Processing KODAK Color Print Films, Module 10

Effects of Mechanical & Chemical Variations in Processes ECP-2D and ECP-2E

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Table of Contents

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10 Effects of Mechanical & Chemical Variations in Process ECP-2D and ECP-2E

PROCESS CONTROL

The successful processing of KODAK VISION Color Print Film / 2383, KODAK VISION Premier Color Print Film / 2393, and KODAK VISION Color Teleprint Film / 2395 / 3395 requires a good process control system. The essential phases of such a control system include mechanical, chemical, and photographic control, plus correlation and interpretation of results. The philosophy and a recommended system of process control are given in Module 1, *Process Control*. The following sections are specific for Processes ECP-2D and ECP-2E.

Mechanical Control

Mechanical control includes items basic to any chemical reaction, such as temperature, agitation, and time of reaction. The developer temperature should be maintained tightly within specifications. The temperatures of other solutions, while not quite so critical, must nevertheless be carefully controlled. Recirculation and replenishment rates must be regulated to maintain the required chemical activity of the various solutions. Turbulated solutions should be piped through devices that indicate the rates of flow and pressures so that the jet-agitation action of the solution at the film surface can be controlled. A method for calibrating and measuring flow rates is given in Module 2, *Equipment and Procedures*. The operating speed of the processing machine should be checked frequently. All such factors, whether regulated automatically or manually, constitute the physical or mechanical aspects of control. A checklist for daily operation of a processor is given in Table 10-2, *Checklist For Daily Operation*.

Chemical Control

Maintaining the proper composition of the processing solutions is one of the most important elements of control. Maintain the chemical composition of the solutions within the published tolerances to achieve satisfactory process control. Do not compensate for chemical imbalances by altering mechanical parameters. This action is not good process control procedure and is not recommended.
Use the Analytical Methods recommended in Module 3, *Analytical Procedures*, to determine the chemical composition of each processing solution. Some of the methods require the use of a pH meter to accurately measure solution acidity or alkalinity. An automatic titrator or pH meter is required for potentiometric titrations. A spectrophotometer is required to measure constituents in some processing solutions. With these three instruments plus chemical reagents and the assorted glassware (pipets, burets, hydrometers, beakers, etc,) usually found in analytical laboratories, all of the solutions used in the process can be analyzed.

Table 10-1, *Critical Chemical Analyses* shows the method number for each analysis that is performed on each process solution. Only the basic method number is listed in Table 10-1. Since the methods are constantly being improved and reissued with a new suffix, be sure to use the latest version of the basic method. For example, if the current basic method for measuring sulfite in color developer is number 1305C, the next revision of the method will be 1305D. When the technology or chemistry of the method is changed, a totally new number will be assigned to the new method as was done when the pH method changed from 810 to ULM-191-2.

Table 10-1
Critical Chemical Analyses

Solution	Analyses	Tank	Analyses Replenisher	Method Number
Developer	pH Specific Gravity Total Alkalinity CD-2 Bromide Sulfite	D, F T, F T, F T, F T, F T, F	F F F F F F	ULM-191-2 ULM-0002/1 ECP-0001/1 ECP-0003/1 ECP-926C ECP-2-1305C
Stop	pH	D, F	F	ULM-191-2
First Fixer*	pH Specific Gravity Hypo Index Thiosulfate Sulfite	D, F W, F W, F W, F W, F	F F F F F	ULM-191-2 ULM-0002/1 ECP-0002/1 ECP-0002/1 ECP-0002/1
Accelerator (Persulfate Bleach)	pH Specific Gravity Metabisulfite Buffer Capacity PBA-1	D, F W, F W, F W, F W, F	F F F F F	ULM-191-2 ULM-0002/1 ECP-0025/01 ECP-0020-01 ECP-0027-01
Bleach Persulfate	pH Specific Gravity Persulfate Chloride Buffer Capacity	D, F W, F W, F W, F W, F	F F F F F	ULM-191-2 ULM-0002/1 ECP-0026/1 ECP-0009/1 ECP-0019-01
Bleach† Ferricyanide	pH Specific Gravity Ferricyanide Bromide	D, F W, F W, F W, F	F F F F	ULM-191-2 ULM-0002/1 ULM-0021/1 ULM-0004/1
Sound Track Developer*	Hydroquinone Viscosity	F F	— —	ECP-2-407 ECP-2-99
Second Fixer	pH Specific Gravity Hypo Index Thiosulfate Sulfite	D, F W, F W, F W, F W, F	F F F F F	ULM-191-2 ULM-0002/1 ECP-0002/1 ECP-0002/1 ECP-0002/1

D=Daily T=Twice Weekly W=Weekly M=Monthly
F=Each Fresh Mix

* Process ECP-2D only
† Alternate Bleach

Table 10-2 Checklist For Daily Operation

Steps		Spec.	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
1.Was shutdown strip in control?									
2.Turn on power, air and water supplies, and the exhaust system.									
3.Check solution levels* in machine tanks.									
4.Check replenisher supply tanks and make fresh replenishment solutions (if necessary).	Developer								
	Stop								
	Fixer†								
	Accelerator								
	Bleach								
	Sound Track Developer								
	Fixer								
	Final Rinse.								
5.Turn on recirculation pumps.									
6.Adjust wash-water flow-meters to proper setting.									
7.Turn on and check air supply to squeegees.									
8.Turn on temperature controls systems.									
9.Turn on replenishers. Use leader rates until film is being processed.									
10.Turn on dryer fan motor and heater.									
11.Start machine and check machine speed.									
12.Check final squeegee for cleanliness and adjustment. Make corrections if necessary.									
13.Check leader for twists.									
14.Check solution time.	Developer								
15.Use KODAK Process Thermometer, Type 3. Check solution temperature.‡	Developer								
	Accelerator								
16.Check recirculation rate.	Developer								
	Stop								
	Fixer†								
	Accelerator								
	Bleach								
	Fixer								
	Final Rinse								
17.Run control strips.									
18.Proceed to production if in control.									
19.Check replenisher flow rate.‡	Developer								
	Stop								
	Wash								
	Accelerator								
	Bleach								
	Wash								
	Sound Track Developer†								
	Spray Rinse								
	Fixer								
	Final Wash								
	Final Rinse								

* Solution levels must be high enough in the weir boxes to prevent air from being drawn into the recirculation systems when recirculator pumps are turned on.
† Process ECP-2D only.
‡ Start-up and every two hours.

Analyze all fresh chemical mixes, as the first defense against mixing errors. The tank solutions should be checked on a regular basis to monitor any changes in the chemical composition. The most useful analysis is pH. It is relatively easy to measure and must be done on a daily basis. A drift in developer pH is usually the first warning of a process about to go out of control. When such drifts are observed, it is important to try to find the cause, rather than to blindly adjust the pH and continue processing. In most cases, this will require a complete developer analysis. Table 10-2, *Checklist For Daily Operation*, indicates a starting point for the frequency of analysis. The schedule of analysis can be customized by a particular installation to keep its process in chemical control. The customized frequency will depend on the amount of film being processed, and the historical stability of the process.

Photographic and Sensitometric Control

The chemical reactions involved in processing color films are so complex that it is impossible to evaluate and control the process completely on the basis of mechanical and chemical data alone. The end results are photographic and include the characteristics of the sensitized material and the chemicals of the process. Actual picture tests demonstrate how the process behaves photographically. It is possible, although cumbersome, to use such tests for photographic control. Apart from rigorous photographic control, however, viewing printed picture work off a process is important because it is an indication of the overall photographic condition of the process, both sensitometric and physical.

The best process control methods furnish quantitative information about the process. Sensitometric control strips provide a rapid, accurate and greatly simplified means of evaluating the process photographically. Introduce strips into the process with regular production footage every one or two hours. Evaluate visually, or more precisely, by densitometric methods. Examine the strips immediately after processing and plot the results on the same charts where the mechanical and chemical data are recorded. This information gives an hour-to-hour check on whether accidents have occurred causing the process to drift away from the process aim. See the *Typical Control Chart* in Module 1, *Process Control*, for examples.

For your convenience, sensitometrically exposed control strips in 16 and 35 mm are available from Eastman Kodak Company. KODAK VISION Color Print Control Strips, Process ECP-2D are packaged in 30.5 metre (100-foot) rolls containing at least 120 exposures and a processed reference strip. The exposures on the roll are spaced at 240 mm (9.5-inch) intervals. Each exposure has 21 gray-scale steps at 0.15 log H increments. The reference strip is exposed exactly as the control strips and is subsequently processed under well-controlled conditions. The instruction sheet contains correction factors that are required to establish your process aims. A four-digit code number appears on the carton, can, control strips, reference strip, and instruction sheet, identifying each production batch of strips. The procedures for using control strips are found in Module 1, *Process Control*.

Correlation of Mechanical, Chemical, and Sensitometric Data

Record and interpret all mechanical, chemical, and photographic results, to monitor whether the process is in or out of control. If the process drifts out of control, your control records should indicate what corrective action was taken to reestablish control.

As your experience increases with Process ECP-2D / ECP-2E, you will accumulate mechanical, chemical, and sensitometric data under many conditions. This reference will indicate what photographic results to expect when various mechanical and chemical changes occur.

Until experience is gained with your process, it is important to know generally what photographic effects to expect as a result of chemical or mechanical variations, and approximately what magnitude of change produces a noticeable photographic effect. This information helps diagnose a photographically off-balance condition.

Effects of Mechanical and Chemical Variations

Diagnostic Charts

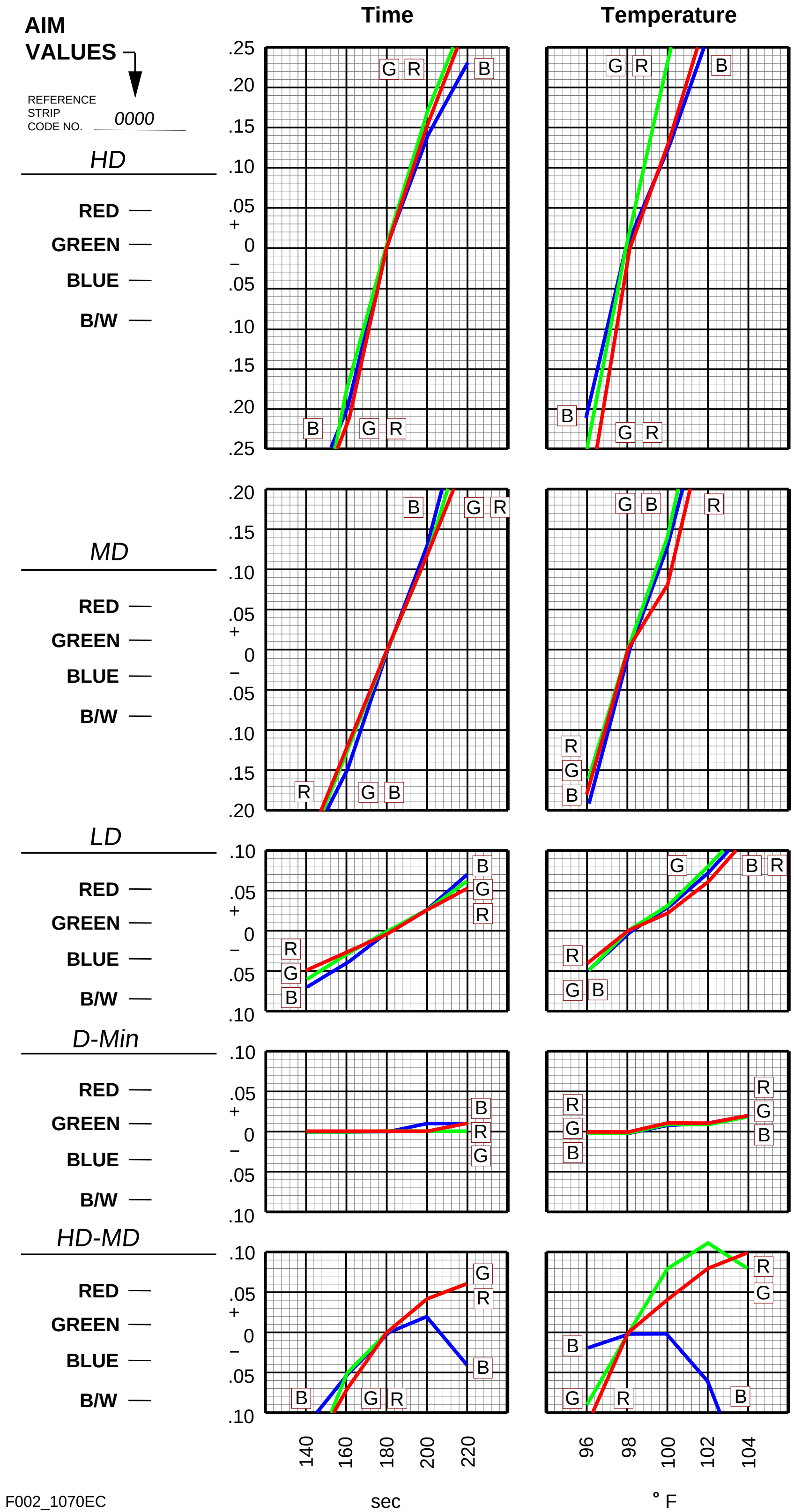
The control plots in this section illustrate some of the major photographic effects of mechanical and chemical variations on KODAK VISION Color Print Film / 2383. Each plot shows the effect of a change in a process parameter (horizontal axis), on the dye density of the processed film (vertical axis). The specifications for the various parameters are represented by the letter “S” along the horizontal axis. A plot at + 0.10 for the red density indicates the parameter change caused the red density to increase by 0.10 densitometric units (looks cyan) above the process aim.

The magnitude of the changes shown in these plots should not be considered to be process control limits. Also, the data presented are qualitative, not quantitative. The plots were derived from experiments using small laboratory machines in which all constituents were held constant except the variable being studied. Hence, the figures should be used only as trend charts and guides. If two or more process parameters are varied, the resulting photographic effect is not predictable because all effects are not additive. Interactions can occur that produce effects other than those predicted by addition. The plots in this publication are representative only; they do not contain all possible solution problems. Most of the important photographic effects take place in the developer.

The *Color Print Film Diagnostic Charts* are diagnostic schemes for the process and highlight the importance of not only the developer, but also the stop, bleach and fixer.

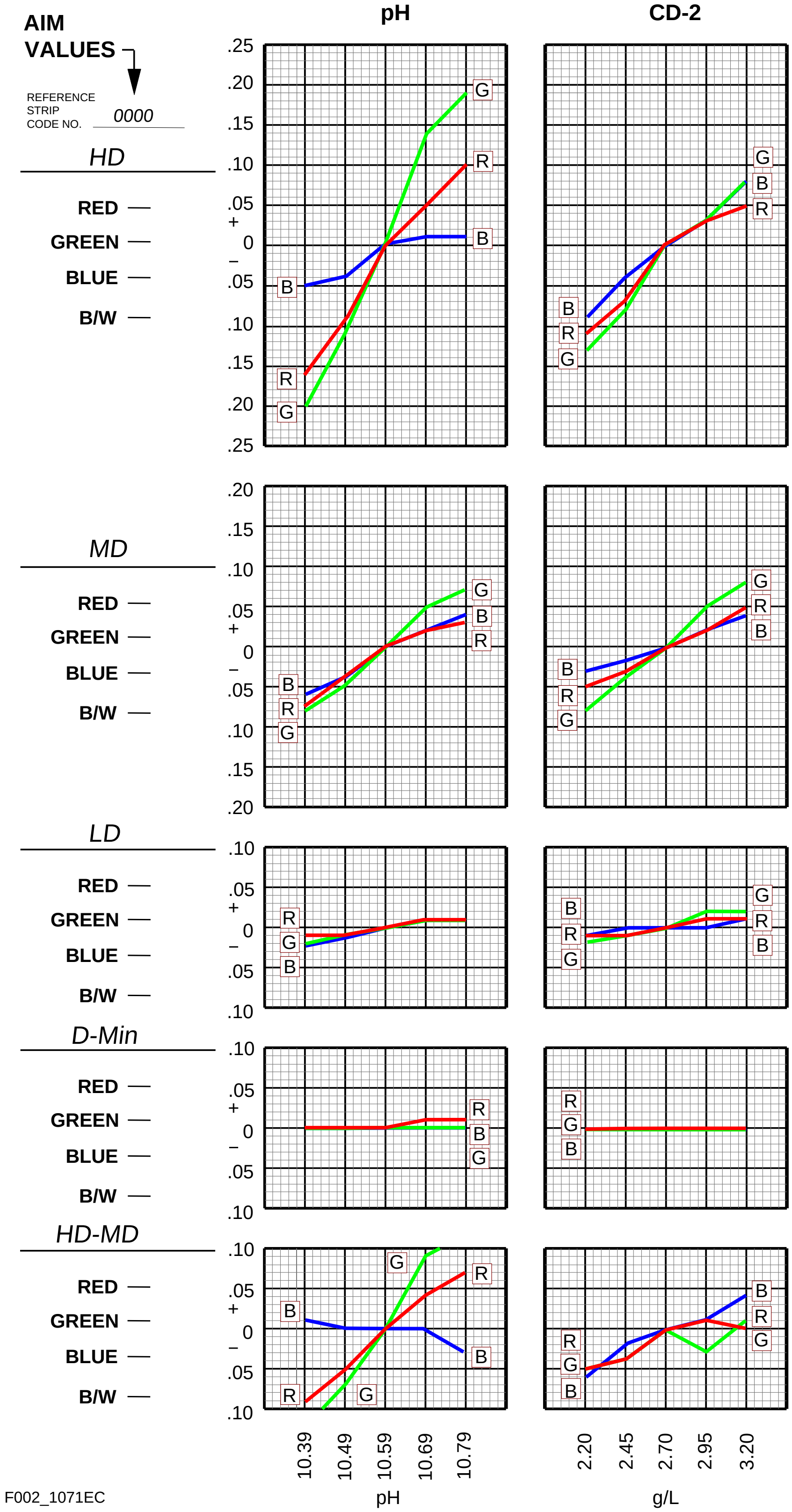
Developer Mechanical Variations

Figure 10-1 Effects of Time and Temperature Variations—2383 Film in Process ECP-2D / ECP-2E Developer



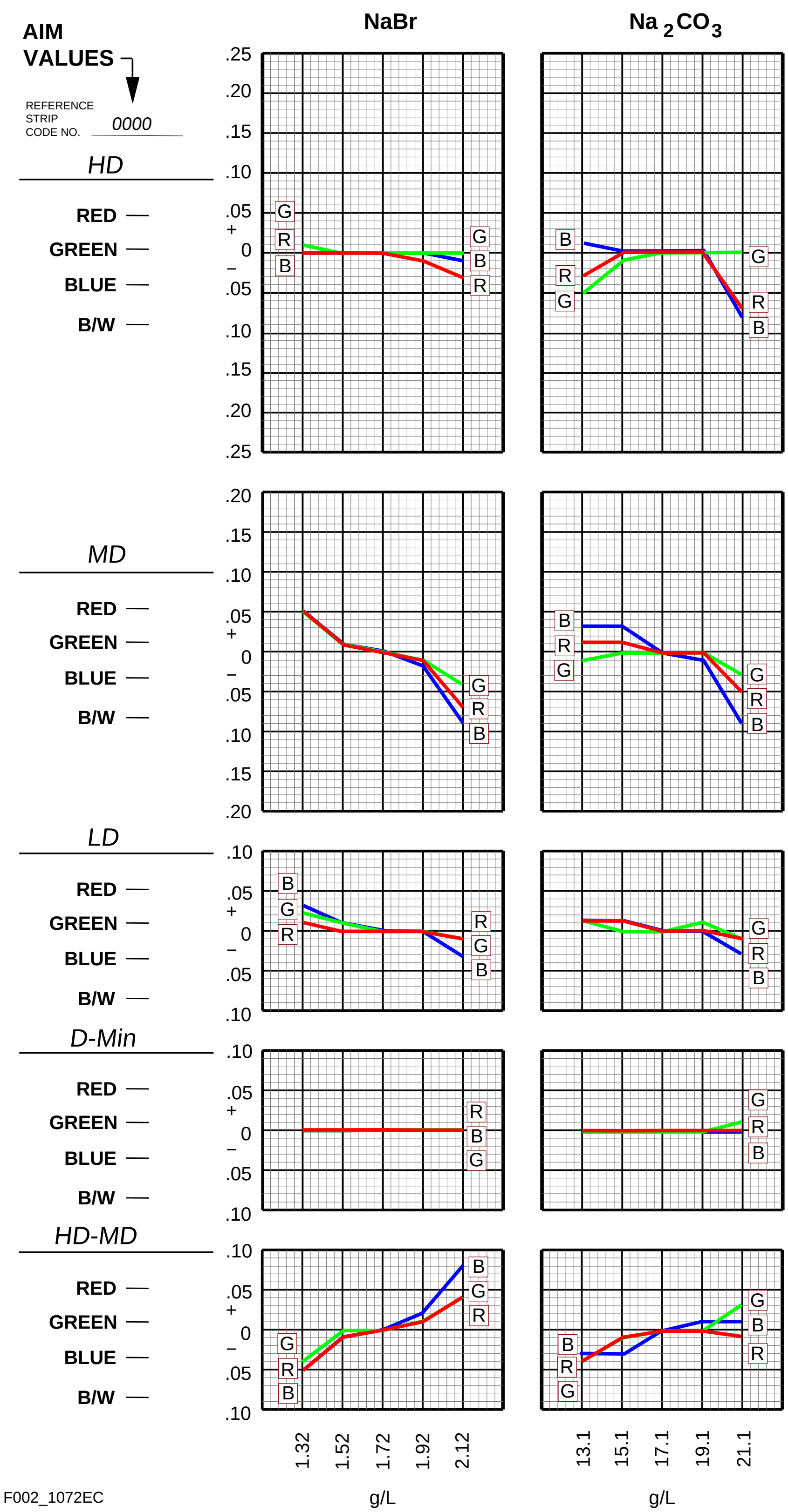
Developer Chemical Variations

Figure 10-2 Effects of pH and CD-2 Variations—2383 Film in Process ECP-2D / ECP-2E Developer



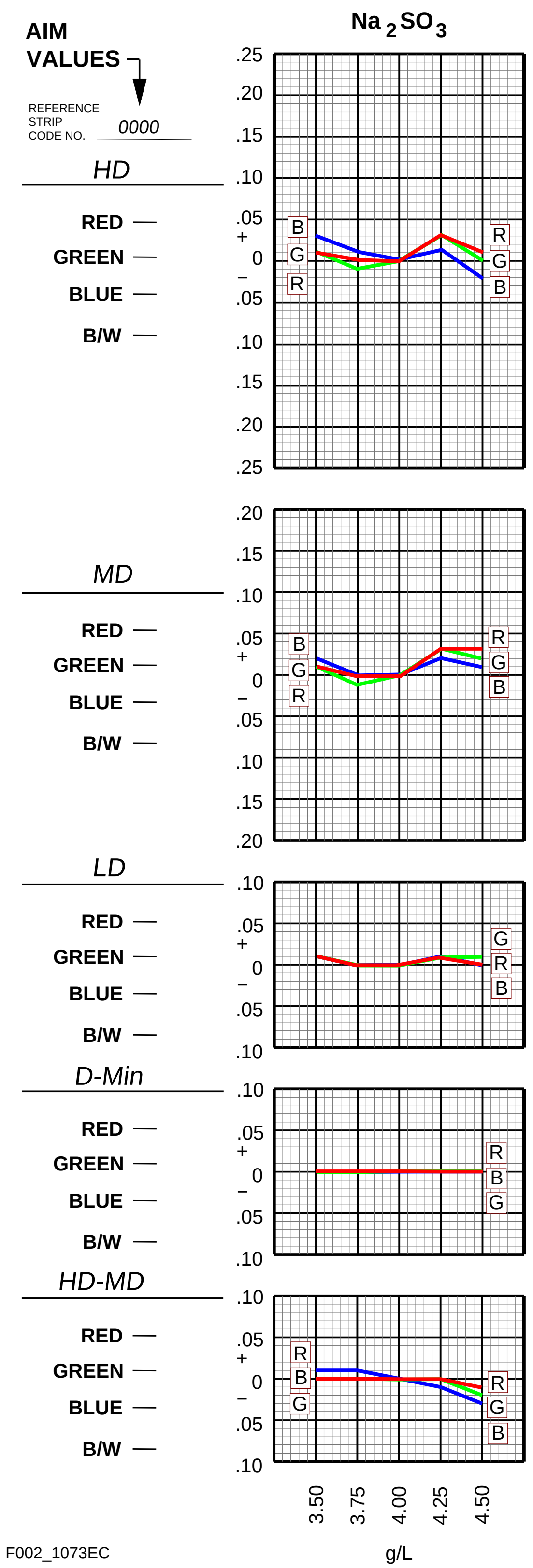
Developer Chemical Variations

Figure 10-3 Effects of NaBr and Na_2CO_3 Variations—2383 Film in Process ECP-2D / ECP-2E Developer



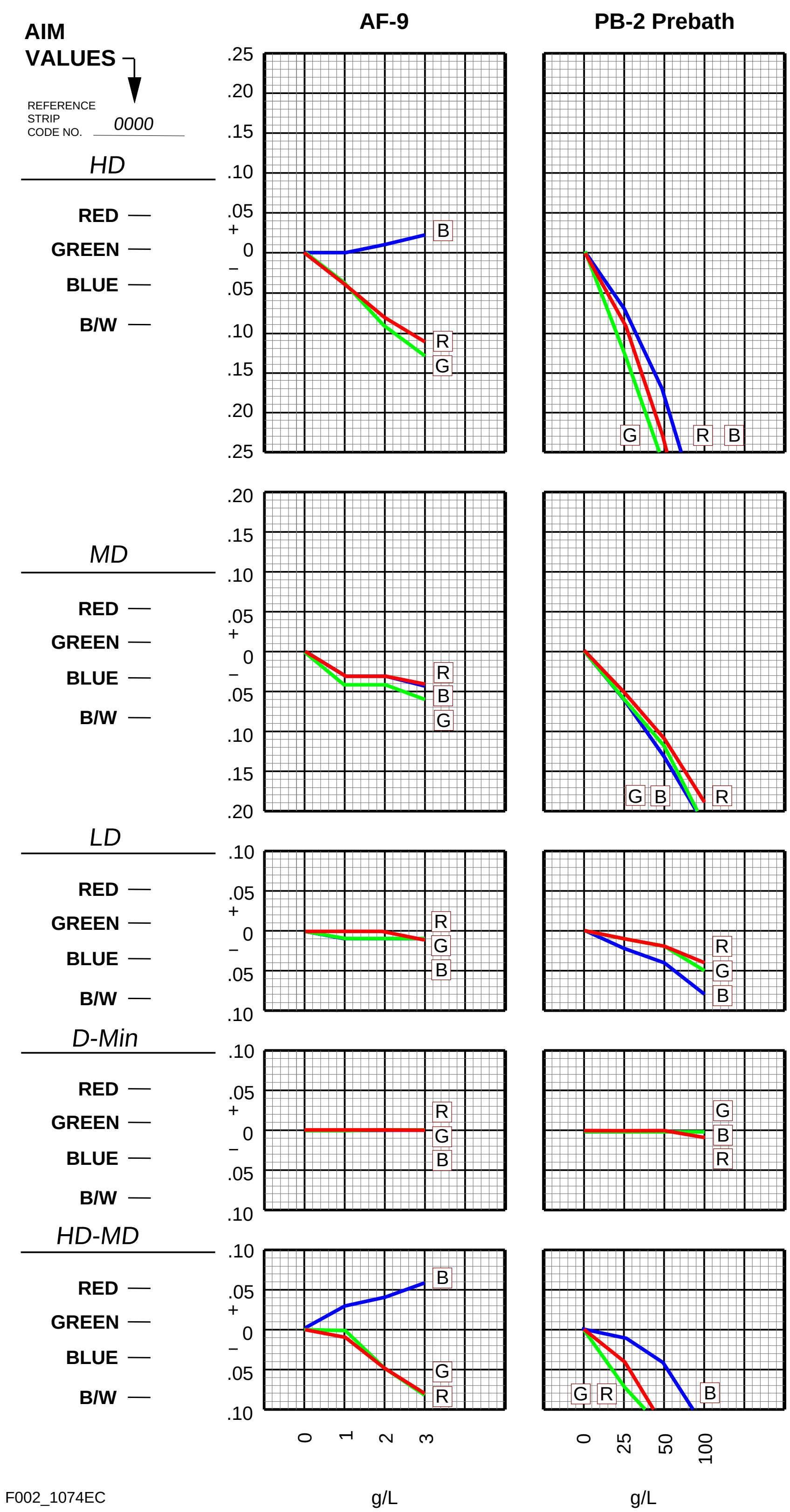
Developer Chemical Variations

Figure 10-4 Effects of Na_2SO_3 Variations—2383 Film in Process ECP-2D / ECP-2E Developer



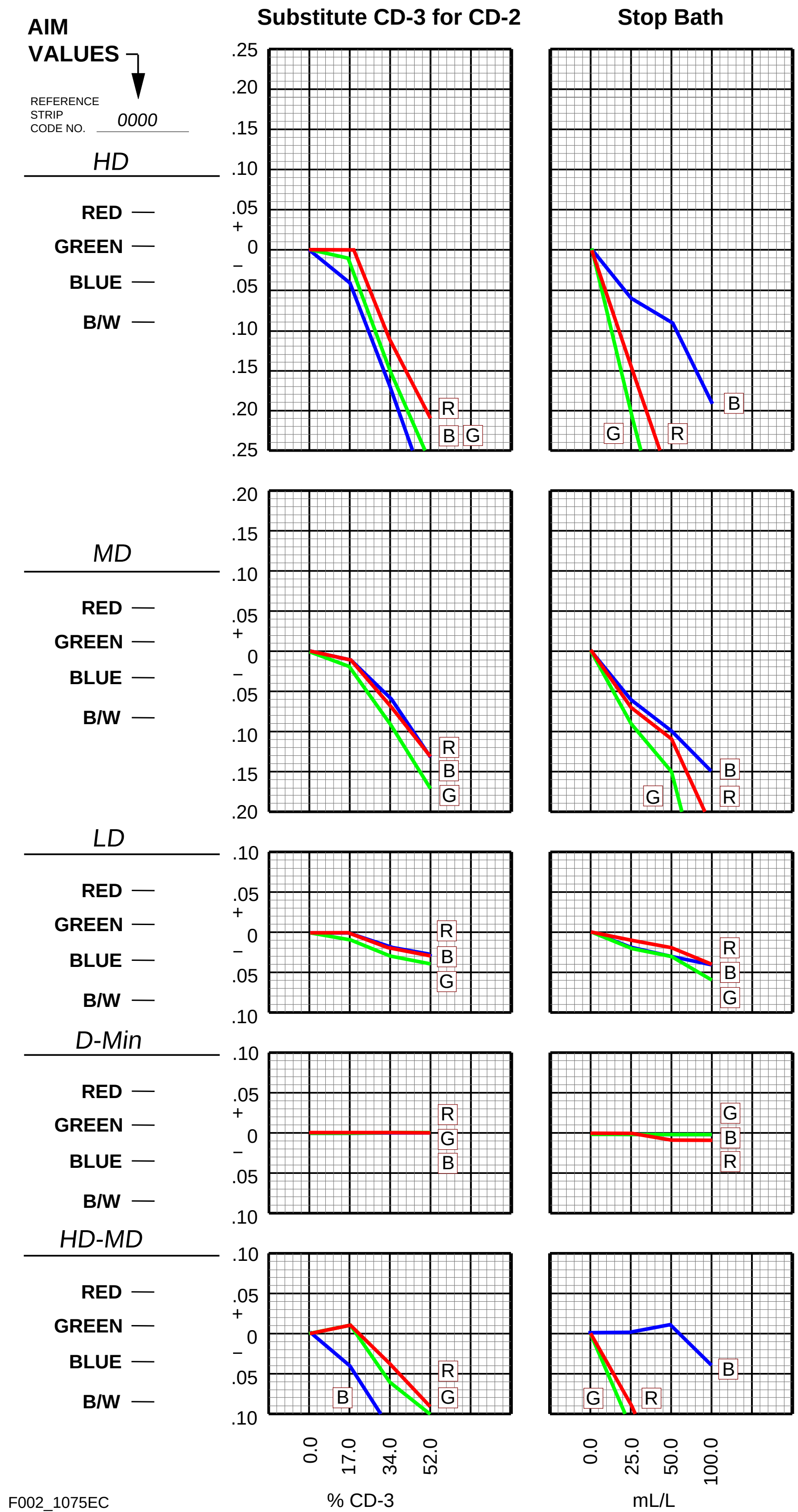
Developer Chemical Variations

Figure 10-5 Effects of AF-9 and PB-2 Prebath Contamination—2383 Film in Process ECP-2D / ECP-2E Developer



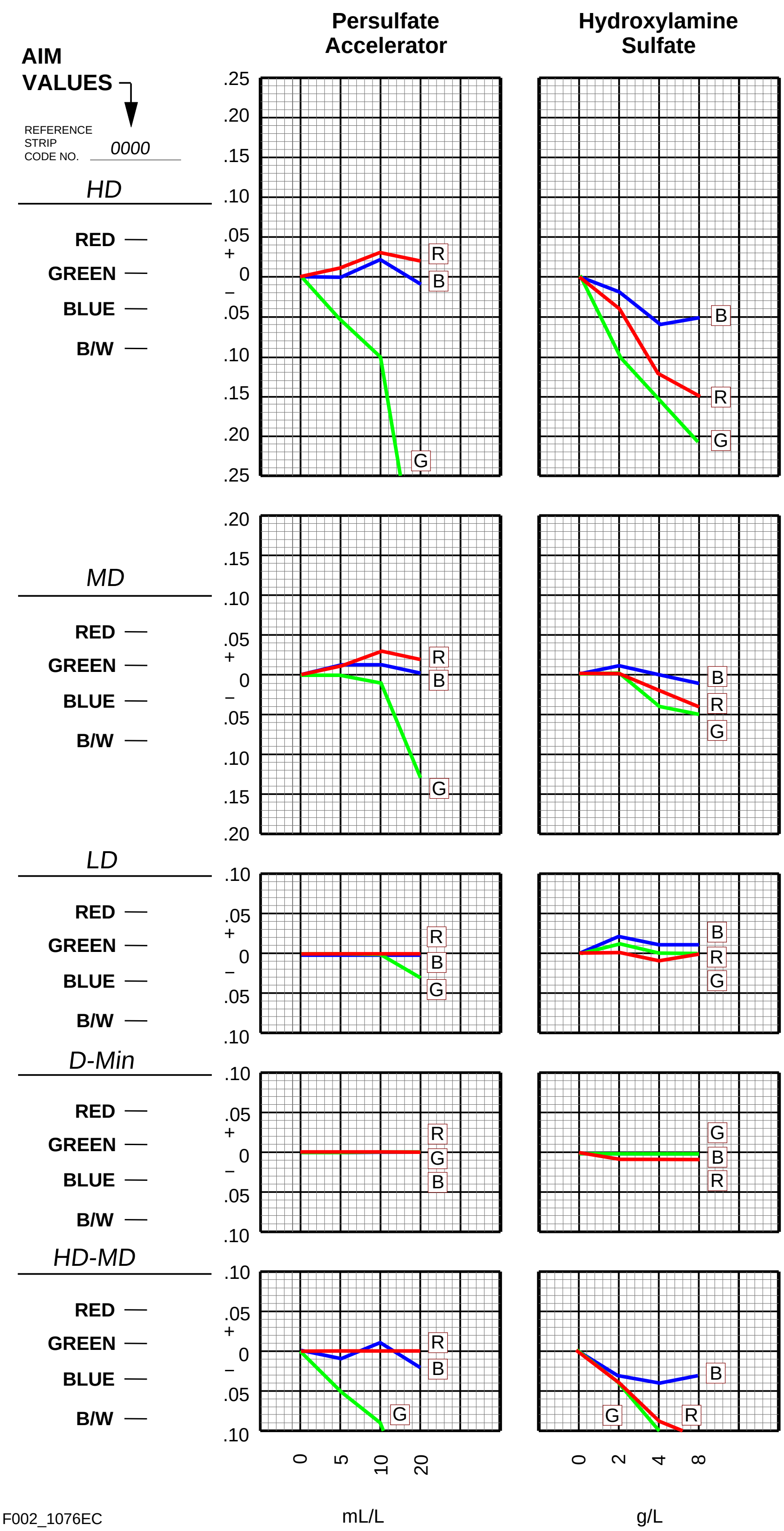
Developer Chemical Variations

Figure 10-6 Effects of CD-3 for CD-2 and Stop Bath Contamination—2383 Film in Process ECP-2D / ECP-2E Developer



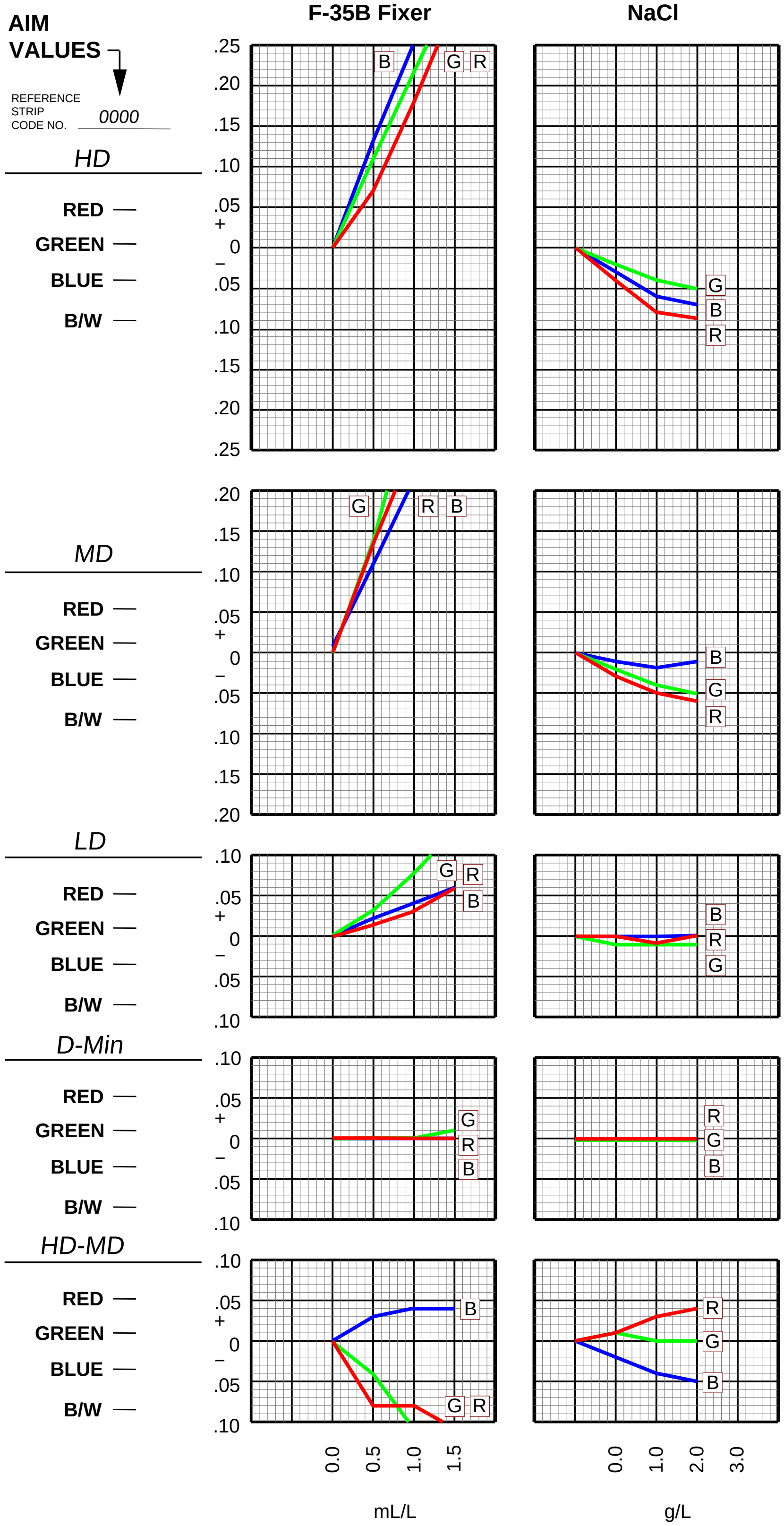
Developer Chemical Variations

Figure 10-7 Effects of Persulfate Accelerator and Hydroxylamine Sulfate Contamination—2383 Film in Process ECP-2D / ECP-2E Developer



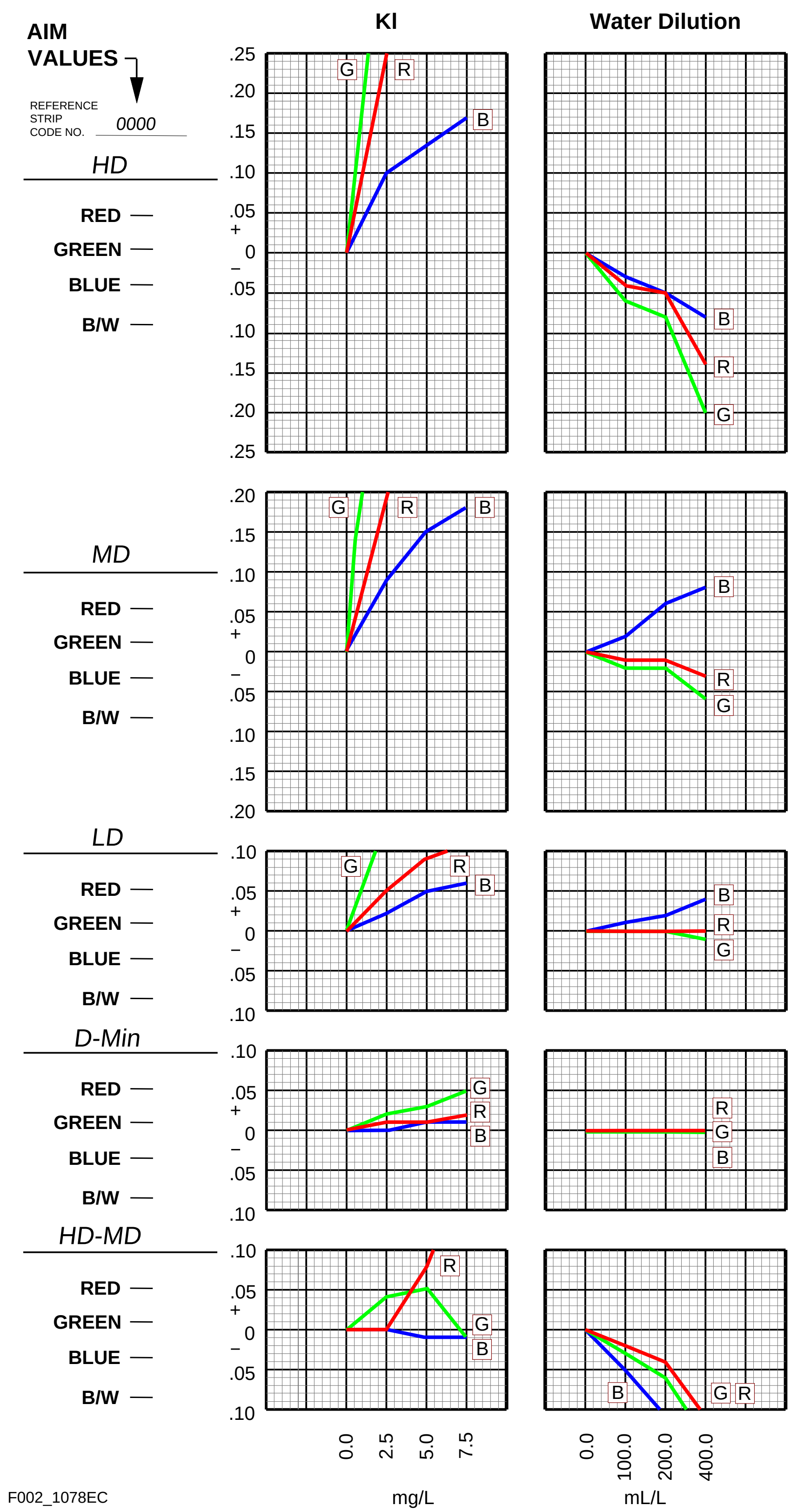
Developer Chemical Variations

Figure 10-8 Effects of F-35B Fixer and NaCl Contamination—2383 Film in Process ECP-2D / ECP-2E Developer



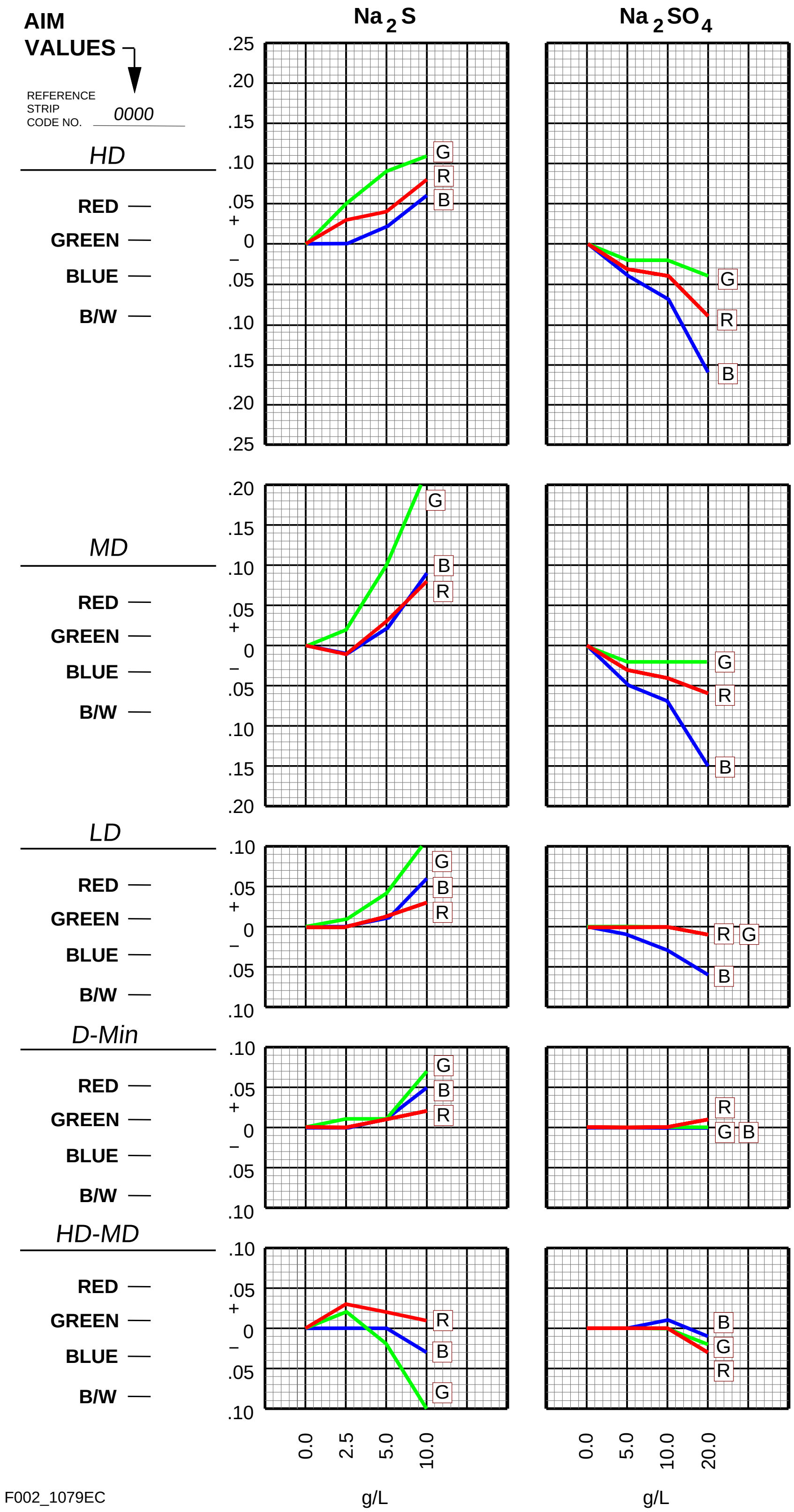
Developer Chemical Variations

Figure 10-9 Effects of KI Contamination and Water Dilution—2383 Film in Process ECP-2D / ECP-2E Developer



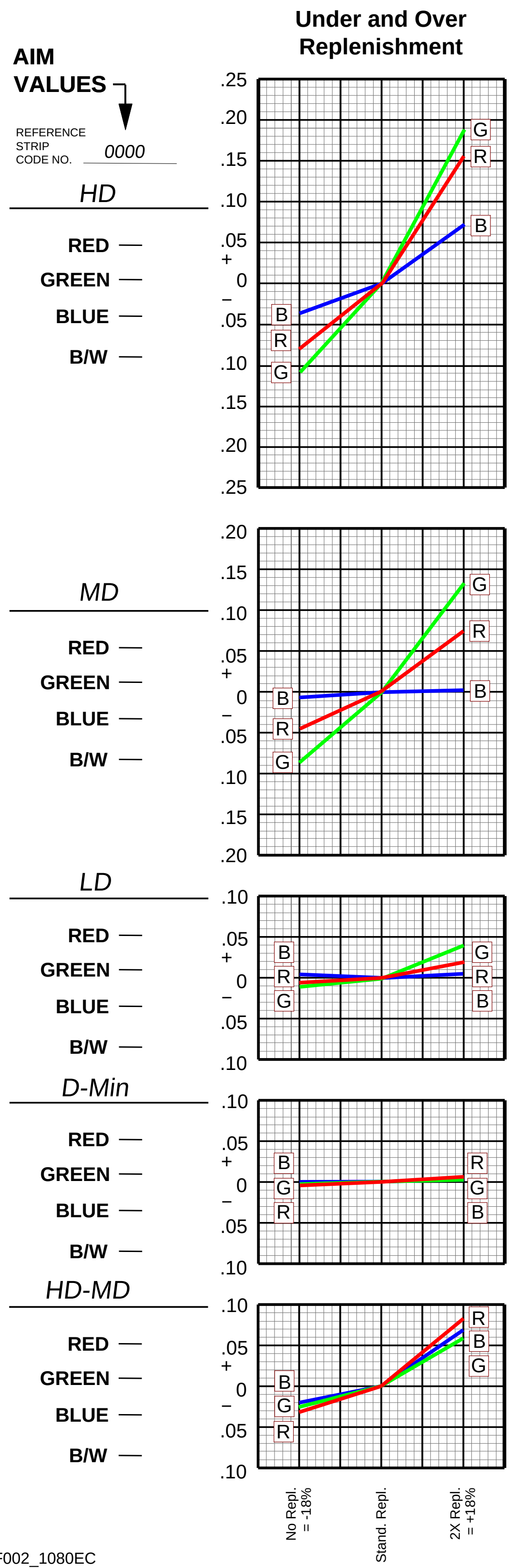
Developer Chemical Variations

Figure 10-10 Effects of Bacterial Na_2S and Na_2SO_4 Contamination—2383 Film in Process ECP-2D / ECP-2E Developer



Developer Chemical Variations

Figure 10-11 Effects of Under- and Over-Replenishment—2383 Film in Process ECP-2D / ECP-2E Developer



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DIAGNOSTIC SCHEMES

Color Print Film Diagnostic Charts

The flow chart procedures illustrated in this section will aid in determining the source of an out-of-control process. There are nine major schemes:

- *Verification Process*, Figure 10-12
- *Problem Sorting*, Figure 10-13
- *Low Developer Activity*, Figure 10-14
- *High Developer Activity*, Figure 10-15
- *High D-min (Green Only)*, Figure 10-16
- *Sound Track Process Analysis*, Figure 10-17
- *Retained Silver (Ferricyanide or UL Bleach)*, Figure 10-18
- *Retained Silver (Persulfate Bleach)*, Figure 10-19
- *Retained Silver Halide*, Figure 10-20

Following Figure 10-20 there are instructions on how to run the three special tests mentioned at various places in the Diagnostic Charts.

Figure 10-12 Verification Process

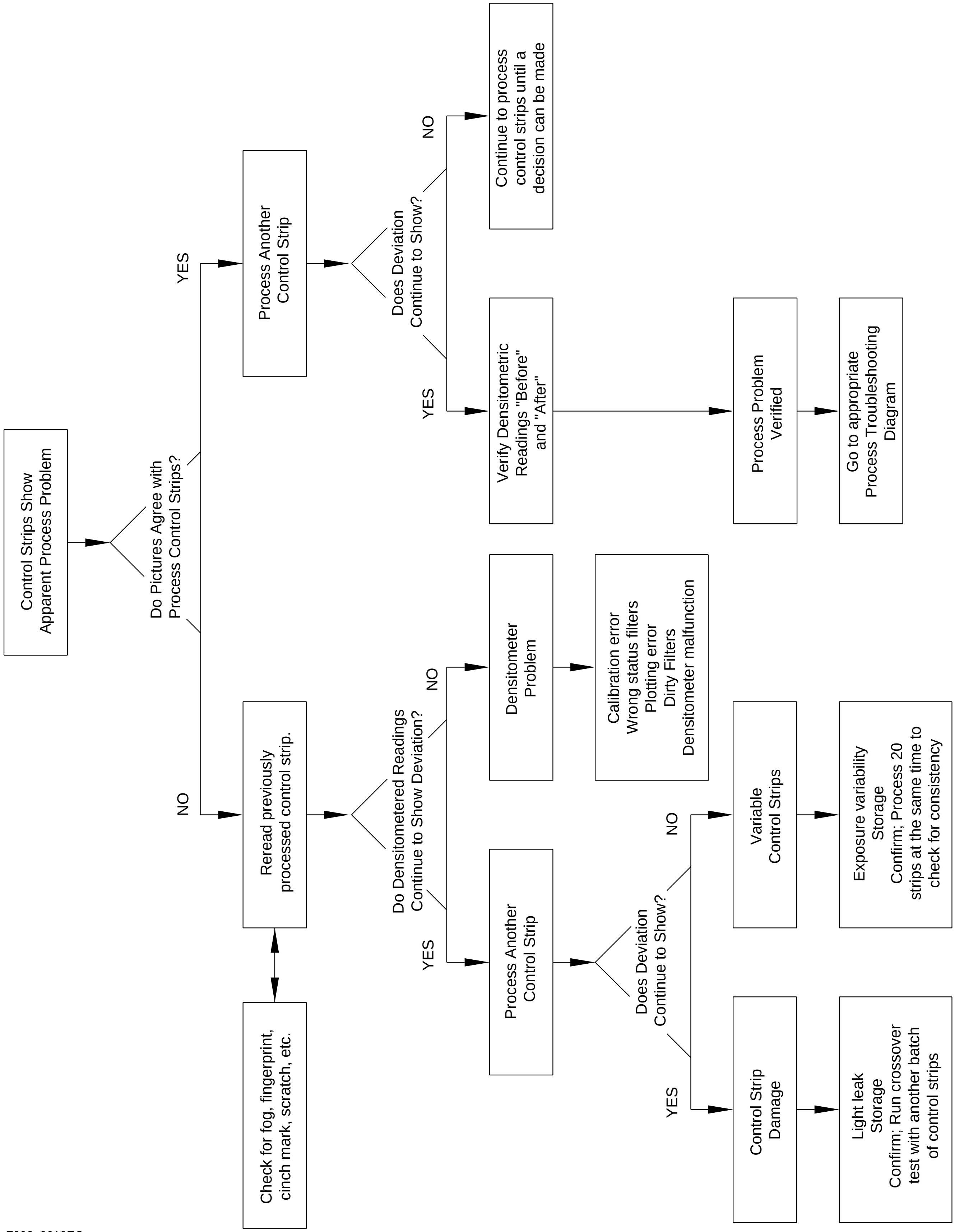

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Figure 10-13 Problem Sorting

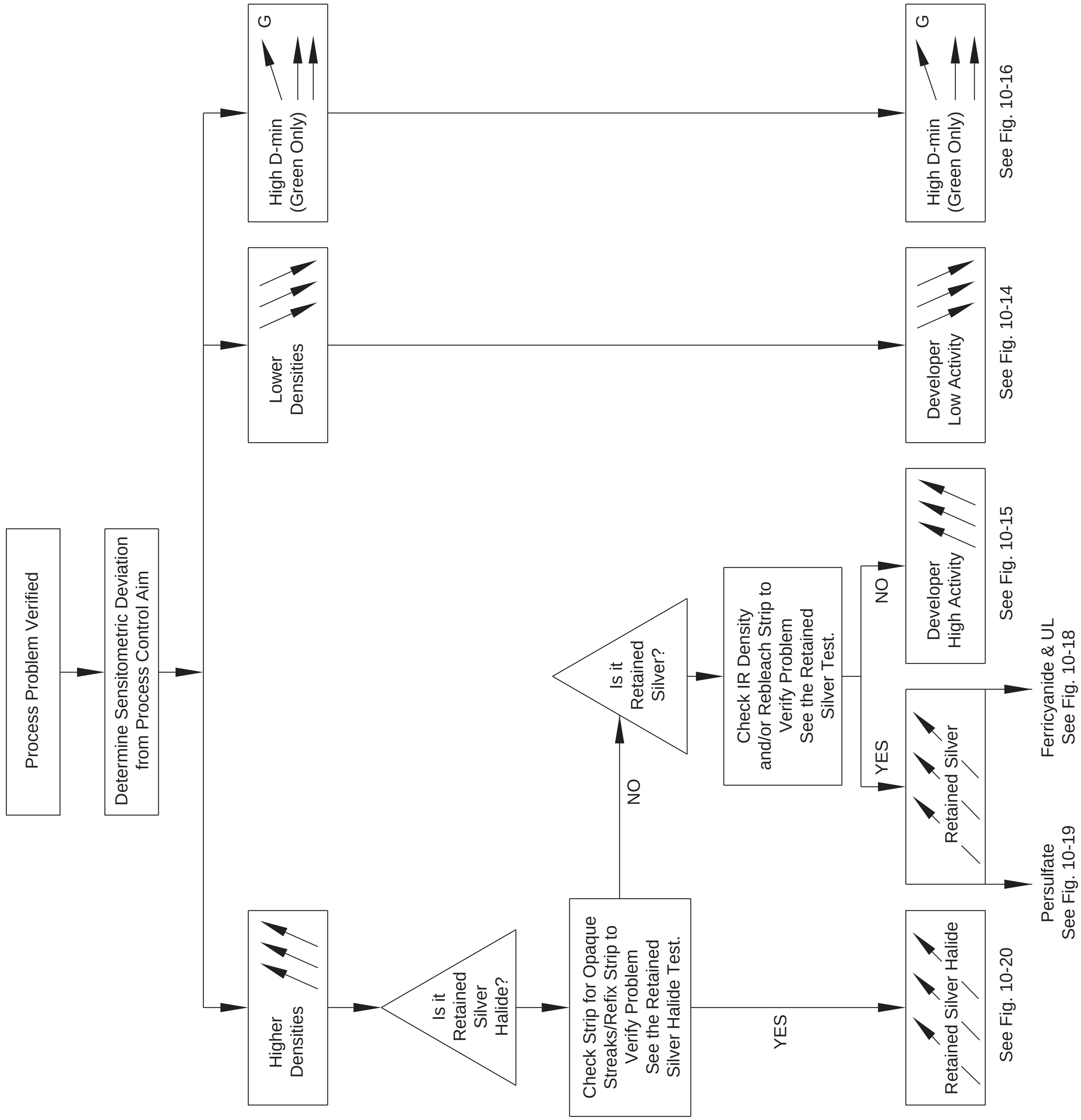

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Figure 10-14 Low Developer Activity

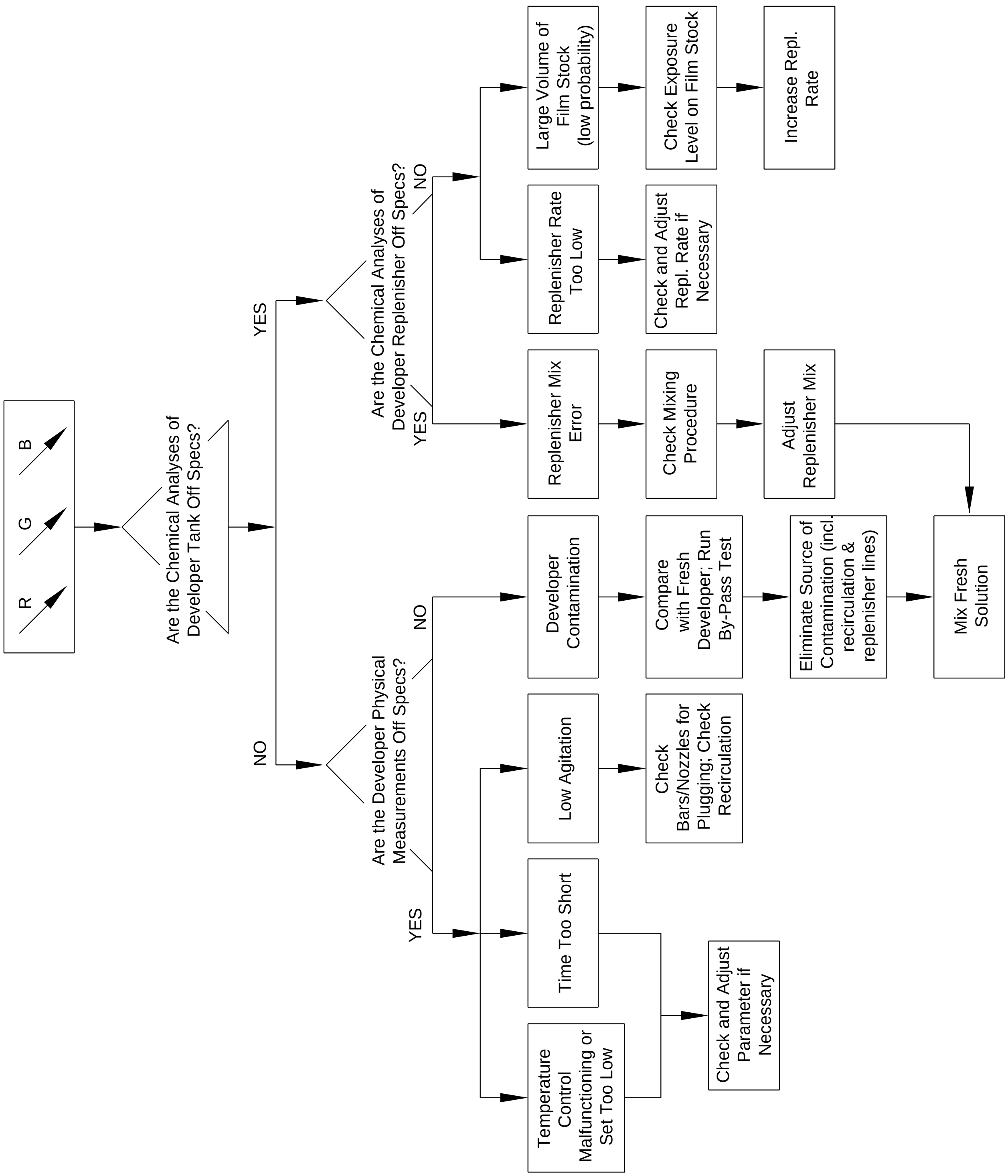

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Figure 10-15 High Developer Activity

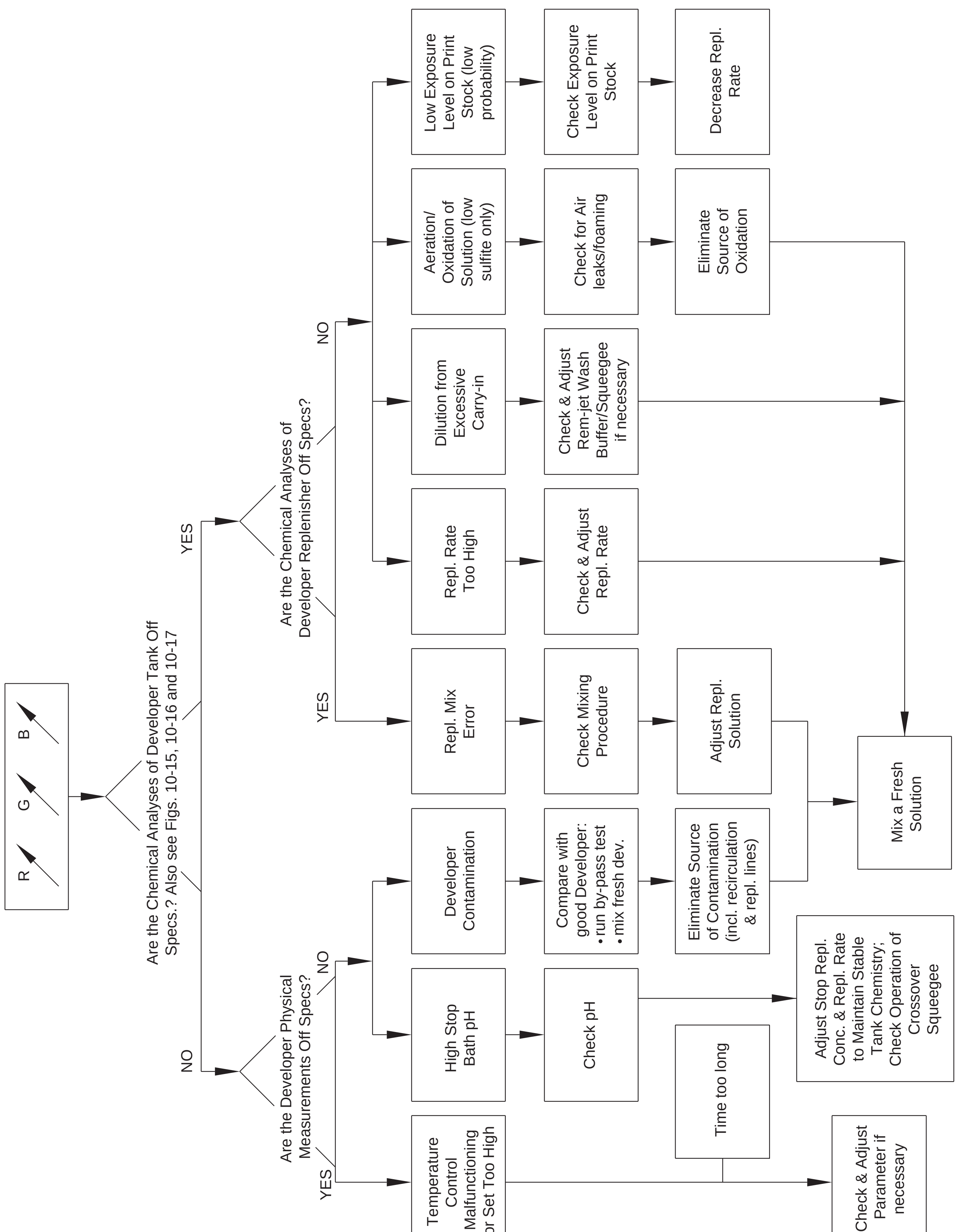

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Figure 10-16 High D-min (Green Only)

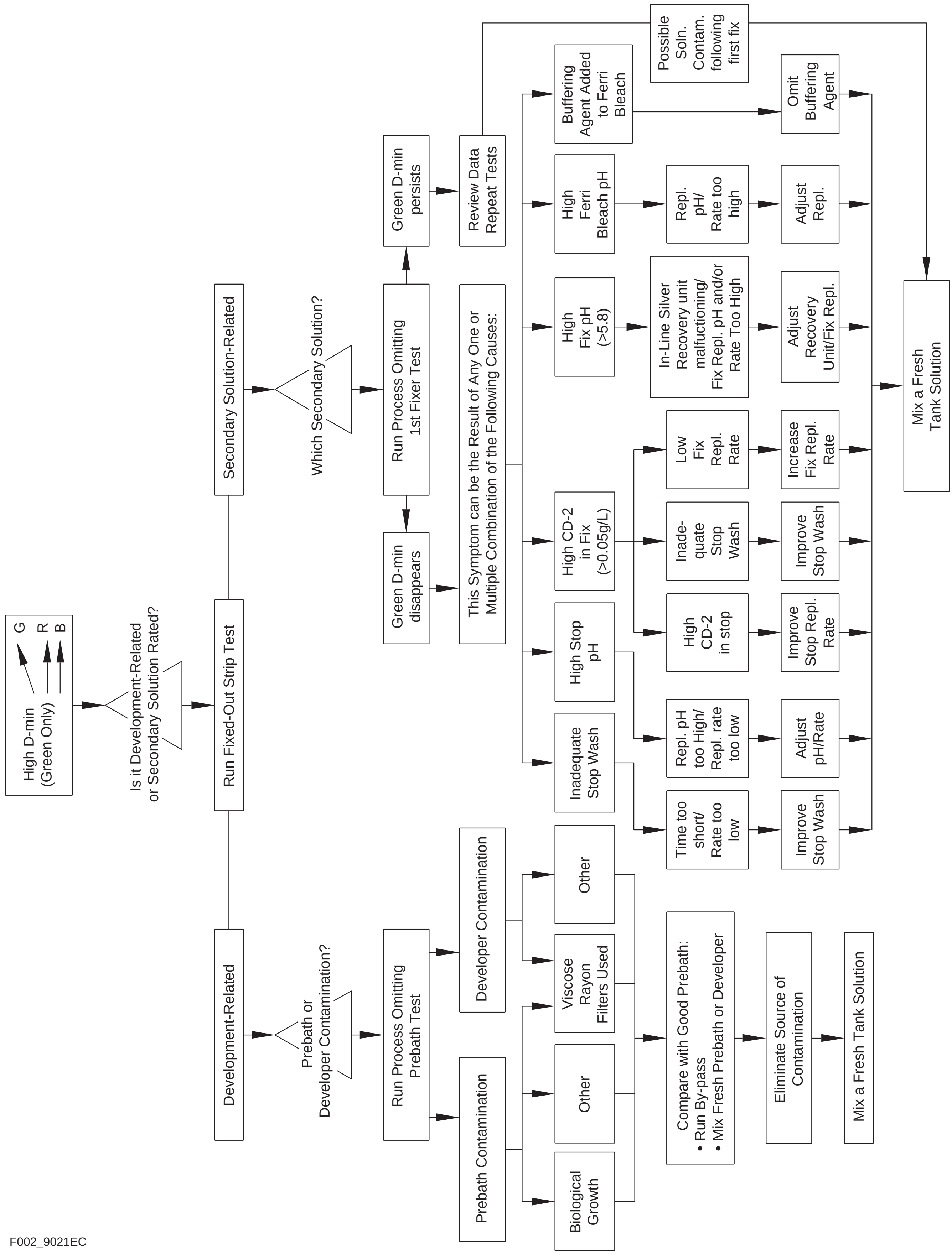

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Figure 10-17 Sound Track Process Analysis

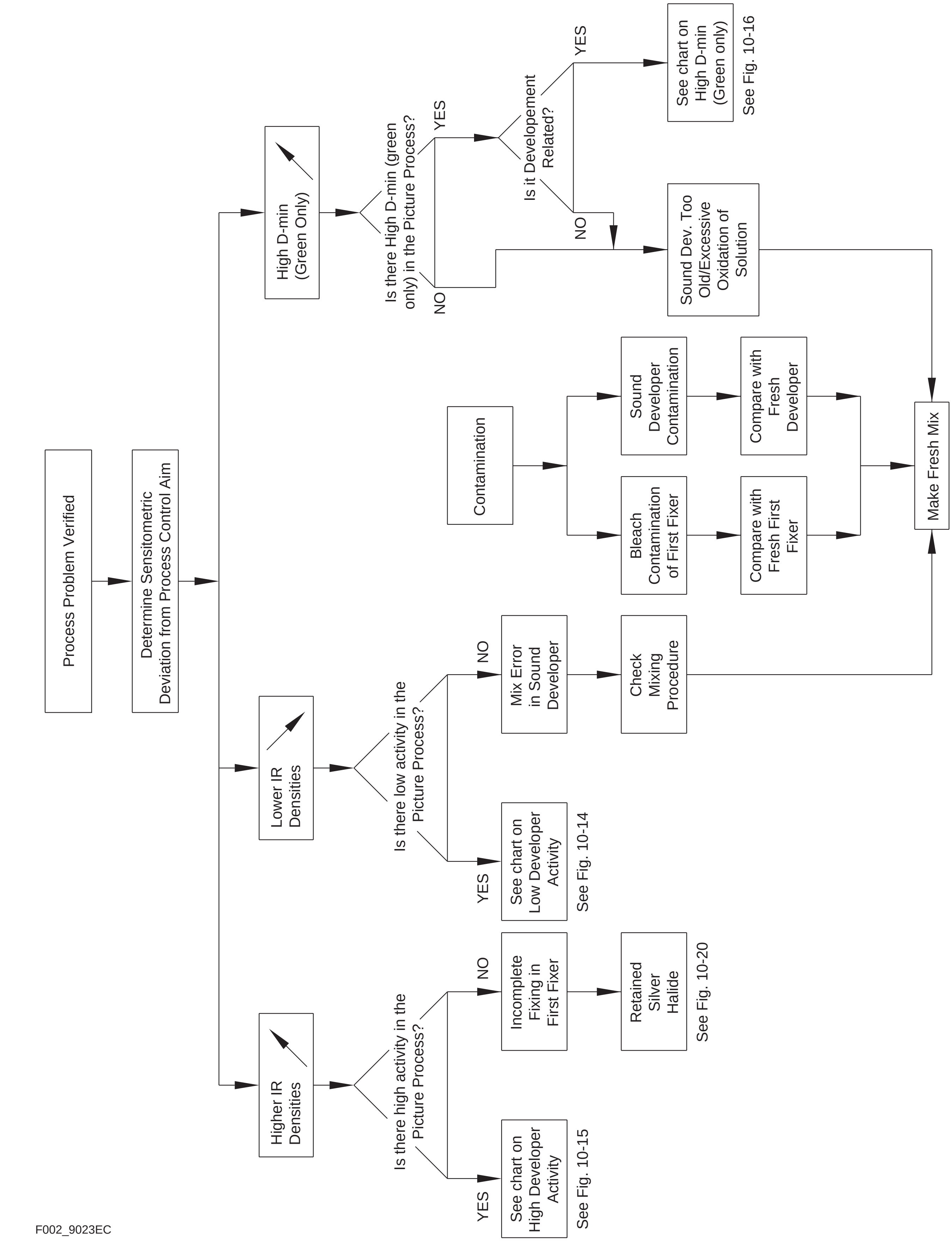

Figure 10-18 Retained Silver (Ferricyanide or UL Bleach)

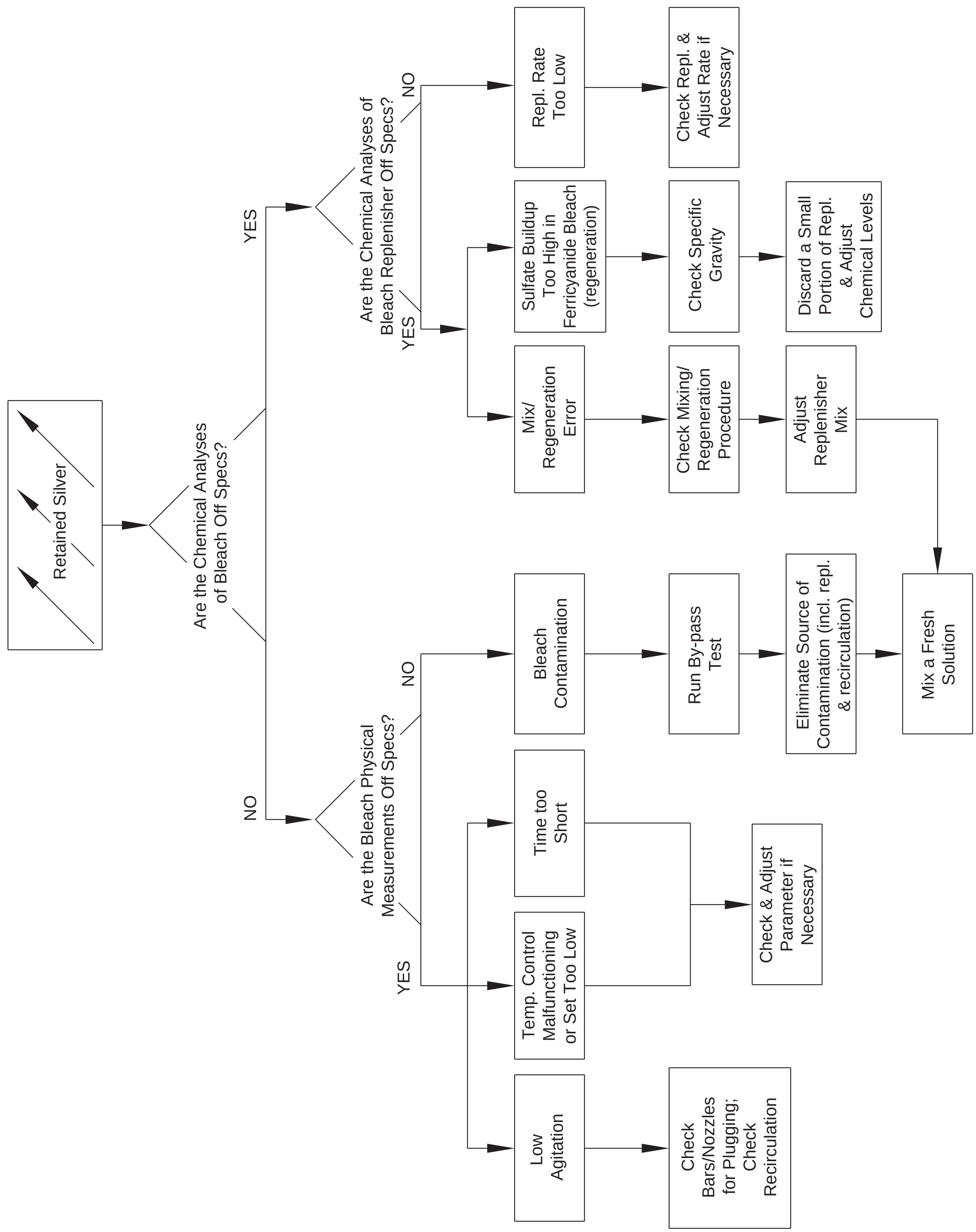

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Figure 10-19 Retained Silver (Persulfate Bleach)

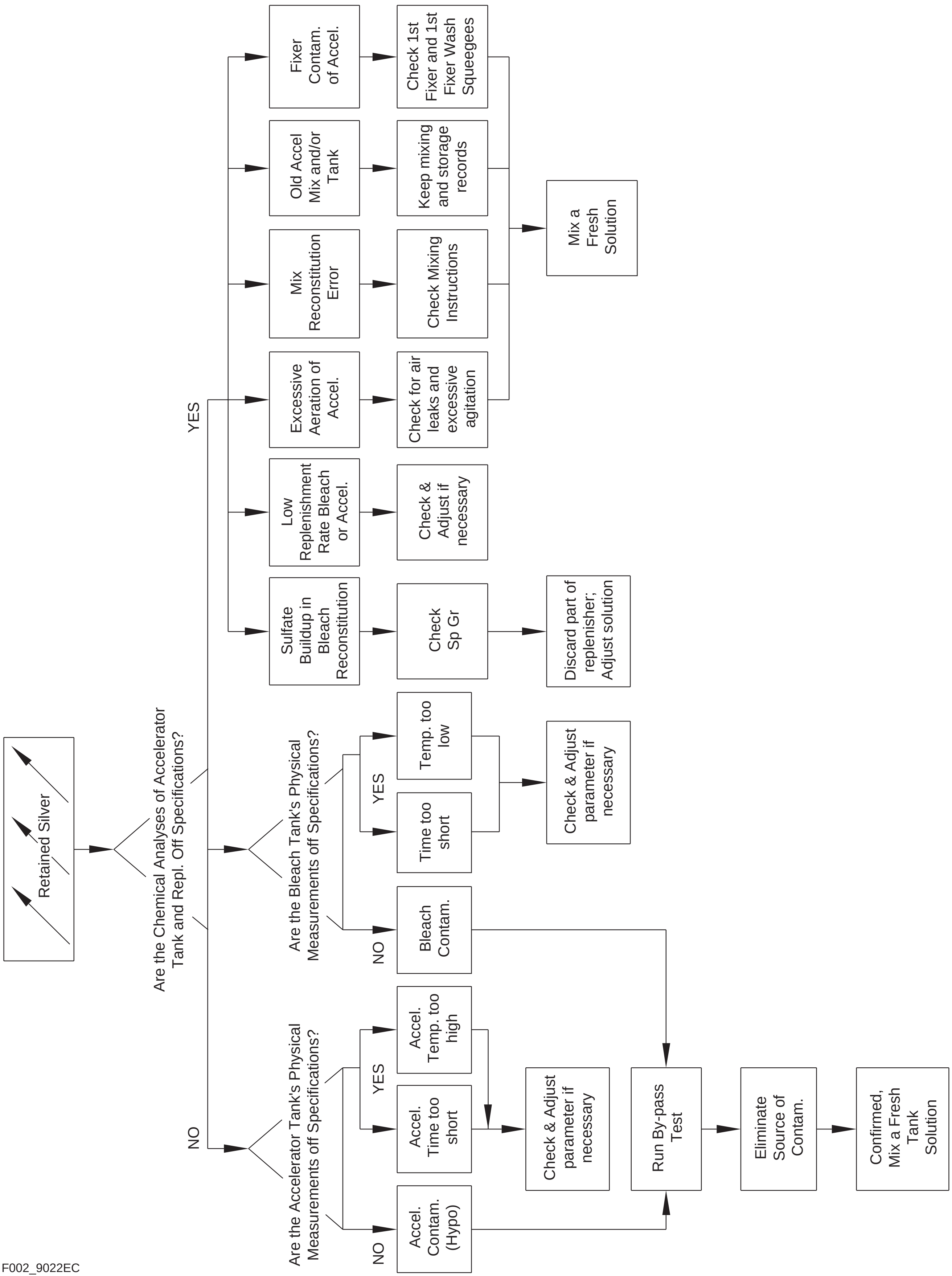
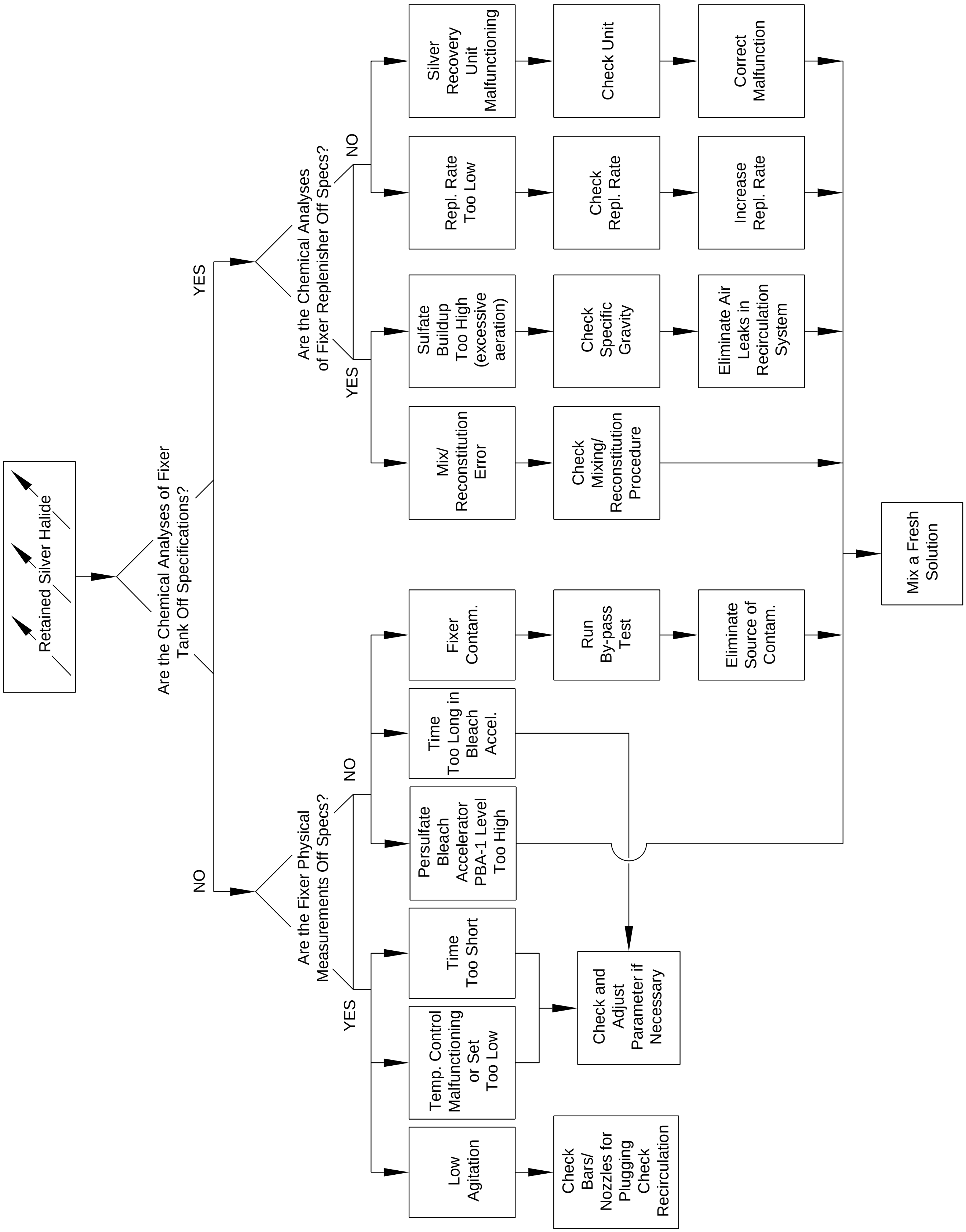


Figure 10-20 Retained Silver Halide



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SPECIAL TESTS

In support of the diagnostic procedures, the following five special tests are required:

- Verification Tests
- Solution By-pass Test
- Process Omitting Prebath Test
- Fixed-out Strip Test
- Process Omitting First Fixer Test

Verification Tests

There are two verification tests for suspected problems—retained silver and retained silver halide.

Retained Silver

Retained silver is the result of ineffective bleaching. The symptoms are:

- Increased density in the high-density areas of the film, particularly D-max, with no changes in lower densities (such as D-min). It may be seen as increased contrast.
- The infrared density of the D-max patch increases. Normally, an infrared density (at 1,000 nm) of less than 0.07 is acceptable, between 0.07 and 0.14 is marginal, and greater than 0.14 is unacceptable. A sound track densitometer is a suitable instrument for this measurement.

Verification Test:

1. Prepare a small volume of fresh ferricyanide bleach, or use a known good solution of ferricyanide bleach replenisher.
2. Immerse the processed film with suspected silver retention in the bleach for 1 to 2 minutes. Agitate by moving the film strip manually. Wash the film for 30 to 40 seconds under running water.
3. Fix the strip for 1-2 minutes in a small volume of a good fixer solution, again agitating manually. Wash the film for 30 to 40 seconds.
4. Dry the film and reread the infrared density. An infrared density within the acceptable region (which had formerly been marginal or unacceptable) confirms silver retention. Lower optical densities also confirm retained silver.

Retained Silver Halide

Retained silver halide is the result of ineffective fixing. The symptoms are:

- There are large increases in density (i.e., greater than + 0.10 R, G, and B) in both the D-min and D-max steps of the control strip. The overall contrast is only slightly increased.
- The infrared density of the D-max patch is normal. Normally, an infrared density (at 1,000 nm) of less than 0.07 is acceptable, between 0.07 and 0.14 is marginal, and greater than 0.14 is unacceptable. A sound track densitometer is a suitable instrument for this measurement.
- Opaque streaks are generally visible when the strip is viewed with reflected light.

Verification Test:

1. Re-fix the processed control strip for 1 to 2 minutes in a small volume of a fresh fixer replenisher solution or known good fixer replenisher. Agitate by moving the film manually. Wash the film for 30 to 40 seconds under running water.
2. Dry the film and reread the densities. If the D-min and D-max readings are down to normal control levels after refixing and/or the opaque streaks disappear, the problem can be attributed to retained silver halide.

Solution By-pass Test

Use this test to check out any processing solution when it is suspected of causing a photographic deviation. It is particularly useful in avoiding unnecessary dumping of a suspected processing solution. Although the test is often used with secondary solutions, it can also be used to check out prebath and developer problems if an adequate "sink-line" process (i.e., with a controlled temperature bath) is available.

1. Obtain a sample of the suspected solution.
2. Mix a fresh sample of the solution in question or use a known good solution of the same type, i.e., from another processing machine.
3. In a sink-line process, run one set of control strips through the suspected solution, and the other set through the known good solution. Use normal processing times and temperatures. If possible, process both sets together at the same time. Use the same solutions for both sets of strips for all other processing steps.

   Note: For secondary solutions, strips can often be processed in the machine up to the point in question. After cutting out the strip at the crossover, proceed as described above in a sink-line process. The strips may be spliced onto machine leader at the exit of the suspected solution and processed together for the remaining steps.
4. Compare the photographic results from the suspected solution and the known good solution. If the set of strips processed in the suspected solution deviates in the same direction as the actual photographic deviation, the suspected solution is causing the photographic effect. If the results between the two solutions are similar, repeat the test to check the other processing solutions, one at a time.

   Note: Since sink-line tests may not give exactly the same results as machine runs, it is important to look at the difference between the sets of strips, even if they do not exactly match normal control strips.

Fixed-out Strip Test

Use this test to help distinguish development-related sources of high green D-mins from those caused by secondary solutions.

1. Fix out a strip of KODAK Color Print Film for 1 to 2 minutes in a fresh fixer or replenisher solution. Wash and dry.
2. Process the above fixed-out strip along with a strip of unexposed print film (D-min).
3. Measure the red, green, and blue (D-min) densities of both strips and compare the readings.
4. Results/Action:
   a. If high green D-mins disappear in the fixed-out strip, the stain is development related.
   b. If high green D-mins persist, a secondary solution problem is implicated.

Process Omitting First Fixer Test (ECP-2D only)

Use this test to help isolate the source of high green D-mins caused by secondary solutions.

1. Process a strip of KODAK Color Print Film omitting the first fixer. This can be done right on the film processor by skipping the first fixer racks.
2. Read the red, green, and blue densities of this strip and compare the results with the D-min of a normally processed strip of print film.
3. Results/Action:
   a. If high green D-mins disappear in the print film strip when omitting the first fixer, the first fixer is most likely the solution causing the stain. Proceed with checking fixer pH levels and CD-2 contamination. Also, check ferricyanide bleach pH and/or any buffering agents that may have been added (a nonstandard addition).

      Note: High green D-mins can also disappear in this test if the stop or stop wash is inadequate.
   b. If high green D-mins persist, check for a contaminated solution after the first fix.

PROCESSED FILM PROBLEMS

Problem	Appearance	Possible Source of Problem	Suggestion Corrective Action
Black lines and comets	Short, black lines and comets on emulsion surface. Shiny in reflected light.	Under certain conditions, the electrolytic silver cell in the fixer recirculation systems produces small, flocculent silver flakes. These flakes get into the fixer tank, attach to the emulsion, and then go through the fixer squeegee, where each one is smeared into a line or comet.	Use a 10- to 15-micron filter in the fixer return line from the cell, or correct operation of the cell.
Dirt particles	Dark spots and marks. Easiest to see under high-intensity specular lighting.	Dirt may consist of dust, cloth filaments, hair, skin flakes, chemical crystals, scum, etc. Such dirt can come from machine operators, air-conditioning units, incorrect construction materials, lack of solution or dryer air filters, water hardness, poor housekeeping, etc.	Establish and follow good laboratory cleanliness procedures. For more information on laboratory cleanliness, refer to Module 2, *Equipment and Procedures*.
	Yellow particles on surface.	Low fixer pH causes the formation of sulfur particles in the fixer.	Maintain the fixer pH within specifications.
Dots equally spaced apart, repeating	Showers of dots on emulsion.	Soft touch tire pressing on the emulsion during processing.	Be certain the emulsion does not ride on spools with soft-touch tires.
Emulsion skivings	Small particles of emulsion sheared from the film edges and deposited on the film surface.	Spools improperly aligned, or with burrs.	Check the machine spools.
Ferrotyping	Irregular, shiny areas on the emulsion surface.	Wet or tacky emulsion at windup.	Adjust the dryer to provide adequate film drying.
		High windup tension on unprocessed films.	Reduce the windup tension.
		Unwinding and rewinding unprocessed cold film without allowing it to reach room temperature.	Always allow adequate time for film to come to room temperature before using.
Fungus or algae deposits	Light irregular smears, streaks, and spots.	Fungi and algae tend to form on the inside walls of the wash tanks. Their presence is indicated by a slippery and slimy feel to the tank walls.	A 5 1/4 percent solution of sodium hypochlorite, available as household liquid bleach (e.g., Clorox), can be used to clean the tank in order to control the formation of fungi and algae. See *Control of Biological Growths* in Module 2.
Magenta fingerprints		Touching the emulsion surface prior to processing.	The film should be handled with lint-free nylon or Dacron gloves.
Newton's rings	Fuzzy, erratic, faintly colored lines.	High or uneven printer gate pressure.	Adjust printer.
		Low relative humidity in printing room.	Raise relative humidity to 60 percent.
		Preprint film was dried too fast or overdried.	Adjust drying conditions of preprint film.
Cyan stain		Contamination of Developer by hypo or RA-1.	Discard developer.
Pink stain	Magenta color balance in low density areas.	High level of CD-2 in stop or first fixer (ECP-2D only).	See Figure 10-16, *High D-min (Green Only)*.
Reticulation	Rough emulsion surface.	High solution temperatures.	Adjust to specifications.
		Dryer temperature too high or relative humidity too low.	Adjust to specifications.
Scalloped or fluted edges		Excessive tension on the film strand.	Check the processing machine for excessive tension in the film loops caused by a high rack or improper machine drive. Check for improper threading. Rectify either condition.

Problem	Appearance	Possible Source of Problem	Suggestion Corrective Action
Scratches	Light lines parallel to the film edges.	Deposits on rem-jet buffer.	Install a buffer-cleaning nozzle, and replace the buffer roller regularly. Water from the cleaning nozzle must not run onto unsprayed rem jet. KODAK Anti-Calcium, No. 4, or equivalent, in the prebath prevents the precipitation of calcium or magnesium salts.
		Old, hard, worn, crystal-laden, or maladjusted wiper-blade squeegees.	Use spring-loaded wiper blade squeegees of 40-durometer hardness or less. Keep them clean, and replace them when worn.
		Cinching a roll of film before or after processing.	Be certain that the machine take-up does not jerk the film roll. Train film handlers in proper film rewinding techniques.
		Improper loading of processing machine.	Always handle film with care. Examine equipment for sharp edges, burrs, etc, and eliminate them.
		Machine spools that are not rotating freely or are out of line.	Check spools regularly, and replace bearings when necessary.
		Chemical crystals or other foreign material on spools.	Spools and racks should be cleaned regularly according to the procedures in the machine maintenance section of this manual.
		Improper machine threading (a twist in the film) or improper splices.	These problems should be corrected according to normal processing procedures.
Shoreline	Fuzzy contour lines near the edges of the film.	Nonuniform drying of the film emulsion.	Reduce the temperature, or increase the relative humidity of the air in the drying cabinet.
Static marks	Magenta and/or yellow spots and dots.	Rapid rewinding or transporting film in low relative humidity.	Unprocessed film should not be rewound at high speed. The relative humidity in the rewinding area should be 50 percent or greater.
		Emulsion contact with flat electrophoretic rollers before processing.	Only undercut rollers should come in contact with the emulsion surface. Use conductive materials on the rewind, load accumulator, etc, and ground them.
Tacky film		Inadequate final film squeegee action.	Check the air flow, alignment and cleanliness of the final squeegee.
		Inadequate drying conditions.	Check the temperature, relative humidity, and flow rate of the air in the dryer cabinet. The heaters or the fan may not be functioning properly, or the air filters may be plugged with dirt. If the dryer uses recirculated air, be sure it is mixed properly with incoming air. Also check the humidity control of recirculated air. If the film is still tacky after all possible normal corrective measures have been taken, as a temporary measure, increase the temperature of the dryer air. Because increased air temperature can be injurious to the film, such action requires close attention to the physical appearance of the film.
Water spots	Irregular areas on emulsion surface best seen in specular reflected light.	Lines, drops, or puddles of water allowed to enter the dryer on the film.	The final squeegee in the process must be very efficient and must remove virtually all water from the emulsion surface.

Problem	Appearance	Possible Source of Problem	Suggestion Corrective Action
Fingering (ECP-2D only)	The edge of the sound track looks like tiny fingers reaching into the picture area	High surfactant level. Low thickener level.	Check viscosity of sound track developer, if low, replace.
		Application too heavy.	Increase distance between applicator wheel and film.
		Film insufficiently dry.	Set-up or adjust pretreatment sqeegees and hot air treatments.
		Bends or turns in the development path.	For higher transport speeds less tolerance exists for film movement in the Z axis direction.

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