOSIVE.

Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections of this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment, and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

1 INTRODUCTION

This manual provides details to enable the MagMaster™ transmitter to be reconfigured from default parameters or from parameters initially set up by the factory to special order. This may be achieved via the communications link or a HART Terminal.

2 OPERATION

2.1 Startup

Switch on the power supply to the flowmeter and if a transmitter with display has been ordered, the flow rate will be shown on the bottom line of the display as shown below.

Sequential application of the provided magnetic wand to the left hand icon in the transmitter display area steps the top line display through the following sequence:

%	(Flow Rate % of Range)
>	(Forward flow total value)
<	(Reverse flow total value)
*	(Net flow total value)
Alm	(Active alarms)
Vel	(Flow Velocity in m/s or ft/s)

Any alarms are displayed sequentially if more than one alarm is present.

The second display line normally indicates flow rate in chosen units, but alternates with an alarm indication signal (Alm) if any alarms occur – see **Fault Finding** book.

Application of the wand to the right hand icon resets the totaliser display if reset is enabled (see Para 3.7, Parameter 73).

To gain access to the above information when a transmitter without display has been ordered, proceed as detailed in the following pages.

3 CONFIGURING THE TRANSMITTER

3.1 Filing Cabinet Analogy

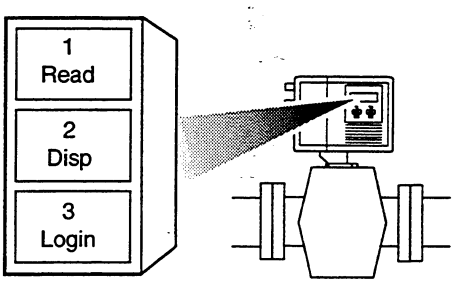


Fig. 3.1 Filing Cabinet Analogy

The main menu is accessed similarly to opening the drawers of a filing cabinet, each drawer of the cabinet representing an item of the main menu.

Main Menu items 1 to 3 are generally accessible; the remainder are password protected.

Files in the drawers of the cabinet would represent the groups of parameters provided by the transmitter which, if required, may be viewed or changed as shown in this, and the following pages.

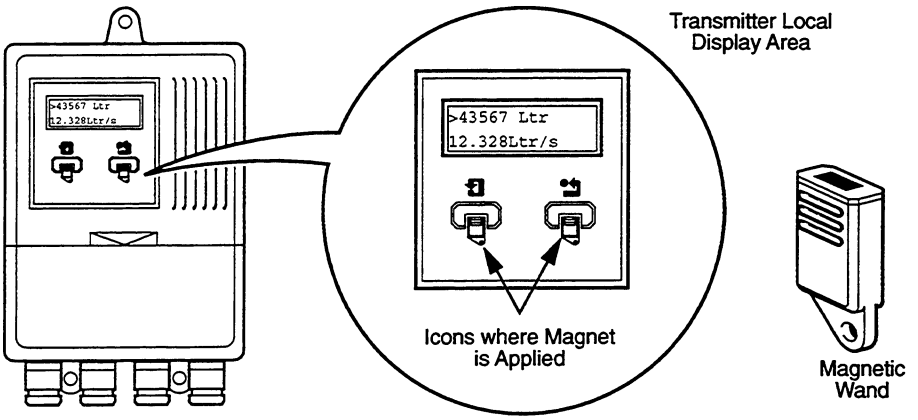


Fig. 2.1 Location of Controls

3.2 Getting Started

The Transmitter is delivered set up either with your chosen units, or set with our standard default values.

Warning. Ensure Plant Safety while configuring at all times.

If you need to change the transmitter configuration for any reason, this may be done by connecting a terminal device e.g. Personal Computer, Electronic Organiser etc., to the transmitter via the 9-way D-Type connector, found by sliding the movable section of the transmitter cover in the direction of the cable glands.

Note. There is no 9-way D-Type connector available on the Hygienic version transmitter; cable must be hard-wired from inside the transmitter via the cable glands.

Special software is not required for configuring the transmitter; any communication program will suffice.

Connect the programming terminal to the transmitter (See APPENDIX A for details of connection and setup of data terminals etc. to the transmitter).

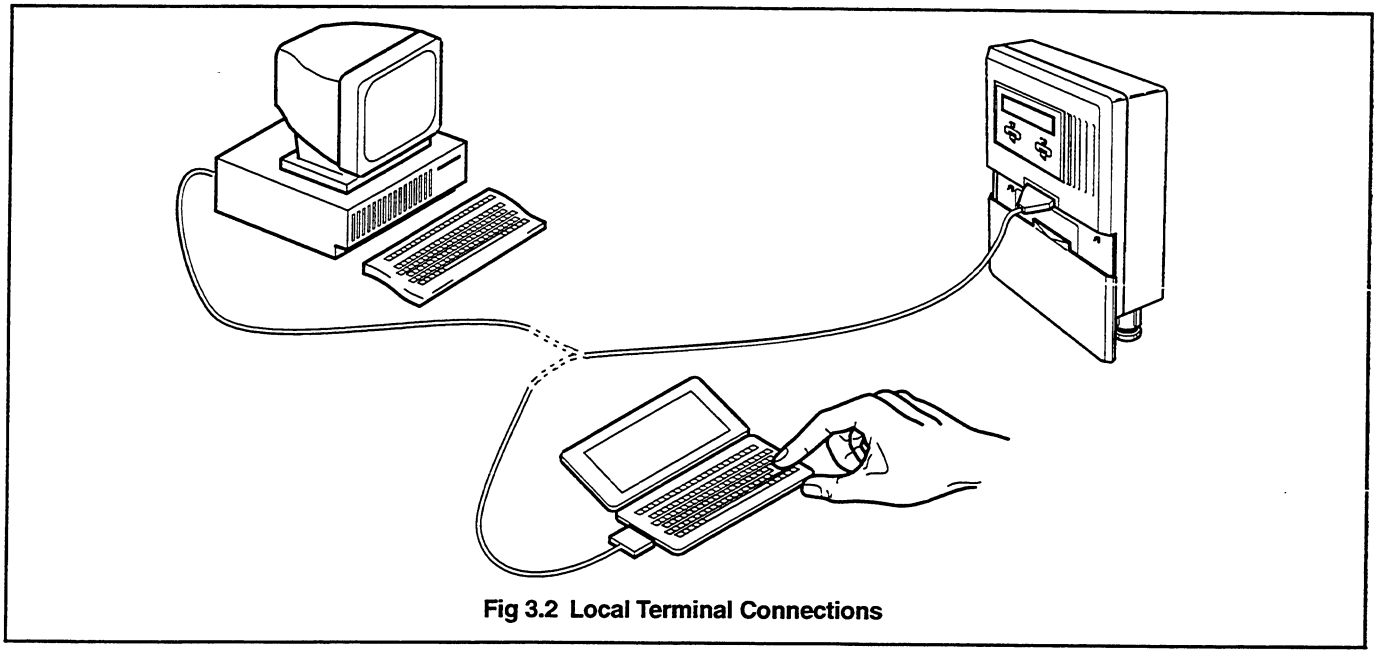
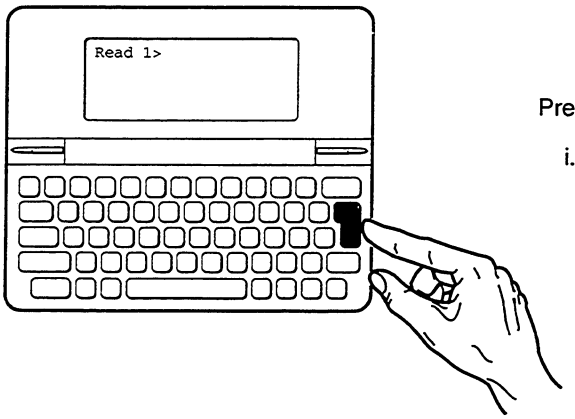


Fig 3.2 Local Terminal Connections

With connections made and the power switched onto the transmitter and terminal, proceed as shown below:

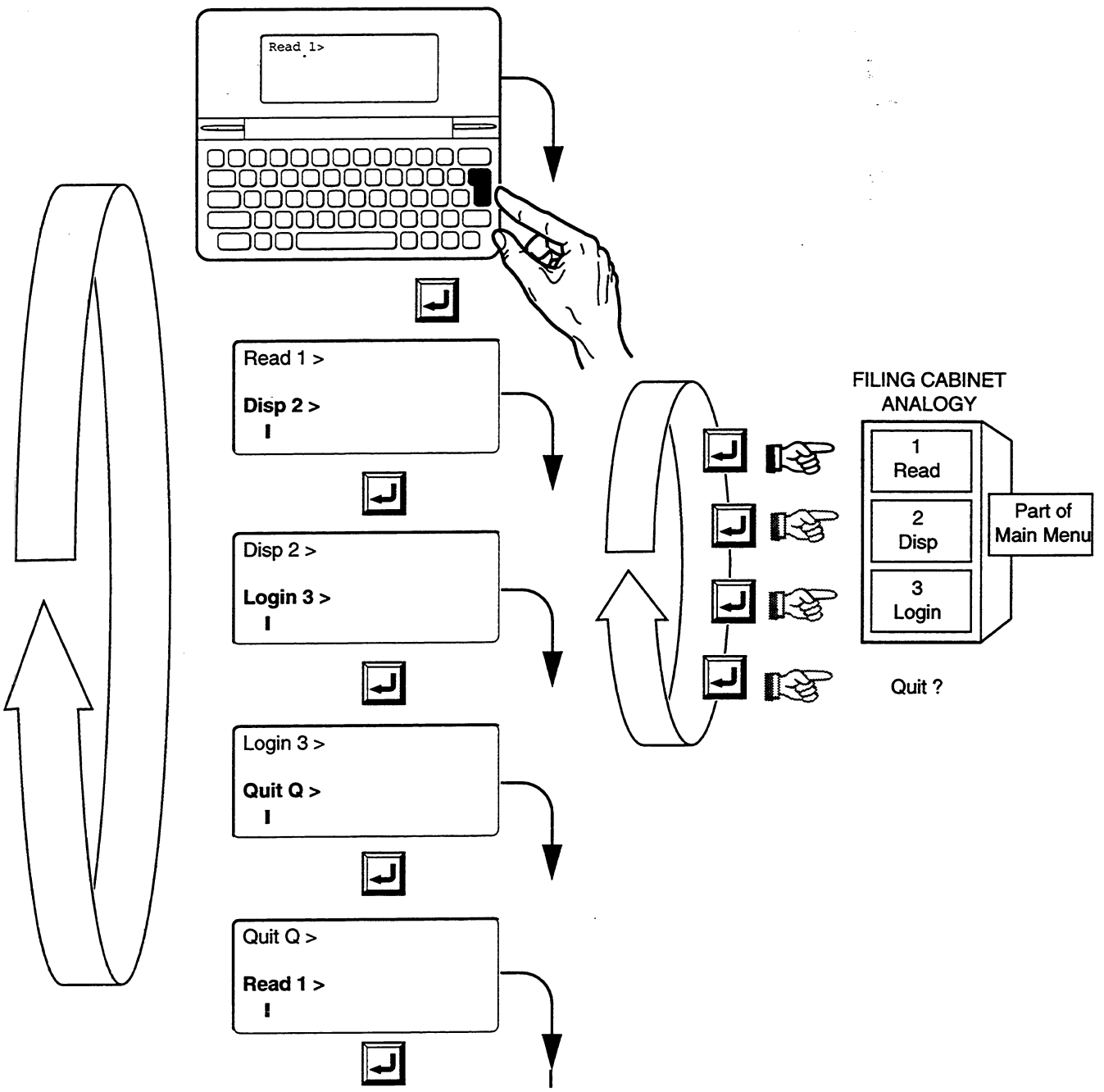
	Psion Organiser II	Psion Series 3	Personal Computer	Apple Macintosh
PRESS ↵	= EXE	= Enter	= Enter or Return	= Enter or *return*



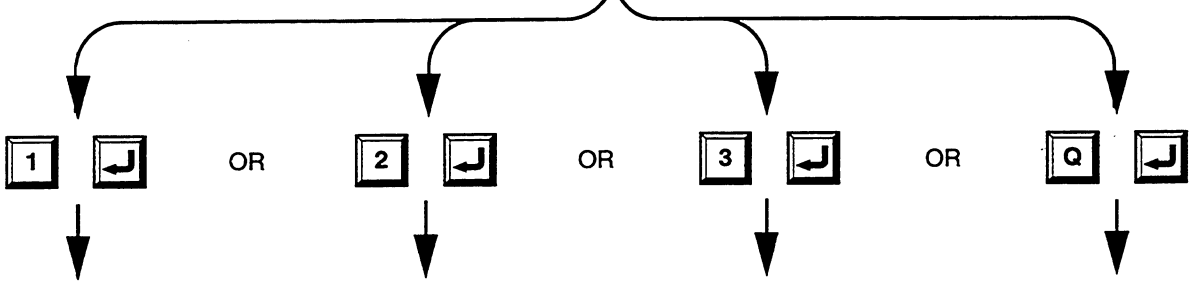
Press ↵ until display shows first item on main menu

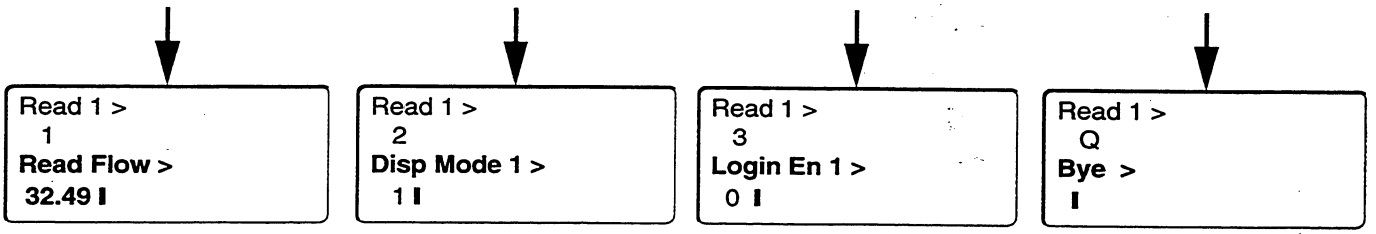
i.e. `'Read 1>'`

3.3 Looking at the Main Menu



3.4 Choosing a Main Menu Item



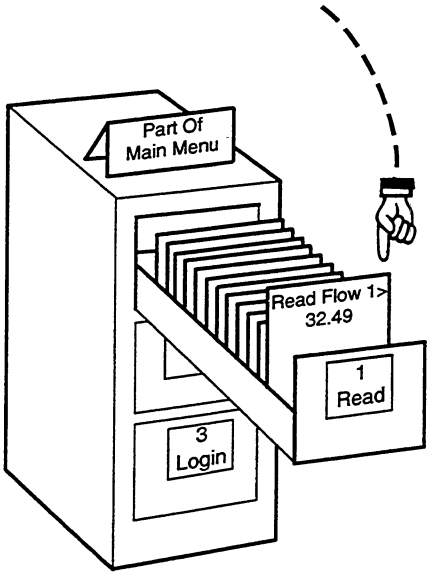


'**Read Flow**' (Item 1 of 'Read' menu) opened and parameter value displayed.

'**Disp Mode**' (Item 1 of 'Disp' menu) opened and parameter value displayed.

'**Login En**' (Item 1 of 'Login' menu) opened and parameter value displayed.

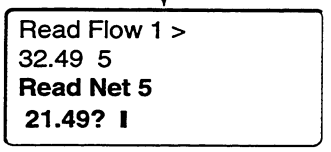
'Quit'





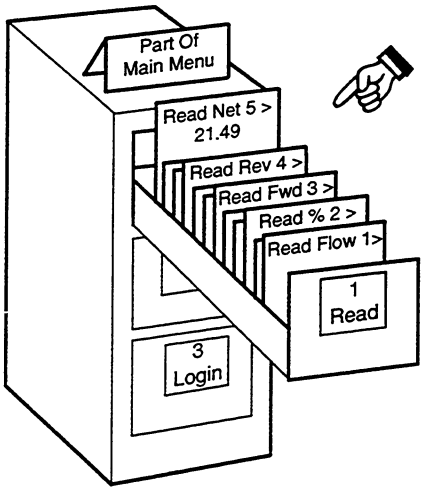
Similar to example shown.

Closes any open drawers of filing cabinet.



'**Read Net**' (Item 5 of 'Read' menu) opened and parameter value displayed.

FILING CABINET ANALOGY



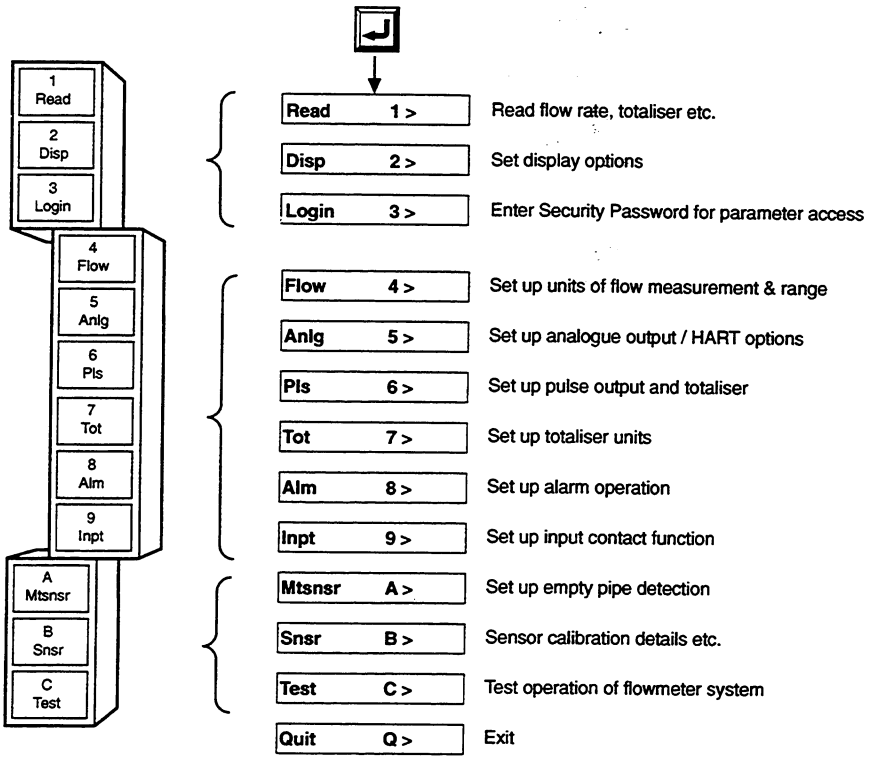
3.5 The Main Menu

SECURITY ACCESS

No security password required
(Level '0')

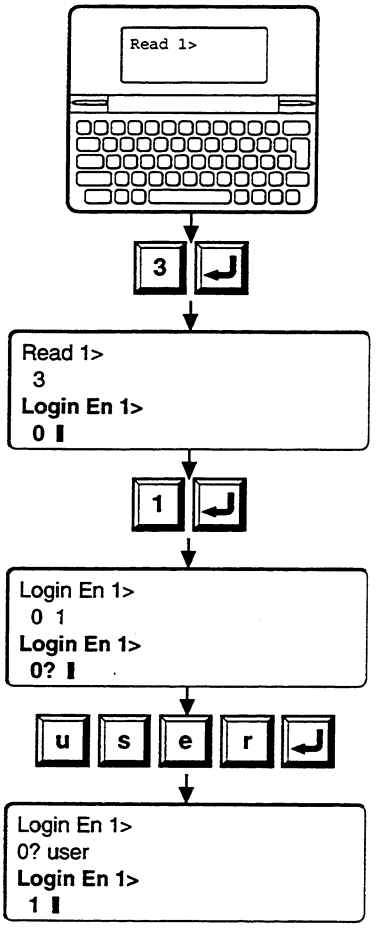
User security password required
(Level '1')

Engineer security password required
(Level '2')



3.6 Password Access

3.6.1 Gaining access to the user level



Note.
The passwords shown below ('user' and 'engineer') are the factory default settings: you can change these for increased security, if required.

From **'3.1 Getting Started'**

Entering '3' accesses 'Login' item from Main Menu.

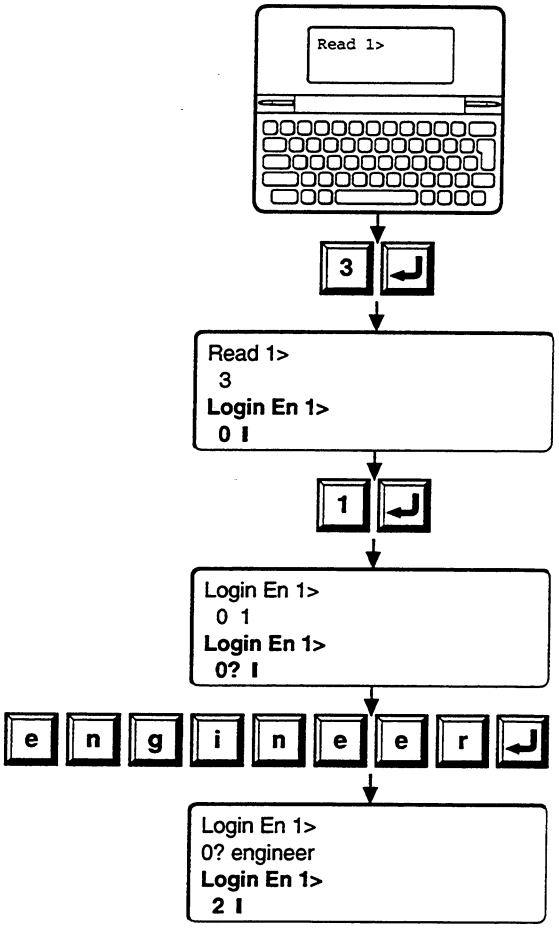
Entering '1' accesses Login Enable parameter.

'?' shows that you can change the '0' security level value.

Entering password **'user'** accesses level 1 security level.
Note the use of lower case in this example. All passwords are case sensitive.

'1' indicates security access level 1 is now in operation.

3.6.2 Gaining Access to the Engineer Level



From **'3.1 Getting Started'**.

Entering '3' accesses 'Login' item from Main Menu.

'0' indicates security access level 0 is in operation.

Entering '1' accesses Login Enable parameter.

'?' shows that you can change the '0' level value.

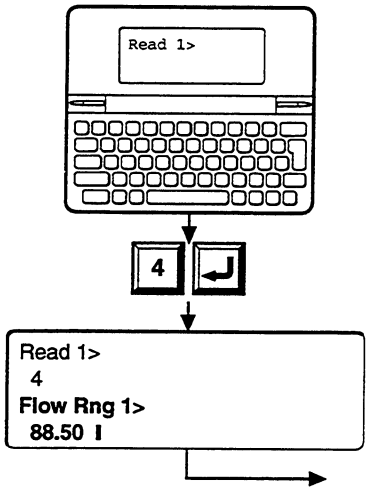
Entering password **'engineer'** accesses level 2 security level. Note the use of lower case in this example. All passwords are case sensitive.

'2' indicates security access level 2 is in operation.

3.7 Changing the Value of a Parameter

3.7.1 Numerical Value Parameters

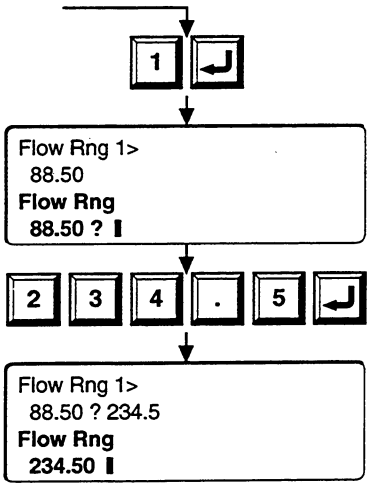
Note. Many parameters, e.g. the flowrate, are calculated internally, and the new value entered will therefore be ignored.



From 3.5.1 or 3.5.2, after gaining 'user' or 'engineer' access.

Entering '4' accesses Flow sub-menu from Main Menu: Item 1 (Flow Range) displayed.

'88.50' indicates present 100% Flow Range or 'Upper Range Value' ('URV')



Entering '1' selects this parameter.

'?' shows that you can change this value.

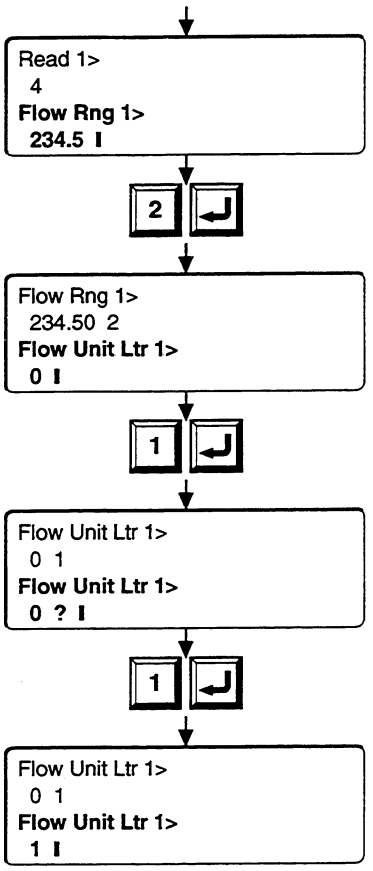
Enter a new value of % Flow Range.

New range setting of 234.5 now in use.

Note. When a '?' prompt is showing, press ↵ to leave current value unaltered.

3.7.2 Logic ('1' or '0') Value Parameters (excluding Alarm Parameters)

Note. Flow units are mutually exclusive in that only one unit can be selected at any one time. All other units are automatically deselected.



Entering '4' as above in 3.7.1 accesses Flow sub-menu.

Entering '2' accesses item 2 (Flow Units) of the Flow sub-menu.

'0' shows that this Flow Unit parameter (Litres) is not selected.
1 = Unit selected; 0 = Unit not selected.

Entering '1' accesses Flow Unit Ltr parameter 1 .

'?' shows that you can change this logic '0' value.

Entering '1' selects this 'units' parameter.
(All other parameters in the Flow Unit sub-menu automatically change to '0').

'1' indicates that litre flow units have been selected.

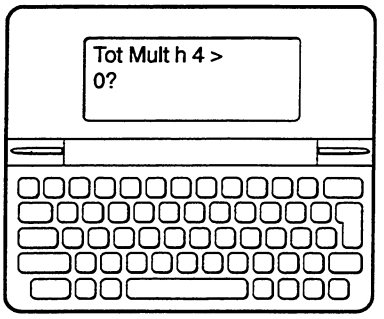
3.7.3 Alarm Parameters

Note. Alarm Parameters are selected with a '1' and deselected with a '0' as shown in the previous flow unit types, but any combination of Alarm Parameters may be selected or deselected as required. Automatic deselection of parameters not required does not take place with alarm parameters.

3.8 Advanced Techniques

3.8.1 Fast Selection of Parameters

Refer to the **B1.1 Parameter Tree Structure** diagram.



To select 'Flow Unit IGal' from **any parameter** (e.g. Tot Mult h):

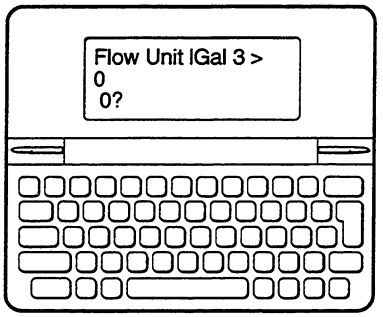


Pressing the ESCAPE key resets the prompt to the START position.
4 2 3 routes the prompt through the required menus to the Flow Unit Menu.
'0' indicates that the gallon units are not selected.
? indicates that it is possible to change the value to a '1' if required.

Any route through the tree structure can be similarly processed if the associated numbers and/or letters for the route is known.

e.g. ESC 8 3 1 followed by ENTER will allow the High Alarm Trip Level to be altered.

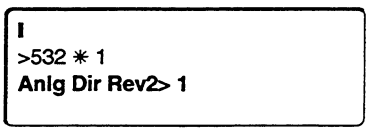
3.8.2 Fast Selection plus Data Entry



To select '**Reverse Analogue Direction** parameter'



Pressing the ESCAPE key resets the prompt to the START position.



5 3 2 routes the prompt through the required menus to the **Reverse Analogue Direction** parameter.
* simulates the ENTER key without terminating the sequence, which would occur if the normal ENTER key were used.
'1' is entered to select the parameter.

Note. Any other necessary data can be entered at this point; e.g. with the correct routing, a password could be entered. (31* user)

The enter key completes the command.

APPENDIX A

A1.1 Programming The Transmitter with a Data Terminal

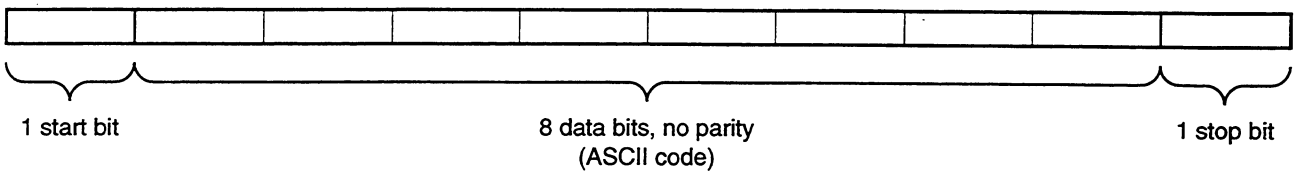
The nine-pin transmitter front panel connector is compatible with most serial devices, e.g. PSION Organiser, IBM PC, using proprietary adaptors where required. This connection is for 'local' use only, i.e. for up to approximately 5 metres between transmitter and data terminal.

The optional RS422/423 interface may be used for considerably greater distances (see **Installation Manual** for connections).

Most serial data terminals may be connected to the transmitter providing that the following three requirements are met:

1. The data rate (transmit and receive) is 4800 Baud.

2. The data format is:



3. Format for computer entry is as above plus the control codes to alter response are typically as follows:

X OFF	ESC	X OFF	Parameter Number	*	Optional New Value	↵

Where 'X OFF' suppresses character echo and the reply consists of the value only.

'ESC' forces the parameter number to start from the top of the Menu Tree.

'*' Separates the Parameter Number from the New Value.

N.B. If no value is entered before pressing ENTER, RETURN etc, the current value is retained.

X ON and/or ENTER will cancel the X OFF control.

Consult the Handbook for your particular terminal device.

A1.2 Using Personal Computers with MagMaster

Many communications software packages are available and in use, and can be used to interface with the MagMaster™.

The following is a sample of typical communications programmes and setup details for interfacing with the MagMaster™.

A personal computer can be used to communicate with MagMaster to set up its operating parameters. The only requirements are:

1) The computer can be any make or type (eg. Apple, BBC, Atari, Amiga, PC etc.) but it must be equipped with a serial communications port capable of operation at 4800 baud. (RS232C is the most common type). Most computers are fitted with this as standard. It is not possible to give specific instructions for all types of computer, because of the large number of computers available, but reference to the instructions of the machine to be used will provide the necessary information. A "dumb terminal", usually found connected to a mainframe computer, can also be used for configuring MagMaster.

2) The computer must be equipped with Terminal emulation software. In many machines (for example the BBC computer) this is built in, in others (IBM PC and AT for example) this has to be added. The software is not special in any way and there are many programmes on the market which provide or include this function, all of which are suitable for MagMaster use. Typical examples for the IBM PC/AT are:

Central Point's PC Tools	(Desktop Telecommunications)
Microsoft Windows	(Built in Terminal Emulator)
Odyssey	(Shareware programme)
Procomm Plus	(Shareware programme)
VBC.EXE	(ABB Kent-Taylor)
AQUAMAG.EXE	(VBC.EXE upgrade)

In all cases the Comms port parameters need to be set up as below; this function is normally provided as part of the software package being used.

Settings

Baud rate	4800
Data bits	8
Stop bits	1
Parity	NONE
Handshaking	NONE (OR RTS/CTS)
COMMS PORT	As appropriate (COM1, COM2 etc.)

Interconnection details

9-pin to 9-pin		9-pin to 25-pin	
2	3	2	2
3	2	3	3
4	6	4	6
5	5	5	7
6	4	6	20
7	8	7	5
8	7	8	4

The most common reason for lack of communication between a MagMaster and a computer or terminal, assuming that everything is set up as above, is the interconnecting lead. The correct lead to use is a LAPLINK lead, also known as a NULL MODEM. This is a lead which is designed to connect the communication ports of two computers together, and therefore the internal wiring "crosses over" (see **Interconnection Details** above). A serial printer lead will therefore not be suitable.

However, where the incorrect lead has been fitted, correct operation will normally result if the wires on pins 2 and 3 of one of the connectors are swapped over. **N.B.** A suitable lead (which also permits operation with certain Toshiba Laptop PCs) is available from ABB Kent-Taylor – see Book 6 Spares and Accessories.

A1.2.1 PC Tools

From the 'Desktop: Telecommunications' utility, use 'Edit: Create new entry' to enter the serial settings as required above and use 'Modem: Setup' to select the COMMS Port.

Use F8 or select 'Manual' to run the utility as a terminal emulator. Press ALT and ESC together once (the MENU bar will show 'ALT-ESC On'). This will allow the ESC key to be used with MagMaster.

A1.2.2 Windows 'TERMINAL'

Use 'Settings : Communications' to set up terminal settings as above.

> ✶ **Note.** Avoid using the backspace key for editing, as this produces misleading results with the Windows Terminal display. Use the Delete key instead for this function.

A1.2.3 Odyssey and Procomm Plus

Use the Port and Setup menus to configure the settings as above.

A1.2.4 'VBC' and 'Aquamag'

These two programmes are very similar and provide a basic, but totally adequate, communication facility for MagMaster. The programmes are configured ready to use with COM1. They will also terminate if the serial port is not connected.

A1.3 Quick Set-up for Psion Series 3

The following instructions are a quick guide to setting up a Psion Series-3 for use with a MagMaster. Refer to the Psion Series-3 Instruction Manuals for full information. These steps are only necessary the first time that the Series 3 is used. If your Psion Series 3 was supplied by ABB Kent-Taylor, the Comms. Application will have been installed. Locate 'MagMastr' under the COMMS icon and press Enter; otherwise proceed as follows:

...APPENDIX A

1) Fit batteries to Organiser as described in Series 3 User guide page 3. Note ERRATUM sheet, if any, packed with unit.

2) Use the Esc key to turn it on and then use ↑ and ↓ keys, followed by Enter to select the language required (most models have this facility).

3) There may be a warning that the Backup battery is low, if so this can be ignored at this stage. (a new backup battery should be fitted later – see manual). If this happens press the Esc key.

4) To ensure sufficient memory is available (128k Model), close down the applications **'Data'**, **'Word'**, **'World'**, **'Calc'** and **'Agenda'** as follows:

   Move the highlight block with ← or → to application, press Delete, followed by Y.

   Switch off by holding down ⌄ and 1 together.

5) Assemble the Psion 3-link cable as described in the 3-link manual page 2 onwards and plug it into the connector on the left side of the Series 3.

6) Press Esc to switch on again, this will give the system screen, showing the applications available. Press the Menu key, and use the ← and → keys to select the "Apps" menu (the centre menu). Select "Install application" by using the ↑ and ↓ keys then press Enter.

   Short cut: from the system screen, hold down ⌄ and press I.

7) Press ↓ key to select disk and then ← and → to select "C". The top line should now show "Comms.app". If so press Enter. (If not press the ↑ and then use the ← and → keys to select it, then press Enter). A new icon will appear, a picture of the organiser connected to a computer.

8) If necessary, use the cursor keys to highlight "Comms[C]" and press Enter to run the communications application. One of two possibilities will occur:

   a) The screen will blank briefly and then a box containing a flashing cursor will appear, together with a message **"Online..."** Proceed to step 9.

   b) A message **"No system memory"** appears. See step 4 above.

   Move the highlight back to **"Comms[C]"** and repeat step 8.

9) Hold down ⌄ and press J. Use the cursor (← → ↓ and ↑) keys to make Serial Port settings as below:

   Set Serial Port

* Baud rate	4800
* Data bits	8
* Stop bits	1
* Parity	none
* Ignore parity	yes

   Press Enter when finished.

10) Hold down ⌄ and press K to set up handshakes as below.

   Set Serial Handshake

* Xon/Xoff	off
* Rts/Cts	off
* Dsr/Dtr	off
* Dcd	off

11) Press the ⌄ and O keys, followed by ↓, →, → to select drive **'Internal'** and then press ↑.

   Type in a suitable name, eg. 'MagMastr' (8 characters max.) and press Enter, to save the settings for future use.

The Series 3 is now ready for use with the MagMaster transmitter, as described in this Configuration Manual.

A1.4 Setup for Psion Organiser II (CM, XP, LZ, LZ64)

Note. It is recommended that the mains adapter is used to power the 'Organiser' where possible.

1. Connect the Psion Organiser Communications Link Adapter to the MagMaster Transmitter using a suitable adapter lead consisting of a 25-pin D-Type plug to 9-pin D-Type socket (available as a Psion accessory).

2. Scroll through the following list of items which will be shown on the 'screen' in the Comms 'SETUP' mode.

BAUD	4800
PARITY	NONE
BITS	8
STOP	1
HAND	NONE
PROTOCOL	NONE
ECHO	HOST
WIDTH	NONE
TIMEOUT	NONE
REOL	<CR><LF>
REOF	NONE
RTRN	NONE
TEOL	<CR>
TEOF	NONE
TTRN	NONE

Enter the following numbers to give the operations shown in the above:

13,10	<CR><LF>
13	<CR>

Select 'TERM' from the 'Comms' menu to allow communication with the MagMaster Transmitter.
Set COMMS to 'No Handshaking', 'No translations'.

Set the MagMaster Display Mode (Parameter '21') to '1'. (Refer to **3.6 Changing the Value of a Parameter** in this manual).

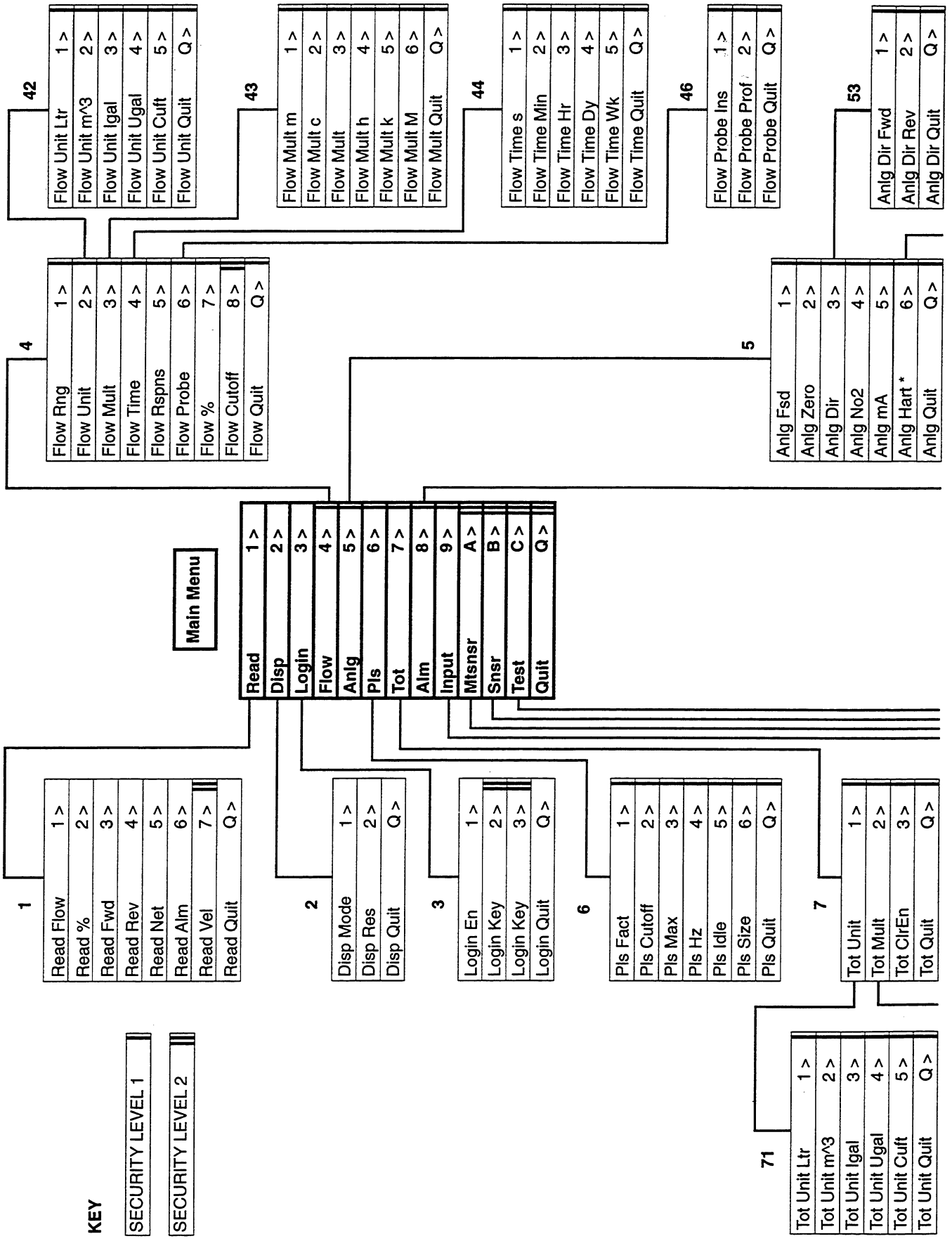
A1.4.1 Keyboard Designations (Psion Organiser II)

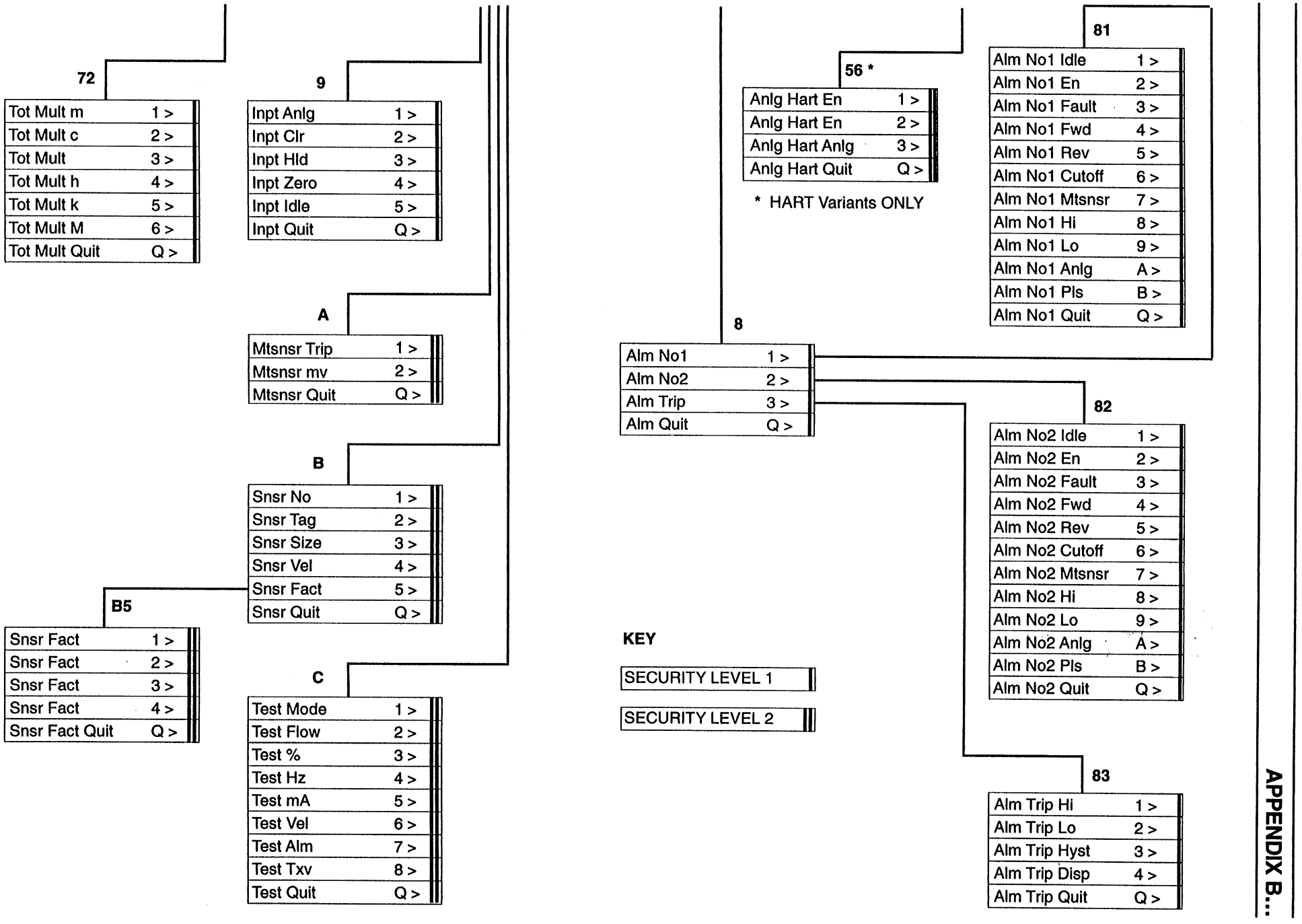
Function	Key
↵	EXE
DEL	DEL
ESC	→ + A

Note. The ↑ and ↓ keys cannot be used, as these enable and disable the Organiser data output. Consult the Psion Organiser handbook for further information.

APPENDIX B

B1.1 Parameter Tree Structure



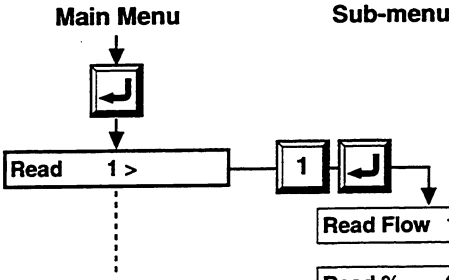

72
Tot Mult m 1 >
Tot Mult c 2 >
Tot Mult 3 >
Tot Mult h 4 >
Tot Mult k 5 >
Tot Mult M 6 >
Tot Mult Quit Q >
9
Inpt Anlg 1 >
Inpt Clr 2 >
Inpt Hld 3 >
Inpt Zero 4 >
Inpt Idle 5 >
Inpt Quit Q >
A
Mtsnsr Trip 1 >
Mtsnsr mv 2 >
Mtsnsr Quit Q >
B
Snsr No 1 >
Snsr Tag 2 >
Snsr Size 3 >
Snsr Vel 4 >
Snsr Fact 5 >
Snsr Quit Q >
B5
Snsr Fact 1 >
Snsr Fact 2 >
Snsr Fact 3 >
Snsr Fact 4 >
Snsr Fact Quit Q >
C
Test Mode 1 >
Test Flow 2 >
Test % 3 >
Test Hz 4 >
Test mA 5 >
Test Vel 6 >
Test Alm 7 >
Test Txv 8 >
Test Quit Q >
56 *
Anlg Hart En 1 >
Anlg Hart En 2 >
Anlg Hart Anlg 3 >
Anlg Hart Quit Q >
* HART Variants ONLY
81
Alm No1 Idle 1 >
Alm No1 En 2 >
Alm No1 Fault 3 >
Alm No1 Fwd 4 >
Alm No1 Rev 5 >
Alm No1 Cutoff 6 >
Alm No1 Mtsnsr 7 >
Alm No1 Hi 8 >
Alm No1 Lo 9 >
Alm No1 Anlg A >
Alm No1 Pls B >
Alm No1 Quit Q >
8
Alm No1 1 >
Alm No2 2 >
Alm Trip 3 >
Alm Quit Q >
82
Alm No2 Idle 1 >
Alm No2 En 2 >
Alm No2 Fault 3 >
Alm No2 Fwd 4 >
Alm No2 Rev 5 >
Alm No2 Cutoff 6 >
Alm No2 Mtsnsr 7 >
Alm No2 Hi 8 >
Alm No2 Lo 9 >
Alm No2 Anlg A >
Alm No2 Pls B >
Alm No2 Quit Q >
KEY
SECURITY LEVEL 1
SECURITY LEVEL 2
83
Alm Trip Hi 1 >
Alm Trip Lo 2 >
Alm Trip Hyst 3 >
Alm Trip Disp 4 >
Alm Trip Quit Q >
APPENDIX B...

B1.2 Description of Parameters

Select the access number or letter, of any of the items in the Main Menu, followed by a CR (RETURN etc), to access its associated sub-menu. It is not necessary for the parameter to be displayed to select it by number.

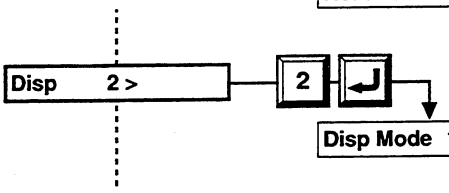
> ✱ **Note.** The correct security level must be selected in **Login** parameter below to access certain parameters. See headings in this description or access notes against individual parameters.

Select the access number or letter of any item in a sub-menu, followed by a CR, to read the value or to change it as necessary. (CR)s without an access code cycles through a menu continuously without accessing a parameter. All 'live' data displayed is updated each second.



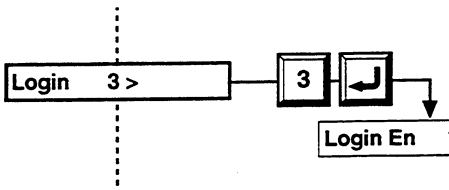
Sub-menus	Remarks
Read Flow 1>	Flowrate in chosen units.
Read % 2>	Flowrate as a percentage of range
Read Fwd 3>	Accumulated total in forward totaliser *
Read Rev 4>	Accumulated total in reverse totaliser *
Read Net 5>	Net Total (= Forward minus Reverse) *
Read Alm 6>	Cyclic display of active alarms.
Read Vel 7> (Requires Level 2 access>)	True flow velocity in m/s, or ft/s if flow units are in Ugal or ft^ 3.
Read Quit Q>	Enter Q (CR) to return to Main Menu or (CR) to cycle around this menu.

* Resettable to zero if Tot ClrEn is set ('73' from Main Menu)



Sub-menus	Remarks
Disp Mode 1 > 1	Set single, double or multi-line display on terminal. 0 = Single line display. 1 = 2 line display for small displays (default). 2 = New line for each display update (e.g. for printers, data logging, etc.).
Disp Res 2 > 3	Set resolution of flow display. Enter number of decimal places required.
Disp Quit Q >	Enter Q (CR) to return to Main Menu, or (CR) to cycle around this menu.

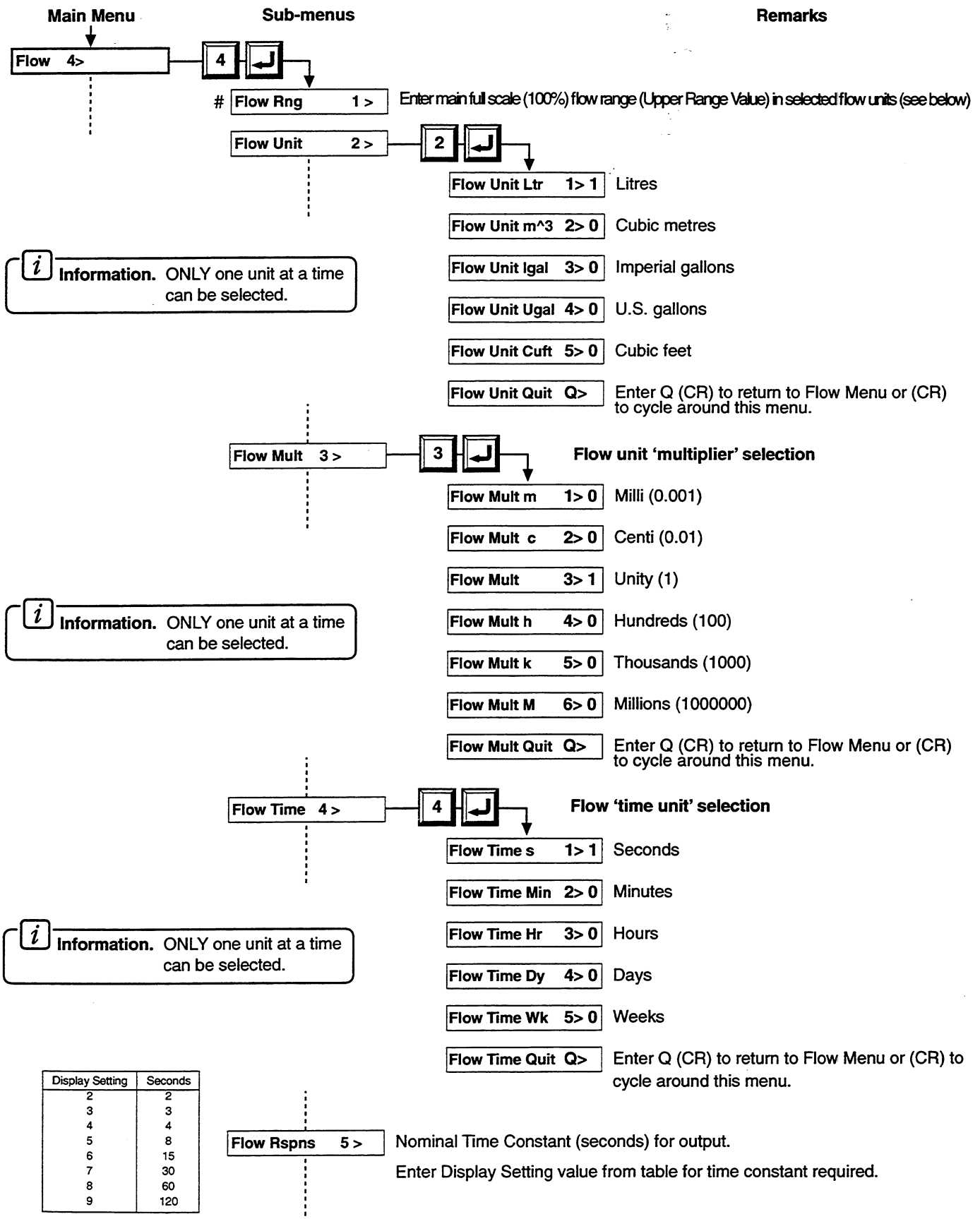
> ⚠ **Caution.** Do not attempt to modify passwords unless fully conversant with the operation of the menu system.



Sub-menus	Remarks
Login En 1 > 0	Shows current security level (0 = default). Enter password for level required. 'user' = Default for Level 1 'engineer' = Default for Level 2
Login Key 2 > (Requires Level 2 access>)	Enter new password to replace existing level 1 word .
Login Key 3 > (Requires Level 2 access>)	Enter new password to replace existing level 2 word .
Login Quit Q >	Enter Q (CR) to return to Main Menu or (CR) to cycle around this menu.

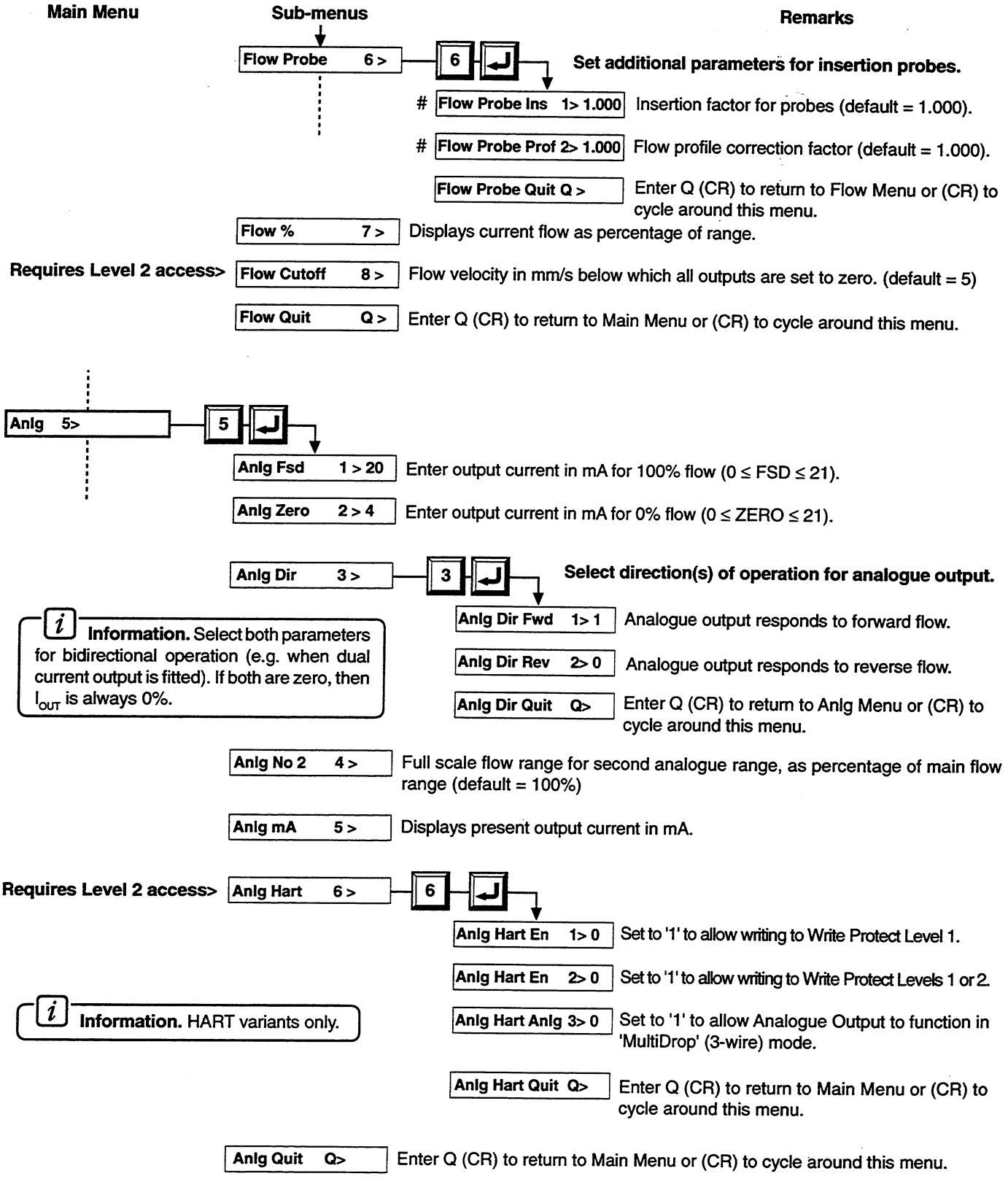
> ✱ Note. Access level selected is reset to Level 0 after a 'Quit' from Main Menu.

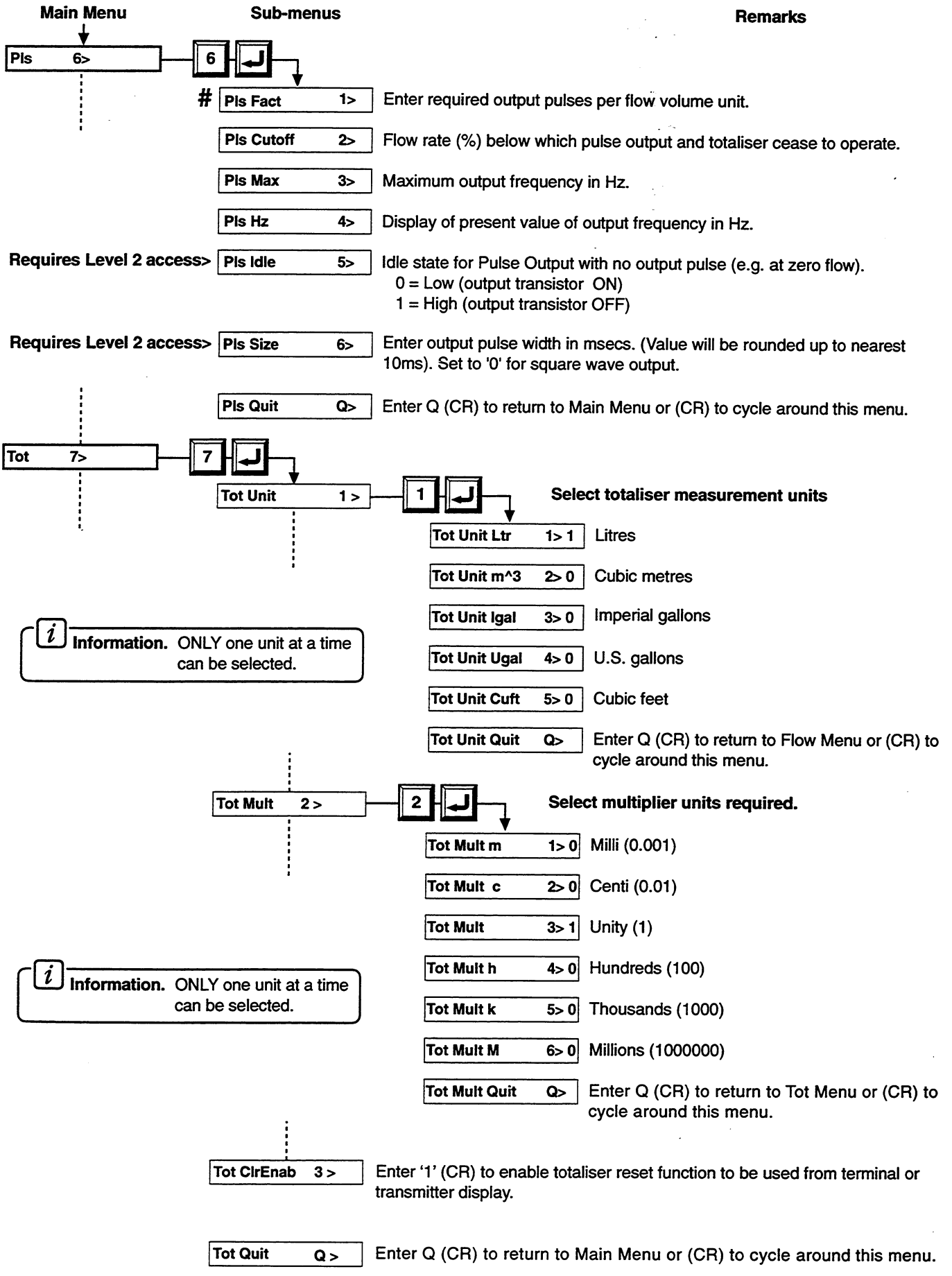
Information. THE FOLLOWING PARAMETERS REQUIRE 'LEVEL 1' OR 'LEVEL 2' ACCESS.
(Enter passwords in 'Login En' parameter above).



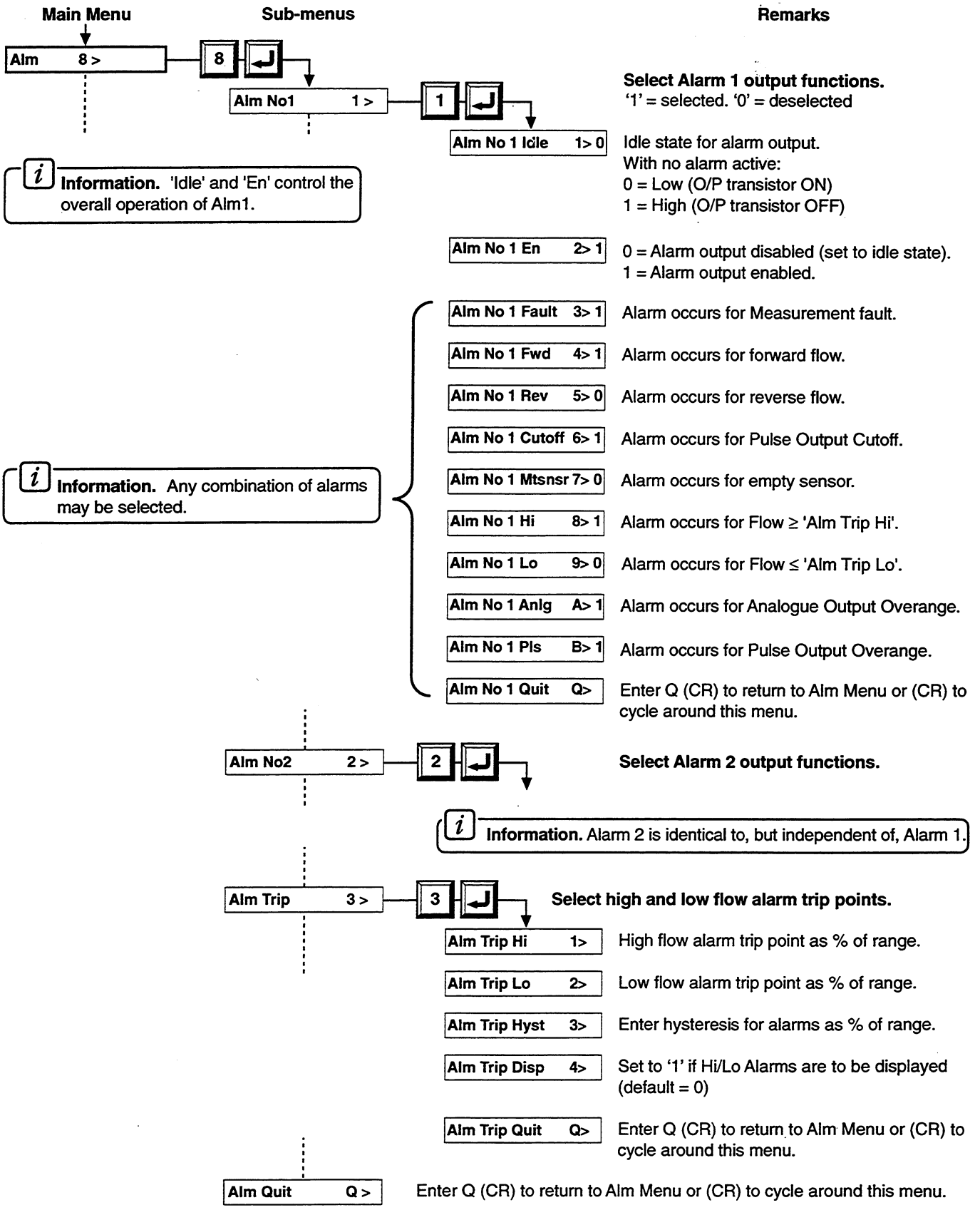
Display Setting	Seconds
2	2
3	3
4	4
5	8
6	15
7	30
8	60
9	120

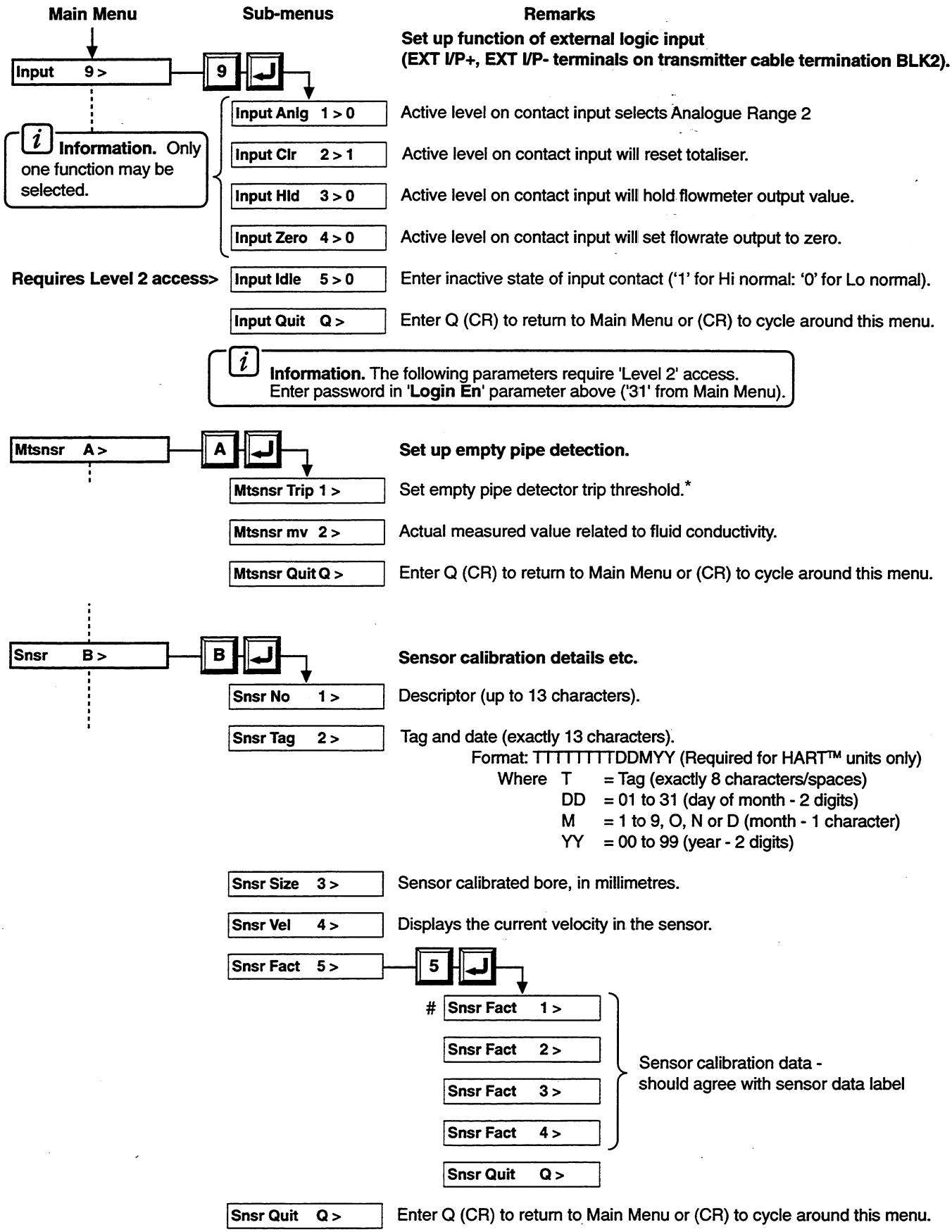
...B1.2 Description of Parameters




Main Menu
Sub-menus
Remarks
Pls 6>
6
Pls Fact 1> Enter required output pulses per flow volume unit.
Pls Cutoff 2> Flow rate (%) below which pulse output and totaliser cease to operate.
Pls Max 3> Maximum output frequency in Hz.
Pls Hz 4> Display of present value of output frequency in Hz.
Requires Level 2 access> Pls Idle 5> Idle state for Pulse Output with no output pulse (e.g. at zero flow).
0 = Low (output transistor ON)
1 = High (output transistor OFF)
Requires Level 2 access> Pls Size 6> Enter output pulse width in msecs. (Value will be rounded up to nearest 10ms). Set to '0' for square wave output.
Pls Quit Q> Enter Q (CR) to return to Main Menu or (CR) to cycle around this menu.
Tot 7>
7
Tot Unit 1 >
1
Select totaliser measurement units
Tot Unit Ltr 1> 1 Litres
Tot Unit m^3 2> 0 Cubic metres
Tot Unit Igal 3> 0 Imperial gallons
Tot Unit Ugal 4> 0 U.S. gallons
Tot Unit Cuft 5> 0 Cubic feet
Tot Unit Quit Q> Enter Q (CR) to return to Flow Menu or (CR) to cycle around this menu.
Information. ONLY one unit at a time can be selected.
Tot Mult 2 >
2
Select multiplier units required.
Tot Mult m 1> 0 Milli (0.001)
Tot Mult c 2> 0 Centi (0.01)
Tot Mult 3> 1 Unity (1)
Tot Mult h 4> 0 Hundreds (100)
Tot Mult k 5> 0 Thousands (1000)
Tot Mult M 6> 0 Millions (1000000)
Tot Mult Quit Q> Enter Q (CR) to return to Tot Menu or (CR) to cycle around this menu.
Information. ONLY one unit at a time can be selected.
Tot ClrEnab 3 > Enter '1' (CR) to enable totaliser reset function to be used from terminal or transmitter display.
Tot Quit Q > Enter Q (CR) to return to Main Menu or (CR) to cycle around this menu.

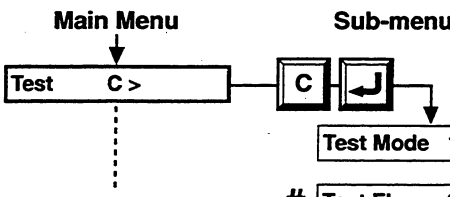
...B1.2 Description of Parameters





* If the liquid being measured is a slurry, set empty pipe detector threshold to 0. If empty pipe detection is required, go to Menu 9 and select (INPUT ZERO 4>1). Connect input wires from MagMaster to level switch, pump starter, etc. as per Electrical Installation Instructions in Book 3. Outputs will be driven to zero.

...B1.2 Description of Parameters



Remarks

System Test: Exercises all outputs (as programmed) from manually entered flowrate.

	Test Mode 1 >	If set to '1', transmitter is in 'Test Mode'
#	Test Flow 2 >	Displays current flowrate: if in 'Test Mode', then any value may be entered manually
	Test % 3 >	Flowrate as a percentage.
	Test Hz 4 >	Output Frequency.
	Test mA 5 >	Output Current.
	Test Vel 6 >	Flow velocity in sensor (for the flowrate above).
	Test Alm 7 >	Shows currently active alarms,* sequentially ('Clr' indicates no alarms active).
	Test Txv 8 >	Live flow velocity (uncorrected for sensor calibration).
	Test Quit Q >	Enter Q (CR) to return to Main Menu or (CR) to cycle around this menu.

Calculated from 'Test Flow 2' above

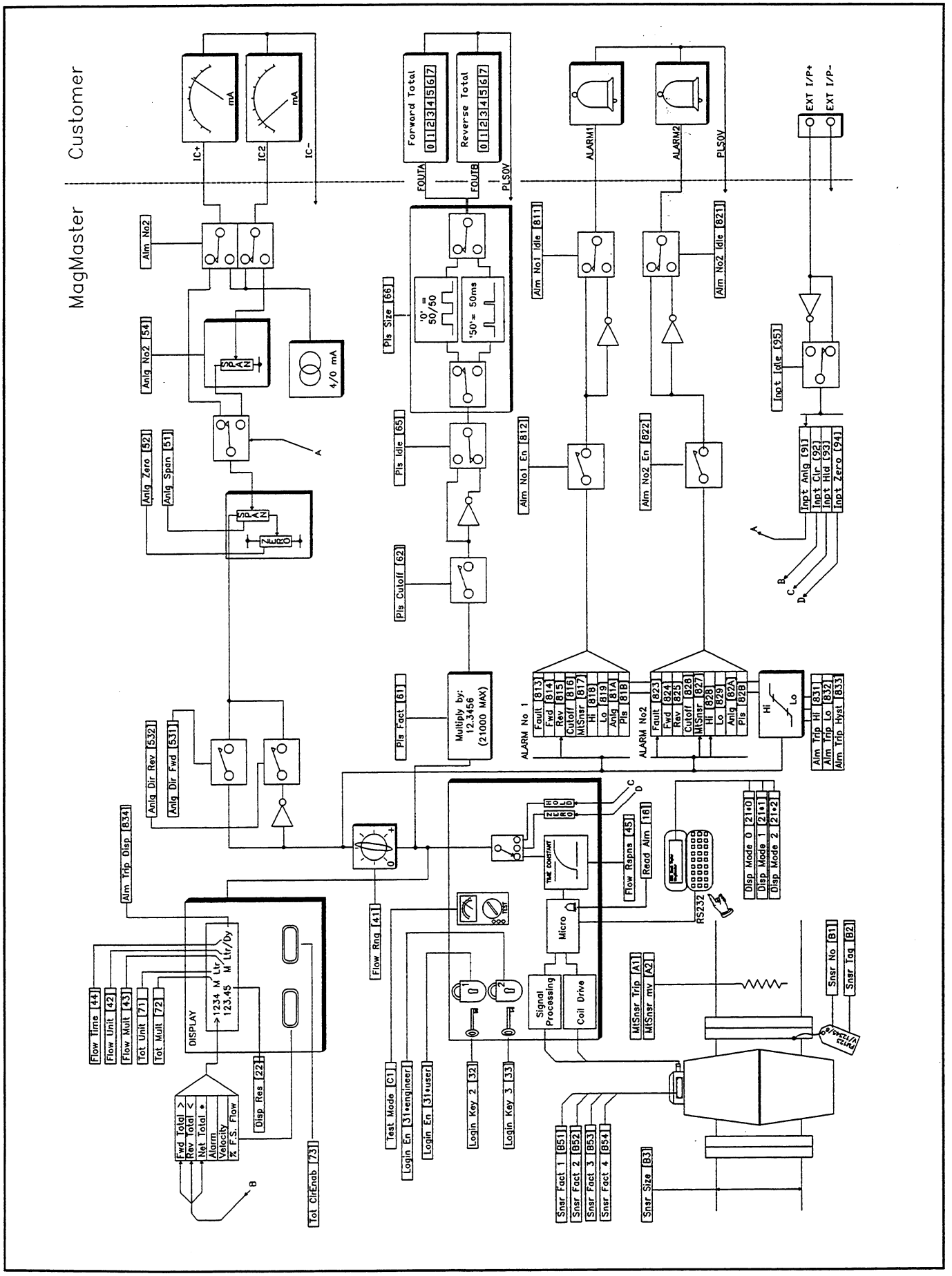
Information. 'Test Mode' self cancels after 30 minutes, if no further entries are made.

* If the sensor is empty or disconnected, the alarms 'MtSnsr' and Coil will be displayed as appropriate.

\# The maximum which can be entered must not exceed 21000. The value entered may be displayed with a small error in the decimal digits e.g. 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.900 will be used by the MagMaster.

END OF PARAMETERS

APPENDIX C MAGMASTER SYSTEM DIAGRAM



NOTES

BOOK 5
Fault Finding

CONTENTS Page

BOOK 5 FAULT FINDING

Section		Page
SAFETY MEASURES		1
1	INTRODUCTION	1
2	FAULT FINDING	2
2.1	Alarms	2
2.2	Test Mode	2
2.3	Fault Finding Flow Chart	3

1 INTRODUCTION

A very powerful test mode, especially useful during commissioning and plant fault finding, enables all external devices connected to the MagMaster to be tested over the full range of flow rates.

This mode can be used regardless of flow conditions in the sensor, or even with the sensor disconnected, and does not require the use of additional equipment.

SAFETY MEASURES

Warning.

- EXPLOSION HAZARD.
  SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- EXPLOSION HAZARD.
  DO NOT REMOVE FUSE OR DISCONNECT POWER LEADS WHILE CIRCUIT IS LIVE.
- THE LOCAL TERMINAL MUST NOT BE USED WHEN THERE IS AN EXPLOSION RISK.

MESURES DE SÉCURITÉ

Avertissement.

- RISQUE D'EXPLOSION.
  SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATÉRIAL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE I, DIVISION 2.
- RISQUE D'EXPLOSION.
  NE PAS RETIRER LE FUSIBLE NI DÉBRANCHER LES FILS D'ALIMENTATION TANT QUE LE CIRCUIT EST SOUS TENSION.
- NE PAS UTILIZEZ LE TERMINAL LOCAL EN ATMOSPHÈRE EXPLOSIVE.

Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.
- All relevant sections of this manual must be read before selecting a location.
- Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
- The installation and use of this equipment must be in accordance with relevant national and local standards.

2 FAULT FINDING

Warning.
- Observe all safety measures (See INTRODUCTION).
- Take all precautions to avoid risk to personnel, plant and risk of explosion in hazardous areas.
- Do NOT open the transmitter main casing. There are no user serviceable parts or adjustments inside.
- Service access is restricted to the termination area

Should the MagMaster fail to operate, first check the power supply, then the power supply connections and fuse located in the termination area. If necessary, replace the fuse with one of the correct rating as listed in Book 6.

Note. All approved versions to use specified fuses – see Book 6.

Check that all external connections are made correctly.

2.1 Alarms

The transmitter has built in diagnostics with alarm indication which interrupts the transmitter local display. A data terminal connected to the transmitter will display these alarms in 'Read Alm' parameter; '16' from Main Menu (see **Warning** in next column).

The table below shows possible alarm indications and Fig. 2.1 Fault Finding Flow Chart indicates checking procedures to find the problems causing the alarms.

For method of interrogating the local display see Startup Section in Book 4.

Table 2.1 Possible Alarm Indications

Display	Alarm
MtSnsr	Empty Sensor
Hi	High flow
Lo	Low flow
Anlg	Analogue over range
Pls	Pulse frequency limited
Coil	Sensor Coil open circuit
19, 20, 21	See Fault Finding Flow Chart

2.2 Test Mode

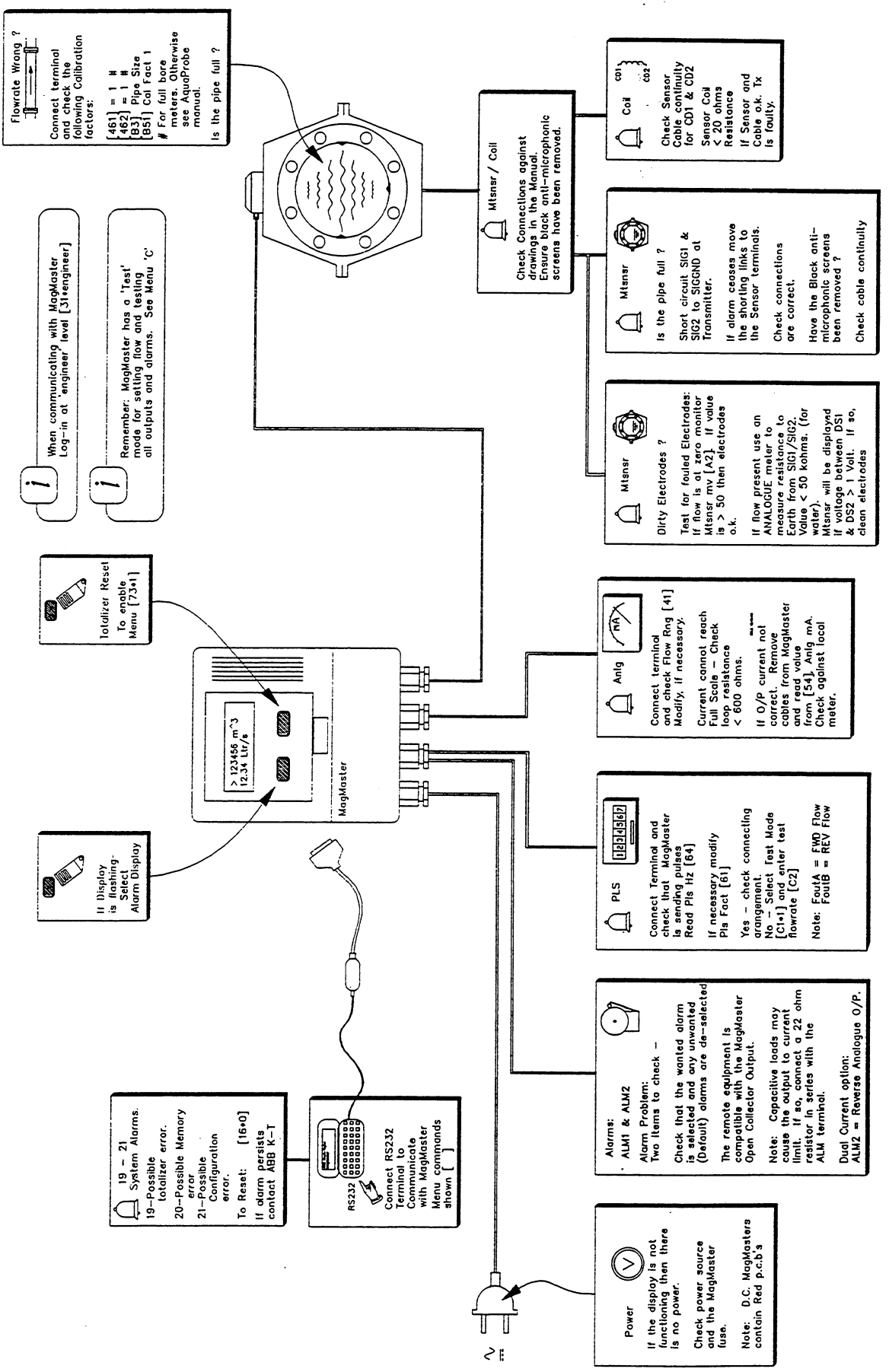
To access the Test Mode, connect a terminal device to the Programming Connector as described in APPENDIX A Section.

Select 'Engineer' security level (see Configuration Section). Set 'Test Mode' parameter to '1' and enter an appropriate flow rate in the 'Test Flow' parameter.

Output responses may now be viewed from the various 'Test' parameters. (See Configuration Section for full details of operation.)

Warning. Refer to Safety Measures if a data terminal is to be used to diagnose faults in hazardous locations.

2.3 Fault Finding Flow Chart



NOTES

BOOK 6
Accessories & Spares

CONTENTS

BOOK 6 ACCESSORIES AND SPARES

Section			Page
1	INTRODUCTION		1
2	ACCESSORIES AND SPARES		
	2.1	MagMaster	2
	2.2	AquaMag and AquaProbe	3
		2.2.1 AquaProbe Replacement Parts	3

1 INTRODUCTION

The items in the following lists may be obtained from the Company, by quoting the relative Part Number.

2 ACCESSORIES AND SPARES

2.1 MagMaster

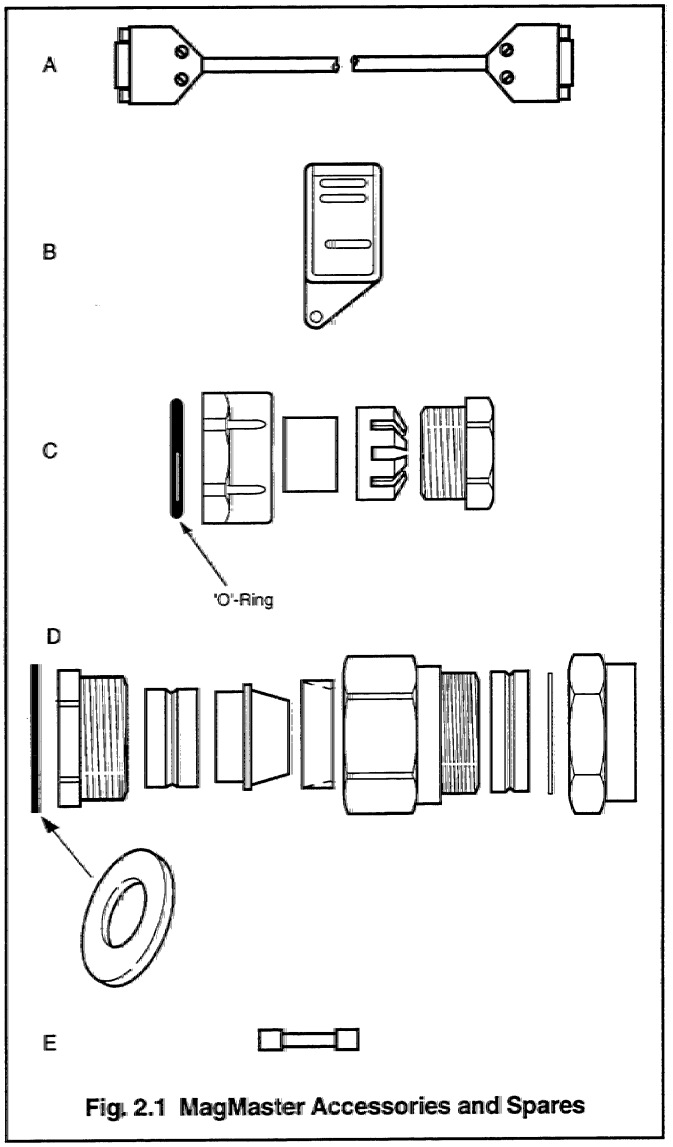


Fig. 2.1 MagMaster Accessories and Spares

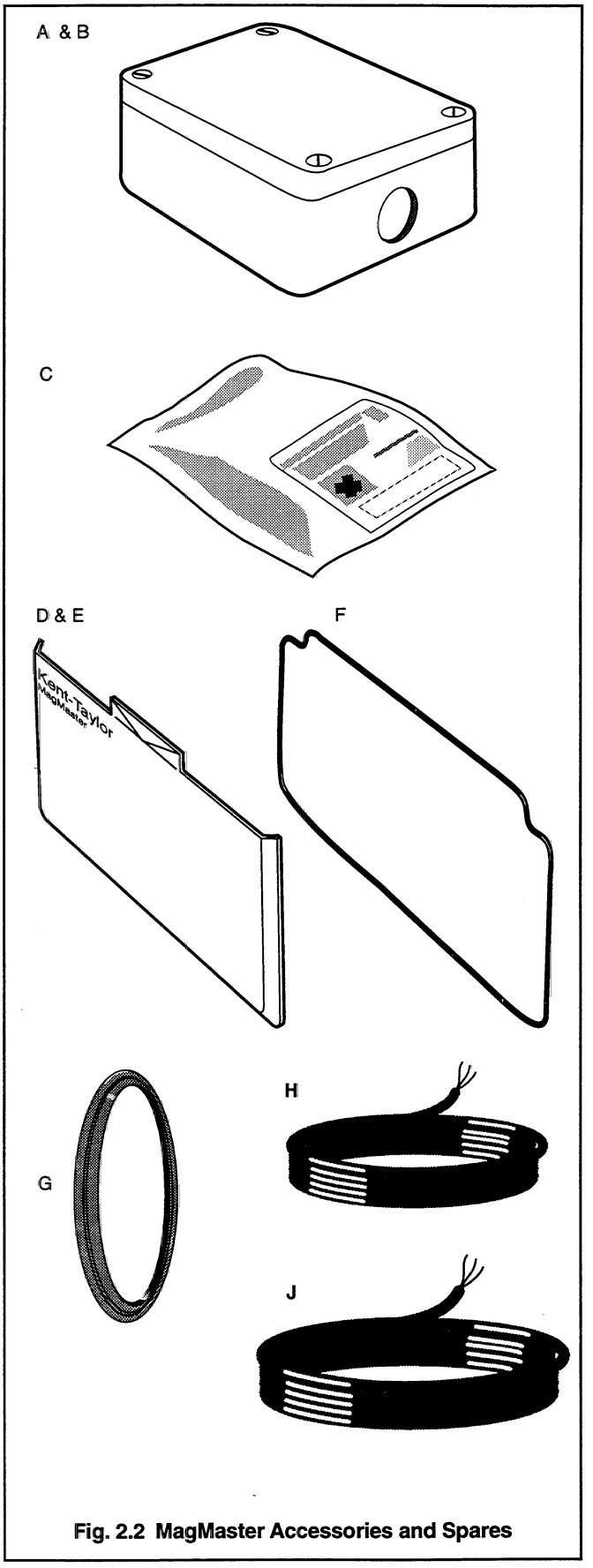


Fig. 2.2 MagMaster Accessories and Spares

Fig. 2.1

A	Serial Data Lead (MagMaster to PC & Toshiba.)	WEBC 0003
B	Display Operating Wand	MEBX 9902
C	M20 Plastic Gland (with fittings)	MUFA 9912
D	Armoured Gland (with fittings)	MUFA 9913
E	Fuses (see Table 2.1)	
F	HART Command Summary Information	MEFD 0001

Fig. 2.2

A	Sensor Cable Junction Box (M20 fitting)	WABX 0020
B	Sensor Cable Junction Box ($\frac{1}{2}$" NPT fitting)	WABX 0021
C	250g Potting Compound (Standard) (Hazardous Area – 2 Packs Required).	0218474
D	Transmitter Terminal Cover (Remote Version)	MEAX 9916
E	Transmitter Terminal Cover (Integral Version)	MEAX 9915
F	Transmitter Terminal Cover Seal	MEAX 9924
G	Gasket (Hygienic Flowmeter)	see Table 2.2
H	Standard Sensor Cable	Call Sales Office.
J	Armoured Sensor Cable	Call Sales Office.

Table 2.1 Fuses

Component Ref.	Part No.	Description	Supplier	Approvals	
				IEC	BS
F1 - DC	B6490	FUSE 3.15A AS.T 20mm	SHURTER 034-3122	IEC 127/111	BS4265
			BUSSMAN S506/3.15A	IEC 127/111	UL. BS4265
F1 - AC	B7721	FUSE 500mA AS.T 20mm	SHURTER 034-3114	IEC 127/111	BS4265
			BUSSMAN S504/500MA	IEC 127/111	UL. BS4265
			BUSSMAN S506/500MA	IEC 127/111	UL. BS4265

Table 2.2 Gaskets (for Hygienic Flowmeters)

Meter Size	Part No.	
	EPDM	Nitrile Rubber
20mm (0.75in)	MRAX2708	MRAX2808
25mm (1in)		
40mm (1.5in)	MRAX2711	MRAX2811
50mm (2in)	MRAX2712	MRAX2812
65mm (2.5in)	MRAX2713	MRAX2813
80mm (3in)	MRAX2714	MRAX2814

2.2 AquaMag and AquaProbe

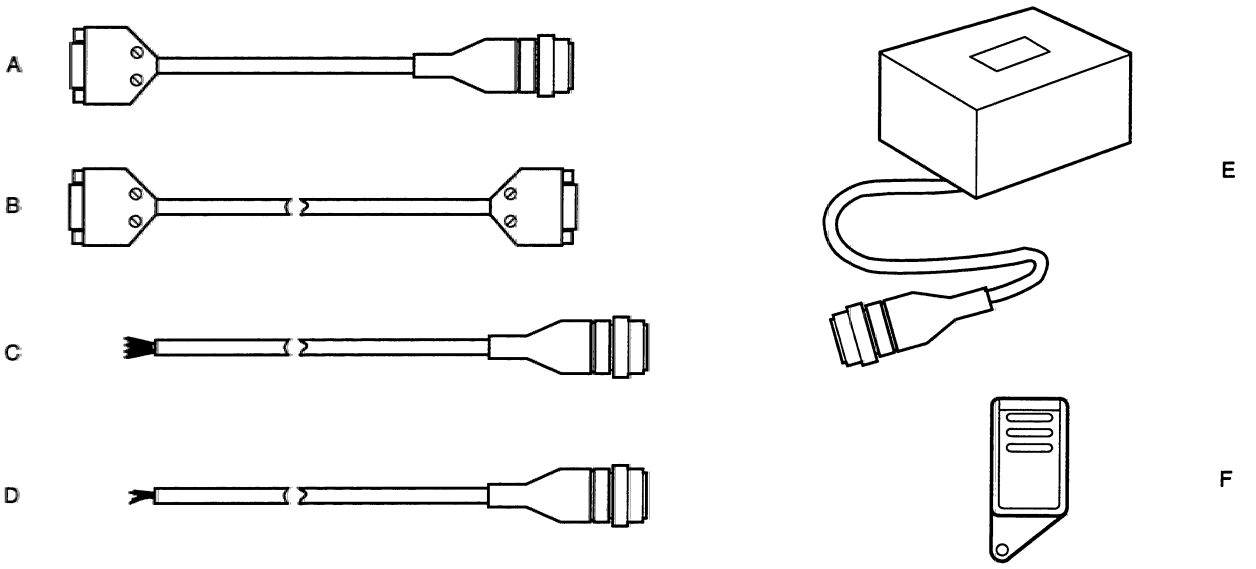


Fig. 2.3 AquaMag/AquaProbe Accessories

A	Communication adaptor (to connect to Psion Organiser etc.)	WEBC 0004
B	Serial Data Lead (to connect PC to 'A' above)	WEBC 0003
C	Output Cable Assembly (14-core plus screen)	MVBX 99147
D	Power Supply Lead	STT 3162
E	Battery Pack	STT 3310
F	Display Operating Wand	MEBX 9902

2.2.1 AquaProbe Replacement Parts

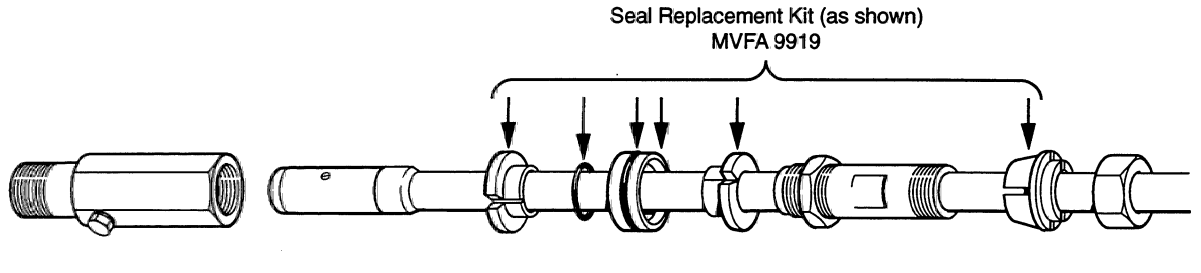


Fig. 2.4 Replacement Parts

BOOK 7
Keypad Version

CONTENTS

BOOK 7 KEYPAD VERSION

Section			Page
1	**INTRODUCTION**		1
2	**CONTROLS AND DISPLAYS**		2
	2.1	Displays	2
	2.2	Switch Familiarisation	2
	2.3	Rapid Reset/Escape	2
3	**OPERATION**		3
	3.1	Startup	3
	3.2	Operation	3
	3.3	Access to Secure Parameters	4
		3.3.1 Security Codes	4
		3.3.2 Changing Parameter Values and Variables	4
	3.4	Menu Layout	5
	3.5	Parameter Access and Change	6

1 INTRODUCTION

This manual provides details to enable the Keypad MagMaster™ transmitter to be reconfigured from default parameters or from parameters initially set up by the factory to special order.

2 CONTROLS AND DISPLAYS

2.1 Displays – Fig. 2.1

The display comprises a 5-digit, 7-segment digital upper display line and two 16-character dot-matrix lower display lines. The upper display shows the flow value. The middle display line shows alarm codes on the left, when an alarm is present – see **Book 5 Fault Finding**, and flow units in the centre.
The lower display line shows user information – see Section 3.1.

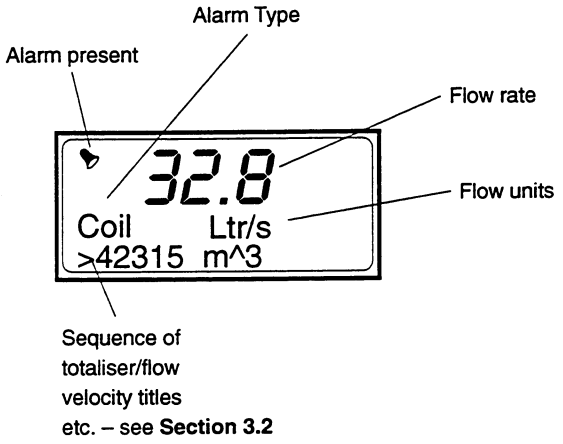


Fig. 2.1 Display Window

2.2 Switch Familiarization – Fig. 2.2

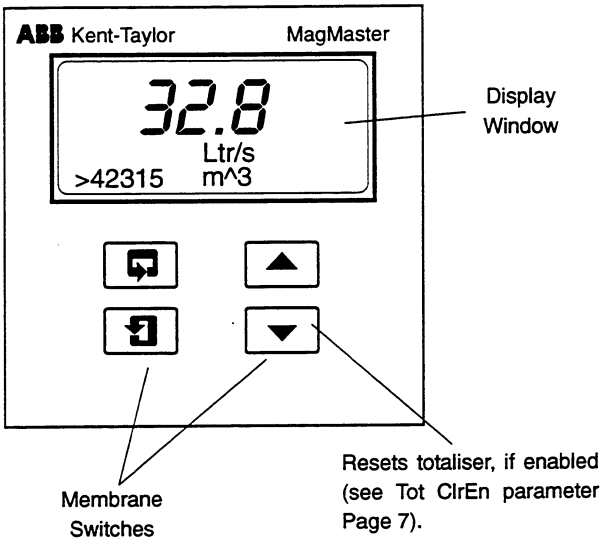


Fig. 2.2 Location of Controls and Display

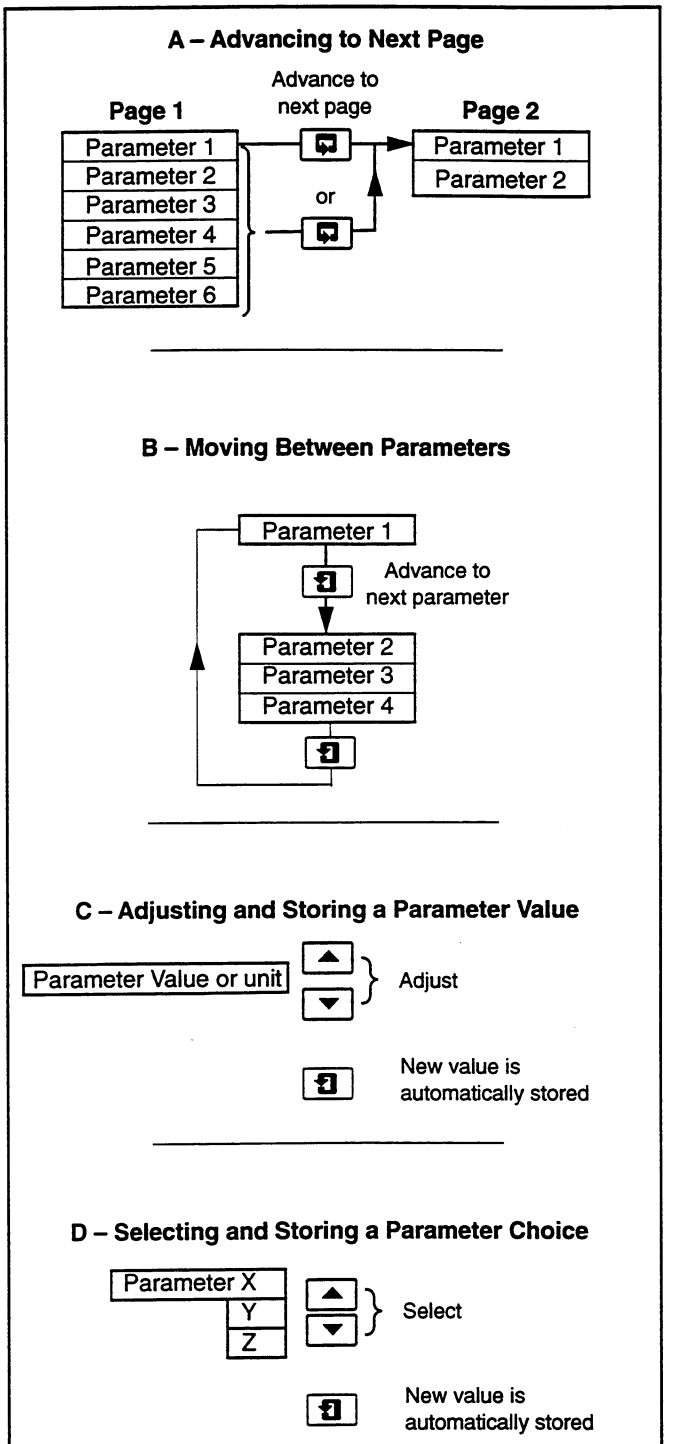


Fig. 2.3 Membrane Switch Functions

2.3 Rapid Reset/Escape

Depressing this switch for 5 seconds and then releasing it will exit the menu system and return to normal operating mode.

Fig. 2.4 Rapid Reset/Escape Switch

3.1 Startup

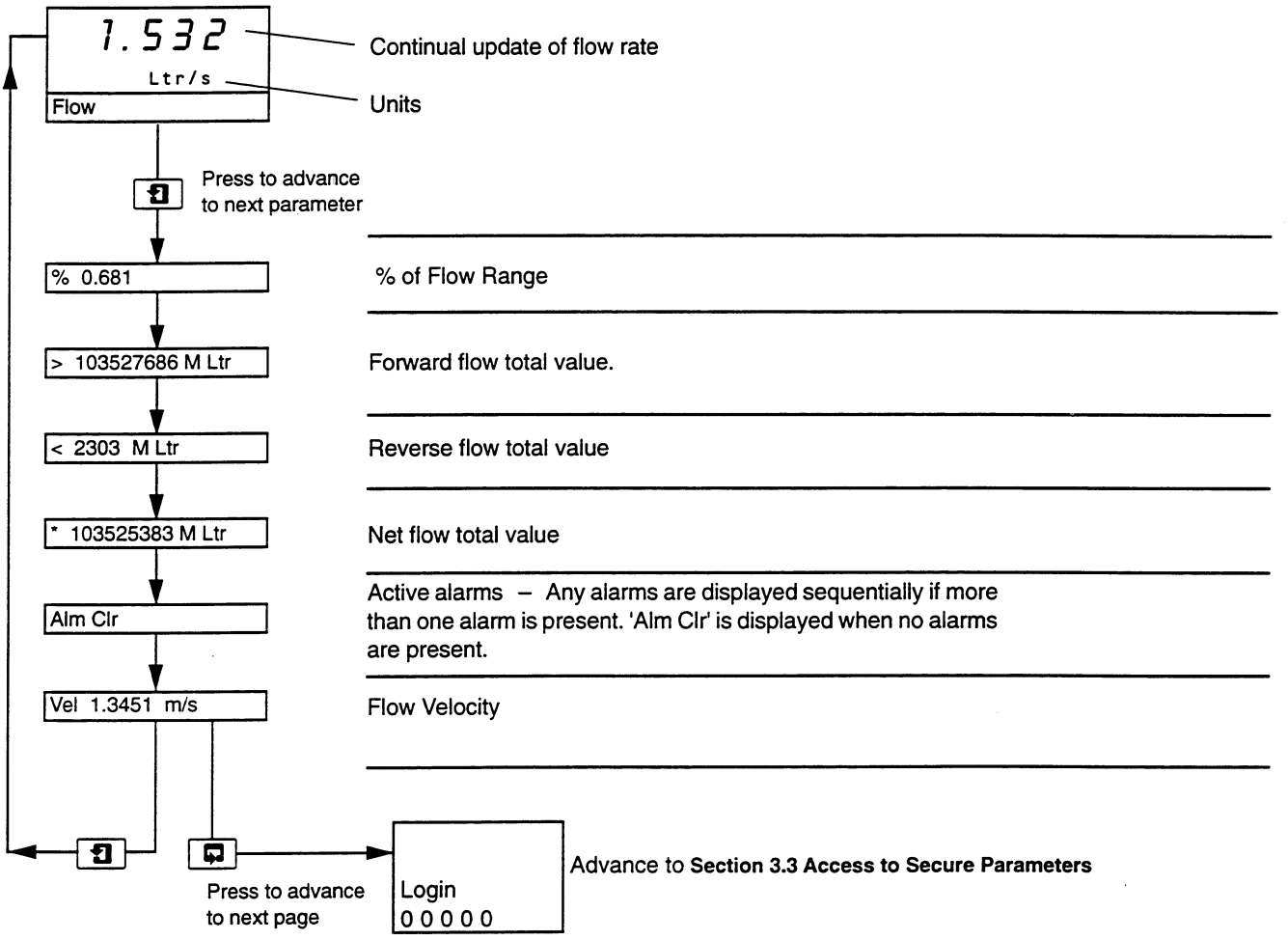
Ensure all necessary electrical connections have been made and switch on the power supply to the flowmeter.

After a short delay, the bottom line of the display will alternate between 'ABB Kent-Taylor' and 'MagMaster V x.x' (MagMaster software version).

In a few seconds the flow rate will appear on the display together with the flow rate units.

3.2 Operation

Viewing User Information (Read Only)



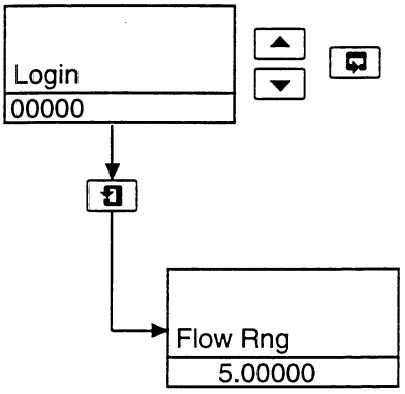
3.3 Access to Secure Parameters

A 5-digit security code is used to prevent tampering with the secure parameters

3.3.1 Security Codes

A code number, between 00000 and 99999, must be entered, to gain access to the secure parameters. A default user code of '10760 has been installed, but this may be changed if required with the' Login Key 1' parameter - see Section **3.4 Menu Layout.**

An 'engineer' code (default - 56360) is used to gain access to test procedures, security code settings and parameters not essential at the user level. This code can be changed if required with the 'Login Key 2' parameter – see Section **3.4 Menu Layout.**



At the flashing cursor on the first digit of the Login code number, press either [▲] or [▼] membrane switches to reach the required digit. To set this digit and pass to the next digit, depress the [⮌] switch. Continue until all digits have been set, and depress the [⮆] switch to enter the complete code. If an incorrect value is entered, access to subsequent programming pages is prevented and the display reverts to the **Operating Page.**

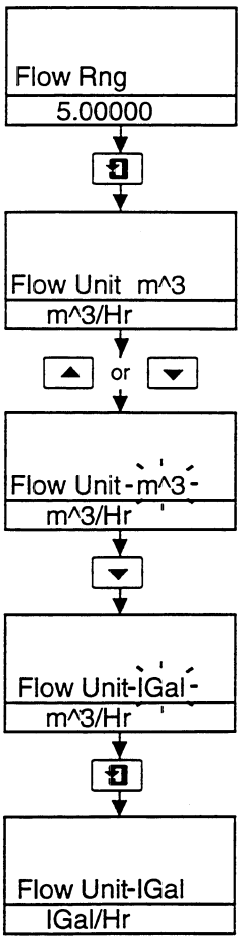
Flow Range Parameter

Press [⮆] to advance to next parameter – see Section **3.4 Menu Layout.**

or

Press [⮌] to advance to next page – see Section **3.4 Menu Layout.**

These two switches are used to advance to all subsequent parameters and pages. If a parameter is changed, it is automatically stored on operation of the [⮆] switch.



3.3.2 Changing Parameter Values and variables

When a parameter is selected, which holds one or more variable units e.g. 'Flow Unit' parameter which can be Litres, Cubic metres, Gallons etc., proceed as follows to change the units: ('Flow Rng' selected).

'Flow Unit' selected.

Press [▲] or [▼] switch to change the units.

[✶] **Note** the existing units will flash at the first depression of the [▲] or [▼] switch, and further switch depressions will change the type of units displayed.

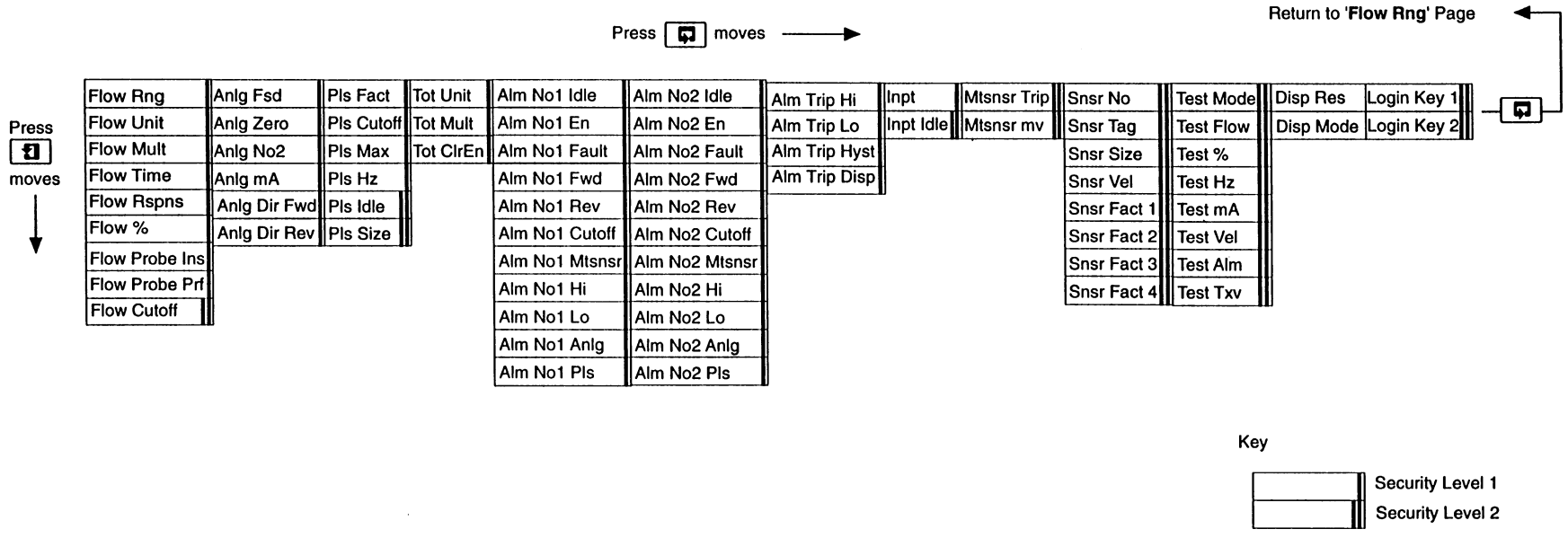
Depressing the [⮆] switch will now enter the newly selected units.

This type of action is similar for all variable units.

Where numerical values are to be changed, initial depression of the [▲] or [▼] switches cause the first of five digits to be highlighted by a flashing cursor. Change the value with the [▲] and [▼] switches, the particular digit with the [⮌] switch and enter the final selection with the [⮆] switch.

3.4 Menu Layout

Below is a summary of all the parameters contained in the menu.



3.5 Parameter Access and Change

The correct security level **MUST** be selected as in **Section 3.3.**

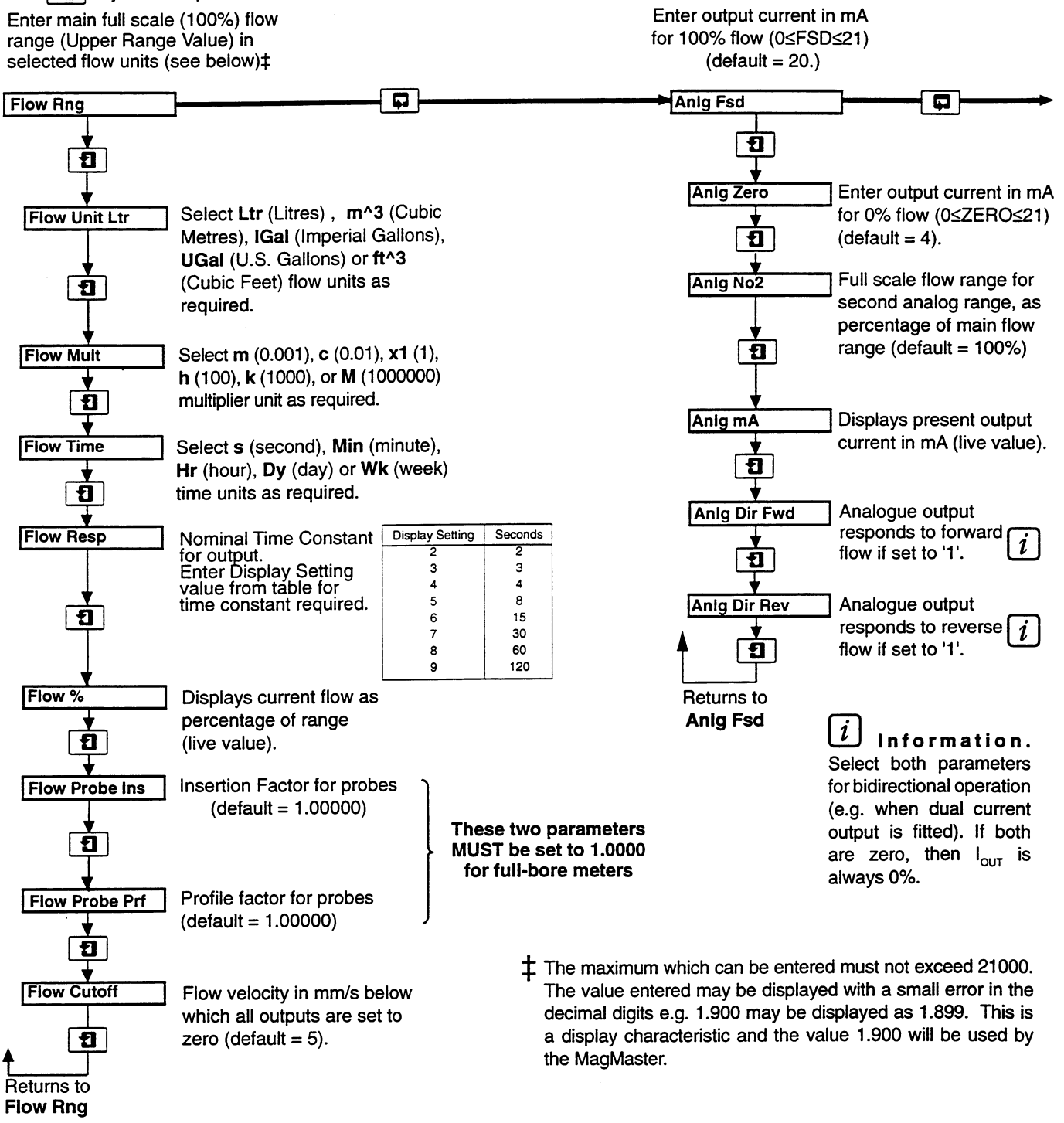
Select the parameter to read the value, or to change it as necessary. All 'live' data displayed is updated each second.

Use the [ ] key to move between pages.

Use the [ ] key to move between parameters.

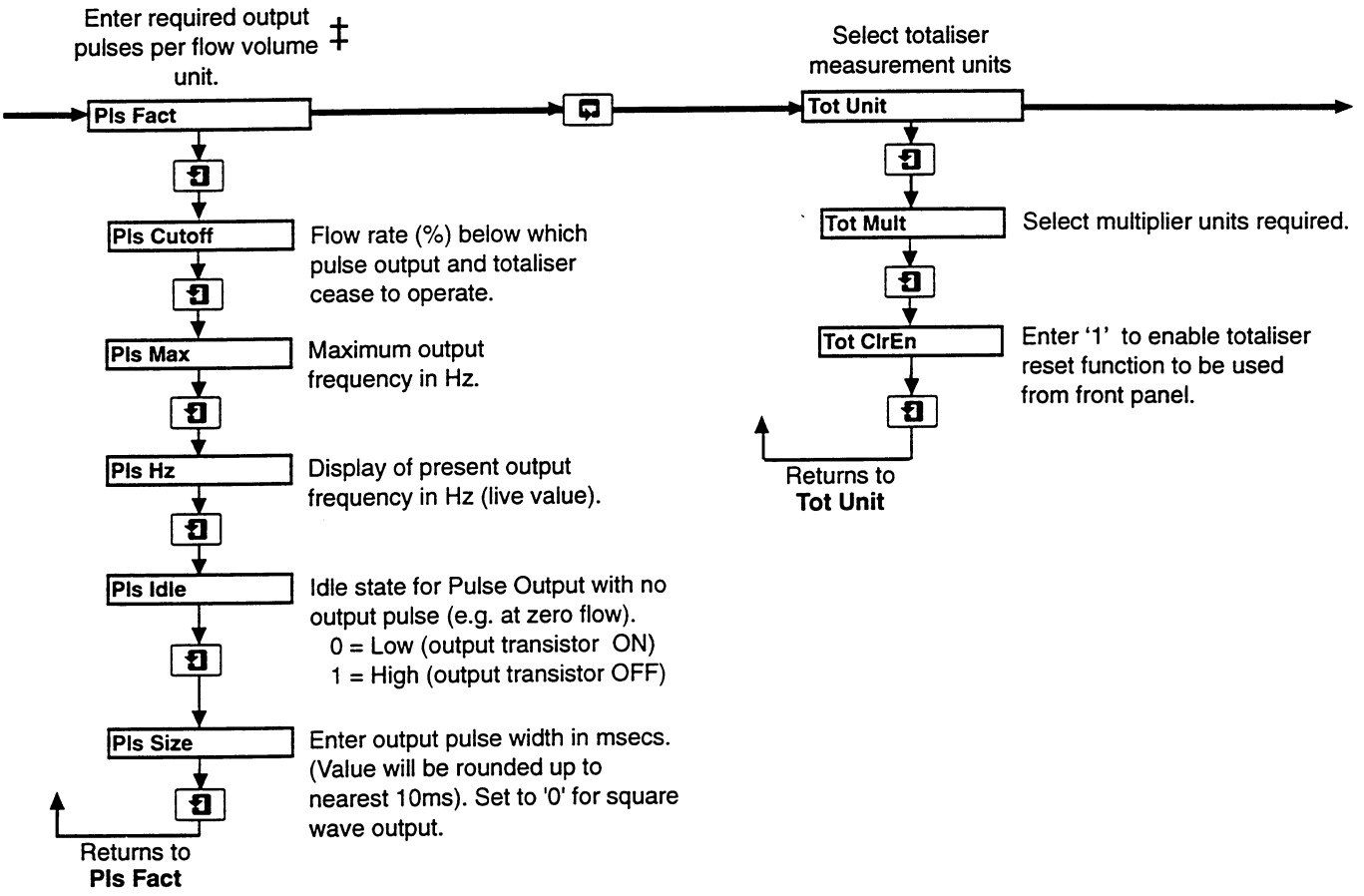
The [▲] and [▼] keys change displayed values and units.

The [ ] key will accept the chosen value or unit.



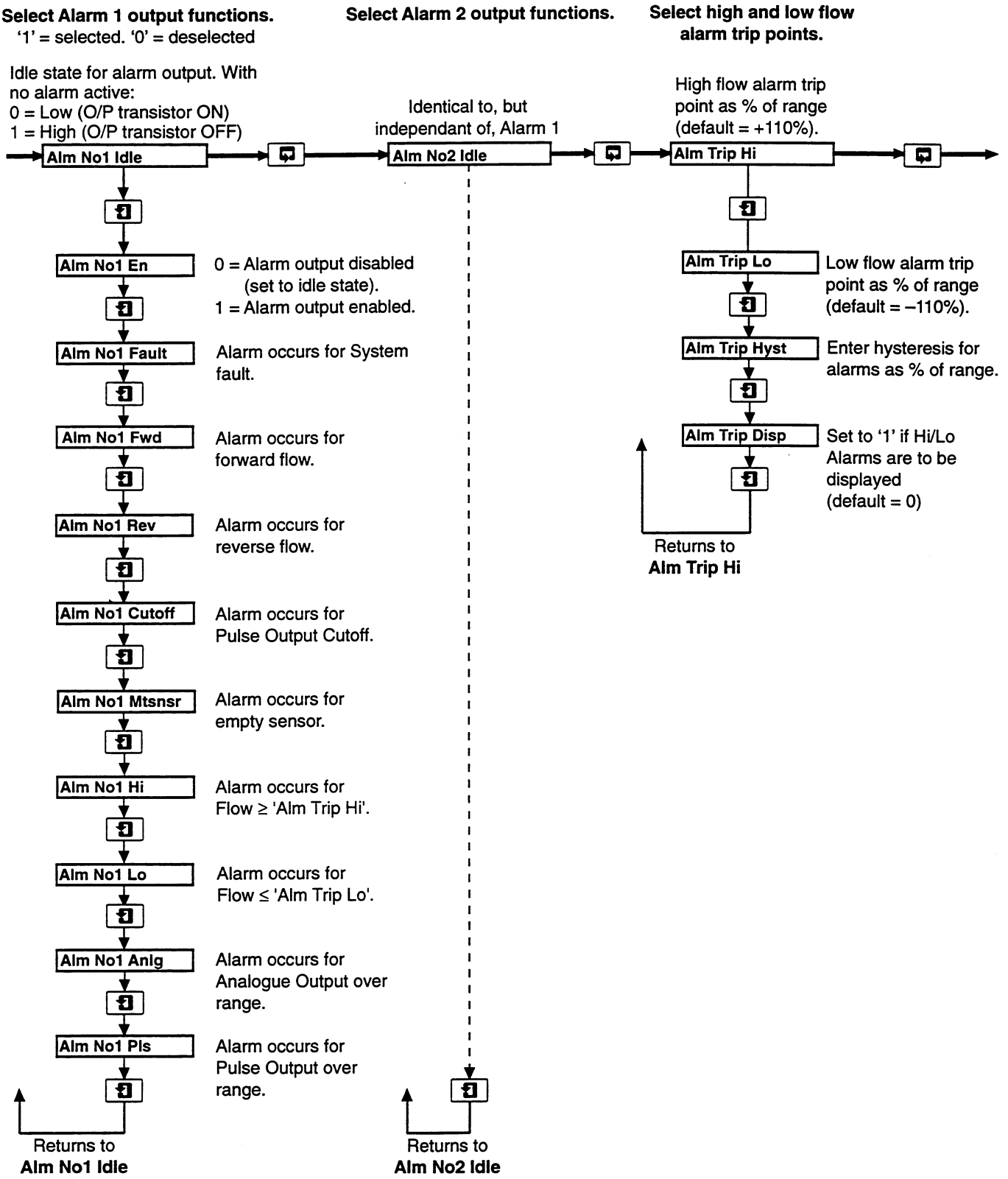
‡ The maximum which can be entered must not exceed 21000. The value entered may be displayed with a small error in the decimal digits e.g. 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.900 will be used by the MagMaster.

...3.5 Parameter Access and Change

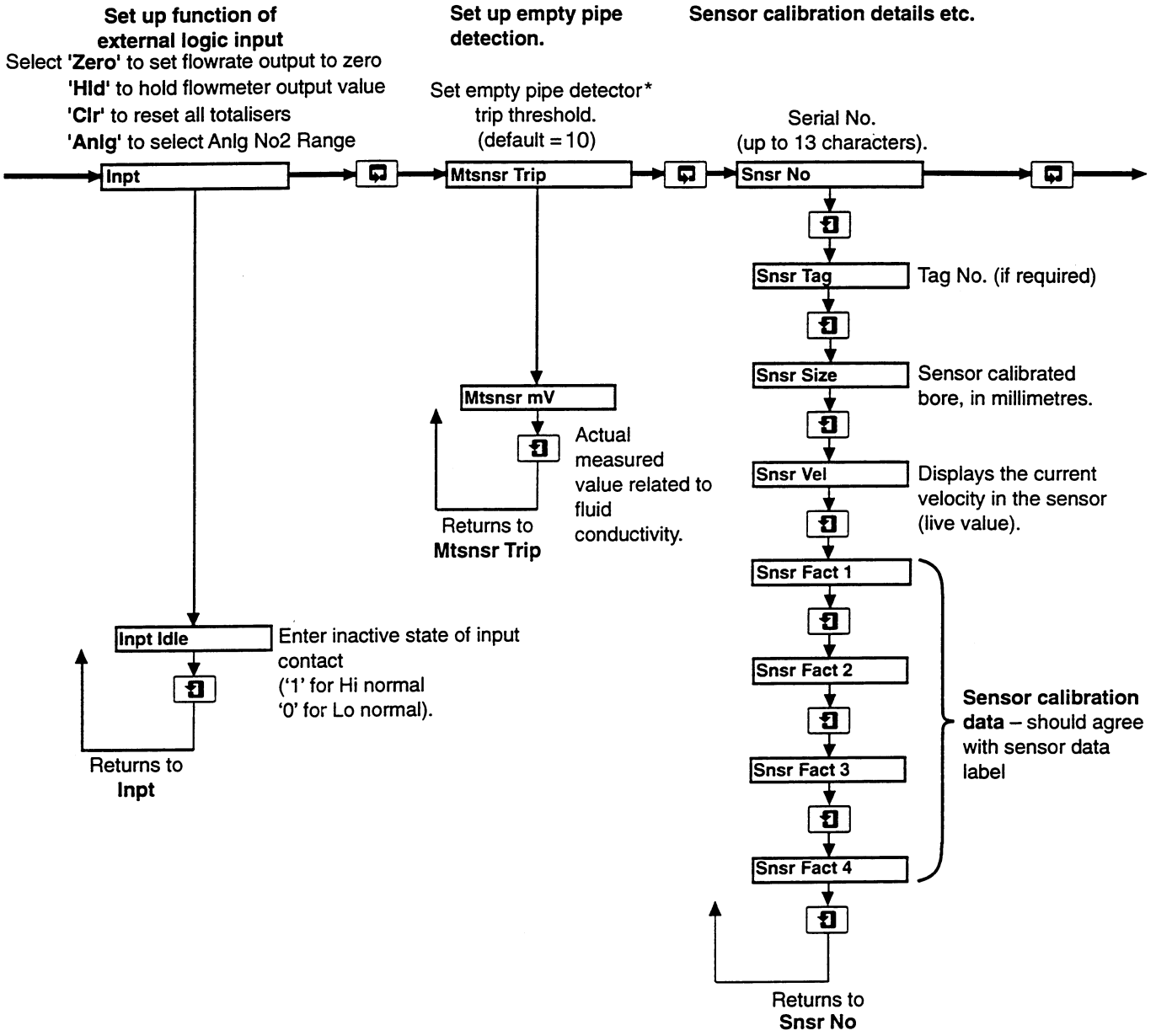


‡ The maximum which can be entered must not exceed 21000. The value entered may be displayed with a small error in the decimal digits e.g. 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.900 will be used by the MagMaster.

...3.5 Parameter Access and Change



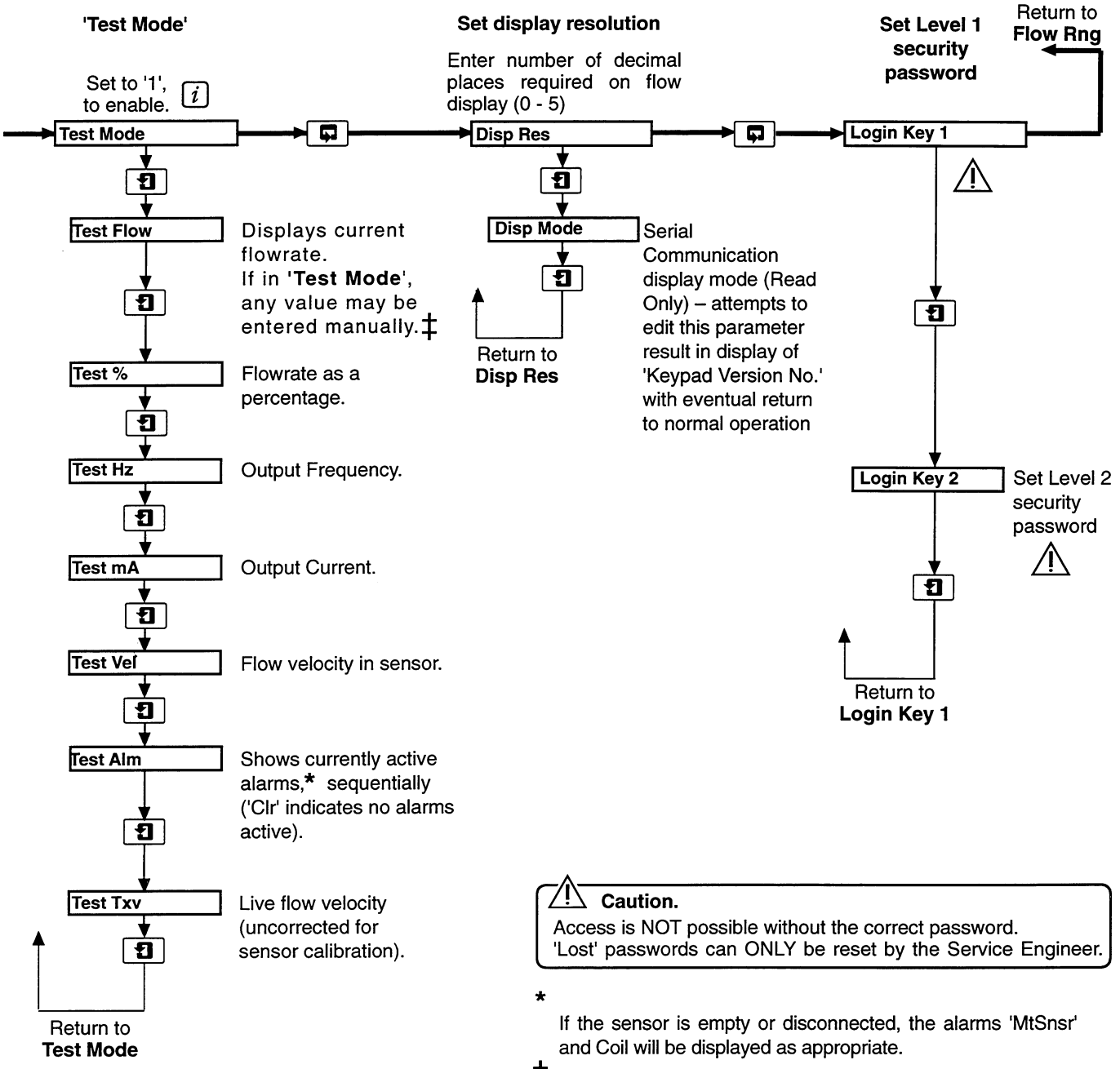
...3.5 Parameter Access and Change



* If the liquid being measured is a slurry, set empty pipe detector threshold to 0.

If empty pipe detection is required, go to Input (**Inpt**) function and select "**Zero**". Connect input wires from MagMaster to level switch, pump starter, etc. as per Electrical Installation Instructions in Book 3. Outputs will be driven to zero.

...3.5 Parameter Access and Change



Information.
On performing a Rapid Reset/Escape to return to 'Operation' level, 'Test Mode' is automatically cancelled.

Caution.
Access is NOT possible without the correct password.
'Lost' passwords can ONLY be reset by the Service Engineer.

* If the sensor is empty or disconnected, the alarms 'MtSnsr' and Coil will be displayed as appropriate.

‡ The maximum which can be entered must not exceed 21000. The value entered may be displayed with a small error in the decimal digits e.g. 1.900 may be displayed as 1.899. This is a display characteristic and the value 1.900 will be used by the MagMaster.

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