CONDUCTIVITY OPERATED LEVEL CONTROLLER
INSTALLATION & SETTING-UP INSTRUCTIONS
ACJ SERIES

Suitability

For conducting liquids providing a resistive path up to and not exceeding 14,500 ohms. For applications where the distance between the controller and the electrodes is in the order of 1000m, the ACJ should be used in the A.C. operational mode (i.e.A.C.current on the electrodes). For greater distance it can be converted by link (see No 5 under Specific Instructions on page 2), but produces D.C current at the electrodes. In this mode the nomenclature of the fail/safe switch is changed in the FSH becomes FSL and vice versa (see note 3 under Definitions of Terms).

Definition of Terms

1. Terminal block legends apply when the relays are in the de-energised state (indicator light off).

2. Each control relay has two independent sets of changeover contacts.

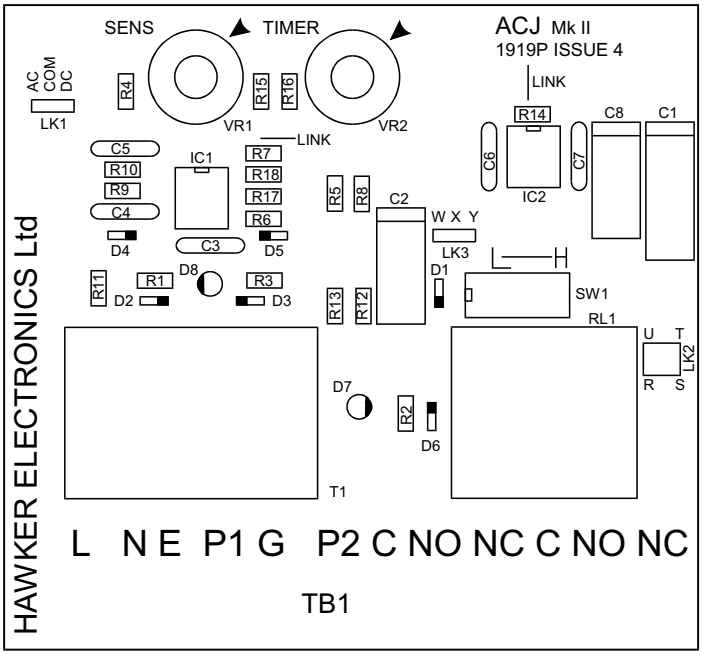
3. The internal fail/safe switch fitted can be selected for the desired mode of operation.
   In the HIGH position the relay is de-energised (light off) when liquid is in contact with the shortest electrode. Generally required for high level alarm and pumping in applications.
   In the LOW position the relay is energised (light on) when liquid is in contact with the shortest electrode. Generally required for low level alarm and pumping out applications.

4. In the A.C. operational mode the ACJ produces A.C. current at the electrodes and is suitable for liquids with resistive paths in the following ranges :-
   a) Approx 200 ohms to 4,200 ohms for dirty and highly conductive liquids.

   b) Approx 200 ohms to 14,500 ohms for cleaner or lower conductive liquids.

Specific Instructions for the ACJ Series

Note the following specific instructions for the ACJ and refer to the PCB drawing.The PCB will generally be fitted to the AC/P enclosure for panel mounting, but may be supplied in a weatherproof enclosure.



1. The sensitivity is fully adjustable between these limits by the potentiometer VR1. In the panel mounting version (ACJ/P) this is fitted to the facia and connected to the PCB by twin cable.

2. The resistance range is changed by means of resistor R4 situated between potentiometer VR1 and VR2.
   For the range 200 ohms to 4,200 ohms, R4 must be fitted.
   For the range 200 ohms to 14,500 ohms, R4 must be omitted.

3. The ACJ has a built in timer circuit which introduces a time delay in the relay de-energised mode. This is generally in the order of 0-10 sec's, but other time ranges are available to special order.
   Referring to the PCB drawing, the ACJ/P/T has :-
   Y linked to X
   R linked to U
   T linked to S
   AC linked to COM
   Unless specifically ordered, ACJ's are supplied ex works with the necessary components fitted for the adjustable time delay.

4. If the time delay is not required the connections should be :-
   W linked to X
   R linked to S
   T linked to U
   In this mode the following components are not required VR2, R8, R14, C6, C7, C8, and IC2.

5. For greater distances between controller and electrodes, the ACJ may be changed to D.C. operation as follows:-
   Link DC to COM
   Remove AC to COM link.

6. The time delay is adjustable by potentiometer VR2. This may be adjusted with the chassis withdrawn, or by a screwdriver through the hole in the enclosure. A spindle lock is provided and if the latter method is a adopted, the lock nut should be left finger tight.

Sensitivity Adjustment Instructions

(A) Single Electrode Applications

1. Fill the vessel until liquid is in contact with the electrode.

2. Turn sensitivity control fully clockwise (position 10 if a dial is fitted).

3. Turn control slowly anticlockwise until relay and light change state.

4. If the relay or light doesn't change state when control has been turned fully anticlockwise (to position 0 if a dial is fitted), it denotes that liquid resistance is less than minimum controller sensitivity.
   Relay remains-
   Light remains-

5. Advance control clockwise by 1 division (or about 25^0 if a dial is not fitted). This is the optimum setting for the particular liquid. If instruction 4 applied, it will be position 1 on dial.

(B) Dual Electrode Applications

1. If the vessel is full, with liquid level in contact with shortest electrode, set up exactly as detailed above under instructions 2- 5.

2. If the vessel is empty, fill until longest electrode is covered by at least 9" of liquid.

3. Turn sensitivity control fully clockwise (position 10 if a dial is fitted).

4. Using a piece of wire, place a momentary short circuit between terminals P1 & G.

5. Remove short circuit
   Relay remains-
   Light remains-

6. Turn control slowly anticlockwise until relay and light change state.

7. If the relay or light doesn't change state when control has been turned fully anticlockwise (to position 0 if a dial is fitted), it denotes that liquid resistance is less than minimum controller sensitivity.
   Relay remains-
   Light remains-

8. Advance control clockwise by 1 division (or about 25^0 if dial is not fitted). This is the optimum setting for the particular liquid. If instruction 7 applied, it will be position 1 on the dial.

Relay & Indicator Light Condition	
Fail/Safe HIGH	Fail/Safe LOW
de-energised light off	energised light on
energises light on	de-energises light off
de-energised off	energised on
de-energised light off	energised light on
energised light on	de-energised light off
de-energised light off	energises light on
de-energised off	energised on
energise light on	de-energised light off
de-energised off	energised on

Notes:-
The indicator light is an LED type positioned near the sensitivity control

Wiring Instructions

1. The control contacts may be used for the stopping and starting of motors, opening and closing of solenoid valves or initiation of alarm circuits. Always ensure that the load is within the contact rating and if in doubt, fit an interposing relay or contactor.

2. For applications using only one sensing electrode (e.g. level alarm or simple cut-out) this is connected to terminal P1.

3. When a pair of sensing electrodes are to used for control between two levels, the shortest is always connected to terminal P1 and the longest to terminal P2, regardless of the fail/safe switch setting.

4. It is essential to have a good, low resistance, earth return path and this is sometimes obtainable from earthed metal piping or an unlined metal tank . In such applications a secure wired connection must be taken back to the controller G terminal. However, where vessels are lined , of concrete or plastic construction and pipework is non-metallic, a separate earth return electrode must be used. This should be longer than the control electrodes and it must be wired back to the controller G terminal to the mains supply earth point alone is not adequate.

5. A common 'stop' electrode can also be used with two or more type controllers, but, because the units are phase conscious, the supply connections to each must follow the same sequence. Failure to observe this procedure will cause the controller relays to remain energised and interlocked when the 'stop' electrode becomes uncovered. Care is taken during manufacture to ensure that all controllers have transformers wound in the same phase.

6. M.I. cable is not recommended for electrode wiring because, if fractured or improperly installed, its powdered insulation will absorb sufficient moisture to create a resistance which may be detected by the controller. When this type of cable has been specified, however, any open ends must have all moisture removed by the application of heat before connections are made and all gland joints must be adequately sealed.

Electrodes

1. They should be preferably inserted vertically into the vessel but, in certain circumstances pressure types HPE7/P and HPE7/Pa may be fitted horizontally when it is known that the liquid being detected will not leave a deposit of wet grime across their insulators.

2. Spacing between electrodes and their distances from the vessel depends upon the amount of suspended or floating matter likely to cause bridging and the degree of turbulence. For clean liquid applications these distances may be as low as 2 or 3 inches but for materials like raw sewage we would recommend a minimum 6 inches, this being the dimension used for our range of holder and support brackets.

3. When electrode holders are to be fitted to concrete floors a clear space of 1" should surround their insulators and these should never be cemented to the floor.

4. It is common practise to fit intermediate support brackets when electrodes exceed 3 metres in length and it may be desirable to reduce this interval to 2 metres where turbulence and floating matter are significant. Whilst 'AC' level controllers will ignore substantial amounts of material deposited on support brackets, a much higher degree of protection against maloperation can be obtained by using plastic covered rod or pipe. To achieve the longest possible track path, the brackets should be fitted midway between section joints or between a joint and the bare tip. The conducting bare portion should be not less 9" in length. It is not advisable to fit standard end sealing plugs to pipe, as they introduce a projection to which floating matter or suspended material can cling. A preferable method is the insertion of a rubber bung under pressure and electrodes can be supplied with the bung already fitted. The upper end of PVC covered rod or pipe must be bared sufficiently well to ensure the terminating collar makes a good electrical connection.

5. For long, trouble free operation, electrode pipes, rods and insulators should be cleaned at regular intervals.

System Fault Testing

1. Ensure the correct supply voltage is present at the controller mains terminals.

2. Check for loose connections at both the controller terminal block and electrodes.

3. Check that there is a good earth return path, as described under ' Wiring Instructions' Item 4.

4. With all wiring disconnected at the terminal block, check continuity to electrodes and to the equipment being controlled.

5. With electrode wiring disconnected at the terminal block, fill the vessel so that all electrodes are in connect with the liquid. An Avometer resistance check between each one and earth, in turn, should provide a reading. (This may not be an accurate resistance reading due to electrolytic battery effect.)

6. Now, with the vessel emptied so that all electrodes are fully uncovered, an Avometer resistance check between each one and earth, in turn, should indicate infinity. If there is a reading, suspect material clinging to the electrodes, or electrode insulator tracking, or low wiring insulation.

7. Ensure that electrodes are reconnected to their terminals at the controller. Hunting about the tip of the longest electrode usually indicates that electrodes are reverse connected.

Testing Controller Operation

1. Disconnect all electrode wiring at the terminal block.

2. Ensure mains supply to controller is switched on.

3. Short circuit terminals G and P2 with wire link.

4. Short circuit terminals P1 and P2 with wire link
   In the fail/safe HIGH mode the relay should be de-energised and the light off.
   In the fail/safe LOW mode it should be energised and the light on.

5. Remove the link from between terminals P1 and P2 only. The relay and light states should not change.

6. Now remove the link from between terminals G and P2.
   In the fail/safe High mode the relay should energise and the light come on.
   In the fail/safe LOW mode it should de-energise and the light go off.

7. For controller type P2 where a light is not fitted, an Avometer placed across the control terminals will provide a visual check if the relay cannot be heard changing its state.

8. As the plug-in control relay has gold flashed contacts it is better to replace it rather than attempt to clean the contacts.

9. Where an internal fail/safe selector switch is fitted, ensure that it is in its correct position.

NOTE :-
Before disconnecting mains leads or control wiring at the terminal block, ensure that-

(a) Mains supply to the controller is switched off.

(b) Mains supply to the equipment being controlled is switched off.

Guarantee

All Hawker products are covered by a 12 month's guarantee against failure of components or faulty workmanship. The period of guarantee commences 7 days after date of despatch or, by special agreement, from date of commissioning.
Equipment returned for service under guarantee will be repaired by Hawker Electronics Limited free of labour and component charges, but subject to the following conditions:-

1. Equipment shall not have been tampered with in any way or subjected to misuse.

2. The guarantee does not cover pilot bulbs.

3. Postage and packing charges are applicable.

WARNING

Before switching on mains supply to instrument and /or control circuit, ensure that:-

1. Supply voltage corresponds to instrument voltage.

2. Control wiring is correct. Failure to observe these precautions may result in damage to printed circuit boards; so invalidating our terms or guarantee.

This product has been designed and complies to the relevant standards as listed in its certificate of comformity. The installer/user must ensure system compliance

Because of continuing development we reserve the right to change the specifications without notice.

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