# WA301 INSTRUCTION MANUAL

# SPECIFICATION

(Specifications apply for 15V pk-pk into 50Ω at x10 gain)

| | |
|---|---|
| Bandwidth: | -3dB at 1MHz |
| Flatness: | -1dB at 400kHz |
| Rise/Fall time: | <0·5µs |
| Distortion: | <0·1% at 1kHz |
| Input Impedance: | 10kΩ |
| ⚠ Maximum Allowable Input Voltage: | ± 10V |
| Gain: | Vernier adjustment between x1 and x10. |
| Output Impedance: | 50Ω and 600Ω |
| Output 0dB: | 30V peak to peak from 50Ω (15V into 50Ω) |
| Output -20dB: | 3V peak to peak from 50Ω (1·5V into 50Ω) |
| Output DC Offset: | <5mV |
| Power: | 230V or 115V nominal, 50/60Hz, adjustable internally; operating range ±14% of nominal; 20VA max. Installation Category II. |
| Operating range: | +5ºC to +40ºC, 20% to 80% RH. |
| Storage range: | -40ºC to 70ºC. |
| Environmental: | Indoor use at altitudes up to 2000m, Pollution Degree 1. |
| Safety: | Complies with EN61010-1. |
| EMC: | Complies with EN55081-1 and EN55082-1. |
| Size: | 210(W) x 75(H) x 230(D) mm, including feet. |
| Weight: | 1·1 kg. |

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# EC Declaration of Conformity

We Thurlby Thandar Instruments Ltd
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declare that the

## WA301 Wideband Amplifier

meets the intent of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. Compliance was demonstrated by conformance to the following specifications which have been listed in the Official Journal of the European Communities.

## EMC

Emissions: EN50081-1 (1992) Generic (Light Industrial) referring to:

a) EN55022 Conducted, Class B.
b) EN55022 Radiated, Class B.

Immunity: EN50082-1(1992) Generic (Light Industrial) referring to:

a) EN60801-2 (1993) Electrostatic Discharge.
b) IEC801-3 (1984) RF Field.
c) IEC801-4 (1988) Fast Transient.

## Safety

EN61010-1 (1993) Installation Category II, Pollution Degree 1.

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CHRIS WILDING
TECHNICAL DIRECTOR
1 December 1997

# SAFETY

This instrument is Safety Class I according to IEC classification and has been designed to meet the requirements of EN61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use). It is an Installation Category II instrument intended for operation from a normal single phase supply.

This instrument has been tested in accordance with EN61010-1 and has been supplied in a safe condition. This instruction manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in a safe condition.

This instrument has been designed for indoor use in a Pollution Degree 1 environment (no pollution, or only dry non-conductive pollution) in the temperature range 5°C to 40°C, 20% - 80% RH (non-condensing). It may occasionally be subjected to temperatures between +5° and -10°C without degradation of its safety.

Use of this instrument in a manner not specified by these instructions may impair the safety protection provided. Do not operate the instrument outside its rated supply voltages or environmental range. In particular excessive moisture may impair safety.

**WARNING! THIS INSTRUMENT MUST BE EARTHED**

Any interruption of the mains earth conductor inside or outside the instrument will make the instrument dangerous. Intentional interruption is prohibited. The protective action must not be negated by the use of an extension cord without a protective conductor.

When the instrument is connected to its supply, terminals may be live and opening the covers or removal of parts (except those to which access can be gained by hand) is likely to expose live parts. The apparatus shall be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair.

Any adjustment, maintenance and repair of the opened instrument under voltage shall be avoided as far as possible and, if inevitable, shall be carried out only by a skilled person who is aware of the hazard involved.

If the instrument is clearly defective, has been subject to mechanical damage, excessive moisture or chemical corrosion the safety protection may be impaired and the apparatus should be withdrawn from use and returned for checking and repair.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse holders is prohibited.

Do not wet the instrument when cleaning it.
The following symbols are used on the instrument and in this manual:-



**Caution** - refer to the accompanying documentation, incorrect operation may damage the instrument.



alternating current.



terminal connected to chassis (ground).

# EMC

This instrument has been designed to meet the requirements of the EMC Directive 89/336/EEC. Compliance was demonstrated by meeting the test limits of the following standards:

## Emissions

EN50081-1 (1992) Generic emission standard for residential commercial and light industry. Test methods and limits used were:

a) EN55022 Conducted, Class B.

b) EN55022 Radiated, Class B.

## Immunity

EN50082-1 (1992) Generic immunity standard for residential, commercial and light industry. Test methods and limits used were:

a) EN60801-2 (1993) Electrostatic Discharge, 8 kV air discharge.

b) IEC801-3 (1984) RF Field, 3 V/m.

c) IEC801-4 (1988) Fast Transient, 1 kV peak (AC line) and 0·5kV peak (signal lines).

## Cautions

To ensure continued compliance with the EMC directive the following precautions should be observed:

a) connect the instrument to other equipment using only high quality, double-screened cables.

b) after opening the case for any reason ensure that all signal and ground connections are remade correctly before replacing the cover. Always ensure all case screws are correctly fitted and tightened.

c) In the event of part replacement becoming necessary, only use components of an identical type, see the Service Manual.

# INSTALLATION

## MAINS OPERATING VOLTAGE

The operating voltage of the instrument is shown on the rear panel. Should it be necessary to change the operating voltage from 230V to 115V or vice-versa, proceed as follows:

1. Disconnect the instrument from all voltage sources.
2. Remove the 4 screws which hold the upper and lower case halves together and lift off the case upper.
3. Remove the 4 screws which hold the power supply printed circuit board to the case lower.
4. Change the appropriate zero-ohm links in the pcb:

   Link LK1 only for 230V operation.
   Link LK2 and LK3 only for 115V operation.

5. Refit the pcb to the case lower, ensuring all connections (especially safety earth) are remade as before, and refit the case upper.
6. To comply with safety standard requirements the operating voltage marked on the rear panel must be changed to clearly show the new voltage setting.

## MAINS LEAD

When a three core mains lead with bare ends is provided it should be connected as follows:

| | | |
|---|---|---|
| **Brown** | **-** | **Mains live** |
| **Blue** | **-** | **Mains Neutral** |
| **Green/Yellow** | **-** | **Earth** |

**WARNING! THIS INSTRUMENT MUST BE EARTHED**

Any interruption of the mains earth conductor inside or outside the instrument will make the instrument dangerous. Intentional interruption is prohibited.

# OPERATION

## General Description

The WA301 is a DC to 1MHz amplifier with a maximum output (e.m.f.) of 30 Volts peak to peak from a 50Ω source impedance. A 600Ω output is also provided.

The unit can provide up to 15 Volts peak to peak into a 50Ω load and can drive up to 300mA peak into a low impedance or short circuit.

Fully variable gain between x1 and x10 is provided by a rotary vernier with calibrated end stops. A -20dB output attenuator is also incorporated.

An “OUTPUT CLIP” lamp is provided to warn if the output amplitude exceeds ±15V.

### Power

When the AC power is connected the amplifier is on and the front panel POWER lamp is lit. Disconnect from the AC supply by unplugging the mains cord from the back of the instrument or by switching off at the AC supply outlet; make sure that the means of disconnection is readily accessible. Disconnect from the AC supply when not in use.

### Operation

Connect the signal to be amplified to the socket marked INPUT and the load to the appropriate output. Note that the 50Ω and 600Ω outputs are not independent (the 600Ω OUTPUT is derived from the 50Ω OUTPUT via a 550Ω resistor) and loading one will affect the other.

Adjust the input signal level and/or the vernier GAIN control to set the required output signal amplitude. The end positions of the GAIN vernier are calibrated to be x1 and x10.

The OUTPUT CLIP lamp will light if an attempt is made to set the output level to greater than ±15V.

A -20dB output attenuator can be selected; this usefully extends the output amplitude range when working with a fixed level input signal. The ATTENUATION lamp is lit when the -20dB attenuator is selected.

The amplifier output impedance is 50Ω and can source up to 300mA into a low impedance or short-circuit indefinitely.

## MAINTENANCE

The Manufacturers or their agents overseas will provide a repair service for any unit developing a fault. Where owners wish to undertake their own maintenance work, this should only be done by skilled personnel in conjunction with the service manual which may be purchased directly from the Manufacturers or their agents overseas.

### Cleaning

If the instrument requires cleaning use a cloth that is only lightly dampened with water or a mild detergent.

**WARNING! TO AVOID ELECTRIC SHOCK, OR DAMAGE TO THE INSTRUMENT, NEVER ALLOW WATER TO GET INSIDE THE CASE. TO AVOID DAMAGE TO THE CASE NEVER CLEAN WITH SOLVENTS.**