



Diagnostic Imaging Specialists Corporation

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Instruction Manual for DISC QA Radchex Meter **Revision C: February 26th, 2009**

CONTACT INFORMATION:

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KONFORMITAETSERKLAERUNG
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE

WE,

**DIAGNOSTIC IMAGING SPECIALISTS CORPORATION
163 ST. MALO STREET, ST. MALO, MANITOBA
CANADA R0A 1T0**

- *erklären, dass die Produkte*
- *declare, that the products*
- *declarons, que les produits*

DISC QA Radchex System consisting of the following:

Model RCX-QA (Radiographic Cassette)

- *auf die sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt:*
- *to which this declaration relates are in conformity with the following standard:*
- *auquels se referent cette declaration sont conforme a la norme:*

EN61010-1 Safety requirements for electrical equipment for measurement control and laboratory use

***Exigences de securite pour de l'equipement electronique
afin de controller les mesures et pour l'utilisation du laboratoire***

- *Gemass den Bestimmungen der Niederspannungsrichtlinie:*
- *following the provisions of the low voltage Directive:*
- *conformement aux dispositions de la Directive basse tension:*

73/23 EWG und 93/68 EWG

October 5, 2002

Getting Started with “2 shot CR QA”

Theory of Operation

The QA Radchex meter measures the X-Ray exposure at the image plane and calculates the following three values:

1. The Manufacturer’s ‘exposure index value’ of their reference factory plate reader.
2. CRLU---Computed Radiography Light Units: This value is directly proportional to the light produced by the CR imaging plate when scanned by laser light in the reader.
3. Relative Speed: Establishes a link between typical film screen operating speeds and CR operating speeds at mid-kVp Radiographic range. (2000/CRLU)

Operating Instructions

1. **To Turn on Meter:** Press and Release “**Power/Reset**”. LCD displays CR manufacturers.
2. **To select a CR Manufacturer:** Press and Release “**Power/Reset**” to ‘toggle’ through manufacturers until desired manufacturer appears. Wait 10 seconds to ‘lock in’ desired manufacturer. Use “**Generic**” for no manufacturer. LCD displays “**Waiting for Reset**”.
3. **Check battery level:** If level is ‘**Low**’, plug in for ½ hour or longer.
4. **To make meter ready for Exposure:** Press and release “**Power/Reset**”. LCD displays “**Ready for Exposure**”. Take an exposure and LCD displays the three values.

*Note: When LCD displays “**Ready for Exposure**”, to go back to “**Waiting for Reset**” press and release “**Power/Reset**”.*

5. **To Turn off meter:** Press and hold “**Power/Reset**” until LCD displays “**Power Down**”, then release “**Power/Reset**”.

Note: If meter is not used for 10 minutes, meter will turn off.

NOTE: The following procedures assume that the X-ray machine and Plate Reader /Scanner have been calibrated and ‘calibration reference values’ have been established; to establish ‘calibration reference values’, follow the procedures below shortly after the X-Ray machine and Reader/Scanner have been calibrated.

Checking X-Ray system Calibration Drift (one shot per Bucky)

1. Center and lock the 24 x 30 cm (10” x 12”) Radchex Cassette in table bucky or Chest Bucky so that the 30cm (12”) dimension is from ‘head-to-foot’ and the 24cm (10”) dimension is from ‘left to right’; When LCD displays ‘**Ready for Exposure**’, close the Bucky.

NOTE: For chest Bucky, attach the 2 self adhesive ‘Velcro’ strips (included) to the top or rear side of the Chest Bucky. The ‘copper filter’ Velcro straps attach to the adhesive Velcro strips and ‘hangs’ the copper filter on entrance side of the Bucky!

2. Place the 24 x 30 cm (10” x 12”) copper filter on the table top or chest bucky front surface and center light/radiation field to filter and Radchex cassette; make sure the copper filter is oriented the same way as the Radchex cassette. Make certain that the radiation field exposes the entire Radchex Cassette!
3. Select AEC mode on X-Ray machine; select all three chambers; select zero density.
4. Select 80 kVp on X-Ray machine (or as close as possible to 80 kVp); always use this kVp for future tests.
5. Make exposure, remove Radchex cassette from Bucky.
6. Read and record ‘CRLU” value from LCD on Data Sheet and plot value on CRLU graph.
7. Read and record mAs from X-Ray machine on Data sheet and plot value on mAs graph.
8. If X-Ray machine AEC calibration has not drifted, the CRLU value will not change from week-to-week; if X-Ray tube output has not drifted, the mAs value will not change from week-to-week.

Checking Plate Reader Calibration Drift (2 shots)

1. Place Radchex cassette on Table Top with 100cm (40") tube-to-cassette front distance.
2. Center light/radiation field to Radchex cassette and adjust light/radiation field about 5cm (2") larger than the cassette; make LCD display 'Ready for exposure'.
3. Center 24 x 30 cm (10" x 12") copper filter on Radchex cassette top surface.
4. Select Manual Mode on X-Ray machine.
5. Select 80 kVp on X-Ray machine (or as close to as possible to 80 kVp); always use this kVp to for future tests.
6. Select 10 mAs on X-Ray machine.
7. Make an exposure and read CRLU value. If CRLU value is not 14.1 ± 0.2 , adjust mAs (coarse adjustment) and/or tube cassette distance (fine adjustment) to get 14.1 ± 0.2 'CRLU reference exposure'.
8. Once 'CRLU reference exposure' technique has been achieved in Step 7, replace the Radchex cassette with freshly erased 24 x 30 cm (10" x 12") CR 'Test' imaging cassette. Center the copper plate on the test imaging cassette. Make exposure using 'reference technique' established in Step 7.
9. Wait 10 minutes and process 'Imaging Plate' in 'Reader' using appropriate 'flat field' corrected image menu.
10. Read and record exposure indicator value from plate reader on Data Sheet and plot value on Reader graph.
11. If Plate Reader calibration has not changed, exposure indicator value will not change from week-to-week.

Getting Started with X-Ray Machine and Plate Reader Assessment

1. Turn on Radchex cassette and select desired CR manufacturer.
2. If battery level is 'Low', plug in Radchex for ½ hour or longer before using.

Checking Chamber Balance

1. Select 'Automatic Exposure Control' mode on X-Ray machine; 80 kVp and zero density selector.
2. Center X-Ray tube to bucky and use correct grid determined distance. Lock in tube to bucky.
3. Place 24 x 30 cm (10" x 12") copper plate on table top or chest bucky and center to bucky.

NOTE: Orient copper plate such that 30 cm (12") dimension is from head-to-foot and the 24cm (10") dimension is from left-to-right.

4. Adjust the collimator light/radiation field to the size of the copper plate.
5. Position Radchex cassette in bucky tray. 30 cm (12") dimension from head-to-foot.
6. Select center chamber.
7. Before you take an exposure, press and release "**Power/Reset**", wait for LCD to display "**Ready for Exposure**", slide Radchex into bucky tray.
8. Take a test exposure.
9. Slide bucky tray out and record CRLU reading.
10. Repeat Steps 7 through 9 for left chamber, right chamber and any other chamber combinations you want to assess.
11. Chambers are balanced if CRLU values are within 10% of each other.

Checking AEC 'Tracking' for patient 'Thickness' and kVp

1. Place Radchex cassette in Bucky and select AEC mode (center chamber) on X-Ray machine.
2. Center desired phantom material thickness on table top or chest bucky, and hold kVp constant.

NOTE: Use patient equivalent phantom of minimum size of 24cm x 24cm that will adequately cover center chamber.

3. Make exposures and record CRLU values for various phantom thicknesses.
4. AEC is 'Thickness tracking' if CRLU values are within 10% of each other over the clinical exposure time range.
5. Select desired kVp and hold phantom thickness constant.
6. Make exposures and record CRLU values at various kVp's.
7. AEC is kVp tracking if CRLU values are within 10% of each other over the clinical exposure time range.

Checking Plate Reader Calibration

1. Place Radchex cassette on Table Top with 100cm (~40") tube-to-cassette distance.
2. Center light/radiation field to Radchex cassette and adjust light/radiation field about ~5cm (~2") larger than cassette; Make sure LCD indicates 'Ready for Exposure'.
3. Center 24 x 30 cm (10" x 12") copper plate on Radchex cassette top surface.
4. Select Manual Mode on X-Ray machine.
5. Select 80 kVp on X-Ray machine (or as close as possible to 80 kVp); this kVp will always be used for this X-Ray machine for future tests.
6. Select 10 mAs on X-Ray machine.

7. Make an exposure and read CRLU value. If CRLU value is not 14.1 ± 0.2 , adjust mAs (coarse adjustment) and/or tube-to-cassette distance (fine adjustment) to get 14.1 ± 0.2 'reference exposure'.
8. Once 'reference exposure' technique has been achieved in Step 7, replace Radchex cassette with a freshly erased 24 x 30 cm (10" x 12") CR 'Test' imaging cassette. Position the copper plate on the test imaging cassette. Make exposure using 'reference technique' established in Step 7.
9. Wait 10 minutes and process 'Imaging plate' in 'Reader' using appropriate 'flat field' corrected image menu.
10. Observe 'exposure indicator value' on Plate Reader.
11. Plate Reader is calibrated if exposure indicator value shown on plate reader is within values shown below ($\pm 10\%$ from vendor's factory calibration).

Manufacturer	Exposure indicator value
Kodak	2000 ± 40
Agfa	2.20 ± 0.04 (200 Speed)
	2.50 ± 0.04 (400 Speed)
Fuji	145 ± 14
Philips	145 ± 14
Konica	145 ± 14
iCRco	0.00 ± 0.09

Specifications

X-Ray energy dependence: *Simulates relative light output of Photostimulatable Phosphor Plate (PSP) within \pm 3% over kVp range of 60 kVp to 120 kVp and a patient equivalent thickness range of 5 cm to 35 cm (within specified operating rates)*

Digital range: *Computed Radiography Light Units: CRLU 0 to 5000.0*

Minimum CRLU Rate: *7/sec (approx 0.7 mR/sec entrance exposure rate)*

Maximum CRLU Rate: *25000/sec (approx 2500 mR/sec entrance exposure rate)*

Power On/Off: *Manual Switch*

Power Requirements: *Built in NiMH rechargeable battery pack (9.6V)*

Typical battery life between charging: *Greater than 20 hours*

Operating Environment: *15° to 35°C (59°F to 95°F)*

X-ray beam filter: *10" x 12" (25cm x 30cm) Copper plate(B152-110) 1.5 mm thick*

Electronic Cassette: Dimensions: *10" x 12" x 0.5" (24cm x 30cm x 1.3cm)*

Weight: *1.8 kg (3.9 lbs)*

LIMITED WARRANTY

QA Radchex Meter

This product, except the use, is warranted by Diagnostic Imaging Specialists Corporation (DISC), to the original purchaser to be free from defects in material and workmanship under normal use for a period of one (1) year from the date of purchase. During the warranty period, and upon proof of purchase, the product will be repaired or replaced (with the same or similar model) at our option, without charge for either parts or labor at the DISC factory. The purchaser shall bear all shipping, packing, and insurance costs to the DISC factory. The warranty will not apply to this product if the product has been misused, abused, or altered. Without limiting the foregoing, bending or dropping of unit, broken electrical wires, visible cracking of the product components and/or enclosures are presumed to be defects resulting from misuse or abuse.

NEITHER THIS WARRANTY NOR ANY OTHER WARRANTY EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY, SHALL EXTEND BEYOND THE WARRANTY PERIOD. NO RESPONSIBILITY IS ASSUMED FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITING THE SAME TO MATHEMATICAL ACCURACY OR PRECISION OF THE PRODUCT. SOME PROVINCES AND OR STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS AND SOME PROVINCES AND OR STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THAT THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY.

This warranty gives the product owner specific legal rights, and the owner may also have other rights which vary from province to province or state to state.

TABLE 1**CR Manufacturer Plate Reader Values Corresponding to CR Radchex values**

(Assuming that the reader is calibrated using the manufacturers specifications)

CRLU (CR Light Units)	Kodak® EI#	Agfa® IgM# (200 Class)	Agfa® IgM# (400 Class)	S#	iCRco® EI#	Relative Imaging Speed (2000 / CRLU)
5.00	1550	1.75	2.05	409	-1.037	400
5.25	1571	1.78	2.08	389	-0.988	381
5.51	1592	1.80	2.1	371	-0.940	363
5.79	1613	1.82	2.12	353	-0.890	345
6.08	1635	1.84	2.14	336	-0.841	329
6.38	1656	1.86	2.16	320	-0.793	313
6.70	1677	1.88	2.18	305	-0.744	299
7.04	1698	1.90	2.2	290	-0.695	284
7.39	1719	1.92	2.22	277	-0.646	271
7.76	1741	1.95	2.25	263	-0.597	258
8.14	1761	1.97	2.27	251	-0.549	246
8.55	1783	1.99	2.29	239	-0.500	234
8.98	1804	2.01	2.31	228	-0.451	223
9.43	1825	2.03	2.33	217	-0.402	212
9.90	1846	2.05	2.35	206	-0.354	202
10.39	1867	2.07	2.37	197	-0.305	192
10.91	1889	2.09	2.39	187	-0.256	183
11.46	1910	2.11	2.41	178	-0.207	175
12.03	1931	2.14	2.44	170	-0.159	166
12.63	1952	2.16	2.46	162	-0.110	158
13.27	1974	2.18	2.48	154	-0.061	151
13.93	1995	2.20	2.50	147	-0.012	144
14.63	2016	2.22	2.52	140	0.037	137

Agfa Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

Speed Class:

Week #	Date	CRLU	Reader Lgm#	Week #	Date	CRLU	Reader Lgm#
1				27			
2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

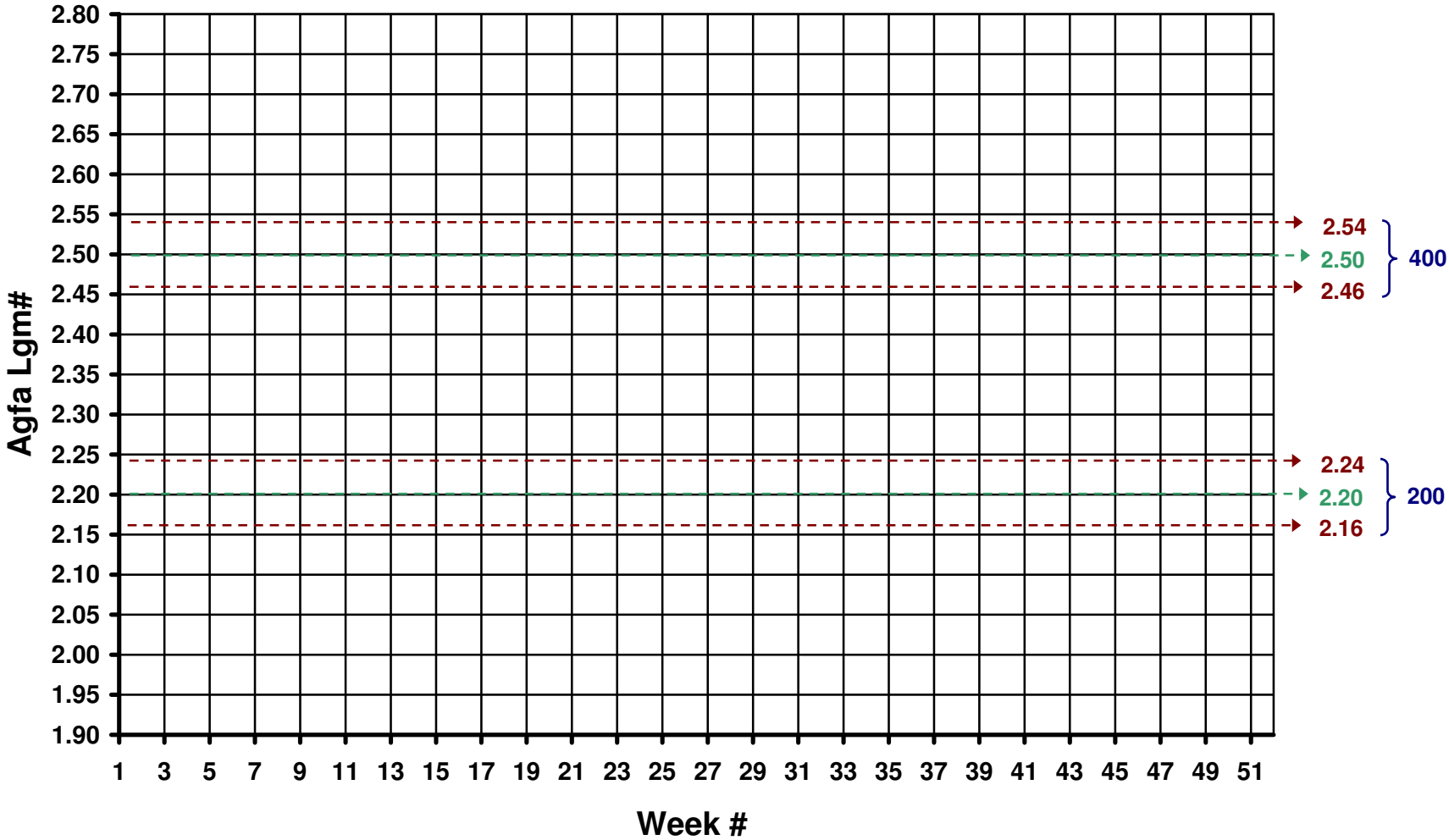
Agfa Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic:

Reader Mfg: **Agfa**

Reader ID:

Speed Class:



Formula to Calculate Agfa LgM# from CRLU: $Agfa\ LgM\# = 2.2 + \text{Log}(CRLU / 14.1) + \text{Log}(\text{Speed Class} / 200)$

Carestream Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

Week #	Date	CRLU	Reader EI#	Week #	Date	CRLU	Reader EI#
1				27			
2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

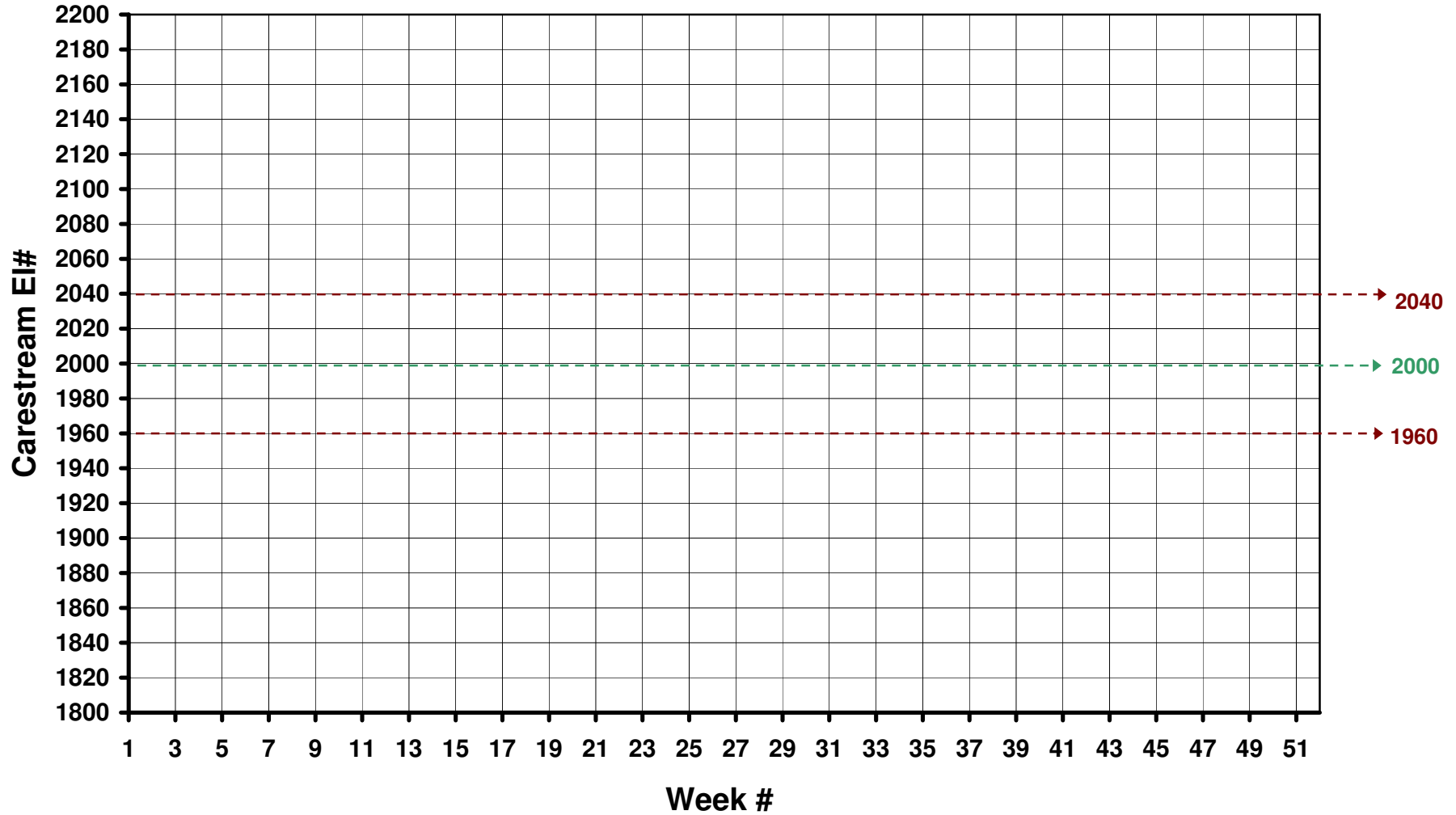
Carestream Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic: [Redacted]

Reader Mfg: [Redacted]

Carestream

Reader ID: [Redacted]



Formula to Calculate Carestream EI# from CRLU: $Carestream\ EI\# = 2000 + (1000 \times \text{Log}(CRLU/14.1))$

CRLU and mAs Datasheet

Hospital/Clinic:

Room #:

Bucky ID:

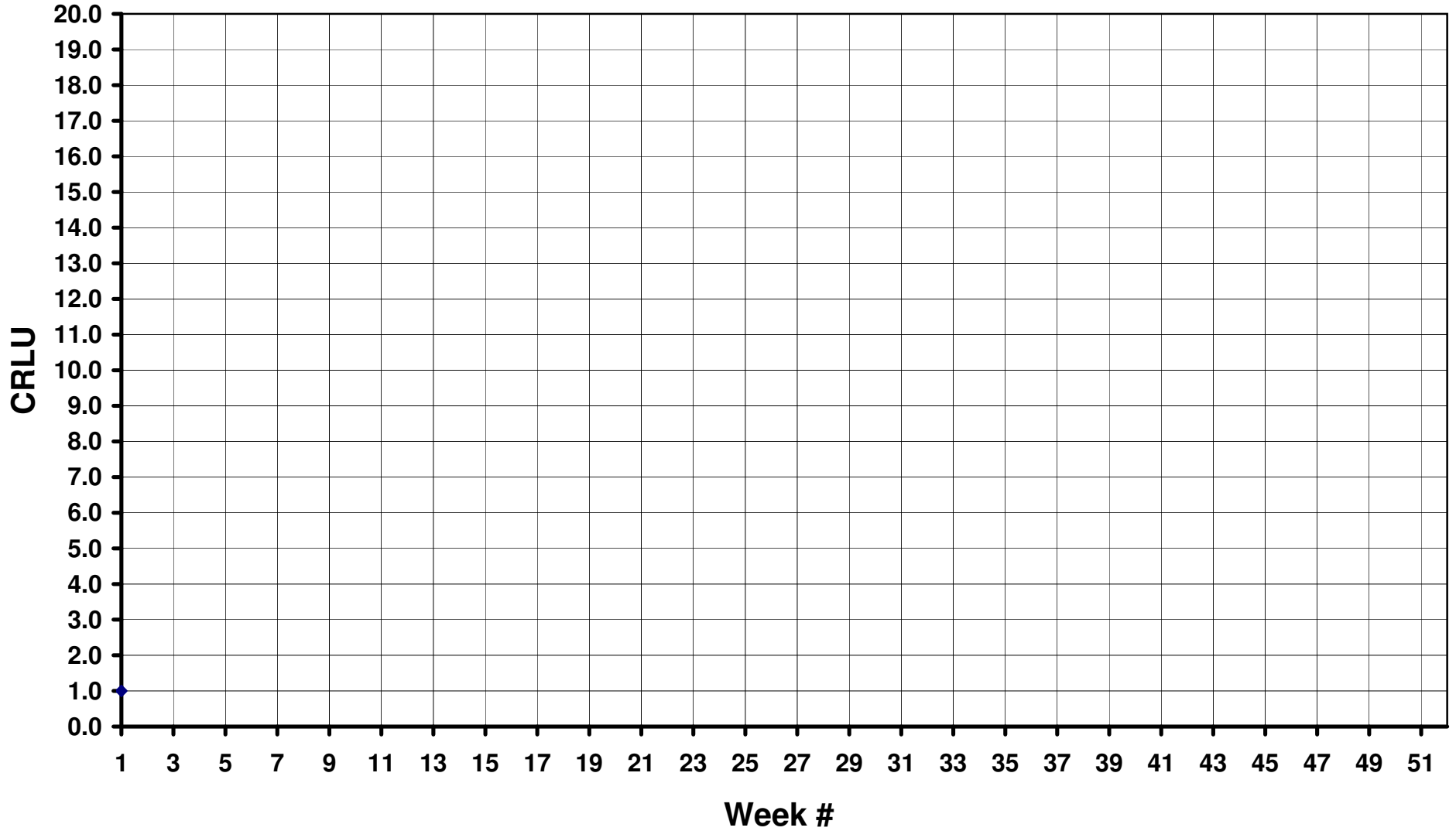
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2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

CRLU Graph

Hospital/Clinic:

Room ID:

Bucky ID:

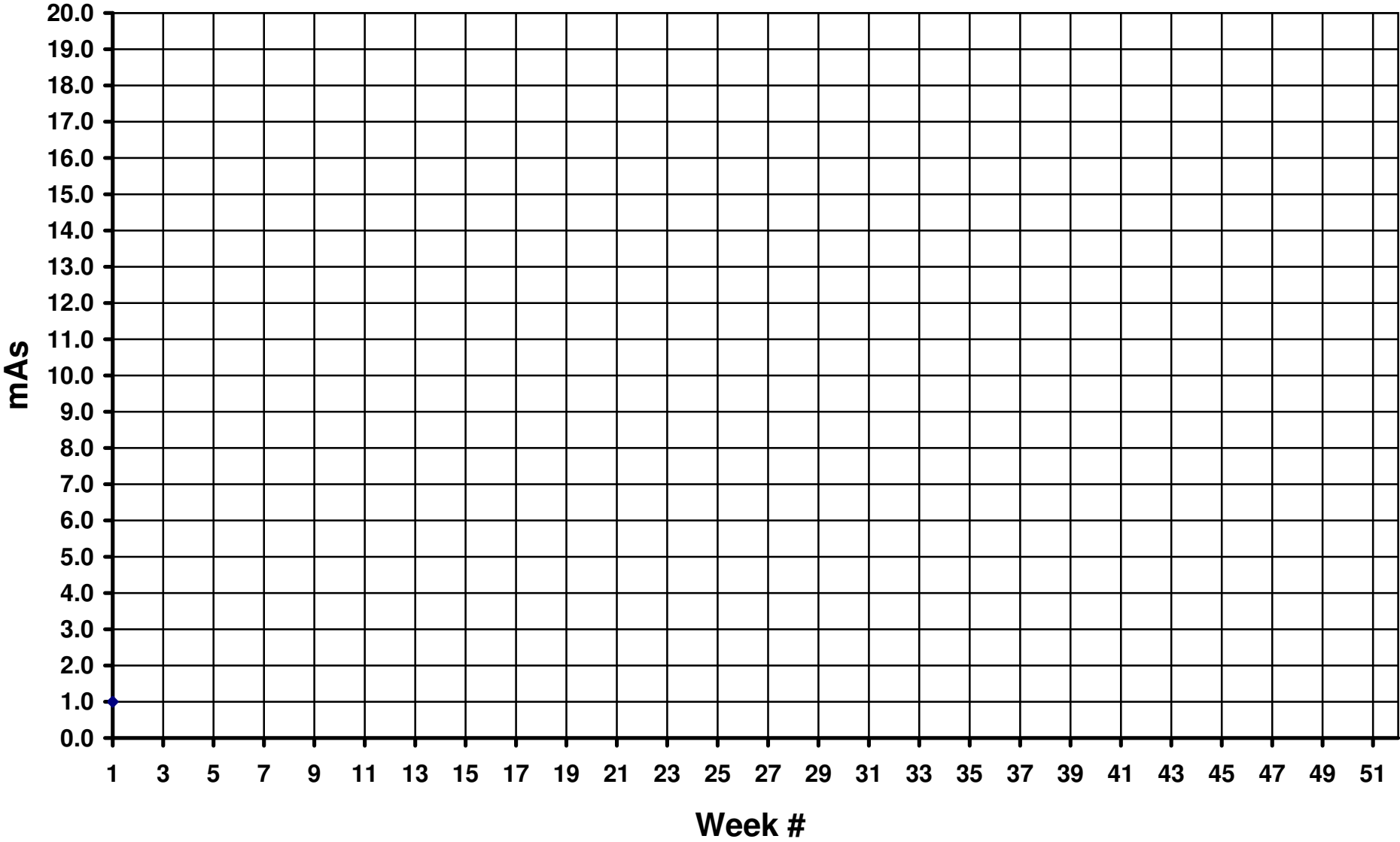


mAs Graph

Hospital/Clinic:

Room ID:

Bucky ID:



Fuji Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

Week #	Date	CRLU	Reader S#	Week #	Date	CRLU	Reader S#
1				27			
2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

Fuji Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

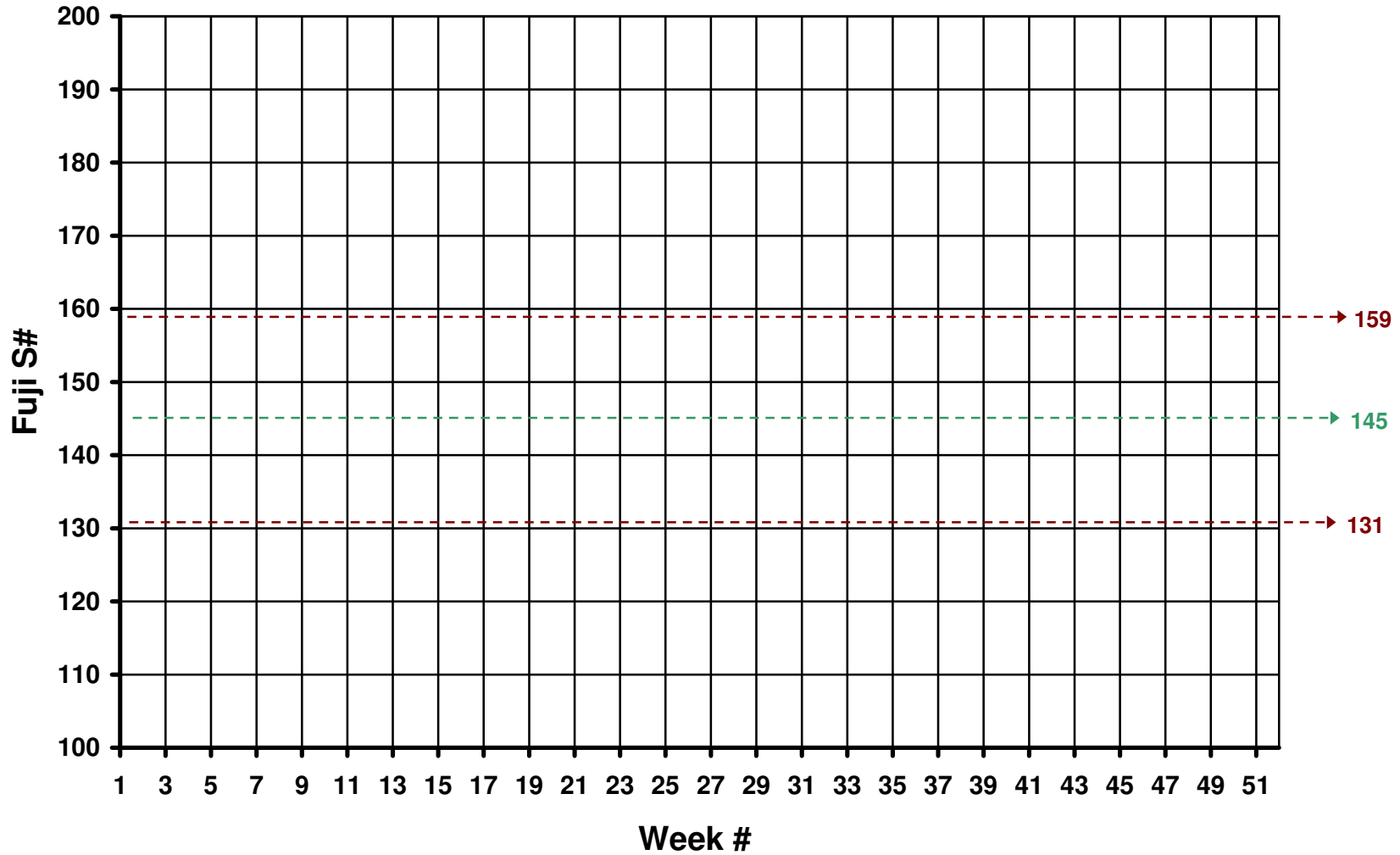
Week #	Date	CRLU	Reader #	Week #	Date	CRLU	Reader #
1				27			
2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
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16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

Fuji Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic:

Reader Mfg:

Reader ID:



Formula to Calculate Fuji S# from CRLU: $Fuji\ S\# = 2044 / CRLU$

iCRco Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

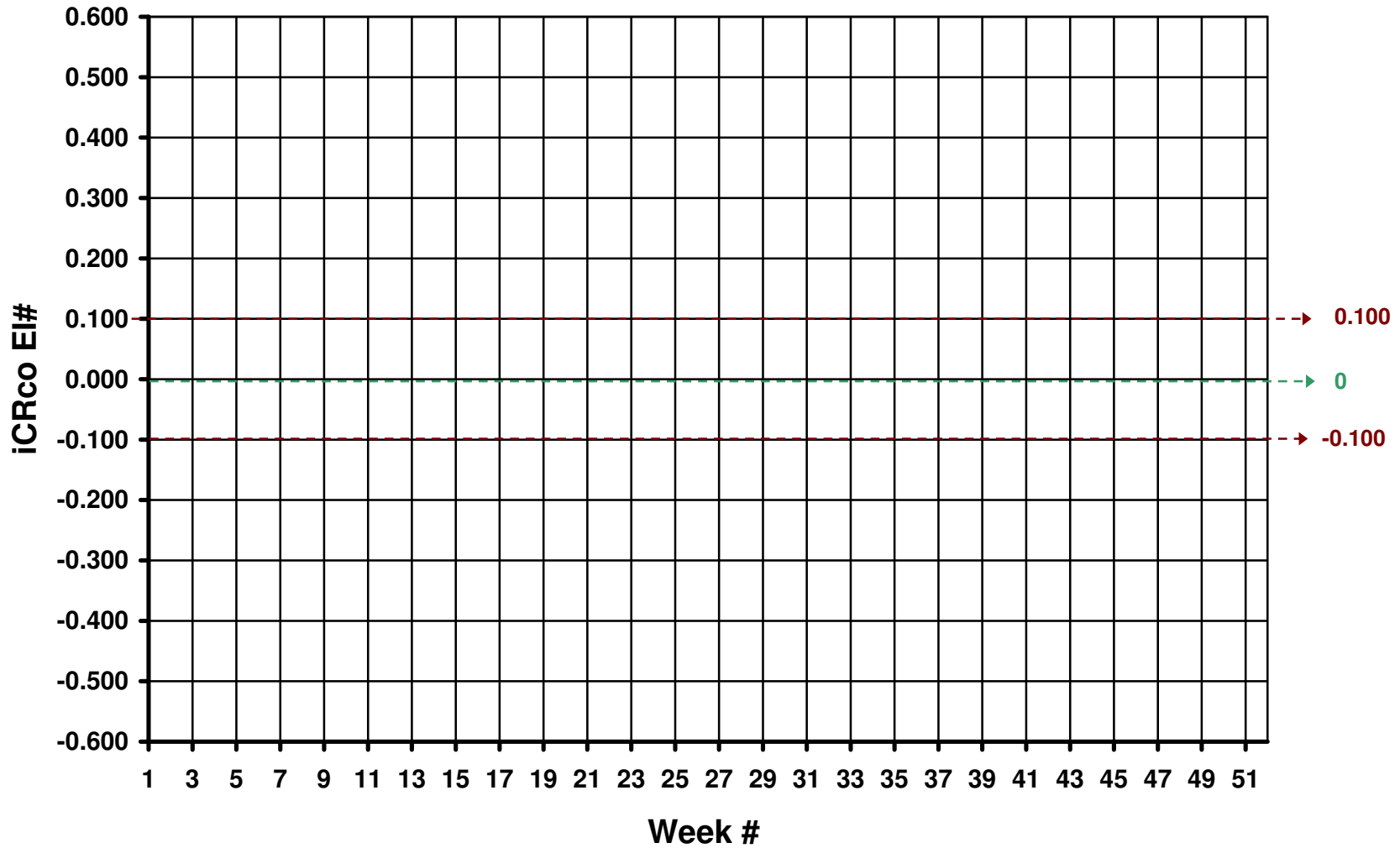
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2				28			
3				29			
4				30			
5				31			
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7				33			
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9				35			
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11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

iCRco Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic:

Reader Mfg:

Reader ID:



Formula to Calculate iCRco EI# from CRLU: $iCRco EI\# = LN(CRLU / 14.1)$

Konica Reader Datasheet

Hospital/Clinic:

Reader Mfg:

Reader ID:

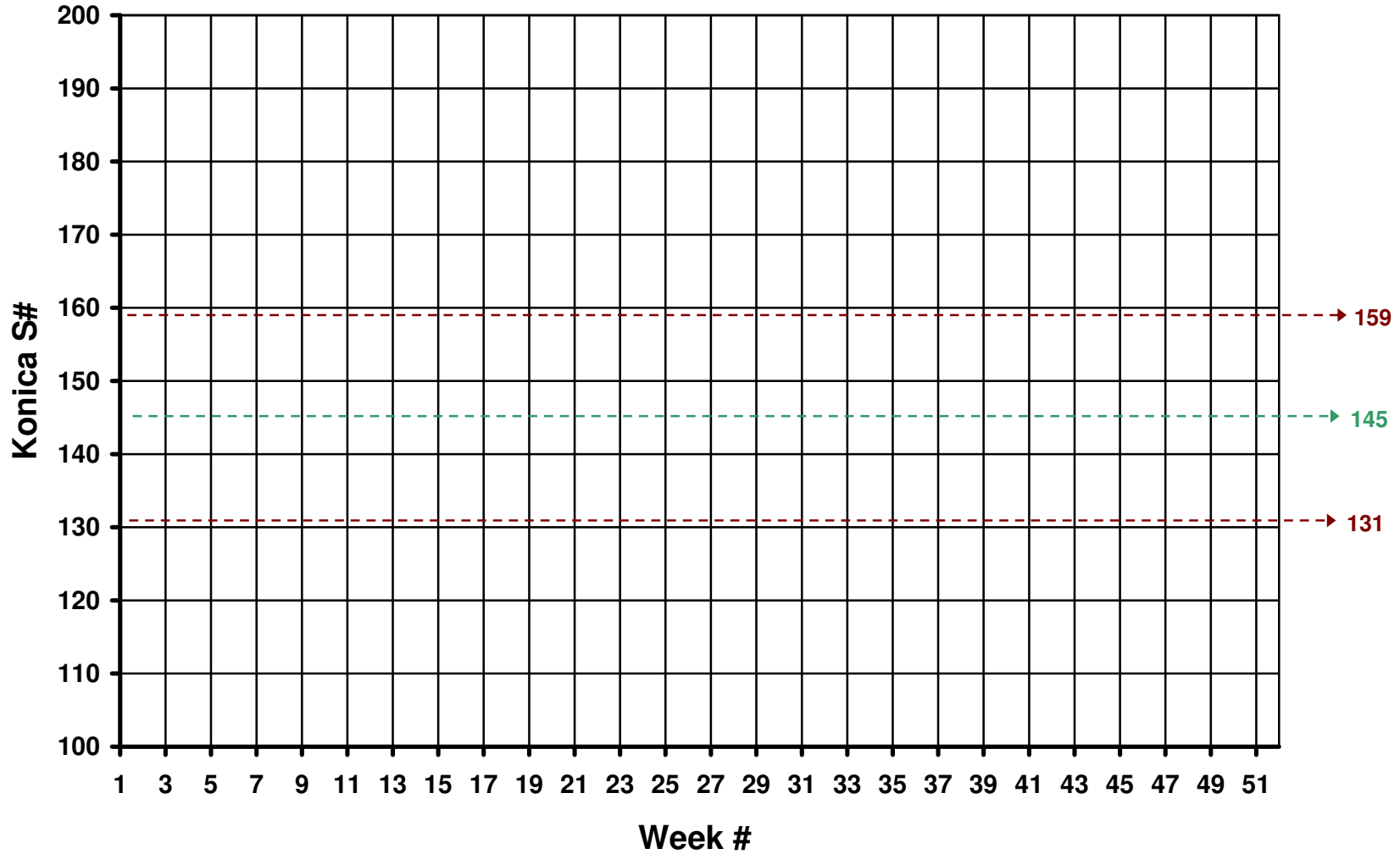
Week #	Date	CRLU	Reader S#	Week #	Date	CRLU	Reader S#
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2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
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15				41			
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17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

Konica Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic:

Reader Mfg:

Reader ID:



Formula to Calculate Konica S# from CRLU: $Konica\ S\# = 2044 / CRLU$

Philips Reader Datasheet

Hospital/Clinic:

Reader Mfg: **Philips**

Reader ID:

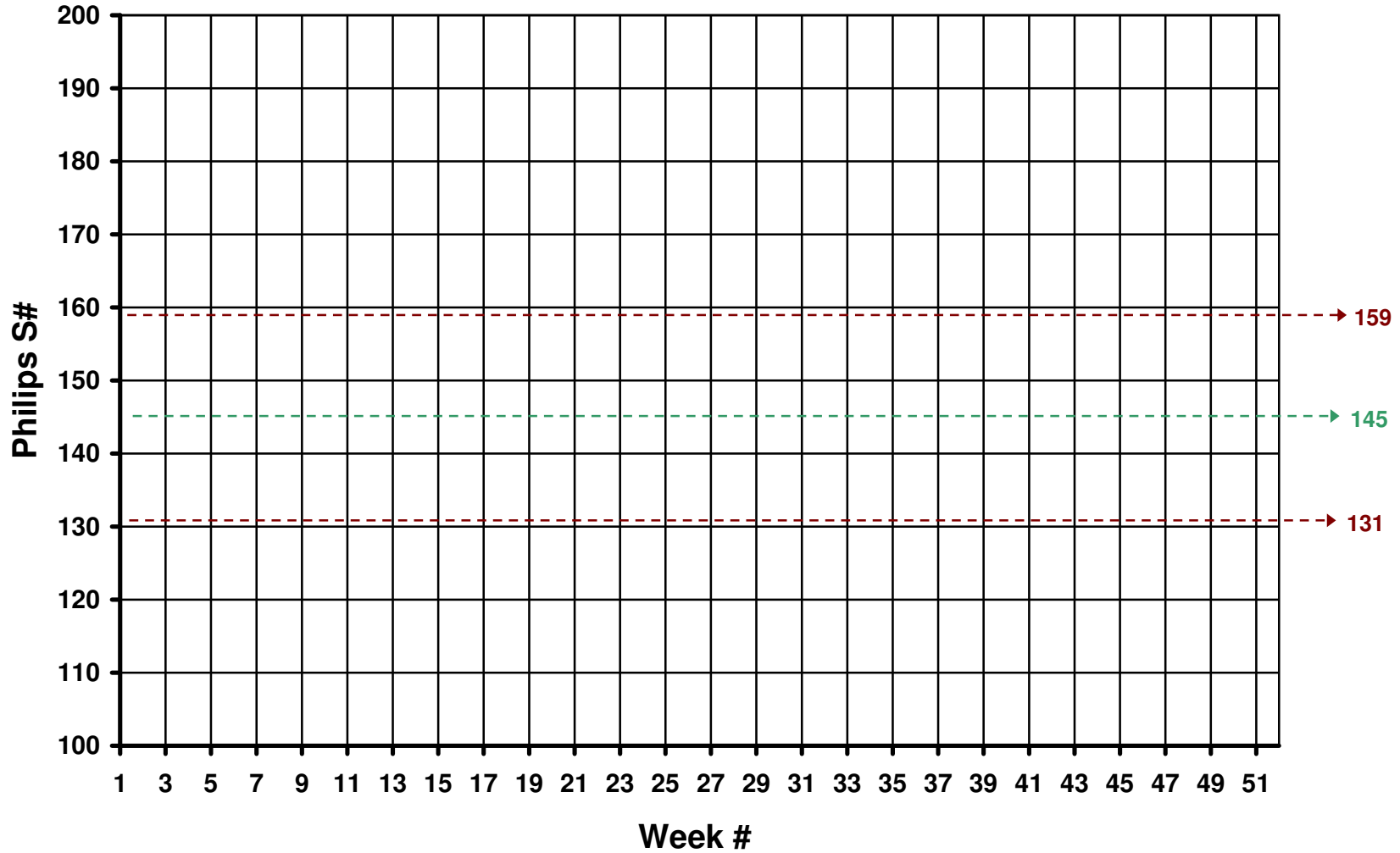
Week #	Date	CRLU	Reader S#	Week #	Date	CRLU	Reader S#
1				27			
2				28			
3				29			
4				30			
5				31			
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7				33			
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17				43			
18				44			
19				45			
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21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

Philips Reader Graph(Based on a CRLU of 14.1)

Hospital/Clinic:

Reader Mfg:

Reader ID:



Formula to Calculate Philips S# from CRLU: $Philips\ S\# = 2044 / CRLU$