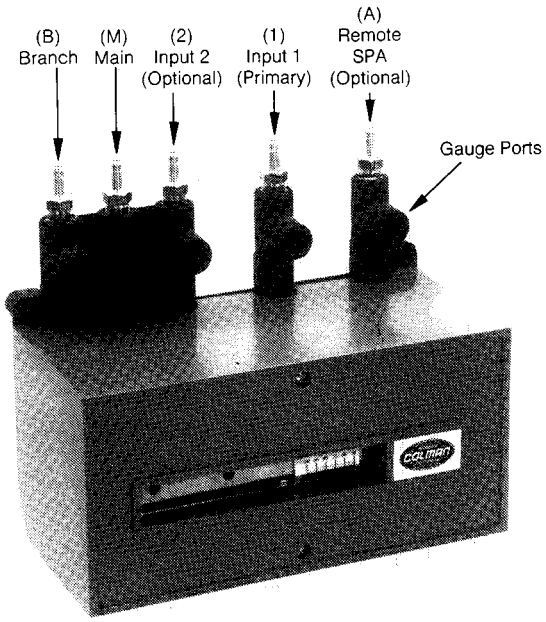
RKSR-4000

Schneider Electric

Universal Pneumatic Receiver-Controller

APPLICATION

For use in conjunction with remote proportional transmitters for proportional control of pneumatic actuated dampers, valves, etc. in air conditioning systems. The transmitter/receiver-controller system may be used to control temperature, humidity or pressure.



SPECIFICATIONS

Receiver-Controller: Forced balanced pneumatic amplifier. Relay type.
Setpoint: Adjustable °F, °C, in. water mm water, % relative humidity labels (included with controller).
Input Signals: 3 to 15 psig (21 to 103 kPa) typically from a transmitter or remote setpoint. Maximum 30 psig (207 kPa).
Output Air Signal: From 0.5 psig (3.4 kPa) to within 0.5 psig (3.4 kPa) of supply air pressure.
Environment:
- **Ambient Temperature Limits,**
  - **Shipping and Storage** -40 to 150°F (-40 to 65°C).
  - **Operating** 40 to 150°F (4 to 65°C).
- **Humidity,** 10 to 98% RH, non-condensing.
- **Locations,** NEMA Type 1 indoor only.

Supply Air Pressure: Clean, oil free, dry air required (see installation section).
- **Nominal,** 20 psig (138 kPa).
- **Minimum,** 18 psig (124 kPa).
- **Maximum,** 30 psig (207 kPa)

Air Connections:
- **Field Connections,** Barb connectors for 1/4" O.D. plastic tubing or 1/8" FNPT by removing barb connectors.
- **Gauge Ports,** 1/8" FNPT for 1-1/2" dia. gauges such as AL-362 or AKS-6XXX series receiver gauges.

Air Consumption for Sizing Air Compressors: 0.008 scfm (3.8 ml/s) plus 0.024 scfm (11.4 ml/s) for each transmitter and remote setpoint.
Air Capacity for Sizing Air Mains: 16 scim (4.4 ml/s) plus 36 scim (13.2 ml/s) for each transmitter and remote setpoint.
Mounting: Upright on surface of wall or panel.
Dimensions: 6-3/4" high x 7-7/16" wide x 4" deep (172 mm x 189 mm x 102 mm).

ACCESSORIES

AL-362	Stem mounted back connected 0 to 30 psi gauge
AT-532-111-1-1	0.0075 tee restrictor for 5/32” plastic tubing
AT-532-222-1-1	0.0075 tee restrictor for 1/4” plastic tubing
AT-532-098-1-1	0.0075 restrictor (white)
AT-539	Pilot pressure kit for low and high limit applications
TOOL-95	Pneumatic calibration tool kit
TOOL-100	Transmitter/receiver-controller calibration panel
TOOL-100-500	Transmitter/receiver-controller calibration panel in a protective case
TOOL-133	Sliderule for calculating percent authority and percent proportional band

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Table-1 Specifications.

Part Number	Description	Remote Setpoint Adjustor[a]	Control Action[b]	Percent Proportional Band	Percent Authority Input 2[c]	Reset Action Input 2
RKSR-4000[d]	Replacement for Single or Dual Input Receiver-Controllers	±10% of Primary Transmitter Span (Input 1)	D.A.	Adjustable 2-1/2% to 40% of Primary Transmitter Span (Input 1) for 10 psi output change at port B	Adjustable 10% to 200% of Primary Transmitter (Input 1)	Reverse Reset[e] To obtain Direct Reset requires RKS-5001

[a] Increasing pressure from remote setpoint (port A) increases setpoint of receiver-controller.
[b] D.A. (Direct Acting): Increases output pressure on rise in input 1 pressure. Field changeable to reverse acting.
R.A. (Reverse Acting): Decreases output pressure on rise in input 1 pressure.
[c] Primary transmitter is input 1 and secondary transmitter is input 2.
[d] RKSR-4000 is a replacement receiver-controller. It is shipped as a single input unit. Remote setpoint and input 2 functions can be added in the field with parts included with RKSR-4000.
[e] Reverse Reset: For direct acting the output pressure increases as input 2 increases. For reverse acting the output pressure increases as input 2 decreases.

Table-2 Transmitter, Receiver Gauges and Remote Setpoint Selection Guide and Transmitter Sensitivity.

Transmitter Part Number	Application (Type)	Transmitter Range for 3 to 15 psi Output	Transmitter Sensitivity	Optional Indication Gauge		Optional Remote Setpoint[a] Requires AKS-1100 & Scale shown below
				1-1/2" Dia. Stem Mount	3-1/2" Dia. Panel Mount	
HKS-2033	Duct Humidity	10 to 90% RH	0.15 psi/1% RH	AKS-6281	AKS-9081	AKS-1189 (±8%)
HKS-5033	Room Humidity	10 to 90% RH	0.15 psi/1% RH	AKS-6281	AKS-9081	AKS-1189 (±8%)
HKS-8065	Duct Enthalpy	16 to 40 BTU/lb. Dry Air	0.5 psi/1 BTU/lb.	None	AKS-9085	None
PKS-2011	Differential Pressure	2" W.C. (Adj. -0.25 to 6" W.C.)	0.6 psi/0.1 W.C.	None	AKS-909X Ser.	AKS-1199 (±0.2" W.C.)/AKS-1191 (±5 mm W.C.)
PKS-9001	Differential Pressure	0 to 50 psi (344 kPa)	0.24 psi/1 psi	AKS-6287	AKS-9087	None
PKS-9002	Differential Pressure	0 to 100 psi (689 kPa)	0.12 psi/1 psi	AKS-6288	AKS-9088	None
PKS-9101	Linear Velocity	200 to 2000 FPM[b]	0.006 psi/1 FPM	AKS-6296	AKS-9096	None
PKS-9102	Linear Velocity	300 to 3000 FPM[b]	0.004 psi/1 FPM	AKS-6297	AKS-9097	None
PKS-9103	Linear Velocity	400 to 4000 FPM[b]	0.003 psi/1 FPM	AKS-6298	AKS-9098	None
PKS-9104	Linear Velocity	550 to 5500 FPM[b]	0.0022 psi/1 FPM	AKS-6299	AKS-9099	None
TKS-2031	Outside Air Temp	-40 to 160°F (-40 to 71°C)	0.06 psi/1°F	AKS-6261	AKS-9061	AKS-1169 (±20°F)/AKS-1179 (±11°C)
TKS-4014	Duct Temp. (Averaging)	0 to 100°F (-18 to 38°C)	0.12 psi/1°F	AKS-6244	AKS-9044	AKS-1141 (±10°F)/AKS-1149 (±5.5°C)
TKS-4017	Duct Temp. (Averaging)	50 to 150°F (10 to 66°C)	0.12 psi/1°F	AKS-6247	AKS-9047	AKS-1129 (±5°F)/AKS-1139 (±2.8°C)
TKS-5001	Room Temp. (Wall)	50 to 100°F (10 to 38°C)	0.24 psi/1°F	AKS-6221	AKS-9021	AKS-1129 (±5°F)/AKS-1139 (±2.8°C)
TKS-5001-600[c]	Room Temp. Aspirating	50 to 100°F (10 to 38°C)	0.24 psi/1°F	AKS-6221	AKS-9021	AKS-1129 (±5°F)/AKS-1139 (±2.8°C)
TKS-6001	Light Troffer (Temp.)	50 to 100°F (10 to 38°C)	0.24 psi/1°F	AKS-6221	AKS-9021	AKS-1129 (±5°F)/AKS-1139 (±2.8°C)
TKS-7001	Diffuser (Temp.)	50 to 100°F (10 to 38°C)	0.24 psi/1°F	AKS-6221	AKS-9021	AKS-1129 (±5°F)/AKS-1139 (±2.8°C)
TKS-8014[d]	Immersion (Temp.)	0 to 100°F (-18 to 38°C)	0.12 psi/1°F	AKS-6244	AKS-9044	AKS-1141 (±10°F)/AKS-1149 (±5.5°C)
TKS-8033[d]	Immersion (Temp.)	40 to 240°F (4 to 118°C)	0.06 psi/1°F	AKS-6263	AKS-9063	AKS-1169 (±20°F)/AKS-1179 (±11°C)
TKS-9014	Duct Temp. (Rod & Tube)	0 to 100°F (-18 to 38°C)	0.12 psi/1°F	AKS-6244	AKS-9044	AKS-1141 (±10°F)/AKS-1149 (±5.5°C)
TKS-9017	Duct Temp. (Rod & Tube	50 to 150°F (10 to 66°C)	0.12 psi/1°F	AKS-6247	AKS-9047	AKS-1141 (±10°F)/AKS-1149 (±5.5°C)

[a] Optional remote setpoints can only be used with RKS-2001, RKS-4002 and RKSR-4000 receiver-controllers.
[b] Transmitter output 4.2 to 15 psi for range.
[c] Requires AT-509 wall box.
[d] Requires AT-201 copper bulb well or AT-203 stainless steel bulb well.

Table-3 RKSR-4000 Competitive Cross Reference Comparison of Receiver-Controllers[a].

Part Number	Manufacturer	Port Codes for RKSR-4000 Versus Ports on Receiver-Controller Being Replaced					Proportional Band Percent	Percent Authority	Remote Setpoint Authority (%)	Reset Action (Input 2)	Port Connection Type	Integral Action
		Port B	Port M	Port 1	Port 2	Port A						
RKSR-4000	TAC	B	M	1	2	A	2.5 to 40%	10 to 200%	+10 to -10%	Reverse	1/4" Plastic Tube (1/8" FNPT)	No
RKS-4002	TAC	B	M	1	2	A	2.5 to 40%	10 to 200%	+10 to -10%	Reverse	1/4" Plastic Tube (1/8" FNPT)	No
RKS-1001	TAC	B	M	1	Unused	Unused	2.5 to 40%	-	-	-	1/4" Plastic Tube (1/8" FNPT)	No
RKS-2001	TAC	B	M	1	Plug	A	2.5 to 40%	-	+10 to -10%	-	1/4" Plastic Tube (1/8" FNPT)	No
RKS-3001	TAC	B	M	1	2	Unused	2.5 to 40%	10 to 200%	-	Reverse	1/4" Plastic Tube (1/8" FNPT)	No
RP908A1005	Honeywell	B	M	1	unused	unused	2.5 to 40%	-	-	-	5/32 or 1/4" Plastic Tube	No
RP908A1013	Honeywell	B	M	1	unused	CPA	2.5 to 40%	-	-10 to -10%	-	5/32 or 1/4" Plastic Tube	No
RP908A1047[b]	Honeywell	B	M	1	unused	unused	2.5 to 40%	-	-	-	5/32 or 1/4" Plastic Tube	No
RP908B1003	Honeywell	B	M	1	2	unused	2.5 to 40%	10 to 200%	-	Reverse	5/32 or 1/4" Plastic Tube	No
RP908B1011	Honeywell	B	M	1	2	CPA	2.5 to 40%	10 to 200%	+10 to -10%	Reverse	5/32 or 1/4" Plastic Tube	No
RP914C1037	Honeywell	B	M	1	2	unused	2.5 to 60%	[c]	-	Reverse	1/4" Plastic Tube	Yes[d]
RP914C1052	Honeywell	B	M	1	2	CPA	2.5 to 60%	[c]	+10 to -10%	Reverse	1/4" Plastic Tube	Yes[d]
RP920A	Honeywell	2	1	3	unused	9	2.5 to 50%	-	+15 to -15%	-	5/32 or 1/4" Plastic Tube	No
RP920B	Honeywell	2	1	3	5	9	2.5 to 50%	5 to 300%	+15 to -15%	DA/RA[e]	5/32 or 1/4" Plastic Tube	No
RP920C	Honeywell	2	1	3	unused	9	2.5 to 50%	-	+15 to 15%	-	5/32 or 1/4" Plastic Tube	Yes[d]
RP920D	Honeywell	2	1	3	5	9	2.5 to 50%	5 to 300%	+15 to -15%	DA/RA[e]	5/32 or 1/4" Plastic Tube	Yes[d]
PM100A41[f]	ITT General Controls	B	M	1	unused	unused	0-50 DA/0-40 RA	-	-	Reverse	1/4" Plastic or Copper	No
PM100A42[f]	ITT General Controls	B	M	1	unused	BS	0-50 DA/0-40 RA	-	40%	Reverse	1/4" Plastic or Copper	No
PM100A43[f]	ITT General Controls	B	M	1	2	unused	0-50 DA/0-40 RA	0 to 200%	-	Reverse	1/4" Plastic or Copper	No
PM100A44[f]	ITT General Controls	B	M	1	2	BS	0-50 DA/0-40 RA	0 to 200%	40%	Reverse	1/4" Plastic or Copper	No
PM100D	ITT General Controls	B	M	1	unused	unused	3 to 50%	-	-	Reverse	1/4" Plastic or Copper	No
PM100R	ITT General Controls	B	M	1	unused	unused	3 to 50%	-	-	Reverse	1/4" Plastic or Copper	No
PP2341-001	Robertshaw	B	M	1	3	2	4 to 40%	20 to 200%	+15 to -15%	Reverse	1/4" Plastic Tube	No
P341	Robertshaw	B	M	1	3	2	4 to 40%	20 to 200%	+15 to -15%	Reverse	1/4" Plastic Tube	No
2341-001	Robertshaw	B	M	1	3	2	4 to 40%	20 to 200%	+15 to -15%	Reverse	1/4" Plastic Tube	No
P340-112	Robertshaw											
P340-122	Robertshaw											
RC-185-1	MCC Powers	C	S	1	3	2	2 to 170%	0 to 200%	[c]	DA/RA[e]	1/8" FNPT	No
RC-195-1	MCC Powers	C	S	1 or 2[a]	3	[c]	4 to 40%	20 to 200%	[c]	DA/RA[e]	1/4" Plastic Tube	No
T-5302-1 (DA)	Johnson Controls	O	S	P	unused	unused	3 to 100%	-	-	-	1/8" FNPT	No
T-532-2 (RA)	Johnson Controls	O	S	P	unused	unused	3 to 100%	-	-	-	1/8" FNPT	No
T-5303-1 (DA)	Johnson Controls	O[c]	S[c]	P[c]	[c]	unused	1.4 to 40%	2 to 85%	-	Direct[e]	1/8" FNPT	No
T-5303-2 (DA)	Johnson Controls	O[c]	S[c]	P[c]	[c]	unused	1.4 to 40%	2 to 85%	-	Reverse	1/8" FNPT	No
T-5303-3 (RA)	Johnson Controls	O[c]	S[c]	P[c]	[c]	unused	1.4 to 40%	2 to 85%	-	Direct[e]	1/8" FNPT	No
T-5303-4 (RA)	Johnson Controls	O[c]	S[c]	P[c]	[c]	unused	1.4 to 40%	2 to 85%	-	Reverse	1/8 FNPT	No
T-5312-1	Johnson Controls	O[c]	S[c]	P[c]	unused	unused	4 to 100%	-	-	-	1/4" Plastic Tube	No
T-5312-2 (2-Pos)	Johnson Controls	O[c]	S[c]	P[c]	unused	unused	0.2 to 4 psi Diff.	-	-	-	1/4" Plastic Tube	No
T-5800-1	Johnson Controls	O	S	2	unused	unused	6 to 200%	-	-	-	1/4" Plastic Tube	No
T-5800-2	Johnson Controls	O	S	2	unused	unused	6 to 200%	-	-	-	1/4" Plastic Tube	Yes[d]
T-5800-3	Johnson Controls	O	S	2	3	unused	6 to 200%	16 to 1000%	-	DA/RA[e]	1/4" Plastic Tube	No
T-5800-4	Johnson Controls	O	S	2	3	unused	6 to 200%	16 to 1000%	-	DA/RA[e]	1/4" Plastic Tube	Yes[d]
T-9001 (Hi Vol)	Johnson Controls	O	S	2	unused	1	2.5 to 33%	-	[c]	-	1/4" Plastic Tube	No
T-9002 (Hi Vol)	Johnson Controls	O	S	2	3	1	2.5 to 33%	20 to 300%	[c]	DA/RA[e]	1/4" Plastic Tube	No
T-9005 (Lo Vol)	Johnson Controls	O	S	2	unused	1	5 to 166%	-	[c]	-	1/4" Plastic Tube	No
T-9006 (Lo Vol)	Johnson Controls	O	S	2	3	1	5 to 166%	20 to 300%	[c]	DA/RA[e]	1/4" Plastic Tube	No
T-9110-8001 (DA)	Johnson Controls	O	S	2	unused	1	100%	-	[c]	-	1/4" Plastic Tube	Yes[d]
T-9110-8001 (RA)	Johnson Controls	O	S	1	unused	2	100%	-	[c]	-	1/4 Plastic Tube	Yes[d]
T-9111-8001 (DA)	Johnson Controls	O	S	2	unused	unused	100%	-	-	-	1/4" Plastic Tube	Yes[d]
T-9111-8002 (RA)	Johnson Controls	O	S	2	unused	unused	100%	-	-	-	1/4" Plastic Tube	Yes[d]
KCR-1001	DYNACON	B	M	1	3	2	4 to 40%	20 to 200%	+10 to -10%	Reverse	1/4" Plastic Tube	No

[a] The user must determine the substitution Acceptability by reviewing the control application and specifications.
[b] Requires AT-539 pilot pressure kit ordered separately. RP908A1047 is a limit controller.
[c] Exact information is not available.
[d] Integral action requires AK-52203 ordered separately.
[e] To obtain direct reset requires RKS-5001 ordered separately. RKS-5001 must be set as 1:1 ratio relay.
[f] "BL" port provides a low signal limit for the branch. This function would require AK-51632 highest of two pressure selection relay ordered separately.

Replacement Of Competitive Receiver-Controllers With RKSR-4000

The RKSR-4000 can be used as a functional replacement for competitive receiver-controllers. As a functional replacement it will require at least minor adaptations of the connections and mounting. Table 3 has a comparison between RKSR-4000 and competitive receiver-controllers.

Replacement Tips

1. Consult Table 3 to determine if any equipment other than RKSR-4000 is required to replace the competitive receiver-controller.
2. Using Table 3, convert and mark the tubing connections for the receiver-controller being replaced to the appropriate port connections for RKSR-4000.
3. From the receiver-controller being replaced, record the percent proportional band, setpoint scale range and percent authority if dual input unit.
4. Based on the application or the configuration of the competitive receiver-controller, determine if direct acting or reverse acting is required.
5. Determine if existing transmitter(s) and/or remote setpoint have an external restrictor by disconnecting them from the receiver-controller. If they are sending an air signal, they have an external restrictor which means a blocking gasket is required in that port of the RKSR-4000.
6. RSKR-4000 is shipped as a single input receiver-controller. See installation section to add restrictors to ports 2 (secondary transmitter) and A (remote setpoint) as required.
7. Using the information in steps 1 through 6, proceed through the installation. Adjustments and Calibration sections of this sheet.

DEFINITIONS

Direct Acting The branch output pressure (port B) increases as primary transmitters (input 1) pressure increases.

Direct Reset (requires RKS-5001 to reverse transmitter signal) The setpoint of the primary transmitter (input 1) is increased as secondary transmitters (input 2) pressure increases. Typical examples of direct reset are humidity reset (outside air temperature drops and humidity setpoint is decreased) or summer compensation (outside air temperature increases and inside temperature setpoint is increased).

Percent Authority The adjustment of a receiver-controller which determines the effect of the reset signal of the secondary transmitter (input 2) as a percentage of the signal of the primary transmitter (input 1).

Percent Proportional Band That percentage of the primary transmitters span (input 1) which will produce a 10 psig (3 to 13 psi) output change in the branch pressure.

Receiver-Controller A device which receives one or more pressure signals from transmitters and remote setpoints and amplifies (percent proportional band) a small portion of their 3 to 15 psi signal into an output signal capable of positioning final control devices. It also establishes the setpoint and, in the case of two input models, provides reset schedule (percent authority).

Receiver Gauge Accurate air gauges with scales graduated in values, such as degrees Fahrenheit, percent relative humidity, inches of water, etc., which are used to indicate the value of the sensed media.

Reverse Acting The branch output pressure (port B) decreases as primary transmitter's (input 1) pressure increases.

Reverse Reset (standard with two input receiver-controller) The setpoint of the primary transmitter (input 1) is increased as secondary transmitter's (input 2) pressure decreases. Typical examples of reverse reset are hot water reset or room and discharge control.

Throttling Range The amount of change of the variable (temperature, humidity, pressure) as measured by primary output change at the branch (port B).

Transmitter A device that measures the variable (temperature, humidity, pressure) and sends a direct acting, linear, proportional 3 to 15 psig (12 psi span) signal to the receiver-controller and receiver gauge, therefore accomplishing control and indication.

Transmitter Sensitivity The output variation that is produced by a change of one unit of the sensed variable. The sensitivity is expressed in psi change per unit of sensed variable (see Table 2). The sensitivity is transmitter output span (3 to 15 psi or 12 psi) divided by the span in units.

Variable The temperature, humidity, pressure, etc., that the control system operates to maintain.

PRE-INSTALLATION

Inspection

Visually inspect the carton for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the carton and visually inspect the device for obvious defects. Return damaged or defective parts.

Required Installation Items

- Appropriate drill and drill bit for mounting screws
- Appropriate screwdriver (not provided) for mounting screws (provided)
- 3/16" wrench (not provided) for adjustments
- Diagonal wire cutter (not provided) to convert the units to R.A.
- Crescent wrench (not provided) for gauge and plug installation
- Pliers (not provided)
- TOOL-100 pneumatic calibration panel (not provided)
- Appropriate accessories

INSTALLATION

Caution:

- Installer must be a qualified experienced technician.
- Make all connections in accordance with piping diagrams, and in compliance with national and local codes.
- Avoid locations where excessive moisture, corrosive fumes or vibration are present, i.e. NEMA 1. The controller cover is intended for indoor use primarily to provide a degree of protection against contact with the enclosed unit.

Clean, Dry, Oil Free Air supplies for Pneumatic Systems

Caution: Receiver-controller and transmitter reliability/life will be affected if the air supply has particles larger than 0.03 microns and more than 0.1 PPM oil vapor.

A refrigerated air dryer, particulate filter and a coalescing filter will provide this quality of air (reference engineering bulletin EN-123).
Compressor oil must be mineral base. **Synthetic or parafin base oils will destroy pneumatic controls.**

Mounting

Mount the receiver-controller in an upright position on wall, panel, etc., using the three (3) mounting screws provided. Refer to dimensional drawing (Figure 1) shown below for location of port connections.

Port B = Branch, connected to controlled device

Port M = Main, supply air pressure

Port 2 = Input number 2 from secondary transmitter

Port 1 = Input number 1 from primary transmitter

Port A = Auxiliary input from remote setpoint

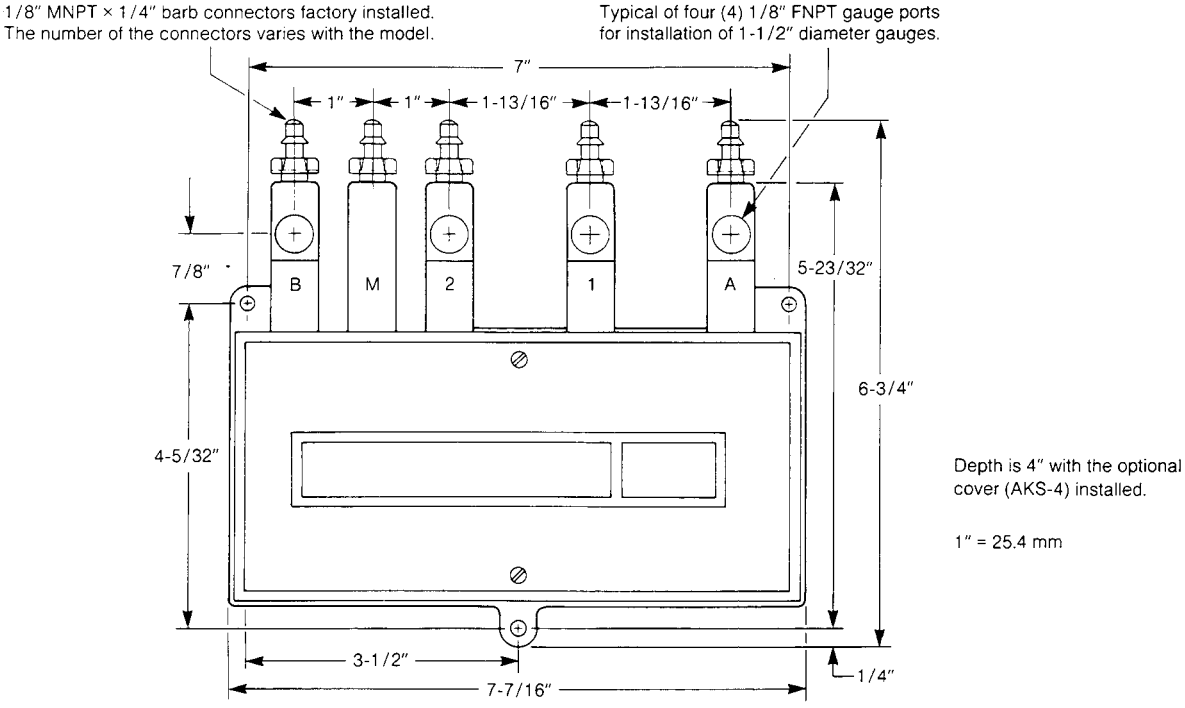


Figure-1 Mounting Dimensions and Port Connections.

Piping

Typical piping arrangements are shown in Figures 2 though 8.

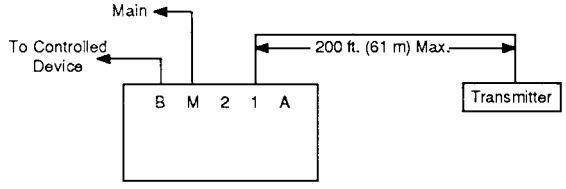


Figure-2 Typical Piping Single Input Receiver-Controller (Internal Restrictor for Transmitter).

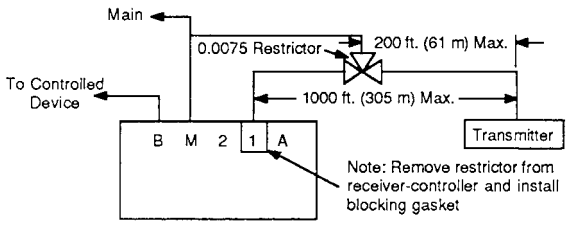


Figure-3 Typical Piping Single Input Receiver-Controller (External Restrictor for Transmitter).

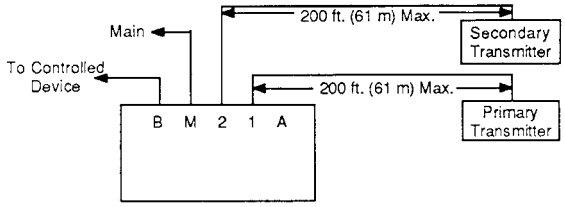


Figure-4 Typical Piping Dual Input Receiver-Controller (Internal Restrictor for Transmitter).

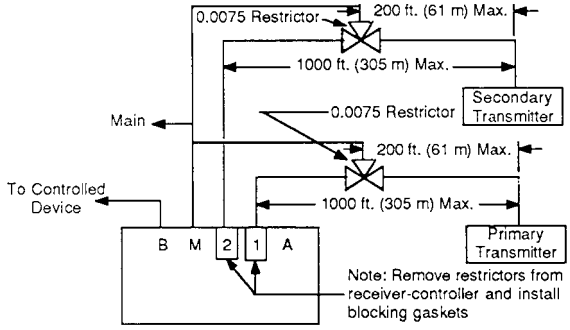


Figure-5 Typical Piping Dual Input Receiver-Controller (External Restrictor for Transmitter).

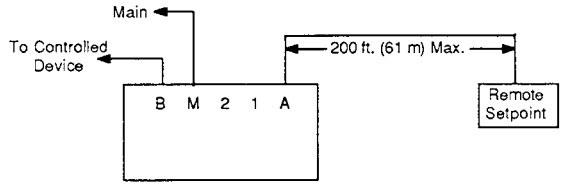


Figure-6 Typical Piping for Remote Setpoint into Receiver-Controller (Internal Restrictor for Remote Setpoint).

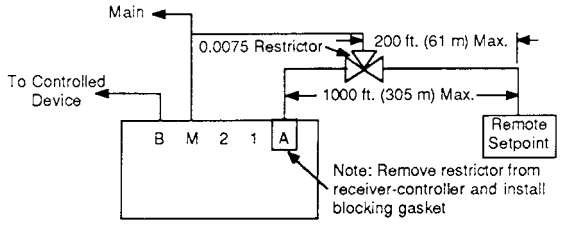
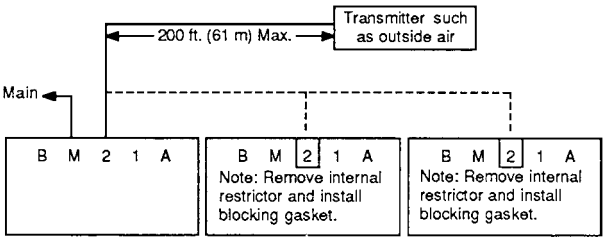


Figure-7 Typical Piping for Remote Setpoint into Receiver-Controller (External Restrictor for Remote Setpoint).



Note: The transmitter is supplied its air by one receiver-controller or an external restrictor. The total length of all tubing must not exceed 1000 feet (305 m) and the restrictor must be within 200 feet (61 m) of the transmitter. Typically a maximum of ten receiver-controllers can be fed from one transmitter in this manner. The example shown above is for input 2, but applies to input 1 also.

Figure-8 Typical Piping for One Transmitter with Multiple Receiver-Controllers.

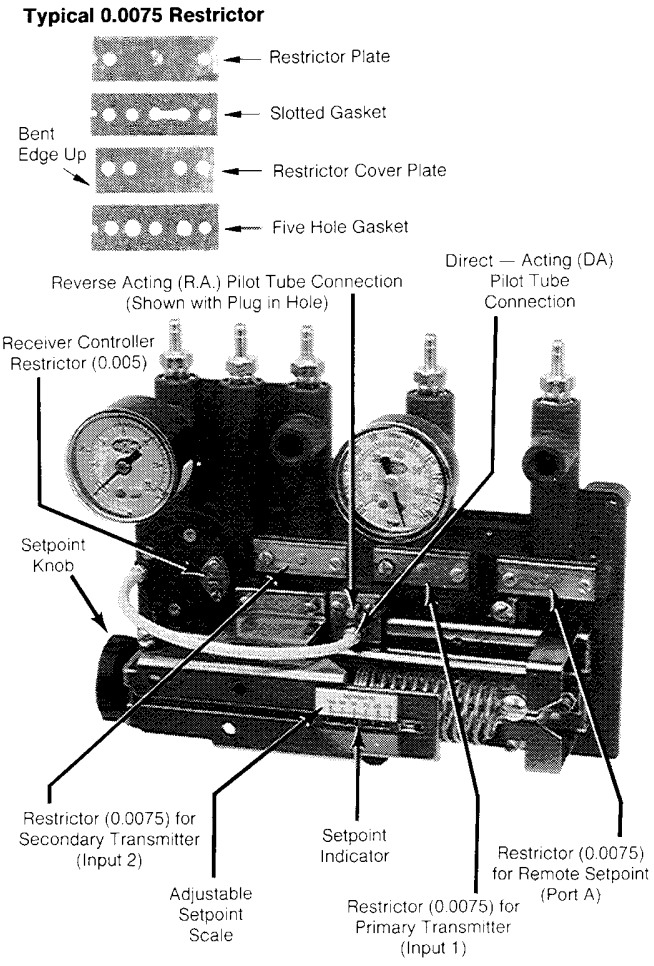


Figure-9 Gasket, Restrictors, Pilot Tube and Setpoint Identification.

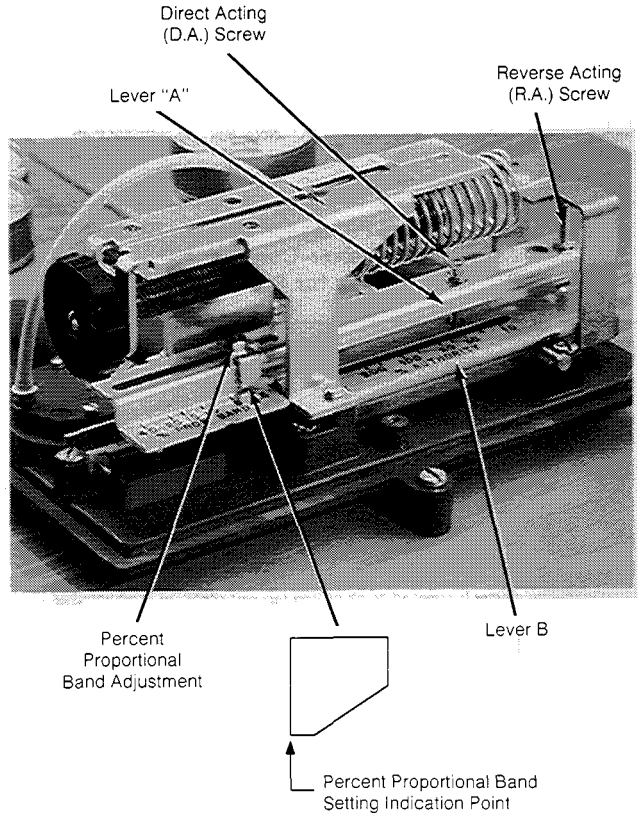


Figure-10 Adjustments.

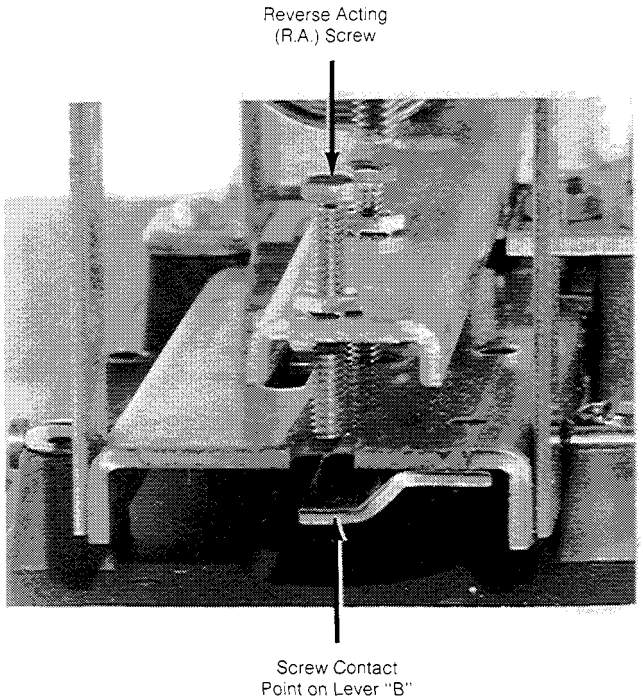


Figure-11 Reverse Acting Screw Location.

Installation of Blocking Gasket

In cases where the transmitter is more than 200 feet (61 m) from the receiver-controller (see Piping section) or where the input signal is the output pressure of another controller (except TK-5XXX series), the restrictor in the receiver-controller for that input must be removed and the passages blocked. To block these passages, proceed as follows (see Figure 9).

1. Remove restrictor cover plate screws.
2. Remove restrictor cover plate.
3. Remove restrictor plate and gaskets.
4. Install blocking gasket packaged with the receiver-controller.
5. Install cover plate and secure with the two (2) cover plate screws.

The blocking gaskets have a red edge which will be visible above the top of the plate to indicate the restrictor has been removed.

Installation of Restrictors in Ports 2 and A in RKSR-4000 or Replacement of an Existing Restrictor

The RKSR-4000 is shipped as a single input receiver-controller with ports 2 and A having blocking gaskets installed. If internal restrictors are required in ports 2 and/or A, proceed as follows (see Figure 9).

1. Remove restrictor cover plate screws.
2. Remove restrictor cover plate and blocking gasket.
3. Using AT-524-010 provided with RKSR-4000, install per the following:
   a. Place the five hole gasket, with the notched end to the left, on the restrictor mounting pad.

Note: The AT-524-010 has a replacement filter for the factory installed filter. The filter should not require replacement.

   b. Place the restrictor plate over the bottom gasket with the bent edge up.
   c. Place the gasket with the slot between the two holes and with the notched end to the left over the restrictor plate.
   d. Place the restrictor cover plate with the cavity side down and with the notched end to the left over the slotted gasket and secure with the two (2) cover plate screws.

Changing the Receiver-Controller to Reverse Acting (R.A.)

The receiver-controllers are factory sent as direct acting (D.A). To convert the unit to reverse acting (R.A.), proceed as shown below (see Figures 9, 10 and 11).

1. Cut the pilot tube with a diagonal wire cutter on a 45° angle as close to the D.A. pilot tube connection as possible. See Figure 9 for location.
2. Remove the plug from R.A. pilot tube connection and tape it to the inside of the cover. Insert the pilot tube into the R.A. tube connection.
3. With a 3/16” wrench, turn the R.A. screw clockwise (in) until it contacts lever B (see Figures 9, 10 and 11). With a 3/16” wrench, turn the D.A. screw counterclockwise (out) approximately four turns.

Changing the Receiver-Controller back to Direct Acting (D.A.)

The receiver-controller is shipped direct acting (D.A.). The following only applies if the unit has been changed to reverse acting (R.A.), and it is now required to be changed back to direct acting (D.A.). See Figures 9, 10 and 11.

1. Remove the pilot tube from the R.A. pilot tube (see Figure 9).
2. Insert the plug taped to the cover of the unit in the vacated hole.
3. Insert M-104 eyelet on the pilot tube. Remove any tube and eyelet that may be on the D.A. pilot tube connection. Push the tube over the D.A. pilot tube connection.
4. Using a pliers, push M-104 eyelet in place to secure the pilot tube to the D.A. pilot tube connection.
5. With a 3/16” wrench, turn the D.A. screw clockwise (in) until it contacts lever B (see Figures 10 and 11). With a 3/16” wrench, turn the R.A. screw counterclockwise (out) approximately four turns.

Installation of Gauges or Pipe Plugs

The gauge ports must either have pipe plugs (supplied with receiver-controller) or gauges installed in the ports that are active.

Installation of Setpoint Label

Select a setpoint label (provided) that matches the primary transmitter (input 1) and apply the label to the setpoint slider (see Figure 9).

ADJUSTMENTS

Percent Proportional Band Adjustment (P.B.)

Percent proportional band setting is that percentage of the primary transmitter span (input 1) which will produce 10 psig (3 to 13 psi) output change in the branch (port B) pressure. The P.B. must be calibrated and set prior to the calibration of the setpoint. If changes in the P.B. are required for stable control, recalibration of receiver-controller is required. See Figures 10 and 12 for location of P.B. adjustment. To adjust use 3/16” wrench to loosen the lock nut, move the slider to the desired setting and tighten the nut.

$$\text{P.B.} = \frac{\text{Throttling Range}}{\text{Transmitter Span (Input 1)}} \times 100$$

Example:

100°F span primary transmitter

10°F required throttling range for 10 psi output change

$$\text{P.B.} = \frac{10°\text{F}}{100°\text{F}} \times 100 = 10\%$$

If the pressure change required to drive all the controlled devices through their stroke is other than 10 psi, the following formula can be used.

$$\text{P.B.} = \frac{\text{Throttling Range}}{\text{Transmitter Span (Input 1)}} \times \frac{10 \text{ psi}}{\Delta P} \times 100$$

ΔP = desired pressure change

Typical percent proportional bands versus throttling ranges are shown in Table 4 below for typical transmitter spans.

Table-4 Throttling Range For 10 PSI Change.

P.B.	50°F Span	100°F Span	200°F Span	80% RH Span	2" W.C. Span
2.5%	1.25°F	2.5°F	5°F	2% RH	0.05"
5%	2.5°F	5°F	10°F	4% RH	0.1"
10%	5°F	10°F	20°F	8% RH	0.2"
15%	7.5°F	15°F	30°F	12%	0.3"
20%	10°F	20°F	40°F	16%	0.4"
25%	12.5°F	25°F	50°F	20%	0.5"
30%	15°F	30°F	60°F	24%	0.6"
35%	17.5°F	35°F	70°F	28%	0.7"
40%	20°F	40°F	80°F	32%	0.8"

Setpoint Knob

The setpoint knob should be rotated per Table 5 shown below to achieve the correct branch pressure.

Table-5 Rotate Setpoint Knob.

Control Action	Branch Pressure Below Desired (8 psi)	Branch Pressure above Desired (8 psi)
D.A.	CCW	CW
R.A.	CW	CCW

The setpoint knob has ten (10) equal divisions. Each division equals a branch output change of approximately 0.06 psi or 0.6 psi per one complete revolution of setpoint knob. Table 6 shown below gives what one division equals for different transmitter spans.

Table-6 Divisions of Transmitter Spans.

Transmitter Span (Input 1)	Each Division of Setpoint Knob Represents
50°F	0.25°F
100°F	0.50°F
200°F	1°F
80% RH	0.4% RH
2" W.C.	0.01" W.C.

Percent Authority (P.A.)

Percent authority is the adjustment of the receiver-controller which determines the effect of the reset signal of the secondary transmitter (input 2) as a percentage of the signal of the primary transmitter (input 1). See Figure 12 for location of P.A. adjustment. To adjust use 3/16" wrench to loosen the lock nut, move the slider to the desired setting and tighten the nut.

$$P.A. = \frac{\Delta \text{Variable Input 1}}{\Delta \text{Variable Input 2}} \times \frac{\text{Span Input 2}}{\text{Span Input 1}} \times 100$$

ΔVariable = Delta temperature, humidity, pressure, etc.

A second method to calculate P.A. is to convert the delta media changes to pressures. This method is required when the inputs are other than transmitters. This method is shown below.

$$P.A. = \frac{\Delta \text{Pressure Input 1}}{\Delta \text{Pressure Input 2}} \times 100 =$$

$$\frac{\Delta \text{Variable Input 1} \times \text{Input 1 Sensitivity}}{\Delta \text{Variable Input 2} \times \text{Input 2 Sensitivity}} \times 100$$

Example: **Hot Water Reset from Outside Air**

Desired Reset Schedule:

Outdoor Air	How Water
-10°F	180°F
60°F	100°F

Transmitter Range:

O.A.; -40 to 160°F (200°F span) or 0.06 psi/°F sensitivity

H.W.; 40 to 240°F (200°F span) or 0.06 psi/°F sensitivity

Desired Throttling Range (TR) = 10°F

$$P.A. = \frac{80°F}{70°F} \times \frac{200°F}{200°F} \times 100 = 114\%$$

Using Method 2:

$$P.A. = \frac{80°F \times 0.06 \text{ psi/°F}}{70°F \times 0.06 \text{ psi/°F}} = 114\%$$

The above example can be plotted on F-14245 as shown in Figure 13. The plot would be made as follows:

1. On the T-1 scale plot point 1 at the upper limit of hot water (180°F) and the lower limit of outside air on T-2 (-10°F).
2. On the T-1 scale plot point 2 at the lower limit of hot water (100°F) and the upper limit of outside air on T-2 (60°F).

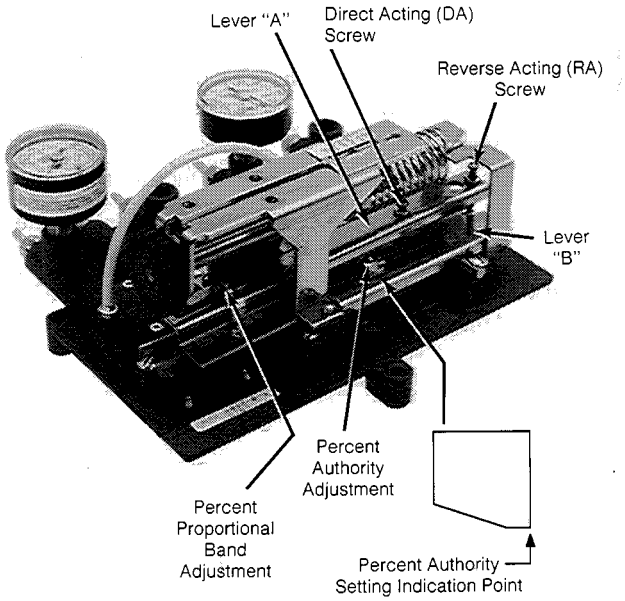


Figure-12 Adjustments.

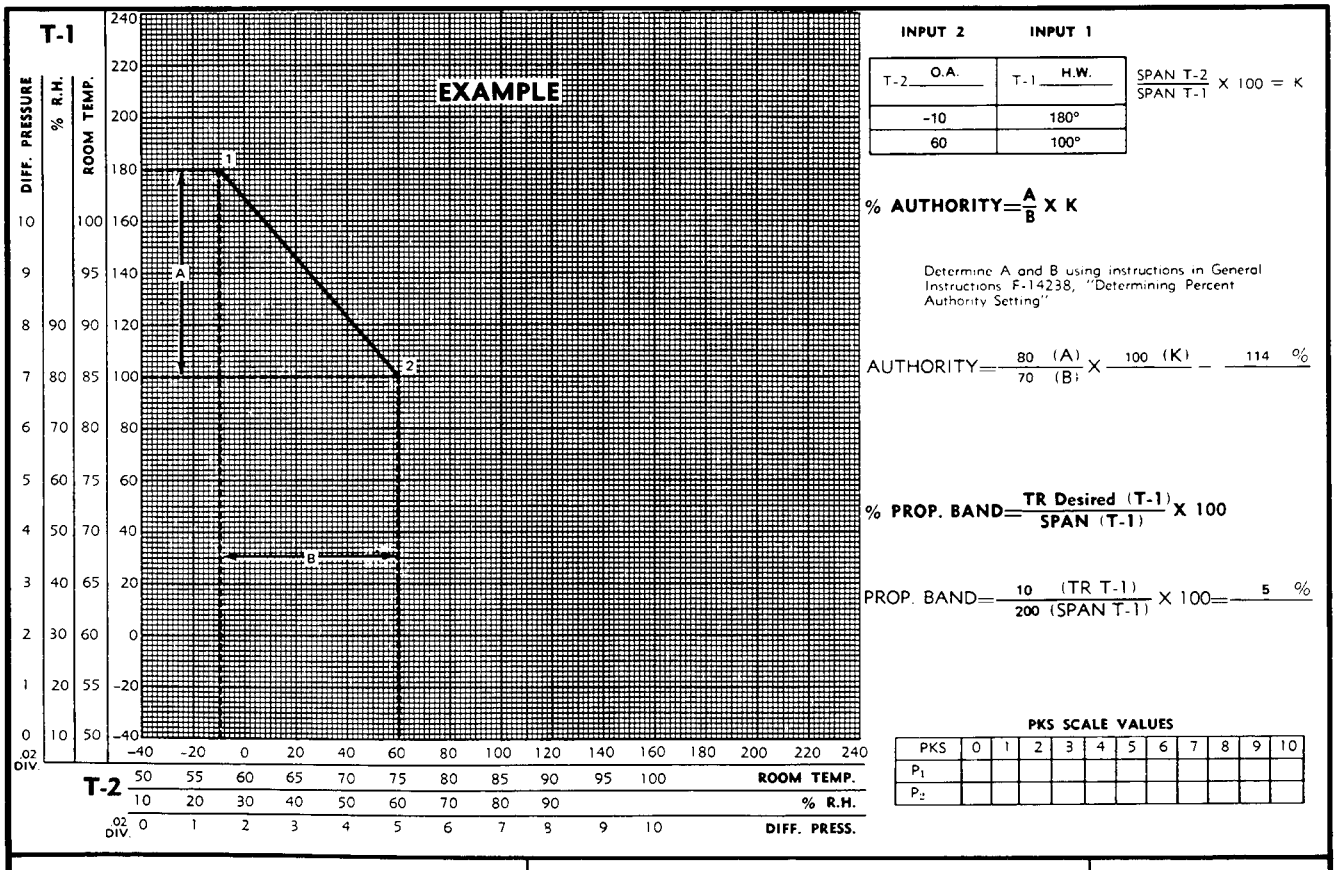


Figure-13 Transmitter Relationship Chart.

CALIBRATION

The installation section of this document should be completed and 18 psig minimum (30 psig maximum) supply main be available to the receiver-controller/transmitter system.

Single Input

Without Calibration Box

1. Set the percent proportional band to the lowest setting that will give stable control (no hunting). See Figures 10 and 12 and Adjustment section.
2. If the unit has remote setpoint, set the remote setpoint so that input A of the receiver-controller is 9 psig (62 kPa).
3. Measure the controlled variable at the transmitter (input 1). The control variable must be stable.
4. Adjust all permanent receiver gauges to match the measured variable.
5. Turn the setpoint on receiver-controller until the branch pressure (port B) is equal to desired calibration pressure (typically 8 psig, mid-stroke of actuator). See Figure 9 and Adjustment section.
6. Slide setpoint scale on receiver-controller until the setpoint indicator coincides with the measured variable.
7. Turn the setpoint knob on the receiver-controller and the remote setpoint if present to the required settings for the application.

With TOOL-100-XXX Calibration Box

1. Connect the receiver-controller, transmitter and remote setpoint if present to TOOL-100-XXX calibration box per Figures 14 and 15.
2. Place the toggle switches on TOOL-100 on the “trans” position.
3. If a remote setpoint is present, adjust it until its output is 9 psig as measured by calibration box gauge.
4. Measured the controlled variable at the transmitter (input 1). The control variable must be stable.
5. Adjust all permanent receiver gauges (not calibration box gauges) to match the measured variable.
6. Place the toggle switch for the transmitter in “cal” position.
7. To check percent proportional band (optional, not typically required), proceed as follows:
   a. Using the manual adjustor for the transmitter on TOOL-100, adjust until 13 psig is read on the branch gauge of the receiver-controller. Based on the transmitter range, record the variable (temperature, humidity, pressure) from the gauge on the calibration case.
   b. Adjust the manual adjustor until 3 psig is read on the branch gauge of the receiver-controller. Record the variable from gauge on the calibration case.
   c. Determine the difference between steps “a” and “b”.

d. If this difference is not correct for the desired throttling range, adjust the percent proportional band adjustor in the proper direction and return to step “a” above.

8. Using the manual adjustor for the transmitter on the TOOL-100, adjust until the permanent gauge indicates the desired variable.
9. Rotate the setpoint on the receiver-controller until the branch pressure (port B) is equal to desired calibration pressure (typically 8 psig, mid-stroke of actuator).
10. Slide setpoint scale on the receiver-controller until the setpoint indicator coincides with the measured variable.
11. The single input receiver-controller is now calibrated; remove the TOOL-100 reconnect the transmitter.

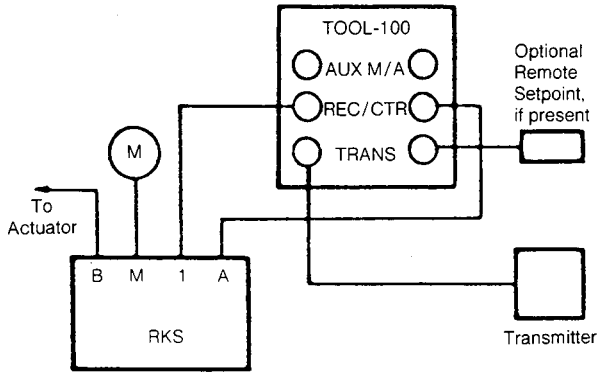


Figure-14 Single Input Receiver-Controller (Internal Restrictor) with or without Remote Setpoint.

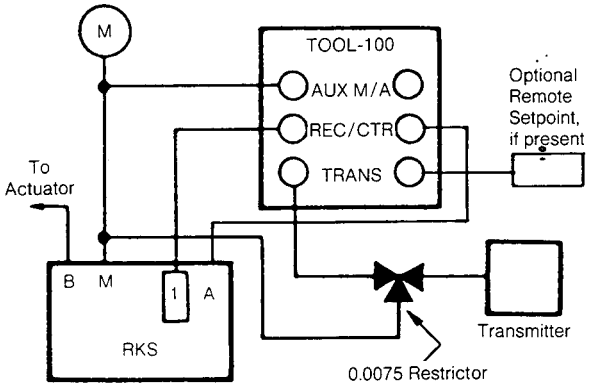


Figure-15 Single Input Receiver-Controller (External Restrictor) with or without Remote Setpoint.

Dual Input

Without Calibration Box

1. If the reset schedule has not been plotted on F-14245 (see Figure 13 for example), it should be done now.
2. Set the percent proportional band and percent authority to the calculated settings.
3. If the unit has remote setpoint, set the remote setpoint so that input A of the receiver-controller is 9 psig (62 kPa).
4. Measure the controlled variable at the primary transmitter (input 1) and at secondary transmitter (input 2). The control variables must be stable.
5. Adjust all permanent receiver gauges to match the measured variables.
6. Turn the setpoint knob on the receiver-controller until the branch pressure (port B) is equal to desired calibration pressure (typically 8 psig, mid-stroke of actuator). See Figure 9 and Adjustment section.
7. Slide setpoint scale on receiver-controller until the setpoint indicator coincides with the measured variable at primary transmitter.
8. Referring to the plot (step 1), adjust the setpoint knob to coincide with the value that it should be per the plot at the current variable at the secondary transmitter (input 2).
9. Slide the setpoint scale to the minimum condition for primary transmitter as shown on the plot.

With TOOL-100-XXX Calibration Box

1. Connect the receiver-controller, transmitters and remote setpoint, if present, to TOOL-100-XXX calibration box per Figures 16 and 17.
2. Place the toggle switches on TOOL-100 in the “trans” position.
3. If a remote setpoint is present, adjust it until its output is 9 psig.
4. Measure controlled variable at the primary transmitter (input 1) and at the secondary transmitter (input 2). The control variables must be stable.
5. Adjust all permanent receiver gauges (not calibration box gauges) to match the measured variable.
6. Place the toggle switch for the transmitter in “cal” position.
7. To check percent proportional band (optional, not typically required), proceed as follows:
   a. Using the manual adjustor for the transmitter on TOOL-100, adjust until 13 psig is read on the branch gauge of the receiver-controller. Based on the transmitter range, record the variable (temperature, humidity, pressure) from the gauge on the calibration case.
   b. Adjust the manual adjustor until 3 psig is read on the branch gauge of the receiver-controller. Record the variable from gauge on the calibration case.
   c. Determine the difference between steps “a” and “b”.
   d. If this difference is not correct for the desired throttling range, adjust the percent proportional band adjustor in the proper direction and return to step “a” above.
8. If the reset schedule has not been plotted on F-14245 (see Figure 13 for example), it should be done now.
9. Set the percent authority to the calculated settings.
10. To check the percent authority setting (optional), proceed as shown below, using plot (step 9).
    a. On the TOOL-100 turn the manual adjustor for input 2 until its gauge indicates the maximum variable for secondary transmitter per plot.
    b. On the TOOL-100 turn the manual adjustor for input 1 until its gauge indicates the minimum variable for primary transmitter per plot.
    c. Adjust setpoint knob on the receiver-controller until 8

psig is indicated on the branch gauge (port B) of receiver-controller.

d. Turn the manual adjustor for input 2 until its gauge indicates the minimum variable for secondary transmitter.

e. Turn the manual adjustor for input 1 to increase its output, until the branch gauge reads 8 psig.

f. Input 1 gauge should be equal to the maximum variable of the primary transmitter. If its reading is not acceptable, readjust the percent authority slider. Increase the setting if the reading is too high and decrease if the reading is too low and then return to step 1.

11. On the TOOL-100 turn the manual adjustor for input 1 until the permanent receiver gauge (not AKS-100) indicates the minimum variable for the primary transmitter per plot (step 9).
12. On the TOOL-100 turn the manual adjustor for input 2 until the permanent receiver gauge (not TOOL-100) indicates the maximum variable for the secondary transmitter per plot (step 9).
13. Turn the setpoint knob on receiver-controller until the branch pressure (port B) is equal to desired calibration pressure (typically 8 psig, mid-stroke of actuator). See Figure 9 and Adjustment section.
14. Slide the setpoint scale to the minimum condition for primary transmitter as shown on the plot.
15. The dual input receiver-controller is now calibrated; remove the TOOL-100 and reconnect the transmitters.

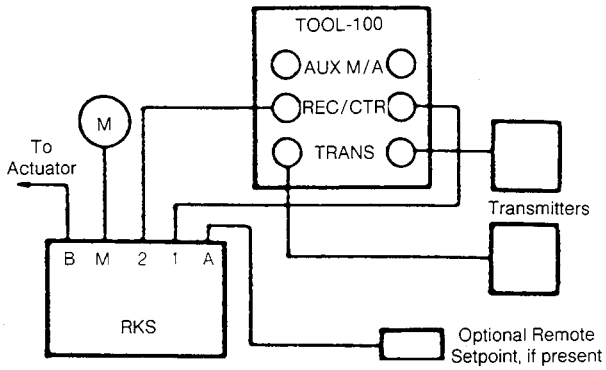


Figure-16 Dual Input Receiver-Controller (Internal Restrictor) with or without Remote Setpoint.

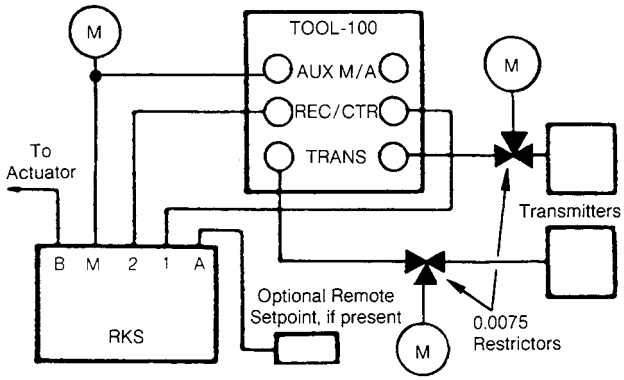


Figure-17 Dual Input Receiver-Controller (External Restrictor) with or without Remote Setpoint.

ADDITIONAL APPLICATIONS

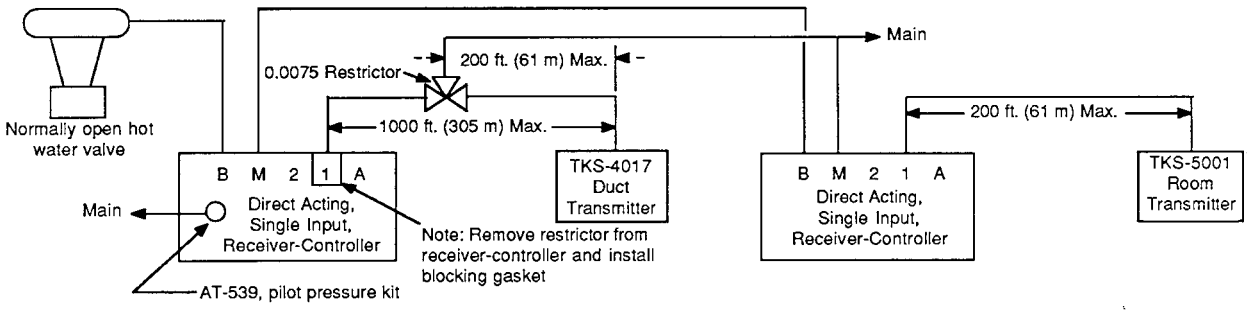
Limit Applications

The limit applications (Figures 18 and 19) require that AT-539 pilot pressure kit be attached to the limit receiver-controller. A low limit application requires two (2) direct acting receiver-controllers, and a high limit application requires two (2) reverse acting receiver-controllers.

Attachment of AT-539 Pilot Pressure Kit

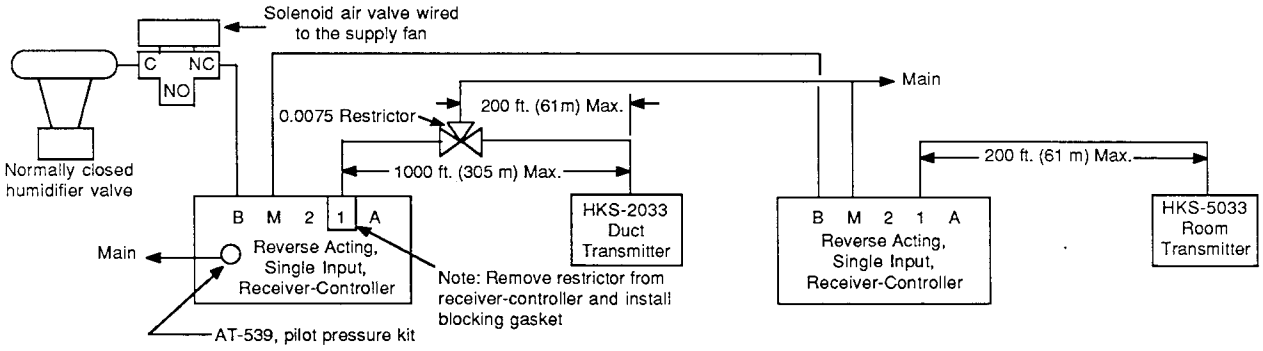
To attach the AT-539 pilot pressure kit to the limit receiver-controller, use the following procedure:

1. Remove the restrictor (0.005) cover plate, restrictor and the two gaskets. See Figure 9 for the location.
2. Using the parts from the AT-539, place in order one gasket, restrictor plate, the other gasket and the cover plate with the tubing attached on to the restrictor mounting pad. Then install the two (2) screws.
3. Route the 5/32" plastic tubing between main and input 2 ports and attach to a constant main of 18 psig minimum (30 psig maximum).
4. The internal restrictor(s) for the limit receiver-controller must be removed and blocking gasket(s) installed (see Installation of Blocking Gasket section). The transmitter(s) and remote setpoint require a remote restrictor.
5. If the receiver-controller has a cover, with a pliers break off the protrusion on the cover that normally fits between the main and input 2.



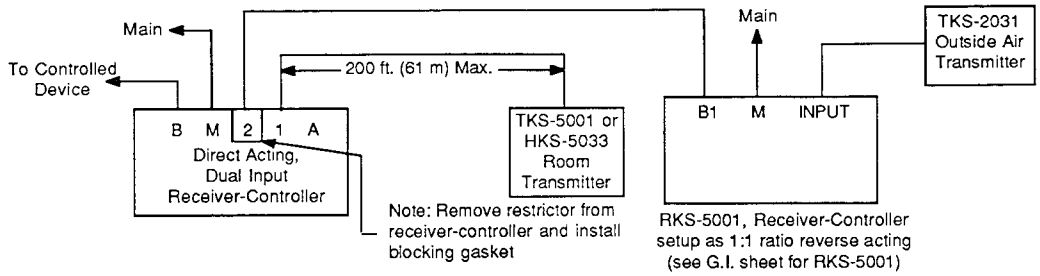
Sequence of Operation: The room temperature transmitter through its receiver-controller modulates the heating valve to maintain the desired space temperature. The duct temperature transmitter through its receiver-controller will bleed off the output pressure from the room transmitter's receiver-controller opening the heating valve to prevent the discharge air temperature from dropping below the setpoint of the duct transmitter.

Figure-18 Typical Low Limit Heating Application.



Sequence of Operation: The room humidity transmitter through its receiver-controller modulates the humidifier valve to maintain the desired space humidity. The duct humidity transmitter through its receiver-controller will bleed off the output pressure from the room transmitter's receiver-controller closing the humidifier valve to prevent the discharge air humidity from exceeding the setpoint of the duct transmitter. Should the fan be shut off, the solenoid air valve will close the humidifier valve.

Figure-19 Typical High Limit Humidity Application.



Sequence of Operation: The room transmitter through its receiver-controller modulates the controlled device to maintain space temperature or humidity. The outdoor transmitter through its receiver-controller resets the setpoint of the room transmitter's receiver-controller in a manner known as direct reset, i.e., an increase in outdoor temperature increases the setpoint of the room transmitter's receiver-controller.

Figure-20 Typical Direct Reset Application (Summer Compensation or Humidity Reset).

Direct Reset Applications

To obtain direct reset (see Definition section) requires an RKS-5001 receiver-controller set up as 1:1 ratio reverse acting (see F-14902 G.I. sheet RKS-5001) to reverse the secondary transmitter. Figure 20 is a typical example.

Two-Position Action from Single Input

The RKSR-4000, when configured as a single input with or without remote setpoint, can be set up as shown below to obtain two-position control. See Figures 10 and 11.

Direct Acting

1. With a 3/16" wrench, turn the reverse acting screw clockwise (down) until it contacts lever B.
2. With a 3/16" wrench, turn the direct acting screw counterclockwise (up) approximately four turns.
3. Leave the direct acting pilot tube connected.

Reverse Acting

1. Leave the direct acting and reverse acting screws in the direct acting position, i.e. as shipped from the factory.
2. Change the pilot tube to reverse acting hole (see steps 1 and 2 in Changing the Receiver-Controller to Reverse Acting section).

Calculation of Differential

The controller differential is adjustable based on the percent proportional band (P.B.) and can be calculated by using the formula below.

$$\text{Differential} = \frac{\text{P.B.} \times \text{Transmitter Span} \times \text{Main Air Pressure}}{1000}$$

$$\text{P.B.} = \frac{\text{Differential} \times 1000}{\text{Transmitter Span} \times \text{Main Air Pressure}}$$

Secondary Input Other Than Transmitter

At times the secondary (port 2) of a dual input receiver-controller has a signal from a controller or transducer. In this case, it is necessary to block input 2 and calculate the percent authority (see percent authority) using pressures. This calculation can be made as shown in examples below.

Example:

The primary transmitter (input 1) is a 200°F span that will be reset 40°F over the throttling range (10 psi) of a controller (input 2).

$$\text{P.A.} = \frac{\Delta\text{Pressure Input 1}}{\Delta\text{Pressure Input 2}} \times 100 =$$

$$\frac{\Delta\text{Variable Input 1 x Input 1 Sensitivity}}{\text{Throttling Range}} \times 100 =$$

$$\frac{40\ °\text{F} \times 0.06\ \text{psi}/\ °\text{F}}{10\ \text{psi}} \times 100 = 24\%$$

Limit of Reset (Master/Sub-master)

To limit the reset action of a receiver-controller requires a controller as input 2 to the receiver-controller, The input 2 controller would be set up so that its output is 3 to 15 psi over the reset limits.This requires calculating the correct throttling range or percent proportional band to produce 12 psi change over the reset limits. The percent authority for the receiver-controller would be calculated the same as Secondary Input Other Than Transmitter section.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. To check out (troubleshoot) the receiver-controller, proceed as follows.

1. Be sure the supply pressure to port M is a constant 18 to 30 psig.
2. Check that the transmitters (ports 1 and 2) are between 3 to 15 psig. If they are approximately zero, check that the internal 0.0075 input restrictor or external 0.0075 restrictor is not clogged. Internal restrictor part number is AT-524-010.
3. Make sure only one restrictor supplies each transmitter.
4. After making the above checks, refer to Table 7.

Table-7 Troubleshooting.

Complaint	Check	Result	Probable Cause	Corrective Action
Control pressure remains at approximately zero	For D.A. units rotate setpoint knob CCW. For R.A. units rotate setpoint knob CW.	Pressure increases	Transmitter variable is above (R.A) or below (D.A.) the proportional band	None
			Receiver-controller is out of calibration	Recalibrate
		Pressure same	Clogged R-C pilot restrictor (0.005)	Replace restrictor with AT-528
			Receiver-controller is defective	Replace receiver-controller
Control pressure remains at approximately supply pressure	For D.A. units rotate setpoint knob CW. For R.A. units rotate setpoint knob CCW.	Pressure decreases	Transmitter variable is above (D.A.) or below (R.A.) the proportional band	None
			Receiver-controller is out of calibration	Recalibrate
		Pressure same	Receiver-controller is defective	Replace receiver-controller
Control pressure pulsates	Add 10' of 1/4" tubing to port B of receiver-controller	Pressure stabilizes	Leave tubing attached or add volume chamber in place of tubing	None
		Pulsates	Receiver-controller is defective	Replace receiver-controller

On October 1st, 2009, TAC became the Buildings business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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