SERVICE BULLETIN

KODAK X-OMAT Processors

Eastman Kodak Company, Health Imaging, Imaging Service Center, Rochester, NY 14650

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Supersedes 7/97

Processing Recommendations for KODAK X-OMAT Processors for Models: M35, M35A, M35A-M, M35-M, M43, M43A, Clinic 1, M7B, M7B-E, 270 RA, 3000 RA, 180 LP, 180 LPS, Multiloader 300, Multiloader 300 Plus, M6A-N, M6AW, M6B, M8, M6RA, 460 RA, 480 RA, 5000 RA,1000, 1000A, & 1000J

This bulletin documents the current processing recommendations for KODAK medical films with KODAK X-OMAT chemicals that are manufactured in the United States. This data supersedes all previous replenishment information given in publications for X-OMAT products.

Recommended Replenishment Rates - General Radiography & Laser

Area Processors (with use compensation): 270 RA, 3000 RA, 180 LP, 180 LPS, Multiloader 300, Multiloader 300 Plus, M6RA, 460 RA, 480 RA, & 5000 RA

In these processors, replenishment takes place only after the equivalent area of a 35 x 43 cm film has been fed. Therefore, replenishment rates need only be set for a 35 x 43 cm film feed. Additional chemicals are also automatically added during low film usage. Additional chemicals are not added automatically if 3.0 or higher software has been installed.

Film Size Processed	Use Condition	Average Amount of Film per 8 hours of Processor Operation	Replenishment Rates mL per 35 x 43 cm	
			Developer	Fixer
All	Any	Any number *	60	85

* Flooded replenishment should not be needed due to the automatic compensation for use, but is available if needed to maintain sensitometry for very low use conditions.

Area Processors (without use compensation): M43, M43A, & M8

In these processors, replenishment rates are calculated based on film area. Replenishment rates are set for a 35 x 43 cm film feed. Rates need to be set for different usage conditions.

Film Size Processed	Use Condition	Average Amount of Film per 8 hours of Processor Operation	Replenishment Rates mL per 35 x 43 cm	
			Developer	Fixer
35 x 43 cm	High	75 sheets or more	60	85
	Medium	25 - 75 sheets	80	100
	Low	25 sheets or less *	100	120

* If sensitometry does not stay within control limits, flooded replenishment may be needed.

Length Processors: M35, M35A, M35-M*, M35A-M*, Clinic 1, M7B, M7B-E, M6A-N, M6AW, & M6B 1000, 1000A, & 1000J

These processors, replenish whenever film is in the entrance rollers. Therefore, replenishment rates must be set according to usage and film sizes fed. Feed as recommended in the Operator Manual.

Film Size Processed	Use Condition	Average Amount of Film per 8 hours of Processor Operation	Replenishment Rates mL per 35 x 43 cm	
			Developer	Fixer
Only roll films 35 cm wide	High Medium Low	105 linear feet or more 35 - 105 linear feet 35 linear feet or less **	50 65 80	70 85 100
Only 35 x 35 cm film	High Medium Low	90 sheets or more 30 - 90 sheets 30 sheets or less **	50 65 80	70 85 100
Average size intermix film	High Medium Low	115 sheets or more 40 - 115 sheets 40 sheets or less **	50 65 80	70 85 100
Only 35 x 43 cm film	High Medium Low	75 sheets or more 25 - 75 sheets 25 sheets or less **	60 80 100	85 100 120

* Not recommended for roll film.

** If sensitometry does not stay within control limits, flooded replenishment may be needed.

Recommended Replenishment Rates - Dedicated Mammography

A processor is considered dedicated if only single-emulsion film (mammography, ultrasound, etc) is processed. General purpose (non-dedicated) should use the replenishment rates listed in the previous section for general use. **These guidelines should be used as initial starting points only.**

Area Processors (with use compensation): 270 RA, 3000 RA, Multiloader 300, Multiloader 300 Plus, M6RA, 460 RA, 480 RA, & 5000 RA

In these processors, replenishment takes place only after the equivalent area of a 35 x 43 cm film has been fed. Therefore, replenishment rates need only be set for a 35 x 43 cm film feed. This is true even though 18 x 24 cm and 24 x 30 cm films are the only sizes fed.

Film Type	Use Condition	Average Number of 18 x 24 cm Films per 8 hours of Processor Operation	Replenishment Rates* mL per 35 x 43 cm	
			Developer	Fixer
MIN-R E	Any	Any number **	70	105
MIN-R H	Any	Any number **	175	105
MIN-R M	Any	Any number **	105	105
MIN-R 2000	With Software Upgrade	Any number**	90	105
MIN-R 2000	Without Software Upgrade (below 3.0)	260 sheets or more 200 sheets 150 sheets 100 sheets 70 sheets Less than 70 sheets	90 80 70 65 60 Flooded	105 105 105 105 105 Flooded

* In addition to these rates per film, the software compensates by adding more chemicals during low film usage.

** Flooded replenishment should not be needed due to the automatic compensation for use, but is available if needed to maintain sensitometry for very low use conditions.

Area Processor (without use compensation): M8

These processors replenish by area but do not automatically compensate for low use conditions.

Film Type	Use Condition	Average Number of 18 x 24 cm Films per 8 hours of Processor Operation	Replenishment Rates mL per 35 x 43 cm	
			Developer	Fixer
MIN-R E	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	70 95 122	105 122 140
MIN-R H	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	175 175 175	105 122 140
MIN-R M	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	105 105 122	105 122 140
MIN-R 2000	Medium - High Low	60 sheets or more 60 sheets or less*	90 Flooded	105 Flooded

* If sensitometry does not stay within control limits, flooded replenishment may be needed.

Length Processors: M35, M35A, M35-M, M35A-M, M7B, M7B-E, M6A-N, M6AW, & M6B

In these processors, replenishment takes place whenever film is in the entrance rollers. Therefore, replenishment rates must be set according to usage and film sizes fed.

Film Type and Feeding	Use Condition	Average Number of 18 x 24 cm Films per 8 hours of Processor Operation	Replenishment Rates mL per 18 x 24 cm **	
			Developer	Fixer
MIN-R E (Single Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	20 30 35	30 35 40
MIN-R E (Double Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	40 55 70	60 70 80
MIN-R H (Single Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	50 50 50	30 35 40
MIN-R H (Double Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	100 100 100	60 70 80
MIN-R M (Single Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	30 30 35	30 35 40
MIN-R M (Double Film Feeding)	High Medium Low	150 sheets or more 60 - 150 sheets 60 sheets or less *	60 60 70	60 70 80
MIN-R 2000 (Single Film Feeding)	Medium - High Low	60 sheets or more 60 sheets or less*	25 Flooded	30 Flooded
MIN-R 2000 (Double Film Feeding)	Medium - High Low	60 sheets or more 60 sheets or less*	50 Flooded	60 Flooded

* If sensitometry does not stay within control limits, flooded replenishment may be needed.

** Use a single 18 x 24 cm film to set the replenishment rates listed.

Recommended Replenisher Mixing

Mix developer and fixer replenishment solutions only in quantities large enough to be used up in 2 weeks. Be sure to use floating lids to reduce oxidation of the developer solution.
When filling the developer processor tank, be sure to add starter as listed below:

Developer	Flooded Mode	Replenishment Tank	Processor Tank
RP	No	No Starter	Add Starter
RP	Yes	Add Starter	*No Starter
RA/30	No	No Starter	No Starter
RA/30	Yes	No Starter	No Starter

*Fill the processor tank with the chemistry that was mixed in the replenishment tank.

Recommended Processor Maintenance Timing

Drain, clean, and refill the developer and fixer processing tanks monthly or as experience indicates. Specific site conditions may dictate more or less frequent cleaning. Follow the maintenance instructions in the Operator Manuals and Service Manuals. Be sure to follow all environmental regulations when disposing of all solutions.

In order to maintain the most stable sensitometry, you may drain and save tank solutions. Once the processor has been cleaned, put the solutions back into the processing tanks. See Service Bulletin No. 205 for more information.

Flooded Replenishment Recommendations

For low use rates, if sensitometry does not stay within control limits, flooded replenishment may be needed to maintain the developer solution at a continuously fresh chemical activity. This is accomplished not only when film is fed or area accumulated, but also on the basis of additional replenishment added during the processor on time with an automatic replenishment timing system. For all films except KODAK MIN-R 2000, developer starter is added to the replenishment tanks at the rate of 3 fl oz per gallon or 89 mL per gallon or 25 mL per litre. For KODAK MIN-R 2000 Film, developer starter is added to the replenishment tank at the rate of 6 fl oz per gallon or 176 mL per gallon or 50 mL per litre.

For detailed information on how to set up each processor for flooded replenishment, see the appropriate service publication for that processor. The setup should be done by qualified service personnel.

All Processors (except M43, M43A, Clinic 1, M6B, M8, 1000, 1000A & 1000J)

It is recommended that flooded replenishment rates be initially set at 65 mL. This amount will then be fed into the processor every 5 minutes. Once set, the rate can be reduced depending on the individual circumstances. Monitoring of processor sensitometry is required in order to reduce replenishment rates. Use the following recommendations as replenishment rates are reduced:

Monitor sensitometry (speed and contrast). Reduce developer and fixer replenishment rates by 5 mL. Monitor sensitometry for 2 weeks. If no change is seen, you may reduce rates by another 5 mL. Once a change is seen, increase the developer and fixer rates by 5 - 10 mL.

1000, 1000A & 1000J Processors

It is recommended that you set the flooded rates as follows: Initially set the regular developer and fixer replenishment rates at 100 mL and the flooded replenishment rate at one-half this amount. The processor will feed the one-half amount (in this case, 50mL) into the processor every 20 minutes. Monitoring of processor sensitometry is required in order to reduce replenishment rates. Use the following recommendations as replenishment rates are reduced:

Monitor sensitometry (speed and contrast). Reduce developer and fixer replenishment rates by 5 mL. Monitor sensitometry for 2 weeks. If no change is seen, you may reduce rates by another 5mL. Once a change is seen, increase the developer and fixer rates by 5-10 mL.

M43, M43A, Clinic 1, & M8* Processors

It is recommended in the M43, M43A, and Clinic 1 Processors that you set flooded replenishment rates at 100 mL for developer and 120 mL for fixer. The processor will deliver these volumes every 24 minutes to maintain sensitometry. Do not reduce these rates. Monitoring of processor sensitometry is required.

***** The rates for the M8 Processor should be set at 105 mL for 35 x 43 cm, because the system activates every 8 minutes.

Recommended Ventilation Requirements

It is recommended that the processing area have 10 air changes per hour, 24 hours per day, 7 days per week. For example: a 10 x 10 x 10-foot room has a volume of 1000 cubic feet. It is recommended that the ventilation system supply the room with 10,000 cubic feet of air per hour, 24 hours per day, 7 days per week.

For through-the-wall installations, the air pressure in the darkroom area where the processor is located must be of higher pressure than the surrounding rooms. This will assure that the airflow through the processor is in the correct direction.

For processor exhaust ventilation requirements, see Service Bulletin No. 101 or the appropriate service publication for the processor.

Adjusting the Dryer Temperature

Use the lowest possible dryer temperature that will maintain proper film drying. The dryer temperature will vary depending on the processing cycle, the relative humidity, and the environmental temperature and should be adjusted to meet individual conditions. Different processing cycles will require different dryer temperatures to compensate for the varying times the film is in the dryer section. See the Operator Manual for instructions on adjusting the dryer temperature.

Recommended Film Types vs Processing Cycle

The following chart summarizes which films can be processed in which processor and at which processing cycle. Use the following key to acceptable processing cycles:

E = Extended Cycle, RP chemicals S = Standard Cycle, RP chemicals
R = Rapid Cycle, RP chemicals K = K/RA (kwik) Cycle, RA chemicals
NR = Not Recommended NA = Not Applicable

Film Type	M35, M35A, M7B, M7B-E, M8, M6A-N, M6AW, M6B,	M35-M, M35A-M	M43, M43A, Clinic 1	270 RA, 3000 RA, Multiloader 300, M6RA, 460 RA, 480 RA, 5000 RA	180 LP, 180 LPS	1000, 1000A, 1000J
Available cycles →	S	E / S	S	E / S / R / K	R	S
T-MAT RA Film	S	S	S	S / R / K	NA	S
CSG/1	S	S	S	S / R / K	NA	S
CSG/2	S	S	S	S / R / K	NA	S
Insight Family	S	S	S	S	NA	S
Dup RA	S	S	S	E / S / R / K	NA	S
EB/RA	S	S	S	S / R / K	NA	NR
EHN/EHNC	S	S	S	S / R	R	NR
EIR/EIRC	S	S	S	S / R	NA	NR
MIN-R M	S	S	NR	S	NA	NR
MIN-R H	S	S	NR	S	NA	NR
MIN-R E	(E with Kit)**	E	NR	E	NA	NR
MIN-R 2000	S	S	NR	S	NA	NR
All Other Films	S	S	S	S	NA	S

** Kodak recommendations for kit only (Kodak kit recommendations are not available for the M8 Processor)

General Processor Information

This chart summarizes various information for reference. Data is approximate and variations may be measured on actual processors.

Processor	Cycle	Approx Dev Tank Volume	Starter Volume[4]	Starter Volume MIN-R 2000	Dev Temp	Fixer Temp	Water Temp	Transport Speed	Capacity 35x43 cm (18x24 cm)	Approx Dev Time	Approx Drop Time[3] 35x43 cm (18x24 cm)
Units →		gal (L)	fl oz (mL)	fl oz (mL)	˚F (˚C)	˚F (˚C)	˚F (˚C)	in./min (cm/min)	films/hr	seconds	seconds
M35 M35A	S	2.25 (8.3)	6.5 (190)	13 (380)	92 (33.3)	NC	40-85 (4-29.4)	30 (76.2)	97	33	150
M35-M M35A-M	E[1]	2.25 (8.3)	6.5 (190)	NR	95 (35)	NC	40-85 (4-29.4)	19.5 (49.5)	63 (119)	49.5	230 (203)
M35-M M35A-M	S	2.25 (8.3)	6.5 (190)	13 (380)	92 (33.3)	NC	40-85 (4-29.4)	30 (76.2)	97 (178)	33	150 (135)
M43, M43A, Clinic 1	S	3.0 (11.2)	9.0 (265)	NR	93 (33.9)	NC	40-85 (4-29.4)	24 (61.0)	90	27	127
M7B M7B-E	E[1]	2.25 (8.3)	6.5 (190)	NR	96 (35.6)	NC	40-85 (4-29.4)	26 (66.0)	93 (155)	43	203 (188)
M7B M7B-E	S	2.25 (8.3)	6.5 (190)	13 (380)	94 (34.4)	NC	40-85 (4-29.4)	42 (106.7)	146 (250)	27	120 (116)
3000 RA, 270 RA Multiloader 300	E	2.25 (8.3)	6.5 (190)	NR	94 (34.4)	85* (30*)	40-85 (4-29.4)	21 (53.3)	74 (125)	52	227 (209)
3000 RA, 270 RA Multiloader 300	S	2.25 (8.3)	6.5 (190)	13 (380)	94 (34.4)	90* (32*)	40-85 (4-29.4)	42 (106.7)	148 (250)	26	111 (104)
3000 RA, 270 RA Multiloader 300	R	2.25 (8.3)	6.5 (190)	NR	99 (37.2)	95* (35*)	40-85 (4-29.4)	57 (144.8)	201	19	82
3000 RA, 270 RA Multiloader 300	K	2.25 (8.3)	NA	NR	96 (35.6)	90* (32*)	40-85 (4-29.4)	76 (193.0)	270	14.5	62
M6A-N M6AW M6B	E[1]	2.8 (10.7)	8.5 M 8 SS (250 M 237 SS)[2]	NR	95 (35)	NC	**M6A-N** 85-90 (30-32.2)	34 (86.4)	120 (202)	47	190 (172)
M6A-N M6AW M6B	S			17 (500)	95 (35)	NC	**M6AW,M6B** 40-90 (4-32.2)	66 (167.6)	229 (393)	25	90 (86)
M8	S	4.3 (16.4)	13 (380)	26 (760)	96 (35.6)	96 (35.6)	40-90 (4-32.2)	69 (175.3)	264	21	90 (85)
M6RA, 460 RA, 480 RA, 5000 RA	E	2.8 (10.7)	8.5 (250)	NR	95 (35)	95* (35*)	40-85 (4-29.4)	34 (86.4)	120 (202)	47	190 (172)
M6RA, 460 RA, 480 RA, 5000 RA	S	2.8 (10.7)	8.5 (250)	17 (500)	95 (35)	95* (35*)	40-85 (4-29.4)	66 (167.6)	233 (393)	24	95 (89)
M6RA, 460 RA, 480 RA, 5000 RA	R	2.8 (10.7)	8.5 (250)	NR	101 (38.3)	95* (35*)	40-85 (4-29.4)	99 (251.5)	351	16	60
M6RA, 460 RA, 480 RA, 5000 RA	K	2.8 (10.7)	NA	NR	98 (36.6)	95* (35*)	40-85 (4-29.4)	132 (335.3)	480	11	45
180 LP 180 LPS	R	2.25 (8.3)	6.5 (190)	NR	100 (37.8)	100* (37.8*)	40-90 (4-32.2)	63 (160.0)	180	18	79
1000, 1000A, 1000J	S	1.0 (3.8)	3.0 (90)	NR	95 (35)	NC	40-85 (4-29.4)	17 (43.2)	50 (84)	20	173

Notes: NC = Not Controlled temperature

NA = Not Applicable, starter not needed for K/RA cycle

* Fixer temperature may exceed value listed due to internal ambient temperatures in the processor.

NR = Process not recommended for this film type.

[1] Kodak Recommendations Only

[2] M = Molded Tank, SS = Stainless Steel Tank

[3] Drop Time is defined as the time from the Lead Edge In (LEI) to the Trail Edge Out (TEO) for a 35 x 43 cm film. ( ) represents 18 x 24 cm LEI/TEO.

[4] All Film Types except MIN-R 2000

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