



**DOSAPRO  
MILTON ROY**

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# **INSTRUCTION MANUAL**

FOR INSTALLATION,  
OPERATING,  
AND MAINTENANCE.



**ELECTRONIQUE CAPACITY CONTROL  
(E.C.C.)  
P.....X Series**

This manual should be made available to the person responsible for installation,  
operating and maintenance.

**ELECTRONIC VOLUME**



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# SECTION 1

## DESCRIPTION

### GENERAL

The Electronic Capacity Control (ECC) mounts to the housing of the pump and drives the manual capacity control knob.

The ECC P.....X series are equipped with two different circuit boards. To make easier this manual the two type circuit board will be called type I and type II. This two circuit board can be dissociated by the quick voltage selector (115/230VAC) installed only on the circuit board type II.

### 1.1 PRINCIPLE OF OPERATION

In response to electrical signals, the Electronic Capacity Control adjusts the volume of liquid delivered by each stroke of the pump plunger by changing the position of the stroke adjustment sleeve. The principle of this method of adjusting capacity control is described in the instruction manual of the pump.

### 1.2 SAFETY PRECAUTIONS

When installing, operating, and maintaining the Electronic Capacity Control, keep safety considerations foremost. Use proper tools, protective clothing, and eye protection when working on the equipment and install the equipment with a view toward ensuring safe operation. Follow the instructions in this manual and take additional safety measures appropriate to the liquid being pumped. *Be extremely careful in the presence of hazardous substances (e.g., corrosives, toxics, solvents, acids, caustics, flammables, etc.).*

### 1.3 SPECIFICATIONS

The electronic capacity control actuator unit operates on 115/230 VAC, 50-60 Hz, single phase electrical service and accepts a control signal input of 4 to 20 milliamps through 250 ohms input impedance. The ECC provides an output signal of 4 to 20 milliamps which is available to indicate actuator position. The actuator uses a 60 RPM motor through a 20:1 gear reduction (and gear drive) to vary the plane of the rotating crank which actuates the pump plunger. Complete travel of the assembly from zero to 100 percent capacity is normally accomplished in 20 seconds or less. As supplied, the actuator is direct-acting (pump capacity increases with increasing input signal to actuator), although it may be converted to a reverse-acting by following the procedure outlined in Section 3 («Operation»).

## SECTION 2 INSTALLATION

The ECC is shipped already mounted to the pump. Installation, therefore, is usually only a matter of connecting the signal and primary power wires.

### 2.1 UNPACKING

In the event that damages occur during shipment, it is the responsibility of the customer to notify the carrier immediately and to file a damage claim.

Carefully examine the shipping crate upon receipt from carrier to be sure there is no obvious damage to contents. Open the crate carefully so accessory items fastened to the inside of the crate will not be damaged or lost. Examine all material inside crate and check against packing list to be sure that all items are accounted for and intact.

### 2.2 MOUNTING

Procedures for mounting and dismantling the ECC are covered in «Maintenance», Section 5.

### 2.3 SERVICE CONNECTIONS

Service connections may be determined by referring to wiring diagrams in this manual and on the equipment. All wiring should conform to National Electrical codes or local codes as they apply.

**CAUTION** : To avoid damage to sensitive electronics, remove the cover from the ECC carefully.

1. Unscrew the ECC cover by turning it counterclockwise (as viewed from the end of the unit).

2 Lift the cover straight off and away.

3. Feed the AC power wires through the access hole in the base of the actuator.

5 Check that the voltage chosen correspond to the voltage which can used by the ECC.

5 Connect the AC power wire to the ECC

6 Check that the circuit board is setting to be powered by the motor voltage

- circuit board type I :the power selector (fig 3) must be correctly connected

- circuit board type II :the power selector (fig 4) must be correctly commuted

7 Feed the control signal wires through the opposite hole at the base of the actuator so that the AC power electrical interference will be kept to the minimum

8. Connect the command signal wires to the ECC terminal strip. as shown in Figure 3 and 4 following the circuit board type

**NOTE** : If possible, use two - or three - conductor shielded wiring for the command lines and tie the shield to ground at the transmitter end.

### 2.4 CONNECTION CHECKOUT

.Verify that all connections are correctly connected

Apply a command signal

Power the ECC (115 or 230VAC)

Slowly change the input signal from one extreme to the other.The ECC should move the pump capacity setting

#### **WARNING :**

- Always disconnect primary power before removing the cover from the ECC.
- Improper connection of the command lines or power wiring can cause damage to ECC
- The ECC motor can only powered with one voltage 115VAC or 230VAC
- The voltage selected to power the circuit board must have the same value than the voltage used for the ECC motor.

## SECTION 3 OPERATION

### 3.1 INITIAL START-UP

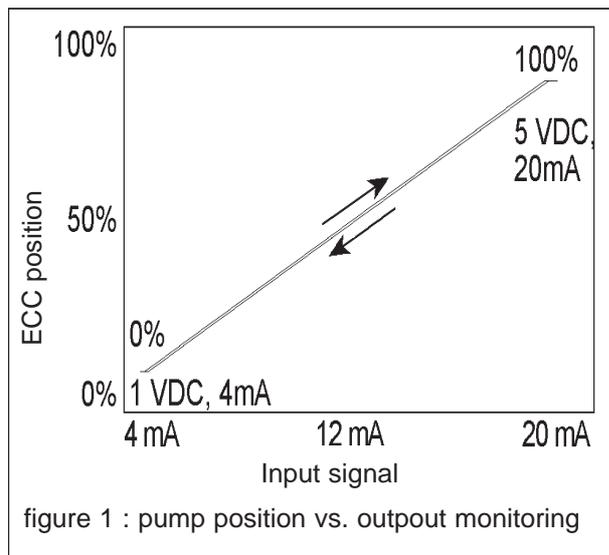
Fill the pump with oil and prepare the pump for operation according to procedures in the instruction manual for the pump.

### 3.2 INITIAL ADJUSTMENTS

The ECC must be set up for operation with respect to the following options

#### 3.2.1. Action mode (refer to figure 1)

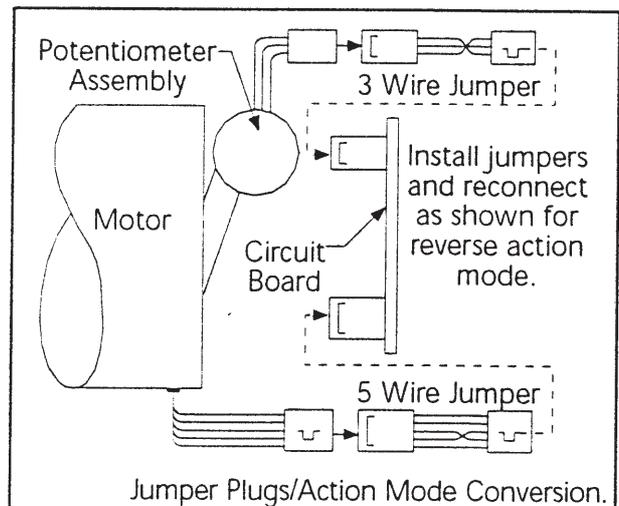
- . In direct-acting mode, an increasing signal causes an increase in pump stroke length
- . Reverse acting mode: In reverse-acting mode, an increasing signal causes a decrease in pump stroke length.



2 Install the two jumper plugs in the potentiometer (to J2) and motor wires (to J1) as shown in the following figure

Specify :

3 wire jumper : 0015-2173-200  
5 wire jumper : 00152173-300



#### 3.2.2. Operation from a command signal

When the actuator is powered and set for 4-20mA range, a 1-5 VDC or 4-20mA feedback signal is present between the Monitor and Common terminals. This voltage/current is proportionnal to the actuator position and can be used for remote position sensing.

#### 3.2.2. Action mode modification

##### *Circuit board type I & type II*

Some application request a action mode modification (ex: two pump with opposite functioning controlled with one input signal )

To modify the action mode the circuit board must be set up according to the following procedure.

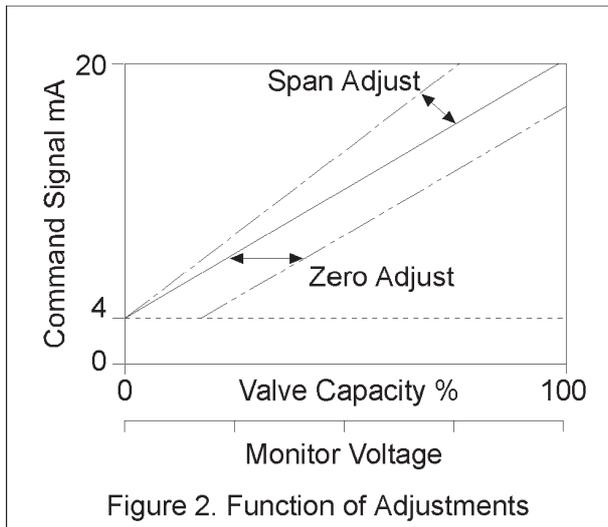
Note : The ECC is delivered set up in direct-acting mode with 4-20mA input signal

Note : The ECC equipped with a circuit board type II can be controlled with an input signal of 4-20mA, 4-12mA and 12-20 mA

1 With power on, apply a 20mA command signal and capacity control knob to 100%capacity setting

### 3.2.3 Actuator calibration

The actuator has six adjustment potentiometers. These potentiometers adjust the actuator's upper and lower travel limits, travel zero and span, and the output and span. The figure 2 shows how the travel span and zero adjustment affect the actuator position.



**Warning :** The electrical actuator is powered by 115/220 VAC, the calibration procedure must be done by qualified personnel. Dosapro Milton Roy does not assume responsibility for damages to equipment or injury to personnel while performing this calibration procedure

#### -A- Connecting

Refer to figure 3 and 4

1. Disconnect the electrical actuator motor (connector J1 with 9 pin)
2. Connect a 4-20mA current source on the terminal block TB2
  - high to the «input +»
  - low to the «input -»
3. Connect a voltmeter
  - the output ground post on the «input -» of the terminal block TB2
  - the center pin #2 of the potentiometer connection J2 to measure the feedback position
4. Connect the power 115V or 230V to the connector TB1 «AC.HIGH» and AC.LOW».

### zero and span calibration

*Circuit board type I & II with 4-20mA input signal*

1. Apply a 4mA input signal
  - With a screwdriver turn motor shaft until you achieve 1VDC at the voltmeter on the potentiometer
  - Adjust the potentiometer «LOWER LIMIT»VR3 until light the red light CR3 is on
  - During the adjustment, one of the light CR5 or CR6 will be on
  - Adjust the potentiometer «ZERO»VR2 to light off both light
  - Adjust again if necessary the potentiometer «LOWER LIMIT»VR3 until the light CR3 is light off
2. Apply a 20mA input signal
  - With a screwdriver turn motor shaft until you achieve 5VDC at the voltmeter on the potentiometer
  - Adjust the potentiometer «UPPER LIMIT»VR4 to light the yellow light CR4
  - During the adjustment, one of the light CR5 or CR6 will be on
  - Adjust again if necessary the potentiometer «UPPER LIMIT»VR4 until the light CR4 is light off

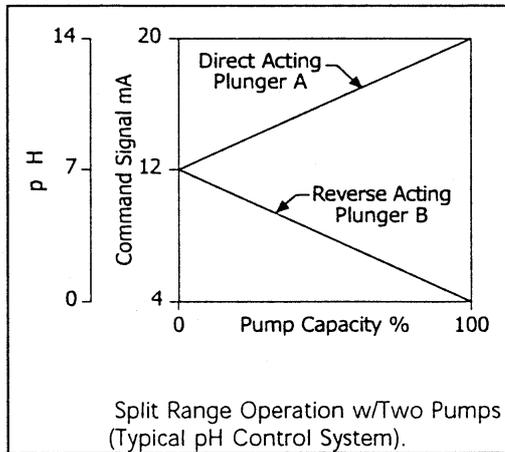
*Circuit board type II with 1-5 VDC 4-12mA and 12-20mA input signal*

*This input signal type can be used like the 4-20mA signal described herebefore or when two pumps are controlled by the same generator with a 4-12mA and 12-20mA signal.*

*One pump works in direct acting mode and the other in reverse acting mode (ex: pH control system)*

- 1 Power the ECC
- 2 Check the functioning mode (direct acting mode for one pump and reverse acting mode for the other)
- 3 Located the potentiometer «ZERO» VR2 and «SPAN»VR1
- 4 Apply a 12 mA input signal
- 5 Turn the potentiometer «ZERO»VR2 to obtain the necessary pump flow ( 0% for the example)

- 6 Apply a 4mA signal for the reverse acting mode and 20mA for the direct acting mode.
- 7 Turn the potentiometer «SPAN» VR1 to obtain the necessary pump flow
- 8 Repeat the step 4 to 7 until the desired results are achieved



### -C- Output signal calibration

1. Turn power off to the unit
2. Reconnect the motor connector (J1)

*Circuit board type I (refer to figure 3)*

3. Place 5 output selection jumper to their proper position for 4-20mA DC output or 1-5VDC output
  - All 5 should be moved to the left for a 4-20mA DC output
  - All 5 should be moved to the right for a 1-5VDC output

*Circuit board type II (refer to figure 4 and table hereafter)*

3 For 1-5VDC output the switch «SW3» must be (off off on on on)

For 4-20mA output the switch «SW3» must be (on on off off off)

4. Connect an amperemeter or a voltmeter to the conector TB2
  - positive to the «output +»
  - ground to the «output -»
5. Turn the power on to the unit
6. Apply a 4mA input signal
7. Adjust the potentiometer VR5 to monitor 4mA or 1V
8. Apply 20mA input signal
9. Adjust the potentiometer VR6 to monitor 20mA or 5V

SW2 switch setting		1	2
For 4-20 mA input signal *		ON	
For 1-5 VDC input signal		OFF	
For hold position on loss of control signal *			ON
For return to lower position on loss of control signal			OFF
SW3 switch setting		1	2
For feedback output signal of 4-20mA *		ON	ON
For feedback output signal of 1-5VDC		OFF	OFF

\* delivered setting

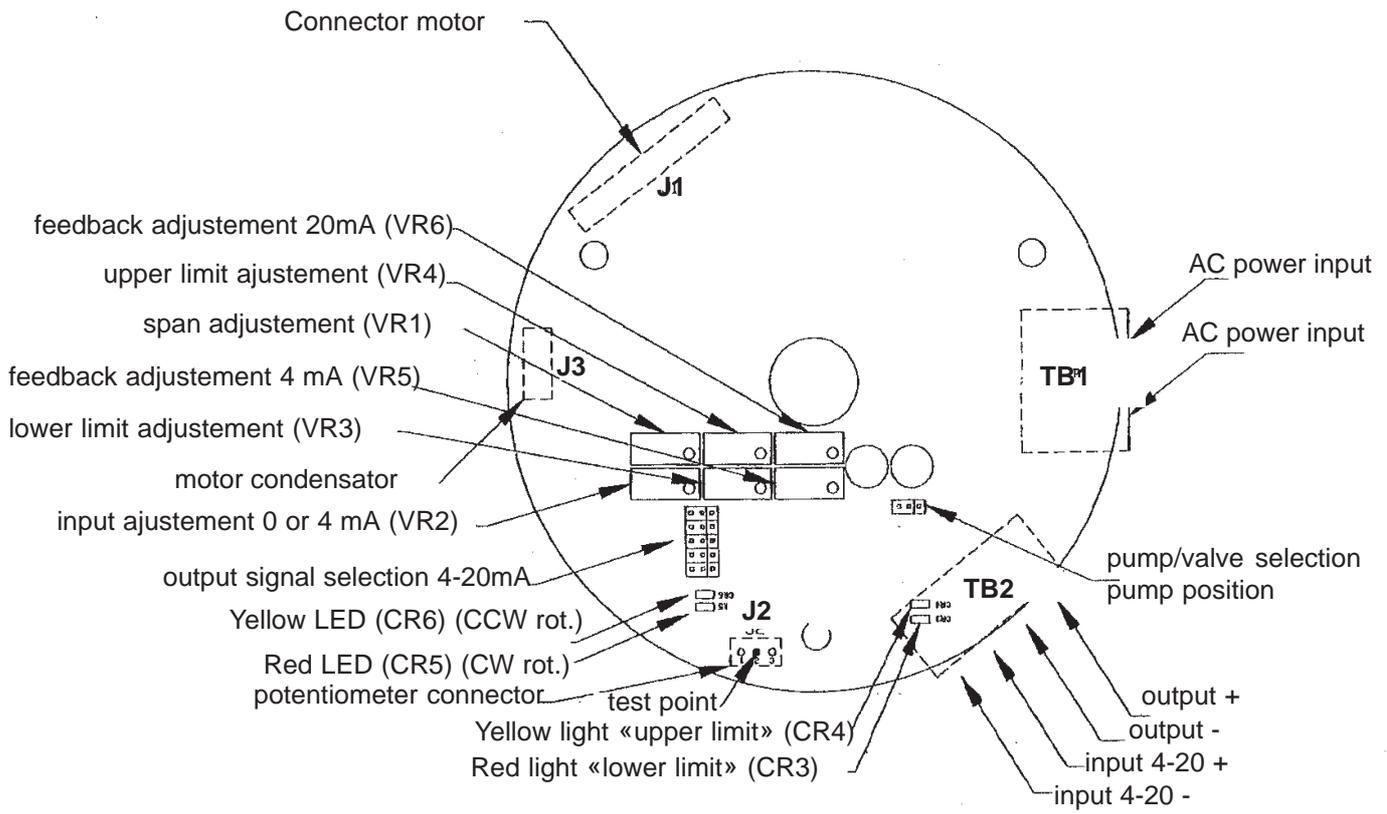
Circuit board type II setting

### -D-Final adjusting

Refer to figure 3

1. Turn power off to the unit
2. Mount the actuator to the pump adjusted at 0% or 100% capacity, paying close attention not turn the actuator shaft during mounting
3. Turn power on to the unit
4. Apply a 4mA input signal
  - Check that the proper zero position is achieved and that the light «LOWER LIMIT» is on
  - Adjust the potentiometers «SPAN»VR1- «UPPER LIMIT»VR4 «FEEDBACK ZERO»VR5 -
5. Apply a 20mA input signal
  - Check that the position 100% is correct and the light «UPPER LIMIT» is on.
  - Repeat if necessary the potentiometers «SPAN»VR1- «UPPER LIMIT»VR4 - «OUTPUT ZERO»VR6 adjustment until the desired results are achieved.
6. Repeat steps until the desired result are achieved.

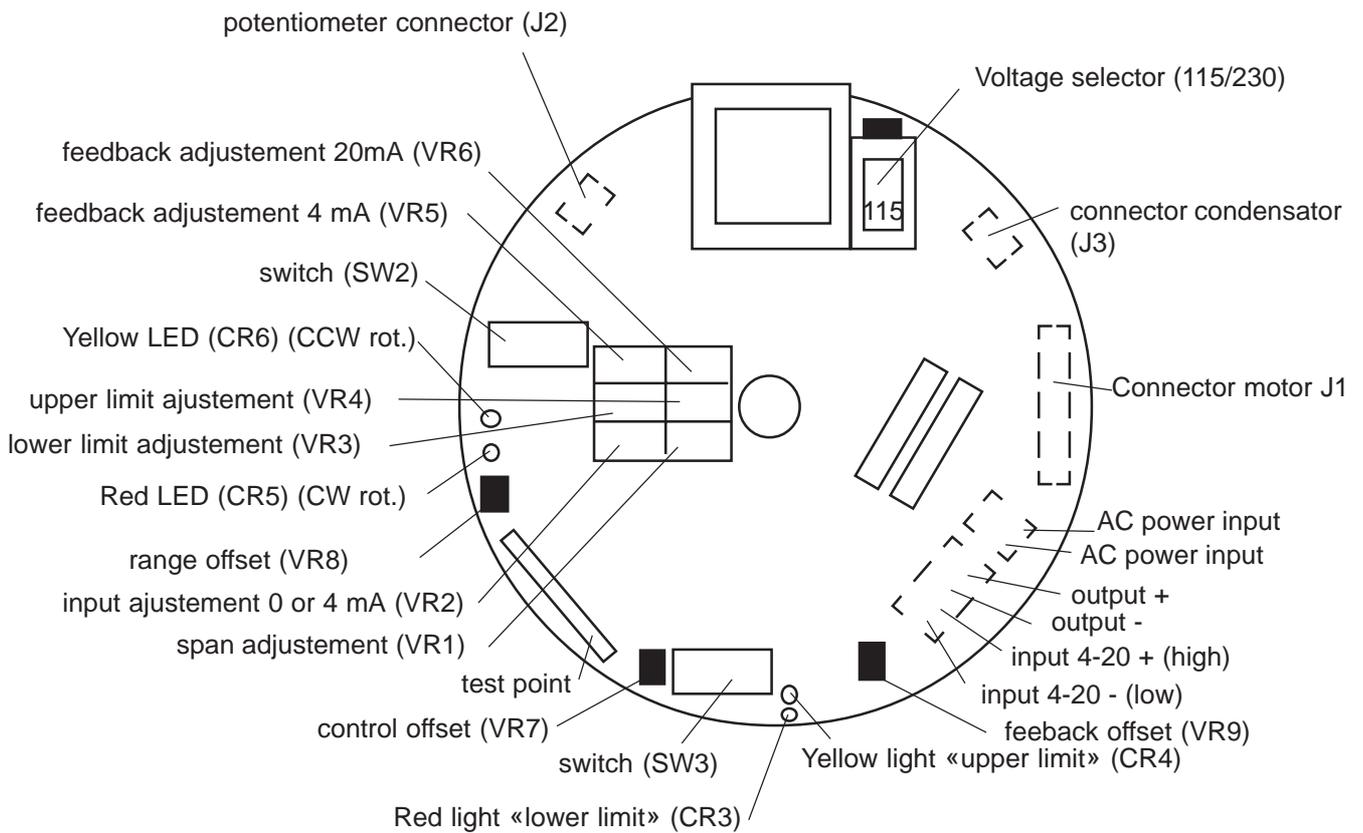
**CIRCUIT BOARD TYPE I**



**Figure 3**

**Note :** The circuit board is shown top view, the components draw with dotted line are installed on the bottom surface

## CIRCUIT BOARD TYPE II



**Figure 4**

**Warning:** The potentiometers VR7 and VR8 are already adjusted, they must be adjusted only when the circuit board is replaced

**Note :** The circuit board is shown top view, the components drawn with dotted line are installed on the bottom surface

## SECTION 4 TROUBLESHOOTING GUIDE

**Actuator moves to same position regardless of signal applied.**

CAUSES	TESTS	REMEDIES
Improper command signal applied to ECC	Connect mA meter into signal line. Read signal.	Correct; signal source, broken wire, loose connection, etc.
Mode setup incorrect.	(None.)	Review Initial Start-up Procedure. (section 3).
Feedback potentiometer gear slipping or worn.	Manually move knob, apply control signal, observe gear.	Replace feedback potentiometer assembly (ch. 5.2.2).

**Limit lights flicker as actuator moves.**

CAUSES	TESTS	REMEDIES
Bad feedback potentiometer	With oscilloscope, observe pot signal while in motion.	Replace feedback potentiometer assembly. (ch. 5.2.2).
Bad connection at plugs.	Check continuity	Repair or replace plugs and/or wiring.
Bad printed circuit board.	(All other tests OK.)	Replace PC board (ch. 5.2.1).

# SECTION 5 MAINTENANCE

## 5.1 SPARE PARTS

### 5.1.1 Returning documentation

To avoid serious delays in repairs, keep the following in stock for each DOSAPRO Milton Roy ECC:

One (1) Feedback Potentiometer Assembly

Parts orders must include the following information:

1. Quantity required.
2. Part number
3. Part description
4. Pump serial number (found on pump nameplate).
5. Full ECC model number (found on ECC nameplate).

### 5.1.2 Returning units to the factory

ECC units will not be accepted for repair without a Return Material Authorization, available from the Factory Repair Department.

## 5.2 DISASSEMBLY

### 5.2.1 Generality

Because of its solid-state design, the Electronic Capacity Control is exceptionally reliable and should seldom need maintenance or repair. Aside from calibrations, the only maintenance procedures are replacement of the feedback potentiometer and replacement of the printed circuit board.

**WARNING** : Disconnect electrical power from the pump motor and ECC before performing any maintenance on the ECC.

**NOTE** : Do not loosen the fixation that hold the mounting bracket to the pump housing. If these screws are loosened, realignment of the bracket will be required.

### 5.2.1 Printed Circuit Board Replacement:

- 1 Disconnect power from the pump and the ECC.
  - 2 Disconnect the ECC from its mounting bracket by removing the four mounting screws and pull the unit straight away to the rear.
  - 3 Unscrew the cover from the ECC.
- NOTE** : record the positions of the special Insulating washers on the mounting standoffs. During reassembly, these must be installed in their original places.
4. Disconnect the three plugs (J1 J2 J3) from the printed circuit board.
  5. Remove the circuit board from its three mounting standoffs.
  6. Install the PCB in reverse order, taking special care to assemble the mounting screws with the insulating washers in their original locations. Tighten the mounting screws and plug the three connectors into the PCB.

*PCB type I replacement by PCB type I*

7. Calibrate the ECC

*PCB type I and type II replacement by PCB type II*

*Setting the PCB like the PCB which must be replaced (voltage switch, input signal...)*

*step 1:*

- 7 Disconnect the motor connector J1. Turn the potentiometers VR3 and VR8 full CCW «click noise» and the potentiometer VR4 full CW «click noise»

Attach a voltmeter negative lead to the pin 8 of the test plug J6 (J6-8).

- 8 Apply a 4 mA or 1v input signal and apply 115 or 230VAC power.

- 9 Measure (J6-1). Turn with a screwdriver the motor to obtain +1.00VDC

- 10 Measure (J6-4). Adjust the potentiometer VR2 to obtain -1.00VDC

- 11 Measure (J6-3). The value must be 0.00VDC or close to it

- 12 Measure (J6-6). Adjust VR9 to obtain 0.00VDC

13. Measure (J6-7) with an amperemeter and adjust the potentiometer VR5 to obtain 4mA (or 1VDC following the input signal).

*step 2:*

14 Apply a 20 mA or 5V input signal. Measure (J6-1) and turn with a screwdriver the motor to obtain +5.00VDC. Adjust the potentiometer «SPAN»VR1 until the two LEDs CR5 and CR6 are light off. Measure (J6-6); Adjust the potentiometer VR6 to obtain -4.00VDC

*step 3*

15 Disconnect power and connect the motor connector J1.

Apply power. Vary input signal from low to high and observe correct operation

*step 4:*

16 Vary the input signal full range and count the number of turns. (number specified on the ECC). Adjust the «RANGE OFFSET» VR8 to achieve the number of turns. This adjustment allows you to change without calibration disturbing.

*step 5:*

17 Perform the calibration specified in the chapter 3.2.3B

### **5.2.3 Feedback Potentiometer Replacement**

1. Remove the printed circuit board as outlined above.
2. Remove the two screws that secure the potentiometer/bracket/gear assembly.
3. Install the replacement potentiometer assembly; very gently press the gears into mesh. Securely tighten the retaining screws.
4. Apply a very small amount of grease to the motor shaft gear (the worm).
5. Install the PCB (with insulating washers correctly in place). Tighten the mounting screws. Plug the two connectors into the PCB.
6. Calibrate the ECC. .





**F**

**FRANCE**

ASSISTANCE TECHNIQUE : Tél. 33.(0).2.32.68.30.02  
PIECES DE RECHANGE : Tél. 33 (0).2.32.68.30.01 télécopie 33.(0).2.32.68.30.92  
ACCUEIL : Tél. 33.(0).2.32.68.3000 - Télécopie 33.(0).2.32.68.3093  
B.P.5,27360 Pont-Saint-Pierre ,France  
Internet : [www.dosapro.com](http://www.dosapro.com)

**E**

**ESPAÑA**

ASISTENCIA TECNICA Y PIEZAS DE REPUESTOS :  
C/Embajadores, 100 - 28012 MADRID  
Tél.(91) 517 80 00 - Fax. (91) 517 52 38 - Télex 23016

**I**

**ITALIA**

ASSISTENZA TECNICA E PARTI DI RICAMBIO :  
Centro Direzionale Colleoni - Via Paracelso 16  
Palazzo Andromeda - Ingresso 1  
20041 AGRATE BRIANZA (MI)  
Tel. (39.39) 60.56.891 - Fax. (39.39) 60.56.906 - Télex 330550

**GB**

**UNITED KINGDOM**

TECHNICAL ASSISTANCE AND SPARE PARTS :  
Oaklands Park, fishponds Road, WOKINGHAM - Berkshire RG 11 2FD  
Tel. (0118) 977 10 66 - Fax. (0118) 977 11 98 - Télex 846989

**USA**

**UNITED STATES**

TECHNICAL ASSISTANCE AND SPARE PARTS :  
201 Ivyland Road, IVYLAND, PA, 18974-0577  
Tel. (215) 441.0800- Fax.(215) 441.8620 - Télex 4761 138  
Internet : [www.miltonroy.com](http://www.miltonroy.com)

**OTHER COUNTRIES :**

Representatives in all countries, contact in FRANCE:  
INTERNATIONAL SALES DEPARTMENT  
Tel. 33.2.32.68.3004 - Fax. 33.2.32.68.3094 - Télex 180345

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