

IND700

Weighing Terminal



METTLER **TOLEDO**

IND700 Weighing Terminal

METTLER TOLEDO Service

Essential Services for Dependable Performance of Your IND700 Weighing Terminal

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use of your new equipment according to this Manual and regular calibration and maintenance by our factory-trained service team ensures dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget. Further information is available at www.mt.com/service.

There are several important ways to ensure you maximize the performance of your investment:

1. **Register your product:** We invite you to register your product at www.mt.com/productregistration so we can contact you about enhancements, updates and important notifications concerning your product.
2. **Contact METTLER TOLEDO for service:** The value of a measurement is proportional to its accuracy – an out of specification scale can diminish quality, reduce profits and increase liability. Timely service from METTLER TOLEDO will ensure accuracy and optimize uptime and equipment life.
 - a. **Installation, Configuration, Integration and Training:** Our service representatives are factory-trained, weighing equipment experts. We make certain that your weighing equipment is ready for production in a cost effective and timely fashion and that personnel are trained for success.
 - b. **Initial Calibration Documentation:** The installation environment and application requirements are unique for every industrial scale so performance must be tested and certified. Our calibration services and certificates document accuracy to ensure production quality and provide a quality system record of performance.
 - c. **Periodic Calibration Maintenance:** A Calibration Service Agreement provides on-going confidence in your weighing process and documentation of compliance with requirements. We offer a variety of service plans that are scheduled to meet your needs and designed to fit your budget.
 - d. **GWP® Verification:** A risk-based approach for managing weighing equipment allows for control and improvement of the entire measuring process, which ensures reproducible product quality and minimizes process costs. GWP (Good Weighing Practice), the science-based standard for efficient life-cycle management of weighing equipment, gives clear answers about how to specify, calibrate and ensure accuracy of weighing equipment, independent of make or brand.

© METTLER TOLEDO 2025

No part of this manual may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose without the express written permission of METTLER TOLEDO.

U.S. Government Restricted Rights: This documentation is furnished with Restricted Rights.

Copyright 2025 METTLER TOLEDO. This documentation contains proprietary information of METTLER TOLEDO. It may not be copied in whole or in part without the express written consent of METTLER TOLEDO.

COPYRIGHT

METTLER TOLEDO® is a registered trademark of Mettler-Toledo, LLC. All other brand or product names are trademarks or registered trademarks of their respective companies.

METTLER TOLEDO RESERVES THE RIGHT TO MAKE REFINEMENTS OR CHANGES WITHOUT NOTICE.

FCC Notice

This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

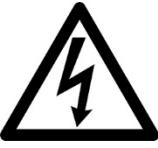
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her expense.

- Declaration of Conformity is available at <http://glo.mt.com/global/en/home/search/compliance.html/compliance/>.

Warnings and Cautions

- READ this manual BEFORE operating or servicing this equipment and FOLLOW these instructions carefully.
- SAVE this manual for future reference.

	! WARNING FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD CONNECT THE TERMINAL TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.
	! WARNING ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THE TERMINAL. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.
	! WARNING DO NOT INSTALL, DISCONNECT OR PERFORM ANY SERVICE ON THIS EQUIPMENT BEFORE POWER HAS BEEN SWITCHED OFF AND THE AREA HAS BEEN SECURED AS NON-HAZARDOUS BY PERSONNEL AUTHORIZED TO DO SO BY THE RESPONSIBLE PERSON ON-SITE.
	! WARNING NOT ALL VERSIONS OF IND700 ARE DESIGNED FOR USE IN HAZARDOUS (EXPLOSIVE) AREAS. REFER TO THE DATA PLATE OF THE IND700 TO DETERMINE IF A SPECIFIC TERMINAL IS APPROVED FOR USE IN AN AREA CLASSIFIED AS HAZARDOUS BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES. TERMINALS THAT ARE NOT FACTORY LABELED AS DIVISION 2 OR EUROPEAN CATEGORY 3 APPROVED MUST NOT BE INSTALLED IN A DIVISION 2 OR ZONE 2/22 ENVIRONMENT.
	! WARNING THE INTERNAL DISCRETE I/O <u>RELAY</u> OPTIONS MUST NOT BE USED IN AREAS CLASSIFIED AS HAZARDOUS BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES. FAILURE TO COMPLY WITH THIS WARNING COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.
	! WARNING WHEN THIS EQUIPMENT IS INCLUDED AS A COMPONENT PART OF A SYSTEM, THE RESULTING DESIGN MUST BE REVIEWED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL COMPONENTS IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.
	! WARNING ONLY THE COMPONENTS SPECIFIED ON THE IND700 DOCUMENTATION CD CAN BE USED IN THIS TERMINAL. ALL EQUIPMENT MUST BE INSTALLED IN ACCORDANCE WITH THE INSTALLATION INSTRUCTIONS DETAILED IN THE INSTALLATION MANUAL. INCORRECT OR SUBSTITUTE COMPONENTS AND/OR DEVIATION FROM THESE INSTRUCTIONS CAN IMPAIR THE SAFETY OF THE TERMINAL AND COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

	CAUTION BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT AND/OR BODILY HARM.
	NOTICE OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

Disposal of Electrical and Electronic Equipment



In conformance with the European Directive 2012/19/EC on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

Contents

1	Introduction.....	1-1
1.1.	Industrial Network Functionality in the IND700	1-1
2	PROFIBUS	2-1
2.1.	PROFIBUS Interface	2-1
2.2.	Communications	2-2
2.2.1.	Node/Rack Address.....	2-2
2.2.2.	Supported Data Formats	2-2
2.3.	Hardware Setup.....	2-2
2.3.1.	Wiring.....	2-2
2.4.	Option Board Setup	2-3
2.4.1.	Option Board Setup Menu	2-3
2.5.	Troubleshooting.....	2-4
2.6.	PROFIBUS Sample Code	2-4
3	PROFINET.....	3-1
3.1.	Overview	3-1
3.2.	PROFINET Interface	3-1
3.3.	Communications	3-2
3.3.1.	Update Rates.....	3-2
3.3.2.	Definition of Terms.....	3-2
3.3.3.	Communications	3-2
3.3.4.	IP Address	3-2
3.3.5.	Connection Methods	3-3
3.4.	Controlling the Discrete I/O Using an Industrial Network Interface	3-5
3.5.	Option Board Setup	3-6
3.5.1.	Option Board Setup Menu	3-6
3.6.	Assigning the IP Address and Device Name	3-7
3.7.	Troubleshooting.....	3-8
3.8.	PROFINET Sample Code.....	3-8
4	EtherNet/IP.....	4-1
4.1.	Preface.....	4-1
4.2.	EtherNet/IP Option Board.....	4-1
4.3.	Overview	4-1
4.4.	EtherNet/IP Characteristics.....	4-2
4.4.1.	Update Rates.....	4-2
4.4.2.	Definition of Terms	4-2
4.4.3.	Communications	4-4

4.4.4.	IP Address	4-4
4.5.	Software Setup.....	4-4
4.5.1.	Option Board Setup Menu	4-5
4.6.	Troubleshooting.....	4-5
4.7.	EtherNet/IP Sample Code	4-6
5	Protocol Configuration	5-1
5.1.	SAI.....	5-1
5.1.1.	Overview	5-1
5.1.2.	Protocol Setup.....	5-1
6	Option Board Firmware Download	6-1
6.1.	Overview	6-1
6.2.	Firmware Download Procedure	6-1

1 Introduction

1.1. Industrial Network Functionality in the IND700

The IND700 supports three Industrial Network Option Boards:

- PROFIBUS
- PROFINET
- EtherNet/IP

The PROFINET and EtherNet/IP interfaces use the same physical hardware (the industrial network option board, Figure 1-1), running different firmware.

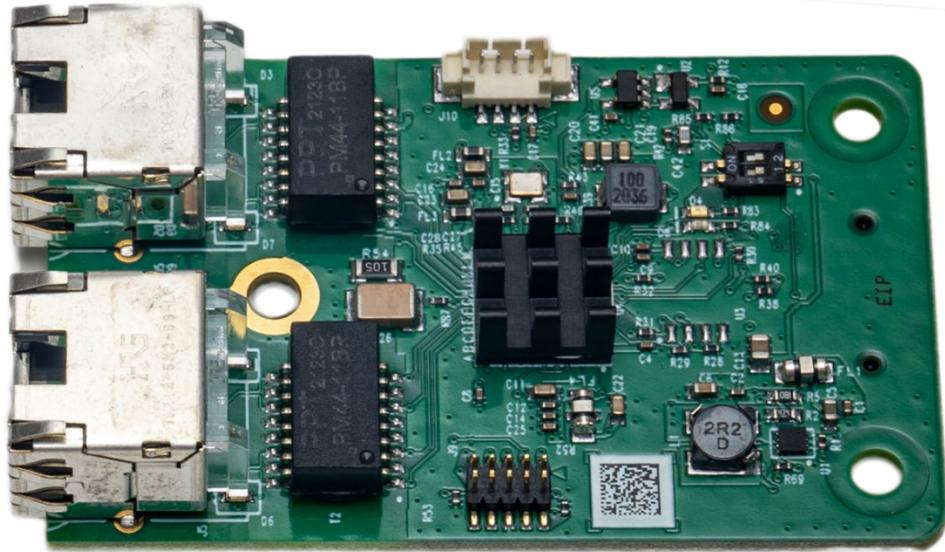


Figure 1-1: Industrial Ethernet Option Board

The PROFIBUS Option Board is shown in Figure 1-2.

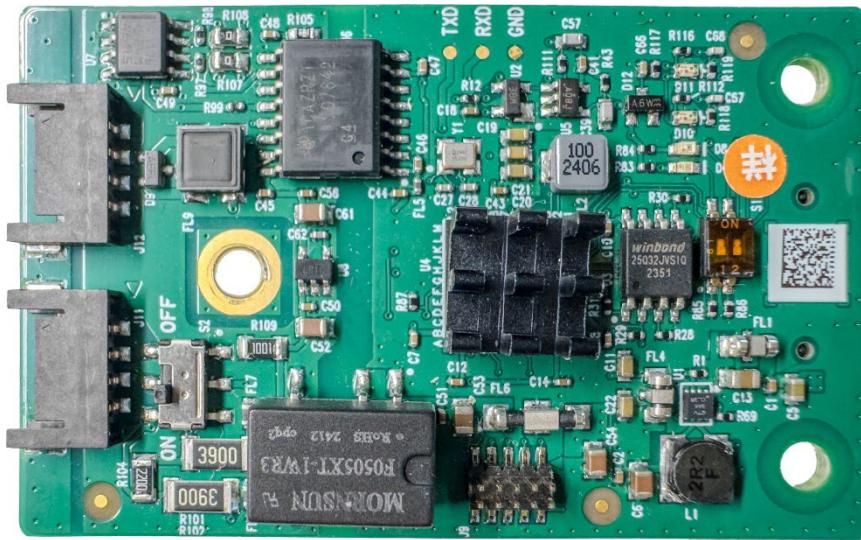


Figure 1-2: PROFIBUS Option Board

The board is installed in the IND700 in a dedicated Industrial Network slot on the motherboard, indicated below:

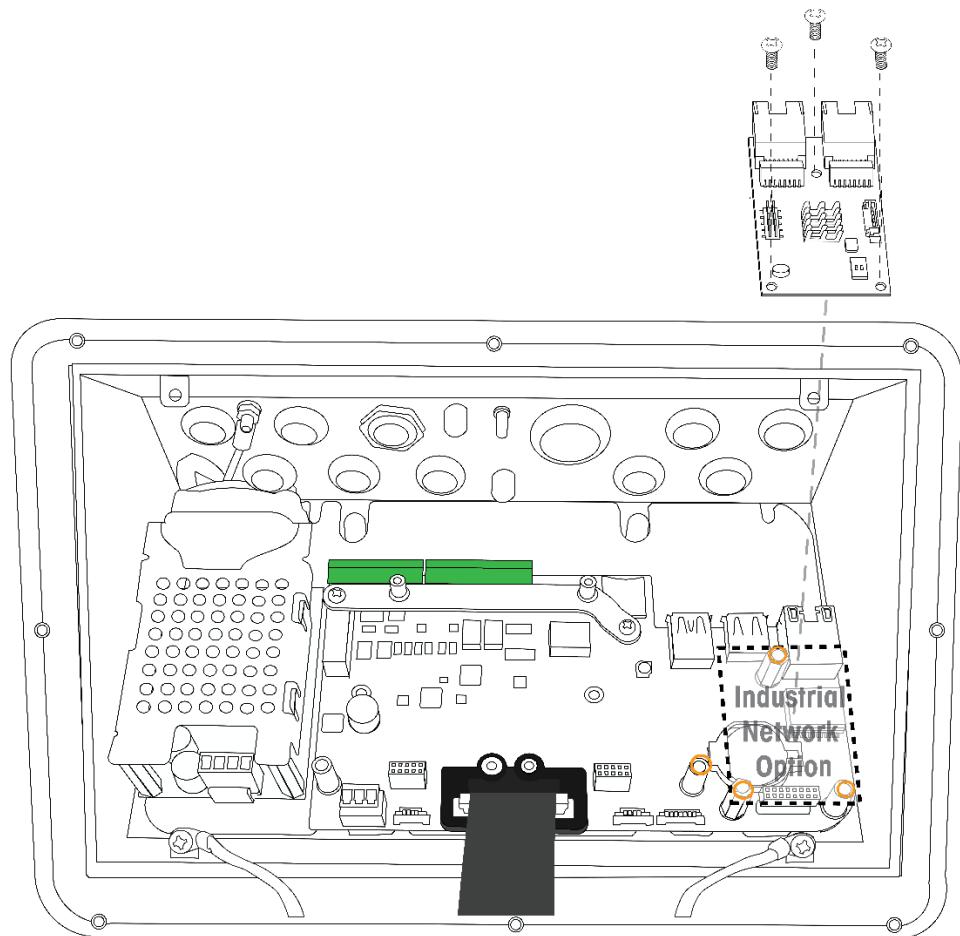


Figure 1-3: Industrial Network Option Board Location in IND700

2 PROFIBUS

PROFIBUS is an open Industrial Network standard for automation. PROFIBUS use RS485, is real-time capable and enables the integration of fieldbus systems.

The IND700 PROFIBUS interface enables the IND700 terminal to communicate to a PROFIBUS master according to DIN 19 245. It consists of an IND700 terminal backplane-compatible module and software that resides in the terminal, which implements the data exchange.

The card interfaces to Industrial Networks and Digital Control Systems (DCSs) that adhere to the PROFIBUS-DPv0 specification. The PROFIBUS interface appears as a block of I/O on the PROFIBUS network. The size and mapping of the I/O depend on the setup of the PROFIBUS interface within the software of the IND700.

The data mapped within the I/O block is defined as Discrete. Discrete data can be set as Integer, Division, or Floating Point.

Discrete data is sent in groups defined as Measuring Blocks. The number of Measuring Blocks (1 or 8) is set within the IND700. While the format of each Measuring Block is the same, the data received depends on the commands in the block.

2.1. PROFIBUS Interface

To connect an IND700 to a PROFIBUS network, a PROFIBUS Option Board (Figure 2-1) must be installed in the terminal, and a GSD (device description file) used to register the terminal in the network.

The part number of the PROFIBUS option kit is 31112532.



Figure 2-1: PROFIBUS Option Board Kit

2.2. Communications

PROFIBUS is based on a variety of existing national and international standards. The protocol architecture is based on the Open Systems Interconnection (OSI) reference model in accordance with the international standard ISO 7498.

The IND700 terminal supports PROFIBUS-DPv0 which is designed for high-speed data transfer at the sensor actuator level – DP means Distributed Peripherals. At this level, controllers such as Industrial Networks exchange data with their distributed peripherals via a fast serial link. The data exchange with these distributed devices is cyclic. The central controller reads the input information from the slaves and sends the output information back to the peripherals.

2.2.1. Node/Rack Address

Each IND700 PROFIBUS Option Board represents one physical node. The node address is chosen by the system designer and then programmed into the IND700 and the Industrial Network. The IND700's node address is programmed in setup at **Communication > Industrial Network**. The node address and number of input and output words used to communicate between the terminal and the Industrial Network are programmed into the Industrial Network by using its PROFIBUS network configuration software and the IND700's PROFIBUS .GSD files.

The IND700 PROFIBUS GSD has a block of I/O defined for each of the 14 possible IND700 PROFIBUS combinations. The IND700 terminal will determine the number of input and output words needed for the number of configured Measuring Blocks and the chosen data format. The Industrial Network must be configured for the same amount of space.

2.2.2. Supported Data Formats

The terminal's PROFIBUS interface uses the SAI protocol. Refer to Chapter 5, **Protocol Configuration**, for details.

2.3. Hardware Setup

2.3.1. Wiring

The IND700 terminal's PROFIBUS Option Board is attached to a connector and stand-offs on the IND700 main board, as shown in Figure 1-2 in Chapter 1, **Introduction**.

The option board has two connectors; either connector can be used. An internal cable connects the Option Board to an M12 4-pin connector where the connection to the PROFIBUS network is made.

2.4. Option Board Setup

When the IND700 terminal detects the presence of a PROFIBUS Option Board kit, the **Communication > Industrial Network > Option Board** page can be used to configure the Industrial Network interface. Figure 2-2 shows a typical Industrial Network Menu screen in setup.

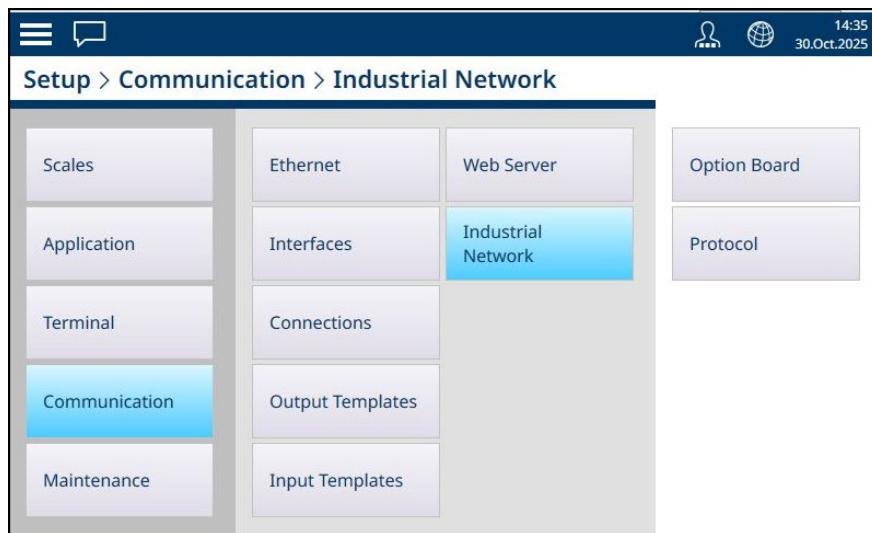


Figure 2-2: Industrial Network Setup Menus

The **Protocol** menu is used to configure the **SAI** protocol. Refer to Chapter 5, **Protocol Configuration** for details of this page.

2.4.1. Option Board Setup Menu

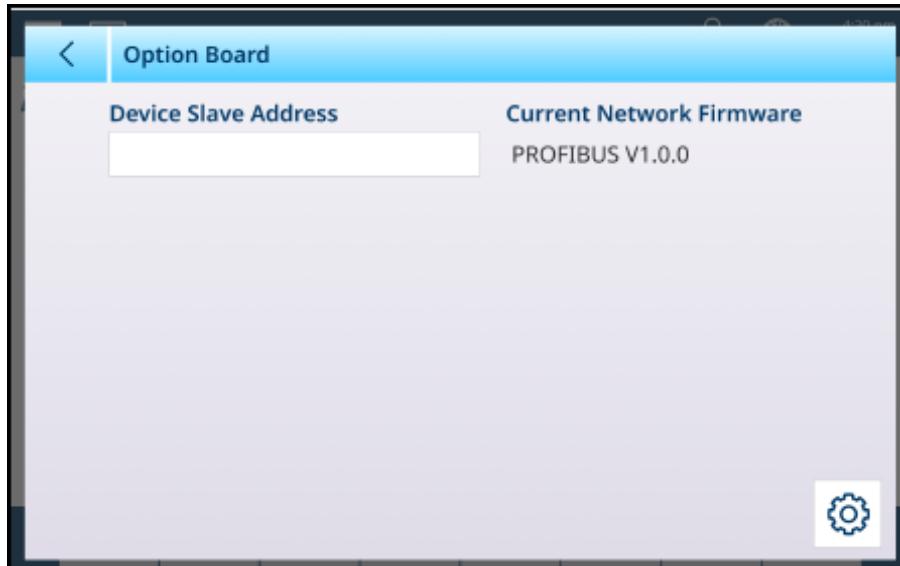


Figure 2-3: PROFIBUS Setup Menu

If no address has been assigned to this PROFIBUS interface, the address field will be blank. Enter an address that conforms to the PROFIBUS standard. Valid values are between 1 and 126.

2.5. Troubleshooting

If the IND700 does not communicate with Industrial Network, do the following:

- Check wiring and network termination.
- Confirm that the IND700's Device Description file has been loaded into the Industrial Network's network configuration.
- Confirm that the IND700 settings for data type and node address match those in the Industrial Network and that each IND700 has a unique node address.
- Confirm that the IND700's Setup protocol configuration matches the assignment in the Siemens IDE.
- Contact METTLER TOLEDO service for further assistance.

2.6. PROFIBUS Sample Code

For documentation describing the integration of the IND700 with a PROFIBUS Industrial Network, together with code samples, visit www.mt.com/IND700-downloads or scan the QR code:



The compressed file containing the sample code includes a document explaining its use.

3 PROFINET

3.1. Overview

PROFINET is an open industrial networking standard that was developed by Siemens as an Ethernet replacement for its widely popular PROFIBUS Network. The network supports Cyclic and Acyclic messaging, both of which have been implemented in the IND700. The PROFINET Standard is supported and maintained by the PROFIBUS and PROFINET International (PI) Organization. PROFINET utilizes commercial, off-the-shelf Ethernet hardware (for example, switches and routers) and is fully compatible with the Ethernet TCP/IP protocol suite.

The IND700 PROFINET interface implements PROFINET IO for cyclic data exchange with the Industrial Network.

The PROFINET interface enables the IND700 terminal to communicate to PROFINET enabled Programmable Logic Controllers (Industrial Networks) through direct connection to the PROFINET network at 100 MBPS speed. This solution consists of an internal module and internal software to implement the data exchange.

3.2. PROFINET Interface

To connect an IND700 to a PROFIBUS network, a PROFIBUS Option Board kit (Figure 3-1) must be installed in the terminal, and a GSD (device description file) used to register the terminal in the network.

The part # of the IND700 PROFINET Option Board kit is 30785338.



Figure 3-1: PROFINET Option Board Kit

3.3. Communications

3.3.1. Update Rates

The update rate for the PROFINET interface varies depending on the terminal's configuration:

- HSALC 1 scale: 66 Hz
- HSALC 2 scales: 50 Hz
- POWERCELL 4 scales 15 Hz

3.3.2. Definition of Terms

The following terms are used in this chapter.

Table 3-1: PROFINET Definition of Terms

Term	Definition
DCP	Discovery and basic Configuration Protocol. Used for IP configuration over PROFINET.
GSDML	XML-based descriptive language for GSD-files
Module	Hardware or logical component of a network device.
MRP	<u>Media Redundancy Protocol</u> . An Ethernet Ring Topology used with PROFINET IO to provide media redundant communications. Messages are sent out one Ethernet port of the Industrial Network and come back in the other. If the Industrial Network detects a media break in the ring then it reconfigures the network within 200 milliseconds so that messages will be sent out both ports of the Industrial Network. Requires Industrial Networks and devices that are MRP enabled. Any switches on the network must also be MRP enabled. Non-MRP enabled devices may be connected to the loop by using MRP enabled switches.
PROFINET IO	PROFINET IO is a communication concept for the implementation of modular, decentralized applications. Comparable to PROFIBUS-DP, where I/O data of field devices are cyclically transmitted to the process image of an Industrial Network. The real time capabilities of PROFINET IO are further divided into RT and IRT (see below).
Record Data	Comparable to PROFIBUS DPV1 acyclic Read/Write.

3.3.3. Communications

The IND700 terminal uses component parts to ensure complete compatibility with the Siemens PROFINET network. An IND700 terminal is recognized as a generic PROFINET device by the Industrial Network.

3.3.4. IP Address

Each PROFINET option represents one physical IP Address. This address can be chosen by the system designer, and then programmed into the IND700 terminal and Industrial Network, or the address can be automatically assigned by the Industrial Network. Each IND700 within a system must have a unique PROFINET IP Address.

The IND700 terminal's PROFINET IP address is programmed in the terminal's setup menu at **Communication > Industrial Network > Option Board**.

3.3.5. Connection Methods

The dual ports on the PROFINET Interface module provide several possible methods for connecting the IND700 to the control Network. Those methods are described in this section. It is important that in both the Daisy Chain and MRP Redundant Loop configurations, the physical network wiring matches the network topology defined on the Industrial Network as it relates to Port 1 and Port 2. If the wiring does not match the defined topology, errors will be reported.

3.3.5.1. Star Network

A star network consists of multiple devices being attached to one or more Ethernet switches.

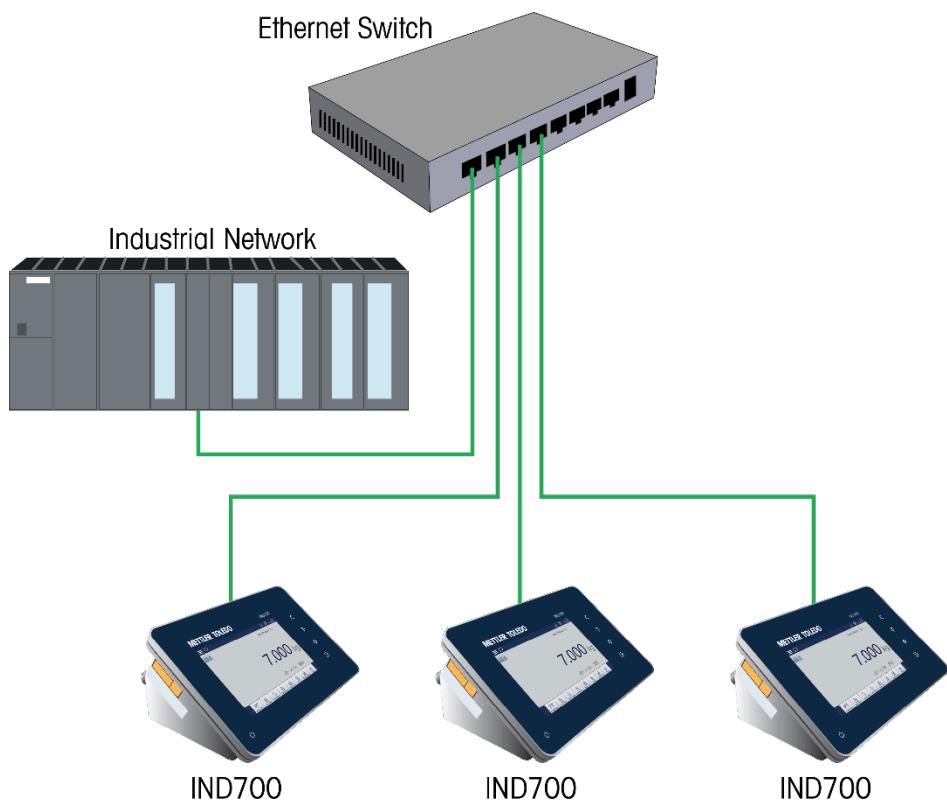


Figure 3-2: Star Network Example

3.3.5.2. Daisy Chain

A Daisy Chain network has the advantage of not requiring switches for multiple devices to be connected to the Controller. This has advantages in a cabinet or tight space where there may not be sufficient area to run individual cables all of the way back to a central point such as a switch.

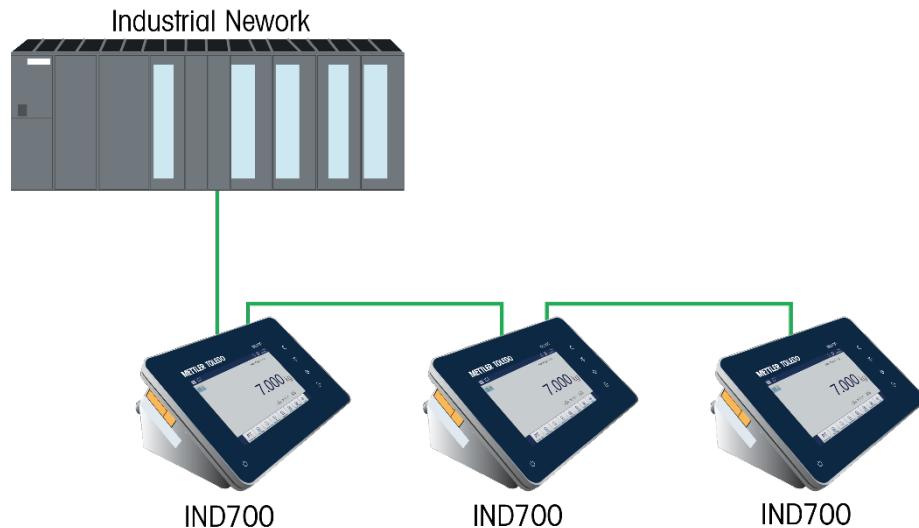


Figure 3-3: Daisy Chain Example

3.3.5.3. MRP Redundant Loop

An MRP redundant loop is very similar to the Daisy Chain topology, where the Industrial Network is connected on one end of the loop, and devices are daisy chained along the loop until the loop is terminated back at the same Industrial Network on a second Ethernet port. This provides a 'Ring' topology where messages can be routed either direction around the ring, and has the advantage of not requiring any switches as long as the Industrial Network and the devices are MRP capable. If a break in the Ring occurs, the Industrial Network will quickly detect it by noticing that messages are no longer making it back to the Industrial Network on the opposite end of the ring that is attached to it. Under those conditions the Industrial Network will then start transmitting the messages out both ports so that all devices on the ring can still get the messages. The result is a network of daisy chains out each port that continue to function regardless of the break. PROFINET MRP is designed to make the break detection and switch over in less than 200 milliseconds. NOTE that your process must be able to tolerate a loss of communications for up to 200 ms.

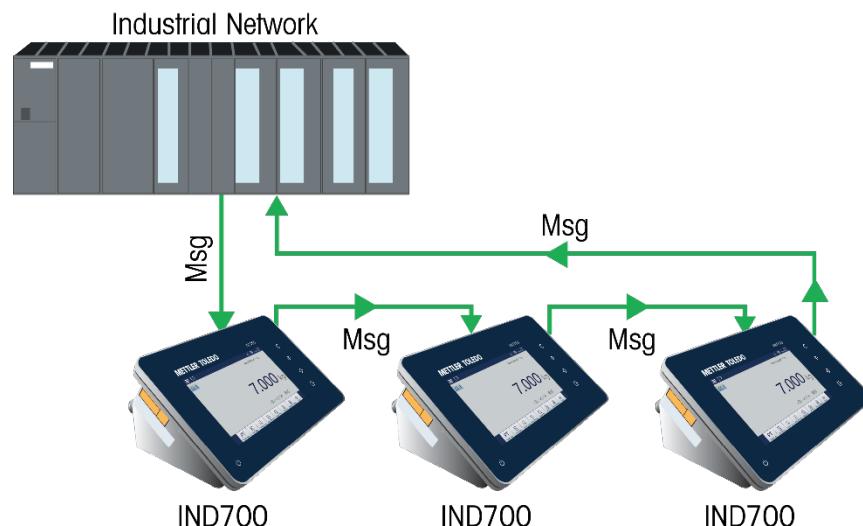


Figure 3-4: Intact MRP Ring

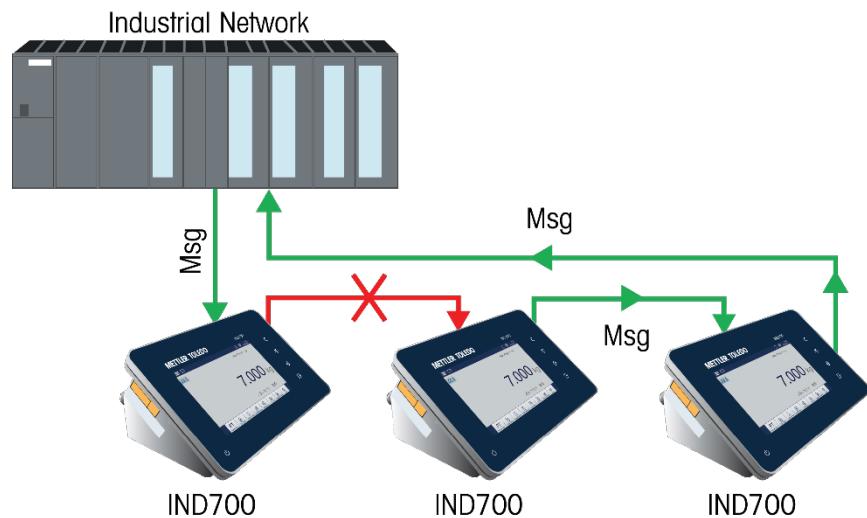


Figure 3-5: MRP Ring with Break

- Note that messages still reach all devices, because the network is self-healing.

3.4. Controlling the Discrete I/O Using an Industrial Network Interface

The IND700 terminal provides the ability to directly control its discrete outputs and read its discrete inputs via the (digital) Industrial Network interface options. System integrators should be aware that the IND700 terminal's discrete I/O updates are synchronized with the terminal's interface update rate and not with the Industrial Network I/O scan rate. This may cause a noticeable delay in reading inputs or updating outputs as observed from the Industrial Network to real world signals. Consult the IND700 Terminal Technical Manual for discrete I/O wiring.

3.5. Option Board Setup

When the IND700 terminal detects the presence of a PROFINET Option Board kit, the PROFINET parameters are enabled in a **Option Board** menu at **Communication > Industrial Network**. Figure 3-6 shows a typical Industrial Network Menu screen in setup.

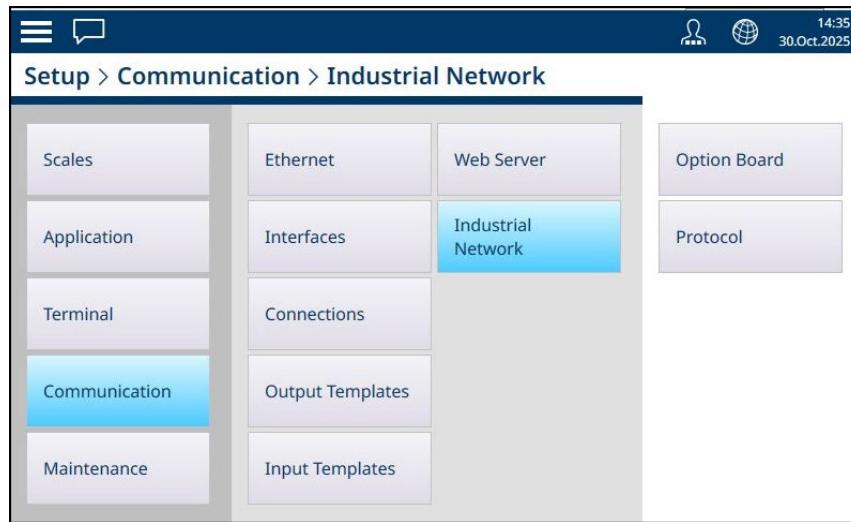


Figure 3-6: Industrial Network Setup Menus

The **Option Board** item is used to configure the installed Option Board.

The **Protocol** menu is used to configure the SAI protocol. Refer to Chapter 5, **Protocol Configuration** for details of this page.

3.5.1. Option Board Setup Menu

The PROFINET Option Board setup menu is shown in Figure 3-7.



Figure 3-7: PROFINET Option Board Setup Menu

The PROFINET interface must be assigned a unique name for its identity in the network. Its IP address must be set by entering values manually in the **IP Address**, **Subnet Mask** and **Gateway Address** fields.

For firmware update information, refer to Chapter 6, **Firmware Update**.

3.6. Assigning the IP Address and Device Name

This function is accessed via the Industrial Network Engineering Software as shown below.

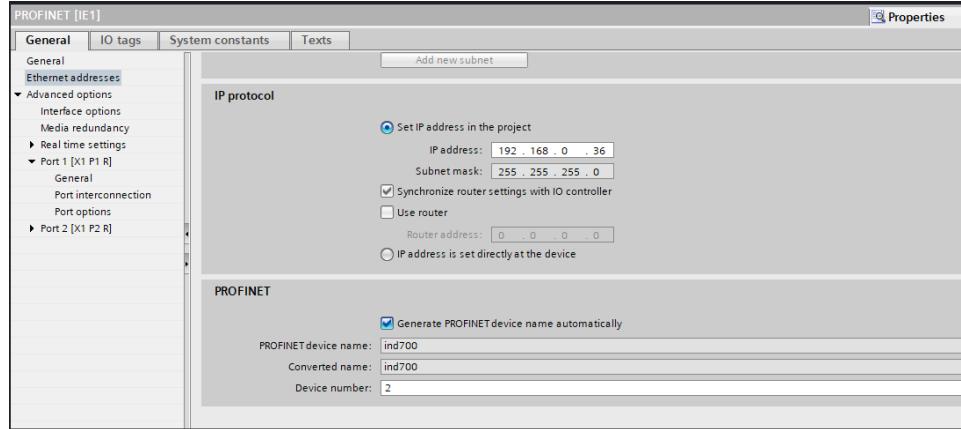


Figure 3-8: IND700 Device Properties- Ethernet Address

To set the IP address and PROFINET device name in IND700, in Setup access **Communications > Industrial Network > Option Board**. Once changes have been made, a check mark  will appear at bottom right of the screen. Touch the check mark to confirm the changes, or the BACK arrow  at upper left to cancel.



Figure 3-9: PROFINET MAC Address in IND700 Setup Screen

3.7. Troubleshooting

If the IND700 does not communicate with Industrial Network, do the following:

- Check physical wiring and network connections.
- Confirm that the IND700's Device Description file has been loaded into the Industrial Network's network configuration.
- Confirm that the Device Name, IP Address, Gateway and Subnet mask configuration have been assigned in the Industrial Network.
- Check for IP Address conflicts. Use a Ping command from a PC to verify addresses.
- Confirm that the IND700's Setup protocol configuration matches the assignment in the Siemens IDE.
- If the communication interface in the IND700 was changed from another type (i.e. EtherNet/IP), a restart of the IND700 must be performed.
- Contact METTLER TOLEDO service for further assistance.

3.8. PROFINET Sample Code

For documentation describing the integration of the IND700 with a PROFINET Industrial Network, together with code samples, visit www.mt.com/IND700-downloads, or scan the QR code:



The compressed file containing the sample code includes a document explaining its use.

4 EtherNet/IP

4.1. Preface

There are minor differences in the Floating Point polled data between the terminals, so care should be taken to use the appropriate Industrial Network data format guide for each terminal family. This chapter describes connections and setup that are specific to the EtherNet/IP interface for IND700.

4.2. EtherNet/IP Option Board

Figure 4-1 shows an EtherNet/IP Option Board kit (part number 30785339) for the IND700. The board's part number is 30785339.



Figure 4-1: EtherNet/IP Option Board Kit

4.3. Overview

EtherNet/IP, short for "EtherNet Industrial Protocol," is an open industrial networking standard that takes advantage of commercial, off-the-shelf EtherNet communication chips and physical media. This networking standard supports both implicit messaging (real-time I/O messaging) and explicit messaging (message exchange). The protocol is supported by the Open DeviceNet Vendor Association (ODVA).

EtherNet/IP utilizes commercial, off-the-shelf EtherNet hardware (for example, switches and routers) and is fully compatible with the Ethernet TCP/IP protocol suite. It uses the proven Control and Information Protocol (CIP) to provide control, configuration, and data collection capability.

The kit enables the IND700 terminal to communicate to Programmable Logic Controllers (Industrial Networks) through direct connection to the EtherNet/IP network at either 10 or 100 MBPS speed. The kit consists of a backplane-compatible I/O module, mounting hardware, and a ferrite. Software to implement the data exchange resides in the IND700 terminal.

4.4. EtherNet/IP Characteristics

The EtherNet/IP Kit option has the following features:

- User-programmable IP addressing.
- Capability for bi-directional discrete mode communications (Class 1 Messaging) of weight or display increments, status, and control data between the Industrial Network and the IND700.

4.4.1. Update Rates

The update rate for the EtherNet/IP interface varies depending on the terminal's configuration:

- HSALC 1 scale: 64 Hz
- HSALC 2 scales: 49 Hz
- POWERCELL 4 scales 14 Hz

4.4.2. Definition of Terms

Some terms (such as Target) used by the EtherNet/IP Industrial Network application have a different sense from their use by the IND700 terminal. Table 4-1 provides definitions specific to EtherNet/IP.

Table 4-1: EtherNet/IP Definition of Terms

Term	Definition
Adapter Class	An Adapter Class product emulates functions provided by traditional rack-adapter products. This type of node exchanges real-time I/O data with a Scanner Class product. It does not initiate connections on its own.
Class 1 Messaging	In EtherNet/IP communication protocol scheduled (cyclic, or implicit) message transfer between an Industrial Network and CIP Adapter Class device. Class 1 messages repeat on a continuous and deterministic basis.
Class 3 Messaging	In EtherNet/IP communication protocol unscheduled (acyclic, or explicit) message transfer between an Industrial Network and CIP Adapter Class device. This is used by the IND700 for explicit messaging of specific data that has been requested for a one-time use, such as alarms, configuration data, or special commands such as for material transfer.
Connected Messaging	A connection is a relationship between two or more application objects on different nodes. The connection establishes a virtual circuit between end points for transfer of data. Node resources are reserved in advance of data transfer and are dedicated and always available. Connected messaging reduces data handling of messages in the node. Connected messages can be Implicit or Explicit. See also Unconnected Messaging.

Term	Definition
Connection Originator	Source for I/O connection or message requests. Initiates an I/O connection or explicit message connection.
Explicit Messaging	Explicit Messages (also known as Discrete, or Class 3, or Acyclic messages) can be sent as a connected or unconnected message. CIP defines an Explicit Messaging protocol that states the meaning of the message. This messaging protocol is contained in the message data. Explicit Messages provide a one-time transport of a data item. Explicit Messaging provide the means by which typical request/response oriented functions are performed (e.g. module configuration). These messages are typically point-to-point.
Implicit Messaging	Implicit Messages (also known as Class 1, or cyclic messages) are exchanged across I/O Connections with an associated Connection ID. The Connection ID defines the meaning of the data and establishes the regular/repeated transport rate and the transport class. No messaging protocol is contained within the message data as with Explicit Messaging. Implicit Messages can be point-to-point or multicast and are used to transmit application-specific I/O data. This term is used interchangeably with the term I/O Messaging.
I/O Client	Function that uses the I/O messaging services of another (I/O Server) device to perform a task. Initiates a request for an I/O message to the server module. The I/O Client is a Connection Originator.
I/O Messaging	Used interchangeably with the term Implicit Messaging.
I/O Server	Function that provides I/O messaging services to another (I/O Client) device. Responds to a request from the I/O Client. I/O Server is the target of the connection request.
Message Client	Function that uses the Explicit messaging services of another (Message Server) device to perform a task. Initiates an Explicit message request to the server device.
Message Server	Function that provides Explicit messaging services to another (Message Client) device. Responds to an Explicit message request from the Message Client.
Scanner Class	A Scanner Class product exchanges real-time I/O data with Adapter Class and Scanner Class products. This type of node can respond to connection requests and can also initiate connections on its own.
Target	Destination for I/O connection or message requests. Can only respond to a request, cannot initiate an I/O connection or message.
Unconnected Messaging	Provides a means for a node to send message requests without establishing a connection prior to data transfer. More overhead is contained within each message and the message is not guaranteed destination node resources. Unconnected Messaging is used for non-periodic requests (e.g. network "Who" function). Explicit messages only. See also Connected Messaging.

4.4.3. Communications

The IND700 terminal utilizes component parts to ensure complete compatibility with the EtherNet/IP network. An IND700 terminal is recognized as a generic EtherNet/IP device by the Industrial Network.

Each EtherNet/IP option connected to the EtherNet/IP network represents a physical IP Address. The connection is made via a RJ-45 connector on the option card (see Figure 4-1).

The wiring between the Industrial Network and the IND700 EtherNet/IP connection uses EtherNet twisted pair cable. The cable installation procedures and specification including distance and termination requirements are the same as recommended by Allen-Bradley for the EtherNet/IP network.

The IND700 only uses Class 1 cyclic data for discrete. Explicit message blocks may be connected or unconnected; the Industrial Network programmer must make this choice.

4.4.4. IP Address

Each EtherNet/IP interface represents one physical IP Address. This address is chosen by the system designer and then programmed into the IND700 terminal and Industrial Network. The IND700 terminal's address is programmed at **Communication > Industrial Network > Option Board** in the terminal's setup menus. The IND700 IP Address entry must be unique for each IND700 terminal and must not conflict with other devices on the network.

4.5. Software Setup

When the IND700 terminal detects the presence of an EtherNet/IP Option Board kit, the EtherNet/IP parameters are enabled in the **Option Board** menu at **Communication > Industrial Network**. Figure 4-2 shows a typical Industrial Network Menu screen in setup.

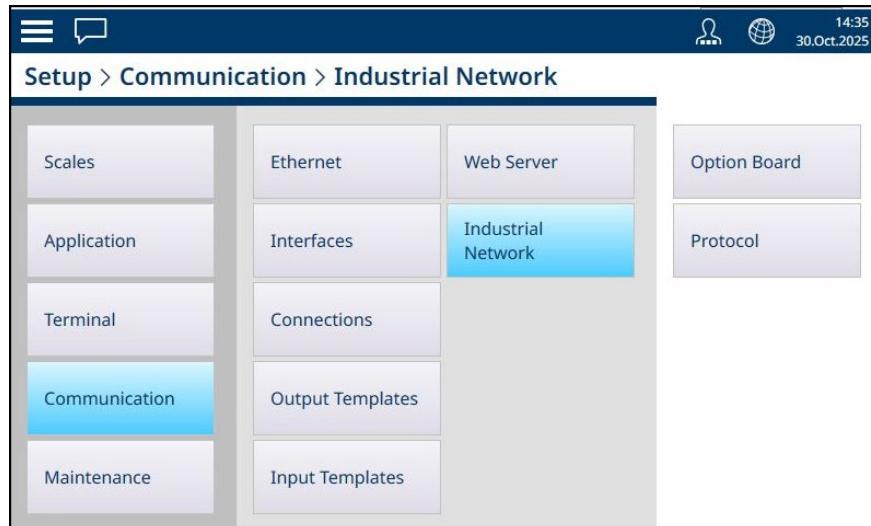


Figure 4-2: Industrial Network Setup Menus

The **Option Board** item is used to configure the installed Option Board.

The **Protocol** menu is used to configure the **SAI** interface. Refer to Chapter 5, **Protocol Configuration** for details of this page.

4.5.1. Option Board Setup Menu



Figure 4-3: EtherNet/IP Setup Menu

The EtherNet/IP interface IP address must be set by entering values manually in the **IP Address**, **Subnet Mask** and **Gateway Address** fields.

For firmware update information, refer to Chapter 6, **Firmware Update**.

4.6. Troubleshooting

- Note: Some Industrial Networks, such as Micrologix and SLC Industrial Networks cannot exchange cyclic (class 1) messages. If these Industrial Networks are used, they must use Explicit (class 3) Messaging to communicate with the IND700.

If the IND700 does not communicate with Industrial Network, do the following:

- Check physical wiring and network connections.
- Confirm that the IND700's Device Description file has been loaded into the Industrial Network's network configuration.
- Confirm that the IP Address, Gateway and Subnet mask configuration have been assigned in the Industrial Network.
- Check for IP Address conflicts. Use a Ping command from a PC to verify addresses.
- Confirm that the IND700's Setup protocol configuration matches the assignment in Rockwell's IDE.
- If the communication interface in the IND700 was changed from another type (i.e. PROFINET), a restart of the IND700 must be performed.

- Contact METTLER TOLEDO service for further assistance.

4.7. EtherNet/IP Sample Code

For documentation describing the integration of the IND700 with an EtherNet/IP Industrial Network, together with code samples, visit www.mt.com/IND700-downloads, or scan the QR code:



The compressed file containing the sample code includes a document explaining its use.

5 Protocol Configuration

5.1. SAI

5.1.1. Overview

- Note that not all SAI commands are available for use in the IND700.

The Standard Automation Interface (SAI) is a protocol designed to exchange data between METTLER TOLEDO devices and automation systems. The goals of this standard are to provide:

1. A common data layout for load cells, terminals, and other devices regardless of the physical interface or automation network used,
2. A single protocol for the convenience of automation integrators, control system programmers, and our automation customers, and
3. A tiered approach to create a flexible protocol for diverse devices.

5.1.2. Protocol Setup

The Industrial Network Protocol configuration is accessed in setup at **Communication > Industrial Network > Protocol**.

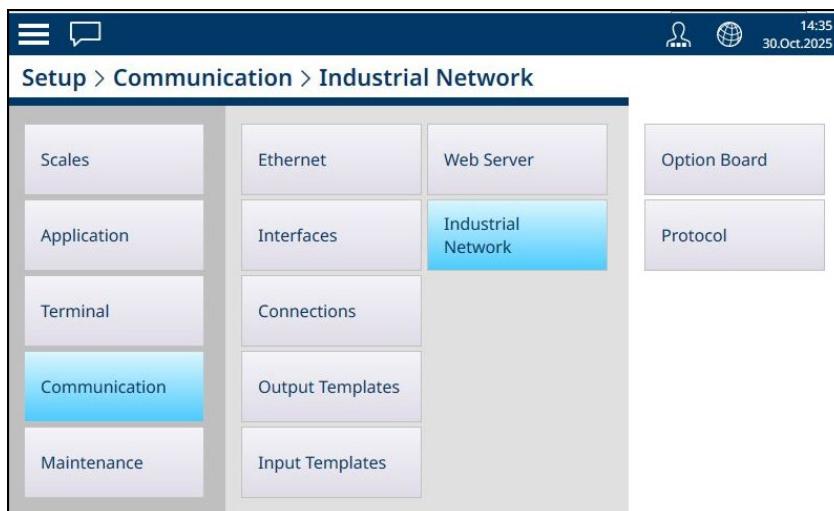


Figure 5-1: Communication Menu Showing Industrial Network and Protocol

Touch the **Protocol** menu item to view the protocol configuration page.

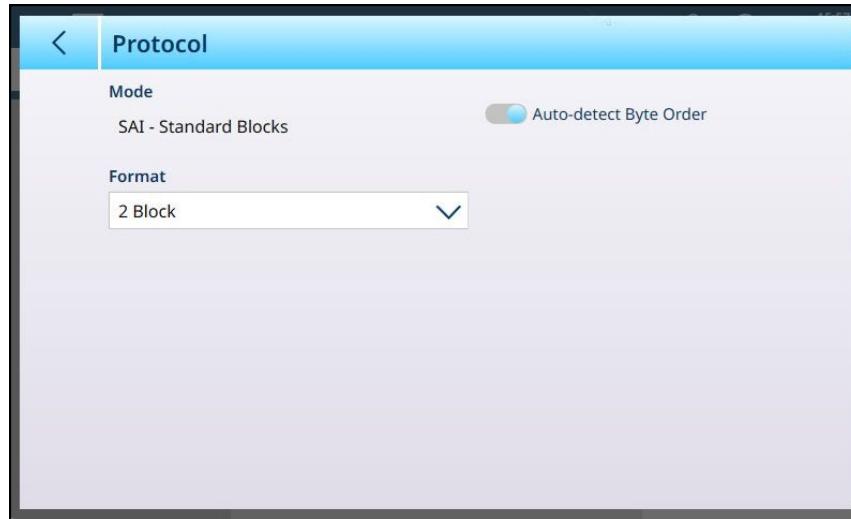


Figure 5-2: Protocol Configuration – 2-Block Selected

Mode is fixed as **SAI – Standard Blocks**. By default, **Auto-detect Byte Order** is **enabled**, and the **2 Block Format** selected.

Touch the **Format** field to view a drop-down list of options. **2 Block** and **8 Block** are available.

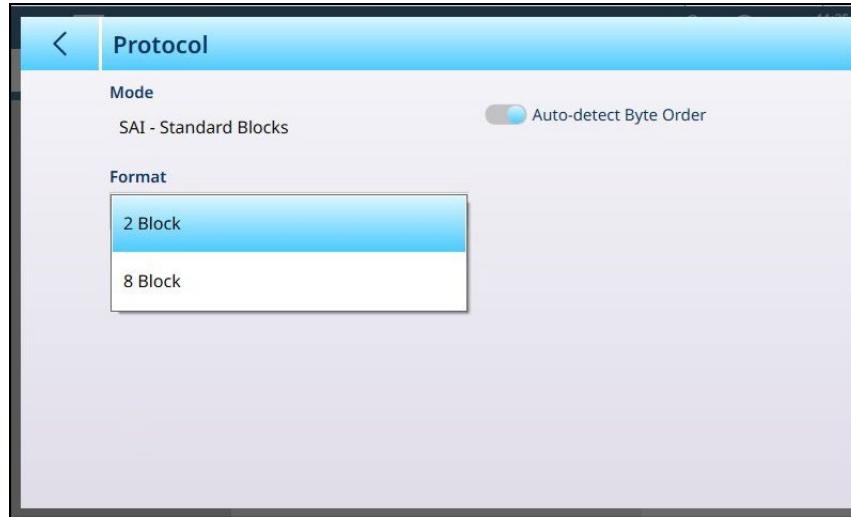


Figure 5-3: Format Options

When **Auto-detect Byte Order** is **disabled** by touching its toggle, a **Byte Order** item appears. Touch the **Byte Order** field to display a drop-down list of options.

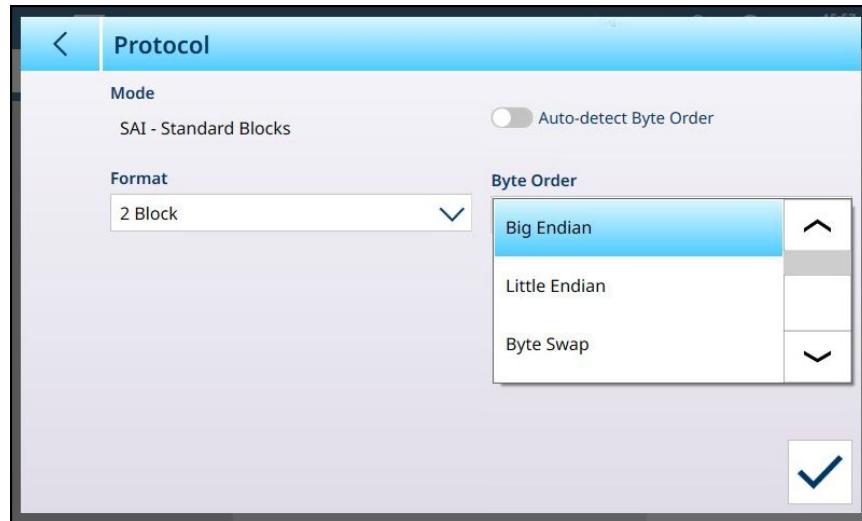


Figure 5-4: Byte Order Options

Whichever **Format** is selected, the **Byte Order** options are:

- Big Endian
- Little Endian
- Byte Swap
- Word Swap

For further details on protocol settings, refer to the **Standard Automatic Interface User's Guide**, 30588288 and the **SAI Reference for Transmitters and Terminals**, 30587511.

6 Option Board Firmware Download

6.1. Overview

Each IND700 Industrial Network option board runs firmware specific to the option type – PROFIBUS, PROFINET or EtherNet/IP. Firmware of option boards can be updated or switched (only for Ethernet-based protocols in setup at **Communication >Industrial Network > Option Board > Option Board Configuration**).

6.2. Firmware Download Procedure

In setup, access **Communication > Industrial Network > Option Board**. Note that this page is only available when an Industrial Network option board is installed.

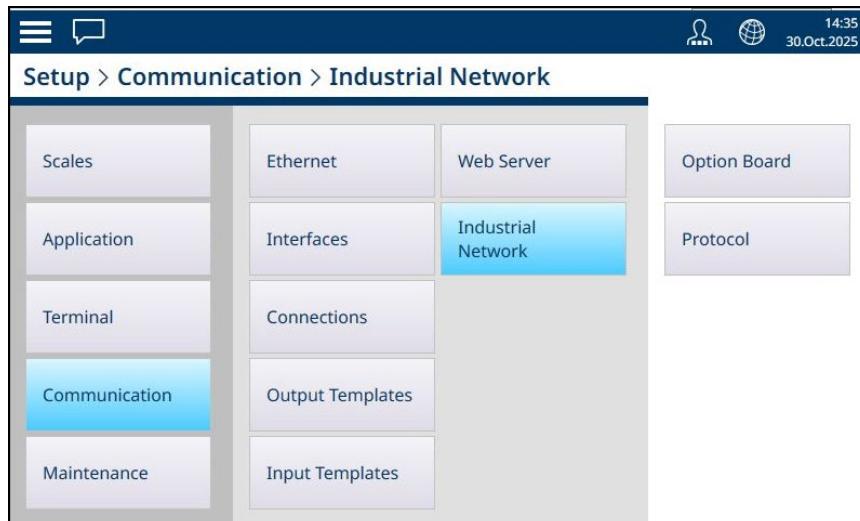


Figure 6-1: Communication Menus

Touch **Option Board** to open the Option Board page. In this example, an EtherNet/IP option board is installed in the terminal.



Figure 6-2: Option Board Page

Touch the setup icon . The **Option Board Configuration** screen will display.

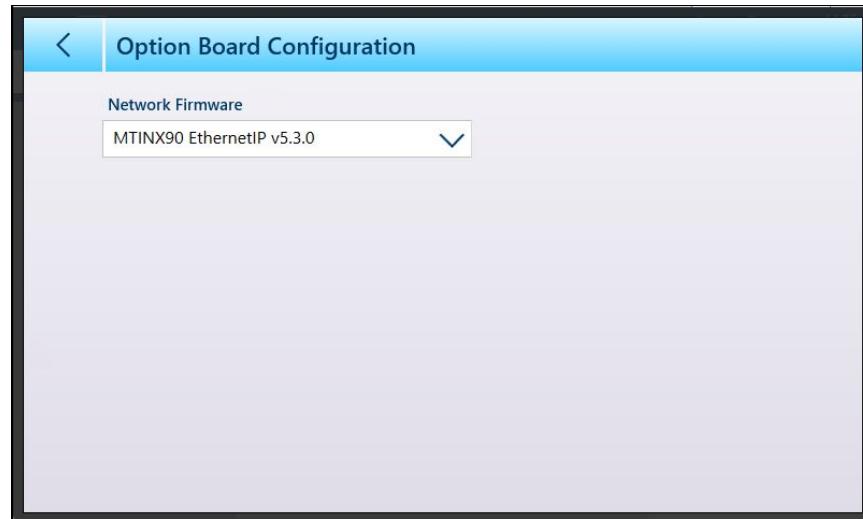


Figure 6-3: Option Board Configuration Screen

Touch the **New Network Firmware** field do see a drop-down list of available firmware.

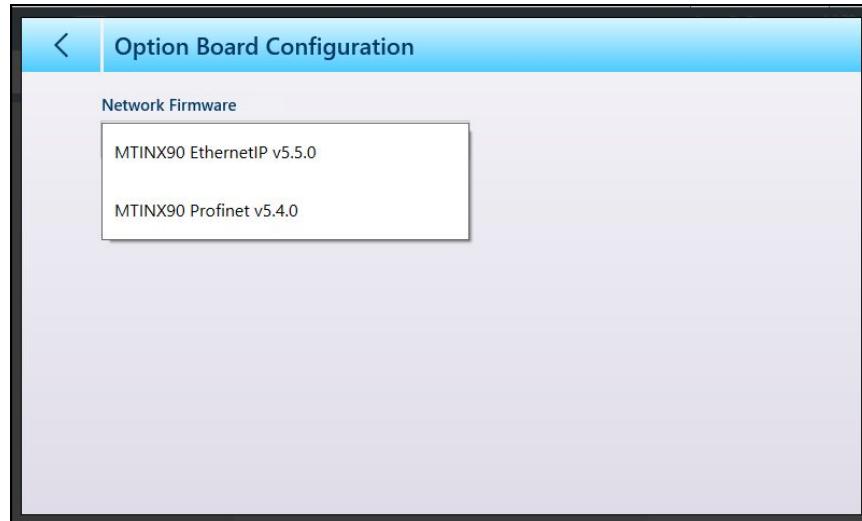


Figure 6-4: List of Available Firmware Downloads

Touch to select the appropriate firmware – in this case, the top choice. A **RUN** ➤ button will appear.

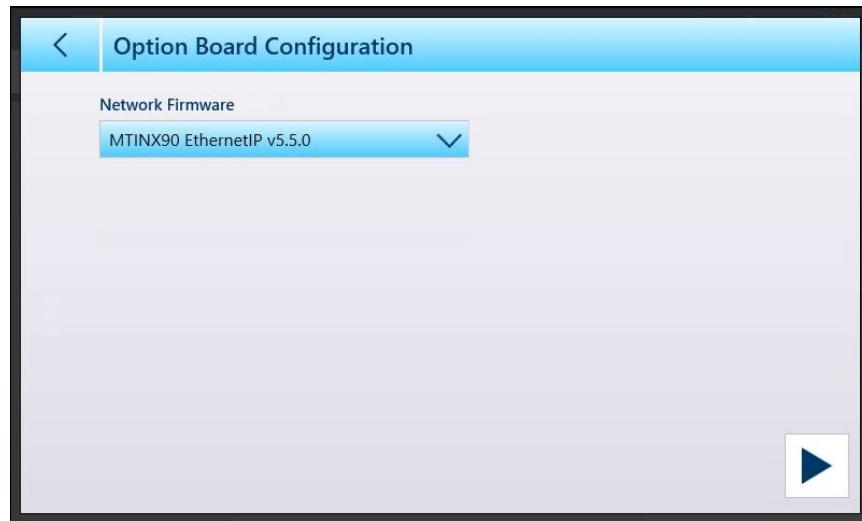


Figure 6-5: Firmware Download Selected

Touch RUN to download and install the update. A **Firmware Download** pop-up will appear.

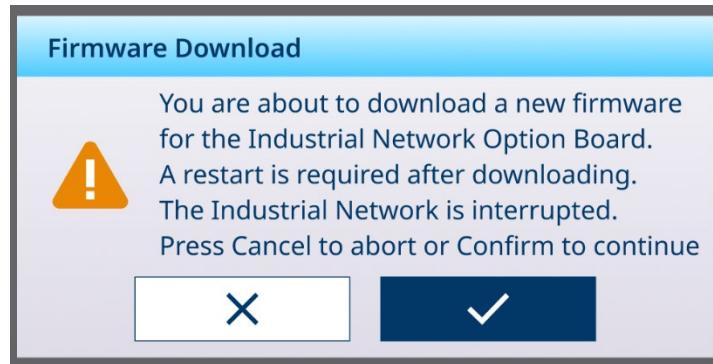


Figure 6-6: Firmware Download Information Pop-Up

Select the check mark to perform the update, or X to cancel. If the check mark is selected, a progress pop-up will display.



Figure 6-7: Firmware Download Progress Indicator

Once the firmware has been downloaded, a screen will confirm either the success or failure of the operation.



Figure 6-8: Download Success Notification



Figure 6-9: Download Failure Notification

If the download has succeeded, either touch X to abort the update, or the check mark to continue. When the check mark is touched, the terminal will reboot with the selected Industrial Network type enabled or, if it was already enabled, updated.

METTLER TOLEDO Service

To protect your product's future:

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use according to these instructions and regular calibration and maintenance by our factory-trained service team ensure dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget.

We invite you to register your product at www.mt.com/productregistration so we can contact you about enhancements, updates and important notifications concerning your product.

www.mt.com/IND700

For more information

Mettler-ToledoGmbH
Im Langacher 44
8606 Greifensee, SWITZERLAND

© 2025 Mettler-Toledo, LLC
30753886 Rev. B, 12/2025



30753886