ILD4 INDUCTION LOOP DRIVER

1. INTRODUCTION

The ILD4 Induction Loop Driver has been designed as a very high quality power driver for small to medium size audio frequency induction loops. Ease of installation and use have been major factors in the design, combined with optimised performance, and freedom from R.F.I. generation to meet all future technical requirements.

To ensure compliance with all technical standards, it is essential that the equipment is installed by a person who is technically competent in professional audio, and who has the necessary installation skills.

This product carries a 5 year warranty which could be invalidated if the following installation instructions are not adhered to.

2. PRELIMINARY INSTALLATION DATA.

2.1 Inspect the equipment upon unpacking, and check for damage.

2.2 Install the unit in the place where it will be used. Care must be taken that this location provides satisfactory ventilation for the equipment. In order to ensure this, the unit should not be installed in a tightly enclosed space. Enough room must be available to permit free airflow across the equipment. If the unit is installed in an enclosed environment, sufficient air flow must be provided through vents, fans or other means. The amount of heat generated depends on the loop size, and wire gauge, but can be such that the reliability of the equipment will be reduced if the ventilation is poor.

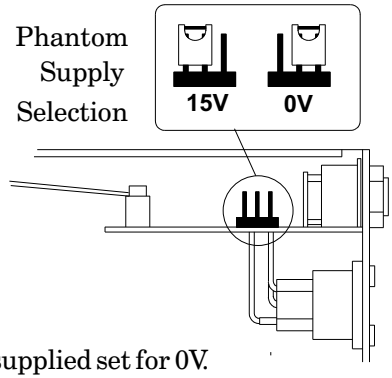
The unit can be installed freestanding, rackmounted or wall hung with special adaptor brackets.

2.3 Prepare the input signal connection as described in section 3.

2.4 Connect the loop cable to the rear Loop Terminals. Ensure that no stray wire ends protrude from the terminals. The polarity of the loop is not important, unless a specialised low–spill system is being installed. For sizing of the loop, see the chapter on Loop Design. It is important that the loop cable ends form a twisted pair between the amplifier and the loop, to reduce the magnetic field near the amplifier position generated by the loop cable.

3. INPUT SIGNAL SOURCES

3.1 The equipment can be driven from various sources, such as a microphone, a P.A. system, any other audio system, or separate microphone preamplifier. In all these cases, apart from a single microphone, which is connected straight to the Input no.1, the Line Input socket (Input 2) should be used.



3.2 Microphone Input – Input 1.

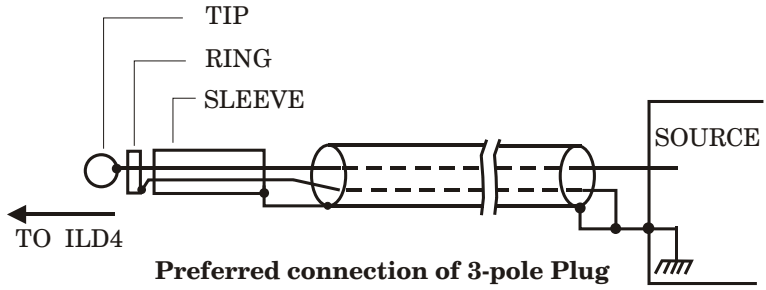
This input provides an XLR, electronically balanced input for direct connection of a microphone. An internal moveable link, positioned near the top edge of the input preamplifier, allows selection of +15V phantom power, or 0V. The equipment is normally supplied set for 0V.

High quality screened microphone cable is necessary for this connection to ensure correct operation. Low quality, or poorly screened cable may result in serious instability of a full system, or non–compliance with the EMC requirements.

3.3 Line Input – Input 2.

This input to the equipment is a balanced line high impedance input connection, which also permits single–ended operation. The connection is made via a 2-pole (unbalanced) or 3-pole (balanced) 6.3mm jack plug. Unbalanced inputs must use less than 3 metres of cable.

To prevent earth current loops causing hum effects, it is usually best to use the balanced input mode, coming from a single–ended signal using a good quality two–core plus screen cable as shown in the figure below. The connector sleeve is connected to the screening braid, the ring connected via one of the two cores to the source ground, and the tip to the source signal. If hum is encountered, then the earth lift switch should be used to disconnect the amplifier signal circuits from the AC power ground.



Preferred connection of 3-pole Plug with unbalanced signals.

3.4 100 Volt Line

The ILD4 can be connected to a 100V line system via the ATT100 adaptor. This allows any line configuration, from single–ended to balanced mode. The leads from the 100V speaker line are wired to the connector which plugs into the adaptor, which is plugged directly (no extension cable!) into the Line Input socket.

3.5 Microphone Modules

The equipment can be used with separate microphone pre–amplifiers, which are available in different configurations (see data sheet for details). The power for these amplifiers (except MP52 which needs a separate supply) can come from the Pre–amp Power socket, and the pre–amp output is connected into the Line Input socket. To ensure EMC immunity, cable length should be less than 1 metre.

3.6 Slave (Input)

The insertion of a 6.3mm 3–pole jack breaks the link between the input stage/ compressor and the power driver. The tip will be the pre–amp output (after compression) and the ring connection is the input to the power amplifier (see below). This connector is mainly used for the connection of the special signal processor used in low–spillover loop installa tions where the master unit controls the signal gain, and the slave unit operates purely as a power driver. This is essential to ensure full tracking between amplifiers. ***Under no circumstances should this input be used as a normal input***, as this bypasses the automatic compression circuit. This compression is essential to the correct operation of other circuits which prevent RFI generation. Cable length must be less than 3 metres.

4. SIGNAL OUTPUT FACILITIES

4.1 Slave (Output)

The output on this connector is the signal needed for driving equipment used with low–spill systems (see 3.6). It is also very valuable for driving other audio equipment such as tape/cassette recording equipment, as the signal has been processed by the compressor, and therefore the dynamic range of the signal is reduced by the amount of compression. This can also be understood as an automatic gain control network. To obtain this recording facility the tip and ring of the 3–pole jack plug must be electrically joined. Do not use 2–pole plugs.

4.2 Loop Monitor

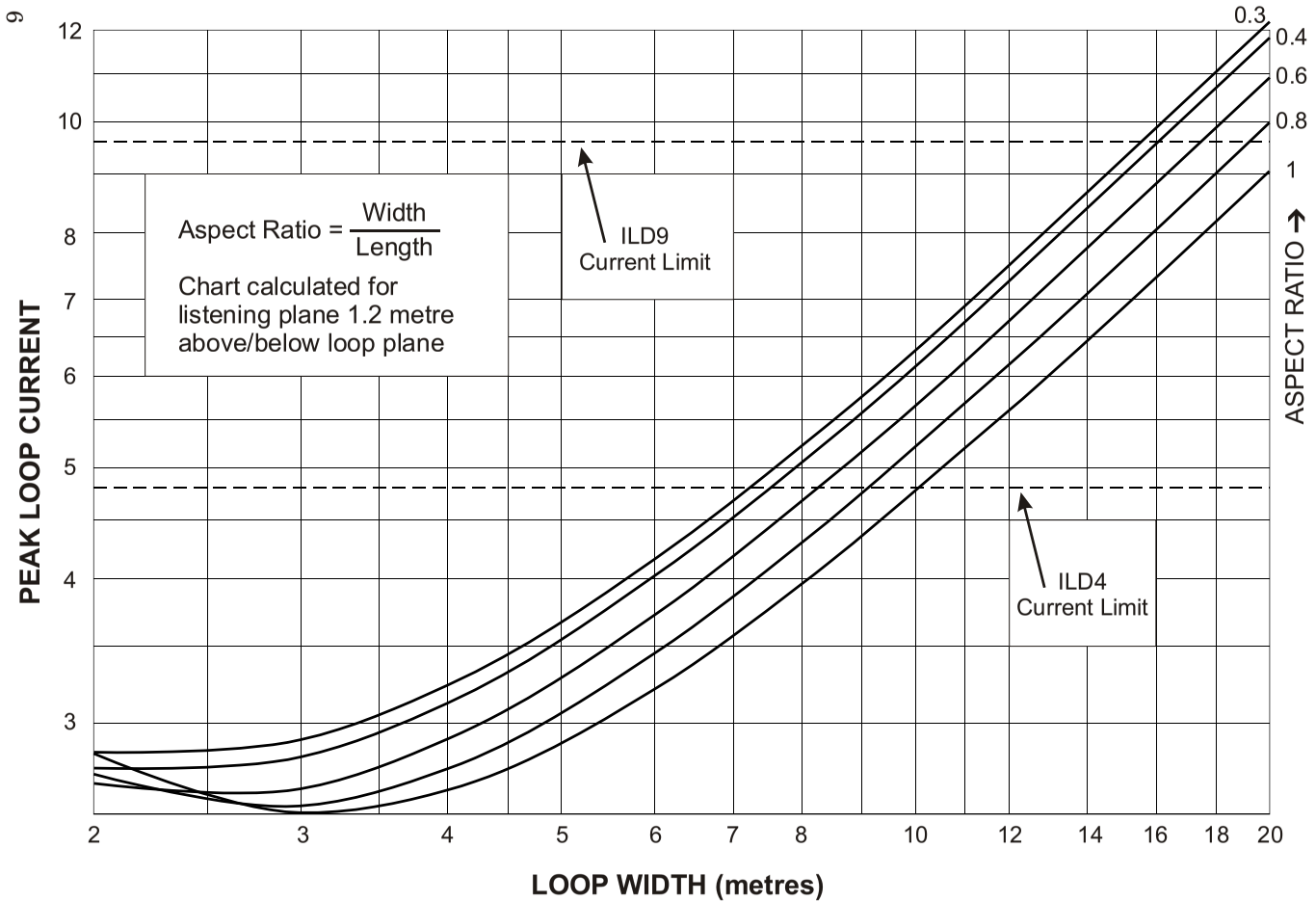
This jack socket on the front panel allows connection of standard, good quality stereo headphones for monitoring the current in the loop (do not use extension cables for this signal). The headphones are at this point connected in parallel with the loop current sensing resistor, which is of very low value (150 mΩ) and therefore what can be heard at this point is exactly the current which is fed into the loop.

5. LOOP DESIGN

The design of the actual loop is an important aspect of the satisfactory operation of the ILD4. A number of parameters must be taken into account, and the following design procedure will provide the correct loop in most installations. It must be stressed that there are sometimes very unusual circumstances which demand unusual solutions, and the installer should then take great care over the design and installation aspects. These instances are generally buildings with heavy metal reinforcement in their structure, which can seriously affect the magnetic field, balcony structures, buildings where several independent loops must be installed in close proximity such as multiple conference rooms without interfering with each other, and rooms which are sub ject to heavy disturbing magnetic fields (close proximity of electricity supply transformer stations, etc.)

5.1 Loop Position

For optimum evenness of magnetic field, it is advisable that the loop plane should be displaced from the normal hearing (listening) plane by some 12–16% of the smallest dimension of the loop (width). Thus for a room 6 metres wide, the optimum loop position is 0.25-0.5 metres above floor level, or some 1.9–2.2 metres above floor level allowing for a normal 1.2 metres seated height. With some degradation, the figures can be 8% to 25%, and this should cater for all normal installations. The position of the loop, and the size thereof, can also be affected by the position of the listening area (often much less than the full room size) and the position of microphones and other equipment that might be affected by the magnetic field of the loop (such as electric guitars without humbucker coils). Where dynamic microphones are used, care must be taken to keep the microphone position outside the loop, or if this is not possible, to keep the actual loop cable as far away as possible from the microphone to prevent feedback (a distance of at least 1 metre is advisable). Some dynamic microphones have better shielding than others, but this can only be established by practical assessment. The use of capacitor/electret microphones reduces this problem. Microphone Lines should always be balanced to reduce the chances of pick–up, and should not run parallel to the loop cable in near proximity.


PEAK LOOP CURRENT
12
10
8
7
6
5
4
3
2
3
4
5
6
7
8
10
12
14
16
18
20
LOOP WIDTH (metres)
ASPECT RATIO →
0.3
0.4
0.6
0.8
1
Aspect Ratio = Width / Length
Chart calculated for listening plane 1.2 metre above/below loop plane
ILD9 Current Limit
ILD4 Current Limit

5.2 Loop Size and Current

Having defined the minimum area that must be covered, obtain the dimensions of this area, which for the sake of simplicity we will consider to be a rectangle. If the area is not an exact rectangle, then take the width and length of the largest portion of the loop area. Note length L and width W. Using a calculator, calculate the aspect ratio W/L (note that L is the larger of the two measurements). Using this ratio figure, and the width, consult the current chart. If the aspect ratio is not a value shown on the chart, then interpolate between given values. The intersection of the "aspect ratio" curve with the "width" line will give the peak current needed in the loop to satisfy the 0.4A/M peak field strength requirement. It must be noted that the chart is computed for a listening plane that is offset from the loop level by 1.2 metres. This is the normal case for a loop at floor level, as this equipment is generally used in rooms with seated listeners. If the chart indicates a current that is greater than the peak current of the ILD4, then a larger driver will be required. This is also true where signifi cant amounts of metal are present, as this absorbs energy in a frequency–dependent manner. A special steel–loss corrector may be needed in such circumstances and substantial extra power may be required to obtain the necessary performance. Please contact Ampetronic for assistance in all these situations.

5.3 Choice of loop Cable

Please note that the Ampetronic Loop Drivers have been designed to operate into ***single turn loops***, and must not be used with old–fashioned multiturn loop layouts. Unusual or special loop layouts may only be used with the express approval of Ampetronic Ltd. to ensure compliance with all the technical standards.

The maximum DC resistance of the loop (including feed cable) should be less than 1 Ohm, but greater than 0.2 Ohm, for optimum performance. Maximum cable length (i.e. total length of cable, end to end, including feed / connecting cable) for these limiting resistances is as follows:

Cable size section	Minimum length (m)	Maximum length (m)
0.5 mm^2	6	29
0.75 mm^2	8	44
1.00 mm^2	11	59
1.50 mm^2	17	88
2.50 mm^2	29	147
18 mm Copper Tape	10	53
25 mm Copper Tape	14	74

Normal stranded, or solid–cored cabled can be used. A suitable cable for most applications is standard "Tri–rated" cable to BS6231, CSA, UL approval. The flat copper foil tape is available from Ampetronic for installation under carpets.

The cable from the loop to the ILD4 output terminals MUST be a twisted pair. Contact Ampetronic if this distance is > 20 metres.

6. LEVEL ADJUSTMENT

6.1 Initial setting up

During the initial commissioning of the equipment it is essential that the following procedure is used to ensure a satisfactory end result. Turn the "Gain1" and "Gain2" and "Drive" controls fully anti–clockwise, i.e. minimum signal. Provide a continuous input signal, preferably from a small tape or CD player with wideband music, connected directly (i.e. not via an external audio system) to the line input.

Increase the "Input 2 Gain" until 2 of the compression LEDs are illuminated under peak signal conditions. This establishes a reference level for the output power driver. Increase the DRIVE setting until the desired output current is achieved (section 5.2). If no reading is obtained, check for loop continuity. Where the current needed is a value in between two LED readings, position the control by interpolating, bearing in mind that consecutive LEDs illuminate at 3dB intervals. Having achieved this setting of the DRIVE, check with headphones plugged into the loop monitor output socket that a satisfactory sound quality is obtained from the loop current. If a standard Field–strength measuring unit is

available, then check that the field has the correct strength. From this point onwards, the DRIVE control will not need re–adjusting, as this only affects the peak field strength.

Before connecting to the sound system, check the entire sound system for crosstalk from the loop into the audio inputs. While still playing a music tape or CD, check every input circuit of the sound system, and if a significant amount of signal is picked up, identify the reason and correct. This ensures adequate stability for the complete system.

Connect the cable from the audio system to the line input, and readjust the input gain control for optimum compression. If only the microphone input is used directly, without another sound system, then set up the entire system from a normal sound source driving the microphone. The level is set with the "Input 1 Gain" control. When using separate pre-amps, then adjust the gain controls on these pre-amps, and the "Input 2 Gain" to achieve a satisfactory balance.

6.2 Setting of GAIN control – Optimising Compression

In order to obtain the greatest possible dynamic control range from the compressor, it is now necessary to establish the highest level of input signal which the equipment may receive in the operational installation. This will often be loud, close talking into a microphone. If the GAIN is adjusted so that the red OVERLOAD LED does not illuminate (just), then the compressor will maintain the highest possible level into the loop for faint speech, etc. Monitoring with the output headphones will indicate the clarity of the signal under all levels of compression. It should be pointed out here that back ground hum and noise from equipment earlier in the chain, such as a P.A. system may sound very troublesome when subjected to some 20–36db extra amplification. When this occurs, the gain must be kept at a lower level. This may also have to be done in the case of marginal magnetic feedback via dynamic microphones, etc. Where the dominant signal is music, it may be important to keep the compression level low to prevent serious degradation of the music dynamics. Experience will indicate which level to use. REMEMBER: once the DRIVE control has been set, only adjust the GAIN controls, otherwise the correct operation of the system is impaired.

7. GENERAL INFORMATION

7.1 Difficulties

If you have any difficulties in calculating the loop design, or experience difficulties with the operation of the equipment, then contact your supplier or Ampetronic Ltd. It is useful to have all the relevant data available when contacting our technical staff who will be pleased to help you. The following are known trouble areas:

– Strong hum field, mainly from fluorescent light fittings, or electrical wiring where current flow and return are not in the same cable or duct.

– Electric guitars used in single–coil mode. Twin coil/humbucker mode is generally necessary to prevent pickup of the loop signal into the guitar.

– Loop cable installed where it is in close proximity to microphone (or other audio) cables for an appreciable length. Telephone cabling can also be very sensitive to this coupling.

7.2 Fuses

A 20mm fuse is incorporated in the rear panel power input socket. It is necessary to remove the power cord before extracting the fuse holder. The fuse rating and type are printed on the rear panel.

7.3 Rack Mounting

A rackmount kit is available for installing the ILD4 in a standard 19" rack, taking up 2 rack spaces (2U). As the unit is only ½ rack width, a blanking plate is needed if only one is installed. Standard pre–amps such as the MP21 and MP52 can be installed in the same rackmount kit.

Wall mounting brackets are also available for fixing the amplifier to a wall in various orientations.

7.4 **WARNING - THIS APPARATUS MUST BE EARTHED.**

7.5 The 5 year warranty is dated from the time the equipment leaves Ampetronic and NOT when it is installed. Any tampering withthe equipment invalidates the warranty.

8. TECHNICAL SPECIFICATION

8.1 Microphone Input:

Suitable for driving from 200–600 Ω microphones.
Electronically balanced, XLR connector.
Phantom voltage +15V available (normally set to 0V).
Input Sensitivity better than -65dbu, overload level -20dbu.

8.2 Line Input:

Impedance 1M Ω each side, 2M Ω differential.
Sensitivity: 7mV to 7Vrms (-40dBu to +20dBu).
Balanced signal input on 6.3mm 3–pole jack socket.
Common mode rejection better than 50dB below 500Hz.

8.3 Slave Input:

Impedance 33k Ω Sensitivity 1V rms, +2.2dBu.
3–pole jack socket.

8.4 Slave Output:

Source Impedance 100 Ω Output level 1V rms +2.2dBu.
3–pole jack socket

8.5 Loop Current:

4.8A Peak signal current into SINGLE TURN loop
Metering via front panel LEDs. These LEDs indicate the peak current, with intervals of 3dB.

8.6 Loop Resistance:

Must be less than 1 Ω, greater than 0.2 Ω.

8.7 Compression:

Compression range 36dB before overload. Front panel indication of compression level. Efficiency: less than 0.25dB output change for 25dB input change. Attack and Decay time constants optimised for speech.

8.8 Frequency response:

80Hz to 10kHz ±1.5dB at low level, measured as loop current.
High frequency high signal level response is a dynamic variable and is a function of loop size, loop current and signal content to ensure that no RFI generation takes place.
Internal time constants are very short.

8.9 Pre–amp power:

±15V regulated at up to 0.1A.

8.10 AC Power input:

115V and 230V operation, 50-60Hz.
Factory setting of voltage selection.

8.11 Dimensions : Length: 215mm
Depth: 175mm
Height: 88mm (2U)
Rackmount and Wallmount accessories available.

8.12 Weight: 2.0kg.

Declaration of Conformity

Manufacturer:	Ampetronic Ltd.
Address:	Northern Road, Newark, Nottinghamshire, NG24 2ET. United Kingdom.

Declares that the product:

Description:	Induction Loop Driver
Type Name:	ILD4

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

Directive 89/336/EEC	
EMC:	EN55103 (1 & 2) 1997
Directive 73/23/EEC	
Safety:	EN60065 (1995)

September 2000

L.A. Pieters
Managing Director
Ampetronic Ltd.