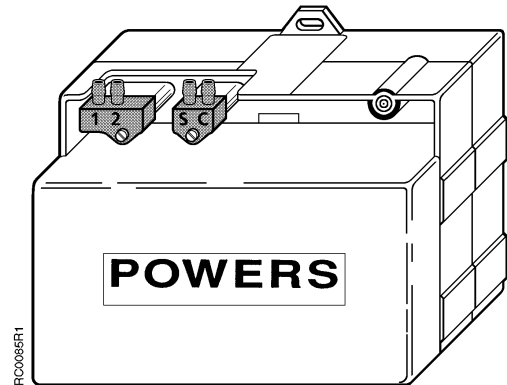


Powers™ Controls

RC 195 Single Input Receiver-Controller



Description

The RC 195 Single Input Receiver-Controller is a pneumatic instrument which receives one pneumatic input, either direct acting (DA) or reverse acting (RA). It produces a pneumatic control signal based on the net pneumatic input and the mechanical settings of the setpoint and percent proportional band.

Features

- Plug-in air connections make connecting, calibrating and servicing easy.
- Internal restrictors provided for transmitter inputs.
- Stick-on scales for setpoint dial in standard transmitter ranges in both English and metric units.
- Large, easy-to-read scales on all adjustments.
- Tamper resistant cover.

Application

The RC 195 Single Input Receiver-Controller is a one input (direct acting or reverse acting) instrument. It is commonly used to control temperatures, humidity, and pressures of mechanical equipment in commercial buildings, such as offices, hospitals, universities, and schools.

Product Number

Single Input Receiver-Controller 195-0011
with case and stick-on DA and RA scales (see Table 1).

Table 1. Scale Ranges.

| English | Scale Identification | Metric |
|--------------------|----------------------|--------------------|
| -40 to 120°F | A | -40 to 50°C |
| 50 to 100°F | B | 10 to 38°C |
| 80 to 240°F | C | 26 to 117°C |
| 20 to 80% rh | D | -18 to 38°C |
| 0 to 100°F | E | 1 to 58°C |
| 35° to 135°F | F | 0 to 750 Pa |
| 0 to 3 IWG | G | 0 to 3.75 kPa |
| 0 to 15 IWG | H | 20 to 80% rh |
| 0 to 0.5 IWG | J | 0 to 125 Pa |
| Blank 10 divisions | K (DA) | Blank 9 divisions |
| Blank 16 divisions | K (RA) | Blank 11 divisions |
| -0.05 to 0.20 IWG | L | -12.5 to 50 Pa |
| -0.5 to 0.5 IWG | M | -125 to 125 Pa |
| 0 to 10 IWG | N | 0 to 2.5 kPa |
| Blank 20 divisions | P | Blank 15 divisions |

Specifications

Operating

| | |
|--|---|
| Action: | Direct Action |
| Input #1 | Reverse Action |
| Input #2 | 3 to 15 psi (21 to 103 kPa) |
| Pneumatic Inputs | 0 psi (0 kPa) to supply pressure |
| Control output | 40 to 120°F (4 to 49°C) |
| Operating Ambient Temperature Range | |
| Supply pressure | |
| Operating | 22 psi (152 kPa) |
| Maximum safe | 30 psi (207 kPa) |
| Percent Proportional Band Adjustment Range | 2 to 20% for a 5 psi (34 kPa) control pressure change |
| Air Consumption | 60 scim (17 ml/s) |

Physical

| | |
|-----------------|--|
| Mounting | Surface |
| Air Connections | Barb fittings for 1/4-inch (6 mm) OD plastic tubing |
| | Two plug-in connectors are provided: one for the direct acting and the reverse acting transmitter inputs and one for supply and control lines. 1/8-inch NPT connection provided for control pressure gauge (gauge not included). |
| Case material | Lexan, 20% glass filled |
| Dimensions | Figure 9 |
| Weight | 3.1 lb (1.4 Kg) |

Accessories

| | |
|--|---------------------------|
| Plug for Control Pressure Gauge Hole | 043-347 |
| Control Pressure Gauge | P142-373 |
| Restrictor Kit | 195-066 |
| Connector Kit | 195-114 |
| RC 195 Pressure Simulator | 195-098, 195-099, 195-100 |
| Receiver-Controller Calibration Slide Rule | 153-054 |
| Scale Conversion Card (Form) | 125-1661 |

Operation

Inputs

The control pressure depends upon the position of the main lever which is determined by the sum of the forces acting upon it. On the left side of the pivot, two forces act against the lever: the bias spring and the #1 direct acting input pressure. On the right side of the pivot, three forces act against the lever: the control pressure acting through the percent proportional band slide, the #2 input pressure, and the setpoint spring. See Figure 1.

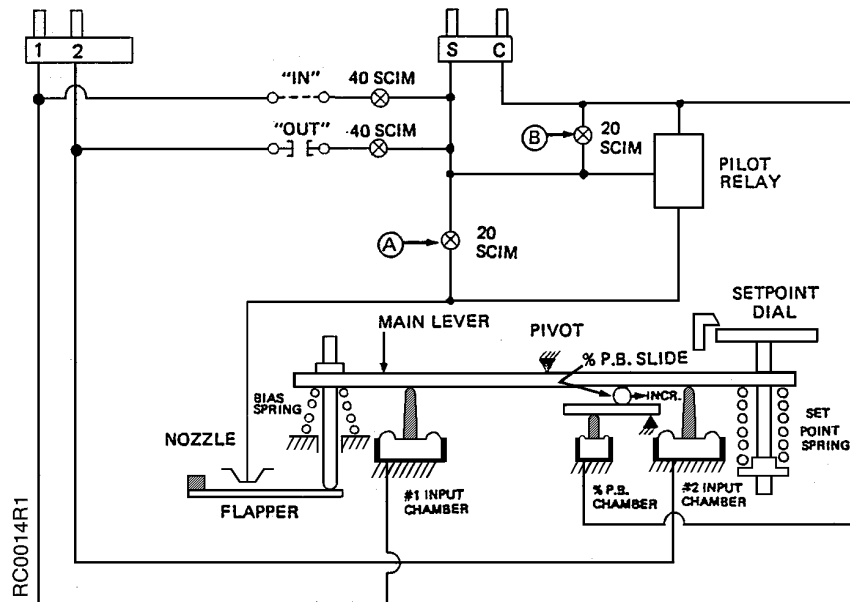


Figure 1. Single Input Receiver-Controller Schematic.

When the net forces on each side of the pivot are equal, the lever is stationary and the control pressure is constant. A change in any of the forces moves the main lever to a new equilibrium position and provides a new control pressure.

The input on the left side of the pivot is direct acting and the input on the right side of the pivot is reverse acting. An internal 40 scim (11 ml/s) restrictor is furnished for each input. Each restrictor must be switched "in" when an external restrictor is not used. When any input is not being used, its restrictor should be in the "out" position and the input connection should be open to the atmosphere. Restrictor "A" provides nozzle pressure and restrictor "B" minimizes hysteresis in the pilot relay as shown in Figure 1.

Operation, Continued

Percent Proportional Band

The pilot relay amplifies the nozzle pressure to provide the control pressure output. Control pressure goes to the controlled device(s) as well as the percent proportional band chamber to provide proportional feedback. For example, if the main lever is moved up on the left side of the pivot, the flapper will move toward the nozzle to increase control pressure. The increased pressure in the percent proportional band chamber will move the main lever up on the right side of the pivot moving the flapper away from the nozzle until an equilibrium and a new control pressure are reached. The amount of feedback is adjusted by moving the percent proportional band slide.

Installation

General

1. Mount the RC 195 Single Input Receiver-Controller in any position on any vertical surface using two #8 or #10 screws. The integral mounting tabs are located on the top and bottom of the case.

NOTE: Small vibrations such as those from an air handling unit will not affect the operation of the instrument.

2. Remove the cover by pulling to the right, lifting, then pulling to the left and lifting. Remove the cover for access to percent proportional band adjustment, the setpoint dial, and setpoint adjustment screw.
3. The setpoint dial comes with a 3-15 psi (21 to 103 kPa) scale. Place one of the stick-on scales (Table 1) on the dial to match the primary transmitter range. Each scale is marked DA or RA to match the required action of the receiver-controller.

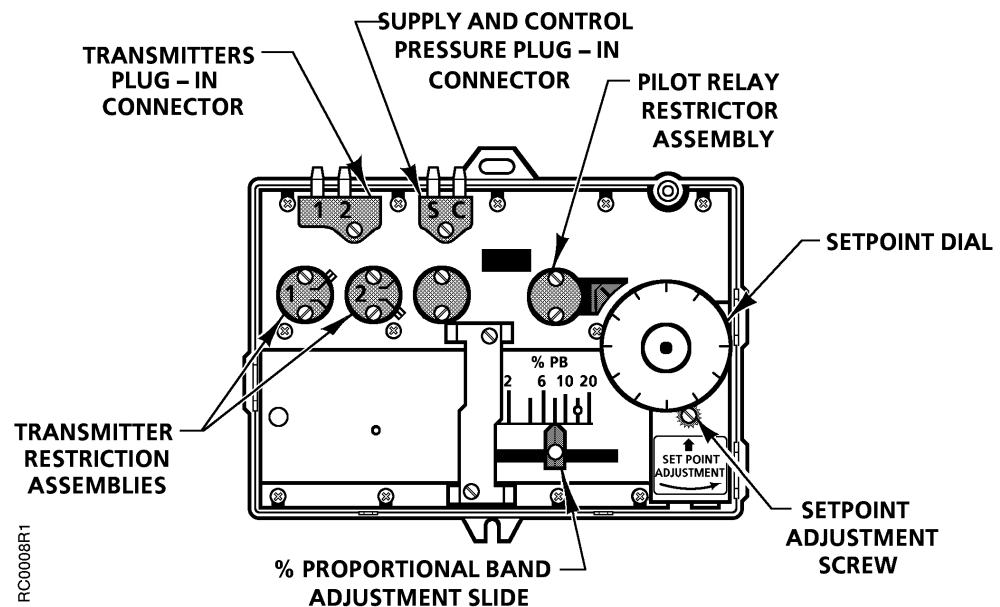


Figure 2. Single Input Receiver-Controller Connector, Restrictor, and Adjustment Locations.

**Installation,
Continued**

4. Check all the air connections particularly those to the transmitter to eliminate leaks. Even small leaks in the pneumatic lines to the transmitters will introduce large errors.
5. Check the supply pressure. The supply pressure must be a constant 22 psi (152 kPa). If it is different or if a dual air supply is used, error will be introduced into the transmitted signal.

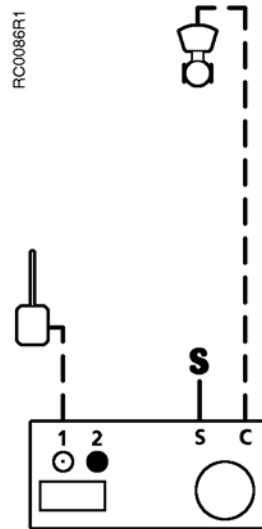


Figure 3. Typical Direct Action (DA) Installation.

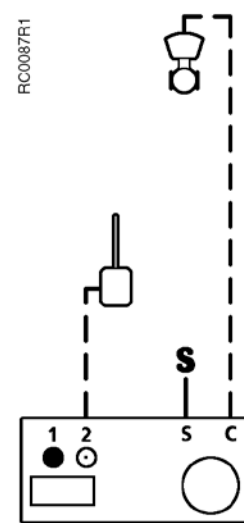


Figure 4. Typical Reverse Action (RA) Installation.

Restrictors

Restrictors are factory installed in all inputs of the receiver-controller. Restrictors are in the "out" position as shipped from the factory. When an internal restrictor is required, the restrictor must be moved to the "in" position. Use the following procedures when dialing a new restrictor position: If the transmitter input line is connected to "1", use restrictor "1". If the transmitter input line is connected to "2", use restrictor "2".

1. Loosen both restrictor screws two full turns.
2. Move the restrictor tab back and forth between the full travel limits a minimum of two times or until there is no sensation of drag against the lever. This will allow the gasket to return to its proper position.
3. Retighten both screws with the restrictor lever fully in position against its stop. Do not over tighten the screws. Screws should be tight enough to provide a good seal without warping the restrictor assembly.

NOTE: When an input is not being used, the restrictor should be in the "out" position and the input connection should be open to atmosphere.

Figure 5 gives the maximum recommended distances for using the internal restrictor, external restrictor, and remote gauges. Note that 300 feet (91.5 m) is the maximum distance between air supply and the transmitter. If the distance is more than 300 feet (91.5 m) between transmitter and receiver-controller, a remote air supply and external restrictor must be used. If the maximum distances are exceeded, there will be excessive pressure drops and time delays which will produce faulty indication and unsatisfactory operation.

Installation, Continued

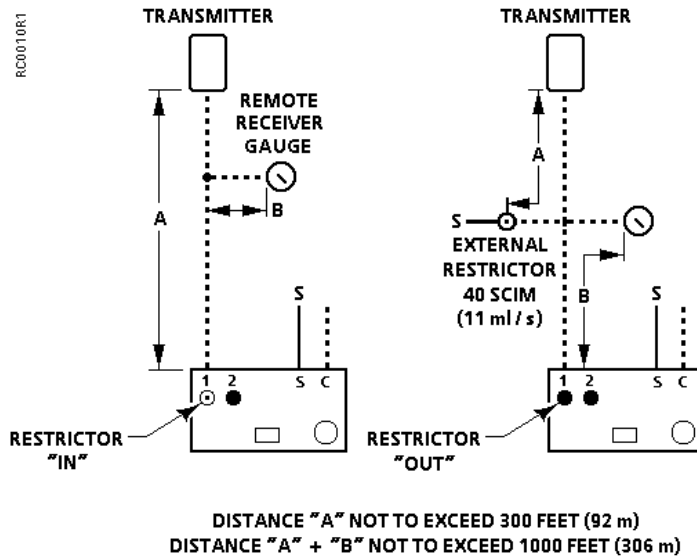


Figure 5. Maximum Distances for External Restrictors and Remote Gauges.

Generally, 1/4-inch (6.4 mm) OD plastic tubing should be used for all the connections to the plug-in air connectors. Larger size tubing will reduce the pressure drops, but it will increase time delays. Conversely, smaller tubing will reduce time delays but will increase pressure drops.

Calibration

Before making adjustments, several calculations are necessary. Steps 1, 2, and 3 must be completed before installation and the values noted on the control drawing. See Figure 6.

Figure 6 shows how the values of percent proportional band and setpoint should be recorded.

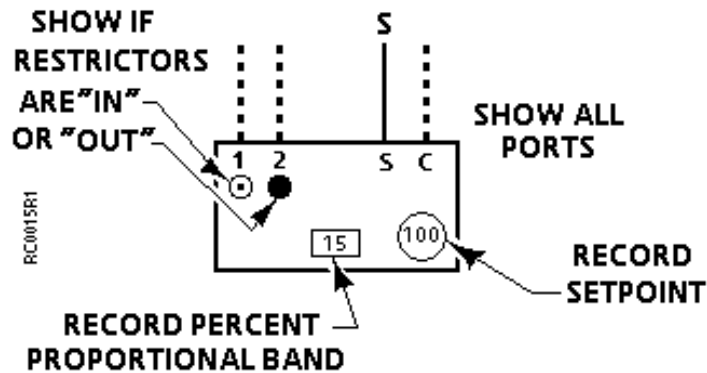


Figure 6. Control Drawing.

**Calibration,
 Continued**

Step 1 Determine Percent Proportional Band setting using Table 2 or Formula A.

Table 2. Percent Proportional Band Settings.

| Transmitter Span °F (°C) | Percent Proportional Band Setting | | | | | |
|--------------------------------|-------------------------------------|----------|-----------|-------------------------------------|----------|-----------|
| | 5 psi (34 kPa) Spring | | | 10 psi (69 kPa) Spring | | |
| | Desired Throttling Range °F (°C) | | | Desired Throttling Range °F (°C) | | |
| | 4 (2) | 8 (4) | 12 (7) | 4 (2) | 8 (4) | 12 (7) |
| 50 (28) | 8% | 16% | – | 4% | 8% | 12% |
| 100 (56) | 4% | 8% | 12% | 2% | 4% | 6% |
| 160 (89) | 2.5% | 5% | 7% | – | 2.5% | 3.8% |

Formula A

$$\begin{aligned}
 \% \text{ P.B.} = & \frac{\text{Desired Throttling Range (°F or °C)}}{\text{Controlling Transmitter Span (°F or °C)}} \times \frac{*5 \text{ psi or } 34.5 \text{ kPa}}{\text{Spring Range Final Controlled Device (psi or kPa)}} \times 100
 \end{aligned}$$

* This is the control pressure change for which the percent proportional band scale is designed.

Example:

1. 5 psi (34.5 kPa) spring range
2. Desired throttling range 10°F (5.6°C)
3. Transmitter span 100°F (56°C)

Using Formula A:

$$\begin{aligned}
 \% \text{ P.B.} = & \frac{10^\circ\text{F}}{100^\circ\text{F}} \times \frac{5 \text{ psi}}{5 \text{ psi}} \times 100 \\
 \% \text{ P.B.} = & 10\%
 \end{aligned}$$

For metric:

$$\begin{aligned}
 \% \text{ P.B.} = & \frac{5.6^\circ\text{C}}{56^\circ\text{C}} \times \frac{34.5 \text{ kPa}}{34.5 \text{ kPa}} \times 100 \\
 \% \text{ P.B.} = & 10\%
 \end{aligned}$$

Step 2 Determine Setpoint Conditions.

For most applications it is necessary to select one point called "Setpoint Conditions" in order to establish the value of all variables. For a single input receiver-controller, the setpoint condition equals the desired control point. This is expressed in percent relative humidity, degrees Fahrenheit, inches W.G., or metric units.

Calibration, Continued

Step 3 Record data from Steps 1 and 2 on Control Schematic.

1. Set the proportional band pointer to value shown on control drawing.
2. Apply setpoint pressure to selected input (#1/DA or #2/RA) and with a screwdriver turn the setpoint adjustment screw until control pressure reaches 8 psi (55 kPa) or midpoint pressure of the spring range of actuator.
3. Calibrate the setpoint dial by pulling it up, turning it to agree with the transmitter input, and then releasing it.
4. Turn the setpoint adjustment screw until dial agrees with control drawing.

NOTE: Whenever the proportional band is changed, the setpoint dial must be recalibrated.

With the RC 195 Simulator the input can be adjusted to any value between 3 and 15 psi (21 and 103 kPa). In this way, the setpoint pressure can be checked to ensure that the receiver-controller is properly calibrated.

Troubleshooting

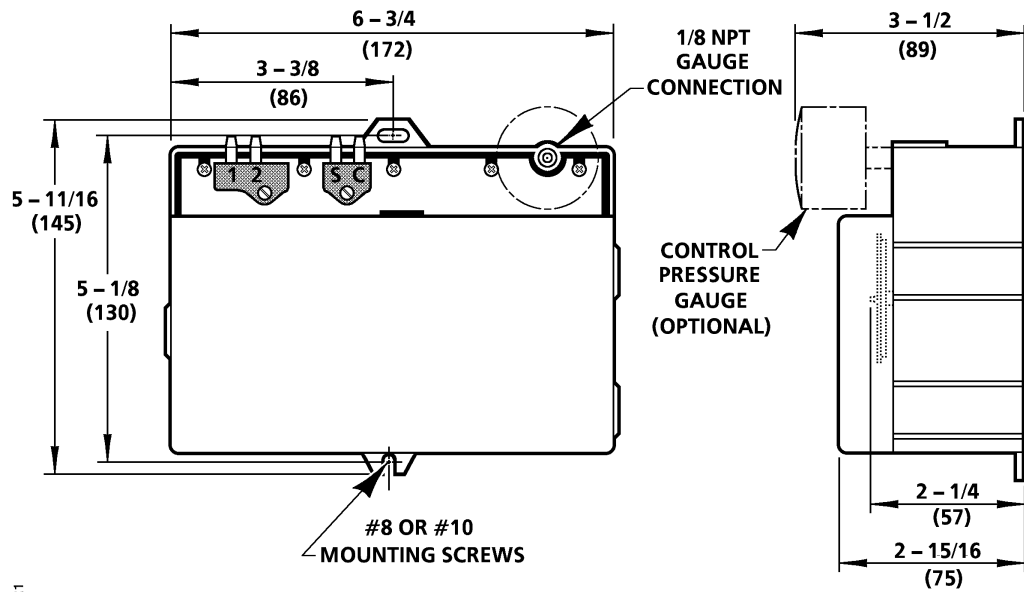
Before troubleshooting the operation of the RC 195 Single Input Receiver-Controller, be sure:

1. The supply pressure at the unit is 22 psi (152 kPa).
2. The transmitter input being used is between 3 and 15 psi (21 to 103 kPa).
3. The only one restrictor supplies the transmitter.
4. The transmitter calibration is correct.

Table 3. Troubleshooting Guide.

| Complaint | Check | Probable Cause | Corrective Action | |
|--|---|--|--|--|
| Control pressure stays at approximately zero | Rotate setpoint adjustment screw counterclockwise | Pressure increases | Transmitter sensing medium which is above (RA) or below (DA) the proportional band Receiver controller out of calibration | None Recalibrate |
| | | Pressure remains unchanged | Plugged pilot relay restrictors | Replace Pilot Relay Restrictors |
| | Receiver-Controller is defective | | Replace Receiver Controller | |
| | Control pressure stays at approximately supply pressure | Rotate setpoint adjustment screw clockwise | Pressure decreases | Transmitter sensing medium which is above (DA) or below (RA) the proportional band Receiver-Controller out of calibration |
| Pressure remains unchanged | | | Receiver-Controller is defective | Replace Receiver-Controller |

Dimensions



RC0009R1

NOTE: DIMENSIONS IN INCHES
MILLIMETERS IN PARENTHESES

Figure 9. Dimensions.

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