DESCRIPTION / IDENTIFICATION

The QBX series valve uses Proportion-Air closed loop technology for pressure control. It gives an output pressure proportional to an electrical command signal input.

The QB1X is a complete closed loop servo system consisting of valves, manifold, housing and electronic controls. Pressure is controlled by the use of two solenoid valves. One valve functions as inlet control, the other as exhaust. The pressure output is measured by a pressure transducer internal to the QB1X and provides a feedback signal to the electronic controls. This feedback signal is compared with the command signal input. A difference between the two signals causes one of the solenoid valves to open, allowing flow in or out of the system. Accurate pressure is maintained by controlling these two valves.

The QB2X is similar to the QB1X but uses a double loop control scheme. In addition to the internal pressure transducer, the QB2X receives an electrical signal from an external sensing device. This primary feedback signal is compared against the command signal input. This comparison is then summed with the internal pressure transducer signal. The gain of the circuit is such that priority is given to the external feedback signal. A difference between the command signal and the feedback signal causes one of the solenoid valves to be activated.

A monitor output is provided for the system measurement. QB1X monitor output is an amplified signal from the internal pressure transducer. QB2X monitor output is a buffered signal from the primary external transducer connected to the QB2X.

The QBX valve has a choice of work ports: side or bottom. The unused port is plugged with a gauge port plug.

INSTALLATION

1. Apply a small amount of anaerobic sealant (provided) to the male threads of the in-line filter supplied with valve.

   CAUTION: USE ONLY THE THREAD SEALANT PROVIDED. OTHER SEALANTS SUCH AS PTFE TAPE AND PIPE DOPE CAN MIGRATE INTO THE FLUID SYSTEM CAUSING FAILURES.

2. Install the in-line filter into the port labeled “I” (Inlet) on QBX valve.
3. Connect supply line to the in-line filter port. Connect device being controlled to port labeled “O” (Outlet) on QBX valve.
4. Mount valve accordingly.
5. The valve can be mounted in any position without affecting performance. Mounting bracket QBT-01 (ordered separately) can be used to attach valve to a panel or wall surface.
6. Proceed with electrical connections.

NOTE: The QB1X/QB2X are available with higher pressure inlet valves. Contact the factory for an option number if this is required.

SPECIFICATIONS

**ELECTRICAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>15-24 VDC</td>
</tr>
<tr>
<td>Supply Current</td>
<td>350 mA</td>
</tr>
<tr>
<td>Command Signal</td>
<td>DIGITAL</td>
</tr>
</tbody>
</table>

**MECHANICAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Ranges</td>
<td>29.9 &quot;Hg (vac) - 175 psig (760 mmHg (vac) - 12 Bar)</td>
</tr>
<tr>
<td>Output Pressure†</td>
<td>0-100% of range</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>1.2 SCFM @ 100 psig inlet (34 L/min @ 6.89 Bar)</td>
</tr>
<tr>
<td>Cv Capacity</td>
<td>0.04</td>
</tr>
<tr>
<td>Min Closed End Volume</td>
<td>1 in³</td>
</tr>
<tr>
<td>Filtration Recommended</td>
<td>20 Micron (included)</td>
</tr>
<tr>
<td>Linearity/Hysteresis</td>
<td>&lt;=±0.15% F.S. BFSL</td>
</tr>
<tr>
<td>Repeatability</td>
<td>&lt;=±0.02% F.S.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt;=±0.2% F.S.</td>
</tr>
<tr>
<td>Port Size</td>
<td>1/8&quot; NPT</td>
</tr>
<tr>
<td>Wetted Parts†</td>
<td></td>
</tr>
<tr>
<td>Elastomers</td>
<td>Fluorocarbon</td>
</tr>
<tr>
<td>Manifold</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Valves</td>
<td>Nickel Plated Brass</td>
</tr>
<tr>
<td>Pressure Transducer</td>
<td>Silicon, Aluminum</td>
</tr>
</tbody>
</table>

**PHYSICAL**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>32-158°F (0-70°C)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.02 lb. (0.50 Kg)</td>
</tr>
<tr>
<td>Protection Rating</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>Housing</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Finish</td>
<td>Black Anodized</td>
</tr>
</tbody>
</table>

† Pressure ranges are customer specified. Output pressures other than 100% are available. ‡ Others available.
TABLE 1

RATED INLET PRESSURE FOR STANDARD QBX VALVES

<table>
<thead>
<tr>
<th>For valves ordered with MAX. calibrated pressure of:</th>
<th>Max. inlet pressure is:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum up to 10 psig (0.69 bar)</td>
<td>Consult factory</td>
</tr>
<tr>
<td>10.1 up to 30 psig (0.70 up to 2 bar)</td>
<td>35 psig (2.4 bar)</td>
</tr>
<tr>
<td>31 up to 100 psig (2.1 up to 7 bar)</td>
<td>110 psig (7.6 bar)</td>
</tr>
<tr>
<td>101 up to 175 psig (7 up to 12 bar)</td>
<td>190 psig (13 bar)</td>
</tr>
</tbody>
</table>

WARNING!

Before you get started, please read these warnings:

- Examine the product. Ensure that you received what you ordered.
- Read this guide first before you start and save it for later use.
- You must have a good understanding of what the adjustments are on this product before using them.
- All compressed air and power should be shut off before installing, removing or performing maintenance on this product.
- Installation and use of this product should be under the supervision and control of properly qualified personnel in order to avoid the risk of injury or death.

WARNING!

RATED INLET PRESSURE FOR STANDARD QBX VALVES

TABLE 1

For valves ordered with MAX. calibrated pressure of:

<table>
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<td>110 psig (7.6 bar)</td>
</tr>
<tr>
<td>190 psig (13 bar)</td>
</tr>
</tbody>
</table>

Each valid command that is received is acknowledged to the client using the response string shown in the command/response table. It is up to the client to handle returned error codes and verify the validity of all returned responses.

When the client sends a command to the server, the client should NOT send another command until it receives a command response to the sent command.

As a safety feature, once a fault is declared or a power loss condition occurs a valid “spc” (set pressure command) command is required to reinstate pressure to the system. The fault and power up pressure will be at 0psig.
RE-CALIBRATION PROCEDURE

All QBX control valves come calibrated from the factory by trained personnel using precision calibration equipment. The QBX valve is a closed loop control valve using a precision electronic pressure sensor. Typical drift is less than 1% over the life of the product. If your QBX valve appears to be out of calibration by more than 1%, it is not likely to be QBX. Check the system for plumbing leakage, wiring and electronic signal levels. Verify the accuracy of your measuring equipment before re-calibrating. Consult factory if you have any questions or require assistance. If the QBX valve needs re-calibration, use the procedure described below:

QB1X VALVES

1. Identify the inputs and outputs of the valve using the model number of the valve, calibration card included with the valve, and the information provided in this sheet.
2. Connect a precision measuring gage or pressure transducer to the “O” (Outlet) port of the QBX.

NOTE: THERE MUST BE A CLOSED VOLUME OF AT LEAST 1 CU. IN. (17 CC) BETWEEN THE VALVE OUTLET AND THE MEASURING DEVICE FOR THE VALVE TO BE STABLE.

3. Connect the correct supply source to the “I” (Inlet) of the QBX, making sure the pressure does not exceed the rating for the valve (See Table 1).
4. Locate the calibration slot plug on top of the QBX valve and completely remove it. Located underneath are two adjustment trim pots, Zero “Z” and Span “S”. See figure 1 for pots location.
5. NOTE: Only use this step if your device is totally out of calibration. If it is slightly out of calibration, omit this step and move on to paragraph 6. Using a small screwdriver, turn both trim pots 15 turns clockwise. Then turn both trim pots 7 turns counterclockwise. This will put the QBX roughly at mid-scale.
6. Make correct electrical connections as noted. Make sure there is a proper meter in place to measure the command input to the QBX.
7. Set the electrical command input to MAXIMUM value.
8. Adjust the SPAN pot until MAXIMUM desired pressure is reached (clockwise increases pressure).
9. Set the electrical command input to MINIMUM value.
10. Adjust the ZERO pot until MINIMUM desired pressure is reached (clockwise increases pressure).
11. Repeat ZERO and SPAN adjustments, which interact slightly, until QBX1 valve is calibrated back to proper range. Steps 6 - 9.
12. Replace calibration access cap.

QB2X VALVES

This section assumes there is a properly scaled and calibrated transducer for use as 2nd loop feedback signal. For information on re-calibrating Proportion-Air DS series pressure transducers see sheet BR060.

1. Follow, in order, steps 1-5 as noted in the section titled QB1X VALVES.
2. Make correct electrical connections as noted. Make sure there is a proper meter in place to measure the command input to the QBX2. Make sure the 2nd loop signal is connected.
3. Set the electrical command input to MAXIMUM value.
4. Adjust the SPAN pot until MAXIMUM desired pressure is reached (clockwise increases pressure).
5. Set the electrical command input to MINIMUM value.
6. Adjust the ZERO pot until MINIMUM desired pressure is reached (clockwise increases pressure).
7. Repeat ZERO and SPAN adjustments, which interact slightly, until QB2 valve is calibrated back to proper range. Steps 3 - 6.
8. Replace calibration access cap.

QB2X SECOND LOOP CONNECTIONS (without 3D option)

All QB2X valves are designed to accept a 0-10 volt second loop input signal. Reference the following wiring diagrams for details if your QB2X does not have the 3 pin connector (option 3D) for 2nd loop.

ELECTRICAL CONNECTIONS

1. Turn off all power to valve.
2. Identify the valve’s analog output using the calibration card included in the package and the ordering information section on the last page of this sheet.
3. Proceed to the appropriate section corresponding to the type of valve being installed.

NOTE: ALL COLOR CODES RELATE TO QB’S ORDERED FROM THE FACTORY WITH WIRE LEADS.

Power Connections

The following diagram shows the proper connections for DC power and DC common

QB2X SECOND LOOP CONNECTIONS (without 3D option)

All QB2X valves are designed to accept a 0-10 volt second loop input signal. Reference the following wiring diagrams for details if your QB2X does not have the 3 pin connector (option 3D) for 2nd loop.

Standard QB2X valves
Second loop signal is wired into the main electrical connector.
QB2X-with Proportion-Air DSY
Second loop signal is plugged into auxiliary receptacle on opposite side.

Please Contract Proportion-Air if you have any questions or need assistance
317-335-2602 | 877-331-1738
info@proportionair.com

ETHERNET INTERFACE & PROTOCOL COMMANDS

The Ethernet QBX product is designed to receive commands and send pressure readings via an Ethernet TCP/IP connection. It contains a pc board which translates the Ethernet packets to analog signals for the analog control pc board. Commands can be sent from a PC using a graphical user interface provided by Proportion-Air or by using a Telnet client and the commands below.

DIGITAL
COMMAND RESOLUTION……16 bits
FEEDBACK RESOLUTION……16 bits

NETWORK INTERFACE
Interface: Ethernet 10Base-T or 100Base-TX (Autosensing)
Protocols: TCP/IP, TFTP, Telnet, BootP, AutoIP
Connector: RJ45

H23 COLOR CODE
Red/White | Signal In
Red/Black | Power
Green     | Common

LEDS ON RJ45

<table>
<thead>
<tr>
<th>Link LED (Left Side)</th>
<th>Activity LED (Right Side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLOR</td>
<td>MEANING</td>
</tr>
<tr>
<td>Off</td>
<td>No Link</td>
</tr>
<tr>
<td>Amber</td>
<td>10 Mbps</td>
</tr>
<tr>
<td>Green</td>
<td>100 Mbps</td>
</tr>
</tbody>
</table>

PROTOCOL

The commands and data character are sent as ASCII printable characters except for the end of command terminator which is an ASCII carriage return (0d hex). Data cannot contain an alphabetic character, data delimiter or end of command terminator.

Command format:

CCC \n or
CCC:ddd.dd \n
Where

C = Command String
: = Command Delimiter
d = Data
\n = End of Command Terminator

Commands and Responses:

Normal cases in black, error cases in red

<table>
<thead>
<tr>
<th>Command String</th>
<th>Response String</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“spc: 23.70”</td>
<td>“spr:23.70”</td>
<td>Set pressure to value after the :</td>
</tr>
<tr>
<td>“spc: 176.70”</td>
<td>“spe”</td>
<td>Pressure requested out of range</td>
</tr>
<tr>
<td>“rpc”</td>
<td>“rpr: 36.77”</td>
<td>Read pressure</td>
</tr>
<tr>
<td>“stc”</td>
<td>“str QBMB, 123456, 1.3 ”</td>
<td>Returns model, serial number, software version</td>
</tr>
<tr>
<td>Unknown command</td>
<td>“bcr”</td>
<td>Bad command received. The command received does not match any of the listed commands.</td>
</tr>
<tr>
<td>Unknown data</td>
<td>“bdr”</td>
<td>Bad data received. Data is not within acceptable values.</td>
</tr>
</tbody>
</table>
Safety Precautions

Please read all of the following Safety Precautions before installing or operating any Proportion-Air, Inc. equipment or accessories. To confirm safety, be sure to observe ‘ISO 4414: Pneumatic Fluid Power - General rules relating to systems’ and other safety practices.

⚠️ Warning

Improper operation could result in serious injury to persons or loss of life!

1. PRODUCT COMPATIBILITY
   Proportion-Air, Inc. products and accessories are for use in industrial pneumatic applications with compressed air media. The compatibility of the equipment is the responsibility of the end user. Product performance and safety are the responsibility of the person who determined the compatibility of the system. Also, this person is responsible for continuously reviewing the suitability of the products specified for the system, referencing the latest catalog, installation manual, Safety Precautions and all materials related to the product.

2. EMERGENCY SHUTOFF
   Proportion-Air, Inc. products cannot be used as an emergency shutoff. A redundant safety system should be installed in the system to prevent serious injury or loss of life.

3. EXPLOSIVE ATMOSPHERES
   Products and equipment should not be used where harmful, corrosive or explosive materials or gases are present. Unless certified, Proportion-Air, Inc. products cannot be used with flammable gases or in hazardous environments.

4. AIR QUALITY
   Clean, dry air is not required for Proportion-Air, Inc. products. However, a 40 micron particulate filter is recommended to prevent solid contamination from entering the product.

5. TEMPERATURE
   Products should be used with a media and ambient environment inside of the specified temperature range of 32°F to 158°F. Consult factory for expanded temperature ranges.

6. OPERATION
   Only trained and certified personnel should operate electronic and pneumatic machinery and equipment. Electronics and pneumatics are very dangerous when handled incorrectly. All industry standard safety guidelines should be observed.

7. SERVICE AND MAINTENANCE
   Service and maintenance of machinery and equipment should only be handled by trained and experienced operators. Inspection should only be performed after safety has been confirmed. Ensure all supply pressure has been exhausted and residual energy (compressed gas, springs, gravity, etc.) has been released in the entire system prior to removing equipment for service or maintenance.

⚠️ Caution

Improper operation could result in serious injury to persons or damages to equipment!

1. PNEUMATIC CONNECTION
   All pipes, pneumatic hose and tubing should be free of all contamination, debris and chips prior to installation. Flush pipes with compressed air to remove any loose particles.

2. THREAD SEALANT
   To prevent product contamination, thread tape is not recommended. Instead, a non-migrating thread sealant is recommended for installation. Apply sealant a couple threads from the end of the pipe thread to prevent contamination.

3. ELECTRICAL CONNECTION
   To prevent electronic damage, all electrical specifications should be reviewed and all electrical connections should be verified prior to operation.

Exemption from Liability

1. Proportion-Air, Inc. is exempted from any damages resulting from any operations not contained within the catalogs and/or instruction manuals and operations outside the range of its product specifications.

2. Proportion-Air, Inc. is exempted from any damage or loss whatsoever caused by malfunctions of its products when combined with other devices or software.

3. Proportion-Air, Inc. and its employees shall be exempted from any damage or loss resulting from earthquakes, fire, third person actions, accidents, intentional or unintentional operator error, product misapplication or irregular operating conditions.

4. Proportion-Air, Inc. and its employees shall be exempted from any damage or loss, either direct or indirect, including consequential damage or loss, claims, proceedings, demands, costs, expenses, judgments, awards, loss of profits or loss of chance and any other liability whatsoever including legal expenses and costs, which may be suffered or incurred, whether in tort (including negligence), contract, breach of statutory duty, equity or otherwise.

Warranty

Proportion-Air, Inc. products are warranted to the original purchaser only against defects in material or workmanship for one (1) year from the date of manufacture. The extent of Proportion-Air’s liability under this warranty is limited to repair or replacement of the defective unit at Proportion-Air’s option. Proportion-Air shall have no liability under this warranty where improper installation or filtration occurred.