



The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

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

The UKAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company, and is indicative of our dedication to quality and accuracy.

EN ISO 9001:2000



Cert. No. Q5907

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A

Electrical Safety

This equipment complies with the requirements of CEI/IEC 61010-1:2001-2 "Safety requirements for electrical equipment for measurement, control, and laboratory use". If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Symbols

One or more of the following symbols may appear on the equipment labelling:

	Warning – Refer to the manual for instructions
	Caution – Risk of electric shock
	Protective earth (ground) terminal
	Earth (ground) terminal

	Direct current supply only
	Alternating current supply only
	Both direct and alternating current supply
	The equipment is protected through double insulation

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 the Technical Publications Department.

Health and Safety

To ensure that our products are safe and without risk to health, 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.

CONTENTS

1 INTRODUCTION	2	4 START-UP AND OPERATION	17
1.1 Contents of Conversion Kit	2	4.1 Connecting Batteries	17
1.2 Basic Upgrade Procedure	2	4.2 First Time of Operation after Conversion to AquaMaster	17
2 MECHANICAL INSTALLATION	3	4.3 Start-up	17
2.1 Installation Conditions	3	4.4 Display Activation	17
2.2 Dimensions	3	4.5 Replacing a Battery	19
2.2.1 The Connection Box	3	4.5.1 Spares Kits	20
2.2.2 The AquaMaster Transmitter	4	4.5.2 Battery Changing Procedures	21
3 ELECTRICAL INSTALLATION	5	APPENDIX A – AQUAMAG TO AQUAMASTER CONVERSION PROGRAM	22
3.1 Disconnecting the AquaMag Transmitter	5	A.1 Preliminary	22
3.2 Upgrade Adaptor Connections	5	A.1.1 Installing the Conversion Program	22
3.2.1 Environmental Protection	6	A.2 Running the Program	22
3.3 Transmitter Connections	7	A.2.1 Conversion using Uploaded Data	22
3.4 Input/Output Connections	10	A.2.2 Manual Data Entry	23
3.4.1 Frequency Outputs	10	A.3 DN80 to DN150 Adjustment	24
3.4.2 Alarm Interface	10	A.3.1 Equipment required	24
3.4.3 MIL Connector Input/Output Connections (Option)	11	A.3.2 Trim Procedure	24
3.4.4 MIL Connector Input/Output (Option) – AquaMag™ x10 Pulse Output Compatibility ...	12	A.4 Potting after Conversion	24
3.3.5 Local Computer Connection	13	APPENDIX B – AQUAMASTER BLOCK DIAGRAM	28
3.3.6 Remote Computer Connection	14		
3.3.7 Power Supply Connection	15		
3.3.8 Pressure Transducer (Optional)	16		
3.3.9 Environmental Protection	16		

1 INTRODUCTION

AquaMaster™ is a range of high performance electromagnetic flowmeters for the measurement of electrically conductive fluids and slurries, and are normally supplied as factory configured, calibrated systems.



Warning.

- Installation and maintenance must only be carried out by suitably trained personnel.
- 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.

This manual first explains how to convert an existing **AquaMag** system to an **AquaMaster** system before detailing operating procedures.

It is assumed that all mechanical/electrical issues have been dealt with in the AquaMag manual.

1.1 Contents of Conversion Kit

- 1 x Sensor Upgrade Adaptor (with pre-wired cable), either fitted with a MIL 7-pin plug or unterminated.
- 1 x Sachet of potting material.
- 1 x CD (conversion program)

1.2 Basic Upgrade Procedure

- 1) Remove the AquaMag transmitter – see Section 3.1.
- 2) Fit the Sensor Upgrade Adaptor – see Section 3.2.
- 3) Connect the AquaMaster transmitter – see Section 3.3 and note the installation conditions in Section 2.1.
- 4) Program the transmitter via a pc from the CD provided – see Appendix A.



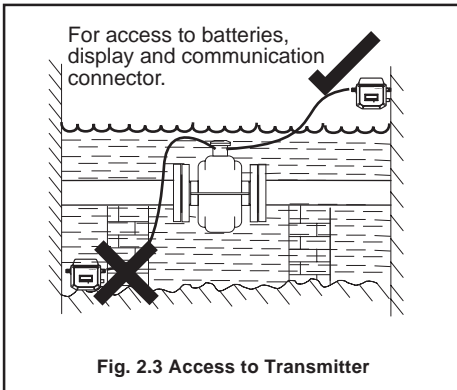
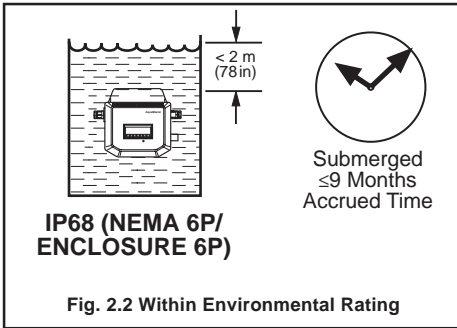
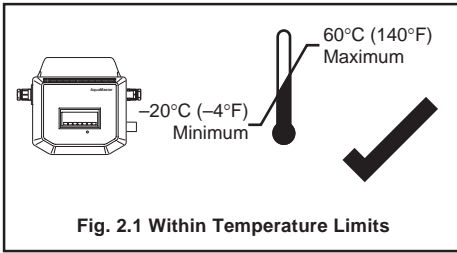
Caution. For security purposes, the conversion software will work once only. Ensure that you follow the on-screen instructions and that the correct details have been entered before leaving the program.



Caution. If the AquaMag sensor has not been installed in accordance with AquaMag instructions, especially with regard to the cross bonding of the sensor to the pipeline to equalise fluid potentials, then the AquaMaster may exhibit poor performance.

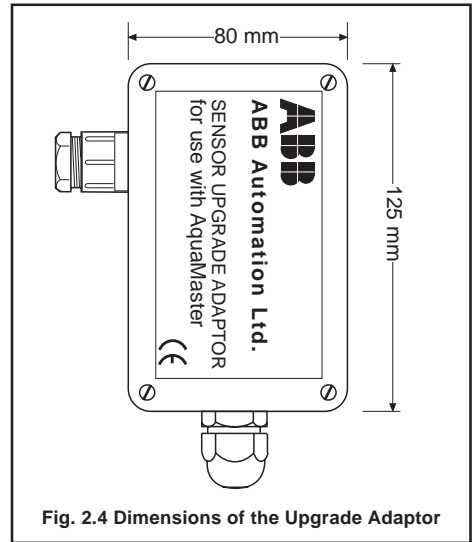
2 MECHANICAL INSTALLATION

2.1 Installation Conditions



2.2 Dimensions

2.2.1 The Connection Box



2.2.2 The AquaMaster Transmitter

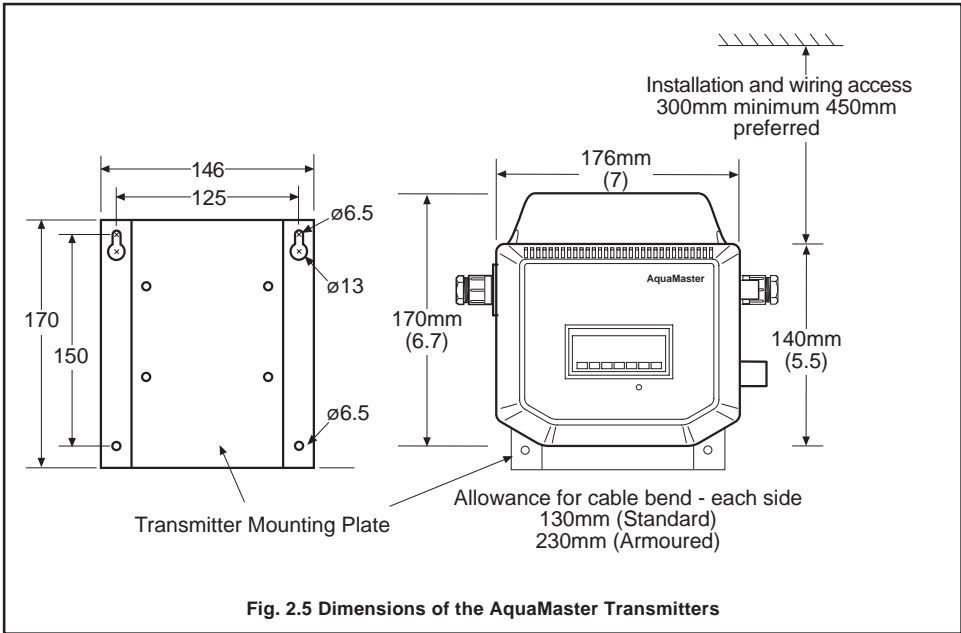


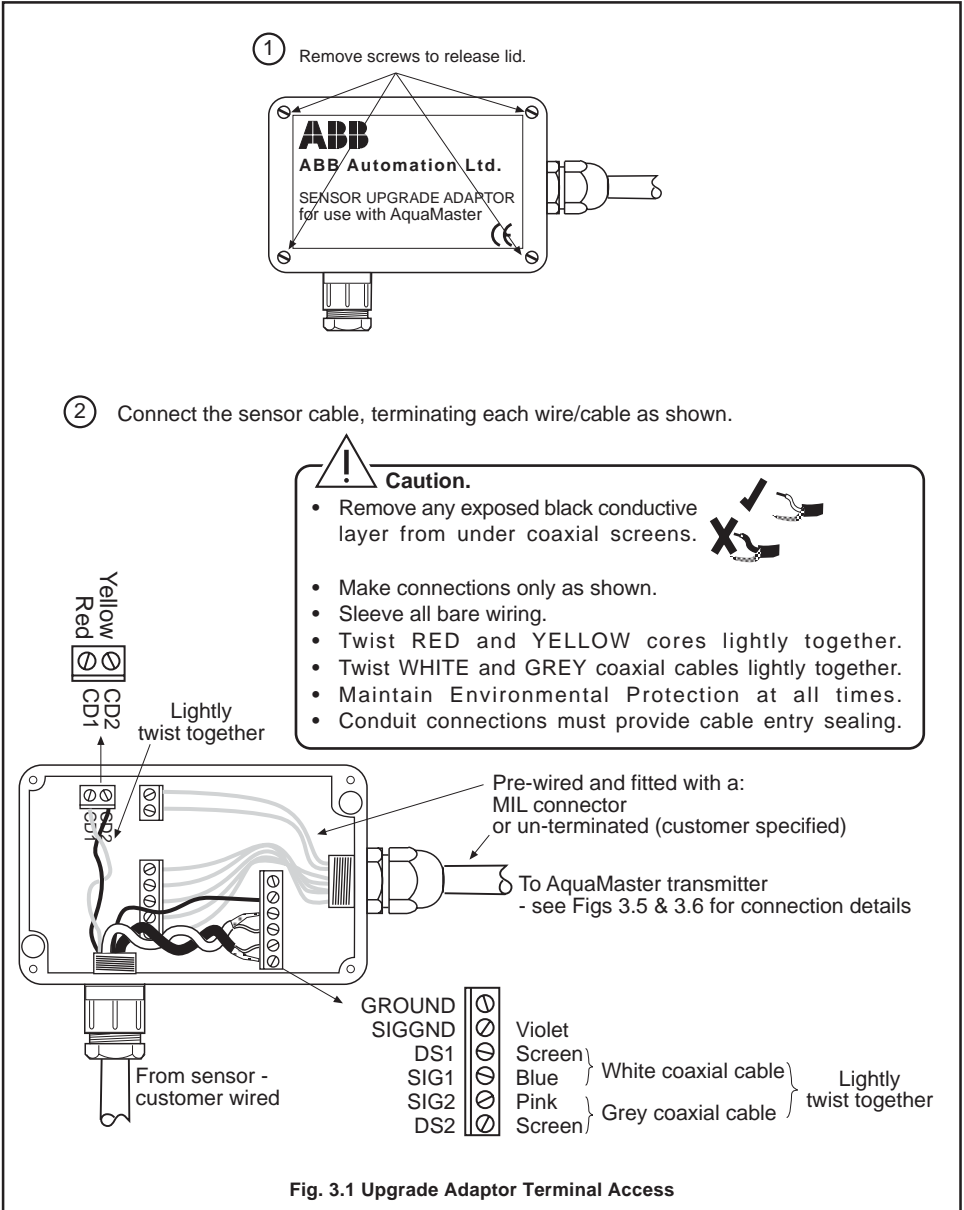
Fig. 2.5 Dimensions of the AquaMaster Transmitters

3 ELECTRICAL INSTALLATION

3.1 Disconnecting the AquaMag Transmitter

- 1) Cut the interconnecting cable between AquaMag transmitter and sensor.
- 2) Disconnect other cables from the AquaMag transmitter.

3.2 Upgrade Adaptor Connections – Fig. 3.1



3.2.1 Environmental Protection – Fig. 3.2



Warnings.

- 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 after a successful run of the Conversion Program – see Appendix A.
- Check all connections before potting – see Section 3, Electrical Installation.
- Do not overfill or allow the potting material to come into contact with ‘O’ rings or grooves.

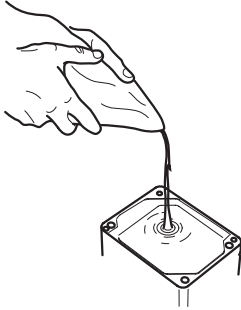


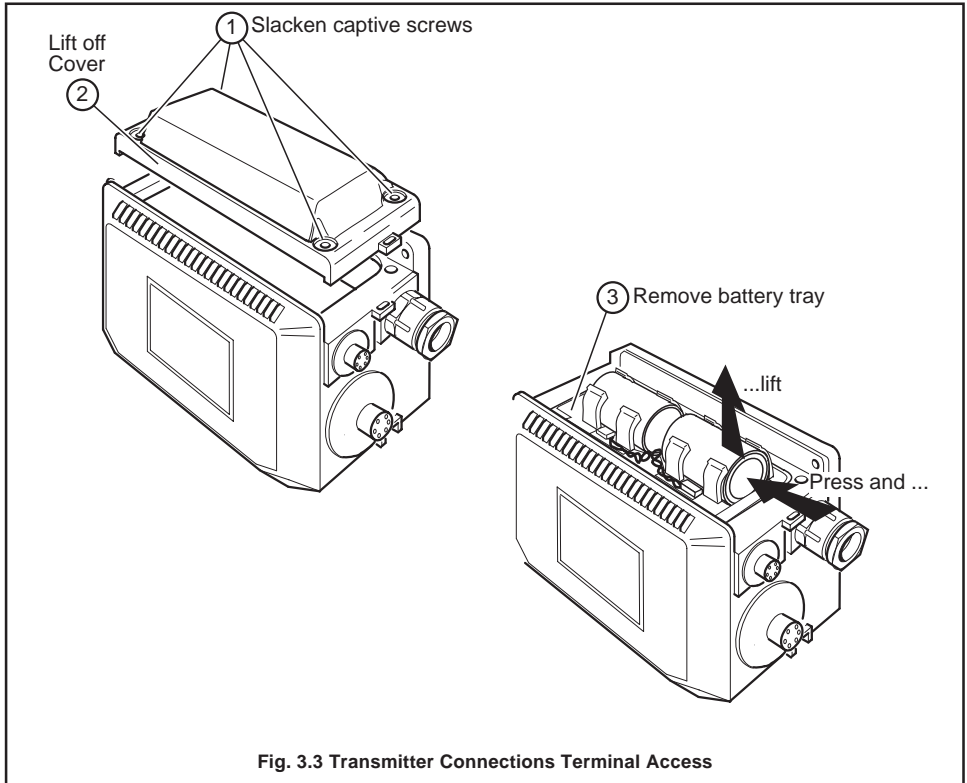
Fig. 3.2 Environmental Protection – Potting the Upgrade Adapter

3.3 Transmitter Connections



Caution.

- To ensure cable glands seal, use cable of diameter 7 to 11 mm (0.28 to 0.43 in) only.
- Ensure cable glands are tightened after wiring. However, overtightening a plastic cable gland will break it and destroy its sealing property. It is recommended that cable glands are tightened finger-tight initially, then a further $\frac{1}{2}$ to $\frac{3}{4}$ turn applied using a suitable spanner.
- Ensure that 'O' ring seals and mating surfaces are clean, to maintain environmental rating.



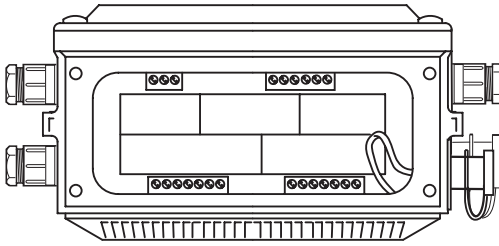


Fig. 3.4 Transmitter Connections (Glands/Conduit Entry)



Caution. (Remote versions)

- Remove foil screens completely, and plastic/foil screens and any fillers
- Twist the three screen wires together and sleeve them.
- Keep cable pairs twisted.
- Make connections only as shown.
- Maintain Environmental Protection at all times.
- Conduit connections must provide cable entry sealing.

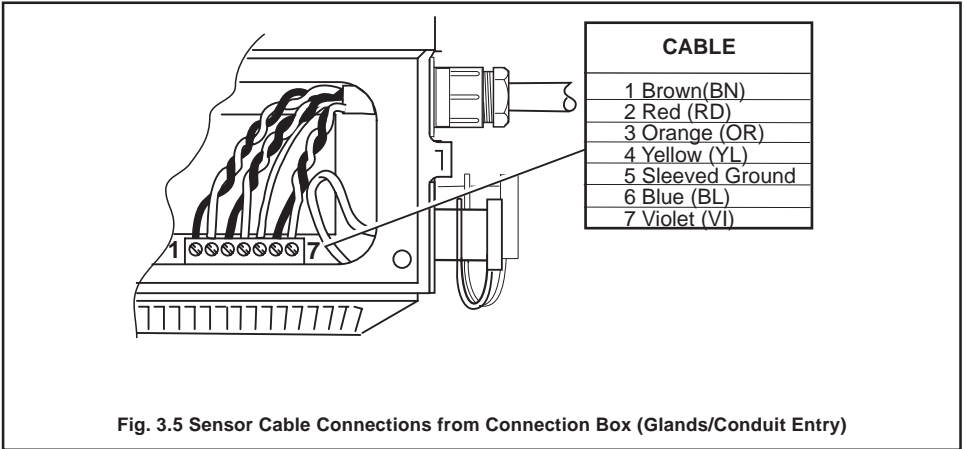


Fig. 3.5 Sensor Cable Connections from Connection Box (Glands/Conduit Entry)

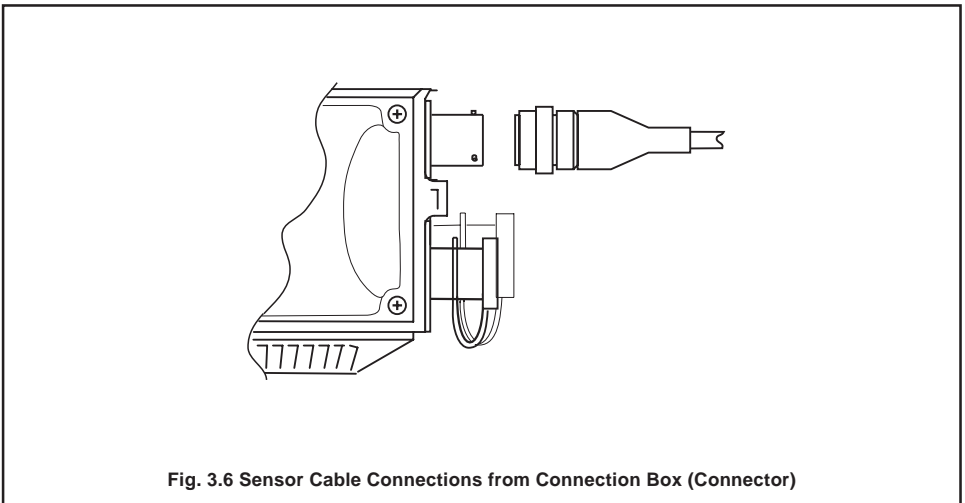


Fig. 3.6 Sensor Cable Connections from Connection Box (Connector)

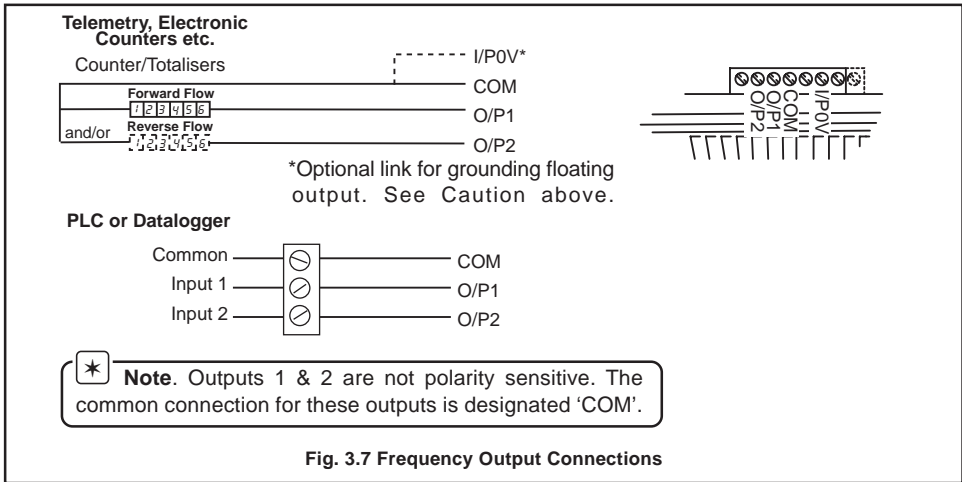
3.4 Input/Output Connections



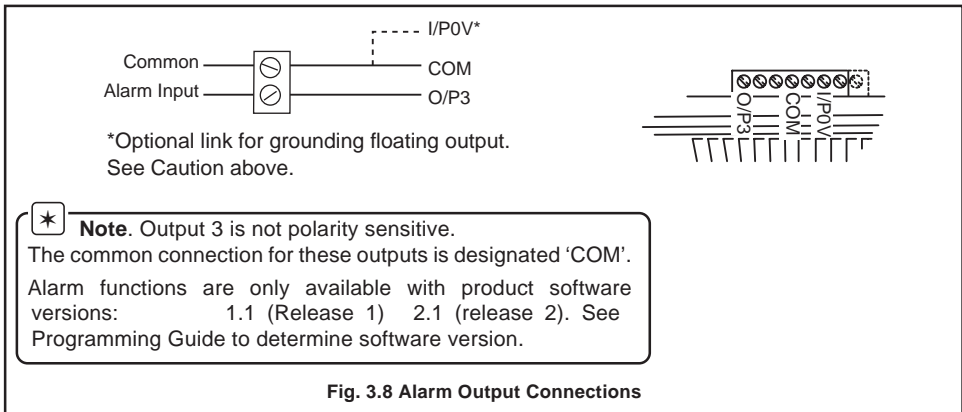
Caution.

- Refer to SPECIFICATION SHEET for Input/Output ratings.
- Inductive loads must be suppressed or clamped to limit voltage swings
- Operation of outputs is programmable – see **Quick Reference Guide** for details.
- External isolators not normally required, as the pulse and alarm circuit is electrically separated from all other AquaMaster connections.
- Capacitive loads must be inrush current limited.
- Fully floating pulse outputs may be subject to static damage, e.g. connecting to a floating datalogger, unless 'COM' is operated within its galvanic isolation range (± 35 V) from earth. Recommended protection for floating output systems is to wire 'COM' to '0V'.

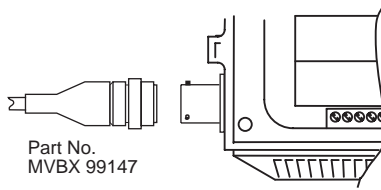
3.4.1 Frequency Outputs – Fig. 3.7



3.4.2 Alarm Interface – Fig. 3.8



3.4.3 MIL Connector Input/Output Connections (Option) – Fig. 3.9



Pin	Name	Function	Colour (Output cable)
A	–	Reserved	
B	–	Reserved	
C	–	Reserved	
D	O/P 1	Forward Pulses or Forward & Reverse Pulses	Orange
E	–	Reserved	
F	O/P 2	Reverse Pulses or Direction Indicator	Blue
G	O/P Com†	Common	Drain Wire/Screen
H	–	Reserved	
J	I/P Gnd	Input Common	White
K	I/P+	Contact Input	Violet
L	RXD	Receive data (serial input connection) #	Turquoise
M	TXD	Transmit data (serial output connection) #	Brown
N	RTS	Request to send #	Red/Black *
P	CTS	Clear to send #	Yellow/Red *
R	–	Reserved	
S	–	Reserved	
T	RI	Ring Indicator #	Yellow
U	–	Reserved	
V	Serial GND	Comms Ground #	Green

When Remote Comms. Option is fitted

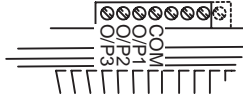
* Not fitted on older cables

† Note **Caution** regarding fully floating outputs. Recommended protection for floating output systems is to wire G to J.

Fig. 3.9 MIL Connector Connections

3.3.4 MIL Connector Input/Output (Option) – AquaMag™ x10 Pulse Output Compatibility

Where an existing installation has been wired to operate from the x10 outputs of an AquaMag™, the wiring of the AquaMaster™ connector can be altered to suit, as shown in **Fig. 3.10**.



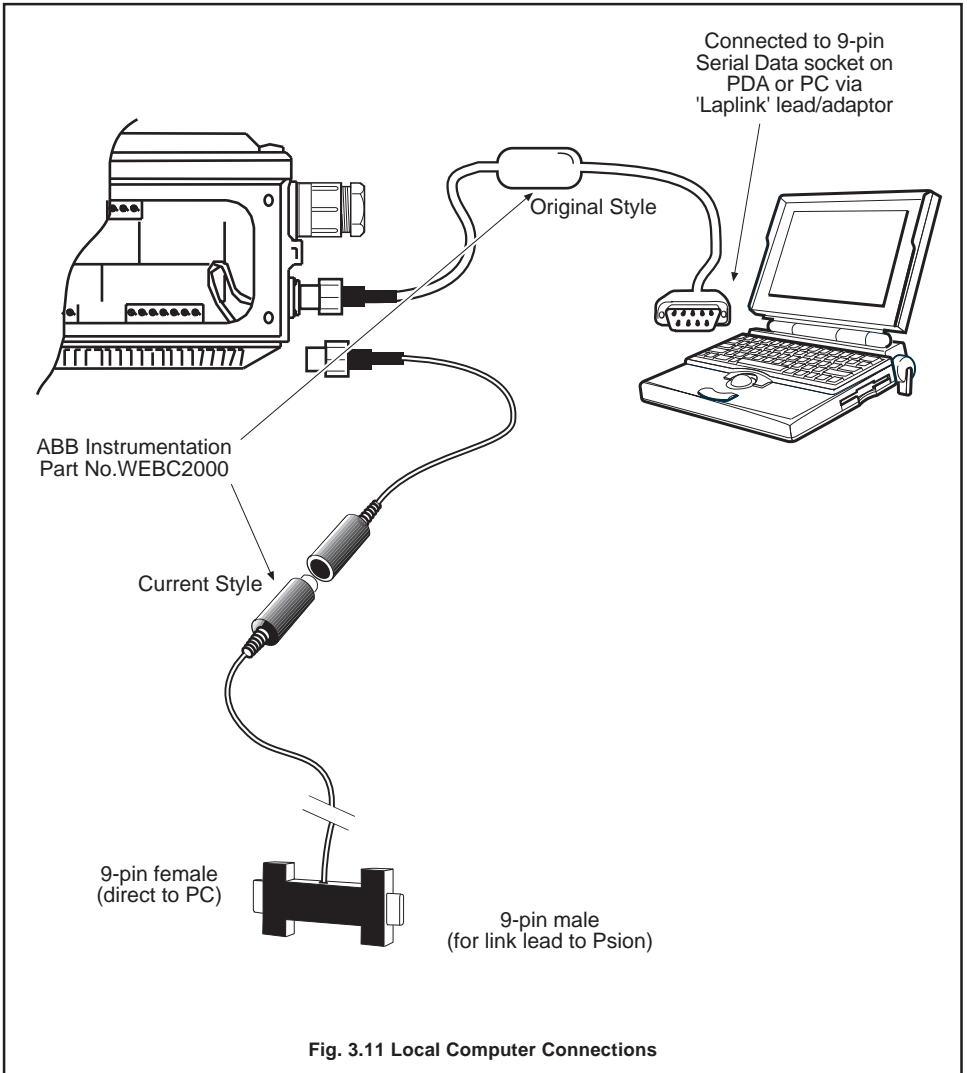
Terminal	AquaMag/ AquaMag x1	AquaMag x10
COM	Grey/Blue	Grey/Blue
O/P 1	Orange	White/Red
O/P 2	Blue	White/Black



Note. Some data logger leads contain components which convert forward and reverse pulses into a single pulse line with a direction signal. Such leads will NOT work with AquaMaster, and are unnecessary as AquaMaster directly provides the correct signals for these loggers.

Fig. 3.10 MIL Connector Input/Output Connections

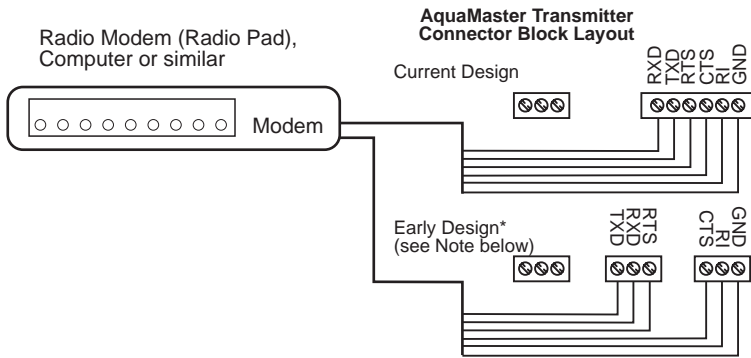
3.3.5 Local Computer Connection – Fig. 3.11



3.3.6 Remote Computer Connection – Fig. 3.12

AquaMaster Signal (DTE)	Modem (DCE) Plug *			Terminal/PC (DTE) Socket		
	Name	DB9	DB25	Name	DB9	DB25
RXD	RXD	2	3	TXD	3	2
TXD	TXD	3	2	RXD	2	3
RTS	RTS	7	4	CTS	8	5
CTS	CTS	8	5	RTS	7	4
RI	RI	9	22	–	NC	NC
GND	GND	5	7	GND	5	7

* Also mates with PDA 'PC-Link cables



*This interface only operates with external power applied to the transmitter

Fig. 3.12 RS232 Connections

3.3.7 Power Supply Connection – Fig. 3.13

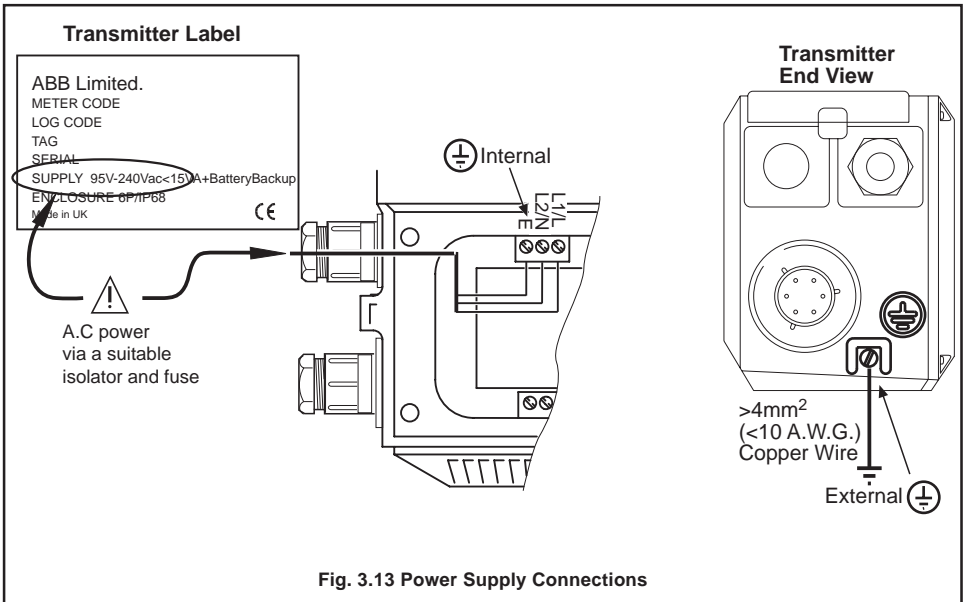


Warning.

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

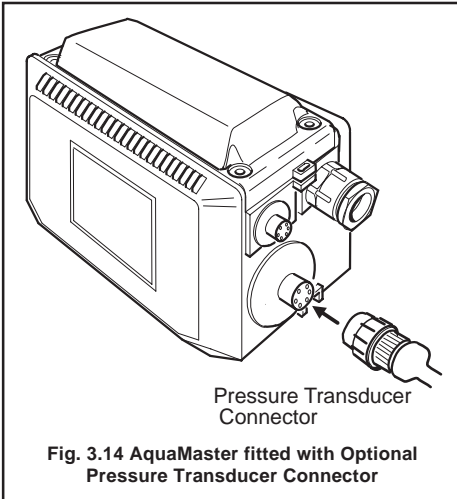


Note. Power supply connections/earthing arrangements are identical for cathodically protected remote transmitter systems. For cathodically protected integral transmitter systems, follow cathodic installation practises.



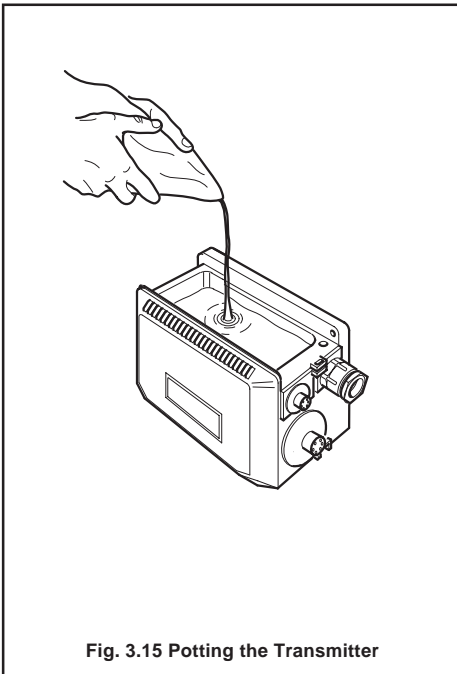
3.3.8 Pressure Transducer (Optional)

Optional pressure transducer cables are available for a range of pressures and cable lengths.



Caution. Ensure that only the pressure transducer supplied with the transmitter is used. Use of other pressure transducers will require alteration of the pressure span and zero factors in the transmitter – see **Quick Reference guide**.

3.3.9 Environmental Protection



Warning.

- Potting materials are toxic – use suitable safety precautions.
- Read the manufacturers instructions carefully before preparing the potting material.

Caution.

- The enclosure is helium leak tested at the factory, i.e. is IP68 watertight without potting the termination area. However, for IP68 protection against water ingress through poorly tightened cable glands etc., pot the termination area on the metal transmitter versions immediately after a successful run of the Conversion Program. See **Appendix A**.
- Check all connections and operations before potting – see **ELECTRICAL INSTALLATION**.
- Do not overfill or allow the potting material to come into contact with 'O' rings or grooves.
- Do not let potting material enter conduit, if used.

4 START-UP AND OPERATION



Warning.

- The lithium battery used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 100°C or incinerate.
- Replace battery with an ABB Automation part only. Use of another battery may present a risk of fire or explosion
- Dispose of used battery promptly. Keep away from children.
- Dispose of used batteries in accordance with your local regulations.
- Where possible, recycle used batteries.
- Contact your local environmental authority for further information regarding disposal or recycling schemes for used batteries.



Note. Each battery must be connected to the cable from the same side of the termination area as the battery position.

4.1 Connecting Batteries

The AquaMaster has been supplied with one or two batteries, but not connected. To connect see **Fig. 4.1**.

4.2 First Time of Operation after Conversion to AquaMaster

Before the AquaMaster can be used for the **first** time, information must be entered in the transmitter via a connected pc and the utility program supplied on CD. Go to **Appendix A** for programming details.

4.3 Start-up

If the AquaMaster is received with a protective plastic film over the display window, remove this film before commencing normal operation.

When the power is connected or the plastic film is removed, the AquaMaster performs a self test operation, and indicates a successful completion with "EE Pass" displayed.

If the display shows "EE Fail 1" or 'Err 1', remove all power, check the sensor wiring and apply power.

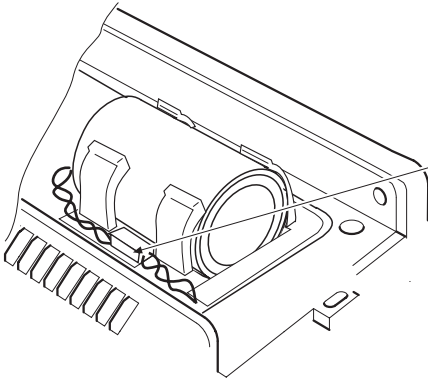
If the display shows "EE Fail 2 or 3" or 'Err 2 or 3', contact ABB Service.

4.4 Display Activation

For normal operation, activate the light sensitive display by first covering the display area totally.

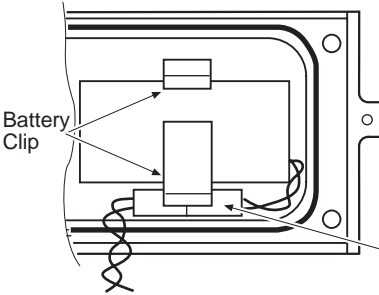
AquaMaster Transmitter

Current Model (top cover removed)



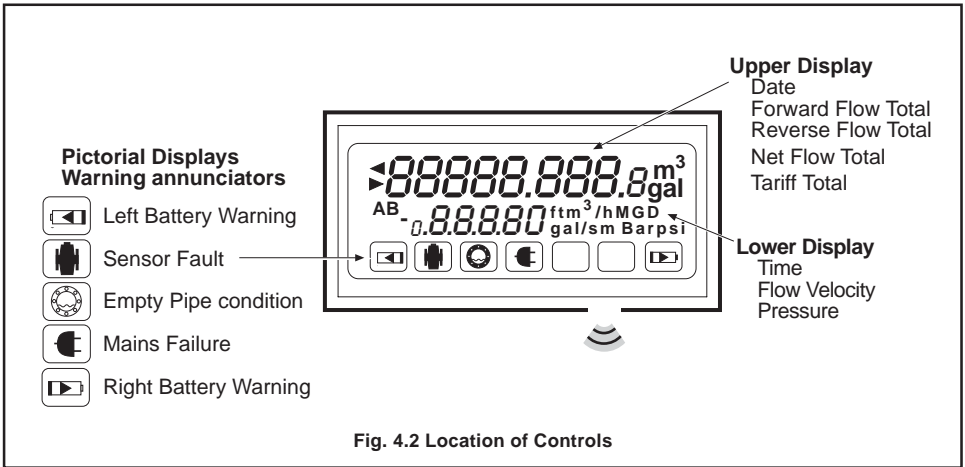
- 1) Remove the top cover of the transmitter – see **Section 3.2.3**.
- 2) Connect the battery or batteries to the wire connector(s) inside the top of the transmitter unit.
- 3) Push the connection(s) into the recess as shown ensuring that the wires are NOT lying on the mating surface.
- 4) Fit the cover and ensure the screws are tightened fully.

Previous Model (batteries in top cover)



- 1) Remove the top cover of the transmitter – see **Section 3.2.3**.
- 2) Slide out the connector from behind the battery clip.
- 3) Connect the battery or batteries to the wire connector(s) inside the top of the transmitter unit.
- 4) Ensure that the end of the battery with the connection wires is pushed up against the inside end of the top cover.
- 5) Push the connection centrally behind the battery clip to secure the battery.
- 6) Fit the cover and ensure the screws are tightened fully.

Fig. 4.1 Connecting Batteries



On removing the covering, the display activates and cycles through the programmed set of display measurements.

With external a.c. power applied, the display is permanently activated.



Information. For the use of local or remote serial communication and how to alter the displayed set of measurements, or instrument setup, see the **Quick Reference Guide**.

4.5 Replacing a Battery – Fig. 4.3

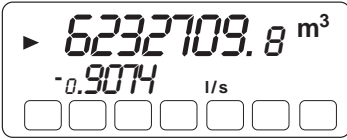


Warning – Risk of Electrical Shock

If replacing the battery on an external powered (a.c.) unit, ensure it is powered during this operation. However, be aware that the mains terminal block is exposed and **MUST NOT** be touched during this procedure.

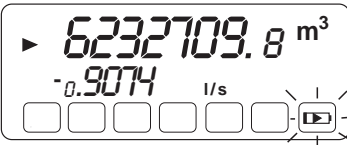


Note. Each battery must be connected to the cable from the same side of the termination area as the battery position in the battery holder or lid. For dual battery units, replace only the battery indicated by the battery legend described on the following page.



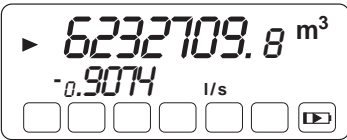
Normal Operation

If both batteries are good, then no battery alarm is indicated.



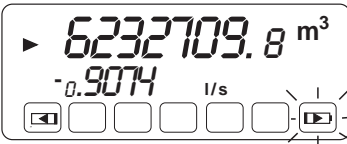
Battery Warning

A single flashing icon indicates that the battery needs replacing in the next 1 to 3 months. It MUST NOT be changed whilst flashing; only change the battery when the icon is steady.



Replace Battery

When a battery alarm is shown, replace the cell on the side indicated – in this example, the right battery. Wait approximately three seconds after disconnecting the battery before connecting the new battery.



Replace both batteries

Important. If both batteries require replacement, first change the cell indicated by the steady icon – in this example, the left battery. The flashing icon indicates the battery currently in use.

4.5.1 Spares Kits.

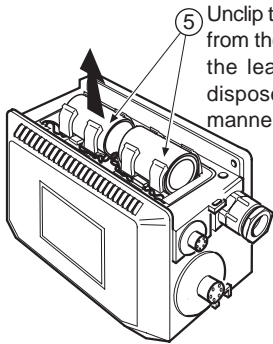
Transmitter

- Battery Kit comprises 1 battery and one seal MEFA 9947
- Lid assembly MEFA 9948

4.5.2 Battery Changing Procedures – Figs 4.3 and 4.4

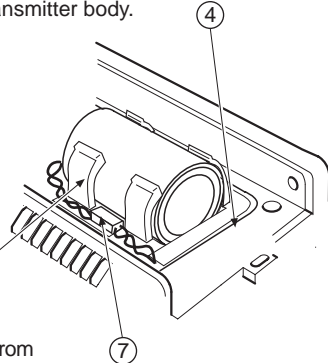
* **Note.** Before changing batteries in a dirty environment it is recommended that the new 'O'-ring is fitted to the new lid (or cleaned lid from a previous installation) in a clean area, then re-sealed in a poly bag. This should minimise contamination by dirty fingers during the following procedures.

- ① If the transmitter is not fixed in any way arrange or hold it with the top cover uppermost.
- ② Using plain water, wash off any loose dirt from the case.
- ③ Remove the top cover of the transmitter – see **Section 3.2.3** – to expose the batteries.



- ⑤ Unclip the appropriate battery from the tray and disconnect the lead at the connector; dispose of in the approved manner.

Using a "wet" tissue wipe the 'O'-ring mating surface around the opening into the transmitter body.



⑥ Fit a new battery from the battery kit into the clips.

⑦ Ensure that the connector is tucked in the recess and that the wires are NOT lying on the 'O'-ring mating surface.

- ⑧ Fit the new 'O'-ring (supplied with the battery) into a new or recycled lid assembly.
- ⑨ Fit the new cover and ensure the screws are tightened fully.

Finally – the removed lid assembly is to be washed under running water, using a brush if necessary, dried and sealed in a plastic bag for later re-use. Dispose of old 'O'-ring seal.

Fig. 4.3 Battery Changing Procedure (metal transmitter)

APPENDIX A – AQUAMAG TO AQUAMASTER CONVERSION PROGRAM

A.1 Preliminary

Caution. For security purposes, the conversion software will work once only. Ensure that you follow the on-screen instructions and that the correct details have been entered before leaving the program.

Note. The program accepts data either by manual input into the data entry screen, or by importing it from the AquaMag transmitter.

A.1.1 Installing the Conversion Program

Load the CD supplied, double click on **Setup** and follow the on-screen instructions.

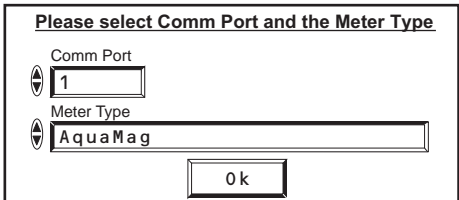
Before running the conversion program check that:

- a) the Upgrade Adaptor is connected, the lid in place, and secured;
- b) the AquaMaster transmitter have all connections made to it;
- c) the batteries are fitted;
- d) the transmitter cover is fitted.

A.2 Running the Program

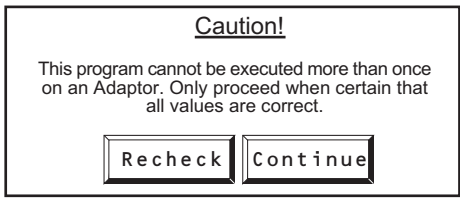
A.2.1 Conversion using Uploaded Data

- 1) Connect the computer to the AquaMag transmitter via a standard AquaMag MIL 19-way comms adaptor lead. Plug in battery into the AquaMag.
- 2) Start the program and the default data entry window is displayed – **Fig. A.1**, page 26.
- 3) Press **Upload** to retrieve the data. The following window is displayed.

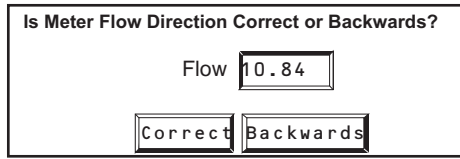


Press **OK** and the retrieved data is displayed in the appropriate fields on the screen. See example data in **Fig. A.2**, page 26.

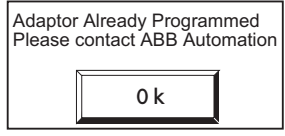
- 4) Disconnect the computer from the AquaMag transmitter and connect it to the AquaMaster transmitter – see **Section 3.3.5**.
- 5) Set meter bore, amend **Required Fields** and **Optional Fields** on the data entry screen. See example data in Fig. A.3.
- 6) When you are sure of the setup, press **Download**. You will have the opportunity here to cancel the download by pressing **Recheck**. Only if you are sure press **Continue**.



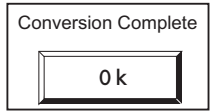
- 7) The following prompt allows you to change the flow direction if the flow is **-ve**.



- 8) If the adapter sensor has already been set up the following message is displayed. Press **OK**.



- 9) When the download is complete the following message is displayed. Press **OK**.



- 10) Press **Exit** to leave the set up program.

- 11) For potting see **Section A.3**.

Use the supplied **Quick Reference Guide** for programming information and altering product configuration.

A.2.2 Manual Data Entry

- 1) Connect the pc/laptop to the AquaMaster transmitter – see **Section 3.3.5**.
- 2) Start the program and the default data entry window is displayed – see **Fig. A.1**, page 26 – and key in data in the appropriate fields (see following notes).



Important Notes.

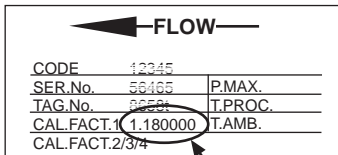
- Where NO up/down arrows are visible, data has to be keyed in. Where up/down arrows ARE visible, values are selected by either left clicking the up or down arrow, or by left clicking in the parameter field to display the entire range of options – see below.

Causes Per U/F Unit



Output 1

- Use the tab key to advance through the fields in sequence, or click in the field.
- With the exception of **Meter Bore** and **Sensor Span**, all parameter values may be amended at a later date using the normal transmitter configuration facility.
- Value for **Sensor Span** is found on the Calibration Certificate, or the sensor label (if accessible – see illustration below).



Sensor Span

- 3) When all required values have been entered/selected (see example in **Fig. A.3** on page 27), check through thoroughly and make any necessary alterations. Ensure that all fields in the **Required Fields** section are set.
- 4) When you are sure of the setup, press **Download**. You will have the opportunity here to cancel the download by pressing **Recheck**. Only if you are sure press **Continue**.

Caution!

This program cannot be executed more than once on an Adaptor. Only proceed when certain that all values are correct.



- 5) The following prompt allows you to change the flow direction if the flow is **-ve**.

Is Meter Flow Direction Correct or Backwards?

Flow



- 6) If the adaptor sensor has already been set up the following message is displayed. Press **OK**.

Adaptor Already Programmed
Please contact ABB Automation



- 7) When the download is complete the following message is displayed. Press **OK**.

Conversion Complete




If you have made an error in either the Meter Bore or Sensor Span fields, please contact ABB.

- 8) Press **Exit** to leave the set up program.
- 9) For potting see **Section A.4**.

Use the supplied **Quick Reference Guide** for programming information and altering product configuration.

A.3 DN80 to DN150 Adjustment

(For improved accuracy)

 **Note.** The following procedure is NOT required for DN200 or greater.

The construction of the DN80, DN100 and DN150 sensor requires a trim operation to obtain the highest accuracy. The following section indicates the equipment required and the procedure to follow.

A.3.1 Equipment required

- 1 off mains/battery AquaMaster for trim process only.
- 1 off 110 V power source, normally a 12 V to 110 V inverter.




Warning. 230 V can be used but users must follow local and national safety standards for use of high voltage equipment in such applications.

- 1 off battery pack to power the above converter.

A.3.2 Trim Procedure

- 1) Install the trim program onto the laptop / pc by double clicking on the CD program **Aqua Trim Setup**.
- 2) Connect the mains / battery AquaMaster to the sensor and the 110 V power source.
- 3) Connect the battery in the AquaMaster and turn on the 110 V power source. As a check to ensure the 110 V power is present, check that the display mains icon goes off when the 110 V is applied.
- 4) Connect the laptop / pc to the AquaMaster – see **Section 3.5.5**.

- 5) Run the program **Aqua Trim**.
- 6) Select **START** to begin a short data logging operation.
- 7) At the appropriate prompts, turn off the 110 V power source, then turn it on again.
- 8) When complete **Adjustment Complete** is displayed.

 **Note.** The program can function only if the flowrate is sufficient. If too low, an error is displayed and the operation should be performed later when an increased flowrate is available.

- 9) Adjust the trim value using the up/down arrows adjacent to the numeric value, or type in values so that the graph appears continuous – **Fig. A.5, page 28**.

If large steps appear – **Fig. A.4, page 28** – then repeat adjustment of the trim to minimise the steps.

- 10) Select **ADJUST** to download the trim values to the AquaMaster settings. Select **EXIT** to leave the program.
- 11) Turn off power to the AquaMaster and disconnect it. Fit the supplied transmitter (normally battery only) that is to be left with the installation, following **Section 3.3**.
- 12) Connect power to the AquaMaster and secure the unit.
- 13) Pot the transmitter and adaptor box – see **Section A.4**.

A.4 Potting after Conversion

When the conversion is complete and no rewiring is required in the Sensor Upgrade Adaptor or the Metal Transmitter, pot these units as described in **Section 3.2.1** and **Section 3.3.9** respectively.

Fig. 4.4 Battery Changing Procedure (plastic transmitter)

Fig. A.1 Default Data Entry Screen

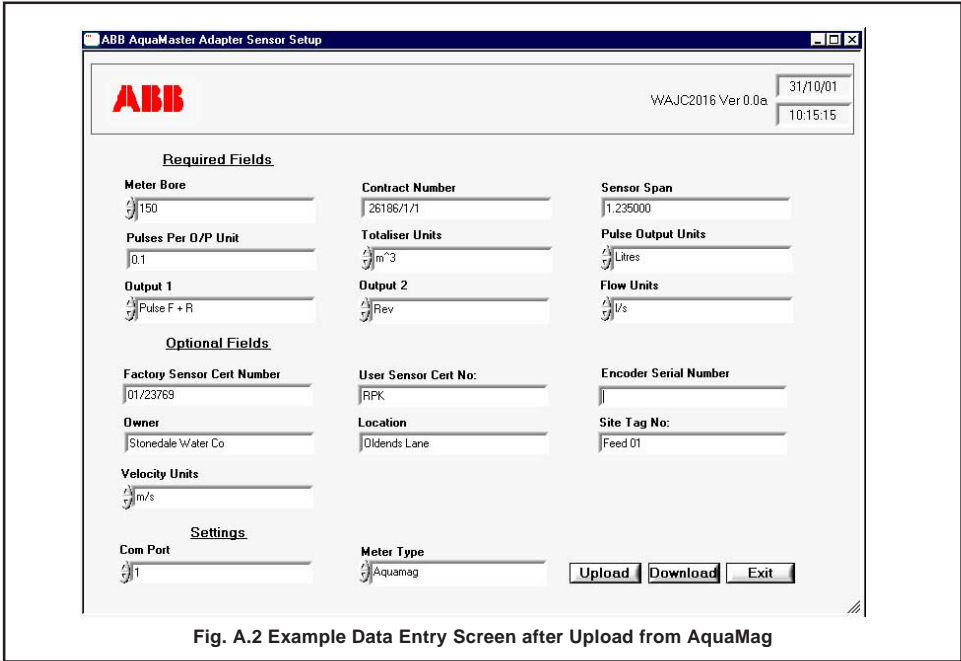


Fig. A.2 Example Data Entry Screen after Upload from AquaMag

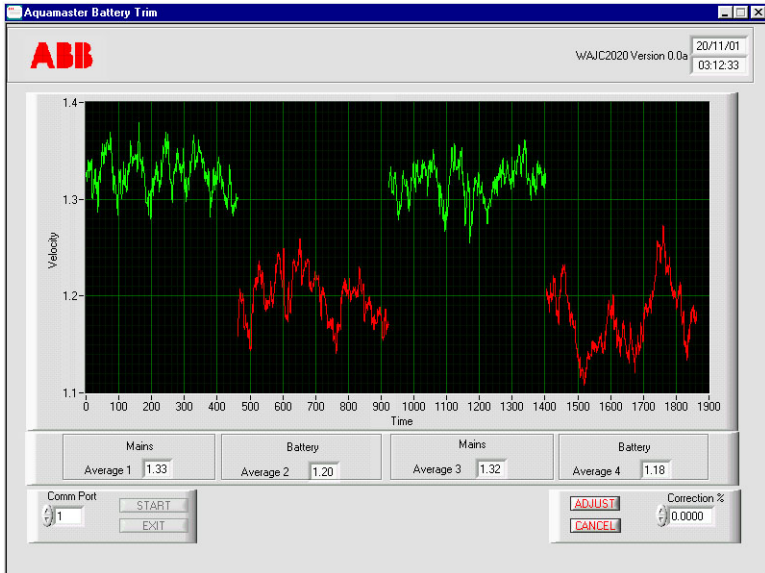


Fig. A.3 Example Data Entry Screen after Manual Data Entry

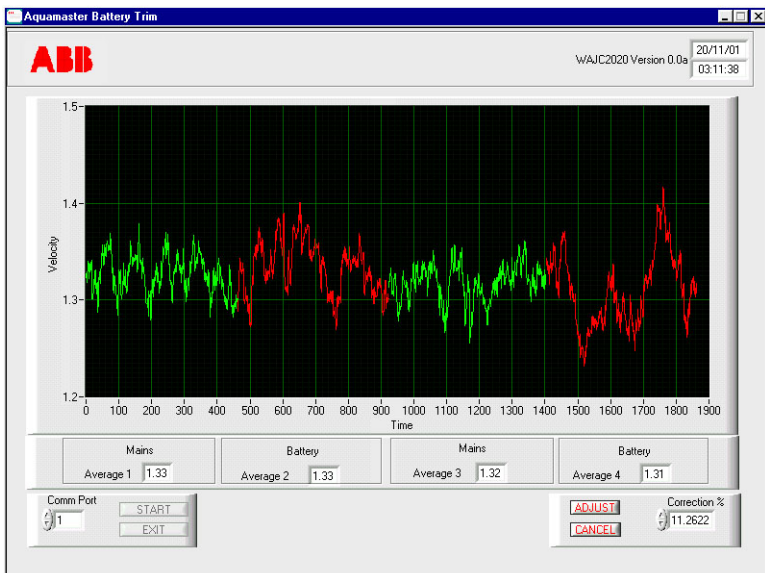
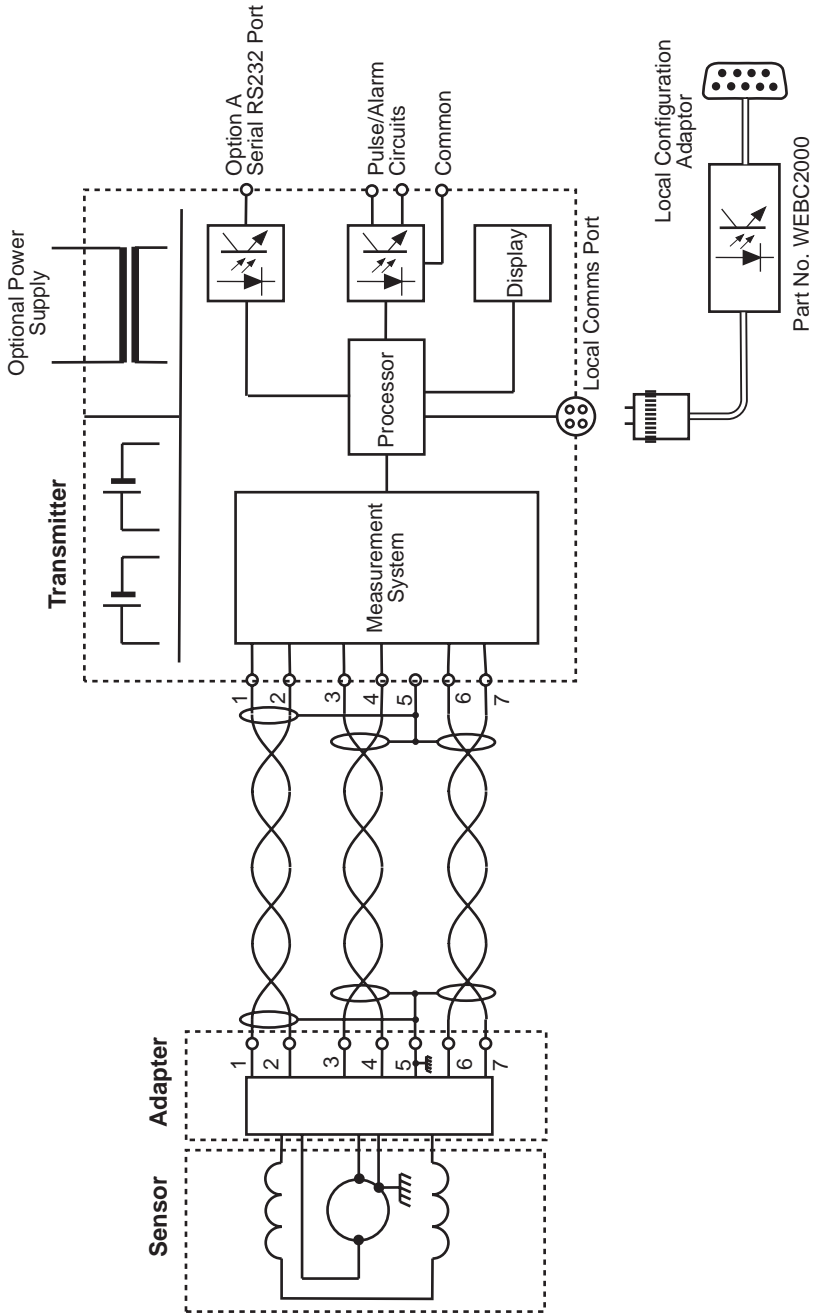


Fig. A.4 Example Display Before Trim Adjustment

APPENDIX B – AQUAMASTER BLOCK DIAGRAM



PRODUCTS & CUSTOMER SUPPORT

Products

Automation Systems

- *for the following industries:*
 - Chemical & Pharmaceutical
 - Food & Beverage
 - Manufacturing
 - Metals and Minerals
 - Oil, Gas & Petrochemical
 - Pulp and Paper

Drives and Motors

- *AC and DC Drives, AC and DC Machines, AC motors to 1kV*
- *Drive systems*
- *Force Measurement*
- *Servo Drives*

Controllers & Recorders

- *Single and Multi-loop Controllers*
- *Circular Chart and Strip Chart Recorders*
- *Paperless Recorders*
- *Process Indicators*

Flexible Automation

- *Industrial Robots and Robot Systems*

Flow Measurement

- *Electromagnetic Flowmeters*
- *Mass Flow Meters*
- *Turbine Flowmeters*
- *Flow Elements*

Marine Systems & Turbochargers

- *Electrical Systems*
- *Marine Equipment*
- *Offshore Retrofit and Refurbishment*

Process Analytics

- *Process Gas Analysis*
- *Systems Integration*

Transmitters

- *Pressure*
- *Temperature*
- *Level*
- *Interface Modules*

Valves, Actuators and Positioners

- *Control Valves*
- *Actuators*
- *Positioners*

Water, Gas & Industrial Analytics Instrumentation

- *pH, conductivity, and dissolved oxygen transmitters and sensors*
- *ammonia, nitrate, phosphate, silica, sodium, chloride, fluoride, dissolved oxygen and hydrazine analyzers.*
- *Zirconia oxygen analyzers, katharometers, hydrogen purity and purge-gas monitors, thermal conductivity.*

Customer Support

We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

United Kingdom

ABB Limited
Tel: +44 (0)1453 826661
Fax: +44 (0)1453 829671

United States of America

ABB Inc
Instrumentation Division
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

ABB has Sales & Customer Support expertise
in over 100 countries worldwide

www.abb.com

The Company's policy is one of continuous product improvement
and the right is reserved to modify the information contained
herein without notice.

Printed in UK (09.05)

© ABB 2005



ABB Limited

Oldends Lane, Stonehouse
Gloucestershire
GL10 3TA
UK

Tel: +44 (0)1453 826661

Fax: +44 (0)1453 829671

ABB Inc.

125 E. County Line Road
Warminster
PA 18974
USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183