Air Resources Board

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TECHNICAL BULLETIN 404-06 **Thermo Scientific 2025i Sequential Sampler**
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Issue

Thermo Scientific has released firmware update (version 02.08.45) for the 2025i PM2.5 FRM sampler. The Operations Support Section (OSS) has evaluated the new update and has determined the firmware suitable for field use. Currently, 2025i PM2.5 FRM samplers used in the network operate firmware (version 02.08.34).

Solution

All network 2025i PM2.5 FRM samplers should be upgraded to the latest Thermo Scientific 2025i firmware release. We recommend the firmware update be completed during the next scheduled 2025i instrument calibration.

A full list of the firmware changes in version 02.08.45 can be found in the firmware documentation (attachment 1). The new firmware makes the following changes to the user interface:

1. Change of mode with run key while in audit mode is now not allowed.
2. Errors can only be cleared while in stop mode.
3. Changed sample programming to allow the insertion of sample before the next repeat time.
4. Analog input and output calibration screens moved to the service menu.
5. Filter Advance item added to calibration menu.
6. Flow is now adjustable from within the Audit screens.
7. Confirmation required for manual advance of filter.
8. Leak status code now cleared on a successful leak check after initial failed test.

Procedure

The new firmware can be installed either through Thermo iPort communication software or using a USB flash drive. Detailed iPort instructions can be found in the firmware

documentation (attachment 1). The USB flash drive installation procedure is as follows (additional details are available in the firmware documentation, attachment 1):

1. Download the new firmware file from the Thermo website (http://www.thermoscientific.com/aqilibrary) or contact OSS staff for the file. Copy the firmware file to the root directory of the USB memory device.
2. The sampler must be in Service mode to upload new firmware. From the main menu, scroll to Service mode to toggle the Service mode On.
3. Insert the USB memory device with the firmware update into the USB port on the sampler.
4. Scroll to USB on the Main Menu and press Enter.
5. Select the USB port and press Enter.
6. Scroll to Firmware Update and press Enter.
7. The instrument will scan the USB memory device and locate installed firmware files on the device. Select the proper firmware update and press Enter
8. Follow the instructions on the screen to update the instrument firmware. The sampler should automatically restart after firmware update is complete. If not, remove the USB memory device and turn the power to the instrument off and then back on.
9. The sampler should maintain all information stored in memory (date/time, sample programming, calibration data, etc.) prior to the firmware update. However, the operator should verify that the data stored in memory has not changed once the sampler reboots.

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Thermo Scientific
iSeries Model 2025i/2025iD/2000i/2000iD Firmware Version 02.08.45.408

OVERVIEW

The firmware for the Model 2025i/2025iD/2000i/2000iD is loaded into the instrument's FLASH memory at the factory, but it may be necessary to load updated firmware into the instrument as new features become available.

This release includes a single file, 2025i020845.cramfs, which can be used to update the Model 2025i, 2025iD, 2000i, and 2000iD.

Before attempting to upgrade the firmware, it is advisable to check that the instrument is a model supported by this update and that it is currently running an upgradeable version of firmware. This information may be viewed by going to the DIAGNOSTICS > PROGRAM VERSION(S) screen. Make sure that the PRODUCT field matches one of the models listed above and the VERSION field matches one of the following release versions:

02.07.85.275
02.07.93.300
02.07.94.301
02.08.00.323
02.08.18.351
02.08.34.383
02.08.40.399

If the instrument is not running a version listed above, it is not field upgradeable using this procedure. Contact Thermo Technical Support for special upgrade instructions or specific information regarding changes to any firmware versions.

The entire firmware update process should take about 30 minutes at 57,600 baud over serial or 5 minutes over Ethernet or USB. There are two steps to upgrading the firmware:

A. Backup configuration/calibration data onto PC
B. Upgrade firmware
    B1. Using iPort
    B2. Using USB

Note: It may be convenient to print this file out before continuing with the firmware upgrade.

A. BACKUP CONFIGURATION/CALIBRATION DATA

Thermo highly recommends backing up configuration and calibration data before performing a firmware update. If this information is somehow lost or corrupted during the update, then a complete recalibration of all sensors and outputs would be required if this data was not saved.

This procedure assumes that Thermo iPort has already been installed onto a PC and has been configured to communicate with the instrument (over serial or Ethernet). Before updating the firmware, the instrument's current settings should be saved to a data file on a PC.
This procedure is described below:

1. Run iPort. Bring up the connection to the instrument using Instrument > Poll Serial or TCP Connect.
2. Once the instrument's window is displayed and selected, select Instrument > Backup/Restore > Backup Config to back up the configuration from the currently selected instrument to a file on the PC.
3. In the Open dialog box, select the appropriate folder and type in a filename for the backup file, then click Open to retrieve the data from the instrument and save it to the file.

B1. UPGRADE FIRMWARE USING iPort

Below is a procedure for loading the firmware into FLASH memory. The firmware update file transfer process should take about 30 minutes at 57,600 baud. It is assumed that iPort is already talking to the instrument and the instrument window is currently open.

NOTE: DO NOT TURN OFF THE INSTRUMENT AT ANY TIME DURING THIS UPDATE
If the instrument is turned off while burning the new image to the FLASH, it may require replacement of the CPU board, motherboard, I/O expansion board, and/or measurement interface board. To reduce this risk, make sure the instrument is running on clean and stable power before performing this update.

1. Close all instrument windows.
2. From the iPort menu, select Instrument > Update Firmware. Select TCP/IP or Serial, depending on the connection.
3. In the Update Instrument Firmware Program dialog box, enter the instrument ID (if using serial port) or the TCP/IP address (if using TCP/IP).
4. In the Open File dialog box, select the firmware update . cramfs file, then click the Open button.
5. File transfer progress can be monitored by looking at the transferred blocks in the lower left corner of the iPort window as well as on the instrument's display.
6. Once the file transfer is complete, the instrument will automatically reboot. There may be some error messages regarding configuration and calibration files that are

displayed, this is normal after a firmware update. At this time, the bootloader and application code in each of the low-level processors will be updated to the latest version.

7. To verify all updates were successful, go to the ALARMS menu and make sure the board status alarms at the bottom of the menu all show “OK”. If any board status alarms show “FAIL”, try rebooting the instrument and checking the ALARMS menu again. If they still show “FAIL”, contact technical service.

B2. UPGRADE FIRMWARE USING a USB FLASH DRIVE

The firmware can be updated by the user in the field via the serial port, over the Ethernet, or from a file on a USB memory device. This includes both the main processor firmware and the firmware in all low-level processors. Refer to the iPort manual for the firmware update procedure when using the serial port or Ethernet. To update the firmware using USB memory device, use the following instructions:

1. Obtain the firmware update file and copy to the root directory of the USB memory device. The firmware can be downloaded from the customer area of the Thermo Fisher Scientific website and should be copied to the root directory of the USB memory device.
2. The Sampler must be in Service mode to upload new firmware. Press, scroll to Service mode and press to toggle the Service mode On.
3. Insert the USB memory device with the firmware update into the USB port on the Sampler.
4. Scroll to USB on the Main Menu and press.
5. Select the USB port and press.
6. Scroll to Firmware Update and press.
7. The instrument will scan the USB memory device and locate installed firmware files on the device. Select the proper firmware update and press.
8. Follow the instructions on the screen to update the instrument firmware. The Sampler should automatically restart after firmware update is complete. If not, remove the USB memory device and turn the power to the instrument Off and then back On.

The instrument firmware update is now complete.

USING THE iSERIES PARTISOL WITH RPCOMM

The iSeries Partisol samplers were designed to work with RPComm as did the original Partisol samplers. There are a few changes in the functionality of RPComm when using it with the iSeries partisol samplers, mainly losing the ability to view the on-screen keypad from RPComm. When accessing the iSeries Partisol samplers running firmware version 02.07.96. and earlier, model 2025 was selected in RPComm for all sampler versions. This allowed for greater functionality to all sampler versions and because the data files were

the same on all models this allowed all models to download all three file types using RPComm.

With this latest update a number of changes were made to the samplers that changes the operation of the sampler when using RPComm. Follow the guidelines below for each model type. The main reason for the changes was to ensure that the data files and formats were the same for the new iSeries Partisol samplers as they were for the original Partisol samplers.

Partisol 2000i:

1. Start RPComm
2. Select New Connection from the File Menu in RPComm or click on the New Connection icon on the toolbar in RPComm.
3. When the New Connection window opens, select 2000 FRM as the model type.
4. Click on the Connect to Selected Instrument icon on the toolbar in RPComm.
5. If the proper PRC file for the 2000i is located in the RPComm operating directory on the computer, the New Connection window will open showing the instrument serial number in the title bar of the window.
6. Downloading data file is performed normally in RPComm for filter and interval data.
7. The original Partisol 2000 FRM sampler did not support user data files as is now supported with the Partisol 2000i sampler. In order to download the user data records, use the USB flash drive or download the user (or LREC) files using the Thermo Scientific iPort software.

Partisol 2000i-D:

1. Start RPComm
2. Select New Connection from the File Menu in RPComm or click on the New Connection icon on the toolbar in RPComm.
3. When the New Connection window opens, select 2000-D as the model type.
4. Click on the Connect to Selected Instrument icon on the toolbar in RPComm.
5. If the proper PRC file for the 2000i-D is located in the RPComm operating directory on the computer, the New Connection window will open showing the instrument serial number in the title bar of the window.
6. Downloading data file is performed normally in RPComm for filter and interval data.
7. The original Partisol 2000-D sampler did not support user data files as is now supported with the Partisol 2000i-D sampler. In order to download the user data records, use the USB flash drive or download the user (or LREC) files using the Thermo Scientific iPort software.

Partisol 2025i and Partisol 2025i-D:

The use of RPComm with the Partisol 2025i and 2025i-D is similar to that of the original Partisol-Plus 2025 and 2025-D Sequential samplers. RPComm automatically determines the instrument type and provides the proper data file records to the operator.

1. Start RPComm
2. Select New Connection from the File Menu in RPComm or click on the New Connection icon on the toolbar in RPComm.
3. When the New Connection window opens, select 2025 as the model type.
4. Click on the Connect to Selected Instrument icon on the toolbar in RPComm.
5. If the proper PRC file for the 2025i, or 2025i-D, is located in the RPComm operating directory on the computer, the New Connection window will open showing the instrument serial number in the title bar of the window.
6. Downloading data file is performed normally in RPComm for filter and interval data.

Included with this update to RPComm are a number of PRC files for use with the different versions of the iSeries Partisol Samplers. If RPComm is already installed on you computer, you do not need to reinstall RPComm. Instead, remove the PRC files and copy these to the location of RPComm on the computer running RPComm. The next time you execute RPComm, the program will automatically use the new PRC list in its operations for the specific sampler and sampler firmware version you are using.

RELEASE NOTES

Version 02.08.45 changes relative to version 02.08.40:

1. Changed filter record list for the 2000iD.
2. Fixed temperature difference status code issues.
3. Fixed initialization of flow control valve.
4. Change of mode with run key while in audit mode is now not allowed.
5. Flow error action is now implemented.
6. Errors can only be cleared while in stop mode.
7. Changed sample programming to allow the insertion of sample before the next repeat time.
   Please note: This change allows the adjustment of sample schedules to reflect missed days in a schedule. If a sample is missed, the system now allows the operator to easily change the start time of a desired sample to a time before the regularly scheduled sample day. For example, if sampling on a 1 in 3 days sample program, if sample 1 is programmed for the correct start date, sample 2 would normally run 72 hours after the start of sample 1 (and sample 3 starts 72 hours after the start of sample 2). By changing the start date of sample 2 to the end of sample 1, it is now inserted into the program periods. Sample three would automatically get reprogrammed to run 72 hours after the start of sample 2. Instead, the sample 3 start date can be changed to 72 hours after the sample 1 start date. All subsequent samples will not occur on the normal 1 in 3 days sample period. (The system must be in Time mode to allow for individual sample time programming.)
   The only constraint in inserting a sample in this way is that sample blanks are treated as having a 24-hour sample period for the manual programming of samples. So if a blank is scheduled to be run and the operator desires to insert a sample into the programming schedule after the blank, the inserted sample cannot be programmed to run until 24-hours after the blank runs through the sampler.
8. Fixed time zone and timeserver issues.
   Please note: When changing time zones on the instrument, the instrument time must first be set to the proper UTC time, not local time. Then change the time zone to the proper value. If in the US for EPA sampling, this would be

standard time, not daylight savings time. After making the changes to the instrument time and time zone, power cycle the sampler to allow the time and time zone changes to take effect. Verify the new instrument time is correct before using the sampler.

Version 02.08.40 changes relative to version 02.08.34:

1. Analog input and output calibration screens moved to the service menu
2. Filter Advance item added to calibration menu
3. Valid Sample Time now calculated as required
4. Flow is now adjustable from within the Audit screens
5. Confirmation required for manual advance of filter
6. Sample Period status code now works correctly
7. Manual shuttle actuation is now dependent on correct lift status
8. Added PRC register for changing the serial communication protocol (register 28)
9. Leak status code now cleared on a successful leak check after initial failed test

Version 02.08.34 changes relative to version 02.08.18:

1. Modify the filter record file header information so that the header and column titles match those used in the original Partisol-Plus 2025.
2. Increase the number of possible filter records from 32 records to 64 records.
3. Update the system to allow for the downloading of all instrument recorded data via iPort. In order to take advantage of this feature, version 01.04.01 or later of iPort must be used.
4. Add status codes as additional data values recorded in the User (LREC) and Interval (SREC) data files.
5. Correct an issue where under certain circumstances, the interval data record storage interval would change from 5 minutes to 1 hour.
6. Add the ability to change the filter blank status in the filter ID/Cassette ID screen. Previously changing this required the operator to edit the value in each individual sample set-up screen.
7. Correct a number of errors related to the recording of information after resumption of power as a result of a power failure.
8. There was an error where the total volume was reset to zero upon resumption of power. The total volume (and other values) are now properly maintained across a power outage.
9. A second related issue occurred when the power failure extend past the end of a programmed sample period. In this case, the total volume was not retained (as above) and the filter record was not recorded properly. Both of these issues have been corrected.
10. Correct an error where the reported volumes were reversed. If the instrument was set to record standard volume, actual volume was recorded, and vice versa.
11. Correct the issue where the sample period status code was not being set properly. If the programmed sample time is greater than 12 hours and the actual sample time is greater than one hour different that the programmed time, the sample period status code will be set.

12. Correct an issue where the sample start times were occasionally incorrectly set when filter blanks were programmed.
13. Correct one issue with uploading the filter lists via the USB port and modified the possible file types. Corrected an issue where if the filter list was of an invalid format, when trying to upload the file to the sampler, the system would crash and a power restart was required. Additionally, added the ability to use a filter list that was exported from RPComm and in the RPComm format, the system will now recognize that file format and can be uploaded to the instrument via the USB port with only a filename change.
14. Add a new function, where if the ambient temperature probe has failed, and the failure lasts greater than 5 minutes, the instrument will stop sampling and enter ERROR mode. In order to properly indicate this new error mode, a new status code indicating ambient temperature failure shut down was added. This new error code is displayed as AX on the status screen. A new HEX code was also created x80000.
15. Correct an error with the RPComm and the PRC list ordering where some of the filter list information was not properly recognized when uploading information with RPComm. There is a limitation when using RPComm to upload filter lists to the sampler. The filter type is not currently recognized. Make sure that the proper default filter type (if used) is entered into the sampler.

Version 02.08.18 changes relative to version 02.08.00:

1. In View Records/Filter Records, the maximum temperature difference value was added to the previously available date and time. This only affects the on-screen data as this value was present in the downloaded data records.
2. Filter records now report the actual stop time instead of the programmed stop time.
3. Update the system so that if PRC values are updated remotely via AK protocol and RPComm, the system automatically saves these after 5 seconds of in activity to the PRC records. Previously if an operator updated PRC records remotely via AK protocol and RPComm, the changes may not have been saved across a power cycle of the sampler.
4. Change the behavior of the auto-populate feature. Auto-populate was previously configured as an option where if this option was set to true, the system would automatically calculate new sample times and increment the filter and cassette ID values. With auto-populate turned off, the system would not automatically update sample times and filter or cassette ID values. This would require the operation to manually program all sample times. The new feature permanently updates all sample times based on the programmed defaults and does not automatically update the filter and cassette ID values.
5. Correct an on-screen error where the flow %COV value was displayed with units of l/min. Now displays %.
6. Filter type is now allowed to be blank.
7. Add an option that allows both fine and coarse flows to be operating during calibration for the 2025i-D and 2000i-D only.
8. Serial number is now retained when operator resets user defaults.

9. Update the behavior of the status light to flash only when critical errors occur (Flow stop and filter shuttle mechanism errors or no filters). [bug 1746] partial fix - status light now flashes and is steady when required.
10. Filter blank is no longer treated as a error status code. The status light no longer illuminates and the alarm bell is not longer displayed on the status bar of the display.
11. Add the ability for users to calibrate the filter compartment temperature.
12. Add status codes as the last column of the Interval data files.

Version 02.08.00 changes relative to version 02.07.94:

1. Filter record data columns and headers match the original Partisol-Plus sampler.
2. Filter and Cassette IDs mimic those from the original Partisol-Plus samplers (PYYYYYYY and RPXXXXXX).
3. Implement different filter record log contents for the four different models of iSeries Partisol samplers.
4. Fix a bug where the status codes in the filter records were occasionally truncated to 4 characters (should be 8 characters).
5. Correct an error where the FLOW STOP error was not triggered properly.
6. Fix an error where the units for volume were displayed incorrectly.
7. Operation of filter blanks in the 2025i and 2025i-D mimic original Partisol-plus samplers.
8. Change the permissions to prevent entering calibration or the ability to reset flow calibration unless in service mode.
9. Add status code column to the filter record of the Partisol 2000i-D.
10. Add the ability to edit the calibration slope and intercept values of the instrument sensors similar to the original Partisol samplers.

Version 02.07.94 changes relative to version 02.07.93:

1. Corrected issue where pump does not restart when exiting audit mode during a sample run

Version 02.07.93 changes relative to version 02.07.85:

1. Add USB Keypad Support
2. Use USB Keypad #defines
3. Float, short and long int editors updated to use USB numeric key codes
4. Replace YYYYMONDD date format with Excel compatible YYYY/MM/DD
5. filter_id, et al, now support 10 digit ids
6. meas_counts_to_raw_mflow() now uses correct scale factor
7. Correct rounding errors in update_flow_drive() and update_flow2_drive()
8. Dichot units now allow editing filter/cassette ids for both magazines
9. After editing the id's, the edited (and possibly auto-populated) id's are displayed rather than returning to previous menu
10. Correct defect in seperator filter logic
11. Add 'report offset' to some user cal commands
12. out_list[] values also zeroed
13. FLOW/FLOW2 only processed when flowing

14. Increased Filter/Cassette ID width to 10 digits (2 Billion)
15. Remove unused #includes
16. Edit reference value field width limit usage corrected
17. Softkey #3 now FiLTer ID; EDIT FILTER/CASSETTE ID now on main menu
18. Corrected several editing anomalies
19. Corrected "help" implementation for edit_field
20. USB keycodes and Matrix keypad scan codes are now unified and unsigned
21. Final fixes to up_var_stats
22. TEST CODE to print out var stats for flow 1
23. Add model type to FRAM struct so that changes to model will trigger a FRAM default
24. Thermo2025 app is now <stdbool> compliant
25. Add ability to import a sample filterlist (type & ID's)
26. String is now terminated in mon_to_month
27. Year handling corrected in parse_ls_line
28. Start using <stdbool.h>
29. Complete %RH Implementation
30. Wind Direction's special requirements now handled
31. Fix possible lockup during analog input initialization
32. Remove debug printf statements
33. Mask Pressure Vent if 2000i in s_svc_discrete_manual_motion_menu()
34. Matrix keypad changed to return USB key codes format
35. Add clink command for unique instrument ID
36. Code cleanup to remove several compiler warnings

Version 02.07.85:

1. Initial release