Antenna Handbook

Table of Contents

	Page
Chapter 1. Radio Principles	
Electromagnetic Radiation	1-1
Radio Waves	1-2
Frequency	1-2
Frequency Calculation	1-3
Frequency Bands	1-3
Radio Communication Circuit	1-5
Propagation Fundamentals	1-8
Earth's Atmosphere	1-8
Radio Wave Propagation	1-8
Other Factors Affecting Propagation	1-18
Path Loss	1-19
Reflected Waves	1-19
Diffraction	1-21
Tropospheric Refraction, Ducting and Scattering	1-22
Noise	1-23
Natural Noise	1-24
Manmade Noise	1-24

Chapter 2. Antenna Fundamentals

Section I. Concepts and Terms	2-2
Forming a Radio Wave	2-2
Radiation	2-2
Radiation Fields	2-3
Radiation Patterns	2-4
Polarization	2-6
Polarization Requirements for Various Frequencies	2-8
Advantages of Vertical Polarization	2-9
Advantages of Horizontal Polarization	2-10
Directionality	2-10
Resonance	2-11
Reception	2-12
Reciprocity	2-13
Impedance	2-14
Bandwidth	2-15
Gain	2-16
Take-Off Angle	2-18
Section II. Ground Effects	2-19
Grounded Antenna Theory	2-19
Types of Grounds	2-20
Counterpoise	2-22
Ground Screen	2-23
Section III. Calculating Antenna Length	2-24
Section IV. Antenna Orientation	2-26

Antenna Handbook ——————

Azimuth	2-26
Improvement of Marginal Communications	2-27
Transmission and Reception of Strong Signals	2-29
Chapter 3. Transmission Lines	
Properties	3-1
Transmission Line Types	3-1
Minimizing Energy Loss	3-3
Impedance	3-3
Optimizing Line Length	3-5
Attenuation	3-6
Making the Best Use of Available Transmission Lines	3-7
Twin-Lead Limitations	3-8
Directly Connecting the Transceiver and Antenna	3-9
Baluns	3-10
Cable Connectors	3-11
Balanced Antenna	3-11
Chapter 4. HF Antenna Selection	
Antenna Selection Procedure	4-2
Determining Antenna Gain	4-6
Antenna Types	4-8
AS-2259/GR	4-9
Vertical Whip	4-10
Half-Wave Dipole	4-14
Inverted Vee	4-19

Long Wire	4-21
Inverted L	4-24
Sloping Vee	4-28
Sloping Wire	4-33
Vertical Half-Rhombic	4-37
HF NVIS Communications	4-40
Chapter 5. VHF and UHF Antenna Selection	
Frequencies	5-1
Polarization	5-2
Gain and Directivity	5-2
Gain	5-3
Directivity	5-3
Transmission Lines	5-4
Radiators	5-5
Vertical Radiator	5-5
Cross Section Radiator	5-5
Insulation	5-5
Interference	5-6
Noise	5-6
Multipath Interference	5-6
Vegetated Areas	5-8
Antenna Types	5-9
Vertical Whip	5-9
OE-254	5-10
Antenna Within Vehicle Interior	5-12
HF Antenna Types Usable at VHF and UHF	5-12
Dual-Function Antennas	5-12

viii

Antenna Handbook -

Chapter 6. Field Repair and Expedients

Repair Techniques	6-1
Whip Antennas	6-1
Wire Antennas	6-2
Guys	6- 4
Masts	6- 4
Tips on Construction and Adjustment	6-4
Constructing the Antenna	6-4
Adjusting the Antenna	6-6
Field Expedient Antennas	6-7
VHF Considerations	6-7
HF Considerations	6-7
End-Fed Half-Wave Antenna	6-8
Center-Fed Doublet Antenna	6-9
Field Expedient Directional Antennas	6-14
Vertical Half-Rhombic and Long-Wire Antennas	6-14
Yagi Antenna	6-14
Vee Antenna	6-16
Sloping Vee Antenna	6-16
Chapter 7. Satellite Communications Antennas	
Siting SATCOM Antennas	7- 4
Considerations	7-4
Determining Horizon Angles	7-4

Chapter 8. Antenna Farms

Command Post	8-1
Tactical	8-1
Main	8-2
Rear	8-2
Location Selection Considerations	8-2
Doctrinal Considerations	8-2
Tactical Considerations	8-3
Technical Considerations	8-5
Siting VHF Antennas	8-6
Transmitting Antenna Site	8-9
Receiving Antenna Sites	8-11
Antenna Farm Internal Arrangement	8-12
Frequency Band	8-12
Antenna Selection and Placement	8-12
Requirements	8-14
Polarization	8-15
Power and Signal Lines	8-16
Antenna Farm Layout Principles	8-16
Appendices	
A Glossary	A-1
R References and Related Publications	R ₋ 1