



## **BAS** Application Note 003

### **Guidelines for Scaling of Analog Inputs**

Although any Analog Input can be scaled to any of the available scaling ranges it is more practical to follow some established guidelines for scaling ranges. A few of the Analog Inputs must follow mandatory scaling ranges for proper system operation. **BAS** makes recommendations for use of the other Analog Inputs to maintain consistency from one project to another. The following are the recommended scaling ranges:

#### **Equipment Schedule 1, 2, 9**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 32.00-95.75   | ° F     | Room Temperature          |
| AI2               | Var           | ° F     | Zone SP Offset Pot        |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4 (1)           | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6               | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | 0-100         | %       | Aux Input                 |

\* Mandatory Inputs.

(1) Mandatory if used as a VariZone or VAV Server.

#### **Equipment Schedule 3, 4, 10**

| Input<br>Location | Range       | Label | Use                       |
|-------------------|-------------|-------|---------------------------|
| AI1*              | 32.00-95.75 | ° F   | Room Temperature          |
| AI2               | Var         | ° F   | Zone SP Offset Pot        |
| AI3               | 30.0-157.5  | ° F   | Return Air Temperature    |
| AI4 (1)           | 30.0-157.5  | ° F   | Discharge Air Temperature |

\* Mandatory Inputs.

(1) Mandatory if used as a VariZone or VAV Server.

**Equipment Schedule 5-8, 11, 12**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 32.00-95.75   | ° F     | Room Temperature          |
| AI2 (1)           | 18.0-36.0     | BTU/LBM | Return Air Enthalpy       |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4 (2)           | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6 (3)           | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | Var           | ° F     | Zone SP Offset Pot        |

\* Mandatory Inputs.

(1) Mandatory if using an economizer.

(2) Mandatory if used as a VariZone or VAV Server.

(3) Mandatory if economizer is a modulating actuator controlled directly by RSC.

**Equipment Schedule 23, 25, 27, 28**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 32.00-95.75   | ° F     | Room Temperature          |
| AI2 (1)           | 18.0-36.0     | BTU/LBM | Return Air Enthalpy       |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4               | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6 (2)           | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | Var           | ° F     | Zone SP Offset Pot        |

\* Mandatory Inputs.

(1) Mandatory if using an economizer.

(2) Mandatory if economizer is a modulating actuator controlled directly by RSC.

**Equipment Schedule 13, 15, 17, 19, 20, 50, 52, 54, 56, 57**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 32.00-95.75   | ° F     | Room Temperature          |
| AI2 (1)           | Var           | CFM     | Air Flow                  |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4               | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6               | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | Var           | ° F     | Zone SP Offset Pot        |

\* Mandatory Inputs.

(1) Mandatory if pressure independent control is used.

**Equipment Schedule 14, 51**

| Input<br>Location | Range       | Label | Use                |
|-------------------|-------------|-------|--------------------|
| AI1*              | 32.00-95.75 | ° F   | Room Temperature   |
| AI2 (1)           | Var         | CFM   | Air Flow           |
| or<br>AI2         | Var         | ° F   | Zone SP Offset Pot |

\* Mandatory Inputs.

(1) Mandatory if pressure independent control is used.

**Equipment Schedule 16, 18, 53, 55, 60**

| Input<br>Location | Range       | Label | Use                    |
|-------------------|-------------|-------|------------------------|
| AI1*              | 32.00-95.75 | ° F   | Room Temperature       |
| AI2 (1)           | (2)         | CFM   | Air Flow               |
| AI3               | Var         | ° F   | Zone SP Offset Pot     |
| AI4               | 30.0-157.5  | ° F   | Supply Air Temperature |

\* Mandatory Inputs.

(1) Mandatory if pressure independent control is used.

**Equipment Schedule 21, 22**

| Input<br>Location | Range       | Label | Use                       |
|-------------------|-------------|-------|---------------------------|
| AI1*              | 32.00-95.75 | ° F   | Room Temperature          |
| AI2               | 30.0-157.5  | ° F   | Discharge Air Temperature |
| or<br>AI2         | Var         | ° F   | Zone SP Offset Pot        |

\* Mandatory Inputs.

**Equipment Schedule 24, 26, 31**

| Input<br>Location | Range       | Label   | Use                   |
|-------------------|-------------|---------|-----------------------|
| AI1*              | 32.00-95.75 | ° F     | Room Temperature      |
| AI2 (1)           | 18.0-36.0   | BTU/LBM | Return Air Enthalpy   |
| AI3               | Var         | ° F     | Zone SP Offset Pot    |
| AI4 (2)           | 30.0-157.5  | ° F     | Mixed Air Temperature |

\* Mandatory Inputs.

(1) Mandatory if using an economizer.

(2) Mandatory if economizer is a modulating actuator controlled directly by RSC.

**Equipment Schedule 29, 30**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 30.0-157.5    | ° F     | Controlled Temperature    |
| AI2               | Var           | ° F     | Zone SP Offset Pot        |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4               | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6               | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | 0-100         | %       | Aux Input                 |

\* Mandatory Inputs.

**Equipment Schedule 32**

| Input<br>Location | Range         | Label   | Use                              |
|-------------------|---------------|---------|----------------------------------|
| AI1*              | 30.0-157.5    | ° F     | Water Loop Return Temperature    |
| AI2               | 0-100         | %       | Aux Input                        |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature          |
| AI4               | 30.0-157.5    | ° F     | Water Loop Supply Temperature    |
| AI5               | 30.0-157.5    | ° F     | Cooling Tower Outlet Temperature |
| AI6               | 0-255         | ° F     | Boiler Outlet Temperature        |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy             |
| AI8               | 0-100         | %       | Aux Input                        |

\* Mandatory Inputs.

**Equipment Schedule 33**

| Input<br>Location | Range         | Label   | Use                              |
|-------------------|---------------|---------|----------------------------------|
| AI1*              | 30.0-157.5    | ° F     | Chilled Water Supply Temperature |
| AI2               | 0-100         | %       | Aux Input                        |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature          |
| AI4               | 30.0-157.5    | ° F     | Chilled Water Return Temperature |
| AI5               | 30.0-157.5    | ° F     | Water Loop Temperature           |
| AI6               | 30.0-157.5    | ° F     | Water Loop Temperature           |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy             |
| AI8               | 0-100         | %       | Aux Input                        |

\* Mandatory Inputs.

### **Equipment Schedule 35, 36**

| Input<br>Location | Range         | Label   | Use                          |
|-------------------|---------------|---------|------------------------------|
| AI1*              | 0-255         | ° F     | Hot Water Supply Temperature |
| AI2               | 0-100         | %       | Aux Input                    |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature      |
| AI4               | 0-255         | ° F     | Hot Water Return Temperature |
| AI5               | 0-255         | ° F     | Water Loop Temperature       |
| AI6               | 0-255         | ° F     | Water Loop Temperature       |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy         |
| AI8               | 0-100         | %       | Aux Input                    |

\* Mandatory Inputs.

### **Equipment Schedule 40**

| Input<br>Location | Range         | Label   | Use                       |
|-------------------|---------------|---------|---------------------------|
| AI1*              | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI2 (1)           | 18.0-36.0     | BTU/LBM | Return Air Enthalpy       |
| AI3               | (-12.0)-115.5 | ° F     | Outside Air Temperature   |
| AI4 (2)           | 30.0-157.5    | ° F     | Discharge Air Temperature |
| AI5               | 30.0-157.5    | ° F     | Return Air Temperature    |
| AI6 (3)           | 30.0-157.5    | ° F     | Mixed Air Temperature     |
| AI7               | 18.0-36.0     | BTU/LBM | Outside Air Enthalpy      |
| AI8               | Var           | ° F     | Zone SP Offset Pot        |

\* Mandatory Inputs.

(1) Mandatory if using an economizer.

(2) Mandatory if used as a VariZone or VAV Server.

(3) Mandatory if economizer is a modulating actuator controlled directly by RSC.

### **Equipment Schedule 41, 42**

| Input<br>Location | Range         | Label | Use                       |
|-------------------|---------------|-------|---------------------------|
| AI1*              | Var           | “ WC  | Discharge Static Pressure |
| AI2               | 0-100         | %     | Aux Input                 |
| AI3               | (-12.0)-115.5 | ° F   | Outside Air Temperature   |
| AI4               | 30.0-157.5    | ° F   | Discharge Air Temperature |

\* Mandatory Inputs.