FREQUENCY MODULATION TELEVISION ANALYSIS

THRESHOLD IMPULSE ANALYSIS

Prepared by
William H. Hodge

Prepared for
GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

REPORT NO. 3007-1
CONTRACT NUMBER NAS5-21872

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16. Abstract A computer program is developed to calculate the FM threshold impulse rates as a function of the carrier-to-noise ratio for a specified FM system. The system parameters and a vector of 1024 integers, representing the probability density of the modulating voltage, are required as input parameters. The computer program is utilized to calculate threshold impulse rates for twenty-four sets of measured probability data supplied by NASA and for sinusoidal and Gaussian modulating waveforms. As a result of the analysis several conclusions are drawn: The use of preemphasis in an FM television system improves the threshold by reducing the impulse rate. Sinusoidal modulation produces a total impulse rate which is a practical upper bound for the impulse rates of TV signals providing the same peak deviations. As the moment of the FM spectrum about the center frequency of the predetection filter increases, the impulse rate tends to increase. A spectrum having an expected frequency above (below) the center frequency of the predetection filter produces a higher negative (positive) than positive (negative) impulse rate.

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PREFACE

This study under NASA Contract NAS5-21872 was initiated to perform a parametric analysis using computer simulation and analysis techniques of the threshold and signal distortion effects in FM TV systems. This report is a study of the FM threshold. The FM distortion study is presented in a separate report.

A computer program was developed to estimate the FM threshold impulse rate on the basis of measured data describing the probability density function of typical TV waveforms. The data, supplied by NASA, were representative of both preemphasized and flat baseband signals with and without audio subcarriers. The threshold was also examined for sinusoidal and Gaussian modulating waveforms.

As a result of the analysis, the following conclusions can be drawn:

1. The total impulse rate for television signals (positive plus negative) generally decreases with the inclusion of preemphasis. Thus, the use of preemphasis and deemphasis in an FM television system does improve the threshold by reducing the impulse rate for a particular carrier-to-noise ratio.

2. Sinusoidal modulation produces a total impulse rate (positive plus negative) which is a practical upper bound for the impulse rates of television signals providing the same peak deviation.

3. As the moment of the FM spectrum about the center frequency of the predetection filter increases, the impulse rate tends to increase.

4. An FM spectrum having an expected frequency above (below) the frequency at the center of a symmetrical predetection filter produces a higher negative (positive) than positive (negative) impulse rate.

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SECTION 1 - INTRODUCTION

When a frequency-modulated (FM) television transmission system is operated near threshold, a very objectionable type of noise is apparent, and it gets worse as lower carrier-to-noise ratios are utilized at the FM receiver. This objectionable noise is observed as random black and white spots on the scanning lines of a television picture tube. The video impulses, causing spots in the picture, are a well-known threshold phenomenon, treated quantitavely in this report.

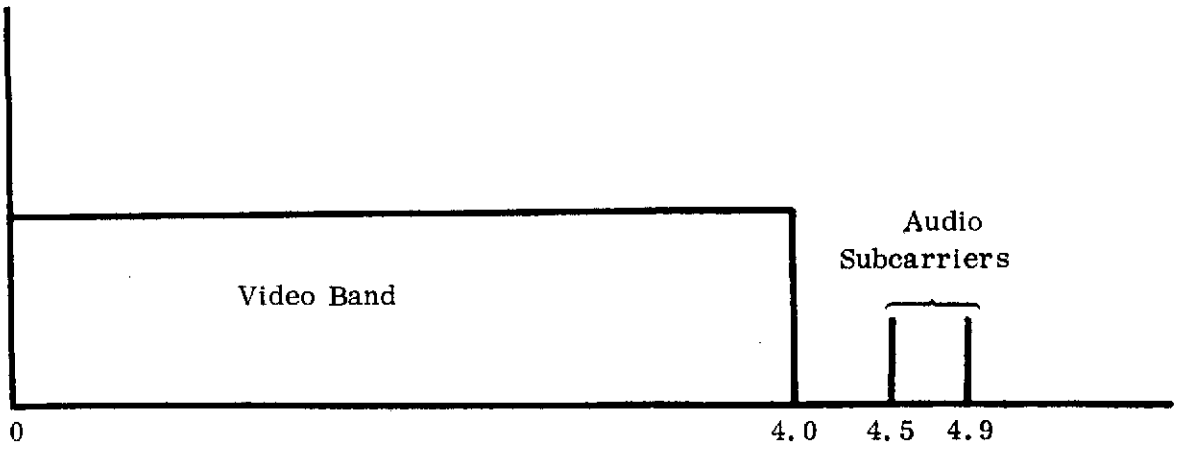
The primary objective of this study is to develop a computer program to calculate the FM threshold impulse, or click, rates and to use the program in quantifying the effects of preemphasis and deemphasis in an FM transmission system. The program calculates the impulse rates as a function of the carrier-to-noise ratio for specified system parameters and any specified probability density function describing the modulating waveform.

Impulse rates are calculated for twenty-four probability functions supplied by NASA. Twelve of the probability functions are for flat, or unpreemphasized, systems and the other twelve functions are for the same systems with preemphasis added. Thus, the effect of preemphasis can be studied.

Impulse rates are also calculated for probability density functions of sinusoidal and Gaussian modulating waveforms. These calculations are made on the basis of the same predetection filter specifications and the same peak deviations used for the other cases.

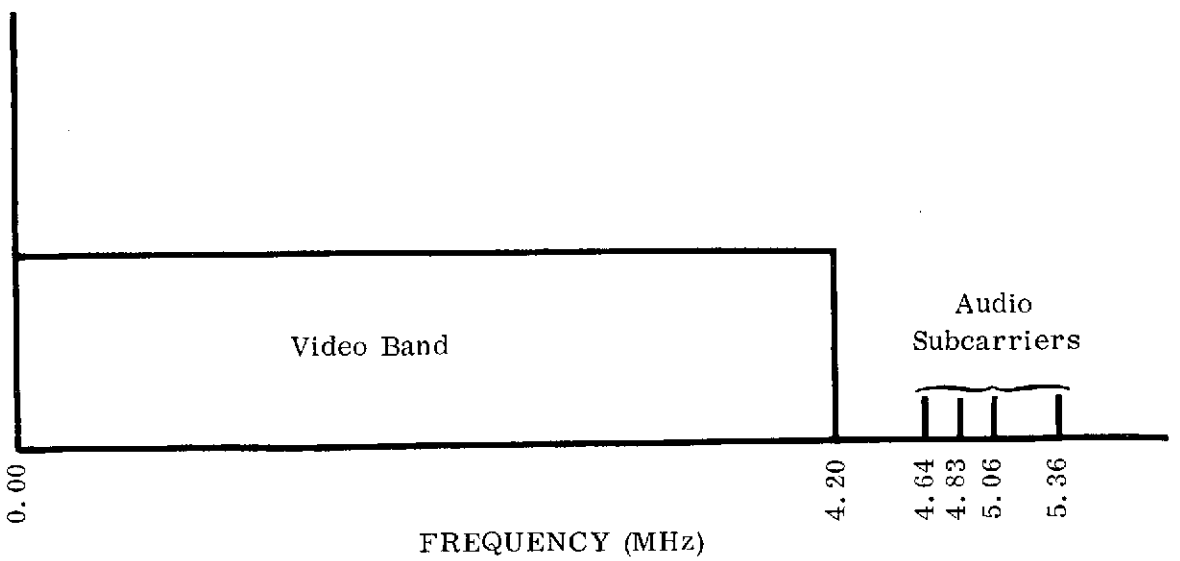
The computer program is based on Rice's mathematical analysis of FM threshold effects (Reference 1). In accordance with Rice's work, the results are based on predetection filter responses that are symmetric with respect to the center frequency. The predetection filter options are two-, three-, and four-pole Butterworth and Chebyshev, Gaussian, and rectangular.

The modulating signals for which the probability data were measured by NASA utilized two different formats designated as TRUST (Television Relay Using Small Terminals) and ETV (Educational Television). These formats are shown in Figures 1-1 and 1-2, respectively.



NOTE: The audio subcarriers were frequency modulated by a 1-kHz tone to provide a 70-kHz peak deviation.

Figure 1-1. Frequency Format of the Composite TRUST Signal Modulating the Carrier



NOTE: The audio subcarriers were frequency modulated by a 1-kHz one to provide a 53-kHz peak deviation.

Figure 1-2. Frequency Format of the Composite ETV Signal Modulating the Carrier

Signals with these formats, different video contents, and different combinations of audio subcarriers were used with and without preemphasis as modulating signals for an FM carrier. The probability densities of twenty-four various modulating signals were measured by NASA as input data to the computer program developed under this contract.

SECTION 2 - DISCUSSION AND APPROACH

2.1 INTRODUCTION

The effects of FM threshold impulse rates on the received signal is discussed. Then the use of Rice's formulas for calculating the impulse rates is discussed. Finally, the analysis of the predetection filters is discussed.

2.2 DISCUSSION OF THRESHOLD CONSIDERATIONS

The threshold effect in FM receivers is the result of sudden 2π-radian phase changes in the detected wave which is composed of a modulated carrier and noise. Any noise on the carrier being detected results in noise accompanying the output signal. The output noise caused by small variations in the instantaneous phase of the detected wave is called fluctuation noise. Reducing the carrier-to-noise ratio increases the probability that the noise will cause a rapid 2π-radian phase change in the composite wave. Such a change causes noise impulses in the detected output. As the carrier-to-noise ratio is reduced further, the impulsive noise increases to the point that it becomes a significant portion of the output noise. When this happens, the FM threshold is said to occur.

Figure 2-1 shows the shape of the output signal-to-noise ratio as a function of the carrier-to-noise ratio (C/N) at the input to the frequency demodulator. As indicated by the deviation of the solid curve from the broken line, impulsive noise increases as C/N decreases. The value of C/N at threshold depends on system parameters such as modulation index and predetection bandwidth.

The impulses may be heard as clicks in audio signals or may be seen as light or dark impulses on a television tube. The impulse rate is therefore of interest in all FM systems.

The instantaneous composite of the modulated carrier and the associated noise at the demodulator input terminals can be represented (using Rice's notation) by

$$Q \cos \left[2\pi f_c t + \phi(t)\right] + I_N(t) = R(t) \cos \left[2\pi f_c t + \phi(t) + \theta(t)\right] \qquad (2\text{-}1)$$

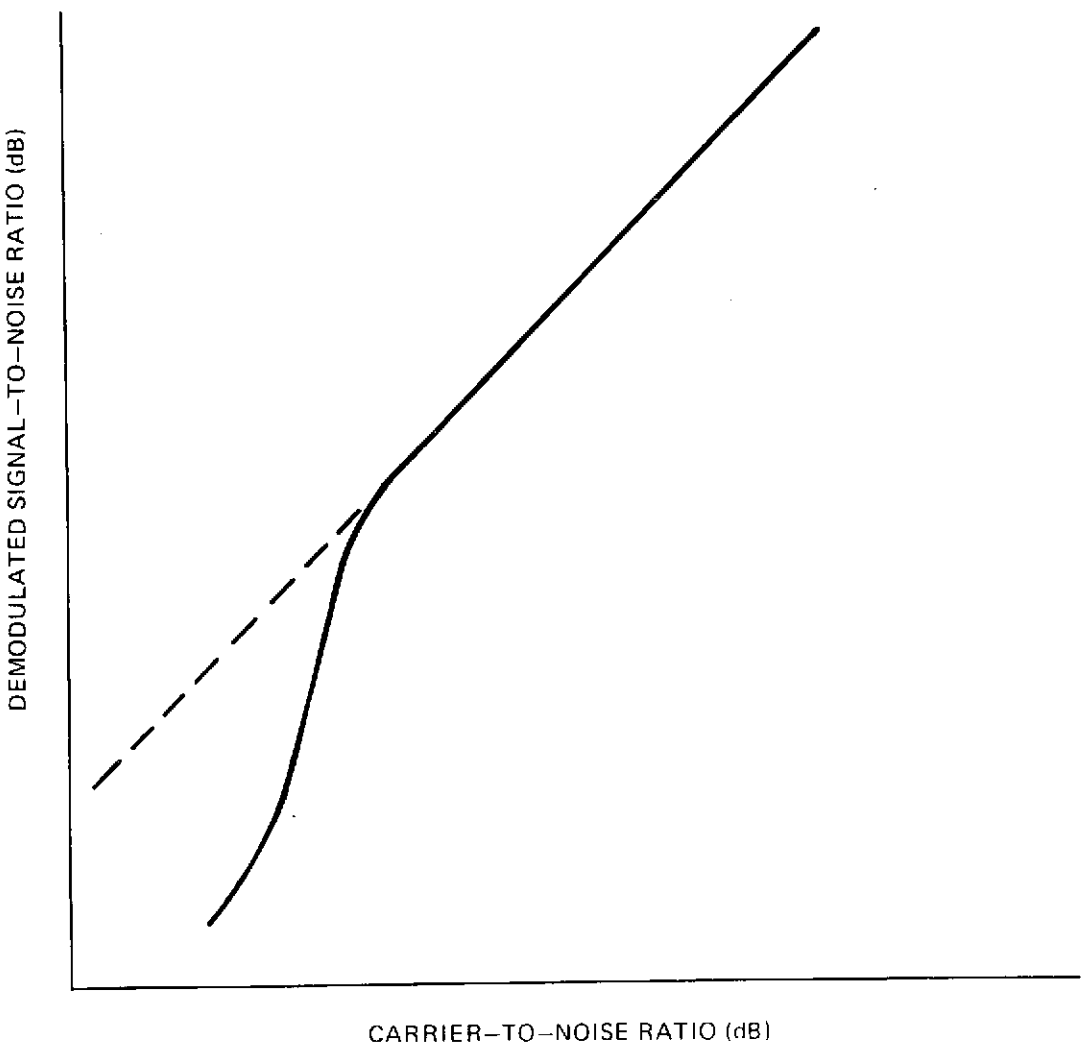


Figure 2-1. Typical Curve of Demodulated Signal-to-Noise Ratio as a Function of Carrier-to-Noise Ratio in an FM Receiver

where $I_N(t)$ represents the additive noise component. Notice that additive noise effectively varies the amplitude and phase of a carrier. The desired demodulated signal is $\phi'(t)$, but the actual demodulated output is $\phi'(t) + \theta'(t)$. Thus $\theta'(t)$ represents the noise accompanying the demodulated signal. At times the noise vector is larger than the carrier amplitude Q and properly phased such that $\theta(t)$, the instantaneous phase of the resultant carrier actually changes suddenly by approximately 2π radians. Such a sudden phase change shows up in the output as a noise impulse. Figure 2-2 (Reference 1) shows how impulses in $\theta'(t)$ are caused by the sudden 2π-radian phase changes in $\theta(t)$. A positive impulse is caused by a sudden increase in $\theta(t)$ and a negative impulse is caused by a sudden decrease in $\theta(t)$. These impulses are a function of various parameters of the FM system and their rates can be calculated as a function of those parameters.

The expected values of impulse rates can be calculated on the basis of Rice's work (Reference 1). His work is based on the assumption that a click occurs each time $\theta(t)$ increases or decreases through an odd multiple of π radians. It has been shown that this is not strictly true (Reference 2), and that $\theta(t)$ sometimes crosses the π-radian boundary and returns through it without making a complete 2π-phase change which is assumed. Although Rice's approximation is a slightly pessimistic approximation from this standpoint, his technique provides a relatively good approximation and is used in this effort.

2.3 ANALYTICAL APPROACH

The application of Rice's formulas to calculating the threshold impulse rates is presented. Then the predetection filter analysis is discussed.

2.3.1 Threshold Formulas

Rice represents the FM threshold impulse rates as

$$N_{\pm} = \int_{-\infty}^{\infty} H_{\pm}(t_1)\, p_u(u)\, du \qquad (2\text{-}2)$$

where

$$H_{+}(t_1) = \frac{r}{2}\left\{\sqrt{1+u^2}\left[1 - \text{erf}\sqrt{\rho+\rho u^2}\right] - u\, e^{-\rho}\left[1 - \text{erf}\left(u\sqrt{\rho}\right)\right]\right\} \qquad (2\text{-}3)$$

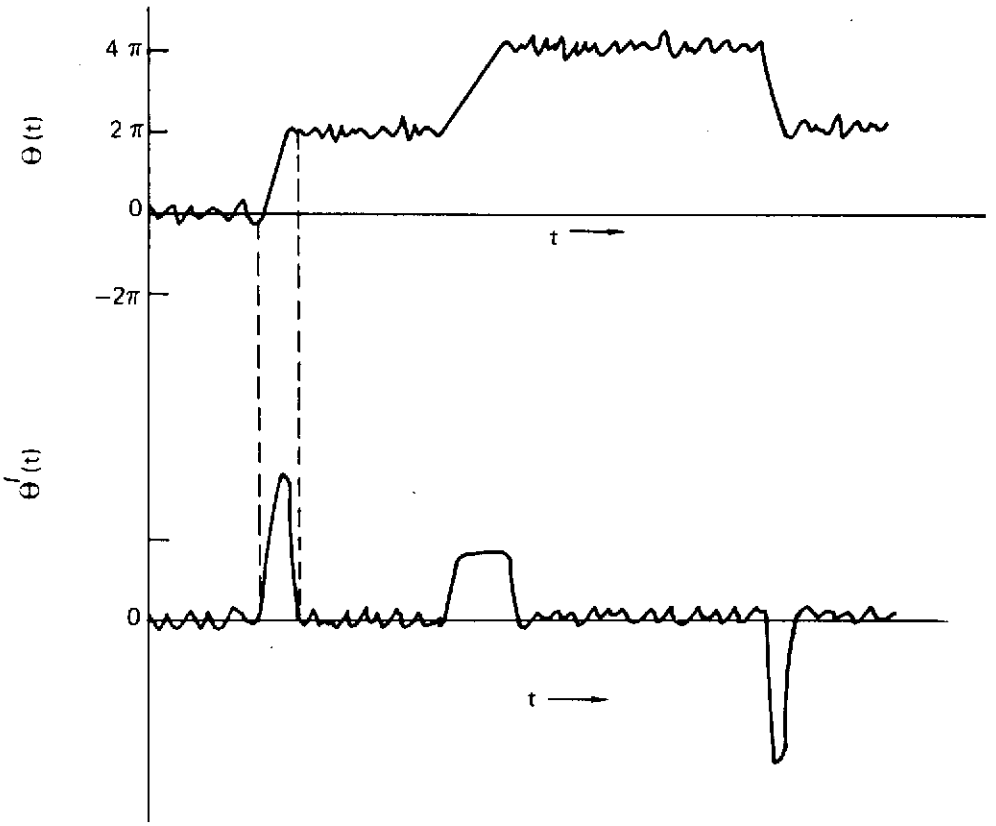


Figure 2-2. Impulses in $\theta'(t)$ Produced by Changes of $\pm 2\pi$ in $\theta(t)$

N_+ and N_- represent, respectively, the expected number of positive and negative impulses per second, and r is the gyration radius of the RF noise spectral density. For band-limited white noise reaching the demodulator, which will be assumed in the proposed analysis, r is just the gyration radius of the predetection bandpass filter with a symmetrical response centered on the carrier frequency. ρ is the carrier-to-noise power ratio and $p_u(u)$ is a probability density function (pdf) related to the voltage probability density function of the baseband signal modulating the FM carrier. $H_-(t_1)$ is obtained by changing the sign of u in $H_+(t_1)$. Note that $H_\pm(t_1)$ depends on t_1 only through u. Hence, t_1 is a parameter that need not actually be considered.

Given $p_v(v)$, the pdf of the voltage modulating the carrier and several other parameters of the FM system, the required pdf, $p_u(u)$, can be calculated from $p_v(v)$. The peak deviation is given in terms of the modulation index m and the highest modulating frequency f_m as follows

$$D_p = m f_m \tag{2-4}$$

To provide for modulating signals that do not have a defined voltage maximum; e.g., Gaussian, let D_p correspond to the deviation that is not exceeded more than a certain designated fraction P of the time; e.g., 0.1 percent of the time for P = 0.001. This deviation corresponds to a certain modulating voltage V that is not exceeded for the same percentage of time. The value of V_c can then be chosen to satisfy the formula

$$\int_{V_c - V_d}^{V_c + V_d} p_v(v)\, dv = 1 - P \tag{2-5}$$

where V_d is the modulating voltage defined by

$$P/2 = \int_{V_c + V_d}^{\infty} p_v(v)\, dv \tag{2-6}$$

and

$$P/2 = \int_{\infty}^{V_c - V_d} p_v(v)\, dv \tag{2-7}$$

Thus, $V_c \pm V_d$ correspond directly to the modulating voltages at peak deviation.

The probability density function of the instantaneous frequency deviation then becomes

$$p_f(f) = \frac{V_d}{D_p} p_v\left(\frac{V_d}{D_p} \quad f\right) \tag{2-8}$$

Since u is defined as $\frac{f}{r}$ the desired pdf is found to be

$$p_u(u) = rp_f(ru) = \left|\frac{rV_d}{D_p}\right| \quad p_v \quad \left(\frac{rV_d}{D_p} \quad u\right) \tag{2-9}$$

or, in terms of the more fundamental parameters used in the analysis,

$$p_u(u) = \left|\frac{rV_d}{mf_m}\right| \quad p_v \quad \left(\frac{rV_d}{mf_m} \quad u\right) \tag{2-10}$$

One can use any pdf of a modulating waveform, and the impulse rate can be derived from it providing that the following information is given.

1. Exact specification of the predetection filter including half-power bandwidth and response.
2. Modulation index m.
3. Carrier-to-noise ratio, ρ, at the RF demodulator after the predetection filter.
4. Maximum modulating frequency, f_m.
5. Probability density function of the modulating voltage.
6. A fraction, P, defining peak deviation in terms of a deviation that is not exceeded more than 100 P percent of the time.

The computer program which implements the theory in this paragraph is discussed in Section 3.

2.3.2 Predetection Filters

A value for the radius of gyration of the RF predetection filter is required for using the threshold impulse rate formulas; therefore, the filter characteristics must be considered. Since Rice's analysis assumes a filter that is symmetric with respect to a center frequency, a translation of the low-pass equivalent up in frequency to the RF frequency of interest is used. For narrow band filters, a symmetric filter is a good approximation to a real nonsymmetric filter.

A filter analysis is provided in Appendix A, and a summary of filter formulas is given in Table A-1 for symmetric filters of the following types:

1. Butterworth (one-, two-, three-, and four-pole)
2. Chebyshev (one- and two-pole)
3. Gaussian
4. Rectangular.

Explicit formulas are not presented for the radii of gyration of the three- and four-pole Chebyshev filters because of the difficulty of deriving them. The radii of gyration of of these filters can be computed by use of several formulas in a computer program.

SECTION 3 - DESCRIPTION OF COMPUTER PROGRAM

3.1 INTRODUCTION

The computer program is a FORTRAN V program for calculating the positive and negative FM threshold impulse rates in accordance with the approach presented in Section 2. The input parameters define the system and the probability density function of the FM spectrum. The computer program calculates the FM threshold impulse rates and prints the results as a function of the carrier-to-noise ratio. The other parameters are also printed out for reference.

3.2 INPUT DATA FORMAT

The data are entered into three different files called File 17, File 18, and File 19. File 17 contains eight real numbers in the following order:

1. AMODX - Modulation index
2. PCPROB - Percent probability of exceeding the "peak deviation"
3. FMODMX - The maximum frequency of the modulating spectrum
4. CONDB1 - The lowest dB value of C/N for which the threshold impulse rate is to be calculated
5. CONDB2 - The highest dB value of C/N for which the threshold impulse rate is to be calculated
6. CONDBI - The dB imcrement to be used in increasing the C/N values from the CONDB1 to the CONDB2
7. DPNUM1 - The specified continuous probability data subscript corresponding to the "peak deviation" on the low side of the carrier. If this value is to be calculated, enter a value of zero.

8. DPNUM2 - The specified continuous probability data subscript corresponding to the "peak deviation" on the high side of the carrier. If this value is to be calculated, enter a value of zero.

File 18 contains two to four elements of filter data in the following order:

1. NFTYP - An integer from 1 to 4 describing the predetection filter as follows:
   1 for Butterworth
   2 for Chebyshev
   3 for Gaussian
   4 for Rectangular
2. BANDW - A real number describing the RF bandwidth in Hz.
3. NPOLES - An integer from 1 to 4 describing the number of poles of the filter. Omit this value for the Gaussian and rectangular cases.
4. RIPLDB - A real number describing the dB ripple in the Chebyshev passband. Omit this value for Butterworth, Gaussian, and rectangular filters.

File 19 contains a vector of order 1024 such that the components are proportional samples that would be taken from the FM spectrum under consideration. The components of the vector are integers. Other components may be zero, but the first and last components must be zero.

3.3 COMPUTER PROGRAM

The computer program is listed in Appendix B and a glossary of the program variable is listed in Appendix C. A flowchart, shown in Figure 3-1, is useful in explaining the workings of the program.

The user-defined functions and dimension statements appear at the beginning of the program. All the input variables of File 17 are read. Then the peak deviation is calculated from the input variables. All of File 19 is read for the probability vector. The data subscripts corresponding to the first and last nonzero components of the vector are determined in order to eliminate the zero components at the ends of the vector from

further consideration. The expected value, or mean value, of the data subscripts is then calculated. Normally this is not an integer. The data vector is then normalized to represent a discrete probability density. That is, each component is multiplied by a constant such that the sum of the components of the resultant vector sums to 1.0. Now the vector components are no longer integers, but nonnegative real numbers less than unity.

A check is then made to determine whether or not nonzero real numbers corresponding to data subscripts, or intermediate real numbers, have been specified as DPNUM1 and DPNUM2 in File 17. If nonzero numbers have been specified, those values are assumed to correspond to the RF peak deviation frequencies without regard for the value of PCPROB, which must be specified anyway. In this way the vector subscript domain is treated as a continuous subscript domain, and the discrete probability density function can be treated as a continuous density function by a straight line approximation between each of the points of the discrete density function. If DPNUM1 and DPNUM2 are both zero, two real numbers in the continuous subscript domain are calculated to replace DPNUM1 and DPNUM2 such that the instantaneous RF frequency falls outside the RF interval defined by DPNUM1 and DPNUM2 with equal probability at each end. The single-end probability is just half the specified probability, PCPROB.

The subscript half way between DPNUM1 and DPNUM2 is then calculated regardless of whether these subscripts were specified or calculated. This new subscript then corresponds to the frequency located at the center of the symmetrical predetection filter. The peak subscript deviation is then calculated. It is just the subscript difference corresponding to the deviation of the RF carrier frequency at the specified peak deviation. By locating the RF spectrum on the predetection filter as described above, the probability of distortion due to exceeding the peak deviation is minimized. It does not necessarily minimize the impulse rates.

The program specifies the number of integration increments to be used. This number has a value of 5000, but it could be changed easily. The size of the integration increment is calculated as a function of the number of integration increments.

The ratio of the frequency change to the probability subscript change is calculated for use in integration, since the actual variable of integration is taken in the continuous data subscript domain.

Next, two variables are read from File 18 to define the predetection type and its RF bandwidth. If File 18 has no more data, the program ends. Otherwise, the program continues and evaluates the radius of gyration of the RF predetection filter by different paths through the program, depending on the type of filter being used.

If the filter is Butterworth, File 18 is read to determine the number of poles, after which the radius of gyration is evaluated by the method corresponding to the specified number of poles. Note that the radius of gyration is undefined for a single-pole filter and an invalid statement is printed out if a single-pole filter is specified.

If the filter is Chebyshev, File 18 is read for two variables defining the number of poles and the ripple specification in that order.

Then the radius of gyration is evaluated in accordance with the formulas for that number of poles. Again, the radius of gyration is undefined for a single-pole filter, and an invalid statement is printed out if a single-pole filter is specified.

If the filter is Gaussian or rectangular, no poles and ripple are specified and the radius of gyration is readily calculated.

After the radius of gyration is calculated for the filter of interest, the ratio of increments in the frequency domain to corresponding increments in the continuous subscript domain is evaluated for use in integration later on.

The carrier-to-noise ratio is incremented from CONDB1 to CONDB2. For each value of the carrier-to-noise ratio, integration takes place in a loop which evaluates the integrand at small increments of the variable of integration. The summation of elements is stored as SUMP for the integral relating to positive click rates and is stored as SUMN for the integral relating to negative click rates. Finally, SUMP and SUMN are multiplied by the proper constant to yield the desired positive and negative click rates, and the results are printed out.

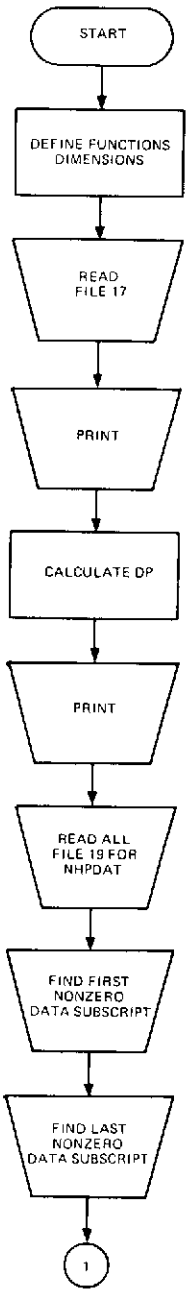


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates

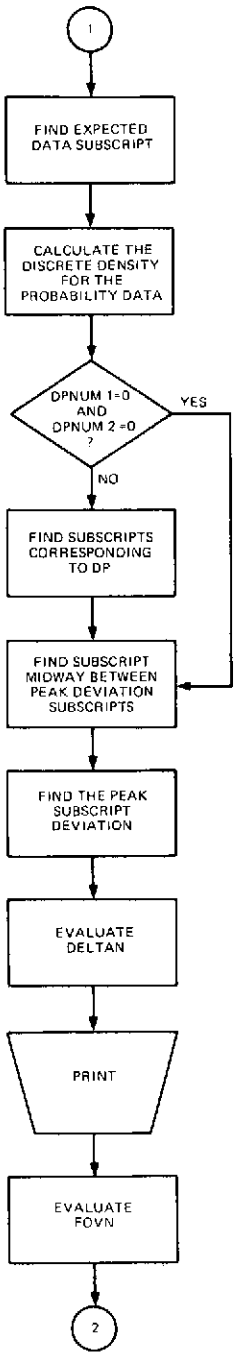


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates (Continued)

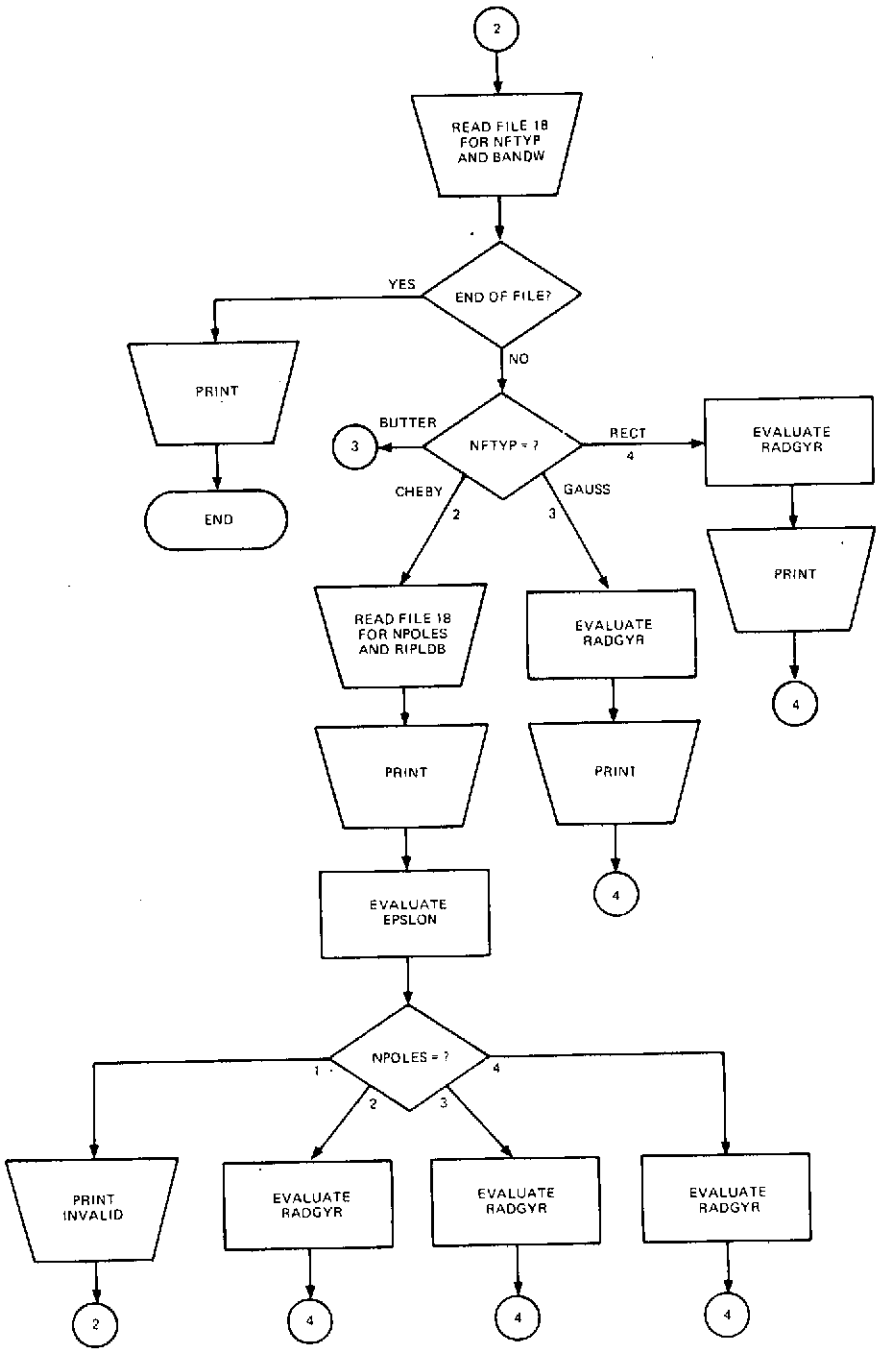


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates (Continued)

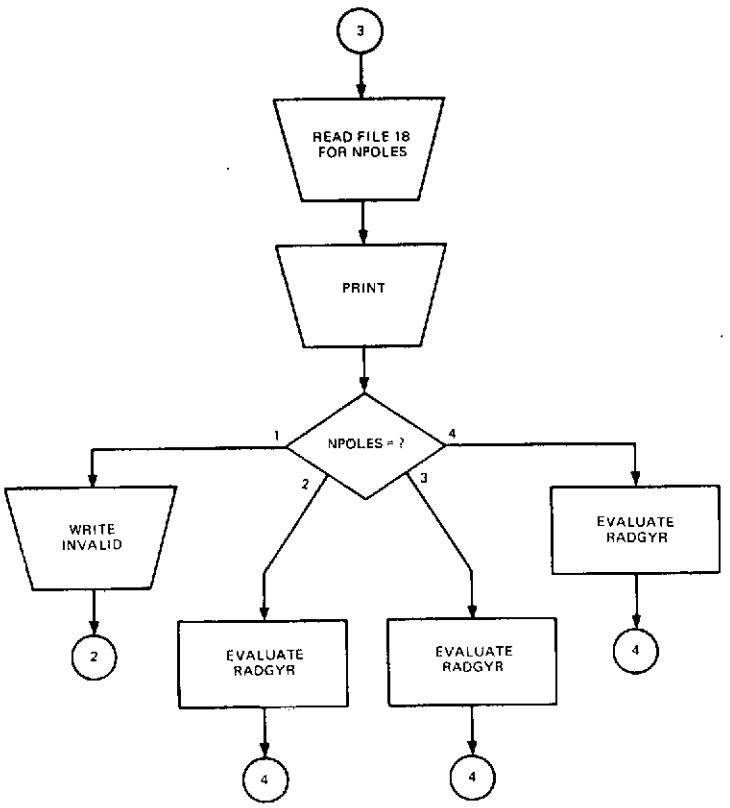


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates (Continued)

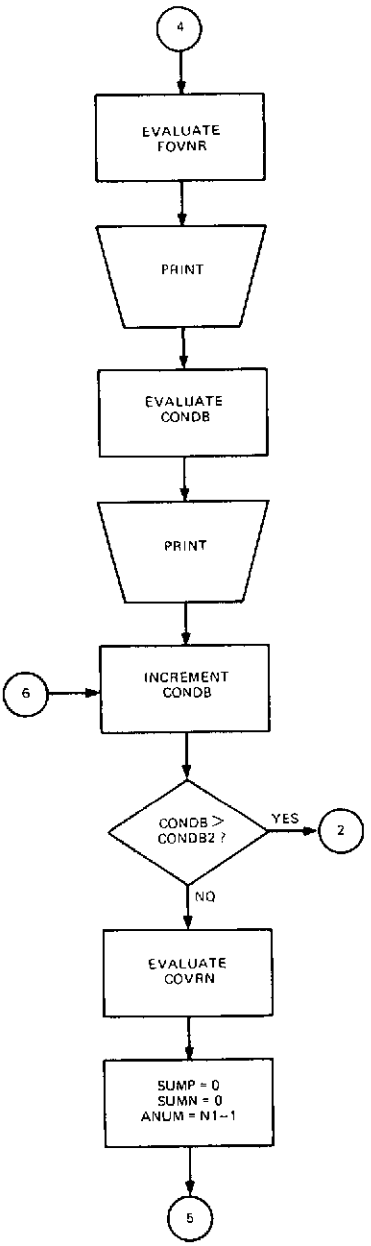


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates (Continued)

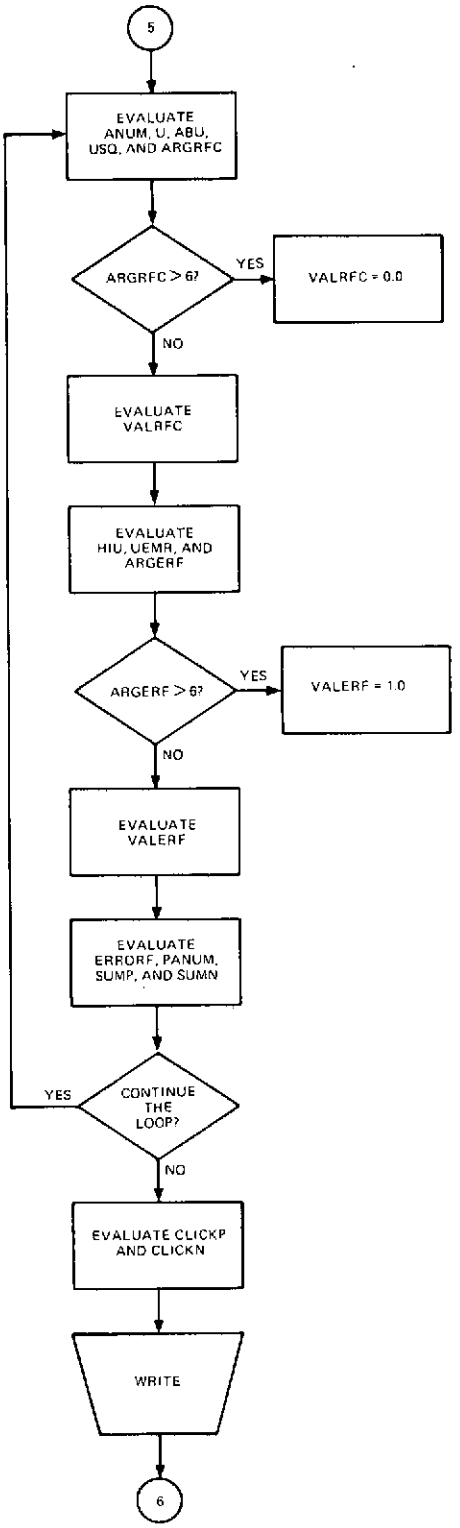


Figure 3-1. Flowchart of Computer Program to Calculate FM Threshold Impulse Rates (Continued)

SECTION 4 - ANALYSIS OF COMPUTER RESULTS

4.1 INTRODUCTION

The computer program described in Section 3 and listed in Appendix B was utilized to calculate the threshold impulse rates for various television scenes transmitted by an FM carrier with and without audio subcarriers. The impulse rates were calculated for particular FM system parameters including the modulation index, the maximum modulating frequency, the percent probability of exceeding the "peak deviation," the RF predetection filter type, its half-power bandwidth, and its number of poles. A vector of integers of order 1024 describing the probability density function of the modulating voltage was also used as an input to the program. Calculated positive and negative impulse rates are shown as a function of the carrier-to-noise ratio in tabular form and are also plotted for ease of comparison. The processed results are discussed with particular attention to the effect of preemphasis on threshold impulse rates.

4.2 INPUT DATA

The computer input data included specified parameters and laboratory-measured data supplied by NASA. Each set of measured data was a vector of nonnegative integers representing the probability density function of the voltage amplitude of the modulating waveform. The vector was formed by automatically counting samples of the modulating waveform that fell in each of the 1024 possible equal-voltage intervals during a given period of time. Thus, the vector of order 1024 was not really a probability density function but was proportional to samples taken from an actual probability density function. Twenty-four such probability density data sets were supplied in paper tape form by NASA for the cases shown in Table 4-1. These measured data are listed in Appendix D along with oscilloscope presentations of the data. All these data were processed by the computer with the four-pole Butterworth predetection filter option in the computer program. The probability of exceeding the calculated peak deviation was defined as 0.1% for the cases of no preemphasis, and the same data subscript numbers corresponding to those peak deviations were used for the corresponding cases utilizing preemphasis. This means that the modulating voltage required at the voltage-controlled oscillator to produce the peak deviation

is unchanged by the addition of preemphasis. Thus, the effect of inserting the preemphasis filter in the system without any other changes could be seen clearly. Other parameters were specified by NASA as shown in Table 4-2.

The test patterns used for generating the video modulating waveforms are listed in Table 4-1 in the column under "Pattern." Two of the test patterns, the RETMA test pattern and the "Post Office," are shown in Figures 4-1 and 4-2, respectively. The off-the-air pattern was actually achieved by tuning to an unprogrammed television channel. Five different test patterns provided a variety of modulating signals for system analysis.

In addition to the 24 sets of probability density data supplied by NASA, two other similar sets of data were mathematically generated to represent sinusoidal and Gaussian modulating signals. These two data sets are also presented in Appendix D along with diagrams representing their probability density functions. Each of these data sets was used as a computer input with the same combinations of peak deviations and RF predetection bandwidths given in Table 4-2. Thus, the computer results for the NASA-supplied probability density data sets can be compared with the results for these two reference data sets.

4.3 COMPUTER RESULTS

The threshold impulse rates are calculated as a function of the predetection carrier-to-noise ratios. The positive and negative impulse rates, calculated separately, are presented in Tables 4-3 through 4-30 and are plotted in Figures 4-3 through 4-54. The positive impulse rates are plotted separately from the negative impulse rates to avoid confusion in those cases for which the curves would overlap so as to be indistinguishable. Since the positive and negative click rates were identical for the sinusoidal and Gaussian modulating signals, only one curve, representing either the positive or the negative rate, was plotted for each case. These curves are shown in Figures 4-51 through 4-54. A summary of the results of all the cases near the FM threshold is presented in Figure 4-55 in the form of a bar graph showing total impulse rates (positive plus negative) for a carrier-to-noise ratio of 10.0 dB.

4.3.1 General Observations

It seems reasonable that the positive and negative impulse rates would be different for an unsymmetrical FM spectrum in a white RF noise environment that is symmetrically filtered. Since the voltage probability density of the modulating waveform is an approximation to the FM spectrum, it is possible to comment on the impulse rates relative to the FM spectrum.

Because of the way the computer program locates the FM spectrum relative to the frequency response of the predetection filter, the mean spectral frequency does not necessarily fall on the filter's center frequency. These two frequencies are identical for the sinusoidal and Gaussian modulating signals and they could be the same for nonsymmetrical spectra, but in general they are different.

Examination of Tables 4-3 through 4-26 shows that there are nine cases for which the mean frequency is lower than the center frequency and 15 cases for which the mean frequency is higher than the center frequency. In each of the nine cases for which the FM spectrum is weighted on the low side, the positive impulse rate is greater than the negative impulse rate; and for each of the cases of spectral weighting on the high side of the center frequency, the negative impulse rate is greater than the positive impulse rate. Even though the positive and negative impulse rates were calculated separately for the sinusoidal and Gaussian data, they were identical, as expected. It does not follow that placing the FM spectral mean on the center frequency of the filter would result in equal numbers of positive and negative impulse rates; however, three nonsymmetrical cases can be cited for which the difference between continuous subscripts corresponding to the mean and center frequencies is less than 3.0. These cases are shown in Tables 4-4, 4-6, and 4-17 for data sets 3, 5, and 12. These data sets were processed with subscript differences of 2.9, 2.9, and 0.5, respectively, with the result that the positive and negative impulse rates were very nearly the same. Specifically, at a carrier-to-noise ratio of 10.0 dB the positive and negative impulse rates differed by 5.66%, 4.07%, and 2.14%, respectively, for these data sets. The differences are small compared with a difference of 1775% at the same 10.0-dB carrier-to-noise

ratio for data set 18 shown in Table 4-26. This large difference in impulse rates occurs for a difference of 70.7 between the mean and center continuous subscripts; however, there are cases with larger subscript differences that have a much better balance between the positive and negative impulse rates.

4.3.2 Effect of the FM Spectral Shape on Impulse Rates

The effect of the FM spectrum shape on the impulse rate is readily visible when the impulse rates for the Gaussian and sinusoidal data are examined in Tables 4-27 through 4-30. The sinusoidal probability density function, plotted in Figure D-25, indicates a higher probability for high peak deviations than does the Gaussian probability density function, plotted in Figure D-26. Thus, one would expect higher impulse rates for the sinusoidal case than for the Gaussian. This is borne out in the tables mentioned above and in Figures 4-51 through 4-54, where those data are plotted. For a peak deviation of 5.4 MHz, an RF bandwidth of 15 MHz, and a sinusoidal distribution, the positive (or negative) impulse rate is 79.00 per second for a C/N of 10.0 dB compared with 35.35 per second for the Gaussian distribution.

Of the 26 probability density functions that were considered, sinusoidal appears to have the largest moment. Therefore, one would expect a sinusoidal modulating signal to cause the largest impulse rates, and this is true. Of all cases having a 5.4-MHz peak deviation, the sinusoidal case has the highest total impulse rate (158.02/s at a $\frac{C}{N}$ of 10.0 dB), and of all cases having a 10.0-MHz peak deviation the sinusoidal case again has the highest total impulse rate (290.8/s at a $\frac{C}{N}$ of 10 dB). Thus, it appears that the use of a sinusoidal modulating signal provides an upper bound of the set of impulse rates for TV signals. While there are probably some exceptions not treated in this report, the use of a sinusoidal test signal to determine the upper bound of threshold carrier-to-noise ratio for a particular FM peak deviation seems sound.

4.3.3 Effect of Preemphasis on Impulse Rates

A preemphasis-deemphasis combination is used to increase the ratio of signal power to fluctuation noise power at the output of the receiver, particularly for the higher frequency

channels that may occupy the baseband. This improvement occurs above threshold where impulsive threshold noise is negligible. It is useful to examine the effect of preemphasis upon the impulse rate which causes the FM threshold condition. Although deemphasis filters are always employed in systems utilizing preemphasis, it is worth noting that a deemphasis filter has no effect on the impulse rate. Of the two filters, only the preemphasis filter can affect the impulse rate.

Tables 4-3 through 4-14 and Figures 4-3 through 4-26 show the impulse rates for flat systems. Tables 4-15 through 4-26 and Figures 4-27 through 4-50 show the impulse rates for the same systems having preemphasis included. The impulse rates calculated for other cases do not apply for the preemphasis-deemphasis consideration.

Of the 12 pairs of data sets considered, the negative impulse rates decreased with the addition of preemphasis for all except the 18-19 pair for which impulse rates are shown in Tables 4-14 and 4-26. The particular case can be identified easily in Table 4-1. The positive impulse rates also decreased for all cases except four corresponding to the following pairs of data sets:

5 and 6

7 and 8

15 and 16

13 and 14

These sets can also be identified in Table 4-1.

If the positive and negative rates are added, there is only one pair (15-16) for which the impulse rate does not decrease with preemphasis, and the increase is only 4%. This exception is clear in Figure 4-55, if one recalls that all even-numbered data sets are associated with preemphasis and all odd-numbered data sets are not. The effect of preemphasis depends on the modulating spectrum, since signals having low baseband frequencies are attenuated and those with high frequencies are amplified. One would expect a lower impulse rate as a result of adding preemphasis if the modulating spectrum is concentrated at the low end of the modulation band. However, a higher impulse rate would be expected if the modulating spectrum were concentrated at the high end. This is based on the effect of preemphasis on peak deviation, and a higher peak deviation implies a higher impulse rate.

Table 4-1. Identification of Data Sets of Measured Probability Densities

	Pattern	Number of Subcarriers	Format	Flat Data Set Number	Preemphasized Data Set Number
Monochrome	RETMA Test	0	Trust	1	2
	"Post Office"	0	Trust	3	4
	Off-The-Air	0	ETV	11	12
Color	EIA Color Bars	0	ETV	5	6
	Modulated Stairstep	0	Trust	7	8
	Off-The-Air	0	ETV	9	10
Monochrome	RETMA Test	2	Trust	19	20
	Off-The-Air	2	Trust	21	22
	Off-The-Air	4	ETV	15	16
Color	EIA Color Bars	4	ETV	13	14
	Off-The-Air	2	Trust	23	24
	Off-The-Air	4	ETV	17	18

Table 4-2. Parameters Used in Computer Analysis of Measured Data

FORMAT	TRUST		ETV	
SUBCARRIERS	0	2	0	4
Maximum Modulating Frequency	4.0 MHz	4.97 MHz	4.2 MHz	5.413 MHz
Modulation Index	1.35	1.087	2.381	1.847
Peak Deviation	5.4 MHz	5.4 MHz	10.0 MHz	10.0 MHz
RF Predetection Bandwidth	15.0 MHz	15.0 MHz	23.0 MHz	23.0 MHz

Table 4-3. Impulse Rates Calculated for Data Set 1

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$2.555\ (10)^{5}$	$7.224\ (10)^{5}$
2	$1.773\ (10)^{5}$	$5.144\ (10)^{5}$
3	$1.136\ (10)^{5}$	$3.372\ (10)^{5}$
4	$6.575\ (10)^{4}$	$1.991\ (10)^{5}$
5	$3.345\ (10)^{4}$	$1.031\ (10)^{5}$
6	$1.445\ (10)^{4}$	$4.514\ (10)^{4}$
7	$5.070\ (10)^{3}$	$1.602\ (10)^{4}$
8	$1.368\ (10)^{3}$	$4.359\ (10)^{3}$
9	$2.645\ (10)^{2}$	$8.483\ (10)^{2}$
10	$3.360\ (10)^{1}$	$1.083\ (10)^{2}$
11	2.513	8.118
12	$9.643\ (10)^{-2}$	$3.117\ (10)^{-1}$
13	$1.597\ (10)^{-3}$	$5.151\ (10)^{-3}$
14	$9.230\ (10)^{-6}$	$2.951\ (10)^{-5}$
15	$1.443\ (10)^{-8}$	$4.480\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 120.0 and 727.2
Center Subscript: 423.6
Mean Subscript: 516.1

Table 4-4. Impulse Rates Calculated for Data Set 3

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.036\ (10)^{5}$	$3.869\ (10)^{5}$
2	$2.806\ (10)^{5}$	$2.686\ (10)^{5}$
3	$1.796\ (10)^{5}$	$1.716\ (10)^{5}$
4	$1.035\ (10)^{5}$	$9.872\ (10)^{4}$
5	$5.230\ (10)^{4}$	$4.980\ (10)^{4}$
6	$2.238\ (10)^{4}$	$2.128\ (10)^{4}$
7	$7.772\ (10)^{3}$	$7.380\ (10)^{3}$
8	$2.073\ (10)^{3}$	$1.966\ (10)^{3}$
9	$3.964\ (10)^{2}$	$3.755\ (10)^{2}$
10	$4.989\ (10)^{1}$	$4.721\ (10)^{1}$
11	3.707	3.506
12	$1.421\ (10)^{-1}$	$1.343\ (10)^{-1}$
13	$2.375\ (10)^{-3}$	$2.248\ (10)^{-3}$
14	$1.420\ (10)^{-5}$	$1.347\ (10)^{-5}$
15	$2.510\ (10)^{-8}$	$2.401\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 258.0 and 799.1
Center Subscript: 528.5
Mean Subscript: 525.6

Table 4-5. Impulse Rates Calculated for Data Set 11

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$5.240\ (10)^{5}$	$5.918\ (10)^{5}$
2	$3.605\ (10)^{5}$	$4.094\ (10)^{5}$
3	$2.281\ (10)^{5}$	$2.606\ (10)^{5}$
4	$1.300\ (10)^{5}$	$1.493\ (10)^{5}$
5	$6.493\ (10)^{4}$	$7.503\ (10)^{4}$
6	$2.747\ (10)^{4}$	$3.193\ (10)^{4}$
7	$9.431\ (10)^{3}$	$1.102\ (10)^{4}$
8	$2.487\ (10)^{3}$	$2.921\ (10)^{3}$
9	$4.707\ (10)^{2}$	$5.555\ (10)^{2}$
10	$5.867\ (10)^{1}$	$6.951\ (10)^{1}$
11	4.329	5.142
12	$1.656\ (10)^{-1}$	$1.968\ (10)^{-1}$
13	$2.798\ (10)^{-3}$	$3.314\ (10)^{-3}$
14	$1.744\ (10)^{-5}$	$2.038\ (10)^{-5}$
15	$3.532\ (10)^{-8}$	$3.973\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 223.3 and 808.8
Center Subscript: 516.1
Mean Subscript: 523.1

Table 4-6. Impulse Rates Calculated for Data Set 5

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$7.237\ (10)^{5}$	$7.494\ (10)^{5}$
2	$5.099\ (10)^{5}$	$5.285\ (10)^{5}$
3	$3.309\ (10)^{5}$	$3.432\ (10)^{5}$
4	$1.935\ (10)^{5}$	$2.008\ (10)^{5}$
5	$9.923\ (10)^{4}$	$1.031\ (10)^{5}$
6	$4.310\ (10)^{4}$	$4.479\ (10)^{4}$
7	$1.518\ (10)^{4}$	$1.578\ (10)^{4}$
8	$4.103\ (10)^{3}$	$4.267\ (10)^{3}$
9	$7.942\ (10)^{2}$	$8.263\ (10)^{2}$
10	$1.009\ (10)^{2}$	$1.050\ (10)^{2}$
11	7.548	7.856
12	$2.896\ (10)^{-1}$	$3.014\ (10)^{-1}$
13	$4.803\ (10)^{-3}$	$4.998\ (10)^{-3}$
14	$2.787\ (10)^{-5}$	$2.898\ (10)^{-5}$
15	$4.450\ (10)^{-8}$	$4.617\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 310.6 and 946.5
Center Subscript: 628.5
Mean Subscript: 631.4

Table 4-7. Impulse Rates Calculated for Data Set 7

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.371\ (10)^{5}$	$4.674\ (10)^{5}$
2	$3.070\ (10)^{5}$	$3.289\ (10)^{5}$
3	$1.986\ (10)^{5}$	$2.131\ (10)^{5}$
4	$1.158\ (10)^{5}$	$1.245\ (10)^{5}$
5	$5.927\ (10)^{4}$	$6.379\ (10)^{4}$
6	$2.569\ (10)^{4}$	$2.769\ (10)^{4}$
7	$9.034\ (10)^{3}$	$9.745\ (10)^{3}$
8	$2.439\ (10)^{3}$	$2.633\ (10)^{3}$
9	$4.717\ (10)^{2}$	$5.096\ (10)^{2}$
10	$5.991\ (10)^{1}$	$6.476\ (10)^{1}$
11	4.479	4.843
12	$1.719\ (10)^{-1}$	$1.858\ (10)^{-1}$
13	$2.850\ (10)^{-3}$	$3.081\ (10)^{-3}$
14	$1.654\ (10)^{-5}$	$1.786\ (10)^{-5}$
15	$2.644\ (10)^{-8}$	$2.841\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 319.2 and 989.6
Center Subscript: 654.4
Mean Subscript: 661.0

Table 4-8. Impulse Rates Calculated for Data Set 9

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.650\ (10)^{5}$	$6.990\ (10)^{5}$
2	$3.189\ (10)^{5}$	$4.879\ (10)^{5}$
3	$2.013\ (10)^{5}$	$3.134\ (10)^{5}$
4	$1.145\ (10)^{5}$	$1.814\ (10)^{5}$
5	$5.712\ (10)^{4}$	$9.201\ (10)^{4}$
6	$2.416\ (10)^{4}$	$3.954\ (10)^{4}$
7	$8.295\ (10)^{3}$	$1.378\ (10)^{4}$
8	$2.190\ (10)^{3}$	$3.689\ (10)^{3}$
9	$4.151\ (10)^{2}$	$7.078\ (10)^{2}$
10	$5.185\ (10)^{1}$	$8.927\ (10)^{1}$
11	3.832	6.642
12	$1.467\ (10)^{-1}$	$2.546\ (10)^{-1}$
13	$2.470\ (10)^{-3}$	$4.251\ (10)^{-3}$
14	$1.518\ (10)^{-5}$	$2.534\ (10)^{-5}$
15	$2.938\ (10)^{-8}$	$4.460\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 349.0 and 650.2
Center Subscript: 499.6
Mean Subscript: 512.0

Table 4-9. Impulse Rates Calculated for Data Set 19

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$2.500\ (10)^{5}$	$6.142\ (10)^{5}$
2	$1.717\ (10)^{5}$	$4.346\ (10)^{5}$
3	$1.088\ (10)^{5}$	$2.832\ (10)^{5}$
4	$6.220\ (10)^{4}$	$1.662\ (10)^{5}$
5	$3.127\ (10)^{4}$	$8.556\ (10)^{4}$
6	$1.335\ (10)^{4}$	$3.729\ (10)^{4}$
7	$4.635\ (10)^{3}$	$1.318\ (10)^{4}$
8	$1.238\ (10)^{3}$	$3.571\ (10)^{3}$
9	$2.375\ (10)^{2}$	$6.929\ (10)^{2}$
10	$2.998\ (10)^{1}$	$8.821\ (10)^{1}$
11	2.233	6.605
12	$8.561\ (10)^{-2}$	$2.535\ (10)^{-1}$
13	$1.425\ (10)^{-3}$	$4.197\ (10)^{-3}$
14	$8.395\ (10)^{-6}$	$2.421\ (10)^{-5}$
15	$1.410\ (10)^{-8}$	$3.779\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 118.0 and 762.7
Center Subscript: 440.3
Mean Subscript: 516.9

Table 4-10. Impulse Rates Calculated for Data Set 21

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$3.134\ (10)^{5}$	$3.617\ (10)^{5}$
2	$2.140\ (10)^{5}$	$2.488\ (10)^{5}$
3	$1.343\ (10)^{5}$	$1.574\ (10)^{5}$
4	$7.589\ (10)^{4}$	$8.967\ (10)^{4}$
5	$3.758\ (10)^{4}$	$4.478\ (10)^{4}$
6	$1.577\ (10)^{4}$	$1.894\ (10)^{4}$
7	$5.369\ (10)^{3}$	$6.501\ (10)^{3}$
8	$1.405\ (10)^{3}$	$1.715\ (10)^{3}$
9	$2.642\ (10)^{2}$	$3.245\ (10)^{2}$
10	$3.275\ (10)^{1}$	$4.046\ (10)^{1}$
11	2.407	2.986
12	$9.203\ (10)^{-2}$	$1.143\ (10)^{-1}$
13	$1.562\ (10)^{-3}$	$1.929\ (10)^{-3}$
14	$9.882\ (10)^{-6}$	$1.198\ (10)^{-5}$
15	$2.080\ (10)^{-8}$	$2.394\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 181.5 and 805.7
Center Subscript: 493.6
Mean Subscript: 503.4

Table 4-11. Impulse Rates Calculated for Data Set 15

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$7.116\ (10)^{5}$	$3.997\ (10)^{5}$
2	$4.959\ (10)^{5}$	$2.708\ (10)^{5}$
3	$3.180\ (10)^{5}$	$1.686\ (10)^{5}$
4	$1.837\ (10)^{5}$	$9.455\ (10)^{4}$
5	$9.298\ (10)^{4}$	$4.647\ (10)^{4}$
6	$3.986\ (10)^{4}$	$1.936\ (10)^{4}$
7	$1.386\ (10)^{4}$	$6.547\ (10)^{3}$
8	$3.701\ (10)^{3}$	$1.703\ (10)^{3}$
9	$7.086\ (10)^{2}$	$3.185\ (10)^{2}$
10	$8.920\ (10)^{1}$	$3.932\ (10)^{1}$
11	6.628	2.883
12	$2.540\ (10)^{-1}$	$1.102\ (10)^{-1}$
13	$4.249\ (10)^{-3}$	$1.875\ (10)^{-3}$
14	$2.550\ (10)^{-5}$	$1.195\ (10)^{-5}$
15	$4.587\ (10)^{-8}$	$2.559\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 374.5 and 712.5
Center Subscript: 543.5
Mean Subscript: 524.9

Table 4-12. Impulse Rates Calculated for Data Set 13

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$7.351\ (10)^{5}$	$7.416\ (10)^{5}$
2	$5.183\ (10)^{5}$	$5.230\ (10)^{5}$
3	$3.365\ (10)^{5}$	$3.397\ (10)^{5}$
4	$1.969\ (10)^{5}$	$1.988\ (10)^{5}$
5	$1.011\ (10)^{5}$	$1.020\ (10)^{5}$
6	$4.392\ (10)^{4}$	$4.435\ (10)^{4}$
7	$1.548\ (10)^{4}$	$1.563\ (10)^{4}$
8	$4.185\ (10)^{3}$	$4.227\ (10)^{3}$
9	$8.104\ (10)^{2}$	$8.185\ (10)^{2}$
10	$1.030\ (10)^{2}$	$1.041\ (10)^{2}$
11	7.705	7.784
12	$2.957\ (10)^{-1}$	$2.987\ (10)^{-1}$
13	$4.902\ (10)^{-3}$	$4.951\ (10)^{-3}$
14	$2.841\ (10)^{-5}$	$2.869\ (10)^{-5}$
15	$4.513\ (10)^{-8}$	$4.555\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 332.6 and 915.3
Center Subscript: 623.9
Mean Subscript: 624.6

Table 4-13. Impulse Rates Calculated for Data Set 23

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$2.650\ (10)^{5}$	$4.366\ (10)^{5}$
2	$1.796\ (10)^{5}$	$3.034\ (10)^{5}$
3	$1.119\ (10)^{5}$	$1.941\ (10)^{5}$
4	$6.283\ (10)^{4}$	$1.118\ (10)^{5}$
5	$3.093\ (10)^{4}$	$5.650\ (10)^{4}$
6	$1.291\ (10)^{4}$	$2.418\ (10)^{4}$
7	$4.375\ (10)^{3}$	$8.398\ (10)^{3}$
8	$1.141\ (10)^{3}$	$2.240\ (10)^{3}$
9	$2.140\ (10)^{2}$	$4.285\ (10)^{2}$
10	$2.649\ (10)^{1}$	$5.392\ (10)^{1}$
11	1.946	4.005
12	$7.438\ (10)^{-2}$	$1.535\ (10)^{-1}$
13	$1.262\ (10)^{-3}$	$2.568\ (10)^{-3}$
14	$7.972\ (10)^{-6}$	$1.542\ (10)^{-5}$
15	$1.665\ (10)^{-8}$	$2.781\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 206.9 and 760.0
Center Subscript: 483.4
Mean Subscript: 514.4

Table 4-14. Impulse Rates Calculated for Data Set 17

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.365\ (10)^{5}$	$8.367\ (10)^{5}$
2	$3.003\ (10)^{5}$	$5.892\ (10)^{5}$
3	$1.903\ (10)^{5}$	$3.820\ (10)^{5}$
4	$1.088\ (10)^{5}$	$2.231\ (10)^{5}$
5	$5.461\ (10)^{4}$	$1.143\ (10)^{5}$
6	$2.325\ (10)^{4}$	$4.957\ (10)^{4}$
7	$8.045\ (10)^{3}$	$1.743\ (10)^{4}$
8	$2.140\ (10)^{3}$	$4.704\ (10)^{3}$
9	$4.088\ (10)^{2}$	$9.093\ (10)^{2}$
10	$5.142\ (10)^{1}$	$1.154\ (10)^{2}$
11	3.819	8.624
12	$1.463\ (10)^{-1}$	$3.308\ (10)^{-1}$
13	$2.446\ (10)^{-3}$	$5.493\ (10)^{-3}$
14	$1.463\ (10)^{-5}$	$3.201\ (10)^{-5}$
15	$2.589\ (10)^{-8}$	$5.192\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 184.5 and 711.4
Center Subscript: 448.0
Mean Subscript: 485.1

Table 4-15. Impulse Rates Calculated for Data Set 2

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$1.227\ (10)^{5}$	$6.013\ (10)^{5}$
2	$7.745\ (10)^{4}$	$4.229\ (10)^{5}$
3	$4.461\ (10)^{4}$	$2.738\ (10)^{5}$
4	$2.297\ (10)^{4}$	$1.597\ (10)^{5}$
5	$1.030\ (10)^{4}$	$8.164\ (10)^{4}$
6	$3.891\ (10)^{3}$	$3.535\ (10)^{4}$
7	$1.190\ (10)^{3}$	$1.241\ (10)^{4}$
8	$2.799\ (10)^{2}$	$3.345\ (10)^{3}$
9	$4.753\ (10)^{1}$	$6.459\ (10)^{2}$
10	5.389	$8.191\ (10)^{1}$
11	$3.719\ (10)^{-1}$	6.117
12	$1.402\ (10)^{-2}$	$2.346\ (10)^{-1}$
13	$2.558\ (10)^{-4}$	$3.898\ (10)^{-3}$
14	$2.017\ (10)^{-6}$	$2.280\ (10)^{-5}$
15	$6.384\ (10)^{-9}$	$3.751\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 120.0 and 727.2
Center Subscript: 423.6
Mean Subscript: 518.4

Table 4-16. Impulse Rates Calculated for Data Set 4

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$3.333\ (10)^{5}$	$2.503\ (10)^{5}$
2	$2.265\ (10)^{5}$	$1.666\ (10)^{5}$
3	$1.414\ (10)^{5}$	$1.016\ (10)^{5}$
4	$7.930\ (10)^{4}$	$5.558\ (10)^{4}$
5	$3.893\ (10)^{4}$	$2.655\ (10)^{4}$
6	$1.616\ (10)^{4}$	$1.071\ (10)^{4}$
7	$5.440\ (10)^{3}$	$3.493\ (10)^{3}$
8	$1.406\ (10)^{3}$	$8.742\ (10)^{2}$
9	$2.609\ (10)^{2}$	$1.570\ (10)^{2}$
10	$3.193\ (10)^{1}$	$1.866\ (10)^{1}$
11	2.325	1.329
12	$8.871\ (10)^{-2}$	$5.043\ (10)^{-2}$
13	$1.527\ (10)^{-3}$	$8.948\ (10)^{-4}$
14	$1.015\ (10)^{-5}$	$6.546\ (10)^{-6}$
15	$2.420\ (10)^{-8}$	$1.880\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 258.0 and 799.1
Center Subscript: 528.5
Mean Subscript: 513.9

Table 4-17. Impulse Rates Calculated for Data Set 12

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.472\ (10)^{5}$	$4.422\ (10)^{5}$
2	$3.011\ (10)^{5}$	$2.975\ (10)^{5}$
3	$1.860\ (10)^{5}$	$1.836\ (10)^{5}$
4	$1.032\ (10)^{5}$	$1.017\ (10)^{5}$
5	$5.003\ (10)^{4}$	$4.928\ (10)^{4}$
6	$2.051\ (10)^{4}$	$2.018\ (10)^{4}$
7	$6.807\ (10)^{3}$	$6.689\ (10)^{3}$
8	$1.734\ (10)^{3}$	$1.702\ (10)^{3}$
9	$3.172\ (10)^{2}$	$3.109\ (10)^{2}$
10	$3.831\ (10)^{1}$	$3.750\ (10)^{1}$
11	2.761	2.700
12	$1.051\ (10)^{-1}$	$1.027\ (10)^{-1}$
13	$1.835\ (10)^{-3}$	$1.797\ (10)^{-3}$
14	$1.283\ (10)^{-5}$	$1.262\ (10)^{-5}$
15	$3.416\ (10)^{-8}$	$3.383\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 223.3 and 808.8
Center Subscript: 516.1
Mean Subscript: 515.6

Table 4-18. Impulse Rates Calculated for Data Set 6

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$9.410\ (10)^{5}$	$3.258\ (10)^{5}$
2	$6.645\ (10)^{5}$	$2.204\ (10)^{5}$
3	$4.320\ (10)^{5}$	$1.374\ (10)^{5}$
4	$2.530\ (10)^{5}$	$7.728\ (10)^{4}$
5	$1.299\ (10)^{5}$	$3.819\ (10)^{4}$
6	$5.647\ (10)^{4}$	$1.603\ (10)^{4}$
7	$1.990\ (10)^{4}$	$5.470\ (10)^{3}$
8	$5.379\ (10)^{3}$	$1.438\ (10)^{3}$
9	$1.041\ (10)^{3}$	$2.719\ (10)^{2}$
10	$1.323\ (10)^{2}$	$3.391\ (10)^{1}$
11	9.888	2.504
12	$3.794\ (10)^{-1}$	$9.579\ (10)^{-2}$
13	$6.296\ (10)^{-3}$	$1.614\ (10)^{-3}$
14	$3.668\ (10)^{-5}$	$9.960\ (10)^{-6}$
15	$5.956\ (10)^{-8}$	$1.955\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 310.6 and 946.5
Center Subscript: 628.5
Mean Subscript: 559.7

Table 4-19. Impulse Rates Calculated for Data Set 8

C/N (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$5.285\ (10)^{5}$	$1.501\ (10)^{5}$
2	$3.695\ (10)^{5}$	$9.632\ (10)^{4}$
3	$2.377\ (10)^{5}$	$5.649\ (10)^{4}$
4	$1.377\ (10)^{5}$	$2.964\ (10)^{4}$
5	$6.997\ (10)^{4}$	$1.356\ (10)^{4}$
6	$3.011\ (10)^{4}$	$5.230\ (10)^{3}$
7	$1.051\ (10)^{4}$	$1.632\ (10)^{3}$
8	$2.815\ (10)^{3}$	$3.911\ (10)^{2}$
9	$5.406\ (10)^{2}$	$6.748\ (10)^{1}$
10	$6.825\ (10)^{1}$	7.747
11	5.081	$5.386\ (10)^{-1}$
12	$1.948\ (10)^{-1}$	$2.033\ (10)^{-2}$
13	$3.250\ (10)^{-3}$	$3.697\ (10)^{-4}$
14	$1.933\ (10)^{-5}$	$2.897\ (10)^{-6}$
15	$3.380\ (10)^{-8}$	$9.183\ (10)^{-9}$

CONDITIONS

Modulation Index: 1.35
Maximum Modulating Frequency: 4.0 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 319.2 and 989.6
Center Subscript: 654.4
Mean Subscript: 571.7

Table 4-20. Impulse Rates Calculated for Data Set 10

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$4.096\ (10)^{5}$	$6.559\ (10)^{5}$
2	$2.772\ (10)^{5}$	$4.550\ (10)^{5}$
3	$1.725\ (10)^{5}$	$2.904\ (10)^{5}$
4	$9.659\ (10)^{4}$	$1.670\ (10)^{5}$
5	$4.741\ (10)^{4}$	$8.413\ (10)^{4}$
6	$1.971\ (10)^{4}$	$3.591\ (10)^{4}$
7	$6.656\ (10)^{3}$	$1.243\ (10)^{4}$
8	$1.728\ (10)^{3}$	$3.306\ (10)^{3}$
9	$3.225\ (10)^{2}$	$6.304\ (10)^{2}$
10	$3.973\ (10)^{1}$	$7.911\ (10)^{1}$
11	2.908	5.864
12	$1.111\ (10)^{-1}$	$2.246\ (10)^{-1}$
13	$1.895\ (10)^{-3}$	$3.770\ (10)^{-3}$
14	$1.222\ (10)^{-5}$	$2.291\ (10)^{-5}$
15	$2.699\ (10)^{-8}$	$4.301\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 349.0 and 650.2
Center Subscript: 499.6
Mean Subscript: 512.7

Table 4-21. Impulse Rates Calculated for Data Set 20

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$1.575\ (10)^{5}$	$4.966\ (10)^{5}$
2	$1.012\ (10)^{5}$	$3.460\ (10)^{5}$
3	$5.939\ (10)^{4}$	$2.218\ (10)^{5}$
4	$3.116\ (10)^{4}$	$1.280\ (10)^{5}$
5	$1.424\ (10)^{4}$	$6.478\ (10)^{4}$
6	$5.478\ (10)^{3}$	$2.777\ (10)^{4}$
7	$1.703\ (10)^{3}$	$9.653\ (10)^{3}$
8	$4.061\ (10)^{2}$	$2.578\ (10)^{3}$
9	$6.967\ (10)^{1}$	$4.936\ (10)^{2}$
10	7.957	$6.217\ (10)^{1}$
11	$5.514\ (10)^{-1}$	4.621
12	$2.082\ (10)^{-2}$	$1.771\ (10)^{-1}$
13	$3.795\ (10)^{-4}$	$2.960\ (10)^{-3}$
14	$2.969\ (10)^{-6}$	$1.769\ (10)^{-5}$
15	$9.312\ (10)^{-9}$	$3.136\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 118.0 and 762.7
Center Subscript: 440.3
Mean Subscript: 511.6

Table 4-22. Impulse Rates Calculated for Data Set 22

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$2.246\ (10)^{5}$	$3.540\ (10)^{5}$
2	$1.479\ (10)^{5}$	$2.414\ (10)^{5}$
3	$8.914\ (10)^{4}$	$1.511\ (10)^{5}$
4	$4.810\ (10)^{4}$	$8.508\ (10)^{4}$
5	$2.262\ (10)^{4}$	$4.192\ (10)^{4}$
6	$8.961\ (10)^{3}$	$1.747\ (10)^{4}$
7	$2.866\ (10)^{3}$	$5.902\ (10)^{3}$
8	$7.019\ (10)^{2}$	$1.531\ (10)^{3}$
9	$1.232\ (10)^{2}$	$2.851\ (10)^{2}$
10	$1.431\ (10)^{1}$	$3.501\ (10)^{1}$
11	1.001	2.555
12	$3.784\ (10)^{-2}$	$9.751\ (10)^{-2}$
13	$6.879\ (10)^{-4}$	$1.673\ (10)^{-3}$
14	$5.391\ (10)^{-6}$	$1.101\ (10)^{-5}$
15	$1.726\ (10)^{-8}$	$2.567\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 181.5 and 805.7
Center Subscript: 493.6
Mean Subscript: 519.9

Table 4-23. Impulse Rates Calculated for Data Set 16

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$8.709\ (10)^{5}$	$2.501\ (10)^{5}$
2	$6.115\ (10)^{5}$	$1.634\ (10)^{5}$
3	$3.951\ (10)^{5}$	$9.784\ (10)^{4}$
4	$2.300\ (10)^{5}$	$5.264\ (10)^{4}$
5	$1.173\ (10)^{5}$	$2.479\ (10)^{4}$
6	$5.070\ (10)^{4}$	$9.888\ (10)^{3}$
7	$1.776\ (10)^{4}$	$3.204\ (10)^{3}$
8	$4.776\ (10)^{3}$	$7.999\ (10)^{2}$
9	$9.202\ (10)^{2}$	$1.440\ (10)^{2}$
10	$1.165\ (10)^{2}$	$1.723\ (10)^{1}$
11	8.688	1.236
12	$3.332\ (10)^{-1}$	$4.702\ (10)^{-2}$
13	$5.545\ (10)^{-3}$	$8.203\ (10)^{-4}$
14	$3.263\ (10)^{-5}$	$5.667\ (10)^{-6}$
15	$5.483\ (10)^{-8}$	$1.445\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 374.5 and 712.5
Center Subscript: 543.5
Mean Subscript: 506.5

Table 4-24. Impulse Rates Calculated for Data Set 14

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$1.035\ (10)^{6}$	$3.316\ (10)^{5}$
2	$7.333\ (10)^{5}$	$2.257\ (10)^{5}$
3	$4.784\ (10)^{5}$	$1.416\ (10)^{5}$
4	$2.810\ (10)^{5}$	$8.015\ (10)^{4}$
5	$1.447\ (10)^{5}$	$3.986\ (10)^{4}$
6	$6.306\ (10)^{4}$	$1.683\ (10)^{4}$
7	$2.227\ (10)^{4}$	$5.781\ (10)^{3}$
8	$6.032\ (10)^{3}$	$1.528\ (10)^{3}$
9	$1.169\ (10)^{3}$	$2.901\ (10)^{2}$
10	$1.487\ (10)^{2}$	$3.630\ (10)^{1}$
11	$1.113\ (10)^{1}$	2.686
12	$4.270\ (10)^{-1}$	$1.028\ (10)^{-1}$
13	$7.080\ (10)^{-3}$	$1.728\ (10)^{-3}$
14	$4.113\ (10)^{-5}$	$1.059\ (10)^{-5}$
15	$6.611\ (10)^{-8}$	$2.037\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 332.6 and 915.3
Center Subscript: 623.9
Mean Subscript: 551.8

Table 4-25. Impulse Rates Calculated for Data Set 24

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$1.976\ (10)^{5}$	$4.278\ (10)^{5}$
2	$1.295\ (10)^{5}$	$2.956\ (10)^{5}$
3	$7.767\ (10)^{4}$	$1.879\ (10)^{5}$
4	$4.174\ (10)^{4}$	$1.075\ (10)^{5}$
5	$1.957\ (10)^{4}$	$5.388\ (10)^{4}$
6	$7.745\ (10)^{3}$	$2.287\ (10)^{4}$
7	$2.480\ (10)^{3}$	$7.876\ (10)^{3}$
8	$6.092\ (10)^{2}$	$2.083\ (10)^{3}$
9	$1.076\ (10)^{2}$	$3.954\ (10)^{2}$
10	$1.261\ (10)^{1}$	$4.940\ (10)^{1}$
11	$8.892\ (10)^{-1}$	3.652
12	$3.370\ (10)^{-2}$	$1.398\ (10)^{-1}$
13	$6.032\ (10)^{-4}$	$2.355\ (10)^{-3}$
14	$4.511\ (10)^{-6}$	$1.451\ (10)^{-5}$
15	$1.334\ (10)^{-8}$	$2.831\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 15 MHz, Butterworth
Peak Deviation Subscripts: 206.9 and 760.0
Center Subscript: 483.4
Mean Subscript: 524.9

Table 4-26. Impulse Rates Calculated for Data Set 18

$\frac{C}{N}$ (dB)	POSITIVE (Impulses/s)	NEGATIVE (Impulses/s)
1	$1.787\ (10)^{5}$	$9.344\ (10)^{5}$
2	$1.119\ (10)^{5}$	$6.575\ (10)^{5}$
3	$6.389\ (10)^{4}$	$4.258\ (10)^{5}$
4	$3.252\ (10)^{4}$	$2.484\ (10)^{5}$
5	$1.438\ (10)^{4}$	$1.270\ (10)^{5}$
6	$5.344\ (10)^{3}$	$5.502\ (10)^{4}$
7	$1.603\ (10)^{3}$	$1.932\ (10)^{4}$
8	$3.690\ (10)^{2}$	$5.210\ (10)^{3}$
9	$6.125\ (10)^{1}$	$1.006\ (10)^{3}$
10	6.807	$1.276\ (10)^{2}$
11	$4.637\ (10)^{-1}$	9.535
12	$1.745\ (10)^{-2}$	$3.658\ (10)^{-1}$
13	$3.214\ (10)^{-4}$	$6.073\ (10)^{-3}$
14	$2.564\ (10)^{-6}$	$3.538\ (10)^{-5}$
15	$8.116\ (10)^{-9}$	$5.727\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.847
Maximum Modulating Frequency: 5.413 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: Not Specified
Predetection Filter: 4-pole, 23 MHz, Butterworth
Peak Deviation Subscripts: 184.5 and 711.4
Center Subscript: 448.0
Mean Subscript: 518.1

Table 4-27. Impulse Rates Calculated For a Sinusoidal Distribution With a Peak Deviation of 5.4 MHz

$\frac{C}{N}$ (dB)	POSITIVE or NEGATIVE (Impulses/s)
1	$5.387\ (10)^{5}$
2	$3.825\ (10)^{5}$
3	$2.501\ (10)^{5}$
4	$1.473\ (10)^{5}$
5	$7.606\ (10)^{4}$
6	$3.324\ (10)^{4}$
7	$1.177\ (10)^{4}$
8	$3.194\ (10)^{3}$
9	$6.203\ (10)^{2}$
10	$7.901\ (10)^{1}$
11	5.917
12	$2.271\ (10)^{-1}$
13	$3.761\ (10)^{-3}$
14	$2.171\ (10)^{-5}$
15	$3.401\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15.0 MHz, Butterworth
Peak Deviation Subscripts: 9.3 and 1010.7
Center Subscript: 510.0
Mean Subscript: 510.0

Table 4-28. Impulse Rates Calculated For a Sinusoidal Distribution With a Peak Deviation of 10.0 MHz

$\frac{C}{N}$ (dB)	POSITIVE or NEGATIVE (Impulses/s)
1	$9.642\ (10)^{5}$
2	$6.882\ (10)^{5}$
3	$4.520\ (10)^{5}$
4	$2.674\ (10)^{5}$
5	$1.385\ (10)^{5}$
6	$6.070\ (10)^{4}$
7	$2.154\ (10)^{4}$
8	$5.859\ (10)^{3}$
9	$1.140\ (10)^{3}$
10	$1.454\ (10)^{2}$
11	$1.089\ (10)^{1}$
12	$4.182\ (10)^{-1}$
13	$6.919\ (10)^{-3}$
14	$3.979\ (10)^{-5}$
15	$6.150\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23.0 MHz, Butterworth
Peak Deviation Subscripts: 9.3 and 1010.7
Center Subscript: 510.0
Mean Subscript: 510.0

Table 4-29. Impulse Rates Calculated For a Gaussian Distribution With a Peak Deviation of 5.4 MHz

$\frac{C}{N}$ (dB)	POSITIVE or NEGATIVE (Impulses/s)
1	$3.305\ (10)^{5}$
2	$2.261\ (10)^{5}$
3	$1.423\ (10)^{5}$
4	$8.058\ (10)^{4}$
5	$4.001\ (10)^{4}$
6	$1.683\ (10)^{4}$
7	$5.747\ (10)^{3}$
8	$1.509\ (10)^{3}$
9	$2.844\ (10)^{2}$
10	$3.535\ (10)^{1}$
11	2.604
12	$9.958\ (10)^{-2}$
13	$1.685\ (10)^{-3}$
14	$1.054\ (10)^{-5}$
15	$2.146\ (10)^{-8}$

CONDITIONS

Modulation Index: 1.087
Maximum Modulating Frequency: 4.97 MHz
Peak Deviation: 5.4 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 15.0 MHz, Butterworth
Peak Deviation Subscripts: 181.4 and 838.6
Center Subscript: 510.0
Mean Subscript: 510.0

Table 4-30. Impulse Rates Calculated For a Gaussian Distribution With a Peak Deviation of 10.0 MHz

$\frac{C}{N}$ (dB)	POSITIVE or NEGATIVE (Impulses/s)
1	$5.428\ (10)^{5}$
2	$3.739\ (10)^{5}$
3	$2.370\ (10)^{5}$
4	$1.354\ (10)^{5}$
5	$6.778\ (10)^{4}$
6	$2.876\ (10)^{4}$
7	$9.908\ (10)^{3}$
8	$2.623\ (10)^{3}$
9	$4.985\ (10)^{2}$
10	$6.238\ (10)^{1}$
11	4.617
12	$1.768\ (10)^{-1}$
13	$2.972\ (10)^{-3}$
14	$1.816\ (10)^{-5}$
15	$3.455\ (10)^{-8}$

CONDITIONS

Modulation Index: 2.381
Maximum Modulating Frequency: 4.2 MHz
Peak Deviation: 10.0 MHz
Probability of Exceeding Peak Deviation: 0.1%
Predetection Filter: 4-pole, 23.0 MHz, Butterworth
Peak Deviation Subscripts: 181.4 and 838.6
Center Subscript: 510.0
Mean Subscript: 510.0

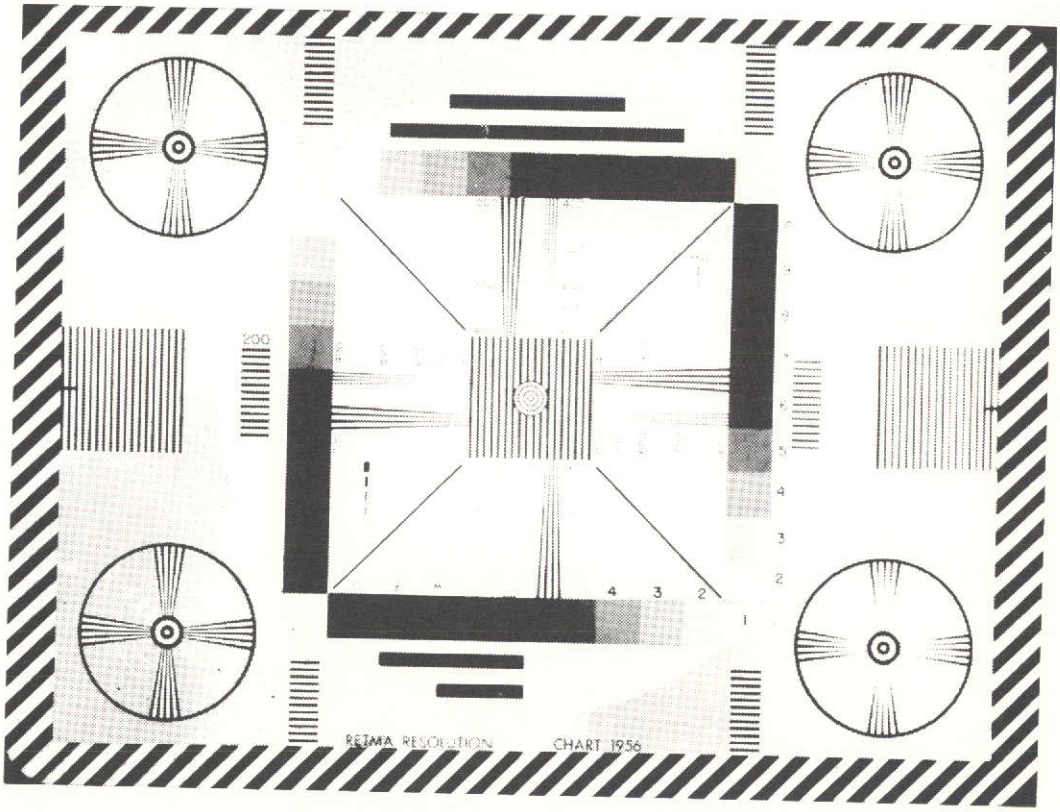


Figure 4-1. RETMA Test Pattern

Figure 4-2. "Post Office" Test Pattern

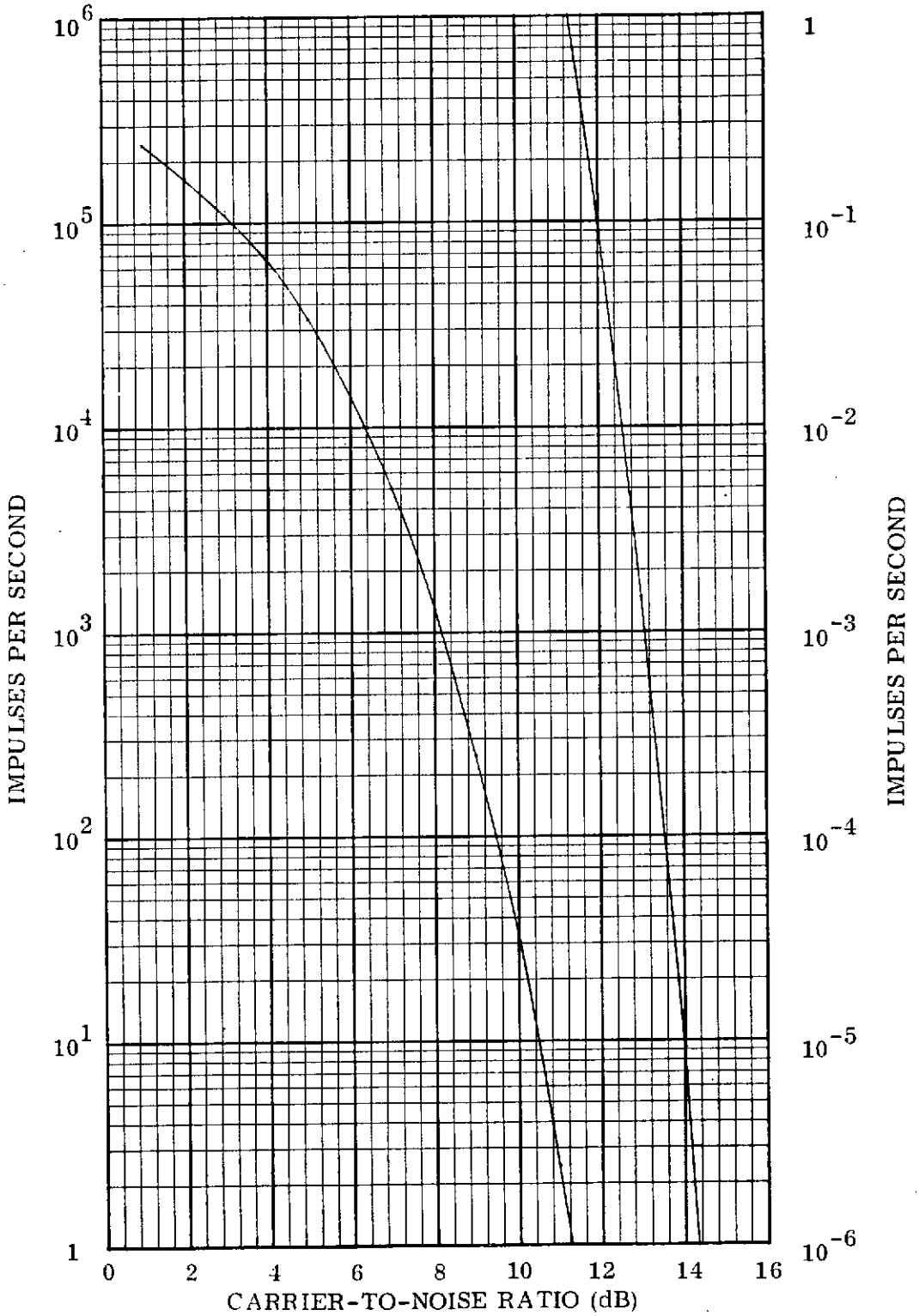


Figure 4-3. Positive Impulse Rates Plotted As a Function of C/N for Data Set 1

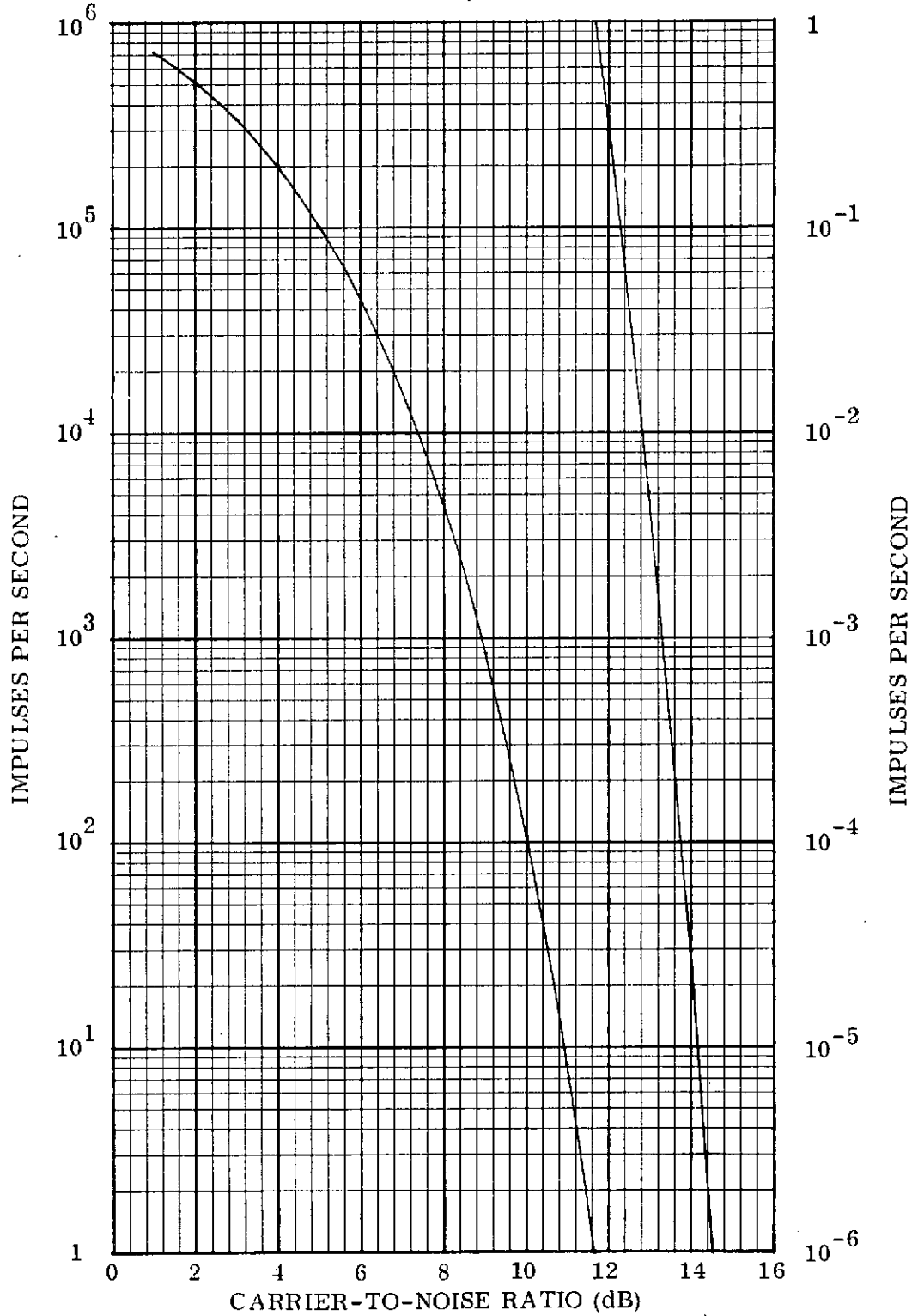


Figure 4-4. Negative Impulse Rate Plotted As A Function of C/N for Data Set 1

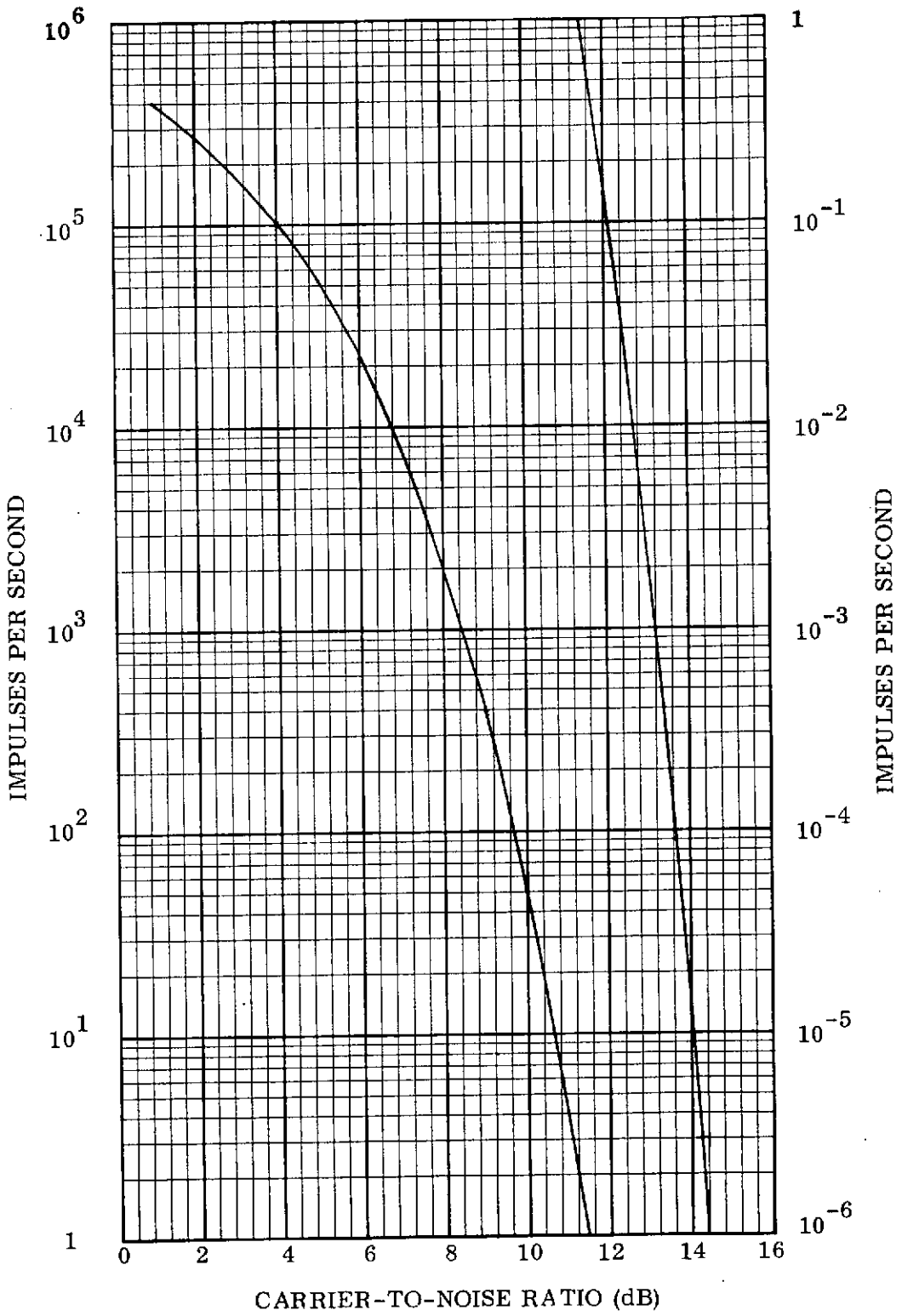


Figure 4-5. Positive Impulse Rates Plotted As a Function of C/N for Data Set 3

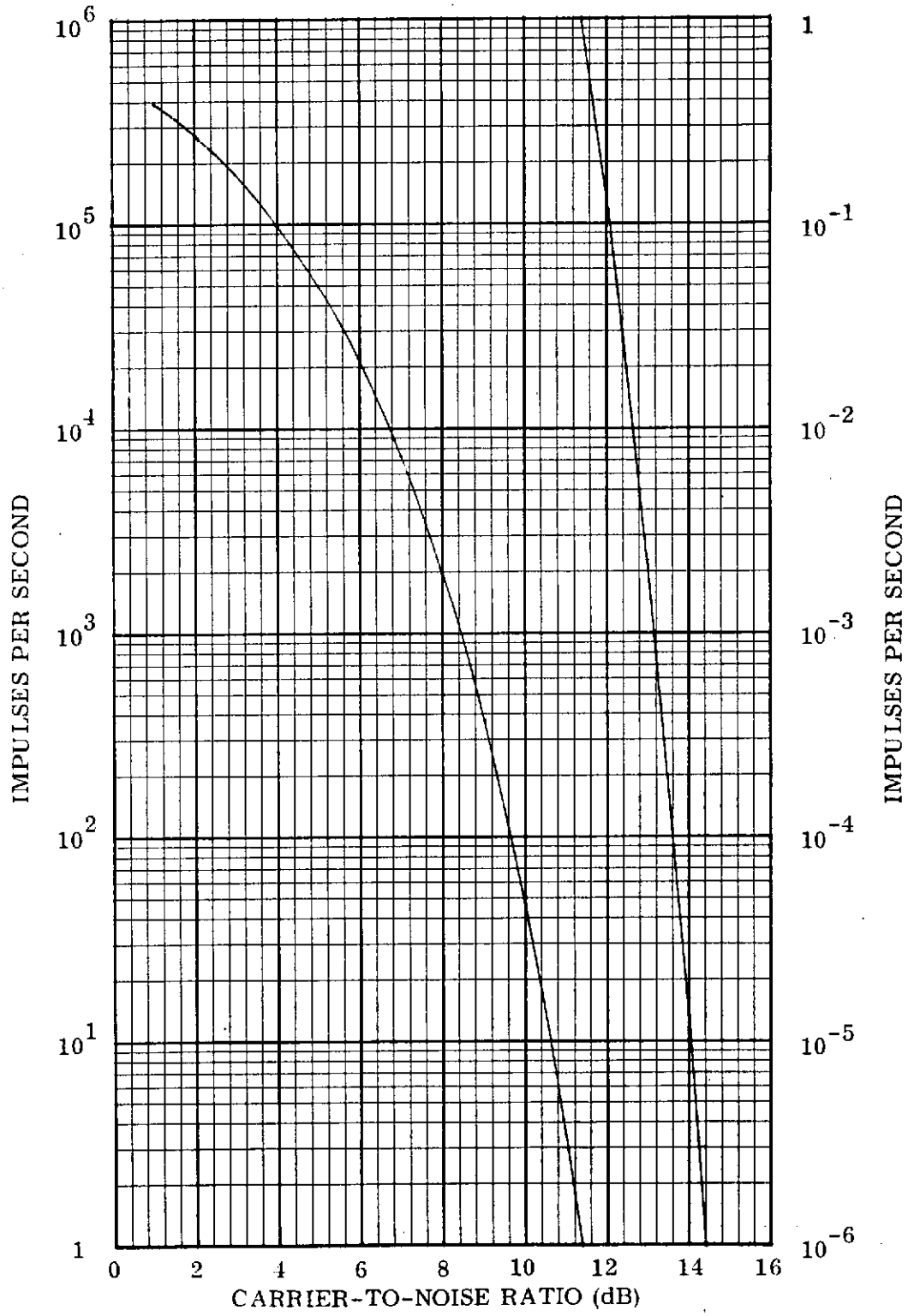


Figure 4-6. Negative Impulse Rates Plotted As a Function of C/N for Data Set 3

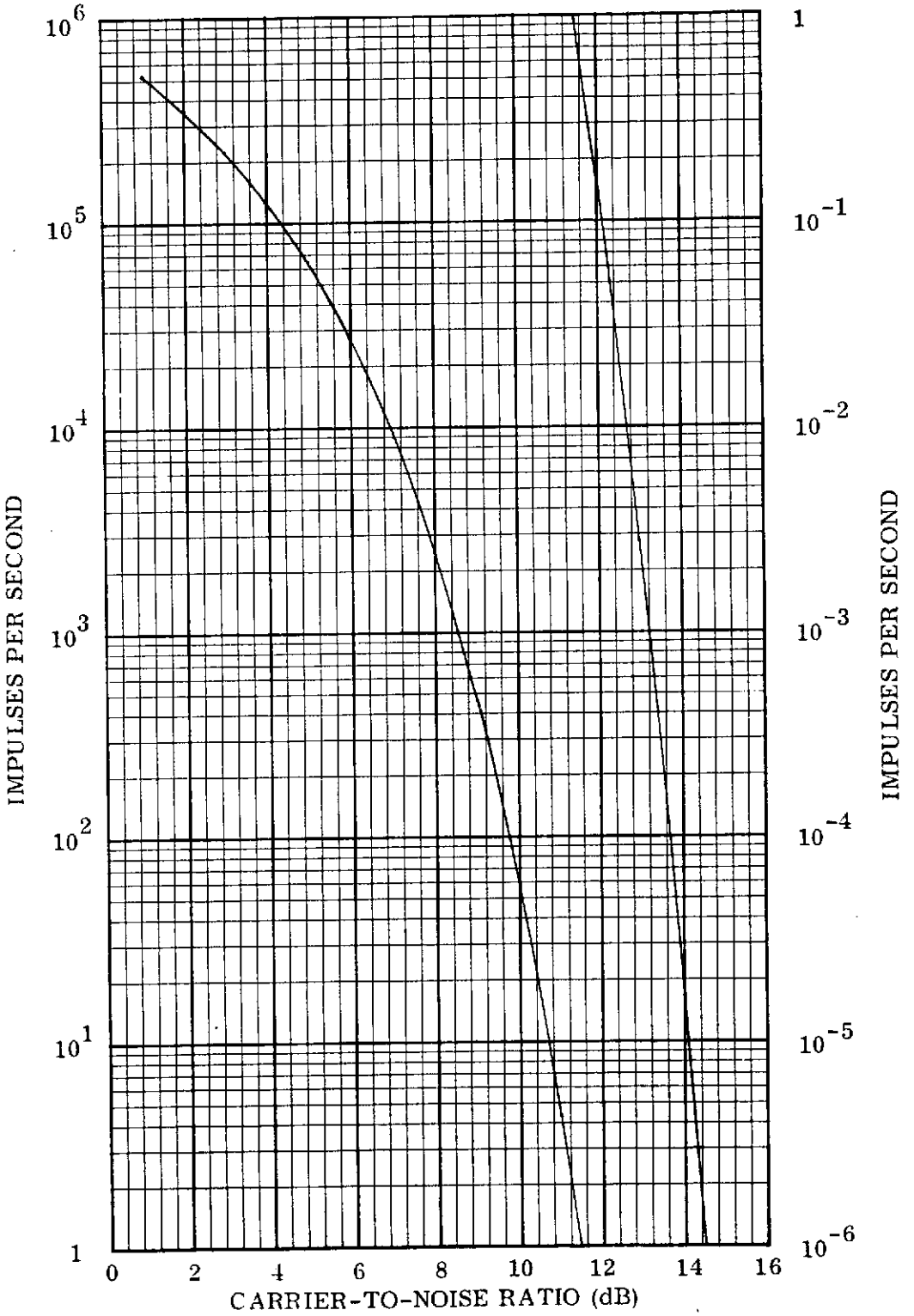


Figure 4-7. Positive Impulse Rates Plotted As a Function of C/N for Data Set 11

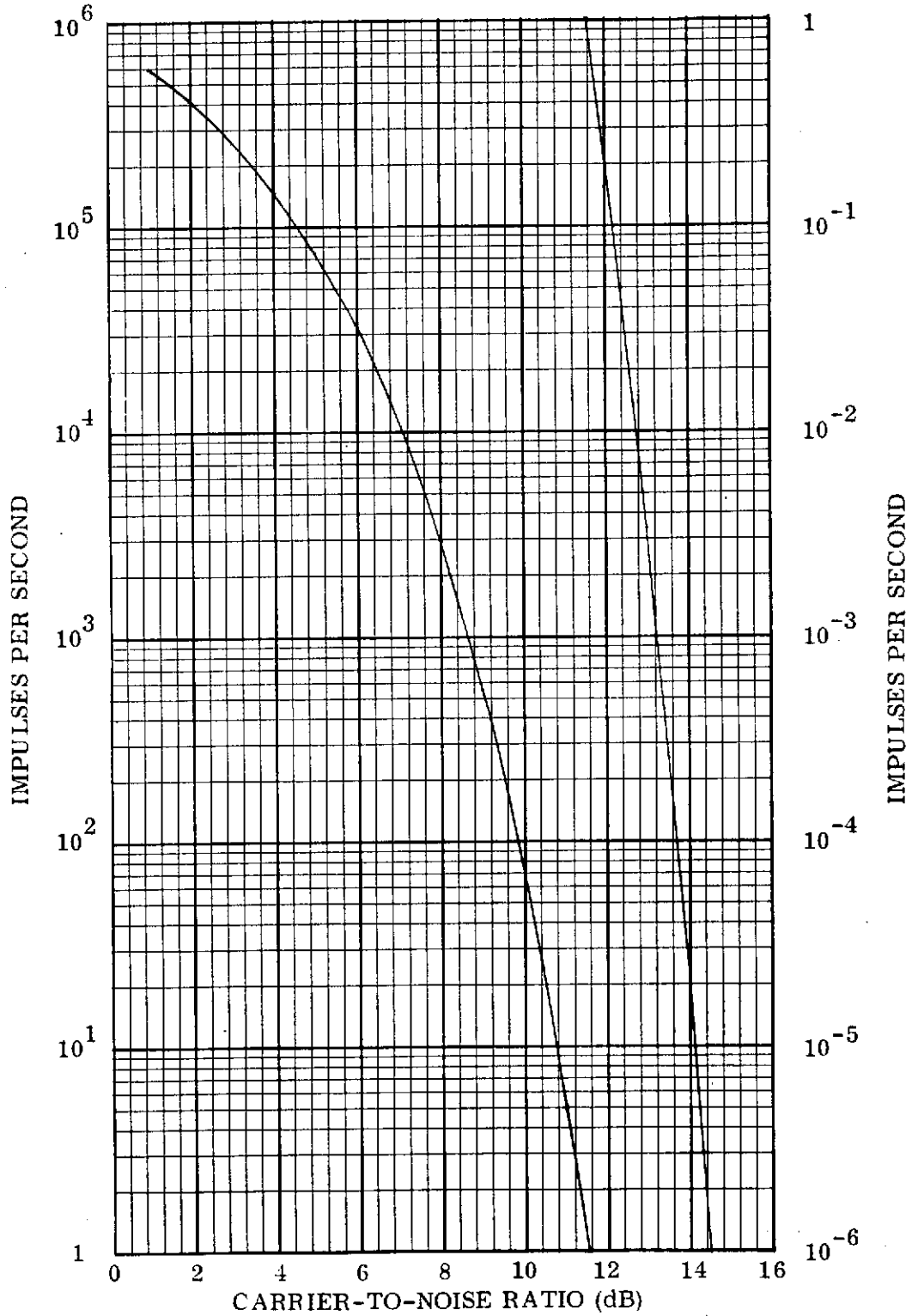


Figure 4-8. Negative Impulse Rates Plotted As a Function of C/N for Data Set 11

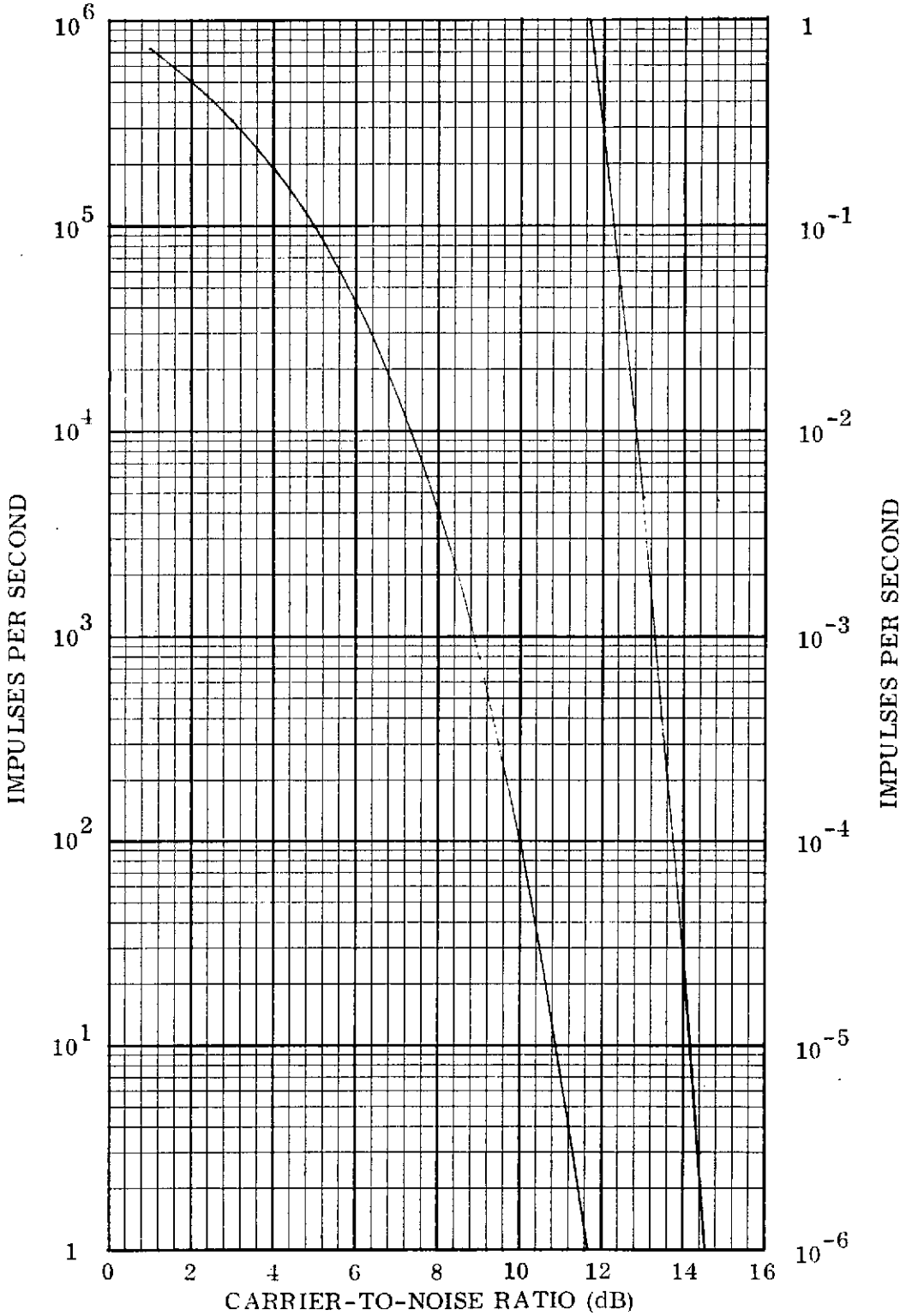


Figure 4-9. Positive Impulse Rates Plotted As a Function of C/N for Data Set 5

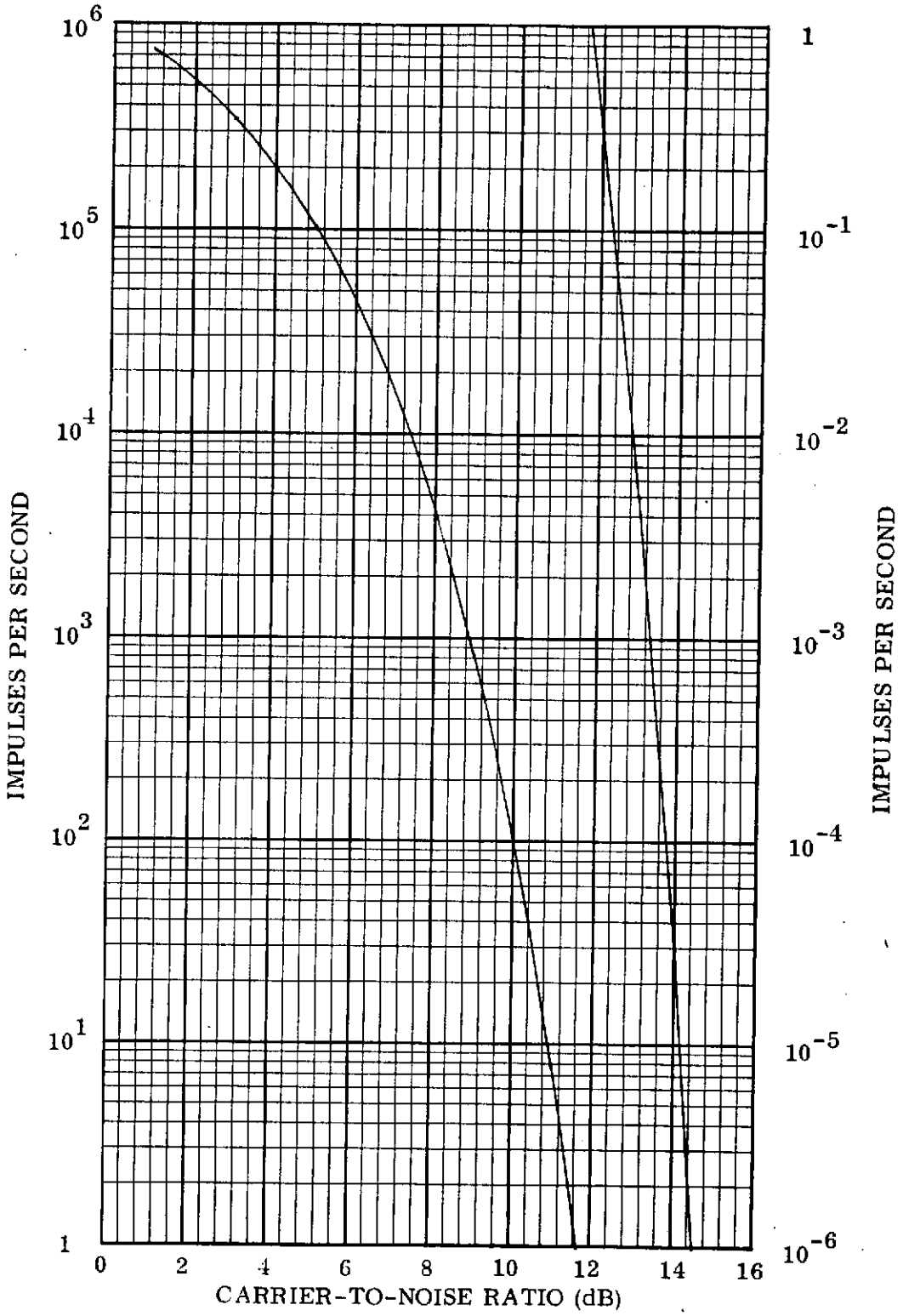


Figure 4-10. Negative Impulse Rates Plotted As a Function of C/N for Data Set 5

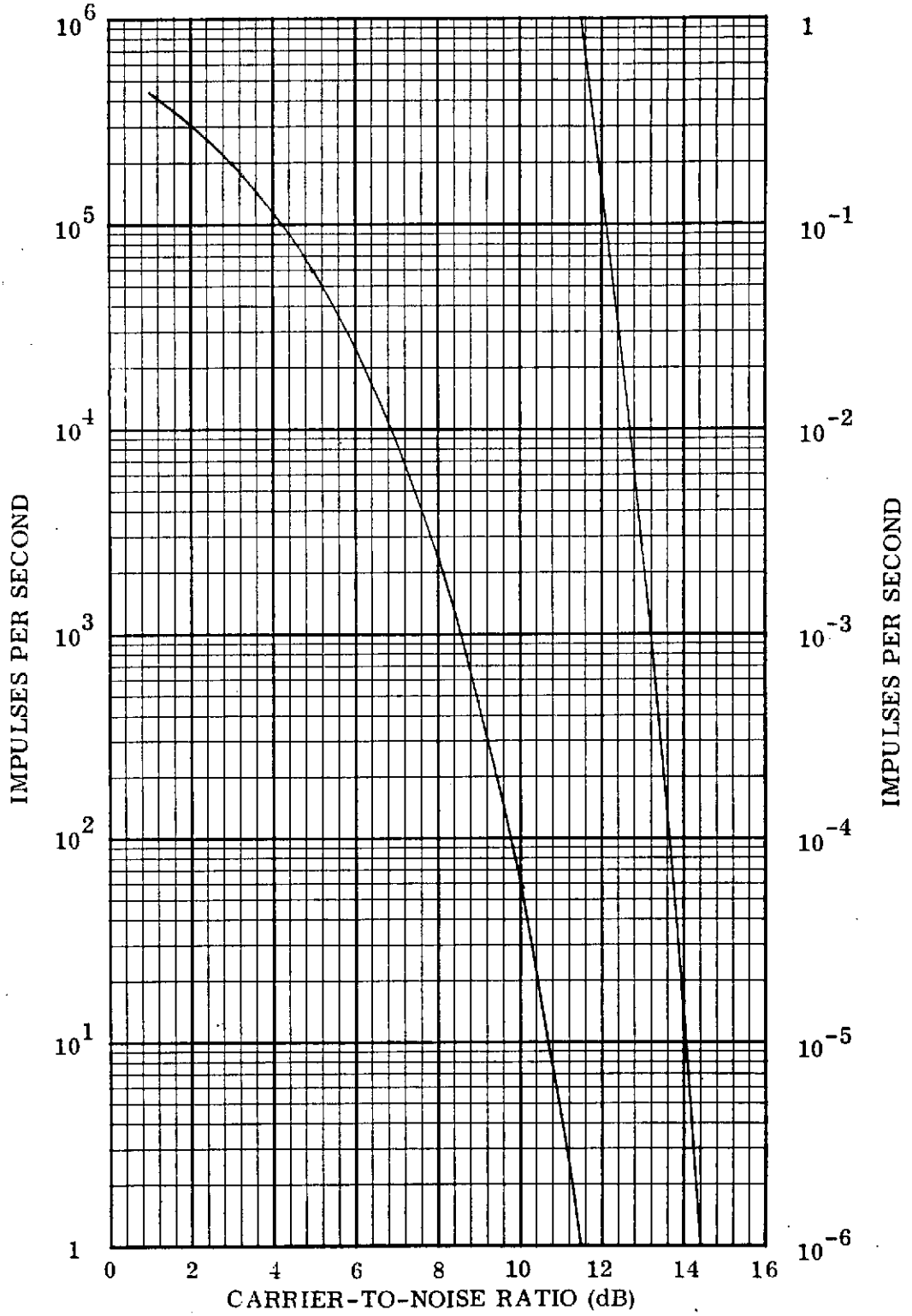


Figure 4-11. Positive Impulse Rates Plotted As a Function of C/N for Data Set 7

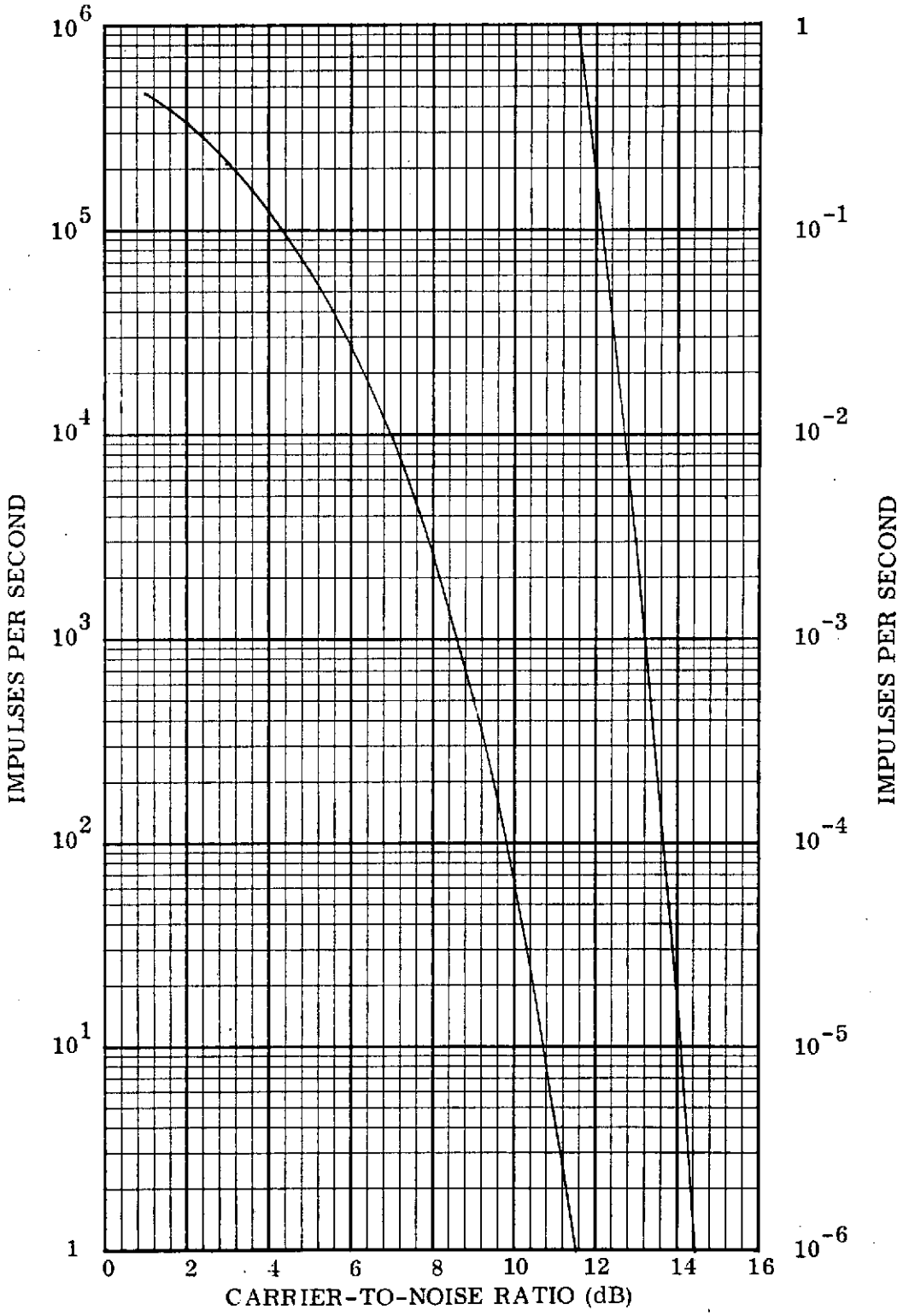


Figure 4-12. Negative Impulse Rates Plotted As a Function of C/N for Data Set 7

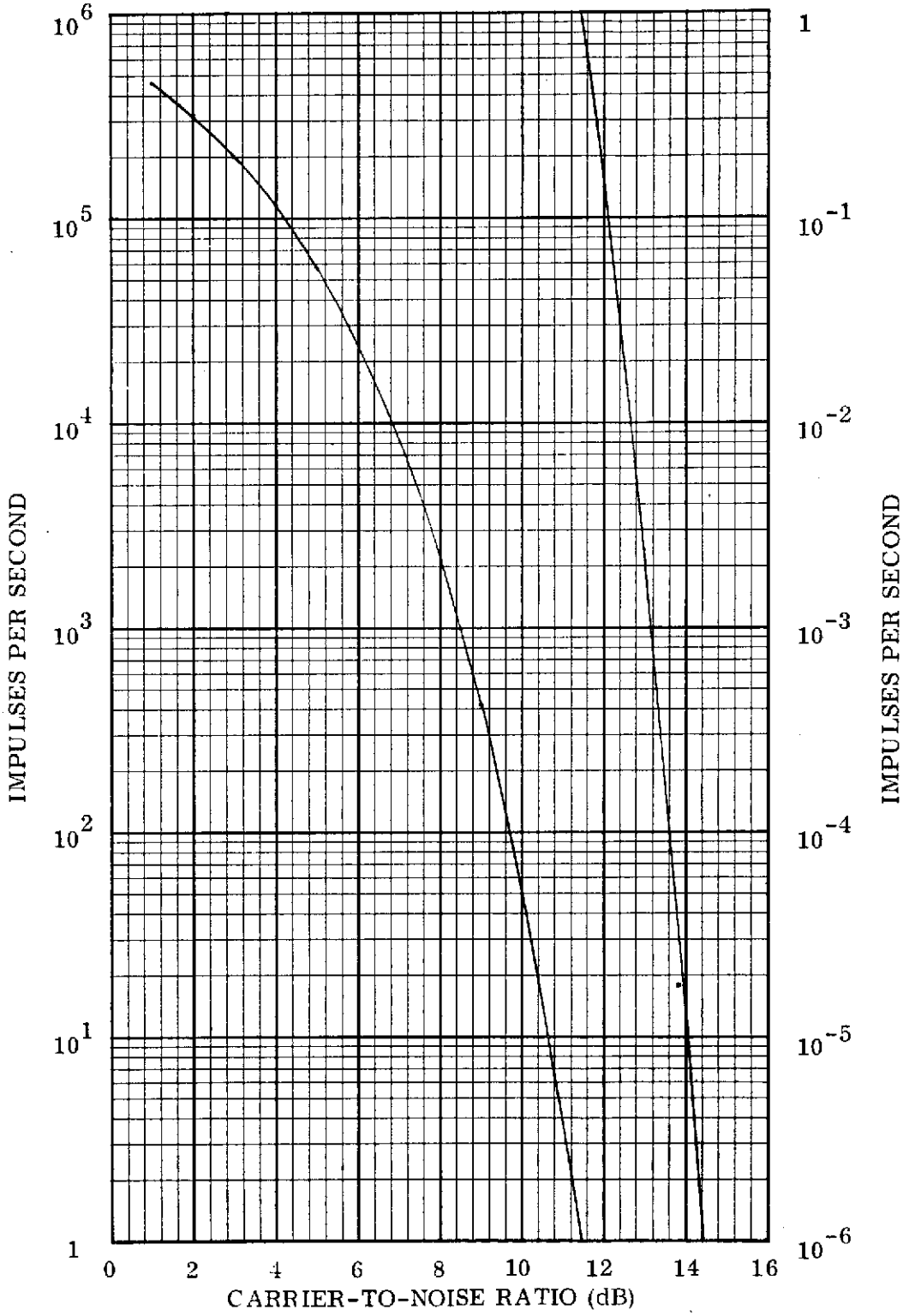


Figure 4-13. Positive Impulse Rates Plotted As a Function of C/N for Data Set 9

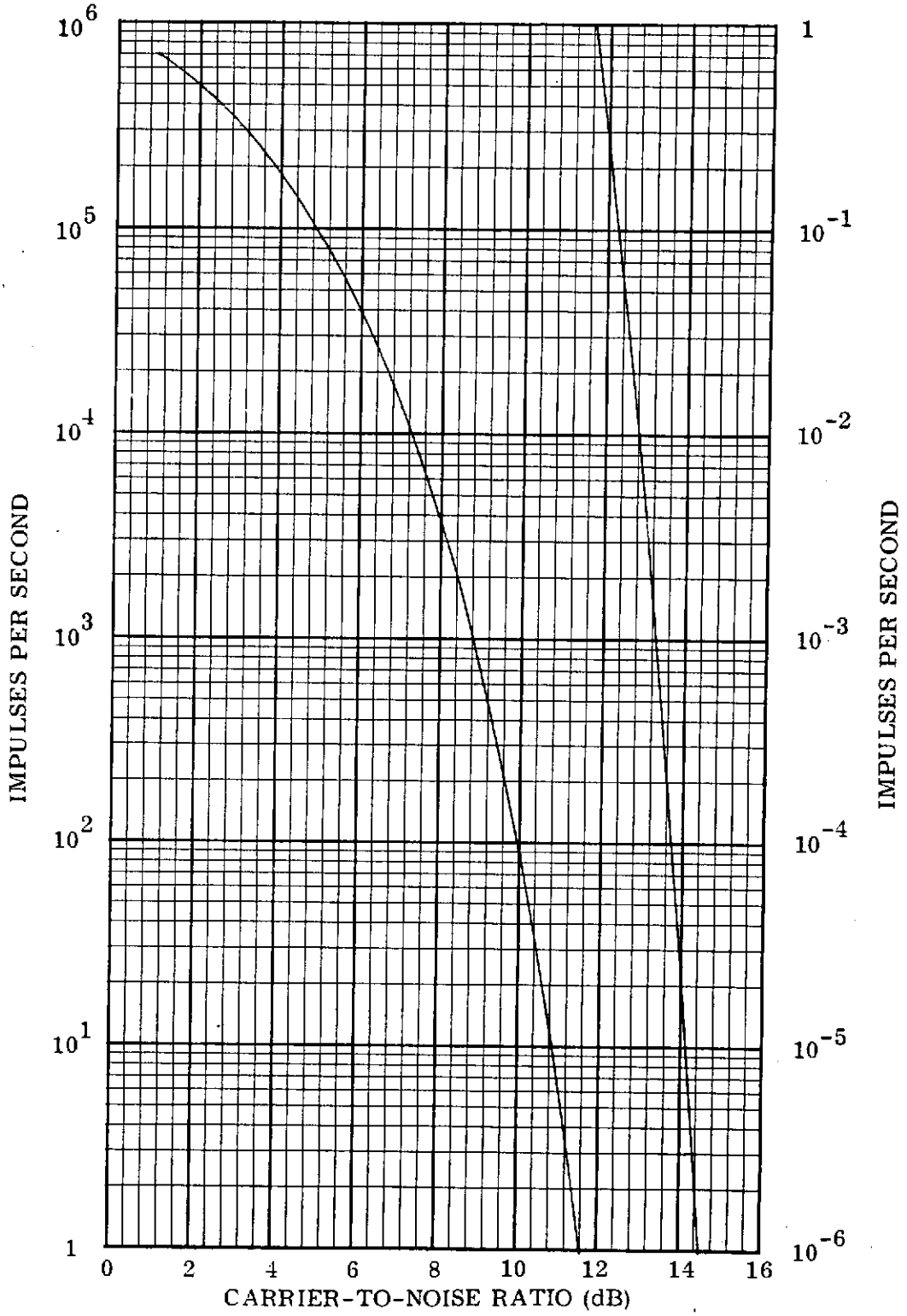


Figure 4-14. Negative Impulse Rates Plotted As a Function of C/N for Data Set 9

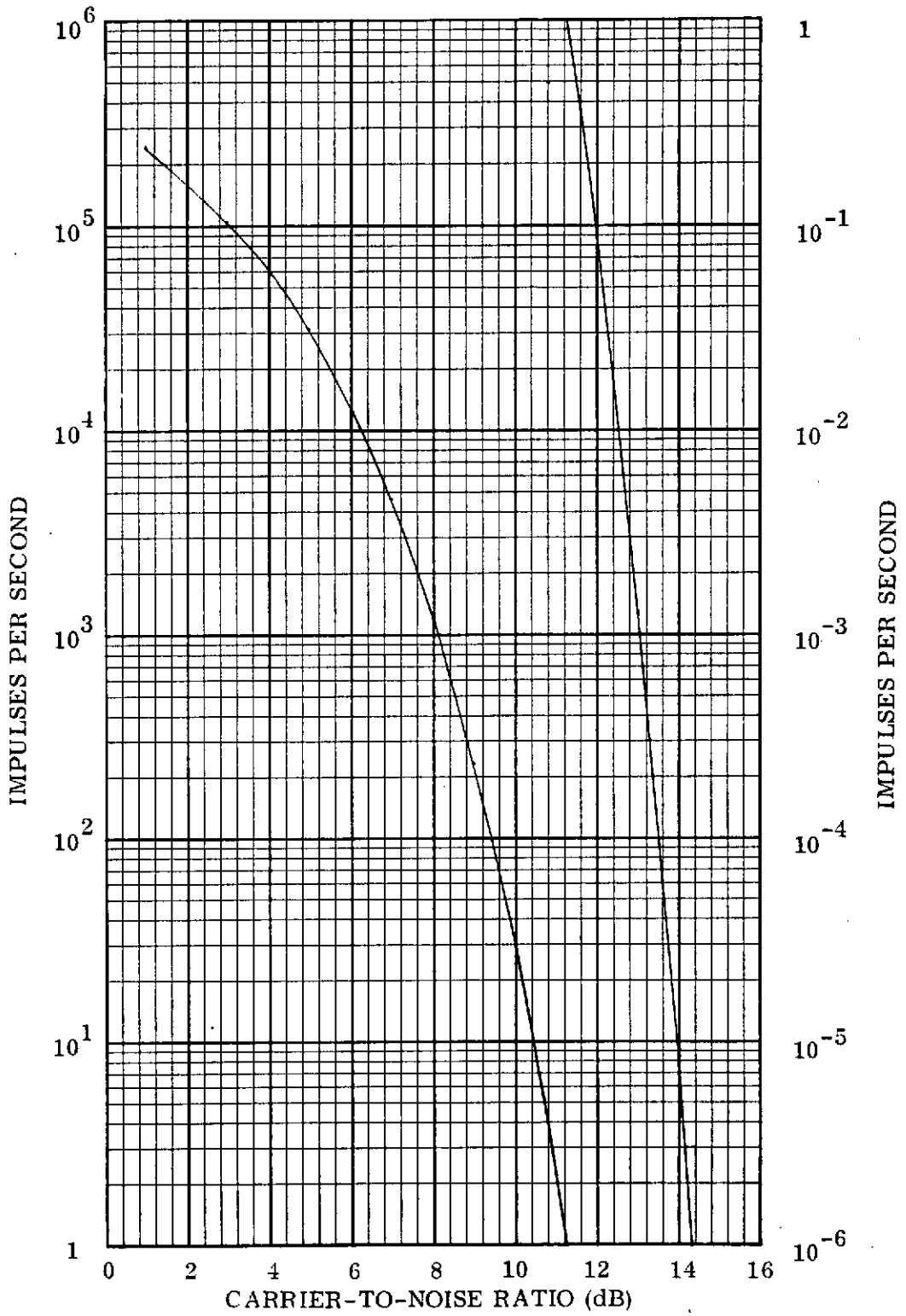


Figure 4-15. Positive Impulse Rates Plotted As a Function of C/N for Data Set 19

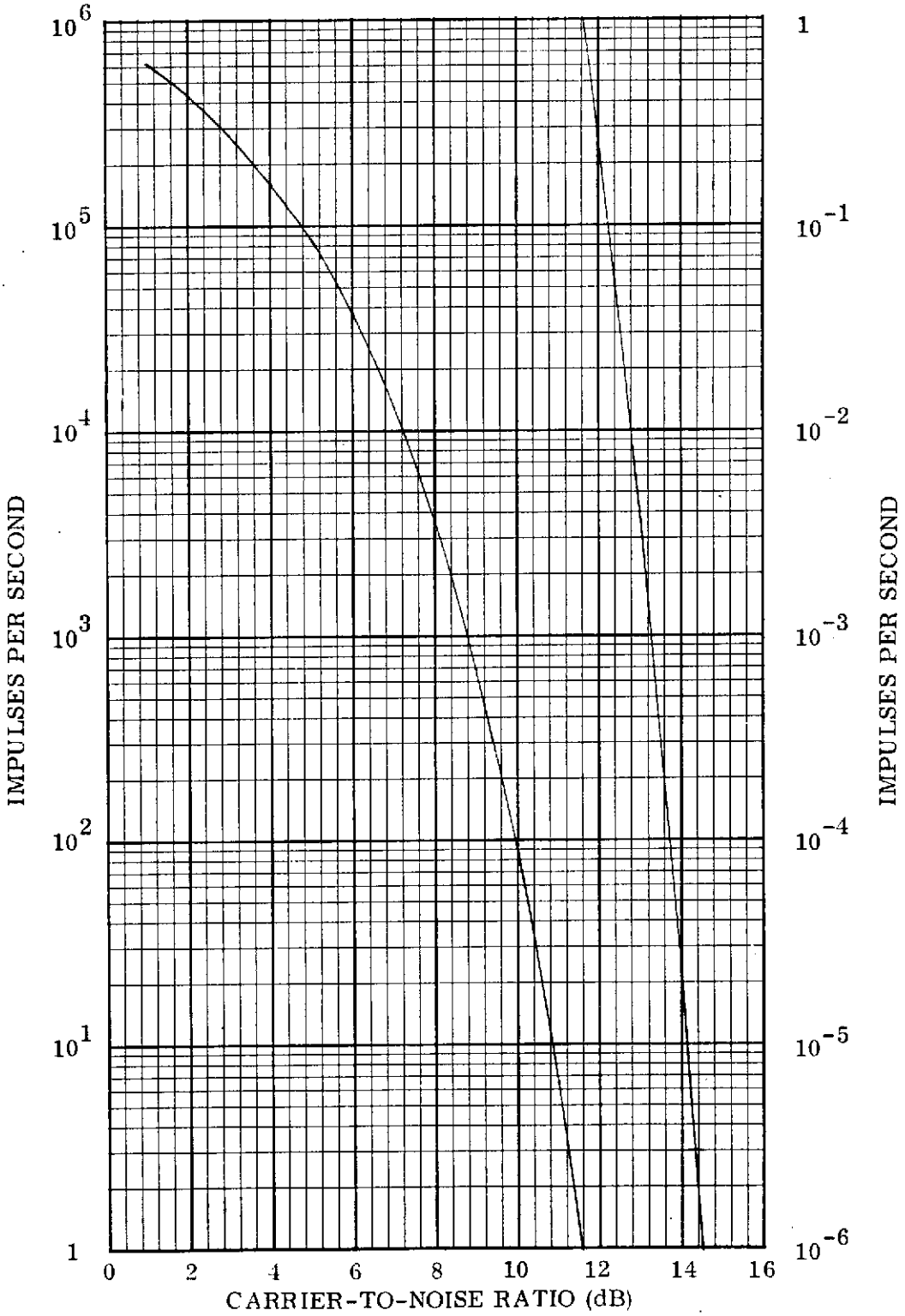


Figure 4-16. Negative Impulse Rates Plotted As a Function of C/N for Data Set 19

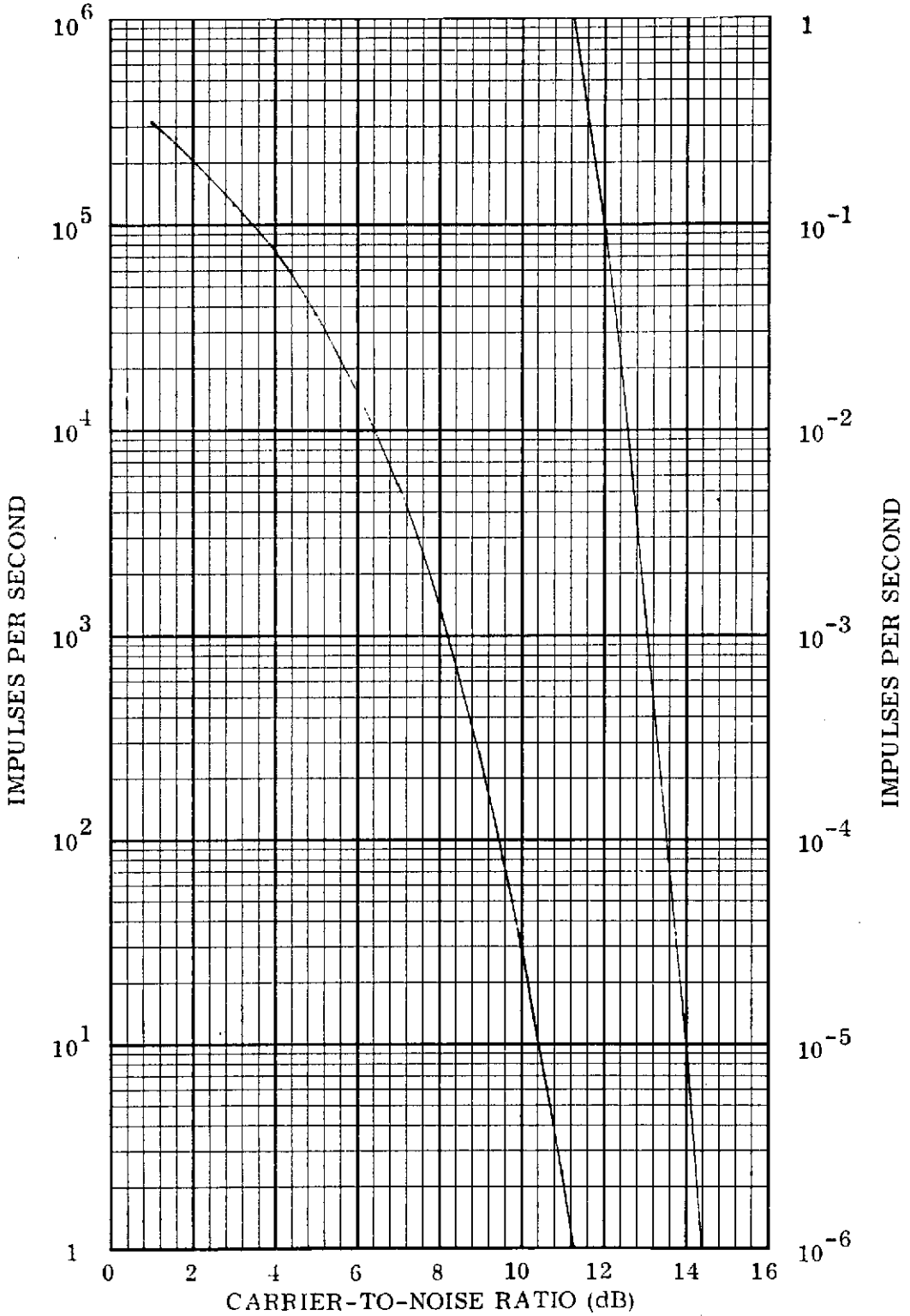


Figure 4-17. Positive Impulse Rates Plotted As a Function of C/N for Data Set 21

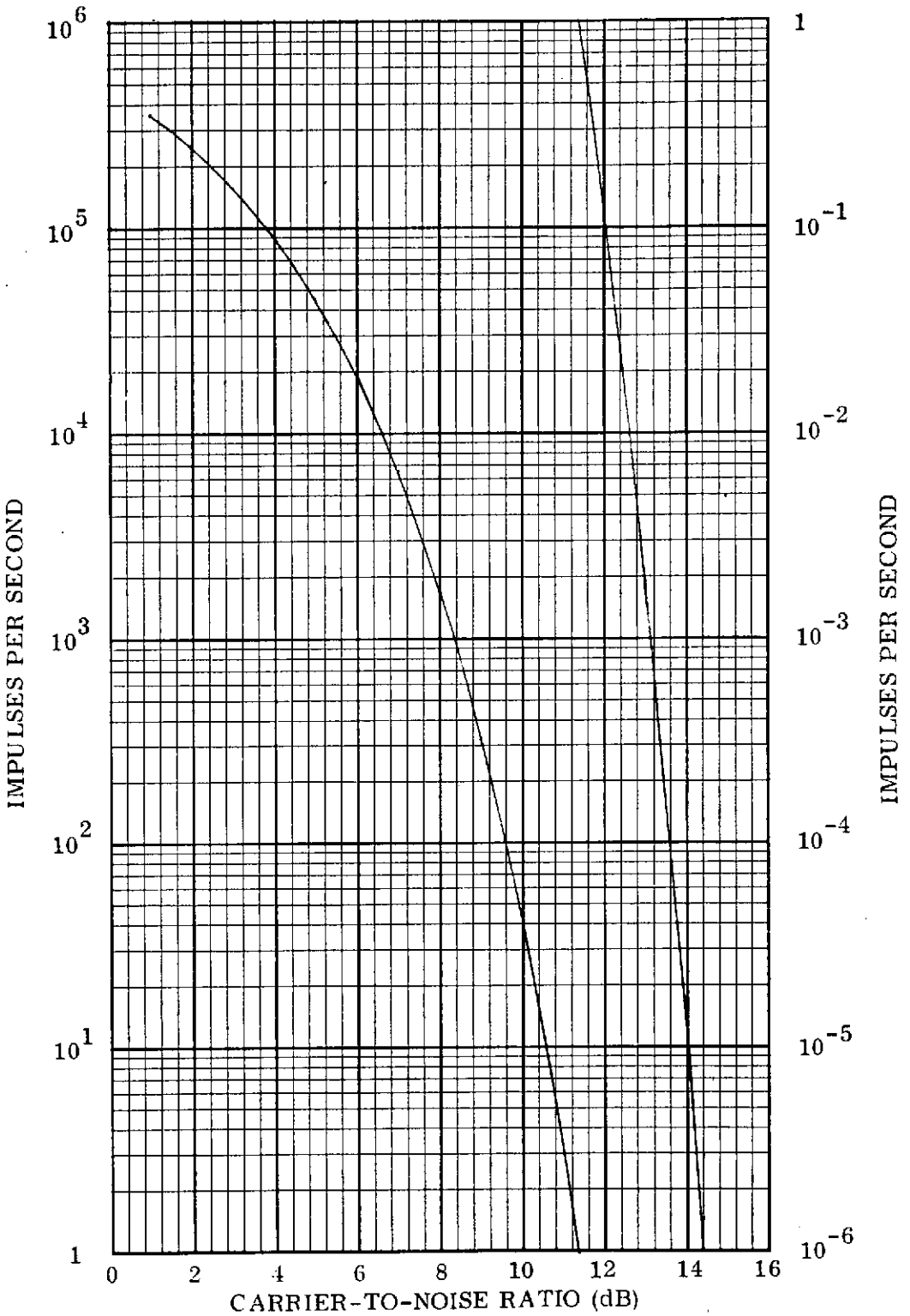


Figure 4-18. Negative Impulse Rates Plotted As a Function of C/N for Data Set 21

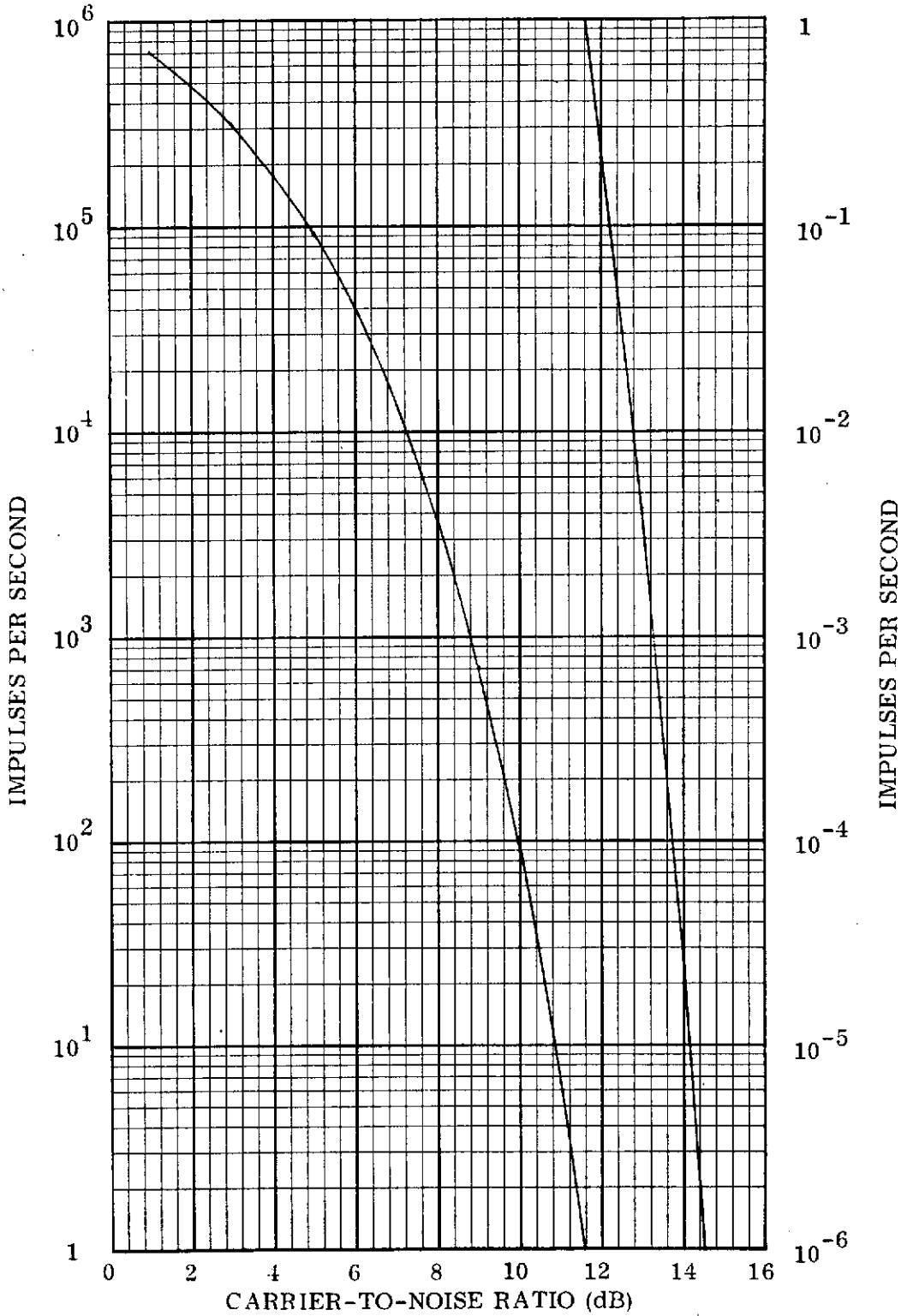


Figure 4-19. Positive Impulse Rates Plotted As a Function of C/N for Data Set 15

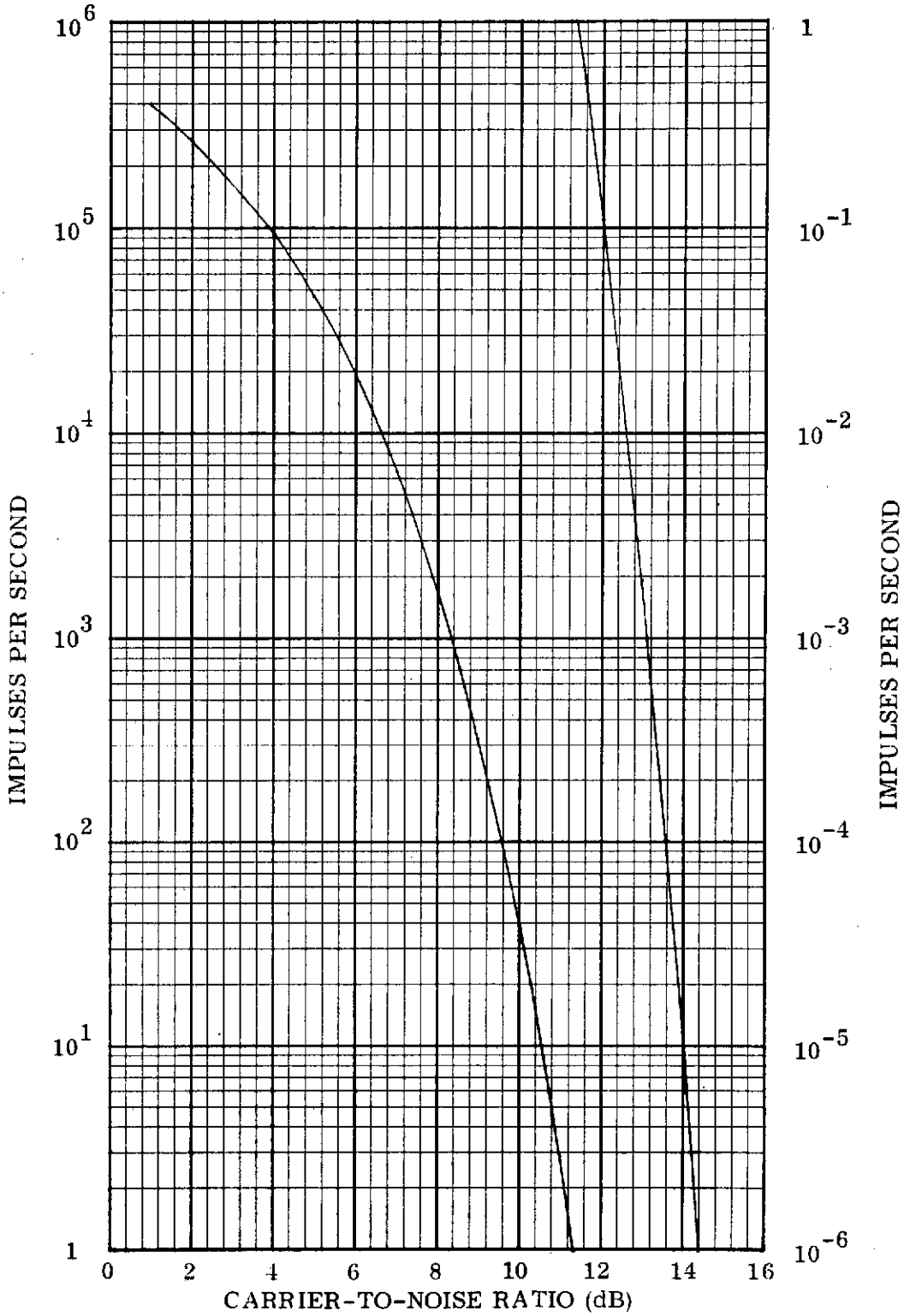


Figure 4-20. Negative Impulse Rates Plotted As a Function of C/N for Data Set 15

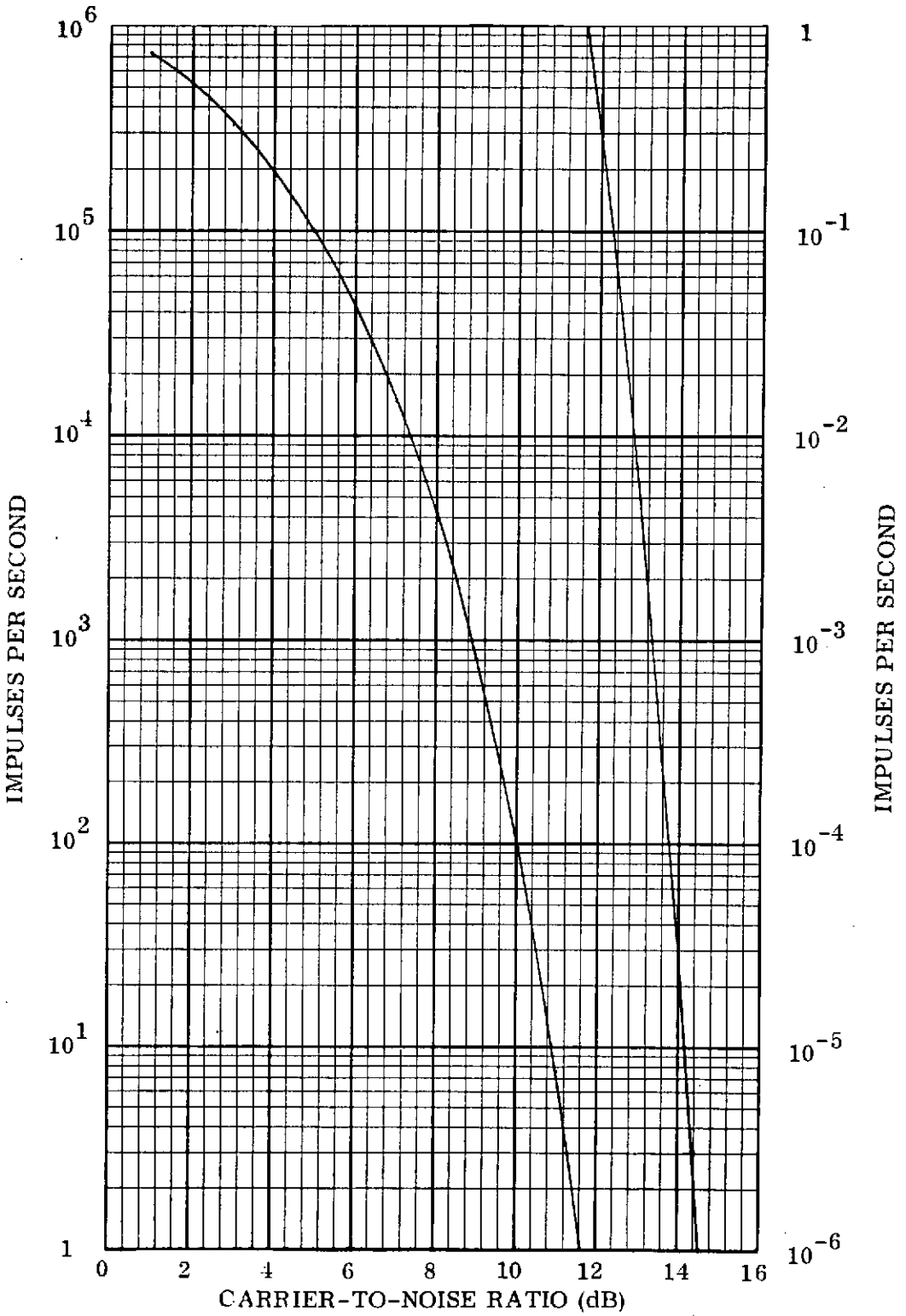


Figure 4-21. Positive Impulse Rates Plotted As a Function of C/N for Data Set 13

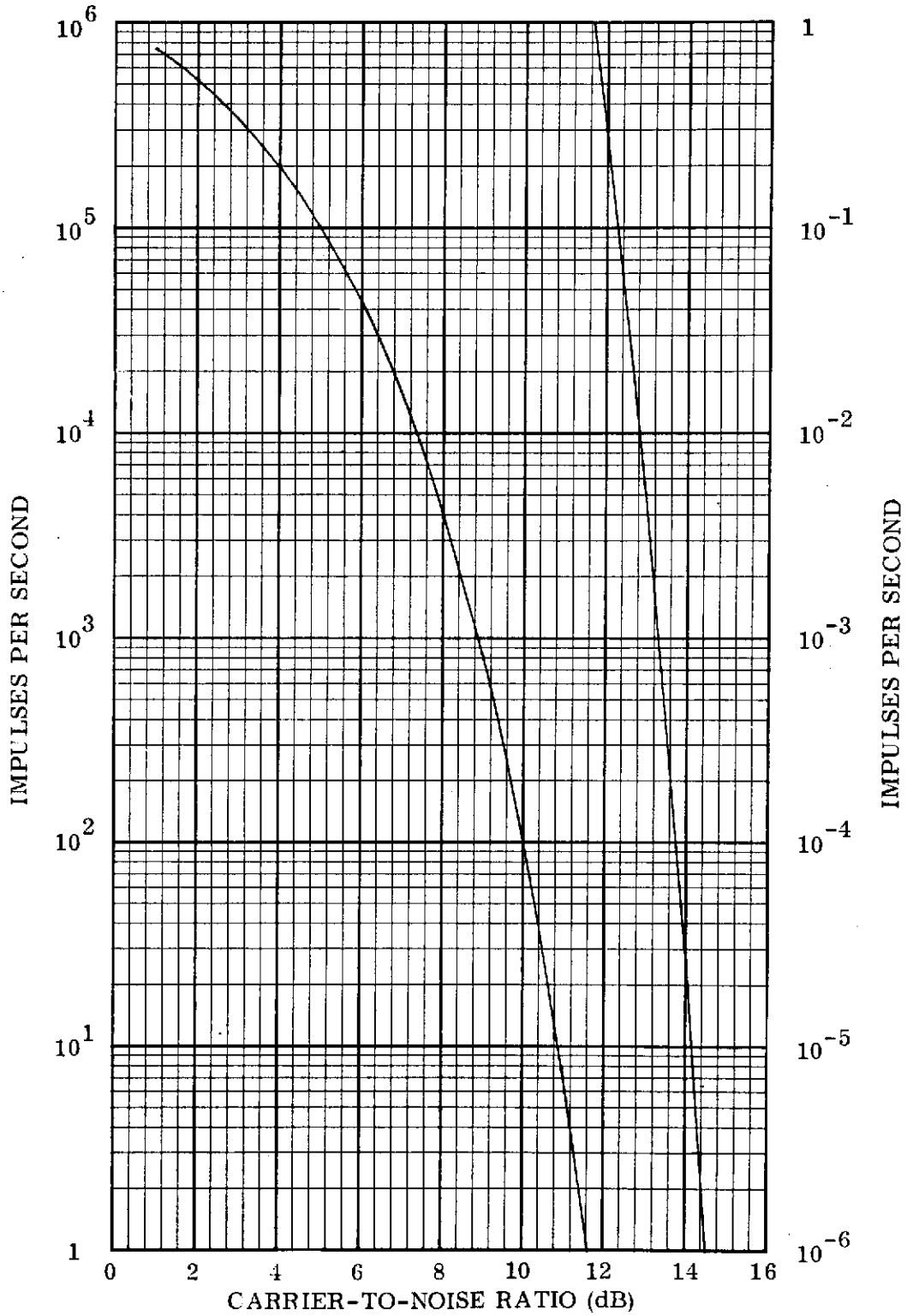


Figure 4-22. Negative Impulse Rates Plotted As a Function of C/N for Data Set 13

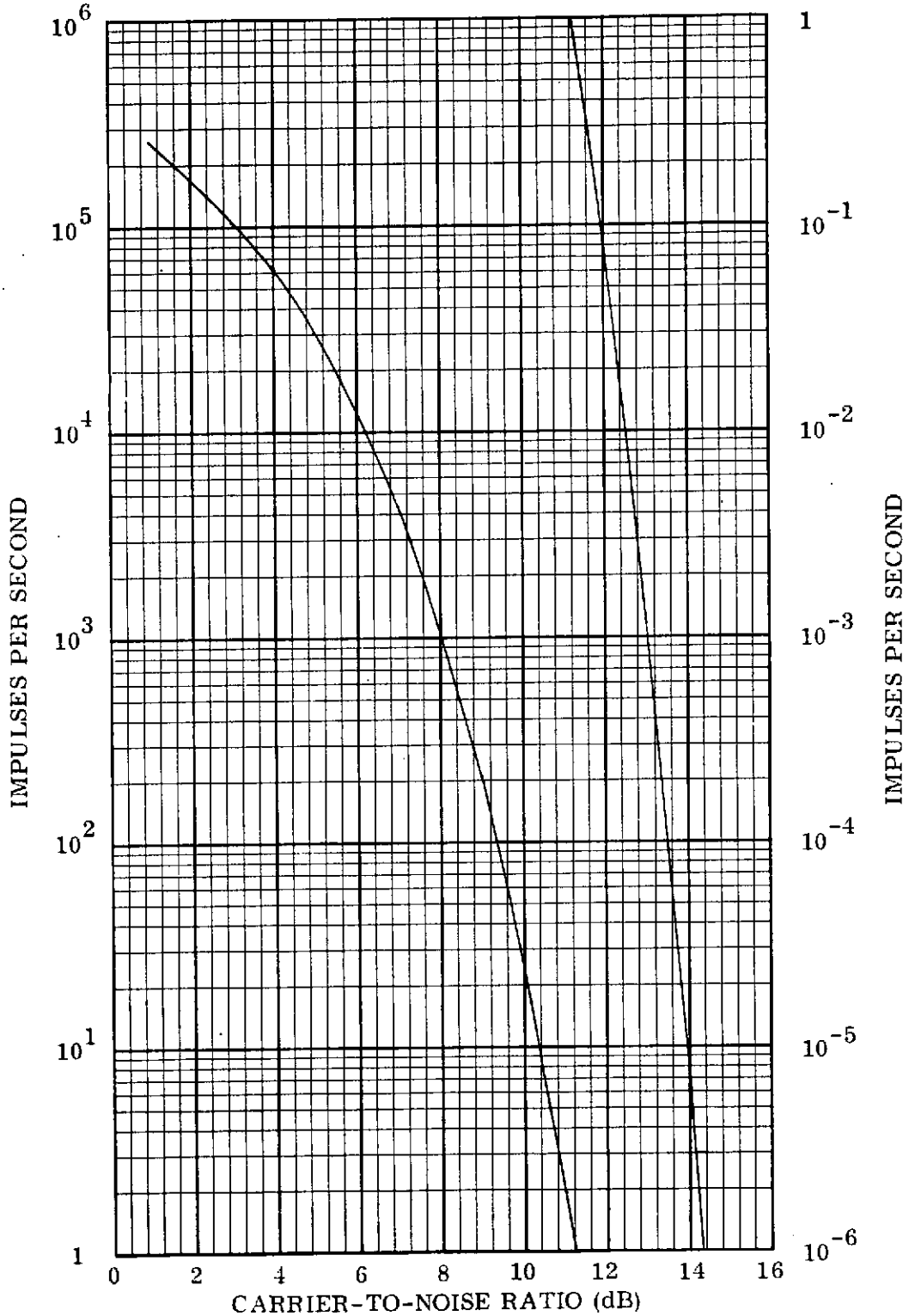


Figure 4-23. Positive Impulse Rates Plotted As a Function of C/N for Data Set 23

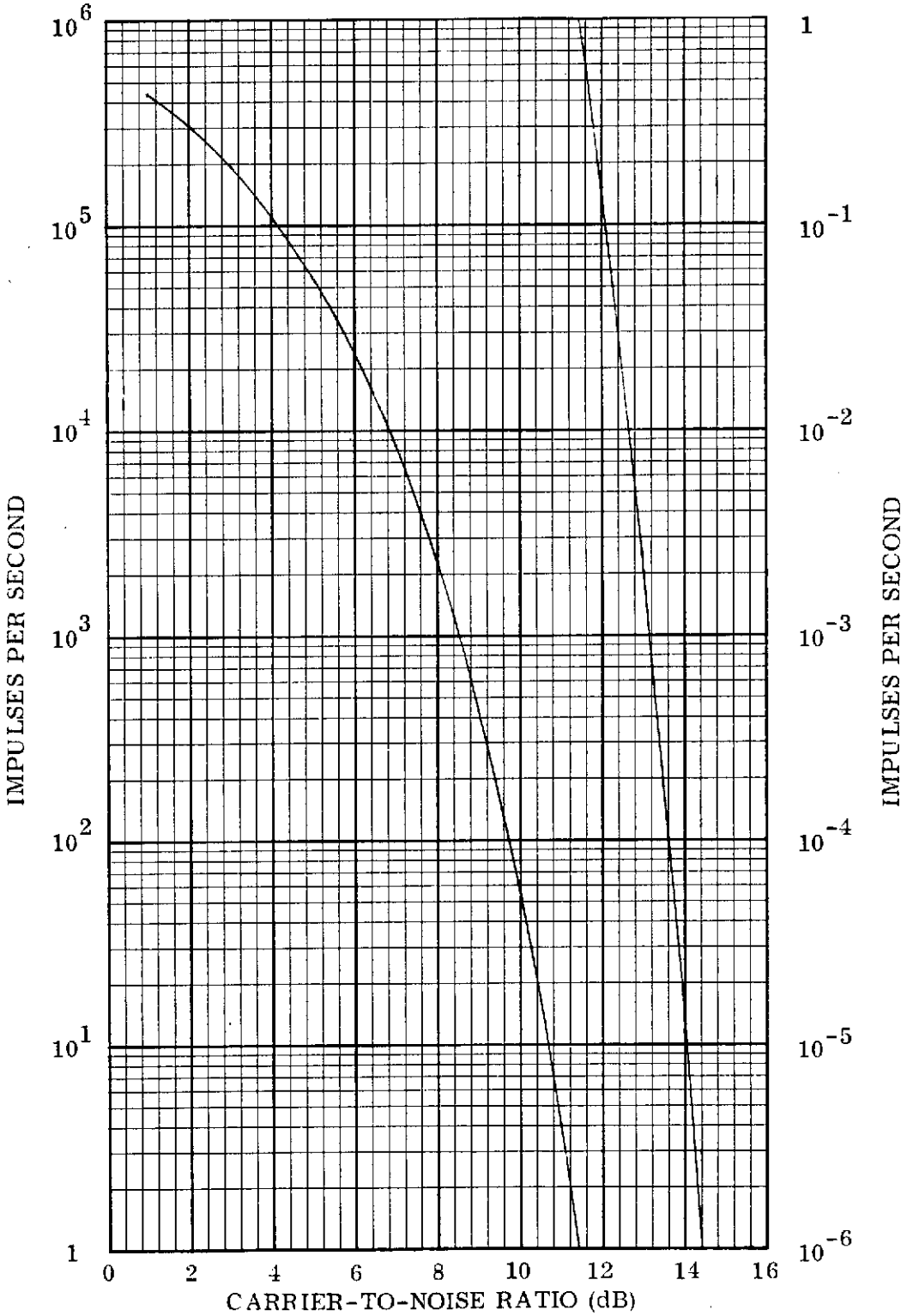


Figure 4-24. Negative Impulse Rates Plotted As a Function of C/N for Data Set 23

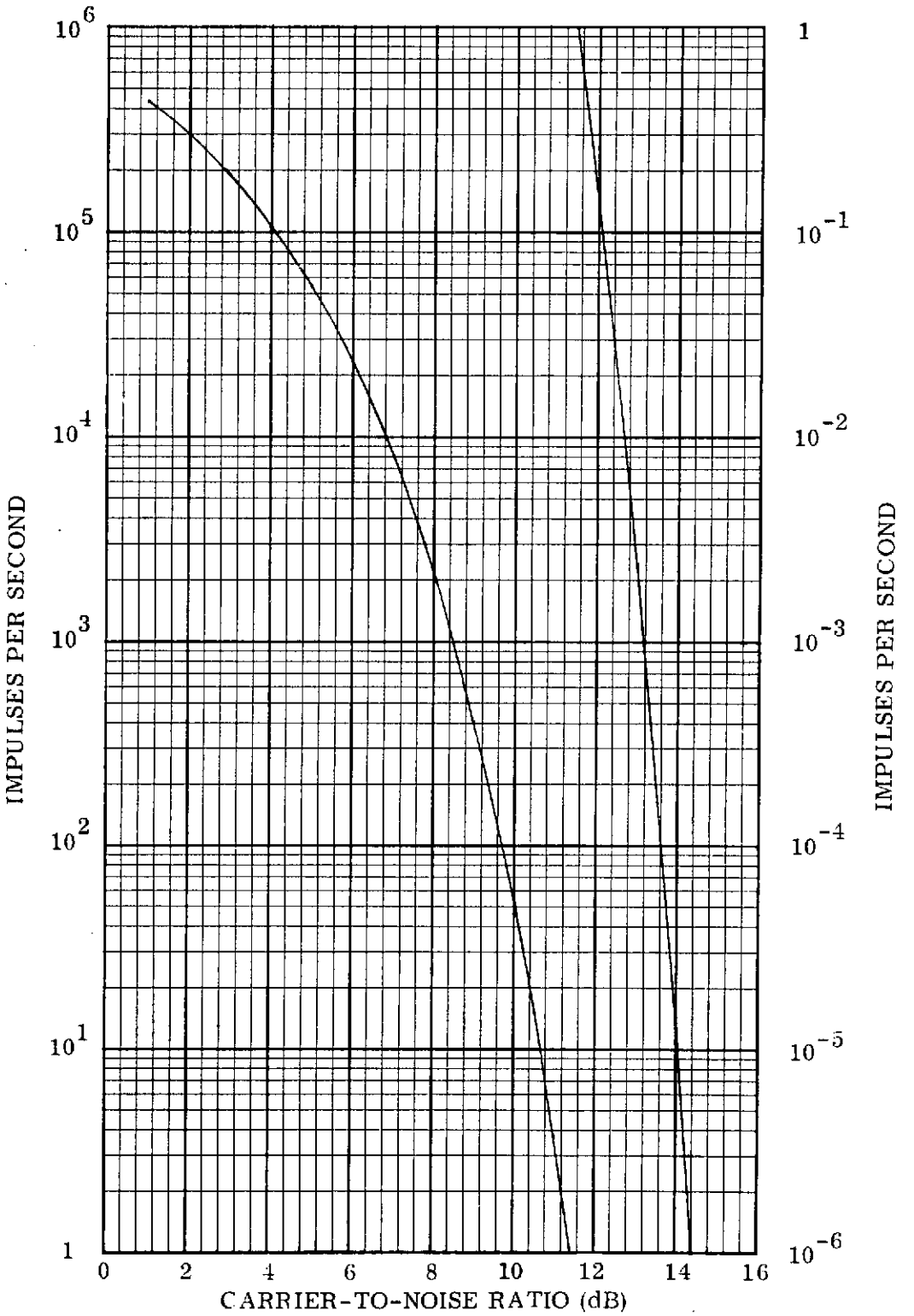


Figure 4-25. Positive Impulse Rates Plotted As a Function of C/N for Data Set 17

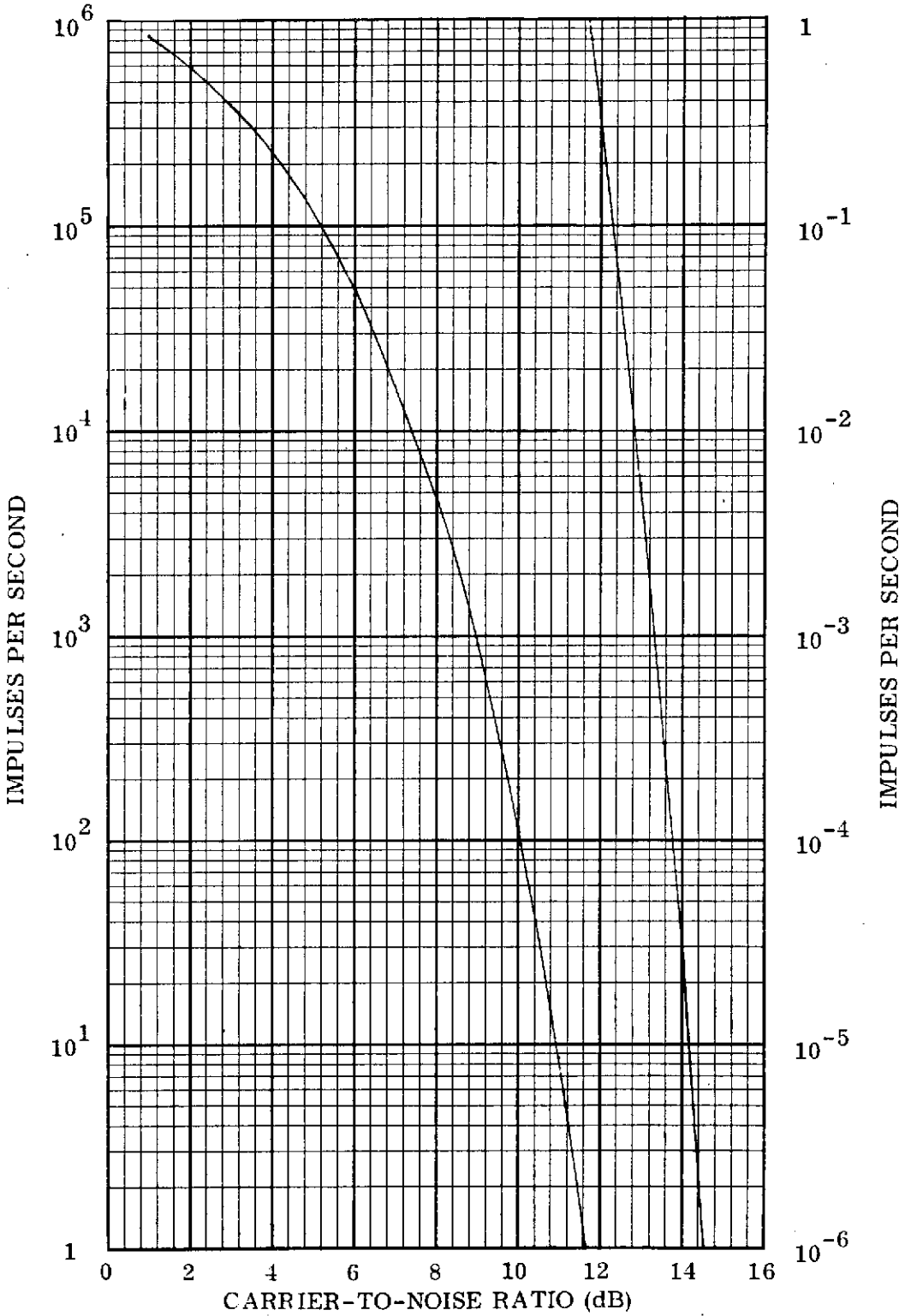


Figure 4-26. Negative Impulse Rates Plotted As a Function of C/N for Data Set 17

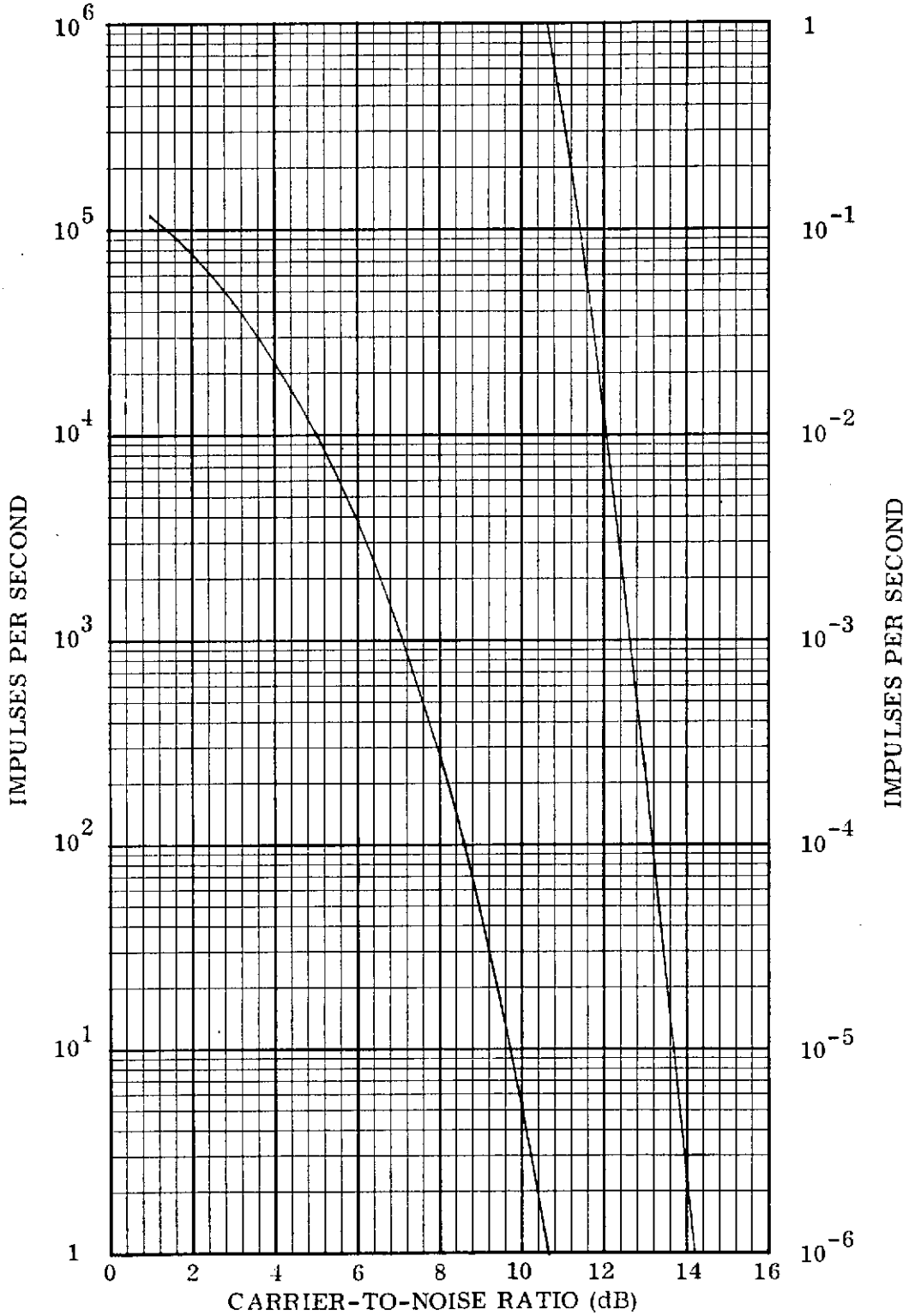


Figure 4-27. Positive Impulse Rates Plotted As a Function of C/N for Data Set 2

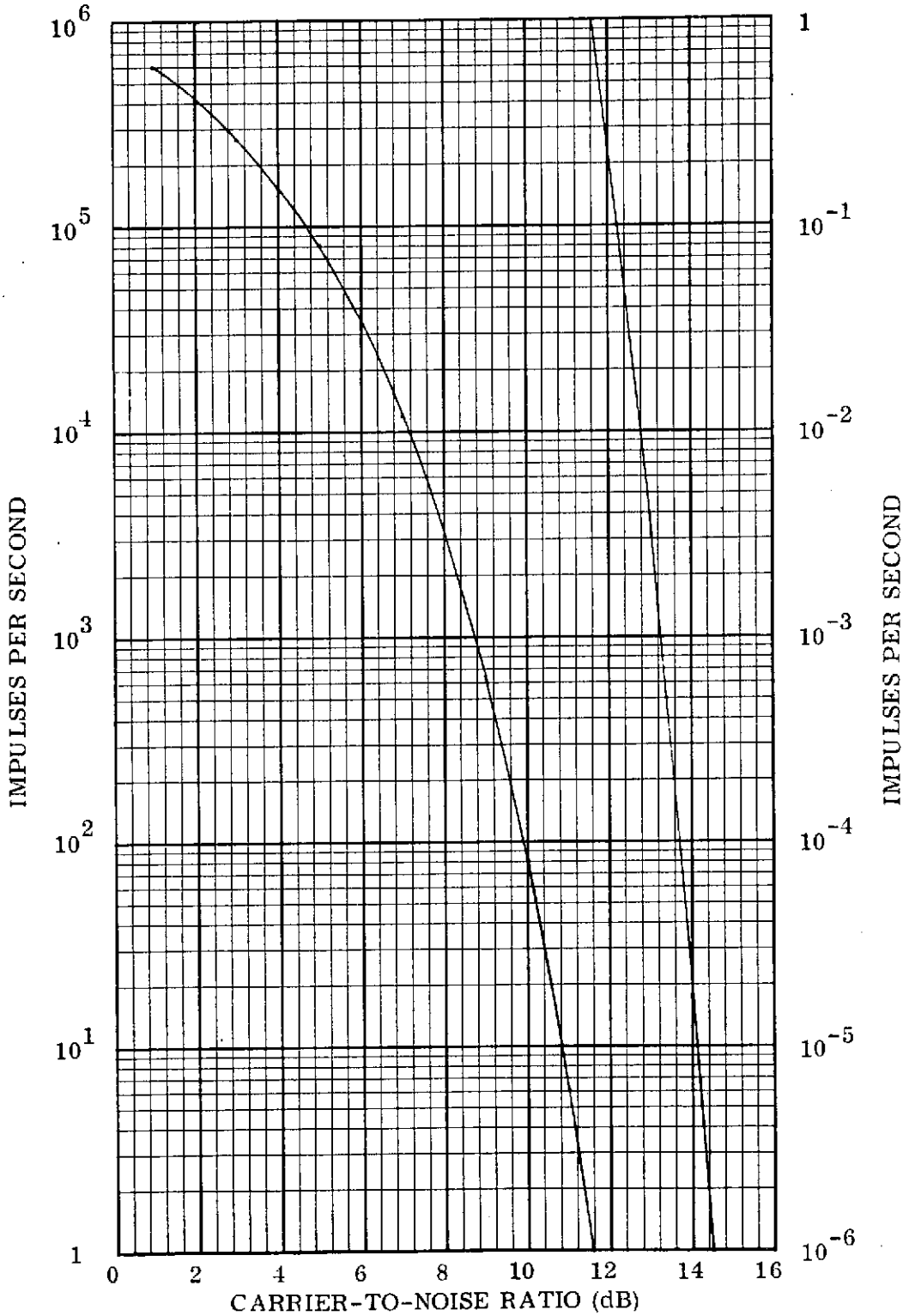


Figure 4-28. Negative Impulse Rates Plotted As a Function of C/N for Data Set 2

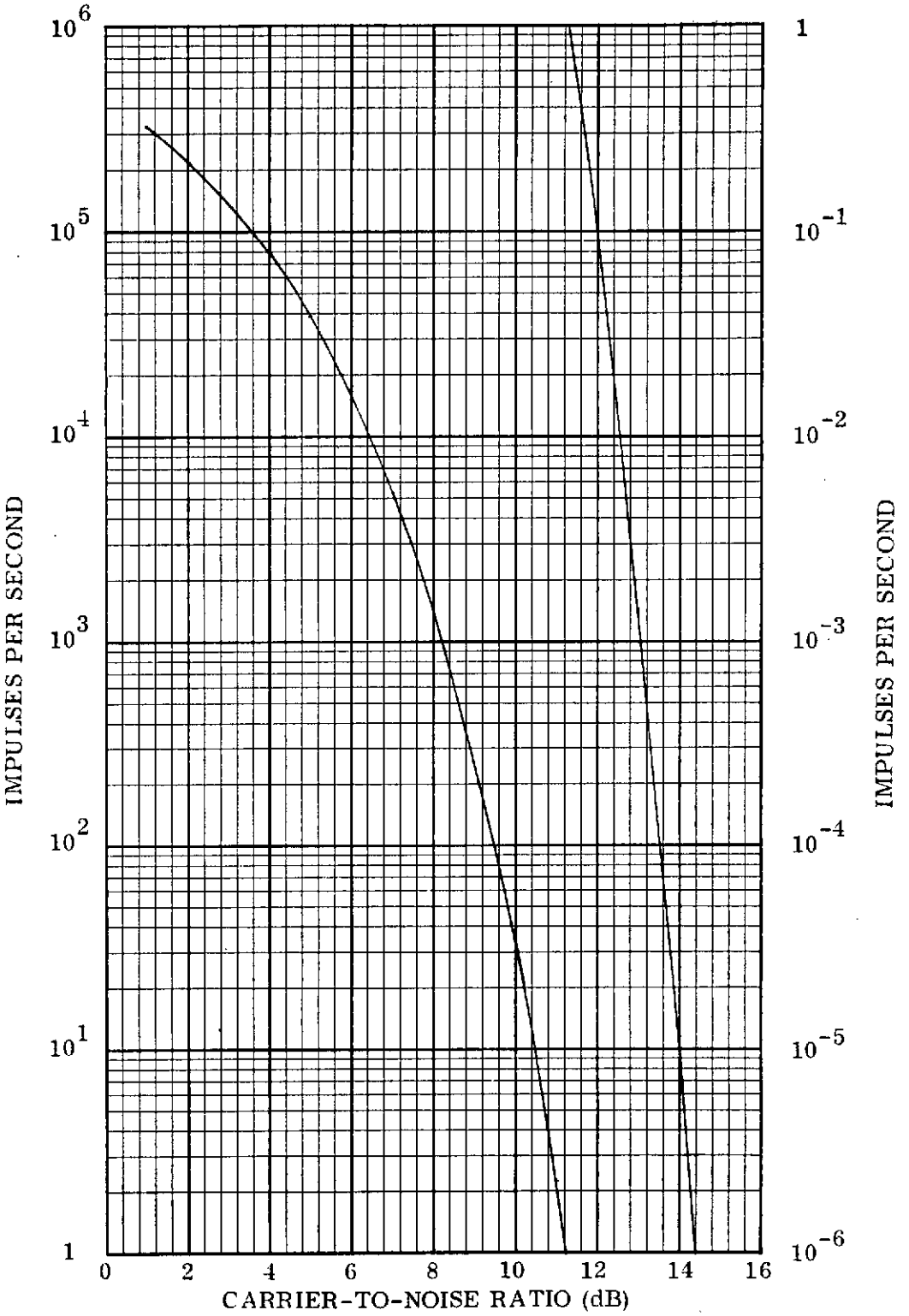


Figure 4-29. Positive Impulse Rates Plotted As a Function of C/N for Data Set 4

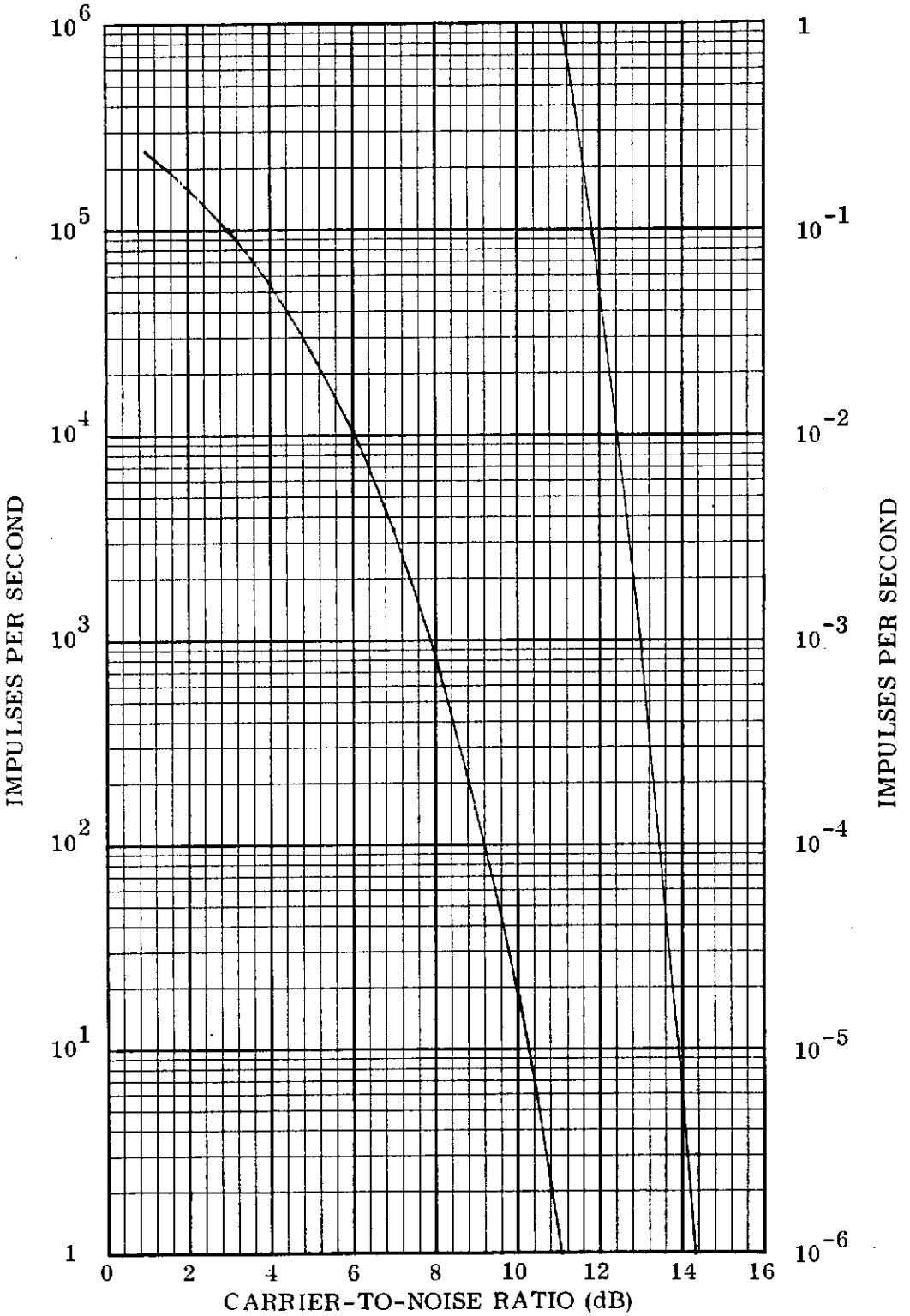


Figure 4-30. Negative Impulse Rates Plotted As a Function of C/N for Data Set 4

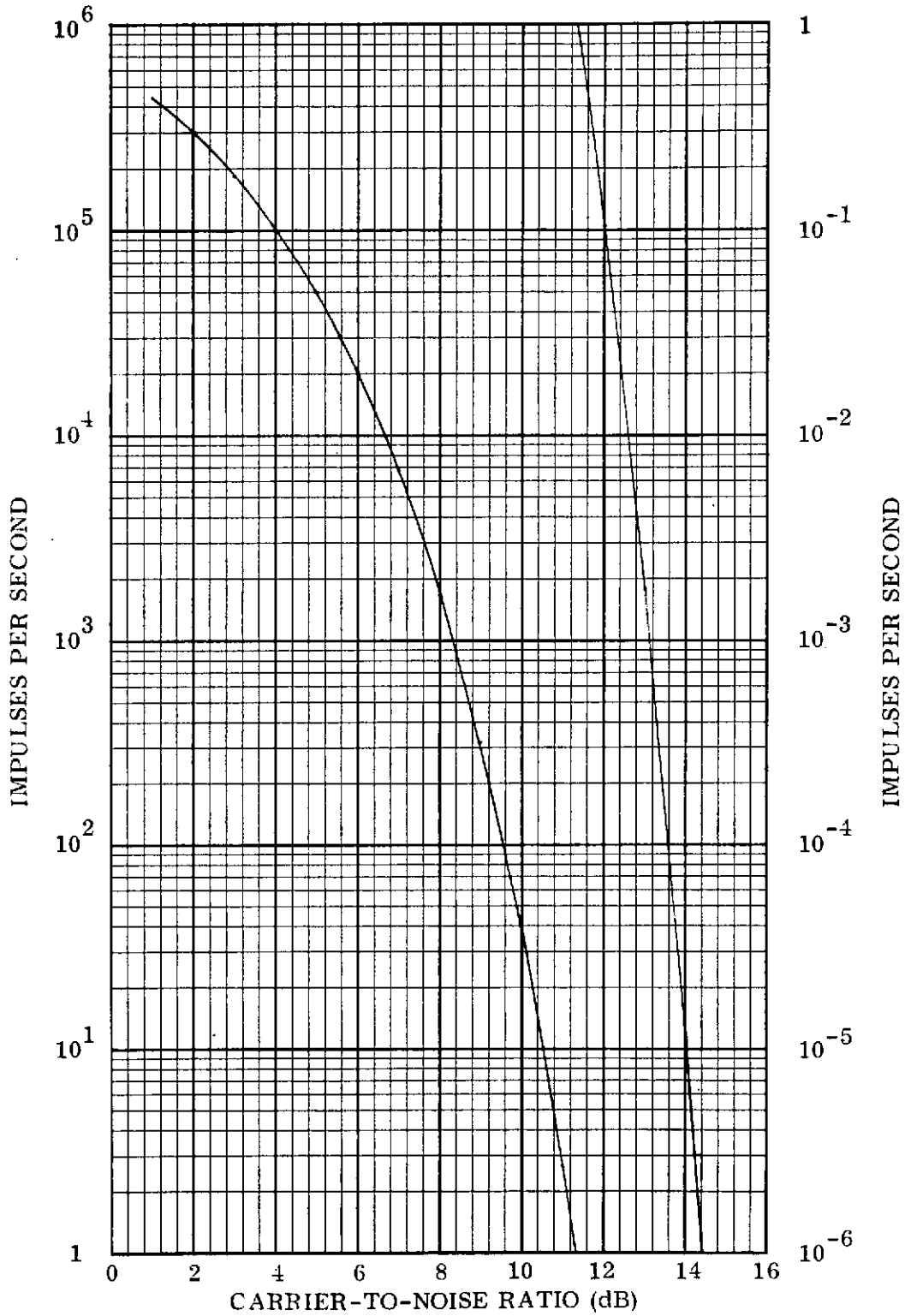


Figure 4-31. Positive Impulse Rates Plotted As a Function of C/N for Data Set 12

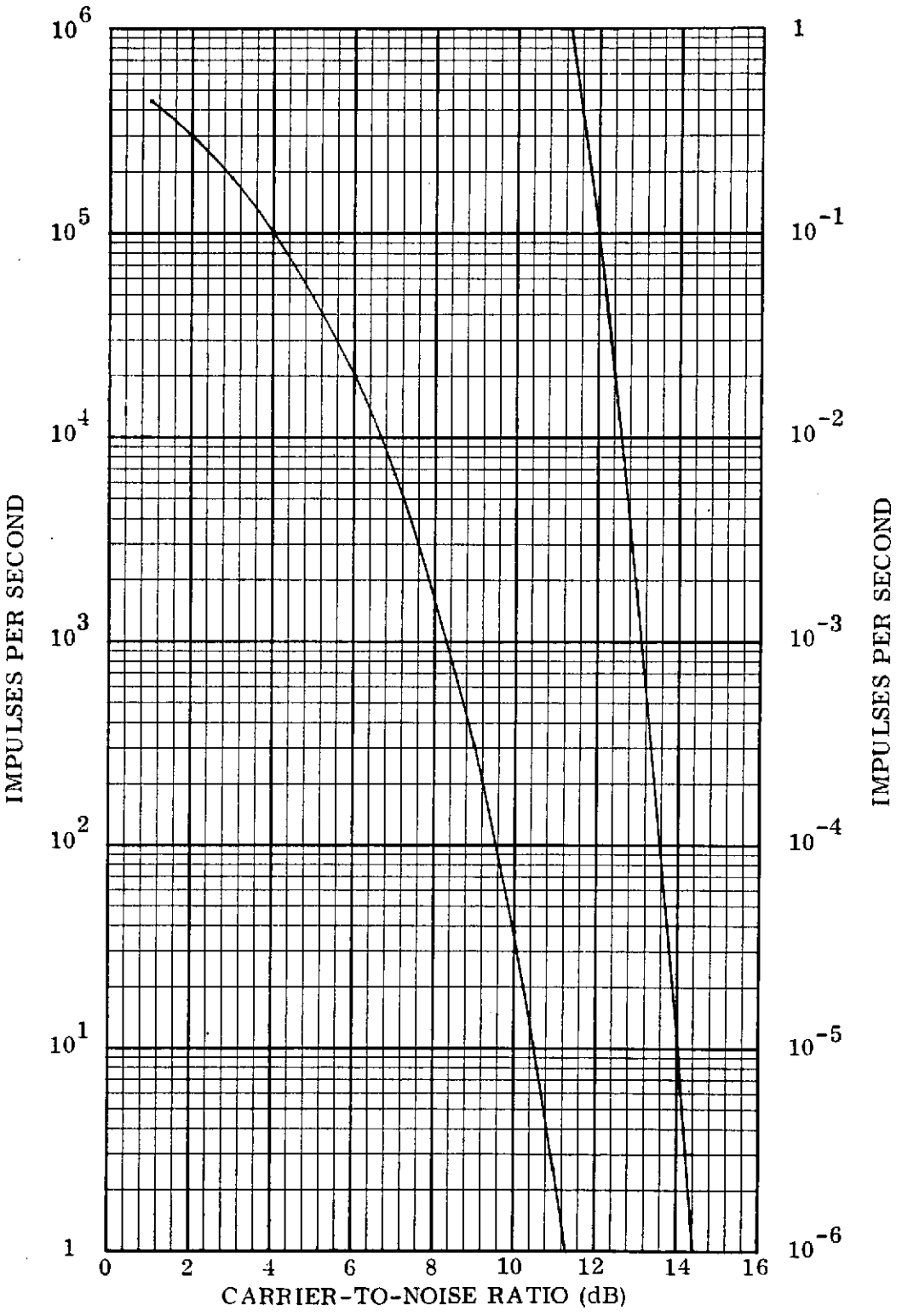


Figure 4-32. Negative Impulse Rates Plotted As a Function of C/N for Data Set 12

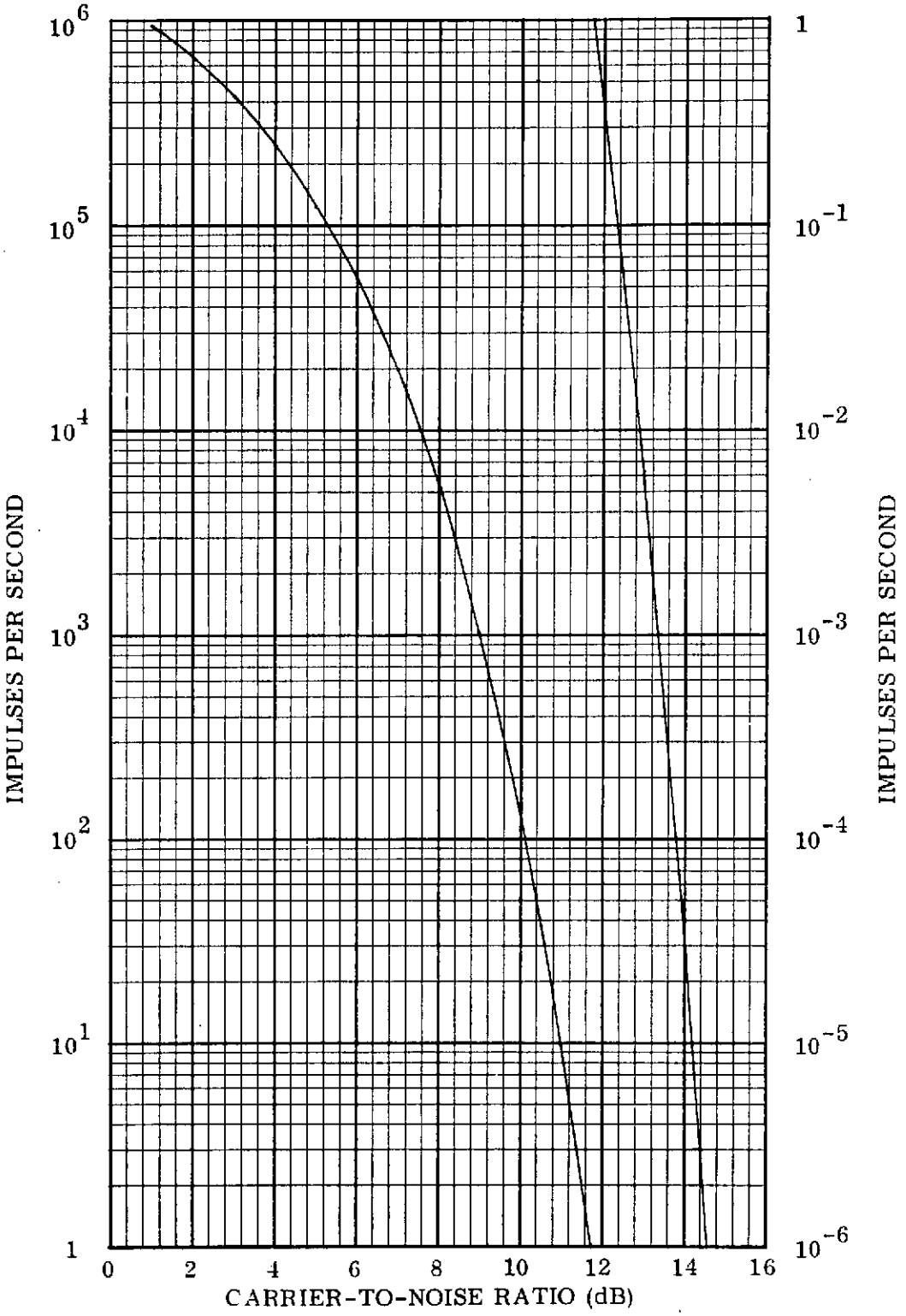


Figure 4-33. Positive Impulse Rates Plotted As a Function of C/N for Data Set 6

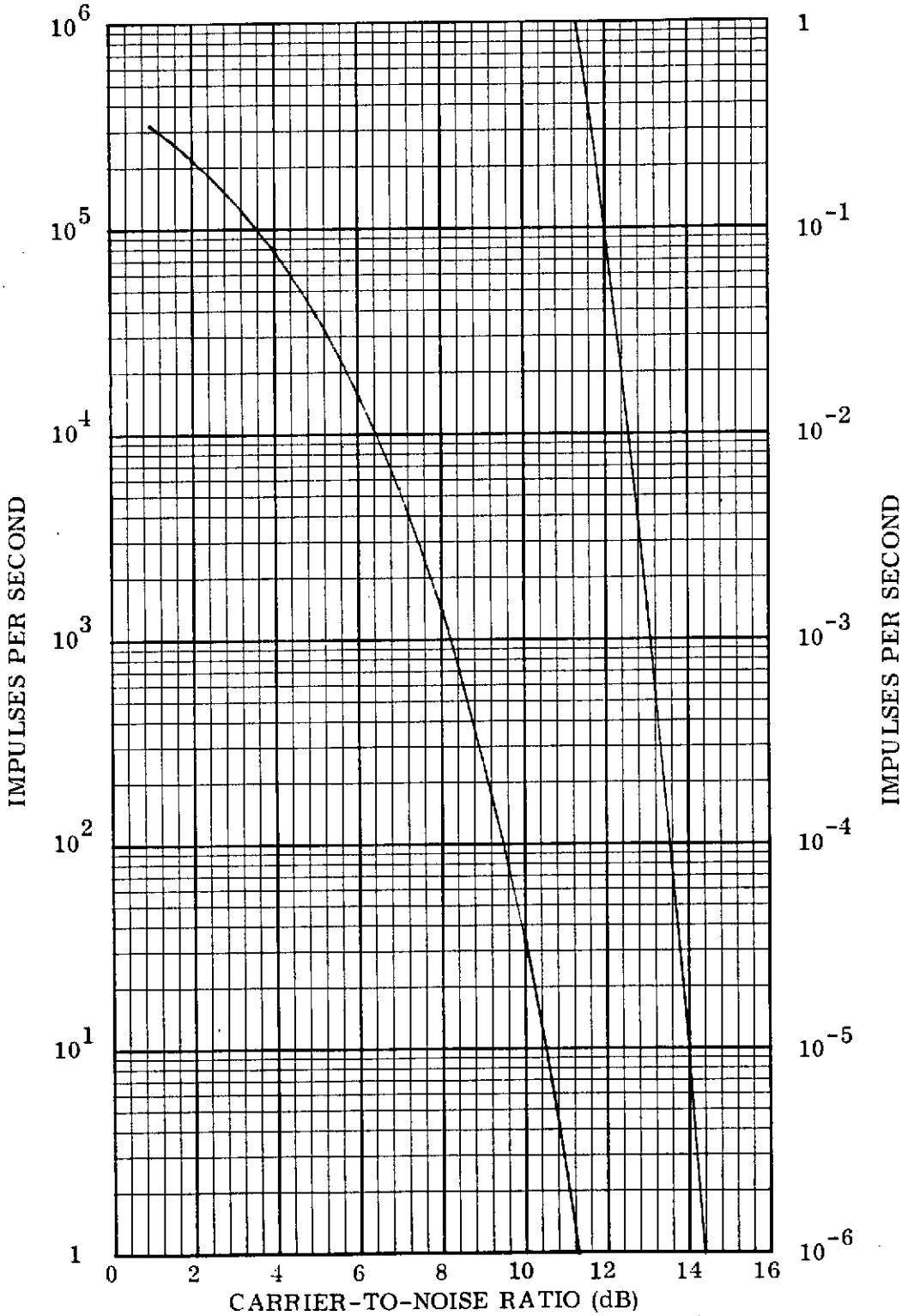


Figure 4-34. Negative Impulse Rates Plotted As a Function of C/N for Data Set 6

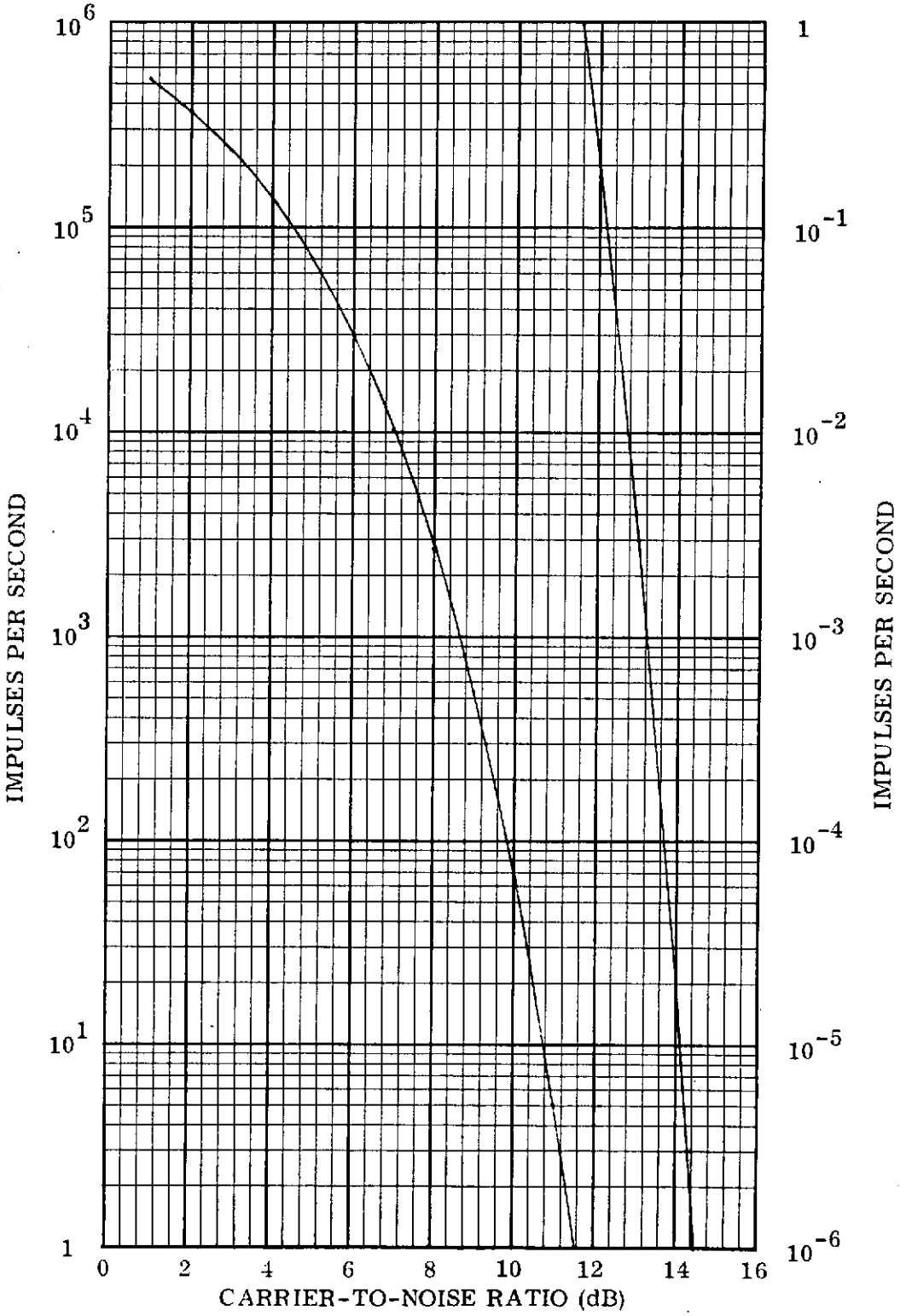


Figure 4-35. Positive Impulse Rates Plotted As a Function of C/N for Data Set 8

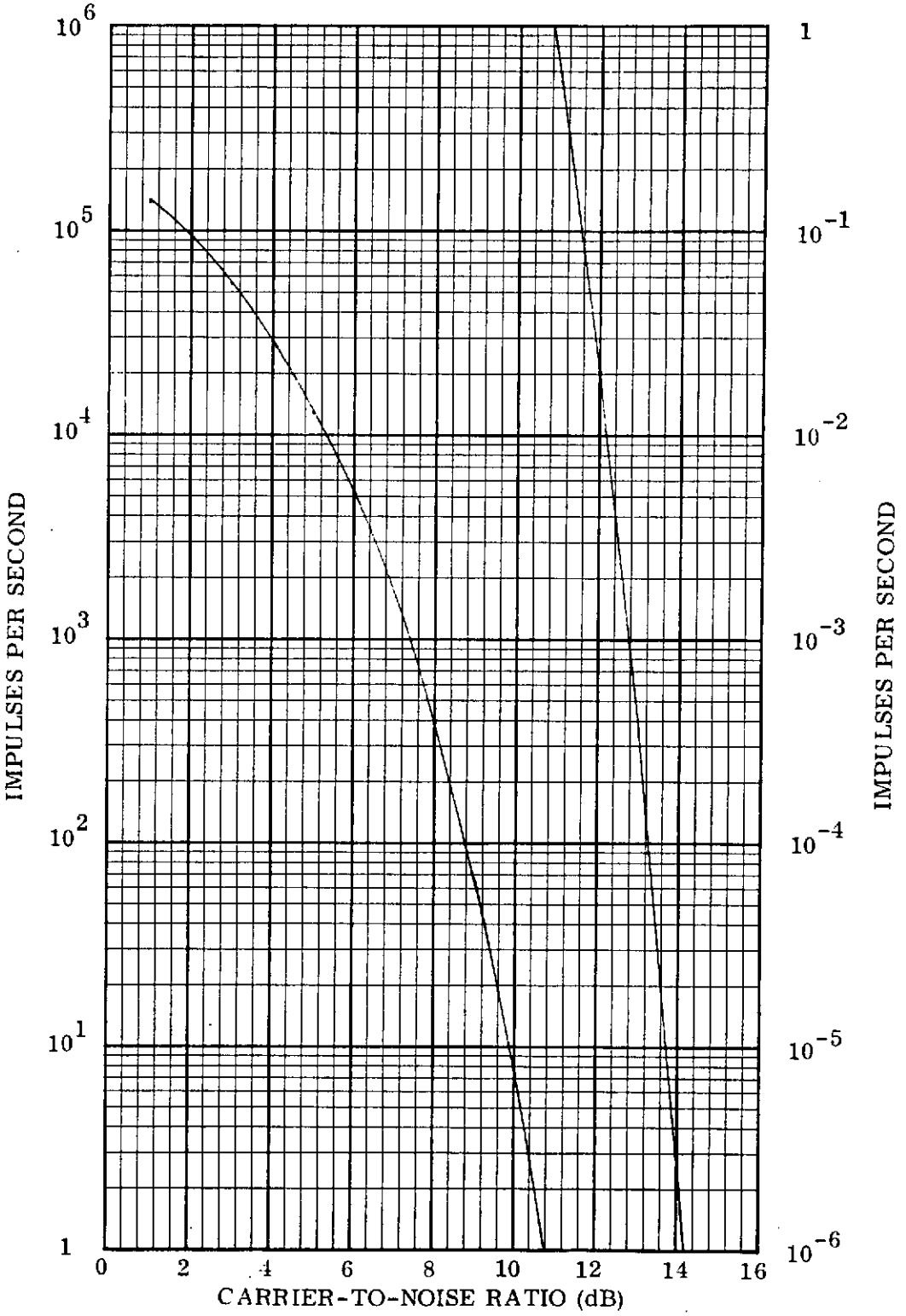


Figure 4-36. Negative Impulse Rates Plotted As a Function of C/N for Data Set 8

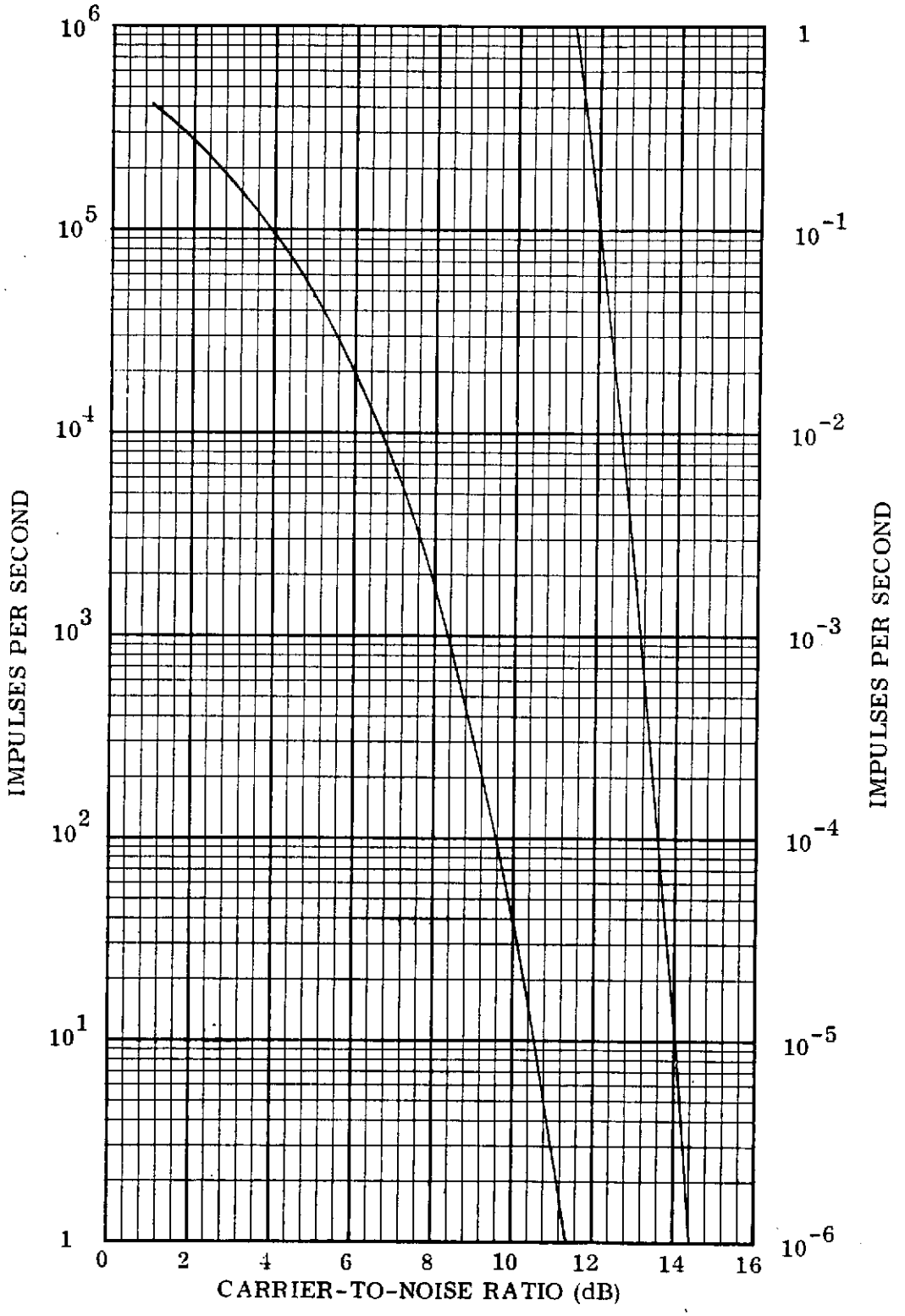


Figure 4-37. Positive Impulse Rates Plotted As a Function of C/N for Data Set 10

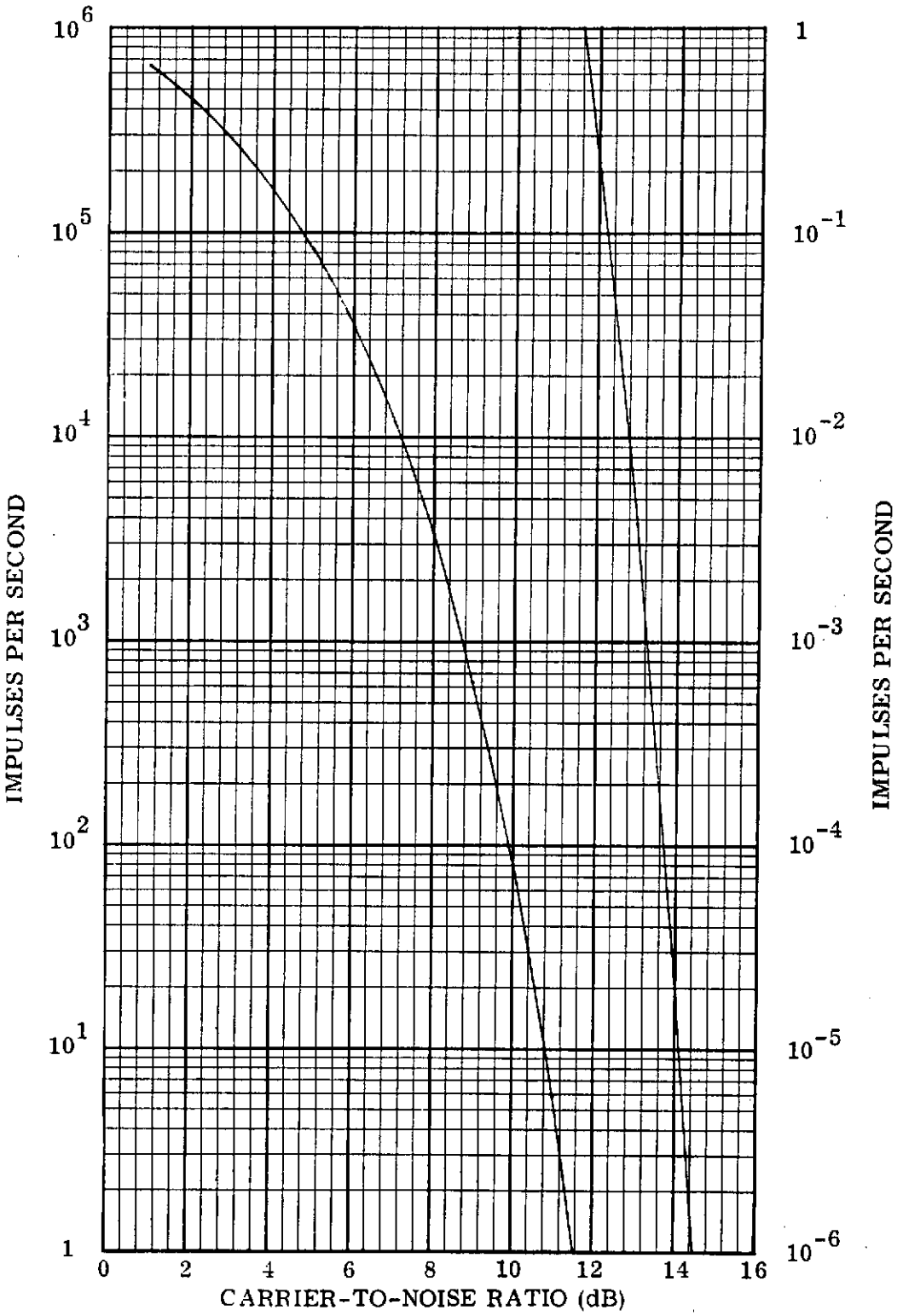


Figure 4-38. Negative Impulse Rates Plotted As a Function of C/N for Data Set 10

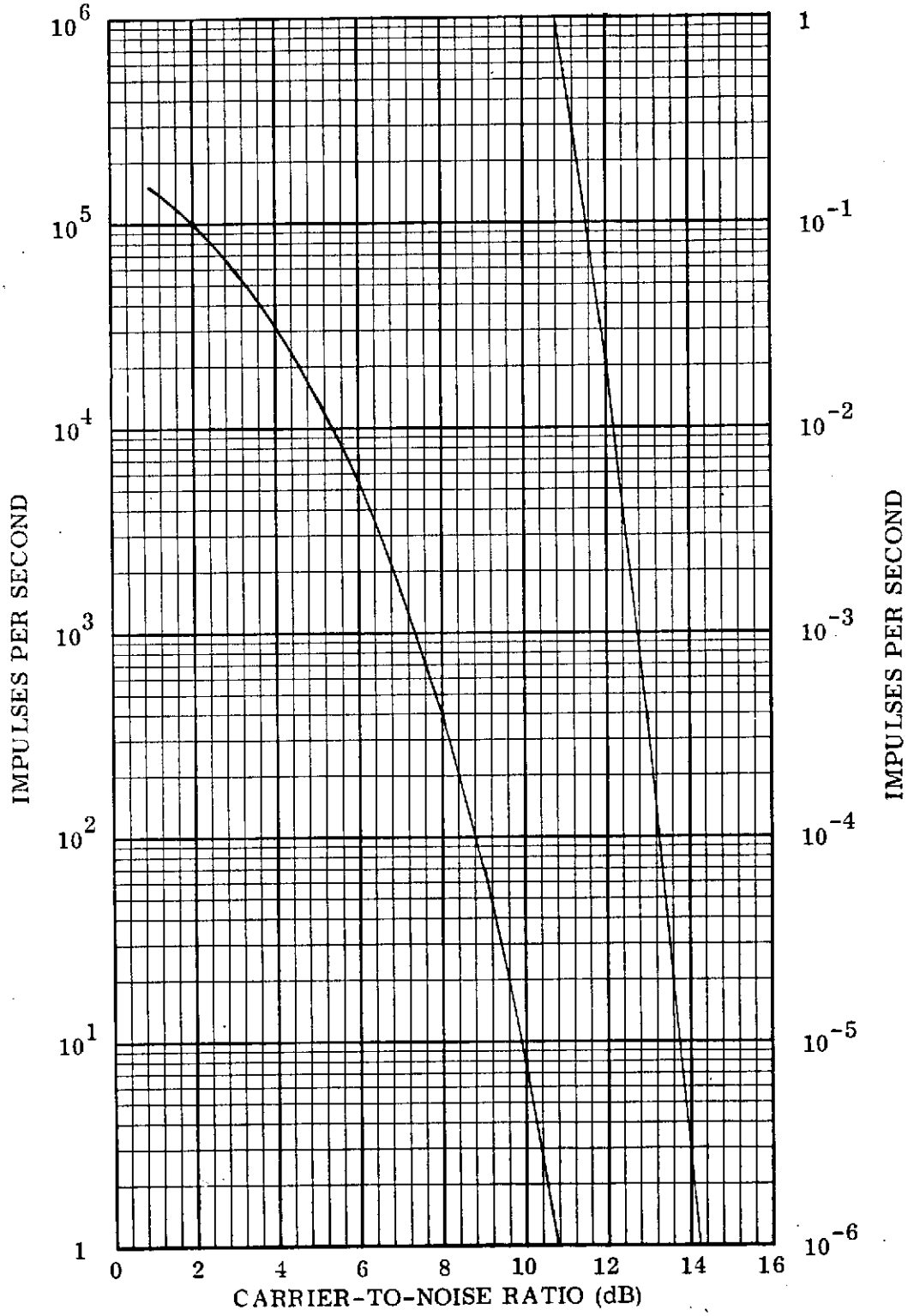


Figure 4-39. Positive Impulse Rates Plotted As a Function of C/N for Data Set 20

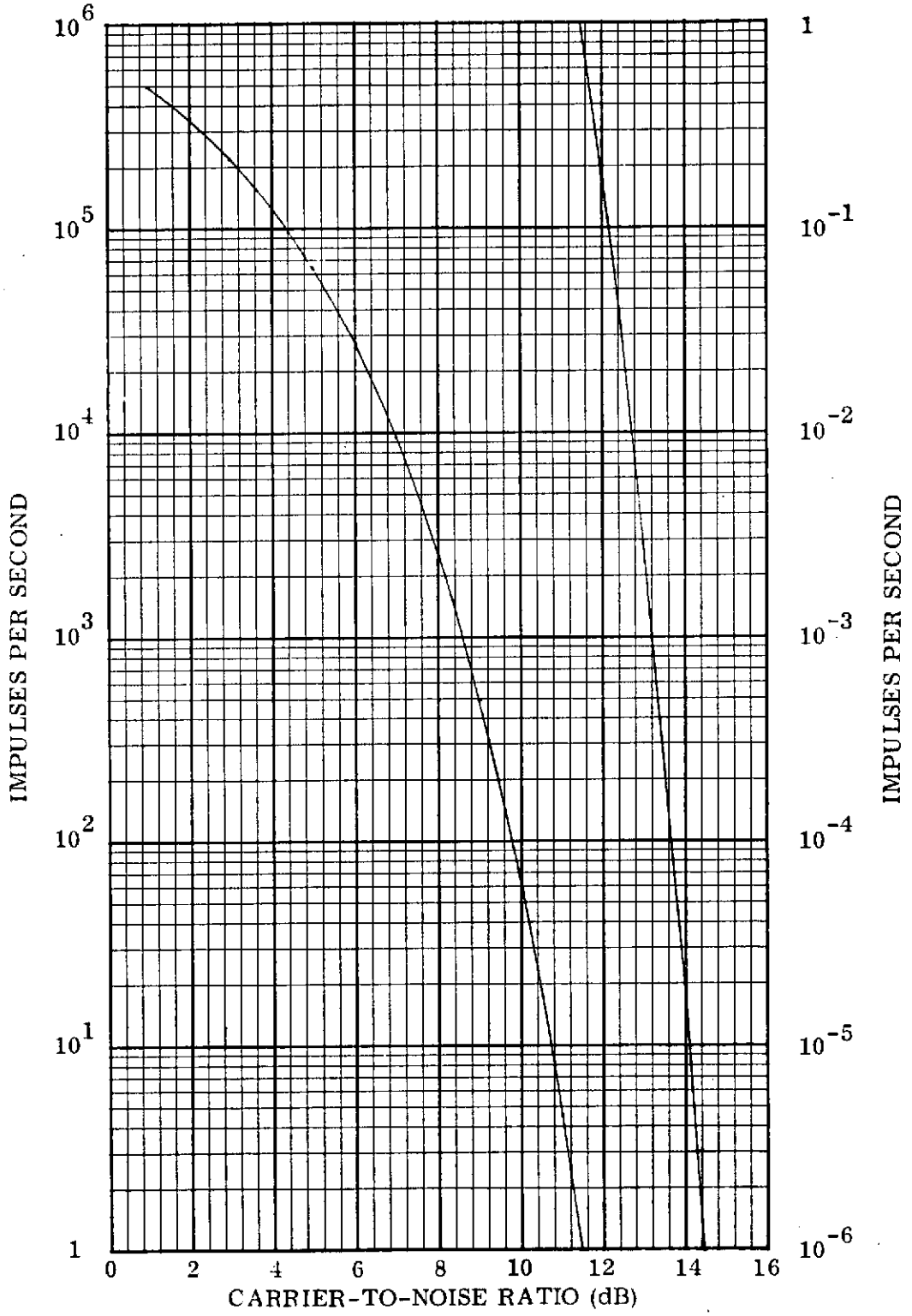


Figure 4-40. Negative Impulse Rates Plotted As a Function of C/N for Data Set 20

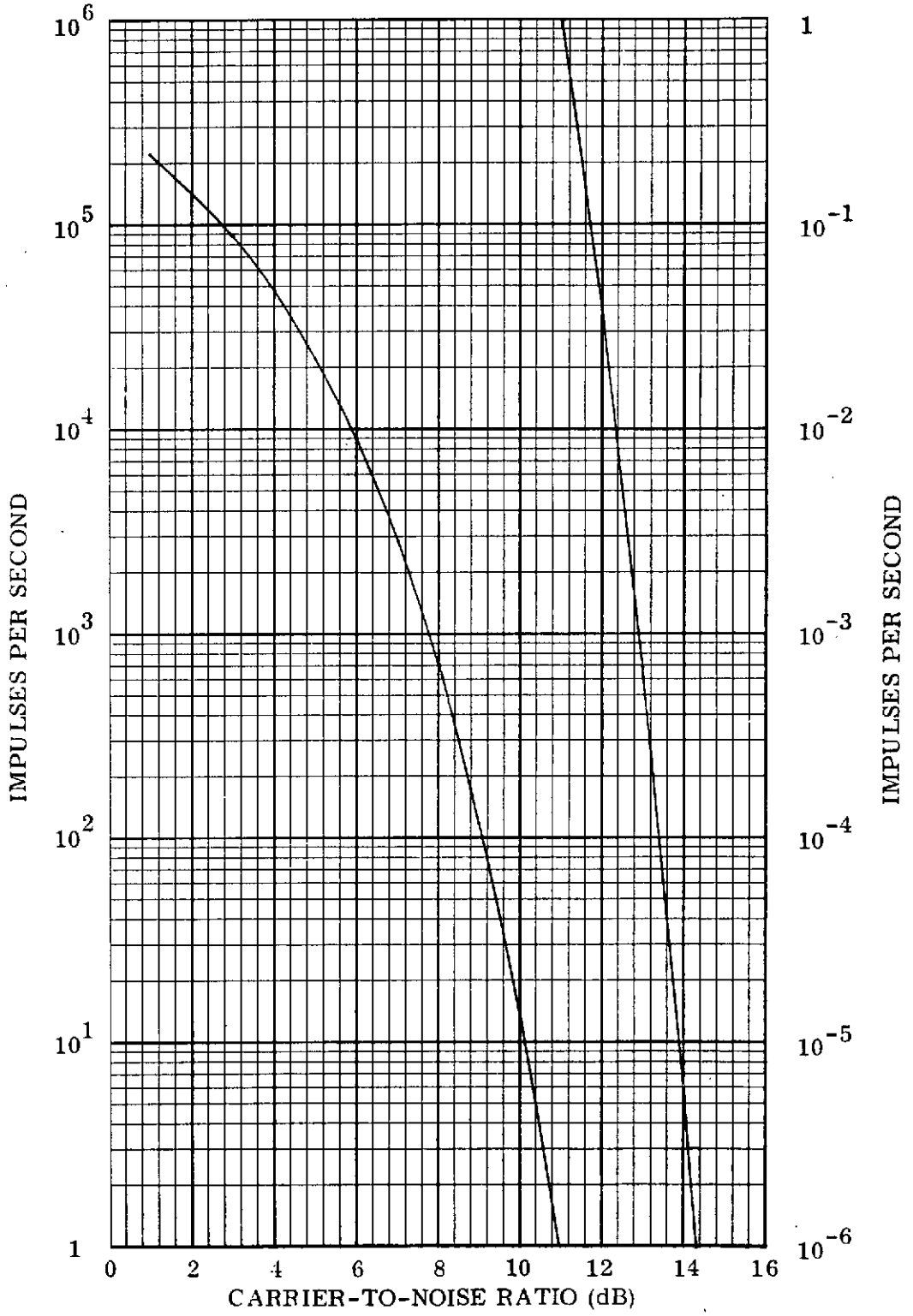


Figure 4-41. Positive Impulse Rates Plotted As a Function of C/N for Data Set 22

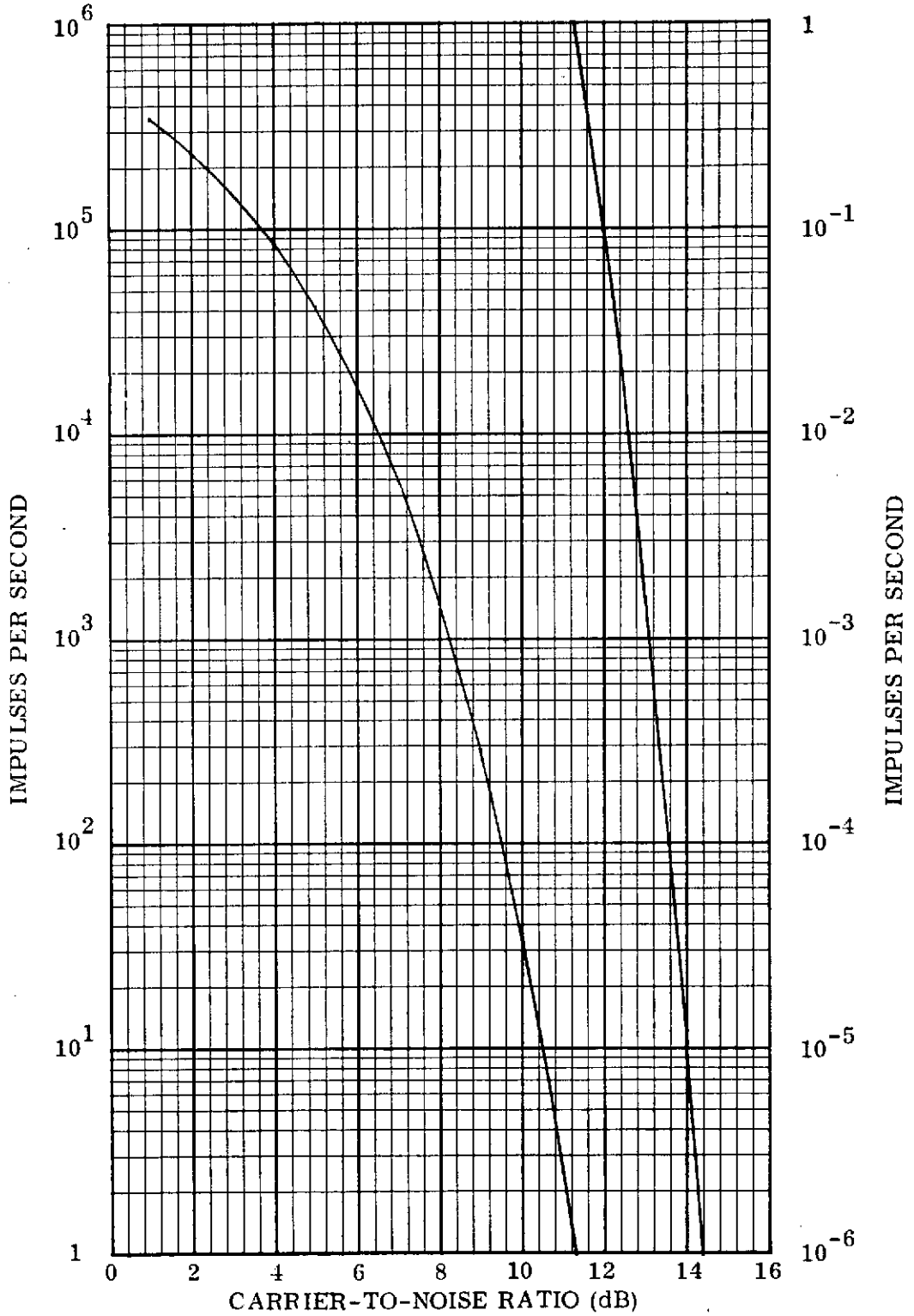


Figure 4-42. Negative Impulse Rates Plotted As a Function of C/N for Data Set 22

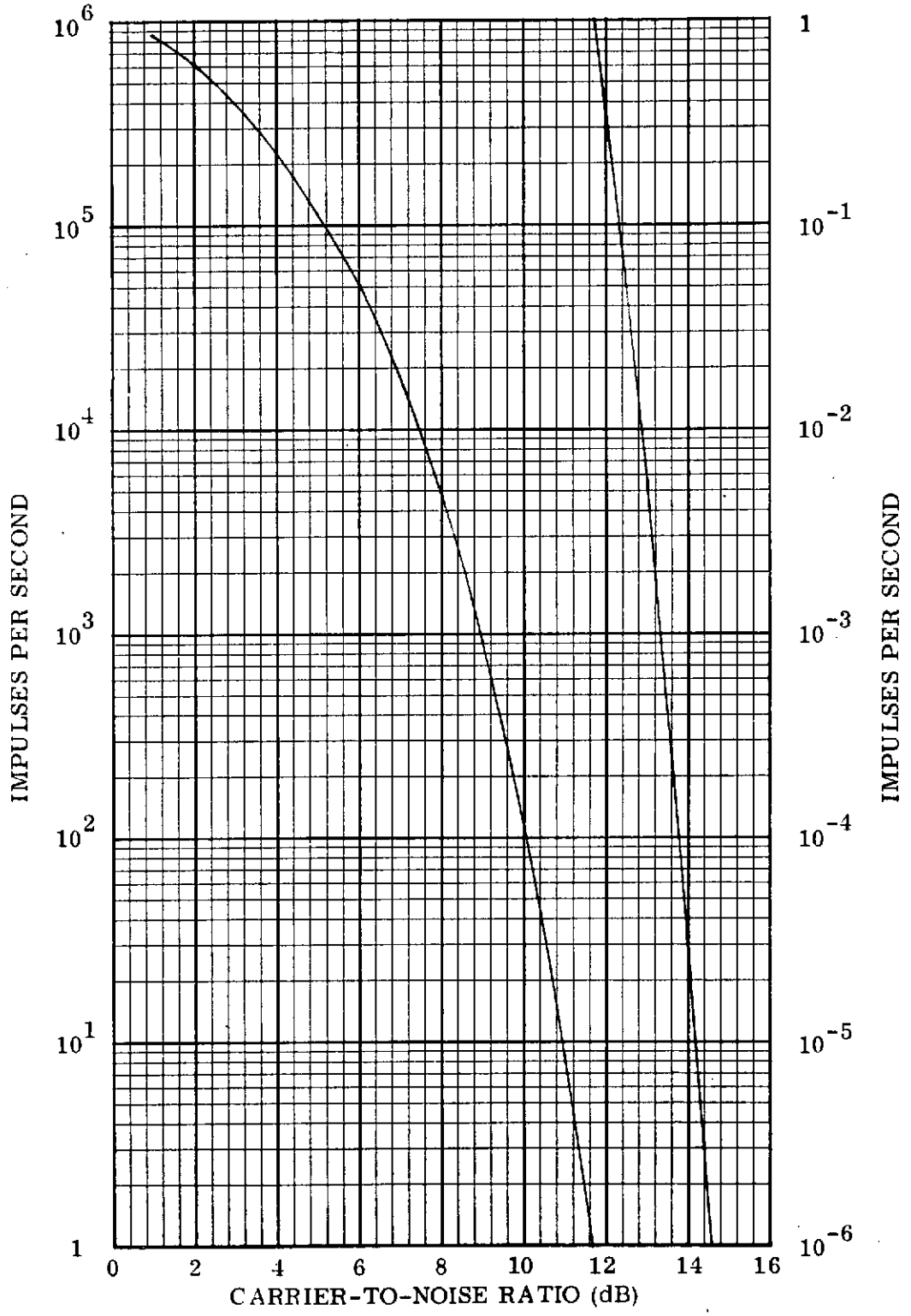


Figure 4-43. Positive Impulse Rates Plotted As a Function of C/N for Data Set 16

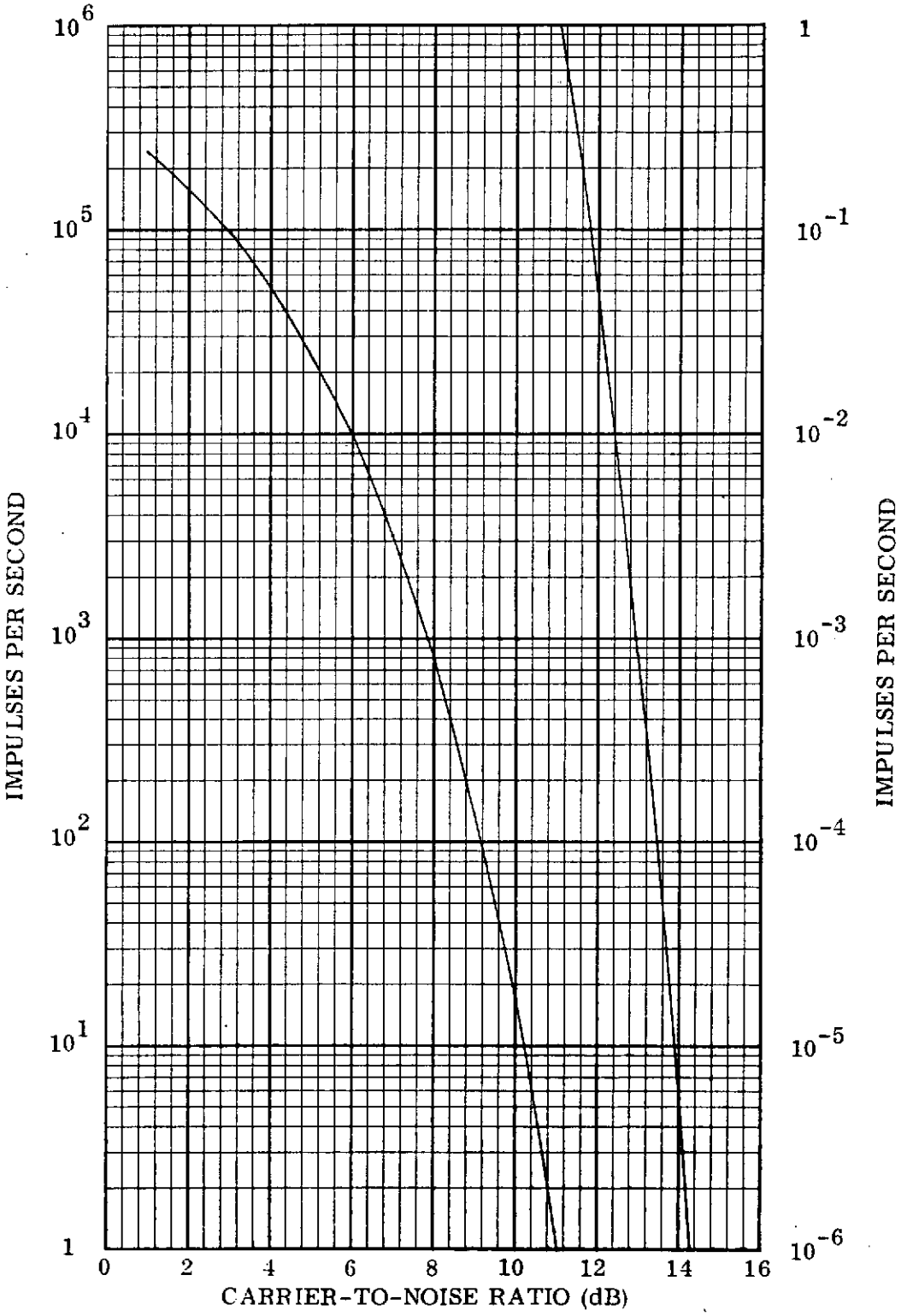


Figure 4-44. Negative Impulse Rates Plotted As a Function of C/N for Data Set 16

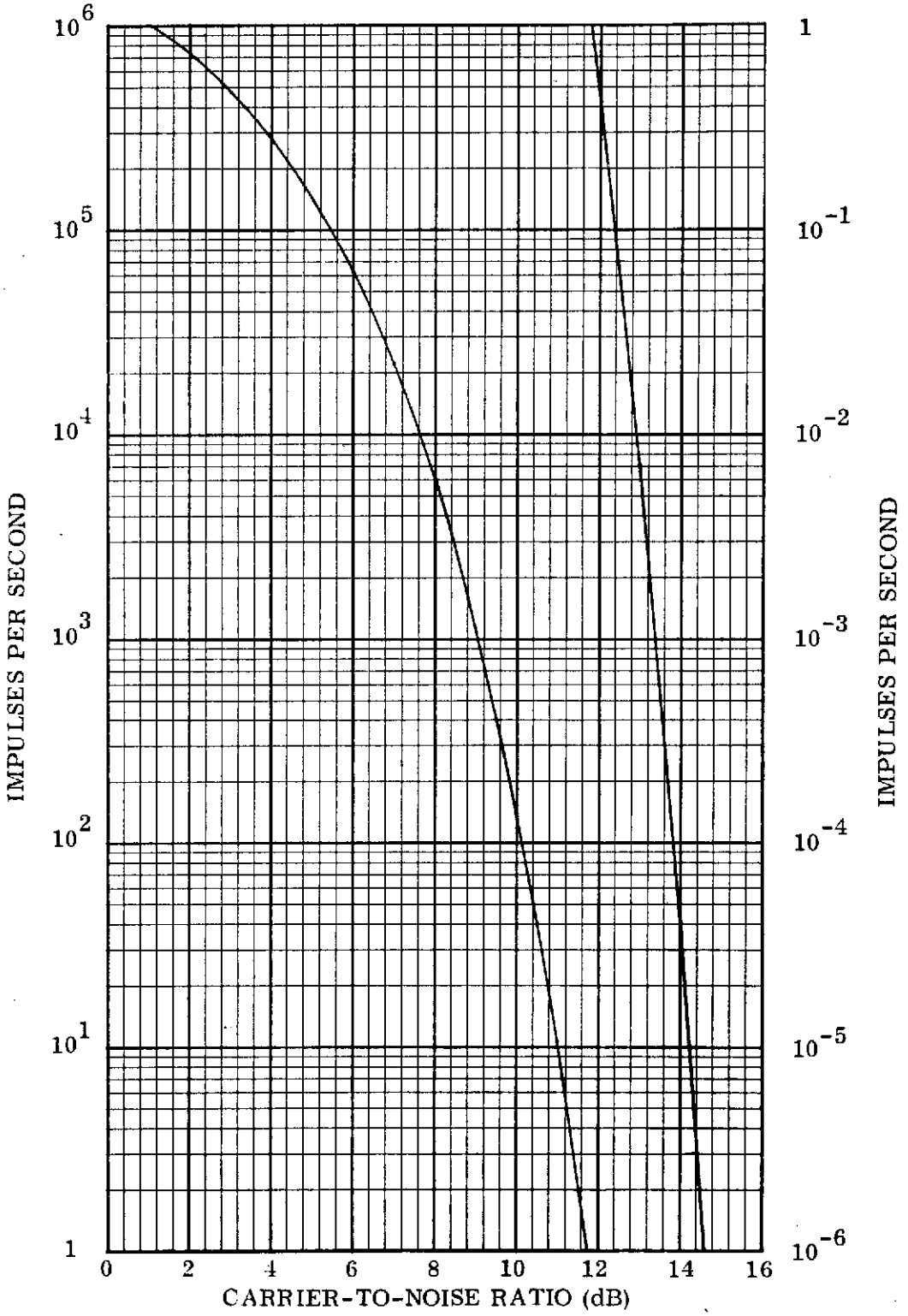


Figure 4-45. Positive Impulse Rates Plotted As a Function of C/N for Data Set 14

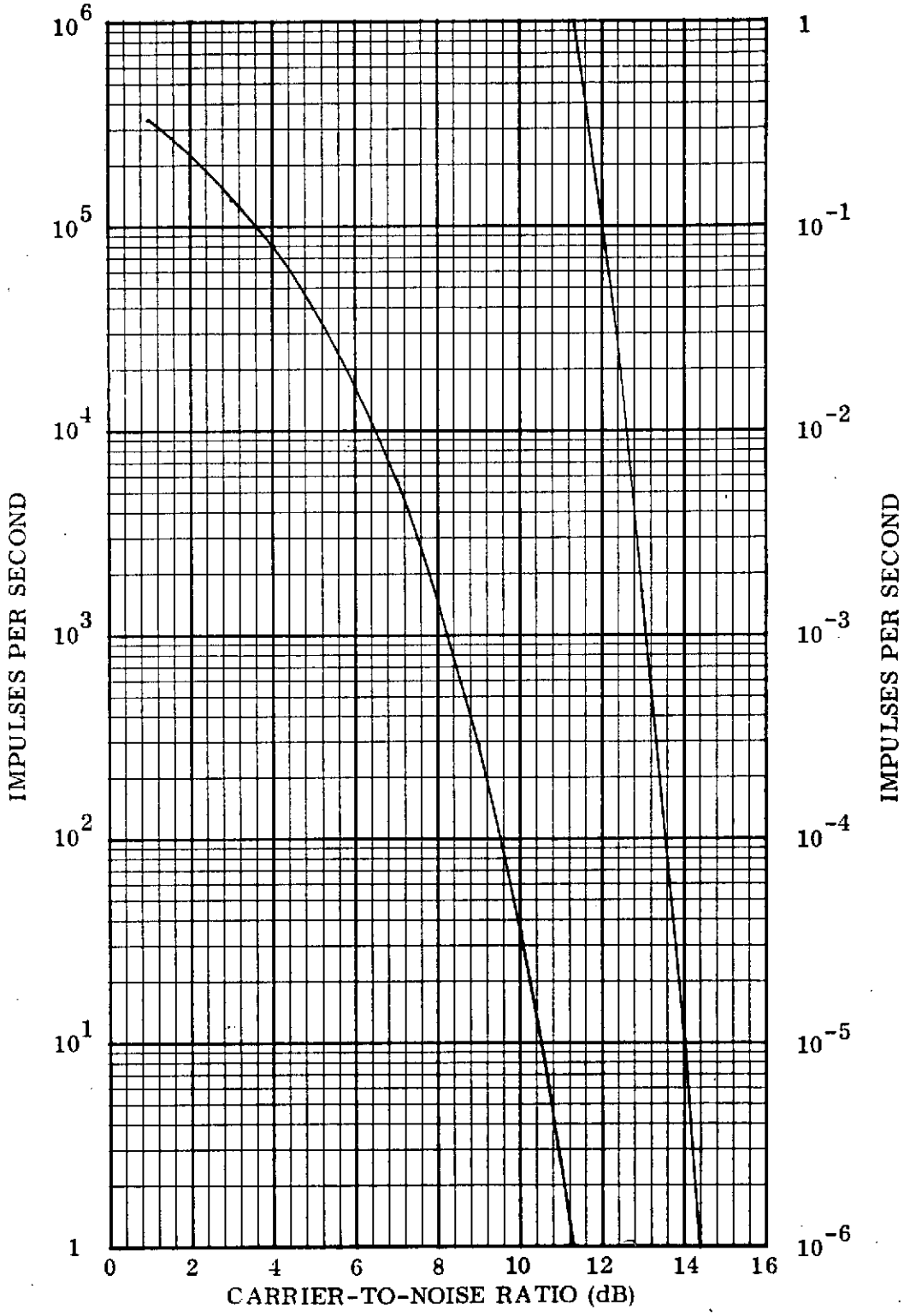


Figure 4-46. Negative Impulse Rates Plotted As a Function of C/N for Data Set 14

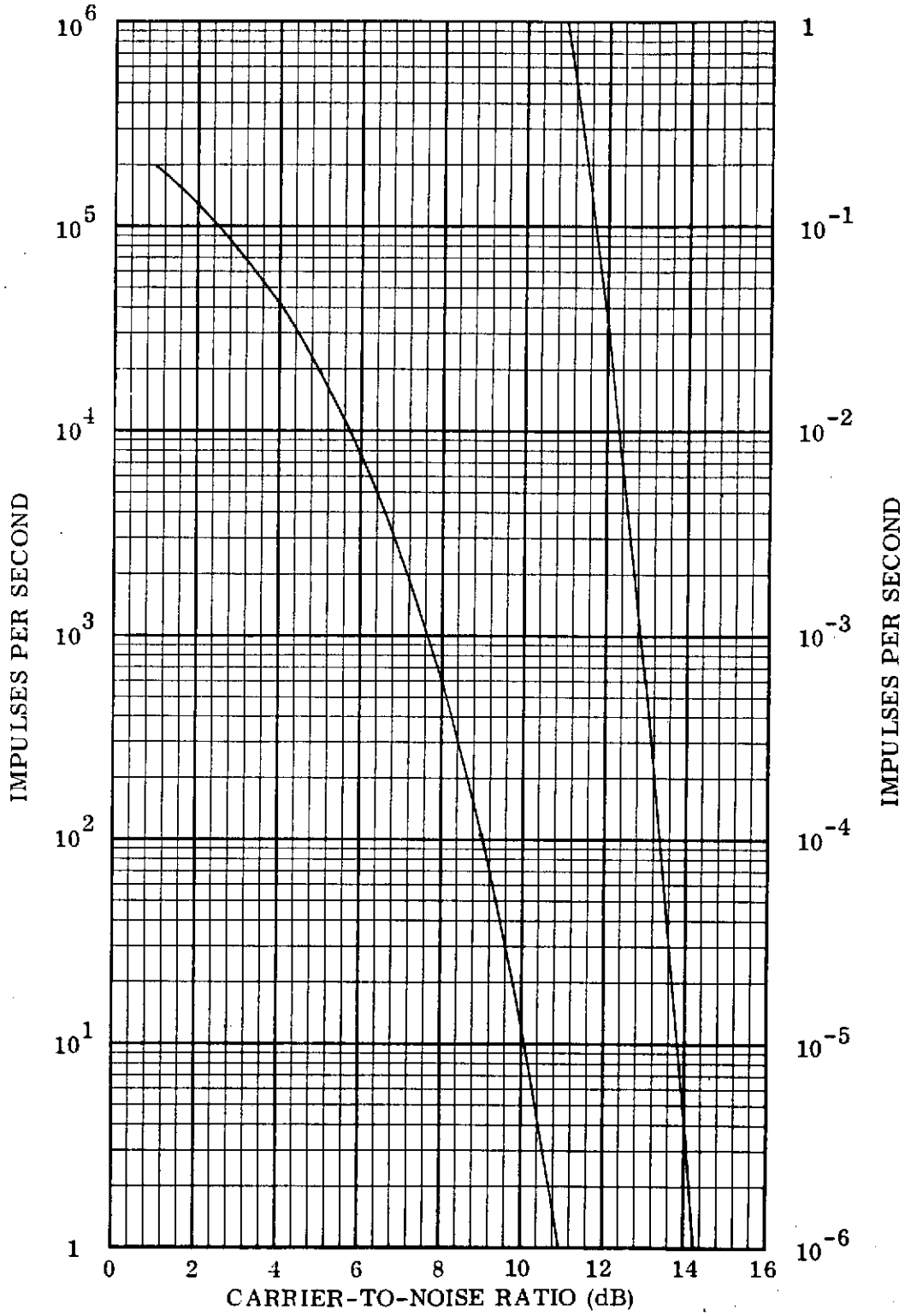


Figure 4-47. Positive Impulse Rates Plotted As a Function of C/N for Data Set 24

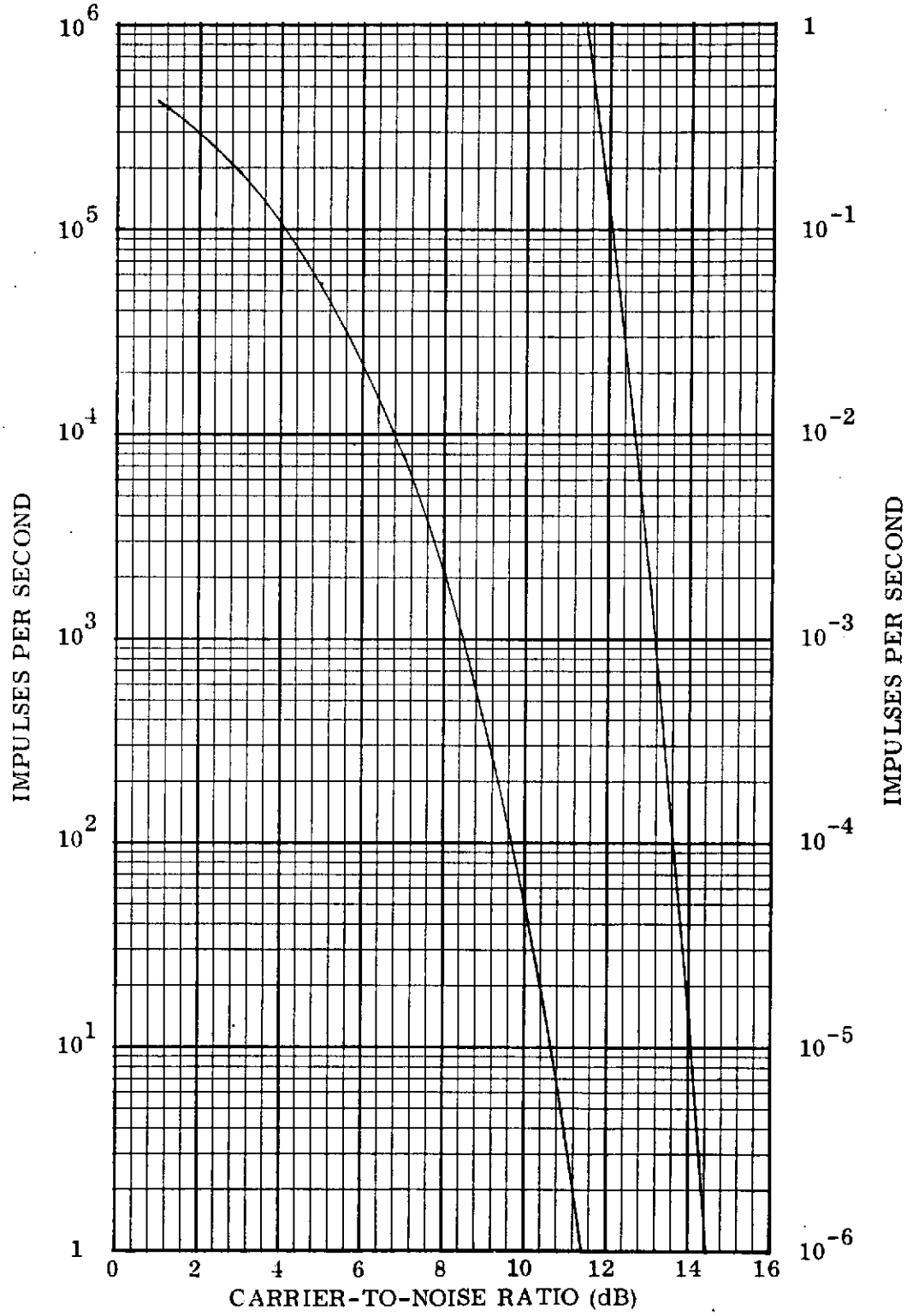


Figure 4-48. Negative Impulse Rates Plotted As a Function of C/N for Data Set 24

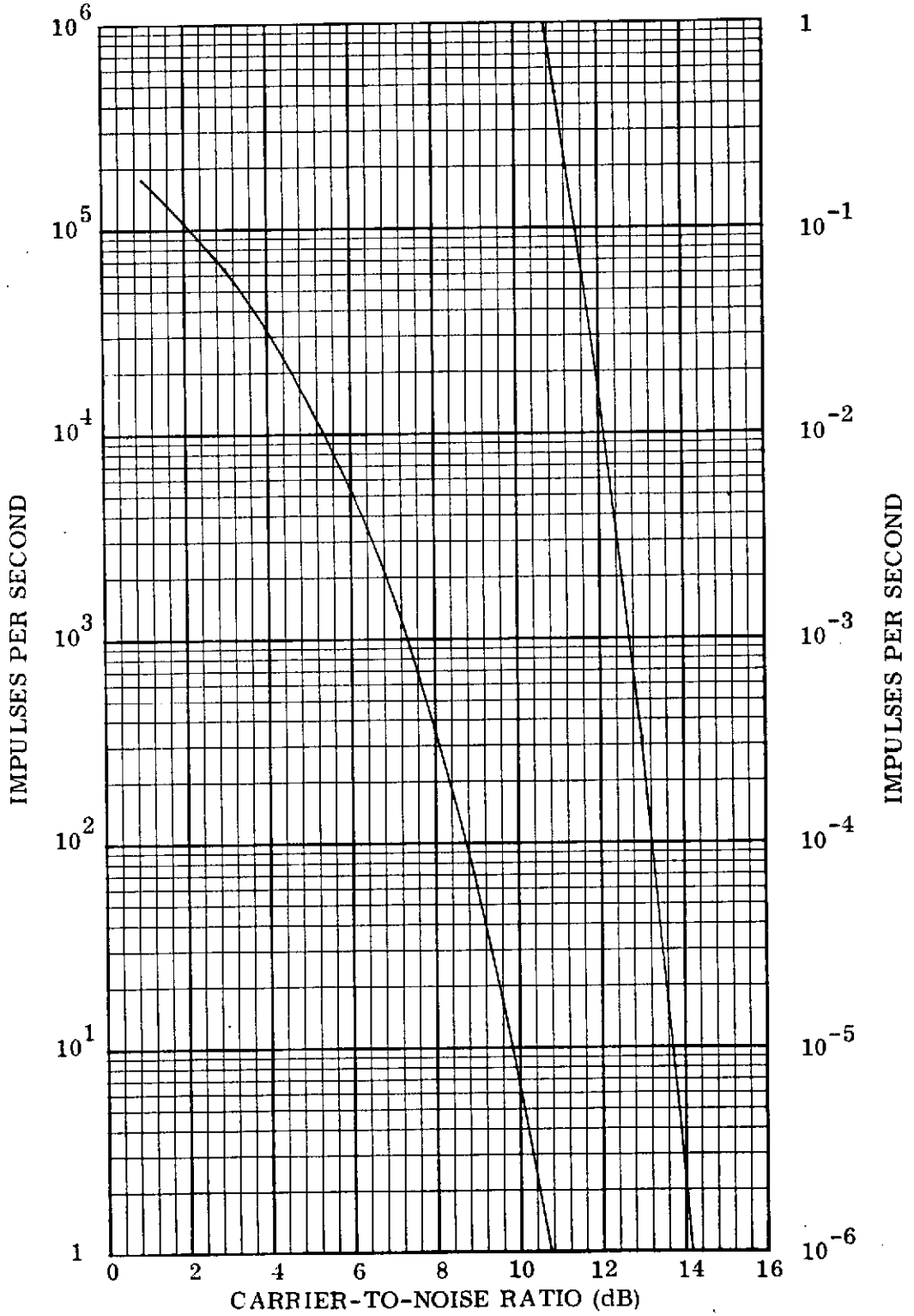


Figure 4-49. Positive Impulse Rates Plotted As a Function of C/N for Data Set 18

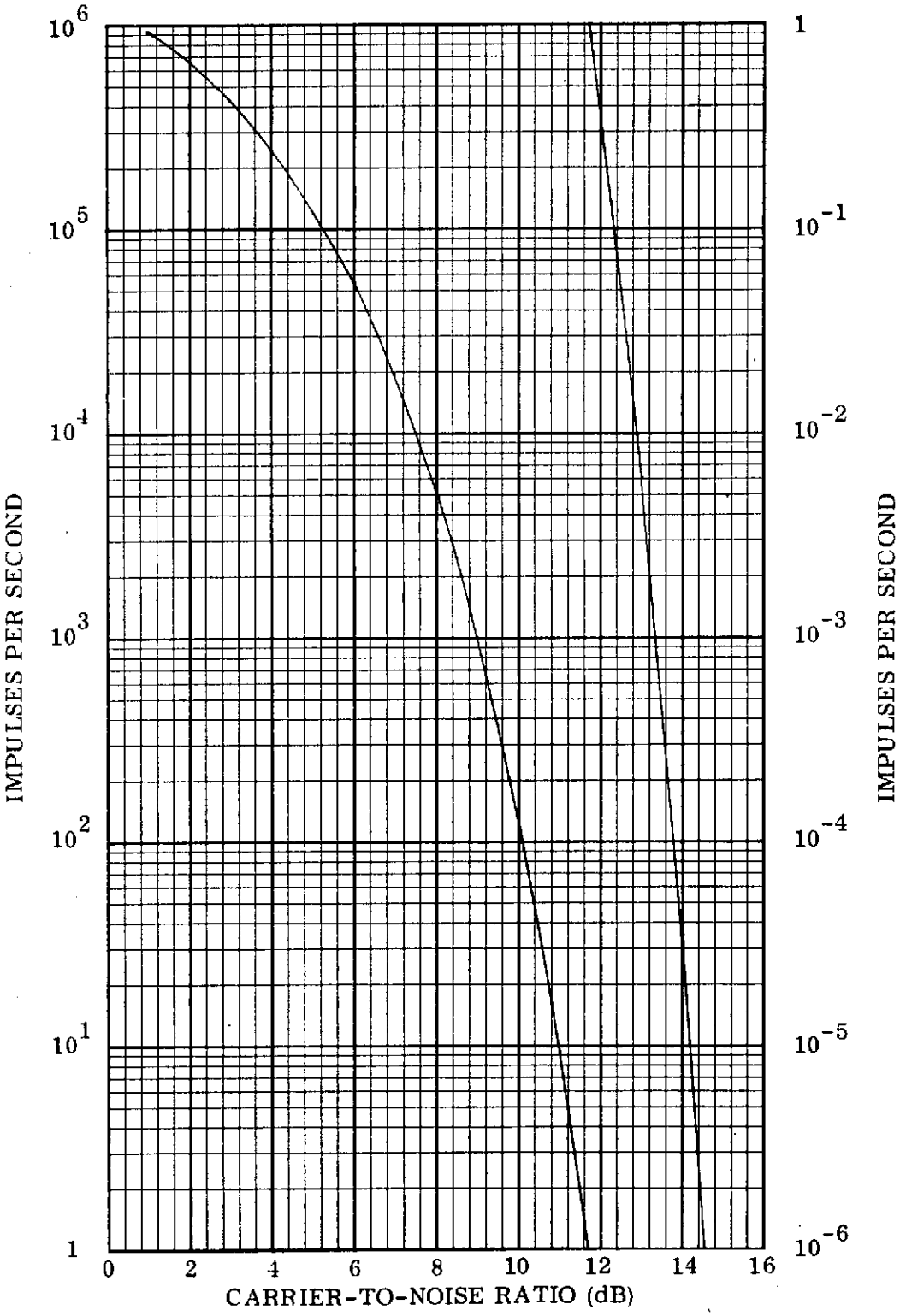


Figure 4-50. Negative Impulse Rates Plotted As a Function of C/N for Data Set 18

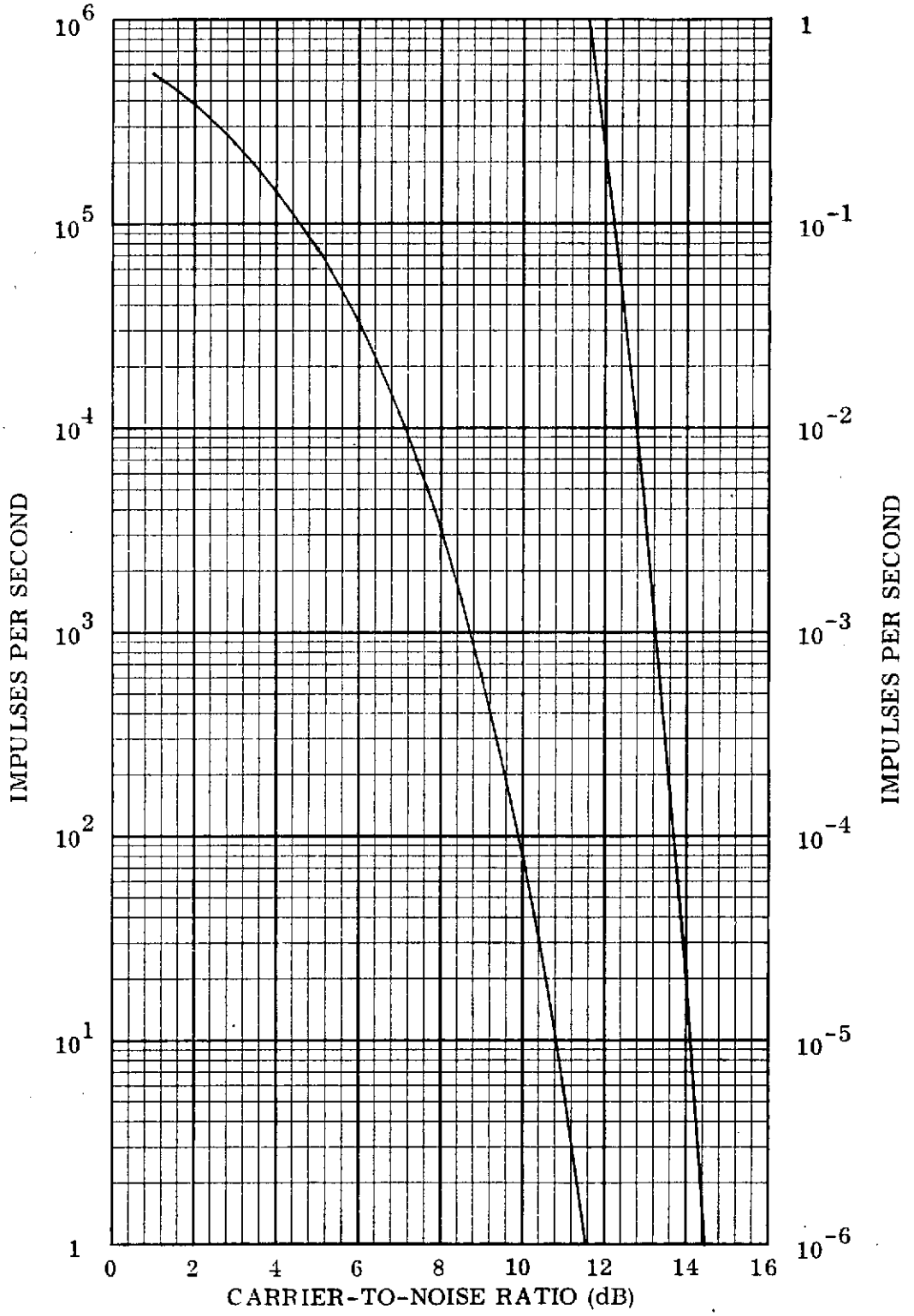


Figure 4-51. Positive (Negative) Impulse Rates Plotted as a Function of C/N for a Sinusoidal Distribution and a Peak Deviation of 5.4 MHz

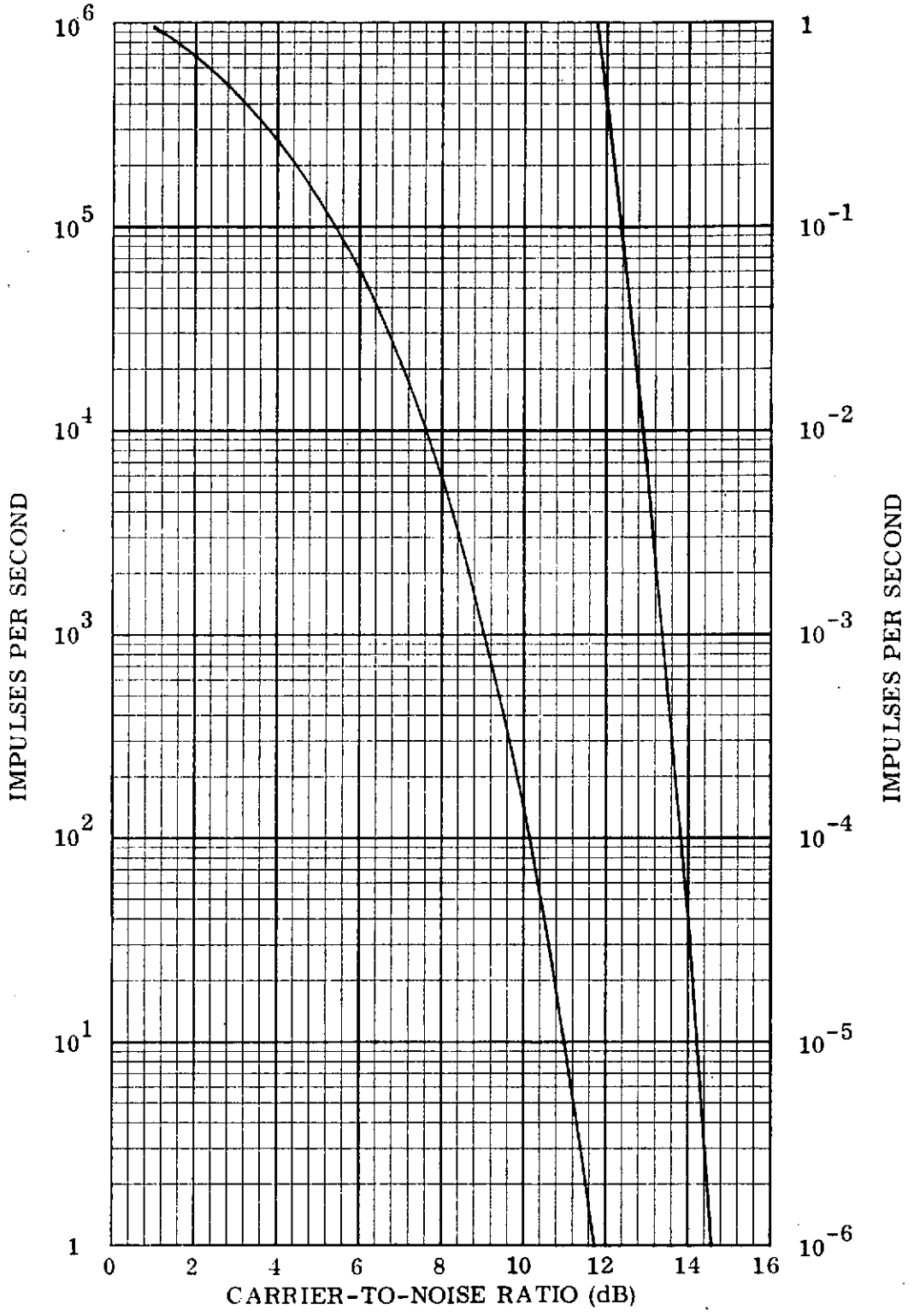


Figure 4-52. Positive (Negative) Impulse Rates Plotted as a Function of C/N for a Sinusoidal Distribution and a Peak Deviation of 10.0 MHz

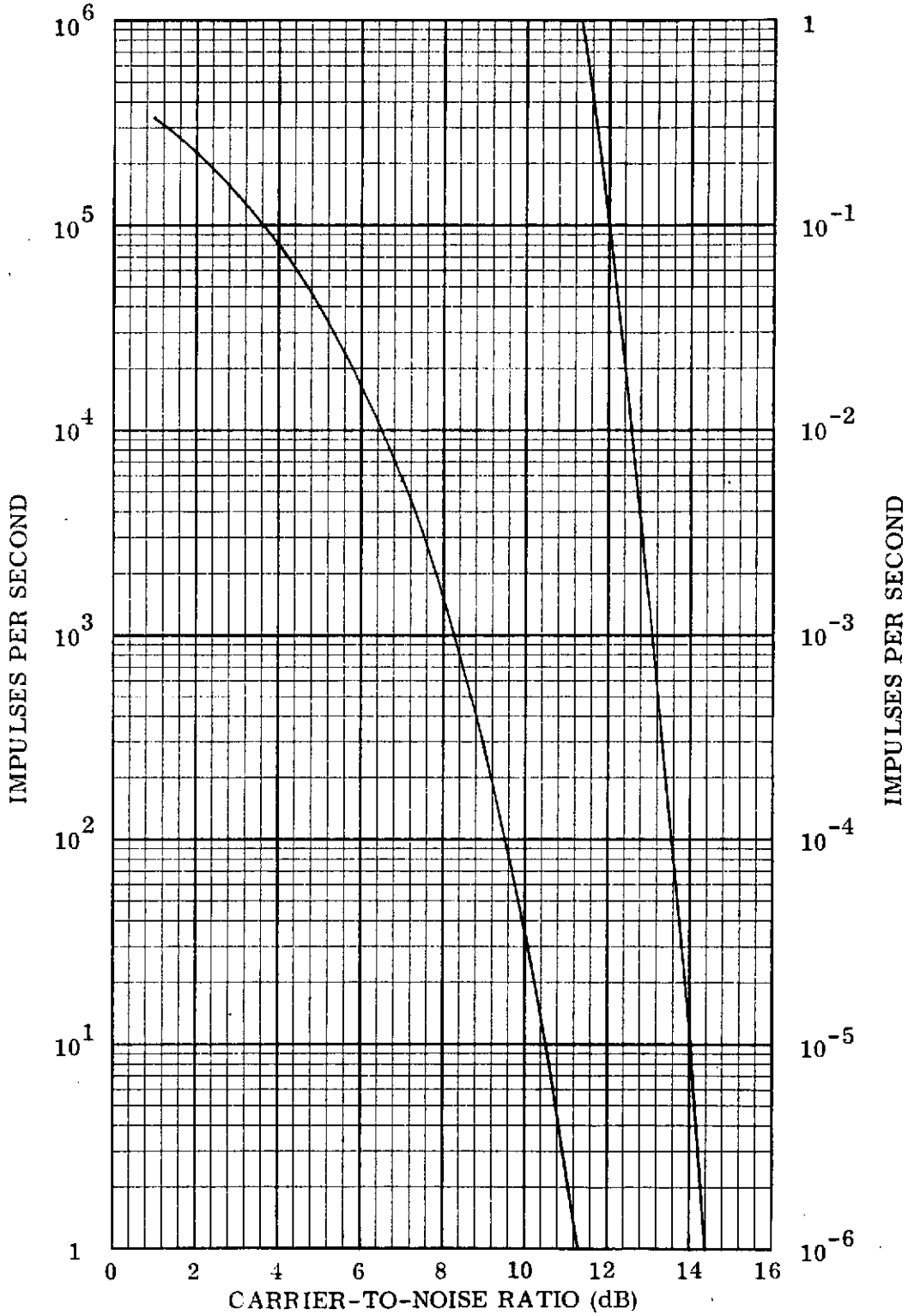


Figure 4-53. Positive (Negative) Impulse Rates Plotted as a Function of C/N for a Gaussian Distribution and a Peak Deviation of 5.4 MHz

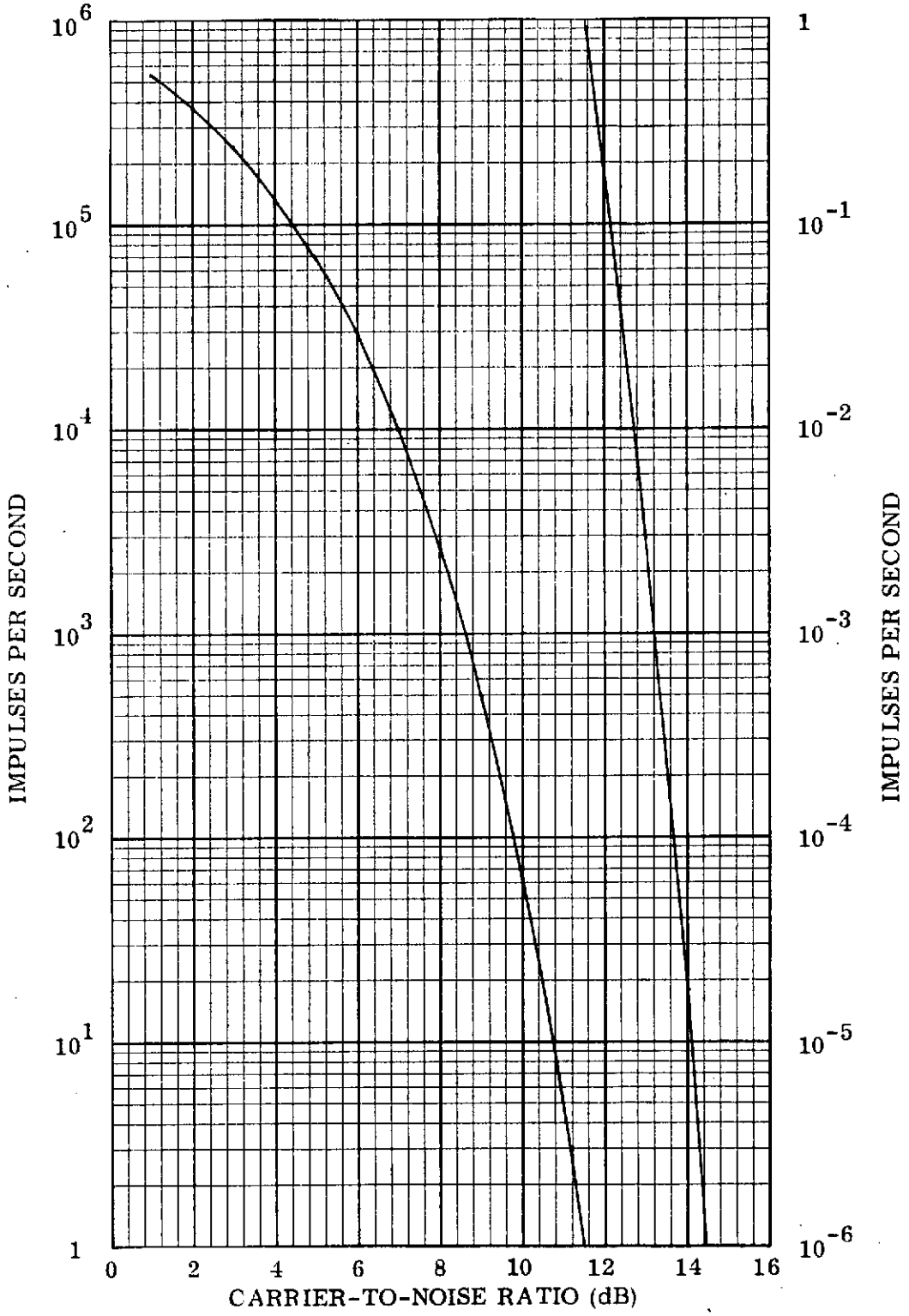
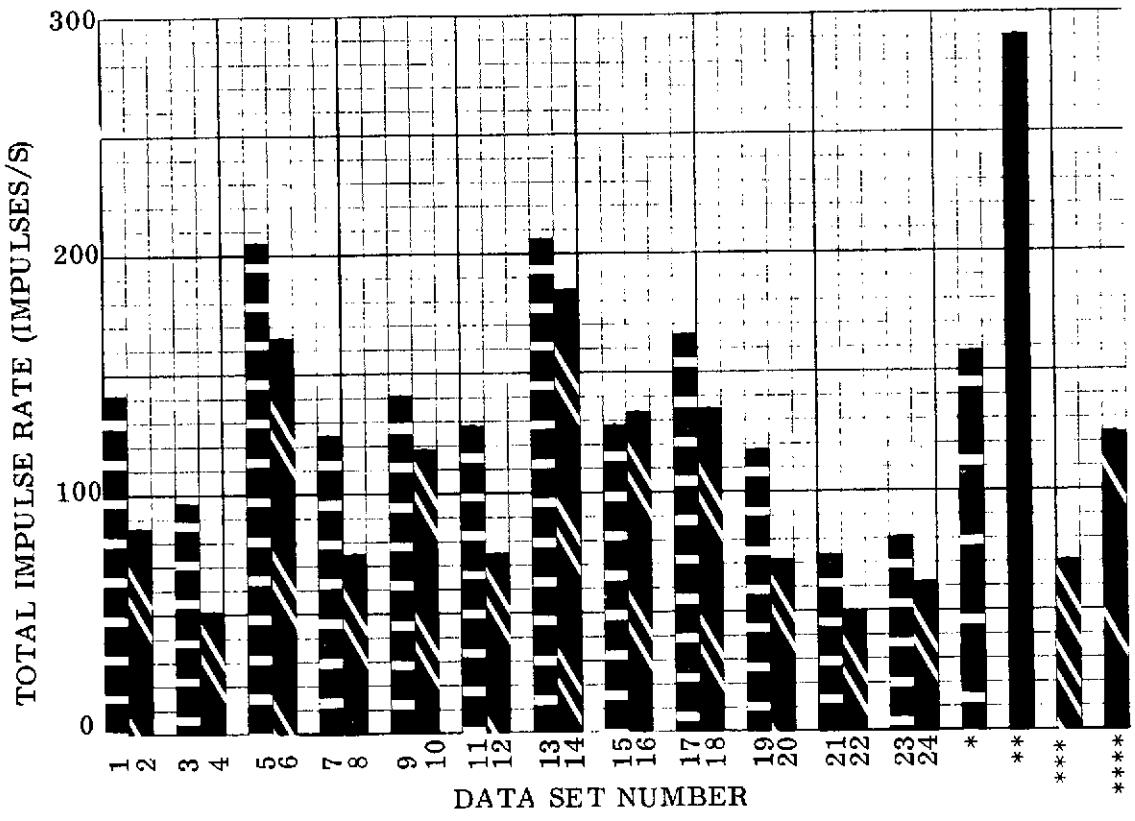


Figure 4-54. Positive (Negative) Impulse Rates Plotted as a Function of C/N for a Gaussian Distribution and a Peak Deviation of 10.0 MHz



Odd-numbered data sets: flat
Even-numbered data sets: preemphasized
* Sinusoidal, D_p = 5.4 MHz
** Sinusoidal, D_p = 10.0 MHz
*** Gaussian, D_p = 5.4 MHz
**** Gaussian, D_p = 10.0 MHz

Figure 4-55. Impulse Rates for a Carrier-To-Noise Ratio of 10.0 dB

SECTION 5 - CONCLUSIONS

Several conclusions can be drawn from this study of the FM threshold. They are:

1. The balance of the FM spectrum around the center frequency of a symmetrical predetection filter affects the balance of positive and negative impulse rates. A balanced spectrum provides balanced impulse rates; whereas, an unbalanced spectrum may not. A spectrum having an expected frequency above the center frequency produces a higher negative impulse rate than positive. On the other hand, a spectrum having an expected frequency below the center frequency produces a higher positive rate than negative.

2. The impulse rates are higher for FM spectra having larger moments about the center frequency. For example, the spectrum of a sinusoidal modulating signal has most of its area away from its axis of symmetry, while the Gaussian has its area concentrated on its axis of symmetry. Thus, the sinusoidal modulating signal produces higher impulse rates than the Gaussian.

3. Sinusoidal modulation produces a total impulse rate (positive plus negative) which is a practical upper bound for the impulse rates of television signals providing the same peak deviation. Figure 4-55 shows that sinusoidal modulation at the highest peak deviation, namely 10.0 MHz, produces the highest total impulse rate of all the other cases considered.

4. It appears that the total impulse rate for television signals generally decreases with the inclusion of preemphasis. There was only one exception to this in the twelve pairs of cases examined in this study. Figure 4-55 shows this anomaly for data sets 15 and 16.

REFERENCES

1. Rice, S.O. (M. Rosenblatt, ed.): "Noise in FM Receivers," Proceedings of the Symposium on Time Series Analysis. John Wiley & Sons, Inc., 1962, pp. 395-422.

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APPENDIX A - PREDETECTION FILTER CALCULATIONS

A.1 INTRODUCTION

The radius of gyration is calculated for symmetric bandpass filters of the following types:

Butterworth (1, 2, 3, and 4 pole)

Chebyshev (1 and 2 pole)

Gaussian

Rectangular

These filters are assumed to have the same frequency response H(f) as the low pass equivalent except for a translation in frequency from zero to f_o.

The radius of gyration is defined by Equation (A-1) as follows:

$$r = \sqrt{\frac{I}{b}} \tag{A-1}$$

where

$$I = \int_{-\infty}^{\infty} (f - f_o)^2 \left| H(f) \right|^2 \, df \tag{A-2}$$

is the moment of inertia of $\left| H(f) \right|^2$ about the f = 0 axis and

$$b = \int_{-\infty}^{\infty} \left| H(f) \right|^2 \, df \tag{A-3}$$

is the noise bandwidth of the filter. Frequency is represented by f and H(f) is the frequency response of the filter. A summary of the results of the calculations herein are shown in Table A-1.

Table A-1. Noise Bandwidth, Moment of Inertia, and Radius of Gyration for Various Filter Types

Filter Type	Noise Bandwidth	Moment of Inertia	Radius of Gyration
Butterworth (1)	$\frac{\pi}{2}B$	∞	∞
Butterworth (2)	$\frac{\pi}{2\sqrt{2}}B$	$\frac{\pi}{2}B^3$	$2^{1/4}B$
Butterworth (3)	$\frac{\pi}{3}B$	$\frac{\pi}{24}B^3$	$\frac{1}{2\sqrt{2}}B$
Butterworth (4)	$\frac{\pi}{8}\left[\sqrt{2+\sqrt{2}}+\sqrt{2-\sqrt{2}}\right]B$	$\frac{\pi}{32}\left[\sqrt{2+\sqrt{2}}-\sqrt{2-\sqrt{2}}\right]B^3$	$\frac{\sqrt{\sqrt{2}-1}}{2}B$
Chebyshev (1)	$\frac{\pi}{2\epsilon}B_\epsilon$	∞	∞
	$\frac{\pi}{2}B$	∞	∞
Chebyshev (2)	$\frac{\pi}{4}\sqrt{\frac{1}{\epsilon\sqrt{1+\epsilon^2}}+\frac{1}{1+\epsilon^2}}B_\epsilon$	$\frac{\pi}{32\epsilon^2}\sqrt{\epsilon\sqrt{1+\epsilon^2}+\epsilon^2}B_\epsilon^3$	$\frac{(1+\epsilon^2)^{1/4}}{2\sqrt{2\epsilon}}B_\epsilon$
	$\frac{\pi}{4}\sqrt{\left(\frac{2}{1+\epsilon}\right)\left(\frac{1}{\sqrt{1+\epsilon^2}}+\frac{1}{1+\epsilon^2}\right)}B$	$\frac{\pi}{4}\sqrt{\left(\frac{2}{1+\epsilon}\right)\left(\frac{1}{\sqrt{1+\epsilon^2}}+\frac{1}{1+\epsilon^2}\right)}B^3$	$\frac{(1+\epsilon^2)^{1/4}}{2\sqrt{\epsilon(1+\epsilon)}}B$
Gaussian	$\frac{1}{2}\sqrt{\frac{\pi}{\ln 2}}B$	$\frac{\sqrt{\pi}}{16(\ln 2)^{3/2}}B^3$	$\frac{1}{2\sqrt{2\ln 2}}B$
Rectangular	B	$\frac{1}{12}B^3$	$\frac{1}{\sqrt{12}}B$

A.2 BUTTERWORTH FILTERS

The Butterworth filter is assumed to have a frequency response defined by

$$\left|H(f)\right|^2 = \frac{1}{1 + \left(\frac{f - f_o}{B/2}\right)^{2n}} \tag{A-4}$$

where f represents frequency

B is the half-power bandwidth

n is the number of poles associated with the filter.

The moment of inertia is calculated by

$$I = \int_{-\infty}^{\infty} \frac{(f - f_o)^2}{1 + \left(\frac{f - f_o}{B/2}\right)^{2n}} df \tag{A-5}$$

which can be simplified by a change of variable to

$$I = \frac{B^3}{8} \int_{-\infty}^{\infty} \frac{x^2 \, dx}{1 + x^{2n}} \tag{A-6}$$

Because the integrand is an even function, it can be simplified further to

$$I = \frac{B^3}{4} \int_{0}^{\infty} \frac{x^2 \, dx}{1 + x^{2n}} \tag{A-7}$$

The noise bandwidth for the Butterworth filter becomes

$$b = \int_{-\infty}^{\infty} \frac{df}{1 + \left(\frac{f - f_o}{B/2}\right)^{2n}} \tag{A-8}$$

which can be simplified to

$$d = B \int_{0}^{\infty} \frac{dx}{1 + x^{2n}} \tag{A-9}$$

Thus, the radius of gyration can be found by first evaluating Equations (A-7) and (A-9) for I and b and then substituting into Equation (A-1) for r.

A.2.1 Single-Pole Filter

First, the noise bandwidth is found to be

$$b = B\int_0^{\infty} \frac{dx}{1+x^2} = \frac{\pi}{2} B \tag{A-10}$$

but the moment of inertia

$$I = \frac{B^3}{4} \int_0^{\infty} \frac{x^2\, dx}{1+x^2} = \infty \tag{A-11}$$

is not defined. Thus, the radius of gyration is also undefined.

A.2.2 Double-Pole Filter

The noise bandwidth of the two-pole filter is

$$b = B\int_0^{\infty} \frac{dx}{1+x^4} = \frac{\pi\ B}{2\sqrt{2}} \tag{A-12}$$

and the moment of inertia is

$$I = \frac{B^3}{4} \int_0^{\infty} \frac{x^2\, dx}{1+x^4} = \frac{\pi}{2} B^3 \tag{A-13}$$

Thus, the radius of gyration is found to be

$$r = 2^{1/4} B \tag{A-14}$$

A.2.3 Triple-Pole Filter

The noise bandwidth is

$$b = B \int_0^\infty \frac{dx}{1 + x^6} = \frac{\pi B}{3} \tag{A-15}$$

and the moment of inertia is

$$I = \frac{B^3}{4} \int_0^\infty \frac{x^2\, dx}{1 + x^6} = \frac{\pi}{24} B^3 \tag{A-16}$$

Substitution of b and I into Equation (A-1) yields a radius of gyration of

$$r = \frac{B}{2\sqrt{2}} \tag{A-17}$$

A.2.4 Quadruple-Pole Filter

The noise bandwidth is given by

$$b = B \int_0^\infty \frac{dx}{1 + x^8} = \frac{\pi}{8} \left[\sqrt{2 + \sqrt{2}} + \sqrt{2 - \sqrt{2}} \right] B \tag{A-18}$$

and the moment of inertia is

$$I = \frac{B^3}{4} \int_0^\infty \frac{x^2\, dx}{1 + x^8} = \frac{\pi}{32} \left[\sqrt{2 + \sqrt{2}} - \sqrt{2 - \sqrt{2}} \right] B^3 \tag{A-19}$$

Thus, the radius of gyration is

$$r = \frac{\sqrt{\sqrt{2} - 1}}{2} B \tag{A-20}$$

by substitution of I and b into Equation (A-1).

A.3 CHEBYSHEV FILTERS

The Chebyshev filter is assumed to have a frequency response defined by

$$\left|H(f)\right|^2 = \frac{1}{1 + \epsilon^2 T_n^2 \left(\frac{f - f_0}{B_\epsilon/2}\right)} \tag{A-21}$$

where ϵ is the ripple factor

f represents frequency

B_ϵ is the ripple bandwidth

n is the number of poles associated with the filter

T_n is a Chebyshev polynomial of order n.

For n = 1 and 2 the Chebyshev polynomials are

$$T_1(x) = x \tag{A-22}$$

$$T_2(x) = 2x^2 - 1 \tag{A-23}$$

For Chebyshev filters with more than two poles, it is better to use the computer in calculating the radius of gyration, because the expressions required in the calculations are very complicated.

The noise bandwidth of Chebyshev filters is given by

$$b = \int_{-\infty}^{\infty} \frac{df}{1 + \epsilon^2 T_n^2 \left(\frac{f - f_0}{B_\epsilon/2}\right)} \tag{A-24}$$

which can be simplified by a change of variable and use of the symmetry of the integrand. The simplified form becomes

$$b = B_\epsilon \int_0^{\infty} \frac{dx}{1 + \epsilon^2 T_n^2(x)} \tag{A-25}$$

Similarly, the moment of inertia can be simplified from

$$I = \int_{-\infty}^{\infty} \frac{(f - fo)^2 \, df}{1 + \epsilon^2 T_n^2 \left(\frac{f - f_o}{B_\epsilon / 2} \right)} \tag{A-26}$$

to

$$I = \frac{B_\epsilon^3}{4} \int_0^{\infty} \frac{x^2 \, dx}{1 + \epsilon^2 T_n^2(x)} \tag{A-27}$$

A.3.1 Single Pole Chebyshev Filter

The noise bandwidth is found by substituting the expression for $T_1(x)$, given in Equation (A-22), into Equation (A-25). Thus the noise bandwidth becomes

$$b = B_\epsilon \int_0^{\infty} \frac{dx}{1 + \epsilon^2 x^2} \tag{A-28}$$

By a change of variable, the noise bandwidth can be simplified further and evaluated as follows:

$$b = \frac{B_\epsilon}{\epsilon} \int_0^{\infty} \frac{dx}{1 + x^2} = \frac{\pi}{2\epsilon} B_\epsilon \tag{A-29}$$

Written in terms of the half-power bandwidth B, the noise bandwidth becomes

$$b = \frac{\pi}{2} B \tag{A-30}$$

The moment of inertia, I, is now found by evaluating the expression in Equation (A-27) with $T_1(x)$. Then

$$I = \frac{B_\epsilon^3}{4} \int_0^{\infty} \frac{x^2 \, dx}{1 + \epsilon^2 x^2} = \infty \tag{A-31}$$

which does not converge. Therefore, the radius of gyration is also undefined.

A.3.2 Double-Pole Chebyshev Filter

The noise bandwidth is found by substituting the expression for $T_2(x)$ given in Equation (A-23) into Equation (A-25). Thus, the noise bandwidth is

$$b = B_\epsilon \int_0^\infty \frac{dx}{1 + \epsilon^2 [2x^2 - 1]^2} \tag{A-32}$$

which can be evaluated by residue theory to yield

$$b = \frac{\pi}{4} \sqrt{\frac{1}{\epsilon \sqrt{1 + \epsilon^2}} + \frac{1}{1 + \epsilon^2}} \; B_\epsilon \tag{A-33}$$

Since the ripple bandwidth B_E can be written in terms of the half-power bandwidth as

$$B_\epsilon = \sqrt{\frac{2\epsilon}{1 + \epsilon}} B \tag{A-34}$$

this expression for B_ϵ can be substituted into Equation (A-33) to express the noise bandwidth as

$$b = \frac{\pi}{4} \sqrt{\left(\frac{2}{1 + \epsilon}\right)\left(\frac{1}{\sqrt{1 + \epsilon^2}} + \frac{1}{1 + \epsilon^2}\right)} \; B \tag{A-35}$$

in terms of the half-power bandwidth.

The moment of inertia can be found by using Equations (A-23) and (A-27) as follows:

$$I = \frac{B_\epsilon^3}{4} \int_0^\infty \frac{x^2 \, dx}{1 + \epsilon^2 [2x^2 - 1]^2} \tag{A-36}$$

This can be evaluated by the use of residue theory to yield the following result

$$I = \frac{\pi}{32\epsilon^2} \sqrt{\epsilon \sqrt{1 + \epsilon^2} + \epsilon^2} \; B_\epsilon^3 \tag{A-37}$$

By use of Equation (A-34) again, Equation (A-37) can be rewritten in terms of the half-power bandwidth as

$$I = \frac{\pi}{4}\sqrt{\left(\frac{2}{1+\epsilon}\right)\left(\frac{1}{\sqrt{1+\epsilon^2}} + \frac{1}{1+\epsilon^2}\right)}\, B^3 \qquad \text{(A-38)}$$

The expressions for the noise bandwidth and the moment of inertia given in Equations (A-33) and (A-37) can be substituted into Equation (A-1) to find the radius of gyration which is

$$r = \frac{(1+\epsilon^2)^{1/4}}{2\sqrt{2\epsilon}} B_\epsilon \qquad \text{(A-39)}$$

in terms of the ripple factor and the ripple bandwidth. This can also be written as

$$r = \frac{(1+\epsilon^2)^{1/4}}{2\sqrt{\epsilon\,(1+\epsilon)}}\, B \qquad \text{(A-40)}$$

in terms of the ripple factor and the half-power bandwidth.

A.4 GAUSSIAN FILTER

The Gaussian filter has a frequency response defined by

$$\left|H(f)\right| = \exp\left[-\left(\frac{f - f_o}{B/2}\right)^2 \ln\sqrt{2}\right] \qquad \text{(A-41)}$$

where B is the half-power bandwidth. According to Equation (A-3), the noise bandwidth can be calculated by evaluation of

$$b = \int_{-\infty}^{\infty} \exp\left[-\left(\frac{f - f_o}{B/2}\right)^2 \ln 2\right] df \qquad \text{(A-42)}$$

By a change of variables in Equation (A-42), b can be evaluated as follows:

$$b = \frac{1}{2}\sqrt{\frac{\pi}{\ln 2}}\, B \qquad \text{(A-43)}$$

The moment of inertia can be calculated in accordance with Equation (A-2) as shown below.

$$I = \int_{-\infty}^{\infty} (f - f_0)^2 \quad \exp \left[- \left(\frac{f - f_0}{B/2} \right)^2 \quad \ln 2 \right] df \tag{A-44}$$

This can be evaluated readily by a change in variables with the result,

$$I = \frac{\sqrt{\pi}}{16 (\ln 2)^{3/2}} \quad B^3 \tag{A-45}$$

Finally, the radius of gyration is evaluated by Equation (A-1) as

$$r = \frac{B}{2\sqrt{2 \ln 2}} \tag{A-46}$$

A.5 RECTANGULAR FILTER

The simplest of the calculations is for the rectangular filter. The noise bandwidth is identical with the half-power bandwidth, since the response is flat in the pass band. Thus,

$$b = B \tag{A-47}$$

The moment of inertia is expressed in accordance with Equation (A-2) as

$$I = \int_{-\infty}^{\infty} (f - f_0)^2 \quad \text{rect} \left(\frac{f - f_0}{B} \right) \quad df \tag{A-48}$$

which is equivalent to

$$I = \int_{-\frac{B}{2}}^{\frac{B}{2}} x^2 \, dx \tag{A-49}$$

This is readily evaluated as

$$I = \frac{B^3}{12} \tag{A-50}$$

Thus, the radius of gyration is calculated by substituting b and I into Equation (A-1). The result is

$$r = \frac{B}{\sqrt{12}} \tag{A-51}$$

A.6 SUMMARY OF RESULTS

The results of calculations in the previous paragraphs are summarized in Table A-1. The noise bandwidths, moments of inertia, and radii of gyration are presented. It is interesting to note upon evaluation of the Butterworth parameters that they approach those of the ideal rectangular filter as the number of poles increases. This is not surprising when one realizes that the rectangular frequency response is the limiting case of the Butterworth filter response as the number of poles increases without bound.

APPENDIX B - COMPUTER PROGRAM LISTING

```
DEFINE ERFC(X)=(1.+.0705230784*X+.042282O123*X**2%
+.0092705272*X**3+.0001520143*X**4+.0002765672*X**5%
+.0000430638*X**6)**(-16)
DEFINE ERF(X)=1.-(1.+.0705230784*X+.042282O123*X**2%
+.0092705272*X**3+.0001520143*X**4+.0002765672*X**5%
+.0000430638*X**6)**(-16)
DIMENSION NHPDAT(1024),HPDAT(1024),PROB(1024)
% IF DPNUM1 & DPNUM2 ARE SET TO ZERO IN FILE 17, THEN
% THEY WILL BE CALCULATED
READ (17,*)AMODX,PCPROB,FMODMX,CONDB1,CONDB2,CONDBI,%
DPNUM1,DPNUM2
PRINT *,' '
PRINT *,' '
PRINT*,'DATA SET:'
PRINT *,'MODULATION INDEX:',AMODX
PRINT *,'PERCENT PROB OF EXCEEDING PEAK DEVIATION:',PCPROB
PRINT *,'MAX MODULATING FREQ (HZ):',FMODMX
NOINC=.5E4
DP=AMODX*FMODMX
PRINT *,'PEAK DEVIATION (HZ):',DP
PRINT *,'NO OF INTEGRATION INCREMENTS:',NOINC
% CALCULATE PDF FROM NHPDAT
READ (19,*)NHPDAT
% FIND FIRST NONZERO DATA SUBSCRIPT N1
DO 5100 I=1,1024
IF(NHPDAT(I) .EQ. 0) GO TO 5100
N1=I
GO TO 5150
5100 CONTINUE
% FIND LAST NONZERO DATA SUBSCRIPT N2
5150 DO 5200 I=1,1024
J=1025-I
IF(NHPDAT(J) .EQ. 0) GO TO 5200
N2=J
GO TO 5250
5200 CONTINUE
5250 SUMNUM=0.
SUMDEN=0.
DO 5300 I=1,1024
HPDAT(I)=FLOAT(NHPDAT(I))
SUMNUM=SUMNUM+HPDAT(I)*I
SUMDEN=SUMDEN+HPDAT(I)
5300 CONTINUE
AMEAN=SUMNUM/SUMDEN
DO 5500 I=1,1024
PROB(I)=HPDAT(I)/SUMDEN
5500 CONTINUE
```

```
IF(DPNUM1 .NE. 0. .AND. DPNUM2 .NE. 0.) GO TO 6000
%FIND LOW NUMBER CORRESPONDING TO DP
PTAIL=PCPROB/200.
I=N1
PRBSUM=PROB(I)/2.
IF (PRBSUM .GE. PTAIL) GO TO 5750
5625 I=I+1
DPRSUM=(PROB(I-1)+PROB(I))/2.
PRBSUM=PRBSUM+DPRSUM
IF (PRBSUM .LT. PTAIL) GO TO 5625
ATEMP=PROB(I)-PROB(I-1)
CTEMP=-2.*(PTAIL-PRBSUM+DPRSUM)
IF(NHPDAT(I) .EQ. NHPDAT(I-1)) GO TO 5700
BTEMP=2.*PROB(I-1)
RTDISC=SQRT(BTEMP**2-4.*ATEMP*CTEMP)
XTEMP=(-BTEMP+RTDISC)/2./ATEMP
IF (XTEMP .GT. 0. .AND. XTEMP .LT. 1.0) GO TO 5650
XTEMP=(-BTEMP-RTDISC)/2./ATEMP
5650 DPNUM1=XTEMP-1.+I
GO TO 5800
5700 DPNUM1=-CTEMP/PROB(I)/2.+I-1.
GO TO 5800
5750 DPNUM1=SQRT(2.*PTAIL/PROB(I))-1.+I
%FIND UPPER NUMBER CORRESPONDING TO DP
5800 I=N2
PRBSUM=PROB(I)/2.
IF(PRBSUM .GE. PTAIL) GO TO 5950
5825 I=I-1
DPRSUM=(PROB(I)+PROB(I+1))/2.
PRBSUM=PRBSUM+DPRSUM
IF (PRBSUM .LT. PTAIL) GO TO 5825
ATEMP=PROB(I)-PROB(I+1)
CTEMP=-2.*(PTAIL-PRBSUM+DPRSUM)
IF(NHPDAT(I) .EQ. NHPDAT(I+1)) GO TO 5900
BTEMP=2.*PROB(I+1)
RTDISC=SQRT(BTEMP**2-4.*ATEMP*CTEMP)
XTEMP=(-BTEMP+RTDISC)/2./ATEMP
IF(XTEMP .GT. 0. .AND. XTEMP .LT. 1.0) GO TO 5850
XTEMP=(-BTEMP-RTDISC)/2./ATEMP
5850 DPNUM2=-XTEMP+I+1
GO TO 6000
5900 DPNUM2=CTEMP/PROB(I+1)/2.+I+1
GO TO 6000
5950 DPNUM2=-SQRT(2.*PTAIL/PROB(I))+1.+I
6000 CTRNUM=(DPNUM1+DPNUM2)/2.
DPNUM=DPNUM2-CTRNUM
DELTAN=FLOAT(N2-N1+2)/FLOAT(NOINC)
PRINT *,'FIRST NONZERO SUBSCRIPT:',N1
PRINT *,'LAST NONZERO SUBSCRIPT:',N2
PRINT *,'MEAN SUBSCRIPT:',AMEAN
```

```
PRINT *,'SUBSCRIPTS CORRESPONDING TO PEAK DEV:',DPNUM1,DPNUM2
PRINT *,'CENTER SUBSCRIPT:',CTRNUM
PRINT*,'****************'
PRINT *,' '
FOVN=DP/DPNUM
100 READ (18,*,END=9000)NFTYP,BANDW
PRINT *,' '
GO TO (1000,2000,3000,4000), NFTYP
*CALCULATE RADIUS OF GYRATION THEN 6010
% BUTTERWORTH
1000 READ (18,*) NPOLES
PRINT *,'BUTTERWORTH FILTER - NO OF POLES:',NPOLES
GO TO (1010,1020,1030,1040), NPOLES
1010 WRITE(6,1015)
1015 FORMAT(3X,'BUTTERWORTH NOT VALID FOR ONE POLE')
GO TO 100
% 2 POLE BUTTER
1020 RADGYR=1.18921*BANDW
GO TO 6010
% 3 POLE BUTTER
1030 RADGYR=.353553*BANDW
GO TO 6010
* 4 POLE BUTTER
1040 RADGYR=.321797*BANDW
GO TO 6010
% CHEBYSHEV
2000 READ (18,*) NPOLES,RIPLDB
PRINT *,'CHEBY FILTER WITH ',NPOLES,' POLES AND ',RIPLDB,' DB RIPPLE'
EPSLON=SQRT(10**(RIPLDB/10.)-1.)
GO TO (2100,2200,2300,2400), NPOLES
2100 PRINT *,'CHEBYSHEV NOT VALID FOR ONE POLE'
2110 FORMAT(3X,'CHEBYSHEV NOT VALID FOR ONE POLE')
GO TO 100
% 2 POLE CHEBY RADGYR
2200 RADGYR=SQRT(SQRT(1.+EPSLON**2)/EPSLON/(1.+EPSLON))*
*BANDW/2.0
GO TO 6010
% 3 POLE CHEBY RADGYR
*USE RESIDUES TO CALCULATE RADGYR
2300 E1=1.0/EPSLON
E2=E1*E1
E3=SQRT(E2+1.0)
E4=(E3+E1)**(1.0/3.0)
B=(E4-1.0/E4)/2.0
A=(E4+1.0/E4)/2.0
C=B/A
R3=A*A*(3.0+C*C)/8.0
X1=1.0
10 T=4.0*X1**3-3.0*X1-(1.0/EPSLON)
```

```
DT=12.0*X1**2-3.0
X2=X1-(T/DT)
X3=ABS(X1-X2)
IF (X3 .LT. 0.0001) GOTO 20
X1=X2
GOTO 10
20 W=X1
BEP=BANDW/W
RADGYR=(BEP/2.0)*SQRT(R3)
GO TO 6010
% 4 POLE CHEBY RADGYR
%USE RESIDUES TO CALCULATE RADGYR
2400 E1=1.0/EPSLON
E2=E1*E1
E3=SQRT(E2+1.0)
E5=(E3+E1)**0.25
B=(E5-1.0/E5)/2.0
A=(E5+1.0/E5)/2.0
C=B/A
C1=0.92388
S1=0.382683
Q=C1*C1-S1*S1
Q1=1.0+(1.0+4.0*S1*S1/Q)*C*C
Q2=1.0+(1.0-4.0*C1*C1/Q)*C*C
Q3=1.0+(1.0-4.0*S1*S1/Q)*C*C
Q4=1.0+(1.0+4.0*C1*C1/Q)*C*C
Q5=1.0+S1*S1*C*C/C1/C1
Q6=1.0+C1*C1*C*C/S1/S1
P1=A*A*(C1*Q1+S1*Q2)*Q5*Q6*S1*C1
P2=S1*Q6*Q3+C1*Q5*Q4
R4=P1/P2
W=SQRT(SQRT(2.0+2.0/EPSLON)+2.0)/2.0
BEP=BANDW/W
RADGYR=(BEP/2.0)*SQRT(R4)
GO TO 6010
* GAUSSIAN RADGYR
3000 RADGYR =.424661*BANDW
PRINT *,'GAUSSIAN FILTER'
GO TO 6010
% RECT RADGYR
4000 RADGYR=.288675*BANDW
PRINT *,'RECTANGULAR FILTER'
6010 FOVNR=FOVN/RADGYR
PRINT *,'RF BANDWIDTH (HZ):',BANDW
PRINT *,'RADIUS OF GYRATION (HZ):',RADGYR
CONDB=CONDB1-CONDBI
PRINT *,' '
PRINT *,'CONDB    CLICKP          CLICKN'
PRINT *,' '
```

```
6025 CONDB=CONDB+CONDBI
IF(CONDB .GT. CONDB2) GO TO 100
COVRN=10.**(CONDB/10.)
SUMP=0.
SUMN=0.
ANUM=N1-1
DO 6050 I=1,NOINC
ANUM=ANUM+DELTAN
U=(ANUM-CTRNUM)*FOVNR
ABU=ABS(U)
USQ=U*U
ARGRFC=SQRT(COVRN+COVRN*USQ)
IF(ARGRFC .GT. 6.0) GO TO 6030
VALRFC=ERFC(ARGRFC)
GO TO 6035
6030 VALRFC=0.0
6035 H1U=SQRT(1+USQ)*VALRFC
UEMR=U/EXP(COVRN)
ARGERF=ABU*SQRT(COVRN)
IF(ARGERF .GT. 6.0) GO TO 6040
VALERF=ERF(ARGERF)
GO TO 6045
6040 VALERF=1.0
6045 ERRORF=U/ABU*VALERF
PANUM=PROB(INT(ANUM))+(PROB(INT(ANUM+1.))-PROB(INT(ANUM)))%
*(ANUM-AINT(ANUM))
SUMP=SUMP+PANUM*(H1U-UEMR*(1.-ERRORF))
SUMN=SUMN+PANUM*(H1U+UEMR*(1.+ERRORF))
6050 CONTINUE
CLICKP=DELTAN*SUMP*RADGYR/2.
CLICKN=DELTAN*SUMN*RADGYR/2.
WRITE(6,7000)CONDB,CLICKP,CLICKN
7000 FORMAT(1X,F4.1,E14.7,E14.7)
GO TO 6025
9000 PRINT *,' '
PRINT *,' '
PRINT *,'DATA USED FOR RESULTS ABOVE'
PRINT *,' '
PRINT *,NHPDAT
CALL EXIT
END
```

APPENDIX C - GLOSSARY OF COMPUTER PROGRAM VARIABLES

A	A variable used to represent different expressions in calculating the radius of gyration for three- and four-pole Chebyshev predetection filters.
ABU	Absolute value of U.
AMEAN	The expected value of the data subscripts.
AMODX	The modulation index specified in file 17.
ANUM	The variable of integration to find the FM threshold impulse rates.
ARGERF	An argument of the error function used in computing the FM threshold impulse rates.
ARGRFC	An argument of the complement of the error function used in computing the FM threshold impulse rates.
ATEMP	A temporary value of differences in probabilities.
B	A variable used to represent different expressions in calculating the radius of gyration for three- and four-pole Chebyshev predetection filters.
BANDW	Half-power bandwidth of the RF predetection filter.
BEP	The ripple bandwidth of the Chebyshev predetection filter.
BTEMP	A temporary value of two times one of the elements in the probability vector.
C	A variable defined by the quotient of B divided by A in calculating the radius of gyration for three- and four-pole Chebyshev predetection filters.
CLICKN	The negative FM threshold impulse rate.
CLICKP	The positive FM threshold impulse rate.
CONDB	Carrier-to-noise ratio in dB.
CONDBI	The incremental dB carrier-to-noise ratio for which FM threshold impulse rates are calculated. It is specified in file 17.
CONDB1	The first dB value of carrier-to-noise ratio for which FM threshold impulse rates are calculated. It is specified in file 17.
CONDB2	The last dB value of carrier-to-noise ratio for which FM threshold impulse rates are calculated. It is specified in file 17.
COVRN	A temporary value used in calculating the data subscripts corresponding to the peak deviations.
CTRNUM	The data subscript midway between the subscripts corresponding to the peak deviations.

C1	A real constant used in calculating the radius of gyration for the four-pole Chebyshev predetection filter.
DP	The peak deviation in Hz.
DPNUM	The data subscript deviation corresponding to the peak frequency deviation.
DPNUM1	The data subscript corresponding to the peak frequency deviation on the low side of the carrier.
DPNUM2	The data subscript corresponding to the peak deviation on the high side of the carrier.
DPRSUM	An incremental probability used in calculating the data subscripts corresponding to the peak deviations.
DT	The derivative of the variable T, which represents the polynomial whose roots are to be determined by the Newton-Rapson method, in calculating the radius of gyration for the three-pole Chebyshev predetection filter.
EPSLON	The numerical ripple factor used in Chebyshev filter analysis.
ERRORF	A value of the error function used in calculating the FM threshold impulse rates.
E1	The reciprocal of the ripple factor for Chebyshev filters.
E2	The square of E1.
E3	A special expression involving the Chebyshev ripple factor.
E4	A special expression involving E1 and used to simplify mathematical expressions for calculating the radius of gyration of the three-pole Chebyshev filter.
E5	A special expression involving E1 and used to simplify mathematical expressions for calculating the radius of gyration of the four-pole Chebyshev filter.
FMODMX	The maximum modulating frequency specified in file 17.
FOVN	The ratio of frequency deviation to the corresponding subscript deviation.
FOVNR	The ratio of FOVN to the radius of gyration of the RF predetection filter.
HPDAT	A vector of order 1024 which is the floating form of the vector NHPDAT.
H1U	A value used in the integrand for calculating the threshold impulse rates.
I	An integer used as an index.
J	An integer used as an index.

NFTYP A number specified in file 18 designating the RF predetection filter type as follows:

1. Butterworth
2. Chebyshev
3. Gaussian
4. Rectangular

NHPDAT A vector of order 1024, the components of which make up the probability input data.

NOINC The number of increments to be used in integrating to determine the FM threshold impulse rates.

NPOLES The number of poles of the RF predetection filter specified in file 18.

N1 The subscript of the first nonzero element of the vector NHPDAT.

N2 The subscript of the last nonzero element of the vector NHPDAT.

PANUM The probability density associated with the continuous variable of integration.

PCPROB The percentage probability of the FM carrier deviation falling outside the range defined by the peak deviation. It is specified in file 17.

PRBSUM An accounting variable used to store the cumulative probability of integrating the tails of the probability density function.

PROB A vector of order 1024 which is the probability density function derived from the vector NHPDAT.

PTAIL The probability that the deviation of the FM carrier exceeds the peak deviation in one direction.

P1 The value of the expression in the numerator of the fraction for calculating R4, which is used in calculating the radius of gyration of the four-pole Chebyshev predetection filter.

P2 The value of the expression in the denominator of the fraction for calculating R4, which is used in calculating the radius of gyration of the four-pole Chebyshev predetection filter.

Q The value of an expression used in calculating the radius of gyration of the four-pole Chebyshev predetection filter.

Q1 The value of an expression used in calculating P1 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.

Q2 The value of an expression used in calculating P1 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.

Q3	The value of an expression used in calculating P2 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.
Q4	The value of an expression used in calculating P2 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.
Q5	The value of an expression used in calculating both P1 and P2 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.
Q6	The value of an expression used in calculating both P1 and P2 during calculation of the radius of gyration of the four-pole Chebyshev predetection filter.
RADGYR	The radius of gyration of the RF predetection filter.
RIPLDB	The dB value of the ripple specified in file 18 for the Chebyshev predetection filter.
RTDISC	The square root of the discriminant used in calculating the continuous subscript number corresponding to the peak deviation of the RF carrier.
R3	A variable used to calculate the radius of gyration of the three-pole Chebyshev predetection filter.
R4	A variable used to calculate the radius of gyration of the four-pole Chebyshev predetection filter.
SUMDEN	The sum of the components of the vector NHPDAT.
SUMN	A summation used in calculating the negative FM threhold impulse rate.
SUMNUM	A summation which is the first moment of the probability input data. It is used to calculate the expected value of the integral subscripts.
SUMP	A summation used in calculating the negative FM threshold impulse rate.
S1	A constant used in calculating the radius of gyration for the four-pole Chebyshev predetection filter.
T	The value of the polynomial in the denominator of the three-pole Chebyshev filter transfer function.
U	A variable of integration used in calculating FM threshold impulse rates. It is obtained by dividing frequency by the radius of gyration of the RF predetection filter.
UEMR	A factor used in the integrand for calculating the FM threshold impulse rates.
USQ	The square of U.
VALERF	A value of the error function used in the integrand for calculating the FM threshold impulse rates.

VALRFC	A value of the complement of the error function used in the integrand for calculating the FM threshold impulse rates.
W	The values of the roots of the polynomials in the denominator of the three-pole and four-pole Chebyshev filters.
XTEMP	A temporary value used in calculating the continuous subscripts corresponding to the peak deviation.
X1	A variable used to approximate the root of a polynomial by the Newton-Raphson method in order to calculate the radius of gyration of the three-pole Chebyshev predetection filter.
X2	The iterated value of the root of the polynomial in the denominator of the three-pole Chebyshev transfer function.
X3	The absolute value of the difference between X1 and X2, used in calculating the radius of gyration of the three-pole Chebyshev predetection filter.

APPENDIX D - PROBABILITY INPUT DATA

The probability data used in the computer program to calculate the threshold impulse rates for an FM transmission system are presented herein.

The data presented in Tables D-1 through D-24 are data measured by NASA at Goddard Space Flight Center. Each data set is a vector of order 1024. The first number in each line is a line number followed by ten components of the data vector in order from left to right, except for the last line which has only four components. Each component of a data vector represents a count of the number of samples in each of 1024 adjacent equal intervals of voltage of the modulating signal during the particular duration of measurement. The duration of measurement was not the same for all data sets. Each vector can be interpreted to represent some multiple of samples of the voltage probability density function of a particular modulating waveform. Thus, the data are referred to as probability data or probability density data.

Figures D-1 through D-24 are pictures of oscilloscope presentations of the data shown, respectively, in Tables D-1 through D-24. Thus, these figures represent the probability density functions of the modulating waveforms, and are approximations to the FM spectrum.

Tables D-25 and D-26 show simulated probability data for sinusoidal and Gaussian modulating signals. These computer-generated data vectors are presented in a slightly different format without line numbers.

Figures D-25 and D-26 show, respectively, sketches of the sinusoidal and Gaussian probability density functions corresponding to Tables D-25 and D-26.

Table D-1. Probability Data Set 01

1	0	0	0	0	0	0	0	0	4	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	0	0	0	0	0	0
30	0	0	11	0	0	0	0	0	0	0
40	3	0	0	0	0	0	0	0	2	0
50	0	0	0	0	0	0	1	0	0	0
60	0	0	0	0	1	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	2	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	2	0	0	1	4	22
110	33	77	185	332	637	973	1369	1907	2377	2847
120	3272	3500	3494	3643	3499	3578	3836	4191	5020	6386
130	8616	12277	16819	23071	30220	38254	46582	54778	61300	65453
140	67657	68257	68380	67841	67788	67723	68831	70172	71309	71282
150	69611	66266	60347	53229	45236	36871	28929	22444	17676	13981
160	11177	8992	7442	6127	5031	3774	2822	2091	1681	1325
170	1073	872	795	747	719	682	671	709	660	611
180	626	623	593	548	507	508	498	488	498	446
190	458	418	386	390	391	354	340	350	312	327
200	319	321	303	314	290	328	295	321	311	294
210	277	295	349	376	309	319	297	306	315	324
220	344	319	299	292	301	314	298	291	291	306
230	301	299	315	273	307	299	276	300	294	300
240	266	295	280	244	292	282	285	261	259	268
250	265	293	279	257	277	256	273	256	281	255
260	310	272	303	347	291	321	318	313	300	342
270	300	328	353	378	382	381	468	537	517	602
280	619	732	821	852	949	1156	1356	1719	2255	2947
290	3802	5264	6587	8266	9889	11989	13431	15119	16279	17981
300	18393	19423	20489	21811	24675	28924	36061	46471	60338	76769
310	96074	118049	139945	161086	178819	192080	199618	201031	195381	184023
320	167855	148157	124530	102112	81011	61223	45049	32264	22219	15760
330	11624	9157	7873	7291	7243	6901	6809	6655	6256	5648

Table D-1. Probability Data Set 01 (Cont'd)

340	5152	4511	3740	3060	2420	1848	1273	1043	721	552
350	418	334	323	254	297	285	247	278	245	270
360	305	300	268	327	278	338	285	292	362	368
370	383	424	459	439	511	465	563	567	645	650
380	699	708	768	817	886	935	965	1057	1104	1141
390	1231	1235	1282	1454	1429	1504	1622	1714	1677	1765
400	1917	1975	1978	2104	2205	2356	2399	2576	2624	2681
410	2778	3031	2974	3263	3306	3348	3531	3637	3839	3881
420	4016	4208	4261	4519	4838	4904	5162	5343	5353	5775
430	6010	6171	6653	6799	7135	7375	7680	8022	8534	8781
440	9387	9852	10298	11045	11758	12039	12905	13650	14286	14938
450	15754	16569	17563	18426	19012	20067	20799	21450	22108	23186
460	24051	24765	24948	25736	26335	26726	26932	27369	27360	27459
470	27825	28056	27760	27697	27828	27353	27232	27169	26801	26338
480	26013	25711	25282	25015	24162	24173	23418	22882	22763	22364
490	22132	21631	21318	20786	20659	20042	20151	19829	19728	19392
500	19295	19007	18805	19086	18856	18661	18693	18735	18600	18645
510	18660	18911	18857	18626	18678	18963	18645	18846	19032	19244
520	19363	19313	19653	19615	19914	20014	20278	20622	20694	20867
530	21182	21610	21889	22244	22187	22661	23172	23439	23829	24254
540	25003	25584	26099	26606	27304	27684	28421	29209	29776	30513
550	31688	32516	33132	34368	35438	36254	37415	38163	39575	41384
560	42714	43425	44963	46465	47922	49642	51431	52615	54515	56464
570	57808	60161	61722	63779	65795	67519	69438	71437	73813	76015
580	77415	79488	81853	83223	85308	87140	88773	91316	92386	94345
590	96184	96768	98971	100080	101296	102653	103786	104984	106256	107172
600	107476	108873	109514	109549	110636	111322	112046	111585	112816	112153
610	112676	112210	112216	112643	112462	112086	111791	111246	111238	110996
620	110287	110377	110485	109328	108365	108718	107809	107180	106440	106065
630	105509	104620	104358	103368	102770	102222	101452	101079	100227	99772
640	98799	98603	97845	97244	95779	96133	94901	94645	93369	92477
650	91867	91175	90467	88955	88055	86836	86371	85389	83856	82486
660	80922	79974	78804	77310	75953	74260	73014	71283	69135	67752
670	66204	64039	62424	60711	58610	56289	55014	53056	51177	49355

Table D-1. Probability Data Set 01 (Cont'd)

680	47236	45399	43616	41695	39667	38004	35864	34101	32717	30950
690	29339	27378	26377	24626	23162	21791	20319	19065	17907	16427
700	15475	14313	13499	12415	11503	10735	9695	9107	8245	7687
710	6949	6301	5768	5226	4736	4389	3945	3518	3233	2872
720	2543	2318	2095	1914	1661	1387	1351	1185	1030	873
730	806	735	583	548	479	413	347	312	275	220
740	203	140	128	135	113	87	73	64	68	45
750	54	41	26	33	10	20	13	13	9	6
760	5	4	5	2	3	2	1	1	3	1
770	0	0	1	1	2	1	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0
790	1	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-2. Probability Data Set 02

1	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	4	0	0	0
20	0	0	0	0	3	0	0	0	0	0
30	0	0	6	0	0	0	0	0	0	0
40	2	0	0	0	0	0	0	0	1	0
50	0	0	0	0	0	0	1	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	1	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	1	0	1	0	1	0
180	0	0	0	0	0	0	1	1	3	0
190	2	2	0	2	6	3	4	9	11	9
200	7	13	13	14	19	20	28	25	30	18
210	33	40	42	57	44	54	66	71	120	98
220	124	133	140	145	161	196	182	240	216	229
230	250	254	260	245	301	280	273	286	265	310
240	288	319	293	308	327	307	314	330	302	308
250	312	312	326	308	333	321	284	317	299	308
260	317	312	329	361	313	277	306	310	323	303
270	328	308	338	332	308	318	307	335	315	321
280	336	336	337	362	377	318	376	359	362	407
290	454	454	529	587	686	771	867	881	1008	1038
300	1059	1165	1149	1187	1181	1238	1241	1257	1311	1222
310	1318	1294	1295	1269	1327	1334	1483	1440	1458	1523
320	1518	1562	1661	1618	1765	1786	1772	1829	1823	1932
330	1976	2064	2127	2021	2110	2030	2048	2038	2183	2095

Table D-2. Probability Data Set 02 (Cont'd)

340	2090	2107	2181	2132	2176	2262	2346	2399	2446	2540
350	2619	2559	2665	2812	2950	2889	3032	3232	3293	3393
360	3430	3680	3608	3902	4014	4068	4167	4344	4397	4701
370	4922	5043	5235	5400	5705	6058	6312	7002	7316	8037
380	8546	9383	9599	10121	10175	10545	10956	11075	11450	11911
390	12741	14115	16174	18752	22904	27324	33083	39518	45762	51723
400	56715	60009	61523	61369	59429	57478	55600	53886	52433	52575
410	52249	52653	53320	55102	56673	58488	60095	61437	61953	61033
420	58484	54430	49102	42063	34856	28190	23503	20093	17640	16415
430	16036	16041	16346	16727	17205	18295	19655	20731	22403	23075
440	24251	25117	25922	27476	28948	31588	34927	40503	47048	55936
450	66809	79005	92187	107529	121433	134762	144958	153776	158190	160115
460	158020	156692	151766	147311	142614	135877	126805	117820	105043	91530
470	77388	63774	51894	43115	37136	34194	31978	31893	31955	32313
480	32925	33367	34317	35161	36523	37510	38715	40226	41460	43467
490	45246	47248	49189	51128	52637	55105	57613	59582	61846	64130
500	66361	68631	71204	72643	75019	77653	79500	82307	84661	86351
510	89042	91130	93869	96528	98662	100305	102343	104682	107543	109496
520	112173	114581	116412	118754	121166	123835	125994	127833	130515	132441
530	134600	136547	138914	141316	141725	144603	146494	148260	149187	150877
540	152121	153397	153952	155264	156526	156055	156704	156748	155700	156904
550	157608	154519	154842	154148	152228	151852	149599	148495	146638	145358
560	143900	140894	138837	136672	134260	132006	128882	126368	124303	121118
570	118124	115043	112516	109135	107150	103641	100659	97842	94539	91128
580	88355	85526	82354	79376	76470	73979	71241	68924	66096	63529
590	60693	58150	55703	53494	51100	48872	47002	45153	42939	41207
600	39125	37903	36122	34609	33126	31751	30498	28965	27882	26645
610	25576	24486	23697	22404	21743	21091	20159	19175	18692	18054
620	17373	16762	16214	15641	15214	14809	14509	14174	13819	13521
630	13002	12806	12456	12163	11665	11608	11318	10999	10868	10607
640	10485	10387	10012	9863	9763	9574	9467	9309	9183	9143
650	8978	8846	8671	8571	8372	8422	8316	8225	7855	7835
660	7647	7505	7372	7344	7233	7136	7043	6976	6738	6519
670	6335	6281	6145	5935	5837	5675	5646	5457	5217	5218

Table D-2. Probability Data Set 02 (Cont'd)

680	5093	5016	4710	4634	4569	4411	4122	4147	4019	3790
690	3744	3658	3426	3334	3165	3069	3007	2910	2821	2620
700	2576	2493	2450	2241	2165	2187	1994	1973	1925	1764
710	1801	1664	1515	1538	1481	1376	1278	1319	1227	1171
720	1098	1047	973	1005	907	880	838	813	776	757
730	654	635	621	591	538	548	525	489	442	471
740	417	383	367	351	357	278	288	252	243	246
750	210	217	203	167	167	160	147	164	118	120
760	99	102	104	84	90	89	96	77	61	53
770	43	42	49	31	33	29	18	27	22	26
780	28	14	10	18	13	15	7	6	11	9
790	11	5	3	2	4	5	4	5	2	4
800	4	3	5	0	2	0	4	0	0	1
810	1	1	1	0	0	0	0	0	0	0
820	0	0	2	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-3. Probability Data Set 03

1	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	1	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	5	0	0	0	0	0	0	0
40	3	0	0	0	0	0	0	0	4	0
50	0	0	0	0	0	0	1	0	0	0
60	0	0	0	0	1	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	2	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	2	0	0	0	0	0	0	0
120	2	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	3	5	9	23	64	135
250	242	420	666	1054	1425	1725	2341	2895	3251	3583
260	3769	3931	4054	4187	4218	4483	4809	5766	7156	9284
270	12305	16015	21562	28170	35396	43847	51796	59060	66111	70621
280	74511	76940	77676	77326	77309	76105	74753	71386	68185	62602
290	56161	48964	41008	33547	27304	21909	17889	14660	12783	10862
300	9874	8995	8205	7257	6434	5490	4715	3734	2997	2314
310	1890	1641	1322	1107	1040	964	930	874	886	888
320	795	751	794	670	705	689	672	629	591	553
330	507	523	472	433	431	446	407	403	392	367

Table D-3. Probability Data Set 03 (Cont'd)

340	365	370	349	332	312	346	331	342	307	303
350	283	333	324	330	298	297	306	287	316	306
360	297	323	374	356	355	360	415	445	453	483
370	472	555	556	571	557	585	553	582	527	511
380	511	469	462	467	416	435	434	459	455	490
390	488	553	554	645	683	793	720	823	828	882
400	938	1019	1146	1277	1583	2073	2693	3722	4925	6345
410	8074	10089	11926	13867	15722	17292	18690	19704	20204	21089
420	22030	23691	26576	31456	38413	48113	60469	76532	93725	113105
430	132639	151704	169744	183468	192303	197012	197547	190656	179269	165525
440	147162	128687	108992	91754	76531	64163	55486	51385	50402	52943
450	58342	64450	73256	79704	87559	94837	101240	106020	109555	111342
460	111847	111745	109804	108532	106729	104256	102607	102243	101369	101692
470	101651	101869	101857	102773	102433	101717	100015	98925	97171	95015
480	92744	89687	87061	84835	82484	80473	79109	78062	77072	75688
490	74212	73750	72859	72328	71128	69942	69127	68629	66868	66359
500	65268	64011	63361	62206	61242	60682	59578	58632	57661	56735
510	56345	55320	54117	53211	51911	51663	50142	49075	47664	46885
520	45508	44966	44087	44315	43262	43184	43262	43470	43656	44281
530	44115	45196	45424	45436	45621	45814	45696	45452	45387	45220
540	45485	44590	44843	44164	44637	44372	44715	45168	45645	46060
550	46517	46694	47812	48626	49659	50467	51430	51866	53355	53562
560	54713	55292	56064	56490	57294	58435	58383	58914	59718	60337
570	60464	61695	62043	63143	64166	65173	66049	66959	68205	70168
580	71001	72123	72631	73744	74449	74628	74389	74869	74254	74271
590	73413	72681	71565	70773	69353	68229	66812	65680	64628	62836
600	61366	59623	57686	56074	53925	51462	49422	46875	44017	41530
610	39091	37188	34755	32435	30236	28220	26435	25092	23998	22357
620	21173	19979	19095	17712	16749	15719	14989	14050	12960	12286
630	11781	10703	9994	9298	8898	8326	7844	7291	6970	6737
640	6350	6242	5949	5966	5831	5787	5627	5698	5693	5683
650	5600	5523	5679	5537	5527	5640	5783	5743	5704	5658
660	5697	5785	5829	5900	5870	5827	5976	6198	6395	6528
670	6546	6692	6952	7302	7525	7891	8154	8316	8728	9057

Table D-3. Probability Data Set 03 (Cont'd)

680	9041	9219	9270	9545	9497	9445	9157	8950	8782	8397
690	8205	7953	7763	7343	6954	6676	6400	6046	5743	5726
700	5274	5150	4758	4690	4494	4170	3921	3804	3684	3369
710	3316	2983	2974	2882	2779	2793	2582	2642	2633	2633
720	2645	2734	2820	2795	2942	3179	3319	3451	3661	3875
730	4127	4233	4636	4946	5078	5419	5864	6162	6557	7177
740	7453	8066	8635	8909	9477	10280	11023	11841	12754	13695
750	14731	15698	16601	17758	19233	20679	22003	23763	25543	27532
760	29458	31331	33960	36361	39327	41955	45591	48491	52125	55501
770	59171	62967	66047	70045	72652	75483	77608	80023	80745	81511
780	80577	79760	77616	74032	70320	66449	60512	55518	49829	43367
790	37562	31181	26203	20873	16691	12570	9352	6623	4542	2968
800	1939	1143	638	353	171	92	69	42	21	7
810	1	2	1	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-4. Probability Data Set 04

1	0	0	0	0	0	0	0	0	3	0
10	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	7	0	0	0	0	0	0	0
40	1	0	0	0	0	0	0	0	4	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	5	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0
120	5	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	2	0	2	1	2	0
230	5	0	1	0	0	6	2	0	8	10
240	6	9	9	10	12	17	19	15	19	28
250	21	27	39	31	28	48	45	55	52	41
260	58	55	70	66	59	61	60	81	60	79
270	75	67	58	49	67	66	68	71	82	71
280	59	60	60	67	80	64	60	75	73	82
290	60	73	80	64	72	70	76	64	64	68
300	72	79	72	72	87	91	81	82	90	93
310	109	94	110	112	104	125	162	146	159	206
320	233	275	342	382	476	508	578	629	746	736
330	857	830	902	911	915	980	1005	982	1009	1019

Table D-4. Probability Data Set 04 (Cont'd)

340	1048	1072	1038	1140	1146	1173	1266	1215	1259	1401
350	1380	1476	1515	1565	1619	1577	1670	1694	1649	1724
360	1671	1718	1689	1756	1633	1649	1646	1611	1703	1664
370	1699	1770	1677	1724	1767	1721	1743	1837	1829	1799
380	1921	1817	1890	1978	2039	2042	2101	2136	2035	2168
390	2169	2229	2253	2259	2394	2466	2596	2713	2891	3174
400	3380	3672	4005	4298	4717	4967	5309	5642	5871	6432
410	6382	6664	7215	7987	8784	10145	12142	14459	17577	21181
420	25013	29373	34131	38572	42836	46665	49451	51480	52309	53472
430	52936	52662	53152	52626	52362	52900	52815	54022	54195	54313
440	54140	52666	50648	47909	43549	39760	34730	29914	25704	21787
450	18861	16216	14669	13707	12963	12737	13734	14130	14983	15982
460	17341	18618	20471	22000	23806	25757	27727	30298	33296	36761
470	40850	46118	52728	60317	69107	79079	89908	102993	115616	129780
480	144674	158313	171168	184128	196233	205582	216793	223974	232430	240663
490	245879	251687	258267	262269	264853	266578	268453	268097	266846	266205
500	264955	262364	259578	254581	249129	242469	234673	226541	218388	210203
510	201777	194545	187557	182863	177258	173532	168557	165928	164320	161387
520	160247	159502	158014	157703	157731	157509	156531	154792	154559	153394
530	150652	148459	145652	141995	138634	134970	129752	124957	119924	114529
540	108929	103126	97821	92659	87425	81959	77090	72667	68937	64745
550	61633	58364	55920	53943	51364	50579	49575	48477	47791	47145
560	47614	47857	48036	48997	50045	50987	52160	53272	55272	56781
570	58580	60893	62386	64375	66197	68269	69695	71819	74098	75889
580	76605	77543	78253	78503	78979	79107	78380	77482	75938	74148
590	72145	70057	67664	65027	61940	58578	55800	52130	48136	44991
600	41807	38282	35200	31984	29022	26066	23375	21061	18900	16455
610	14699	12763	11476	9905	8721	7754	6560	5925	5146	4513
620	3974	3457	3173	2886	2541	2216	1999	1974	1747	1611
630	1548	1503	1348	1373	1253	1197	1151	1145	1149	1094
640	1060	962	948	943	894	968	878	918	883	845
650	856	816	862	783	752	789	731	731	689	712
660	660	686	644	612	608	601	539	544	559	540
670	475	444	438	433	437	403	366	366	349	363

Table D-4. Probability Data Set 04 (Cont'd)

680	318	318	328	295	272	275	257	251	223	253
690	231	237	210	214	206	197	259	224	201	202
700	222	201	227	196	200	229	228	229	210	244
710	199	199	246	226	200	201	235	211	210	206
720	239	251	202	226	199	196	210	182	170	186
730	175	171	146	172	144	132	112	120	100	107
740	86	71	78	59	55	64	38	49	31	34
750	32	26	29	25	21	12	14	9	11	13
760	11	6	3	3	5	9	4	2	5	2
770	5	5	2	1	3	0	2	3	4	3
780	0	1	0	1	1	2	1	1	1	1
790	1	0	0	0	1	0	1	0	0	0
800	0	0	1	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	1	0	0
850	0	0	0	0	0	1	0	0	1	0
860	0	0	0	0	0	1	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-5. Probability Data Set 05

1	0	0	0	0	0	0	0	0	3	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	5	0	0	0	0	0	0	0
40	1	0	0	0	0	0	0	0	1	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	1	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	3	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	1	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	3	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	1	0
290	0	0	0	0	1	2	4	5	10	33
300	74	98	208	327	549	783	1103	1551	1912	2469
310	2740	3040	3196	3438	3438	3476	3569	3945	4289	4988
320	6354	8316	11025	14603	19202	24954	31244	38262	45272	51666
330	56980	60911	63576	64613	65027	64816	64107	64459	64549	64861

Table D-5. Probability Data Set 05 (Cont'd)

340	65130	63640	61228	58065	52307	45794	38253	30666	23356	17831
350	13508	10652	9074	8022	7312	7056	6990	6757	6437	5961
360	5578	5275	4636	4170	3745	2915	2588	2093	1664	1405
370	1212	1065	920	864	802	798	702	734	705	697
380	645	663	633	614	575	597	603	616	574	592
390	565	556	559	567	513	555	510	536	529	504
400	517	457	530	501	527	467	516	497	493	501
410	484	507	463	518	462	489	491	505	481	502
420	545	580	571	558	611	634	721	771	782	760
430	834	841	908	829	936	1024	1098	1233	1460	1709
440	2135	2707	3309	4037	4846	5694	6440	6975	7731	8184
450	8658	8772	9222	9139	9102	9093	9015	9328	9549	10159
460	11003	12066	13525	15141	16786	18768	20202	21890	23624	25046
470	26375	27554	28912	30058	31402	32731	34177	35761	37453	38836
480	41377	42745	45056	46930	47874	49230	49986	50676	50992	50294
490	49646	49198	47900	47389	47269	48287	49553	53253	58743	66400
500	75321	87261	98607	112507	124260	134405	142099	147918	149323	149709
510	146141	140441	132425	123056	113019	103072	93289	84644	75865	68926
520	61966	57045	52115	49469	47680	47118	49428	53318	59987	68553
530	80624	94448	109038	124111	137751	148799	155646	158332	155013	148714
540	138652	126702	111453	96050	80003	65112	52229	43284	37199	33773
550	32147	30472	30204	29919	29030	28660	28610	28372	27851	27739
560	27825	27734	27404	27377	27099	27533	27174	27650	27594	27752
570	28096	28770	29268	29864	30544	31608	32411	33445	34272	34911
580	35732	36084	36582	36783	36552	36236	36116	35298	34525	33739
590	33289	32367	32102	31745	31306	31487	31655	31786	32686	33230
600	34802	35890	37273	38698	39844	41145	42008	42323	42434	41633
610	40655	39495	37764	36146	34222	32301	30763	29349	27897	27364
620	26208	26095	25408	24911	25030	24674	24495	24501	24000	23647
630	23682	23794	23690	23958	23777	23473	23480	23207	23348	23246
640	23128	23080	23222	23295	23312	23821	23682	23814	24067	24276
650	24101	24170	24654	24732	24576	25020	24632	24713	24755	24976
660	24875	24978	25026	25605	26249	26465	26850	27468	28220	28759
670	29432	29325	29633	29481	28790	27875	26687	25482	24008	22747

Table D-5. Probability Data Set 05 (Cont'd)

680	20933	19636	18494	17278	16761	16200	15812	15925	15838	16201
690	15883	15805	15932	16017	15908	15968	16061	16091	16287	16425
700	16349	17000	17379	17832	19045	19957	21241	22817	24312	25920
710	27214	28215	28749	29892	29788	29830	29680	29117	28528	27609
720	27277	26572	26014	25490	24479	24847	24555	24229	24008	24001
730	23593	23943	23755	23638	23485	23512	23668	23565	23608	23328
740	23562	23390	23449	23391	23442	23540	23550	23717	23546	23752
750	24324	23665	24268	24384	24159	24504	24623	24847	25120	24941
760	24930	25220	25593	25686	25689	26338	26531	27238	27846	28357
770	28984	29856	30333	30806	31048	31294	31135	30780	30127	29427
780	27964	27079	25460	24550	23303	22566	21765	21613	21158	21299
790	21471	21710	22135	22409	22954	23531	24087	24680	25315	25792
800	25877	25793	25395	24599	23537	22471	21493	20243	18975	17822
810	16984	16163	15552	15082	14877	14777	14548	14770	14630	15056
820	15004	15156	15844	16257	17180	18208	19391	20258	21225	22312
830	22982	22935	23319	23305	22866	23499	23937	25290	27689	32398
840	39992	49745	62238	77015	92201	108332	122634	133733	140198	141540
850	137187	129067	119866	106554	91865	76236	61071	47328	36056	28380
860	23288	20050	17905	16549	15244	14056	13354	12835	12437	12440
870	12415	12275	12620	12793	12897	13085	13044	13489	13505	13567
880	13883	14202	14393	14629	14715	14936	15703	15916	16175	16892
890	17264	18160	18733	19643	20632	21188	21802	21988	22041	21583
900	21104	20218	19173	17917	17056	15862	15374	15210	14866	15132
910	15921	15917	16469	16724	16581	15932	14632	13711	12303	10958
920	9505	7916	6538	5532	4774	4917	5342	6916	9360	12964
930	17415	23006	29052	35448	41134	44997	47710	48095	46591	42824
940	38350	32758	26754	19986	13886	8751	4779	2364	992	371
950	120	36	8	2	0	0	0	0	0	0
960	0	0	1	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-6. Probability Data Set 06

1	0	0	0	0	0	0	0	0	1	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	5	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	2	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	1	0	0	0	0	0
70	0	0	1	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	1	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	1	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	1	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	1	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	1	0	1	0	0	2
300	0	2	2	4	1	7	4	6	7	9
310	8	24	24	38	29	70	73	84	143	161
320	222	267	282	344	404	379	473	532	576	646
330	721	930	1072	1262	1528	2003	2400	2878	3320	4136

Table D-6. Probability Data Set 06 (Cont'd)

340	4738	5442	5896	6742	7297	7859	8288	8928	9287	9429
350	9670	9874	10122	10170	10020	9998	10015	9569	9645	9602
360	9510	9863	9912	10457	10878	11355	12158	12777	13513	13996
370	14690	15262	16077	16702	17252	17922	19067	19824	20628	22015
380	23309	24554	25889	27408	28986	30799	32161	33631	34600	36312
390	37035	37482	38668	38494	38532	38852	38078	37538	36825	35661
400	34682	33663	32500	31772	30494	30147	29196	28407	27887	27492
410	26948	26568	26427	25974	25836	25797	25836	25807	25829	25807
420	26169	26437	26769	27142	27969	28388	29120	29928	30722	31521
430	32521	33685	34903	35671	36133	37023	37737	38134	38501	38916
440	38994	39046	39430	39482	40079	41117	42309	44495	47538	50056
450	53786	57719	61567	65249	68928	71450	72653	74264	74506	74227
460	74345	74446	73916	73694	73650	74236	74135	75679	76268	77993
470	78582	79353	79440	78901	77566	75656	71892	68378	63576	58498
480	53846	49069	45401	42222	39334	37443	36067	35035	34645	34586
490	34630	35153	35416	35637	36293	37341	37696	38168	38835	39823
500	41348	42348	44584	46712	48926	52675	57739	63551	70918	78388
510	87366	95605	106215	115237	125055	133286	141016	149020	157017	164347
520	172604	178729	183321	185266	185188	183672	178017	171133	163283	154796
530	145329	136795	127527	118815	108900	99982	90143	79702	71355	62462
540	54890	48820	43900	39607	36825	34553	33312	31926	31149	30970
550	30768	30171	29902	29657	29201	29049	28597	28279	28058	27811
560	27458	27102	26984	26647	26660	26773	26641	26216	26296	26252
570	26210	26043	26569	26186	26401	26327	26602	26475	26442	26272
580	26035	26411	26609	26562	26547	26403	26562	26739	26799	27137
590	27034	27052	27282	27422	27377	27796	28030	28331	28839	29564
600	29958	30466	31117	31797	32704	32890	33917	34232	34695	35223
610	35696	36458	38159	39740	42663	46236	50448	56719	62455	70229
620	76465	83436	90032	94631	97894	100689	102161	101956	101589	100366
630	98155	94966	91385	86547	79939	72726	65201	57805	50438	44275
640	38400	34001	30985	28994	27514	27324	27969	29330	30991	33603
650	36102	38994	41406	44267	45800	47121	48452	49417	49685	49707
660	49664	49464	48775	47708	45403	43760	41746	38880	36468	33836
670	31346	28768	27337	25813	24944	24467	24331	24322	23960	24297

Table D-6. Probability Data Set 06 (Cont'd)

680	24901	25150	25356	25741	25690	25948	25981	25865	26047	25753
690	25239	24921	24345	23944	23091	22736	22308	21348	20620	19959
700	19507	19153	18652	17902	18195	17585	17353	17555	17698	17556
710	17715	17819	17673	18045	17959	18241	18273	18365	18528	18437
720	18676	18561	18914	18855	19494	19215	19111	19838	19822	20093
730	20187	19993	20427	20598	20655	20784	21215	21327	21616	21875
740	22168	22420	22777	23276	23776	23990	24246	24523	25109	25729
750	25772	26581	27276	27540	28176	28648	29621	30818	32037	32566
760	33522	34369	35304	36195	36655	36905	37227	36851	36487	35431
770	34546	33977	32381	31016	29368	28144	26287	24892	23208	21894
780	20479	19147	17968	17020	16285	15478	15092	14473	13665	13225
790	12739	12070	11574	10993	10633	9968	9685	8991	8606	8541
800	8625	8360	8416	8690	8923	9220	9162	9307	9184	9203
810	8887	8718	8367	7981	7512	7163	6280	5868	5165	4558
820	3987	3352	2774	2301	1999	1674	1374	1168	1106	868
830	893	805	763	675	622	552	468	475	378	326
840	272	237	198	199	131	129	94	98	98	78
850	46	57	39	35	21	15	11	5	3	2
860	2	2	1	2	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-7. Probability Data Set 07

1	0	0	0	0	0	0	0	0	2	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	2	0	0	0	0	0
30	0	0	7	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	3	0
50	0	0	0	0	0	0	3	0	0	0
60	0	0	0	0	3	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	1	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	2	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	0	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	1	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0
300	0	2	2	2	7	10	25	32	63	138
310	226	369	494	746	994	1275	1550	1953	2205	2462
320	2629	2852	3114	3206	3501	3950	4518	5619	6990	9293
330	12176	15390	20054	24521	29967	35108	40457	45239	48688	52171

Table D-7. Probability Data Set 07 (Cont'd)

340	55175	56791	58075	59089	59432	60038	60344	60877	60245	59786
350	58613	56602	53427	49687	45413	40382	35340	29638	24889	20829
360	16799	13765	11294	9646	8427	7410	6738	6010	5469	4908
370	4424	3867	3287	2874	2541	2167	1778	1611	1314	1169
380	1049	984	892	913	827	895	791	756	714	729
390	714	685	672	660	610	582	612	594	555	596
400	510	553	512	565	543	553	525	533	546	527
410	538	495	494	523	508	528	455	485	473	521
420	471	532	480	503	538	573	573	584	599	644
430	654	697	715	745	805	779	875	863	1005	1052
440	1092	1360	1578	1860	2207	2643	2940	3579	4100	4667
450	5146	5676	6044	6572	6940	7042	7329	7373	7420	7422
460	7291	7480	7273	7196	7212	7150	7207	7199	6955	7171
470	7189	7201	7384	8086	8624	9840	11383	12843	14839	17049
480	19650	22537	24911	27419	29634	31848	33750	35485	36847	38463
490	39175	40186	41730	43406	44425	45400	46978	47976	48195	49060
500	49385	49870	50352	53008	56907	63542	73113	87324	104228	124921
510	149695	175912	200312	225205	244884	260461	270760	274129	270797	260460
520	245452	226746	203963	179321	153757	131156	111415	94003	79983	68462
530	60615	54472	50077	47020	44998	43367	42839	41962	41859	41534
540	41910	42658	43371	43706	44492	44887	44242	44270	43677	42503
550	41561	39001	37041	34832	32530	30235	27598	25901	23528	21758
560	20970	19978	19239	19504	19648	20350	21204	22108	23238	24625
570	26109	26910	28279	29189	30126	30508	30948	31091	31039	31534
580	30435	30387	29845	29764	29218	29244	28734	28115	27975	27409
590	26648	26190	25363	24133	23604	22100	21088	20006	18520	17502
600	16174	15165	14392	13757	13113	13134	12855	13092	13874	14402
610	15317	16567	17336	18837	19786	21083	22022	22871	23681	24332
620	24397	24467	24719	24285	24198	23633	23587	23919	23757	23590
630	23916	24045	24133	24249	24234	24247	23917	23364	23058	22050
640	21311	20221	19102	17856	17073	15674	14976	14093	13373	12814
650	12687	12926	13240	13506	14385	15223	16304	17209	18347	19618
660	20492	21697	22467	23147	23748	24125	23974	24228	24313	23996
670	24028	23678	23731	23794	23363	23753	23784	24093	24212	23967

Table D-7. Probability Data Set 07 (Cont'd)

680	23707	23524	23131	22496	21462	20966	19599	18449	17643	16427
690	15308	14642	13661	13234	12697	12595	12858	13119	13569	14513
700	15538	16656	17970	18887	19975	21350	22667	23059	23930	24289
710	24684	24773	24764	24597	24559	24266	23964	24243	23814	23858
720	24167	24014	24455	24089	24184	24276	23614	23117	22496	21889
730	20540	19569	18417	17371	16302	15441	14325	13772	13431	13102
740	12963	13136	13537	14238	15297	16345	17549	18773	19928	21142
750	22262	23157	23960	24519	24912	25218	25100	25097	24922	24873
760	24444	24570	24293	24440	24504	24881	24842	25223	25066	24871
770	24588	24247	23181	22497	21532	20381	19316	17714	16887	15772
780	14507	13875	13317	12883	13103	13112	13605	14336	15089	16521
790	17430	18568	19903	21259	22441	23011	23698	24397	24916	25098
800	25058	24952	24837	24715	24464	24477	24575	24276	24605	24820
810	24756	25137	25048	24914	24635	24063	23174	22253	21253	20195
820	18923	17710	16483	15489	14698	13703	13404	13384	13297	13554
830	14172	14885	15899	16947	18372	19540	20965	22125	23131	23844
840	24625	24990	25195	25653	25527	25624	25212	24930	24672	24826
850	24850	25338	25196	25030	25369	25189	25314	24944	24442	23607
860	22623	21789	20476	19428	18160	17109	15917	15163	14450	13931
870	13945	13885	14574	15098	15976	17053	18152	19769	21122	22356
880	23429	24535	25001	25764	25961	26315	26088	26034	26078	25584
890	25507	25534	25688	25841	26018	26421	26466	26758	26331	26556
900	26296	25488	24512	23762	22624	21146	19761	18745	17403	16555
910	16146	15865	16231	16818	17960	19013	20367	22199	24312	25927
920	27873	29616	31011	32330	33807	34592	35529	35472	36030	36831
930	36756	37546	37805	38084	38893	39631	40719	42948	45937	50003
940	55039	62034	70285	79460	89071	99294	107558	114478	118070	121015
950	119502	115372	107836	98914	87765	76339	64242	53434	44005	36282
960	29770	24840	21390	18807	17329	16535	16330	16242	16239	16553
970	16963	17692	18411	18809	19312	20135	20576	20841	20991	20141
980	19283	18135	16514	14518	12514	10489	8317	6617	4947	3527
990	2429	1514	1045	609	290	145	68	24	11	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-8. Probability Data Set 08

1	0	0	0	0	0	0	0	0	2	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	2	0	0	0	0	0
30	0	0	7	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	1	0
50	0	0	0	0	0	0	2	0	0	0
60	0	0	0	0	2	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	2	0
90	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	1	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	2	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0
310	0	1	0	1	0	1	0	7	8	15
320	21	14	12	15	11	18	31	33	33	26
330	34	41	48	68	93	127	162	215	246	309

Table D-8. Probability Data Set 08 (Cont'd)

340	323	389	443	487	573	610	683	647	682	749
350	788	837	867	979	1104	1190	1297	1498	1635	1752
360	1932	1964	2078	2156	2394	2410	2506	2521	2623	2710
370	2763	2685	2707	2633	2774	2692	2658	2522	2462	2471
380	2365	2344	2338	2223	2190	2143	2083	2080	1942	1975
390	1977	2017	2015	1963	1914	1921	1931	1796	1985	1949
400	1930	1896	1976	1965	1994	1941	2084	2033	2068	2054
410	2050	2210	2217	2178	2296	2313	2491	2509	2525	2689
420	2884	3198	3466	3732	4148	4473	4884	5216	5622	5998
430	6255	6669	6999	7400	7737	8039	8556	8892	9187	9517
440	9984	9973	10257	10050	10556	10731	10603	10987	11529	12520
450	13525	15118	17034	19894	23390	26997	31088	35051	38694	42136
460	44899	46924	48422	49170	49298	49799	49042	49574	50243	50727
470	51903	52608	54997	56287	58726	61681	63465	65437	66675	67673
480	67661	66910	64416	62313	59252	55510	52206	49332	46821	43907
490	41817	40635	39351	38724	38700	38702	39955	41082	42590	43880
500	45404	47413	48629	50167	50747	52672	54377	56906	59419	62854
510	67962	74092	82974	93948	106663	121553	137252	155620	172132	188664
520	202043	212699	222297	228633	232358	233692	233669	230439	224948	216995
530	204672	192204	176361	158815	142238	126590	111963	99745	89431	80291
540	74126	69063	64816	62084	60789	60399	59479	60067	60159	60583
550	60980	60688	61346	62454	62728	63511	63913	65024	65398	66645
560	67076	68597	69228	70090	71472	72410	73336	73953	74167	74988
570	75273	74869	74943	74328	74261	74120	73356	73014	71798	71003
580	70777	70228	69399	69074	67849	68461	67119	67571	67445	67238
590	67107	67309	67779	68443	68028	67954	68215	68216	68072	68207
600	68211	68391	68430	68899	68677	69287	69133	69262	69910	70120
610	70425	71112	71366	71805	71915	71005	72023	71737	71403	71212
620	71176	70296	70185	69200	68830	67233	66665	65320	64376	62903
630	61685	61148	60408	59148	58330	58318	56932	57058	57241	56097
640	55894	55851	55671	55299	54607	54843	54595	55106	55348	56226
650	57460	59374	62407	66017	70829	76115	82058	88383	94089	99566
660	105210	108987	112020	113581	114249	114185	113528	111609	109051	105367
670	99674	93293	87615	79631	72426	65238	58918	53532	48318	44243

Table D-8. Probability Data Set 08 (Cont'd)

680	40596	37759	34736	33740	31942	30917	30168	29478	29315	28886
690	28032	27818	27649	27051	26965	25817	25874	25223	24662	24224
700	23619	23219	22602	22506	22590	21750	20997	20785	20161	19349
710	18296	17529	16494	15539	14702	13661	12642	11615	10744	9531
720	8400	7670	6567	5579	4662	4019	3313	2787	2281	1840
730	1614	1286	1058	898	754	708	498	450	386	327
740	252	189	139	96	83	58	33	33	11	15
750	8	2	0	0	2	0	0	0	0	0
760	0	0	0	0	0	0	0	0	0	0
770	0	0	0	0	0	0	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-9. Probability Data Set 09

1	0	0	0	0	0	0	0	0	13	0
10	0	0	0	0	0	0	3	0	0	0
20	0	0	0	0	3	0	0	0	0	0
30	0	0	40	0	0	0	0	0	0	0
40	7	0	0	0	0	0	0	0	4	0
50	0	0	0	0	0	0	4	0	0	0
60	0	0	0	0	4	0	0	0	0	0
70	0	0	5	0	0	0	0	0	0	0
80	2	0	0	0	0	0	0	0	1	0
90	0	0	0	0	0	0	7	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	8	0	0	0	0	0	0	0
120	7	0	0	0	0	0	0	0	1	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	10	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	2	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	5	0
290	0	0	0	0	1	0	0	5	1	0
300	0	10	9	9	17	18	26	31	31	27
310	37	77	69	76	105	91	108	132	144	166
320	202	253	272	279	358	365	456	503	626	690
330	714	843	861	1018	1130	1257	1387	1519	1647	1865

Table D-9. Probability Data Set 09 (Cont'd)

340	1959	2194	2448	2677	3018	3519	3919	4433	4957	5743
350	6217	7000	7849	8875	9722	11157	12225	13669	15580	17162
360	19230	21331	23428	25923	28698	31790	34437	38140	40961	44723
370	48875	53281	57678	63105	68787	75238	81754	88041	94636	101629
380	107773	113820	120177	125398	130452	136139	140940	144743	147582	151677
390	154514	156779	159302	160580	161882	163778	163061	165154	164267	162933
400	161090	160717	158003	156861	155120	153089	149928	147399	143930	141824
410	138851	136278	131802	129270	125147	121632	117420	114086	111506	108192
420	105690	102617	100775	99417	97784	96153	95629	95402	94943	95624
430	95330	96375	97775	98568	100418	103593	106394	110673	114381	120077
440	125457	132186	139459	146934	156072	164402	172785	182398	192742	202179
450	212601	222605	232960	243560	255503	267054	277303	287629	297996	304834
460	312323	318123	322347	325397	326994	329239	328940	329923	330124	330821
470	332135	334646	336149	338900	341576	344984	348102	351374	354301	357695
480	362796	367325	373829	382661	393441	404583	418025	431730	445476	459368
490	472178	487457	501613	516841	534964	550592	571638	594405	619360	648323
500	679389	714043	747791	784486	820434	853130	882010	911234	933795	950780
510	965104	974228	979513	985341	985823	985348	983309	981748	979443	976264
520	976139	967410	953615	938867	917550	893927	866049	836542	810587	786606
530	762032	743238	725839	709514	695479	683495	671038	662937	650683	640776
540	632026	625526	616177	607830	599812	593360	584457	577883	569095	561531
550	554768	540904	537726	529144	520558	510595	504169	494912	485928	474771
560	468176	458117	449582	440858	430894	423780	414113	405082	397067	389003
570	380777	371978	361587	353804	345157	334008	325677	316397	305672	295255
580	286658	276351	266461	256863	247187	239529	230340	221793	213455	206480
590	198212	189856	183748	176177	168518	161857	155441	148415	142734	136647
600	131583	125589	120525	114707	110810	105140	100848	96457	91529	87782
610	82926	79099	75555	71824	67970	64169	60763	57811	54426	51361
620	48081	45731	42997	40711	38197	35532	33416	31670	29567	27814
630	25994	24159	22809	21353	19654	18542	16877	15770	14394	13226
640	12302	11136	10145	9321	8494	7707	7150	6292	5732	5196
650	4653	4296	3852	3606	3196	2936	2515	2233	2009	1797
660	1498	1376	1201	1126	928	787	690	575	488	421
670	393	293	273	259	246	163	165	159	113	113

Table D-9. Probability Data Set 09 (Cont'd)

680	83	67	56	56	51	38	32	13	22	19
690	9	11	11	8	11	1	1	6	5	1
700	1	2	4	0	1	1	1	0	0	0
710	1	1	0	0	0	0	0	0	0	0
720	0	0	0	0	0	0	0	0	1	0
730	0	0	0	0	0	0	0	0	0	0
740	0	0	0	0	0	0	0	0	0	0
750	0	0	0	0	0	0	0	0	0	0
760	0	0	0	0	0	0	0	0	0	0
770	0	0	0	0	0	0	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	1	0	0	0	0	0	0	0	1	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-10. Probability Data Set 10

1	0	0	0	0	0	0	0	0	6	0
10	0	0	0	0	0	0	6	0	0	0
20	0	0	0	0	5	0	0	0	0	0
30	0	0	41	0	0	0	0	0	0	0
40	10	0	0	0	0	0	0	0	7	0
50	0	0	0	0	0	0	3	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	2	0	0	0	0	0	0	0	4	0
90	0	0	0	0	0	0	3	0	0	0
100	0	0	0	0	3	0	0	0	0	0
110	0	0	11	0	0	0	0	0	0	0
120	9	0	0	0	0	0	0	0	0	0
130	0	0	0	1	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	1	0	0	0	0	0	0	0	0	0
220	1	0	0	0	0	1	0	0	0	1
230	1	0	0	2	3	1	3	2	0	4
240	2	1	2	3	4	8	8	9	10	10
250	10	8	7	18	17	16	27	20	15	22
260	18	18	20	26	15	37	40	31	47	33
270	48	41	50	52	51	49	66	55	62	80
280	71	68	70	67	74	73	87	95	78	109
290	94	120	96	121	145	143	128	147	165	164
300	193	203	241	262	254	318	328	312	357	369
310	409	470	474	509	530	606	661	667	743	759
320	768	858	920	1000	1028	1171	1247	1242	1358	1356
330	1402	1469	1555	1558	1703	1721	1771	1847	1911	1943

Table D-10. Probability Data Set 10 (Cont'd)

340	2047	2236	2151	2337	2404	2537	2695	2665	2908	2889
350	3041	3202	3342	3388	3616	3630	3772	4033	4316	4396
360	4526	4790	4845	5176	5257	5650	5691	5974	6212	6622
370	6874	7238	7403	7751	8364	8695	9052	9307	9795	10105
380	10696	11227	11692	12054	12668	13249	13862	14542	15193	15839
390	16635	17430	18157	18942	19873	20845	22000	22995	24165	25213
400	26835	28207	29986	31273	33114	35312	36572	38890	41026	43323
410	45971	48210	51494	54712	57436	61446	64762	68574	72803	76811
420	81155	85809	90192	95204	100181	105926	111197	116776	122886	129180
430	135695	141751	148123	153444	159580	165131	169891	175414	178530	183243
440	185957	189605	192077	194282	196279	198111	199787	199868	200342	201018
450	200575	200307	198635	198657	198420	197364	196720	197487	196930	199811
460	200851	202457	206805	209770	216000	221229	225779	233921	241441	250643
470	261136	270230	283332	295275	308408	324493	339412	354798	372950	389555
480	409891	429128	449271	469848	491297	514234	536537	558240	580171	604766
490	623446	645891	669694	691192	712155	733523	756652	779536	797844	822164
500	843541	864481	882983	904200	920740	936383	949145	961756	967500	976214
510	977597	973078	971789	964861	954096	942029	926910	914169	896549	875733
520	860258	841771	822378	804037	783677	765962	750212	729381	713473	694307
530	675591	658726	640893	626214	608817	594095	577896	564396	549075	535189
540	520534	509404	494558	481040	471014	455879	444638	433068	421866	409621
550	400974	386363	378457	368503	356802	348461	338479	328790	319482	310047
560	300946	291168	283130	274179	266486	258775	250148	241936	234451	227977
570	219351	211359	205168	197993	192210	185041	178402	171579	165747	160790
580	153990	147825	142535	137666	132452	127295	122058	117896	112801	108430
590	103496	99597	95161	91839	87933	84877	81057	77105	73819	71014
600	68188	64878	63051	59508	57030	54193	52493	50215	48019	45688
610	43551	41973	40098	38275	36852	35368	33588	32408	31097	29851
620	28596	27120	26326	25151	24198	23326	22291	21531	20710	19894
630	19110	18349	17659	16946	16451	15935	15205	14692	14217	13608
640	13179	12836	12351	11863	11596	11191	10545	10464	9825	9615
650	9496	8826	8569	8333	8067	7870	7487	7168	6908	6696
660	6525	6296	5946	5815	5524	5367	5265	4975	4823	4519
670	4406	4334	4117	3954	3857	3685	3603	3559	3328	3375

Table D-10. Probability Data Set 10 (Cont'd)

680	3004	2817	2959	2774	2699	2601	2453	2487	2381	2208
690	2061	2036	1937	1916	1772	1661	1645	1579	1493	1515
700	1413	1256	1306	1205	1183	1107	1103	1030	997	943
710	980	912	853	826	802	808	811	728	755	700
720	678	620	629	609	532	541	554	514	478	454
730	450	466	452	425	371	366	348	338	287	325
740	279	293	262	274	262	223	234	203	190	191
750	191	205	184	175	184	146	164	122	123	133
760	119	119	81	90	98	88	88	77	72	74
770	70	68	70	56	51	65	61	53	53	46
780	32	39	28	28	39	35	42	36	34	30
790	28	28	24	16	20	19	22	20	15	14
800	9	13	7	9	9	15	12	9	11	2
810	7	4	2	4	10	8	6	5	2	2
820	4	3	1	0	0	1	1	0	1	3
830	1	0	1	0	0	0	0	1	1	1
840	1	0	0	0	0	0	0	0	0	0
850	1	0	0	0	0	0	0	0	0	1
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-11. Probability Data Set 11

1	0	0	0	0	0	0	0	0	10	0
10	0	0	0	0	0	0	20	0	0	0
20	0	0	0	0	4	0	0	0	0	0
30	0	0	46	0	0	0	0	0	0	0
40	3	0	0	0	0	0	0	0	14	0
50	0	0	0	0	0	0	4	0	0	0
60	0	0	0	0	7	0	0	0	0	0
70	0	0	7	0	0	0	0	0	0	0
80	12	0	0	0	0	0	0	0	3	0
90	0	0	0	0	0	0	9	0	0	0
100	0	0	0	0	5	0	0	0	0	0
110	0	0	8	0	0	0	0	0	0	0
120	5	0	0	0	0	0	0	0	0	0
130	1	0	0	0	0	2	1	0	0	1
140	0	0	3	2	0	5	4	2	1	1
150	0	12	6	6	5	11	15	14	18	20
160	13	24	33	35	44	47	63	48	55	91
170	85	77	119	97	129	125	146	164	177	200
180	231	225	245	280	315	350	401	393	447	500
190	509	602	596	692	759	763	879	886	1041	1108
200	1212	1302	1379	1501	1566	1693	1785	1947	2069	2182
210	2293	2454	2502	2645	2751	2893	3139	3139	3191	3467
220	3442	3606	3657	3793	3887	3927	3807	4068	4179	4190
230	4255	4394	4421	4753	4660	4689	4806	4891	5054	5137
240	5236	5492	5646	5895	5918	6199	6345	6649	6914	7436
250	7747	8100	8546	9000	9719	10115	10973	11616	12383	13174
260	14132	15239	16427	17410	18854	20197	21758	23206	25042	26940
270	28588	30087	32622	34793	36722	39214	41340	43402	45826	48419
280	50705	53235	55653	57985	60342	63417	66286	68823	72137	74756
290	78267	81676	83764	87274	90853	94729	97450	102464	104928	108719
300	112444	116170	119630	122914	126812	130173	133442	136780	139767	142397
310	144816	147975	149918	152863	154499	156674	159062	160357	162294	163653
320	163584	164422	165775	165463	165333	165381	165802	164051	163657	162388
330	159647	159073	157336	154662	153055	150444	147781	146142	142253	139198

Table D-11. Probability Data Set 11 (Cont'd)

340	137279	134229	130377	126429	124027	121226	117290	113922	110034	107554
350	103346	100074	97209	94339	91138	87528	84500	81669	78698	75971
360	73354	70332	68091	65784	63743	61085	58993	56163	54515	52656
370	50500	48844	46736	45930	44221	42905	41567	40445	39784	38704
380	37799	37411	36535	36729	36407	36386	36012	36218	36889	36930
390	37631	38510	39428	40935	42041	43900	45741	47471	49305	51586
400	53405	56812	59529	62434	65930	68930	72297	75751	79621	84272
410	88653	93777	98073	103681	108877	114410	119139	125826	131634	137872
420	143904	151528	157384	165027	172467	179312	185999	193626	201318	208887
430	215885	223986	232503	241534	249191	259266	268832	280697	290292	300065
440	311039	320846	329763	340822	348345	357879	365989	373471	381827	388422
450	393958	401389	408130	414140	419948	424958	430643	438682	442199	448126
460	453682	457261	463979	466971	472532	477486	480813	485951	491216	498123
470	503921	510391	519196	529408	538563	551280	563278	575520	591445	605283
480	622368	640167	657958	677115	694045	715343	731994	754951	773497	793969
490	811496	834253	850973	870289	884944	902629	916628	931629	939509	953687
500	961477	968272	975972	980171	983800	987711	987514	988378	985821	983494
510	975648	968240	964454	955729	945030	934029	920606	911880	896517	882467
520	867843	853347	836927	823767	807139	792209	774414	758202	743672	727991
530	709376	697333	682724	668958	654673	639115	627381	616212	603201	591936
540	580425	569142	556484	547680	538264	529108	520337	512003	503961	495249
550	490937	478246	477072	469928	463060	459532	455069	451744	446747	441313
560	437167	433827	429410	425142	421138	417228	412162	408199	404796	400823
570	395307	391936	386017	383912	378687	373814	372399	367782	363614	360601
580	358998	354768	351912	348914	345904	343018	340218	338053	335198	332215
590	330268	327559	323592	322777	318225	316438	313152	311467	308208	305629
600	304025	301441	298592	296671	294207	292639	289726	286501	284876	282693
610	280841	278556	275395	273548	271345	268444	265918	265201	262536	261229
620	257958	255865	253980	251723	249482	248075	244976	242893	240200	239162
630	235086	234510	232250	230553	227826	225915	223493	221678	220640	217951
640	215415	214811	212706	210367	208117	206604	204664	202768	201266	200072
650	197629	195672	194339	192612	190719	188741	185920	186870	183669	181807
660	180628	179356	177347	175155	173685	172592	171023	169261	167055	165441
670	164026	162368	161735	159679	157712	157247	154348	153745	152500	150600

Table D-11. Probability Data Set 11 (Cont'd)

680	150000	148328	147557	145805	143358	142700	141503	139505	138405	137382
690	134718	134387	132380	130817	128955	128040	126647	124773	124169	122154
700	120277	119536	117627	116051	115012	113107	112005	110278	109169	108029
710	106387	104709	102216	101779	100413	98445	97158	95789	93638	92563
720	90497	90314	88639	85988	85408	84068	82756	81227	79677	78153
730	76406	75613	74455	73240	71469	70627	68880	67777	66390	64992
740	63759	62116	61341	60051	58405	57310	56238	55124	53870	53174
750	51265	50682	49214	47965	47318	46060	44999	44123	42678	41718
760	41120	39748	39225	38090	37093	36215	34986	34226	33679	32346
770	31421	30502	29777	29047	28061	27658	26570	25442	24607	24024
780	22992	22020	21189	20676	19543	18991	18366	17623	16694	16041
790	15393	14363	13834	13309	12659	11875	11402	10716	10281	9631
800	9130	8608	8307	7505	7186	6910	6326	6092	5679	5265
810	4943	4688	4255	3976	3736	3470	3214	3001	2730	2485
820	2247	2125	1916	1761	1642	1438	1335	1187	1012	948
830	869	726	659	575	581	425	407	339	302	254
840	235	224	191	175	138	135	93	106	85	83
850	69	69	42	51	44	39	41	38	24	29
860	20	24	9	16	14	8	14	11	11	8
870	10	9	3	5	9	4	3	3	2	0
880	2	0	0	0	1	0	2	0	1	1
890	0	0	0	0	0	1	2	0	0	0
900	0	0	0	0	0	1	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-12. Probability Data Set 12

1	0	0	0	0	0	0	0	0	10	0
10	0	0	0	0	0	0	12	0	0	0
20	0	0	0	0	3	0	0	0	0	0
30	0	0	26	0	0	0	0	0	0	0
40	5	0	0	0	0	0	0	0	6	0
50	0	0	0	0	0	0	8	0	0	0
60	0	0	0	0	2	0	0	0	0	0
70	0	0	1	0	0	0	0	0	0	1
80	4	0	0	0	0	0	0	0	2	0
90	0	0	0	0	0	0	4	0	0	0
100	0	0	0	0	3	0	0	0	0	0
110	0	0	6	0	0	0	0	0	0	0
120	3	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	1	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	1	0	0	0	0	1	0	0	0
230	0	1	0	1	1	0	0	0	0	2
240	0	2	2	3	0	2	3	1	4	2
250	5	3	4	4	5	7	19	7	7	7
260	5	5	8	6	6	12	15	9	9	7
270	16	14	13	18	18	22	15	19	17	21
280	21	21	30	24	15	37	27	35	49	41
290	48	42	30	46	43	45	38	51	50	64
300	50	54	47	57	76	69	72	61	95	99
310	88	86	101	85	114	112	120	124	135	175
320	155	185	206	211	264	256	277	314	344	418
330	453	462	531	576	687	698	836	869	990	988

Table D-12. Probability Data Set 12 (Cont'd)

340	1107	1230	1324	1485	1619	1845	1906	2092	2196	2367
350	2544	2657	2744	2981	3122	3247	3315	3517	3573	3681
360	3866	3906	4202	4209	4345	4480	4729	4837	4912	5222
370	5206	5422	5682	5770	5786	6209	6184	6336	6495	6566
380	6807	6745	7024	6948	7077	7032	7354	7349	7616	7791
390	7949	8320	8542	8726	9311	9719	10304	10821	11377	12175
400	12749	14222	15112	16159	17997	19185	21064	23117	24687	28008
410	30586	33349	37024	40742	44641	48665	53498	58167	64091	68979
420	75368	81803	89057	95656	104253	113393	121448	129482	138236	147273
430	154693	163011	169246	176370	181580	186109	188782	192691	194024	195113
440	196053	195117	193397	191848	189319	186043	182969	178167	172675	167080
450	161578	155017	148825	143022	136162	130874	125819	121716	118060	116283
460	115271	115204	117423	120558	125953	133564	141564	152143	164920	180363
470	197526	216125	237573	261256	285510	315385	345251	377792	410847	445602
480	480655	513544	548297	581415	610994	639647	664696	690485	710490	731578
490	744630	761361	775745	788271	803212	814906	828115	841556	854616	869116
500	881454	895630	906691	917841	928765	937260	941890	947629	952407	955950
510	958046	960866	965623	967028	967124	966801	964961	966714	962254	957720
520	950566	942974	930526	920091	900132	888599	869753	848466	828444	808047
530	787566	766399	747118	727675	705997	690904	672256	656113	640245	624333
540	608569	594929	579544	567842	553556	541927	529426	517645	504122	493340
550	484919	467858	461154	449971	436682	427288	416215	406333	396332	384717
560	376760	363905	354550	344536	334684	324602	314991	305040	296044	285888
570	276079	267114	258872	249262	240172	231022	222639	214516	205429	198075
580	190501	182148	175235	167349	160780	153668	146797	140191	134154	128488
590	122049	115917	110669	105623	100276	95073	89397	85396	81059	76465
600	72224	68474	64690	61963	58826	55208	52526	49770	47628	45467
610	43132	41527	39713	37659	35842	34161	32307	30886	29174	27637
620	26116	24820	23196	21702	20269	19145	17711	16545	15570	14488
630	13711	12585	11683	10866	10297	9528	9024	8251	7943	7429
640	6963	6539	6193	5987	5619	5347	5038	4746	4529	4329
650	4066	3928	3727	3695	3492	3261	3186	2984	2821	2600
660	2548	2413	2344	2236	2115	2053	2001	1914	1782	1699
670	1758	1548	1478	1448	1273	1252	1180	1113	1158	1026

Table D-12. Probability Data Set 12 (Cont'd)

680	1089	1026	876	864	776	789	780	672	669	609
690	629	636	551	513	490	434	465	403	407	404
700	349	321	301	308	292	260	266	232	260	234
710	211	184	184	179	178	144	153	142	120	109
720	102	128	123	96	93	98	87	71	71	58
730	81	69	51	78	57	40	52	56	49	44
740	45	39	41	47	35	40	36	34	30	30
750	29	22	27	23	39	25	22	23	19	16
760	20	13	16	16	12	15	19	18	19	17
770	14	15	18	13	19	21	9	9	7	11
780	9	8	13	5	10	10	12	12	8	6
790	6	10	14	9	11	9	6	4	9	6
800	9	3	7	4	8	10	13	9	11	9
810	6	11	7	7	9	8	4	1	5	4
820	6	4	7	2	1	3	2	2	2	1
830	1	0	1	2	1	0	0	1	1	1
840	0	0	0	1	0	0	0	0	0	0
850	0	0	1	0	1	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-13. Probability Data Set 13

1	0	0	0	0	0	0	0	0	3	0
10	0	0	0	0	0	0	1	0	0	0
20	0	0	0	0	2	0	0	0	0	0
30	0	0	7	0	0	0	0	0	0	0
40	1	0	0	0	0	0	0	0	3	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	2	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	1	0	0	0
100	0	0	0	0	0	0	0	0	0	0
110	0	0	1	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	1	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	0	0	0	0	0	0	0	0
280	0	0	0	0	0	0	0	0	0	0
290	0	0	0	0	0	0	0	0	0	0
300	0	0	1	0	1	0	0	0	0	1
310	1	5	15	19	30	38	62	78	109	147
320	166	214	259	355	439	504	673	808	986	1165
330	1448	1671	2070	2275	2736	3238	3781	4258	5061	6022

Table D-13. Probability Data Set 13 (Cont'd)

340	6768	7856	9163	10617	12364	14240	16563	18632	20708	22782
350	25016	26945	29148	31398	33304	35615	37300	39278	40882	42237
360	43478	44180	44854	45103	45735	45512	45220	44583	43837	42575
370	41532	40153	38168	36828	35070	33573	31410	29113	27029	24744
380	22392	20440	18281	16353	14541	13195	11967	10670	9559	8531
390	7915	6980	6373	5919	5289	4904	4422	4043	3606	3207
400	2823	2543	2281	2100	1819	1613	1411	1295	1163	1059
410	983	940	880	800	839	819	771	755	742	734
420	733	773	747	801	787	899	887	977	1031	1141
430	1232	1291	1526	1574	1784	1985	2196	2554	2922	3228
440	3751	4025	4577	5221	5744	6346	7069	7714	8659	9650
450	10434	11514	12839	13742	14987	16123	17465	18400	19611	20936
460	21882	23142	24178	25561	26581	27391	28342	29597	30456	31106
470	31900	32713	33046	33719	34123	34598	35036	35009	36058	36412
480	36428	36781	37041	38158	38437	38855	39529	40149	41122	41616
490	42305	43276	44313	45663	47036	48493	50992	54046	57067	60342
500	64057	68183	72089	76540	79799	83294	86401	88640	90932	92946
510	94529	96417	97584	98783	98846	100306	101399	101874	102516	102709
520	102636	101976	100621	100215	99256	98276	98233	97531	97632	98675
530	98648	99602	100006	100106	98948	98547	96761	95728	93573	92231
540	90333	90021	88619	88164	87838	87104	86578	85973	83550	81461
550	78932	74912	70893	67039	62642	58408	54660	52211	49145	47314
560	44956	43899	42991	42318	41481	41351	40542	40505	40550	40683
570	40220	40332	40192	40250	40180	40042	39963	39763	39792	39865
580	39220	39735	39494	39298	39176	38796	38548	38360	38030	37709
590	37215	36514	36627	36069	35543	35199	34933	35323	34695	34409
600	34020	33826	33423	33309	32852	32706	32575	32280	31812	31539
610	30937	31082	30630	30008	29515	29339	28791	28310	28091	27274
620	27401	26588	26002	25601	25093	24958	24380	23870	23425	23088
630	22654	22278	21970	21838	21733	21515	21380	21334	21443	21497
640	21520	21082	21327	21493	21603	21570	21499	21702	22039	21916
650	22095	22278	22473	22605	23033	23286	23218	23592	23801	24578
660	24307	24861	25228	25795	26555	27068	27940	28350	28959	29397
670	29935	30430	31114	31308	31649	31723	31753	31722	32077	31754

Table D-13. Probability Data Set 13 (Cont'd)

680	31903	31673	31755	31233	31461	31194	30645	30330	29963	29645
690	28478	27984	27306	26608	26100	25494	24868	24134	23858	23689
700	22979	22448	22426	22215	22002	22002	21829	21761	21414	21394
710	21447	21046	21013	21220	20896	21128	21146	20815	21098	21051
720	21023	20838	20978	20953	21119	21028	21019	20994	21032	21558
730	20966	21067	20962	21074	21123	21069	21127	20961	21418	21426
740	21648	21584	21789	21556	21739	21429	21770	22155	22110	22460
750	22427	22432	22663	22802	23216	23471	23202	23679	23557	23703
760	24282	24697	24844	24854	25450	25612	25755	26213	26398	26635
770	26784	27121	27308	27684	26990	27421	27494	27748	27546	27663
780	27504	27610	27541	27456	27889	27953	27741	28293	28549	28657
790	29442	29339	29876	30821	31336	31710	32022	33468	34498	35468
800	37413	39483	41841	45098	48448	52018	55739	59049	61972	64556
810	66674	69002	69732	69703	69117	69223	68175	67826	67352	67317
820	66420	66336	65841	64565	63318	61754	58451	55133	52237	47976
830	44380	40382	37060	33907	31106	29014	27084	25834	24520	23243
840	22896	22152	21758	21067	20930	20307	20337	19995	19997	19869
850	19396	19270	18917	18528	18483	18166	18019	17785	17272	17293
860	16857	16723	16478	16288	16381	16432	16451	16806	16991	17319
870	17876	18343	18930	19574	20273	20911	21953	22733	23924	24672
880	25906	26818	28305	29961	30957	32612	34237	35092	35881	36976
890	36507	36283	36564	35524	34876	33681	32586	31803	30854	29574
900	28286	27395	25917	24337	22469	20546	18579	16304	13947	11522
910	9366	7666	5934	4666	3528	2638	1931	1419	998	638
920	418	260	149	73	44	21	11	1	1	1
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-14. Probability Data Set 14

1	0	0	0	0	0	0	0	0	2	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	10	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	5	0
50	0	0	0	0	0	0	2	0	0	0
60	0	0	0	0	2	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0
80	1	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	4	0	0	0
100	0	0	0	0	2	0	0	0	0	0
110	0	0	3	0	0	0	0	0	0	0
120	2	0	0	0	0	0	0	0	0	1
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	1	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	2	0	0	0
260	0	0	0	0	0	0	0	0	0	1
270	1	0	7	4	14	22	45	32	71	66
280	93	116	124	169	151	199	226	276	305	343
290	416	485	551	661	826	1054	1211	1472	1777	2076
300	2318	2739	3119	3436	3741	4156	4443	4636	4850	5168
310	5445	5837	6073	6422	6478	6855	6837	7337	7452	7677
320	7971	8259	8158	8531	8936	9078	9520	9460	9798	10072
330	10515	10751	11375	11796	12215	12810	13600	13885	14815	15608

Table D-14. Probability Data Set 14 (Cont'd)

340	16306	17001	17860	18645	19420	20349	20804	21855	22438	23260
350	23835	24394	24997	25306	25956	26513	26758	27505	27928	28246
360	28431	28526	28828	28900	28776	28732	28684	28803	28445	28412
370	28124	27754	27355	27388	27262	26533	26289	26010	25862	25401
380	24989	24671	24262	23758	23462	23257	22869	22103	22547	22096
390	21993	21460	21347	21193	20835	21030	20952	20670	20775	21130
400	20917	21099	21151	21439	21535	21517	22005	22099	22191	22615
410	23231	23598	23612	24030	24277	24554	24995	25665	25886	26326
420	26798	27503	27977	28802	29292	29482	30235	31094	31628	32333
430	32458	33186	33385	34057	34436	34632	35089	35662	35988	36597
440	37054	37656	37802	38449	38581	39237	39169	39457	39702	40167
450	40209	40284	40502	40441	41109	41634	42180	42750	43791	44969
460	45282	46900	48556	49864	51199	52574	53526	54881	55460	56711
470	57197	57676	58808	59847	60728	61657	62842	64752	65756	66263
480	67266	67998	67562	68390	67785	67093	66568	65742	65063	64672
490	64867	66050	67093	68008	69309	72592	74080	77358	79989	83084
500	86541	90473	93662	98182	103157	107983	112968	118696	122992	127020
510	130262	134418	135828	138294	139479	139128	138414	137429	135716	134129
520	131600	129247	126542	123181	119392	115321	110880	105788	100475	94099
530	88373	81656	76317	70671	64591	59976	54818	51513	48815	46093
540	44686	43138	41582	40851	40359	39198	38455	37383	36711	35834
550	35167	34248	33396	32962	32269	31887	31291	31401	30937	30665
560	30454	29927	30010	29944	29572	29461	29011	28877	28281	28412
570	27979	28140	27462	27449	27168	26958	26545	26475	26333	26506
580	26841	26469	26475	26980	27318	27202	27764	28143	28702	29359
590	29158	30055	30376	30971	31745	32430	33407	34969	36710	39063
600	40926	43822	46494	50580	53339	56676	59720	62559	66017	68629
610	71001	73280	74426	76683	77571	78302	79265	80177	80309	80592
620	80640	81372	81321	81414	80613	80321	79213	77744	76441	74659
630	72204	69466	67205	64705	61660	59438	56038	54274	52573	50044
640	48560	47134	45757	44563	43779	42149	41564	40008	38735	37102
650	35178	33860	31926	30339	28861	27050	25634	24663	23130	22544
660	21518	21124	21023	20789	20835	20626	20730	20642	20792	20595
670	20623	20777	21058	21255	21153	21839	21459	21909	21875	22119

Table D-14. Probability Data Set 14 (Cont'd)

680	21965	22635	22715	22787	23005	23059	23106	23288	23351	22998
690	23068	22874	23082	22659	22650	22230	22355	21976	21895	21481
700	21094	20753	20524	20272	20009	19634	19413	19082	18554	18607
710	18288	18045	17663	17509	17256	17353	17290	17488	17170	17644
720	17504	17748	18104	18059	18098	18282	18261	18548	18523	18595
730	19262	19073	19351	19275	19658	19714	20002	20346	20471	20660
740	20790	21262	21589	21659	21942	21728	22342	22877	23189	23691
750	24201	24429	24712	25396	25884	26475	26829	27066	27571	28171
760	28264	28781	28731	29272	29647	29662	29558	29312	29777	29381
770	29403	29229	29011	28198	27991	27645	27122	26204	25821	24781
780	24148	23295	22924	21740	21103	20191	19205	18249	17531	16606
790	15993	15109	14588	13717	12871	12498	11613	11486	10857	10688
800	10403	9857	9415	9384	9093	8663	8566	8361	8151	7886
810	7516	7249	7091	6673	6711	6312	5996	5779	5497	5248
820	4787	4561	4443	4015	3629	3270	2922	2605	2221	1821
830	1501	1186	987	738	487	367	224	129	58	31
840	18	8	1	1	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	1	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-15. Probability Data Set 15

1	0	0	0	0	0	0	0	0	16	0
10	0	0	0	0	0	0	8	0	0	0
20	0	0	0	0	4	0	0	0	0	0
30	0	0	42	0	0	0	0	0	0	0
40	6	0	0	0	0	0	0	0	8	0
50	0	0	0	0	0	0	7	0	0	0
60	0	0	0	0	4	0	0	0	0	0
70	0	0	9	0	0	0	0	0	0	0
80	4	0	0	0	0	0	0	0	2	0
90	0	0	0	0	0	0	4	0	0	0
100	0	0	0	0	7	0	0	0	0	0
110	0	0	9	0	0	0	0	0	0	0
120	5	0	0	0	0	0	0	0	1	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	1	2	0	0	0	0	0	1	1
190	1	0	1	1	1	1	1	1	2	1
200	2	2	0	1	0	2	0	0	0	0
210	0	0	1	0	0	0	0	0	1	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	1	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	0	0	3	0	0	0
260	0	0	0	0	0	0	0	0	0	0
270	0	0	1	0	0	0	0	0	0	0
280	1	0	0	0	0	0	0	0	4	0
290	0	0	0	0	0	0	1	0	0	0
300	0	0	0	0	0	0	0	0	0	0
310	0	0	0	0	0	0	0	0	0	0
320	1	0	0	0	0	0	0	0	0	0
330	1	0	1	1	1	0	1	1	3	4

Table D-15. Probability Data Set 15 (Cont'd)

340	2	6	5	5	7	9	14	22	40	30
350	43	60	86	116	142	180	250	301	448	508
360	619	871	917	1230	1584	1862	2305	2659	3287	3822
370	4369	5090	5909	7016	8118	9257	10662	12010	13783	15628
380	17703	20134	22590	24632	27700	30442	33825	36876	40125	43400
390	46753	49815	53334	56544	59751	63509	65652	68474	71358	73512
400	75372	78645	80430	82486	84721	86496	88791	91195	93486	95653
410	98294	101077	103908	106497	109612	112834	115175	117374	119805	122107
420	123671	125533	126397	126120	127088	127864	127147	128030	127637	127560
430	127222	127302	127975	128041	129547	131867	133002	135262	136955	140226
440	143056	146904	149704	153651	157584	161200	165222	168557	172571	177546
450	179993	184350	187831	190535	193932	198068	199541	202955	204582	207197
460	208963	211444	213517	215358	217879	219875	223570	228188	232159	236104
470	242102	249689	256403	263462	273783	283774	293310	303435	315450	325779
480	338989	349902	361038	374057	385709	399119	410497	423765	436754	451817
490	465280	481185	496888	514682	531405	551192	571729	592544	613400	633665
500	658652	682374	704624	726704	752666	776461	797348	818534	838057	858795
510	878443	894189	913357	926060	939145	951708	961075	970915	975927	981132
520	985398	988745	988547	990174	987992	984329	977940	970685	962205	951154
530	936409	923144	906542	887456	868975	847769	826379	803510	780848	754833
540	732669	710276	684071	662753	642913	620698	600160	582106	563545	547592
550	534413	513674	505841	491821	478034	468359	456795	450101	439458	430827
560	423377	418785	408896	403244	395712	391044	383124	376775	371584	365972
570	359029	353461	347195	341133	334584	328668	321719	316787	311095	304749
580	299284	293684	289065	281911	276161	271156	265243	260341	254021	249068
590	244228	237965	233274	228492	222929	217938	212614	207639	202886	197568
600	192347	188016	182396	178279	173335	168240	163208	158597	153364	148774
610	143649	139089	134502	129518	123979	120133	115321	109930	105624	101860
620	97704	93491	89414	85288	81100	78056	74023	70396	67186	63901
630	60770	57603	54698	51846	49352	46692	43691	41339	39132	37068
640	34959	32865	30610	28747	27239	25397	23827	22434	20582	19299
650	17978	16659	15643	14519	13549	12731	11648	10863	10190	9635
660	8836	8585	8242	8099	8351	8838	9700	10880	12222	14288
670	16400	18951	22096	25639	29335	33420	36840	40781	43819	47057

Table D-15. Probability Data Set 15 (Cont'd)

680	49635	51996	53705	54457	54296	53523	51739	49633	47306	45080
690	41863	38651	35698	32592	29959	27649	25491	23344	21792	20695
700	20138	19164	18284	17722	17097	16346	15550	14724	13535	12598
710	11182	9987	8987	7528	6350	5349	4142	3257	2593	1901
720	1391	1022	650	460	276	121	63	38	7	1
730	0	0	0	0	0	0	0	0	0	0
740	0	0	0	0	0	0	0	0	0	0
750	0	0	0	0	0	0	0	0	0	0
760	0	0	0	0	0	0	0	0	0	0
770	0	0	0	0	0	0	0	0	0	0
780	0	0	0	0	0	0	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-16. Probability Data Set 16

1	0	0	0	0	0	0	0	0	8	0
10	0	0	0	0	0	0	7	0	0	0
20	0	0	0	0	3	0	0	0	0	0
30	0	0	37	0	0	0	0	0	0	0
40	8	0	0	0	0	0	0	0	3	0
50	0	0	0	0	0	0	5	0	0	0
60	0	0	0	0	4	0	0	0	0	0
70	0	0	4	0	0	0	0	0	0	0
80	9	0	0	0	0	0	0	0	3	0
90	0	0	0	0	0	0	13	0	0	0
100	0	0	0	0	7	0	0	0	0	0
110	0	0	12	0	0	0	0	0	0	0
120	5	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	1	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	1	1	0	0	0	0	0	0	0
240	1	0	0	1	0	0	0	1	2	3
250	2	2	0	4	3	2	18	2	4	4
260	5	6	7	9	11	5	13	13	8	7
270	9	14	21	12	26	24	22	16	15	18
280	23	20	30	19	20	32	33	45	37	43
290	39	42	46	57	49	59	60	72	75	81
300	82	97	110	109	94	116	119	139	159	140
310	181	172	186	170	192	212	223	277	264	277
320	339	342	369	415	450	474	515	557	590	644
330	694	776	800	819	881	973	989	1106	1183	1235

Table D-16. Probability Data Set 16 (Cont'd)

340	1285	1384	1472	1607	1656	1773	1849	1939	2052	2116
350	2237	2295	2421	2588	2667	2792	2937	3014	3211	3285
360	3513	3595	3622	3850	4033	3970	4318	4406	4684	4815
370	5026	5058	5244	5543	5829	6034	6280	6582	6690	6997
380	7420	8052	8274	8859	9455	10186	10938	11489	12355	13431
390	14344	15622	16994	17881	19719	21144	23166	25463	27274	29384
400	31751	34667	37145	39767	42862	45508	48896	52012	55735	59587
410	63055	67066	70532	74964	79028	83059	86488	91646	95551	100026
420	104113	108956	113221	118293	121970	126904	132725	137324	141869	146798
430	153701	157524	163537	169072	174424	180734	186808	192683	199977	207296
440	213289	221688	227473	236185	243284	252047	260638	268829	277557	287293
450	296205	307098	315530	326325	336984	347636	359686	369705	381566	394584
460	407140	420973	433864	448621	462992	476874	492732	509538	525867	542097
470	557992	576240	593376	612464	627943	648220	665832	686192	704375	722195
480	741893	759190	778100	794760	812223	827924	844446	858788	874067	886240
490	898502	911721	919971	928777	938908	945961	951237	959449	959952	960840
500	965928	965269	959810	959309	957179	953185	947166	939958	929008	925202
510	913048	902923	893517	882267	869043	856952	842944	833309	818321	801664
520	789889	777698	762155	750148	733902	723217	710501	694027	680194	670684
530	655376	642058	630685	617217	606792	593726	583633	572858	560576	550742
540	539879	529747	517934	507555	500622	489852	479474	470986	460058	451020
550	443699	429351	424207	415822	404366	395517	386019	378327	369813	360717
560	352026	343755	334295	325851	317411	308117	299342	291673	282366	273844
570	264976	256843	248205	239566	231228	223070	214751	207009	197339	190397
580	182865	175172	166802	158973	152060	144647	138014	130881	124733	118496
590	111848	105420	99738	94345	88559	82940	78347	73170	68894	63938
600	59966	56301	52180	48367	45366	42361	39547	36730	34203	31624
610	29552	27055	25172	23214	21768	20220	18758	17656	16237	15180
620	14160	13219	12054	11398	10567	9917	9116	8824	8214	7527
630	7138	6753	6256	5975	5537	5184	4988	4592	4278	4080
640	3850	3670	3461	3302	3133	2830	2723	2499	2384	2311
650	2078	1940	1828	1743	1683	1567	1467	1330	1316	1196
660	1118	1107	978	947	957	854	784	747	747	706
670	655	666	600	513	558	498	413	393	433	442

Table D-16. Probability Data Set 16 (Cont'd)

680	390	375	359	330	330	290	288	292	265	265
690	246	203	266	209	221	185	202	176	144	157
700	154	163	150	141	160	136	115	124	113	116
710	127	99	89	100	82	85	75	84	84	83
720	63	78	63	71	69	59	56	51	55	38
730	47	38	42	40	40	40	26	27	32	29
740	24	24	22	14	26	12	7	10	14	15
750	10	12	12	10	8	17	10	6	6	5
760	8	5	3	2	1	3	2	3	2	0
770	2	0	1	2	2	1	0	0	0	0
780	0	1	0	0	0	1	0	0	0	0
790	1	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-17. Probability Data Set 17

1	0	0	0	0	0	0	0	0	19	0
10	0	0	0	0	0	0	18	0	0	0
20	0	0	0	0	9	0	0	0	0	0
30	0	0	65	0	0	0	0	0	0	0
40	25	0	0	0	0	0	0	0	19	0
50	0	0	0	0	0	0	11	0	0	0
60	0	0	0	0	15	0	0	0	0	0
70	0	0	12	0	0	0	0	0	0	0
80	16	0	0	0	0	0	0	0	5	0
90	0	0	0	0	0	0	17	0	0	0
100	0	0	0	1	13	0	0	0	0	0
110	1	1	6	1	0	1	0	1	4	3
120	9	5	7	6	5	6	16	4	12	21
130	15	24	26	30	25	41	41	56	76	67
140	88	83	115	138	150	159	161	239	221	285
150	310	319	386	409	485	536	603	643	722	762
160	884	1028	1117	1274	1351	1492	1653	1874	2018	2283
170	2565	2883	3130	3560	3918	4388	4866	5444	5911	6568
180	7294	8090	8805	9776	10647	11854	12938	14279	15479	16933
190	18355	20016	21792	24072	25329	27801	30417	32507	35459	37476
200	40460	43602	46647	49896	53065	56560	59801	63848	67762	71762
210	75632	80048	84067	88710	93161	97741	102111	106705	110880	116030
220	121244	126168	130664	135183	139766	144881	149971	155193	158528	163799
230	168685	172608	177109	180929	184833	188214	191257	195617	198801	201958
240	204517	207273	209326	212262	213429	215925	217409	217532	218180	218918
250	218607	218505	219144	218350	217241	216120	214513	213951	210704	208955
260	206863	203864	200900	199366	195388	192820	189866	186149	182199	178652
270	175712	170887	167128	163892	159131	155861	151911	148314	144400	141302
280	137161	133567	129733	126659	123924	120791	117496	114033	112054	109556
290	106370	104549	101982	99639	98187	96272	94312	92811	91676	90155
300	89919	88616	87890	86556	86534	86261	86100	86032	86594	86592
310	87283	87035	87603	89280	90119	90191	91334	93444	94631	95741
320	97696	99327	101592	104109	106324	108291	111237	113982	117151	119803
330	122735	126159	129497	132938	137290	140513	144801	148785	153098	157547

Table D-17. Probability Data Set 17 (Cont'd)

340	162209	167369	172070	177608	182176	189024	193942	200151	204902	211876
350	217292	223543	229805	236861	243054	249394	256719	262383	269573	277690
360	285482	291878	299757	305620	314207	320105	328319	333953	341236	348138
370	354553	361628	367674	375068	381231	387303	392515	398935	403736	409144
380	414179	417713	423820	426801	431794	435038	438262	440239	443906	444695
390	445218	448189	449572	449841	448887	449268	449508	449053	447777	447497
400	445473	443732	442488	437803	439239	436514	433671	431747	428609	426434
410	422585	420996	418090	417091	415214	412722	410329	410033	407334	404983
420	404169	403649	403409	402427	402110	403358	400659	402703	402500	404017
430	403845	404742	406872	409972	410929	413082	415398	418133	420346	423986
440	428241	431196	434941	438949	443263	447421	452945	456039	462053	467062
450	472231	477218	482931	488727	495290	501609	508118	514743	521396	529340
460	536671	543469	550504	558874	567965	575093	584117	591351	599198	609677
470	616404	626381	635304	644800	653367	663108	672422	683579	692204	701305
480	710771	720954	729759	742640	748961	760802	770332	778620	787659	798137
490	806413	814565	823265	832116	839082	848154	857024	864370	869455	880084
500	884446	891039	896990	902717	909608	914746	920493	924615	927889	933084
510	936727	938285	944572	947072	949465	952716	954013	957623	958881	960104
520	964100	964742	966310	970210	968368	973938	972400	973357	974977	975518
530	974205	975916	977078	979081	979306	976100	976354	978256	975756	976329
540	974890	977358	971577	971776	972602	971662	969184	969790	963758	962953
550	964024	951713	955517	951952	946062	945324	938337	937409	931196	929031
560	922106	916176	908974	905308	896984	894276	886652	879307	871115	864198
570	855009	848666	841286	830510	821590	811450	802582	792030	781517	772175
580	760859	751964	739507	729736	718729	707369	694136	684762	671359	660481
590	649190	635549	625372	612789	600182	587873	575727	564310	552548	539673
600	528244	518770	504026	493726	481183	471911	460144	448120	438148	429826
610	416490	408345	396927	386850	376497	367559	358722	349410	338451	330552
620	320573	313188	304169	294900	288049	278817	271294	264023	255342	248568
630	241745	233196	227399	221083	214530	207744	201242	195084	188787	182346
640	175949	170842	164813	159555	153992	148939	143456	138764	133410	129769
650	124458	119606	114736	110835	106787	102415	97630	94008	90445	87098
660	82971	79252	75704	73272	69856	66076	63735	60846	57726	54600
670	52809	49951	47838	45118	43053	41124	38557	36962	35166	33319

Table D-17. Probability Data Set 17 (Cont'd)

680	31482	29967	28281	26808	25674	24019	22362	21525	20046	19025
690	17872	16982	16189	15273	14224	13578	12770	12193	11256	10821
700	10150	9792	9398	8664	8136	7705	7358	6647	6346	6129
710	5999	5524	5134	4947	4635	4483	4217	3929	3730	3677
720	3384	3238	3083	2796	2729	2587	2517	2365	2234	2114
730	1938	1866	1837	1690	1673	1514	1385	1306	1304	1189
740	1103	1060	1040	921	879	841	735	720	652	610
750	609	555	553	470	441	395	370	359	344	314
760	290	269	218	227	190	185	160	147	151	119
770	129	118	106	94	79	78	56	75	46	51
780	46	30	32	29	36	28	16	17	19	20
790	17	7	13	12	7	6	7	4	5	5
800	4	2	5	2	4	4	2	1	1	0
810	1	0	1	1	0	0	0	0	0	1
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-18. Probability Data Set 18

1	0	0	0	0	0	0	0	0	8	0
10	0	0	0	0	0	0	4	0	0	0
20	0	0	0	0	4	0	0	0	0	0
30	0	0	35	0	0	0	0	0	0	0
40	3	0	0	0	0	0	0	0	18	0
50	0	0	0	0	0	0	5	0	0	0
60	0	0	0	0	5	0	0	0	0	0
70	0	0	6	0	0	0	0	0	0	0
80	6	0	0	0	0	0	0	0	4	0
90	0	0	0	0	0	0	6	0	0	0
100	0	0	0	0	10	0	0	0	0	0
110	0	0	6	1	0	0	0	0	0	0
120	9	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	1	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	1	0	0	0	0	0
190	0	0	0	0	0	1	0	0	0	0
200	0	1	0	0	0	0	0	0	0	0
210	0	0	0	1	0	0	0	0	0	0
220	1	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	1	0	0
250	1	0	0	2	1	3	14	2	0	1
260	1	1	3	1	1	2	3	3	5	6
270	3	1	7	5	6	4	10	9	3	4
280	8	8	11	10	15	11	14	14	19	22
290	20	15	18	23	20	25	24	24	38	38
300	33	34	31	39	38	49	51	53	52	66
310	52	81	77	79	81	70	107	96	107	125
320	148	129	133	155	163	174	193	179	213	252
330	257	290	299	323	333	391	440	464	500	549

Table D-18. Probability Data Set 18 (Cont'd)

340	590	640	691	779	900	924	1022	1129	1249	1323
350	1442	1563	1717	1844	1934	2185	2383	2567	2704	2958
360	3079	3431	3709	3959	4199	4506	4883	5046	5606	6164
370	6150	6752	7014	7509	7935	8636	9019	9513	10036	10757
380	11201	12140	12485	13318	14086	14722	15419	16533	17731	17993
390	19139	20061	21224	22316	23545	24590	25983	27065	28686	29760
400	31445	33355	34869	36916	38527	40847	42720	45541	47319	50194
410	52298	55650	59127	61769	64870	68353	71943	76173	79519	83640
420	88525	92567	97100	102452	106893	111104	115883	121042	125713	131802
430	137556	141992	147224	153770	157981	162911	168328	173968	177567	182197
440	188371	192450	197068	201842	205863	210020	213863	218350	221992	225756
450	229572	233554	237118	240826	245308	248493	253345	258318	262460	268542
460	274046	279680	284740	291988	299256	308512	315526	324586	333710	344110
470	355482	366476	379158	390986	405298	419733	434531	450682	466015	481914
480	500016	517893	536314	553732	573888	592284	611682	629709	651374	671529
490	689639	711016	729418	747427	766441	785138	802593	821193	836274	853351
500	869722	886003	898221	911379	924057	934658	944913	956726	964309	972382
510	975911	981090	984550	987187	985183	988026	985819	984183	980073	975719
520	969734	964355	956662	949769	940443	930378	920314	906370	894981	881909
530	868772	856307	840751	827381	811136	797162	779571	765242	750267	736016
540	717756	705955	686056	675885	659105	644787	629830	614187	598992	586799
550	573785	554109	546344	535009	519930	507972	494217	482314	470981	458969
560	448613	437720	425932	414737	404852	395248	384080	374826	364624	355039
570	345881	335407	327695	318674	309172	299750	291502	282849	275379	268250
580	260315	252342	245100	236152	229870	223860	215928	209323	202442	196842
590	189493	184396	176573	172103	165471	160153	154208	148686	144304	138366
600	133032	129198	124115	119768	115206	110961	106901	102392	98351	94877
610	91108	87395	84131	80178	76874	73390	70442	67821	65142	62074
620	59962	57045	54665	52116	49766	47747	45534	43860	41802	40287
630	38426	36190	34823	33649	31720	30870	29097	28092	26964	25411
640	24446	23607	22409	21596	20163	19658	18805	17976	17247	16076
650	15640	14998	14130	13755	13192	12872	12061	11510	10962	10540
660	10153	9645	9440	8891	8715	8103	7941	7663	7243	7063
670	6761	6556	6116	5992	5647	5631	5250	5161	4938	4726

Table D-18. Probability Data Set 18 (Cont'd)

680	4510	4346	4211	3956	3907	3721	3541	3496	3386	3211
690	3107	3008	2893	2711	2619	2493	2389	2302	2356	2200
700	2070	2015	1889	1795	1758	1715	1550	1466	1497	1426
710	1304	1365	1228	1182	1179	1032	1016	985	1000	926
720	843	845	803	750	729	700	688	653	590	590
730	578	528	534	477	484	442	435	397	398	361
740	364	349	309	280	314	290	270	245	245	221
750	221	173	178	183	152	152	168	145	130	122
760	123	124	95	95	82	82	75	75	64	54
770	65	61	66	70	57	53	45	39	29	27
780	35	32	31	23	19	15	20	20	20	27
790	18	11	15	11	10	11	13	8	5	7
800	4	3	4	2	4	1	3	2	5	2
810	2	2	2	0	2	1	1	2	1	1
820	0	0	0	0	1	1	0	0	0	0
830	0	0	0	0	1	0	0	0	0	0
840	1	0	0	0	0	0	0	0	1	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	1	0	0	0	0	0	0
880	1	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	1	0	0
900	0	0	0	1	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	1	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-19. Probability Data Set 19

1	0	0	0	0	0	0	0	0	3	0
10	0	0	0	0	0	0	1	0	0	0
20	0	0	0	0	2	0	0	0	0	0
30	0	0	8	0	0	0	0	0	0	0
40	2	0	0	0	0	0	0	0	1	0
50	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	4	0	0	0	0	0
70	0	0	2	0	0	0	0	0	0	0
80	0	0	1	0	0	1	2	2	5	6
90	5	9	13	9	16	36	33	41	52	58
100	93	110	123	153	192	204	261	305	339	425
110	489	600	679	859	1010	1198	1403	1521	1809	2000
120	2347	2701	2806	3204	3530	3909	4230	4565	4746	5169
130	5426	5483	5949	6165	6422	6777	6966	7044	7309	7405
140	7688	7677	7806	8012	8144	8232	8359	8402	8637	8772
150	8817	9038	9252	9284	9429	9561	9683	9953	9916	10134
160	10412	10627	10626	10800	10995	11250	11349	11530	11836	11979
170	12176	12397	12490	13069	13266	13350	13698	14118	14284	14643
180	14954	15228	15842	15939	16387	16439	17120	17377	17453	17554
190	17869	18081	17979	17943	18139	17899	17741	17744	17480	17232
200	16993	16575	16572	16214	15875	15572	15259	15228	14663	14498
210	14123	13756	13720	13523	13074	12700	12758	12640	12375	12271
220	12128	11969	11641	11469	11351	11006	10805	10912	10635	10676
230	10344	10212	10127	10122	10029	9621	9587	9431	9409	9245
240	9229	8980	9012	8878	8692	8523	8571	8515	8175	8319
250	8196	8017	8032	7709	7600	7376	7211	7198	6872	6621
260	6383	6282	6098	5955	5874	5853	5841	5825	6038	6200
270	6136	6555	6901	7332	7650	8022	8374	9025	9584	9993
280	10808	11211	11837	12198	12630	13275	13704	13898	14367	14885
290	15140	15413	15518	15974	15953	16537	16468	17128	17019	17396
300	17287	17773	18153	18067	18299	18718	18903	19271	19697	20120
310	20152	20378	20829	21257	21502	22044	22219	22550	23069	23453
320	23951	24284	24742	25148	25702	26191	26725	27076	27562	28398
330	28352	29521	30215	30693	31360	32080	33134	33593	33993	34795

Table D-19. Probability Data Set 19 (Cont'd)

340	35488	36055	36436	36912	37061	36987	36884	37561	37218	37111
350	36618	36264	35675	35328	34830	34227	33409	33222	32333	31725
360	31549	31081	30095	29631	29571	28917	28648	28129	27988	27493
370	27465	27110	26563	26727	26268	26185	26139	26184	25883	25946
380	25551	25343	25475	25101	25289	25084	25081	25082	24776	24621
390	24762	24489	24305	24218	24098	24375	24099	23983	23454	23528
400	23313	23422	23084	22745	22205	22244	21663	21473	21265	20569
410	20293	19525	19341	18776	18117	17569	17248	16614	16211	16036
420	15575	15347	14911	14755	14459	14507	14330	14215	14113	14161
430	14275	14189	14446	14449	14578	14582	14640	14825	14848	15089
440	15141	15281	15412	15735	15523	15814	15855	15877	16320	16009
450	16187	16333	16323	16524	16508	16652	17132	17031	16961	17095
460	17265	17236	17468	17544	17486	17977	17942	18230	18059	18258
470	18431	18454	18546	18813	18868	19198	19348	19060	19456	19406
480	19505	20020	19729	20158	20164	20373	20519	20845	21010	21161
490	21362	21649	21737	22077	22471	22480	22953	23633	23446	23220
500	23995	24151	24699	25384	25477	25958	25956	26733	26877	27433
510	28139	28331	28525	29223	29585	29933	30215	30891	31597	31896
520	32616	33362	33862	34108	35353	35564	36103	36668	37292	37936
530	38615	39564	39763	40419	41683	42001	42431	43552	44289	44725
540	45650	46195	46256	47660	48244	49060	49659	50953	51243	52116
550	52901	53116	54170	55511	55733	57066	57060	58369	58713	59971
560	60357	61640	62266	63161	63757	64468	65016	66150	66778	67609
570	67847	69202	69559	70334	70910	71633	72673	73060	73891	74837
580	75598	75786	76589	76776	77709	78237	78849	79637	79590	80445
590	80779	81543	82158	82156	82423	82624	83328	83599	83988	84160
600	84417	85043	84988	85545	85497	85823	85341	85599	85966	86013
610	85976	85922	85017	85683	84928	85486	84973	84970	84610	84762
620	83956	84491	83676	84246	83657	82863	82858	82569	81794	81474
630	81697	81139	80101	80336	79722	78902	78366	78341	77280	76879
640	76137	75648	75117	74089	74308	72756	72649	71423	70398	70427
650	69279	68559	67794	67303	66318	65619	64695	63822	62773	62168
660	61274	60117	59449	58517	58121	56752	55786	54748	54186	53264
670	52009	50809	50089	48916	48095	47387	46069	45314	44421	43050

Table D-19. Probability Data Set 19 (Cont'd)

680	42470	41542	40617	39745	38760	37898	36846	36054	34842	34211
690	33708	32344	31420	31100	30199	29416	28494	27326	26781	26165
700	25730	24853	23966	23238	22447	21773	21047	20518	19807	19243
710	18574	17896	17232	16833	16108	15684	14768	14383	13756	13430
720	13035	12512	11936	11238	10921	10635	9968	9490	9163	8547
730	8380	7855	7776	7066	6684	6375	6024	5794	5490	5185
740	4869	4646	4373	4043	3834	3537	3353	3204	2854	2744
750	2549	2313	2277	2017	1894	1714	1618	1415	1364	1257
760	1125	1029	937	948	771	703	670	660	513	497
770	457	394	323	320	287	249	259	185	193	163
780	128	120	116	103	74	65	68	75	47	43
790	39	29	37	20	26	21	18	10	9	14
800	8	6	6	4	3	9	4	2	2	2
810	1	0	3	0	4	1	1	0	0	0
820	0	0	0	0	0	1	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-20. Probability Data Set 20

1	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	2	0	0	0
20	0	0	0	0	1	0	0	0	0	0
30	0	0	4	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	4	0
50	0	0	0	0	0	0	3	0	0	0
60	0	0	0	0	0	0	0	0	0	0
70	0	0	1	0	0	0	0	0	0	0
80	2	0	0	0	0	0	0	0	2	0
90	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	2	0	0	0	0	0
110	0	0	2	0	0	0	0	0	0	0
120	1	0	0	0	0	0	0	1	1	0
130	0	0	0	0	0	0	1	0	0	1
140	1	1	0	0	0	1	0	0	0	1
150	1	2	0	0	0	2	1	1	1	1
160	2	1	2	1	3	2	3	0	3	1
170	4	0	5	4	3	0	2	4	1	5
180	5	7	2	6	5	6	2	4	6	8
190	0	4	8	4	3	2	6	7	8	9
200	8	6	5	9	6	4	11	10	14	14
210	11	11	15	14	13	13	18	27	21	22
220	20	17	18	20	28	24	28	36	26	37
230	41	39	44	43	31	54	44	53	49	57
240	61	70	67	75	85	79	73	69	62	92
250	87	87	101	95	107	112	116	131	130	150
260	131	160	175	164	157	164	196	192	231	252
270	208	251	246	248	247	255	270	331	337	317
280	323	323	330	358	402	418	398	437	477	457
290	495	501	486	533	498	549	556	542	566	542
300	583	654	641	642	642	657	675	740	737	759
310	799	843	797	803	866	894	961	967	1020	1058
320	1046	1053	1130	1149	1309	1313	1296	1392	1428	1505
330	1589	1652	1703	1790	2030	2047	2276	2320	2483	2625

Table D-20. Probability Data Set 20 (Cont'd)

340	2858	2976	3276	3443	3526	3899	4076	4361	4601	4876
350	5150	5438	5593	5999	6174	6361	6651	7056	7261	7400
360	7523	8134	8116	8445	8539	8915	9084	9251	9350	10023
370	9995	10285	10415	10634	10999	11243	11528	11586	11960	12356
380	12721	13210	13368	13829	14550	14921	15644	15957	16549	16815
390	17657	18614	19298	19958	20650	21608	22965	23251	24259	25313
400	26288	27196	28328	28881	29827	31313	32002	32599	33547	34656
410	35387	35817	36840	37906	38653	38884	39882	40473	41094	41872
420	42640	43169	44084	44514	44612	45429	46068	46734	47610	48370
430	48162	49381	50133	50371	51174	52250	52816	54665	54672	55837
440	56937	57485	58985	60054	61083	62210	63394	65148	66157	67568
450	68646	70162	71700	72933	74385	76326	77590	79322	80728	82054
460	83985	84920	85726	87422	88968	89646	90813	92193	93142	93577
470	94394	95483	96252	96590	97252	97843	98489	99313	100013	100694
480	101336	102099	102729	103721	103994	104319	105459	105303	106920	107294
490	107476	108820	109273	110397	110727	111559	112160	112822	113717	115036
500	114706	115788	116544	117716	118382	119120	120140	120165	120502	121417
510	122043	122555	123409	123662	123929	124665	124498	125292	125665	125835
520	126533	126399	125798	126589	126485	126067	126145	124827	124547	124503
530	124225	123849	123075	122047	121743	120963	120238	119518	118165	118523
540	117275	116405	115884	114449	113662	113423	111977	110688	110365	109577
550	108717	106674	106830	105704	103956	103150	101994	101366	99493	98760
560	97772	96903	95130	93647	92487	91417	90434	88923	87503	86112
570	84637	83754	82293	81124	79563	77934	76986	75926	74847	73026
580	71491	70145	68946	67755	66034	64359	63793	62396	61197	60125
590	58254	56936	55673	54575	53059	51806	50871	48897	47952	46653
600	45352	43909	42569	41275	40179	38997	37800	36387	35286	34291
610	33033	31643	30650	29619	28468	27142	26572	25192	24306	23547
620	22798	21801	20919	20200	19227	18545	17637	17343	16462	15482
630	15024	14213	13662	12915	12618	12207	11479	11170	10536	9946
640	9449	9252	8754	8456	8072	7606	7245	6997	6723	6518
650	5929	5901	5579	5263	4994	4837	4494	4429	4127	3893
660	3743	3532	3363	3277	3112	2805	2742	2600	2508	2265
670	2128	2006	1925	1734	1649	1585	1488	1430	1306	1208

Table D-20. Probability Data Set 20 (Cont'd)

680	1163	1054	980	955	843	824	777	745	662	618
690	576	553	507	467	472	392	391	405	376	333
700	326	339	314	271	246	230	242	212	198	205
710	207	157	153	146	147	144	134	127	113	98
720	107	115	80	103	94	71	63	63	65	66
730	64	53	57	62	52	45	52	51	39	46
740	41	49	28	23	37	30	30	26	24	26
750	26	27	14	25	12	22	24	12	14	23
760	13	8	11	15	12	17	15	14	10	13
770	5	7	14	8	13	15	10	11	15	9
780	10	11	13	11	10	11	3	9	9	13
790	5	9	11	10	11	9	4	13	9	11
800	7	9	7	9	9	6	8	11	12	8
810	12	8	7	5	6	7	4	10	5	9
820	3	5	9	13	6	2	8	7	3	7
830	8	7	4	5	4	2	7	8	3	5
840	4	6	4	3	1	11	8	9	7	7
850	4	4	7	3	3	4	4	4	4	3
860	6	3	5	5	2	1	3	6	5	3
870	4	2	3	4	4	5	2	2	3	4
880	2	3	4	3	1	8	3	1	3	1
890	3	2	4	3	2	1	2	3	1	1
900	5	0	3	0	1	3	0	1	2	1
910	1	2	0	2	1	0	2	2	1	0
920	2	0	3	1	0	0	2	1	1	0
930	0	1	1	0	1	0	0	0	0	0
940	0	0	0	0	1	0	0	1	0	2
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-21. Probability Data Set 21

1	0	0	0	0	0	0	0	0	9	0
10	0	0	0	0	0	0	16	0	0	0
20	0	0	0	0	6	0	0	0	0	0
30	0	0	69	0	0	0	0	0	0	0
40	8	0	0	0	0	0	0	0	13	0
50	0	0	0	0	0	0	11	0	0	0
60	0	0	0	0	16	0	0	0	0	0
70	0	0	9	0	0	0	0	0	0	0
80	14	1	1	0	0	1	0	0	13	1
90	1	1	0	0	3	1	12	1	0	2
100	2	2	2	3	15	3	5	10	2	4
110	7	6	27	6	9	7	12	13	13	19
120	35	18	20	25	44	34	32	43	40	44
130	56	56	83	79	110	91	98	106	123	123
140	167	200	189	198	244	267	313	337	405	425
150	476	586	684	698	790	911	964	1131	1135	1287
160	1460	1596	1751	1899	2160	2345	2586	2788	3051	3427
170	3668	3799	4280	4596	4918	5159	5623	6040	6337	6977
180	7474	7790	8413	9017	9409	10154	10696	11045	11619	12318
190	13066	13763	14682	15117	15610	16644	17626	18367	19108	19786
200	20807	21404	22535	23486	24524	25286	26528	27446	28834	29668
210	30732	31859	32882	34274	35255	36809	37687	38849	40324	41846
220	43038	44058	45681	46425	48324	49582	50706	52304	53535	54994
230	56715	58211	59550	60969	62431	63488	64838	67102	67735	69512
240	71000	72609	73388	74992	76656	77727	79595	81080	81826	83613
250	85378	86336	87810	89070	90190	91712	92701	94611	95731	96623
260	98144	99197	100791	102049	102943	104597	105158	106253	106996	108124
270	109477	110460	111291	112883	113599	114583	115144	116248	116941	117268
280	118226	119551	119552	119666	121031	121761	122086	122529	123849	124388
290	123881	124968	125388	125897	126370	126775	126697	127609	127178	128474
300	128540	129046	129243	129303	130113	130238	130676	130824	131151	131446
310	131181	132219	132048	132066	131805	132679	133118	133695	132967	133047
320	133851	133989	133743	133723	134021	133885	134111	133894	135312	135361
330	135389	135276	135354	135677	136501	136987	137491	137899	138032	138873

Table D-21. Probability Data Set 21 (Cont'd)

340	139344	139553	140228	140855	141621	142246	144012	144425	145080	146927
350	147451	149079	150544	152161	153813	155503	156284	158748	160453	162424
360	164776	166569	168110	170491	173139	175396	177822	180107	183243	185180
370	186999	191215	193316	196437	199179	201327	204704	208242	211091	213971
380	217937	221358	224815	228062	231885	235528	239024	243179	247479	251780
390	255328	260018	264608	268973	273205	278726	282287	288542	292826	298951
400	303365	308865	315521	321032	327302	332540	338932	345016	350376	357921
410	363452	370664	376953	383000	390745	397364	404258	411148	417945	424103
420	431559	438545	444397	453232	458978	467847	473963	482294	488265	497022
430	502608	510260	519475	525730	532899	541137	546498	553631	562364	568094
440	577128	582719	590450	599277	605426	612480	620524	628549	635232	642709
450	649912	658221	665269	672191	677907	684171	692625	700922	706014	713591
460	720416	727724	733768	741137	749211	755574	760389	769066	774541	781863
470	786300	793663	798403	803001	809200	815330	818262	823900	830769	834807
480	839959	843499	847638	853603	854835	859862	865140	866376	870807	873389
490	875140	877513	883429	884418	885635	887277	887593	894195	893050	895010
500	896032	898046	896308	898643	898909	900071	897320	899349	899692	898474
510	898173	895993	896593	896365	892426	893475	891245	890791	885685	885233
520	883262	883493	878615	877402	872297	871333	868345	864227	861365	857607
530	851228	848213	842510	840865	835571	829616	825606	820914	814694	809812
540	804512	800589	794429	787827	782806	777276	771034	765003	757051	753185
550	748334	734592	735973	729647	720741	716113	705549	702064	695794	689660
560	684045	674992	668477	665193	658017	650857	644605	637327	631773	624786
570	615388	611774	604776	599210	591495	585759	578840	573254	566489	559498
580	555436	548566	541541	535165	528800	523526	516495	510672	503219	498736
590	489842	486505	479736	475108	467638	461756	455320	450871	446321	437594
600	433562	428525	422840	418255	413086	407215	403405	397099	392364	387473
610	382459	378377	372534	367414	363547	359533	354406	350239	345507	341423
620	336764	334547	328441	324519	320612	316568	312786	309545	304635	301814
630	298229	293780	289570	286537	282149	279026	274236	272121	267514	264272
640	261250	257820	255096	251065	247974	245298	241827	238391	235438	231936
650	228815	225543	223225	220278	216860	213787	211188	207974	205082	202005
660	199570	196507	194447	191409	187896	185897	183521	180867	178009	175537
670	173228	169893	167286	165260	161952	160442	157640	155120	152621	150788

Table D-21. Probability Data Set 21 (Cont'd)

680	148369	146601	144306	141532	139736	137588	135111	132631	130763	128451
690	126165	124077	122357	120659	118644	116465	114667	112815	110259	108619
700	106858	104710	103256	101240	99459	97816	96179	94834	92933	91604
710	89658	88092	86315	84025	82931	81095	79274	78402	76239	74567
720	73636	72212	70639	69731	68104	66715	65588	64306	62328	61275
730	60138	58477	56831	56011	55148	53944	52738	51894	50290	49417
740	48113	46675	46104	44624	43845	42528	41559	40263	39449	38363
750	37723	36703	35668	34687	33914	32949	32169	31031	30397	29409
760	28964	27588	27045	26285	25528	25238	24167	22994	22362	21881
770	21238	20321	20069	19003	18783	17847	17466	16611	16329	15493
780	15179	14781	14078	13647	13185	12828	12284	11831	11487	10918
790	10515	10067	9566	9206	8772	8617	8103	7880	7584	7188
800	6859	6587	6454	6084	5810	5396	5209	5039	4811	4512
810	4295	4101	3923	3640	3328	3249	3058	3079	2871	2707
820	2523	2282	2229	2031	1999	1834	1640	1619	1594	1468
830	1338	1204	1198	1093	1066	967	892	843	739	705
840	683	664	574	526	488	423	413	323	341	301
850	278	250	246	199	196	178	163	138	128	109
860	94	88	80	68	56	64	37	45	31	24
870	18	22	20	16	14	9	9	10	7	2
880	4	5	3	1	5	2	0	0	1	1
890	3	0	2	1	0	0	0	0	1	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-22. Probability Data Set 22

1	0	0	0	0	0	0	0	0	8	0
10	0	0	0	0	0	0	4	0	0	0
20	0	0	0	0	4	0	0	0	0	0
30	0	0	1	0	0	0	0	0	0	0
40	11	0	0	0	0	0	0	0	16	0
50	0	0	0	0	0	0	5	0	0	0
60	0	0	0	0	11	0	0	0	0	0
70	0	0	5	0	0	0	0	0	0	0
80	9	0	0	0	0	0	0	0	4	0
90	0	0	0	0	0	0	9	0	0	0
100	0	0	0	0	6	0	0	0	0	0
110	0	0	7	0	0	0	0	0	0	0
120	5	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	0	0	0	0	0	0	0	0
210	0	0	0	0	0	0	0	0	0	0
220	0	0	0	0	0	0	0	0	0	0
230	0	0	0	0	0	0	0	0	0	0
240	0	0	0	0	0	0	0	0	0	0
250	0	0	0	0	1	0	7	0	0	0
260	2	0	0	0	1	0	0	0	0	1
270	0	4	5	1	1	1	0	2	2	1
280	5	2	5	2	5	2	7	4	11	5
290	3	6	8	9	6	7	8	12	20	18
300	12	8	13	21	18	26	23	27	20	29
310	24	31	36	51	36	64	54	72	78	88
320	110	112	127	145	166	168	203	210	253	276
330	280	357	365	429	405	483	483	564	589	598

Table D-22. Probability Data Set 22 (Cont'd)

340	718	749	727	770	840	926	931	1016	1104	1214
350	1217	1309	1309	1382	1514	1551	1580	1626	1741	1868
360	1939	1932	2070	2216	2123	2323	2448	2586	2626	2793
370	2918	3055	3291	3344	3614	3840	4114	4316	4730	4872
380	5361	5656	6180	6723	7248	8006	8614	9302	10644	11469
390	12575	13774	15055	16399	17784	19611	21281	22861	24650	26771
400	28518	30725	32547	35234	36935	39442	40809	42958	45046	46772
410	48843	50983	52807	54608	55589	57791	59974	61320	63208	65144
420	66877	68990	71268	73339	76005	79094	81982	85241	88584	92808
430	96542	101460	106247	111983	117141	123551	129006	137796	143698	152957
440	160430	169174	177882	187933	197036	206889	216652	226845	236635	249328
450	258940	270498	281095	292626	303507	315100	325778	337084	350274	359249
460	373054	383274	395536	406526	418168	429481	441208	451815	464921	474743
470	485899	497787	508083	521380	531709	544285	556523	570465	580335	594308
480	610317	623666	636464	652911	665777	682845	696105	710025	726397	741124
490	755223	771771	784939	800186	813711	825633	839923	854411	866782	877378
500	889140	900242	909017	916759	928810	935767	941452	949962	958107	963270
510	968280	972451	977283	979078	980261	983730	985296	985954	982025	983507
520	982104	978870	977430	975096	970140	967606	962972	957347	952823	946971
530	938713	935944	931243	921968	915383	910479	902665	895984	889235	881996
540	874226	865987	855687	846291	837635	827693	816891	806340	793288	782161
550	772891	753226	745353	734212	716894	704728	689904	679347	663711	648377
560	634477	621620	605301	591645	577015	562332	546425	532632	517024	503333
570	485664	473585	457215	442066	429349	413555	399402	387004	372935	359501
580	347841	335623	321859	309346	300048	287838	276501	265708	256881	247165
590	236093	226539	218168	209322	200775	192991	183985	176041	168702	161149
600	154101	147541	140083	134640	127799	121470	115670	109845	104105	98369
610	93513	88706	83250	79248	74115	70487	65726	62524	58308	54782
620	51953	48405	45238	41989	39514	37085	34547	32125	29859	27752
630	25803	23790	21630	20473	18661	17363	15799	14681	13630	12519
640	11331	10469	9853	8998	8224	7431	7056	6424	5970	5398
650	5007	4587	4290	3998	3669	3436	3167	2963	2904	2627
660	2464	2408	2110	1964	1841	1761	1623	1543	1407	1298
670	1198	1139	1094	994	990	860	790	786	706	682

Table D-22. Probability Data Set 22 (Cont'd)

680	642	586	553	528	489	515	369	384	350	339
690	282	277	264	224	231	202	201	178	168	168
700	159	103	90	101	93	96	82	81	72	70
710	66	50	58	51	54	35	29	28	33	32
720	50	27	28	23	18	20	17	20	11	21
730	11	11	14	7	12	4	12	8	5	5
740	10	7	4	6	6	3	3	4	5	3
750	2	2	4	1	0	2	3	4	3	3
760	4	1	3	2	2	0	0	0	0	0
770	1	0	0	0	0	0	0	0	0	0
780	0	1	0	0	0	1	0	0	0	0
790	0	0	0	0	0	0	0	0	0	0
800	0	0	0	0	0	0	0	0	0	0
810	0	0	0	0	0	0	0	0	0	0
820	0	0	0	0	0	0	0	0	0	0
830	0	0	0	0	0	0	0	0	0	0
840	0	0	0	0	0	0	0	0	0	0
850	0	0	0	0	0	0	0	0	0	0
860	0	0	0	0	0	0	0	0	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	0	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-23. Probability Data Set 23

1	0	0	0	0	0	0	0	0	14	0
10	0	0	0	0	0	0	24	0	0	0
20	0	0	0	0	10	0	0	0	0	0
30	0	0	77	0	0	0	0	0	0	0
40	10	0	0	0	0	0	0	0	23	0
50	0	0	0	0	0	0	10	0	0	0
60	0	0	0	0	10	0	0	0	0	0
70	0	0	8	0	0	0	0	0	0	0
80	14	0	0	0	0	0	0	0	4	0
90	0	0	0	0	0	0	15	1	0	0
100	0	0	0	0	15	1	0	2	0	0
110	0	0	18	1	2	3	7	6	9	7
120	22	8	8	17	16	25	30	30	41	39
130	43	42	50	68	62	62	77	89	75	100
140	85	121	108	122	161	162	171	185	221	222
150	247	254	251	273	296	321	327	360	414	417
160	489	446	492	535	576	637	650	644	740	728
170	794	805	878	945	966	1029	1128	1134	1264	1290
180	1345	1376	1494	1645	1720	1758	1869	1989	2087	2297
190	2333	2561	2616	2838	3014	3186	3355	3523	3705	4019
200	4097	4331	4654	4926	5167	5514	5785	5836	6257	6719
210	6975	7379	7594	8132	8373	8664	9210	9780	10114	10446
220	11163	11439	12099	12410	12840	13151	13964	14787	15231	15841
230	16407	17031	17822	18346	19265	19779	20813	21578	22171	23439
240	24300	24965	26203	26992	28341	29880	30518	32021	32918	33998
250	35473	37084	38193	39667	41783	42929	44585	46331	47821	49581
260	51025	52833	54829	56473	57992	59845	61986	63533	65325	67427
270	68793	71317	73142	74321	76706	78952	80058	82411	84040	86304
280	88025	89520	91897	93380	95717	97544	99472	101980	103567	105386
290	108235	110107	111540	112826	115739	117676	119528	122313	124002	125701
300	127455	129635	130803	134062	135433	138047	139888	141537	143629	145219
310	147188	149592	150840	152912	154291	156337	157119	159054	160082	161200
320	163030	164212	165448	166700	168140	169290	170007	170977	172034	172845
330	173377	174265	174590	176533	177101	178496	179345	180130	180143	181038

Table D-23. Probability Data Set 23 (Cont'd)

340	182246	182883	183796	185329	185987	187564	188500	189566	190396	191940
350	192714	194208	194705	196118	197278	198136	199938	201384	203422	203195
360	205677	207181	208042	209713	212169	213542	215244	216317	218848	220570
370	223166	223770	226704	228383	230310	231772	234895	236978	238925	240764
380	243966	246229	248758	251449	252989	256041	257774	261414	264386	268002
390	270247	273171	276523	280781	282858	285528	288630	292846	296331	298687
400	304565	306792	310506	314171	316589	320558	325625	328689	332234	336717
410	340576	343647	348997	351879	356395	360866	364050	369409	372126	377998
420	381103	385292	391624	394268	398347	403977	408465	412010	417635	422023
430	425612	431071	436236	441075	444255	450523	455199	462251	466245	470721
440	474143	482616	486873	492377	497778	504553	510095	517157	523217	527549
450	533610	541724	546901	552963	559698	565202	574601	581224	587842	594759
460	602450	611213	618116	625250	633895	640000	649767	656591	665574	673173
470	680051	687125	695048	702516	708596	718790	724192	732887	738642	746938
480	755898	763302	771792	778967	787193	794987	800312	808384	816248	825119
490	831310	839351	846401	853047	858502	867049	872313	880434	883694	891946
500	898657	903914	910824	918150	923801	930796	932829	939282	944579	948725
510	954355	956203	960379	965240	965548	970847	970590	972855	975455	974544
520	976251	976856	976840	979260	979165	978666	979336	978288	977718	976496
530	973503	973346	971540	970639	969625	966222	967953	964912	960062	959616
540	956662	954916	952435	945777	945379	943556	938228	934970	930351	925309
550	927142	913825	916151	910610	903136	901577	893852	894957	885339	881159
560	876455	869320	864367	861512	853436	849559	843125	835872	827685	823178
570	817203	811223	802867	799049	791640	786888	780501	775636	767176	763589
580	755201	749823	744103	736832	732385	727003	718483	714267	708127	702080
590	696262	689632	684663	679233	670940	666821	659687	654380	647411	643118
600	635582	631185	622748	618421	611765	607540	600635	592183	587448	581786
610	574097	569193	561780	555953	547972	543314	535873	528925	522639	516157
620	509777	503648	497268	489264	482976	477579	471095	463290	456315	451792
630	444621	437255	431196	424432	417106	411682	404872	398510	392266	385123
640	379405	372577	364669	358767	352642	347148	340608	333816	328281	321679
650	314811	310456	304103	297015	291291	285242	279930	274002	268398	263222
660	256712	250921	245708	239953	234575	229927	223292	218484	213688	208381

Table D-23. Probability Data Set 23 (Cont'd)

670	202807	197968	192788	188251	183208	178835	173053	169178	164483	159503
680	155409	152168	147345	142530	138758	134971	130860	127511	122652	119224
690	115698	111953	109014	105293	102042	98777	95593	92824	89584	86772
700	83965	81633	78382	75513	73040	70721	68444	65485	63306	61032
710	58728	56603	54408	52470	50472	48837	46566	45234	43088	42080
720	40182	38126	37003	35291	33865	32921	31441	30312	28465	27360
730	26343	25102	24307	23352	21943	20962	20052	19360	18419	17405
740	16648	15821	15278	14150	13605	13055	12567	11950	11189	10805
750	9903	9633	9025	8776	8156	7588	7282	6926	6575	6093
760	5842	5536	5230	5088	4701	4362	4221	3952	3775	3563
770	3349	3144	2964	2862	2626	2425	2354	2172	2033	1955
780	1860	1692	1641	1560	1516	1354	1315	1139	1025	954
790	982	892	827	733	700	642	625	569	544	469
800	468	427	424	341	353	309	286	255	227	219
810	220	207	164	134	144	121	111	113	92	75
820	66	62	71	48	49	45	40	28	27	28
830	31	28	15	13	22	16	5	11	8	7
840	6	6	1	3	3	1	7	3	2	6
850	3	3	1	3	1	1	1	0	0	0
860	0	0	0	2	0	0	1	1	0	0
870	0	0	0	0	0	0	0	0	0	0
880	0	0	0	0	1	0	0	0	0	0
890	0	0	0	0	0	0	0	0	0	0
900	0	0	0	0	0	0	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	0	0	0	0
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-24. Probability Data Set 24

1	0	0	0	0	0	0	0	0	10	0
10	0	0	0	0	0	0	14	0	0	0
20	0	0	0	0	3	0	0	0	0	0
30	0	0	52	0	0	0	0	0	0	0
40	7	0	0	0	0	0	0	0	13	0
50	0	0	0	0	0	0	12	0	0	0
60	0	0	0	0	11	0	0	0	0	0
70	0	0	5	0	0	0	0	0	0	0
80	11	0	0	0	0	0	0	0	4	0
90	0	0	0	0	0	0	7	0	0	0
100	0	0	0	0	9	0	0	0	0	0
110	0	0	7	0	0	0	0	0	0	0
120	6	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	1	0	0	0
170	0	0	0	0	0	0	0	0	0	0
180	0	1	1	0	1	0	1	0	0	0
190	0	0	0	0	0	0	0	0	0	0
200	0	0	1	0	0	0	0	1	0	0
210	0	0	0	0	1	0	0	0	0	1
220	0	1	1	0	1	2	1	0	1	2
230	2	1	2	1	0	2	1	1	0	5
240	1	1	4	4	4	1	1	1	3	3
250	2	3	6	4	6	3	19	7	7	6
260	9	7	13	13	13	7	13	14	16	22
270	16	20	20	18	26	26	27	27	31	35
280	27	39	41	35	44	43	44	46	64	50
290	80	74	77	73	88	79	111	92	85	109
300	119	133	143	140	159	137	165	180	193	210
310	216	233	221	244	243	236	268	317	301	333
320	344	371	448	440	460	493	534	600	593	665
330	678	723	748	813	899	951	1083	1100	1203	1315

Table D-24. Probability Data Set 24 (Cont'd)

340	1344	1469	1592	1709	1787	1887	2207	2303	2523	2650
350	3006	3047	3247	3535	3858	4213	4527	4783	5209	5623
360	6165	6583	7267	7872	8503	9185	9740	10696	11732	12472
370	13515	14483	15764	17196	18222	19786	21729	23026	24713	26450
380	28655	30959	33031	35599	37712	40464	42265	45033	47856	50260
390	53088	55229	58686	61633	63796	67334	69578	72686	75397	78273
400	81479	84549	87237	89821	92944	96422	99312	102371	105646	108232
410	111945	115521	119309	123140	127383	130434	135318	140337	144057	149396
420	154338	159395	165106	171164	176273	182875	188819	196361	202478	209432
430	217947	225062	231719	241181	249039	256264	264496	272954	280552	289032
440	297385	305772	313139	321975	330279	338075	346475	354639	361898	371577
450	378443	386440	393083	402764	410356	418423	426301	435610	443683	453563
460	462097	473032	481946	491955	502212	512784	522664	534373	544513	556345
470	567409	578554	591243	603360	614284	627647	638366	652542	665890	674492
480	690862	701573	711722	724374	734713	746695	760932	769323	779154	791917
490	798900	810506	818217	829531	834733	845279	852029	861305	866425	875493
500	881560	889426	894534	901522	906302	913853	918750	925514	929538	935559
510	938628	944820	948295	954371	955624	960662	962258	968151	972675	972884
520	977204	976173	979391	982198	981543	984385	983326	981567	980320	980151
530	977381	974026	971744	967988	963966	957724	952194	949152	942326	935201
540	928259	924949	914858	907276	899328	891998	884120	874852	864116	857371
550	852468	834243	827841	821044	808104	800298	789309	780047	771750	758300
560	749711	739474	728278	718796	708591	696079	685912	674117	663369	654045
570	641901	630562	618901	608350	599315	585183	573895	564526	551353	542288
580	529087	516210	506260	495369	485006	474048	461749	451198	439703	430026
590	419335	407985	398712	388625	377984	369999	359357	350060	341515	332414
600	323883	315499	306382	299061	290927	284075	276239	267313	261435	255131
610	246867	240537	233231	226720	219972	214680	208488	201684	196761	190710
620	185859	180555	174284	169822	164354	159852	154996	150808	145395	141449
630	137573	132297	128345	124685	120810	117188	113101	109644	106496	103470
640	99944	96694	93129	90363	88230	85337	82293	79608	77153	74650
650	72482	70186	67757	65915	62991	61068	58836	57154	55734	53369
660	51623	49797	48144	47005	45113	44012	42157	40923	39147	38334

Table D-24. Probability Data Set 24 (Cont'd)

670	36714	35716	34158	33145	32074	31061	30084	28749	27920	26795
680	26099	25120	24073	23506	22652	21675	20968	20330	19456	18830
690	18207	17524	17064	16491	15740	15070	14715	14232	13857	13226
700	12631	12120	11804	11194	10982	10664	10160	9902	9141	9111
710	8823	8267	8182	7662	7487	7128	7009	6730	6350	6243
720	6015	5737	5536	5460	5097	5000	4720	4418	4408	4216
730	4174	3784	3673	3553	3507	3281	3267	3031	2939	2761
740	2729	2669	2480	2385	2244	2228	2128	1993	1963	1843
750	1843	1699	1653	1548	1591	1461	1436	1372	1355	1266
760	1231	1165	1069	1075	1041	1017	964	914	869	839
770	809	795	771	684	714	649	645	633	608	559
780	505	527	484	499	465	413	440	390	392	372
790	375	348	332	331	310	313	274	247	273	267
800	233	231	247	211	216	198	181	179	191	162
810	165	149	149	155	135	163	102	126	140	81
820	103	91	90	117	96	77	69	95	72	69
830	62	66	57	43	62	54	37	40	48	40
840	41	46	31	38	30	26	26	29	22	19
850	19	24	23	16	12	20	12	14	9	11
860	12	8	10	8	8	4	7	3	4	4
870	4	4	4	2	8	3	5	0	1	3
880	1	3	3	1	0	1	0	0	1	0
890	0	2	2	0	2	1	0	0	0	1
900	0	0	0	0	0	1	0	0	0	0
910	0	0	0	0	0	0	0	0	0	0
920	0	0	0	0	0	0	0	0	0	0
930	0	0	0	0	0	0	0	0	0	0
940	0	0	0	0	0	0	0	0	0	0
950	0	0	0	0	0	0	0	0	0	0
960	0	0	0	0	0	0	0	0	0	0
970	0	0	0	0	0	0	1	0	0	1
980	0	0	0	0	0	0	0	0	0	0
990	0	0	0	0	0	0	0	0	0	0
1000	0	0	0	0	0	0	0	0	0	0
1010	0	0	0	0	0	0	0	0	0	0
1020	0	0	0	0						

Table D-25. Mathematically-Generated Probability Data for a Sinusoidal Signal

9*0, 142316, 82207, 63709, 53871, 47534, 43017, 39590, 36875
34655, 32797, 31212, 29839, 28635, 27568, 26614, 25754, 24974
24262, 23610, 23008, 22451, 21934, 21452, 21001, 20579, 20182
19807, 19454, 19119, 18802, 18501, 18214, 17941, 17680, 17431
17193, 16964, 16745, 16535, 16333, 16138, 15951, 15771, 15596
15428, 15266, 15108, 14956, 14809, 14667, 14528, 14394, 14264
14137, 14014, 13895, 13779, 13666, 13555, 13448, 13344, 13242
13142, 13046, 12951, 12859, 12768, 12680, 12594, 12510, 12427
12347, 12268, 12191, 12115, 12041, 11969, 11898, 11828, 11760
11693, 11627, 11563, 11500, 11438, 11377, 11317, 11258, 11201
11144, 11088, 11034, 10980, 10927, 10875, 10824, 10774, 10724
10675, 10628, 10580, 10534, 10488, 10443, 10399, 10355, 10313
10270, 10228, 10187, 10147, 10107, 10068, 10029, 9990, 9953
9916, 9879, 9843, 9807, 9772, 9737, 9703, 9669, 9635, 9602
9570, 9538, 9506, 9475, 9444, 9413, 9383, 9353, 9324, 9294
9266, 9237, 9209, 9181, 9154, 9127, 9100, 9074, 9047, 9022
8996, 8971, 8946, 8921, 8897, 8872, 8848, 8825, 8801, 8778
8755, 8733, 8710, 8688, 8666, 8644, 8623, 8601, 8580, 8560
8539, 8519, 8498, 8478, 8458, 8439, 8419, 8400, 8381, 8362
8344, 8325, 8307, 8289, 8271, 8253, 8235, 8218, 8201, 8184
8167, 8150, 8133, 8117, 8100, 8084, 8068, 8052, 8036, 8021
8005, 7990, 7975, 7960, 7945, 7930, 7915, 7901, 7886, 7872
7858, 7844, 7830, 7816, 7803, 7789, 7776, 7762, 7749, 7736
7723, 7710, 7698, 7685, 7672, 7660, 7648, 7635, 7623, 7611
7599, 7588, 7576, 7564, 7553, 7541, 7530, 7519, 7507, 7496
7485, 7475, 7464, 7453, 7442, 7432, 7421, 7411, 7401, 7391
7380, 7370, 7360, 7351, 7341, 7331, 7321, 7312, 7302, 7293
7284, 7274, 7265, 7256, 7247, 7238, 7229, 7220, 7211, 7203
7194, 7186, 7177, 7169, 7160, 7152, 7144, 7136, 7127, 7119
7111, 7103, 7096, 7088, 7080, 7072, 7065, 7057, 7050, 7042
7035, 7028, 7020, 7013, 7006, 6999, 6992, 6985, 6978, 6971
6964, 6957, 6951, 6944, 6937, 6931, 6924, 6918, 6911, 6905
6899, 6892, 6886, 6880, 6874, 6868, 6862, 6856, 6850, 6844

Table D-25. Mathematically-Generated Probability Data for a Sinusoidal Signal (Cont'd)

```
6838,  6832,  6827,  6821,  6815,  6810,  6804,  6799,  6793,  6788
6782,  6777,  6772,  6767,  6761,  6756,  6751,  6746,  6741,  6736
6731,  6726,  6721,  6716,  6712,  6707,  6702,  6697,  6693,  6688
6684,  6679,  6675,  6670,  6666,  6661,  6657,  6653,  6649,  6644
6640,  6636,  6632,  6628,  6624,  6620,  6616,  6612,  6608,  6604
6600,  6597,  6593,  6589,  6585,  6582,  6578,  6575,  6571,  6567
6564,  6561,  6557,  6554,  6550,  6547,  6544,  6541,  6537,  6534
6531,  6528,  6525,  6522,  6519,  6516,  6513,  6510,  6507,  6504
6501,  6498,  6496,  6493,  6490,  6488,  6485,  6482,  6480,  6477
6475,  6472,  6470,  6467,  6465,  6462,  6460,  6458,  6455,  6453
6451,  6449,  6446,  6444,  6442,  6440,  6438,  6436,  6434,  6432
6430,  6428,  6426,  6424,  6422,  6421,  6419,  6417,  6415,  6414
6412,  6410,  6409,  6407,  6406,  6404,  6402,  6401,  6400,  6398
6397,  6395,  6394,  6393,  6391,  6390,  6389,  6388,  6386,  6385
6384,  6383,  6382,  6381,  6380,  6379,  6378,  6377,  6376,  6375
6374,  6373,  2*6372,  6371,  6370,  2*6369,  6368,  2*6367,  6366
2*6365,  2*6364,  3*6363,  2*6362,  4*6361,  6*6360,  7*6359,  6*6360
4*6361,  2*6362,  3*6363,  2*6364,  2*6365,  6366,  2*6367,  6368
2*6369,  6370,  6371,  2*6372,  6373,  6374,  6375,  6376,  6377,  6378
6379,  6380,  6381,  6382,  6383,  6384,  6385,  6386,  6388,  6389
6390,  6391,  6393,  6394,  6395,  6397,  6398,  6400,  6401,  6402
6404,  6406,  6407,  6409,  6410,  6412,  6414,  6415,  6417,  6419
6421,  6422,  6424,  6426,  6428,  6430,  6432,  6434,  6436,  6438
6440,  6442,  6444,  6446,  6449,  6451,  6453,  6455,  6458,  6460
6462,  6465,  6467,  6470,  6472,  6475,  6477,  6480,  6482,  6485
6488,  6490,  6493,  6496,  6498,  6501,  6504,  6507,  6510,  6513
6516,  6519,  6522,  6525,  6528,  6531,  6534,  6537,  6541,  6544
6547,  6550,  6554,  6557,  6561,  6564,  6567,  6571,  6575,  6578
6582,  6585,  6589,  6593,  6597,  6600,  6604,  6608,  6612,  6616
6620,  6624,  6628,  6632,  6636,  6640,  6644,  6649,  6653,  6657
6661,  6666,  6670,  6675,  6679,  6684,  6688,  6693,  6697,  6702
6707,  6712,  6716,  6721,  6726,  6731,  6736,  6741,  6746,  6751
6756,  6761,  6767,  6772,  6777,  6782,  6788,  6793,  6799,  6804
```

Table D-25. Mathematically-Generated Probability Data for a Sinusoidal Signal (Cont'd)

```
6810,  6815,  6821,  6827,  6832,  6838,  6844,  6850,  6856,  6862
6868,  6874,  6880,  6886,  6892,  6899,  6905,  6911,  6918,  6924
6931,  6937,  6944,  6951,  6957,  6964,  6971,  6978,  6985,  6992
6999,  7006,  7013,  7020,  7028,  7035,  7042,  7050,  7057,  7065
7072,  7080,  7088,  7096,  7103,  7111,  7119,  7127,  7136,  7144
7152,  7160,  7169,  7177,  7186,  7194,  7203,  7211,  7220,  7229
7238,  7247,  7256,  7265,  7274,  7284,  7293,  7302,  7312,  7321
7331,  7341,  7351,  7360,  7370,  7380,  7391,  7401,  7411,  7421
7432,  7442,  7453,  7464,  7475,  7485,  7496,  7507,  7519,  7530
7541,  7553,  7564,  7576,  7588,  7599,  7611,  7623,  7635,  7648
7660,  7672,  7685,  7698,  7710,  7723,  7736,  7749,  7762,  7776
7789,  7803,  7816,  7830,  7844,  7858,  7872,  7886,  7901,  7915
7930,  7945,  7960,  7975,  7990,  8005,  8021,  8036,  8052,  8068
8084,  8100,  8117,  8133,  8150,  8167,  8184,  8201,  8218,  8235
8253,  8271,  8289,  8307,  8325,  8344,  8362,  8381,  8400,  8419
8439,  8458,  8478,  8498,  8519,  8539,  8560,  8580,  8601,  8623
8644,  8666,  8688,  8710,  8733,  8755,  8778,  8801,  8825,  8848
8872,  8897,  8921,  8946,  8971,  8996,  9022,  9047,  9074,  9100
9127,  9154,  9181,  9209,  9237,  9266,  9294,  9324,  9353,  9383
9413,  9444,  9475,  9506,  9538,  9570,  9602,  9635,  9669,  9703
9737,  9772,  9807,  9843,  9879,  9916,  9953,  9990,  10029,  10068
10107,  10147,  10187,  10228,  10270,  10313,  10355,  10399,  10443
10488,  10534,  10580,  10628,  10675,  10724,  10774,  10824,  10875
10927,  10980,  11034,  11088,  11144,  11201,  11258,  11317,  11377
11438,  11500,  11563,  11627,  11693,  11760,  11828,  11898,  11969
12041,  12115,  12191,  12268,  12347,  12427,  12510,  12594,  12680
12768,  12859,  12951,  13046,  13142,  13242,  13344,  13448,  13555
13666,  13779,  13895,  14014,  14137,  14264,  14394,  14528,  14667
14809,  14956,  15108,  15266,  15428,  15596,  15771,  15951,  16138
16333,  16535,  16745,  16964,  17193,  17431,  17680,  17941,  18214
18501,  18802,  19119,  19454,  19807,  20182,  20579,  21001,  21452
21934,  22451,  23008,  23610,  24262,  24974,  25754,  26614,  27568
28635,  29839,  31212,  32797,  34655,  36875,  39590,  43017,  47534
53871,  63709,  82207,  142316,  14*0
```

Table D-26. Mathematically-Generated Probability Data for a Gaussian Signal

49*0, 16*1, 9*2, 6*3, 6*4, 4*5, 4*6, 3*7, 3*8, 2*9, 3*10
2*11, 2*12, 2*13, 14, 2*15, 2*16, 17, 18, 2*19, 20, 21, 22
23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37
39, 40, 42, 44, 45, 47, 49, 51, 52, 54, 56, 59, 61, 63
65, 68, 70, 73, 75, 78, 81, 84, 87, 90, 93, 96, 100, 103
107, 111, 115, 119, 123, 127, 131, 136, 141, 145, 150, 155
161, 166, 172, 178, 183, 190, 196, 202, 209, 216, 223, 230
238, 246, 254, 262, 270, 279, 288, 297, 306, 316, 326, 336
347, 358, 369, 380, 392, 404, 417, 430, 443, 456, 470, 484
499, 514, 529, 545, 561, 578, 595, 612, 630, 649, 667, 687
707, 727, 748, 769, 791, 813, 836, 860, 884, 909, 934, 960
987, 1014, 1042, 1070, 1099, 1129, 1160, 1191, 1223, 1255
1289, 1323, 1358, 1394, 1430, 1467, 1505, 1544, 1584, 1625
1667, 1709, 1752, 1797, 1842, 1888, 1935, 1983, 2032, 2082
2134, 2186, 2239, 2293, 2349, 2405, 2463, 2521, 2581, 2642
2704, 2768, 2832, 2898, 2965, 3033, 3103, 3173, 3246, 3319
3394, 3470, 3547, 3626, 3706, 3787, 3870, 3955, 4040, 4127
4216, 4306, 4398, 4491, 4586, 4682, 4779, 4879, 4980, 5082
5186, 5291, 5399, 5507, 5618, 5730, 5844, 5959, 6076, 6195
6315, 6437, 6561, 6687, 6814, 6943, 7074, 7206, 7340, 7476
7614, 7753, 7895, 8038, 8182, 8329, 8477, 8627, 8779, 8933
9088, 9245, 9404, 9565, 9728, 9892, 10058, 10226, 10396, 10567
10740, 10915, 11092, 11270, 11450, 11632, 11815, 12000, 12187
12376, 12566, 12758, 12951, 13146, 13343, 13541, 13741, 13943
14145, 14350, 14556, 14763, 14972, 15183, 15394, 15607, 15822
16038, 16255, 16473, 16693, 16914, 17136, 17360, 17584, 17810
18037, 18264, 18493, 18723, 18954, 19186, 19418, 19652, 19886

Table D-26. Mathematically-Generated Probability Data for a Gaussian Signal (Cont'd)

20121,	20357,	20593,	20830,	21068,	21306,	21545,	21785,	22025
22265,	22505,	22746,	22988,	23229,	23471,	23713,	23955,	24197
24439,	24680,	24922,	25164,	25405,	25647,	25888,	26128,	26368
26608,	26847,	27086,	27324,	27561,	27798,	28034,	28269,	28503
28736,	28969,	29200,	29430,	29659,	29887,	30113,	30338,	30562
30785,	31006,	31225,	31443,	31659,	31873,	32086,	32297,	32506
32713,	32918,	33121,	33322,	33521,	33717,	33912,	34104,	34294
34481,	34666,	34849,	35029,	35206,	35381,	35553,	35722,	35889
36052,	36213,	36371,	36526,	36678,	36827,	36972,	37115,	37254
37391,	37524,	37653,	37780,	37903,	38022,	38138,	38251,	38360
38466,	38568,	38666,	38761,	38852,	38940,	39024,	39104,	39180
39253,	39321,	39386,	39447,	39505,	39558,	39608,	39653,	39695
39732,	39766,	39796,	39822,	39844,	39862,	39876,	39886,	39892
39894,	39892,	39886,	39876,	39862,	39844,	39822,	39796,	39766
39732,	39695,	39653,	39608,	39558,	39505,	39447,	39386,	39321
39253,	39180,	39104,	39024,	38940,	38852,	38761,	38666,	38568
38466,	38360,	38251,	38138,	38022,	37903,	37780,	37653,	37524
37391,	37254,	37115,	36972,	36827,	36678,	36526,	36371,	36213
36052,	35889,	35722,	35553,	35381,	35206,	35029,	34849,	34666
34481,	34294,	34104,	33912,	33717,	33521,	33322,	33121,	32918
32713,	32506,	32297,	32086,	31873,	31659,	31443,	31225,	31006
30785,	30562,	30338,	30113,	29887,	29659,	29430,	29200,	28969
28736,	28503,	28269,	28034,	27798,	27561,	27324,	27086,	26847
26608,	26368,	26128,	25888,	25647,	25405,	25164,	24922,	24680
24439,	24197,	23955,	23713,	23471,	23229,	22988,	22746,	22505
22265,	22025,	21785,	21545,	21306,	21068,	20830,	20593,	20357
20121,	19886,	19652,	19418,	19186,	18954,	18723,	18493,	18264

Table D-26. Mathematically-Generated Probability Data for a Gaussian Signal (Cont'd)

```
18037,  17810,  17584,  17360,  17136,  16914,  16693,  16473,  16255
16038,  15822,  15607,  15394,  15183,  14972,  14763,  14556,  14350
14145,  13943,  13741,  13541,  13343,  13146,  12951,  12758,  12566
12376,  12187,  12000,  11815,  11632,  11450,  11270,  11092,  10915
10740,  10567,  10396,  10226,  10058,  9892,  9728,  9565,  9404
9245,  9088,  8933,  8779,  8627,  8477,  8329,  8182,  8038,  7895
7753,  7614,  7476,  7340,  7206,  7074,  6943,  6814,  6687,  6561
6437,  6315,  6195,  6076,  5959,  5844,  5730,  5618,  5507,  5399
5291,  5186,  5082,  4980,  4879,  4779,  4682,  4586,  4491,  4398
4306,  4216,  4127,  4040,  3955,  3870,  3787,  3706,  3626,  3547
3470,  3394,  3319,  3246,  3173,  3103,  3033,  2965,  2898,  2832
2768,  2704,  2642,  2581,  2521,  2463,  2405,  2349,  2293,  2239
2186,  2134,  2082,  2032,  1983,  1935,  1888,  1842,  1797,  1752
1709,  1667,  1625,  1584,  1544,  1505,  1467,  1430,  1394,  1358
1323,  1289,  1255,  1223,  1191,  1160,  1129,  1099,  1070,  1042
1014,  987,  960,  934,  909,  884,  860,  836,  813,  791,  769,  748
727,  707,  687,  667,  649,  630,  612,  595,  578,  561,  545,  529
514,  499,  484,  470,  456,  443,  430,  417,  404,  392,  380,  369
358,  347,  336,  326,  316,  306,  297,  288,  279,  270,  262,  254
246,  238,  230,  223,  216,  209,  202,  196,  190,  183,  178,  172
166,  161,  155,  150,  145,  141,  136,  131,  127,  123,  119,  115
111,  107,  103,  100,  96,  93,  90,  87,  84,  81,  78,  75,  73,  70
68,  65,  63,  61,  59,  56,  54,  52,  51,  49,  47,  45,  44,  42
40,  39,  37,  36,  35,  33,  32,  31,  30,  29,  28,  27,  26,  25
24,  23,  22,  21,  20,  2*19,  18,  17,  2*16,  2*15,  14,  2*13
2*12,  2*11,  3*10,  2*9,  3*8,  3*7,  4*6,  4*5,  6*4,  6*3,  9*2
16*1,  54*0
```

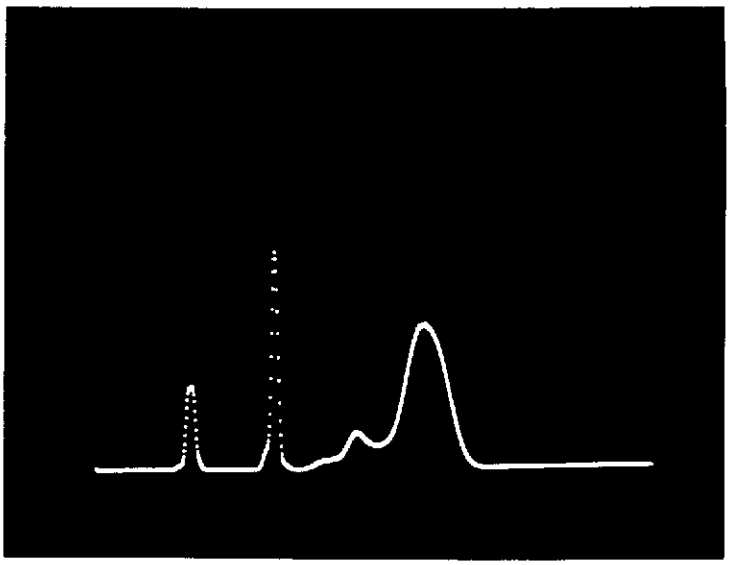

Figure D-1. Oscilloscope Presentation of Probability Data Set 01

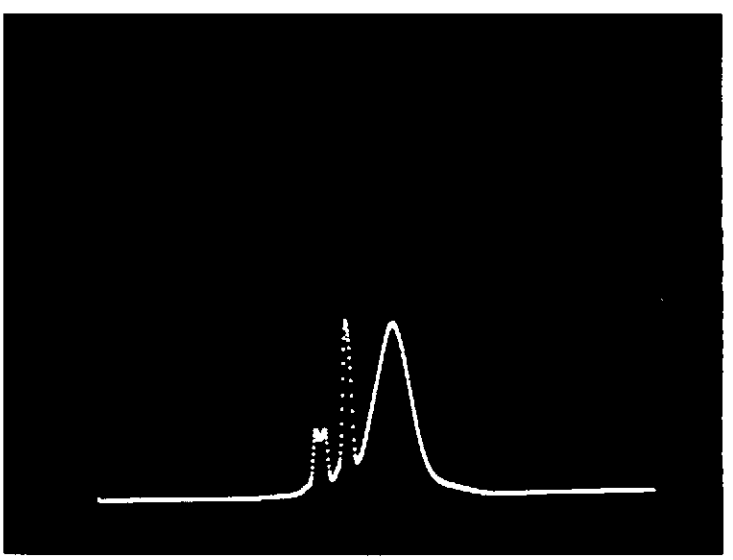

Figure D-2. Oscilloscope Presentation of Probability Data Set 02

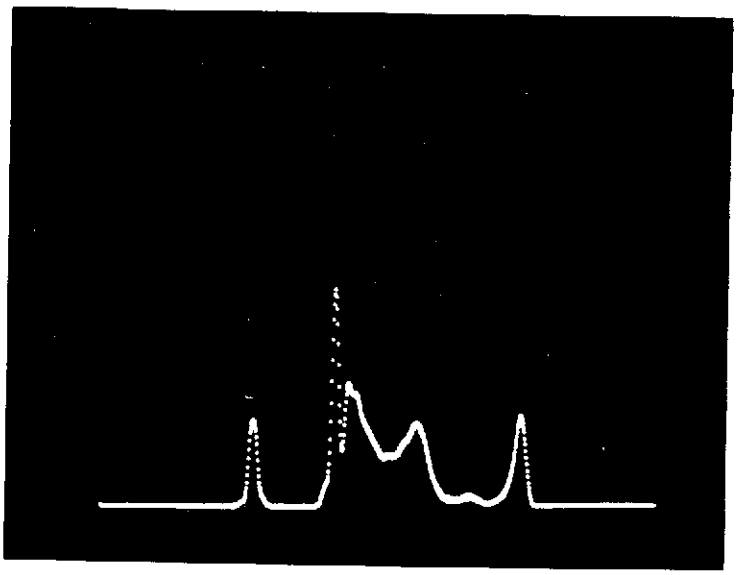

Figure D-3. Oscilloscope Presentation of Probability Data Set 03

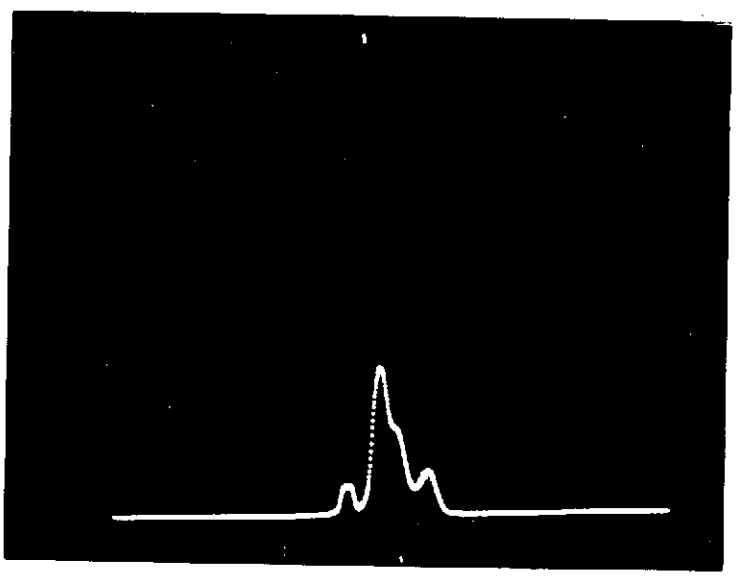

Figure D-4. Oscilloscope Presentation of Probability Data Set 04

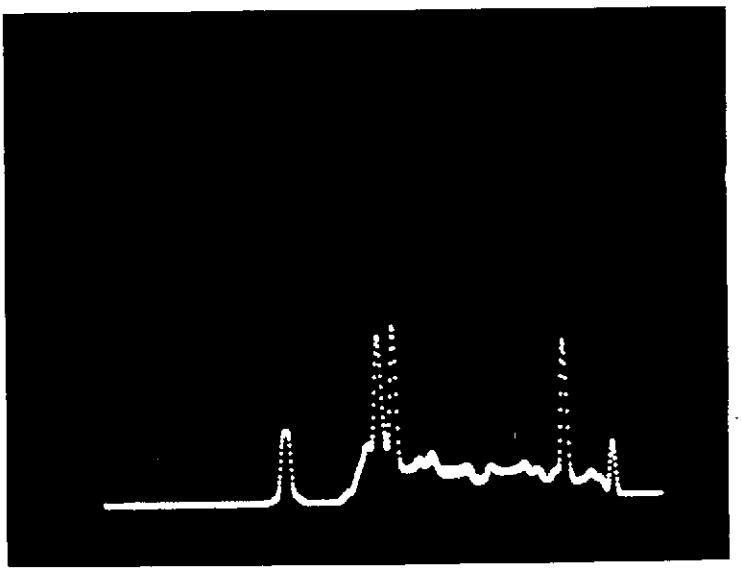

Figure D-5. Oscilloscope Presentation of Probability Data Set 05

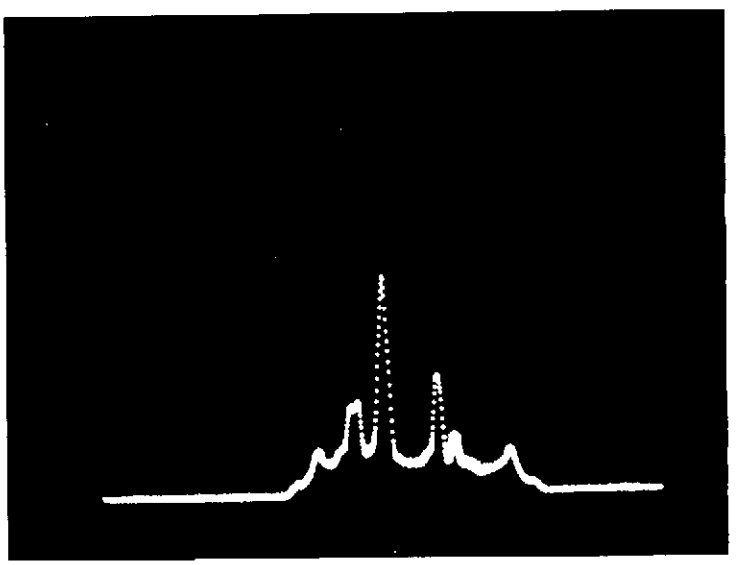

Figure D-6. Oscilloscope Presentation of Probability Data Set 06

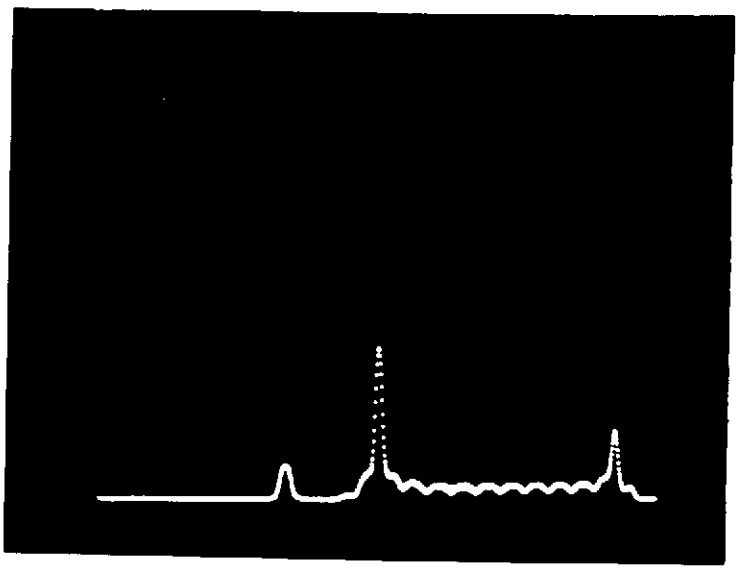

Figure D-7. Oscilloscope Presentation of Probability Data Set 07

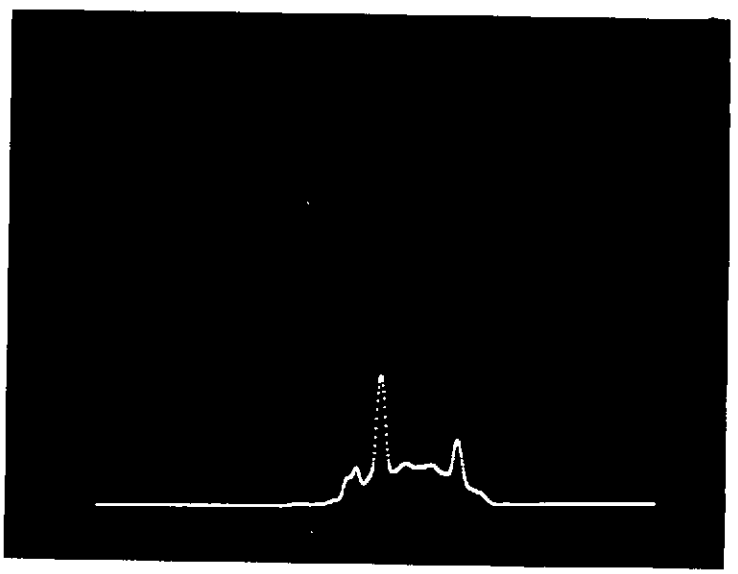

Figure D-8. Oscilloscope Presentation of Probability Data Set 08

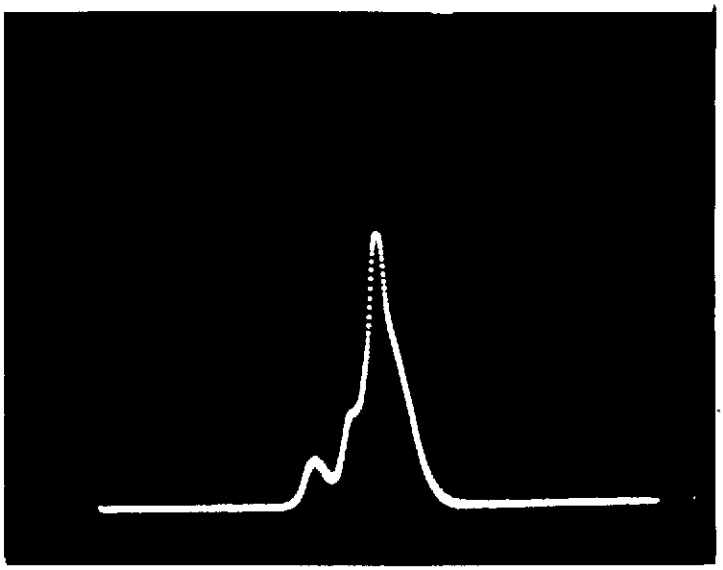

Figure D-9. Oscilloscope Presentation of Probability Data Set 09

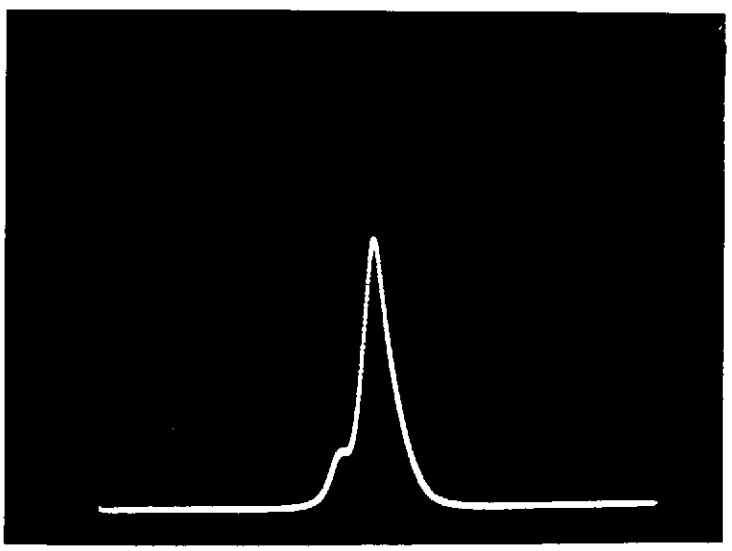

Figure D-10. Oscilloscope Presentation of Probability Data Set 10

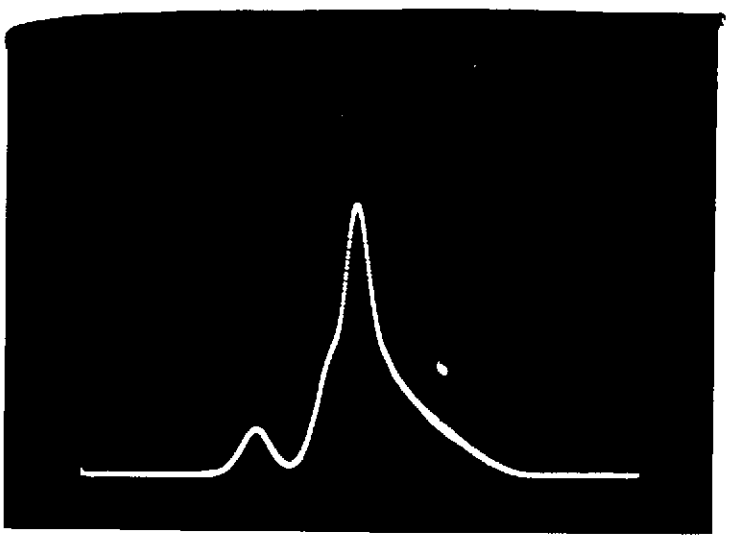

Figure D-11. Oscilloscope Presentation of Probability Data Set 11

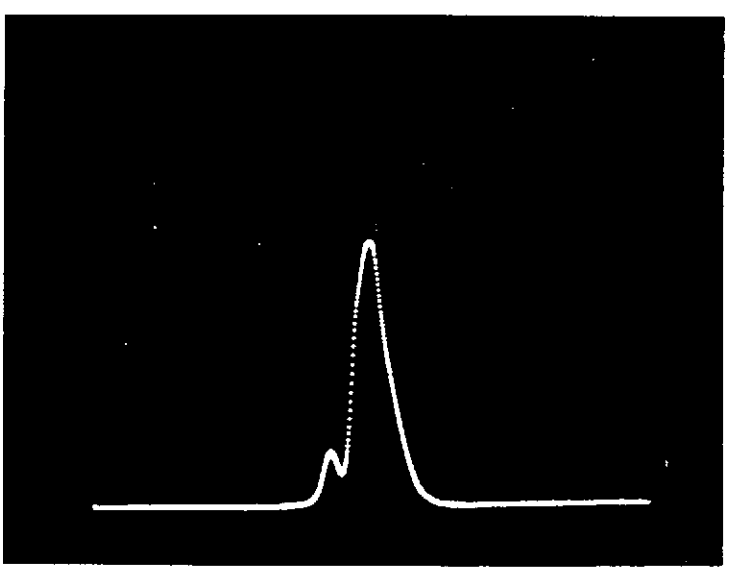

Figure D-12. Oscilloscope Presentation of Probability Data Set 12

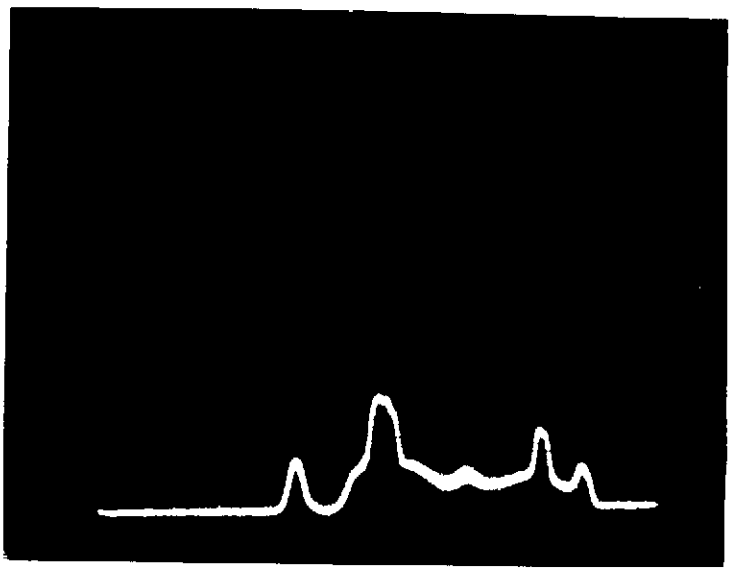

Figure D-13. Oscilloscope Presentation of Probability Data Set 13

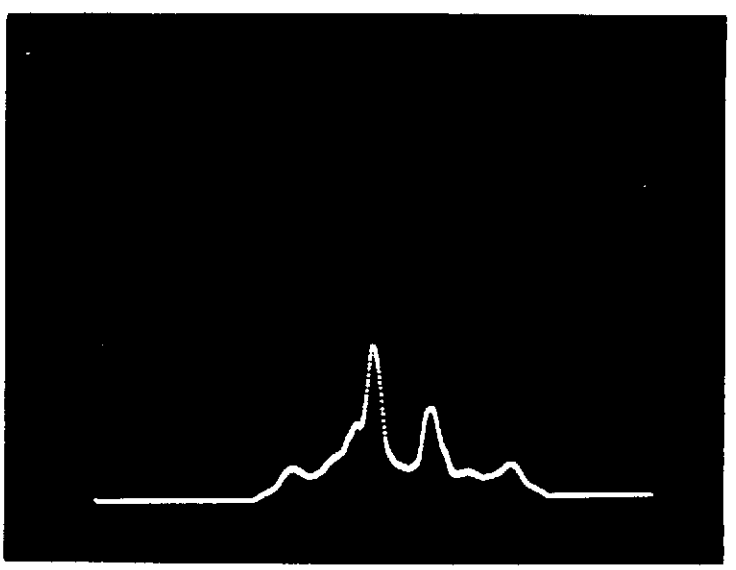

Figure D-14. Oscilloscope Presentation of Probability Data Set 14

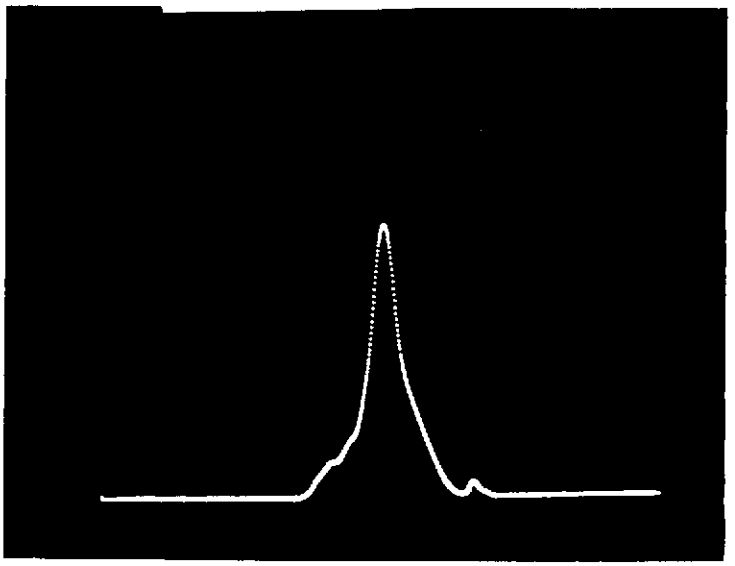

Figure D-15. Oscilloscope Presentation of Probability Data Set 15

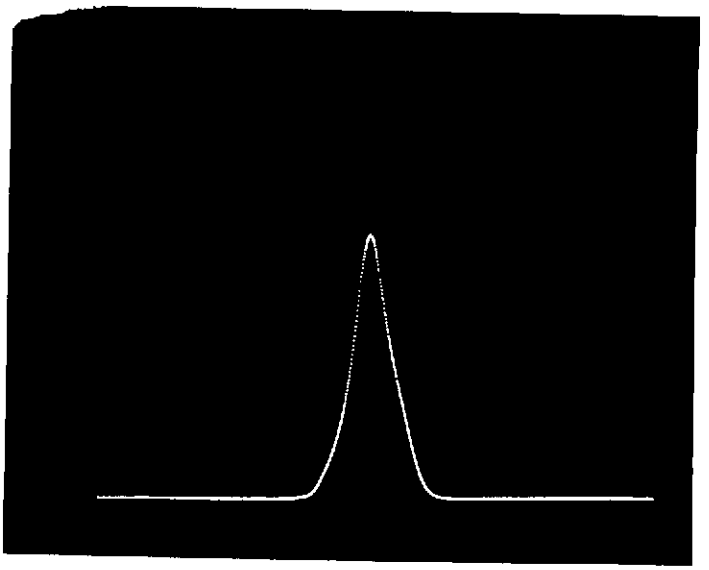

Figure D-16. Oscilloscope Presentation of Probability Data Set 16

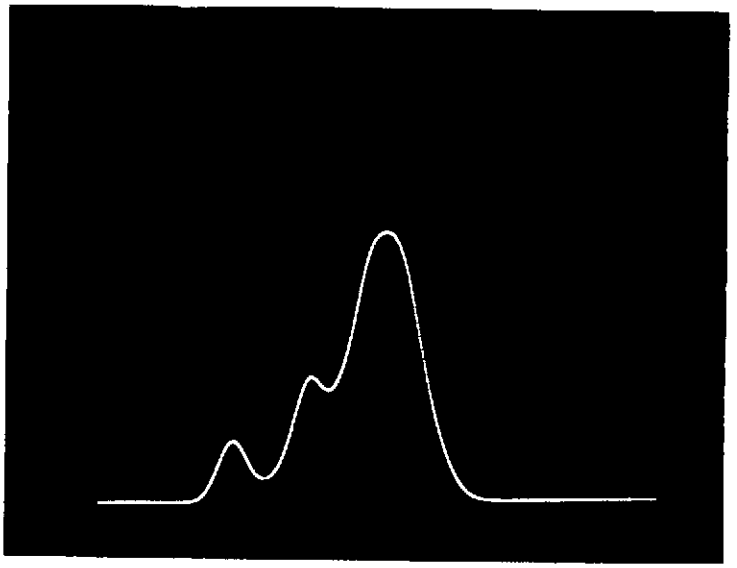

Figure D-17. Oscilloscope Presentation of Probability Data Set 17

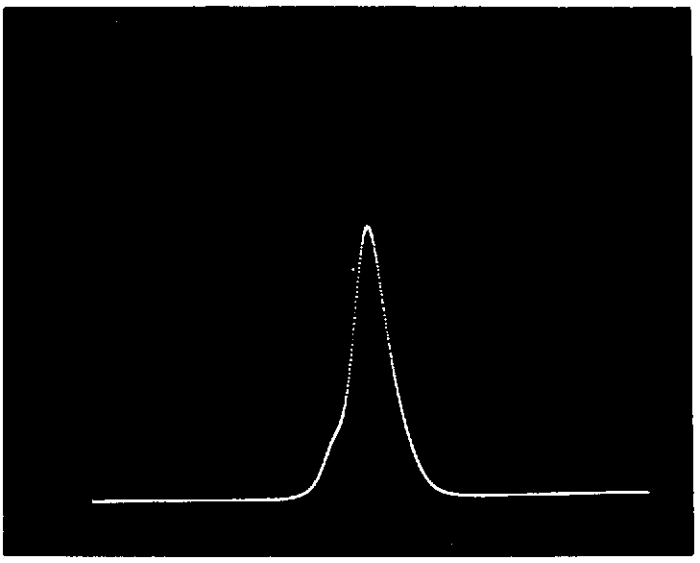

Figure D-18. Oscilloscope Presentation of Probability Data Set 18

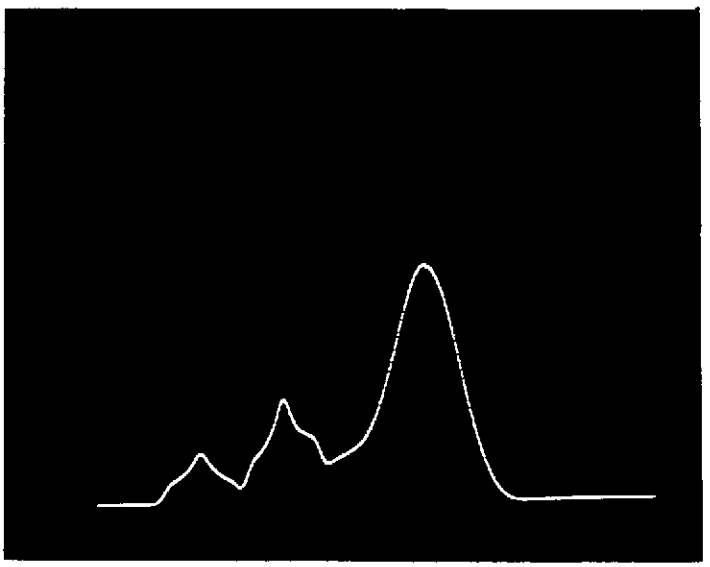

Figure D-19. Oscilloscope Presentation of Probability Data Set 19

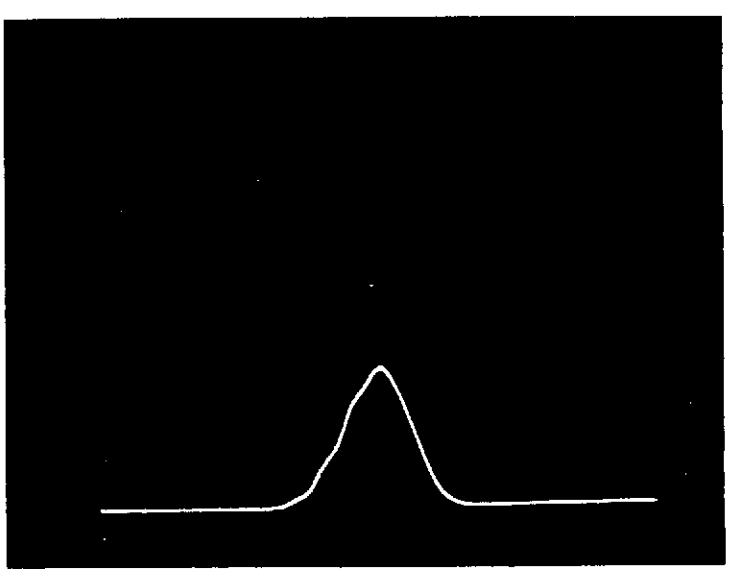

Figure D-20. Oscilloscope Presentation of Probability Data Set 20

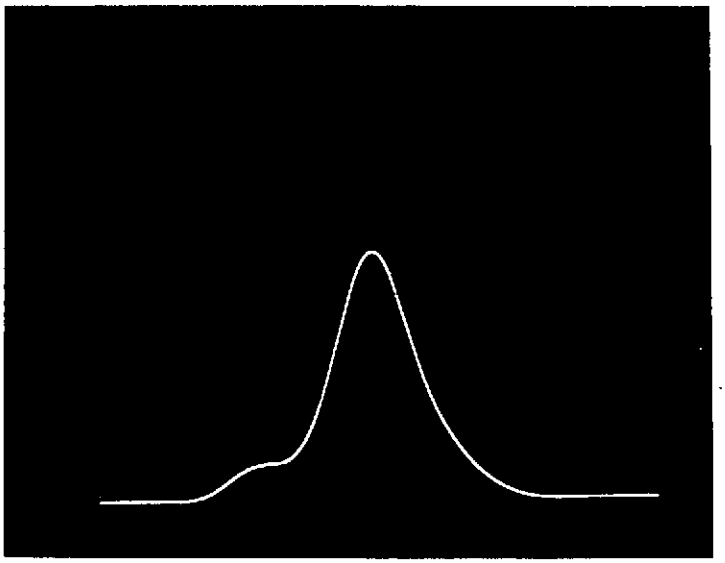

Figure D-21. Oscilloscope Presentation of Probability Data Set 21

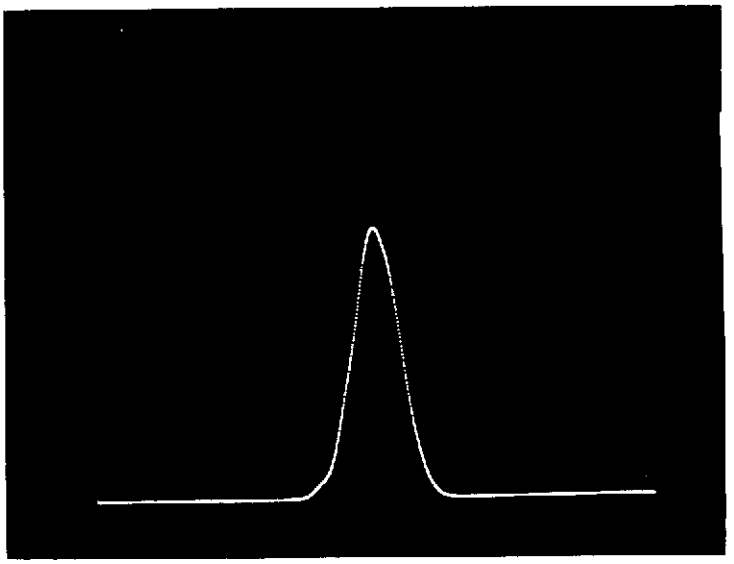

Figure D-22. Oscilloscope Presentation of Probability Data Set 22

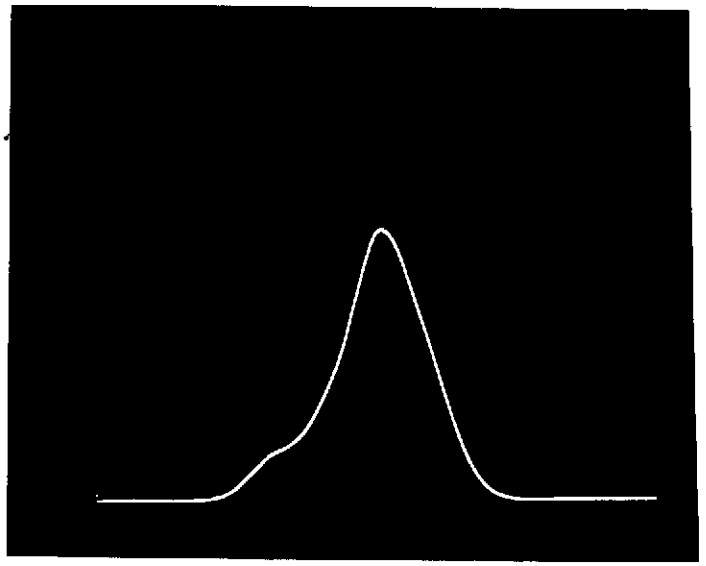

Figure D-23. Oscilloscope Presentation of Probability Data Set 23

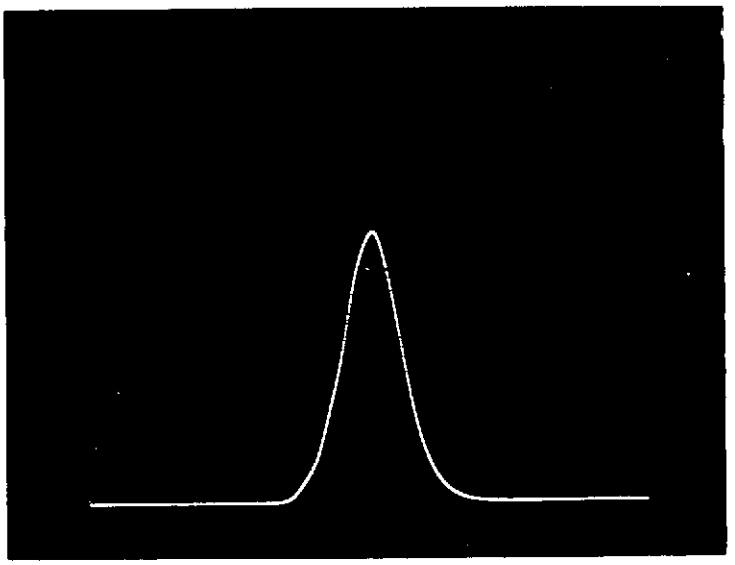

Figure D-24. Oscilloscope Presentation of Probability Data Set 24

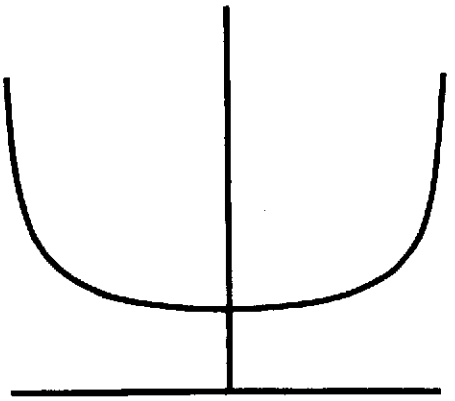

Figure D-25. Probability Density Function of a Sinusoidal Signal

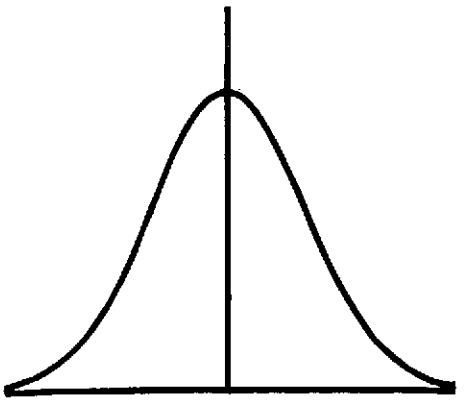

Figure D-26. Probability Density Function of a Gaussian Signal