METTLER TOLEDO

IND130

Terminal

Technical/User Manual

A17153100A
(04/05).00
www.mt.com/support

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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 own expense.

METTLER TOLEDO

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Model/Type: IND130

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in combination with a weighing platform or load cells produced by Mettler-Toledo is in conformity with the following directives and standards.

Council directive on the harmonization of the laws of the Member states:	**standards:**	**Certificate number (if applicable)**
relating to non-automatic weighing instruments (90/384/EEC) amended by directive (93/68/EEC)	Article 1.2.b	
relating to electromagnetic compatibility (89/336/EEC) amended by directive (93/68/EEC; 92/31/EEC)	EN 55022, B	
relating to electrical equipment designed for use within certain voltage limits (73/23/EEC amended by directive (93/68/EEC)	EN 60950	

Worthington, Ohio USA, January, 2005 **Mettler-Toledo, Inc.**

Darrell Flocken, Manager - Weights & Measures
Office of Weights and Measures

Original issue: January, 2005

According to EN 45014

INTRODUCTION

This publication is provided solely as a guide for individuals who have received Technical Training in servicing the METTLER TOLEDO product.

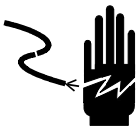
For information, locate the closest authorized METTLER TOLEDO representative at the METTLER TOLEDO website
www.mt.com

This manual correctly describes the operation and functionality of the IND130 Terminal containing software versions as follows:

Model	Software Number	Revision	Date
IND130	170338R	3.0	02/05

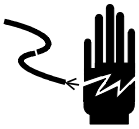
PRECAUTIONS

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



WARNING!

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, CLEANING, OR SERVICING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.



WARNING!

DO NOT APPLY POWER TO THE IND130 TERMINAL UNTIL THE EXTERNAL WIRING AND THE INSTALLATION OF ALL COMPONENTS HAS BEEN COMPLETED.

CAUTION

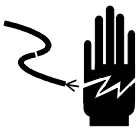
BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION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

CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

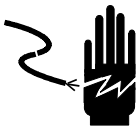
WARNING!

THE IND130 TERMINAL IS NOT INTRINSICALLY SAFE! DO NOT USE WITHIN AREAS CLASSIFIED AS HAZARDOUS DIVISION 1,2 OR ZONE 0,1or2 BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.



WARNING!

IF THIS DEVICE IS USED IN AN AUTOMATIC OR MANUAL FILLING CYCLE, ALL USERS MUST PROVIDE A HARD-WIRED EMERGENCY STOP CIRCUIT OUTSIDE THE DEVICE CIRCUITRY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

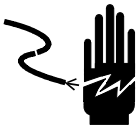


WARNING!

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!

PERMIT ONLY QUALIFIED PERSONNEL TO SERVICE THE IND130 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!

OUTPUTS ARE ALWAYS ACTIVE. DISABLE THE CONNECTED DEVICE(S) WHILE PERFORMING TERMINAL MAINTENANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

Contents

Chapter 1.0

Introduction

This chapter covers

- Overview
- Physical Dimensions
- Specifications
- Operating Environment
- Standards Compliance

Thank you for purchasing a METTLER TOLEDO® IND130 Terminal. The IND130 combines simple operation with flexibility to enable use with a wide range of analog load cell scales while providing fast, digitally filtered responses to changes in weight.

This manual provides information about the IND130 Terminal's functions, configuration and programming, service and maintenance, installation, and connections. For further information about installation procedures, refer to the *IND130 Terminal Installation Guide*.

Overview

The IND130 Terminal is a high-performance basic capability weighing instrument with a continuous RS-232 serial data output or data exchange with Allen-Bradley RIO or PROFIBUS programmable logic control (PLC) interfaces.

A configuration tool software program (PC Toolbox) is provided with the IND130 and is used to configure, calibrate, and test the terminal. The configuration tool enables users to set up and calibrate the terminal features that affect weighing operation. In order to calibrate the terminal with the configuration tool, IND130 toolbox software must be installed on a PC. The IND130 Terminal is then connected to the PC by an RS-232 serial data cable at a COM1 serial port.

In addition, the PC may be used as a weight display when not in calibration mode.

The IND130 Terminal is available with two enclosure styles:

- DIN Rail Mount
- Harsh Environment

Six IND130 Terminal versions are available from the factory listed in Table 1-1.

Table 1-1: IND130 Terminal Versions

Order Number	Enclosure	PLC Interface
IND13011	DIN Rail Mount	PROFIBUS
IND13012		Allen-Bradley RIO
IND13013		Serial only
IND13021	Harsh Environment	PROFIBUS
IND13022		Allen-Bradley RIO
IND13023		Serial only

DIN Rail Mount Enclosure

The DIN rail mount version of the IND130 Terminal includes the following hardware features:

- Plastic enclosure
- Visible LEDs for indication of setpoint, zero tolerance, error reporting and status (see Fig.1-1)
- Snap in mounting to a 35 mm steel top hat DIN rail.

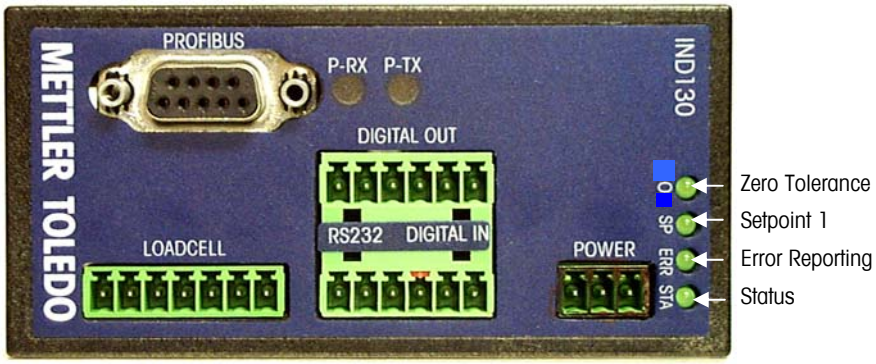


Figure 1-1: LED Indicators (Profibus model shown)

Harsh Environment Enclosure

The Harsh Environment version of the IND130 Terminal includes the following hardware features:

- Protective stainless steel enclosure UL tested to IP65 requirements.
- Summing board for up to four analog load cells
- Easily mounted to a wall or other mounting surface

IND130 Features

Both Harsh Environment & DIN Rail Mount versions include the following features:

Hardware Features

- Isolated DC power from an optional external 24 VDC Class 2 supply
- Removable screw terminal wiring connectors
- Zero and tare weight power loss protection
- One optically isolated discrete input; two optically isolated open collector outputs
- Serial port (RS-232)
- Standard analog load cell support for up to four 350-ohm cells
- Factory configured direct PLC connectivity to
  - Allen-Bradley RIO
  - PROFIBUS

Software Features

- Scale functions
  - CalFREE™ calibration without test weights
  - 10,000 d (divisions) display resolution
  - Motion detection and indication
- TraxDSP™ vibration rejection
  - Serial data functions
  - Continuous data output
  - Serial command input
- Operator interface via serial port to the configuration tool
  - Consistent and intuitive operator interaction
  - Program block setup menu
  - Save/Load of configuration data
- Memory Functions
  - Storage of zero and tare values during power-loss conditions
  - Storage of one setpoint value

- Toolbox information button displays
  - Port speed status
  - Toolbox version
  - Installed main board
  - IND130 software version
  - Option card installed
  - Switch status

Allen-Bradley RIO Version

The Allen-Bradley (A-B) RIO version consists of the IND130 with RIO interface with software that resides in the unit to implement the data exchange. This version supports bi-directional communications using the Discrete Data Transfer mode.

The IND130 Terminal initiates a communication exchange with the PLC at every A-to-D weight update utilizing the Allen-Bradley Discrete Data Transfer protocol. This weight-synchronous communications is a high-speed, real-time message interface between the IND130 Terminal and PLC for process control.

- Refer to the Allen-Bradley documentation or Allen-Bradley directly for questions related to the A-B RIO network such as cable length, number of nodes, and PLC model compatibility.

PROFIBUS Version

The IND130 Terminal communicates to a PROFIBUS L2-DP master according to DIN 19 245. The PROFIBUS option consists of a module and software that resides in the IND130 Terminal to implement the data exchange.

- Refer to the PROFIBUS documentation or PROFIBUS International directly for questions related to the PROFIBUS module, such as cable length, number of nodes, and PLC model compatibility.

Physical Dimensions

The IND130 Terminal Harsh Environment version is shown in Figure 1-2.

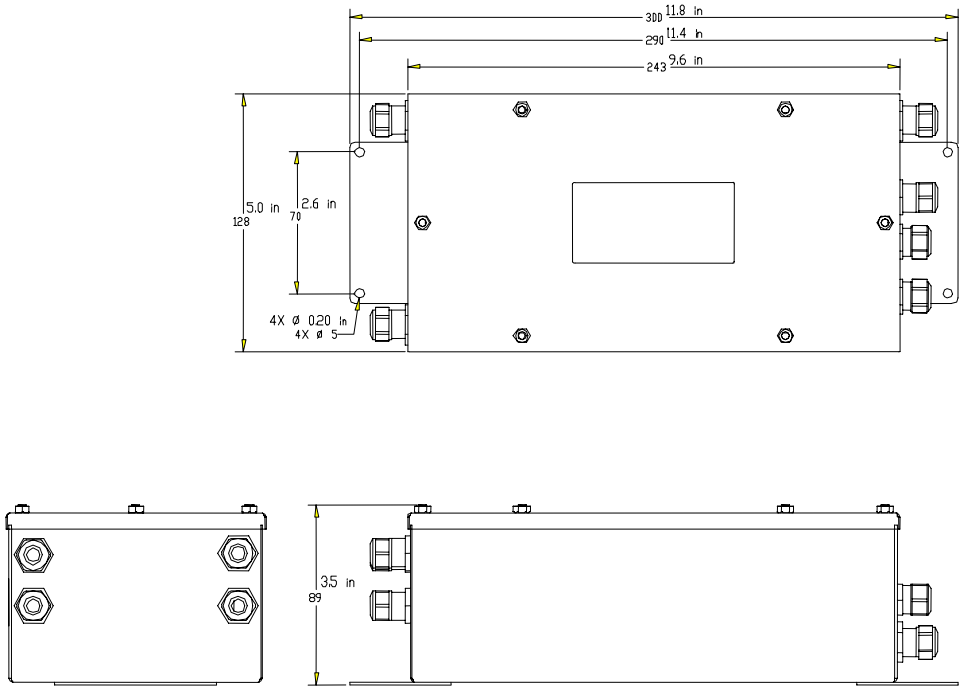


Figure 1-2: IND130 Terminal Harsh Environment Version

The IND130 Terminal DIN Rail Mount version is shown in Figure 1-3.

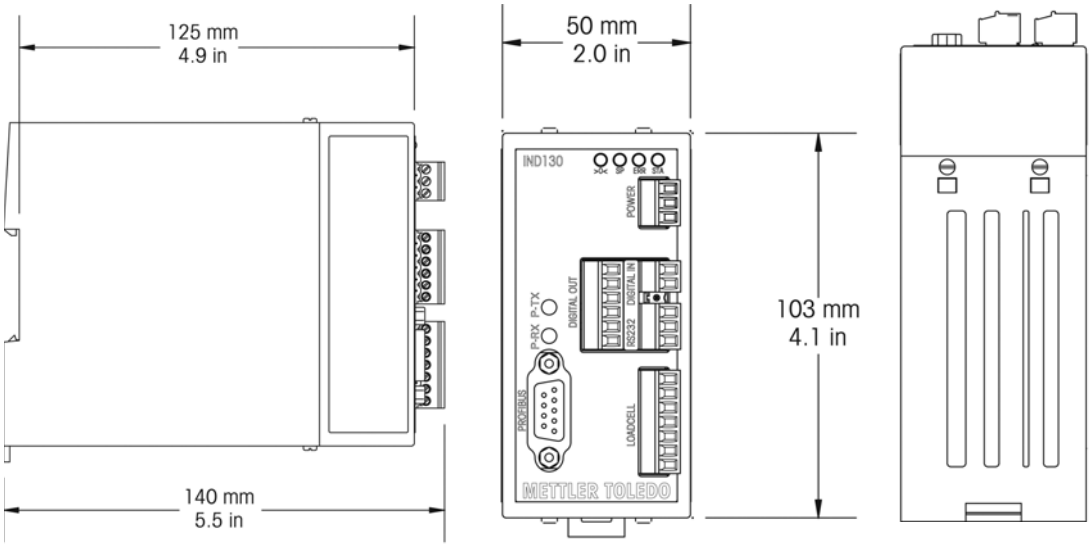


Figure 1-3: IND130 Terminal DIN Rail Mount Version

Specifications

Table 1-2: IND130 Terminal Specifications Table

Specification	DIN Rail Version	Harsh Enclosure Version
W × D × H	50 × 140 × 103 mm (2.0 × 5.5 × 4.1 in.)	300 × 128 × 89 mm (11.8 × 5.0 × 3.5 in.)
Enclosure	Plastic; Designed to meet IP20 requirements	Stainless steel; Dust-tight, splash-proof. UL approved for IP65 environments
Power	External 24 VDC 17 W listed Class 2 or Certified "**L**imited **P**ower **S**ource" power supply	
Operating Environment	–10° C to 40° C (14° F to 104° F) 10 to 90% RH, non-condensing	
Storage Environment	–40° C to 60° C (–40° F to 140° F) 10 to 90% RH, non-condensing	
Scale Performance	1,000,000 counts internal resolution Up to 10,000 counts external resolution	
Analog Scale Interface	Up to four 350 ohm analog load cells 5 volts excitation	
A/D Update Rate	>300 Hz Internal; 20 Hz External (Serial and PLC I/F)	
Calibration	Test weight calibration METTLER TOLEDO CalFREE operation (when used with qualified J-Box PCB)	
Filtering	METTLER TOLEDO exclusive TraxDSP™	
Discrete Inputs	One optically isolated, positive true input for remote zero; Vmax = 30V; Imax = 10mA	
Discrete Outputs	Two optically isolated, negative true open collector outputs for zero tolerance and setpoint status; Vmax = 30V; Imax = 30mA	
Serial Interface	RS-232 supporting METTLER TOLEDO continuous output format and C,T, Z inputs	
PLC Interfaces	Allen-Bradley Remote I/O, discrete mode Or PROFIBUS L2DP	
Optional Interface	METTLER TOLEDO DeviceNET Module (requires connection to serial port)	
Approvals	UL, cUL, CE marked	

Controller PCB

The IND130 Terminal's COM1 serial port is an RS-232 transmission port. It also supports receipt of a single ASCII "C", "T" or "Z" character for clear**, tare**, or **zero.**

Connections to the terminal PCB are made using screw terminal strips. The wire size range for these terminal strips is 16 to 22 AWG.

Standards Compliance

- **UL and cUL** listing
- Conducted and radiated emissions
- **CE** European declaration (see certification in front portion of this manual)

UL and cUL Listing

The IND130 has been tested and complies with UL 60950-1-2003 1st edition. It is designed to CSA standard C22.2 No 60950-1-03 1st edition, Office Machines and carries UL and cUL labels.

Conducted and Radiated Emissions

The IND130 Terminal meets or exceeds FCC docket 80-284 for conducted and radiated emissions requirements as a Class A digital device.

Radio Frequency Interference (RFI) Susceptibility

The IND130 Terminal meets U.S., Canadian, and EC requirements for RFI susceptibility as listed in Table 1-3, with a maximum of one display increment of change when calibrated for recommended builds up to 6000e.

Table 1-3: IND130 Terminal RFI Susceptibility

RFI Susceptibility		
Radio Reference Frequency	U.S.A./ Canadian Field Strength	EC Field Strength
27 MHz	3 volts/meter	N/A
169 MHz	3 volts/meter	N/A
464 MHz	3 volts/meter	N/A
27-1000 MHz	N/A	10 volts/meter

METTLER TOLEDO

For your notes

Chapter 2.0

Configuration and Calibration

This chapter covers

- Configuration Tool
- Configuration
- Calibration

The IND130 Terminal connects to a PC to enable straightforward, efficient configuration, calibration, and testing of the terminal. PC Toolbox is the configuration tool software that enables terminal configuration and programming by a PC. The configuration tool program is provided on a CD-ROM with the IND130 Terminal.

Configuration Tool

The configuration tool is Windows-driven and includes a setup wizard that guides the user through the installation steps. In addition, the PC may be used as a weight display when not in calibration mode. The minimum PC system requirements are:

- Windows 2000 or Windows XP operating system
- Minimum monitor resolution of 800 x 600 with 16 bit color depth
- COM1 serial port
- A serial cable for the COM1 port for RS-232 signals RXD (receive), TXD (transmit), and GND (ground) to the IND130

Software Installation

To install the configuration tool software:

1. Close all applications that are running on the PC
2. Insert the CD-ROM that contains the PC Toolbox software in the PC's CD drive. The installation menu will display (Figure 2-1). This menu provides links to the *IND130 Terminal Technical/User Manual*, the METTLER TOLEDO website, and a file for installing the Adobe Acrobat Reader.

If the installation menu does not display, use Window's Explorer to open the Doccd/Maestro.exe file.

Figure 2-1: Configuration Tool Installation Menu

3. Click the **Install PC Toolbox** button. If .NET Framework is not detected, the installation of .NET Framework begins. A window displays a message that .NET Framework installation is occurring. When complete, Setup Wizard is displayed.

The installation of .NET Framework can take five minutes or more.

4. Click the Next button located in the lower-right corner of the Setup Wizard window. The next window for installing supporting tools is displayed.
5. The Flash Magic tool can be installed by clicking the checkbox next to Install Flash Magic Tool and then clicking the Next button. The Flash Magic Tool enables reprogramming of the microchip in the IND130 Terminal. **To prevent inadvertent reprogramming of the IND130 Terminal's microchip, do NOT install Flash Magic. Instead, leave the checkbox next to Install Flash Magic Tool blank, and click only the Next button.** The next window for selecting an installation folder is displayed.
6. The default installation folder, c:/Program Files/Mettler Toledo/IND130 Toolbox displays as the selected installation folder. Click the Next button. The window for confirming installation is displayed.
7. To complete the installation, click the Next button. The installation proceeds and completes automatically.

Startup

To open the configuration tool, click on: **Start>Programs>Mettler Toledo>IND130 Toolbox**. The program launches in **disconnected (offline)** mode with the default file open and default settings active. To change the settings from the default values, open or create a new configuration file (see the Configuration section).

Navigation

Use the menu bar, tool bar buttons, and menu tree (see Figure 2-2) to navigate within the configuration tool.

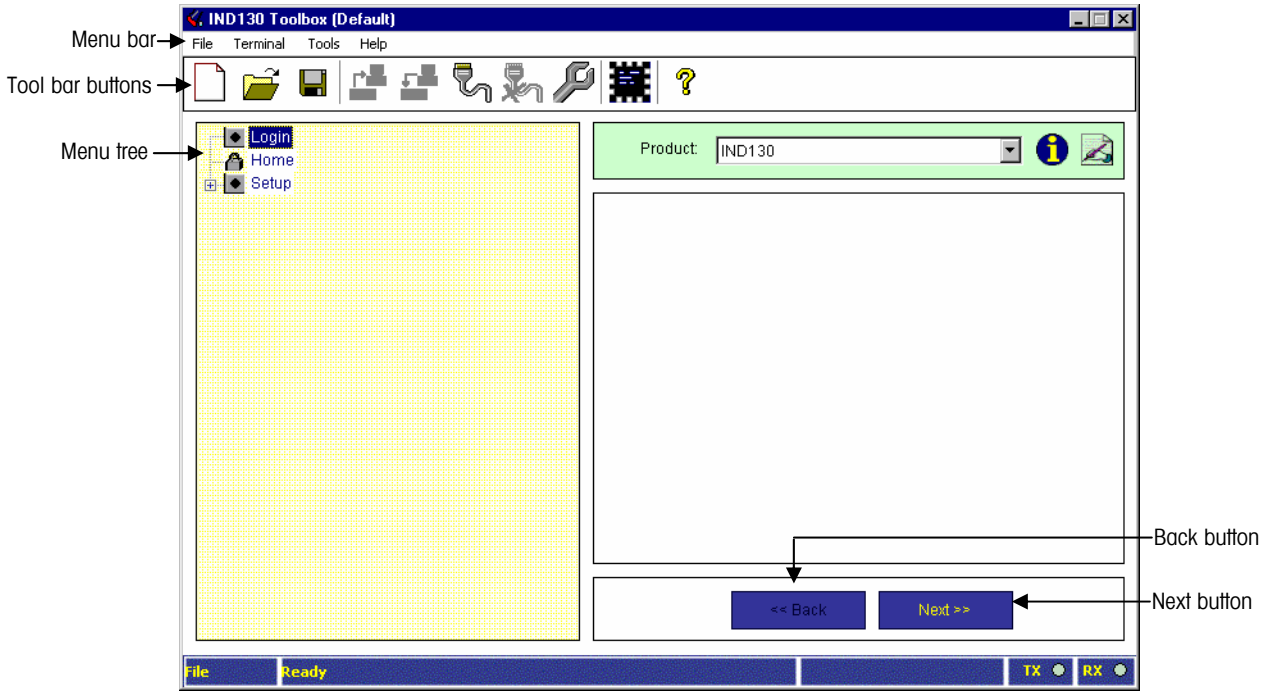


Figure 2-2: Configuration Tool Main Window

Menu Bar

The following functions are available on the menu bar:

- **File**
  - New—Enables the user to create a new configuration file for the IND130 Terminal
  - Open—Opens an existing configuration file for the IND130 Terminal
  - Save—Saves the configuration data in the currently open file
  - Save As—Saves the configuration data to a file name entered or selected bythe user (file format is Extensible Markup Language (XML), which cannot be changed)
  - Exit—Closes the configuration tool
- **Terminal**
  - Connect—Establishes the data connection between the IND130 Terminal and the configuration tool
  - Disconnect—Terminates the data connection between the IND130 Terminal and the configuration tool
  - **Read Data from Terminal**—Copies the configuration data from the IND130 Terminal into PC working buffer. This buffer can be later saved to a PC file.

  - **Write Data to Terminal**—Copies PC working buffer to the IND130 Terminal

- **Tools**
  - Options—There are no options implemented for the IND130
  - **PC Port Settings**—Enables the selection of a COM port on the PC. All other data shown is for informational purposes only and cannot be modified.
  - **Flash Magic**—Launches the Flash Magic application if it was installed during the Configuration tool installation procedures. See the Software Installation section for further information about Flash Magic.
- **Help**
  - **? Help**—Launches a help file for the configuration tool
  - **About**—Opens a window that provides information about the configuration tool and the IND130 Terminal (if connected)

Tool Bar Buttons

The tool bar buttons are short cuts for implementing menu bar functions including:


File>New


File>Open


File>Save


Terminal>Read Data from Terminal


Terminal>Write Data to Terminal


Terminal>Connect


Terminal>Disconnect


Tools>PC Port Settings


Tools>Flash Magic


Help>? Help


Product Information


Notes

Menu Tree

The menu tree includes the following main branches:

- **Login**—For use with future products.
- **Home**—Displays a virtual operator panel that enables live weight viewing when the IND130 Terminal is connected (see Figure 2-3). Click on Home to display current weight readings. Click on the Tare, Tare Clear, or Zero buttons to perform these functions from the virtual operator panel. The Home branch has no function when the terminal is disconnected.
- **Setup**—Contains the configuration navigation tree, which functions in connected or disconnected mode. The Next and Back buttons located near the lower-right corner of the window, a mouse pointing device, or the cursor keys can be used to navigate in the setup tree.

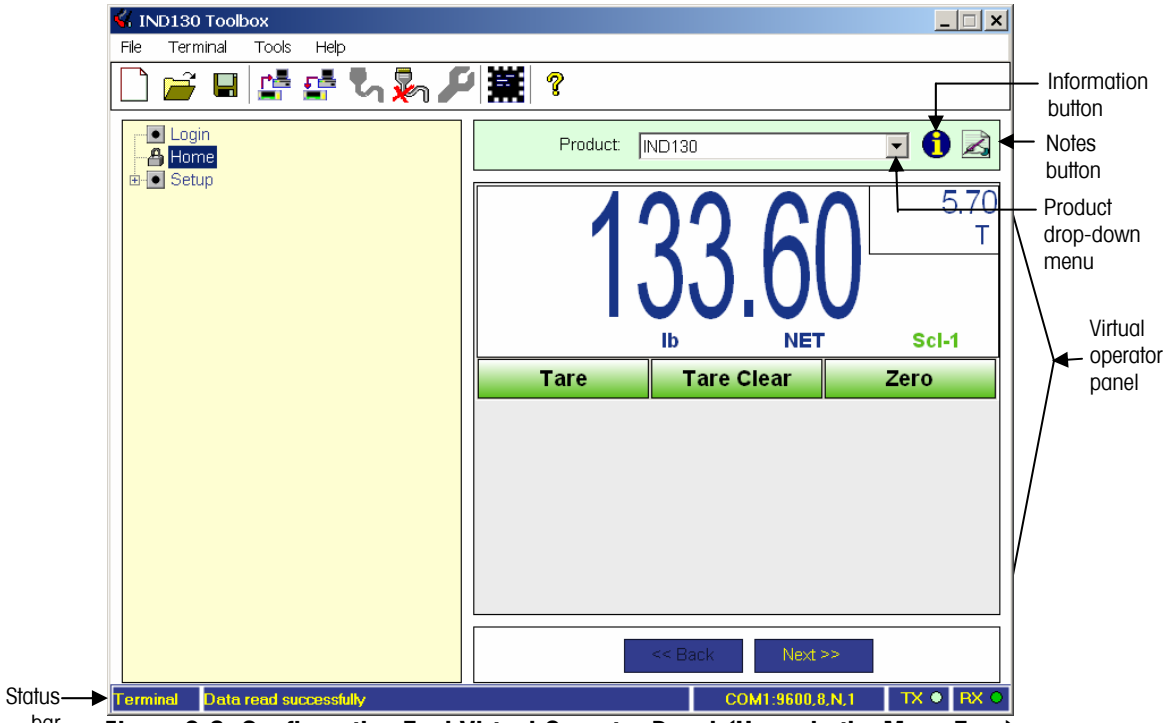


Figure 2-3: Configuration Tool Virtual Operator Panel (Home in the Menu Tree)

Other Configuration Tool Elements

Other configuration tool elements (see Figure 2-2 for locations) and their functions are as follows:

- **Product Drop-Down Menu**—Enables selection of the product to be configured. Version 1.0 of the PC Toolbox software only supports the IND130, so no other products are listed.
- **Product Information Button**—Opens a window that provides information about the configuration tool and the IND130 Terminal (if connected) or about the configuration tool only (if disconnected)

- **Notes Button**—Opens a text box for recording information about the IND130 Terminal for which the configuration file is being created (for example the terminal's location or serial number). This data is annotated to the configuration file when it is saved to PC file.

- **Status Bar**—Displays the state of the configuration tool (connected or disconnected) and status of the serial port. The TX (transmit) and RX (receive) lights are active in the status bar when a corresponding connection is active.

Connecting to the Terminal

The configuration tool functions in two modes:

- **Connected**—The mode of the configuration tool when it is actively communicating with an IND130 Terminal.
- **Disconnected**—The mode of the configuration tool when it is offline and not communicating with an IND130 Terminal.

IND130 Terminal and PC Connection

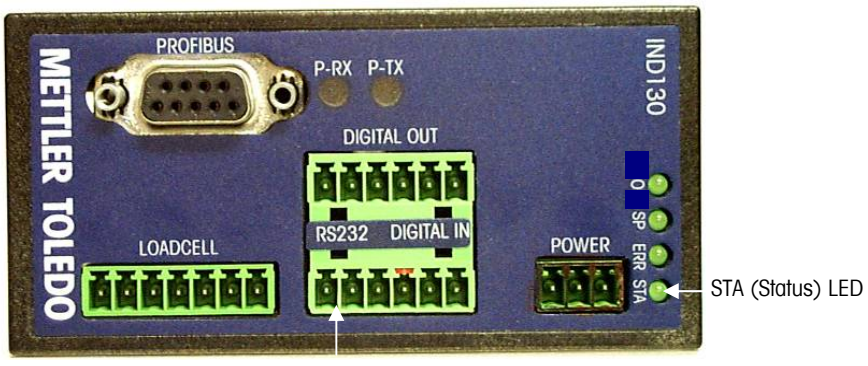
The configuration tool communicates with the IND130 Terminal by an RS-232 connection at 9600 baud, 8 data bits, 1 stop bit, and no parity. This port configuration is automatically established and cannot be altered by the user.

Connect the IND130 Terminal to a PC that has had the configuration tool installed as described in the Software Installation section. Connect the terminal as follows:

1. With the PC **OFF**, connect a serial data cable from the RS-232 connector on the terminal (see Figure 2-4) to the configured COM port on the PC. (Do **NOT** apply power to the IND130 terminal.)

If the COM port has been connected and power is applied to the terminal before or while the PC is booting, Windows will interpret the data from the terminal as serial mouse data and lock out the COM port on some computers. An error message displays if this situation occurs. When connecting the terminal, the power to the terminal, the serial data cable, or both should not be connected until after the PC has booted and is fully up and running.

Figure 2-4: IND130 Terminal



2. Turn on the PC. Wait until the PC has completed the booting process and Windows is fully up and running.
3. Apply power to the terminal. The four LEDs on the front panel will flash a quick test pattern upon power up. The terminal is in operating mode when the STA (Status) LED (see Figure 2-4) flashes in a slow steady manner.
4. Open the configuration tool by clicking on: **Start>Programs>Mettler Toledo>IND130 Toolbox**.
5. Click the Connect button  . The TX (transmit) and RX (receive) data indicators flash in the status bar at the lower-right corner of the configuration tool window. The lower-left status bar changes to "Terminal" to indicate that edits made while in connected mode will impact the connected IND130 Terminal.
6. A pop-up window displays with a reminder that the configuration data in the configuration tool memory might not match the configuration in the connected IND130 Terminal. The pop-up window asks "Read data from Terminal?". If the configuration data is already edited as desired on the PC, click "No". Otherwise, click "Yes" so that the PC memory and the target memory are synchronized.

Connection Errors

If terminal connection is unsuccessful, check for the following connection errors:

- Serial cable connected improperly or miswired
- Incorrect COM port selected on the PC Port Settings menu
- COM port connected and power applied to the terminal before the PC completes the booting process. **IMPORTANT! IND130 power must be off while the PC is booting.** IND130 Terminal switches incorrectly configured. Switch 2 (Factory Test) and Switches 3 and 4 (unused) must be OFF. See Appendix A, *Installation* for further information about switches.

After correcting any connection errors, the PC must be off and IND130 unplugged and/or disconnected from the COM port. Follow steps 1 through 6 (do **NOT** skip any steps) under Connecting the Terminal.

Connected Operation

While connected to and exchanging data with the IND130 Terminal, users can

- View live weight data using the virtual operator panel
- Calibrate the IND130 Terminal
- Change configuration settings
- Read configuration data from the terminal and save it to a PC file
- Write configuration data from a PC file to the terminal

Viewing Live Weight Data

Live weight data can be viewed on the virtual console display when the IND130 Terminal is connected to the PC. Click on Home in the menu tree to display current weight data (see Figure 2-3). Information shown on the virtual console display includes weighing units, weighing mode (gross or net), current tare value (T), and weight. While viewing live weight data, the user can also use the following buttons to perform the functions listed.

- **Tare**—Sets the tare value to the current weight on the load cell
- **Tare Clear**—Clears the current tare value
- **Zero**—Sets the zero position of the load cell

Calibrating the Terminal

To accommodate a wider variety of load cell types, the IND130 Terminal includes a jumper to select one of two possible gain settings. The gain settings enable a 2 mV/V or a 3 mV/V load cell to behave as though the outputs are identical**. The analog to digital (A/D) converter in the terminal is factory calibrated for both gain settings, which makes all IND130 Terminal devices interchangeable.**

To ensure proper internal calibration, the jumper setting on the PCB (shipped from the factory in the 3 mV/V setting) must match the Gain Jumper setting selected using the configuration tool. This setting is made using the configuration tool menu tree to select Setup>Scale>Capacity and Increment. See the Configuration section for more information about how to set the Gain Jumper setting.

For the best accuracy, calibrate the IND130 Terminal using certified test weights and the Capture Zero and Capture Span procedures that are available in the configuration tool menu tree. To access these procedures, select Setup>Scale>Calibration>Capture Zero and Setup>Scale>Calibration>Capture Span.

If calibration with test weights is inconvenient or impossible, use the METTLER TOLEDO CalFREE process, which enables calibration without test weights. CalFREE is a method of mathematically calculating calibration factors based on the A/D converter gain setting, the load cell gain, and the desired scale capacity and increment size. Best results are achieved when the load cell gain factor is known to a high degree of accuracy. After performing a CalFREE computation, an on-site zero calibration can be performed to remove any zero balance error.

Perform the CalFREE procedure by navigating in the calibration tool menu tree to Setup>Scale>Calibration>CalFREE.

See the Configuration section for more information about calibration procedures with and without test weights.

NOTE: If a load cell junction box is used with CalFREE, the box MUST NOT contain load cell trimming potentiometers. Any trimming pots in the load cell circuit will alter the individual load cell mv output preventing an accurate calibration.

Changing Configuration Settings

The IND130 configuration tool enables users to access and modify configuration settings. Save any configuration settings on the PC that will be needed in the future to a PC file before clicking on the Read data from Terminal button. Use the Setup section of the menu tree to navigate to the configuration parameters that are available for reconfiguration. Keep in mind that any configuration changes made while the IND130 Terminal is connected are updated in the local configuration tool memory as well as the configuration memory of the IND130 Terminal.

See the Configuration section for further information about configuration parameters and associated settings.

Reading Configuration Data From the Terminal

When operating in connected mode, click the Read data from Terminal button  to read the configuration data from the IND130 Terminal. The configuration settings will change to match those currently in effect on the terminal.

Writing Data To the Terminal

Use the Write data to Terminal button  to program the terminal with configuration data in a currently open or previously saved PC file. To write data to the terminal, open a previously created configuration file or establish the configuration settings desired in the currently open file. Click the Write data to Terminal button to change the terminal settings to match those in the open configuration file.

Disconnected Operation

When the configuration tool is in disconnected mode, the status bar displays "File" in the lower-left corner, which indicates that configuration settings made in this mode will only affect local PC files. The Connect button  in the tool bar at the top of the window is active (available) when the configuration tool is in disconnected mode, and the Disconnect button  is inactive (unavailable).

IND130 Terminal configuration files can be created or edited in disconnected mode and saved to a PC file. Configuration settings must be written to the IND130 Terminal in connected mode in order to implement them in the terminal's operations. See the Connected Operation, Writing Data To the Terminal section.

Configuration

The Setup menu tree enables users to access configuration parameters that are available for reconfiguration and view parameters that cannot be changed. Click on the nodes listed under the main branches of the menu tree to navigate to the desired configuration setup parameters.

The Back button << Back and the Next button Next >> also enable navigation in the setup menu tree.

The Setup menu (Figure 2-5) enables configuration of parameters in four areas:

- Scale
- Application
- Communication
- Maintenance

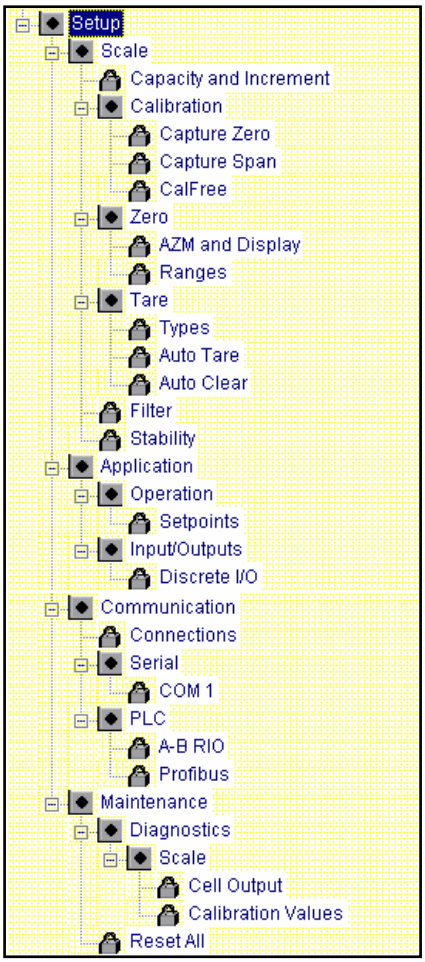


Figure 2-5: Setup Menu Tree

Scale Configuration Parameters

Scale configuration parameters include:

- Capacity and Increment
- Calibration
- Zero
- Tare
- Filter
- Stability

Capacity and Increment Parameters

Use the Capacity and Increment setup (Figure 2-6) to select primary units, set the capacity and increment, and the Gain Jumper setting.

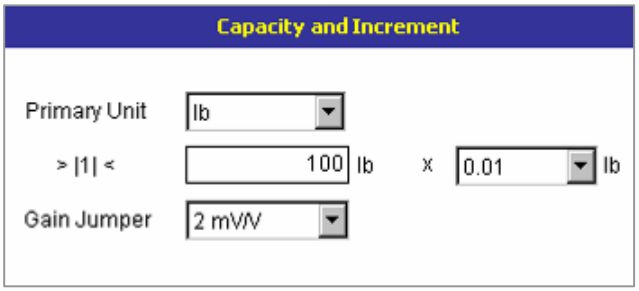


Figure 2-6: Capacity and Increment Setup

Primary Units

Set the primary units from the drop-down menu selections, which include:

- Pounds (lb)
- Kilograms (kg)
- Grams (g)
- Ounces (oz)
- Troy Ounces (ozt)
- Pennyweight (dwt)
- Tonnes (t)
- Tons (ton)

Capacity and Increment

The units for setting capacity and increment change to match the primary units selected. To enter a new value for capacity, click in the text box. Use the keyboard to delete the value displayed and to enter a new value. To change the increment setting, use the drop-down menu to select the desired increment size. Increment sizes available will depend on the capacity selected. The largest available increment size is 50, and the smallest size is 0.001.

Gain Jumper

To ensure proper internal calibration, the jumper setting on the PCB (shipped from the factory in the 3 mV/V setting) must match the PC Toolbox Gain Jumper setting. If the PCB jumper has not been changed from the 3 mV/V factory setting, use the drop-down menu for the Gain Jumper setting to select 3 mV/V. If the PCB jumper has been changed to 2 mV/V, use the drop-down menu for the Gain Jumper setting to select 2 mV/V. If the toolbox gain setting does not match the IND130 PCB jumper position, an incorrect internal span and zero calibration will be used.

Calibration Parameters

Calibration procedures include:

- Capture Zero
- Capture Span
- CalFREE

Capture Zero

The capture zero procedure is an independent operation to reset the zero condition of the scale. To capture zero, make sure that the scale is empty, and click Capture Zero in the Setup menu tree. A status message "Start Calibration?" is displayed.

Click the OK button to start the capture zero procedure.

The status message reads "Capturing Zero! Please Wait…". When the operation is complete, a final status message reads "Capture Zero Completed", which verifies the successful completion of the capture zero operation.

Capture Span

The capture span procedure initiates a sequence to capture span (the difference between the highest and lowest calibration weight values).

To capture span:

1. Click Capture Span in the Setup menu tree. A status message "Place Test Load" is displayed.
2. Place the test load weight on the scale.
3. Enter the weight for the test load in the Test Load text box. The units displayed will match the primary units set in the Capacity and Increment settings.
4. Click the OK button to start the capture span procedure. The status message reads "Capturing Test Load…"
5. If the capture span operation was successful, a verification message that reads "Capture Span Completed" displays. If the capture span operation was not successful, an error message "Error! Capture Span failed" is displayed.

   - If an error occurs during the capture span operation, check for any problems with the test load weight on the scale or entered in the Test Load text box. Repeat steps 1 through 5.

   - Note: it **is** possible to calibrate the system with a test weight combination that would produce an overload condition if the full displayed capacity is applied. However, the software prevents more than approximately 55,000 internal counts(approx 110% output capacity) before the out of range indication ⌐¬ is displayed.

CalFREE

The METTLER TOLEDO CalFREE process enables calibration without test weights by mathematically calculating calibration factors based on the A/D converter gain setting, the load cell gain, and the desired scale capacity and increment size.

Calculated calibration requires that both the load cell(s) and the A/D converter be independently calibrated and their output gains known. If multiple, similar load cells are mounted in parallel (typical for most multi-cell scales), the rated load cell output gain will be equal to the average of the load cell output gains.

NOTE: If a standard calibration is performed, the CalFREE values will be overwritten.

Before starting the CalFREE process, make sure the toolbox gain jumper setting matches the physical jumper setting on the IND130 PCB. It they don't match, a calibrated system without test weights is not possible

To calibrate using the CalFREE process

1. Click CalFREE in the Setup menu tree. The CalFREE setup displays along with the status message "Calculate Calibration?" (Figure 2-7). The units displayed will match the primary units set in the Capacity and Increment settings.

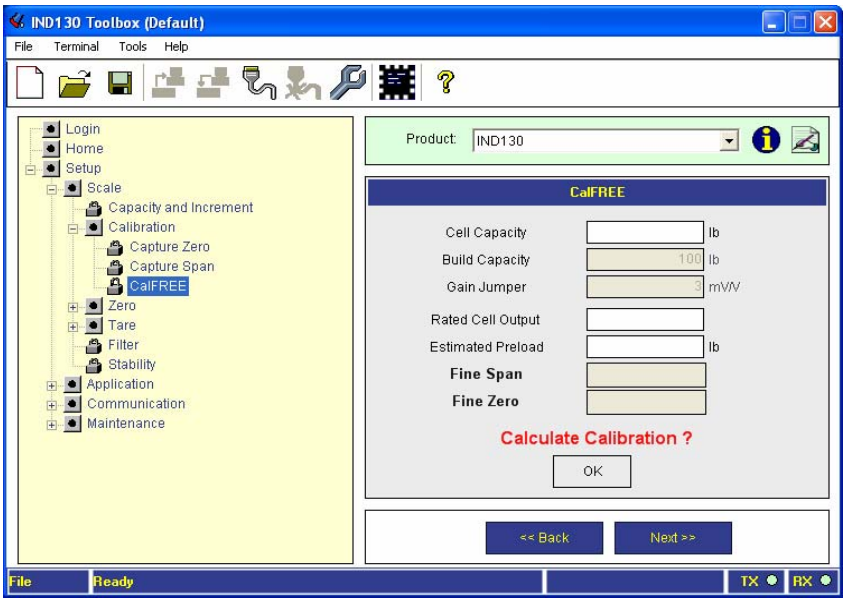


Figure 2-7: CalFREE Setup

2. To enter new values for cell capacity, rated cell output, and estimated preload, click in the associated text boxes. If the preload value is unknown, do not enter a value at this time. Proceed and enter preload in a second pass calibration in step 6. Use the PC keyboard to enter a new value. Values in gray text boxes cannot be changed in CalFREE setup. Build capacity and gain jumper values must be changed in Capacity and Increment setup.
3. Calculate the "Rated Cell Output" value. That block must contain the **AVERAGE** combined output in millivolts/volt of all cells at full load cell rated capacity. This is calculated by adding all the millivolt ratings together and dividing by the number of cells. The individual rating is on each cell nameplate. Example for 4

cells in the system: Cell 1 = 2.0047mv/v, cell 2 = 1.9984 mv/v, cell 3 = 2.1093 mv/v and cell 4 = 2.1239 mv/v.
Rated cell output = (2.0047+1.9984+2.1093+2.1239) / 4 = 2.059075.
Enter 2.059075 in the "Rated Cell Output" block. If only one load cell is used, simply enter the rated output of that cell.

4. Click the OK button to start the CalFREE procedure.
5. When CalFREE operation is complete, the verification message "Calibration values Saved" is displayed with updated values for Fine Span and Fine Zero.
6. If the displayed weight is not zero when the scale is at a zero load condition, a preload value (scale initial) value is needed. Repeat the above process using the zero load value as the preload value. If the displayed value is within the zero capture range, simply "zero" the scale and bypass an additional CalFREE step.

   NOTE: The entered values are not saved, only the calculated calibration (Fine Span and Fine Zero) results**. Also,** If a load cell junction box is used with CalFREE, the box **MUST NOT** contain load cell trimming potentiometers. Any trimming pots in the load cell circuit will alter the individual load cell mv output preventing an accurate calibration.

Zero Parameters

There is only one selection available to reset the zero condition of a scale when small amounts of material are on the platform.

- Ranges

AZM and Display

AZM is a means of maintaining "true zero" at all times on a digital scale but is disabled for the IND130. Figure 2-8 shows the AZM and Display setup selections.

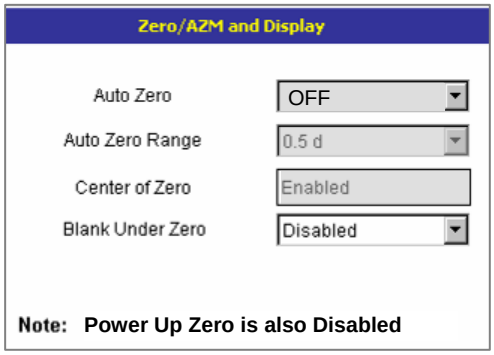


Figure 2-8: AZM and Display Setup

Auto Zero

The auto zero function is set to **off**. This setting cannot be changed.

Auto Zero Range

The auto zero range is disabled. This setting cannot be changed.

Center of Zero

The center of zero status is enabled. This setting cannot be changed.

Blank Under Zero

Blanking the display is used to indicate an under-zero condition when the terminal is in the Gross mode (no tare). Use the drop-down menu to enable or disable the under zero blanking.

Ranges

Use the drop-down menus (see Figure 2-9) to change the settings for pushbutton zero and the pushbutton zero range.

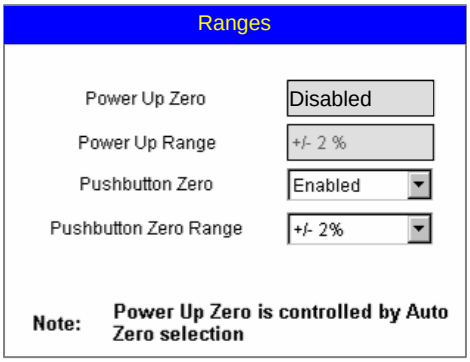


Figure 2-9: Ranges Setup

Pushbutton Zero

If Pushbutton Zero is enabled, a discrete input or command from a PLC interface returns the scale to zero.

Pushbutton Zero Range

If Pushbutton Zero is enabled, use the Pushbutton Zero Range drop-down menu to set the range around the original zero condition for the scale within which Pushbutton Zero can be applied. The range setting can be either +/–2% or +/–20%. For example, if the Range setting for Pushbutton Zero is set at +/–2%, the Pushbutton Zero can only be used when the weight reading on the scale is at or below 2% of the original zero condition or when the weight reading on the scale is at or above –2% of the original zero condition.

Tare Parameters

Tare is used to subtract the empty weight of a container or the weight of a container and the material inside from the gross weight on the scale to determine the net weight of the contents of a container. Tare is inhibited if the scale is in motion.

Three setup selections are available to configure tare:

- Types
- Auto Tare
- Auto Clear

Types

Use the Types setup selection to enable or disable tare.

Tare

Use the Tare drop-down menu to enable or disable the tare function.

Auto Tare

This function is set to disabled. It cannot be changed.

Auto Clear

This function is set to disabled. It cannot be changed.

Filter

The Filter setup selection enables the user to set a numeric value for the low pass filter frequency and to enable or disable the stability filter.

Low Pass Frequency

Enter the numeric data entry for the low pass filter frequency (0.1 through 9.9 Hz) by clicking in the text box and using the keyboard to enter the data. A lower corner frequency provides greater vibration rejection at the expense of a longer settling time. A higher corner frequency provides less vibration rejection with a faster settling time. If an invalid value is entered, a pop-up window displays with an invalid entry notification.

Stability Filter

The stability filter can be used to improve the readability of a static weight display by removing small variations in weight around a steady state value. If the stability filter is enabled and a "no-motion" condition is detected, a heavy filer is utilized, which keeps the display stable during slight changes in weight.

If motion is detected while in this condition, the heavy filter is removed and the "normal" filter is used, which permits quick changes between stable weight

readings. The stability filter is normally used for static weighing applications. If the stability filter is enabled in dynamic applications, such as batching or filling, unrepeatable cutoff weights may result if the heavy filter switches in as the cutoff point is reached.

Stability

Use the Stability Filter drop-down menu to enable or disable stability filter function.

Motion range

Use the Motion Range drop-down menu to select the desired motion range or to disable motion detection.

The motion detection feature determines when a scale platform no-motion condition exists. The sensitivity level determines what is considered stable. Stability detection occurs over a predefined period of time and allows a predetermined "acceptable" amount of motion in scale increments (d). Available settings are 1d or 3d.

Application Parameters

Application parameters configures the functions that are externally controllable such as set points and discrete I/O.

Operation

The Operation setup selection includes:

- Setpoints
- Zero Tolerance
- Print at Setpoint

Setpoints

A setpoint is an on/off output that indicates whether the weight displayed on the scale is greater than or less than a preprogrammed weight value. One setpoint weight can be set by clicking in the Setpoint text box and using the keyboard to enter the data.

Zero Tolerance

Zero tolerance is used as a control check to ensure that the scale has returned to within a preset incremental tolerance of zero before the next weighing operation may begin. Use the Zero Tolerance drop-down menu to select none, 1 increment, or 5 increments for the zero tolerance setting.

Print at Setpoint

Printing at setpoint is permanently disabled.

Input/Outputs

The Input/Outputs setup selection enables viewing only of the settings for one discrete input and three outputs.

Discrete I/O

The discrete I/O settings are assigned by the terminal and data is provided for informational purposes only. They cannot be changed.

I/O:	Assignment:
Output 1	Setpoint 1
Output 2	Unused
Output 3	Zero Tolerance
Input 1	Zero

Communication Parameters

Communication configuration parameters include:

- Connections
- Serial
- PLC

Connections

The Connections setup selection includes:

- Checksum
- STX
- Protocol

Checksum

Checksum is used to detect errors in the transmission of data. Use the Checksum drop-down menu to enable or disable the checksum function.

STX (Start of Text)

The ASCII Start of Text character (02 hex) is always transmitted and cannot be disabled.

Protocol

The Protocol text box shows data for informational purposes only and indicates MT CONTINUOUS as the protocol. This setting cannot be changed.

Serial

The Serial setup selection enables viewing COM1 settings only.

COM1

The terminal is configured as COM1. The settings are assigned by the IND130 and cannot be changed. They are:

Baud Rate:	9600
Parity:	None
Data Bits:	8
Stop Bits:	1

PLC (Programmable Logic Control)

The PLC setup selection enables the configuration of Allen-Bradley RIO or PROFIBUS PLC interfaces. The following selections display in the configuration tool:

- A-B RIO
- PROFIBUS

A-B RIO

The Allen-Bradley Remote I/O (A-B RIO) network is an Allen-Bradley proprietary network that permits certain Allen-Bradley PLCs to communicate to additional racks of input and output devices or to other peripheral devices that implement the RIO interface. For more information about A-B RIO connections, refer to Appendix D, *Allen-Bradley RIO Connections*.

The A-B RIO connection setup selections include:

- Data Format
- Node Address
- Start Quarter
- Last Rack?
- Data Rate

Data Format

Data formats available include displayed weight without decimal point or Integer Divisions (total number of increments). Use the drop-down menu to select the desired data format.

Node Address

Each IND130 Terminal connected to the network represents one physical node; however, the addressing of the node is defined as a logical rack address. This address is determined by the system designer, then configured in the IND130 Terminal by clicking in the Node Address text box and using the keyboard to enter the appropriate node address (0 – 64). When the node address is changed, the IND130 power must be cycled for the change to take effect.

Start Quarter

Each scale occupies a quarter rack in the RIO address space and the quarter may be defined as the first, second, third, or fourth quarter of a rack. Designate the location of the PLC that is the highest quarter used in a logical rack by using the drop-down menu to select the appropriate start quarter address (1 – 4).

Last Rack?

The IND130 configuration selections enable designation of the last rack. Use the drop-down menu to select Yes or No to designate a quarter rack in the RIO address space as the last rack.

Data Rate

Use the drop-down menu to select the desired data rate. Selections available are:

- 57.6 K
- 115.2 K
- 230.4 K

PROFIBUS

For more information about PROFIBUS connections, refer to Appendix E, *PROFIBUS Connections*.

The PROFIBUS connection setup selections include:

- Data Format
- Node Address

Data Format

Data formats available include displayed weight without decimal point or Integer Divisions (total number of increments). Use the drop-down menu to select the desired data format.

Node Address

Each IND130 Terminal connected to the network represents one physical node. This address is determined by the system designer, then configured in the IND130 Terminal by clicking in the Node Address text box and using the keyboard to enter the appropriate node address (0–126). When the node address is changed, the IND130 power must be cycled for the change to take effect.

GSD File

The GSD configuration file used with the PROFIBUS option is available on the IND130 CD, in the 917-0418-000 floppy disk kit, or down loadable from the PROFIBUS web site.

Maintenance Parameters

Maintenance configuration parameters include:

- Diagnostics – Scale
- Reset All

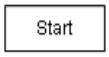
Diagnostics—Scale

The Diagnostics—Scale setup selection includes:

- Cell Output
- Calibration Values

Cell Output

The Total Cell Output selection enables users to check the IND130 Terminal to ensure that the device is producing a data stream. To check the data stream using cell output:

1. Use the View drop-down menu to select
   - **Expanded Weight**—Displays approx. 10 times the load cell output weight
     OR
   - **Cell Output**—Displays the actual load cell output
2. Click on the Start button 

to begin viewing the load cell output.
3. Click on the Stop button 

to terminate the cell output view.

Calibration Values

The Calibration Values selection enables users to view zero and span factors. These factors can be changed in the corresponding text boxes; however, changes to calibration values should **NOT** be made from this setup selection.

Reset All

The Reset All operation changes all configuration settings in the active file back to the factory default settings and deletes all calibration values.

Click the OK button to start the Reset All procedure.

When the Reset All operation initiates, a status message "Initializing to default…" displays. When the operation is complete, a verification message that reads "Reset Complete" is displayed.

Saving Configuration Files

When configuring the terminal settings in connected mode, configuration settings are automatically saved to the terminal when a navigation window is closed. In order to save settings to a PC file (in both connected and disconnected modes), the configuration settings must be saved to an existing file or saved as a new file.

Configuration files created by the configuration tool are saved as Extensible Markup Language (XML) files. Do NOT change the file extension (.xml) to any other type of file extension.

Click on the Notes button  to open a text box for recording information about the IND130 Terminal for which the configuration file is being saved (for example the terminal's location or serial number). This data is annotated to the XML file when it is saved to the PC.

Click on File>Save from the menu bar or on the Save button  in the tool bar to save configuration data in the currently open file.

Click on File>Save As to save the configuration data to an existing file or to a new file created by the user.

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For your notes

Chapter 3.0

Service and Maintenance

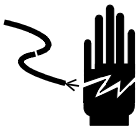
This chapter covers

- Cleaning and Maintenance
- Service
- Troubleshooting

Regular maintenance inspections and service by a qualified service technician are recommended in order to optimize the operations of the IND130 Terminal.

Cleaning and Maintenance

For general cleaning, wipe the IND130 Terminal's cover with a clean, soft cloth that has been dampened with a mild glass cleaner. Do **NOT** use any type of industrial solvent such as toluene or isopropanol (IPA), which could damage the terminal's finish. Do not spray cleaner directly on the terminal.



WARNING!

DISCONNECT ALL POWER TO THIS UNIT BEFORE, INSTALLING, CLEANING, OR SERVICING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Service

Only qualified personnel should provide service for the IND130 Terminal. Contact an authorized local METTLER TOLEDO representative for service assistance.

WARNING!

PERMIT ONLY QUALIFIED PERSONNEL TO SERVICE THE IND130 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.

Troubleshooting

The IND130 Terminal is designed to be error-free and reliable. If problems do occur, ensure that the DC input power is within ±15% of the nominal 24 VDC input voltage.

If the IND130 Terminal is malfunctioning, check the LED lights (Figure 3-1) to determine if the terminal is properly operating.

Figure 3-1: IND130 Terminal LED Lights (PROFIBUS option shown)

The LEDs and the indications associated with each when they are lit are listed in Table 3-1.

Table 3-1: LED Lights and Indications

LED		Indication
O	(Zero)	Zero tolerance indication. (**on** when transmitted weight is within zero tolerance)
SP	(Setpoint)	Setpoint status. (**on** when weight is below setpoint value)
ERR	(Error)	Error indication (an error in terminal operation has occurred)
STA	(Status)	Slow steady flash: Operating mode. Status is OK. Rapid flash: Incorrect switch setting. (eg: factory test sw. 2 on)
All LED Lights		Light in rapid succession: IND130 powering up

Attempt to determine the source of a problem prior to obtaining service. Record as much information as possible about what has happened including any error messages and physical responses of the terminal and/or scale.

Troubleshooting Tips.

1. intermittent connections to the Phoenix terminals is possible when wires are improperly inserted. Be sure screws are fully open when inserting wires as it is possible to install them on the wrong side of the clamp.

2. Terminal continuity cannot be reliably measured with no wires installed. Screw continuity depends upon the clamp action of an inserted wire.

Chapter 4.0

Parts and Accessories

This chapter covers
- Service Parts List

This chapter provides information on service parts for the following IND130 Terminal versions:

- Harsh Environment—Serial
- Harsh Environment—Allen-Bradley
- Harsh Environment—PROFIBUS
- DIN Rail Mount—Serial
- DIN Rail Mount—Allen-Bradley
- DIN Rail Mount—PROFIBUS

Service Parts List

Table 4-1 shows the service parts list for the IND130.

Table 4-1: IND130 Service Parts List

Item Description	Order Number
Replacement Main PCB	64054358
Fuse	64055127
Summing PCB	64055004
PROFIBUS Connector	64054361
24 VDC Power Supply	64053820
Replacement Profibus PCB	68002075
Replacement A-B RIO PCB	64055126

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For your notes

Appendix A

Installation

This chapter covers

- Inspection and Contents Checklist
- Operating Environment
- Terminal Connection
- Controller PCB Switches and Jumper

This appendix provides detailed information for installing the IND130 Terminal.

Locate the closest authorized METTLER TOLEDO representative at the METTLER TOLEDO website, www.mt.com.

Inspection and Contents Checklist

Prior to beginning the installation process, implement the following procedures:

- Inspect the shipping container for damage.
  - If the shipping container appears damaged upon delivery, check inside for damage. File a freight claim with the carrier if necessary.
  - If the container is undamaged, unpack the container. Keep the original packing materials for future use.
- Make sure the IND130 Terminal package contains the following:
  - IND130 Terminal (indicator)
  - Installation Installation Guide (paper copy)
  - Documentation CD-ROM

Operating Environment

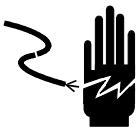
The first IND130 Terminal installation step is to select the best location. Placing the IND130 Terminal in an appropriate location will enhance longevity and operation.

WARNING!

THE IND130 TERMINAL IS NOT INTRINSICALLY SAFE! DO NOT USE WITHIN AREAS CLASSIFIED AS HAZARDOUS DIVISION 1,2 OR ZONE 0,1, or 2 BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.

Keep in mind the following factors when choosing a location for the IND130 Terminal:

- The IND130 Terminal can be operated between a temperature range of 14° F to 104° F (–10° C to 40° C) at 10% to 90% humidity, non-condensing.
- **The IND130 Terminal is not intrinsically safe.** However, the IND130 terminal is capable of operation with scales and barriers located in a hazardous area. Contact your authorized METTLER TOLEDO representative for assistance with hazardous area applications.



WARNING!

DISCONNECT ALL POWER TO THIS UNIT BEFORE, INSTALLING, CLEANING, OR SERVICING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Terminal Connection

This section provides instructions for connecting the IND130 Terminal Harsh Environment and DIN Rail Mount enclosures.

Terminal Connections for the Harsh Environment Version

To connect the unit:

1. Remove the six cover nuts from the enclosure (see Figure A-1).

Figure A-1: IND130 Terminal Harsh Environment Enclosure (Closed)

2. Remove the cover to access the connection locations on the terminal. (See Figure A-2 for an open view of the Harsh Environment Enclosure and the location of the power and communication connections.)

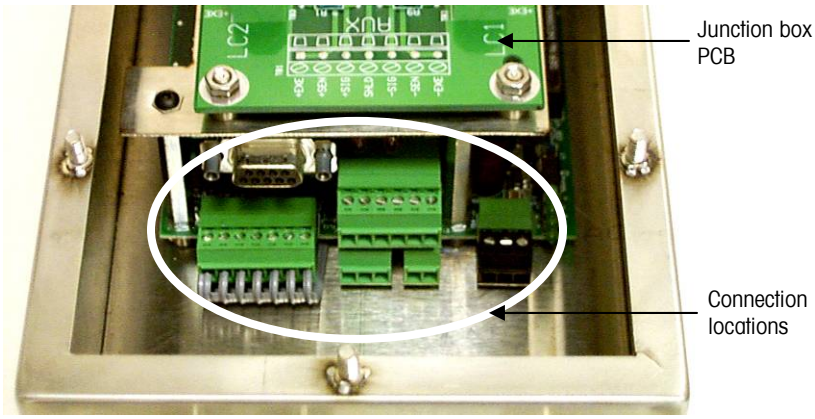


Figure A-2: IND130 Terminal Harsh Environment Enclosure (Open)

3. Pass the cables that enter the enclosure through an appropriately sized cable grip before connecting the wires (see Figure A-1).
4. Connect up to four 350-ohm load cells to the junction box PCB (See Figure A-3).

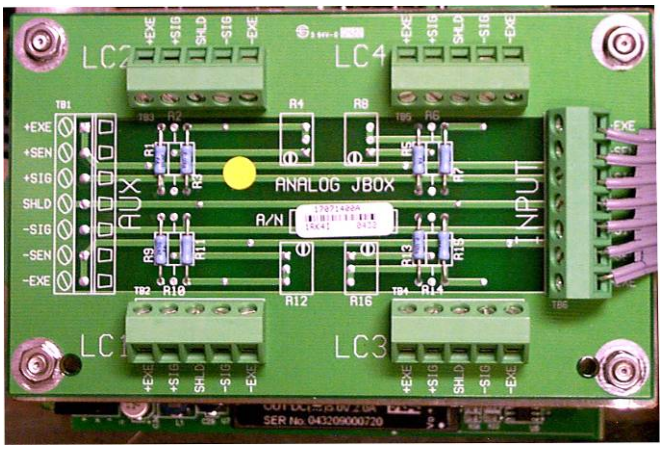


Figure A-3: Junction Box PCB

5. Connect the cabling to the terminal at the appropriate connection locations. (See Figure A-5 for each connection location.)
6. Re-secure the cover with the six screws that were removed.
7. Tighten the cable grip sufficiently to provide a water-tight seal around the cables. This will allow any internal cable slack to be received through the cable grip.

Terminal Connections for the DIN Rail Mount Version

To mount the module, snap it onto the desired DIN rail. To dismount the module, retract the plastic module tab located on the bottom of the terminal with a screwdriver as shown in Figure A-4.

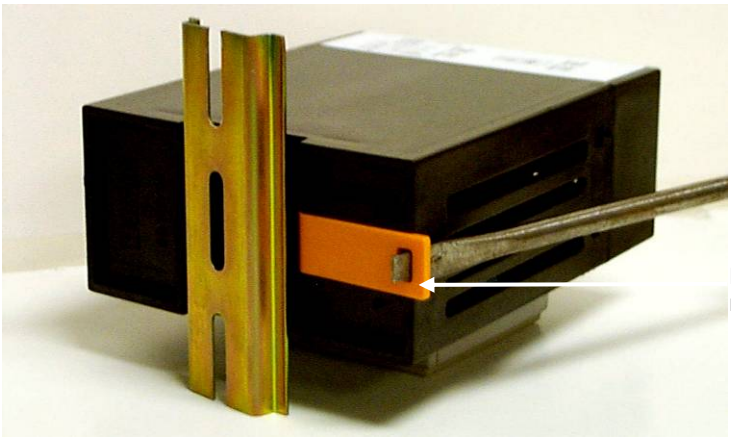


Figure A-4: Plastic Retractable Mounting Tab

The IND130 Terminal DIN Rail Mount enclosure type uses an exposed terminal access design. All connections are made on the front panel of the terminal.

Up to four 350-ohm load cells can be connected to the terminal by an external junction box available from METTLER TOLEDO (Model TB100801). A junction box **WITHOUT** potentiometers must be used if the CalFREE feature is utilized.

If access inside the unit is necessary, gently push in on the tab slots with a flat-head screwdriver. A quiet "pop" can be heard when the cover has been released.

Making Connections

This section provides instructions for making connections to the IND130 Terminal, including:

- Electrical Connection
- Load Cell Connection
- Serial Port Connection
- Discrete I/O Connections
- Allen-Bradley RIO and PROFIBUS Options Connections

Figure A-5 shows the locations where connections are made on the terminal.

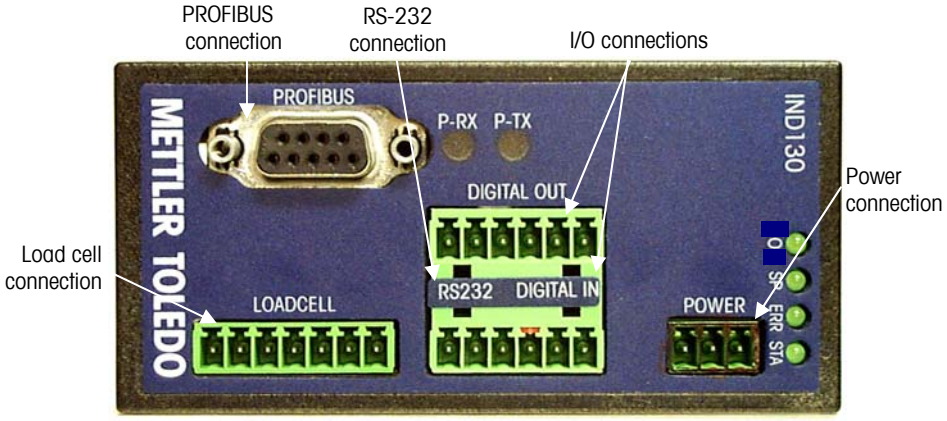
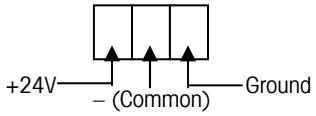


Figure A-5: Connection Locations (Profibus option shown)

Electrical Connection

In both the Harsh Environment and DIN Rail Mount version, connect power to the POWER terminal strip on the controller PCB (Figure A-5) from a 24VDC class 2 power source. Power terminal strip wiring is shown in Figure A-6.



FigureA-6: Power Connection Wiring

Power Requirements

The IND130 Terminal **must** be powered by a 24 VDC Listed or recognized Class 2 or certified LPS power supply. (A class 2 power supply is a current limited supply capable of withstanding a continuous short circuit without destruction). Use at least #18 AWG 300 volt wires for connections to class 2 and/or class 3 circuits.

WARNING!

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, CLEANING, OR SERVICING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Load Cell Connection

Procedures for making load cell connections are the same for the Harsh Environment and DIN Rail Mount enclosures.

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.

Cabling

The maximum cable length for load cell connections to the IND130 Terminal depends on the total scale resistance (TSR) of the scale base. To calculate TSR:

$$TSR = \frac{\text{Load Cell Input Resistance (ohms)}}{\text{Number of Load Cells}}$$

The IND130 Terminal can power up to four 350-ohm analog load cells. Table A-1 lists the recommended cable lengths based on TSR and cable gauge.

Table A-1: Recommended Maximum Cable Length

TSR (Ohms)	24 Gauge (feet/meters)	20 Gauge (feet/meters)	16 Gauge (feet/meters)
350	800/244	2000/610	4000/1219
87 (4-350 Ω cells)	200/61	600/183	1000/305

Connect the appropriate length of cable to the LOADCELL terminal strip of the IND130 Terminal (see Figure A-5). The pinout for the LOADCELL terminal strip is labeled on the bottom of the controller. Figures A-7, A-8, and A-9 show the IND130 Terminal LOADCELL terminal strip wiring for standard six-wire cable, heavy capacity (MASSTRON) six-wire cable, and standard four-wire cable.

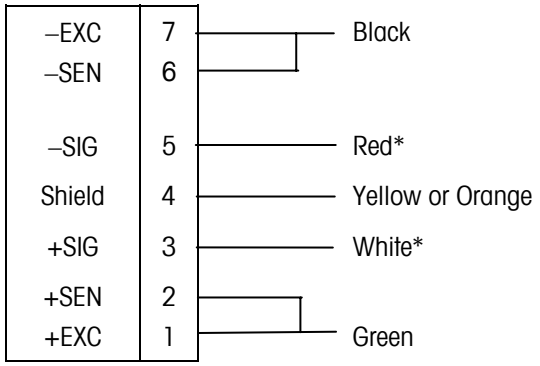
NOTE: Colors shown at right and in subsequent load cell cable lists are typical and do not represent all load cells. There are many variations with no defined standard. Actual colors vary.

–EXC	7	Blue
–SEN	6	Red
–SIG	5	Black
Shield	4	Orange
+SIG	3	Green
+SEN	2	Yellow
+EXC	1	White

Figure A-7: Wiring for Standard Six-Wire Cable

–EXC	7	Black
–SEN	6	Blue
–SIG	5	Red
Shield	4	Yellow
+SIG	3	White
+SEN	2	Brown
+EXC	1	Green

Figure A-8: Heavy Capacity (MASSTRON) Six-Wire Cable



*If an increase in load results in a decrease in weight display, reverse the signal wires (+SIG and –SIG).

Figure A-9: Standard Four-Wire Cable

Minimum Increment Size for Scale Input

The minimum increment size selection for an analog scale input is determined by calculating the microvolts per increment for the desired build. To calculate the microvolts per increment, use the following equation:

$$\mu V \text{ per increment} = \frac{\text{Increment Size} \times \text{Cell Output} \times 5000}{\text{Load Cell Capacity} \times \text{Ratio}}$$

The increment size, scale capacity, and load cell capacity must all be measured in the same weight units (lb or kg). If the weight units for any of these variables are listed in kg units, multiply by 2.2046 to convert to lb units for the purposes of this calculation.

Load cell output is rated in millivolts per volt of excitation (mV/V) and is marked on load cell data tag. METTLER TOLEDO load cells are typically 2 mV/V. Other load cells can range from 1 mV/V to 4.5 mV/V.

The load cell capacity is the rated capacity marked on the load cell data tag. The ratio is the total number of load cells in the system or the total lever ratio (if the scale is a mechanical lever system conversion).

Sample Calculation

The following example of μV per increment calculation for a four load cell scale installation is provided as a reference.

Use the following formula to calculate the μV per increment:

$$\mu V \text{ per increment} = \frac{\text{Increment Size} \times \text{Cell Output} \times \text{Excitation (mV/V)}}{\text{Load Cell Capacity} \times \text{Ratio}}$$

The scale parameters are as follows:

Scale Capacity	5000 lb
Increment Size	1.0 lb
Load Cell Capacity	2500 lb
Number of Cells	4
Cell Output	2 mV/V
Excitation Voltage	5 VDC

Using these parameters in the formula

$$\mu V \text{ per increment} = \frac{1.0 \text{ lb} \times 2 \text{ mV/V} \times 5000}{2500 \text{ lb} \times 4 \text{ Load Cells}} = 1.0 \ \mu V \text{ per increment}$$

The IND130 Terminal acceptable weighing performance can be obtained with a minimum of 0.25 μV per increment. At full scale, the maximum load cell output must not exceed 10 mV when the W1 jumper is in the 2 mV/V position or 15 mV when the W1 jumper is in the 3 mV/V position.

Serial Port Connection

The COM1 serial port is bi-directional. It can receive simple commands or serial target data, as well as transmit data to a printer or other serial device. Figure A-5 shows the location of the RS-232 terminal strip for serial port connections. The communications are fixed at 9600 baud, 8 data bits (no parity) and 1 stop bit. They cannot be changed. The ASCII input characters are limited to "C", "T" and "Z" (single character with no CR)

Figure A-10 shows the IND130 Terminal block COM1 pin-to-pin cable connections using an RS-232 cable. The maximum recommended cable length for RS-232 communications is 50 feet.

COM1

1	RSGND	Signal Ground
2	RSRXD	RS-232 Receive
3	RSTXD	RS-232 Transmit
4	NC	Keyed pin

Figure A-10: COM1 Connections

Discrete I/O Connections

See Figure A-5 for the location of the I/O (labeled DIGITAL OUT and DIGITAL IN) terminal strips. Refer to the Appendix B, *Inputs and Outputs* for additional information on discrete I/O functions.

DIGITAL IN

4	NC	Keyed pin
5	IN-	Common (GND)
6	IN+	Momentary +24VDC to zero terminal

Figure A-11: Digital Input Connections

DIGITAL OUT

1	PULL-UP	+5 to +24VDC
2	NC	Not used
3	OUT1	Announce Setpoint 1 Status
4	OUT2	Not used
5	OUT3	Announce Zero Tolerance Status
6	OUT GND	Common (GND)

Figure A-12: Digital Output Connections

Allen-Bradley RIO, PROFIBUS Optional Connections

The Allen-Bradley RIO interface requires a three-pin Phoenix plug (provided). The PROFIBUS connection requires a special male 9-pin D subminiature connector (not provided) See Figure A-5 for location. The PROFIBUS connector may be ordered through METTLER TOLEDO. Refer to Refer to Appendix D, Allen-Bradley RIO Connections and Appendix E, PROFIBUS Connections, for more information.

Controller PCB Switches and Jumper

Figure A-11 shows the location of the controller PCB switches and jumper.

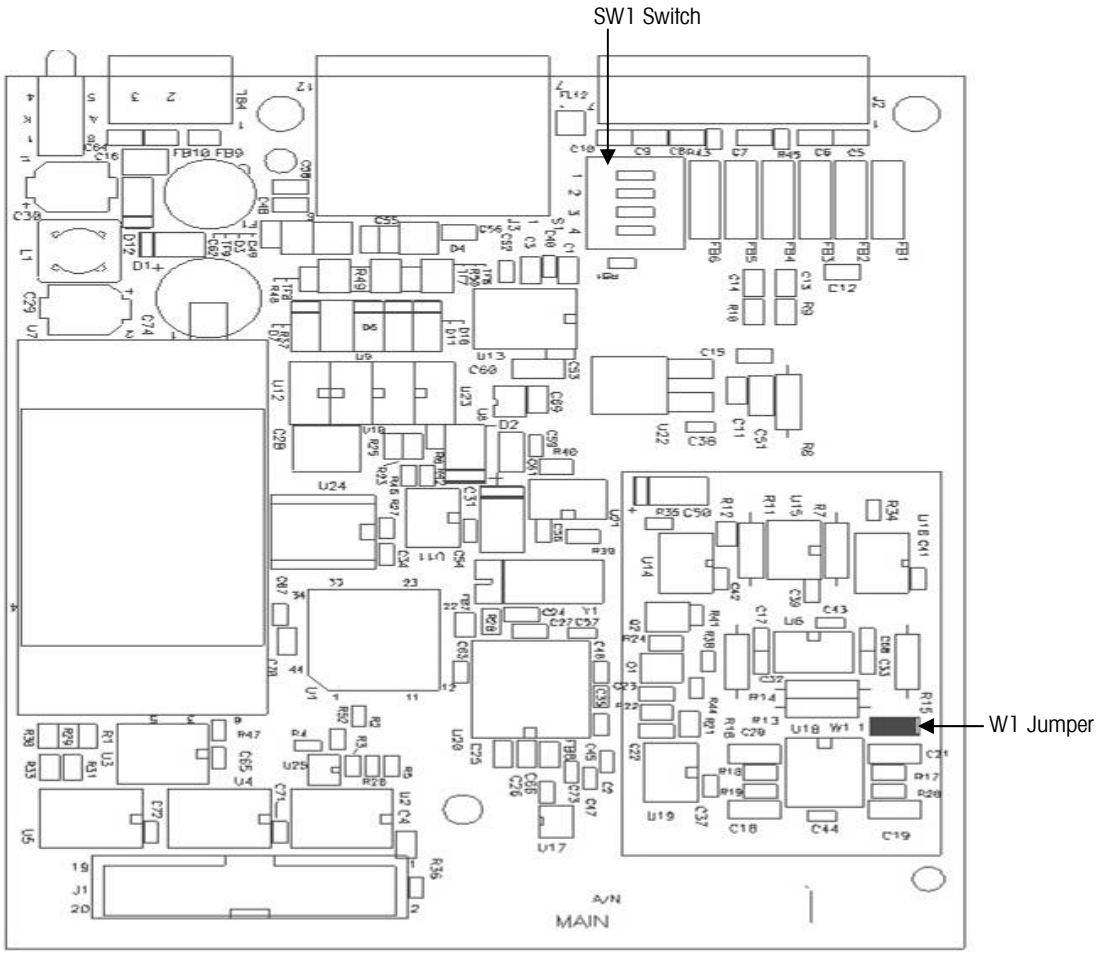


Figure A-13: Main Controller PCB

Switches

The SW1 switch settings are shown in Table A-2.

Table A-2: SW1 Switch Settings

Switch	Function
1	Access Control (must be on to modify setup)
2	Factory Test Mode (must be off)
3	No function (must be off)
4	No function (must be off)

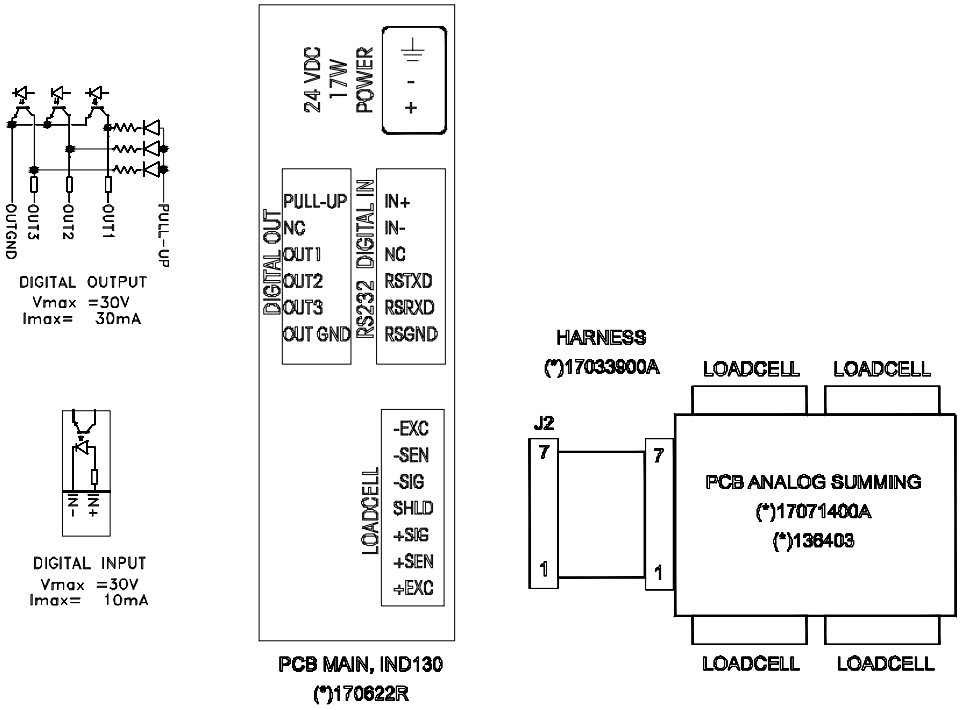
Gain Jumper

The W1 gain jumper setting on the PCB can be either 2 mV/V or 3 mv/V. The terminal is shipped from the factory in the 3 mV/V setting. The jumper settings are:

- 2 mv/V—Jumper installed on both pins
- 3 mv/V—Jumper removed

This jumper setting must be the same as the selection made during configuration.

Connector layout



METTLER TOLEDO

For your notes

Appendix B

Inputs and Outputs

This appendix covers

- RS-232 Serial I/O
- Discrete I/O Reference
- Setpoint Mode

This appendix provides information about the IND130 Terminal's inputs and outputs.

RS-232 Serial I/O

The IND130 Terminal transmits continuous serial data at the RS-232 Serial I/O port. The RS-232 connection is 9600 baud, 8 data bits, no parity, 1 stop bit. This port configuration is automatically established and cannot be altered. This data consists of 16 or 18 bytes transmitted in a 10-bit ASCII frame consisting of: 1 start bit, 8 data bits, no parity bit, and 1 stop bit. The format is shown in Table B-1:

The continuous serial data output is also used by the configuration tool when a PC is connected. It automatically switches back to continuous when the IND130 Terminal is connected to another remote device.

An ASCII Start of Text (STX) and a checksum character may be added to the data output if desired. The checksum character is defined as the 2's complement of sum of the 7 least significant bits of all preceding characters including the <STX> and <CR> (dropping all bits that carry past the 7 least significant bits). The checksum character is transmitted with the same parity as all other characters. The checksum is supported, but may be optionally configured as "off", in which case the character is not sent.

Table B-1: Serial Data Output Format

Character	Function	Character	Function
1	STX (Start of text—Optional)	10	Weight LSD
2	Status Word A	11	Tare Weight MSD
3	Status Word B	12	Tare Weight
4	Status Word C	13	Tare Weight
5	Weight MSD	14	Tare Weight
6	Weight	15	Tare Weight
7	Weight	16	Tare Weight LSD
8	Weight	17	CR (carriage return)
9	Weight	18	CKSM (Checksum—Optional)

Non-significant weight data and tare data digits will be transmitted as spaces. Status words A, B, and C descriptions are shown in Tables B-2, B-3, and B-4.

Table B-2: Continuous Mode Status Word A

Bit	Status Word A			
0,1,2	Encoded Decimal Point			
	Display	**Bit 2**	**Bit 1**	**Bit 0**
	XXXXX0	0	0	1
	XXXXXX	0	1	0
	XXXXX.X	0	1	1
	XXXX.XX	1	0	0
	XXX.XXX	1	0	1
3	1 = or greater than setpoint 0 = less than setpoint			
4	Always = 1			
5	Always = 1			
6	Always = 0			
7	Always = 0			

Table B-3: Continuous Mode Status Word B

Bit	Status Word B
0	Gross=0, Net=1
1	Minus sign = 1
2	Overcap = 1
3	Motion = 1
4*	lb = 0, kg = 1
5	Always = 1
6	Within zero tolerance = 0
7	Always = 0

*If bit 4 =0 and Sw C bits 0-2 are not 0 then units = alternate units.

Table B-4: Continuous Mode Status Word C

Bit	Status Word C						
***Alt units**	lb	g	t	oz	ozt	dwt	ton
***0**	0	1	0	1	0	1	0
***1**	0	0	1	1	0	0	1
***2**	0	0	0	0	1	1	1
3	Print = 1						
4	Always = 1						
5	Always = 1						
6	Always = 1						
7	Always = 0						

Serial Input

The IND130 terminal has an RS232 input mode that allows simple commands to be received. All characters must be uppercase with **no** control characters such as STX, CR and LF. All other ASCII characters are ignored. It recognizes the following commands.

ASCII Command	Function	Description
C	Clear	Clear tare value to gross mode
T	Tare	Tare scale to zero
Z	Zero	Zero scale (if within range and no-motion)

Discrete I/O Commands

The IND130 Terminal has one discrete input and two available discrete outputs. The open collector discrete outputs require a +5 to 24 VDC reference and can sink up to 30 mA maximum.

To activate the input, apply +5 to 24 VDC to the input terminal. Input function is edge triggered and must be held at positive true for at least 100 ms. The only command available via the discrete input is Zero.

Discrete I/O terminal block assignment considerations include:

- All discrete outputs are open collector circuits, common emitter
- Discrete input levels are
  - $V_{IN\ LOW}$ = 0.0 to + 0.8 VDC
  - $V_{IN\ HIGH}$ = +3.5 to +24 VDC

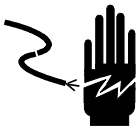
The 2 outputs and 1 input are assigned the following functions:

OUT1	Setpoint 1
OUT2	Unused
OUT3	Zero Tolerance
IN+	Zero
IN-	Logic common

Setpoint Mode

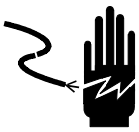
The setpoint outputs are negative true and "ON" when the scale weight is below the setpoint value and "OFF" when equal to or above the setpoint value. The setpoint operates on the absolute value of the scale weight so it can be used for both weigh-in and weigh-out processes. The setpoint is **ENABLED** at power up.

Interlocks and/or relay logic are not included with the IND130 Terminal. If start-stop logic is required, METTLER TOLEDO recommends purchasing this hardware (and design) through an authorized local METTLER TOLEDO representative.



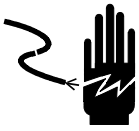
WARNING!

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!

IF THIS TERMINAL IS USED IN AN AUTOMATIC OR MANUAL FILLING CYCLE, ALL USERS MUST PROVIDE A HARD-WIRED EMERGENCY STOP CIRCUIT OUTSIDE THE TERMINAL CIRCUITRY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.



WARNING!

OUTPUTS ARE ALWAYS ACTIVE. DISABLE THE CONNECTED DEVICE(S) WHILE PERFORMING TERMINAL MAINTENANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

Appendix C

Default Settings

This appendix covers

- IND130 default settings

When the configuration tool is opened, the default file opens and the default settings for configuration setup are active. Table C-1 lists the configuration tool default settings.

Table C-1: Configuration Tool Default Settings

Setup Group	Configuration Parameter	Default Setting
Scale		
Capacity and Increment	Primary Unit Increment Gain Jumper	lb 100 lb x 0.01 lb 3 mV/V
Calibration	Capture Zero Capture Span CalFREE	No Settings—Used to implement calibration procedures
Zero	AZM and Display Auto Zero Auto Zero Range Blank Under Zero Ranges Power up Zero Power up Range "Pushbutton" Zero "Pushbutton" Zero	 Off * 0.5 d * Disabled Disabled * +/–2% * Enabled +/–2%
Tare	Types Tare Auto Tare Auto Clear Tare	 Enabled Disabled* Disabled*
Filter	Low Pass Frequency Stability Filter	2.0 Hz Disabled
Stability	Motion Range	1 d (divisions)
Application		
Operation	Setpoints Setpoint Zero Tolerance Print at Setpoint	 0.00 None Disabled*
Input/Outputs	Discrete I/O OUT1 OUT2 OUT3 In+	 Setpoint 1* Unused* Zero Tolerance* Zero*

Setup Group	Configuration Parameter	Default Setting
Communication		
Connections	Checksum	Disabled
	STX (Start of Text)	Disabled*
	Protocol	MT Continuous*
Serial	COM1	
	Baud Rate	9600*
	Parity	None*
	Data Bits	8*
	Stop Bits	1*
PLC (Optional)	A-B RIO (Allen-Bradley)	
	Data Format	Display Increments
	Node Address	001
	Start Quarter	1
	Last Rack?	Yes
	Data Rate	115.2 K
	PROFIBUS	
	Data Format	Display Increments
	Node Address	001
Maintenance		
Diagnostics	Scale	
	Cell Output	
	View	Expanded Weight
	Expanded Weight	000000 #
	Calibration Values	
	Zero	0
	Span Factor	0.1000000
Reset All		No Settings—Used to reset default settings

*Settings displayed for informational purposes. These settings cannot be modified.
= Updated by start/stop functions

Appendix D

Allen-Bradley RIO Connections

This appendix covers

- Interface PCB Wiring
- Status Lights
- Setup in the IND130 Terminal
- Discrete I/O Control
- Data Definition

This appendix provides information about the IND130 Terminal Allen-Bradley RIO version connections.

WARNING!

OUTPUTS ARE ALWAYS ACTIVE. DISABLE THE CONNECTED DEVICE(S) WHILE PERFORMING TERMINAL MAINTENANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

Interface PCB Wiring

The IND130 Terminal Allen-Bradley RIO interface PCB wiring uses a three wire connector. The Allen-Bradley "blue hose" cabling is wired left to right as Blue, Shield, Clear.

Status Lights

ON	normal operation
Flashing	PLC in Program Mode
OFF	PLC Communication problem

The Allen-Bradley (A-B) option board has a status LED with three modes:

Setup In the IND130 Terminal

To configure the IND130 Terminal for an A-B RIO PCB, select setup>Communication>PLC>A-B RIO from the configuration tool menu tree. Configure data for the following options:

- **Data Format**— Select Displayed integer weight (decimal point ignored) or Integer Divisions
- **Node Address**—Enter the appropriate node address (0 – 64)
- **Start Quarter**—Designate quarter used in a logical rack by selecting the appropriate start quarter address (1 – 4)
- **Last Rack?**—Select Yes or No to designate a quarter rack in the RIO address space as the last quarter of the rack
- **Data Rate**—Select the desired data rate:

– 57.6 K

– 115.2 K
– 230.4 K

Communications

The Allen-Bradley Remote I/O (RIO) network is a proprietary network that permits certain A-B PLCs to communicate to additional racks of input and output devices or to other peripheral devices that implement the RIO interface. The IND130 Terminal utilizes component parts that are provided by A-B thereby ensuring complete compatibility with the RIO network. An IND130 Terminal is recognized as an A-B device by the PLC. Each IND130 Terminal connected to the RIO network represents a physical node.

The connection is facilitated by a three-position removable terminal block on the IND130 Terminal RIO option back panel. The terminal block is labeled 1, SHLD, and 2. These terminals correspond to the like terminals on the A-B PLC RIO connector. The wiring between the PLC and the IND130 Terminal RIO connector uses the standard RIO cable supplied by A-B. This cable is often referred to as the "blue hose." The cable installation procedures and specifications are the same as recommended by A-B for the RIO network.

Node Address

Although each IND130 Terminal RIO option represents one physical node, the addressing of the node is defined as a logical rack address. This address is determined by the system designer, then programmed into the IND130 Terminal. Programming is done through the configuration tool using the Communication>PLC>A-B RIO program block in Setup.

Each scale occupies a quarter rack in the RIO address space and the quarter may be defined as the first, second, third, or fourth quarter of a rack. It is also necessary to designate the location of the PLC that is the highest quarter used in a logical rack. The IND130 Terminal's programming capabilities enable selection of the starting quarter and designation of the last rack. (See the Setup In the IND130 Terminal section for further setup information.)

NOTE: When the node (rack) address is changed, the IND130 power must be cycled for the address change to take effect.

Discrete I/O Control

The IND130 Terminal provides I/F cannot directly control the discrete outputs. It reads its discrete input via the (digital) PLC interface options. The IND130 Terminal's discrete I/O updates are synchronized with the IND130 A/D rate, not with the PLC I/O scan rate. This factor may cause a noticeable delay in reading inputs or updating outputs as observed from the PLC to real-world signals.

Data Definition

The IND130 Terminal A-B RIO I/O network supports Discrete Data Transfer that enables bi-directional communication of discrete bit encoded information or 16-bit binary word (signed integer) numerical values. Each IND130 represents a quarter rack of data to the RIO option and each quarter rack provides two input (read) and two output (write) words. A quarter logical rack has 32 input bits (two 16-bit words) and 32 output bits (two 16-bit words). The data in these input and output words is formatted as shown in Table D-1.

Table D-1: Discrete Read—IND130 Terminal Output to PLC Input

Bit Numbers	Word 0	Word 1
0	Integer Weight bit 00	Setpoint 1[5]
1	Integer Weight bit 01	Not Used
2	Integer Weight bit 02	Zero Tolerance[6]
3	Integer Weight bit 03	Not Used
4	Integer Weight bit 04	Not Used
5	Integer Weight bit 05	Not Used
6	Integer Weight bit 06	Not Used
7	Integer Weight bit 07	Not Used
8	Integer Weight bit 08	Not Used
9	Integer Weight bit 09	PAR 1.1[1] (zero)
10	Integer Weight bit 10	Not Used
11	Integer Weight bit 11	Not Used
12	Integer Weight bit 12	Motion[2]
13	Integer Weight bit 13	Net Mode[2]
14	Integer Weight bit 14	Update in Progress[3]
15	Integer Weight bit 15	Data OK[4]

1. PAR 1.1 is the current state of the IND130 Terminal discrete "**zero**" input (1=zero).
2. Positive true (1=True)
3. If 1, the IND130 Terminal was updating the PLC interface shared memory while data was read. The PLC should ignore this data and rescan.
4. Set to 1 if scale is operating properly, not over or under range, in power-up, expanded mode, or in setup mode. (Integer weight will be set to zero.)
5. Setpoint 1 output bit status
6. Zero Tolerance output bit status

Table D-2: Discrete Write—PLC Output to IND130 Terminal Input

Bit Numbers	Word 0	Word 1
0	Integer tare/Setpoint Bit 00	Select 1[1]
1	Integer tare/Setpoint Bit 01	Select 2[1]
2	Integer tare/Setpoint Bit 02	Select 3[1]
3	Integer tare/Setpoint Bit 03	Load Preset Tare[2,7]
4	Integer tare/Setpoint Bit 04	Clear Tare Command[3,8]
5	Integer tare/Setpoint Bit 05	Pushbutton Tare Command[3,7]
6	Integer tare/Setpoint Bit 06	Not used
7	Integer tare/Setpoint Bit 07	Zero Command[3]
8	Integer tare/Setpoint Bit 08	Enable Setpoint Command[4,5]
9	Integer tare/Setpoint Bit 09	Not Used
10	Integer tare/Setpoint Bit 10	Not Used
11	Integer tare/Setpoint Bit 11	Not Used
12	Integer tare/Setpoint Bit 12	Not Used
13	Integer tare/Setpoint Bit 13	Not Used
14	Integer tare/Setpoint Bit 14	Not Used
15	Integer tare/Setpoint Bit 15	Load Setpoint Value[6]

1. A binary value in bits 0-2 select the data in Discrete Read weight data source: 0 = Gross weight, 1 = Net weight, 2 = Displayed weight, 3 = Tare or active Target if in Over/Under mode, 4 = Setpoint 1, 5-7 = Gross.
2. A 0 to 1 transition causes the value in Word 0 to be written into the preset tare register.
3. A 0 to 1 transition activates the command.
4. Setpoint high level outputs are disabled if this bit is set = 0, enabled if set = 1. Setting this bit to 1 after a downloaded Setpoint value will store the downloaded value in non-volatile memory. It must be set = 0 to cause setpoint target register to be written. See 6 to update memory.
5. A value =1 must be written here for PLC to assume control of setpoint enable. NOTE: Both PLC and IND130 toolbox can write a setpoint value. The IND130 is setpoint enabled at power up.
6. A 0 to 1 transition causes the value in Word 0 to be written into IND130 memory, however, the non-volatile memory Setpoint target register will not be updated unless the Enable Setpoint Command bit = 1. The Word 0 value for Setpoint 1 or Target 1 is in the primary unit (calibrated unit).
7. When tare interlocks are set, accumulative tares will not be permitted.
8. When tare interlocks are set, tare can only be cleared at gross zero.

Appendix E

PROFIBUS Connections

This appendix covers

- Wiring
- Setup in the IND130 Terminal
- Discrete I/O Control
- Data Definition

This appendix provides information about the IND130 Terminal PROFIBUS version connections.

WARNING!

OUTPUTS ARE ALWAYS ACTIVE. DISABLE THE CONNECTED DEVICE(S) WHILE PERFORMING TERMINAL MAINTENANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

Wiring

The PROFIBUS connection is a female 9-pin D subminiature connector, which is the PROFIBUS standard connection. The field connector assembly is not supplied with the IND130. This connector may be purchased from METTLER TOLEDO. The wiring for the connector is as follows:

1	GND (isolated)
2	N.C.
3	TX/RX+
4	RTS
5	GND (isolated)
6	+5V (isolated)
7	N.C.
8	TX/RX-
9	N.C.

Setup In the IND130 Terminal

To configure the IND130 Terminal for a PROFIBUS PCB, select Setup>Communication>PLC>PROFIBUS from the configuration tool menu tree. Configure data for the following options:

- **Data Format**— Select Display Increments (decimal point implied) or Integer Divisions (no decimal point implied)
- **Node Address**—Enter the appropriate node address (0 – 126)
  NOTE: When the node address is changed, the IND130 power must be cycled for the address change to take effect.

Data Definition

The IND130 Terminal PROFIBUS PLC Interface supports Discrete Data Transfer that enables bi-directional communication of discrete bit encoded information or 16-bit binary word (signed integer) numerical values. The data in these input and output words is formatted as shown in Table E-1.

Table E-1: Discrete Read—IND130 Terminal Output to PLC Input

Bit Numbers	Word 0	Word 1
0	Integer Weight bit 00	Setpoint [5]
1	Integer Weight bit 01	Not Used
2	Integer Weight bit 02	Zero Tolerance[6]
3	Integer Weight bit 03	Not Used
4	Integer Weight bit 04	Not Used
5	Integer Weight bit 05	Not Used
6	Integer Weight bit 06	Not Used
7	Integer Weight bit 07	Not Used
8	Integer Weight bit 08	Not Used
9	Integer Weight bit 09	Zero[1]
10	Integer Weight bit 10	Not Used
11	Integer Weight bit 11	Not Used
12	Integer Weight bit 12	Motion[2]
13	Integer Weight bit 13	Net Mode[2]
14	Integer Weight bit 14	Update in Progress[3]
15	Integer Weight bit 15	Data OK[4]

1. Zero is the current state of the IND130 Terminal **"zero"** input.
2. Positive true (1=True)
3. If 1, the IND130 Terminal was updating the PLC interface shared memory while data was read. The PLC should ignore this data and rescan.
4. Set to 1 if scale is operating properly, not over or under range, in power-up, expanded mode, or in setup mode (Integer weight will be set to zero.)
5. Setpoint output bit status
6. Zero Tolerance output bit status

Table E-2: Discrete Write—PLC Output to IND130 Terminal Input

Bit Numbers	Word 0	Word 1
0	Integer tare/Setpoint Bit 00	Select 1[1]
1	Integer tare/Setpoint Bit 01	Select 2[1]
2	Integer tare/Setpoint Bit 02	Select 3[1]
3	Integer tare/Setpoint Bit 03	Load Preset Tare[2,7]
4	Integer tare/Setpoint Bit 04	Clear Tare Command[3,8]
5	Integer tare/Setpoint Bit 05	Pushbutton Tare Command[3,7]
6	Integer tare/Setpoint Bit 06	Print Command[3]
7	Integer tare/Setpoint Bit 07	Zero Command[3]
8	Integer tare/Setpoint Bit 08	Enable Setpoint Command[4,6]
9	Integer tare/Setpoint Bit 09	Unused
10	Integer tare/Setpoint Bit 10	Unused
11	Integer tare/Setpoint Bit 11	Unused
12	Integer tare/Setpoint Bit 12	Unused
13	Integer tare/Setpoint Bit 13	Unused
14	Integer tare/Setpoint Bit 14	Unused
15	Integer tare/Setpoint Bit 15	Load Setpoint Value[5]

1. A binary value in bits 0-2 select the data in Discrete Read weight data source: 0 = Gross weight, 1 = Net weight, 2 = Displayed weight, 3 = Tare or active Target if in Over/Under mode, 4 = Setpoint 1, 5-7 = Gross.
2. A 0 to 1 transition causes the value in Word 0 to be written into the preset tare register.
3. A 0 to 1 transition activates the command.
4. Setpoint outputs are disabled if this bit is set = 0, enabled if set = 1. Setting this bit to 1 after a downloaded Setpoint value will store the downloaded value in non-volatile memory. It must be set = 0 to write to the setpoint target register. See note 5 to update memory.
5. A 0 to 1 transition causes the value in Word 0 to be written into IND130 terminal memory, however, the non-volatile memory Setpoint target register will not be updated unless the Enable Setpoint Command bit = 1. The Word 0 value for Setpoint 1 or Target 1 is in the primary unit (calibrated unit).

6. A value = 1 must be written for PLC to assume control of setpoint enable.

NOTE: Both PLC and IND130 toolbox can write a setpoint value. The IND130 is setpoint enabled at power up.

PROFIBUS GSD or Type Files

The IND130 Terminal PROFIBUS GSD files are available free of charge. They can be ordered from METTLER TOLEDO in a kit PN 0917-0418, which also includes a .200 type file for ET200 applications. The GSD file can also be downloaded free of charge from the PROFIBUS website: www.profibus.com.

Appendix F

Glossary

Auto Clear	When auto clear is enabled, the tare is automatically cleared when the scale returns to the center of zero.
Auto Tare	When auto tare is enabled, the tare weight is taken automatically when weight is on the scale.
Auto Zero	When auto zero is enabled, automatic internal corrections for offsets and/or drift at zero input are applied.
Blank Under Zero	When blank under zero is enabled, the display becomes blank to indicate an under-zero condition when the terminal is in the Gross mode (no tare).
CalFREE	A method of mathematically calculating calibration factors based on the A/D converter gain setting, the load cell gain (sensitivity), and the desired scale capacity and increment size.
Capacity	Maximum amount of weight that can be placed on a scale
Extensible Markup Language (XML)	A widely used system for defining data formats. XML provides a powerful system to define complex documents and data structures.
Increment	The value of the finest division of a scale
Low Pass Filter	An electronic network for passing low and attenuating high frequencies.
Motion Range	A predetermined "acceptable" amount of motion in scale increments (d) used to determine when a no-motion condition exists on the scale platform. The sensitivity level determines what is considered stable.

Node Address	Each unit connected to a remote I/O (RIO) network represents one physical node. The node address is a logical rack address that is determined by the system designer.
Pushbutton Zero	When pushbutton zero is enabled, auto zero can be implemented by pushbutton.
Setpoints	Setpoints are on/off outputs that indicate whether the weight displayed on the scale is greater than or less than a preprogrammed weight value. Setpoints are typically used in material filling applications in order to fill a container to a preset weight.
Span	The difference between the highest and lowest calibration weight values.
Stability Filter	A filter that can be used to improve the readability of a static weight display by removing small variations in weight around a steady state value.
Tare	Tare is the empty weight of a container. Tare is normally used to determine the net weight of the contents of a container.
Tare interlocks	A set of restrictions on how tare can be used that are required by some local weights and measures regulations. If tare interlocks are enabled, the terminal must be at gross zero to clear a tare weight.
Virtual Operator Panel	A panel that displays in the active window of the configuration tool that enables live weight viewing when the terminal is connected to the PC.
Zero	Zero is the empty weight of the scale platform or weighbridge. The gross zero reference is recorded during calibration. Also see AZM.
Zero Tolerance	Zero tolerance is used as a control check to ensure that the scale has returned to within a preset incremental tolerance of zero before the next weighing operation may begin.

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