

FIELD MANUAL

**HIGH FREQUENCY
RADIO COMMUNICATIONS**

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1978

APPENDIX C

REQUIRED SIGNAL-TO-NOISE RATIOS FOR VARIOUS GRADES OF SERVICE

C-1. General

The primary factor in determining the circuit reliability is the signal-to-noise ratio, which is directly associated with a grade of service. The grade of service defines the type of communication desired. The grade of service may state the percentage of error-free messages in teletype transmissions, the intelligibility of voice transmissions, or the percentage of satisfied observers of facsimile transmissions. A minimum required signal-to-noise ratio is associated with the desired grade of service. This ratio is a function of the class of emissions, modulation index, modulation rate, and signaling codes, and includes the effects of fading, error-correcting schemes, noise reducers, optimum modulation and detection techniques, and diversity schemes. The user of the system may specify the grade of service or the signal-to-noise ratio. Representative signal-to-noise ratios for various grades of service are given in table C-1.

C-2. Bandwidth Considerations

a. Note that this table lists the required S/N ratio for the signal in the occupied bandwidth relative to noise in a 1-Hz bandwidth. To convert the values to the ratio S/N (signal to noise in the occupied bandwidth), subtract the dB equivalent of the actual signal bandwidth from the tabulated values.

b. For example, the tabulated required S/N for 6A3 emission, double sideband am, dual diversity, fading, operator-to-operator, is 48 dB. The equivalent required S/N for both signal and noise in a 3-kHz bandwidth

$$\begin{aligned}
 &= 48 \text{ dB} - 10 \log \text{signal bandwidth} \\
 &= 48 \text{ dB} - 10 \log 3000 \text{ dB} \\
 &= 48 \text{ dB} - 10 \times 3.5 \text{ dB} \\
 &= 48 \text{ dB} - 35 \text{ dB} \\
 &= 13 \text{ dB}
 \end{aligned}$$

Table C-1. Required Signal-to-Noise Ratio in Occupied Bandwidth Relative to Noise in a 1-Hz Bandwidth

Radio telephone	Signal-to-noise ratio (dB)					
	Operator-to-operator ¹			Good commercial quality		
	Stable condition	Fading condition		Stable condition	Fading condition	
		No diversity	Dual diversity		No diversity	Dual diversity
6A3 Double sideband am	50	51	48	67	75	70
6A3 Single sideband am						
6A3A (reduced carrier)	48	49	46	65	73	68
6A3J (suppressed carrier)	47	48	45	64	72	67
6A3 Independent sideband am						
6A3 (2 voice channels)	49	50	47	66	74	69
6A3B (3 voice channels)	49	50	47	66	74	69
6A3B (4 voice channels)	50	51	48	67	75	70

¹See note below table.