BT-645

Particulate Monitor
Operation Manual

Revision E

Met One Instruments, Inc
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BT-645 Manual

Technical Support

Should you require support, please consult your printed documentation to resolve your problem. If you are still experiencing difficulty, you may contact a Technical Service representative during normal business hours—7:00 a.m. to 4:00 p.m. Pacific Standard Time, Monday through Friday.

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Grants Pass, OR 97526

NOTICE

CAUTION—Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

WARNING—This product, when properly installed and operated, is considered a Class I laser product. Class I products are not considered to be hazardous.

There are no user serviceable parts located inside the cover of this device.

Do not attempt to remove the cover of this product. Failure to comply with this instruction could cause accidental exposure to laser radiation.

Table of Contents

1 INTRODUCTION

1.1 About This Manual

This document is organized with the most important information grouped together for easy reference by the user. All BT-645 owners and operators should read and understand the sections on installation, setup, and field calibrations. Other sections that provide in-depth information on subjects such as theory, diagnostics, accessories, and alternate settings provide valuable information which should be consulted as needed. Electronic version of this manual is also available.

1.2 Technical Service

This manual is structured by customer feedback to provide the required information for setup, operation, testing, maintaining, and troubleshooting your BT-645 unit. Should you still require support after consulting your printed documentation, we encourage you to contact one of our expert Technical Service representatives during normal business hours of 7:00 a.m. to 4:00 p.m. Pacific Standard Time, Monday through Friday. In addition, technical information and service bulletins are often posted on our website. Please contact us and obtain a Return Authorization (RA) number before sending any equipment back to the factory. This allows us to track and schedule service work and to expedite customer service. Please have your instrument serial number available when contacting the manufacturer.

Contact Information:
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U.S.A.

1.3 About the BT-645

The Met One Instruments, Inc. model BT-645 is a type of nephelometer which measures real-time airborne TSP particulate concentration levels using the principle of forward laser light scatter.

Laser Light Scatter System
Sample air is drawn into the BT-645 and through the laser optical module, where the particulate in the sample air stream scatters the laser light through reflective and refractive properties. This scattered light is collected onto a photodiode detector at a near-forward angle, and the resulting electronic signal is processed to determine a continuous, real-time measurement of airborne particulate mass concentrations.

1.4 Laser Radiation Safety and Conformity

The BT-645 is considered a Class I laser product. Class I products are not considered to be hazardous.

This system contains a diode laser operating at < 5 mW power and 670 nm wavelength. This is visible to the naked eye, and can cause damage to the eye if directly exposed. A protective optical housing fully encapsulates the laser beam and optics system within the BT-645. Do not attempt to disassemble the optical module. Failure to comply with this instruction could cause accidental exposure to laser radiation. The manufacture certifies that this product operates in compliance with following standards and regulations:

- **FDA / CDRH This product is tested and complies with 21 CFR, Subchapter J, of the health and Safety Act of 1968.**
- **US 21 CFR 1040.10.**

Always power down the system whenever service or repair work is being performed inside the instrument enclosure. Only trained technicians should attempt to repair the BT-645.

1.5 BT-645 Specifications

PARAMETER	SPECIFICATION
Measurement Principles:	Particulate concentration by forward light scatter laser Nephelometer.
Measurement Range:	0 to 100 mg/m^3 (0 to 100,000 μg/m^3)
Measurement Sensitivity:	0.001 mg/m^3.
Nephelometer Accuracy:	± 5% traceable standard with 0.6 μm PSL.
Particle Size Sensitivity:	0.1 to 100 μm. Optimal sensitivity 0.5 to 10 μm particles.
Long Term Stability:	5% with clean optics.
Laser Type:	Diode Laser, 5 mW, 670nm. Visible red.
Display:	4 X 20 backlit LCD.
Flow Rate:	2.0 liters/minute ± 0.1 lpm. Actual volumetric flow.
Pump Type:	Brushless Diaphragm (20,000 hour).
Power:	Input: 14.8V Li Battery, Output: 16.8VDC @ 1.8A
Power Consumption:	500mA @ 15VDC
Digital I/O:	RS-232, USB
Purge Filter	0.2 micron
Protection Filter:	10.0 micron.
Serial Communication:	ASCII
Internal Data Storage	>11,000 records (> 7.5 days @ 1 min, > 114 days @ 15 min)
Operating Temperature:	0 - 40°C
Ambient Humidity Range:	0 to 90% RH, non-condensing.
Factory Service Interval:	24 Months typical, under continuous use in normal ambient air.
Unit Weight:	3.7lbs
Unit Dimensions:	10.8cm high, 18.9cm wide, 8.26cm deep (4.25” x 7.44” x 3.25”)

Specifications may be subject to change without notice.

2 BT-645 SETUP and STARTUP

The following sections cover unpacking, layout and performing a test run to verify operation.

2.1 Unpacking

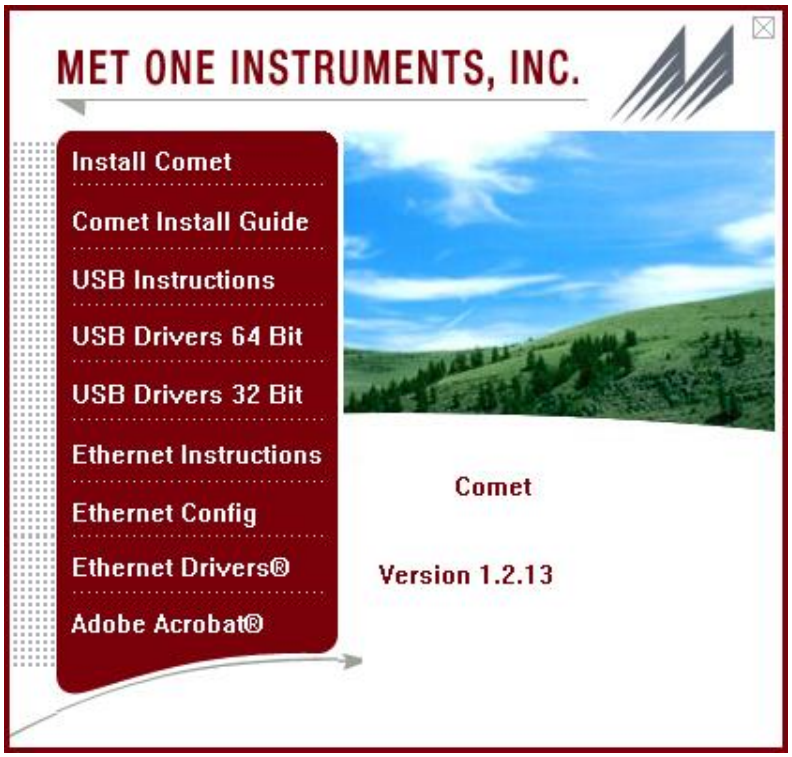
When unpacking a new BT-645, verify that the contents are undamaged. Any damages incurred to the equipment during shipping are the responsibility of the carrier. If any damage to the shipment is noticed before unpacking, **a claim must be filed with the commercial carrier immediately**. You should follow any special unpacking instructions provided by the carrier as you then carefully remove all items from the containers and inspect each component. It is recommended to document and photograph all damaged packages and items before, during, and after unpacking them. Contact Met One Instruments (see section 1.2 of this manual) to arrange for any replacement items needed.

See section 10 Accessories for more details.

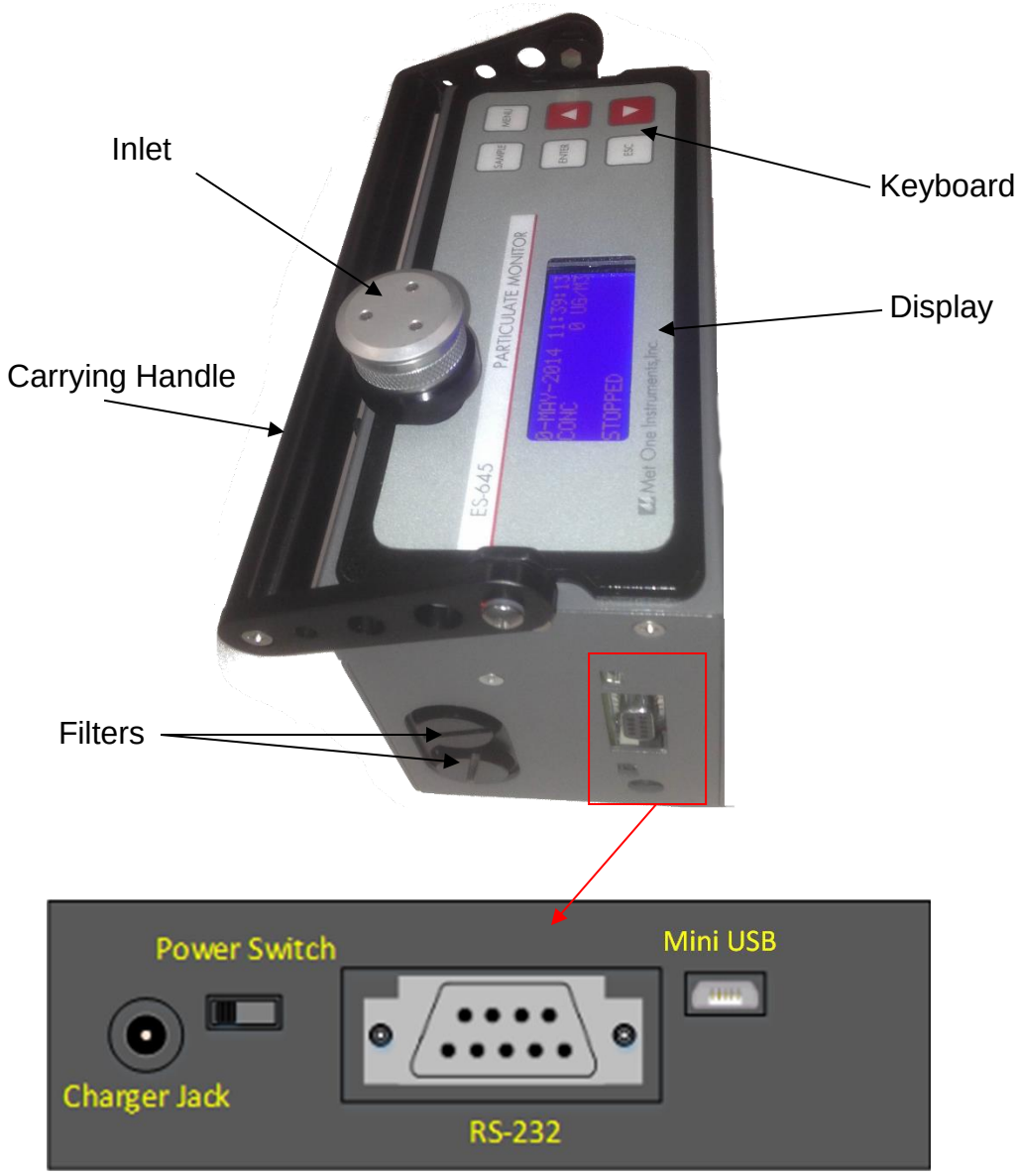
ATTENTION:
The included USB drivers must be installed before connecting the BT-645 USB port to your computer. If the supplied drivers are not installed first, Windows may install generic drivers that are not compatible with this product.

To install USB drivers:

Insert the Comet CD. The install program should run automatically and display the screen below. If an AutoPlay pop-up window appears, select “Run AutoRun.exe”. Finally, select “USB Drivers” to start the install process.



2.2 Layout



Component	Description
Display	4X20 character LCD display (backlit)
Keyboard	6 key membrane keypad
Power Switch	Switch that turns the BT-645 on or off (up for on).
Charger Jack	Input jack for the battery charger. This jack charges the internal battery pack and provides continuous operating power for the unit.
Inlet	Ambient air inlet.
USB I/O	USB communication port
RS-232 Serial Port	Connection used for serial communication

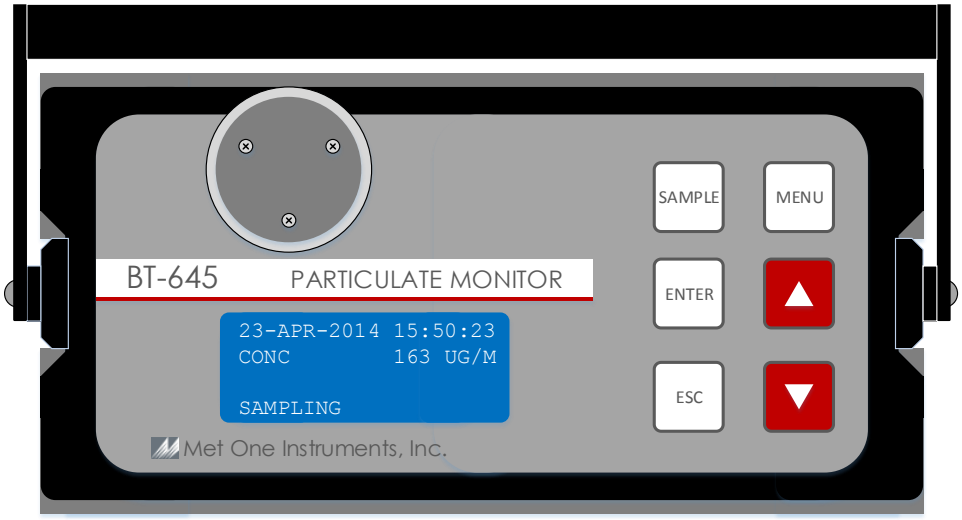
2.3 Default Settings

The BT-645 comes with the user settings configured as follows:

Parameter	Value
Sample Location ID	1
Sample Time	15 Minutes
Count Units	UG/M3
Baud Rate	9600
K Factor	1.0

3 User Interface

The BT-645 user interface is composed of a 6 button keypad and a LCD display. The following table describes keypad functionality.



Note: Some keys have more than one function.

Key	Description
SAMPLE	• Starts or stops a sample
MENU	• Loads the Main Menu Screen. • Cancel editing. Returns the field to the original value before editing began and loads Main Menu Screen.
ENTER	• Loads the screen associated with menu item. • Stops editing a field and saves the changed value.
ESC	• Cancel editing. Returns the field to the original value before editing began. • Loads previous menu or Operate Screen when in the Main Menu screen.
▲ ▼	• Navigates up / down when not editing. • Modifies field when editing.

4 Power-Up and Operation

Before operating the BT-645 for the first time, it is recommended that the unit be fully charged. Information regarding battery charging is found in Section 6. Complete the following steps to verify proper operation.

1. Slide the power switch to turn the power on.
2. Observe the Startup Screen for 2 seconds then the Operate Screen (Section 4.2).
3. Press Sample key. The BT-645 will start to sample.
4. Observe the values on the display
5. Press the Sample key again to stop counting.
6. Press the Menu key and confirm the main menu screen appears.
7. The unit is ready for use.

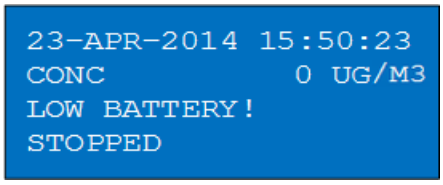
4.1 Power Up

The BT-645 power is controlled by a switch located on the side of the unit. To power up the unit move the switch to the on position (up).

The first screen shown on power up is the Startup Screen (shown below). This screen displays the product type and company website for approximately 2 seconds before loading the Operate Screen.

4.2 Operate Screen

The Operate Screen displays the date/time, sample status, current sample data and alarms. The image below shows the Operate Screen.



The top line of the Operate Screen displays the device's date and time. The second line displays the concentration sample reading. This sample value is only read when the device is sampling and the pump is enabled. The third line displays the alarm status and the fourth line displays the sample status. More information about each line is explained in the sections below.

4.2.1 Device Clock

The top line of the Operate Screen displays the device's date and time. This value is displayed in real time and can be set through the setup menu.

4.2.2 Sampling

The Operate Screen displays current sample information when the unit is sampling (real time data). Concentration values (UG/M3, MG/M3) are time dependent so these values may fluctuate early in the sample; however, after several seconds the measurement will stabilize. Longer samples (e.g. 15 minutes) will improve concentration measurement accuracy. The concentration units can be changed in the device's setup menu.

4.2.3 Alarm Status

The BT-645 displays alarm messages on the last line of the Operate Screen. The following table lists the warning/error messages:

Display Message	Description
LOW BATTERY	Low battery warning. Less than 15 minutes of normal operation remaining. Recharge the battery
ZERO FAULT	This alarm indicates a problem during the Zero phase and the sensor was not stable or the zero value was too high.
SENSOR ERROR	This alarm indicates a failure in the laser. This error requires the sensor to be returned for repair.
COUNTER FAULT	This alarm indicates the detector is not functioning correctly.

Note: The alarm indication will continue to show until the start of the next sample.

The BT-645 also contains an alarm code column to indicate if there were any alarm or error flags during that sample period.

The following table defines the error codes that can appear in the alarm column of the BT-645 data output:

Code	Error/Alarm Type
0	No Alarm
1	Zero Low
2	Zero High
3	Zero Stability
16	Low Battery
32	Sensor Error
64	Flow Error
128	Counter Fault

Note: If multiple errors or alarms occur in the same data period, then the alarm code stored in the data array will be the *sum of the individual code numbers*.

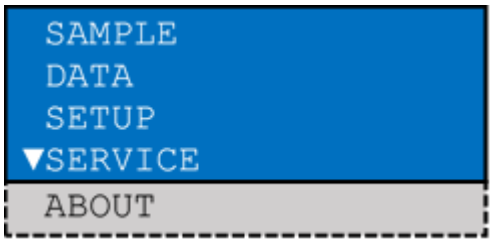
4.2.4 Sample Status

The third line of the Operate Screen displays the status of the BT-645. The following table shows the various status messages and their meaning:

Status	Description
STARTING	Starting the sample and waiting for the count system to initialize.
SAMPLING	The BT-645 is currently counting and taking real time samples.
STOPPING	Waiting for the sample to finish before coming to a complete stop.
STOPPED	The BT-645 is not sampling.
ZEROING	Displayed when the device is in a zero cycle.

5 Main Menu

The Main Menu is accessible by pressing the menu key on the Operate Screen. The table below shows the Main Menu items. Press ▲ or ▼ to navigate to a menu item then press Enter to display a screen where you can view or change item setting(s).



Menu Item	Description	Press Enter to navigate to…
SAMPLE	View real time sample data.	Operate Screen
DATA	View / change the current device memory. View historical data.	Data Menu
SETUP	View / change Sample Period, Clock, Concentration Units, Location ID, K Factor, Baud Rate, and Contrast.	Setup Menu
SERVICE	View / change the pump speed Run a Zero Test to set Zero Offset	Service Menu
ABOUT	View Device Name, Revision number, Serial Number, and Met One website.	About Screen

5.1 Edit Main Menu Items

To change settings, press Menu to display the Main Menu, press ▲ or ▼ to navigate to the desired item and press Enter to display the item view/edit screen.

To edit pick list items (e.g. Sample Setup - Single/Repeat), press ▲ or ▼ to navigate to the item. Press Enter to select the item. Press ▲ or ▼ to change the setting. Press ENTER to save the setting or ESC to cancel and return to the main value.

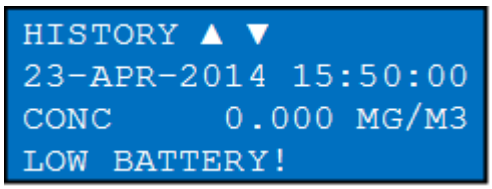
To edit numeric values (e.g. Count Alarms - Alarm Limit), press ▲ or ▼ to navigate to the item. Press Enter to select the item. Press ▲ or ▼ to increment or decrement a value. Press ENTER to move to the next digit or ESC to cancel and return to the original value. Pressing ENTER after the last edit value will save the setting.

5.2 Data Menu

The image below shows the Data Menu. Each parameter is covered in the following sections.

5.2.1 History Screen

Sample history (previous data) can be viewed on the History Screen found in the Data Menu. To view sample history, press the Enter key from the History Screen. The unit will display the last sample event (newest record). Press ▲ or ▼ to move through sample history one record at a time (▼ displays older events, ▲ displays newer events). The image below shows the History Screen.

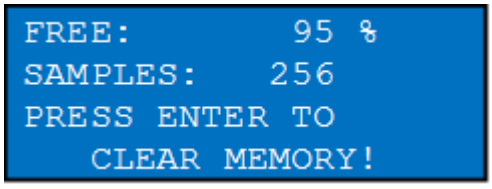


5.2.2 Memory Screen

The BT-645 memory is composed of a single file which contains the data from sample events. Every time a sample is completed, the BT-645 stores that data into the memory. The BT-645 memory is circular, meaning when the memory is full, the unit will start overwriting the oldest saved samples with new samples. The BT-645 provides the user the ability to view the memory usage as well as clear the memory.

5.2.2.1 View Available Memory

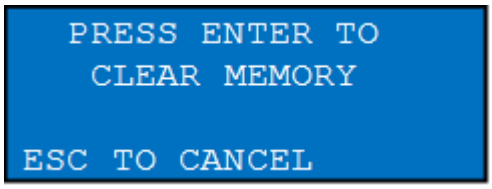
Memory Screen is used to view available memory or to clear the memory. The Memory Screen is accessed by selecting MEMORY from the Data Menu. The image below shows the Memory Screen.



FREE shows the percent of space available for data storage. When 0% is displayed, memory is full and the oldest data will be overwritten by new data. SAMPLES shows the current number of samples stored in memory.

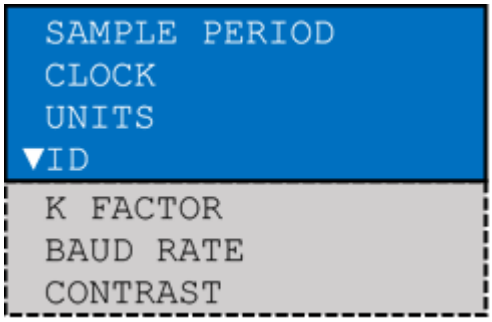
5.2.2.2 Clearing memory

To clear memory, press the ENTER key while viewing the Memory Screen. This will delete all the sample events in memory. A warning screen will be displayed to prevent accidental erasure.



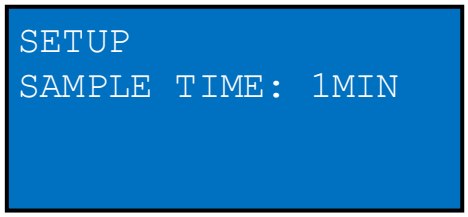
5.3 Setup Menu

The following picture shows the setup menu. Each parameter is covered in the following sections.



5.3.1 Sample Period

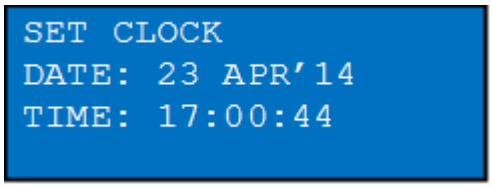
The sample period determines the amount of time that counts are accumulated while the pump is running. The image below shows the Setup Sample Time screen and the following table lists the available choices:



Selection	Description
1 MIN	Samples for 1 minute before recording the sample.
5 MIN	Samples for 5 minutes before recording the sample.
10 MIN	Samples for 10 minutes before recording the sample.
15 MIN	Samples for 15 minutes before recording the sample.
30 MIN	Samples for 30 minutes before recording the sample.
60 MIN	Samples for 60 minutes before recording the sample.

5.3.2 Clock

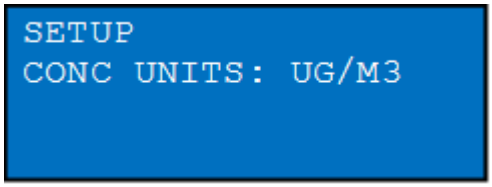
To set the date and time select CLOCK from the setup menu. Setting the date and time is important not only to the user but the device will not function correctly unless given the correct date and time. The image below shows the Set Clock Screen and the following table describes the date and time formats.



Date / Time Formats		
Date	dd mmm'yy	dd=day, mmm=month, yy=year
Time	hh:mm:ss	hh=hours, mm=minutes, ss=seconds

5.3.3 Concentration Units

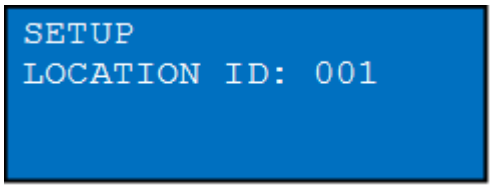
The BT-645 supports microgram per meter cubed (UG/M3) and milligrams per meter cubed (MG/U3). The setup concentration unit's screen can be seen below:



Selection	Description
UG/M3	Micrograms per meter cubed.
MG/M3	Milligrams per meter cubed.

5.3.4 Location ID

The location number is used to assign a unique number to a location or area. This important field is included in sample data records. Valid values for the location ID are from 0 – 999.

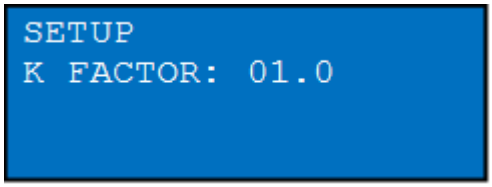


5.3.5 K Factor

The BT-645 is calibrated on latex 0.6 micron micro-spheres. These provide an extremely consistent calibration, but do not necessarily match the characteristics of all ambient particulate.

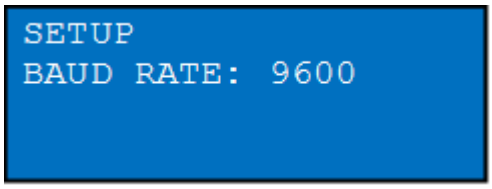
A K-Factor (multiplier) must be established for good accuracy and correlation to collocated instruments. The base K-Factor multiplier is set to 1.0 at the factory.

The K-Factor is only valid at the same site and for the same particulate type. If the local particulate source changes, the K-Factor may no longer be valid.



5.3.6 Baud Rate

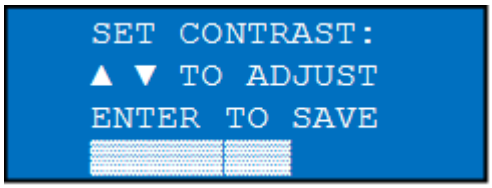
Use the Baud Rate selection to set the serial communications baud rate. BT-645 communicates at baud rates from 1200 – 38400.



Selection	Description
1200	Sets the serial communications baud rate to 1200.
2400	Sets the serial communications baud rate to 2400.
4800	Sets the serial communications baud rate to 4800.
9600	Sets the serial communications baud rate to 9600.
19200	Sets the serial communications baud rate to 19200.
38400	Sets the serial communications baud rate to 38400.

5.3.7 Contrast

Press ▲ or ▼ to improve display quality. Press Enter to save the setting or ESC to cancel the change. The image below shows the setup Contrast Screen.

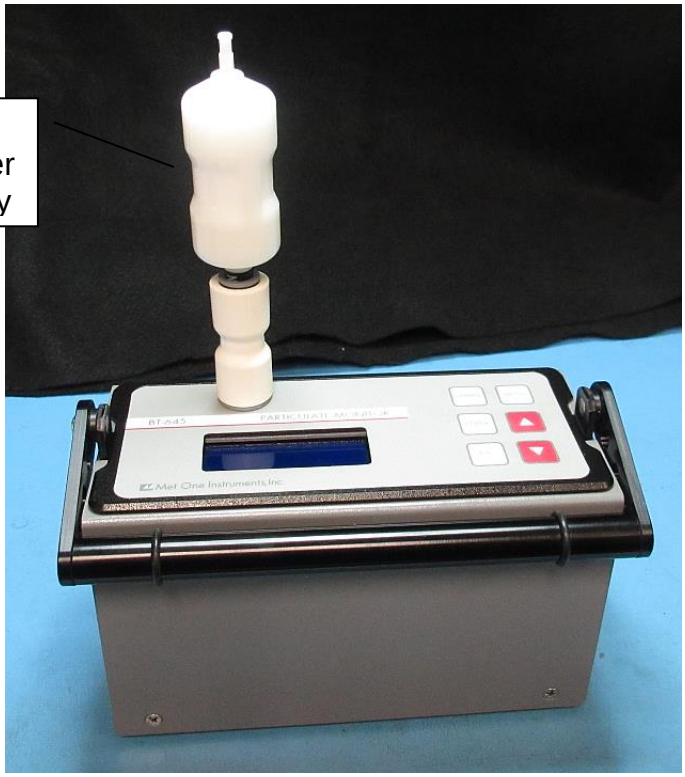


5.4 Service Menu

The image below shows the Service Menu. Each parameter is covered in the following sections.

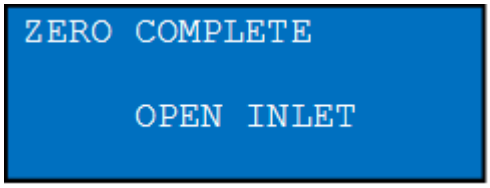
5.4.1 Zero Screen (Zero Calibration)

Remove the inlet sampling head and replace it with the 81893 Zero Filter Assembly. Navigate to the Zero Screen from the Service Menu. You will see the following screen below. Press the enter button to begin the zero calibration.



The BT-645 will take several samples and when the zero is stable it will make an electronic adjustment to the value, if required. This process does not require any adjustments by the user, the cycle will complete in about 90 seconds. However, if the zero has shifted the cycle may take up to 10 minutes. The image below shows the zero screen while it is running.

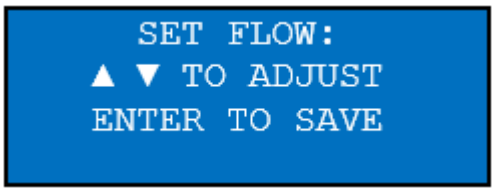
Once the zero calibration has finished, you will see the following screen below. Remove the Zero Filter Assembly and replace the sampling head. Press ESC to go back to the Service Menu.



5.4.2 Flow Screen

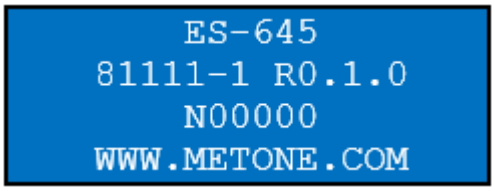
The BT-645 has a factory calibrated flow rate of 2.0 LPM. Use the following procedure to adjust the flow rate.

1. Connect a reference flow meter to the inlet fitting on the top of the unit.
2. Navigate to the Set Flow Screen from the Service Menu. The pump will start automatically when you enter the Set Flow Screen and stop when you leave the screen.
3. Press ▲ or ▼ to obtain a reading of 2.0 LPM ±0.1 LPM on the reference flow meter.
4. Press Enter to save the setting or ESC to cancel the change.



5.5 About Screen

The About Screen shows the firmware version and programmable logic version on the second line. Press ▲ or ▼ to toggle between the two version numbers. The device's serial number is shown on the third line.



6 Charging the Battery

Caution:
The provided battery charger is designed to work safely with this device. Do not attempt to connect any other charger or adapter to this device. Doing so may result in equipment damage.

To charge the battery, connect the battery charger to an AC power outlet and the DC plug to the socket on the side of the BT-645. The battery charger is universal and will work with power line voltages of 100 to 240 volts, 50 to 60 Hz. The battery charger LED will be Red while charging and the LED will turn Green when the battery is fully charged.

When fully charged the battery inside the BT-645 will power the unit for about 10 hours of continuous sampling. For continuous operation, operate the unit with the battery charger attached. Charge the battery before storing the BT-645. Storing a discharged battery will degrade its performance.

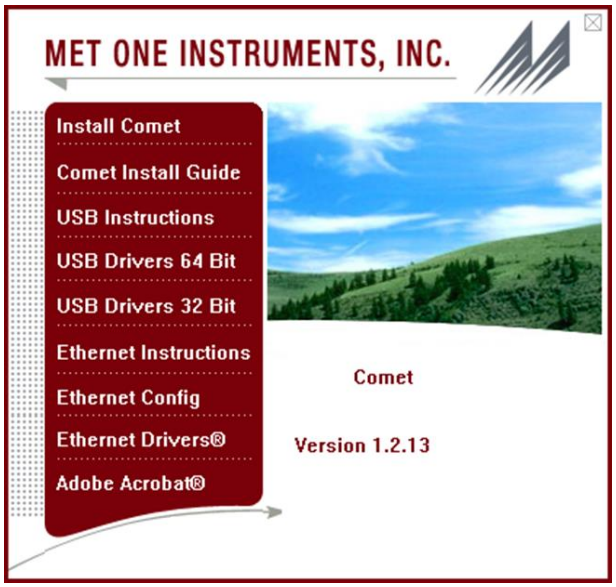
7 Serial Communications

BT-645 provides serial communications via USB and DB9 connectors located on the side of the unit. The following sections discuss the various serial communications.

ATTENTION:
The included USB drivers must be installed before connecting the BT-645 USB port to your computer. If the supplied drivers are not installed first, Windows may install generic drivers that are not compatible with this product.

<u>To install USB drivers:</u>

Insert the Comet CD. The install program should run automatically and display the screen below. If an AutoPlay pop-up window appears, select “Run AutoRun.exe”. Finally, select “USB Drivers” to start the install process.



7.1 Commands

The BT-645 provides serial commands for accessing stored data and settings. All commands are terminated by a carriage return. These commands are not case sensitive. The following table lists the available commands. These commands are available via USB and RS232 hardware interfaces. The settings (baud rate, parity and stop bits) must match the computer setting for proper communication regardless of the hardware interface type (USB or RS232). See Section 12.2 for more details.

7.1.1 Computer Mode

Computer Mode is intended for connecting the unit directly to a data logger or computer program such as Comet. This is the default mode of the unit.

In Computer Mode, all commands are preceded by the <Esc> (ASCII 27) character. No characters are echoed back to the user when entering commands. All commands are executed using the <ENTER> key.
Each time the <Esc> key is pressed, the unit will reset to Computer Mode and restart the command input.

7.1.2 User Mode

User Mode is intended for direct user interaction. In User Mode, all incoming characters are echoed back to the terminal. The user can wake the unit into User Mode by sending 3 <CR> (Enter Key) characters within 3 seconds. An asterisk "*" will be displayed when the unit is in Terminal Mode.
The unit will return to Computer Mode after 2 minutes of inactivity on the serial port. The Q command will return the unit immediately to Computer Mode.

Serial Settings	Value
Baud Rate	See Section 5.3.6
Data Bits	8
Parity	None
Port Name	The com port your computer is using to connect to the device.
Stop Bits	1

Command	Description
#	Displays MetRecord revision.
?,H	Displays the help menu
1	Returns the units settings information
2	Returns all available records from the data file
3	Returns all records since last '2' or '3' command.
4	Returns the last n records
D	Date (yyyy/mm/dd)
T	Time (HH:MM:ss)
C	Clear data
S	Start a sample
E	End a sample
Q	Exit User Mode and Enter Computer Mode
ST n	Sample Time: n=0 - 1 min n=1 - 5 min, n=2 – 10 min, n=3 – 15 min, n=4 – 30 min, n=5 – 60 min
RV	Show software revision.
ID	Set/Get the Location ID. Range 1-999.
SS	Read serial number
CU	Count Units (0=UG/M3, 1=MG/M3)
SK	Set/Get the K Factor. Range 0.1 – 20.0
DT	Set/Get Date/Time
OP	Operational Status. S=Stop, R=Running, Z=Zero.
RQ	Request Current Data Record

7.2 Output

When the RQ <enter> command is issued, the unit reports the last 1 second sample. When the 4<enter> command is issued, the unit reports the last Sample Time Average stored in memory. The output format is comma separated values (CSV).

7.2.1 Comma Separated Value (CSV)

The CSV output fields are both comma separated and fixed length.

CSV Header:

Time,Conc,Loc,Status

CSV Example Record:

2014-05-05 14:47:43,0000231,001,000,*01751

CSV Fields		
Field	**Parameter**	**Example Value**
1	Date and Time	2014-05-05 14:47:43
2	Concentration (UG/M3, MG/M3)	0000231
3	Location	001
4	Status	000
5	Checksum	*01751

Code	Error/Alarm Type
0	No Alarm
1	Zero Low
2	Zero High
3	Zero Stability
16	Low Battery
32	Sensor Error
64	Flow Error
128	Counter Fault

8 Maintenance

This section provides information about routine maintenance of the BT-645. The case of the BT-645 should never be removed or opened for any reason. **Opening or removing the case of the BT-645 voids the warranty and may result in exposure to laser radiation, which can cause eye injury.**

8.1 Suggested Periodic Maintenance Intervals

The table below shows the service schedule for the BT-645.

Maintenance Item	Suggested Period
Zero Calibration	Monthly
Replace PUMP filter and PURGE filter	Yearly
Factory service, recalibration, and optical system cleaning	Every 24 months

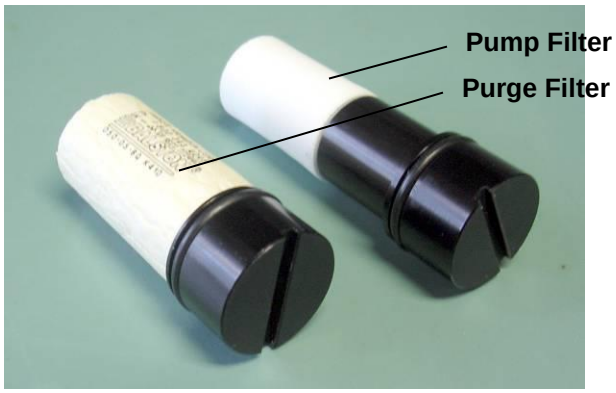
8.2 Zero Calibration

Refer to section 5.4.1 on how to run the zero calibration.

8.3 PUMP and PURGE Filter Changes

The BT-645 PUMP FILTER and PURGE FILTER are the two filter cartridges located on the side panel of the instrument. They can be removed by unscrewing the black aluminum filter holders with a coin using the slot in the face of the holder. The expected lifetime of the two filters is greater than one year, but in heavy particulate areas they may need to be replaced more often.

The 10 micron PUMP filter keeps any large particles from entering the sample pump. The 0.2 micron PURGE filter cleans the recirculated purge air which is used to keep the optics clean during normal operation.



8.4 Factory Service

The BT-645 needs to be periodically returned to the factory for service and recalibration. The recommended period is typically two years during continuous use. However, some users establish their own interval depending on the harshness of the sampling conditions, particulate levels, and data scrutiny. High concentration operation will often require more frequent factory service.

Factory service primarily consists of optical system cleaning, laser/detector checks, and recalibration. As-found calibration checks can also be requested. Contact the Met One technical service department to schedule BT-645 service. A Return Authorization (RA) number must be obtained before the unit is returned.

Refer to section 1.2 to contact Met One for technical assistance and/or factory services.

8.5 Flash Upgrade

BT-645 is firmware upgradeable via the serial connection using a Met One Instruments flash burn program. Binary files and the flash program must be provided by Met One Instruments. Refer to section 1.2 to contact Met One for more information about flash upgrades.

9 Troubleshooting

The following section covers some common failure symptoms, causes and solutions. The BT-645 case should never be removed or opened for any reason. **Opening or removing the case will void the warranty and may result in exposure to laser radiation, which can cause eye injury.** Refer to section 1.2 to contact Met One for more information and technical support.

Symptom	Possible Cause	Solution
Display does not turn on	• Low Battery • Defective Battery	• Charge battery • Send to service center
Pump does not turn on when a sample is started	• Low Battery • Defective pump	• Charge battery • Send to service center
Keypad does not work	• Loose connector • Internal hardware failure	• Send to service center
Sample result is lower than normal	• Optics may be contaminated	• Send to service center
Sample result is higher than normal	• Optics may be contaminated	• Send to service center • Send to service center
Battery does not hold a charge	• Defective or worn out battery • Defective charger	• Send to service center

10 Accessories

The following is a list of included accessories and replacement parts for the BT-645.

Replacement Parts (not included)		
Description	**Part Number**	**Graphic**
Purge Filter Holder, Black Aluminum	**8912**	
Pump Filter Holder, Black Aluminum	**8913**	
Purge Air Filter, 0.2 micron	**580302**	
Pump Filter, 10 micron	**580292**	
O-Ring, For Purge and Pump Filter Holders	**720063**	

Included Accessories		
Zero Filter Assembly	**81893**	
Li-Ion Smart Charger with power cord	**81818**	
Sampling Inlet	**80485**	
Sample Tube	**81885**	
USB Communication cable	**500787**	

11 Warranty / Service

Warranty

Products manufactured by Met One Instruments, Inc. are warranted against defects and workmanship for a period of one (1) year from the ship date.

Any product found to be defective during the warranty period will, at the option of Met One Instruments, Inc., be replaced or repaired. In no case shall the liability of Met One Instruments, Inc. exceed the purchase price of the product.

This warranty may not apply to products that have been subject to misuse, negligence, accident, acts of nature, or that have been altered or modified other than by Met One Instruments, Inc. Consumable items such as filters, bearings pumps and batteries are not covered under this warranty.

Other than the warranty set forth herein, there shall be no other warranties, whether expressed, implied or statutory, including warranties of fitness of merchantability.

Service

Any product being returned to Met One Instruments, Inc. for service, repair or calibration, including items sent for warranty repair, must be assigned a return authorization (RA) number. Please call (541) 471-7111 or send an email to service@metone.com requesting an RA number and shipping instructions.

All returns must be shipped to the factory, freight pre-paid. Met One Instruments, Inc. will pay the shipping charge to return the product to the end user after repair or replacement of an item covered by warranty.

All instruments sent to the factory for repair or calibration must be free of contamination resulting from sampling chemicals, biological matter, or radioactive materials. Any items received with such contamination will be disposed and the customer will be billed a disposal fee.

Replacement parts or service/repair work performed by Met One Instruments, Inc. are warranted against defects in material and workmanship for a period of ninety (90) days from the date of shipment, under the same conditions as stated above.

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12 APPENDIX A – Communication

12.1 Comet Software

The BT-645 is supplied with a CD containing a free copy of the Comet™ program, which is a simple Windows-based communications terminal program developed by Met One Instruments. Comet allows the user to connect to the BT-645 and read/set various parameters (K factor, Concentration Alarm, Analog Output Range and DAC Output Range), and log real time data.
The Comet CD also contains a pdf user's manual for the program. Install the program onto the computer that you will be using, and review the manual for more details.

12.2 Serial Commands

Command	Description
#	Get MetRecord Revision.
?,H	Help Menu.
1	Report Settings
2	Report All Data
3	Report New Data
4	Report Last Data
C	Clear Data File
D	Get/Set Date
E	End (Stop) Sample Cycle
S	Start a Sample Cycle
T	Get/Set Time
Q	Quit Out of Terminal Mode
CU	Get/Set Concentration Units
DS	MetRecord Descriptor Command
DT	Get/Set the Date and Time
ID	Get/Set Location ID
OP	Get Operational Status
QH	Report Data Record Header
RQ	Request Current Data Sample
RS	Report Settings
RV	Get Product Information
SB	Get/Set Serial Baud Rate
SK	Get/Set K Factor
ST	Get/Set Sample Time
SS	Get Device Serial Number
UN	MetRecord Units Command
DSCRC	Descriptor CRC signature