

Particulate Matter 2.5 QA Plan (2.24)

Section I

Electronic Calibrations Branch

(ECB)

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1.0 BACKGROUND, PROCUREMENT OF INSTRUMENTATION, and SET-UP

General Information: Particulate matter originates from a variety of sources. The chemical and physical composition of these various particles vary widely. While individual particles can not be seen with the naked eye, collectively they can appear as black soot, dust clouds, or grey hazes.

EPA's initial attempt at regulating particles was called Total Suspended Particulate (TSP). That is all particles that are present in ambient air, up to 70-100 micrometers (μm). By 1987, research had shown that the particles of greatest health concern were those equal to or less than 10 μm (PM 10). Particles this small can penetrate the sensitive regions of the respiratory tract. Today those particles greater than 2.5 μm are known today as coarse particles. Those particles that are less than 2.5 μm are known as fine particles. Fine particles were regulated by the EPA in July 1997.

Fine particles can be formed in the atmosphere from gases such as sulphur dioxide, nitrogen oxides, and volatile organic compounds (VOC). Other sources include power plants, diesel trucks, wood stoves, and industrial processes. The North Carolina PM 2.5 program goal is the measurement of particles less than 2.5 μm concentration in units of micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). These particles are collected on 47mm (46.2 mm) polytetrafluoroethylene (PTFE) filters. These concentrations are then compared to the National Ambient Air Quality Standard (NAAQS) of 65 $\mu\text{g}/\text{m}^3$ for 24 hours and 15 $\mu\text{g}/\text{m}^3$ annual arithmetic mean concentration.

The Electronics and Calibration Branch (ECB) and the Local Programs received Rupprecht & Patashnick Partisol-Plus Model 2025 PM 2.5 Sequential Samplers air

monitoring equipment, some spare parts, and flow standards through an EPA 103 Grant process during 1998, 1999, and 2000. Subsequent samplers, spare parts, and ancillary supplies will be procured by the maintenance section of the responsible agency in accordance with all current purchasing procedures.

1.0.1 New Monitors The most recent EPA Reference or Equivalent method list should be reviewed to determine models of monitors acceptable for network monitoring. If possible, the identical sampler (Rupprecht & Patashnick Partisol-Plus Model 2025 PM 2.5 Sequential Samplers) should be purchased. Each monitor used in the NAMS/SLAMS system will be a reference method (Appendix C of 40CFR53 and 40CFR58).

1.1 DESCRIPTION OF THE Rupprecht & Patashnick Partisol-Plus Model 2025 PM 2.5 Sequential Samplers

The Partisol-Plus Model 2025 Sequential Air Sampler is designed to meet the regulatory monitoring requirements for PM 2.5 (40 CFR Part 50 Appendix L). A filter storage and exchange system permits the operation of the device for the four days (96 hrs.) between required site visits. Internal data storage and output features allow data and information to be averaged and stored. Built-in sensors of ambient conditions include temperature, atmospheric pressure, and relative humidity. The Partisol-Plus Sampler provides flexibility in the definition of sampling programs, but only the **EPA basic program, 24-hour midnight-to-midnight** implementation, will be used for the network. The sampler includes the logging of information by exposed filter (filter data) and by 5-minute period (interval data).

The following is a listing of some of the features contained in the Partisol-Plus Sampler:

- An active volumetric flow control system maintains a constant volumetric flow rate at the

level specified by the user (default of 16.7 l/min) by incorporating a mass flow controller, and ambient temperature and pressure sensors. Sampled volumes will be reported in volumetric terms.

- The sampler uses standard 47 mm filters housed in reusable cassettes.
- The temperature of the collection filter is maintained within 5 °C of the outdoor ambient temperature by a continuous filter compartment ventilation system.
- A record of filter data is stored for each filter used in the device, and includes all U.S. EPA-specified values such as error condition flagging, average temperatures and pressures. Filter data records also include sampled volume in volumetric terms, and analog input data averaged over the collection period. The sampler has a capacity of 50 filter data records.
- Interval data are stored every five minutes, and include the five-minute averages of the filter temperature, ambient temperature, ambient pressure, and average flow rate. Data storage continues both during and after the exposure of the collection filter. The sampler has a capacity of 16 days of five-minute interval data.
- The sampler stores records of input data every 30 minutes by default. The sampler has a capacity of 32 days of input data records stored every 30 minutes.
- Automatic calibration of analog input and output channels
- A bi directional RS232 interface for data transfer to or from a PC or Palmtop allows interval, filter and input data to be retrieved. The sampler's standard configuration includes basic PC-based communication software for bi directional information exchange with the system.

Initial Setup: This SOP Section is to familiarize new maintenance technicians with the setup of the sampler through the system of Liquid Crystal Display (LCD) screen inputs. A preventative maintenance program is in effect on a scheduled

basis. The supplied Service Manual is the reference for all adjustments to the sampler by maintenance technicians and will not be duplicated in this Standard Operating Procedure. This SOP is to be reviewed prior the unpacking, assembly, and EPA acceptance procedure of all new instruments and the repair of current samplers.

2.0 ASSEMBLY

2.1 Unpacking and Inspection

If upon receipt of the R & P Partisol-Plus Model 2025 PM 2.5 Sequential Sampler, there is obvious damage to the shipping container, notify the carrier immediately and hold for his/her inspection. The carrier, and not R & P, is responsible for any damage incurred during shipment.

2.2 Parts Inventory

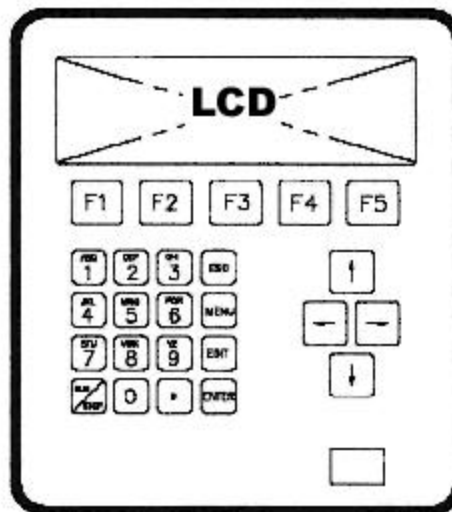
Inventory the sampler container using the included packing list (figure 1). If all materials are not present, make a note of the deficiency and go to the next sampler. When all samplers have been checked, immediately call R&P with the deficiencies, noting the serial number of the sampler(s) and the part number of the missing part(s).

2.3 Assemble the Unit

Use the Quick Start Guide that accompanies the sampler for sampler assembly Instructions (figure 2) and the Partisol Stand Assembly Instructions (figure 3).

3.0 Initial Setup and Operation of the Partisol Plus PM 2.5 Sampler

The sampler is operated and maintained through a series of menus on a LCD. This display has an adjustment knob / rheostat to the right of the screen. You may have to adjust the screen lighter or darker with the rheostat. All operations are performed using this screen.



3.1 Initial Screens

Upon **initial power up**, or if after the sampler is shut down, the following screen will be visible in the LCD. **Note:** to shut down the sampler (power off), press the run/stop button to **stop**, and only then turn the power switch off.

System Information				
Software Version		3.200		
Software Date:		1-July-99		
Serial Number:		10019		
Filter Exchange:		SINGLE		
Int Board Rev:		1		
Flow Type 1:		20		
F1	F2	F3	F4	F5

This screen will only be visible for up to 30 seconds. It gives the software version, date of the software, and the serial number of the machine (these parameters will be different than above on the samplers). The other information and format should be as shown.

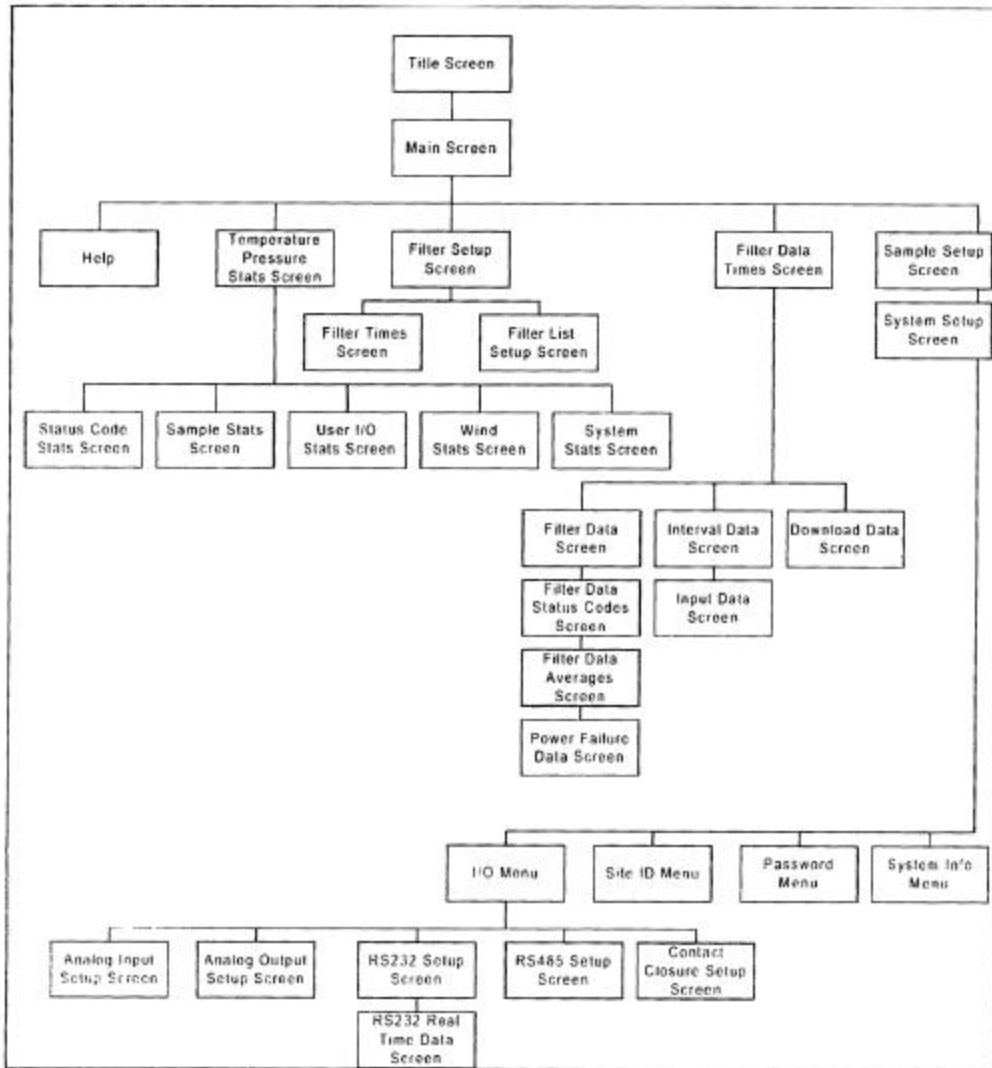
The next screen to be viewed automatically is the Main Screen.

Stat:OK		Partisol 2025		Mode:Done	
Current Time:		09.27 97/07/23			
Start Sample:		00.00 97/07/24			
Stop Sample:		00.00 97/07/25 .			
Filter ID:		123456			
Cassette ID:		100123			
Blank:		No			
Help	Stats	FiltSet	Data	Setup	
F1	F2	F3	F4	F5	

This part of the SOP is planned to flow from one menu to the next menu in a logical sequence for initial familiarization. It is expected that as familiarity with menus is gained, that the technician will skip only to the required screens. Look at the hierarchy of the

menus in the next graphic to see how the menus fit together.

MENU HIERARCHY



Stat:OK Partisol 2025 Mode:Done					
Current Time: 09.27 97/07/23					
Start Sample: 00.00 97/07/24					
Stop Sample: 00.00 97/07/25 .					
Filter ID: 123456					
Cassette ID: 100123					
Blank: No					
Help	Stats	FiltSet	Data	Setup	
F1	F2	F3	F4	F5	

3.2 Main Screen: The main screen (above) will appear after the initial screen. Updating of the screen will be accomplished later. The upper right corner (Done) denotes the operating mode (Stop, Wait, Sampling, Audit, Done). The upper left corner gives the current status(OK). The complete list of Status Codes are found in appendix 1. A few examples of status codes are:

- X Filter exchange failed
- N No Filters
- Z Power Failure (greater than 60 sec.)

Power failures longer than 60 seconds will initiate a z status code and stores the date and time of the power failure in the current record of filter data. If ending sampling conditions are not yet reached upon resumption of the power supply, the sampler continues its sampling program in the Sampling Operating Mode. Otherwise, it enters the Wait Operating Mode to await the

next sample.

All parameters shown can be corrected by the Set Up F5 key.

3.3 Maintenance Check of the Operational Capability: Press the F5 (Setup) key (Main Screen). The next menu will appear.

Sample Definition Method: Basic				
Default Sample Start Time: 00:00				
Default Sample Duration: 24:00				
Default Sample Repeat Time: 00:00				
Default Filter Type: P				
Sample Flow Rate: 16.7				
Flow Error Mode: Err Separators: No				
Help	SetEPA			System
F1	F2	F3	F4	F5

Again press F5(System) to enter the next screen to correct the time(only Eastern Standard

System Setup				
Average Temp: 99		Standard Temp: 99		
Average Pres: 999		Standard Pres: 999		
Date Form: 98:06:21		Average Time: 30		
Time Form: 13:00:00				
Curr Time: 05:00:00				
Curr Date: 98:04:10				
Help	I/O	Site ID	Passwd	SysInfo

Time).

F1 F2 F3 F4 F5

Scroll the cursor to the Curr Time, and press edit. The cursor should transition to a large block. Enter the correct Eastern Standard Time (EST) utilizing each section between the colons separately. If the next minute is 8:07 (assuming your watch has been set and checked), in the first area insert 08, shift the cursor to the next block and insert 07. When it is 8:07 exactly on your watch, **press the enter key. This will lock in the change.**

Current time: 08:07:00 Now correct the date in a similar manner.

3.4 Sampling Setup The Basic mode is the EPA default of everyday sampling. Default (start) time is always midnight 00:00. Duration for the network is always 24 hr. To change to the every third day (most sites) sampling period the Default Sample Repeat Time must be changed to 72:00. Precision samplers use repeat time 144:00 (6days). Use the edit function as before.

Sample Definition Method: Basic				
Default Sample Start Time: 00:00				
Default Sample Duration: 24:00				
Default Sample Repeat Time: 00:00				
Default Filter Type: P				
Sample Flow Rate: 16.7				
Flow Error Mode: Err Separators: No				
Help	SetEPA			System

F1 F2 F3 F4 F5

The default filter type (P) can/should be edited on this screen. Use the edit function to

insert a "T". The separator line is always NO.

3.4.1 System Setup Verification: While on the Sample Definition screen (above), press F5 (System). The System Setup Screen will appear. Defaults are as pictured and will be

System Setup				
Average Temp: 99		Standard Temp: 99		
Average Pres: 999		Standard Pres: 999		
Date Form: 98:06:21		Average Time: 30		
Time Form: 13:00:00				
Curr Time: 05:00:00				
Curr Date: 98:04:10				
Help	I/O	Site ID	Passwd	SysInfo
Function Keys in Browse Mode				
Help	I/O	Site ID	Passwd	SysInfo
Function Keys in Edit Mode				
-List	+List	Bksp	ChSign	

used.

F1 F2 F3 F4 F5

Average Temp: 99 is the default to use the temperature sensor on the exterior of the sampler. Average Press: 999 is the default to use the samplers internal pressure sensor to maintain a constant volumetric flow rate. Standard Temp and Standard Pres are defaults, but do not affect the sampler for our purposes. These values should remain as pictured.

The date format is

yr/ mo/ day and is defaulted. Average time is defaulted at 30 minutes. Current date and time (EST only) may be adjusted by using the edit mode as previously stated. Move the cursor, to the value to be changed, then press edit on the keypad and change the value. Each area hours, min, day, mo, and yr are treated separately. Change the day only and press Enter to lock in the change. Move to the next position to be changed with the cursor and press Edit. Continue as before changing each block separately. **Note:** In the edit mode, only the lower set of function keys will appear. If there are limited options on updating a field use + List or – List to view the options. **Pressing ENTER saves the change and resets back to the browse mode.**

3.4.2 Site Identification: This menu must be completed as directed. Using the System

Site Identification				
ID1: 371830014				
ID2: MILBROOK				
Function Keys In Edit Mode				
		Bksp	A <--	A -->
F1	F2	F3	F4	F5

Setup Screen, press F3 **Site ID** to enter and then update the AIRS site number.

Move the cursor to the ID1 row at the first position. Press edit, then 3, press F5 (A→) to move to the next digit, press 7, press F5 to move to the next digit. Continue until the entire AIRS code is completed. **Then press enter to lock in the number**, i.e., 371830014 is the AIRS code for Milbrook in Raleigh. For counties that only have two (2) digits in the county code, insert a zero before the county code. For example, Thomasville is

370571002. **Notice there are no dashes.**

Move the cursor to the ID2 row at the first position. Press edit, identify the number key that has the first letter of the site name. The first press of the number key displays the number. Press again and the first letter on the key appears. Press again and the second letter appears etc. until you get the desired letter. As before use the F4 or F5 key as required to move the cursor. When complete, **press Enter to lock in the selection.**

To leave this screen (or any other screen), press the escape key (ESC). This key will back up the screen one level. To completely go back to the main screen, it may take several repetitions of pressing the escape key. **Note: to leave the service menu, you must first escape to the main service menu and then select exit.**

3.4.3 System Information: From the System Id screen, select ESC and once back at the System Set-Up screen, select F5 to review the System Information Screen.

System Information				
Software Version:	1.302			
Software Date:	1 July 99			
Serial Number:	2077			
Filter Exchange:	SINGLE			
Int Board Rev:	1			
Flow Type 1:	20			
F1	F2	F3	F4	F5

4.0 Perform the EPA Acceptance Test Procedure

The ECB technician should first become familiar with this SOP, the R&P Operating Manual and Service Manual, Partisol-Plus Model 2025 Sequential Sampler. The EPA Acceptance test procedure (figure 4) will be performed using the R&P Partisol-Plus Model 2025 Sequential Sampler. If any item does not pass the procedure contact the QA Supervisor. Completed EPA Testing records will be forwarded to the QA Supervisor for review.

NOTE: This form to be submitted to EPA for contract samplers only. The form will be accomplished for all samplers.

SEQUENTIAL AND SINGLE CHANNEL FRM SAMPLER TESTING AND ACCEPTANCE CRITERIA

Please fax this completed form to Vickie Presnell, U.S.EPA, telephone 919-541-7620, fax 919-541-2357 (alternate fax 919-541-1903) within 25 calendar days of receipt of the sampler(s). Please use the AAceptance Form for Accessories for PM_{2.5} FRM Samplers® to document receipt of the accessories that will be delivered for use with each single channel and sequential FRM sampler.

Yes No

1. Check the enclosed packing list. Were all parts listed included in the delivery of the monitor?
2. Were any of the enclosed parts broken during the shipping of the monitor?
3. Check the enclosed assembly instructions. Did all parts fit together during assembly of the monitor?

4. Does the motor turn on when supplied with electrical power?
5. Using an independent timing mechanism, check to ensure the timer operates properly. Check to see if the timer will automatically turn on and off during a set time by setting the timer to start and stop the monitor while the operator is present.
6. Does the computer boot up and operate properly? Check to see if the computer has working software by performing manual input of information into the computer.
7. Does the computer download information properly? Check this by manually trying to download information.
8. Does the internal fan operate properly? Check this by supplying electrical power to the unit and checking if the fan will turn on and off.
9. Does the temperature sensor operate properly? Check this by taking a temperature reading with the internal fan off and then with the internal fan on and checking to see if the temperature readings change.
10. Does the filter holder apparatus operate properly? Check this by manually installing a filter into the holder apparatus and checking to see if the filter is sealed into the unit.
11. Does the casing protect the internal unit from weather? Check this by visually inspecting the unit's gaskets and seals for holes, leaks, etc. Note: This is a visual inspection only. Do not take apart the unit.
12. Does the unit support structure keep the unit secure and upright?
13. When all parts are assembled and operated together, does the unit function properly? Check this by assembling the unit as the instructions dictate, installing a filter, setting the timer, and operating the unit as a normal monitoring period.
14. a. Does unit calibrate?
b. Does unit pass calibration?

Certifying Official

(Accept / Reject)

City/State: _____ Telephone Number: _____

Serial Numbers for Samplers Accepted:
Rejected:

Serial Numbers for Samplers Being

5.0 Preventive Maintenance (PM) Program

A preventative maintenance program is established to be more efficient in the number of sampler failures and subsequent trips by the ECB technicians to repair or replace failed samplers. This program directs each sampler to be scheduled for replacement once 18 months with a sampler that has recently undergone the following checks. The retrieved sampler will then undergo these checks and then replace the next sampler in the schedule.

This is the recommended schedule of events. Variations are authorized for complications not here envisioned. There will be trips for sampler failures, hopefully not as many as w/o PM.

5.1 Pick Up sampler(s) at the site.

- A. **Insure region performs closing audit**, or ECB performs closing audit (flow, temperature, barometer) if no regional personnel available.
- B. Record site identification and down load filter, input, and interval data.
- C. **Insure region performs initial calibration of new sampler**, if they are there.
- D. Inform Headquarters of sampler change.

5.2 Procedures at the ECB

1. Clean 2.5 sampler inside & out
 - a. Inspect & clean head [inlet], down tube & 'o' rings
 - b. Cabinet, clean all areas
 - c. Exchange & clean particle trap filter
 - d. Inspect & clean wins impacter [proper threading & 'o' rings]
 - e. Inspect & clean fans/ filters
 - f. Clean external temp. probe & plug. [check 'o' ring]
2. Check keypad [worn/ cracked] & contrast knob,
3. Check proper motion of cassette magazines [hand pump] [5lbs]

4. **Replace 'V'-seals & replace (3) AA batteries.**
5. Check filter exchange operation [guide arm corrosion & bumpers]
6. **Rebuild pump** [pressure test - 40lbs steady, 34 to 38lbs filter exchange, 23-27lbs from

the pump
7. Inspect or replace vacuum tubing if required
8. Perform internal & external leak test
9. Perform temperature, pressure, & humidity calibration
10. Perform 3 point calibration
11. Perform Audit
12. Perform/create status code [power off]
13. Document annual preventive maintenance in ECB sampler logbook.

A copy of this form will be signed by the technician(s) performing the preventive maintenance.

Any other maintenance performed during this check out, will also be annotated on the form.

The completed form will accompany the sampler to its new location. The form will be given to the regional representative at the transfer site.

ATTACHMENT I
PRC 5: Status Codes

Hexidecimal On Filter file	Sampler	Problem
0	OK	No Status Conditions
(H)1	M	Flash Memory
(H)2	C	Automatic System Calibration Failed
(H)4	Y	System Reset Occurred
(H)8	Z	Power Failure
(H)10	F1	Flow 1 Out of Range
(H)20	F2	x- Flow 2 Out of Range
(H)40	F3	x- Flow 3 Out of Range
(H)80	S1	Flow 1 Stopped Due to 10% Dev for 5 minutes*
(H)100	S2	x- Flow 2 Stopped Due to 10% Dev for 5 minutes*
(H)200	S3	x- Flow 3 Stopped Due to 10% Dev for 5 minutes*
(H)400	A	Ambient Sensor Out of Range
(H)800	T	Filter or Compartment Temp Sensor Out of Range
(H)1000	E	Electronics Temperature Out of Range
(H)2000	R1	Diff of Filter Temp 1 and Ambient Temp > ± 5 °C
(H)4000	R2	x- Diff of Filter Temp 2 and Ambient Temp > ± 5 °C
(H)8000	X	Filter Exchange Mechanism Failure*
(H)10000	N	Out of Filters
(H)20000	O1	Coeff of Variation for Flow 1 Too High
(H)40000	O2	x- Coeff of Variation for Flow 2 Too High
(H)80000	O3	x- Coeff of Variation for Flow 3 Too High
(H)100000	P	Elapsed Sample Period Out of Range
(H)200000	L	Leak Check Failed
(H)400000	D	Audit Performed in Middle of Sample
(H)800000	B	Blank Filter

(H)1000000 S Stop Key Pressed
(H)2000000 V Flow #1 > 1 lpm in wait mode

NOTE: The current status code is the sum of all conditions that currently apply.

x- does not apply to EPA 2025 samplers

DECIPHERING HEXADECIMAL STATUS CODES

When the Partisol-Plus Sampler's PRC 5: Status Codes are downloaded, they are displayed as hexadecimal numbers. This attachment explains how they relate to the sampler's status codes. Generally, in our everyday lives, we use the decimal number system, which is a base-10 number system. It uses 10 symbols (0, 1, 2, 3, 4, 5, 6, 7, 8 and 9) to represent number values. The hexadecimal number system is a base-16 number system that uses 16 symbols (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E and F) to represent number values.

Dec	Hex
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

When downloaded, the Partisol-Plus Sampler's Status Codes are displayed in hexadecimal form. The sampler may display more than one code at a time. When the unit does show more than one status code, it adds the codes together and displays them

as a hexadecimal sum.

For example, if the unit displays the Flash Memory status code (hexadecimal number "1") and the System Reset Occurred status code (hexadecimal number "4") at the same time, the two status codes (when downloaded) will be displayed as the hexadecimal number "5." The status Code table has only two status codes that would add up to a value of 5. By looking at this table and breaking down the downloaded status codes, you will be able to decipher which status codes the unit has displayed. To properly use the Status Code table, you must separate the status codes on the table into place holders: the "one's," "ten's," "100's," "1,000's," "10,000's," and "100,000's" and the "1,000,000's" place. To break down the downloaded status codes, you must match each section of the status code with these place holders. See examples for assistance with deciphering hexadecimal status codes.

Example 1:

Decipher the following downloaded status code: 20C30

First, look at the Status Code table and break down the status code into its different place holders:

- 1) There are no status codes displayed in the "one's" place of the original status code.
- 2) In the "ten's" place of the original status code, a status code of "30" is displayed. Because there are no status codes in the table that match this number, you will need to break down this number further. In the "ten's" place of the table, there are only two status codes that, when added together, will amount to 30: 10 "Flow 1 Out of Range" and 20 "Flow 2 Out of Range." These are two of the status codes that the unit is displaying in its original status code. At this point, you must subtract "30" from the original status code: $20C30 - 30 = 20C00$. Now, continue to break down the resulting status code to decipher the rest of the status codes displayed in this number.
- 3) In the "100's" place of the new status code (20C00), a status code of "C00" is displayed. Because there are no status codes in the table that match this number, you will need to break down this number further. First, convert C00 to a decimal number. From the table, you see that "C" is 12, which converts "C00" to "1200."

Next, look at the Status Code table to decipher the "1200" status code. In the "100's" place of the

table, there are only two status codes that, when added together, will amount to 1200: 400 “Ambient Sensor Out of Range” and 800 “Filter or Compartment Temp Sensor Out of Range.” These are two more of the status codes that the unit is displaying in its original status code. Now, subtract “C00” from “20C00”: $20C00 - C00 = 20,000$. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

4) In the “10,000’s” place of the Status Code table, the status code 20000 “Coeff of Variation for Flow 1 Too High” matches the “20,000” status code. This is the last status code that the unit is displaying in its original status code. Therefore, the downloaded status code, “20C30,” breaks down into the following status codes, according to the Status Code table:

10 “Flow 1 Out of Range”

20 “Flow 2 Out of Range”

400 “Ambient Sensor Out of Range”

800 “Filter or Compartment Temp Sensor Out of Range”

20000 “Coeff of Variation for Flow 1 Too High.”

Example 2:

Decipher the following downloaded status code: 70B002

First, look at the Status Code table and break down the status code into its different place holders:

1) In the “one’s” place of the original status code, a status code of “2” is displayed. In the “one’s” place of the Status Code table, the “2” status code matches the 2 “Automatic System Calibration Failed” status code. This is one of the status codes that the unit is displaying in its original status code. Now, subtract “2” from “70B002”: $70B002 - 2 = 70B000$. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

2) In the “ten’s” place of the new status code, there are no status codes displayed.

3) In the “100’s” place of the new status code, there are no status codes displayed.

4) In the “1,000’s” place of the new status code (70B000), a status code of “B000 ” is displayed.

Because there are no status codes in the Status Code table that match this number, you will need to break down this number further.

First, convert “B000” to a decimal number. From the table you see that “B” is 11, which converts “B000” to “11,000.” Next, look at the Status Code table to decipher the 11,000” status code. In the “1,000’s” place of the table, there are three status codes that, when added together, will amount to

11,000: 1000 "Electronics Temperature Out of Range," 2000 "Diff of Filter Temp 1 and Ambient Temp > ±5° C" and 8000 "Filter Exchange Mechanism Failure." These are three more of the status codes that the unit is displaying in its original status code. Now, subtract "B000" from "70B000": $70B000 - B000 = 700000$. Continue to break down this status code to decipher the rest of the status codes displayed in this number.

5) In the "10,000's" place of the new status code, there are no status codes displayed.

6) In the "100,000's" place of the new status code (700000), a status code of "700000" is displayed. Because there are no status codes in the Status Codes table that match this number, you will need to break down this number further. In the "100,000's" place of the PRC 5: Status Code, there are three status codes that, when added together, will amount to "700,000": 100000 "Elapsed Sample Period Out of Range," (H)200000 "Leak Check Failed" and 400000 "Audit Performed in Middle of Sample." These are three more status codes that the unit is displaying in its original status code. Therefore, the downloaded status code, "70B002," breaks down into the following status codes, according to the Status Code table:

2 "Automatic System Calibration Failed"

1000 "Electronics Temperature Out of Range"

2000 "Diff of Filter Temp 1 and Ambient Temp > ±5° C"

8000 "Filter Exchange Mechanism Failure"

100000 "Elapsed Sample Period Out of Range"

200000 "Leak Check Failed"

400000 "Audit Performed in Middle of Sample."

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