UWT™

Unattended Weighing Terminal Installation and Setup Manual

16841600A
(3-03)

This manual describes the operation and functionality of the UWT weighing terminal.

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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.

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	Met and exceeded my needs
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PRECAUTIONS

READ this manual BEFORE operating or servicing this equipment.

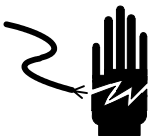
FOLLOW these instructions carefully.

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.

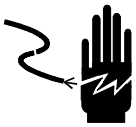


⚠ WARNING

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

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.



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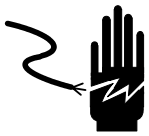


⚠ WARNING

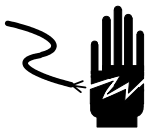
FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO PROPERLY GROUNDED OUTLET ONLY. DO NOT REMOVE THE GROUND PRONG.

WARNING!

THE UWT IS NOT INTRINSICALLY SAFE! DO NOT USE IN AREAS CLASSIFIED AS HAZARDOUS BY THE NATIONAL ELECTRIC CODE (NEC) BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.

WARNING!

USE ONLY THE POWER CORD SUPPLIED OR AN EQUIVALENT TYPE. U.S. MODELS USE UL APPROVED TYPE SJT CORD; EC MODELS USE HARMONIZED APPROVED TYPE H05VV-F CORDS.



⚠ WARNING!

IMPROPER INSTALLATION OF THE POWER CABLE WILL RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT. THE HOT WIRE MUST BE APPLIED TO "L", NEUTRAL TO "N" AND GROUND TO ⏚

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1 Introduction

Overview

The following information is intended to help you install and configure the UWT weighing terminal. Please read the information thoroughly prior to beginning installation. Only qualified technicians should do internal wiring, install options, and/or do any programming.

Note: The specific hardware configuration of the UWT is detailed in the assembly and wiring diagrams that accompany the equipment. Please reference those diagrams as you review the information provided here.

This document references the METTLER TOLEDO JAGXTREME terminal. Please refer to the JAGXTREME Terminal Technical Manual for details on configuring the discrete I/O and serial ports and for setting up scale interfaces.

UWT Overview

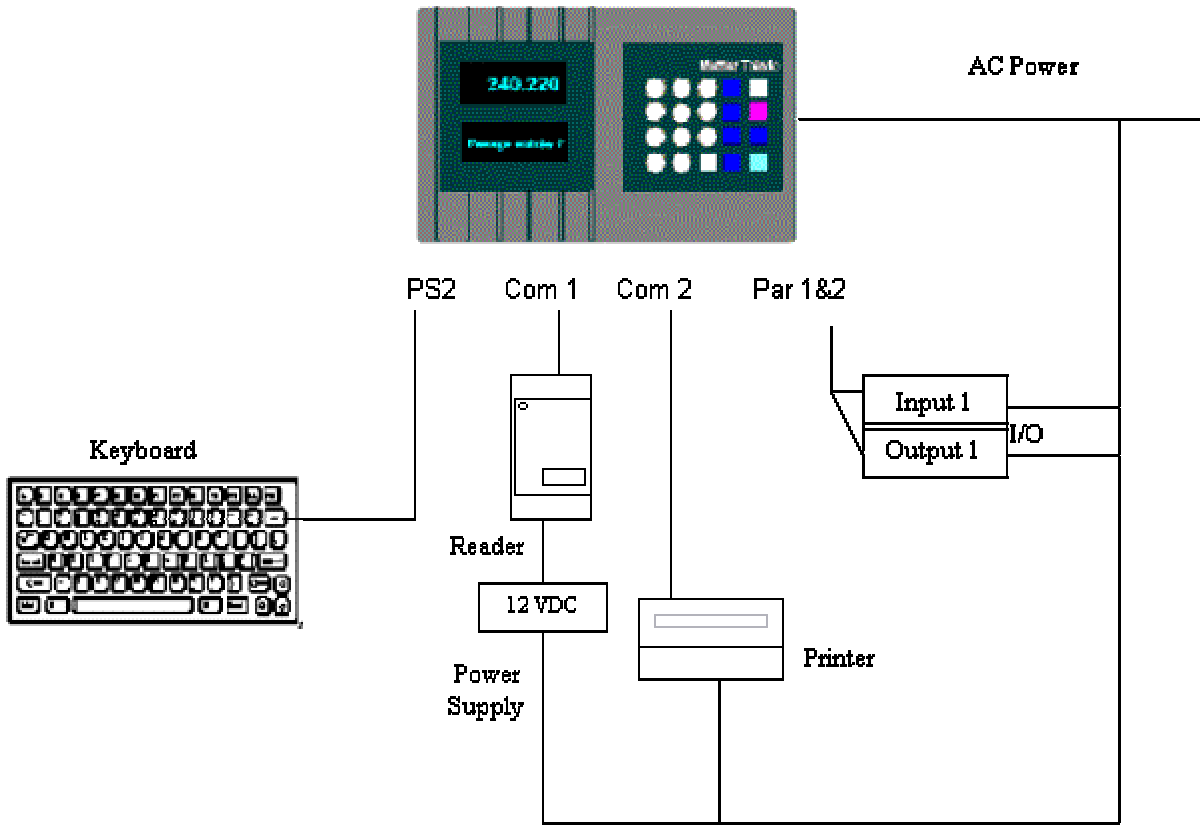
The UWT is designed for use with a full-length vehicle scale in situations in which the processing of vehicles is operated in an "unattended" (no operator support) manner. It can communicate with a personal computer (PC) via an Ethernet or serial connection. The UWT is available in a variety of hardware configurations based on the layout of the unattended operation site and the needs of the unattended operation.

UWT Model Numbers

XXX	X	X	X	X	X	X	X	X
Model	**Scale Interface**	**Printer Type**	**Reader Interface**	**Intercom**	**Loop Interface**	**I/O**	**Heater**	**Supply Voltage**
UWT	1 = Single/dual analog 2 = triple/quad dual analog 3 = Power cell	0 = no printer 1 = thermal kiosk printer	0 = no reader 1 = US proximity reader	0 = no intercom 1 = intercom	0 = no loop interface 1 = dual loop interface	0 = no additional I/O 1 = 2 in/2 out 2= 2 in / 4 out 3 = 0 in / 6 out	0 = no heater 1 = heater	0 = 110VAC 1 = 220VAC

UWT Basic Configuration

The internal configuration of the UWT consists of a panel-mount JAGXTREME (JXPA) terminal connected to a keyboard. Additional peripherals devices, such as a proximity reader or printer, may be added as required to meet the needs of the unattended operation.



The JAGXTREME terminal can control traffic signals and barriers, read loops detector outputs, and communicate with serial devices such as prompting displays, proximity card readers, and magnetic badge readers. The terminal can be configured with analog or POWERCELL scale cards.

An optional physical interface between an office PC and the UWT can be made via the JAGXTREME terminal using 10BASET Ethernet or serial connection. Through this interface weighing data can be imported into transaction programs or databases.

Keyboard
The 81-character QWERTY backlit keyboard is used to enter data (such as driver ID number) needed to complete weighing transactions.

Display
The JAGXTREME display has a 7-digit, 7-segment 0.5″ higher vacuum fluorescent upper display, and a 16-character, 5 x 7 dot matrix 0.25″ high lower display. A separate scoreboard weight display is available as an option.

Options and Accessories

The UWT can be equipped with the following options and accessories:

Printer
A kiosk style thermal printer with paper cutter can be installed in the driver station to print information about a weighing transaction on a driver's ticket. It prints 37 columns per line.

Card Reader
An RFID proximity card reader with LED status indicator installed in the front door of the UWT is optionally available.

I/O Modules
I/O modules connected to the JAGXTREME parallel inputs and outputs are used to control peripheral devices such as traffic lights or gates, and accept signals from roadway loops.

Intercom
An AIPhone model LE-DA slave station intercom speaker installed in the front door of the UWT is optionally available.

Heater
A 200W, thermostatically controlled, panel heater installed inside the UWT enclosure is optionally available. A heater is recommended when the optional printer is used.

Pole Mounting Strap (METTLER TOLEDO Part # 90804100C)
A bracket for mounting the enclosure to an existing 4″ o.d. pole is optionally available.

Pole Kit (METTLER TOLEDO Part # 90893200A)
A 10′ high, 4″ o.d., mounting pole with base kit for mounting to a concrete pad is optionally available.

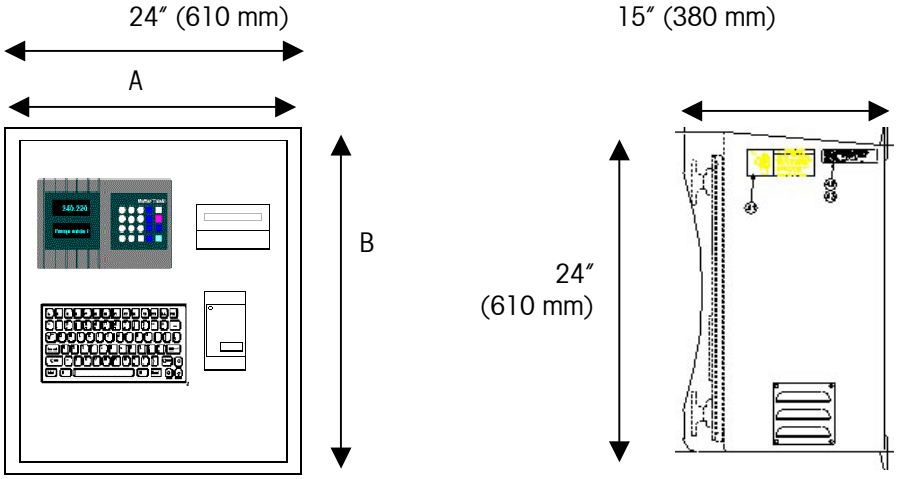
Scoreboard (METTLER TOLEDO Part # 86180003)

A six-character, 4″ HIGH, LCD digital display, RS-422 interface, 90-260VAC 50/60Hz, for display of vehicle weight is available.

Specifications

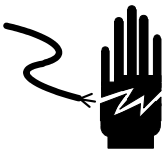
The UWT conforms to the following specifications.

Physical Dimensions



Note: Wall-mounting or bracket-mounting hole spacing A = 22.5″ (572 mm), B = 24.63″ (626 mm)

Power Requirements



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The UWT requires an input power source of 220 VAC or 115VAC. Rated current draw is nominally 6A (115VAC) or 3A (220VAC), but varies depending on which options are installed. Refer to the nameplate on the side of the enclosure for specific electrical requirements.

Operating and Storage Temperature

The standard UWT (without printer) can be operated at temperatures ranging from –10°C to +40°C (14°F to 104°F). When a printer is used, the minimum operating temperature without an optional heater is 5°C (41°F). When using the optional heater, the minimum operating temperature is –30°C (-22°F). The storage temperature is -20°C to +60°C (4°F to 140°F).

Hazardous Areas

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THE UWT IS NOT INTRINSICALLY SAFE! DO NOT USE IN AREAS CLASSIFIED AS HAZARDOUS BY THE NATIONAL ELECTRIC CODE (NEC) BECAUSE OF COMBUSTIBLE OR EXPLOSIVE ATMOSPHERES.

The UWT 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.

UWT Master/slave Operation

Unattended configurations that require an inbound and outbound UWT on a single scale must use a master/slave UWT configuration. This configuration can be created using a custom JAGXTREME Operator Interface (JXOI) mounted in a separate enclosure, connected via Ethernet to the JAGXTREME in the UWT. Contact METTLER TOLEDO for further information on this type of configuration.

2 Installation

Unpacking and Inspection

This chapter explains how to install the UWT unattended driver station. Please read this information thoroughly before you begin installation.

- Please inspect the package upon receipt from the carrier.
- If the shipping container is damaged, check for internal damage and file a freight claim with the carrier if necessary.
- If the container is not damaged, remove the driver station from its protective package, noting how it was packed, and inspect each component for damage.
- If you need to ship the driver station, it is best to use the original shipping container. It must be packed correctly to ensure its safe transportation.

Guidelines

- Select a location for the UWT. Typically, the UWT is installed so that a driver can reach it from inside a vehicle that is parked on the scale.
- Make sure that the UWT is installed at the right height and near the scale. Since trucks have varied heights, measure several trucks in the following manner. Measure from the scale platform to the bottom of the window opening (where the driver rests his or her arm when the window is open) and add approximately six inches to this figure. This height is where the bottom of the card reader should be located.
- Install traffic barriers, such as short poles, to protect the UWT and/or traffic lights from trucks.
- The UWT must be mounted in a position that will allow the drivers to use it without any part of the truck being off the scale.
- A UWT can be mounted on a column or on a wall bracket.
- Cables for connecting to an input power source, the OverDrive PC, and any I/O enter the UWT via user-installed conduits in the base of the enclosure.
- When installing the UWT, provisions must be made for routing cables through a mounting pole or wall.

Wall Mounting

WARNING!

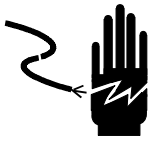
USE EXTREME CAUTION WHEN LIFTING AND MOVING THE UWT. DO NOT ATTEMPT TO LIFT AND MOVE THE DRIVER STATION BY YOURSELF OR INJURY COULD OCCUR.

- A bracket is included for mounting the driver station to a wall, using M8 x 45 mm (3/8" diameter x 1.75" long) expansion anchor bolts. Make sure that the wall and each embedded anchor can resist a pulling force of 150 pounds.
- Position the bracket on the wall at a height that will make it convenient for drivers to use the driver station. Make sure that the top of the mounting plate is level, and then mark the locations for the plate's bolt holes.
- Drill holes into the wall for the bolts or anchors. Depending on the application, you may need to provide an opening in the wall for the routing cables.
- Route the cables through the wall (if applicable). Bolt the mounting bracket securely to the wall.

Pole Mounting

An optional pole-mounting strap (METTLER TOLEDO Part # 90804100C) can be used to mount the UWT to a 4″ (102 mm) diameter pole. The pole-mounting strap should be fastened to the wall-mounting bracket with the included hardware. An optional 10′ aluminum pole with base plate and anchors (METTLER TOLEDO part # 90893200A) is available.

Power Supply Connection



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The UWT requires a properly grounded power supply of 115 or 230 volts AC.

- Connect the power supply cable to terminal block inside the UWT enclosure.
- Consult the wiring diagram supplied with the UWT.

Remote PC Connection

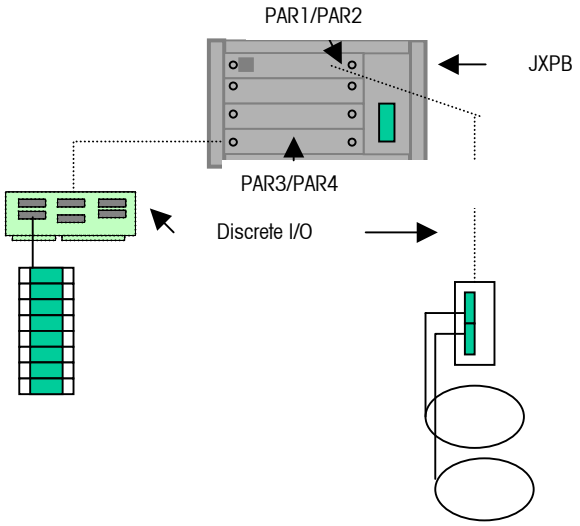
The UWT can be connected to a remote PC via10BASET Ethernet cabling between the JAGXTREME terminal inside the UWT enclosure and the Ethernet port on the remote PC. The maximum cable distance is 300′ (90 m). Longer distances require the use of fiber optic or a wireless connection.

Connection to Loops, Lights and Gates

Electrical connection to loops, lights, and gates is made within the UWT enclosure. Refer to the wiring diagram supplied for the location of I/O connection points and loop detectors. Refer to Appendix A for suggested loop installation procedures.

UWT Discrete I/O Operation

The UWT uses the JAGXTREME terminal's discrete I/O to interface with field devices such as loops, traffic signals, and gates. The JAGXTREME terminal executes a program to read inputs from loops, RFID badge readers, and to manage the outputs, traffic signals and barriers (gates). For configuration of inputs, refer to the UWT software manual, part number (*)16841500A.



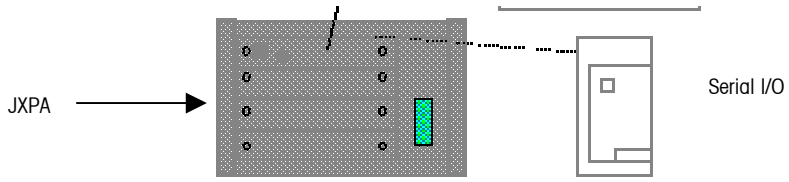
For each parallel input point (four on the JAGXTREME terminal's CPU and eight more on the optional multifunction card,) the UWT can be configured to support the following list of input devices: none, entrance detector such as a loop, exit detector, entrance barrier (gate) limit switch, or exit barrier limit switch.

For each parallel output point (four on the CPU and eight more on the optional multifunction card), the UWT can be configured to support the following list of output devices: none, entrance green, entrance red, exit green, exit red, entrance barrier, exit barrier.

A particular site may have no high level I/O devices, all of the devices listed above, or any number in-between. The default setup for the I/O when the JAGXTREME UWT program is run for the first time is no inputs or outputs assigned.

UWT Serial I/O Operation

The UWT uses the JAGXTREME terminal's serial I/O to interface to serial devices such as card readers. For each of the four serial ports (two standard on the JAGXTREME terminal's CPU and two optional on the multifunction I/O card), the UWT can be configured to support serial devices.



3 UWT Setup

UWT Startup Sequence

Upon applying power to the UWT, the JAGXTREME terminal will initiate its standard power-up sequence to validate the contents of its RAM with the hardware configuration that it reads at power-up. If the RAM and hardware configuration have a conflict, the JAGXTREME terminal will suspend operation leaving the UWT terminal non-functional.

Once the JAGXTREME terminal has completed its power-up sequence, it will automatically load the FILE1.BAS application program and begin executing the UWT application. This must be configured in JagBASIC setup.

The first step in the UWT application is to read the file named SETUP off the RAM disk. If the UWT application program cannot find this file, it will not properly execute a transaction.

UWT JAGXTREME RAM Disk File

File	Description
JAGXCAL.DMT	Calibration data stored in the JAGXTREME's memory
JAGXLIT.DMT	Literal and Printer Templates stored in the JAGXTREME's memory (not used in this application)
JAGXSRAM.DMT	All setup parameters stored in JAGXTREME's memory
MONITOR.LOG	Condition monitoring log file stored in JAGXTREME's memory
FILE1.BAS	Program required for UWT application
INITIAL.BAS	Program required for UWT application
REPORT.BAS	Program required for UWT application
SUPER.BAS	Program required for UWT application
BADGE.DAT	Program required for UWT application
COMOD.DAT	Program required for UWT application
INBOUND.DAT	Program required for UWT application
PERM.DAT	Program required for UWT application
PROMPT.DAT	Program required for UWT application
QUICK.DAT	Program required for UWT application
SETUP.DAT	Program required for UWT application

JAGXTREME Configuration

On a typical UWT, the JAGXTREME terminal can be set up using its Ethernet embedded web server or via the JAGXTREME keypad by exiting the VSX program. Refer to the UWT software guide, part number (*)16841500A, and the JAGXTREME technical manual, (*)15896200A, for further information.

The following JAGXTREME parameters are required for the UWT to operate properly.

Note: Reference the JAGXTREME Terminal Technical Manual for assistance in using the web server interface for configuring and setting up a JAGXTREME terminal.

Config JagBASIC

JagBASIC Configuration	Setting
Passwd	User settable
Keyboard	Keyboard
Display	JagX
Autostart	Y
Manual Start	Y

Config. Discrete

Inputs PAR1	Polarity	Assign
1	+ Only	None
2	+ Only	None
3	+ Only	None
4	+ Only	None
Outputs PAR2		
1	+ Only	None
2	+ Only	None
3	+ Only	None
4	+ Only	None

Config. Discrete (optional multifunction PCB)

Inputs PAR3	Polarity	Assign
1	+ Only	None
2	+ Only	None
3	+ Only	None
4	+ Only	None
5	+ Only	None
6	+ Only	None
7	+ Only	None
8	+ Only	None
Outputs PAR4		
1	+ Only	None
2	+ Only	None
3	+ Only	None
4	+ Only	None
5	+ Only	None
6	+ Only	None
7	+ Only	None
8	+ Only	None

Config. Serial Setup

COM1	**Card Reader (Optional)**
Baud Rate	9600
Data Bits	7
Parity	N
Flow	None
Stop Bit	1
Connection	None
COM2	**Printer (Optional)**
Interface Type	RS-232
Baud Rate	9600
Data Bits	8
Parity	N
Flow	N
Stop Bit	1
Connection	Serial Out
Mode	Demand

Connecting Two UWT's

For applications where one scale has two UWT's (one on inbound driver side/one on outbound driver side), it is possible to "cluster" the UWT's together allowing for one UWT to be the master and the second unit to be the slave terminal. The JAGXTREME in each UWT are connected together via an 10BASET Ethernet connection. "B" Revision JAGXTREME OS must run on both terminals, and the slave terminal must have the its scale interface set to "no scale? Via the JAGXTREME "Configure Network" program block a IP address is assigned to each terminal – see page 3-58 of the JAGXTREME technical manual for further details.

For inbound tickets to print at one UWT and outbound at the second UWT, print templates must be assigned to print to a specific COM port. For example:

	Inbound UWT (slave unit)	**Outbound UWT (master unit)**
Printer Connection	COM 1	COM 2
Template Setup	COM 1/Local/Serial Out/Demand Mode/Custom Print 3	COM 2/ Local/Serial Out/Demand Mode/Custom Print 4

See page 3-35, "Configure Port Sub-Block", of the JAGXTREME technical manual for further details.

Connecting UWT to a JXOI

For applications where a JXOI is connected to a UWT (such as a remote JXOI in the scale house) the following connection process must be followed:

1. Assign an IP address to the JXOI via the JXOI terminal.
2. Set the UWT JAGXTREME IP address as the target via the JXOI termial.

Note: Printing locally at the JXOI terminal requires modification to the system configuration. Refer to the JXOI technical manual, 16467300A, for further information.

For your notes

4 VSX Inbound/Outbound Weighing Software

The UWT comes pre-loaded with JAGBASIC VSX inbound/outbound vehicle weighing software. Refer to the UWT software guide, part number (*)16841500A, for details on configuring the system to meet application specific requirements.

For your notes

5 Operation

Overview

For a typical unattended mode transaction, a vehicle would be weighed twice. For example, an empty vehicle would be weighed to determine its tare weight. Then the vehicle would be loaded and weighed to determine its gross weight. The system can be configured to print a ticket after each weighing or after the second weighing only.

When a vehicle arrives at the scale, the driver must enter the first input data (Contract ID or Vehicle ID) at the driver station by using typing via the keyboard or using the optional proximity reader.

The UWT display then prompts the driver to enter any additional data required for the transaction, such as commodity type. The driver can enter the data by using the keyboard or by scrolling through a list of options on the UWT display. The options are displayed one at a time.

Once all data have been entered correctly, the weighing takes place automatically. The driver station will display a message telling the driver whether the transaction was accepted or refused. If unattended mode is configured to print a ticket after the first weighing the driver station will print a ticket at this point. The driver can then take the ticket and leave the unattended station.

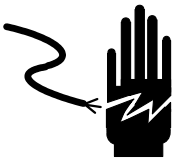
When the vehicle returns to the scale for its second weighing, the driver must enter the first input data again. The display will prompt the driver if any additional data must be entered. Once all data have been entered correctly, the weighing takes place automatically and the driver station prints and cuts a ticket. The driver station will display a message telling the driver whether the transaction was accepted or refused. The driver can then take the ticket and leave the unattended station.

For further information on weighing of vehicles using the VSX software, refer to the UWT software guide, part number (*)16841500A.

For your notes

6 Service and Maintenance

Cleaning and Regular Maintenance



⚠ WARNING

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Clean the UWT unattended driver station by wiping it with a soft cloth that has been dampened with a mild detergent. Do not use chemicals such as cellosolve or benzene. Always switch off power to the driver station when cleaning it.

Printer Operation

Refer to the printer manual located on the UWT documentation CD-ROM for details on the printer operation and maintenance.

⚠ WARNING

- Do not touch heat elements of the print head, the driver IC, or the IC terminals with a screwdriver or tweezers, or directly with your fingers.
- Avoid applying mechanical stress or shocks, including friction generated from micro particles, to the print head surface.
- Do not touch the print head area and the motor surface, because they become very hot during and just after printing.
- Avoid leaving the printer unused for a long period without paper, because the platen and the print head may stick together temporarily.
- Do not force the thermal head excessively.

Installing Printer Paper

Notes on Handling Thermal Paper

- Do not allow chemicals or oil to contact thermal paper because they may cause discoloration or print fading. Strongly rubbing thermal paper with a piece of metal or with fingernails may also cause discoloration.
- Avoid storing thermal paper in high temperatures and humidity. Avoid exposing thermal paper to direct sunlight, because it will gradually become discolored at about 7°C (15°F).

Loading Paper for the Paper Roll Supply Module

- Remove the large knurled nut that holds the paper roll onto the threaded spindle
- Position the paper roll so that the paper unspools from the top of the roll toward the print head.
- Lower the green paper release handle.
- Feed the paper through the print head and dispenser.
- Raise the green paper release handle.

Printer Maintenance

Cleaning the Thermal Head and the Platen

Paper dust, paper chips, and thermal chemicals attached to the heat elements of the print head and the platen may reduce print quality. If this occurs, clean the print head and the platen as follows:

- Lower the green paper release lever.
- Using compressed air, blow out the paper cut-and-feed unit.
- Lightly wipe the heat elements of the print head and the platen with a cotton swab soaked in alcohol solvent (ethanol, methanol, or IPA). Note: Using other solvents may damage the print head.
- After the alcohol evaporates completely, return the unit to its original position.

NOTE: Do not touch the print head or the motor surface just after printing, as these areas are very hot.

Removing Jammed Paper

- Lower the green paper release lever.
- Remove any jammed paper in the printer module.
- Return the unit and paper release lever to their original positions.

7 Parts

Ordering Information

Refer to the following table when ordering UWT parts.

Part Number	Description
90885800A	Printer Thermal Paper, 8" diameter x 60 mm
90871900A	Thermal Printer
90910500A	M-T522AF-011 Print Head, for TK-41-60 Fenix Printer
90778700A	81-Character QWERTY NEMA 4 Keyboard
90406200A	200W Panel Heater, 115V
90823800A	Intercom, #LE-DA
90787000A	Proximity Reader
15265700A	Proximity Reader Power Supply, 12V dc
Inquire	JAGXTREME Terminal

For your notes

8 Appendix – Loop Installation

Loops and Detectors

The purpose of the loop is to detect the presence and the absence of vehicles. The UWT computer monitors the loop detector continually. When a vehicle enters the loop, the UWT computer starts the weigh task running. Shortly after a vehicle leaves the loop and the loop becomes vacant, the UWT computer stops the weight task.

The hardware of the loop system consists of wire, which is installed in the pavement in a specific configuration to make an inductive coil. The loop is attached to a loop detector via the loop wire or a special lead-in cable. The loop detector requires a weather-protected environment. The loop detector requires 120 VAC. Adjustment and calibration of the loop system is done in the loop detector. Operation of the loop system is fully automatic and requires no operator action.

Loop Theory

When electric current flows through a wire, a magnetic field is produced around the wire. When the wire is shaped in a loop and additional turns of wire are added, the field strength increase. A loop has measurable inductance.

Inductance is the resistance to change in current flow within the wire. When current flow is initiated in the inductor (the looped wire), the indicator will try to maintain the current until the magnetic field is dissipated. The basic unit of measurement of inductance is the Henry. The loop configurations used with UWT system create inductors in the 75 to 150 micro Henries range.

A resonant circuit is made when the inductor (the loop) is connected in parallel with a capacitor (the loop detector). With the loop installed and wired to a loop detector, the loop will create a magnetic field around itself that oscillates at the resonant frequency determined by the loop inductance and loop detector capacitance. As a metallic mass (the vehicle) moves into the magnetic field, it changes the inductance of the loop, which in turn alters the resonant frequency so that the detector senses the vehicle's presence.

The area of detection is determined primarily by the length of the short side of the loop, up to a length of approximately six feet. Therefore, METTLER TOLEDO generally recommends loops with a short dimension of six feet.

Loop geometry is critical to the performance of the loop system. Contact METTLER TOLEDO for information on typical loop configurations.

Considerations and Notes

Where the loop wire passes through construction joints, saw the slot deeper by an inch or so or drill a core hole at that point. Leave some slack in the wire at the joint to prevent undue strain on the wire if the pavement should move at the joint.

Identify and tag all loop wires in the enclosure for future reference. No splices are allowed in the loop wire. When the loop wire must be spliced METTLER TOLED has had success using SCOTCH® MH14BCX heat shrink butt splices. NOTE: This is a compromise in the system and is not recommended for new installations.

When marking the pavement before saw cutting, you may substitute spray paint for chalk lines. Spray paint will not be as cosmetically acceptable because the chalk line will be entirely eradicated during sawing. Traces of paint lines may remain.

If the wire passes through a curb, be sure to core drill a hole at the curb or pavement joint. Keep the wire flexible enough at the joint to prevent it from being stressed by movement of the curb or pavement joint. If wire lugs are used any where in the loop wire system, be sure to solder the connection. The common size caulking gun will not accommodate the 29 oz cartridges used for sealing the slots.

Loop Installation

Materials Required

- Wire - Belden #9438 or equal roadway loop cable, 14-gauge stranded with polyethylene jacket (METTLER TOLEDO part # KN771077 020).
- Lead in cable – Belden #8720 shielded twisted pair 14 gauge - not suitable for ground burial but may be used in conduit. (METTLER TOLEDO part number KN771079 020).
- 3 / 8 " diameter closed cell plastic foam backer rod (METTLER TOLEDO part # MZ0602000103).
- 1 / 2 " diameter closed cell plastic foam backer rod (METTLER TOLEDO part # 90548000A).
- DOW 890-SL silicone joint sealant for asphalt or concrete in 29 oz cartridges (METTLER TOLEDO part # KN771750 020).

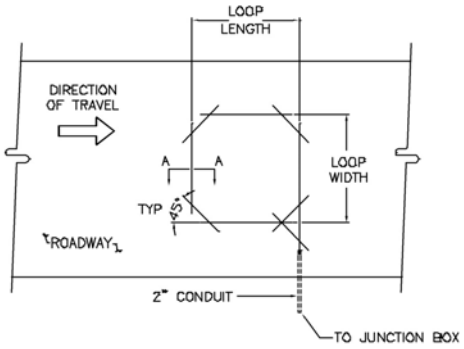
Tools Required:

- Pavement saw
- Water to clean slots
- Air compressor and hose for cleaning and drying out slots
- Blunt tool with an approximate diameter of 1 / 4 " for use in placing wire and backer rod I slot (such as a wooden paint stirrer).
- Variable speed drill motor for twisting wire
- Electrical power and extension cord for drill motor
- Tape measure
- Marking pen or crayon
- Chalk line
- Clear acrylic spray lacquer
- Caulking gun for 29 oz caulk cartridges
- Hand tools that are generally used during construction

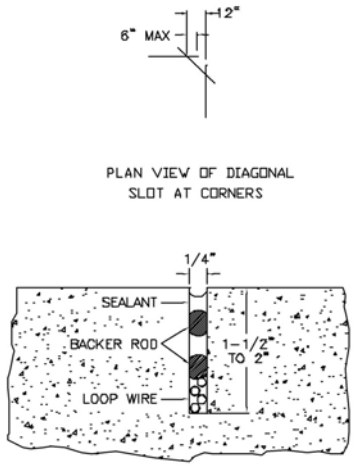
Layout the Loop

Consult the appropriate reference drawings for your UWT system to determine the size, shape and location of the loop to be installed.

1. Using a tape measure and marking crayon, mark on the pavement where the four corners of the loop are to be
2. Run a chalk line between two adjacent corners, tighten the line then snap it to leave a straight line of chalk dust on the pavement. Repeat this three more times until the perimeter of the rectangle for the loop is marked.
3. Mark the corners of the rectangle with a chalk line at a 45-degree angle approximately 12″ from the corners.
4. Note: In lieu of the 45-degree angles, a hole may be drilled at each corner. The hold must be approximately 1: in diameter to provide ample room for the loop wire to make a gentle bend at the corners. This is to help prevent damage to the wire caused by the concrete cutting the insulation.
5. Make a chalk line from the conduit for the loop cable the nearest corner of the rectangle.
6. Spray the chalk lines with clear acrylic lacquer. This will protect them while sawing.
7. See the figure below for a sketch of what your layout should look like. The dimensions are not shown because these must come from your UWT system reference drawings, which are not part of this manual. See the below figure for a cross section view of the loop.



LOOP CONFIGURATION



SECTION A-A

Saw the Pavement

After you have finished marketing the pavement you are ready to saw. This activity should be done at the same time you saw the channels and slots for the axle sensors.

⚠ WARNING

ONLY PERMIT PERSONNEL TRAINED IN THE SAFE OPERATION OF SAWING EQUIPMENT TO OPERATE THIS EQUIPMENT.

1. Saw the slots. All slots associated with the rectangle are to be 1 / 4 " wide and between 1 1 / 2″ and 2″ deep.
2. The slot for the lead in should be 3 / 8″ wide and between 1 and 3 inches deep. Up to three lead in cables may share the same slot. Add 3 /8″ to the depth of the slot for each additional lead in. Do not exceed three inches total depth.
3. Check the slots for the correct depth by running a depth gauge (screwdriver blade or a piece of flat stock steel) to ensure that the entire perimeter of the rectangle and lead in do not exceed three inches total depth.
4. Clean the slots with water to remove all dust and/or sludge. Blow out the slots with air and allow them to thoroughly dry. The slots must be free of debris and dust before installing the wire and sealing with caulk.

Install the Loop Wire

1. Placement of the loop wire in the slots is best accomplished when two people are working together. Do not use the twisted pair lead in cable unless it cannot be avoided. The best loop can be made by using the loop wire only and twisting it yourself. Use only the specified loop wire.
2. Measure from the rectangle to the termination point of the loop wire (probably in the UWT cabinet.) Make sure you allow for all bends, etc. in the conduit so that your measurement will not be short. Add 5% to this measurement because the wire length will reduce when you twist it.
3. Unspool the wire to the length you determined would be required to make into the twisted lead in.
4. Starting at the corner of the rectangle, unspool the wire and lay in the 1 / 4″ slot perimeter. It does not matter if you go clockwise or counterclockwise.
5. Make sure the wire lays flat in the bottom of the slot and does not bunch up. Do not use any type of tool that could puncture the wire insulation.
6. Use care, especially at the corners, so as not to damage the wire insulation. NOTE: You can pierce the insulation by sliding the wire against the concrete corners, thus ruining the loop.
7. For a standard 6 x 6 loop, make four turns of wire around the rectangle. If you have any other loop size, consult your reference drawings for the number of turns required.
8. After completing the turns, unspool sufficient wire to equal the length previously unspooled for the lead in.
9. You should now have the loop wire placed in the slot and both ends of the wire unspooled to a length sufficient for each the termination point after twisting of the wire into a twisted pair.
10. Secure the wire in the loop slot with a single row of the 3 / 8″ backer rod.
11. Push the rod firmly to secure the wire at the bottom of the slot. It is important that the wire not be allowed to move or vibrate during operation of the UWT system because it will trip the loop detector.
12. Now install a second row of the 3 / 8″ backer rod in the slot. Place this second row to a depth that provides a one-half inch clearance form the top of the backer rod to the pavement surface. You will probably have a gap between the two rows of backer rod. This is okay. The first rod is to hold the wire secure and the second rod is to support the sealant while it cures.

Note: The second layer of backer rod is to maintain the proper sealant thickness. The sealer will not cure or perform properly unless the correct thickness is achieved.

13. Make the twisted lead in cable for the loop.
14. Have one person hold the wires where they exit the rectangle while you lay out both wires to their entire length.
15. Cut the longer of the wires to be the same length as the other.
16. Chuck the wires into a variable speed drill motor.
17. The person holding the wire(s) at the rectangle must not allow the wire to rub the concrete saw cuts curing the twisting.
18. Twist the wire by operating the drill motor at slow speed until you have between five and ten turns per foot.
19. Tape the twisted pair with electrical tape at approximately every foot.
20. Being careful not to let the wire untwist or tangle, take it out of the drill motor. Place it in the lead in cable slot and run it through the conduit to the UWT cabinet. Secure the cable in the cabinet to prevent it from untwisting.
21. Secure the wire in the lead in slot with the 1 / 2″ backer rod in the same fashion you did for the loop rectangle. Do not seal the loop yet. You must test the loop before sealing.

Loops and Loop Detectors

Tools Required

A wire insulation tester (commonly referred to as a Megger® that tests with 500 VDC). There are three criteria of interest.

Continuity: The loop must have a resistance of less than 10 ohms

Insulation resistance: Resistance of the loop wire to ground must be greater than 100 mega-ohms.

Loop inductance: Loop inductance should be acceptable if the loop dimensions and number of turns are correct. Typically, you will not have to check the inductance. Contact METTLER TOLEDO for information.

⚠ WARNING

Read, understand and follow all safety procedures for your test equipment.

1. Check the continuity of the loop wire form one end to the other.
2. Strip a short section of insulation from each end of the loop wire. Attach your test leads and measure the resistance of the wire. Resistance of 14 gauge-stranded wire is approximately 2.5 ohms per 1000 linear feet.
3. If the loop measures less than 10 ohms the continuity is fine.
4. If the loop measures more than 10 ohms inspect it for a partial or complete break. Replace the loop if necessary to correct the continuity problem.
5. The insulation resistance check uses the 500 VDC feature of the tester. Make sure to follow all safety procedures for your meter and proceed with testing.

6. Never touch live circuits during the test, including the exposed portions of the meter leads.
7. Make sure that both ends of the loop being tested are disconnected from all circuitry.
8. Connect together both end so the loop wire, strip insulation back, as needed.
9. Make sure the tester circuit is off.
10. Connect one lead of the tester to the loop wire.
11. Connect the other lead of tester to true earth ground, such as to the conduit or to a ground rod.
12. Energize the tester and measure the insulation resistance to ground for at least ten seconds.
13. De-energize the tester but leave it connected to the loop wire for a minimum of one minute. Disconnect the tester from the loop wire. Dissipate any remaining energy in the circuits by:
14. Short the loop wire to ground for five seconds.
15. Short the tester leads to ground for five seconds.
16. If resistance is greater than 100 mega-ohms, the insulation resistance check is fine. If resistance is less than 100 mega-ohms, then the loop is shorted to ground and must be replaced.

NOTE: Insulation resistance is most likely to fail after rainfall when the soil and pavement are damp. Also, insulation resistance failure is the number one cause of loop failures.

Loop Sealing

Materials and Tools Required

- Dow Corning® sealant
- Caulking gun for 29 oz caulking tubes
- Hand tools generally used during construction

1. Make sure that the slot is clean, dry and frost-free before applying the sealant. The ambient temperature must be between -35°F to 140°F for application of Dow 890 SL.
2. Apply the sealant to the loop and the loop lead in slots in a continuous operation to cover the backer rod in the slot and to properly seal the slot. Do not overfill the slot. The sealer should be recessed one-fourth inch in the slot after sealing. This will protect the sealer from traffic wear and allow you to open the lane to traffic before the sealant cures. Follow the sealant manufacturer's warnings, cautions and directions.

Loop Detector Type

A two-channel loop detector, Never Fail Model LD200 (METTLER TOLEDO part number 90738300A) can also be used with UWT systems.

The loop detector is mounted in the UWT cabinet by METTLER TOLEDO at the manufacturing plant. It is pre-wired to a terminal strip. The field wiring consists of terminating the loop wires to the terminal strip in the UWT cabinet for some systems, or terminating loop wires at the dual loop detector socket in the UWT enclosure. Refer to the external wiring diagram for further information.

Operation of the loop detector is fully automatic. The detector has two lamps, one for each channel, to indicate when vehicles are present at the loops.

Loop Detector Adjustment

Never Fail LD200

The loop detector has two channels and can accommodate two loops, one loop per channel. Each channel has separate adjustments for sensitivity, mode and frequency. Eight sensitivity settings are available. Internal jumpers can be configured for normally open or normally closed operation. An LED shows the status of power and loop condition. Refer to the wiring diagram on the side of the loop detector.

Loop Detector Troubleshooting

Symptom	Action
Detector lamp never lights	Check that the loop detector has 120 VAC supplied. Replace the loop detector.
Detector lamp blinks continuously.	A continuously repeated series of 3 blinks indicates that the detector has detected a faulty loop. (Refer to the section on loop testing.) After correcting the problem, reset the detector by momentarily changing the mode or sensitivity switch.
Detector lamp stays lit	Make sure that the loop is vacant (no vehicle or other metallic mass is near the loop). Check the loop for shorts and continuity, especially if the pavement and/or soil is/are damp.
Loop detector sticks on intermittently.	Check and adjust the sensitivity of the loop detector.

Note: The four channels of the loop detector are independent of one another. To determine whether it is the loop or the detector that is causing the problem, try moving the suspected loop to another channel and then retest.

The purpose of the axle sensors in the UWT system is to measure the speed of the vehicle axles. The hardware of the axle sensor consists only of the sensor and its integral coaxial cable. There are two speed-sensing axle sensors in the UWT system. Off-scale axle sensors may be supplied as an option.

Installation of the axle sensors should be done at the same time you install the loop since both require the same tools for pavement sawing and sealing. Adjustment of the axle sensor is made on the signal conditioner PCB in the UWT cabinet. Adjustment is not part of the axle sensor installation procedure. Operation of the axle sensor is fully automatic.

For your notes

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