# 8530 Cougar™

## Industrial Terminal

User's Guide

(for Standard Software)

B15472600A
(10/99).00

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**METTLER TOLEDO**

# Publication Revision History

**An overview of this manual's revision history is compiled below.**

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| A15472600A | 3/99 | Added declaration of conformity. Changed NEMA 1 (IP20) rating to NEMA 4X (IP65). |
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# Declaration of conformity
Konformitätserklärung
Déclaration de conformité
Declaración de Conformidad
Conformiteitsverklaring
Dichiarazione di conformitá

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**Worthington, Ohio 43085**
**USA**

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**Model/Type:** **8530 Cougar ***

**(*When installed and operated with an AULT model PW102 series external power supply.)**
**(A copy of the AULT Declaration of Conformity for the PW102 series supply is on file.)**

**to which this declaration relates is in conformity with the following standard(s) or other normative document(s).**
auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.
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**CE Conformity** / CE-Konformität / Conformité CE
90/384/EU Nonautomatic Balances and Scales / Nichteselbsttätige Waagen / Balances à Functionnement non automatique
EN45501:1992 Adopted European Standard / Norme Européenne Adoptée / Angenommene Europäische Norm
89/336/EU EMC Directive / EMU-Richtlinie / Directive concernant la CEM
EN55022, B : 1987 Emissions / Funkstörungen
EN50082-2: 1995 Immunity
73/23/EU Low Voltage / Niederspannung / basse tension
EN61010 el. Safety / el. Sicherheit / sécurité el.

**Other Directives and Standards** / Andere Richtlinien und Normen / Autres documents
**corresponding to local requirements** / entsprechend lokalen Anforderungen / correspondant aux exigences locales
UL1950 el. Safety / el. Sicherheit / sécurité el. (if UL mark is applied)
C22.2 No. 950-M89 el. Safety / el. Sicherheit / sécurité el. (If CUL mark is applied)
FCC, Part 15, class A Emissions / Funkstörungen

Darrell Flocken, Manager - Weights & Measures
Office of Weights and Measures
Worthington, Ohio USA
August 1998

according to EN45014

## INTRODUCTION

This publication is provided solely as a guide to operating the Cougar Industrial Scale Terminal. Information about installing, maintaining, and servicing the terminal is available in the Cougar Service Manual (PN C15339200A).

## 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 users will be required to correct the interference at their own expense.

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

# Precautions

READ this manual BEFORE operating or servicing this equipment.

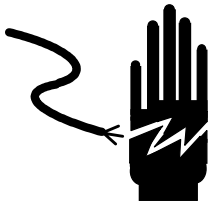
FOLLOW these instructions carefully.

SAVE this manual for future reference.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CALL METTLER TOLEDO for parts, information, and service.

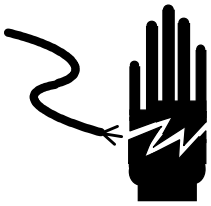


## ⚠ WARNING

**PERMIT ONLY QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. 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.**

## ⚠ WARNING

**FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.**



## ⚠ WARNING

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

## ⚠ CAUTION

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

## CAUTION

**OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.**

# Contents

# 1 Introduction

Thank you for purchasing the Cougar™ industrial terminal. It is a multi-range, high-performance terminal for use with METTLER TOLEDO POWERCELL® scale platforms. It is compatible with the DigiTOL® POWERCELLs used in TRUCKMATE and RAILMATE vehicle scale models 7260, 7531, 7541, 7560, and 760 DC.

Two versions of the Cougar terminal are available:

**The Cougar Standard Software Version** has 10 memory locations for storing vehicle weights that can be recalled to complete a transaction and print a ticket. Vehicle weights can be stored in permanent memory for vehicles that will be weighed repeatedly. Vehicle weights can be stored in temporary memory for a single inbound/outbound weighing.

**The Cougar VS Software Version** has 100 memory locations for storing vehicle weights (permanently or temporarily) that can be recalled to complete a transaction and print a ticket. Up to 10 of those locations can be used as commodity registers with conversion factors for converting weight to a unit of measure such as bushels of wheat or yards of concrete. VS software also provides a Quick Print mode for printing vehicle weight or net weight without storing a tare in a memory location. Four printed report formats are available: open temporary registers, permanent registers, scale accumulator, and commodity table.

If any information in this manual is incorrect or missing, please use the Publication Suggestion Report at the back of the manual to tell us about it.

## Model Identification

Each Cougar terminal is marked with a Factory Number. Table 1-1 explains how to use that number to determine the specifications of a particular terminal.

| Cougar Terminal Model Configuration | | |
|---|---|---|
| **CTHN** | **XXXX** | **XXX** |
| **Type of Terminal** | **Type of Software** | **Destination Market** |
| Cougar Terminal | 0000 = Standard<br>0001 = VS | Finish Code |

**Table 1-1 : Cougar Terminal Factory Numbers**

For example, the Factory Number CTHN-0000-000 indicates the following:

CTHN = Cougar terminal

0000 = Standard software

000 = United States is destination market

# Specifications

The Cougar conforms to the following specifications.

## Physical Dimensions

The Cougar terminal (excluding the mounting bracket) measures

- 10.00 inches (25.4 cm) wide x 7.00 inches (17.78 cm) high
- 3.22 inches (8.18 cm) deep

See Figure 1-1 for mounting dimensions.

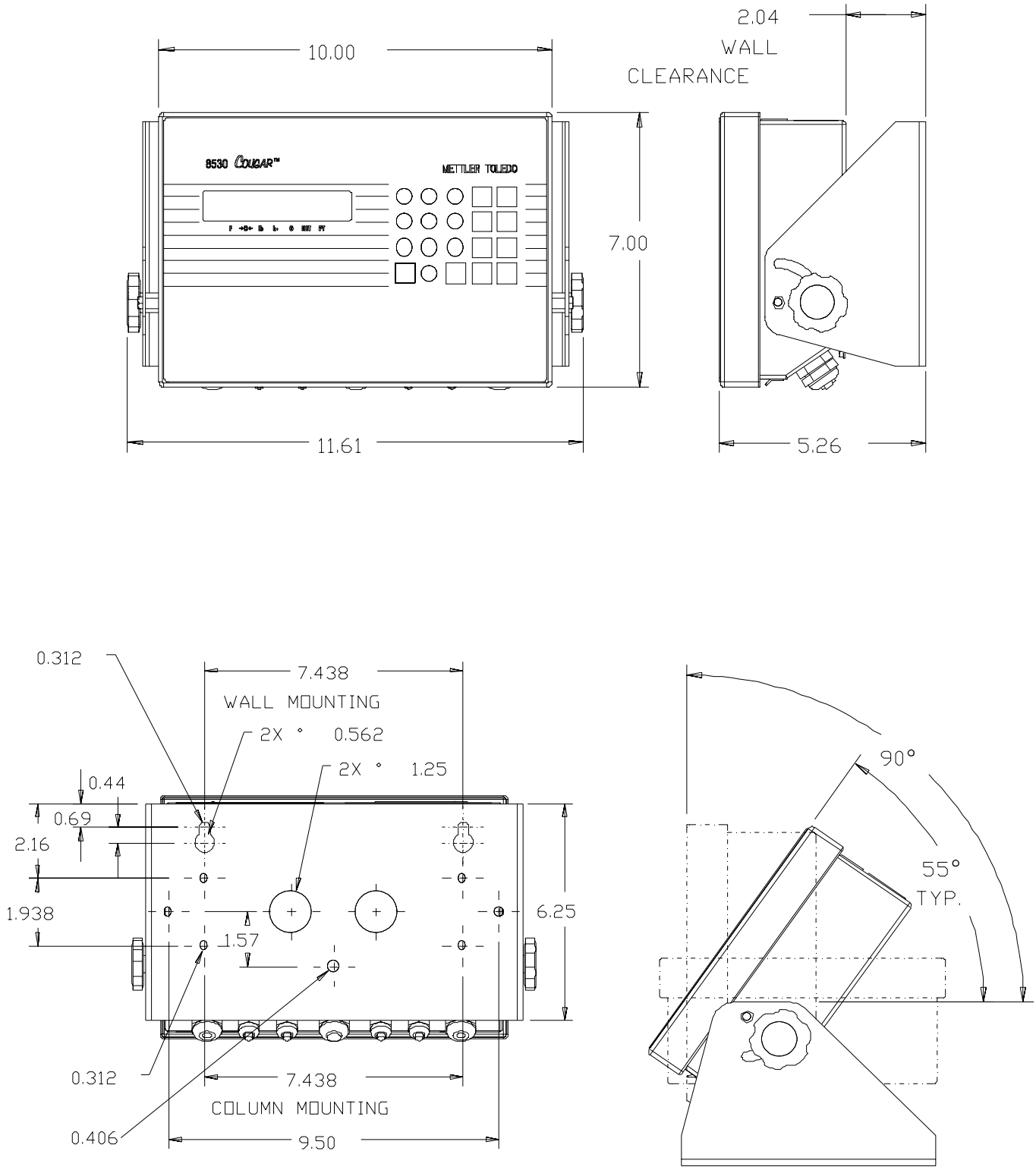
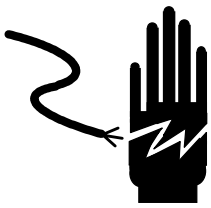



**Figure 1-1 : Cougar Terminal Dimensions (Dimensions shown are in inches)**

## Power Requirements



**⚠ WARNING**

**FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.**

The Cougar terminal uses an externally mounted, universal line-switching power supply. It accepts an IEC modular line cord for worldwide operation. The terminal operates at 90 to 265 VAC with a line frequency of 47 to 63 Hz. Power consumption is 12 watts maximum.

The integrity of the power ground is important both for safety and for dependable operation of the Cougar and its associated scale bases. A poor ground can result in an unsafe condition if an electrical short develops in the equipment. A good ground connection is needed to minimize extraneous electrical noise pulses. It is important that equipment does not share power lines with noise-generating equipment such as heavy load switching, motor starter circuits, RF thermal heaters, and inductive loads.

To confirm ground integrity, a commercial branch circuit analyzer like an ICE Model SureTest ST-1D (or equivalent) is recommended. This instrument uses a high-amperage pulse to check ground resistance. It measures the voltage from the neutral wire to the ground connection and will provide an assessment of the line loading. Instructions with the instrument give guidelines about limits that ensure good connections. Visually inspect the installation and question the user to get information about equipment sharing the power line.

If adverse power conditions exist, a dedicated power line or circuit might be required.

## Controller PCB

The Cougar terminal's controller printed circuit board (PCB) has a POWERCELL interface that can support up to 24 load cells. Supply voltage for the load cells is 24 VDC.

The printer serial port can be either RS-232 or 20 mA current loop active transmit.

The computer serial port can be either RS-232 or RS-422. Both serial ports are available simultaneously for transmitting; however, only one can receive data.

Connections to the controller PCB are made using removable terminal strips. The wire size for these terminal strips ranges from 23 to 16 AWG.

The controller PCB stores setup parameters in a battery-backed RAM. Scale calibration and other metrological data are stored in a removable EEPROM.

## Display and Keyboard

The Cougar terminal has a vacuum fluorescent display that shows weighing data, setup information, and error messages. The display includes seven alphanumeric characters, each measuring 0.55 inch (12.7 mm) high. Cursors below these characters light up to indicate which of the legends printed on the keyboard overlay are currently active.

The terminal's 20-key keyboard is used to enter data and commands. The keyboard consists of a flat membrane switch covered with a domed polyester overlay. The lens is made of polyester and hardcoated to resist damage.

## Temperature and Humidity

The Cougar can be operated at temperatures ranging from 14° to 113° F (-10° to 45° C) at 10 to 95% relative humidity, noncondensing.

It can be stored at temperatures ranging from -40° to 158° F (-40° to 70° C) at 10 to 95% relative humidity, noncondensing.

## Environmental Protection

The Cougar is designed to meet NEMA 4X (IP65) requirements.

## Hazardous Areas

The Cougar is not intrinsically safe and must not be operated in areas classified as Hazardous by the National Electrical Code (NEC) because of the combustible or explosive atmospheres in those areas. Contact your authorized METTLER TOLEDO representative for information about hazardous applications.

**⚠ WARNING**

**The Cougar terminal IS NOT intrinsically safe. DO NOT use in areas classified as Hazardous by the National Electrical Code (NEC) because of combustible or explosive atmospheres.**

# Standards Compliance

The following compliance standards apply to the Cougar industrial terminal.

## UL and cUL Listing

The Cougar terminal complies with UL 1950.

## CE Conformity

The Cougar terminal conforms to the following European Union regulations:

- EN61010 Safety
- 73/23/EU Low Voltage

## Weights and Measures Approval (U.S.)

The Cougar terminal meets or exceeds requirements for Class III or IIIL devices. Certificate of Conformance number 88-259 was issued under the National Type Evaluation Program of the National Conference on Weights and Measures for approval.

## Conducted and Radiated Emissions (RFI)

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

## Radio Frequency Interference Susceptibility

The Cougar terminal meets US, Canadian, and EC requirements for RFI susceptibility as listed in Table 1-2 with a maximum of one display increment of change when calibrated for recommended builds.

| RFI Susceptibility | | | |
|---|---|---|---|
| Radio Interference Frequency | United States | Canadian | EC |
| | Field Strength | Transmitted Power at Specified Distance | Field Strength |
| 27 MHz | 3 volts/meter | 4 Watts at 2 meters | N/A |
| 169 MHz | 3 volts/meter | N/A | N/A |
| 464 MHz | 3 volts/meter | 4 Watts at 2 meters | N/A |
| 27-1000 MHz | N/A | N/A | 3 volts/meter |

**Table 1-2 : RFI Susceptibility**

# 2 Operating Instructions

This chapter provides general information that you will need to operate the Cougar industrial terminal. Refer to the following table to locate step-by-step instructions for how to perform basic tasks with the terminal.



The front panel of the Cougar terminal is shown in Figure 2-1.

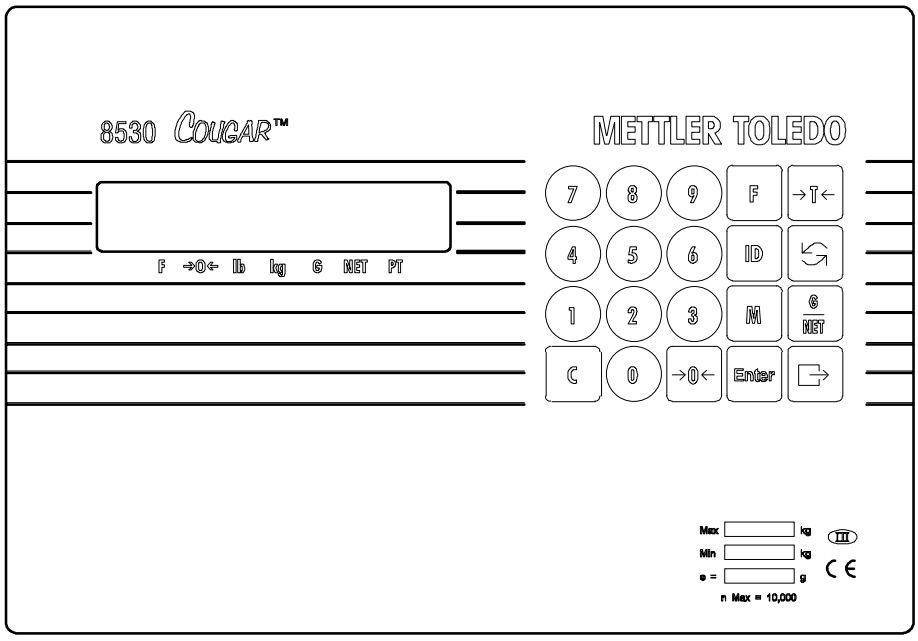



**Figure 2-1 : Cougar Terminal Front Panel**

# Cougar Display

The Cougar terminal has a seven-segment display where scale data and operational messages are presented. The display is pictured in Figure 2-2.

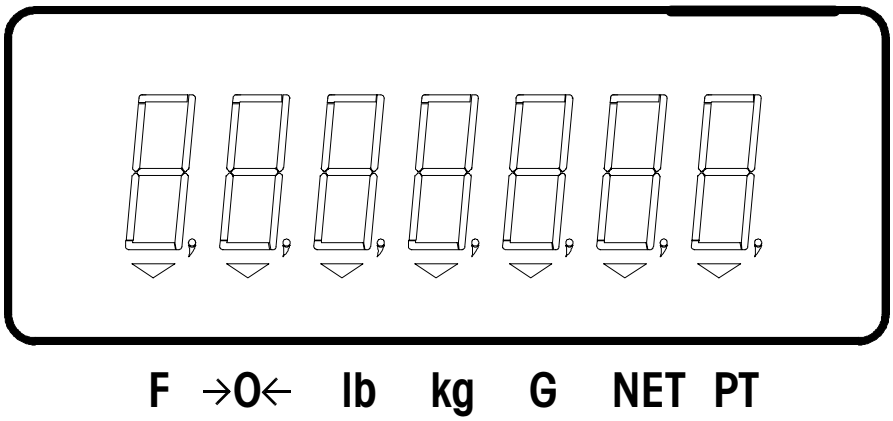



**Figure 2-2 : Cougar Terminal Display**

The display uses both letters and numbers. It shows the weight on the scale unless the terminal is in setup mode. Error messages are displayed when errors occur. The display includes cursors that point to the legends printed on the keyboard overlay directly below the display area. Cursors are used to indicate which of those legends are currently active. Cougar terminals feature the following legends:

- **Function (F)**
  The Function cursor lights up when the FUNCTION key has been pressed.
- **Zero (→0←)**
  The Zero cursor lights up to indicate that the weight on the scale is within ± 0.25 increments of gross zero and that the Cougar terminal is in the gross weight mode. If the net zero cursor is enabled during setup, the zero cursor indicates when the weight on the weighbridge is within ± 0.25 increments of gross or net zero.
- **Pounds (lb)**
  The lb cursor lights up to indicate that pound weight units are being used and that the weight on the scale is stable.
- **Kilograms (kg)**
  The kg cursor lights up to indicate that kilogram weight units are being used and that the weight on the scale is stable.
- **Gross (G)**
  The Gross cursor lights up to indicate that a gross weight value is being displayed.
- **Net (NET)**
  The Net cursor lights up to indicate that a tare has been entered and that a net weight value is being displayed.
- **Preset Tare (PT)**
  The Preset Tare cursor lights up to indicate that a preset tare weight value is being displayed. It also lights up when displaying the stored tare value of a permanent register.

# Cougar Keypad

The Cougar terminal has a 20-key keypad as shown in Figure 2-3.

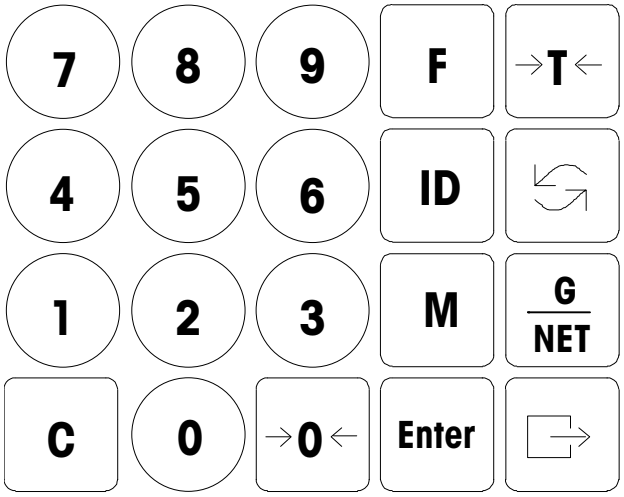



**Figure 2-3 : Cougar Terminal Keypad**

The keypad consists of numeric keys 0 to 9, decimal point, space, and eight function keys. The keys perform the following functions:

- **Numeric Keys (0-9)**
  Numeric keys are used to enter numeric data for tare, consecutive numbering, time, date, setpoints, etc.
- **Function (F)**
  The FUNCTION key is used in conjunction with numeric keys to access functions for consecutive numbering, time, date, accumulators, and setpoints 1 to 4.
- **Tare (→T←)**
  The TARE key is used to perform an autotare (the weight on the scale must be stable and not at gross zero). The TARE key is also used to terminate a keyboard (numeric) tare entry. The least significant digit of a keyboard tare entry must correspond to the displayed increment size in order for a tare value to be accepted. If tare interlock is enabled during setup, a keyboard tare can be entered only at gross zero.
- **Identification Number (ID)**
  The ID key is used for entering and recalling the scale's identification number.
- **lb/kg Switching (↺)**
  The lb/kg switching key toggles between pound and kilogram weight units if lb/kg switching is enabled during setup. The increment size and decimal point are adjusted to the nearest equivalent when switching between units. For example, a 1-lb increment size changes to 0.5 kg, a 2-lb increment size changes to 1 kg, etc.
- **Memory (M)**
  The MEMORY key is used to recall the 10 stored tare weight memories.
- **Gross/Net (G/NET)**
  The GROSS/NET key is used to toggle between gross and net weight display. This

key has no effect if the terminal is in the gross weight mode.

- **Clear (C)**
  The CLEAR key is used to clear data entries from the display so that new data can be entered. It is also used to clear a tare weight when in the net weight mode.
- **Zero (→0←)**
  The ZERO key is used to zero the scale when it is within the zero capture range selected during setup. In setup, the ZERO key is used to back up to the previous step.
- **Enter**
  The ENTER key is used to terminate data entries and to move through the setup mode without making changes.
- **Print (⊡→)**
  The PRINT key is used to request a demand mode output. If the weight on the scale is unstable when PRINT is pressed, the print request is saved and data will be output when the weight becomes stable. The PRINT key is also used to print setup parameters when the terminal is in setup mode.

Throughout this manual we make a distinction between key names and commands. Key names such as ENTER are presented in capital letters, and commands such as "select" are presented in lower case. For example:

"Press SELECT..." means to press the SELECT key on the key pad.

"Select an option..." means to use the SELECT key to display an item, then press ENTER.

## Powerup Sequence

The Cougar terminal executes a series of self tests when it is turned on. These tests confirm that the terminal is operating properly. The powerup sequence is as follows:

1. The software part number is displayed briefly.
2. The revision level number of the software is displayed briefly.
3. All segments of the seven display digits are lit briefly.
4. All cursors are lit briefly.
5. All decimal points are lit briefly.
6. The terminal may display **[ E E E ]** or **[ -E E E ]** while attempting to capture zero. Once zero has been captured, the terminal will display weight. If autozero capture and tare interlock are disabled, the terminal will display the current weight without attempting to capture zero. After powerup, zero must always be captured before the terminal will print demand mode data or before lb/kg switching.

# FUNCTION Key Operations

Function mode allows you access to several commonly used non-weighing parameters without having to open the enclosure and insert the calibration jumper. When you enter function mode, the terminal automatically returns to weighing mode if no key is pressed within five seconds. Cougar terminals support the following FUNCTION key operations:

## Manual Shift Adjust

The FUNCTION-0 key is used only when manual shift adjust is enabled. Manual shift adjust should be performed only by a qualified service technician.

1. Press FUNCTION, then press 0. Refer to the Cougar Service Manual for instructions on how to perform a manual shift adjust.

## Setpoints 1 to 4

These Function keys let you display and change setpoint data. You can use these keys only if the setpoints were enabled during setup.

1. Press FUNCTION, then press the number of the setpoint to be displayed (1 to 4).
2. The current setpoint value will be displayed for five seconds. Enter a new setpoint value while the current value is displayed. Press ENTER to accept the new setpoint value (or the current value if you made no changes) and return to the weight display mode.

The least significant digit of the setpoint value that is entered must match the displayed increment size selected in setup; otherwise the terminal will ignore the setpoint entry.

## Consecutive Numbering

The FUNCTION-5 key lets you display and change the consecutive numbering counter.

1. Press FUNCTION, then press 5.
2. The current consecutive numbering value will be displayed for five seconds. Enter a new consecutive numbering value (up to six digits) while the current value is displayed. Press ENTER to accept the new consecutive numbering value (or the current value if you made no changes) and return to the weight display mode.

## Time

The FUNCTION-6 key lets you display and change the time.

1. Press FUNCTION, then press 6.
2. The current time will be displayed for five seconds. Enter a new time while the current time is displayed (time is entered in the format selected during setup). Press ENTER to accept the new time (or the current time if you made no changes) and return to the weight display mode.

## Date

The FUNCTION-7 key lets you display and change the date.

1. Press FUNCTION, then press 7.
2. The current date will be displayed for five seconds. Enter a new date while the current date is displayed (date is entered in the format selected during setup). Press ENTER

to accept the new date (or the current date if you made no changes) and return to the weight display mode.

## Accumulators

The FUNCTION-8 key lets you display and change the total weight accumulator and subtotal weight accumulator. Accumulation of gross weight, net weight, or displayed weight can be selected during setup. Weight data will be accumulated every time a print request is made.

1. Press FUNCTION, then press 8.
2. The **[ACC]** prompt will be displayed to indicate that you are accessing the accumulators. Press PRINT to print the contents of the total and subtotal accumulators. Once the data has been printed, the subtotal accumulator will be cleared. To clear both total and subtotal accumulators, press CLEAR at the **[ACC]** prompt.

To print accumulators, demand mode printing must be selected during setup.

## Tare Recall

This Function key is used to display the current tare value.

1. Press FUNCTION, then press TARE. The current tare value will be displayed but cannot be changed.

# MEMORY Key Operations

Cougar terminals have ten memory locations (numbers 0 to 9) that can be used to store vehicle weights permanently or temporarily so that the weights can be recalled to complete a transaction and print a ticket with gross, tare, and net weight. To permit stored tare weight operation, tare memory must be enabled during setup.

To view a stored weight value, press the MEMORY key and then the memory location (0 to 9) where the tare weight is stored. The terminal will display the current contents of the memory location for five seconds and then return to the weigh mode. If you press the MEMORY key while a tare memory is displayed, the next tare memory will be displayed.

The MEMORY key is used to perform the following operations:

## Manually Storing a Known Tare Weight into Permanent Memory

Tare weights are often permanently stored when the user has a fleet of vehicles with known empty (tare) weights that can be used as fixed tare values. When a loaded vehicle is driven onto the scale, the tare weight can be recalled by ID from memory and a ticket can be printed. Use the following procedure to enter a known tare weight manually into a permanent memory location:

1. Press MEMORY, then press the memory location (0 to 9) where you want to store the tare weight.
2. The terminal will display the current contents of the memory location for five seconds. Use the numeric keys to enter a new tare value while the current value is displayed. Press ENTER to accept the new tare value (or the current value if you made no changes) and return to the weight display mode. The tare value that you entered will be held in memory until manually replaced or cleared.

## Storing an Empty Truck Weight into Permanent Memory

If the empty (tare) weight of a vehicle is not known, it can be stored into a permanent memory location using the following procedure:

1. Clear any tare weight that is stored in the memory location you plan to use. Before you can store a new truck weight, the display must show **[000000]** for the location where the tare weight will be stored.
2. Drive the empty vehicle onto the scale platform and verify that the Cougar terminal is in the gross weight mode.
3. Press MEMORY, then press the memory location (0 to 9) where you want to store the tare weight.
4. The terminal will display **[000000]** for five seconds. While this value is being displayed, press ENTER to store the weight reading from the scale platform.

## Recalling a Permanently Store Tare Weight

To recall a permanently stored tare weight from memory, use the following procedure:

1. Verify that the Cougar terminal is in the gross weight mode, then drive the loaded vehicle onto the scale platform.
2. Press MEMORY, then press the memory location (0 to 9) where the tare weight for this vehicle is stored.

3. While the contents of the memory location is displayed, press TARE to recall the stored weight into the tare weight register. The difference between the weight currently on the scale and the stored tare weight will then be displayed as the net weight.
4. Press PRINT to print a ticket. The weight value recalled from memory will be printed with the memory location in parentheses after it. The following example shows a ticket printed with a tare weight recalled from memory location 4:

```
62040 lb
18060 lb TR (4)
43980 lb NET
```

## Clearing a Permanently Stored Tare Weight

To clear a permanently stored tare weight from memory, use the following procedure:

1. Press MEMORY, then press the memory location (0 to 9) you want to clear.
2. The terminal will display the current contents of the memory location for five seconds. While this value is being displayed, press CLEAR to erase the contents of the memory location.

## Temporarily Storing Inbound/Outbound Weight

The inbound/outbound weighing mode is commonly used with random, over-the-road haulers that are delivering or picking up a product. The vehicle is weighed twice, once inbound and once outbound. The inbound weight is stored in a temporary register. When the outbound vehicle is weighed, the stored inbound weight is recalled from memory and used to calculate the net weight of the contents of the vehicle. Once an inbound stored tare weight has been recalled, the memory location is cleared and is free to be used for storing a new inbound weight. To use this memory feature, inbound/outbound weighing must be enabled during setup.

Net sign correction permits a temporary memory register to be used for both shipping and receiving. If net sign correction is enabled during setup, then the stored inbound weight can be either the full or the empty weight of the vehicle. When the inbound weight is recalled from memory, the Cougar terminal will automatically select the larger of the two weights (the current weight on the scale and the inbound weight recalled from memory) as the gross weight. The smaller weight becomes the tare weight, and the difference between the two is a positive net weight.

To store an inbound vehicle weight into a temporary memory location, use the following procedure:

1. Verify that the Cougar terminal is in the gross weight mode, then drive the inbound vehicle onto the scale platform.
2. Press MEMORY, then press PRINT. The current weight on the scale will be stored in the next available memory location (0 to 9) and the inbound weight will be printed with the memory location in parentheses. The display will read **[ FLL ]** if all ten memory locations are full when you try to store an inbound weight, and no more inbound weights can be stored until a memory location is cleared. The following example shows a ticket printed with an inbound weight stored in memory location 1:

```
12540 lb (1)
```

## Recalling a Stored Inbound Vehicle Weight

To recall an inbound vehicle weight that has been stored in memory, use the following procedure:

1. Verify that the Cougar terminal is in the gross weight mode, then drive the outbound loaded vehicle (or unloaded vehicle if net sign correction is enabled) onto the scale platform.
2. Press MEMORY, then press the memory location (0 to 9) where the inbound weight for this vehicle was stored. The memory location was printed in parentheses after the inbound weight. The terminal will display the current contents of the memory location for five seconds.
3. Press TARE while the terminal is displaying the contents of the memory location to recall the stored weight into the tare weight register. The terminal will then display the difference between the weight currently on the scale and the stored tare weight as a net weight.
4. Press PRINT to print a ticket. The weight value recalled from memory will be printed with the memory location in parentheses after it. The following example shows a ticket printed with a tare weight recalled from memory location 4:

```
62040 lb
18060 lb TR (4)
43980 lb NET
```

If net sign correction is enabled and the inbound weight is larger than the outbound weight, then the terminal will switch the positions of the gross and tare weights on the printed ticket so that the larger weight is the gross weight, the smaller weight is the tare weight, and the difference between them is printed as a positive net weight. The following examples show tickets printed with and without net sign correction:

```
62040 lb (1)
18060 lb TR
43980 lb NET
```

```
-18060 lb
62040 lb TR (1)
-43980 lb NET
```

# 3 Appendices

## Appendix 1: Basic Weighing Concepts

This Appendix explains some of the specialized terminology and concepts that are used in the weighing industry.

### Zero

Zero is the empty weight of the scale platform or weighbridge. The gross zero reference is recorded during calibration.

Pushbutton Zero is a way for the operator to capture a new gross zero reference point. The weight on the scale must be stable and be within the pushbutton zero capture range, typically ±20% of full scale capacity. The zero of the scale can change because material builds up on the scale or because the temperature changes.

Auto Zero Maintenance (AZM) is a way for the terminal to gradually rezero itself in order to compensate for small changes in zero. Class IIIL legal-for-trade vehicle scales use an AZM range of ±3 displayed increments above/below gross zero. AZM is active any time the weight on the scale is stable and is within the AZM range.

### Tare

Tare is the empty weight of a vehicle. Tare is normally used to determine the net weight of the contents of a vehicle. It can be used in the following ways:

#### Autotare

An autotare is taken by pressing the TARE key when an empty vehicle is on the scale. The terminal then displays a zero weight with the net cursor lit. The vehicle is loaded and driven back onto the scale. The terminal then displays the net weight of the contents. If the TARE key is pressed while the terminal is in the net mode, the current weight on the scale becomes the new tare value. Tare interlocks inhibit replacement autotare.

#### Keyboard Tare

Keyboard entered tare is used when the empty weight of the vehicle is a known value. The known tare weight is entered using the numeric keys, and the TARE key is pressed. The terminal will then display the net weight of the contents of the vehicle.

#### Chain Tare

Chain tare is a rarely used mode of keyboard entered tare. If a tare is entered using the numeric keypad while the terminal is in the net weight mode, the tare value entered is added to the existing tare weight value. Tare interlocks inhibit this mode.

### Tare Interlocks

Tare interlocks are a set of restrictions on how tare can be used. They 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 or to enter a keyboard tare. Tare interlocks also prevent the terminal from replacing an existing tare with a new tare.

## Sections

Vehicle scale weighbridges are normally divided into what are called "sectional pairs" or sections. A section is a pair of load cells that are side by side in the weighbridge (see Figure 3-1). Sections are primarily a consideration when dealing with shift errors.

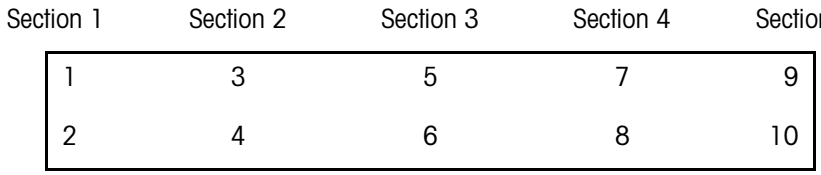



**Figure 3-1 : Load Cells and Sections in a Typical Vehicle Scale**

## 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 vehicle to a preset weight. A Cougar terminal provides four single-speed setpoints. It does not provide discrete electrical outputs. The setpoint information is coded into the continuous serial data output. In order to use the terminal's setpoint capabilities, you need an additional piece of equipment that understands the continuous format data output. METTLER TOLEDO Model 3015 Setpoint Controllers and Model 9215 Batching Controllers are examples of devices that understand the continuous format data output and can convert the setpoint data into high-level on/off outputs designed to control material feeders.

## Inbound/Outbound Weighing

Vehicle scales are often used in an inbound/outbound mode of operation where the vehicle is loaded or unloaded at the user's site. In the inbound/outbound mode the vehicle empty (tare) weight is not known, so the vehicle must be weighed twice (once empty and once loaded). In the past this was normally done by printing the inbound weight, printing the outbound weight, and then calculating the difference (net weight) by hand.

A Cougar terminal simplifies inbound/outbound weighing by permitting the operator to store the inbound vehicle weight in memory and then recalling that weight at a later time. Once the inbound weight is recalled, the terminal calculates the net weight and prints an outbound ticket.

## Net Sign Correction

Net sign correction is a feature that permits the Cougar terminal to be used for both shipping (inbound empty) and receiving (inbound loaded) operations. If net sign correction is enabled, The terminal will swap the gross and tare weight fields on the printed ticket, if necessary, so that the larger weight is the gross weight, the smaller weight is the tare weight, and the difference is always a positive net weight.

## One-Pass Weighing

One-pass weighing is a mode where the user has a fleet of vehicles with known empty (tare) weight. The tare weight is recalled by ID with the loaded vehicle on the scale.

# Appendix 2: Autorange Operation

Range switching occurs when the total number of displayed increments for a range is equal to the total number of displayed increments for the high range. For example, assume that a terminal is programmed as follows:

**[11 0]** Calibrate in pounds

**[13 2]** Dual-range operation is selected

**[14 ] [400000]** Scale Capacity

**[15 ] [ 50]** High range increment size

**[17 ] [ 20]** Low range increment size

The following equations and Table 3-1 show how to calculate the largest weight that can be displayed in the lower ranges. For the correct scale capacity and minimum increment size, refer to the indicator setup section of the weighbridge installation manual.

$$\textit{Low Range Capacity} = \frac{\textit{Scale Capacity, Step } \textbf{\textit{[14]}} \times \textit{Low Range Increment Size, Step } \textbf{\textit{[17]}}}{\textit{High Range Increment Size, Step } \textbf{\textit{[15]}}}$$

$$\textit{Mid Range Capacity} = \frac{\textit{Scale Capacity, Step } \textbf{\textit{[14]}} \times \textit{Mid Range Increment Size, Step } \textbf{\textit{[16]}}}{\textit{High Range Increment Size, Step } \textbf{\textit{[15]}}}$$

| Display | Displayed Increment Size | Range Calculation Formula | Active Weight Range |
|---|---|---|---|
| Low Increment Range | 20 lb | Capacity × Low Increment ÷ High Increment = Low Increment Range<br>(400,000 × 20) ÷ 50 = 160,000 lb | 0 lb to 160,000 lb |
| High Increment Range | 50 lb | From Top of the Low Increment Range to Capacity | 160,050 lb to 400,000 lb |

**Table 3-1 : Autorange Operation Example**

Autorange works on the displayed weight value. Once a tare is taken, the net weight is displayed in the low increment size until the net weight exceeds the low increment range. If the gross, tare, and net weights are not in the same increment range, the total of the net and tare weight might not exactly equal the gross weight.

Example: A tare weight of 46,020 lb is taken. The net weight of the contents of the vehicle is 180,050 lb. The total of the tare and net weight is 226,070 lb, which is an invalid increment size. The terminal will use the valid increment size for the gross weight, which in this case is 50 lb increments, resulting in a printed gross weight of 226,100 lb. This value is the same gross weight that would be displayed if the tare weight was cleared.

# 4

# Glossary

**Accuracy**—The capability of a measuring device to provide measured values without systematic measurement deviations.

**Address**—A unique sequence of letters or numbers for the location of data or the identity of an intelligent device.

**ASCII (American Standard Code for Information Interchange)**—A system used to represent alphanumeric data; a 7-bit-plus-parity character set established by ANSI and used for data communications and data processing; ASCII allows compatibility among data services.

**Auto Range**—An automatic device for switching ranges in multiple-range scales and multiple-division scales.

**Automatic Zero Setting (autozero)**—An automatic zero-setting device which makes it possible to correct zero-point drifts or soiling of load carriers without manual intervention.

**Baud/Baud Rate**—Unit of the transmission rate in serial data transmission expressed in bits per second.

**Bit (Binary Digit)**—The smallest unit of information in a binary system; a 1 or 0 condition.

**Byte**—A data word with a length of 8 bits, which allows the encoding of 256 different characters. All common microprocessors possess a byte structure or a multiple of it in their data words.

**Calibration**—In the field of metrology, calibration means determination of the relationship between the displayed quantity and the true value of the measured variable under specified measurement conditions, for example, by means of a calibration curve.

**Capacity**—The maximum load that can be weighed on a particular scale.

**Character**—Letter, number, punctuation, or any other symbol contained in a message.

**Checksum**—The total of a group of data items or a segment of data that is used for error-checking purposes. Both numeric and alphabetic fields can be used in calculating a checksum, since the binary content of the data can be added. Just as a check digit tests the accuracy of a single number, a checksum serves to test an entire set of data which has been transmitted or stored. Checksum can detect single-bit errors and some multiple-bit errors.

**Current Loop Interface (20 mA)**—A digital peripheral interface for serial data transmission in which the logic states 0 and 1 are represented by the current 0 mA and 20 mA.

**EPROM (Erasable Programmable Read-Only Memory)**—Read-only, nonvolatile, semiconductor memory that can be erased via ultraviolet light and reprogrammed. See ROM.

**Even Parity**—Each data character must have an even number of "on" bits.

**I/O**—Input/Output.

**Jumper**—A wire which connects a number of pins on one end of a cable only, such as looping back Request to Send from Clear to Send. A connector on a printed circuit board of an electronic circuit used to set or initiate certain functions.

**Keyboard (keypad)**—A device consisting of an array of keys used to initiate functions and/or enter alphanumeric data and special characters.

**Linearity**—A measure of how well a scale follows the linear relationship between the loaded weight and the display value. The characteristic curve of a balance is envisaged as a straight line between zero and the maximum load. The nonlinearity defines the width of the band within which a plus or minus deviation of the measured value from the ideal characteristic line can occur.

**Metrology**—The science of measurement, measurement systems, and units.

**MultiRange**—A balance whose weighing range is divided into partial weighing ranges with different scale division values. Switching of the division values occurs automatically with increasing and decreasing load at the same display values.

**Net Weight**—The weight of a weighing sample after deduction of the weight of its packaging or of the transport device (tare weight) with which it had previously been weighed.

**Odd Parity**—Each data character must have an odd number of "on" bits.

**Parity Bit**—A bit that is set at 0 or 1 in a character to ensure that the total number of 1 bits in the data field is even or odd.

**PCB**—Printed Circuit Board.

**Port**—A point of access into a computer, a network, or other electronic device; the physical or electrical interface through which one gains access; the interface between a process and a communications or transmission facility.

**Preset Tare Value (PT)**—A numerical value, representing a weight, that is introduced in the scale terminal. This can be done by keying in the data, recalling it from data storage, or inserting it via an interface.

**RAM (Random Access Memory)**—A storage device into which data can be entered (written) and read. Compare with ROM.

**RFI**—Radio Frequency Interference.

**ROM (Read-Only Memory)**—A data storage device, the contents of which cannot normally be altered; storage in which writing over is prevented; permanent storage. Compare with RAM.

**RS-232 Interface**—A digital serial interface that complies with the EIA RS-232 standard for modem connections for data transmission over telephone lines. The standard is suitable for the description of computer interfaces (for example, descriptions of connector design, pin assignment, and signals). The use of modem control lines is not defined for the connection of computers and often leads to difficulties in data transmission.

**RS-422**—Electrical characteristics of balanced-voltage digital interface circuits.

**Serial Transmission**—The most common transmission mode, in which information bits are sent sequentially on a single data channel.

**Stability**—The measure of a scale's ability to give the same weight or count reading at different points in time. Phenomena affecting stability include creep, vibration, temperature, and humidity.

**Start Bit**—In asynchronous transmission, the first bit or element in each character, normally a space, which prepares the receiving equipment for the reception and registration of the character.

**Stop Bit**—In asynchronous transmission, the last bit, which is used to indicate the end of a character and serves to return the line to its idle state.

**String**—Any combination of alphanumeric characters (letters, numbers, and special characters), for example, language sets for output on the screen. With variable types, a distinction is made between numeric variables, which can contain only numbers, and string variables.

**Tare, Tare Weight**—The mass of the package or transport container of the weighing sample. See Gross Weight, Net Weight.

**Tare Memory**—A feature that makes it possible to store and then recall the tare weight.

**Terminal**—The point in a network at which data can either enter or leave; a device, usually equipped with a keyboard and display, capable of sending and receiving data over a communications link.

**Test Weight**—A weight piece that comes with the balance. This weight has the appropriate accuracy and is used for regular checks on the functioning and accuracy of the balance.

**X-ON/X-OFF (Transmitter On/Transmitter Off)**—Control characters used for flow control, instructing a terminal to start transmission (X-ON) and end transmission (X-OFF).

**METTLER TOLEDO**

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