

Section 508 Compliant ☐ Yes ☒ No

Post Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 1 of 14

UCD IMPROVE Technical Information #251F

Post Sample Processing

*Interagency Monitoring of Protected Visual Environments
Air Quality Research Center
University of California, Davis*

*September 1, 2026
Version 3.2*

Prepared By: Rachel Anderson Date: 9/2/2026

Reviewed By: Lindsay Kline Date: 9/3/2026

Approved By: Marcus Langston Date: 9/3/2026



Section 508 Compliant ☐ Yes ☒ No

Post Sample Processing
 UCD TI #251F, Version 3.2
 September 1, 2026
 Page 2 of 14

DOCUMENT HISTORY

Revision	Release Date	Initials	Section/s Modified	Brief Description of Modifications
	02/11/2022	SRS	All	Previously anthologized version separated into individual TIs
	3/21/2022	GRM	All	Updated wording to accommodate adjusted procedure
	6/29/2022	TAK	5.4, 5.5	Updated order for field blank processing
3.1	12/27/2023	TAK	All	Updated terminology for terminal-status filters
3.2	09/01/2026	RMA	2, 3, 4, 5, 6	Reorganized procedural steps and section content for improved readability. Updated wording and content for consistency across SHL TIs. Added and revised figures to reflect lab-app updates and procedural changes. Added Ethanol caution. Added additional step to 6.5 to accurately reflect procedure.

Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 3 of 14

TABLE OF CONTENTS

1. Purpose and Applicability	4
2. Summary of the Method	4
3. Definitions.....	4
4. Cautions	5
5. Equipment and Supplies	5
6. Procedural Steps.....	6
6.1 Petri Dish and Tray Setup	6
6.2 Lab App Navigation, Sample Priorities, and On-Screen Information	6
6.3 Organization and Cartridge Inspection	7
6.4 Rearranging the O-ring Cassettes	8
6.5 Processing of Normal Nylon and Quartz Filters.....	9
6.6 Handling of Terminal-status Cassettes	11
6.7 Filter Anomalies.....	11
6.7.1 Handling of Incorrect Cartridge Dates.....	12
6.8 Preparing Inventory Trays	12
6.8.1 Identification Numbers for Bs and Cs	14
6.8.2 Identification Numbers for Terminal-status Trays	14

LIST OF FIGURES

Figure 1. Post-sample processing screen.	7
Figure 2. 3-Filter cartridge configuration.	8
Figure 3. Post-sample processing reporting problems.	12
Figure 4. Top view of labeled inventory tray.	13
Figure 5. End view of labeled inventory tray.	14

1. PURPOSE AND APPLICABILITY

The purpose of this technical information (TI) document is to describe in detail the procedures used at the Post-sample Processing station. It is applicable to all routine filters in the IMPROVE network.

2. SUMMARY OF THE METHOD

At the Post-sample Processing station, all contents of each bin are inspected to verify the filters were used on the assigned dates. Sampled nylon and quartz filters and associated field blanks are placed into Petri dishes and then into trays. Sample order should follow what is listed on the screen in the IMPROVE Filter Processing (lab app) software when placing Petris into trays. Terminal-status filters for nylon, quartz, and associated field blanks are removed at this station. These filters are placed into a separate tray from valid samples.

3. DEFINITIONS

- **2B module:** IMPROVE sampling module for nylon filters. Can be shortened to 2B, or simply B module.
- **2-3-2 Cycle:** One possible box cycle for IMPROVE sites. While all IMPROVE filters sample on the same days, cartridges are delivered to the sites in one of two cycles offset by one week. 2-3-2 cycle bins are delivered one week sooner and are processed through the lab in yellow bins. The cycle also has a different physical cartridge configuration.
- **3-2-2 Cycle.** One possible box cycle for IMPROVE sites. While all IMPROVE filters sample on the same days, cartridges are delivered to the sites in one of two cycles offset by one week 3-2-2 cycle bins are due one week later and are processed through the lab in blue bins. These cycles also have a different physical cartridge configuration.
- **3C module:** IMPROVE sampling module for quartz filters. Can be shortened to 3C, or C module.
- **Cassette:** A white plastic item that holds one filter in place. Made up of two halves; a cassette bottom and top.
- **Cartridge:** A set of four cassettes with a clear plastic base. Holds 2-3 cassettes with filters.
- **Field Blank:** IMPROVE filters with abbreviated purpose FB. These filters don't have air pumped through them when they are in the sampler and serve as a control group for lab and field contamination.
- **IMPROVE Filter Processing Application:** Proprietary laboratory software for processing IMPROVE samples in the Sample Handling Lab. Can also be referred to as the lab app.

- **Multi-boxes:** Refers to sites that have more than two boxes in rotation. These boxes are sent out much further in advance than other boxes.
- **PPE:** Personal Protective Equipment.
- **Set:** A group of organized filters. Usually contains eight trays.
- **Terminal status:** A status applied to IMPROVE filters that have been damaged or sampled incorrectly. Terminal filters are not analyzed.
- **Trays:** White plastic items that hold 50 Petri dishes.

4. CAUTIONS

Ethanol is used for cleaning equipment during this procedure. Ethanol is a highly flammable solvent and must be kept in the approved containers. It is also a skin and eye irritant. A lab coat, safety glasses, and gloves must be worn while working with it. For more information, see the Ethanol Safety Data Sheet.

Many site codes look similar. Verify the correct bin is being processed by checking the cassette labels against the site and dates listed by the lab app.

Ensure the correctly labeled forceps are used for each filter medium. Quartz filters flake very easily and can contaminate other filter types; therefore, it is important to use the appropriate forceps when processing these filters.

Do not clean nylon cassette bottoms with a lab wipe that has been used to clean quartz cassette bottoms. Instead, discard each lab wipe after cleaning all quartz cassette bottoms and use new lab wipes for the next bin.

Be careful to place the correct sampling date cassette label on the corresponding Petri dish. There is no other form to confirm which filter sampled on which date. Be sure to stack the filters in ascending order. If the filters are not found in the correct order during inventory, the associated filters must be given a Questionable Data (QD) status.

5. EQUIPMENT AND SUPPLIES

- Forceps for nylon filters
- Forceps for quartz filters
- Forceps for removing stickers
- Computer with the lab app installed
- Three empty Petri trays (one for nylons, one for quartz, and one for terminal-status filters)
- Brush for quartz
- Ethanol in appropriate container
- Nitrile gloves, lab coat, safety glasses (must be worn when using ethanol)
- Laboratory wipes
- Container for loose C screens

- Arbor press
- Clean Petri dishes

6. PROCEDURAL STEPS

6.1 Petri Dish and Tray Setup

The benchtop includes trays full of Petri dishes with already processed 2B and 3C filters. All trays are labeled with colored dot stickers indicating their set and tray number. Trays placed in the labeled area for “2B Filters” with yellow stickers are for the nylon filters, and the trays placed in the labeled area for “3C filters” with green stickers are for the quartz filters. Terminal-status trays are labeled with pink dot stickers and labeled “Terminal-status.” See section 6.8 if any of the required trays aren’t present or need to be created.

When Petri dishes are placed into a tray, the lid of the Petri dishes (the sides without the Pall logo) should have a label placed on them and be facing forward. The Petri dishes are placed in the tray starting from the back left. Petris are added in stacks as they are processed, with each stack placed in front of the previous bin’s Petris. Within each site, the oldest dates go in first.

Terminal-status filters should be placed in a separate tray labeled “Terminal-status” with the oldest date first as well. If terminal-status filters share a date, place them in the order of their module letters, with 2B (first) to 3C (second) and 5B or 5C (last if applicable). Field blank (FB) terminal-status filters follow the associated filter type.

6.2 Lab App Navigation, Sample Priorities, and On-Screen Information

1. Prior to beginning work, open the lab app. Click on **Post-sampling**, then select **Post-sample Processing** and check if there are any sites in the queue. Do not start processing a box if there are no sites in the queue.
2. If sites are available, select a bin that appears in the queue and use the scanner to scan the barcode associated with the site. If there are site bins ready to be processed that do not show up in the queue, ask senior lab staff. If there are multiple bins to choose from, select the highest priority bin available.
 - a. Check the Velcro tag on the front of the bin. The priorities are as ordered: bins with a “priority” tag on them > bins with yellow tags > bins with green tags > bins with pink tags > bins with Post-Process only tags.
3. The Post-sample Processing screen will display:
 - a. The site code in bolded text.
 - b. Two or three tables; one for 2B module one for 3C module and one for 5B or 5C module if applicable (Figure 1).
 - c. Each table contains the following columns “STAT” for filter status, “SAMDAT” for sampling date, and “!” for entering comments. For valid

Section 508 Compliant ☐ Yes ☒ No

filters the STAT column will be empty; for terminal you will see the following  .

- d. Each week’s samples are separated within the table by a black line.
- e. A field blank may appear in its module’s column based on cartridge position and will show up as FB with a date (Figure 1).
- f. The “!” button, which will open a pop-up window to report sample problems (Figure 4).

Figure 1. Post-sample processing screen.

Main Menu

Current User Initials:

Station: Post-sample Processing for site: STIL1 (1A, 2B, 3C, 4D)

Module 2B

STAT	SAMDAT	!
	07/01/2026	!
	07/04/2026	!
	07/07/2026	!
	07/10/2026	!
	07/13/2026	!
	07/16/2026	!
	07/19/2026	!
	FB 07/16	!

SUBMIT

Module 3C

STAT	SAMDAT	!
	07/01/2026	!
	07/04/2026	!
	07/07/2026	!
	07/10/2026	!
	07/13/2026	!
	07/16/2026	!
	07/19/2026	!
	FB 07/16	!

EXIT

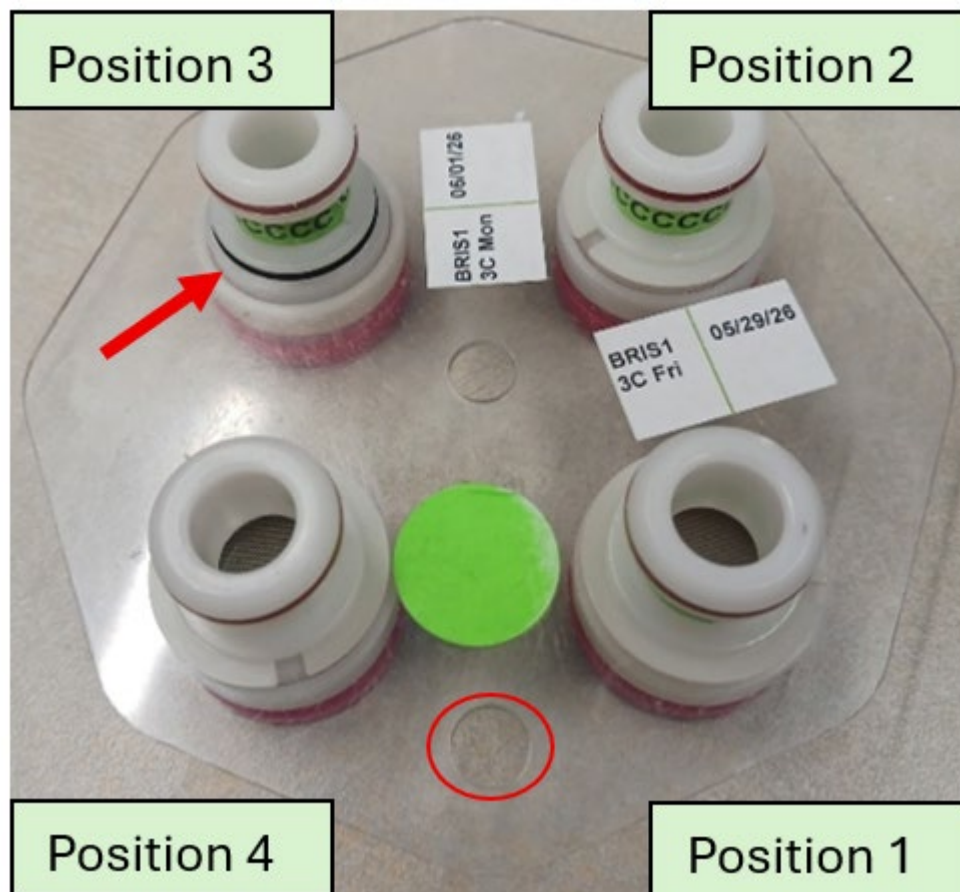
6.3 Organization and Cartridge Inspection

- 1. Confirm the bags are in numerical order in the bin, with week 1 in front to week 3 in back. Take the cartridges out of the week 1 bag and place them on the counter in order (1A, 2B, 3C, 4D, 5X; or, red, yellow, green, blue, orange). Make sure the cartridges are oriented correctly with the labeled side face up and the holes in the cartridge are oriented toward the user (Circled in Figure 2).

Section 508 Compliant ☐ Yes ☒ No

Post Sample Processing
 UCD TI #251F, Version 3.2
 September 1, 2026
 Page 8 of 14

Figure 2. 3-Filter cartridge configuration.



2. Verify site name and sampling dates from the lab app match the cassette labels. If the dates or site name does not match the information on the screen, see section 6.6.1.
3. Do the same for week 2, placing the cartridges behind week 1, then again for week 3.

6.4 Rearranging the O-ring Cassettes

Cassettes with an O-ring will need to be moved when they return from the field. This is to return the cartridge configuration to how they are when sent out for sampling. This step is done for all modules at the post-sample processing station.

- Yellow bins: Look at the cartridges in week 2. There should be a missing cassette with a sample label in position 3 for each cartridge, 1A, 2B, 3C, 4D, and 5X. Now look at the cartridges in week 3. The third position cassette from week 3 is removable, this position should not have a sample label. It will be the only cassette attached with a black O-ring instead of a white C-clip (O-ring is identified with an arrow in figure 2). Remove the third position out of each cartridge of week 3 and insert them into the appropriate week 2 cartridge (1A to

Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 9 of 14

1A, 2B to 2B, etc.) in the open hole.

- If the O-ring was already in Week 2 Position 3 without having to be moved, leave a comment on the O-ring filter in the lab app, and proceed to section 6.5.
- Blue bins: Look at the cartridges in week 1. There should be a missing cassette with a sample label in position 3 for each 1A, 2B, 3C 4D, and 5X. Now look at the cartridges in week 2. The third position cassette from week 2 is removable, this position should not have a sample label. It will be the only cassette attached with a black O-ring instead of a white plastic C-clip. (O-ring is identified with an arrow in figure 2) Pop the third position out of each week 2 cartridge and insert them into the appropriate week 1 cartridge (1A to 1A, 2B to 2B, etc.).
 - If the O-ring was already in Week 1 Position 3 without having to be moved, leave a comment on the O-ring filter in the lab app, and proceed to section 6.5.

If the configuration of the cassettes is incorrect, see section 6.6.1

6.5 Processing of Normal Nylon and Quartz Filters

The following steps are performed after confirming the O-rings are already in the correct position for an outgoing box of a given cycle. If the O-rings are not where expected, see section 6.4. 2B filters should be processed first, then 3C filters, then 5B or 5C filters last. Physically, start with the filter in position 1 of week 1, then samples are processed in order from cartridge positions 1→3 for each week. Once week 1 is finished, move on to week 2, then 3. Viewed on screen, the samples should be unloaded in the order they are listed in each column in Figure 1.

If there are any red highlighted statuses, refer to the instructions in section 6.6.

1. A and D module filters are not processed at this station beyond moving the O-ring positions. Stack the week 1 A and D cartridges together and place them to the side. Repeat this process for weeks 2 and 3.
2. Remove all the red caps from the 2B, 3C, and 5B/C cassettes and place the caps in the front of the tray. Do not remove the red caps for A and D cassettes.
3. From this point forward, handle only one cartridge at a time. Process all filters of that cartridge's module before moving onto the next module. Start with the 2B cartridges and then move on to the 3C then 5B/C cartridges.
4. Remove the label from the first position B cassette from week 1 and place it on the lid of a clean Petri dish. Remove the lid from the Petri dish and leave it on the benchtop label side up.
5. Remove the bottom of the cassette using the arbor press.
6. Carefully invert the open cassette over the Petri dish bottom to gently knock the

Electronic documents are official. Paper copies are for reference only.

Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 10 of 14

filter out of the cassette. This will leave the filter deposit side up in the bottom of the Petri dish. If necessary, use the labeled forceps for the B filters to separate the filter from the cassette.

7. As the filters are processed, stack the Petri dishes from the earliest date (on the bottom) to the latest (on top). Proceed to process all the B filters in this fashion for all three weeks.
 - a. If any field blanks are present, treat them in the same manner as other cassettes. A field blank should be processed and stacked in the order that the filters in the cartridge are unloaded. This order may not be exactly chronological.
8. Then, place the Petri dishes into the tray marked for B filters (nylons). The proper order of placement in trays is left side first from top to bottom with the oldest date placed in first. If the tray is filled, continue with the Inventory instructions below in section 6.7.
9. Process the C (quartz) filters in the same order as the nylons. Starting with position 1 of week 1, remove the label and place on a clean Petri dish.
10. Using the arbor press open the cassette. Cassettes for C filters have loose screens, so when the cassette bottom is inverted, both the filter and the loose screen will come out. The filter will come out of the cassette deposit side up. Separate the filter from the cassette using the appropriate forceps.
11. Place the loose screens in the labeled quartz screen container.
12. As the C filters are processed follow the same process by stacking and placing them in the Petri tray as you did for B filters. If the tray is full, see section 6.7
13. Don PPE. Clean all the B cassette bottoms, fixed screens, and forceps using ethanol and laboratory wipes. Blow air on fixed screens to remove laboratory wipe fibers.
14. Clean the cartridge plate and the red caps, then place the red caps in the week 1 bag.
15. Clean the C cassette bottoms, cartridge plates, and forceps with ethanol and new lab wipes. If there is a lot of quartz residue on the cassette bottom, brush the cassette bottom with a quartz brush before wiping it.
 - a. If brushing is needed, brush the cassette bottom while holding it over a garbage can. This ensures that no quartz residue gets on the counter.
16. Discard laboratory wipes after the 3C cartridges have been cleaned.
17. If there are 5B or 5C cartridges, process and clean these cassettes in the same manner as the 2B or 3C filters. They will go in the B or C inventory directly after the whole set of 2B or 3C Petri dishes.
18. Attach all cassette bottoms back onto the cassette tops with the arbor press when finished cleaning.

Electronic documents are official. Paper copies are for reference only.

Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 11 of 14

19. Stack cartridges from each of the three weeks in pairs: 1A+4D and 2B+3C. Place them back in their corresponding bags. 2B and 3C cartridges should be in the bottom of the bag and the 1A and 4D cartridges on the top.

6.6 Handling of Terminal-status Cassettes

1. If any statuses within a bin are highlighted in red, take a red pen and put an X directly on the label(s) belonging to the terminal-status cassette(s) label. Make sure the proper cassette is identified by double-checking the sample date and the module number with the lab app. If there is a field blank that shares a date with a regular filter that has a terminal-status, the field blank may have a different status from the regular filter and should be treated accordingly.
2. Once all terminal-status cassettes are labeled, proceed with processing filters like normal following sections 6.3 and 6.4 above. Terminal filters are placed in a separate terminal tray from valid samples. Remember to separate them when placing filters in Petri trays.

6.7 Filter Anomalies

Filter anomalies or issues when handling the filters are reported by entering a comment. Click the exclamation mark next to the appropriate sample and select the issue from the list or type a comment. (Figure 3). From top to bottom, the comments that can be entered are:

- a. Hole: refers to existing rips or holes (filter was damaged prior to current station). Select a hole size and location. Pinholes are the size of a needle or smaller.
- b. Hole at post-processing: refers to holes made at this station. Select a size and location.
- c. If a filter was dropped, specify it was deposit-side up or deposit-side down and on the benchtop or floor.
- d. Insect/Large Particle: Select if bugs or large particles are visible. If it can be done without damaging the filter, remove the bug or large particle and leave a note that it was removed at post-sample processing. Ask senior lab staff for assistance if necessary.
- e. Scratches/Uneven sample: Select if a filter is nonhomogeneous, or wrinkled. If wrinkled, also leave a comment about where the wrinkles are.
- f. Screen: There should be one screen, with the 'up' symbol visible when cassette bottom is opened. If screen is missing, or two screens are present, report that here. If up sign is not visible, report screen as upside down.
- g. Upside down filter: C filters are supposed to have sampled on the 'smooth' side. If the filter sampled on the 'rough side', mark this box.

Section 508 Compliant ☐ Yes ☒ No

Figure 3. Post-sample processing reporting problems.

Main Menu

Current User Initials: RMA

Station: Post-sample Processing for site: EVER1 (1A, 2B, 3C, 4D, 5C)

PROBLEMS FOR LOG ENTRY 11/21/2025 MODULE 2B

Hole:
☐ Pinhole(s)
☐ Large
☐ Middle
☐ Outer edge

Hole at post processing:
☐ Small
☐ Large
☐ Middle
☐ Outer edge

Dropped:
☐ Sample side up
☐ Sample side down
☐ Small particles (A only)
☐ Insect / Large particles
☐ Scratches / Uneven sample

Screen:
☐ Double
☐ Missing screen
☐ Upside down
☐ Upside down filter (A, C, or D only)

Notes:

OK

Module 2B

MDAT	STAT	SAMDAT	STAT	SAMDAT
6/2025	!	11/06/2025	!	11/06/2025
9/2025	!	11/09/2025	!	11/09/2025
2/2025	!	11/12/2025	!	11/12/2025
5/2025	!	11/15/2025	!	11/15/2025
8/2025	!	11/18/2025	!	11/18/2025
1/2025	!	11/21/2025	!	11/21/2025
4/2025	!	11/24/2025	!	11/24/2025

SUBMIT

EXIT

SHOW COMMENTS

Module 3C

Module 5C

6.7.1 Handling of Incorrect Cartridge Dates

If a bin is found to have dates that don’t match the expected dates listed in the lab app, that bin needs to be inspected by full-time staff. Retrieve a ‘Problem Form’ and fill in all the fields listed on it. Describe anything unusual about the box in the notes section at the bottom. This will help staff follow up on and resolve the issue.

Place this form at the front of the bin and place the bin at the top available space of the shelf labeled “Problem shelf”. Don’t press submit in the lab app. Instead, exit out of the page.

6.8 Preparing Inventory Trays

Each tray is labeled with six correctly colored labels. Four labels are placed on top of the tray (Figure 4) and two are placed on the front end (Figure 5). An inventory tray is considered full when it contains 50 total filters, 25 on the left-side and 25 on the right-side. A new tray needs to be started when the previous one is full. Empty trays are found at Post-sample processing or Post-weigh chamber preparation. Labels needed are hanging on the shelf above Post-sample processing. See below for labeling a tray.

- 1. Locate an empty tray.
- 2. Locate the correct label color used for labeling the tray. Nylon (B) filters use yellow, and quartz (C) filters use green. Terminal-status B and C trays are labeled with pink.

Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 13 of 14

3. Orient the empty tray so the hinge is on the left, and the Pall logo is visible on the top.
4. Place a label in the top left and write a 1 on it with an arrow pointing down. This is to show positions 1-25 are on the left.
5. Place a label in the top right and write 26 on it with an arrow pointing down. This is to show positions 26-50 are on the right.
6. Place a label in the bottom left and write the 4-digit sampling year on it (see figure 4).
 - a. Make a duplicate of this label and place it on the left-front end of the tray (see figure 5).
7. Place a label in the bottom right and write the set and tray number on it, refer to 6.8.1 for details on tray identification numbers (see figure 4).
 - a. Make a duplicate of this label and place it on the right-front end of the tray (see figure 5).

Figure 4. Top view of labeled inventory tray.



Section 508 Compliant ☐ Yes ☒ NoPost Sample Processing
UCD TI #251F, Version 3.2
September 1, 2026
Page 14 of 14

Figure 5. End view of labeled inventory tray.



6.8.1 Identification Numbers for Bs and Cs

B and C trays are identified by set number and tray number. A given set will typically contain 8 trays, but this can vary. Once a set has 8 trays a new set number is started. The new set number is 1 higher than the just completed set number. To find out what set and tray number to label the tray with, check the previous tray. If the tray number on the previous tray is seven or less, copy the set number and add the next sequential tray number to the labels, then place them on the tray. If the previous tray is labeled as tray 8, the next tray is the start of a new set. Label the trays with the next sequential set number and the tray number will be 1 (one).

6.8.2 Identification Numbers for Terminal-status Trays

The identification numbers for terminal-status filters are the set and tray number. The set number for terminal B and C filters is always Set 1. The tray number goes up by one with every new tray, until the end of the calendar year, when it resets back to 1.