# Australian Monitor

# KLa

## K SERIES LOOP AMPLIFIERS

## Introduction

Australian Monitor is proud to introduce to you its range of Induction Loop amplifiers. Modelled on the successful K-Series range, these amplifiers utilise our unique impedance and phase sensing system to provide a constant current into a single turn Induction Loop, resulting in clarity and detail whilst maintaining total stability.

Hosting most of the features and protection networks of the K-Series Audio Amplifiers the **KLa** loop amplifiers offer some additional circuitry, controls and Indicators to assist in the correct set-up of an Induction loop system.

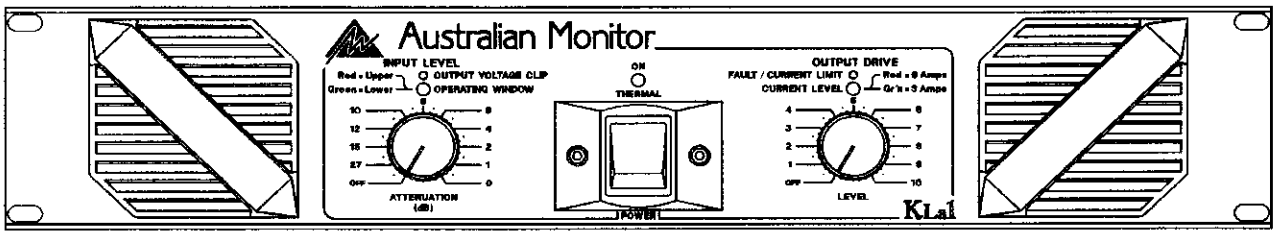
These include:
- Internal limiter with 250mV threshold and front panel indication
- 10dB into compression indicator
- Input Level Control for adjusting input signal for the ideal operating window
- Dual level output current indicators
- Low frequency output current limiting (and indication)
- Loop disable relay at turn on
- Loop open / voltage too high indication
- Binding Post and Speakon loop connections
- Active Balanced Inputs
- Signal Ground "LIFT" switch.

**Additional features include**: Custom designed - heavy duty chassis, open modular construction for ease of servicing, well regulating high current power supply, Input signal strapping connectors, massive heatsinking, Front to back cooling and a dual speed axial fan.

**Protection features include**: Mains inrush current suppression, Input muting at turn on, Input over-voltage protection, RF interference suppression, Short-circuit protection, Mains Circuit Breaker, Independent DC supply rail Fuses.
The layout, grounding, decoupling and componentry have been optimised to provide the user with stability, reliability and longevity.

# Front Panel Controls and Indicators

Your **KLa** loop amplifier is furnished with simple controls and indicators to assist in the set up of the amplifier for driving a properly calculated Induction Loop. The indicators provide visual detail to show the proper operating levels of input signals and output current.




## 1 Input Level Control.

A "Input Level" attenuation control is provided so as to adjust your incoming signal to a level suitable for processing by the internal limiter. The circuit is based on a fixed gain and thus the Input Level Control provides attenuation only. The input of the unit can deal with Gain Levelled Input Signals between -10 and +10dB but 0dB (.775v) is preferable.

## 2 Operating Window Indicator.

This Bi-Colour LED indicates signal level to the unit's limiter circuitry.

Green indicates the threshold of the limiter and is factory preset for 250mV (-10dB). Any applied signal should be illuminating this LED with the Input Level control in the appropriate position.

Red indicates that the signal is 10dB or more into compression. This led should not be illuminated all the time but should flash with programme peaks. Ideal signal level will cause a continuous toggle between the LED illuminating green and red.

## 3 Output Voltage Clip Indicator.

This LED is provided and will illuminate amber when the output voltage of the amplifier is driven into clipping. Ideally this LED should never illuminate and implies that the output level is too high, that the loop has gone open circuit and/or the loop impedance is too high.

## 4 Output Drive Control.

The "Output Drive" level control dictates current drive to the loop. Its position will be dictated by the peak current level required to properly drive the loop as indicated by the chart on page 8.

## 5 Current Level Indicator.

The "Current Level" LED is provided as indication to show the peak current in the loop.

**KLa 1** - Green = 3 Amps, Red = 6 Amps.
**KLa 2** - Green = 5 Amps, Red = 10 Amps

see chart for loop calculations.

## 6 Fault / Current Limit Indicator.

This amber coloured LED will illuminate when load current exceeds a safe value. The led indicates limiting of the current into the load and will flash with programme peaks. The infrequent flashing of this LED on peaks at lower frequencies is quite acceptable. Constant illuminating of this LED requires the output drive to be reduced.

The LED will also illuminate with other faults such as blown negative rail fuse and short circuits on the output.

## 7 On / Thermal Indicator

This is a Bi-Colour LED which will normally illuminate **green** and indicates that the amplifier is on and receiving mains power.

In the advent of a Thermal Overload this LED will turn **red** indicating that the internal operating temperature of the amplifier has exceeded a safe level of operation and that the amplifier has shut down and isolated itself from the loop. The fan will continue to run and once the amplifier has had a cool down period the unit will restart automatically providing inrush current suppression, input muting and the loop relay isolation will be bypassed.

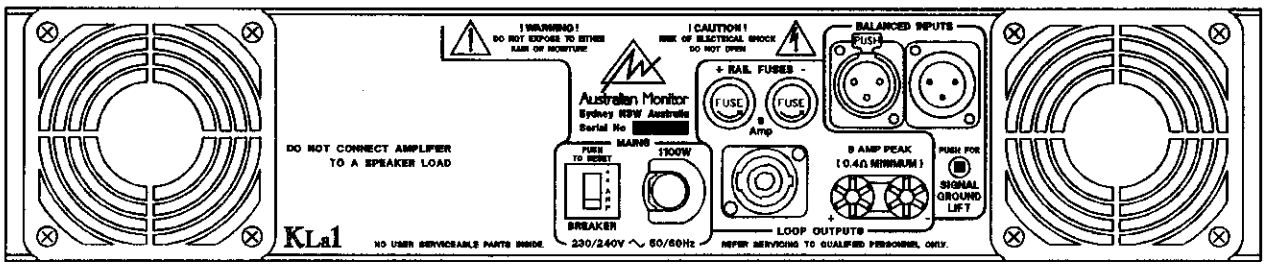
## 8 Power Switch

Press the switch **down** for **ON** and **up** for **OFF**. Like any other power amplifier in any system it should be the **last** piece of equipment you turn **on** and the **first** piece of equipment you turn **off**.

At turn-on a number of events happen during the power-up of the amplifier.

a) Mains inrush current suppression is provided,
b) A relay isolates the Induction Loop until the amplifier has established itself,
c) Input signal to the main amplifier is muted (>30dB) for approx' 2 to 3 seconds.

# Rear Panel




## 1 Balanced Input & Strapping Connection

A female 3-pin XLR connector is provided as input connection. A male XLR connector is provided as a strapping connector wired in parallel with the input XLR allowing strapping/looping between multiple amplifiers.
Pin allocation is: **Pin-1** = Signal Ground, **Pin-2** = Cold (reverse phase), **Pin-3** = Hot (in phase).

## 2 Signal Ground Lift Switch

When this switch is engaged it disconnects signal ground from the amplifier. It is intended to be used when "HUM" is caused by earth loops or stray magnetic fields.

**The amplifier should be turned off before engaging this switch.**

## 3 Loop Outputs.

Your **Kla** Loop Amplifier is provided with 2 options for output termination of the loop. Heavy current Binding Post outputs are provided as well as a Neutrik "Speakon" connector.
The Speakon connector is wired 1+ = positive & 1- = negative.

## 4 Mains Lead

Your amplifier is supplied with a heavy duty mains lead (power cord) appropriately rated for the mains supply voltage marked on the rear panel of your amplifier. The wires in the mains lead are coloured in accordance with the following code.

Brown = Active, Blue = Neutral, Green/yellow = Earth.

**Your unit must always be earthed!**

## 5 Mains Circuit Breaker

A "push to reset" thermal circuit breaker is supplied to provide overall protection of your amplifiers power supply. It will isolate the "active" mains conductor in the event of a high current internal fault or in continued overload conditions.

## 6 D.C. Rail Fuses

3AG "fast blow" type fuses are provided and are in series with the positive and negative supply rails for your amplifiers output stage. These fuses provide overall protection of the output stage.
The fuses must be replaced with the same type fuse.

**KLa1 = 8 Amps, KLa2 = 10 Amps.**

# To set up your KLa Loop Amplifier:

Once all connections have been made:

1. Make sure all the controls are down before you turn the amplifier ON.
2. Apply signal ( applied signal should be gain levelled and be around 0dB - 0.775 volts )
3. Turn up "INPUT LEVEL" knob until "OPERATING WINDOW" LED is flashing between green and red illuminations.

   **NOTE:** The red LED should not be on constantly, but should flash with programme peaks.

4. Turn up "OUTPUT DRIVE" control to the desired current level.

   **KLa 1** Green = 3 Amps, Red = 6 Amps.

   **KLa 2** Green = 5 Amps, Red = 10 Amps.

   **NOTE:** These LEDs are to illuminate on peaks only.

5. Use a field strength meter or loop listening device to monitor level and coverage in the loop.

# The do's and don'ts

There are a few precautions you need to consider when installing your Induction Loop System.

As there is a strong field radiating from the cable it can interfere with other electronic equipment thus your loop should be restricted (as far as possible) to a defined listening area.

## Do:

Always ensure the installation of your Loop is in accordance with wiring regulations.

As far as possible have your loop at the same elevation as the listening position, 1 to 2 metres above or below this is acceptable but more current drive may be required.

Run balanced signals / cables wherever possible.

## Do Not:

Do not install the loop with other cable runs - never run the loop cable in parallel with other cables and always cross other cables at right angles.

Do not run your Loop cable in conduit or in / or near shielded trays as this may effect its performance.

Do not have dynamic type microphones, which may be a part of the signal source, inside or near the loop. The coil may pick up the radiated field from the loop and cause feedback to occur in the system.

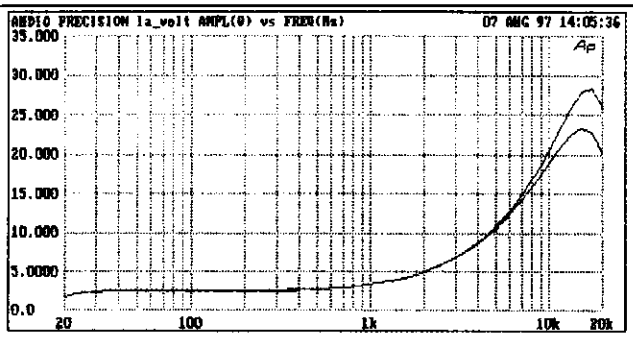
Do not run unbalanced signals / cables as they may be affected by the Loop and cause feedback.

# Why An Induction Loop system.

Usually, an Induction Loop system is installed as an aid to provide audio for the hearing impaired. The system is driven by an amplifier which can provide a constant current into a wire loop encompassing the listening area. A field is radiated from the current flowing in the loop, and this radiated field induces current to flow (more often than not) in a "T-Coil" in the hearing aid device of the hearing impaired.

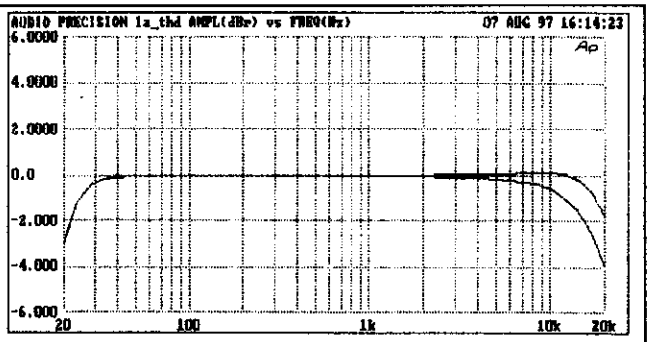
Because a length of wire is used as the load from which the signal is radiated, it makes special demands on the amplifier driving it.
The wire will exhibit a very low impedance at low frequencies and exhibit a higher impedance as the frequency rises. To maintain a constant radiation from the piece of wire (through the audio bandwidth) you must maintain a constant current into the load. Normally encountered amplifiers are a constant voltage type and will not drive an Induction Loop System properly as their voltage output is constant (regardless of load variations) and fidelity will be lost in the system as radiation will reduce as the frequency rises.

The graphs below show the transfer characteristic of a **Kla1** into 50 metres of 2.00 $mm^2$ cable.




Output Voltage Vs Frequency

The above graph (lowest trace) shows the output voltage variation of a KLa1 required to maintain a constant current of 5 amps into the Induction Loop.




Current Output Vs Frequency

The above graph (lowest trace) shows the Frequency Response relative to current output of the KLa1. 0dB reference = 5amps @ 200Hz.

*This Loop exhibits an impedance of 0.5 ohm at 200Hz and an impedance of 4 ohms at 10kHz. Power into the loop @ 200Hz = 12.5 VA but @ 10kHz the power = 100 VA. A constant voltage type amplifier driving the same loop at 5 amps @ 200Hz would be down 18dB @ 10kHz.*

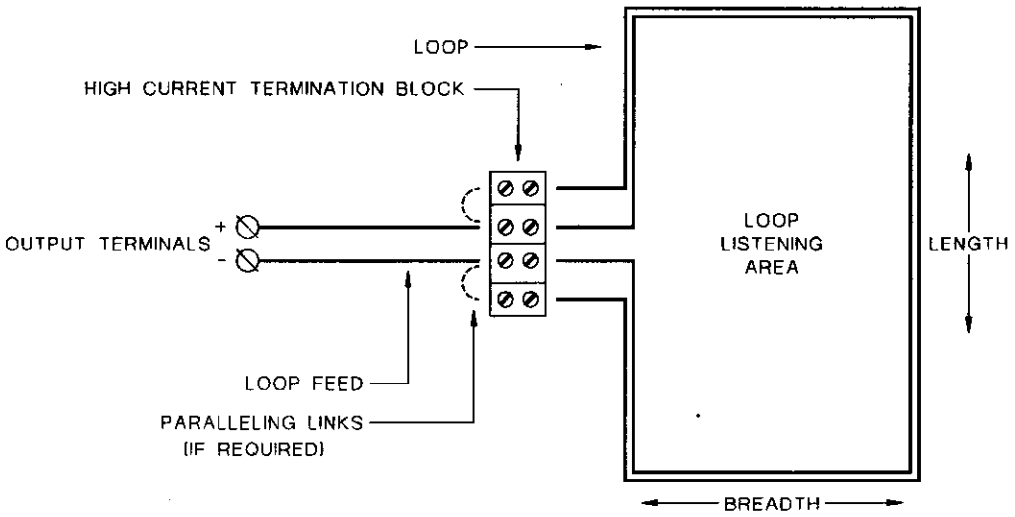
Also the amplifier is driving a virtual short circuit for the lower frequency spectrum and thus would invoke protection circuitry to continuously operate in constant voltage type amplifiers.

Two traces are shown above. The **KLa** Loop Amplifiers have an internal adjustment (RV-1) which allows for the higher frequency response to be extended. The upper trace on the graphs show a fully compensated high frequency response. This adjustment would normally be left at the factory preset (no compensation), but could become useful in circumstances where the loop was not properly calculated.

The hearing impaired can detect more detail in the programme if dynamic range is reduced. For this reason Induction Loop Systems should be fed with gain levelled signal. The **KLa** amplifiers have a built in limiter to further reduce transients in the applied programme source.

# Calculating the Induction Loop.

The following information is provided as a guide for the proper calculation of your Inductive Loop installation. You will need to know the size of your loop to ascertain the peak drive current required and to select the appropriate gauge of the wire for the loop.




First we need to calculate the Peak current required in the loop. The Induction Loop Peak Current Chart (page 8) shows the relative current required for different size loops - Pick the closest current (Ampere) curve. If your loop is a circle, simply approximate it to a square.

Then we need to determine the length of cable required (length + breadth) x 2. this will give us the perimeter of the loop. To this add the loop feed distance, for a total wire length.

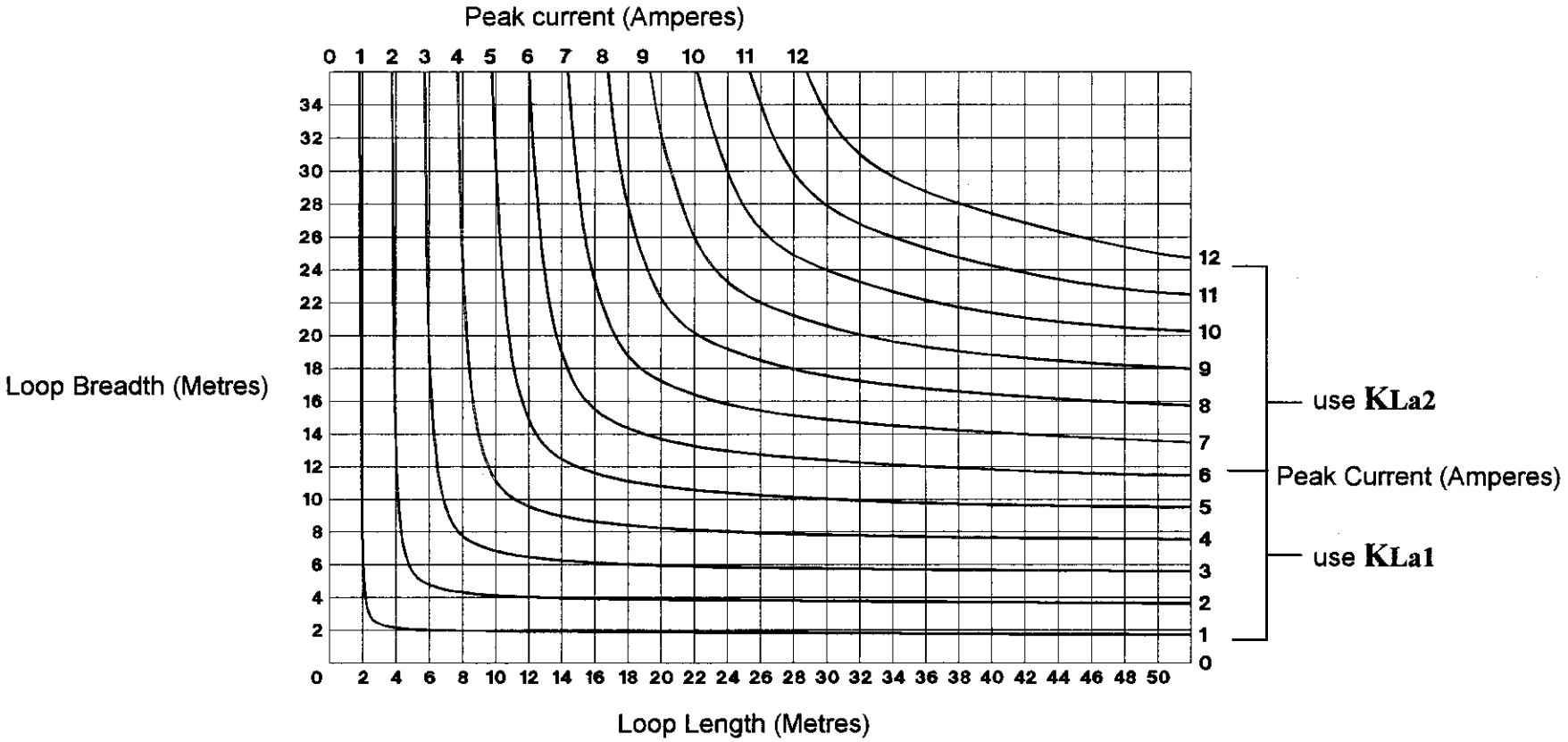
Now we need to calculate the gauge of the wire. It is recommended that the total D.C. resistance of the loop is between 0.5ohm and 1.0 ohm. We also recommend that you ensure the current rating of the cable is well above the peak current required into the loop (>2 times) and that the insulation is of a heavy duty type with a good dielectric strength and high thermal capacity.
To help reduce the variation in wire gauges needed to satisfy every loop we suggest running a heavy duty figure-8 cable with a termination block (as shown in the above diagram) which will allow you to parallel the conductors if the resistance of the loop is too high.

**Stranded copper conductors to BS6360 - 1991**

| Nominal Area $mm^2$ | Conductor stranding | Nearest AWG | ohms per 100 Metres | Current rating |
|---|---|---|---|---|
| 1.00 | 32/0.20 | 17 | 1.85 | 6 |
| 1.50 | 30/0.25 | 16 | 1.26 | 9 |
| 2.00 | 40/.025 | 14 | 0.98 | 11 |
| 2.50 | 50/.025 | 13 | 0.76 | 15 |
| 3.00 | 63/0.25 | 12 | 0.60 | 20 |

For example: A loop that is 15 metres by 40 metres requires a peak current of **8 amps**. Its perimeter = 110 metres and the loop feed is 10 metres long, thus **120 metres** of cable is required. To achieve a D.C. resistance of between 0.5 and 1.0 ohms we would need to use 12 AWG wire which will give us **0.72** ohms total D.C. resistance and a current rating 2.5 times the peak current required (20 amps). Paralleling 16 AWG wire would give us a similar result @ 0.756 ohms for 18 amps.

## Induction Loop Peak Current chart




To determine the Peak Current requirement of your Induction Loop, simply cross reference your loop Breadth by loop length and choose the closest current (Ampere) curve.

Example: A loop **10 metres** in breadth **by 30 metres** in length would require a peak current of **5 Amps** and only requires a **KLa1**.
A loop **20 metres** in breadth **by 32 metres** in length would require a peak current of **9 Amps** and requires a **KLa2**.