SAS-521-2
Bilogical Antenna
Operation Manual

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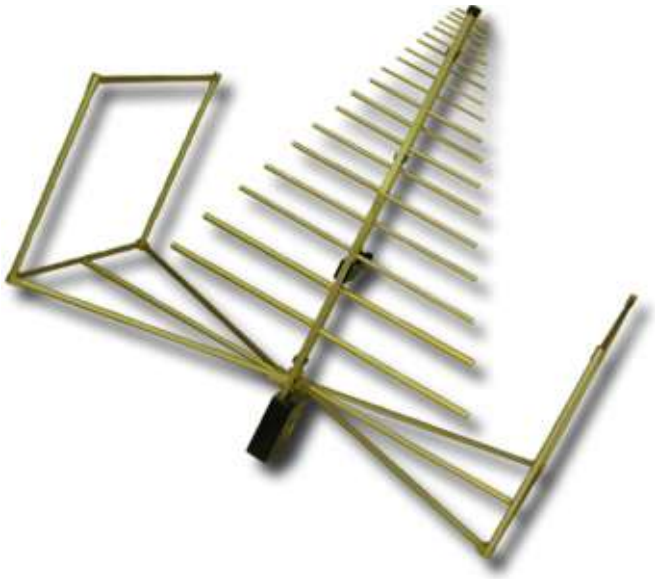


The SAS-521-2 Bilogical Antenna (also known as a hybrid log periodic, biconical antenna) is a lightweight antenna that has been designed to ensure medium gain, low VSWR and high power handling capabilities. Constructed of lightweight aluminum, the SAS-521-2 Bilogical Antenna has been manufactured to operate over a very wide bandwidth. With it's high input power capabilities, the SAS-521-2 is ideal for applications requiring the generation of field strengths. The reduced size of the antenna is preferred to minimize chamber wall coupling and increasing the half power beamwidth to a more acceptable angle that will cover the whole device under test.

INTENDED PURPOSES

The bilogical antenna is intended for general laboratory use in a wide variety of industrial and scientific applications and has been 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.

OPTIONAL EQUIPMENT

The following is a recommend accessory list for the SAS-521-2 Bilogical Antenna:

CONNECTING ACCESSORIES:

PAM-0202

This preamplifier has a broad frequency range and at least 25 dB of gain. An ideal solution for improving overall system sensitivity for various emissions testing requirements.

SAC-213

Standard N(m) to N(m) RF cable made with RG-58/U and optional ferrite loading that can be made to your specified length. Other cable types available upon request.

Adapters

Need an Adapter? We stock those as well.

MOUNTING ACCESSORIES:

AEH-510

Azimuth and elevation head to assist the test engineer in orientating biconical antenna at the device under test.

ATU-510

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.

BTE-510

Bilog Tripod Extension is a mounting rod the extends the antenna off of the tripod to enable both horizontal and vertical testing.

OPERATING INSTRUCTIONS

ASSEMBLY INSTRUCTIONS

The SAS-521-2 Bilogical Antenna is shipped with the triangle and window elements removed from the boom, this allows for easy transportation. The Bilogical Antenna also comes with the LPM-510 tripod mounting adapter that is already assembled onto the antenna.

Remove the triangular elements and the 3-sided pieces from the case. Attach the 3-sided pieces to the triangular pieces with the captive screws installed in the triangular fittings.

Attach the element assemblies (with the 3-sided pieces towards the short log periodic end) to the Bilogical boom in front of the black balun housing with the pre-installed captive screws.

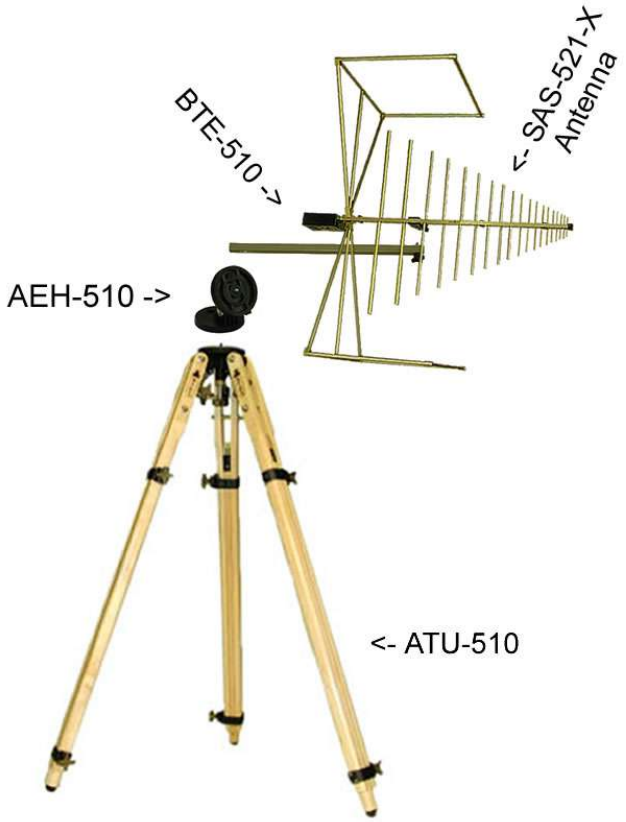
MOUNTING INSTRUCTIONS

The model SAS-521-X antennas have a mid-mount adapter supplied with the antenna to allow mounting at the CG of the antenna. Mounting the antenna to the extension rod enables the antenna to be used in either horizontal or vertical polarization.

1. Mount the BTE-510 tripod extension rod to the ATU-510 tripod with the ¼-20 mounting screw.

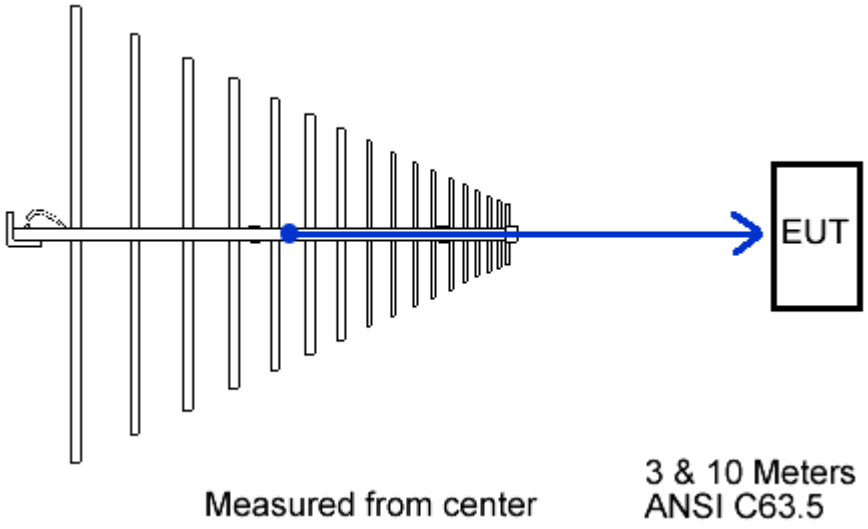
2. Mount the assembled antenna to the other end of the BTE-510 extension rod with the supplied ¼-20 captive mounting screw.

Attach the antenna to the azimuth and elevation head (AEH-510) through the screw hole in the antenna base. 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. 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.

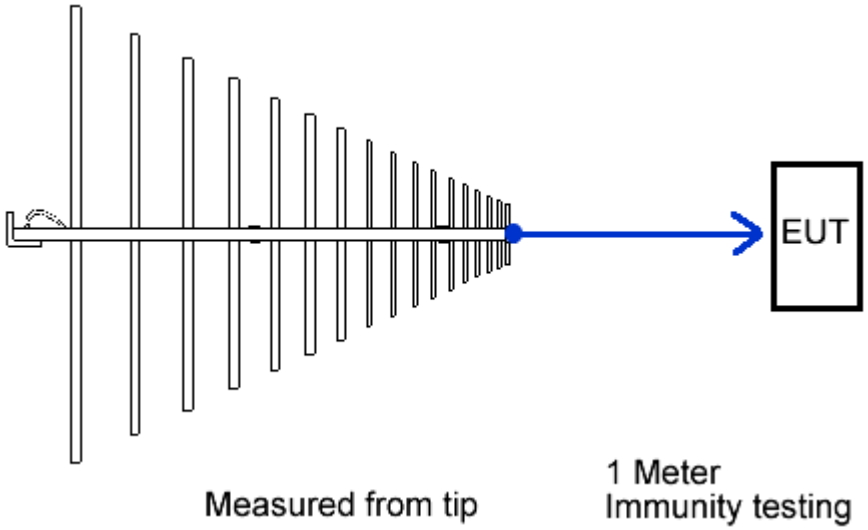


Mount the antenna such that the elements are parallel to the ground for horizontal polarization testing, or perpendicular to the ground for vertical testing. The horizontal beamwidth of the Bilogical is approximately 45 degrees and it should be pointed or aimed in the direction that the received signal is coming from.

EMISSIONS TESTING MEASUREMENT POINT:
For 3 and 10 meter testing, the measurement is made from the center of the antenna radiating elements and is annotated by a measurement point sticker (per ANSI C63.5).



IMMUNITY TESTING MEASUREMENT POINT:
Measurement is made from the tip of the antenna and typically preformed at a 1 meter distance. (3 meters per IEC 61000-4-3)



OPERATING INSTRUCTIONS

Once the antenna is mounted to a mast or tripod, connect an N-type coaxial cable from the antenna to a receiver or RF generator. The cable should be matched to 50 ohms, relatively low loss and adequately shielded against leakage such as RG-58 or better. For certain applications where an increased dynamic range is required, an optional preamplifier (PAM-0202) may be used to increase the total system sensitivity.

The Bilogical Antenna is in the horizontal polarization when the antenna elements are parallel to the ground, and vertical polarization when the elements are perpendicular to the ground.

To minimize impedance mismatch errors, it is recommended that high-quality in-line attenuators be used to reduce reflections. Connect the attenuator at the antenna end of the transmitting cable, or when receiving connect the attenuator at the measuring instrument or preamplifier input.

Dress the cables straight back from the antenna connector at least 1 meter before being dressed vertically down to the ground plane. Signal cables that are dressed orthogonal to the antenna elements will have minimal coupling to the antenna field, but the cable shields may carry external currents caused by impedance imperfections. Also, portions of the cables that are not straight down or straight back will couple to the antenna fields.

SPECIFICATIONS

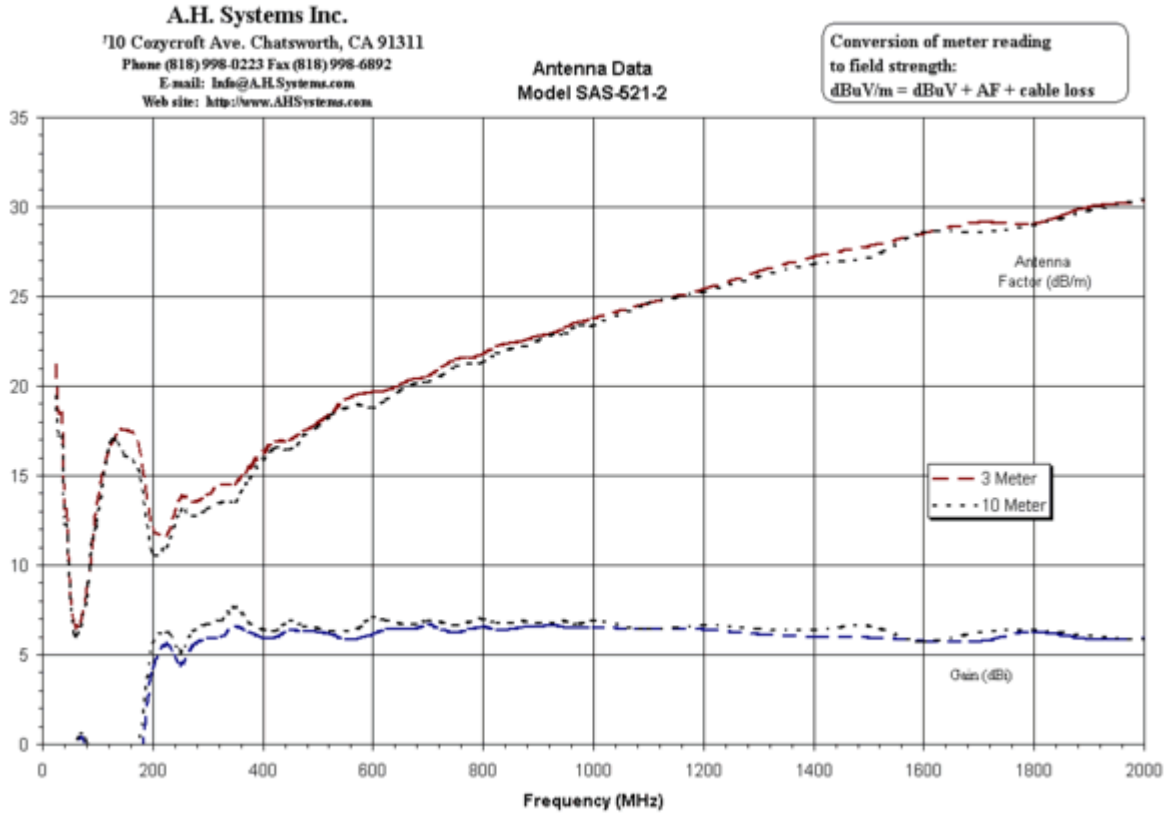
ELECTRICAL SPECIFICATIONS

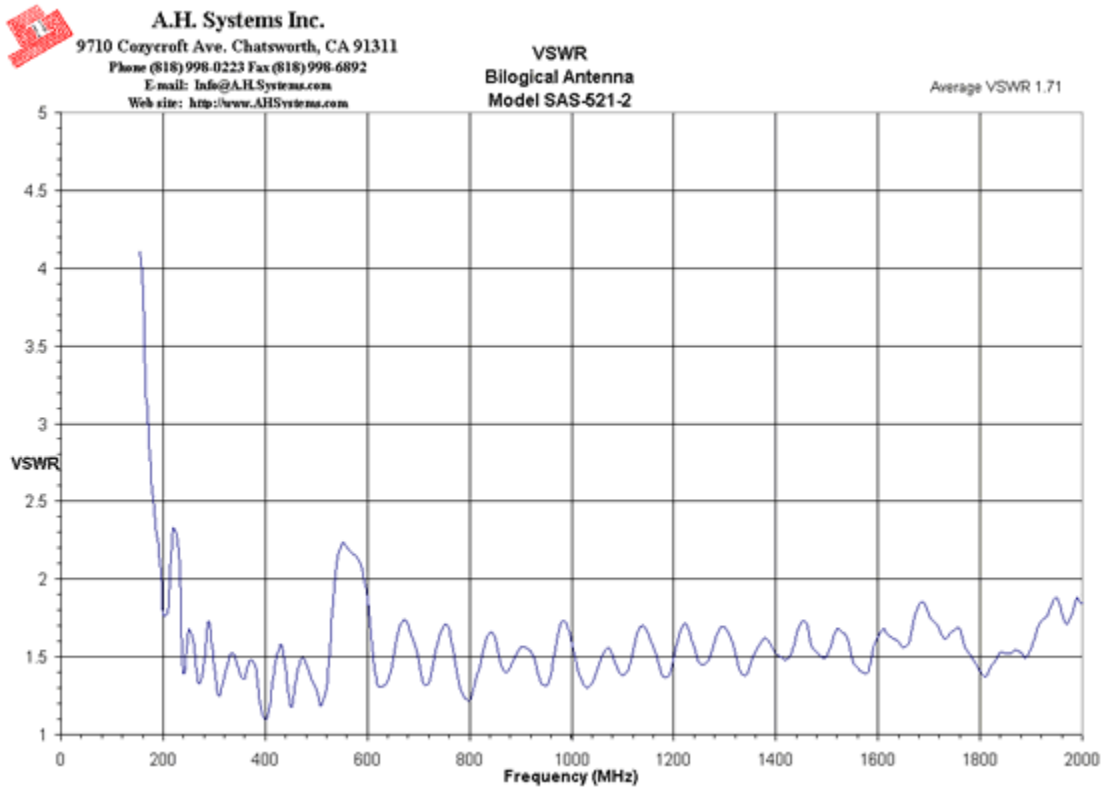
Frequency Range	25 MHz – 2 GHz
Antenna Factor	7 to 30 dB/m
Antenna Gain (Ave)	6.4 dBi
Maximum Continuous Power	1000 Watts
Impedance (nominal)	50Ω
Average VSWR	1.6:1 typ.
Maximum Radiated Field	100 V/m
Connector	N-Type (female)
Mounting	1/4-20 (female)

PHYSICAL SPECIFICATIONS

Weight	4.4 lbs. *(2 kg)*
Size (L x W x H)	37.3" x 38.5" x 22.2" (94.7cm x 98cm x 57cm)

TYPICAL DATA





CALCULATIONS

EMISSIONS TESTING

Individual calibration data for the log periodic antenna is supplied at appropriate distances (3, and 10 meter) to comply with various emissions test requirements. For emissions measurements, add antenna factor plus cable loss to receiver reading in dBμV to convert to field strength in dBμV/meter.

Field Strength(dBuV/m) = SA(dBuV) + AF(dB/m) + cable loss (dB)

SA = Spectrum Analyzer or Receiver voltage reading

AF = Antenna Correction Factor

CL = Cable Loss in dB

IMMUNITY TESTING

For Immunity measurements, the generated electric field strength can be calculated by:

FS = Approximate Field Strength in (V/m)

$$FS\ (V/m) = \frac{\sqrt{30Pg}}{d}$$

P = Power in watts
g = Numeric Gain
d = Distance in meters

TYPICAL CONVERSION FORMULAS

LOG -> LINEAR VOLTAGE

dBμV to Volts	$V = 10^{((dB\mu V - 120) / 20)}$
Volts to dBμV	$dB\mu V = 20 \log(V) + 120$
dBV to Volts	$V = 10^{(dBV / 20)}$
Volts to dBV	$dBV = 20\log(V)$
dBV to dBμV	$dB\mu V = dBV + 120$
dBμV to dBV	$dBV = dB\mu V - 120$

LOG -> LINEAR CURRENT

dBμA to uA	$\mu A = 10^{(dB\mu A / 20)}$
μA to dBμA	$dB\mu A = 20 \log(\mu A)$
dBA to A	$A = 10^{(dBA / 20)}$
A to dBA	$dBA = 20\log(A)$
dBA to dBμA	$dB\mu A = dBA + 120$
dBμA to dBA	$dBA = dB\mu A - 120$

LOG -> LINEAR POWER

dBm to Watts	$W = 10^{((dBm - 30)/10)}$
Watts to dBm	$dBm = 10\log(W) + 30$
dBW to Watts	$W = 10^{(dBW / 10)}$
Watts to dBW	$dBW = 10\log(W)$
dBW to dBm	$dBm = dBW + 30$
dBm to dBW	$dBW = dBm - 30$

TERM CONVERSIONS

dBm to dBμV	$dB\mu V = dBm + 107$ (50Ω) *$dB\mu V = dBm + 10\log(Z) + 90$*
dBμV to dBm	$dBm = dB\mu V - 107$ (50Ω) *$dBm = dB\mu V - 10\log(Z) - 90$*
dBm to dBμA	$dB\mu A = dBm - 73$ (50Ω) *$dB\mu A = dBm - 10\log(Z) + 90$*
dBμA to dBm	$dBm = dB\mu A + 73$ (50Ω) *$dBm = dB\mu A + 10\log(Z) - 90$*
dBμA to dBμV	$dB\mu V = dB\mu A + 34$ (50Ω) *$dB\mu V = dB\mu A + 20\log(Z)$*
dBμV to dBμA	$dB\mu A = dB\mu V - 34$ (50Ω) *$dB\mu A = dB\mu V - 20\log(Z)$*

FIELD STRENGTH & POWER DENSITY

dBμV/m to V/m	$V/m = {}_{10}^{(((dB\mu V/m) -120) / 20)}$
V/m to dBμV/m	$dB\mu V/m = 20 \log(V/m) + 120$
dBμV/m to dBmW/m²	$dBmW/m^2 = dB\mu V/m - 115.8$
dBmW/m² to dBμV/m	$dB\mu V/m = dBmW/m^2 + 115.8$
dBμV/m to dBμA/m	$dB\mu A/m = dB\mu V/m - 51.5$
dBμA/m to dBμV/m	$dB\mu V/m = dB\mu A + 51.5$
dBμA/m to dBpT	$DBpT = dB\mu A/m + 2$
dBpT to dBμA/m	$dB\mu A/m = dBpT - 2$
W/m² to V/m	$V/m = SQRT(W/m^2 * 377)$
V/m to W/m²	$W/m^2 = (V/m)^2 / 377$
μT to A/m	$A/m = \mu T / 1.25$
A/m to μT	$\mu T = 1.25 * A/m$

E-FIELD ANTENNAS

Correction Factor	$dB\mu V/m = dB\mu V + AF$
Field Strength	$V/m = \sqrt{\frac{30 * watts * Gain_{numeric}}{meters}}$
Required Power	$Watts = \frac{(V/m * meters)^2}{30 * Gain_{numeric}}$

LOOP ANTENNAS

Correction Factors	$dB\mu A/m = dB\mu V + AF$
Assumed E-field for shielded loops	$dB\mu V/m = dB\mu A/m + 51.5$
	$dBpT = dB\mu V + dBpT/\mu V$

CURRENT PROBES

Correction Factor	$dB\mu A = dB\mu V - dB_{(ohm)}$

Power needed for injection probe given voltage(V) into 50Ω load and Probe Insertion Loss (I_L)

$$Watts = {}_{10}^{((I_L + 10\log(V^2/50))/10)}$$

MAINTENANCE

MAINTENANCE PROCEDURES

Proper antenna maintenance should include:

- Visual inspection of RF connectors
- Check for bent and loose elements
- Check for loose or missing hardware
- Corrosion near the element joints

At least once a month it is a good idea to wipe down the antenna with a damp rag.

ANNUAL CALIBRATION

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.

It is always up to the user to determine the appropriate interval for calibration certification based on the requirements of the end users specific test/application. The calibration of EMC antennas is important for those conforming to compatibility standard. Radiated emissions testing for electromagnetic compatibility (EMC) requires the measurement of electric field (E-field) strength, which is compared with a limit level. The output voltage of an antenna is converted to E-field strength via its antenna factor, the measurement of which must include the uncertainty components related to that particular antenna, taking into consideration the environment in which the antenna is to be used for the testing. Most standards will specify the appropriate interval for re-calibration of your EMC antenna.

In some cases these antennas are used for a manufacturers pre-compliance testing, field monitoring, surveillance and/or other applications where the exact field intensity of the received signal is not of importance. For those customers a yearly re-calibration is not necessary, however it is recommended that an interval for maintenance be performed.

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.

WARRANTY INFORMATION

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 it's 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.