FLEX I/O Thermocouple Input Analog Module and RTD Module
Cat. No. 1794-IT8 and 1794-IR8

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all applicable local, national and international laws and standards. In no event will Rockwell Automation be responsible for risks (real or apparent) or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (including intellectual property liability) for what one based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, Safety Guidelines for the Application, Installation and Maintenance of Field-Bus System (available from your local Rockwell Automation office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this copyrighted publication, in whole or part, without written permission of Rockwell Automation, is prohibited.

Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard:

**ATTENTION**

Identifies information about practices or circumstances that can cause an equipment in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

**IMPORTANT**

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

**Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category III applications (as defined in IEC Publication 61000-6-1, or equivalent up to 2000 V CATIII). This equipment is contained Group 3. Class A industrial equipment according to EN 61558-1 (without protection). Peratures, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

This equipment is supplied as “open type” equipment. It must be installed within an enclosure that is suitably designed for these specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be suitably designed and constructed to prevent personnel injury.

This equipment is not resistant to sunlight or materials (e.g. aluminum, plastic, etc.) that can corrode, oxidize, or be poor conductors, can result in improper or intermittent operation.

This equipment is considered Group 1, Class A industrial environment, in overvoltage Category II applications.

This equipment is not resistant to sunlight or materials (e.g. aluminum, plastic, etc.) that can corrode, oxidize, or be poor conductors, can result in improper or intermittent operation. Follow these guidelines when you handle boards:

- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the enclosure.
- If available, use a static-safe workstation.

When you insert or remove the module while it is powered to or from the I/O controller, be sure that proper mounting instructions for the module are followed. Failure to follow installation instructions will cause the module to be moved from the area in maintenance before processing.

This equipment is intended for use in Group I, Hazardous Area environments, in overvoltage Category I applications. This equipment is intended for use in Group I, Zone 2 environments.

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC. The LCE (Laboratoire Central des Industries Electriques) certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of this equipment when used in potentially explosive atmospheres, given in Annex II to this Directive. The examination and test results are recorded in confidential report No. 28 682 010. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021.

European Hazardous Location Approval

The following analog input modules are European Zone 2 approved: 1794-IR8 and 1794-IT8.

European Zone 2 Certification

This equipment is intended for use in potentially explosive atmosphere as defined by European Union Directive 94/9/EC. The LCE (Laboratoire Central des Industries Electriques) certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of this equipment when used in potentially explosive atmospheres, given in Annex II to this Directive. The examination and test results are recorded in confidential report No. 28 682 010. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021.

**Installation Instructions**

Where you insert or remove the module while it is powered to or from the I/O controller, be sure that proper mounting instructions for the module are followed. Failure to follow installation instructions will cause the module to be moved from the area in maintenance before processing.

- **ATTENTION**
  - When you insert or remove the module while it is powered to or from the module do not touch the connector or pins.
  - When you insert or remove the module do not touch the module, as you can damage the module.

- **IMPORTANT**
  - When you insert or remove the module while it is powered to or from the module do not touch the connector or pins.
  - When you insert or remove the module do not touch the module, as you can damage the module.

- **WARNING**
  - When you insert or remove the module while it is powered to or from the module do not touch the connector or pins.
  - When you insert or remove the module do not touch the module, as you can damage the module.

- **Environmental and Enclosure**

  - **ATTENTION**
    - This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category III applications (as defined in IEC Publication 61000-6-1, or equivalent up to 2000 V CATIII). This equipment is contained Group 3. Class A industrial equipment according to EN 61558-1 (without protection). Peratures, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

  - **IMPORTANT**
    - This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category III applications (as defined in IEC Publication 61000-6-1, or equivalent up to 2000 V CATIII). This equipment is contained Group 3. Class A industrial equipment according to EN 61558-1 (without protection). Peratures, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

  - **WARNING**
    - This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category III applications (as defined in IEC Publication 61000-6-1, or equivalent up to 2000 V CATIII). This equipment is contained Group 3. Class A industrial equipment according to EN 61558-1 (without protection). Peratures, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

- **Preventing Electrostatic Discharge**

  - **ATTENTION**
    - This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle boards:
      - Wear an approved grounding wriststrap.
      - Do not touch connectors or pins on component boards.
      - Do not touch circuit components inside the enclosure.
      - If available, use a static-safe workstation.

- **European Hazardous Location Approval**

  - The following analog input modules are European Zone 2 approved: 1794-IR8 and 1794-IT8.

- **European Zone 2 Certification**

  - This equipment is intended for use in potentially explosive atmosphere as defined by European Union Directive 94/9/EC. The LCE (Laboratoire Central des Industries Electriques) certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of this equipment when used in potentially explosive atmospheres, given in Annex II to this Directive. The examination and test results are recorded in confidential report No. 28 682 010. Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021.

Publication 1794-IN021D-EN-P - August 2003
North American Hazardous Location Approval

The following analog-input modules are Hazardous Location approved 1794-IR8 and 1794-IT8.

Connecting Wiring for 1794-TB2, -TB3, -TB3S, -TB3T and -TB3TS

Terminals Base Units

1. Connect individual high and low signal wiring to numbered terminals on the 0-15 row (A) as indicated in the table. Use Belden 9761 cable for mV signal wiring, or the appropriate thermocouple wire for your thermocouples. (For more accurate readings in mV modules, use the 1794-TB2 or -TB3S terminal base units)

2. Connect individual channel signal returns to the associated terminal on row (B) as shown in the wiring table.

3. Connect individual channel shield returns to the associated terminal on row (B) for 1794-TB3 or -TB3S or row (C) for the 1794-TB3T or -TB3TS as shown in the wiring table.

4. Position the module (4) with its alignment bar (5) aligned with the groove (6) on the terminal base.

5. Press firmly and evenly to seat the module in the terminal base unit.

The module is seated when the latching mechanism (7) is locked into the module.

Installing Your Thermocouple or RTD Input Module

ATTENTION

During mounting or dismounting, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage on power up.

ATTENTION

The module mounts on a 1794 terminal base.

1. Rotate the keyswitch (1) on the terminal base (2) clockwise to position 3 as required for this type of module.

2. Make certain the flexbus connector (3) is pushed all the way to the left to connect with the neighboring terminal base/adapter. You cannot install the module unless the connector is fully extended.

3. Make sure the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base.

ATTENTION

If you remove or insert the module while the backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

4. Position the module (4) with its alignment bar (5) aligned with the groove (6) on the terminal base.

5. Press firmly and evenly to seat the module in the terminal base unit.

ATTENTION

The thermocouple, mV and RTD modules do not receive power from the backplane. 12V dc power must be supplied to the modules. If power is not applied, the module position will appear to the adapter as an empty slot in your chassis.

ATTENTION

You must power this module from the same power supply that supplies the adapter module, so if both power up at the same time. You must cycle power for the adapter to recognize the module.

ATTENTION

Do not daisy chain power or ground from this terminal base unit to any ac or dc digital module terminal base units.

ATTENTION

To reduce susceptibility to noise, power analog modules and digital modules from separate power supplies. Do not exceed a length of 5 ft (1.5m) for dc power cabling.

ATTENTION

Do not service this module while it is connected to the backplane power. Turn off all power to the system to avoid the potential for electrical shock.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.

ATTENTION

Do not service this module while it is connected to the backplane power.
7. If daisy chaining power to the next terminal base, connect a jumper from terminal 53 (+V dc) on this base unit to the 5 V terminal on the next base unit.

8. If continuing dc common to the next base unit, connect a jumper from terminal 33 (common) on this base unit to the COM (return) terminal on the next base unit.

**Wiring Connections for the Thermocouple/RTD Module**

<table>
<thead>
<tr>
<th>RTD or mV</th>
<th>Channel</th>
<th>1794-TB3, -TB3 and -TBS5 Terminal Base Units</th>
<th>1794-TB3 and -TBS5 Terminal Base Units</th>
<th>Return (1 or 0)</th>
<th>For 2, 3 and 4-wire RTD Wiring to a 1794-TB3 Terminal Base Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel 0</td>
<td>0</td>
<td>Terminal 1 (L or 0)</td>
<td>Terminal 2 (H or +)</td>
<td>33</td>
<td>Example of 2, 3 and 4-wire RTD Wiring to a 1794-TB3 Terminal Base Unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Signal Terminal (L or 0)</td>
<td>High Signal Terminal (H or +)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel 1</td>
<td>1</td>
<td>Terminal 9 (L or 0)</td>
<td>Terminal 10 (H or +)</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Channel 2</td>
<td>2</td>
<td>Terminal 11 (L or 0)</td>
<td>Terminal 12 (H or +)</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Channel 3</td>
<td>3</td>
<td>Terminal 13 (L or 0)</td>
<td>Terminal 14 (H or +)</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Channel 4</td>
<td>4</td>
<td>Terminal 15 (L or 0)</td>
<td>Terminal 16 (H or +)</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Channel 5</td>
<td>5</td>
<td>Terminal 17 (L or 0)</td>
<td>Terminal 18 (H or +)</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Channel 6</td>
<td>6</td>
<td>Terminal 19 (L or 0)</td>
<td>Terminal 20 (H or +)</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Channel 7</td>
<td>7</td>
<td>Terminal 21 (L or 0)</td>
<td>Terminal 22 (H or +)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Channel 8</td>
<td>8</td>
<td>Terminal 23 (L or 0)</td>
<td>Terminal 24 (H or +)</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>Channel 9</td>
<td>9</td>
<td>Terminal 25 (L or 0)</td>
<td>Terminal 26 (H or +)</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Channel 10</td>
<td>10</td>
<td>Terminal 27 (L or 0)</td>
<td>Terminal 28 (H or +)</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Channel 11</td>
<td>11</td>
<td>Terminal 29 (L or 0)</td>
<td>Terminal 30 (H or +)</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Channel 12</td>
<td>12</td>
<td>Terminal 31 (L or 0)</td>
<td>Terminal 32 (H or +)</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Channel 13</td>
<td>13</td>
<td>Terminal 33 (L or 0)</td>
<td>Terminal 34 (H or +)</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Channel 14</td>
<td>14</td>
<td>Terminal 35 (L or 0)</td>
<td>Terminal 36 (H or +)</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Channel 15</td>
<td>15</td>
<td>Terminal 37 (L or 0)</td>
<td>Terminal 38 (H or +)</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Channel 16</td>
<td>16</td>
<td>Terminal 39 (L or 0)</td>
<td>Terminal 40 (H or +)</td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

**Example of Grounded Thermocouple Wiring to a 1794-TB3 Terminal Base Unit**

**Example of Millivolt Wiring to a 1794-TB3, -TB3S or -TB3T Terminal**

**Base Unit**

For more accurate readings, use the 1794-TB3T for pH measurement.
Block Transfer Read and Write

The following block transfer read and write word bit information is presented for experienced users only. Refer to the user manuals (publication 1794-UM004 for the RTD or 1794-UM007 for TC/mV) for these products for complete information on programming and configuring your modules.

Input Map (Read) for 1794-IR8 and 1794-IT8

<table>
<thead>
<tr>
<th>Bit 10</th>
<th>Bit 9</th>
<th>Bit 8</th>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 1</td>
<td>Ch 2</td>
<td>Ch 3</td>
<td>Ch 4</td>
<td>Ch 5</td>
<td>Ch 6</td>
<td>Ch 7</td>
<td>Ch 8</td>
<td>Ch 9</td>
<td>Ch 10</td>
<td>Ch 11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Output Map (Write) for 1794-IR8 and 1794-IT8

<table>
<thead>
<tr>
<th>Bit 10</th>
<th>Bit 9</th>
<th>Bit 8</th>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ch 0</td>
<td>Ch 1</td>
<td>Ch 2</td>
<td>Ch 3</td>
<td>Ch 4</td>
<td>Ch 5</td>
<td>Ch 6</td>
<td>Ch 7</td>
<td>Ch 8</td>
<td>Ch 9</td>
<td>Ch 10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data Format for All Channels - Write Word 0

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RTD Type - Write Word 1 and 2

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermocouple Type - Write Word 1 and 2

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>Bit 6</th>
<th>Bit 5</th>
<th>Bit 4</th>
<th>Bit 3</th>
<th>Bit 2</th>
<th>Bit 1</th>
<th>Bit 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature and resistance data is returned with an implied decimal point. For example, a temperature data of 1779 is 177.9°C. Resistance data of 2034 is 203.4Ω. Data is returned with an implied decimal point of 2 decimal points. For example, 7300 is 73.00Ω.

Publication 1794-IN021D-EN-P - August 2003
Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>1794-T78</th>
<th>1794-T88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>16-bit</td>
<td>16-bit</td>
</tr>
<tr>
<td>Accuracy</td>
<td>10V</td>
<td>10V</td>
</tr>
<tr>
<td>Common Mode Rejection</td>
<td>718.36</td>
<td>718.36</td>
</tr>
<tr>
<td>Input Offset</td>
<td>±10V</td>
<td>±10V</td>
</tr>
<tr>
<td>Gain Drift</td>
<td>0.05%</td>
<td>0.05%</td>
</tr>
<tr>
<td>Rejection</td>
<td>60dB</td>
<td>60dB</td>
</tr>
<tr>
<td>Normal Mode Noise</td>
<td>±2kV</td>
<td>±2kV</td>
</tr>
<tr>
<td>Normal Mode</td>
<td>45.7H x 94W x 53.3D mm</td>
<td>45.7H x 94W x 53.3D mm</td>
</tr>
<tr>
<td>Voltage Range</td>
<td>19.2 to 31.2V dc</td>
<td>19.2 to 31.2V dc</td>
</tr>
<tr>
<td>Temperature</td>
<td>0 to 40°C</td>
<td>0 to 40°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 40°C</td>
<td>0 to 40°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-25 to 70°C</td>
<td>-25 to 70°C</td>
</tr>
<tr>
<td>Temperature Derating</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>