

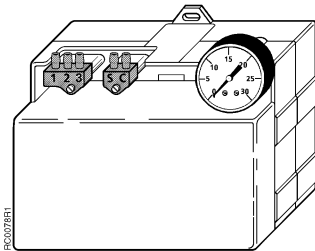
RETROLINE®

RC 195 Multiple Input Receiver-Controller

Product Description

The RC 195 Multiple Input Receiver-Controller is a pneumatic instrument that can be used as a one input (DA or RA), two input (DA or RA with reset), or three input (DA or RA with reset and control point adjust) instrument.

It produces a pneumatic control signal based on the net pneumatic input and the mechanical settings, such as set point, percent proportional band, and authority.



Troubleshooting

Before troubleshooting the operation of the RC 195 Multiple Input Receiver-Controller, check the following:

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

Contents

- RC 195 Multiple Input Receiver-Controller
- Custom labels for connector identification
- Stick-on scales for setpoint dial
- Scale conversion card

Product Number

195-2000

The RC195 Multiple Input Receiver-Controller replaces the products listed in Table 1.

Table 1. Cross Reference.

Manufacturer	Product Number
Barber-Colman	RKS-3002 RKS-4002
Honeywell	PR908B RP920B
Johnson Controls	T-5800-3
Robertshaw/Siebe	P341 P541

Required Tools

- Flat-blade screwdriver
- Two No. 8 or No. 10 screws
- RC 195 Simulator for calibration of two and three inputs

Expected Installation Time

45 minutes

Table 2. Troubleshooting Chart.

Complaint	Check	Probable Cause	Corrective Action	
Control pressure stays close to 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 close to supply (main) pressure	Rotate setpoint adjustment screw clockwise	Pressure decreases
Pressure remains unchanged	Receiver-controller is defective			Replace receiver-controller

Prerequisites

- Clean, dry, oil-free air supply
- Constant air supply. The receiver-controller and transmitter are factory calibrated to use 22 ±2 psi (152 kPa) air supply

Specifications

Operating

Action:	
Input #1	Direct Action (DA)
Input #2	Reverse Action (RA)
Reset:	
Input #3	Direct reset relative to Input #2
	Reverse reset relative to Input #1
Transmitter restriction	
Size	0.0075 inches (0.2 mm)
Flow	40 scim (11 cm ³ /s)

Supply pressure	
Operating	22 ±2 psi (152 ±14 kPa)
Proportional band (%PB) with	
10 psi output	Tables 8 and 9

Physical

Mounting	Vertical Surface
Air connections	Barb fittings for 1/4-inch (6 mm) O.D. plastic tubing
Case material	Lexan, 20% glass filled
Dimensions	Figure 12
Weight	3.1 lbs.(1.4 kg)

Operation

Authority

Authority is the effect of a secondary transmitter signal upon the primary transmitter input signal. The authority is set on the authority adjustment slide. The formula for determining the setting is found in *Calibration, Step 2*.

Authority application

Inputs 1 and 3 provide direct action with reverse reset (Figure 1), and Inputs 2 and 3 provide reverse action with direct reset (Figure 2). When other combinations of action and reset are required (reverse action with reverse reset or direct action with direct reset), use the combination of inputs that provide the proper reset action, and add a reversing relay in the control line of the RC 195 Receiver-Controller to change the action.

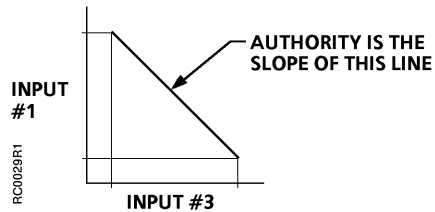


Figure 1. Authority for Reverse Reset.

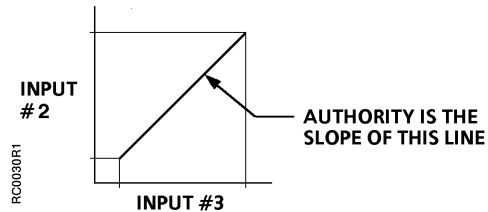


Figure 2. Authority for Direct Reset.

Installation

General

Before beginning, determine which custom connector labels you need to fit your individual installation. See Figures 3 through 6. Place them on the RC 195 Receiver-Controller plug-in connectors.

Installation, Continued

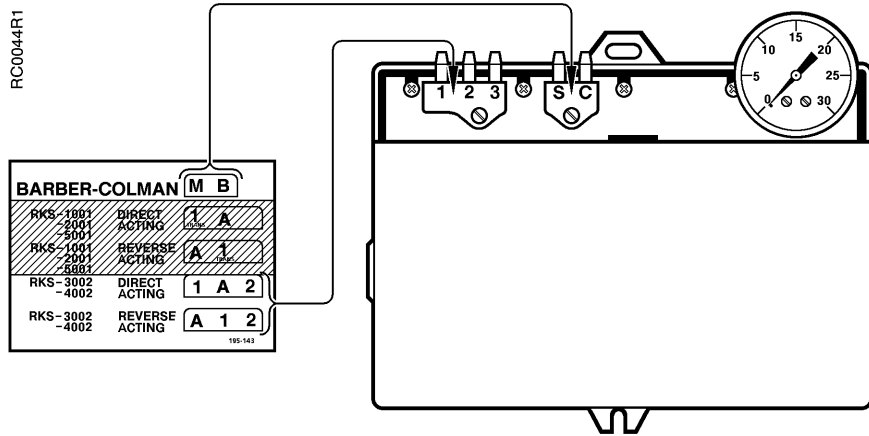


Figure 3. Custom Connector Labels for a Barber-Colman Installation (Shaded Labels are Not Used).

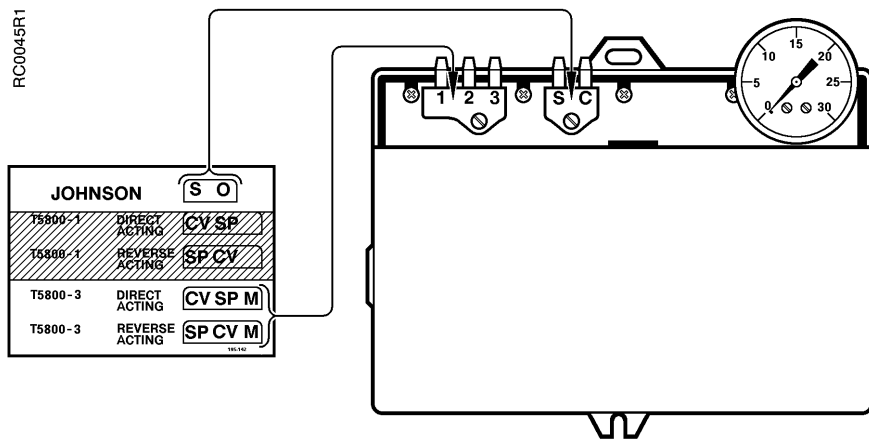


Figure 4. Custom Connector Labels for a Honeywell Installation.

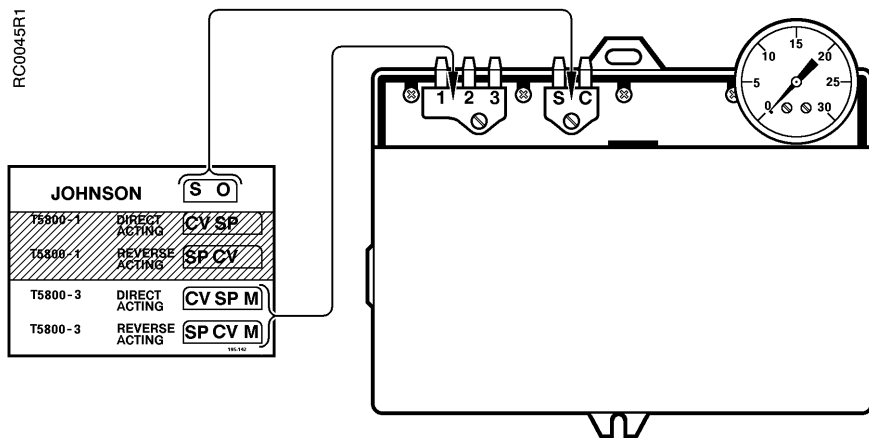


Figure 5. Custom Connector Labels for a Johnson Controls Installation (Shaded Labels are Not Used).

Installation, Continued

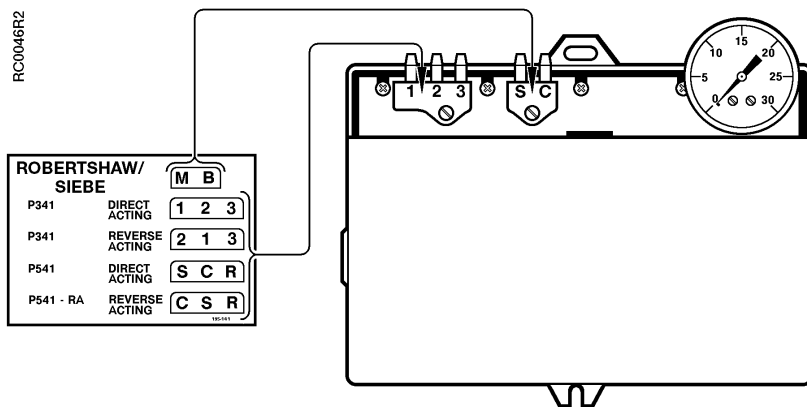


Figure 6. Custom Connector Labels for a Robertshaw/Siebe Installation.

1. Remove the old receiver-controller from the wall.
2. Mount the receiver-controller in any position on any vertical surface using two No. 8 or No. 10 screws. The integral mounting tabs are located on the top and bottom of the case.

NOTE: 1. Mount the RC 195 as close as possible to the location of the old receiver-controller to alleviate any problems that may arise because of shortened piping lengths.

2. Small vibrations such as those from an air handling unit will not affect the operation of the instrument.
3. Remove the cover by pulling the cover to the right, lifting, then pulling to the left and lifting. You now have access to the percent proportional band adjustment, the authority slide, the set point dial, and set point adjustment screw.
4. Connect the transmitter tubing to the plug-in connector. See Tables 2 through 5 for equivalent markings.

Table 2. Port Designation Equivalents.

Connections	Powers™ Controls Designation	Barber-Colman Designations
R.A. primary input	2	1
Master input (reset)	3	2
Control signal output	C	B
Supply air	S	M
CPA input	1 or 2	A

Table 3. Port Designation Equivalents.

Connections	Powers™ Controls Designation	Honeywell Designations	
		RP908B	RP920B
D.A. primary input	1	1 (if DA)	3 (if DA)
R.A. primary input	2	1 (if RA)	3 (if RA)
Master input (reset)	3	2	5
Control signal output	C	B	2
Supply air	S	M	1
CPA input	1 or 2	unmarked	9

Table 4. Port Designation Equivalents.

Connections	Powers™ Controls Designation	Johnson Controls Designations	
		DA	RA
D.A. primary input	1	CV	SP
R.A. primary input	2	SP	CV
Master input (reset)	3	M	M
Control signal output	C	O	O
Supply air	S	S	S
CPA input	1 or 2	SP	SP

Table 5. Port Designation Equivalents.

Connections	Powers™ Controls Designation	Robertshaw Designations	
		P341*	P541
D.A. primary input	1	1	S (DA)
R.A. primary input	2	(none)	S (RA)
Master input (reset)	3	3	R
Control signal output	C	B	B
Supply air	S	M	M
CPA input	1 or 2	2	C

* Reverse action requires a RA relay on output line.

Installation, Continued

- Select the stick-on label that corresponds to the range of the transmitter piped to the plug-in connector 1 or 2. See Table 6 for DA scale ranges or Table 7 for RA scale ranges. Apply the label to the set point dial.

Table 6. Scale Ranges (DA) for Receiver-Controller Set Point Dials.

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
-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
0 to 50 psi	R	0 to 345 kPa
50° to 150°F	S	10° to 66°C
40° to 240°F	T	4°C to 116°C
-40° to 160°F	V	-40°C to 71°C
30 to 190°C	W	-1 to 88°C

Table 7. Scale Ranges (RA) for Receiver-Controller Set Point Dials.

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/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
0 to 50 psi	R	0 to 345 kPa
50° to 150°F	S	10° to 66°C
40° to 240°F	T	4°C to 116°C
-40° to 160°F	V	-40°C to 71°C
30 to 190°C	W	-1 to 88°C

- Check the supply pressure. The supply pressure must be a constant 22 ± 2 psi (152 kPa). If it is different or if a dual air supply is used, error will be introduced into the transmitted signal.

Restrictors

NOTE: Before performing the following steps, make sure the system does not have any external restrictors. If there are external restrictors, you should not use the internal restrictors on the RC 195 Receiver-Controller.

To use an internal restrictor, move the restrictor tab to the "IN" position. Restrictors are in the **OUT** position when shipped from the factory.

- If the transmitter input line is connected to 1, use restrictor 1.
- If the transmitter input line is connected to 2, use restrictor 2.

- Loosen both screws on the restrictor two full turns.
- 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.
- Place the tab in the **IN** position.
- Tighten both screws with the restrictor lever fully in position against its stop. Do not overtighten the screws. The 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 the atmosphere.

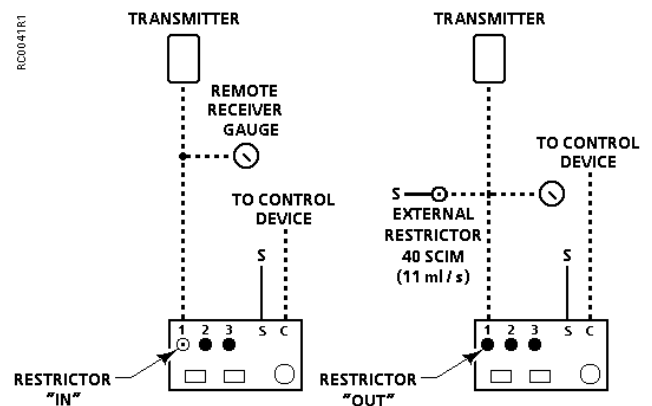


Figure 7. Examples of Piping with and without Internal Restrictors.

Installation, Continued

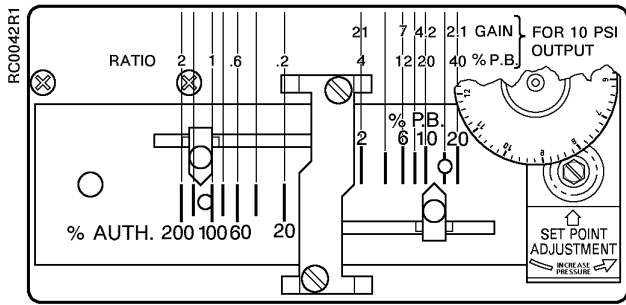


Figure 8. Percent Proportional Band Equivalents for 10 psi Output or for Gain.
 (Label Affixed Inside the Receiver Controller Cover).

Calibration

Before making adjustments, several calculations are necessary. Steps 1, 2, 3, and 4 must be completed before installation and the values recorded for future reference.

1. Determine percent proportional band setting using Formula A, Table 8, or Table 9.

Formula A

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

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

Example 1

Spring range: 5 psi (34.5 kPa)
 Desired throttling range: 10°F (5.6°C)
 Transmitter span: 100°F (56°C)

Using Formula A:

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

Percent proportional band = 10%

For metric:

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

Percent proportional band = 10%

Table 8. Percent Proportional Band Equivalents.

Lever Markings (5 psi out)	Barber-Colman Honeywell Robertshaw/Siebe Equivalent (10 psi out)
2	4
4	8
6	12
8	16
10	20
15	30
20	40

Table 9. Percent Proportional Band Equivalents for Johnson Control Gains.

% P.B.		Gain (Johnson Controls Equivalent)
5 psi out	10 psi out	
2	4	20.8
4	8	10.4
6	12	6.9
8	16	5.2
10	20	4.2
15	30	2.8
20	40	2.1

Gain = 83.33 % ÷ P.B. (10 psi out)

2. Determine percent authority setting using Formula B.

Using Formula B:

$$\% \text{ Authority} = \frac{\text{Change of input 1 or 2} + \text{TR}}{\text{Span of input 1 or 2}} \times \frac{\text{Span of input 3}}{\text{Change of input 3}} \times 100$$

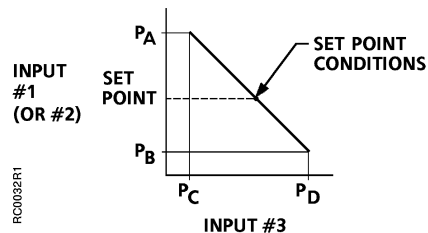


Figure 9. Graph of Percent Authority Formula.

Where:

Change of input 1 or 2 = $P_A - P_B$

Change of input 3 = $P_D - P_C$

TR = Throttling range

Example 2

Assume a hot deck reset schedule as shown in Figure 10 and a 10°F (5.6°C) throttling range.

Calibration, Continued

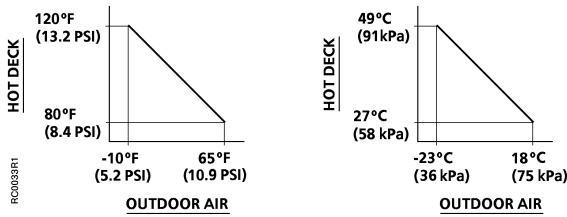


Figure 10. Sample Percent Authority.

Change of input 1 or 2: 120 - 80°F (49 - 27°C)
 Change of input 3: 65°F - (-10°F) or (18°C - [-23°C])
 TR: 10°F (5.6°C)

$$\frac{\% \text{ Authority}}{100} = \frac{(120 - 80) + 10}{100} \times \frac{160}{65 - (-10)} \times 100$$

Percent authority = 107%

For metric:

$$\frac{\% \text{ Authority}}{100} = \frac{(49 - 27) + 10}{100} \times \frac{160}{18 - (-23)} \times 100$$

Percent authority = 107%

3. Determine set point conditions.

For most applications, it is necessary to select one point called "Set point conditions" in order to establish the value of all variables.

- For a single input receiver-controller, the set point condition equals the desired control point. This is expressed in percent RH, degrees Fahrenheit, inches W.G., or metric units.
- For two and three input receiver-controllers the set point conditions equal the midpoint of the usable portion of the schedule. See *Figure 9*. This is expressed in percent RH, degrees Fahrenheit, inches W.G., or metric units.

4. Record data.

% PB/Gain = _____
 Authority/Ratio = _____
 Set point = _____

Whenever the proportional band is changed, the set point dial must be recalibrated.

Single input (See Figure 11)

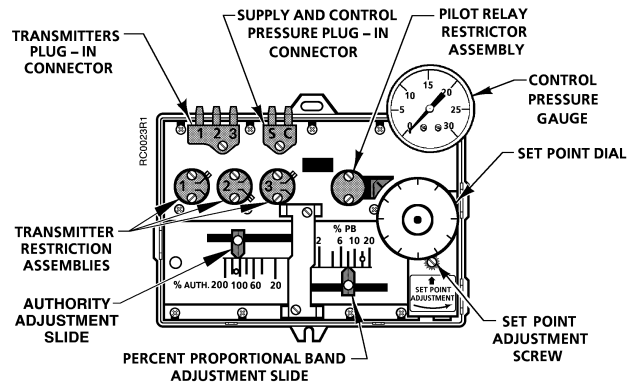


Figure 11. Multiple Input Receiver-Controller Connector, Restrictor, and Adjustment Locations.

1. Set the proportional band pointer to value recorded in Step 4.
2. Apply set point pressure to the selected input (#1/DA or #2/RA), and with a screwdriver turn the set point adjustment screw until control pressure reaches 8 psi (55 kPa) or midpoint pressure of the spring range of an actuator.

If you are controlling two actuators in sequence, use the following formula to find the control pressure desired.

Control pressure =

$$\frac{\text{High end of the higher spring range} - \text{Low end of the lower spring range}}{2} + \text{Low end of the lower spring range}$$

Example 3

N.O. valve spring range = 3 to 8 psi

N.C. valve spring range = 9 to 14 psi

$$\text{Control pressure} = \frac{14 - 3}{2} + 3 = 8.5 \text{ psi}$$

Set the control pressure to 8.5 psi.

3. Calibrate the set point dial by pulling it up, turning it to agree with the transmitter input, and then releasing it.

NOTE: Make sure that the set point dial scale matches the transmitter range.

4. Turn the set point adjustment screw until the dial agrees with the value recorded in *Calibration*, Step 4.

Two or three inputs (See Figure 11)

Use an RC Simulator to provide a variety of input signal pressures. This allows calibration across the entire range of the transmitter.

Instructions on using the simulator are included with the product.

1. Attach the RC 195 Simulator with the plug-in connector.
2. Percent proportional band. Move the pointer to the desired setting on the proportional band scale of the receiver-controller.
3. Authority (when input three is used). Move the pointer to the percent authority band scale of the receiver-controller.
4. Simulate set point conditions. Adjust the knobs on the simulator so that all the pneumatic inputs are at their set point condition.

5. Set point. Turn the set point adjustment screw of the receiver-controller to obtain the desired control pressure. Pull the set point dial up, turn it to agree with the set point recorded above, and then release it.
6. Check operation. Simulate pneumatic inputs corresponding to both ends of the reset schedule to ensure that the receiver controller is in calibration throughout its entire range. Minor variations of 2 to 3 psi (14 to 21 kPa) in the control pressure are normal.

Scale Conversion Card

The scale conversion card (Part No. 144-022) shows the relationship of pressure to transmitter range in both English and metric units.

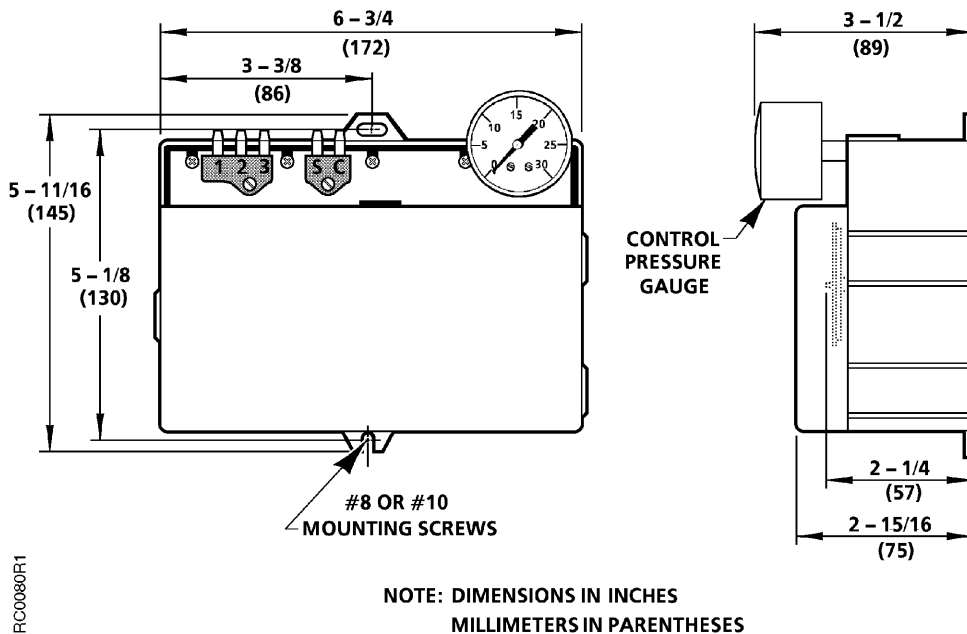


Figure 12. Dimensions of the RC 195 Multiple Input Receiver-Controller.

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