

# American National Standard

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FIPS PUB 85  
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Front Cover

## for optical character recognition (OCR) inks

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american national standards institute, inc.  
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**American National Standard  
for Optical Character Recognition (OCR) Inks**

Secretariat

Computer and Business Equipment Manufacturers Association

Approved May 30, 1980

American National Standards Institute, Inc

# Foreword

(This Foreword is not a part of American National Standard for Optical Character Recognition (OCR) Inks, ANSI X3.86-1980.)

Since the introduction of operational optical character recognition systems, specifications for read and nonread inks have been based on individual system requirements.

Carbon based inks have low reflectance and can be read by most optical readers. High reflectance nonread inks cannot be read by most optical readers.

A survey of the spectral sensitivity of a cross section of scanners indicated that most of them were sensitive in either the red portion or the blue portion of the visible spectrum. The particular region of the spectrum is a function of the illumination system and the photodetection system used.

It was determined that certain common pigments could be selected by the ink manufacturer — for example, one light red would meet the nonread requirements of most of the red-region scanners surveyed and one light blue would meet the requirements of most of the blue-region scanners surveyed. Thus it was apparent that two nonread colored inks would be required. It was also determined that, within each group, different optical readers may or may not respond to nonread inks, depending on their level of reflectance.

This standard defines the spectral band for read inks and provides spectrophotometric curves for the red and blue nonread inks, each at three levels of reflectance. Manufacturers and users can then determine the best tradeoff between legibility to humans and reliability of the optical reader.

The nonread inks used to generate the spectrophotometric curves contained in this standard were specifically formulated to have spectral reflectances suitable for their intended use. It is unlikely that any commercial ink will have a spectral reflectance that exactly matches the curves given. However, as long as the reflectance is greater than that specified by the curves, such inks are acceptable.

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, Inc, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Computers and Information Processing, X3. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard for submittal to ANSI, the X3 Committee had the following members:

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# American National Standard for Optical Character Recognition (OCR) Inks

## 1. Scope, Purpose, and Application

**1.1 Scope.** This standard specifies optical character recognition (OCR) inks by their spectral characteristics for different users within the OCR community. It includes definitions, test methods, and information needed to apply this standard. It does not address ink formulation.

While printing equipment varies, and each type requires specific working qualities in the inks used, the ink properties are independent of the OCR quality of the final print. Moreover, a specified OCR quality in a printed image can be achieved from dissimilar inks – for example, offset, gravure, letterpress, flexographic, typewriter ribbons, credit card carbon, and the like.

**1.2 Purpose.** The purpose of this standard is to provide data and guidelines for specifying OCR inks suitable for optical readers and for interchange of information among compatible OCR equipment.

**1.3 Applications.** Because of the widely diverse nature of OCR applications, this standard may not include all of the necessary specifications or considerations for a successful OCR system. Where new OCR equipment or a new ink is involved, consultation among users, suppliers, and manufacturers is recommended.

## 2. Definitions

**2.1 Read Inks.** Read inks are inks that, when viewed by the optical reader, reflect little light (low reflective), thus appearing black to the optical reader.

NOTE: These inks normally contain in their formula a significant amount of carbon black which is highly absorbent to light in the spectral ranges used for OCR scanning.

**2.2 Nonread Inks.** Nonread inks are highly reflective and, to the optical reader, appear to be the same color as the paper they're printed on, thus making them non-readable to the optical reader while, at the same time, they are readable by the human eye.

**2.3  $R_w$ .** The diffuse reflectance of printed ink on white OCR paper backed with a white reference (reflectance  $\geq 95\%$ ).

**2.4  $R_o$ .** The diffuse reflectance of printed ink on white OCR paper backed with a black reference (reflectance  $\leq 2\%$ ).

## 3. OCR Inks

**3.1 Read Inks.** Read inks are inks that are highly absorbing (low reflective) to light in all spectral ranges used for OCR scanning.

For reliable recognition, read inks should have a reflectance throughout the spectral region of interest of less than 18% as shown by the heavy line in Fig. 1. Read inks above this level may not be read reliably. Read inks shall not have a reflectance greater than 40%. Fig. 1 shows the relationship of read and nonread ink reflectances throughout the spectral band (400 nm to 1080 nm) and the reflectance levels that should be avoided for any ink used for OCR purposes. As in the case of nonread inks, read inks can frequently be prepared in a variety of colors, if the maximum spectral absorption of the ink is matched to the OCR equipment by the ink manufacturer. For reference purposes, the best read ink is a highly absorbent (called low reflective) and low gloss ink pigmented with carbon black. Some inks made with dyes instead of carbon will appear black to the human eye but may be marginal or invisible to scanners that are not sensitive to the spectral absorbance band of the dye used.

**3.2 Nonread Inks.** Nonread inks are used to print guidelines or instructions that appear in the OCR read area(s). They are highly reflective to the optical reader and normally will not be recognized by scanners. However, information printed with these inks shall be legible to the human eye.

This standard defines two nonread colored inks, each at three reflectance levels, by spectral curves at wave-

lengths between 400 and 1080 nanometers as listed in Table 1 on pages 9-20. This data is plotted in Figs. 2-7 as follows:

<i>Group</i>	<i>Nomenclature</i>	<i>Reference Response Curve in</i>
Blue	Standard Dark Blue	Fig. 2
	Standard Medium Blue	Fig. 3
	Standard Light Blue	Fig. 4
Red	Standard Dark Red	Fig. 5
	Standard Medium Red	Fig. 6
	Standard Light Red	Fig. 7

Note that within each of the two groups, the reflectances specified by the curves differ while the shapes of the curves are the same. Figs. 2-7 show two curves for each ink: (1) the reflectance  $R_w$  of the ink printed on 20-pound white (500 sheets, 17 in  $\times$  22 in) OCR bond paper and backed with a white reference having a reflectance value greater than or equal to 95%, and (2) the reflectance  $R_o$  of ink printed on 20-pound white (500 sheets, 17 in  $\times$  22 in) OCR bond paper and backed with a black reference having a reflectance value of less than or equal to 2%. The reflectance of the paper on which the ink was coated and the reflectance of the two backing references are also shown in Figs. 2-7. The spectrophotometer used to measure the reflectance was calibrated with a NBS Vitrolite White Glass Reflectance Standard VI-G3 whose reflectance is known to within 0.5% of absolute value.

Note that for each of the twelve curves, numeric reflectance values are given in Table 1 at 2-nanometer (nm) intervals.

The choice of one of the six ink types for use with

one or more OCR systems should be agreed upon by manufacturers and users.

Visual color matches may appear alike, but unless their spectrophotometric curves are identical, they cannot be assumed to be identical.

Various colorimetric descriptions of the spectral information in Figs. 2-7 are easily derived. Such descriptions are given in the Appendix for informational purposes only. They do not constitute a part of this standard.

#### 4. Method of Measurement

**4.1 Sample.** Test areas of at least 50 mm (approximately 2 in) in diameter shall be printed on 20-pound (500 sheets, 17 in  $\times$  22 in) OCR bond white paper with the ink to be measured.

##### 4.2 Test Conditions

**4.2.1** White backing, that is, a white nonglossy material having a reflectance greater than or equal to 95% throughout the spectral region of the test, shall be used to back the sample when measuring  $R_w$ .

**4.2.2** Black backing, that is, a black nonglossy material having a reflectance less than or equal to 2% throughout the spectral region of the test, shall be used to back the sample when measuring  $R_o$ .

**4.3 Test Instrument.** A reflectance spectrophotometer meeting the applicable requirements of American National Standard Recommended Practice for Spectrophotometry and Description of Color in CIE 1931 System, ANSI/ASTM E308-66(1973), shall be used.

Table 1 Numerical Values of Reflectance

OCR Dark Blue Ink (White Backing)

WAVE	% REF								
400.0	0.608	402.0	0.627	404.0	0.641	406.0	0.658	408.0	0.669
410.0	0.677	412.0	0.686	414.0	0.693	416.0	0.699	418.0	0.705
420.0	0.710	422.0	0.717	424.0	0.724	426.0	0.730	428.0	0.734
430.0	0.740	432.0	0.744	434.0	0.751	436.0	0.758	438.0	0.764
440.0	0.768	442.0	0.772	444.0	0.777	446.0	0.782	448.0	0.787
450.0	0.790	452.0	0.792	454.0	0.797	456.0	0.798	458.0	0.802
460.0	0.804	462.0	0.807	464.0	0.810	466.0	0.813	468.0	0.815
470.0	0.816	472.0	0.819	474.0	0.821	476.0	0.823	478.0	0.826
480.0	0.825	482.0	0.829	484.0	0.829	486.0	0.830	488.0	0.830
490.0	0.832	492.0	0.831	494.0	0.831	496.0	0.832	498.0	0.831
500.0	0.831	502.0	0.830	504.0	0.830	506.0	0.828	508.0	0.826
510.0	0.823	512.0	0.820	514.0	0.818	516.0	0.813	518.0	0.811
520.0	0.807	522.0	0.802	524.0	0.798	526.0	0.792	528.0	0.786
530.0	0.780	532.0	0.774	534.0	0.767	536.0	0.761	538.0	0.753
540.0	0.743	542.0	0.735	544.0	0.726	546.0	0.715	548.0	0.705
550.0	0.693	552.0	0.682	554.0	0.669	556.0	0.655	558.0	0.642
560.0	0.628	562.0	0.616	564.0	0.603	566.0	0.590	568.0	0.576
570.0	0.567	572.0	0.554	574.0	0.546	576.0	0.537	578.0	0.531
580.0	0.525	582.0	0.519	584.0	0.513	586.0	0.508	588.0	0.504
590.0	0.501	592.0	0.495	594.0	0.492	596.0	0.489	598.0	0.484
600.0	0.481	602.0	0.477	604.0	0.474	606.0	0.472	608.0	0.471
610.0	0.471	612.0	0.470	614.0	0.471	616.0	0.473	618.0	0.475
620.0	0.476	622.0	0.478	624.0	0.480	626.0	0.483	628.0	0.485
630.0	0.486	632.0	0.489	634.0	0.492	636.0	0.494	638.0	0.497
640.0	0.502	642.0	0.507	644.0	0.512	646.0	0.518	648.0	0.524
650.0	0.529	652.0	0.536	654.0	0.541	656.0	0.547	658.0	0.553
660.0	0.558	662.0	0.564	664.0	0.567	666.0	0.570	668.0	0.571
670.0	0.572	672.0	0.572	674.0	0.572	676.0	0.571	678.0	0.568
680.0	0.566	682.0	0.565	684.0	0.562	686.0	0.559	688.0	0.554
690.0	0.551	692.0	0.546	694.0	0.542	696.0	0.538	698.0	0.534
700.0	0.528	702.0	0.525	704.0	0.523	706.0	0.522	708.0	0.522
710.0	0.523	712.0	0.527	714.0	0.530	716.0	0.535	718.0	0.543
720.0	0.551	722.0	0.561	724.0	0.572	726.0	0.582	728.0	0.597
730.0	0.609	732.0	0.627	734.0	0.642	736.0	0.661	738.0	0.675
740.0	0.703	742.0	0.720	744.0	0.740	746.0	0.760	748.0	0.775
750.0	0.794	752.0	0.811	754.0	0.828	756.0	0.839	758.0	0.858
760.0	0.867	762.0	0.879	764.0	0.886	766.0	0.895	768.0	0.900
770.0	0.907	772.0	0.909	774.0	0.915	776.0	0.915	778.0	0.917
780.0	0.919	782.0	0.920	784.0	0.922	786.0	0.923	788.0	0.925
790.0	0.924	792.0	0.926	794.0	0.925	796.0	0.926	798.0	0.927
800.0	0.927	802.0	0.927	804.0	0.927	806.0	0.927	808.0	0.926
810.0	0.928	812.0	0.927	814.0	0.927	816.0	0.926	818.0	0.927
820.0	0.926	822.0	0.927	824.0	0.927	826.0	0.927	828.0	0.928
830.0	0.926	832.0	0.928	834.0	0.926	836.0	0.928	838.0	0.928
840.0	0.926	842.0	0.926	844.0	0.926	846.0	0.926	848.0	0.927
850.0	0.926	852.0	0.926	854.0	0.926	856.0	0.926	858.0	0.926
860.0	0.925	862.0	0.926	864.0	0.925	866.0	0.926	868.0	0.926
870.0	0.925	872.0	0.925	874.0	0.925	876.0	0.924	878.0	0.923
880.0	0.924	882.0	0.924	884.0	0.924	886.0	0.925	888.0	0.925
890.0	0.924	892.0	0.923	894.0	0.924	896.0	0.924	898.0	0.922
900.0	0.923	902.0	0.923	904.0	0.921	906.0	0.920	908.0	0.920
910.0	0.921	912.0	0.918	914.0	0.919	916.0	0.919	918.0	0.918
920.0	0.920	922.0	0.918	924.0	0.918	926.0	0.919	928.0	0.919
930.0	0.919	932.0	0.919	934.0	0.918	936.0	0.918	938.0	0.918
940.0	0.919	942.0	0.917	944.0	0.918	946.0	0.919	948.0	0.918
950.0	0.917	952.0	0.917	954.0	0.917	956.0	0.917	958.0	0.915
960.0	0.916	962.0	0.915	964.0	0.915	966.0	0.915	968.0	0.914
970.0	0.913	972.0	0.913	974.0	0.914	976.0	0.915	978.0	0.914
980.0	0.913	982.0	0.913	984.0	0.913	986.0	0.912	988.0	0.913
990.0	0.913	992.0	0.913	994.0	0.913	996.0	0.913	998.0	0.913
1000.0	0.913	1002.0	0.913	1004.0	0.912	1006.0	0.912	1008.0	0.912
1010.0	0.912	1012.0	0.911	1014.0	0.911	1016.0	0.912	1018.0	0.912
1020.0	0.911	1022.0	0.910	1024.0	0.911	1026.0	0.911	1028.0	0.910
1030.0	0.910	1032.0	0.911	1034.0	0.911	1036.0	0.912	1038.0	0.910
1040.0	0.910	1042.0	0.910	1044.0	0.911	1046.0	0.913	1048.0	0.913
1050.0	0.911	1052.0	0.911	1054.0	0.911	1056.0	0.912	1058.0	0.912
1060.0	0.912	1062.0	0.913	1064.0	0.913	1066.0	0.913	1068.0	0.913
1070.0	0.913	1072.0	0.910	1074.0	0.911	1076.0	0.911	1078.0	0.911

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Dark Blue Ink (Black Backing)

WAVE	% REF								
400.0	0.590	402.0	0.607	404.0	0.623	406.0	0.636	408.0	0.645
410.0	0.652	412.0	0.658	414.0	0.662	416.0	0.668	418.0	0.675
420.0	0.678	422.0	0.683	424.0	0.689	426.0	0.693	428.0	0.696
430.0	0.702	432.0	0.704	434.0	0.709	436.0	0.713	438.0	0.718
440.0	0.721	442.0	0.724	444.0	0.727	446.0	0.731	448.0	0.734
450.0	0.735	452.0	0.737	454.0	0.739	456.0	0.740	458.0	0.742
460.0	0.744	462.0	0.744	464.0	0.744	466.0	0.747	468.0	0.748
470.0	0.748	472.0	0.749	474.0	0.750	476.0	0.750	478.0	0.751
480.0	0.751	482.0	0.753	484.0	0.752	486.0	0.751	488.0	0.751
490.0	0.752	492.0	0.751	494.0	0.751	496.0	0.751	498.0	0.751
500.0	0.749	502.0	0.748	504.0	0.748	506.0	0.746	508.0	0.744
510.0	0.742	512.0	0.740	514.0	0.737	516.0	0.735	518.0	0.731
520.0	0.728	522.0	0.723	524.0	0.720	526.0	0.715	528.0	0.711
530.0	0.705	532.0	0.700	534.0	0.693	536.0	0.686	538.0	0.680
540.0	0.673	542.0	0.662	544.0	0.655	546.0	0.646	548.0	0.637
550.0	0.626	552.0	0.616	554.0	0.604	556.0	0.592	558.0	0.580
560.0	0.566	562.0	0.557	564.0	0.544	566.0	0.533	568.0	0.523
570.0	0.513	572.0	0.503	574.0	0.495	576.0	0.488	578.0	0.480
580.0	0.475	582.0	0.469	584.0	0.465	586.0	0.462	588.0	0.457
590.0	0.454	592.0	0.450	594.0	0.446	596.0	0.442	598.0	0.439
600.0	0.435	602.0	0.431	604.0	0.429	606.0	0.427	608.0	0.426
610.0	0.426	612.0	0.424	614.0	0.424	616.0	0.425	618.0	0.427
620.0	0.428	622.0	0.430	624.0	0.431	626.0	0.432	628.0	0.433
630.0	0.435	632.0	0.437	634.0	0.438	636.0	0.440	638.0	0.443
640.0	0.445	642.0	0.449	644.0	0.453	646.0	0.457	648.0	0.462
650.0	0.466	652.0	0.471	654.0	0.475	656.0	0.478	658.0	0.484
660.0	0.488	662.0	0.492	664.0	0.495	666.0	0.496	668.0	0.497
670.0	0.497	672.0	0.497	674.0	0.496	676.0	0.495	678.0	0.494
680.0	0.491	682.0	0.489	684.0	0.487	686.0	0.483	688.0	0.480
690.0	0.477	692.0	0.473	694.0	0.470	696.0	0.465	698.0	0.462
700.0	0.458	702.0	0.455	704.0	0.453	706.0	0.453	708.0	0.452
710.0	0.453	712.0	0.455	714.0	0.460	716.0	0.463	718.0	0.470
720.0	0.475	722.0	0.482	724.0	0.491	726.0	0.502	728.0	0.512
730.0	0.524	732.0	0.536	734.0	0.549	736.0	0.563	738.0	0.579
740.0	0.598	742.0	0.612	744.0	0.628	746.0	0.642	748.0	0.659
750.0	0.673	752.0	0.687	754.0	0.699	756.0	0.708	758.0	0.722
760.0	0.730	762.0	0.739	764.0	0.743	766.0	0.749	768.0	0.753
770.0	0.758	772.0	0.759	774.0	0.763	776.0	0.764	778.0	0.766
780.0	0.767	782.0	0.768	784.0	0.769	786.0	0.769	788.0	0.771
790.0	0.771	792.0	0.771	794.0	0.771	796.0	0.770	798.0	0.771
800.0	0.772	802.0	0.772	804.0	0.772	806.0	0.772	808.0	0.771
810.0	0.772	812.0	0.771	814.0	0.772	816.0	0.770	818.0	0.771
820.0	0.770	822.0	0.771	824.0	0.771	826.0	0.771	828.0	0.772
830.0	0.771	832.0	0.772	834.0	0.771	836.0	0.772	838.0	0.771
840.0	0.770	842.0	0.771	844.0	0.771	846.0	0.770	848.0	0.771
850.0	0.770	852.0	0.770	854.0	0.770	856.0	0.770	858.0	0.770
860.0	0.771	862.0	0.770	864.0	0.770	866.0	0.770	868.0	0.770
870.0	0.770	872.0	0.770	874.0	0.770	876.0	0.770	878.0	0.769
880.0	0.769	882.0	0.769	884.0	0.768	886.0	0.769	888.0	0.770
890.0	0.769	892.0	0.768	894.0	0.769	896.0	0.768	898.0	0.767
900.0	0.768	902.0	0.768	904.0	0.767	906.0	0.766	908.0	0.766
910.0	0.766	912.0	0.765	914.0	0.766	916.0	0.765	918.0	0.764
920.0	0.766	922.0	0.765	924.0	0.765	926.0	0.766	928.0	0.766
930.0	0.766	932.0	0.766	934.0	0.766	936.0	0.765	938.0	0.765
940.0	0.766	942.0	0.764	944.0	0.765	946.0	0.766	948.0	0.765
950.0	0.763	952.0	0.763	954.0	0.763	956.0	0.763	958.0	0.762
960.0	0.763	962.0	0.761	964.0	0.761	966.0	0.761	968.0	0.761
970.0	0.760	972.0	0.759	974.0	0.760	976.0	0.761	978.0	0.761
980.0	0.760	982.0	0.760	984.0	0.759	986.0	0.759	988.0	0.760
990.0	0.760	992.0	0.760	994.0	0.760	996.0	0.759	998.0	0.759
1000.0	0.759	1002.0	0.759	1004.0	0.759	1006.0	0.759	1008.0	0.758
1010.0	0.758	1012.0	0.757	1014.0	0.757	1016.0	0.758	1018.0	0.758
1020.0	0.757	1022.0	0.757	1024.0	0.758	1026.0	0.756	1028.0	0.755
1030.0	0.755	1032.0	0.756	1034.0	0.756	1036.0	0.756	1038.0	0.755
1040.0	0.755	1042.0	0.755	1044.0	0.756	1046.0	0.756	1048.0	0.756
1050.0	0.754	1052.0	0.754	1054.0	0.755	1056.0	0.755	1058.0	0.755
1060.0	0.755	1062.0	0.756	1064.0	0.755	1066.0	0.755	1068.0	0.755
1070.0	0.754	1072.0	0.751	1074.0	0.752	1076.0	0.752	1078.0	0.752
1080.0	0.753								

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Medium Blue Ink (White Backing)

WAVE	% REF								
400.0	0.620	402.0	0.636	404.0	0.653	406.0	0.667	408.0	0.677
410.0	0.685	412.0	0.693	414.0	0.699	416.0	0.705	418.0	0.712
420.0	0.717	422.0	0.722	424.0	0.730	426.0	0.735	428.0	0.740
430.0	0.745	432.0	0.750	434.0	0.757	436.0	0.762	438.0	0.767
440.0	0.770	442.0	0.776	444.0	0.780	446.0	0.785	448.0	0.790
450.0	0.792	452.0	0.796	454.0	0.799	456.0	0.801	458.0	0.805
460.0	0.806	462.0	0.810	464.0	0.812	466.0	0.817	468.0	0.818
470.0	0.820	472.0	0.822	474.0	0.823	476.0	0.826	478.0	0.829
480.0	0.829	482.0	0.832	484.0	0.831	486.0	0.832	488.0	0.832
490.0	0.834	492.0	0.833	494.0	0.833	496.0	0.835	498.0	0.834
500.0	0.833	502.0	0.833	504.0	0.833	506.0	0.831	508.0	0.830
510.0	0.828	512.0	0.825	514.0	0.822	516.0	0.819	518.0	0.816
520.0	0.813	522.0	0.808	524.0	0.804	526.0	0.800	528.0	0.795
530.0	0.789	532.0	0.783	534.0	0.777	536.0	0.771	538.0	0.764
540.0	0.756	542.0	0.749	544.0	0.739	546.0	0.731	548.0	0.721
550.0	0.711	552.0	0.700	554.0	0.689	556.0	0.677	558.0	0.663
560.0	0.651	562.0	0.637	564.0	0.627	566.0	0.614	568.0	0.603
570.0	0.593	572.0	0.582	574.0	0.572	576.0	0.564	578.0	0.558
580.0	0.551	582.0	0.546	584.0	0.541	586.0	0.537	588.0	0.531
590.0	0.528	592.0	0.523	594.0	0.519	596.0	0.517	598.0	0.513
600.0	0.509	602.0	0.506	604.0	0.504	606.0	0.502	608.0	0.502
610.0	0.502	612.0	0.501	614.0	0.502	616.0	0.503	618.0	0.506
620.0	0.506	622.0	0.509	624.0	0.511	626.0	0.513	628.0	0.515
630.0	0.517	632.0	0.519	634.0	0.522	636.0	0.525	638.0	0.528
640.0	0.532	642.0	0.537	644.0	0.542	646.0	0.547	648.0	0.555
650.0	0.561	652.0	0.567	654.0	0.572	656.0	0.577	658.0	0.584
660.0	0.589	662.0	0.594	664.0	0.598	666.0	0.601	668.0	0.602
670.0	0.603	672.0	0.603	674.0	0.603	676.0	0.601	678.0	0.600
680.0	0.597	682.0	0.597	684.0	0.595	686.0	0.592	688.0	0.588
690.0	0.584	692.0	0.578	694.0	0.575	696.0	0.571	698.0	0.567
700.0	0.561	702.0	0.558	704.0	0.556	706.0	0.555	708.0	0.555
710.0	0.555	712.0	0.558	714.0	0.563	716.0	0.568	718.0	0.575
720.0	0.583	722.0	0.591	724.0	0.602	726.0	0.613	728.0	0.627
730.0	0.639	732.0	0.653	734.0	0.669	736.0	0.687	738.0	0.703
740.0	0.727	742.0	0.741	744.0	0.760	746.0	0.774	748.0	0.793
750.0	0.810	752.0	0.827	754.0	0.840	756.0	0.853	758.0	0.867
760.0	0.875	762.0	0.888	764.0	0.895	766.0	0.902	768.0	0.906
770.0	0.912	772.0	0.914	774.0	0.918	776.0	0.919	778.0	0.922
780.0	0.923	782.0	0.923	784.0	0.925	786.0	0.926	788.0	0.928
790.0	0.927	792.0	0.929	794.0	0.929	796.0	0.928	798.0	0.929
800.0	0.929	802.0	0.929	804.0	0.931	806.0	0.931	808.0	0.929
810.0	0.931	812.0	0.929	814.0	0.930	816.0	0.928	818.0	0.929
820.0	0.928	822.0	0.929	824.0	0.929	826.0	0.929	828.0	0.930
830.0	0.928	832.0	0.930	834.0	0.929	836.0	0.930	838.0	0.930
840.0	0.929	842.0	0.930	844.0	0.930	846.0	0.928	848.0	0.929
850.0	0.928	852.0	0.928	854.0	0.928	856.0	0.928	858.0	0.928
860.0	0.929	862.0	0.929	864.0	0.928	866.0	0.929	868.0	0.928
870.0	0.928	872.0	0.928	874.0	0.928	876.0	0.928	878.0	0.927
880.0	0.928	882.0	0.927	884.0	0.926	886.0	0.927	888.0	0.928
890.0	0.927	892.0	0.926	894.0	0.926	896.0	0.926	898.0	0.925
900.0	0.926	902.0	0.925	904.0	0.923	906.0	0.924	908.0	0.923
910.0	0.923	912.0	0.922	914.0	0.922	916.0	0.921	918.0	0.920
920.0	0.922	922.0	0.921	924.0	0.922	926.0	0.921	928.0	0.921
930.0	0.921	932.0	0.921	934.0	0.921	936.0	0.921	938.0	0.921
940.0	0.923	942.0	0.920	944.0	0.920	946.0	0.922	948.0	0.920
950.0	0.918	952.0	0.918	954.0	0.918	956.0	0.918	958.0	0.917
960.0	0.917	962.0	0.916	964.0	0.916	966.0	0.916	968.0	0.916
970.0	0.915	972.0	0.915	974.0	0.915	976.0	0.916	978.0	0.916
980.0	0.915	982.0	0.915	984.0	0.915	986.0	0.914	988.0	0.915
990.0	0.915	992.0	0.915	994.0	0.915	996.0	0.916	998.0	0.916
1000.0	0.914	1002.0	0.915	1004.0	0.915	1006.0	0.915	1008.0	0.915
1010.0	0.915	1012.0	0.913	1014.0	0.913	1016.0	0.915	1018.0	0.914
1020.0	0.914	1022.0	0.914	1024.0	0.915	1026.0	0.913	1028.0	0.913
1030.0	0.913	1032.0	0.913	1034.0	0.913	1036.0	0.914	1038.0	0.913
1040.0	0.913	1042.0	0.913	1044.0	0.913	1046.0	0.915	1048.0	0.915
1050.0	0.913	1052.0	0.913	1054.0	0.913	1056.0	0.914	1058.0	0.914
1060.0	0.914	1062.0	0.915	1064.0	0.915	1066.0	0.915	1068.0	0.915
1070.0	0.915	1072.0	0.912	1074.0	0.913	1076.0	0.913	1078.0	0.912

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Medium Blue Ink (Black Backing)

WAVE	% REF								
400.0	0.606	402.0	0.620	404.0	0.633	406.0	0.646	408.0	0.655
410.0	0.662	412.0	0.670	414.0	0.675	416.0	0.678	418.0	0.685
420.0	0.687	422.0	0.692	424.0	0.698	426.0	0.703	428.0	0.705
430.0	0.710	432.0	0.713	434.0	0.718	436.0	0.722	438.0	0.726
440.0	0.728	442.0	0.732	444.0	0.735	446.0	0.738	448.0	0.741
450.0	0.742	452.0	0.743	454.0	0.745	456.0	0.745	458.0	0.748
460.0	0.749	462.0	0.750	464.0	0.751	466.0	0.753	468.0	0.754
470.0	0.754	472.0	0.755	474.0	0.756	476.0	0.757	478.0	0.759
480.0	0.759	482.0	0.761	484.0	0.759	486.0	0.759	488.0	0.760
490.0	0.761	492.0	0.760	494.0	0.760	496.0	0.760	498.0	0.758
500.0	0.757	502.0	0.756	504.0	0.756	506.0	0.754	508.0	0.752
510.0	0.750	512.0	0.748	514.0	0.746	516.0	0.743	518.0	0.742
520.0	0.739	522.0	0.734	524.0	0.731	526.0	0.726	528.0	0.722
530.0	0.718	532.0	0.712	534.0	0.706	536.0	0.701	538.0	0.695
540.0	0.688	542.0	0.682	544.0	0.674	546.0	0.665	548.0	0.654
550.0	0.645	552.0	0.636	554.0	0.625	556.0	0.616	558.0	0.603
560.0	0.591	562.0	0.581	564.0	0.568	566.0	0.558	568.0	0.548
570.0	0.539	572.0	0.531	574.0	0.523	576.0	0.515	578.0	0.508
580.0	0.503	582.0	0.498	584.0	0.494	586.0	0.490	588.0	0.485
590.0	0.481	592.0	0.477	594.0	0.473	596.0	0.470	598.0	0.466
600.0	0.463	602.0	0.460	604.0	0.458	606.0	0.455	608.0	0.455
610.0	0.454	612.0	0.454	614.0	0.454	616.0	0.454	618.0	0.456
620.0	0.456	622.0	0.459	624.0	0.460	626.0	0.462	628.0	0.463
630.0	0.464	632.0	0.465	634.0	0.468	636.0	0.469	638.0	0.471
640.0	0.475	642.0	0.478	644.0	0.481	646.0	0.487	648.0	0.491
650.0	0.496	652.0	0.500	654.0	0.504	656.0	0.508	658.0	0.513
660.0	0.518	662.0	0.521	664.0	0.522	666.0	0.525	668.0	0.526
670.0	0.526	672.0	0.526	674.0	0.525	676.0	0.524	678.0	0.522
680.0	0.521	682.0	0.519	684.0	0.517	686.0	0.514	688.0	0.511
690.0	0.507	692.0	0.503	694.0	0.500	696.0	0.496	698.0	0.493
700.0	0.488	702.0	0.486	704.0	0.483	706.0	0.482	708.0	0.481
710.0	0.481	712.0	0.485	714.0	0.489	716.0	0.493	718.0	0.499
720.0	0.505	722.0	0.511	724.0	0.520	726.0	0.530	728.0	0.541
730.0	0.551	732.0	0.562	734.0	0.576	736.0	0.587	738.0	0.604
740.0	0.621	742.0	0.633	744.0	0.648	746.0	0.664	748.0	0.677
750.0	0.690	752.0	0.702	754.0	0.714	756.0	0.724	758.0	0.736
760.0	0.741	762.0	0.750	764.0	0.755	766.0	0.761	768.0	0.763
770.0	0.768	772.0	0.768	774.0	0.772	776.0	0.772	778.0	0.774
780.0	0.775	782.0	0.775	784.0	0.777	786.0	0.777	788.0	0.779
790.0	0.778	792.0	0.779	794.0	0.779	796.0	0.779	798.0	0.779
800.0	0.780	802.0	0.780	804.0	0.780	806.0	0.780	808.0	0.779
810.0	0.780	812.0	0.779	814.0	0.779	816.0	0.778	818.0	0.779
820.0	0.778	822.0	0.779	824.0	0.779	826.0	0.779	828.0	0.780
830.0	0.778	832.0	0.780	834.0	0.777	836.0	0.779	838.0	0.778
840.0	0.777	842.0	0.778	844.0	0.778	846.0	0.778	848.0	0.778
850.0	0.778	852.0	0.778	854.0	0.778	856.0	0.778	858.0	0.777
860.0	0.777	862.0	0.778	864.0	0.777	866.0	0.778	868.0	0.778
870.0	0.776	872.0	0.776	874.0	0.776	876.0	0.776	878.0	0.775
880.0	0.776	882.0	0.776	884.0	0.776	886.0	0.776	888.0	0.777
890.0	0.777	892.0	0.775	894.0	0.776	896.0	0.776	898.0	0.775
900.0	0.776	902.0	0.776	904.0	0.773	906.0	0.774	908.0	0.773
910.0	0.774	912.0	0.773	914.0	0.773	916.0	0.773	918.0	0.771
920.0	0.773	922.0	0.772	924.0	0.773	926.0	0.773	928.0	0.773
930.0	0.773	932.0	0.772	934.0	0.772	936.0	0.772	938.0	0.772
940.0	0.773	942.0	0.771	944.0	0.772	946.0	0.773	948.0	0.772
950.0	0.771	952.0	0.770	954.0	0.770	956.0	0.770	958.0	0.770
960.0	0.771	962.0	0.770	964.0	0.769	966.0	0.769	968.0	0.769
970.0	0.768	972.0	0.768	974.0	0.769	976.0	0.769	978.0	0.769
980.0	0.768	982.0	0.768	984.0	0.768	986.0	0.768	988.0	0.769
990.0	0.768	992.0	0.768	994.0	0.768	996.0	0.768	998.0	0.768
1000.0	0.768	1002.0	0.768	1004.0	0.767	1006.0	0.767	1008.0	0.767
1010.0	0.767	1012.0	0.766	1014.0	0.766	1016.0	0.767	1018.0	0.766
1020.0	0.765	1022.0	0.765	1024.0	0.766	1026.0	0.765	1028.0	0.764
1030.0	0.764	1032.0	0.764	1034.0	0.764	1036.0	0.765	1038.0	0.764
1040.0	0.763	1042.0	0.763	1044.0	0.763	1046.0	0.765	1048.0	0.765
1050.0	0.763	1052.0	0.763	1054.0	0.763	1056.0	0.764	1058.0	0.764
1060.0	0.763	1062.0	0.764	1064.0	0.764	1066.0	0.764	1068.0	0.764
1070.0	0.764	1072.0	0.761	1074.0	0.762	1076.0	0.762	1078.0	0.761

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Light Blue Ink (White Backing)

WAVE	% REF								
400.0	0.626	402.0	0.641	404.0	0.656	406.0	0.669	408.0	0.678
410.0	0.686	412.0	0.694	414.0	0.700	416.0	0.705	418.0	0.712
420.0	0.717	422.0	0.724	424.0	0.730	426.0	0.735	428.0	0.740
430.0	0.745	432.0	0.749	434.0	0.756	436.0	0.761	438.0	0.766
440.0	0.769	442.0	0.774	444.0	0.778	446.0	0.783	448.0	0.788
450.0	0.791	452.0	0.793	454.0	0.797	456.0	0.799	458.0	0.803
460.0	0.804	462.0	0.807	464.0	0.810	466.0	0.813	468.0	0.816
470.0	0.817	472.0	0.820	474.0	0.822	476.0	0.824	478.0	0.828
480.0	0.828	482.0	0.831	484.0	0.830	486.0	0.831	488.0	0.832
490.0	0.834	492.0	0.833	494.0	0.833	496.0	0.836	498.0	0.835
500.0	0.835	502.0	0.833	504.0	0.834	506.0	0.831	508.0	0.831
510.0	0.829	512.0	0.828	514.0	0.825	516.0	0.822	518.0	0.820
520.0	0.818	522.0	0.813	524.0	0.809	526.0	0.804	528.0	0.801
530.0	0.797	532.0	0.791	534.0	0.786	536.0	0.779	538.0	0.773
540.0	0.767	542.0	0.761	544.0	0.753	546.0	0.745	548.0	0.736
550.0	0.726	552.0	0.716	554.0	0.707	556.0	0.697	558.0	0.685
560.0	0.673	562.0	0.661	564.0	0.650	566.0	0.639	568.0	0.628
570.0	0.620	572.0	0.609	574.0	0.603	576.0	0.594	578.0	0.586
580.0	0.580	582.0	0.574	584.0	0.571	586.0	0.567	588.0	0.562
590.0	0.559	592.0	0.554	594.0	0.550	596.0	0.547	598.0	0.543
600.0	0.540	602.0	0.536	604.0	0.533	606.0	0.532	608.0	0.531
610.0	0.531	612.0	0.531	614.0	0.532	616.0	0.533	618.0	0.535
620.0	0.537	622.0	0.539	624.0	0.541	626.0	0.544	628.0	0.546
630.0	0.547	632.0	0.549	634.0	0.552	636.0	0.555	638.0	0.559
640.0	0.562	642.0	0.568	644.0	0.573	646.0	0.577	648.0	0.584
650.0	0.590	652.0	0.597	654.0	0.603	656.0	0.608	658.0	0.615
660.0	0.620	662.0	0.624	664.0	0.628	666.0	0.630	668.0	0.631
670.0	0.632	672.0	0.632	674.0	0.632	676.0	0.631	678.0	0.630
680.0	0.629	682.0	0.628	684.0	0.626	686.0	0.622	688.0	0.619
690.0	0.615	692.0	0.610	694.0	0.606	696.0	0.602	698.0	0.599
700.0	0.594	702.0	0.591	704.0	0.588	706.0	0.587	708.0	0.587
710.0	0.588	712.0	0.590	714.0	0.596	716.0	0.601	718.0	0.609
720.0	0.615	722.0	0.624	724.0	0.632	726.0	0.643	728.0	0.657
730.0	0.670	732.0	0.684	734.0	0.697	736.0	0.710	738.0	0.728
740.0	0.747	742.0	0.761	744.0	0.778	746.0	0.793	748.0	0.809
750.0	0.823	752.0	0.836	754.0	0.849	756.0	0.859	758.0	0.872
760.0	0.881	762.0	0.890	764.0	0.895	766.0	0.902	768.0	0.905
770.0	0.910	772.0	0.911	774.0	0.916	776.0	0.916	778.0	0.917
780.0	0.918	782.0	0.920	784.0	0.920	786.0	0.922	788.0	0.923
790.0	0.923	792.0	0.924	794.0	0.924	796.0	0.924	798.0	0.924
800.0	0.925	802.0	0.925	804.0	0.925	806.0	0.925	808.0	0.923
810.0	0.925	812.0	0.924	814.0	0.924	816.0	0.923	818.0	0.924
820.0	0.923	822.0	0.924	824.0	0.924	826.0	0.924	828.0	0.924
830.0	0.923	832.0	0.925	834.0	0.923	836.0	0.925	838.0	0.924
840.0	0.923	842.0	0.924	844.0	0.924	846.0	0.924	848.0	0.924
850.0	0.924	852.0	0.924	854.0	0.924	856.0	0.923	858.0	0.923
860.0	0.923	862.0	0.924	864.0	0.923	866.0	0.924	868.0	0.923
870.0	0.922	872.0	0.922	874.0	0.922	876.0	0.922	878.0	0.921
880.0	0.922	882.0	0.922	884.0	0.921	886.0	0.921	888.0	0.922
890.0	0.922	892.0	0.921	894.0	0.922	896.0	0.921	898.0	0.920
900.0	0.920	902.0	0.920	904.0	0.918	906.0	0.918	908.0	0.917
910.0	0.918	912.0	0.916	914.0	0.917	916.0	0.917	918.0	0.916
920.0	0.918	922.0	0.917	924.0	0.917	926.0	0.917	928.0	0.917
930.0	0.917	932.0	0.917	934.0	0.917	936.0	0.917	938.0	0.917
940.0	0.918	942.0	0.916	944.0	0.917	946.0	0.918	948.0	0.916
950.0	0.914	952.0	0.915	954.0	0.915	956.0	0.914	958.0	0.913
960.0	0.914	962.0	0.912	964.0	0.912	966.0	0.912	968.0	0.912
970.0	0.911	972.0	0.910	974.0	0.911	976.0	0.911	978.0	0.911
980.0	0.910	982.0	0.910	984.0	0.910	986.0	0.910	988.0	0.910
990.0	0.910	992.0	0.910	994.0	0.910	996.0	0.910	998.0	0.909
1000.0	0.909	1002.0	0.909	1004.0	0.909	1006.0	0.909	1008.0	0.909
1010.0	0.909	1012.0	0.908	1014.0	0.908	1016.0	0.909	1018.0	0.909
1020.0	0.908	1022.0	0.908	1024.0	0.909	1026.0	0.908	1028.0	0.907
1030.0	0.907	1032.0	0.908	1034.0	0.908	1036.0	0.908	1038.0	0.907
1040.0	0.907	1042.0	0.908	1044.0	0.908	1046.0	0.910	1048.0	0.909
1050.0	0.907	1052.0	0.907	1054.0	0.908	1056.0	0.908	1058.0	0.908
1060.0	0.908	1062.0	0.910	1064.0	0.910	1066.0	0.910	1068.0	0.910
1070.0	0.910	1072.0	0.906	1074.0	0.907	1076.0	0.907	1078.0	0.907

UNIT OF WAVELENGTH NANOMETER

Table 1 (Continued)

## OCR Light Blue Ink (Black Backing)

WAVE	% REF								
400.0	0.608	402.0	0.623	404.0	0.636	406.0	0.647	408.0	0.655
410.0	0.662	412.0	0.668	414.0	0.673	416.0	0.677	418.0	0.681
420.0	0.685	422.0	0.690	424.0	0.696	426.0	0.699	428.0	0.702
430.0	0.706	432.0	0.708	434.0	0.713	436.0	0.717	438.0	0.722
440.0	0.724	442.0	0.727	444.0	0.731	446.0	0.733	448.0	0.735
450.0	0.736	452.0	0.738	454.0	0.740	456.0	0.741	458.0	0.743
460.0	0.743	462.0	0.745	464.0	0.747	466.0	0.749	468.0	0.749
470.0	0.750	472.0	0.751	474.0	0.751	476.0	0.752	478.0	0.754
480.0	0.753	482.0	0.756	484.0	0.755	486.0	0.754	488.0	0.755
490.0	0.756	492.0	0.756	494.0	0.755	496.0	0.756	498.0	0.754
500.0	0.754	502.0	0.753	504.0	0.752	506.0	0.750	508.0	0.749
510.0	0.747	512.0	0.745	514.0	0.742	516.0	0.741	518.0	0.739
520.0	0.737	522.0	0.733	524.0	0.730	526.0	0.726	528.0	0.723
530.0	0.719	532.0	0.713	534.0	0.709	536.0	0.703	538.0	0.700
540.0	0.693	542.0	0.687	544.0	0.680	546.0	0.673	548.0	0.665
550.0	0.655	552.0	0.646	554.0	0.638	556.0	0.627	558.0	0.616
560.0	0.608	562.0	0.598	564.0	0.586	566.0	0.577	568.0	0.568
570.0	0.558	572.0	0.549	574.0	0.543	576.0	0.536	578.0	0.529
580.0	0.524	582.0	0.519	584.0	0.515	586.0	0.512	588.0	0.507
590.0	0.505	592.0	0.501	594.0	0.497	596.0	0.492	598.0	0.490
600.0	0.487	602.0	0.484	604.0	0.481	606.0	0.480	608.0	0.478
610.0	0.478	612.0	0.477	614.0	0.478	616.0	0.478	618.0	0.479
620.0	0.480	622.0	0.482	624.0	0.483	626.0	0.484	628.0	0.486
630.0	0.486	632.0	0.489	634.0	0.492	636.0	0.493	638.0	0.495
640.0	0.498	642.0	0.501	644.0	0.504	646.0	0.510	648.0	0.513
650.0	0.518	652.0	0.522	654.0	0.526	656.0	0.530	658.0	0.535
660.0	0.539	662.0	0.542	664.0	0.545	666.0	0.546	668.0	0.547
670.0	0.547	672.0	0.547	674.0	0.547	676.0	0.545	678.0	0.543
680.0	0.541	682.0	0.540	684.0	0.538	686.0	0.535	688.0	0.533
690.0	0.530	692.0	0.525	694.0	0.521	696.0	0.517	698.0	0.516
700.0	0.512	702.0	0.508	704.0	0.508	706.0	0.507	708.0	0.505
710.0	0.506	712.0	0.509	714.0	0.512	716.0	0.516	718.0	0.522
720.0	0.528	722.0	0.535	724.0	0.542	726.0	0.550	728.0	0.561
730.0	0.571	732.0	0.583	734.0	0.596	736.0	0.607	738.0	0.619
740.0	0.636	742.0	0.646	744.0	0.661	746.0	0.672	748.0	0.685
750.0	0.696	752.0	0.707	754.0	0.718	756.0	0.725	758.0	0.735
760.0	0.740	762.0	0.747	764.0	0.751	766.0	0.757	768.0	0.758
770.0	0.762	772.0	0.763	774.0	0.767	776.0	0.767	778.0	0.768
780.0	0.768	782.0	0.769	784.0	0.769	786.0	0.770	788.0	0.771
790.0	0.771	792.0	0.771	794.0	0.771	796.0	0.770	798.0	0.772
800.0	0.772	802.0	0.772	804.0	0.772	806.0	0.772	808.0	0.771
810.0	0.772	812.0	0.771	814.0	0.772	816.0	0.770	818.0	0.771
820.0	0.770	822.0	0.771	824.0	0.771	826.0	0.771	828.0	0.772
830.0	0.771	832.0	0.772	834.0	0.770	836.0	0.771	838.0	0.771
840.0	0.770	842.0	0.771	844.0	0.771	846.0	0.770	848.0	0.771
850.0	0.770	852.0	0.770	854.0	0.770	856.0	0.770	858.0	0.769
860.0	0.769	862.0	0.770	864.0	0.770	866.0	0.770	868.0	0.770
870.0	0.770	872.0	0.770	874.0	0.770	876.0	0.769	878.0	0.768
880.0	0.769	882.0	0.769	884.0	0.768	886.0	0.769	888.0	0.770
890.0	0.769	892.0	0.768	894.0	0.768	896.0	0.768	898.0	0.767
900.0	0.768	902.0	0.768	904.0	0.767	906.0	0.766	908.0	0.766
910.0	0.766	912.0	0.765	914.0	0.766	916.0	0.766	918.0	0.765
920.0	0.766	922.0	0.765	924.0	0.765	926.0	0.766	928.0	0.766
930.0	0.766	932.0	0.766	934.0	0.765	936.0	0.765	938.0	0.765
940.0	0.766	942.0	0.764	944.0	0.765	946.0	0.766	948.0	0.765
950.0	0.762	952.0	0.763	954.0	0.763	956.0	0.763	958.0	0.762
960.0	0.763	962.0	0.761	964.0	0.761	966.0	0.761	968.0	0.761
970.0	0.760	972.0	0.759	974.0	0.760	976.0	0.761	978.0	0.761
980.0	0.760	982.0	0.759	984.0	0.759	986.0	0.759	988.0	0.760
990.0	0.760	992.0	0.760	994.0	0.759	996.0	0.759	998.0	0.759
1000.0	0.759	1002.0	0.759	1004.0	0.759	1006.0	0.758	1008.0	0.758
1010.0	0.758	1012.0	0.757	1014.0	0.757	1016.0	0.758	1018.0	0.758
1020.0	0.757	1022.0	0.756	1024.0	0.757	1026.0	0.756	1028.0	0.755
1030.0	0.755	1032.0	0.756	1034.0	0.756	1036.0	0.756	1038.0	0.755
1040.0	0.755	1042.0	0.755	1044.0	0.756	1046.0	0.757	1048.0	0.756
1050.0	0.754	1052.0	0.754	1054.0	0.755	1056.0	0.755	1058.0	0.755
1060.0	0.755	1062.0	0.756	1064.0	0.756	1066.0	0.755	1068.0	0.755
1070.0	0.755	1072.0	0.752	1074.0	0.753	1076.0	0.753	1078.0	0.753

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Dark Red Ink (White Backing)

WAVE	X REF								
400.0	0.147	402.0	0.146	404.0	0.146	406.0	0.146	408.0	0.146
410.0	0.144	412.0	0.144	414.0	0.144	416.0	0.144	418.0	0.144
420.0	0.144	422.0	0.143	424.0	0.143	426.0	0.143	428.0	0.143
430.0	0.143	432.0	0.143	434.0	0.142	436.0	0.142	438.0	0.141
440.0	0.140	442.0	0.138	444.0	0.137	446.0	0.135	448.0	0.134
450.0	0.131	452.0	0.128	454.0	0.125	456.0	0.123	458.0	0.119
460.0	0.117	462.0	0.115	464.0	0.112	466.0	0.110	468.0	0.107
470.0	0.106	472.0	0.104	474.0	0.103	476.0	0.103	478.0	0.102
480.0	0.100	482.0	0.101	484.0	0.100	486.0	0.100	488.0	0.100
490.0	0.101	492.0	0.100	494.0	0.102	496.0	0.103	498.0	0.103
500.0	0.104	502.0	0.104	504.0	0.106	506.0	0.106	508.0	0.108
510.0	0.109	512.0	0.110	514.0	0.111	516.0	0.112	518.0	0.112
520.0	0.113	522.0	0.115	524.0	0.116	526.0	0.117	528.0	0.117
530.0	0.118	532.0	0.120	534.0	0.122	536.0	0.123	538.0	0.124
540.0	0.126	542.0	0.127	544.0	0.131	546.0	0.133	548.0	0.136
550.0	0.140	552.0	0.144	554.0	0.150	556.0	0.156	558.0	0.163
560.0	0.172	562.0	0.183	564.0	0.196	566.0	0.211	568.0	0.232
570.0	0.254	572.0	0.280	574.0	0.309	576.0	0.340	578.0	0.376
580.0	0.412	582.0	0.456	584.0	0.496	586.0	0.538	588.0	0.580
590.0	0.618	592.0	0.654	594.0	0.686	596.0	0.717	598.0	0.742
600.0	0.764	602.0	0.783	604.0	0.799	606.0	0.811	608.0	0.822
610.0	0.833	612.0	0.840	614.0	0.850	616.0	0.855	618.0	0.861
620.0	0.865	622.0	0.871	624.0	0.875	626.0	0.880	628.0	0.883
630.0	0.887	632.0	0.890	634.0	0.894	636.0	0.897	638.0	0.900
640.0	0.902	642.0	0.906	644.0	0.908	646.0	0.911	648.0	0.915
650.0	0.917	652.0	0.919	654.0	0.920	656.0	0.923	658.0	0.927
660.0	0.928	662.0	0.931	664.0	0.933	666.0	0.935	668.0	0.937
670.0	0.938	672.0	0.940	674.0	0.941	676.0	0.942	678.0	0.942
680.0	0.945	682.0	0.946	684.0	0.948	686.0	0.947	688.0	0.948
690.0	0.948	692.0	0.947	694.0	0.948	696.0	0.949	698.0	0.951
700.0	0.950	702.0	0.951	704.0	0.952	706.0	0.953	708.0	0.953
710.0	0.953	712.0	0.953	714.0	0.953	716.0	0.952	718.0	0.954
720.0	0.953	722.0	0.952	724.0	0.953	726.0	0.952	728.0	0.952
730.0	0.952	732.0	0.952	734.0	0.952	736.0	0.951	738.0	0.952
740.0	0.952	742.0	0.950	744.0	0.951	746.0	0.950	748.0	0.950
750.0	0.950	752.0	0.951	754.0	0.951	756.0	0.949	758.0	0.951
760.0	0.951	762.0	0.953	764.0	0.951	766.0	0.953	768.0	0.950
770.0	0.953	772.0	0.951	774.0	0.953	776.0	0.951	778.0	0.952
780.0	0.952	782.0	0.951	784.0	0.952	786.0	0.952	788.0	0.953
790.0	0.951	792.0	0.952	794.0	0.951	796.0	0.951	798.0	0.951
800.0	0.952	802.0	0.952	804.0	0.952	806.0	0.952	808.0	0.950
810.0	0.952	812.0	0.951	814.0	0.950	816.0	0.948	818.0	0.950
820.0	0.949	822.0	0.950	824.0	0.950	826.0	0.950	828.0	0.950
830.0	0.949	832.0	0.950	834.0	0.949	836.0	0.949	838.0	0.949
840.0	0.948	842.0	0.949	844.0	0.949	846.0	0.949	848.0	0.949
850.0	0.949	852.0	0.949	854.0	0.948	856.0	0.948	858.0	0.948
860.0	0.948	862.0	0.948	864.0	0.948	866.0	0.949	868.0	0.948
870.0	0.948	872.0	0.947	874.0	0.947	876.0	0.947	878.0	0.946
880.0	0.947	882.0	0.947	884.0	0.946	886.0	0.947	888.0	0.948
890.0	0.948	892.0	0.947	894.0	0.948	896.0	0.948	898.0	0.946
900.0	0.947	902.0	0.947	904.0	0.945	906.0	0.945	908.0	0.945
910.0	0.945	912.0	0.943	914.0	0.944	916.0	0.944	918.0	0.942
920.0	0.945	922.0	0.943	924.0	0.943	926.0	0.944	928.0	0.944
930.0	0.944	932.0	0.943	934.0	0.943	936.0	0.943	938.0	0.943
940.0	0.944	942.0	0.942	944.0	0.942	946.0	0.943	948.0	0.942
950.0	0.940	952.0	0.941	954.0	0.940	956.0	0.940	958.0	0.939
960.0	0.940	962.0	0.938	964.0	0.938	966.0	0.938	968.0	0.936
970.0	0.935	972.0	0.935	974.0	0.937	976.0	0.937	978.0	0.937
980.0	0.936	982.0	0.936	984.0	0.936	986.0	0.934	988.0	0.936
990.0	0.936	992.0	0.936	994.0	0.936	996.0	0.936	998.0	0.935
1000.0	0.935	1002.0	0.935	1004.0	0.935	1006.0	0.935	1008.0	0.935
1010.0	0.935	1012.0	0.934	1014.0	0.934	1016.0	0.935	1018.0	0.935
1020.0	0.934	1022.0	0.934	1024.0	0.935	1026.0	0.934	1028.0	0.933
1030.0	0.933	1032.0	0.933	1034.0	0.933	1036.0	0.933	1038.0	0.933
1040.0	0.933	1042.0	0.933	1044.0	0.933	1046.0	0.935	1048.0	0.935
1050.0	0.933	1052.0	0.933	1054.0	0.933	1056.0	0.934	1058.0	0.934
1060.0	0.934	1062.0	0.935	1064.0	0.935	1066.0	0.935	1068.0	0.935
1070.0	0.935	1072.0	0.932	1074.0	0.933	1076.0	0.933	1078.0	0.933
1080.0	0.934								

UNIT OF WAVELENGTH NANOMETER

Table 1 (Continued)

## OCR Dark Red Ink (Black Backing)

WAVE	% REF								
400.0	0.145	402.0	0.144	404.0	0.143	406.0	0.142	408.0	0.142
410.0	0.142	412.0	0.141	414.0	0.141	416.0	0.141	418.0	0.140
420.0	0.139	422.0	0.139	424.0	0.140	426.0	0.140	428.0	0.138
430.0	0.138	432.0	0.138	434.0	0.137	436.0	0.137	438.0	0.136
440.0	0.134	442.0	0.133	444.0	0.132	446.0	0.130	448.0	0.128
450.0	0.126	452.0	0.123	454.0	0.120	456.0	0.117	458.0	0.115
460.0	0.112	462.0	0.110	464.0	0.107	466.0	0.105	468.0	0.103
470.0	0.102	472.0	0.100	474.0	0.099	476.0	0.098	478.0	0.097
480.0	0.097	482.0	0.097	484.0	0.096	486.0	0.096	488.0	0.097
490.0	0.097	492.0	0.097	494.0	0.098	496.0	0.098	498.0	0.099
500.0	0.100	502.0	0.102	504.0	0.103	506.0	0.103	508.0	0.104
510.0	0.105	512.0	0.106	514.0	0.107	516.0	0.109	518.0	0.109
520.0	0.110	522.0	0.111	524.0	0.112	526.0	0.113	528.0	0.115
530.0	0.115	532.0	0.116	534.0	0.117	536.0	0.119	538.0	0.120
540.0	0.123	542.0	0.124	544.0	0.126	546.0	0.129	548.0	0.132
550.0	0.136	552.0	0.139	554.0	0.144	556.0	0.150	558.0	0.157
560.0	0.165	562.0	0.174	564.0	0.186	566.0	0.200	568.0	0.219
570.0	0.239	572.0	0.262	574.0	0.289	576.0	0.317	578.0	0.349
580.0	0.381	582.0	0.418	584.0	0.452	586.0	0.489	588.0	0.525
590.0	0.558	592.0	0.589	594.0	0.614	596.0	0.640	598.0	0.663
600.0	0.682	602.0	0.697	604.0	0.708	606.0	0.721	608.0	0.728
610.0	0.736	612.0	0.742	614.0	0.748	616.0	0.752	618.0	0.757
620.0	0.759	622.0	0.763	624.0	0.765	626.0	0.768	628.0	0.770
630.0	0.770	632.0	0.772	634.0	0.775	636.0	0.775	638.0	0.776
640.0	0.777	642.0	0.780	644.0	0.780	646.0	0.781	648.0	0.783
650.0	0.784	652.0	0.785	654.0	0.785	656.0	0.786	658.0	0.786
660.0	0.788	662.0	0.789	664.0	0.790	666.0	0.790	668.0	0.791
670.0	0.791	672.0	0.792	674.0	0.792	676.0	0.793	678.0	0.793
680.0	0.793	682.0	0.793	684.0	0.794	686.0	0.794	688.0	0.794
690.0	0.794	692.0	0.793	694.0	0.794	696.0	0.794	698.0	0.795
700.0	0.794	702.0	0.794	704.0	0.795	706.0	0.796	708.0	0.795
710.0	0.795	712.0	0.795	714.0	0.795	716.0	0.794	718.0	0.795
720.0	0.794	722.0	0.793	724.0	0.793	726.0	0.792	728.0	0.792
730.0	0.792	732.0	0.792	734.0	0.793	736.0	0.792	738.0	0.791
740.0	0.795	742.0	0.793	744.0	0.794	746.0	0.793	748.0	0.794
750.0	0.794	752.0	0.795	754.0	0.795	756.0	0.792	758.0	0.794
760.0	0.792	762.0	0.794	764.0	0.792	766.0	0.794	768.0	0.792
770.0	0.794	772.0	0.792	774.0	0.794	776.0	0.793	778.0	0.794
780.0	0.793	782.0	0.793	784.0	0.792	786.0	0.792	788.0	0.793
790.0	0.792	792.0	0.793	794.0	0.792	796.0	0.792	798.0	0.793
800.0	0.793	802.0	0.793	804.0	0.793	806.0	0.792	808.0	0.791
810.0	0.792	812.0	0.791	814.0	0.791	816.0	0.790	818.0	0.791
820.0	0.790	822.0	0.791	824.0	0.791	826.0	0.791	828.0	0.790
830.0	0.789	832.0	0.791	834.0	0.789	836.0	0.791	838.0	0.790
840.0	0.789	842.0	0.790	844.0	0.790	846.0	0.790	848.0	0.789
850.0	0.789	852.0	0.789	854.0	0.789	856.0	0.789	858.0	0.789
860.0	0.789	862.0	0.788	864.0	0.788	866.0	0.789	868.0	0.789
870.0	0.788	872.0	0.788	874.0	0.788	876.0	0.788	878.0	0.786
880.0	0.787	882.0	0.787	884.0	0.787	886.0	0.787	888.0	0.788
890.0	0.788	892.0	0.787	894.0	0.787	896.0	0.787	898.0	0.786
900.0	0.787	902.0	0.787	904.0	0.784	906.0	0.784	908.0	0.784
910.0	0.785	912.0	0.784	914.0	0.783	916.0	0.783	918.0	0.782
920.0	0.784	922.0	0.783	924.0	0.784	926.0	0.784	928.0	0.784
930.0	0.784	932.0	0.783	934.0	0.783	936.0	0.783	938.0	0.783
940.0	0.784	942.0	0.782	944.0	0.783	946.0	0.783	948.0	0.782
950.0	0.781	952.0	0.781	954.0	0.781	956.0	0.781	958.0	0.779
960.0	0.780	962.0	0.779	964.0	0.779	966.0	0.778	968.0	0.778
970.0	0.777	972.0	0.777	974.0	0.779	976.0	0.778	978.0	0.778
980.0	0.778	982.0	0.778	984.0	0.778	986.0	0.776	988.0	0.777
990.0	0.777	992.0	0.777	994.0	0.777	996.0	0.778	998.0	0.776
1000.0	0.776	1002.0	0.777	1004.0	0.777	1006.0	0.777	1008.0	0.777
1010.0	0.777	1012.0	0.776	1014.0	0.774	1016.0	0.775	1018.0	0.775
1020.0	0.775	1022.0	0.775	1024.0	0.776	1026.0	0.775	1028.0	0.774
1030.0	0.774	1032.0	0.774	1034.0	0.773	1036.0	0.774	1038.0	0.773
1040.0	0.773	1042.0	0.773	1044.0	0.773	1046.0	0.775	1048.0	0.775
1050.0	0.773	1052.0	0.773	1054.0	0.773	1056.0	0.774	1058.0	0.774
1060.0	0.774	1062.0	0.775	1064.0	0.775	1066.0	0.774	1068.0	0.774
1070.0	0.774	1072.0	0.771	1074.0	0.772	1076.0	0.772	1078.0	0.772
1080.0	0.773								

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Medium Red Ink (White Backing)

WAVE	% REF								
400.0	0.450	402.0	0.451	404.0	0.453	406.0	0.455	408.0	0.457
410.0	0.459	412.0	0.462	414.0	0.462	416.0	0.465	418.0	0.468
420.0	0.469	422.0	0.471	424.0	0.474	426.0	0.476	428.0	0.478
430.0	0.480	432.0	0.481	434.0	0.483	436.0	0.484	438.0	0.485
440.0	0.484	442.0	0.485	444.0	0.484	446.0	0.483	448.0	0.481
450.0	0.477	452.0	0.472	454.0	0.468	456.0	0.461	458.0	0.457
460.0	0.450	462.0	0.445	464.0	0.438	466.0	0.432	468.0	0.427
470.0	0.419	472.0	0.412	474.0	0.408	476.0	0.402	478.0	0.396
480.0	0.390	482.0	0.385	484.0	0.379	486.0	0.374	488.0	0.370
490.0	0.365	492.0	0.361	494.0	0.357	496.0	0.356	498.0	0.353
500.0	0.352	502.0	0.351	504.0	0.351	506.0	0.349	508.0	0.350
510.0	0.350	512.0	0.352	514.0	0.352	516.0	0.353	518.0	0.354
520.0	0.354	522.0	0.355	524.0	0.357	526.0	0.358	528.0	0.358
530.0	0.359	532.0	0.360	534.0	0.363	536.0	0.365	538.0	0.367
540.0	0.371	542.0	0.376	544.0	0.380	546.0	0.386	548.0	0.396
550.0	0.406	552.0	0.416	554.0	0.430	556.0	0.447	558.0	0.465
560.0	0.488	562.0	0.510	564.0	0.538	566.0	0.563	568.0	0.591
570.0	0.623	572.0	0.652	574.0	0.682	576.0	0.708	578.0	0.734
580.0	0.756	582.0	0.776	584.0	0.794	586.0	0.808	588.0	0.821
590.0	0.831	592.0	0.838	594.0	0.844	596.0	0.849	598.0	0.854
600.0	0.858	602.0	0.860	604.0	0.863	606.0	0.866	608.0	0.868
610.0	0.872	612.0	0.873	614.0	0.877	616.0	0.879	618.0	0.882
620.0	0.883	622.0	0.887	624.0	0.889	626.0	0.890	628.0	0.892
630.0	0.894	632.0	0.897	634.0	0.899	636.0	0.901	638.0	0.904
640.0	0.907	642.0	0.911	644.0	0.912	646.0	0.915	648.0	0.919
650.0	0.920	652.0	0.922	654.0	0.923	656.0	0.925	658.0	0.929
660.0	0.932	662.0	0.934	664.0	0.936	666.0	0.937	668.0	0.940
670.0	0.942	672.0	0.943	674.0	0.944	676.0	0.945	678.0	0.946
680.0	0.947	682.0	0.948	684.0	0.948	686.0	0.948	688.0	0.950
690.0	0.951	692.0	0.950	694.0	0.951	696.0	0.952	698.0	0.953
700.0	0.952	702.0	0.952	704.0	0.954	706.0	0.955	708.0	0.954
710.0	0.954	712.0	0.954	714.0	0.954	716.0	0.954	718.0	0.956
720.0	0.954	722.0	0.953	724.0	0.955	726.0	0.955	728.0	0.955
730.0	0.955	732.0	0.954	734.0	0.955	736.0	0.954	738.0	0.953
740.0	0.954	742.0	0.952	744.0	0.953	746.0	0.952	748.0	0.953
750.0	0.952	752.0	0.953	754.0	0.953	756.0	0.951	758.0	0.954
760.0	0.952	762.0	0.954	764.0	0.952	766.0	0.954	768.0	0.952
770.0	0.954	772.0	0.952	774.0	0.954	776.0	0.952	778.0	0.954
780.0	0.953	782.0	0.953	784.0	0.953	786.0	0.953	788.0	0.954
790.0	0.953	792.0	0.954	794.0	0.953	796.0	0.952	798.0	0.952
800.0	0.953	802.0	0.953	804.0	0.953	806.0	0.953	808.0	0.952
810.0	0.953	812.0	0.952	814.0	0.952	816.0	0.951	818.0	0.951
820.0	0.950	822.0	0.951	824.0	0.951	826.0	0.951	828.0	0.951
830.0	0.950	832.0	0.952	834.0	0.949	836.0	0.951	838.0	0.950
840.0	0.949	842.0	0.950	844.0	0.950	846.0	0.950	848.0	0.950
850.0	0.950	852.0	0.949	854.0	0.949	856.0	0.949	858.0	0.949
860.0	0.949	862.0	0.949	864.0	0.948	866.0	0.949	868.0	0.948
870.0	0.948	872.0	0.948	874.0	0.948	876.0	0.948	878.0	0.947
880.0	0.948	882.0	0.948	884.0	0.946	886.0	0.947	888.0	0.948
890.0	0.948	892.0	0.947	894.0	0.948	896.0	0.948	898.0	0.947
900.0	0.947	902.0	0.947	904.0	0.945	906.0	0.945	908.0	0.945
910.0	0.946	912.0	0.943	914.0	0.944	916.0	0.944	918.0	0.942
920.0	0.945	922.0	0.943	924.0	0.943	926.0	0.944	928.0	0.944
930.0	0.944	932.0	0.944	934.0	0.943	936.0	0.943	938.0	0.943
940.0	0.944	942.0	0.942	944.0	0.943	946.0	0.944	948.0	0.943
950.0	0.940	952.0	0.941	954.0	0.941	956.0	0.940	958.0	0.939
960.0	0.940	962.0	0.939	964.0	0.938	966.0	0.938	968.0	0.936
970.0	0.935	972.0	0.935	974.0	0.937	976.0	0.937	978.0	0.937
980.0	0.936	982.0	0.936	984.0	0.936	986.0	0.934	988.0	0.936
990.0	0.936	992.0	0.936	994.0	0.936	996.0	0.936	998.0	0.936
1000.0	0.935	1002.0	0.935	1004.0	0.935	1006.0	0.935	1008.0	0.935
1010.0	0.935	1012.0	0.932	1014.0	0.934	1016.0	0.935	1018.0	0.935
1020.0	0.934	1022.0	0.934	1024.0	0.935	1026.0	0.934	1028.0	0.933
1030.0	0.933	1032.0	0.933	1034.0	0.933	1036.0	0.934	1038.0	0.933
1040.0	0.933	1042.0	0.933	1044.0	0.933	1046.0	0.935	1048.0	0.935
1050.0	0.933	1052.0	0.933	1054.0	0.933	1056.0	0.934	1058.0	0.934
1060.0	0.934	1062.0	0.935	1064.0	0.935	1066.0	0.935	1068.0	0.935
1070.0	0.935	1072.0	0.932	1074.0	0.933	1076.0	0.933	1078.0	0.933
1080.0	0.934								

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Medium Red Ink (Black Backing)

WAVE	% REF								
400.0	0.438	402.0	0.438	404.0	0.439	406.0	0.442	408.0	0.443
410.0	0.443	412.0	0.446	414.0	0.447	416.0	0.448	418.0	0.450
420.0	0.450	422.0	0.451	424.0	0.453	426.0	0.455	428.0	0.455
430.0	0.457	432.0	0.457	434.0	0.458	436.0	0.459	438.0	0.458
440.0	0.458	442.0	0.458	444.0	0.457	446.0	0.455	448.0	0.451
450.0	0.447	452.0	0.443	454.0	0.439	456.0	0.432	458.0	0.427
460.0	0.420	462.0	0.415	464.0	0.409	466.0	0.402	468.0	0.396
470.0	0.390	472.0	0.384	474.0	0.378	476.0	0.372	478.0	0.366
480.0	0.361	482.0	0.356	484.0	0.349	486.0	0.344	488.0	0.340
490.0	0.336	492.0	0.333	494.0	0.329	496.0	0.327	498.0	0.324
500.0	0.323	502.0	0.322	504.0	0.321	506.0	0.321	508.0	0.321
510.0	0.322	512.0	0.322	514.0	0.323	516.0	0.323	518.0	0.325
520.0	0.326	522.0	0.326	524.0	0.327	526.0	0.328	528.0	0.328
530.0	0.329	532.0	0.331	534.0	0.332	536.0	0.334	538.0	0.336
540.0	0.340	542.0	0.344	544.0	0.348	546.0	0.355	548.0	0.361
550.0	0.370	552.0	0.380	554.0	0.393	556.0	0.408	558.0	0.423
560.0	0.444	562.0	0.463	564.0	0.487	566.0	0.510	568.0	0.535
570.0	0.558	572.0	0.585	574.0	0.612	576.0	0.634	578.0	0.656
580.0	0.676	582.0	0.694	584.0	0.708	586.0	0.721	588.0	0.730
590.0	0.740	592.0	0.744	594.0	0.747	596.0	0.752	598.0	0.757
600.0	0.760	602.0	0.761	604.0	0.762	606.0	0.765	608.0	0.766
610.0	0.767	612.0	0.767	614.0	0.769	616.0	0.770	618.0	0.772
620.0	0.772	622.0	0.773	624.0	0.774	626.0	0.775	628.0	0.775
630.0	0.776	632.0	0.777	634.0	0.779	636.0	0.779	638.0	0.780
640.0	0.781	642.0	0.783	644.0	0.783	646.0	0.785	648.0	0.786
650.0	0.786	652.0	0.788	654.0	0.787	656.0	0.788	658.0	0.789
660.0	0.791	662.0	0.792	664.0	0.792	666.0	0.793	668.0	0.793
670.0	0.794	672.0	0.794	674.0	0.795	676.0	0.795	678.0	0.795
680.0	0.795	682.0	0.795	684.0	0.797	686.0	0.796	688.0	0.796
690.0	0.796	692.0	0.795	694.0	0.796	696.0	0.796	698.0	0.797
700.0	0.796	702.0	0.796	704.0	0.797	706.0	0.798	708.0	0.797
710.0	0.797	712.0	0.797	714.0	0.797	716.0	0.796	718.0	0.797
720.0	0.796	722.0	0.796	724.0	0.796	726.0	0.795	728.0	0.795
730.0	0.795	732.0	0.794	734.0	0.795	736.0	0.794	738.0	0.794
740.0	0.795	742.0	0.793	744.0	0.794	746.0	0.793	748.0	0.794
750.0	0.794	752.0	0.795	754.0	0.795	756.0	0.793	758.0	0.795
760.0	0.793	762.0	0.795	764.0	0.793	766.0	0.795	768.0	0.793
770.0	0.795	772.0	0.793	774.0	0.795	776.0	0.793	778.0	0.794
780.0	0.793	782.0	0.793	784.0	0.793	786.0	0.793	788.0	0.794
790.0	0.793	792.0	0.794	794.0	0.792	796.0	0.792	798.0	0.793
800.0	0.793	802.0	0.793	804.0	0.793	806.0	0.793	808.0	0.792
810.0	0.793	812.0	0.792	814.0	0.792	816.0	0.791	818.0	0.791
820.0	0.790	822.0	0.791	824.0	0.791	826.0	0.791	828.0	0.792
830.0	0.790	832.0	0.792	834.0	0.789	836.0	0.791	838.0	0.790
840.0	0.789	842.0	0.790	844.0	0.790	846.0	0.790	848.0	0.790
850.0	0.789	852.0	0.789	854.0	0.789	856.0	0.789	858.0	0.789
860.0	0.789	862.0	0.790	864.0	0.789	866.0	0.790	868.0	0.789
870.0	0.788	872.0	0.788	874.0	0.788	876.0	0.788	878.0	0.787
880.0	0.788	882.0	0.788	884.0	0.787	886.0	0.787	888.0	0.788
890.0	0.788	892.0	0.787	894.0	0.788	896.0	0.788	898.0	0.786
900.0	0.787	902.0	0.787	904.0	0.785	906.0	0.786	908.0	0.785
910.0	0.785	912.0	0.784	914.0	0.784	916.0	0.784	918.0	0.783
920.0	0.784	922.0	0.783	924.0	0.784	926.0	0.784	928.0	0.784
930.0	0.784	932.0	0.783	934.0	0.783	936.0	0.783	938.0	0.783
940.0	0.784	942.0	0.782	944.0	0.783	946.0	0.784	948.0	0.783
950.0	0.782	952.0	0.781	954.0	0.781	956.0	0.781	958.0	0.780
960.0	0.781	962.0	0.779	964.0	0.779	966.0	0.780	968.0	0.780
970.0	0.777	972.0	0.777	974.0	0.779	976.0	0.779	978.0	0.779
980.0	0.778	982.0	0.778	984.0	0.778	986.0	0.778	988.0	0.779
990.0	0.779	992.0	0.777	994.0	0.777	996.0	0.778	998.0	0.778
1000.0	0.778	1002.0	0.778	1004.0	0.777	1006.0	0.777	1008.0	0.777
1010.0	0.777	1012.0	0.776	1014.0	0.776	1016.0	0.777	1018.0	0.777
1020.0	0.776	1022.0	0.776	1024.0	0.777	1026.0	0.775	1028.0	0.774
1030.0	0.774	1032.0	0.774	1034.0	0.774	1036.0	0.775	1038.0	0.774
1040.0	0.774	1042.0	0.774	1044.0	0.774	1046.0	0.776	1048.0	0.775
1050.0	0.773	1052.0	0.773	1054.0	0.773	1056.0	0.774	1058.0	0.774
1060.0	0.774	1062.0	0.775	1064.0	0.775	1066.0	0.774	1068.0	0.774
1070.0	0.774	1072.0	0.771	1074.0	0.772	1076.0	0.772	1078.0	0.772

UNIT OF WAVELENGTH = NANOMETER

Table 1 (Continued)

## OCR Light Red Ink (White Backing)

WAVE	% REF								
400.0	0.527	402.0	0.530	404.0	0.532	406.0	0.536	408.0	0.538
410.0	0.541	412.0	0.544	414.0	0.546	416.0	0.549	418.0	0.552
420.0	0.555	422.0	0.557	424.0	0.561	426.0	0.563	428.0	0.565
430.0	0.568	432.0	0.569	434.0	0.571	436.0	0.573	438.0	0.574
440.0	0.574	442.0	0.575	444.0	0.575	446.0	0.575	448.0	0.574
450.0	0.571	452.0	0.566	454.0	0.564	456.0	0.559	458.0	0.554
460.0	0.547	462.0	0.543	464.0	0.537	466.0	0.532	468.0	0.525
470.0	0.518	472.0	0.513	474.0	0.508	476.0	0.502	478.0	0.497
480.0	0.491	482.0	0.487	484.0	0.480	486.0	0.474	488.0	0.471
490.0	0.465	492.0	0.461	494.0	0.457	496.0	0.456	498.0	0.453
500.0	0.452	502.0	0.451	504.0	0.451	506.0	0.449	508.0	0.450
510.0	0.450	512.0	0.450	514.0	0.452	516.0	0.453	518.0	0.454
520.0	0.454	522.0	0.456	524.0	0.457	526.0	0.457	528.0	0.458
530.0	0.459	532.0	0.459	534.0	0.462	536.0	0.464	538.0	0.466
540.0	0.470	542.0	0.475	544.0	0.481	546.0	0.487	548.0	0.495
550.0	0.504	552.0	0.515	554.0	0.531	556.0	0.545	558.0	0.562
560.0	0.584	562.0	0.606	564.0	0.630	566.0	0.651	568.0	0.675
570.0	0.699	572.0	0.720	574.0	0.744	576.0	0.763	578.0	0.782
580.0	0.797	582.0	0.812	584.0	0.822	586.0	0.832	588.0	0.839
590.0	0.848	592.0	0.852	594.0	0.856	596.0	0.860	598.0	0.862
600.0	0.865	602.0	0.867	604.0	0.869	606.0	0.871	608.0	0.874
610.0	0.877	612.0	0.878	614.0	0.882	616.0	0.883	618.0	0.887
620.0	0.887	622.0	0.890	624.0	0.892	626.0	0.895	628.0	0.896
630.0	0.898	632.0	0.901	634.0	0.904	636.0	0.906	638.0	0.909
640.0	0.911	642.0	0.913	644.0	0.916	646.0	0.919	648.0	0.920
650.0	0.924	652.0	0.926	654.0	0.927	656.0	0.930	658.0	0.931
660.0	0.935	662.0	0.937	664.0	0.938	666.0	0.941	668.0	0.942
670.0	0.943	672.0	0.945	674.0	0.945	676.0	0.946	678.0	0.947
680.0	0.947	682.0	0.948	684.0	0.949	686.0	0.949	688.0	0.950
690.0	0.951	692.0	0.950	694.0	0.952	696.0	0.952	698.0	0.953
700.0	0.953	702.0	0.953	704.0	0.954	706.0	0.956	708.0	0.955
710.0	0.955	712.0	0.955	714.0	0.955	716.0	0.954	718.0	0.957
720.0	0.956	722.0	0.955	724.0	0.955	726.0	0.955	728.0	0.955
730.0	0.955	732.0	0.954	734.0	0.956	736.0	0.955	738.0	0.954
740.0	0.955	742.0	0.953	744.0	0.954	746.0	0.953	748.0	0.954
750.0	0.953	752.0	0.955	754.0	0.955	756.0	0.952	758.0	0.955
760.0	0.953	762.0	0.955	764.0	0.953	766.0	0.955	768.0	0.953
770.0	0.955	772.0	0.953	774.0	0.955	776.0	0.954	778.0	0.955
780.0	0.954	782.0	0.954	784.0	0.954	786.0	0.954	788.0	0.955
790.0	0.954	792.0	0.955	794.0	0.955	796.0	0.953	798.0	0.954
800.0	0.954	802.0	0.954	804.0	0.954	806.0	0.954	808.0	0.952
810.0	0.953	812.0	0.952	814.0	0.952	816.0	0.951	818.0	0.952
820.0	0.951	822.0	0.952	824.0	0.952	826.0	0.951	828.0	0.951
830.0	0.950	832.0	0.952	834.0	0.950	836.0	0.952	838.0	0.951
840.0	0.950	842.0	0.951	844.0	0.951	846.0	0.950	848.0	0.950
850.0	0.950	852.0	0.950	854.0	0.950	856.0	0.950	858.0	0.950
860.0	0.949	862.0	0.949	864.0	0.949	866.0	0.950	868.0	0.950
870.0	0.949	872.0	0.948	874.0	0.948	876.0	0.948	878.0	0.947
880.0	0.948	882.0	0.948	884.0	0.948	886.0	0.948	888.0	0.949
890.0	0.949	892.0	0.947	894.0	0.948	896.0	0.948	898.0	0.947
900.0	0.948	902.0	0.948	904.0	0.946	906.0	0.946	908.0	0.945
910.0	0.946	912.0	0.944	914.0	0.945	916.0	0.945	918.0	0.944
920.0	0.946	922.0	0.944	924.0	0.944	926.0	0.945	928.0	0.945
930.0	0.945	932.0	0.945	934.0	0.945	936.0	0.944	938.0	0.944
940.0	0.945	942.0	0.943	944.0	0.944	946.0	0.945	948.0	0.943
950.0	0.941	952.0	0.942	954.0	0.942	956.0	0.941	958.0	0.940
960.0	0.941	962.0	0.939	964.0	0.939	966.0	0.939	968.0	0.938
970.0	0.937	972.0	0.937	974.0	0.938	976.0	0.938	978.0	0.938
980.0	0.937	982.0	0.937	984.0	0.936	986.0	0.936	988.0	0.937
990.0	0.937	992.0	0.937	994.0	0.936	996.0	0.936	998.0	0.936
1000.0	0.936	1002.0	0.936	1004.0	0.936	1006.0	0.936	1008.0	0.936
1010.0	0.936	1012.0	0.935	1014.0	0.935	1016.0	0.936	1018.0	0.935
1020.0	0.934	1022.0	0.934	1024.0	0.935	1026.0	0.934	1028.0	0.933
1030.0	0.933	1032.0	0.933	1034.0	0.933	1036.0	0.934	1038.0	0.933
1040.0	0.933	1042.0	0.933	1044.0	0.933	1046.0	0.935	1048.0	0.935
1050.0	0.934	1052.0	0.934	1054.0	0.935	1056.0	0.935	1058.0	0.934
1060.0	0.934	1062.0	0.935	1064.0	0.935	1066.0	0.936	1068.0	0.936
1070.0	0.936	1072.0	0.933	1074.0	0.934	1076.0	0.934	1078.0	0.934
1080.0	0.936								

UNIT OF WAVELENGTH NANOMETER

Table 1 (Continued)

## OCR Light Red Ink (Black Backing)

WAVE	% REF								
400.0	0.513	402.0	0.514	404.0	0.516	406.0	0.518	408.0	0.520
410.0	0.521	412.0	0.524	414.0	0.524	416.0	0.527	418.0	0.530
420.0	0.531	422.0	0.531	424.0	0.534	426.0	0.536	428.0	0.536
430.0	0.538	432.0	0.538	434.0	0.540	436.0	0.541	438.0	0.541
440.0	0.540	442.0	0.540	444.0	0.539	446.0	0.538	448.0	0.536
450.0	0.532	452.0	0.527	454.0	0.523	456.0	0.518	458.0	0.513
460.0	0.507	462.0	0.503	464.0	0.497	466.0	0.492	468.0	0.485
470.0	0.479	472.0	0.472	474.0	0.467	476.0	0.461	478.0	0.457
480.0	0.450	482.0	0.447	484.0	0.440	486.0	0.435	488.0	0.432
490.0	0.427	492.0	0.422	494.0	0.419	496.0	0.418	498.0	0.415
500.0	0.414	502.0	0.412	504.0	0.412	506.0	0.411	508.0	0.412
510.0	0.411	512.0	0.412	514.0	0.412	516.0	0.413	518.0	0.414
520.0	0.415	522.0	0.415	524.0	0.416	526.0	0.416	528.0	0.417
530.0	0.419	532.0	0.419	534.0	0.421	536.0	0.422	538.0	0.425
540.0	0.428	542.0	0.433	544.0	0.437	546.0	0.442	548.0	0.450
550.0	0.458	552.0	0.468	554.0	0.480	556.0	0.494	558.0	0.509
560.0	0.527	562.0	0.545	564.0	0.565	566.0	0.584	568.0	0.606
570.0	0.626	572.0	0.644	574.0	0.665	576.0	0.681	578.0	0.697
580.0	0.711	582.0	0.723	584.0	0.732	586.0	0.740	588.0	0.744
590.0	0.751	592.0	0.754	594.0	0.757	596.0	0.761	598.0	0.762
600.0	0.764	602.0	0.765	604.0	0.766	606.0	0.768	608.0	0.768
610.0	0.769	612.0	0.769	614.0	0.771	616.0	0.772	618.0	0.773
620.0	0.773	622.0	0.775	624.0	0.775	626.0	0.777	628.0	0.777
630.0	0.777	632.0	0.778	634.0	0.780	636.0	0.781	638.0	0.781
640.0	0.782	642.0	0.784	644.0	0.784	646.0	0.786	648.0	0.787
650.0	0.788	652.0	0.789	654.0	0.788	656.0	0.789	658.0	0.790
660.0	0.792	662.0	0.792	664.0	0.793	666.0	0.793	668.0	0.794
670.0	0.794	672.0	0.794	674.0	0.795	676.0	0.795	678.0	0.795
680.0	0.796	682.0	0.796	684.0	0.797	686.0	0.796	688.0	0.796
690.0	0.796	692.0	0.795	694.0	0.796	696.0	0.796	698.0	0.797
700.0	0.796	702.0	0.796	704.0	0.797	706.0	0.798	708.0	0.797
710.0	0.797	712.0	0.797	714.0	0.797	716.0	0.796	718.0	0.797
720.0	0.796	722.0	0.794	724.0	0.795	726.0	0.795	728.0	0.795
730.0	0.795	732.0	0.794	734.0	0.795	736.0	0.794	738.0	0.793
740.0	0.795	742.0	0.793	744.0	0.794	746.0	0.793	748.0	0.793
750.0	0.792	752.0	0.793	754.0	0.793	756.0	0.792	758.0	0.794
760.0	0.792	762.0	0.794	764.0	0.792	766.0	0.794	768.0	0.792
770.0	0.794	772.0	0.792	774.0	0.794	776.0	0.793	778.0	0.792
780.0	0.792	782.0	0.792	784.0	0.792	786.0	0.792	788.0	0.793
790.0	0.792	792.0	0.793	794.0	0.792	796.0	0.792	798.0	0.793
800.0	0.792	802.0	0.792	804.0	0.792	806.0	0.792	808.0	0.791
810.0	0.792	812.0	0.791	814.0	0.791	816.0	0.790	818.0	0.790
820.0	0.789	822.0	0.790	824.0	0.790	826.0	0.790	828.0	0.790
830.0	0.789	832.0	0.791	834.0	0.789	836.0	0.791	838.0	0.790
840.0	0.789	842.0	0.789	844.0	0.789	846.0	0.789	848.0	0.789
850.0	0.789	852.0	0.789	854.0	0.789	856.0	0.789	858.0	0.789
860.0	0.789	862.0	0.788	864.0	0.788	866.0	0.789	868.0	0.789
870.0	0.788	872.0	0.787	874.0	0.787	876.0	0.787	878.0	0.786
880.0	0.787	882.0	0.787	884.0	0.787	886.0	0.787	888.0	0.787
890.0	0.787	892.0	0.786	894.0	0.787	896.0	0.787	898.0	0.786
900.0	0.786	902.0	0.786	904.0	0.784	906.0	0.784	908.0	0.784
910.0	0.785	912.0	0.784	914.0	0.783	916.0	0.783	918.0	0.782
920.0	0.784	922.0	0.783	924.0	0.783	926.0	0.783	928.0	0.783
930.0	0.783	932.0	0.783	934.0	0.783	936.0	0.783	938.0	0.783
940.0	0.784	942.0	0.782	944.0	0.783	946.0	0.783	948.0	0.782
950.0	0.781	952.0	0.781	954.0	0.780	956.0	0.780	958.0	0.779
960.0	0.780	962.0	0.779	964.0	0.778	966.0	0.778	968.0	0.778
970.0	0.776	972.0	0.776	974.0	0.777	976.0	0.778	978.0	0.778
980.0	0.776	982.0	0.776	984.0	0.776	986.0	0.776	988.0	0.777
990.0	0.777	992.0	0.777	994.0	0.776	996.0	0.776	998.0	0.776
1000.0	0.776	1002.0	0.777	1004.0	0.777	1006.0	0.775	1008.0	0.775
1010.0	0.775	1012.0	0.774	1014.0	0.774	1016.0	0.775	1018.0	0.775
1020.0	0.775	1022.0	0.775	1024.0	0.776	1026.0	0.774	1028.0	0.773
1030.0	0.773	1032.0	0.773	1034.0	0.773	1036.0	0.774	1038.0	0.773
1040.0	0.773	1042.0	0.773	1044.0	0.773	1046.0	0.775	1048.0	0.775
1050.0	0.772	1052.0	0.772	1054.0	0.772	1056.0	0.773	1058.0	0.773
1060.0	0.773	1062.0	0.774	1064.0	0.774	1066.0	0.774	1068.0	0.774
1070.0	0.774	1072.0	0.771	1074.0	0.772	1076.0	0.772	1078.0	0.771
1080.0	0.772								

UNIT OF WAVELENGTH = NANOMETER

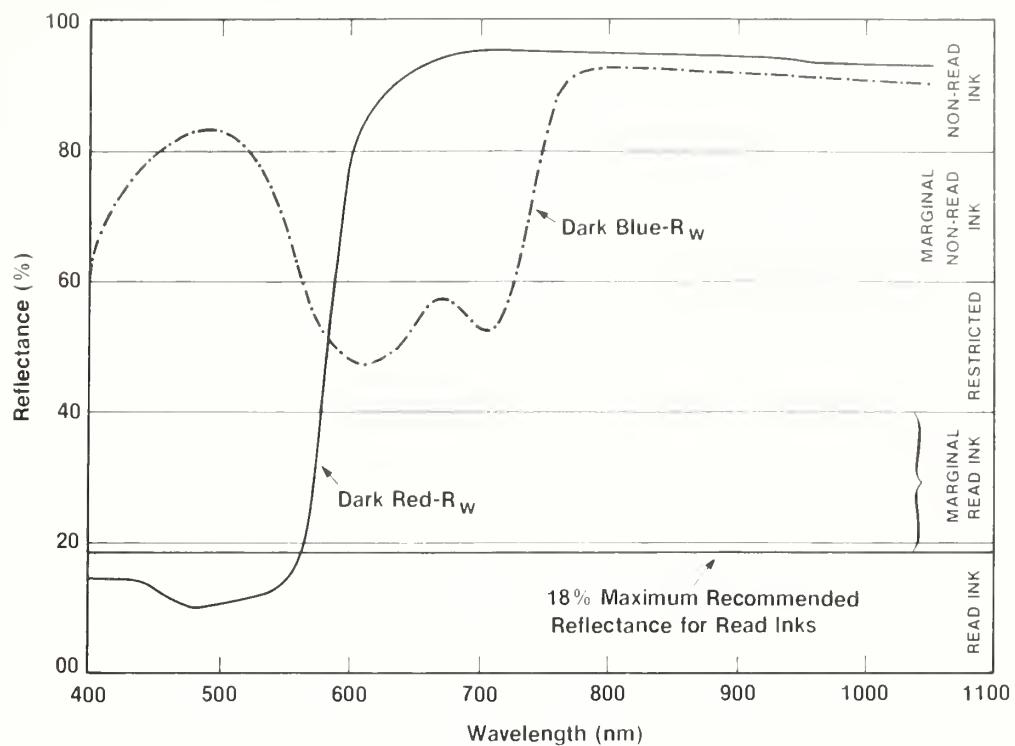


Fig. 1  
Spectral Reflectance of OCR Inks

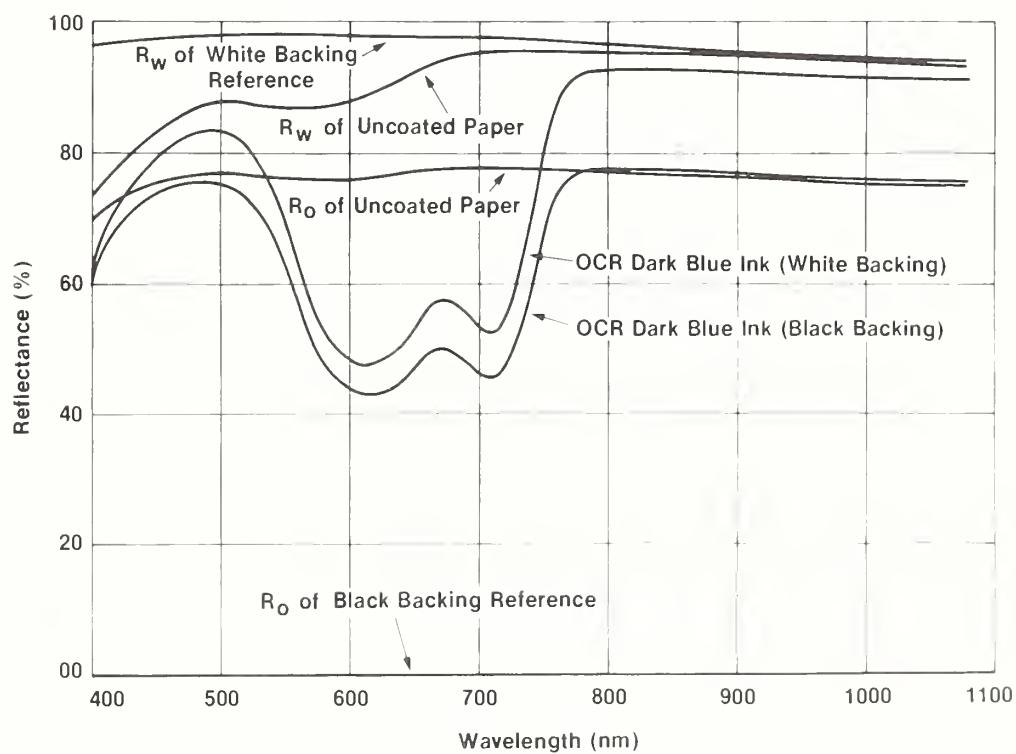


Fig. 2  
Spectral Reflectance of Standard Dark Blue Ink

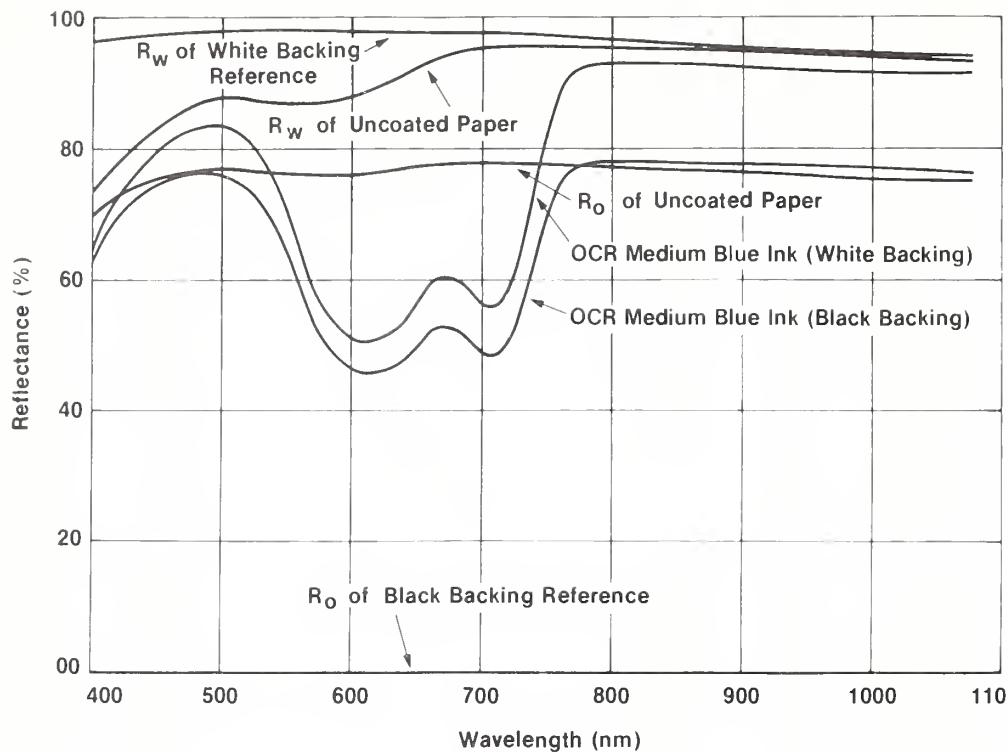


Fig. 3  
Spectral Reflectance of Standard Medium Blue Ink

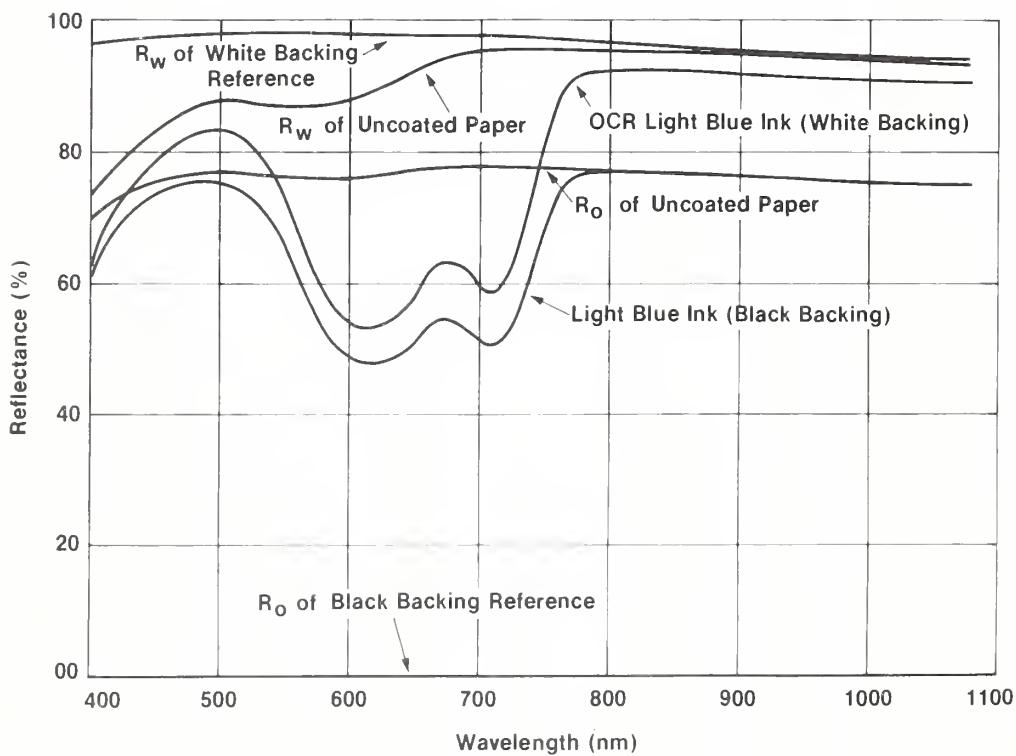


Fig. 4  
Spectral Reflectance of Standard Light Blue Ink

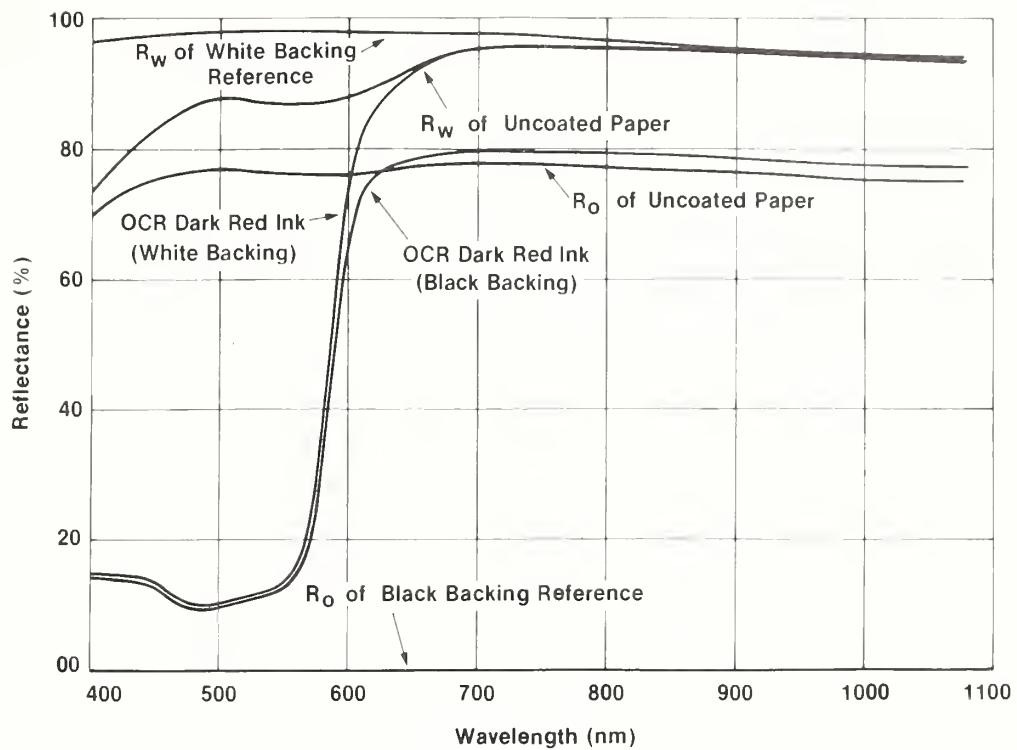


Fig. 5  
Spectral Reflectance of Standard Dark Red Ink

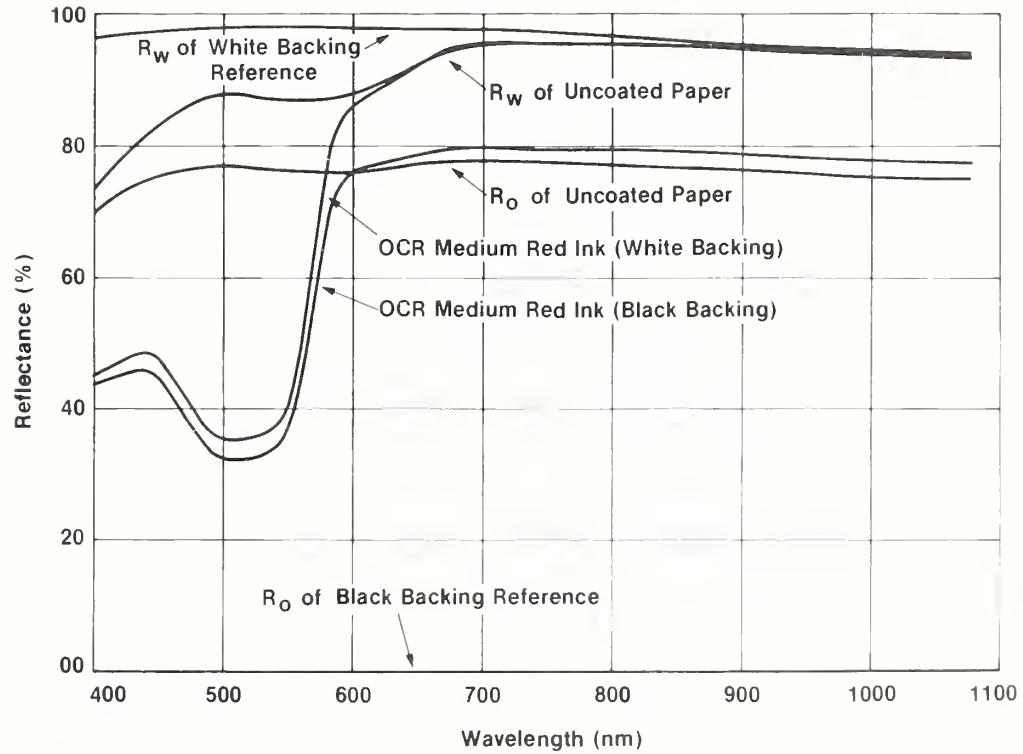


Fig. 6  
Spectral Reflectance of Standard Medium Red Ink

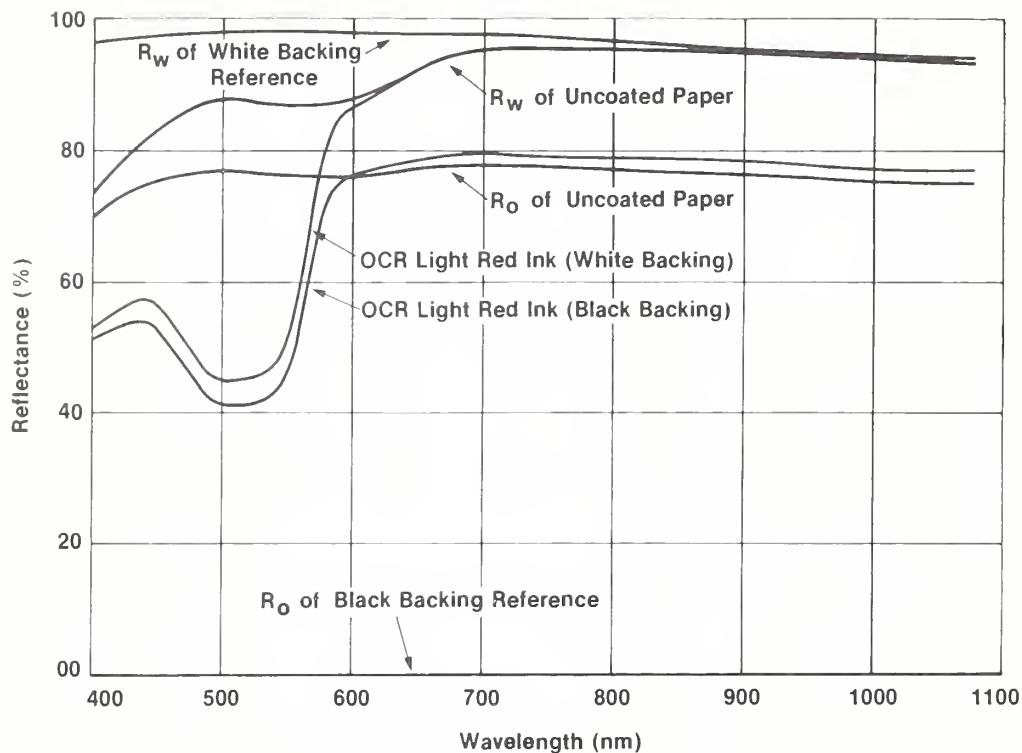


Fig. 7  
Spectral Reflectance of Standard Light Red Ink

## Appendix

(This Appendix is not a part of American National Standard for Optical Character Recognition (OCR) Inks, ANSI X3.86-1980, but is included for information purposes only.)

### Color Analysis of Typical Commercial Blue and Red Nonread OCR Inks

Munsell Notation	Name* (ISCC-NBS)†	Daylight Reflectance Y%‡	Chromaticity Coordinates	
			x‡	y‡
5B 8.63/3	very pale blue/very light greenish blue	71.01	0.2797	0.3069
2.5B 8.70/2	very pale blue	73.2	0.2885	0.3124
10BG 8.6/2.5	very pale blue/very pale green/very light bluish green	70.5	0.2848	0.3139
2.5R 7.88/7	moderate pink/strong pink	57.01	0.3790	0.3188
3.0R 7.61/10	strong pink	52.4	0.3942	0.3210
5.R 7.81/7	moderate pink/strong yellowish pink	55.8	0.3935	0.3253

\* Kelly, Kenneth L. and Judd, Deane B. Color Universal Language and Dictionary of Names. NBS Special Publication SP 440 (latest edition).

†ISCC is the Inter-Society Color Council; NBS is the National Bureau of Standards.

‡See Judd, Deane B. and Wyszecki, Gunter. Color in Business, Science, and Industry, 3rd Edition. New York: John Wiley and Sons, Inc; 1975.



# American National Standards for Information Processing

- X3.1-1976 Synchronous Signaling Rates for Data Transmission  
X3.2-1970 (R1976) Print Specifications for Magnetic Ink Character Recognition  
X3.3-1970 (R1976) Bank Check Specifications for Magnetic Ink Character Recognition  
X3.4-1977 Code for Information Interchange  
X3.5-1970 Flowchart Symbols and Their Usage in Information Processing  
X3.6-1965 (R1973) Perforated Tape Code for Information Interchange  
X3.9-1978 FORTRAN  
X3.11-1969 Specification for General Purpose Paper Cards for Information Processing  
X3.14-1973 Recorded Magnetic Tape for Information Interchange (200 CPI, NRZI)  
X3.15-1976 Bit Sequencing of the American National Standard Code for Information Interchange in Serial-by-Bit Data Transmission  
X3.16-1976 Character Structure and Character Parity Sense for Serial-by-Bit Data Communication in the American National Standard Code for Information Interchange  
X3.17-1977 Character Set and Print Quality for Optical Character Recognition (OCR-A)  
X3.18-1974 One-Inch Perforated Paper Tape for Information Interchange  
X3.19-1974 Eleven-Sixteenths-Inch Perforated Paper Tape for Information Interchange  
X3.20-1967 (R1974) Take-Up Reels for One-Inch Perforated Tape for Information Interchange  
X3.21-1967 Rectangular Holes in Twelve-Row Punched Cards  
X3.22-1973 Recorded Magnetic Tape for Information Interchange (800 CPI, NRZI)  
X3.23-1974 Programming Language COBOL  
X3.24-1968 Signal Quality at Interface between Data Processing Terminal Equipment and Synchronous Data Communication Equipment for Serial Data Transmission  
X3.25-1976 Character Structure and Character Parity Sense for Parallel-by-Bit Data Communication in the American National Standard Code for Information Interchange  
X3.26-1980 Hollerith Punched Card Code  
X3.27-1978 Magnetic Tape Labels and File Structure for Information Interchange  
X3.28-1976 Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Communication Links  
X3.29-1971 Specifications for Properties of Unpunched Oiled Paper Perforator Tape  
X3.30-1971 Representation for Calendar Date and Ordinal Date for Information Interchange  
X3.31-1973 Structure for the Identification of the Counties of the United States for Information Interchange  
X3.32-1973 Graphic Representation of the Control Characters of American National Standard Code for Information Interchange  
X3.34-1972 Interchange Rolls of Perforated Tape for Information Interchange  
X3.36-1975 Synchronous High-Speed Data Signaling Rates between Data Terminal Equipment and Data Communication Equipment  
X3.37-1980 Programming Language APT  
X3.38-1972 (R1977) Identification of States of the United States (Including the District of Columbia) for Information Interchange  
X3.39-1973 Recorded Magnetic Tape for Information Interchange (1600 CPI, PE)  
X3.40-1976 Unrecorded Magnetic Tape for Information Interchange (9-Track 200 and 800 CPI, NRZI, and 1600 CPI, PE)  
X3.41-1974 Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Standard Code for Information Interchange  
X3.42-1975 Representation of Numeric Values in Character Strings for Information Interchange  
X3.43-1977 Representations of Local Time of the Day for Information Interchange  
X3.44-1974 Determination of the Performance of Data Communication Systems  
X3.45-1974 Character Set for Handprinting  
X3.46-1974 Unrecorded Magnetic Six-Disk Pack (General, Physical, and Magnetic Characteristics)  
X3.47-1977 Structure for the Identification of Named Populated Places and Related Entities of the States of the United States for Information Interchange  
X3.48-1977 Magnetic Tape Cassettes for Information Interchange (3.810-mm [0.150-in] Tape at 32 bpmm [800 bpi], PE)  
X3.49-1975 Character Set for Optical Character Recognition (OCR-B)  
X3.50-1976 Representations for U.S. Customary, SI, and Other Units to Be Used in Systems with Limited Character Sets  
X3.51-1975 Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange  
X3.52-1976 Unrecorded Single-Disk Cartridge (Front Loading, 2200 BPI), General, Physical, and Magnetic Requirements  
X3.53-1976 Programming Language PL/I  
X3.54-1976 Recorded Magnetic Tape for Information Interchange (6250 CPI, Group Coded Recording)  
X3.55-1977 Unrecorded Magnetic Tape Cartridge for Information Interchange, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded  
X3.56-1977 Recorded Magnetic Tape Cartridge for Information Interchange, 4 Track, 0.250 Inch (6.30 mm), 1600 bpi (63 bpmm), Phase Encoded  
X3.57-1977 Structure for Formatting Message Headings for Information Interchange Using the American National Standard Code for Information Interchange for Data Communication Systems Control  
X3.58-1977 Unrecorded Eleven-Disk Pack, General, Physical, and Magnetic Requirements  
X3.60-1978 Programming Language Minimal BASIC  
X3.61-1978 Representation of Geographic Point Locations for Information Interchange  
X3.62-1979 Paper Used in Optical Character Recognition (OCR) Systems  
X3.64-1979 Additional Controls for Use with American National Standard Code for Information Interchange  
X3.66-1979 Advanced Data Communication Control Procedures (ADCCP)  
X3.73-1980 Single-Sided Unformatted Flexible Disk Cartridge (for 6631-BPR Use)  
X3.77-1980 Representation of Pocket Select Characters in Information Interchange  
X3.79-1981 Determination of Performance of Data Communications Systems That Use Bit-Oriented Communication Control Procedures  
X3.82-1980 One-Sided Single-Density Unformatted 5.25-Inch Flexible Disk Cartridge (for 3979-BPR Use)  
X3.83-1980 ANSI Sponsorship Procedures for ISO Registration According to ISO 2375  
X3.86-1980 Optical Character Recognition (OCR) Inks

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