Remote Position Controller (RPC)
Installation and Operating Manual

Model: RPC-07-B
ITQ-M0104/1010
(Revised 27th of Jan in 2009)
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Many thanks for purchasing our ITQ series electric Actuator!
For safe and proper operation, please read this manual carefully before using it and save it for reference.

Important Notice: The contents in this manual are subject to change due to quality improvement without individual notice.

1. Checkpoints before using actuator

1) Before applying the power, ensure the unit is properly mounted and wired to the actuator. And ensure potentiometer gears are tight and properly meshed.
2) Ensure the specifications (Model No, Main Power, Control Power, Options) of delivered actuator meet your requirements.
3) Ensure the applications such as butterfly, ball valves and Damper etc meet your requirements.
4) Ensure mounting of actuator on the application is correct and tight.
5) Ensure the settings of actuator such as limit switches, stopper bolts and indicator are correct.
6) Ensure electric wiring (Power, input/output signals) is correct.
7) In case of 3-phase motor, must check rotating direction first before normal operation.
   * Check rotating direction of actuator
   * Open actuator about 50% by manual, supply power to actuator for about 5 seconds.
   * Push close button and check whether actuator moves toward close direction or not.
   * If yes, it is O.K,
   But in case of reverse direction, cut the power supply to Actuator and exchange the 2 power lines each other among 3 lines.
8) Generally all the functions of RPC are set by the factory before delivery and no need to set the functions again. Setting is very simple and customer only pushes the AUTO SETTING button after setting the actuator at about the 50% open (Or close) position. RPC accomplishes all the functions to set automatically by itself.
**Remark**
When Users want to adjust the limit switches or use the other functions of the RPC card, they must do it by themselves.
9) Disassembly, modification without factory’s consent may affect the performance of the actuator.

2. General Performance

RPC card is the Remote Position controller and high performance positioner intended to control AC Actuator, using 12 bit A/D converter and 8 bits Microprocessor, which operates actuator to open and close according to the Input signal from the main controller. After positioning actuator, detect the current position of the actuator and transmit feed-back output signal (4-20mA) current position to the main controller.
3. Standard specification

1) **Model**: RPC-07-B
2) **Power**: 85 ~ 265VAC ±10%, 50/60Hz ±2%, 4VA Max - Changeable by DIP switch (Optional 24VDC)
3) **Input signal**: 4-20mA DC, 1 ~ 5V DC, 2 ~ 10V DC, 0 ~ 5V DC, 0 ~ 10V DC
4) **Input resistance**: 250 ohms,
5) **Feedback signal**: 1 K ohm
6) **Excitation**: 2.3VDC (When user input the signal, the Minimum power)
7) **Output signal**: 4~20 mA DC
8) **Load Resistance**: 750 ohms Max.
9) **Control Output**: Relay contact 250V AC, 10A Max (Inductive load)
10) **Number of Output Contact**: 2 ea (Open and Close contact)
11) **Delay time adjustment**: 1.0 ~ 8.5 seconds (1 step: 0.5sec, 0~15 step)
12) **Dead Band adjustment**: 0.1 ~ 4.5% (1 step 0.3%, 0~15 step)
13) **Resolution**: Min. 1/1,000
14) **Position Conversation Accuracy**: ±0.5 ~ ±1.5% (Depends on installation conditions)
15) **Ambient temperature**: -10°C ~ +60°C  (8.6°F ~ 140°F)
16) **Ambient humidity**: 90% RH Max (Non-condensing)
17) **Dielectric strength**: 1500V AC 1Min (Input to output, Power to Ground)
18) **Insulation resistance**: Min. 500VDC more than 30 M ohms
19) **Vibration & Shock (X, Y, Z)**: 10g (6g based on RMF, Frequency: 0.2 ~ 34Hz, within 30Min)
20) **LED signal**

<table>
<thead>
<tr>
<th>LED</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POWER</strong></td>
<td>Power On</td>
</tr>
<tr>
<td><strong>CLOSE</strong></td>
<td>Green On</td>
</tr>
<tr>
<td></td>
<td>Green Flicker</td>
</tr>
<tr>
<td></td>
<td>Full Close</td>
</tr>
<tr>
<td></td>
<td>Closing or Close Auto-setting</td>
</tr>
<tr>
<td><strong>OPEN</strong></td>
<td>Red On</td>
</tr>
<tr>
<td></td>
<td>Red Flicker</td>
</tr>
<tr>
<td></td>
<td>Full Open</td>
</tr>
<tr>
<td></td>
<td>Opening or Opening Auto-setting</td>
</tr>
<tr>
<td><strong>FAULT</strong></td>
<td>Yellow On</td>
</tr>
<tr>
<td></td>
<td>Yellow Flicker</td>
</tr>
<tr>
<td></td>
<td>Manual Mode</td>
</tr>
<tr>
<td></td>
<td>Input Signal Fault</td>
</tr>
<tr>
<td></td>
<td>Potentiometer Fault</td>
</tr>
<tr>
<td></td>
<td>During Auto-Setting, all the Potentiometer &amp; Motor (Capacitor) Faults (specially PK out of range)</td>
</tr>
<tr>
<td>Yellow + Green Flicker</td>
<td>During Auto-Setting ( During Auto -Setting)</td>
</tr>
<tr>
<td>Yellow + Green + Red Flicker</td>
<td>Input Signal Memory Fault 4-20mA</td>
</tr>
</tbody>
</table>
4. Main Functions and how to use

1) Input Signal Choice

User can select suitable input signal by adjusting DIP switches as following.

- 4~20mA DC
  - Dip Switches: 1 ON, 2 ON, 3 OFF
- 2~10V DC
  - Dip Switches: 1 ON, 2 OFF, 3 ON
- 0~5V DC
  - Dip Switches: 1 OFF, 2 ON, 3 ON
- 0~10V DC
  - Dip Switches: 1 OFF, 2 ON, 3 ON
- 1~5V DC
  - Dip Switches: 1 OFF, 2 ON, 3 ON

* If there is no instruction for the input signal, factory already set the signal as 4-20mA.

2) Change of Input Signal (Ex: Change 4-20mA DC to 2~10V DC)

1. First set Input Signal Selection Dip Switch according to 2~10V DC (refer to Input Signal Selection)
2. Turn Dip Switch 4(CH1) On
3. Enter Input Signal 2V DC into the RPC card; then push the Zero Button for more than 2 seconds.
   After Fault(Yellow), Close(Green) and Open(Red) are flashing about 2 times, RPC Card recognizes the position as a Full Close.
4. Enter Output Signal 10V DC into the RPC card, and then push the Span Button for more than 2 seconds. After Fault (Yellow), Close(Green) and Open(Red) are On and Off 2 times, RPC Card recognizes the position as Full Open.
5. Turn Dip Switch 4(CH1) Off
6. Push A-SCAN(RED) Button for more than 2 seconds to make RPC card Auto Setting
7. After Auto Setting, check if RPC card moves according to Input Signal.

3) Setting Fail Position

In order to prevent serious troubles when Input Signal is failed, User can set the fail position of Actuator by setting of DIP switches as following.

- Fail Close: When Input Signal is failed, Actuator moves to Full Close Position automatically.
  (Turn the Dip Switch 1<Full Close> on)
- Fail Open: When Input Signal is failed, Actuator moves to Full Open Position automatically.
  (Turn the Dip Switch 2<Full Open> on)
- Fail Stop: When Input Signal is failed, Actuator stops at the current position automatically.
  (Turn all Dip Switches Off)
4) **Delay Time**

It prevents continuous operation of RPC card caused by abnormal Input Signal. Such as Noise, Microphone and other frequencies.

In case of the same direction, it does not apply to Delay Time.

But when RPC card only moves to the opposite direction, RPC card can start moving after input signal lasts for a certain time preset.

And by adjusting the switch to clockwise, delay time is getting longer. Vice versa.

(Range: 1.0 ~ 8sec, 1 step: 0.5sec, 0~15 step)

5) **Dead Band**

This is tolerance between the input signal and position of the Actuator and if adjusting it to clockwise, it is getting wider. Vice versa.

Please be careful when adjusting it to the **counter-clockwise(0,1)** too much, sensitivity is getting increased, it might be the reason called “HUNTING”.

HUNTING means the actuator doesn’t stop at the right position and repeats open and close to find the right position when the motor slip(drift) range is bigger than the DEAD BAND.

**Remark:** Range: 0.5~4.5%, 1step 0.3%, 0~15step

* HUNTING might be the reason of burning the motor and damages of the potentiometer and RPC card.

6) **Manual Operation by ZERO and SPAN Buttons**

In order to operate actuator by manual, push the ZERO SPAN for 2 seconds simultaneously.

After Yellow/Red/Green LEDs are on and off 2times, Fault (Yellow) LED is ON and RPC becomes manual operation mode.

When push a ZERO button, actuator moves toward Close or when push a SPAN button, actuator moves toward Open. When it is for more than 15 seconds without any operation, RPC card automatically comes out from manual operation mode. (During manual operation mode, input signal is ignored)

7) **A-Full Function**

=> If user turns the Dip Switch 3 (A-Full) on like the picture, when Input Signal is less than 4.3mA DC, RPC card realizes the position as a Full Close position/

when Input Signal is more than 19.7mA DC, RPC card realizes the position as a Full Open position.

**Note:**

When Input signal is 0~5V DC or 0~10V DC, RPC card doesn’t supply A-Full Function.
8) **Auto-Setting**

1. When actuator is mounted on proper application and input signal, input power and wiring are done properly, Push Auto-setting (A-SCAN: Red button) just 1 time for more than 2 seconds.

2. After Fault (Yellow), Close (Green) and Open (Red) LED are flashing about 2 times, Fault (Yellow) LED is on.

3. During the Auto-setting,
   - Actuator starts moving to the closer position between Full Open and Full Close first.
   - After setting the closer position (as a Full Close or a Full Open Position), Actuator will starts moving to the other position.
   - Then set the position (as a Full Close or a Full Open Position).

4. After Auto-Setting, Fault (Yellow), Close (Green) and Open (Red) LEDs are flashing about 2 times, Auto-Setting is completed.

9) **Free Range (CH1)**

When User want to set RPC card’s Input Signal Full close position as about 3~8mA DC and Output Signal Full Open Position as about 16~21mA DC abnormally, User can use this function.

The procedure is as following;

1. Turn Dip Switch 4(CH1) on.
   - (Note: While Dip Switch 4(CH1) is turning on, the actuator doesn’t work.)

2. After entering Input Signal 5mA DC into RPC card, push a ZERO button for more than 2 seconds.

3. After Fault(Yellow), Close(Green) and Open(Red) LEDs are on and off 2 times,
   - RPC card recognizes 5mA DC as a Full Close Position.

4. After entering Input Signal 18 mA DC into RPC card, push SPAN button for more than 2 seconds.

5. After Fault(Yellow), Close(Green) and Open(Red) LEDs are on and off 2 times,
   - RPC card recognizes 18mA DC as a Full Open Position.

6. Turn Dip Switch 4(CH1) off.

7. After Auto Setting, Check if RPC card moves according to Input Signal.

*Adjustable range is

- Close: 3 ~ 8mA DC
- Open: 16 ~ 21mA DC
- By using this DIP switch 4(CH1), customer may set various positions at certain signals.
10) Manual Setting (CH2)

This is useful function when user wants to set by using Control Panel.

1. Turn DIP Switch 5(CH2) on
2. Put actuator Close position by using Control Panel without Input signal. Move to a Full Close Position user wants by Manual handle and Push ZERO button for more than 2 seconds. After Fault (Yellow), Close (Green) and Open (Red) LEDs are on and off 2 times, RPC card recognizes the position as a Full Close.
3. Move to Full Open position User wants by Manual handle and Push SPAN button for more than 2 seconds. After Fault (Yellow), Close (Green) and Open (Red) LEDs are on and off 2 times, RPC card recognizes the position as a Full Open.
5. Turn Dip Switch 5 (CH2) off and Check if RPC card moves according to Input Signal.

During CH2 setting, A-Full function stops. That means it (A-Full function) doesn’t work.

5. Special Tools for Adjustment

1) L-Wrench 1 set (mm) 2) Screw driver (-) 
3) Monkey spanner 200mm (1 set) 4) DC signal generator (0~24mA DC)
5) Multi-Tester 6) mA DC meter (0~25mA DC)

6. Setting reverse action actuator

Generally clockwise-rotating direction of actuator is close position but when User wants reverse action (Close <-> Open direction), please follow below instructions.

A. Open the body top cover by using L-Wrench.
B. Turn Dip switch 6(REV) on.
C. Exchange each 9th and 10th wire, and each 11th and 12th wire on the main terminal block in Actuator if Customer does wiring for on-off control from remote.
D. Change the direction of indicator (only Applicable to ITQ1500, ITQ2000 and ITQ3000)
E. Put actuator 50% open (or close) position, and push Auto setting button for more than 2 seconds..
F. After Fault (Yellow), Close (Green) and Open (Red) LEDs are flashing about 2 times, RPC card recognizes a Full close position as a Full Open and a Full Open position as a Full Close.
G. Supplying 4~20mA, check operation and rotating direction.
7. Setting potentiometer

A. Put actuator full close position
B. Set Lead wires between P1 (orange) and P2 (purple)'s resistance as 80~120 Ohm.
C. Turning potentiometer around by moving point shaft gear with L-wrench (M4) until measured resistance reaches between 80~120 Ohm (Full Close position).
D. Tighten the unfixed screw in point shaft gear.
E. Tighten the potentiometer by spring

Remark:
* Full Close range: P1 (orange): P2 (purple) = 10~100 Ohm
* Full Open range: P1 (orange): P2 (purple) = 700~900 Ohm
* PK should maintain the above range of resistances to proceed with Auto Setting.

8. Setting Limit Switch

① Pull the lever for manual operation and turn hand wheel to move actuator full close (Or open) position
② Loosen the bolts tightening cam by L-wrench, and turn a CLS (Or OLS) cam to CW (or to CCW), so that cam may hit the lever of close (Or open) limit switch.
③ Then tighten the bolt by L-wrench
9. Check operation of RPC

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Full close</th>
<th>Full open</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input signal</td>
<td>4mA DC</td>
<td>20mA DC</td>
</tr>
<tr>
<td></td>
<td>0V DC</td>
<td>5V DC</td>
</tr>
<tr>
<td></td>
<td>1V DC</td>
<td>10V DC</td>
</tr>
<tr>
<td></td>
<td>2V DC</td>
<td></td>
</tr>
<tr>
<td>Output signal</td>
<td>4mA DC (1V DC 2V DC)</td>
<td>20mA DC (5V DC 10V DC)</td>
</tr>
<tr>
<td>Signal LED</td>
<td>Green LED on</td>
<td>RED LED on</td>
</tr>
<tr>
<td>Auto setting</td>
<td>Green(Close) + Red(Open) LED flicker</td>
<td></td>
</tr>
<tr>
<td>Input signal fail</td>
<td></td>
<td>Yellow LED flicker</td>
</tr>
</tbody>
</table>

10. **Switch Description**

ⓐ. Potentiometer Switch
*GL (Gear Box/Linear Actuator) => the switch for PK of ITQ6000/9000 and Linear Actuator
*QS (Quarter Turn Actuator) => the switch for PK from ITQ0100 to ITQ3000
=> User doesn’t have to re-wire for PK

ⓑ. Program Selection Switch
*Q: The switch for Quarter Turn Actuator Program
*L: The switch for Linear Actuator Program
=> User can use the RPC card for both Quarter turn and Linear Actuators.

ⓒ. Phase Selection Switch
*1Ph: The Switch for 110VAC/220VAC 1Phase
*3Ph: The Switch for 380VAC to 440VAC 3 Phases

NOTE: In case of 24VDC,
Please let the factory know before order,
The factory will program RPC card for 24VDC.
11. RPC card Layout

12. LCD LAYOUT (OPTION)

- CLOSING
- F-CL
- 1.0%
- 2.0s
- 35%

- FULL CLOSE / CLOSING / STOP / OPENING / FULL OPEN
- FAIL SAFE: F-CL / F-OP
- DEAD BAND
- DELAY TIME
- INPUT SIGNAL
- ACTUATOR POSITION
- REVERSE