MODEL GT-521
PARTICLE COUNTER
OPERATION MANUAL

GT-521-9800 REV F

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Model GT-521 Particle Counter Operation 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—7:30 a.m. to 4:00 p.m. Pacific Standard Time, Monday through Friday.

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Safety Notice

The contents of this manual have been checked against the hardware and software described herein. Since deviations cannot be prevented entirely, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections are included in subsequent editions.

Faultless and safe operation of the product presupposes proper transportation, storage, and installation as well as careful operation and maintenance. The seller of this equipment cannot foresee all possible modes of operation in which the user may attempt to utilize this instrumentation.

The user assumes all liability associated with the use of this instrumentation. The seller further disclaims any responsibility for consequential damages.

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.

This system contains a laser operating at 850 nm. This wavelength is invisible to the naked eye and can cause damage to the eye if directly exposed. The unit is protected by a protective housing. To avoid the possibility of accidental exposure, always power down the system any time service or repair work is being preformed.

Repair of instrumentation manufactured by Met One Instruments, Inc. should only be attempted by manufacturer trained service personnel.

Electrical & Safety Conformity

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.
- European Community (CE) Directive 72/23/EEC
  EN 61010-1 (Safety)
- IEC 60825-1 Ed.1.1 (1998-01)
- EN 60825-1 W/A11 (1996)
- US 21 CFR 1040.10

Warranty

Products manufactured by Met One Instruments, Inc. are warranted against defects in materials and workmanship for a period of (1) year from the date of shipment from the factory. Offered products not manufactured by Met One Instruments, Inc. will be warranted to the extent and in the manner warranted by the manufacturer of that product.

Any product found to be defective during the warranty period will, at the expense of Met One Instruments, Inc. be replaced or repaired and return freight prepaid. 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 modified other than by Met One Instruments, Inc. Opening the particle counter, e.g. removing the cover, voids warranty!

Consumable items such as bearings 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 or merchantability.

Table of Contents

1.   Safety

1.1.   Safety Indicators

This manual uses a **CAUTION** and a **WARNING** indication. Familiarize yourself with the following definitions for the meanings of these indicators.

A **CAUTION** indicates a hazard and calls attention to a procedure that if not correctly followed could result in damage to the instrument. Do not proceed beyond a caution indicator without understanding the hazard.

A **WARNING** indicates a hazard to you and calls attention to a procedure that if no correctly followed could result in injury or even death. Do not proceed beyond a warning without understanding the hazard.

2. Setting Up

2.1. Unpacking

When you unpack the GT-521 and accessories, inspect the carton for obvious damage. If the carton is damaged notify the carrier. Unpack everything and make a visual inspection.

You should have the following:

Item	Description	Part Number
1	Carrying case	8517
2	GT-521 Hand Held Particle Counter	GT-521
3	Miniature screwdriver	993020
4	Iso-kinetic Sample Probe with a short piece of tubing	G3110
5	Zero Particulate Filter	G3111
6	Universal AC to DC converter module with IEC AC power cord	510640+400100
7	Custom Serial Cable	3228
8	GT-521 Operation Manual	GT-521-9800
9	GT-521 Calibration Certificate	Please call
10	GT-Comm Software (CD)	3305
11	GT-Comm Operation Manual	GT-COM-9800
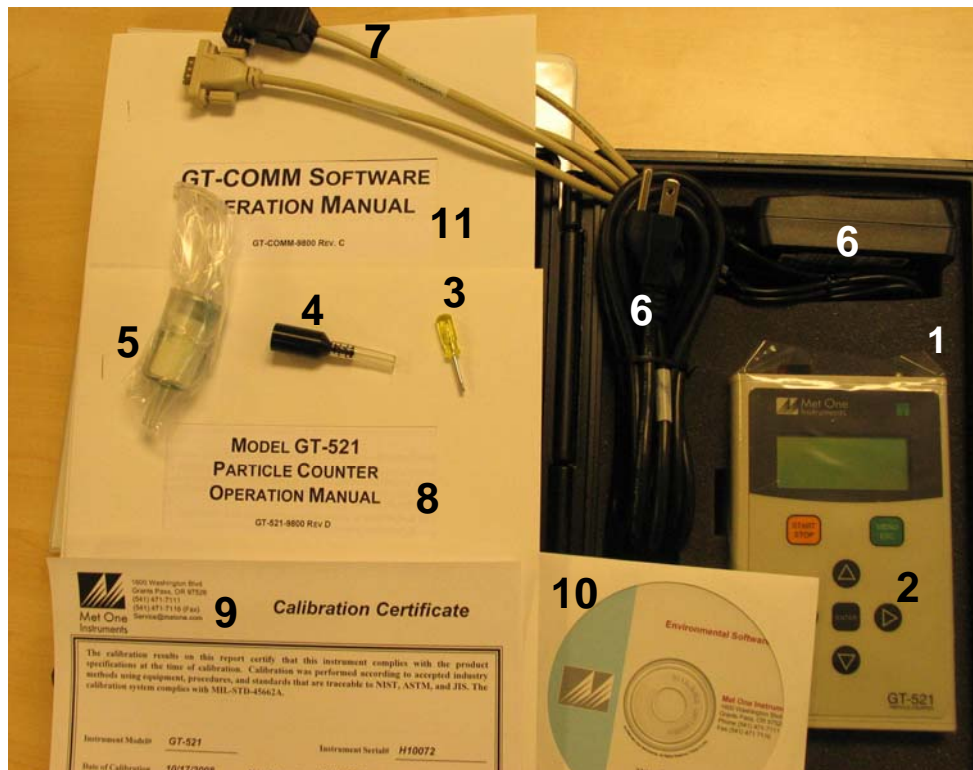
If any of the above components are missing contact your supplier.

Keep the carton and packing material for reuse.

2.2. Optional Accessories

Description	Part Number
Temperature & Humidity Probe	G3120
Dwyer™ Ball Flow Meter	9801
Printer	G3115
Printer Paper	750509

2.3. Familiarization
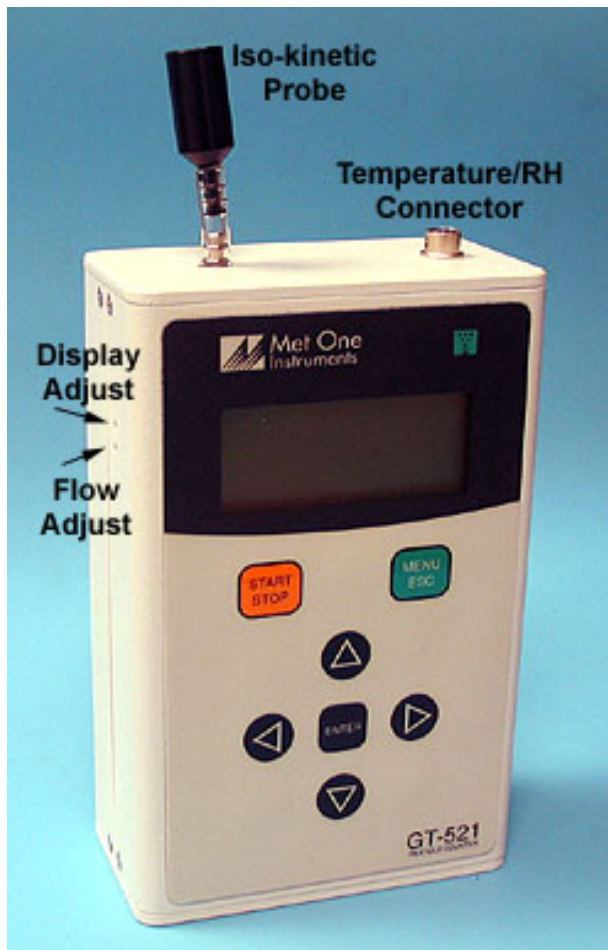
Item	Description
Power Switch	Slide to turn the GT-521 ON or OFF.
Charging Jack	Plug Universal AC to DC converter module into the jack to charge the internal battery.
Serial Port	Used for RS-232 or RS-485 serial communication (Section 5).
Iso-kinetic Probe	Reduces count errors due to mismatched sample flow velocity.
Temp/RH Connector	Used to connect an external temperature and humidity probe.
Display Adjust	Adjusts the LCD display contrast.
Flow Adjust	Adjusts the flow rate of the GT-521.

2.4. Test Run

The battery pack inside the GT-521 was charged at the factory and the instrument should be ready to use. The GT-521 was shipped with the following factory settings.

Parameter	Value
Channel 1	0.3μ (micron)
Channel 2	0.5μ (micron)
Sample Time	60 Seconds
Hold Time	0 (Zero)
Samples	1
Count Mode	ACTUAL
Count Units	/CUBIC FT
Temperature	Degree C
Alarms	OFF

1. Remove the red rubber cap from the GT-521 inlet nozzle.

2. Turn on the power switch that is located on the right side of the GT-521.

3. On power up the product intro screen is displayed for 3 seconds. The intro screen displays the product name and firmware version.

Note: If there is no display or a dim display, or you here a long beep, the battery pack probably needs charging and you should refer to Section 6.3.

4. Next you will see the main counter screen.

```
0.3µ                    0
0.5µ                    0
        /CUBIC FT
        WAIT
```

5. Press the START button. You should hear the internal vacuum pump start running. After 1 minute the pump will stop and the 0.3µm and 0.5µm channels will show the cumulative counts of particles larger than 0.3µm and 0.5µm per cubic foot.

Note: Do not change any of the factory default settings before reading section 4 on Manual Operation.

6. The GT-521 is now checked out and ready for use, however you should read the rest of this manual to better understand how to use and maintain this instrument.

7. Be sure to switch off the GT-521 power when you are finished sampling to conserve battery power.

If the GT-521 failed the test run, first check to see if the factory defaults are still set properly, program them in if they are not (Section 4), then try another test sample. If there is still a problem refer to Section 7 Troubleshooting.

Note: NEVER let moisture (e.g. rain) enter the sample inlet. Also put the GT-521 in a watertight enclosure if you plan to use it outdoors.

3.   GT-521 Overview

3.1.   Description

The GT-521 is a full-featured, battery operated, and completely portable hand held laser particle counter. It provides the functionality of a bench unit with the convenience of a hand held!

The GT-521 counts individual particles in the surrounding air utilizing scattered laser light.

An internal near-IR long-life laser diode is collimated and directed through the sample air flow. This sample air is drawn into the GT-521 by an internal rotary vane pump. When an airborne particle intersects the laser beam it scatters the light proportional to its cross section. The scattered light is collected over some angle perpendicular to the airflow and laser beam by a highly efficient elliptical mirror and focused on a photo diode. The photo diode converts the scattered light signal to a proportional voltage response. This output from the photo diode is then analyzed for two criteria.

The number of particles that scatter light and the amount of light scattered. The amount of light scattered is used to measure the size of the particle.

3.2.   Features - User Interface

The LCD display provides an understandable and easy to learn, user interface. It allows simultaneous viewing of two discrete counting channels in real time.

The output format can be configured to display cumulative counts, differential counts, or concentration (particles per cubic foot).

Each counting channels particle size setting can be defined in 0.1µm increments in the range of 0.3µm to 5.0µm. This significantly increases the analytical usefulness, no more special calibration or guess work.

The sample time is adjustable from 6 to 999 seconds. There are two programmable alarm levels for each channel.

The display also allows on screen data recall due to a large memory buffer capacity.

If an external temperature and humidity probe is added, the display will automatically update and show current values in real time.

3.3.   Features – Serial Communication

Remote operation via RS-232 or RS-485 is supported with an extensive command set that includes all of the front panel operations.

The GT-521 stores up to 4000 records for printer output, Excel ® formatted output, or networked datalogging through the included single computer software (GT-Comm).

The GT-521 is compatible with Facility Monitoring Software (FMS) for up to 99 remote sensors.

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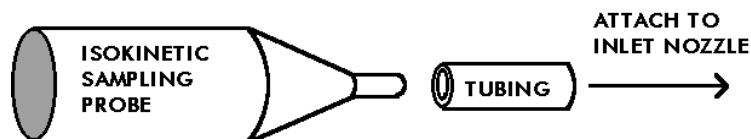
3.4. Applications

The GT-521 is a rugged and reliable particle counter that can be configured in many ways. Due to its flexibility it is used in a wide range of applications, for example

- Monitoring controlled environments such as hospitals and nursing homes.
- Indoor and outdoor (*) air quality studies.
- Process control monitoring in sawmills, grain elevators, quarries etc.
- Finding leaks and sources of contamination in air ducts and filtration systems.
- Testing the efficiency of residential air purifiers and vacuum cleaners.
- Concerned citizen groups that want to do their own air quality studies
- Clean room monitoring and verification.
- Filter Testing
- Epidermiological studies
- Reentrainment studies
- Air quality in mines and ore processing plants
- Compliance Testing
- Remote Sampling

(*) only with proper protection (e.g. watertight enclosure) and proper precautions (e.g. no moisture can enter the sample inlet).

3.5. Iso-kinetic Sampling

The GT-521 comes with an iso-kinetic probe that attaches to its inlet nozzle with the short piece of Tygon tubing provided.

The iso-kinetic probe reduces count errors related to the sample flow velocity and the aerodynamics of small particles.

The iso-kinetic probe should be used for most sampling applications.

When taking a sample of typical indoor or outdoor aerosols the opening of the iso-kinetic probe should always face upward. The GT-521 can be held in your hand or placed on a flat surface with its display facing you.

When sampling in an area that has a constant airflow, such as a clean room, duct, vent or the downstream side of a filter, always align the opening of the iso-kinetic probe to the air movement.

The length of the Tygon tubing going from the inlet of the GT-521 to the iso-kinetic probe can be increased if necessary. However, longer lengths can burden the pump and slow the sample flow rate or cause premature pump failures. Also, count losses, especially for larger particles, will increase. Met One Instruments recommends to keep the tubing length as short as possible. The tubing length should never exceed four feet.

The sampling height will affect the GT-521 reading. Taking a sample near the floor can give results several times higher than a sample taken at eye level.

When using the GT-521 to analyze a contamination problem be aware that not all contamination problems are continuous, some are the result of a short-term event or burst of particles. Locating the source will require taking a number of samples in the same area. It may be necessary to connect the GT-521 to a computer and log data over 24 hours to detect a fast contamination event.

3.6.   G3120 Relative Humidity/Temperature Sensor

Relative Humidity and Temperature measurements may be added to the AEROCET 531 at any time by plugging in the G3120 Relative Humidity/Temperature Sensor into the plug on the top of the unit.

The screen will now include actual readings of both measurements; data will now include the measurements in each data record.

Once the Relative Humidity/Temperature sensor is attached, a temperature alarm can be set and is reported as described in section 4.8.

3.7.   G3115 Printer

Printed records may be added to the AEROCET 531 at any time by plugging in the optional G3115 printer. This printer is a complete 40 character wide portable printer with an internal battery and an external AC adapter/charger.

4.   Manual Operation

CAUTION: Never sample smoke, paint spray, oil mist, reactive, or pressurized gasses to avoid damaging the sensor optics.

CAUTION: Remove the rubber cap from the GT-521 aerosol inlet nozzle before taking a sample. Running the internal vacuum pump with the cap attached for any appreciable time may damage the pump.

4.1.   Main Sample Screen

The main sample screen is viewed during normal operation of the GT-521. The display includes two real time counting channels and the particle size setting for each channel. The display also shows the status of the counter, alarm status, battery condition, temperature(*), humidity(*), and type of count data.

(*) Relative humidity and temperature are only displayed on screen if the external Temperature/RH probe is connected to the unit.

The screens below show examples of the actual/cumulative count mode and the differential count mode.

```
┌─────────────────────┐    ┌─────────────────────┐
│ 0.3μ        127821  │    │ 0.3-0.5μ   124254   │
│ 0.5μ          3567  │    │ 0.5μ ->       3567  │
│        COUNTS       │    │        COUNTS       │
│  23C RUN       38%  │    │  23C RUN       38%  │
└─────────────────────┘    └─────────────────────┘
```
Actual/cumulative count mode   Differential count mode

4.2.   Menu Select Screen

Changing the operating parameters, accessing data and outputting data is done through the GT-521 menu selection screen. Each GT-521 is shipped with factory default operating parameters as described in Section 2.4.

All changes to the operation of the GT-521, as well as accessing or exporting (e.g. via printing or computer download) the data follow the same sequence of steps.

1. Press the **<MENU>** key to enter the Menu Select screen.
2. Use the ↑ and ↓ keys to select the selection containing the parameter to change, then press **<ENTER>.**
3. In the sub-menu screen you just selected, use the → key to sequence to the parameter you want to change and use the ↑ ↓ keys to make a change.
4. Press **<ENTER>** to accept the change and **<ESC>** to return back to the main menu.

```
┌─────────────────────────┐
│ SAMPLE SETUP    ↑       │
│ CH1/CH2/CNT/TMP         │
│ DATA RECALL             │
│ PRINT OPTIONS   ↓       │
└─────────────────────────┘
```

4.3. Location ID, Sample Time Options

The SAMPLE SETUP menu selection is used for setting the location ID, sample time, hold time and number of samples.

The location ID is used to identify sampling locations. Each sampling location can be identified by a number from 1 to 99.

The sample time in seconds determines how long the GT-521 will sample the air. It can be set from 6 to 999 seconds.

The hold time in seconds determines how long the GT-521 will wait between samples. It can be set from 0 to 999 seconds.

The "Samples" selection shows the number of samples to take. It can be set from 1 to 999 or INFINITE (0). Select INFINITE for continuous sampling.

```
┌─────────────────────────┐
│ LOCATION ID   01        │
│ SAMPLE TIME   060       │
│ HOLD TIME     010       │
│ SAMPLES       010       │
└─────────────────────────┘
```

4.4. Channel Sizes, Count Modes, & Temperature Options

The CH1/CH2/CNT/TEMP menu selection is used to select the particle size, count type, and unit of temperature (°C or °F).

The Channel 1 and Channel 2 particle sizes can be set from 0.3µm to 5.0µm in 0.1µm steps. After the sizes are set they will be displayed on the main operating screen.

Note: Channel 1 cannot be equal to or greater than Channel 2.

```
┌─────────────────────────┐
│ CH1:0.3  CH2:0.5        │
│ MODE: ACTUAL            │
│ UNITS: COUNTS           │
│ TEMPERATURE: C          │
└─────────────────────────┘
```

The MODE is used to enable one of two counting modes:

- ACTUAL – The CH1 and CH2 outputs are actual cumulative counts. The cumulative count represents the total number of particles equal to and larger than the selected particle size.
- DIFFERENCE – The output is in differential counts, i.e. the difference of the cumulative counts in CH1 and CH2. Differential counts are useful for examining a particle size range of interest.

The count UNITS setting determines how to display the count data—counts or concentration.

- COUNTS – This setting selection will indicate the number of particles for both CH1 and CH2.
- CUBIC FT – This setting selection will indicate the number of particles per cubic feet for both CH1 and CH2.
- LITER – This setting selection will indicate the number of particles per liter for both CH1 and CH2.

4.5. Data Recall Options

The DATA RECALL menu selection allows you to scroll through historic data records by viewing each record.

The date and time is displayed on line 1.

The channel 1 particle size, alarm condition, and count or concentration value is displayed on line 2.

The channel 2 particle size, alarm condition, and count or concentration value is displayed on line 3.

An alarm condition is designated by an ***** character.

The location ID, count units, temperature and RH is displayed on line 4. Count units are designated by **L** for Liters, **FT3** for cubic feet and blank for counts.

An **ACTUAL/CUMULATIVE** count mode screen is shown on the left and a **DIFFERENCE** mode screen is shown on the right.

```
05/14/1999 02:31        05/14/1999 02:31
0.3µ    * 1645372       0.3-0.5* 1645372
0.5µ    *   95124       0.5µ ->*   95124
02       22C  34%       02       22C  34%
```

4.6. Print, Beep, Memory Clear Options

The PRINT OPTIONS menu selection allows you to enable or disable automatic sample printout, clear the memory buffer, print the entire memory content, and enable or disable the keypad beep. This screen also shows the memory percent full. To clear the memory, press the right arrow key until the curser is at memory percent full and press the Enter key. High light Y and hit Enter again to clear all saved records.

```
┌─────────────────────────┐
│ PRINTING    ON          │
│ MEMORY 50% FULL         │
│ PRINT MEMORY            │
│ KEYPAD BEEP OFF         │
└─────────────────────────┘
```

4.7. Date/Time, Com. Port Options

The DT/TM/BAUD menu selection is used for setting the date and time and communication parameters.

Date and time are used when storing data records to memory.

The baud rate selection is used for remote operation. 9600 baud is the default setting. In most cases this setting is appropriate. If another setting is needed use the ↑↓ keys to choose from 300, 600, 1200, 2400, 4800, and 9600 BPS.

Comm Port allows for communication via RS-232 or RS-485, and data output to a 24 character serial printer (PRINT).

```
┌─────────────────────────┐
│ DATE 01/12/1999         │
│ TIME 05:00:42           │
│ BAUD RATE 9600          │
│ COMM PORT RS232         │
└─────────────────────────┘
```

The PRINT output format looks like this:

```
MODE: ACTUAL, UNITS: COUNTS
     01    01/04/1999   16:23
     1.2u     9999999      120C
     2.5u     9999999       99%
MODE: ACTUAL, UNITS: /CUBIC FT
     01    01/04/1999   16:23
     1.2u     9999999 FT3 120C
     2.5u     9999999 FT3  99%
MODE: ACTUAL, UNITS: /LITER
     01    01/04/1999   16:23
```

```
        1.2u     9999999 L    120C
        2.5u     9999999 L     99%
MODE: DIFFERENCE, UNITS: COUNTS
        01     01/04/1999   16:23
        1.2-2.5 9999999     120C
        2.5u -> 9999999      99%
MODE: DIFFERENCE, UNITS: /CUBIC FT
        01     01/04/1999   16:23
        1.2-2.5 9999999 FT3 120C
        2.5u -> 9999999 FT3  99%
MODE: DIFFERENCE, UNITS: /LITER
        01     01/04/1999   16:23
        1.2-2.5 9999999 L    120C
        2.5u -> 9999999 L     99%
```

4.8. Alarm Options

The CH1 ALARMS and CH2 ALARMS selections on the menu can provide alarms that are shown on screen. If a count value exceeds the preset alarm value an asterisk is displayed on the screen next to the count data. The logic behind the alarms is described below. The alarms are available on both channel 1 and channel 2.

Note: Channel 1 includes the ambient temperature alarm.

How it works:

- The alarm channel logic is either ON or OFF.

- There are two alarm levels settings - HI and HI HI.

- When a count reading is greater than or equal to either alarm level an asterisk (*) is displayed by the LCD reading. The alarm status flag is also set. The alarm status flag is stored to the data logger. Each alarm level has its own bit assignment.

- There is also an alarm level analog output for each channel.

- It is always active. It is not tied to the alarm channel logic being either ON or OFF

The analog output levels for each alarm are shown below.

Channel 1	No Alarm	0.00 V	Channel 2	No Alarm	0.00 V
	Temp Alarm	0.50 V			
	HI Alarm	0.75 V		HI Alarm	0.75 V
	HI HI Alarm	1.00 V		HI HI Alarm	1.00 V

```
┌──────────────────────┐  ┌──────────────────────┐
│ CH1 ALARMS OFF       │  │ CH2 ALARMS OFF       │
│ HI         0000000   │  │ HI         0000000   │
│ HI HI      0000000   │  │ HI HI      0000000   │
│ TEMP       50        │  │                      │
└──────────────────────┘  └──────────────────────┘
```

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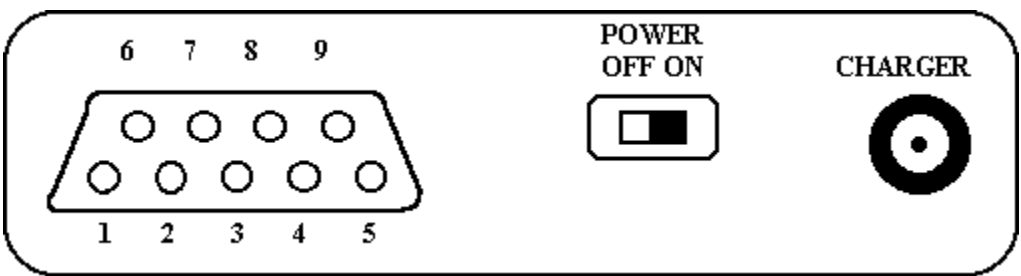
5.   Remote Operation

5.1.   Serial Interface

The serial interface to the GT-521 is a standard 9 pin (DB-9) connector. It is located on the right hand side of the instrument as shown below. Communication with the GT-521 requires a custom serial cable (P/N 3228).

CAUTION: Standard serial cables will not work and may cause damage to the instrument if connected**.**

Below is a description of the DB-9 connector.

Pin	Function	Comm. Type
1	Chassis Ground	
2	TX	RS-232
3	RX	RS-232
4	DTR	RS-232
5	Ground	RS-232 & RS-485
6	A OUT 1	DAC
7	A OUT 2	DAC
8	A	RS-485
9	B	RS-485

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5.2. Output Records

The GT-521 remote operation is similar to manual operation.

The protocol uses an ASCII based command structure. Section 5.3 shows a list of all commands that are available with the GT-521.

The output record is a comma-separated string (CSV-File) containing information for one count cycle.

The record format is as follows:

Date, Time, ID, Ch1 size, Ch1 count, Ch2 size, Ch2 count, RH, temp, status/alarms

07/17/98,10:25:00,10,0.3,123498,0.5,003487,34,23,ACFSZMNOPLTR

Status

A	=	Auto count
C	=	Temperature scaling in Degrees C
F	=	Temperature scaling in Degrees F
S	=	External AT/RH probe connected
I	=	Cumulative Counting mode
D	=	Differential Counting mode
U	=	Uncorrected Count value
Q	=	Count corrected to Cubic Foot value
Z	=	Count corrected to Liter value

Alarms

M	=	Hi alarm 1
N	=	HiHi alarm 1
O	=	Hi alarm 2
P	=	HiHi alarm 2
L	=	Laser cal alarm
T	=	Temperature alarm
R	=	Power Fail

Status and alarm conditions are stored as flags along with the logged data. An alarm exists only if the letter associated with that alarm is placed in the output string.

5.3. Command Summary

Command	Description	Syntax	Example
U – Unit select	Selects a unit for communication	U and the # of the counter 1-99. The # is the Location ID.	U21 <enter>
S - Start counting	Starts remote counter	Location ID and S to start counting	U21 <enter> S
E - Stop counting	Stops remote counter	Location ID and E to stop counting	U21 <enter> E
L - Send last record	Sends the counters last record	Location ID and L to retrieve record	U21 <enter> L
Q – Firmware version	Shows the version of the firmware in the counter	Location ID and Q to retrieve information about firmware	U21 <enter> Q
I - Location ID Set	Sets the Location ID of the unit from 1 to 99	I and a number between from 1 to 99	V <enter> I22 <enter>
R – Diagnostic Information	Shows Diagnostic Information about the unit	Location ID and R	U21 <enter> R
T - Sample time	Selects sample time from 6 to 999 seconds	Location ID and T with sample time from 6 to 999 seconds.	U21 <enter> T10 <enter>
A – Automatic Counting mode	Automatic Counting as specified by sample and hold times. Unit will wait to be started and continue until stopped	Location ID and A followed by a: 1 = on 0 = off	U21 <enter> A1 <enter>
B – Clear Memory	Clears all records from memory	Location ID and B	U21 <enter> BY <enter>
F – Set Channel 1	Sets the channel 1 size. (0.3 ~ 5.0)	Location ID and F followed by particle size	U21 <enter> F0.4 <enter>
G – Set Channel 2	Sets the channel 2 size. (0.3 ~ 5.0)	Location ID and F followed by particle size	U21 <enter> F4.5<enter>
H – Hold time	Sets the amount of time in seconds that the counter will wait before starting the next sample (0 – 999 seconds).	Location ID and H followed by time in seconds	U21 <enter> H060<enter>
J – Set Date	Sets the date that's stored in the counter	Location ID and J followed by date	U21 <enter> J12/21/1998<enter>
K – Set Time	Sets the time that's stored in the counter	Location ID and K followed by date	U21 <enter> K12:51:00 <enter>
M – Send all records	Sends entire memory contents	Location ID and M	U21 <enter> M
N – Start Pump	Starts the internal pump	Location ID and N	U21 <enter> N
D – Auto Records	Enabled and disables records sent after a sample is complete	Location ID and 1 for enable or 0 for disable	U21<enter> D1<enter>
r – Set Channel 1 Hi Alarm	Sets the channel 1 Hi alarm trigger value	Location ID and r followed by the number of actual counts	U21<enter> r100000<enter>
s – Set Channel 1 HiHi Alarm 1	Sets the channel 1 HiHi alarm trigger value	Location ID and s followed by the number of actual counts	U21<enter> s200000<enter>
t – Set Channel 2 Hi Alarm	Sets the channel 2 Hi alarm trigger value	Location ID and t followed by the number of actual counts	U21<enter> t100000<enter>
u – Set Channel 2 HiHi Alarm	Sets the channel 2 HiHi alarm trigger value	Location ID and u followed by the number of actual counts	U21<enter> u200000<enter>
v – Set Temperature Alarm	Sets the temperature trigger value	Location ID and v followed by the temperature value	U21<enter> V40<enter>

6.   Maintenance

6.1.   Service Schedule

WARNING: There are no user serviceable components inside this instrument. The covers on this instrument should not be removed or opened for servicing, calibration or any other purpose except by a factory authorized person. To do so will void warranty and may result in exposure to invisible laser radiation that can cause blindness.

Sensor, vacuum pump and filter replacement requires access to the inside of the GT-521 and a factory-authorized person should perform these tasks. Contact Met One Instruments for service information.

Calibrating particle sensors like the one in the GT-521 requires specialized equipment and a skilled technician. Met One Instruments, Inc. maintains a calibration facility for calibrating particle counters according to industry accepted methods like ASTM and JIS using NIST traceable standards.

The sensor in the GT-521 should be calibrated on a yearly basis.

6.2.   Service Schedule Table

Item To Service	Frequency	Performed By
Zero Count Test	Weekly	Customer
Flow Rate Test	Monthly	Customer
Replace Internal Filter	Yearly	Factory service at time of recalibration.
Calibrate Sensor	Yearly	Factory service only

6.3.   Battery Pack

CAUTION: The battery pack is not a user replaceable item, do not attempt to change the internal battery pack. The wrong battery pack could cause serious damage or a fire. Only a factory qualified person should change and properly dispose of the battery pack.

When the battery is low the GT-521 will sound a long beep. Another indication of low battery is if the pump fails to start when the **<START>** key is pressed.

The GT-521 provides no means of measuring the battery pack condition or capacity directly on the GT-521.

To charge the battery pack, connect the AC power cord from the AC to DC converter module to an AC power outlet. The module is universal and will work with power line voltages of 100 to 240 volts, 50 to 60 Hz. Take the plug on the end of the cord coming from the converter module and plug it into the charger-input socket on the side of the GT-521 just below the power switch. To fully charge a discharged battery pack may take up to 15 hours.

The battery pack inside the GT-521 when fully charged will power the GT-521 for about five hours of continuous sampling. Under normal intermittent or manual operation however, the battery should last for about 8 hours.

If the GT-521 is used on a daily basis, connect the charger at the end of each day. The battery pack will not be damaged if left connected to the charger over long periods.

If the GT-521 is used in an area where AC power is available leave the charger connected to the GT-521.

If the GT-521 is to be stored charge the battery pack. Storing a discharged Ni-MH battery for any length of time will degrade its performance.

6.4.   Zero Count Test

Met One Instruments recommends to periodically perform a zero count test as described below. False counts caused by air leaks or spurious noise will cause errors, that are especially apparent when sampling relatively clean aerosols.


1. Attach a filter with a rating of 0.2µm or better to the GT-521 inlet nozzle. The filter must be large enough that it does not create a restriction and load down the small vacuum pump inside the GT-521. One zero particulate filter (Part number G3111, see section 2.3) is supplied with the GT-521.

2. Since the air passing through the GT-521 is now virtually particle free, the output should be zero.

3. Select the 0.3µm range on the GT-521 and take a one-minute sample.

4. The result of the one-minute sample should be less than 1 actual count.

6.5.   Flow Rate Test

Testing the flow rate is an easy procedure but it requires a flow meter that is ±3% accurate at 0.1-cfm. The flow meter should be non-loading. The vacuum pump inside

the GT-521 can be easily loaded down by a small restriction. Most hot wire, ball type, and differential pressure type flow meters are non-loading.

Met One Instruments sells a flow meter (Part number 9801) upon request.
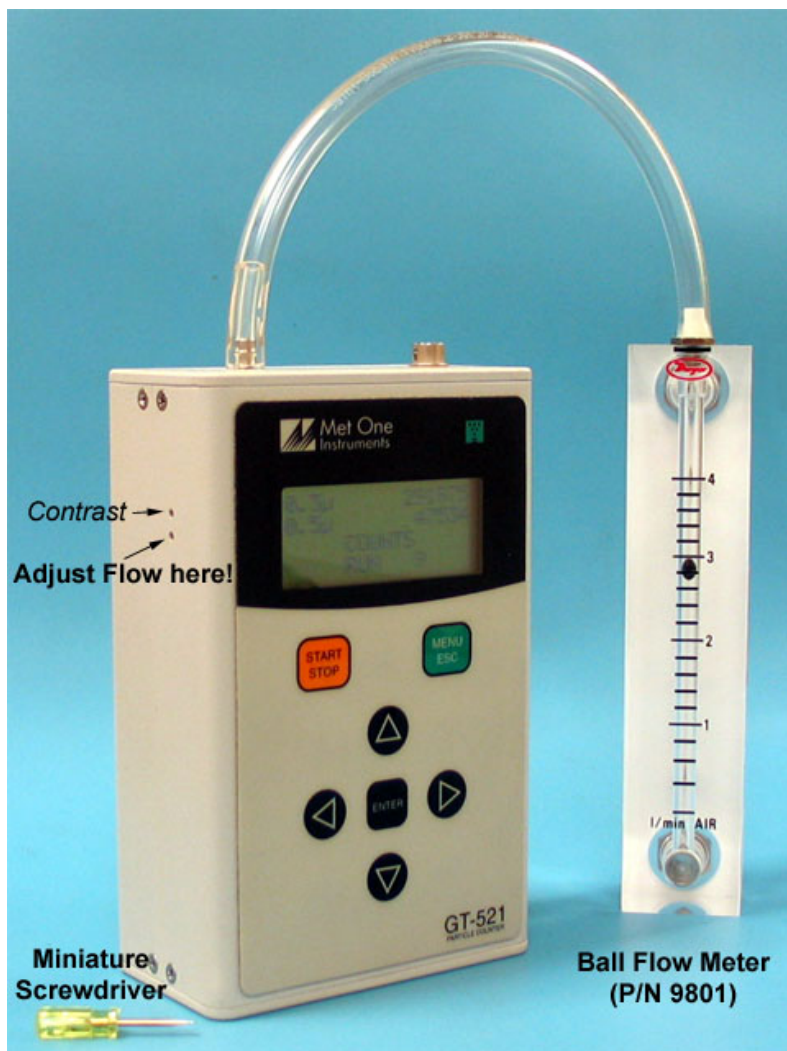
1. To test the flow rate, connect a flow meter to the sample inlet nozzle of the GT-521 using a short piece of flexible 1/8 " ID tubing, Tygon tubing is a good choice.

2. Turn on the GT-521 and note the flow meter reading. The flow rate should be 0.1-cfm ±5%.

3. The flow rate can be adjusted by a trimpot located in the lower of the two access holes in the left side of the GT-521 case (see section 2.3). Use the small screwdriver that came with the GT-521 to make the adjustment. Turn the adjustment pot clockwise to increase the flow and counter-clockwise to decrease the flow.

4. Monitor the flow rate while adjusting the trimpot.

7.   Troubleshooting

WARNING: The covers on this instrument should not be removed or opened for servicing, calibration or any other purpose except by a factory authorized person. To do so will void warranty and may result in exposure to invisible laser radiation that can cause blindness.

A factory-authorized person should replace the sensor, vacuum pump, filter or any component inside the GT-521.

Symptom	Possible Cause	Correction
Does not turn on, no display	1. Low battery 2. Defective Battery	1. Charge battery 10 hrs 2. Send to service center
Display turns on but pump does not	1. Low Battery 2. Defective pump	1. Charge battery 10 hrs 2. Send to service center
Keypad functions do not work	Loose connector or defective component inside	Send to service center
Sample result remains at zero after sampling	1. Pump stopped 2. Laser diode bad	1. Send to service center 2. Send to service center
Sample result is lower than normal	1. Flowrate is low 2. Debris may be stuck in the inlet nozzle and blocking the beam 3. Contaminated optics in sensor	1. Check flowrate 2. Blow pressurized air into the nozzle. Do not put any object down into nozzle! 3. Send to service center
Sample result is higher than normal	1. Air leak in sensor 2. Noisy laser	1. Send to service center 2. Send to service center
Battery pack does not hold a charge	1. Defective or worn out battery pack 2. Defective power cords 3. Defective charger module or chords	1. Send to service center 2. Check with an Ohm-meter 3. Contact your distributor to get another charger

8.   Specifications GT-521

OPERATING PRINCIPLE   Counts individual particles utilizing scattered laser light.

PERFORMANCE
Particle Size Range   Two channels - from 0.3 to 5.0 µm (selectable in 0.1µ increments)
Concentration Range   0 - 3,000,000 particles per cubic foot (105,900 particles/L)
Accuracy   ± 10%, to calibration aerosol
Sensitivity   0.3 µm with 2 to 1 peak to valley (JIS), 2 to 1 S/N
Flow Rate   0.1 cfm (2.83 lpm)
Sample Time   adjustable: 6 to 999 seconds
Hold Time   adjustable: 1 to 999 seconds

ELECTRICAL
Light Source   Laser Diode, 40 mW, 850 nm
Power   6V Ni-MH Self-contained battery pack - provides for 8 hours
                              of typical intermittent operation, up to 5 hours continuous use.
                              Full recharge may take up to 15 hours.
AC Adapter/Charger   AC to DC module, 100-240 VAC to 9 VDC @ 350 mA typical
Communications   RS-232 or RS-485
Certifications: Meets or exceeds CE, ISO, ASTM and JIS international certifications.

INTERFACE
Display   16 character x 4 line LCD
Keyboard   7 key membrane type

PHYSICAL
Size   Height = 6.25"   Width = 4.0"   Thickness = 2.12"
                              (15.9 cm)   (10.2 cm)   (5.4cm)
Weight   1.94 lbs - 31 ounces - (0.88 kg)

ENVIRONMENTAL
Operating Temperature   0° to +50° C
Storage Temperature   -20 to +60° C

ACCESSORIES
Supplied: Operation Manual
                           Serial Cable
                           Communication Software (GT-Comm)
                           AC to DC Converter Module with IEC AC Power Cord
                           Iso-kinetic Sample Probe
                           Screwdriver
                           Carrying Case
                           Zero Particulate Filter (Met One Part Number G3111)

Optional: RH & Temperature Probe (Met One Part Number G3120)
                           Flow Meter (Met One Part Number 61082)
                           Portable Printer (Met One Part Number G3115)

www.aikencolon.com

Declaration of Conformity

CE MARKING

Manufacturer's Name: Met One Instruments, Inc.

Manufacturer's Address: Met One Instruments, Inc.
1600 NW Washington Blvd
Grants Pass, Oregon 97526
United States of America
Phone: 541-471-7111
  FAX: 541-471-7116
E-Mail: metone@metone.com

Declares, that the product(s):

Product Names: Particulate Monitor, Aerosol Mass Monitor, Particle Counter

Model Numbers: GT-321, GT-321-1, GT-331, GT-521,
AEROCET-531

Product Options: All

Are in compliance with the following documents:

EMC: Emissions: CISPR 11:1990 / EN 61326-1

Immunity: EN50082-1 / EN 61326-1

Tom Pottberg
President
January 26, 1999