TUNED
DIPOLE ANTENNA

MODEL AD-100

WARRANTY

All equipment manufactured by Com-Power Corporation is warranted against defects in material and workmanship for a period of two years from the date of shipment. Com-Power Corporation will repair or replace any defective item or material if notified within the warranty period.

You will not be charged for warranty service performed at our factory. You must, however, pre-pay inbound shipping costs and have a return authorization.

This warranty does not apply to:

a) products damaged during shipment from your plant or ours.
b) improperly installed products.
c) products operated outside their specifications.
d) improperly maintained products.
e) products which have been modified.
f) normal wear of material.
g) calibration.

Any warranties or guarantees, whether expressed or implied, that are not specified set forth herein, will not be considered applicable to any equipment sold or otherwise furnished by Com-Power Corporation. Under no circumstances does Com-Power Corporation recognize or assume any liability for any loss, damage or expense arising either directly or indirectly from the use or handling of products manufactured by Com-Power Corporation, or any inability to use them separately or in combination with other equipment or material.

The warranty is void if items are shipped outside the United States, without prior approval of Com-Power Corporation.

Warranty Limitations

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by the buyer, unauthorized modification or misuse, operation exceeding specifications, or improper site preparation.

About this Manual

This manual provides instructions for setting up and using the Tuned Dipole Antenna model AD-100.

If You Need Assistance

If you encounter problems while using the Model AD-100 Dipole antenna, contact Com-Power Corporation at (949) 459-9600.

Contents

List of Figures

List of Tables

General Information 1

This section includes the following:

a) Introduction
b) General Description
c) Specifications
d) Equipment Supplied

1.1 Introduction

This section contains general description of the Model AD-100 dipole antenna. This section also contains general performance and technical information about the antenna.

1.2 General Description

The Model AD-100 dipole is a the standard antenna for EMC measurements, site calibration and as a reference antenna for calibrating other antennas over the frequency range of 30 to 1000 MHz.

1.3 Equipment Specifications

The Table 1-1 list the characteristics of the Model AD-100 dipole antenna.

1.4 Equipment, Accessories, and Documents Supplied

a) Four antenna baluns
b) Two pairs of fixed extension elements
c) Two pairs of collapsible extension elements
d) User's guide, Typical antenna factors
e) Individual calibration, upon request

f) Carrying case

Table 1-1. Equipment Specifications

Model: Dipole Antenna model AD-100

Frequency range:	30 MHz -1000 MHz Overall
Balun1 (DB-1)	30 MHz - 65 MHz
Balun 2 (DB-2)	65 MHz - 180 MHz
Balun 3 (DB-3)	180 MHz - 400 MHz
Balun 4 (DB-4)	400 MHz - 1000 MHz
Impedance:	50 Ohm
Connector Type:	BNC
Weight:	18 lb. (Max)
Length:	17.5 feet maximum

Figure 1.1 Antenna Factors for Tuned Dipole Antenna

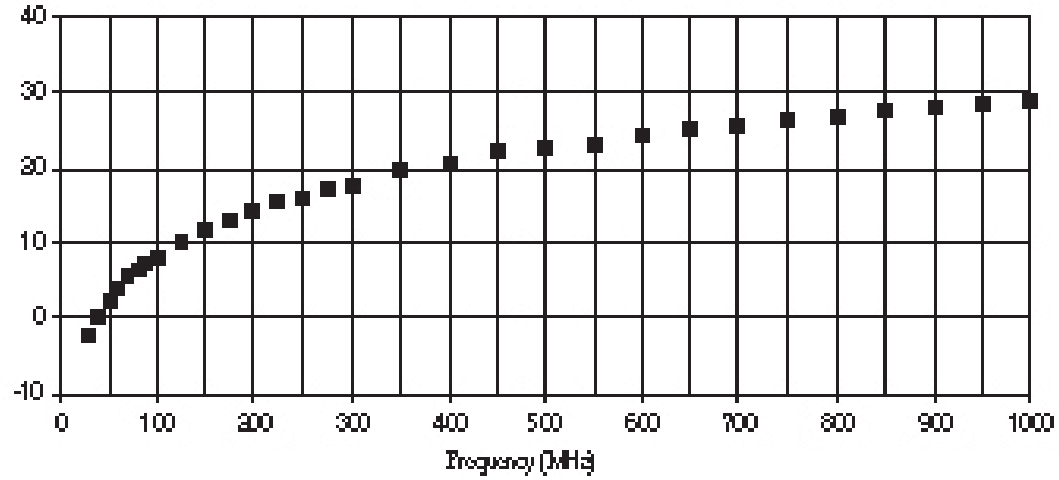
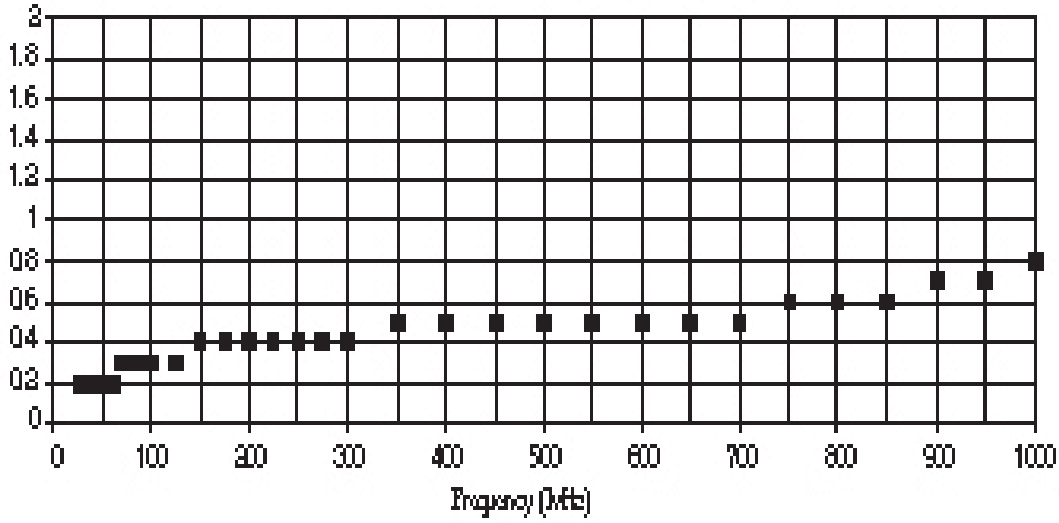


Figure 1.2 Typical Balun Loss



Operating Procedure 2

This section explains the following:

a) Introduction
b) Setup

2.0 Introduction

This section describes antenna setup for use.

2.1 Setup

2.1.1 Setting up and using the antenna.

Tuned dipole antennas operate over the frequency range of 30 MHz to 1000 MHz. There are four baluns to cover the entire frequency range. Each balun has a specific frequency range. It is possible to extend the element length above and below the specified frequency range of each balun. To prevent errors in measurement, the element lengths should not be adjusted beyond frequency range of each balun. Use the appropriate balun and elements for the frequency to be measured.

Table 3.1 gives tuning lengths at selected frequencies for each balun. The tuning length is measured from the center of the balun head. The collapsed length of each of the element set is given in table 2.1. The lowest frequency balun DB-1 requires the use of two fixed elements and the longer (II) collapsible elements on each side of the balun up to 45 MHz. Beyond 45 MHz, the DB-1 balun uses one fixed length element and collapsible element (II) on each side. The DB-2 balun uses the longer collapsible elements (II) up to 125 MHz and the two shorter collapsible elements (III) beyond it. The DB-3 balun uses only the shorter collapsible elements (III). The DB-4 balun elements are already inserted and fixed.

Table 2.1, Tunable dipole antenna elements

Element	Type	Length (in.)
I	Fixed	27.5
II	Collapsible	8.5
III	Collapsible	4.25

2.1.2 Setup for receiving signals

The Model AD-100 dipole antenna can be used to measure EMI from an equipment under test (EUT). The antenna is mounted on either an antenna mast (such Model AM-400) or an antenna tripod. The coax cable is used to connect the antenna to the a measuring instrument. If a long cable is used, cable loss must be measured and used in calculating the field strength.

Theory of Operation 3

This chapter explains the following:

a) Overview
b) Theory of Operation
c) Functional Block Diagram

3.0 Overview

This section describes the theory of operation of AD-100 Dipole Antenna.

3.1 Theory of Operation

The tuned dipoles are standard antennas used for calibrating Open Area Test Sites (OATS), EMC measurement and as a reference antenna for calibrating other antennas. These antennas are constructed according to ANSI standard C63.5 requirements.

For site attenuation measurement for the range of 30 MHz 1000 MHz, ANSI C63.5 recommends to using half wave tuned dipoles. Broadband antennas such as biconical and log periodic antennas can also be used for site attenuation measurements. However, use of dipole antennas are preferred because they are precise and reduce measurement uncertainty. The broadband antennas are desirable for EMC testing because they do not have be tuned to each frequency before making the measurement. To tune the dipole, the wavelength of the frequency that is being measured must be calculated. The elements of the dipole must be then adjusted to the half wavelength for that frequency before taking measurements.

The wavelength for any frequency F the equation: Wavelength = C / Frequency in MHz where C is the velocity of light, 3×10^8 meters /sec.

Using this formula the wavelength of 30 MHz is 3×10^8 m/sec divided by 30×10^6 Hz or 300/30 = 10 meter. Therefore, half wavelength is 10/2= 5 meters. This is the total dipole length tip to tip. Since the balun has two sides, the elements of on both sides of the balun head must be adjusted quarter wave length. That is 10/4 = 2.5 meters per side measured from the center of the balun head.

It must be noted however, that these calculations are theoretical. The tuned dipole is typically 4% smaller than this theoretical length. Table 3.1 lists the typical quarter wavelength for adjusting the tuned dipole elements.

Table 3.1 Dipole element lengths, typical factors, typical balun loss

Balun Number	Frequency MHz	L/4 Length mm	Balun Loss dB	Antenna Factor dB
DB-1	30	2413	0.2	-1.8
	35	2080	0.2	-0.5
	40	1803	0.2	0.6
	45	1600	0.2	1.7
	50	1438	0.2	2.5
	60	1197	0.2	4.2
DB-2	70	1026	0.3	5.5
	80	889	0.3	6.7
	90	791	0.3	7.7
	100	714	0.3	8.8
	120	589	0.3	10.2
	125	565	0.3	10.3
	140	500	0.4	11.5
	150	467	0.4	11.7
	160	438	0.4	12.7
	175	400	0.4	12.9
	180	389	0.4	13.7
DB-3	180	389	0.4	13.7
	200	352	0.4	14.6
	250	283	0.4	16.6
	300	235	0.4	18.1
	400	175	0.5	20.8
DB-4	400	175	0.5	20.6
	500	143	0.5	22.6
	600	117	0.5	24.2
	700	102	0.5	25.5
	800	89	0.5	26.7
	900	79	0.5	27.7
	1000	76	0.5	28.6

Note: L/4 is the quarter wave length of the tunable dipole at the given frequency. This is the length measured from the notch at the center of the antenna to each tip of the two elements. Due to the finite diameter of the elements, the optimum or tuned length of the dipole is found to be slightly less (approx. 4%) than determined by calculations.