

7600 Series

Operating Instructions

Ultrasonic & Mechanical
Electrode Cleaning Systems

Models:

7651, 7654, 7655, 7656,
7660, 7661, 7664, 7665

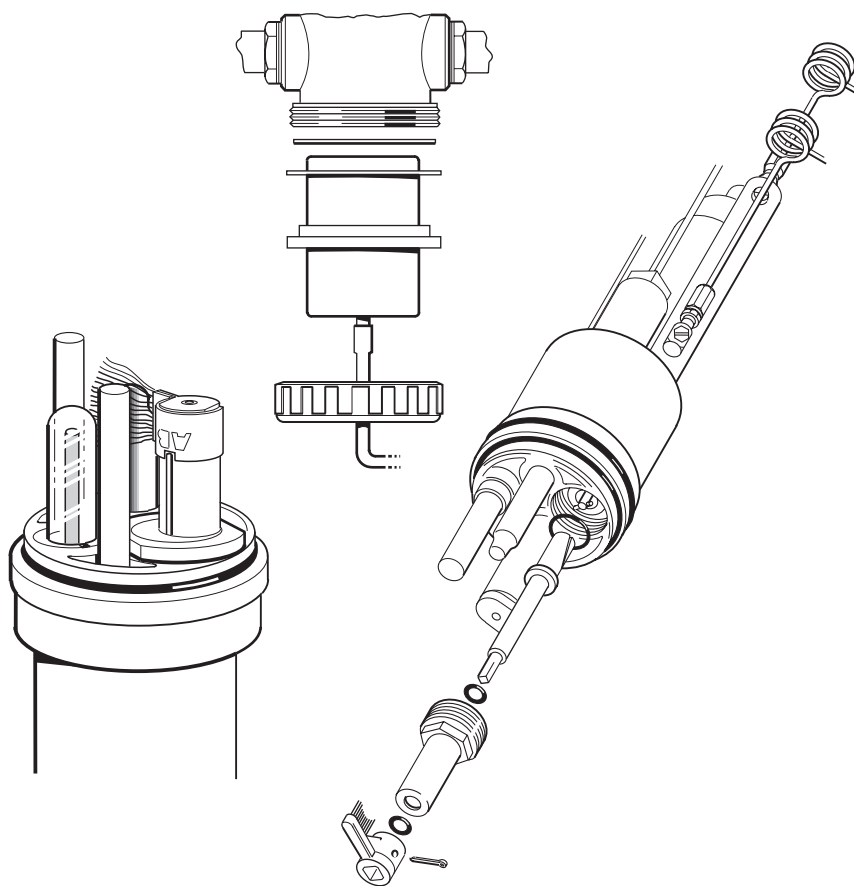


ABB Instrumentation

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The Company

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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.

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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 Instrumentation's dedication to quality and accuracy.

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Use of Instructions



Warning.

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



Note.

Clarification of an instruction or additional information.



Caution.

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



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.

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 Instrumentation.

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.

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INTRODUCTION

This manual gives the information required by users of the various types of Kent-Taylor electrode cleaning systems.

The systems are as follows:

- Model 7650 020 Flow Powered Cleaning System
- Model 7612/13 Ultrasonic Cleaning System
- Model 7610/11 Mechanical Wiper Cleaning System

The 7650 020 system uses a flow powered device for direct mechanical cleaning of the sensor tip. The 7612/13 system uses ultrasonic pressure waves for indirect cleaning of the sensor. The 7610/11 system uses an air powered wiper for direct mechanical cleaning of the sensor tip.

The cleaning systems are supplied for fitting to certain models of the Kent-Taylor 7650/60 series of industrial electrode systems as indicated in Tables A1.1, B1.1 and C1.1. For information on the various Kent-Taylor industrial electrode systems refer to the operating manual for the 7650/60 series of Electrode Systems.

For information on a particular cleaning system model refer to the appropriate section of this manual. Information is given for the separate supply of system items for new or existing electrode system installations. When a cleaning system is fitted into an electrode system, it is not normally necessary to remove any of the cleaning system components when removing the sensors.

Although information relates to the current series of industrial electrode systems, the information on the 7612/ 13 ultrasonic and 7610/ 11 wiper cleaning systems themselves is also valid for the earlier 7600 series of industrial electrode systems. There are installation differences within the electrode systems on the earlier series. These differences can be established by reference to the operating manual for the original electrode system.

General Notes:

- a) The term 'high purity water' is used throughout this manual to mean distilled or double de-ionised water with a background impurity level of less than 0.01mg^{-1} (ppm).
- b) Where parts for fitting are mentioned in the text, it may be assumed that they are of new supply with the cleaning systems, unless specifically mentioned as being retained from existing equipment.
- c) Where appropriate, Kent-Taylor part numbers are given in the text thus: (XXXX XXX)
- c) Where an instruction is given to 'discard' an item, this means that the item is not required in the modified system. The actual disposal policy for the redundant item is a user decision.

A1 DESCRIPTION

This system uses a special flow powered device (FPD) which is fitted inside the electrode system flowcell so that the tail of the FPD fibres can brush across the sensing tip of the downstream measurement electrode. The flow powered cleaning system may be fitted to the various electrode systems indicated in Table A1.1.

The FPD consists of a tuft of flexible synthetic fibres secured in a clip which is fixed on the reference electrode housing of the sensor holder. The clip has a slot which locates in a rib on the housing, to position the FPD tail over the downstream measurement electrode. When the sample is flowing the reference electrode housing splits the sample flow to induce lateral oscillations of the FPD fibres. These continuous oscillations give a gentle brushing action which maintains the electrode sensing tip area free from significant deposits that affect sensor performance.

A2 LOCATION

The FPD is fitted inside the electrode system at a specific location on the reference electrode housing which is part of the normal sensor holder. It must be possible to achieve the minimum sample flowrate specified in Section A7 for effective operation.

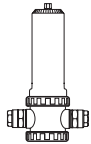
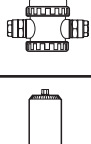
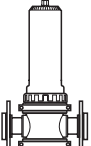
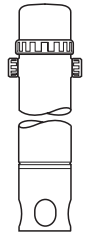
Model 7650/ 60 Electrode Systems		Model 7650 020 Flow Powered Cleaning System		
		Used with Model?	Main System Components	
‘Flow’ Systems		7651	Yes	7650 020 FPD
		7660		
		7661	No	—
‘Dip’ Systems		7654	No	—
		7655		
		7665		
		7664		
		7656		

Table A1.1 Application of Model 7650 0202 Flow Powered Cleaning System to Model 7650/60 Electrode Systems, with Main System Components

A3 INSTALLATION

A3.1 Existing Installation

To fit the flow powered cleaning system to an existing 'flow' electrode system installation, carry out the procedure as follows:



Warning. Always ensure in the case of in-line systems that the sample line pressure is reduced to zero before removing the electrode assembly from the sampling point.



Caution. Complete this procedure within 2 hours, or take steps to avoid drying out and degradation of electrodes.

- Isolate the sample line.
- Release the clamp ring securing the top cover and lift off the cover with the sensor holder.
- Identify the reference electrode housing and the locating rib for the clip – see Fig. A3.1.
- Take the FPD and clip it over the end of the housing. Rotate the clip so that the slot aligns with the rib on the housing and push it down into position – see Fig. A3.1.
- Check that the FPD is positioned centrally to brush the electrode tip. If necessary, make a fine adjustment to the radial position.
- Replace the top cap with the sensor holder and secure with the clamp ring.,
- Restore sample flow to the line.

A3.2 New Installation

To fit the flow powered system to a new 'flow' electrode system installation, carry out the procedure as follows:

- Release the clamp ring securing the top cover and lift off the cover with the sensor holder.
- Carry out the sensor fitting and connecting instructions given in the electrode system manual up to the point of replacing the top cover.
- Identify the reference electrode housing and the locating rib for the clip – see Fig. A3.1.
- Take the FPD and clip it over the end of the housing. Rotate the clip so that the slot aligns with the rib on the housing and push it down into position – see Fig. A3.1.
- Check that the FPD is positioned centrally to brush the electrode tip. If necessary, make a fine adjustment to the radial position.
- Important.** Refit the sensor into the flow chamber ensuring that the reference electrode is positioned immediately downstream of the incoming sample.

A4 OPERATION

A4.1 Setting-up

There are no setting-up requirements for the system, other than ensuring that the sample flowrate conforms to the requirements given in Section A7.

A4.2 Routine

There are no routine activities for checking the operation of the system other than using instrument readings as an indirect check.

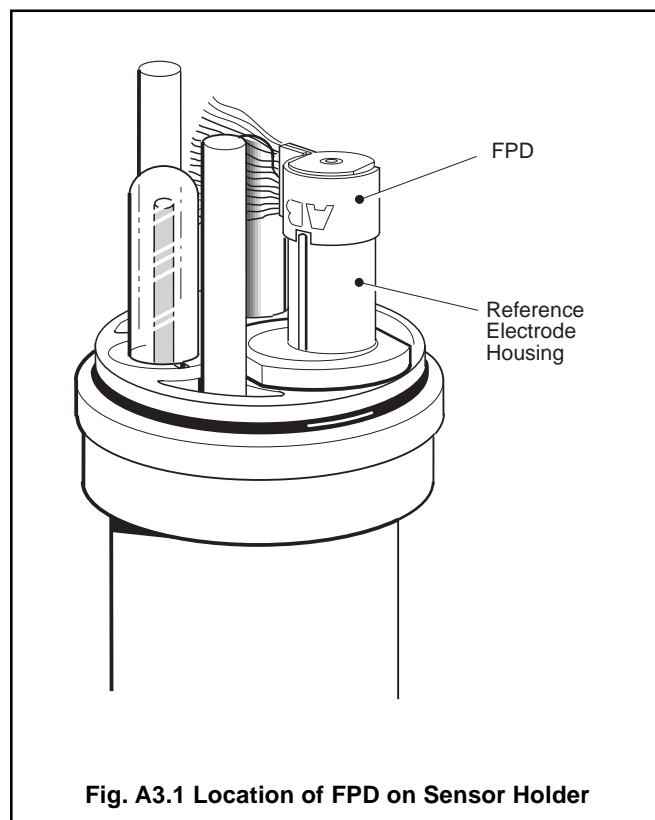


Fig. A3.1 Location of FPD on Sensor Holder

A5 MAINTENANCE

A5.1 Examination of FPD

After extended use, the FPD will lose efficiency and deposits will accumulate on the sensor. This can be indicated by interpretation of the readings on the indicator/transmitter instrument.

The procedure is as follows:

- a) Isolate the sample line.



Warning. Always ensure in the case of in-line systems that the sample line pressure is reduced to zero before removing the electrode assembly from the sampling point.



Caution. Complete this procedure within 2 hours, or take steps to avoid drying out and degradation of electrodes.

- b) Release the clamp ring securing the top cover and lift off the cover with the sensor holder.
- c) Visually examine the electrode tip for surface deposits and the condition of the FPD fibres. If there is evidence of deposits and loss or degradation of fibres, replace the FPD.

This task should be undertaken to coincide with other maintenance tasks on the electrode system and at maximum interval of 3 months.

A5.2 Replacement of FPD

The procedure is as follows:

- a) Isolate the sample line.



Caution. Complete this procedure within 2 hours, or take steps to avoid drying out and degradation of electrodes.

- b) Release the clamp ring securing the top cover and lift off the cover with the sensor holder.
- c) Release the clip from the reference electrode housing and discard the FPD.
- d) Take a new FPD and carry out steps (d) and (e) given in Section A3.2.
- e) Replace the top cover with the sensor holder and secure with the clamp ring.
- f) Restore sample flow to the line.

A6 SPARE PARTS

The following spare parts are available for the flow powered cleaning system direct from ABB Kent-Taylor, Oldends Lane, Stonehouse, Gloucs., GL10 3TA, England or through our worldwide organisation :

Item	Kent-Taylor Part No.
Flow Powered Device (FPD)	7650 020



Note. Individual items can only be supplied against the current Kent-Taylor minimum order value.

A7 SPECIFICATION

Minimum sample flowrate:	3.5 lmin ⁻¹	with oriface fitted
	7 lmin ⁻¹	with no oriface fitted

Optimum sample flowrate: 7 lmin⁻¹

Sample Temperature: 0 to 50°C

Materials in sample system:
Nylon (polyamide), rigid polypropylene

B1 INTRODUCTION

This section describes the installation and operation of the Model 7612 pH electrode ultrasonic cleaning system. The system comprises a generator unit (the Model 7612) and a piezoelectric transducer (model 7613) fitted to a flow or dip system of the 7650 /60 Series together with a specially developed pH glass electrode. The application of this system to the 7650/60 Series is indicated in Table B1.1.

The transducer element, which is contained within a stainless steel cylinder, connects to the generator unit using a length of coaxial cable: it may be fitted retrospectively to existing 7650 / 60 Series electrode systems, or fitted to a completely new system. Installation details are given for both these requirements.

It is strongly recommended that this instruction manual is read in conjunction with the 7650 /60 Series Instruction Manual where appropriate: the present manual covers the 'add on' features of an ultrasonic cleaning system for keeping the pH electrode free from accumulated deposits and maintaining its performance under adverse sample conditions. Installation and operation of the pH measurement system is covered by the 7650 /60 Series manual.

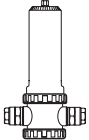
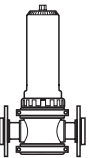
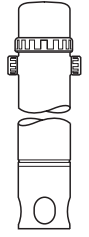
Model 7650/60 Electrode Systems			Model 7612 Ultrasonic Cleaning System			
			Used with Model?	Main System Components		
‘Flow’ Systems		7651	Yes	7612 000 Generator Unit	7613 200 Kit with 7613 210 Transducer	—
		7660	Yes			
		7661	No	—	—	—
‘Dip’ Systems		7654	Yes	7612 000 Generator Unit	7613 100 Kit with 7613 110 Transducer	7650 056 Sensor Holder
		7655	Yes			
		7656	Yes			
		7664	No	—	—	—
		7665	No	—	—	—

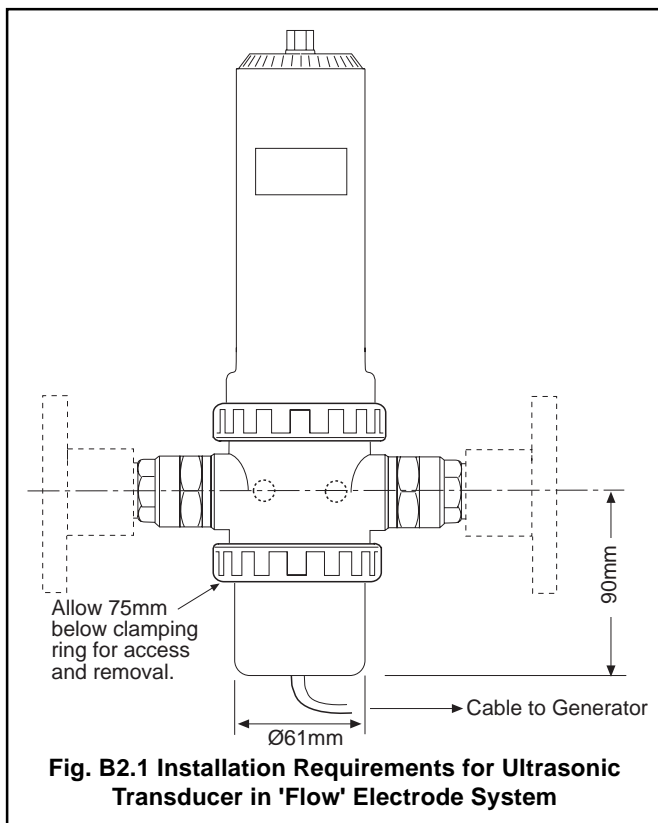
Table B1.1 Application of Model 7612 Ultrasonic Cleaning System to Model 7650/60 Electrode Systems, with Main System Components

B2.1 Transducer Element

The ultrasonic transducer element uses a high frequency electronic generator connected to a robust piezoelectric transducer mounted inside a stainless steel holder. This is installed in a position underneath the pH electrode so that when the element is activated by the generator unit, a rapid scrubbing action is carried out on the glass surface to free it of stubborn and insoluble deposits. The piezoelectric transducer element is sandwiched between two metal blocks clamped together. When operating, the transducer end plate vibrates at a controlled frequency (40 kHz), and the vibrations are transmitted into the fluid above the plate causing violent stress reversals. This gives rise to cavitation, a phenomenon in which minute vacuum bubbles are formed which produce a scrubbing action on the surface of anything within the fluid, thus cleaning it. The Model 7612 has different power levels for different severities of accumulated deposits which may be selected by the operator to suit requirements.

The two forms of element housing are intended for the two types of 7650/60 electrode systems:

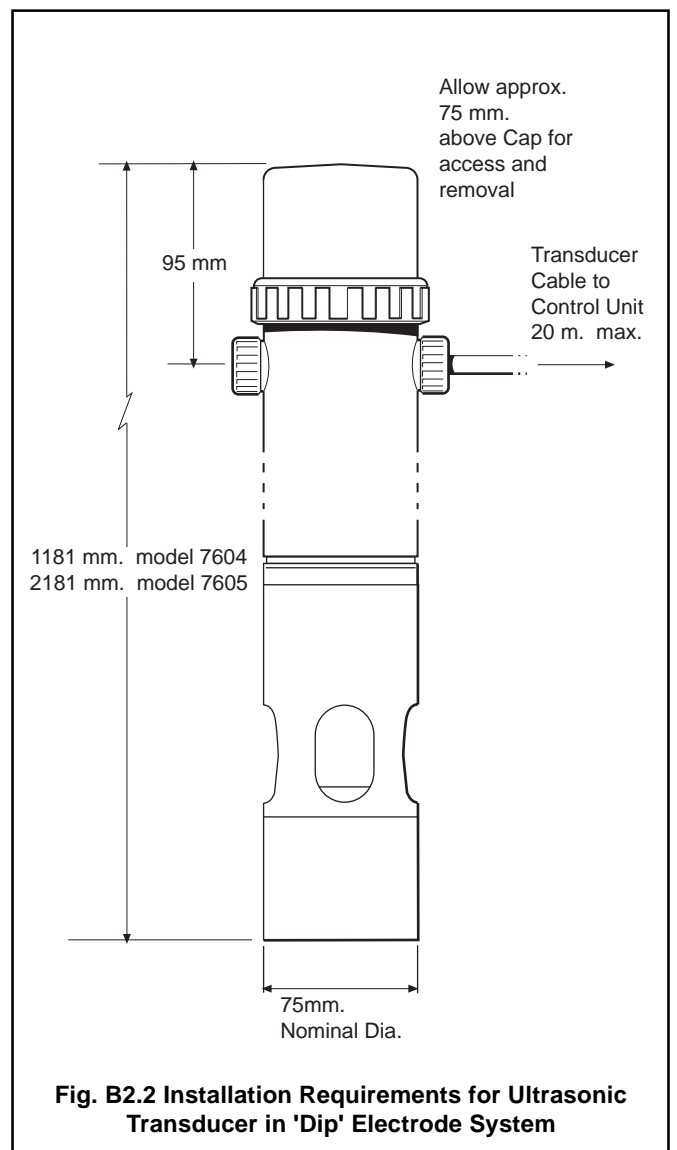
- In the version used in the Models 7651 and 7660 Flow Systems, the base of the flowcell is replaced by the transducer element which has its output cable leaving the unit from the underside – see Fig. B2.1.
- In the version on the Models 7654 and 7655 Dip Systems the element is fitted to the sensor holder block using a spare fixing position on the holder block. The transducer cable in this case is contained within the electrode system and leaves it via a gland fitting at the top of the dip tube – see Fig. B2.2



B2.2 Generator Unit

The Model 7612 Ultrasonic Generator unit is contained within an industrial wall mounted splash proof case which has a removable gasketed cover retained by two captive screws; a single window in the cover permits observation of the interior of the case.

The electronic circuitry comprising the generator unit is mounted on a single printed circuit board fixed to the chassis of the case, and this is protected when the case cover is removed by a grey plastic shroud. Mounted on the front of this shroud, and visible through the window, is the operating control of the generator which permits selection of any of the three output power levels available, together with a STANDBY position, in which ultrasonic power to the transducer is switched off, and the adjustment control for the timer 'on' period.



...B2 DESCRIPTION

The generator unit is fitted with an electronic sequence timer mounted on a single printed circuit board with a single adjustable control (TRANSDUCER 'ON' TIME - MIN/MAX). This timer circuit, which is independent of the generator, serves to switch the generator circuit on and off in a variable mark-space mode with a total cycle time of 16 minutes approximately. When the operating control is set at MIN (imum), the ultrasonic frequency is on for only a few seconds, whilst when it is set for MAX (imum), the ultrasonic frequency is on for almost all the total cycle time, and switched off for only a few seconds.

Electrical connections to the generator unit are made to two separate screw terminal blocks mounted directly on the chassis of the case. They are normally covered by a protective cover which contains details of the wiring connections – see Fig. B3.5 and Section B3.3. Cable connections to the unit enter the case through the two sealed cable glands located at the bottom of the unit. The maximum cable length is fitted as standard to the transducer.

B2.3 Glass Electrodes

The correct pH glass electrode for use when operating the Model 7612 Ultrasonic Generator is a specially developed cone head type (Part No. 1721 000 or Part No. 1723 000). These electrodes are filled with a special gel which minimises the effect of cavitation: they are installed in the 7650 /60 Series electrode systems in the same way as the conventional glass electrodes listed in the 7650 /60 Series instruction manual.

B3 INSTALLATION

B3.1 Mounting the Generator Unit

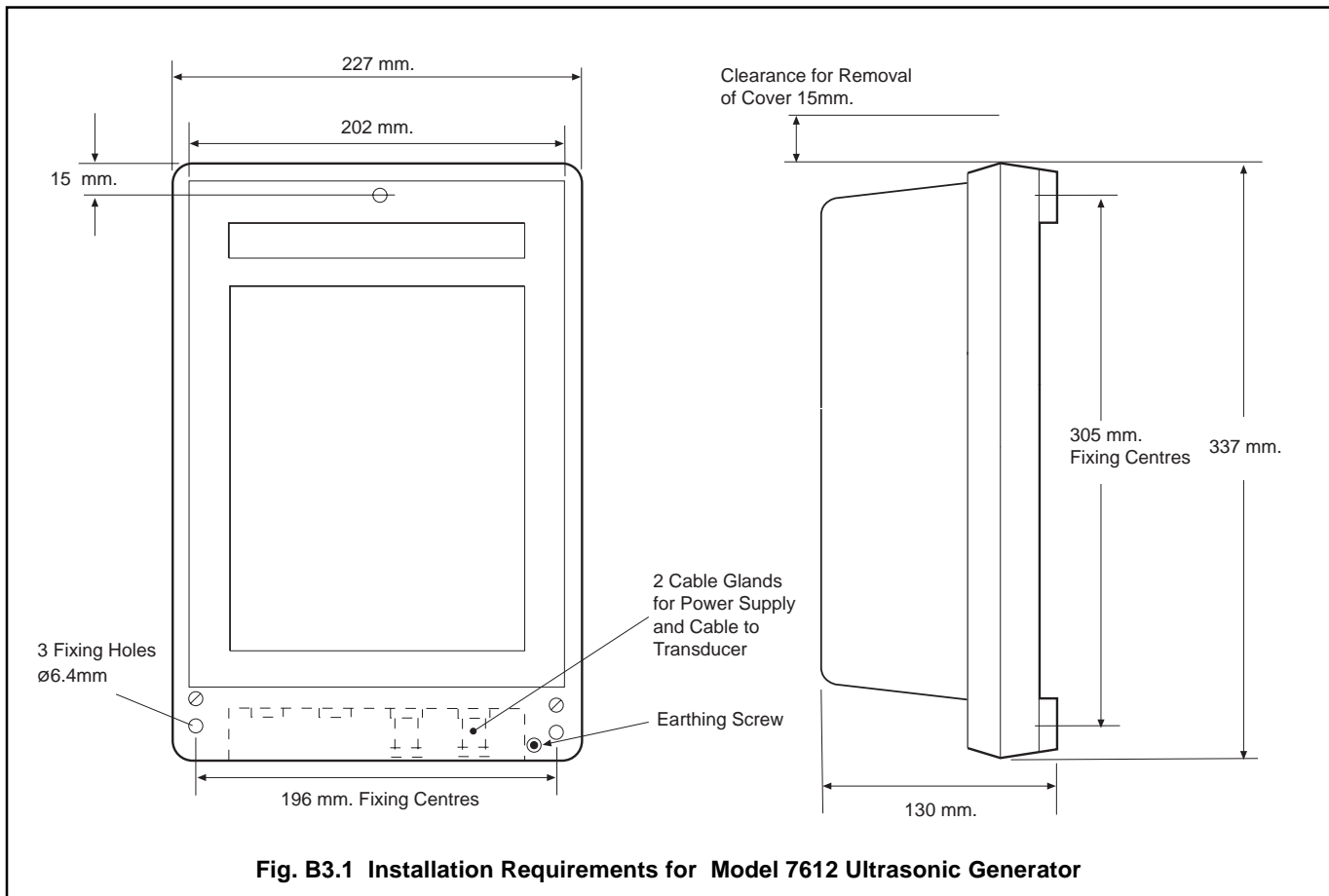
The location selected for installing the Model 7612 will be determined by the position of the pH electrode system; the generator unit should ideally be as close to its associated electrode system as possible. The maximum permitted cable length between transducer and generator is 20m (65ft).

The generator can be fixed to any convenient vertical surface with sufficient access to the front and with enough overhead clearance to enable the cover to be removed from its top hinges.

The overall dimensions of the case are shown in Fig. B3.1 the case should be fixed with the two cable glands downwards on a clean dry surface in a reasonably sheltered location. The three fixing holes are suitable for either M6 or 1/4 in. bolts.

B3.2 Fitting the Transducer

The instructions which follow are for fitting a transducer element to Models 7651/7660 Flow Systems or Models 7654/7655/7656 Dip Systems which is already installed and in operation, i.e., the ultrasonic equipment is being supplied as an 'add on' feature to an existing installation. However, where the installation is new and it is required to fit the ultrasonic cleaning facility at the outset, a completely assembled system can be installed. The dimensions of these complete systems are shown in Fig. B2.1 and B2.2.



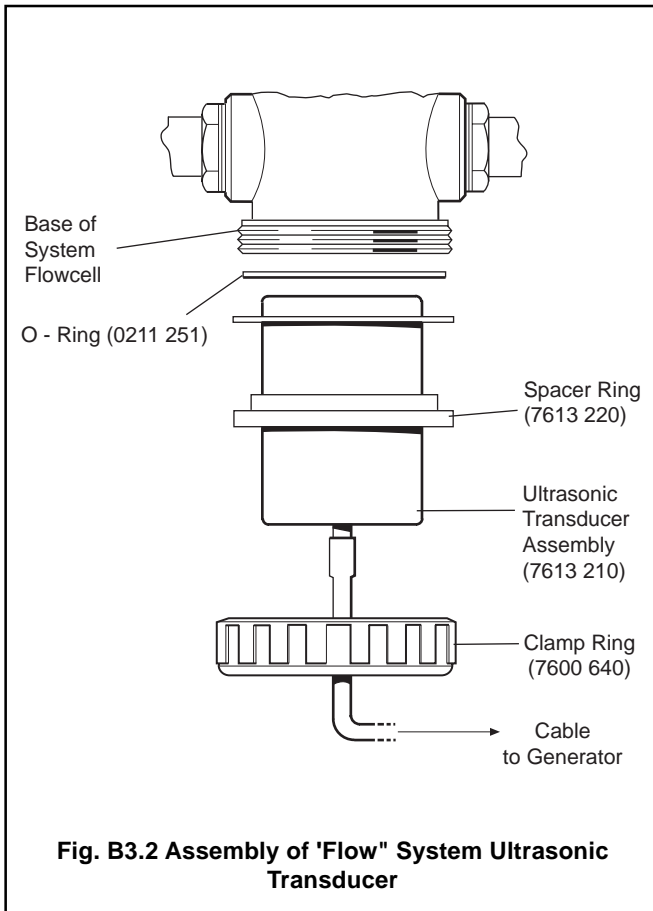


Fig. B3.2 Assembly of 'Flow' System Ultrasonic Transducer

B3.2.1 Models 7651/7660 'flow' Systems

To fit the transducer to a Model 7651/7660 Flowline System already installed at its sampling point, carry out the following steps:

- a) Reduce the sample line pressure to zero.
- b) Unscrew the knurled clamp ring (7600 640) from the underside of the flowcell, and remove it and the base blanking plate of the flowcell from the system, together with the O-ring seal. It is not necessary to remove the upper portion of the electrode system or disturb the sensor block.
- c) Fit the O-ring taken from the base plate into position on top of the weld on the transducer assembly – see Fig. B3.2.
- d) Feed the spacer ring (7613 220) and clamp ring (7600 640) over the coaxial cable and reassemble the system onto the bottom of the flowcell. Do not overtighten the clamp ring; it should not be necessary to use a wrench to obtain a good seal.
- e) Pass the coaxial cable to the generator unit – see Section B3.3; if the cable is to hang loose, ensure that it does not lie against any hot surfaces or abrasive objects. Alternatively, it may be routed in conduit to the generator unit.

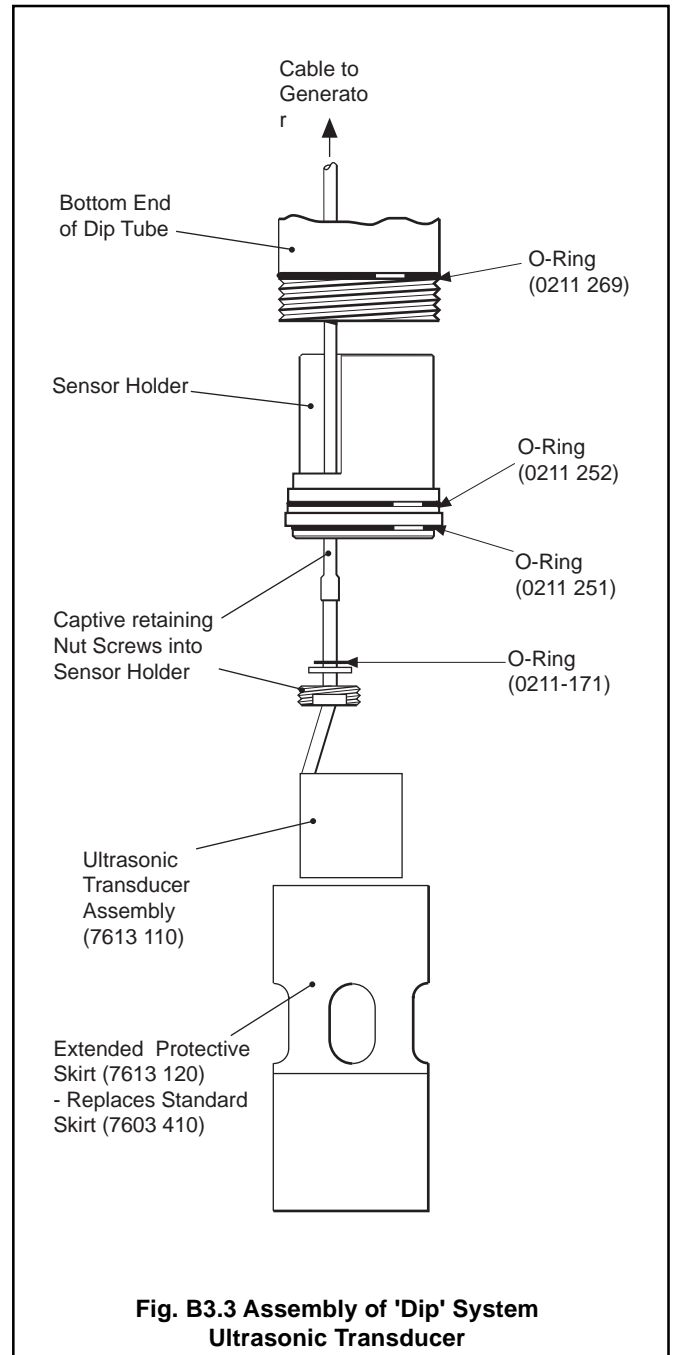


Fig. B3.3 Assembly of 'Dip' System Ultrasonic Transducer

B3.2.2 Models 7654 , 7655 or 7656 'dip' Systems

To fit the transducer to a Model 7654, 7655 or 7656 Dip System already installed, carry out the following steps:

- a) Remove the dip system from its retaining clips.
- b) Unscrew the plastic skirt from the bottom of the dip tube taking care to retain the O-ring seal (Part No. 0211 260 – see Fig. B3.3) on the threaded part of the dip tube.

...B3 INSTALLATION

- c) Rinse the sensors and sensor block with clean water and detach it from the end of the dip tube by pulling it firmly. Unscrew and remove the glass pH electrode, temperature compensation sensor and sealed reference electrode from the sensor block. Always avoid handling the glass pH electrode as far as possible.
- d) Discard the sensor holder and take the special sensor holder (7605 056) supplied with the cleaning system.
- e) Take the small O-ring seal (0211 171) and feed it over the transducer coaxial cable until it is against the welded flange as shown in Fig. B3.3.
- f) Pass the transducer coaxial cable through the sensor block and using a wrench (3/4 in. or 19mm A/F) screw the stainless steel captive retaining nut into the recessed hole. It is advisable to use PTFE thread seal tape to ensure a good seal. When the retaining nut is screwed in firmly, the top surface of the transducer casing should locate beneath the glass bulb of the pH electrode at approximately 10mm (3/8 in.) below it.
- g) Fit the glass electrode and sealed reference electrode to the sensor block, taking care to retain their O-ring seals in position.
- h) Fit the sensor block (with transducer now attached) to the bottom of the dip tube: the block locates with a small keyway and should be firmly inserted home.
- i) Screw onto the bottom of the dip tube the extended protective skirt (7613 120) in place of the skirt removed in step b). The replacement skirt is longer and serves to give some degree of mechanical protection against debris, etc., when the dip system is installed at its sampling point.
- j) Remove the orange top cap from the dip system and feed the coaxial cable from the transducer up the length of the dip tube and out of the side cable gland diametrically opposite the gland carrying the multiway cable to the pH meter. To obtain a satisfactory seal on the transducer cable, the existing cable bush in the gland should be replaced by the bush (7613 150).
- k) Replace the orange top cap and tighten the cable gland.
- l) Replace the dip system in its sampling point and pass the transducer cable to the generator unit (see next section for electrical connections): if the cable is to hang loose, ensure that it does not lay against any hot surfaces or abrasive objects. Alternatively, it may be routed in conduit to the generator unit.

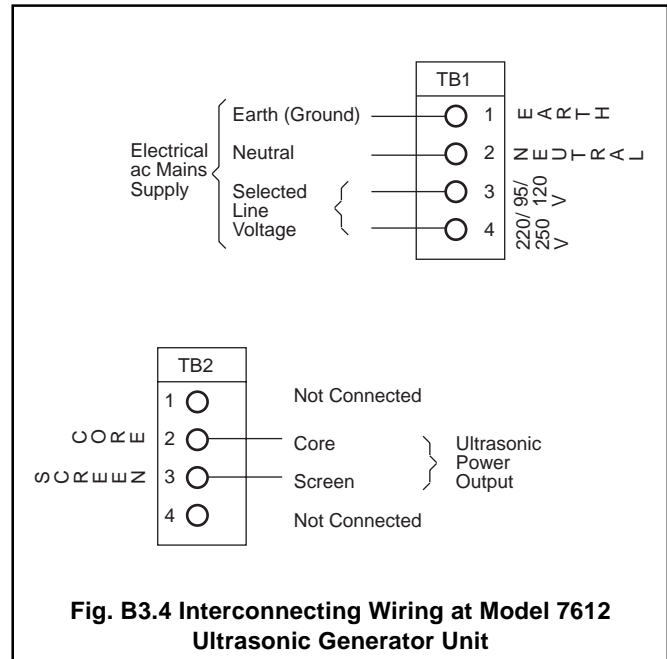


Fig. B3.4 Interconnecting Wiring at Model 7612 Ultrasonic Generator Unit

B3.3 Electrical Connections – Fig. B3.5

As previously noted, electrical connections are made to the Model 7612 Ultrasonic Generator Unit via two sealed cable glands to two separately designated screw terminal blocks. It is important to reassemble the component parts of the gland assembly correctly onto the cable, to ensure a watertight seal, especially where the generator unit is installed in the open air.

Each cable gland has an M16 internal thread for conduit fitting, or alternatively, when removed from the casting, leaves an internal M20 thread in the case. The terminal blocks are located beneath a flat protective cover, on which the electrical connections are detailed.



Warning. Replace the protective cover when the connections have been made. Never operate the generator with this cover removed.

Connect the power supply cable to the left hand terminal block (TB1). Refer to Fig. B3.4.

Connect the transducer coaxial cable to the right hand block (TB2). Refer to Fig. B3.4.

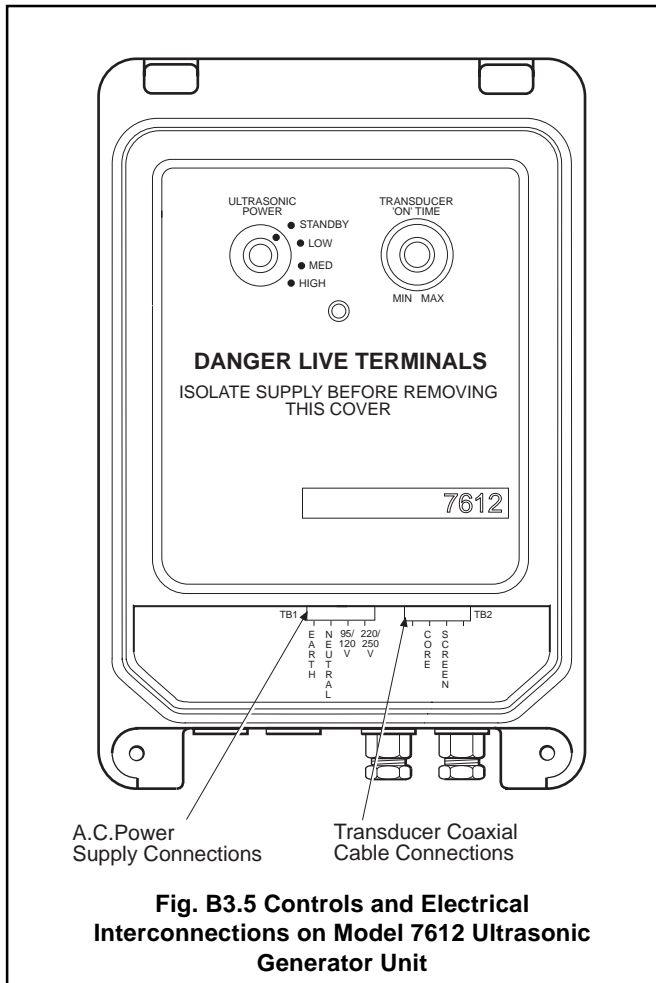


Fig. B3.5 Controls and Electrical Interconnections on Model 7612 Ultrasonic Generator Unit

When the electrical connections to the generator unit have been satisfactorily completed, and the modified electrode system reinstalled at its sampling point, the ultrasonic cleaning system can be set in operation by simply turning the front panel control switch from STANDBY to one of the three available power levels - LOW, MEDIUM or HIGH. Refer to Fig. B3.5.

The choice of power setting is determined largely by the particular application in which the pH measurement is being made: if it has already been established that ultrasonic cleaning is desirable, some impression will already have been gained of the rate of accumulation of debris, fouling of the glass membrane etc. Similarly, the rate of cleaning (determined by the MIN/MAX control setting) will depend upon the application. Adjustment over a period will determine the optimum setting to ensure satisfactory cleaning without unnecessary power consumption.

Two points concerning the operation of the generator unit should be particularly noted:

- Never operate the generator with the transducer disconnected i.e. open circuit output.
- Do not operate the generator with the transducer dry i.e. not immersed in sample: the power dissipation in the transducer will cause overheating after a short period and consequent possible damage to the piezoelectric ceramic if the temperature rises too high. Thus it should always be checked that sample is available in the case of the flow system (Model 7651) before operating the generator unit.

Replace the cover on the generator unit after setting the power selector switch to the desired position, and the MIN/MAX control to the optimum setting.

B5 ROUTINE MAINTENANCE

Apart from an occasional check that the ultrasonic cleaning action is operating (the action should be audible when standing close to the electrode system), it is not anticipated that the generator unit or the transducer assembly will require any regular maintenance. However, the sensors in the electrode system will require changing when they reach the end of their useful life, and a quick check of the cleanliness of the transducer will indicate the efficiency of the cleaning system. At the same time, the coaxial transducer cable should be checked for signs of possible wear or fraying.

B5.1 Changing the Sensors

Instructions are given in the 7600 Series instruction manual for replacing any of the sensors in the electrode system, and the instruction manual (normally supplied with the electrode system) should be consulted when this becomes necessary. When the electrode system is fitted with an ultrasonic transducer, it should not be necessary to remove the transducer when changing sensors. When replacing a glass electrode ensure that it is firmly held in the sensor block by its O-ring seal and clamp nut, so that it is absolutely rigid. The bulb of the electrode should be positioned approximately 10mm (3/8 in.) above the top surface of the transducer when correctly located.

B6 SPARE PARTS

The following suggested spare items are available from ABB Kent-Taylor Limited, Oldends Lane, Stonehouse, Gloucestershire, England, GL10 3TA by quoting the Part No. below.

Spares items for the appropriate electrode system are listed in the 7650 /60 Series instruction manual.

Item	Kent-Taylor Part No.
------	----------------------

Printed circuit board assembly, complete (ultrasonic generator)	0232 042
Printed circuit board assembly, complete (electronic timer)	7612 200
Supply transformer	0315 210
Transducer assembly (for 76517660 flow systems)	7613 210
Transducer assembly (for 7654 or 7655 dip system)	7613 110
pH glass electrode (industrial)	1021 000
pH glass electrode (low temp.)	1023 000

The 'add-on' kit for converting an existing 76517660 flow system contains the following items, as shown in Fig. B3.2:

Item	Kent-Taylor Part No.
------	----------------------

Kit	7613 200
Contents:	
O-ring (to seal welded flange to bottom of flowcell)	(0211 251)
Spacer ring	(7613 220)
Transducer assembly (flow type)	(7613 210)

The 'add-on' kit for converting an existing 7654 or 7655 dip system contains the following items, as shown in Fig. B3.3.

Item	Kent-Taylor Part No.
------	----------------------

Kit	7613 100
Contents:	
O-ring (to seal welded flange of transducer stem to sensor block)	(0211 171)
Special extended skirt (replaces the standard skirt fitted)	(7613 120)
Gland bush (has enlarged hole for transducer coaxial cable)	(7613 150)
Transducer assembly (dip type)	(7613 110)
Sensor holder	(7650 056)

Generator output:

Three settings of 9, 18 or 35 watts approximately.

Output frequency:

40kHz nominal

Sequence timer:

Single variable control alters on/off ratio from a minimum of a few seconds to a maximum of approximately. 15 minutes., within a total cycle time of 16 minutes approximately.

Sample Pressure:

172kNm⁻² (25lbf/in⁻²) max. (flow system)

Power supply:

95 to 120V or 220 to 250V, 50 to 60Hz

Power consumption:

Max. approximately 80VA

Separation:

Max. cable length between transducer and generator 20m (65ft). Standard cable length 20m (65ft) approximately.

Dimensions of Generator:

227 x 337 x 130mm – see Fig. B3.1 (8.94 x 13.25 x 5.13in.)

Fixing:

Three fixing holes Ø6.4mm (0.2in.) on centres 196mm (7.72in.) and 305mm (12.0in.) – see Fig. B3.1.

Dimensions of transducer:

When fitted to a Model 7651 or 7660 system, adds approximately 38mm (1.5in.) to the overall length of the electrode system – see Fig. B2.1. When fitted to a Model 7654, 7655 or 7656 system, adds approximately. 64mm (2.52in.) to the overall length of the electrode system –see Fig. B2.2

C1 INTRODUCTION

This instruction manual describes the installation and operation of the Model 7610 pH electrode mechanical cleaning system. The system comprises a pneumatic control unit (the Model 7610) which supplies a regulated pneumatic signal to a maximum of three wiper mechanisms (the Model 7611) fitted to a 7650 /60 Series pH electrode system. The cleaning system may be fitted retrospectively to existing electrode systems as indicated in Table C1.1, or supplied already fixed to a replacement electrode system sensor block. Installation details are given to cover both of these requirements.

Reference should also be made to the 7650/60 Series Instruction Manual where appropriate, for details of the installation and operation of the pH measurement system: this manual covers the 'add-on' features of a cleaning system for mechanically wiping the pH glass electrode to maintain its performance in adverse conditions.

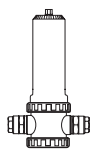

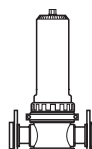
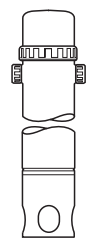
Model 7650/ 60 Electrode Systems		Model 7610 Mechanical Wiper Cleaning System				
		Used with Model ?	Main System Components			
‘Flow’ Systems		7651	No	—	—	—
		7660	No	—	—	—
		7661	No	—	—	—
‘Dip’ Systems		7654	Yes	7610 000 Control Unit	7611 000 Mech. Wiper Kit	7650 056 Sensor Holder
		7655	Yes			
		7665	No	—	—	—
		7664	No	—	—	—
		7656	No	—	—	—

Table C1.1 Application of Model 7610 Wiper Cleaning System of Model 7650/60 Electrode Systems, with Main System Components

C2.1 Principle of Operation (Fig. 3.2)

Clean dry filtered air is supplied to the Model 7610 Control Unit from an air-line or other source in the range 550 to 690kNm⁻² (80 to 100lbf/in⁻²), regulated and passed via a multi-port solenoid valve to a double-acting pneumatic actuator mounted alongside the pH sensors on the electrode system sensor block (see Fig. C3.5). This pneumatic actuator is a small brass cylinder with two pipe couplings to which are connected to the two pneumatic lines from the Control Unit. When the solenoid valve is energised, the transmitted air pressure operates the actuator piston to provide a stroke of about 25mm (1in.) and this is converted to arc motion (about 45°) by a cleaning rod fixed so that a transverse pin on the end of the actuator piston locates in a spiral groove on the top of the rod. At the bottom end of the rod is fitted the wiper assembly which is a small polypropylene brush positioned so that the twisting motion of the cleaning rod wipes the brush across the tip of the glass bulb of the pH electrode, serving to keep it clean of deposits or accumulated debris.

A printed circuit board assembly in the Control Unit contains a timing circuit to energise the solenoid valve, so that the wiper operates continuously or at set intervals, depending on a position selected by a front panel slide switch.

C2.2 Model 7610 Control Unit

The Control Unit is mounted inside a cast-alloy weatherproof case suitable for direct wall-mounting at a convenient location near the associated pH electrode system. The case has a removable gasketed cover fastened with a central quick-release knob and an inset plastic lens covering the RUN lamp on the front panel.

Removal of the cover permits access to the front panel and controls of the unit: the front panel is supported by pillars at each corner of the chassis so that a small printed circuit board assembly is mounted beneath it, and space remains under the board for the pneumatic components fixed to the chassis.

The front panel controls (see Fig. C3.4) and their functions are as follows:

RUN/STANDBY: miniature toggle switch

In the STANDBY (down) position, power is disconnected from the electronic circuitry and solenoid valve: in the RUN (up) position power is connected to the instrument and the RUN lamp (green lens on the cover) illuminates.

RESET: toggle switch, biased to the 'up' position

Depressing this switch resets the electronic timing to the beginning of its cycle.

Interval Selector: slide switch (8 positions) C, 1, 4, 16, 32 minutes) 1, 2, 8 hours)

Sets the interval duration between the cleaning actions in the C position wiping is continuous, in the remaining positions four wiping cycles occur at the beginning of the selected period.

In addition to the electrical controls listed above there are two pneumatic adjustment controls located at the bottom of the case – see also Fig. C3.4). These are the air pressure regulator control knob (fitted with a red locking ring), used to set the operating pressure for the actuator at 4 bars (58lbf/in⁻²) approximately, and the restrictor adjuster fitted to the exhaust outlet. Adjusting the restrictor gives some control over the smoothness of the wiping action: depending upon the type and degree of accumulation of deposits on the pH electrode, the brush can be wiped smoothly or abruptly across the tip of the glass bulb. These adjustments are described more fully in the 'Setting up' section.

Pneumatic connections to the Model 7610 are made using plastic bulkhead connectors at the bottom of the case suitable for 6mm nylon tubing.

Power supply cable enters the Model 7610 by a single sealed cable gland and connects directly to a small terminal block located under a protective cover on the left-hand side of the unit. An additional earthing connector (screw terminal) is provided at the side of the instrument panel, if required.

C3 INSTALLATION

C3.1 Mounting the Control Unit

The overall dimensions and fixing arrangements for the Model 7610 are shown in Fig. C3.1. The unit should be fixed to a convenient vertical surface adjacent to the pH electrode system in a dry, vibration-free position. Sufficient space should be available for the unit cover to be removed easily, and access gained to the electrical connections terminal block (see Fig. C3.7), and to the operating controls when required. In particular, long runs of pneumatic tubing should be avoided as far as possible - the maximum separation for a single wiper assembly/Control Unit is 50 metres (164ft) approximately. When three separate wiper assemblies are controlled from a single Control Unit, this is reduced to 15 metres (49ft) approximately.

C3.2 Fitting the Wiper Mechanism

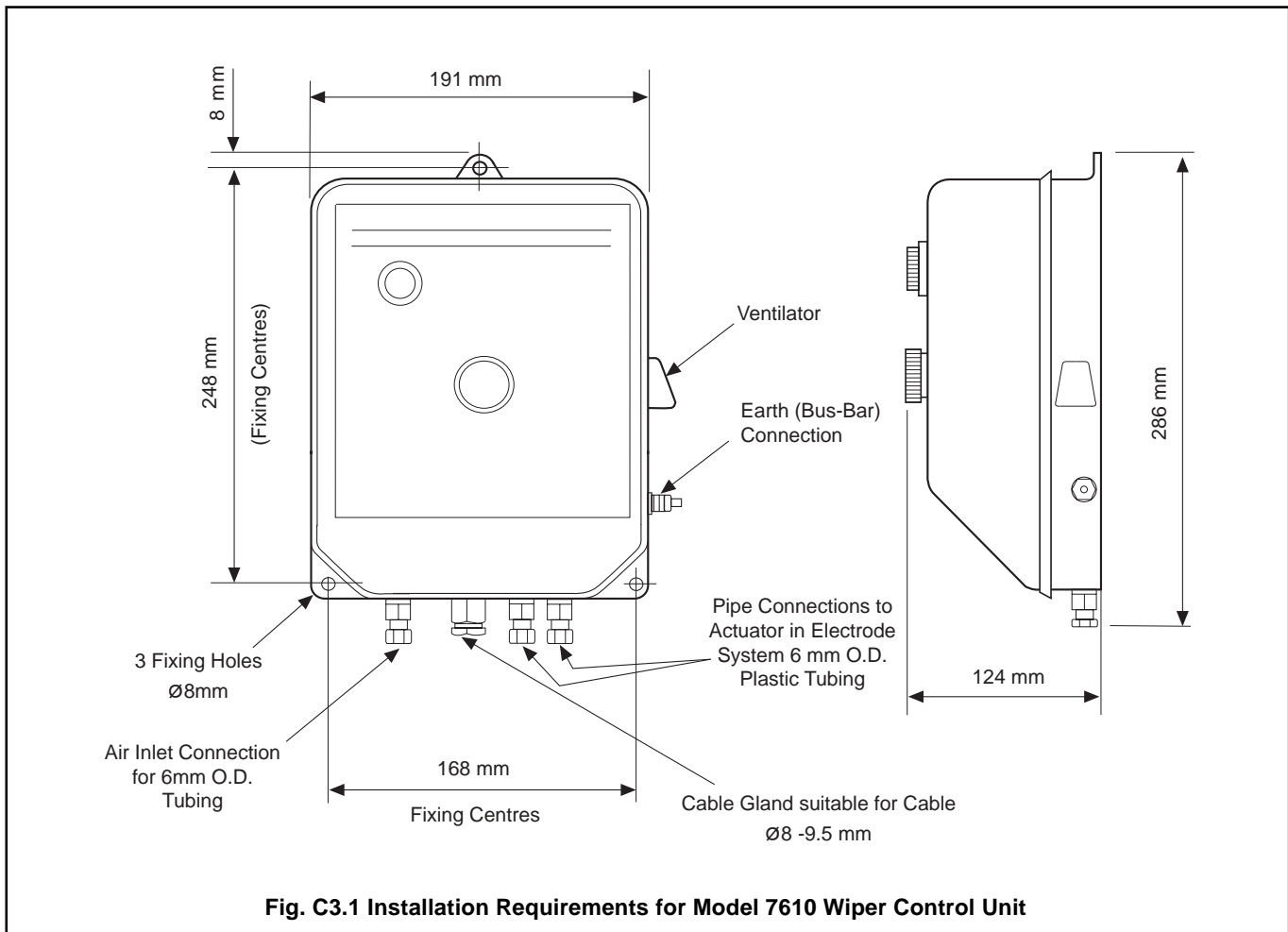
The instructions which follow are for fitting a Model 7611 Wiper Mechanism to an existing 7650 /60 electrode system. The items listed below are supplied as an 'add-on' list of components which are fitted to the existing sensor holder

block of the electrode system. However, a complete replacement wiper assembly (7611 180) as shown in Fig. C3.5 is available for exchanging with the existing sensor holder assembly, and merely requires transferring the sensors from it to the replacement sensor holder block which has all the wiper mechanism components already fitted.

The components required to make up the 'add-on' kit are:

Cylinder assembly	7611 140
Wiper brush	7611 150
Split pin	0226 553
Bearing assembly	7611 120
Cleaning rod	7611 130
O-ring 9/16in. x 0.070in. cord	0211 171
Nylon coil tubing (2 required)	7611 230
2 brass coupling adaptors	7611 190
Twin gland bush	7600 840

Fig. C3.2 shows the location of these items in the electrode system. The following instructions should be followed carefully to ensure correct operation of the wiper mechanism.



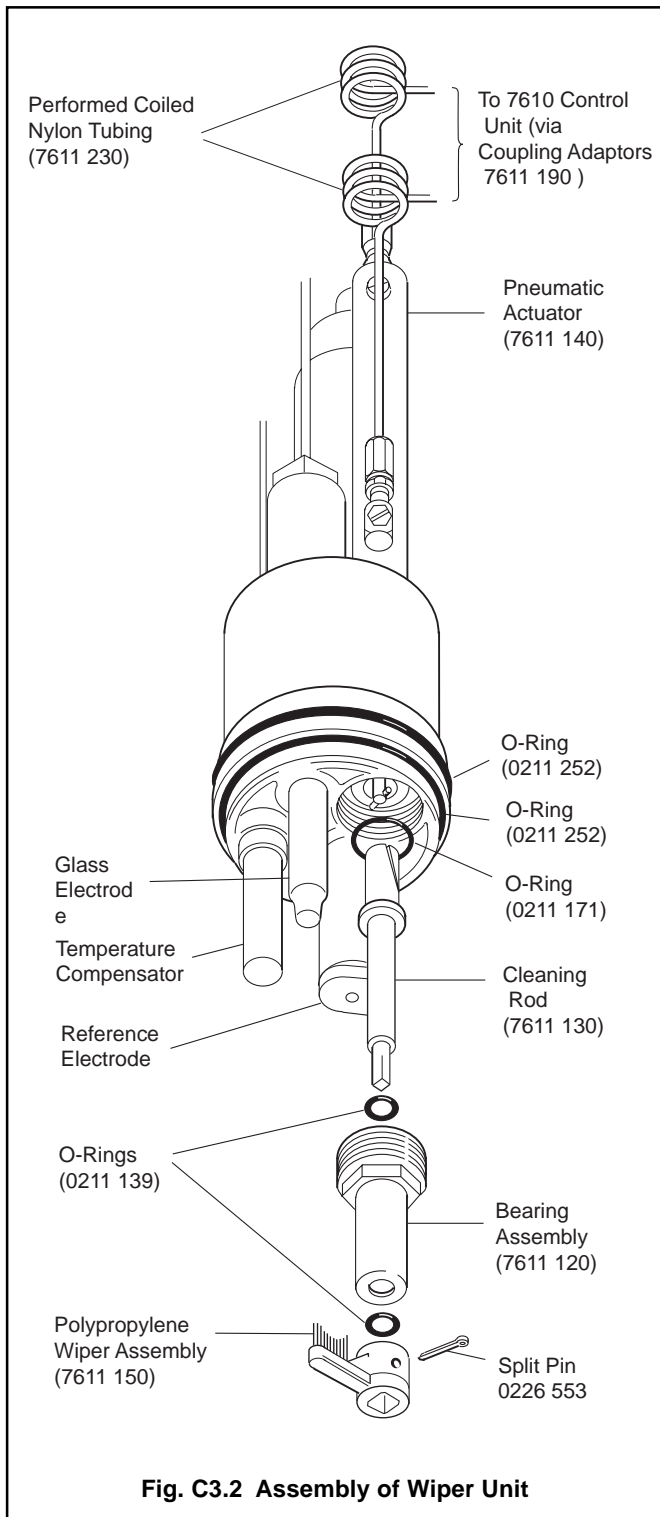


Fig. C3.2 Assembly of Wiper Unit



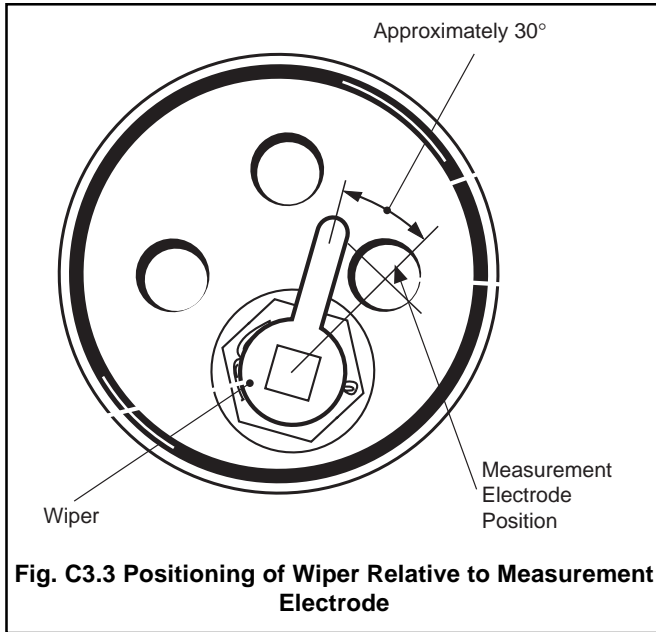
Warning. Always ensure in the case of in-line systems that the sample line pressure is reduced to zero before removing the electrode assembly from the sampling point.



Caution. Complete this procedure within 2 hours, or take steps to avoid drying out and degradation of electrodes.

- a) Dismantle the electrode system so as to gain access to the sensor holder assembly; steps are given in the 7650 /60 Series instruction manual to do this.
- b) Rinse the sensor holder assembly in clean water and remove the glass pH electrode, the temperature compensation sensor and the reference electrode from the sensor holder .
- c) Discard the sensor holder and take the special sensor holder (7605 056) supplied with the cleaning system.
- d) Take the cylinder assembly from the kit and using a pair of pliers, push the pin fitted to the end of the actuator rod from its central position to one side. This will now permit the cylinder (with actuator extended) to be screwed into the sensor holder from the top side. The interior thread of the actuator housing has a slotted cut-out to enable the pin to pass through the sensor block completely.
- e) Screw the cylinder assembly firmly into the sensor block and use the brass locking nut on the threaded portion to position the cylinder so that the pipe fitting on the side of the cylinder does not obstruct either the glass electrode clamp nut or the reference electrode, when these are fitted back into the sensor block. Tighten the locking nut.
- f) Using a pair of pliers, push the pin back to its central position.
- g) Fit the O-ring (0211 171) from the kit into the groove on the sensor side of the block (position as shown in Fig. C3.2) and fit the cleaning rod (7611 130) so that the pin locates in the end of the rod in its spiral grooves.
- h) Pass the bearing assembly (7611 120) over the cleaning rod and screw into the sensor block to hold the complete assembly together firmly.
- i) Fit the wiper brush onto the squared end of the cleaning rod by pushing it on. The brush should locate over the glass electrode position, so that when the electrode is inserted in the block, the brush just touches the tip of the glass bulb. See Fig. C3.3. Fit the split pin in the locating hole and bend over the ends with pliers.

...INSTALLATION

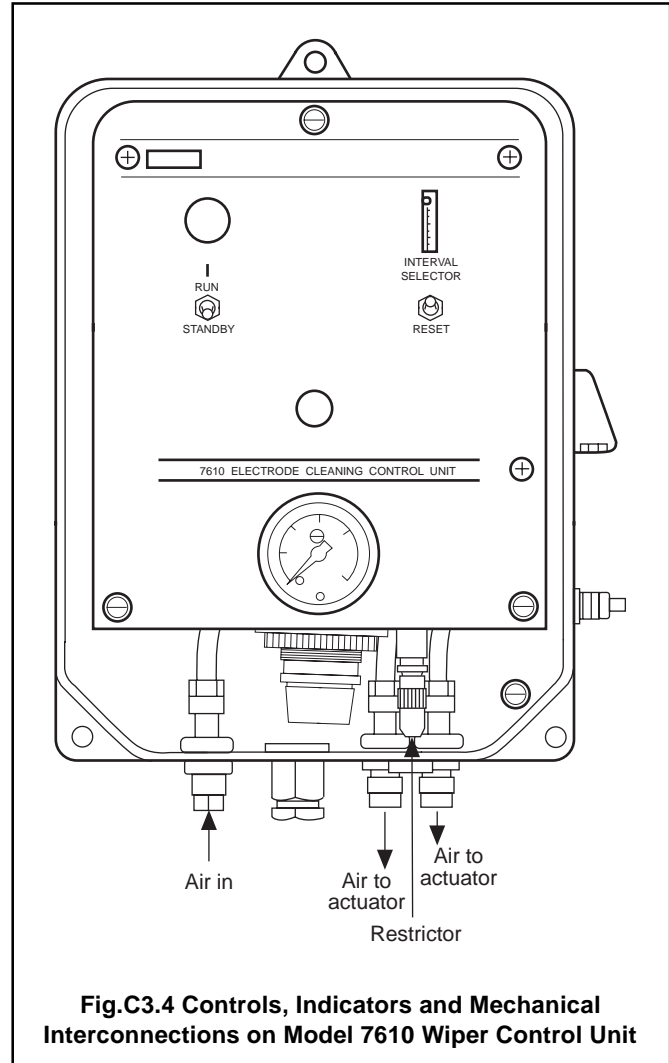


- j) Take the two nylon preformed coils (7611 230) from the kit and fit one to each of the pipe fittings on the cylinder assembly. It is important in order to obtain a good seal that the brass gland couplings are tightly clamped onto the tubing. Depending upon the particular type of 7650 /60 system, it will be necessary to cut the nylon tubing so that it can be accommodated within the electrode system tube. The other ends of the preformed coils should be fed out of the side cable gland, using the twin gland bush (7600 840) from the kit to replace the existing sealing bush.

Tighten the gland nut firmly onto the bush. The reason for using a preformed coil inside the tube is so that it will be possible at a later date to detach the sensor block assembly from the system tube (for examination or replacement of sensors) without needing to disturb the pneumatic connections to the cylinder assembly – see Fig. C3.5.

- k) Refit the pH glass electrode, temperature compensation sensor and reference electrode assembly into the sensor holder in accordance with the information given in the 7650/60 electrode system manual.
- l) Re-assemble the electrode system by inserting the sensor block into the bottom of the electrode holder unit (locate using the keyway on the sensor holder block) and clamping the holder unit to the in-line process fitting using the clamping ring.

Where the complete replacement wiper assembly (7611 180) is supplied, it is of course not necessary to carry out the assembly steps detailed above. In this case, it remains only to transfer the pH glass electrode, the reference electrode and temperature compensator to the replacement sensor holder block and fit it to the electrode system. Take care to handle the sensors carefully at all times, and remember to fill the temperature compensator housing with paraffin oil (supplied in the kit) before inserting the compensator with its snap-on connector.



C3.3 Pneumatic Connections

As shown on Fig. C3.1 the air inlet to the Model 7610 Control Unit is suitable for 6mm o.d. tubing; the connection is the left-hand gland fitting on the underside of the Control Unit. The air supply should be dry clean filtered air at a maximum pressure of 690kNm^{-2} (100lbfin^{-2}).

The other two gland fittings on the underside of the Model 7610 are the connections to the two lengths of preformed nylon tubing fixed to the actuator. The gland fittings on the Model 7610 are suitable for 6mm o.d. nylon tubing and must be joined to the wiper mechanism tubing, using the brass adaptors (7611 190) supplied in the kit. These adaptors can be located conveniently just outside the electrode system (as shown in Fig. C3.5 (It is not important which way round the connections are made, since the actuator is a double-acting cylinder).

Where more than one electrode system is to be supplied from a single Model 7610, the brass adaptors will need to be replaced by an appropriate adaptor Tee-piece fitting (6mm inlet and 6mm outlet).

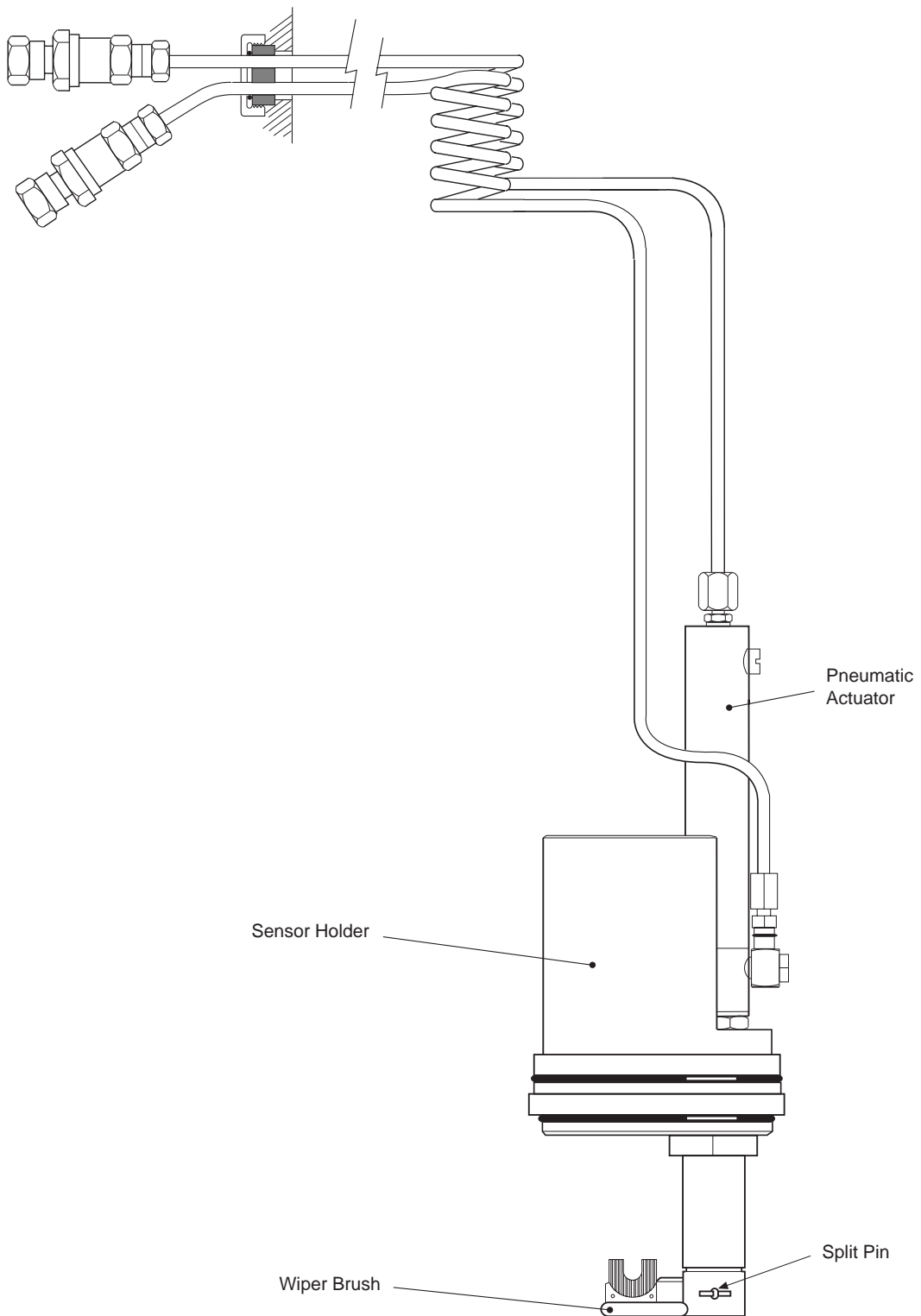
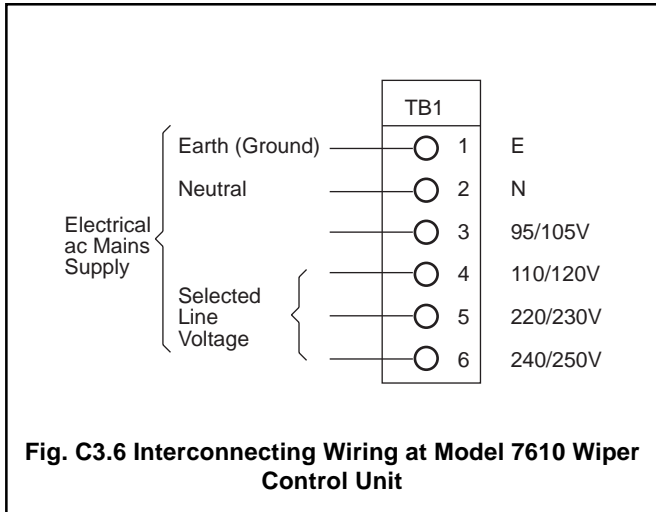


Fig. C3.5 Wiper Unit and Interconnecting Air Lines

...INSTALLATION



C3.4 Electrical Connections

The electrical power supply connections to the Model 7610 enter the instrument via a single waterproof gland which can accommodate a single three-core cable in the range 8 to 9mm (0.31 to 0.38in) diameter. Care should be taken to re-assemble the component parts to ensure a watertight fit.

Cable connections are made to a single multi-way terminal block (TB1) which is located beneath a labelled cover plate on the left-hand side of the main chassis (see Fig. C3.7). The cable passes through a grommet fixing on the connection bracket and is then connected to the labelled terminals as indicated in Fig. C3.6. Select the required LINE terminal depending on the electrical power supply.



Note. There is an additional earth point on the case (see Fig. C3.1) where an earthing (bus-bar) screw connection is provided.

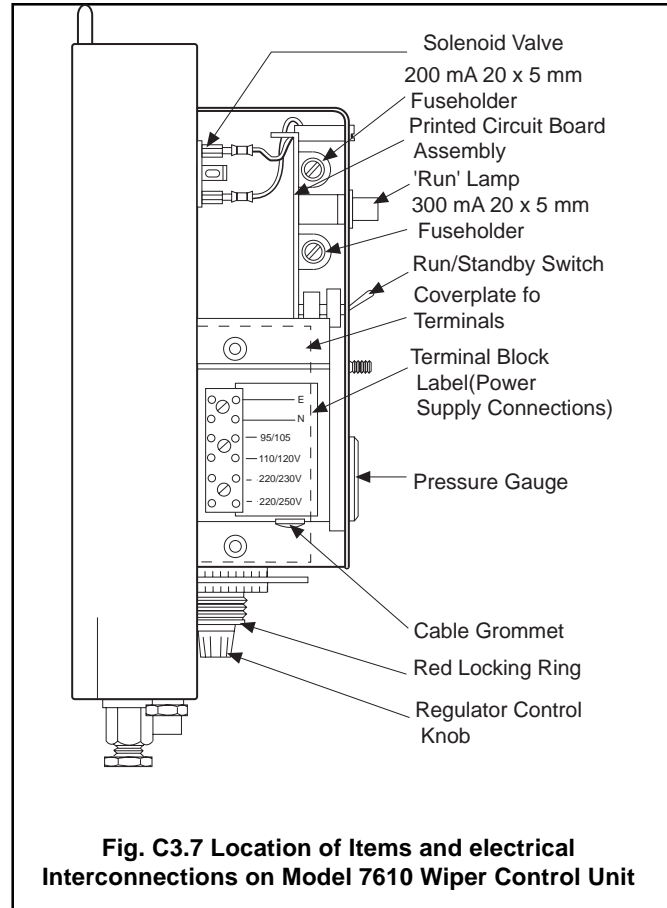
Always replace the terminal coverplate after making the wiring connections.

C4 SETTING-UP

When the installation steps detailed above have been completed, the Model 7610 is ready for operation. Carry out the following steps:

a) With the air-line connected to the Model 7610 (maximum pressure 690 kN/m² or 100 lbf/in²), remove the lid of the unit and first check that the pressure regulator control knob (the black plastic knob with red locking ring) is turned fully anti-clockwise (as viewed from the underside of the unit) to close off the air supply. See Fig. C3.7.

C4 SETTING-UP...



- b) Pull the red locking ring downwards to disengage it, and slowly turn the black control knob clockwise until the pressure gauge indicates an operating pressure of 4 bars (58lbf/in²) approx. For long pipe runs over 30 metres (98ft) it is recommended to open the pressure regulator fully so that the gauge indicates the inlet pressure supply of 6.9 bars (100 lbf/in²).
- c) Push the red locking ring upwards to hold the control knob in position.
- d) Set the INTERVAL SELECTOR slide switch to the appropriate position estimated for a satisfactory cleaning action. This will depend largely on the particular application and previous experience of the degree of electrode fouling will be a useful guide to selecting the optimum frequency of cleaning.
- e) Connect the power supply to the instrument, and set the RUN/STANDBY switch to RUN. Note that the RUN lamp (green lens) illuminates.
- f) Depress the RESET switch : the unit should now perform four cycles (four wipes in each direction) and then wait for a period set by the INTERVAL SELECTOR switch before repeating the wiping action. If the INTERVAL SELECTOR switch is set to C (for continuous action), it is not necessary to operate the RESET switch as the cleaning action will start immediately.

...C4 SETTING-UP

- g) If at any time it is required to check that the cleaning action is still operating, depressing the RESET switch will cause a cleaning cycle to restart immediately.
- h) If necessary, adjustment of the flow restrictor can be made to provide a smoother wiping action or a more abrupt 'wipe' if this is required. Loosening the brass restrictor ensures a stronger 'kick' of the wiper arm across the electrode, whilst from the front) are located two fuseholders which contain miniature 20 x 5mm DIN glass cartridge fuses.

Tightening the restrictor has the effect of slowing down the wiper stroke and produces a smoother 'wipe'. Again, experience is the best guide for finding an optimum adjustment position for a particular application.

- i) When the system is operating satisfactorily, replace the cover on the unit.

C5 MAINTENANCE

Apart from an occasional check that the cleaning action is still operating periodically, it is not anticipated that once set in operation the Model 7610 will require any maintenance on a regular basis apart from changing the wiper brush. The brush will after extended use eventually no longer wipe satisfactorily and clean the electrode bulb, and it will be necessary to fit a new brush assembly.

Supplied in the spares kit is a sachet of lubricating grease, which should be used to lubricate the O-rings in the system.

C5.1 Changing the Wiper Assembly

When it becomes apparent from the pH readings that the brush is no longer wiping satisfactorily, carry out the following steps:

- a) Set the RUN/STANDBY.
- b) Remove the electrode holder unit from its sampling position by unscrewing the large clamping ring holding the two halves of the electrode system together.



Warning. In the case of in-line systems, first ensure that the sample line pressure is reduced to zero before separating the holder unit from the system.

- c) Remove the split pin and pull off the wiper assembly from the end of the cleaning rod and replace with a new wiper (7611 150). Discard the old wiper assembly. It is important that the new wiper is fitted in exactly the same position on the squared end of the cleaning rod as the old wiper, to ensure that the arc motion across the electrode bulb is in the same position to maintain the cleaned area on the bulb.

...C5 MAINTENANCE

C5.2 Changing the Sensor

Instructions are given in the 7650/60 Series instruction manual for replacing any of the sensors in the electrode system, and the instruction manual should be consulted when this becomes necessary. When the electrode system is fitted with a wiper mechanism, it should not be necessary to remove any of the wiper components from the sensor block to exchange sensors. When fitting a new glass electrode ensure that it is tightly held in the block by its clamp nut so that the electrode is rigid. The bulb of the electrode should just touch the bottom of the 'trough' section of the wiper bristles when correctly located in position.

C5.3 Fuses

On the top left-hand side of the printed circuit board (as viewed from the front) are located two fuseholders which contain miniature 20x5mm DIN cartridge fuses.

The upper fuse is a 200mA fuse and protects the 16.5V a.c. supply to the timing circuit. If it fails, the timing and wiping action will cease completely. The part number for a replacement fuse is 0231 546.

The lower fuse is a 300mA fuse and protects the solenoid valve supply (24V a.c.). If it fails, the solenoid will not operate and the wiping action will cease completely. The part number for a replacement fuse is 0231 547.

C6 SPARE PARTS

In order to maintain continuity of operation of the Model 7610, a Spares Pack (7611 040) is supplied with the unit. It contains the following items, which are illustrated in Figs. C3.2 and C3.5:

Item	Kent-Taylor Part No.
5 Wiper brushes	7611 150
5 Split pins	0226 553
2 Coupling adaptors (1/8 - 6mm)	7611 190
2 O-rings (for the bearing assembly)	0211 139
1 O-ring (for the cleaning rod)	0211 171
2 Spirol pins	0226 532
1 Bearing body assembly	7611 120
1 Cleaning rod	7611 130
1 Sachet of grease (for the O-rings)	0218 791

The 'add-on' kit for converting an existing 7650/60 system comprises the following items:

Item	Kent-Taylor Part No.
1 Cylinder assembly	7611 140
1 Wiper brush	7611 150
1 Split pin	0226 553
1 Bearing assembly	7611 120
1 Cleaning rod	7611 130
1 O-ring (for the cleaning rod)	0211 171
2 Pre-formed nylon coiled tubing	7611 230
2 Coupling adaptors	7611 190
1 Twin gland bush	7600 840

A complete replacement wiper assembly has the Part No. 7611 180 : in addition 2 Coupling adaptors (7611 190) and the twin gland bush (7600 840) are also required to convert the system.

The following items may also be required as spares:

Item	Kent-Taylor Part No.
200mA fuse cartridge, 20 x 5mm	0231 546
300mA fuse cartridge, 20 x 5mm	0231 547
Bulb, 24V	0231 328
Relay, 24V, p.c. board mounting type	0232 576
Nylon tubing, 6mm o.d. 4mm i.d.	0212 307
Printed circuit board, complete	7610 160
Solenoid valve assembly	0232 026

C7 SPECIFICATION

Cleaning Action:

Continuously or 4 cycles every 1, 4, 16, 32 minutes or 1, 2, 8 hours

Accuracy of timing cycle:

±5%

Air Supply:

Dry filtered air in range 550 to 690kNm⁻² (80 to 100 lbf/in⁻²)

Air consumption:

Typically 125 l min⁻¹ maximum at 80lbf/in⁻² (continuous action)

Pneumatic connections:

Inlet suitable for 6mm o.d. plastic tubing

Maximum Separation of actuator and Control Unit:

50m (164ft) approximately for one Wiper Assembly per Control Unit

15m (49ft) approximately for three Wiper Assemblies per Control Unit

Power Supply:

95/105, 110/120, 220/230, 240/250V 50 to 60Hz

Power consumption:

8VA (approximately)

Dimensions of Control Unit:

191 x 286 x 124mm (7.5 x 11.25 x 4.9in.)

Fixings:

Three holes Ø8mm (0.31in.) on fixing centres 168 x 248mm (6.63 x 9.75in.) – See Fig. C3.1

Weight of Control Unit: 4.1kg (9lb) approximately.

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Customer Support

ABB Instrumentation provides 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.

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Fax: +44 (0)1480 470787

United States of America

ABB Instrumentation Inc.
Tel: +1 716 292 6050
Fax: +1 716 273 6207

Italy

ABB Kent-Taylor SpA
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 58278

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 operating and maintenance records relating to the alleged faulty unit.



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

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