

# AMPETRONIC CLS2-R1 Concourse Hearing Loop Driver Instruction Manual

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Listen to the difference  
CLS2-R1  
Installation Handbook  
& Maintenance Manual  
[www.ampetronic.com](http://www.ampetronic.com)

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## Box Contents

- 1 x CLS2-R1
- 1 x Installation handbook
- 1 x IEC lead
- 1 x NL4 FC Speakon loop connector

- 2 x 4 way 5mm terminal blocks
- 1 x P-clip & M4 nut & washers (fitted)
- 1 x M6 nut & washers (fitted)





This symbol is used to alert the user to important operating or maintenance instructions.



The Lightning bolt triangle is used to alert the user to the risk of electric shock.

## SAFETY

1. It is important to read these instructions, and to follow them.
2. Keep this instruction manual in an accessible place.
3. Clean only with a dry cloth. Cleaning fluids may effect the equipment.
4.  Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
5. Do not install this equipment near any heat sources such as radiators, heating vents or other apparatus that produces heat.
6.  **WARNING – THIS APPARATUS MUST BE EARTHED / GROUNDED.**
7. Only power cords with the correct power connector may be used to maintain safety. Cables incorporating the UK 13A fused plug, Schuko with earthing contacts and UL approved “grounding type” are acceptable. These must be plugged into power outlets which provide a protective earth.
8. Refer all servicing to qualified personnel. Servicing is required when the apparatus has been damaged in any way, such as a power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to any rain or moisture, does not operate normally or has been dropped.
9. **WARNING –** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. The apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.



**TO PREVENT ELECTRIC SHOCK DO NOT REMOVE THE COVER. THERE ARE NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL**

## Introduction

The CLS2-R1 professional induction loop driver has been designed as a high quality amplifier for use in transport infrastructure public address applications, such as on railway platforms and bus station waiting areas. Depending on a number of factors regarding the installation of the loop and the set-up of the amplifier the CLS2-R1 can provide compliance with IEC60118-4 for areas >400m<sup>2</sup>.

The unit is designed for wall or panel installation and features a detachable lid. Connections are made using industry standard connectors. All adjustments are made within the amplifier case reducing the likelihood of tampering after commissioning.

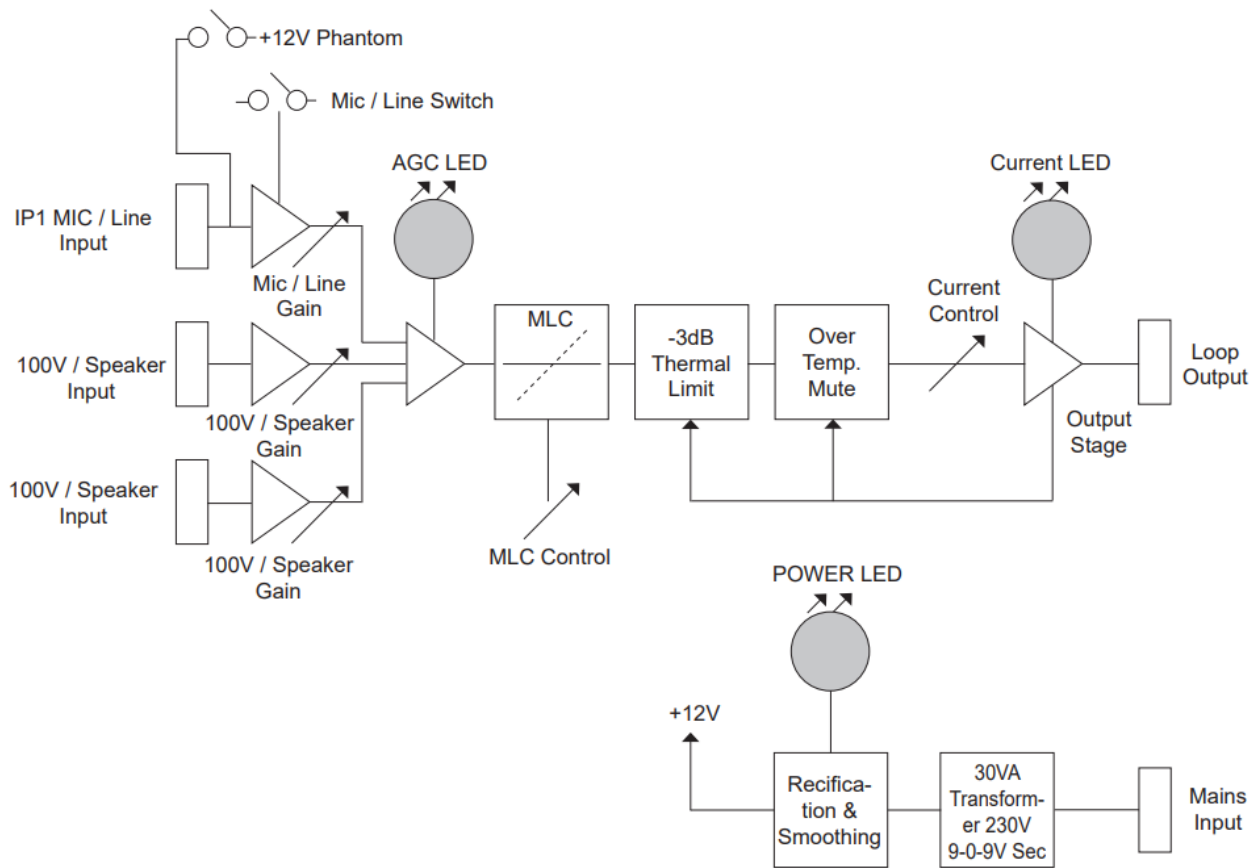
The CLS2-R1 is supplied pre-adjusted for a typical site. However, correct operation must be checked for each installation and it may be necessary to adjust the settings for IEC 60118-4 Standard compliant operation.

The CLS2-R1 has been designed with ease of installation and use in mind and to mitigate radio frequency interference in the rail / transport environment.

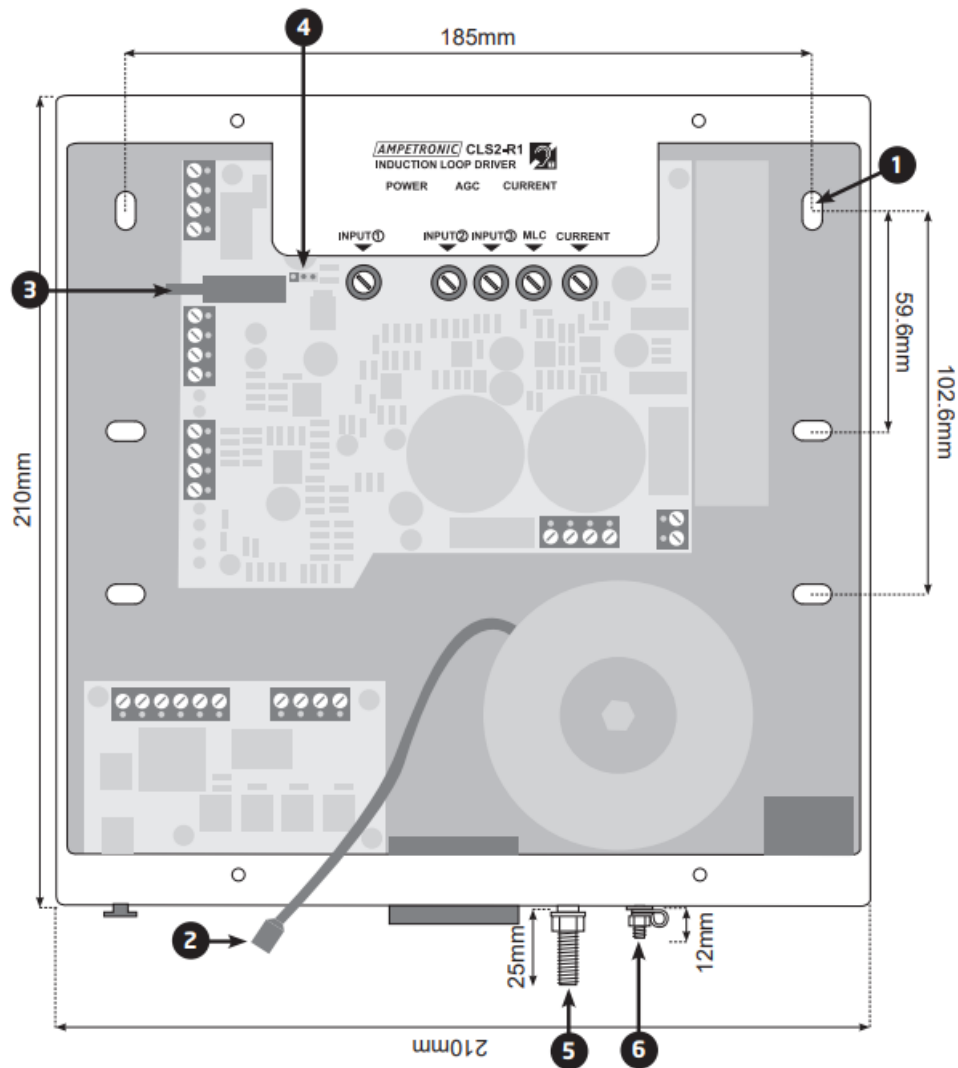
The CLS2-R1 has three audio inputs, two of which can be 100V line / speaker line, and one which can be

configured for balanced line or balanced microphones.

## BLOCK DIAGRAM

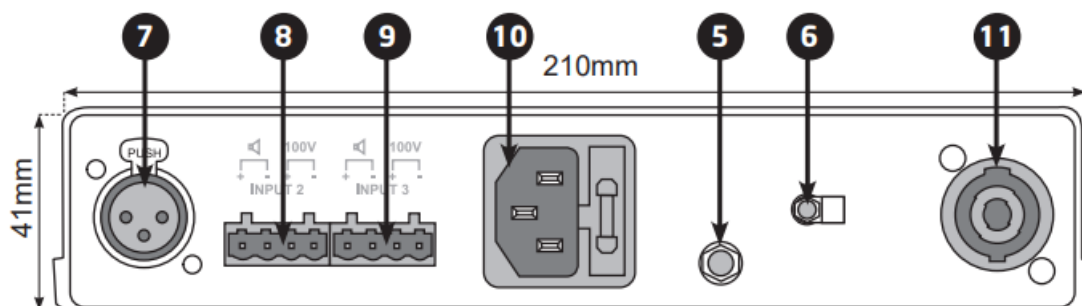


## OVERVIEW



1. OVAL MOUNTING HOLES: 10mm x 6
2. DETACHABLE EARTH LEAD: Must be reconnected before lid is secured
3. INPUT 1 MIC / LINE SELECTOR
4. +12V PHANTOM POWER: On / Off
5. Ground Stud: M6
6. Mains Cable Securing 'P Clip': M4

### CONNECTIONS

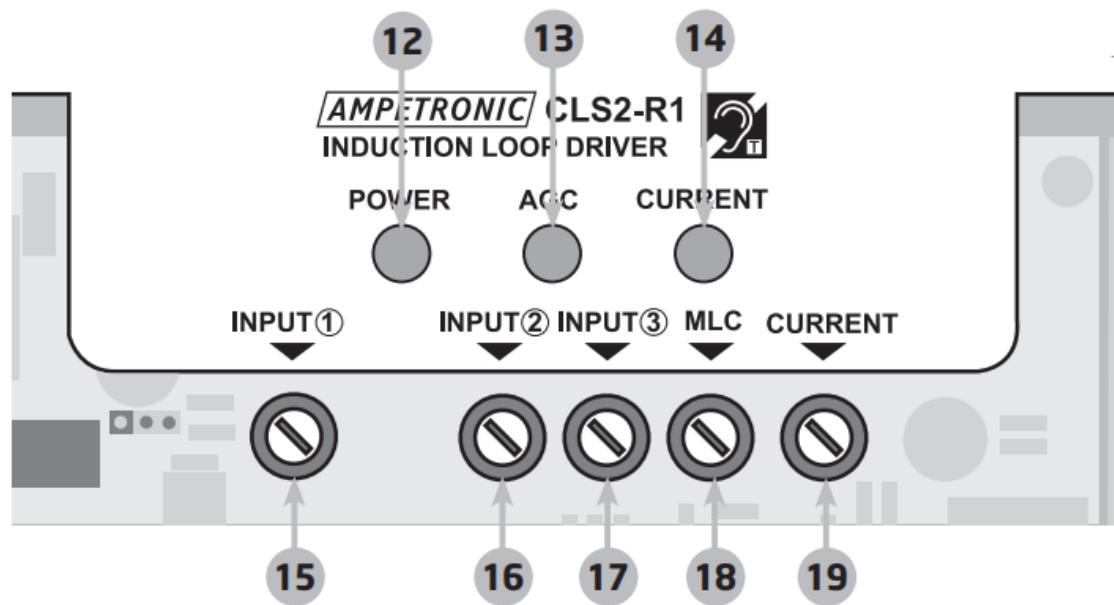


7. INPUT 1: Mic / Line
8. INPUT 2: 100V Line / Speaker
9. INPUT 3: 100V Line / Speaker
10. AC POWER: IEC Inlet
11. Ground Stud: M6

12. Mains Cable Securing 'P Clip': M4

13. Loop Out: Neutrik NL4

## CONTROLS & INDICATION



14. AC POWER INDICATOR LED

15. AGC ACTIVE INDICATOR LED

16. CURRENT SUPPLIED TO LOOP INDICATOR LED

17. INPUT 1 GAIN: Screw Adjuster

18. INPUT 2 GAIN: Screw Adjuster

19. INPUT 3 GAIN: Screw Adjuster

20. METAL LOSS CONTROL: Screw Adjuster

21. OUTPUT CURRENT CONTROL: Screw Adjuster

## INSTALLATION

### Tools

A magnetic field strength meter (e.g. Ampetronic FSM) or a loop receiver (e.g. Ampetronic ILR3 or ILR3+) is vital to check that the loop system is providing the desired level of performance.

A small flat bladed screwdriver is necessary to adjust the controls and secure cables into the screw terminals.

A PH2 driver is required to open and close the lid Location

The unit is designed for wall or panel installation (or optional insertion into a 1U rack space), with a detachable lid which is secured by four Phillips No 2 screws. The unit may also be used free standing.



The location must provide adequate ventilation for the unit. If the unit is installed in an enclosed environment, sufficient airflow into the enclosure must be provided through vents, fans or other means.

Contact Ampetronic for advice on cooling requirements for your installation.

Once the location is decided remove the lid by unscrewing the 4 securing screws and unplug the earth wire. Use the base section to mark the wall for drilling.



The CLS2-R1 is classed as a permanently connected apparatus and as such shall be installed in accordance with relevant building and wiring regulations.

## CONNECTION & SET-UP

It is advised that the loop system is initially set up using a local audio source such as a CD player, which is not connected into any other system. This avoids the complication of ground loops and feedback etc, whilst the unit is

set up.

The following procedure assumes cables have already been installed to the site where the unit will be mounted and that the AC power feed is isolated.

1. Mount the unit in its intended position.
2. Route cables / conduits to appropriate connectors.
3. Turn all controls fully anti-clockwise.
4. Connect the loop feed cable into the NL4 connector (1+ & 1-) and plug into the Loop Out.



The feed cable should be tightly twisted. The 'Designing Induction Loops' handbook contains more details on loop and feed cables. The correct design and positioning of the actual loop is vital for satisfactory system performance. If in doubt consult Ampetronic for advice, or see project specific documentation.

5. Connect the signal inputs appropriately:

Microphones (balanced only): Suitable dynamic or condenser microphones. Select phantom power as required. Connect to INPUT 1 (with Mic/line selector switch in the Mic. position) see Connections drawing.



100V line / low impedance speaker: Connect to the appropriate terminals of INPUT 2 & 3 (see Connections drawing). This input may have a hazardous voltage on its terminals and must only be connected by a suitably qualified person.



6. Connect AC power to the I.E.C. Connector

Ensure all relevant tests of AC supply have been carried out before turning supply on.

7. Turn on AC power feed. The POWER and AGC LEDs will illuminate. If the LEDs fail to illuminate consult the Troubleshooting section. The AGC LED will go out after a few seconds.
8. Select one input and apply a suitable audio signal (ideally the FSM test signal track applied via an audio player to INPUT 1, with no connection to the other inputs). If the product has not been supplied pre-configured, turn the associated input control clockwise until the AGC LED illuminates.
9. If the product has not been supplied pre-configured, turn the CURRENT control clockwise until the CURRENT LED begins to illuminate. If high frequency oscillation or low frequency hum is experienced, consult the Troubleshooting section. If pre-configured, check that the AGC and Current LEDs are lit.
10. The loop system should now be providing a magnetic field inside the area of the loop – use a field strength meter or loop receiver to examine its performance with respect to:
  - a) Magnetic field strength. This may vary across the coverage due to layout, metal loss and loop current.
  - b) Frequency response. Metal losses tend to increase with frequency, and may require the adjustment of the MLC control.

As a result of this analysis, adjust the CURRENT and set the MLC. Ideally a field strength meter should be used to ensure adequate magnetic field strength (0.4A/m rms with a sinewave signal) and a level frequency response ( $\pm 3\text{dB}$  ref. 1kHz between 100Hz and 5kHz) to satisfy IEC60118-4. Once the CURRENT and MLC controls have been adjusted to the correct level they should NOT need re-adjusting.

**NOTE:** If the magnetic field strength, or frequency response varies significantly between the edges and the centre of a perimeter loop this may indicate significant metal loss. If the standard cannot be met a redesign of the loop will be required.

11. If not already done so, steps can now be taken to integrate the CLS2-R1 into a PA / mixer arrangement following standard audio techniques. If any unusual effects are experienced refer to the Troubleshooting section.

**NOTE:** Ideally, each input signal level should be set to just illuminate the AGC LED with the quietest level of input likely to be used. This will maximise the dynamic range of the system and ensure satisfactory performance.

12. Repeat the above procedure for each input used. When adjusting each input, make sure the signals are removed from the other inputs. This ensures that all signals are set to equivalent loudness and drive the AGC properly.
13. Finally refit the lid and earth wire. Secure with the screws provided.



The earth wire **MUST** be reconnected to maintain safety

## TROUBLESHOOTING

### POWER LED not illuminated

Check fuse continuity. A 20mm fuse is incorporated into the I.E.C. Inlet. Test the continuity of the fuse using a multimeter. A spare fuse is provided in the fuse holder

Any replacement fuse **MUST** be of the same rating and type as printed on the inner label of the unit.

AGC LED not illuminating

Check input connections.

Ensure that the appropriate control (INPUT1, INPUT2 or INPUT3) is turned up. Check there is sufficient signal level for the required input.

CURRENT LED not illuminating

Check the AGC LED is illuminating.

Check that the CURRENT control is turned up sufficiently.

Ensure the POWER LED is illuminated.

Check that the loop cable is connected & terminated correctly.

Check the loop is not open circuit, short circuit, or connected to earth (see instability or high frequency noise section of Troubleshooting)

The unit could be overheating (loop current is not delivered if the internal heatsink reaches a predetermined level). To establish if this is the case turn the unit off and allow to cool down before turning on. Ensure that the unit is installed in a location with sufficient ventilation.

Low magnetic field strength

Due to insufficient current or excessive metal loss.

May require a special loop design to achieve acceptable performance, contact Ampetronic for advice.

### Instability or high frequency noise

1. It is possible for the loop cable to be grounded under fault conditions, resulting in instability which may sound like high frequency noise, buzz or whistling.

This fault is easy to determine. Simply disconnect the loop cable from the amplifier and test with a resistance meter between either of the loop wires and a good earth point such as a metal radiator. There should be an infinitely high reading i.e. no connection at all. Any reading indicates a failure of the loop cable insulation and you will need to either repair or replace the loop cable.

2. Instability can be caused by using poor quality signal cables, long unbalanced (2-wire) signal runs to the inputs, or by running input cables in close proximity with the loop wire over an appreciable distance. Loop amplifiers are capable of delivering high currents at audio frequencies. If the loop cable is run close to sensitive signal cables it may be possible to induce a signal back into the input of the amplifier causing feedback. Cable runs and loop wires should be kept well apart from each other. To avoid interference maintain a separation of at least 300mm.
3. Instability can cause the amplifier to run hot and may result in an overheat condition (see CURRENT LED not illuminating section).

## **Interference**

1. Background magnetic field signals or interference may be present in any location and may not be anything to do with the loop system. Monitor this with a loop receiver (such as an ILR3, ILR3+ or Field strength meter). If the interference is still present with the loop system switched off, then you need to locate and eliminate the source of the interference before switching the loop system back on.
2. Magnetic fields can induce currents into any low impedance electrical path or loop. Audio or video systems with multiple earths may experience pick up of the loop signal. Check entire sound system for evidence of loop signal, and trace source of pick up.
3. Under certain circumstances, the loop signal may appear as jagged lines or hum bars on a CCTV picture. This could be due to running CCTV (low impedance unbalanced 2-wire circuit) cables in close proximity to the loop cable. Separate the loop cables to reduce the effect.
4. Remote (and apparently unconnected) PA systems can sometimes pick up loop signals. This is usually because the loop cable becomes damaged (see point 1 of Instability) or induces signals into the remote system through long unbalanced cables. Always run long audio signal cables as 3-wire balanced circuits and keep away from loop cables.
5. See also point 1 of Instability

## **ACCESSORIES**

Details of all products and services provided by Ampetronic can be found at [www.ampetronic.com](http://www.ampetronic.com)

## **OPERATION INSTRUCTIONS**

The CLS2-R1 unit can be left connected and powered on indefinitely. It should not require post commissioning adjustment of the controls during normal operation.

A visual check of the status LEDs can be performed to ensure that the unit is powered up and has an input signal. Periodic system testing can be performed using the Maintenance Manual contained in this Handbook method to ensure the amplifier and loop are functioning correctly.

## **TECHNICAL SPECIFICATIONS**



INPUTS 8 SIGNAL PROCESSING	MIC		Line		UNIT S
Input figures quoted at maximum front panel gain control setting.	Low gain	High gain	Low gain	High gain	
INPUT 1; (MIC/Line) XLR connector. Balanced, Suitable for up to 6000 microphones or line level. Input impedance Sensitivity Overload	8,700 -62 -24	8.700 -77 -39	8.700 -37 +1	8.700 -52 -14	a dBu dBu
	100V		Speaker! Line		
INPUTS 2 8 3; (100V/Speaker) Isolated 100V line or low impedance speaker Input impedance Sensitivity Overload	120.000 +15 +47		8.000 -9 +27		i) dBu dBu
AGC; Compression of signal in dB indicated by front panel LE O when active Input range Output range Min. input level for AGC Attack time Decay time	>36 ±1 Depends on input mode used (see sensitivity) 3.8 1.7				dB dB ms s
METAL LOSS CORRECTION; Specially designed adjustable filter to compensate for the effects of metal loss. Gain @ 1kHz remains constant Min. slope Max. slope	0 +3				dB/ oct. dB / oct.
	230V Version		120V Version		
AC Power; Frequency Consumption Fuse	45-65 30 T250		45-65 30 T500		, 1 1
OUTPUTS					UNIT S
LOOP OUTPUT: NL4 speakon. Voltage RMS Current RMS into single turn loop. Absolute max short term peak current. Continuous pink noise current THD +N (@1kHz full output) Maximum loop impedance at full current Frequency response (±3.0dB no AGC)	7.1 4.9 10.0 2.3 0.5 1.3 80 to 6300				VRms ARM S ARM S ARM S 0 Hz

## WARRANTY

This product carries a five year parts and labour warranty from date of shipment from Ampetronic. To qualify for the five year warranty, the product must be registered at [www.ampetronic.com](http://www.ampetronic.com) (products/warranty), without which the warranty will be valid for two years only.

The warranty could be invalidated if the instructions in this handbook are not followed correctly, or if the unit is misused in any way.

## **DECLARATION OF CONFORMITY**

Manufacturer: Ampetronic Ltd.  
Unit 2, Trentside Business Village  
Farndon Road  
Newark  
NG24 4XB

Declares that the product:

Description: Induction Loop Driver

Type name: CLS2-R1

Conforms to the following Directive(s) and Norm(s):

Directive 2014/30/EU

EMC:

EN 55032:2015 Emission

EN 55103-2:2009 Immunity

EN 50121-4:2016 Railway Applications

Directive 2014/35/EU

Safety:

EN 62368-1:2020

Directive 2011/65/EU RoHS

Date: March 2022

J.R. Pieters

Managing Director

Ampetronic Ltd

## **MAINTENANCE MANUAL**

### **Overview**

1. This procedure is for checking an Induction loop systems (otherwise known as a hearing loop, T-loop or 'AFILS' performance against the IEC 60118-4: 2006 Standard.
2. The procedure takes into account how the system is actually used. You will need access to the induction loop amplifier to conduct the tests.
3. To use this procedure the loop amplifier must have an indicator which shows when the Automatic Gain Control (AGC) is activated. This indicator may be labelled as 'AGC', 'Compression', 'In' or 'Input' on the amplifier. Most amplifiers have this feature.
4. You will need to follow all the steps detailed to properly to check the system.
5. In the event that any step of the process shows a problem, and you are not able to resolve the problem as instructed, the issue should be reported for further action.

### **Equipment required**

You will require:

- A field strength meter (FSM), or professional audio analyser that reads 0dB at 400mA/m field strength, and headphones to listen to the loop system
- This document.
- If not using a PA signal, a Signal Source and connections will be required.
- If adjusting the controls, a small Phillips screwdriver and a small terminal screwdriver / trim tool.

**NOTE:** If the platform PA is not available to be used, you cannot complete the test BUT you will be able to identify most problems using the separate pink noise signal source.

## **Product Installation – Visual Inspection**

1. The unit must be securely mounted in a location not susceptible to water ingress or excessive dust/dirt.
2. The installed unit should not have any sign of physical damage
3. The following connections should be present and correctly terminated at BOTH ends of the connection (where this can be inspected):
  - AC POWER
  - Safety Earth bond
  - LOOP OUTPUT (feed cable to loop)Check that the connector has been rotated clockwise to lock after insertion.
  - PA speaker line input connected to appropriate pins in connector INPUT 2 and/or INPUT 3 as required – at least one connection required

## **Environmental Magnetic Noise Check**

1. Use a Ampetronic FSM Field Strength Meter, held vertically at about 1.4m above floor level, in the centre of the looped area. The FSM should be set to 'background noise' mode (lower / 'Green' switch position).
2. Check that the reading is not above -22 dBL on the FSM, ideally below -32 dBL. It may occasionally be higher for a very short time, typically during a nearby tram movement, but in the 'Listening Check' (later) this must not impair intelligibility of the loop signal.

## **Basic Functionality**

1. Ensure the PA is not actively delivering a message
2. Apply AC power to the unit.
3. Initially, the POWER and AGC lights should be lit.
  - The CURRENT light should not be lit after a very short time.
  - The Power light should remain illuminated at all times.
  - The AGC light will fade and go out after about 20 seconds.
4. Set the PA to deliver a message
  - If this is not possible, deliver a test signal (from a suitable source) into the 2V terminals of input 2 or input 3 (choose the unused input if there is one). The test signal should be of sufficient level that the AGC light is illuminated whilst the signal is present.
5. When the PA is delivering a message, check:
  - The AGC light is lit, and the CURRENT light is lit on peaks of signal (may only be occasionally lit)

## **Magnetic Field Strength Check**


1. Identify the area of platform enclosed by the loop
2. Apply a pink noise signal to the unit
  - Either by playing pink noise through the PA,
  - Or by applying a test signal to the 2V pins of one of the inputs 2 or 3
  - If it is not possible to use pink noise, set the PA to deliver a voice message.
3. Use a Ampetronic FSM Field Strength Meter, held vertically at about 1.4m above floor level, in the centre of the

- looped area. The FSM should be set to 'field strength' mode (middle / 'White' switch position)
4. Check the field strength reading across the looped area (move around the area):
- With pink noise, the reading should be about -3 dBL to -7 dBL typically.
  - With PA speech, the reading should be about -5 dBL to -9 dBL typically on peaks of audio

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## Documents / Resources

	<p><a href="#">AMPETRONIC CLS2-R1 Concourse Hearing Loop Driver</a> [pdf] Instruction Manual CLS2-R1 Concourse Hearing Loop Driver, CLS2-R1, Concourse Hearing Loop Driver, Hearing Loop Driver, Loop Driver, Driver</p>
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## References

- [4 Ampetronic hearing loop system drivers and loop design - 60118-4](#)
- [User Manual](#)