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Barchart Density Response of Unifax II as a Function of Varying Bias Voltage

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INTRODUCTION

The Pacific Weather Centre utilizes Unifax II Facsimile machines to reproduce satellite imagery. In order to maintain quality control over the images produced, consideration must be given to adjustable components within the machine which may have an effect on image quality. Since a number of Unifax II machines are in use at PWC, it is necessary to calibrate all machines to operate and produce image results with no variations of image, quality, and contrast.

OBJECTIVE

The objective is to understand how adjustable electronic components within the Unifax II machines affect image quality and contrast leading to quality control over the satellite imagery received at PWC.

BACKGROUND INFORMATION

The Unifax II Faxsimile machines have few adjustable components due to the microprocessor technology used in construction. For calibration purposes, the only adjustable component is the "BIAS" voltage of the "OP AMP" (Operating Amplifier). The "BIAS" voltage regulates the amount of electrical charge deposited by a stylus on chemically treated paper resulting in an image of acceptable image density and contrast.

Included in the satellite picture is a "Barchart" consisting of 16 graduated steps of grey ranging from black at one end of the chart to white at the opposite end. The "Barchart" indicates the density response of the machine in use and thus indicates the contrast and quality of the imagery.

Changes in density can be measured with a densitometer, an optical device that is sensitive to minute variations in shades of grey and registers unitless values to the nearest .01.

PROCEDURE

By design, the "Op Amp Bias Voltage" can be adjusted, via a potentiometer, from 6.0 volts to 8.0 volts only. To determine the effects of varying this voltage, a series of "WIPS" imagery was fed to Unifax II machine, serial number 1409. For each picture received, the "Bias" voltage was adjusted by 0.2 volts through the range of 6.0 to 8.0 volts. The resulting "Barcharts"

(Figure 1) were measured with a Macbeth densitometer (Model RD912, Serial Number 1054) and the results recorded (Figure 2). Significant results were graphically plotted (Figure 3).

RESULTS

The most significant change in "Barchart" density occurred between 8.0 and 7.8 volts (Figure 3). The density was limited to only 4 steps on the black end of the scale. However, from 7.8 volts down to 6.0 volts the density was well distributed through all 16 steps of the "Barchart".

After subjectively considering the measured density values for all "Bias" voltage settings, the optimum setting for near equal increments of the "Barchart", 16 steps appeared to be between 7.4 and 7.2 volts. A test at 7.3 volts showed good results and the Unifax II was calibrated at this "Bias" voltage (see Figure 3).

SUMMARY REMARKS

By design, there are very few electrical adjustments that can be made internally to the Unifax II. "Op Amp Bias Voltage" can be set within the range of adjustment from 6.0 to 7.8 volts. This will result in acceptable contrast response in the "Barchart". A point of interest is the fact that the manufacturer does not state any optimum "Bias Voltage setting". Subjectively, 7.3 volts gives near equal increments of "Barchart" contrast response.

For quality control purposes, contrast and picture quality may have to be approached from developer replenishment or chemical replacement.

ACKNOWLEDGEMENT

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REFERENCES

Funk, Larry; Uses of a Densitometer at the Pacific Weather Centre, Pacific Region Technical Note 83-015.

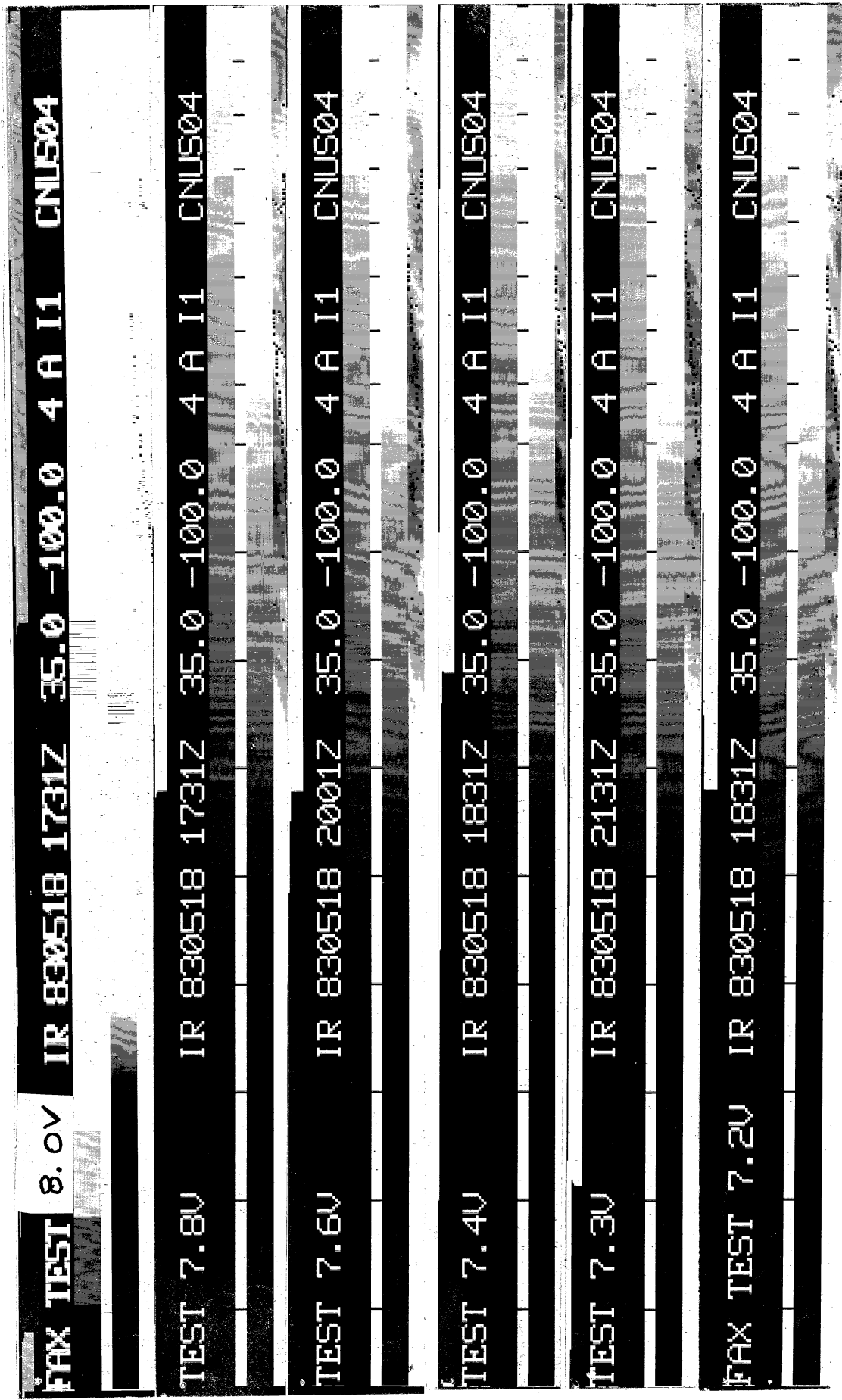


Figure 1(a) UNIFAX II DENSITY BAR CHARTS

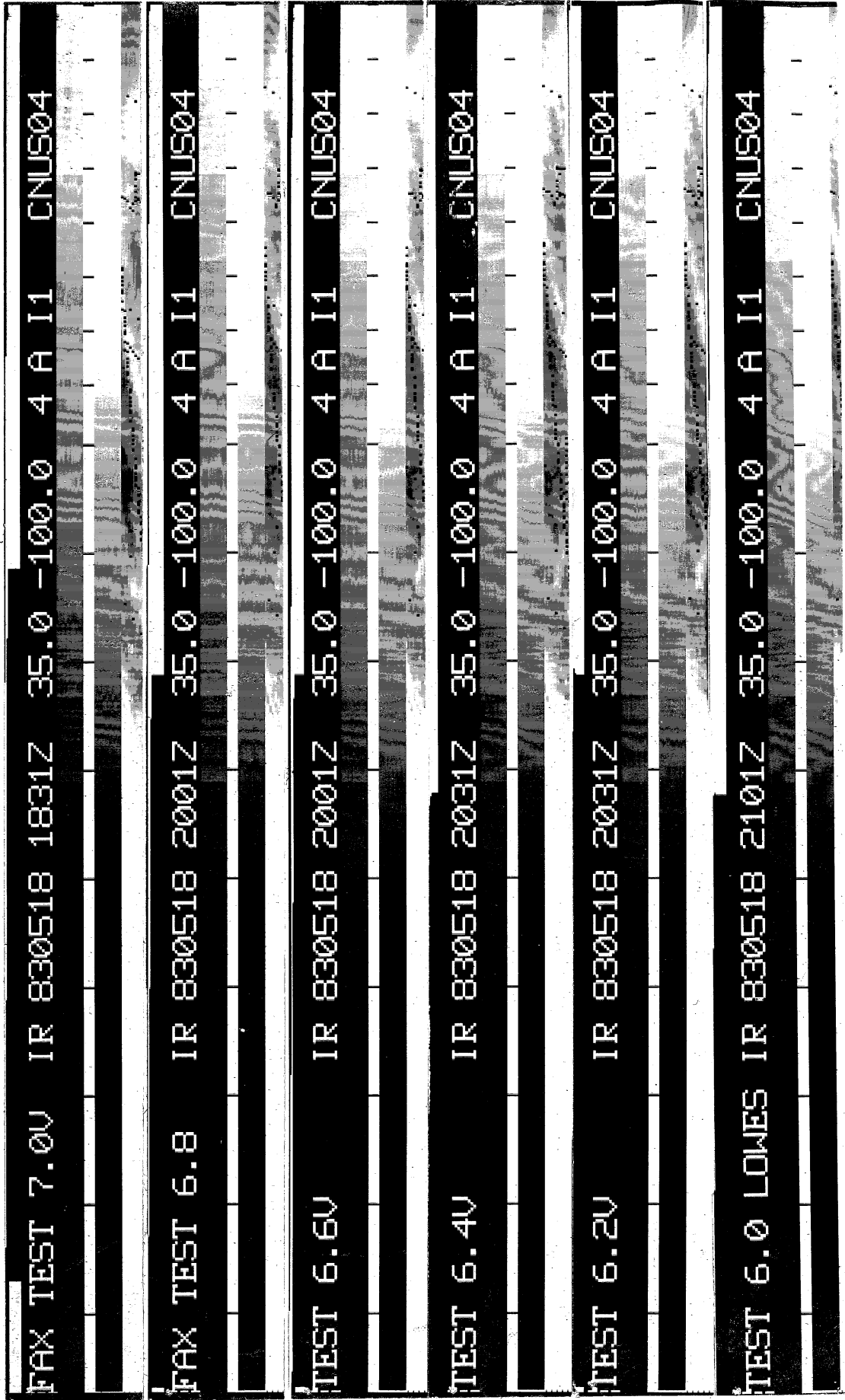


Figure 1 (b) UNIFAX II DENSITY BAR CHARTS

Picture Number	Bias Voltage	Enhancement Step Number															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	(8.0v)	1.20	.57	.18	.07	.08	.07	.07	.06	.06	.06	.05	.05	.05	.04	.04	.04
2	(7.8v)	1.51	1.49	1.33	1.22	1.11	.81	.70	.60	.49	.42	.37	.29	.23	.17	.12	.12
3	(7.6v)	1.62	1.57	1.38	1.26	1.19	.86	.73	.63	.54	.41	.36	.32	.24	.17	.12	.12
4	(7.4v)	1.56	1.47	1.34	1.30	1.16	.86	.74	.60	.49	.44	.37	.32	.25	.15	.14	.14
5	(7.3v)	1.54	1.51	1.39	1.30	1.15	.84	.75	.64	.52	.44	.37	.31	.28	.20	.11	.11
6	(7.2v)	1.48	1.50	1.39	1.25	1.16	.83	.72	.62	.51	.41	.35	.28	.21	.19	.16	.16
7	(7.0v)	1.53	1.50	1.33	1.26	1.12	.87	.73	.61	.50	.41	.35	.28	.22	.17	.18	.18
8	(6.8v)	1.64	1.59	1.42	1.36	1.20	.90	.77	.64	.54	.44	.38	.31	.26	.20	.13	.13
9	(6.6v)	1.56	1.55	1.42	1.32	1.16	.85	.76	.61	.51	.43	.36	.28	.20	.12	.09	.09
10	(6.4v)	1.58	1.52	1.39	1.31	1.18	.85	.75	.64	.53	.42	.29	.31	.24	.14	.09	.09
11	(6.2v)	1.64	1.52	1.40	1.28	1.12	.94	.84	.71	.57	.48	.34	.30	.23	.15	.08	.08
12	(6.0v)	1.57	1.53	1.39	1.29	1.13	.97	.84	.70	.60	.49	.34	.25	.17	.11	.08	.08

Figure 2

UNIFAX II Bar Chart Density Values

FIGURE 3

RESPONSE CURVE FOR UNIFAX

SER # 1409

(IMAGE CONTRAST WIPS CNUS 04 1731Z - 2131Z)

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