

# AK-4G Antenna Kit Operation Manual

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## WARRANTY INFORMATION

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A.H. Systems Inc., warrants that our Antennas, Sensors and Probes will be free from defects in materials and workmanship for a period of three (3) years. All other products delivered under contract will be warranted for a period of two (2) years. Damage caused by excessive signals at the product's input is not covered under the warranty. A.H. Systems' obligation under this warranty shall be limited to repairing or replacing, F.O.B. Chatsworth, California, each part of the product which is defective, provided that the buyer gives A.H. Systems notice of such defect within the warranty period commencing with the delivery of the product by A.H. Systems.

The remedy set forth herein shall be the only remedy available to the buyer, and in no event shall A.H. Systems be liable for direct, indirect, incidental or consequential damages.

This warranty shall not apply to any part of the product which, without fault of A.H. Systems has been subject to alteration, failure caused by a part not supplied by A.H. Systems, accident, fire or other casualty, negligence, misuse or normal wear of materials.

Except for the warranty set forth above, there are no other warranties, expressed or implied, with respect to the condition of the product or its suitability for the use intended for them by the buyer.

For prompt service, please contact our service department for a Return Material Authorization Number before shipping equipment back to us.

# INTRODUCTION

shown with optional  
preamplifiers



Shown: AK-18G

## SPECIFICATIONS

Model Number	Frequency Range	Antenna Factor (dB/m)
SAS-510-4	290 MHz – 4000 MHz	15 to 37
SAS-530,542	20 MHz – 500 MHz	8 to 27
SAS-550-1B	9 KHz – 60 MHz	-1 to 3
SAS-560	20 Hz – 2 MHz	18 to 15
		Transfer Impedance
BCP-610	20 Hz – 20 MHz	-65 to -28
BCP-611	10 KHz – 150 MHz	-25 to 5
		Attenuation
SAC-211	Up to 10 GHz	4.4 dB @ 10 GHz
<b>OPTIONAL EQUIPMENT</b>		
		Gain / Attenuation
PAM-0204	20 MHz – 4 GHz	24 dB

# GENERAL INFORMATION

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## INTENDED PURPOSES

This equipment is intended for general laboratory use in a wide variety of industrial and scientific applications, and designed to be used in the process of generating, controlling and measuring high levels of electromagnetic Radio Frequency (RF) energy. It is the responsibility of the user to assure that the device is operated in a location which will control the radiated energy such that it will not cause injury and will not violate regulatory levels of electromagnetic interference.

## GENERAL DESCRIPTION

The A.H. Systems AK-4G antenna kit series consist of five E-field antennas, one magnetic loop antenna, and two current probes. Each of the antennas and probes are provided with calibrations when connected to a 50 ohm input receiver or spectrum analyzer.

Each of the E-field antennas mount directly to the tripod azimuth and elevation head. The azimuth and elevation head allows the operator to vary the antenna azimuth (direction) and to change the antenna polarity (vertical or horizontal).

Cables and an adapter are provided to connect each antenna and probe to either a BNC or N type connector on the receiver. Cable calibrations are supplied.

To obtain the field strength of the signal being measured, the operator must add the receiver reading in dBuV, the antenna factor in dB, and the cable attenuation in dB. This yields the field strength in dBuV/m. Calibrations for the E-field antennas are supplied at appropriate spacings (1, 3, and 10 meter) to comply with various specification requirements.

## E-FIELD ANTENNAS

### SAS-510-4 Log Periodic Antenna 290 MHz - 4000 MHz

The log periodic antenna comes assembled and ready to use.

**Operation:** Attach the antenna to the tripod azimuth and elevation head through the screw hole in the antenna base. Connect a cable between the antenna connector and the receiver. The log periodic beamwidth is 65 degrees and it should be pointed or aimed in the direction that the received signal is coming from.

### SAS-530,542 Broadband Dipole Antenna 160 MHz - 500 MHz

The broadband dipole antenna consists of the SAS-530,542 balun assembly and two dipole (2" tubular) elements.

**Operation:** Attach the balun assembly to the tripod through the screw hole in balun assembly base. Screw the two dipole elements into the 'tee' end of the balun

assembly. Connect a cable between the antenna connector and the receiver. The broadband dipole beam pattern is similar to a dipole response.

#### SAS-542 Biconical Antenna 20 MHz - 330 MHz

The biconical antenna consists of the SAS-542 balun assembly and two folding biconical elements.

**Operation:** Attach the balun assembly to the tripod thru the screw hole in the balun assembly base. Screw the two biconical elements into the 'tee' end of the balun assembly. Open the antenna elements completely and secure in open position by tightening the knurled knobs in the element caps. Connect a cable between the antenna connector and the receiver. The biconical beam pattern is similar to a dipole response.

#### SAS-550-1B Active Monopole Antenna 10kHz - 60 MHz

The active monopole antenna consists of a ground plane upon which are mounted a preamplifier with internal rechargeable battery pack for battery operation, and a telescoping rod antenna.

**Operation:** Mount the antenna on the tripod. Connect an external ground to the ground plane if called out in test specification. Attach the telescoping rod to the connector on the amplifier top and extend fully. Connect the output on amplifier side to the receiver using a cable. Apply power to antenna (turn battery power 'on'). The active monopole antenna is omni-directional.

### MAGNETIC LOOP ANTENNA

#### SAS-560 Magnetic Loop Antenna 20 Hz - 2 MHz

The loop antenna does not require any assembly.

**Operation:** The loop antenna is designed to be held by hand and moved around each surface of the EUT to measure magnetic radiation. Connect the antenna via a cable to a receiver with either a 50 ohm input or high impedance (10 K ohm or greater) input. Calibrations for both inputs are provided.

### CURRENT PROBES

#### BCP-610 LF Current Probe 20 Hz - 20 MHz

#### BCP-611 HF/VHF Current Probe 10 kHz - 150 MHz

The current probes come ready for use.

**Operation:** The two current probes measure conducted emissions when clamped around a single conductor, cable or a bundle of conductors. Disconnect the probe latch. Position the probe around the conductor and close the probe. Reconnect the probe latch to ensure that the probe is tightly closed. Connect the probe connector to the receiver with a cable. The probe calibrations supplied are into a 50-ohm receiver.

## TRIPOD AND MOUNTING ADPTERS

### ATU-510 Tripod

### AEH-510 Azimuth and Elevation Head

The azimuth and elevation head (AEH-510) mounts to the tripod (ATU-510) top and allows the antennas to be rotated 360 degrees and tilted between horizontal and vertical polarization. The tripod and azimuth and elevation head come in their own carrying case. Each tripod leg is independently adjustable in angle and length to facilitate antenna height setting. The tripod legs have a rubber tip on one end for indoor or hard surface use, and a metal spike on the other end for outdoor soft surface (such as dirt) use.

## TRANSIT STORAGE CASES

### TCC-510 Tripod Carrying Case

### TSC-542 Transit Storage Case

The antenna carrying case (TSC-542) prevents damage and loss of antennas when storing or transporting the antenna kit. The case is constructed of lightweight and durable polyethylene. Two case keys are provided with the case.

## OPTIONAL EQUIPMENT

The AK-4G case comes with three additional cutouts for optional preamplifiers. In order to improve overall system sensitivity, the following equipment will be required:

- PAM-0204 with an SAC-211-0.5

### PAM-0204 Preamplifier 20 MHz – 4 GHz

The preamplifier will increase the system sensitivity 24 dB and is recommend for the SAS-510-4 and SAS-530,542. An optional short length cable (SAC-211-0.5), is required to connect the preamplifier to any 50-ohm receiver or spectrum analyzer.

## ANTENNA FORMULAS AND CALCULATIONS

### **E-FIELD ANTENNAS**

Add antenna factor plus cable loss to receiver reading in dBuV to convert to field strength in dBuV/meter.

$$\text{Field Strength(dBuV/m)} = \text{SA(dBuV)} + \text{AF(dB/m)} + \text{cable loss (dB)}$$

### **LOOP ANTENNA**

$$\text{dBpT} = \text{dBuV} + \text{dBpT/uV} + \text{Cable Loss}$$

$$\text{dBuV/m} = \text{dBpT} + 49.5 \text{ dB}$$

### **BROADBAND CURRENT PROBES**

A specific Transfer Impedance Factor is associated with each frequency. This number is to be subtracted from the receiver reading in order to convert to dBuA

$$\text{dB}\mu\text{A} = \text{dB}\mu\text{V (from Receiver)} - \text{Transfer Impedance (dB}\Omega) - \text{cable Loss (dB)}$$

EXAMPLE:

Assume that the frequency of interest is 80 KHz and we need to find the current at this frequency. Connect the probe per figure 1

Frequency: 80 KHz

Transfer Impedance: -2.76 dB ohms

Cable Loss: 0.1dB

Receiver Reading: -33.0dBuV

$$\text{dB}\mu\text{A} = \text{dB}\mu\text{V (from Receiver)} - \text{Transfer Impedance (dB}\Omega) - \text{cable Loss (dB)}$$

$$\text{dB}\mu\text{A} = -33.0 \quad - \quad (-2.76) \quad - \quad 0.1$$

$$\text{dB}\mu\text{A} = -30.14$$



# MAINTENANCE

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To ensure reliable and repeatable long-term performance, annual re-calibration of your antennas, preamplifiers and current probes by A.H. Systems experienced technicians is recommended. Our staff can calibrate almost any type or brand of antenna.

For more information about our calibration services or to place an order for antenna calibration visit our website at <http://www.AHSystems.com> or call 1(818) 998-0223.