

FLEX I/O Thermocouple, RTD, and Millivolt Input Modules



Catalog Numbers 1794-IRT8, 1794-IRT8K, 1794-IRT8XT
User Manual



Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to: personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
SHOCK HAZARD 	Labels may be on or inside the equipment, such as a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment, such as a drive or motor, to alert people that surfaces may reach dangerous temperatures.

Allen-Bradley, Rockwell Automation, FLEX I/O, RSLink, RSLogix 5000 and TechConnect are trademarks of Rockwell Automation, Inc.

Trademarks not belonging to Rockwell Automation are property of their respective companies.

This manual contains new and updated information. Changes throughout this revision are marked by change bars, as shown to the right of this paragraph.

New and Updated Information

This table contains the changes made to this revision.

Changes	Page
Addition of two catalogs – 1794-IRT8K and 1794-IRT8XT	1, 53
The following sections have been added to Chapter 1 – Overview of FLEX I/O and Your Thermocouple, RTD, and Millivolt Input Module: <ul style="list-style-type: none">• The FLEX System• Types of Modules• What the FLEX I/O Input Module Does• The FLEX I/O Module in a Logix Control System	1
The following section has been added to Chapter 2 – Install Your FLEX I/O Input Module: <ul style="list-style-type: none">• Series A and Series B	8
The following new topics have been added: <ul style="list-style-type: none">• Configure Your FLEX I/O Module with RSLogix 5000 Software (Chapter 3)• Troubleshoot the Module (Chapter 6)• Electronic Data Sheet (EDS) Files (Appendix B)	21 51 57
The following topic, previously Chapter 3 in the last revision, has been relegated to the Appendices section: <ul style="list-style-type: none">• Program Your Thermocouple/RTD Input Module (Appendix C)	59

Additional less significant changes (such as improvement of drawings) have been made throughout the document.

■ Notes:

Summary of Changes

New and Updated Information	iii
---------------------------------------	-----

Preface

Who Should Use This Manual.	ix
Purpose of the Manual.	ix
About the Vocabulary	ix
Related Documentation.	x
Common Techniques Used in this Manual.	xii

Overview of FLEX I/O and Your Thermocouple, RTD, and Millivolt Input Module

Chapter 1

Overview.	1
The FLEX System	1
Types of Modules.	2
What the FLEX I/O Input Module Does	2
The FLEX I/O Module in a Logix Control System	3
Physical Features of Your Module	4
Chapter Summary.	5

Install Your FLEX I/O Input Module

Chapter 2

Overview.	7
Before You Install Your Module	7
Series A and Series B	8
Power Requirements	8
Install the Module	10
Mount on a DIN Rail	10
Mount on a Panel or Wall	13
Mount the FLEX I/O Module on the Terminal Base Unit	14
Wiring Information	16
Connect Wiring to the FLEX I/O Module	16
Identify RTD Wire Pairs	17
Chapter Summary.	20

Configure Your FLEX I/O Module with RSLogix 5000 Software

Chapter 3

Overview.	21
Add and Configure the FLEX I/O Module.	21
Chapter Summary.	26

Read and Write Configuration Maps for the FLEX I/O Module

Chapter 4

Overview.	27
Configure Your Input Module	27
Configurable Options and Their Effect on the Channels	27
Options that Affect All Channels	27
Options that Affect Each Group of Four Inputs	28
Sensor Types.	29
Read Data From the Module.	30

	Map Data for the Module	30
	Thermocouple and RTD Input Module Image Table	
	Mapping	31
	Block Transfer Read and Write	31
	Bit/Word Descriptions for the Input Module Block Transfer	
	Read Words	32
	Using Series A Functionality in a	
	Series B Module	38
	Chapter Summary	38
	Chapter 5	
Calibrate Your Module	Overview	39
	When and How to Calibrate Your FLEX I/O Module.	39
	Tools and Equipment	40
	Calibrate Your Input Module.	40
	Calibration Setup	41
	Wiring Connections for Calibrating the Thermocouple and	
	RTD Input Module	41
	Read and Write Words for Calibration.	42
	EDT Calibration Command and Command Data Summary	44
	Offset Calibration	45
	Gain Calibration	46
	Current Source Calibration	47
	Cold Junction Calibration	49
	Channel Loop Compensation Calibration	49
	Chapter Summary	49
	Chapter 6	
Troubleshoot the Module	Overview	51
	Module Indicators	51
	Chapter Summary	52
	Appendix A	
Specifications	Overview	53
	General Specifications.	53
	Environmental Specifications.	55
	Certifications	56
	Appendix B	
Electronic Data Sheet (EDS)	Overview	57
Files	Updating EDS File	57
	EDS Installation	58

Programming Your Module with PLC Family Processors	Appendix C
	Overview. 59
	Enter Block Transfer Instructions. 59
	PLC-2 Family Processor 60
	PLC-3 Family Processor 60
	PLC-5 Family Processor 61
	PLC-5/250 Family Processor 62
Safety Approvals	Appendix D
	European Hazardous Location Approval. 65
	North American Hazardous Location Approval 66
	Index

Notes:

Read this preface to familiarize yourself with the rest of the manual. It provides information concerning:

- who should use this manual
- the purpose of this manual
- related documentation
- conventions used in this manual
- terminology used in this manual

Who Should Use This Manual

We assume that you have previously used an Allen-Bradley programmable controller, that you are familiar with its features, and that you are familiar with the terminology we use. If not, read the user manual for your processor before reading this manual.

Purpose of the Manual

This manual is a reference guide for the FLEX I/O Thermocouple, RTD, Millivolt Input Modules. It describes the procedures for installing, configuring and troubleshooting your module. For more information, consult the following chapters.

Topic	See
Overview of FLEX I/O and Your Thermocouple, RTD, and Millivolt Input Module	Chapter 1
Install Your FLEX I/O Input Module	Chapter 2
Configure Your FLEX I/O Module with RSLogix 5000 Software	Chapter 3
Read and Write Configuration Maps for the FLEX I/O Module	Chapter 4
Calibrate Your Module	Chapter 5
Troubleshoot the Module	Chapter 6
Specifications	Appendix A
Electronic Data Sheet (EDS) Files	Appendix B
Programming Your Module with PLC Family Processors	Appendix C
Safety Approvals	Appendix D

About the Vocabulary

This manual covers the 1794-IRT8, 1794-IRT8K, and 1794-IRT8XT modules, which are identical, except that the 1794-IRT8K is conformally coated.

In this manual, we refer to:

- the individual Thermocouple, RTD, and mV module as the “module,” or “TC, RTD, and mV module.”
- the programmable controller as the “controller” or the “processor.”

Related Documentation

The following documents contain additional information about Rockwell Automation products. To obtain a copy, contact your local Rockwell Automation office or distributor.

Resource	Description
FLEX I/O Product Profile, publication 1794-PP019	Comprehensive product profile for the FLEX I/O product line.
FLEX I/O ControlNet Redundant Media Adapter, publication 1794-5.18	Information on how to install the FLEX I/O ControlNet Redundant Media Adapter (1794-ACNR).
FLEX I/O EtherNet/IP Adapter Module Installation Instructions, publication 1794-IN082	Information on how to install the FLEX I/O EtherNet/IP Adapter Module (Catalog No. 1794-AENT).
FLEX I/O ControlNet Adapter Module Installation Instructions, publication 1794-IN128	Information on how to install the ControlNet Adapter Modules (Catalog No. 1794-ACN15, 1794-ACN15K, 1794-ACNR15, 1794-ACNR15XT, Series D).
FLEX I/O DeviceNet Adapter Module Installation Instructions, publication 1794-IN099	Information on how to install the FLEX I/O DeviceNet Adapter Modules (Catalog No. 1794-ADN, 1794-ADNK).
Remote I/O Adapter Modules Installation Instructions, publication 1794-IN098	Information on how to install the Remote I/O Adapter Modules (Catalog No. 1794-ASB, 1794-ASB2, 1794-ASBK, 1794-ASB2K).
Remote I/O Adapter Module User Manual, publication 1794-UM009	Information on how to use the Remote I/O Adapter Module (Catalog No. 1794-ASB).
FLEX I/O PROFIBUS Adapter Module Installation Instructions, publication 1794-IN087	Information on how to install the FLEX I/O PROFIBUS Adapter (Catalog No. 1794-APB).
FLEX I/O PROFIBUS Adapter Module User Manual, publication 1794-UM057	Information on how to use the FLEX I/O PROFIBUS Adapter Module (Catalog No. 1794-APB).
Flex I/O Digital Input Modules Installation Instructions, publication 1794-IN093	Information on how to install the Flex I/O Digital Input Modules (Catalog No. 1794-IB8, 1794-IB16, 1794-IB16K, 1794-IB32).
Flex I/O Digital DC Sourcing Input and Sinking Output Modules Installation Instructions, publication 1794-IN095	Information on how to install the Flex I/O Digital DC Sourcing Input and Sinking Output Modules (Catalog No. 1794-IV16, 1794-OV16, 1794-OV16P).
Flex I/O Digital DC Sourcing Output Modules Installation Instructions, publication 1794-IN094	Information on how to install the Flex I/O Digital DC Sourcing Output Modules (Catalog No. 1794-OB8, 1794-OB8EP, 1794-OB16, 1794-OB16P, 1794-OB32P).
Flex I/O Input/ Output Module Installation Instructions, publication 1794-IN083	Information on how to install the Flex I/O Input/ Output Modules (Catalog No. 1794-IB16XOB16P, 1794-IB10XOB6).
Flex I/O 8 Output Relay Module Installation Instructions, publication 1794-IN019	Information on how to install the Flex I/O 8 Output Relay Modules (Catalog No. 1794-OW8, 1794-OW8K, 1794-OW8XT).
FLEX I/O Input, Output and Input/Output Analog Modules Installation Instructions, publication 1794-IN100	Information on how to install the FLEX I/O Input, Output and Input/Output Analog Modules (Catalog No. 1794-IE8, 1794-IE4XOE2, 1794-OE4, 1794-IE8K, 1794-OE4K).
FLEX I/O Analog Module User Manual, publication 1794-6.5.2	Information on how to install the FLEX I/O Analog Modules (Catalog No. 794-OE4, 1794-IE8, 1794-IE12, 1794-OE12, 1794-IE4XOE2, 1794-IE8XOE4, 1794-IE4XOE2XT, 1794-IE8XT, 1794-OE4XT).
FLEX I/O Isolated Analog Output Module Installation Instructions, publication 1794-IN037	Information on how to install the FLEX I/O Isolated Analog Output Module (Catalog No. 1794-OF4I).

Resource	Description
FLEX I/O 4 Isolated Input Module Installation Instructions, publication 1794-IN038	Information on how to install the FLEX I/O 4 Isolated Input Module (Catalog No. 1794-IF4I).
FLEX I/O 2 In/2 Out Isolated Analog Combo Module Installation Instructions, publication 1794-IN039	Information on how to install the FLEX I/O 2 In/2 Out Isolated Analog Combo Module (Catalog No. 1794-IF2XOF2I).
FLEX I/O Isolated Analog Modules User Manual, publication 1794-6.5.8	Information on how to use the FLEX I/O Isolated Analog Modules (Catalog No. 1794-IF4I, 1794-OF4I, 1794-IF2XOF2I, 1794-IF4IXT, 1794-IF4ICFXT, 1794-OF4IXT, 1794-IF2XOF2IXT).
FLEX I/O 8 Thermocouple Input Module Installation Instructions, publication 1794-IN021	Information on how to install the FLEX I/O 8 Thermocouple Input Modules (Catalog No. 1794-IT8, 1794-IR8).
FLEX I/O 8 Input RTD Module User Manual, publication 1794-6.5.4	Information on how to use the FLEX I/O 8 Input RTD Module (Catalog No. 1794-IR8).
FLEX I/O Thermocouple/Millivolt Input Module User Manual, publication 1794-6.5.7	Information on how to use the Thermocouple and Millivolt Input Module (Catalog No. 1794-IT8).
FLEX I/O Thermocouple/RTD Input Analog Module Instructions, publication 1794-IN050	Information on how to install the Thermocouple/Millivolt Input Modules (Catalog No. 1794-IRT8, 1794-IRT8K, 1794-IRT8XT).
2-Input Frequency Module Installation Instructions, publication 1794-IN049	Information on how to install the 2-Input Frequency Module (Catalog No. 1794-IJ2, 1794-IJ2K, 1794-IJ2XT).
FLEX I/O Frequency Input Module User Manual, publication 1794-6.5.11	Information on how to use the FLEX I/O Frequency Input Module (Catalog No. 1794-IJ2).
24V FLEX I/O 2 Channel Incremental Encoder Module Installation Instructions, publication 1794-IN063	Information on how to install the 24V FLEX I/O 2 Channel Incremental Encoder Module (Catalog No. 1794-ID2).
FLEX Integra Analog Module User Manual, publication 1793-6.5.1	Information on how to install the FLEX Integra Analog Module (Catalog No. 1793-IE2XOE1, 1793-IE2XOE1S, 1793-IE4, 1793-IE4S, 1793-OE2, 1793-OE2S).
FLEX I/O 4 Channel Pulse Counter Module Installation Instructions, publication 1794-IN064	Information on how to install the 24V DC FLEX I/O 4-Channel Module (Catalog No. 1794-IP4).
FLEX I/O Very High Speed Counter Module Installation Instruction, publication 1794-IN067	Information on how to install the Very High Speed Counter Module (Catalog No. 1794-VHSC).
FLEX I/O 48V DC Input and Output Modules Installation Instructions, publication 1794-IN105	Information on how to install the FLEX I/O 48V DC Input and Output Modules (Catalog No. 1794-IC16, 1794-OC16).
FLEX I/O AC Digital Input Modules Installation Instructions, publication 1794-IN102	Information on how to install the FLEX I/O AC Input Modules (Catalog No. 1794-IA8, 1794-IA8I, 1794-IA16).
FLEX I/O Digital AC Output Modules Installation Instructions, publication 1794-IN103	Information on how to install the FLEX I/O Digital AC Output Modules (Catalog No. 1794-OA8, 1794-OA8K, 1794-OA8I, 1794-OA16).
FLEX I/O 220V AC Input and Output Modules Installation Instructions, publication 1794-IN104	Information on how to install the FLEX I/O 220V AC Input and Output Modules (Catalog No. 1794-IM8, 1794-OM8).
FLEX I/O Terminal Base Units Installation Instructions, publication 1794-IN092	Information on how to install the FLEX I/O Terminal Base Units (Catalog No. 1794-TB2, 1794-TB3, 1794-TB3K, 1794-TB3S, 1794-TB32, 1794-TB3G, 1794-TB3GK, 1794-TB3GS, 1794-TB3T, 1794-TB3TS, 1794-TBN, 1794-TBNK, 1794-TBNF).
Interconnect Cable Installation Instructions, publication 1794-5.12	Information on how to install the Interconnect Cable (Catalog No. 1794-CE1, 1794-CE3).

Resource	Description
FLEX I/O DC Power Supply Installation Instructions, publication 1794-IN069	Information on how to install the FLEX I/O DC Power Supply (Catalog No. 1794-PS13, 1794-PS3).
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	In-depth information on grounding and wiring Allen-Bradley programmable controllers.
Rockwell Automation Industrial Automation Glossary, AG-7.1	A glossary of industrial automation terms and abbreviations.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

Overview of FLEX I/O and Your Thermocouple, RTD, and Millivolt Input Module

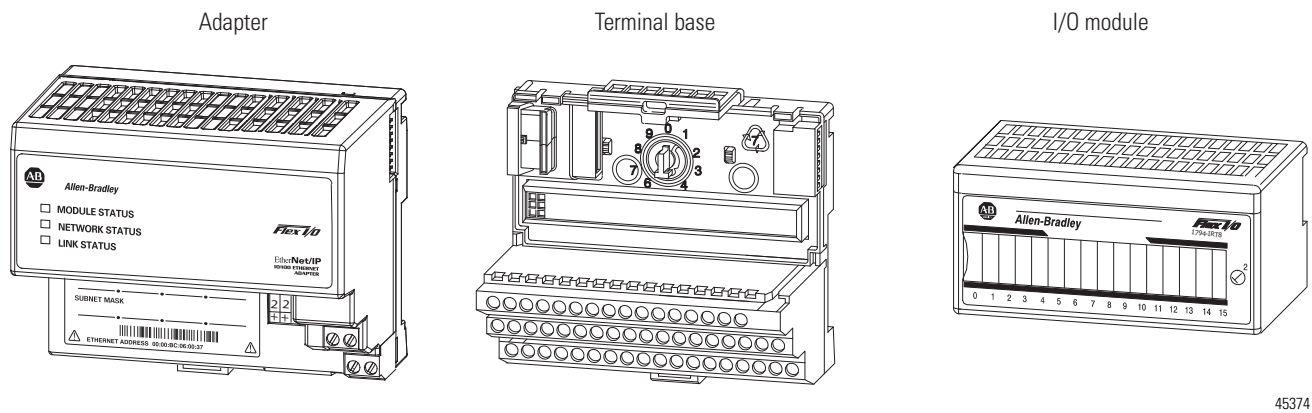
Overview

This chapter provides a description of the FLEX I/O Thermocouple, RTD, and Millivolt Input module and an overview of how it communicates with programmable controllers.

Topic	Page
The FLEX System	1
Types of Modules	2
What the FLEX I/O Input Module Does	2
The FLEX I/O Module in a Logix Control System	3
Physical Features of Your Module	4
Chapter Summary	5

The FLEX System

FLEX I/O is a small, modular I/O system for distributed applications that performs all of the functions of rack-based I/O. The FLEX system contains the following components shown below:



- Adapter – transfers read and write configuration data to and from the I/O module
- Terminal base – contains a terminal strip to terminate wiring for two- or three-wire devices
- I/O module – contains the bus interface and circuitry needed to perform specific functions related to your application

The FLEX system consists of an adapter module, terminal base unit, DIN rail, power supply, and adapter cabling components. You can use up to 8 terminal bases per adapter module.

For detailed instructions on how to set up and install your module, refer to the topic, *Install Your FLEX I/O Input Module*, on page 7.

Types of Modules

The module refer to the following catalogs.

Catalog No.	Voltage	Inputs	Description
1794-IRT8	24V DC	8	Analog – 8-pt, 16 bit non-isolated RTD, thermocouple and mV Input module
1794-IRT8K	24V DC	8	Analog – 8-pt, 16 bit non-isolated RTD, thermocouple and mV Input module. Conformally coated module.
1794-IRT8XT	24V DC	8	Analog – 8-pt, 16 bit non-isolated RTD, thermocouple and mV Input module designed for extended temperature.

The module accepts up to 8 thermocouple or RTD inputs. The inputs are nonisolated and are selected with analog multiplexers. The inputs accept millivolt or resistive inputs. Default input spans are -40.00 mV... +100.00 mV or 0.0...500.0 Ω . Fault indicators are located on the field side.

No switches or jumpers are used on the TC and RTD Input module. The inputs have both fixed hardware filters and selectable firmware digital filters.

What the FLEX I/O Input Module Does

The module is a high-speed, high-accuracy temperature and millivolt measuring module that accepts thermocouple inputs, 2-, 3-, and 4-wire RTD inputs, and mV source inputs.

It offers the following:

- wire-off, over-range, and under-range detection
- good common mode rejection
- usage with long thermocouple wiring
- usage with grounded or ungrounded thermocouples

The Series B version of 1794-IRT8 provides capability to work with grounded thermocouples.

Use cold junction compensators (cat. no. 1794-CJC2) in thermocouple mode. Two cold junction compensators are shipped with the 1794-IRT8.

The FLEX I/O Module in a Logix Control System

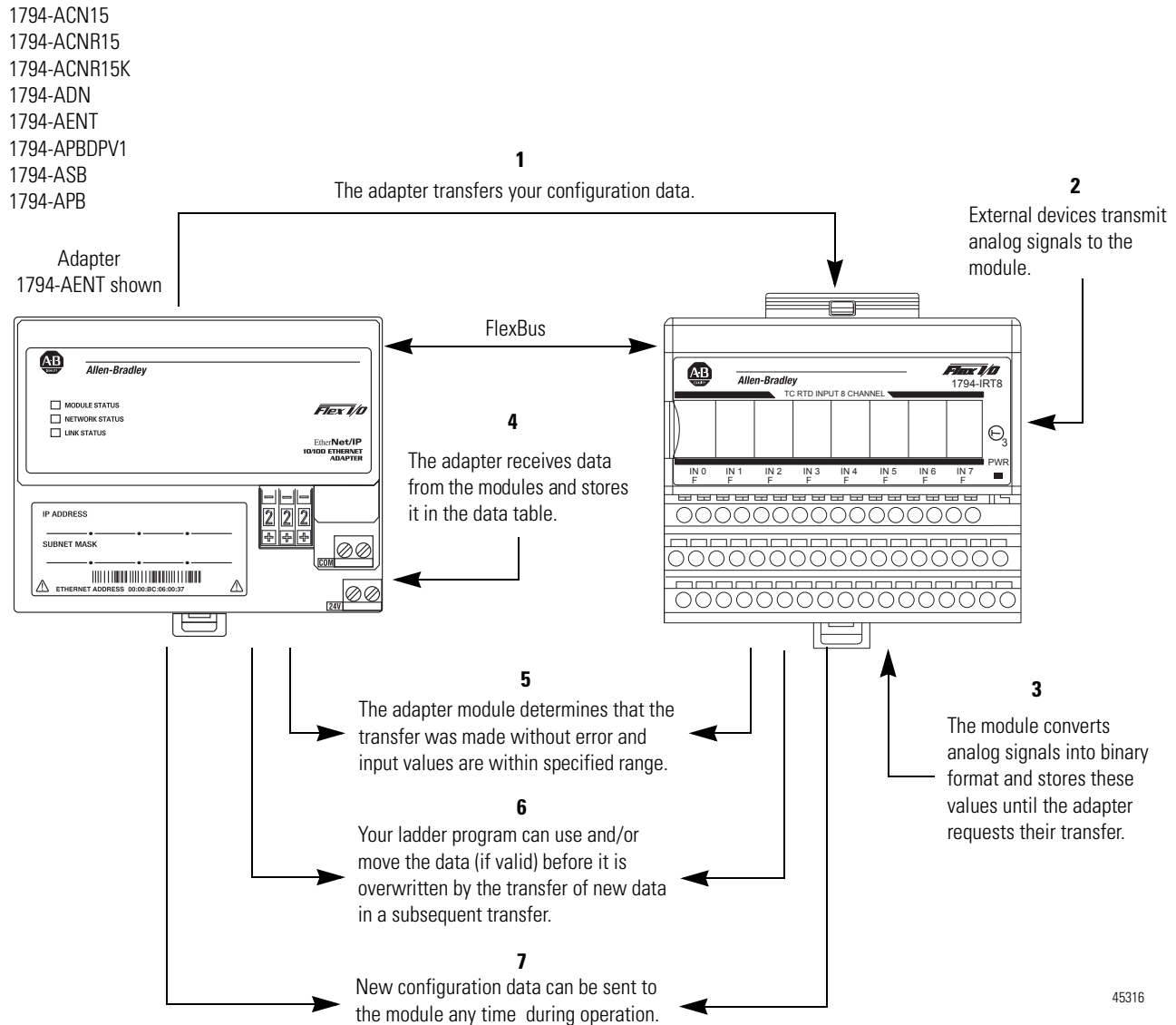
The FLEX I/O Thermocouple, RTD, and Millivolt modules are intelligent modules that interface analog signals with Rockwell Automation programmable controllers through a FLEX I/O adapter module.

The adapter transfers data to and from the module. These transfers allow:

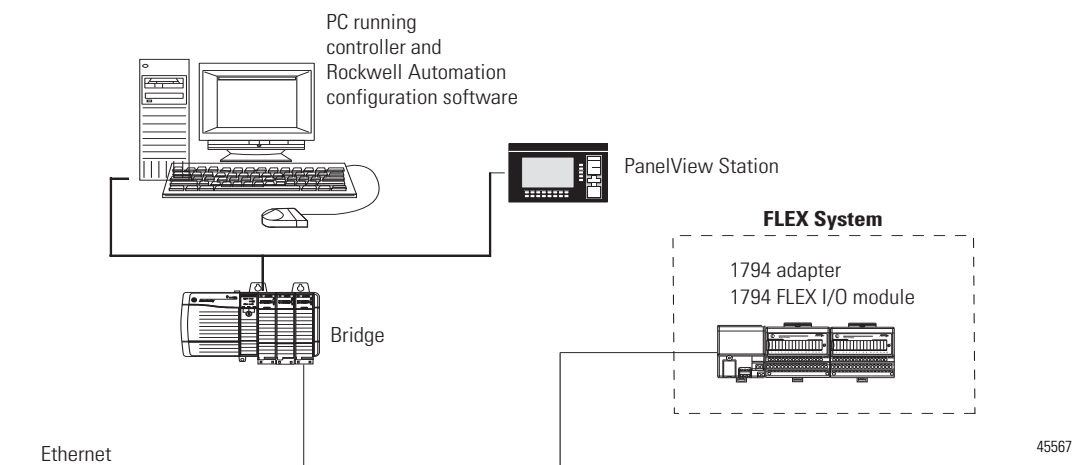
- the adapter to obtain input or output values and status from the module
- the user to establish the mode of operation through a process called configuration

The following illustration shows the flow of communication between the adapter and the I/O module.

Typical Communication Between the Adapter and a Module



A broader view of how the FLEX I/O module interfaces with the different elements in a Logix system is shown in the sample illustration below.



In this example, the FLEX I/O module communicates with the controller through the adapter. The controller can produce and consume tags. It can initiate MSG instructions that send and receive data or configure devices. Configuration of devices and the network is done through the personal computer running the controller and configuration software.

To learn the prerequisites and steps to configure your FLEX I/O module using RSLogix 5000 software, see *Configure Your FLEX I/O Module with RSLogix 5000 Software* on page 21.

ATTENTION



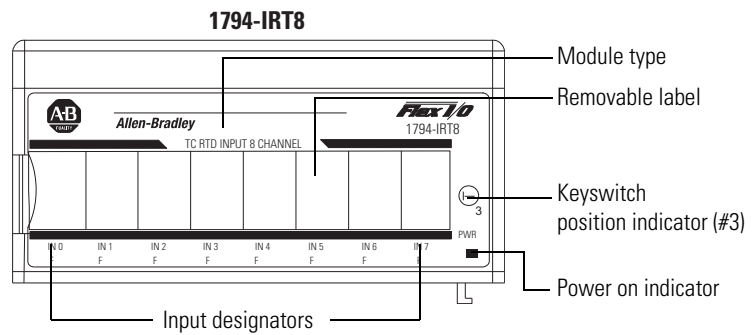
The following publications provide more information about EtherNet/IP, and ControlNet modules in a Logix5000 system:

- EtherNet/IP Modules in Logix5000 Control Systems, publication [ENET-UM001](#)
- ControlNet Modules in Logix5000 Control Systems, publication [CNET-UM001](#)

Physical Features of Your Module

The module label identifies the keyswitch position, wiring and module type. A removable label provides space for writing individual designations per your application. Indicators are provided to identify input fault conditions, and to show when power is applied to the module.

Module Label and Indicators



45317

Chapter Summary

In this chapter, you were introduced to the FLEX I/O system and the Thermocouple, RTD, and mV input module, and how it communicates with programmable controllers.

Notes:

Install Your FLEX I/O Input Module

Overview

This chapter provides you with pre-installation requirements and instructions on how to install your FLEX I/O Thermocouple, RTD, and Millivolt Input module.

Topic	Page
Before You Install Your Module	7
Series A and Series B	8
Power Requirements	8
Install the Module	10
Mount on a DIN Rail	10
Mount on a Panel or Wall	13
Mount the FLEX I/O Module on the Terminal Base Unit	14
Wiring Information	16
Chapter Summary	20

Before You Install Your Module

Before installing your FLEX I/O Thermocouple, RTD, and mV module, you need to:

- verify that a suitable enclosure is available for installation of the module, and
- position the keyswitch on the terminal base.

ATTENTION



These modules do not receive primary operational power from the backplane. 24V DC power must be applied to your module before installation. If power is not applied, the module position may appear to the adapter as an empty slot in your chassis.

ATTENTION



If using a Series B product to replace a Series A product, connect a wire between terminals 39 and 48 on the 1794-TB3G or 1794-TB3GS terminal base unit. If not connected, the Series B product defaults to Series B functionality.

Series A and Series B

The table, Series A and Series B Differences, describes the differences between Series A and Series B of the FLEX I/O Thermocouple, RTD, and mV Input modules.

Series A and Series B Differences

Mode	1794-IRT8 Series A	1794-IRT8, 1794-IRT8XT Series B
Isolation	Between user side and system side	Between user 24V DC and user I/O; between user side and system side
Common Mode Range	±4V DC	±15V DC
Thermocouple Mode Wire-off Detection	When an open sensor is detected, data defaults to maximum value	When open sensor is detected, data defaults to minimum value

ATTENTION



In the RSLogix 5000 software, if using a series B product to replace a series A product, the module will be accepted without an electronic key mismatch warning.

This is true for 1794-IRT8 and 1794-IRT8XT modules installed on Ethernet/IP, ControlNet, or Remote I/O networks.

ATTENTION



The CJC Status bit, Read Word 9, Bit 3 is added with the Firmware C release of the 1794-IRT8 Series B module.

The CJC Status bit is turned On when the temperature between the CJC's is greater than 6 °C but less than 12 °C.

When this temperature difference is above 12 °C, then the CJC Alarm bits are set.

Also, if a CJC temperature is over-range or under-range, then the associated CJC Alarm bit is set. In this condition, the CJC Status bit is not set.

The CJC Status bit did not exist in Series A.

Power Requirements

The wiring of the terminal base unit is determined by the current draw through the terminal base. Make certain that the current draw does not exceed 10 A.

ATTENTION

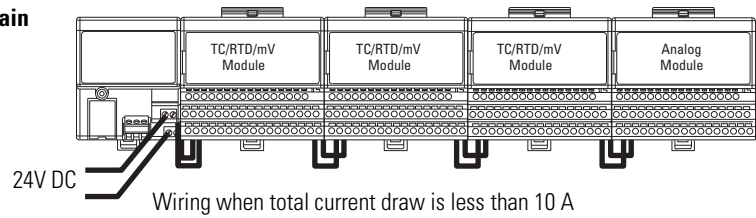
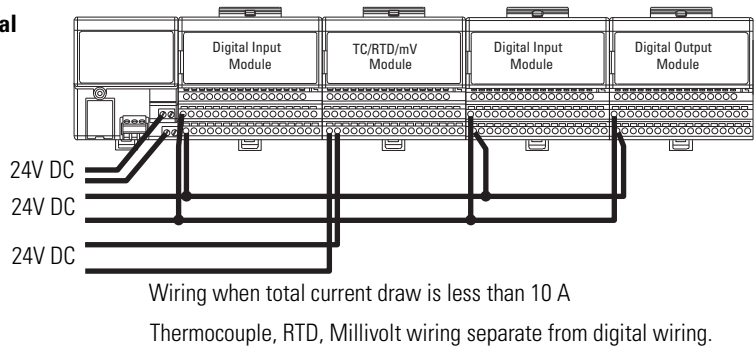
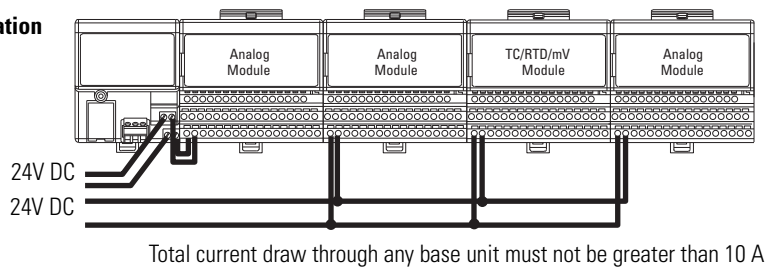


Total current draw through the terminal base unit is limited to 10 A. Separate power connections may be necessary.

ATTENTION

Do not daisychain power or ground from the terminal base unit to any AC or DC digital module terminal base unit.

Methods of wiring the terminal base units are shown in the illustration below.

Daisychain**Individual****Combination**

45318

ATTENTION

Note the following considerations for each type of wiring configuration:

- Daisychain – All modules must be analog or TC, RTD, and mV modules for this configuration.
 - Individual – Use this type of configuration for any "noisy" DC digital I/O modules in your system.
 - Combination – All modules powered by the same power supply must be analog or TC, RTD, and mV modules for the combination type of configuration.
-

Install the Module

Installation of the FLEX I/O module consists of:

- mounting the terminal base unit
- installing the TC, RTD, and mV module into the terminal base unit
- installing the connecting wiring to the terminal base unit

If you are installing your module into a terminal base unit that is already installed, proceed to the section, Mount the FLEX I/O Module on the Terminal Base Unit, on page 14.

Mount on a DIN Rail

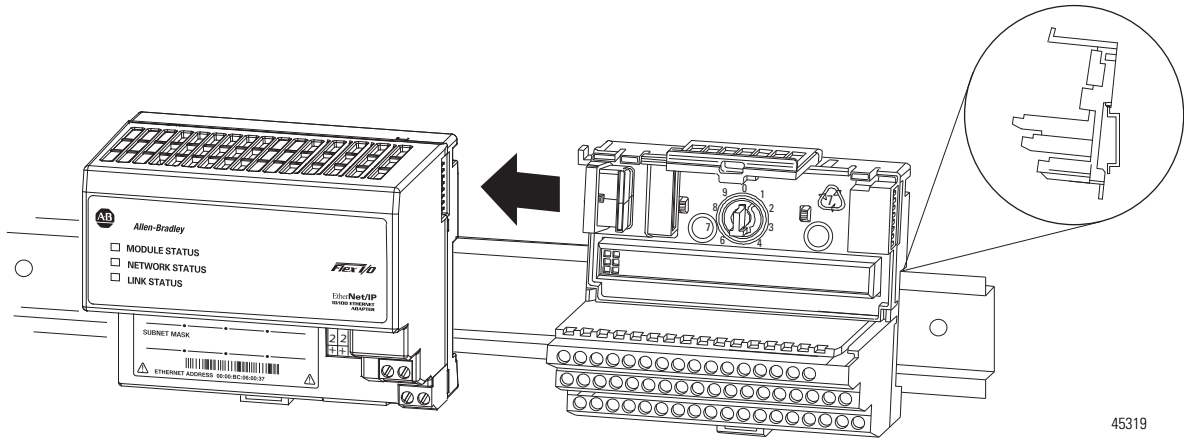
ATTENTION

Do not remove or replace a terminal base unit when power is applied. Interruption of the FlexBus can result in unintended operation or machine motion.

Install the Terminal Base Unit

1. Remove the cover plug in the male connector of the unit to which you are connecting this terminal base unit.

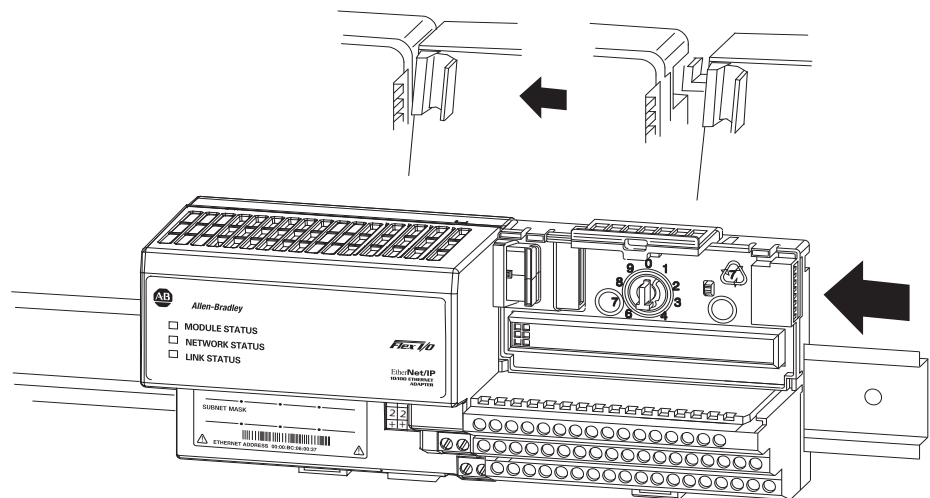
2. Check to make sure that the 16 pins in the male connector on the adjacent device are straight and in line so that the mating female connector on this terminal base unit will mate correctly.



45319

Make certain that the female FlexBus connector is fully retracted into the base unit.

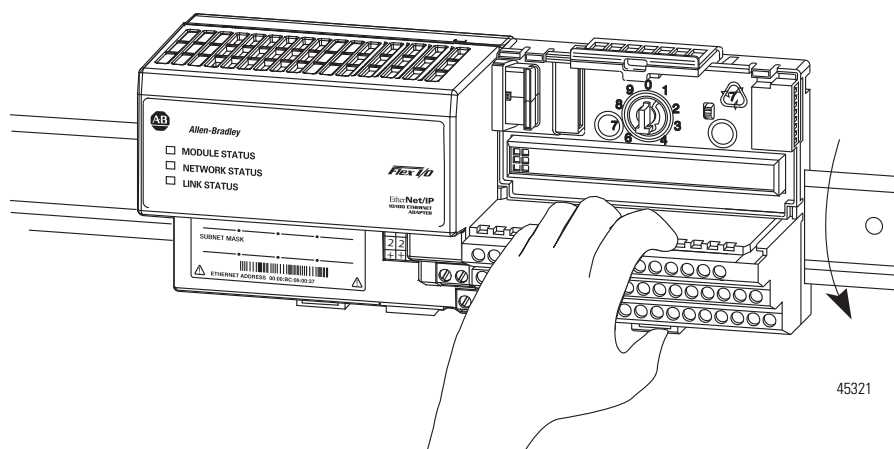
3. Position the terminal base at a slight angle and hooked over the top of the 35 x 7.5 mm DIN rail A (Allen-Bradley part number 199-DR1; 46277-3).



45320

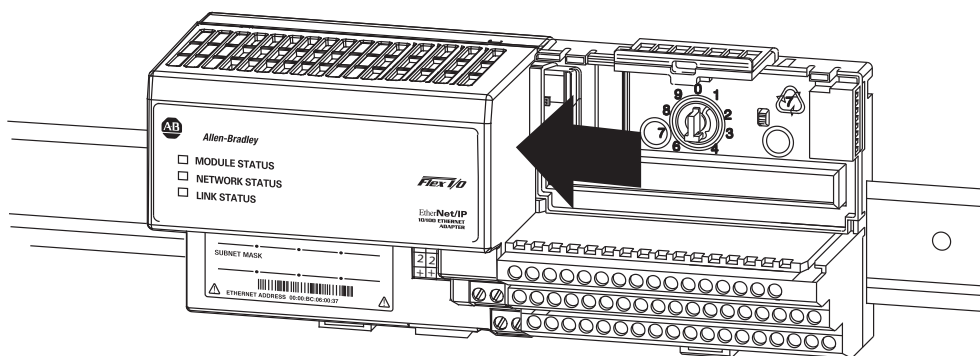
4. Slide the terminal base over tight against the adapter, or proceeding terminal base. Make sure the hook on the terminal base slides under the edge of the adapter, or proceeding terminal base, and the FlexBus connector is fully retracted.

5. Rotate the terminal base onto the DIN rail with the top of the rail hooked under the lip on the rear of the terminal base.
Use caution to make sure that the female FlexBus connector does not strike any of the pins in the mating male connector.
6. Press down on the terminal base unit to lock the terminal base on the DIN rail. If the terminal base does not lock into place, use a screwdriver or similar device to open the locking tab, press down on the terminal base until flush with the DIN rail and release the locking tab to lock the base in place.



45321

Gently push the FlexBus connector into the side of the adapter, or proceeding terminal base, to complete the backplane connection.



45322

For specific wiring information, refer to the installation instructions for the module you are installing in this terminal base unit.

7. Repeat the above steps to install the next terminal base unit.
Ensure that the cover of the FlexBus connector on the last terminal base unit is in place.

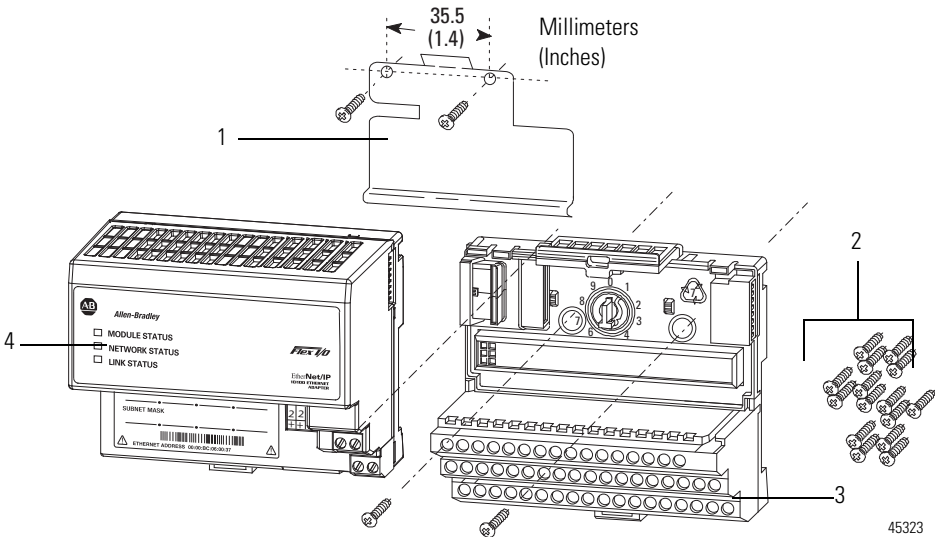
Mount on a Panel or Wall

Installation of a FLEX system on a wall or panel consists of:

- laying out the drilling points on the wall or panel.
- drilling the pilot holes for the mounting screws.
- mounting the adapter mounting plate.
- installing the terminal base units and securing them to the wall or panel.

If you are installing your module into a terminal base unit that is already installed, proceed to the section, Mount the FLEX I/O Module on the Terminal Base Unit, on page 14.

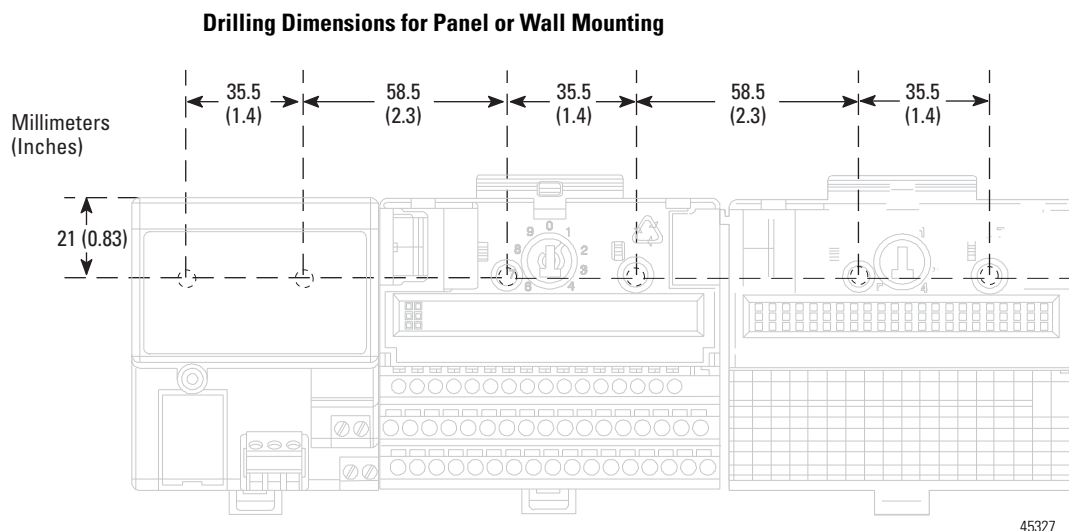
Use the mounting kit Cat. No. 1794-NM1 for panel or wall mounting.



	Description		Description
1	Mounting plate for adapter	3	Terminal base unit (not included)
2	#6 Self-tapping screws	4	Adapter module (not included)

To install the mounting plate on a wall or panel:

1. Lay out the required points on the wall or panel as shown in the drilling dimension drawing.



2. Drill the necessary holes for the #6 self-tapping mounting screws.
3. Mount the mounting plate for the adapter module using two #6 self-tapping screws – 18 screws included for mounting up to 8 modules and the adapter.

IMPORTANT

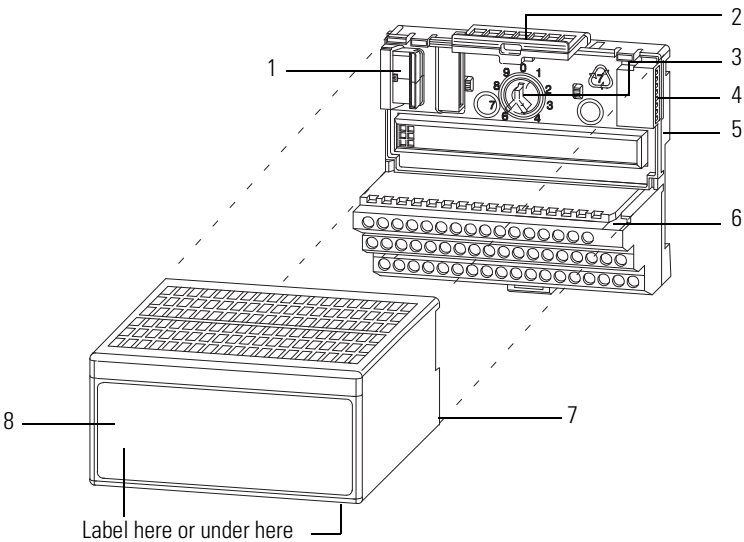
Make certain that the mounting plate is properly grounded to the panel. Refer to Industrial Automation Wiring and Grounding Guidelines, publication [1770-4.1](#).

4. Hold the adapter at a slight angle and engage the top of the mounting plate in the indentation on the rear of the adapter module.
5. Press the adapter down flush with the panel until the locking lever locks.
6. Position the terminal base unit up against the adapter and push the female bus connector into the adapter.
7. Secure to the wall with two #6 self-tapping screws.
8. Repeat for each remaining terminal base unit.

Mount the FLEX I/O Module on the Terminal Base Unit

The Thermocouple, RTD, and mV input module mounts on a 1794-TB3G or 1794-TB3GS terminal base unit.

1. Rotate keyswitch (3) on terminal base unit (4) clockwise to position 3 as required for the module.
Do not change the position of the keyswitch after wiring the terminal base unit.



40231

	Description		Description
1	FlexBus connector	5	Base unit
2	Latching mechanism	6	Alignment groove
3	Keyswitch	7	Alignment bar
4	Cap plug	8	Module

2. Make certain the FlexBus connector (1) is pushed all the way to the left to connect with the neighboring terminal base or 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 unit.

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 (8) with its alignment bar (7) 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 is locked into the module.

6. Remove cap plug and attach another terminal base unit to the right of this terminal base unit if required.
Make sure the last terminal base has the cap plug in place.

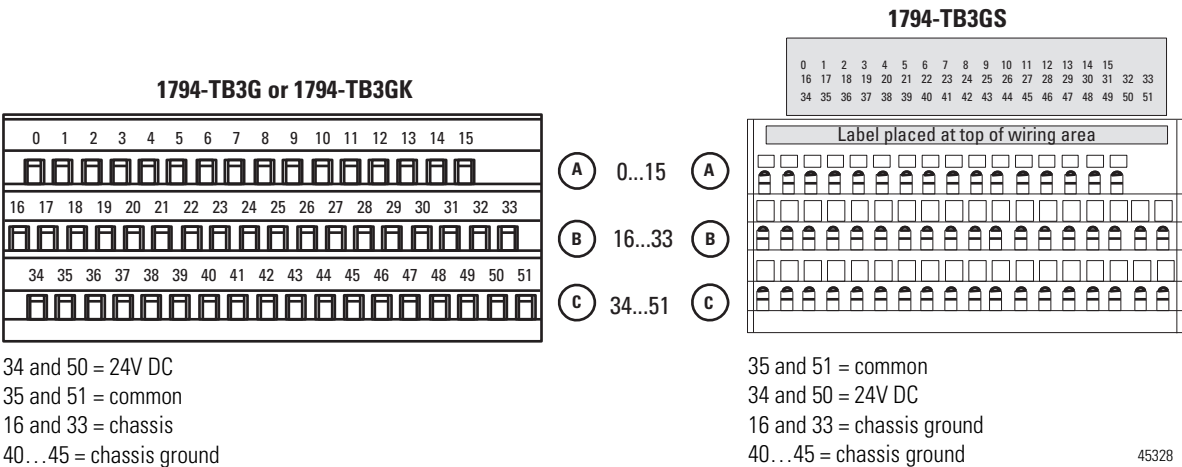
IMPORTANT

The adapter is capable of addressing eight modules. Do not exceed a maximum of eight terminal base units in your system.

Wiring Information

Wiring the module is done using the 1794-TB3G, 1794-TB3GK or the 1794-TB3GS terminal base units.

1794-TB3G, 1794-TB3GK and 1794-TB3GS Wiring



Connect Wiring to the FLEX I/O Module

Wiring to the TC, RTD, and mV module is made through the terminal base unit on which the module mounts.

The module is compatible with the 1794-TB3G, 1794-TB3GK and 1794-TB3GS terminal base units.

Connecting Wiring Using a 1794-TB3G, 1794-TB3GK or 1794-TB3GS Terminal Base Unit

1. Connect individual signal wiring to numbered terminals on 0...15 row (A), and 17...32 row (B), on the terminal base unit as indicated in the table below. Use Belden 8761 cable for mV signal wiring, or the appropriate thermocouple wire for your thermocouples.

Signal wiring shields can be connected to terminals 16 or 33 on row B or terminals 40...45 on row C.

2. Connect the +V DC power lead to terminal 34 on row C, terminals 34...51.
3. Connect the -V DC common (return-) to terminal 35 on row C, terminals 34...51.

ATTENTION



Do not daisychain power or ground from this terminal base unit to any AC or DC digital module terminal base units.

4. If daisy chaining power to the next terminal base unit, connect a jumper from terminal 50 (+V DC) on this base unit to +V terminal on the next terminal base unit.
5. Connect a jumper from terminal 51 (-V DC common) to the -V DC common terminal on the next terminal base unit.
6. If using cold junction compensators, make these connections as shown in the CJC Sensor chart below.

Identify RTD Wire Pairs

If the RTD wires are color-coded, the wires that are the same color are connected together. If the wires are not color-coded, use an ohmmeter to determine the pairs as explained below.

How to Connect a 4-wire RTD

If the 4-wire RTD wires are all different colors, use an ohmmeter to determine which leads are connected together. One of the leads in each pair is the compensation lead. Either lead of the pair can be the compensation lead. Attach one pair to terminals L and - and the other pair to + and H.

How to Connect a 3-wire RTD

If the 3-wire RTD wires are all different colors, use an ohmmeter to determine which leads are connected together. Either lead of the pair can be the compensation lead. Attach one lead of the pair to terminal L and the other to +. Attach the single lead to -.

Refer to the table, Wiring Connections for the FLEX I/O Input Module, on page 18.

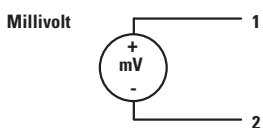
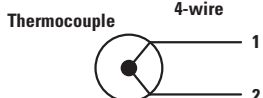
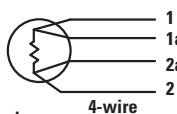
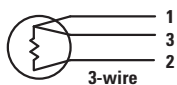


Diagram of a 40-pin connector. The pins are labeled as follows:

- Pins 1-20: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
- Pins 21-40: C, NO, C, NC, C, NO, C, NC, C, NO, C, NC, C, NO, C, NC, C, NO, C, NC
- Pins 41-60: V, C, J, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C
- Pins 61-80: J, C, V, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C, C

45359

Wiring Connections for the FLEX I/O Input Module

Input types	Connect the following:				
	H	L	+	-	Shield ⁽¹⁾
RTD – 2-wire			1	2	
RTD – 3-wire		3	1	2	
RTD – 4-wire	1a	2a	1	2	
Thermocouple		1		2	
Millivolt		1		2	

(1) Terminals 37, 38 and 39 and 46, 47 and 48 are for cold junction compensation, with 38 and 47 as chassis GND.

	CJC Sensor			
Input	+	Chassis Ground	-	CJC Tail ⁽¹⁾
CJC1	C-37	C-38	C-39	A-5 (B-22)
CJC2	C-46	C-47	C-48	A-12 (B-29)

(1) Terminals 37, 38, and 39, and 46, 47, and 48 are for cold junction compensation, with 38 and 47 as chassis GND. Connect the tail of CJC1 to terminal 5 and CJC2 to terminal 12 if channels 0...3 or 0...7 are configured for thermocouples. Connect the tail of CJC1 to terminal 22 and CJC2 to 29 if channels 4...7 are configured for thermocouples.

Terminal Base Unit Wiring Connections

RTD or TC Channel	1794-TB3G, 1794-TB3GK, and 1794-TB3GS Terminal Base Units ⁽¹⁾			
	High Signal Terminal (H)	Low Signal Terminal (L)	RTD Source Current (+)	Signal Return (-)
0	A-1	A-2	A-0	A-3
1	A-5	A-6	A-4	A-7
2	A-9	A-10	A-8	A-11
3	A-13	A-14	A-12	A-15
4	B-18	B-19	B-17	B-20
5	B-22	B-23	B-21	B-24
6	B-26	B-27	B-25	B-28
7	B-30	B-31	B-29	B-32
+24V DC Power	34 and 50			
24V DC Common	35 and 51			

(1) Terminals 37, 38, and 39, and 46, 47 and 48 are for cold junction compensation. Terminals 16, 33 and 40...45 are chassis ground. Connect tail of CJC1 to terminal 5 and CJC2 to 12 if channels 0...3 or 0...7 are thermocouples. Connect tail of CJC1 to terminal 22 and CJC2 to 29 **only** if channels 4...7 are used.

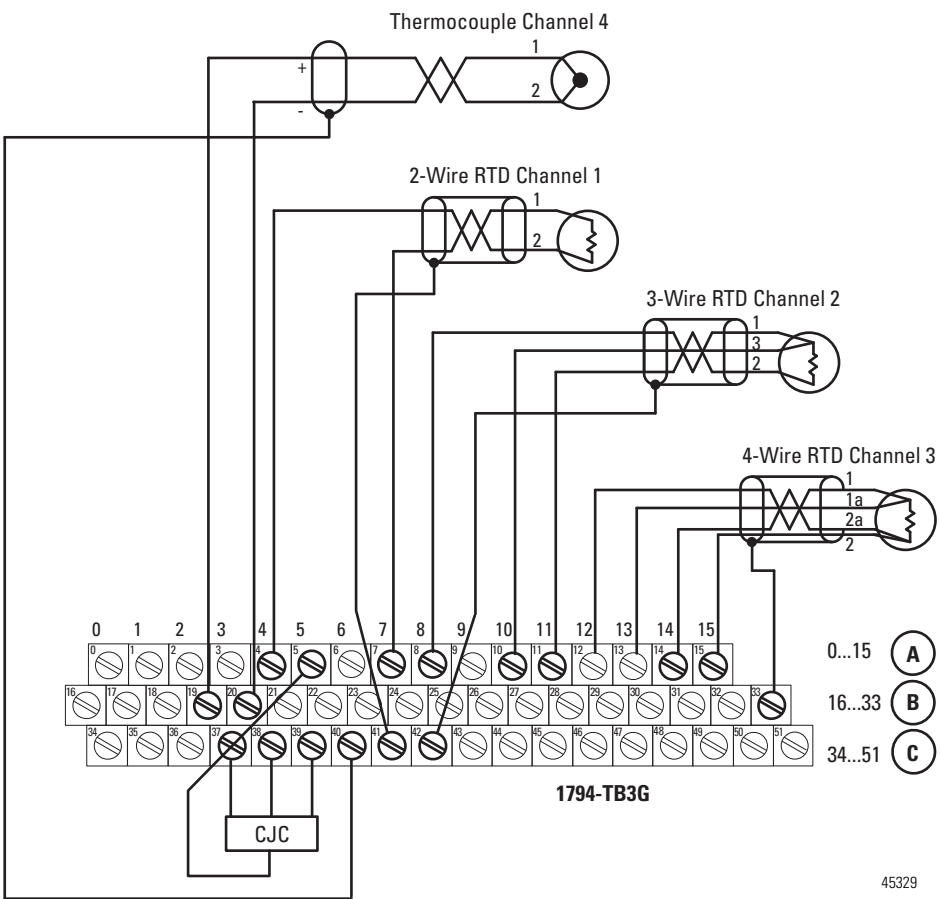
IMPORTANT

Disconnecting and reconnecting RTDs or CJC's with power applied temporarily disturbs the channel steady state data. Allow 2 minutes for settling time after finishing connections.

IMPORTANT

If using RTD isolators, use 2- or 4-wire configurations only, and add digital filtering to the inputs.

Example of 2-, 3- and 4-wire RTD and Thermocouple Wiring to a 1794-TB3G Terminal Base Unit



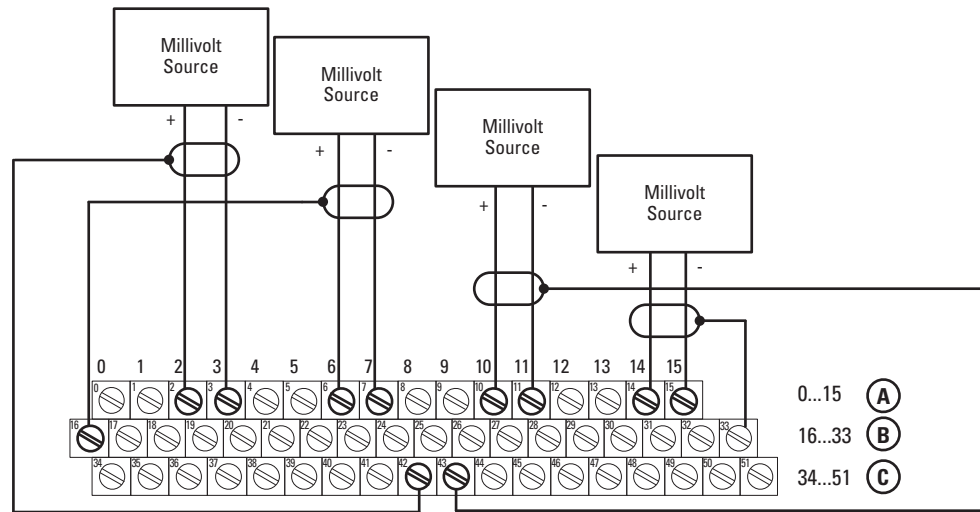
45329

ATTENTION



Keep exposed area of inner conductor as short as possible.

Example of Millivolt Wiring to a 1794-TB3G Terminal Base Unit



45330

Chapter Summary

This chapter provided the user with installation prerequisites and instructions for the FLEX I/O Input module in an existing programmable controller system. It also provided the user with instructions on how to wire to a terminal base unit.

Configure Your FLEX I/O Module with RSLogix 5000 Software

Overview

This chapter describes how to configure the FLEX I/O Thermocouple, RTD, and mV module for the ControlLogix and CompactLogix system using the RSLogix 5000 software. The 1794-IRT8 module can communicate through different networks such as ControlNet, Ethernet, Profibus, among others. In the examples below, the Ethernet adapter is used for communication between the Logix processor and the FLEX I/O bus.

ATTENTION

If using an SLC controller with ControlNet, refer to the associated I/O scanner documentation.

If using a PLC 5 controller, refer to the PLC 5 controller documentation for ControlNet configuration information.

You need to follow these series of steps to fully configure your FLEX I/O module in the RSLogix 5000 software.

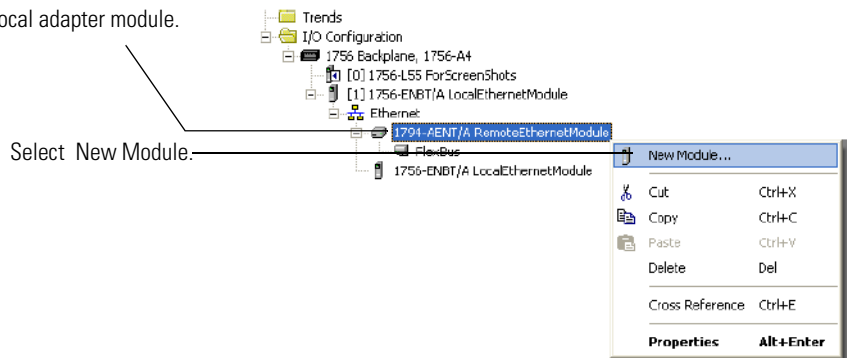
1. Add and configure the new local bridge module, such as 1756-ENBT, to your project. This user manual assumes you have already properly configured this module. Refer to the associated documentation.
2. Add and configure the new adapter module, such as a FLEX I/O EtherNet Adapter (1794-AENT). This user manual assumes you have already properly configured this module. Refer to the associated documentation.
3. Add and configure your FLEX I/O module. See the steps provided below.
4. Download the configuration to the controller.

Add and Configure the FLEX I/O Module

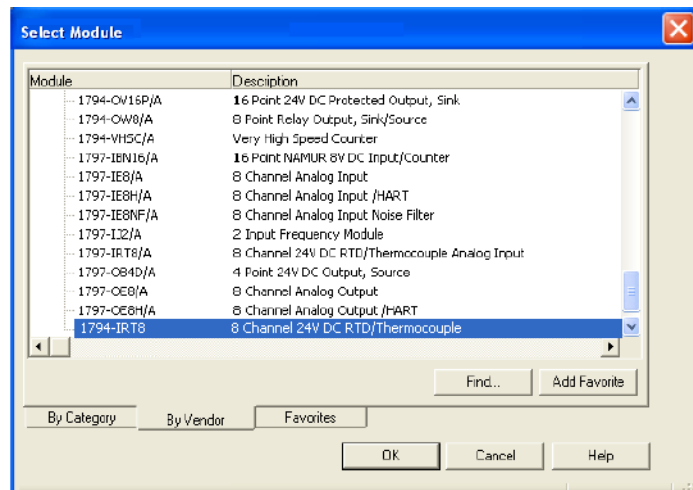
To be able to add your FLEX I/O Thermocouple, RTD, mV module, you should have already added and configured your Ethernet bridge and/or adapter.

1. In the I/O Configuration tree, right-click the 1794-AENT adapter, and select New Module.

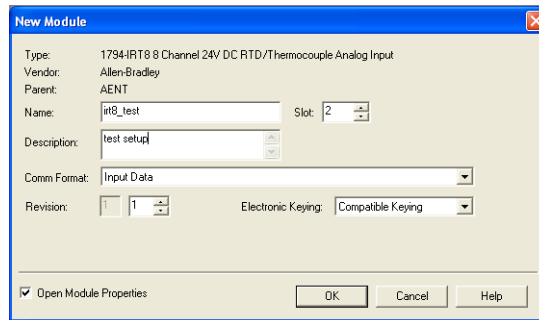
Right-click the local adapter module.



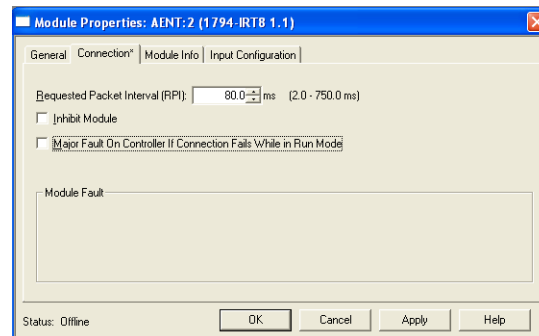
2. The Select Module dialog appears. Select the FLEX I/O module and click OK.



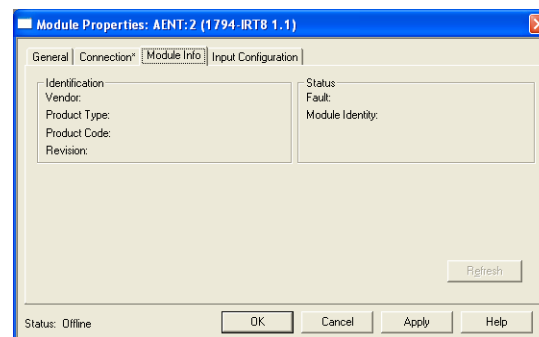
3. Complete the following fields in the New Module dialog that appears. Click OK.
 - Name
 - Description
 - Comm Format
 - Electronic Keying



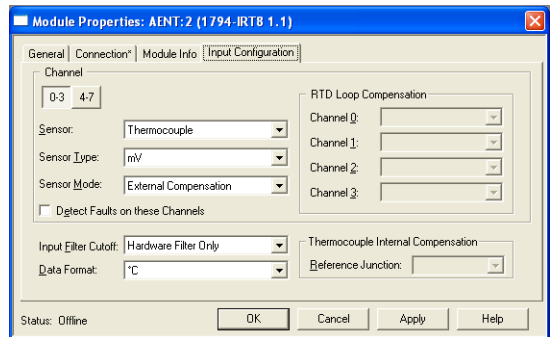
4. Click the Connection tab. Specify a value for the Requested Packet Interval (RPI).



5. Click the Module Info tab to see Module Identification and Status information. These fields are populated when the module goes online.



6. Click the Input Configuration tab and specify the values for the following fields:
 - Channel
 - Sensor
 - Sensor Mode
 - Input Filter Cutoff
 - Data Format



Configuration Parameters

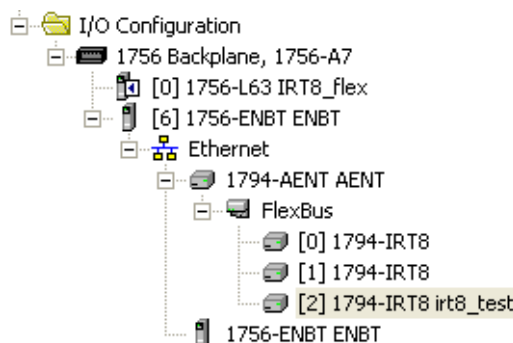
Field Name	Description	Configuration Options	
Sensor	Allows you to select the main sensor function of your module, whether Thermocouple or RTD. You will need to configure your module based on this main configuration by specifying the next parameters.	Thermocouple RTD	
Sensor Type	Allows you to select one of nine thermocouple types or one of eight RTD types. Default unit is mV for thermocouples and ohms for RTDs.	For Thermocouple mV Type B Type E Type J Type K Type TXK/XKL(L) Type N Type R Type S Type T	To help you select the proper operating range of your thermocouple, see Resolution Curves for Thermocouples, on page 65.
		For RTD Resistance 100 ohm Pt 385 200 ohm Pt 385 100 ohm Pt 3916 200 ohm Pt 3916 100 ohm Ni 618 200 ohm Ni 618 120 ohm Ni 672 10 ohm Cu 427	To help you specify the value for your RTD, see Sensor Types, on page 29.

Configuration Parameters

Field Name	Description	Configuration Options	
Sensor Mode	Allows you to select the operational mode for the thermocouple or RTD inputs. For thermocouple inputs, you can choose the cold junction compensation mode. For RTD inputs, you can choose 2-wire, 2-wire with user selected RTD offset, 3-wire, and 4-wire. Default for thermocouples is external compensation; default for RTDs is 2-wire (with no offsets).	For Thermocouple External compensation Internal compensation No compensation Differential compensation	For a description of the different sensor mode options, for both Thermocouple and RTD, see Bit/Word Descriptions for Block Transfer Write Words, on page 34.
		For RTD 2-wire compensation (default) 2-wire with Loop compensation 3-wire 4-wire	When you select Internal Compensation for your Thermocouple, you need to specify a corresponding Reference Junction value. This parameter sets a fixed reference junction to compensate all thermocouple channels and ranges from 0 °C...70 °C. When you select 2-wire with Loop compensation for your RTD, you need to specify values for each channel for the RTD Loop Compensation.
Input Filter Cutoff	Allows you to select one of eight levels on input filtering. The single pole, low pass filtering is accomplished by the module microprocessor. The filter selections range from Hardware Only to 5 s time constant. The times are approximate because they are based on the module scan time, which varies. The default is Hardware Only.	Hardware Filter Only (default) 25 ms 100 ms 250 ms 500 ms 1 s 2 s 5 s	
Data Format	Allows you to specify the format of the data reported. Module defaults to -4000...10000 in millivolt mode, and 0...5000 in Ω mode with implied decimal points (i.e. -40.00mV, 0.1 Ω) whenever °C, °F, °K is selected.	°C °F °K -32767...32767 0...65535	

- After you have completed all the Module Configuration parameters, click OK in the Module Properties dialog box.

You should see the FLEX I/O module in the I/O Configuration tree.



To be able to check if your configured parameters are acceptable and the configuration is successful, you need to go online.

Refer to the RSLogix 5000 Online Help for detailed descriptions of the configuration parameters.

Chapter Summary

This chapter provided instructions and required parameters for setting up your FLEX I/O module on an EtherNet/IP network.

Read and Write Configuration Maps for the FLEX I/O Module

Overview

This chapter describes how to configure, read data from, and map data to your FLEX I/O Thermocouple, RTD, and mV Input module.

Topic	Page
Configure Your Input Module	27
Configurable Options and Their Effect on the Channels	27
Sensor Types	29
Read Data From the Module	30
Map Data for the Module	30
Using Series A Functionality in a Series B Module	38
Chapter Summary	38

Configure Your Input Module

The Thermocouple, RTD, and mV input module is configured using a group of data table words mapped by the processor that is used when the connection to the module is established.

The software configurable features available are:

- input range selection
- selectable single pole low pass filter
- data reported in °F, °C, °K, mV, Ω , unipolar or bipolar count
- fault detection

Configurable Options and Their Effect on the Channels

There are two types of configurable options: those that affect all channels, and those that affect each group of 4 input channels.

Options that Affect All Channels

Input Filter Selection

This combination of bits allows you to select one of eight levels on input filtering. The single pole, low pass filtering is accomplished by the module

microprocessor. The filter selections range from Hardware Only to 5 s time constant. The times are approximate because they are based on the module scan time, which varies. The default is Hardware Only.

Data Format Selection

This set of bits allows you to select one of these five formats:

- Degree C
- Degree F
- Degree K
- Unipolar – The end points for Unipolar are scaled to the end points of the thermocouple or RTD range. The default unit is mV.
- Bipolar – The end points for Bipolar are scaled to the end points of the thermocouple or RTD range. It uses Ω as default unit.

Options that Affect Each Group of Four Inputs

Sensor Type

This set of bits allows you to select one of nine thermocouple types or one of eight RTD types. Default unit is mV for thermocouples and ohms for RTDs.

Sensor Mode

This set of bits allows you to select the operational mode for the thermocouple or RTD inputs. For thermocouple inputs, you can choose the cold junction compensation mode: internal, external, no CJC and differential measurement between 2 channels, for example, the value of channel 0 minus the value of channel 1 appears in the channel 0 and channel 1 data table locations. For RTD inputs, you can choose 2-wire, 2-wire with user selected RTD offset, 3-wire, and 4-wire. Default for thermocouples is external CJC; default for RTDs is 2-wire (with no offsets).

Input Types

This set of bits allows you to select one of two input types: thermocouple (millivolt) or RTD (resistance). The default input type is thermocouple.

Reference Junction

These bits allow you to select from seven fixed temperatures for the CJC value that is used by the module in thermocouple mode. Use this mode when the ambient temperature surrounding the thermocouple connection point is known and steady. The default temperature is 0 °C (32 °F).

Fault Mode

You can enable or disable the fault detection. When enabled in thermocouple mode, each channel is monitored for an open circuit. If an open is detected, the overrange and fault bits are set for that channel, and the channel data is set to the maximum value (Series A), or minimum value (Series B) for the chosen mode of operation.

When enabled in RTD mode, each channel is monitored for an open circuit (RTD and wires) and short circuits (RTD). If an open is detected, the overrange and fault bits are set for that channel, and the channel data is set to the maximum value for the chosen mode of operation. If a short is detected, the underrange bits is set for that channel, except when in Ω mode. The channel data is set to the minimum value for the chosen mode of operation.

RTD Offset

You can select from four fixed resistive values used by the module when inputs are configured for 2-wire with user selected RTD offset. The RTD offset is used to nullify the effects of the resistance of long lead wires. Each value represents the total resistance of both leads of a 2-wire RTD. For example, if you choose 5 Ω , the module compensates for a total of 5 Ω of lead resistance.

You can perform a calibration operation that measures the actual total lead resistance with RTD replaced with a short circuit. The value stored from this operation is used when the option Use Channel Loop Compensation Value is selected. This is also the default setting and is initially set to 0 at the factory. Each channel has its own pair of RTD offset bits and a Channel Loop Compensation value.

Sensor Types


Individual input channels are configurable to operate with the following sensor types:

RTD Type	Thermocouple Type
Sensor type for channels 0...3	Sensor type for channels 0...3
Sensor type for channels 4...7	Sensor type for channels 4...7
Resistance (default)	mV (default)
100 Ω Pt $\alpha = 0.00385$ Euro (-200...+870 °C) (-328...1598 °F)	B 300...1800 °C (572...3272 °F)
200 Ω Pt $\alpha = 0.00385$ Euro (-200...+400 °C) (-328...752 °F)	E -270...1000 °C (-454...1832 °F)
100 Ω Pt $\alpha = 0.003916$ U.S. (-200...+630 °C) (-328...1166 °F)	J -210...1200 °C (-346...2192 °F)
200 Ω Pt $\alpha = 0.003916$ U.S. (-200...+400 °C) (-328...752 °F)	K -270...1372 °C (-454...2502 °F)
100 Ω Nickel $\alpha = 0.00618$ (-60...+250 °C) (-76...482 °F)	TXK/XK(L) -200...800 °C (-328...1472 °F)
200 Ω Nickel $\alpha = 0.00618$ (-60...+200 °C) (-76...392 °F)	N -270...1300 °C (-450...2372 °F)

RTD Type	Thermocouple Type
120 Ω Nickel $\alpha = 0.00672$ (-80...+320 °C) (-112...608 °F)	R -50...1768 °C (-58...3214 °F)
10 Ω Copper $\alpha = 0.00427$ (-200...+260 °C) (-328...500 °F)	S -50...1768 °C (-58...3214 °F)
	T -270...400 °C (-454...752 °F)


You select individual channel ranges using write word 1 of the block transfer write instruction.

ATTENTION




Disconnecting and reconnecting RTDs with power applied temporarily disturbs the steady state data of the channel. Allow 2 minutes for settling time or cycle power to the module after terminating connections.

ATTENTION



If using RTD isolators, we recommend using 2- or 4-wire configurations only and digital filtering to the inputs.

WARNING



The range -32768...32767 should only be used with mV selection.

Signals from a thermocouple or RTD are non-linear; the mV selection is not recommended for thermocouple or RTD real time readings.

If selected, the module will return the mV generated by the thermocouple or RTD, in addition to any offsets generated by wiring without any correction for the non-linearity of the device.

Also, when the module is configured for mV the CJC compensation is not applied for thermocouple devices.

For thermocouples and RTDs you should use F or C data format. When configured as thermocouple or RTD the module will use an internal table to adjust for the non-linear mV returned by the field devices. After the internal calculations are performed the module will provide results in degrees F or C.

Read Data From the Module

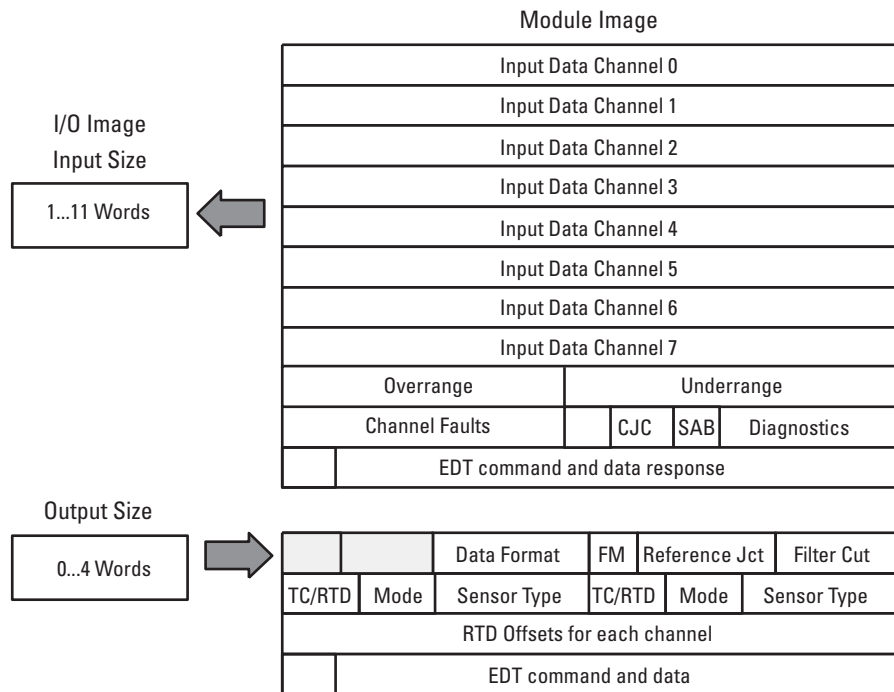
Read programming transmits status and data from the TC and RTD input module to the processor data table in one I/O scan. The processor user program initiates the request to transfer data from the TC and RTD input module to the processor.

Map Data for the Module

The following read and write words and bit/word descriptions describe the information written to and read from the TC and RTD input module. The

module uses up to 11 words of input data and up to 4 words of output data. Each word is composed of 16 bits.

Thermocouple and RTD Input Module Image Table Mapping



45333

Block Transfer Read and Write

The following block transfer read and write word bit information is presented for experienced users only.

Input Map (Block Transfer Read)

Dec.	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Oct.	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word 0	Channel 0 Input Data															
Word 1	Channel 1 Input Data															
Word 2	Channel 2 Input Data															
Word 3	Channel 3 Input Data															
Word 4	Channel 4 Input Data															
Word 5	Channel 5 Input Data															

Input Map (Block Transfer Read)

Dec.	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Oct.	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word 6	Channel 6 Input Data															
Word 7	Channel 7 Input Data															
Word 8	Overrange Alarm Bits (channel 0 = bit 8, and so on.)								Underrange Alarm Bits (channel 0 = bit 0, and so on.)							
Word 9	Ch 7 Flt	Ch 6 Flt	Ch 5 Flt	Ch 4 Flt	Ch 3 Flt	Ch 2 Flt	Ch 1 Flt	Ch 0 Flt	Res	CJC2 Alm	CJC1 Alm	SAB	CJC Status	Reserved		
Word 10	Resp Flag	Command Response							Response Data							

Where:
 Ch Flt = Channel Fault
 CJC = Cold Junction Compensation
 SAB = Series of unit; 0 = Series A, 1 = Series B
 Alm = Alarm

Output Map (Block Transfer Write)

Dec.	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Oct.	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word 0	Reserved				Data Format				Flt Mode Ch 4...7	Flt Mode Ch 0...3	Reference Jct.			Filter Cutoff		
Word 1	TC/RTD Ch 4...7		Sensor Mode Ch 4...7		Sensor Type Ch 4...7				TC/RTD Ch 0...3		Sensor Mode Ch 0...3		Sensor Type Ch 0...3			
Word 2	RTD Offset Ch 7		RTD Offset Ch 6		RTD Offset Ch 5		RTD Offset Ch 4		RTD Offset Ch 3		RTD Offset Ch 2		RTD Offset Ch 1		RTD Offset Ch 0	
Word 3	Cmd Flag	EDT Command							EDT Command Data							

Where:
 Flt = Fault
 Ch = Channel
 TC/RTD = Thermocouple/Resistance Temperature Detector
 EDT = Extended Data Transfer

Bit/Word Descriptions for the Input Module Block Transfer Read Words

Word	Dec. Bits (Octal Bits)	Description
Read Word 0	00...15 (00...17)	Channel 0 Input data
Read Word 1	00...15 (00...17)	Channel 1 Input data
Read Word 2	00...15 (00...17)	Channel 2 Input data

Read Word 3	00...15 (00...17)	Channel 3 Input data					
Read Word 4	00...15 (00...17)	Channel 4 Input data					
Read Word 5	00...15 (00...17)	Channel 5 Input data					
Read Word 6	00...15 (00...17)	Channel 6 Input data					
Read Word 7	00...15 (00...17)	Channel 7 Input data					
Read Word 8	00...07	Underrange bits – these bits are set if the input signal is below the minimum range of the input channel. Bit 00 corresponds to channel 0...bit 07 corresponds to channel 7.					
	08...15 (10...17)	Overrange bits – these bits are set if 1), the input signal is above the maximum range of the input channel; or 2), an input is disconnected. Bit 08 (10) corresponds to channel 0, bit 09 (11) corresponds to channel 1, and so on.					
Read Word 9	00...03	Diagnostic bits – represent module configuration and/or hardware errors.					
		Bit	03	02	01	00	
			0	0	0	0	Reserved for factory use
			0	0	1	0	Improper module configuration
			0	1	1	0	RAM aultf
			0	1	1	1	EEPROM fault
		0001, 0100, and 0011...1111 Reserved for factory use					
	04	Series of Unit (SAB) – 0 = Series A, 1 = Series B					
05...06	Cold junction compensation fault bits – These bits are set (1) when the corresponding cold junction compensator lead is broken, unattached or shorted, and the thermocouple is set to "external compensation." Bit 05 corresponds to CJC1, and bit 06 to CJC2.						
07	Not used						
08...15 (10...17)	Fault alarm bits – An alarm bit is set (1) when an individual input lead opens (broken, disconnected). If the alarm is enabled, the channel reads maximum value. Bit 08 (10) corresponds to input channel 0, bit 09 (11) to channel 1, and so on.						

Word	Dec. Bits (Octal Bits)	Description
Read Word 10	00...07	Extended data table data response bits – These bits echo the EDT command data written to the module during calibration.
	08...14 (10...16)	Extended data table command response bits – These bits echo the EDT command written to the module during calibration.
	15 (17)	Reserved for factory use

Bit/Word Descriptions for Block Transfer Write Words

Word	Dec. Bits (Octal Bits)	Description
Write Word 0	00...02	Input Filter Selection bits
		Bit 02 01 00 Filter Time Constants – actual filtering depends on the module mode of operation
		0 0 0 Hardware filtering only (default filtering)
		0 0 1 25 ms
		0 1 0 100 ms
		0 1 1 250 ms
		1 0 0 500 ms
		1 0 1 1s
		1 1 0 2 s
		1 1 1 5 s
	Bits 03...05	Reference Junction – used when input type is set to thermocouple and sensor mode is set to internal compensation. Sets a fixed reference junction to compensate all thermocouple channels.
		Bit 05 04 03 Reference Junction
		0 0 0 0 °C (32 °F)
		0 0 1 20 °C (68 °F)
		0 1 0 25 °C (77 °F)
		0 1 1 30 °C (86 °F)
		1 0 0 40 °C (104 °F)
		1 0 1 50 °C (122 °F)
		1 1 0 60 °C (140 °F)
		1 1 1 70 °C (158 °F)
	Bits 06...07	Fault Mode bits – when a bit is set (1), fault mode is enabled for that channel. Bit 06 corresponds to channels 0...3; bit 07 corresponds to channels 4...7. 0 = Disabled 1 = Enable wire-off detection
	Bits 08...11 (10...13)	Data format – module defaults to -4000...10000 in millivolt mode, and 0...5000 in Ω mode with implied decimal points (i.e. -40.00mV, 0.1 Ω) whenever °C, °F, °K is selected.

Bit/Word Descriptions for Block Transfer Write Words

Word	Dec. Bits (Octal Bits)	Description						
Write Word 0 (continued)	Bits 08...11 (10...13)	Bit	11	10	09	08	Data type for channels 0...7	
			0	0	0	0	°C (implied decimal point xxxx.x)	
			0	0	0	1	°F (implied decimal point xxxx.x)	
			0	0	1	0	°K (implied decimal point xxxx.x)	
			0	0	1	1	-32767...+32767	
			0	1	0	0	0...65535	
			0101...1111 not used					
	Bits 12...15 (14...17)	Not used						
	Write Word 1	Bits 00...03	Sensor Type (Thermocouple or RTD)					
			RTD Type					
			Bit	03	02	01	00	Sensor type for channels 0...3
				0	0	0	0	Resistance (default)
				0	0	0	1	100 Ω Pt α = 0.00385 Euro (-200...+870 °C) (-328...1598 °F)
0				0	1	0	200 Ω Pt α = 0.00385 Euro (-200...+400 °C) (-328...752 °F)	
0				0	1	1	100 Ω Pt α = 0.003916 U.S. (-200...+630 °C) (-328...1166 °F)	
0				1	0	0	200 Ω Pt α = 0.003916 U.S. (-200...+400 °C) (-328...752 °F)	
0				1	0	1	100 Ω Nickel (-60...+250 °C) (-76...482 °F)	
0				1	1	0	200 Ω Nickel (-60...+200 °C) (-76...392 °F)	
0				1	1	1	120 Ω Nickel (-80...+320 °C) °F) (-112...608 °F)	
1				0	0	0	10 Ω Copper (-200...+260 °C) °F) (-328...500 °F)	
1001...1111 not used								
Thermocouple Type								
Bit			03	02	01	00	Sensor type for channels 0...3	
			0	0	0	0	mV (default)	
			0	0	0	1	B 300...1800 °C (572...3272 °F)	
			0	0	1	0	E -270...1000 °C (-454...1832 °F)	
			0	0	1	1	J -210...1200 °C (-346...2192 °F)	
			0	1	0	0	K -270...1372 °C (-454...2502 °F)	
			0	1	0	1	TXK/XK(L) -200...800 °C (-328...1472 °F)	
			0	1	1	0	N -270...1300 °C (-450...2372 °F)	
			0	1	1	1	R -50...1768 °C (-58...3214 °F)	
			1	0	0	0	S -50...1768 °C (-58...3214 °F)	
			1	0	0	1	T -270...400 °C (-454...752 °F)	
1010...1111 not used								
Bits 04...05			Sensor Mode Select bits					
			Bit	05	04	Sensor mode select for channels 0...3		
			Thermocouple					

Bit/Word Descriptions for Block Transfer Write Words

Word	Dec. Bits (Octal Bits)	Description				
Write Word 1 (continued)			0	0	External compensation – uses cold junction sensors. Both CJC sensors must be used when external compensation is selected.	
			0	1	Internal compensation – uses the user selected Reference Junction Selection.	
			1	0	No compensation. Data is referenced to 0 °C (32 °F).	
			1	1	Differential measurement between 2 channels (0...1, 2...3, 4...5, 6...7)	
		RTD				
			0	0	2-wire RTD no compensation	
			0	1	2-wire RTD with user selected RTD offset	
			1	0	3-wire RTD	
	1		1	4-wire RTD		
	Bits 06...07	Input Type Select				
		Bit	07	06	Input type selection for channels 0...3	
			0	0	Thermocouple	
0			1	RTD		
1			0	Not used		
1			1	Not used		
Bits 08...11 (10...13)	Sensor Type (Thermocouple or RTD)					
	RTD Type					
	Bit	11	10	09	08	Sensor type for channels 4...7
		0	0	0	0	Resistance (default)
		0	0	0	1	100 ΩPt α = 0.00385 Euro -200...+870 °C (-328...1598 °F)
		0	0	1	0	200 ΩPt α = 0.00385 Euro -200...+400 °C (-328...752 °F)
		0	0	1	1	100 ΩPt α = 0.003916 U.S. -200...+630 °C (-328...1166 °F)
		0	1	0	0	200 ΩPt α = 0.003916 U.S. -200...+400 °C (-328...752 °F)
		0	1	0	1	100 ΩNickel -60...+250 °C (-76...482 °F)
		0	1	1	0	200 ΩNickel -60...+200 °C (-76...362 °F)
		0	1	1	1	120 ΩNickel -80...+320 °C (-112...608 °F)
		1	0	0	0	10 ΩCopper -200...+260 °C (-328...470 °F)
	1001...1111 not used					
	Bits 08...11 (10...13)	Thermocouple Type				
Bit		11	10	09	08	Sensor type for channels 4...7
		0	0	0	0	mV (default)
		0	0	0	1	B 300...1800 °C (572...3272 °F)
		0	0	1	0	E -270...1000 °C (-454...1832 °F)
		0	0	1	1	J -210...1200 °C (-346...2192 °F)
		0	1	0	0	K -270...1372 °C (-454...2502 °F)
		0	1	0	1	TXK/XK(L) -200...800 °C (-328...1472 °F)
		0	1	1	0	N -270...1300 °C (-450...2372 °F)
		0	1	1	1	R -50...1768 °C (-58...3214 °F)
1	0	0	0	S -50...1768 °C (-58...3214 °F)		

Bit/Word Descriptions for Block Transfer Write Words

Word	Dec. Bits (Octal Bits)	Description						
			1	0	0	1	T -270...400 °C (-454...752 °F)	
			1010...1111 not used					
	Bits 12...13 (14...15)	Sensor Mode Select bits						
		Bit	13	12	Sensor mode select for channels 4...7			
		Thermocouple						
			0	0	External compensation – uses cold junction sensors. Both CJC sensors must be used when external compensation is selected.			
			0	1	Internal compensation – uses the user selected Reference Junction.			
			1	0	No compensation. Data is referenced to 0 °C (32 °F).			
			1	1	Differential measurement between 2 channels.			
		RTD						
			0	0	2-wire RTD no compensation			
			0	1	2-wire RTD with user selected offset			
			1	0	3-wire RTD			
			1	1	4-wire RTD			
		Bits 14...15 (16...17)	Input Type Select					
			Bit	15	14	Input type selection for channels 4...7		
			0	0	Thermocouple			
			0	1	RTD			
			1	0	Not used			
			1	1	Not used			
	Write Word 2	00...15 (00...17)	RTD offset select bits – used when input type is set to RTD and sensor mode select is set to 2-wire with user selected RTD offset. Allows you to set the type of RTD loop resistance compensation used for all RTDs or one of three fixed values for all channels.					
			NOTE: Not applicable to 10 Ωcopper RTD.					
			Bit	01	00	RTD Offset Select Bits – channel 0		
			03	02	RTD Offset Select Bits – channel 1			
			05	04	RTD Offset Select Bits – channel 2			
			07	06	RTD Offset Select Bits – channel 3			
			09	08	RTD Offset Select Bits – channel 4			
			11	10	RTD Offset Select Bits – channel 5			
			13	12	RTD Offset Select Bits – channel 6			
			15	14	RTD Offset Select Bits – channel 7			
			0	0	Use channel loop compensation value stored during calibration procedure for 2-wire RTD (default = 0 Ω)			
			0	1	5 Ω (total lead resistance)			
			1	0	10 Ω (total lead resistance)			
			1	1	15 Ω			

Bit/Word Descriptions for Block Transfer Write Words

Word	Dec. Bits (Octal Bits)	Description
Write Word 3	00...07	Extended data table data bits – These bits are written to the module during calibration. They are used to define offset, gain and general channel calibration.
	08...14 (10...16)	Extended data table command bits – These bits are written to the module during calibration. They are used to select channel calibration action.
	15 (17)	Reserved for factory use only

**Using Series A
Functionality in a
Series B Module**

To employ Series A functionality when using a Series B 1794-IRT8 module, connect a wire from terminal 39 to terminal 48 on the 1794-TB3G or 1794-TB3GS terminal base unit. When terminals 39 and 48 are wired together, bit 4 in read word 9 will **not** be set (0), indicating the module is in Series A functionality.

ATTENTION



If these terminals are not connected together, the Series B product will default to Series B functionality.

Chapter Summary

This chapter provided the user with data and instructions to configure and map data for the FLEX I/O Thermocouple, RTD, and Millivolt Input module.

Calibrate Your Module

Overview

This chapter provides the tools and equipment, and procedure for calibrating your FLEX I/O Thermocouple, RTD, and mV input module.

Topic	Page
When and How to Calibrate Your FLEX I/O Module	39
Tools and Equipment	40
Calibrate Your Input Module	40
Calibration Setup	41
Wiring Connections for Calibrating the Thermocouple and RTD Input Module	41
Read and Write Words for Calibration	42
EDT Calibration Command and Command Data Summary	44
Offset Calibration	45
Gain Calibration	46
Current Source Calibration	47
Cold Junction Calibration	49
Channel Loop Compensation Calibration	49
Chapter Summary	49

When and How to Calibrate Your FLEX I/O Module

This module is shipped to you already calibrated. If a calibration check is required, the module must be in a FLEX system. We recommend recalibrating your module, if the module is going to be used in an environment with temperature other than 25 °C (77 °F) and 30% humidity.

ATTENTION

Perform module calibration periodically, based on your application, or at least once a year. Module calibration may also be required to remove module error caused by aging components in your system. Offset calibration must be done first, followed by gain calibration.

IMPORTANT

You must use a 1794-TB3G or 1794-TB3GS terminal base when calibrating this module.

Calibration can be accomplished using the manual calibration procedure described in the following sections.

Tools and Equipment

To calibrate your Thermocouple, RTD, and mV input module, you will need the following tools and equipment:

Tool or Equipment	Description
Precision Resistors	High Precision Resistors: 383 W, 0.01%, 5ppm/°C 100 W, 0.01%, 5ppm/°C 10 K Ω , 0.5%, 5ppm/°C
Precision Voltage Source	320 mV, 1 μ V resolution Analogic 3100, Data Precision 8200 or equivalent
Industrial Terminal and Interconnect Cable	Programming terminal for Allen-Bradley family processors

Calibrate Your Input Module

ATTENTION



You must calibrate the module in a FLEX I/O system. The module must communicate with the processor and an industrial terminal. You can calibrate input channels in any order, or all at once.

IMPORTANT

To allow the internal module temperature to stabilize, apply power to the module at least 20 minutes before calibration.

When using remote I/O, before calibrating your module, you must enter ladder logic into the processor memory, so that you can initiate block transfer writes (BTW) to the module, and read inputs (BTR) from the module.

To manually calibrate the module:

1. Apply a reference to the desired input(s).
2. Send a message to the module indicating which inputs to read and what calibration step is being performed (offset).

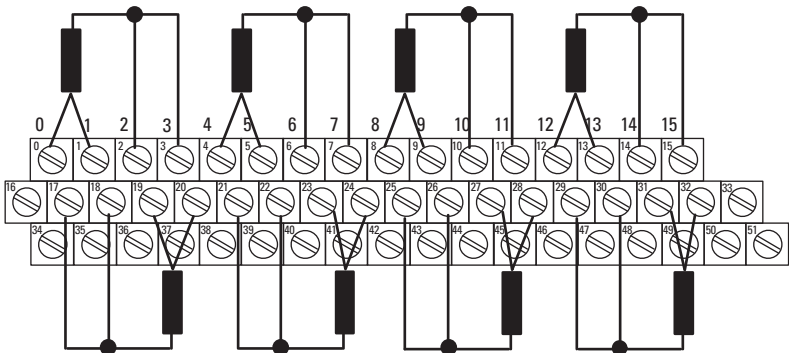
The module returns a response which echoes the message sent to the module. The module stores this input data.

3. Apply a second reference signal to the module.
4. Send a second message indicating which inputs to read and what calibration step is being performed (gain).

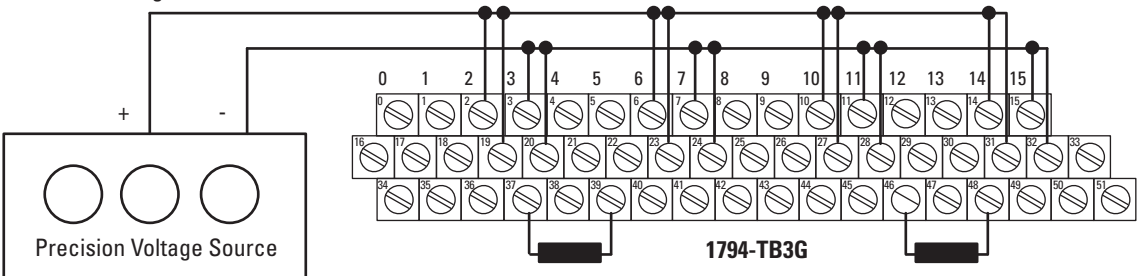
The module computes new calibration values for the inputs and returns a response which echoes back the message sent to the module. If the calibration cannot be completed, the module returns a fault message.

Calibration Setup

Using Precision Resistors -
for 383 Ω and 100 Ω calibration



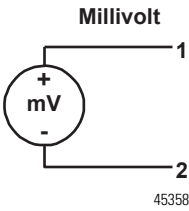
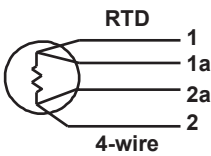
Using Precision Voltage Source -
for offset and gain calibration



45357

Connect + to terminals 2, 6, 10, 14, 18, 22, 26, and 30
Connect - to terminals 3, 7, 11, 15, 19, 23, 27, and 31
Connect one 10 K Ω, 0.5% resistor across terminals 37 and 39 and another across 46 and 48.

Wiring Connections for Calibrating the Thermocouple and RTD Input Module



45358

Type of Input	Connect the following				
	H	L	+	-	Shield
RTD – 4-wire	1a	2a	1	2	
Millivolt		1		2	

Wiring to the 1794-TB3G and 1794-TB3GS Terminal Base Units

RTD or Thermocouple Channel	1794-TB3G and 1794-TB3GS Terminal Base Units ⁽¹⁾			
	High Signal Terminal (H)	Low Signal Terminal (L)	RTD Source Current (+)	Signal Return (-)
0	1	2	0	3
1	5	6	4	7
2	9	10	8	11
3	13	14	12	15
4	18	19	17	20
5	22	23	21	24
6	26	27	25	28

Wiring to the 1794-TB3G and 1794-TB3GS Terminal Base Units

RTD or Thermocouple Channel	1794-TB3G and 1794-TB3GS Terminal Base Units ⁽¹⁾			
	High Signal Terminal (H)	Low Signal Terminal (L)	RTD Source Current (+)	Signal Return (-)
7	30	31	29	32
24V DC Power	34 and 50			
24V DC Common	35 and 51			

⁽¹⁾ Terminals 16, 33 and 40...45 are chassis ground.

Read and Write Words for Calibration

The following tables provide read and write words for module calibration.

Write Words for Calibration

Decimal	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	
Octal	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	
Word ↓	Write																
0	Reserved				Data Format				Flt Mode Ch 0...3	Flt Mode Ch 4...7	Reference Junction			Filter Select			
1	TC/RTD Ch. 4...7		Sensor Mode Ch 4...7		Sensor Type Ch 4...7				TC/RTD Ch. 0...3		Sensor Mode Ch 0...3		Sensor Type Ch 0...3				
2	RTD Offset Ch 7		RTD Offset Ch 6		RTD Offset Ch 5		RTD Offset Ch 4		RTD Offset Ch 3		RTD Offset Ch 2		RTD Offset Ch 1		RTD Offset Ch 0		
3		EDT command							EDT command data								

Where: Flt = Fault
TC/RTD = Thermocouple/Resistance Temperature Detector
EDT = Extended Data Transfer

Read Words for Calibration

Decimal	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Octal	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word ↓	Read															
0	Channel 0 Input Data															
1	Channel 1 Input Data															
2	Channel 2 Input Data															
3	Channel 3 Input Data															
4	Channel 4 Input Data															

Read Words for Calibration

Decimal	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
Octal	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word↓	Read															
5	Channel 5 Input Data															
6	Channel 6 Input Data															
7	Channel 7 Input Data															
8	Overrange Alarm Bits (channel 0 = bit 08, and so on.)								Underrange Alarm Bits (channel 0 = bit 00, and so on.)							
9	Ch7 Flt	Ch6 Flt	Ch5 Flt	Ch4 Flt	Ch3 Flt	Ch2 Flt	Ch1 Flt	Ch0 Flt		CJC 2 Flt	CJC 1 Flt	SAB	Diagnostic Status			
10		EDT command response							EDT data response							

Where: Flt = Fault
 CJC = Cold Junction Compensation
 SAB = Series of unit; 0 = Series A; 1 = Series B

ATTENTION

The CJC Status bit, Read Word 9, Bit 3 is added with the Firmware C release of the 1794-IRT8 Series B module.

The CJC Status bit is turned On when the temperature between the CJC's is greater than 6 °C but less than 12 °C.

When this temperature difference is above 12 °C, then the CJC Alarm bits are set.

Also, if a CJC temperature is over-range or under-range, then the associated CJC Alarm bit is set. In this condition, the CJC Status bit is not set.

The CJC Status bit does not exist in Series A.

EDT Calibration Command and Command Data Summary

Config Word 3 EDT Command bits 8...15	Meaning	Config Word 3 bits 4...7	Config Word 3 bits 0...3	Meaning
Dec. (Hex)		Channel No.	Command data	
4 (4)	General calibration by channel	0...7	1	Channel internal current source and current sense resistor, with 4-wire external 383 Ω inputs
		0...7	2	Channel internal current source and current sense resistor with 4-wire external 100 Ω inputs
		0...7	3	Loop channel compensation for 2-wire RTD
		0...7	4	CJC calibration
5 (5)	Offset calibration by channel	0...7	0	gain = 1, input = -320 mV
		0...7	1	gain = 2, input = 0.0 mV
		0...7	2	gain = 4, input = -50 mV
		0...7	3	gain = 8, input = -10.0 mV
		0...7	4	gain = 16, input = -9 mV
		0...7	5	gain = 32, input = 1.0 mV
6 (6)	Gain calibration by channel		0	gain = 1, input = 320 mV
			1	gain = 2, input = 320 mV
			2	gain = 4, input = 110 mV
			3	gain = 8, input = 70 mV
			4	gain = 16, input = 29 mV
			5	gain = 32, input = 19 mV
36 (24)	Calibration all channels			
	General calibration all channels	0	1	Channel internal current source and current sense resistor, with 4-wire external 383 Ω inputs
		0	2	Channel internal current source and current sense resistor with 4-wire external 100 Ω inputs
		0	3	Loop channel compensation for 2-wire RTD
		0	4	CJC calibration
	Offset calibration all channels	1	0	gain = 1, input = -320 mV

Config Word 3 EDT Command bits 8...15	Meaning	Config Word 3 bits 4...7	Config Word 3 bits 0...3	Meaning
		1	1	gain = 2, input = 0.0 mV
		1	2	gain = 4, input = -50 mV
		1	3	gain = 8, input = -10.0 mV
		1	4	gain = 16, input = -9 mV
		1	5	gain = 32, input = 1.0 mV
	Gain calibration all channels	2	0	gain = 1, input = 320 mV
		2		gain = 2, input = 320 mV
		2		gain = 4, input = 110 mV
		2		gain = 8, input = 70 mV
		2		gain = 16, input = 29 mV
		2		gain = 32, input = 19 mV

Offset Calibration

Inputs can be calibrated one at a time or all at once. To calibrate the offsets, proceed as follows:

1. Apply power to the module for 20 minutes before calibrating.
2. Connect a precision millivolt source across each input channel. Set the source to -320.00 mV for a gain of 1. Connect all (L) signal terminals together and attach to the positive lead from the precision voltage source. Connect all (-) signal terminals together and attach to the negative lead.

EDT Commands for Offset Calibration

		All Channels		Single Channel		
		EDT Command		EDT Command Dec. or Hex Bits 8...15	EDT Command Data Dec. or Hex	
Gain Selected	Input (mV)	Hex	Decimal		Bits 4...7	Bits 0...3
1	-320.00 + 0.064 mV	2410	9232	05	0...7	0
2	0.000 + 0.032 mV	2411	9233	05	0...7	1
4	-50.00 + 0.016 mV	2412	9234	05	0...7	2

EDT Commands for Offset Calibration

		All Channels		Single Channel		
Gain Selected	Input (mV)	EDT Command		EDT Command Dec. or Hex Bits 8...15	EDT Command Data Dec. or Hex	
		Hex	Decimal		Bits 4...7	Bits 0...3
8	-10.00 + 0.008 mV	2413	9235	05	0...7	3
16	-9.00 + 0.004 mV	2414	9236	05	0...7	4
32	1.000 + 0.002 mV	2415	9237	05	0...7	5

- Initiate a write to the module with the appropriate value in the EDT command location (write word 3, bits 00...15), as shown above.
- Monitor the EDT response location (read word 11 bits 00...15) for an echo of the EDT command. Depending on which command you sent, it should show 241X Hex.

If the EDT response word reads 80FF (hex), repeat the step 3. Make sure that sufficient time is allowed for the module to respond to your request. If there is no change, calibration has failed. Check the wiring and try again.

- Set the precision millivolt source to the value required for a gain of 2. Repeat steps 3 and 4 for gain 2. Repeat for each gain setting.
- When all offset calibrations are successful, proceed to the gain calibration.

Gain Calibration

After completing the offset calibration, proceed with the gain calibration.

- Connect a precision millivolt source across each input channel. Set the source to 320.00 mV for a gain of 1. Connect all (I) signal terminals together and attach to the positive lead from the precision voltage source. Connect all (-) signal terminals together and attach to the negative lead.

EDT Commands for Gain Calibration

		All Channels		Single Channel		
		EDT Command		EDT Command Dec. or Hex Bits 8...15	EDT Command Data Dec. or Hex	
Gain Selected	Input (mV)	Hex	Decimal		Bits 4...7	Bits 0...3
1	-320.00 + 0.064 mV	2420	9248	06	0...7	0
2	320.00 + 0.032 mV	2421	9249	06	0...7	1
4	110 + 0.016 mV	2422	9250	06	0...7	2
8	70.00 + 0.008 mV	2423	9251	06	0...7	3
16	29.00 + 0.004 mV	2424	9252	06	0...7	4
32	19.00 + 0.002 mV	2425	9253	06	0...7	5

2. Apply power to the module for 20 minutes before calibrating.
3. After the connections stabilize, initiate a write word with the appropriate EDT command location (write word 3, bits 00...15) as shown above.
4. Monitor the value in the EDT response location (read word 11, bits 00...15) for an echo of the EDT command. Depending on which command you sent, it should show 242X Hex.

If the EDT response word reads 80FF (hex), repeat step 3. Make sure to allow for sufficient time for the module to respond to your request. If there is no change, calibration has failed. Check the wiring and try again.

5. Set the precision millivolt source to the value required for a gain of 2. Repeat steps 3 and 4 for gain 2. Repeat for each gain setting.

When all gain calibrations are successful, proceed to perform Current Source Calibration on page 47.

Current Source Calibration

The current sources can be calibrated one at a time or all at once. To calibrate all the current sources, proceed as follows:

1. Connect a 383 Ω 0.01% resistor across (H, +) and (L, -) of each input channel (8 resistors).
2. Apply power to the module for 20 minutes before calibrating.

3. Initiate a write to the module with 2401 (hex) value in EDT command location (word 3, bits 00...15), as shown, for calibrating all channels at once. For individual channel calibrations, use the 04X1 (hex) (0401, 0411, 0421, ...0471 hex).
4. Monitor the EDT response location (read word 10, bits 00...15) for an echo of the EDT command.

If the EDT response word reads 80FF (hex), repeat step 3. Make sure to allow for sufficient time for the module to respond to your request. If there is no change, calibration has failed. Check the wiring and try again.

5. Connect a 100 Ω 0.01% resistor across (H, +) and (L, -) of each input channel (8 resistors). Repeat steps 3 and 4 using the EDT command value of 2402 (hex) for calibrating all channels at once. For individual channel calibrations, use the 04X2 (hex) (0402, 0412, 0422, ...0472 hex).

When all calibrations are successful, proceed to the Cold Junction Calibration on page 47.

Cold Junction Calibration

Both cold junction compensation inputs must be calibrated at the same time. To calibrate both at once, proceed as follows:

1. Connect 10 K Ω 0.5% resistors across terminals 37 and 39 (CJC 1) and terminals 46 and 48 (CJC 2).
2. Apply power to the module for 20 minutes before calibrating.
3. Initiate a write to the module with 2404 (hex) value in the EDT command location (word 3, bits 00...15).
4. Monitor the EDT response location (read word 11, bits 00...15) for an echo of the EDT command.

If the EDT response word reads 80FF (hex), repeat step 3. Make sure that sufficient time is allowed for the module to respond to your request. If there is no change, calibration has failed. Check the wiring and try again.

Channel Loop Compensation Calibration

Each 2-wire RTD can be calibrated individually, or at the same time. Proceed as follows.

1. Short circuit the end of each input cable at the RTD element. Do this for all the channels to be calibrated.
2. Apply power to the module for 20 minutes before calibrating.
3. Initiate a write to the module with 2403(hex) (calibrate all channels) in the EDT command location (write word 3, bits 00...15). For individual channel calibrations, use 04X3 (hex) (0403, 0413, 0423, ...0473).
4. Monitor the EDT response location (read word 1X, bits 00...15) for an echo of the EDT command.

If the EDT response word reads 80FF (hex), repeat step 3. Make sure that sufficient time is allowed for the module to respond to your request. If there is no change, calibration has failed. Check the wiring and try again.

Chapter Summary

This chapter provided the user with instructions on how to calibrate your FLEX I/O Thermocouple, RTD, and mV input module.

Notes:

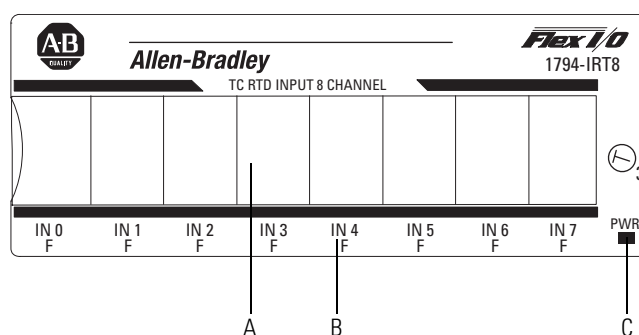
Troubleshoot the Module

Overview

This chapter provides a description of the different status indicators for the FLEX I/O Thermocouple, RTD, and mV module to help you troubleshoot.

Module Indicators

The FLEX I/O module has one status indicator (PWR) that is On when power is applied to the module, and one fault indicator (F) for each input.



A – Insertable label for writing individual input designations

B – Fault Indicator - indicates noncritical fault

C – Power Indicator - indicates power applied to module A

Status Indicators

Indicator	Color	State	Description
Fault	Red	On	<p>At power up – Channel 0 indicator lights at power up until all internal diagnostics are checked. After successful power up, the indicator goes off if no fault is detected and the module has started communicating with an adapter.</p> <p>After successful power up – Indicates a critical fault, such as diagnostic failure. If channel indicator stays solid red after power up, there is an internal module error. Try cycling power. If problem persists, replace module.</p> <p>If channel indicator continues to blink after power up, communication between the module and the adapter has not been established.</p>

Status Indicators

Indicator	Color	State	Description
		Blinking (when faults are enabled, and bit set)	Indicates a noncritical fault (such as open sensor). Input data set to maximum, and indicator flashes at about 1 Hz rate.
Power		Off	Module not powered
	Green	On	Module receiving power

The FLEX I/O Thermocouple, RTD, and mV module returns diagnostics to the processor in Word 9 of the block transfer read (BTR) file. These diagnostics give you information on the status or condition of the module.

Diagnostic Bits in Word 9

Word	Dec. Bits (Octal Bits)	Description					
Read Word 9	00...03	Diagnostic bits – represent module configuration and/or hardware errors.					
		Bit	03	02	01	00	
			0	0	0	0	Reserved for factory use
			0	0	1	0	Improper module configuration
			0	1	1	0	RAM aultf
			0	1	1	1	EEPROM fault
			0001, 0100, and 0011...1111 Reserved for factory use				
04		Series of Unit (SAB) – 0 = Series A, 1 = Series B					
05...06		Cold junction compensation fault bits – These bits are set (1) when the corresponding cold junction compensator lead is broken, unattached or shorted, and the thermocouple is set to "external compensation." Bit 05 corresponds to CJC1, and bit 06 to CJC2.					
07		Not used					
08...15 (10...17)		Fault alarm bits – An alarm bit is set (1) when an individual input lead opens (broken, disconnected). If the alarm is enabled, the channel reads maximum value. Bit 08 (10) corresponds to input channel 0, bit 09 (11) to channel 1, and so on.					

Chapter Summary

This chapter specified the different status indicators that would help the user troubleshoot the module.

Specifications

Overview

This appendix contains general and environmental specifications and certifications for the FLEX I/O Thermocouple, RTD, mV Input Modules.

General Specifications

Attribute	Value																														
Number of inputs	8 channels (2 groups of 4)																														
Module location	Cat. Nos. 1794-TB3G, 1794-TB3GS, 1794-TB3GK Terminal base units																														
Nominal input voltage ranges	-40...100 mV DC for thermocouples 0...325 mV for RTDs mV default																														
Supported thermocouple types	<table><tr><th>Type</th><th>Range °C</th><th>Range °F</th></tr><tr><td>B</td><td>300...1800 °C</td><td>(572...3272 °F)</td></tr><tr><td>E</td><td>-270...1000 °C</td><td>(-454...1832 °F)</td></tr><tr><td>J</td><td>-210...1200 °C</td><td>(-346...2192 °F)</td></tr><tr><td>K</td><td>-270...1372 °C</td><td>(-454...2502 °F)</td></tr><tr><td>TXK/XK(L)</td><td>200...800 °C</td><td>(-328...1472 °F)</td></tr><tr><td>N</td><td>-270...1300 °C</td><td>(-454...2372 °F)</td></tr><tr><td>R</td><td>-50...1768 °C</td><td>(-58...3214 °F)</td></tr><tr><td>S</td><td>-50...1768 °C</td><td>(-58...3214 °F)</td></tr><tr><td>T</td><td>-270...400 °C</td><td>(-454...752 °F)</td></tr></table>	Type	Range °C	Range °F	B	300...1800 °C	(572...3272 °F)	E	-270...1000 °C	(-454...1832 °F)	J	-210...1200 °C	(-346...2192 °F)	K	-270...1372 °C	(-454...2502 °F)	TXK/XK(L)	200...800 °C	(-328...1472 °F)	N	-270...1300 °C	(-454...2372 °F)	R	-50...1768 °C	(-58...3214 °F)	S	-50...1768 °C	(-58...3214 °F)	T	-270...400 °C	(-454...752 °F)
Type	Range °C	Range °F																													
B	300...1800 °C	(572...3272 °F)																													
E	-270...1000 °C	(-454...1832 °F)																													
J	-210...1200 °C	(-346...2192 °F)																													
K	-270...1372 °C	(-454...2502 °F)																													
TXK/XK(L)	200...800 °C	(-328...1472 °F)																													
N	-270...1300 °C	(-454...2372 °F)																													
R	-50...1768 °C	(-58...3214 °F)																													
S	-50...1768 °C	(-58...3214 °F)																													
T	-270...400 °C	(-454...752 °F)																													
Supported RTD types	Resistance 100 ΩPt α= 0.00385 Euro -200...870 °C (-328...1598 °F) 200 ΩPt α= 0.00385 Euro -200...400 °C (-328...752 °F) 100 ΩPt α= 0.003916 U.S. -200...630 °C (-328...1166 °F) 100 ΩPt α= 0.003916 U.S. -200...400 °C (-328...752 °F) 100 ΩNickel -60...250 °C (-76...482 °F) 200 ΩNickel -60...200 °C (-76...362 °F) 120 ΩNickel -80...320 °C (-112...608 °F) 10 ΩCopper -200...260 °C (-328...470 °F)																														
Resolution	14 bits																														
Accuracy vs. filter cutoff	0.05% of full range in millivolt mode with filtering selected Hardware only = 0.10% of full range in millivolt mode																														
Data format	°C (implied decimal point XXX.X) °F (implied decimal point XXX.X) °K (implied decimal point XXX.X) -32767...32767 0...65535 0...5000 ohms mode (implied decimal point XXX.X) -4000...+10000 millivolt mode (implied decimal point XXX.XX)																														
Common mode rejection	-80 db @ 5V peak-to-peak, 50...60 Hz																														
Common mode input range	±15V min																														

General Specifications

Attribute	Value
Isolation voltage (continuous voltage withstand rating)	50V (continuous), Basic Insulation Type Type tested @ 1365V AC for 60 s, between field side and system No isolation between individual channels
System throughput (8 channels scanned) – Add 0.5 ms if filtering is selected	Typical module timing is shown here. 7.4 ms - millivolt 8.0 ms - Ω - 2-wire RTD 10.0 ms - Ω - 3-wire RTD 10.4 ms - Ω - 4-wire RTD 8.0 ms - 2-wire RTD (°F) 10.4 ms - 4-wire RTD (°F) 8.8 ms - 2-wire RTD (°C), (°K) 10.8 ms - 4-wire RTD (°C), (°K) 9.8 ms - 3-wire RTD (°F) 10.0 ms - 3-wire RTD (°C), (°K) 9.0 ms - Thermocouples (°F) 9.4 ms - Thermocouples (°C), (°K)
Open circuit protection	RTD mode – Open input – Module defaults to max value TC mode – Open input – Module defaults to min value To simulate wire-off detection in Series A TC mode when using a Series B module, attach a jumper from terminal 39 to terminal 48 on the 1794-TB3G, 1794-TB3GS, or 1794-TB3GK terminal base unit so that an open input will default to max value.
Open input detection time	Immediate detection 2 scans, max
Overvoltage capability	15V DC continuous at 25 °C
Overall drift with temperature, max	50 ppm/°C of span
Cold junction compensation range	-20...100 °C
Cold junction compensator	Allen-Bradley catalog number 1794-CJC2
Indicators	1 green power status indicator 8 red open input indicators
FlexBus current	40 mA
Power dissipation, max	3.0 W @ 31.2V DC
Thermal dissipation, max	10.2 BTU/hr @ 31.2V DC
Keyswitch position	3
External DC power supply voltage	
Voltage range Supply current	24V DC nom 95 mA @ 24V DC
Dimensions (with module installed in base) HxWxD approx.	94 x 94 x 69 mm (3.7 x 3.7 x 2.7 in.)
Temperature code, IEC	T4

General Specifications

Attribute	Value
Temperature code, North American	T4A
Enclosure type rating	None (open-style)
Wire size	Determined by installed terminal base
Signal conductors	
Thermocouple Millivolt Wire type	Use appropriate shielded thermocouple wire ⁽²⁾ Belden 8761 Shielded on signal ports
Wiring category ⁽¹⁾	2 – on signal ports 3 – on power ports
Terminal screw torque for cage-clamp terminal base	Determined by installed terminal base

⁽¹⁾ Refer to the thermocouple manufacturer for proper thermocouple extension.

⁽²⁾ Use this category information for planning conductor routing as described in Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication [1770-4.1](#).

Environmental Specifications

Attribute	Value
Temperature, operating	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): -20...55 °C (-4...131 °F) (1794-IRT8, 1794-IRT8K) -20...70 °C (-4...158 °F) (1794-IRT8XT)
Temperature, non- operating	IEC 60068-2-1 (Test Ab, Unpackaged Non-operating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Non-operating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Non-operating Thermal Shock): -40...85 °C (-40...185 °F)
Relative humidity	IEC 60068-2-30 (Test Db, Unpackaged Damp Heat): 5...95% noncondensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 5 g @ 10...500 Hz
Shock operating nonoperating	IEC60068-2-27 (Test Ea, Unpackaged shock): 30 g 50 g
Emissions	CISPR 11: Group 1, Class A (with appropriate enclosure)
ESD immunity	IEC 61000-4-2: 6 kV contact discharges 8 kV air discharges

Environmental Specifications

Attribute	Value
Radiated RF immunity	IEC 61000-4-3: 10V/m with 1 kHz sine-wave 80% AM from 80...2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM at 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity	IEC 61000-4-4: ±2 kV at 5 kHz on power ports ±2 kV at 5 kHz on shielded signal ports
Surge transient immunity	IEC 61000-4-5: ±2 kV line-earth(CM) on shielded signal ports
Conducted RF immunity	IEC 61000-4-6: 10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz on shielded signal ports

ATTENTION



To comply with the CE Low Voltage Directive (LVD), all connections to this equipment must be powered from a source compliant with the following:
Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

Certifications

Certification (when product is marked) ⁽¹⁾	Value
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CE	European Union 2004/108/EC EMC Directive, compliant with: EN 61326-1; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: EN 60079-15; Potentially Explosive Atmospheres, Protection "n" (II 3 G Ex nA IIC T4 X) EN 60079-0; General Requirements (Zone 2)
TÜV	TÜV Certified for Functional Safety: up to and including SIL 2

⁽¹⁾ See the Product Certification link at <http://www.ab.com> for Declarations of Conformity, Certificates, and other certification details.

Electronic Data Sheet (EDS) Files

Overview

EDS provides the definition for a device's configurable parameters and public interfaces to those parameters.

Every type of configurable device has its own unique EDS. It is a simple text file that allows product-specific information to be made available to third-party vendors.

This makes updating of configuration tools easier without having to constantly revise the configuration software tool.

Beginning with the following revisions, EDS files are required for RSNetworkx for Devicenet and ControlNet, RSLinx, RSLogix5, and RSLogix 5000 software to recognize a device:

RSNetworkx	Version 2.21
RSLinx	Version 1.10.176
RSLogix5	Version 4.0
RSLogix5000	Version 5.12

Updating EDS File

Most EDS files are installed with RSLinx, RSNetworkx, and other RSI software as long as you enable the option during installation.

There are instances where you will need to acquire and register EDS files on your own even after all software is installed.

- If you go online with RSNetworkx and it shows a device with a "?" mark icon, a globe, or a message that says the device is unrecognized, this means the EDS file for that device **does not** exist on your PC.
- If RSLinx can see a processor but going online, uploading or downloading is **not** possible.

With ControlLogix modules the backplane **does not** show after expanding the tree or ControlLogix modules in the backplane show up as a yellow question mark without a red X sign.

An EDS file is also required if a bridge module such as a 1756-CNB or DNB **does not** show the "+" sign to expand the tree to show its network.

To acquire EDS files for Rockwell Automation and Allen-Bradley devices, go to Tools & Resources EDS Files at www.ab.com/networks/eds. It allows you to search for devices by the type of network and their catalog number.

ATTENTION

- Make sure to match the major firmware revision of the device as each major firmware revision is associated with a specific EDS file.
 - Download the EDS file and place it in any folder, except the /Program Files/Rockwell Software/RSCCommon/EDS folder where your Rockwell Automation software is installed.
 - Register EDS files with RSNetworx by selecting Tools EDS Wizard.
 - Select Register an EDS File, then click the Browse button on the Next page to find your file.
-

EDS Installation

You can register EDS files with the EDS Hardware Installation tool.

1. In Windows, go to Rockwell Software → RSLinx Tools → EDS Hardware Installation Tool.
2. Click Add to register an EDS file.

When an EDS file is registered, a copy of the file is made and placed in the /RSCCommon/EDS folder, where your Rockwell Automation software is installed and your Windows registry is updated. Once the registration is complete you can move, copy, or delete the original files.

ATTENTION

Only one EDS file is required to support both the Series A and Series B modules. The module ID for the Series A and B is identical because there is no change in software functionality.

The Series B hardware jumper determines how the module data reacts to an open circuit condition.

ATTENTION

The Series A and B EDS file can be downloaded from www.ab.com/networks/eds.

The EDS file is installed using the RSLinx Tools EDS Hardware Installation Tool.

Program Your Module with PLC Family Processors

Overview

This Appendix serves as a reference to users of the PLC-* Family Processors to program their modules.

To initiate communication between the Thermocouple, RTD, and Millivolt modules and your PLC processor, you must enter block transfer instructions into your ladder logic program. Use this chapter to enter the necessary block transfer instructions into your ladder logic program.

Enter Block Transfer Instructions

The Thermocouple, RTD, and Millivolt modules communicate with the PLC processor through bidirectional block transfers. This is the sequential operation of both read and write block transfer instructions.

Before you configure the module, you need to enter block transfer instructions into your ladder logic. The following example programs illustrate the minimum programming required for communication to take place between the module and a PLC processor. These programs can be modified to suit your application requirements.

A configuration block transfer write (BTW) is initiated when the frequency module is first powered up, and subsequently only when the programmer wants to enable or disable features of the module. The configuration BTW sets the bits which enable the programmable features of the module, such as scalars and alarm values, and so on. Block transfer reads are performed to retrieve information from the module.

Block transfer read (BTR) programming transmits status and data from the module to the processor data table. The processor user program initiates the request to transfer data from the module to the processor. The transferred words contain module status, channel status and input data from the module.

Your program should monitor status bits, block transfer read and block transfer write activity.

PLC-2 Family Processor

The 1794 Thermocouple, RTD, and Millivolt modules are not recommended for use with PLC-2 family programmable controllers due to the number of digits needed for high resolution.

IMPORTANT

The Thermocouple, RTD, and Millivolt modules function with reduced performance in PLC-2 systems. Because the modules do not support BCD and the PLC-2 processor is limited to values of 4095 (12 bit binary), many values returned in the BTR file may not provide meaningful data to the PLC-2 processor.

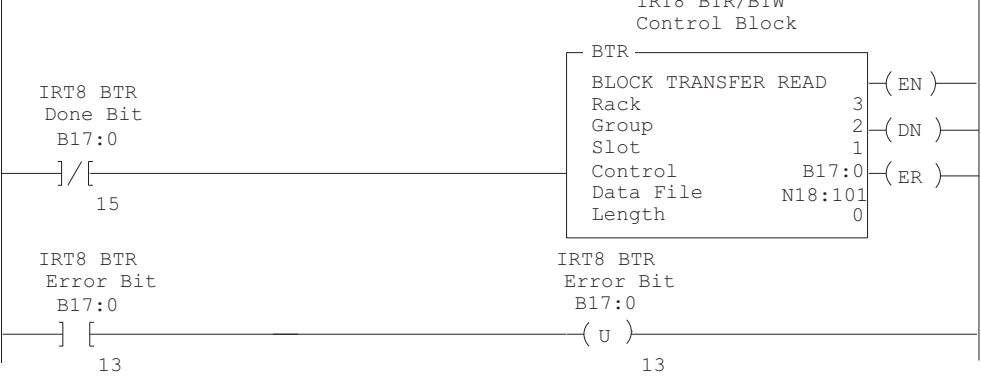
PLC-3 Family Processor

Block transfer instructions with the PLC-3 processor use a control file and a data file. The block transfer control file contains the data table section for module location, the address of the block transfer data file and other related data. The block transfer data file stores data that you want transferred to the module (when programming a BTW) or from the module (when programming a BTR).

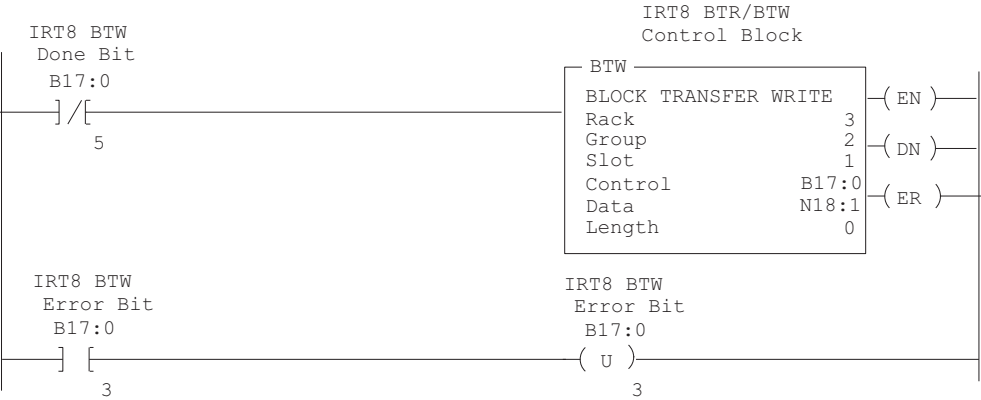
The programming terminal prompts you to create a control file when a block transfer instruction is being programmed. The same block transfer control file is used for both the read and write instructions for your module. A different block transfer control file is required for every module.

PLC-3 Processor
Program Example

Rung M:0
The IRT8 module is located in rack 3, I/O group 2, slot 1. The control file is a 10 word file starting at B17:0 that is shared by the BTR/BTW. The data obtained by the PLC3 processor is placed in memory starting at location N18:101, and with the default length of 0, is 11 words long.



The IRT8 module is located in rack 3, I/O group 2, slot 1. The control file is a 10 word file starting at B17:0 that is shared by the BTR/BTW. The data sent by the PLC-3 processor to the IRT8 module is from PLC memory starting at N18:1, and with the default length of 0, is 4 words long.



45566

PLC-5 Family Processor

Block transfer instructions with the PLC-5 processor use a control file and a data file. The block transfer control file contains the data table section for module location, the address of the block transfer data file and other related data. The block transfer data file stores data that you want transferred to the module (when programming a BTW) or from the module (when programming a BTR).

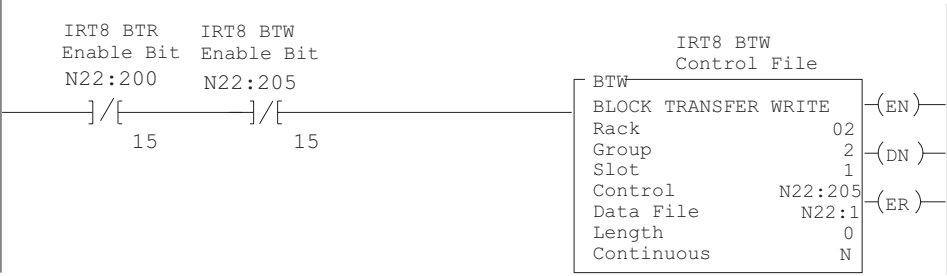
The programming terminal prompts you to create a control file when a block transfer instruction is being programmed. A different block transfer control file is used for the read and write instructions for your module.

**PLC-5 Processor
Program Example**

Rung 2:0
The IRT8 module is located in rack 2, I/O group 2, slot 1. The integer control file starts at N22:200, is 5 words long and is compatible with all PLC-5 family members. The data obtained by the PLC-5 processor from the IRT8 module is placed in memory starting at N22:101, and with the default length of 0, is 11 words long. The length can be any number



Rung 2:1
The IRT8 module is located in rack 2, group 2, slot 1. The integer control file starts at N22:205, is a 5 words long and is compatible will all PLC-5 family members. The data sent by the PLC-5 processor to the IRT8 module starts at N22:1, and with the default length of 0, is 4 words long. Valid BTW lengths: 0, 1, 2, 3, and 4. In enhanced PLC-5 processors, the block transfer data type may be used as a control file.



[^] Enhanced PLC-5 processors include: PLC-5/11, -5/20, -5/3x, -5/4x, and -5/6x.

PLC-5/250 Family Processor

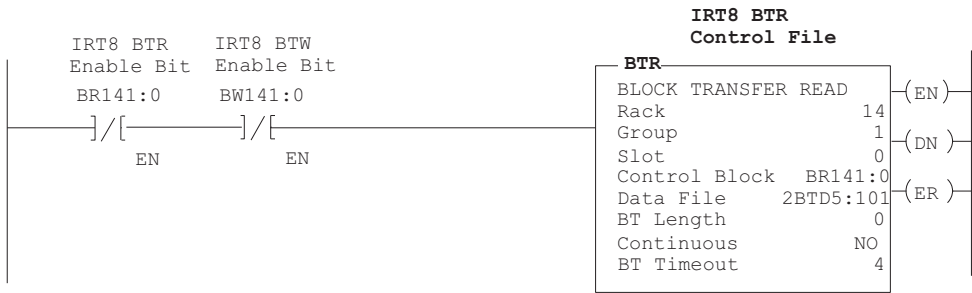
Block transfer instructions with the PLC-5/250 processor use a control file and a data file. The block transfer control file contains the data table section for module location, the address of the block transfer data file and other related data. The block transfer data file stores data that you want transferred to the module (when programming a BTW) or from the module (when programming a BTR).

The programming terminal automatically selects the control file based on rack, group and module, and whether it is a read or write. A different block transfer control file is used for the read and write instructions for your module. A different block transfer control file is required for every module.

PLC-5/250 Processor
Program Example

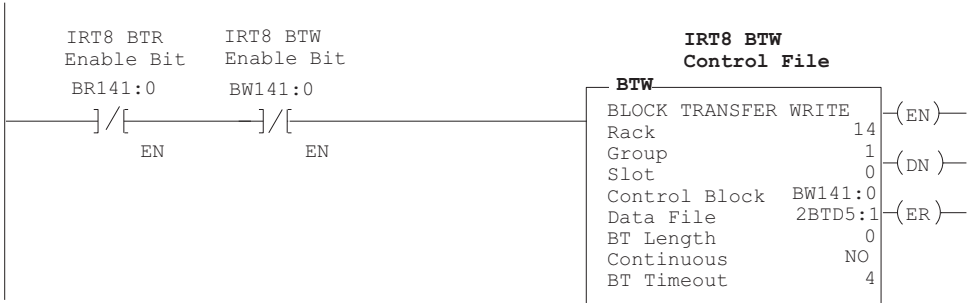
Rung 1STEPO:1

The IRT8 module is located in rack 14, I/O group 1, slot 0. The data obtained by the PLC-5/250 processor from the IRT8 module is placed in the data table starting at 2BTD5:101, and with the default length of 0, is 11 words long. The length can be any number between 0 and 11.



Rung 1STEPO:1

The IRT8 module is located in rack 14, I/O group 1, slot 0. The data sent to the IRT8 module from the PLC-5/250 processor is from the data table starting at 2BTD5:1, and with a default length of 0, is 4 words long. Valid BTW lengths: 0, 1, 2, 3, and 4.



Notes:

Safety Approvals

European Hazardous Location Approval

The 1794-IRT8, 1794-IRT8K, and 1794-IRT8XT modules are European Hazardous Location approved.

European Zone 2 Certification (The following applies when the product bears the Ex or EEx Marking)

This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/EC and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to this Directive.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 60079-15 and EN 60079-0.



WARNING

Observe the following additional Zone 2 certification requirements.

- This equipment is not resistant to sunlight or other sources of UV radiation.
 - This equipment must be installed in an enclosure providing at least IP54 protection when applied in Zone 2 environments.
 - This equipment shall be used within its specified ratings defined by Allen-Bradley.
 - Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40% when applied in Zone 2 environments.
 - Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
 - Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
-

North American Hazardous Location Approval

The 1794-IRT8, 1794-IRT8K, and 1794-IRT8XT modules are North American Hazardous Location approved.

The following information applies when operating this equipment in hazardous locations.	Informations sur l'utilisation de cet équipement en environnements dangereux.
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, hazardous locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>	<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>
<div data-bbox="269 821 446 873"> WARNING </div> <div data-bbox="310 877 406 961">  </div> <div data-bbox="464 814 690 842"> EXPLOSION HAZARD </div> <ul data-bbox="464 873 862 1373" style="list-style-type: none"> • Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. • Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. • Substitution of components may impair suitability for Class I, Division 2. • If this product contains batteries, they must only be changed in an area known to be nonhazardous. 	<div data-bbox="862 821 1039 873"> AVERTISSEMENT </div> <div data-bbox="909 877 1005 961">  </div> <ul data-bbox="1068 814 1481 1404" style="list-style-type: none"> • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. • Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. • La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. • S'assurer que l'environnement est classé non dangereux avant de changer les piles.

Numerics

1756-CNB 57
1756-ENBT 21
1794-ACN15 3
1794-ACNR15 3
1794-ACNR15K 3
1794-ADN 3
1794-AENT 3, 22
1794-APB 3
1794-APBDPV1 3
1794-ASB 3
1794-CJC2 2, 54
1794-IRT8 ix, 2, 4, 8, 21, 38, 71, 72
1794-IRT8K ix, 2, 71, 72
1794-IRT8XT ix, 2, 71, 72
1794-TB3G 7, 14, 15, 16, 18, 38, 39, 53, 54
1794-TB3GK 15, 16, 18, 53, 54
1794-TB3GS 7, 14, 15, 16, 18, 38, 39, 53, 54

A

accuracy 65
adapter 1, 2, 12, 14
alignment
 bar 15
 groove 15
Allen-Bradley 40, 71
analog signals 3

B

backplane 7, 15
base unit 15
Belden 8761 55
bipolar 27
bits
 CJC alarm 8
 CJC fault 33, 52
 data format 28, 34
 diagnostic 33, 52
 EDT 34
 EDT command 38
 EDT data 38
 fault alarm 33, 52
 fault mode 34
 input type 37
 input types 28
 overrange alarm 32
 reference junction 28
 sensor mode 28, 35, 37
 sensor type 28, 36
 underrange alarm 32

block transfer read (BTR) 31, 52, 59, 60, 61, 62
block transfer write (BTW) 30, 31, 40, 59, 60, 61, 62

C

calibration

CJC 44
cold junction 43, 48, 49
current source 47
EDT command 44, 45
environment 39
equipment 39
gain 44, 46
general 44
manual 40
offset 44, 45, 46
periodic 39
power supply 40, 45
preparation 40
procedure 39
read words 42
setup 41
temperature 39, 40
tools 39, 40
types of 39
using resistors 41
write words 42

cap plug 15

CE Low Voltage Directive 56

certification

CE 56
C-Tick 56
c-UL-us 56
European Zone 2 71

chassis 7, 16, 18, 42

CJC

disconnecting 18, 19
fault 52
sensors 36, 37
alarm bit 8

cold junction

calibration 49
compensation 18, 25, 28, 43
compensators 2, 17

commands

EDT 44

common mode 8

communication

module and adapter 3

CompactLogix 21

compensation

2-wire 25
2-wire with Loop 25

- channel loop 29
- CJC 30
- differential 25
- external 25, 36, 37
- internal 25, 36, 37

conductors 55**configuration**

- data format selection 28
- fault mode 29
- input filter 27
- input range 27
- input types 28
- options 27
- parameters 24
- reference junction 28
- RTD offset 29
- sensor mode 28
- sensor type 28

connecting wiring 41**connector**

- current 54
- female 10
- male 10

controller 21**ControlLogix** 21, 57**ControlNet** 4, 8, 21**C-Tick** 56**current draw** 8**current source**

- calibration 47

D

daisychain 9, 17**data format**

- bipolar 28
- unipolar 28

data table 27**detection**

- over-range 2
- under-range 2
- wire-off 2

diagnostics 51, 52**digital module** 9**dimensions** 54**DIN rail** 2, 11**dissipation**

- power 54

drilling

- dimension 13
- points 12

E

EDT

- command 32, 45, 46, 47, 48
- data response 34
- response 46, 48, 49

EFT/B immunity 56**Electronic Data Sheet (EDS)** 58**emissions** 55**EN 60079-0** 71**EN 60079-15** 71**enclosure** 7

- type rating 55

equipment 40**ESD immunity** 55**Ethernet**

- adapter 21

EtherNet/IP 4, 8**explosion hazard** 72

F

fault

- alarm 33, 52
- channel 32
- detection 27
- EEPROM 52
- mode 29
- RAM 52

filter

- single pole 28

firmware 8**FLEX I/O** 39

- components 1
- millivolt 7, 27, 53
- RTD 7, 27, 53
- system 12, 39, 40
- thermocouple 7, 27, 53

FLEX system 1, 2**FlexBus** 3, 10, 11, 12, 15**frequency input**

- indicators 51

G

gain 39, 40, 46

H

hazardous location

- European 71
- North American 72

humidity 39

I

indicator 54

input

- channels 40
- default 28
- designators 5
- filter 24, 25
- range 30
- resistive 2
- type 36, 37

installation

- connecting wiring 10
- hazardous location 15
- instructions 7
- mounting 10
- requirements 7
- terminal base 12

IP54 protection 71

isolation mode 8

K

keyswitch 7, 14, 15, 54

L

ladder logic 40, 59

latching mechanism 15

Logix system 4

loop compensation 37

low pass 28

M

male connector 10

manual

- conventions xii
- purpose ix
- related x

manual calibration 40

message

- fault 40

millivolt 28, 39, 60

- calibration 41
- wiring 18, 20

module

- label 4
- status 52

mounting

- kit 13

- wall or panel 12

MSG instructions 4

mV source 2, 28

O

offset calibration 45

ohmmeter 17

open input 54

open sensor 52

overrange 29

P

PLC processors

- control file 62, 60
- data file 62, 60
- PLC-2 60
- PLC-2 system 60
- PLC 5-250 21, 61, 62
- PLC 5 controller 21

power 40

- connections 8
- external DC 54
- operational 7

precision millivolt 45, 46, 47

processor 27, 40

programming 59

Protected Extra Low Voltage (PELV) 56

publications

- related x

R

read programming 30

read words

- decimal 42
- octal 42
- overrange bits 33
- underrange bits 33

recalibration 39

reference junction 34, 37, 42

- default temperature 28
- selection 36

related documentation x

relative humidity 55

Requested Packet Interval (RPI) 23

resistance 28, 35, 36

resolution curve

- type B 24, 65
- type E 24, 66
- type J 24, 66

- type K 24, 67
- type N 24, 69
- type R 24, 68
- type S 24, 68
- type T 24, 69
- type TXK/XKL(L) 24, 70

RF immunity 56**RSLinux** 57, 58**RSLogix 5000 software** 4, 8, 21, 57**RSLogix 5 software** 57**RSNetworx** 57, 58**RTD**

- analog input mapping 31
- 2-wire 18, 36, 37
- 3-wire 18, 25, 36, 37
- 3-wire connection 17
- 4-wire 18, 25, 36, 37, 41
- 4-wire connection 17
- disconnecting 19
- fault mode 29
- isolators 19, 30
- loop channel compensation 44
- mode 29
- offset 29, 32, 37, 42
- wire pairs 17

S

Safety Extra Low Voltage (SELV) 56**sensor**

- CJC 36
- mode 24, 25, 32, 28, 35, 42
- RTD Type 29
- RTD type 36
- thermocouple type 29, 36
- type 24, 32, 28, 29, 35, 36

series A 7, 8, 38**series B** 7, 8, 38, 43**shock** 55**signal**

- analog to binary 3
- conductors 55
- wiring 16

SLC 21**specification**

- accuracy vs. filter cutoff 53
- cold junction compensation 54
- common mode input range 53
- common mode rejection 53
- conducted RF immunity 56
- data format 53
- DIN rail 11

- emissions 55
- enclosure type rating 55
- ESD immunity 55
- general 53
- indicators 54
- isolation voltage 54
- module location 53
- nominal input voltage 53
- number of inputs 53
- open circuit 54
- overall drift with temperature 54
- overvoltage capability 54
- radiated RF immunity 56
- relative humidity 55
- resolution 53
- supply voltage 54
- supported RTD 53
- supported thermocouple 53
- system throughput 54
- temperature 55
- vibration 55
- wire size 55

status indicator

- diagnostic 43
- fault 51
- power 52

supply voltage 54**surge transient immunity** 56

T

T4 55**T4A** 55**temperature**

- ambient 28
- code 55
- non-operating 55
- operating 55

terminal base 1, 2, 7, 10, 13, 55

- installation 12
- mounting 10
- wiring 8

thermal dissipation 54**thermocouple** 2, 24, 25, 28, 30, 36, 39, 42, 60

- mode 8
- resolution curves 65
- wiring 18

tools

- precision resistors 40
- precision voltage source 40
- calibration 40
- interconnect cable 40

troubleshoot 51

U

unipolar 27

V

vibration 55

voltage
supply 54

W

wire type 55

wire pairs
3-wire RTD 17
4-wire RTD 17

connecting 17

wiring

category 55
combination 9
connections 18, 41
terminal base 8, 41

write words

data format 42
filter time constants 34
input type 36
RTD Type 35
sensor mode 37
sensor type 36

Z

Zone 2 71

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.

At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html , or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 1794-6.5.12 - April 2011

Supersedes Publication 1794-6.5.12 - November 1997

Copyright © 2011 Rockwell Automation, Inc. All rights reserved.