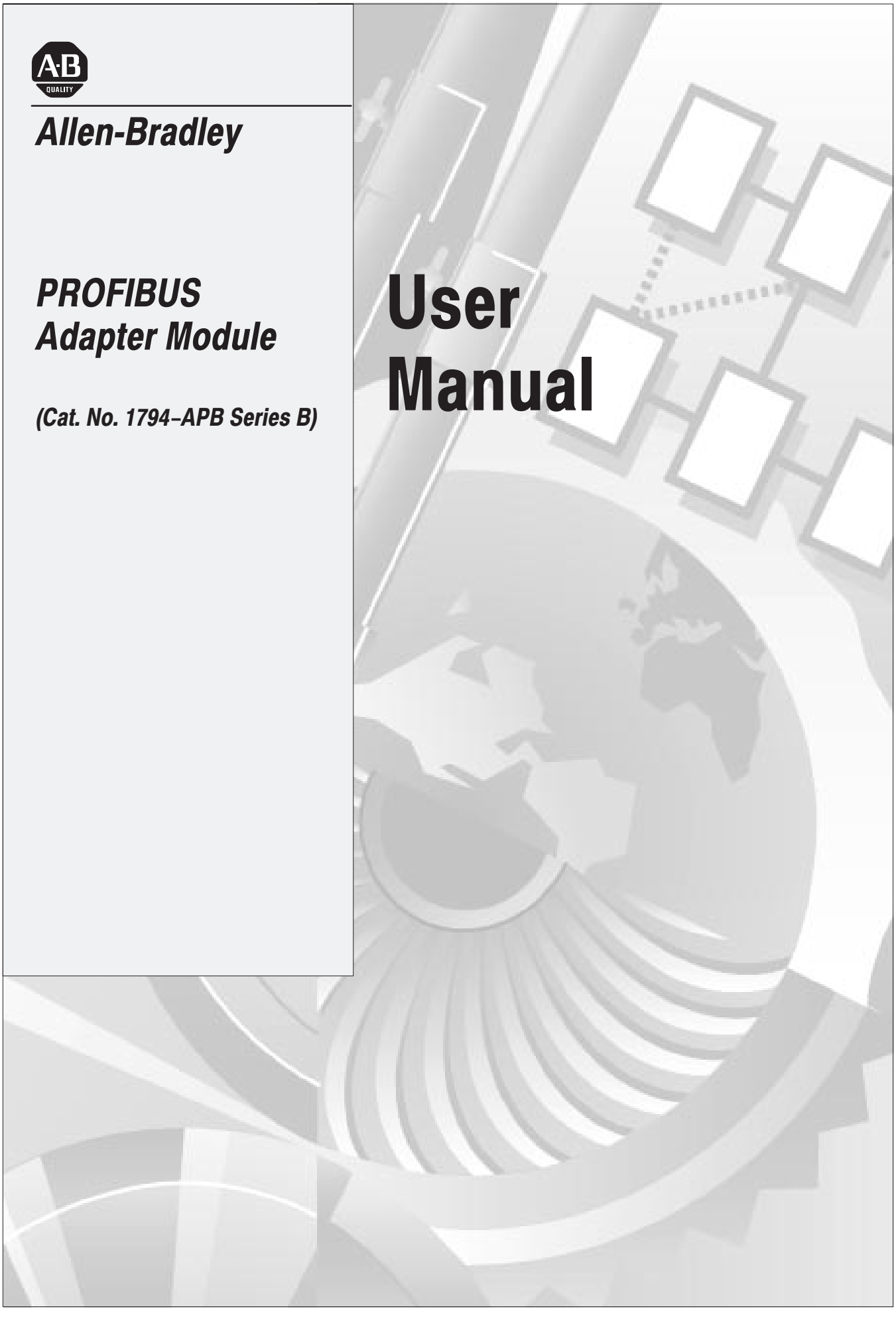

Allen-Bradley

# PROFIBUS Adapter Module

*(Cat. No. 1794–APB Series B)*

# User Manual

## Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

In no event will the Allen-Bradley Company 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, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

Allen-Bradley publication SGI-1.1, *"Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls"* describes some important differences between solid state equipment and hard–wired electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Reproduction of the contents of this manual, in whole or in part, without written permission of the Allen-Bradley Company is prohibited.

Throughout this document 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.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

**ATTENTION**

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

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Windows is a trademark of the Microsoft Corporation.
FLEX I/O and PLC-5 are trademarks of the Allen-Bradley Company, Inc.
PROFIBUS is a trademark of the PROFIBUS User Organization

**IMPORTANT** Identifies information that is critical for successful application and understanding of the product.

**ATTENTION**

**Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664–1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present, and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosures. Also, see the appropriate sections in this publication, as well as the Allen–Bradley publication 1770–4.1, (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

# About this User Manual

## Purpose

Use this manual to install and configure your FLEX I/O™ PROFIBUS Adapter, cat. no. 1794-APB Series B.

## Vocabulary

In this manual, we refer to:

- the FLEX I/O PROFIBUS adapter module as the “adapter”
- the programmable controller as the “processor”

## What this Manual Contains

The following table shows what each chapter of this manual describes:

| Chapter | Title | Describes |
|---|---|---|
| 1 | Overview of FLEX I/O and Your PROFIBUS Adapter | The FLEX I/O system and PROFIBUS adapter. |
| 2 | How Communication Takes Place and I/O Mapping | Backplane communication between the modules and the adapter, and how data is mapped into the image table. |
| 3 | Connect the Adapter to the PROFIBUS DP Network | The DP physical layer, how to select the line type you should use and how to connect to and terminate the network. |
| 4 | Configure the Adapter for Master/Slave Communication | How to configure the adapter for master/slave communication. |
| 5 | Troubleshooting | How to use the indicators for troubleshooting. |
| Appendix A | Specifications | Adapter specifications. |
| Appendix B | Device Data Base File | Device Data Base (GSD) File. |
| Appendix C | Hazardous Locations | Identification of hazardous ratings |

## Related Publications

For additional information on planning and installing your PROFIBUS system using FLEX I/O modules, refer to the following publications:

| Catalog Number | Voltage | Description | Publications | |
|---|---|---|---|---|
| | | | Installation Instructions | User Manual |
| 1794 | | 1794 FLEX I/O Technical Data | 1794-TD001 | |
| 1794-ACN | 24V dc | ControlNet Adapter | 1794-5.8 | |
| 1794-ACNR | 24V dc | Redundant Media ControlNet Adapter | 1794-5.18 | |
| 1794-ACN15 | 24V dc | ControlNet Adapter | 1794-IN047 | |
| 1794-ACNR15 | 24V dc | Redundant Media ControlNet Adapter | 1794-IN048 | |
| 1794-ADN | 24V dc | DeviceNet Adapter | 1794-IN014 | 1794-UM005 |
| 1794-ASB/C & D | 24V dc | Remote I/O Adapter | 1794-5.46 | 1794-6.5.9 |
| 1794-ASB/E | 24V dc | Remote I/O Adapter | 1794-IN046 | 1794-UM009 |
| 1794-ASB2/D | 24V dc | 2-Slot Remote I/O Adapter | 1794-IN044 | 1794-UM013 |
| 1794-APB | 24V dc | PROFIBUS Adapter | 1794-5.40 | 1794-6.5.6 |
| 1794-APB/B | 24V dc | PROFIBUS Adapter | 1794-IN087 | 1794-UM057 |
| 1794-IB8 | 24V dc | 8 Sink Input Module | 1794-IN030 | |
| 1794-OB8 | 24V dc | 8 Source Output Module | 1794-IN031 | |
| 1794-IB16 | 24V dc | 16 Sink Input Module | 1794-IN072 | |
| 1794-IB32 | 24V dc | 32 Sink Input Module | 1794-IN084 | |
| 1794-OB16 | 24V dc | 16 Source Output Module | 1794-IN071 | |
| 1794-IV16 | 24V dc | 16 Source Input Module | 1794-IN028 | |
| 1794-OV16 | 24V dc | 16 Sink Output Module | 1794-IN029 | |
| 1794-OB8EP | 24V dc | 8 Electronically Fused Output Module | 1794-IN020 | |
| 1794-IB8S | 24V dc | Sensor Input Module | 1794-5.7 | |
| 1794-IB10XOB6 | 24V dc | 10 Input/6 Output Module | 1794-IN024 | |
| 1794-IE8 | 24V dc | Selectable Analog 8 Input Module | 1794-IN003 | |
| 1794-OE4 | 24V dc | Selectable Analog 4 Output Module | 1794-IN004 | 1794-UM002 |
| 1794-IE4XOE2 | 24V dc | 4 Input/2 Output Analog Module | 1794-IN015 | |
| 1794-OF4 | 24V dc | 4 Output Isolated Analog Module | 1794-IN037 | |
| 1794-IF4 | 24V dc | 4 Input Isolated Analog Module | 1794-IN038 | 1794-UM008 |
| 1794-IF2XOF2 | 24V dc | 2 Input/2 Output Isolated Analog Module | 1794-IN039 | |
| 1794-IR8 | 24V dc | 8 RTD Input Analog Module | 1794-IN022 | 1794-UM004 |
| 1794-IT8 | 24V dc | 8 Thermocouple Input Module | 1794-IN021 | 1794-UM007 |
| 1794-IRT8 | 24V dc | 8 Thermocouple/RTD Input Module | 1794-IN050 | 1794-UM012 |
| 1794-IJ2 | 24V dc | 2 Frequency Input Module | 1794-IN049 | 1794-UM011 |
| 1794-ID2 | 24V dc | 2 Channel Frequency Input Module | 1794-IN063 | 1794-UM015 |
| 1794-IP4 | 24V dc | 2 Channel Pulse Counter Module | 1794-IN064 | 1794-UM016 |
| 1794-VHSC | 24V dc | High Speed Counter Module | 1794-IN067 | 1794-UM010 |

**Table continued on next page**

| Catalog Number | Voltage | Description | Publications | |
|---|---|---|---|---|
| | | | Installation Instructions | User Manual |
| 1794-IC16 | 48V dc | 48V dc 16 Input Module | 1794-IN053 | |
| 1794-OC16 | 48V dc | 48V dc Output Module | 1794-IN054 | |
| 1794-IA8 | 120V ac | 8 Input Module | 1794-IN009 | |
| 1794-OA8 | 120V ac | 8 Output Module | 1794-IN010 | |
| 1794-IA8I | 120V ac | Isolated 8 Input Module | 1794-IN055 | |
| 1794-OA8I | 120V ac | Isolated Output Module | 1794-IN056 | |
| 1794-IA16 | 120V ac | 16 Input Module | 1794-IN060 | |
| 1794-OA16 | 120V ac | 16 Output Module | 1794-IN061 | |
| 1794-IM8 | 220V ac/dc | 8 Input Module | 1794-IN057 | |
| 1794-OM8 | 220V ac/dc | 8 Output Module | 1794-IN058 | |
| 1794-TB2<br>1794-TB3 | | 2-wire Terminal Base<br>3-wire Terminal Base | 1794-IN070 | |
| 1794-TBN | | Terminal Base Unit | 1794-IN016 | |
| 1794-TBNF | | Fused Terminal Base Unit | 1794-IN017 | |
| 1794-TB3T | | Temperature Terminal Base Unit | 1794-IN041 | |
| 1794-TB3S | | Spring Clamp Terminal Base Unit | 1794-IN042 | |
| 1794-TB3TS | | Spring Clamp Temperature Base Unit | 1794-IN043 | |
| 1794-TB3G | | Terminal Base Unit | 1794-IN051 | |
| 1794-TB3GS | | Spring Clamp Terminal Base Unit | 1794-IN059 | |
| 1794-CE1, -CE3 | | Extender Cables | 1794-IN012 | |
| 1794-NM1 | | Mounting Kit | 1794-IN013 | |
| 1794-PS1 | 24V dc | Power Supply | 1794-IN035 | |
| 1794-PS13 | 24V dc | Power Supply | 1794-IN069 | |
| 1794-PS3 | 24V dc | Power Supply | 1794-5.71 | |

To order these publications, contact your local Allen-Bradley representative.

## Conventions

More Information...

This icon appears when more information is available in related documentation.

# Table of Contents

## Overview of FLEX I/O and Your PROFIBUS Adapter Module

**Chapter 1**



## How Communication Takes Place and I/O Image Table Mapping

**Chapter 2**

## Connect the Adapter to the PROFIBUS DP Network

### Chapter 3



## Configure the Adapter for Master/Slave Communication

### Chapter 4

# Overview of FLEX I/O and Your PROFIBUS Adapter Module

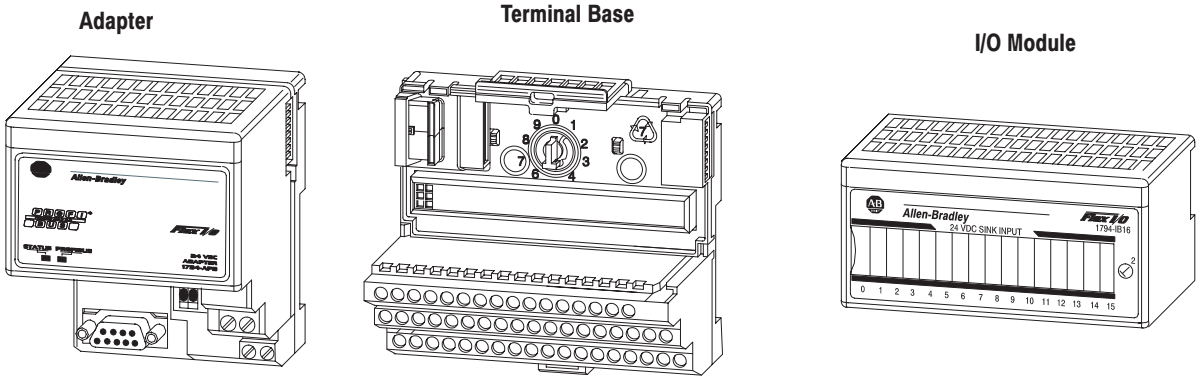
## What this Chapter Contains

This chapter describes:

- what the FLEX I/O system is and what it contains
- how to mount and remove your system easily
- optional accessories
- mounting dimensions and spacing requirements
- the 1794-APB FLEX I/O PROFIBUS Adapter
- adapter components
- how to connect power wiring

## The FLEX I/O 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 I/O system contains the following components:

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- PROFIBUS adapter/power supply – powers the internal logic for as many as eight I/O modules
- 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

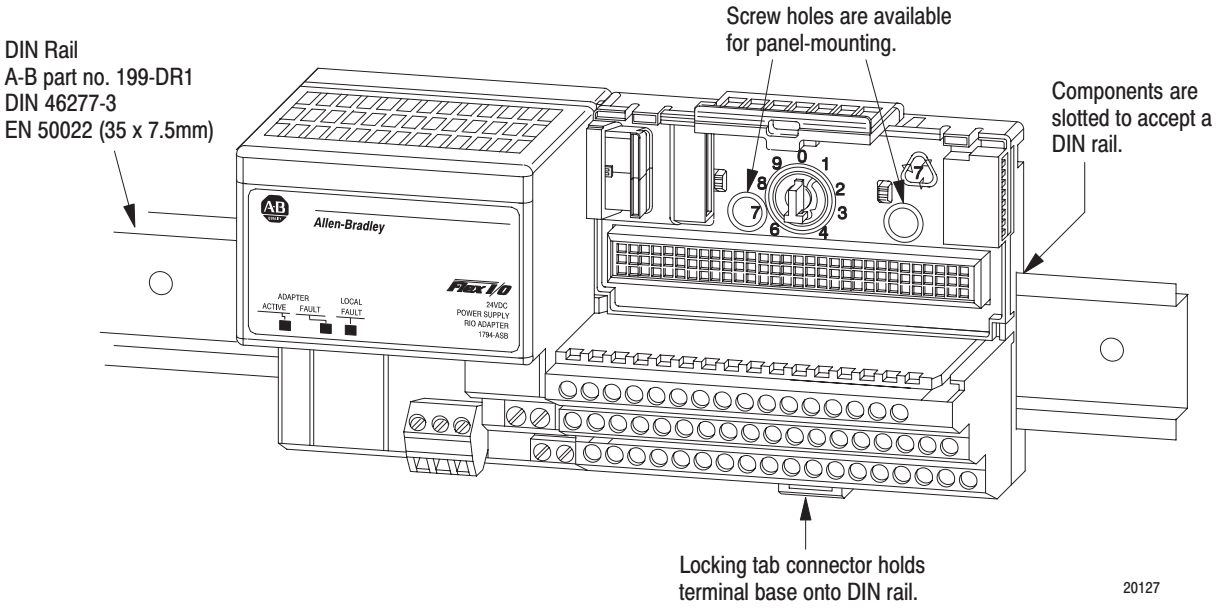
For information on how communication occurs over the FLEX I/O system backplane, refer to Chapter 2.

More Information...

## Mount and Remove your System Easily

You can horizontally or vertically mount the FLEX I/O system on a standard DIN rail. The adapter and terminal base easily snap on the DIN rail by hand. Refer to the installation instructions shipped with these components.

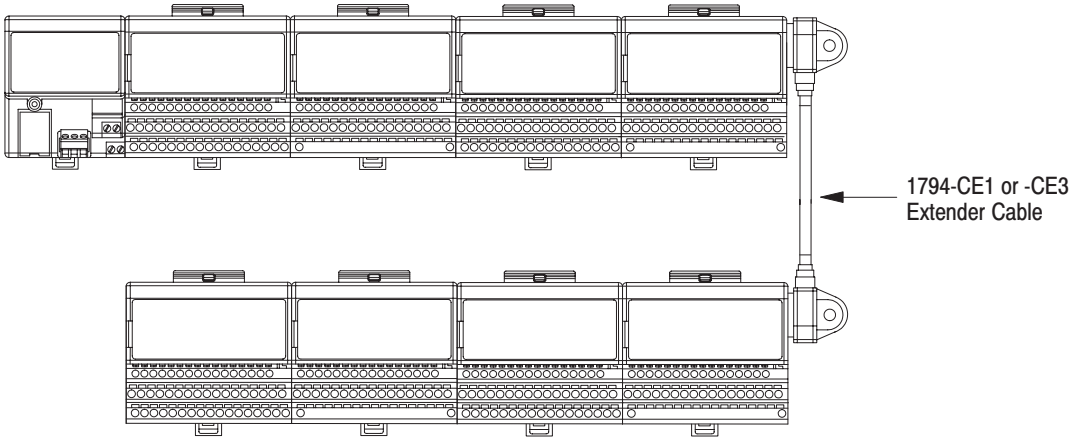
Screw holes are also provided to horizontally or vertically panel-mount your system in an enclosure. To panel-mount your FLEX I/O system, use the optional mounting kit (1794-NM1). An example of a DIN rail-mounted system is shown below.




## Optional Accessories

### Extender Cables (1794-CE1 or -CE3)

Use the optional 1794-CE1 (0.3m) or -CE3 (0.9m) extender cable (one per system) to arrange your system in two rows or split your system into horizontal and vertical orientation.

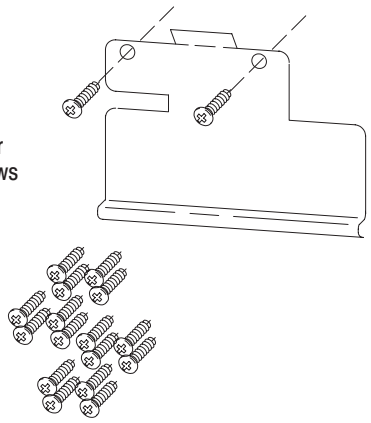


**ATTENTION** Do not use more than one cable per system.

## Mounting Kit (1794-NM1)

Use the optional 1794-NM1 mounting kit to mount your system on a panel or wall without a DIN rail.

1794-NM1
Mounting Kit with
18 screws (2 screws for
the adapter and 2 screws
for each module)



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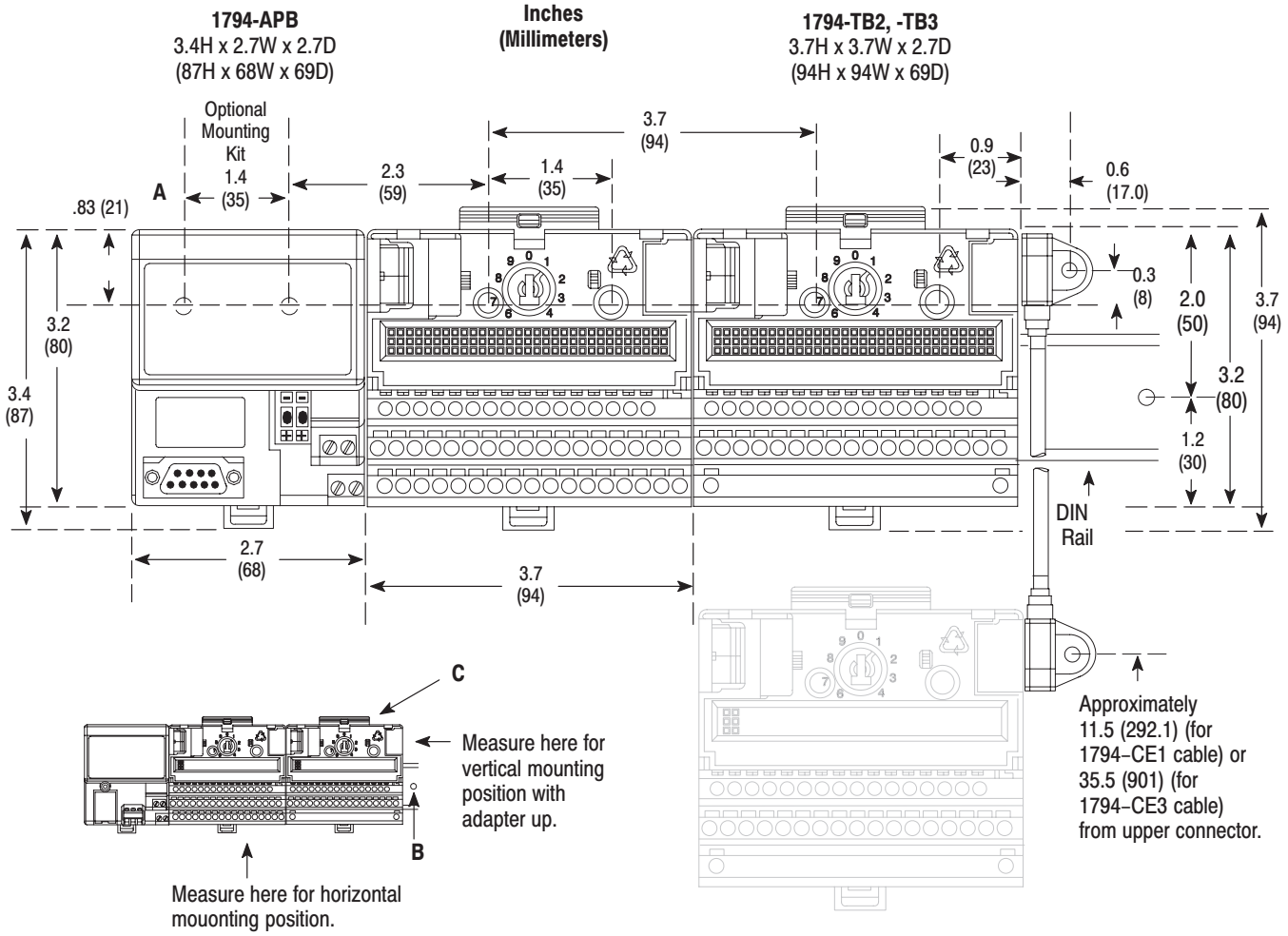
## Mounting Dimensions and Spacing Requirements




**Secure DIN Rail every 200mm.**

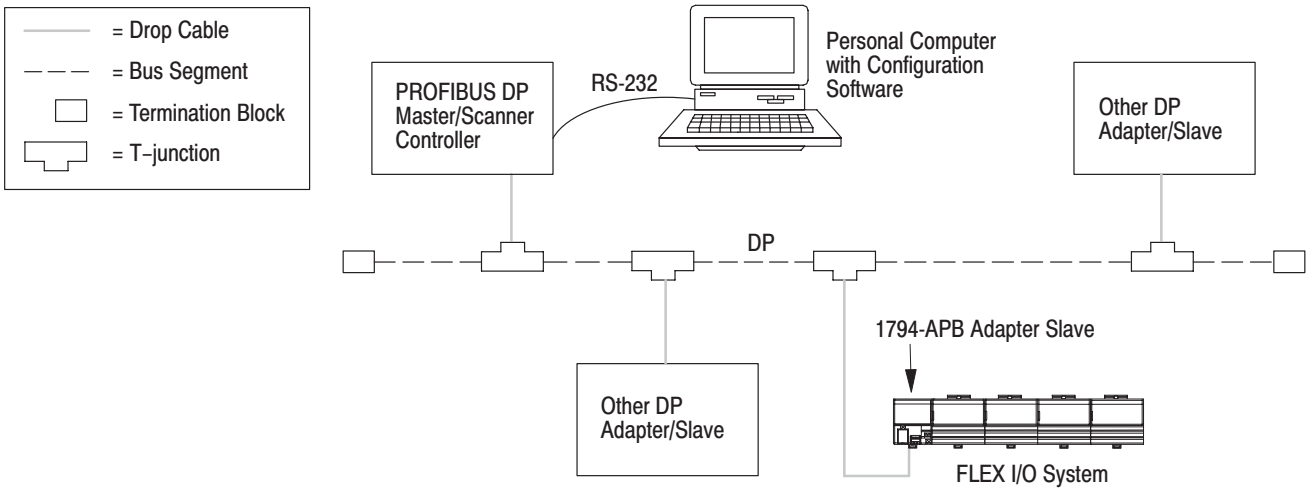
A = Mounting hole dimensions for optional mounting kit 1794–NM1
B = DIN rail
C = Operating temperature 1.0 (25.4) below each module when mounted in any position not to exceed 55°C (131°F).

## Purpose of the 1794-APB FLEX I/O Adapter

The 1794-APB is a FLEX I/O adapter that interacts with the FLEX I/O backplane and any PROFIBUS DP master/scanner controller on a PROFIBUS DP network.

The 1794-APB module is a slave device to the DP master/scanner, and is a master controller of the FLEX I/O system where it is installed.

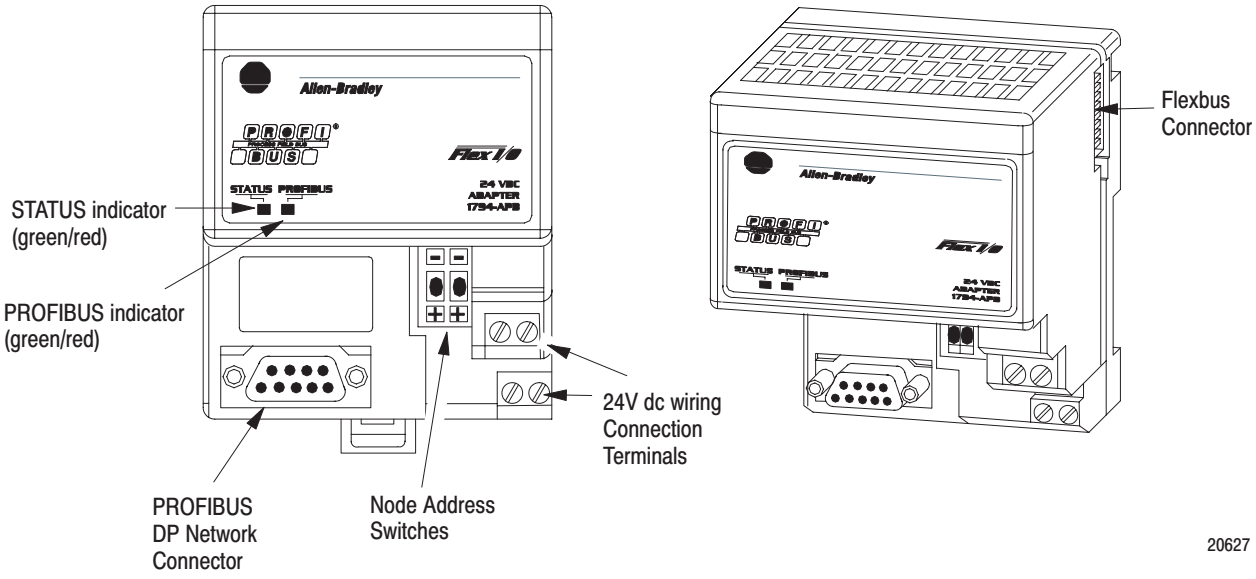
The I/O data exchange occurs as follows: Output data is sent from the DP master/scanner controller across the PROFIBUS DP network to the 1794-APB adapter. The adapter then automatically transfers the data across the FLEX I/O backplane to the output modules. Inputs from the input modules are collected by the FLEX I/O adapter via the backplane and sent across the PROFIBUS DP network to the DP master/scanner controller.



## PROFIBUS Adapter Components

The adapter module consists of the following components:

- two diagnostic indicators
- PROFIBUS DP network connector
- 24V dc power wiring connection terminals
- two node address switches




### Diagnostic Indicators

Diagnostic indicators are located on the front panel of the adapter module. They show both normal operation and error conditions in your FLEX I/O system. The indicators are:

- Device status (STATUS)
- Communication link status (PROFIBUS)

Upon power-up, the adapter goes to an initialization state and performs a self-test (memory check, data memory clear, CRC on code). The indicators also go through a self-test sequence. If a failure occurs, the adapter transitions to a faulted state and waits for reset (cycle power). Otherwise, the adapter begins monitoring the network (run state) for messages.

More Information...

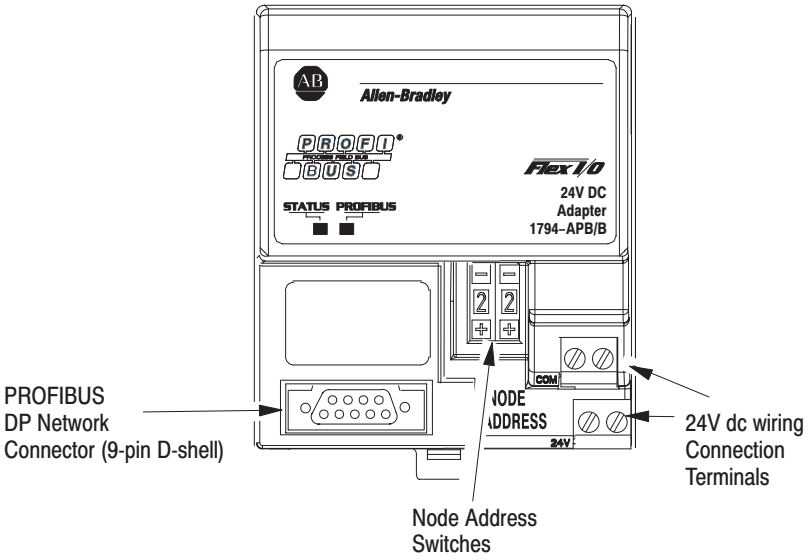
Chapter 5 describes the diagnostic indicators and how to use them for troubleshooting.

## Network Connector

Use the 9-pin D-shell connector to connect your adapter to the PROFIBUS network.

## Setting the Node Address Switches

Set the node address using the 2-position thumbwheel switch. Valid settings range from 01 to 99. Use a pen to press either the + or – buttons to change the number.




## Power Wiring

Connections are provided for connecting the required 24V dc power to the front of the module. The power wiring can be daisy-chained to the terminal base unit located next to the adapter to supply power to the module installed in that base unit.

More Information...

Refer to the Installation Instructions (pub. no. 1794-IN040) you received with your adapter to learn how to install and wire the adapter.

# How Communication Takes Place and I/O Image Table Mapping

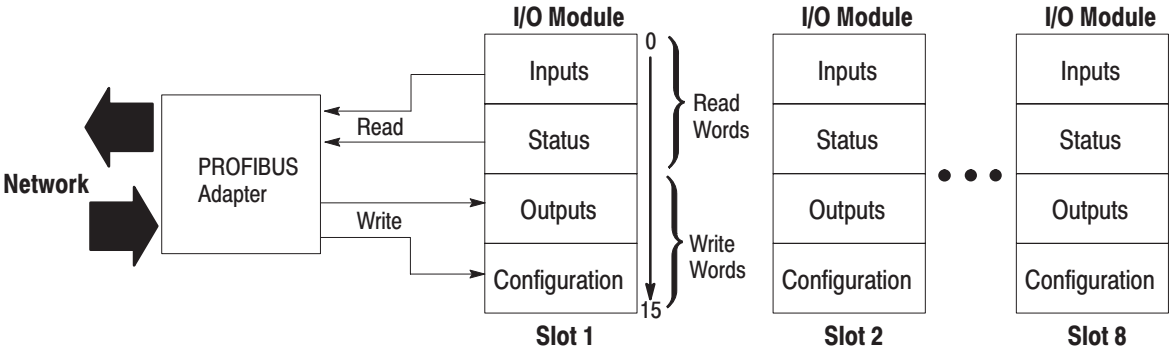
## What this Chapter Contains

In this chapter, you will learn about:

- communication over the FLEX I/O backplane (between the PROFIBUS adapter and the I/O modules)
- how data is mapped into the I/O image table

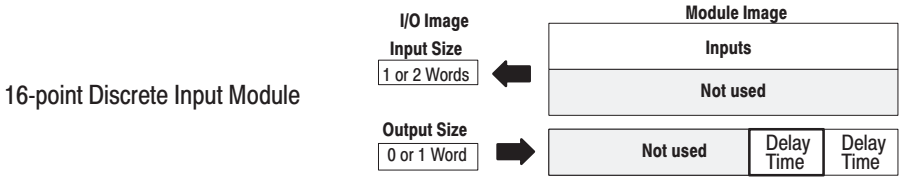
## Communication Over the I/O Backplane

One 1794-APB PROFIBUS adapter can interface with up to eight terminal base units with installed FLEX I/O modules, forming a FLEX I/O system of up to eight slots. The adapter communicates to other network system components over the PROFIBUS network. The adapter communicates with its I/O modules over the backplane.




The I/O map for a module is divided into read words and write words. Read words consist of input and status words, and write words consist of output and configuration words. The number of read words or write words can be 0 or more. The length of each I/O module's read words and write words vary in size depending on module complexity. Each I/O module will support at least 1 input word or 1 output word. Status and configuration are optional, depending on the module.

For example, a 16 point discrete input module will have up to 2 read words and 1 write word.

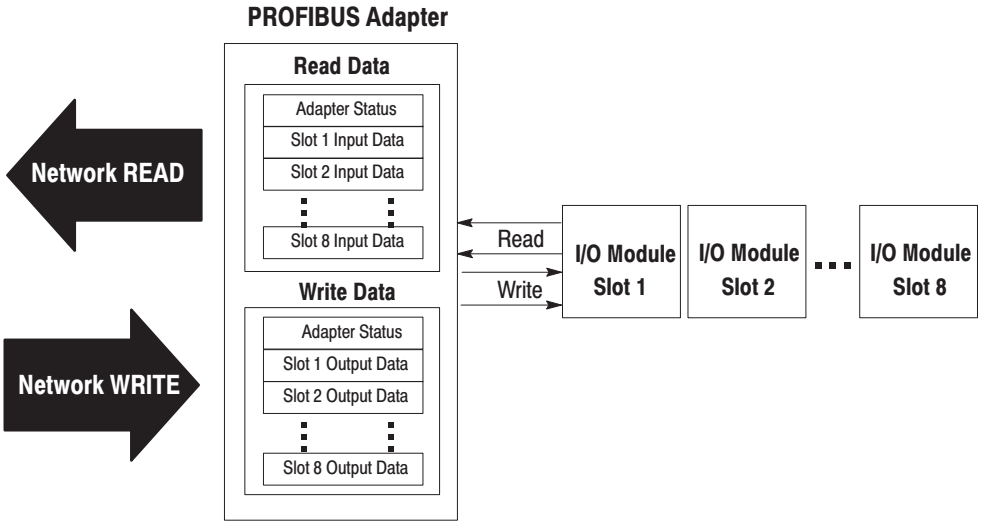



Check the I/O map for each module for the exact mapping.

## Polled I/O Structure

The first word of output data received by the adapter is the Adapter Status Word. Output data is received by the adapter in the order of the installed I/O modules. The Output data for Slot 1 is received first, followed by the Output data for Slot 2, and so on up to slot 8. All bits in the output status word are reserved

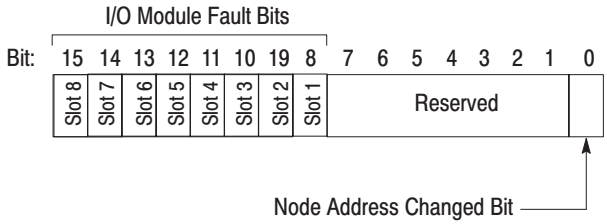
The first word of input data sent by the adapter is the Adapter Status Word. This is followed by the input data from each slot, in the order of the installed I/O modules. The Input data from Slot 1 is first after the status word, followed by Input data from Slot 2, and so on up to slot 8.



## Adapter Input Status Word

The input status word consists of:

- I/O module fault bits – 1 status bit for each slot
- node address changed – 1 bit




The adapter input status word bit descriptions are shown in the following table.

| Bit Description | Bit | Explanation |
|---|---|---|
| I/O Module Fault | 8 | This bit is set (1) when an error is detected in slot position 1. |
| | 9 | This bit is set (1) when an error is detected in slot position 2. |
| | 10 | This bit is set (1) when an error is detected in slot position 3. |
| | 11 | This bit is set (1) when an error is detected in slot position 4. |
| | 12 | This bit is set (1) when an error is detected in slot position 5. |
| | 13 | This bit is set (1) when an error is detected in slot position 6. |
| | 14 | This bit is set (1) when an error is detected in slot position 7. |
| | 15 | This bit is set (1) when an error is detected in slot position 8. |
| Reserved | 1–7 | Reserved |
| Node Address Changed | 0 | This bit is set (1) when the node address switch setting has been changed since power up. |

Possible causes for an **I/O module fault** are:

- transmission errors on the FLEX I/O backplane
- a failed module
- a module removed from its terminal base
- incorrect module inserted in a slot position
- the slot is empty

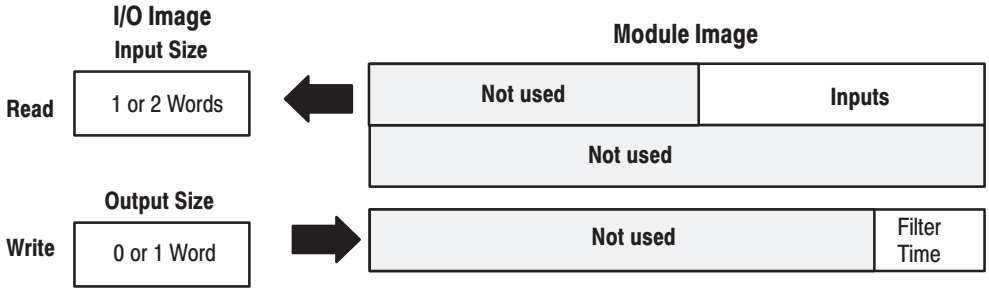
The **node address changed** bit is set when the node address switch setting has been changed since power up. The new node address does not take effect until the adapter has been powered down and then powered back up. Until this power cycling occurs, the node address switches will not match the actual node address.

## Mapping Data into the Image Table

FLEX I/O modules presently supported by the PROFIBUS adapter are listed below. Additional modules will be added as they are developed.

| Module Description | Catalog Number | For image table mapping, refer to: |
|---|---|---|
| 8 Sink Input Module | 1794-IB8 | page 2–5 |
| 16 Sink Input Module | 1794-IB16 | page 2–6 |
| 8 Source Output Module | 1794-OB8 | page 2–7 |
| 16 Source Output Module | 1794-OB16 | page 2–7 |
| 16 Source Input Module | 1794-IV16 | page 2–8 |
| 16 Sink Output Module | 1794-OV16P | page 2–9 |
| 8 Sensor Input Module | 1794-IB8S | page 2–10 |
| 8 Electronically Fused Output Module | 1794-OB8EP | page 2–11 |
| 10 Input/6 Output Module | 1794-IB10XOB6 | page 2–11 |
| 8 Input Module | 1794-IA8 | page 2–12 |
| 8 Output Module | 1794-OA8 | page 2–13 |
| 8 Relay Output Module | 1794-OW8 | page 2–13 |
| 8 Input Analog Module | 1794-IE8 | page 2–14 |
| 4 Output Analog Module | 1794-OE4 | page 2–17 |
| 4 in/2 out Analog Combo Module | 1794-IE4XOE2 | page 2–20 |
| 8 Input RTD Analog Module | 1794-IR8 | page 2–23 |
| 8 Input Thermocouple Module | 1794-IT8 | page 2–27 |
| 8 Input Thermocouple/RTD/mV Module | 1794-IRT8 | page 2–27 |
| 2 Input Pulse Counter Module | 1794–ID2 | page 2–55 |
| 4 Input Encoder Counter Module | 1794–IP4 | page 2–60 |
| SCANport Module | 1203-FM1 | page 2–64 |

## 1794-IB8 – 8-point Digital Input Module Image Table Mapping




### 1794-IB8 Memory Map

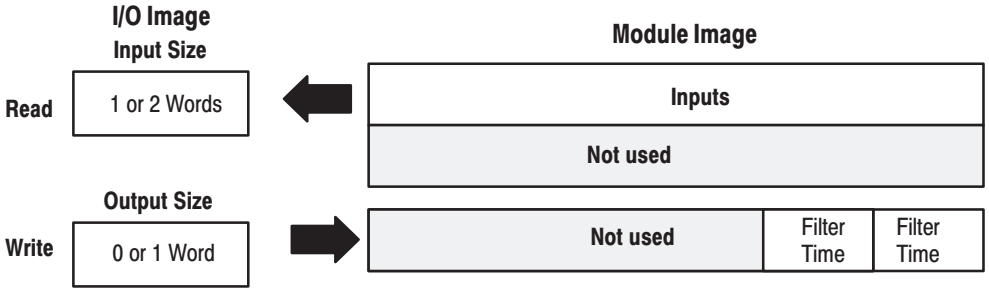
| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** | **Read Words** |
| | Not used | | | | | | | | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read Word 1 |
| | **Not used** | | | | | | | | | | | | | | | | Read Word 2 |
| | **Not used** | | | | | | | | | | | | | FT 00–07 | | | Write Word 1 |

Where D = Input Data (D0 corresponds to input 0, D1 corresponds to input 1, etc.
DT = Input Filter Time (DT 00–07 corresponds to inputs 0 thru 7)

### 1794-IB8 Input Filter Times

| Bits | | | Description | Selected Filter Time |
|---|---|---|---|---|
| **02** | **01** | **00** | **Filter Time for Inputs 00–07** | |
| 0 | 0 | 0 | Filter Time 0 (default) | 512µs |
| 0 | 0 | 1 | Filter Time 1 | 1ms |
| 0 | 1 | 0 | Filter Time 2 | 2ms |
| 0 | 1 | 1 | Filter Time 3 | 4ms |
| 1 | 0 | 0 | Filter Time 4 | 8ms |
| 1 | 0 | 1 | Filter Time 5 | 16ms |
| 1 | 1 | 0 | Filter Time 6 | 32ms |
| 1 | 1 | 1 | Filter Time 7 | 64ms |

## 1794-IB16 – 16-point Digital Input Module Image Table Mapping




### 1794-IB16 Memory Map

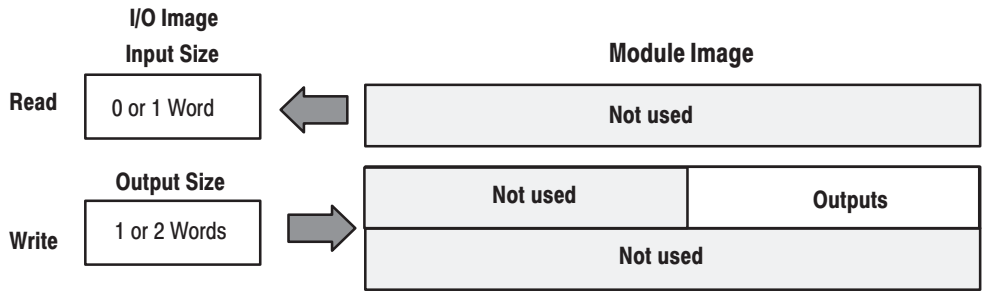
| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** | **Read Words** |
| | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read Word 1 |
| | **Not used** | | | | | | | | | | | | | | | | Read Word 2 |
| | **Not used** | | | | | | | | | | FT 12–15 | | | FT 00–11 | | | Write Word 1 |

Where D = Input Data (D0 corresponds to input 0, D1 corresponds to input 1, etc.
DT = Input Filter Time (FT 00–11 corresponds to inputs 0 thru 11; FT 12–15 corresponds to inputs 12 thru 15)

### 1794-IB16 Input Delay Times

| Bits | | | Description | Selected Filter Time |
|---|---|---|---|---|
| **02** | **01** | **00** | **Filter Time for Inputs 00–11** | |
| **05** | **04** | **03** | **Filter Time for Inputs 12–15** | |
| 0 | 0 | 0 | Filter Time 0 (default) | 512µs |
| 0 | 0 | 1 | Filter Time 1 | 1ms |
| 0 | 1 | 0 | Filter Time 2 | 2ms |
| 0 | 1 | 1 | Filter Time 3 | 4ms |
| 1 | 0 | 0 | Filter Time 4 | 8ms |
| 1 | 0 | 1 | Filter Time 5 | 16ms |
| 1 | 1 | 0 | Filter Time 6 | 32ms |
| 1 | 1 | 1 | Filter Time 7 | 64ms |

## 1794-OB8 – 8-point Discrete Output Module Image Table Mapping

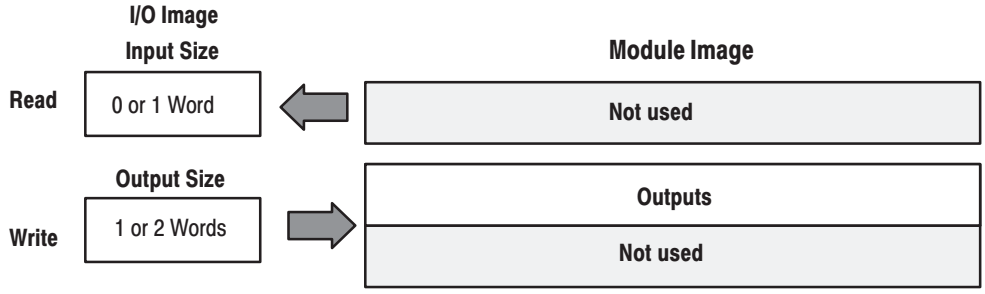



**1794-OB8 Memory Map**

| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Octal. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read Words |
| | Not used | | | | | | | | | | | | | | | | Read Word 1 |
| | Not used | | | | | | | | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write Word 1 |
| | Not used | | | | | | | | | | | | | | | | Write Word 2 |

Where O = Output value (O0 corresponds to output 0, O1 corresponds to output 1, etc.)

## 1794-OB16 – 16-point Discrete Output Module Image Table Mapping

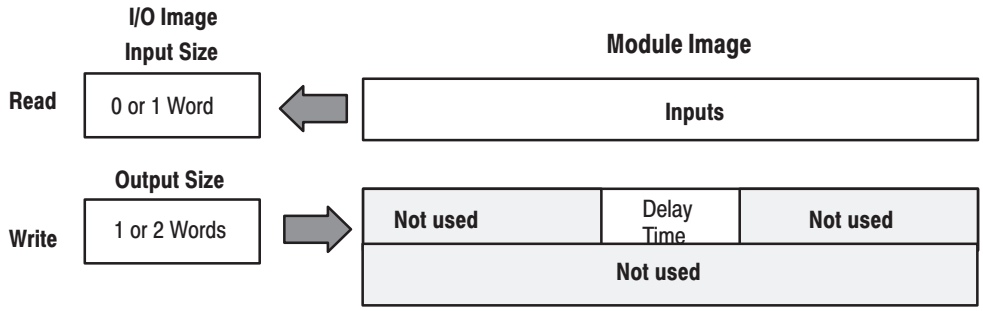



**1794-OB16 Memory Map**

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | Not used | | | | | | | | | | | | | | | | Read Word 1 |
| | O15 | O14 | O13 | O12 | O11 | O10 | O9 | O8 | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write Word 1 |
| | Not used | | | | | | | | | | | | | | | | Write Word 2 |

Where O = Output value (O0 corresponds to output 0, O1 corresponds to output 1, etc.)

## 16-point Source Input Module Image Table Mapping – 1794-IV16




### Memory Map of 16-Point Input Module Image Table – 1794-IV16

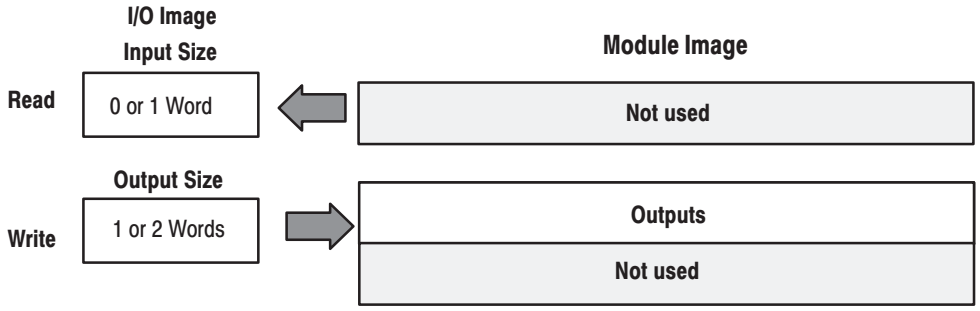
| Dec. Bits | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bits | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read word 1 |
| | Not used | | | | | FT for all channels | | | Not used | | | | | | | | Write word 1 |
| | Not used | | | | | | | | | | | | | | | | Write word 2 |

Where D = Input Data
FT = Input filter Time

### Input Filter Times for the 1794-IV16 Input Module

| Bits | | | Description | Selected Filter Time |
|---|---|---|---|---|
| 10 | 09 | 08 | Filter Time for Inputs 00–15 (00–17) | |
| 0 | 0 | 0 | Filter Time 0 (default) | 216µs |
| 0 | 0 | 1 | Filter Time 1 | 512µs |
| 0 | 1 | 0 | Filter Time 2 | 1ms |
| 0 | 1 | 1 | Filter Time 3 | 2ms |
| 1 | 0 | 0 | Filter Time 4 | 4ms |
| 1 | 0 | 1 | Filter Time 5 | 8ms |
| 1 | 1 | 0 | Filter Time 6 | 16ms |
| 1 | 1 | 1 | Filter Time 7 | 32ms |

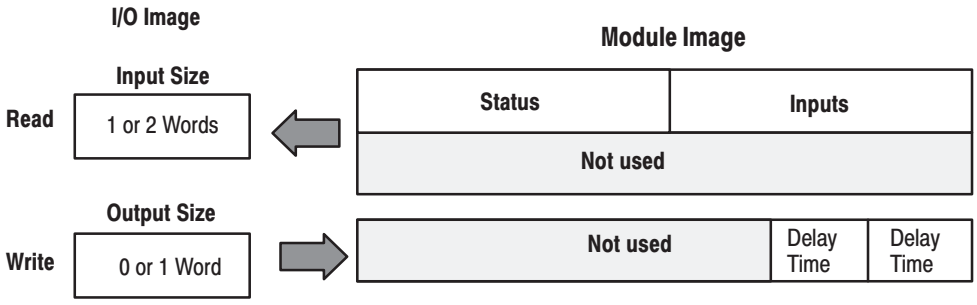
## 16-point Digital Sink Output Module Image Table Mapping – 1794-OV16




### Memory Map of 16-Point Digital Sink Output Module Image Table – 1794-OV16

| Dec. Bits | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bits | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | Not used | | | | | | | | | | | | | | | | Read word 1 |
| | O15 | O14 | O13 | O12 | O11 | O10 | O9 | O8 | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write word 1 |
| | Not used | | | | | | | | | | | | | | | | Write word 2 |
| Where O = Output value | | | | | | | | | | | | | | | | | |

## 1794-IB8S – 8-point Discrete Sensor Input Module Image Table Mapping




### 1794-IB8S Memory Map

| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** | **Read Words** |
| | S7 | S6 | S5 | S4 | S3 | S2 | S1 | S0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read Word 1 |
| | **Not used** | | | | | | | | | | | | | | | | Read Word 2 |
| | **Not used** | | | | | | | | | | DT 12–15 | | | DT 00–11 | | | Write Word 1 |

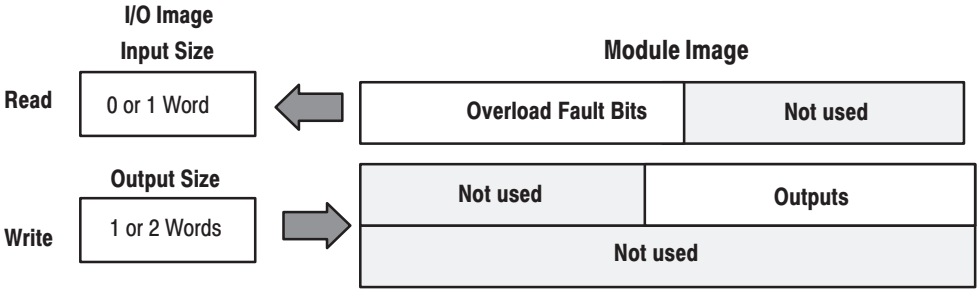
Where S = Status of input (where S1 corresponds to the diagnostic bit for input 1, S2 corresponds to the diagnostic bit for input 2, etc.)
D = Input Data (where D0 corresponds to input 0, D1 corresponds to input 1, etc.
DT = Input Delay Time (where DT 00–11 corresponds to inputs 0 thru 11; DT 12–15 corresponds to inputs 12 thru 15.
**Make certain that the delay time for 00–11 is the same as the delay time for 12–15.**

| | | | | | |
|---|---|---|---|---|---|
| **Smart Sensor** | | | | | |
| Bits 08–15 | S = Diagnostic data – | 1 = Fault present (Smart)<br>0 = Normal (no errors) | Bits 00–07 | D = Input data | 1 = Sensor on<br>0 = Sensor off |
| **Standard Sensor** | | | | | |
| Bits 08–15 | S = Diagnostic data – | 1 = Diagnostics not disabled<br>0 = Normal (Disabled) | Bits 00–07 | D = Input data | 1 = Sensor on<br>0 = Sensor off |

### 1794-IB8S Input Delay Times

| Bits | | | Description | Selected Delay Time |
|---|---|---|---|---|
| **02** | **01** | **00** | **Delay Time for Inputs 00–11** | |
| **05** | **04** | **03** | **Delay Time for Inputs 12–15** | |
| 0 | 0 | 0 | Delay Time 0 (default) | 512µs |
| 0 | 0 | 1 | Delay Time 1 | 1ms |
| 0 | 1 | 0 | Delay Time 2 | 2ms |
| 0 | 1 | 1 | Delay Time 3 | 4ms |
| 1 | 0 | 0 | Delay Time 4 | 8ms |
| 1 | 0 | 1 | Delay Time 5 | 16ms |
| 1 | 1 | 0 | Delay Time 6 | 32ms |
| 1 | 1 | 1 | Delay Time 7 | 64ms |

## 1794-OB8EP – 8-point Discrete Protected Output Module Image Table Mapping




| Dec. Bits | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bits | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | F7 | F6 | F5 | F4 | F3 | F2 | F1 | F0 | Reserved (see note) | | | | | | | | Read 1 |
| | Not used | | | | | | | FR | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write 1 |
| | Reserved | | | | | | | | | | | | | | | | Write 2 |

Where:

F = overload fault bits – 1 = fault present; 0 = no fault

O□ = output data (O0 corresponds to output 0, O1 corresponds to output 2, etc.)

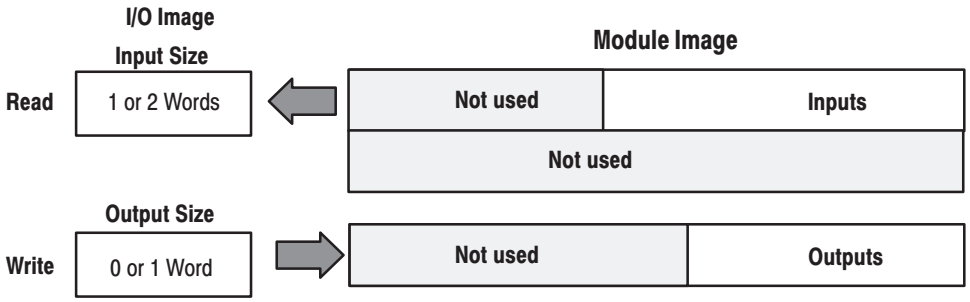
FR = fault reset bit – 1 = reset output; 0 = no change.

**Note:** The unused lower byte in read word 1 floats during operation. Do not use this byte for fault status.

**Using the Fault Reset Button** When you press the manual reset button:

1. the fault indicator for the faulted output turns off for about 1.2s (the faulted output will not attempt to turn on during this delay)
2. after the 1.2s delay, the faulted output attempts to turn on
3. if the external condition causing the fault is corrected, the output remains on, the fault indicator is off, and the status indicator is on

## 16-point Digital Input/Output Module Image Table Mapping – 1794-IB10XOB6

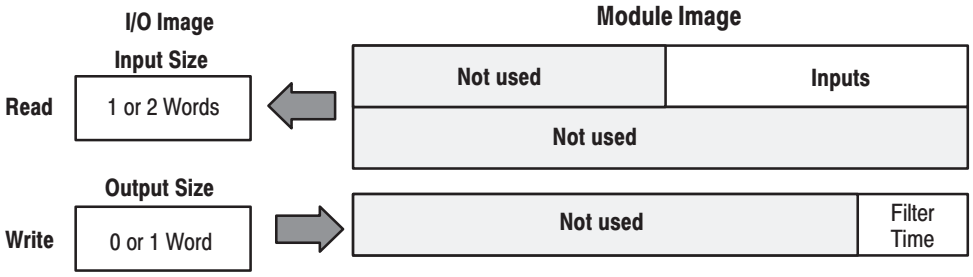



### Memory Map of 16-Point Digital Input/Output Module Image Table – 1794-IB10XOB6

| Dec. Bits | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bits | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | Not used | | | | | | I9 | I8 | I7 | I6 | I5 | I4 | I3 | I2 | I1 | I0 | Read word 1 |
| | Not used | | | | | | | | | | | | | | | | Read word 2 |
| | Not used | | | | | | | | | | O5 | O4 | O3 | O2 | O1 | O0 | Write word 1 |

Where I = Input Channel
O = Output Channel

## 1794-IA8 – 8-point Discrete Input Module Image Table Mapping




### 1794-IA8 Memory Map

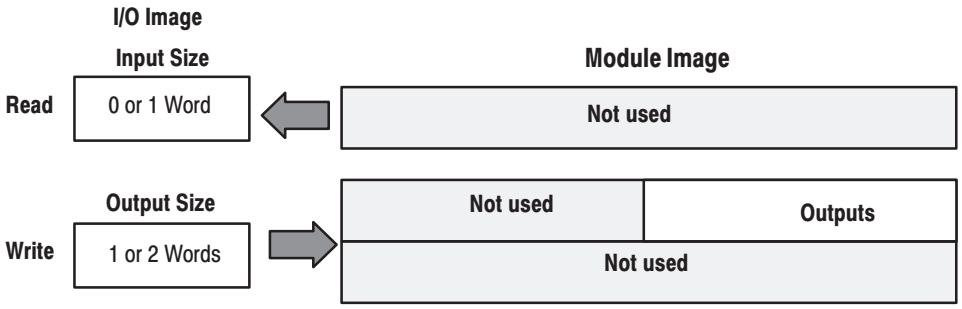
| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** | **Read Words** |
| | **Not used** | | | | | | | | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read Word 1 |
| | **Not used** | | | | | | | | | | | | | | | | Read Word 2 |
| | **Not used** | | | | | | | | | | | | | FT 00–07 | | | Write Word 1 |

Where D = Input Data (where D0 corresponds to input 0, D1 corresponds to input 1, etc.
DT = Input Filter Time (where DT 00–07 corresponds to inputs 0 thru 7)

### 1794-IA8 Input Filter Times

| Bits | | | Description | Maximum Filter Time | |
|---|---|---|---|---|---|
| **02** | **01** | **00** | **Filter Time for Inputs 00–07** | **Off to On** | **On to Off** |
| 0 | 0 | 0 | Filter Time 0 (default) | 8.6ms | 26.6ms |
| 0 | 0 | 1 | Filter Time 1 | 9ms | 27ms |
| 0 | 1 | 0 | Filter Time 2 | 10ms | 28ms |
| 0 | 1 | 1 | Filter Time 3 | 12ms | 30ms |
| 1 | 0 | 0 | Filter Time 4 | 17ms | 35ms |
| 1 | 0 | 1 | Filter Time 5 | 26ms | 44ms |
| 1 | 1 | 0 | Filter Time 6 | 43ms | 61ms |
| 1 | 1 | 1 | Filter Time 7 | 78ms | 96ms |

## 1794-OA8 – 8-point Discrete Output Module Image Table Mapping

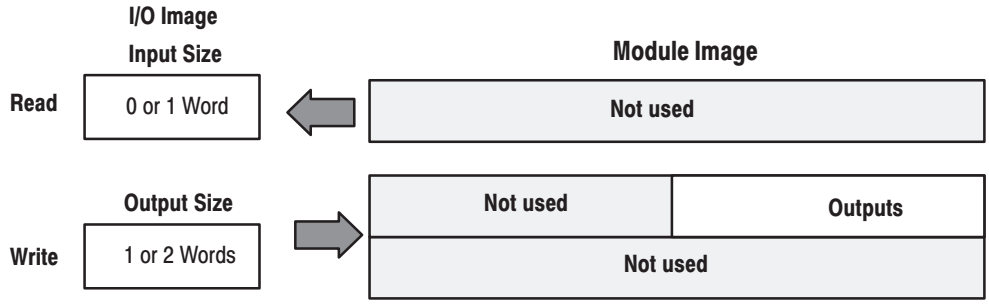



### 1794-OA8 Memory Map

| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read Words |
| | Not used | | | | | | | | | | | | | | | | Read Word 1 |
| | Not used | | | | | | | | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write Word 1 |
| | Not used | | | | | | | | | | | | | | | | Write Word 2 |

Where O = Output value (where O0 corresponds to output 0, O1 corresponds to output 1, etc.)

## 1794-OW8 – 8-point Discrete Relay Output Module Image Table Mapping

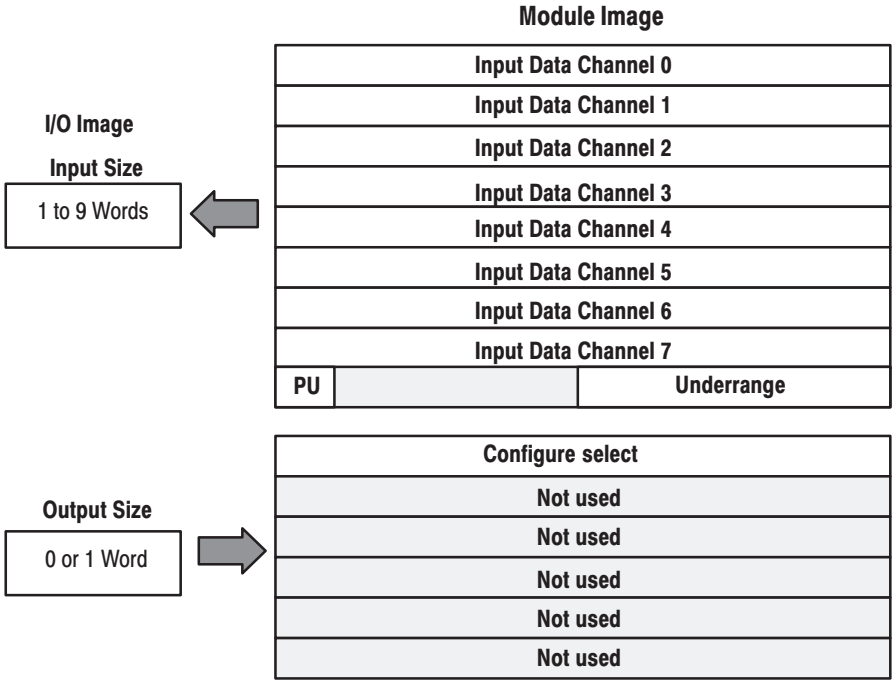



### 1794-OW8 Memory Map

| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read Words |
| | Not used | | | | | | | | | | | | | | | | Read Word 1 |
| | Not used | | | | | | | | O7 | O6 | O5 | O4 | O3 | O2 | O1 | O0 | Write Word 1 |
| | Not used | | | | | | | | | | | | | | | | Write Word 2 |

Where O = Output value: where O0 corresponds to output 0, O1 corresponds to output 1, etc., and when bit = 0, the output is off; when bit = 1, the output is on.

## 1794-IE8 Series B – 8 Input Analog Module




### 1794-IE8/B Memory Map

| Decimal Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | S | Analog Value Channel 0 | | | | | | | | | | | | | | | Read Word 1 |
| | S | Analog Value Channel 1 | | | | | | | | | | | | | | | Read Word 2 |
| | S | Analog Value Channel 2 | | | | | | | | | | | | | | | Read Word 3 |
| | S | Analog Value Channel 3 | | | | | | | | | | | | | | | Read Word 4 |
| | S | Analog Value Channel 4 | | | | | | | | | | | | | | | Read Word 5 |
| | S | Analog Value Channel 5 | | | | | | | | | | | | | | | Read Word 6 |
| | S | Analog Value Channel 6 | | | | | | | | | | | | | | | Read Word 7 |
| | S | Analog Value Channel 7 | | | | | | | | | | | | | | | Read Word 8 |
| | PU | Not used – set to zero | | | | | | | U7 | U6 | U5 | U4 | U3 | U2 | U1 | U0 | Read Word 9 |
| | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | F7 | F6 | F5 | F4 | F3 | F2 | F1 | F0 | Write Word 1 |
| | Not used – set to 0 | | | | | | | | | | | | | | | | Write Word 2 thru 6 |

Where: PU = Power up bit – included in series B modules only.
U = Underrange bits for 4-20mA inputs
C = Configure select bit
F = Full range bit
S = sign bit (in 2's complement)

**1794-IE8/B Range Selection Bits**

| Channel No. | Channel 0 | | Channel 1 | | Channel 2 | | Channel 3 | | Channel 4 | | Channel 5 | | Channel 6 | | Channel 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F0 | C0 | F1 | C1 | F2 | C2 | F3 | C3 | F4 | C4 | F5 | C5 | F6 | C6 | F7 | C7 |
| Decimal Bits (Octal Bits) | 00 | 08 (10) | 01 | 09 (11) | 02 | 10 (12) | 03 | 11 (13) | 04 | 12 (14) | 05 | 13 (15) | 06 | 14 (16) | 07 | 15 (17) |
| 0–10V dc/0–20mA | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 4–20mA | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| -10 to +10V dc | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Off[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

C = Configure select bit

F = Full range bit

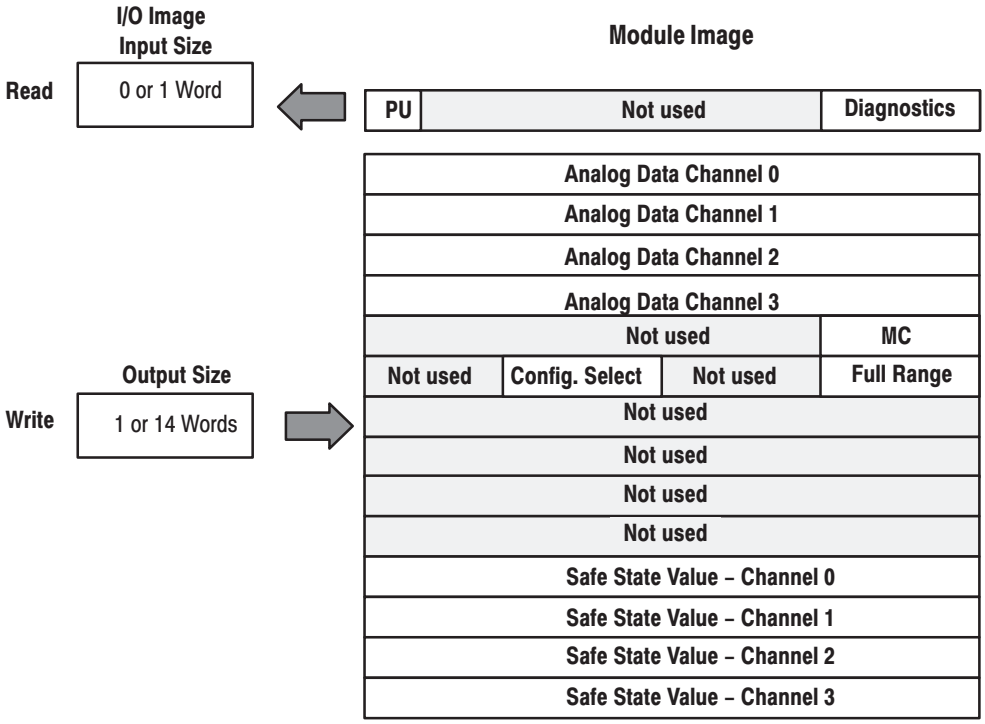
1 When configured to off, individual channels will return 0000H on Series B modules, and 4 to 20mA on Series A modules.

**1794-IE8 Word/Bit Descriptions**

| Word | Decimal Bit | Definition |
|---|---|---|
| Read Word 1 | Bits 00–14 | **Channel 0 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 0 analog data sign bit. |
| Read Word 2 | Bits 00–14 | **Channel 1 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 1 analog data sign bit. |
| Read Word 3 | Bits 00–14 | **Channel 2 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 2 analog data sign bit. |
| Read Word 4 | Bits 00–14 | **Channel 3 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 3 analog data sign bit. |
| Read Word 5 | Bits 00–14 | **Channel 4 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 4 analog data sign bit. |
| Read Word 6 | Bits 00–14 | **Channel 5 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 5 analog data sign bit. |
| Read Word 7 | Bits 00–14 | **Channel 6 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 6 analog data sign bit. |
| Read Word 8 | Bits 00–14 | **Channel 7 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 | Channel 7 analog data sign bit. |

| Word | Decimal Bit | Definition |
|---|---|---|
| Read Word 9 | Bits 00–07 | **Underrange bits (U)** for individual channels **(4-20mA current input only)**– Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, and so on. When set (1), indicates either a broken or open input wire, or input current below 4-20mA. |
| | Bits 08-14 | Not used – set to 0. |
| | Bit 15 | **Power Up bit – included in series B modules only. This bit is 0 in series A modules. This bit is set to 1 when all bits in the configuration register are 0 (unconfigured state).** The configuration register can be cleared by either of the reset inputs, or by the user writing all zeroes to it. |
| Write Word 1 | Bits 00–07 | **Full range bits (F)** for individual channels – Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, and so on. Refer to range selection above. |
| | Bits 08–15 | **Configure select bits (C)** for individual channels – Bit 08 corresponds to input channel 0, bit 09 corresponds to input channel 1, and so on. Refer to range selection above. |
| Write Word 2 | Bits 00–15 | Not used – set to 0. |
| Write Word 3 | Bits 00–15 | Not used – set to 0. |
| Write Word 4 | Bits 00–15 | Not used – set to 0. |
| Write Word 5 | Bits 00–15 | Not used – set to 0. |
| Write Word 6 | Bits 00–15 | Not used – set to 0. |

## 1794-OE4 Series B – 4 Output Analog Module Image Table Mapping




### 1794-OE4 Memory Map

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Octal Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | PU | Not used – set to zero | | | | | | | | | | | W3 | W2 | W1 | W0 | Read Word 1 |
| | S | Analog Data – Channel 0 | | | | | | | | | | | | | | | Write Word 1 |
| | S | Analog Data – Channel 1 | | | | | | | | | | | | | | | Word 2 |
| | S | Analog Data – Channel 2 | | | | | | | | | | | | | | | Word 3 |
| | S | Analog Data – Channel 3 | | | | | | | | | | | | | | | Word 4 |
| | 0 | Not used – set to 0 | | | | | | | | | | | M3 | M2 | M1 | M0 | Word 5 |
| | 0 | Not used – set to 0 | | | C3 | C2 | C1 | C0 | Not used – set to 0 | | | | F3 | F2 | F1 | F0 | Word 6 |
| | Not used – set to 0 | | | | | | | | | | | | | | | | Word 7 thru 10 |
| | S | Safe State Value – Channel 0 | | | | | | | | | | | | | | | Word 11 |
| | S | Safe State Value – Channel 1 | | | | | | | | | | | | | | | Word 12 |
| | S | Safe State Value – Channel 2 | | | | | | | | | | | | | | | Word 13 |
| | S | Safe State Value – Channel 3 | | | | | | | | | | | | | | | Word 14 |

Where: PU = Power up bit – included in series B modules only.
W = Diagnostic bits for current output wire broken or load resistance high. (Not used on voltage outputs.)
S = Sign bit (in 2's complement)
M = Multiplex control
C = Configure select bit
F = Full range bit

### 1794-OE4/B Range Selection Bits (Write Word 6)

| Channel No. | Channel 0 | | Channel 1 | | Channel 2 | | Channel 3 | |
|---|---|---|---|---|---|---|---|---|
| | F0 | C0 | F1 | C1 | F2 | C2 | F3 | C3 |
| **Decimal Bit** | **00** | **08** | **01** | **09** | **02** | **10** | **03** | **11** |
| 4–20mA | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0–10V dc/0–20mA | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| -10 to +10V dc | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Off[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

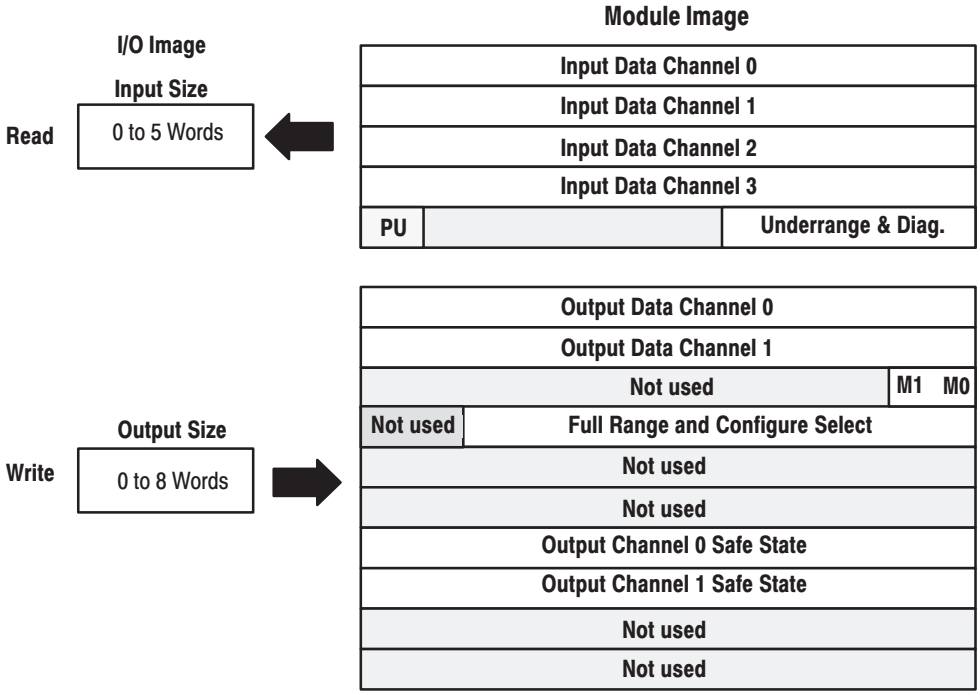
C = Configure select bit
F = Full range bit
1 When configured to off, individual channels will return 0V.

### 1794-OE4 Word/Bit Descriptions

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Read Word 1 | Bits 00-03 | Current outputs only – When set (1), the wire on the output is broken or the load resistance is too high. Bit 00 corresponds to channel 0, bit 01 corresponds to channel 2, and so on. |
| | Bits 04-14 (04–16) | Not used – set to 0 |
| | Bit 15 (17) | **Power Up bit – included in series B modules only. This bit is always 0 in series A modules. This bit is set to 1 when all bits in the configuration register (write word 5) are 0 (unconfigured state).** The configuration register can be cleared by either a reset, or by the user writing all zeroes to it. |
| Write Word 1 | Bits 00–14 (00–16) | **Channel 0 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 0 analog data sign bit.** |
| Word 2 | Bits 00–14 (00–16) | **Channel 1 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 1 analog data sign bit.** |
| Word 3 | Bits 00–14 (00–16) | **Channel 2 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 2 analog data sign bit.** |
| Word 4 | Bits 00–14 (00–16) | **Channel 3 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 3 analog data sign bit.** |
| Word 5 | Bits 00–03 | **Multiplex control bits (M)** for individual channels. These bits control the safe state analog outputs. – Bit 00 corresponds to output channel 0, bit 01 corresponds to output channel 1, and so on.<br>1 = use words 0, 1, 2 or 3 as directed by channel number n<br>0 = use words 10, 11, 12 or 13 as directed by channel number n<br>When bits 00-03 are all cleared (0) simultaneously by a communication error or user choice thru the programmable controller program, word 5 full range and configure select bits are preserved at their last setting. |
| | Bits 04-15 (04-17) | Not used – set to 0. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 6 | Bits 00–03 | **Full range bits (F)** for individual channels – Bit 00 corresponds to output channel 0, bit 01 corresponds to output channel 1, and so on. |
| | Bits 04-07 | Not used – set to 0. |
| | Bits 08–11 (10-13) | **Configure select bits (C)** for individual channels – Bit 08 corresponds to output channel 0, bit 09 corresponds to output channel 1, and so on. |
| | Bits 12-15 (14-17) | Not used – set to 0. |
| Words 7 thru 10 | Bits 00–15 (00–17) | Not used – set to 0. |
| Word 11 | Bits 00–14 (00–16) | **Channel 0 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 0 Safe State analog data sign bit.** |
| Word 12 | Bits 00–14 (00–16) | **Channel 1 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 1 Safe State analog data sign bit.** |
| Word 13 | Bits 00–14 (00–16) | **Channel 2 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 2 Safe State analog data sign bit.** |
| Word 14 | Bits 00–14 (00–16) | **Channel 3 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 3 Safe State analog data sign bit.** |

## 1794-IE4XOE2 Series B – Analog Combo Module Image Table Mapping




### 1794-IE4XOE2 Memory Map

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | S | Analog Value Input Channel 0 | | | | | | | | | | | | | | | Read Word 1 |
| | S | Analog Value Input Channel 1 | | | | | | | | | | | | | | | Read Word 2 |
| | S | Analog Value Input Channel 2 | | | | | | | | | | | | | | | Read Word 3 |
| | S | Analog Value Input Channel 3 | | | | | | | | | | | | | | | Read Word 4 |
| | PU | Not used – set to 0 | | | | | | | | | W1 | W0 | U3 | U2 | U1 | U0 | Read Word 5 |
| | S | Analog Data – Output Channel 0 | | | | | | | | | | | | | | | Write Word 1 |
| | S | Analog Data – Output Channel 1 | | | | | | | | | | | | | | | Write Word 2 |
| | Not used – set to 0 | | | | | | | | | | | | | | M1 | M0 | Write Word 3 |
| | Not used | C5 | C4 | C3 | C2 | C1 | C0 | 0 | 0 | F5 | F4 | F3 | F2 | F1 | F0 | | Write Word 4 |
| | Not used – set to 0 | | | | | | | | | | | | | | | | Write Word 5 and 6 |
| | S | Safe State Value – Output Channel 0 | | | | | | | | | | | | | | | Write Word 7 |
| | S | Safe State Value – Output Channel 1 | | | | | | | | | | | | | | | Write Word 8 |
| | Not used – set to 0 | | | | | | | | | | | | | | | | Write Word 9 and 10 |

Where: S = sign bit (in 2's complement)
W = Diagnostic bits for current output wire broken or load resistance high. (Not used on voltage outputs.)
U = Underrange bits for 4-20mA inputs
PU = Power up bitPU = Power up bit – included in series B modules only.
M = Multiplex control bits
C = Configure select bit
F = Full range bit

**1794-IE4XOE2 Range Selection Bits**

| Channel No. | Input Channel 0 | | Input Channel 1 | | Input Channel 2 | | Input Channel 3 | | Output Channel 0 | | Output Channel 1 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F0 | C0 | F1 | C1 | F2 | C2 | F3 | C3 | F4 | C4 | F5 | C5 |
| Decimal Bits (Octal Bits) | 00 | 08 (10) | 01 | 09 (11) | 02 | 10 (12) | 03 | 11 (13) | 04 | 12 (14) | 05 | 13 (15) |
| 4–20mA | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 0–10V dc/0–20mA | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| -10 to +10V dc | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Off[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

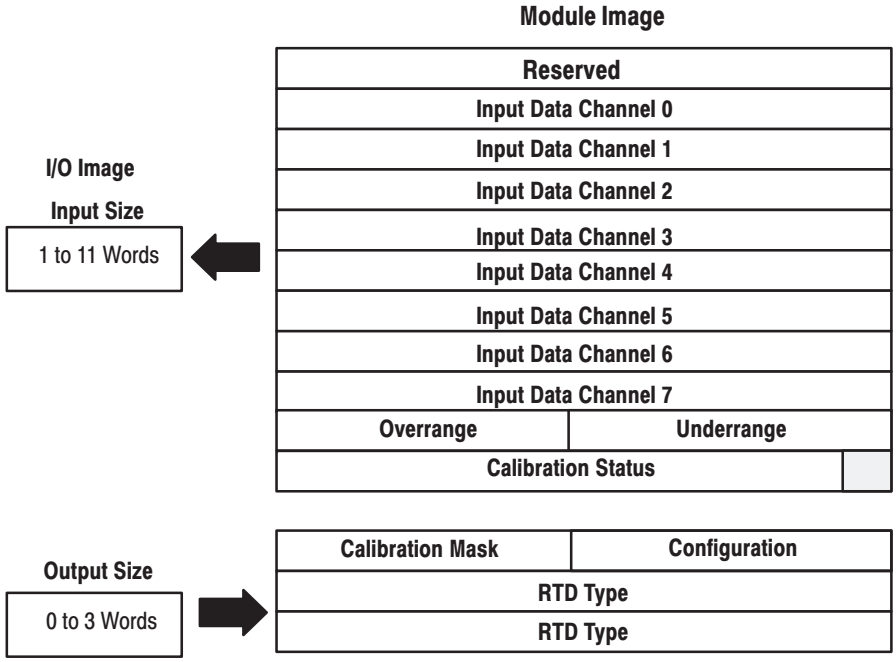
C = Configure select bit
F = Full range bit
1 When configured to off, individual channels will return or send either 0V or 0mA on Series B modules. On Series modules, 2V or 4mA is output until the module is configured.

**1794-IE4XOE2 Word/Bit Descriptions**

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Read Word 1 | Bits 00–14 (00–16) | **Channel 0 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 0 analog data sign bit.** |
| Word 2 | Bits 00–14 (00–16) | **Channel 1 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 1 analog data sign bit.** |
| Word 3 | Bits 00–14 (00–16) | **Channel 2 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 2 analog data sign bit.** |
| Word 4 | Bits 00–14 (00–16) | **Channel 3 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 3 analog data sign bit.** |
| Word 5 | Bits 00–03 | **Underrange bits (U)** for individual channels **(4-20mA current inputs only)** – Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, and so on. When set (1), indicates either a broken or open input wire, or input current is at or below 4mA. |
| | Bits 04-05 | **Wire Off bits (W)** – Current outputs only – When set (1), the wire on the current output is broken or the load resistance is too high. Bit 00 corresponds to channel 0, bit 01 corresponds to channel 2, and so on. |
| | Bits 06–14 (06–16) | Not used |
| | Bit 15 (17) | **Power Up bit – included in series B modules only. This bit is always 0 in series A modules. This bit is set to 1 when all bits in the configuration register (write word 3) are 0 (unconfigured state).** The configuration register can be cleared by either a reset, or by the user writing all zeroes to it. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| **Write Word 1** | Bits 00–14 (00–16) | **Channel 0 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 0 analog data sign bit.** |
| Word 2 | Bits 00–14 (00–16) | **Channel 1 analog data** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 1 analog data sign bit.** |
| Word 3 | Bits 00–01 | **Multiplex control bits (M**) for individual channels. These bits control the safe state analog outputs – Bit 00 corresponds to output channel 0, and bit 01 corresponds to output channel 1.<br>1 = use words 0 and 1 (analog value) as directed by channel number n<br>0 = use words 6 and 7 (safe state analog value) as directed by channel number n<br>When bits 00-01 are all cleared (0) simultaneously by a communication error or user choice thru the programmable controller program, word 3 full range and configure select bits are preserved at their last setting. |
| | Bits 02–15 (02–17) | Not used – set to 0. |
| Word 4 | Bits 00–05 | **Full range bits (F)** for individual channels – Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, bit 02 corresponds to input channel 3, bit 03 corresponds to input channel 3, bit 04 corresponds to output channel 1, and bit 05 corresponds to output channel 2. Refer to Range Bit Selections. |
| | Bits 06-07 | Not used – set to 0. |
| | Bits 08–13 (10-15) | **Configure select bits (C)** for individual channels – Bit 08 corresponds to input channel 0, bit 09 (11) corresponds to input channel 1, bit 10 (12) corresponds to input channel 2, bit 11 (13) corresponds to input channel 3, bit 12 (14) corresponds to output channel 0, and bit 13 (15) corresponds to output channel 1. Refer to Range Bit Selections. |
| | Bits 14-15 (16-17) | Not used – set to 0. |
| Words 5 and 6 | | Not used – set to 0. |
| Word 7 | Bits 00–14 (00–16) | **Channel 0 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 0 Safe State analog data sign bit.** |
| Word 8 | Bits 00–14 (00–16) | **Channel 1 Safe State analog value** – 12-bit left justified two's complement number; unused lower bits are zero; 4-20mA uses all 16 bits. |
| | Bits 15 (17) | **Channel 1 Safe State analog data sign bit.** |

## 1794-IR8 – RTD Input Analog Module Image Table Mapping




### 1794-IR8 Read

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct. Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | Reserved | | | | | | | | | | | | | | | | Read Word 1 |
| | Channel 0 Input Data | | | | | | | | | | | | | | | | Read Word 2 |
| | Channel 1 Input Data | | | | | | | | | | | | | | | | Read Word 3 |
| | Channel 2 Input Data | | | | | | | | | | | | | | | | Read Word 4 |
| | Channel 3 Input Data | | | | | | | | | | | | | | | | Read Word 5 |
| | Channel 4 Input Data | | | | | | | | | | | | | | | | Read Word 6 |
| | Channel 5 Input Data | | | | | | | | | | | | | | | | Read Word 7 |
| | Channel 6 Input Data | | | | | | | | | | | | | | | | Read Word 8 |
| | Channel 7 Input Data | | | | | | | | | | | | | | | | Read Word 9 |
| | Overrange Bits | | | | | | | | Underrange Bits | | | | | | | | Read Word 10 |
| | 0 | 0 | 0 | 0 | 0 | Bad Cal | Cal Done | Cal Range | 0 | Diagnostic Status Bits | | | Pwr Up | 0 | 0 | 0 | Read Word 11 |
| | 8-bit Calibration Mask | | | | | | | | Cal Clk | Cal Hi Cal Lo | Filter Cutoff | | | Enh | MDT | | Write Word 1 |
| | RTD 3 Type | | | | RTD 2 Type | | | | RTD 1 Type | | | | RTD 0 Type | | | | Write Word 2 |
| | RTD 7 Type | | | | RTD 6 Type | | | | RTD 5 Type | | | | RTD 4 Type | | | | Write Word 3 |

Where: Enh = Enhanced
MDT = Module Data Type

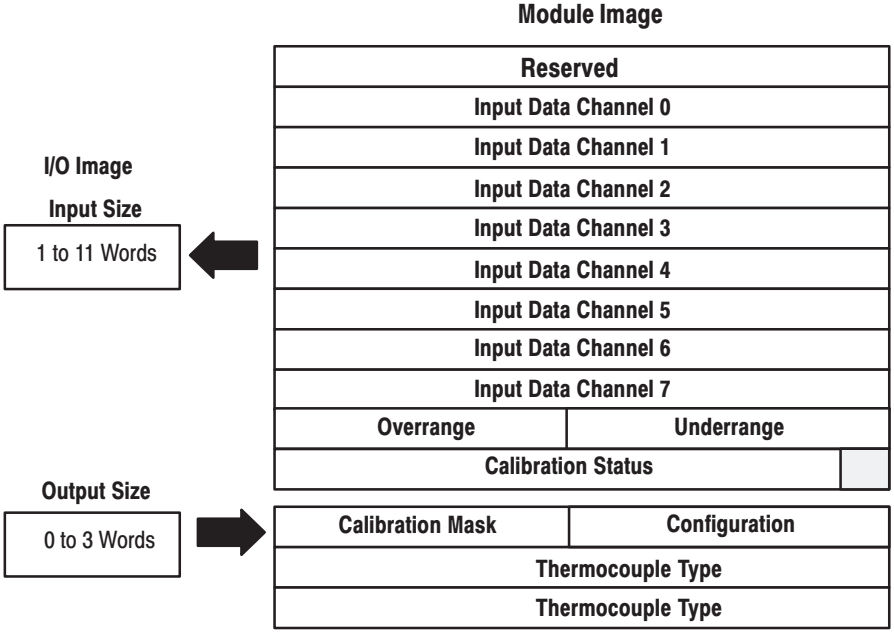
**1794-IR8 Word/Bit Descriptions**

| Word | Dec. Bits (Octal Bits) | Description |
|---|---|---|
| Read Word 1 | 00–15 (00–17) | Reserved |
| Read Word 2 | 00–15 (00–17) | Channel 0 Input data |
| Read Word 3 | 00–15 (00–17) | Channel 1 Input data |
| Read Word 4 | 00–15 (00–17) | Channel 2 Input data |
| Read Word 5 | 00–15 (00–17) | Channel 3 Input data |
| Read Word 6 | 00–15 (00–17) | Channel 4 Input data |
| Read Word 7 | 00–15 (00–17) | Channel 5 Input data |
| Read Word 8 | 00–15 (00–17) | Channel 6 Input data |
| Read Word 9 | 00–15 (00–17) | Channel 7 Input data |
| Read Word 10 | 00–07 | **Underrange bits –** these bits are set if the input signal is below the input channel's minimum range. |
| | 08–15 (10–17) | **Overrange bits –** these bits are set if 1), the input signal is above the input channel's maximum range, or 2), an open detector is detected. |
| Read Word 11 | 00–01 | Not used – set to 0 |
| | 02 | Reserved |
| | 03 | **Powerup bit –** this bit is set (1) until configuration data is received by the module. |
| | 04–06 | **Critical Error bits –** If these bits are anything other than all zeroes, return the module to the factory for repair |
| | 07 | Unused – set to 0 |
| | 08 (10) | **Calibration Range bit –** set to 1 if a reference signal is out of range during calibration |
| | 09 (11) | **Calibration Done bit –** set to 1 after an initiated calibration cycle is complete. |
| | 10 (12) | **Calibration Bad bit –** set to 1 if the channel has not had a valid calibration. |
| | 11–15 (13–17) | Unused – set to 0 |

| Word | Dec. Bits (Octal Bits) | Description | | | | |
|---|---|---|---|---|---|---|
| **Write word 1** | 00–01 | **Module Data Type** | | | | |
| | | **Bit** | **01** | **00** | | |
| | | | 0 | 0 | °C (default) | |
| | | | 0 | 1 | °F | |
| | | | 1 | 0 | Bipolar counts scaled between –32768 and +32767 | |
| | | | 1 | 1 | Unipolar counts scaled between 0 and 65535 | |
| | 02 | **Enhanced mode select** – measures voltage drop across a precision resistor in the module to compare with the unknown input. | | | | |
| | 03–05 | **A/D Filter First Notch Frequency** | | | | |
| | | **Bit** | **05** | **04** | **03** | **Definition** |
| | | | 0 | 0 | 0 | 10Hz (default) |
| | | | 0 | 0 | 1 | 25Hz |
| | | | 0 | 1 | 0 | 50Hz |
| | | | 0 | 1 | 1 | 60Hz |
| | | | 1 | 0 | 0 | 100Hz |
| | | | 1 | 0 | 1 | 250Hz |
| | | | 1 | 1 | 0 | 500Hz |
| | | | 1 | 1 | 1 | 1000hZ |
| | 06 | **Calibration High/Low bit** – This bit is set during gain calibration; reset during offset calibration. | | | | |
| | 07 | **Calibration clock** – this bit must be set to 1 to prepare for a calibration cycle; then reset to 0 to initiate calibration. | | | | |
| | 08–15 | **Calibration mask** – The channel, or channels, to be calibrated will have the correct mask bit set. Bit 0 corresponds to channel 0, bit 1 to channel 1, and so on. | | | | |

| Word | Dec. Bits (Octal Bits) | Description | | | | | |
|---|---|---|---|---|---|---|---|
| Write Word 2 | 00–03 | Channel 0 RTD Type | | | | | |
| | | **Bit** | **03** | **02** | **01** | **00** | **RTD Type – Range** |
| | | | 0 | 0 | 0 | 0 | Resistance (default) |
| | | | 0 | 0 | 0 | 1 | No sensor connected – do not scan |
| | | | 0 | 0 | 1 | 0 | 100 ohm Pt $\alpha$ = 0.00385 Euro (–200 to +870°C) |
| | | | 0 | 0 | 1 | 1 | 100 ohm Pt $\alpha$ = 0.003916 U.S. (–200 to +630°C) |
| | | | 0 | 1 | 0 | 0 | 200 ohm Pt $\alpha$ = 0.00385 (–200 to +630°C) |
| | | | 0 | 1 | 0 | 1 | 500 ohm Pt $\alpha$ = 0.00385 (–200 to +630°C) |
| | | | 0 | 1 | 1 | 0 | Reserved |
| | | | 0 | 1 | 1 | 1 | 10 ohm Copper (–200 to +260°C) |
| | | | 1 | 0 | 0 | 0 | 120 ohm Nickel (–60 to +250°C) |
| | | | 1 | 0 | 0 | 1 | 100 ohm Nickel (–60 to +250°C) |
| | | | 1 | 0 | 1 | 0 | 200 ohm Nickel (–60 to +250°C) |
| | | | 1 | 0 | 1 | 1 | 500 ohm Nickel (–60 to +250°C) |
| | | | 1 | 1 | 0 | 0 | Module data time stamp |
| | | | 1101 to 1111 – Reserved | | | | |
| | 04–07 | Channel 1 RTD Type (see bits 00–03) | | | | | |
| | 08–11 | Channel 2 RTD Type (see bits 00–03) | | | | | |
| | 12–15 | Channel 3 RTD Type (see bits 00–03) | | | | | |
| Write Word 3 | 00–03 | Channel 4 RTD Type (see write word 2, bits 00–03) | | | | | |
| | 04–07 | Channel 5 RTD Type (see write word 2, bits 00–03) | | | | | |
| | 08–11 | Channel 6 RTD Type (see write word 2, bits 00–03) | | | | | |
| | 12–15 | Channel 7 RTD Type (see write word 2, bits 00–03) | | | | | |

## 1794-IT8 – Thermocouple Input Module Image Table Mapping




### 1794-IT8 Read and Write Words

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** | **Read/Write Words** |
| | Reserved | | | | | | | | | | | | | | | | Read Word 1 |
| | Channel 0 Input Data | | | | | | | | | | | | | | | | Read Word 2 |
| | Channel 1 Input Data | | | | | | | | | | | | | | | | Read Word 3 |
| | Channel 2 Input Data | | | | | | | | | | | | | | | | Read Word 4 |
| | Channel 3 Input Data | | | | | | | | | | | | | | | | Read Word 5 |
| | Channel 4 Input Data | | | | | | | | | | | | | | | | Read Word 6 |
| | Channel 5 Input Data | | | | | | | | | | | | | | | | Read Word 7 |
| | Channel 6 Input Data | | | | | | | | | | | | | | | | Read Word 8 |
| | Channel 7 Input Data | | | | | | | | | | | | | | | | Read Word 9 |
| | Overrange Bits | | | | | | | | Underrange Bits | | | | | | | | Read Word 10 |
| | 0 | 0 | 0 | 0 | 0 | Bad Cal | Cal Done | Cal Range | 0 | Diagnostics | | | Pwr Up | Bad Structure | CJC over | CJC Under | Read Word 11 |
| | 8-Bit Calibration Mask | | | | | | | | Cal Clk | Cal hi Cal lo | Filter Cutoff | | | FDF | Data Type | | Write Word 1 |
| | Thermocouple 3 Type | | | | Thermocouple 2 Type | | | | Thermocouple 1 Type | | | | Thermocouple 0 Type | | | | Write Word 2 |
| | Thermocouple 7 Type | | | | Thermocouple 6 Type | | | | Thermocouple 5 Type | | | | Thermocouple 4 Type | | | | Write Word 3 |

Where: FDF = fixed digital filter bit

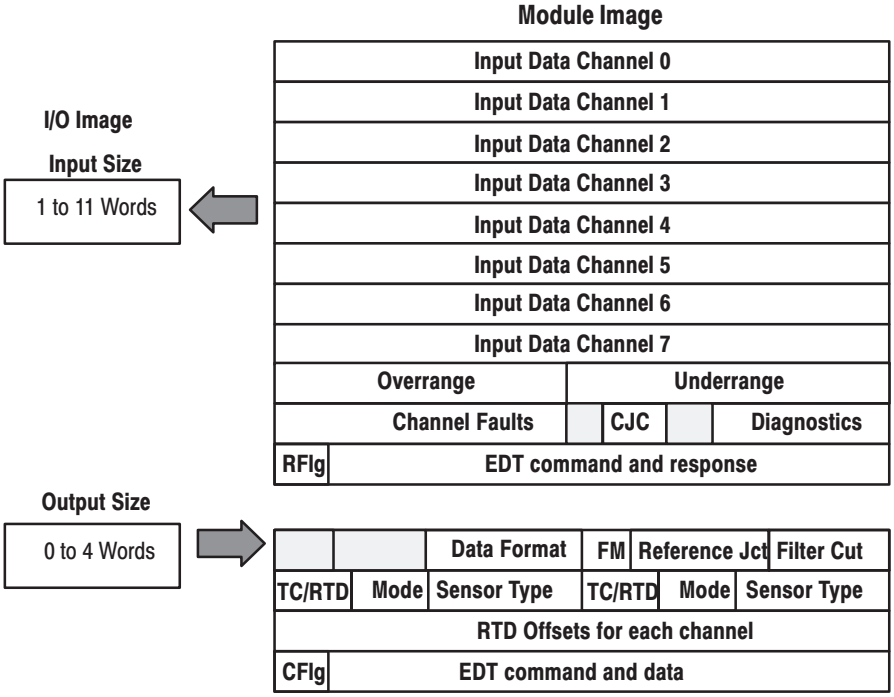
**1794-IT8 Word/Bit Descriptions**

| Word | Decimal Bit (Octal Bit) | Description |
|---|---|---|
| Read Word 1 | 00–15 (00–17) | Reserved |
| Read Word 2 | 00–15 (00–17) | Channel 0 Input data |
| Read Word 3 | 00–15 (00–17) | Channel 1 Input data |
| Read Word 4 | 00–15 (00–17) | Channel 2 Input data |
| Read Word 5 | 00–15 (00–17) | Channel 3 Input data |
| Read Word 6 | 00–15 (00–17) | Channel 4 Input data |
| Read Word 7 | 00–15 (00–17) | Channel 5 Input data |
| Read Word 8 | 00–15 (00–17) | Channel 6 Input data |
| Read Word 9 | 00–15 (00–17) | Channel 7 Input data |
| Read Word 10 | 00–07 (00–07) | **Underrange bits –** these bits are set if the input signal is below the input channel's minimum range. |
| | 08–15 (10–17) | **Overrange bits –** these bits are set if 1), the input signal is above the input channel's maximum range, or 2), an open detector is detected. |
| Read Word 11 | 00 (00) | Cold Junction sensor underrange bit. – this bit is set if the cold junction temperature is below 0ºC. |
| | 01 (01) | Cold Junction sensor overrange bit. – this bit is set if the cold junction temperature is above 70ºC. |
| | 02 (02) | **Bad Structure –** this bit is set if there is an invalid thermocouple type selected. |
| | 03 (03) | **Powerup bit –** this bit is set (1) until configuration data is received by the module. |
| | 04–06 (04–06) | **Critical Fault bits –** If these bits are anything other than zero, return the module to the factory for repair. |
| | 07 (07) | Unused – set to 0 |
| | 08 (10) | **Calibration Range bit –** set to 1 if a reference signal is out of range during calibration |
| | 09 (11) | **Calibration Done bit –** set to 1 after an initiated calibration cycle is complete. |
| | 10 (12) | **Calibration Bad bit –** set to 1 if the channel has not had a valid calibration. |
| | 11–15 (13–17) | Unused – set to 0 |

| Word | Decimal Bit (Octal Bit) | Description | | | | |
|---|---|---|---|---|---|---|
| Write Word 1 | 00–01 (00–01) | **Module Data Type** | | | | |
| | | **Bit** | **01** | **00** | **Definition** | |
| | | | 0 | 0 | ºC (default) | |
| | | | 0 | 1 | ºF | |
| | | | 1 | 0 | Bipolar counts scaled between –32768 and +32767 | |
| | | | 1 | 1 | Unipolar counts scaled between 0 and 65535 | |
| | Bit 02 (02) | **Fixed Digital Filter –** When this bit is set (1), a software digital filter is enabled. This filter settles to 100% of a Full Scale step input in 60 scans. | | | | |
| | 03–05 (03–05) | **A/D Filter First Notch Frequency** | | | | |
| | | **Bit** | **05** | **04** | **03** | **Definition** |
| | | | 0 | 0 | 0 | 10Hz (default) |
| | | | 0 | 0 | 1 | 25Hz |
| | | | 0 | 1 | 0 | 50Hz |
| | | | 0 | 1 | 1 | 60Hz |
| | | | 1 | 0 | 0 | 100Hz |
| | | | 1 | 0 | 1 | 250Hz |
| | | | 1 | 1 | 0 | 500Hz |
| | | | 1 | 1 | 1 | 1000hZ |
| | 06 (06) | **Calibration High/Low bit –** This bit is set during gain calibration; reset during offset calibration. | | | | |
| | 07 (07) | **Calibration clock –** this bit must be set to 1 to prepare for a calibration cycle; then reset to 0 to initiate calibration. | | | | |
| | 08–15 (10–17) | **Calibration mask –** The channel, or channels, to be calibrated will have the correct mask bit set. Bit 8 corresponds to channel 0, bit 9 to channel 1, and so on. | | | | |

| Word | Decimal Bit (Octal Bit) | Description | | | | | |
|---|---|---|---|---|---|---|---|
| Write Word 2 | 00–03 (00–03) | Channel 0 Thermocouple Type | | | | | |
| | | **Bit** | **03** | **02** | **01** | **00** | **Thermocouple Type – Range** |
| | | | 0 | 0 | 0 | 0 | Millivolts (default) |
| | | | 0 | 0 | 0 | 1 | B 300 to 1800°C (572 to 3272°F) |
| | | | 0 | 0 | 1 | 0 | E –270 to 1000°C (–454 to 1832°F) |
| | | | 0 | 0 | 1 | 1 | J –210 to 1200°C (–346 to 2192°F) |
| | | | 0 | 1 | 0 | 0 | K –71 to 1372°C (–95 to 2502°F) |
| | | | 0 | 1 | 0 | 1 | R –50 to 1768°C (–58 to 3214°F) |
| | | | 0 | 1 | 1 | 0 | S –50 to 1768°C (–58 to 3214°F) |
| | | | 0 | 1 | 1 | 1 | T –73 to 400°C (–99 to 752°F) |
| | | | 1 | 0 | 0 | 0 | C 0 to 2315°C (32 to 4199°F) |
| | | | 1 | 0 | 0 | 1 | N –270 to 1300°C (–450 to 2372°F) |
| | | | 1 | 0 | 1 | 0 | TXK/XK(L) –200 to 800°C (–328 to 1472°F) |
| | | | 1 | 0 | 1 | 1 | Module data time stamp |
| | | | 1 | 1 | 0 | 0 | Module reports cold junction sensor temperature for channels 00–03 |
| | | | 1 | 1 | 0 | 1 | Module reports cold junction sensor temperature for channels 04–07 |
| | | | 1 | 1 | 1 | 0 | Reserved |
| | | | 1 | 1 | 1 | 1 | No input device connected (do not scan) |
| | 04–07 (04–07) | Channel 1 Thermocouple Type (see bits 00–03) | | | | | |
| | 08–11 (10–13) | Channel 2 Thermocouple Type (see bits 00–03) | | | | | |
| | 12–15 (14–17) | Channel 3 Thermocouple Type (see bits 00–03) | | | | | |
| Write Word 3 | 00–03 (00–03) | Channel 4 Thermocouple Type (see word 13, bits 00–03) | | | | | |
| | 04–07 (04–07) | Channel 5 Thermocouple Type (see word 13, bits 00–03) | | | | | |
| | 08–11 (10–13) | Channel 6 Thermocouple Type (see word 13, bits 00–03) | | | | | |
| | 12–15 (14–17) | Channel 7 Thermocouple Type (see word 13, bits 00–03) | | | | | |

## Thermocouple/RTD Input Module (1794-IRT8) Image Table Mapping




### Thermocouple/RTD/mV Input Module (1794-IRT8) Read Words

| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| Channel 0 Input Data | | | | | | | | | | | | | | | | Read 1 |
| Channel 1 Input Data | | | | | | | | | | | | | | | | Read 2 |
| Channel 2 Input Data | | | | | | | | | | | | | | | | Read 3 |
| Channel 3 Input Data | | | | | | | | | | | | | | | | Read 4 |
| Channel 4 Input Data | | | | | | | | | | | | | | | | Read 5 |
| Channel 5 Input Data | | | | | | | | | | | | | | | | Read 6 |
| Channel 6 Input Data | | | | | | | | | | | | | | | | Read 7 |
| Channel 7 Input Data | | | | | | | | | | | | | | | | Read 8 |
| Overrange Alarm Bits (channel 0 = bit 08, etc) | | | | | | | | Underrange Alarm Bits (channel 0 = bit 00, etc) | | | | | | | | Read 9 |
| Ch7 Fault | Ch6 Fault | Ch5 Fault | Ch4 Fault | Ch3 Fault | Ch2 Fault | Ch1 Fault | Ch0 Fault | | CJC 2 Fault | CJC 1 Fault | | Diagnostic Status | | | | Read 10 |
| | EDT command response | | | | | | | EDT response data | | | | | | | | Read 11 |
| Not used | | | Data Format | | | | | Flt Mode Ch 0-3 | Flt Mode Ch 4-7 | Reference Jct. | | Filter Cutoff | | | | Write 1 |
| TC/RTD Ch. 4-7 | Sensor Mode Ch. 4-7 | | Sensor Mode Ch. 4-7 | | | | | TC/RTD Ch. 0-3 | | Sensor Mode Ch. 0-3 | | Sensor Mode Ch. 0-3 | | | | Write 2 |

| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| 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 | | Write 3 |
| | EDT command | | | | | | | EDT command data | | | | | | | | Write 4 |

## Bit/Word Definitions for the Block Transfer Words for the TC/RTD/mV Input Module

| Word | Dec. Bits (Octal Bits) | Description |
|---|---|---|
| Read Word 1 | 00–15 (00–17) | Channel 0 Input data |
| Read Word 2 | 00–15 (00–17) | Channel 1 Input data |
| Read Word 3 | 00–15 (00–17) | Channel 2 Input data |
| Read Word 4 | 00–15 (00–17) | Channel 3 Input data |
| Read Word 5 | 00–15 (00–17) | Channel 4 Input data |
| Read Word 6 | 00–15 (00–17) | Channel 5 Input data |
| Read Word 7 | 00–15 (00–17) | Channel 6 Input data |
| Read Word 8 | 00–15 (00–17) | Channel 7 Input data |
| Read Word 9 | 00–07 | **Underrange bits** – these bits are set if the input signal is below the input channel's minimum range. Bit 00 corresponds to channel 0, bit 01 corresponds to channel 1, etc. |
| | 08–15 (10–17) | **Overrange bits** – these bits are set if 1), the input signal is above the input channel's maximum range, or 2), an open detector is detected. Bit 08 (10) corresponds to channel 0, bit 09 (11) corresponds to channel 1, etc. |
| Read Word 10 | 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 fault |
| | 0 | 1 | 1 | 1 | EEPROM fault |
| | 0001, 0100, and 0011 thru 1111 Reserved for factory use | | | | |

| | | |
|---|---|---|
| | 04 | Not used. |
| | 05–06 | **Cold junction compensation alarm bits** – These bits are set (1) when the corresponding cold junction compensator lead is broken, unattached or shorted. 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, etc. |
| Read Word 11 | 00–07 | **Extended data table command response data 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 |

| Word | Dec. Bits (Octal Bits) | Description |
|---|---|---|
| Write Word 1 | 00–02 | **Input Filter Cutoff bits** |

| Bit | 02 | 01 | 00 | Filter Time Constants – actual filtering depends on the module's mode of operation |
|---|---|---|---|---|
| | 0 | 0 | 0 | Hardware filtering only (default filtering) |
| | 0 | 0 | 1 | 25ms |
| | 0 | 1 | 0 | 100ms |
| | 0 | 1 | 1 | 250ms |
| | 1 | 0 | 0 | 500ms |
| | 1 | 0 | 1 | 1s |
| | 1 | 1 | 0 | 2s |
| | 1 | 1 | 1 | 5s |

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 |
| | 0 | 0 | 1 | 20°C |
| | 0 | 1 | 0 | 25°C |
| | 0 | 1 | 1 | 30°C |
| | 1 | 0 | 0 | 40°C |
| | 1 | 0 | 1 | 50°C |
| | 1 | 1 | 0 | 60°C |
| | 1 | 1 | 1 | 70°C |

| Word | Dec. Bits (Octal Bits) | Description |
|---|---|---|
| Write Word 1 Contimued | 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.<br>0 = disabled<br>1 = enable wire-off detection |
| | Bits 08–11 (10–13) | **Data format** – module defaults to –4000 to 10000 in millivolt mode, and 0 to 5000 in ohms mode with implied decimal points (i.e. –40.00, 0.0Ω) |

| 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 to +32767 |
| | 0 | 1 | 0 | 0 | 0 to 65535 |
| | 0101 through 1111 not used | | | | |

| | | |
|---|---|---|
| | Bits 12–15 (14–17) | Not used |

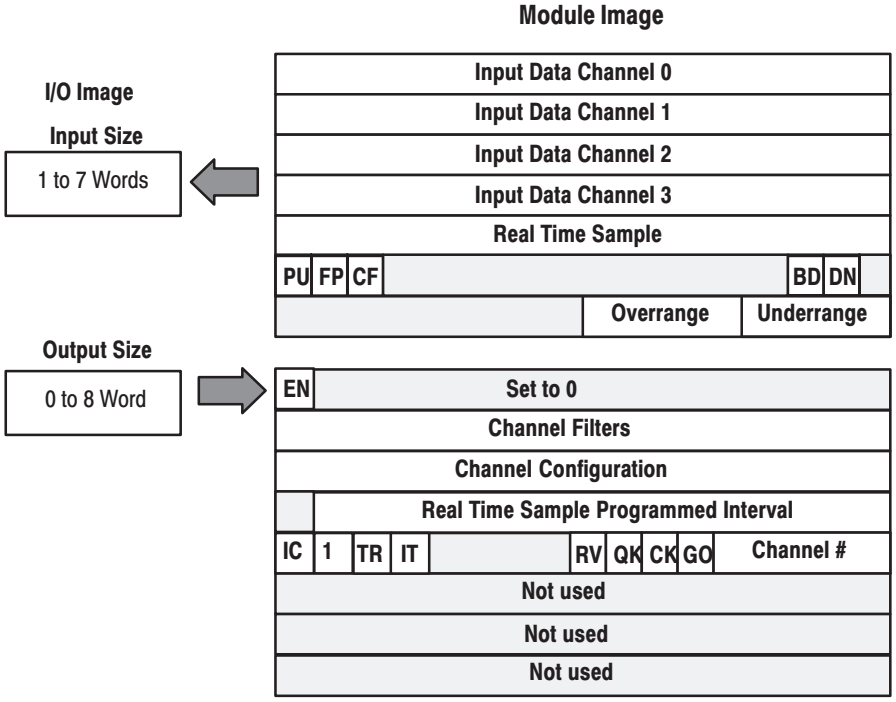
| Word | Dec. Bits (Octal Bits) | Description | | | | | |
|---|---|---|---|---|---|---|---|
| Write Word 2 | Bits 00–03 | **Sensor Type (Thermocouple or RTD)** | | | | | |
| | | **RTD Type** | | | | | |
| | | Bit | 03 | 02 | 01 | 00 | Sensor type for channels 0 through 3 |
| | | | 0 | 0 | 0 | 0 | Resistance (default) |
| | | | 0 | 0 | 0 | 1 | 100 ohm Pt $\alpha$ = 0.00385 Euro (–200 to +870°C) |
| | | | 0 | 0 | 1 | 0 | 200 ohm Pt $\alpha$ = 0.00385 Euro (–200 to +400°C) |
| | | | 0 | 0 | 1 | 1 | 100 ohm Pt $\alpha$ = 0.003916 U.S. (–200 to +630°C) |
| | | | 0 | 1 | 0 | 0 | 200 ohm Pt $\alpha$ = 0.003916 U.S. (–200 to +400°C) |
| | | | 0 | 1 | 0 | 1 | 100 ohm Nickel (–60 to +250°C) |
| | | | 0 | 1 | 1 | 0 | 200 ohm Nickel (–60 to +200°C) |
| | | | 0 | 1 | 1 | 1 | 120 ohm Nickel (–80 to +320°C) |
| | | | 1 | 0 | 0 | 0 | 10 ohm Copper (–200 to +260°C) |
| | | | 1001 through 1111 not used | | | | |
| Write Word 2 Continued | Bits 00–03 | **Thermocouple Type** | | | | | |
| | | Bit | 03 | 02 | 01 | 00 | Sensor type for channels 0 through 3 |
| | | | 0 | 0 | 0 | 0 | mV (default) |
| | | | 0 | 0 | 0 | 1 | B 300 to 1800°C (572 to 3272°F) |
| | | | 0 | 0 | 1 | 0 | E –270 to 1000°C (–454 to 1832°F) |
| | | | 0 | 0 | 1 | 1 | J –210 to 1200°C (–346 to 2192°F) |
| | | | 0 | 1 | 0 | 0 | K –270 to 1372°C (–454 to 2502°F) |
| | | | 0 | 1 | 0 | 1 | TXK/XK(L) -200 to 800°C (-328 to 1472°F) |
| | | | 0 | 1 | 1 | 0 | N –270 to 1300°C (–450 to 2372°F) |
| | | | 0 | 1 | 1 | 1 | R –50 to 1768°C (–58 to 3214°F) |
| | | | 1 | 0 | 0 | 0 | S –50 to 1768°C (–58 to 3214°F) |
| | | | 1 | 0 | 0 | 1 | T –270 to 400°C (–454 to 752°F) |
| | | | 1010 through 1111 not used | | | | |

| Word | Dec. Bits (Octal Bits) | Description | | | |
|---|---|---|---|---|---|
| | Bits 04–05 | **Sensor Mode Select bits** | | | |
| | | Bit | 05 | 04 | Sensor mode select for channels 0–3 |
| | | **Thermocouple** | | | |
| | | | 0 | 0 | External compensation – uses cold junction sensors |
| | | | 0 | 1 | Internal compensation – uses the value selected for "reference junction selection" |
| | | | 1 | 0 | No compensation (Data is referenced to 0°C.) |
| | | | 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 compensation |
| | | | 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 | |

| Word | Dec. Bits (Octal Bits) | Description | | | | | |
|---|---|---|---|---|---|---|---|
| Write Word 2 (cont.) | Bits 08–11 (10–13) | **Sensor Type (Thermocouple or RTD)** | | | | | |
| | | **RTD Type** | | | | | |
| | | Bit | 11 | 10 | 09 | 08 | Sensor type for channels 4 through 7 |
| | | | 0 | 0 | 0 | 0 | Resistance (default) |
| | | | 0 | 0 | 0 | 1 | 100 ohm Pt $\alpha$ = 0.00385 Euro (–200 to +870°C) |
| | | | 0 | 0 | 1 | 0 | 200 ohm Pt $\alpha$ = 0.00385 Euro (–200 to +400°C) |
| | | | 0 | 0 | 1 | 1 | 100 ohm Pt $\alpha$ = 0.003916 U.S. (–200 to +630°C) |
| | | | 0 | 1 | 0 | 0 | 200 ohm Pt $\alpha$ = 0.003916 U.S. (–200 to +400°C) |
| | | | 0 | 1 | 0 | 1 | 100 ohm Nickel (–60 to +250°C) |
| | | | 0 | 1 | 1 | 0 | 200 ohm Nickel (–60 to +200°C) |
| | | | 0 | 1 | 1 | 1 | 120 ohm Nickel (–80 to +320°C) |
| | | | 1 | 0 | 0 | 0 | 10 ohm Copper (–200 to +260°C) |
| | | | 1001 through 1111 not used | | | | |
| | | **Thermocouple Type** | | | | | |
| | | Bit | 11 | 10 | 09 | 08 | Sensor type for channels 4 through 7 |
| | | | 0 | 0 | 0 | 0 | mV (default) |
| | | | 0 | 0 | 0 | 1 | B 300 to 1800°C (572 to 3272°F) |
| | | | 0 | 0 | 1 | 0 | E –270 to 1000°C (–454 to 1832°F) |
| | | | 0 | 0 | 1 | 1 | J –210 to 1200°C (–346 to 2192°F) |
| | | | 0 | 1 | 0 | 0 | K –270 to 1372°C (–454 to 2502°F) |
| | | | 0 | 1 | 0 | 1 | TXK/XK(L) -200 to 800°C (-328 to 1472°F) |
| | | | 0 | 1 | 1 | 0 | N –270 to 1300°C (–450 to 2372°F) |
| | | | 0 | 1 | 1 | 1 | R –50 to 1768°C (–58 to 3214°F) |
| | | | 1 | 0 | 0 | 0 | S –50 to 1768°C (–58 to 3214°F) |
| | | | 1 | 0 | 0 | 1 | T –270 to 400°C (–454 to 752°F) |
| | | | 1010 through 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 sensor | | |
| | | | 0 | 1 | Internal compensation – uses the value selected for reference junction | | |
| | | | 1 | 0 | No compensation (Data is referenced to 0°C.) | | |
| | | | 1 | 1 | Differential measurement between 2 channels | | |
| | | **RTD** | | | | | |
| | | | 0 | 0 | 2-wire RTD no compensation | | |
| | | | 0 | 1 | 2-wire RTD with loop resistance compensation | | |
| | | | 1 | 0 | 3-wire RTD | | |
| | | | 1 | 1 | 4-wire RTD | | |

| Word | Dec. Bits (Octal Bits) | Description | | | |
|---|---|---|---|---|---|
| Write Word 2 cont. | 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 | |
| Write Word 3 | 00–15 (00–17) | **RTD loop resistance offset select bits** – used when input type is set to RTD and sensor mode select is set to 2-wire with loop resistance compensation. 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 10Ω copper RTD, which defaults to 0Ω. | | | |
| | | Bit | 01 | 00 | RTD channel 0 |
| | | Bit | 03 | 02 | RTD channel 1 |
| | | Bit | 05 | 04 | RTD channel 2 |
| | | Bit | 07 | 06 | RTD channel 3 |
| | | Bit | 09 | 08 | RTD channel 4 |
| | | Bit | 11 | 10 | RTD channel 5 |
| | | Bit | 13 | 12 | RTD channel 6 |
| | | Bit | 15 | 14 | RTD channel 7 |
| | | | 0 | 0 | Use channel loop compensation value stored during calibration procedure for 2-wire RTD (default = 0Ω) |
| | | | 0 | 1 | 5Ω |
| | | | 1 | 0 | 10Ω |
| | | | 1 | 1 | 15Ω |
| Write Word 4 | 00–07 | **Extended data table command 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 | | | |

## 4 Input Isolated Analog Module (Cat. No. 1794-IF4I) Image Table Mapping




### Isolated Analog Input Module (1794-IF4I) Read

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Octal Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| | Analog Value Channel 0 | | | | | | | | | | | | | | | | Read Word 1 |
| | Analog Value Channel 1 | | | | | | | | | | | | | | | | Word 2 |
| | Analog Value Channel 2 | | | | | | | | | | | | | | | | Word 3 |
| | Analog Value Channel 3 | | | | | | | | | | | | | | | | Word 4 |
| | | Real Time Sample | | | | | | | | | | | | | | | Word 5 |
| | PU | FP | CF | 0 | Reserved | | | | 0 | 0 | 0 | 0 | 0 | BD | DN | 0 | Word 6 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V3 | V2 | V1 | V0 | U3 | U2 | U1 | U0 | Word 7 |
| | EN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Write Word 1 |
| | Chnl 3 Filter | | | | Chnl 2 Filter | | | | Chnl 1 Filter | | | | Chnl 0 Filter | | | | Word 2 |
| | Chnl 3 Configuration | | | | Chnl 2 Configuration | | | | Chnl 1 Configuration | | | | Chnl 0 Configuration | | | | Word 3 |
| | 0 | Real Time Sample Programmed Interval | | | | | | | | | | | | | | | Word 4 |
| | IC | 1 | TR | IT | 0 | 0 | 0 | 0 | RV | QK | CK | GO | Channel Number | | | | Word 5 |
| | Not used | | | | | | | | | | | | | | | | Word 6 |
| | Not used | | | | | | | | | | | | | | | | Word 7 |

| Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Octal Bit | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 | Read/Write Words |
| Word 8 | Not used | | | | | | | | | | | | | | | | Word 8 |

Where:
PU = Power up unconfigured state
FP = Field power off
CF = In configuration mode
BD = Calibration bad
DN = Calibration accepted
U = Under range for specified channel
V = Overrange for specified channel
EN = Enable outputs; 0 = output follows S1/S0, 1 = output enabled
IC = Initiate configuration bit
TR = Transparent bit
IT = Interrupt toggle bit
RV = Revert to defaults bit
QK = Quick calibration
CK = Calibration clock
GO = Gain offset select

## Setting the Input Filter

| Bits | | | | Channel | |
|---|---|---|---|---|---|
| 03 | 02 | 01 | 00 | Input 0 | |
| 07 | 06 | 05 | 04 | Input 1 | |
| 11 | 10 | 09 | 08 | Input 2 | |
| 15 | 14 | 13 | 12 | Input 3 | |
| | | | | A/D Conversion Rate | Low Pass Filter |
| 0 | 0 | 0 | 0 | 1200Hz | No low pass |
| 0 | 0 | 0 | 1 | 1200Hz | 100ms low pass |
| 0 | 0 | 1 | 0 | 1200Hz | 500ms low pass |
| 0 | 0 | 1 | 1 | 1200Hz | 1000ms low pass |
| 0 | 1 | 0 | 0 | 600Hz | No low pass |
| 0 | 1 | 0 | 1 | 600Hz | 100ms low pass |
| 0 | 1 | 1 | 0 | 600Hz | 500ms low pass |
| 0 | 1 | 1 | 1 | 600Hz | 1000ms low pass |
| 1 | 0 | 0 | 0 | 300Hz | No low pass |
| 1 | 0 | 0 | 1 | 300Hz | 100ms low pass |
| 1 | 0 | 1 | 0 | 300Hz | 500ms low pass |
| 1 | 0 | 1 | 1 | 300Hz | 1000ms low pass |
| 1 | 1 | 0 | 0 | 150Hz | No low pass |
| 1 | 1 | 0 | 1 | 150Hz | 100ms low pass |
| 1 | 1 | 1 | 0 | 150Hz | 500ms low pass |
| 1 | 1 | 1 | 1 | 150Hz | 1000ms low pass |

## Configuring Your Input Channel

| Input Channel Configuration | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 03 | 02 | 01 | 00 | Set these bits for Channel 0 | | | | | | |
| 07 | 06 | 05 | 04 | Set these bits for Channel 1 | | | | | | |
| 11 | 10 | 09 | 08 | Set these bits for Channel 2 | | | | | | |
| 15 | 14 | 13 | 12 | Set these bits for Channel 3 | | | | | | |
| Bit Settings | | | | Input Values | Data Format | % Underrange/ % Overrange | Input Range[2] Hexadecimal | Input Range[2] Decimal | Module Update Rate (RTSI = 0) | Module Update Rate (RTSI = 0), IT=1 |
| 0 | 0 | 0 | 0 | Channel not configured | | | | | | |
| 0 | 0 | 0 | 1 | 4–20mA | signed 2's complement | 4% Under; 4% Over | <0000–7878> | <0000–30840> | 7.5ms | 5.0ms |
| 0 | 0 | 1 | 0 | ±10V | signed 2's complement | 2% Under, 2% Over | <831F–7CE1> | <–31969–31969> | 2.5ms | 2.5ms |
| 0 | 0 | 1 | 1 | ±5V | signed 2's complement | 4% Under, 4% Over | <8618–79E8> | <–31208–31208> | 2.5ms | 2.5ms |
| 0 | 1 | 0 | 0 | 0–20mA | signed 2's complement % | 0% Under, 4% Over | 0–2710> | 0–10000> | 7.5ms | 5.0ms |
| 0 | 1 | 0 | 1 | 4-20mA | signed 2's complement % | 4% Under, 4% Over | <0–2710> | <0–10000> | 7.5ms | 5.0ms |
| 0 | 1 | 1 | 0 | 0–10V | signed 2's complement % | 0% Under, 2% Over | 0–2710> | 0–10000> | 5.0ms | 5.0ms |
| 0 | 1 | 1 | 1 | ±10V | signed 2's complement % | 2% Under, 2% Over | <–D8F0–2710> | <–10000–10000> | 5.0ms | 5.0ms |
| 1 | 0 | 0 | 0 | 0–20mA | binary | 0% Under, 4% Over | 0000–F3CF> | 0000–62415> | 2.5ms | 2.5ms |
| 1 | 0 | 0 | 1 | 4–20mA[1] | binary | 4% Under, 4% Over | 0000–F0F1> | 0000–61681> | 7.5ms | 5.0ms |
| 1 | 0 | 1 | 0 | 0–10V | binary | 0% Under, 2% Over | 0000–F9C2> | 0000–63938> | 2.5ms | 2.5ms |
| 1 | 0 | 1 | 1 | 0–5V | binary | 0% Under, 4% Over | 0000–F3CF> | 0000–62415> | 2.5ms | 2.5ms |
| 1 | 1 | 0 | 0 | ±20mA | offset binary, 8000H = 0mA | 4% Under, 4% Over | <0618–F9E8> | <1560–63976> | 2.5ms | 2.5ms |
| 1 | 1 | 0 | 1 | 4–20mA | offset binary, 8000H = 4mA | 4% Under, 4% Over | <8000–F878> | <32768–63608> | 7.5ms | 5.0ms |
| 1 | 1 | 1 | 0 | ±10V | offset binary, 8000H = 0V | 2% Under, 2% Over | <031F–FCE1> | <799–64737> | 2.5ms | 2.5ms |
| 1 | 1 | 1 | 1 | ±5V | offset binary, 8000H = 0V | 4% Under, 4% Over | <0618–F9E8> | <1560–63976> | 2.5ms | 2.5ms |

1 Underrange for 4-20mA occurs in the blind area below 0 (3.2mA).
2 < and > indicate the overrun beyond actual range (about 5%).

## Word/Bit Descriptions for the 1794-IF4I Isolated Analog Input Module

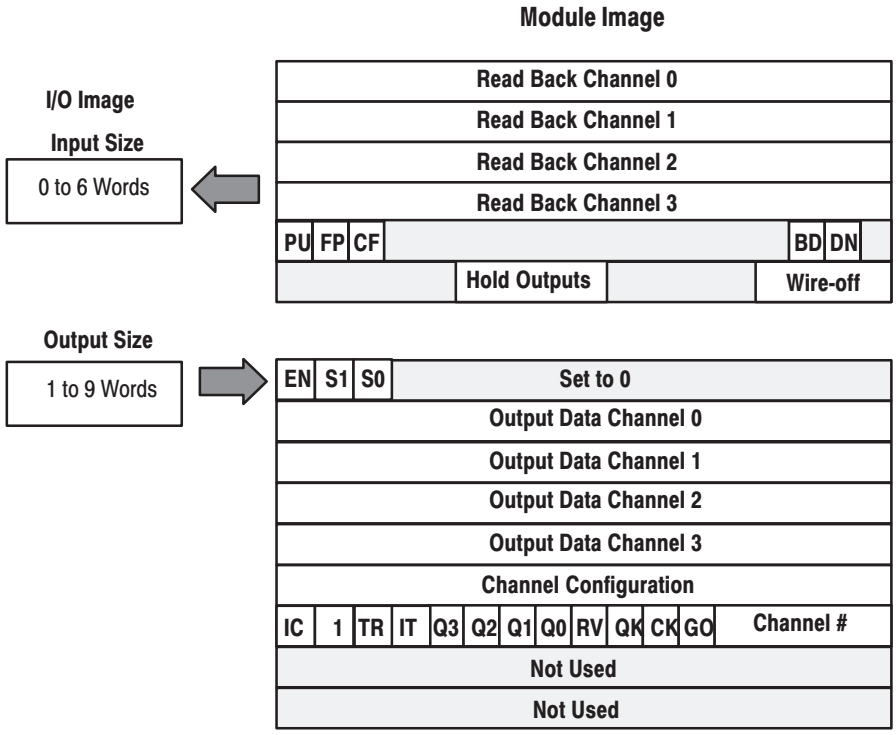
| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Read Word 1 | Bits 00–15 (00–17) | **Channel 0 analog data** – Real time input data per your configuration |
| Read Word 2 | Bits 00–15 (00–17) | **Channel 1 analog data** – Real time input data per your configuration |
| Read Word 3 | Bits 00–15 (00–17) | **Channel 2 analog data** – Real time input data per your configuration |
| Read Word 4 | Bits 00–15 (00–17) | **Channel 3 analog data** – Real time input data per your configuration |
| Read Word 5 | Bits 00–15 (00–17) | **Real Time Sample**. The elapsed time in increments programmed by the real time sample interval. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Read Word 6 | Bits 00 | Reserved |
| | Bits 01 | **Calibration Done bit (DN).** – This bit is set to 1 after a calibration cycle is completed. |
| | Bit 02 | **Calibration Bad bit (BD).** – This bit is set to 1 if the channel calibration coefficients cannot be saved or be read properly. |
| | Bits 03–07 | Set to 0. |
| | Bits 08–11 (10–12) | Reserved |
| | Bit 12 (14) | Set to 0 |
| | Bit 13 (15) | **Configuration mode bit (CF)** – This bit is set (1) when the calibration mode is selected (bit 15, word 5 in the block transfer write set to 1). When this bit is set (1), the module status indicator flashes. |
| | Bit 14 (16) | **Field Power Off bit (FP)** – This bit is set (1) when the 24V field power fails. When this bit is set (1), the module status indicator flashes. |
| | Bit 15 (17) | **Power Up (unconfigured state) bit (PU).** – This bit is set (1) when the configuration word is all zeroes (0) due to a reset (adapter power cycle or module insertion) or a cleared configuration word (all 0). When this bit is set (1), the module status indicator flashes. |
| Read Word 7 | Bits 00–03 | **Underrange bits (U).** – These bits are set (1) when the input channel is below a preset limit as defined by the configuration selected. U0 (bit 00) corresponds to input channel 0 and U1 (bit 01) corresponds to input channel 1, etc. Refer to Configuring Your Input Channels. |
| | Bits 04–07 | **Overrange bits (V).** – These bits are set (1) when the input channel is above a preset limit as defined by the configuration selected. Bit 04 corresponds to input channel 0 and bit 05 corresponds to input channel 1, etc. Refer to Configuring Your Input Channels. |
| | Bits 08–15 (10–17) | Not used. Set to 0. |
| Write Word 1 | Bits 00–14 (00–16) | Not used. Set to0. |
| | Bit 15 (17) | **Output enable bit (EN).** – Not used in the 1794-IF4I module. |
| Write Word 2 | **Channels 0 through 3 Filter Selections (refer to Setting the Input Filter )** | |
| | Bits 00–03 | **Channel 0 Filter Setting** |
| | Bits 04–07 | **Channel 1 Filter Setting** |
| | Bits 08–11 (10–13) | **Channel 2 Filter Setting** |
| | Bits 12–15 (14–17) | **Channel 3 Filter Setting** |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Write Word 3 | **Channel Configuration (refer to Configuring Your Input Channel )** | |
| | Bits 00–03 | **Channel 0 Configuration** |
| | Bits 04–07 | **Channel 1 Configuration** |
| | Bits 08–11 (10–13) | **Channel 2 Configuration** |
| | Bits 12–15 (14–17) | **Channel 3 Configuration** |
| Write Word 4 | Bits 00–14 (00–16) | **Real Time Sample Interval –** Programs the interval of the real time sample. Can be varied from 0 to 30 seconds (30000 decimal). Resolution is in ms with granularity in 5ms steps. |
| | Bit 15 (17) | Not used. Set to 0. |
| Write Word 5 | Bit 00–03 | **Channel calibration selection bit.** When this bit is set (1), the channel can be calibrated using the calibration clock bit (CK). Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, it 02 corresponds to input channel 2, bit 03 corresponds to input channel 3 |
| | Bit 04 | **Gain/Offset selection bit (GO).** – When this bit is cleared, a 0 to 1 to 0 transition of the CK bit performs on offset calibration. When this bit is 1, the module is directed to do a gain calibration. |
| | Bit 05 | **Calibration clock bit (CK).** – When this bit is set to 1 (calibration mode), the calibration coeffiicient for the selected channels is accepted. When this bit is reset (0), the accepted calibration coefficients for the selected channels are stored, applied, and the calibration mode exited. Monitor status bits DN and BD for succesful calibration. |
| | Bit 06 | **Quick Calibration bit (QK).** – Normally reset (0). When this bit is set (1) during a calibration sequence, the calibration coefficient is stored to all related configurations for the selected channels. **NOTE:** This method of calibration quickly calibrates the selected channels, however you will not be within the rated accuracy of the module. |
| | Bit 07 | **Revert to defaults bit (RV).** – Normally reset (0). When set (1) during a calibration procedure, default values for selected channels are used for the calibration coefficient.**NOTE:** You will not be within the rated accuracy of the module. |
| | Bit 08–11 (10–14) | Not used. Set to 0. |
| | Bit 12 (14) | **Interrupt Toggle bit (IT)** – This bit, when set (1), permits interleaving of module interrupts ensuring exchange of critical data when channels are configured for their fastest update times. RTSI and “no low pass filter” must be 0 in order for the module to recognize this feature. This groups data update rates for all channels to the slowest configuration setting of any of the channels. In addition, channel update rates for all channels with a 7.5ms update rate are reduced to 5.0ms. When reset (0), real time sampling and filter features are enabled. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Write Word 5 | Bit 13 (15) | **Transparent bit (TR).** – This bit, when set to 1, permits configuration to be changed without using the IC bit. |
| | Bit 14 (16) | Set to 1. |
| | Bit 15 (17) | **Initiate Configuration bit (IC).** – When set (1), instructs the module to enter configuration mode. Present configuration data prior to or coincident with IC being set. Once IC returns to 0, the configuration is applied and any subquent configuration information is ignored until IC is toggled. |
| Write Words 6, 7 and 8 | Bits 00–15 (00–17) | Not used |

## 4 Output Isolated Analog Module (1794-OF4I) Image Table Mapping




### Isolated Analog Output Module (1794-OF4I) Read

| Word/Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Word/Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** |
| Read Word 1 | Read Back Channel 0 | | | | | | | | | | | | | | | |
| Word 2 | Read Back Channel 1 | | | | | | | | | | | | | | | |
| Word 3 | Read Back Channel 2 | | | | | | | | | | | | | | | |
| Word 4 | Read Back Channel 3 | | | | | | | | | | | | | | | |
| Word 5 | PU | FP | CF | 0 | Reserved | | | | 0 | 0 | 0 | 0 | 0 | BD | DN | 0 |

| Word/Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Word/Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** |
| Word 6 | 0 | 0 | 0 | 0 | P3 | P2 | P1 | P0 | 0 | 0 | 0 | 0 | W3 | W2 | W1 | W0 |
| Write word 1 | EN | S1 | S0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Word 2 | Output Data – Channel 0 | | | | | | | | | | | | | | | |
| Word 3 | Output Data – Channel 1 | | | | | | | | | | | | | | | |
| Word 4 | Output Data – Channel 2 | | | | | | | | | | | | | | | |
| Word 5 | Output Data – Channel 3 | | | | | | | | | | | | | | | |
| Word 6 | Output Chnl 3 Configuration | | | | Output Chnl 2 Configuration | | | | Input Chnl 1 Configuration | | | | Input Chnl 0 Configuration | | | |
| Word 7 | IC | 1 | TR | IT | Q3 | Q2 | Q1 | Q0 | RV | QK | CK | GO | Channel Number | | | |
| Words 8 and 9 | Not used | | | | | | | | | | | | | | | |

Where:
PU = Power up unconfigured state
FP = Field power off
CF = In configuration mode
BD = Calibration bad
OR = Reference calibration signal is out of range
P0 thru P3 = Outjput holding in response to Q0 thru Q3
W0 thru W3 = Wire off current loop status for channels 0 thru 3 respectively. (Not used on voltage outputs.)
EN = Enable outputs; 0 = output follows S1/S0, 1 = output enabled
IC = Initiate configuration bit
TR = Transparent bit
IT = Interrupt toggle bit
Q0–3 = Request for outputs to hold
RV = Revert to defaults bit
QK = Quick calibration
CK = Calibration clock
GO = Gain offset select

## Configuring Your Outputs for the 1794-OF4I Isolated Output Module

| Configuration Bits MSD | | | LSD | Nominal Range | Data Type | Output Values[1] Hexadecimal | Decimal | Update Rate |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 4-20mA | 2's complement | <0000–7878> | <0000–30840> | 5.0ms |
| 0 | 0 | 1 | 0 | ±10V | 2's complement | <831F–79E8> | <–31208–31208> | 2.5ms |
| 0 | 0 | 1 | 1 | ±5V | 2's complement | <8618–79E8> | <–31208–31208> | 2.5ms |
| 0 | 1 | 0 | 0 | 0-20mA | 2's complement % | 0–2710> | 0–10000> | 5.0ms |
| 0 | 1 | 0 | 1 | 4-20mA | 2's complement % | <0–2710> | <0–10000> | 5.0ms |
| 0 | 1 | 1 | 0 | 0-10V | 2's complement % | 0–2710> | 0–10000> | 5.0ms |
| 0 | 1 | 1 | 1 | ±10V | 2's complement | <–D8F0–2710> | <–10000–10000> | 5.0ms |
| 1 | 0 | 0 | 0 | 0-20mA | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 0 | 0 | 1 | 4-20mA | binary | 0000–F0F1> | 0000–61681> | 5.0ms |
| 1 | 0 | 1 | 0 | 0-10V | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 0 | 1 | 1 | 0-5V | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 1 | 0 | 0 | ±20mA | offset binary | <8000–F9E8> | 32768–63976> | 2.5ms |
| 1 | 1 | 0 | 1 | 4-20mA | offset binary | <8000–F878> | <32768–63608> | 5.0ms |
| 1 | 1 | 1 | 0 | ±10V | offset binary | <0618–F9E8> | <1560–63976> | 2.5ms |
| 1 | 1 | 1 | 1 | ±5V | offset binary | <0618–F9E8> | <1560–63976> | 2.5ms |

[1] < and > indicate the overrun beyond actual range (about 5%).

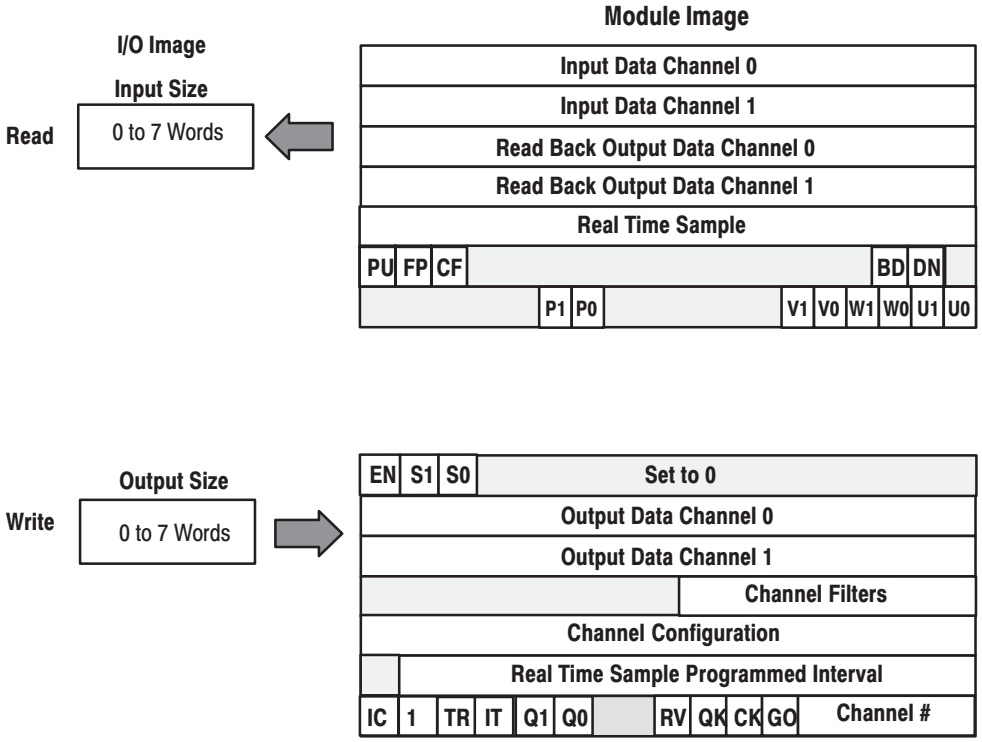
## Word/Bit Descriptions for the 1794-OF4I Isolated Analog Output Module

| Read Words | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 1 | Bits 00–15 (00–17) | **Read Back Channel 0** – During normal operation, it is a copy of the output of channel 0. During an EN transition, it is the condition of the output as determined by S1 and S0. Read back is an image of what the user has sent as output to the module; no checks are performed on the data. |
| Word 2 | Bits 00–15 (00–17) | **Read Back Channel 1** – During normal operation, it is a copy of the output of channel 1. During an EN transition, it is the condition of the output as determined by S1 and S0. Read back is an image of what the user has sent as output to the module; no checks are performed on the data. |
| Word 3 | Bits 00–15 (00–17) | **Read Back Channel 2** – During normal operation, it is a copy of the output of channel 2. During an EN transition, it is the condition of the output as determined by S1 and S0. Read back is an image of what the user has sent as output to the module; no checks are performed on the data. |
| Word 4 | Bits 00–15 (00–17) | **Read Back Channel 3** – During normal operation, it is a copy of the output of channel 3. During an EN transition, it is the condition of the output as determined by S1 and S0. Read back is an image of what the user has sent as output to the module; no checks are performed on the data. |
| Word 5 | Bits 00 | Reserved |
| | Bits 01 | **Calibration Done bit (DN).** – This bit is set to 1 after a calibration cycle is completed. |
| | Bit 02 | **Calibration Bad bit (BD).** – This bit is set to 1 if the channel calibration coefficients cannot be saved or read properly. |
| | Bits 03–07 | Set to 0. |
| | Bits 08–11 (10–12) | Reserved |
| | Bit 12 (14) | Set to 0 |
| | Bit 13 (15) | **Configuration mode bit (CF)** – This bit is set (1) when the configuration mode is selected (bit 15, word 5 in the block transfer write set to 1). When this bit is set, the module status indicator flashes. |
| | Bit 14 (16) | **Field Power Off bit (FP)** – This bit is set (1) when the 24V field power fails. When this bit is set (1), the module status indicator flashes. |
| | Bit 15 (17) | **Power Up (unconfigured state) bit (PU).** – This bit is set (1) when the configuration word is all zeroes (0) due to a reset (adapter power cycle or module insertion) or a cleared configuration word (all 0). When this bit is set, the module status indicator flashes. |
| Word 6 | Bits 00–03 | **Wire-Off status bits. (W).** – These bits, when set (1), indicate the corresponding current output channel is open. W0 corresponds to channel 0, W1 corresponds to channel 2, etc. |
| | Bits 04–07 | Set to 0. |
| | Bits 10–11 (12–13) | **Hold output bits (P).** – These bits are set (1) in response to Q0 or Q1 and a transition of the EN bit. When P0 or P1 is set (1), they indicate that the output is holding at the level in the readback data for the respective channel. These bits return to 0 when the output data matches the readback output data. |
| | Bits 12–15 (14–17) | Set to 0. |

| Write Words | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Write Word 1 | Bits 00–12 (00–14) | Not used |
| | Bit 13–14 (15–16) | **Safe State Source bits (S1/S0).** – When EN is 0, these bits designate the source of the safe state data.<br>Bit 13 = 0, bit 14 = 1 – reset outputs to 0V/0mA (used with 1794-ASB/C)<br>Bit 13 = 1, bit 14 = 1 – hold output at its current level (used with 1794-ASB/C)<br>Bit 13 = 0; bit 14 = 0 – Safe state data is in output data words |
| | Bit 15 (17) | **Output enable bit (EN).** – When set (1), the outputs are enabled. This bit must be set in order for the real time data to appear at the outputs. If this bit is not set (0), the outputs will be determined by S1/S0. |
| Word 2 | Bits 00–15 (00–17) | **Channel 0 output data.** – The output data is real time data formatted to the selected configuration. (This data is also safe state data when directed by S! and S0.) |
| Word 3 | Bits 00–15 (00–17) | **Channel 1 output data.** – The output data is real time data formatted to the selected configuration. (This data is also safe state data when directed by S! and S0.) |
| Word 4 | Bits 00–15 (00–17) | **Channel 2 output data.** – The output data is real time data formatted to the selected configuration. (This data is also safe state data when directed by S! and S0.) |
| Word 5 | Bits 00–15 (00–17) | **Channel 3 output data.** – The output data is real time data formatted to the selected configuration. (This data is also safe state data when directed by S! and S0.) |
| Word 6 | **Channel Configuration (refer to Configuring Your Outputs)** | |
| | Bits 00–03 | **Channel 0 Configuration** |
| | Bits 04–07 | **Channel 0 Configuration** |
| | Bits 08–11 (10–13) | **Channel 0 Configuration** |
| | Bits 12–15 (14–17) | **Channel 0 Configuration** |

| Write Words | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 7 | Bit 00–03 | **Channel calibration selection bit.** When this bit is set (1), the channel can be calibrated using the calibration clock bit (CK). Bit 00 corresponds to output channel 0, bit 01 corresponds to output channel 1, it 02 corresponds to output channel 3, bit 03 corresponds to output channel 4 |
| | Bit 04 | **Gain/Offset selection bit (GO).** – When this bit is cleared, a 0 to 1 to 0 transition of the CK bit performs on offset calibration. When this bit is 1, the module is directed to do a gain calibration. |
| | Bit 05 | **Calibration clock bit (CK).** – When this bit is set to 1 (calibration mode), the calibration coeffiicient for the selected channels is accepted. When this bit is reset (0), the accepted calibration coefficients for the selected channels are stored, applied, and the calibration mode exited. Monitor status bits DN and BD for succesful calibration. |
| | Bit 06 | **Quick Calibration bit (QK).** – Normally reset (0). When this bit is set (1) during a calibration sequence, the calibration coefficient is stored to all related configurations for the selected channels. **NOTE:** Although this method of calibration quickly calibrates the selected channels, they will not be within the rated accuracy of the module. |
| | Bit 07 | **Revert to defaults bit (RV).** – Normally reset (0). When set (1) during a calibration procedure, default values for selected channels are used for the calibration coefficient. **NOTE:** They will not be within the rated accuracy of the module. |
| | Bits 08–11 (10–13) | **Request for hold outputs (Q).** – Channel request bits that instruct an output to hold its output level when EN transitions from 1 to 0 to 1. When EN is 0, outputs go to a safe state dictated by S1/S0. When EN returns to 1, the outputs will hold their level until the output data equals the output level. P0–P3 indicates channels holding. Output read back data shows what level is being held. Q0 = bit 08 (10) = channel 0; Q1 = bit 08 (10) = channel 1, etc. |
| | Bit 12 (14) | **Interrupt Toggle bit (IT)** – This bit, when set (1), permits interleaving of module interrupts ensuring exchange of critical data when channels are configured for their fastest update times. RTSI and “no low pass filter” must be 0 in order for the module to recognize this feature. This groups data update rates for all channels to the slowest configuration setting of any of the channels. In addition, channel update rates for all channels with a 7.5ms update rate are reduced to 5.0ms. When reset (0), real time sampling and filter features are enabled. |
| | Bit 13 (15) | **Transparent bit (TR).** – This bit, when set to 1, permits configuration to be changed without using the IC bit. |
| | Bit 14 (16) | Set to 1 |
| | Bit 15 (17) | **Initiate Configuration bit (IC).** – When set (1), instructs the module to enter configuration mode. Present configuration data prior to or coincident with IC being set. Once IC returns to 0, the configuration is applied and any subquent configuration information is ignored until IC is toggled. |
| Words 8 and 9 | Bits 00–15 (00–17) | Not used |

## Isolated Analog Combo Module (1794-IF2XOF2I Series B) Image Table Mapping




### Isolated Analog Combo Module (1794-IF2XOF2I) Read

| Word/Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Word/Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** |
| Read Word 1 | Input Data Channel 0 | | | | | | | | | | | | | | | |
| Word 2 | Input Data Channel 1 | | | | | | | | | | | | | | | |
| Word 3 | Read Back Output Channel 0 | | | | | | | | | | | | | | | |
| Word 4 | Read Back Output Channel 1 | | | | | | | | | | | | | | | |
| Word 5 | 0 | Real Time Sample | | | | | | | | | | | | | | |
| Word 6 | PU | FP | CF | 0 | Reserved | | | | 0 | 0 | 0 | 0 | 0 | BD | DN | 0 |
| Word 7 | 0 | 0 | 0 | 0 | P1 | P0 | 0 | 0 | 0 | 0 | V1 | V0 | W1 | W0 | U1 | U0 |
| Write Word 1 | EN | S1 | S0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Word 2 | Output Data Channel 0 | | | | | | | | | | | | | | | |
| Word 3 | Output Data Channel 1 | | | | | | | | | | | | | | | |
| Word 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Input Channel 1 Filter | | | | Input Channel 0 Filter | | | |
| Word 5 | Output Channel 1 Configuration | | | | Output Channel 0 Configuration | | | | Input Channel 1 Configuration | | | | Input Channel 0 Configuration | | | |
| Word 6 | 0 | Real Time Sample Programmed Interval | | | | | | | | | | | | | | |
| Word 7 | IC | 1 | TR | IT | Q1 | Q0 | 0 | 0 | RV | QK | CK | GO | Channel Number | | | |

| Word/Dec. Bit | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Word/Octal Bit** | **17** | **16** | **15** | **14** | **13** | **12** | **11** | **10** | **07** | **06** | **05** | **04** | **03** | **02** | **01** | **00** |
| Word 8 | Not Used | | | | | | | | | | | | | | | |

Where:
PU = Power up unconfigured state
FP = Field power off
CF = In configuration mode
BD = Calibration bad
DN = Calibration accepted.
P0 and P1 = Output holding in response to Q0 thru Q1
W0 and W1 = Wire off current loop status for input channels 0 and 1 respectively. (Not used on voltage outputs.)
U0 and U1 = Underrange for input channels o and 1 respectively.
V0 and V1 = Overrange for input channels 0 and 1 respectively.
EN = Enable outputs; 0 = output follows S1/S0, 1 = output enabled
IC = Initiate configuration bit
TR = Transparent bit
IT = Interrupt toggle bit
Q0 and Q1 = Request for outputs to hold
RV = Revert to defaults bit
QK = Quick calibration
CK = Calibration clock
GO = Gain offset select

## Configuring Your Input Channels

**Input Channel Configuration**

| 03 | 02 | 01 | 00 | Set these bits for Channel 0 |
|---|---|---|---|---|
| 07 | 06 | 05 | 04 | Set these bits for Channel 1 |

| Bit Settings | | | | Input Values | Data Format | % Underrange/ % Overrange | Input Range[2] Hexadecimal | Decimal | Module Update Rate (RTSI = 0) | (RTSI = 0), IT = 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | Channel not configured | | | | | | |
| 0 | 0 | 0 | 1 | 4–20mA | signed 2's complement | 4% Under; 4% Over | <0000–7878> | <0000–30840> | 7.5ms | 5.0ms |
| 0 | 0 | 1 | 0 | ±10V | signed 2's complement | 2% Under, 2% Over | <831F–7CE1> | <–31969–31969> | 2.5ms | 2.5ms |
| 0 | 0 | 1 | 1 | ±5V | signed 2's complement | 4% Under, 4% Over | <8618–79E8> | <–31208–31208> | 2.5ms | 2.5ms |
| 0 | 1 | 0 | 0 | 0–20mA | signed 2's complement % | 0% Under, 4% Over | 0–2710> | 0–10000> | 7.5ms | 5.0ms |
| 0 | 1 | 0 | 1 | 4-20mA | signed 2's complement % | 4% Under, 4% Over | <0–2710> | <0–10000> | 7.5ms | 5.0ms |
| 0 | 1 | 1 | 0 | 0–10V | signed 2's complement % | 0% Under, 2% Over | 0–2710> | 0–10000> | 5.0ms | 5.0ms |
| 0 | 1 | 1 | 1 | ±10V | signed 2's complement % | 2% Under, 2% Over | <–D8F0–2710> | <–10000–10000> | 5.0ms | 5.0ms |
| 1 | 0 | 0 | 0 | 0–20mA | binary | 0% Under, 4% Over | 0000–F3CF> | 0000–62415> | 2.5ms | 2.5ms |
| 1 | 0 | 0 | 1 | 4–20mA[1] | binary | 4% Under, 4% Over | 0000–F0F1> | 0000–61681> | 7.5ms | 5.0ms |
| 1 | 0 | 1 | 0 | 0–10V | binary | 0% Under, 2% Over | 0000–F9C2> | 0000–63938> | 2.5ms | 2.5ms |
| 1 | 0 | 1 | 1 | 0–5V | binary | 0% Under, 4% Over | 0000–F3CF> | 0000–62415> | 2.5ms | 2.5ms |
| 1 | 1 | 0 | 0 | ±20mA | offset binary, 8000H = 0mA | 4% Under, 4% Over | <0618–F9E8> | <1560–63976> | 2.5ms | 2.5ms |
| 1 | 1 | 0 | 1 | 4–20mA | offset binary, 8000H = 4mA | 4% Under, 4% Over | <8000–F878> | <32768–63608> | 7.5ms | 5.0ms |
| 1 | 1 | 1 | 0 | ±10V | offset binary, 8000H = 0V | 2% Under, 2% Over | <031F–FCE1> | <799–64737> | 2.5ms | 2.5ms |
| 1 | 1 | 1 | 1 | ±5V | offset binary, 8000H = 0V | 4% Under, 4% Over | <0618–F9E8> | <1560–63976> | 2.5ms | 2.5ms |

1 Underrange for 4-20mA occurs in the blind area below 0 (3.2mA).
2 < and > indicate the overrun beyond actual range (about 5%).

## Setting the Input Filters

| Bits | | | | Channel | |
|---|---|---|---|---|---|
| 03 | 02 | 01 | 00 | Input Channel 0 | |
| 07 | 06 | 05 | 04 | Input Channel 1 | |
| | | | | A/D Conversion Rate | Low Pass Filter |
| 0 | 0 | 0 | 0 | 1200Hz | No low pass |
| 0 | 0 | 0 | 1 | 1200Hz | 100ms low pass |
| 0 | 0 | 1 | 0 | 1200Hz | 500ms low pass |
| 0 | 0 | 1 | 1 | 1200Hz | 1000ms low pass |
| 0 | 1 | 0 | 0 | 600Hz | No low pass |
| 0 | 1 | 0 | 1 | 600Hz | 100ms low pass |
| 0 | 1 | 1 | 0 | 600Hz | 500ms low pass |
| 0 | 1 | 1 | 1 | 600Hz | 1000ms low pass |
| 1 | 0 | 0 | 0 | 300Hz | No low pass |
| 1 | 0 | 0 | 1 | 300Hz | 100ms low pass |
| 1 | 0 | 1 | 0 | 300Hz | 500ms low pass |
| 1 | 0 | 1 | 1 | 300Hz | 1000ms low pass |
| 1 | 1 | 0 | 0 | 150Hz | No low pass |
| 1 | 1 | 0 | 1 | 150Hz | 100ms low pass |
| 1 | 1 | 1 | 0 | 150Hz | 500ms low pass |
| 1 | 1 | 1 | 1 | 150Hz | 1000ms low pass |

**Table 2.A**
**Configuring Your Outputs for the 1794-IF2XOF2I Analog Combo Module**

| Configuration Bits MSD | | | LSD | Nominal Range | Data Type | Output Values Hexadecimal | Decimal | Update Rate |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 4-20mA | 2' complement | <0000–7878> | <0000–30840> | 5.0ms |
| 0 | 0 | 1 | 0 | ±10V | 2' complement | <8618–79E8> | <–31208–31208> | 2.5ms |
| 0 | 0 | 1 | 1 | ±5V | 2' complement | <8618–79E8> | <–31208–31208> | 2.5ms |
| 0 | 1 | 0 | 0 | 0-20mA | 2' complement % | 0–10000> | 0–10000> | 5.0ms |
| 0 | 1 | 0 | 1 | 4-20mA | 2' complement % | <0–10000> | <0–10000> | 5.0ms |
| 0 | 1 | 1 | 0 | 0-10V | 2' complement % | 0–10000> | 0–10000> | 5.0ms |
| 0 | 1 | 1 | 1 | ±10V | 2' complement | <–10000–10000> | <–10000–10000> | 5.0ms |
| 1 | 0 | 0 | 0 | 0-20mA | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 0 | 0 | 1 | 4-20mA | binary | 0000–F0F1> | 0000–61681> | 5.0ms |
| 1 | 0 | 1 | 0 | 0-–10V | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 0 | 1 | 1 | 0-5V | binary | 0000–F3CF> | 0000–62415> | 2.5ms |
| 1 | 1 | 0 | 0 | 4-20mA | offset binary | <8000–F9E8> | 32768–63976> | 2.5ms |
| 1 | 1 | 0 | 1 | ±20mA | offset binary | <8000–F878> | <32768–63608> | 5.0ms |
| 1 | 1 | 1 | 0 | ±10V | offset binary | <0618–F9E8> | <1560–63976> | 2.5ms |
| 1 | 1 | 1 | 1 | ±5V | offset binary | <0618–F9E8> | <1560–63976> | 2.5ms |

## Word/Bit Descriptions for the 1794-IF2XOF2I Analog Combo Module

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 0 | Bits 00–15 (00–17) | **Input Channel 0 input data** – 16-bit unipolar; 15-bit plus sign bipolar |
| Word 1 | Bits 00–15 (00–17) | **Input Channel 1 input data** – 16-bit unipolar; 15-bit plus sign bipolar |
| Word 2 | Bits 00–15 (00–17) | **Read Back Output Channel 0** – During normal operation, it is a copy of the output of channel 0. During an EN transition, it is the condition of the output as determined by S1 and S0. |
| Word 3 | Bits 00–15 (00–17) | **Read Back Output Channel 1** – During normal operation, it is a copy of the output of channel 1. During an EN transition, it is the condition of the output as determined by S1 and S0. |
| Word 4 | Bits 00–15 (00–17) | **Real Time Sample**. The fixed time period you set telling the module when to provide data to the processor. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 5 | Bits 00 | Reserved |
| | Bits 01 | **Calibration Done bit (DN).** – This bit is set to 1 after a calibration cycle is completed. |
| | Bit 02 | **Calibration Bad bit (BD).** – This bit is set to 1 if the channel calibrationn coefficients cannot be saved or be read properly. |
| | Bits 03–07 | Set to 0. |
| | Bits 08–11 (10–12) | Reserved |
| | Bit 12 (14) | Set to 0 |
| | Bit 13 (15) | **Configuration mode bit (CF)** – This bit is set (1) when the calibration mode is selected (bit 15, word 5 in the block transfer write set to 1). |
| | Bit 14 (16) | **Field Power Off bit (FP)** – This bit is set (1) when the 24V field power fails. When this bit is set (1), the module status indicator flashes. |
| | Bit 15 (17) | **Power Up (unconfigured state) bit (PU).** – This bit is set (1) when the configuration word is all zeroes (0) due to a reset (adapter power cycle or module insertion) or a cleared configuration word (all 0). |
| Word 6 | Bits 00–01 | **Underrange bits (U).** – These bits are set (1) when the input channel is below a preset limit as defined by the configuration selected. U0 (bit 00) corresponds to input channel 0 and U1 (bit 01) corresponds to input channel 1 |
| | Bits 02–03 | **Wire-Off status bits. (W).** – These bits, when set (1), indicate the corresponding current output channel is open. W0 (bit 02) corresponds to channel 0, and W1 (bit 03) corresponds to channel 1. |
| | Bits 04–05 | **Overrange bits (V).** – These bits are set (1) when the input channel is above a preset limit as defined by the configuration selected. Bit 04 corresponds to input channel 0 and bit 05 corresponds to input channel 1 |
| | Bits 06–09 (06–11) | Not used. Set to 0. |
| | Bits 10–11 (12–13) | **Hold output bits (P).** – These bits are set (1) in response to Q0 or Q1 and a transition of the EN bit. When P0 or P1 is set (1), they indicate that the output is holding at the level in the readback data for the respective channel. These bits return to 0 when the output data matches the readback output data. |
| | Bits 12–15 (14–17) | Not used. Set to 0. |
| Write Word 1 | Bits 00–12 (00–14) | Not used |
| | Bit 13–14 (15–16) | **Safe State Source bits (S1/S0).** – When EN is 0, these bits designate the source of the safe state data.<br>Bit 13 = 0, bit 14 = 1 – reset outputs to 0V/0mA<br>Bit 13 = 1, bit 14 = 1 – hold the output at its current level |
| | Bit 15 (17) | **Output enable bit (EN).** – When set (1), the outputs are enabled. This bit must be set in order for the real time data to appear at the outputs. If this bit is not set (0), the outputs will be determined by S1/S0. |
| Word 2 | Bits 00–15 (00–17) | **Output Channel 0 data.** Refer to Table 2.A. |
| Word 3 | Bits 00–15 (00–17) | **Output Channel 1 data.** Refer to Table 2.A. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 4 | **Input Channels 0 and 1 Filter Selections** Refer to **Setting the Input Filters** | |
| | Bits 00–01 | **Channel 0 Filter Setting** |
| | Bits 04–07 | **Channel 1 Filter Setting** |
| | Bit 8–15 (11–17) | Set to 0. |
| Word 5 | **Channel Configuration** | |
| | Bits 00–03 | **Input Channel 0 Configuration** – Refer to **Configuring Your Input Channels** |
| | Bits 04–07 | **Input Channel 1 Configuration** – Refer to **Configuring Your Input Channels** |
| | Bits 08–11 (10–13) | **Output Channel 0 Configuration** – Refer to **Configuring Your Input Channels** |
| | Bits 12–15 (14–17) | **Output Channel 1 Configuration**– Refer to **Configuring Your Input Channels** |
| Word 6 | Bits 00–14 (00–16) | **Real Time Sample Interval –** Programs the interval of the real time sample. Can be varied from 0 to 30 seconds (30000 decimal). Resolution is in ms with granularity in 5ms steps. |
| | Bit 15 (17) | Set to 0. |
| Word 7 | Bit 00–03 | **Channel calibration selection bit.** When this bit is set (1), the channel can be calibrated using the initiate calibration bit (IC). Bit 00 corresponds to input channel 0, bit 01 corresponds to input channel 1, it 02 corresponds to output channel 0, bit 03 corresponds to output channel 1 |
| | Bit 04 | **Gain/Offset selection bit (GO).** – When this bit is set (1), a reset (0), set (1), reset (0) pattern of the calibration clock bit (CK) causes a **gain** calibration to occur. When this bit is set to 0, a reset (0), set (1), reset (0) pattern of the calibration clock bit (CK) causes an **offset** calibration to occur. |
| | Bit 05 | **Calibration clock bit (CK).** – When this bit is set to 1 (calibration mode), the calibration coeffiicient for the selected channels is accepted. When this bit is reset (0), the accepted calibration coefficients are stored in the selected channels, applied, and the calibration mode exited. Monitor status bits DN and BD for succesful calibration. |
| | Bit 06 | **Quick Calibration bit (QK).** – Normally reset (0). When this bit is set (1) during a calibration sequence, the calibration coefficient is stored to all related configurations for the selected channels. **NOTE:** This method of calibration quickly calibrates the selected channels, you will not be within the rated accuracy of the module. |
| Word 7 | Bit 07 | **Revert to defaults bit (RV).** – Normally reset (0). When set (1) during a calibration procedure, default values for selected channels are used for the calibration coefficient. |
| | Bits 08–09 (10–11) | Not used. Set to 0. |

| Word | Decimal Bit (Octal Bit) | Definition |
|---|---|---|
| Word 7 continued | Bits 10–11 (12–13) | **Request for hold outputs (Q).** – Channel request bits that instruct an output to hold its output level when EN transitions from 0 to 1 to 0. When EN is 0, outputs go to a safe state dictated by S1/S0. When EN returns to 1, the outputs will hold their level until the output data equals the output level. P0–P3 indicates channels holding. Output read back data shows what level is being held. Q0 = bit 08 (10) = channel 0; Q1 = bit 08 (10) = channel 1, etc. |
| | Bit 12 (14) | **Interrupt Toggle bit (IT)** – This bit, when set (1), permits interleaving of module interrupts ensuring exchange of critical data when channels are configured for their fastest update times. RTSI and “no low pass filter” must be 0 in order for the module to recognize this feature. This groups data update rates for all channels to the slowest configuration setting of any of the channels. In addition, channel update rates for all channels with a 7.5ms update rate are reduced to 5.0ms. When reset (0), real time sampling and filter features are enabled. |
| | Bit 13 (15) | **Transparent bit (TR).** – This bit, when set to 1, permits configuration to be changed without using the IC bit. |
| | Bit 14 (16) | Set to 1. |
| | Bit 15 (17) | **Initiate Configuration bit (IC).** – When set (1), instructs the module to enter configuration mode. Present configuration data prior to or coincident with IC being set. Once IC returns to 0, additional configuration information is ignored. |
| Word 8 | Bits 00–15 (00–17) | Not used |

## Incremental Encoder Module (1794-ID2) Image Table Mapping

**Module Image**

**I/O Image**

**Input Size**

1 to 8 Words

| R | PD1 | PD0 | S1 | S0 | C1 | C0 | G1 | Z1 | B1 | A1 | G0 | Z0 | B0 | A0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Store 0 – Saved Counter Value on channel 0 | | | | | | | | | | | | | | |
| Store 1 – Saved Counter Value on channel 1 | | | | | | | | | | | | | | |
| Channel 0 – current counter value on channel 0 | | | | | | | | | | | | | | |
| Channel 1 – current counter value on channel 1 | | | | | | | | | | | | | | |
| Channel 0 – Counter word readback | | | | | | | | | | | | | | |
| Channel 1 – Counter word readback | | | | | | | | | | | | | | |
| Code for identification of software version | | | | | | | | | | | | | | |

**Output Size**

0 to 7 Words

| |
|---|
| Channel 0 Control Word– sets the function of counter 0 |
| Channel 1 Control Word – sets the function of counter 1 |
| Channel 0 Preset – value to load or compare with counter 0 |
| Channel 1 Preset – value to load or compare with counter 1 |
| Control Word 2 – Sets filter function for both channels |
| Not used |
| Not used |

### Bit/Word Definitions for Block Transfer Read Words for the Pulse Counter Module

| Word | Bit | Definition |
|---|---|---|
| Read Word 1 | Bit 00 | **Status for input A** (pulse transmitter 0) – This bit, when set, indicates a signal at A. |
| | Bit 01 | **Status for input B** (pulse transmitter 0) – This bit, when set, indicates a signal at B. |
| | Bit 02 | **Status for input Z** (pulse transmitter 0) – This bit, when set, indicates a signal at Z. |
| | Bit 03 | **Status for input G** (pulse transmitter 0) –This bit, when set, indicates a signal at G. |
| | Bit 04 | **Status for input A** (pulse transmitter 1) – This bit, when set, indicates a signal at A. |
| | Bit 05 | **Status for input B** (pulse transmitter 1) – This bit, when set, indicates a signal at B. |
| | Bit 06 | **Status for input Z** (pulse transmitter 1) – This bit, when set, indicates a signal at Z. |

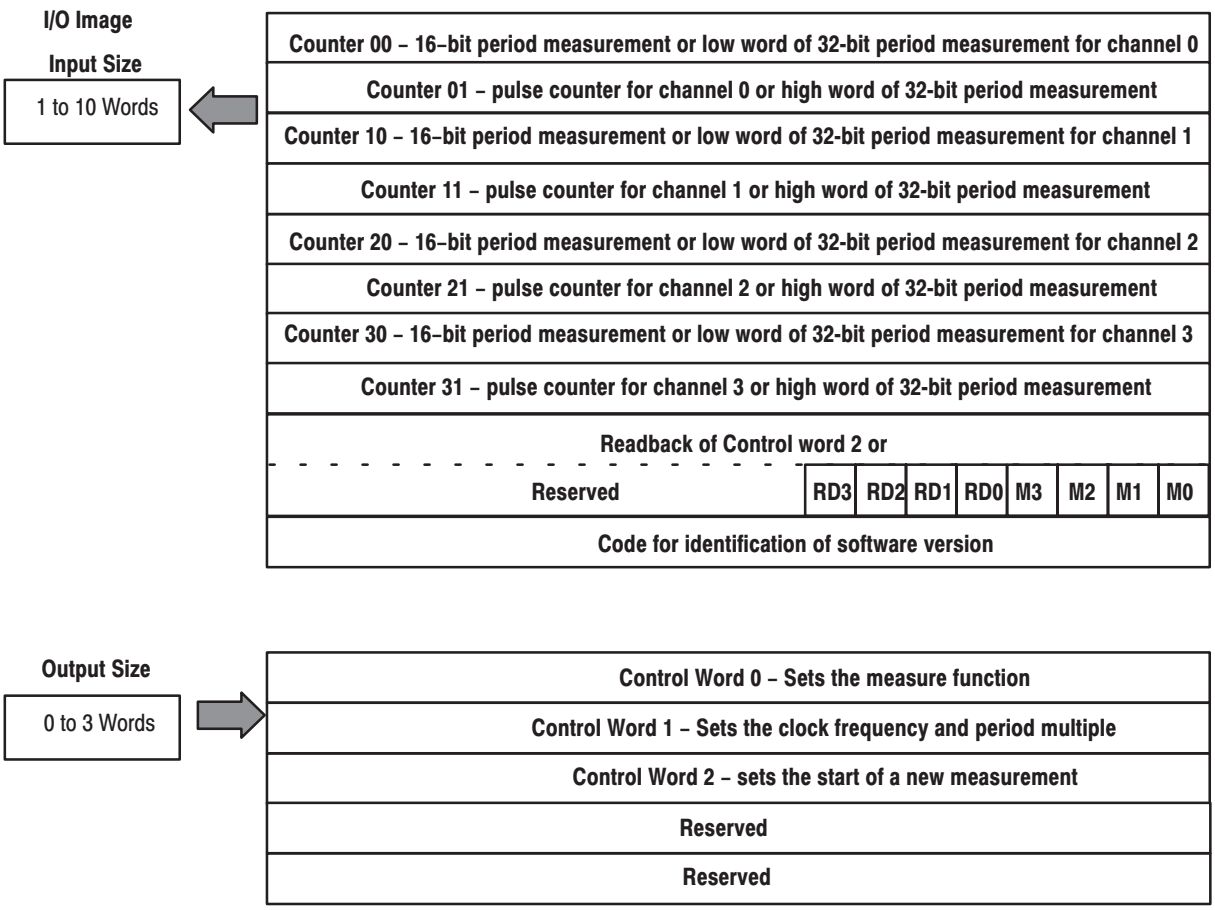
| Word | Bit | Definition |
|---|---|---|
| Read Word 1 (cont'd) | Bit 07 | **Status for input G** (pulse transmitter 1) – This bit, when set, indicates a signal at G. |
| | Bit 08 (10) | **Cal 0** – This bit, when set (1), indicates that counter 0 has been calibrated. This bit is reset by CalReset. |
| | Bit 09 (11) | **Cal 1** – This bit, when set (1), indicates that counter 1 has been calibrated. This bit is reset by CalReset. |
| | Bit 10 (12) | **Store 0** – This bit, when set (1), indicates a counter value is saved in store 0. This bit is reset by StoreReset. |
| | Bit 11 (13) | **Store 1** – This bit, when set (1), indicates a counter value is saved in store 1. This bit is reset by StoreReset. |
| | Bit 12 (14) | **Preset Reached 0 (PR0)** – When this bit is set (1), in all configuration modes, the counter 0 value equals the preset 0 value, either in a positive or negative direction. This bit is reset by PresetReset0 and can only be set again after at least 1 more pulse. |
| | Bit 13 (15) | **Preset Reached 1 (PR1)** – When this bit is set (1), in all configuration modes, the counter 1 value equals the preset 1 value, either in a positive or negative direction. This bit is reset by PresetReset1 and can only be set again after at least 1 more pulse. |
| | Bit 14–15 (16–17) | Not used – set to 0 |
| Read Word 2 | Bits 00–15 (00–17) | **Store 0** – Saved counter value on channel 0 |
| Read Word 3 | Bits 00–15 (00–17) | **Store 1** – Saved counter value on channel 1 |
| Read Word 4 | Bits 00–15 (00–17) | **Channel 0 Current Counter Value**– Current value in counter 0 |
| Read Word 5 | Bits 00–15 (00–17) | **Channel 1 Current Counter Value**– Current value in counter 1 |
| Read Word 6 | Bits 00–15 (00–17) | **Counter 0 Readback** – Counter word readback – last value written to write word 1 |
| Read Word 7 | Bits 00–15 (00–17) | **Counter 1 Readback** – Counter word readback – last value written to write word 2 |
| Read Word 8 | Bits 00–15 (00–17) | **Revision Read** – identification of latest software version code |

| Word | Bit | Definition | | | |
|---|---|---|---|---|---|
| Write Word 1 | 0–15 (0–17) | Control 0 – Control word for setting the function of counter 0. | | | |
| | Bits 00–02 | 02 | 01 | 00 | Mode Selection bits |
| | | 0 | 0 | 0 | Counting on positive (rising) edge of input signal A. (Up/dwn counting determined by B.) |
| | | 0 | 0 | 1 | Quadrature encoder X1 |
| | | 0 | 1 | 0 | Quadrature encoder X2 |
| | | 0 | 1 | 1 | Quadrature encoder X4 |
| | | 1 | 0 | 0 | Counting up on the positive edge of input signal A, and down on positive edge of input signal B. |
| | | 1 | 0 | 1 | No count function. |
| | | 1 | 1 | 0 | No count function. |
| | | 1 | 1 | 1 | No count function. |
| | Bit 03 | **Preset (Reset) bit** – A positive edge on this bit moves the value in Preset X to Counter X, independent of Preset Enable. NOTE: To use Preset as Reset, use a count value of 0000 in the Preset value word. | | | |
| | Bit 04 | **Enable Z Preset bit** – When this bit is set (1), a positive edge on Z preloads Counter X = Preset X, independent of Cal Enable. NOTE: If Z is configured to do Store and Preset (Reset), the Store will occur first. | | | |
| | Bit 05 | **Count Enable bit** – When this is set (1), the incremental encoder is enabled. | | | |
| | Bits 06–08 (06–10) | **Calibration Control bits** – bits 06, 07 and 08 | | | |
| | | 06 | **Enable bit** – When this bit is set (1), the counter can be calibrated. | | |
| | | 07 | **Direction bit** – When this bit set (1), calibration is performed in a negative direction; when reset (0), calibration is performed in a positive direction. | | |
| | | 08 | **Reset bit** – Calibration is acknowledged and a new calibration is enabled on a positive edge on this bit. | | |
| | Bits 09–10 (11–12) | 10 | 09 | **Gate Control bits** | |
| | | 0 | 0 | No gate function on input G | |
| | | 0 | 1 | Counting only if G is high (active) | |
| | | 1 | 0 | Counting only if G is low (inactive) | |
| | | 1 | 1 | The counter can be calibrated when G is high (active). | |
| | Bits 11–12 (13–14) | 12 | 11 | **Store Control bits** | |
| | | 0 | 0 | Save the counter value on the positive edge of Z (if Stored X = 0) | |
| | | 0 | 1 | Save the counter value on the positive edge of G (if Stored X = 0) | |
| | | 1 | 0 | Save the counter value on the negative edge of G (if Stored X = 0) | |
| | | 1 | 1 | Save the counter value on the positive edge and negative edge of G (if Stored X = 0) | |
| | Bit 13 (15) | **Rollover bit** – When set (1), the counter counts up to the preset and then restarts at 0. If this bit is reset (0) (not rollover), the rollover preset value = FFFF (hex = 65535 (decimal). | | | |
| | Bit 14 (16) | **Store Reset bit** – A positive edge on this bit resets Stored X in Signals. | | | |
| | Bit 15 (17) | **Preset Reset bit** – A positive edge on this bit resets Preset Detected in Signals. | | | |

| Word | Bit | Definition | | | | |
|---|---|---|---|---|---|---|
| Write Word 2 | | **Channel 1 Control Word** – Control word for setting the function of counter 1. | | | | |
| | Bits 00–02 | Bit | 02 | 01 | 00 | **Mode Selection bits** |
| | | | 0 | 0 | 0 | Counting on positive (rising) edge of input signal A. (Up/dwn counting determined by B.) |
| | | | 0 | 0 | 1 | Quadrature encoder X1 |
| | | | 0 | 1 | 0 | Quadrature encoder X2 |
| | | | 0 | 1 | 1 | Quadrature encoder X4 |
| | | | 1 | 0 | 0 | Counting up on the positive edge of input signal A, and down on positive edge of input signal B. |
| | | | 1 | 0 | 1 | No count function. |
| | | | 1 | 1 | 0 | No count function. |
| | | | 1 | 1 | 1 | No count function. |
| | Bit 03 | **Preset bit –** A positive edge on this bit moves the value in Preset X to Counter X, independent of Preset Enable. | | | | |
| | Bit 04 | **Preset Enable bit –** When this bit is set (1), a positive edge on Z preloads Counter X = Preset X, independent of Cal Enable. | | | | |
| | Bit 05 | **Count Enable bit –** When this is set (1), the incremental encoder is counting. | | | | |
| | Bits 06–08 (06–10) | **Calibration Control bits –** bits 06, 07 and 08 | | | | |
| | | 06 | **Enable bit –** When this bit is set (1), the counter can be calibrated. | | | |
| | | 07 | **Direction bit –** When this bit set (1), calibration is performed in a negative direction; when reset (0), calibration is performed in a positive direction. | | | |
| | | 08 | **Reset bit –** Calibration is acknowledged and a new calibration is enabled on a positive edge on this bit. | | | |
| | Bits 09–10 (11–12) | 10 | 09 | **Gate Control bits** | | |
| | | 0 | 0 | No gate function on input G | | |
| | | 0 | 1 | Counting only if G is high (active) | | |
| | | 1 | 0 | Counting only if G is low (inactive) | | |
| | | 1 | 1 | Calibration if G is high (active) and ??? | | |
| | Bits 11–12 (13–14) | 12 | 11 | **Latch Control bits** | | |
| | | 0 | 0 | Save the counter value on the positive edge of Z (if Stored X = 0) | | |
| | | 0 | 1 | Save the counter value on the positive edge of G (if Stored X = 0) | | |
| | | 1 | 0 | Save the counter value on the negative edge of G (if Stored X = 0) | | |
| | | 1 | 1 | Save the counter value on the positive edge and negative edge of G (if Stored X = 0) | | |
| | Bit 13 (15) | **Rollover bit –** When set (1), the counter counts up to the preset and then restarts at 0. If this bit is reset (0) (not rollover), the rollover preset value = FFFF (hex = 65535 (decimal). | | | | |
| | Bit 14 (16) | **Store Reset bit –** A positive edge on this bit resets Stored X in Signals. | | | | |
| | Bit 15 (17) | **Store Reset bit –** A positive edge on this bit resets Preset Reached in Signals. | | | | |
| Write Word 3 | Bits 00–15 (00–17) | **Preset 0** – Value to load or compare with counter 0 | | | | |
| Write Word 4 | Bits 00–15 (00–17) | **Preset 1** – Value to load or compare with counter 1 | | | | |

| Word | Bit | Definition | | |
|---|---|---|---|---|
| Word 5 | **Filter Selection** | | | |
| | Bit 00 | **Filter A0 enable –** When this bit is set (1), anda counter 0 is in mode 000 (pulse counting), signal A0 is filtered by a digital low pass filter with selectable filter constant. | | |
| | Bit 01 | **Filter A1 enable –** When this bit is set (1), anda counter 1 is in mode 000 (pulse counting), signal A1 is filtered by a digital low pass filter with selectable filter constant. | | |
| | Bit 02-07 | Unused | | |
| | Bits 08-09 (10-11) | 09 (11) | 08 (10) | **Filter Constant bits –** This constant is common to both counters. |
| | | 0 | 0 | 73.5kHZ or minimum 0.007ms pulsewidth |
| | | 0 | 1 | 37.8kHz or minimum 0.013ms pulsewidth |
| | | 1 | 0 | 12.8kHz or minimum 0.04ms pulsewidth |
| | | 1 | 1 | 1.2kHz or minimum 0.4ms pulsewidth |
| Write Words 6–7 | Bits 00–15 (00–17) | Not used – set to 0. | | |

## Pulse Counter Module (1794-IP4) Image Table Mapping




### Block Transfer Word Assignments for the Pulse Counter Module (1794-IP4)

| (Octal Bit⇒) | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec. Bit ⇒ | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Word⇓ | Read | | | | | | | | | | | | | | | |
| 1 | Counter 00 – 16–bit period measurement or low word of 32-bit period measurement for channel 0 | | | | | | | | | | | | | | | |
| 2 | Counter 01 – pulse counter or high word of 32-bit period measurement for channel 0 | | | | | | | | | | | | | | | |
| 3 | Counter 10 – 16–bit period measurement or low word of 32-bit period measurement for channel 1 | | | | | | | | | | | | | | | |
| 4 | Counter 11 – pulse counter or high word of 32-bit period measurement for channel 1 | | | | | | | | | | | | | | | |
| 5 | Counter 20 – 16–bit period measurement or low word of 32-bit period measurement for channel 2 | | | | | | | | | | | | | | | |
| 6 | Counter 21 – pulse counter or high word of 32-bit period measurement for channel 2 | | | | | | | | | | | | | | | |
| 7 | Counter 30 – 16–bit period measurement or low word of 32-bit period measurement for channel 3 | | | | | | | | | | | | | | | |
| 8 | Counter 31 – pulse counter or high word of 32-bit period measurement for channel 3 | | | | | | | | | | | | | | | |
| 9 | Readback of Control Word 2 | | | | | | | | | | | | | | | |
| | Reserved | | | | | | | | RD3 | RD2 | RD1 | RD0 | M3 | M2 | M1 | M0 |
| 10 | Revision read – software version code | | | | | | | | | | | | | | | |

| (Octal Bit⇒) | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dec. Bit ⇒ | 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Word⇓ | Write | | | | | | | | | | | | | | | |
| 1 | Control Word 0 – selects the measure function | | | | | | | | | | | | | | | |
| 2 | Control Word 1 – sets the clock frequency and period multiple | | | | | | | | | | | | | | | |
| 3 | Control Word 2 – sets the start of a new measurement | | | | | | | | | | | | | | | |
| 4–5 | Reserved | | | | | | | | | | | | | | | |

Where: M = positive edge measurement ready for the respective channel.
RD = Reset Done for respective channel.

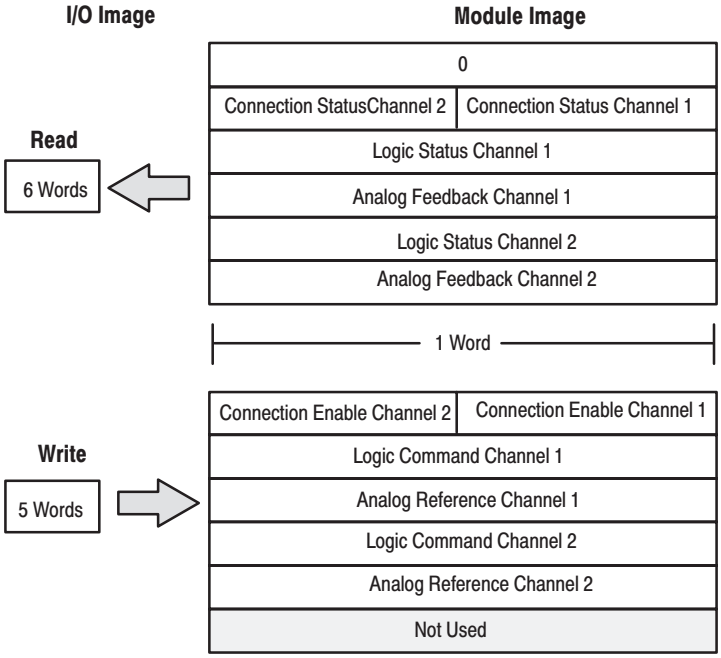
### Bit/Word Definitions for the Pulse Counter Module

| Word | Bit | Definition |
|---|---|---|
| Read Word 1 | Bits 00–15 (00–17) | **Store Counter 00** – 16–bit period measurement or low word of 32-bit period measurement for channel 0. |
| Read Word 2 | Bits 00–15 (00–17) | **Counter 01** – pulse counter or high word of 32-bit period measurement for channel 0 |
| Read Word 3 | Bits 00–15 (00–17) | **Counter 10** – 16–bit period measurement or low word of 32-bit period measurement for channel 1. |
| Read Word 4 | Bits 00–15 (00–17) | **Counter 11** – pulse counter or high word of 32-bit period measurement for channel 1 |
| Read Word 5 | Bits 00–15 (00–17) | **Counter 20** – 16–bit period measurement or low word of 32-bit period measurement for channel 2. |
| Read Word 6 | Bits 00–15 (00–17) | **Counter 21** – pulse counter or high word of 32-bit period measurement for channel 2 |
| Read Word 7 | Bits 00–15 (00–17) | **Counter 30** – 16–bit period measurement or low word of 32-bit period measurement for channel 3. |
| Read Word 8 | Bits 00–15 (00–17) | **Counter 31** – pulse counter or high word of 32-bit period measurement for channel 3 |
| Read Word 9 | | **Readback of Control Word 2** |
| | Bit 00 | **Positive edge – Channel 0** – measurement ready |
| | Bit 01 | **Positive edge – Channel 1** – measurement ready |
| | Bit 02 | **Positive edge – Channel 2** – measurement ready |
| | Bit 03 | **Positive edge – Channel 3** – measurement ready |
| | Bit 04 | **Reset Done, Channel 0** – a positive edge on this bit indicates counter 01 reset done |
| | Bit 05 | **Reset Done, Channel 1** – a positive edge on this bit indicates counter 11 reset done |
| | Bit 06 | **Reset Done, Channel 2** – a positive edge on this bit indicates counter 21 reset done |
| | Bit 07 | **Reset Done, Channel 3** – a positive edge on this bit indicates counter 31 reset done |
| | Bit 08–15 | Reserved for factory use |
| Read Word 10 | Bits 00–15 (00–17) | **Software revision** – version code of software installed |

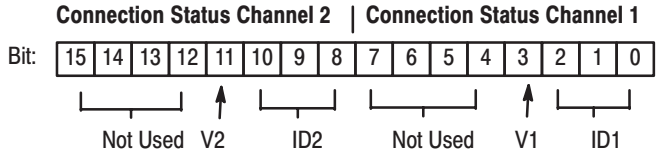
| Word | Bit | Definition |
|---|---|---|
| Write Word 1 | | **Control Word 0 –** Control word for setting the function of counter 0. |
| | Bits 00 | **Pulse counting and period time measurement selection for Channel 0** –<br>0 = pulse counting and period time measurement selected<br>1 = period time measurement selected |
| | Bits 01 | **Pulse counting and period time measurement selection for Channel 1** –<br>0 = pulse counting and period time measurement selected<br>1 = period time measurement selected |
| | Bits 02 | **Pulse counting and period time measurement selection for Channel 2** –<br>0 = pulse counting and period time measurement selected<br>1 = period time measurement selected |
| | Bits 03 | **Pulse counting and period time measurement selection for Channel 3** –<br>0 = pulse counting and period time measurement selected<br>1 = period time measurement selected |
| | Bits 04–15 (04–17) | Reserved |
| Write Word 2 | Bit 00 | **Clock frequency for period time measurement – Channel 0** –<br>0 = period time measurement with 10MHz internal clock selected<br>1 = period time measurement with 1MHz internal clock selected |
| | Bits 01–03 | 03 02 01 Number of periods for measurement – Channel 0<br>0 0 0 1 period<br>0 0 1 2 periods<br>0 1 0 4 periods<br>0 1 1 8 periods<br>1 0 0 16 periods<br>1 0 1 32 periods<br>1 1 0 64 periods<br>1 1 1 128 periods |
| | Bit 04 | **Clock frequency for period time measurement – Channel 1** – refer to bit 00. |
| | Bits 05–07 | Selection of Number of periods for measurement – Channel 1 – see bits 01–03 above |
| | Bit 08 (10) | **Clock frequency for period time measurement – Channel 2** – refer to bit 00. |
| | Bits 09–11 (11–13) | Selection of Number of periods for measurement – Channel 2 – see bits 01–03 above |
| | Bit 12 (14) | **Clock frequency for period time measurement – Channel 1** – refer to bit 00. |
| | Bits 13–15 (15–17) | Selection of Number of periods for measurement – Channel 1 – see bits 01–03 above |

| Word | Bit | Definition |
|---|---|---|
| Write Word 3 | Bit 00 | **Start new measurement bit – Channel 0** – when set, start new measurement on positive edge |
| | Bit 01 | **Start new measurement bit – Channel 1** – when set, start new measurement on positive edge |
| | Bit 02 | **Start new measurement bit – Channel 2** – when set, start new measurement on positive edge |
| | Bit 03 | **Start new measurement bit – Channel 3** – when set, start new measurement on positive edge |
| | Bit 04 | **Reset Counter, Channel 0 –** a positive edge on this bit resets counter 01 |
| | Bit 05 | **Reset Counter, Channel 1 –** a positive edge on this bit resets counter 11 |
| | Bit 06 | **Reset Counter, Channel 2 –** a positive edge on this bit resets counter 21 |
| | Bit 07 | **Reset Counter, Channel 3 –** a positive edge on this bit resets counter 31 |
| | Bit 08–15 (10–17) | Reserved |
| Write Words 4 and 5 | Bit 0–15 (0–17) | Reserved |

## 1203-FM1 – SCANport Module Image Table Mapping




### Connection Status Word Definition

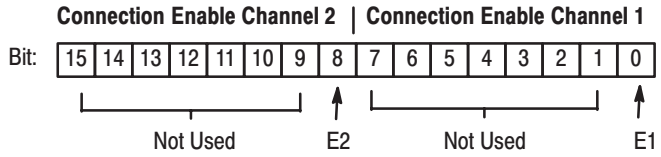



| | Description |
|---|---|
| V1 | SCANport channel 1 valid data bit. When high (1), the Logic Status and Analog Feedback values are valid and can be used. When low (0), the values should not be used. |
| ID1 | SCANport channel 1 connected peripheral port ID number. This three bit field contains the port number that channel 1 is connected to on the SCANport device. It should contain a value between 1 and 7. If this field is 7, then the channel is not connected to the SCANport device, or the SCANport device may not be powered. |
| V2 | SCANport channel 2 valid data bit. When high (1), the Logic Status and Analog Feedback values are valid and can be used. When low (0), the values should not be used. |
| ID2 | SCANport channel 2 connected peripheral port ID number. This three bit field contains the port number that channel 2 is connected to on the SCANport device. It should contain a value between 1 and 7. If this field is 7, then the channel is not connected to the SCANport device, or the SCANport device may not be powered. |

### Logic Status/Analog Feedback Definition

The Logic Status and Analog Feedback values are defined within the product manuals of the connected SCANport device(s).

### Connection Enable Word Definition




| | Description |
|---|---|
| E1 | SCANport channel 1 enable bit. When set to 1, the module will attempt to connect to the SCANport device. When reset to 0, the module stops communicating with the connected SCANport device. This usually causes the device to fault. |
| E2 | SCANport channel 2 enable bit. When set to 1, the module will attempt to connect to the SCANport device. When reset to 0, the module stops communicating with the connected SCANport device. This usually causes the device to fault. |

### Logic Command/Analog Reference Definition

The Logic Command and Analog Reference values are defined within the product manuals of the connected SCANport device(s).

## Defaults

Each I/O module has default values associated with it. At default, each module will generate inputs/status and expect outputs/configuration.

| Module Defaults for: | | Adapter Defaults | | Optimal Sizes | |
|---|---|---|---|---|---|
| Catalog Number | Description | Input Default | Output Default | Input Default | Output Default |
| 1794-IB8 | 8-pt 24V dc Sink Input | 1 | 1 | 1 | 0 |
| 1794-OB8 | 8-pt 24V dc Source Output | 1 | 1 | 0 | 1 |
| 1794-IB16 | 16-pt 24V dc Sink Input | 1 | 1 | 1 | 0 |
| 1794-OB16 | 16-pt 24V dc Source Output | 1 | 1 | 0 | 1 |
| 1794-IV16 | 16-pt 24V dc Source Input | 1 | 1 | 1 | 0 |
| 1794-OV16 | 16-pt 24V dc Sink Output | 1 | 1 | 0 | 1 |
| 1794–IB8S | Sensor Input Module | 1 | 1 | 1 | 0 |
| 1794–OB8EP | Elec. Prot. Output Module | 1 | 1 | 0 | 1 |
| 1794–IB10XOB6 | 10 In/6 Out Combo Module | 1 | 1 | 1 | 1 |
| 1794-IA8 | 8-pt 120V ac Input | 1 | 1 | 1 | 0 |
| 1794-OA8 | 8-pt 120V ac Output | 1 | 1 | 0 | 1 |
| 1794-IB8S | 8-pt 24V dc Sensor Input | 1 | 1 | 1 | 0 |
| 1794-OW8 | 8-pt Relay Output | 1 | 1 | 0 | 1 |
| 1794-IE8 | 8-pt Analog Input | 9 | 6 | 8 | 0 |
| 1794-OE4 | 4-pt Analog Output | 1 | 14 | 0 | 4 |
| 1794-IE4XOE2 | 4 in/2 out Analog Combo | 5 | 10 | 4 | 2 |
| 1794-IR8 | 8-pt RTD Analog Input | 11 | 4 | 10 | 0 |
| 1794-IT8 | 8-pt Thermocouple Input | 11 | 4 | 10 | 0 |

| Module Defaults for: | | Adapter Defaults | | Optimal Sizes | |
|---|---|---|---|---|---|
| Catalog Number | Description | Input Default | Output Default | Input Default | Output Default |
| 1794–IRT8 | TC/mV/RTD Module | 11 | 4 | 1 | 0 |
| 1794–IF4I | 4 Isolated Input Module | 7 | 8 | 1 | 0 |
| 1794–OF4I | 4 Isolated Output Module | 6 | 9 | 0 | 1 |
| 1794–IF2XOF2I | Isolated Combo Module | 7 | 7 | 1 | 1 |
| 1794–ID2 | Incremental Encoder Module | 8 | 7 | 1 | 0 |
| 1794–IP4 | Pulse Counter Module | 10 | 3 | 1 | 0 |
| 1203-FM1 | SCANport Module | 6 | 5 | 4 | 3 |

The default values reflect the maximum number of read/write words.

You can change the I/O data size for a module by reducing the number of words mapped into the adapter module, as shown in optimal sizes.

**Optimal sizes** are the settings that provide optimal data to and from the I/O module. You need a software configuration tool to change the size. Make sure the FLEX I/O adapter is compatible with the configuration tool you choose.

The optimal settings provide the fastest network time by only mapping read and write words used by the I/O modules. If you reduce your data sizes to only include optimal data, you can only change your configuration data with a software tool. If you need to change configuration information on an optimal basis, your data size must be large enough to include the necessary words.

# Connect the Adapter to the PROFIBUS DP Network

## What this Chapter Contains

This chapter describes:

- the DP physical layer
- using line types A and B
- equipment you need
- how to connect the adapter to the network
- how to terminate the network

## The DP Physical Layer

The PROFIBUS network media is a balanced transmission line corresponding to the standard EIA RS-485, terminated at both ends. Both line A and line B types are available, depending on your system requirements.

Specifications and guidelines for DP media:

- linear bus, terminated at both ends
- drop cables (preferably no longer than .30m), no branches
- shielded twisted pair
- max. line length between 100 and 1200m (depending on baudrate and cable type)
- number of stations: 32
- DP baudrates: 9.6, 19.2, 93.75, 187.5, 500 Kbit/s and 1.5M bit/s

Use the following table to determine what line type will best meet your needs.

| Characteristic | | Bus Segments and Drop Cables | | |
|---|---|---|---|---|
| | | Line A Requirements | Line B Requirements | Total Capacity of all Drop Cables |
| Impedance | | 135–165 Ω (3–29 MHz) | 100–130 Ω (f > 100 kHz) | |
| Capacity | | < 30 pF/m | < 60 pF/m | |
| Resistance | | < 110 Ω/km | – | |
| Wire Gauge | | > 0.64 mm | > 0.53 mm | |
| Conductor Area | | > 0.34 mm$^2$ | > 0.22 mm$^2$ | |
| Maximum Length[1] with a Baud Rate (bits/s) of: | ≤ 19.2k | 1200 m$^2$ | 1200 m$^2$ | ≤ 15nF |
| | 93.75k | 1200 m$^2$ | 1200 m$^2$ | ≤ 3nF |
| | 187.5k | 1000 m$^2$ | 600 m$^2$ | ≤ 1nF |
| | 500k | 400 m$^2$ | 200 m$^2$ | ≤ 0.6nF |
| | 1.5M | 200 m$^2$ | NA | ≤ 0.2nF |

NA = Not Applicable

[1] If using a combination of both line types, divide the lengths shown by two.

[2] This is the sum of all bus segment and drop cable lengths.

## Cabling and Equipment Required for Line A Type

Line A cabling can support baudrates as high as 1.5M bits/s.

### Cables

You need a shielded twisted pair cable for your cabling (bus segments or drop cables). Any line A cable available on the market can be used to connect your adapter to a PROFIBUS network.

### T-junction Connectors

You need t-junction connectors to connect your droplines to bus segments. You can use any t-junctions available on the market.

### Termination Blocks

Termination blocks are only needed if the devices on the end of the network do not have built-in terminating resistors. If you need termination blocks, you can use any termination blocks available on the market.

### Bus Connector

Connect your adapter to the PROFIBUS DP network by attaching a bus connector to the female 9 pin D-Sub connector on the front of the module.

More Information...

**IMPORTANT** For detailed information on the topology and cabling for line A, see the PROFIBUS Standard (DIN 19245 Parts 1 & 3, Issue 1994).

## Cabling and Equipment Required for Line B Type

Line B cabling can support baudrates as high as 500k bits/s.

### Cables

You need a shielded twisted pair cable for your cabling (bus segments or drop cables). Any shielded twisted pair cables available on the market can be used to connect your adapter to a PROFIBUS network, however, bus segment cables must contain wire for data ground and a cable braid shield. We recommend Sprecher+Schuh cable as shown in the table below.

### T-junction Connectors

You need t-junction connectors to connect your droplines to bus segments. You can use any t-junctions available on the market, however, we recommend Sprecher+Schuh connectors as shown in the table below.

### Termination Blocks

Termination blocks are only needed if the devices on the end of the network do not have built-in terminating resistors. If you need to use termination blocks, any termination blocks available on the market can be used, however, we recommend Sprecher+Schuh termination blocks as shown in the table below.

### Bus Connector

Connect your adapter to the PROFIBUS DP network by attaching a bus connector to the female 9 pin D-Sub connector on the front of the module.

More Information...

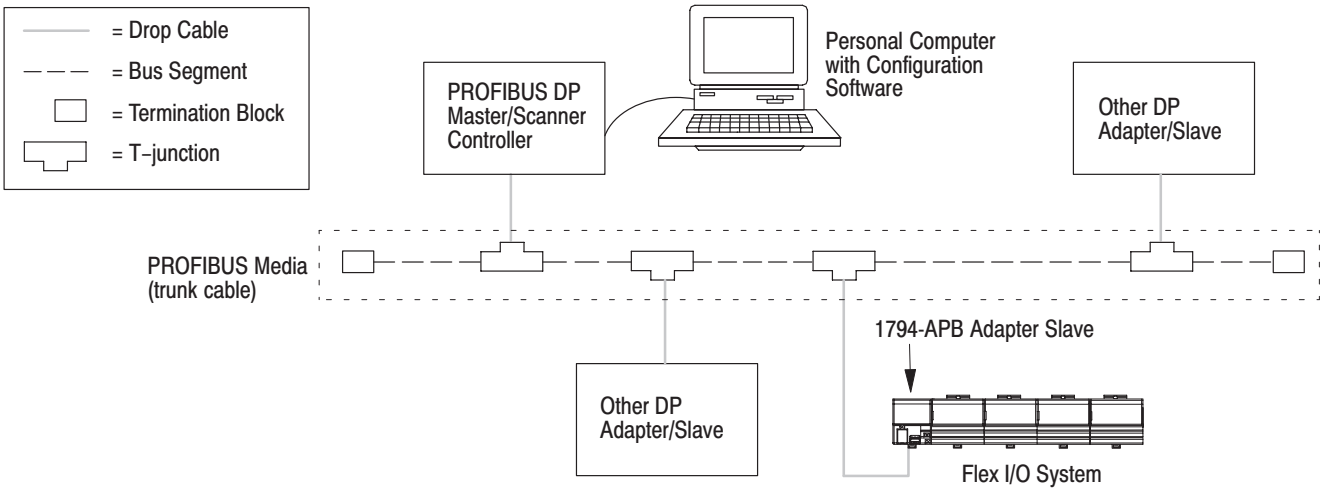
**IMPORTANT** For detailed information on the topology and cabling for line B, see the PROFIBUS Standard (DIN 19245 Parts 1 & 3, Issue 1994).

| Equipment | Type | Catalog Number | Part Number |
|---|---|---|---|
| Drop cable | Sprecher + Schuh | PTL-2, PTL-4, or PDC-10 | 87.890.282-10 |
| T-junction connector | Sprecher + Schuh | PTS-0 | 87.890.276-01 |
| Bus segment cable | Sprecher + Schuh | none | 299.257.001 |
| Bus segment 1m | Sprecher + Schuh | PCB-10 | 87.890.281-10 |
| Connector | Sprecher + Schuh | none | 87.890.283-01 |
| Termination Block | Sprecher + Schuh | PCE-0 | 87.890.284-01 |

## Connect the Adapter to the Network

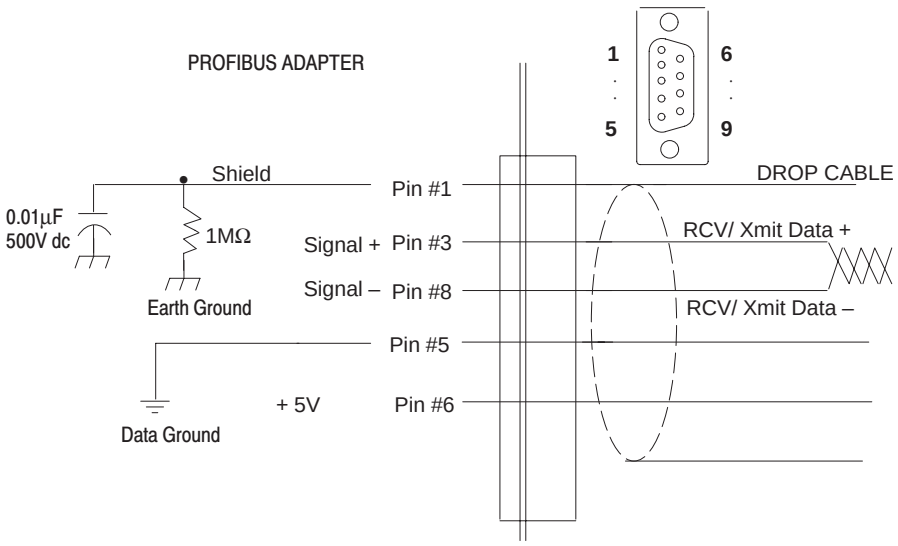
For line A or B connections, use bus segments with t-junctions and termination blocks to form the PROFIBUS media (trunk cable). Use termination blocks to terminate the line at each end of the trunk cable. Use drop cables to connect devices to the network.

The maximum number of stations on the same network is 32.




### Connect to the Adapter

Connect your drop cable (using either line A or B) to the adapter as shown below:




1. Connect the cable shield to Pin #1. The shield is connected to the FLEX I/O chassis ground through an RC circuit as shown above.
2. Connect the data signal pins on both ends (Signal + Pin #3 and Signal – Pin#8).

3. Insert the wired connector into the mating connector on the PROFIBUS adapter.

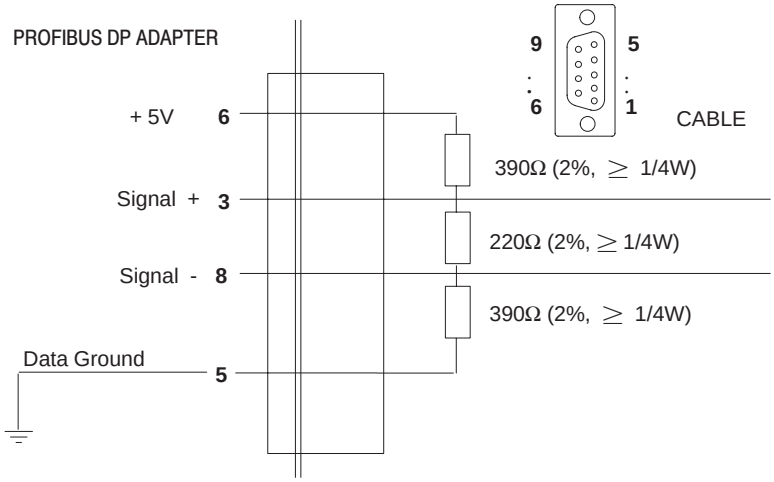
## Terminate the Network

You must use termination blocks only if your devices on the end of the network do not have built-in terminating resistors.

Terminate the PROFIBUS media (trunk cable) at both ends of the network. If you are not using a connector with built-in resistors, terminate the cable at the adapter connector as shown below.

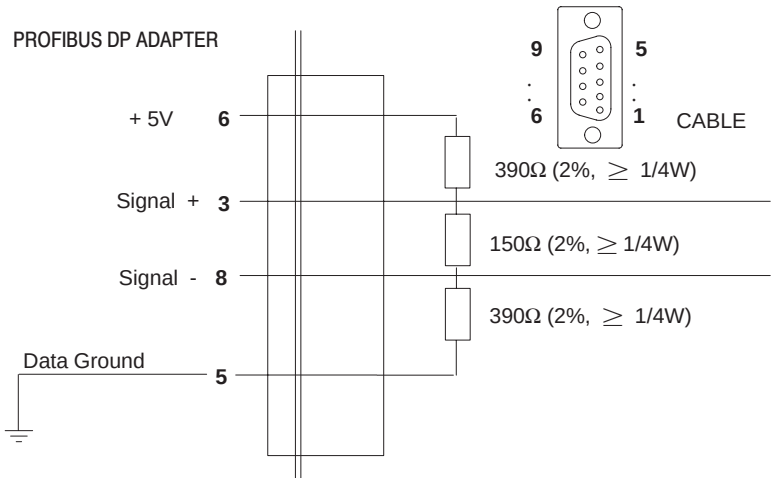
### Terminate at the Adapter Using Line A

Since Line A has a higher line impedance, you must use the following termination resistors:




### Terminate at the Adapter Using Line B

Use the following termination resistors with line B:



# Configure the Adapter for Master/Slave Communication

## What this Chapter Contains

In this chapter, we describe:



## How Master/Slave Communication Takes Place

A data exchange between the master and slave cannot be performed until check configuration and send parameter data are issued. Each time you power-up the network, the master sends check configuration and send parameter data to the slave (FLEX I/O adapter).

**Check configuration data** determines or checks the number of input and output words used by each FLEX I/O module.

**Send parameter data** contains device-specific parameters you define for each FLEX I/O module.

You need a **software configuration tool** to set the values associated with these parameters. Since the FLEX I/O adapter is compatible with any master, you can use any compatible configuration tool available.

The **device database (GSD) file** is included on the software diskette you received with your shipment of the FLEX I/O adapter. The GSD file is used by your configuration tool to help you set up your system. Your configuration tool automatically reads the GSD file and extracts defaults used in the data exchange.

The file is in ASCII format and you can view it with any text editor. A printed copy of your GSD file appears in Appendix B of this user manual.

The user parameter data fields are not defined in the GSD file. Depending on the format you choose, you may have to manually edit these values with your configuration tool.

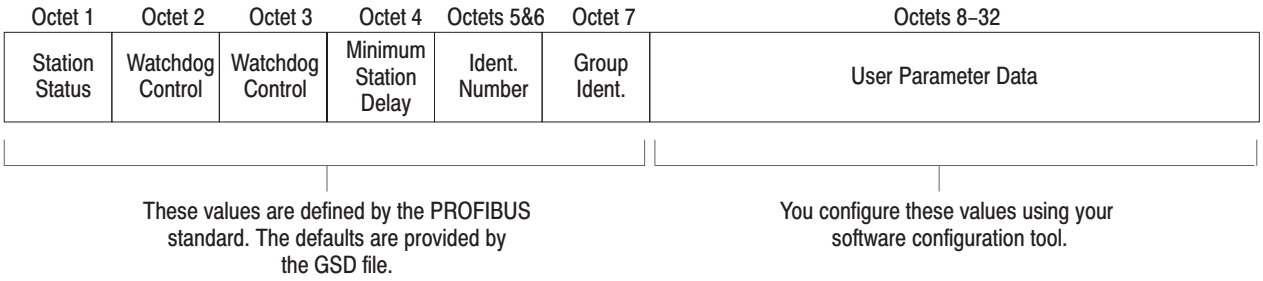
For more information on how you define and enter these user parameter values, refer to the documentation associated with your master and software configuration tool.

## Entering User Parameter Data

Send parameter data is comprised of a string of octets (1–32) that contain 244 bytes of data:

- octets 1–7 contain data specific to the:
  - PROFIBUS standard
  - defaults contained in the database (GSD) file
- octets 8–32 are user configurable and contain **user parameter data**. User parameter data consists of these formats:
  - auto configure
  - condensed
  - full

The following illustration shows the structure of the send parameter data table.




### User Parameter Data

The first byte of the user parameter data is the **flags byte.** This byte selects the appropriate format and also specifies adapter behavior. The flags byte is defined in the following table:

**Send Parameter Data Flags Byte**

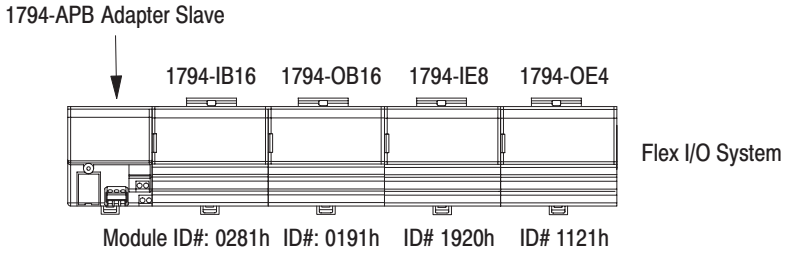
| Bit Position | Name | Description |
|---|---|---|
| 0–1 | Format Selection | 00 = Auto Configure<br>01 = Reserved<br>10 = Condensed<br>11 = Full |
| 2–3 | Fault Action | 00 = Reset to zero<br>01 = Hold Last State<br>10 = Use Safe State<br>11 = Reserved |
| 4 | Format Selection | 0 = Reset inputs to zero<br>1 = Hold Last Value |
| 5–7 | Reserved | Reserved bits must be zero |

If the send parameter data is received with no user parameter data, the flags byte is set to zero which selects:

- auto configure
- reset outputs to zero on fault
- reset inputs to zero on fault

The reserved bits must be set to zero to prevent undesired firmware update behavior. This is the default behavior of the module as defined in the GSD file.

The descriptions in this chapter use the following example FLEX I/O configuration to explain the information required for each of these functions:




### Auto Configure Format

The Auto Configure format allows you to change modules without affecting the User Parameter or Check Configuration data. This format provides no keying from the master on the I/O modules installed in the FLEX I/O system. The installed module at power-up is taken as the key.

If you change a module while it is being controlled by a master, a minor recoverable fault will occur. To recover from this fault, you must replace the module with an identical module type.

**User Parameter Example**

*User Parameter Message, Auto Configure Format (Length 1 byte)*

| Name | Value | Description |
|---|---|---|
| Octet 8: | 00h | Auto Configure Format, Reset to Zero on Fault |

### Condensed Format

The condensed format consists of the flags byte and the module key parameter for each of the eight slots. This parameter dictates which I/O module must be installed. If at any time the actual module ID does not match this module key, the slot will be considered in fault and the following occurs:

- STATUS LED flashes red/off
- an error bit in the poll response data is set
- a diagnostic bit in the Ext_Diag_Data field returned in the Read DP–Slave Diagnostic Information message response is set

All eight slots must be configured. The size for this format is always 17 bytes (including the flags byte). The condensed format structure must be repeated for each of the eight slots.

**Data format for Condensed Format**

| Name | Size | Description |
|---|---|---|
| Module Key | WORD | Module ID # that must be installed[1] |

[1] Only bits 0–12 are used. Bits 13–15 must be zero except when keying an empty slot where 0FFFFh is used.

The following table shows the identification numbers for current FLEX I/O modules.

| FLEX I/O Module Catalog Number | Module Identification Number (module key) |
|---|---|
| Four-word Modules | |
| 1794-IB8 | 0180h |
| 1794-OB8 | 0190h |
| 1794-IB16 | 0281h |
| 1794-OB16 | 0191h |
| 1794-IV16 | 0204h |
| 1794-OV16 | 010Ch |
| 1794-IA8 | 0285h |
| 1794-OA8 | 0195h |
| 1794-OA8I | 019Ch |
| 1794-IB8S | 0289h |
| 1794-OW8 | 0199h |
| Sixteen-word Modules | |
| 1794-IE8/A | 1920h |
| 1794-OE4/A | 1121h |
| 1794-IE4XOE2/A | 1522h |
| 1794-IE8/B | 1924h |
| 1794-OE4/B | 1125h |
| 1794-IE4XOE2/B | 1526h |
| 1794-IT8 | 1B00h |
| 1794-IR8 | 1B01h |
| 1794-IRT8 | 1B03h |
| 1794-ID2/B | 1804h |
| 1794-IP4/B | 1A04h |
| 1794- | h |
| 1293-FM1 | 1600h |

When you use the condensed format, no safe state data can be defined, thus the safe state data is left at the power up default of all zeroes. Setting the Fault Action in the byte to Use Safe State with this format is the equivalent of setting Reset to Zero.

**User Parameter Example**

*User Parameter Message, Condensed Format (Length 17 bytes)*

| Name | Value | Description |
|---|---|---|
| Octet 8: | 02h | Condensed Format, Reset to Zero on Fault, Rest Inputs to Zero |
| Octet 9–10: | 0281h | 1794-IB16 16-point discrete input module |
| Octet 11–12: | 0191h | 1794-OB16 16-point discrete output module |
| Octet 13–14: | 1920h | 1794-IE8 8-point analog input module |
| Octet 15–16: | 1121h | 1794-OE4 4-point analog output module |
| Octet 17–18: | 0FFFFh | Empty |
| Octet 19–20: | 0FFFFh | Empty |
| Octet 21–22: | 0FFFFh | Empty |
| Octet 23–24: | 0FFFFh | Empty |

Refer to your configuration tool publications for information on how and where to enter this data.

### Full Format

The full format consists of the flags byte and four parameters for each of the eight slots. The module key parameter is the same for the full format as defined by the condensed format, but adds three more parameters for each slot.

Use the full format to:

- provide Safe State values for output points
- send FLEX I/O module configurations once (when you send parameters) instead of every poll
- configure data sizes to reduce the size of data required during run mode

You must configure all eight slots. The minimum size is 25 bytes (no slots have FLEX I/O module configuration or safe state data). The maximum size is 237 bytes (the size of the PROFIBUS user parameter area).

**Data format for Full Format**

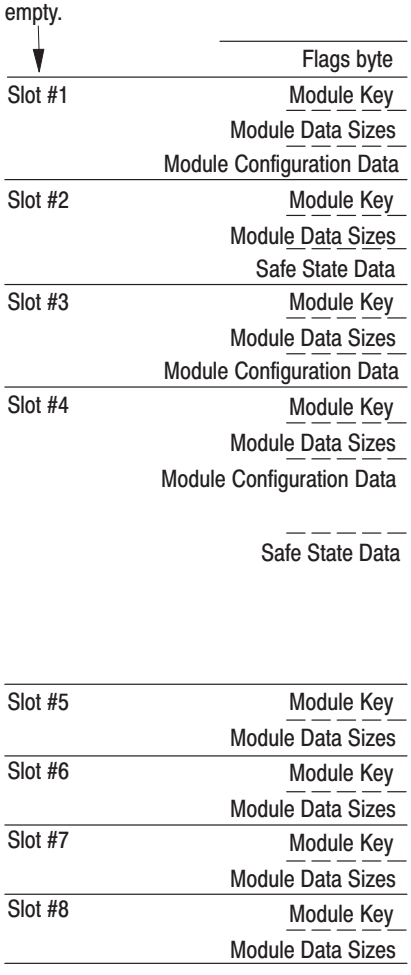
| Name | Size | Description |
|---|---|---|
| Module Key | WORD | Module ID that must be installed[1] |
| Module Data Sizes[2] | BYTE | Bits 0–3 Safe State Size (in words)<br>Bits 4–7 Config Size (in words) |
| Safe State Data | ARRAY | Output Safe States. Word array of size Safe State Size. |
| Module Configuration Data | ARRAY | FLEX Module Configuration. Word array of size Config Size. |

1 Only bits 0–12 are used. Bits 13–15 must be zero except when keying an empty slot where 0FFFFh is used.

2 Each of the two sizes can range from 0–15 words but when combined cannot exceed 15 words total.

There are some possible configurations of FLEX I/O modules that would exceed the user parameter area of 237 bytes. Be aware of the totals of the words and modules you are using.

The data format is repeated for each Flex I/O slot. and all slots are configured, even when empty.




**User Parameter Example**

*User Parameter Message, Full Format (Length 43 bytes)*

| Name | Value | Description |
|---|---|---|
| Octet 8: | 02h | Full Format, Reset to Zero on Fault |
| Octet 9–10: | 0281h | Slot 1 Module Key 1794-IB16 16-point discrete input module |
| Octet 11: | 10h | Slot 1 config size 1 word, safe state size 0 words |
| Octet 12–13: | 0000h | 1 config word, input delay times |
| Octet 14–15: | 0191h | Slot 2 Module Key 1794-OB16 16-point discrete output module |
| Octet 16: | 01h | Slot 2 config size 0 words, safe state size 1 word |
| Octet 17–18: | 0000h | 1 safe state data word, safe state value for output points |
| Octet 19–20: | 1920h | Slot 3 Module Key 1794-IE8 8-point analog input module |
| Octet 21: | 10h | Slot 3 config size 1 word, safe state size 0 words |
| Octet 22–23: | 0000h | 1 config word, channel selection |
| Octet 24–25: | 5121h | Slot 4 Module Key 1794-OE4 4-point analog output module |
| Octet 26: | 24h | Slot 4 config size 2 words, safe state size 4 words |
| Octet 27–28: | 0000h | 2 config words – channel selection and |
| Octet 29–30: | 0000h | output enable |
| Octet 31–32: | 0000h | 4 safe state data words – safe state value for output point 1 |
| Octet 33–34: | 0000h | output point 2 |
| Octet 35–36: | 0000h | output point 3 |
| Octet 37–38: | 0000h | output point 4 |
| Octet 39–40: | 0FFFFh | Slot 5 empty |
| Octet 41: | 00h | Slot 5 all sizes zero |
| Octet 42–43: | 0FFFFh | Slot 6 empty |
| Octet 44: | 00h | Slot 6 all sizes zero |
| Octet 45–46: | 0FFFFh | Slot 7 empty |
| Octet 47: | 00h | Slot 7 all sizes zero |
| Octet 48–49: | 0FFFFh | Slot 8 Empty |
| Octet 50: | 00h | Slot 8 all sizes zero |

Refer to your configuration tool publications for information on how and where to enter this data.

## Entering Check Configuration Data

On a PROFIBUS DP network, the I/O data exchanged between the PROFIBUS DP master and a DP slave is encapsulated into **logical modules**. The total I/O data exchanged between a PROFIBUS DP master and a DP slave device comprises a set of logical modules which is defined in the check configuration data.

Each physical slot of the FLEX I/O system is represented by two logical modules (one input and one output). When the FLEX I/O adapter is powered-up, the check configuration message configures the module format (input and output words) and defines the size of the modules within the device. When the sizes are configured, the I/O data can be optimized to remove unused data from the data stream.

Both input and output sizes can be configured. If a slot is empty, or if either the input or output module is zero length, the specific identifier for an empty module (free place) must be used.

If the end of the identifiers is reached before all slots have been configured, the remaining slots are configured as empty.

The first two modules allocated are for the adapter itself, and must always be a 1 word input module and a 1 word output module, regardless of what parameter format you choose. The adapter uses these words for adapter status information. Modules for each of the individual slots (FLEX I/O modules) must also follow these word assignments.

The format of the adapter status word is defined in the following table:

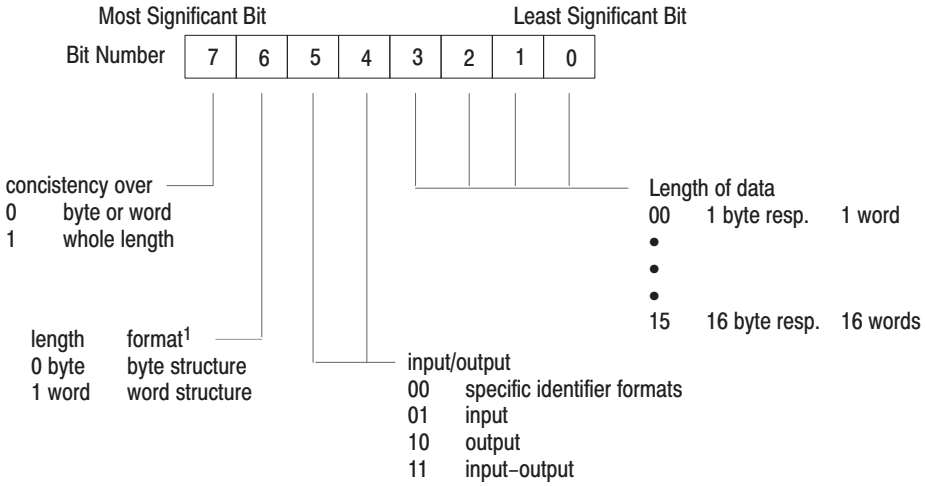
**Adapter Status Word**

| Input Status Word | | |
|---|---|---|
| **Bit Position** | **Name** | **Description** |
| 0 | Address Change | This bit is set when the Node Address switch is changed since power up. |
| 1–7 | Reserved | Sent as zeroes. |
| 8–15 | I/O Module Fault[1] | This bit is set when an error is detected in a slot position (bits 0–7 refer to slots 1–8) |
| **Output Status Word** | | |
| **Bit Position** | **Name** | **Description** |
| 0–15 | Reserved | Sent as zeroes. |

[1] I/O Module Faults are caused by:
- transmission errors on the FLEX I/O backplane
- bad module
- removed module
- incorrect module inserted

The adapter expects the identifier area for each of the eight FLEX I/O slots to be 2 bytes. The DP input/output identifier and all specific DP identifiers (except the empty module) are not supported.

The identifier byte and its format are described in the following illustration. This byte is defined in Part 3 of the PROFIBUS standard.




The maximum size of this identifier area is 17 bytes. If no FLEX I/O modules are installed in the upper slots, the length may be less. Consistency must be over a word.

**Check Configuration Example**

*Check Configuration Message when used with Send Parameter Auto Configure or Condensed Format (Length 10 bytes)*

| Name | Identifier Byte | Description |
|---|---|---|
| Octet 1: | 50h | Input Status Word (input – 1 word) |
| Octet 2: | 60h | Output Status Word (output – 1 word) |
| Octet 3: | 51h | Slot 1, input module 2 words |
| Octet 4: | 60h | Slot 1, output module 1 word |
| Octet 5: | 00h | Slot 2, input module empty |
| Octet 6: | 60h | Slot 2, output module 1 word |
| Octet 7: | 57h | Slot 3, input module 8 words |
| Octet 8: | 60h | Slot 3, output module 1 word |
| Octet 9: | 50h | Slot 4, input module empty |
| Octet 10: | 65h | Slot 4, output module 6 words |
| I/O sizes configured: 22 input bytes, 20 output bytes | | |

Refer to your configuration tool publications for information on how and where to enter this data.

**Check Configuration Example**

*Check Configuration Message when used with Send Parameter Full Format (Length 10 bytes)*

| Name | Identifier Byte | Description |
|---|---|---|
| Octet 1: | 50h | Status Word (input – 1 word) |
| Octet 2: | 60h | Output Status Word (output – 1 word) |
| Octet 3: | 51h | Slot 1, input module 2 words |
| Octet 4: | 00h | Slot 1, output module 1 word |
| Octet 5: | 00h | Slot 2, input module empty |
| Octet 6: | 60h | Slot 2, output module 1 word |
| Octet 7: | 57h | Slot 3, input module 8 words |
| Octet 8: | 00h | Slot 3, output module 1 word |
| Octet 9: | 00h | Slot 4, input module empty |
| Octet 10: | 63h | Slot 4, output module 6 words |
| I/O sizes configured: 22 input bytes, 12 output bytes | | |

Refer to your configuration tool publications for information on how and where to enter this data.

## Read Configuration Response Data

The read configuration message response returns the current configuration data. At power up, the configuration is the maximum read and write sizes supported by each FLEX I/O module.

A valid check configuration message updates the internal configuration. The updated internal configuration is then returned in the message response.

**Power Up Configuration Example**

*Read Configuration Message response at Power Up (Length 10 bytes)*

| Name | Identifier Byte | Description |
|---|---|---|
| Octet 1: | 50h | Status Word (input – 1 word) |
| Octet 2: | 60h | Output Status Word (output – 1 word) |
| Octet 3: | 51h | Slot 1, input module 2 words |
| Octet 4: | 60h | Slot 1, output module 1 word |
| Octet 5: | 50h | Slot 2, input module empty |
| Octet 6: | 61h | Slot 2, output module 1 word |
| Octet 7: | 58h | Slot 3, input module 8 words |
| Octet 8: | 65h | Slot 3, output module 1 word |
| Octet 9: | 50h | Slot 4, input module empty |
| Octet 10: | 65h | Slot 4, output module 6 words |

Refer to your configuration tool publications for information on how and where to enter this data.

# Troubleshooting

## What this Chapter Contains

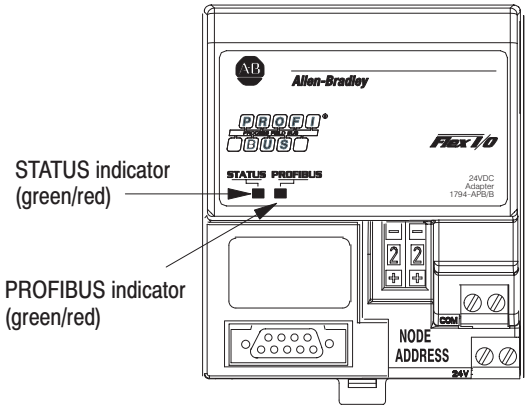
In this chapter, we describe how to use the adapter's indicators for troubleshooting.

## Troubleshooting with the Indicators

Locate the two bi-color indicators on the front panel of the adapter. They show both normal operation and fault conditions in your Flex I/O PROFIBUS system. The indicators are:

- STATUS – this indicator provides device status
- PROFIBUS – this indicator provides communication link status

Use the following table to determine the indicator conditions and status.




| STATUS Indicator | |
|---|---|
| **Indication** | **Status** |
| OFF | No power |
| Solid Green | Normal operation |
| Flashing Red/OFF | Recoverable fault<br>– Flex I/O module bad<br>– Incorrect Flex I/O module installed<br>– Node address changed since power up |
| Solid Red | Unrecoverable fault |

| PROFIBUS Indicator | |
|---|---|
| **Indication** | **Status** |
| OFF | No power or no communication |
| Solid Green | Data is being transmitted and recieved |
| Flashing Red/OFF | Recoverable fault<br>– Invalid Send Parameter data<br>– Invalid Check Configuration data |
| Solid Red | Unrecoverable fault<br>– Unable to communicate |

## Viewing Status from the Master's Configuration Software

You can use read diagnostics to view status using the master's configuration software. The adapter returns identification in response to the Read DP–Slave Diagnostic Information message.

**Read DP–Slave Diagnostics Information Message**

| *Ext_Diag_Data field (Length 9 bytes)* | |
|---|---|
| **Octet** | **Description** |
| 7 | Device Related diagnostic header byte (05h) |
| 8 | Revision – Minor |
| 9 | Revision – Major |
| 10 | Adapter Status<br>Bit 0 – Node Address Changed<br>Bits 1-7 – Reserved |
| 11 | Node Address switch setting |
| 12 | Identifier Related diagnostic header byte (44h) |
| 13–15 | Identifier diagnostic bits[1] |

[1] One identifier bit for each logical module (adapter and each slot use two identifier bits). The bits set indicate a module fault.

# Specifications

| Specifications – FLEX I/O PROFIBUS Adapter Module, 1794-APB Series B | |
|---|---|
| I/O Capacity | 8 modules |
| Input Voltage Rating | 24V dc nominal |
| Input Voltage Range | 19.2V to 31.2V dc (includes 5% ac ripple) |
| Communication Rate | All rates up to 12.0Mbit/s |
| Indicators | STATUS – red/green<br>PROFIBUS – red/green |
| Flexbus Output Current | 640mA maximum @ 5V dc |
| Isolation Voltage | 100% tested at 850V dc for 1s between user power and flexbus |
| Power Consumption | 400mA maximum from external 24V dc supply |
| Power Dissipation | 7.68W maximum @ 19.2V dc |
| Thermal Dissipation | 26 BTU/hr @ 19.2V dc |
| Environmental Conditions | |
| Operating Temperature | IEC 60068–2–1 (Test Ad, Operating Cold)<br>IEC 60068–2–2 (Test Bd, Operating Dry Heat)<br>IEC 60068–2–14 (Test Nb, Operating Thermal Shock)<br>32 to 131°F (0 to 55°C) |
| Storage Temperature | IEC 60068–2–1 (Test Ab, Unpackaged, Nonoperating Cold)<br>IEC 60068–2–2 (Test Bb, Unpackaged, Nonoperating Dry Heat)<br>IEC 60068–2–14 (Test Na, Unpackaged, Nonoperating Thermal Shock)<br>–40 to 185°F (–40 to 85°C) |
| Relative Humidity | IEC 60068–2–30 (Test Db, Unpackaged, Nonoperating Damp Heat)<br>5 to 95%, noncondensing |
| Shock<br>Operating<br>Nonoperating | IEC 60068–2–27 (Test Ea, Unpackaged Shock)<br>30g<br>50g |
| Vibration | IEC 60068–2–6 (Test Fc, Operating)<br>5g @ 10–500Hz |
| ESD Immunity | IEC 61000–4–2<br>4kV contact discharges<br>8kV air discharges |
| Radiated RF Immunity | IEC 61000–4–3<br>10V/m with 1kHz sine–wave 80% AM from 30MHz to 2000MHz |
| EFT/B Immunity | IEC 61000–4–4<br>+4kV @ 2.5kHz on power ports<br>±2kV @ 5kHz on communications ports |
| Surge Transient Immunity | IEC 61000–4–5<br>±1kV line–line (DM) and ±2kV line–earth (CM) on signal ports |
| Conducted RF Immunity | IEC 61000–4–6<br>10V rms with 1kHz sine wave 80% AM from 150kHz to 80MHz |
| Emissions | CISPR 11<br>Group 1, Class A (with appropriate enclosure) |
| Enclosure Type Rating | None (open–style) |
| **Specifications continued on next page** | |

| Specifications – FLEX I/O PROFIBUS Adapter Module, 1794-APB Series B | | |
|---|---|---|
| PROFIBUS Connector | 9-pin D-shell | |
| PROFIBUS Drop Cable | Standard drop cable | |
| Power Conductors<br>Wire Size<br><br><br>Category | <br>12 gauge (4mm$^2$) maximum solid or stranded copper wire rated at 75ºC or greater<br>3/64 inch (1.2mm) insulation max.<br>2[1] | |
| Agency Certification (when product is marked) | UL | UL Listed Industrial Control Equipment |
| | UL | UL Listed for Class I, Division 2 Group A, B, C and D Hazardous Locations |
| | CSA | CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations |
| | EEx[2] | European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection “n” |
| | CE[2] | European Union 89/336/EEC EMC Directive, compliant with:<br>EN 50081–2, Industrial Emissions<br>EN 50082–2, Industrial Immunity<br>EN 61326, Meas./Control/Lab., Industrial Requirements<br>EN 61000–6–2, Industrial Immunity |
| | C–Tick[2] | Australian Radiocommunications Act,compliant with:<br>AS/NZS 2064, Industrial Emissions |
| Publications | Installation Instructions 1794–IN087 | |

1 Use this conductor category information for planning conductor routing. Refer to publication 1770-4.1, “Industrial Automation Wiring and Grounding Guidelines.”

# Device Data Base File (GSD)

## What this Chapter Contains

This PROFIBUS adapter requires a (GSD) file for implementation.

This file is available for downloading from www.ab.com/networks/gsd/. The GSD file is used by your configuration tool to help you set up your system. Your configuration tool automatically reads the GSD file and extracts defaults used in the data exchange.The file is in ASCII format and you can view it with any text editor.

This device data base file changes when new FLEX I/O modules are introduced. When you add new modules to your system, go to www.ab.com/networks/gsd/ for the latest version of this file.

# Hazardous Locations

**The following information applies when operating this equipment in hazardous locations:**

Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, and 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.

**WARNING**

**EXPLOSION HAZARD –**

- 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 are known to be nonhazardous. Secure any external connections that mate to this equipment by 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.

**Informations sur l'utilisation de cet équipement en environnements dangereux:**

Les produits marqués CL I, DIV 2, GP A, B, C, D ne conviennent que 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 systéme, le code de température le plus défavorable (code de température le plus faible) peut eatre utilisé pour déterminer le code de température global du systéme. Les combinaisons d'equipements dans le systéme sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

**AVERTISSEMENT**

**RISQUE D'EXPLOSION –**

- 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 produ
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe 1, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

This Glossary contains terms specific to Allen-Bradley and PROFIBUS FMS and DP.

A

**Allen-Bradley communication defaults**
values used for communication configuration data such as OD, CRL ( for FMS) DP slave database,and bus parameters whenever the coprocessor's working RAM configuration is reinitialized.

**application layer**
the seventh layer of the seven-layer OSI reference model. This layer is where the coprocessor first interacts with the application program.

B

**baud rate**
the speed of communication between devices on the network. All devices must communicate at the same rate.

**broadcast relationships**
allow transmission of messages to all nodes simultaneously, but only unconfirmed services are available.

**bus parameters**
communication parameters used by Link Layer. Main Bus Parameters are station address, maximum address and baud rate. These can be changed using the Local Station Manager or your compatible programming tool.

C

**client**
the FMS device that makes use of resources to perform some type of application function.

**CLOSE command**
in FMS, terminates the connection with a remote node on the network.

**communication object model**
describes the externally visible behavior associated with an FMS service or group of services. Three types of communication object models are domain objects, program invocation objects and variable objects.

**CREF**
communication reference. In FMS, an index assigned to each entry connection defined in the CRL.

**CSTAT**
a qualifier that allows to save the status of a connection.

**communication parameters**
parameters within the PROFIBUS communication layers that control the communication process. They are used to configure and indicate current status of communication and consist of the OD, CRL, bus parameters for FMS, and slave database and bus parameters for DP.

**communication relationship**
in FMS, defines all the parameters for the communication between two nodes.

**configuration management**
in FMS, set of FMA 7 services to upload and download the PROFIBUS bus parameters, CRL, and to read SAP status and station identification.

**connector header**
a connector that attaches between the processor and coprocessor and provides communication between the two modules.

**connection type**
in FMS, the type of connection between two nodes. There are three connection types: defined (D), open at the responder (O), and open at the initiator (I)

**connection zero**
opens automatically during the coprocessor's power-up and allows access to local data either by physical addressing or via objects defined locally in the OD.

**consistency**
the DP protocol allows to associate data consistency requirements with blocks of data exchanged between a PLC master and its slaves. A consistent block of data must always be written or read as a whole, because contained data is not independent. For example, when it holds both real data and data identification, or when granularity exceeds 2 bytes (e.g. floating point data).

**context management**
set of FMA 7 services that establishes and releases connections

**CRL**
Communication Relationship List. In FMS, a CRL is a database within the station, holding the description of all communication relationships of that station to all other stations, independent of the time of use. For more information on CRLs, refer to DIN 19245 Part 2: Process Field Bus.

D

**default settings**
values used for communication configuration data such as OD, CRL ( for FMS) DP slave database,and bus parameters whenever the coprocessor's working RAM configuration is reinitialized.

**defined connection**
in FMS, a connection type that specifies both end nodes of the channel by giving their network address and the FDL service access points (SAPs) used in both nodes

**diagnostics**
three LED indicators located on the front panel of the coprocessor provide the user with the status of the coprocessor and its communication channels. Also referred to as *user interface*.

**domain object**
in FMS, represents a portion of the processor's memory image. In the coprocessor, represents the processor's entire memory image.

**DIN**
Deutsches Institut fur Normung. The German Normalization Agency.

**DP**
Decentralized Periphery. A German/European standard (DIN 19245 Part 3) that specifies a simplified user interface with PROFIBUS link layer services and protocol to use with decentralized peripherals.

**DP interface**
a 9-pin female D-shell connector located at Port 2 on the front panel of the coprocessor.

**EC 96**
European Community 1996. European Union Directives for 1996.

**EMC**
Electro-magnetic Compatibility.

**ESD**
Electrostatic Discharge. Can cause internal circuit damage to the coprocessor.

**FDL**
Fieldbus Data Link. A German standard (DIN 19245 Part 1) that specifies the Data Link layer of the PROFIBUS fieldbus.

**FMA**
Fieldbus Management. A German standard (DIN 19245 Parts 1 and 2) that specifies the network management services and protocol of the PROFIBUS fieldbus.

**FMS**
Fieldbus Message Specification. A German standard (DIN 19245 Part 2) that specifies the Application Layer services and protocol of the PROFIBUS fieldbus.

**FMS interface**
a 9-pin female D-shell connector located at Port 1 on the front panel of the coprocessor.

**FMS Physical Access Addressing**
FMS option that allows the access of data at a physical address by specifying the address in the service.

**FMS Symbolic Access Addressing**
FMS option that allows to statically associate a symbolic name or short reference number (or index) with a physical address within a node.

**fault management**
set of FMA 7 services that allows resetting the communication and indicates communication faults and events

**HPRIO**
High Priority service request. A qualifier to specify high priority for unconfirmed services such as UINFO and USTAT.

**I/O chassis**
the chassis or rack that serves as the location for the processor, coprocessor, power supply and other I/O modules. Also referred to as *chassis.*

**LED**
Light-emitting diode.

**link layer**
defines a hybrid method for accessing the communication medium (bus) with master/active stations or slave/passive stations.

**Local Station Manager**
an Allen-Bradley PC program that runs under Microsoft Windows version 3.1. This program transfers data (FDL,CRL, OD, station address, communication rate, and maximum station address) between the PC and the coprocessor over RS-232.

**logical module**
DP protocol describes I/O data exchanged between a PLC master and a slave device as a set of logical modules (up to 64, but 32 preferred) each one featuring up to 16 bits maximum of inputs, outputs or a combination of both. The actual structure of exchanged input and output frames is deduced from this description.

**lower layer interface (LLI)**
in FMS, responsible for interfacing the FMS layer 7 with FDL layer 2. LLI manages connections

**LSAP or SAP**
Link layer Service Access Point. A logical sub-addresses within devices that allow the distribution of communication flow over dedicated tasks, depending on the required processing. FMS uses LSAPs indifferently to define generic communication relationships between two devices (logical communication channels). DP uses predefined LSAPs to access specific functions or services between masters and slaves.

**master**
initiates transfer of messages without any prior remote request. The right to access the bus (token) is circulated among the master stations. Management of this logical token ring is performed automatically by the masters (such as startup, removal or insertion of masters). Also referred to as *active stations or scanner.*

**module**
any of the plug-in hardware devices that are located in the 1771 I/O chassis: processor, coprocessor, power supply or I/O module

**module slot**
location in the I/O chassis for installing a module. Each module slides into a module slot that lines up with the backplane connector. Also referred to as *slot*.

**multicast relationships**
allow transmission of messages to a group of nodes simultaneously, but only unconfirmed services are available.

**network**
a series of stations or nodes connected by some type of communication medium. A network may consist of a single link or multiple links.

**node**
an address or software location on the network. Also referred to as *node*.

**STATUS LED**
a bicolor LED, located on the front panel of the coprocessor that indicates the condition of the coprocessor

**OD**
Object Dictionary. In FMS, an OD is a database within the station, holding the description of all explicit communication objects of that station and making them available for control and monitoring.

**open at the initiator**
in FMS, a connection type where the source service access point (SAP) is shared among several communication relationships (associated with a different destination address and SAP). The device uses only one of these relationships at a time, depending on the selected remote node.

**open at the responder**
in FMS, a connection type where the destination address and service access point (SAP) are undefined, thus making the connection available to any device.

**OPEN command**
in a MSG instruction, establishes a connection between the coprocessor and a remote node on the network

**OSI**
Open Systems Interconnect. A standard that provides the framework for defining the process of communication between nodes on the PROFIBUS network.

**physical layer**
The first layer of the seven-layer OSI reference model. This layer is where the coprocessor connects to the network media.

**PICS**
Protocol Implementation Conformance Statement. System conformance requirements associated with network communications, consisting of four parts: implementation and system information, supported services, supported parameters and their options, and local implementation values

**PLC-5™ processor**
Any one of the family of Allen-Bradley Programmable Logic Controllers that support the coprocessor interface: PLC-5/11™ , -5/20™ , -5/30™ , -5/40™ , -5/60™ and -5/80™ .

**PNO**
PROFIBUS Nutzerorganisation, or PROFIBUS User Organization.

**PORT 1 LED**
a bicolor LED, located on the front panel of the coprocessor that indicates the condition of the FMS communication channel of the coprocessor

**PORT 2 LED**
a bicolor LED, located on the front panel of the coprocessor that indicates the condition of the DP communication channel of the coprocessor

**power supply**
module that supplies power to the I/O chassis containing the processor and coprocessor and other modules

**processor**
Any one of the family of Allen-Bradley Programmable Logic Controllers that support the coprocessor interface: PLC-5/11™ , -5/20™ , -5/30™ , -5/40™ , -5/60™ and -5/80™ .

**processor interface**
a 58-pin connector located on the left side of the coprocessor that uses a PLC-5 Connector Header to attach to the processor for communication between the two modules.

**PROFIBUS**
PROcess FIeld BUS. A German standard (DIN 19245 Parts 1, 2 and 3) that specifies a fieldbus for communications at the process level.

**PROFIBUS Manager**
a program that allows you to create, download and monitor network FMS and DP configurations on your personal computer through an RS-232 interface to your coprocessor.

**program invocation objects**
allow an FMS client to place the processor into different modes (for example, program, test, run)

**protocol**
the language or packaging of information that is transmitted between nodes on a network.

**qualifier**
in a MSG instruction, a word that specifies options for an MSG command

**RFI**
Radio Frequency Interference.

**RS-232**
communication protocol between the personal computer and the coprocessor

**RS-232 interface**
a 9-pin male D-shell connector located at the RS-232 port on the front panel of the coprocessor. Use this interface to connect the Local Station Manager and PROFIBUS Manager installed in your personal computer.

**server**
an FMS device that makes resources available for use by another FMS device. Also referred to as *slave*.

**station**
an address or software location on the network. Also referred to as *node*.

**SET command**
in a MSG instruction, allows transfer of an element, an array of elements or an FMS structure to or from a node on the network.

**slave**
are only allowed to transmit immediate acknowledge or immediate response to master requests. At the Link Layer level, any master can access any slave without restrictions. Also referred to as *passive stations or adapters*.

**STATUS command**
in a MSG instruction, retrieves status information from a remote node and stores it locally.

**system parameters**
allow you to check the current state of the coprocessor

**third party multivendor configurator**
a remote software tool used to define connections between devices and their communication parameters on the network. The tool is available on the open market from many vendors.

**UINFO command**
Unsolicited Variable Information. In a MSG instruction, a command that sends unsolicited data such as an element, array of elements or predefined FMS structure.

**USTAT command**
Unsolicited Status Information. In a MSG instruction, a command that sends unsolicited status information such as an element, array of elements or predefined FMS structure.

**user interface**
three LED indicators located on the front panel of the coprocessor provide the user with the status of the coprocessor and its communication channels. Also referred to as *diagnostics*.

**variable objects**
data that can be accessed from the network within an FMA server.

**VFD**
Virtual Field Device. A portion of the FMS server application process that makes a set of resources (data files, program files, I/O) and their associated functionality available for control and monitoring. For more information on VFDs, refer to DIN 19245 Parts 1 and 2: Process Field Bus.

## A



## B



## C



## D

## N



## O



## P



## R



## S



## T

## U



## V



## W

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